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October 20, 2022

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SUBJECT: PFAS Release at United States Coast Guard Air Station Traverse City, 1175 Airport Access Road Traverse City, Grand Traverse County, Michigan; Site ID No. 28000154

Dear Mr. Flickinger:

The United States Coast Guard (USCG) submits the Supplemental Site Investigation Report (Report) to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in response to the EGLE requested investigation for suspected per- and polyfluoroalkyl substances (PFAS) releases potentially related to USCG Air Station Traverse City.

As noted in the Report, there are data gaps that the USCG will be addressing in the near future. We look forward to working with your office as we proceed further into this investigation. If you or your staff have additional questions or concerns feel free to contact Mr. Gregory Carpenter, Chief of Environmental Compliance, at 216-902-6219.

Sincerely,

Commander Neal E. Armstrong
Commanding Officer
USCG Civil Engineering Unit Cleveland

U.S. Department of
Homeland Security

United States
Coast Guard

United States Coast Guard

Supplemental Site Investigation Report

US Coast Guard Air Station Traverse City
Traverse City, Michigan

October 20, 2022

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Acronyms and Abbreviations

AFFF	Aqueous film forming foam
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CCA	Cherry Capital Airport
CPT	Cone Penetration Testing
CSM	Conceptual Site Model
DOD	Department of Defense
DPT	Direct Push Technology
DW	Drinking Water
EGLE	Michigan Department of Environment, Great Lakes and Energy
ELAP	Environmental Laboratory Accreditation Program
EVS	Earth Volumetric Studio
FSS	Fire Suppression System
GAC	Granular activated carbon
GSI	Groundwater Surface Water Interface
MDOT	Michigan Department of Transportation
ppb	parts per billion
ppt	parts per trillion
OWS	Oil-Water Separator
PA	Preliminary Assessment
PFAS	Per- and polyfluoroalkyl substances
PFCA	Perfluorinated carboxylic acids
PFHxS	Perfluorohexane sulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PFSA	Perfluorosulfonic acid
POTW	Publicly owned treatment works
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QSM	Quality System Manual

ROW	Right-of-way
SI	Site Investigation
SSI	Supplemental Site Investigation
TGI	Technical guidance instruction
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VAP	Vertical Aquifer Profile
VAS	Vertical Aquifer Sample
VOC	Volatile Organic Compound

Executive Summary

In December 2020, Arcadis conducted a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) based, PFAS focused Preliminary Assessment/Site Investigation (PA/SI) at the United States Coast Guard (USCG) Air Station Traverse City (ASTC: the site). The PA/SI was conducted in response to the results of a per- and polyfluoroalkyl substances (PFAS) groundwater investigation conducted by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in September 2020, which identified concentrations of either perfluorooctanoic acid (PFOA) or perfluorooctane sulfonic acid (PFOS) exceeding EGLE Part 201 Drinking Water (DW) Criteria or Groundwater Surface Water Interface (GSI) Criteria at 10 investigation locations. The locations were placed in a north-west to south-east transect along the former railroad property south of Parsons Road. The source of the PFOA/PFOS detected along Parsons Road has not been confirmed; however, potential sources of the PFAS include historical releases of Aqueous Film Forming Foam (AFFF) at Cherry Capital Airport (CCA) and USCG.

The PA/SI identified PFAS in soil and groundwater in various areas of the USCG property and the potential for groundwater impacts to have migrated beyond the northern and eastern property boundaries. The results also indicated that PFAS impacted groundwater has migrated onto the USCG property from upgradient sources.

Based on the results of the PA/SI, a Supplemental Site Investigation (SSI) was performed to determine the distribution of PFAS across the USCG property. The objective was to evaluate potential on-site PFAS source areas of the soil and groundwater impacts; the vertical and lateral extent of the impacts at the property; and the vertical and lateral off-site extent of the PFAS impacts in groundwater. The SSI consisted of completing 15 soil borings and 13 cone penetration testing (CPT)/vertical aquifer profiling (VAP) borings on site; 14 CPT/VAP borings off site and evaluating the sanitary/storm sewer system on site.

The results of the SSI indicate the following:

- The Air Station Oil-Water Separator (OWS) and Fire Suppression System (FSS) pumphouse area appear to be primary source areas contributing to PFOS and Perfluorohexane sulfonic acid (PFHxS) exceedances in groundwater observed on-site. Limited detections in soil suggest that any release may have occurred below ground surface (i.e., leaking infrastructure / utility lines).
- PFOS concentrations in groundwater near the OWS greatly exceed concentrations from water within the OWS suggesting that while residual PFAS within the OWS may present the potential for an ongoing source, the vast majority of contaminant mass is already in the groundwater. Water from the OWS is discharged to the sanitary sewer, and subsequently to the Traverse City Water Treatment Plant.
- A camera survey of the oily water lines, storm drains and sanitary sewer identified cracks, open joints, and build-up of residual material. The cracks present a potential for leakage of PFAS impacted water to the soil and groundwater. The storm drain also transports potentially PFAS impacted run-off water to the retention pond, where it can seep into the groundwater.
- The core of the PFOS plume appears focused along a narrow path, driven primarily by groundwater advection.
- There appear to be at least two plumes comingling as they cross the site. One plume dominated by Perfluorosulfonic acids (PFSAs) such as PFOS and PFHxS appears to have originated on-site, and another plume consisting primarily of Perfluorinated carboxylic acids (PFCAs) such as PFOA and Perfluorononanoic acid (PFNA) is unrelated to the PFSAs identified on-site and originates from one or more upgradient sources located off-site.

- The vertical and horizontal extent of PFAS has not been fully defined. However, the vertical extent is expected to be limited by the underlying clay.
- Based on knowledge of contaminant distribution and current site-use, worker contact with impacted media is unlikely during routine activities.

1 Introduction

In accordance with United States Coast Guard's (USCG) objectives, Arcadis completed an on-site and off-site supplemental site investigation (SSI) for Air Station Traverse City (ASTC: the site), Traverse City, Michigan (**Figure 1**) The SSI was based on the findings of the PFAS focused Preliminary Assessment (PA) and Site Investigation (SI) completed in December 2020 and documented in the 2021 USCG Air Station Traverse City Focused PA SI Report – Final at the site (Arcadis 2021a). The investigation was also informed by the results of an investigation conducted by the Michigan Department of Environmental, Great Lakes, and Energy (EGLE) in September 2020 (EGLE 2020a); a PFAS Soil Investigation Report for Cherry Capital Airport (TVC), Traverse City, Michigan by Gosling (Gosling) Czubak Engineering (Gosling 2020); and the 4th Quarter Groundwater Sampling Report for Cherry Capital Airport (TVC), Traverse City, Michigan by Gosling (Gosling 2021).

This SSI Report was prepared in accordance with the SSI Work Plan (Arcadis 2021b) and Comprehensive Environmental Response Compensation and Liability Act (CERCLA) – type Quality Assurance Project Plan (QAPP) developed for the PA/SI (Arcadis 2021c).

2 Background

In September 2020, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) completed a groundwater investigation along the railroad property south of Parsons Road, downgradient of the United States Coast Guard (USCG) ASTC and the Cherry Capital Airport (CCA), and upgradient of private drinking water wells located north of Parsons Road (EGLE 2020a). The EGLE groundwater investigation consisted of ten vertical aquifer profile (VAP) borings to depths ranging from 34 to 54 feet below ground surface (bgs) with up to five groundwater sampling intervals per boring. Concentrations of either perfluorooctanoic acid (PFOA) or perfluorooctane sulfonic acid (PFOS) exceeded EGLE Part 201 Drinking Water (DW) Criteria or Groundwater Surface Water Interface (GSI) Criteria at all 10 locations. The source(s) of the PFOA/PFOS detected along Parsons Road have not yet been confirmed. Potential sources of the per- and polyfluoroalkyl substances (PFAS) include historical releases of Aqueous Film Forming Foam (AFFF) at CCA and USCG. Based on the findings by EGLE, USCG initiated a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) based, PFAS focused Preliminary Assessment/Site Investigation (PA/SI) at the USCG ASTC property (the site).

2.1 Site Setting

The site occupies approximately 16 acres in Grand Traverse County, Michigan and is located approximately one-half mile from the southern shore of East Grand Traverse Bay (**Figure 1-1**). It is bordered by the CCA to the south and west, mixed commercial and industrial properties to the east, and athletic fields to the north. It consists of several storage buildings, a multi-use building, a public works building, and one hangar (**Figure 1-2**). The hangar is used for helicopter storage and maintenance and is the primary building of interest. The hangar is equipped with an AFFF Fire Suppression System (FSS) supplied with AFFF stored in two 1,000-gallon above ground storage tanks (ASTs) in the Fire Suppression Pump House.

2.1.1 Regional Geology

The Traverse City region is geologically composed of an array of glacial and lacustrine deposits overlying shale bedrock of Late-Devonian to Early-Mississippian age. Based on lithology observed during this site investigation as well as previous subsurface investigations, overburden stratigraphy in the area of the site consists primarily of lacustrine and glacial outwash sand and gravel deposits to a depth of approximately 20 to 60 feet bgs underlain by a lacustrine clay. Lacustrine deposits extend from the bay to the southern edge of CCA. South of CCA, the geology consists of outwash deposits and glacial till (United States Geological Survey [USGS] 1985). The lacustrine sands thicken toward the east arm of Grand Traverse Bay. The bedrock surface exhibits significant relief and ranges from 200 feet below mean sea level (msl) to 600 feet above msl within Grand Traverse County (USGS 1990). Depth to bedrock in the northeast quarter of East Bay Township, where the site is located, is estimated to range from 200 to 700 feet bgs.

2.1.2 Site Topography

The site is relatively flat with ground surface elevations ranging from 611 feet above msl in the southeastern portion of the site to 616 feet above msl in the southwestern portion. Beyond the site boundaries, the topography slopes to the north, with a 34.5-foot elevation difference between the site and East Bay.

2.1.3 Site Hydrogeology

The site hydrogeology has been characterized by advancing soil borings and Cone Penetration Testing borings (CPT) shown on **Figure 1-2 and Figure 1-3**. Soil boring logs and CPT logs are provided in **Appendix A**. The following sections summarize the subsurface geology, depth to groundwater and flow, and surface water features.

2.1.3.1 Subsurface Geology

The unconfined aquifer at the site consists primarily of fine to medium lacustrine sand overlying a thick lacustrine clay. The surface of the underlying clay slopes steeply to the east-northeast and the aquifer subsequently thickens in this direction. Glacial outwash deposits consisting of gravelly sand can be found throughout the aquifer matrix in the explored area and were generally observed to increase in thickness and frequency to the east. Three cross-sections were prepared based on soil boring logs and CPT data.

Figure 2-1 presents cross-section A-A’, extending from the south-western property boundary of the USCG property to the intersection of Avenue E and US-31, near the shore of East Bay to the north-east of the site. **Figure 2-2** presents cross-section B-B’ extending from west to south along the northern and eastern site boundaries. **Figure 2-3** presents the northwest to southeast cross-section C-C’, depicting the geological composition beneath the East Bay residential neighborhood.

These cross sections depict the contacts identified in soil borings between the sand and the clay. The USGS completed a 1985 study of groundwater contamination in East Bay Township focusing on the USCG property and the downgradient area. The USGS study suggests that the clay is a continuous impermeable unit at least 100-feet thick, extending from the southern boundary of CCA to East Traverse Bay (USGS 1985).

Closing the distance between the site and East Bay, the clay drops beyond the target investigation depths and was not encountered in all off-site borings.

2.1.3.2 Groundwater

Groundwater occurs throughout the lacustrine sand and gravel deposits underlying the site. The lacustrine sands and gravels underlying the site comprise an unconfined aquifer that flows toward Grand Traverse Bay at an estimated velocity of 5 to 6 feet per day (USGS 1985). Hydraulic conductivities within the unconfined aquifer range from 85 to 150 feet per day (USGS 1985). Depth to water ranges from approximately 10 to 15 feet bgs at the site. Beyond the extent of the lacustrine deposits, confined aquifers are present in outwash deposits located within glacial tills to the south of CCA, and public Type I and II water supply wells located upgradient and side gradient to the site are screened within the confined sands. According to the EGLE PFAS Response, East Bay Township Area of Interest webpage (EGLE 2021), 18 residential drinking water wells and one irrigation well in the East Bay neighborhood were abandoned and the residences connected to municipal drinking water.

2.1.3.3 Surface Water

The surface water features at the site include a retention pond located east of the hangar, and storm drains in the tarmac south of the hangar. The storm lines drain water from the roof drains and the tarmac to the unlined retention pond where it seeps into the ground. Mitchell Creek is located approximately 7,000 feet to the south and 5,000 feet east of the site. Grand Traverse Bay is located approximately 4,000 feet northeast of the site, and Boardman Lake is approximately 8,000 feet to the west.

2.2 Site History and Background

The site is located on property operated as an air station by the United States Navy from 1942 until 1945, when the USCG took possession of the land and all associated buildings.

Many of the former buildings, including five barracks, a dispensary, a bachelor officer quarters, and a mess hall were razed during the 1950s and 1960s. The northern 27 acres of the property, including the portion of the site formerly consisting of the five barracks and mess hall, were transferred to the Traverse City Area Public Schools by congressional legislation in February 1997. The remaining 16 acres of the site are operated by the USCG as a helicopter air station.

2.2.1 AFFF Use and Storage at Air Station Traverse City

According to the site Environmental Protection Specialist, AFFF historically and currently is stored in two 1,000-gallon ASTs located in the Pump House. When activated, AFFF is pumped from the storage tanks to a deluge system where it is mixed with municipal water. The AFFF/water mixture is then pumped to the fire suppression deluge system located in the hangar, where it is dispersed through an overhead fire sprinkler system. The AFFF/water mixture flows toward catch basins located inside the hangar, which direct the mixture to below-grade piping that empties to the OWS and, if the volume exceeds the influent capacity of the OWS, into an on-site retention pond.

Known releases of AFFF from the FSS were reportedly limited to the 2015 partial FSS activation and annual testing of the FSS AFFF concentrations (Arcadis 2021). Annual testing reportedly involved discharge of a small volume of AFFF through a hose located in the hangar. Discharge for testing took place on the tarmac south of the hangar and was used to verify the proper proportioning of AFFF concentrate to water. Annual AFFF discharge for testing purposes was discontinued in 2018. **Figure 1-2** shows potential on-site AFFF sources.

2.2.2 Off-Site PFAS Source Areas

CCA conducted a soil and groundwater investigation to identify potential sources of PFAS on their property (Gosling Czubak Engineering Sciences, Inc. 2020). The investigation identified four potential source areas within the airport boundaries (**Figure 3-1**). One area is located northwest of the Air Station, near the runway at the taxi strip. Another area is located upgradient to the west of the Air Station property, bordering at the site. This is the area were CCA conducted fire drills. A third area is approximately 400 feet upgradient to the south of the site. The fourth potential release area on the CCA property is located approximately 1,800 feet upgradient to the south (**Figure 3-1**).

2.2.3 EGLE September 2020 Vertical Aquifer Sampling Investigation

Between September 14 and 18, 2020, EGLE's Remediation and Redevelopment Division (RRD), conducted a Vertical Aquifer Sampling Investigation along the railroad property to the northeast of the site. EGLE advanced 10 soil borings to a depth of 54 feet bgs, using direct-push technology, and collected up to five groundwater samples from each boring. The groundwater samples were obtained in 10-foot intervals using a 4-foot-long SP-15 stainless steel groundwater sampler.

The groundwater samples were submitted to Vista Analytical Laboratory for PFAS analysis using Vista's Isotope Dilution Method (modified United States Environmental Protection Agency (USEPA) Method 537 for aqueous samples). Groundwater samples were also submitted to the EGLE Laboratory for volatile organic compound (VOC) analysis using USEPA method 8260.

The EGLE report (EGLE 2020a) focused on PFOS and PFOA and compared the sampling results to drinking water (DW) and groundwater/surface water interface (GSI) criteria.

Except for VAS-1, PFOS and PFOA were detected exceeding DW and/or GSI in all VAS locations. In VAS-1, PFOS was detected exceeding DW and GSI criteria. The highest PFOS result (17,900 parts per trillion [ppt]) was detected in VAS-9 at 40-44 feet bgs, the highest PFOA concentration (102 ppt) was detected in VAS-9 ad 50-54 feet bgs.

VAS-1 through VAS-6 did not extend below 40 feet bgs; impacts above criteria at VAS-1 through VAS-5 appear to be limited to a depth of approximately 30 feet bgs, while the PFOA impact above DW was not delineated below 39 feet bgs.

PFOA and PFOS impacts above the applicable criteria in VAS-8 through VAS-10 have been detected in the deepest sampled interval (50 to 54 feet bgs). These impacts were not delineated vertically or horizontally.

Analytical results for the VOC samples indicated tetrachloroethylene in VAS-8 at 40-44 feet bgs below the EGLE Part 201 criteria. No other VOC were detected.

3 Preliminary Site Investigation

In December 2020, Arcadis conducted a Combined Focused Preliminary Assessment/Site Investigation at Air Station Traverse City (Arcadis 2021a). The investigation locations are shown on **Figure 1-2.**

The soil and groundwater investigation completed as part of the PA/SI identified that groundwater PFAS concentrations in 11 of the 12 boring locations (VAP-01 through VAP-06 and VAP-08 through VAP-12) exceeded the DW and/or GSI criteria for PFAS compounds regulated by EGLE. PFAS compounds were detected in VAP-07

but did not exceed their respective DW or GSI criteria. PFAS at various concentrations were detected in all sampling intervals. PFOS and PFOA were the only compounds exceeding criteria in a surface water sample collected from the on-site retention pond.

PFOA and Perfluorononanoic acid (PFNA) were identified in samples collected from upgradient VAP borings VAP-08 through VAP-12 along the western and southern property boundary at the same order of magnitude or higher as in borings VAP 05 through VAP-07, downgradient from the suspected on-site source areas.

PFOS concentrations above criteria entering the site were detected only in VAP-08. On-site PFOS concentrations above criteria were found in samples collected from VAP-01 and VAP-02, located in the suspected on-site source areas, and in samples from downgradient borings VAP-03, VAP-04, VAP-05, located along the eastern property boundary. The analytical results are summarized in **Table 1.**

Soil samples collected from VAP-01 (near the retention pond) and VAP-02 (beneath the tarmac) and one sediment sample collected from the retention pond exhibited concentrations of PFOS exceeding GSI protection criteria. PFOA was not detected in the soil samples or the sediment sample. The analytical results are summarized in **Table 2**.

4 Supplemental Site Investigation

Based on the December 2020 PA/SI, the on-site investigation activities were extended to determine the extent of the on-site PFAS impacts to soil and groundwater. In addition, the SSI scope included verifying the findings of the EGLE September 2020 study and extending the off-site investigation into the East Bay residential neighborhood, if necessary.

The objectives of the on-site and off-site SSI were to:

- Determine the extent of Per- and polyfluoroalkyl substances (PFAS) impacts to soil and shallow groundwater near potential source areas.
- Characterize potential impacts to soil and groundwater near the Oil/Water Separator (OWS) and Pumphouse at the site.
- Determine potential PFAS impacts to the storm and sanitary sewer network at the site.
- Continue to assess on-site groundwater impacts and define Site related contamination versus PFAS impacts related to off-site sources.
- Investigate off-site migration of PFAS-impacted groundwater down-gradient of the site towards East Bay.
- Verify the continuity of the lacustrine clay underlying the impacted aquifer.
- Assess if the on-site retention pond is lined.

Utility clearance was conducted for all on- and off-site subsurface investigation activities. Utility clearing included the request and review of utility maps obtained from the various utility companies in the work area, Grand Traverse County and the City of Traverse City; informing the Michigan OneCall system of the planned activities prior to drilling; and contracting with a private utility clearing company to verify the safety of the chosen drilling locations.

4.1 On-Site Soil and Groundwater Assessment

Arcadis completed soil and groundwater sampling at the potential on-site source areas including the area around the oil/water separator and the fire suppression pump house.

- Three vadose zone soil samples were collected from each soil boring. A soil sample was collected at or near ground surface, above the water table, and at the approximate midpoint between the water table and ground surface to characterize both the horizontal and vertical distribution of PFAS.
- One groundwater sample was collected from each soil boring at the water table using a screen-point sampling devise.

Soil and groundwater samples were analyzed for the 28 PFAS compounds listed in the EGLE PFAS Minimum Analyte List (EGLE 2019). Laboratory analysis was completed by Modified USEPA Method 537 with isotope dilution per QSM 5.3 from a DOD ELAP certified laboratory. Level IV data packages were requested for all PFAS samples (excluding waste characterization samples) and the data was validated by Arcadis. Soil samples were also collected for grain-size and fraction of organic carbon (FOC) analysis.

Arcadis contracted Pace Analytical to analyze all soil and groundwater samples for PFAS; select soil samples for fraction of organic carbon; and waste characterization parameters. Grain size analysis was prepared by a Pace subcontractor, Schnabel Engineering.

4.1.1 Source Area Assessment

Arcadis completed a soil assessment of potential shallow soil impacts related to the known releases of AFFF on the tarmac near the storm lines at the hangar, near the retention pond, and at the former fire training area on the west side of the property.

The source area assessment included investigation of the oil/water separator and characterization near the pump house. Arcadis assessed the potential for secondary releases from the oil/water separator, the fire suppression system pumphouse and the associated piping.

A total of 15 soil borings (ASTC-SC-01 through ASTC-SC-15) were advanced at the approximate locations depicted on **Figure 1-2** using direct push technology (DPT) to a maximum depth of 15 feet bgs at each location.

4.1.2 Drain Assessment

The hangar drains discharge to the storm lines in the tarmac and the sanitary sewer system via the OWS shown in **Figure 1-2**. The storm drains, the OWS, and sanitary sewer were evaluated to determine if they contain residual PFAS, which could be transported to the local waste-water treatment plant, contributing to the contamination of the wastewater with PFAS. Depending on the condition of the storm and sanitary infrastructure, PFAS impacted waste and storm water could also leak to the groundwater acting as a secondary source.

The following steps were completed:

- Available sewer infrastructure including manhole covers and pipe inverts were surveyed by a licensed surveyor.
- Closed Circuit Television camera was used to investigate the sewer lines for potential damage.
- Arcadis collected sediment and waste-water samples from five sanitary sewer manholes and the OWS as well as from the three storm sewer manholes in the tarmac.

The on-site retention pond is part of the storm drain system. As part of the storm drain assessment, the pond was evaluated for the presence of a liner that would minimize infiltration of potentially impacted storm water and wash water from the hangar to infiltrate the soil and impact the groundwater.

4.1.3 On-Site Groundwater Characterization

Arcadis advanced 12 CPT (ASTC-VAP-01 through ASTC-VAP-12) borings on-site as shown on **Figure 1-2**. These borings were in addition to the vertical aquifer profiling borings advanced in December 2020. The objective of these CPT borings was to:

- Further define on-site PFAS impacts related to off-site sources.
- Provide information to confirm whether the results obtained during the PA/SI correlate to downgradient off-site impacts.
- Confirm the presence of a continuous aquitard by advancing exploratory borings 10 feet into the lacustrine clay layer underlying the aquifer.
- Soil data was collected using CPT. The electronic CPT logs were reviewed for geotechnical information (friction, pore pressure) specific to different types of soil encountered. The CPT data was correlated to the manual soil logs generated during the PA/SI to expand upon the Conceptual Site Model (CSM). The CPT logs were also used to determine the intervals for vertical aquifer profiling. Groundwater samples were collected from a second boring adjacent to the CPT boring.

CPT borings were advanced to maximum depth of 70 feet at 12 locations located upgradient and downgradient of the AFF release area (see **Figure 1-2**). At each boring location up to five VAP groundwater samples were collected at nominal 10-foot intervals using a temporary screen point sampling device, if possible.

4.2 Off-Site Groundwater Assessment

4.2.1 Permits

Arcadis contacted the Traverse County Road Commission and the City of Traverse City and obtained the necessary permits to advance borings in the Right-of-Ways of county and city roadways to complete the off-site scope of work.

4.2.2 Off-Site Groundwater Characterization

Arcadis advanced 12 CPT borings (VAP-28 through VAP 39) downgradient of the USCG Air Station Traverse City and two locations to the east of the site (**Figure 1-3**). Planned locations along Parsons Road and Aero Park Drive were not completed because utilities in both streets as well as along the railroad track south of Parsons Road did not allow for investigation in that area without moving onto private properties, which was not planned during this phase of the investigation. CPT borings were advanced to maximum depth of 70 feet and up to five VAP groundwater samples were collected at nominal 10-foot intervals using a temporary screen point sampling device.

Groundwater samples from the off-site sampling locations were analyzed for the 28 PFAS compounds listed in the EGLE PFAS Minimum Analyte List (EGLE 2019). Analysis was completed by Modified USEPA Method 537 with isotope dilution per QSM 5.3 from a DOD ELAP certified laboratory. Level IV data packages for all samples (excluding waste characterization samples) were prepared by the laboratory and validated by Arcadis.

4.3 Investigation Derived Waste

All soil boring locations were abandoned with soil cuttings from the soil borings and bentonite to seal any part of the borehole that did not collapse naturally. Borings in the tarmac were also sealed with concrete. All CPT locations were abandoned with bentonite to seal any part of the borehole that does not collapse naturally. Approximately 495 gallons of liquid investigative derived waste (IDW) – generated during the 2020 and 2021 soil and groundwater investigations were containerized and characterized. The liquid IDW was subsequently disposed of through Northern A1/GFL. GFL picked-up the waste from the site and transported it to the GFL Transfer Station in Kalkaska, Michigan. Here GFL determined that, because there were no solids in the water, that the water could be bulked up with other non-hazardous liquids and deep well injected. GFL transferred the water to Johannesburg, Michigan, where GFL owns a deep injection well (Northeastern Exploration, site ID number MIK493136980). The well is a licensed Class I and Class II disposal well and is inspected quarterly by EGLE. The Bill of Lading for the removal of the drums of liquid IDW from the Air Station is attached in **Appendix D**.

5 Quality Assurance/Quality Control

5.1 Sample QA/QC

Quality assurance/quality control (QA/QC) samples associated with SI activities included field equipment blanks, field duplicates, matrix spikes, and matrix spike duplicates. All QA/QC samples were prepared and collected according to the protocols specified in the QAPP (Arcadis 2021b) and were submitted to Pace for analysis. The analytical results from all QA/QC samples are provided in **Tables 1** and **2**; laboratory reports are attached in **Appendix B**.

5.2 Chain-of-Custody

Chain-of-custody forms identifying each sample contained in a shipping container were completed and signed by Arcadis field sampling personnel, sealed in a plastic bag, and taped to the inside of each cooler lid. One chain-of-custody form was retained for the field records; the remaining copies were placed inside the plastic bag. Samples were shipped to Pace using an overnight carrier service, with custody seals in place on the outside of the cooler. All samples were handled and shipped in accordance with current Department of Transportation (DOT) and International Air Transport Association (IATA) guidelines.

5.3 Field Documentation

Site activities were documented on daily logs. Included in the daily documentation were:

- Procedures for sampling and other routine activities associated with the site activities.
- Logging of soil borings, field screening results, and analytical samples collected.
- Personnel working at the site.
- Chronological log of site activities.
- Photographic documentation as part of the daily logs.

A copy of field notes, including photographs, for the SI activities are provided in **Appendix C**.

5.4 Data Validation

Laboratory analytical reports were reviewed and validated in accordance with the QAPP (Arcadis 2021), using DoD QSM 5.3 and USEPA's National Functional Guidelines (USEPA 1999, 2004, 2017a, 2017b) as appropriate for data validation, laboratory control limits, and professional judgment.

The Arcadis data validator rejected the analytical results for several PFAS compounds for the water sample collected from the sanitary manholes MH-01, MH-02, and MH-03. Among the results rejected was the PFOS result for San-MH-01, which exceeded the applicable criterion. The sample results (including non-detects) were affected by serious deficiencies in the ability of the laboratory to analyze the sample and to meet published method and project quality control criteria. Because of this, the presence, or absence, of the analyte could not be confirmed. The rejection was recommended because the recovery of the extracted internal standards was below the control limits for the method. Arcadis and USCG decided to publish the data for completion.

The laboratory's overall system performance and data quality were acceptable and within the guidelines specified in the analytical method.

Data validation reports are included in **Appendix B**.

6 Results and Discussion

The following section summarizes the groundwater, wastewater, soil and sediment analytical results for the SI. Solely to maintain consistency for comparison purposes with CCA, EGLE and the PA/SI, analytical data for groundwater and stormwater were compared to EGLE Part 201, Table 1, updated December 2020, DW and GSI criteria (EGLE 2020b). Soil and sediment results were compared to EGLE Part 201 Table 3, updated June 2018, GSI protection criteria (EGLE 2018). PFAS compounds are not regulated at the federal level; however, the USEPA has provided a health advisory for PFOA and PFOS in drinking water at 70 ppt.

Soil and sediment analytical results are summarized in **Tables 3 and 4** and on **Figures 4-1** and **4-2**. Groundwater and surface water analytical results are summarized in **Tables 5** and **6** and on **Figures 4-3, 4-4, 4-5, and 5-1**. The certified laboratory analytical reports and data validation reports are included in **Appendix B**.

6.1 On-site Soil Analytical Results.

6.1.1 Source Area Soil Analytical Results

The source area assessment summarizes the analytical results for the tarmac near the storm lines at the hangar; the area near the retention pond; and the former fire training area on the west side of the property. This section also includes the results for areas of potential secondary releases in the vicinity of the oil/water separator, the fire suppression system pumphouse and the associated piping.

PFOS was detected in soil samples collected from twelve of the fourteen source characterization soil borings completed during the SSI (**Figure 4-1**). Laboratory detection limits for PFOS (typically 0.7 to 1 part per billion [ppb]) exceeded EGLE criteria for GSI protection (0.24 ppb) and GSI protection for surface water used as drinking water source of 0.22 ppb. The highest detection of PFOS in soil was 12 ppb in a sample collected from 0 to 1 feet bgs at soil boring ASTC-SC-09, located to the northeast of the retention pond. The remaining detections of PFOS in soils were one to three orders of magnitude lower in concentration. PFOA was not detected in any soil samples.

6.1.2 On-site Storm Drain and Sanitary Sewer Analytical Results

Arcadis collected sediment samples from two of the five sanitary sewer manholes on site (**Figure 4-2).** PFOS exceeding the GSI protection criterion was detected in sediment samples from manholes MH-02 and MH-03 at concentrations of 230 and 61 ppb, indicating decreasing impacts with distance from the Oil/water separator, which is connected to the sanitary sewer system (Arcadis 2021a).

As part of the drain assessment, one sediment sample was collected from the oil/water separator (see **Figure 4-2**). PFOS was detected above the GSI protection criterion of 0.24 ppb at a concentration of 2,300 ppb. See **Table 4** for the full result.

6.1.2.1 On-site Storm Drain and Sanitary Sewer Assessment

The storm drains, the sanitary sewer and the oily water lines in and around the hangar are situated above the groundwater table. Infiltration of impacted groundwater is therefore unlikely. However, water from the pipes could infiltrate into the ground and the groundwater if the pipes were compromised. On August 23, 2021, Arcadis conducted a visual storm drain assessment. Young's Environmental Clean Up of Flint, Michigan, was contracted to operate a close-circuit television camera and provide video footage.

Documentation of the sewer survey is attached in **Appendix E**. Arcadis also attempted to video survey the sanitary sewer, but the video quality did not allow a proper assessment.

In January 2022, Geodetic Designs of Lansing, Michigan, surveyed the available storm drain and sewer manholes as part of a site survey. Northings, eastings, and elevations of the manholes were documented. The inverts of storm drain manhole MH-01 and sanitary sewer manhole MH-5 were also surveyed. Inverts of the remaining manholes were not accessible because they were either filled with snow or water or could not be opened.

The following is a summary of observations made during the sewer video survey.

6.1.2.1.1 Storm Drain Manhole MH-01 to Hangar Manhole

The pipe between storm drain manhole MH-01 and the storm drain manhole in the hangar is an 18” vitrified clay pipe with a total length of 97.5 feet long. The video survey shows cracks at 15.4, 44.3, and 59.0 feet at the dome of the pipe, starting at MH-01. Several of the pipe segment connections also appear not to be tight, showing gaps between the segments. Rebar is showing through broken concrete at the connection between the pipe and the hangar manhole.

6.1.2.1.2 Storm Drain Manhole MH-01 to Oily Water Manhole

The pipe between manhole MH-01 and the oily water line manhole is an 18” reinforced concrete pipe with a total length of 39.8 feet. It was surveyed from both manholes because of a bend in the pipe at approximately 10.8 feet, staring from MH-01. In this first leg of the survey, no cracks or openings have been observed. The second leg of the survey, starting at the oily water drain manhole, is 29.75 feet long before the bend is encountered. In this portion of the storm drain, openings at the pipe segment connections were identified. At 9.41, 17.0, 24.5, and 34.0 feet, filled-in lift holes were observed in the dome of the pipe.

6.1.2.1.3 Storm Drain Manhole MH-01 to Storm Drain Manhole MH-03

The pipe between manholes MH-01 and MH-03 is an 18” reinforced concrete pipe with a length of approximately 107 feet. The video survey was started at MH-01 but abandoned after 9.4 feet due to deposits in the pipe that could not be passed. No cracks were observed in this portion of the pipe. The survey of this pipe was attempted again, starting from MH-03. Gravelly deposits were observed at the bottom of the pipe. At 44.1 feet, a large concrete block was observed in the middle of the pipe and the survey was abandoned because the obstacle could not be passed. A longitudinal crack was observed in the dome of the pipe at 34.4 feet. Plugged lift holes were observed at approximately 35 and 42 feet.

6.1.2.1.4 Storm Drain Manhole MH-03 to Retention Pond

The pipe connecting manhole MH-03 and the on-site retention pond is a 10” reinforced concrete pipe that is 159 feet long. Longitudinal cracks in or near the dome of the pipe were observed at 46.6, 54.5, and 152.1 feet, starting at MH-03. A hole in the bottom of the pipe was observed at 157 feet. The connections between the individual pipe segments appear to be reasonably tight. Lift plugs were missing in two locations (145 and 152.2 feet) in the dome of the pipe, leaving a hole. Filled-in lift holes were observed at 63, 71, 80, and 87 feet.

6.1.2.1.5 Storm Drain Manhole MH-02 to Storm Drain Manhole MH-03

The pipe between MH-02 and MH-03 is a 10” vitrified clay pipe with a length of 154 feet. Encrusted deposits were observed at the bottom of the pipe in the pipe segment connections at 12.0, 22.1, and 153.2 feet. In general, the connections between these segments appear reasonably tight. No crack or holes were observed in this pipe.

6.1.2.1.6 Oily Water Manhole to the East

This 12” vitrified clay pipe was surveyed over a length of 62.4 feet. It extends from a manhole in the Hangar to the east underneath the building. The pipe collects water from the floor drains in the hangar that is generated during helicopter maintenance.

Oily deposits were encountered in the pipes. The connections between the pipe segments are reasonably tight with a joint showing encrusted deposits at 39.2 feet. A tab-in from the north is filled with debris. The end of the pipe is heavily encrusted and filled with debris.

6.1.2.1.7 Oily Water Manhole to the West

This 18” vitrified clay pipe was surveyed over a length of 154.7 feet. It extends from a manhole in the Hangar to the west underneath the building. The pipe collects water from the floor drains in the hangar that is generated during helicopter maintenance.

Oily deposits were encountered in the pipes. The connections between the pipe segments are reasonably tight with joints at 8.4, 97, and 101.4 feet. Multiple cracks were observed in the dome of the pipe at 57.5 feet. Five tab-ins were observed, one from the north, four from the south. Two of the southern tab-ins intrude into the pipe. At 120 feet, the diameter of the pipe decreases. The survey stops at 154.58 feet because the pipe is too dirty.

6.1.2.2 On-site Retention Pond Assessment

The on-site retention pond is part of the storm drain system at the site. During the August site investigation, Arcadis used a hand auger to determine if a liner exists in the on-site retention pond. The hand auger was advanced to 5 feet below surface. According to the Site Civil Plan provided in Arcadis 2021a, Appendix D, the entire basin area of the pond was sodded. A liner is not present beneath the sediments of the pond. The bottom of the pond was surveyed in January 2022.

6.2 Groundwater Analytical Results

6.2.1 On-Site Groundwater Analytical Results

6.2.1.1 Source Area Groundwater Analytical Results

Shallow (water table) groundwater samples were collected from source characterization borings completed to assess the area of the pumphouse and OWS, delineate PFAS detected at the retention pond and south of the hanger on the tarmac, and assess the fire training areas identified along the west side of the site (**Figure 4-4)**.

A groundwater sample collected from 11-15 feet bgs at ASTC-SC-12 (located between the pumphouse and the OWS) contained PFOS at a concentration of 64,000 ppt, the highest concentration observed during the investigation. The same sample also contained Perfluorohexane sulfonic acid (PFHxS) at a concentration of 1,600 ppt. Concentrations of PFOA detected in source characterization groundwater samples were all one to two orders of magnitude lower than PFOA concentrations observed in upgradient groundwater samples suggesting that any releases from the site are not a significant source of PFOA. Similarly, detections of PFNA in source characterization groundwater samples were limited and generally in line with concentrations downgradient and upgradient of the site, suggesting that the site is not a significant source of PFNA.

6.2.1.2 Storm Drain and Sanitary Sewer Infrastructure

Water samples were collected from the OWS, five sanitary sewer manholes, and one storm drain manhole. The water in the OWS was impacted with PFOS, PFOA, and PFHxS above non-residential drinking water criteria for these compounds. The PFOS result also exceeded the EGLE groundwater-surface water interface criterion. Two of the sanitary manholes showed exceedances for PFOS and PFOA, respectively. Impacted water in the sanitary sewer system is likely to be discharged to the Traverse City Water Treatment Plan. The sample from the storm drain manhole MH-02 did not exceed criteria for PFAS compounds.

The presence of PFAS in the sanitary sewer system is likely caused by residual PFAS from run-off water generated during site operations in the hangar, which is collected through the oily water lines and routed to the OWS. The OWS subsequently discharges to the sanitary sewer system. Infiltrating groundwater is not the cause because the sewers are not in contact with groundwater. The results are summarized in **Table 6** and shown on **Figure 4-3**.

6.2.1.3 On-site Groundwater Characterization

Arcadis advanced 13 CPT borings on-site to verify the stratigraphy followed by advancement of VAP borings at each CPT location to collect groundwater samples. Eight CPT/VAP boring pairs (ASTC-VAP-13 through ASTC-VAP-19 and ASTC-VAP-25) were advanced along the downgradient site boundary to determine the horizontal and vertical distribution of PFAS in groundwater at the downgradient site boundary, while four CPT/VAP boring pairs (ASTC-VAP-20 and ASTC-VAP-22 through ASTC-VAP-24) were advanced along the upgradient/side gradient site boundary to fill data gaps relating to PFAS migrating onto the site, and a single CPT/VAP boring pair (ASTC-VAP-21) was advanced at the location of previous VAP boring ASTC-VAP-03 to verify the depth to the clay and collect a deep groundwater sample. On-site groundwater analytical results are presented on **Figure 4-5**.

PFOS, PFOA, PFHxS, and PFNA were detected in one or more on-site groundwater samples at concentrations exceeding EGLE Part 201 DW criteria. The highest concentrations of PFOS observed in groundwater outside of the source characterization borings were located directly downgradient of the source area identified near the OWS and FSS Pumphouse, however, these PFOS concentrations (2,100 ppt in ASTC-VAP-04 and 1,500 ppt in ASTC-VAP-18) are an order of magnitude lower than the PFOS concentration identified in source characterization boring ASTC-SC-12 (64,000 ppt). Detections of PFHxS exceeding EGLE Part 201 DW criteria were generally co-located with PFOS exceedances with the highest concentration of 1,600 ppt collocated with the highest PFOS concentration in ASTC-SC-12.

Exceedances of the DW criteria for PFOA were generally widespread at the site and were identified in all eight VAP locations completed along the upgradient site boundary. The maximum concentration of PFOA identified in groundwater on site was 300 ppt at a depth of 44-46 feet bgs in ASTC-VAP-19. The highest PFOA concentrations identified in groundwater downgradient of the hanger were generally located 10 to 20 feet deeper than the highest PFOS and PFHxS concentrations within the same boring. Concentrations of PFNA exceeding the DW criteria are generally co-located with PFOA exceedances. The highest concentration of PFNA detected on the site was 190 ppt from 28-30 feet bgs in ASTC-VAP-23, located along the upgradient site boundary.

6.2.2 Off-Site Groundwater Analytical Results

CPT and VAP borings were advanced at 14 off-site locations to collect stratigraphy and groundwater information. CPT/VAP locations ASTC-VAP-26 and ASTC-VAP-27 were placed on the Traverse City Area Public Schools property in the north-western extension of the EGLE VAS transact at Parsons Road to capture the lateral extent of the PFAS impacts in groundwater. ASTC-VAP-32 and ASTC-VAP-33 are side-gradient locations selected to assess potential impacts to groundwater off-site to the east. Two transects of CPT/VAP borings were located within the East Bay residential area. The first transect was advanced in north-west to south-east corridor of Indian Trail Blvd (ASTC-VAP-28 through ASTC-VAP-31 and ASTC-VAP-39). The second transect (ASTC-VAP-34 through ASTC-VAP-38) was located along Pine Grove Avenue, between Avenue B and Anne Street.

Glacial outwash deposits consisting of poorly sorted sands and gravels were generally identified at depths of 30 to 45 feet bgs along the off-site CPT/VAP transects and thicken to the east, corresponding to the increasing depth of the clay. Many of the thicker glacial outwash deposits resulted in drilling refusal during CPT soundings and

more frequently during VAP sampling. As a result, several of the borings located along the eastern half of the offsite transects (ASTC-VAP-30, -31, -36, -37, and -39), as well as ASTC-VAP-32 and ASTC-VAP -33 located along West Aero Park Court, were unable to be completed to the target depth.

PFOS was detected at concentrations as high as 2,700 ppt in ASTC-VAP-30 at a depth of 33.5 to 35.5 feet bgs, directly downgradient from EGLE's VAS-9 and VAS-10. PFOS at VAS-9 was detected at 5,450 ppt at 30 to 34 feet and 17,900 ppt at 40 to 44 feet. The highest PFOS concentration at VAS-10 was 1,330 ppt at 40 to 44 feet bgs. ASTC-VAP-30 encountered refusal in coarse outwash deposits at 35.5 feet and based on the results from EGLE VAS-9 concentrations could potentially be significantly higher at a greater depth.

PFOS concentrations at location VAP-35, near the shoreline of East Grand Traverse Bay and further downgradient from VAP-30, ranged from 1,500 ppt at 49 to 51 feet to 2,100 ppt at 39 to 41 feet bgs. The concentration at 60 to 62 feet bgs, the deepest sampling interval, dropped to 790 ppt. The vertical extent of the plume has not been delineated along the inferred plume axis. Concentrations of PFOS drop to the east and west of the inferred plume axis, decreasing below criteria in the deeper sampling intervals. The sample locations and analytical results are shown on **Figure 5-1** and summarized in **Table 1**.

Off-site groundwater containing DW exceedances for PFOA is relatively diffuse both horizontally and vertically and concentrations generally are observed to decrease with distance downgradient from CCA.

Off-site distribution of PFHxS and PFNA follows a pattern similar to that observed on site, with PFHxS exceedances generally co-located with PFOS exceedances and PFNA exceedances co-located with PFOA exceedances.

6.2.3 Sitewide Distribution and Extent of PFAS in Groundwater

The highest concentrations of PFOS identified along the on- and off-site VAP transects correlate well with historical groundwater flow directions as well as the locations of the highest concentrations of PFOS identified on the EGLE VAS transect and the source characterization boring ASTC-SC-12 located near the OWS and pumphouse. Order of magnitude differences in concentration are observed from one sample location to another along the inferred plume axis with 64,000 ppt of PFOS observed at ASTC-SC-12 followed by concentrations of 2,100 ppt and 1,500 ppt respectively with each step downgradient along the two on-site VAP transects. Moving further downgradient, the highest concentration of PFOS observed in EGLE VAS borings near Parsons Road is 17,900 ppt followed by concentrations of 2,700 ppt and 2,100 ppt respectively at ASTC-VAP-30 on Indian Trail Boulevard and ASTC-VAP-35 at the north end of Avenue E. The combined on-site and off-site groundwater analytical results are shown on **Figure 5-2.** Combined On-Site and Off-site Groundwater Characterization Results are depicted along with the estimated extent of PFOS on **Figure 5-3**. The order of magnitude differences in maximum PFOS concentration observed along the plume axis suggests two potential scenarios:

- A highly focused plume core. The difference in PFOS concentrations observed within tightly spaced EGLE VAS borings suggests that the core of the plume is focused within a small cross-sectional area.
- Multiple temporally separated releases could be contributing to discontinuous concentrations along the plume axis.

All PFOS and PFOA groundwater analytical results were incorporated into a three-dimensional model created using Earth Volumetric Studio™ along with lithologic data and approximate groundwater elevations. Analytical data were interpolated using kriging to produce estimated plume extents in three dimensions. Kriging is a geostatistical interpolation technique that considers both the distance and the degree of variation in concentrations between known points. The groundwater table and underlying clay surface were used to bound

the vertical extent of the interpolation area. The three-dimensional extents of PFOS and PFOA in groundwater are presented on **Figures 5-4 and 5-5** respectively. Vertical distribution of both PFOS and PFOA concentrations demonstrates that the plume cores are increasing in depth as the plumes extend downgradient. The increase in depth is consistent with the geologic setting, which consists of a relatively thick sandy unconfined aquifer where sands generally extend to the ground surface and precipitation is able to infiltrate directly down to the water table across a broad area. Direct recharge along the length of the plume in this environment will generally drive plumes further away from the water table as distance from the source area increases. Comparison of the vertical distribution of PFOA and PFOS demonstrates that the highest concentrations of PFOA are generally encountered at deeper intervals than the highest concentrations of PFOS, suggesting that PFOA is likely coming from an upgradient source. Additionally, although PFOA is considered to be more mobile than PFOS, the PFOA plume core extends back to sample locations along the upgradient site boundary, further suggesting an upgradient source.

Groundwater analytical results for all PFAS show a distinct difference in chemical composition between PFAS detected along the upgradient site boundary and PFAS detected at the suspected AFFF release area on-site as well as groundwater immediately downgradient of the suspected release area. Detections of PFAS along the upgradient site boundary are dominated by perfluoroalkyl carboxylic acids (PFCAs), including PFOA and PFNA and contain limited detections of perfluoroalkanesulfonic acids (PFSAs) such as PFOS and PFHxS. Conversely, PFAS detections near the FSS Pumphouse, hanger, and the area immediately downgradient are dominated by PFSAs and contain limited PFCAs. The distinct differences observed in the distribution PFCAs and PFSAs suggests multiple source areas with different AFFF formulations, and the majority of PFOA concentrations observed on and off-site appear to be un-related to the PFOS plume. The differences in composition become less apparent downgradient due to likely comingling of plumes from the different sources.

7 Data Gaps and Proposed Path Forward

Investigation activities completed at the site have provided insight into the nature and extent of PFAS contamination at the site. Key findings include:

- Understanding of contaminant sources:
  - Analytical results suggest that the OWS and FSS pumphouse area is the primary source area contributing to PFOS and PFHxS exceedances in groundwater at the site. Limited detections in soil suggest that any release to environmental media occurred below ground surface.
  - Concentrations of PFOS detected in soil do not appear to correlate with locations of elevated PFOS concentrations in groundwater, suggesting that soils are not the primary on-site contributors to the groundwater plume.
  - PFOS concentrations in groundwater near the OWS greatly exceed concentrations from water within the OWS suggesting that while residual PFAS within the OWS may present the potential for an ongoing source, the vast majority of contaminant mass is already in the groundwater.
  - Results from source characterization borings as well as site-wide and off-site groundwater characterization suggest that PFOA and other PFCAs such as PFNA are not related to the PFOS plume and originate from an upgradient off-site source.
- Hydrogeology and contaminant distribution
  - PFAS plumes are increasing in depth as distance from source increases, due to direct recharge from precipitation.

- The aquifer is bounded by an underlying lacustrine clay and thickens to the east-northeast due to significant relief in the clay surface.
- Although coarser outwash deposits were identified within the lacustrine sands that comprise the aquifer, the lacustrine sands comprising most of the aquifer are still highly permeable, and differences in hydraulic conductivity between the two materials is expected to be limited. Groundwater analytical data does not suggest that the outwash acts as a significant preferential pathway.
- The core of the PFOS plume may be focused along a narrow path, driven primarily by groundwater advection.
- There appear to be at least two plumes comingling as they cross the site. One plume dominated by PFSAs such as PFOS and PFHxS appears to have originated on-site, and another plume consisting primarily of PFCA such as PFOA is unrelated to the PFSAs identified on-site and originates from one or more upgradient sources located off-site.
- Based on knowledge of contaminant distribution and current site-use, worker contact with impacted media is unlikely during routine activities.

Data gaps regarding the nature and extent of contamination include the following:

- Soils are not delineated to EGLE Part 201 GSIP criteria for PFOS, however, comparison of source characterization groundwater results to soils results suggest PFOS identified in soils is not a significant contributor to groundwater.
- The downgradient vertical extent of PFAS in groundwater is not delineated due to drilling refusals at depth.
- The side gradient extent of PFAS in groundwater is not fully defined to the east or west. Comingling of plumes from off-site sources appears to contribute to a diffuse PFOA plume and will confound efforts to delineate PFOA in either direction. PFAS source areas spread across the CCA upgradient of the site may also complicate efforts to delineate other PFAS to the west.

Arcadis recommends the following tasks to address the identified data gaps:

Additional VAP Sampling for Groundwater Delineation

- Completion of VAP sampling at seven CPT/VAP locations where VAP sampling could not be completed due to CPT/VAP refusal. VAP sampling would be completed using a larger DPT rig to reach target depths and would utilize completed CPT logs to select sampling intervals.
- Installation of two VAP borings to the east of the site for side gradient delineation.
- Installation of a network of monitoring wells following delineation of groundwater impacts, once the locations of necessary monitoring wells has been determined.

Storm Drain and Sewer Maintenance

One potential source of PFAS impact to the groundwater at the site is the residual PFAS detected within the oily-water lines, storm drains, sanitary sewer, and the oil/water separator.

Arcadis recommends that the oily-water lines and the oil/water separator be cleaned, and the waste properly disposed.

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Tables

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-01	VAP-02	VAP-03	VAP-03	VAP-03	VAP-03
			Sample ID	ASTC-VAP-01-GW(8.5-12.5)-(123020)	ASTC-VAP-02-GW(11-15)-(123020)	ASTC-VAP-03-GW(9-13)-(121520)	ASTC-VAP-03-GW(18-22)-(121520)	ASTC-VAP-03-GW(30-34)-(121520)	ASTC-VAP-03-GW(46-50)-(121520)
			Sample Date	12/30/2020	12/30/2020	12/15/2020	12/15/2020	12/15/2020	12/15/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**25**	**34**	< 3.6 U	**2.2 J**	**62**	**150**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	**2.8 J**	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.9 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**18**	**13**	**6.1**	**13**	**1.6 J**	**2.0 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**11**	**96**	**17**	**19**	**120**	**40**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	**22**	**2.8 J**	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	**1.2 J**	**2.3 J**	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.0 U	**9.8**	< 1.9 U	**4.1**	< 1.8 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**5.2**	**59**	**9.3**	**6.2**	**60**	**47**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**11**	**130**	**48**	**69**	**4.0**	**1.2 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**23**	**210**	**16**	**33**	**210**	**85**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**1.3 J**	**3.4 J**	< 1.9 U	**5.6**	**18**	**23**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	**130**	**3.7 J**	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***57***	***1400 DJ***	**12**	***650 DJ***	***18***	**8.7**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**2.9 J**	**14**	**3.6 J**	**9.7**	**140**	**250**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**1.3 J**	**4.7**	< 1.9 U	**3.8**	< 1.8 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**25**	**380**	**26**	**54**	**470**	**130**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.9 U	< 1.9 U	< 1.8 U	< 1.9 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-03	VAP-03	VAP-04	VAP-04	VAP-04	VAP-04	VAP-04
			Sample ID	ASTC-VAP-DUP02-(121520)	ASTC-VAP-03-GW(56-60)-(121620)	ASTC-VAP-04-GW(12-16)-(121720)	ASTC-VAP-DUP03-(121720)	ASTC-VAP-04-GW(17-21)-(121720)	ASTC-VAP-04-GW(25-29)-(121720)
			Sample Date	12/15/2020	12/16/2020	12/17/2020	12/17/2020	12/17/2020	12/17/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 UJ	< 18 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 U	**19**	**2.7 J**	< 3.6 U	**680**	**1400 DJ**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.8 U	< 18 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**6.8**	< 1.8 U	**3.8**	**4.2**	**31**	**27 DJ**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**17**	**19**	**6.6 BJ+**	**6.9**	**380**	**120 DJ**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	**23**	**25 DJ**
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**11**	**24**	**2.6 J**	**2.3 J**	**110**	**62 DJ**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**48**	**1.3 J**	**8.3**	**9.2**	**330**	**320 DJ**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**17**	**31**	**9.3**	**10**	**1100 DJ**	**290 DJ**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	**3.2 J**	< 1.8 UJ	< 1.8 U	**2.7 J**	< 9.0 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**12**	**4.9**	**5.0 BJ+**	**5.4**	***2100 DJ***	***2100 DJ***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**3.3 J**	**190**	**7.4 BJ+**	**7.3**	**20**	**40 DJ**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	**17**	**17 DJ**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**26**	**49**	**6.6**	**7.4**	**1600 DJ**	**490 DJ**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 9.0 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-04	VAP-04	VAP-05	VAP-05	VAP-05	VAP-06
			Sample ID	ASTC-VAP-04-GW(34-38)-(121720)	ASTC-VAP-04-GW(46-50)-(121720)	ASTC-VAP-05-GW(11-15)-(121820)	ASTC-VAP-05-GW(23-27)-(121820)	ASTC-VAP-05-GW(34-38)-(121820)	ASTC-VAP-06-GW(12-16)-(121820)
			Sample Date	12/17/2020	12/17/2020	12/18/2020	12/18/2020	12/18/2020	12/18/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 UJ
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**80**	**17**	**14**	**5.8 J**	**6.9 J**	**6.2 J**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.8 U	< 3.6 U	< 3.5 U	< 3.8 U	< 3.6 U	< 3.6 UJ
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.9 J**	**1.1 J**	**2.2 J**	**13**	**1.2 J**	**1.4 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**26**	**27**	**8.2**	**67**	**20**	**4.0**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**2.2 J**	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**15**	**22**	**3.5**	**50**	**27**	**1.3 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**38**	**7.1**	**21**	**55**	**5.8**	**5.2**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**43**	**67**	**5.9**	**140**	**43**	**4.6**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 UJ
Perfluorononanoic acid (PFNA)	6	NC	ppt	**2.1 J**	**2.8 J**	< 1.8 U	**1.1 J**	< 1.8 U	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***160***	***19***	***27***	***28***	< 1.8 UB	**1.7 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**20**	**100**	**12**	**19**	**16**	**4.3**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**2.2 J**	< 1.8 U	< 1.8 U	**4.7**	< 1.8 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**73**	**84**	< 1.8 UB	**240**	**49**	**1.5 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 1.8 UJ	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U

Table 1
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USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-06	VAP-06	VAP-07	VAP-07	VAP-07
			Sample ID	ASTC-VAP-06-GW(20-24)-(121820)	ASTC-VAP-06-GW(28.5-32.5)-(121820)	ASTC-VAP-07-GW(10-14)-(122120)	ASTC-VAP-07-GW(18-22)-(122120)	ASTC-VAP-07-GW(27.5-31.5)-(122120)
			Sample Date	12/18/2020	12/18/2020	12/21/2020	12/21/2020	12/21/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units					
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 UJ	< 3.6 UJ	< 3.6 U	< 3.6 U	< 3.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**2.4 J**	**2.9 J**	< 3.6 U	< 3.6 U	< 3.5 UB
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 UJ
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.6 U	< 3.5 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 UJ	< 3.6 UJ	< 3.6 U	< 3.6 U	< 3.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**3.7**	**1.5 J**	**0.96 J**	**2.1 J**	**0.88 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**10**	**5.4**	**2.4 J**	**11**	**13**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**4.6**	**2.2 J**	< 1.8 U	**3.4 J**	**11**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**110**	**21**	**1.7 J**	**5.8**	**2.2 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**20**	**4.0**	< 1.8 U	**5.6**	**12**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 UJ	< 1.8 UJ	< 1.8 U	< 1.8 UJ	< 1.8 UJ
Perfluorononanoic acid (PFNA)	6	NC	ppt	**3.6**	**4.4**	< 1.8 U	**3.2 J**	**2.2 J**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**8.6**	**11**	< 1.8 U	**11**	**2.5 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**22**	**6.9**	< 1.8 U	**5.0**	**6.1**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**1.9 J**	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**10**	**3.0 J**	< 1.8 U	**9.2**	**22**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-08	VAP-08	VAP-08	VAP-08	VAP-08	VAP-09
			Sample ID	ASTC-VAP-08-GW(9-13)-(122220)	ASTC-VAP-08-GW(14-18)-(122220)	ASTC-VAP-DUP04-(122220)	ASTC-VAP-08-GW(22-26)-(122220)	ASTC-VAP-08-GW(30.5-34.5)-(122220)	ASTC-VAP-09-GW(9-13)-(122320)
			Sample Date	12/22/2020	12/22/2020	12/22/2020	12/22/2020	12/22/2020	12/23/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.7 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**1.1 J**	**17**	**18**	**1.6 J**	**1.9 J**	**1.3 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**13**	**8.1**	**8.0**	**11**	**17**	**7.7**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	**3.1 J**	**3.2 J**	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**2.0 J**	**11**	**11**	**6.9**	**9.5**	**7.2**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**2.3 J**	**2.6 J**	**2.5 J**	**1.5 J**	**4.9**	**2.3 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**2.1 J**	**12**	**14**	**13**	**33**	**6.7**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	**15**	**13**	< 1.8 U	< 1.8 U	**1.6 J**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**1.1 J**	**37**	***38***	**3.3 J**	**2.5 J**	**7.2**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**2.5 J**	**15**	**17**	**3.5 J**	**9.5**	**7.3**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**2.7 J**	**11**	**11**	**25**	**66**	**8.9**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-09	VAP-09	VAP-10	VAP-10	VAP-10	VAP-11
			Sample ID	ASTC-VAP-09-GW(16-20)-(122320)	ASTC-VAP-09-GW(25-29)-(122320)	ASTC-VAP-10-GW(8-12)-(122320)	ASTC-VAP-10-GW(17-21)-(122320)	ASTC-VAP-10-GW(26-30)-(122320)	ASTC-VAP-11-GW(7-11)-(122920)
			Sample Date	12/23/2020	12/23/2020	12/23/2020	12/23/2020	12/23/2020	12/29/2020
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.5 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.8 U	< 1.8 U	**2.0 J**	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**38**	**15**	**27**	**140**	**10**	**3.0 J**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**3.6 J**	< 1.8 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**21**	**25**	**43**	**130**	**110**	**3.6 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**3.9**	**1.7 J**	**1.6 J**	**4.5**	**1.4 J**	< 1.9 U
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**49**	**28**	**74**	**420**	**74**	**3.6 J**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	< 1.8 U	**4.4**	**6.2**	< 1.8 U	< 1.9 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 UJ
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**4.1**	**3.6**	**6.1**	**9.0**	**0.91 J**	**4.9**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**27**	**36**	**52**	**210**	**54**	**4.4**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**62**	**37**	**130**	**740**	**48**	**3.2 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.9 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-11	VAP-11	VAP-12	VAP-12	VAP-12	VAP-13
			Sample ID	ASTC-VAP-11-GW(20-24)-(122920)	ASTC-VAP-11-GW(30-34)-(122920)	ASTC-VAP-12-GW(7.5-11.5)-(123020)	ASTC-VAP-12-GW(21-25)-(123020)	ASTC-VAP-12-GW(28-32)-(123020)	ASTC-VAP-13GW(10-13)-(072721)
			Sample Date	12/29/2020	12/29/2020	12/30/2020	12/30/2020	12/30/2020	7/27/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**2.3 J**	< 4.0 U	**4.9 J**	**4.8 J**	**2.0 J**	< 3.5 UJ-
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	**2.5 J**	< 3.8 U	< 3.5 UJ-
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 3.9 U	< 3.8 U	< 3.5 UJ-
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	**2.1 J-**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**33**	**14**	**44**	**65**	**81**	**9.2 J-**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	**18**	< 2.0 U	< 2.0 U	**2.3 J**	**2.1 J**	< 1.8 UJ-
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**82**	**26**	**95**	**120**	**80**	< 1.8 UJ-
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**1.6 J**	**2.1 J**	**1.2 J**	**1.4 J**	**1.6 J**	**12 J-**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**120**	**32**	**110**	**270**	**270**	**9.0 J-**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluorononanoic acid (PFNA)	6	NC	ppt	**18**	**2.8 J**	**2.6 J**	**11**	**2.8 J**	< 1.8 UJ-
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 UJ	< 2.0 UJ	< 2.0 UJ	< 2.0 UJ	< 1.9 UJ	< 1.8 UJ-
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**10**	< 2.0 U	**3.2 J**	**8.4**	**3.8**	< 1.8 UJ-
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**230**	**60**	**60**	**200**	**110**	**3.2 J-**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**97**	**39**	**110**	**300**	**360**	< 1.8 UJ-
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 UJ	< 1.8 UJ-
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.9 U	< 1.8 UJ-
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	**1.9 J**	< 2.0 U	< 2.0 U	**26**	**4.5**	< 1.8 UJ-

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-13	VAP-13	VAP-13	VAP-14	VAP-14	VAP-14
			Sample ID	ASTC-VAP-13GW(18-21)-(072721)	ASTC-VAP-13GW(22-25)-(072721)	ASTC-VAP-13GW(32-35)-(072721)	ASTC-VAP-14GW(10-13)-(072821)	ASTC-VAP-14GW(18-21)-(072821)	ASTC-VAP-14GW(25-28)-(072821)
			Sample Date	7/27/2021	7/27/2021	7/27/2021	7/28/2021	7/28/2021	7/28/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 UJ	< 3.6 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 5.5 UJ-	**19 J-**	**17 J-**	< 3.6 U	< 3.9 U	**11 J-**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 UJ	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 5.5 UJ-	< 3.5 U	< 3.5 U	< 3.6 U	< 3.9 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**11 J+**	**6.1**	**2.6 J**	< 1.8 U	**3.2 J**	< 1.8 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**95 J-**	**46**	**18**	**7.5**	**13**	**20**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 UJ	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	**7.6 J-**	**1.9 J**	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**5.0 J+**	**3.4 J**	**8.8**	< 1.8 U	< 2.0 U	**6.6**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**8.1 J+**	**41**	**48**	**14**	**11**	**120**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**74 J+**	**29**	**31 J-**	**3.6**	**7.4**	**27**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 UJ	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 2.8 UJ-	**1.9 J**	**3.2 J**	< 1.8 U	< 2.0 U	**9.8**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**6.2 J+**	**12**	***14***	< 1.8 U	< 2.0 UJ	**27**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**28 J+**	**13**	**23**	**4.9**	**4.7**	**25**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	**2.3 J**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**7.3 J-**	**6.3**	**45**	< 1.8 U	< 2.0 U	**12**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 UJ	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.8 UJ-	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location Sample ID Sample Date	VAP-14 ASTC-VAP-14GW(35-38)-(072821) 7/28/2021	VAP-14 ASTC-VAP-DUP05-(072821) 7/28/2021	VAP-15 ASTC-VAP-15GW(10-13)-(072821) 7/28/2021	VAP-15 ASTC-VAP-15GW(19-22)-(072821) 7/28/2021	VAP-15 ASTC-VAP-15GW(27-30)-(072821) 7/28/2021	VAP-15 ASTC-VAP-15GW(40-43)-(072821) 7/28/2021
Analyte	**EGLE Drinking Water 2020 Criteria**	**EGLE GSI 2020 Criteria**	**Units**						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.5 U	< 3.5 UJ	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.5 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.5 U	< 3.5 UJ	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.5 U	< 3.5 UJ	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.5 U	< 3.5 UJ	< 3.6 U	< 3.6 U	< 3.5 U	< 3.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.4 J**	**2.5 J+**	**2.1 J**	**3.4 J**	**45**	**1.9 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**21**	**24**	**5.4**	**8.6**	**27**	**17**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	**4.8**	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**6.4**	**7.3 J+**	< 1.8 U	< 1.8 U	**11**	**16**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**14**	**14 J+**	**37**	**25**	**250**	**12**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**16**	**19 J+**	**4.8**	**11**	**74**	**23**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**3.4 J**	**3.6 J+**	< 1.8 U	< 1.8 U	**3.1 J**	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**5.9**	**5.2 J+**	< 1.8 U	***24***	***340***	**8.0 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**13**	**14 J+**	**8.5**	**9.2**	**24**	**9.4**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	**2.7 J**	**40**	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**18**	**19 J+**	**2.0 J**	**4.6**	**49**	**24**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-16	VAP-16	VAP-16	VAP-16	VAP-16	VAP-17
			Sample ID	ASTC-VAP-16GW(12-15)-(072921)	ASTC-VAP-16GW-22-25)-(072921)	ASTC-VAP-16GW(30-33)-(072921)	ASTC-VAP-16GW(42-45)-(072921)	ASTC-VAP-16GW(50-53)-(072921)	ASTC-VAP-17GW(13-16)-(072921)
			Sample Date	7/29/2021	7/29/2021	7/29/2021	7/29/2021	7/29/2021	7/29/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.5 U	**12 J+**	< 3.5 UB	**7.2 J+**	**18 J+**	< 3.6 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.5 U	< 3.5 UJ	< 3.5 UJ	< 3.5 UJ	< 3.5 UJ	< 3.6 UJ
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.1 J**	**5.2**	**3.8**	**2.8 J**	< 1.8 U	**2.3 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**17**	**18**	**38**	**22**	**16**	**5.5**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	**4.9**	**2.2 J**	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**13**	**3.1 J**	**7.2**	**8.9**	**9.2**	**4.5**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**47**	**240**	**46**	**35**	**14**	**720 DJ**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**36**	**77**	**53**	**42**	**23**	**11**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**1.8 J**	< 1.8 U	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**2.4 J**	***28***	***240***	***20***	***14***	< 1.8 U
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**9.8**	**26**	**8.3**	**15**	**12**	**45**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	**2.0 J**	< 1.8 U	< 1.8 U	< 1.8 U	**1.9 J**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**23**	**30**	**100**	**52**	**33**	**3.0 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 UJ	< 1.8 UJ	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-17	VAP-17	VAP-17	VAP-17	VAP-17	VAP-17
			Sample ID	ASTC-VAP-17GW(24-27)-(072921)	ASTC-VAP-17GW(34-37)-(072921)	ASTC-VAP-17GW(44-47)-(072921)	ASTC-VAP-17GW(57-60)-(072921)	ASTC-VAP-17GW(70-72)-(080221)	ASTC-VAP-DUP07-(080221)
			Sample Date	7/29/2021	7/29/2021	7/29/2021	7/29/2021	8/2/2021	8/2/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 UJ
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	**5.9 J**	< 3.5 U	< 3.8 UJ-	< 18 U	**4.5 J-**
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**890 DJ**	**2800 DJ**	**4900 DJ**	**360 J-**	**740 DJ**	**780 DJ**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 UJ	< 3.6 U	< 3.5 UJ	< 3.8 UJ-	< 18 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 UJ
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.5 U	< 3.8 UJ-	< 18 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**19**	**8.1**	**22**	**4.5 J-**	**7.2 DJ**	**9.0**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**100**	**160**	**190**	**47 J-**	**94 DJ**	**110**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 UJ	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 UJ
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**9.8**	**9.6**	**9.8**	< 1.9 UJ-	**23 DJ**	**19**
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**25**	**80**	**60**	**45 J-**	**34 DJ**	**39**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**150**	**120**	**140**	**29 J-**	**130 DJ**	**160**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**290**	**330**	**380**	**150 J-**	**240 DJ**	**270**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 UJ
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	**2.5 J**	**5.4**	**4.0 J-**	**4.9 DJ**	**3.9**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	**2.8 J**	**2.5 J**	< 1.9 UJ-	< 8.5 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***590***	***840 DJ***	***760 DJ***	***110 J-***	***650 DJ***	***560 DJ***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**19**	**260**	**160**	**260 J-**	**120 DJ**	**110**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**9.4**	**8.4**	**11**	< 1.9 UJ-	**6.6 DJ**	**6.6**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**460**	**770**	**810 DJ**	**190 J-**	**300 DJ**	**270**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 UJ-	< 8.5 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-18	VAP-18	VAP-18	VAP-18	VAP-18	VAP-18
			Sample ID	ASTC-VAP-18GW(14-16)-(080221)	ASTC-VAP-DUP06-(080221)	ASTC-VAP-18GW(25-27)-(080221)	ASTC-VAP-18GW(34-36)-(080221)	ASTC-VAP-18GW(44-46)-(080221)	ASTC-VAP-18GW(58-60)-(080321)
			Sample Date	8/2/2021	8/2/2021	8/2/2021	8/2/2021	8/2/2021	8/3/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 UJ	< 3.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.6 U	**4.1 J**	**150 DJ**	**32**	**51 J-**	**29**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	**2.1 J**	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 U	< 3.5 U	< 18 U	< 3.5 U	< 3.5 U	< 3.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.8 J**	**2.7 J**	**46 DJ**	**3.2 J**	**7.0**	**2.5 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**3.1 J**	**3.3 J**	**230 DJ**	**24**	**65**	**78**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	**12**	**11**	< 9.0 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	**2.2 J**	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	< 1.8 UJ	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	**42 DJ**	**5.4**	**8.0**	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**2.9 J**	**2.9 J**	**96 DJ**	**5.5**	**22**	**55**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**16**	**16**	**570 DJ**	**37**	**56**	**2.6 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**5.3**	**4.5**	**950 DJ**	**36**	**130**	**120**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	**6.4**	**6.3**	< 9.0 U	**1.1 J**	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	**18**	**26**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	**17 J**	**27 J**	< 9.0 U	**8.5**	**20**	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***36***	***31***	***1500 DJ***	***540***	***1300 DJ***	***170***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**11**	**6.0**	**47 DJ**	**6.4**	**95**	**190**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 U	**36 DJ**	**1.7 J**	< 1.8 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**2.7 J**	**2.7 J**	**1300 DJ**	**52**	**150**	**270**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	< 2.4 UJ-	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	< 1.8 UJ	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 9.0 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-18	VAP-18	VAP-19	VAP-19	VAP-19	VAP-19
			Sample ID	ASTC-VAP-18GW(76-78)-(080321)	ASTC-VAP-DUP08-(080321)	ASTC-VAP-19GW(13-15)-(080321)	ASTC-VAP-19GW(25-27)-(080321)	ASTC-VAP-19GW(34-36)-(080321)	ASTC-VAP-19GW(44-46)-(080321)
			Sample Date	8/3/2021	8/3/2021	8/3/2021	8/3/2021	8/3/2021	8/3/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**32 J-**	**24**	**71 J-**	**5500 DJ**	**12 J+**	**7.3 J**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 U	< 3.7 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 40 UJ-	< 3.7 U	< 3.6 UJ	< 3.7 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.0 J**	**2.0 J**	< 20 UJ-	**12**	< 1.8 U	< 1.9 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**37 J**	**24 J**	**23 J-**	**420**	**54**	**46**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	**6.4**	< 1.8 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	**4.6**	< 1.8 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**33**	**26**	< 20 UJ-	**290**	**57**	**40**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**4.2**	**6.4**	**57 J-**	**140**	**8.7 J+**	< 1.9 U
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**70**	**52**	< 20 UJ-	**850 DJ**	**77**	**100**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**8.7**	**8.1**	< 20 UJ-	**2.7 J**	**14 J+**	**10**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	**2.7 J**	< 20 UJ-	**13**	**9.7 J+**	< 1.9 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***490 J***	***340 J***	< 20 UJ-	***320***	***130***	***25***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**190**	**210**	< 20 UJ-	**24**	**81**	**300**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	**8.7**	< 1.8 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**100 J**	**63 J**	< 20 UJ-	**1400 DJ**	**140**	**160**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.9 U	< 20 UJ-	< 1.8 U	< 1.8 U	< 1.9 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-19	VAP-19	VAP-20	VAP-20	VAP-20	VAP-20
			Sample ID	ASTC-VAP-19GW(57-59)-(080321)	ASTC-VAP-19GW(70-72)-)(080321)	ASTC-VAP-20GW(23-25)-(080521)	ASTC-VAP-20GW(32-34)-(080521)	ASTC-VAP-20GW(45-47)-(080521)	ASTC-VAP-20GW(58-60)-(080521)
			Sample Date	8/3/2021	8/3/2021	8/5/2021	8/5/2021	8/5/2021	8/5/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**53**	**9.2**	**86**	**120**	**50**	< 3.5 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 U	< 3.6 U	**3.8 J**	< 3.7 U	< 3.5 U	< 3.5 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.7 U	< 3.7 U	< 3.5 U	< 3.5 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.8 U	< 1.8 U	**36**	**110**	**1.9 J**	< 1.8 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**40**	**22**	**36**	**63**	**85**	**2.3 J**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	**2.0 J**	**3.0 J**	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**2.1 J**	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**37**	**30**	**24**	**37**	**120**	< 1.8 U
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**4.1 J**	**2.0 J**	**13**	**45**	**130**	< 1.8 U
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**71**	**54**	**74**	**110**	**220**	**4.1**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**8.8**	**4.6**	**3.1 J**	**120**	**100**	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	**13**	**11**	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***150***	**5.3**	***170***	***130***	**5.1**	< 1.8 U
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**170**	**210**	**7.6**	**28**	**300**	**3.8**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**3.2 J**	**4.3**	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**130**	**66**	**100**	**210**	**390**	**6.0**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 UJ	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-21	VAP-21	VAP-22	VAP-22	VAP-22	VAP-22
			Sample ID	ASTC-VAP-21GW(59-61)-(080421)	ASTC-VAP-DUP09-(080421)	ASTC-VAP-22GW(12-14)-(080421)	ASTC-VAP-22GW(24-26)-(080421)	ASTC-VAP-22GW(32-34)-(080421)	ASTC-VAP-22GW(44-46)-(080421)
			Sample Date	8/4/2021	8/4/2021	8/4/2021	8/4/2021	8/4/2021	8/4/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**4.8 J**	**5.5 J**	**460**	**13**	**150**	**6.6 J**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.6 U	< 3.7 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**35**	**9.0**	< 1.8 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**19**	**18**	**53**	**18**	**56**	**43**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**18**	**18**	**22**	**20**	**100**	**42**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	< 1.8 U	< 1.8 U	**7.7**	< 1.9 U	< 1.8 U	**2.3 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**35**	**36**	**41**	**19**	**200**	**93**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	**31**	**27**	**2.3 J**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	< 1.8 U	< 1.8 U	***14***	***32***	**3.4 J**	< 1.8 U
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**100**	**100**	**22**	**22**	**190**	**68**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**61**	**60**	**160**	**29**	**260**	**160**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.9 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-22	VAP-23	VAP-23	VAP-23	VAP-23	VAP-23
			Sample ID	ASTC-VAP-22GW(55-57)-(080421)	ASTC-VAP-23GW(13-15)-(080521)	ASTC-VAP-23GW(28-30)-(080521)	ASTC-VAP-23GW(34-36)-(080521)	ASTC-VAP-23GW(44-46)-(080521)	ASTC-VAP-23GW(54-56)-(080521)
			Sample Date	8/4/2021	8/5/2021	8/5/2021	8/5/2021	8/5/2021	8/5/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.6 U	**100**	**35 J+**	**52 J+**	**7.9 BJ+**	< 3.6 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.6 U	< 3.6 U	< 3.6 U	< 3.7 U	< 3.5 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.8 U	< 1.8 U	**15**	**6.8**	**1.9 J**	< 1.8 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**22**	**33**	**110**	**59**	**20**	**6.0**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**9.9**	**21**	**180**	**130**	**14**	< 1.8 U
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**1.9 J**	**3.4 J**	**39**	**33**	**6.6**	< 1.8 U
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**37**	**36**	**290**	**160**	**26**	**2.4 J**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.8 U	**2.0 J**	**190**	**64**	**8.3**	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**2.1 J**	***14***	***62***	***14***	< 1.8 U	< 1.8 U
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**12**	**6.0**	**270**	**210**	**33**	**5.5**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 1.8 U	**10**	**9.5**	**1.8 J**	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**79**	**100**	**460**	**240**	**45**	**4.0**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-23	VAP-23	VAP-24	VAP-24	VAP-24	VAP-25
			Sample ID	ASTC-VAP-23GW(66-68)-(080521)	ASTC-DUP10-(080521)	ASTC-VAP-24GW(10-12)-(080621)	ASTC-VAP-24GW(18-20)-(080621)	ASTC-VAP-24GW(24-26)-(080621)	ASTC-VAP-25-GW(12-14)-(121821)
			Sample Date	8/5/2021	8/5/2021	8/6/2021	8/6/2021	8/6/2021	12/18/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 UB	< 3.7 U	< 3.6 U	< 3.6 UJ	**14**	< 4.0 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.7 U	< 3.6 U	< 3.6 U	< 3.6 U	< 4.0 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.9 U	< 1.8 U	**420**	**29**	< 1.8 U	< 2.0 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**3.2 J**	**3.1 J**	**3.4 J**	**16 J**	**24 J**	**8.9**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	**4.1**	< 1.8 U	< 2.0 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**2.0 J**	**2.0 J**	**1.9 J**	**12**	**32**	**2.7 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	< 1.9 U	< 1.8 U	**2.7 J**	< 1.8 U	< 1.8 U	**5.0**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**4.2**	**4.7**	**2.8 J**	**18**	**26**	**10**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	**4.6**	**4.7**	< 2.0 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	**5.9**
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	< 1.9 U	< 1.8 U	**3.2 J**	**9.7**	**3.4 J**	***48***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	< 1.9 U	< 1.8 U	**4.7**	**16**	**110**	**3.8 J**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**8.6**	**8.5**	**5.0**	**36**	**46**	**5.3**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 1.8 U	< 1.8 U	< 1.8 U	< 1.8 U	< 2.0 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-25	VAP-25	VAP-26	VAP-26	VAP-26	VAP-27
			Sample ID	ASTC-VAP-25-GW(22-24)-(121821)	ASTC-VAP-25-GW(30-32)-(121821)	ASTC-VAP-26-GW(14-16)-(121021)	ASTC-VAP-26-GW(24-26)-(121021)	ASTC-VAP-26-GW(31-33)-(121021)	ASTC-VAP-27-GW(15-17)-(121221)
			Sample Date	12/18/2021	12/18/2021	12/10/2021	12/10/2021	12/10/2021	12/12/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 U	< 4.0 U	**17 J-**	< 4.7 UJ	< 4.5 UJ	**9.0 J-**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 4.0 U	< 7.0 UJ	< 4.7 UJ	< 4.5 UJ	< 7.0 UJ
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.1 J**	< 2.0 U	**12 J-**	**3.9 J-**	**21 J-**	**24 J-**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**3.8**	**10**	**30 J-**	**5.7 J-**	**44 J-**	**41 J-**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**3.4 J**	**6.6**	< 3.5 UJ	< 2.4 UJ	**33 J-**	**6.0 J-**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**9.9**	**4.7**	**15 J-**	**5.4 J-**	**2.2 J-**	**800 J-**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**5.8**	**11**	**17 J-**	**4.8 J-**	**40 J-**	**85 J-**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluorononanoic acid (PFNA)	6	NC	ppt	**2.0 J**	**2.8 J**	< 3.5 UJ	< 2.4 UJ	**4.3 J-**	< 3.4 UJ
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**11**	< 2.0 U	**4.9 J-**	***13 J-***	**4.5 J-**	***18 J-***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**6.2**	**4.7**	**5.3 J-**	**2.9 J-**	**12 J-**	**58 J-**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	**17 J-**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**6.6**	**15**	**4.8 J-**	< 2.4 UJ	**69 J-**	**11 J-**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.8 UJ	< 2.0 UJ	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 X
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.8 U	< 2.0 U	< 3.5 UJ	< 2.4 UJ	< 2.2 UJ	< 3.4 UJ

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-27	VAP-27	VAP-28	VAP-28	VAP-28	VAP-29
			Sample ID	ASTC-VAP-27-GW(24-26)-(121221)	ASTC-VAP-27-GW(32-34)-(121221)	ASTC-VAP-28-GW(20-22)-(121321)	ASTC-VAP-28-GW(34-36)-(121321)	ASTC-VAP-28-GW(44-46)-(121321)	ASTC-VAP-29-GW(15-17)-(121421)
			Sample Date	12/12/2021	12/12/2021	12/13/2021	12/13/2021	12/13/2021	12/14/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	**8.3 J**	< 3.7 U	< 3.9 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 6.0 UJ	< 4.2 U	< 6.0 U	< 3.7 U	< 3.9 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**3.2 J-**	< 2.1 U	**23 J-**	**3.6 J**	**12**	**5.7**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**11 J-**	**14**	**14 J-**	**6.1**	**17**	**2.7 J**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**4.9 J-**	**7.9**	**4.8 J**	**1.9 J**	**15**	**3.3 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**10 J-**	**8.6**	**17 J-**	**19**	**2.8 J**	< 1.8 U
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**15 J-**	**16**	**12 J-**	**3.2 J**	**27**	**6.8**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**14 J-**	**2.8 J**	< 3.0 U	**3.3 J**	**5.5**	< 1.8 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***52 J-***	**5.2**	***21 J-***	***50***	< 2.0 U	**3.4 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**14 J-**	**6.8**	**17 J-**	**3.6 J**	**10**	**10**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**21 J-**	**27**	**8.1 J-**	< 1.9 U	**51**	**6.3**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.9 UX	< 2.1 UJ	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.9 UJ	< 2.1 U	< 3.0 U	< 1.9 U	< 2.0 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

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			Location	VAP-29	VAP-29	VAP-29	VAP-29	VAP-29	VAP-30
			Sample ID	ASTC-VAP-29-GW(26-28)-(121421)	ASTC-VAP-29-GW(38-40)-(121421)	ASTC-VAP-29-GW(47-49)-(121421)	ASTC-VAP-29-GW(57-59)-(121421)	ASTC-VAP-29-GW(68-70)-(121421)	ASTC-VAP-30-GW(10-12)-(121521)
			Sample Date	12/14/2021	12/14/2021	12/14/2021	12/14/2021	12/14/2021	12/15/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.7 U	**7.1 J**	**4.6 J**	< 3.9 U	**19**	< 4.0 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 4.3 U	< 3.8 U	< 3.9 U	< 3.5 U	< 4.0 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.5 J**	**5.8 J-**	**3.8**	**2.4 J**	**1.7 J**	**3.9 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**5.2**	**13 J-**	**9.0**	**9.0**	**15**	**5.2**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	< 1.9 U	**2.7 J**	**5.9**	**6.1**	**8.4**	< 2.0 U
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**12**	**39 J-**	**120**	**120**	**34**	**4.1**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**2.0 J**	**12 J-**	**16**	**16**	**14**	**5.8**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	< 2.2 U	**2.6 J**	< 1.9 U	< 1.7 U	< 2.0 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***20***	***19 J-***	**4.5**	**7.9**	< 1.7 U	**4.0**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**5.1**	**11 J-**	**25**	**26**	**11**	**5.5**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 2.2 U	**2.3 J**	**3.4 J**	**1.7 J**	< 2.0 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	< 1.9 U	**4.0 J-**	**13**	**14**	**20**	**3.5 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 UJ	< 1.9 U	< 1.7 UJ	< 2.0 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 2.2 U	< 1.9 U	< 1.9 U	< 1.7 U	< 2.0 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-30	VAP-30	VAP-30	VAP-31	VAP-31	VAP-31
			Sample ID	ASTC-VAP-30-GW(22-24)-(121521)	ASTC-VAP-DUP12-(121521)	ASTC-VAP-30-GW(33.5-35.5)-(121521)	ASTC-VAP-31-GW(9-11)-(121321)	ASTC-VAP-31-GW(21-23)-(121321)	ASTC-VAP-31-GW(32-34)-(121321)
			Sample Date	12/15/2021	12/15/2021	12/15/2021	12/13/2021	12/13/2021	12/13/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**19 J**	**32 J**	**2100 DJ**	< 4.1 U	< 3.8 U	< 3.8 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 4.1 U	< 3.7 U	< 3.4 U	< 4.1 U	< 3.8 U	< 3.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.8 J**	**3.0 J**	**40**	**2.6 J**	**1.9 J**	**1.9 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**6.6**	**6.9**	**96**	**7.2 J-**	**11**	**11**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**6.8**	**7.2**	**92**	< 2.1 U	< 1.9 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**15**	**16**	**82**	**3.3 J**	**20**	**20**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**150**	**150**	**490**	**3.2 J**	**3.4 J**	**3.4 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**39**	**41**	**390**	**8.0 J-**	**15**	**15**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 2.0 U	< 1.9 U	**35**	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***410***	***490***	***2700 DJ***	**6.6 J-**	**2.9 J**	**2.9 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**18**	**19**	**91**	**8.2 J-**	**13**	**13**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**3.6 J**	**4.3**	**24**	< 2.1 U	< 1.9 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**28**	**27**	**570**	< 2.1 U	**22**	**22**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.0 U	< 1.9 UJ	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.0 U	< 1.9 U	< 1.7 U	< 2.1 U	< 1.9 U	< 1.9 U

Table 1
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USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-32	VAP-32	VAP-32	VAP-32	VAP-32	VAP-33
			Sample ID	ASTC-VAP-32-GW(11-13)-(121121)	ASTC-VAP-32-GW(20-22)-(121121)	ASTC-VAP-DUP11-(121121)	ASTC-VAP-32-GW(30-32)-(121121)	ASTC-VAP-32-GW(40-42)-(121121)	ASTC-VAP-33-GW(13-15)-(121921)
			Sample Date	12/11/2021	12/11/2021	12/11/2021	12/11/2021	12/11/2021	12/19/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 4.5 UJ	**58 J-**	**55 J-**	**3600 DJ**	**220**	< 3.8 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	**420**	**36**	< 3.8 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 4.5 UJ	< 4.6 UJ	< 4.7 UJ	< 4.1 U	< 4.1 U	< 3.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.6 J-**	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**15 J-**	**54 J-**	**54 J-**	**150**	**19**	**6.3 J**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	**11**	< 2.0 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	< 2.3 UJ	**28 J-**	**29 J-**	**270**	**18**	< 1.9 U
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**14 J-**	**3.7 J-**	**3.3 J-**	**6.8**	**2.8 J**	**2.4 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**8.3 J-**	**77 J-**	**80 J-**	**300**	**24**	**2.0 J**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 2.3 UJ	**40 J-**	**40 J-**	**520**	**76**	< 1.9 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***17 J-***	**7.1 J-**	**6.3 J-**	***25***	**4.5**	**3.7 J**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**6.4 J-**	**16 J-**	**16 J-**	**240**	**70**	**5.4 J**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**5.4 J-**	**180 J-**	**180 J-**	**550**	**40**	**3.1 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.3 UX	< 2.3 UJ	< 2.4 UX	< 2.1 UJ	< 2.0 U	< 1.9 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.3 UJ	< 2.3 UJ	< 2.4 UJ	< 2.1 U	< 2.0 U	< 1.9 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-33	VAP-33	VAP-33	VAP-33	VAP-33	VAP-34
			Sample ID	ASTC-VAP-DUP13-(121921)	ASTC-VAP-33-GW25-27)-(121921)	ASTC-VAP-33-GW(37-39)-(121921)	ASTC-VAP-DUP14-(121921)	ASTC-VAP-33-GW(48-50)-(121921)	ASTC-VAP-34-GW(14-16)-(121621)
			Sample Date	12/19/2021	12/19/2021	12/19/2021	12/19/2021	12/19/2021	12/16/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 3.8 UJ
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.8 U	< 4.0 U	< 3.9 U	< 4.1 U	< 3.9 U	< 4.0 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	**16**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**19 J**	**22**	**19 J**	**6.9 J**	**5.4**	**5.4**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**11**	**12**	**9.9**	< 2.1 U	< 2.0 U	**2.8 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**9.8**	< 2.0 U	**10**	**2.9 J**	**3.2 J**	**16**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**25 J**	**23**	**24 J**	< 2.1 UJ	< 2.0 U	**4.9**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	**4.4**	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluorooctane sulfonic acid (PFOS)	16	12	ppt	< 1.9 U	**2.6 J**	< 2.0 U	**3.1 J**	< 2.0 U	**36**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**23 J**	**10**	**24 J**	**6.0 J**	**2.3 J**	**18**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**56 J**	**56**	**57 J**	**3.0 J**	< 2.0 U	**2.7 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 2.0 UJ	< 2.0 UJ	< 2.1 UJ	< 2.0 U	< 2.0 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.0 U	< 2.1 U	< 2.0 U	< 2.0 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location Sample ID Sample Date	VAP-34 ASTC-VAP-34-GW(24-26)-(121621) 12/16/2021	VAP-34 ASTC-VAP-34-GW(36-38)-(121621) 12/16/2021	VAP-34 ASTC-VAP-34-GW(48-50)-(121621) 12/16/2021	VAP-34 ASTC-VAP-34-GW(60-62)-(121621) 12/16/2021	VAP-34 ASTC-VAP-34-GW(6-8)-(121621) 12/16/2021	VAP-35 ASTC-VAP-35-GW(6-8)-(122021) 12/20/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.8 U	< 3.8 U	< 4.0 U	< 3.6 U	< 4.5 UJ	< 3.9 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**13**	**2.5 J**	**2.5 J**	**1.8 J**	**11 J-**	**6.6**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**6.2**	**4.9**	**4.4**	**11**	**8.3 J-**	**6.0**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	**3.3 J-**	< 2.0 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 UJ
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**11**	< 1.9 U	**2.1 J**	**2.2 J**	**5.4 J-**	**2.6 J**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**15**	**40**	**59**	**64**	**16 J-**	**56**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**14**	**4.0**	**5.3**	**14**	**10 J-**	**6.8**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 1.9 U	**8.1**	**22**	**12**	**6.0 J-**	< 2.0 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**7.7**	***76***	***110***	***24***	***170 J-***	***13***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**7.6**	**5.4**	**11**	**14**	**21 J-**	**7.4**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	**6.2**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**7.0**	**2.2 J**	**3.4 J**	**26**	**7.0 J-**	**3.4 J**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 UJ	< 1.8 U	< 2.3 UJ	< 2.0 UX
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 UJ
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 1.9 U	< 2.0 U	< 1.8 U	< 2.3 UJ	< 2.0 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-35	VAP-35	VAP-35	VAP-35	VAP-35	VAP-35
			Sample ID	ASTC-VAP-35-GW(18-20)-(122021)	ASTC-VAP-DUP15-(122021)	ASTC-VAP-35-GW(29-31)-(122021)	ASTC-VAP-35-GW(39-41)-(122021)	ASTC-VAP-35-GW(49-51)-(122021)	ASTC-VAP-35-GW(60-62)-(122021)
			Sample Date	12/20/2021	12/20/2021	12/20/2021	12/20/2021	12/20/2021	12/20/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.9 U	< 4.0 U	< 4.1 U	< 3.6 U	< 4.2 U	< 4.4 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**5.9**	**6.0**	**19**	**170**	**130**	**59**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**11**	**10**	**9.4**	**29**	**26**	**35**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 UJ
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.0 U	< 2.0 U	**35**	**62**	**65**	**28**
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**3.2 J**	**3.3 J**	**4.7**	**23**	**27**	**42**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**110**	**100**	**200**	**520**	**520**	**220**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**12**	**12**	**22**	**140**	**110**	**110**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 2.0 U	< 2.0 U	**5.5**	**21**	**20**	**15**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***140***	***130***	***1800 DJ***	***2100 DJ***	***1500 DJ***	***790 DJ***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**11**	**10**	**25**	**88**	**91**	**45**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**7.5**	**6.5**	**25**	**120**	**110**	**47**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**8.7**	**8.2**	**8.2**	**60**	**45**	**100**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.0 UJ	< 2.0 U	< 2.0 UJ	< 1.8 UJ	< 2.1 UX	< 2.2 UX
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 UJ
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.0 U	< 2.0 U	< 2.0 U	< 1.8 U	< 2.1 U	< 2.2 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-36	VAP-36	VAP-36	VAP-36	VAP-37	VAP-37
			Sample ID	ASTC-VAP-36-GW(5-7)-(121721)	ASTC-VAP-36-GW(15-17)-(121721)	ASTC-VAP-36-GW(26-28)-(121721)	ASTC-VAP-36-GW(33.4-35.4)-(121721)	ASTC-VAP-37-GW(9-11)-(121721)	ASTC-VAP-37-GW(20-22)-(121721)
			Sample Date	12/17/2021	12/17/2021	12/17/2021	12/17/2021	12/17/2021	12/17/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.0 U	**61**	< 4.2 U	< 3.6 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.1 U	< 3.7 U	< 4.2 U	< 3.6 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.0 U	< 3.7 U	< 4.2 U	< 3.6 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 4.1 U	< 3.9 U	< 4.0 U	< 3.7 U	< 4.2 U	< 3.6 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	**4.5**	**20**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	< 2.1 U	**2.4 J**	**15**	**18**	**5.3**	**33**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.0 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	< 2.1 U	**6.2**
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	< 2.1 U	**2.5 J**	**20**	**47**	**7.7**	**33**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**2.2 J**	< 2.0 U	**4.8**	**2.6 J**	**18**	**310**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	< 2.1 U	**8.9**	**19**	**26**	**9.3**	**87**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	**3.4 J**	< 2.1 U	**41**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.0 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	**7.3**	**2.4 J**	**4.2 J**	< 1.9 U	***20***	***120***
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**2.6 J**	< 2.0 U	**20**	**53**	**29**	**48**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 U	< 1.9 U	< 2.1 U	**21**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	< 2.1 U	**5.2**	**26**	**40**	**7.9**	**140**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.1 UJ	< 1.9 U	< 2.1 UJ	< 1.8 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.0 U	< 1.9 U	< 2.1 U	< 1.8 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.1 U	< 2.0 U	< 2.0 U	< 1.9 U	< 2.1 U	< 1.8 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-37	VAP-37	VAP-38	VAP-38	VAP-38	VAP-38
			Sample ID	ASTC-VAP-37-GW(31-33)-(121721)	ASTC-VAP-37-GW(39.5-41.5)-(121721)	ASTC-VAP-38-GW(7-9)-(122121)	ASTC-VAP-38-GW(19-21)-(122121)	ASTC-VAP-38-GW(26-28)-(122121)	ASTC-VAP-38-GW(39-41)-(122121)
			Sample Date	12/17/2021	12/17/2021	12/21/2021	12/21/2021	12/21/2021	12/21/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 UJ	< 4.0 U	< 3.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**49**	**57**	**4.2 J**	< 4.1 U	< 4.0 U	< 3.8 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 3.7 U	< 3.9 U	< 4.1 U	< 4.1 U	< 4.0 U	< 3.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**22**	**11**	< 2.1 U	**11**	**3.9**	**35**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**52**	**50**	**2.2 J**	**9.2**	**3.5 J**	**22**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**5.8**	**6.0**	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**80**	**92**	< 2.1 U	**2.8 J**	< 2.0 U	**10**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**180**	**100**	**6.7**	**8.8**	**14**	**3.3 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**140**	**160**	**2.2 J**	**8.9**	**2.7 J**	**18**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**93**	**95**	< 2.1 U	< 2.1 U	**5.3**	**7.0**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	***250***	***160***	***47***	**4.6**	**12**	< 1.9 U
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**100**	**78**	**8.8**	**4.6**	< 2.0 U	**7.1**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**14**	**12**	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**240**	**220**	< 2.1 U	**12**	**2.6 J**	**44**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 1.9 UJ	< 2.0 UJ	< 2.1 UJ	< 2.1 UJ	< 2.0 U	< 1.9 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 1.9 U	< 2.0 U	< 2.1 U	< 2.1 U	< 2.0 U	< 1.9 U

Table 1
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	VAP-38	VAP-38	VAP-39	VAP-39	VAP-39	VAP-39
			Sample ID	ASTC-VAP-38-GW(50-52)-(122121)	ASTC-VAP-DUP16-(122121)	ASTC-VAP-39-GW(10-12)-(122221)	ASTC-VAP-39-GW(21-23)-(122221)	ASTC-VAP-39-GW(33-35)-(122221)	ASTC-VAP-39-GW(41.5-43.5)-(122221)
			Sample Date	12/21/2021	12/21/2021	12/22/2021	12/22/2021	12/22/2021	12/22/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	**15**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 4.2 U	< 3.8 U	< 4.7 UJ	< 4.8 UJ	< 5.5 UJ	< 5.0 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**21**	**21**	**11 J-**	**2.5 J-**	< 2.8 UJ	< 2.6 U
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**19**	**19**	**39 J-**	**7.5 J-**	**13 J-**	**23**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**8.9**	**8.3**	**9.6 J-**	**3.3 J-**	**3.9 J-**	**16**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	< 2.1 U	**2.1 J**	**7.2 J-**	**9.4 J-**	< 2.8 UJ	**4.0 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**16**	**16**	**49 J-**	**5.4 J-**	**13 J-**	**39**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**5.2**	**5.2**	< 2.4 UJ	**5.1 J-**	**5.6 J-**	**22**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluorooctane sulfonic acid (PFOS)	16	*12*	ppt	< 2.1 U	< 1.9 U	***83 J-***	**3.9 J-**	**4.3 J-**	**6.3**
Perfluorooctanoic acid (PFOA)	8	12000	ppt	**4.6**	**4.5**	**29 J-**	**5.7 J-**	**5.3 J-**	**6.8**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**43**	**43**	**53 J-**	**9.8 J-**	**28 J-**	**71**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 2.1 UJ	< 1.9 UJ	< 2.4 UX	< 2.4 UX	< 2.8 UJ	< 2.6 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 2.1 U	< 1.9 U	< 2.4 UJ	< 2.4 UJ	< 2.8 UJ	< 2.6 U

Notes

Bold - Analyte detected above limit of quantitation.
Shaded - Analytical results exceed the drinking water criteria.
Italic - Analyte detected above Groundwater/Surface Water Interface (GSI) criteria.
bgs - below ground surface
DUP - Duplicate
DW - Drinking water
EB - Equipment Blank
GSI - Groundwater/Surface Water Interface
NC - No criteria
ppt - parts per trillion
SW - Surface Water
< - Analytical result is less than the limit of quantitation (LOQ).
Samples were analyzed using modified United States Environmental Protection Agency (USEPA) Method 537 consistent with Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3 Table B-15
Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 12/21/2020. Table 1. Residential and Nonresidential Groundwater Criteria. Available online at: https://www.michigan.gov/documents/egle/deq-rrd-Rules-Groundwater_698452_7.pdf.

Criteria Footnotes:
A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:
Concentration (C) Qualifiers

U	The analyte was not detected and was reported as less than the LOD. The LOD has been adjusted for any dilution or concentration of the sample.
B	The compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.

Quantitation (Q) Qualifiers

E	The compound was quantitated above the calibration range.
D	Concentration is based on a diluted sample analysis.

Validation Qualifiers

J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
UJ	The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.
UB	Compound considered non-detect at the listed value due to associated blank contamination.

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-01	ASTC-SC-01	ASTC-SC-01	ASTC-SC-02	ASTC-SC-02
		Sample ID	ASTC-SC-01SS(1-2)-(082321)	ASTC-SC-01SS(5.5-6.5)-(082321)	ASTC-SC-01SS(11.5-12.5)-(082321)	ASTC-SC-02SS(1-2)-(082321)	ASTC-SC-02SS(5.5-6.5)-(082321)
		Sample Date	8/23/2021	8/23/2021	8/23/2021	8/23/2021	8/23/2021
Analyte	EGLE GSIP 2020 Criteria	Units					
PFASs							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0018 U	< 0.0017 U	< 0.0018 U	< 0.0018 U	< 0.0020 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00085 U	< 0.00085 U	< 0.00090 U	< 0.00090 U	< 0.00095 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.00058 J**	**0.0016**	**0.00094**	**0.00081 J**	**0.0019**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00044 U	< 0.00043 U	< 0.00044 U	< 0.00046 U	< 0.00049 U
GenChem							
Percent Solids	NC	%	**95.8**	**98.6**	**97.7**	**94.5**	**97.6**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-02	ASTC-SC-03	ASTC-SC-03	ASTC-SC-03	ASTC-SC-04
		Sample ID	ASTC-SC-02SS(11.5-12.5)-(082321)	ASTC-SC-03SS(1-2)-(082421)	ASTC-SC-03SS(5.5-6.5)-(082421)	ASTC-SC-03SS(11.5-12.5)-(082421)	ASTC-SC-04SS(0-1)-(082421)
		Sample Date	8/23/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021
Analyte	EGLE GSIP 2020 Criteria	Units					
PFASs							
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0019 U	< 0.0018 U	< 0.0019 U	< 0.0018 U	< 0.0020 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.00066 J**	< 0.00045 U	< 0.00047 U	< 0.00045 U	**0.0030**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00047 U	< 0.00045 U	< 0.00047 U	< 0.00045 U	< 0.00049 U
GenChem							
Percent Solids	NC	%	**96.6**	**95.5**	**97.9**	**96.9**	**97.7**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-04	ASTC-SC-04	ASTC-SC-05	ASTC-SC-05	ASTC-SC-05	ASTC-SC-05
		Sample ID	ASTC-SC-04SS(5.5-6.5)-(082421)	ASTC-SC-04SS(11-12)-(082421)	ASTC-SC-05SS(0-1)-(082421)	ASTC-SC-05SS(5.5-6.5)-(082421)	DUP-01082421)	ASTC-SC-05SS(11-12)-(082421)
		Sample Date	8/24/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0018 U	< 0.0019 U	< 0.0020 U	< 0.0021 U	< 0.0018 U	< 0.0019 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00090 U	< 0.00090 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00095 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00085 U	< 0.00090 U	< 0.0010 U	< 0.0010 U	< 0.00085 U	< 0.00095 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.045**	**0.031**	**0.0033**	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00044 U	< 0.00046 U	< 0.00050 U	< 0.00050 U	< 0.00044 U	< 0.00048 U
GenChem								
Percent Solids	NC	%	**97.7**	**94.9**	**95.5**	**92.6**	**95.6**	**96.9**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-06	ASTC-SC-06	ASTC-SC-06	ASTC-SC-07	ASTC-SC-07	ASTC-SC-07
		Sample ID	ASTC-SC-06SS(0-1)-(082421)	ASTC-SC-06SS(5-6)-(082421)	ASTC-SC-06SS(10-11)-(082421)	ASTC-SC-07SS(0-1)-(082421)	ASTC-SC-07SS(5-6)-(082421)	DUP-03(082421)
		Sample Date	8/24/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0020 U	< 0.0019 U	< 0.0019 U	< 0.0020 U	< 0.0019 U	< 0.0018 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.0011 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U	< 0.0010 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00090 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.0029**	< 0.00047 U	< 0.00047 U	**0.0036**	< 0.00048 U	**0.0034**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00047 U	< 0.00049 U	< 0.00048 U	< 0.00045 U
GenChem								
Percent Solids	NC	%	**96.2**	**97.8**	**96.9**	**96.4**	**96.8**	**95.7**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-07	ASTC-SC-08	ASTC-SC-08	ASTC-SC-08	ASTC-SC-09	ASTC-SC-09
		Sample ID	ASTC-SC-07SS(10-11)-(082421)	ASTC-SC-08SS-(0-1)-(082521)	ASTC-SC-08SS(5-6)-(082521)	ASTC-SC-08SS(10-11)-(082521)	ASTC-SC-09SS(0-1)-(082521)	ASTC-SC-09SS(4.5-5.5)-(082521)
		Sample Date	8/24/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0018 U	< 0.0021 U	< 0.0018 U	< 0.0018 U	< 0.0017 U	< 0.0020 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00090 U	< 0.0011 UX	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00090 U	< 0.0011 U	< 0.00085 U	< 0.00090 U	< 0.00085 U	< 0.00095 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	< 0.00044 U	**0.0016**	< 0.00044 U	< 0.00046 U	**0.012**	**0.0035**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00044 U	< 0.00050 U	< 0.00044 U	< 0.00046 U	< 0.00043 U	< 0.00049 U
GenChem								
Percent Solids	NC	%	**96.9**	**83.1**	**97.8**	**94.9**	**98.1**	**96.3**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-09	ASTC-SC-10	ASTC-SC-10	ASTC-SC-10	ASTC-SC-10	ASTC-SC-11
		Sample ID	ASTC-SC-09SS(9-10)-(082521)	ASTC-SC-10SS(1-2)-(082521)	ASTC-SC-10SS(6.5-7.5)-(082521)	DUP-05-(082521)	ASTC-SC-10SS(12-13)-(082521)	ASTC-SC-11SS(0-1)-(082521)
		Sample Date	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0019 U	< 0.0019 U	< 0.0019 U	< 0.0018 U	< 0.0018 U	< 0.0021 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 UJ	< 0.00090 U	< 0.0010 UJ
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.00090 U	< 0.0010 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.0034**	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	**0.0020**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00047 U	< 0.00046 U	< 0.00048 U	< 0.00046 U	< 0.00045 U	< 0.00050 U
GenChem								
Percent Solids	NC	%	**97.2**	**95.9**	**96.2**	**96.1**	**96.4**	**94.7**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-11	ASTC-SC-11	ASTC-SC-12	ASTC-SC-12	ASTC-SC-12	ASTC-SC-12
		Sample ID	ASTC-SC-11SS(6.5-7.5)-(082521)	ASTC-SC-11SS(12-13)-(082521)	ASTC-SC-12SS(0-1)-(082521)	ASTC-SC-12SS(6.5-7.5)-(082521)	DUP-04-(082521)	ASTC-SC-12SS(12-13)-(082521)
		Sample Date	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0020 U	< 0.0020 U	< 0.0020 U	< 0.0019 U	< 0.0020 U	< 0.0020 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00095 UJ	< 0.00095 UJ	< 0.00095 UX	< 0.00095 UX	< 0.00095 U	< 0.0010 UX
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.00095 U	< 0.0010 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 UJ	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	< 0.00049 U	< 0.00048 U	**0.0033**	**0.0011**	**0.0016**	< 0.00050 U
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00049 U	< 0.00048 U	< 0.00049 U	< 0.00047 U	< 0.00049 U	< 0.00050 U
GenChem								
Percent Solids	NC	%	**96.4**	**88.7**	**94.7**	**95.8**	**95.8**	**94.5**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-13	ASTC-SC-13	ASTC-SC-13	ASTC-SC-14	ASTC-SC-14	ASTC-SC-14
		Sample ID	ASTC-SC-13SS(0-1)-(082521)	ASTC-SC-13SS(6.5-7.5)-(082521)	ASTC-SC-13SS(12-13)-(082521)	ASTC-SC-14SS(1-2)-(082621)	ASTC-SC-14SS(6.5-7.5)-(082621)	DUP-07-(082621)
		Sample Date	8/25/2021	8/25/2021	8/25/2021	8/26/2021	8/26/2021	8/26/2021
Analyte	EGLE GSIP 2020 Criteria	Units						
PFASs								
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0020 U	< 0.0019 U	< 0.0018 U	< 0.0019 U	< 0.0018 U	< 0.0022 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.0010 UX	< 0.00095 UX	< 0.00090 UX	< 0.0010 U	< 0.00090 UX	< 0.0011 UX
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.0010 U	< 0.00095 U	< 0.00090 U	< 0.00095 U	< 0.00090 U	< 0.0011 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 UJ	< 0.00046 U	< 0.00055 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.0020**	**0.00072 J**	**0.00072 J**	< 0.00048 U	**0.00082 J**	< 0.00055 U
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00050 U	< 0.00047 U	< 0.00045 U	< 0.00048 U	< 0.00046 U	< 0.00055 U
GenChem								
Percent Solids	NC	%	**93.7**	**93.1**	**93.5**	**95.7**	**96.4**	**90.2**

Table 2
Summary of PFAS Soil Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-SC-14	ASTC-SC-15	ASTC-SC-15	ASTC-SC-15
		Sample ID	ASTC-SC-14SS(12-13)-(082621)	ASTC-SC-15SS(1-2)-(082621)	ASTC-SC-15SS(6.5-7.5)-(082621)	ASTC-SC-15SS(12-13)-(082621)
		Sample Date	8/26/2021	8/26/2021	8/26/2021	8/26/2021
Analyte	EGLE GSIP 2020 Criteria	Units				
PFASs						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0019 U	< 0.0021 U	< 0.0019 U	< 0.0017 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.00095 UX	< 0.0011 UX	< 0.00090 UX	< 0.00085 UX
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.00095 U	< 0.0011 U	< 0.00090 U	< 0.00085 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	< 0.00048 U	< 0.00050 U	**0.0022**	< 0.00043 U
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00048 U	< 0.00050 U	< 0.00046 U	< 0.00043 U
GenChem						
Percent Solids	NC	%	**95.0**	**94.7**	**96.4**	**97.4**

Notes:

Shaded - Analytical results exceed the associated criteria.

Bolded - Analytical result exceeds limit of quantitation (LOQ)

bgs - below ground surface

DUP - Duplicate

GSIP - Groundwater/Surface Water Protection

NC - No criteria

SD - Sediment

ppm - parts per million

< - Analytical result is less than the limit of quantitation (LOQ).

% - percent

Samples were analyzed by modified United States Environmental Protection Agency (USEPA) Method 537 consistent with DoD Quality Systems Manual (QSM) version 5.3 Table B-15

Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 6/25/2018.Table 3. Nonresidential Soil Criteria. Available online at: https://www.michigan.gov/documents/deq/deq-rrd-Rules-Table3SoilNonresidential_447075_7.pdf.

Criteria Notes:

X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:

J - The reported result is an estimated value.

U - Analyte was not detected.

UJ - The analyte was not detected and was reported as less than the Limit of Detection (LOD). However, the associated numeric value is approximate.

Table 3
Summary of PFAS Soil Analytical Results, Preliminary Site Investigation, December 2020
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	VAP-01	VAP-01	VAP-01	VAP-02	VAP-02	VAP-02	VAP-02
		Sample ID	ASTC-VAP-01-SS(4.5-5)-(123020	ASTC-VAP-01-SS(6.5-7.5)-(123020)	ASTC-VAP-01-SS(8.5-9)-(123020)	ASTC-VAP-02-SS(1-1.5)-(123020)	ASTC-VAP-02-SS(6.5-7)-(123020)	ASTC-VAP-DUP01SS-(123020)	ASTC-VAP-02-SS(11.5-12)-(123020)
		Sample Date	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020	12/30/2020
Analyte	EGLE GSIP 2020 Criteria	Units							
PFASs									
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.0020 U	< 0.0018 U	< 0.0022 U	< 0.0021 U	< 0.0018 U	< 0.0019 U	< 0.0021 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.0010 UJ	< 0.00090 UJ	< 0.0011 UJ	< 0.0011 UJ	< 0.00090 UJ	< 0.00095 U	< 0.0011 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.0010 U	< 0.00090 U	< 0.0011 U	< 0.0011 U	< 0.00090 U	< 0.00095 U	< 0.0011 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorobutanoic acid (PFBA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.00050 UJ	< 0.00045 UJ	< 0.00055 UJ	< 0.00050 UJ	< 0.00045 UJ	< 0.00048 U	< 0.00055 U
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	**0.00028 J**	< 0.00048 U	< 0.00055 U
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**0.00044 J**	< 0.00045 U	**0.00065 J**	**0.0033**	< 0.00045 U	**0.00027 J**	**0.0019**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.00050 U	< 0.00045 U	< 0.00055 U	< 0.00050 U	< 0.00045 U	< 0.00048 U	< 0.00055 U
GenChem									
Percent Solids	NC	%	**96.5**	**94.7**	**88.2**	**94.8**	**96.3**	**96.5**	**86.5**

Notes:

Shaded - Analytical results exceed the associated criteria.

Bolded - Analytical result exceeds limit of quantitation (LOQ)

bgs - below ground surface

DUP - Duplicate

GSIP - Groundwater/Surface Water Protection

NC - No criteria

SD - Sediment

ppm - parts per million

< - Analytical result is less than the limit of quantitation (LOQ).

% - percent

Samples were analyzed by modified United States Environmental Protection Agency (USEPA) Method 537 consistent with DoD Quality Systems Manual (QSM) version 5.3 Table B-15

Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 6/25/2018.Table 3. Nonresidential Soil Criteria. Available online at: https://www.michigan.gov/documents/deq/deq-rrd-Rules-Table3SoilNonresidential_447075_7.pdf.

Criteria Notes:

X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:

J - The reported result is an estimated value.

U - Analyte was not detected.

UJ - The analyte was not detected and was reported as less than the Limit of Detection (LOD). However, the associated numeric value is approximate.

Table 4
Summary of PFAS Soil Analytical Results, Storm Drain and Sanitary Sewer Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

		Location ID	ASTC-OWS	ASTC-OWS	ASTC-SAN-MH02	ASTC-SAN-MH03
		Sample ID	ASTC-OWSSED-082421	ASTC-OWS-DUP02-082421	ASTC-SAN-MH02SED-082421	ASTC-SAN-MH03SED-082421
		Sample Date	8/24/2021	8/24/2021	8/24/2021	8/24/2021
Analyte	EGLE GSIP 2020 Criteria	Units				
PFASs						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	NC	ppm	< 0.12 U	< 0.025 U	< 0.0070 U	< 0.0018 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
4:2 Fluorotelomer sulfonate	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	ppm	< 0.060 U	< 0.013 U	**0.0081**	< 0.00090 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	ppm	< 0.060 U	< 0.013 U	< 0.0035 U	< 0.00090 U
Perfluorobutane sulfonic acid (PFBS)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	**0.00054 J**
Perfluorobutanoic acid (PFBA)	NC	ppm	**0.030 J**	< 0.0060 U	**0.0043**	**0.00078 J**
Perfluorodecane sulfonic acid (PFDS)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0048**	**0.0019**
Perfluorodecanoic acid (PFDA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0029 J**	**0.0029**
Perfluorododecanoic acid (PFDoA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0023 J**	**0.0017**
Perfluoroheptane sulfonic acid (PFHpS)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	< 0.00046 U
Perfluoroheptanoic acid (PFHpA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.010**	**0.0011**
Perfluorohexane sulfonic acid (PFHxS)	NC	ppm	**0.14**	**0.024**	**0.0075**	**0.0018**
Perfluorohexanoic acid (PFHxA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0091**	**0.0027**
Perfluorononane sulfonic acid (PFNS)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	< 0.00046 U
Perfluorononanoic acid (PFNA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0019 J**	**0.00055 J**
Perfluorooctane sulfonamide (PFOSA)	NC	ppm	**0.049 J**	**0.010 J**	< 0.0018 U	< 0.00046 U
Perfluorooctane sulfonic acid (PFOS)	0.00024	ppm	**2.3 J**	**0.55 J**	**0.23**	**0.061**
Perfluorooctanoic acid (PFOA)	10	ppm	< 0.029 U	< 0.0060 U	**0.0030 J**	**0.00073 J**
Perfluoropentane sulfonate (PFPeS)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	< 0.00046 U
Perfluoropentanoic acid (PFPeA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.022**	**0.0056**
Perfluorotetradecanoic acid (PFTeDA)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	**0.00051 J**
Perfluorotridecanoic acid (PFTrDA)	NC	ppm	< 0.029 U	< 0.0060 U	< 0.0018 U	**0.00051 J**
Perfluoroundecanoic acid (PFUdA)	NC	ppm	< 0.029 U	< 0.0060 U	**0.0044**	**0.0016**
GenChem						
Percent Solids	NC	%	**1.36**	**7.14**	**27.5**	**91.6**

Notes:

Shaded - Analytical results exceed the associated criteria.

Bolded - Analytical result exceeds limit of quantitation (LOQ)

bgs - below ground surface

DUP - Duplicate

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NC - No criteria

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% - percent

Samples were analyzed by modified United States Environmental Protection Agency (USEPA) Method 537 consistent with DoD Quality Systems Manual (QSM) version 5.3 Table B-15

Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 6/25/2018.Table 3. Nonresidential Soil Criteria. Available online at: https://www.michigan.gov/documents/deq/deq-rrd-Rules-Table3SoilNonresidential_447075_7.pdf.

Criteria Notes:

X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:

J - The reported result is an estimated value.

U - Analyte was not detected.

UJ - The analyte was not detected and was reported as less than the Limit of Detection (LOD). However, the associated numeric value is approximate.

Table 5
Summary of PFAS Groundwater Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	ASTC-SC-01	ASTC-SC-02	ASTC-SC-03	ASTC-SC-03	ASTC-SC-04	ASTC-SC-05
			Sample ID	ASTC-SC-01GW(11-15)-(082321)	ASTC-SC-02GW(11-15)-(082321)	ASTC-SC-03GW(11-15)-(082421)	DUP-02(082421)	ASTC-SC-04GW(11-15)-(082421)	ASTC-SC-05GW(11-15)-(082421)
			Sample Date	8/23/2021	8/23/2021	8/24/2021	8/24/2021	8/24/2021	8/24/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 6.8 U	**4,100**	< 7.0 U	< 6.8 U	**110**	< 7.0 U
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 6.8 U	< 7.1 U	< 7.0 U	< 6.8 U	< 6.8 U	< 7.0 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**2.6 J**	**3.5**	< 3.5 U	< 3.4 U	**2.7 J**	**3.0 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**48**	**100**	**110**	**110**	**98**	**42**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 3.4 U	**3.8**	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 3.4 U	< 3.5 U	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 3.4 U	< 3.5 U	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**6.2**	**40**	< 3.5 U	< 3.4 U	9.0	3.2 J
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**10**	**28**	**40**	**41**	**43**	**28**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**31**	**120**	**2.3 J**	**2.4 J**	**41**	**68**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**84**	**170**	**160**	**180**	**130**	**71**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 3.4 U	**2.0 J**	< 3.5 U	< 3.4 U	2.0 J	< 3.5 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 3.4 U	**2.5 J**	**3.9**	**3.7**	**16**	**19**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 3.4 U	**9.7**	**2.4 J**	< 3.4 U	< 3.4 U	< 3.5 U
Perfluorooctane sulfonic acid (PFOS)	16	12	ppt	***210***	***3,000***	***28***	***28***	***1,400***	***320***
Perfluorooctanoic acid (PFOA)	8	12,000	ppt	**10**	**20**	**9.2**	**9.1**	**11**	**11**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 3.4 U	**2.7 J**	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**170**	**390**	**450**	**440**	**310**	**150**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 3.4 U	< 3.5 U	< 3.4 HU	< 3.4 HU	< 3.4 U	< 3.5 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 3.4 U	< 3.5 U	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 3.4 U	< 3.5 U	< 3.5 U	< 3.4 U	< 3.4 U	< 3.5 U

Table 5
Summary of PFAS Groundwater Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	ASTC-SC-06	ASTC-SC-07	ASTC-SC-08	ASTC-SC-09	ASTC-SC-10	ASTC-SC-10
			Sample ID	ASTC-SC-06GW(11-15)-(082421)	ASTC-SC-07GW(11-15)-(082421)	ASTC-SC-08GW(11-15)-(082521)	ASTC-SC-09GW(10-14)-(082521)	ASTC-SC-10GW(11-15)-(082521)	DUP-06-(082521)
			Sample Date	8/24/2021	8/24/2021	8/25/2021	8/25/2021	8/25/2021	8/25/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units						
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	< 6.9 U	**11**	**7.9**	**33**	**130**	**130**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 6.9 U	< 6.9 U	< 6.9 U	< 7.0 U	< 6.8 U	< 6.8 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	< 3.4 U	< 3.4 U	**68**	**45**	**25**	**25**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**12**	**16**	**40**	**22**	**95**	**93**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	**2.0 J**	< 3.4 U	< 3.4 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.5 U	< 3.4 U	< 3.4 U
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.5 U	< 3.4 U	< 3.4 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	< 3.4 U	< 3.4 U	**4.8**	< 3.5 U	**29**	**28**
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**4.7**	**18**	**21**	**9.0**	**19**	**18**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**1.7 J**	**5.1**	**200**	**36**	**220**	**220**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**15**	**28**	**66**	**53**	**320**	**310**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 3.4 U	< 3.4 U	**5.9**	< 3.5 U	< 3.4 U	< 3.4 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.5 U	< 3.4 U	< 3.4 U
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	< 3.4 U	< 3.4 U	**5.0**	**17**	< 3.4 U	< 3.4 U
Perfluorooctane sulfonic acid (PFOS)	16	12	ppt	***100***	***20***	***97***	***100***	***3600 DJ***	***4000 DJ***
Perfluorooctanoic acid (PFOA)	8	12,000	ppt	**3.3 J**	**3.8**	**17**	**7.4**	**36**	**34**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	< 3.4 U	< 3.4 U	**19**	**3.5**	**8.1**	**8.0**
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**32**	**41**	**83**	**44**	**400**	**400**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.4 UJ	< 3.4 U	< 3.4 U
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.5 U	< 3.4 U	< 3.4 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 3.4 U	< 3.4 U	< 3.4 U	< 3.5 U	< 3.4 U	< 3.4 U

Table 5
Summary of PFAS Groundwater Analytical Results, Source Area Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

			Location	ASTC-SC-11	ASTC-SC-12	ASTC-SC-13	ASTC-SC-14	ASTC-SC-15
			Sample ID	ASTC-SC-11GW(11-15)-(082521)	ASTC-SC-12GW(11-15)-(082521)	ASTC-SC-13GW(11-15)-(082521)	ASTC-SC-14GW(11-15)-(082621)	ASTC-SC-15GW(11-15)-(082621)
			Sample Date	8/25/2021	8/25/2021	8/25/2021	8/26/2021	8/26/2021
Analyte	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units					
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	370	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
4:2 Fluorotelomer sulfonate	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	NC	NC	ppt	**5600 DJ**	**1200 DJ**	**9.8**	**4.1 J**	**69**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	**11**
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
N-Methylperfluoroocatane sulfonamidoacetic acid (MeFOSAA)	NC	NC	ppt	< 6.7 U	< 1400 U	< 7.0 U	< 7.0 U	< 7.1 U
Perfluorobutane sulfonic acid (PFBS)	420	NC	ppt	**15**	< 680 U	**44**	< 3.5 U	**1.9 J**
Perfluorobutanoic acid (PFBA)	NC	NC	ppt	**1100 DJ**	< 680 U	**8.1**	**6.6**	**180**
Perfluorodecane sulfonic acid (PFDS)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluorodecanoic acid (PFDA)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	**7.4**
Perfluorododecanoic acid (PFDoA)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluoroheptane sulfonic acid (PFHpS)	NC	NC	ppt	**17**	**390 DJ**	**8.6**	< 3.5 U	< 3.6 U
Perfluoroheptanoic acid (PFHpA)	NC	NC	ppt	**170**	< 680 U	**2.5 J**	**4.3**	**78**
Perfluorohexane sulfonic acid (PFHxS)	51	NC	ppt	**150**	**1600 DJ**	**40**	**13**	**2.0 J**
Perfluorohexanoic acid (PFHxA)	400000	NC	ppt	**1800 DJ**	**440 DJ**	**12**	**7.0**	**250**
Perfluorononane sulfonic acid (PFNS)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluorononanoic acid (PFNA)	6	NC	ppt	**2.2 J**	< 680 U	< 3.5 U	**2.1 J**	**15**
Perfluorooctane sulfonamide (PFOSA)	NC	NC	ppt	**2.5 J**	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluorooctane sulfonic acid (PFOS)	16	12	ppt	***3100 DJ***	***64000 DJ***	***300***	***19***	***16***
Perfluorooctanoic acid (PFOA)	8	12,000	ppt	**23**	< 680 U	**14**	**9.1**	**13**
Perfluoropentane sulfonate (PFPeS)	NC	NC	ppt	**9.4**	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluoropentanoic acid (PFPeA)	NC	NC	ppt	**3700 DJ**	**680 DJ**	**10**	**8.9**	**540**
Perfluorotetradecanoic acid (PFTeDA)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 UJ
Perfluorotridecanoic acid (PFTrDA)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U
Perfluoroundecanoic acid (PFUdA)	NC	NC	ppt	< 3.4 U	< 680 U	< 3.5 U	< 3.5 U	< 3.6 U

Notes

Bold - Analyte detected above limit of quantitation.
Shaded - Analytical results exceed the drinking water criteria.
Italic - Analyte detected above Groundwater/Surface Water Interface (GSI) criteria.
bgs - below ground surface
DUP - Duplicate
DW - Drinking water
EB - Equipment Blank
GSI - Groundwater/Surface Water Interface
NC - No criteria
ppt - parts per trillion
SW - Surface Water
< - Analytical result is less than the limit of quantitation (LOQ).
Samples were analyzed using modified United States Environmental Protection Agency (USEPA) Method 537 consistent with Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3 Table B-15
Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 12/21/2020. Table 1. Residential and Nonresidential Groundwater Criteria. Available online at: https://www.michigan.gov/documents/egle/deq-rrd-Rules-Groundwater_698452_7.pdf.

Criteria Footnotes:
A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:
Concentration (C) Qualifiers

U	The analyte was not detected and was reported as less than the LOD. The LOD has been adjusted for any dilution or concentration of the sample.
B	The compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.

Quantitation (Q) Qualifiers

E	The compound was quantitated above the calibration range.
D	Concentration is based on a diluted sample analysis.

Validation Qualifiers

J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
UJ	The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.
UB	Compound considered non-detect at the listed value due to associated blank contamination.

Table 6
Summary of PFAS Water Analytical Results, Storm Drain and Sanitary Sewer Investigation, August 2021
USCG Air Station Traverse City, Traverse City, Michigan

ARCADIS

Analyte	CAS	EGLE Drinking Water 2020 Criteria	EGLE GSI 2020 Criteria	Units	ASTC-SAN-MH01 ASTC-SAN-MH01WW-082421 8/24/2021	ASTC-SAN-MH02 ASTC-SAN-MH02WW-082421 8/24/2021	ASTC-SAN-MH03 ASTC-SAN-MH03WW-082421 8/24/2021	ASTC-SAN-MH04 ASTC-SAN-MH04WW-082421 8/24/2021	ASTC-SAN-MH05 ASTC-SAN-MH05WW-082421 8/24/2021	ASTC-SD-MH02 ASTC-SD-DUP01-082321 8/23/2021	ASTC-SD-MH02SW-082321 ASTC-SD-MH02SW-082321 8/23/2021	ASTC-OWS ASTC-OWSWW-082421 8/24/2021	SW-01 ASTC-SW01-(121820) 12/18/2020
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	763051-92-9	NC	NC	ppt	< 7.6 UX	< 11 UJ	< 7.6 U	< 7.7 UJ	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
2,3,3,3-Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (HFPO-DA)	13252-13-6	370	NC	ppt	< 7.6 UJ	< 11 UJ	< 7.6 UJ	< 7.7 U	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
4,8-Dioxa-3H-perfluorononanoic acid (DONA)	919005-14-4	NC	NC	ppt	< 7.6 U	< 11 U	< 7.6 U	< 7.7 UJ	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
4:2 Fluorotelomer sulfonate	757124-72-4	NC	NC	ppt	< 7.6 U	< 11 U	< 7.6 U	< 7.7 U	< 7.4 U	< 7.7 UJ	< 7.7 U	< 8.0 U	< 11 UJ-
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	27619-97-2	NC	NC	ppt	**7.7 J+**	< 11 U	< 7.6 U	< 7.7 U	**4.8 J-**	**100 J-**	**120**	**28 J-**	**140 J-**
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	39108-34-4	NC	NC	ppt	< 7.6 U	< 11 U	< 7.6 U	< 7.7 U	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (F-53 Major)	756426-58-1	NC	NC	ppt	< 7.6 UX	< 11 U	< 7.6 U	< 7.7 UJ	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	NC	NC	ppt	< 7.6 UX	< 11 U	< 7.6 U	< 7.7 UJ	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
N-Methylperfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	NC	NC	ppt	< 7.6 UX	< 11 U	< 7.6 UJ	< 7.7 UJ	< 7.4 U	< 7.7 U	< 7.7 U	< 8.0 U	< 11 UJ-
Perfluorobutane sulfonic acid (PFBS)	375-73-5	420	NC	ppt	**9.5 J+**	< 5.6 UX	**10 J+**	**4.6**	**6.1**	< 3.9 U	< 3.8 U	**25**	**8.0 J-**
Perfluorobutanoic acid (PFBA)	375-22-4	NC	NC	ppt	**14 X**	< 5.6 UX	< 3.8 UX	**7**	**11 J+**	**17**	**17**	**160**	**65 J-**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	NC	NC	ppt	< 3.8 UX	< 5.6 U	< 3.8 U	< 3.8 UJ	< 3.7 U	< 3.9 U	< 3.8 U	< 4.0 U	< 5.5 UJ-
Perfluorodecanoic acid (PFDA)	335-76-2	NC	NC	ppt	< 3.8 UJ	< 5.6 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.9 U	< 3.8 U	**2.3 J**	< 5.5 UJ-
Perfluorododecanoic acid (PFDoA)	307-55-1	NC	NC	ppt	< 3.8 UX	< 5.6 U	< 3.8 U	< 3.8 UJ	< 3.7 U	< 3.9 U	< 3.8 U	< 4.0 UJ	< 5.5 UJ-
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	NC	NC	ppt	< 3.8 U	< 5.6 U	< 3.8 U	< 3.8 UJ	< 3.7 U	< 3.9 U	< 3.8 U	**7.1**	**1.5 J-**
Perfluoroheptanoic acid (PFHpA)	375-85-9	NC	NC	ppt	**3.1 J**	< 5.6 U	< 3.8 U	**4.9**	**3.7**	**5.4**	**3.8**	**13**	**41 J-**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	51	NC	ppt	< 3.8 U	< 5.6 U	< 3.8 U	< 3.8 UJ	**1.9 J**	**3.0 J**	**2.5 J**	**110**	**34 J-**
Perfluorohexanoic acid (PFHxA)	307-24-4	400,000	NC	ppt	**12**	< 5.6 UJ	**6.8 J+**	**12**	**16**	**34**	**28**	**68**	**120 J-**
Perfluorononane sulfonic acid (PFNS)	68259-12-1	NC	NC	ppt	< 3.8 UX	< 5.6 U	< 3.8 U	< 3.8 UJ	< 3.7 U	< 3.9 U	< 3.8 U	< 4.0 U	< 5.5 UJ-
Perfluorononanoic acid (PFNA)	375-95-1	6	NC	ppt	< 3.8 U	< 5.6 U	< 3.8 U	**2.1 J**	< 3.7 U	< 3.9 U	< 3.8 U	**3.0 J**	< 5.5 UJ-
Perfluorooctane sulfonamide (PFOSA)	754-91-6	NC	NC	ppt	< 3.8 UJ	< 5.6 U	< 3.8 U	< 3.8 U	< 3.7 U	< 3.9 U	< 3.8 U	**5.6**	**3.5 J-**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	16	12	ppt	***71 X***	< 5.6 U	**12**	***14 J+***	***16***	**6.2**	**6.9**	***710***	***66 J-***
Perfluorooctanoic acid (PFOA)	335-67-1	8	12,000	ppt	**4.9 J+**	< 5.6 U	**2.7 J**	**12**	**7.5**	< 3.9 U	< 3.8 U	**18**	**8.2 J-**
Perfluoropentane sulfonate (PFPeS)	138495-42-8	NC	NC	ppt	< 3.8 UJ	< 5.6 UX	< 5.5 UJ	< 3.8 U	< 3.7 U	< 3.9 U	< 3.8 U	**8.8**	**2.6 J-**
Perfluoropentanoic acid (PFPeA)	2706-90-3	NC	NC	ppt	**11 J+**	**200 J+**	< 3.8 UX	**18**	**18**	**36**	**32**	**34**	**190 J-**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	NC	NC	ppt	< 3.8 UX	< 5.6 UJ	< 3.8 UX	< 3.8 UX	< 3.7 UJ	< 3.9 U	< 3.8 U	< 4.0 UJ	< 5.5 UJ-
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	NC	NC	ppt	< 3.8 UX	< 5.6 UJ	< 3.8 U	< 3.8 UJ	< 3.7 U	< 3.9 U	< 3.8 U	< 4.0 UJ	< 5.5 UJ-
Perfluoroundecanoic acid (PFUdA)	2058-94-8	NC	NC	ppt	< 3.8 UX	< 5.6 U	< 3.8 U	**1.9 J+**	< 3.7 U	< 3.9 U	< 3.8 U	< 4.0 U	< 5.5 UJ-

Table 6
Summary of PFAS Groundwater Analytical Results, Vertical Aquifer Profiling, December 2020, July 2021, and December 2021
USCG Traverse City

ARCADIS

Notes

Bold - Analyte detected EGLE Drink-EGLE GSI 2020 Criteria
Shaded - Analytical results exceed the drinking water criteria.
Italic - Analyte detected above Groundwater/Surface Water Interface (GSI) criteria.
bgs - below ground surface
DUP - Duplicate
DW - Drinking water
EB - Equipment Blank
GSI - Groundwater/Surface Water Interface
NC - No criteria
ppt - parts per trillion
SW - Surface Water
< - Analytical result is less than the limit of quantitation (LOQ).
Samples were analyzedusing modified United States Environmental Protection Agency (USEPA) Method 537 consistent with Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3 Table B-15
Analytical results were compared to the Michigan Department of Environment, Great Lakes and Energy (EGLE) Criteria Reference: EGLE. 12/21/2020. Table 1. Residential and Nonresidential Groundwater Criteria. Available online at: https://www.michigan.gov/documents/egle/deq-rrd-Rules-Groundwater_698452_7.pdf.

Criteria Footnotes:
A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV).

Laboratory Notes:
Concentration (C) Qualifiers

U	The analyte was not detected and was reported as less than the LOD. The LOD has been adjusted for any dilution or concentration of the sample.
B	The compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.

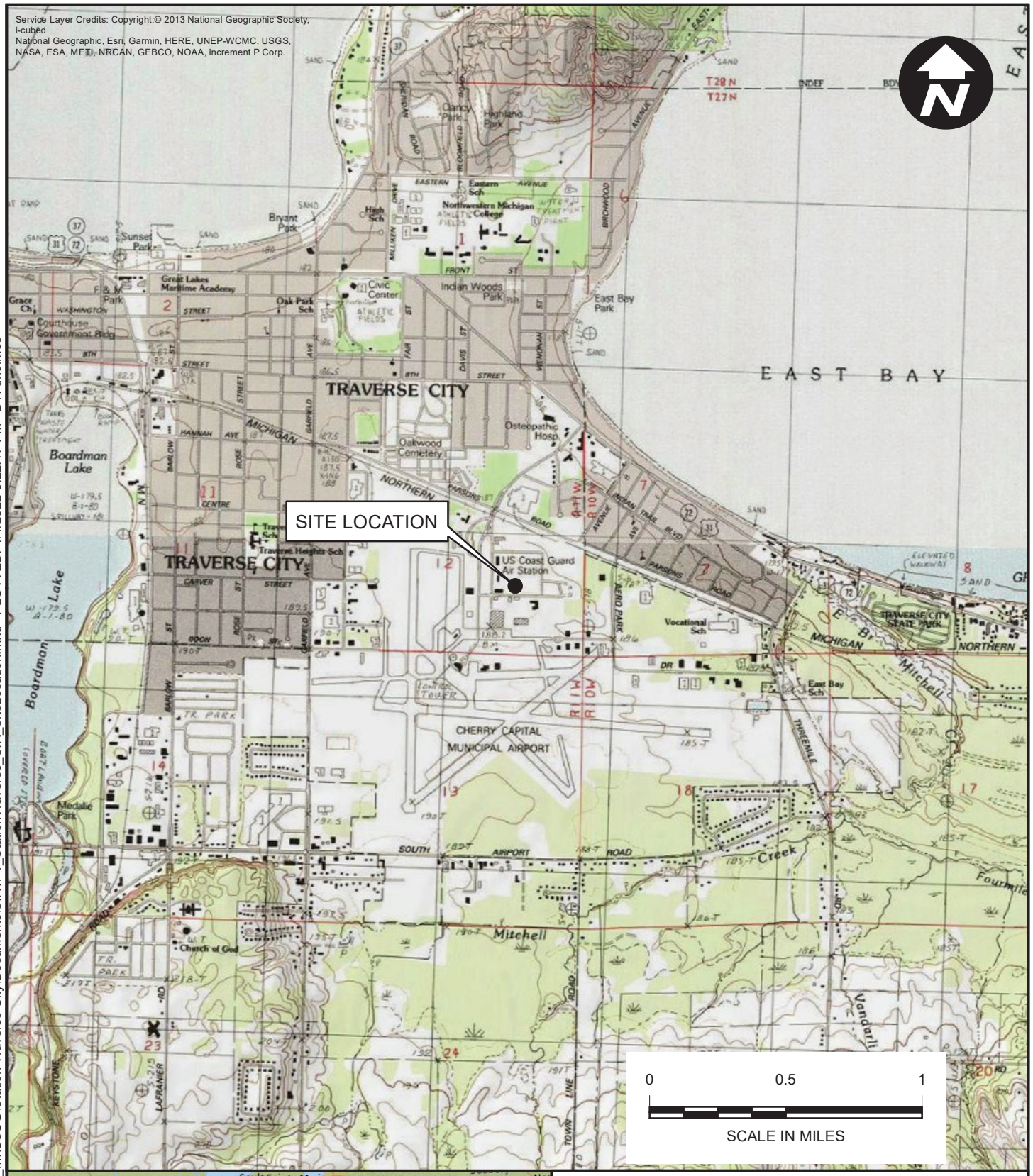
Quantitation (Q) Qualifiers

E	The compound was quantitated above the calibration range.
D	Concentration is based on a diluted sample analysis.

Validation Qualifiers

J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
UJ	The analyte was not detected and was reported as less than the LOD. However, the associated numerical value is approximate.
UB	Compound considered non-detect at the listed value due to associated blank contamination.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

Figures



UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SITE LOCATION MAP

ARCADIS

FIGURE
1-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
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UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SITE LAYOUT WITH ON-SITE BORING LOCATIONS

ARCADIS

FIGURE
1-2

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
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UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

OFF-SITE GROUNDWATER CHARACTERIZATION LOCATIONS

ARCADIS

FIGURE
1-3

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sciafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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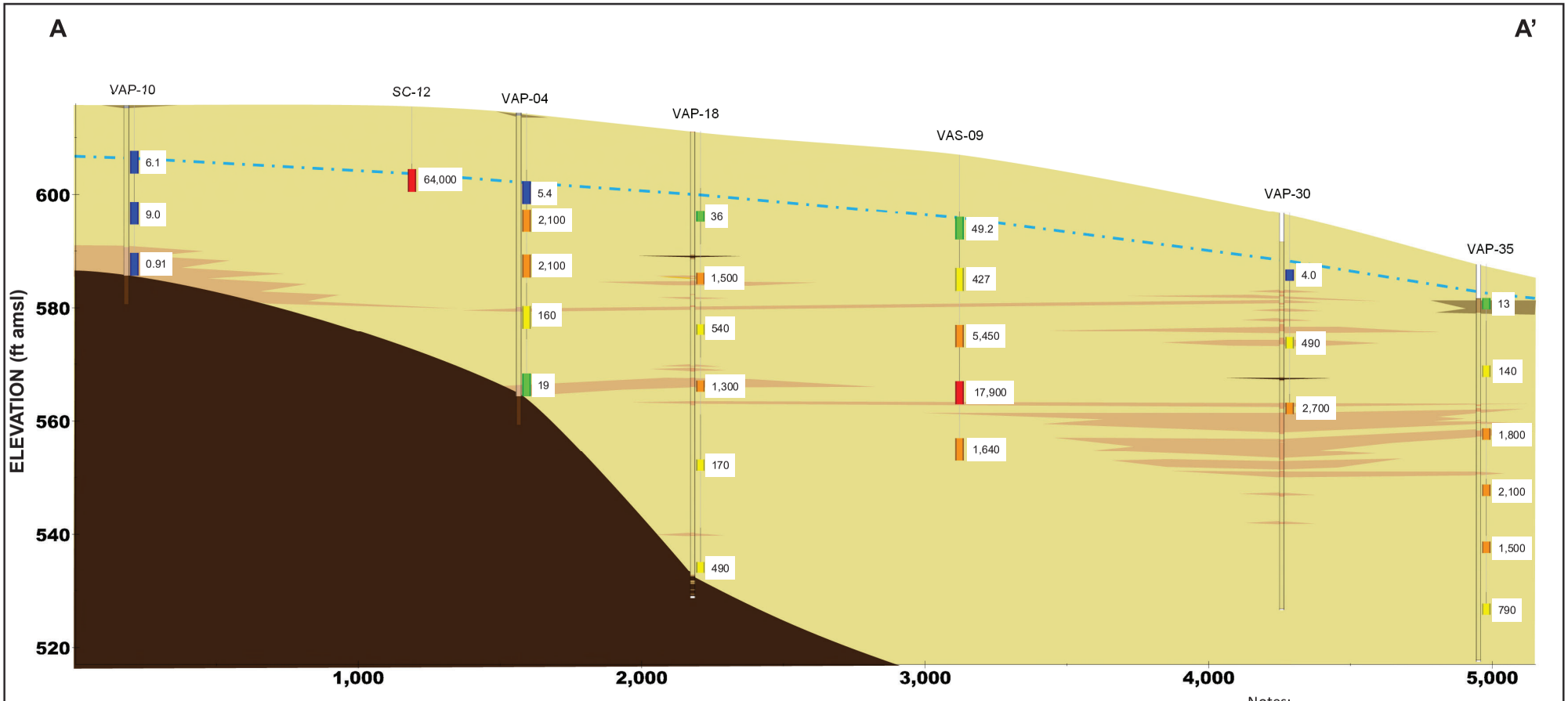


Material (CPT Log)

- Undefined/Organic Material
- Gravelly Sand
- Sand
- Silty Sand
- Clay
- No Recovery

Approximate Water Table Observed During CPT/VAP Investigation

PFOS

- > 10,000 ppt
- 1,000 - 10,000 ppt
- 100 - 1,000 ppt
- Above Criteria < 100 ppt
- Below Applicable Criteria

Notes:

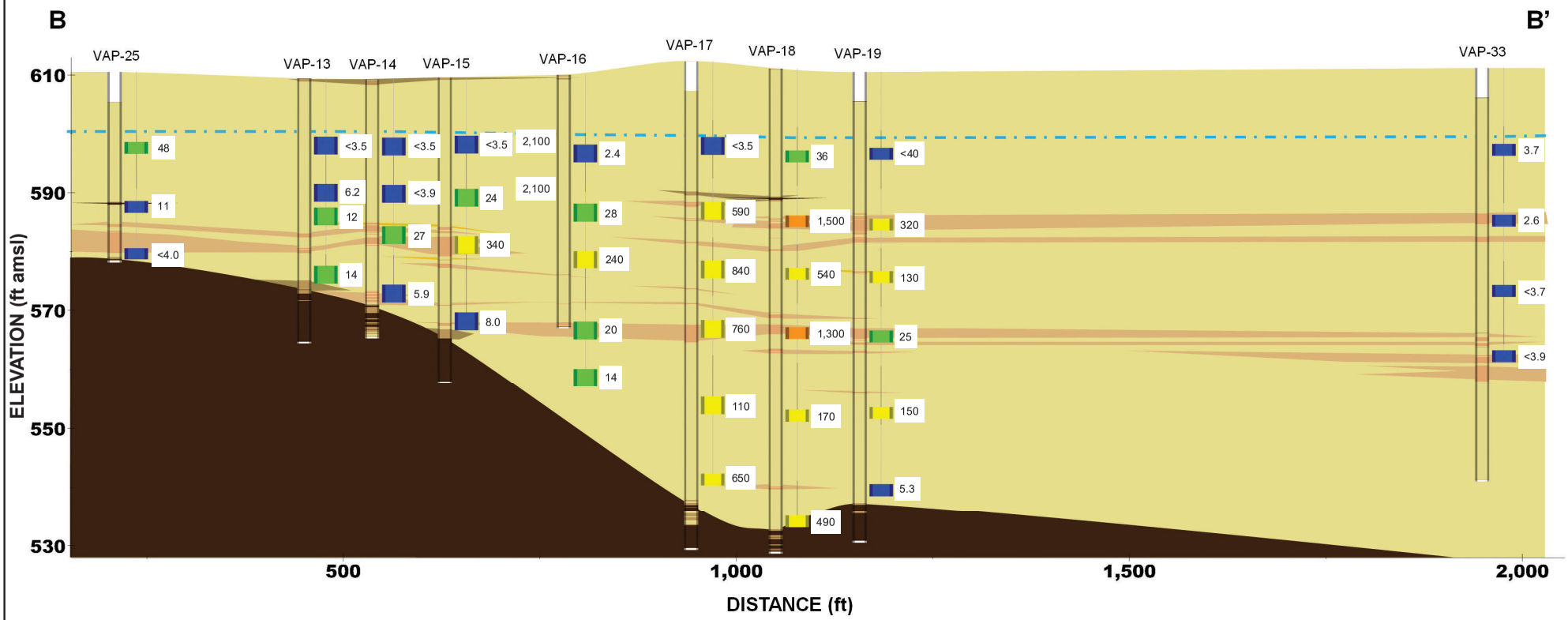
PFOS = perfluorooctane sulfonic acid
< = not detected above laboratory reporting limits
ppt = parts per trillion
amsl = above mean sea level
Vertical exaggeration = 20x
Analytical results presented in ppt
The EGLE GSI criterion for PFOS is 11 ppt

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

CROSS SECTION A-A'
SOUTHWEST - NORTHEAST

ARCADIS

FIGURE
2-1



Material (CPT Log)

- Undefined/Organic Material
- Gravelly Sand
- Sand
- Silty Sand
- Clay
- No Recovery

Approximate Water Table Observed During CPT/VAP Investigation

PFOS

- > 10,000 ppt
- 1,000 - 10,000 ppt
- 100 - 1,000 ppt
- Above Criteria < 100 ppt
- Below Applicable Criteria

Notes:

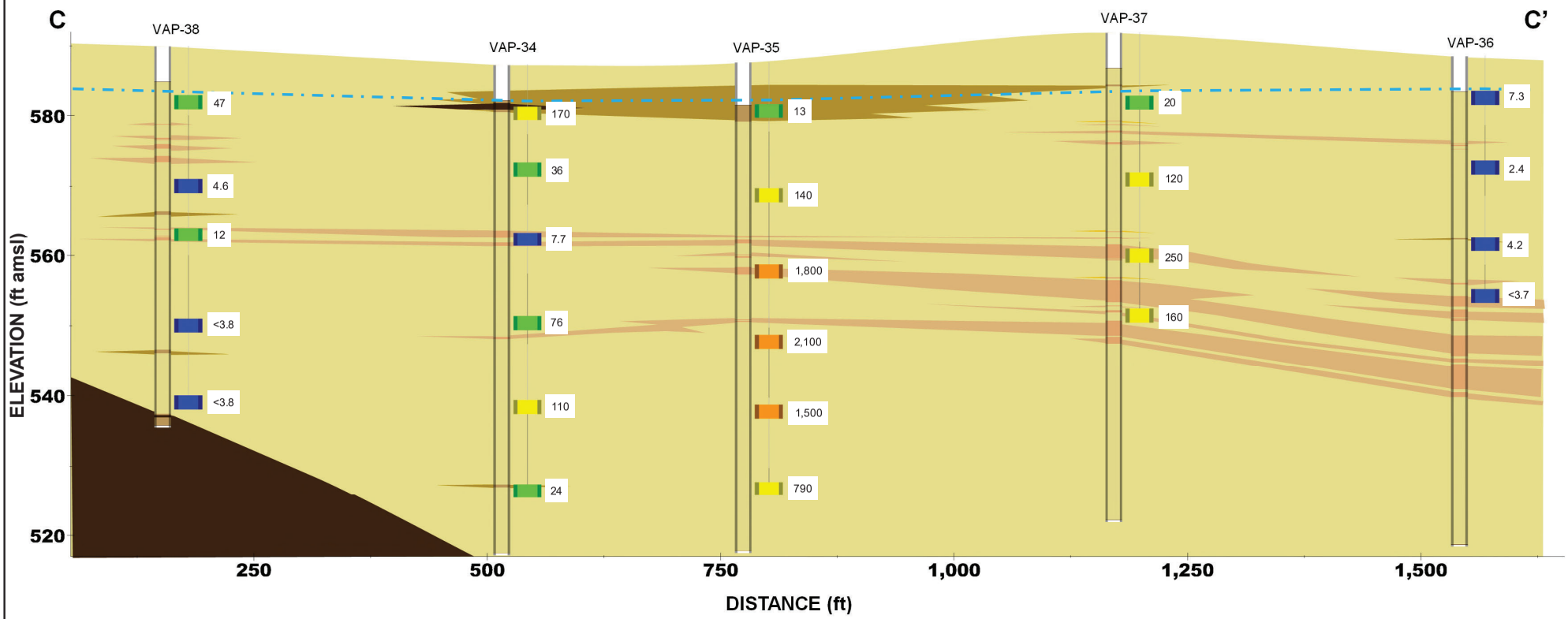
PFOS = perfluorooctane sulfonic acid
< = not detected above laboratory reporting limits
ppt = parts per trillion
amsl = above mean sea level
Vertical exaggeration = 7.5x
Analytical results presented in ppt
The EGLE GSI criterion for PFOS is 11 ppt

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

CROSS SECTION B-B'
NORTHWEST - SOUTH

ARCADIS

FIGURE
2-2



Material (CPT Log)

- Undefined/Organic Material
- Gravelly Sand
- Sand
- Silty Sand
- Clay
- No Recovery
- Approximate Water Table Observed During CPT/VAP Investigation

PFOS

- > 10,000 ppt
- 1,000 - 10,000 ppt
- 100 - 1,000 ppt
- Above Criteria < 100 ppt
- Below Applicable Criteria

Notes:
PFOS = perfluorooctane sulfonic acid
< = not detected above laboratory reporting limits
ppt = parts per trillion
amsl = above mean sea level
Vertical exaggeration = 7.5x
Analytical results presented in ppt
The EGLE GSI criterion for PFOS is 11 ppt

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

CROSS SECTION C-C'
NORTHWEST - SOUTHEAST

ARCADIS

FIGURE
2-3

LEGEND

ASTC PROPERTY BOUNDARY

POTENTIAL OFF-SITE AFFF SOURCE AREA

ASTC - AIR STATION TRAVERSE CITY

AFFF - AQUEOUS FILM FORMING FOAM

SOURCE REFERENCE: Gosling Czubak Engineering Sciences, Inc. 2020. PFAS Soil Investigation report, Cherry Capital Airport (TVC), Traverse City, Michigan. December

0 700 1,400

SCALE IN FEET

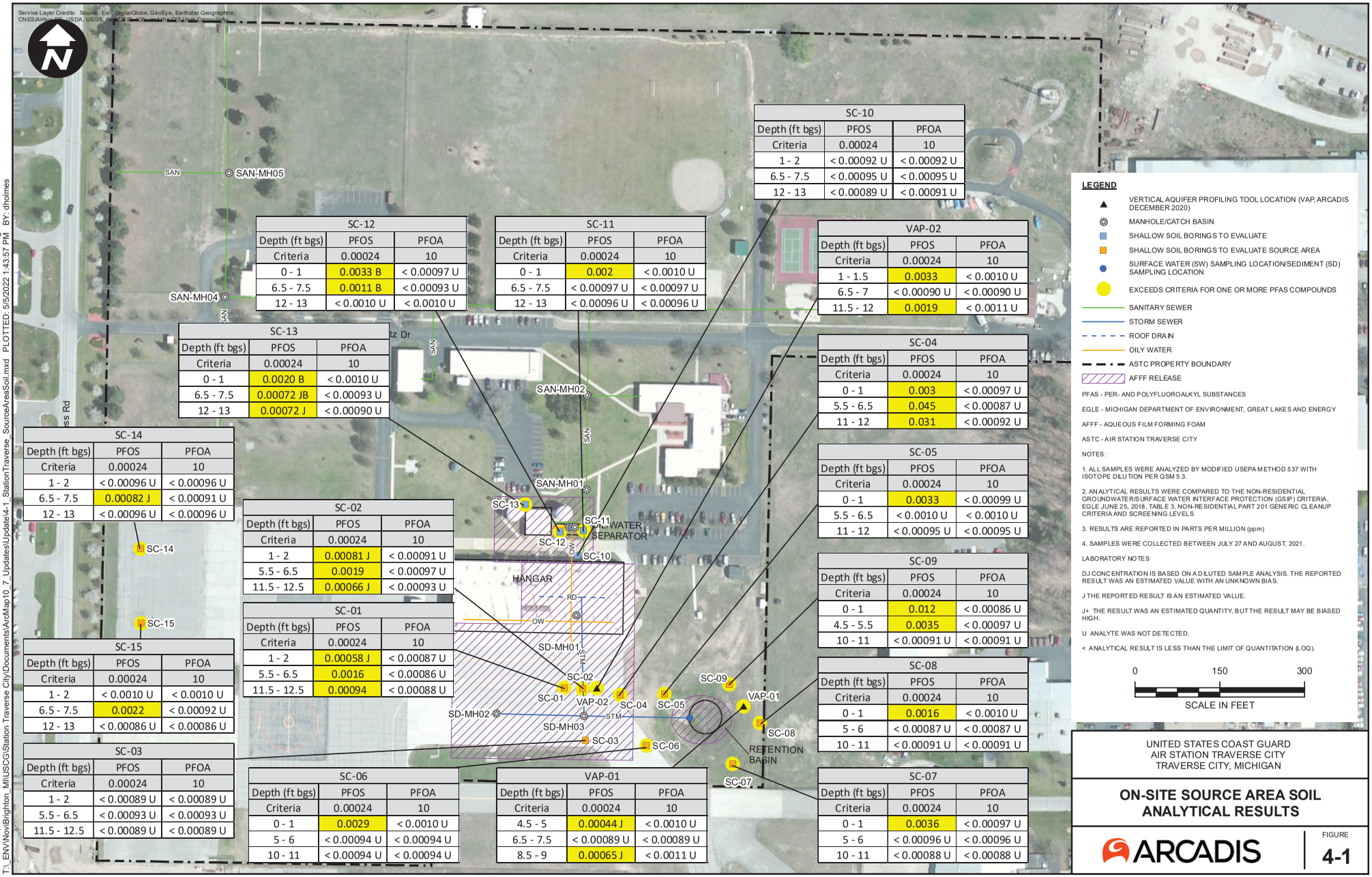
UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

POTENTIAL OFF-SITE AFFF SOURCES

ARCADIS

FIGURE 3-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
T:_ENV\Novi\Brighton_MI\USCG\Station Traverse City\Documents\ArcMap\10_7_Updates\Update\3-1_StationTraverse_SIR_PotentialOffSiteSources.mxd PLOTTED: 4/21/2022 8:28:34 AM BY: dholmes



SC-10		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	< 0.00092 U	< 0.00092 U
6.5 - 7.5	< 0.00095 U	< 0.00095 U
12 - 13	< 0.00089 U	< 0.00091 U

SC-12		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0033 B	< 0.00097 U
6.5 - 7.5	0.0011 B	< 0.00093 U
12 - 13	< 0.0010 U	< 0.0010 U

SC-11		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.002	< 0.0010 U
6.5 - 7.5	< 0.00097 U	< 0.00097 U
12 - 13	< 0.00096 U	< 0.00096 U

VAP-02		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 1.5	0.0033	< 0.0010 U
6.5 - 7	< 0.00090 U	< 0.00090 U
11.5 - 12	0.0019	< 0.0011 U

SC-13		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0020 B	< 0.0010 U
6.5 - 7.5	0.00072 JB	< 0.00093 U
12 - 13	0.00072 J	< 0.00090 U

SC-04		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.003	< 0.00097 U
5.5 - 6.5	0.045	< 0.00087 U
11 - 12	0.031	< 0.00092 U

SC-14		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	< 0.00096 U	< 0.00096 U
6.5 - 7.5	0.00082 J	< 0.00091 U
12 - 13	< 0.00096 U	< 0.00096 U

SC-02		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	0.00081 J	< 0.00091 U
5.5 - 6.5	0.0019	< 0.00097 U
11.5 - 12.5	0.00066 J	< 0.00093 U

SC-05		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0033	< 0.00099 U
5.5 - 6.5	< 0.0010 U	< 0.0010 U
11 - 12	< 0.00095 U	< 0.00095 U

SC-01		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	0.00058 J	< 0.00087 U
5.5 - 6.5	0.0016	< 0.00086 U
11.5 - 12.5	0.00094	< 0.00088 U

SC-09		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.012	< 0.00086 U
4.5 - 5.5	0.0035	< 0.00097 U
10 - 11	< 0.00091 U	< 0.00091 U

SC-15		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	< 0.0010 U	< 0.0010 U
6.5 - 7.5	0.0022	< 0.00092 U
12 - 13	< 0.00086 U	< 0.00086 U

SC-08		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0016	< 0.0010 U
5 - 6	< 0.00087 U	< 0.00087 U
10 - 11	< 0.00091 U	< 0.00091 U

SC-03		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
1 - 2	< 0.00089 U	< 0.00089 U
5.5 - 6.5	< 0.00093 U	< 0.00093 U
11.5 - 12.5	< 0.00089 U	< 0.00089 U

SC-06		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0029	< 0.0010 U
5 - 6	< 0.00094 U	< 0.00094 U
10 - 11	< 0.00094 U	< 0.00094 U

VAP-01		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
4.5 - 5	0.00044 J	< 0.0010 U
6.5 - 7.5	< 0.00089 U	< 0.00089 U
8.5 - 9	0.00065 J	< 0.0011 U

SC-07		
Depth (ft bgs)	PFOS	PFOA
Criteria	0.00024	10
0 - 1	0.0036	< 0.00097 U
5 - 6	< 0.00096 U	< 0.00096 U
10 - 11	< 0.00088 U	< 0.00088 U

LEGEND

- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- MANHOLE/CATCH BASIN
- SHALLOW SOIL BORINGS TO EVALUATE
- SHALLOW SOIL BORINGS TO EVALUATE SOURCE AREA
- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- EXCEEDS CRITERIA FOR ONE OR MORE PFAS COMPOUNDS
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

2. ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL GROUNDWATER/SURFACE WATER INTERFACE PROTECTION (GSIP) CRITERIA, EGLE JUNE 25, 2018, TABLE 3, NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

3. RESULTS ARE REPORTED IN PARTS PER MILLION (ppm)

4. SAMPLES WERE COLLECTED BETWEEN JULY 27 AND AUGUST, 2021.

LABORATORY NOTES

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

ON-SITE SOURCE AREA SOIL ANALYTICAL RESULTS

ARCADIS

FIGURE 4-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Scafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
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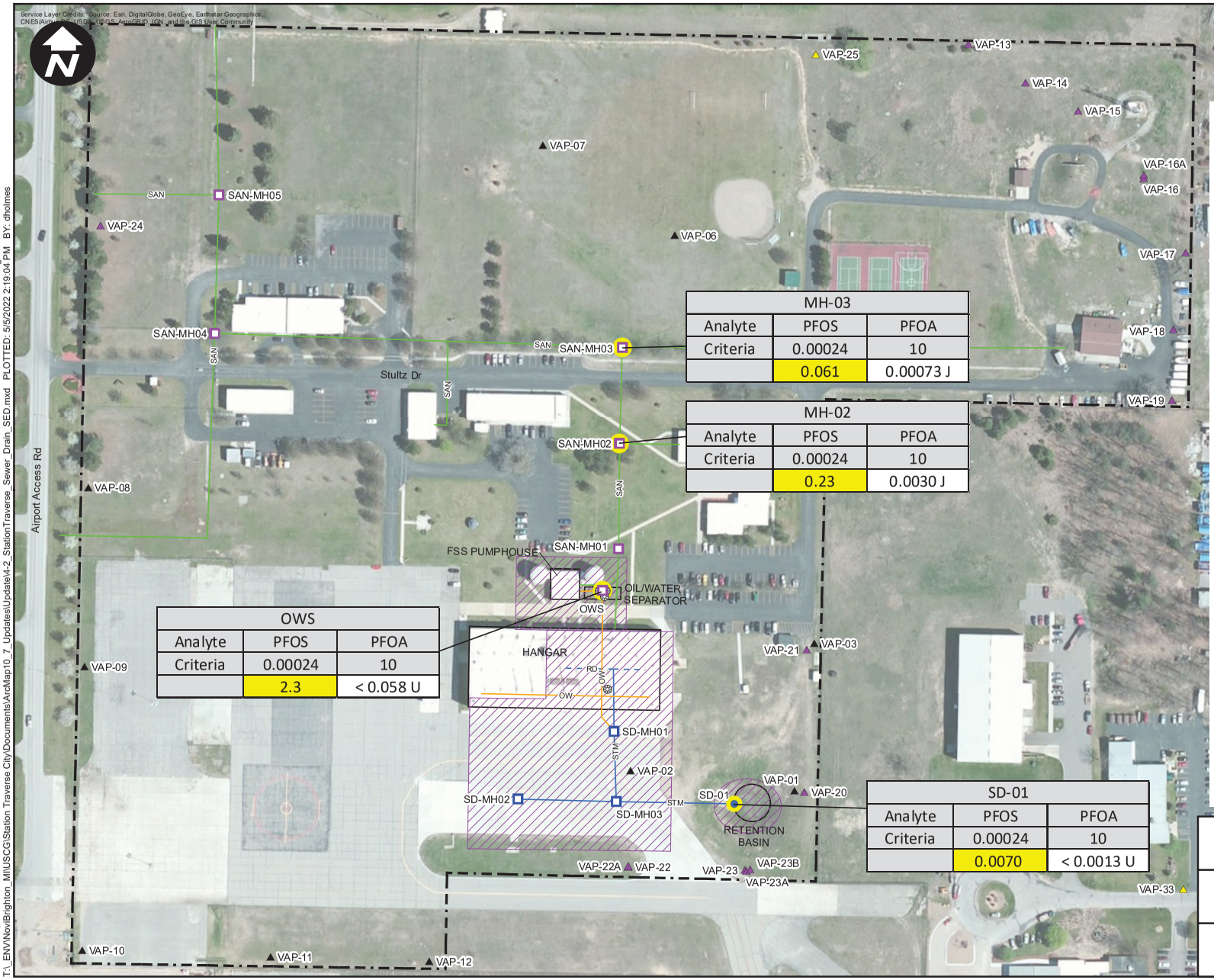

MH-03		
Analyte	PFOS	PFOA
Criteria	0.00024	10
	0.061	0.00073 J

MH-02		
Analyte	PFOS	PFOA
Criteria	0.00024	10
	0.23	0.0030 J

OWS		
Analyte	PFOS	PFOA
Criteria	0.00024	10
	2.3	< 0.058 U

SD-01		
Analyte	PFOS	PFOA
Criteria	0.00024	10
	0.0070	< 0.0013 U

LEGEND

- MANHOLE/CATCH BASIN
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS JULY 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- SANITARY SEWER SAMPLING LOCATION
- STORM DRAIN SAMPLING LOCATION
- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- EXCEEDS CRITERIA FOR ONE OR MORE PFAS COMPOUNDS
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

FSS - FIRE SUPPRESSION SYSTEM

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

2. ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL GROUNDWATER/SURFACE WATER INTERFACE PROTECTION (GSIP) CRITERIA, EGLE JUNE 25, 2018, TABLE 3, NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

3. RESULTS ARE REPORTED IN PARTS PER MILLION (ppm)

4. SAMPLES WERE COLLECTED BETWEEN JULY 27 AND AUGUST, 2021.

LABORATORY NOTES

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

X THE SAMPLE RESULTS (INCLUDING NON-DETECTS) WERE AFFECTED BY SERIOUS DEFICIENCIES IN THE ABILITY TO ANALYZE THE SAMPLE AND TO MEET PUBLISHED METHOD AND PROJECT QUALITY CONTROL CRITERIA. THE PRESENCE OR ABSENCE OF THE ANALYTE CANNOT BE SUBSTANTIATED BY THE DATA PROVIDED. ACCEPTANCE OR REJECTION OF THE DATA SHOULD BE DECIDED BY THE PROJECT TEAM (WHICH SHOULD INCLUDE A PROJECT CHEMIST), BUT EXCLUSION OF THE DATA IS RECOMMENDED.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

STORM DRAIN AND SANITARY SEWER - SEDIMENT RESULTS

ARCADIS

FIGURE 4-2

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Scafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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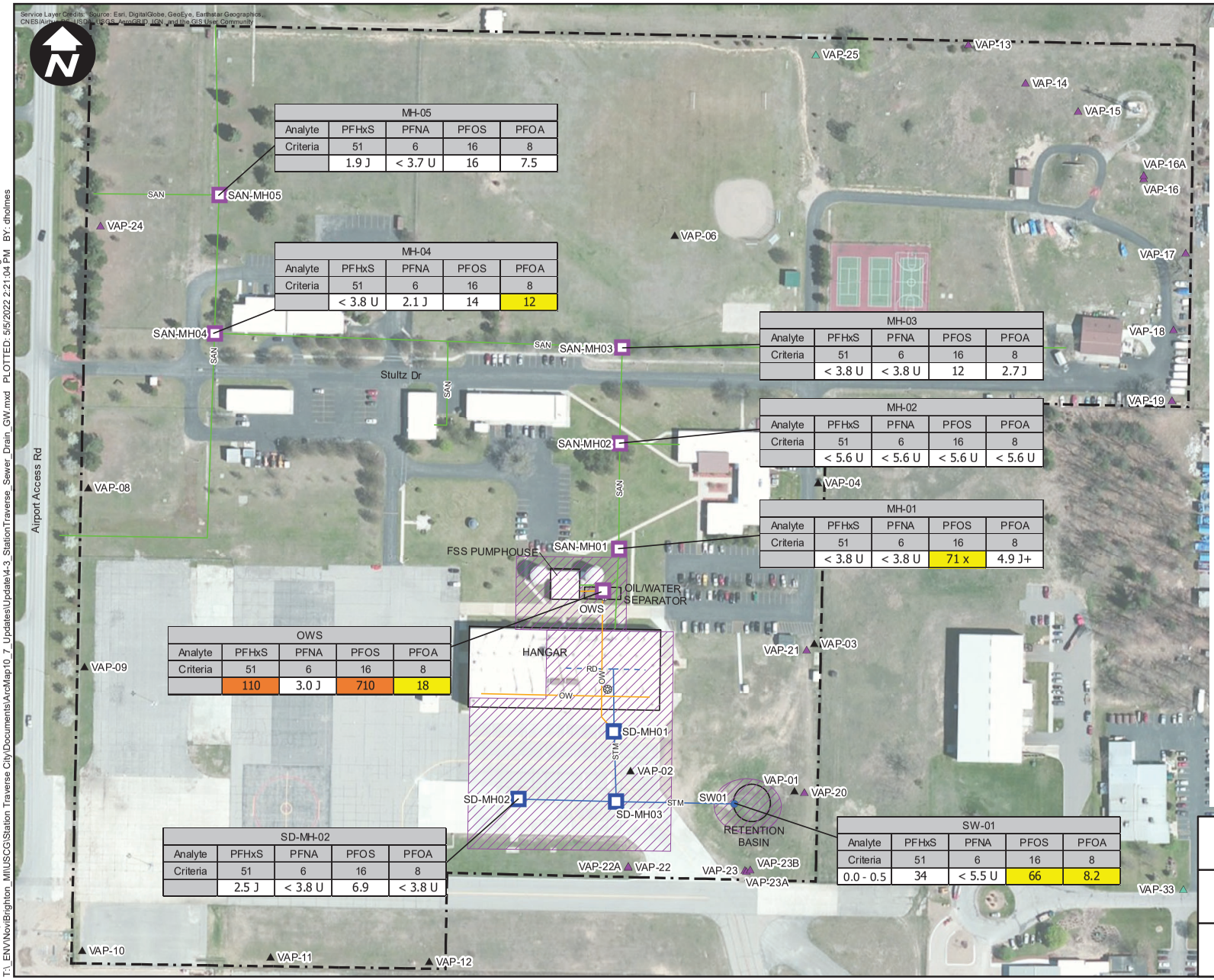

MH-05				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	1.9 J	< 3.7 U	16	7.5

MH-04				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	< 3.8 U	2.1 J	14	12

MH-03				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	< 3.8 U	< 3.8 U	12	2.7 J

MH-02				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	< 5.6 U	< 5.6 U	< 5.6 U	< 5.6 U

MH-01				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	< 3.8 U	< 3.8 U	71 x	4.9 J+

OWS				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	110	3.0 J	710	18

SD-MH-02				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
	2.5 J	< 3.8 U	6.9	< 3.8 U

SW-01				
Analyte	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
0.0 - 0.5	34	< 5.5 U	66	8.2

LEGEND

- MANHOLE/CATCH BASIN
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS JULY 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- SANITARY SEWER SAMPLING LOCATION
- STORM DRAIN SAMPLING LOCATION
- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

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3. RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt)

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< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

STORM DRAIN AND SANITARY SEWER - WATER RESULTS

FIGURE

4-3

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Scafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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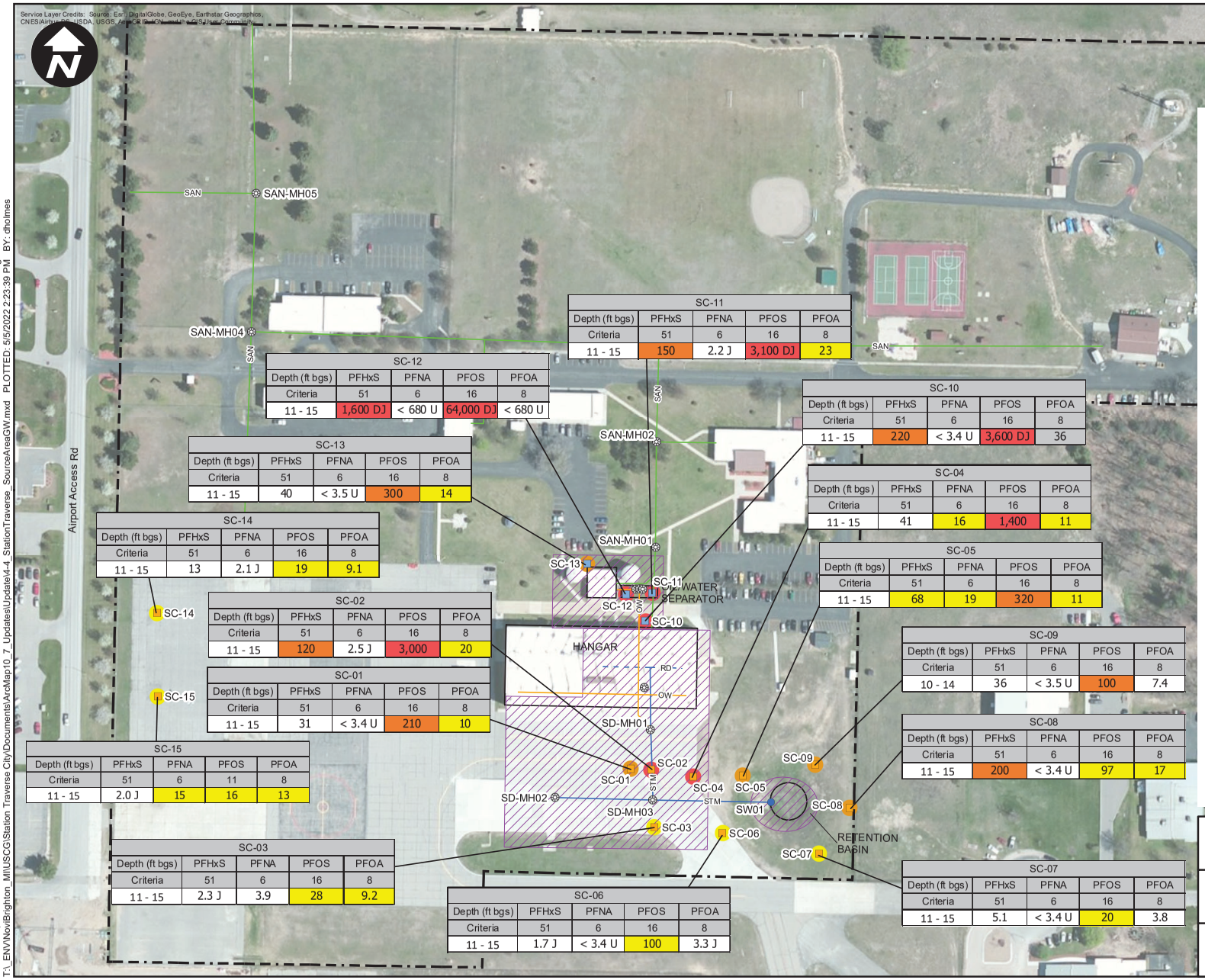

SC-11				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	150	2.2 J	3,100 DJ	23

SC-12				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	1,600 DJ	< 680 U	64,000 DJ	< 680 U

SC-10				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	220	< 3.4 U	3,600 DJ	36

SC-13				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	40	< 3.5 U	300	14

SC-04				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	41	16	1,400	11

SC-14				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	13	2.1 J	19	9.1

SC-05				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	68	19	320	11

SC-02				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	120	2.5 J	3,000	20

SC-09				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 14	36	< 3.5 U	100	7.4

SC-01				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	31	< 3.4 U	210	10

SC-08				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	200	< 3.4 U	97	17

SC-15				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
11 - 15	2.0 J	15	16	13

SC-03				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	2.3 J	3.9	28	9.2

SC-06				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	1.7 J	< 3.4 U	100	3.3 J

SC-07				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	5.1	< 3.4 U	20	3.8

LEGEND

- MANHOLE/CATCH BASIN
- SHALLOW SOIL BORINGS TO EVALUATE
- SHALLOW SOIL BORINGS TO EVALUATE SOURCE AREA
- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt
- > 1,000 ppt - ≤10,000 ppt

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.
2. ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL DRINKING WATER CRITERIA, EGLE DECEMBER 21, 2020, TABLE 1. GROUNDWATER RESIDENTIAL AND NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELLS
3. RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt)
4. SAMPLES WERE COLLECTED BETWEEN JULY 27 AND AUGUST, 2021.

LABORATORY NOTES

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

SOURCE AREA AND OIL-WATER SEPARATOR/PUMPHOUSE EVALUATION - GROUNDWATER ANALYTICAL RESULTS

ARCADIS

FIGURE 4-4

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Scafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
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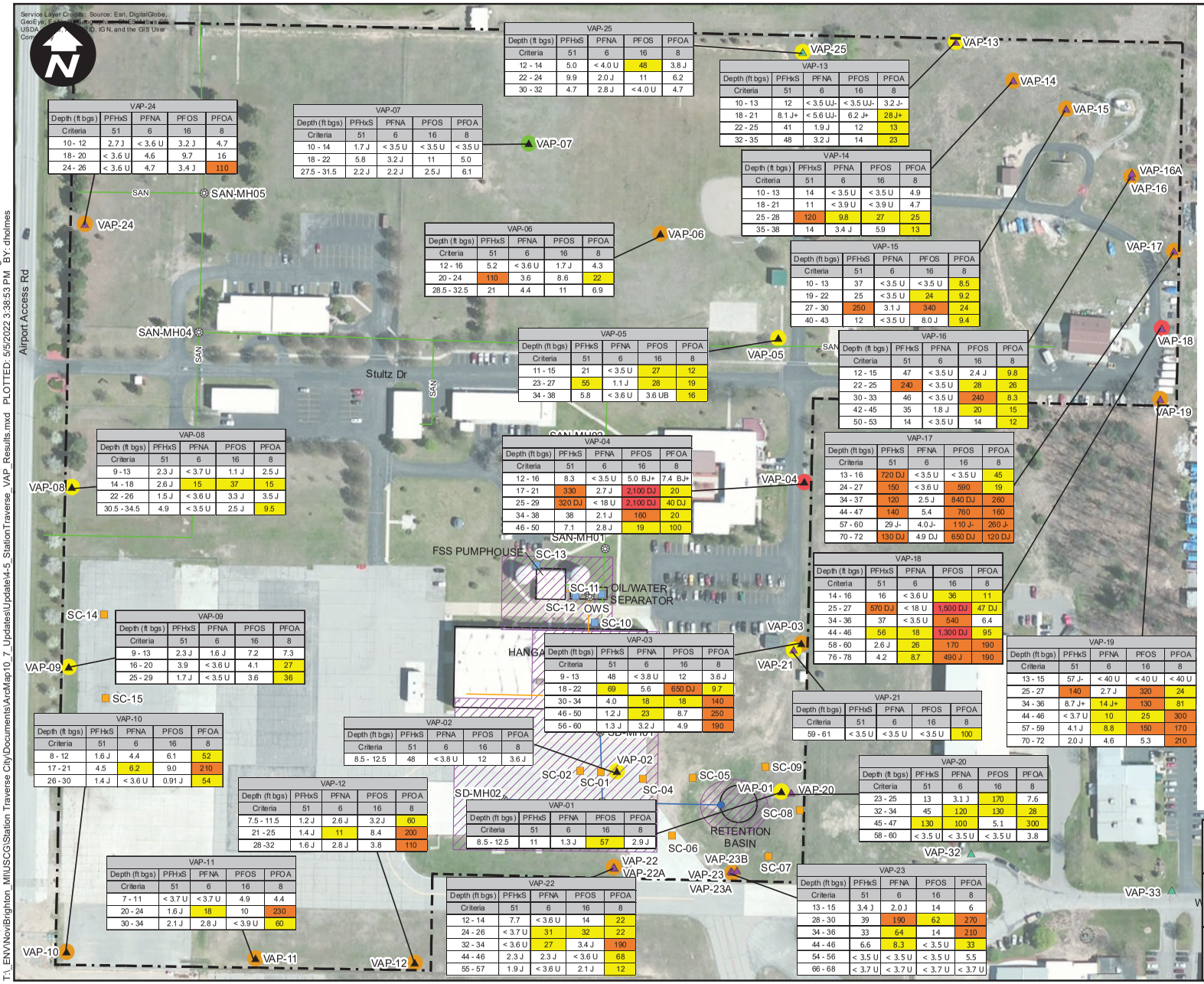

VAP-24				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 12	2.7 J	< 3.6 U	3.2 J	4.7
18 - 20	< 3.6 U	4.6	9.7	16
24 - 26	< 3.6 U	4.7	3.4 J	110

VAP-07				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 14	1.7 J	< 3.5 U	< 3.5 U	< 3.5 U
18 - 22	5.8	3.2 J	11	5.0
27.5 - 31.5	2.2 J	2.2 J	2.5 J	6.1

VAP-25				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 14	5.0	< 4.0 U	48	3.8 J
22 - 24	9.9	2.0 J	11	6.2
30 - 32	4.7	2.8 J	< 4.0 U	4.7

VAP-13				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	12	< 3.5 UJ-	< 3.5 UJ-	3.2 J-
18 - 21	8.1 J+	< 5.6 UJ-	6.2 J+	28 J+
22 - 25	41	1.9 J	12	13
32 - 35	48	3.2 J	14	23

VAP-14				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	14	< 3.5 U	< 3.5 U	4.9
18 - 21	11	< 3.9 U	< 3.9 U	4.7
25 - 28	120	9.8	27	25
35 - 38	14	3.4 J	5.9	13

VAP-06				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 16	5.2	< 3.6 U	1.7 J	4.3
20 - 24	110	3.6	8.6	22
28.5 - 32.5	21	4.4	11	6.9

VAP-15				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	37	< 3.5 U	< 3.5 U	8.5
19 - 22	25	< 3.5 U	24	9.2
27 - 30	250	3.1 J	340	24
40 - 43	12	< 3.5 U	8.0 J	9.4

VAP-05				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	21	< 3.5 U	27	12
23 - 27	55	1.1 J	28	19
34 - 38	5.8	< 3.6 U	3.6 UB	16

VAP-16				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 15	47	< 3.5 U	2.4 J	9.8
22 - 25	240	< 3.5 U	28	26
30 - 33	46	< 3.5 U	240	8.3
42 - 45	35	1.8 J	20	15
50 - 53	14	< 3.5 U	14	12

VAP-08				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 13	2.3 J	< 3.7 U	1.1 J	2.5 J
14 - 18	2.6 J	15	37	15
22 - 26	1.5 J	< 3.6 U	3.3 J	3.5 J
30.5 - 34.5	4.9	< 3.5 U	2.5 J	9.5

VAP-04				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 16	8.3	< 3.5 U	5.0 BJ+	7.4 BJ+
17 - 21	330	2.7 J	2,100 DJ	20
25 - 29	320 DJ	< 18 U	2,100 DJ	40 DJ
34 - 38	38	2.1 J	160	20
46 - 50	7.1	2.8 J	19	100

VAP-17				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 16	720 DJ	< 3.5 U	< 3.5 U	45
24 - 27	150	< 3.6 U	590	19
34 - 37	120	2.5 J	840 DJ	260
44 - 47	140	5.4	760	160
57 - 60	29 J-	4.0 J-	110 J-	260 J-
70 - 72	130 DJ	4.9 DJ	650 DJ	120 DJ

VAP-18				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
14 - 16	16	< 3.6 U	36	11
25 - 27	570 DJ	< 18 U	1,500 DJ	47 DJ
34 - 36	37	< 3.5 U	540	6.4
44 - 46	56	18	1,300 DJ	95
58 - 60	2.6 J	26	170	190
76 - 78	4.2	8.7	490 J	190

VAP-09				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 13	2.3 J	1.6 J	7.2	7.3
16 - 20	3.9	< 3.6 U	4.1	27
25 - 29	1.7 J	< 3.5 U	3.6	36

VAP-03				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 13	48	< 3.8 U	12	3.6 J
18 - 22	69	5.6	650 DJ	9.7
30 - 34	4.0	18	18	140
46 - 50	1.2 J	23	8.7	250
56 - 60	1.3 J	3.2 J	4.9	190

VAP-19				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	57 J-	< 40 U	< 40 U	< 40 U
25 - 27	140	2.7 J	320	24
34 - 36	8.7 J+	14 J+	130	81
44 - 46	< 3.7 U	10	25	300
57 - 59	4.1 J	8.8	150	170
70 - 72	2.0 J	4.6	5.3	210

VAP-21				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
59 - 61	< 3.5 U	< 3.5 U	< 3.5 U	100

VAP-10				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8 - 12	1.6 J	4.4	6.1	52
17 - 21	4.5	6.2	9.0	210
26 - 30	1.4 J	< 3.6 U	0.91 J	54

VAP-02				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8.5 - 12.5	48	< 3.8 U	12	3.6 J

VAP-20				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
23 - 25	13	3.1 J	170	7.6
32 - 34	45	120	130	28
45 - 47	130	100	5.1	300
58 - 60	< 3.5 U	< 3.5 U	< 3.5 U	3.8

VAP-12				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7.5 - 11.5	1.2 J	2.6 J	3.2 J	60
21 - 25	1.4 J	11	8.4	200
28 -32	1.6 J	2.8 J	3.8	110

VAP-01				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8.5 - 12.5	11	1.3 J	57	2.9 J

VAP-11				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7 - 11	< 3.7 U	< 3.7 U	4.9	4.4
20 - 24	1.6 J	18	10	230
30 - 34	2.1 J	2.8 J	< 3.9 U	60

VAP-22				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 14	7.7	< 3.6 U	14	22
24 - 26	< 3.7 U	31	32	22
32 - 34	< 3.6 U	27	3.4 J	190
44 - 46	2.3 J	2.3 J	< 3.6 U	68
55 - 57	1.9 J	< 3.6 U	2.1 J	12

VAP-23				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	3.4 J	2.0 J	14	6
28 - 30	39	190	62	270
34 - 36	33	64	14	210
44 - 46	6.6	8.3	< 3.5 U	33
54 - 56	< 3.5 U	< 3.5 U	< 3.5 U	5.5
66 - 68	< 3.7 U	< 3.7 U	< 3.7 U	< 3.7 U

LEGEND

- MANHOLE/CATCH BASIN
- SHALLOW SOIL BORINGS TO EVALUATE
- SHALLOW SOIL BORINGS TO EVALUATE SOURCE AREA
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS JULY 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- SURFACE WATER (SW) SAMPLING LOCATION/SEDIMENT (SD) SAMPLING LOCATION
- SANITARY SEWER
- STORM SEWER
- ROOF DRAIN
- OILY WATER
- ASTC PROPERTY BOUNDARY
- AFFF RELEASE

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt
- > 1,000 ppt - ≤10,000 ppt

PFAS - PER- AND POLYFLUOROALKYL SUBSTANCES

EGLE - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY

AFFF - AQUEOUS FILM FORMING FOAM

ASTC - AIR STATION TRAVERSE CITY

FSS - FIRE SUPPRESSION SYSTEM

NOTES:

1. ALL SAMPLES WERE ANALYZED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

2. ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL DRINKING WATER CRITERIA, EGLE DECEMBER 21, 2020, TABLE 1, GROUNDWATER RESIDENTIAL AND NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELLS

3. RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt)

4. SAMPLES WERE COLLECTED BETWEEN JULY 27 AND AUGUST, 2021.

LABORATORY NOTES

B THE COMPOUND HAS BEEN FOUND IN THE SAMPLE AS WELL AS ITS ASSOCIATED BLANK, ITS PRESENCE IN THE SAMPLE MAY BE SUSPECT.

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J- THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED LOW.

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

UJ THE ANALYTE WAS NOT DETECTED AND WAS REPORTED AS LESS THAN THE LOD. HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS APPROXIMATE.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

0 150 300

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

ON-SITE GROUNDWATER CHARACTERIZATION ANALYTICAL RESULTS 2020 AND 2021

ARCADIS

FIGURE 4-5

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Scafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
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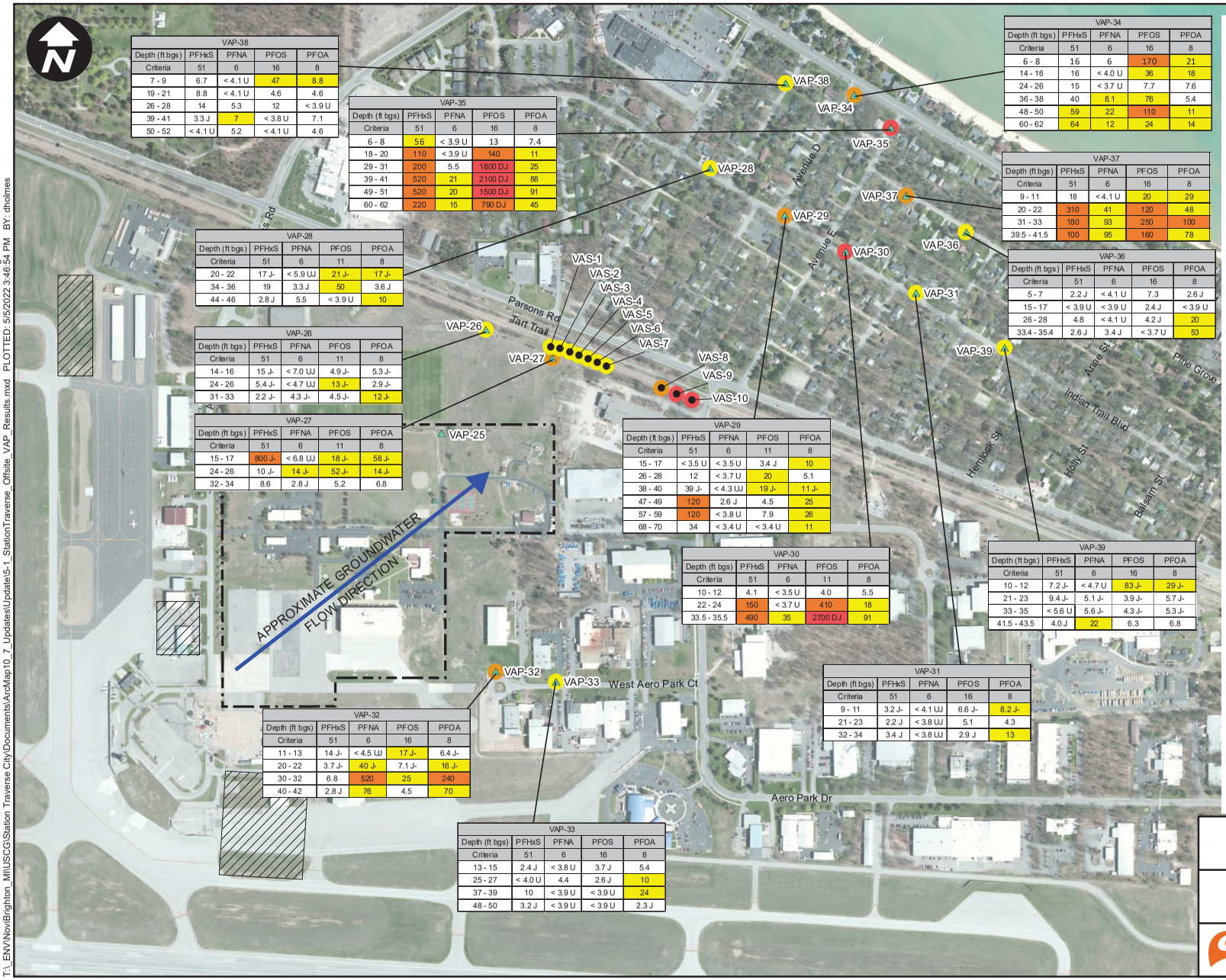

VAP-38				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7 - 9	6.7	< 4.1 U	47	8.8
19 - 21	8.8	< 4.1 U	4.6	4.6
26 - 28	14	5.3	12	< 3.9 U
39 - 41	3.3 J	7	< 3.8 U	7.1
50 - 52	< 4.1 U	5.2	< 4.1 U	4.6

VAP-35				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
6 - 8	56	< 3.9 U	13	7.4
18 - 20	110	< 3.9 U	140	11
29 - 31	200	5.5	1800 DJ	25
39 - 41	520	21	2100 DJ	88
49 - 51	520	20	1500 DJ	91
60 - 62	220	15	790 DJ	45

VAP-28				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
20 - 22	17 J-	< 5.9 UJ	21 J-	17 J-
34 - 36	19	3.3 J	50	3.6 J
44 - 46	2.8 J	5.5	< 3.9 U	10

VAP-26				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
14 - 16	15 J-	< 7.0 UJ	4.9 J-	5.3 J-
24 - 26	5.4 J-	< 4.7 UJ	13 J-	2.9 J-
31 - 33	2.2 J-	4.3 J-	4.5 J-	12 J-

VAP-27				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
15 - 17	800 J-	< 6.8 UJ	18 J-	58 J-
24 - 26	10 J-	14 J-	52 J-	14 J-
32 - 34	8.6	2.8 J	5.2	6.8

VAP-29				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
15 - 17	< 3.5 U	< 3.5 U	3.4 J	10
26 - 28	12	< 3.7 U	20	5.1
38 - 40	39 J-	< 4.3 UJ	19 J-	11 J-
47 - 49	120	2.6 J	4.5	25
57 - 59	120	< 3.8 U	7.9	26
68 - 70	34	< 3.4 U	< 3.4 U	11

VAP-30				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
10 - 12	4.1	< 3.5 U	4.0	5.5
22 - 24	150	< 3.7 U	410	18
33.5 - 35.5	490	35	2700 DJ	91

VAP-32				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 13	14 J-	< 4.5 UJ	17 J-	6.4 J-
20 - 22	3.7 J-	40 J-	7.1 J-	16 J-
30 - 32	6.8	520	25	240
40 - 42	2.8 J	76	4.5	70

VAP-33				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	2.4 J	< 3.8 U	3.7 J	5.4
25 - 27	< 4.0 U	4.4	2.6 J	10
37 - 39	10	< 3.9 U	< 3.9 U	24
48 - 50	3.2 J	< 3.9 U	< 3.9 U	2.3 J

VAP-34				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
6 - 8	16	6	170	21
14 - 16	16	< 4.0 U	36	18
24 - 26	15	< 3.7 U	7.7	7.6
36 - 38	40	8.1	76	5.4
48 - 50	59	22	110	11
60 - 62	64	12	24	14

VAP-37				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 11	18	< 4.1 U	20	29
20 - 22	310	41	120	48
31 - 33	180	93	250	100
39.5 - 41.5	100	95	160	78

VAP-36				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
5 - 7	2.2 J	< 4.1 U	7.3	2.6 J
15 - 17	< 3.9 U	< 3.9 U	2.4 J	< 3.9 U
26 - 28	4.8	< 4.1 U	4.2 J	20
33.4 - 35.4	2.6 J	3.4 J	< 3.7 U	53

VAP-39				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 12	7.2 J-	< 4.7 U	83 J-	29 J-
21 - 23	9.4 J-	5.1 J-	3.9 J-	5.7 J-
33 - 35	< 5.6 U	5.6 J-	4.3 J-	5.3 J-
41.5 - 43.5	4.0 J	22	6.3	6.8

VAP-31				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 11	3.2 J-	< 4.1 UJ	6.6 J-	8.2 J-
21 - 23	2.2 J	< 3.8 UJ	5.1	4.3
32 - 34	3.4 J	< 3.8 UJ	2.9 J	13

LEGEND

- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER SAMPLING LOCATION (VAS)
- ASTC PROPERTY BOUNDARY
- POTENTIAL OFF-SITE SOURCE

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt
- > 1,000 ppt - ≤10,000 ppt

VAP - VERTICAL AQUIFER PROFILE

VAS - VERTICAL AQUIFER SAMPLE

NOTE:
ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL DRINKING WATER CRITERIA, EGLE DECEMBER 21, 2020, TABLE 1, GROUNDWATER RESIDENTIAL AND NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

ALL SAMPLES WERE ANALYTED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt)

SAMPLES WERE COLLECTED IN DECEMBER 2021.

LABORATORY NOTES:

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE

J- THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED LOW.

U ANALYTE WAS NOT DETECTED

UJ THE ANALYTE WAS NOT DETECTED AND WAS REPORTED AS LESS THAN THE LOD. HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS APPROXIMATE.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITAION (LOQ).

SOURCE REFERENCE: Gosling Czubak Engineering Sciences, Inc. 2020. PFAS Soil Investigation report, Cherry Capital Airport (TVC), Traverse City, Michigan. December

0 500 1,000
SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

OFF-SITE GROUNDWATER CHARACTERIZATION ANALYTICAL RESULTS

ARCADIS

FIGURE
5-1

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sofafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet
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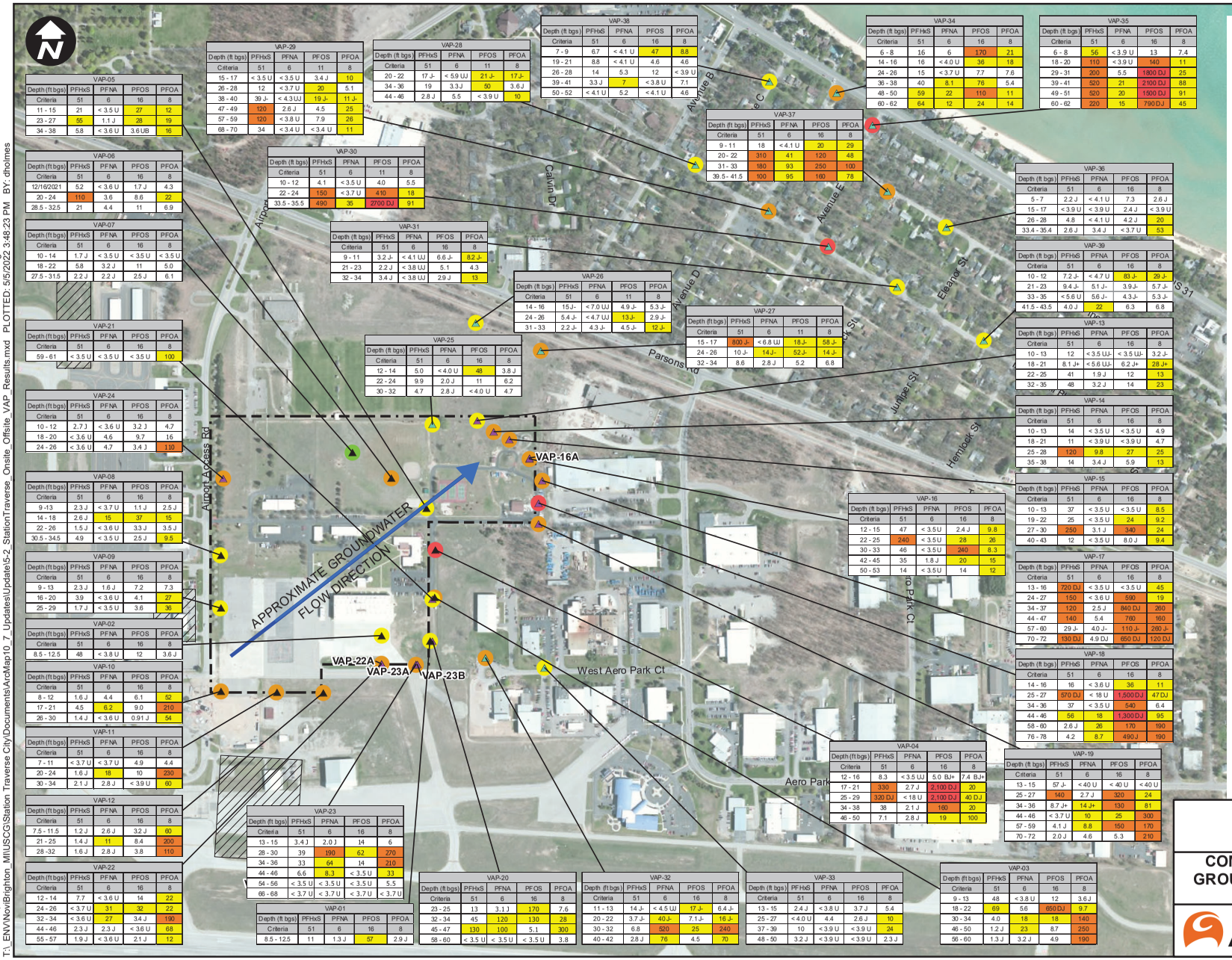

VAP-05				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 15	21	< 3.5 U	27	12
23 - 27	55	1.1 J	28	19
34 - 38	5.8	< 3.6 U	3.6 UB	16

VAP-06				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12/16/2021	5.2	< 3.6 U	1.7 J	4.3
20 - 24	110	3.6	8.6	22
28.5 - 32.5	21	4.4	11	6.9

VAP-07				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 14	1.7 J	< 3.5 U	< 3.5 U	< 3.5 U
18 - 22	5.8	3.2 J	11	5.0
27.5 - 31.5	2.2 J	2.2 J	2.5 J	6.1

VAP-21				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
59 - 61	< 3.5 U	< 3.5 U	< 3.5 U	100

VAP-24				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 12	2.7 J	< 3.6 U	3.2 J	4.7
18 - 20	< 3.6 U	4.6	9.7	16
24 - 26	< 3.6 U	4.7	3.4 J	110

VAP-08				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 -13	2.3 J	< 3.7 U	1.1 J	2.5 J
14 - 18	2.6 J	15	37	15
22 - 26	1.9 J	< 3.6 U	3.3 J	3.5 J
30.5 - 34.5	4.9	< 3.5 U	2.5 J	9.5

VAP-09				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 13	2.3 J	1.6 J	7.2	7.3
16 - 20	3.9	< 3.6 U	4.1	27
25 - 29	1.7 J	< 3.5 U	3.6	36

VAP-02				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8.5 - 12.5	48	< 3.8 U	12	3.6 J

VAP-10				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8 - 12	1.6 J	4.4	6.1	52
17 - 21	4.5	6.2	9.0	210
26 - 30	1.4 J	< 3.6 U	0.91 J	54

VAP-11				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7 - 11	< 3.7 U	< 3.7 U	4.9	4.4
20 - 24	1.6 J	18	10	230
30 - 34	2.1 J	2.8 J	< 3.9 U	60

VAP-12				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7.5 - 11.5	1.2 J	2.6 J	3.2 J	60
21 - 25	1.4 J	11	8.4	200
28 - 32	1.6 J	2.8 J	3.8	110

VAP-22				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 14	7.7	< 3.6 U	14	22
24 - 26	< 3.7 U	31	32	22
32 - 34	< 3.6 U	27	3.4 J	190
44 - 46	2.3 J	2.3 J	< 3.6 U	68
55 - 57	1.9 J	< 3.6 U	2.1 J	12

VAP-29				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
15 - 17	< 3.5 U	< 3.5 U	3.4 J	10
26 - 28	12	< 3.7 U	20	5.1
38 - 40	30 J-	< 4.3 UJ	19 J-	11 J-
47 - 49	120	2.6 J	4.5	25
57 - 59	120	< 3.8 U	7.9	26
68 - 70	34	< 3.4 U	< 3.4 U	11

VAP-28				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
20 - 22	17 J-	< 5.9 UJ	21 J-	17 J-
34 - 36	19	3.3 J	50	3.6 J
44 - 46	2.8 J	5.5	< 3.9 U	10

VAP-30				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
10 - 12	4.1	< 3.5 U	4.0	5.5
22 - 24	150	< 3.7 U	410	18
33.5 - 35.5	490	35	2700 DJ	91

VAP-31				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 11	3.2 J-	< 4.1 UJ	6.6 J-	8.2 J-
21 - 23	2.2 J	< 3.8 UJ	5.1	4.3
32 - 34	3.4 J	< 3.8 UJ	2.9 J	13

VAP-26				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
14 - 16	15 J-	< 7.0 UJ	4.9 J-	5.3 J-
24 - 26	5.4 J-	< 4.7 UJ	13 J-	2.9 J-
31 - 33	2.2 J-	4.3 J-	4.5 J-	12 J-

VAP-25				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 14	5.0	< 4.0 U	48	3.8 J
22 - 24	9.9	2.0 J	11	6.2
30 - 32	4.7	2.8 J	< 4.0 U	4.7

VAP-38				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
7 - 9	6.7	< 4.1 U	47	8.8
19 - 21	8.8	< 4.1 U	4.6	4.6
26 - 28	14	5.3	12	< 3.9 U
39 - 41	3.3 J	7	< 3.8 U	7.1
50 - 52	< 4.1 U	5.2	< 4.1 U	4.6

VAP-37				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 11	18	< 4.1 U	20	29
20 - 22	310	41	120	48
31 - 33	180	93	250	100
39.5 - 41.5	100	95	160	78

VAP-27				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	11	8
15 - 17	800 J-	< 6.8 UJ	18 J-	58 J-
24 - 26	10 J-	14 J-	52 J-	14 J-
32 - 34	8.6	2.8 J	5.2	6.8

VAP-34				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
6 - 8	16	6	170	21
14 - 16	16	< 4.0 U	36	18
24 - 26	15	< 3.7 U	7.7	7.6
36 - 38	40	8.1	76	5.4
48 - 50	59	22	110	11
60 - 62	64	12	24	14

VAP-35				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
6 - 8	56	< 3.9 U	13	7.4
18 - 20	110	< 3.9 U	140	11
29 - 31	200	5.5	1800 DJ	25
39 - 41	520	21	2100 DJ	88
49 - 51	520	20	1500 DJ	91
60 - 62	220	15	790 DJ	45

VAP-36				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
5 - 7	2.2 J	< 4.1 U	7.3	2.6 J
15 - 17	< 3.9 U	< 3.9 U	2.4 J	< 3.9 U
26 - 28	4.8	< 4.1 U	4.2 J	20
33.4 - 35.4	2.6 J	3.4 J	< 3.7 U	53

VAP-39				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 12	7.2 J-	< 4.7 U	83 J-	29 J-
21 - 23	9.4 J-	5.1 J-	3.9 J-	5.7 J-
33 - 35	< 5.6 U	5.6 J-	4.3 J-	5.3 J-
41.5 - 43.5	4.0 J	22	6.3	6.8

VAP-13				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	12	< 3.5 UJ-	< 3.5 UJ-	3.2 J-
18 - 21	8.1 J+	< 5.6 UJ-	6.2 J+	28 J+
22 - 25	41	1.9 J	12	13
32 - 35	48	3.2 J	14	23

VAP-14				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	14	< 3.5 U	< 3.5 U	4.9
18 - 21	11	< 3.9 U	< 3.9 U	4.7
25 - 28	120	9.8	27	25
35 - 38	14	3.4 J	5.9	13

VAP-15				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
10 - 13	37	< 3.5 U	< 3.5 U	8.5
19 - 22	25	< 3.5 U	24	9.2
27 - 30	250	3.1 J	340	24
40 - 43	12	< 3.5 U	8.0 J	9.4

VAP-16				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 15	47	< 3.5 U	2.4 J	9.8
22 - 25	240	< 3.5 U	28	26
30 - 33	46	< 3.5 U	240	8.3
42 - 45	35	1.8 J	20	15
50 - 53	14	< 3.5 U	14	12

VAP-17				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 16	720 DJ	< 3.5 U	< 3.5 U	45
24 - 27	150	< 3.6 U	590	19
34 - 37	120	2.5 J	840 DJ	260
44 - 47	140	5.4	760	160
57 - 60	29 J-	4.0 J-	110 J-	260 J-
70 - 72	130 DJ	4.9 DJ	650 DJ	120 DJ

VAP-18				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
14 - 16	16	< 3.6 U	36	11
25 - 27	570 DJ	< 18 U	1,500 DJ	47 DJ
34 - 36	37	< 3.5 U	540	6.4
44 - 46	56	16	1,300 DJ	95
58 - 60	2.6 J	26	170	190
76 - 78	4.2	8.7	490 J	190

VAP-04				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
12 - 16	8.3	< 3.5 UJ	5.0 BJ+	7.4 BJ+
17 - 21	330	2.7 J	2,100 DJ	20
25 - 29	320 DJ	< 18 U	2,100 DJ	40 DJ
34 - 38	38	2.1 J	160	20
46 - 50	7.1	2.8 J	19	100

VAP-19				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	57 J-	< 40 U	< 40 U	< 40 U
25 - 27	140	2.7 J	320	24
34 - 36	8.7 J+	14 J+	130	81
44 - 46	< 3.7 U	10	25	300
57 - 59	4.1 J	8.8	150	170
70 - 72	2.0 J	4.6	5.3	210

VAP-23				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	3.4 J	2.0 J	14	6
28 - 30	39	190	62	270
34 - 36	33	64	14	210
44 - 46	6.6	8.3	< 3.5 U	33
54 - 56	< 3.5 U	< 3.5 U	< 3.5 U	5.5
66 - 68	< 3.7 U	< 3.7 U	< 3.7 U	< 3.7 U

VAP-01				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
8.5 - 12.5	11	1.3 J	57	2.9 J

VAP-20				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
23 - 25	13	3.1 J	170	7.6
32 - 34	45	120	130	28
45 - 47	130	100	5.1	300
58 - 60	< 3.5 U	< 3.5 U	< 3.5 U	3.8

VAP-32				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
11 - 13	14 J-	< 4.5 UJ	17 J-	6.4 J-
20 - 22	3.7 J-	40 J-	7.1 J-	16 J-
30 - 32	6.8	520	25	240
40 - 42	2.8 J	76	4.5	70

VAP-33				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
13 - 15	2.4 J	< 3.8 U	3.7 J	5.4
25 - 27	< 4.0 U	4.4	2.6 J	10
37 - 39	10	< 3.9 U	< 3.9 U	24
48 - 50	3.2 J	< 3.9 U	< 3.9 U	2.3 J

VAP-03				
Depth (ft bgs)	PFHxS	PFNA	PFOS	PFOA
Criteria	51	6	16	8
9 - 13	48	< 3.8 U	12	3.6 J
18 - 22	69	5.6	650 DJ	9.7
30 - 34	4.0	18	18	140
46 - 50	1.2 J	23	8.7	250
56 - 60	1.3 J	3.2 J	4.9	190

LEGEND

- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS JULY 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- ASTC PROPERTY BOUNDARY
- POTENTIAL OFF-SITE SOURCE

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt
- > 1,000 ppt - ≤10,000 ppt

ASTC - AIR STATION TRAVERSE CITY

VAP - VERTICAL AQUIFER PROFILE

NOTE:
ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL DRINKING WATER CRITERIA, EGLE DECEMBER 21, 2020, TABLE 1. GROUNDWATER RESIDENTIAL AND NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

ALL SAMPLES WERE ANALYTED BY MODIFIED USEPA METHOD 537 WITH ISOTOPE DILUTION PER QSM 5.3.

RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt).

SAMPLES WERE COLLECTED BETWEEN DECEMBER 2020 AND DECEMBER 2021.

LABORATORY NOTES:

B THE COMPOUND HAS BEEN FOUND IN THE SAMPLE AS WELL AS ITS ASSOCIATED BLANK, ITS PRESENCE IN THE SAMPLE MAY BE SUSPECT.

DJ CONCENTRATION IS BASED ON A DILUTED SAMPLE ANALYSIS. THE REPORTED RESULT WAS AN ESTIMATED VALUE WITH AN UNKNOWN BIAS.

J THE REPORTED RESULT IS AN ESTIMATED VALUE.

J- THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED LOW

J+ THE RESULT WAS AN ESTIMATED QUANTITY, BUT THE RESULT MAY BE BIASED HIGH.

U ANALYTE WAS NOT DETECTED.

UJ THE ANALYTE WAS NOT DETECTED AND WAS REPORTED AS LESS THAN THE LOD. HOWEVER, THE ASSOCIATED NUMERICAL VALUE IS APPROXIMATE.

< ANALYTICAL RESULT IS LESS THAN THE LIMIT OF QUANTITATION (LOQ).

SOURCE REFERENCE: Gosling Czubak Engineering Sciences, Inc. 2020. PFAS Soil Investigation report, Cherry Capital Airport (TVC), Traverse City, Michigan. December

0 500 1,000

SCALE IN FEET

UNITED STATES COAST GUARD
AIR STATION TRAVERSE CITY
TRAVERSE CITY, MICHIGAN

COMBINED ON-SITE AND OFF-SITE GROUNDWATER CHARACTERIZATION ANALYTICAL RESULTS

ARCADIS

FIGURE 5-2

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sclafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
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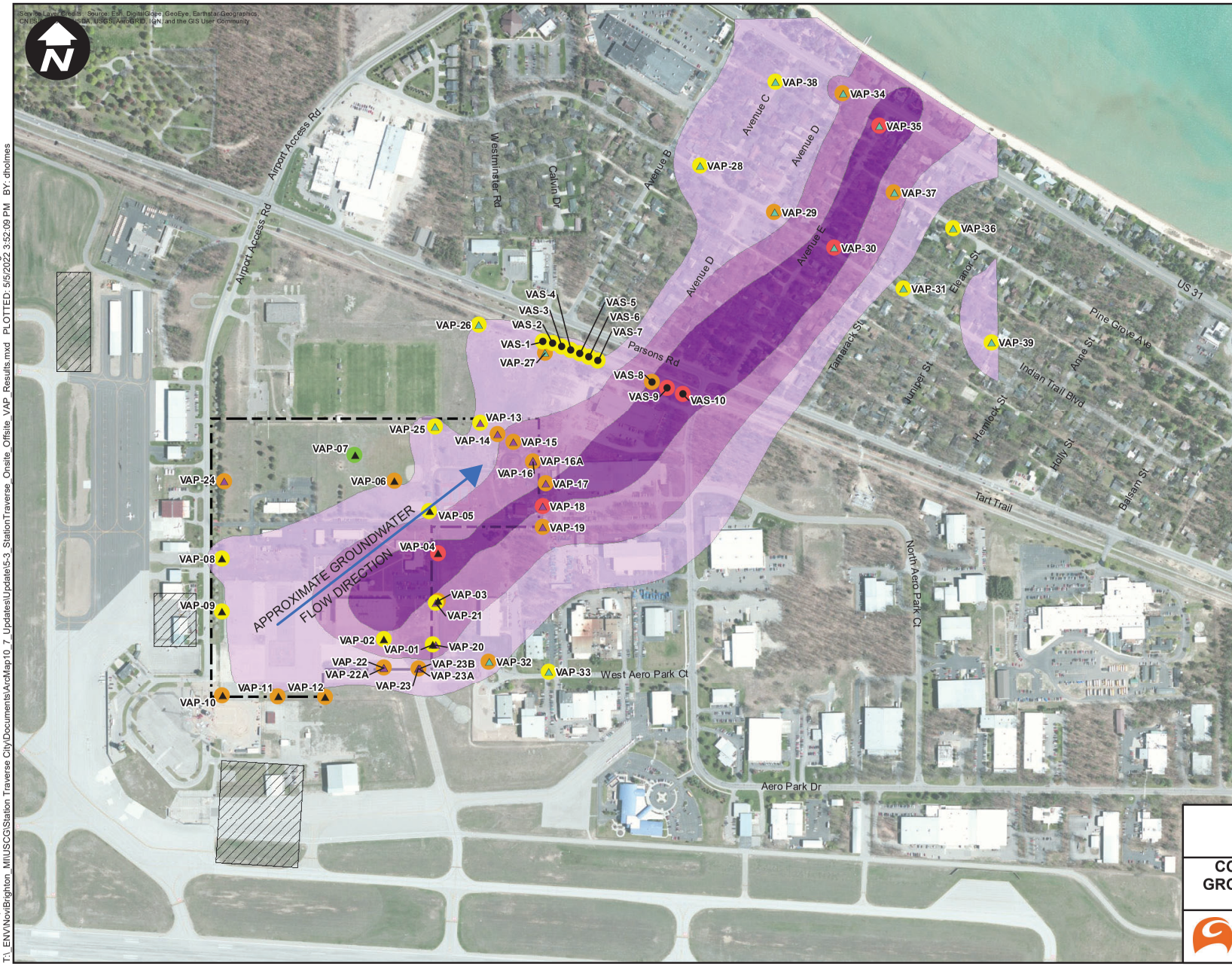

LEGEND

- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS JULY 2021)
- VERTICAL AQUIFER PROFILING TOOL LOCATION (VAP, ARCADIS DECEMBER 2020)
- VERTICAL AQUIFER SAMPLING LOCATION (VAS)

MAXIMUM CONCENTRATIONS OF PFOS, PFOA, PFHxS, OR PFNA IN GROUNDWATER (COMPOUND WITH THE HIGHEST VALUE IS SHOWN)

- < MICHIGAN CRITERIA
- > CRITERIA ≤ 100 ppt
- > 100 ppt - ≤1,000 ppt
- > 1,000 ppt
- ASTC PROPERTY BOUNDARY
- POTENTIAL OFF-SITE SOURCE

PFOS CONCENTRATION CONTOURS

- >CRITERIA - ≤100 ppt
- <100 - ≤1,000 ppt
- >1,000 ppt

ASTC - AIR STATION TRAVERSE CITY

VAP - VERTICAL AQUIFER PROFILE

VAS - VERTICAL AQUIFER SAMPLE

NOTE:
ANALYTICAL RESULTS WERE COMPARED TO THE NON-RESIDENTIAL DRINKING WATER CRITERIA, EGLE DECEMBER 21, 2020, TABLE 1. GROUNDWATER RESIDENTIAL AND NON-RESIDENTIAL PART 201 GENERIC CLEANUP CRITERIA AND SCREENING LEVELS

PFAS CONCENTRATION CONTOURS DEVELOPED USING KRIGING INTERPOLATION METHOD

RESULTS ARE REPORTED IN PARTS PER TRILLION (ppt)

SOURCE REFERENCE: Gosling Czubak Engineering Sciences, Inc. 2020. PFAS Soil Investigation report, Cherry Capital Airport (TVC), Traverse City, Michigan. December

0 500 1,000

SCALE IN FEET

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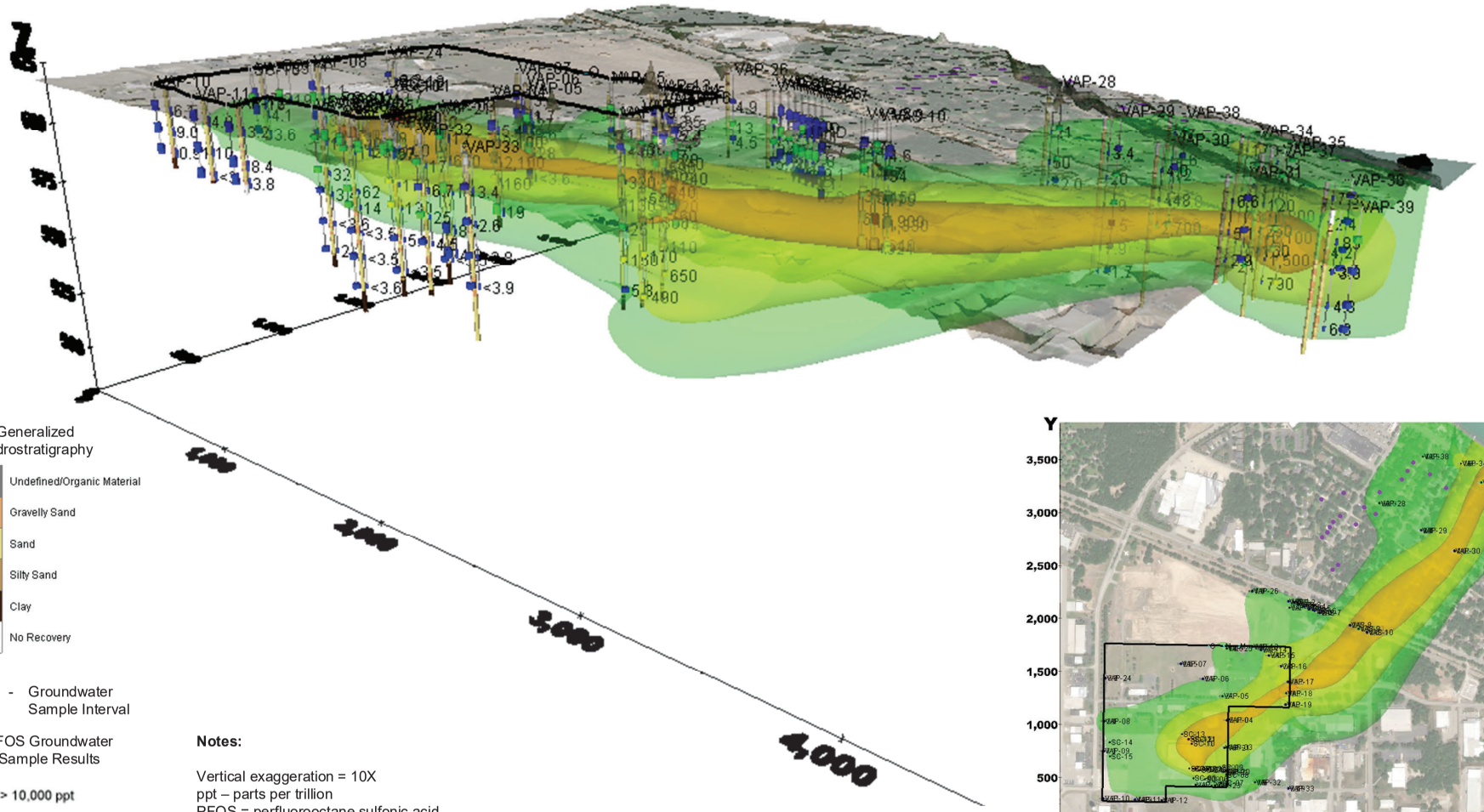
TRAVERSE CITY, MICHIGAN

COMBINED ON-SITE AND OFF-SITE GROUNDWATER CHARACTERIZATION RESULTS - PLUME MAP

ARCADIS

FIGURE 5-3

CITY: NOVI, MI DIV: ENV DB: TRY PIC: T. Sciafani PM: G. Zellmer TM: C. Seidel PROJECT NUMBER: 30062388 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl
T:_ENV\Novi\Brighton_MI\USCG\Station Traverse City\Documents\ArcMap10_7_Updates\Update\5-3_StationTraverse_Onsite_Offsite_VAP_Results.mxd PLOTTED: 5/5/2022 3:52:09 PM BY: dholmes



Generalized Hydrostratigraphy

- Undefined/Organic Material
- Gravelly Sand
- Sand
- Silty Sand
- Clay
- No Recovery

- Groundwater Sample Interval

PFOS Groundwater Sample Results

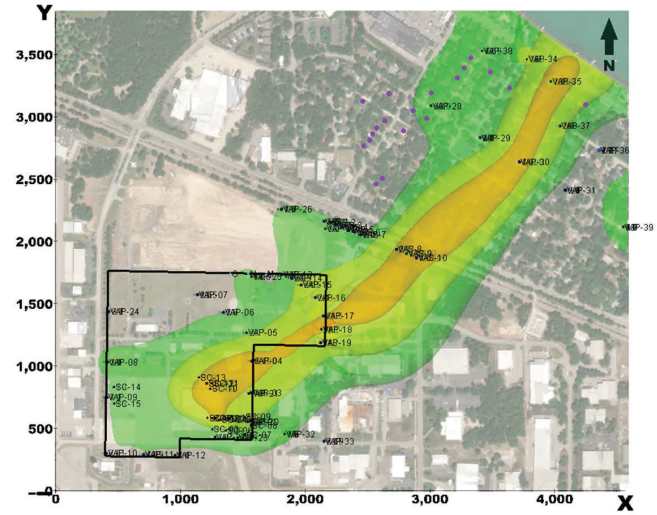
- > 10,000 ppt
- 1,000 - 10,000 ppt
- 100 - 1,000 ppt
- Above Criteria < 100 ppt
- Below Applicable Criteria

Notes:

Vertical exaggeration = 10X
ppt – parts per trillion
PFOS = perfluorooctane sulfonic acid
< = not detected above laboratory reporting limits

This 3D Model was constructed using Earth Volumetric Studio™ from soil descriptions and groundwater analytical data collected between December 2020 and December 2021.

Analytical results presented in ppt
The EGLE GSI criterion for PFOS is 11 ppt



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TRAVERSE CITY, MICHIGAN

3D EXTENT OF PFOS

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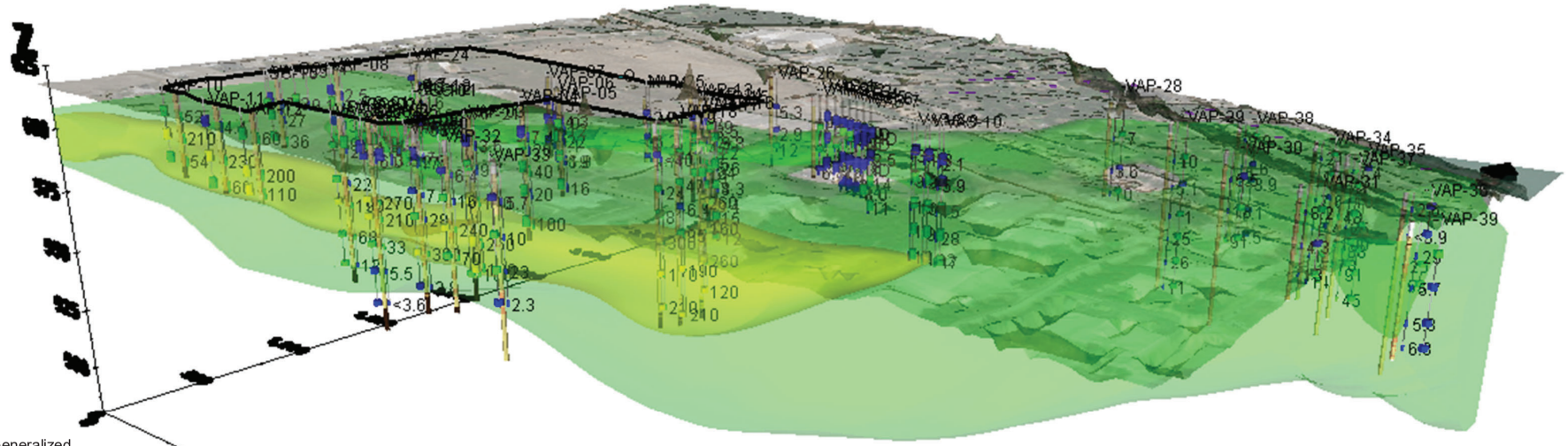
FIGURE
5-4



Generalized Hydrostratigraphy

- Undefined/Organic Material
- Gravelly Sand
- Sand
- Silty Sand
- Clay
- No Recovery

- Groundwater Sample Interval

PFOA Groundwater Sample Results

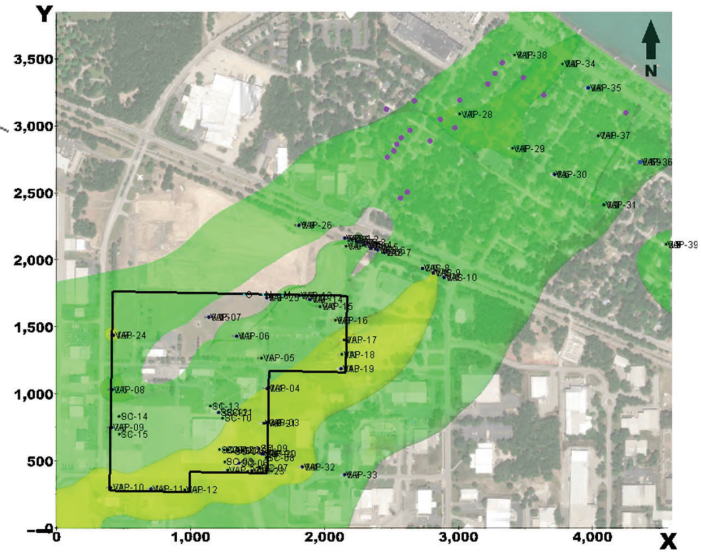
- > 10,000 ppt
- 1,000 - 10,000 ppt
- 100 - 1,000 ppt
- Above Criteria < 100 ppt
- Below Applicable Criteria

Notes:

Vertical exaggeration = 10X
ppt – parts per trillion
PFOA = perfluorooctanoic acid
< = not detected above laboratory reporting limits

This 3D Model was constructed using Earth Volumetric Studio™ from soil descriptions and groundwater analytical data collected between December 2020 and December 2021.

Analytical results presented in ppt
The EGLE DW criterion for PFOS is 8 ppt



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TRAVERSE CITY, MICHIGAN

3D EXTENT OF PFOA

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FIGURE
5-5

Appendix A

Soil Boring Logs and Cone Penetration Testing Logs

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Soil Boring Log

Boring No.: ASTC-SC-01

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/23/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/23/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 80F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-01SS (1-2)-(082321) @ 1450 for PFAS and FOC	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.8') CONCRETE.	
							(0.8-2.5') SAND, fine to medium, subrounded, trace silt; well sorted; dry, yellowish brown (10YR 5/6).	
							(2.5-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-01SS (5.5-6.5)-(082321) @ 1455 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			48	ASTC-SC-01SS (11.5-12.5)-(082321) @ 1500 for PFAS and FOC ASTC-SC-01SS (14-15)-(082321) @ 1505 for FOC and Grain size analysis	0.0, 0.0, 0.0, 0.0, 0.0			
							(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles, subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 12.5' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 12.5ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-01
GW(11-15)-(082321) @1525 for PFAS
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG C:\USERS\SSUKAR\AIDOWNLOADS\USCG ASTC BORING LOGS 2020.GPJ ARCADIS.GDT 3/15/22

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Soil Boring Log

Boring No.: ASTC-SC-02

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Project Number: 30062388
Project Location: Traverse City, MI

Date Started: 08/23/2021
Date Completed: 08/23/2021

Logger: A. Westhuis
Editor: Christina Weaver
Weather Conditions: 80F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-SC-02SS (1-2)-082321 @ 1650 for PFAS	0.0		(0.0-0.8') CONCRETE.	
2					0.0		(0.8-2.0') SAND, Fine to medium, subrounded; trace silt; well sorted; dry; dark brown (10YR 3/3).	
3					0.0		(2.0-3.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown (10YR 5/6).	
4					0.0		(3.0-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
5					0.0			
6			48	ASTC-SC-02SS (5.5-6.5)-082321 @ 1655 for PFAS	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			48	ASTC-SC-02SS (11.5-12.5)-082321 @ 1700 for PFAS	0.0			
12					0.0			
13					0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles, subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 12.5' bgs	
14					0.0			
15					0.0			
16							End of boring at 15.0' bgs	
17								
18								
19								
20								

Drilling Co.: Cascade
Driller: James Ashe
Drilling Method: Hand Auger / Direct Push
Drilling Fluid: None
Remarks: Groundwater Sample: ASTC-SC-02
GW(11-15)-(08232) @1715 for PFAS

Sampling Method: Macro Core
Sampling Interval: 5ft
Water Level Start: 12.5ft
Water Level Finish:
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG C:\USERS\SSUKAR\AIDOWNLOADS\USCG ASTC BORING LOGS 2020.GPJ ARCADIS.GDT 3/15/22

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Soil Boring Log

Boring No.: ASTC-SC-03

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/24/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/24/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 70F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-SC-03SS (1-2)-(082421) @ 0945 for PFAS Dup-01(082421) @ 0945 for PFAS	0.0		(0.0-0.8') CONCRETE.	
2					0.0		(0.8-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown (10YR 3/3).	
3					0.0		(2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown (10YR 5/6).	
4					0.0		(3.0-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
5					0.0			
6			54	ASTC-SC-03SS (5.5-6.5)-(082421) @1020 for PFAS Collected for MS/MSD	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			48	ASTC-SC-03SS (11.5-12.5)-(082421) @1025 for PFAS	0.0			
12					0.0			
13					0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles, subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet and slight odor at 12.5' bgs.	
14					0.0			
15					0.0			
16							End of boring at 15.0' bgs	
17								
18								
19								
20								

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 12.5ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-03
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082421) @1040 for PFAS
Surface Elev.:
Dup-02(082421) @ 1040
North Coor:
East Coor:

SOIL BORING LOG C:\USERS\SSUKAR\AIDOWNLOADS\USCG ASTC BORING LOGS 2020.GPJ ARCADIS.GDT 3/15/22

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Soil Boring Log

Boring No.: ASTC-SC-04

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/24/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/24/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 75F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-04SS (0-1)-(082421) @ 1140 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.3') TOPSOIL; grass. (0.3-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (3.0-3.5') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.5-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-04SS (5.5-6.5)-(082421) @1145 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			48	ASTC-5C-04SS (11-12)-(082421) @1150 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules, subrounded; trace silt; poorly sorted; wet; yellowish brown (10YR 5/4). Note: wet at 12.0' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 12.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-04
GW(11-15)-(082421) @1205 for PFAS
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-05

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Project Number: 30062388
Project Location: Traverse City, MI

Date Started: 08/24/2021
Date Completed: 08/24/2021

Logger: A. Westhuis
Editor: Christina Weaver
Weather Conditions: 80F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-05SS (0-1)-(082421) @ 1305 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.3') TOPSOIL; grass. (0.3-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-04SS (5.5-6.5)-(082421) @ 1325 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			48	ASTC-SC-05SS (11-12)-(082421) @1330 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles, subrounded; trace silt; poorly sorted; wet; yellowish brown (10YR 5/4). Note: wet at 12.0' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Driller: James Ashe
Drilling Method: Hand Auger / Direct Push
Drilling Fluid: None
Remarks: Groundwater Sample: ASTC-SC-05
GW(11-15)-(082421) @1400 for PFAS
Collected for MS/MSD

Sampling Method: Macro Core
Sampling Interval: 5ft
Water Level Start: 12.0ft
Water Level Finish:
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-06

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/24/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/24/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 80F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-SC-06SS (0-1)-(082421) @1520 for PFAS	0.0		(0.0-0.3') TOPSOIL; grass.	
					0.0		(0.3-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3).	
2								
3					0.0		(2.0-3.5') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6).	
4					0.0		(3.5-11.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; pale brown (10YR 6/3).	
5					0.0			
6			48	ASTC-SC-06SS (5-6)-(082421) @1525 for PFAS	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			54	ASTC-SC-06SS (10-11)-(082421) @1530 for PFAS MS/MSD	0.0			
12					0.0		(11.0-15.0') SAND, very fine to medium, subrounded; trace granules, subrounded; trace silt; poorly sorted; wet; yellowish brown (10YR 5/4). Note: wet at 11.0' bgs	
13					0.0			
14					0.0			
15					0.0			
16							End of boring 15.0' bgs	
17								
18								
19								
20								

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 11.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-06
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082421) @1545 for PFAS
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-07

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/24/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/24/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 80F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-07SS (0-1)-(082421) @1625 for PFAS Dup-03(082421) @1625	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.3') TOPSOIL; grass. (0.3-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-11.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-07SS (5-6)-(082421) @1630 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			54	ASTC-SC-07SS (10-11)-(082421) @1635 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(11.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules, subrounded; poorly sorted; wet; yellowish brown (10YR 5/4). Note: wet at 11.0' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 11.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-07
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082421) @1700 for PFAS
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-08

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/25/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/25/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 70F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-08SS (0-1)-(082521) @0900 for PFAS Dup-04(082521) @0900	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.3') TOPSOIL; grass. (0.3-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.5') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.5-11.0') SAND, fine to medium, subrounded; trace granules to small pebbles, subrounded; trace silt; well sorted; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-08SS (5-6)-(082521) @0905 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			54	ASTC-SC-08SS (10-11)-(082521) @0910 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(11.0-15.0') SAND, very fine to medium, subrounded; trace course sound, subrounded; trace granules to small pebbles, subrounded; poorly sorted; wet; yellowish brown (10YR 5/4). Note: wet at 11.0' bgs	
16, 17, 18, 19, 20							End of boring 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 11.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-08
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082521) @0920 for PFAS
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-09

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/25/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/25/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 75F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-09SS (0-1)-(082521) @1000 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.3') TOPSOIL; grass. (0.3-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-10.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-09SS (4.5-5.5)-(082521) @1005 for PFAS; ASTC-SC-08SS (9-10)-(082521) @1010 for PFAS and FOC	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			54	ASTC-SC-09SS (12-13)-(082521) @1015 for FOC and Grain Size analysis	0.0, 0.0, 0.0, 0.0, 0.0		Note: wet at 10.0' bgs (11.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles, subrounded; poorly sorted; wet; yellowish brown (10YR 5/4).	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 10.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-09
Converted to SVMP: ☐ Yes ☒ No
GW(10-14)-(082521) @1030 for PFAS
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-10

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/25/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/25/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 75F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-SC-10SS (1-2)-(082521) @1130 for PFAS	0.0		(0.0-0.8') CONCRETE.	
2					0.0		(0.8-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3).	
3					0.0		(2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6).	
4					0.0		(3.0-13.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
5					0.0			
6			48	ASTC-SC-10SS (6.5-7.5)-(082521) @1135 for PFAS	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			60	ASTC-SC-10SS (12-13)-(082521) @1140 for PFAS Dup-05(082521) @1140	0.0			
12					0.0		Note: wet at 13.0' bgs	
13					0.0			
14					0.0		(13.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles; subrounded; trace silt; poorly sorted; wet; yellowish brown (10YR 5/4).	
15					0.0			
16							End of boring at 15.0' bgs	
17								
18								
19								
20								

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 13.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-10
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082521) @1150 for PFAS
Surface Elev.:
Dup-06(082521) @1150
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-11

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/25/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/25/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 75F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-10SS (1-2)-(082521) @1130 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.5') TOPSOIL; grass. (0.5-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-13.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-11SS (6.5-7.5)-(082521) @1235 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			54	ASTC-SC-10SS (12-13)-(082521) @1240 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		Note: wet at 13.0' bgs (13.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles; subrounded; trace silt; poorly sorted; wet; yellowish brown (10YR 5/4).	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 13.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-11
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082521) @1255 for PFAS
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-12

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Project Number: 30062388
Project Location: Traverse City, MI

Date Started: 08/25/2021
Date Completed: 08/25/2021

Logger: A. Westhuis
Editor: Christina Weaver
Weather Conditions: 80F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-5C-12SS (0-1)-(082521) @1345 for PFAS and FOC	0.0		(0.0-0.5') TOPSOIL; grass.	
					0.0		(0.5-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3).	
2								
3					0.0		(2.0-3.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6).	
4					0.0		(3.0-12.5') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
5					0.0			
6			48	ASTC-SC-12SS (6.5-7.5)-(082521) @1350 for PFAS	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			54	ASTC-SC-12SS (12-13)-(082521) @1355 for PFAS and FOC	0.0			
12					0.0			
13				ASTC-5C-12SS (14-15)-(082521) @1400 for FOC and Grain size analysis	0.0		(12.5-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to large pebbles; subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 13.0' bgs	
14					0.0			
15					0.0			
16							End of boring at 15.0' bgs	
17								
18								
19								
20								

Drilling Co.: Cascade
Driller: James Ashe
Drilling Method: Hand Auger / Direct Push
Drilling Fluid: None
Remarks: Groundwater Sample: ASTC-SC-12 GW(11-15)-(082521) @1420 for PFAS

Sampling Method: Macro Core
Sampling Interval: 5ft
Water Level Start: 13.0ft
Water Level Finish:
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-13

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/25/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/25/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 80F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-SC-13SS (0-1)-(082521) @1505 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.5') TOPSOIL; grass. (0.5-2.0') SAND, fine to medium, subrounded; trace granules to small pebbles, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-13SS (6.5-7.5)-(082521) @1510 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			48	ASTC-SC-13SS (12-13)-(082521) @1515 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace granules to small pebbles; subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 13.0' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 13.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-13
GW(11-15)-(082521) @1545 for PFAS
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

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Soil Boring Log

Boring No.: ASTC-SC-14

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Project Number: 30062388
Project Location: Traverse City, MI

Date Started: 08/26/2021
Date Completed: 08/26/2021

Logger: A. Westhuis
Editor: Christina Weaver
Weather Conditions: 75F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1, 2, 3, 4, 5			60	ASTC-5C-14SS (0-1)-(082621) @0915 for PFAS Collected for MS/MSD	0.0, 0.0, 0.0, 0.0, 0.0		(0.0-0.2') ASPHALT. (0.2-0.7') CONCRETE. (0.7-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3). (2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6). (3.0-12.0') SAND, fine to medium, subrounded; trace granules to small pebbles, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
6, 7, 8, 9, 10			48	ASTC-SC-14SS (6.5-7.5)-(082621) @0920 for PFAS	0.0, 0.0, 0.0, 0.0, 0.0			
11, 12, 13, 14, 15			48	ASTC-SC-14SS (12-13)-(082521) @0925 for PFAS Dup-07(082621) @0925	0.0, 0.0, 0.0, 0.0, 0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles; subrounded; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 13.0' bgs	
16, 17, 18, 19, 20							End of boring at 15.0' bgs	

Drilling Co.: Cascade
Driller: James Ashe
Drilling Method: Hand Auger / Direct Push
Drilling Fluid: None
Remarks: Groundwater Sample: ASTC-SC-14
GW(11-15)-(082621) @0935 for PFAS

Sampling Method: Macro Core
Sampling Interval: 5ft
Water Level Start: 13.0ft
Water Level Finish:
Converted to SVMP: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG C:\USERS\SSUKAR\AIDOWNLOADS\USCG ASTC BORING LOGS 2020.GPJ ARCADIS.GDT 3/15/22

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: ASTC-SC-15

Sheet: 1 of 1

Project Name: USCG ASTC Soil Borings
Date Started: 08/26/2021
Logger: A. Westhuis
Project Number: 30062388
Date Completed: 08/26/2021
Editor: Christina Weaver
Project Location: Traverse City, MI
Weather Conditions: 75F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1			60	ASTC-SC-15SS (1-2)-(082621) @1105 for PFAS	0.0		(0.0-0.2') ASPHALT.	
							(0.2-0.7') CONCRETE.	
					0.0		(0.7-2.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; dark brown, (10YR 3/3).	
2								
3					0.0		(2.0-3.0') SAND, fine to medium, subrounded; trace silt; well sorted; dry; yellowish brown, (10YR 5/6).	
4					0.0		(3.0-12.0') SAND, fine to medium, subrounded; trace granules, subrounded; trace silt; well sorted; dry; pale brown (10YR 6/3).	
5					0.0			
6			48	ASTC-SC-15SS (6.5-7.5)-(082621) @1110 for PFAS	0.0			
7					0.0			
8					0.0			
9					0.0			
10					0.0			
11			48		0.0			
12					0.0			
13				ASTC-SC-15SS (12.0-13.0)-(082621) @1115 for PFAS	0.0		(12.0-15.0') SAND, very fine to medium, subrounded; trace coarse sand, subrounded; trace granules to small pebbles; subrounded; trace silt; poorly sorted; moist to wet; yellowish brown (10YR 5/4). Note: wet at 13.0' bgs	
14					0.0			
15				ASTC-SC-15SS (12.0-13.0)-(082621) @1120 for FOC	0.0			
							End of boring at 15.0' bgs	
16								
17								
18								
19								
20								

Drilling Co.: Cascade
Sampling Method: Macro Core
Driller: James Ashe
Sampling Interval: 5ft
Drilling Method: Hand Auger / Direct Push
Water Level Start: 13.0ft
Drilling Fluid: None
Water Level Finish:
Remarks: Groundwater Sample: ASTC-SC-15
Converted to SVMP: ☐ Yes ☒ No
GW(11-15)-(082621) @1130 for PFAS
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG C:\USERS\SSUKAR\AIDOWNLOADS\USCG ASTC BORING LOGS 2020.GPJ ARCADIS.GDT 3/15/22

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[2] (°)	Longitude[2] (°)	Refer to Notation Number
CPT21-VAP-13	21-61-22763_CPVAP-13	27-Jul-2021	801:T1500F15U35	10.5	45.03	44.74852	-85.57214	
CPT21-VAP-14	21-61-22763_CPVAP-14	27-Jul-2021	801:T1500F15U35	10.5	44.05	44.74842	-85.57685	3
CPT21-VAP-15	21-61-22763_CPVAP-15	28-Jul-2021	801:T1500F15U35	12.0	52.00	44.74830	-85.57653	3
CPT21-VAP-16	21-61-22763_CPVAP-16	28-Jul-2021	801:T1500F15U35	12.1	43.14	44.74801	-85.57612	
CPT21-VAP-16A	21-61-22763_CPVAP-16A	28-Jul-2021	801:T1500F15U35	13.2	58.40	44.74802	-85.57612	
CPT21-VAP-17	21-61-22763_CPVAP-17	29-Jul-2021	801:T1500F15U35	13.6	83.09	44.74769	-85.57586	
CPT21-VAP-18	21-61-22763_CPVAP-18	30-Jul-2021	801:T1500F15U35	13.2	82.43	44.74736	-85.57592	
CPT21-VAP-19	21-61-22763_CPVAP-19	30-Jul-2021	801:T1500F15U35	12.3	80.05	44.74705	-85.57593	
CPT21-VAP-20	21-61-22763_CPVAP-20	30-Jul-2021	801:T1500F15U35	9.9	70.05	44.74533	-85.57813	
CPT21-VAP-21	21-61-22763_CPVAP-21	03-Aug-2021	801:T1500F15U35	10.7	71.28	44.74594	-85.57813	
CPT21-VAP-22	21-61-22763_CPVAP-22	04-Aug-2021	801:T1500F15U35	11.8	29.36	44.74499	-85.57920	
CPT21-VAP-22A	21-61-22763_CPVAP-22A	04-Aug-2021	801:T1500F15U35	11.8	63.73	44.74499	-85.57920	3
CPT21-VAP-23	21-61-22763_CPVAP-23	04-Aug-2021	801:T1500F15U35	9.5	30.68	44.74498	-85.57849	3
CPT21-VAP-23A	21-61-22763_CPVAP-23A	04-Aug-2021	801:T1500F15U35	9.5	31.09	44.74498	-85.57848	3
CPT21-VAP-23B	21-61-22763_CPVAP-23B	04-Aug-2021	801:T1500F15U35	9.5	78.17	44.74499	-85.57845	3
CPT21-VAP-24	21-61-22763_CPVAP-24	06-Aug-2021	802:T1500F15U35	10.2	38.71	44.74774	-85.58247	
CPT21-ASTC-VAP-25	21-61-22763_CPVAP-25	18-Dec-2021	661:T1500F15U35	11.9	32.56	44.74859	-85.57818	
CPT21-ASTC-VAP-25A	21-61-22763_CPVAP-25A	18-Dec-2021	661:T1500F15U35	11.9	15.58	44.74858	-85.57816	
CPT21-ASTC-VAP-26	21-61-22763_CPVAP-26	09-Dec-2021	801:T1500F15U35	12.0	40.03	44.75018	-85.57774	3
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	12-Dec-2021	801:T1500F15U35	14.7	35.93	44.74961	-85.57594	
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	10-Dec-2021	801:T1500F15U35	19.4	47.00	44.75235	-85.57268	
CPT21-ASTC-VAP-29	21-61-22763_CPVAP-29	14-Dec-2021	661:T1500F15U35	15.0	70.05	44.75167	-85.57114	
CPT21-ASTC-VAP-30	21-61-22763_CPVAP-30	15-Dec-2021	661:T1500F15U35	10.7	70.21	44.75111	-85.56988	

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[2] (°)	Longitude[2] (°)	Refer to Notation Number
CPT21-ASTC-VAP-31	21-61-22763_CPVAP-31	13-Dec-2021	801:T1500F15U35	8.5	41.67	44.75057	-85.56859	
CPT21-ASTC-VAP-31A	21-61-22763_CPVAP-31A	13-Dec-2021	661:T1500F15U35	8.5	43.31	44.75058	-85.56861	
CPT21-ASTC-VAP-32	21-61-22763_CPVAP-32	11-Dec-2021	801:T1500F15U35	12.2	43.64	44.74510	-85.57700	
CPT21-ASTC-VAP-32A	21-61-22763_CPVAP-32A	11-Dec-2021	801:T1500F15U35	12.2	62.09	44.74510	-85.57702	
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	12-Dec-2021	801:T1500F15U35	11.5	70.21	44.74494	-85.57583	
CPT21-ASTC-VAP-34	21-61-22763_CPVAP-34	15-Dec-2021	661:T1500F15U35	5.5	70.21	44.75340	-85.56972	
CPT21-ASTC-VAP-35	21-61-22763_CPVAP-35	20-Dec-2021	661:T1500F15U35	5.2	25.10	44.75293	-85.56897	
CPT21-ASTC-VAP-35A	21-61-22763_CPVAP-35A	20-Dec-2021	661:T1500F15U35	5.2	70.21	44.75295	-85.56894	
CPT21-ASTC-VAP-36	21-61-22763_CPVAP-36	16-Dec-2021	661:T1500F15U35	5.1	70.21	44.75300	-85.56894	
CPT21-ASTC-VAP-37	21-61-22763_CPVAP-37	17-Dec-2021	661:T1500F15U35	8.7	70.05	44.75194	-85.56863	
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	21-Dec-2021	661:T1500F15U35	7.0	54.54	44.75358	-85.57111	
CPT21-ASTC-VAP-39	21-61-22763_CPVAP-39	21-Dec-2021	661:T1500F15U35	9.5	47.16	44.74976	-85.56672	
Totals	35 soundings				1880.97			

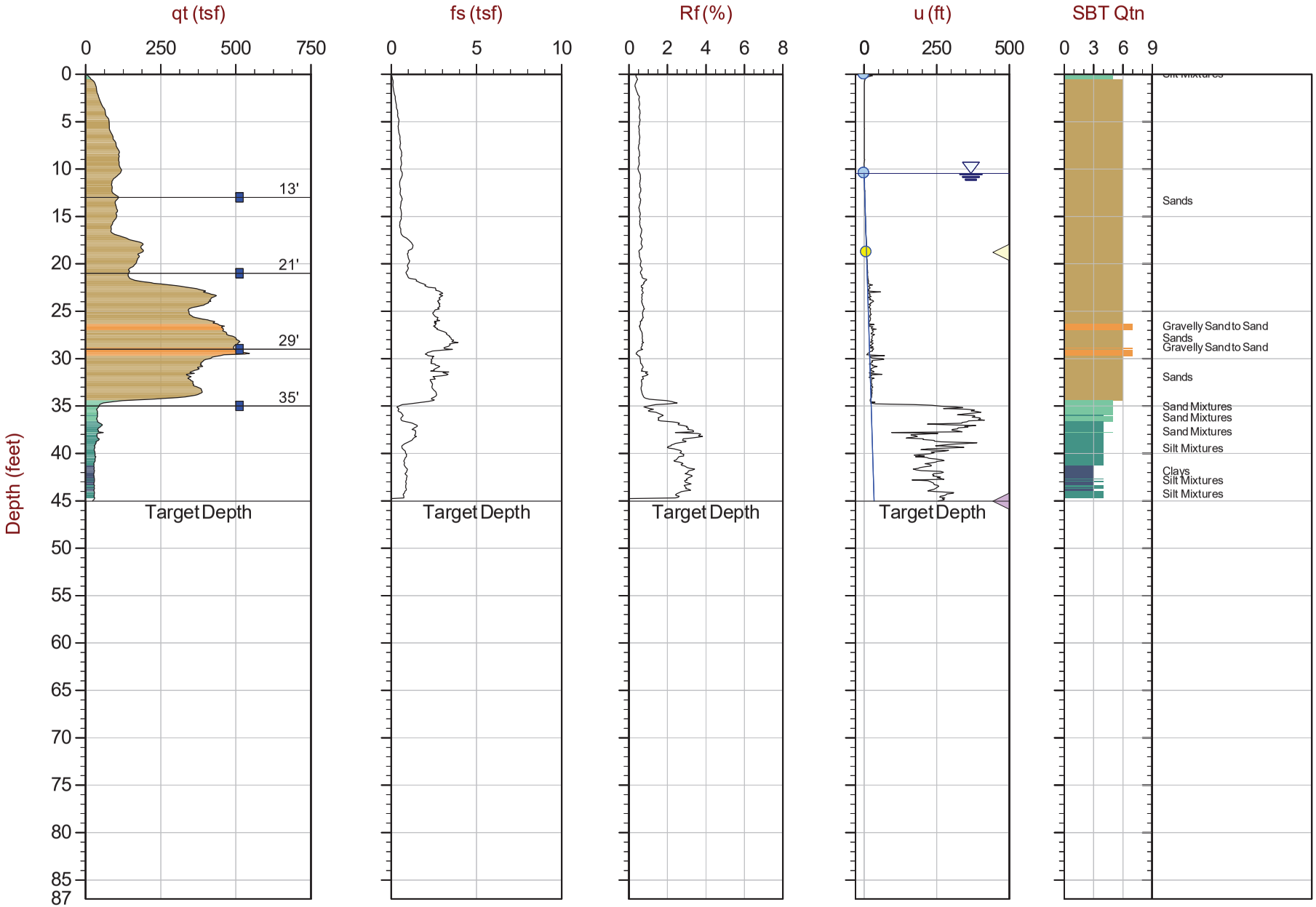
1. The assumed phreatic surface was based on pore pressure dissipation tests. Hydrostatic data was used for the calculated parameters.
2. Coordinates were acquired using a MR-350 GlobalSat GPS Receiver in datum: WGS84 Latitude / Longitude.
3. The assumed phreatic surface was estimated from the dynamic pore pressure data.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35



Max Depth: 13.725 m / 45.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-13.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74852 Long: -85.57214

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

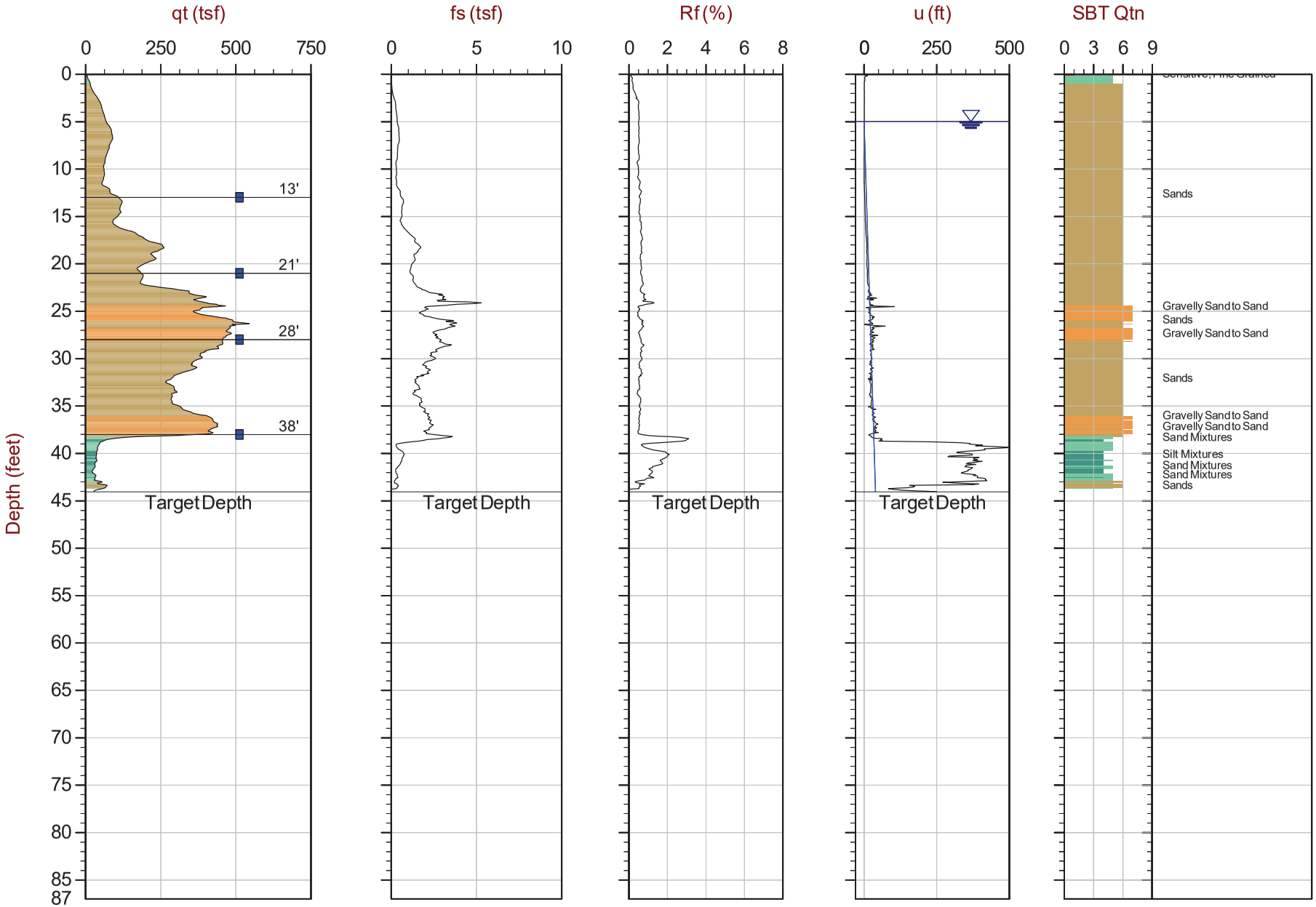
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35



Max Depth: 13.425 m / 44.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-14.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74842 Long: -85.57685

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

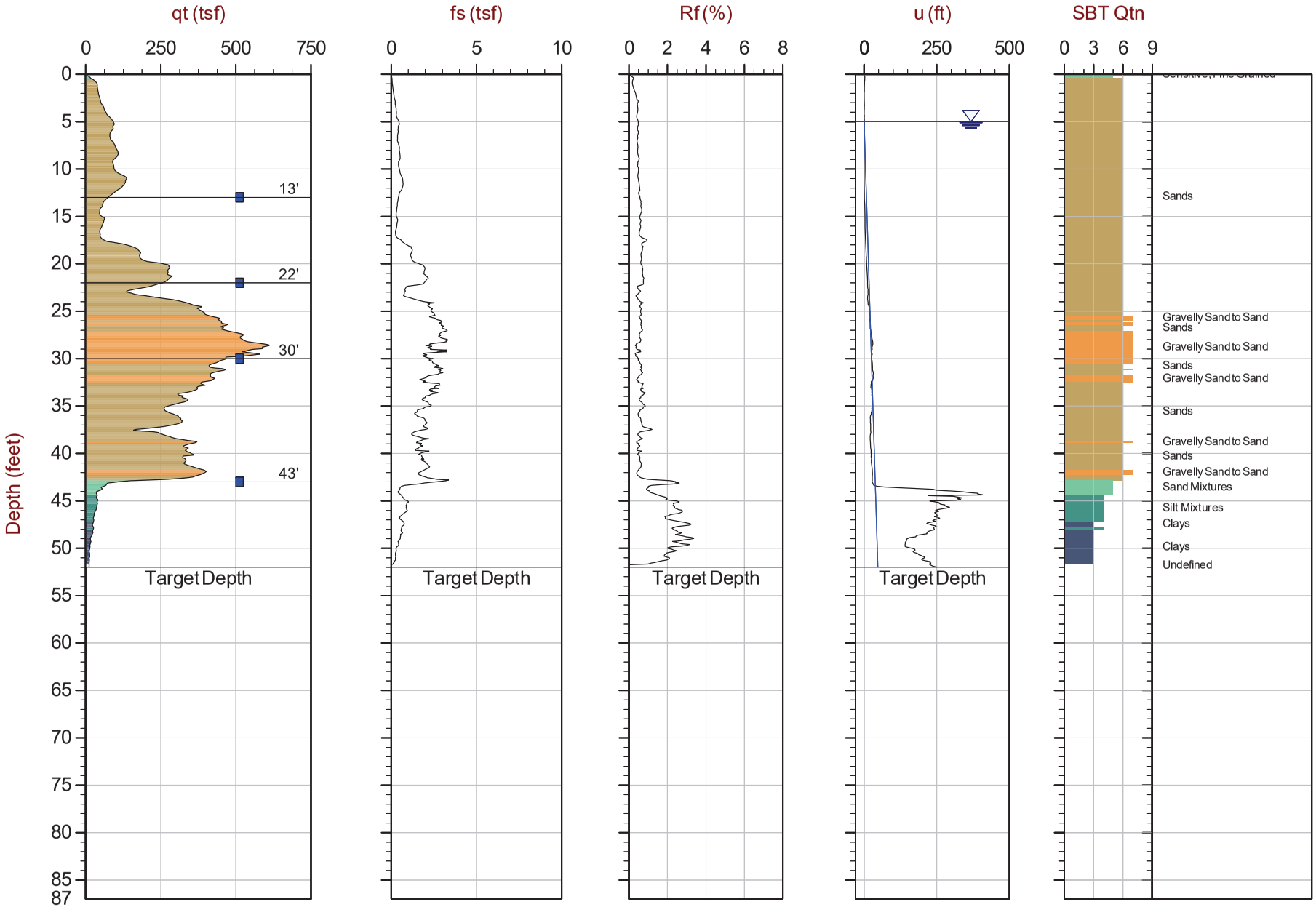
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35



Max Depth: 15.850 m / 52.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-15.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74830 Long: -85.57653

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

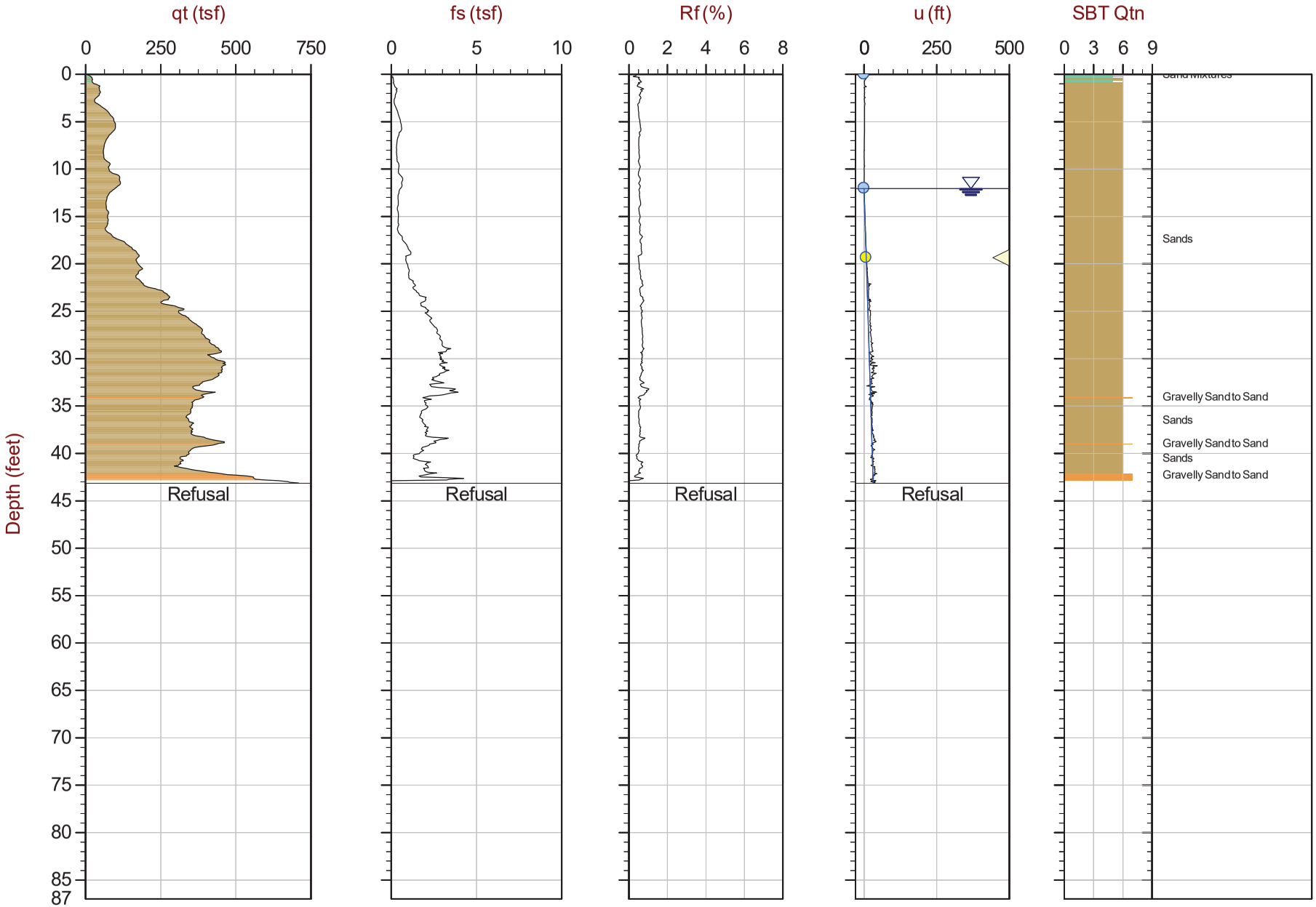
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35



Max Depth: 13.150 m / 43.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74801 Long: -85.57612

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

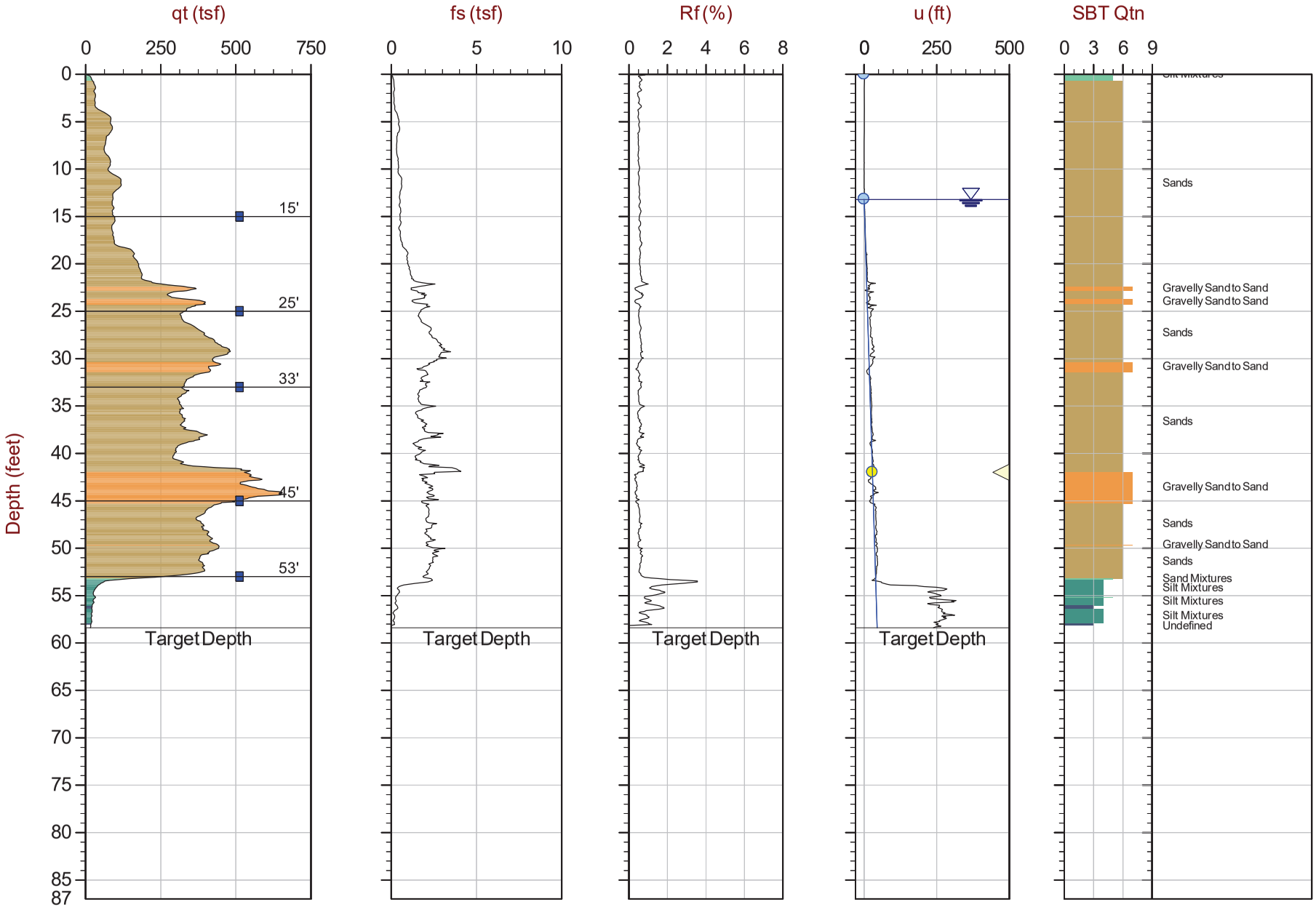
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35



Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74802 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

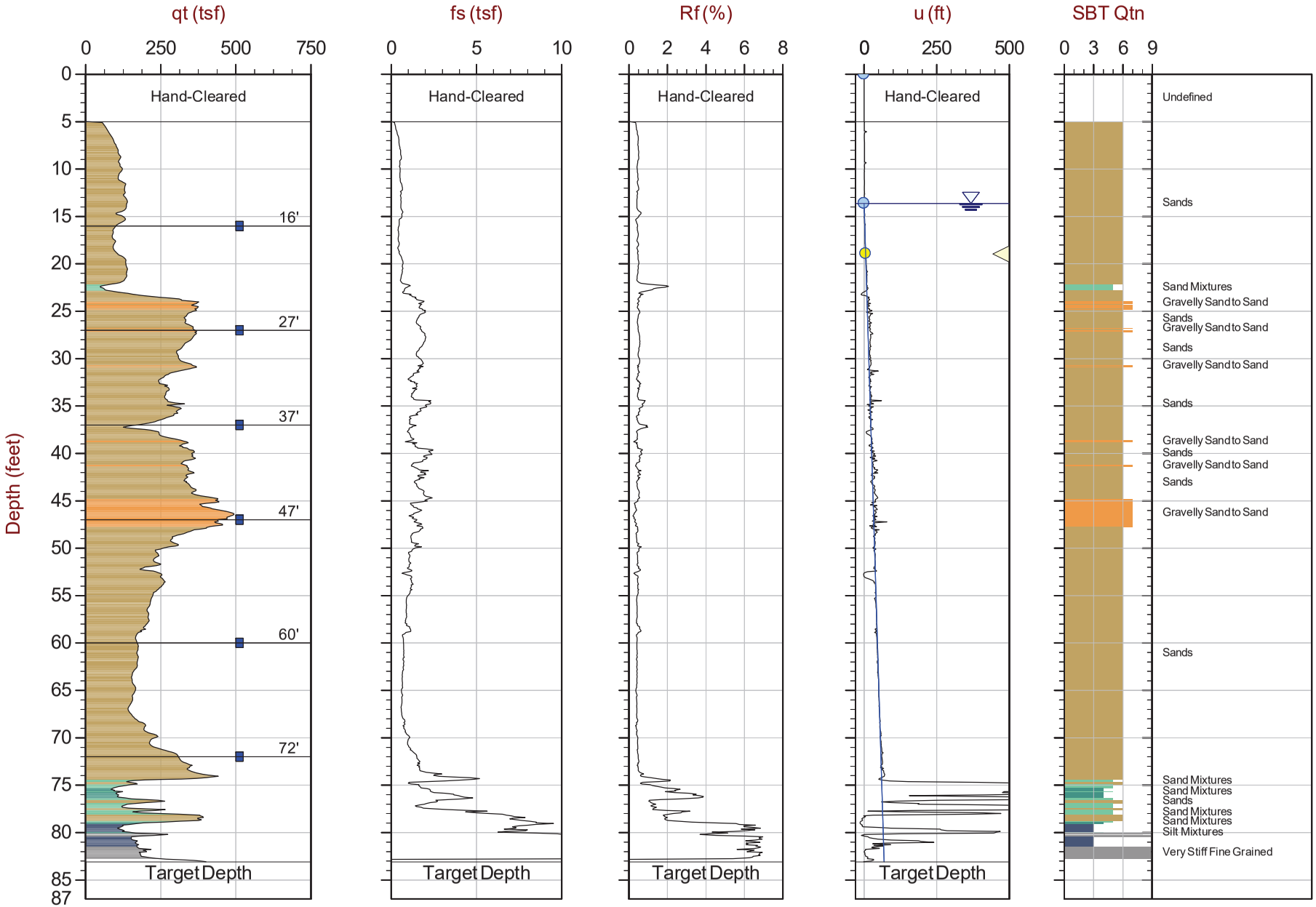
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35



Max Depth: 25.325 m / 83.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-17.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74769 Long: -85.57586

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

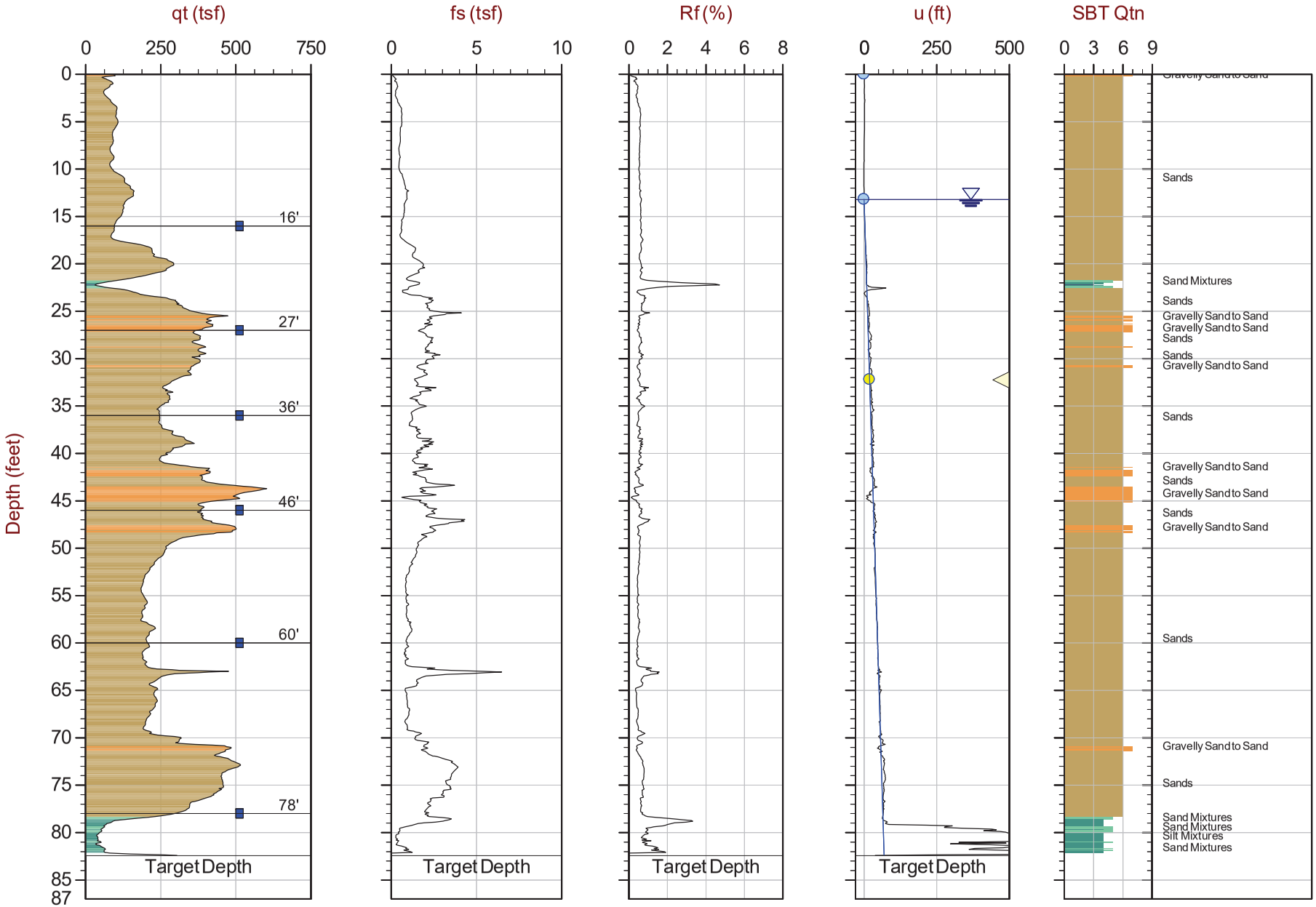
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35



Max Depth: 25.125 m / 82.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-18.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74735 Long: -85.57592

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

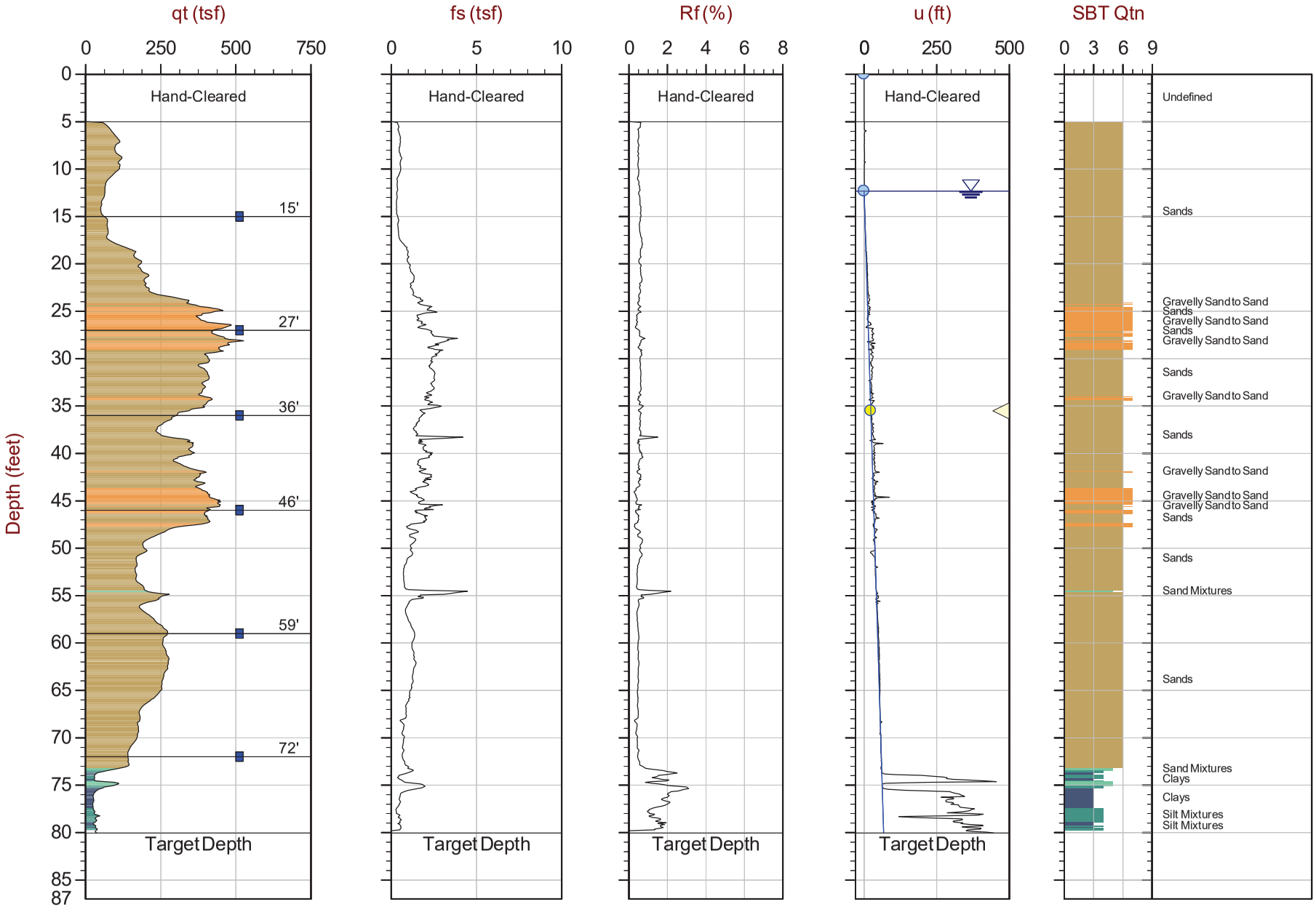
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35



Max Depth: 24.400 m / 80.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-19.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74705 Long: -85.57593

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

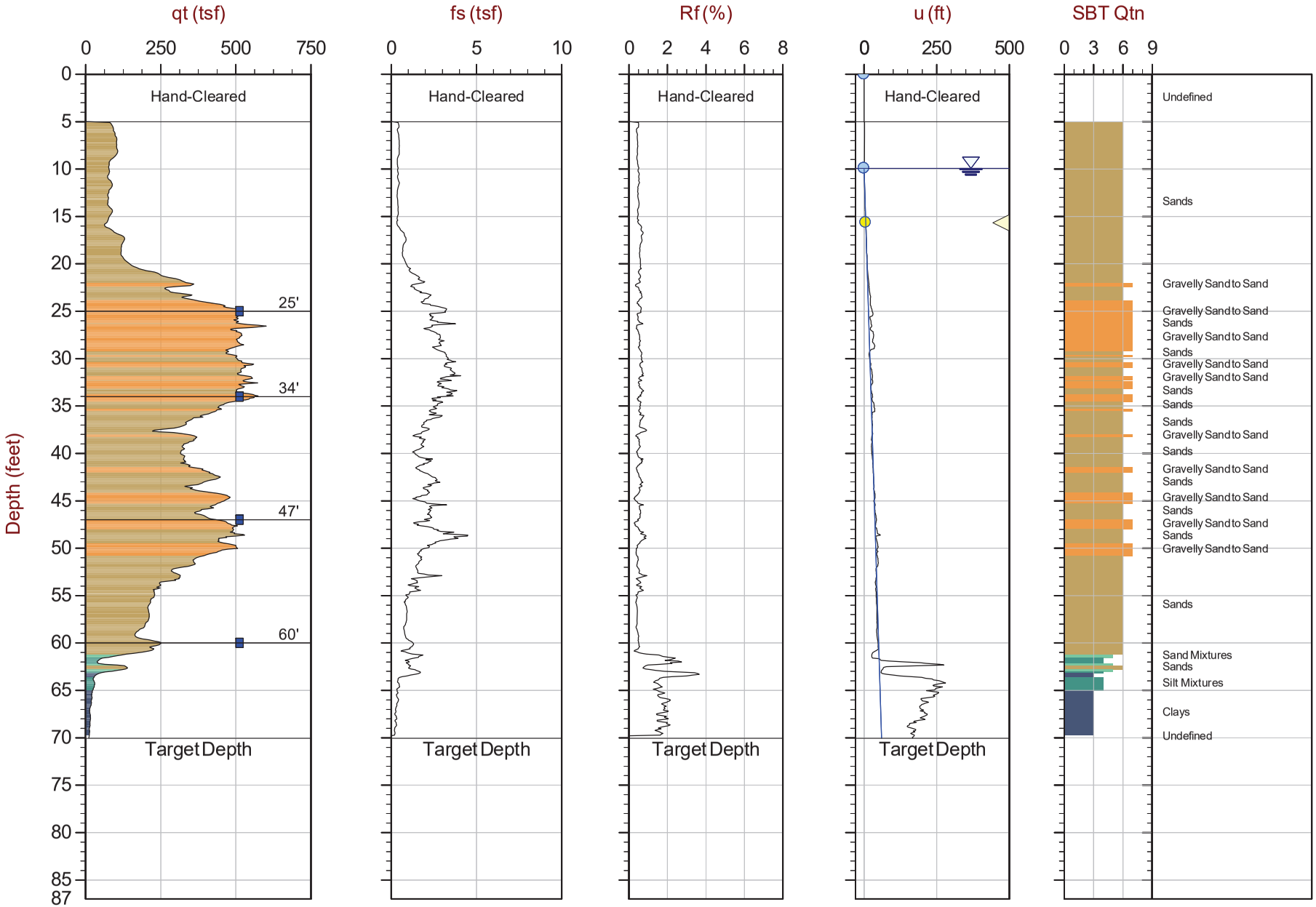
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-20.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74533 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

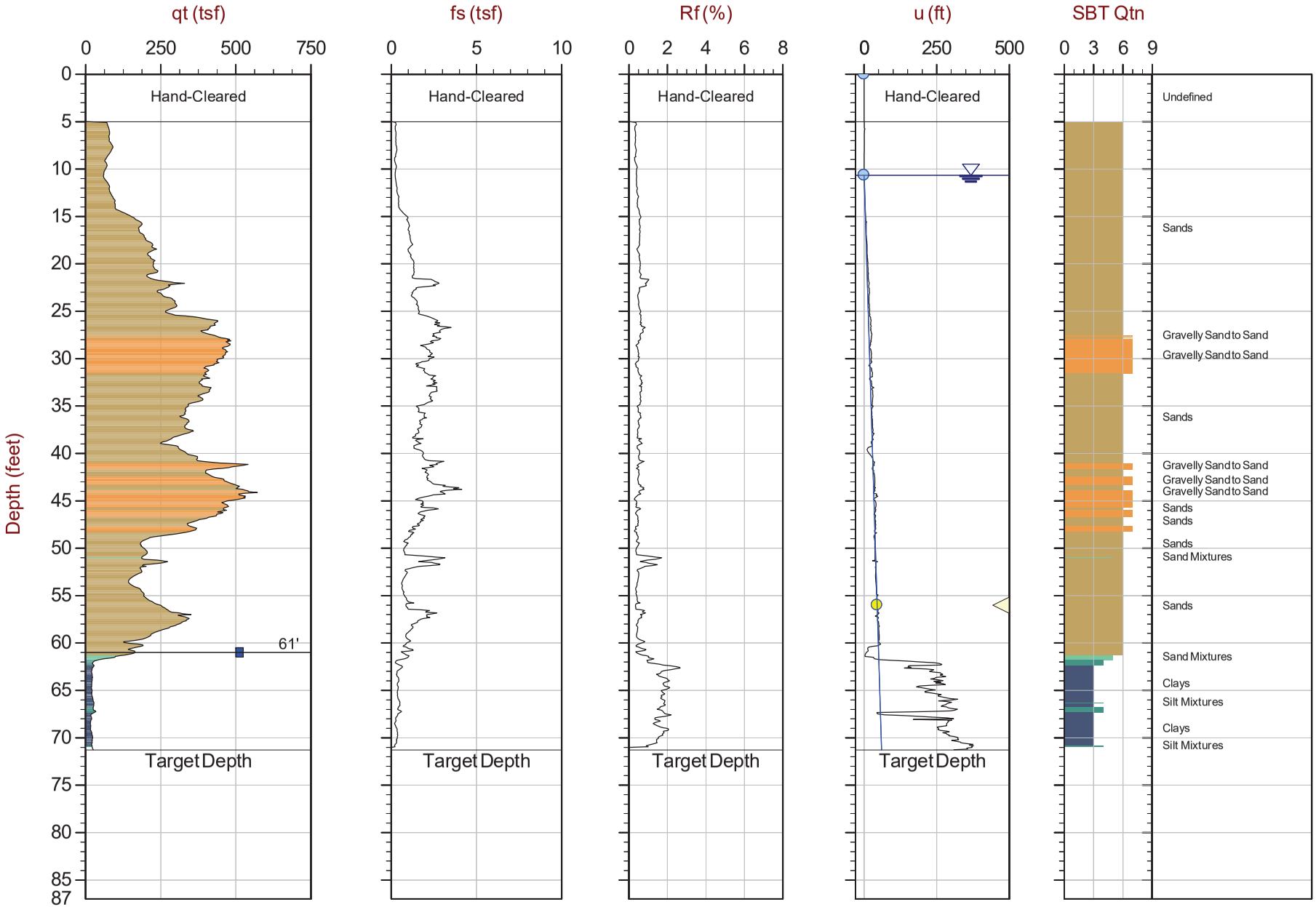
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35



Max Depth: 21.725 m / 71.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-21.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74594 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

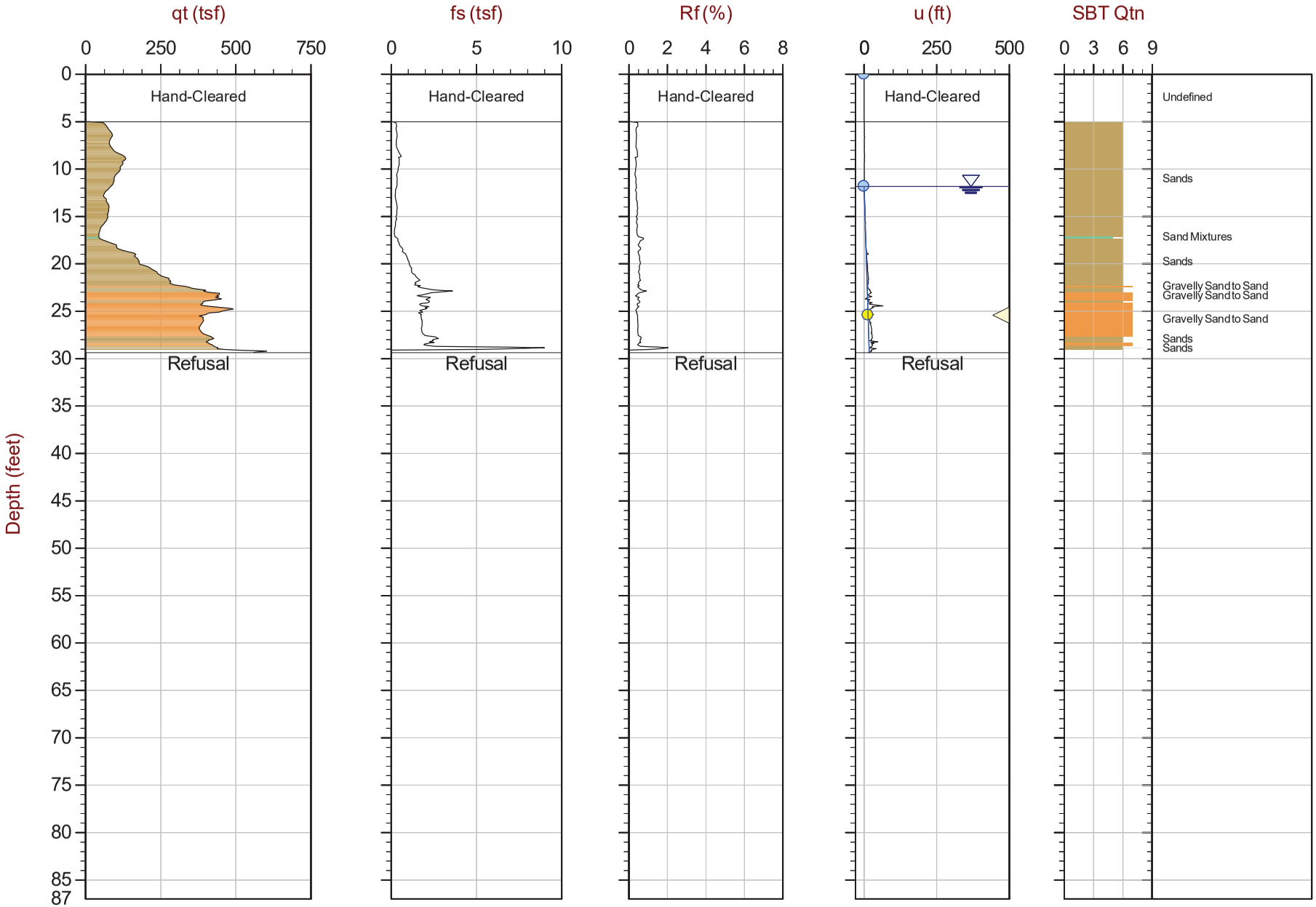
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35



Max Depth: 8.950 m / 29.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

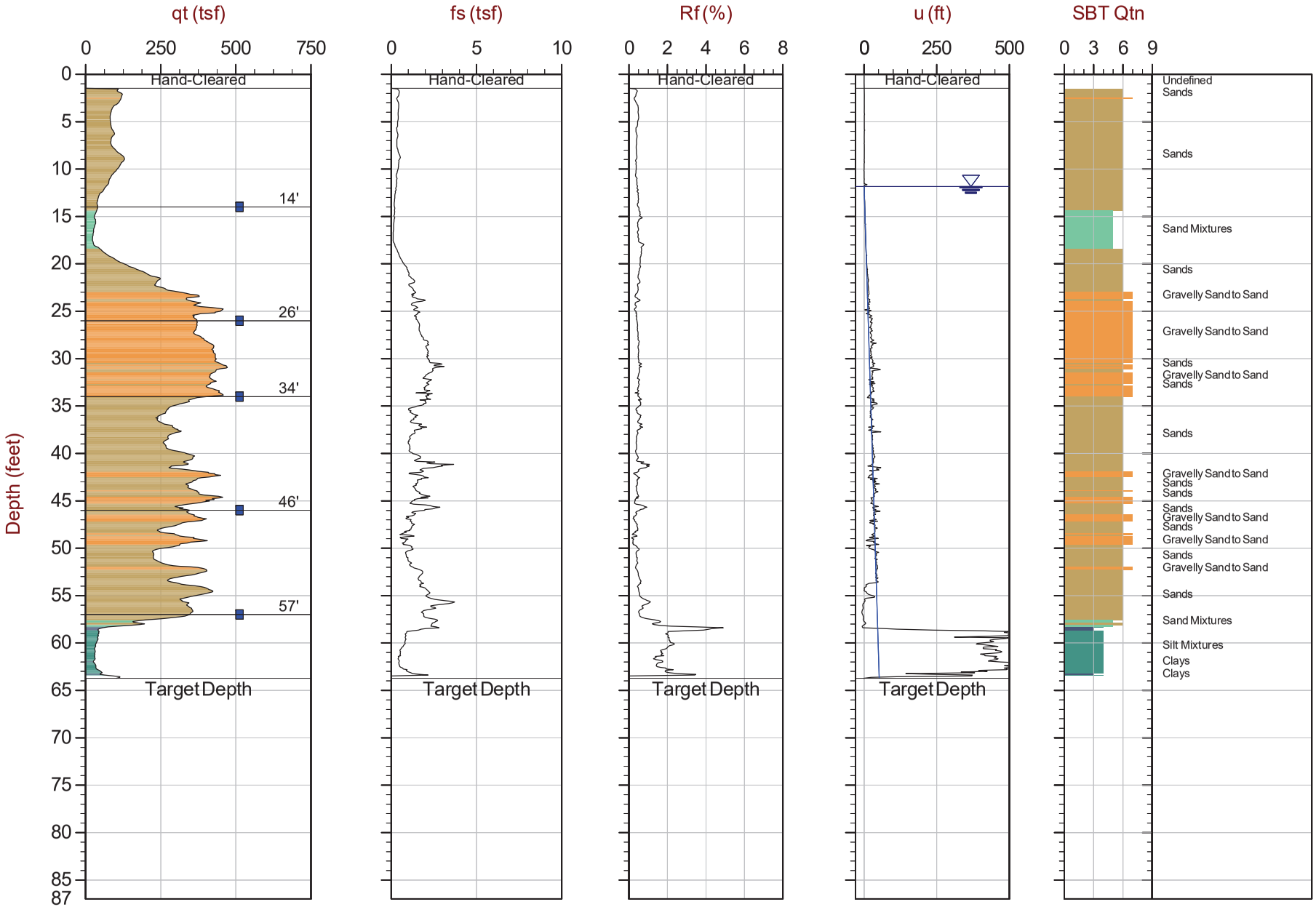
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35



Max Depth: 19.425 m / 63.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

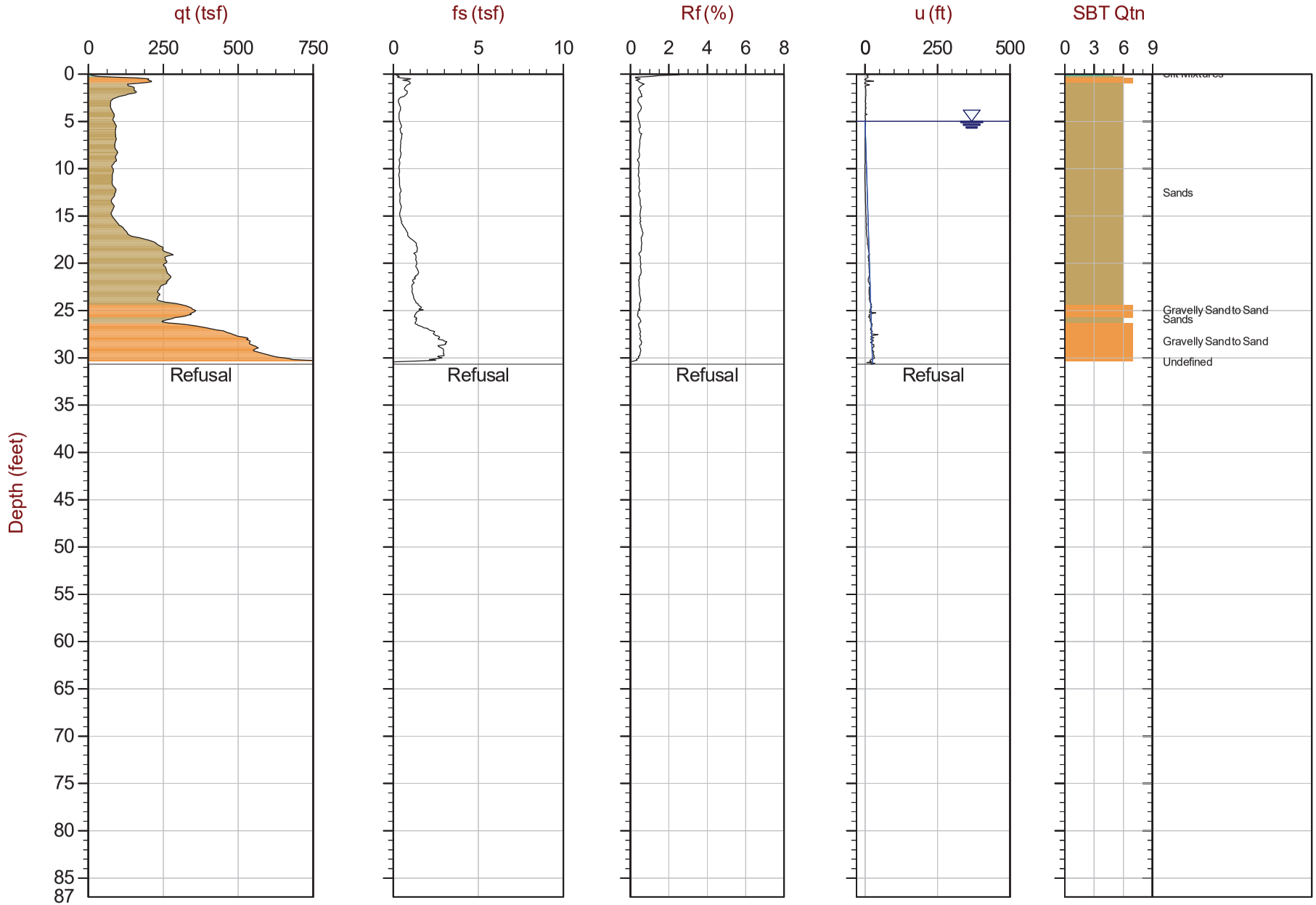
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35



Max Depth: 9.350 m / 30.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57849

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

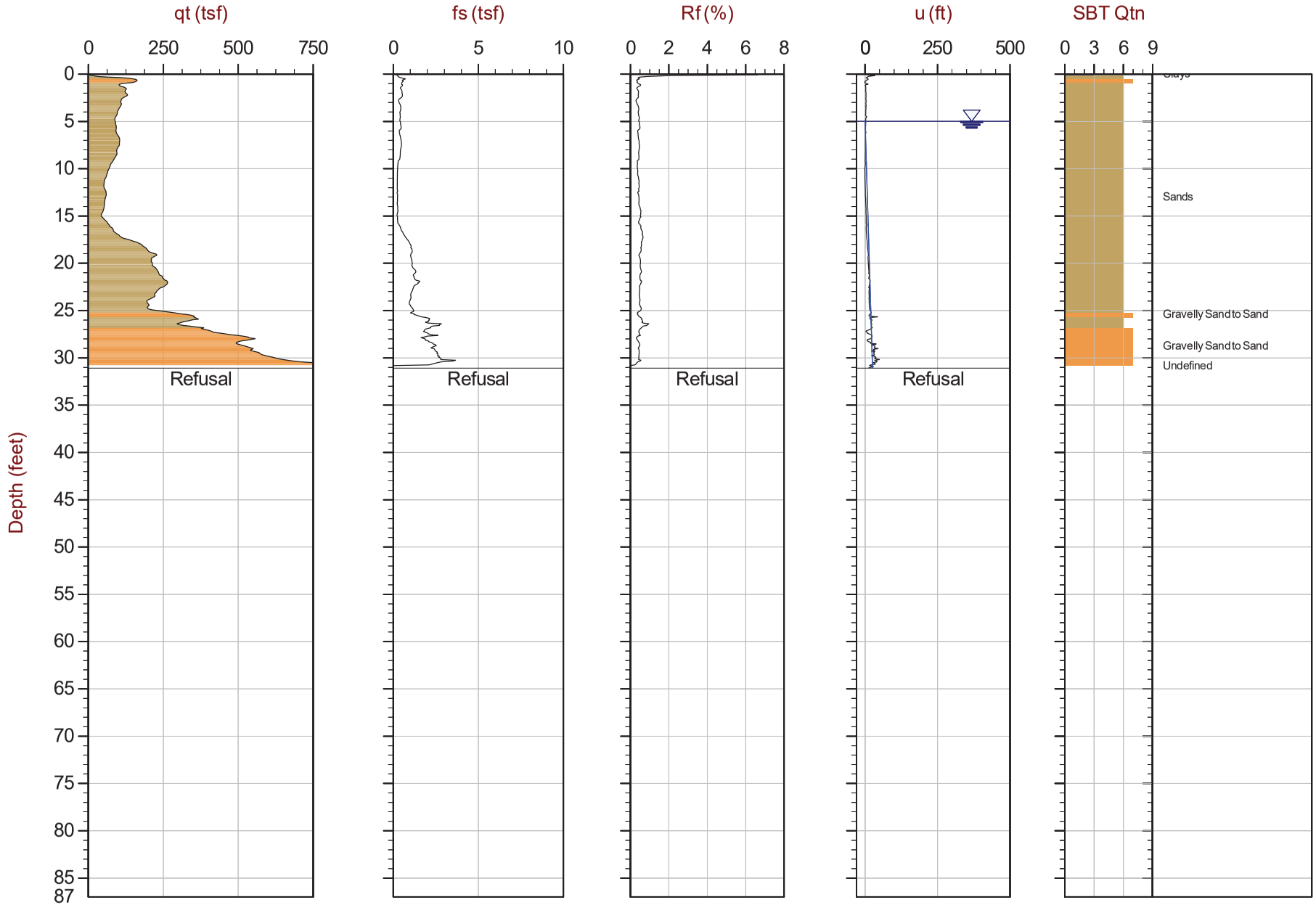
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57848

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

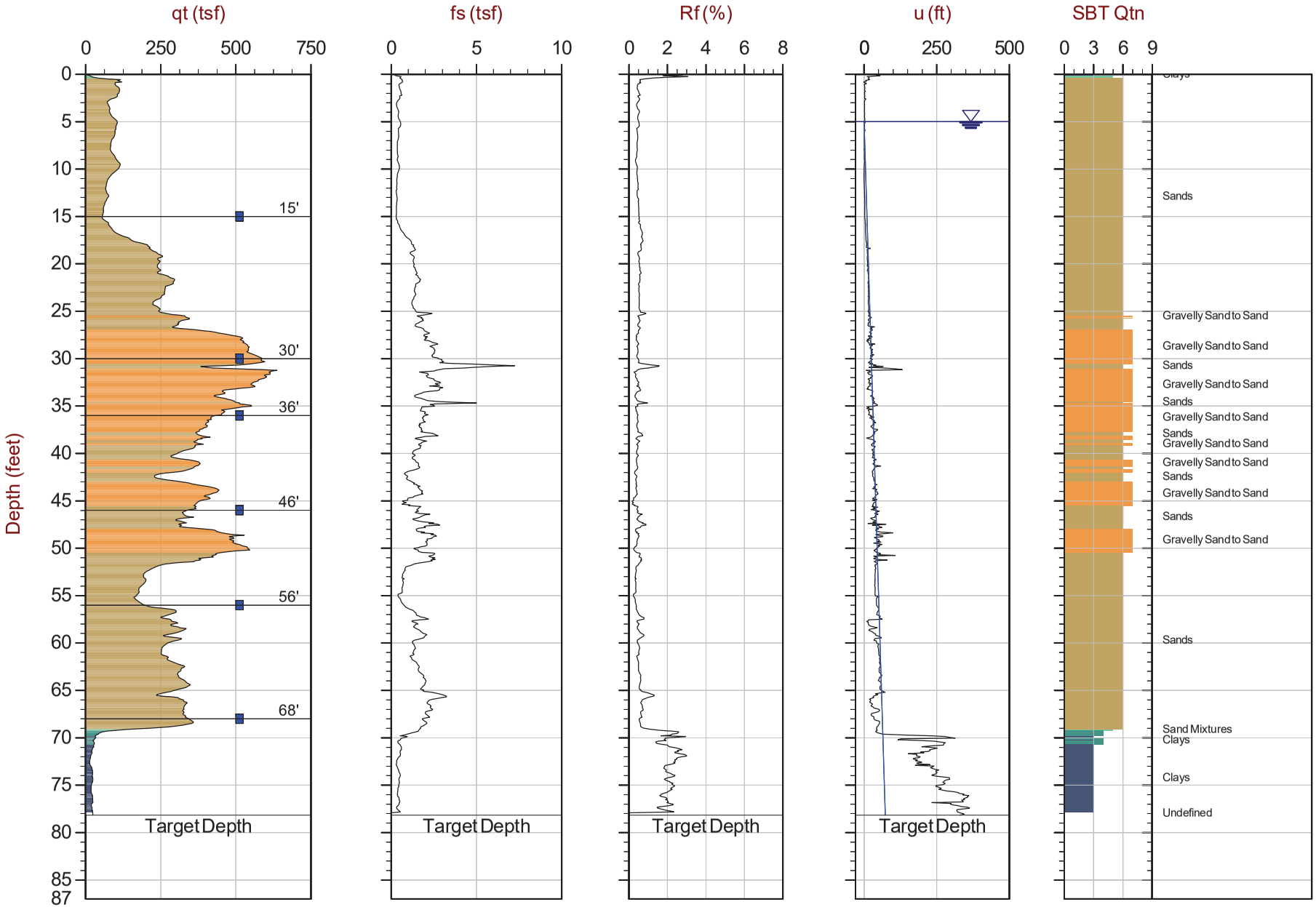
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35



Max Depth: 23.825 m / 78.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57845

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

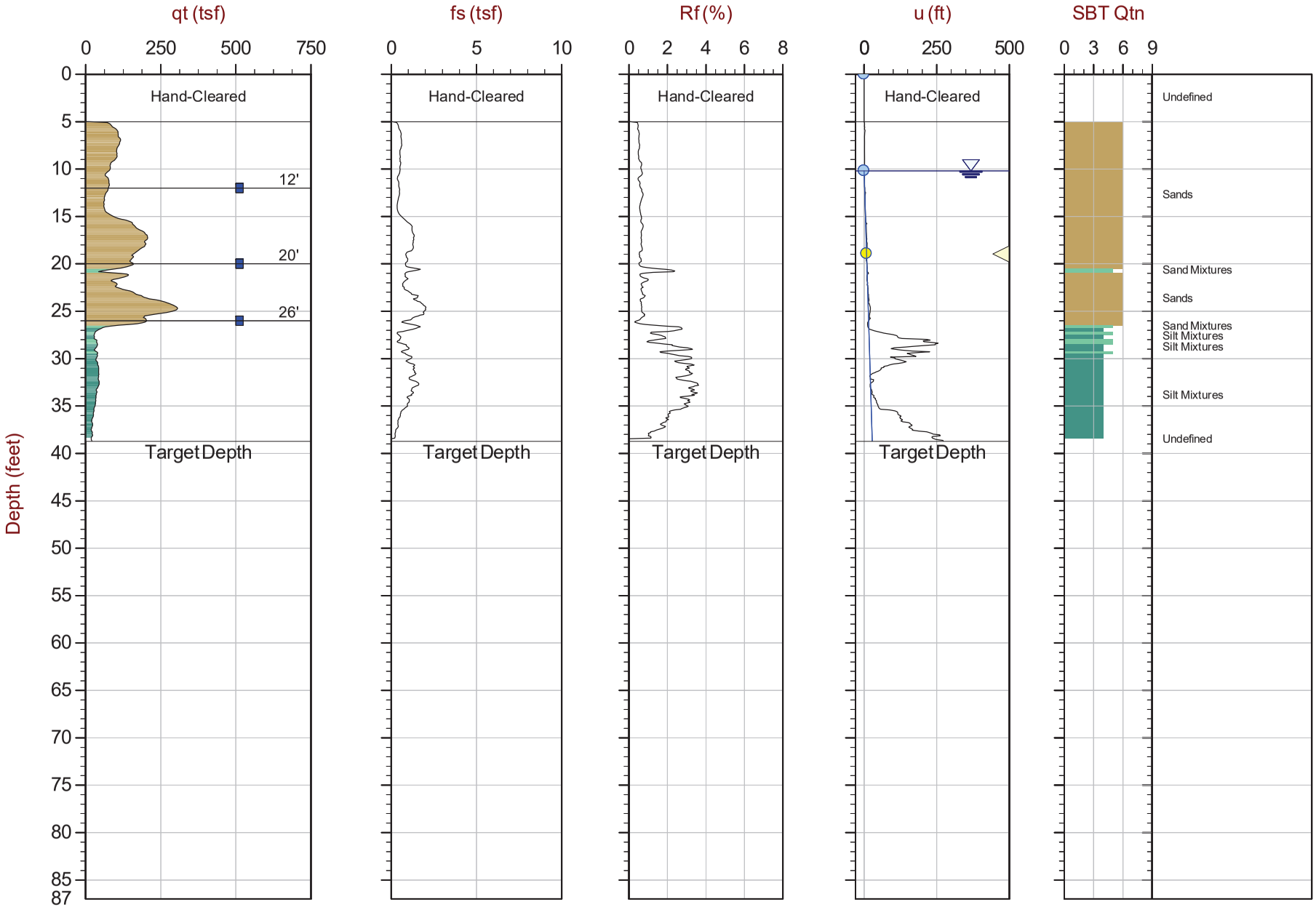
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-24.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74773 Long: -85.58247

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

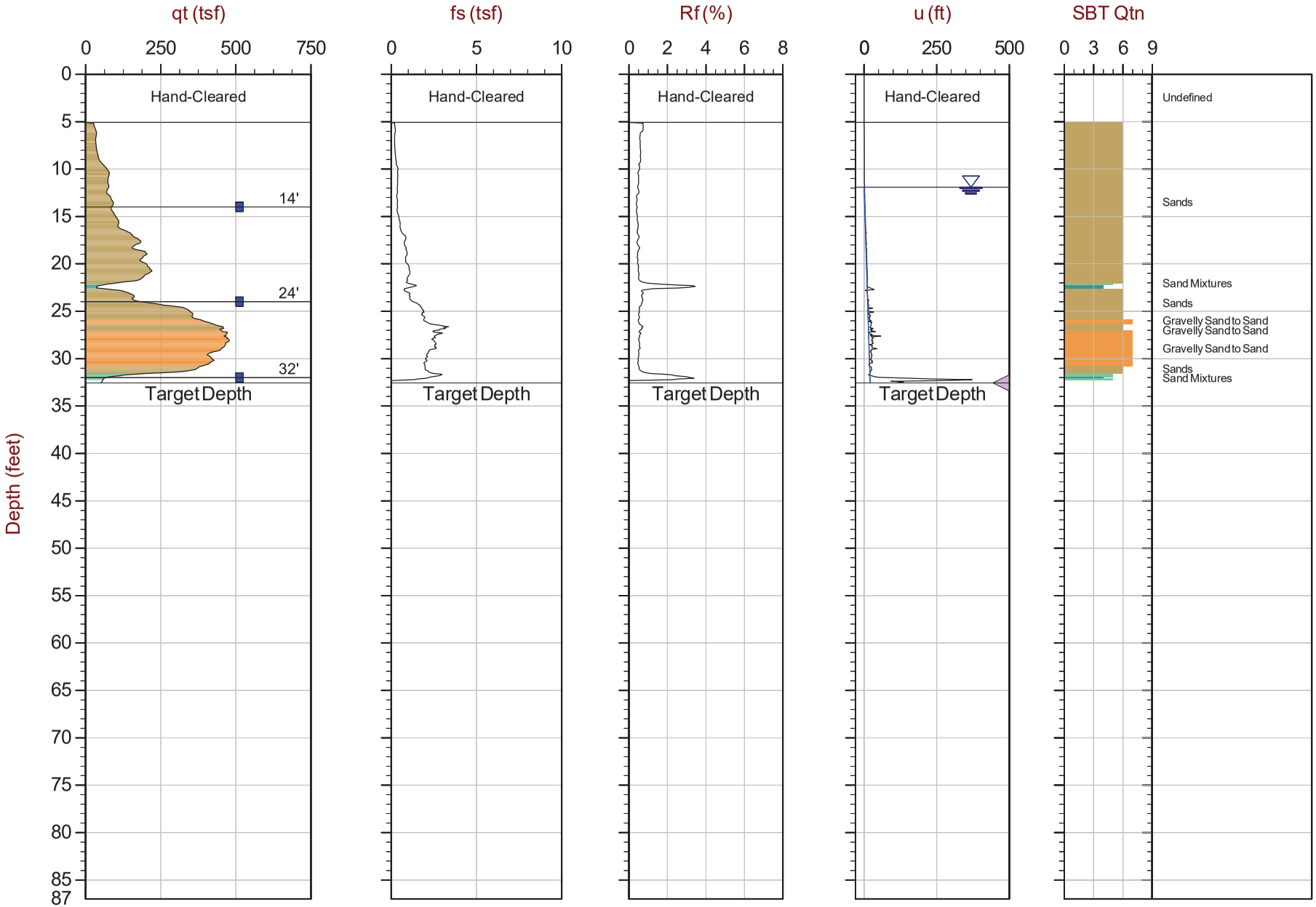
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35



Max Depth: 9.925 m / 32.56 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74859 Long: -85.57818

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

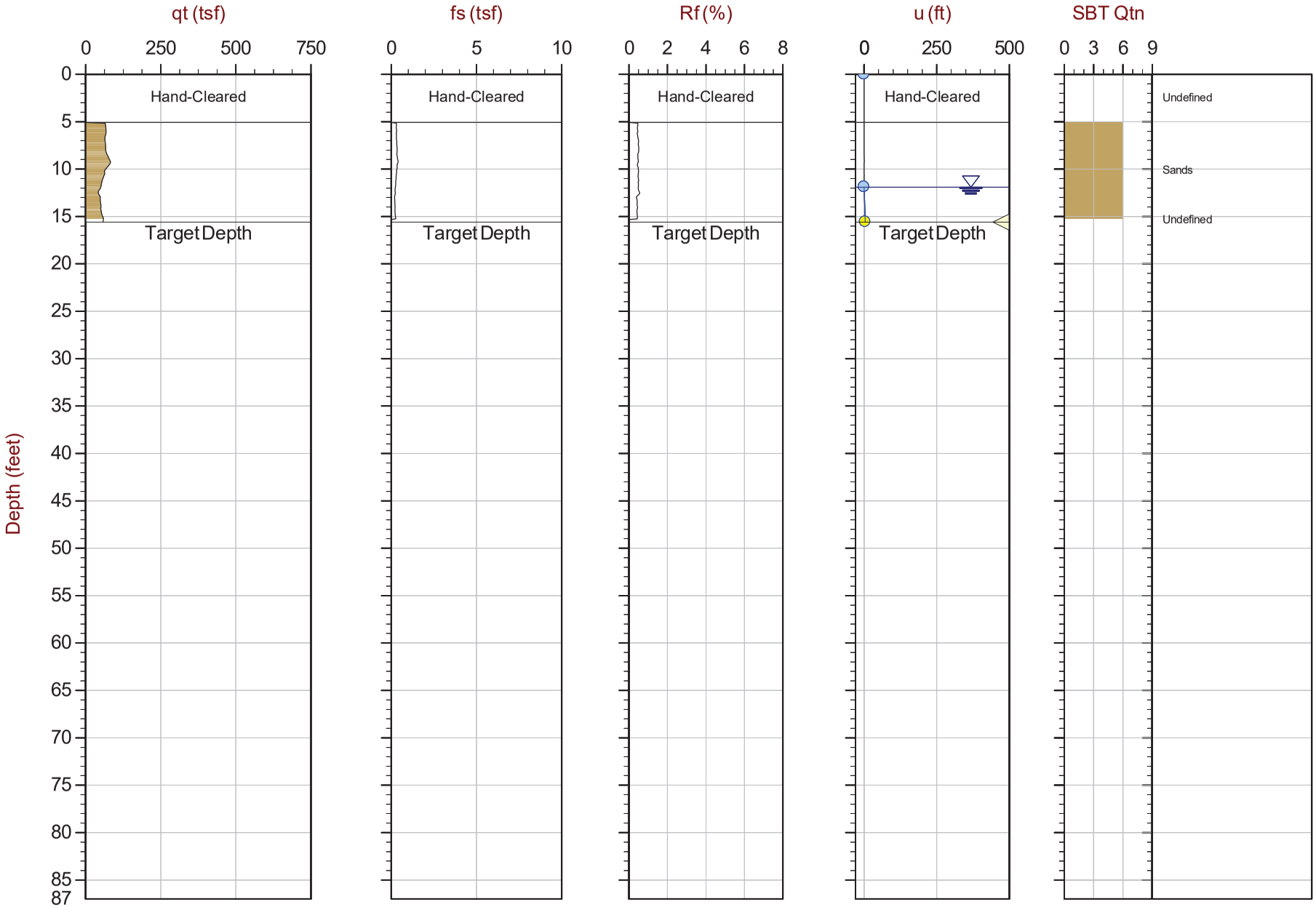
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35



Max Depth: 4.750 m / 15.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74858 Long: -85.57816

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

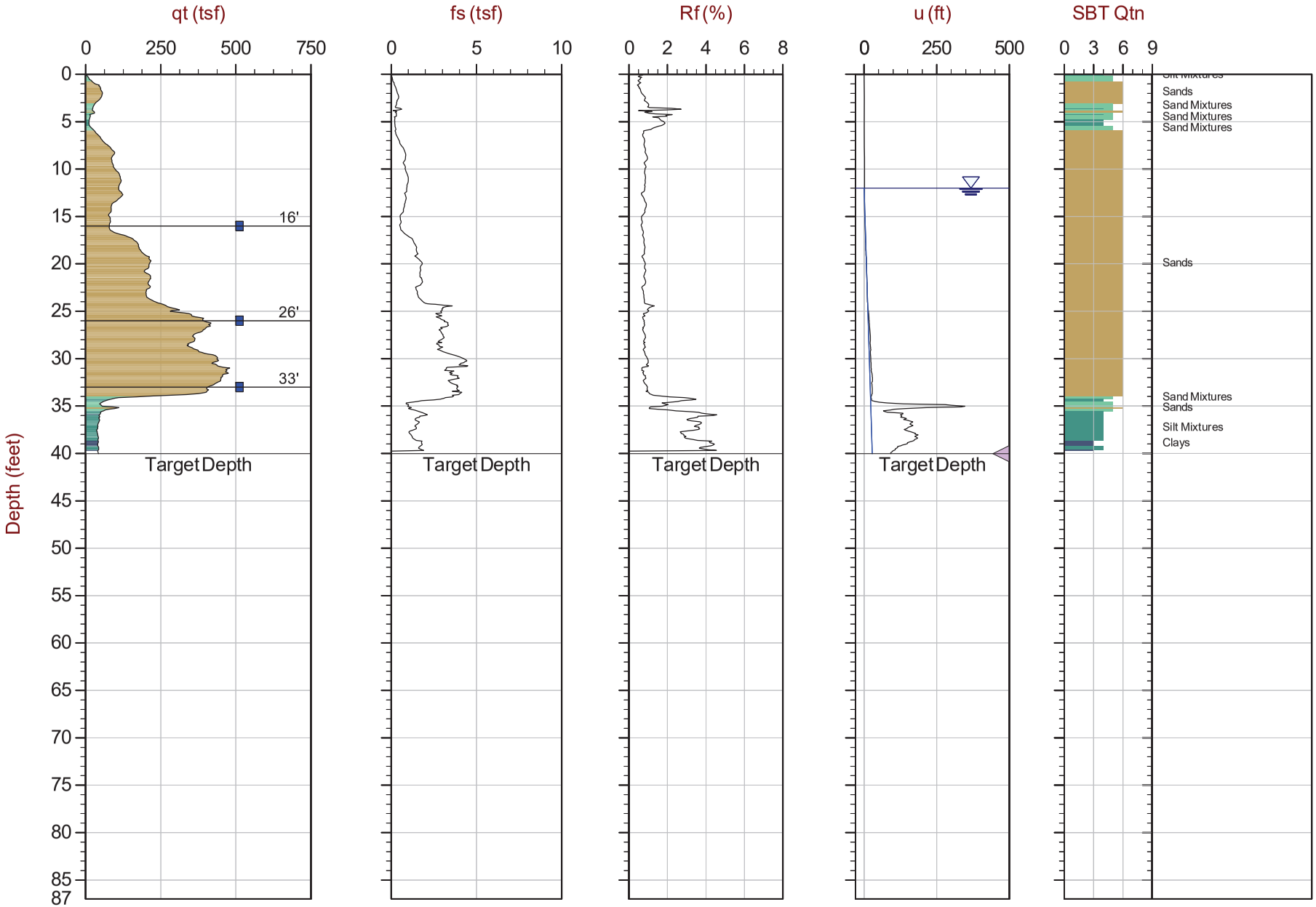
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-26.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75018 Long: -85.57774

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

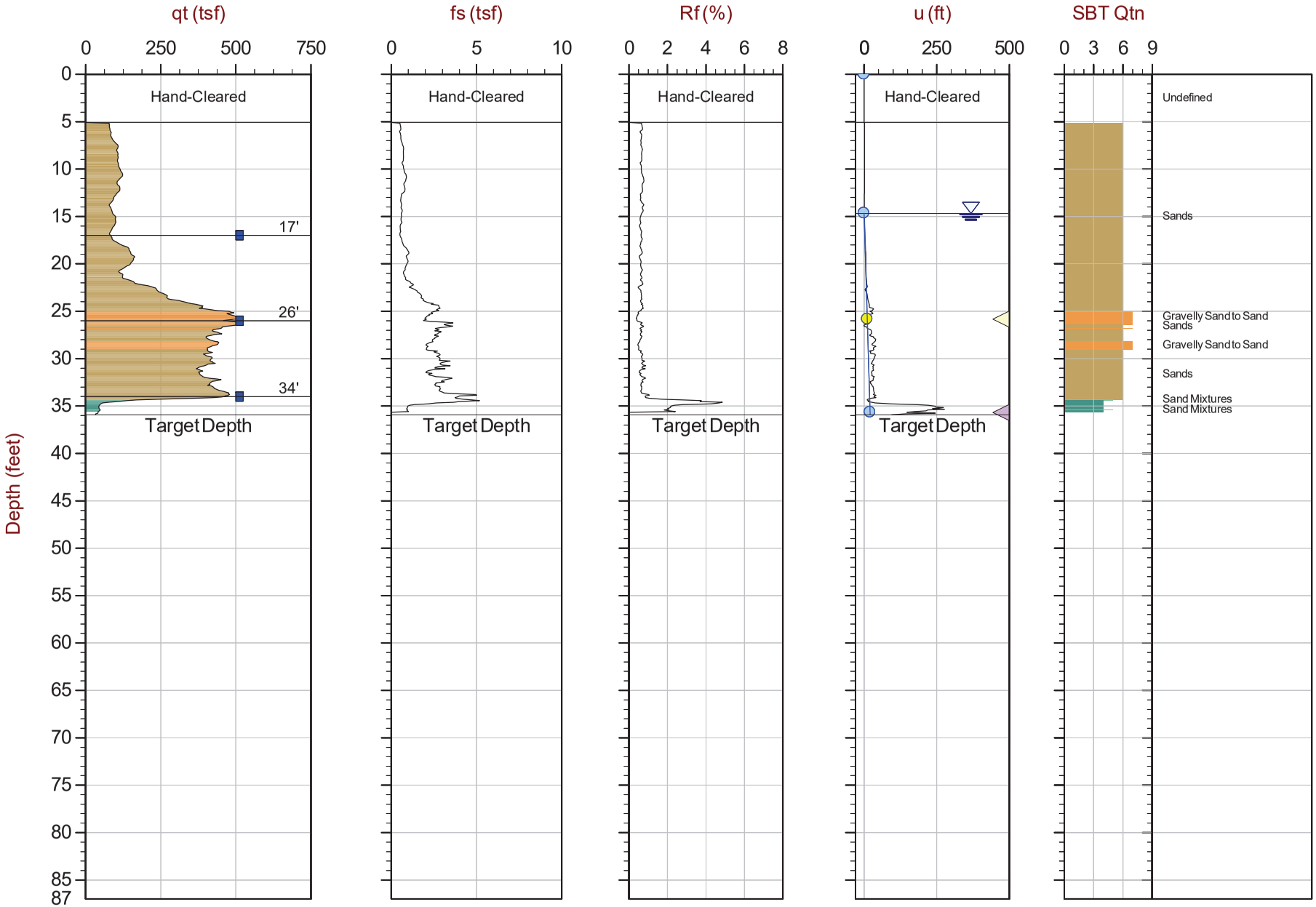
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35



Max Depth: 10.950 m / 35.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-27.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74961 Long: -85.57594

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

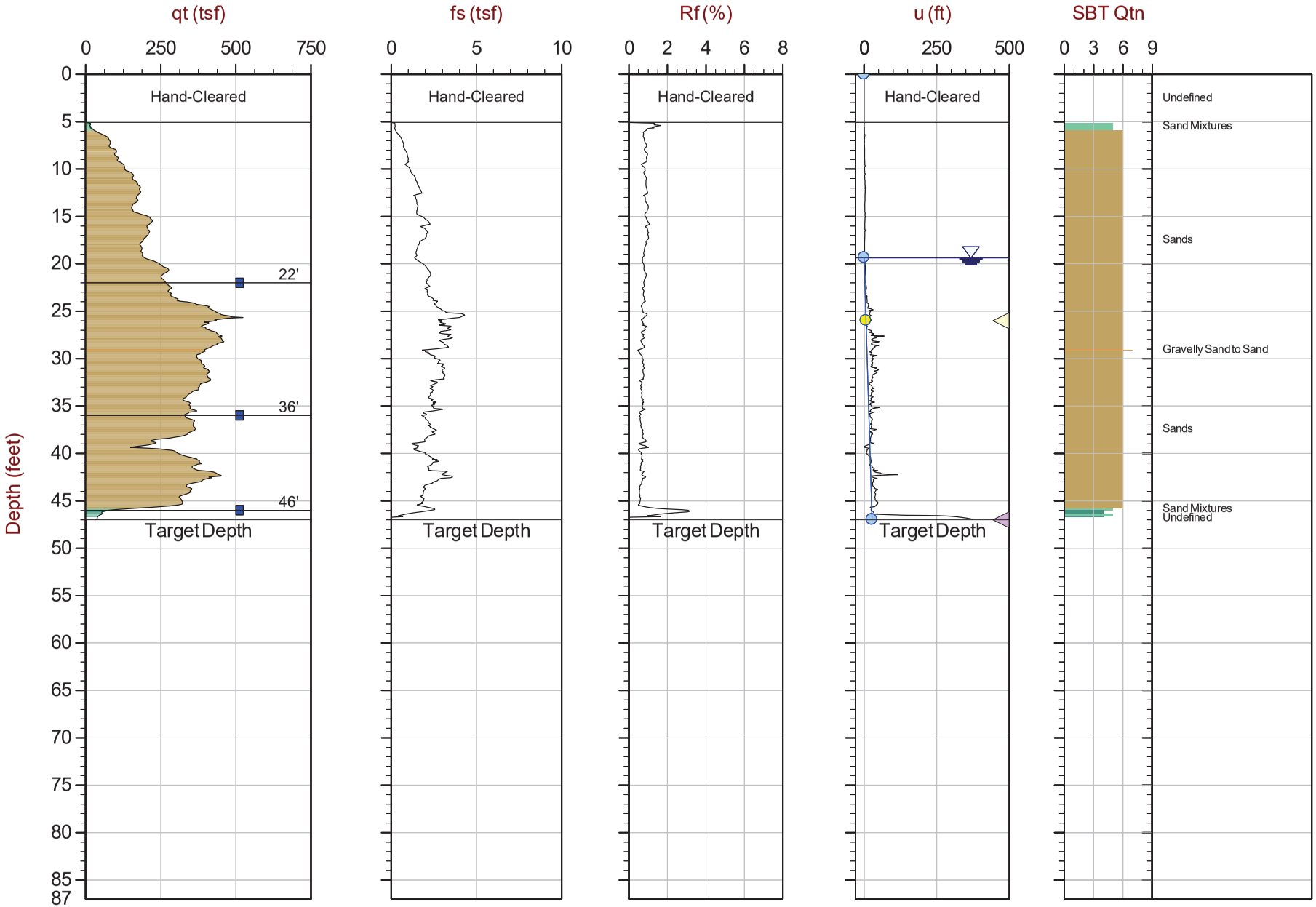
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35



Max Depth: 14.325 m / 47.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-28.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75235 Long: -85.57268

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

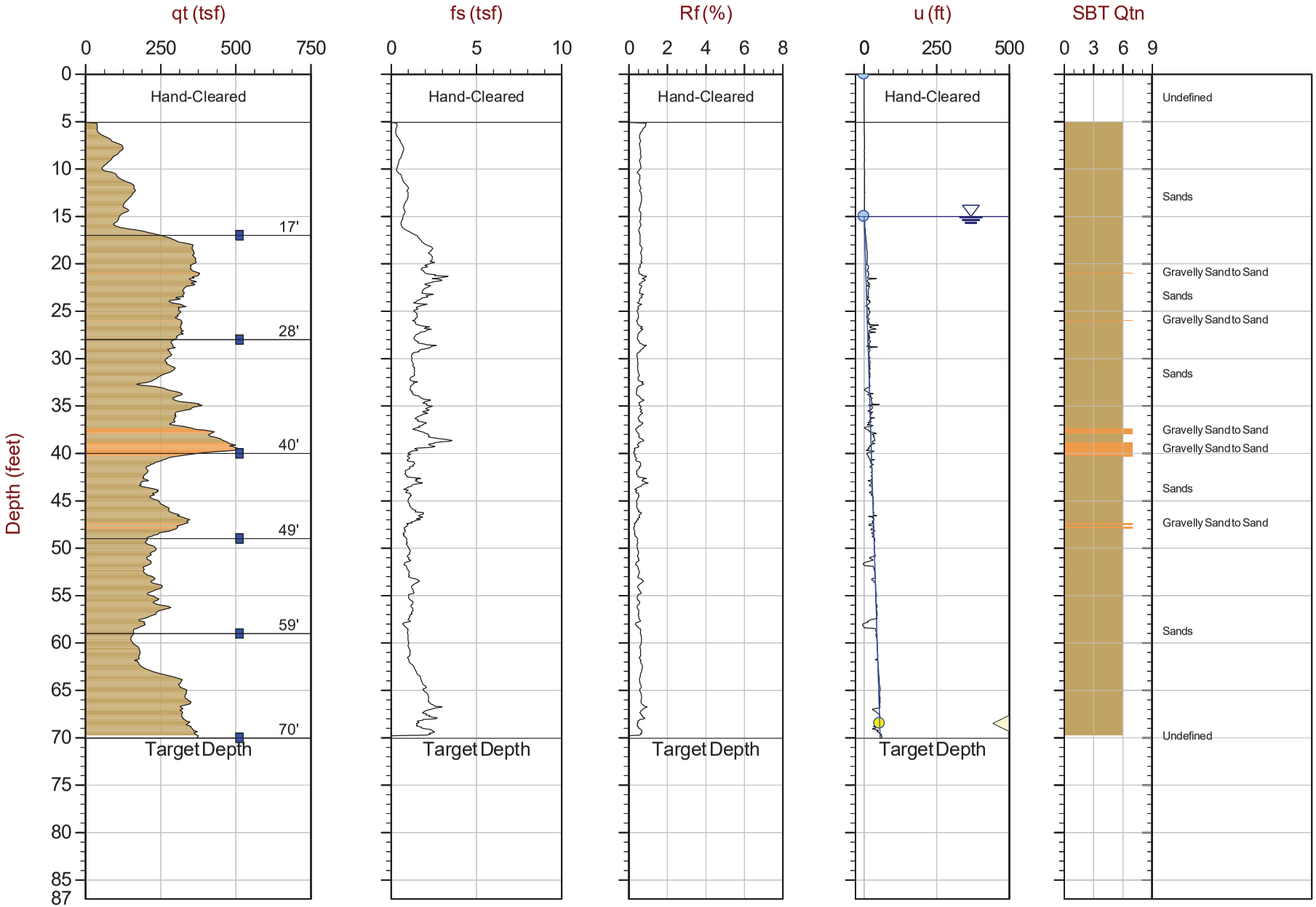
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-29.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75167 Long: -85.57113

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

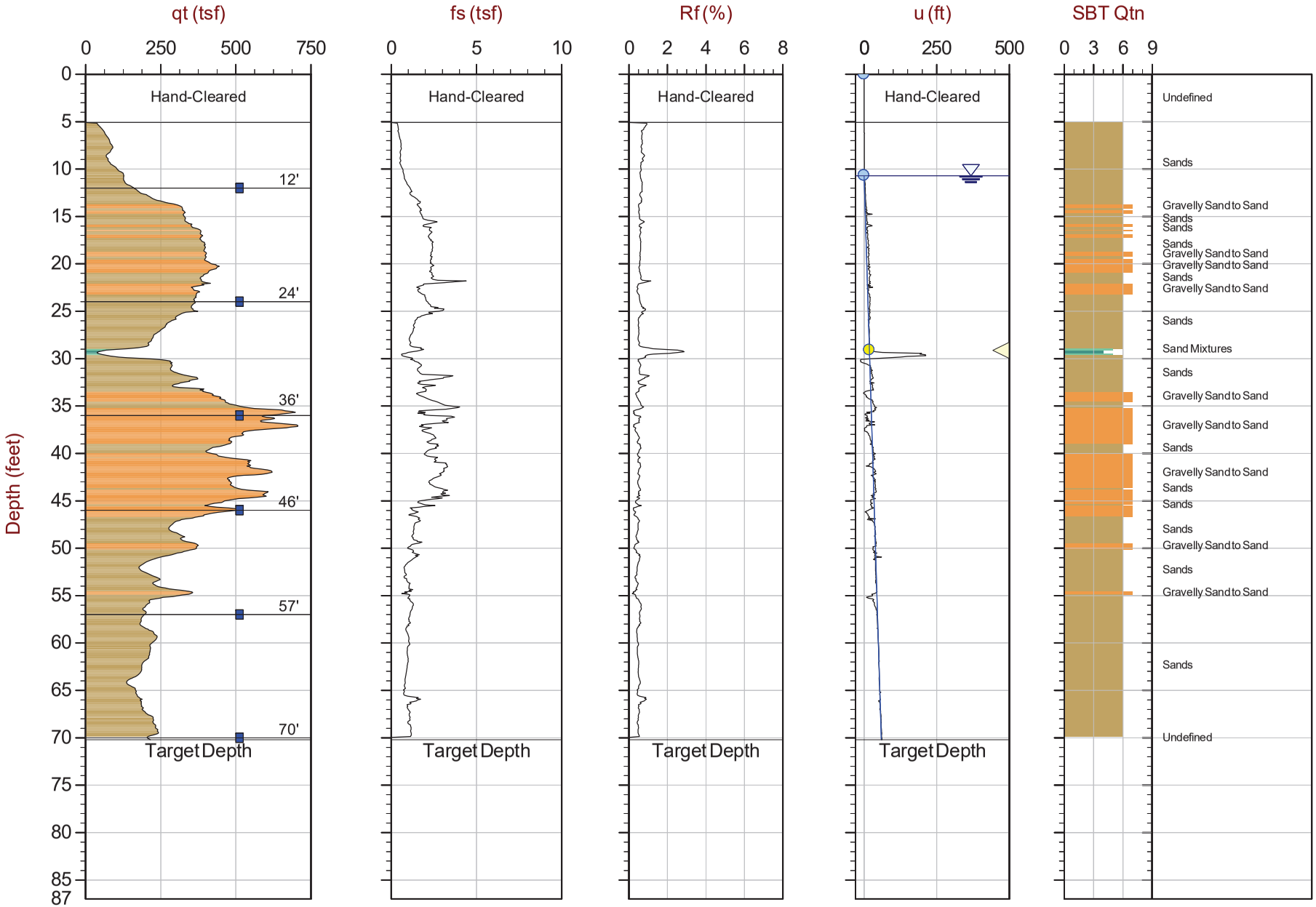
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-30.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75111 Long: -85.56988

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

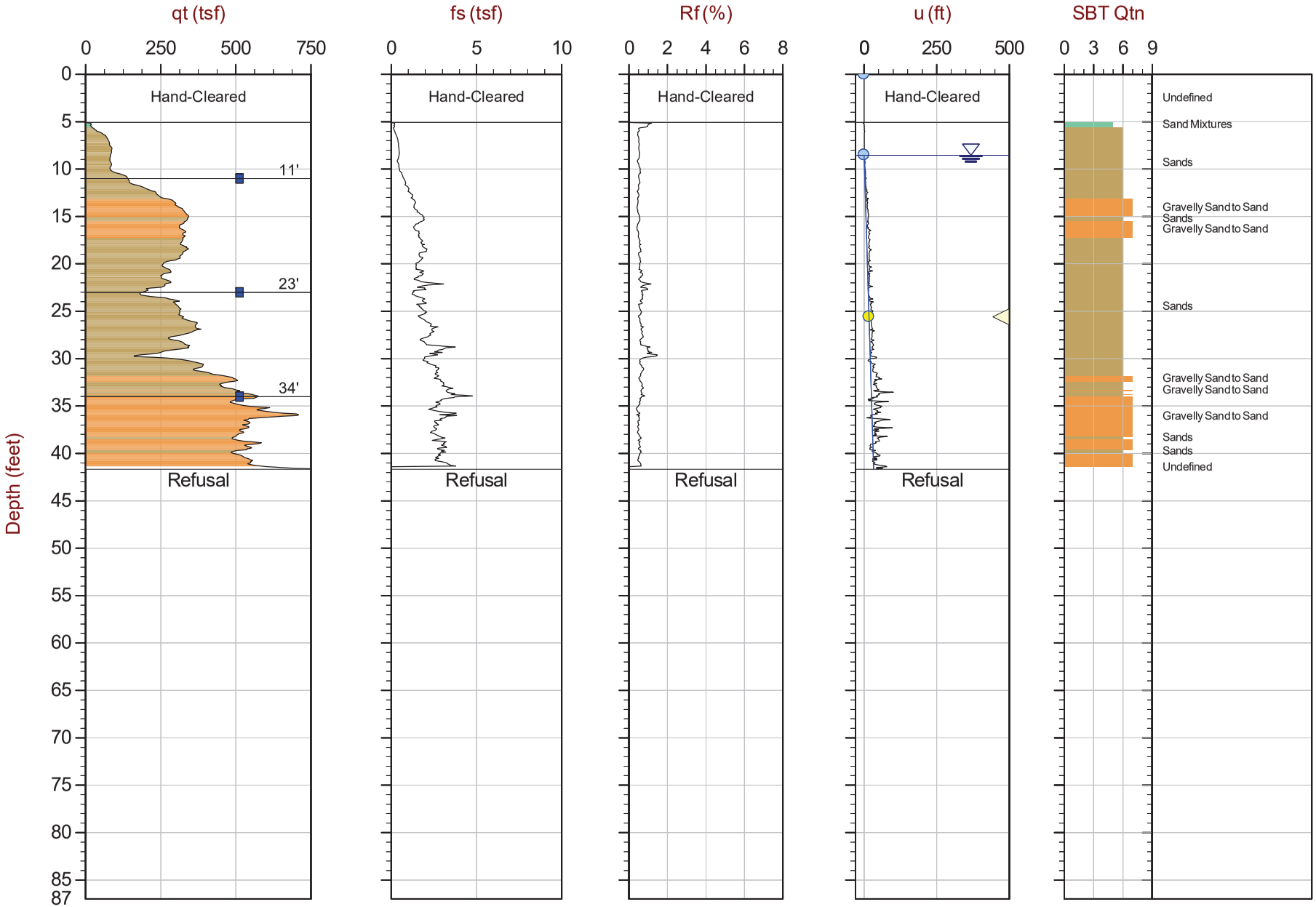
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35



Max Depth: 12.700 m / 41.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56858

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

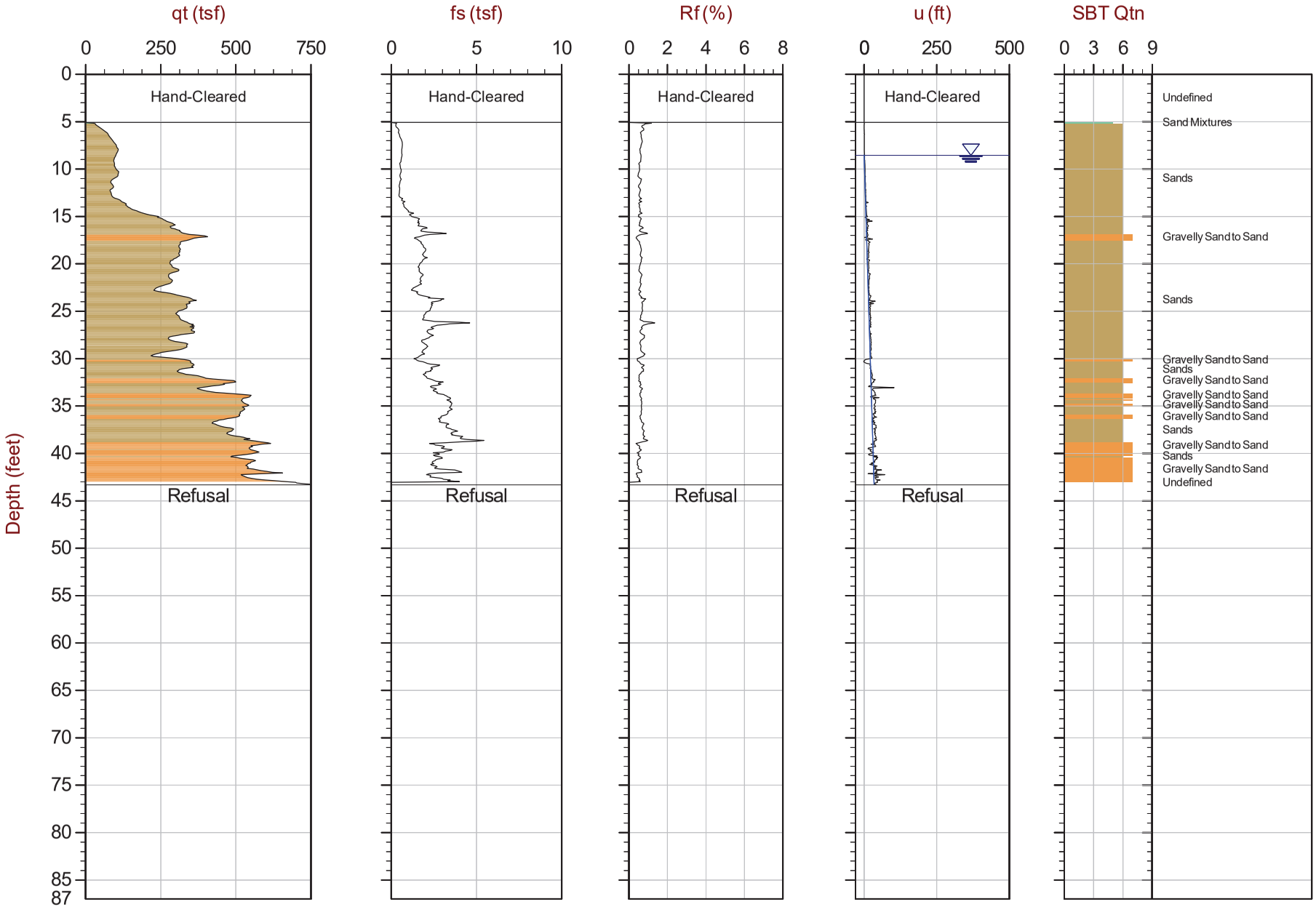
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35



Max Depth: 13.200 m / 43.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56861

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

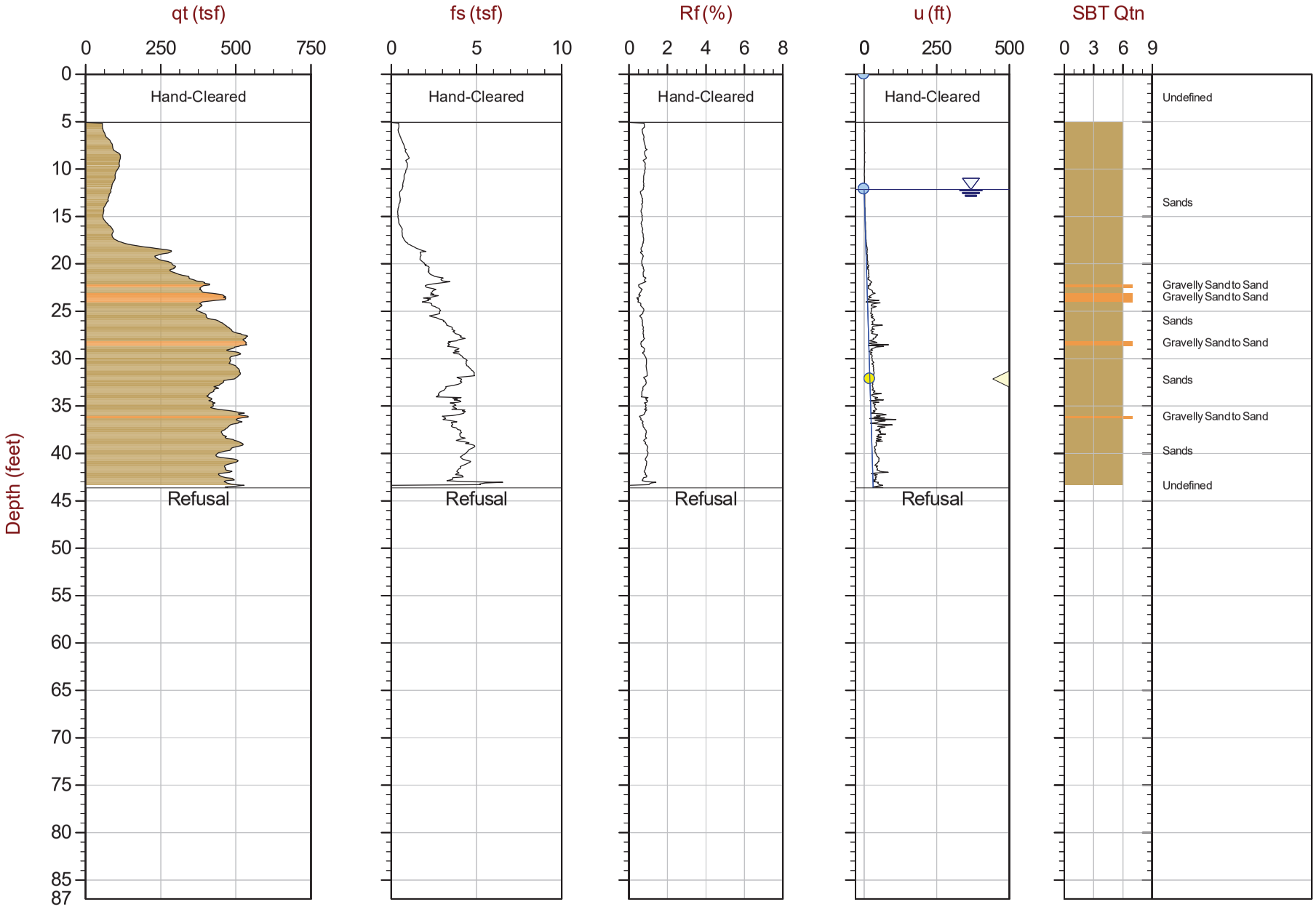
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35



Max Depth: 13.300 m / 43.63 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74509 Long: -85.57700

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

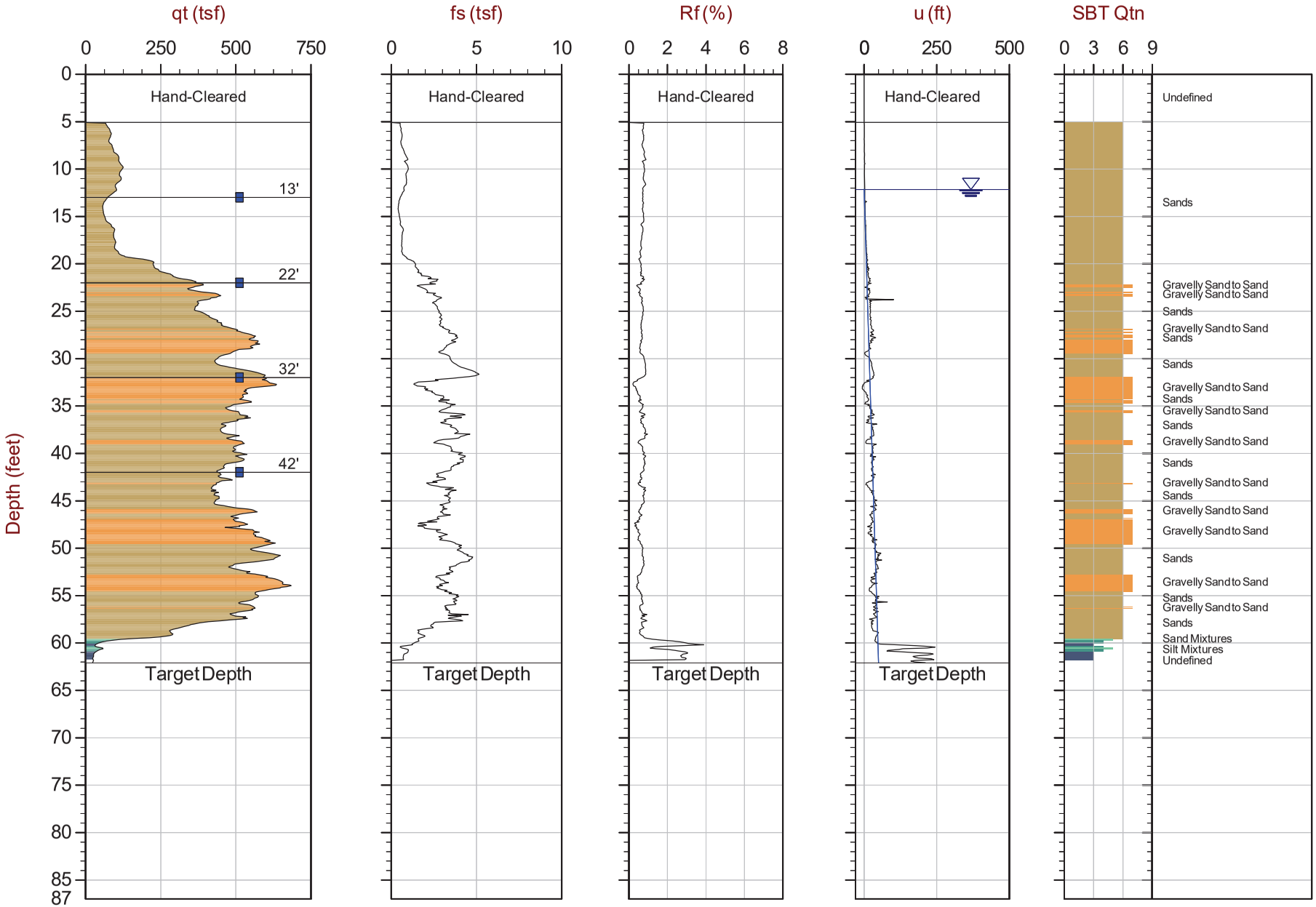
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35



Max Depth: 18.925 m / 62.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74510 Long: -85.57702

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

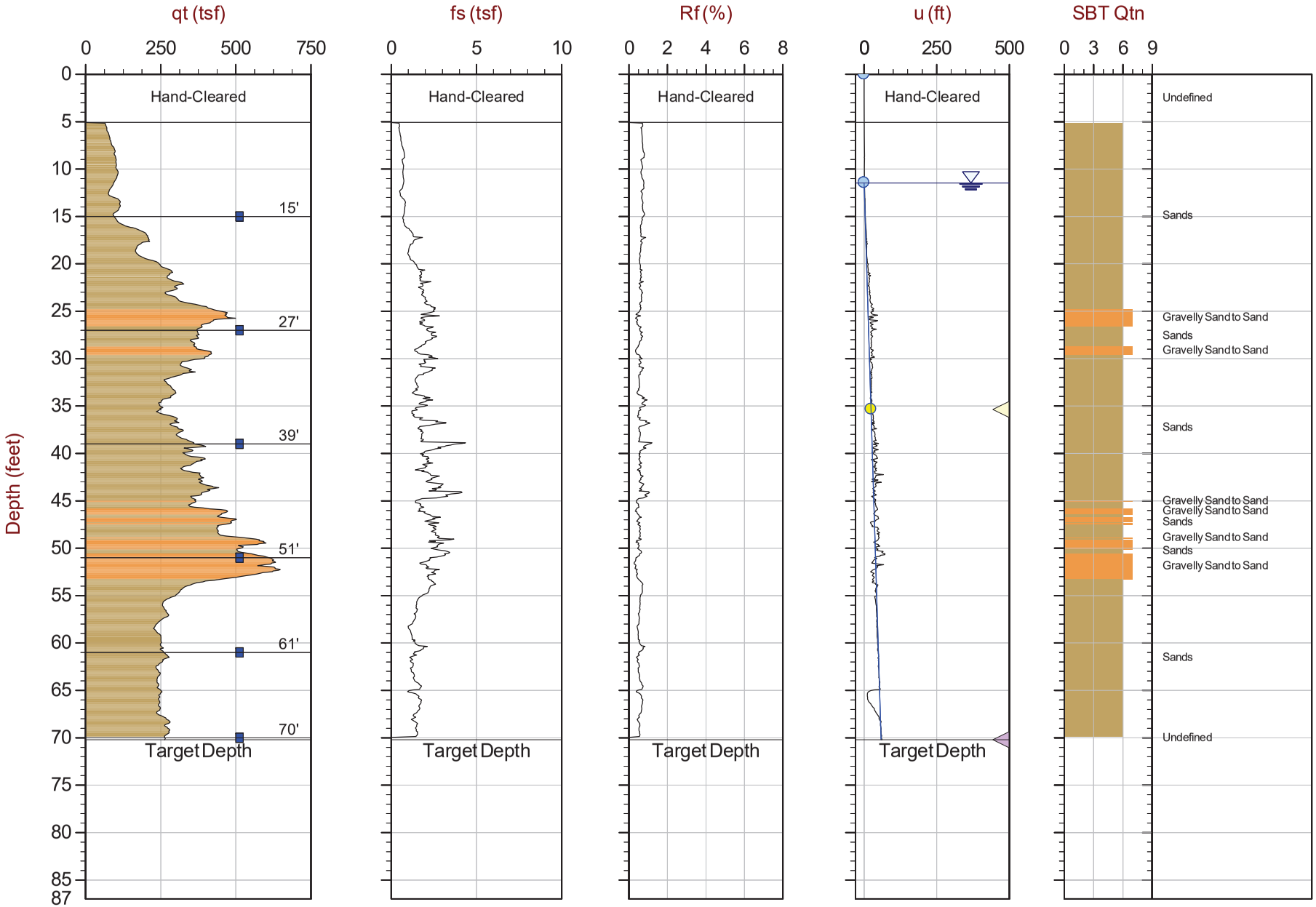
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-33.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74494 Long: -85.57582

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

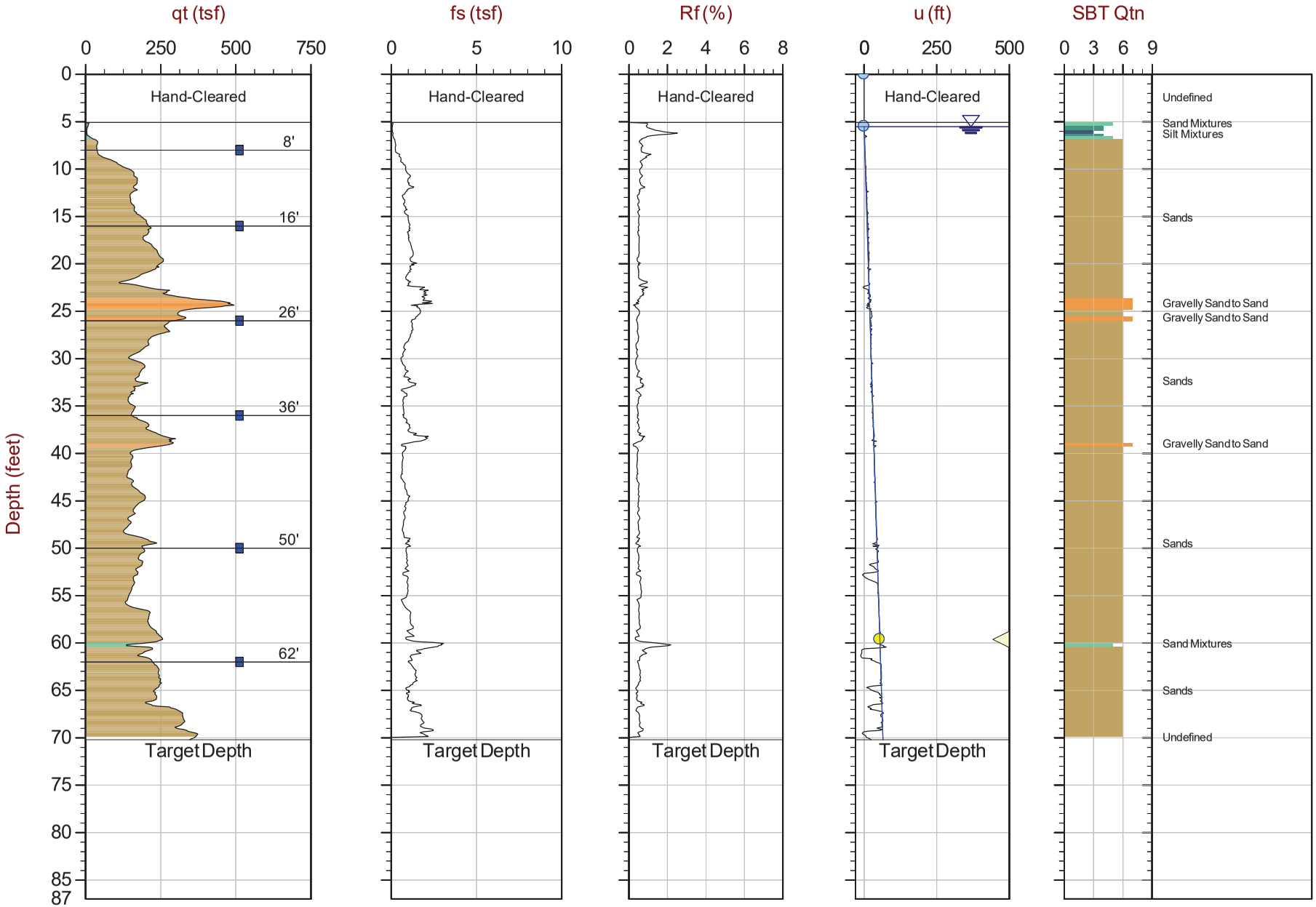
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-34.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75340 Long: -85.56972

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

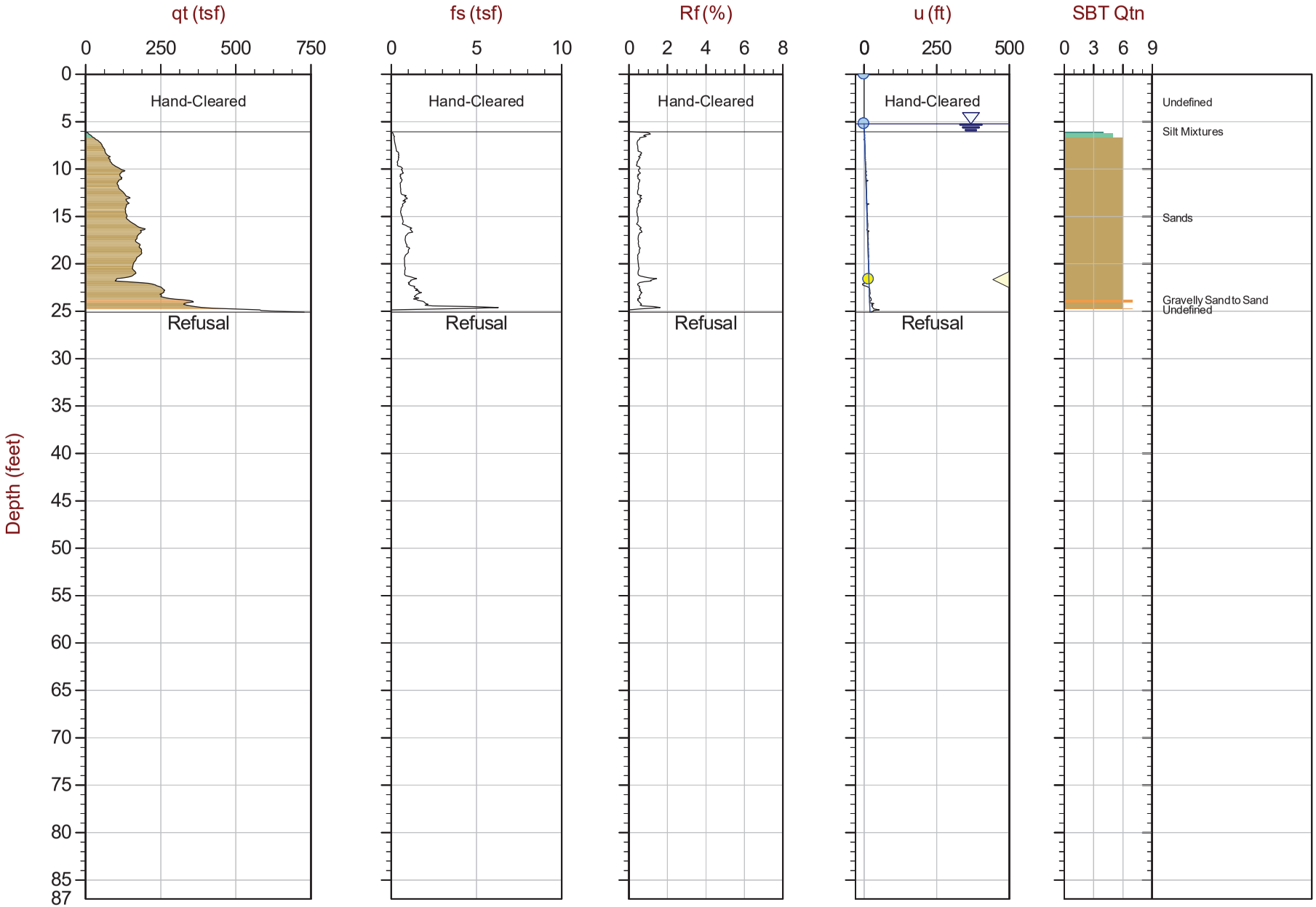
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35



Max Depth: 7.650 m / 25.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75293 Long: -85.56897

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

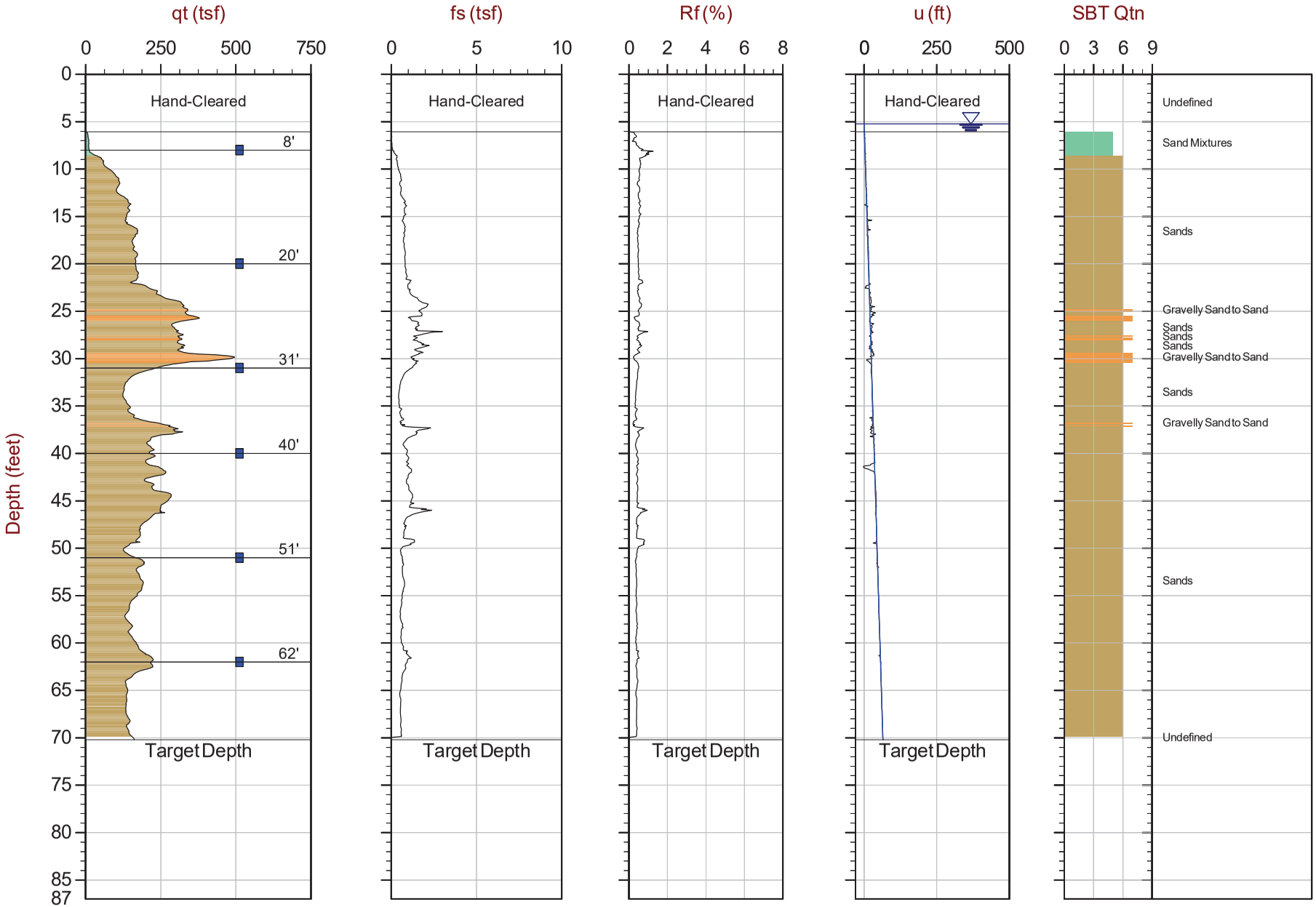
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75295 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

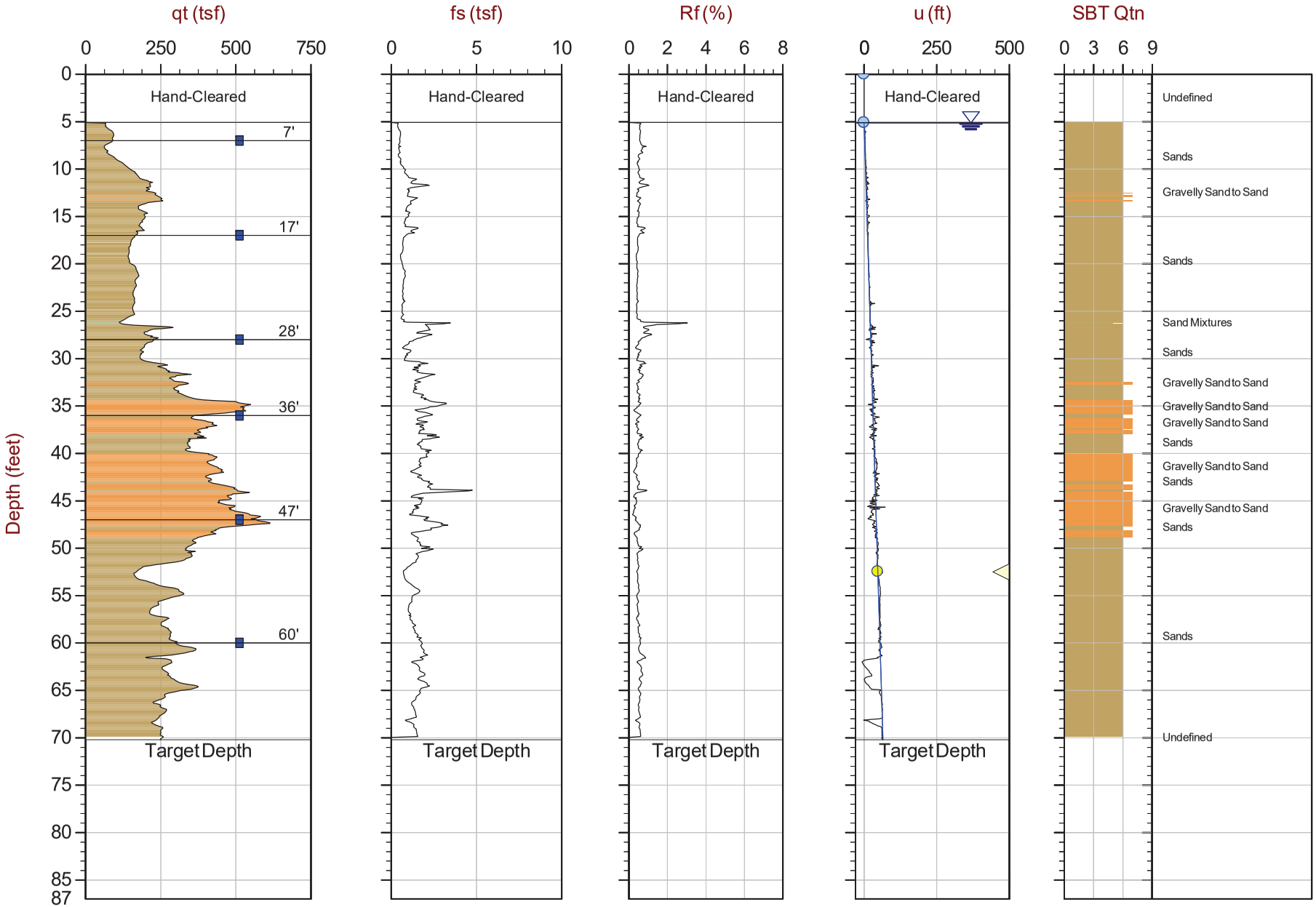
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-36.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75299 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

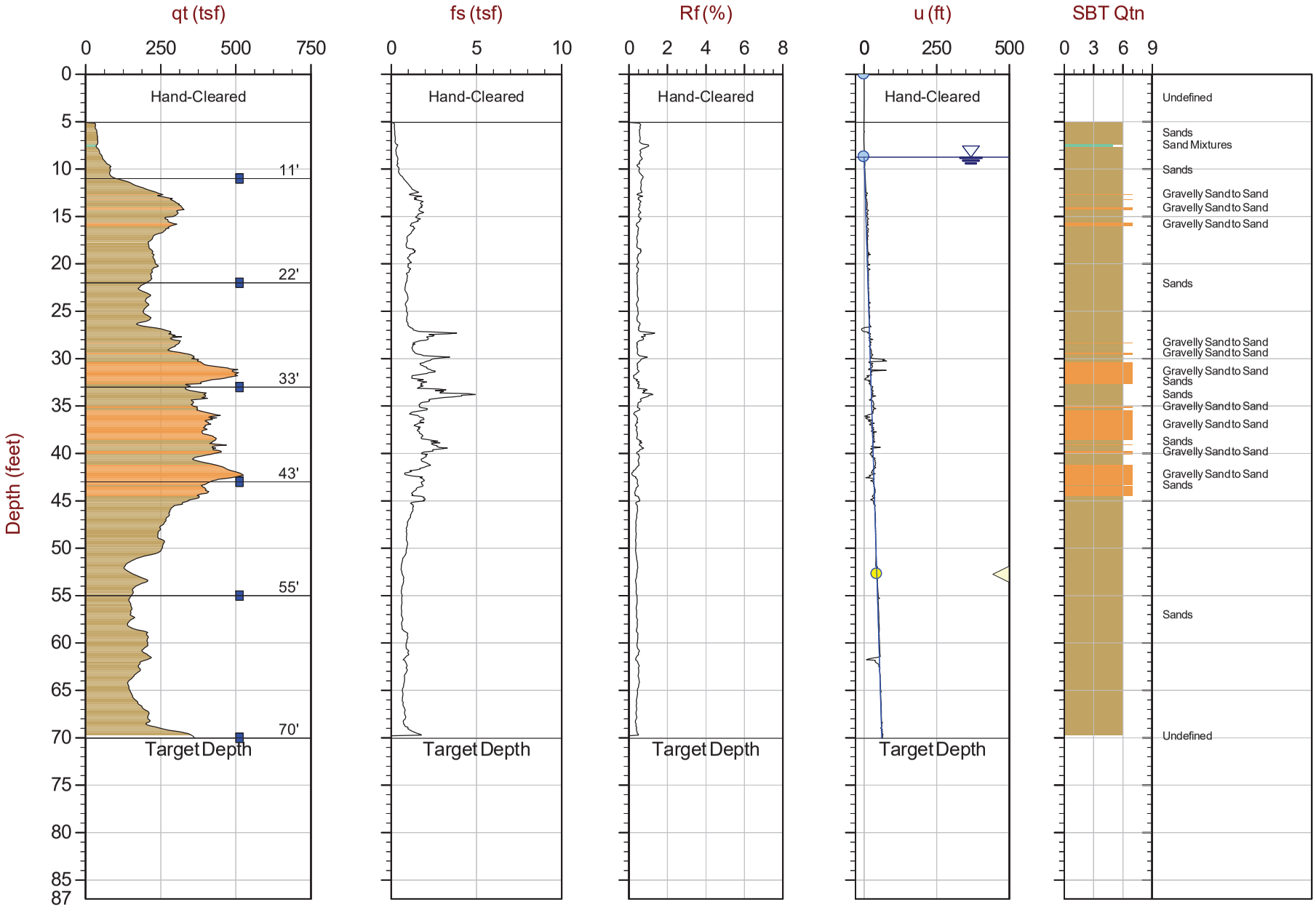
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-37.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75194 Long: -85.56863

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

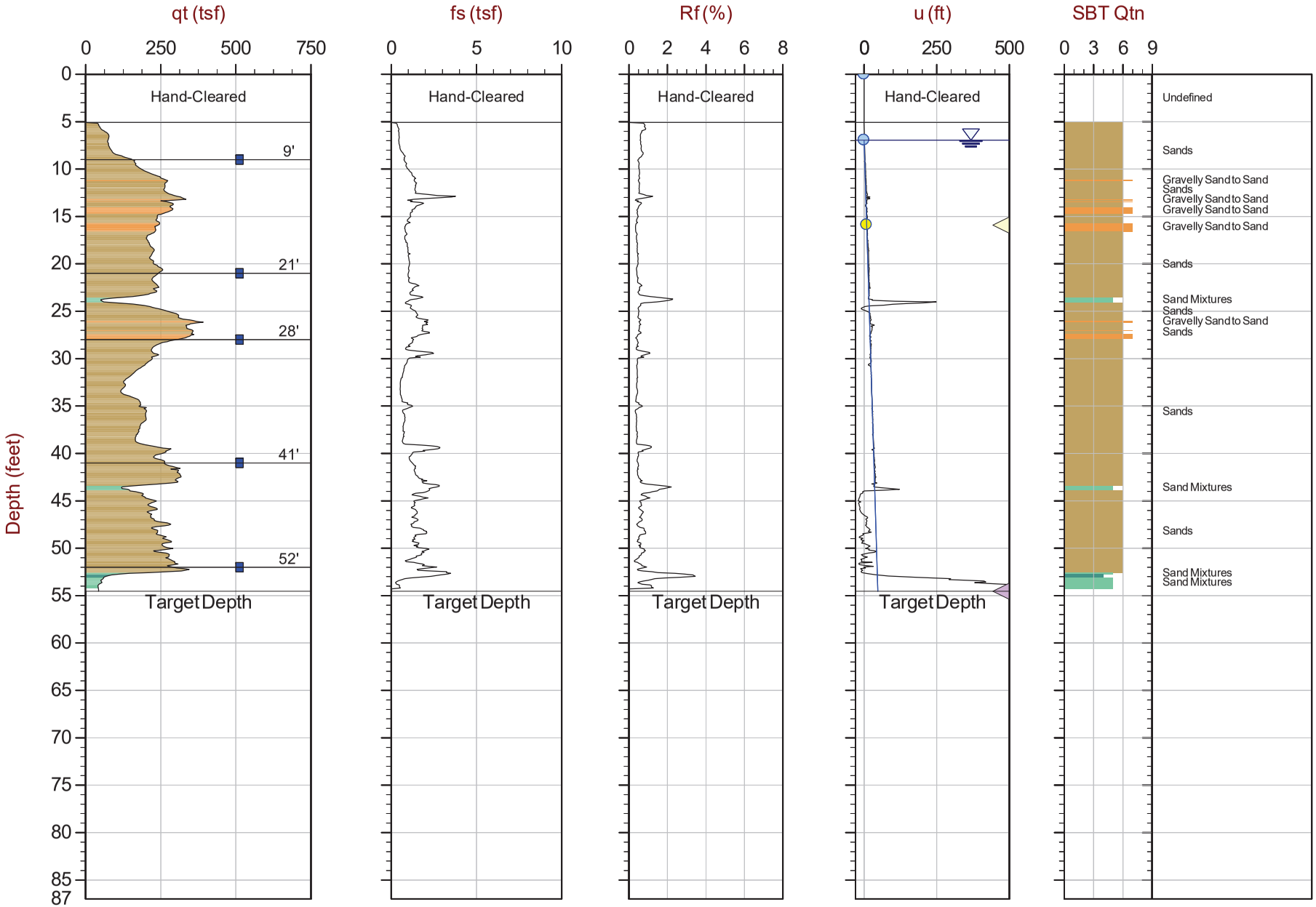
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35



Max Depth: 16.625 m / 54.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-38.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75358 Long: -85.57111

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

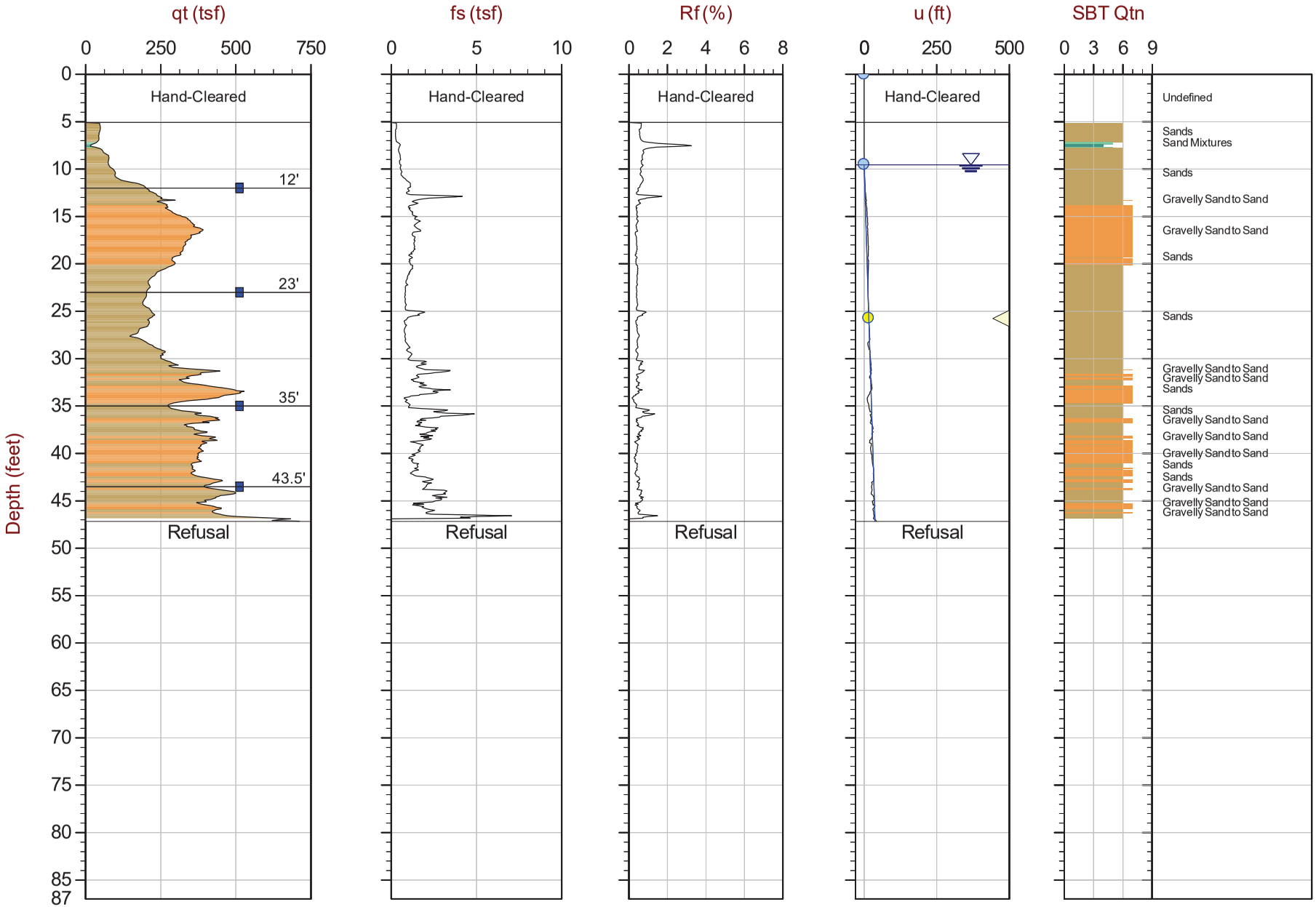
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35



Max Depth: 14.375 m / 47.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-39.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74976 Long: -85.56672

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Plots with Ic, Su(Nkt), Phi and N1(60)Ic

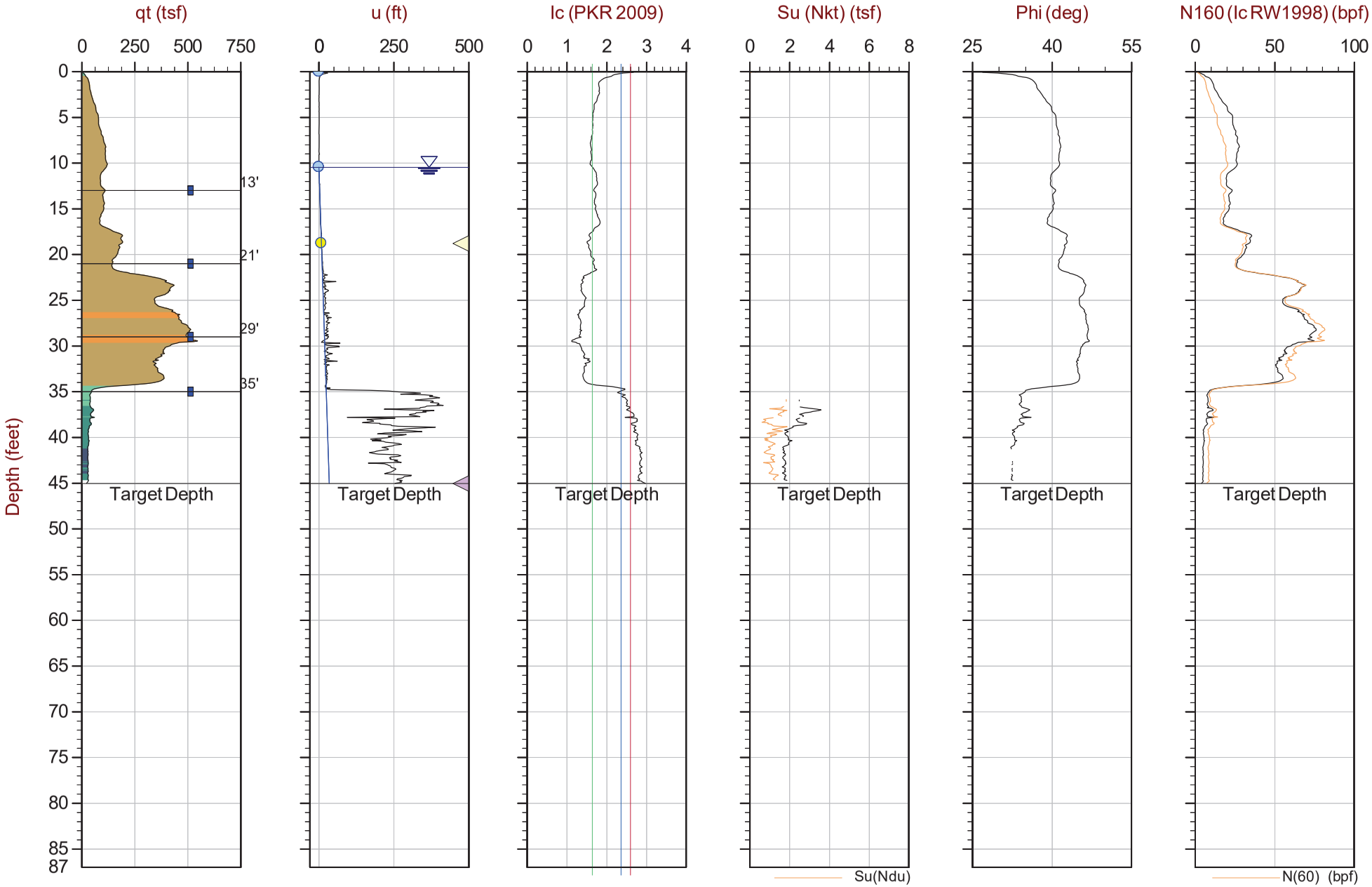
CONETEC

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35



Max Depth: 13.725 m / 45.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-13.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74852 Long: -85.57214

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

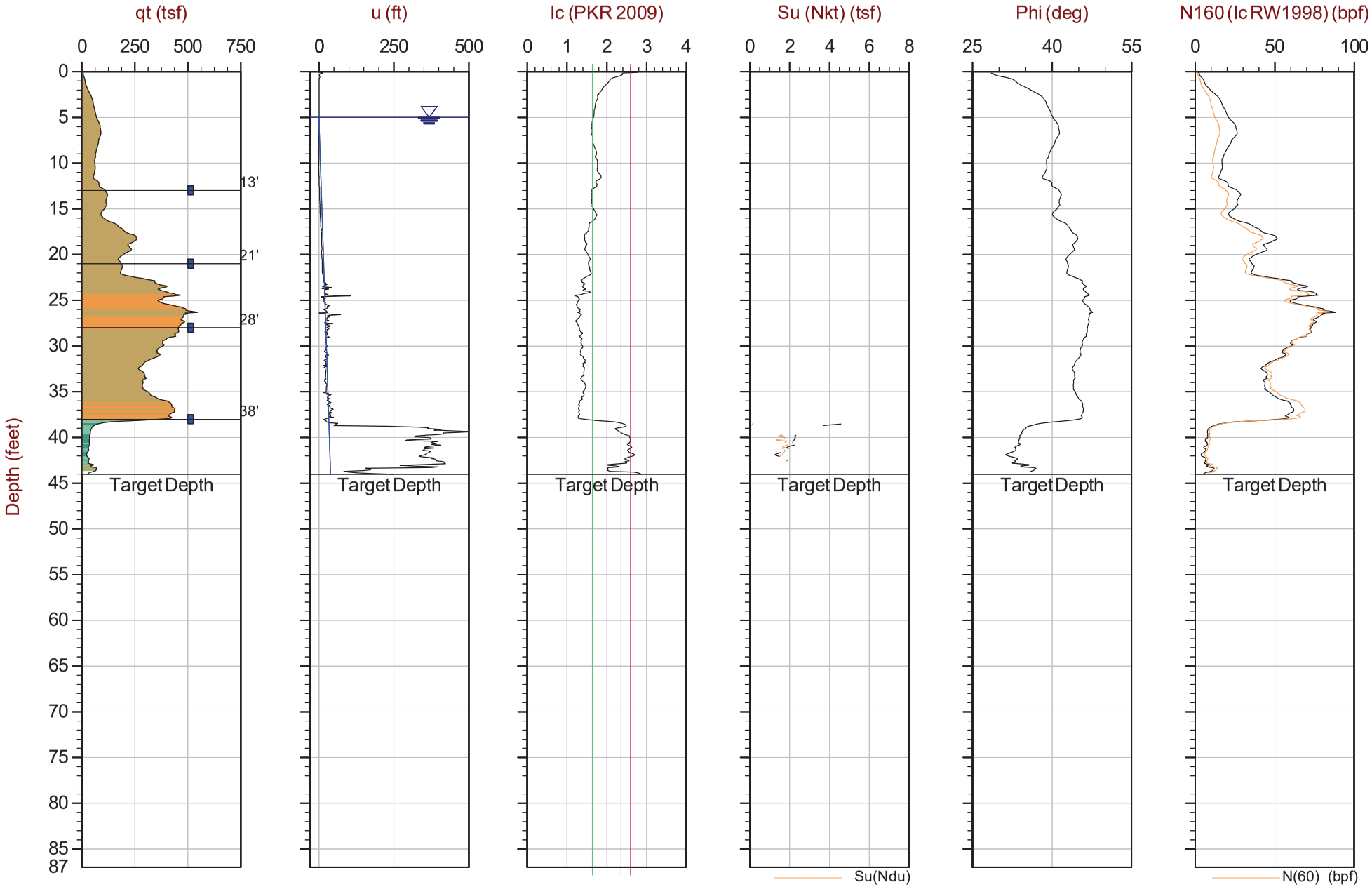
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35



Max Depth: 13.425 m / 44.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-14.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74842 Long: -85.57685

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

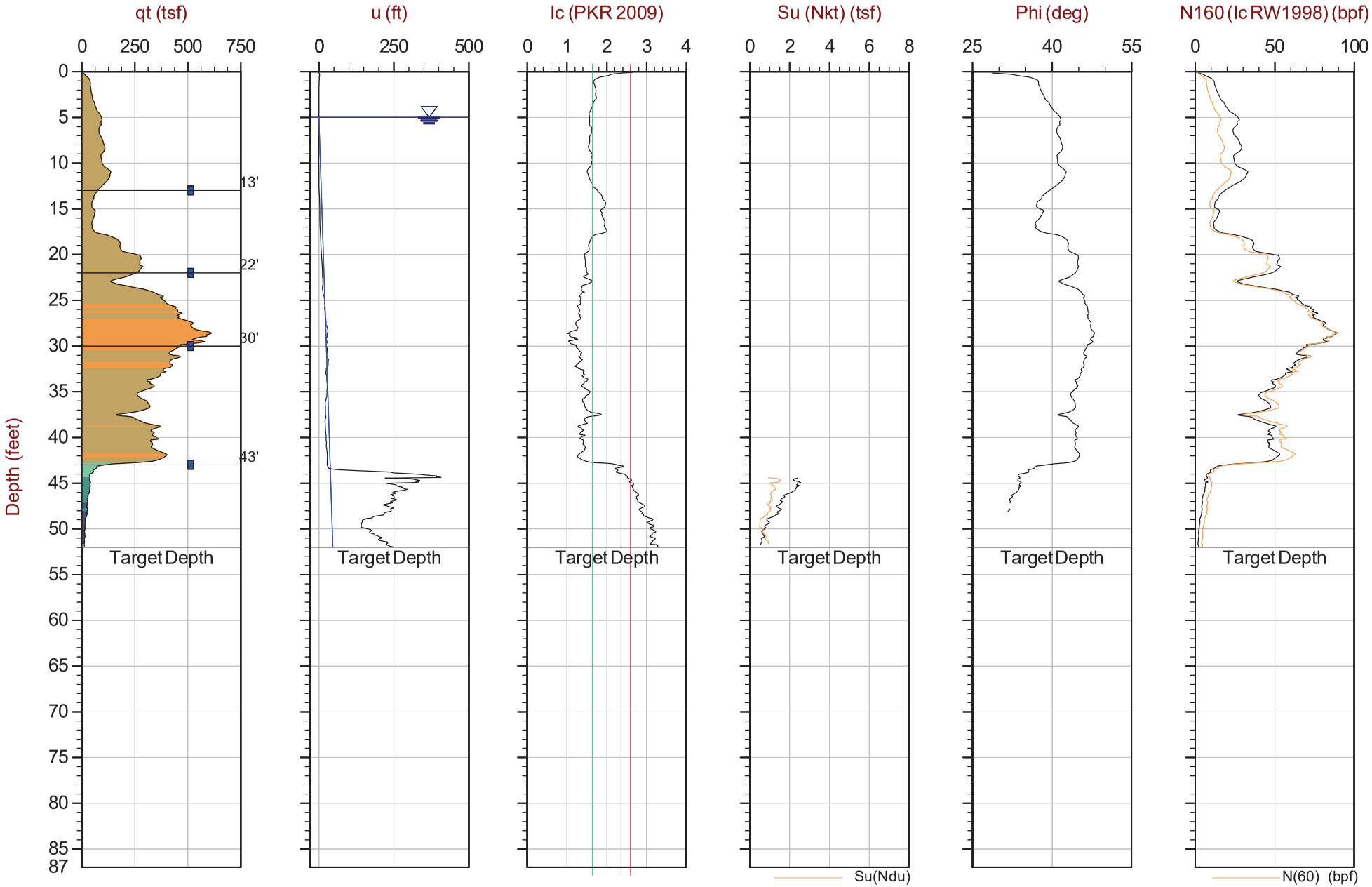
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35



Max Depth: 15.850 m / 52.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-15.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74830 Long: -85.57653

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

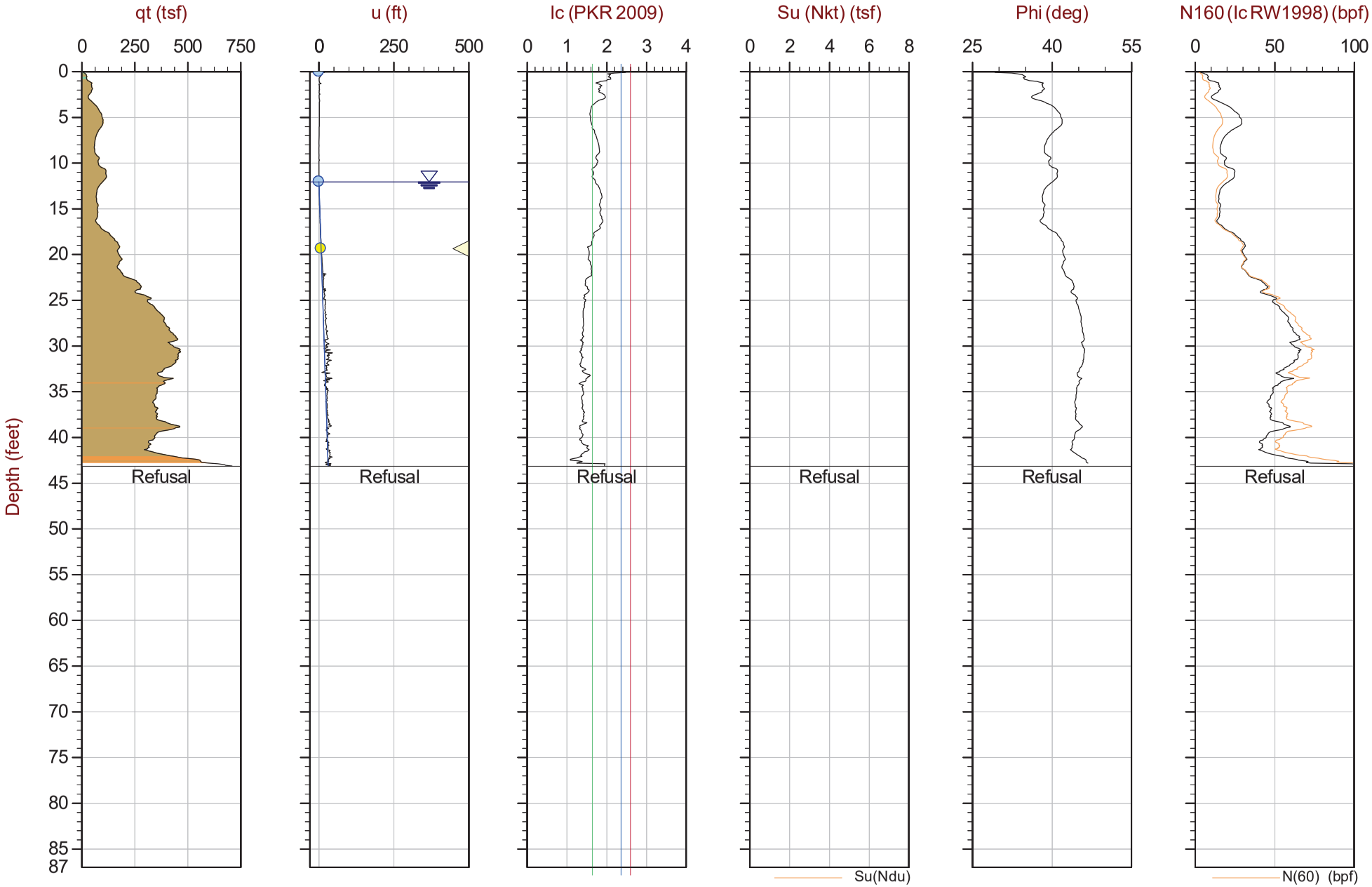
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35



Max Depth: 13.150 m / 43.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74801 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

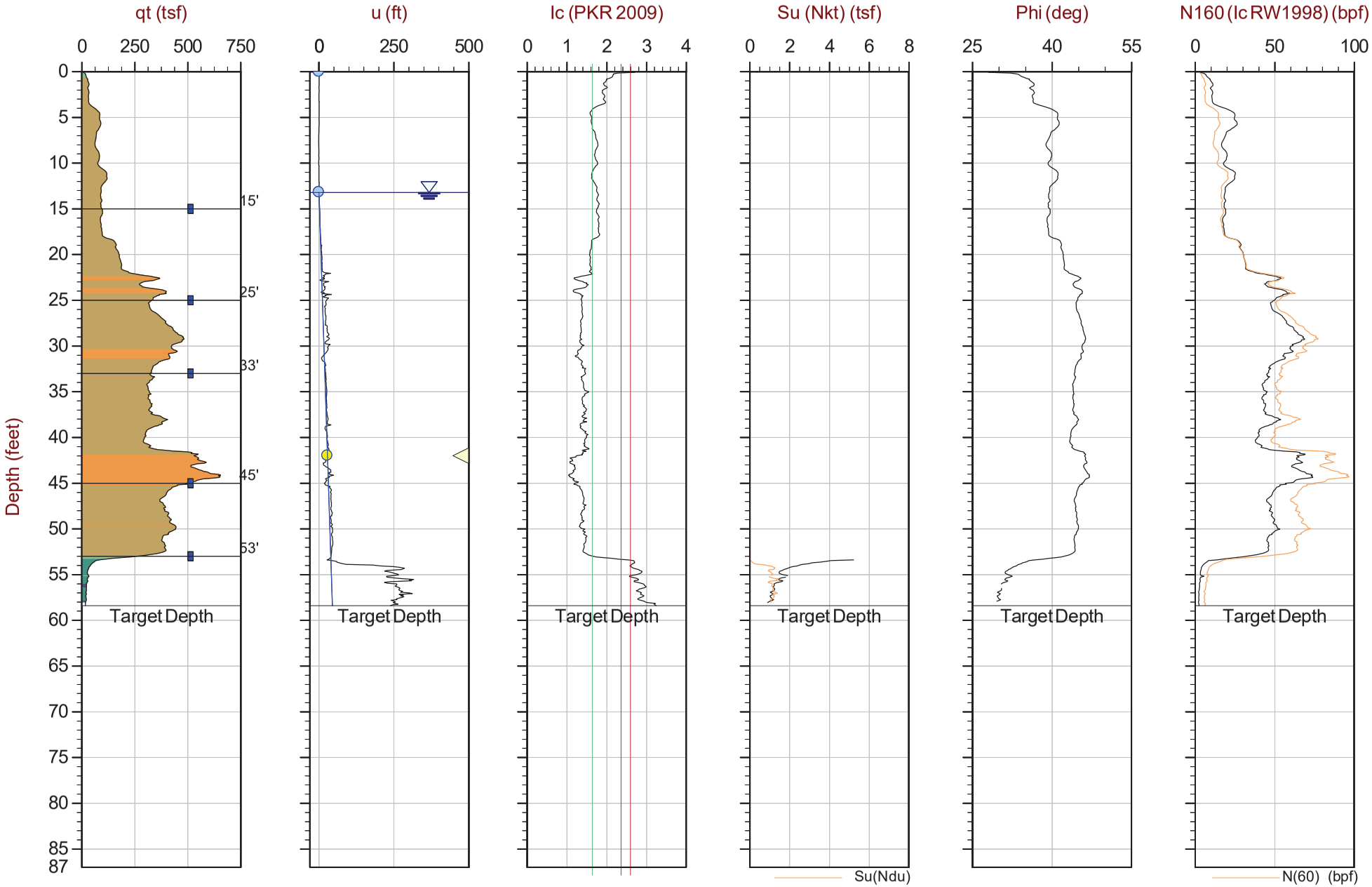
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35



Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74802 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

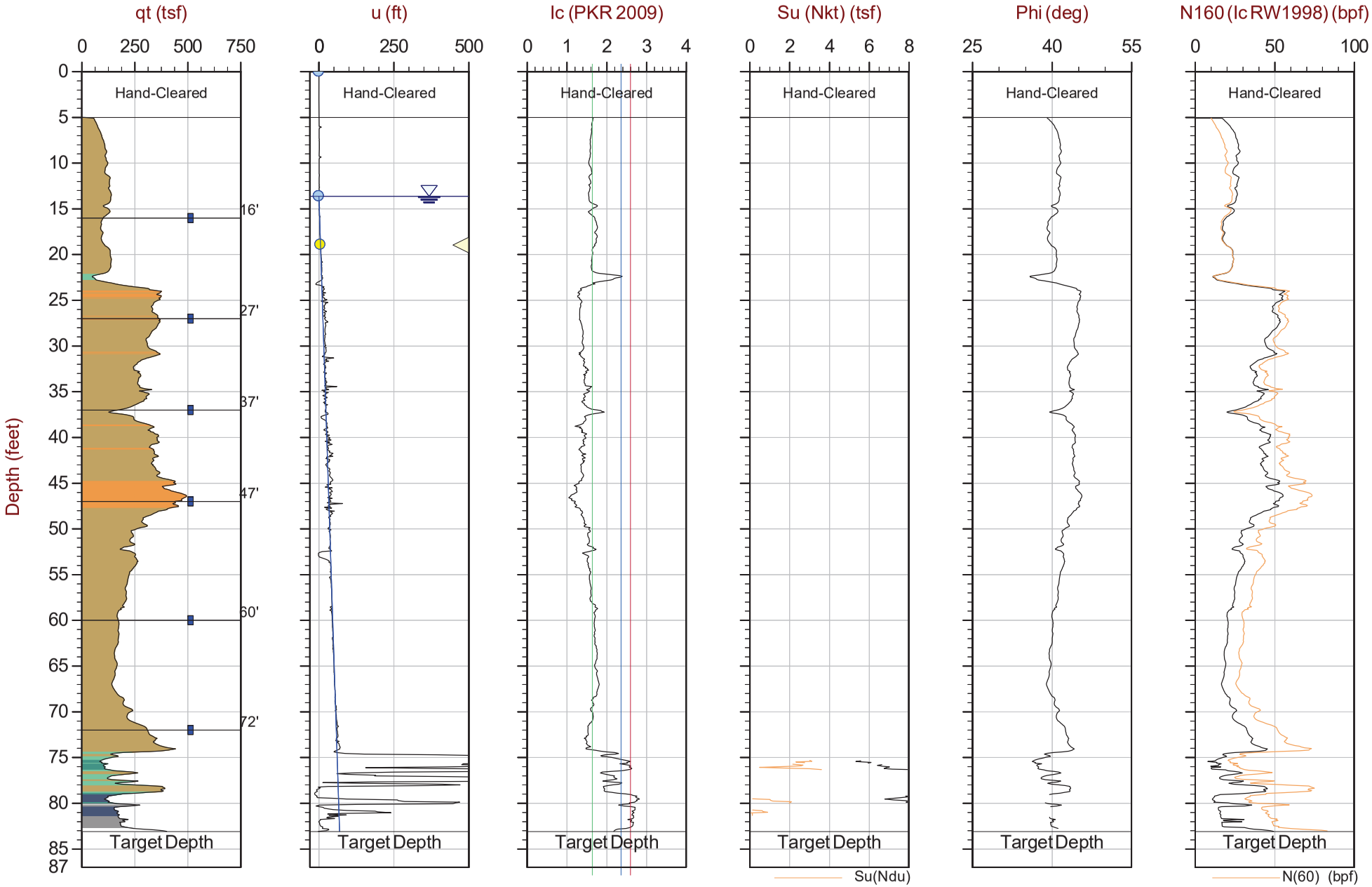
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35



Max Depth: 25.325 m / 83.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-17.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74769 Long: -85.57586

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

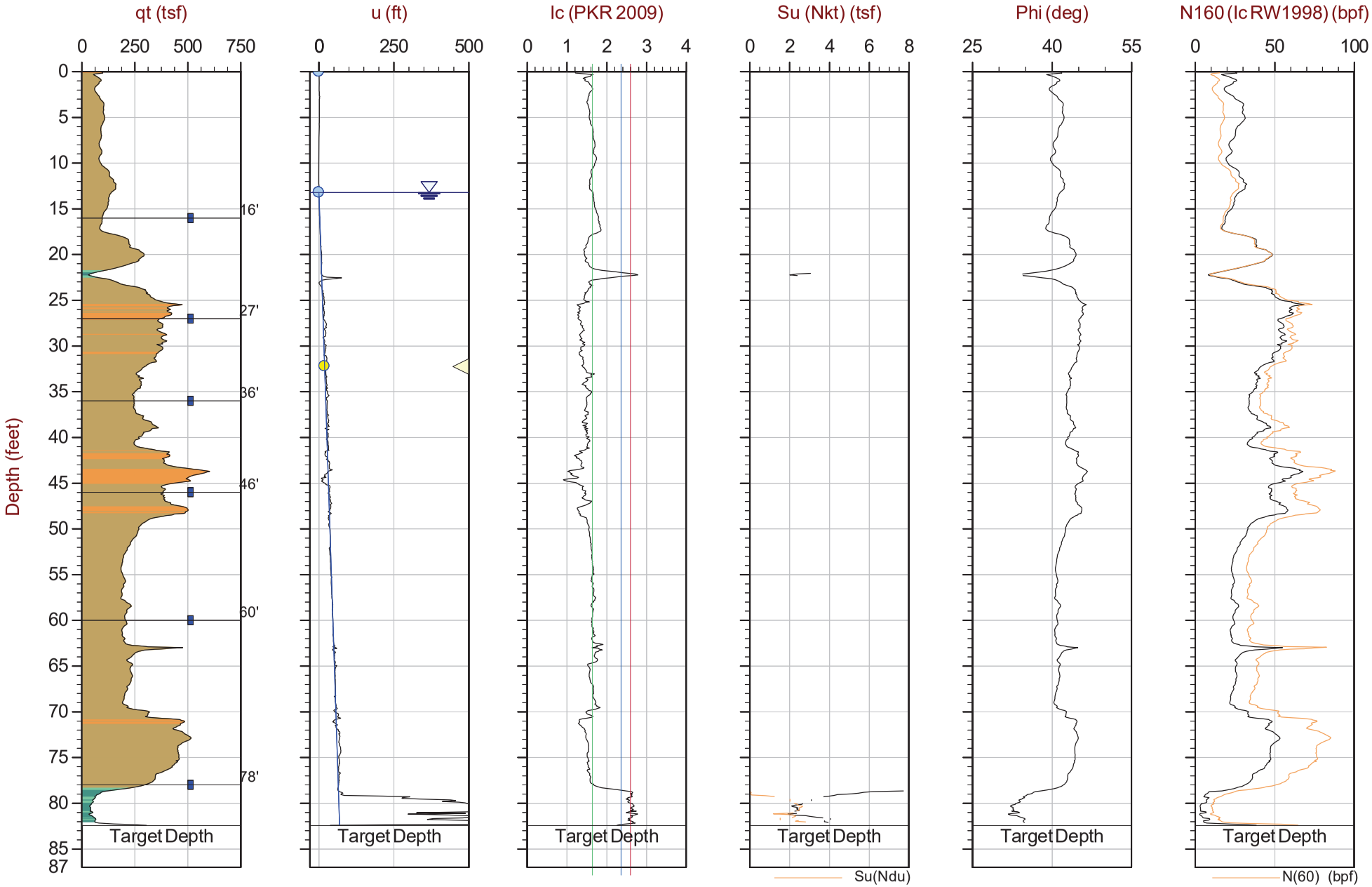
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35



Max Depth: 25.125 m / 82.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-18.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74735 Long: -85.57592

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

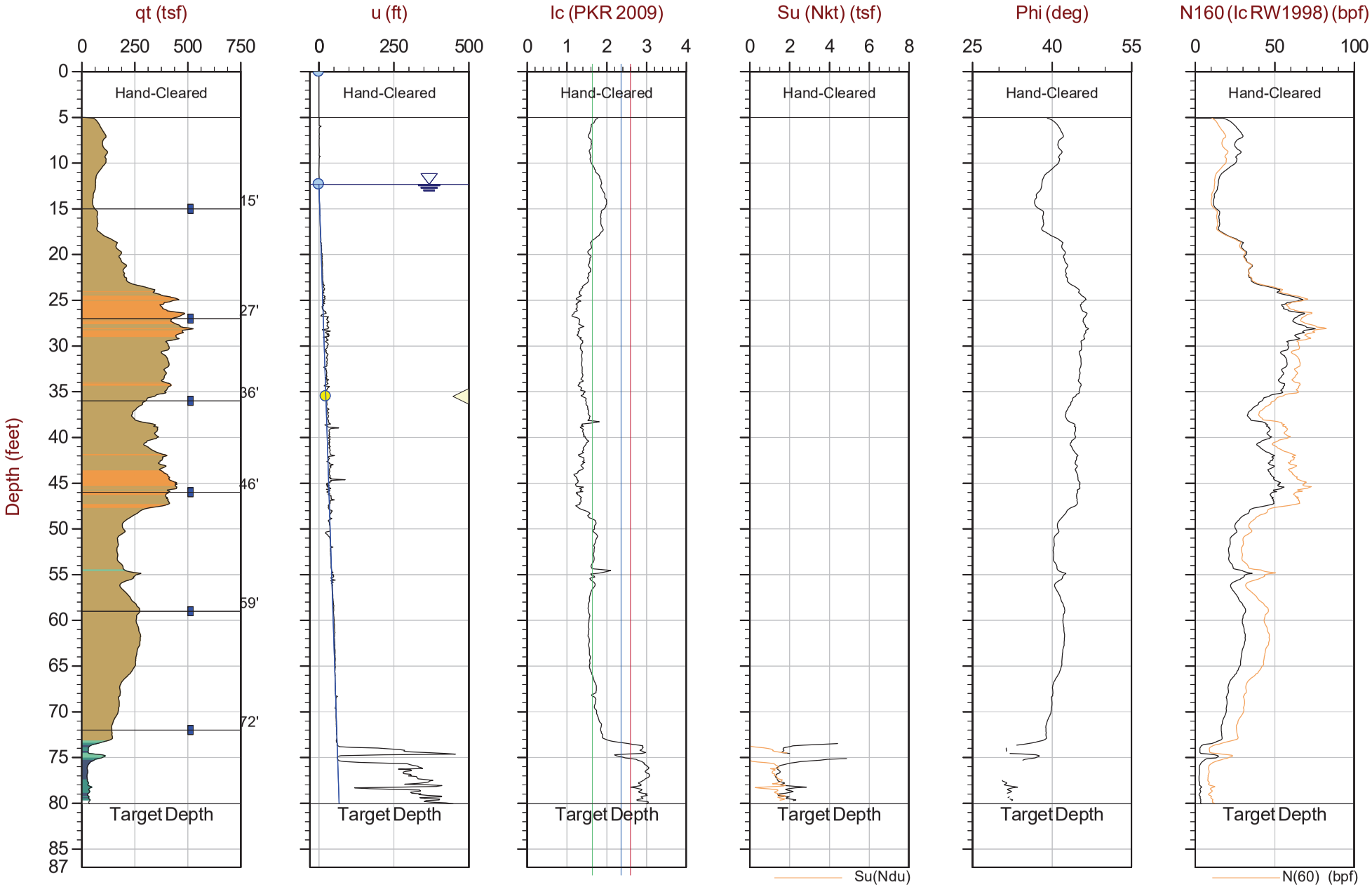
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35



Max Depth: 24.400 m / 80.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-19.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74705 Long: -85.57593

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

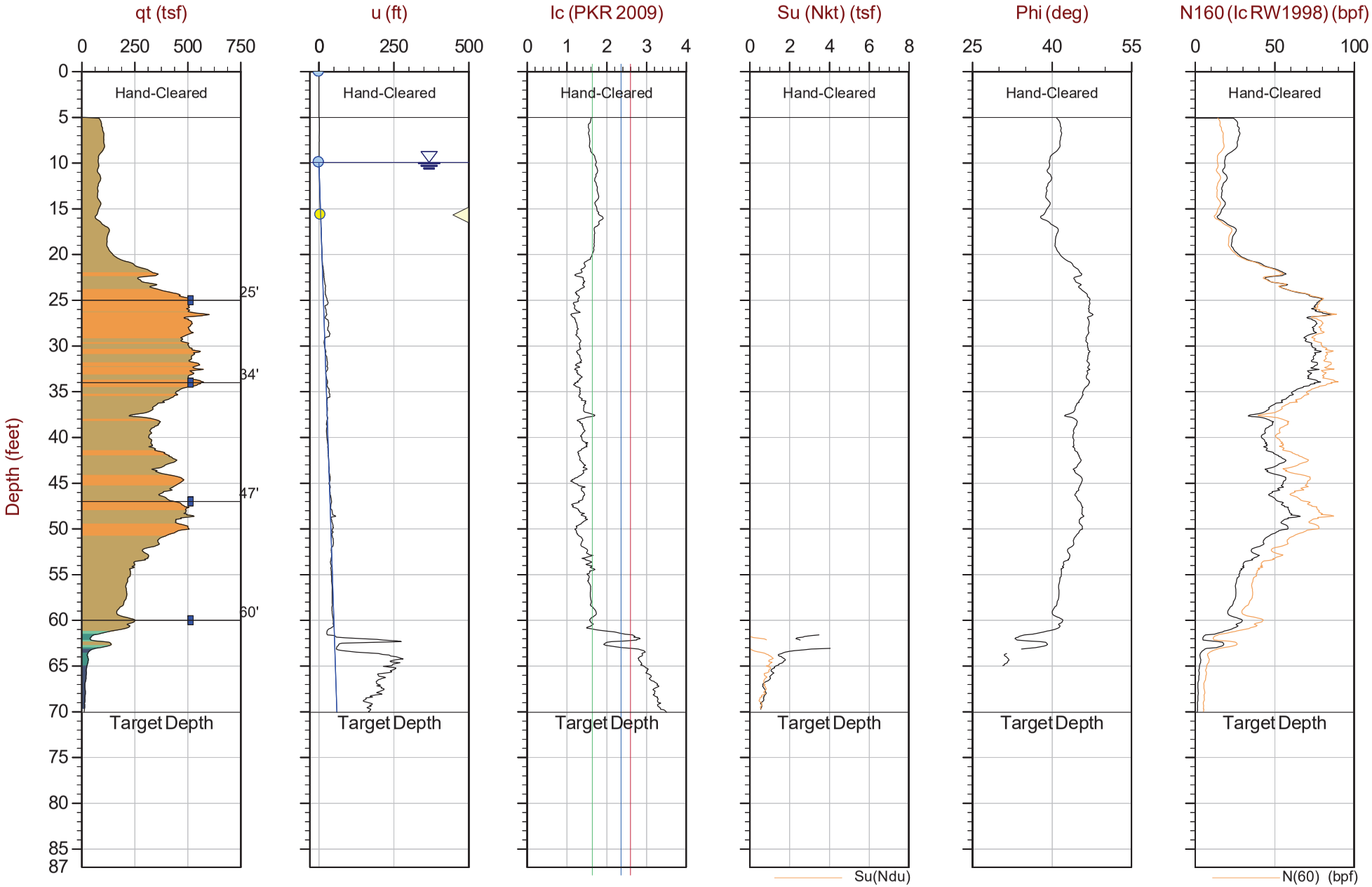
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-20.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74533 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

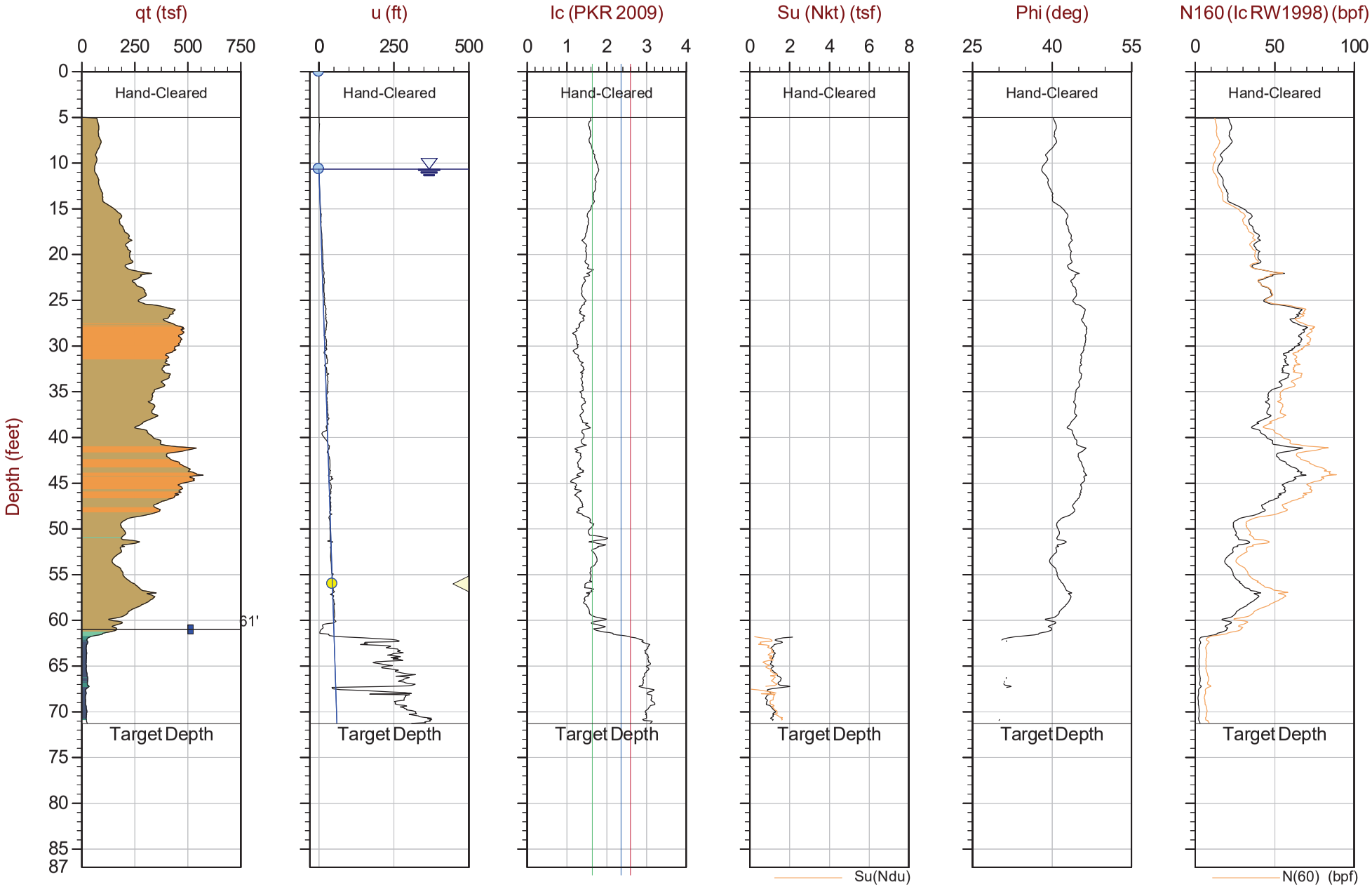
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35



Max Depth: 21.725 m / 71.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-21.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74594 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

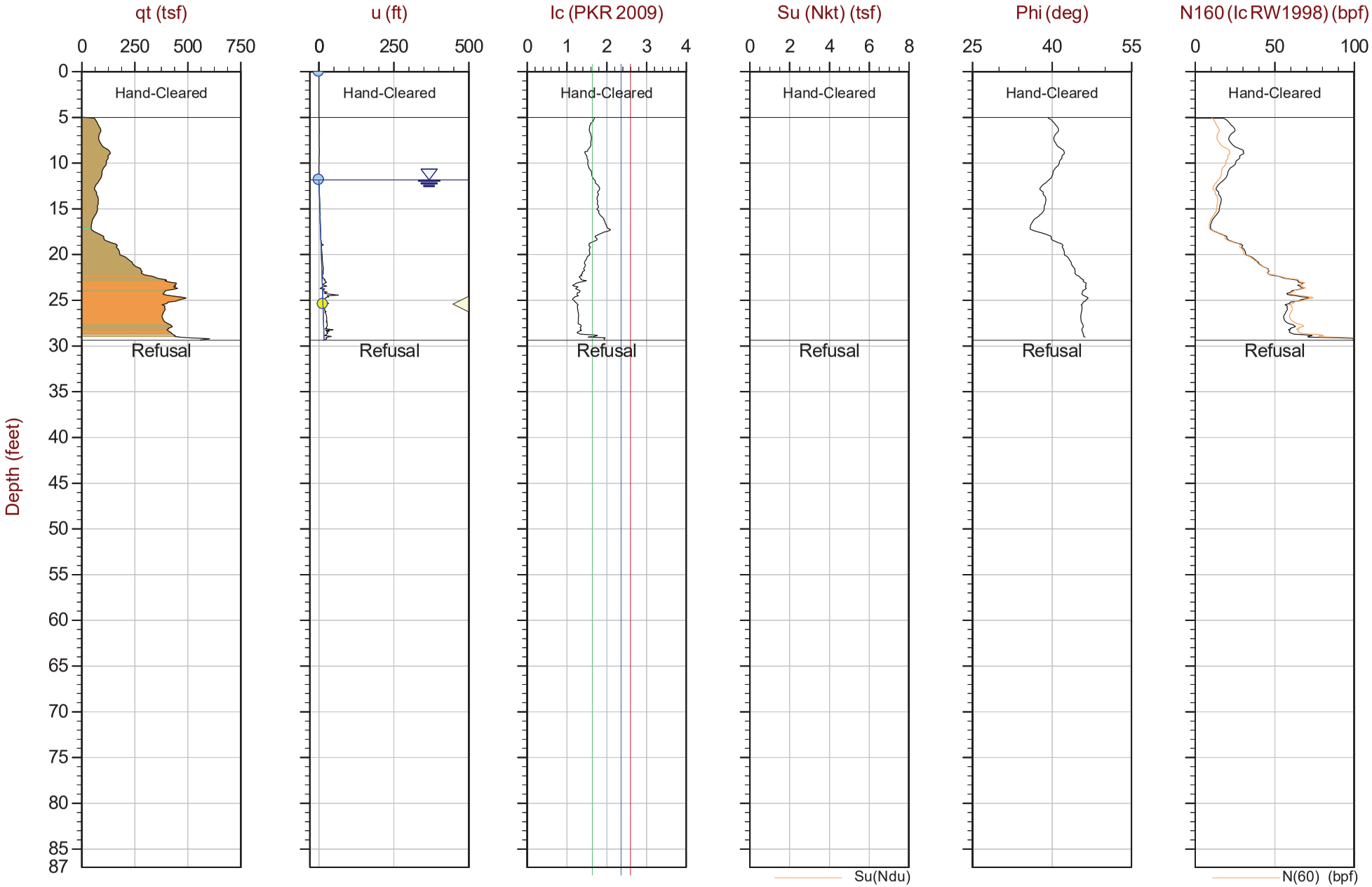
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35



Max Depth: 8.950 m / 29.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

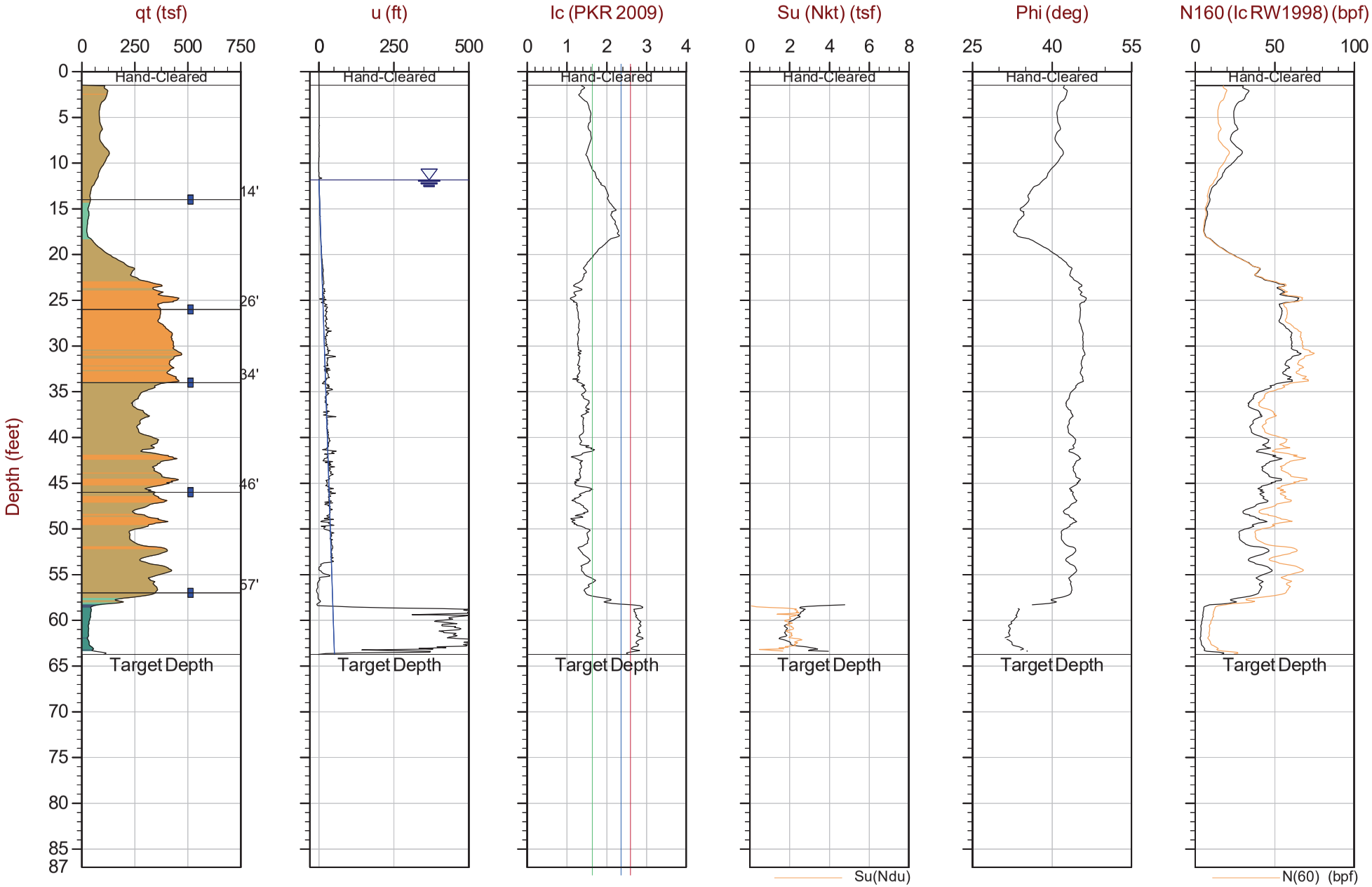
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35



Max Depth: 19.425 m / 63.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

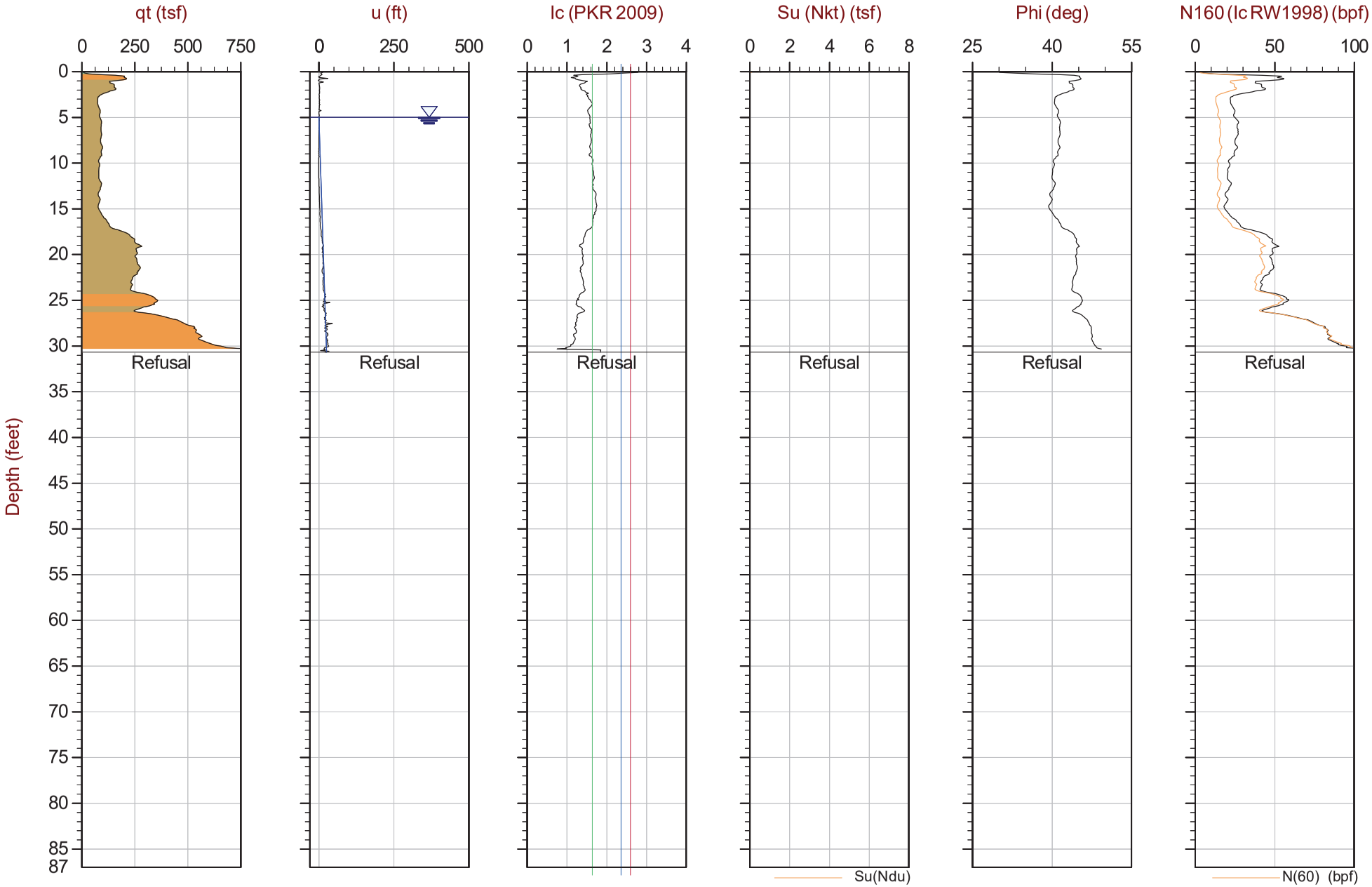
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35



Max Depth: 9.350 m / 30.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57849

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

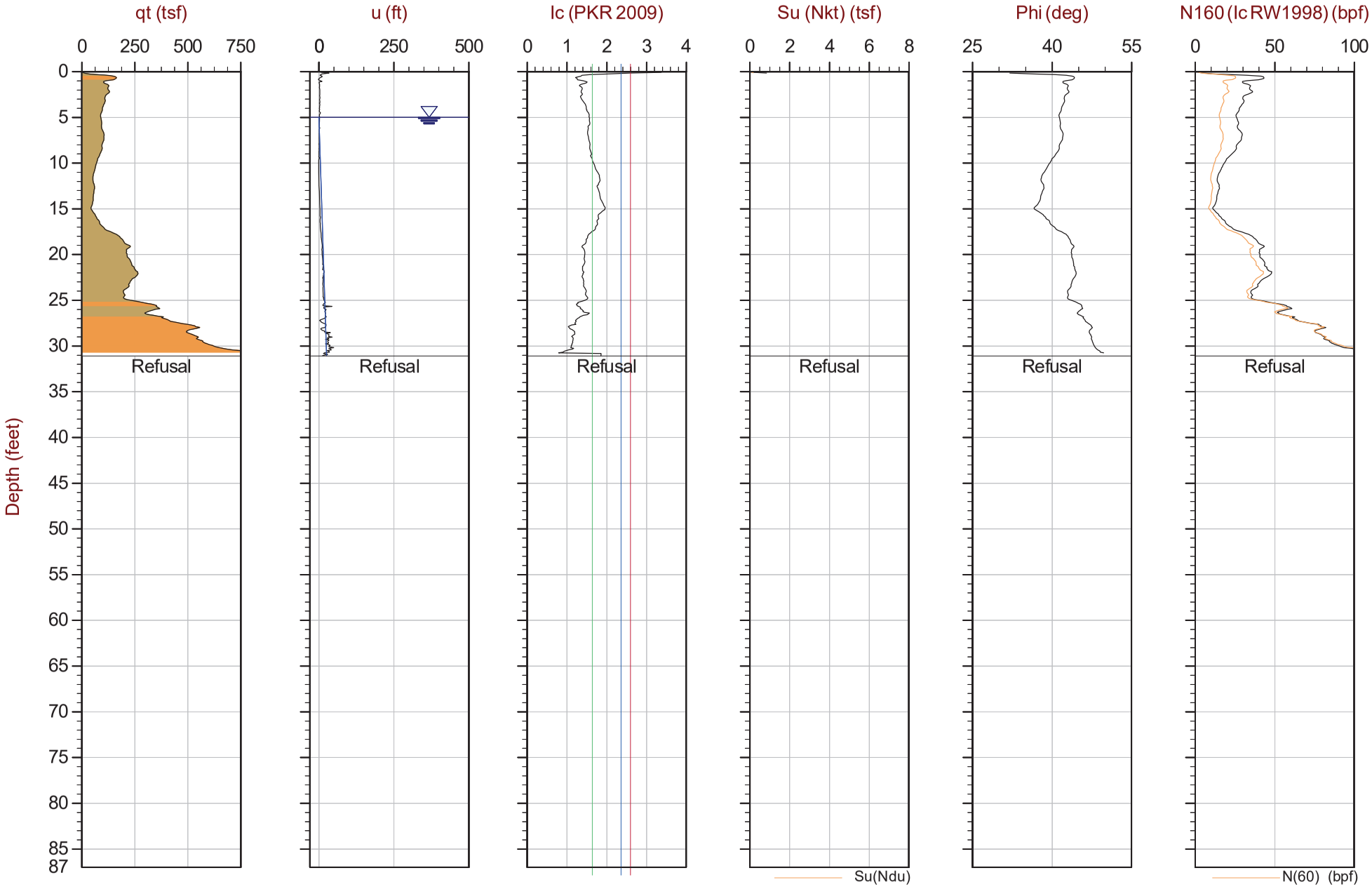
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57848

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

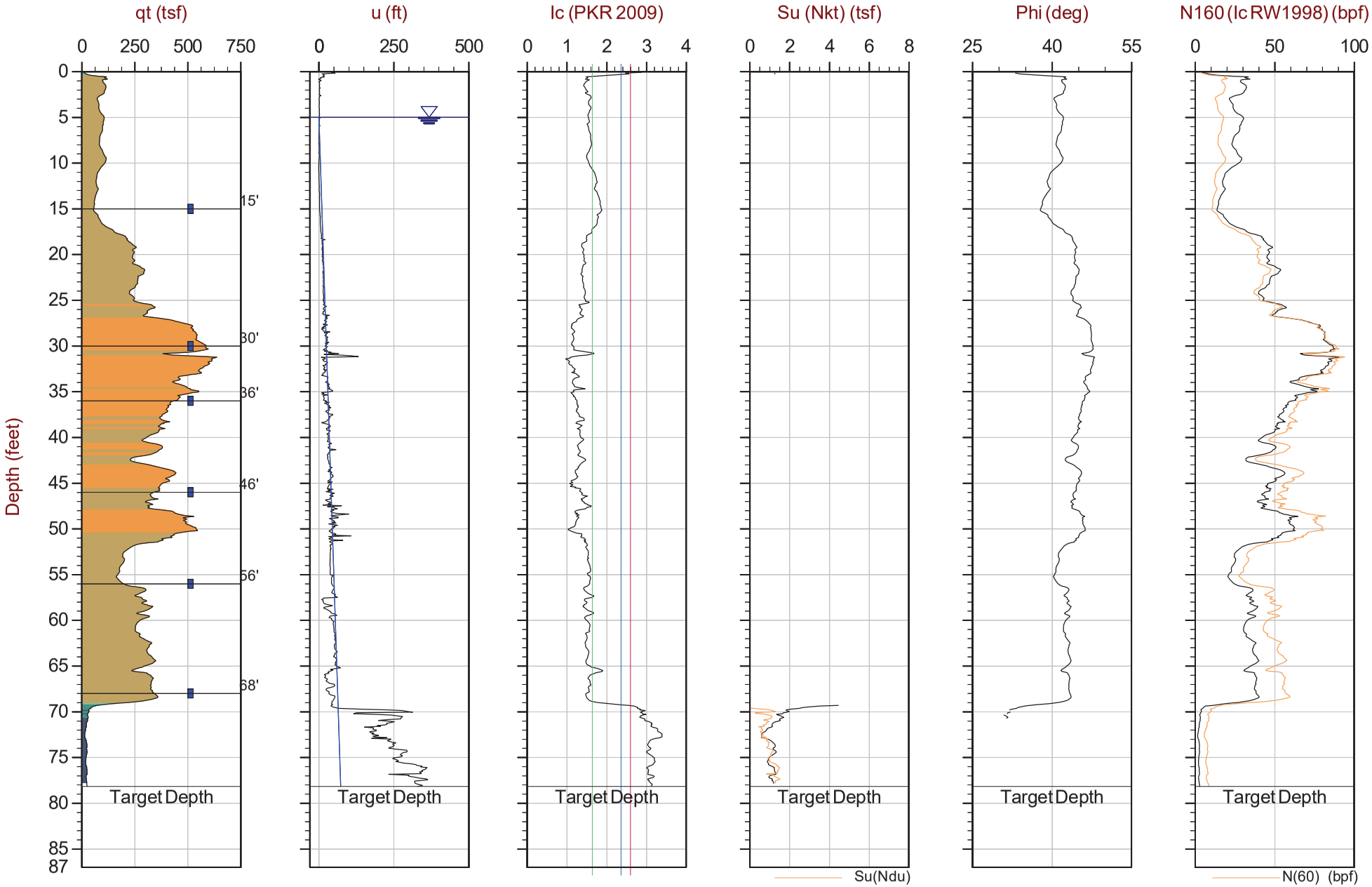
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35



Max Depth: 23.825 m / 78.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23B.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57845

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

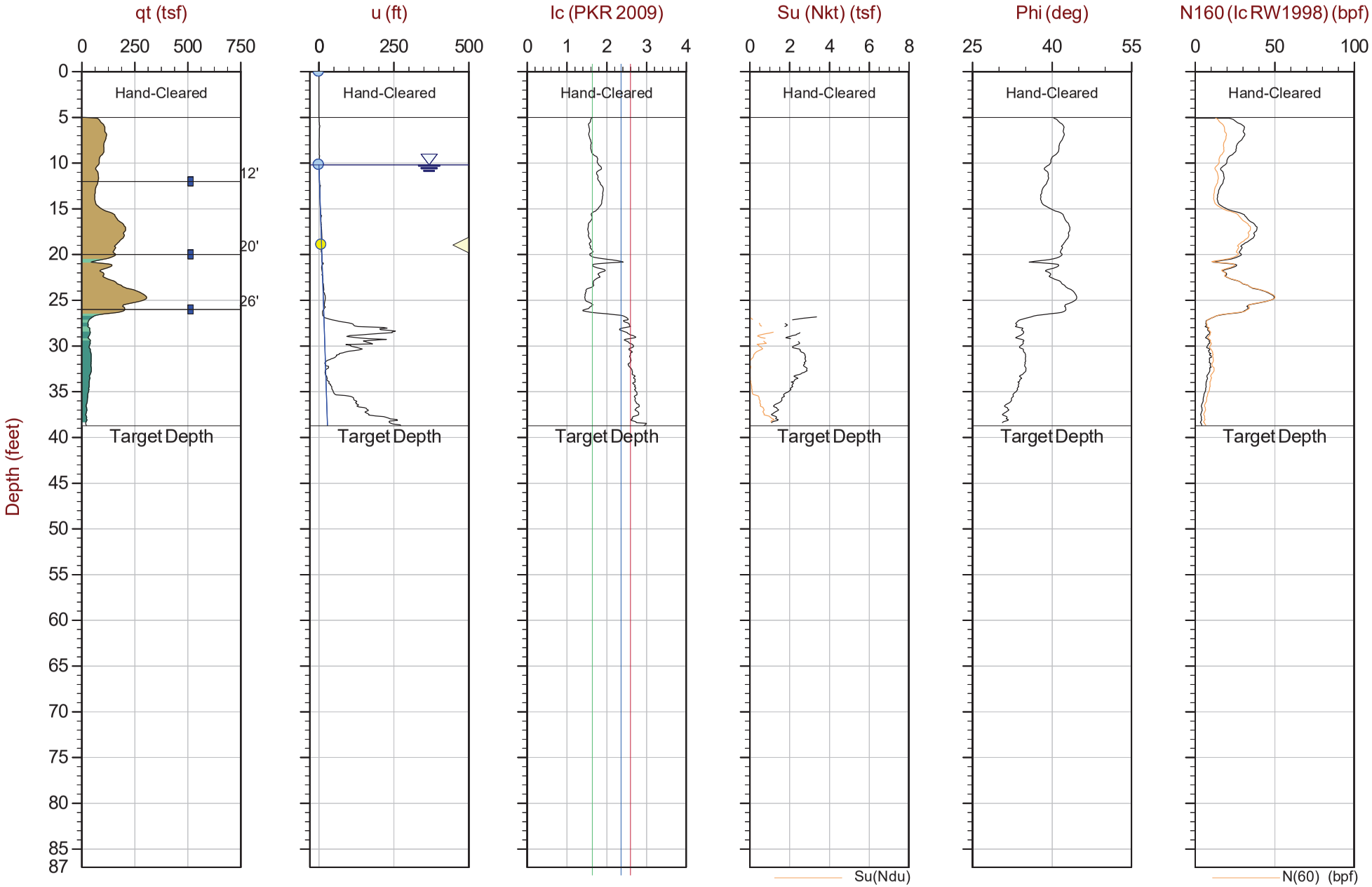
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-24.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74773 Long: -85.58247

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

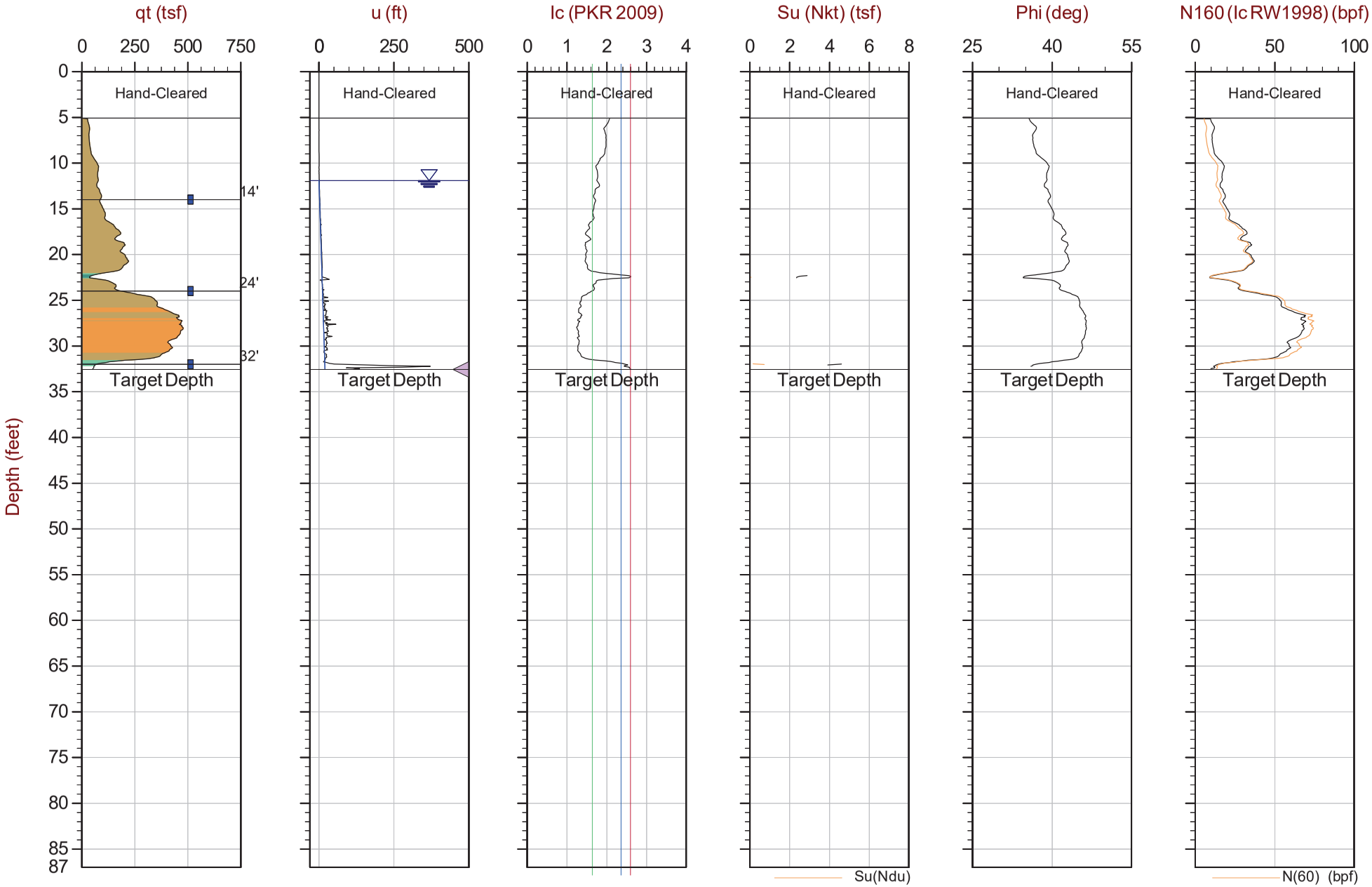
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35



Max Depth: 9.925 m / 32.56 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74859 Long: -85.57818

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

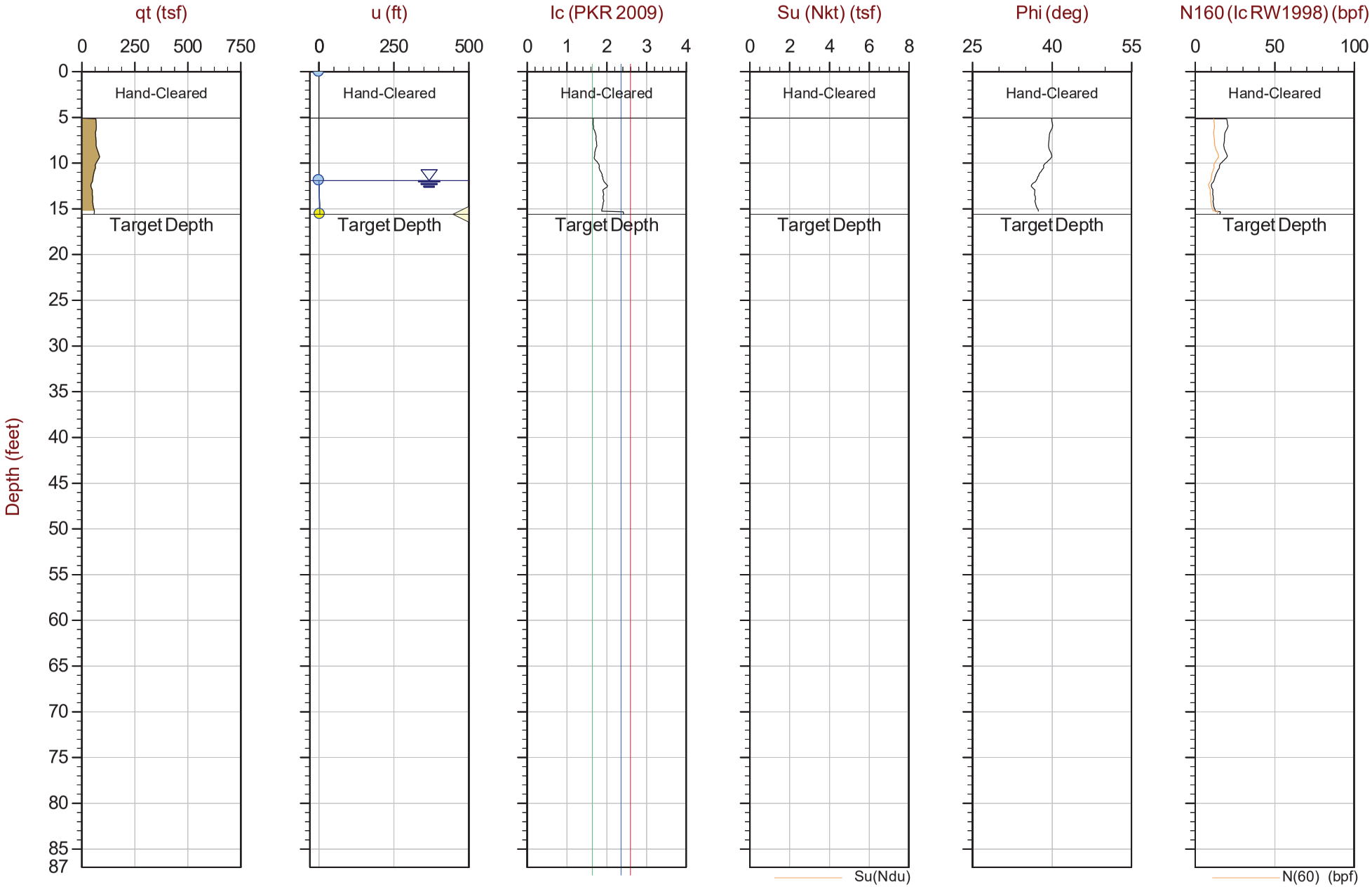
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35



Max Depth: 4.750 m / 15.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74858 Long: -85.57816

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

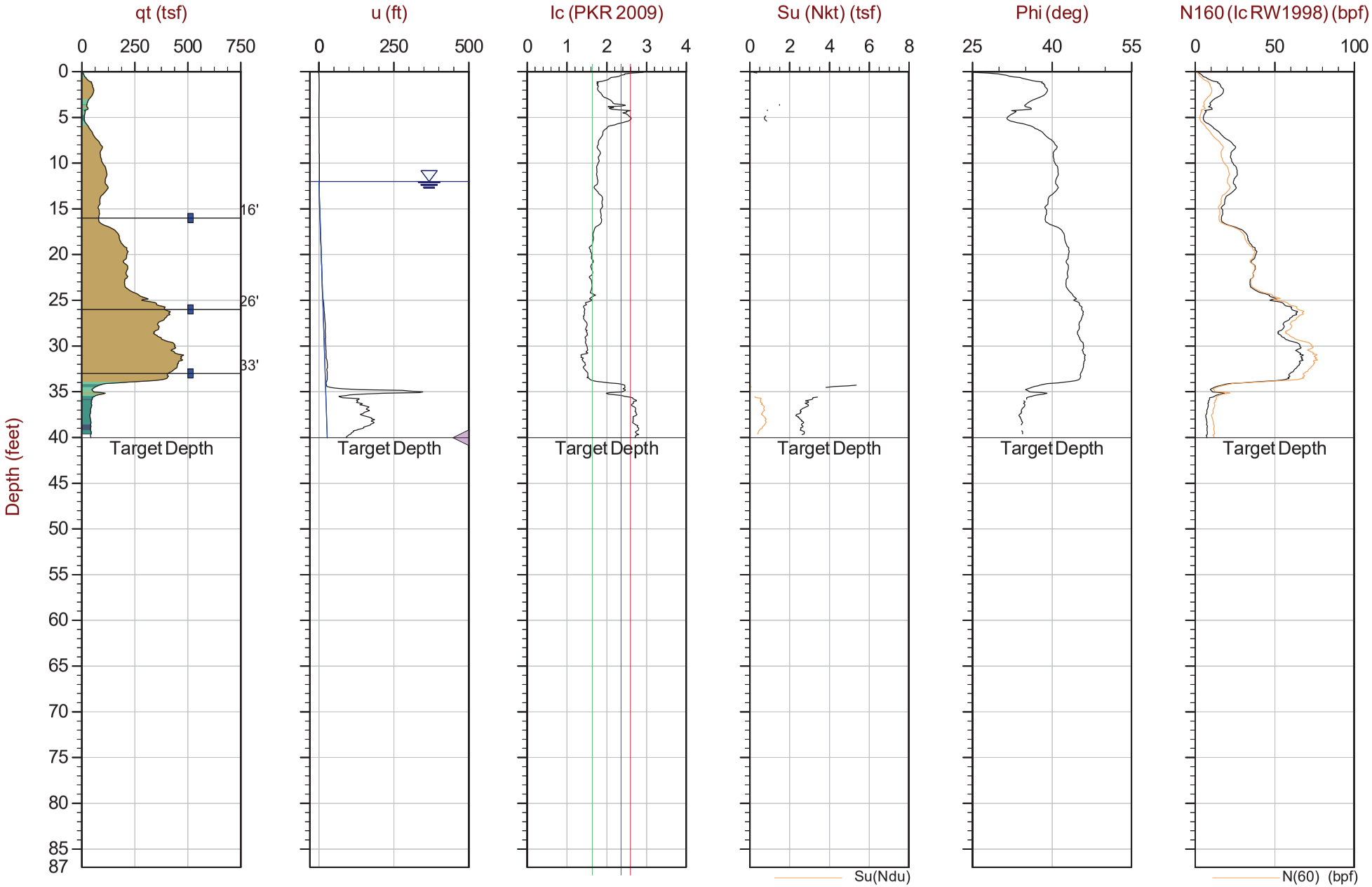
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-26.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75018 Long: -85.57774

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

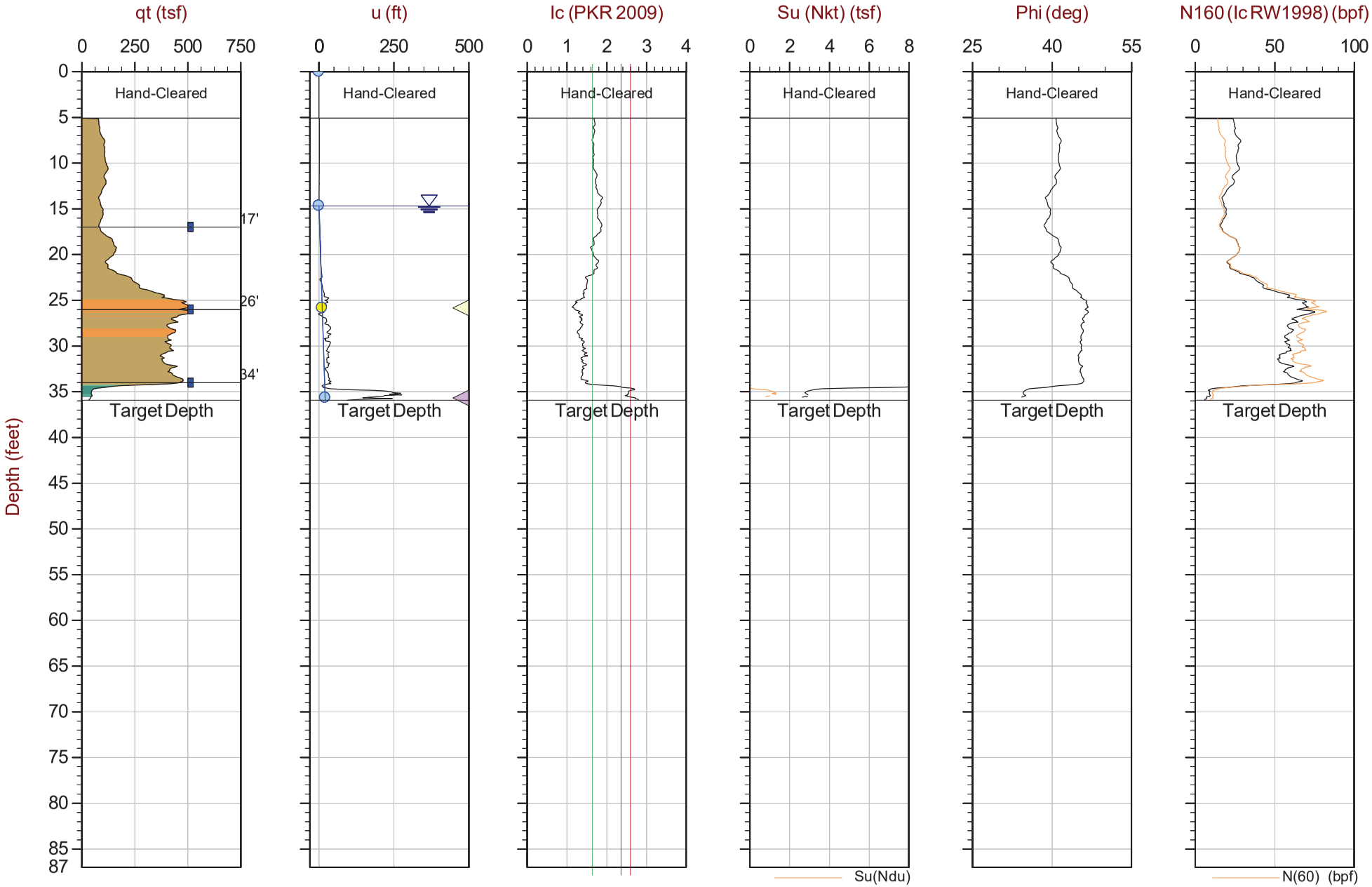
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35



Max Depth: 10.950 m / 35.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-27.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74961 Long: -85.57594

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

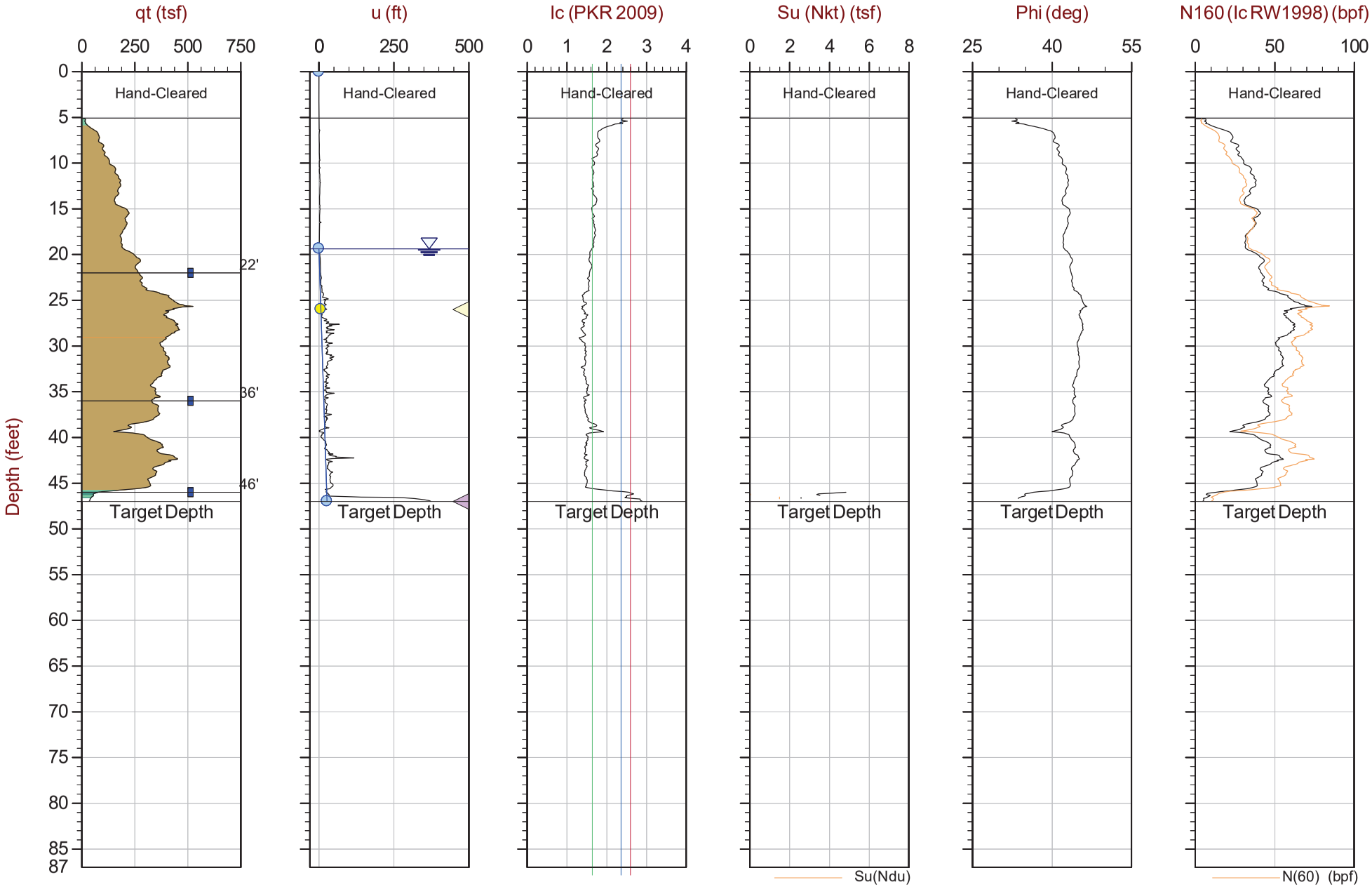
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35



Max Depth: 14.325 m / 47.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-28.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75235 Long: -85.57268

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

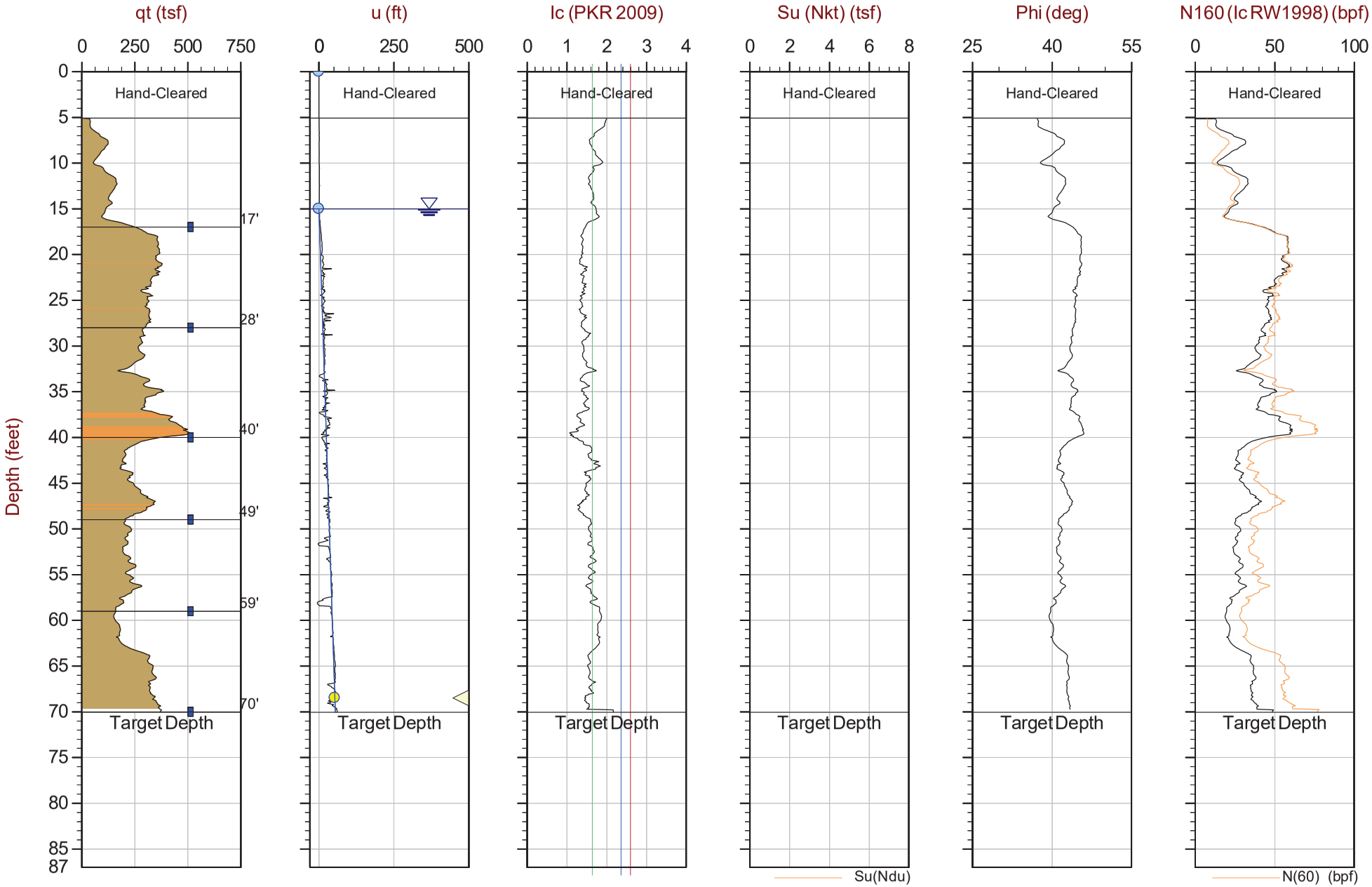
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-29.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75167 Long: -85.57113

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

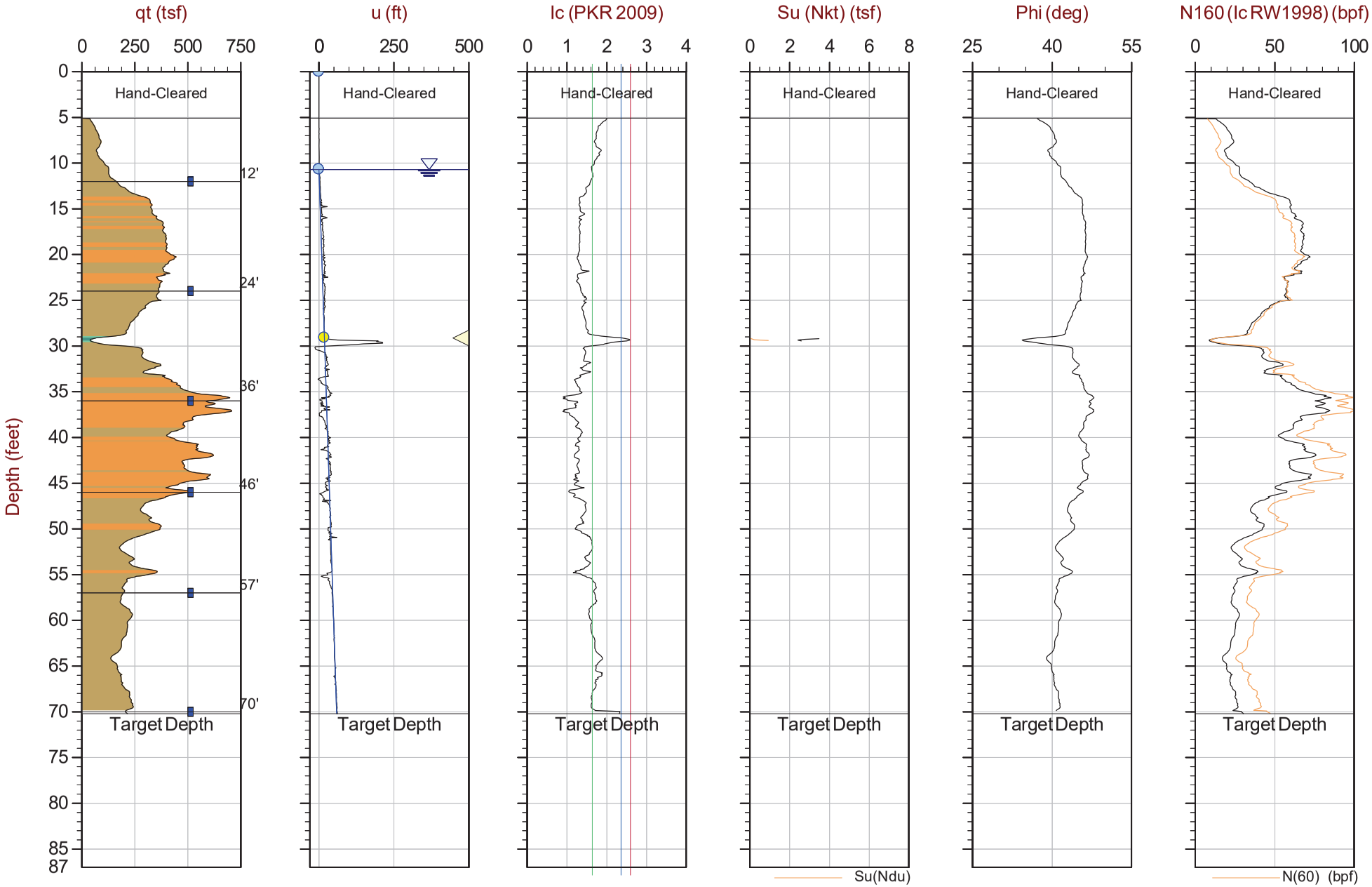
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-30.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75111 Long: -85.56988

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

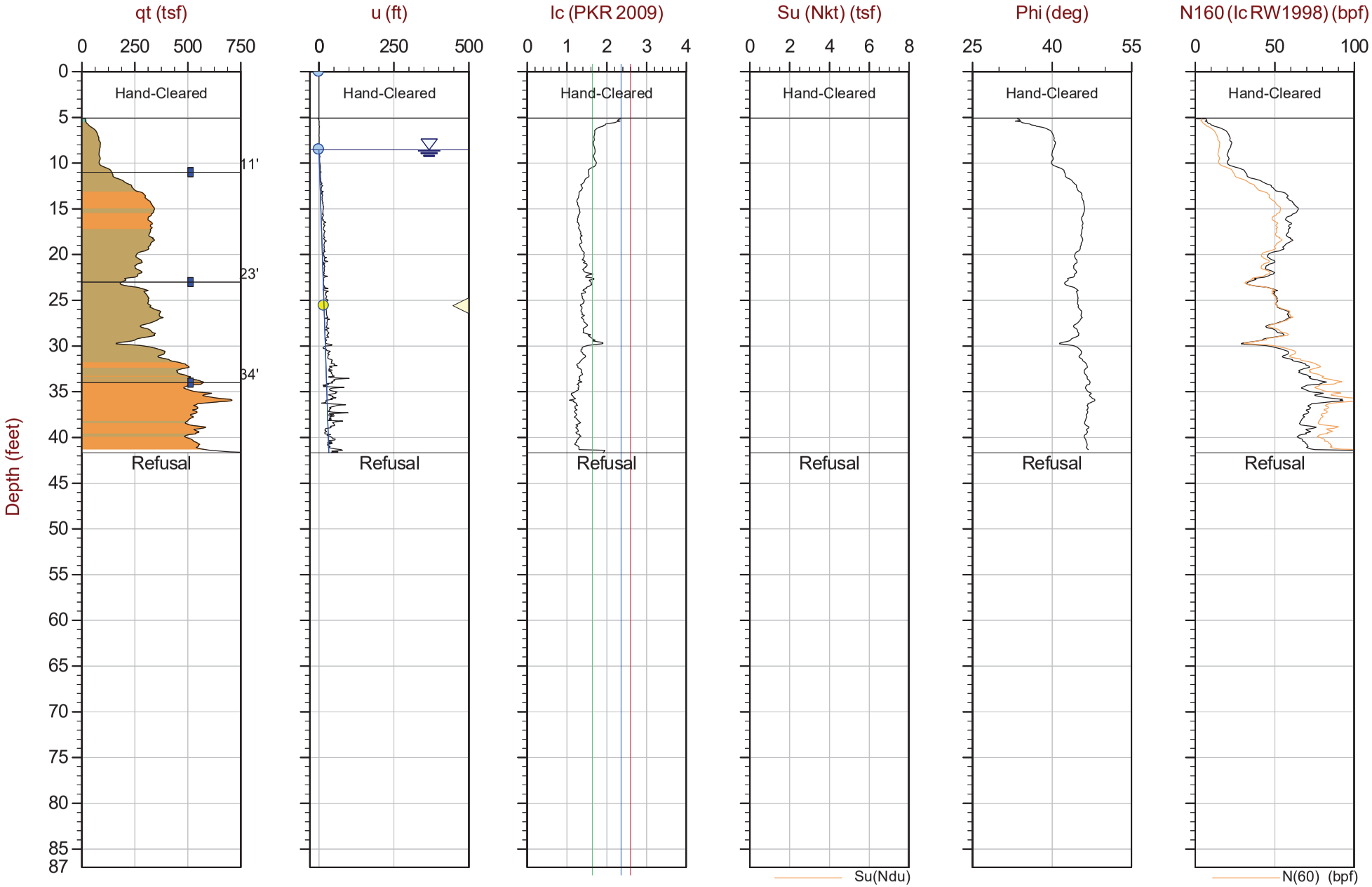
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35



Max Depth: 12.700 m / 41.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56858

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

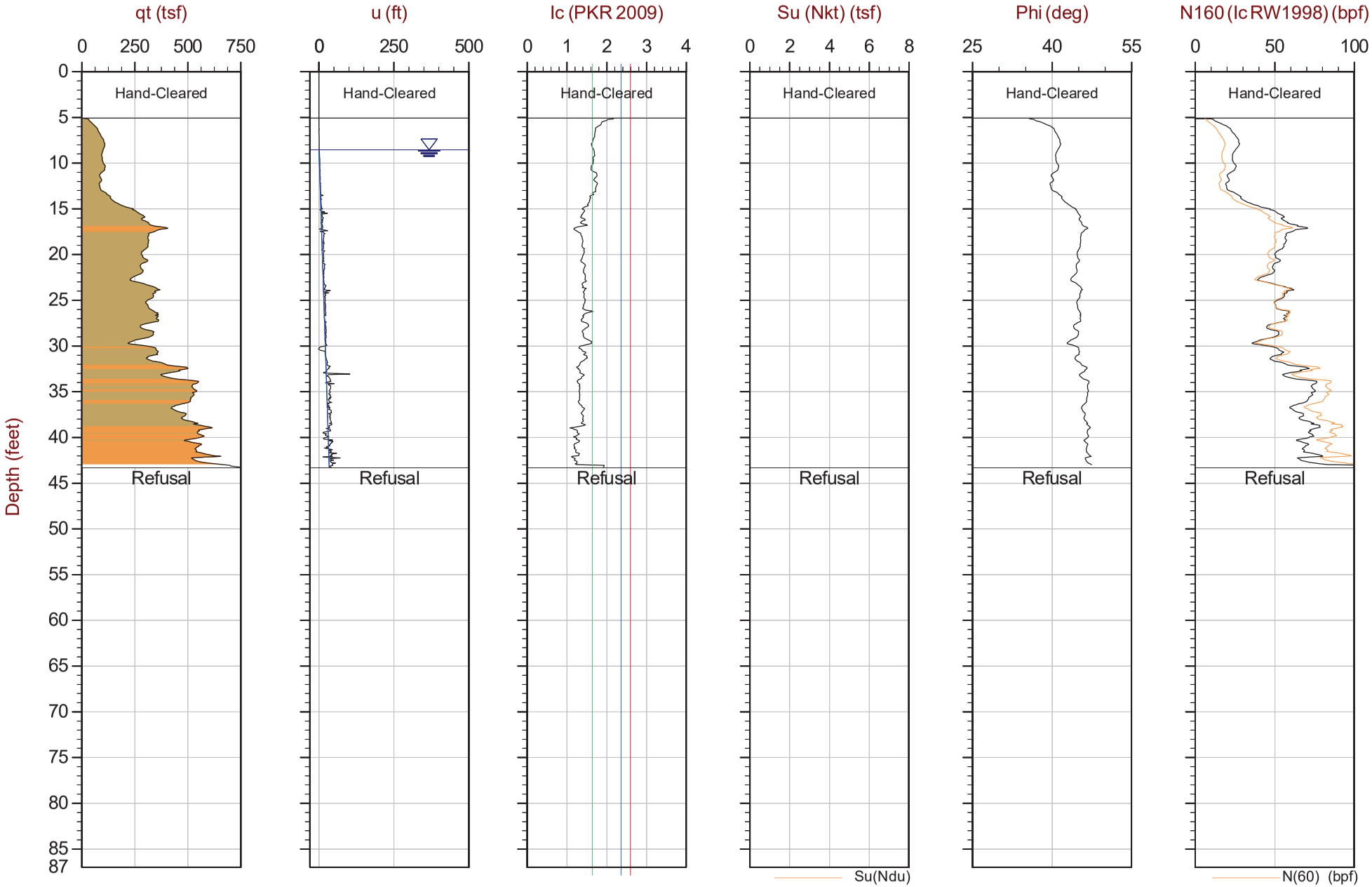
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35



Max Depth: 13.200 m / 43.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56861

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

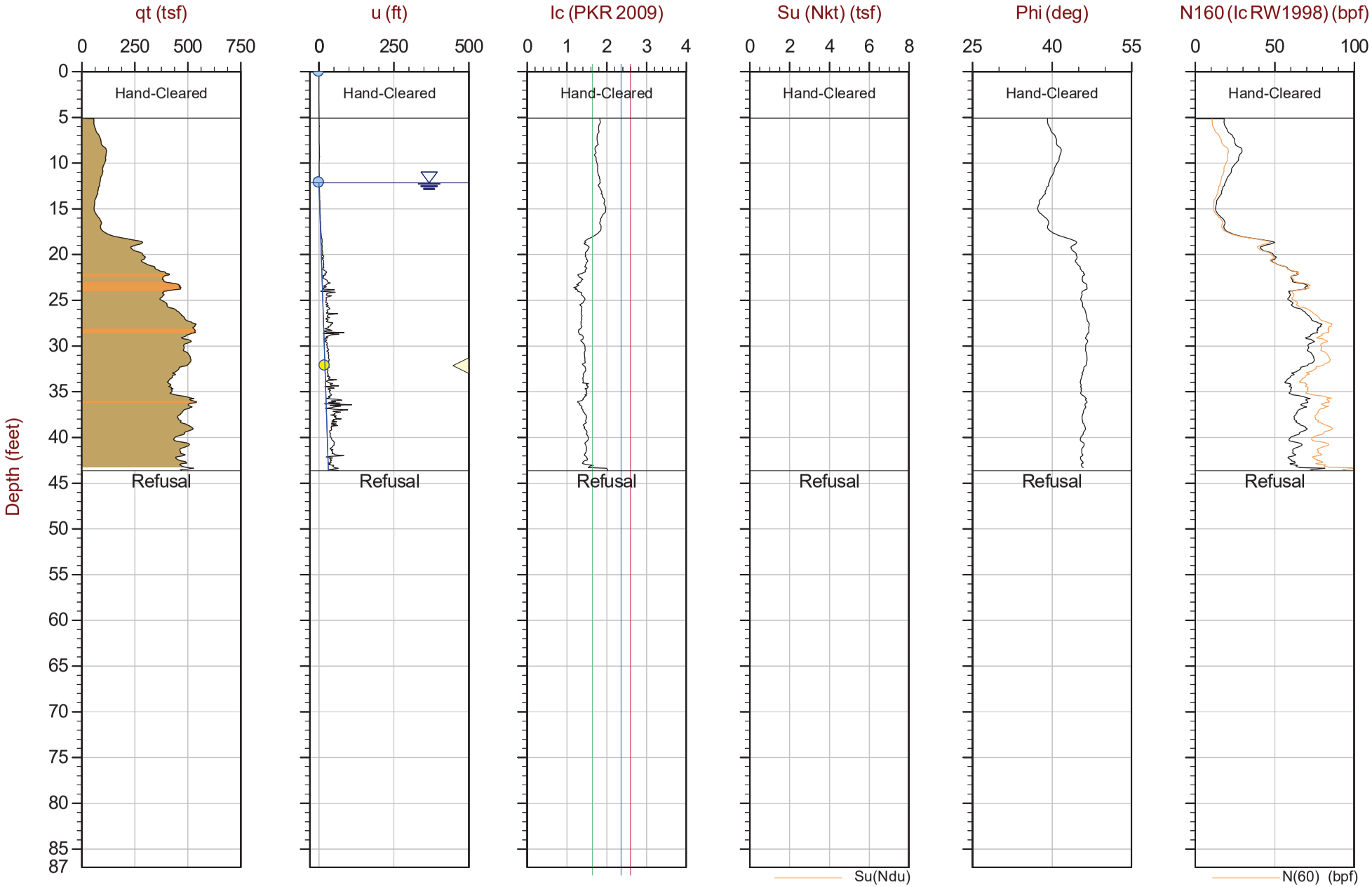
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35



Max Depth: 13.300 m / 43.63 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74509 Long: -85.57700

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

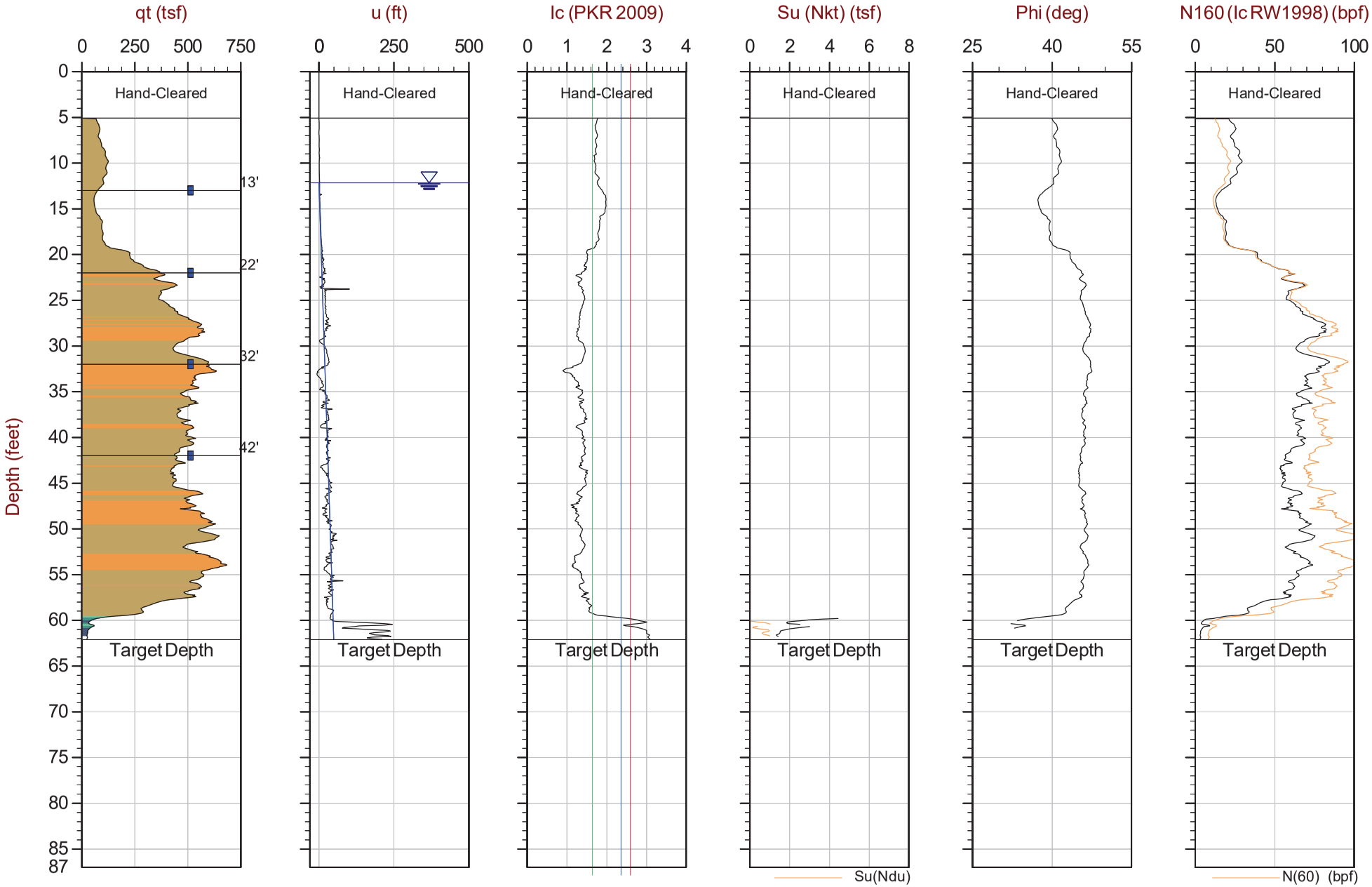
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35



Max Depth: 18.925 m / 62.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74510 Long: -85.57702

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

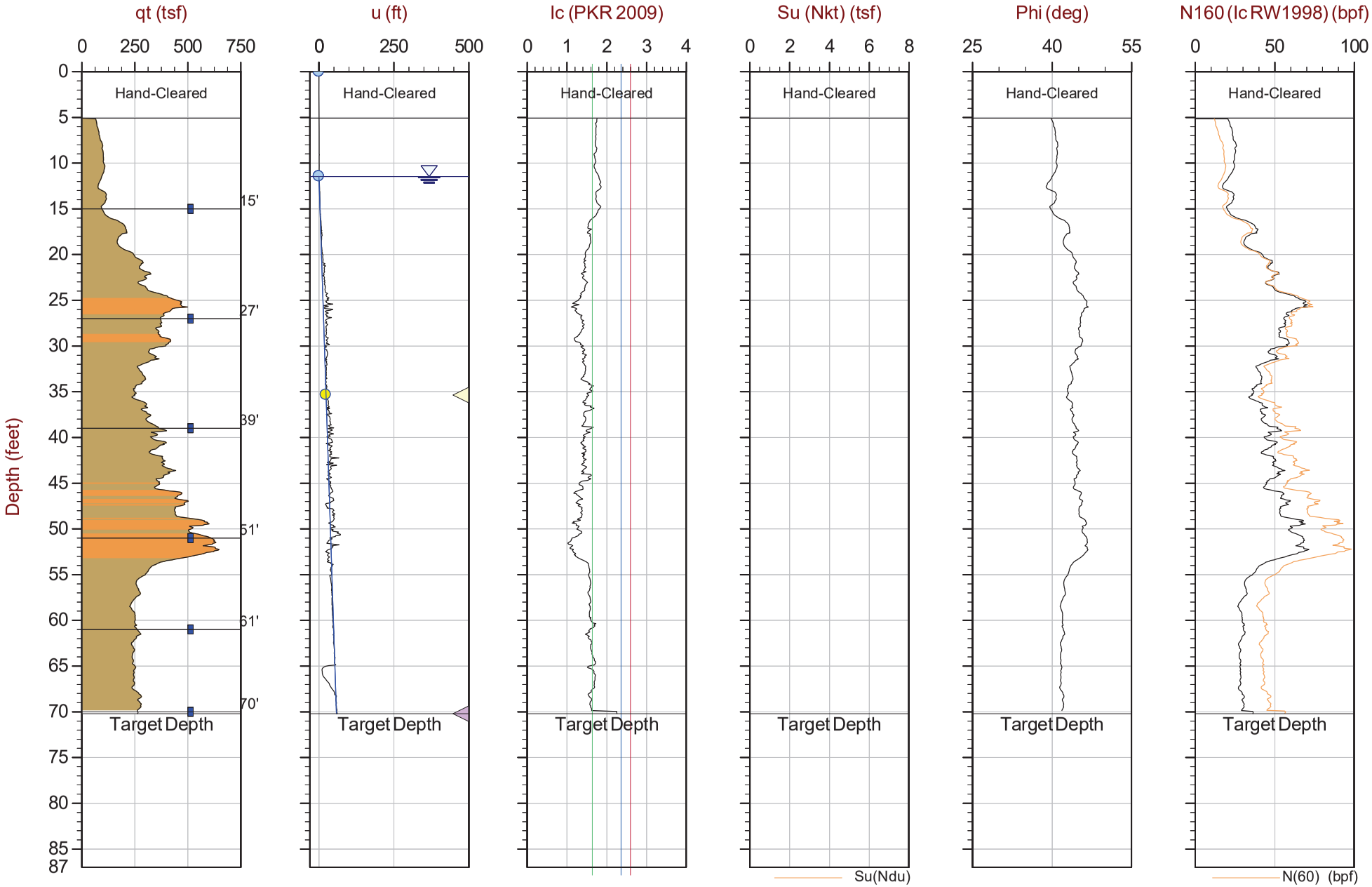
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-33.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74494 Long: -85.57582

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

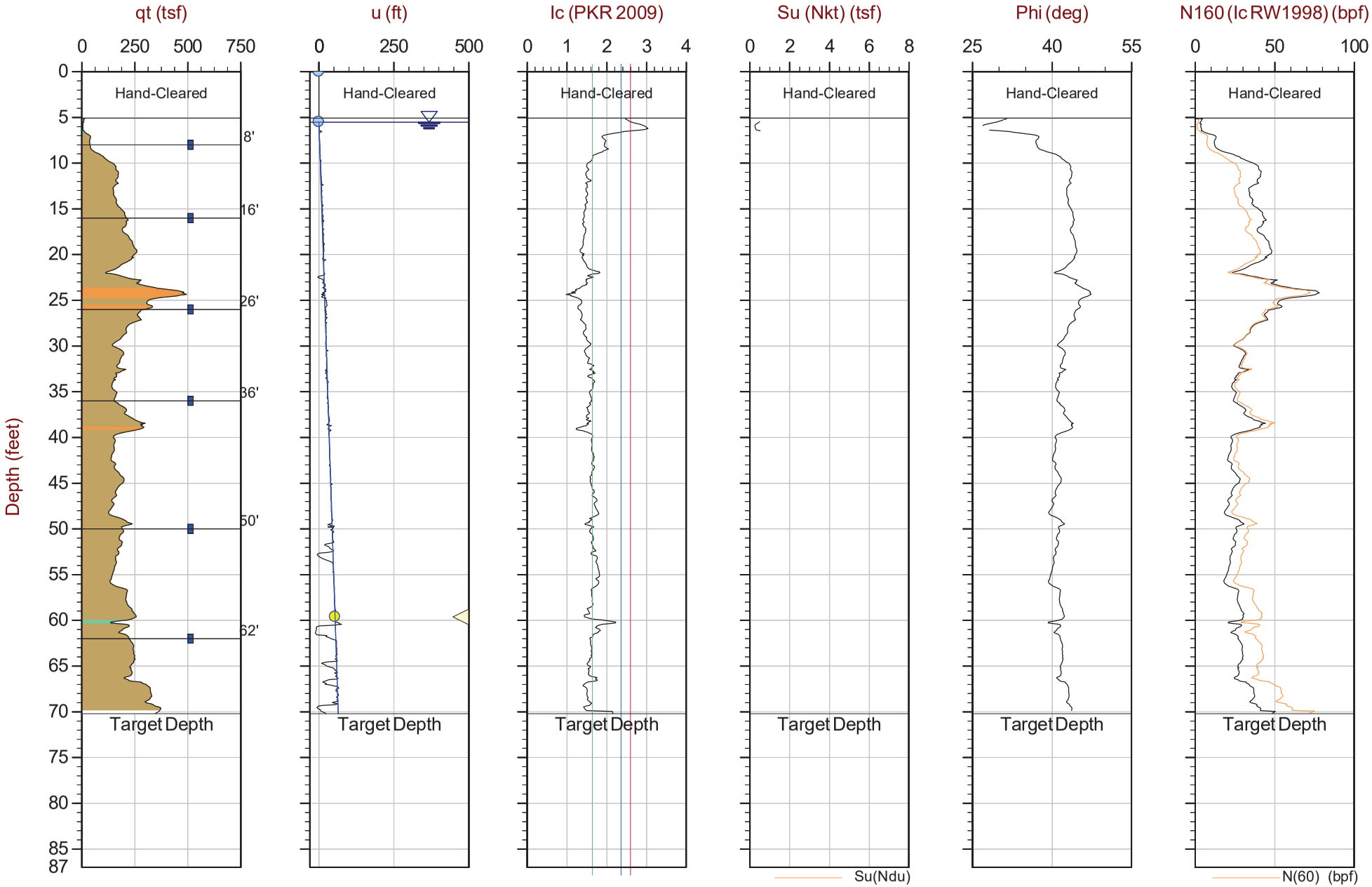
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-34.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75340 Long: -85.56972

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

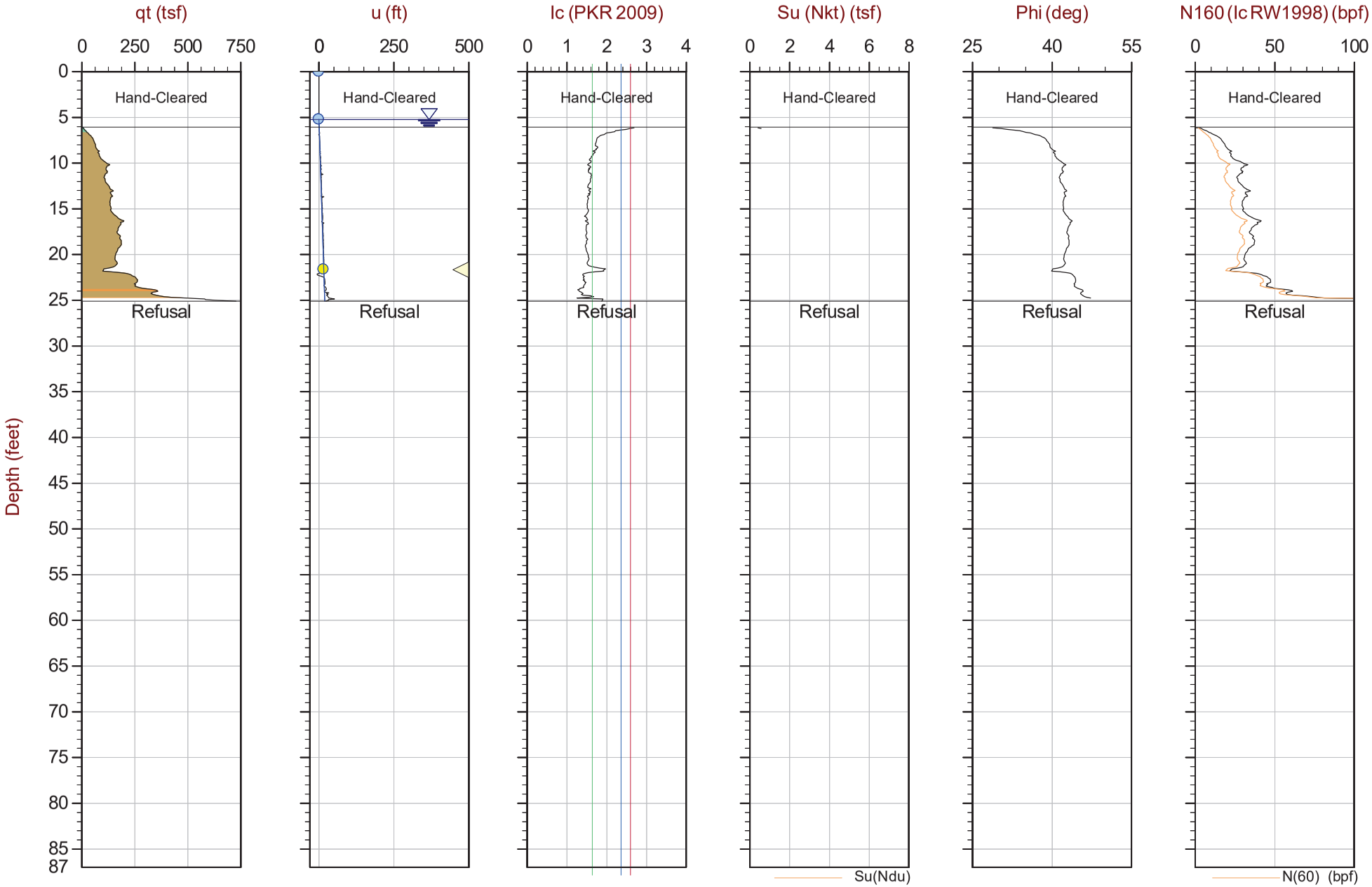
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35



Max Depth: 7.650 m / 25.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75293 Long: -85.56897

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

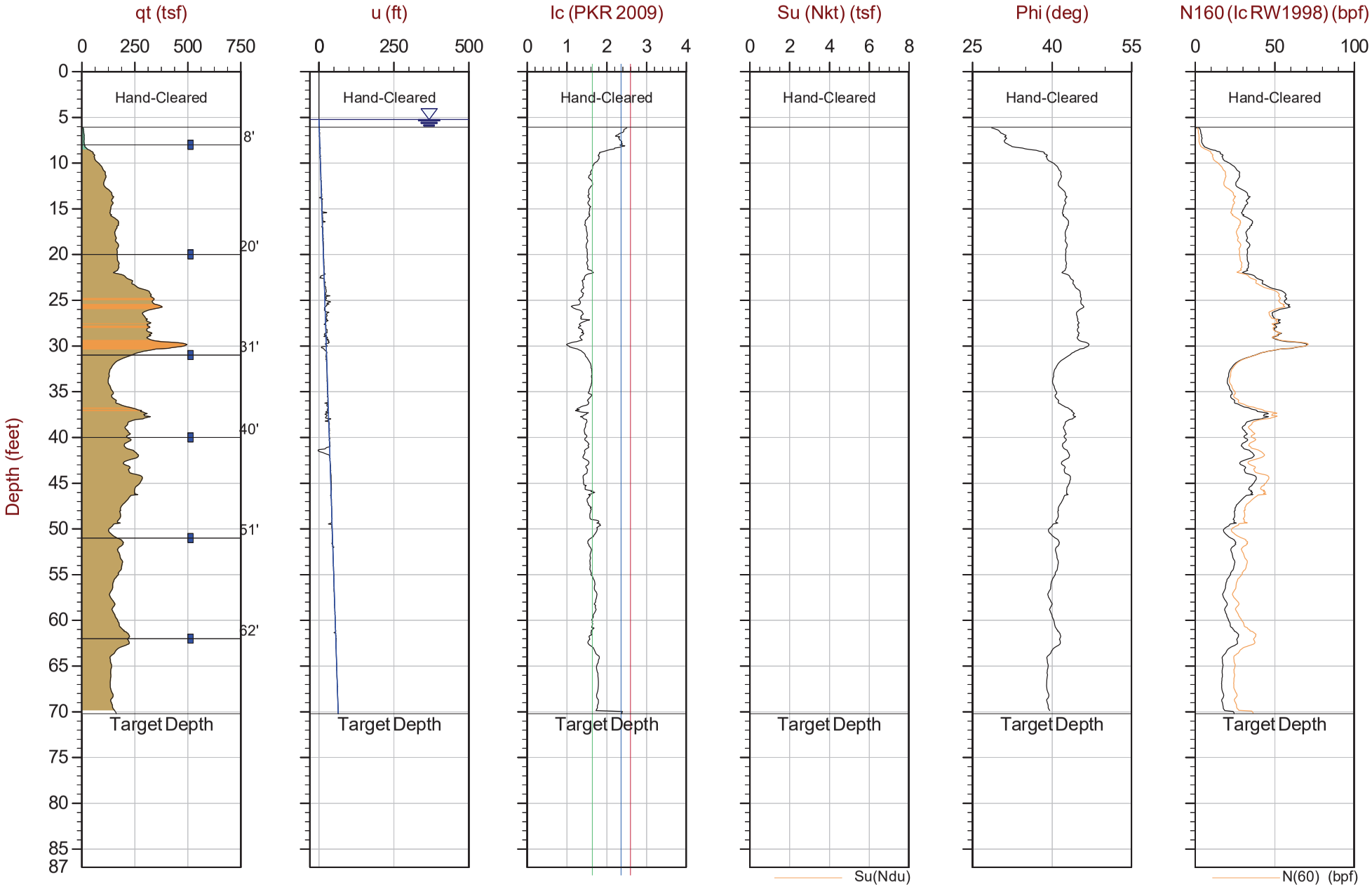
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75295 Long: -85.56894

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

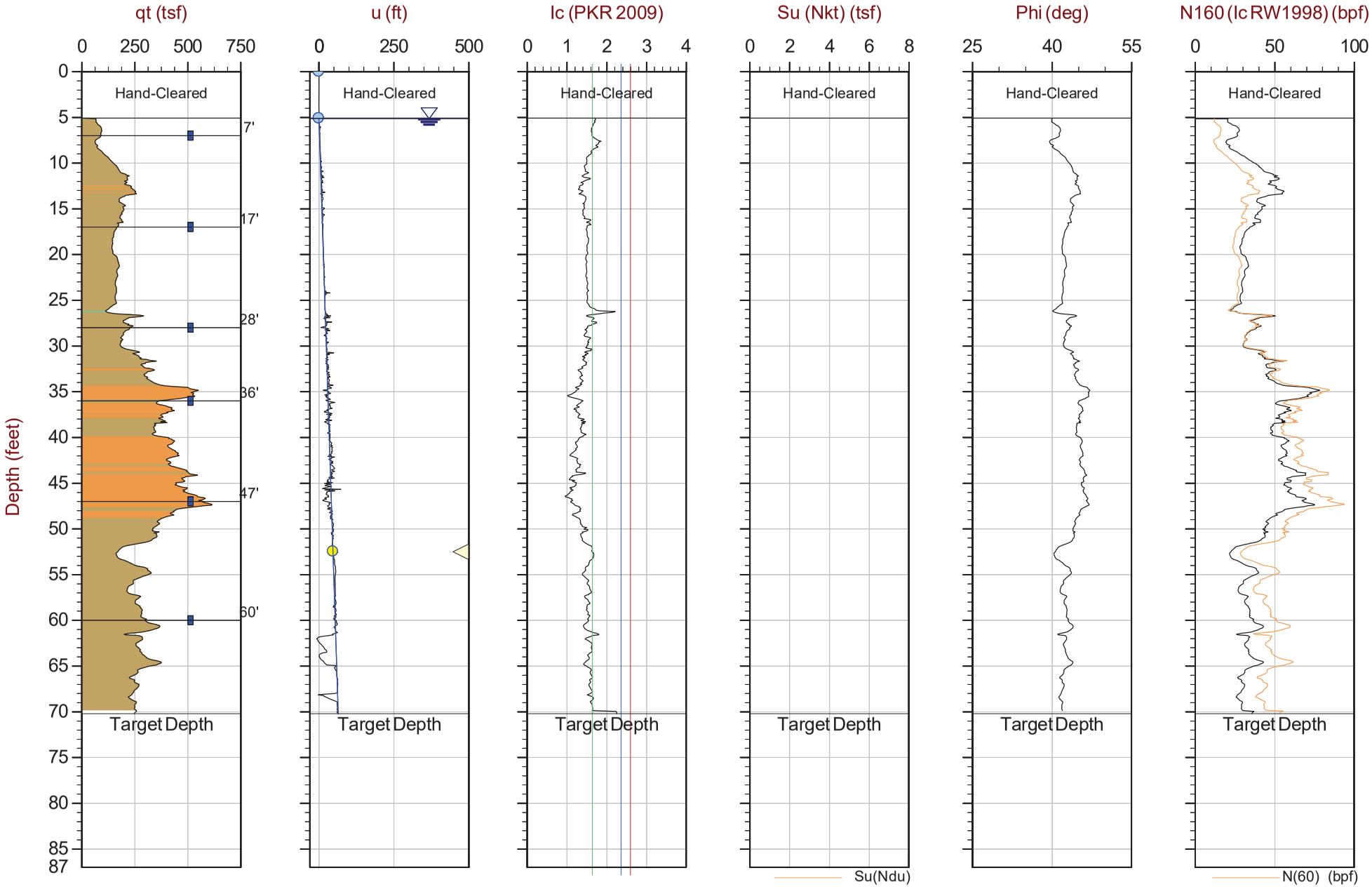
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-36.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75299 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

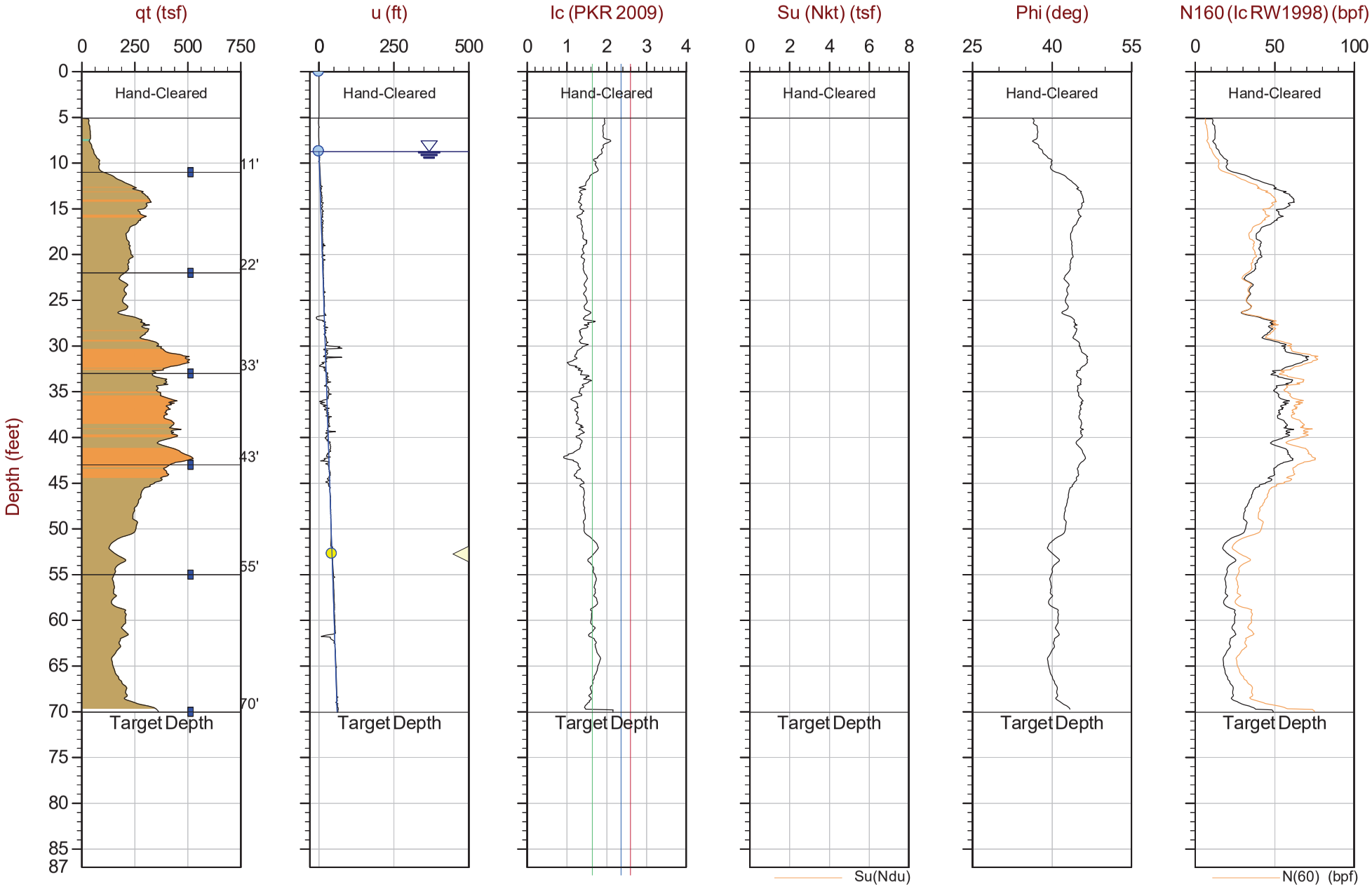
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-37.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75194 Long: -85.56863

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

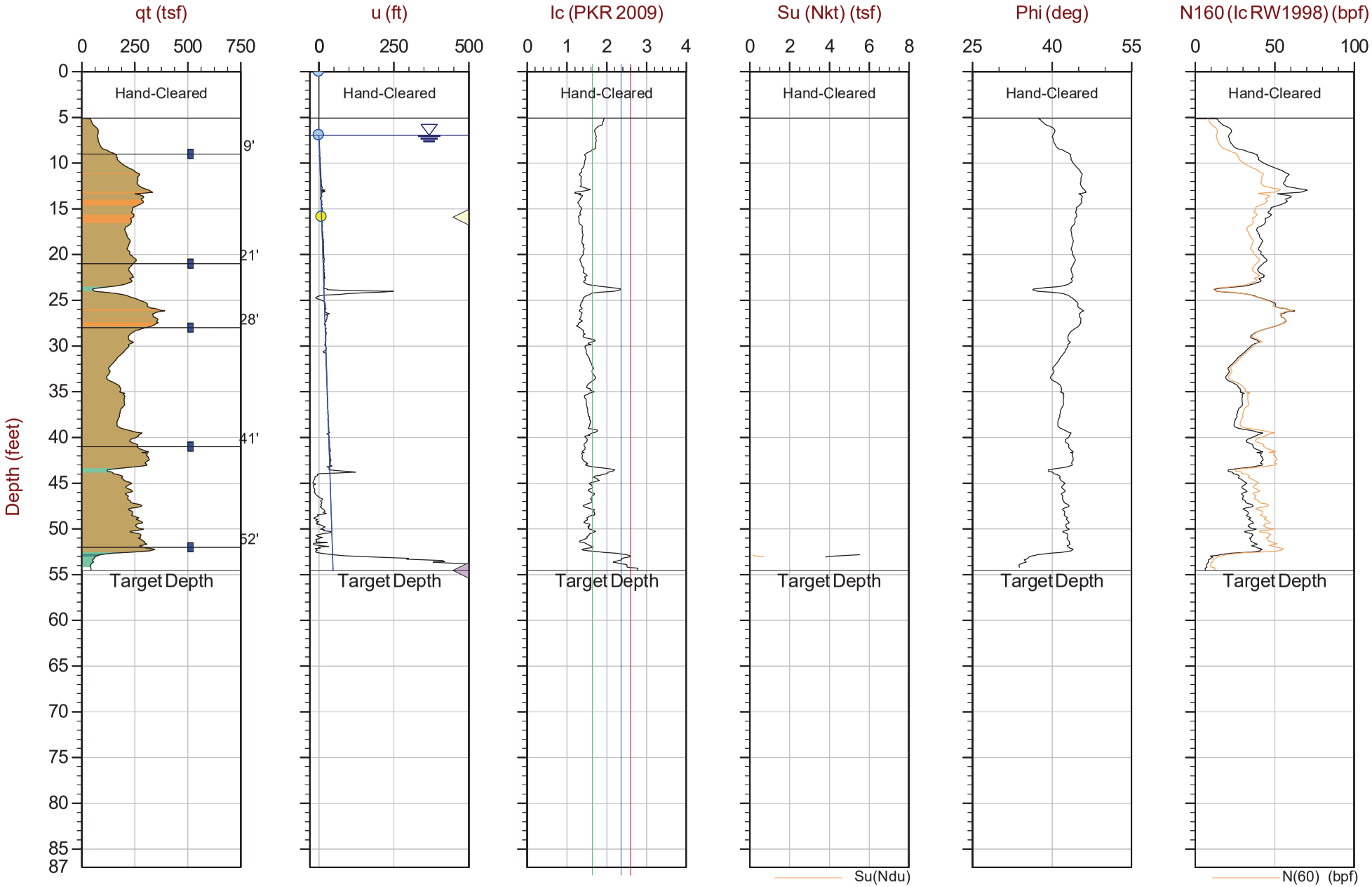
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35



Max Depth: 16.625 m / 54.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-38.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75358 Long: -85.57111

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

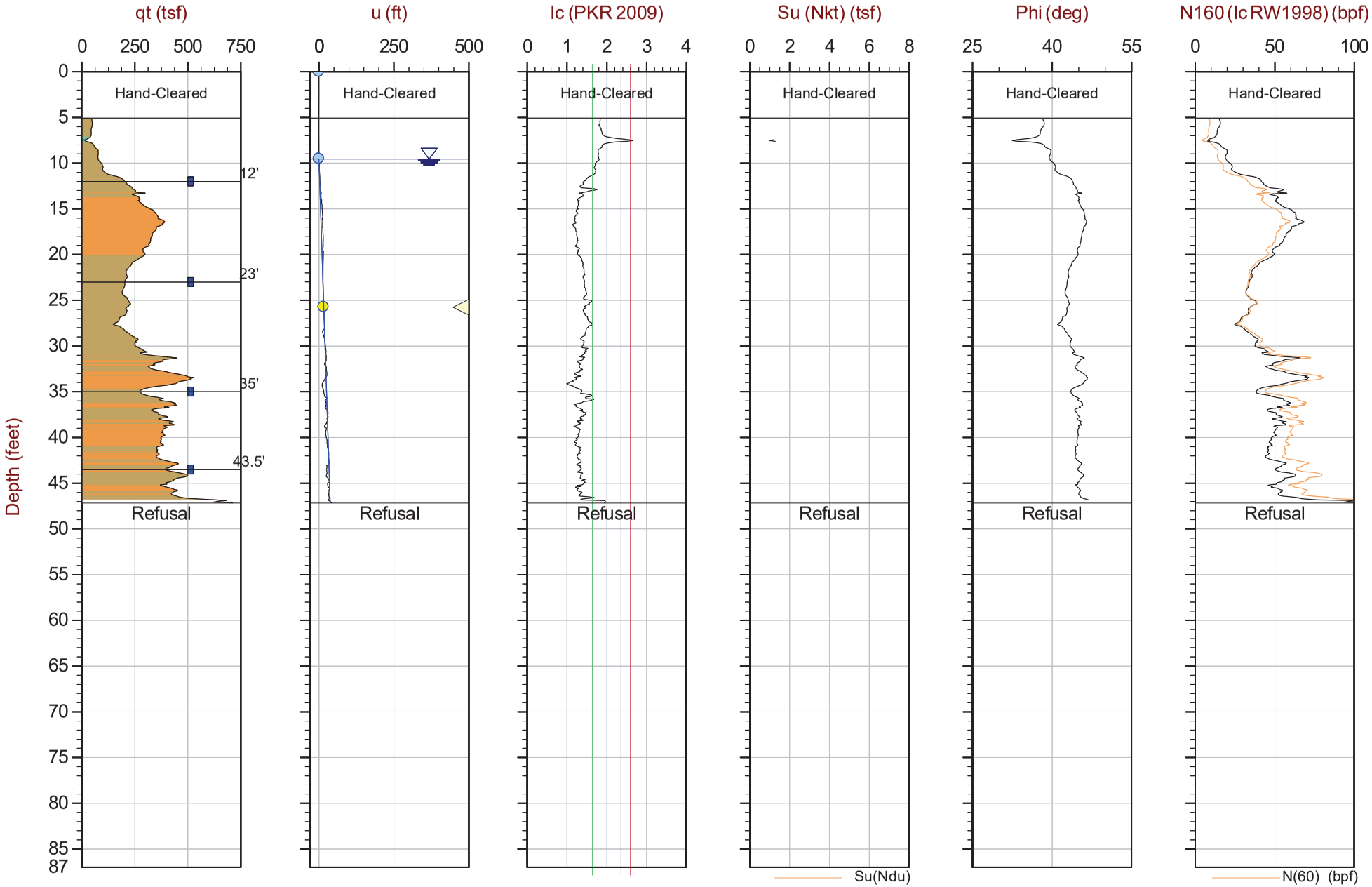
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35



Max Depth: 14.375 m / 47.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-39.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74976 Long: -85.56672

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

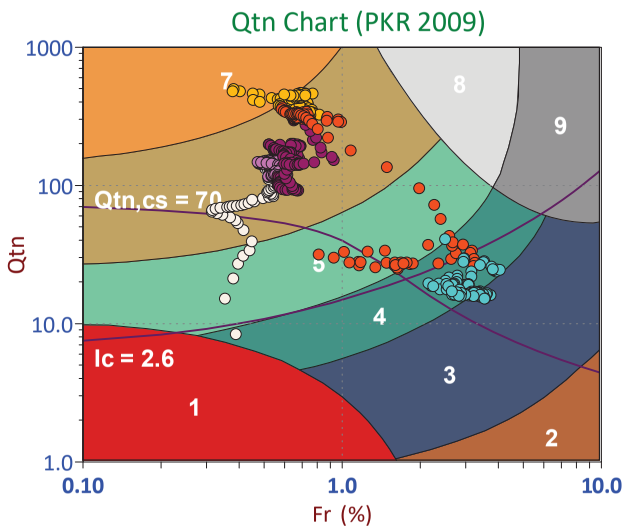
CONETEC

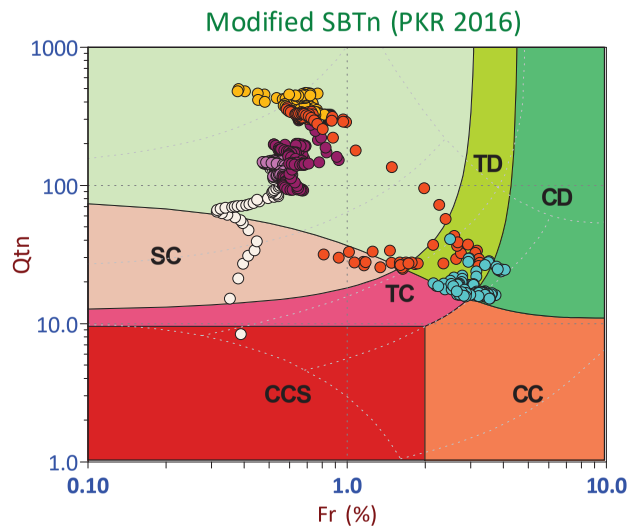
CONETEC

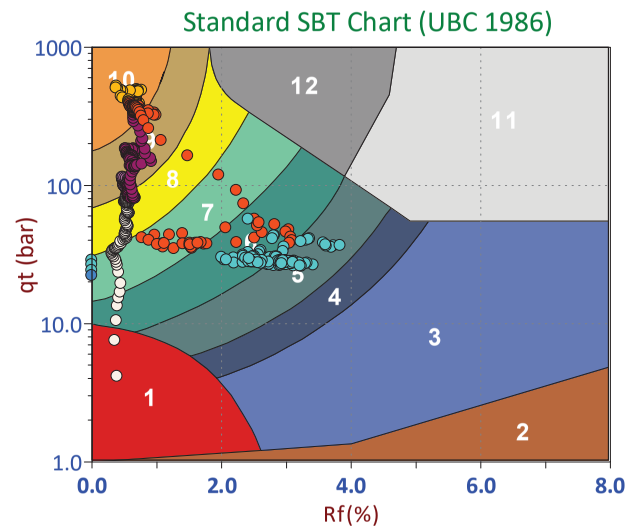
Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

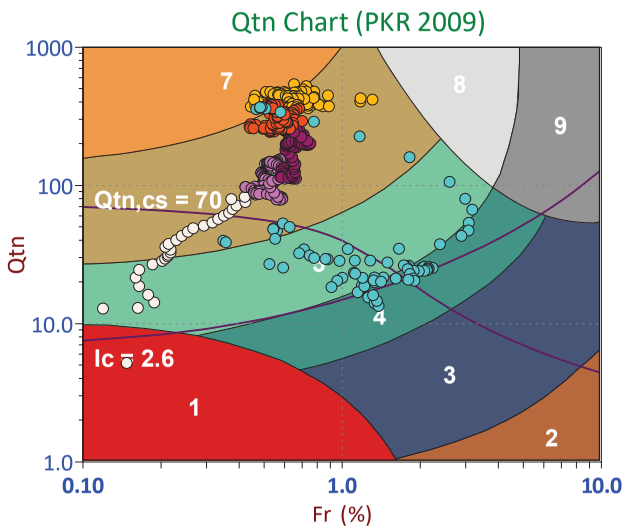
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

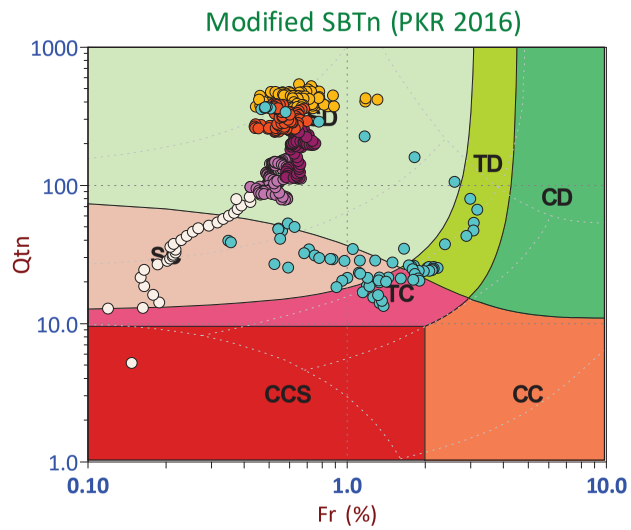
CONETEC

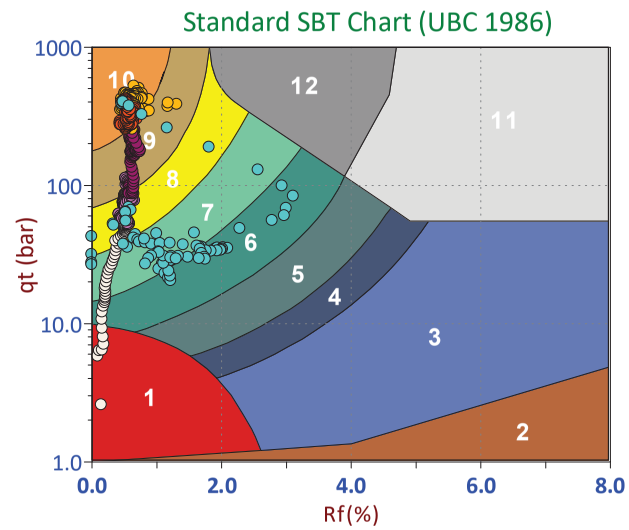
Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

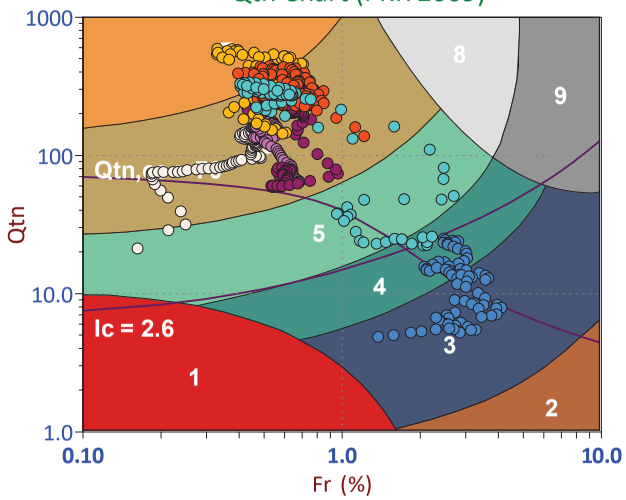
CONETEC

Arcadis

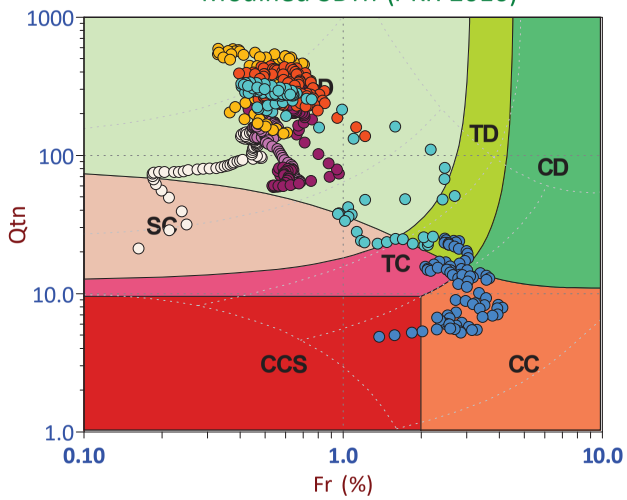
Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35

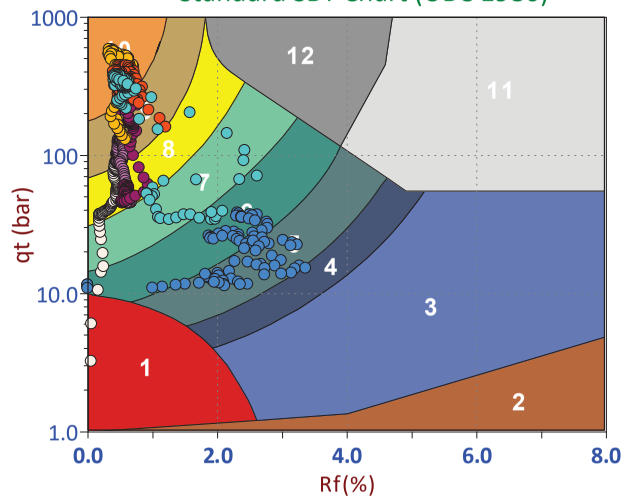
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

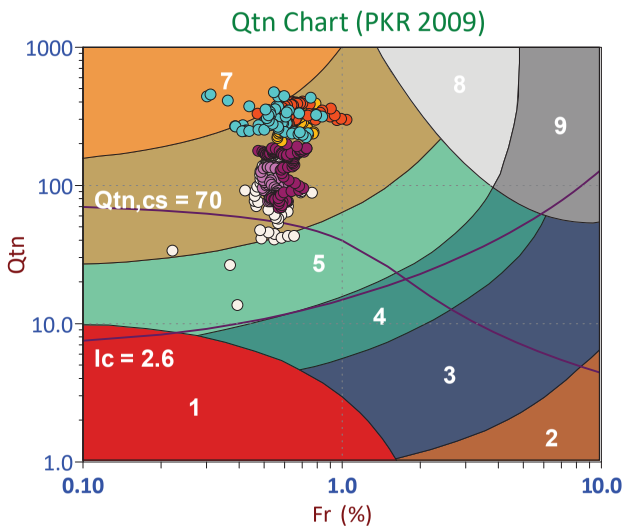
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

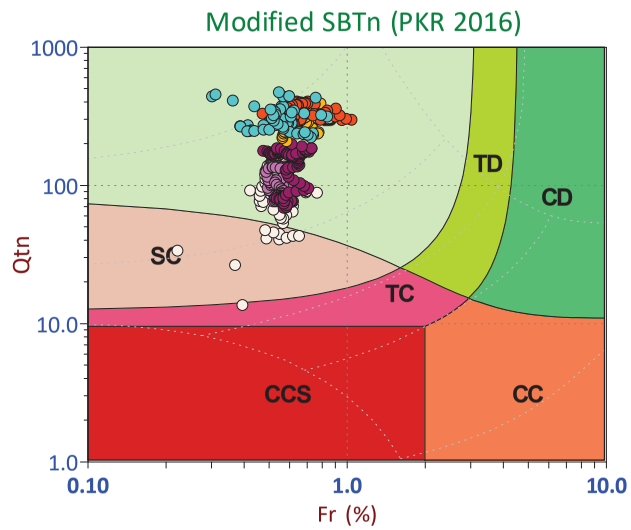
CONETEC

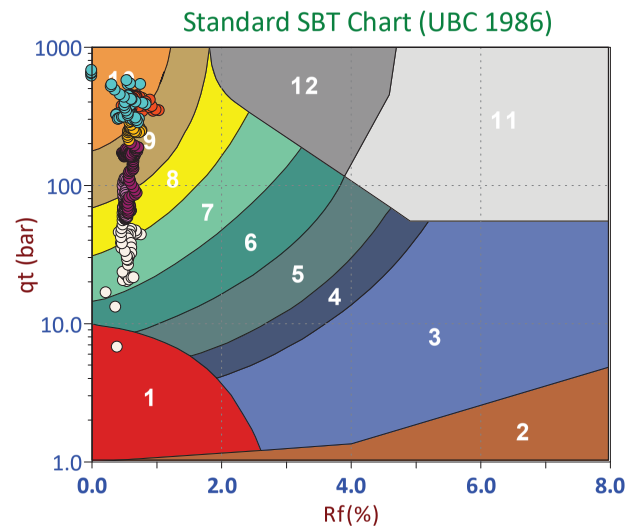
Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

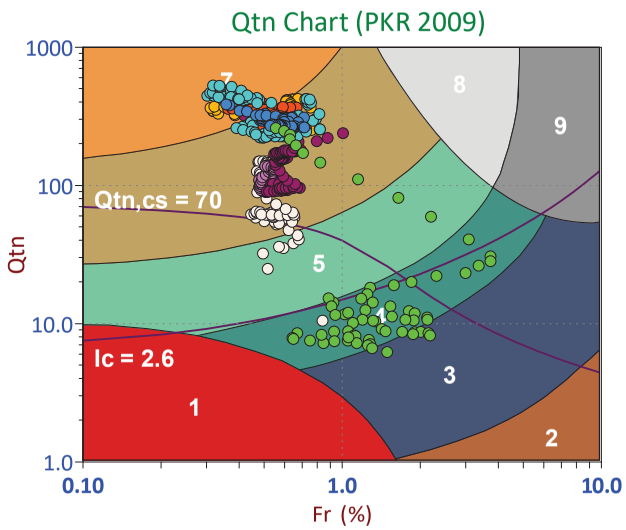
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

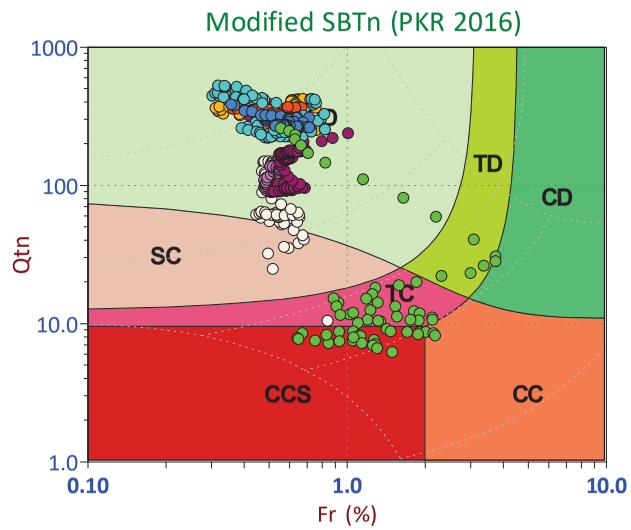
CONETEC

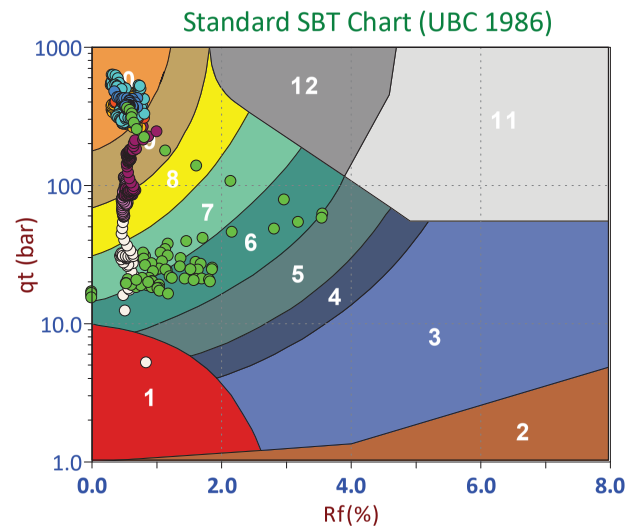
Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

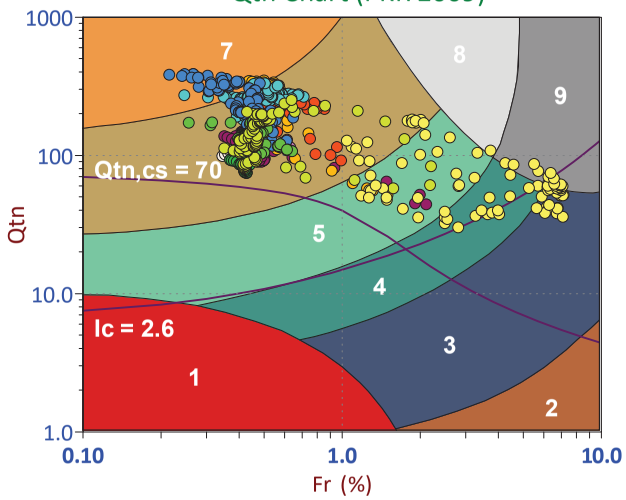
CONETEC

Arcadis

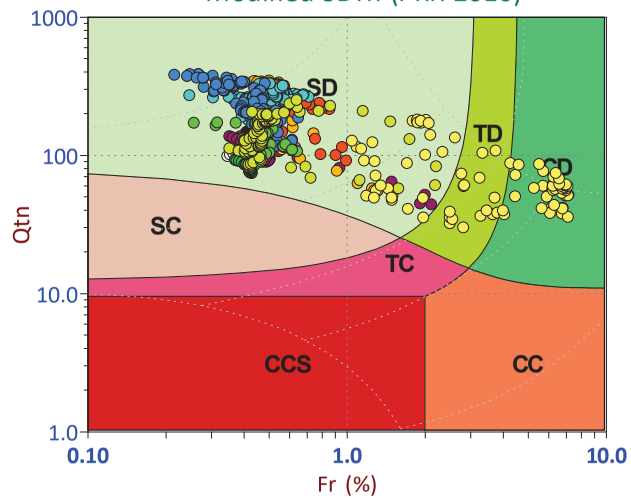
Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35

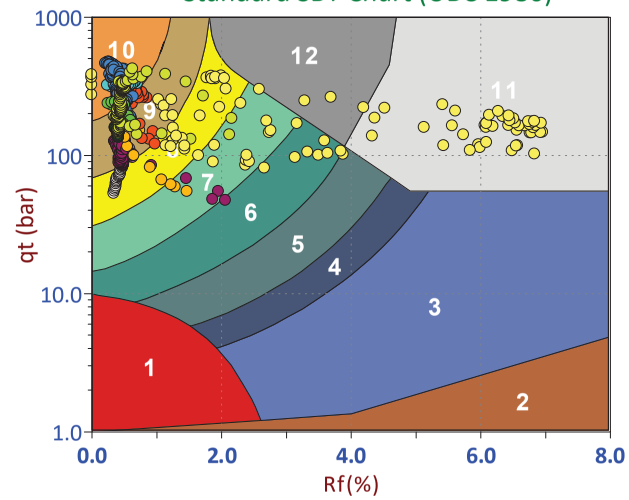
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

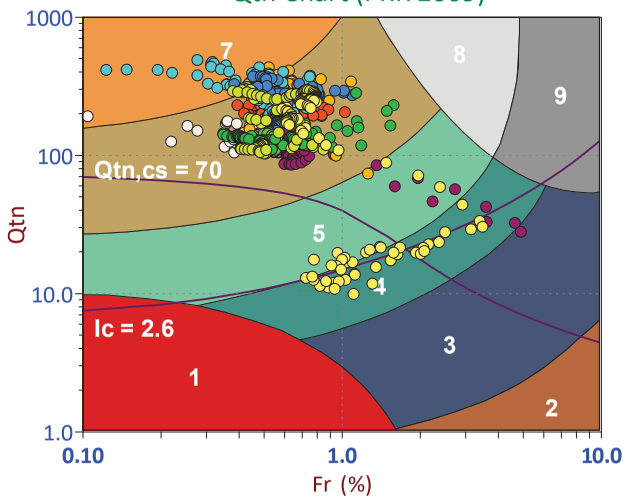
CONETEC

Arcadis

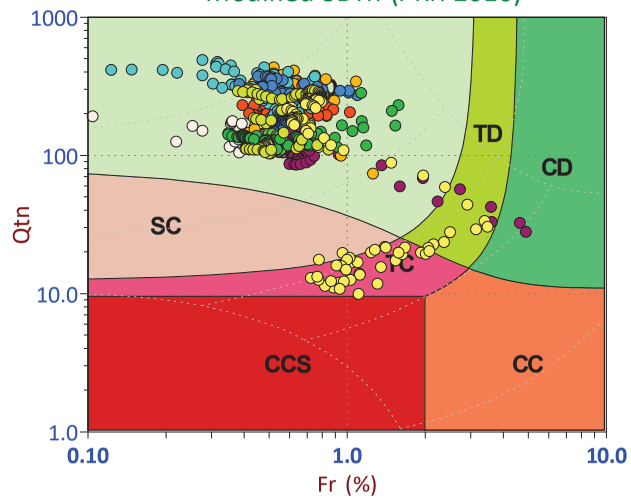
Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35

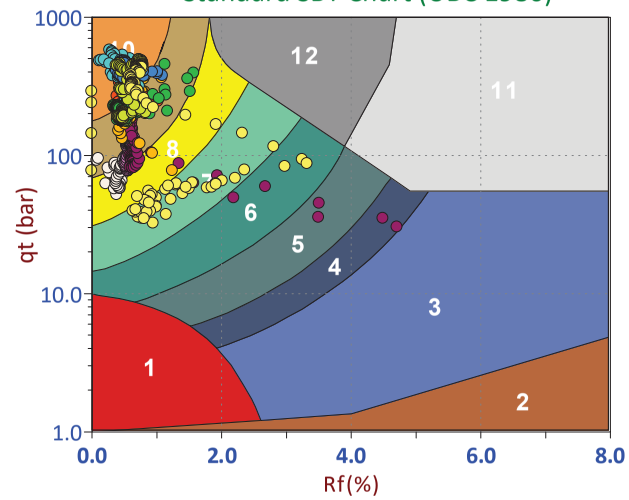
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

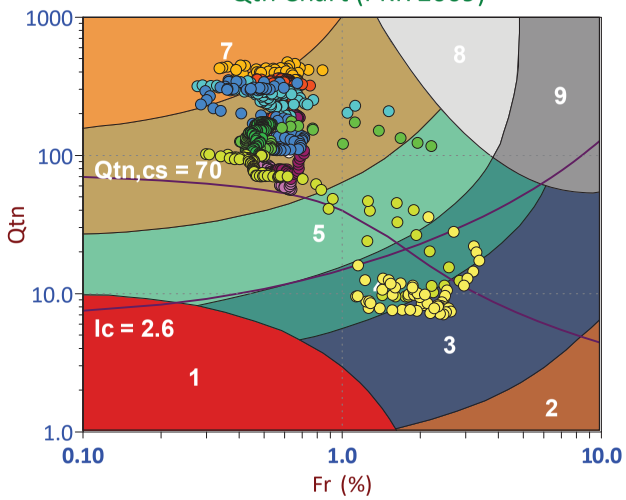
CONETEC

Arcadis

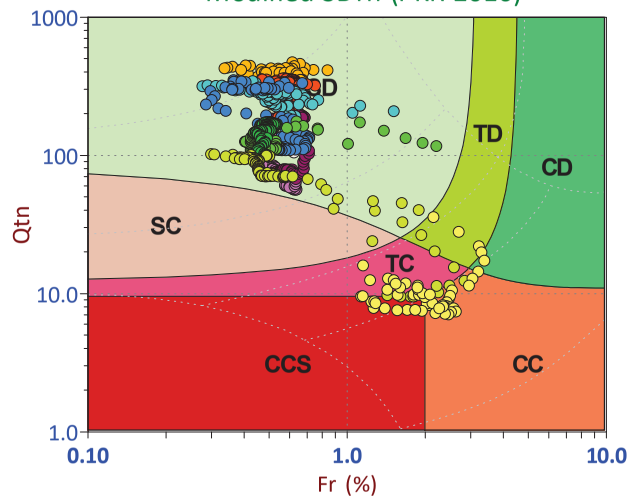
Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35

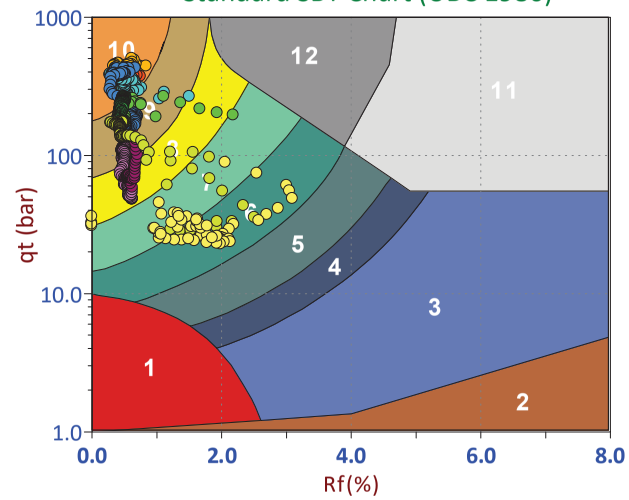
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

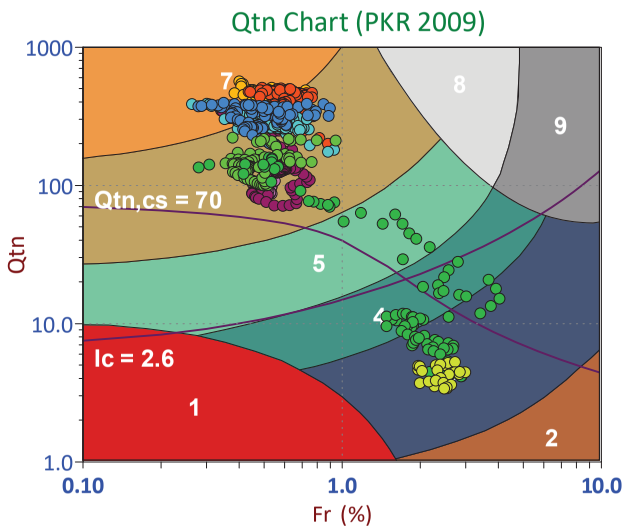
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

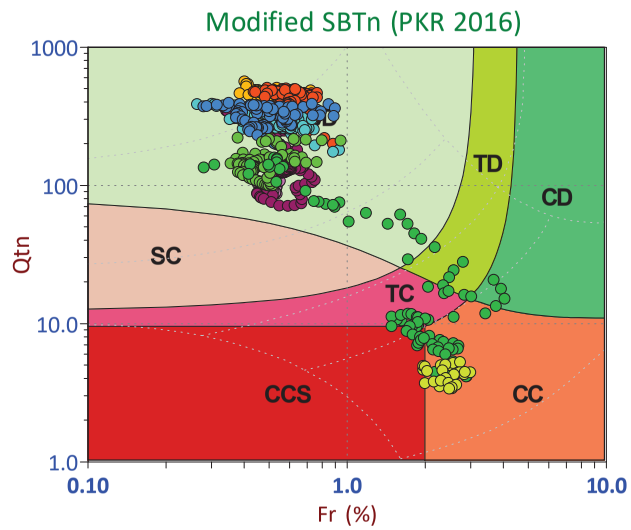
CONETEC

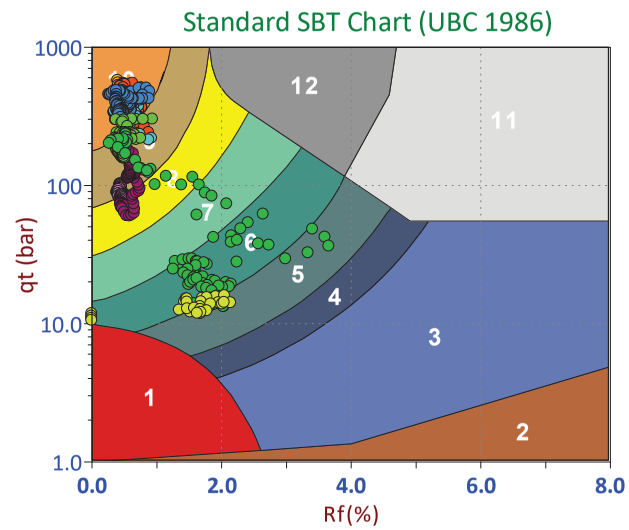
Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

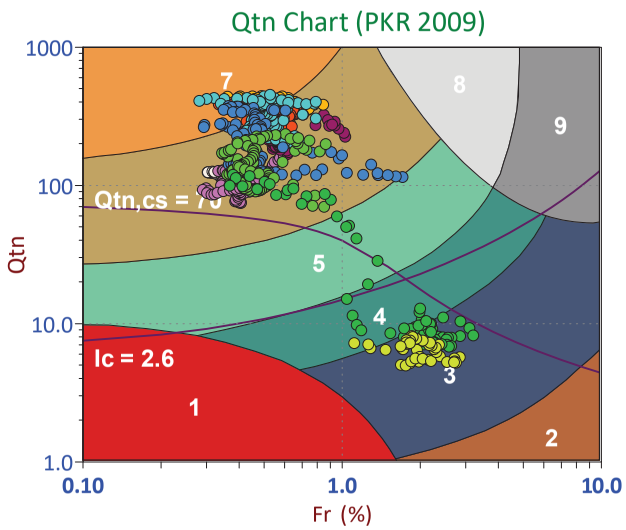
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

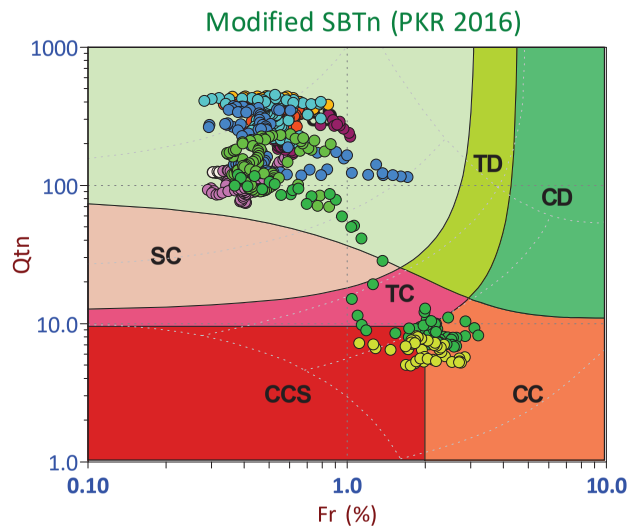
CONETEC

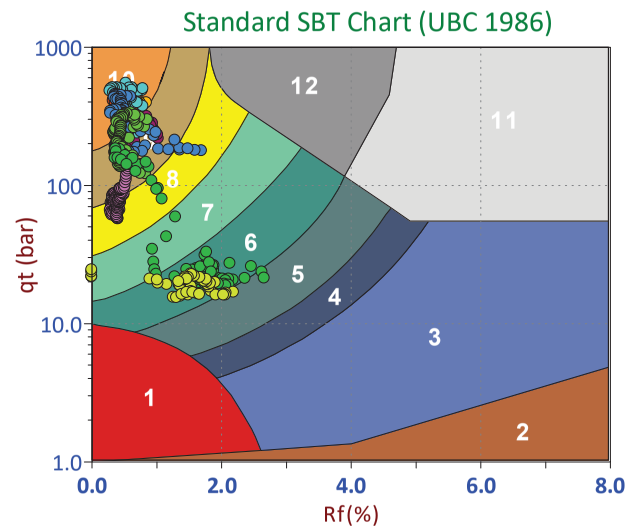
Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

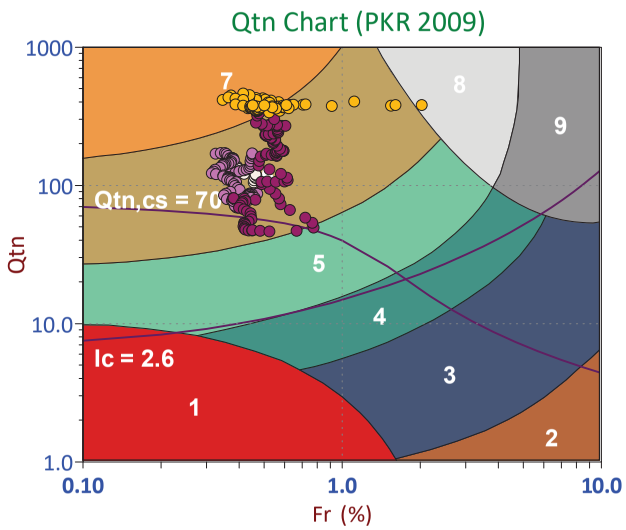
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

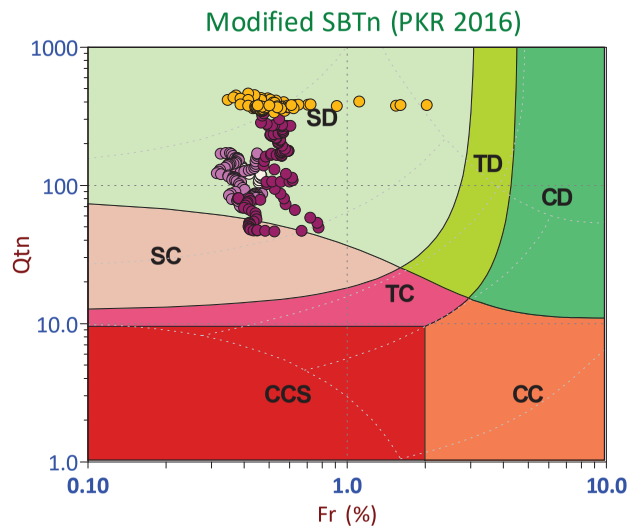
CONETEC

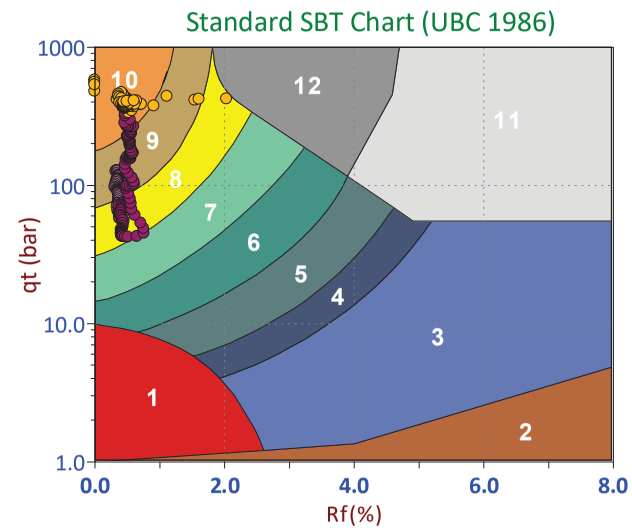
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

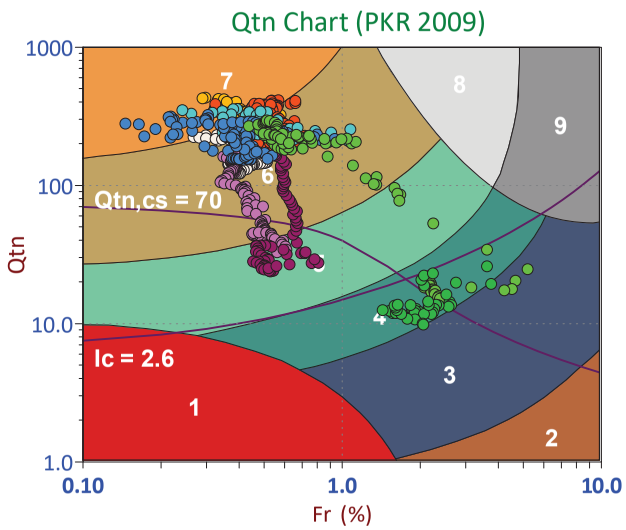
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

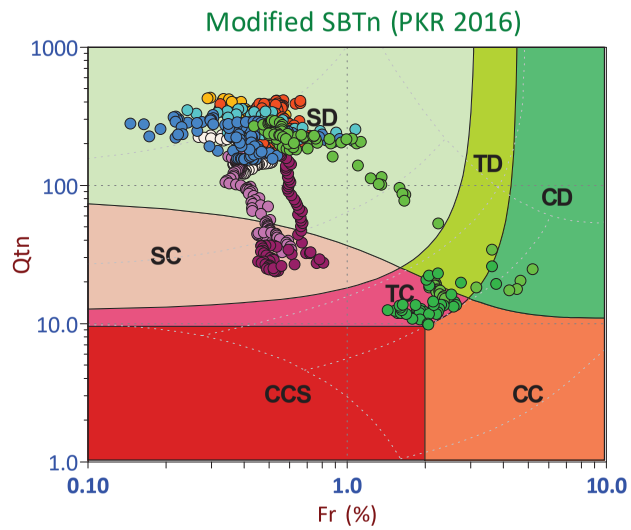
CONETEC

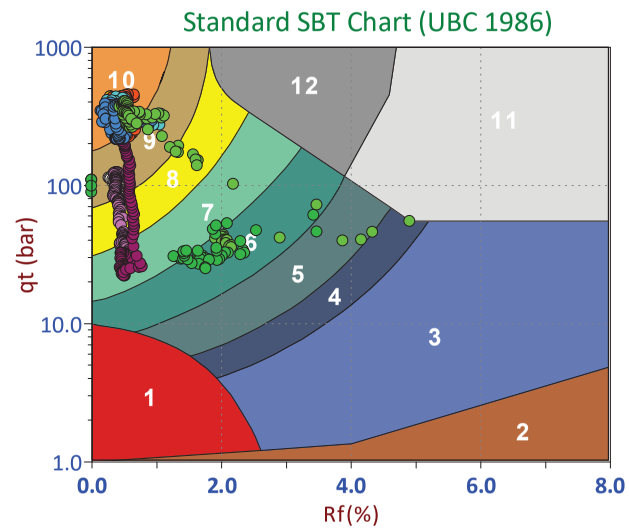
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

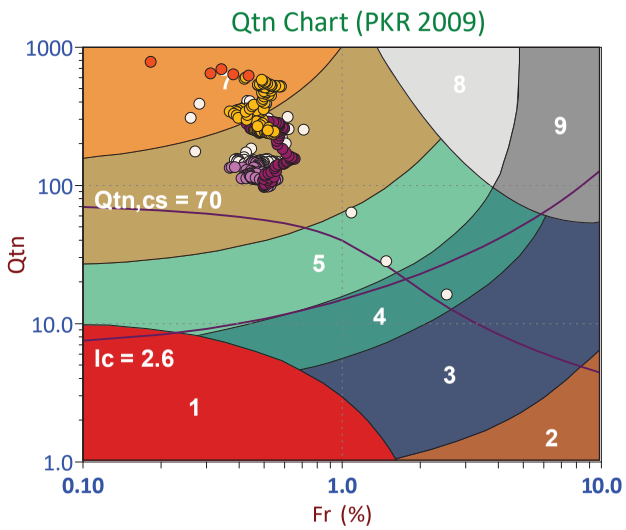
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

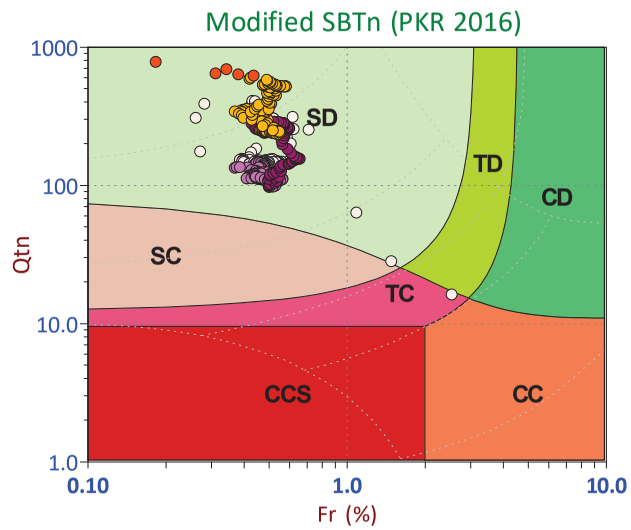
CONETEC

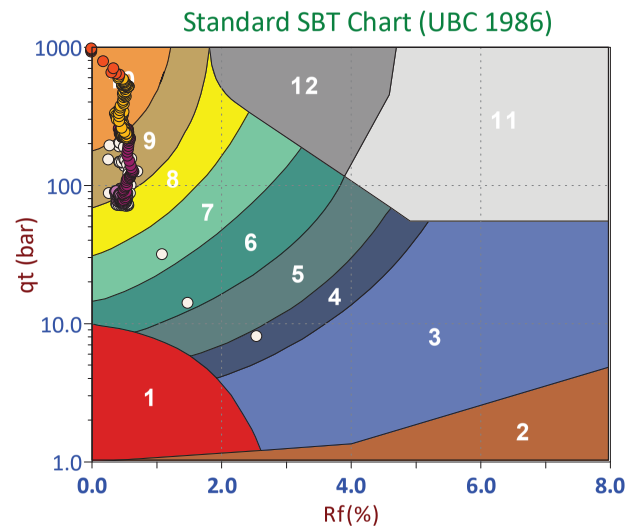
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

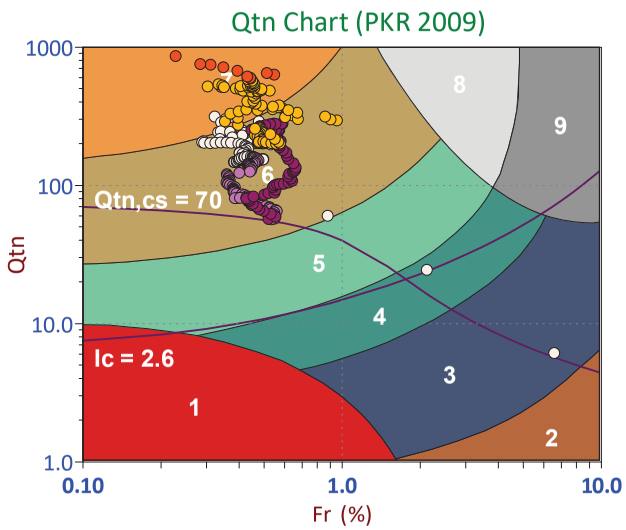
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

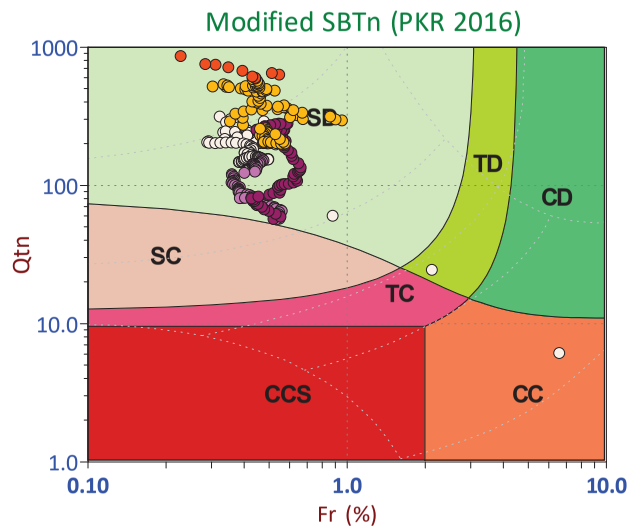
CONETEC

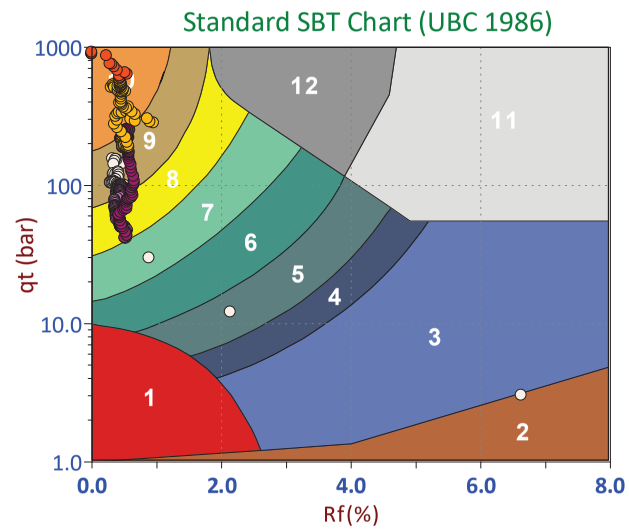
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35







Depth Ranges
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- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

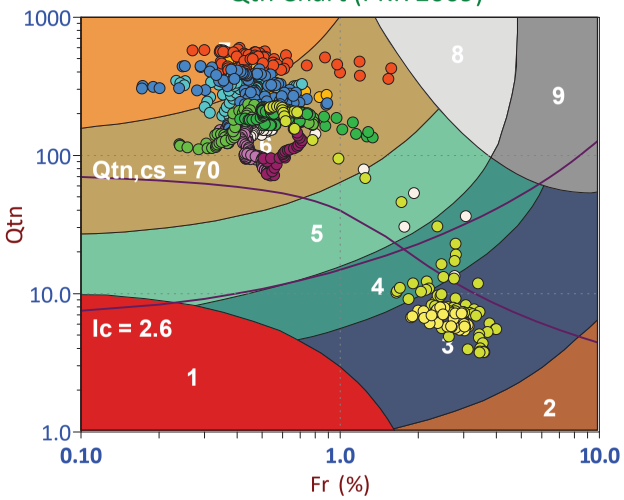
CONETEC

Arcadis

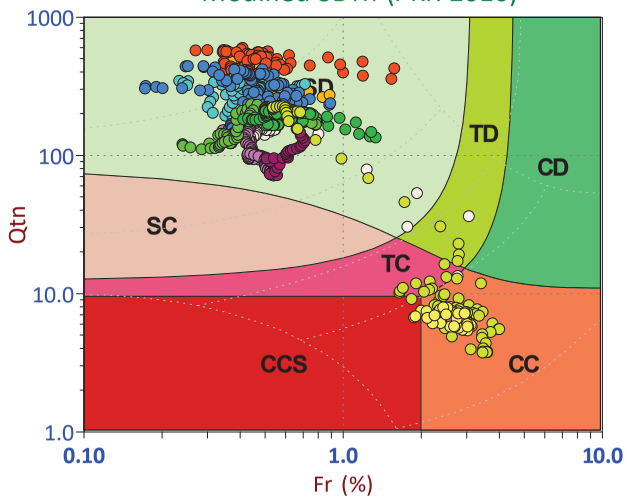
Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35

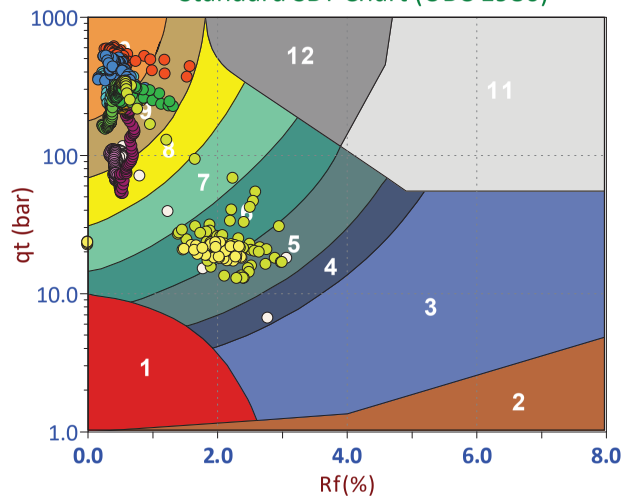
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
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- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

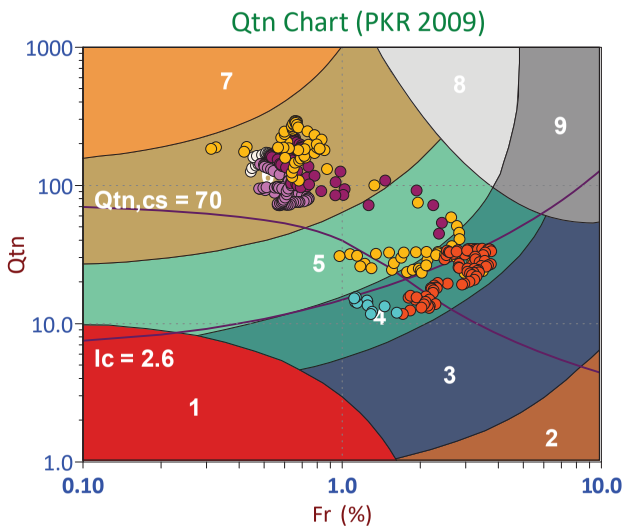
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

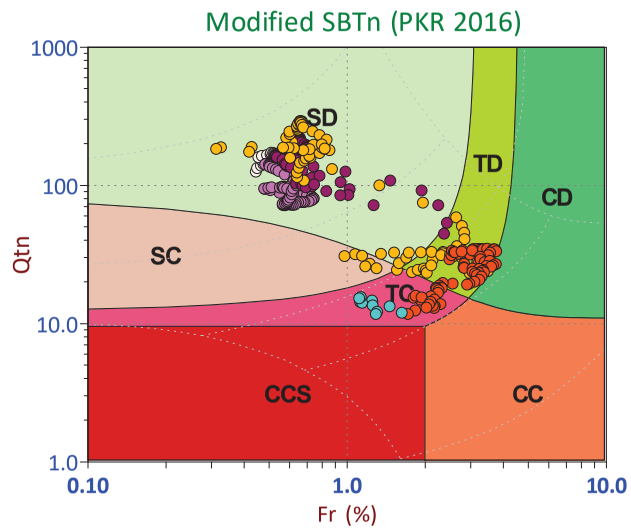
CONETEC

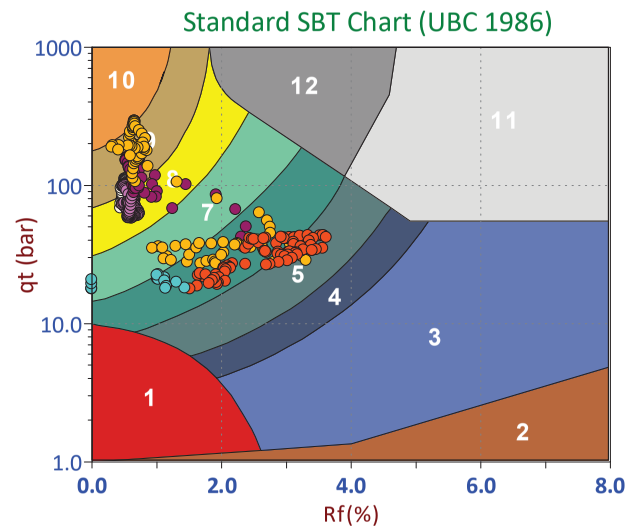
Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

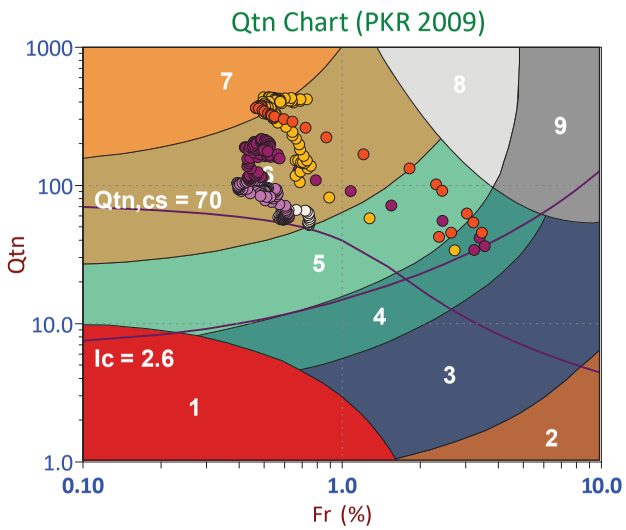
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

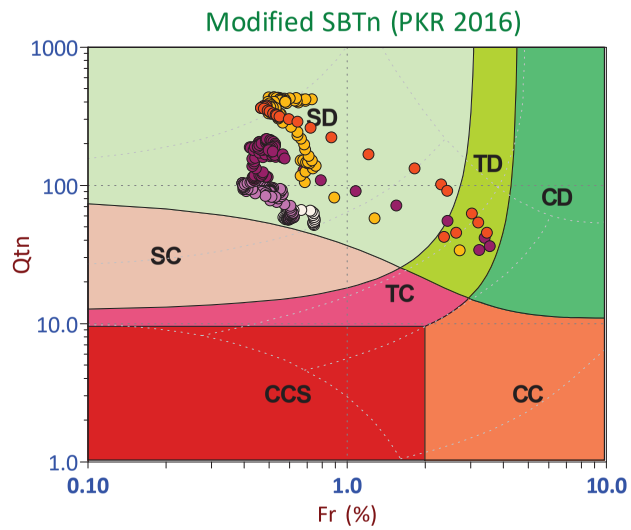
CONETEC

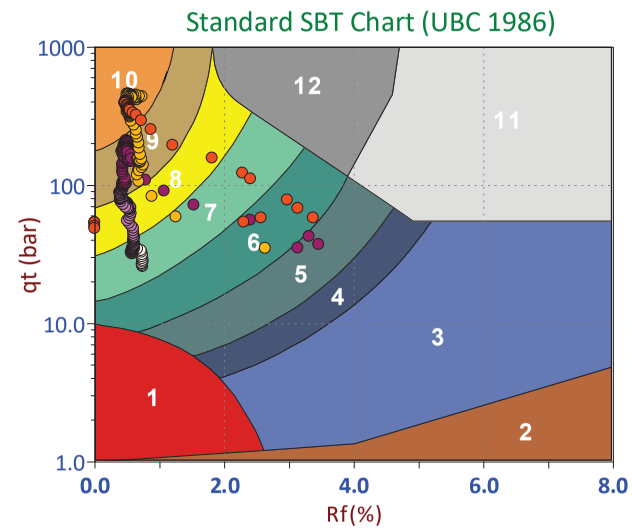
Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

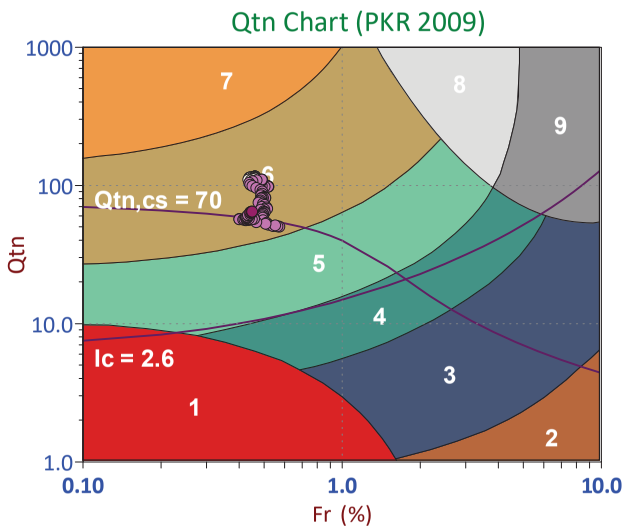
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

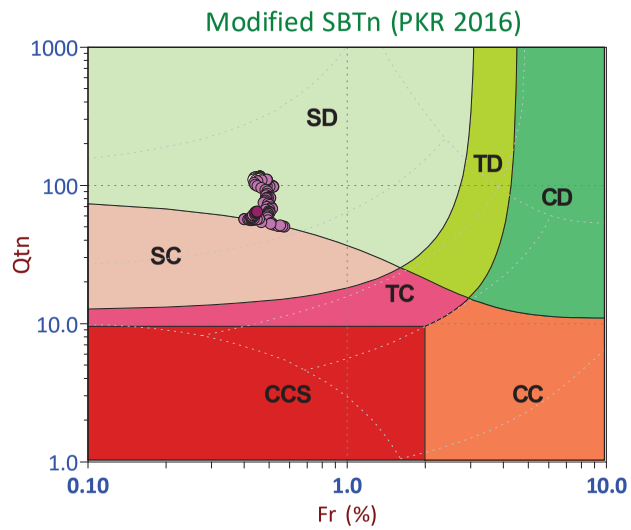
CONETEC

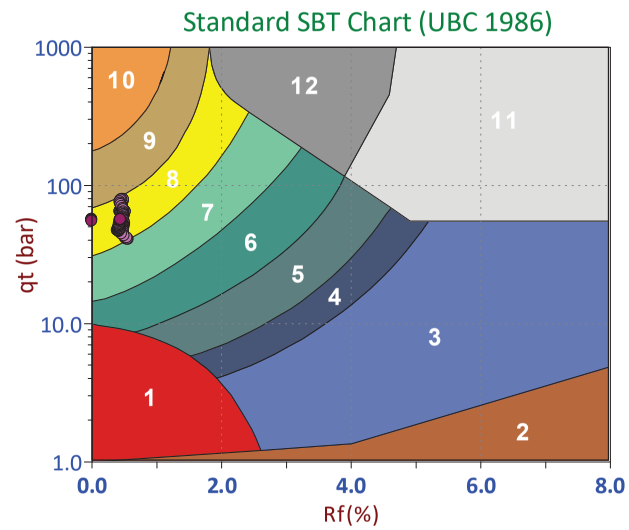
Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35







Depth Ranges
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- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

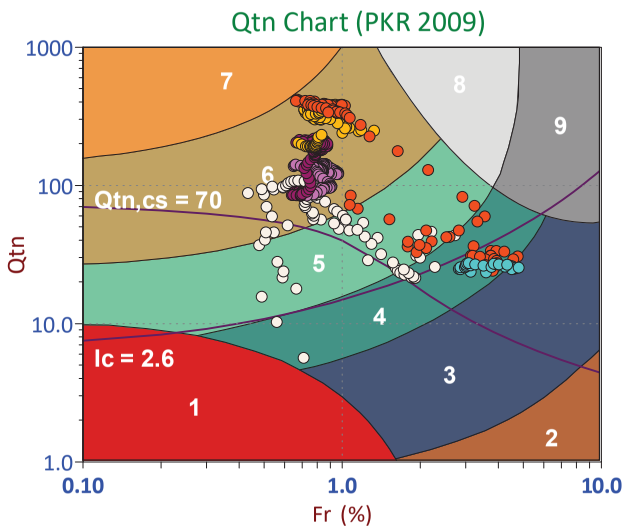
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

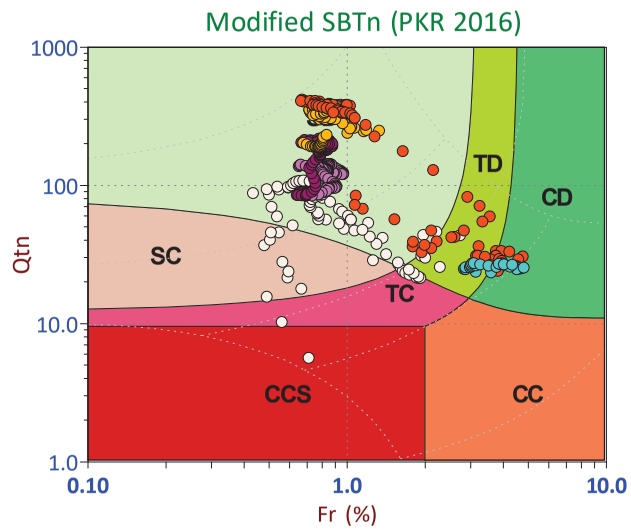
CONETEC

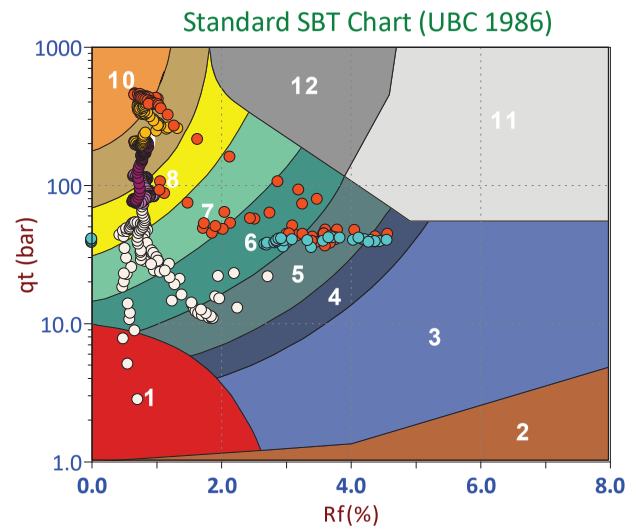
Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

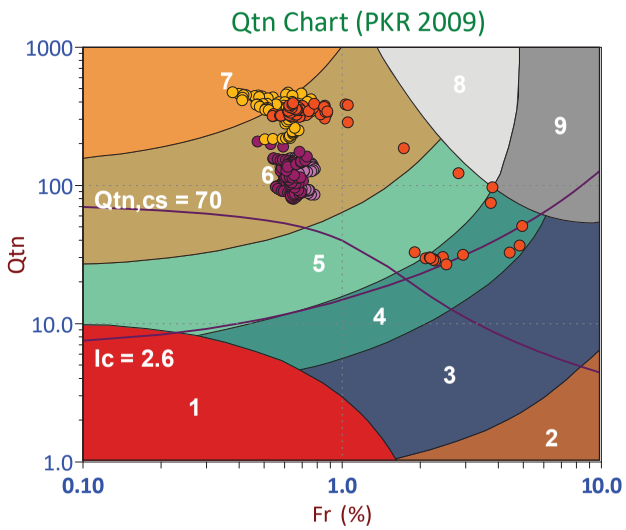
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

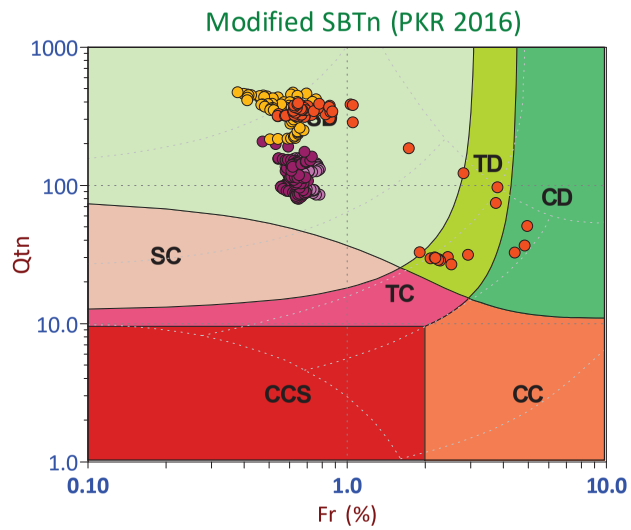
CONETEC

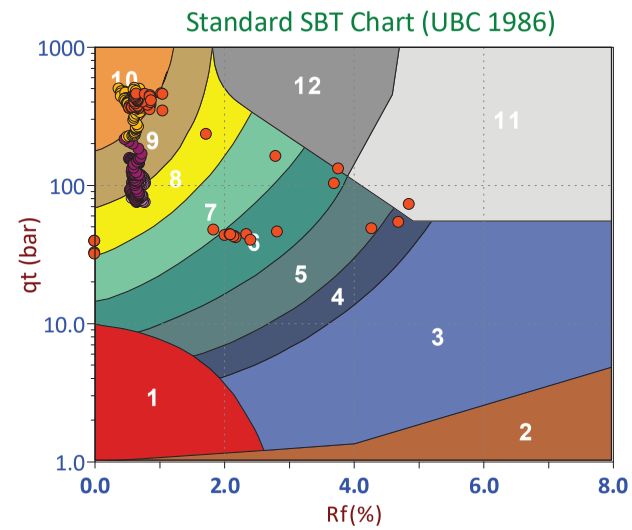
Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

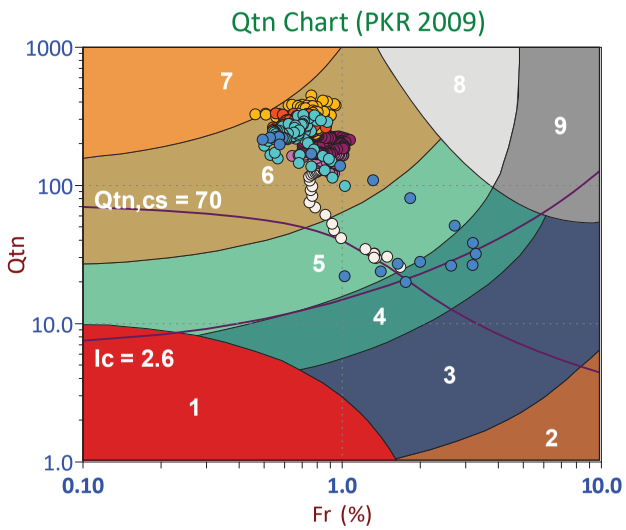
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

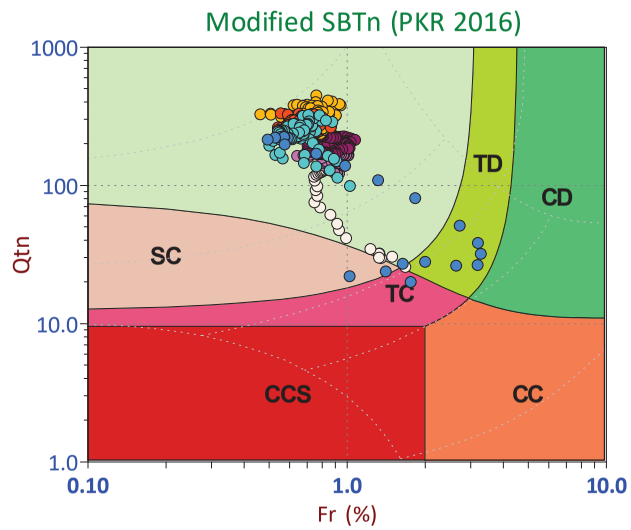
CONETEC

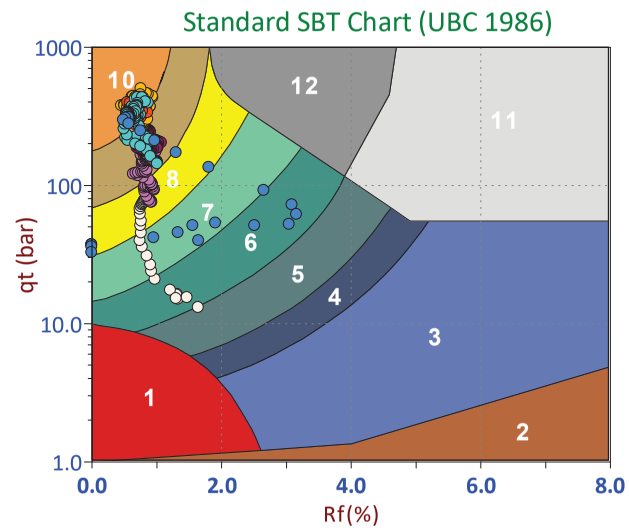
Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

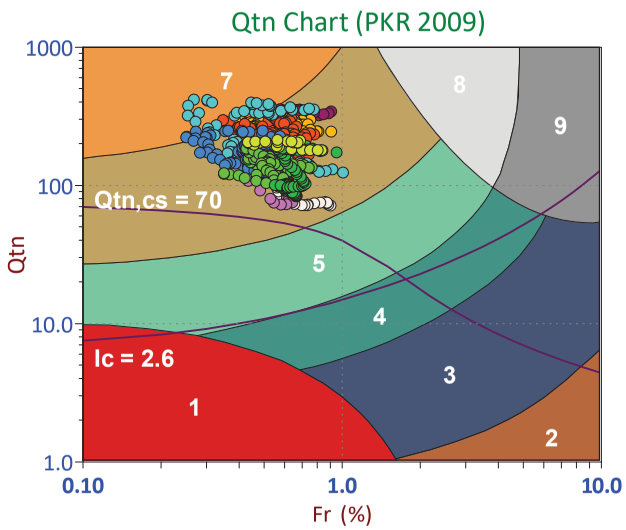
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

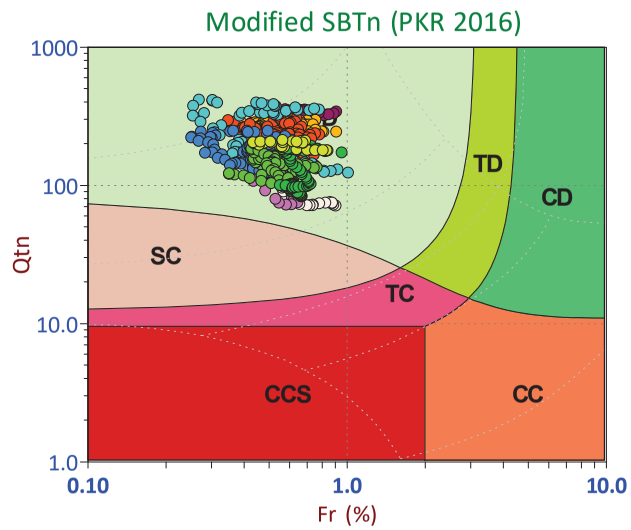
CONETEC

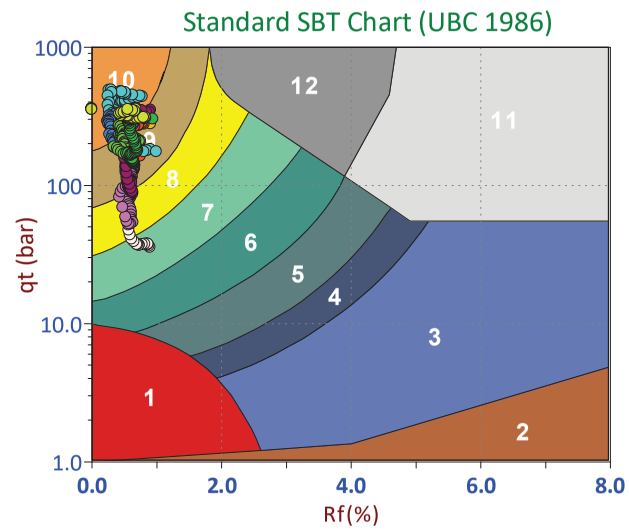
Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

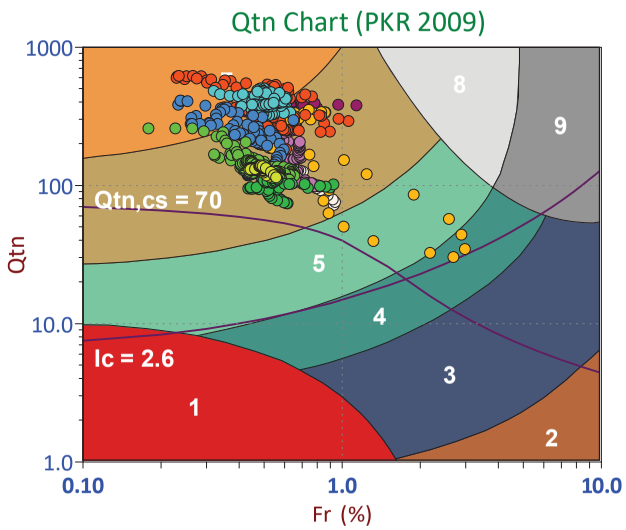
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

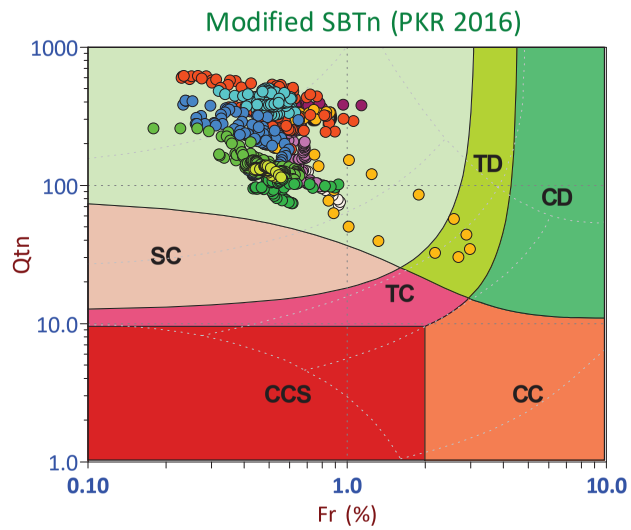
CONETEC

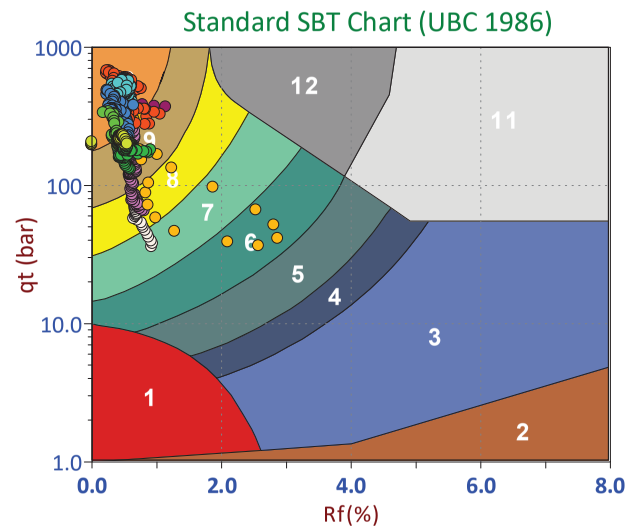
Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

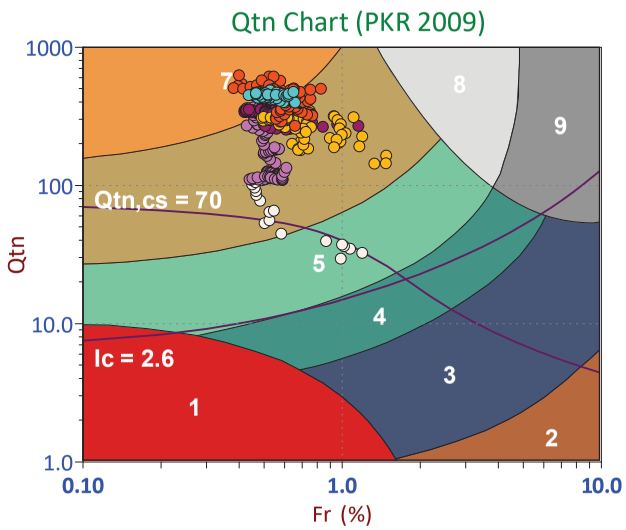
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

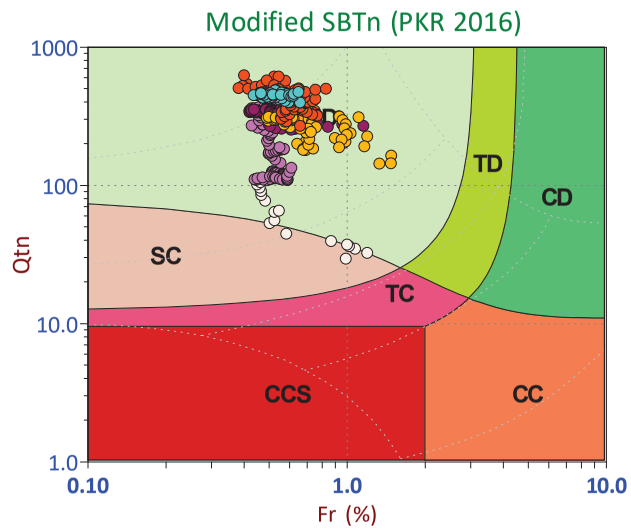
CONETEC

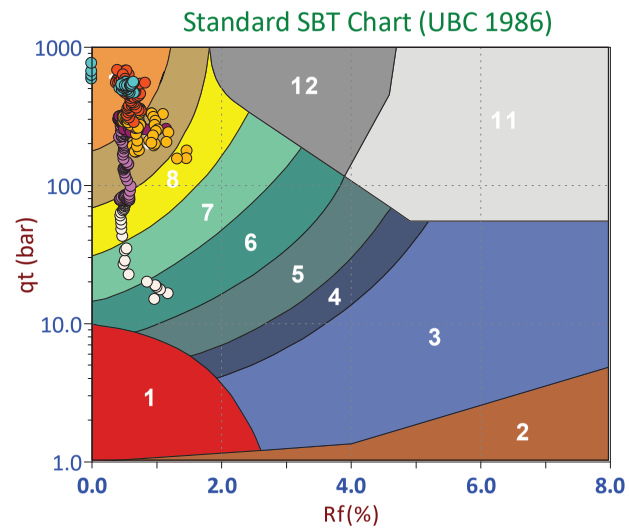
Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

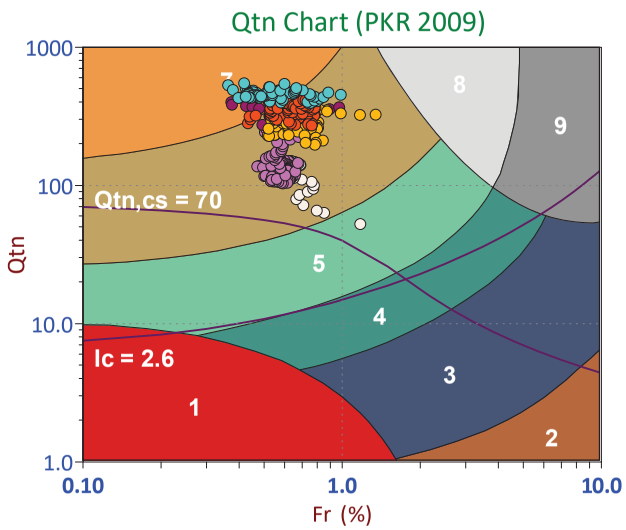
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

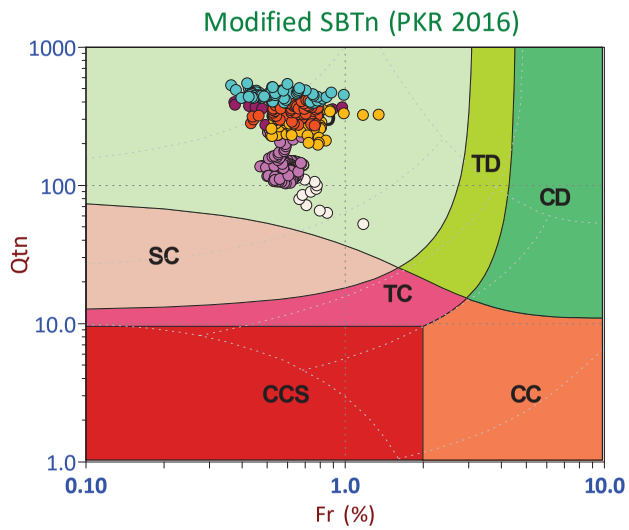
CONETEC

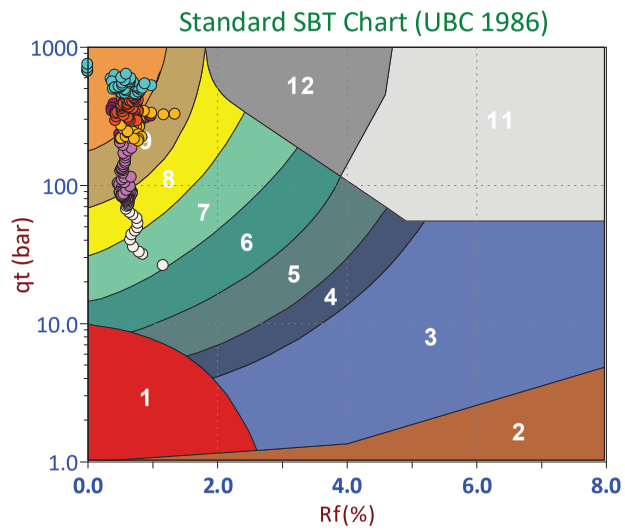
Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

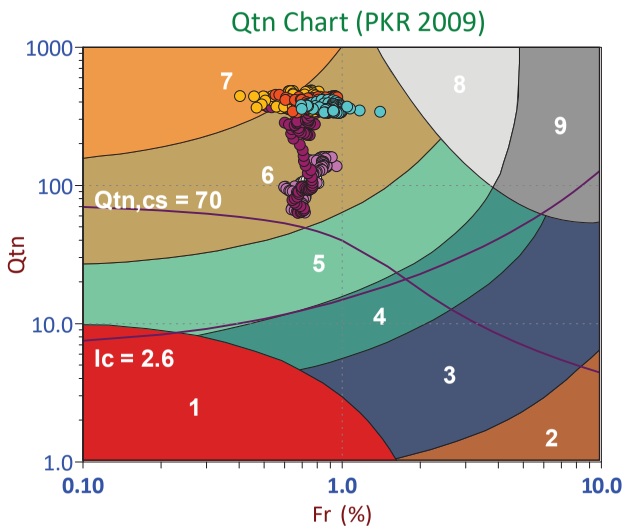
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

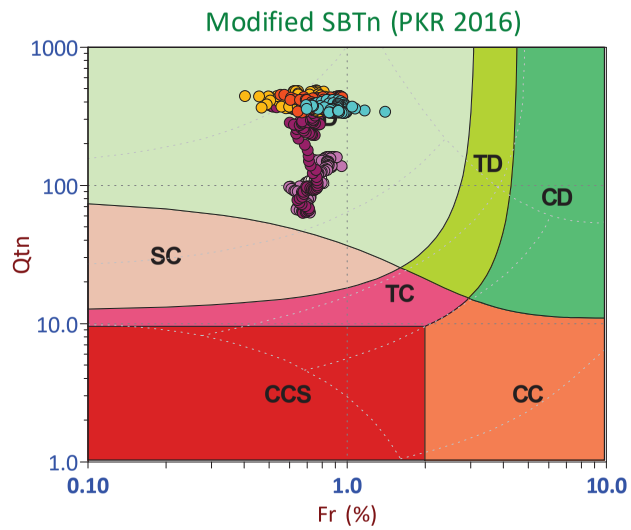
CONETEC

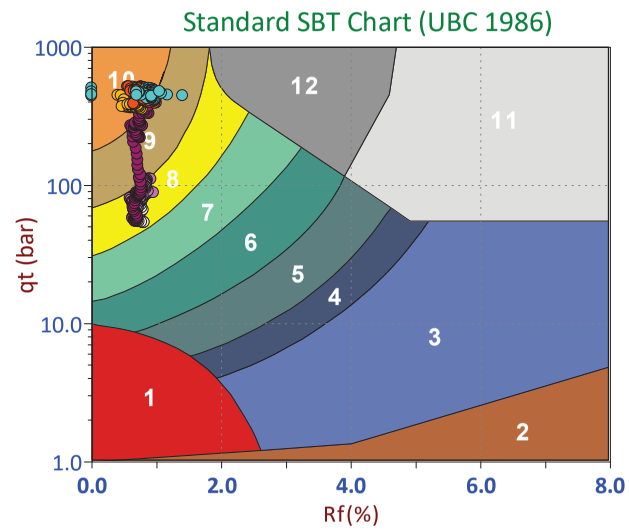
Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

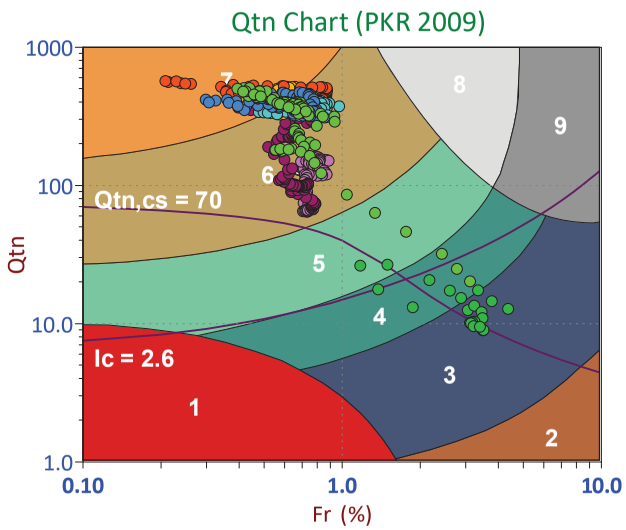
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

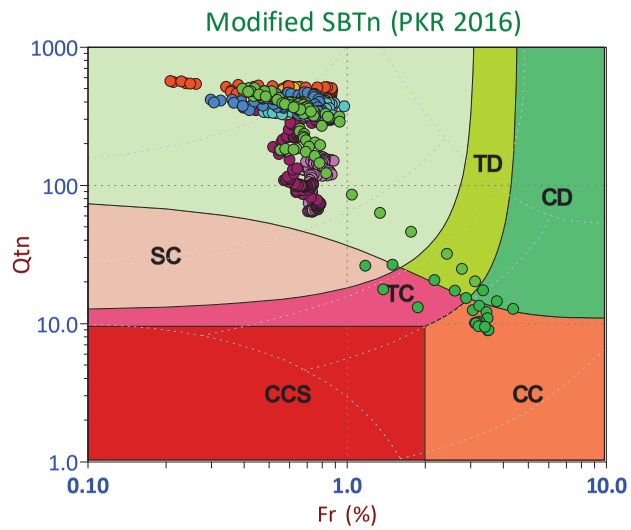
CONETEC

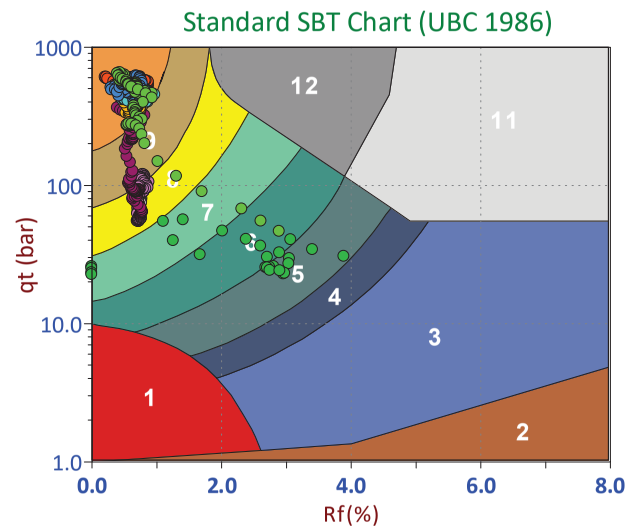
Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

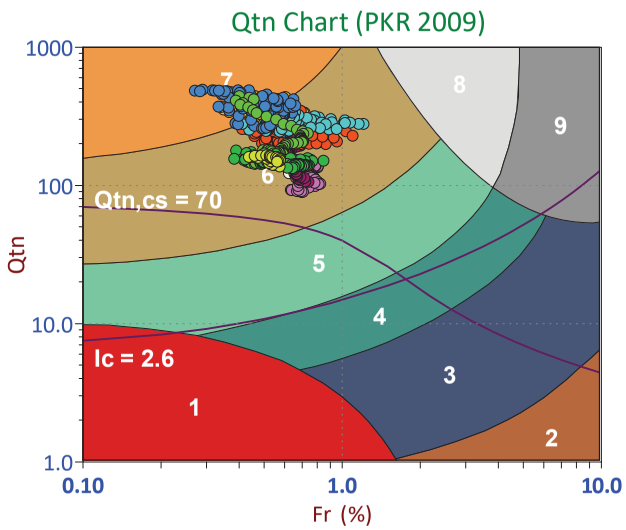
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

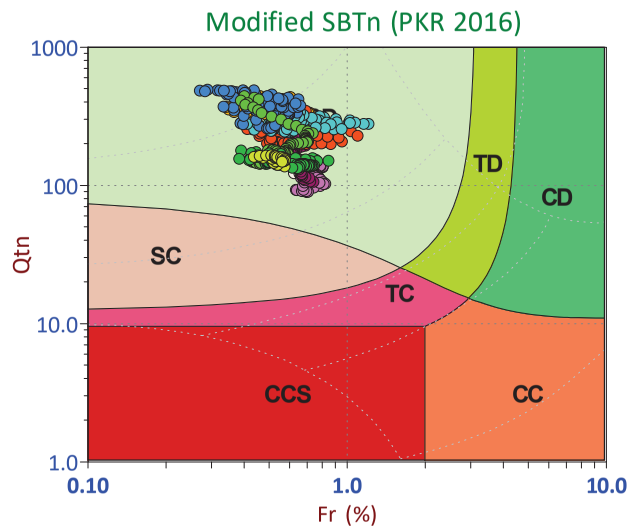
CONETEC

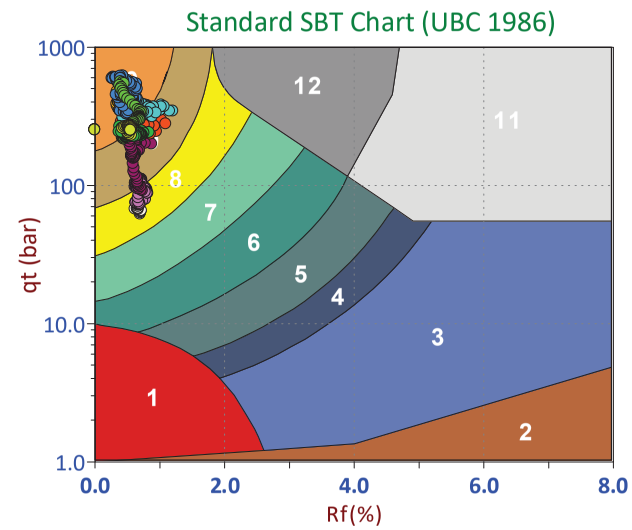
Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

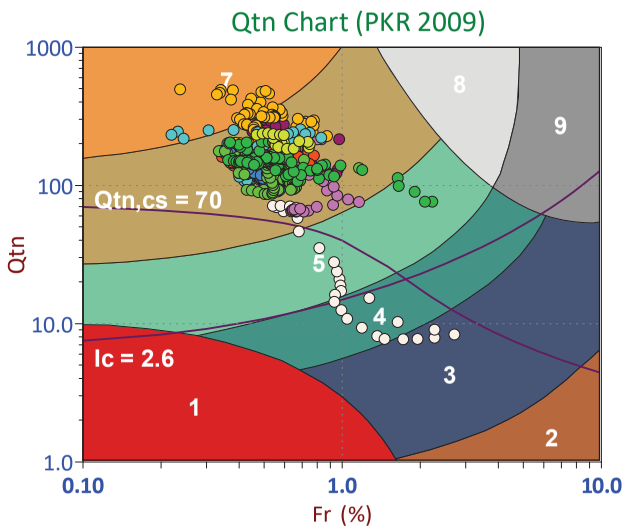
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

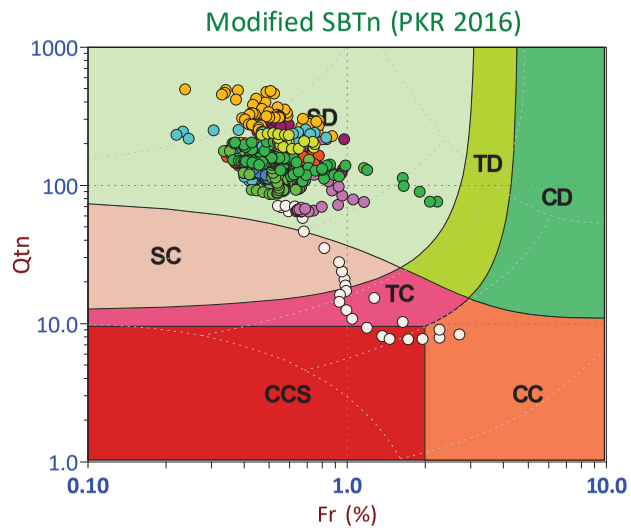
CONETEC

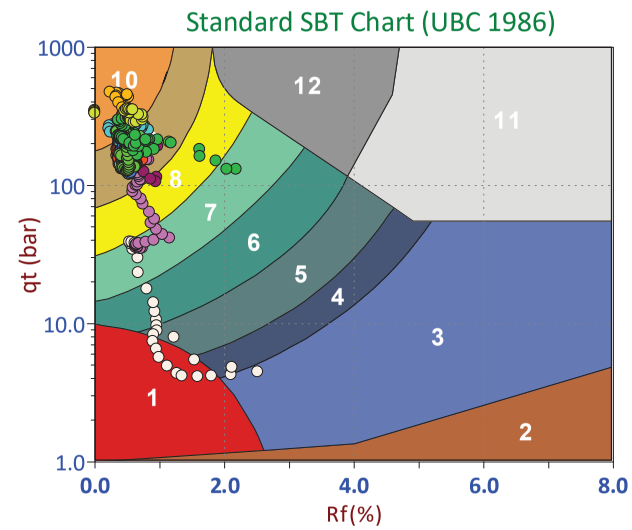
Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

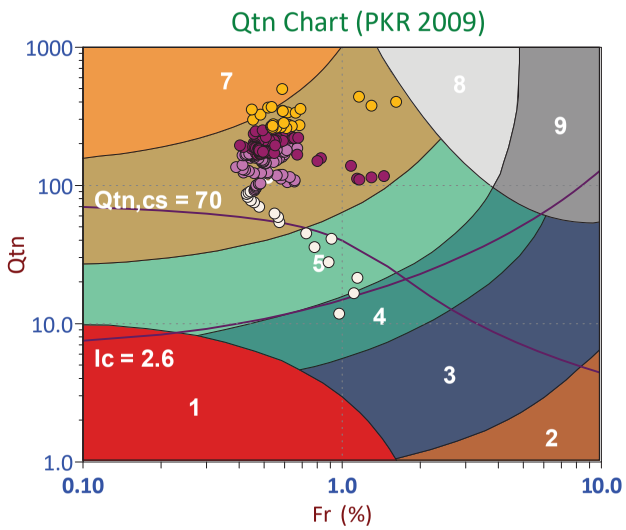
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

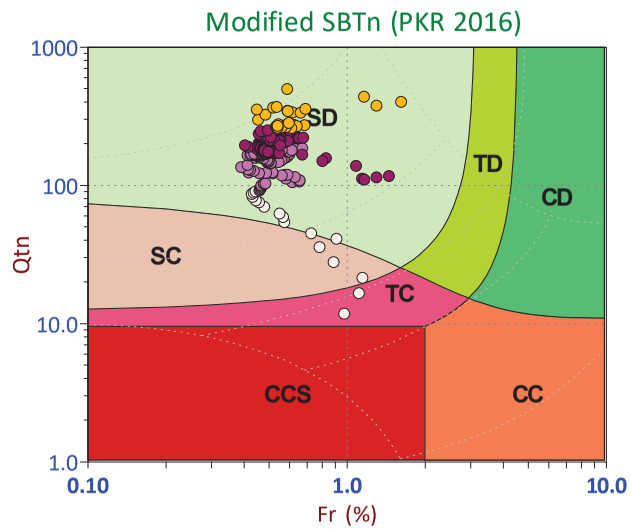
CONETEC

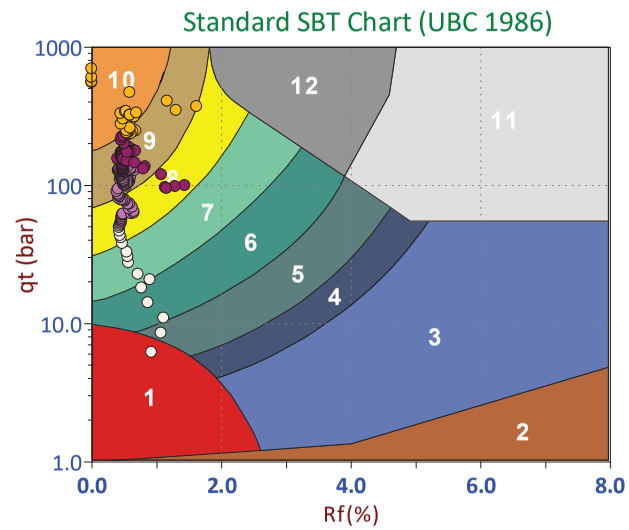
Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

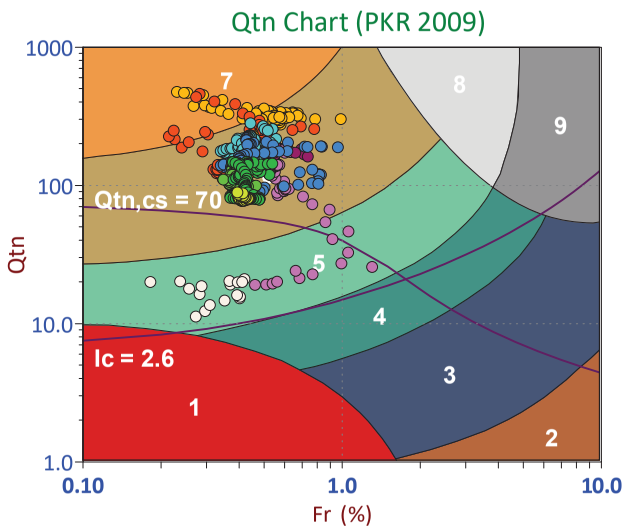
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

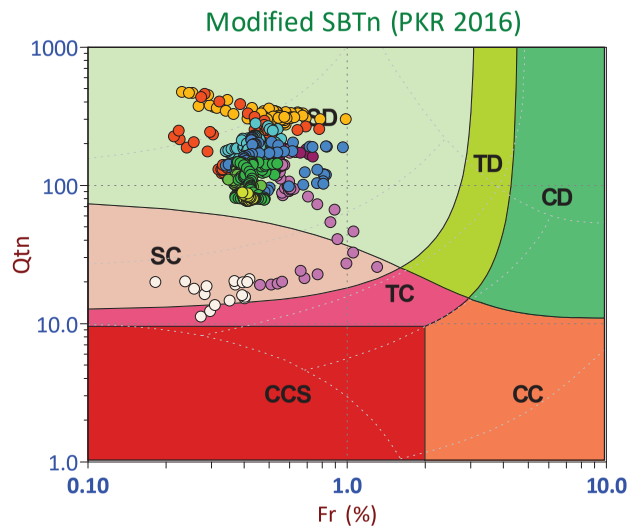
CONETEC

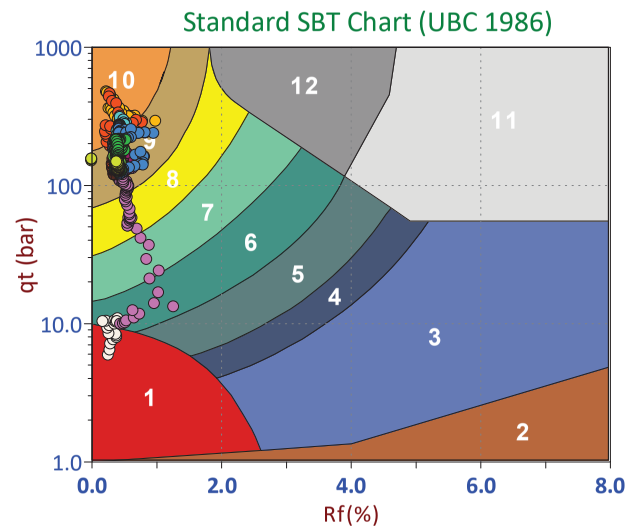
Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

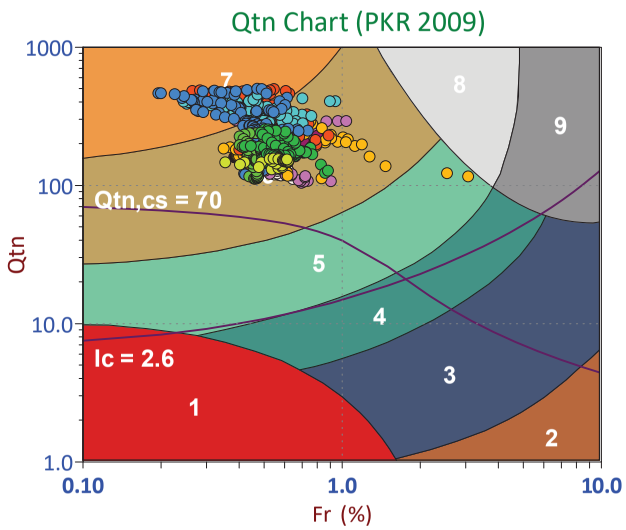
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

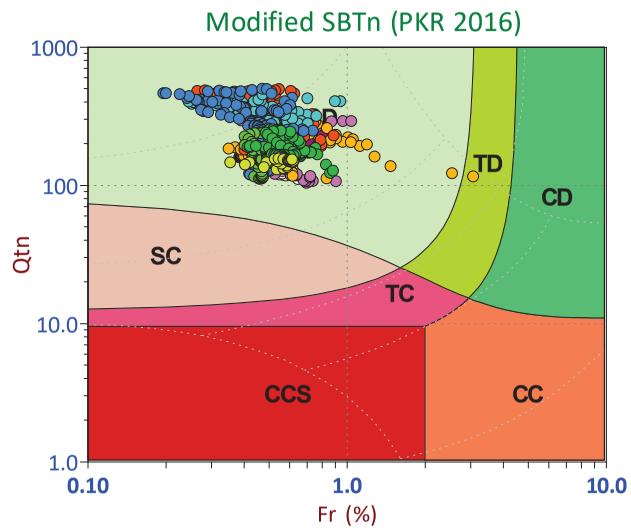
CONETEC

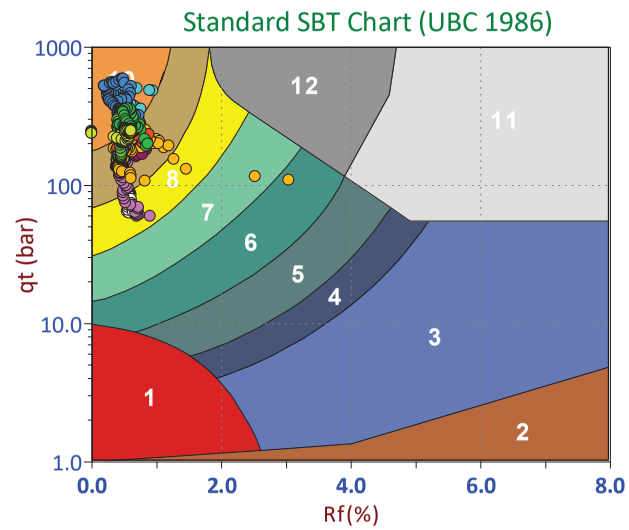
Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

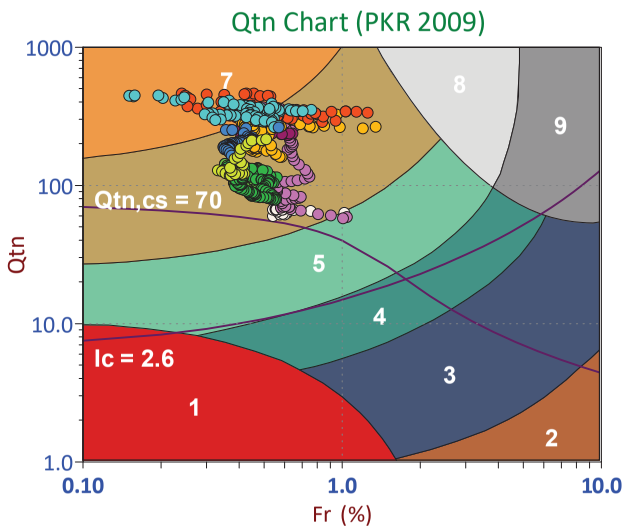
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

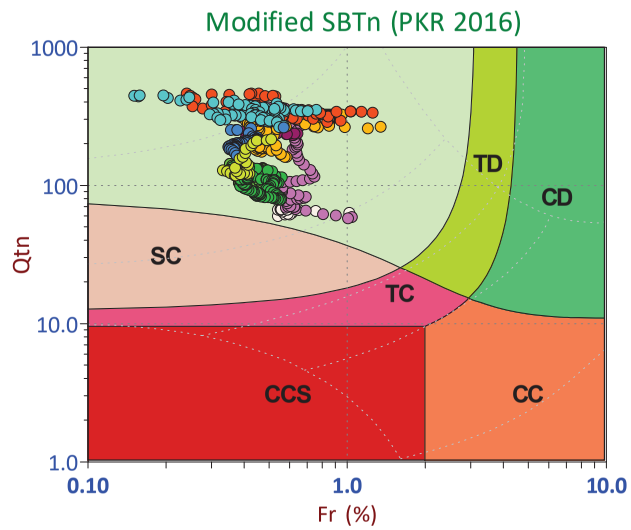
CONETEC

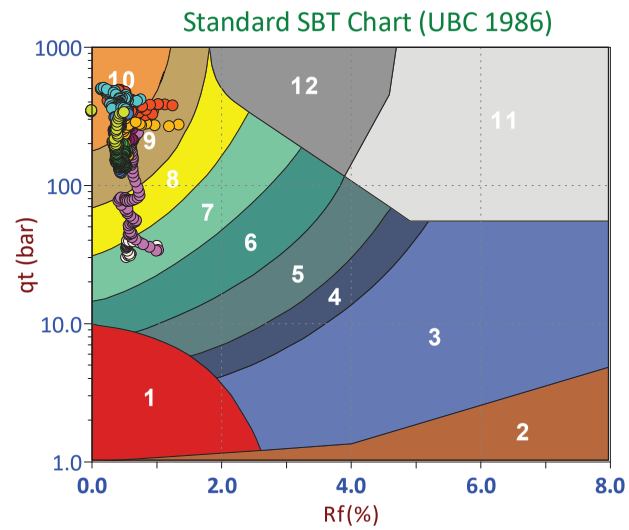
Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

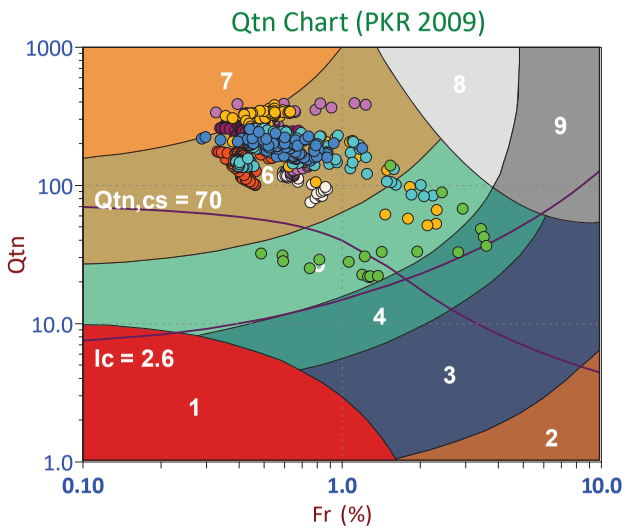
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

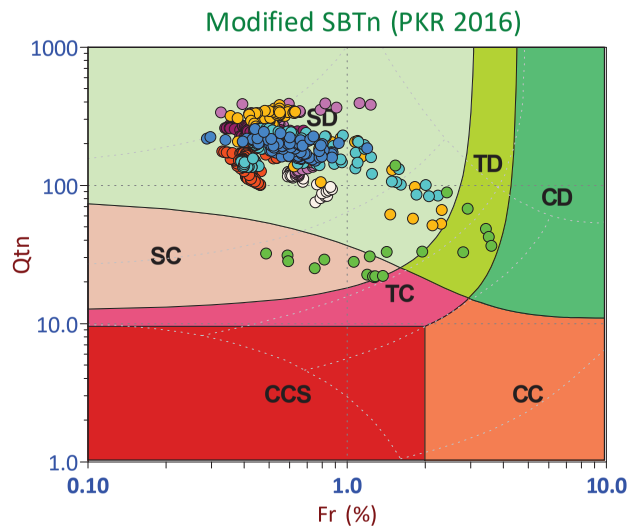
CONETEC

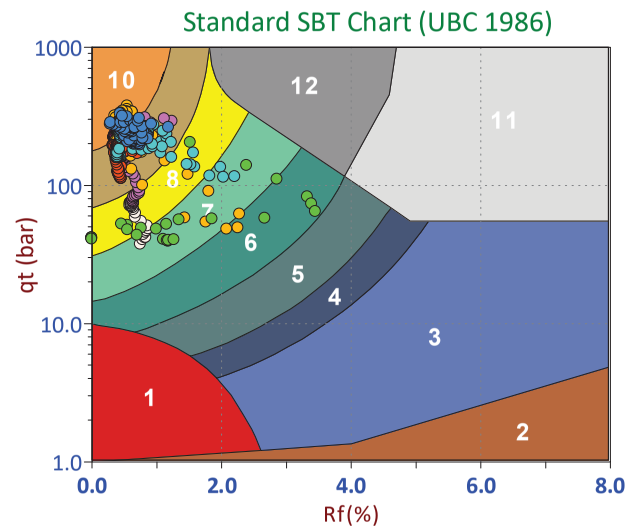
Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

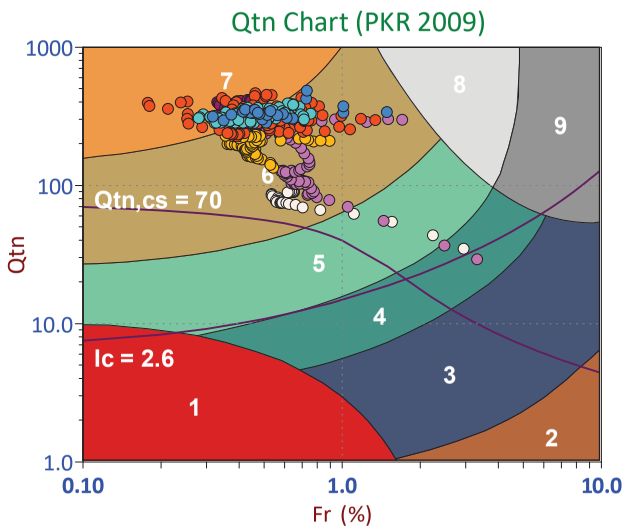
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

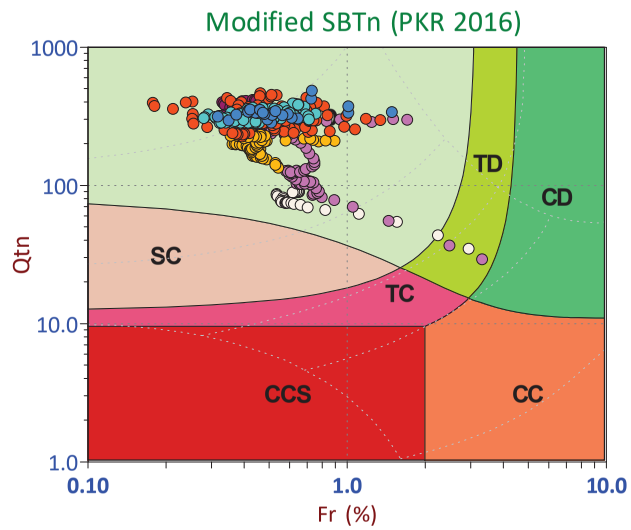
CONETEC

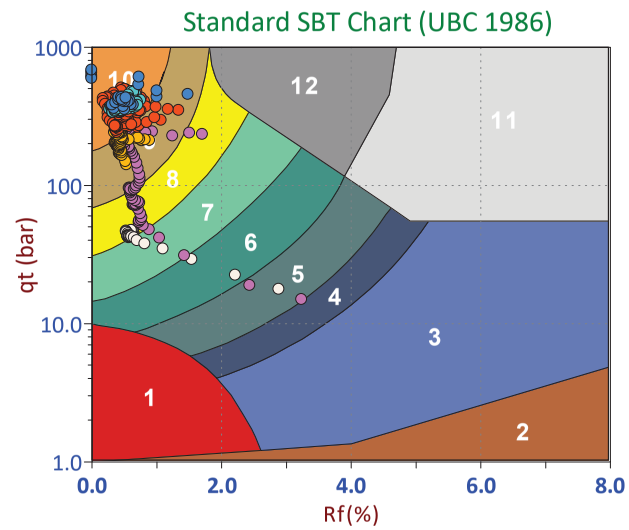
Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

CONETEC

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT21-VAP-13	21-61-22763_CPVAP-13	15	485	18.78	8.3	10.5				
CPT21-VAP-13	21-61-22763_CPVAP-13	15	345	45.03						
CPT21-VAP-16	21-61-22763_CPVAP-16	15	720	19.36	7.3	12.1				
CPT21-VAP-16A	21-61-22763_CPVAP-16A	15	260	41.99	28.8	13.2				
CPT21-VAP-17	21-61-22763_CPVAP-17	15	720	18.95	5.3	13.6				
CPT21-VAP-18	21-61-22763_CPVAP-18	15	780	32.23	19.0	13.2				
CPT21-VAP-19	21-61-22763_CPVAP-19	15	720	35.51	23.2	12.3				
CPT21-VAP-20	21-61-22763_CPVAP-20	15	300	15.67	5.7	9.9				
CPT21-VAP-21	21-61-22763_CPVAP-21	15	420	56.02	45.3	10.7				
CPT21-VAP-22	21-61-22763_CPVAP-22	15	660	25.43	13.6	11.8				
CPT21-VAP-24	21-61-22763_CPVAP-24	15	300	18.95	8.7	10.2				
CPT21-ASTC-VAP-25	21-61-22763_CPVAP-25	15	940	32.56						
CPT21-ASTC-VAP-25A	21-61-22763_CPVAP-25A	15	600	15.58	3.7	11.9				
CPT21-ASTC-VAP-26	21-61-22763_CPVAP-26	15	425	40.03						
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	15	900	25.84	11.2	14.7				
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	15	910	35.68	21.0		14.7	745	100	0.9
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	15	1200	26.00	6.6	19.4				
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	15	560	47.00	27.6		19.4	523	100	1.3
CPT21-ASTC-VAP-29	21-61-22763_CPVAP-29	15	1800	68.49	53.5	15.0				
CPT21-ASTC-VAP-30	21-61-22763_CPVAP-30	15	1200	29.12	18.4	10.7				

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT21-ASTC-VAP-31	21-61-22763_CPVAP-31	15	1500	25.59	17.1	8.5				
CPT21-ASTC-VAP-32	21-61-22763_CPVAP-32	15	1500	32.15	20.0	12.2				
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	15	1800	35.35	23.9	11.5				
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	15	485	70.21						
CPT21-ASTC-VAP-34	21-61-22763_CPVAP-34	15	600	59.63	54.1	5.5				
CPT21-ASTC-VAP-35	21-61-22763_CPVAP-35	15	600	21.65	16.4	5.2				
CPT21-ASTC-VAP-36	21-61-22763_CPVAP-36	15	1500	52.49	47.4	5.1				
CPT21-ASTC-VAP-37	21-61-22763_CPVAP-37	15	595	52.74	44.0	8.7				
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	15	1200	15.91	8.9	7.0				
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	15	370	54.54						
CPT21-ASTC-VAP-39	21-61-22763_CPVAP-39	15	900	25.75	16.2	9.5				
Totals	31 dissipations		421.6 min							

a. Time is relative to where umax occurred.

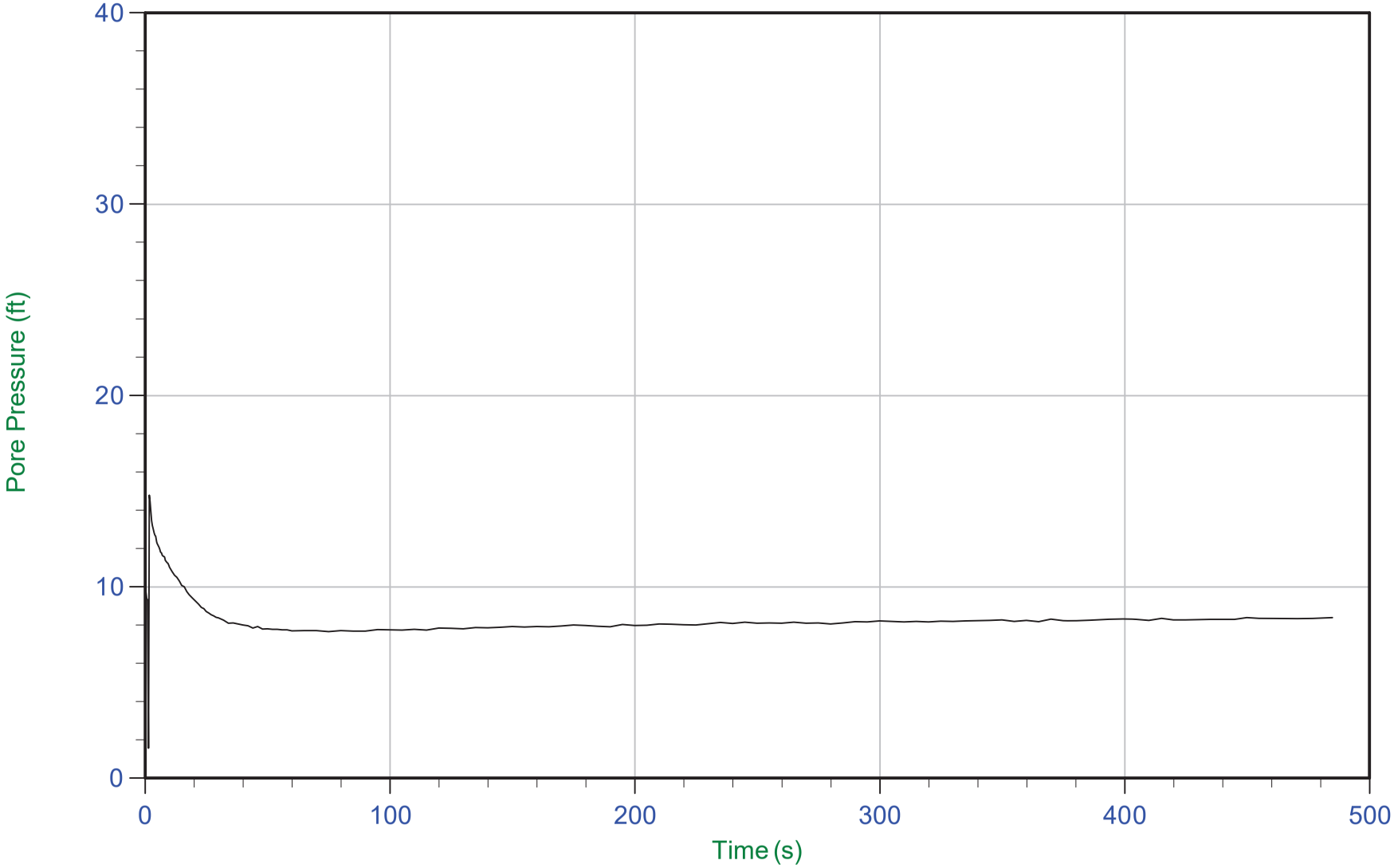
b. Houlsby and Teh, 1991.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/27/2021 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-13.ppd2
Depth: 5.725 m / 18.783 ft
Duration: 485.0 s

u Min: 1.6 ft
u Max: 14.8 ft
u Final: 8.4 ft

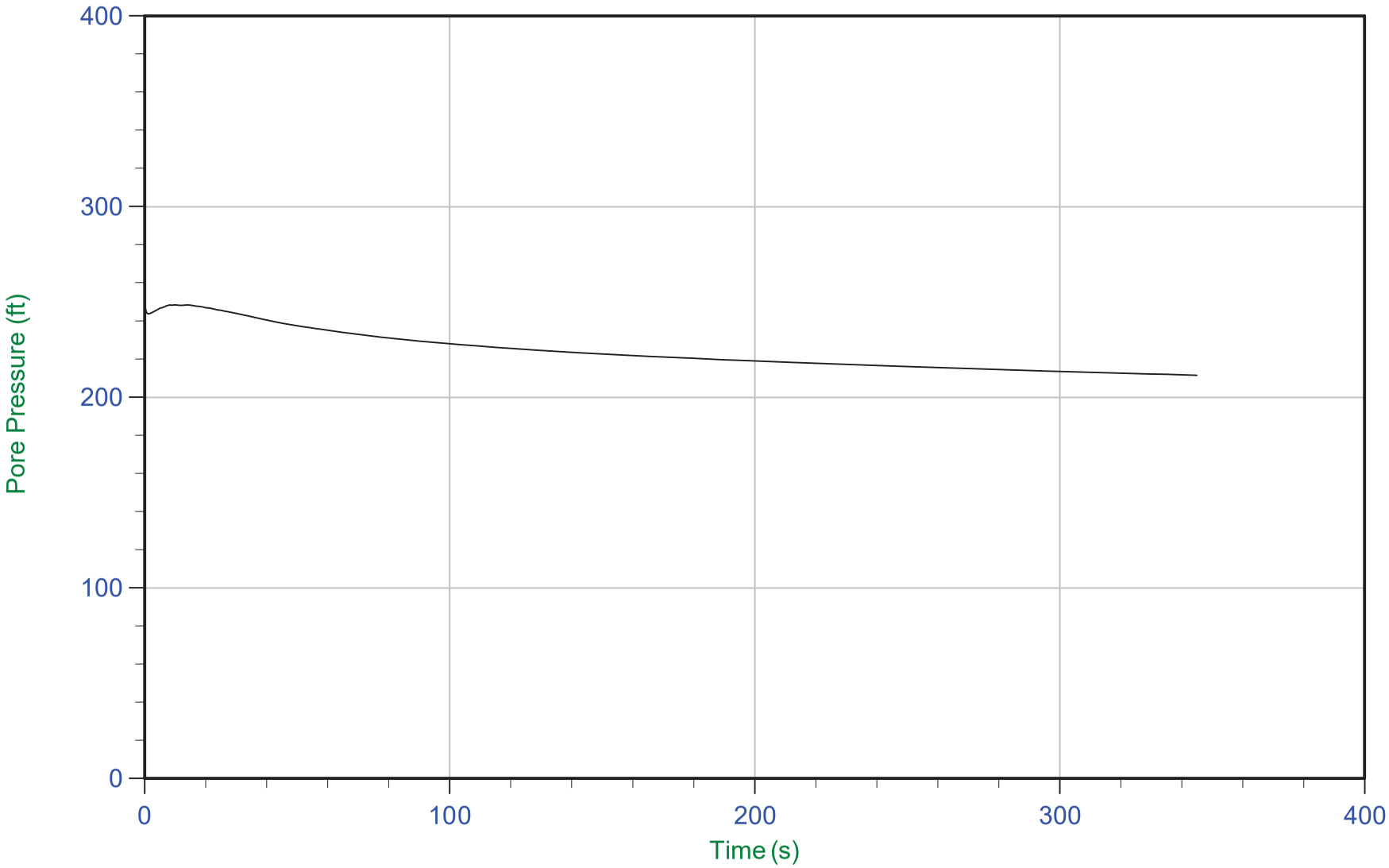
WT: 3.188 m / 10.460 ft
Ueq: 8.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/27/2021 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-13.ppd2
Depth: 13.725 m / 45.029 ft
Duration: 345.0 s

u Min: 211.5 ft
u Max: 249.1 ft
u Final: 211.5 ft

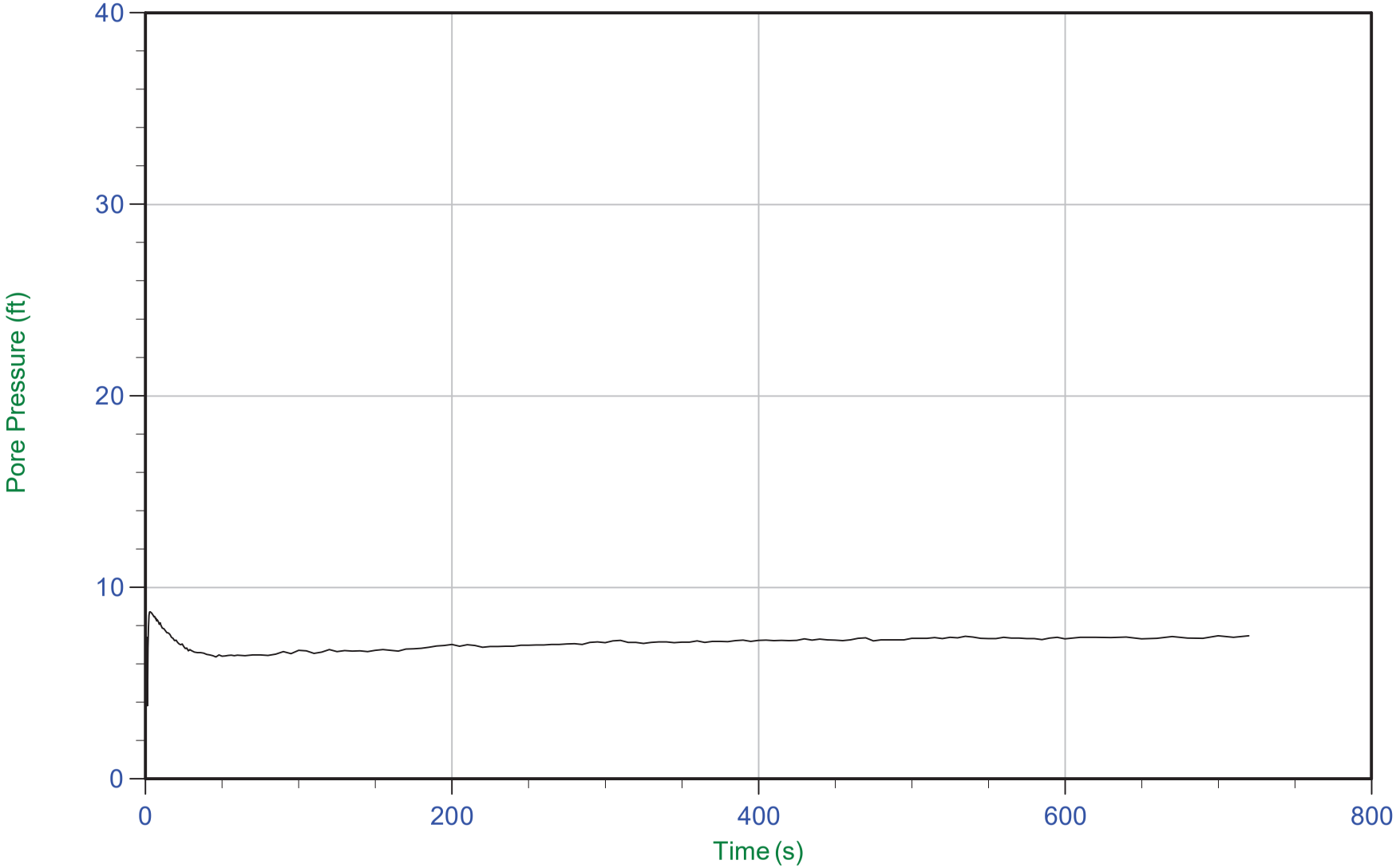
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/28/2021 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-16.ppd2
Depth: 5.900 m / 19.357 ft
Duration: 720.0 s

u Min: 3.8 ft
u Max: 8.7 ft
u Final: 7.5 ft

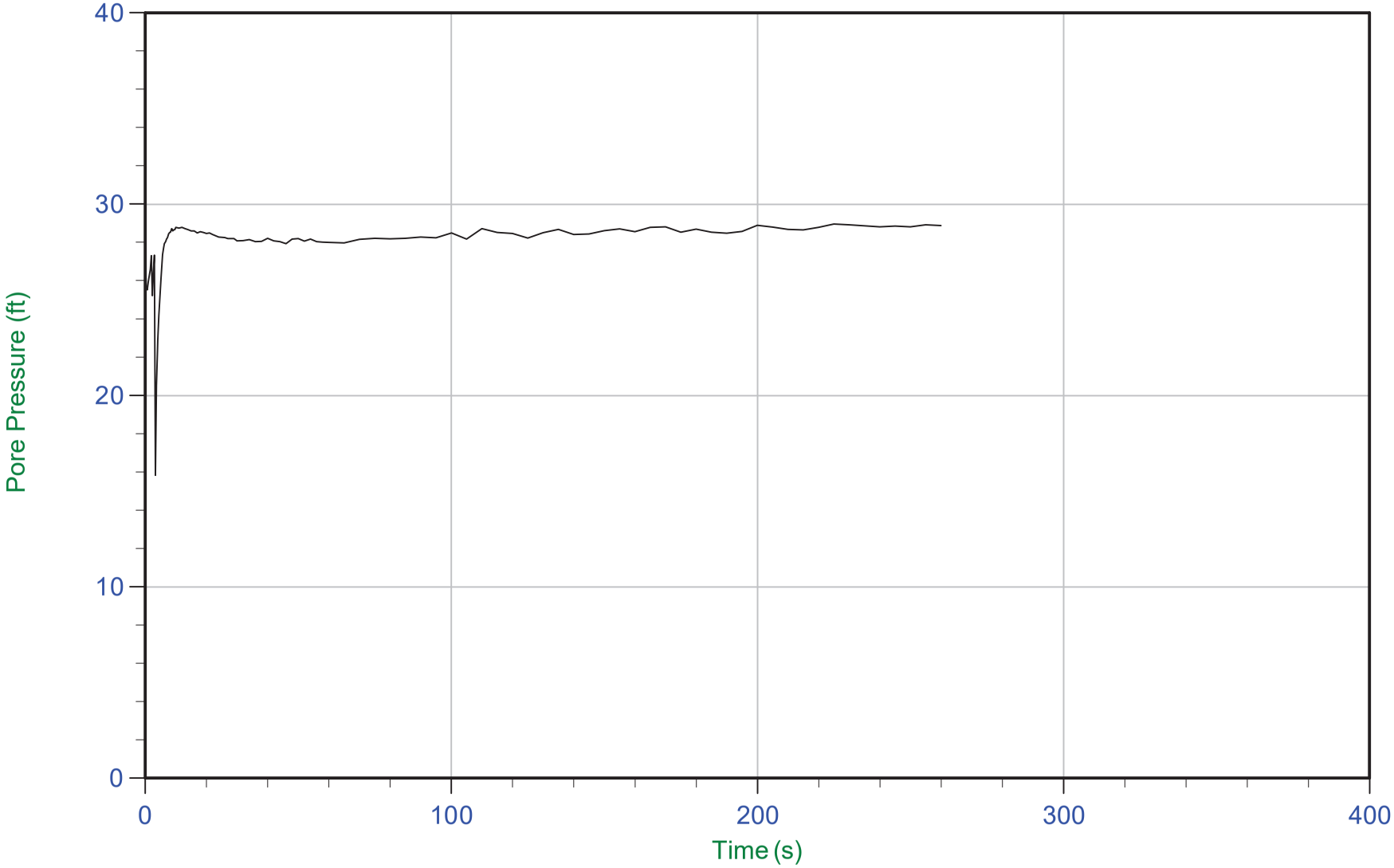
WT: 3.674 m / 12.053 ft
Ueq: 7.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/28/2021 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-16A.ppd2
Depth: 12.800 m / 41.994 ft
Duration: 260.0 s

u Min: 15.8 ft
u Max: 29.0 ft
u Final: 28.9 ft

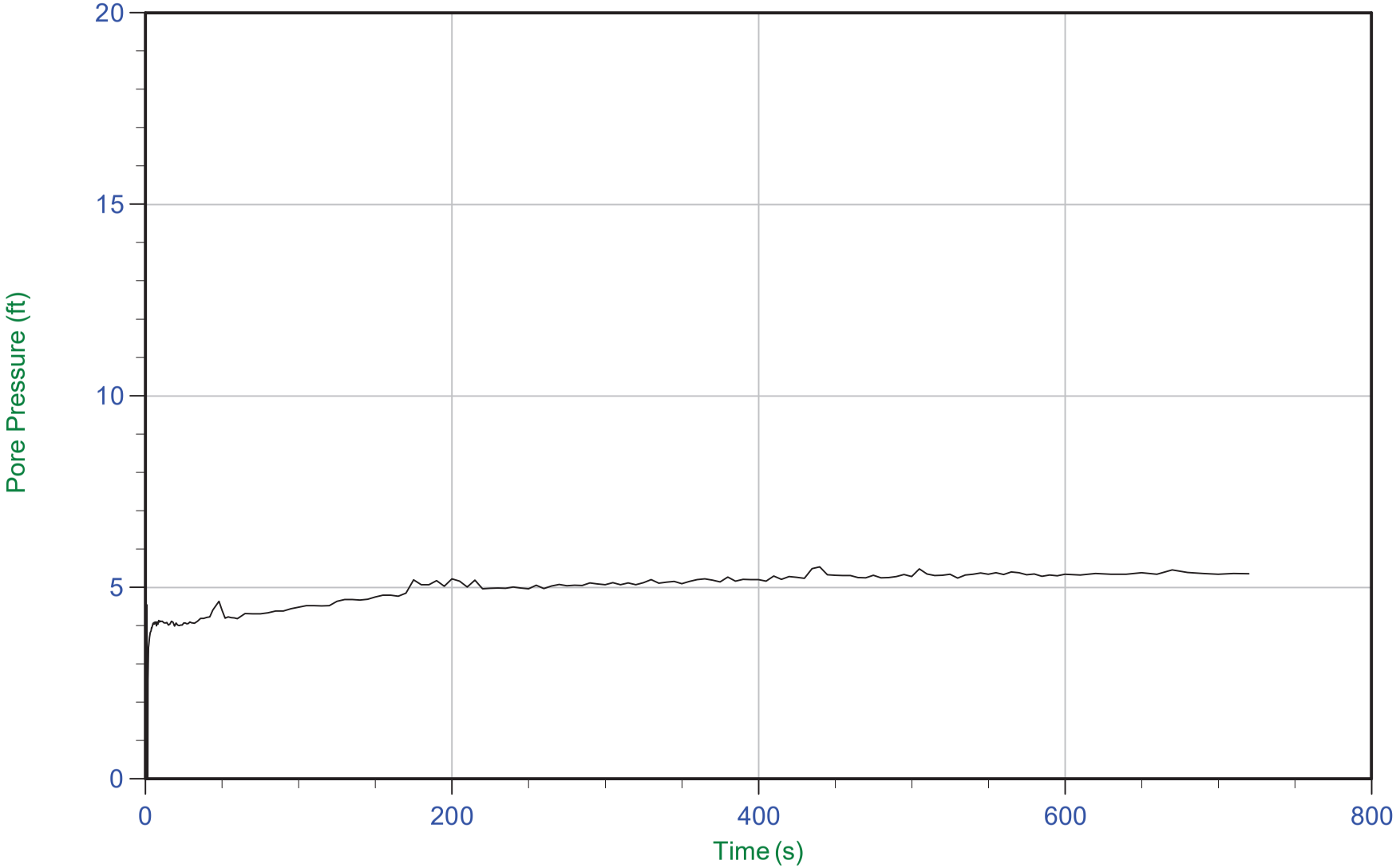
WT: 4.025 m / 13.205 ft
Ueq: 28.8 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/29/2021 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-17.ppd2
Depth: 5.775 m / 18.947 ft
Duration: 720.0 s

u Min: -7.1 ft
u Max: 5.5 ft
u Final: 5.4 ft

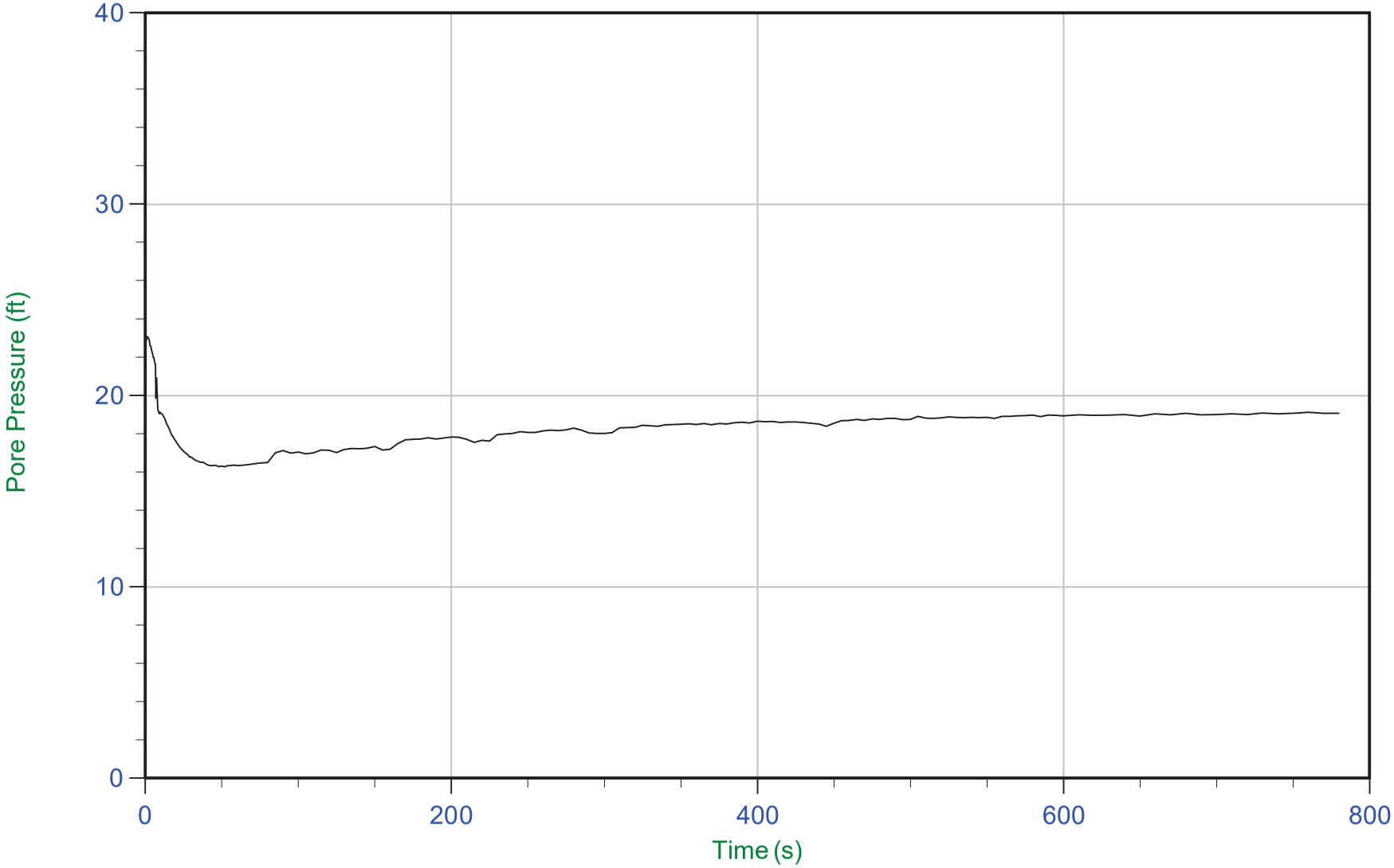
WT: 4.157 m / 13.639 ft
Ueq: 5.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-18.ppd2
Depth: 9.825 m / 32.234 ft
Duration: 780.0 s

u Min: 16.3 ft
u Max: 23.1 ft
u Final: 19.1 ft

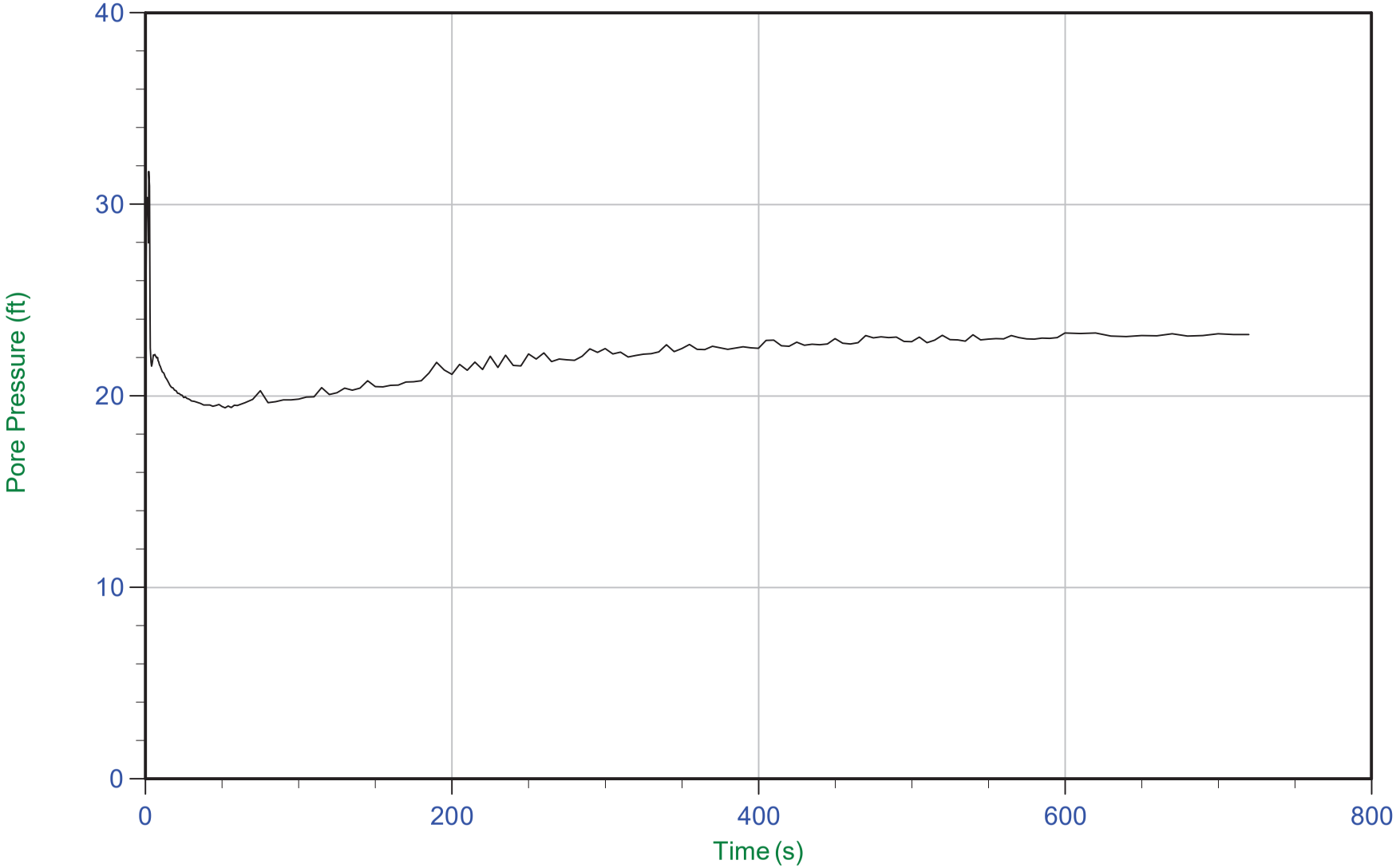
WT: 4.027 m / 13.211 ft
Ueq: 19.0 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-19.ppd2
Depth: 10.825 m / 35.515 ft
Duration: 720.0 s

u Min: 19.4 ft
u Max: 31.7 ft
u Final: 23.2 ft

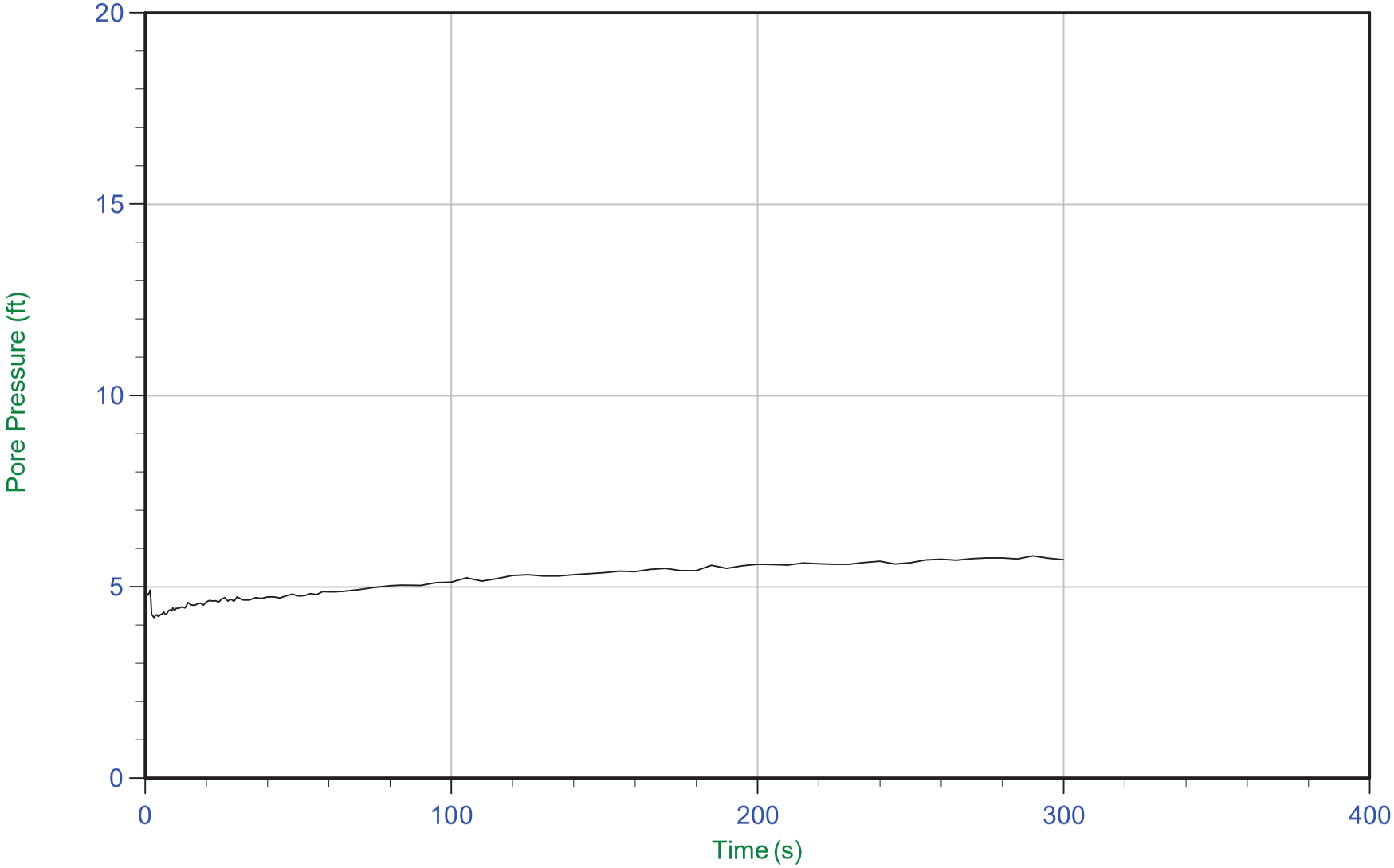
WT: 3.758 m / 12.330 ft
Ueq: 23.2 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-20.ppd2
Depth: 4.775 m / 15.666 ft
Duration: 300.0 s

u Min: 4.2 ft
u Max: 5.8 ft
u Final: 5.7 ft

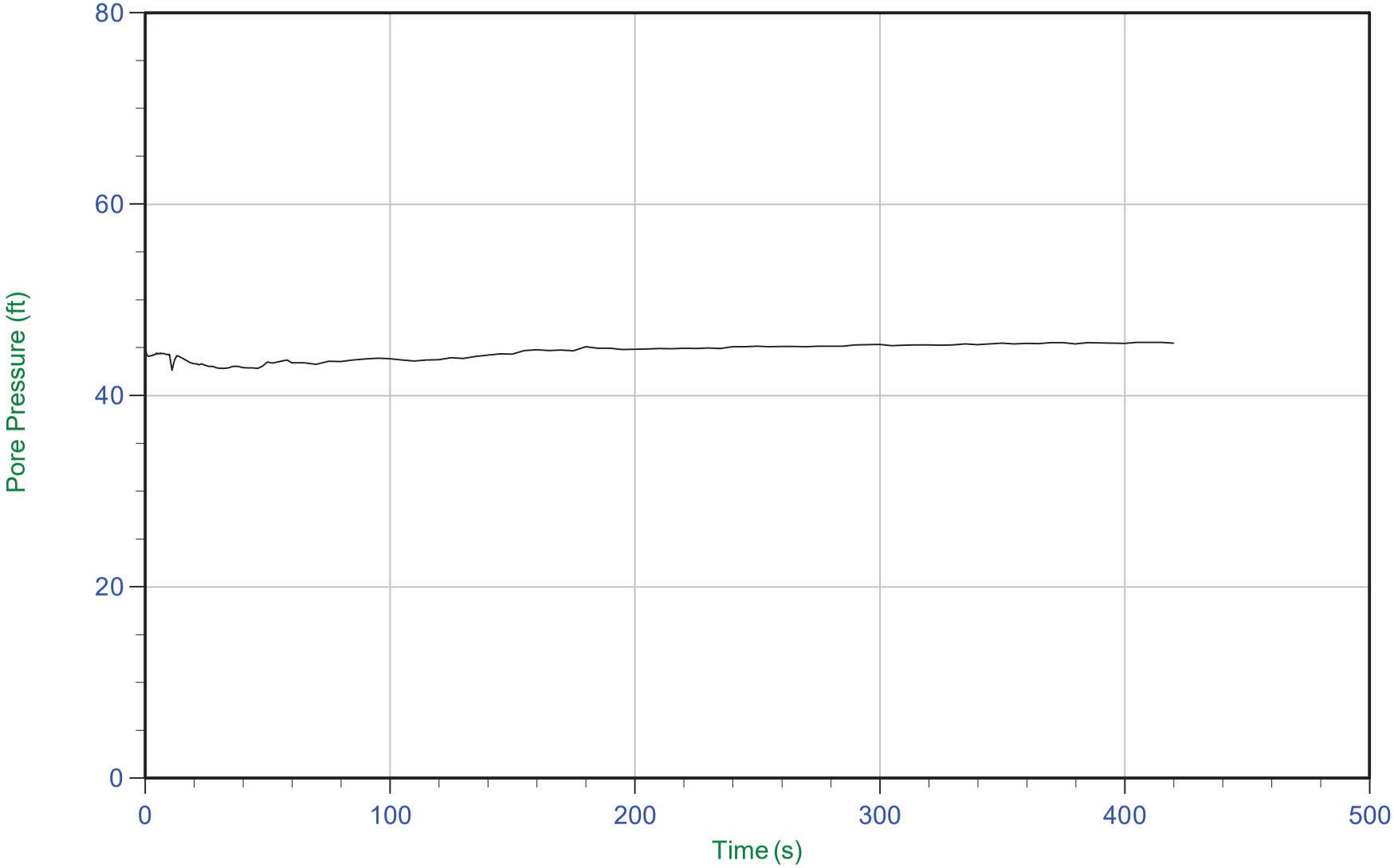
WT: 3.028 m / 9.933 ft
Ueq: 5.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/03/2021 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-21.ppd2
Depth: 17.075 m / 56.020 ft
Duration: 420.0 s

u Min: 42.6 ft
u Max: 45.8 ft
u Final: 45.5 ft

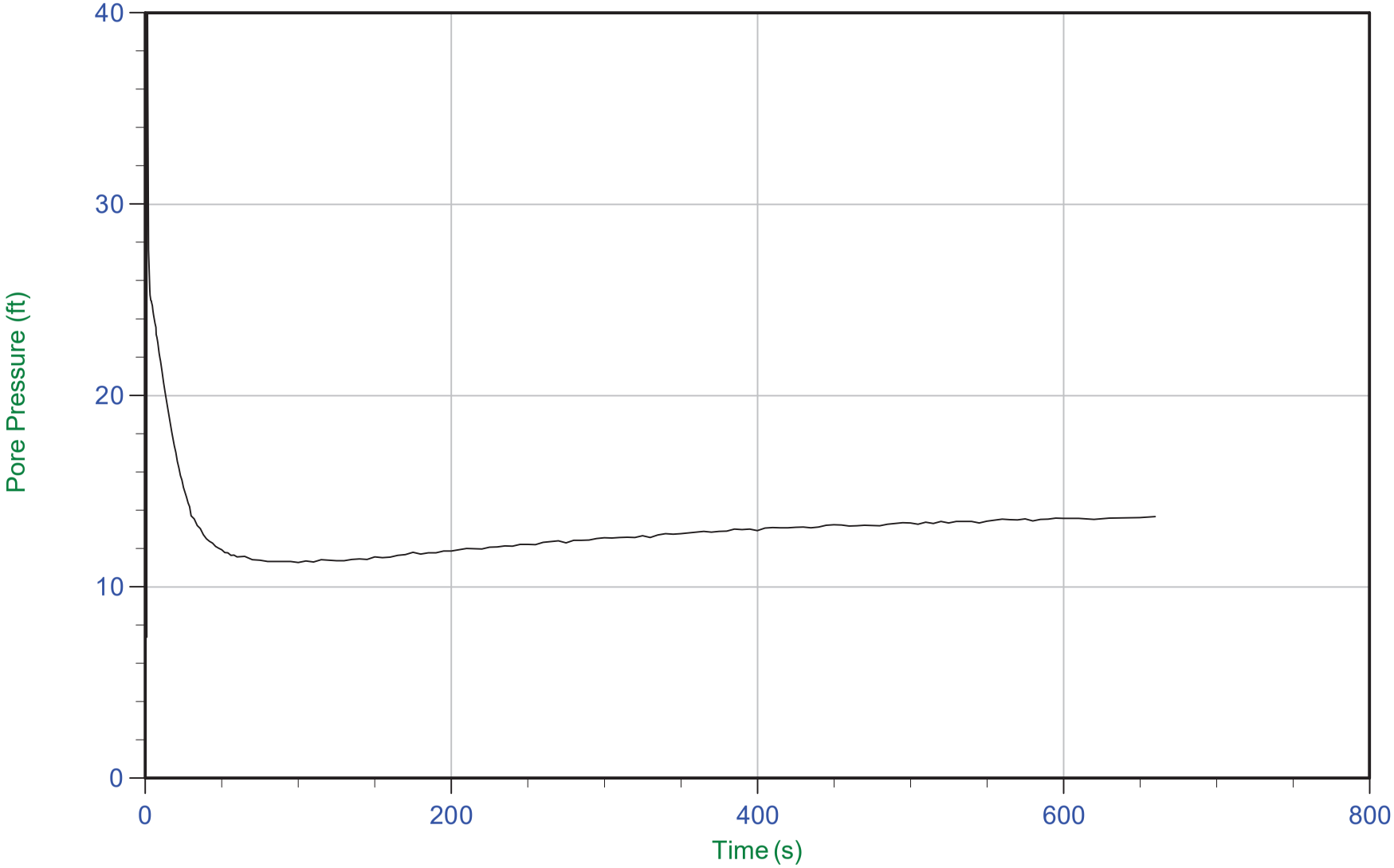
WT: 3.252 m / 10.670 ft
Ueq: 45.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/04/2021 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-22.ppd2
Depth: 7.750 m / 25.426 ft
Duration: 660.0 s

u Min: 7.4 ft
u Max: 49.0 ft
u Final: 13.7 ft

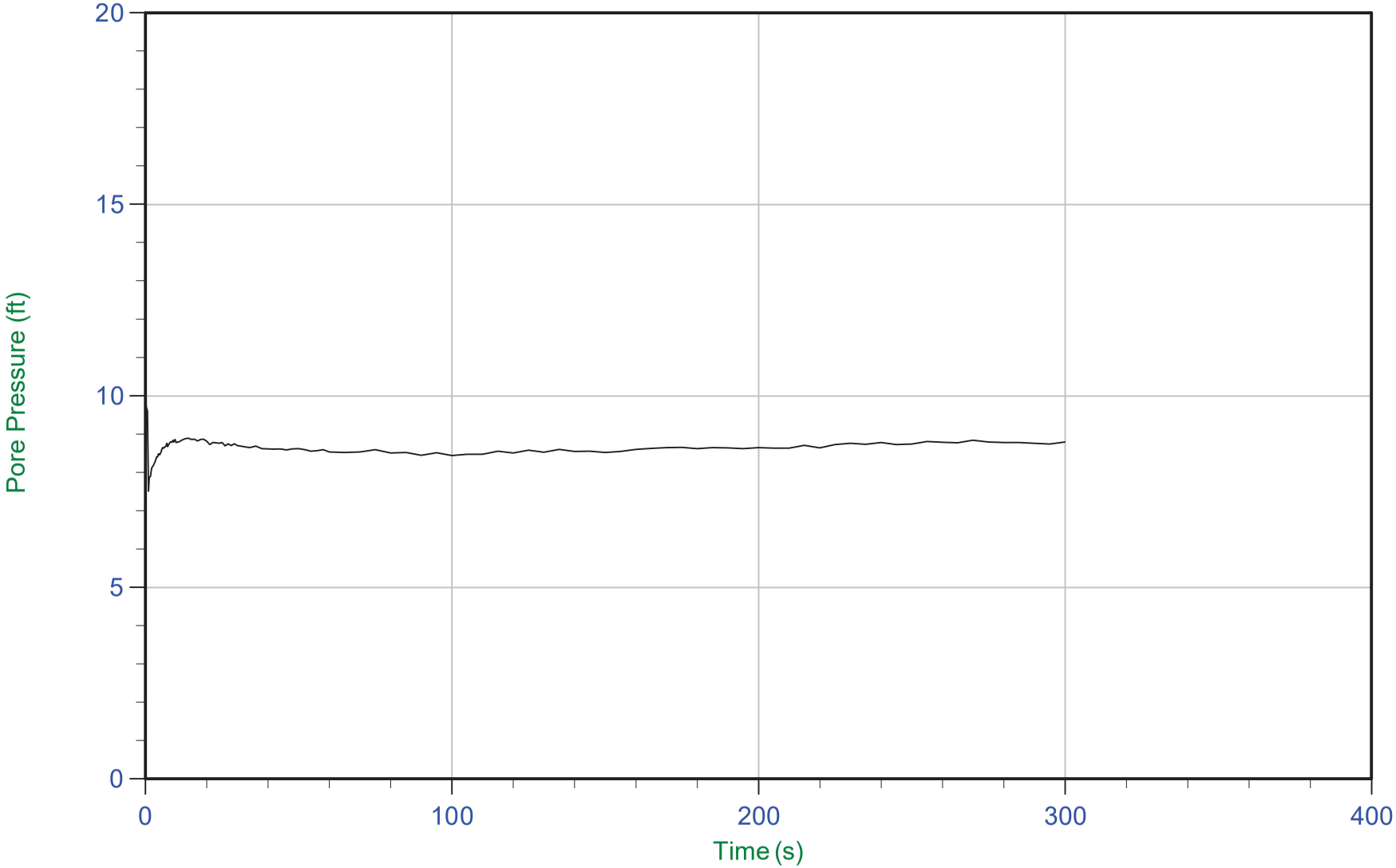
WT: 3.608 m / 11.838 ft
Ueq: 13.6 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/06/2021 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-24.ppd2
Depth: 5.775 m / 18.947 ft
Duration: 300.0 s

u Min: 7.5 ft
u Max: 9.9 ft
u Final: 8.8 ft

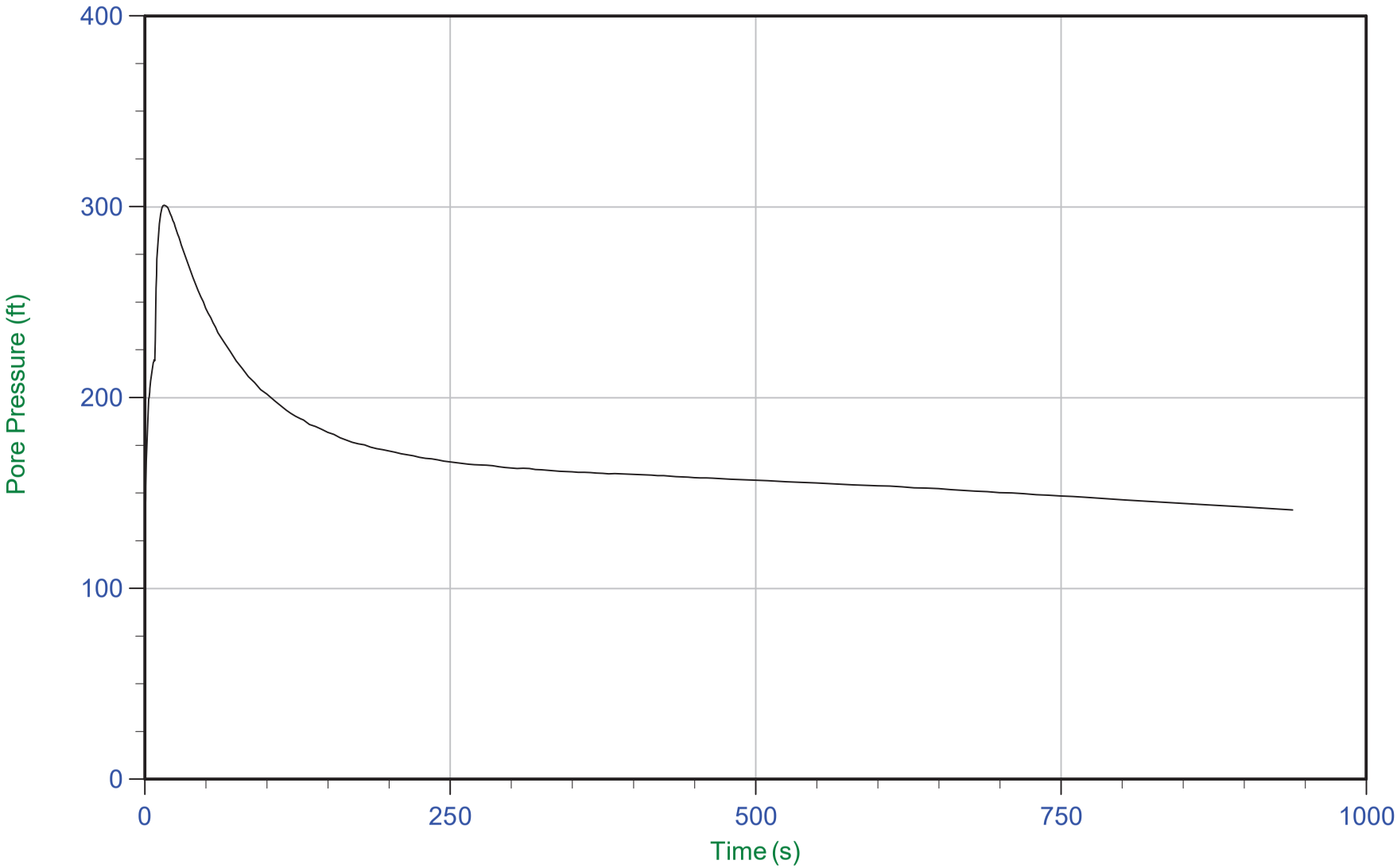
WT: 3.109 m / 10.199 ft
Ueq: 8.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/18/2021 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-25.ppd2
Depth: 9.925 m / 32.562 ft
Duration: 940.0 s

u Min: 120.8 ft
u Max: 300.8 ft
u Final: 141.2 ft

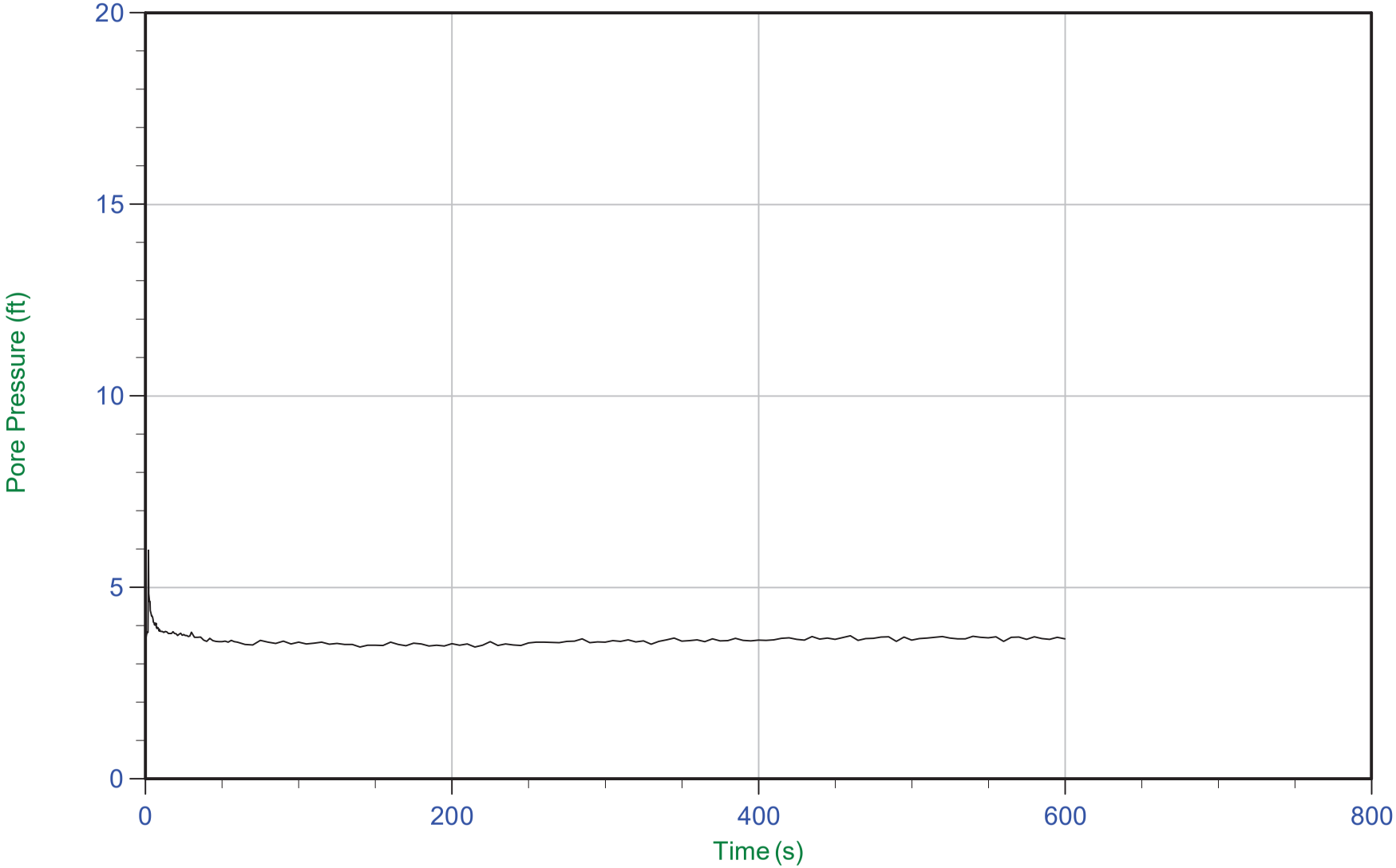
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/18/2021 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-25A.ppd2
Depth: 4.750 m / 15.584 ft
Duration: 600.0 s

u Min: 3.4 ft
u Max: 6.0 ft
u Final: 3.7 ft

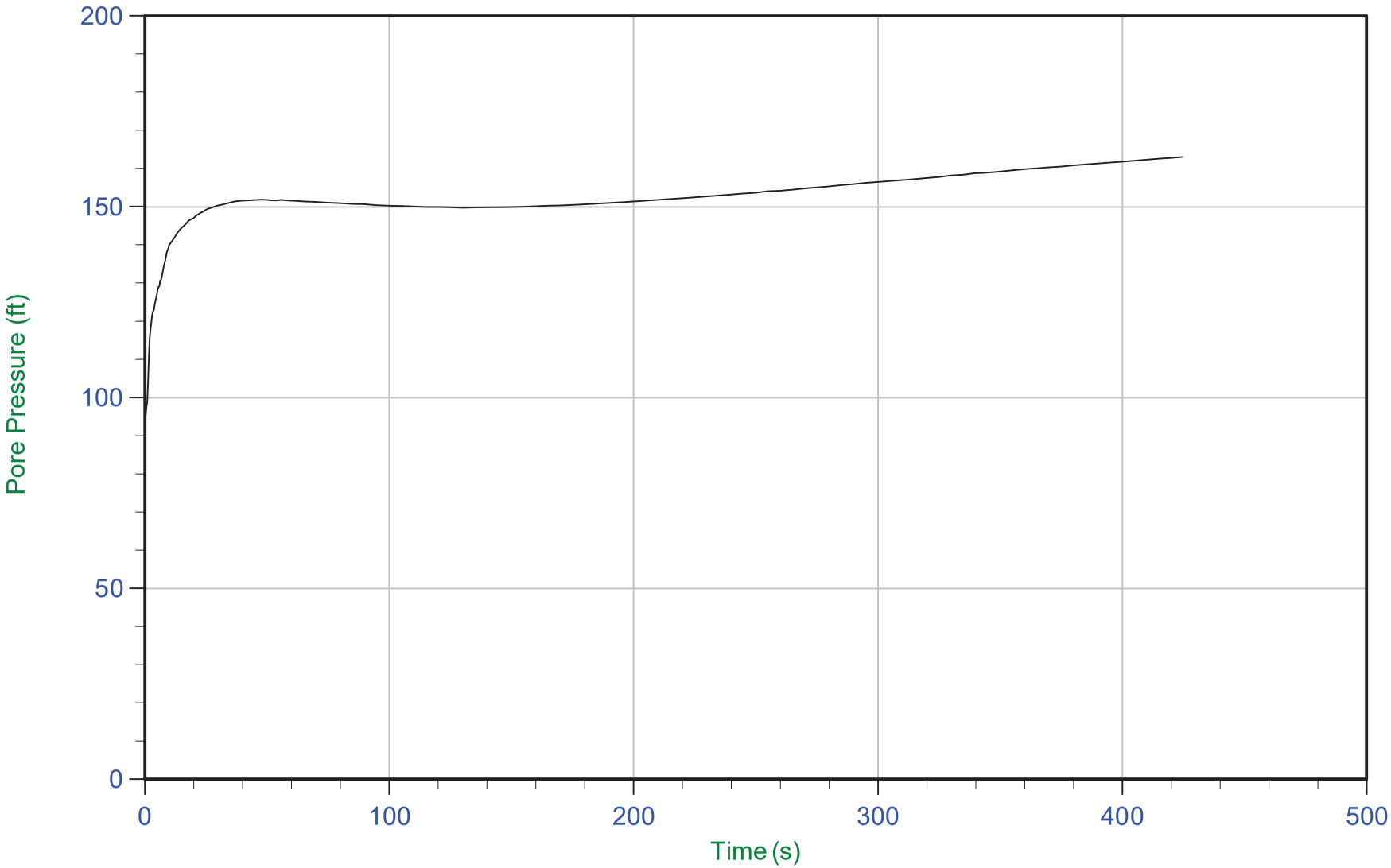
WT: 3.627 m / 11.900 ft
Ueq: 3.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/09/2021 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35 Area=15 cm²



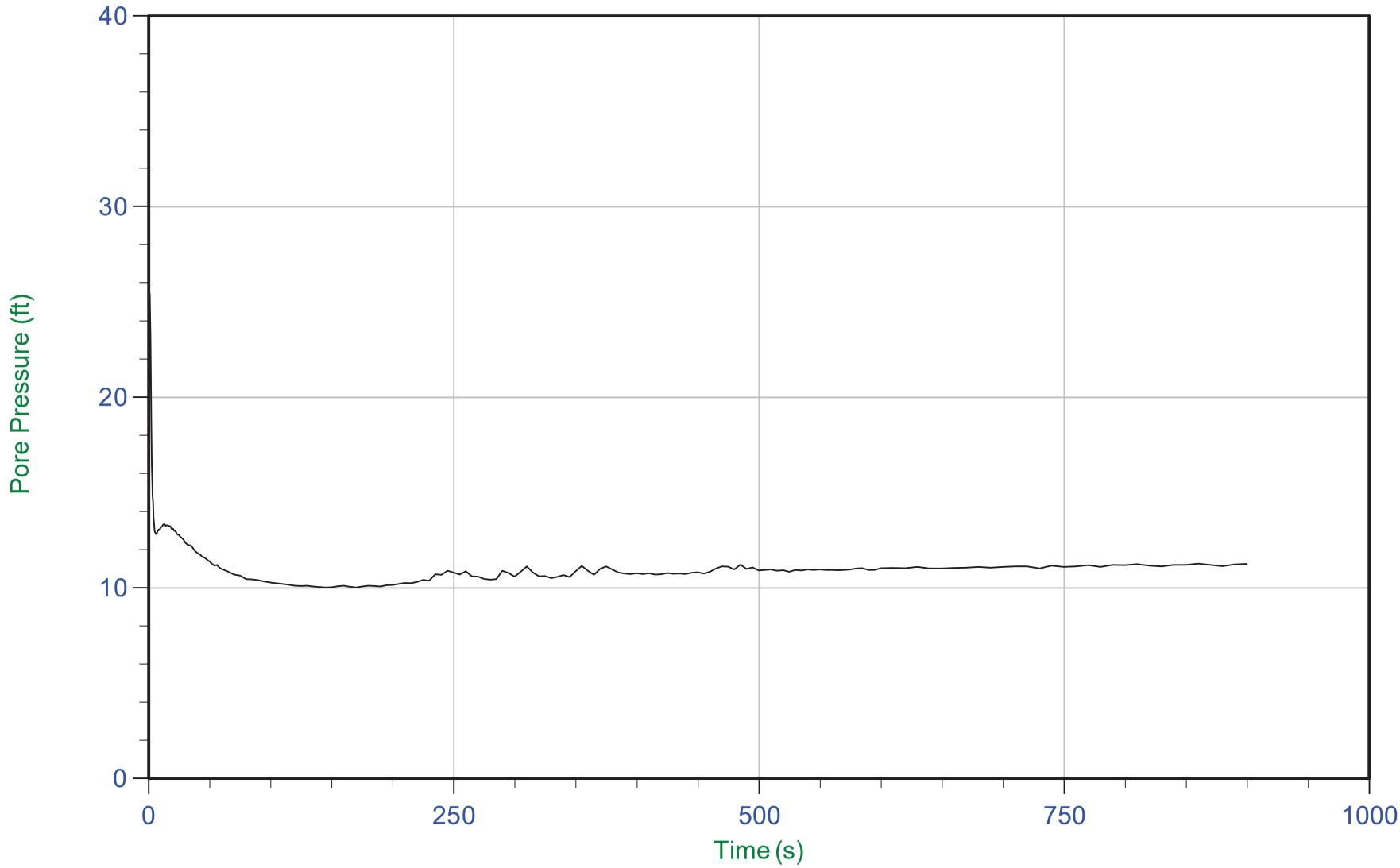
Trace Summary:

Filename: 21-61-22763_CPVAP-26.ppd2
Depth: 12.200 m / 40.026 ft
Duration: 425.0 s

u Min: 93.9 ft
u Max: 163.1 ft
u Final: 163.1 ft

WT: N/A
Ueq: N/A

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/12/2021 09:08 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-27 Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

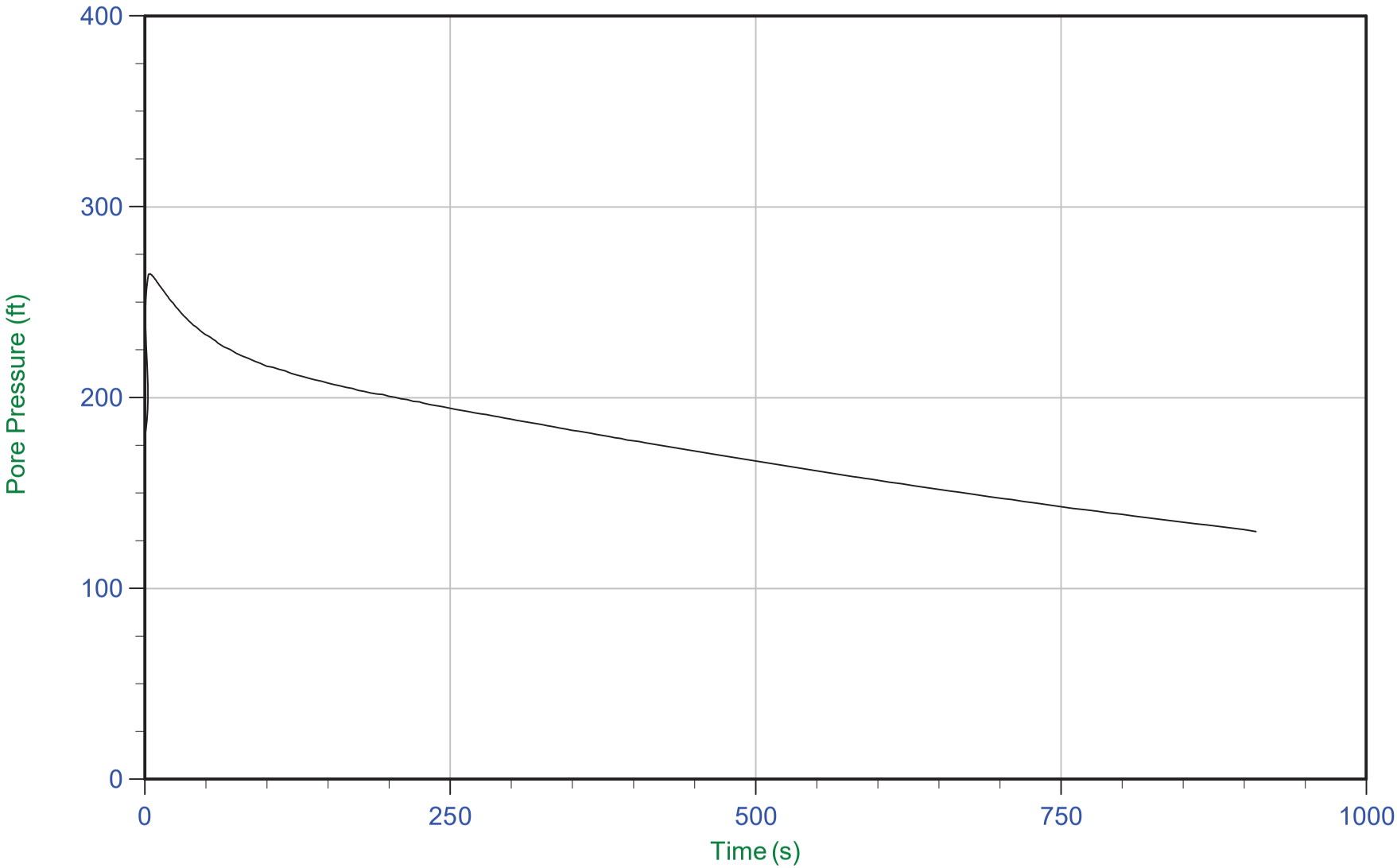
Filename: 21-61-22763_CPVAP-27.ppd2	u Min: 10.0 ft	WT: 4.474 m / 14.679 ft
Depth: 7.875 m / 25.836 ft	u Max: 25.5 ft	Ueq: 11.2 ft
Duration: 900.0 s	u Final: 11.3 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-27.ppd2
Depth: 10.875 m / 35.679 ft
Duration: 910.0 s

u Min: 129.9 ft
u Max: 264.9 ft
u Final: 129.9 ft

WT: 4.474 m / 14.679 ft
Ueq: 21.0 ft
U(50): 142.94 ft

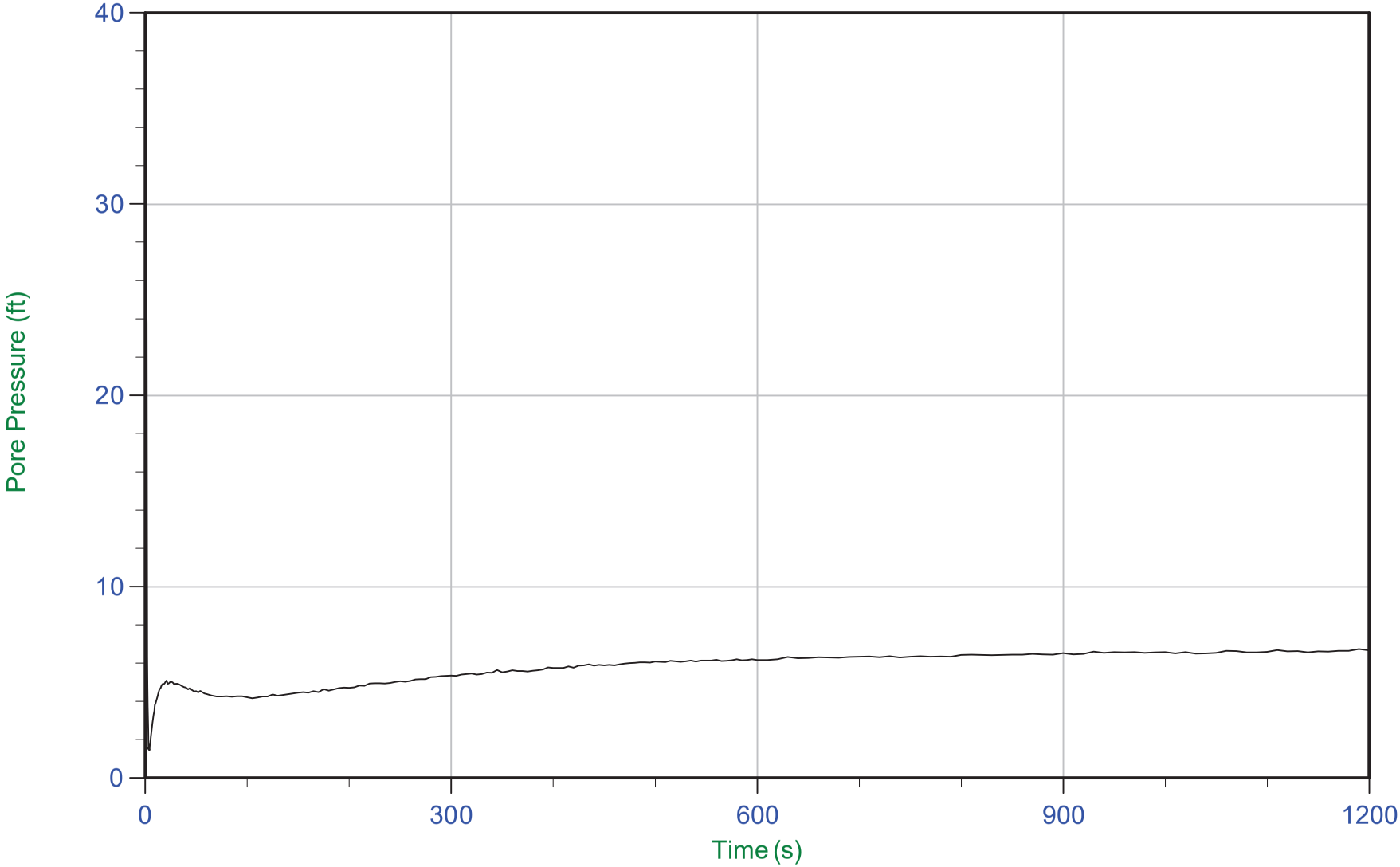
T(50): 744.7 s
Ir: 100
Ch: 0.9 cm²/min

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/10/2021 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-28.ppd2
Depth: 7.925 m / 26.000 ft
Duration: 1200.0 s

u Min: 1.4 ft
u Max: 25.6 ft
u Final: 6.7 ft

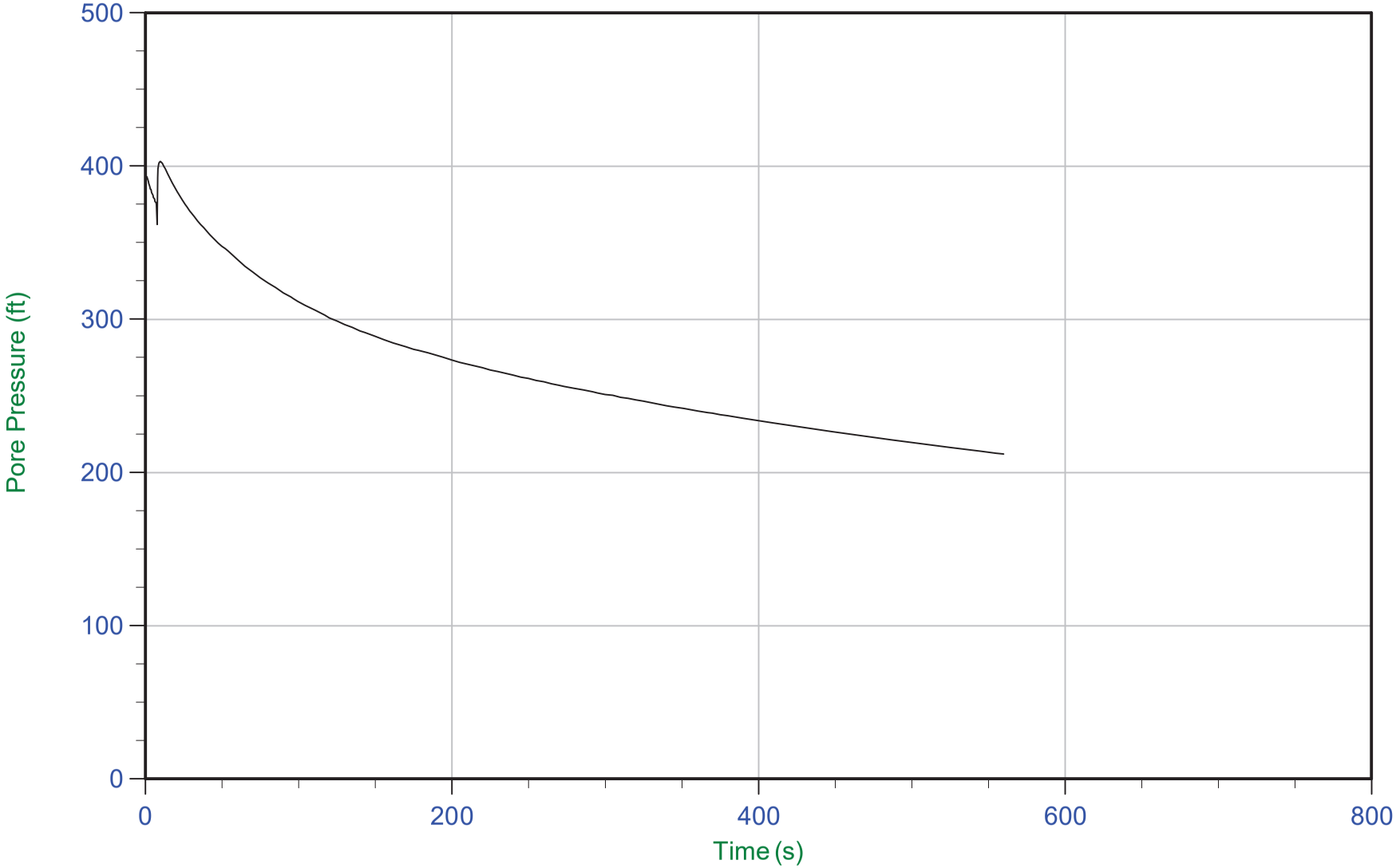
WT: 5.904 m / 19.369 ft
Ueq: 6.6 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/10/2021 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

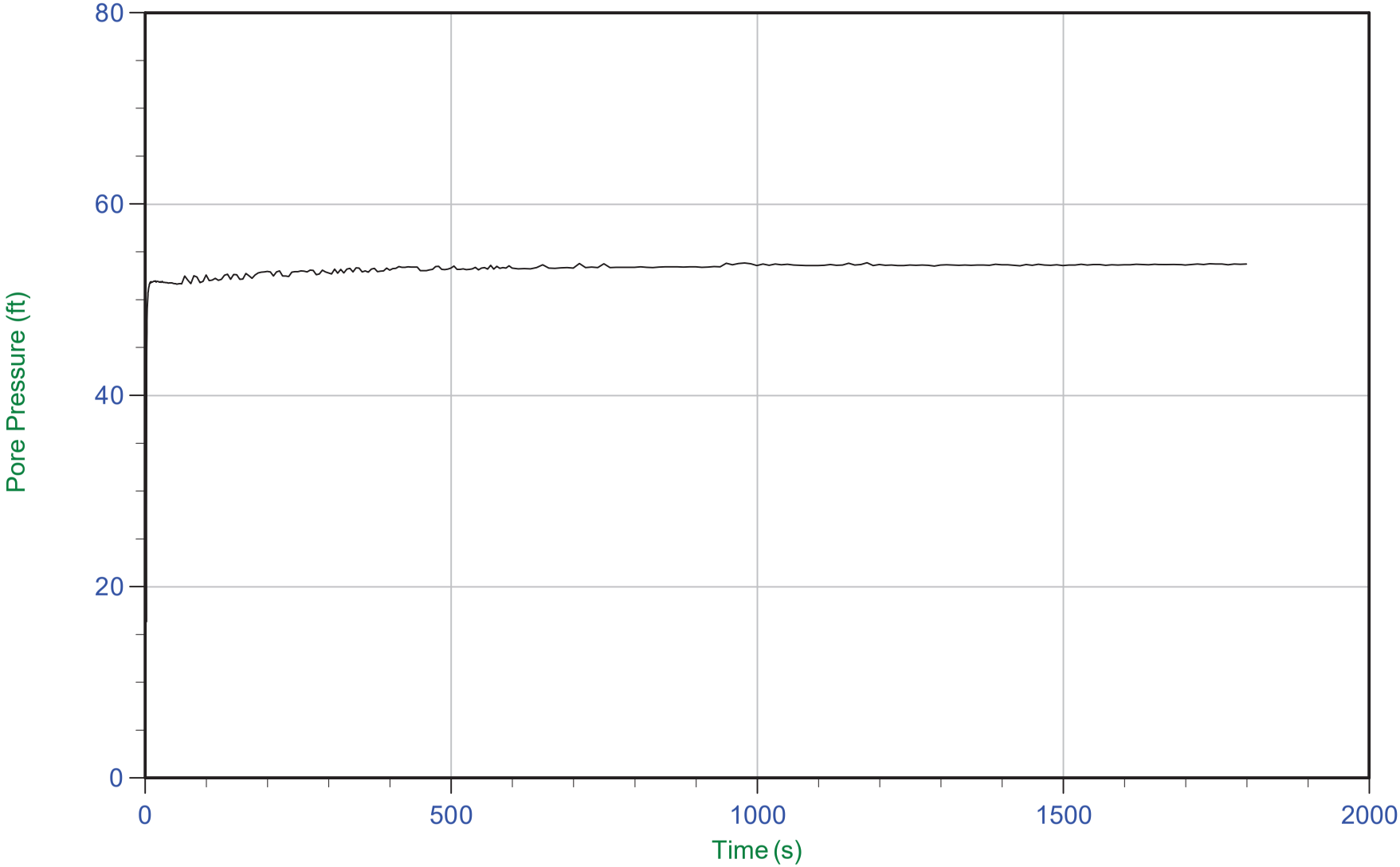
Filename: 21-61-22763_CPVAP-28.ppd2
Depth: 14.325 m / 46.997 ft
Duration: 560.0 s

u Min: 212.1 ft
u Max: 403.0 ft
u Final: 212.1 ft

WT: 5.904 m / 19.369 ft
Ueq: 27.6 ft
U(50): 215.32 ft

T(50): 523.2 s
Ir: 100
Ch: 1.3 cm²/min

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/14/2021 09:07 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-29 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

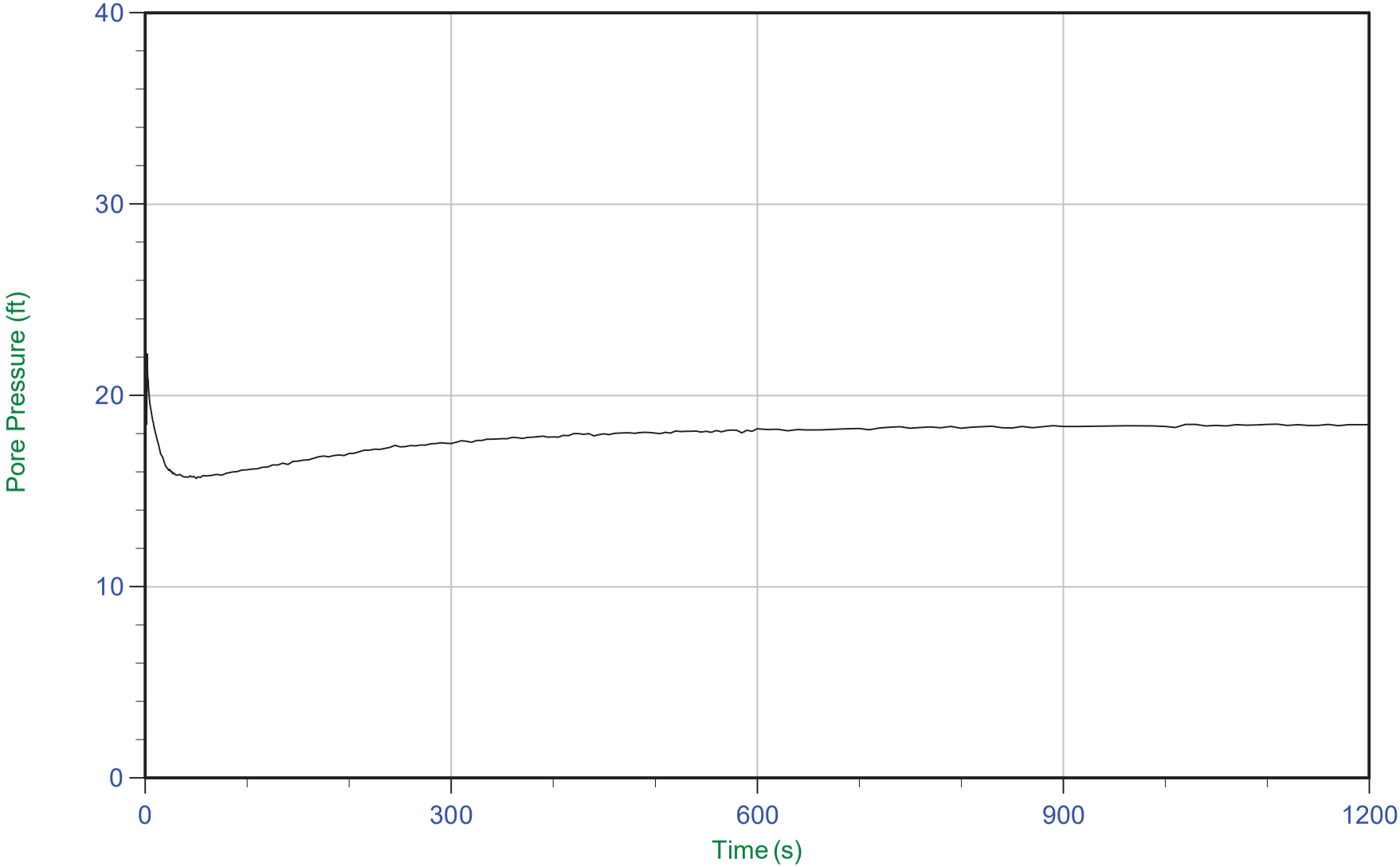
Filename: 21-61-22763_CPVAP-29.ppd2	u Min: 16.3 ft	WT: 4.576 m / 15.014 ft
Depth: 20.875 m / 68.487 ft	u Max: 53.9 ft	Ueq: 53.5 ft
Duration: 1800.0 s	u Final: 53.8 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/15/2021 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-30.ppd2
Depth: 8.875 m / 29.117 ft
Duration: 1200.0 s

u Min: 15.7 ft
u Max: 22.2 ft
u Final: 18.5 ft

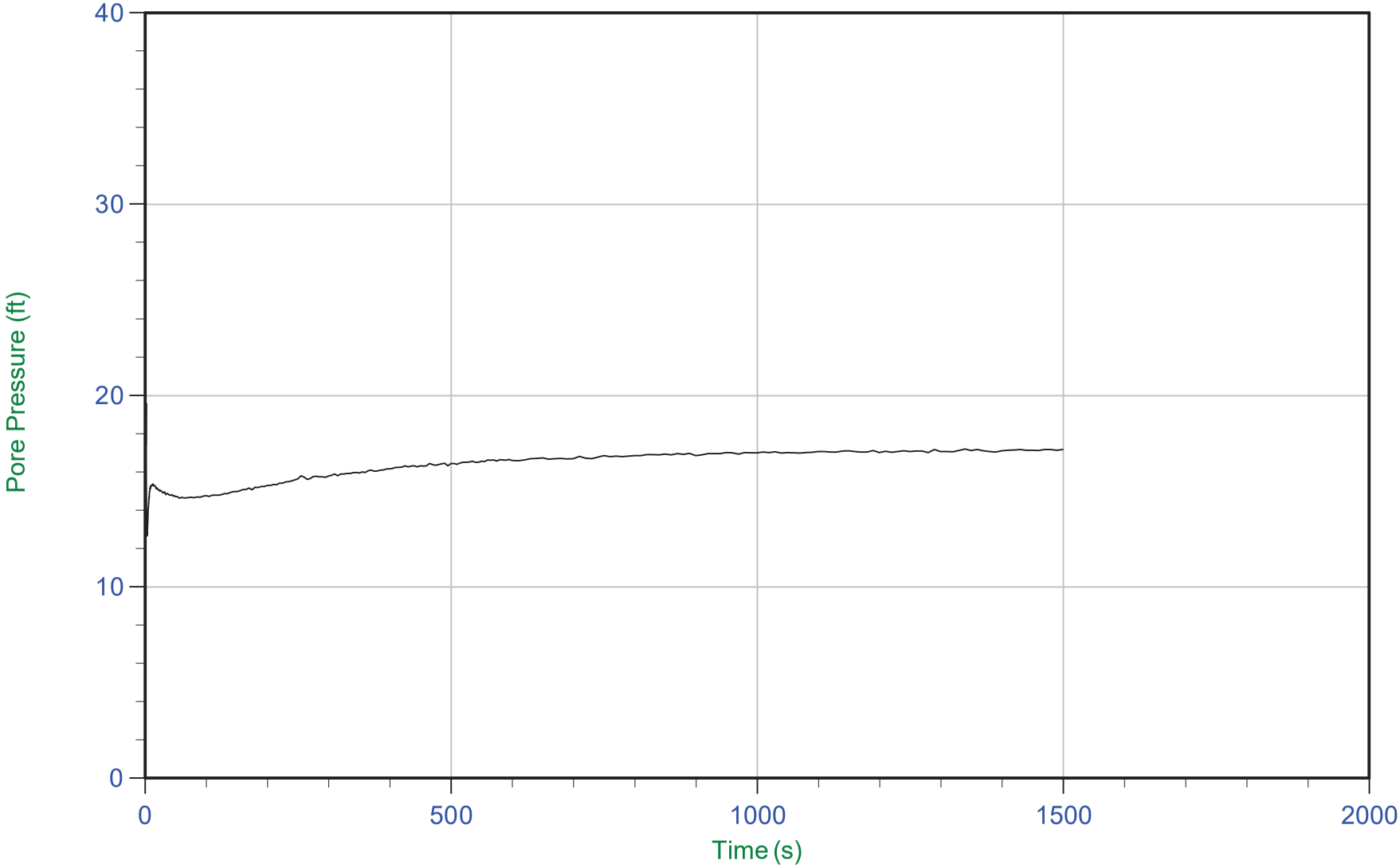
WT: 3.260 m / 10.696 ft
Ueq: 18.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/13/2021 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35 Area=15 cm²



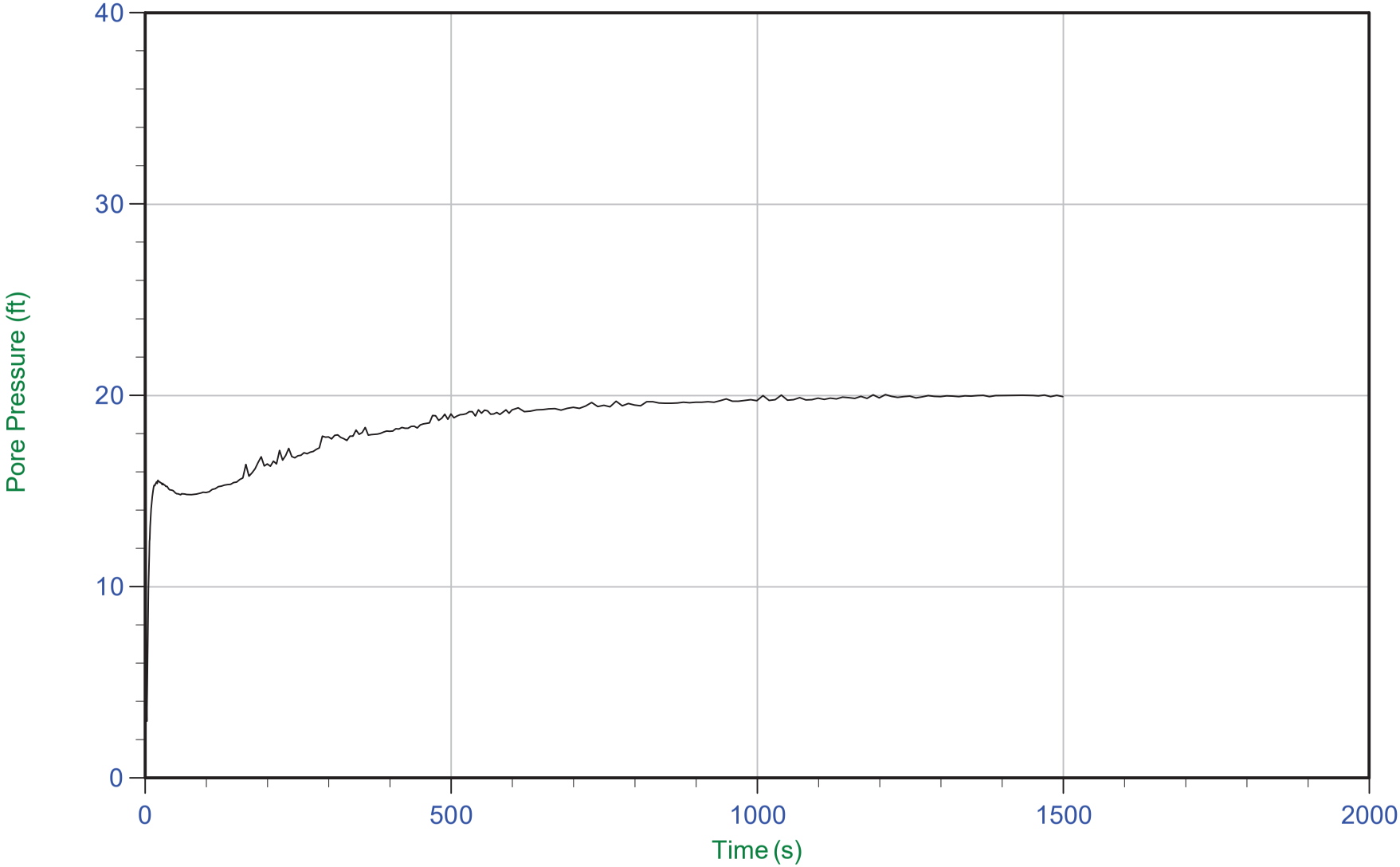
Trace Summary:

Filename: 21-61-22763_CPVAP-31.ppd2
Depth: 7.800 m / 25.590 ft
Duration: 1500.0 s

u Min: 12.7 ft
u Max: 20.3 ft
u Final: 17.2 ft

WT: 2.602 m / 8.538 ft
Ueq: 17.1 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/11/2021 09:27 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-32 Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

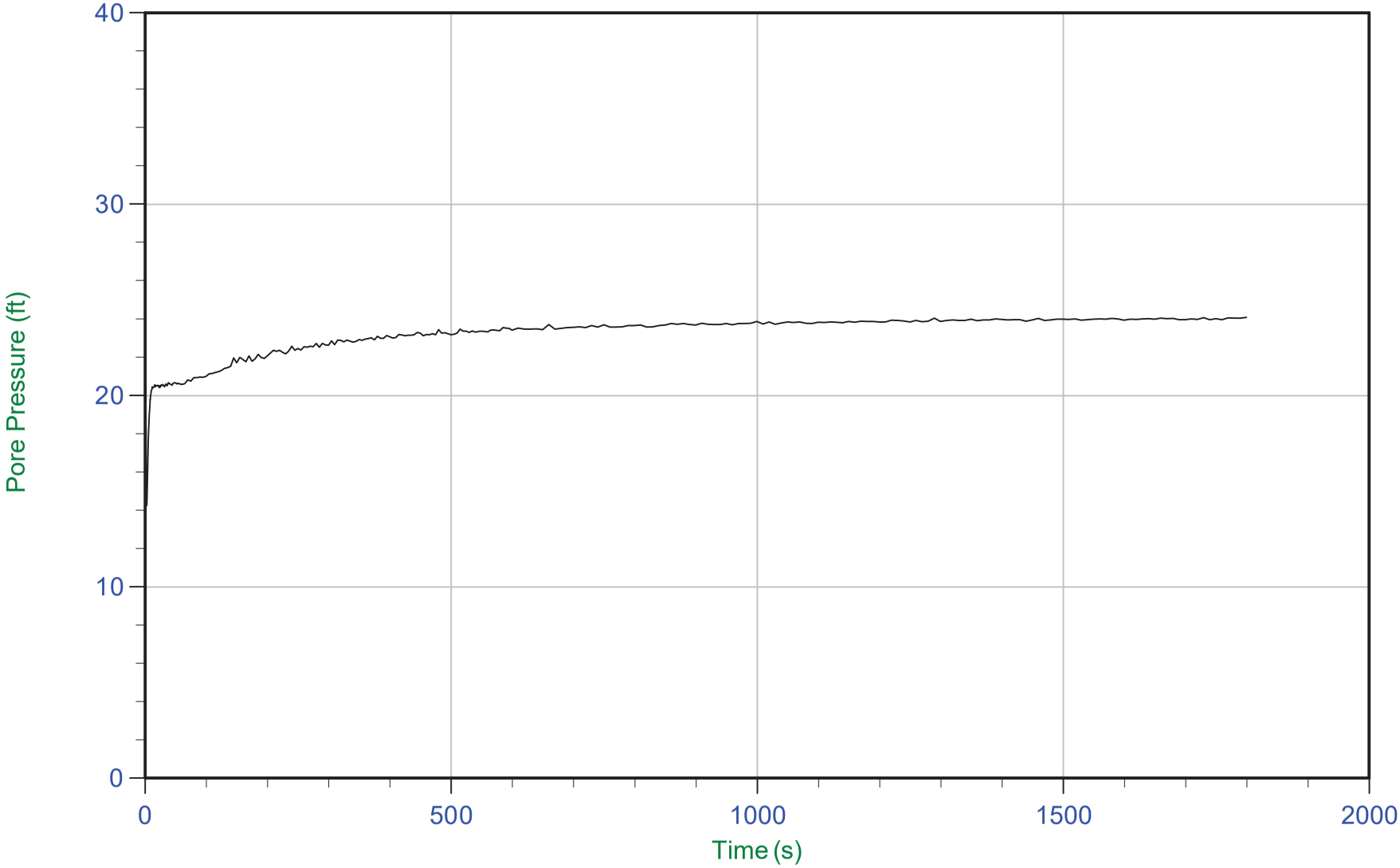
Filename: 21-61-22763_CPVAP-32.ppd2	u Min: 3.0 ft	WT: 3.704 m / 12.152 ft
Depth: 9.800 m / 32.152 ft	u Max: 28.6 ft	Ueq: 20.0 ft
Duration: 1500.0 s	u Final: 19.9 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-33.ppd2
Depth: 10.775 m / 35.351 ft
Duration: 1800.0 s

u Min: 14.3 ft
u Max: 24.6 ft
u Final: 24.1 ft

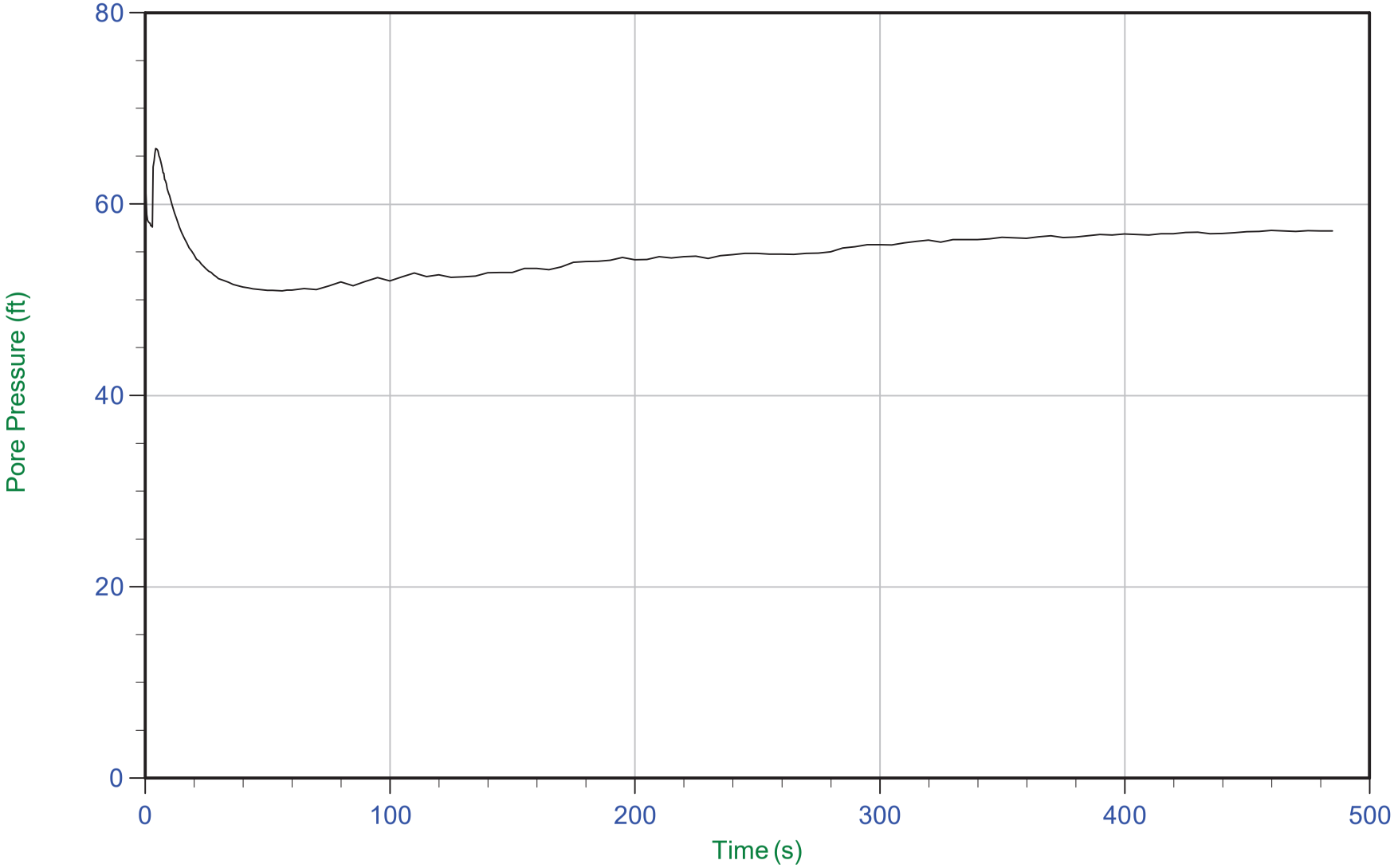
WT: 3.492 m / 11.456 ft
Ueq: 23.9 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-33.ppd2
Depth: 21.400 m / 70.209 ft
Duration: 485.0 s

u Min: 51.0 ft
u Max: 65.8 ft
u Final: 57.2 ft

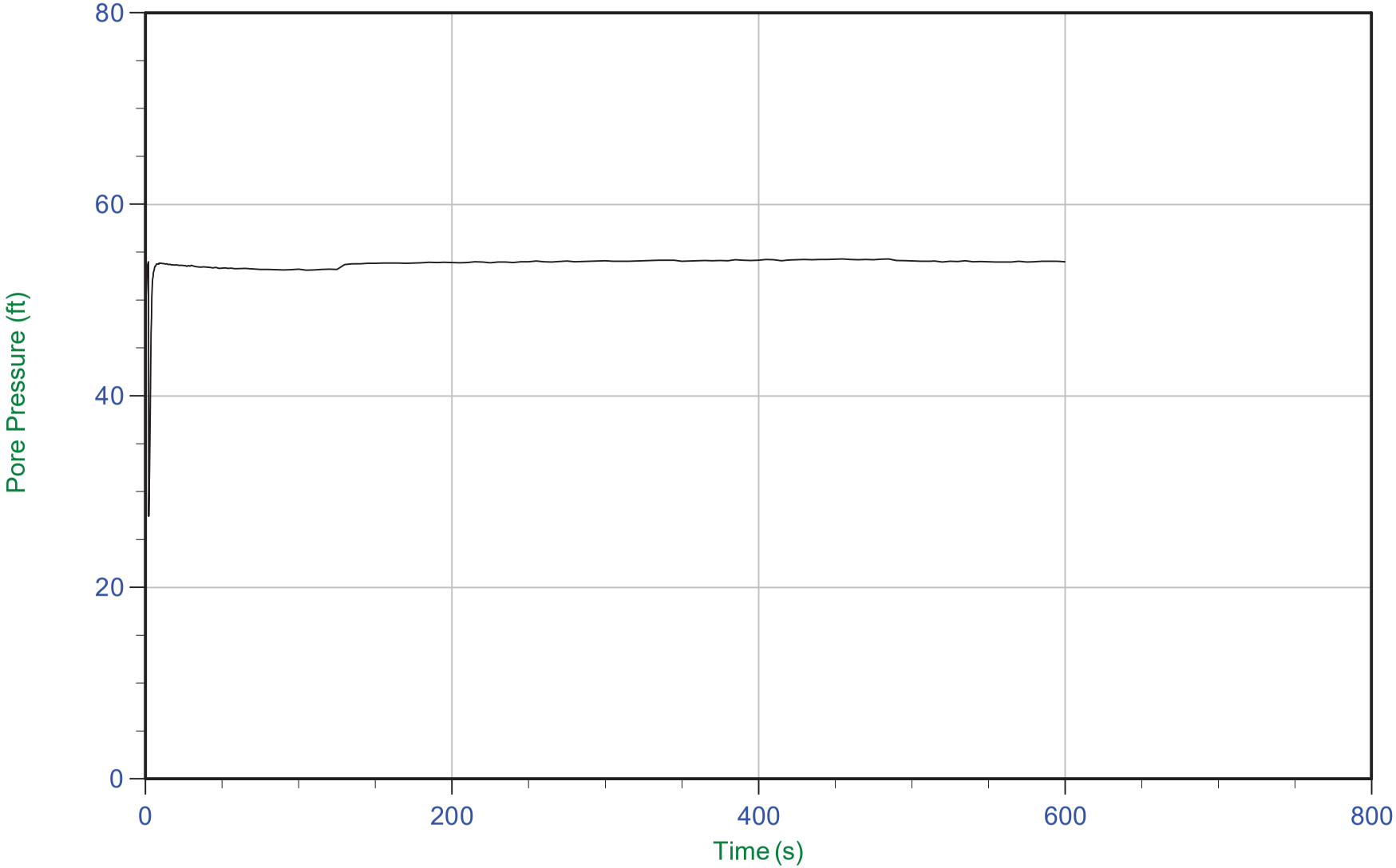
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/15/2021 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35 Area=15 cm²



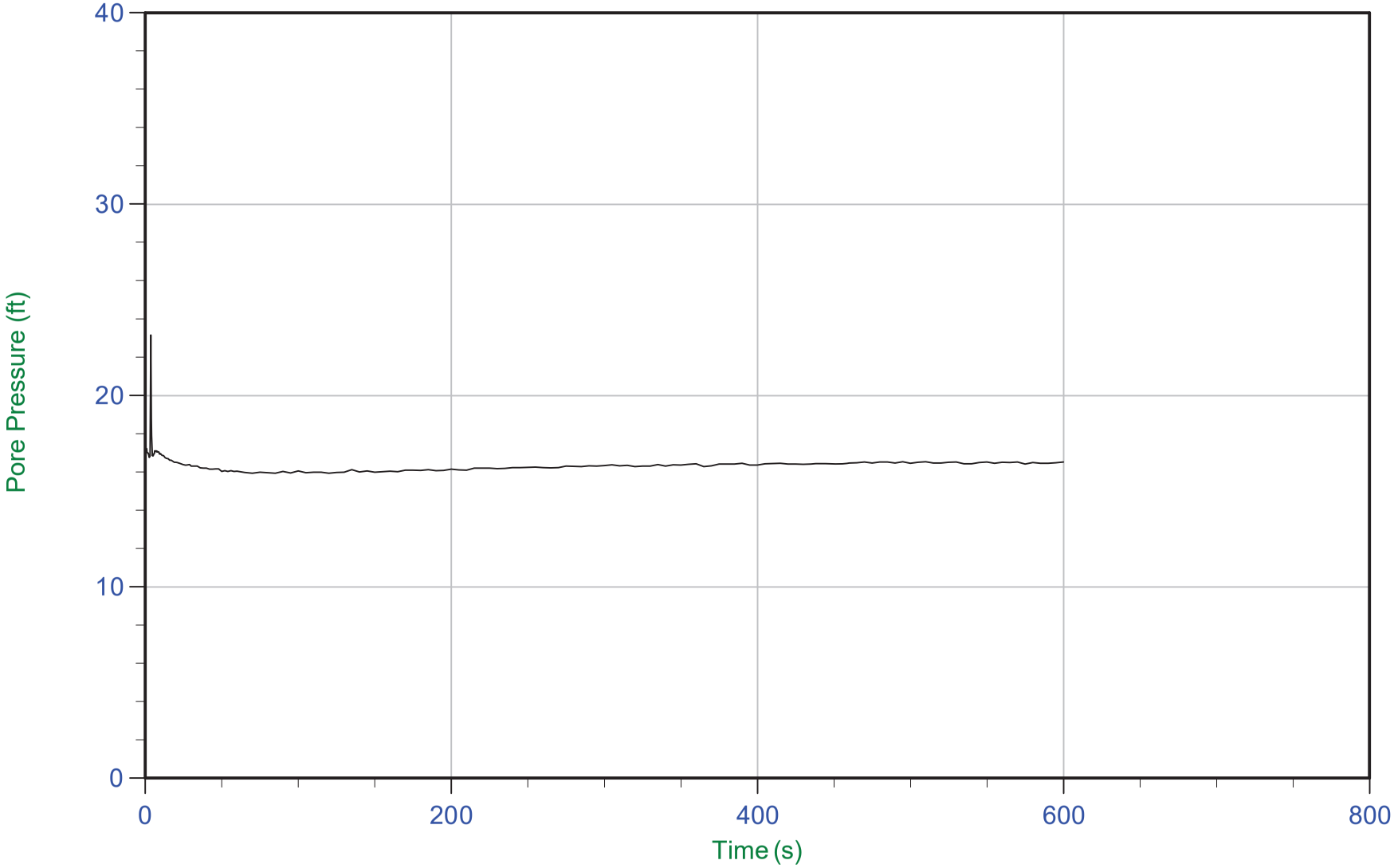
Trace Summary:

Filename: 21-61-22763_CPVAP-34.ppd2
Depth: 18.175 m / 59.629 ft
Duration: 600.0 s

u Min: 27.4 ft
u Max: 54.8 ft
u Final: 54.0 ft

WT: 1.684 m / 5.524 ft
Ueq: 54.1 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/20/2021 10:40 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-35 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

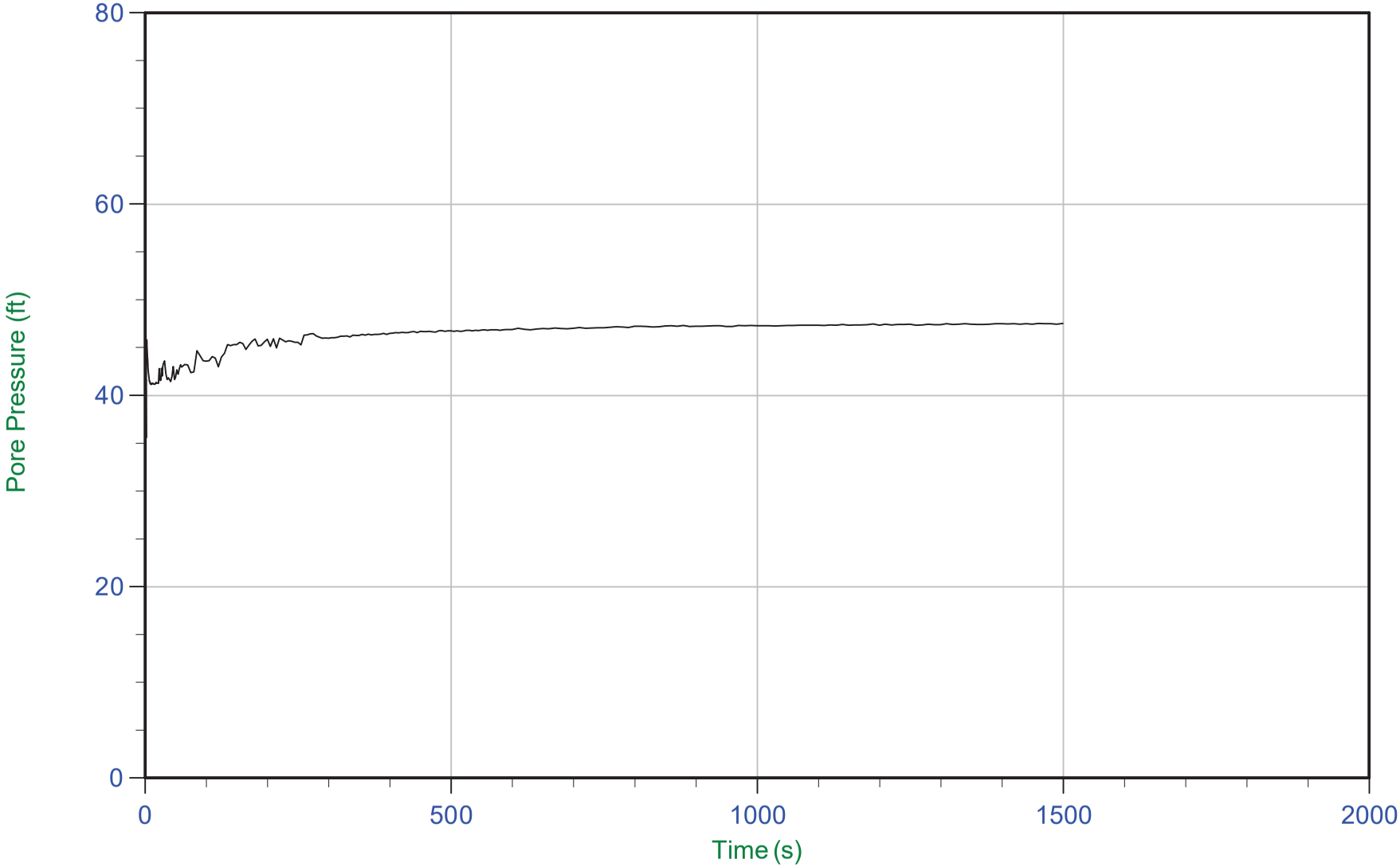
Filename: 21-61-22763_CPVAP-35.ppd2	u Min: 15.9 ft	WT: 1.595 m / 5.232 ft
Depth: 6.600 m / 21.653 ft	u Max: 23.2 ft	Ueq: 16.4 ft
Duration: 600.0 s	u Final: 16.5 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/16/2021 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-36.ppd2
Depth: 16.000 m / 52.493 ft
Duration: 1500.0 s

u Min: 35.6 ft
u Max: 47.5 ft
u Final: 47.5 ft

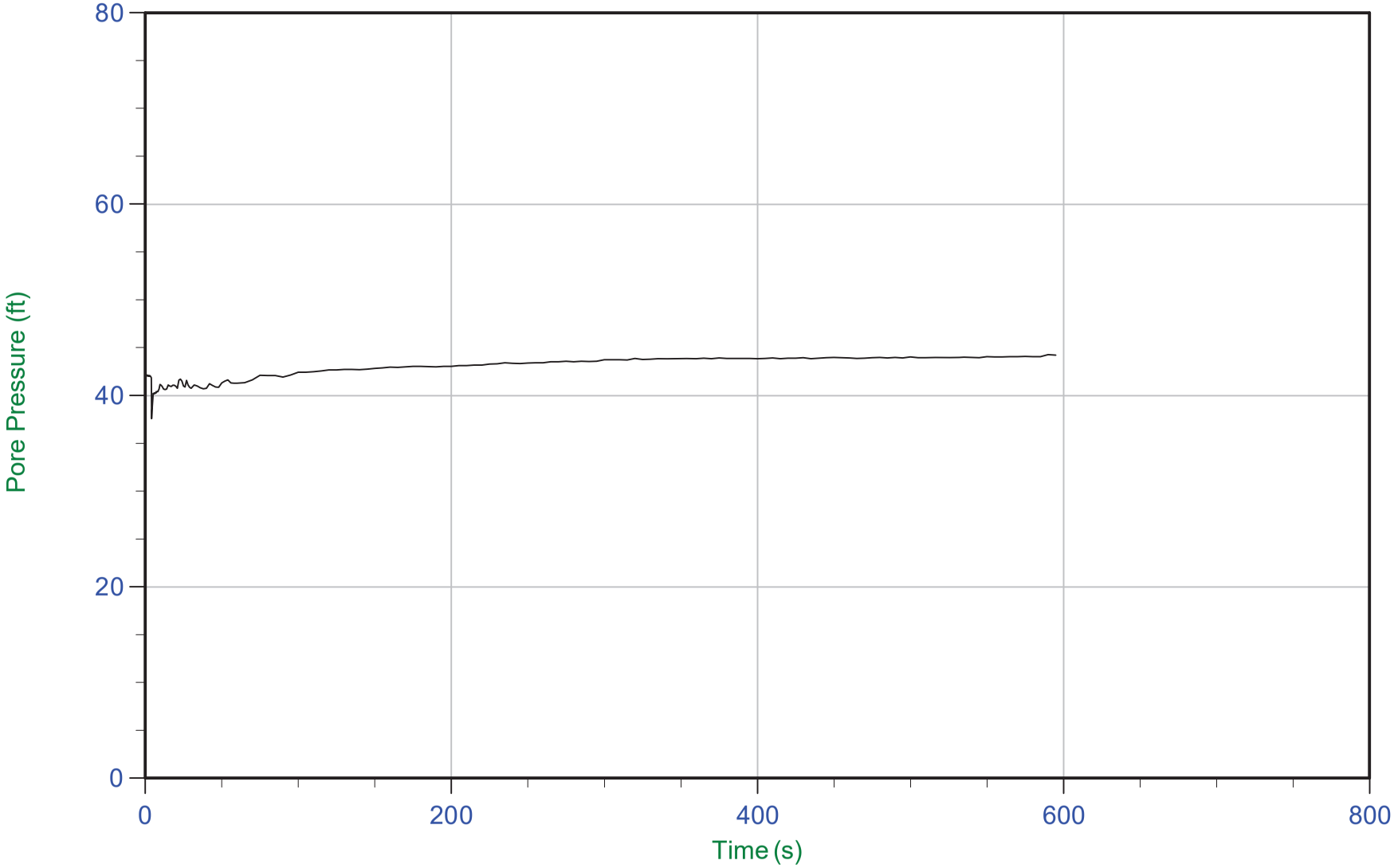
WT: 1.562 m / 5.125 ft
Ueq: 47.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/17/2021 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35 Area=15 cm²



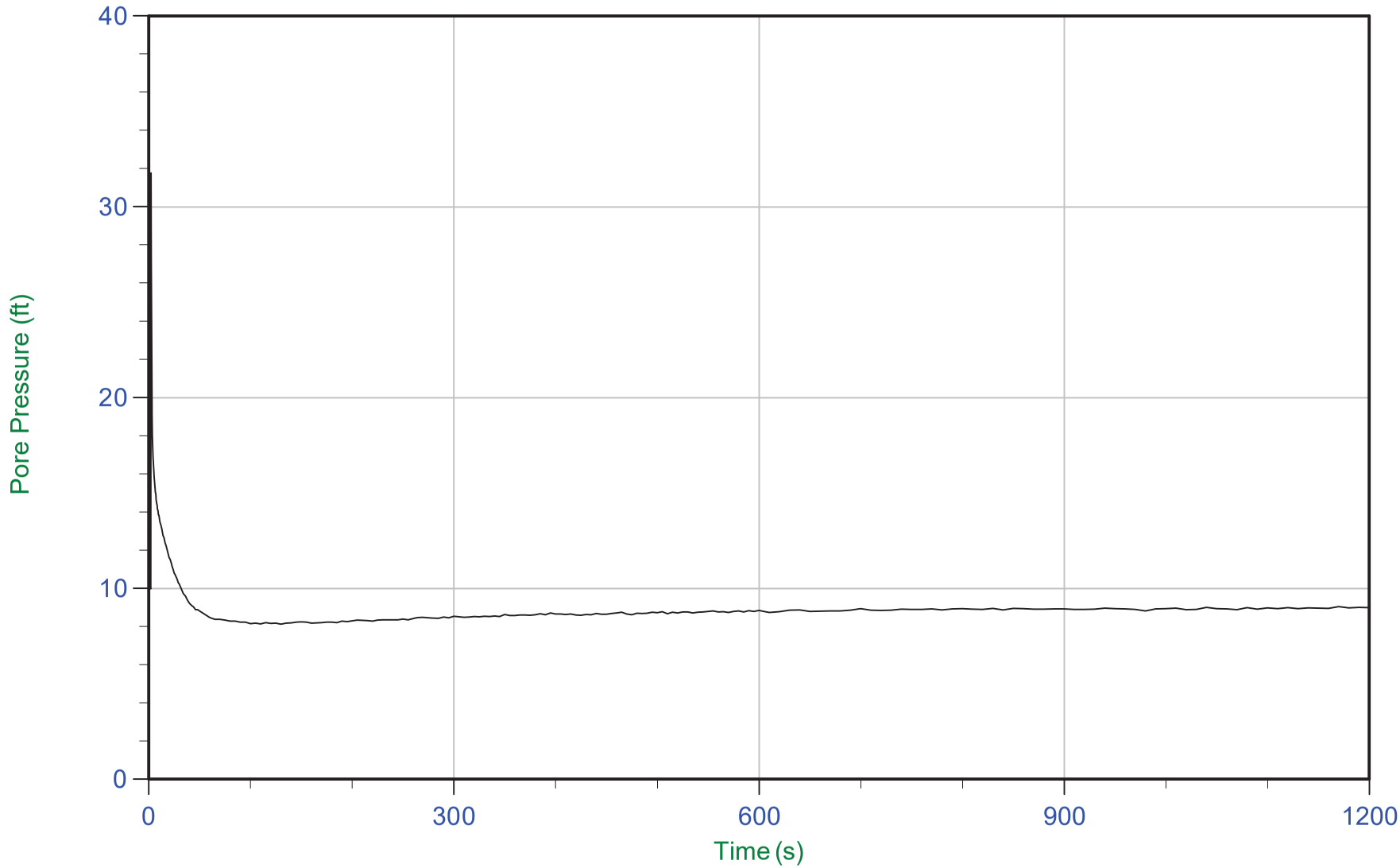
Trace Summary:

Filename: 21-61-22763_CPVAP-37.ppd2
Depth: 16.075 m / 52.739 ft
Duration: 595.0 s

u Min: 37.6 ft
u Max: 44.3 ft
u Final: 44.2 ft

WT: 2.664 m / 8.739 ft
Ueq: 44.0 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/21/2021 08:50 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-38 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

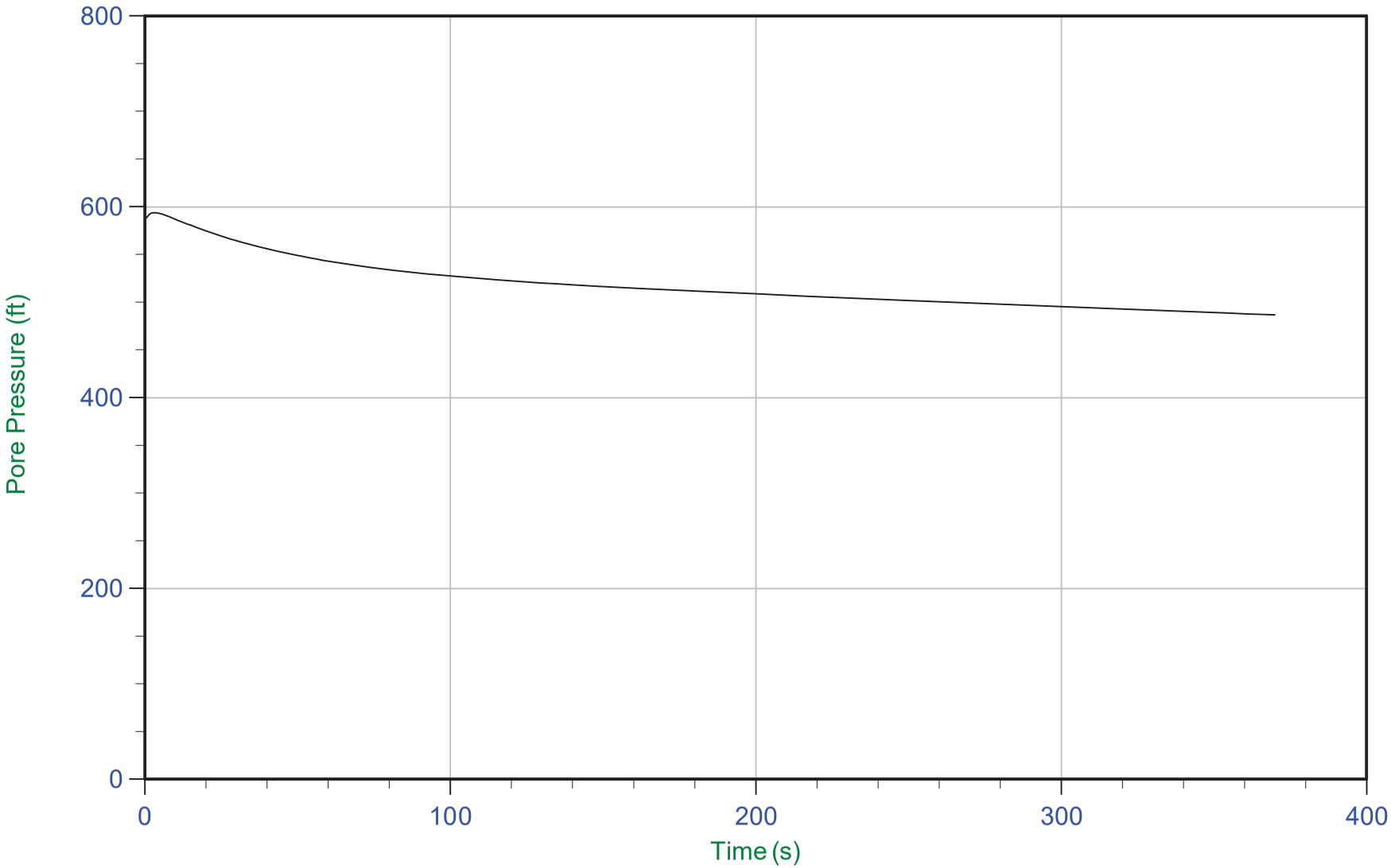
Filename: 21-61-22763_CPVAP-38.ppd2	u Min: 8.1 ft	WT: 2.123 m / 6.965 ft
Depth: 4.850 m / 15.912 ft	u Max: 31.8 ft	Ueq: 8.9 ft
Duration: 1200.0 s	u Final: 9.0 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/21/2021 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-38.ppd2
Depth: 16.625 m / 54.543 ft
Duration: 370.0 s

u Min: 486.7 ft
u Max: 594.0 ft
u Final: 486.7 ft

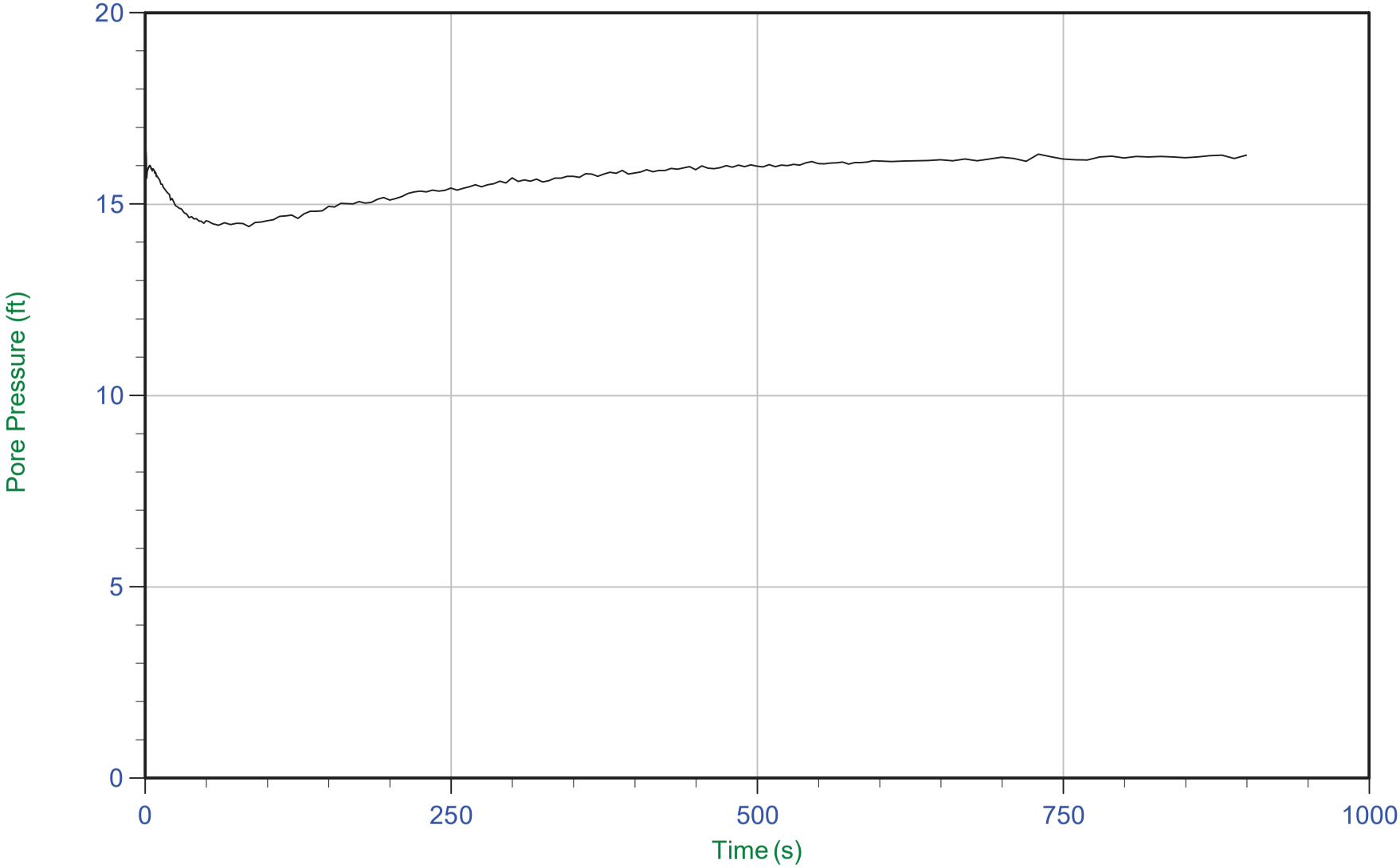
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/21/2021 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-39.ppd2
Depth: 7.850 m / 25.754 ft
Duration: 900.0 s

u Min: 14.4 ft
u Max: 16.4 ft
u Final: 16.3 ft

WT: 2.909 m / 9.544 ft
Ueq: 16.2 ft

PRESENTATION OF SITE INVESTIGATION RESULTS

Vertical Aquifer Sampling
Traverse City, Michigan

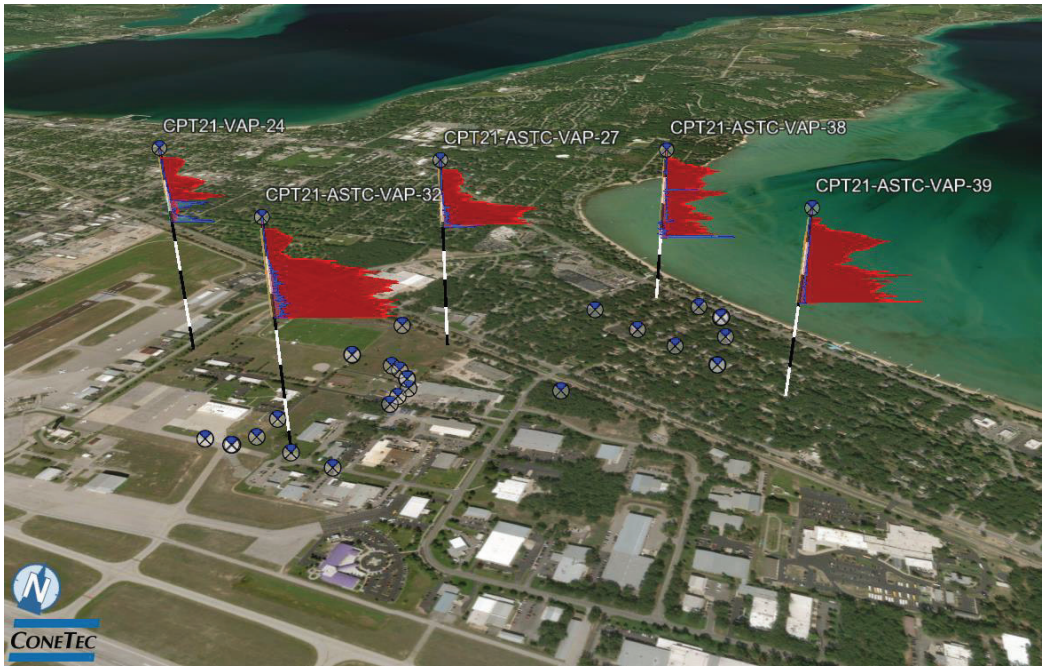
Rev. 1

Prepared for:

Arcadis

ConeTec Job No: 21-61-22763

Project Start Date: 27-Jul-2021
Project End Date: 22-Dec-2021
Report Date: 28-Jan-2022



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Introduction

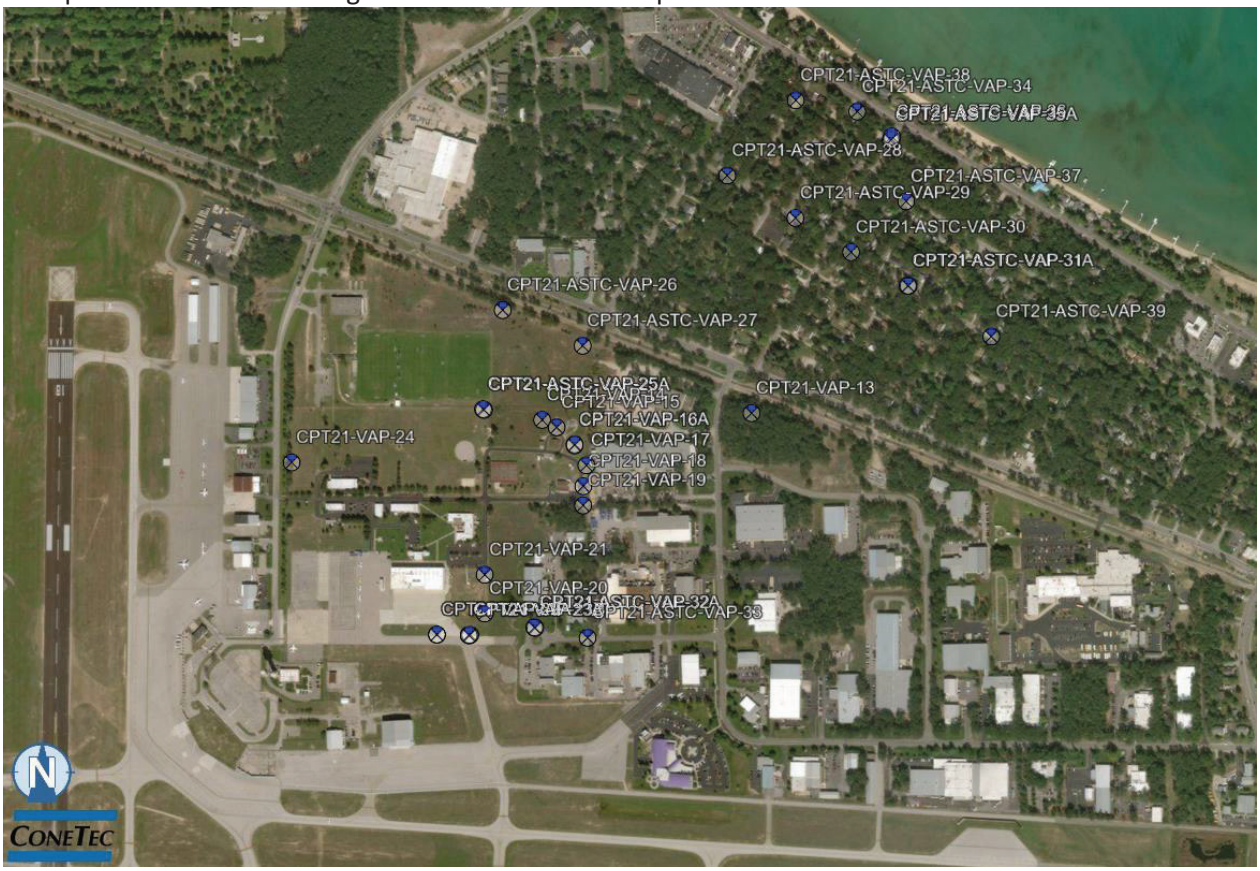
The enclosed report presents the results of a piezocone penetration testing (CPTu or CPT) program carried out for the Vertical Aquifer Sampling investigation located in Traverse City, Michigan. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to Arcadis US Inc (Arcadis) of Novi, Michigan.

A total of 35 cone penetration tests were completed at 27 locations (several locations were offset and attempted again due to shallow refusal). The CPT program was performed to evaluate the subsurface soil conditions. CPT sounding locations were selected and numbered under supervision of Arcadis personnel (Christina Weaver).

Project Information

Project	
Client	Arcadis
Project	Vertical Aquifer Sampling, MI
ConeTec project number	21-61-22763

A map from CESIUM including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Truck Rig	25 ton truck mounted (twin cylinders)	CPT

Coordinates		
Test Type	Collection Method	EPSG Number
CPT	GPS (GlobalSat MR-350)	WGS 84 Latitude / Longitude

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Thirty-one pore pressure dissipation tests were completed primarily to determine the phreatic surface and consolidation characteristics.
Additional plots	Advanced and Soil Behavior Type (SBT) scatter plots are included in the data release package.

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
661:T1500F15U35	661	15	225	1500	15	35
801:T1500F15U35	801	15	225	1500	15	35
802:T1500F15U35	802	15	225	1500	15	35
The CPT summary indicates which cone was used for each sounding.						

Calculated Geotechnical Parameters Tables	
Additional information	The Normalized Soil Behavior Type Chart based on Q_{tn} (SBT Qtn) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile. Soils were classified as either drained or undrained based on the Q_{tn} Normalized Soil Behavior Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).

Limitations

This report has been prepared for the exclusive use of Arcadis (Client) for the project titled "Vertical Aquifer Sampling, Traverse City, MI". The report's contents may not be relied upon by any other party without the express written permission of ConeTec. ConeTec has provided site investigation services, prepared the factual data reporting and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum 16 bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

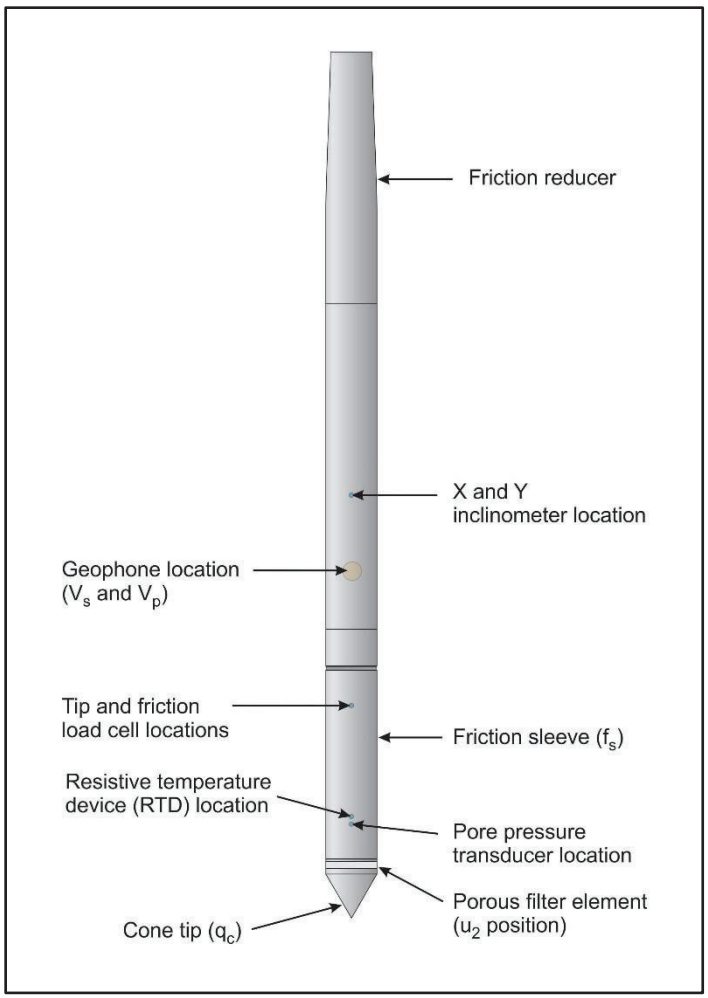


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal interface box and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 cm; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson et al. (1986) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

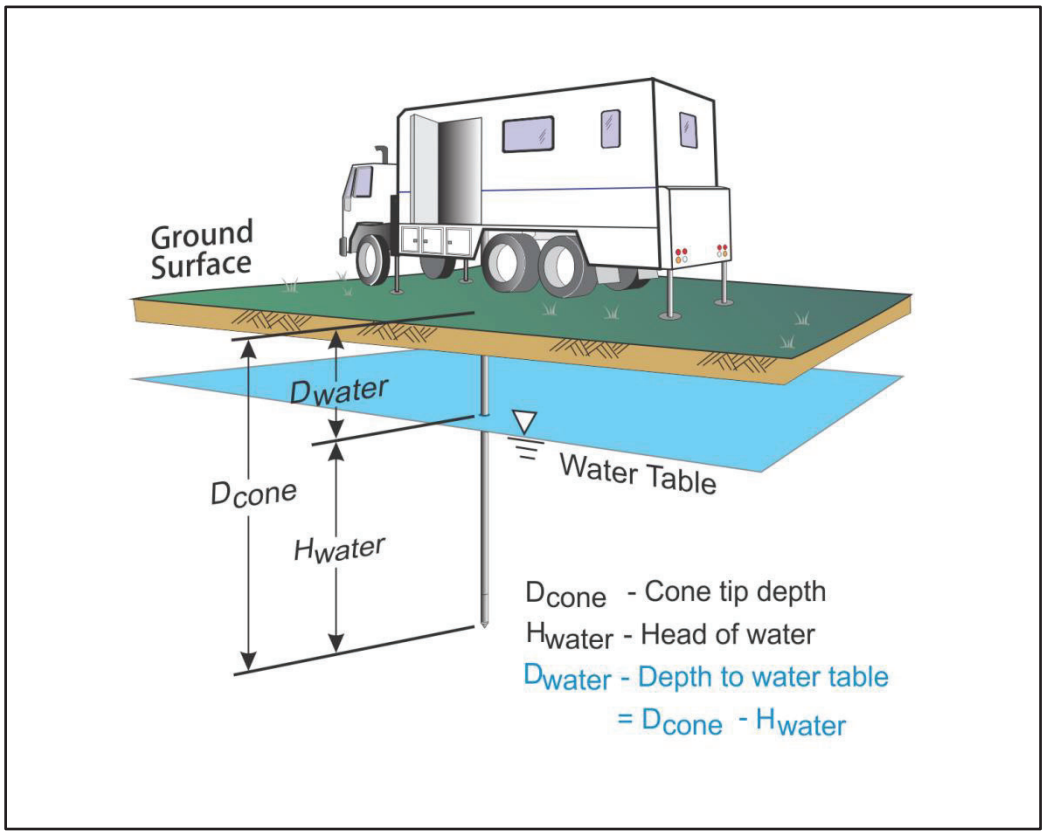


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

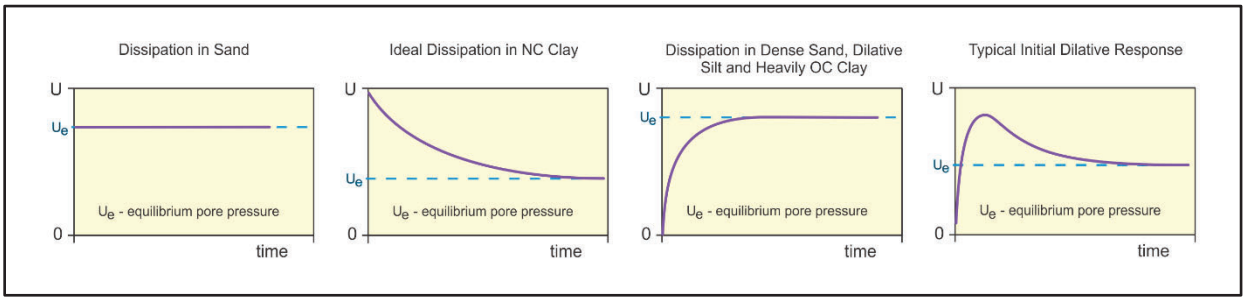


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby (1991))

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby (1991)), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, “Monotonic and dilatory pore pressure decay during piezocone tests”, Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, “Analytical cavity expansion-critical state model cone dissipation in fine-grained soils”, Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, “The piezometer probe: a useful investigation tool”, Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, “Estimating coefficient of consolidation from piezocone tests”, Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, “An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils”, Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi and N1(60)Ic
- Soil Behavior Type (SBT) Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

CONETEC

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[2] (°)	Longitude[2] (°)	Refer to Notation Number
CPT21-VAP-13	21-61-22763_CPVAP-13	27-Jul-2021	801:T1500F15U35	10.5	45.03	44.74852	-85.57214	
CPT21-VAP-14	21-61-22763_CPVAP-14	27-Jul-2021	801:T1500F15U35	10.5	44.05	44.74842	-85.57685	3
CPT21-VAP-15	21-61-22763_CPVAP-15	28-Jul-2021	801:T1500F15U35	12.0	52.00	44.74830	-85.57653	3
CPT21-VAP-16	21-61-22763_CPVAP-16	28-Jul-2021	801:T1500F15U35	12.1	43.14	44.74801	-85.57612	
CPT21-VAP-16A	21-61-22763_CPVAP-16A	28-Jul-2021	801:T1500F15U35	13.2	58.40	44.74802	-85.57612	
CPT21-VAP-17	21-61-22763_CPVAP-17	29-Jul-2021	801:T1500F15U35	13.6	83.09	44.74769	-85.57586	
CPT21-VAP-18	21-61-22763_CPVAP-18	30-Jul-2021	801:T1500F15U35	13.2	82.43	44.74736	-85.57592	
CPT21-VAP-19	21-61-22763_CPVAP-19	30-Jul-2021	801:T1500F15U35	12.3	80.05	44.74705	-85.57593	
CPT21-VAP-20	21-61-22763_CPVAP-20	30-Jul-2021	801:T1500F15U35	9.9	70.05	44.74533	-85.57813	
CPT21-VAP-21	21-61-22763_CPVAP-21	03-Aug-2021	801:T1500F15U35	10.7	71.28	44.74594	-85.57813	
CPT21-VAP-22	21-61-22763_CPVAP-22	04-Aug-2021	801:T1500F15U35	11.8	29.36	44.74499	-85.57920	
CPT21-VAP-22A	21-61-22763_CPVAP-22A	04-Aug-2021	801:T1500F15U35	11.8	63.73	44.74499	-85.57920	3
CPT21-VAP-23	21-61-22763_CPVAP-23	04-Aug-2021	801:T1500F15U35	9.5	30.68	44.74498	-85.57849	3
CPT21-VAP-23A	21-61-22763_CPVAP-23A	04-Aug-2021	801:T1500F15U35	9.5	31.09	44.74498	-85.57848	3
CPT21-VAP-23B	21-61-22763_CPVAP-23B	04-Aug-2021	801:T1500F15U35	9.5	78.17	44.74499	-85.57845	3
CPT21-VAP-24	21-61-22763_CPVAP-24	06-Aug-2021	802:T1500F15U35	10.2	38.71	44.74774	-85.58247	
CPT21-ASTC-VAP-25	21-61-22763_CPVAP-25	18-Dec-2021	661:T1500F15U35	11.9	32.56	44.74859	-85.57818	
CPT21-ASTC-VAP-25A	21-61-22763_CPVAP-25A	18-Dec-2021	661:T1500F15U35	11.9	15.58	44.74858	-85.57816	
CPT21-ASTC-VAP-26	21-61-22763_CPVAP-26	09-Dec-2021	801:T1500F15U35	12.0	40.03	44.75018	-85.57774	3
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	12-Dec-2021	801:T1500F15U35	14.7	35.93	44.74961	-85.57594	
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	10-Dec-2021	801:T1500F15U35	19.4	47.00	44.75235	-85.57268	
CPT21-ASTC-VAP-29	21-61-22763_CPVAP-29	14-Dec-2021	661:T1500F15U35	15.0	70.05	44.75167	-85.57114	
CPT21-ASTC-VAP-30	21-61-22763_CPVAP-30	15-Dec-2021	661:T1500F15U35	10.7	70.21	44.75111	-85.56988	

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[2] (°)	Longitude[2] (°)	Refer to Notation Number
CPT21-ASTC-VAP-31	21-61-22763_CPVAP-31	13-Dec-2021	801:T1500F15U35	8.5	41.67	44.75057	-85.56859	
CPT21-ASTC-VAP-31A	21-61-22763_CPVAP-31A	13-Dec-2021	661:T1500F15U35	8.5	43.31	44.75058	-85.56861	
CPT21-ASTC-VAP-32	21-61-22763_CPVAP-32	11-Dec-2021	801:T1500F15U35	12.2	43.64	44.74510	-85.57700	
CPT21-ASTC-VAP-32A	21-61-22763_CPVAP-32A	11-Dec-2021	801:T1500F15U35	12.2	62.09	44.74510	-85.57702	
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	12-Dec-2021	801:T1500F15U35	11.5	70.21	44.74494	-85.57583	
CPT21-ASTC-VAP-34	21-61-22763_CPVAP-34	15-Dec-2021	661:T1500F15U35	5.5	70.21	44.75340	-85.56972	
CPT21-ASTC-VAP-35	21-61-22763_CPVAP-35	20-Dec-2021	661:T1500F15U35	5.2	25.10	44.75293	-85.56897	
CPT21-ASTC-VAP-35A	21-61-22763_CPVAP-35A	20-Dec-2021	661:T1500F15U35	5.2	70.21	44.75295	-85.56894	
CPT21-ASTC-VAP-36	21-61-22763_CPVAP-36	16-Dec-2021	661:T1500F15U35	5.1	70.21	44.75300	-85.56894	
CPT21-ASTC-VAP-37	21-61-22763_CPVAP-37	17-Dec-2021	661:T1500F15U35	8.7	70.05	44.75194	-85.56863	
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	21-Dec-2021	661:T1500F15U35	7.0	54.54	44.75358	-85.57111	
CPT21-ASTC-VAP-39	21-61-22763_CPVAP-39	21-Dec-2021	661:T1500F15U35	9.5	47.16	44.74976	-85.56672	
Totals	35 soundings				1880.97			

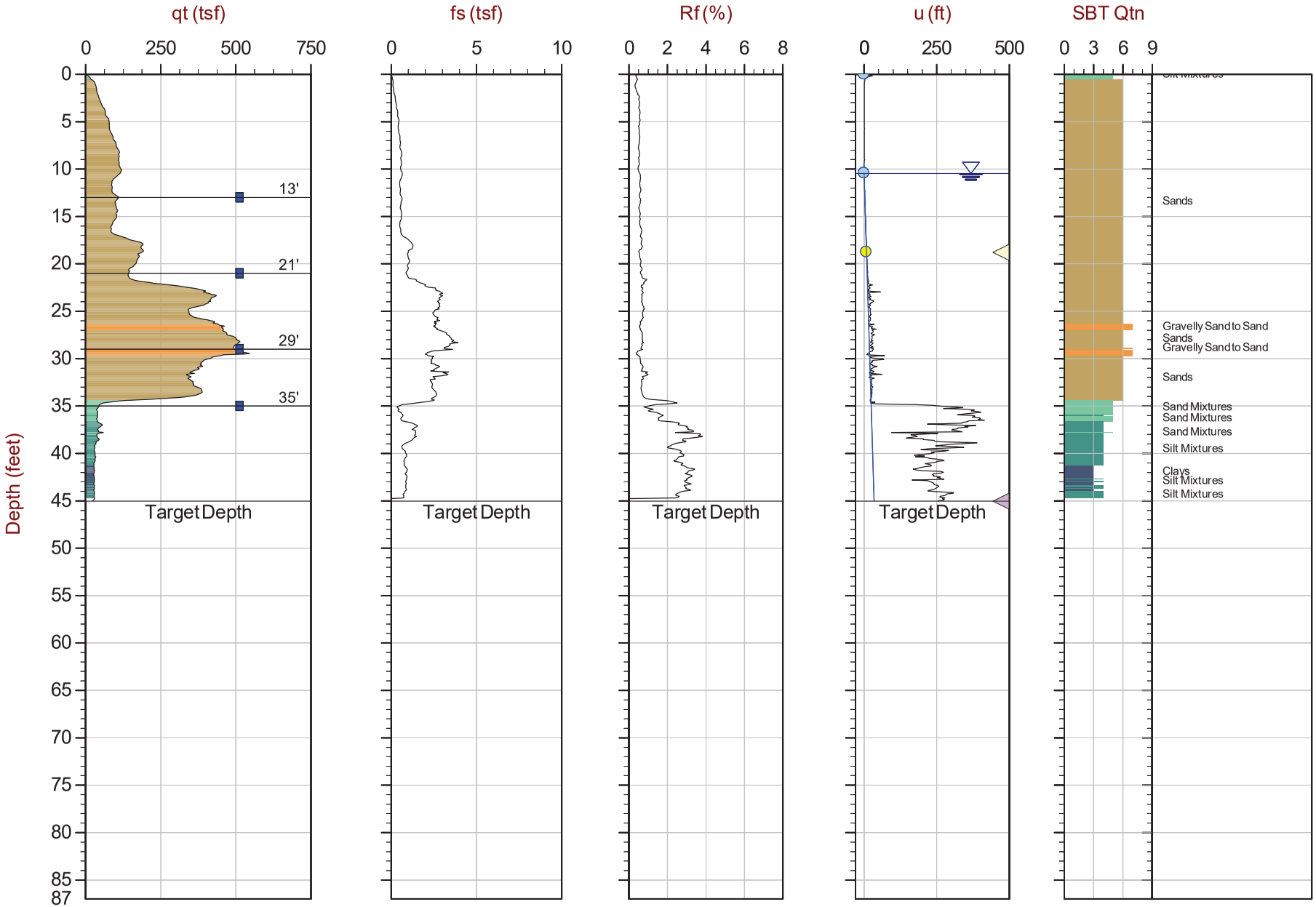
1. The assumed phreatic surface was based on pore pressure dissipation tests. Hydrostatic data was used for the calculated parameters.
2. Coordinates were acquired using a MR-350 GlobalSat GPS Receiver in datum: WGS84 Latitude / Longitude.
3. The assumed phreatic surface was estimated from the dynamic pore pressure data.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35



Max Depth: 13.725 m / 45.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-13.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74852 Long: -85.57214

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

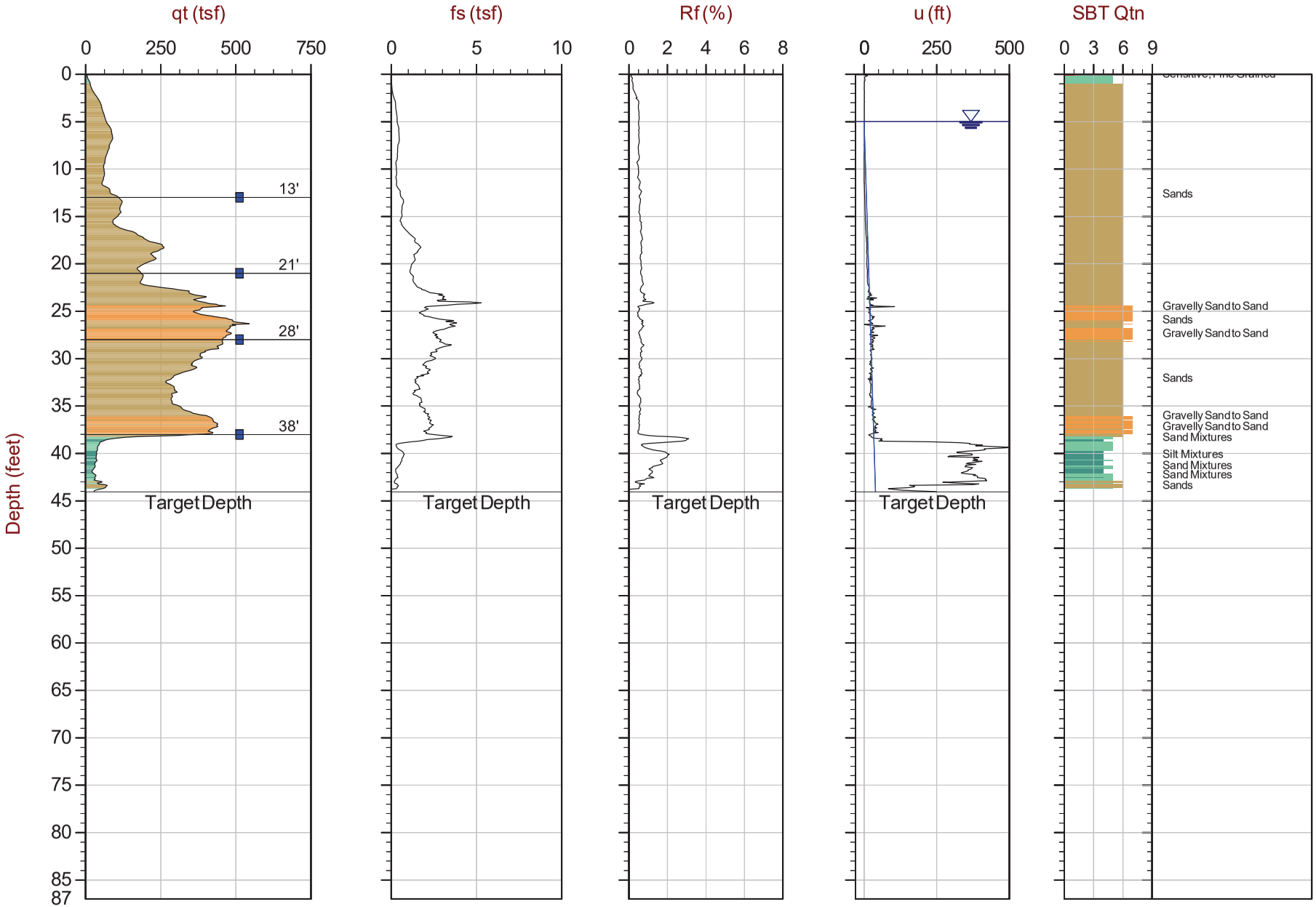
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35



Max Depth: 13.425 m / 44.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-14.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74842 Long: -85.57685

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

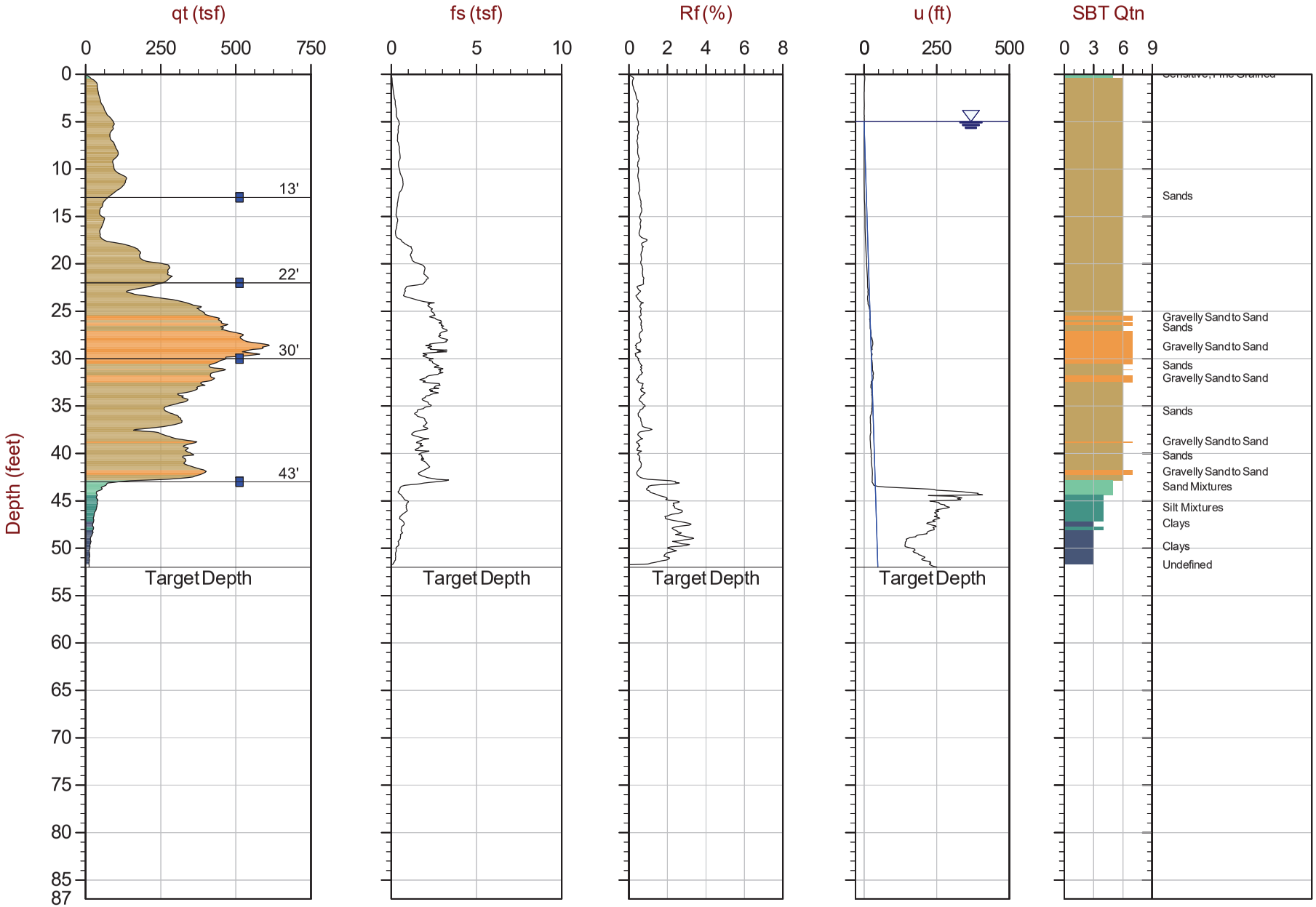
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35



Max Depth: 15.850 m / 52.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-15.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74830 Long: -85.57653

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

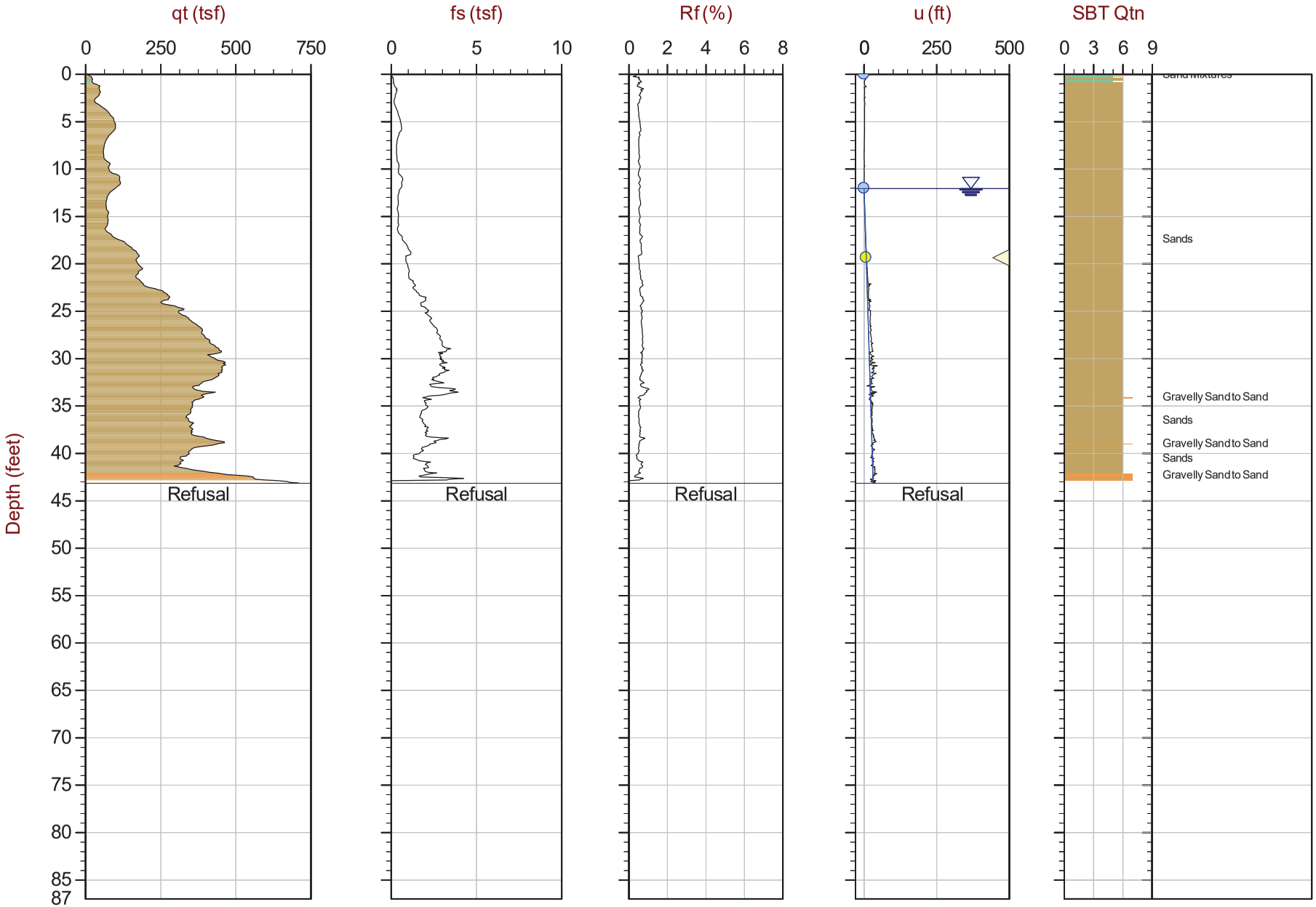
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35



Max Depth: 13.150 m / 43.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74801 Long: -85.57612

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

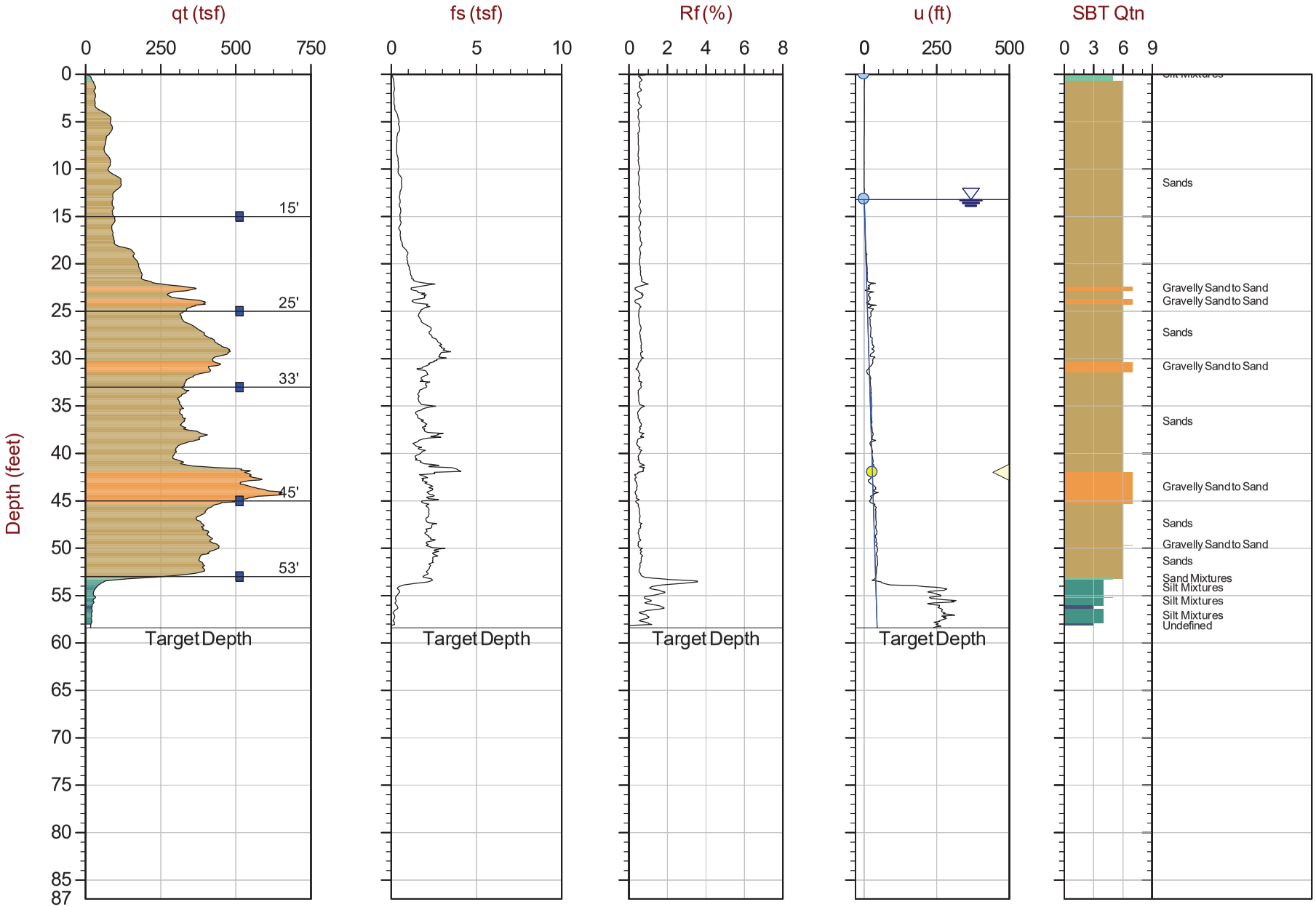
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35



Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74802 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

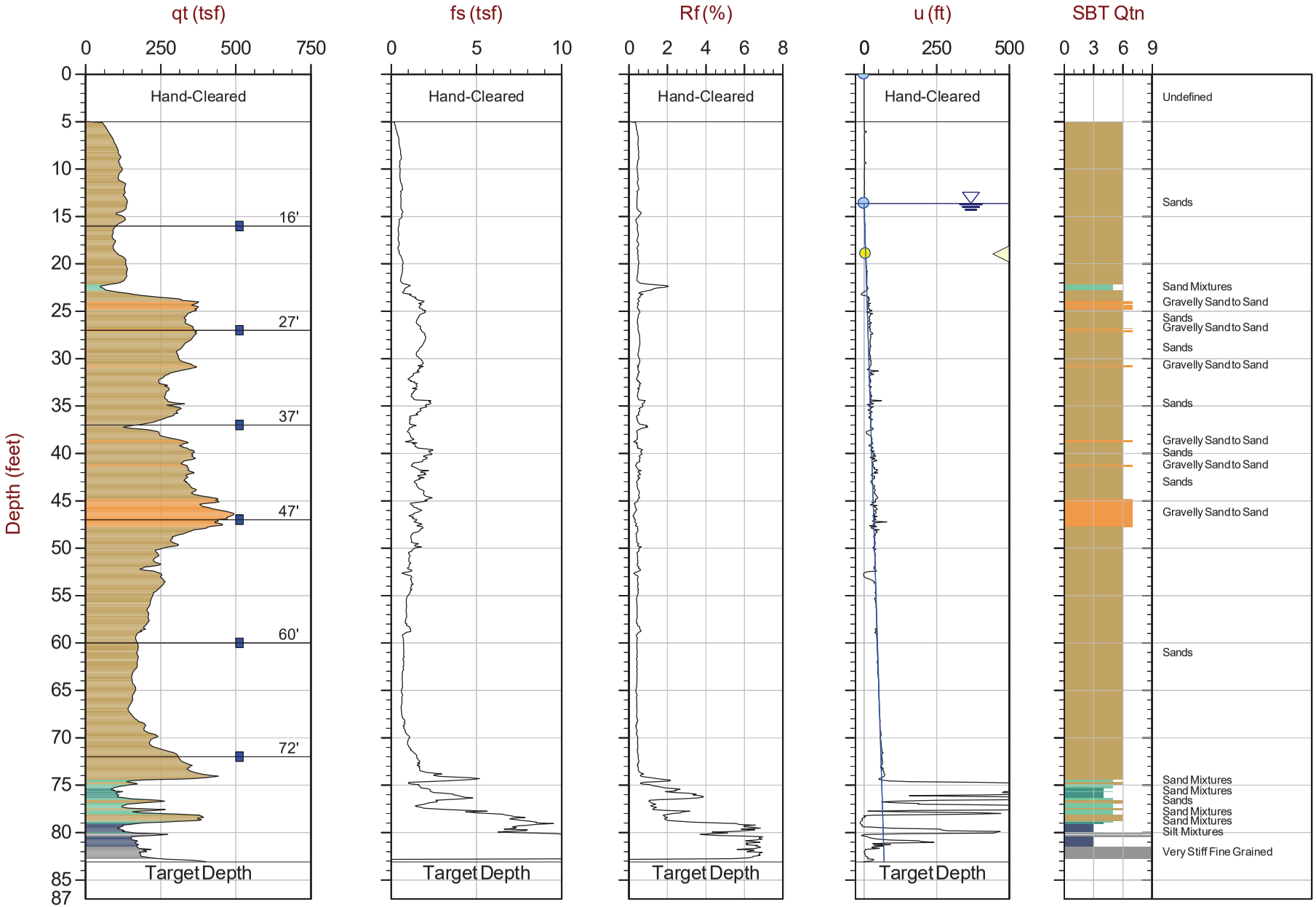
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35



Max Depth: 25.325 m / 83.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-17.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74769 Long: -85.57586

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

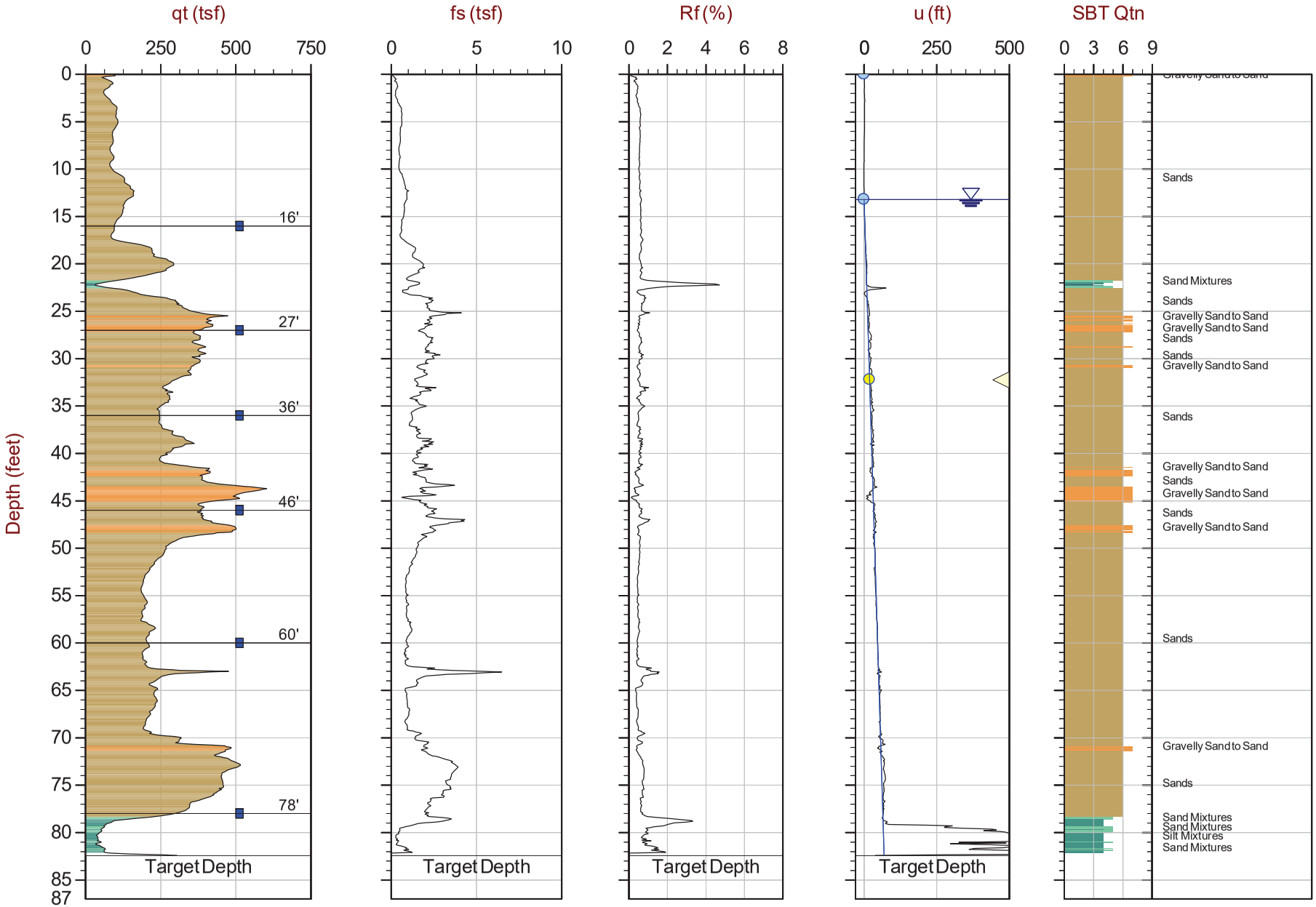
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35



Max Depth: 25.125 m / 82.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-18.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74735 Long: -85.57592

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

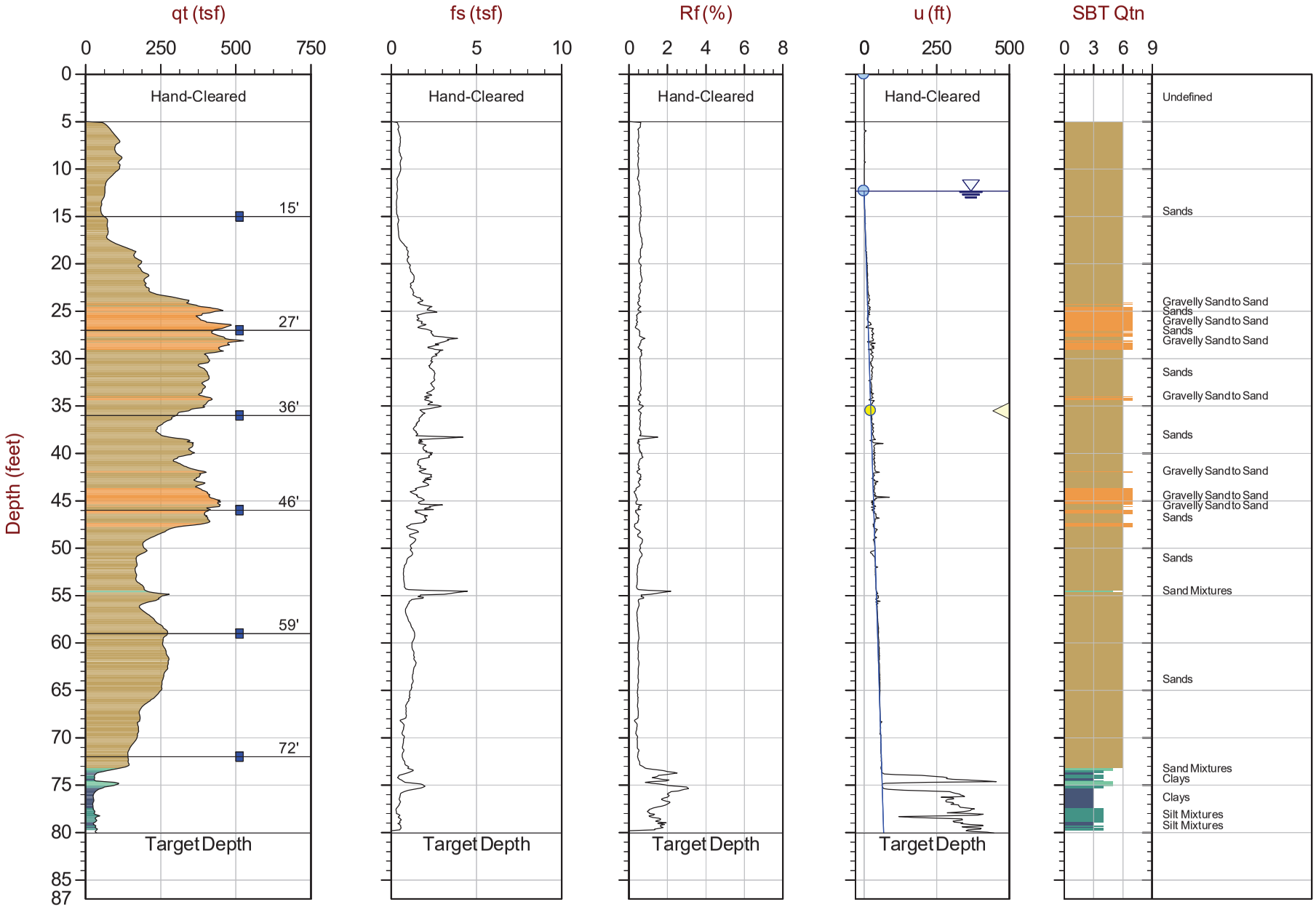
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35



Max Depth: 24.400 m / 80.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-19.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74705 Long: -85.57593

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

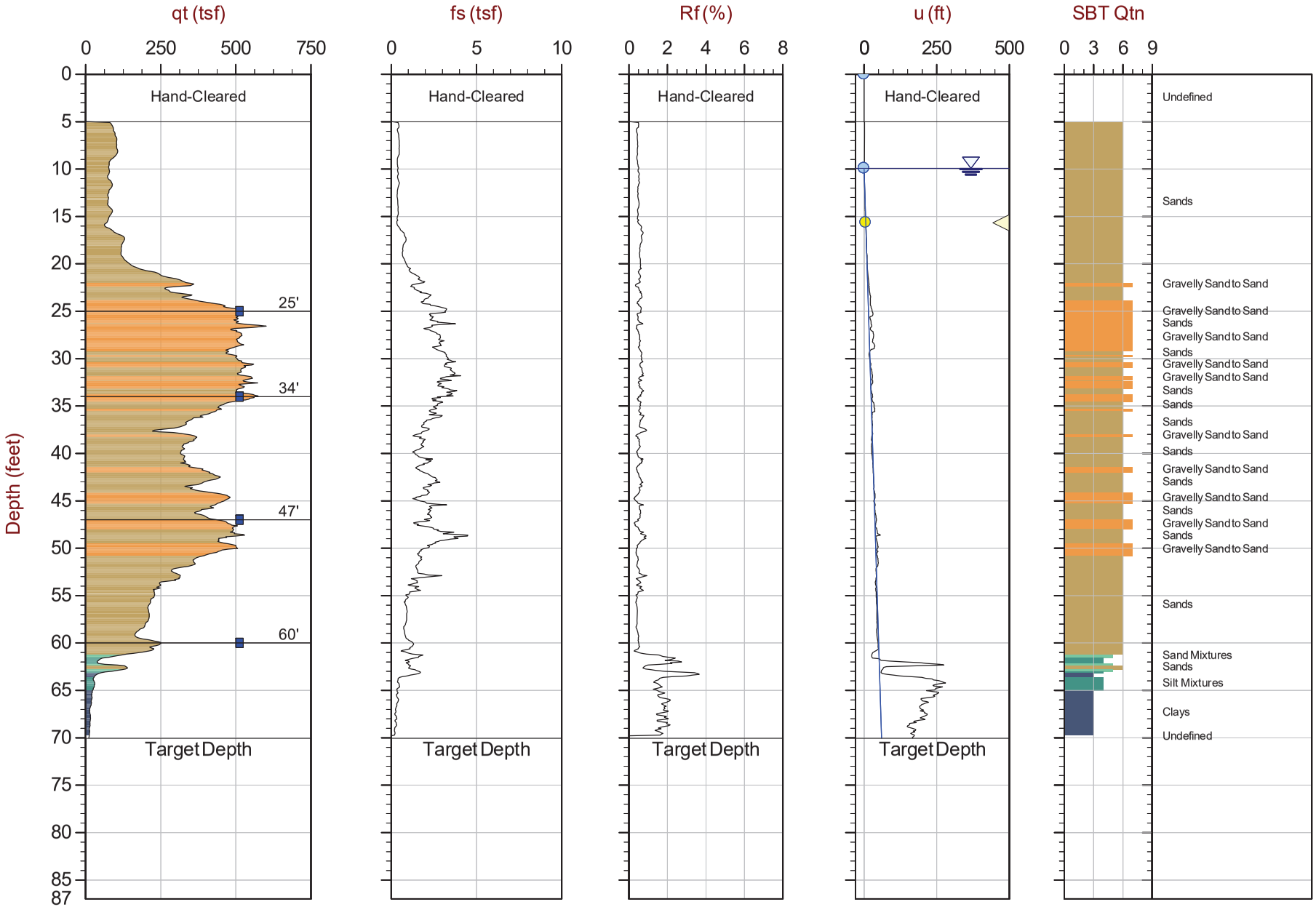
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-20.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74533 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

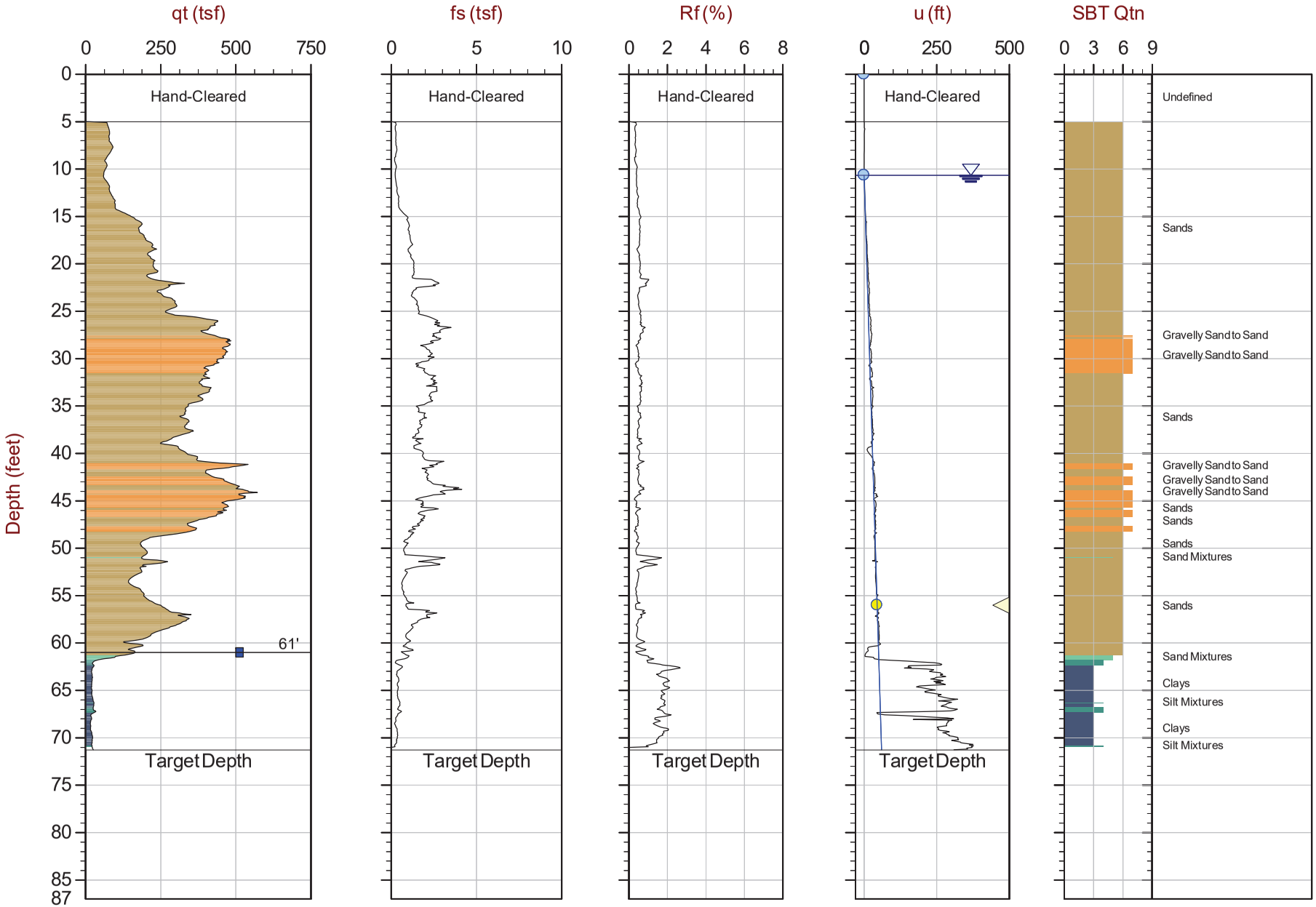
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35



Max Depth: 21.725 m / 71.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-21.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74594 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

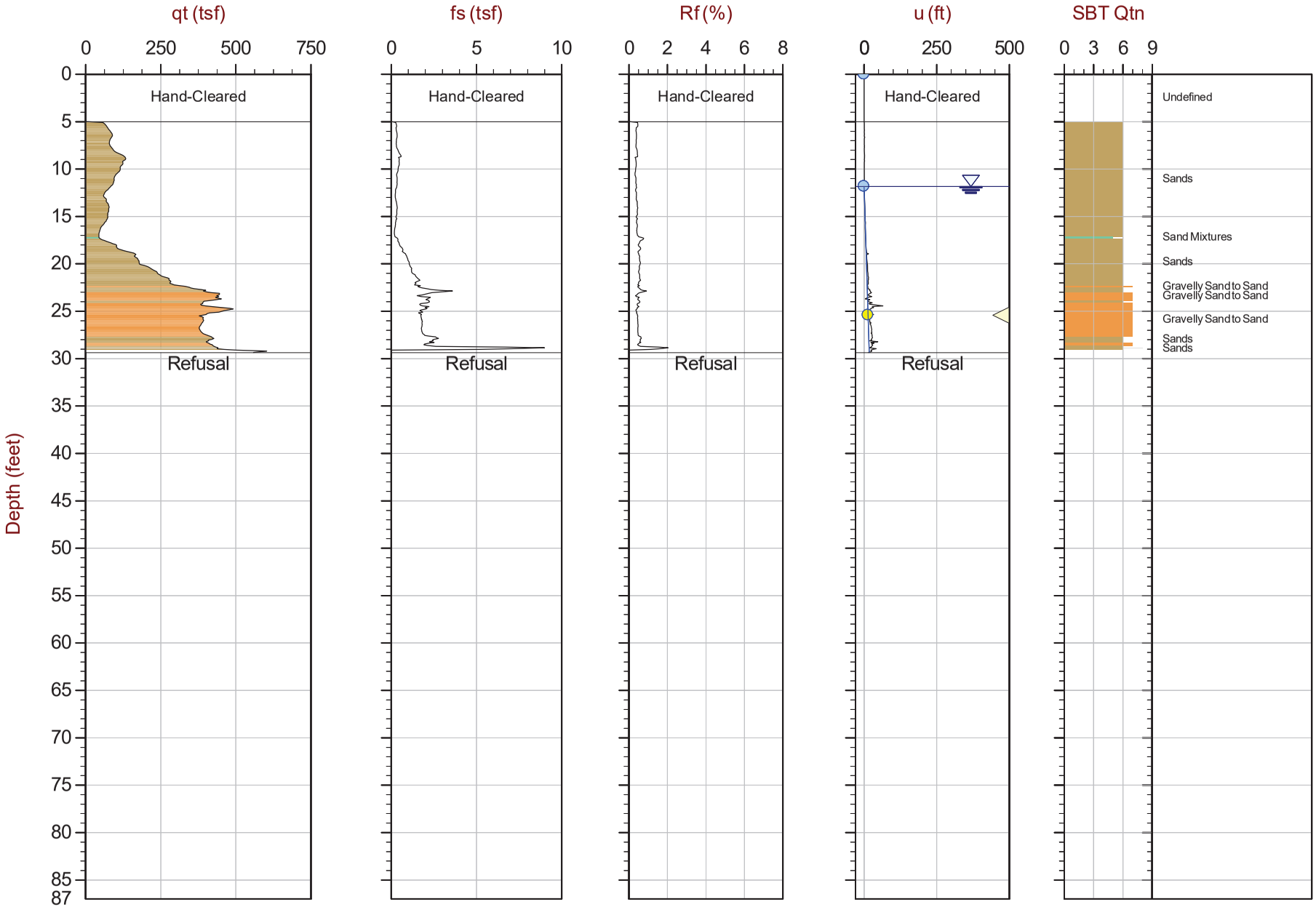
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35



Max Depth: 8.950 m / 29.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

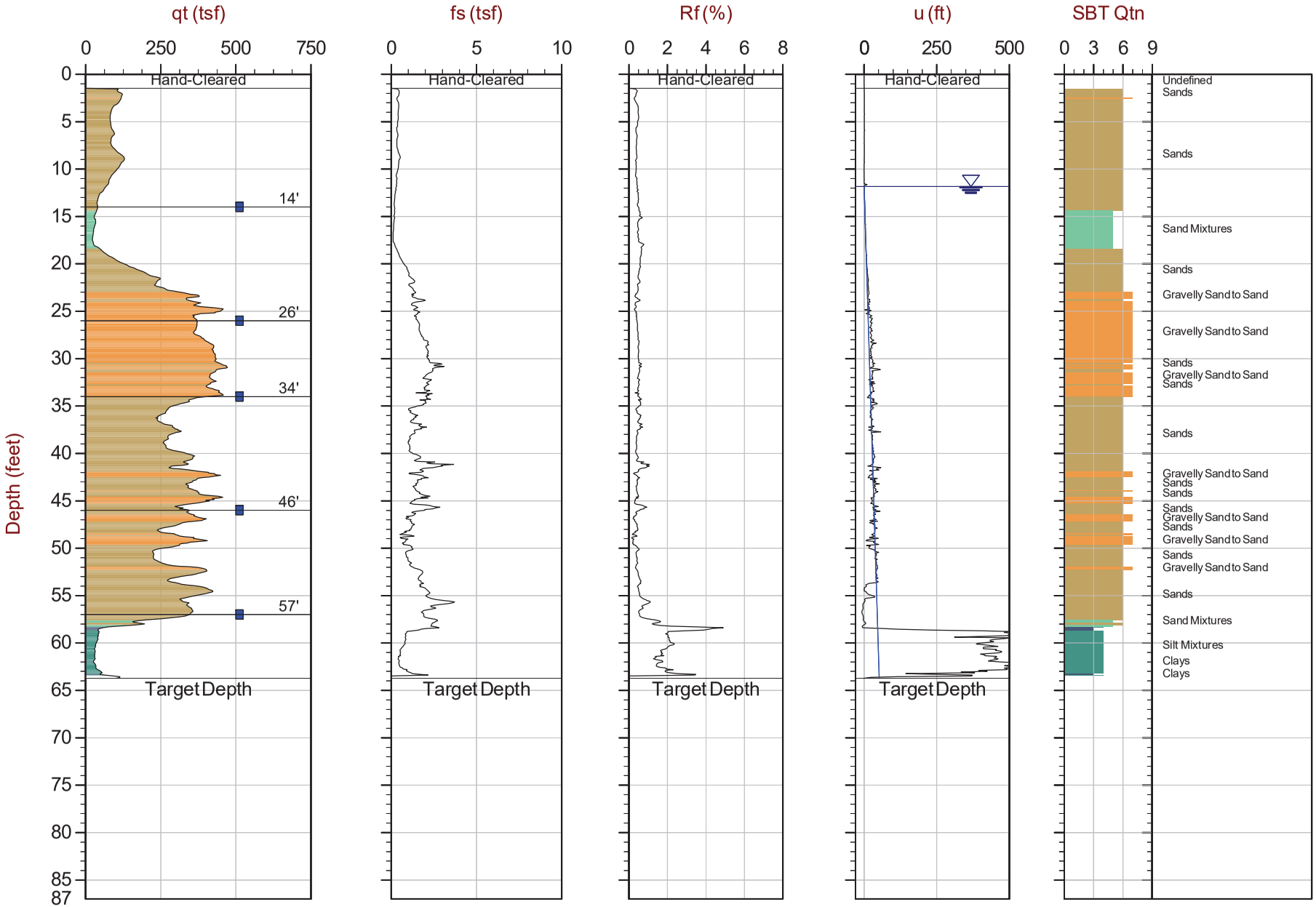
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35



Max Depth: 19.425 m / 63.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

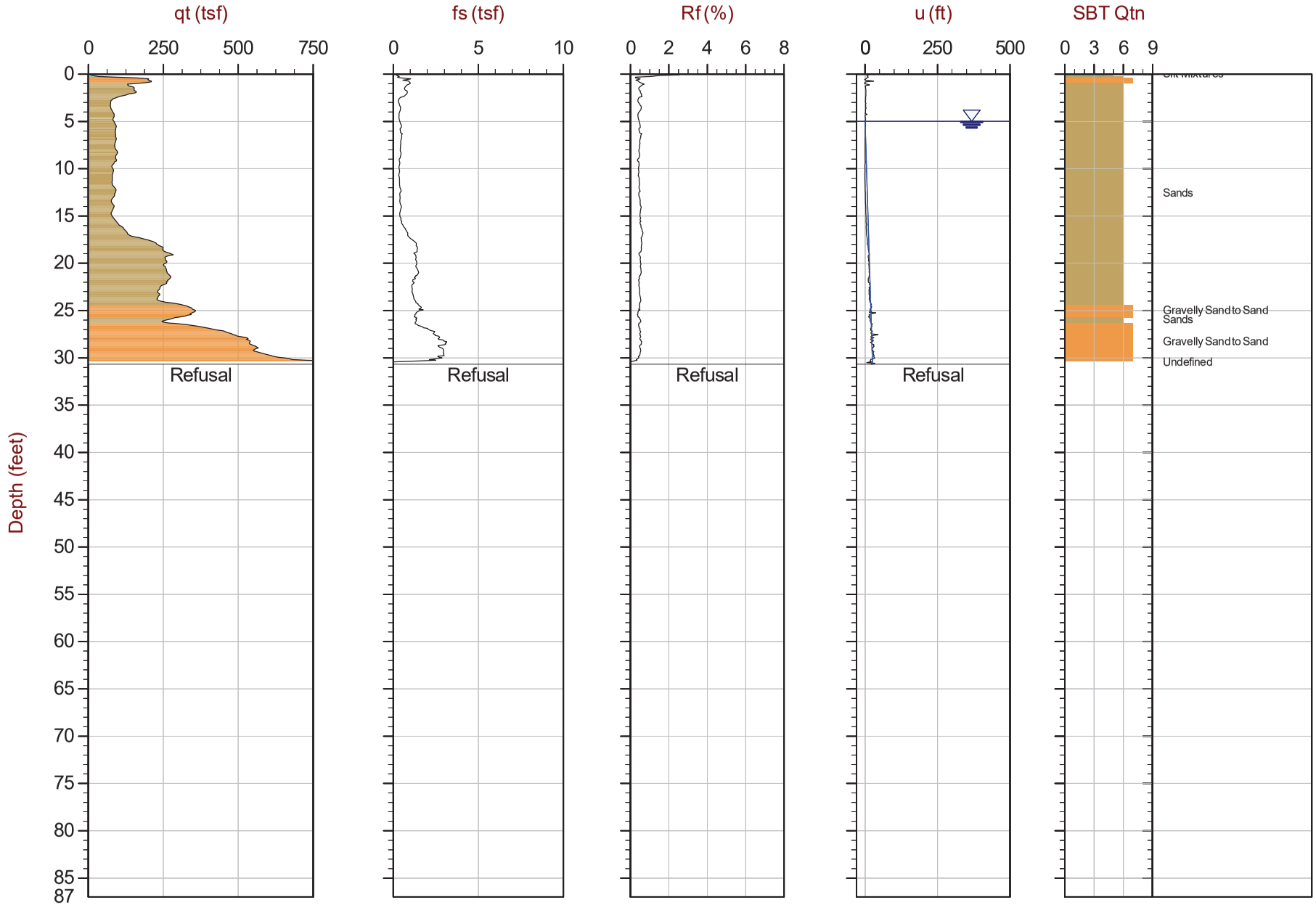
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35



Max Depth: 9.350 m / 30.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57849

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

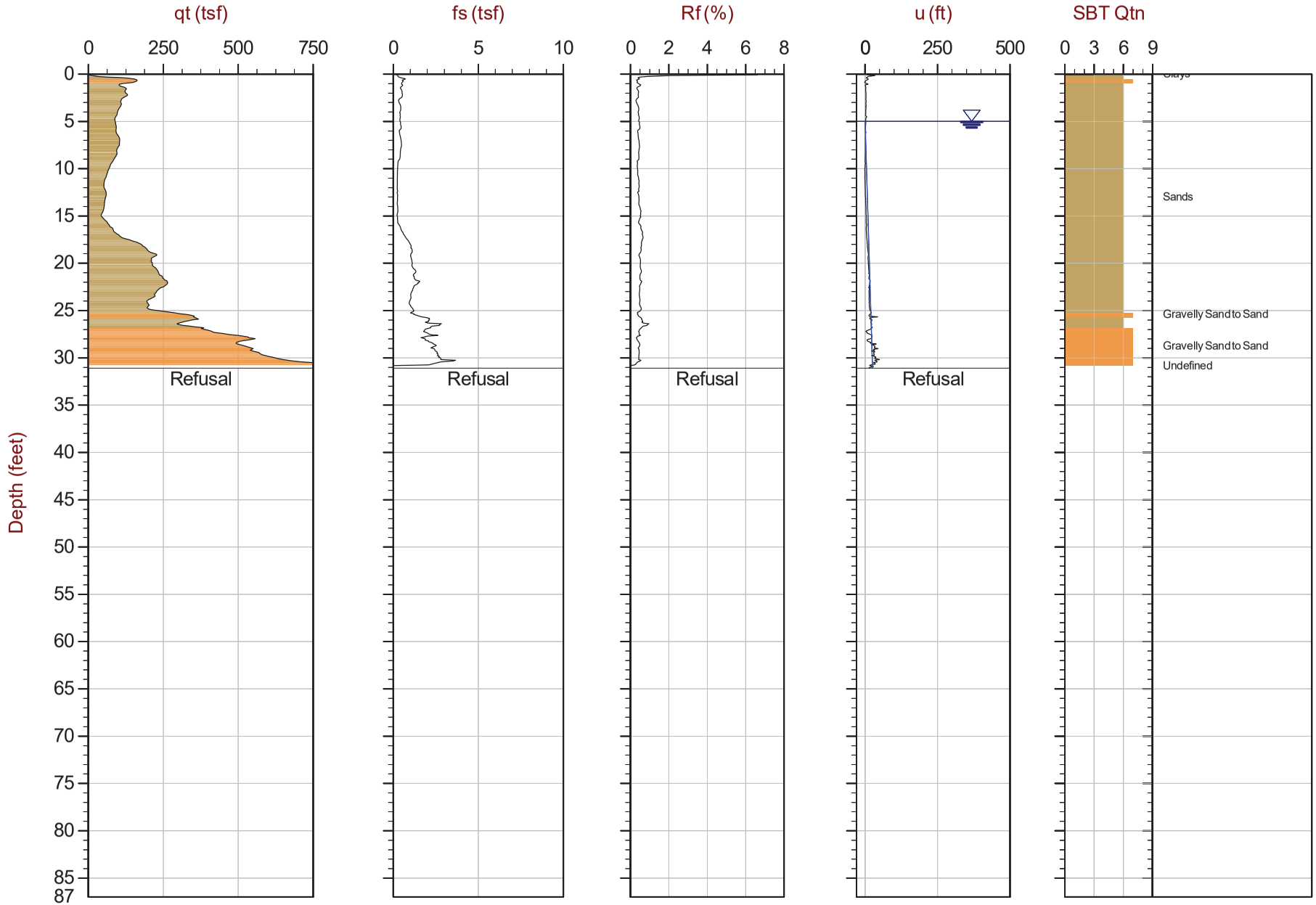
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57848

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

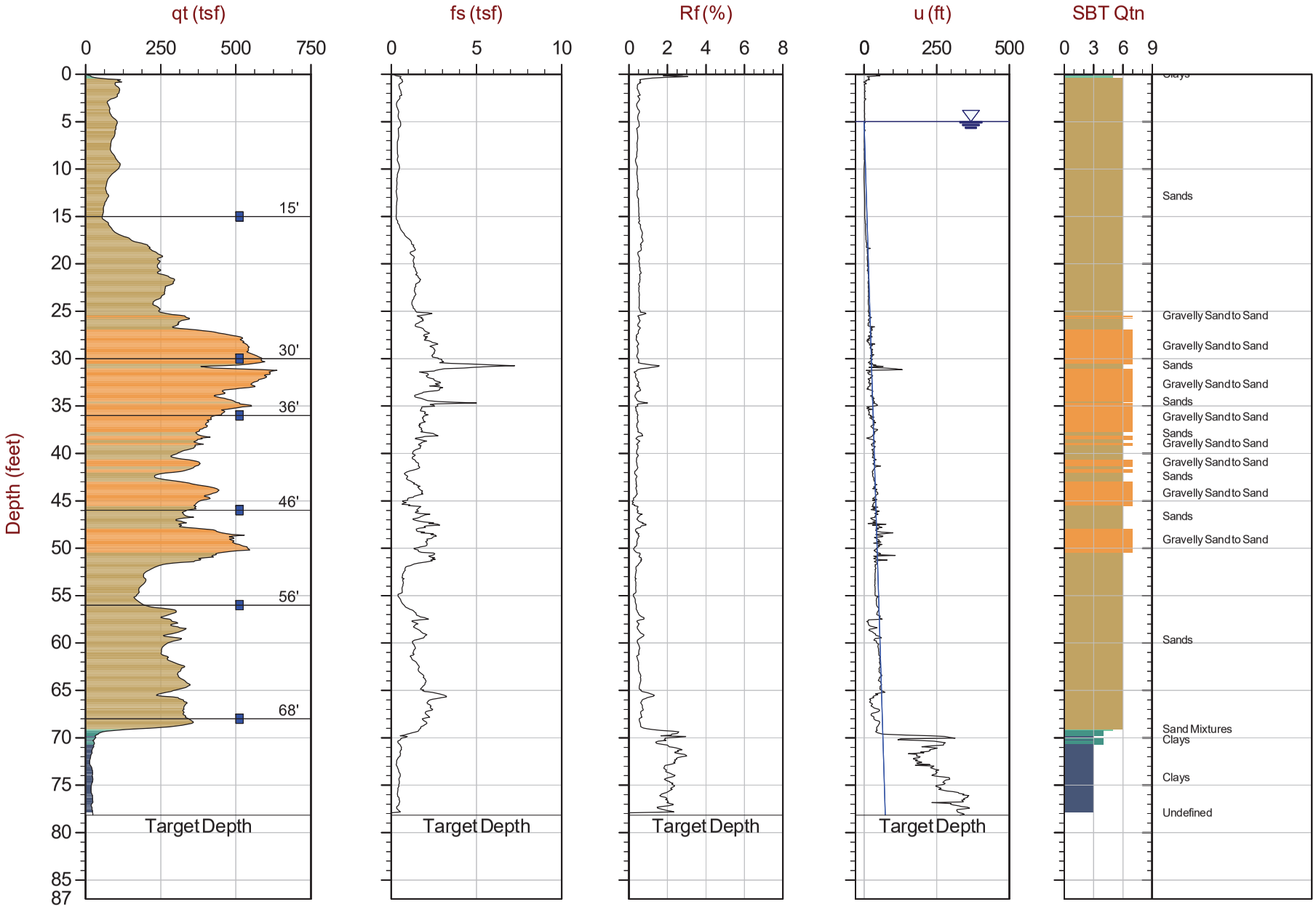
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35



Max Depth: 23.825 m / 78.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57845

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

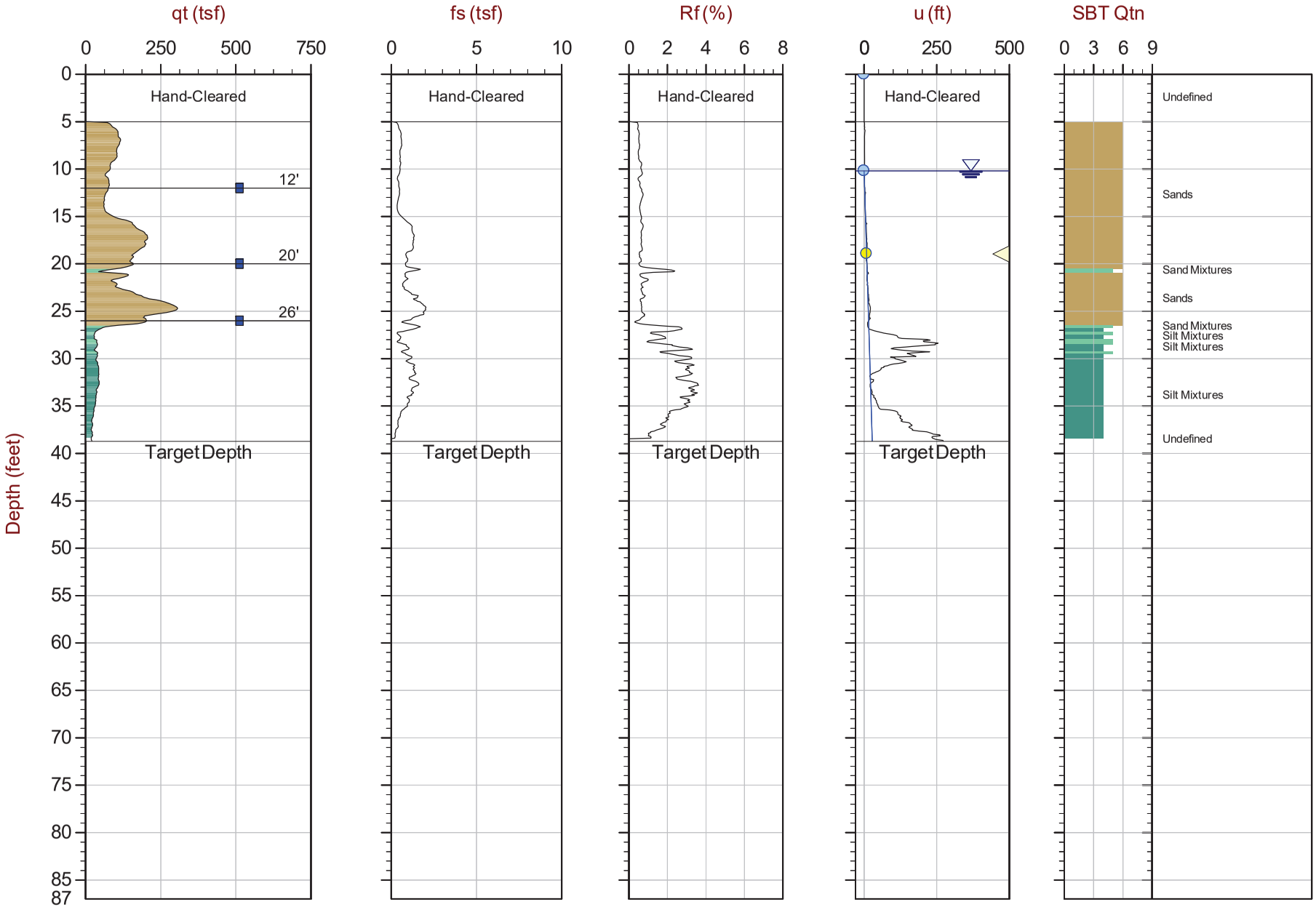
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-24.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74773 Long: -85.58247

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

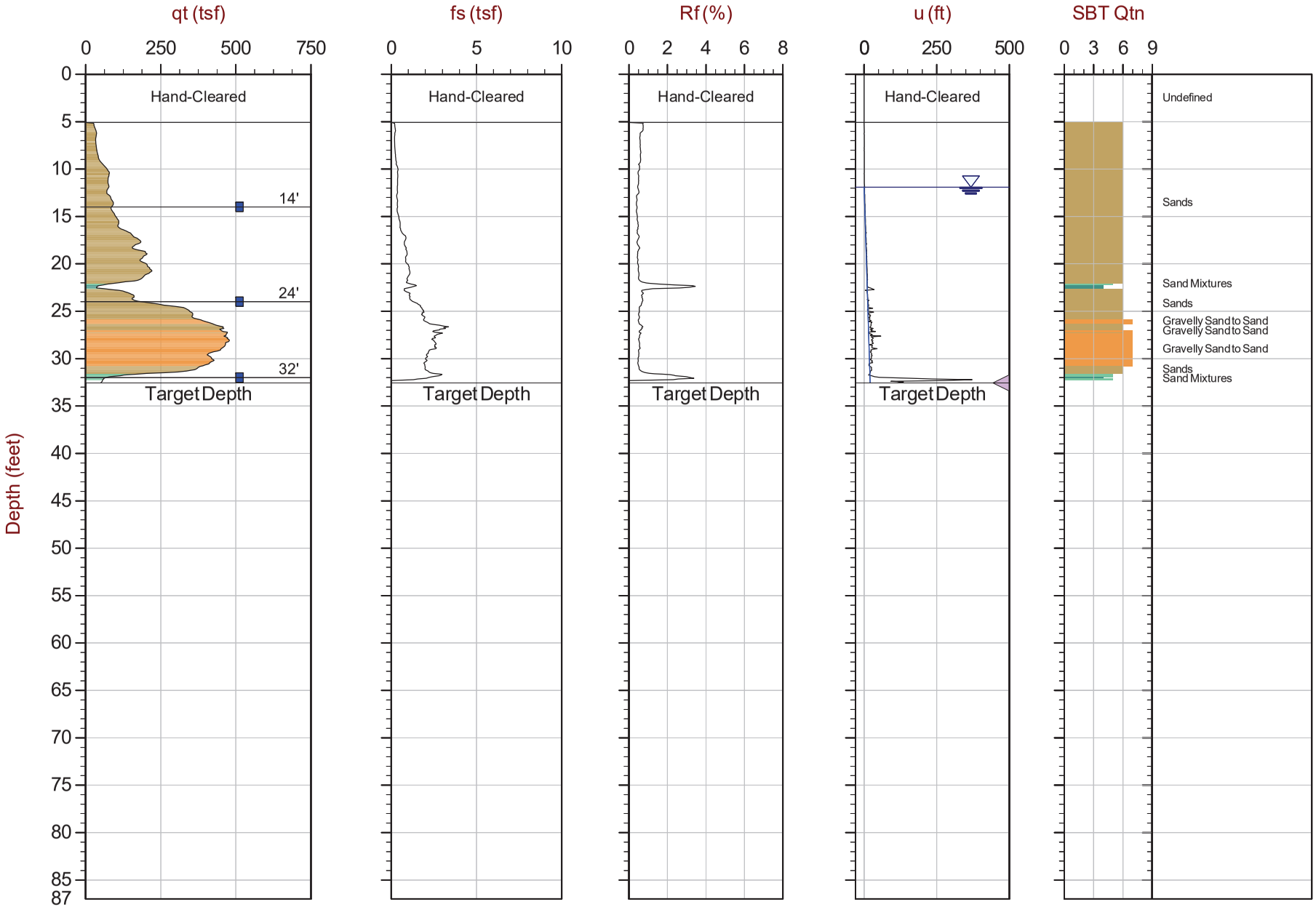
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35



Max Depth: 9.925 m / 32.56 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74859 Long: -85.57818

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

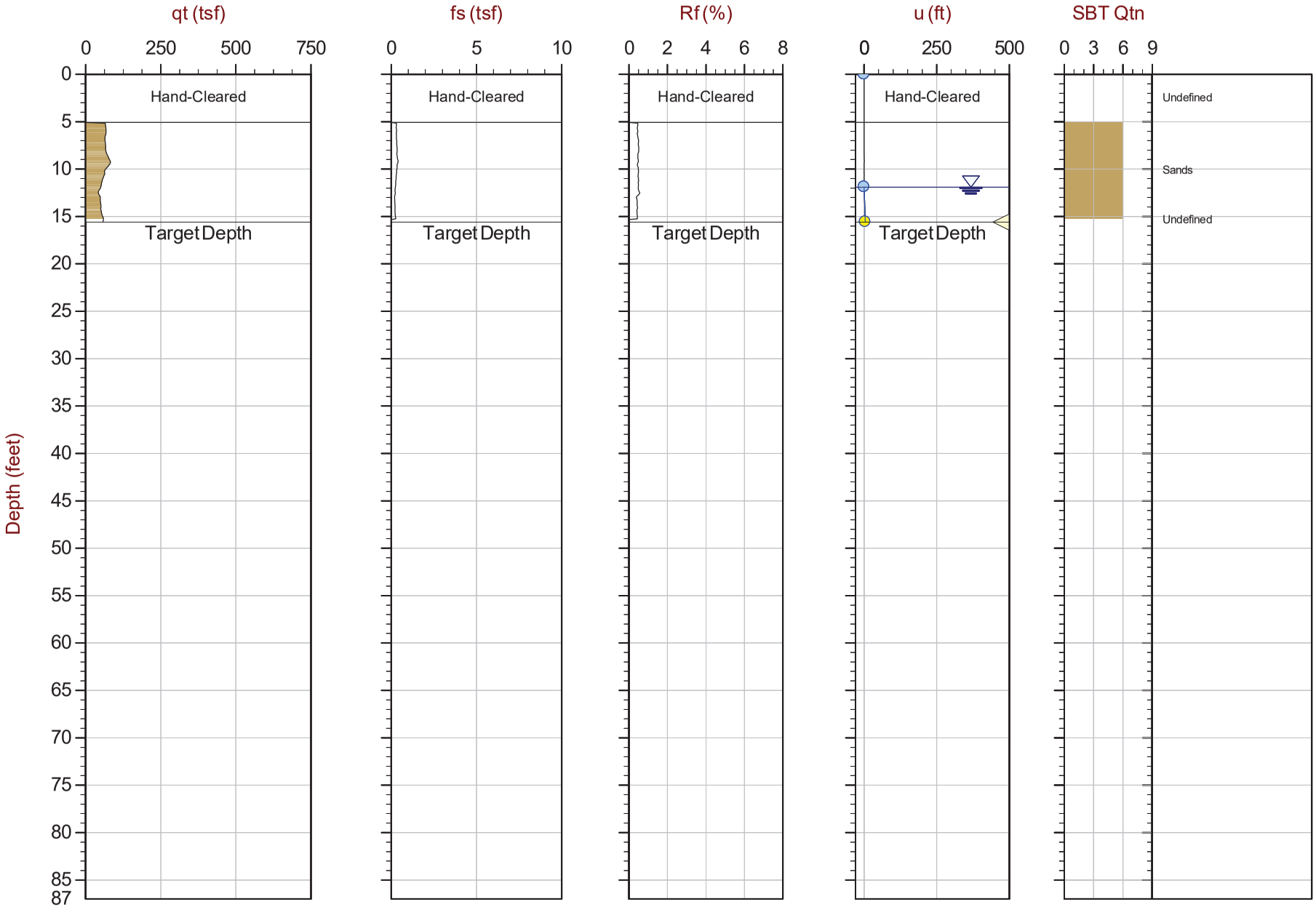
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35



Max Depth: 4.750 m / 15.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74858 Long: -85.57816

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

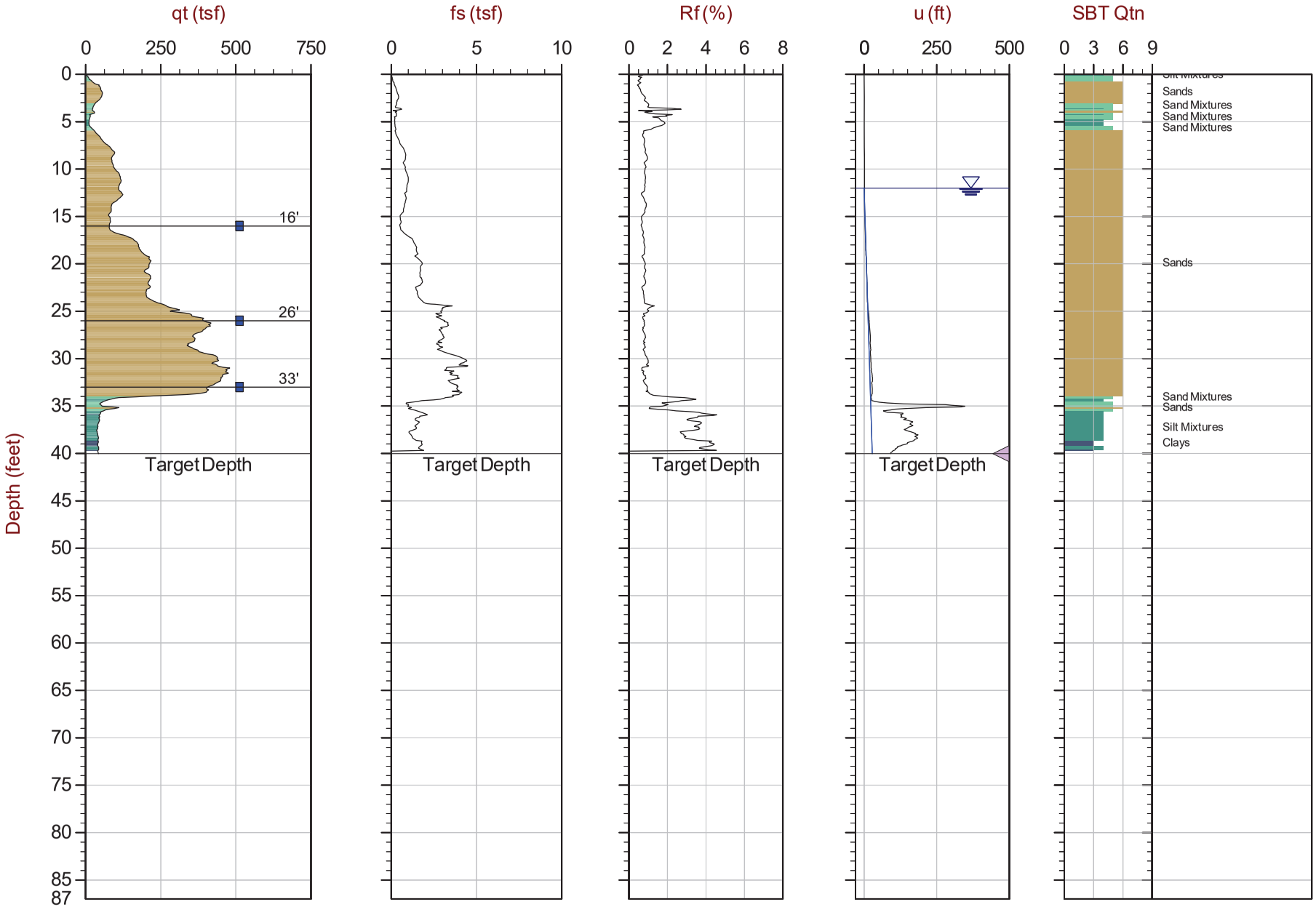
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-26.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75018 Long: -85.57774

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

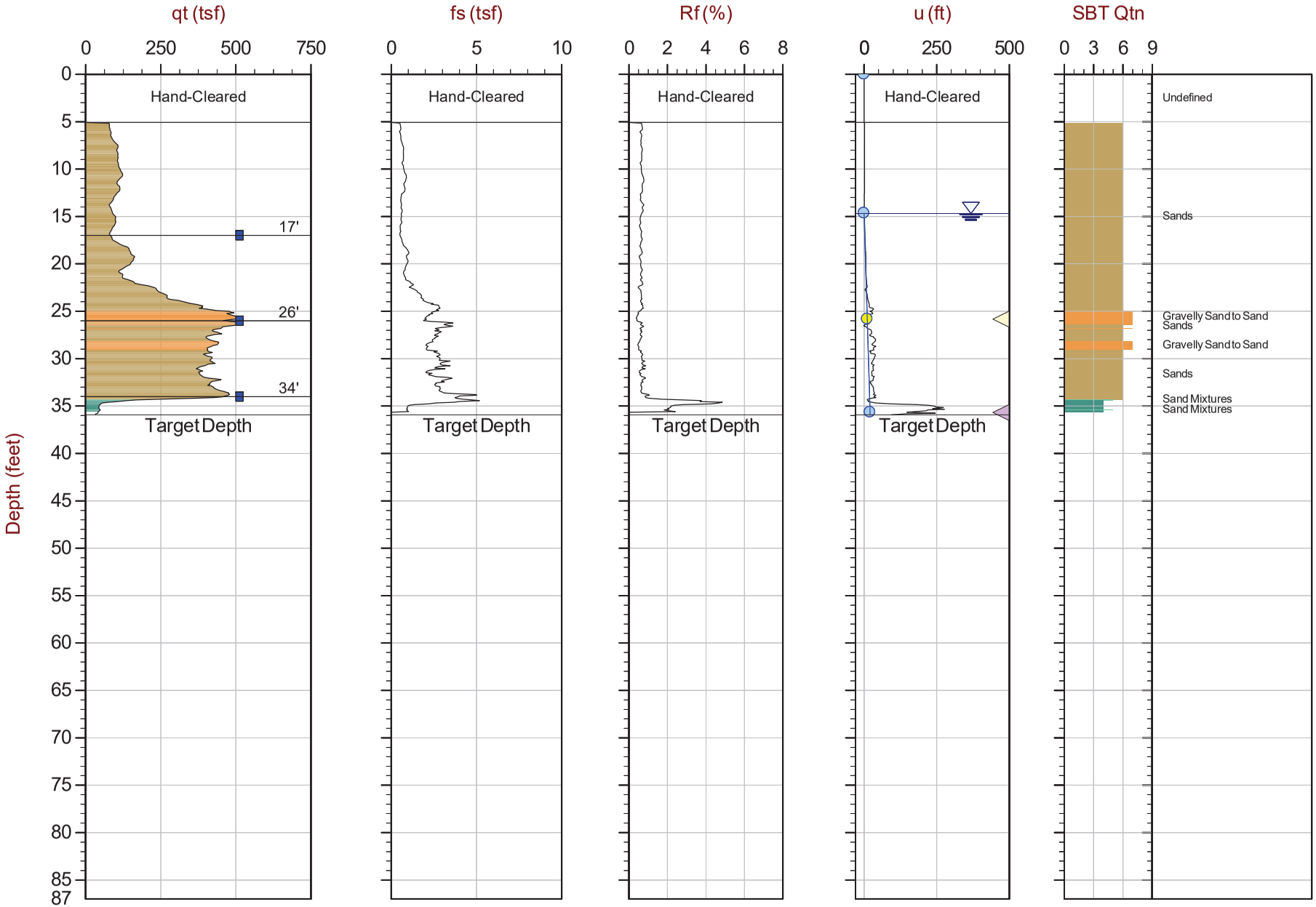
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35



Max Depth: 10.950 m / 35.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-27.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74961 Long: -85.57594

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

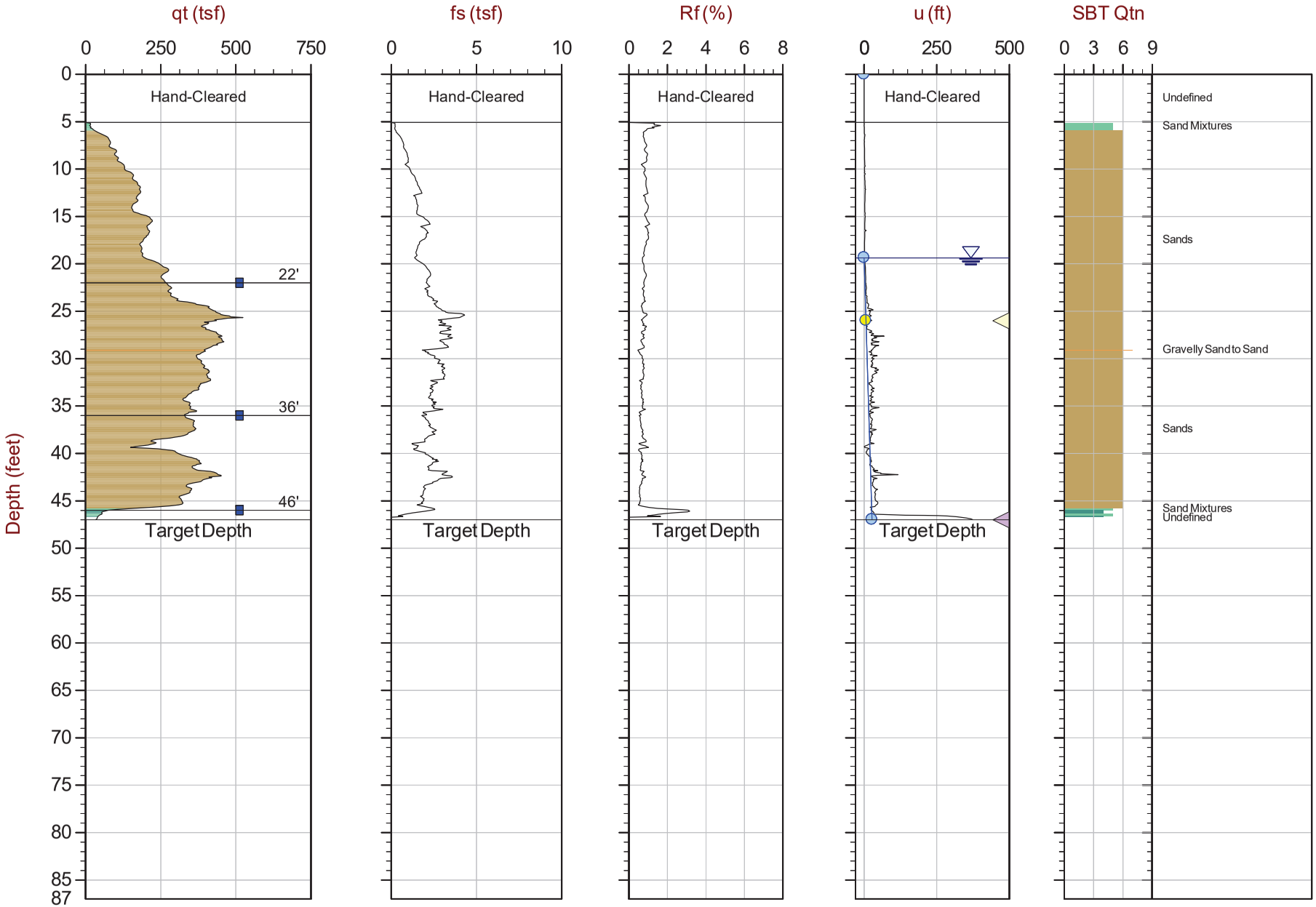
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35



Max Depth: 14.325 m / 47.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-28.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75235 Long: -85.57268

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

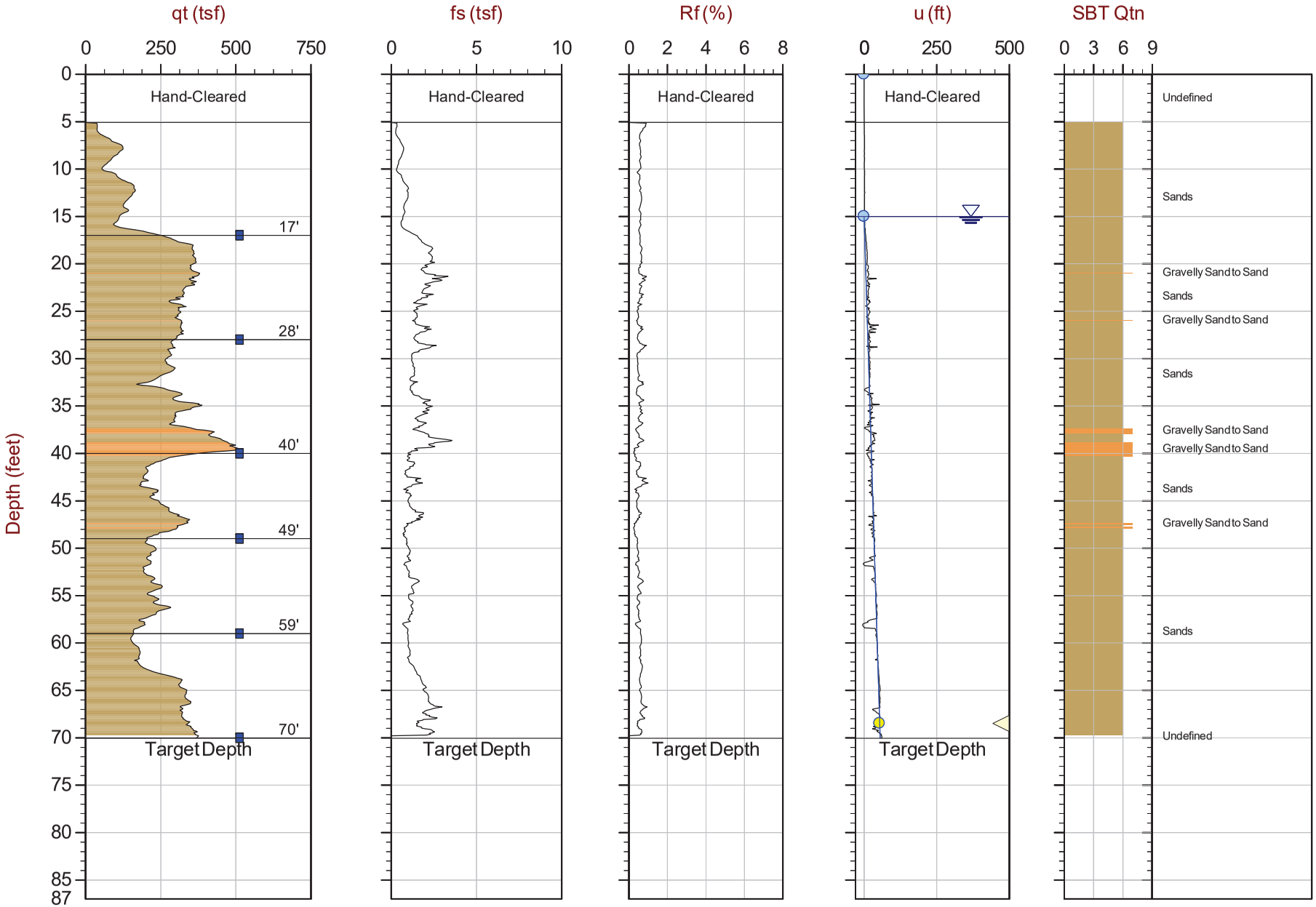
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-29.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75167 Long: -85.57113

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

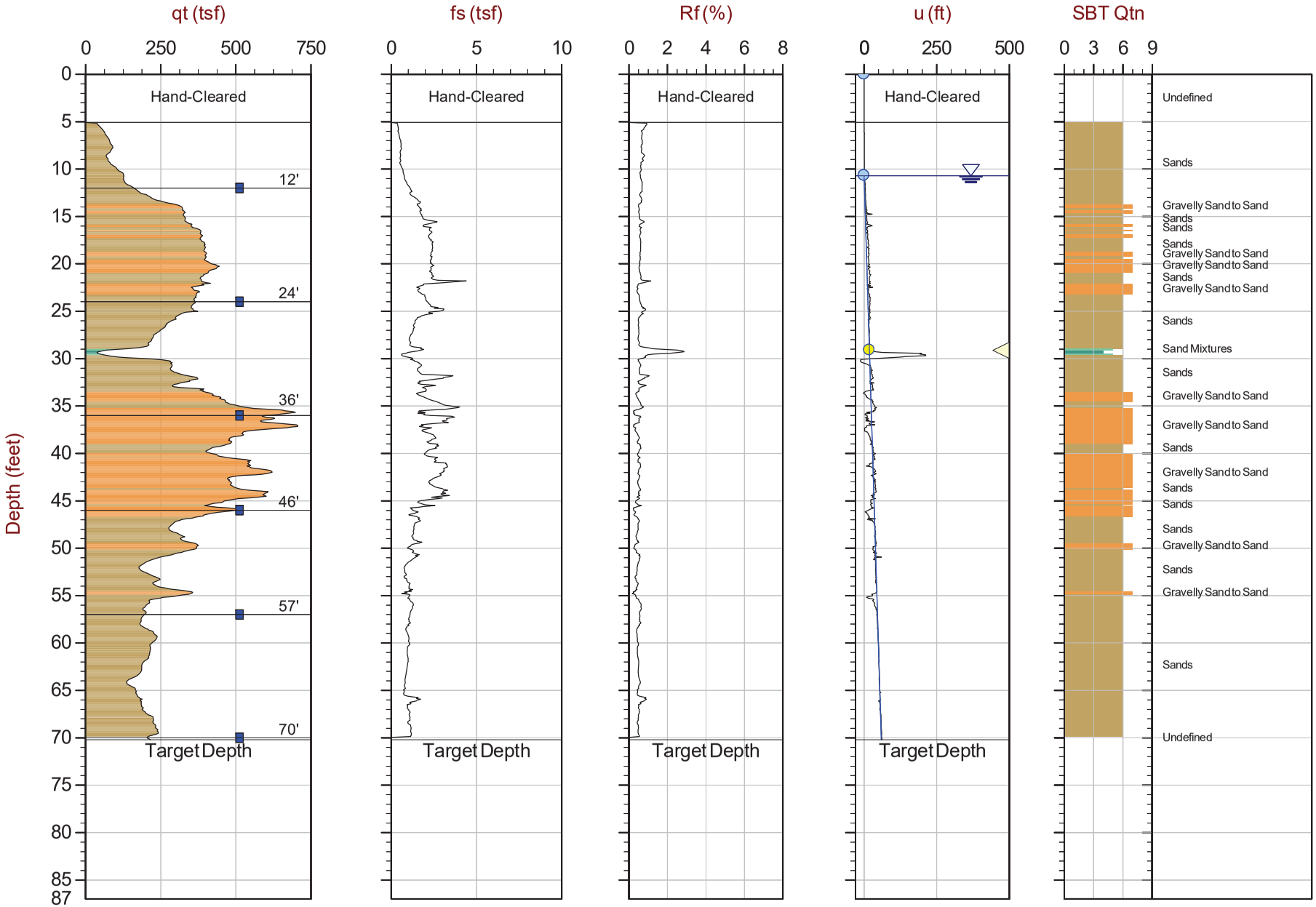
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-30.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75111 Long: -85.56988

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

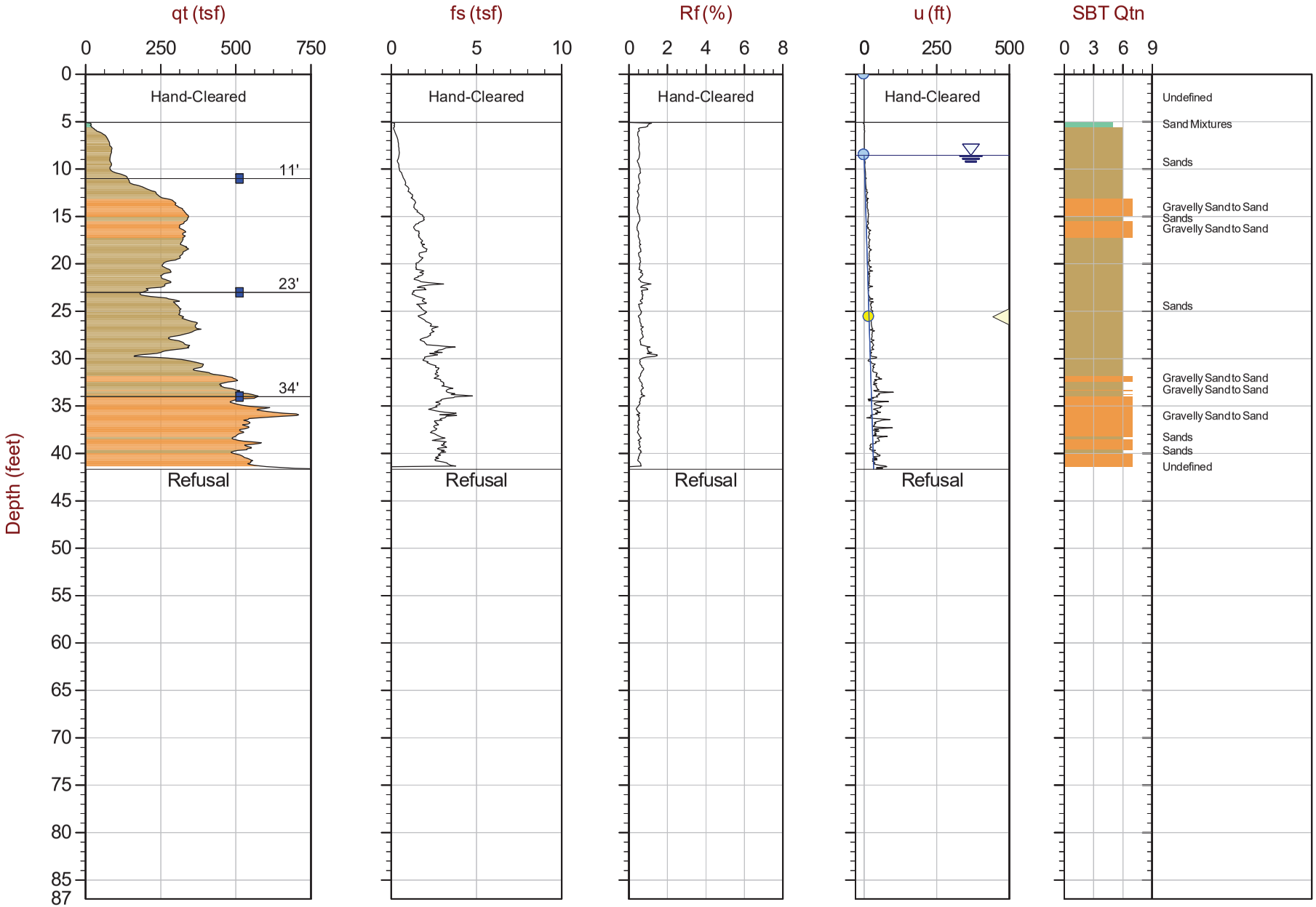
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35



Max Depth: 12.700 m / 41.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56858

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

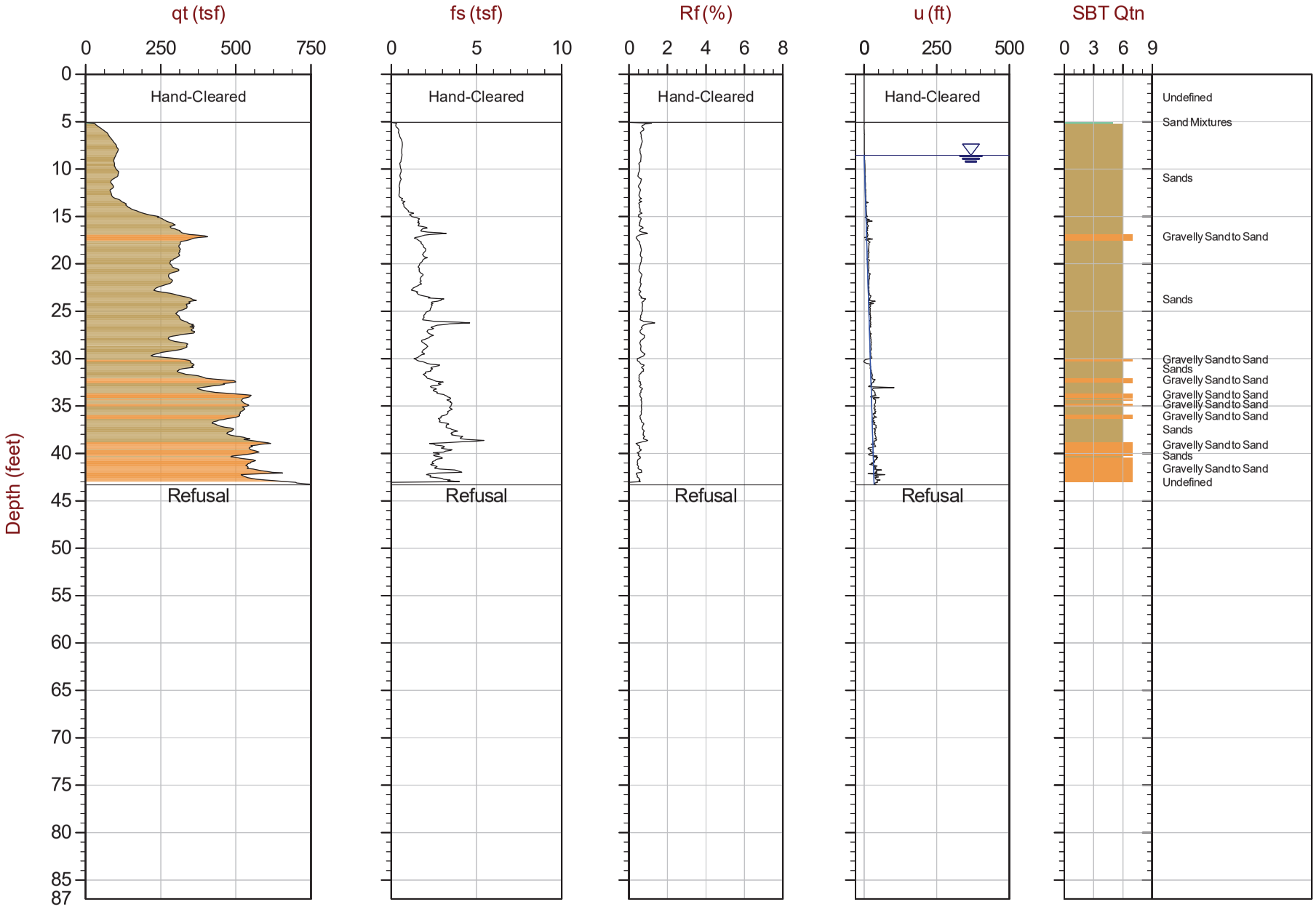
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35



Max Depth: 13.200 m / 43.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56861

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

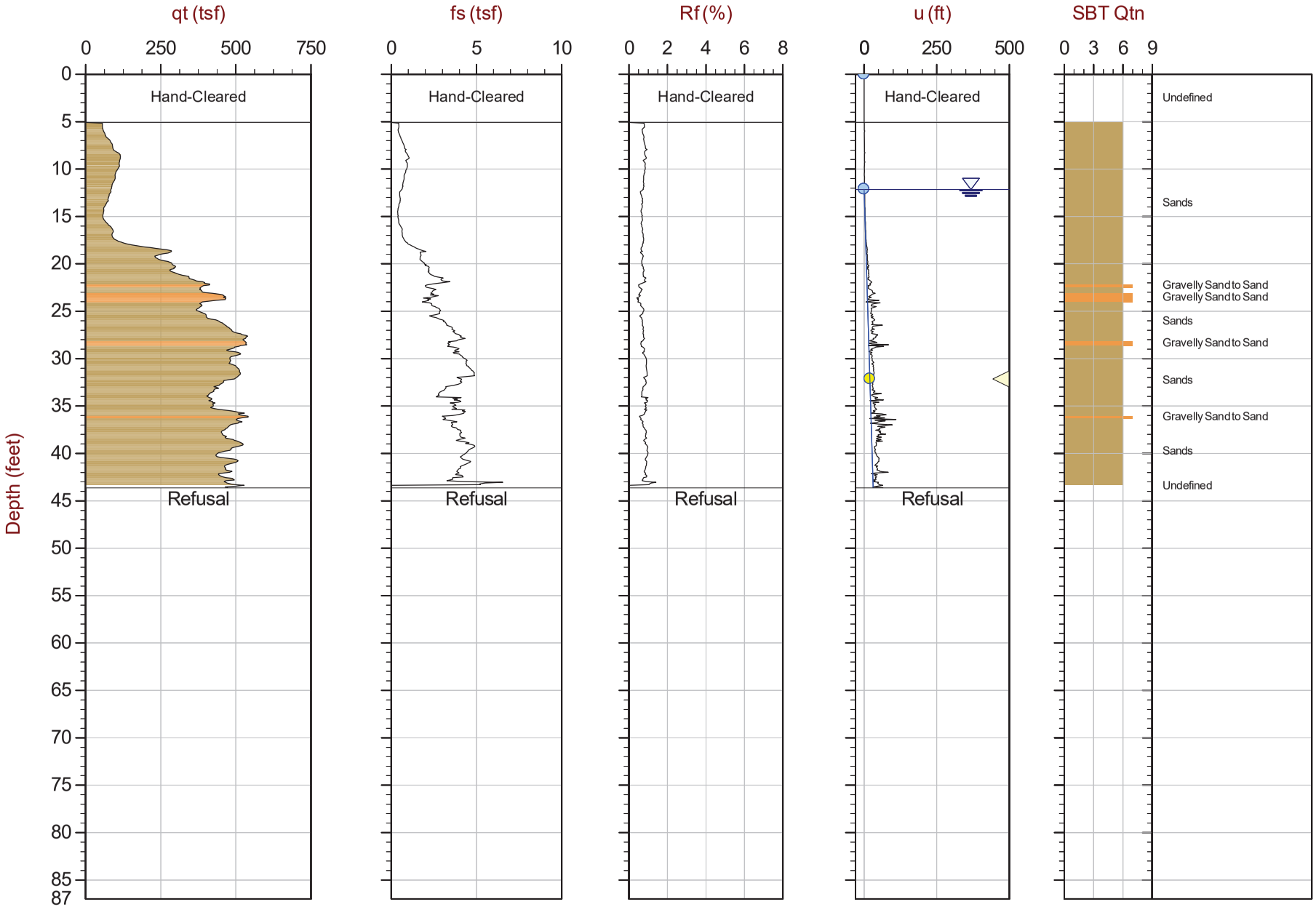
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35



Max Depth: 13.300 m / 43.63 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74509 Long: -85.57700

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

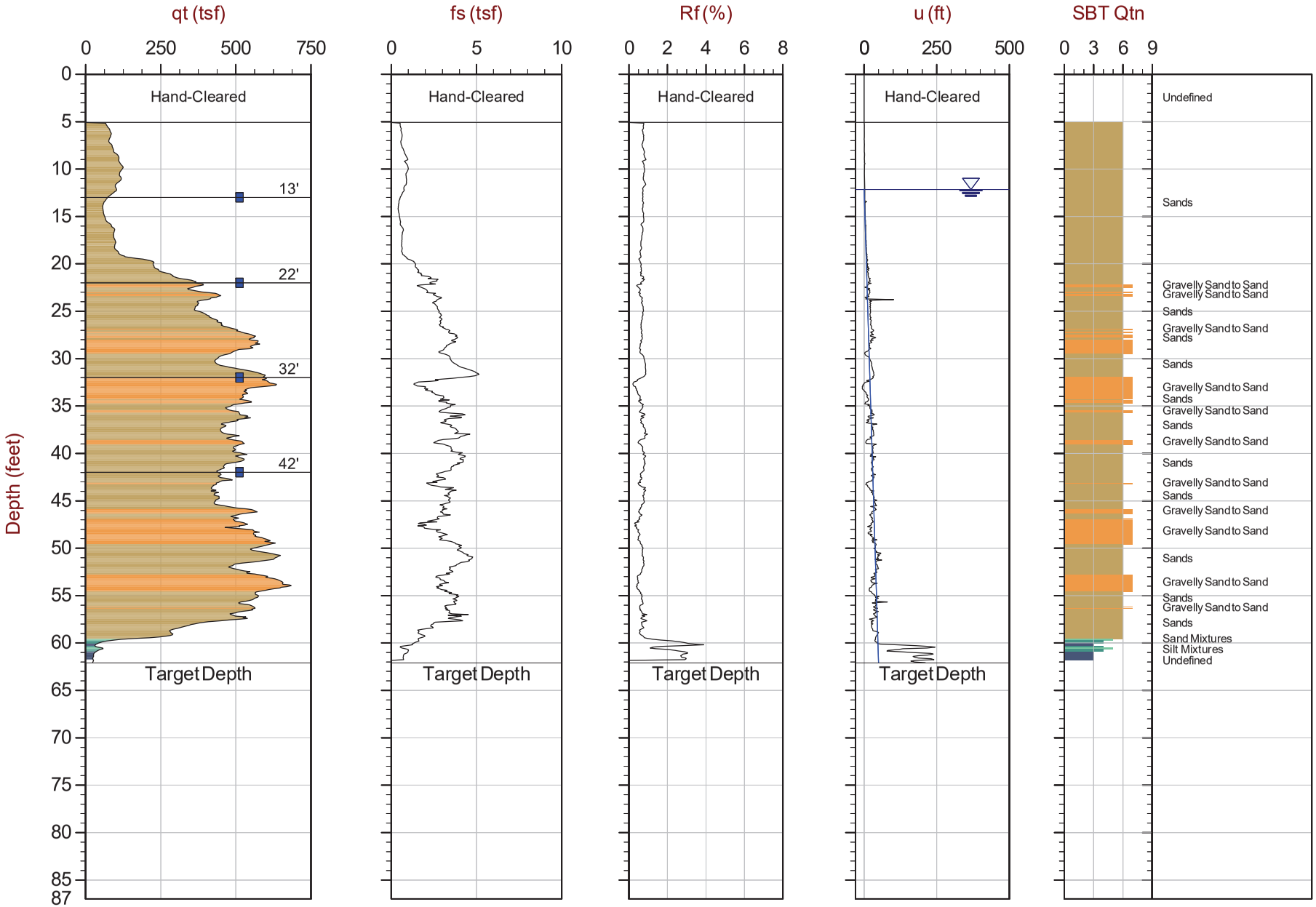
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35



Max Depth: 18.925 m / 62.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74510 Long: -85.57702

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

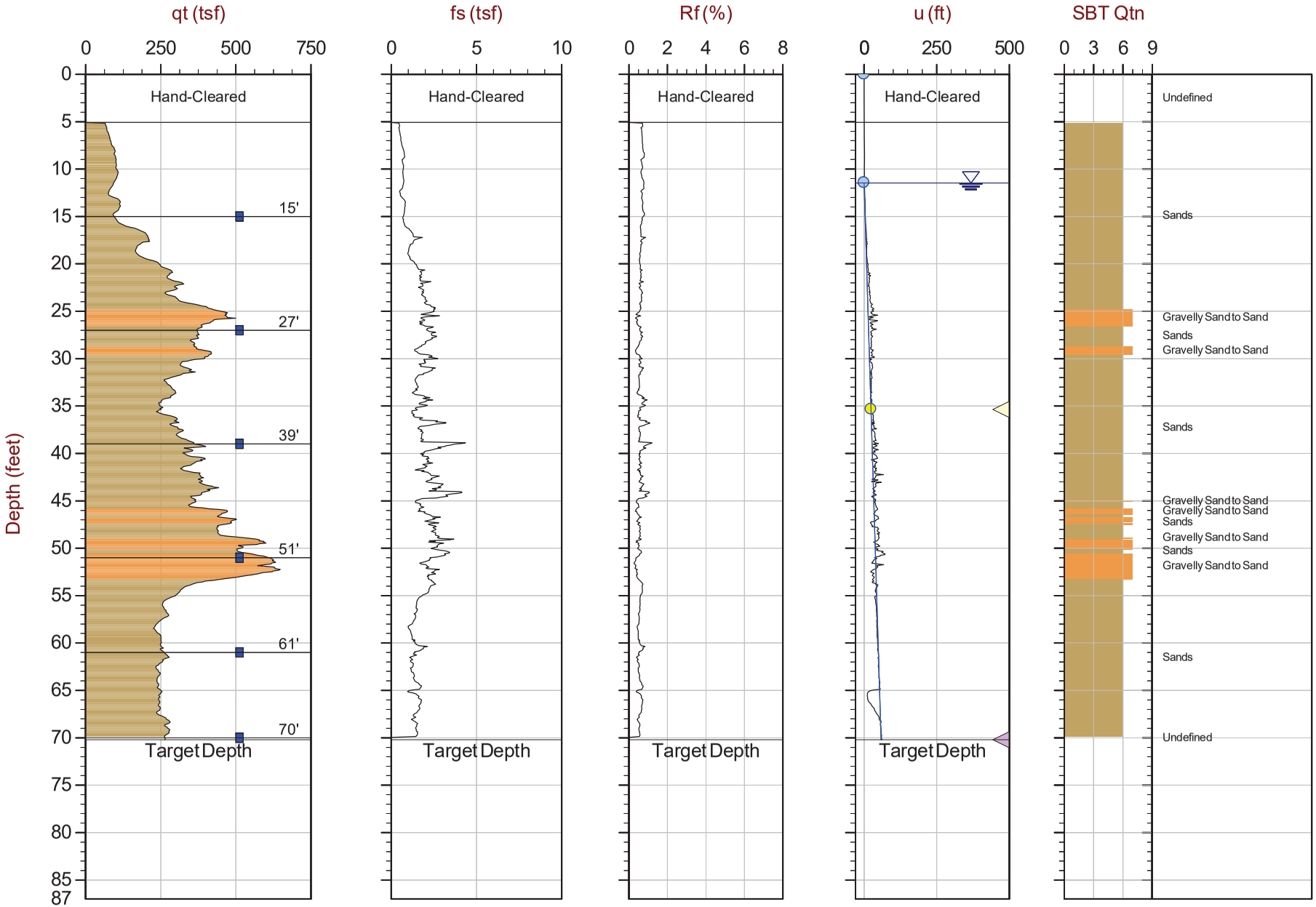
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-33.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74494 Long: -85.57582

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

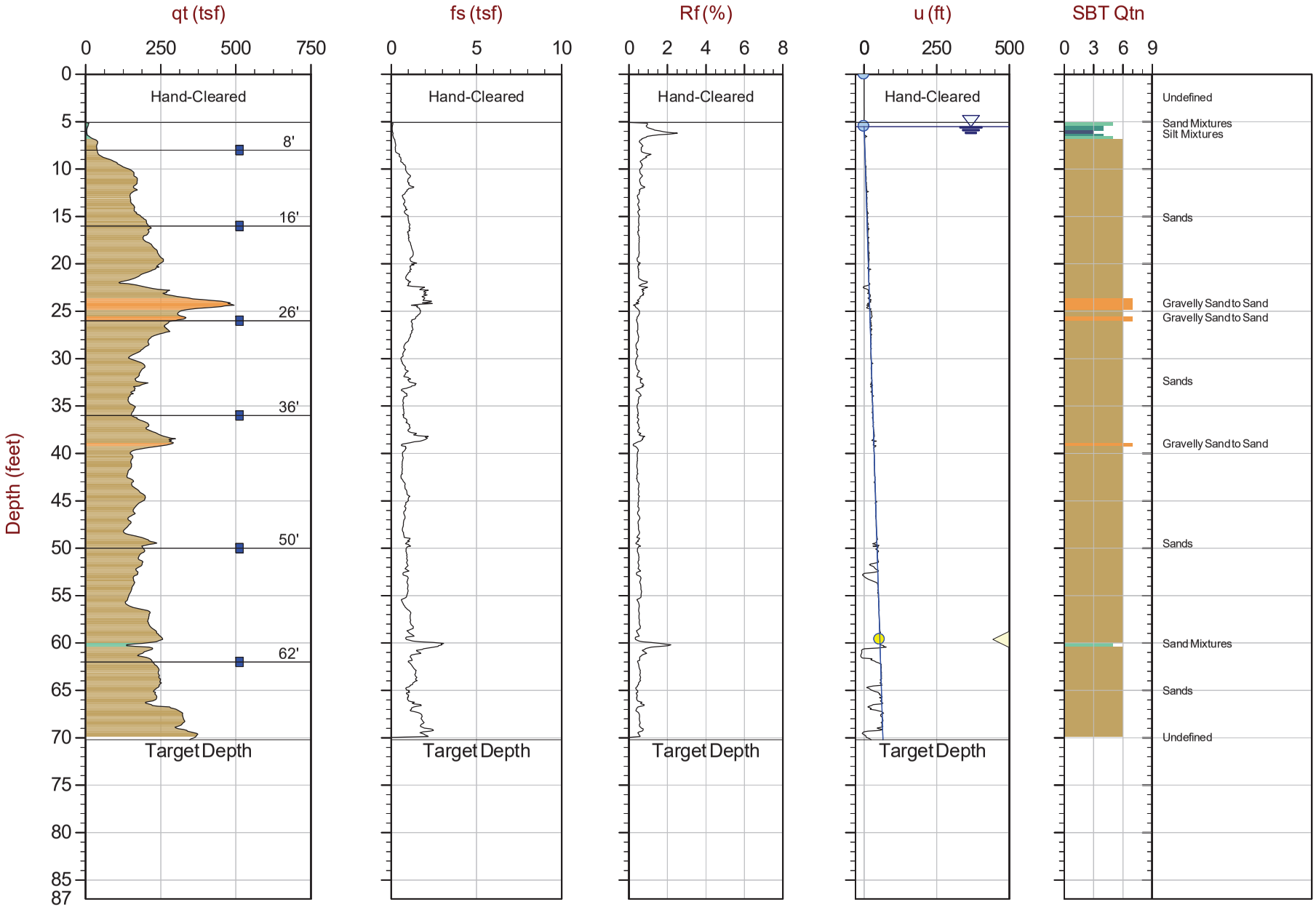
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-34.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75340 Long: -85.56972

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

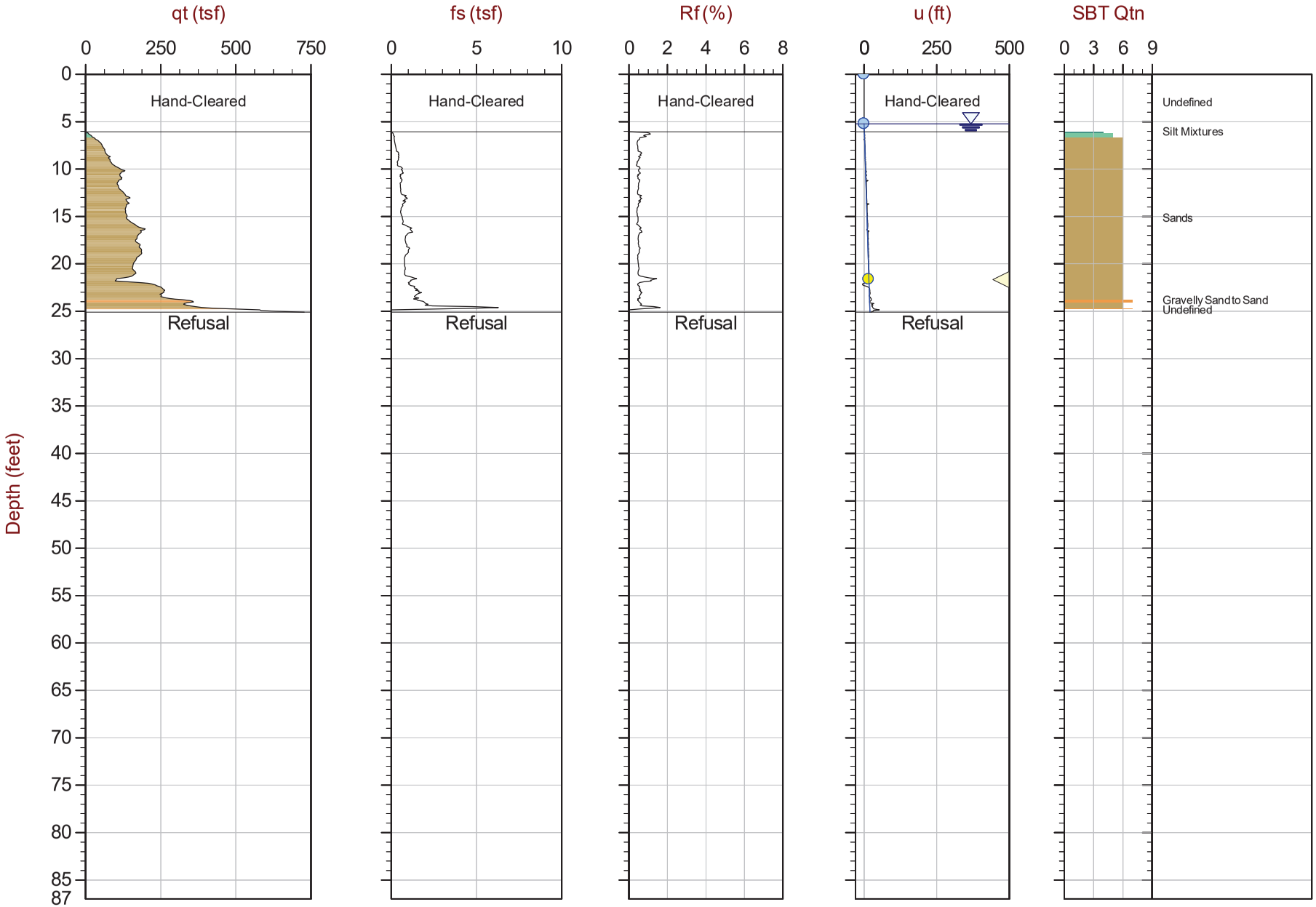
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35



Max Depth: 7.650 m / 25.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75293 Long: -85.56897

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

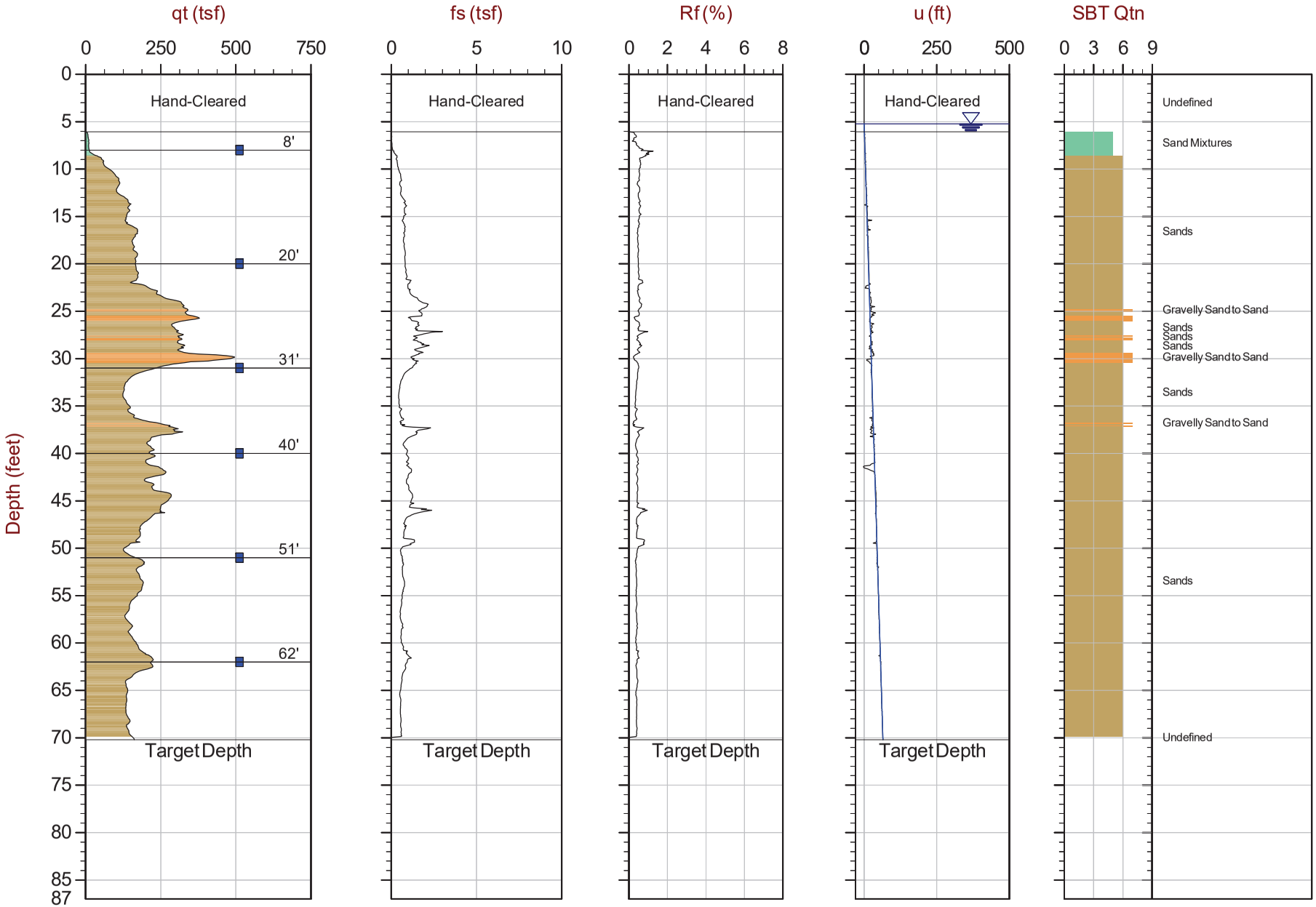
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75295 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

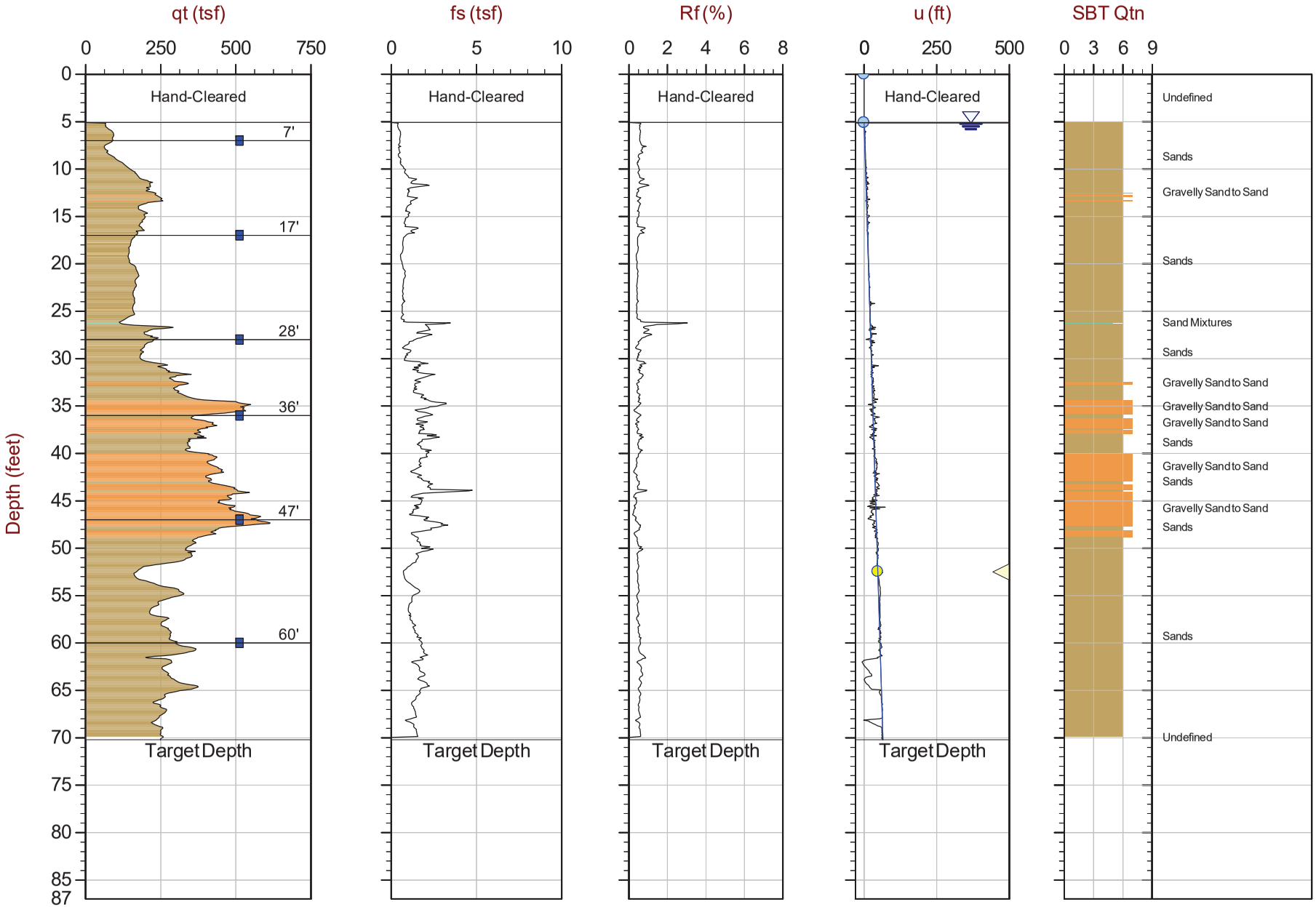
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-36.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75299 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

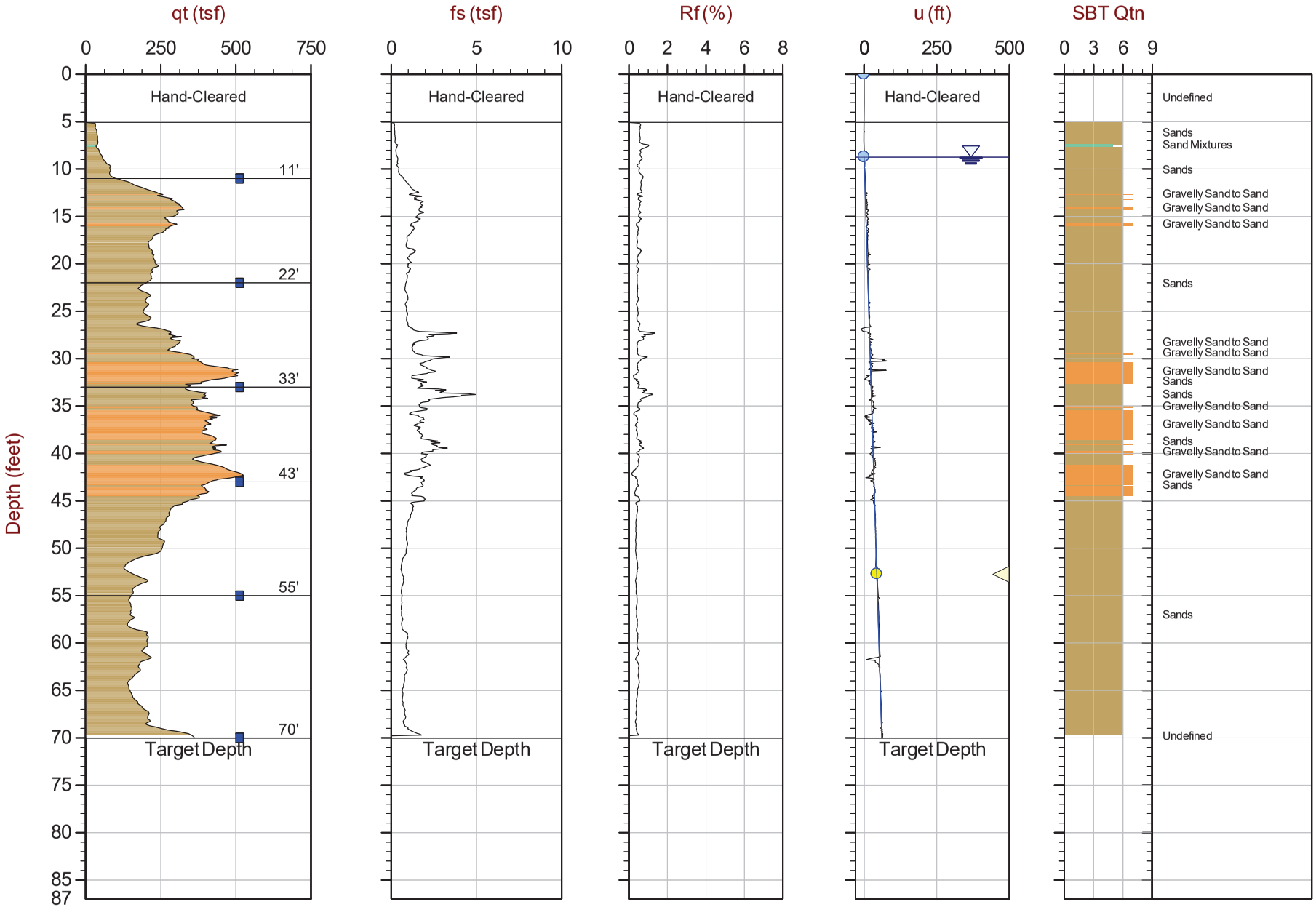
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-37.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75194 Long: -85.56863

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

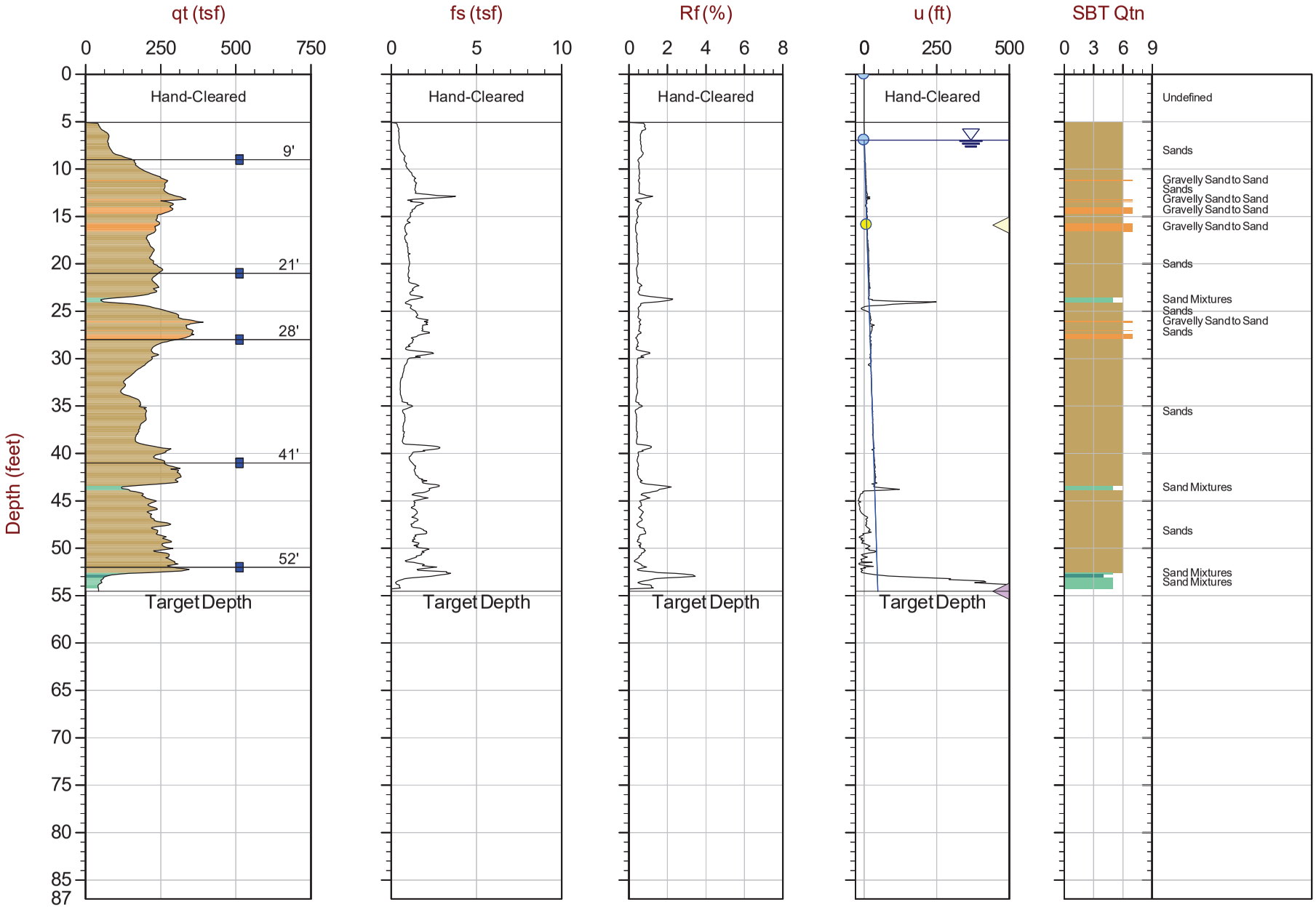
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35



Max Depth: 16.625 m / 54.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-38.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75358 Long: -85.57111

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

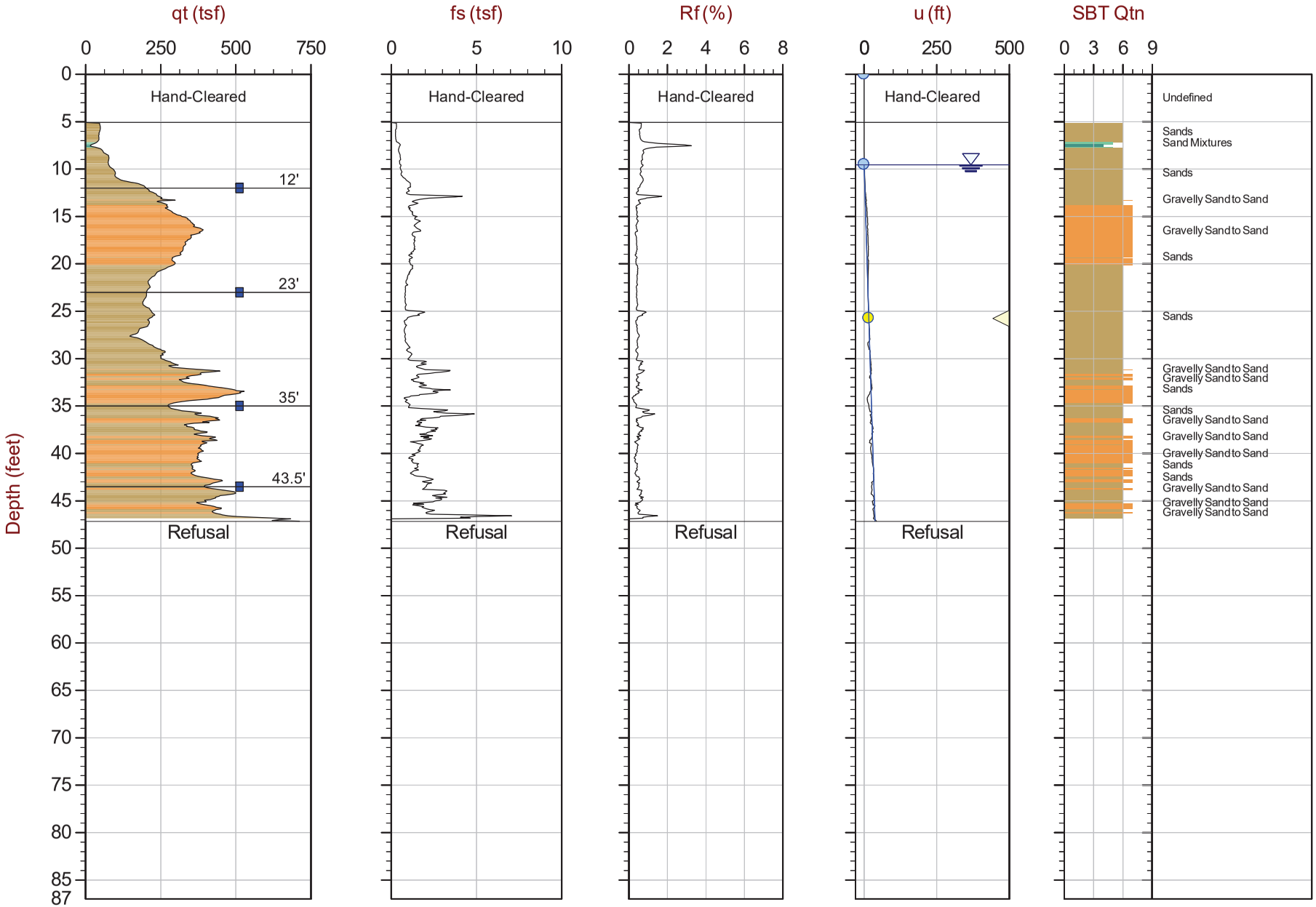
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35



Max Depth: 14.375 m / 47.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-39.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74976 Long: -85.56672

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Plots with Ic, Su(Nkt), Phi and N1(60)Ic

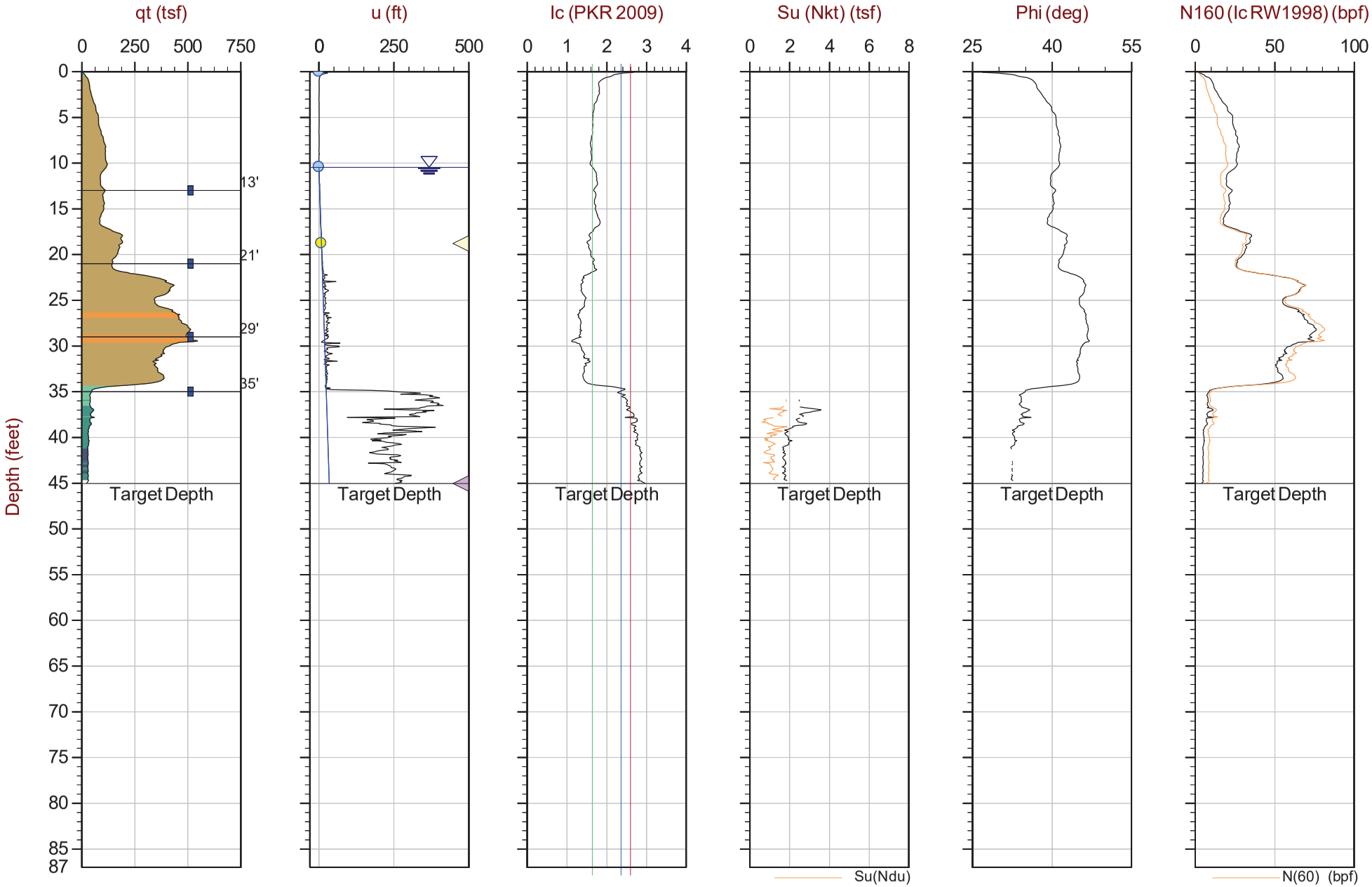
CONETEC

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35



Max Depth: 13.725 m / 45.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-13.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74852 Long: -85.57214

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

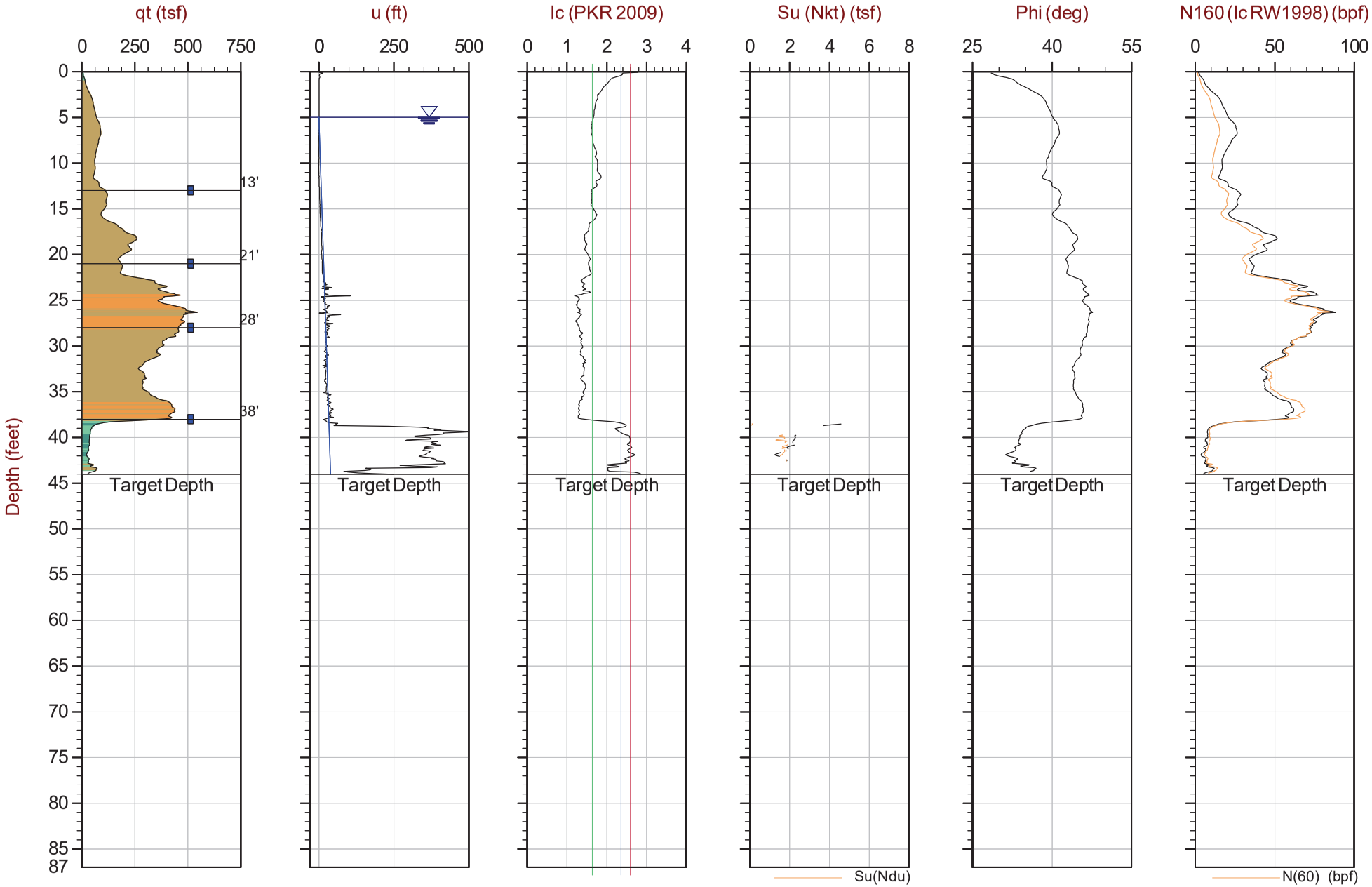
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35



Max Depth: 13.425 m / 44.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-14.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74842 Long: -85.57685

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

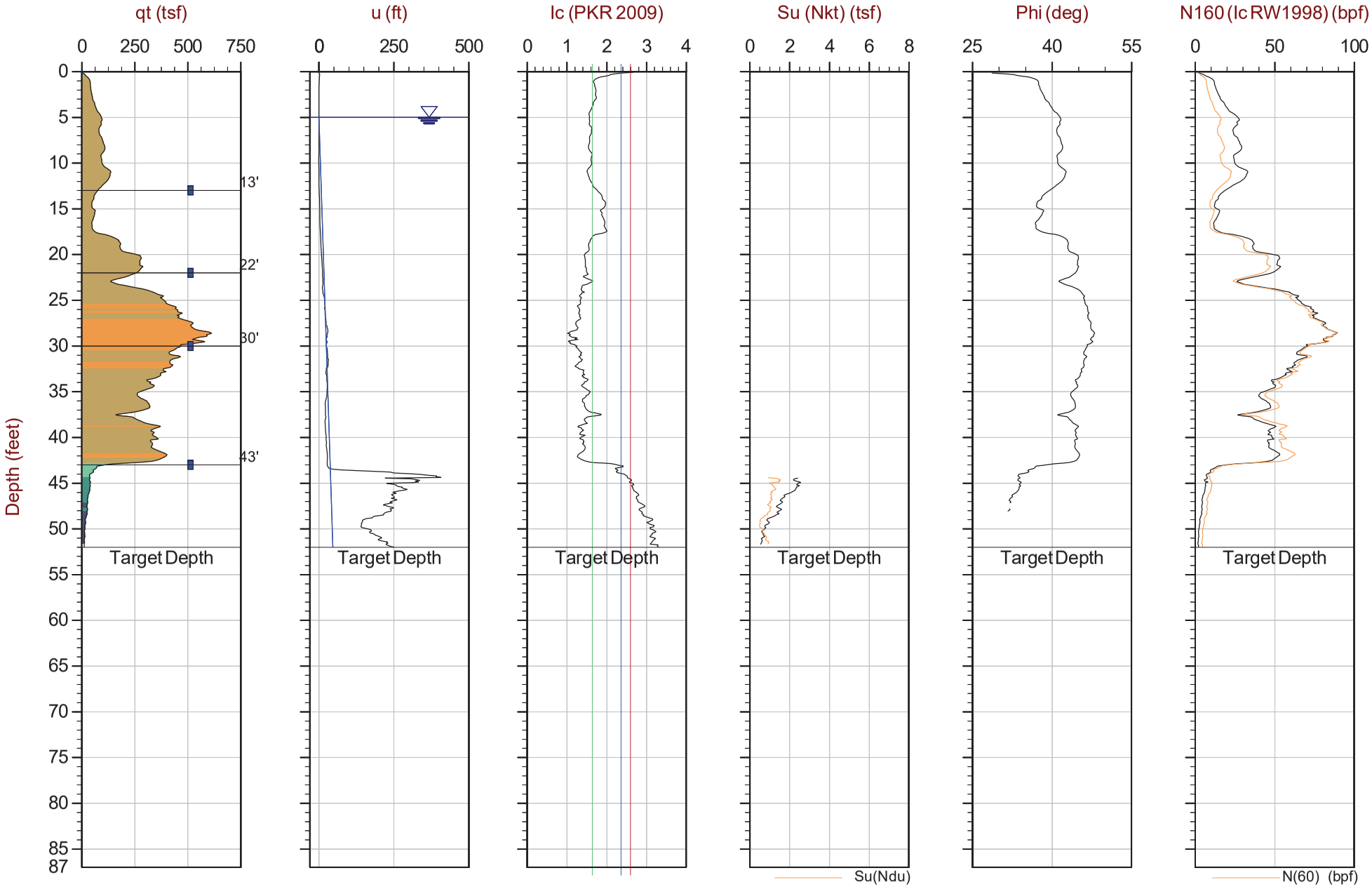
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35



Max Depth: 15.850 m / 52.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-15.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74830 Long: -85.57653

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

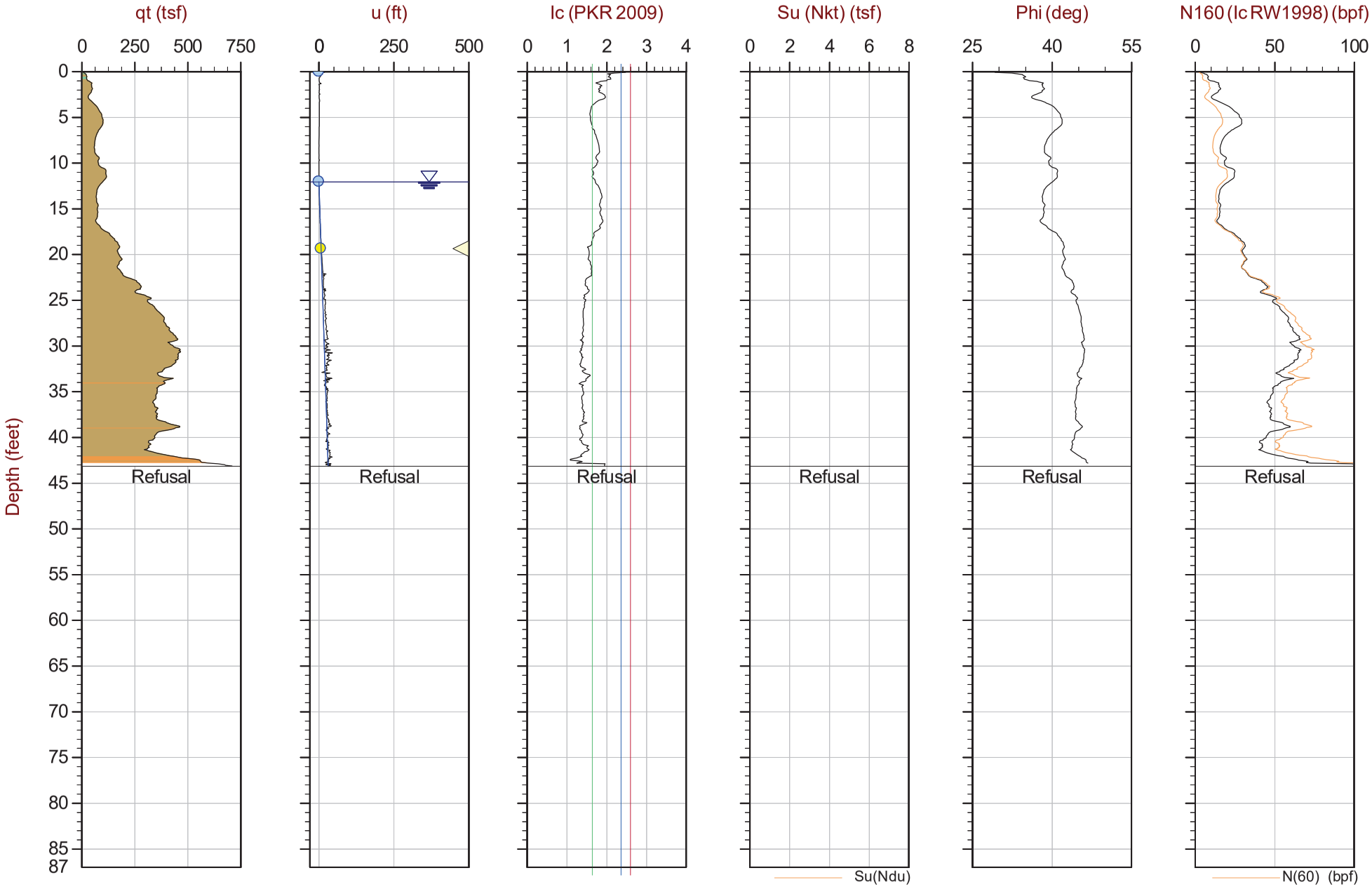
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35



Max Depth: 13.150 m / 43.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74801 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

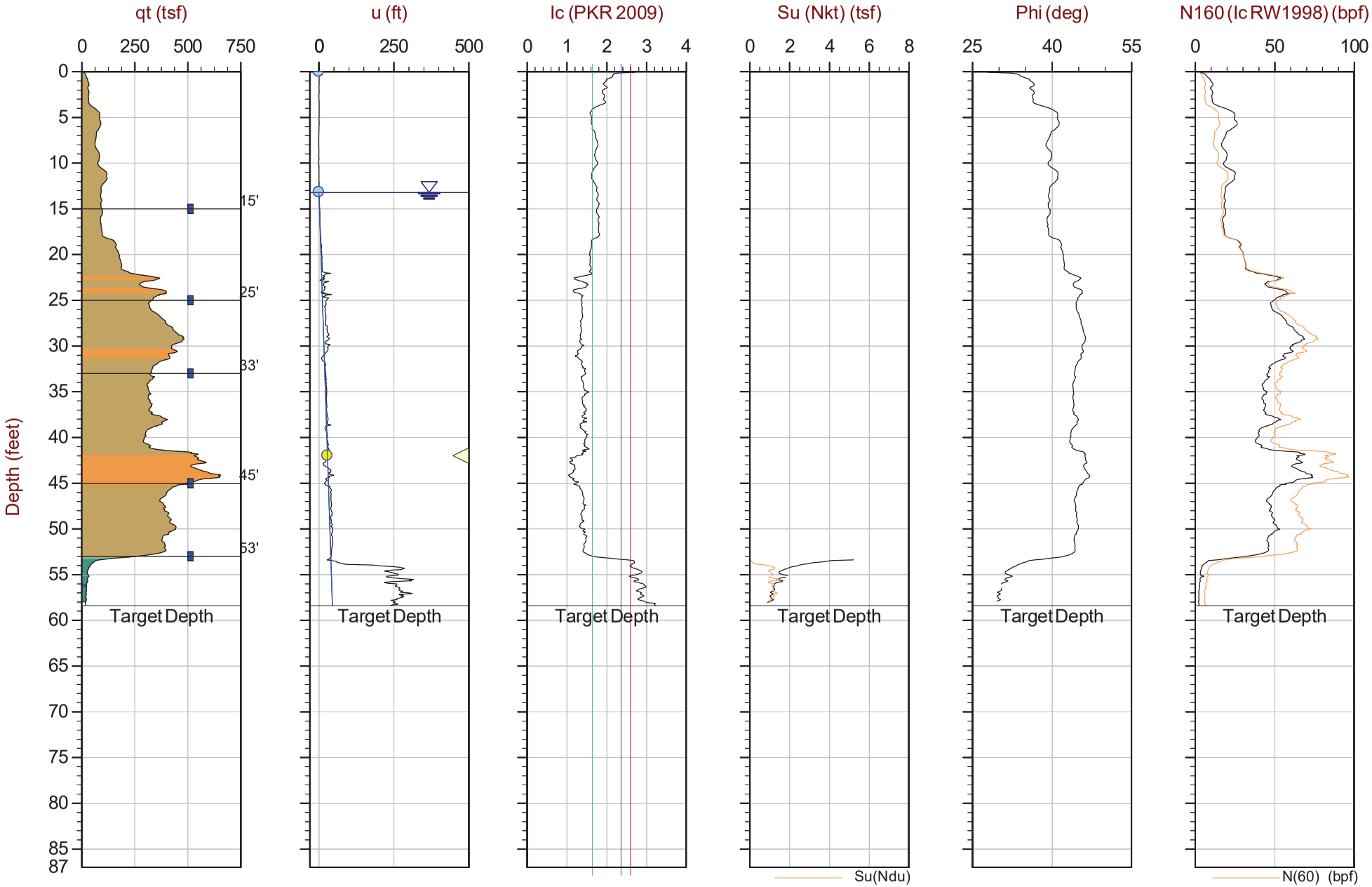
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35



Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-16A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74802 Long: -85.57612

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

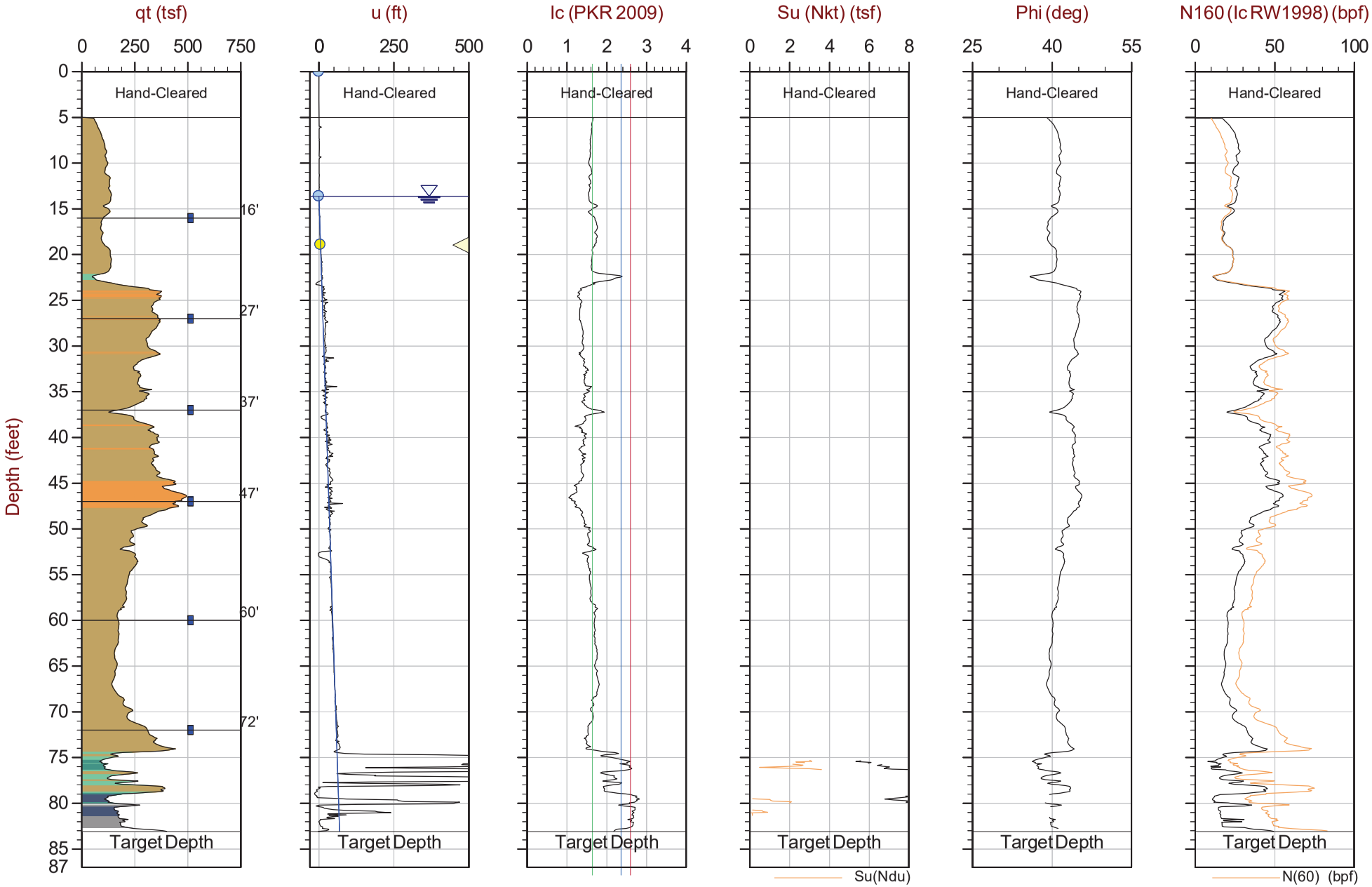
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35



Max Depth: 25.325 m / 83.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-17.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74769 Long: -85.57586

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

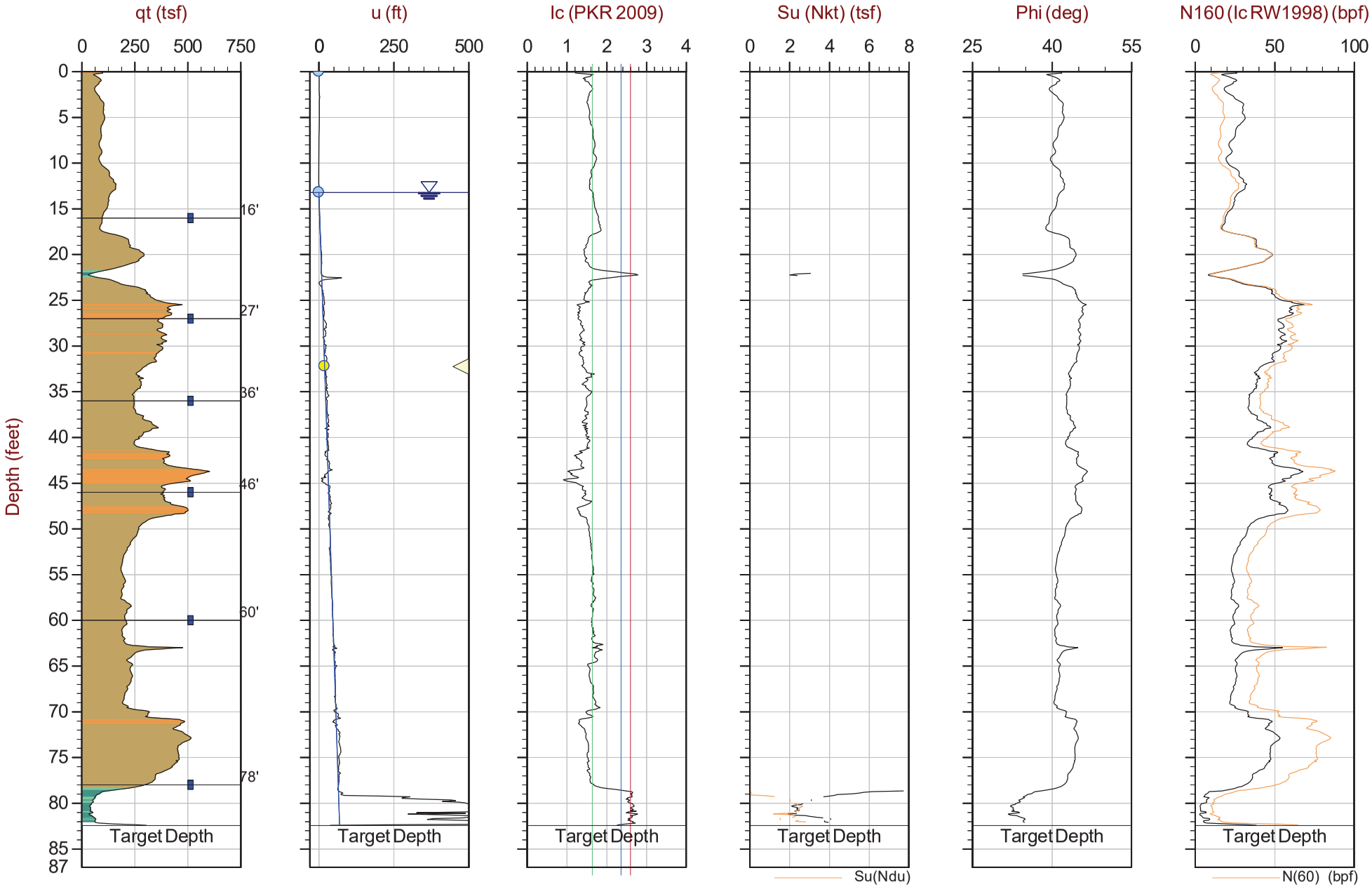
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35



Max Depth: 25.125 m / 82.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-18.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74735 Long: -85.57592

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

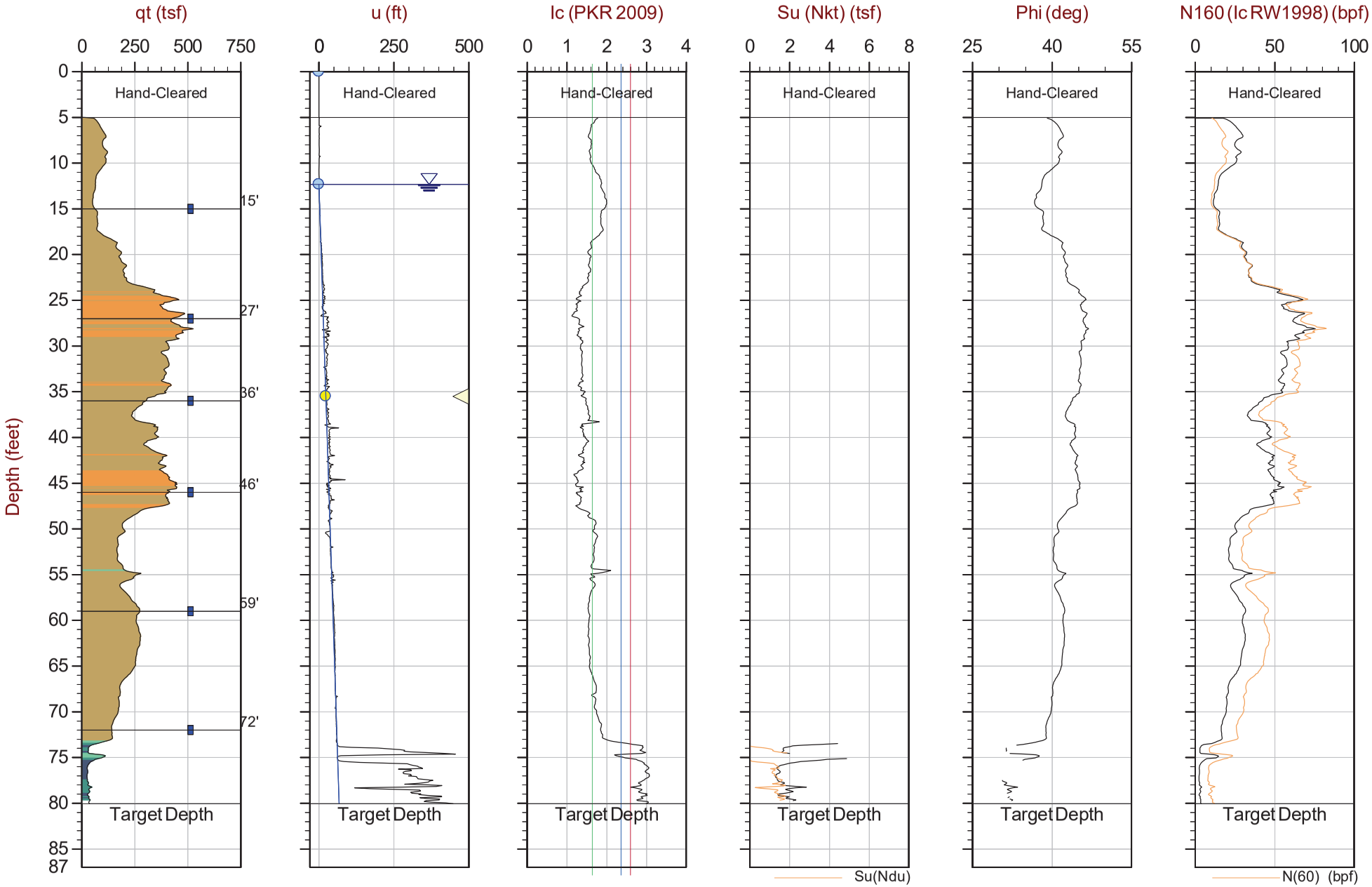
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35



Max Depth: 24.400 m / 80.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-19.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74705 Long: -85.57593

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

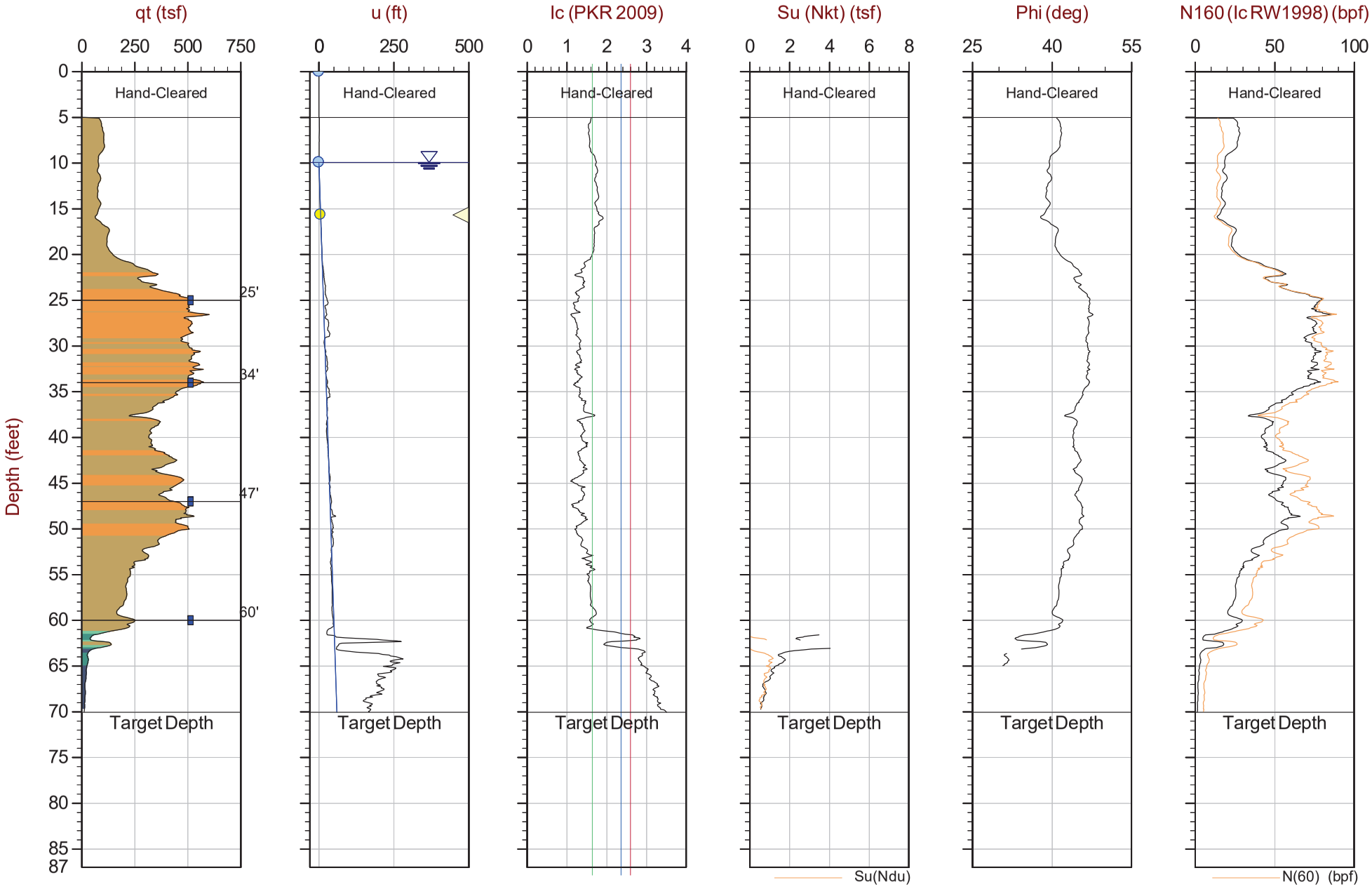
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-20.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74533 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

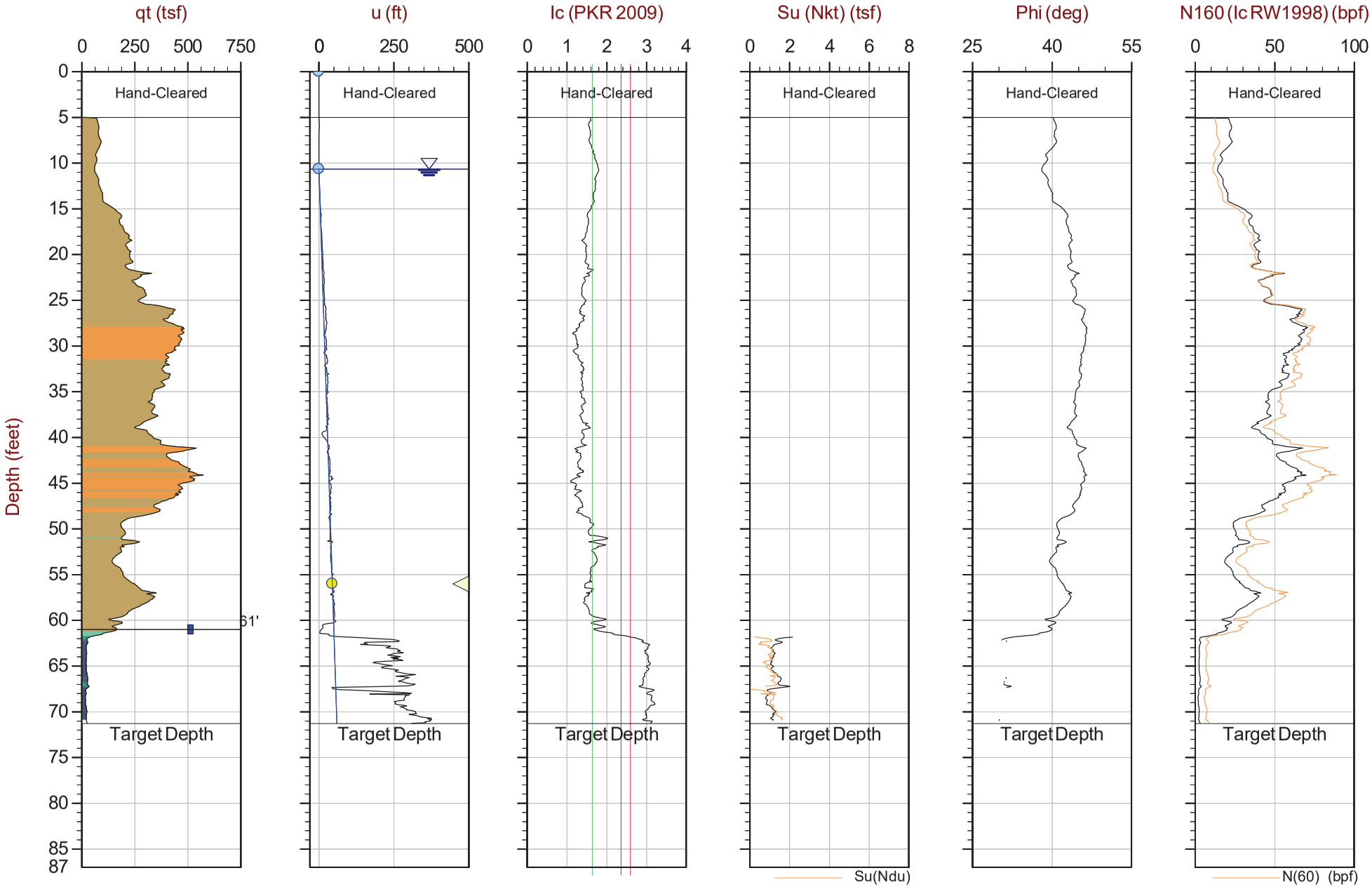
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35



Max Depth: 21.725 m / 71.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-21.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74594 Long: -85.57813

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

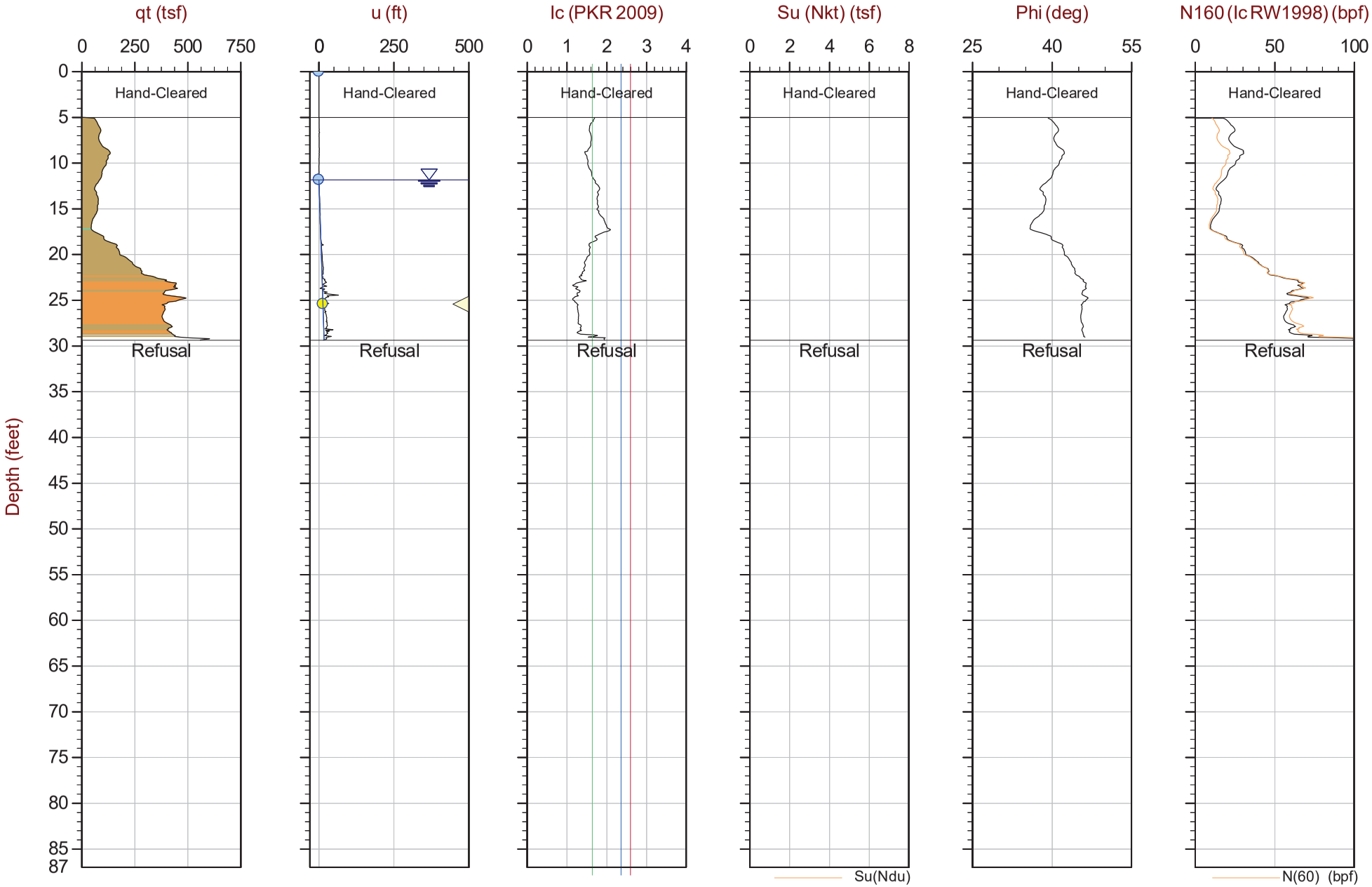
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35



Max Depth: 8.950 m / 29.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

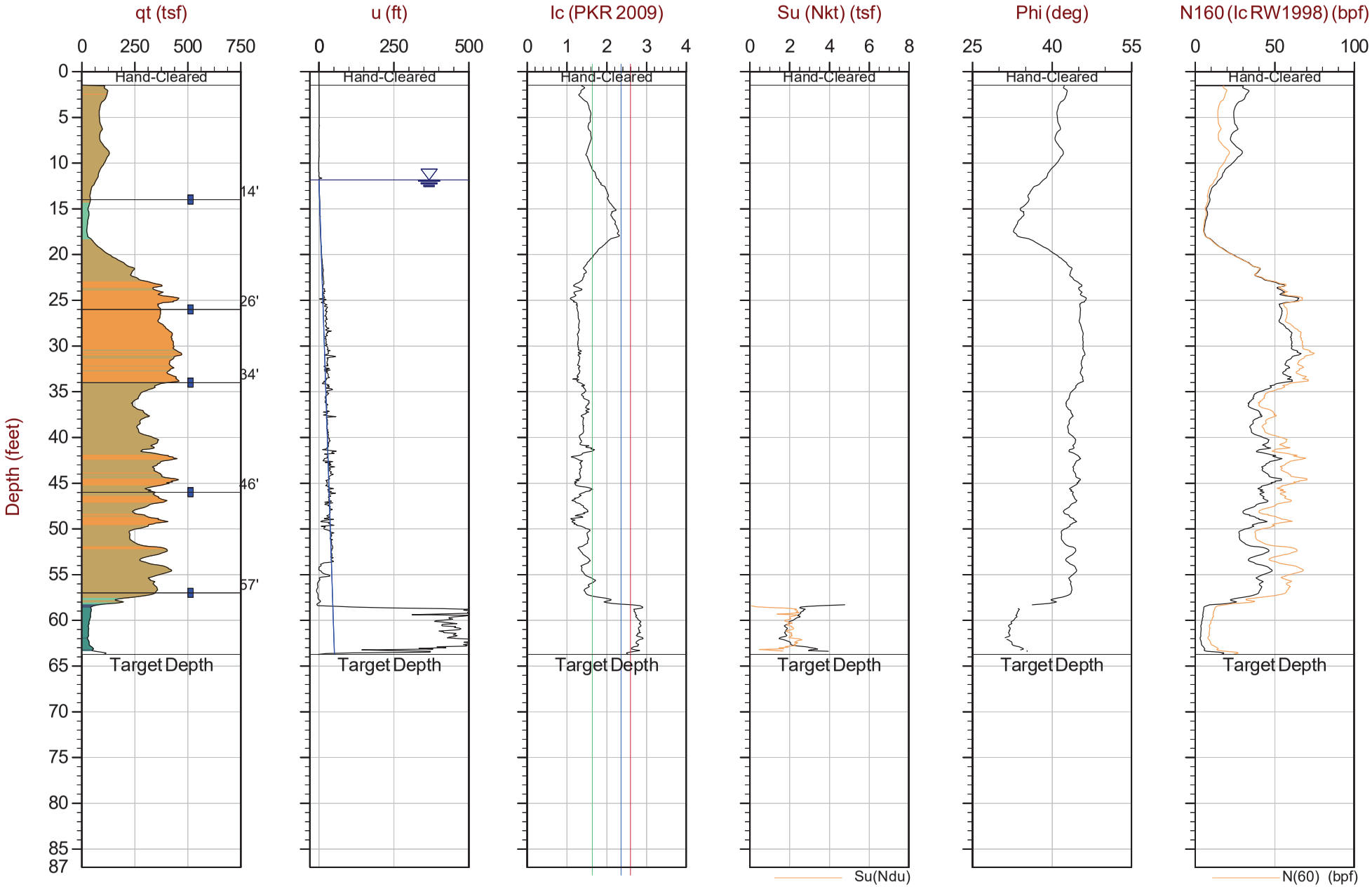
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35



Max Depth: 19.425 m / 63.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-22A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74499 Long: -85.57920

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

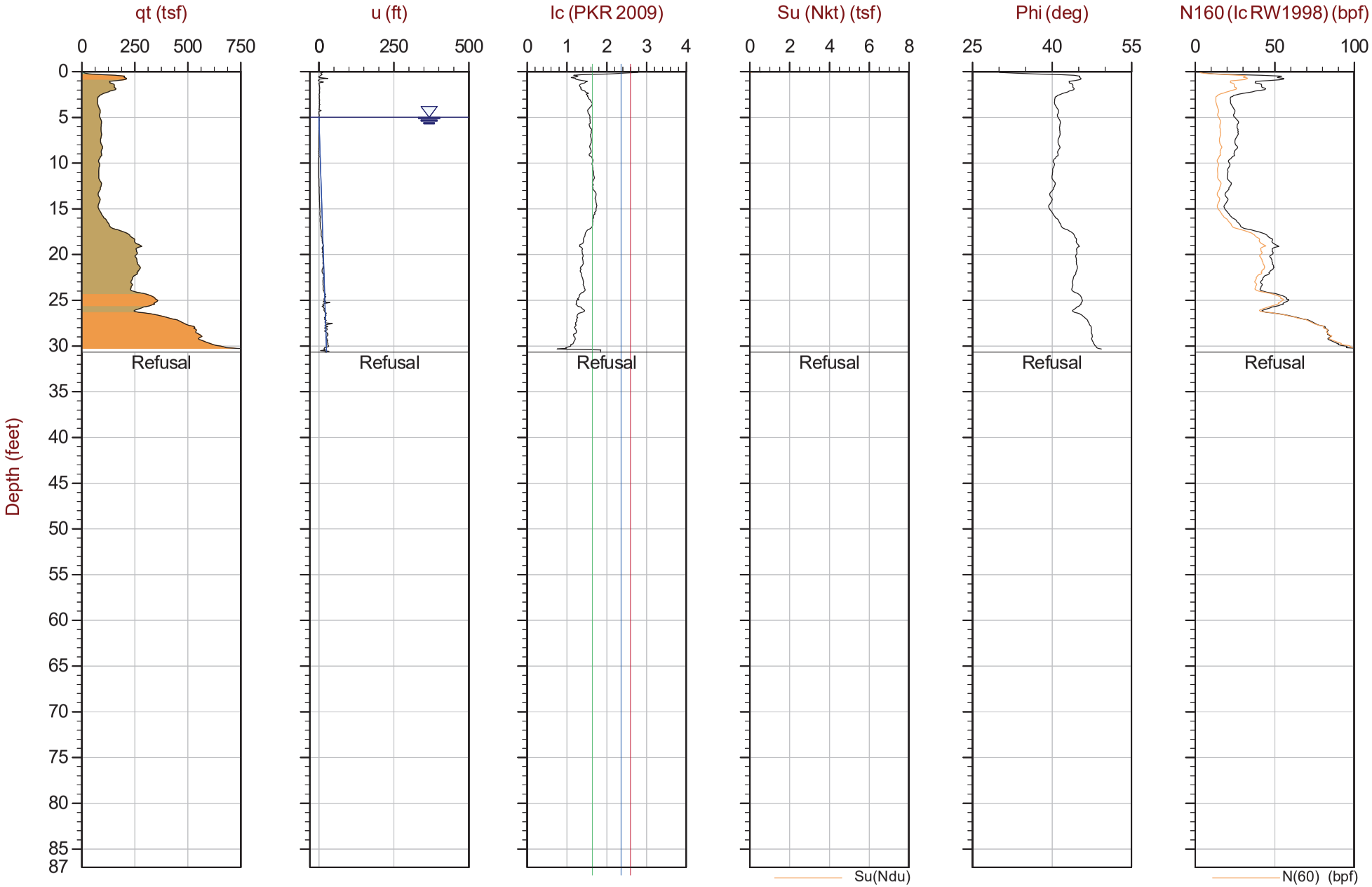
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35



Max Depth: 9.350 m / 30.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57849

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

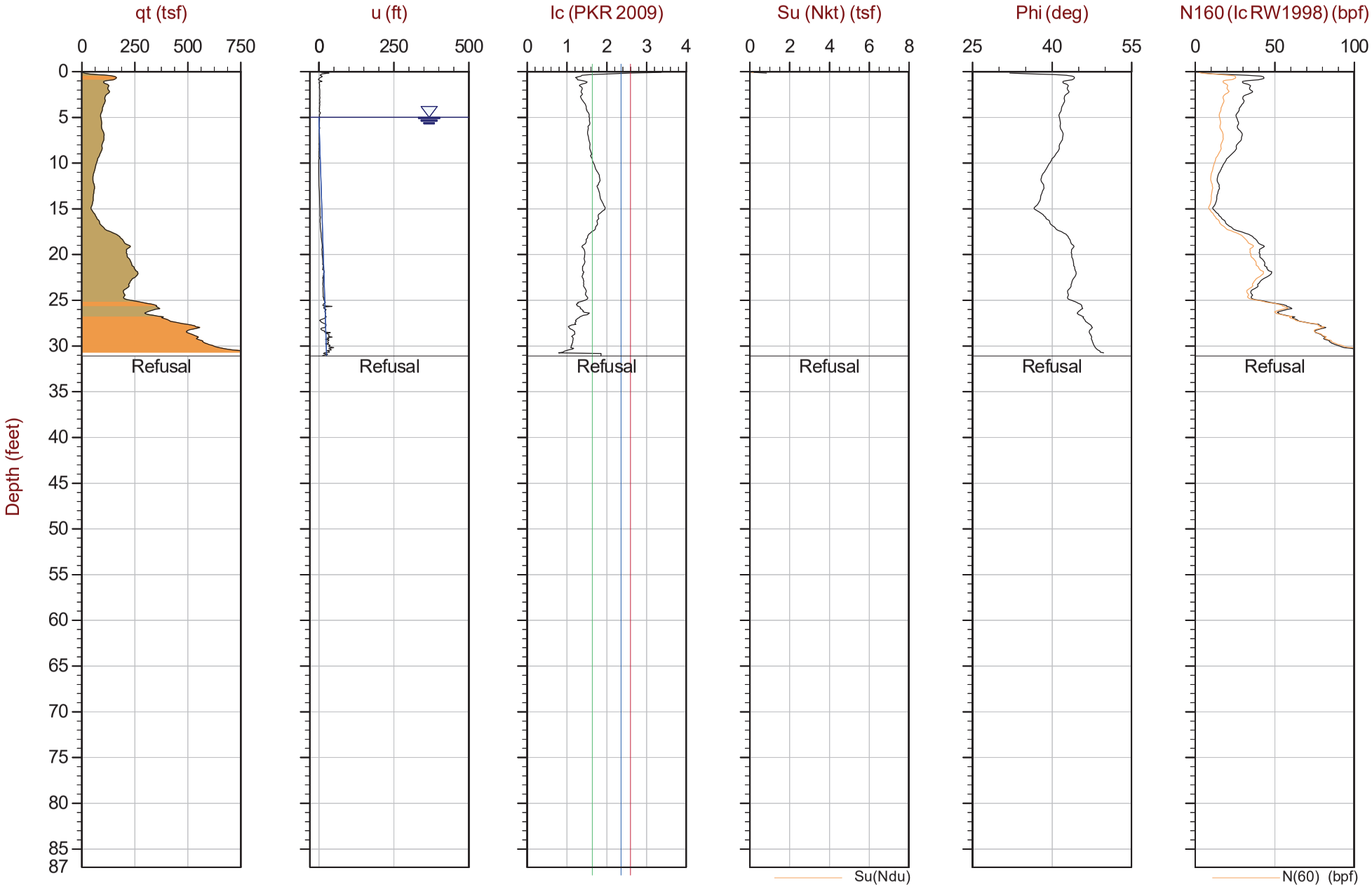
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57848

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

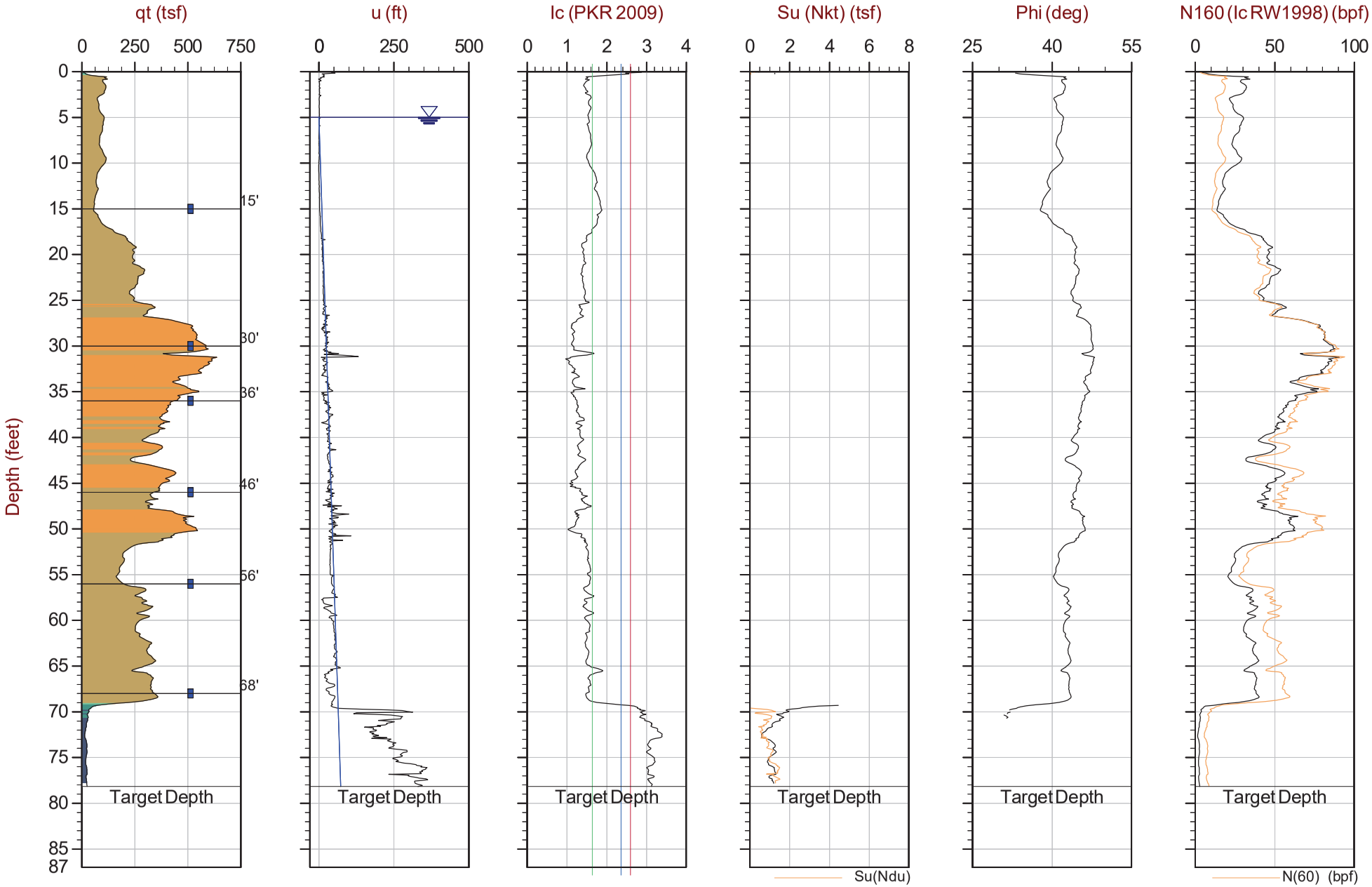
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35



Max Depth: 23.825 m / 78.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-23B.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74498 Long: -85.57845

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

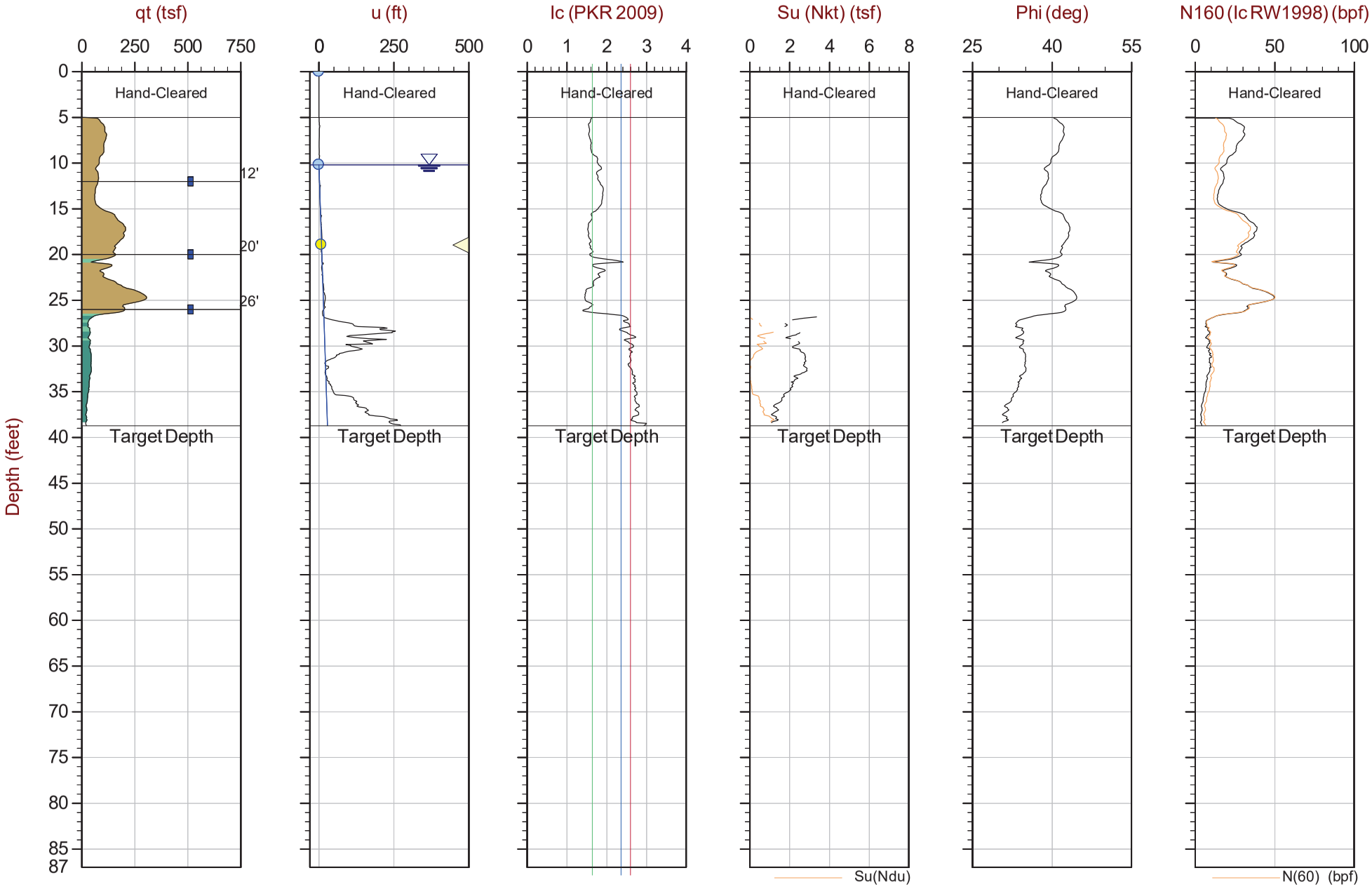
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35



Max Depth: 11.800 m / 38.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-24.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74773 Long: -85.58247

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

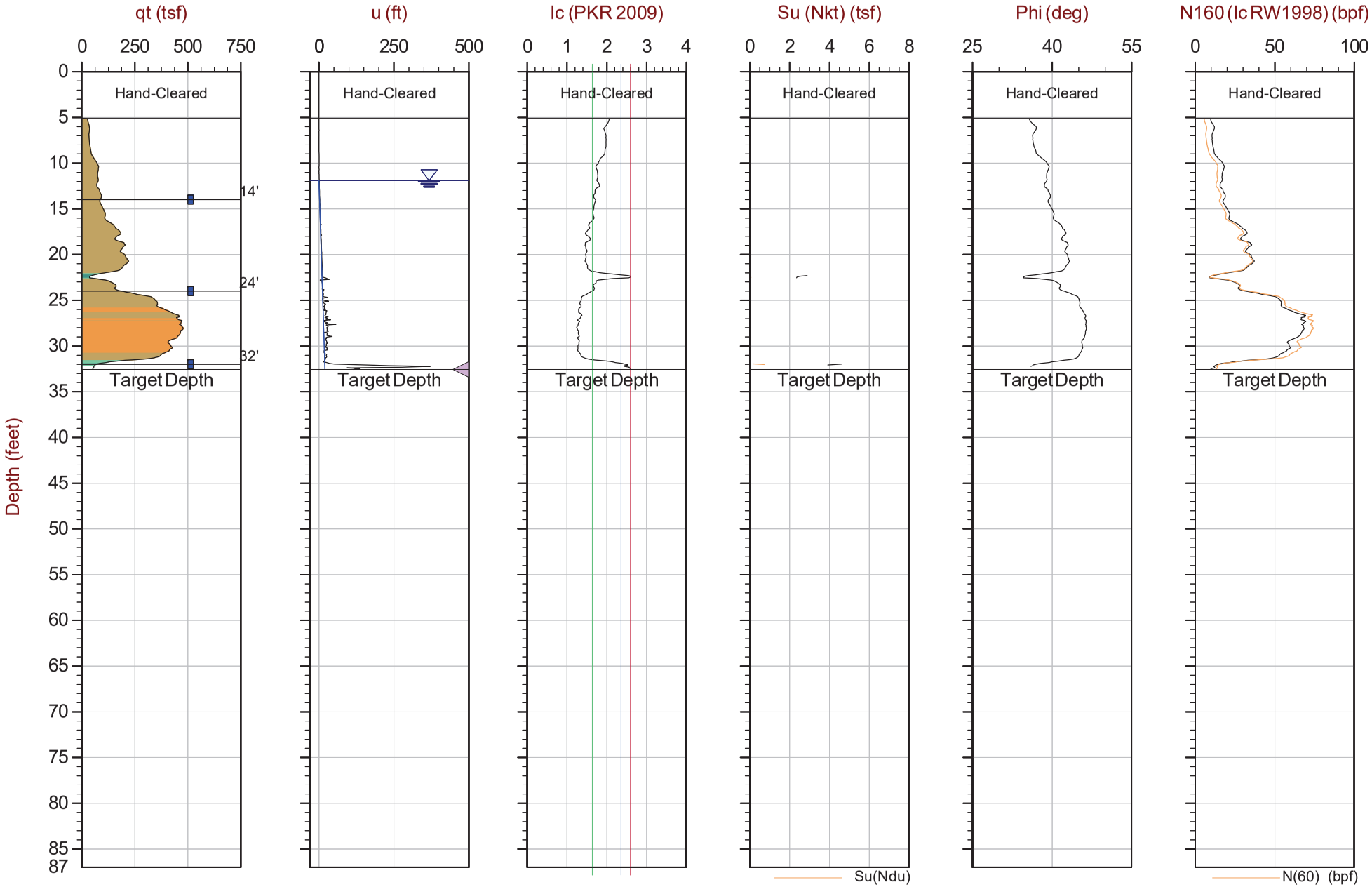
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35



Max Depth: 9.925 m / 32.56 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74859 Long: -85.57818

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

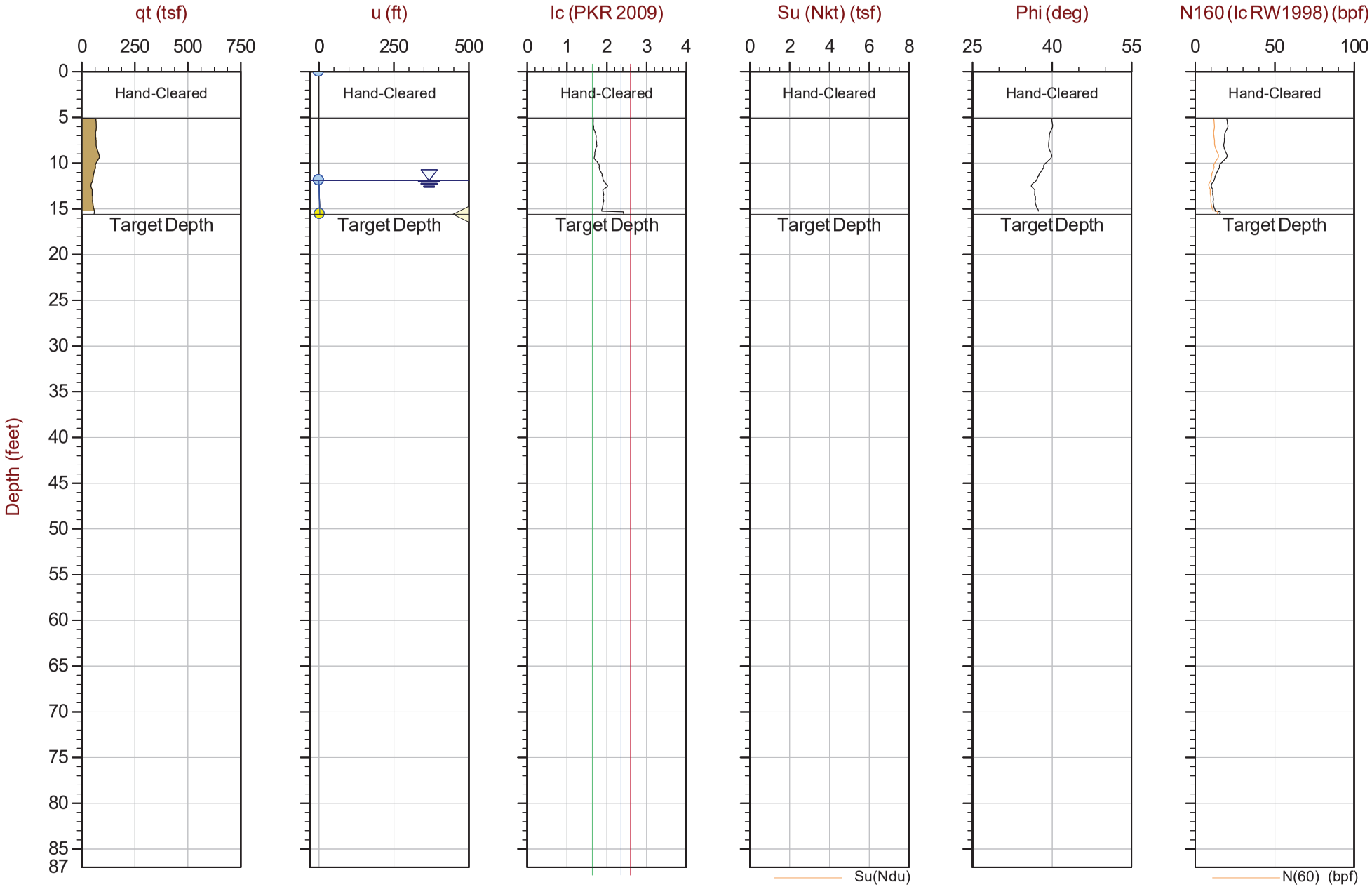
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35



Max Depth: 4.750 m / 15.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-25A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74858 Long: -85.57816

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

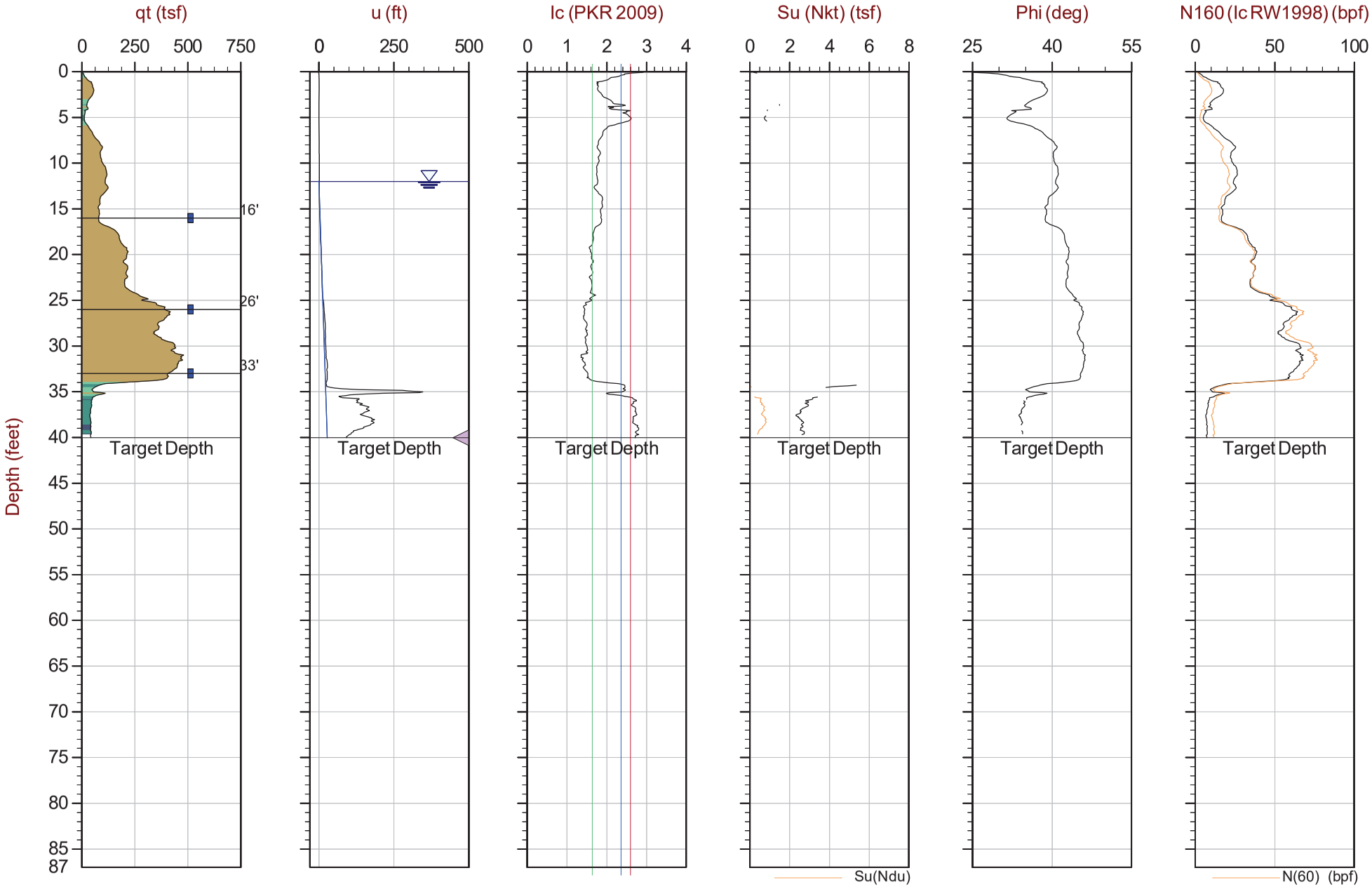
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-26.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75018 Long: -85.57774

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

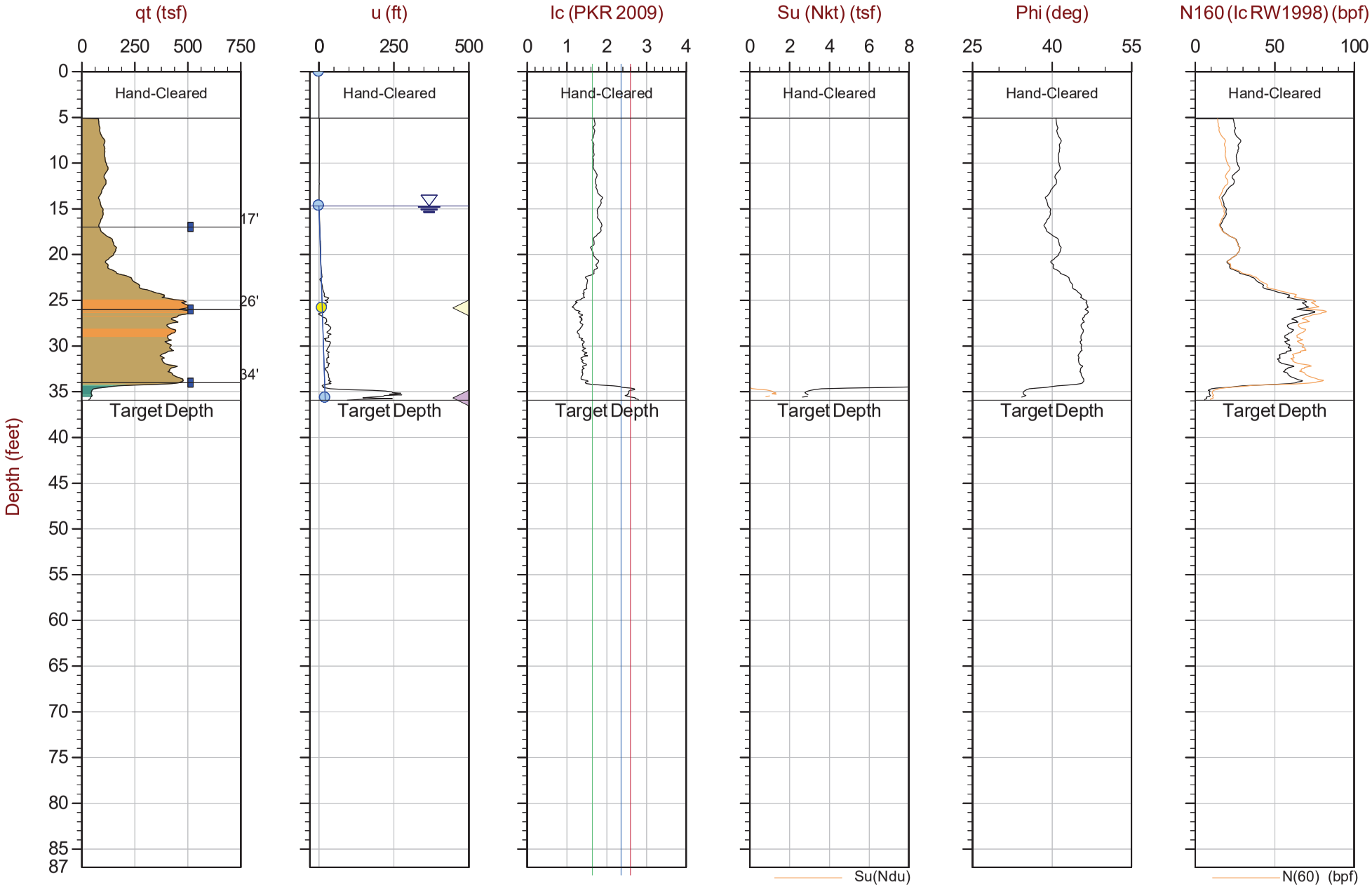
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35



Max Depth: 10.950 m / 35.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-27.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74961 Long: -85.57594

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

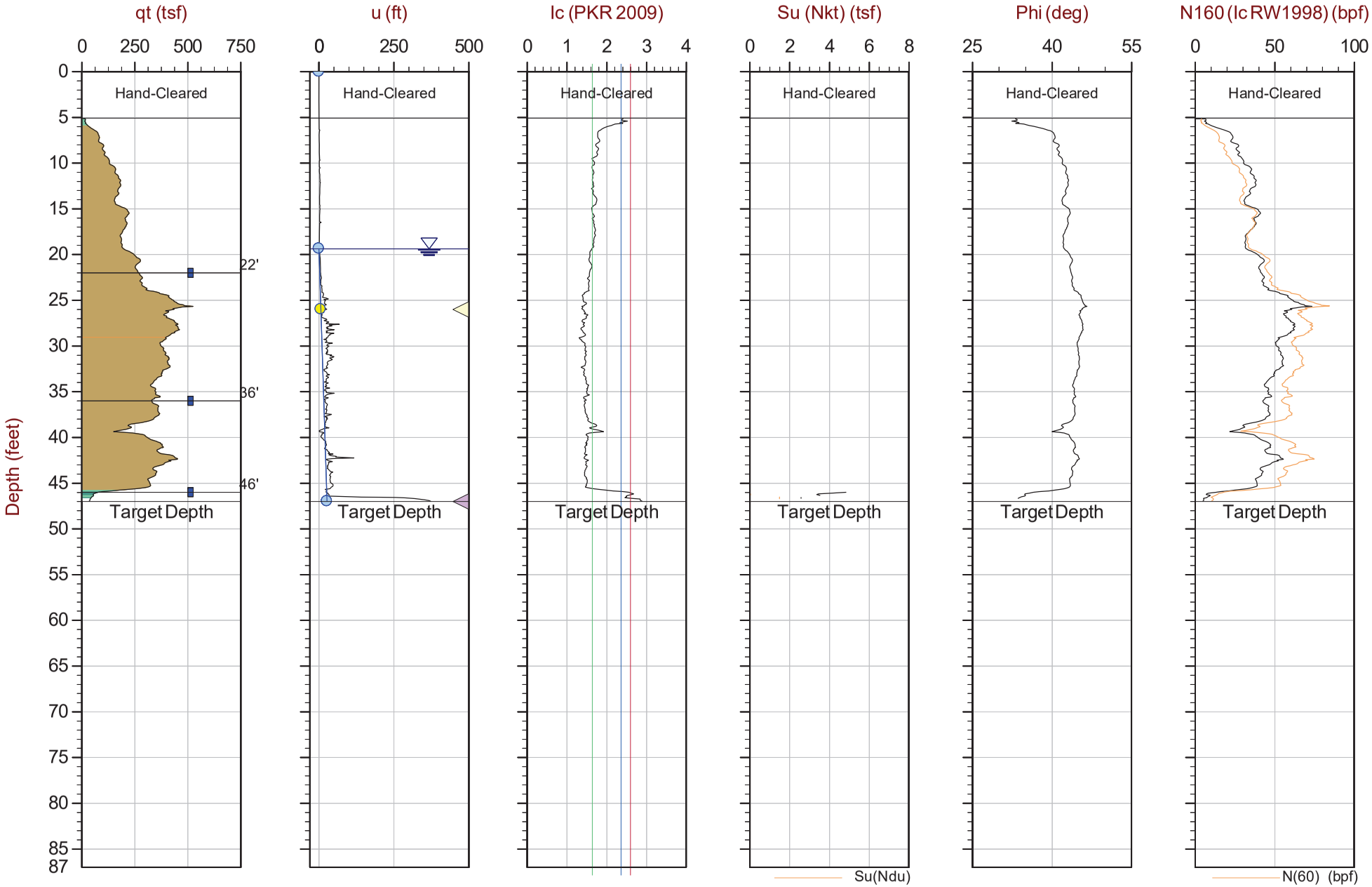
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35



Max Depth: 14.325 m / 47.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-28.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75235 Long: -85.57268

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

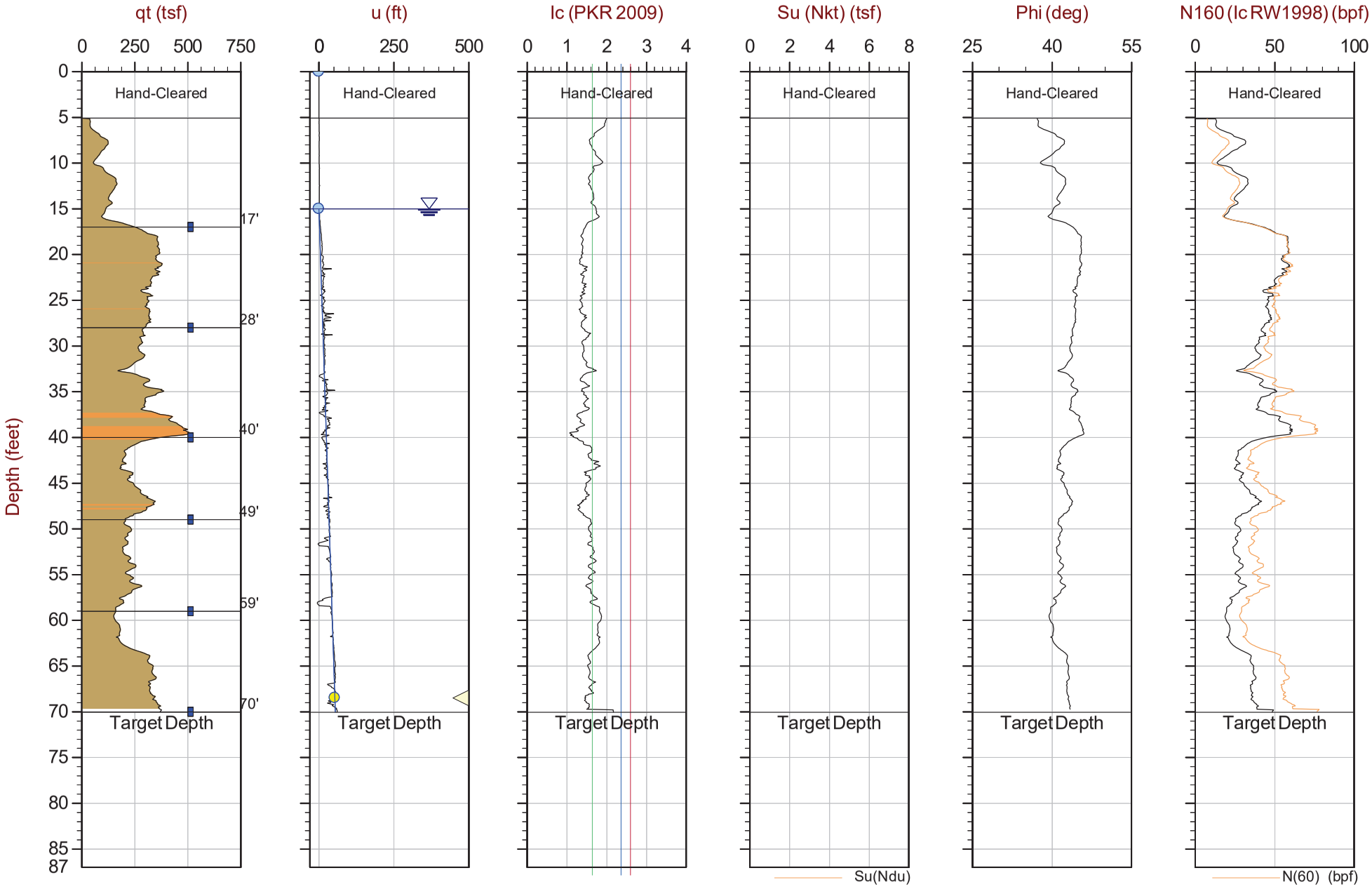
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-29.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75167 Long: -85.57113

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

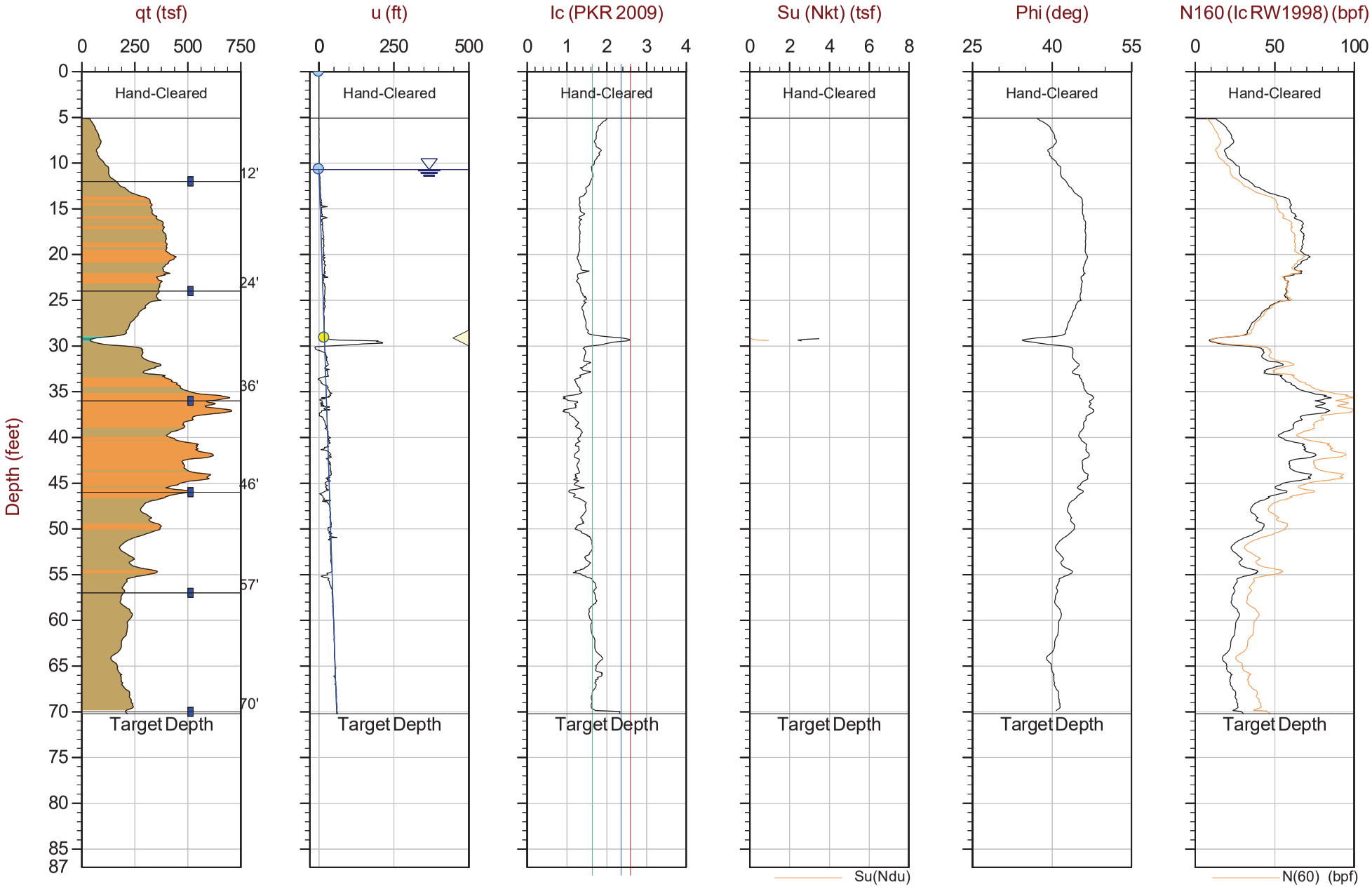
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-30.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75111 Long: -85.56988

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

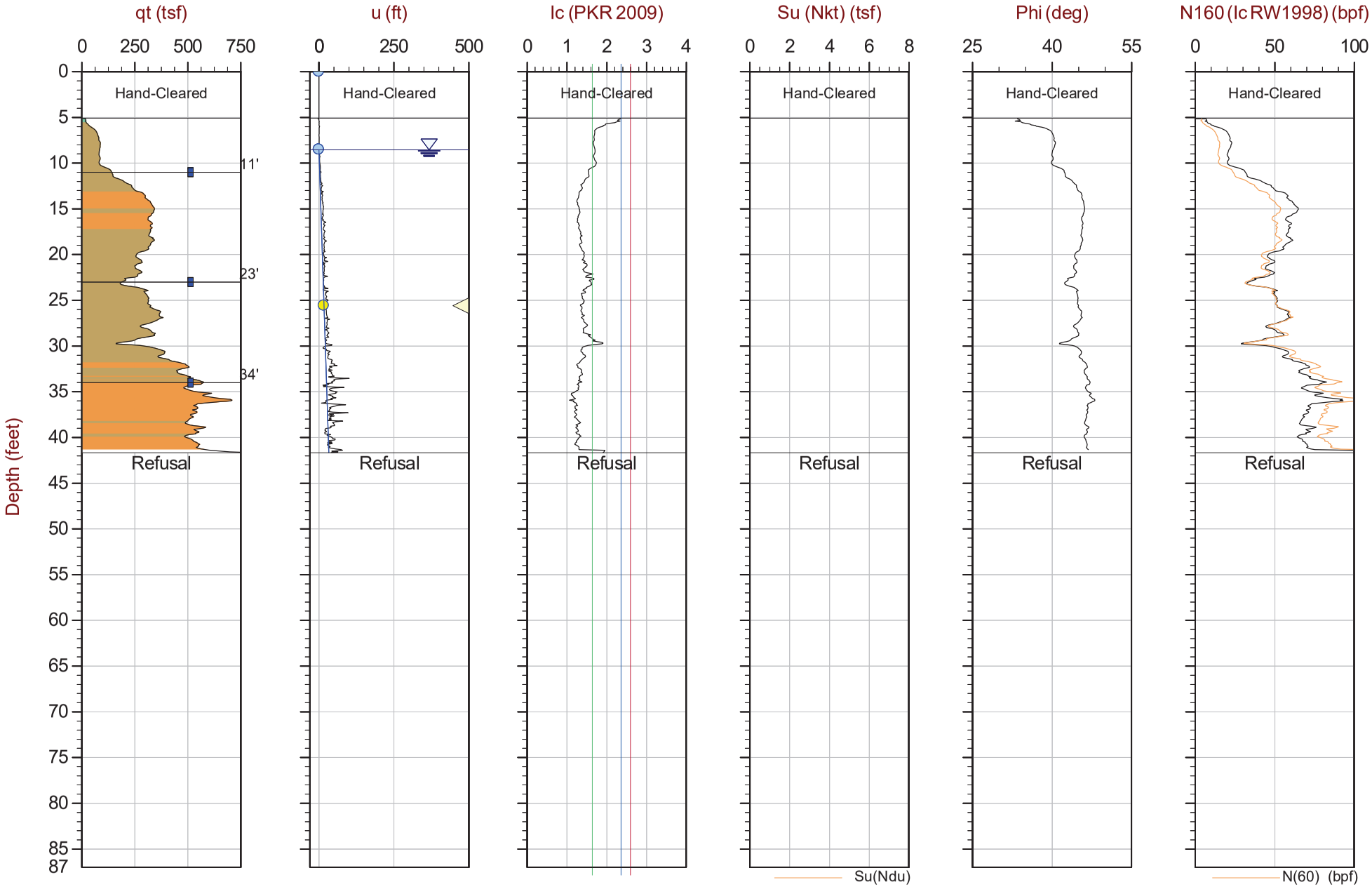
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35



Max Depth: 12.700 m / 41.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56858

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

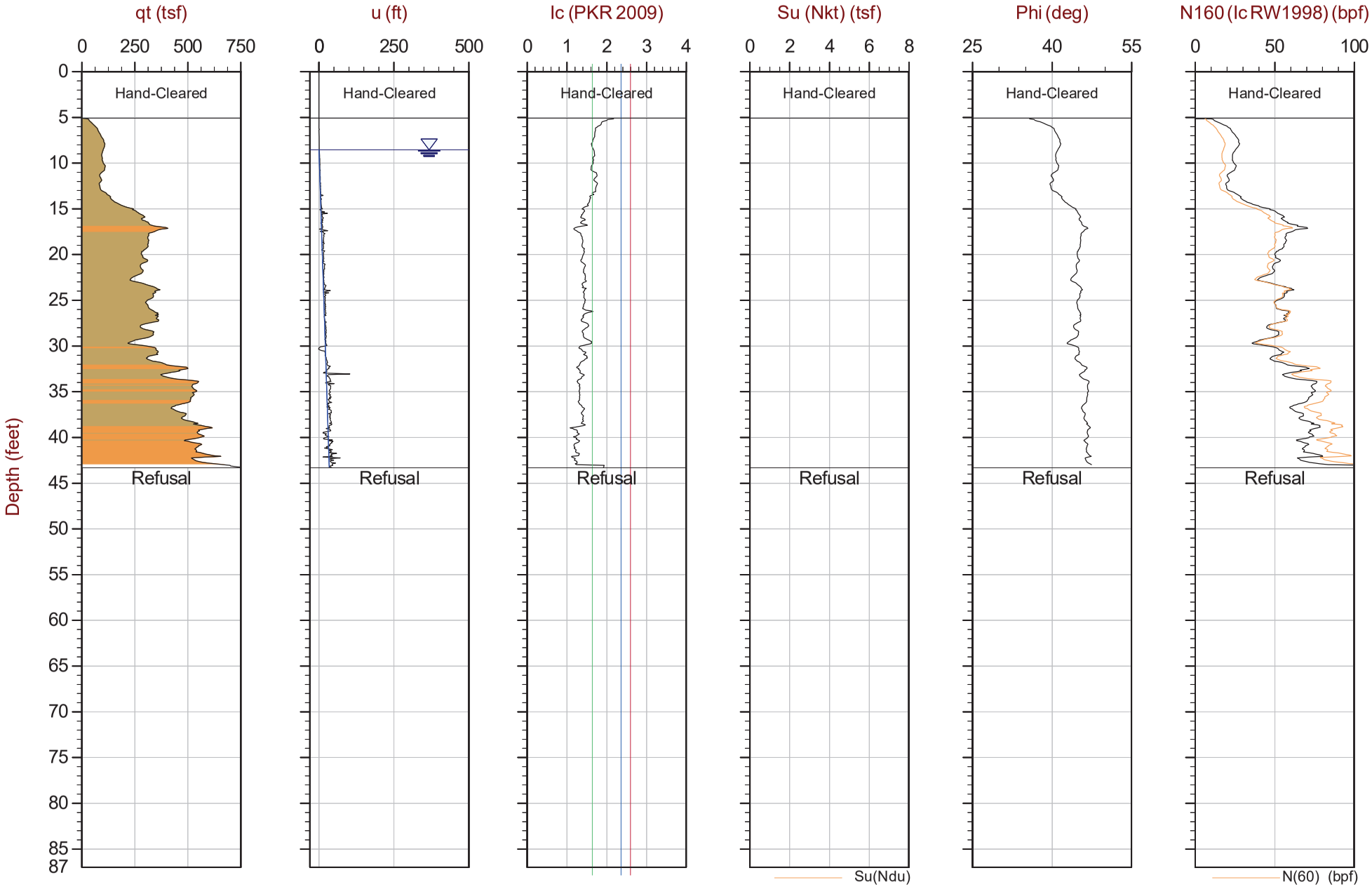
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35



Max Depth: 13.200 m / 43.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-31A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75057 Long: -85.56861

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

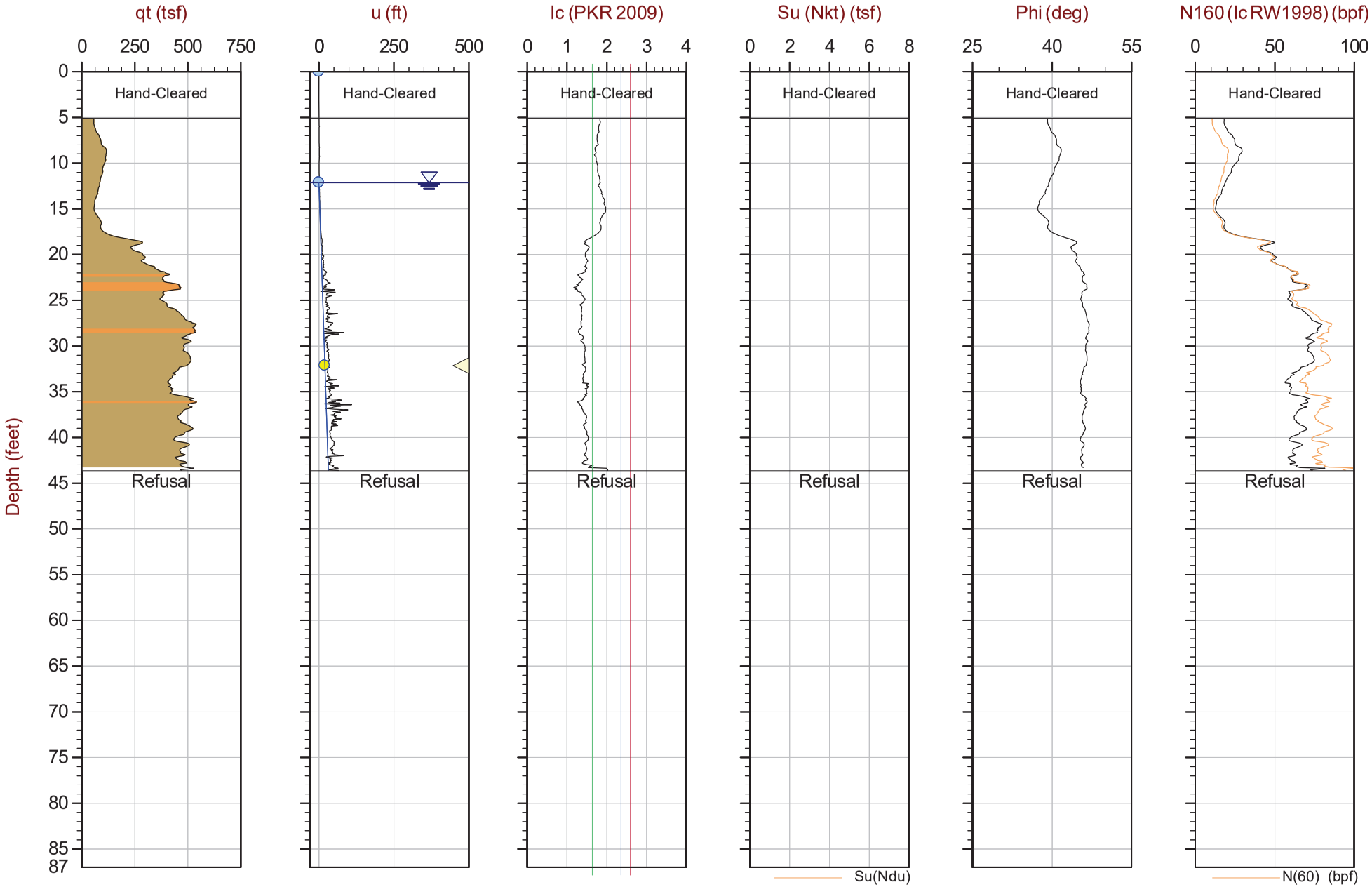
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35



Max Depth: 13.300 m / 43.63 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74509 Long: -85.57700

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

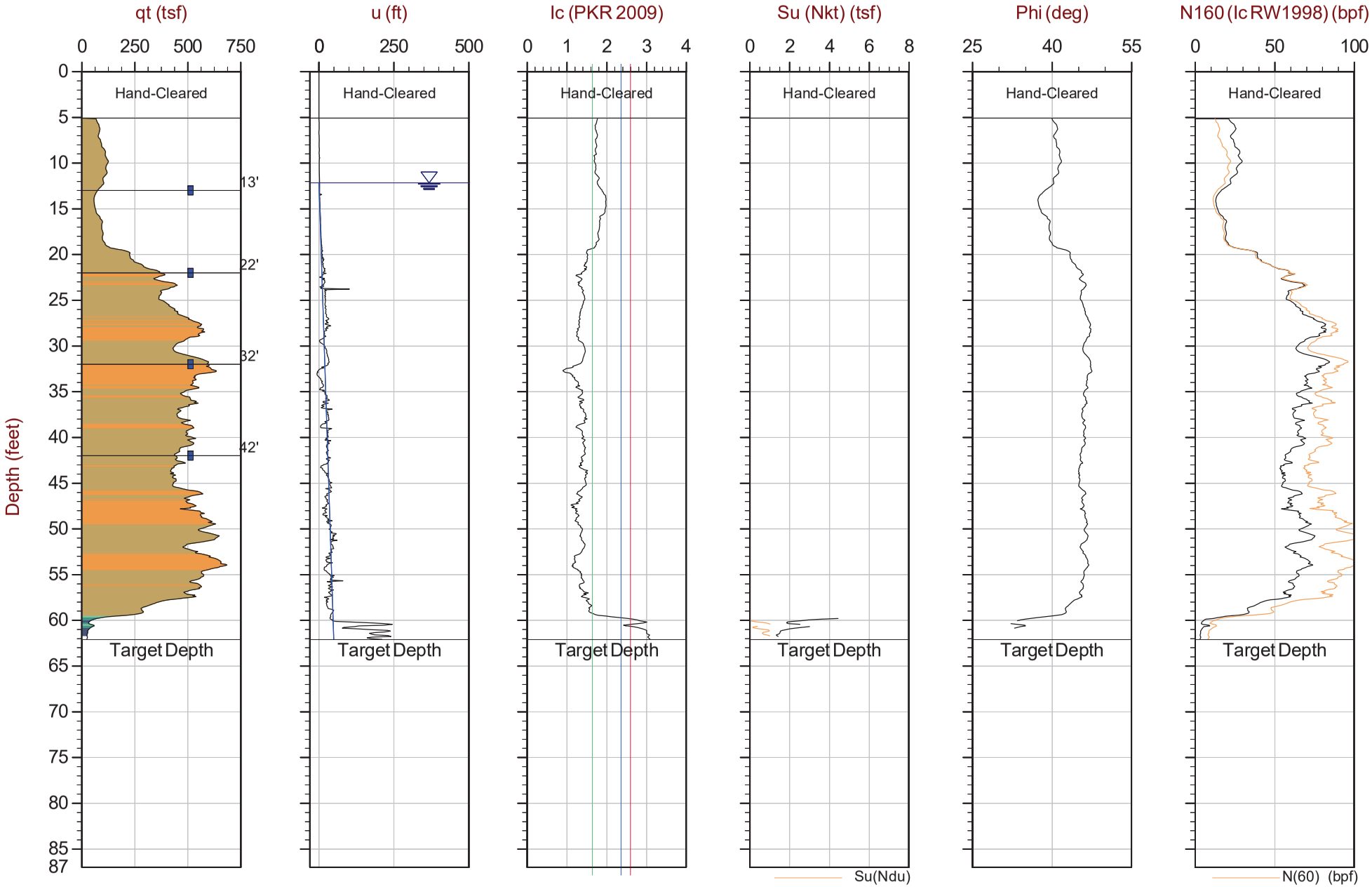
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35



Max Depth: 18.925 m / 62.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-32A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74510 Long: -85.57702

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

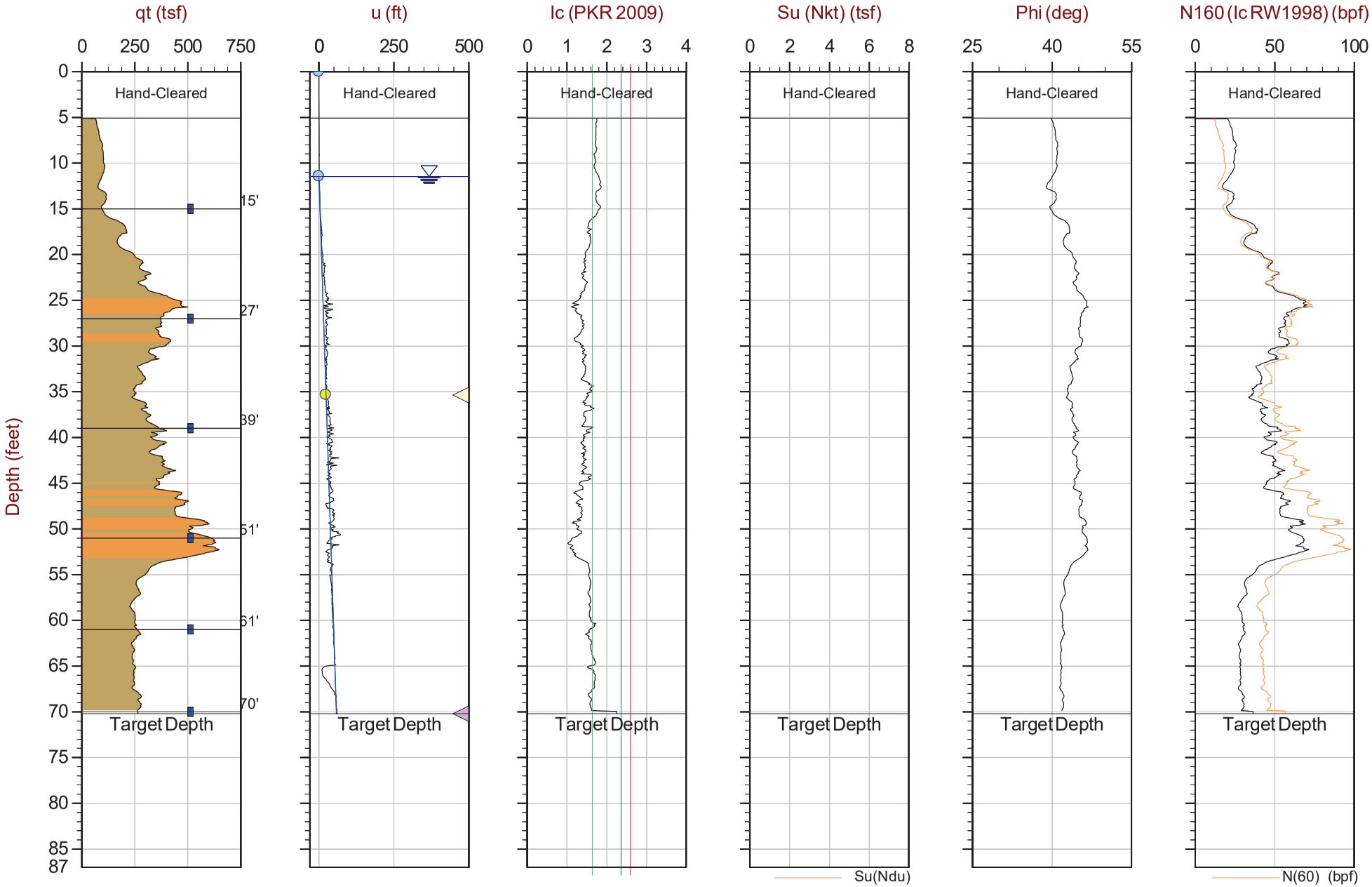
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-33.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74494 Long: -85.57582

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

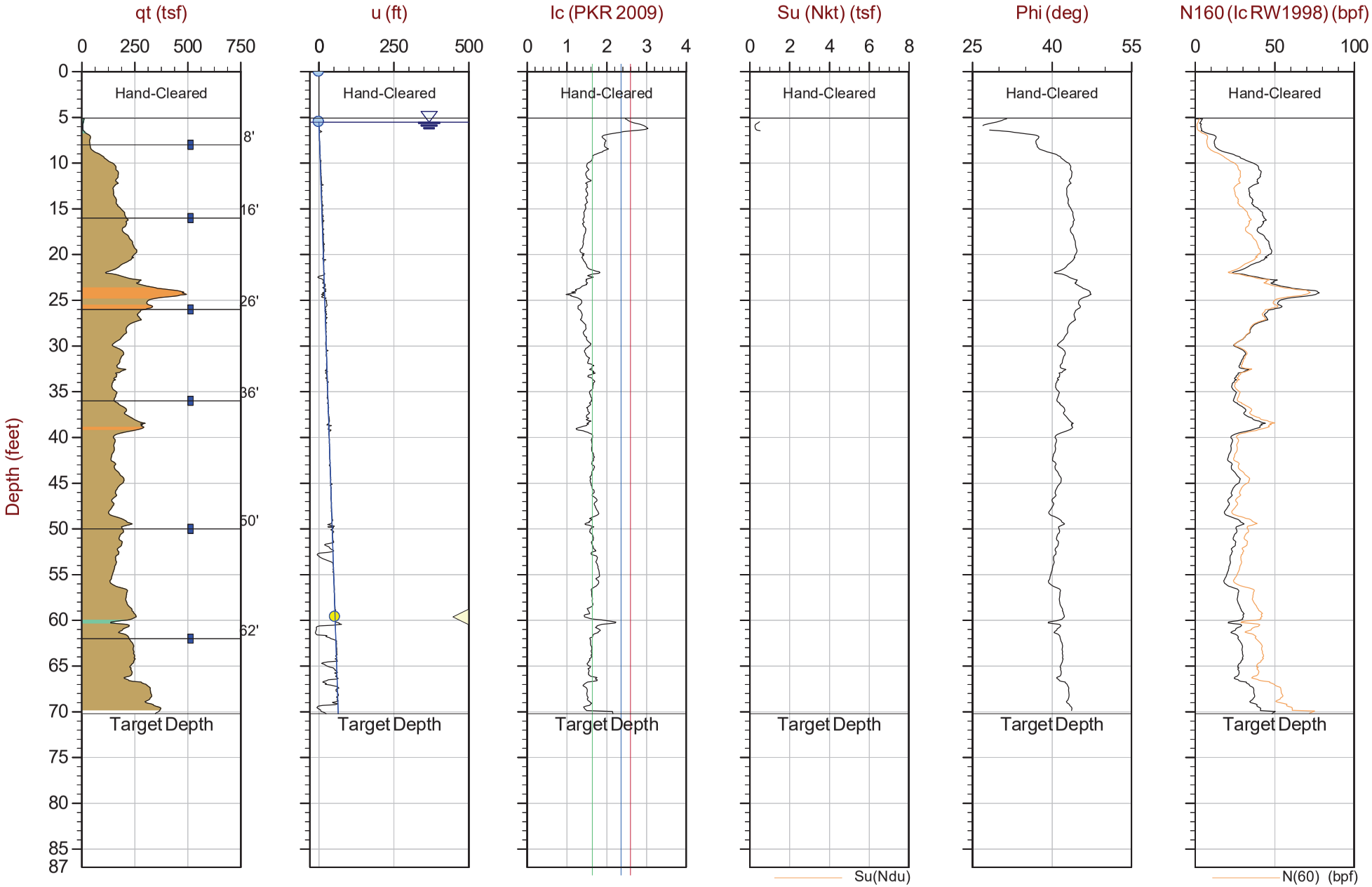
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-34.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75340 Long: -85.56972

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

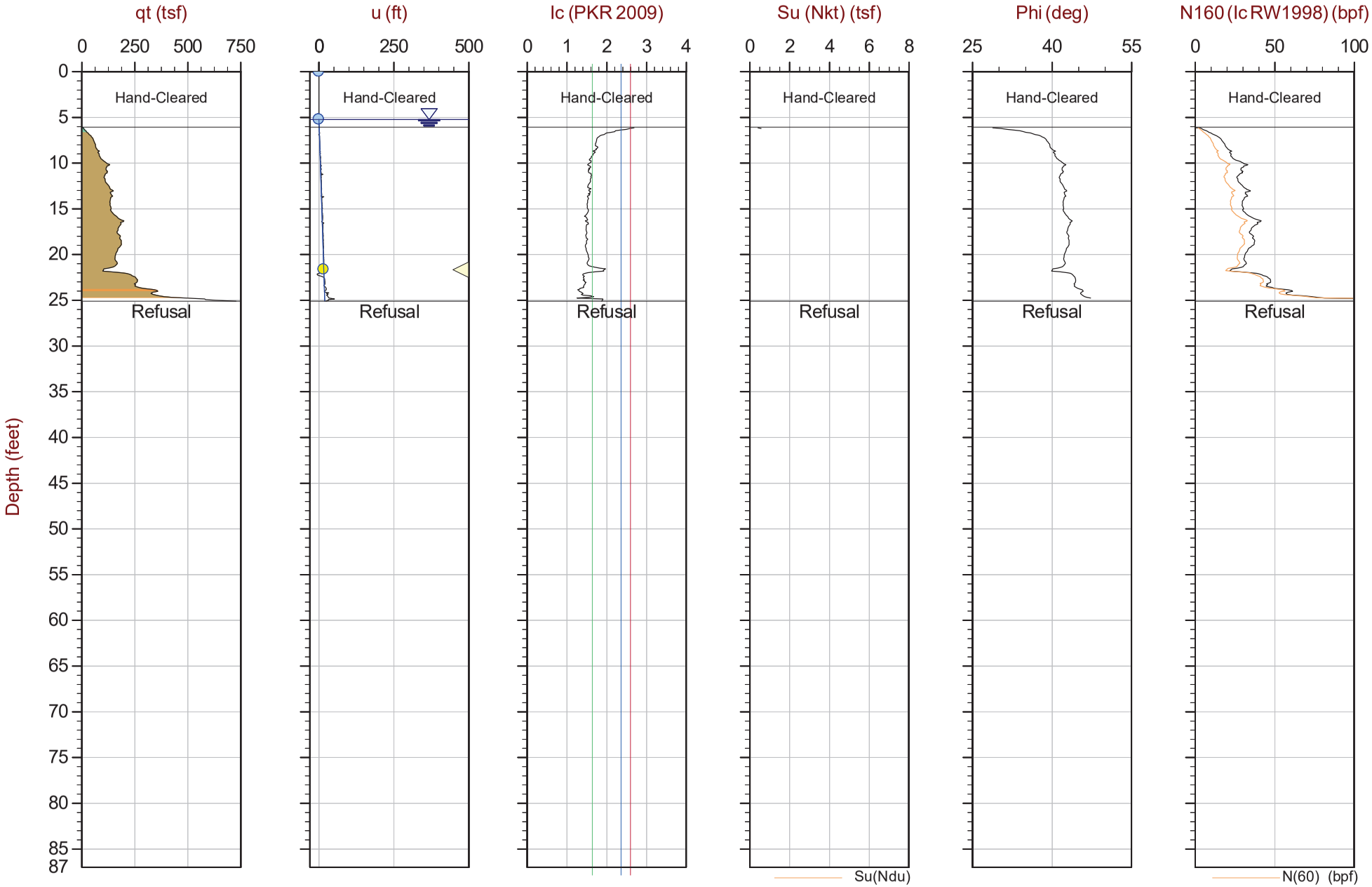
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35



Max Depth: 7.650 m / 25.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75293 Long: -85.56897

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

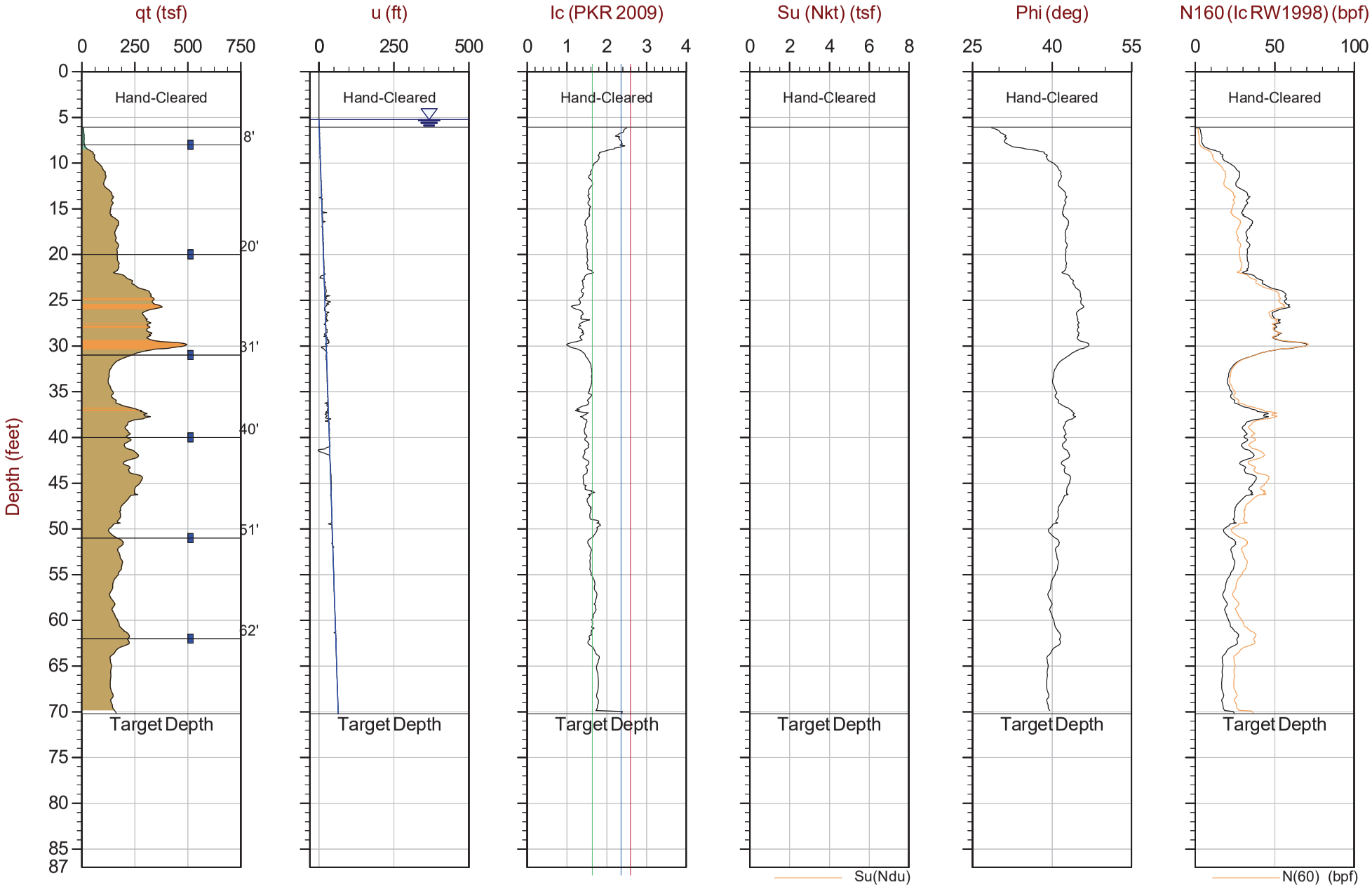
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-35A.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75295 Long: -85.56894

■ Water Sample ——— Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

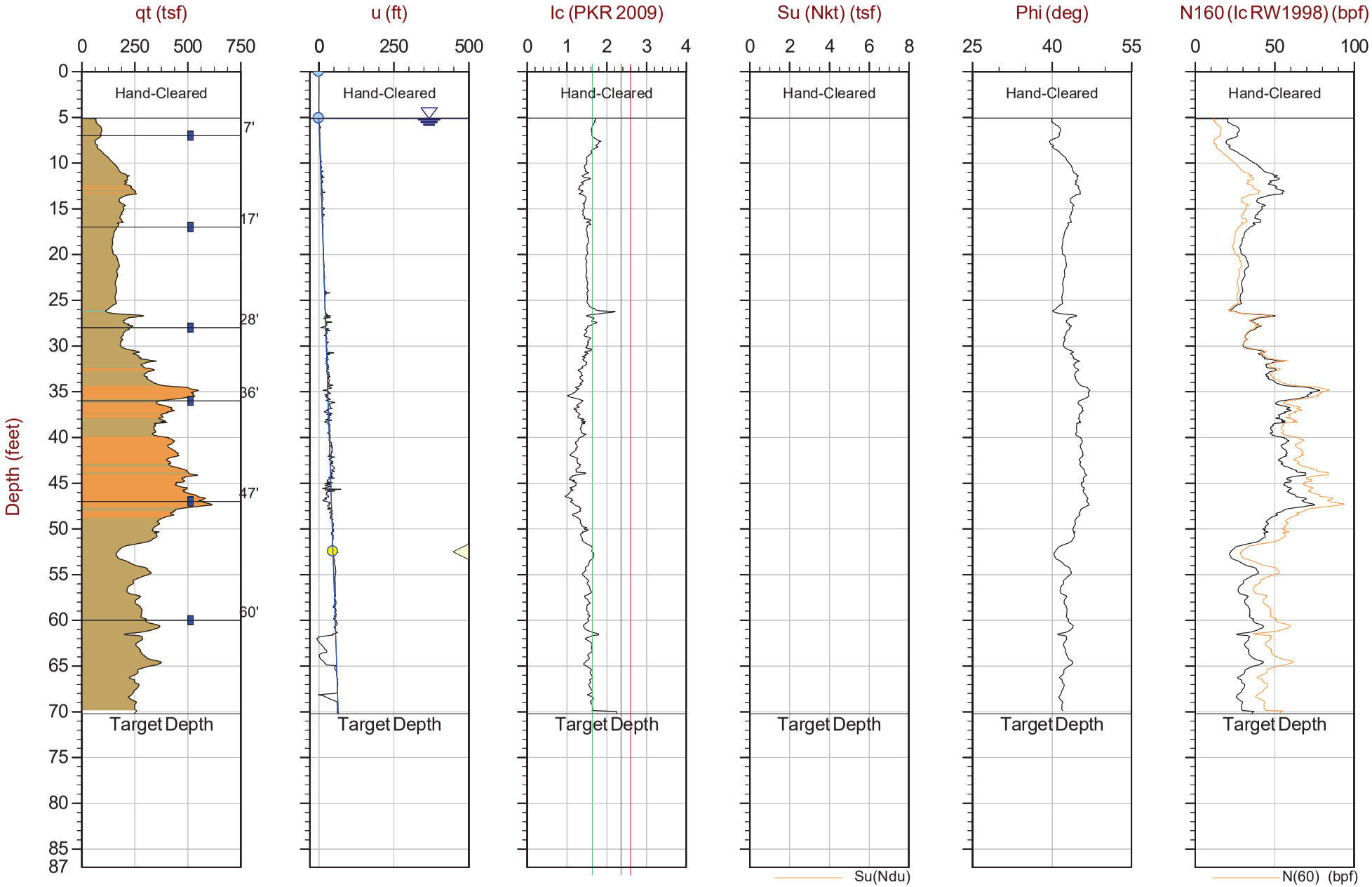
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35



Max Depth: 21.400 m / 70.21 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-36.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75299 Long: -85.56894

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

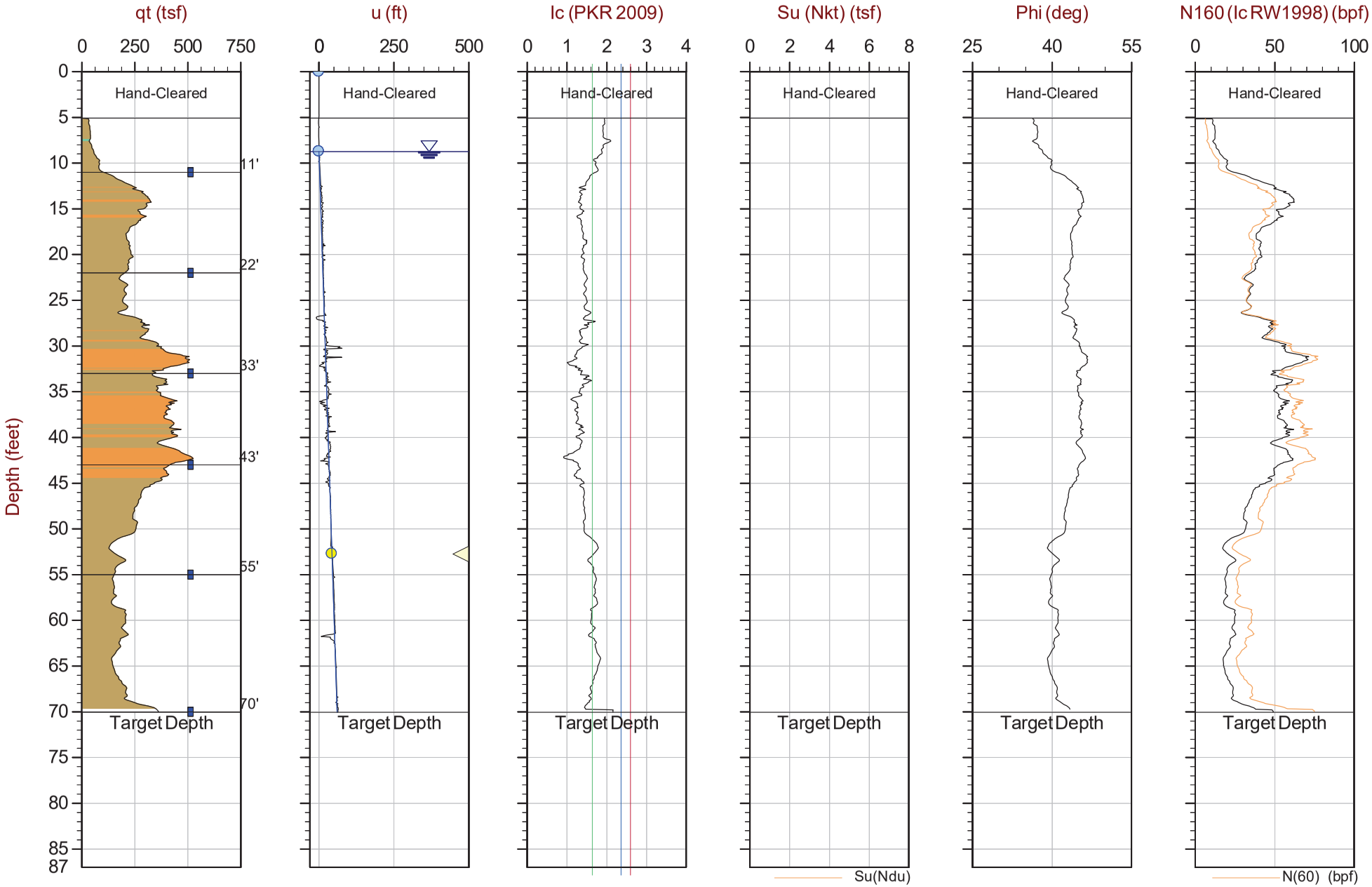
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-37.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75194 Long: -85.56863

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

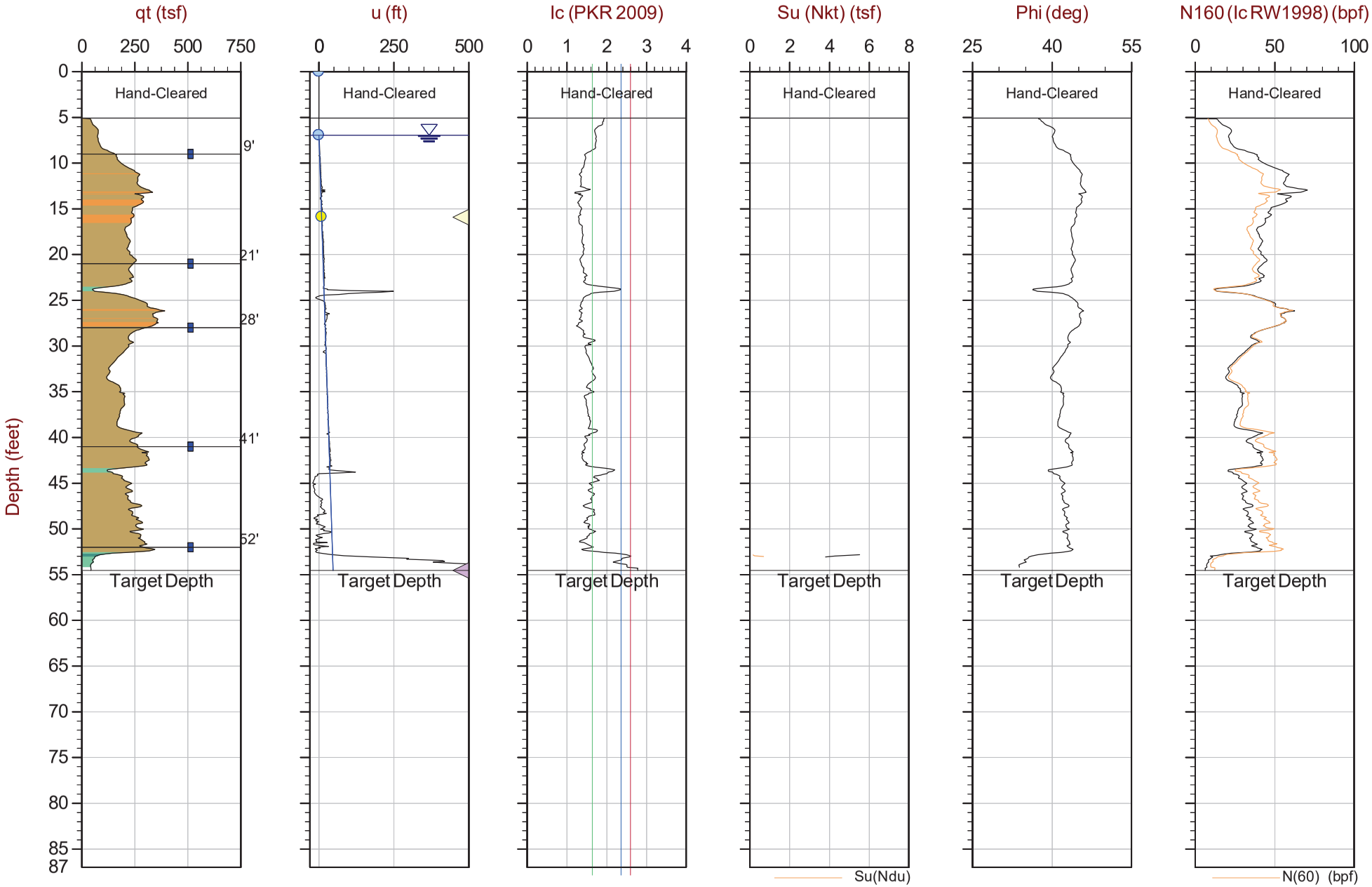
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35



Max Depth: 16.625 m / 54.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-38.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.75358 Long: -85.57111

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

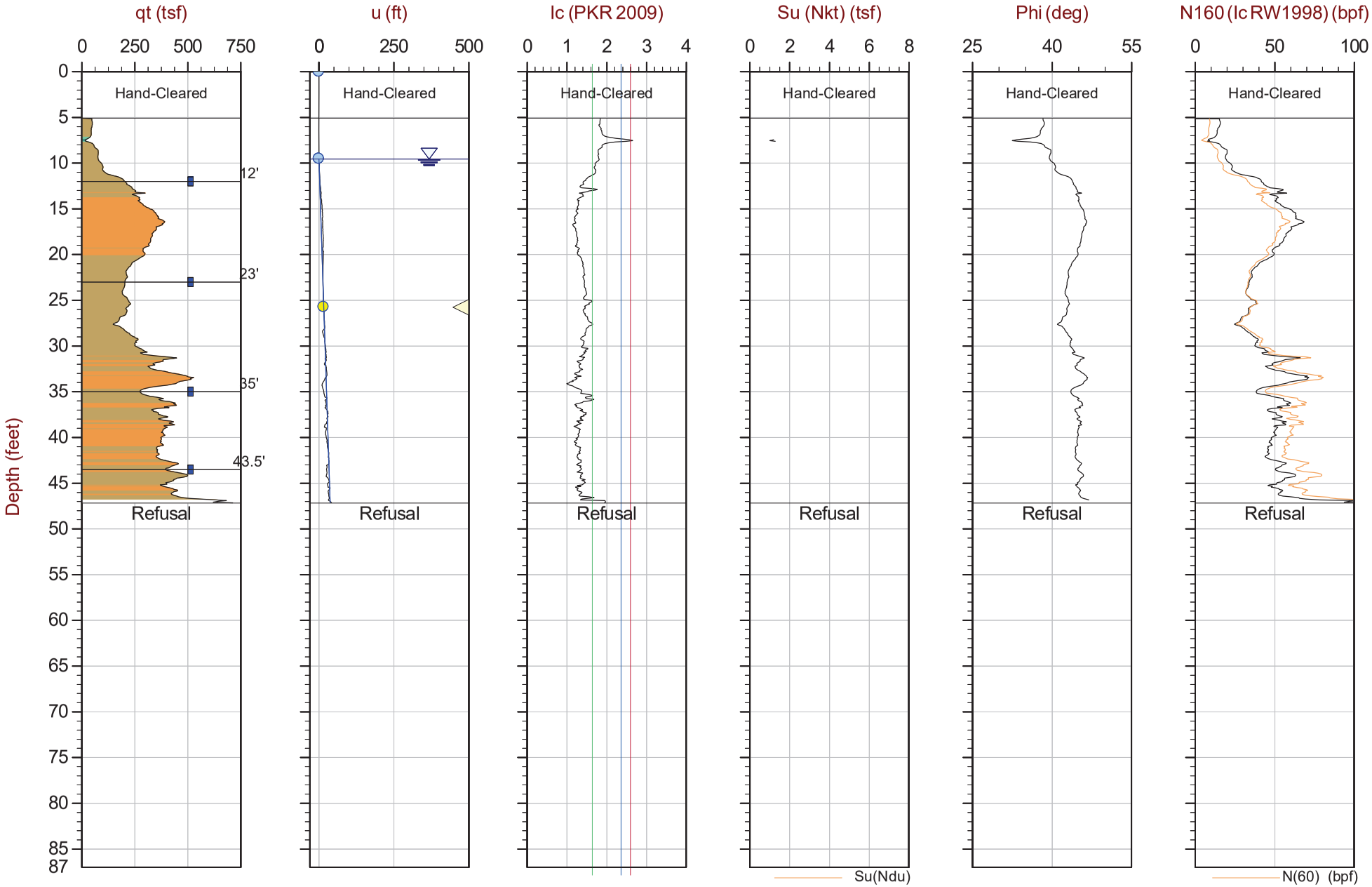
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35



Max Depth: 14.375 m / 47.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-61-22763_CPVAP-39.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 44.74976 Long: -85.56672

■ Water Sample — Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

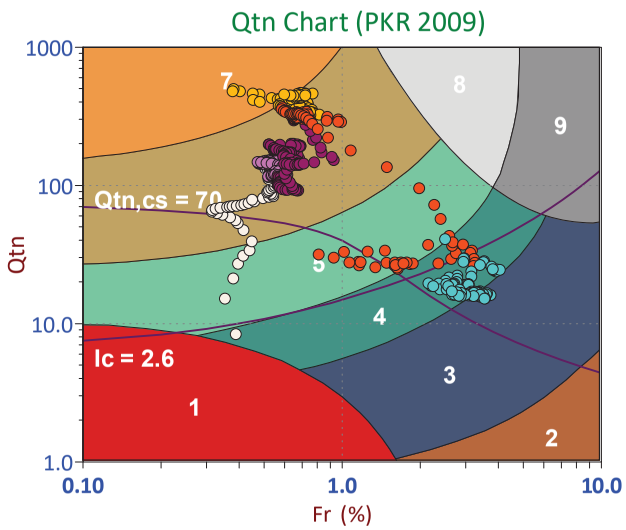
CONETEC

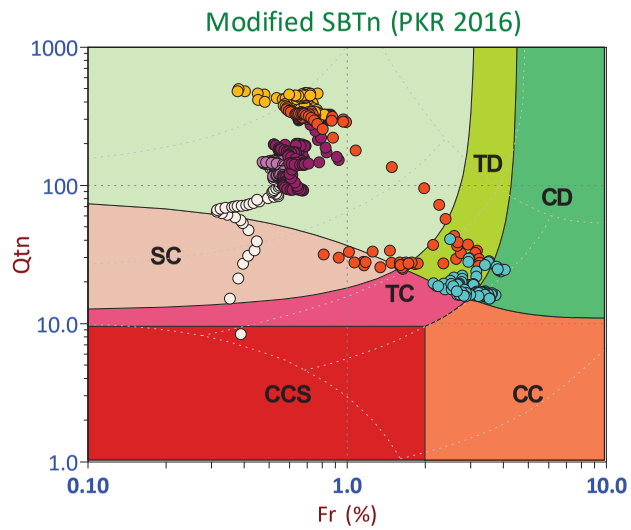
CONETEC

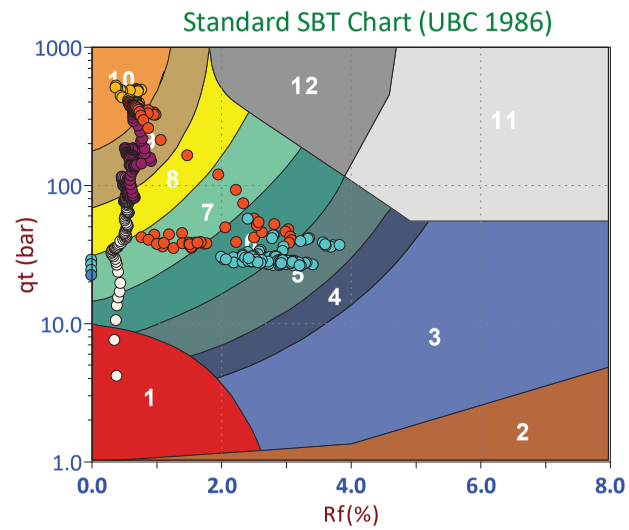
Arcadis

Job No: 21-61-22763
Date: 2021-07-27 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

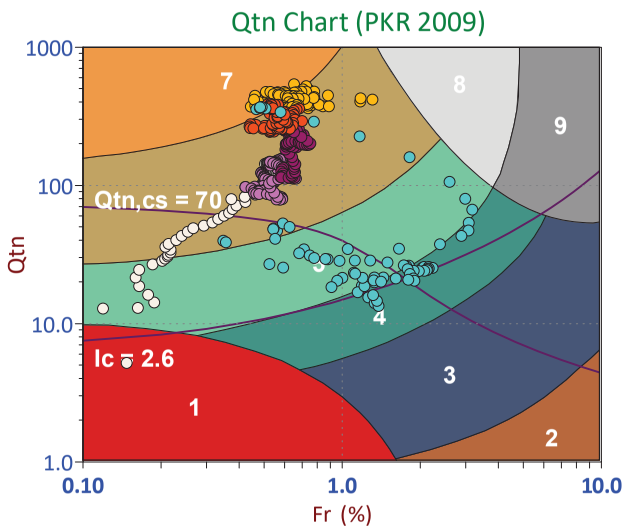
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

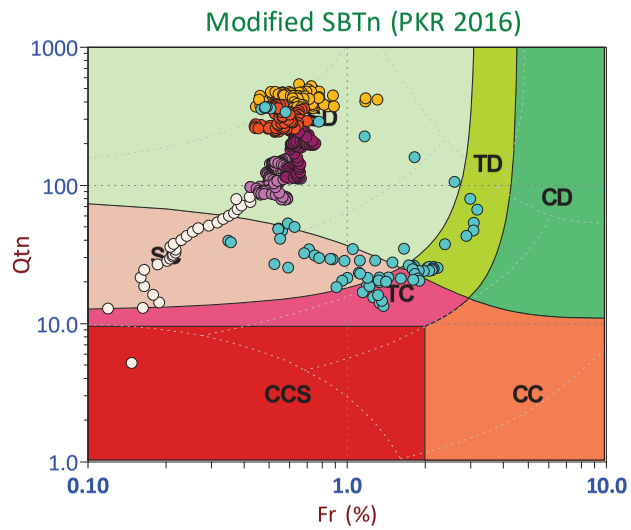
CONETEC

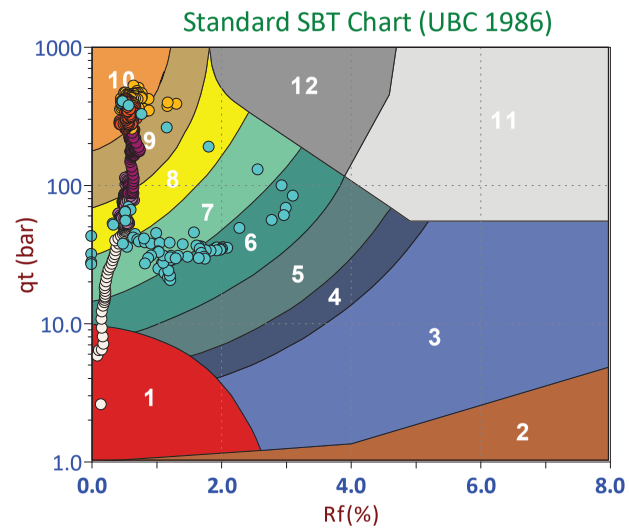
Arcadis

Job No: 21-61-22763
Date: 2021-07-27 10:32
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-14
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

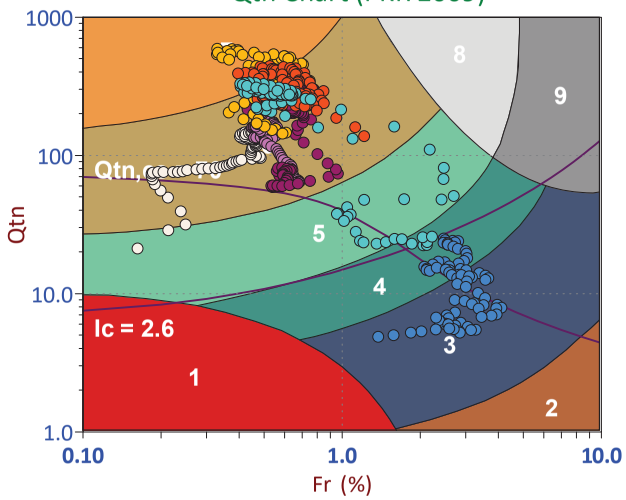
CONETEC

Arcadis

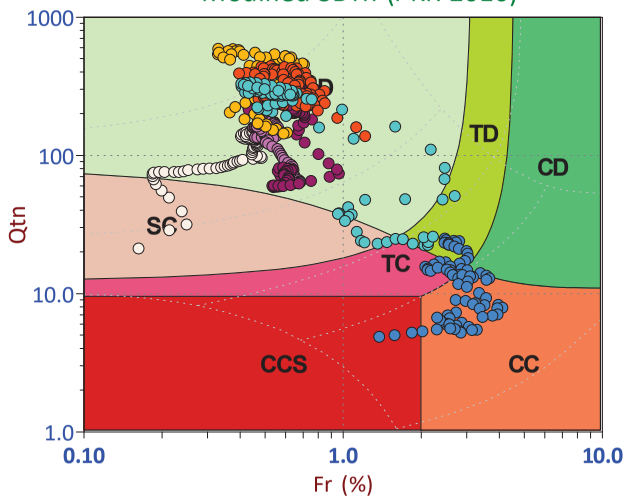
Job No: 21-61-22763
Date: 2021-07-28 08:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-15
Cone: 801:T1500F15U35

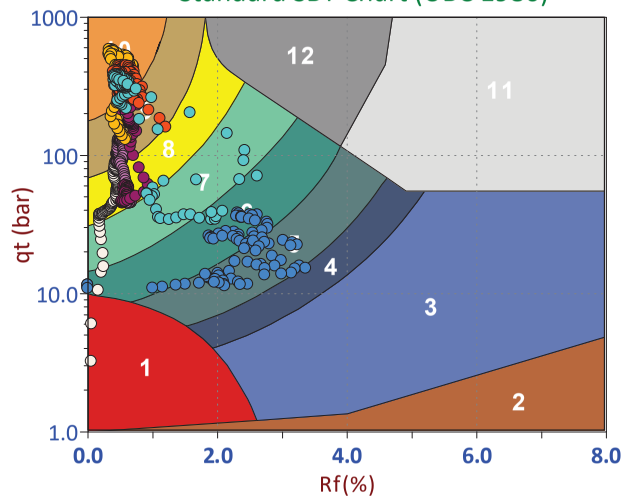
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

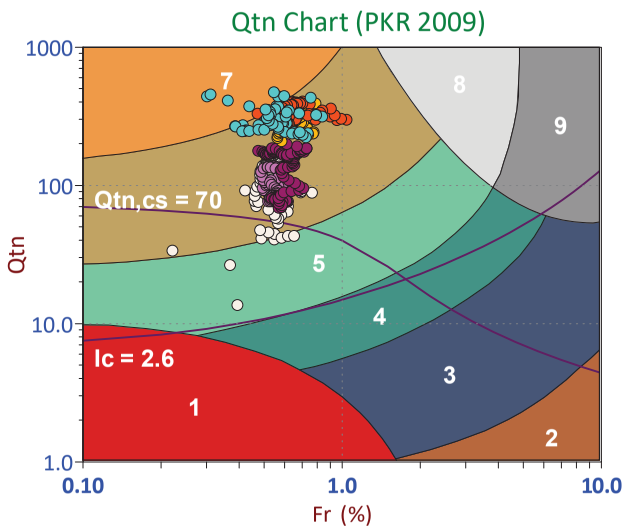
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

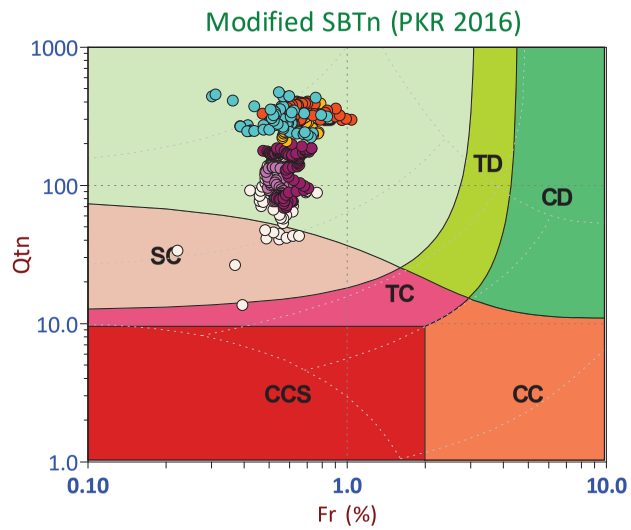
CONETEC

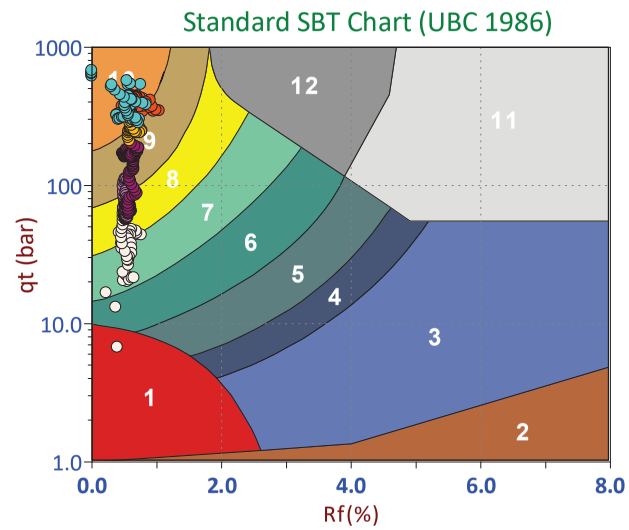
Arcadis

Job No: 21-61-22763
Date: 2021-07-28 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

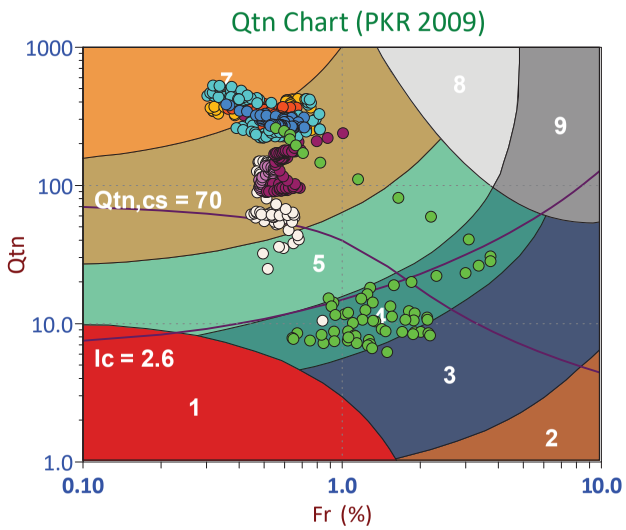
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

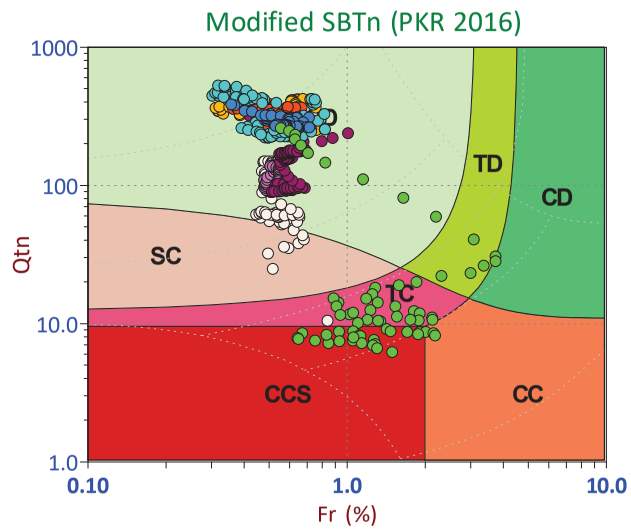
CONETEC

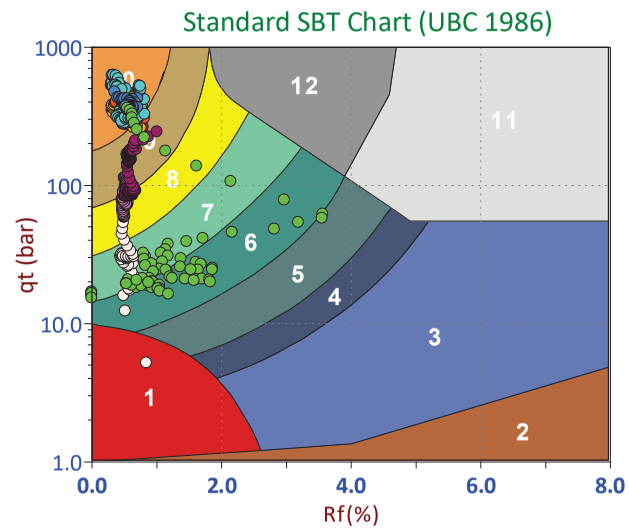
Arcadis

Job No: 21-61-22763
Date: 2021-07-28 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

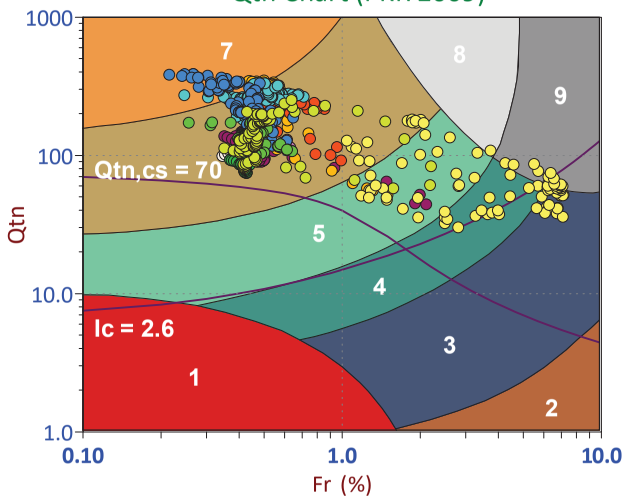
CONETEC

Arcadis

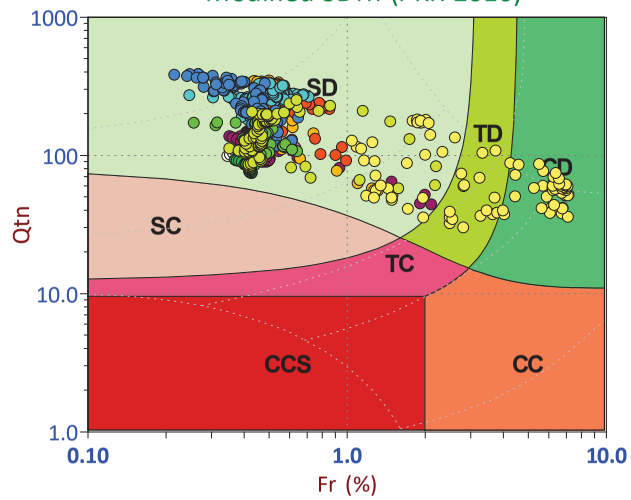
Job No: 21-61-22763
Date: 2021-07-29 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35

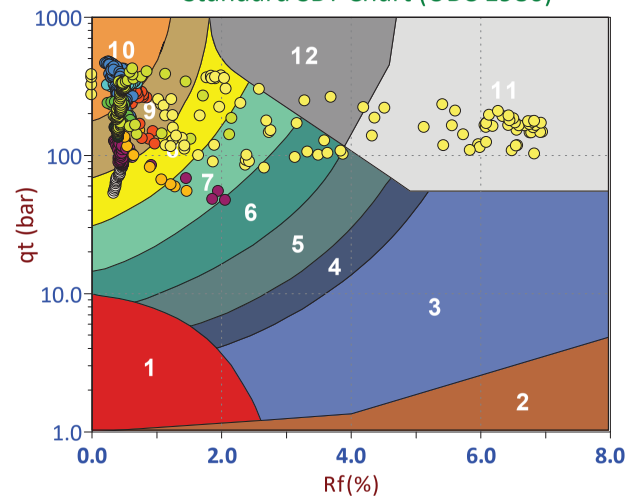
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

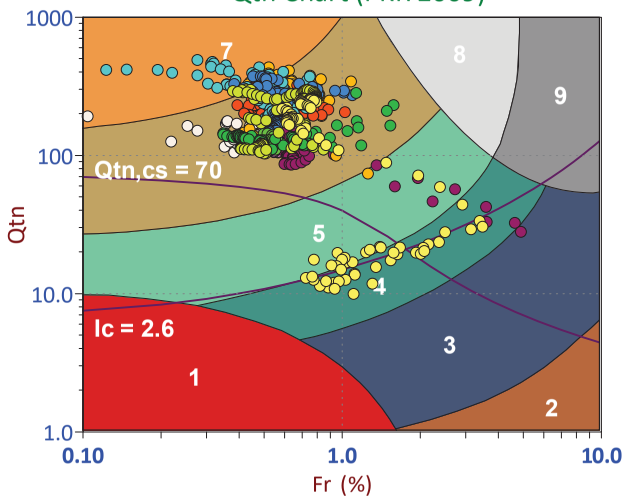
CONETEC

Arcadis

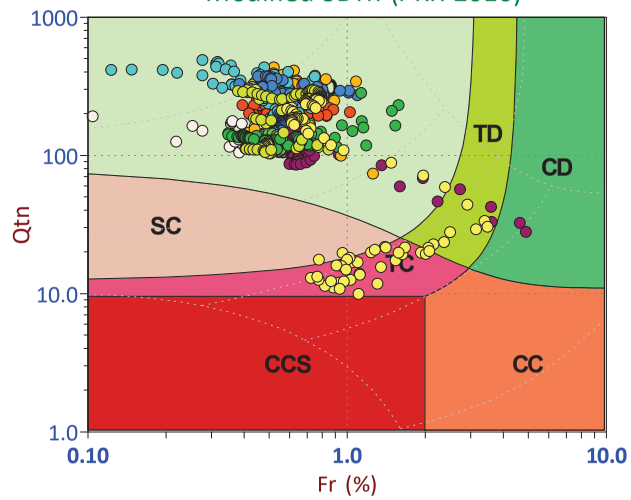
Job No: 21-61-22763
Date: 2021-07-30 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35

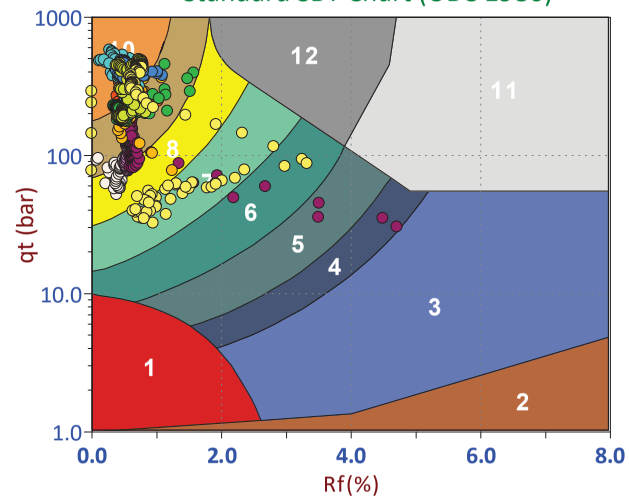
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

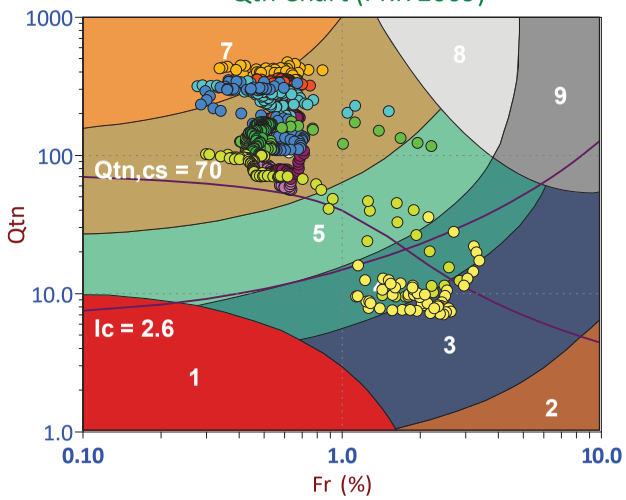
CONETEC

Arcadis

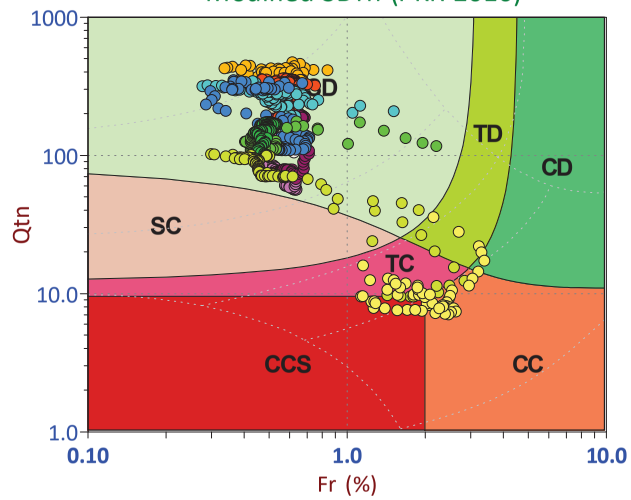
Job No: 21-61-22763
Date: 2021-07-30 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35

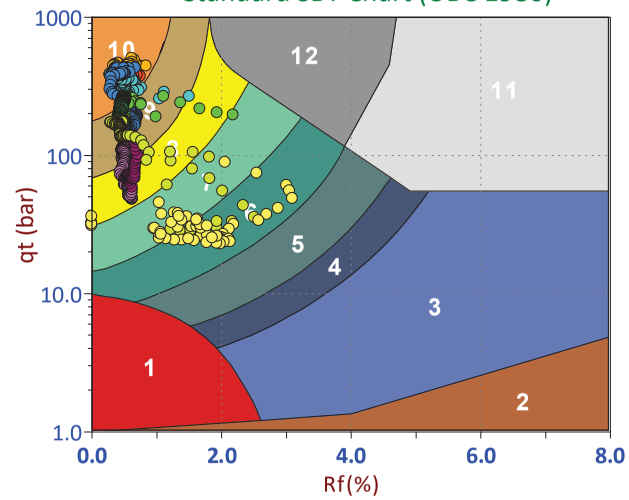
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

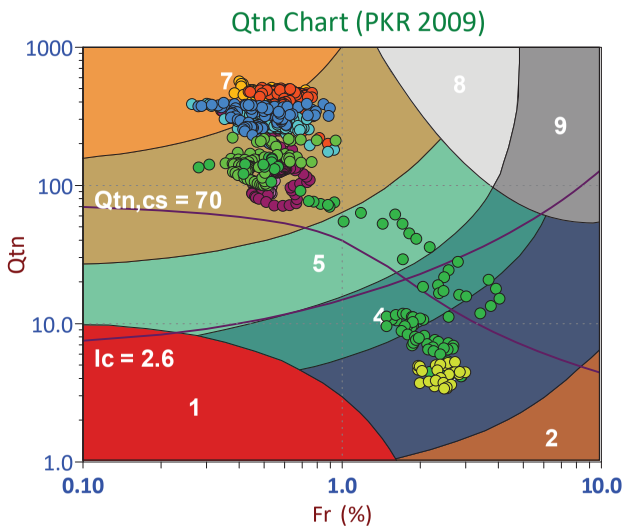
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

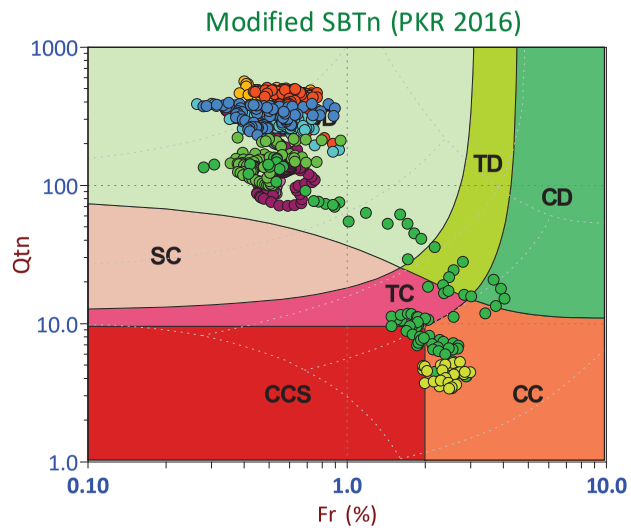
CONETEC

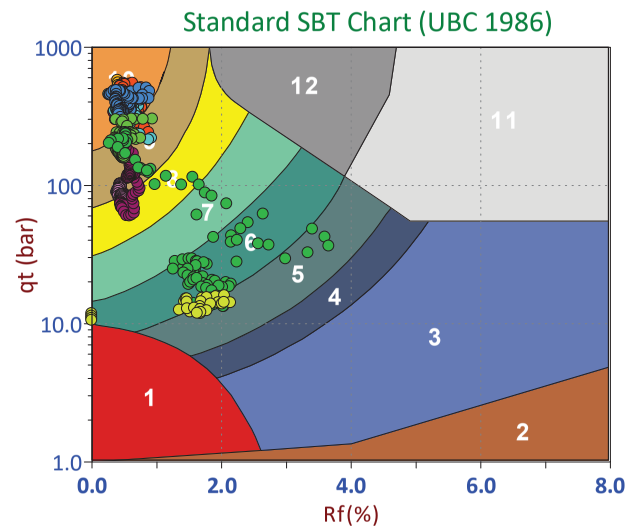
Arcadis

Job No: 21-61-22763
Date: 2021-07-30 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35







Depth Ranges
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- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

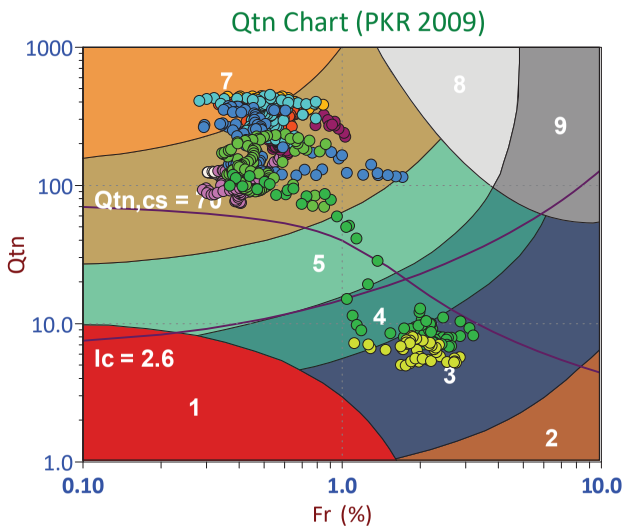
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

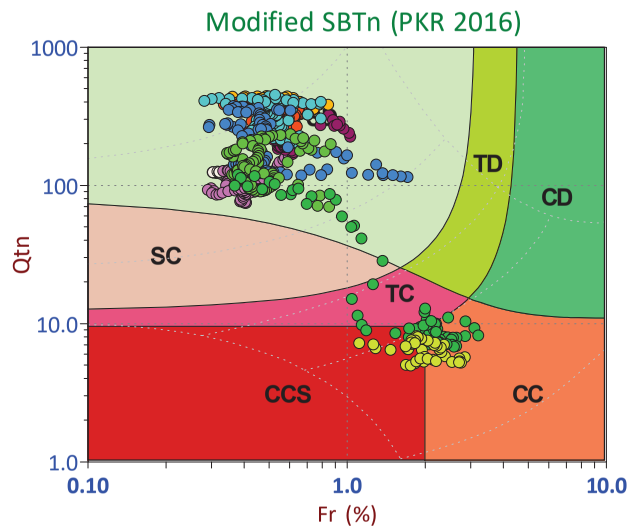
CONETEC

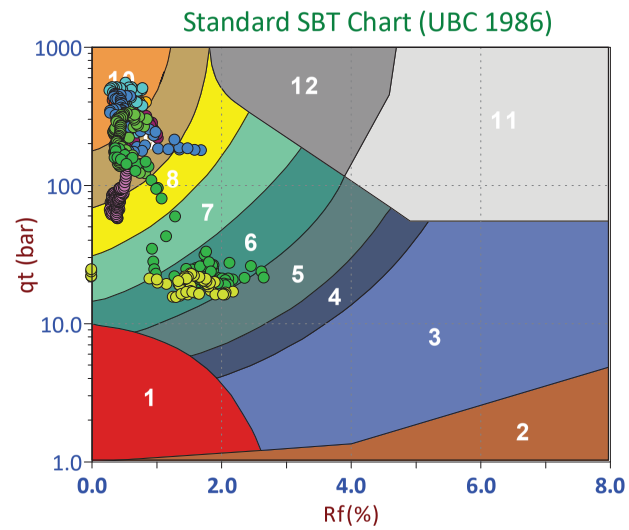
Arcadis

Job No: 21-61-22763
Date: 2021-08-03 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

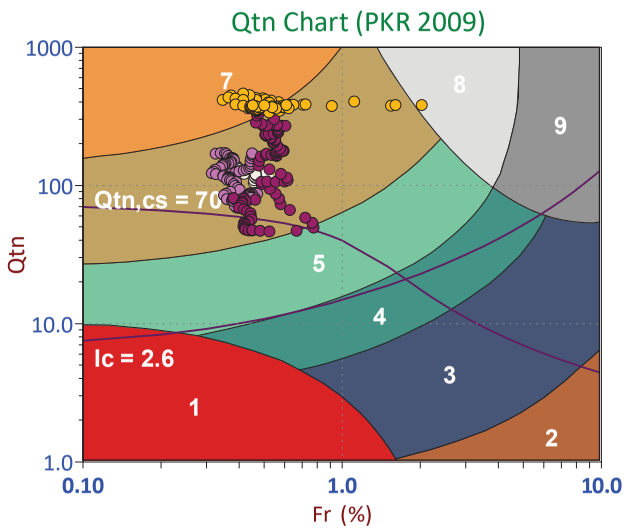
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

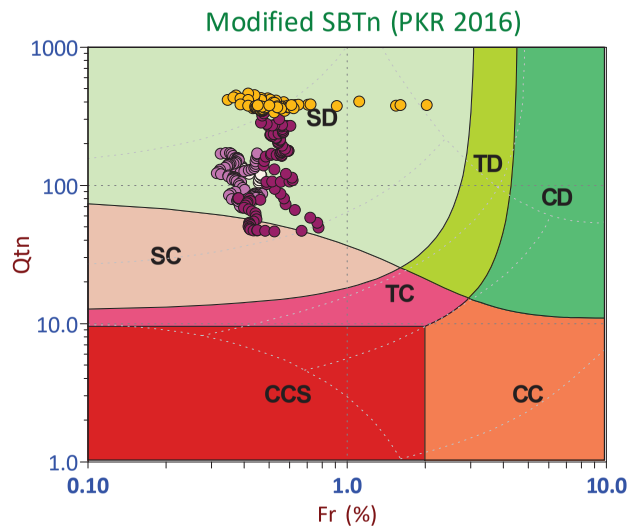
CONETEC

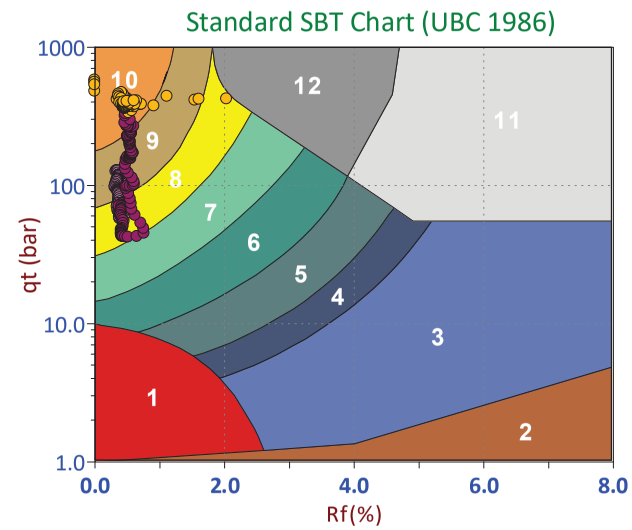
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

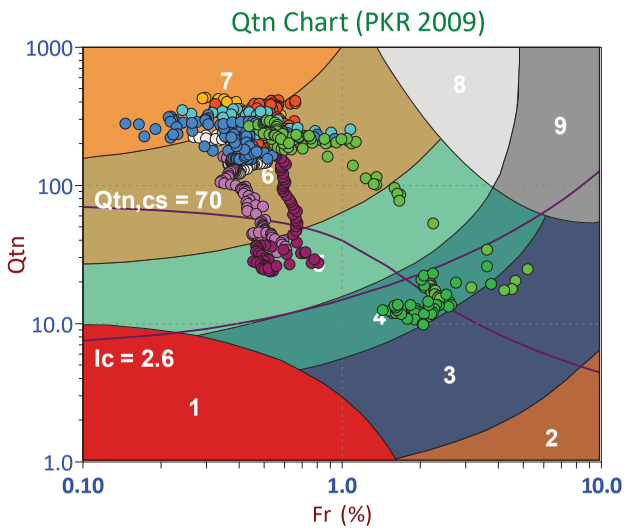
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

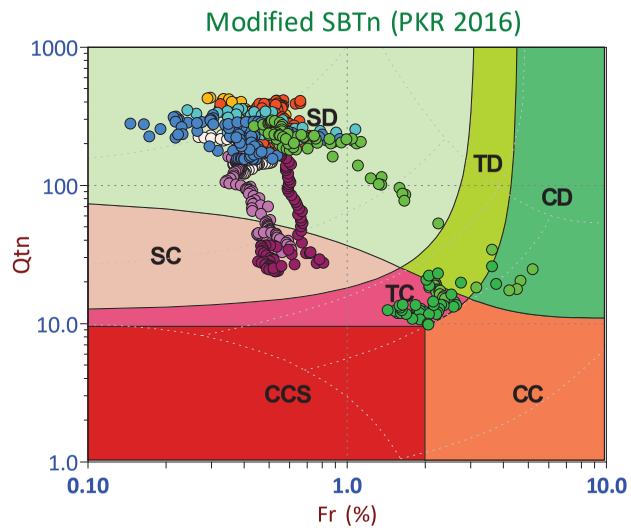
CONETEC

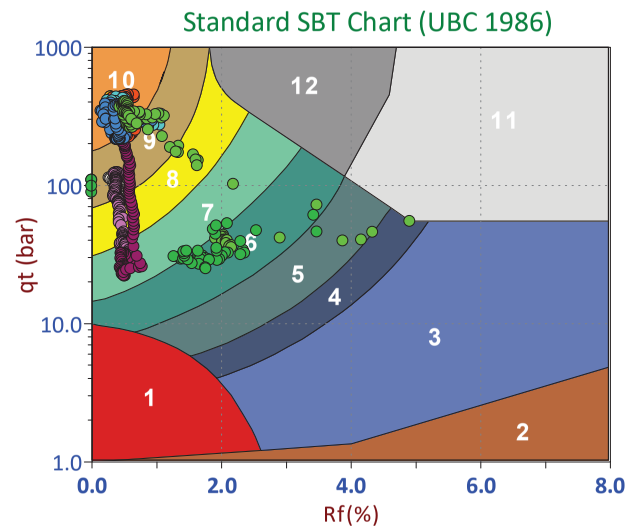
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 10:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

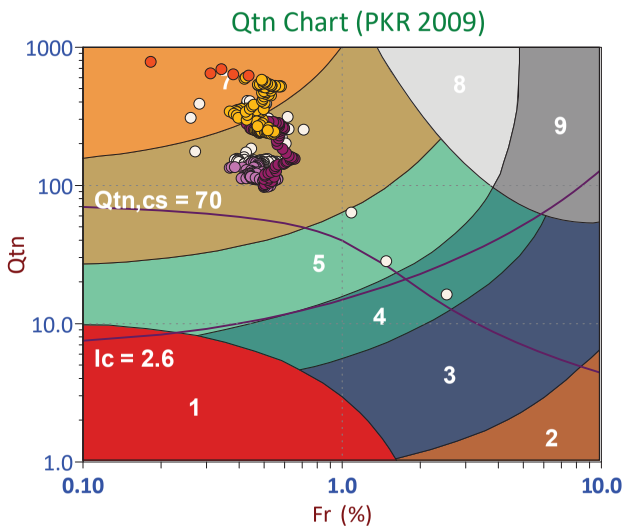
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

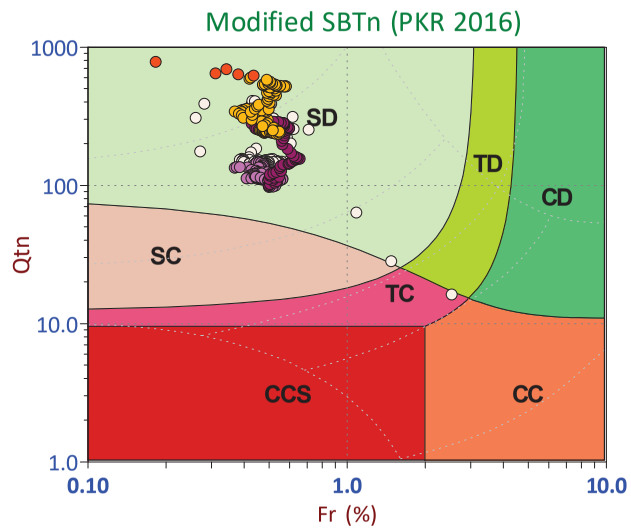
CONETEC

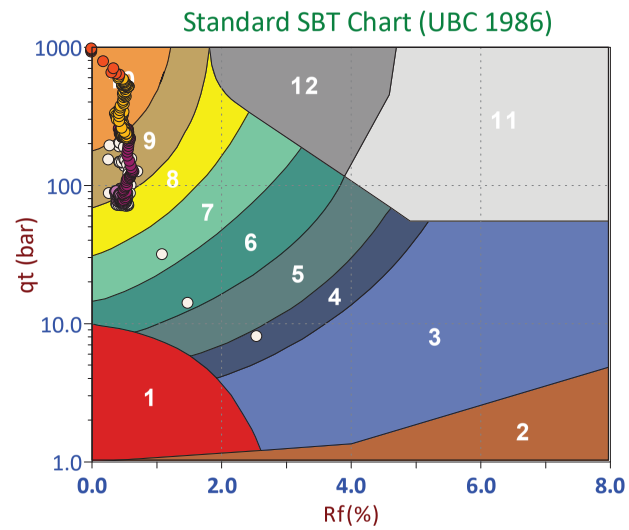
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 14:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

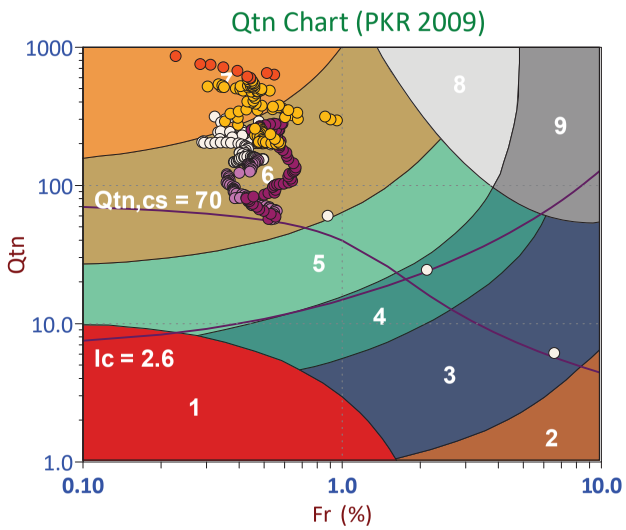
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

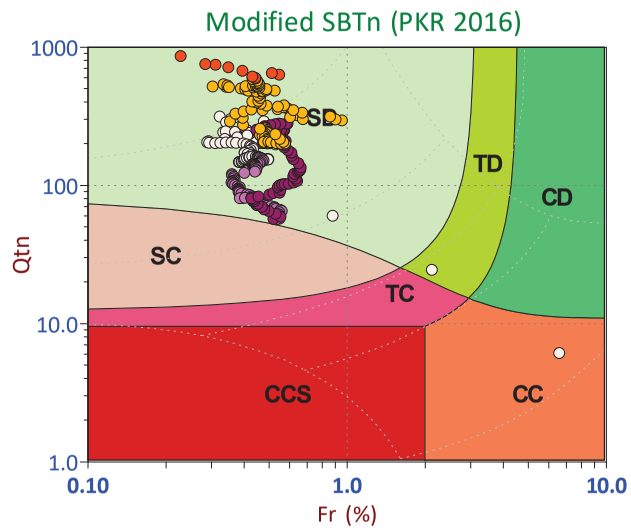
CONETEC

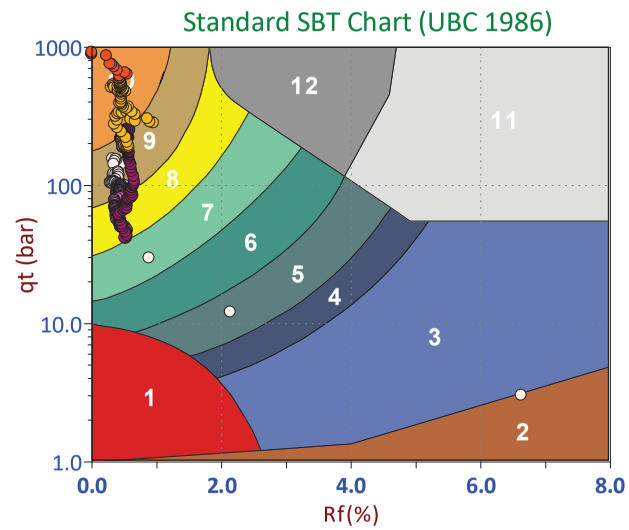
Arcadis

Job No: 21-61-22763
Date: 2021-08-04 15:11
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

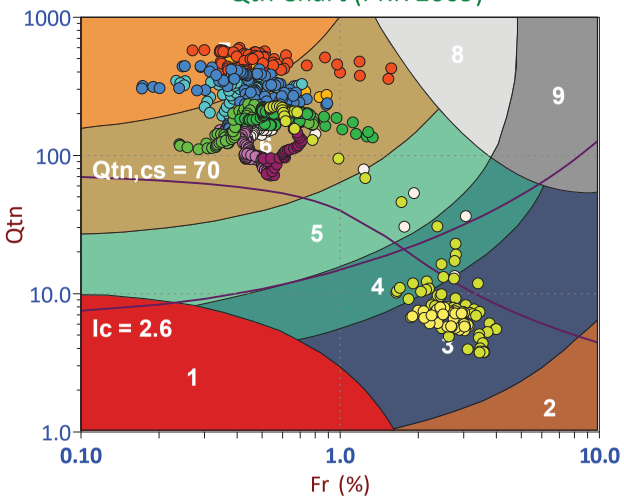
CONETEC

Arcadis

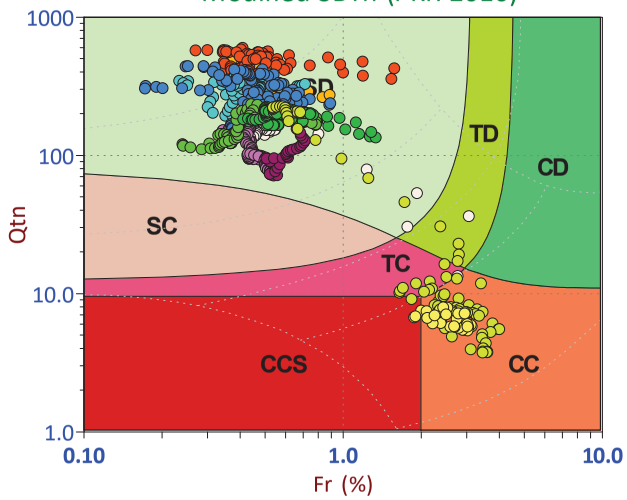
Job No: 21-61-22763
Date: 2021-08-04 15:51
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-23B
Cone: 801:T1500F15U35

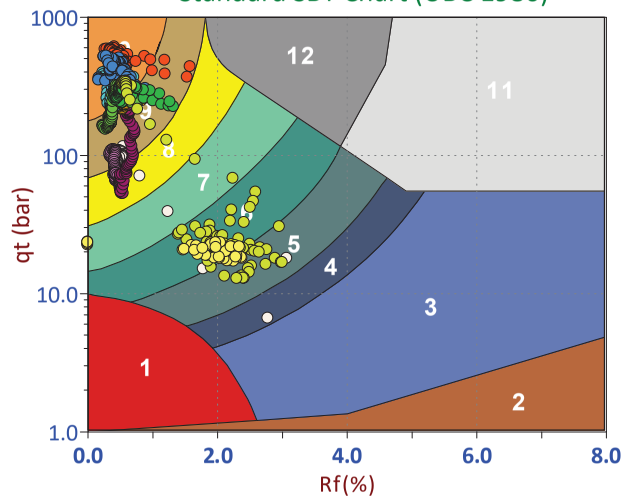
Qtn Chart (PKR 2009)



Modified SBTn (PKR 2016)



Standard SBT Chart (UBC 1986)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

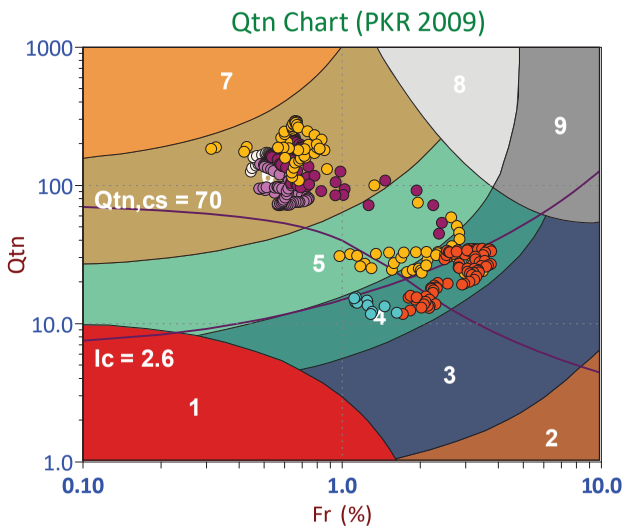
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

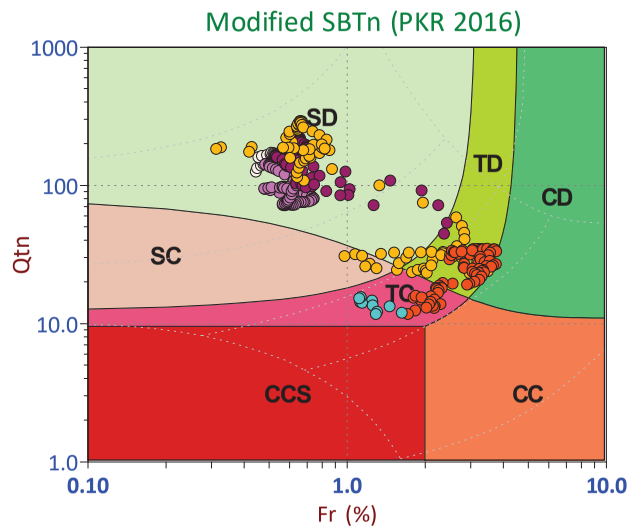
CONETEC

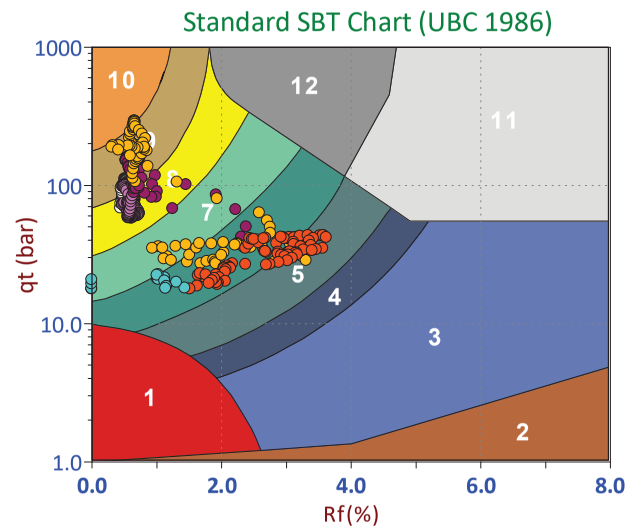
Arcadis

Job No: 21-61-22763
Date: 2021-08-06 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

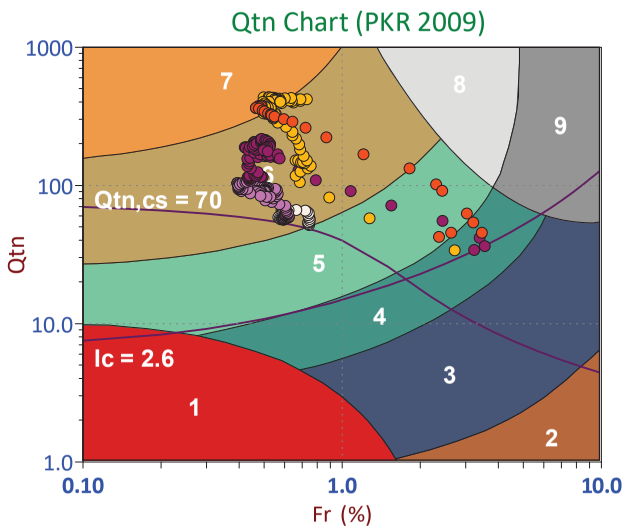
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

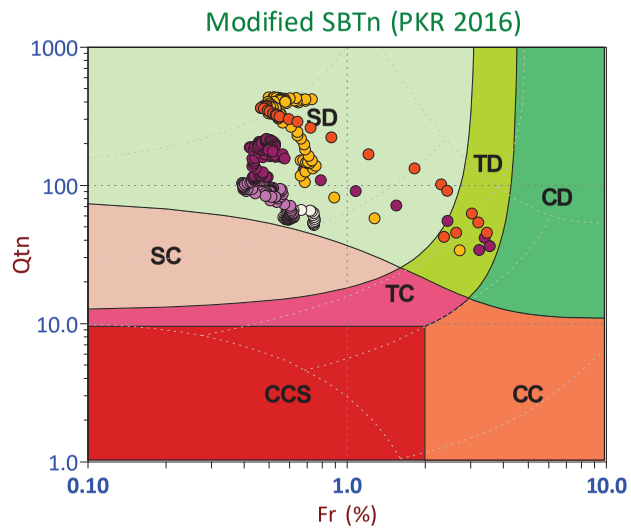
CONETEC

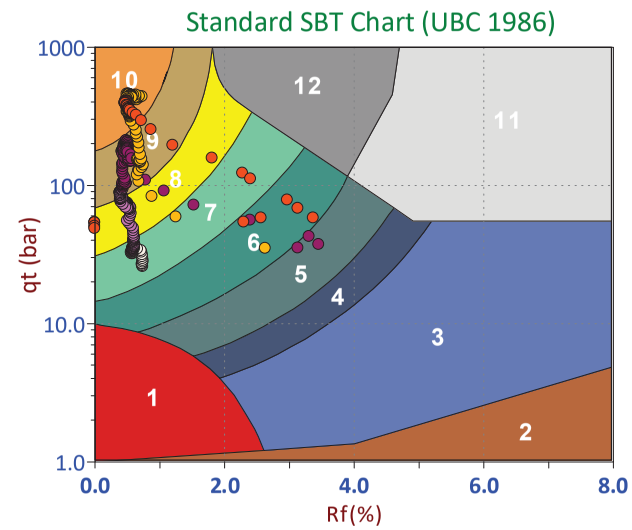
Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

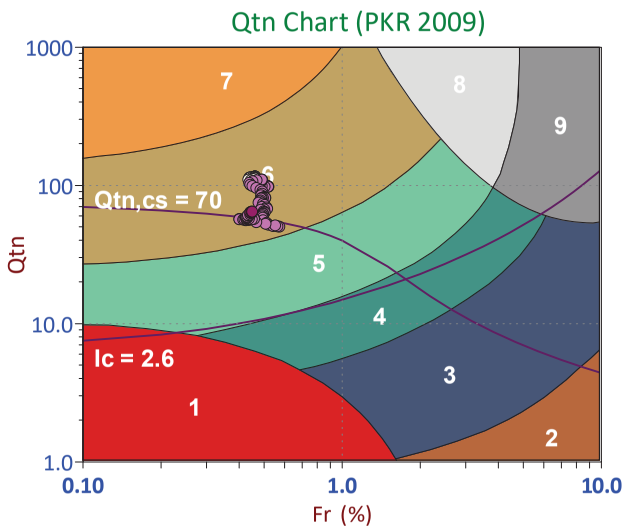
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

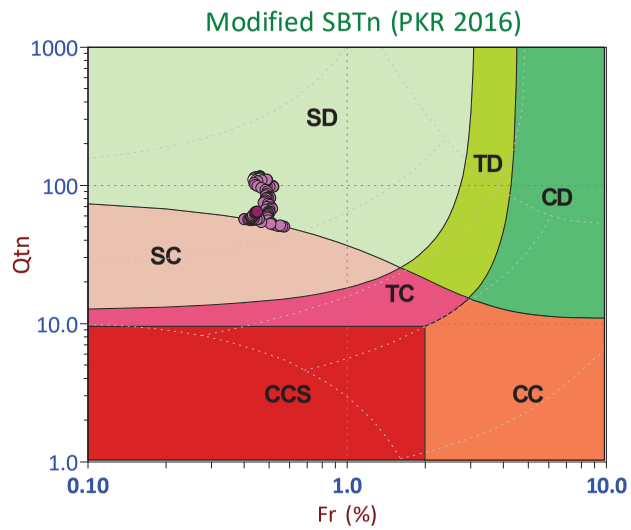
CONETEC

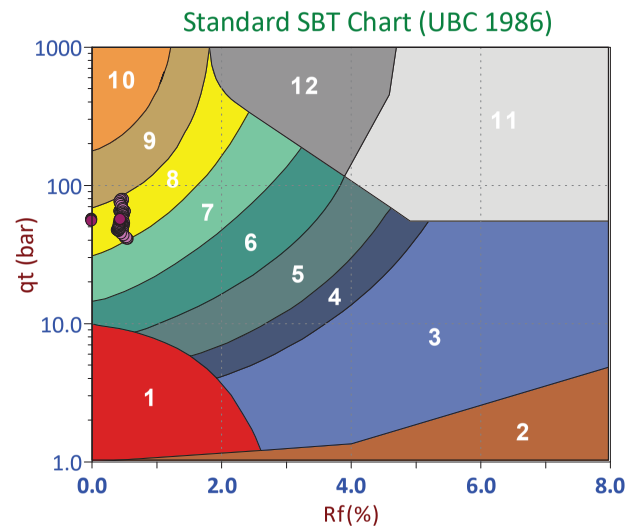
Arcadis

Job No: 21-61-22763
Date: 2021-12-18 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

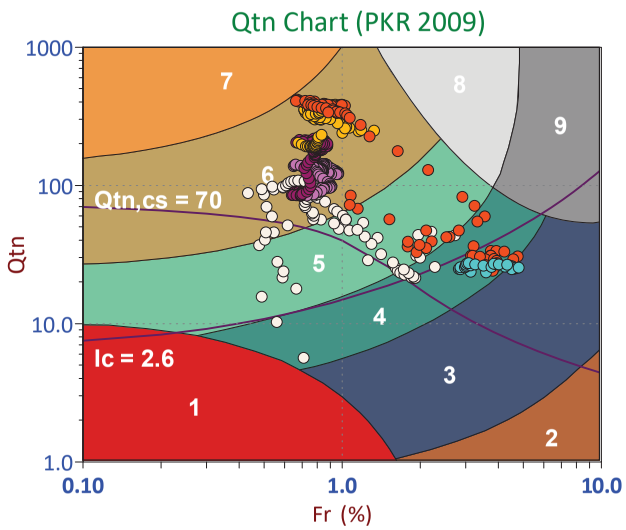
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

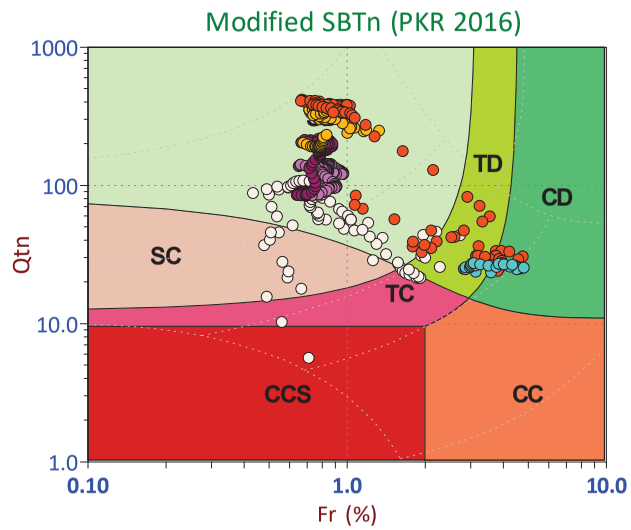
CONETEC

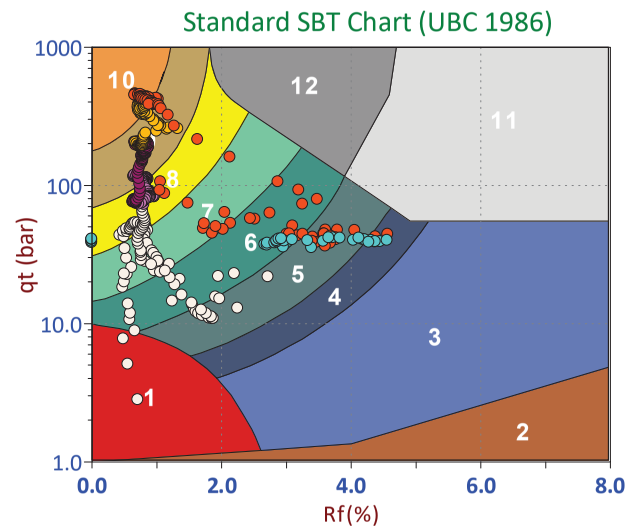
Arcadis

Job No: 21-61-22763
Date: 2021-12-09 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

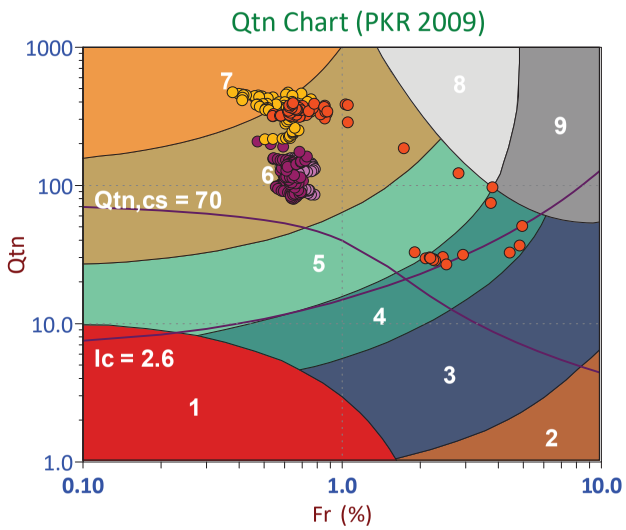
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

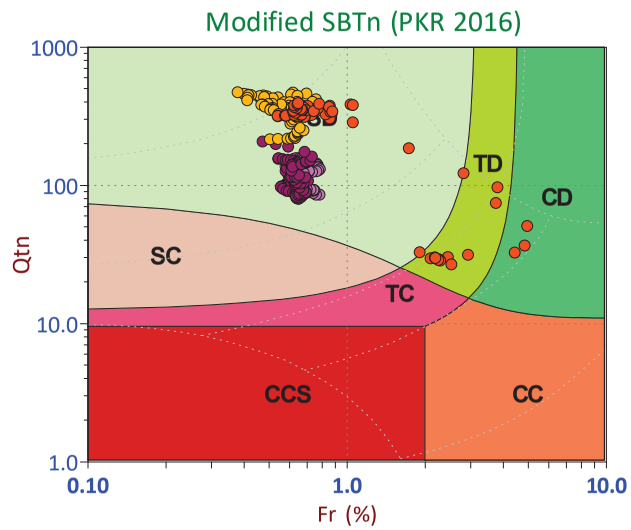
CONETEC

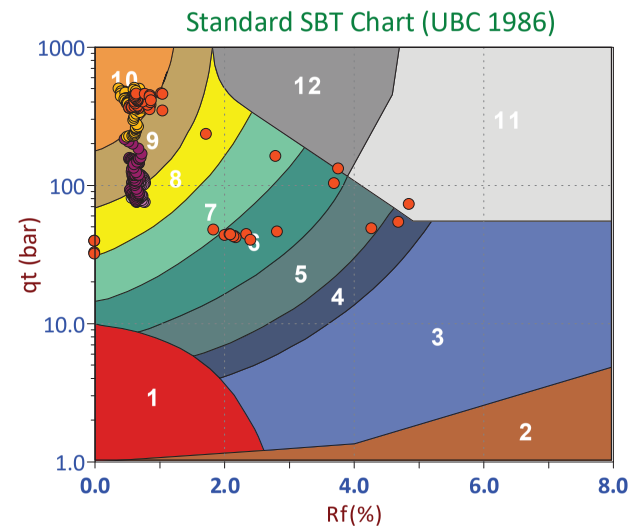
Arcadis

Job No: 21-61-22763
Date: 2021-12-12 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

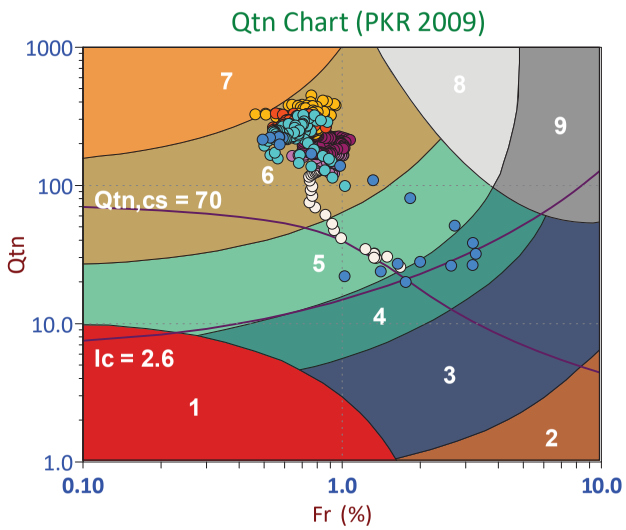
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

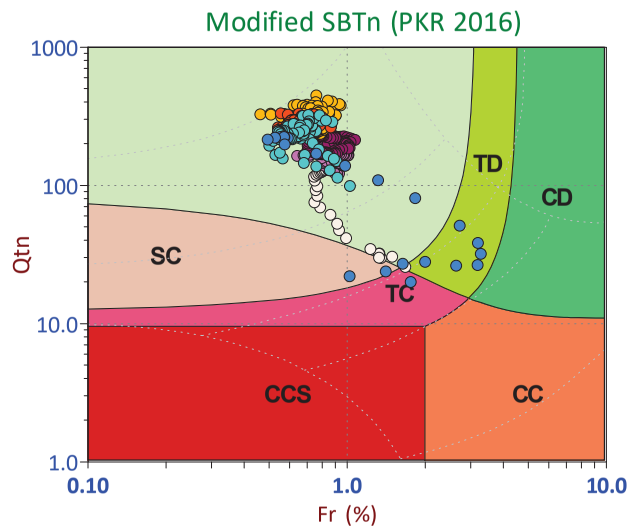
CONETEC

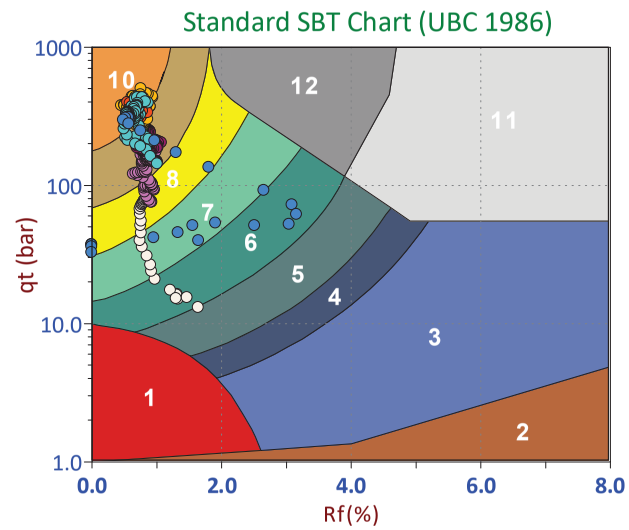
Arcadis

Job No: 21-61-22763
Date: 2021-12-10 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

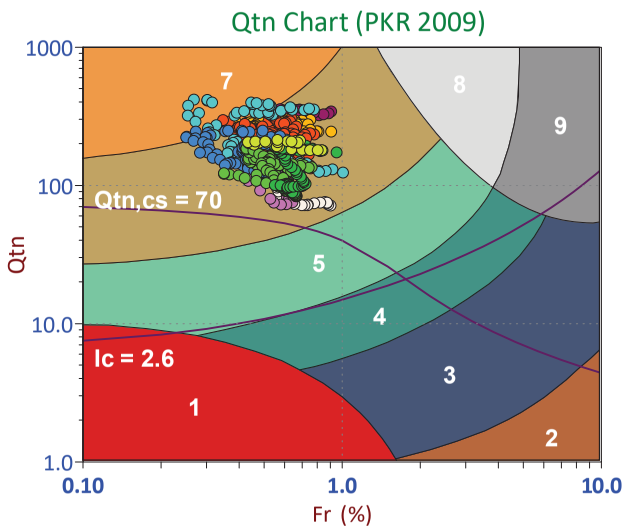
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

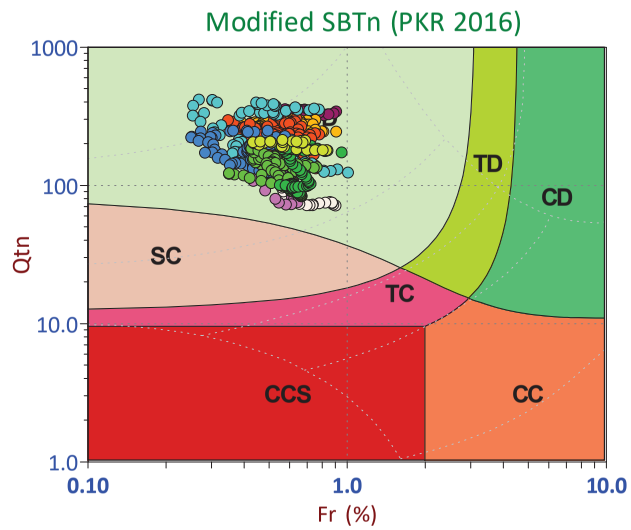
CONETEC

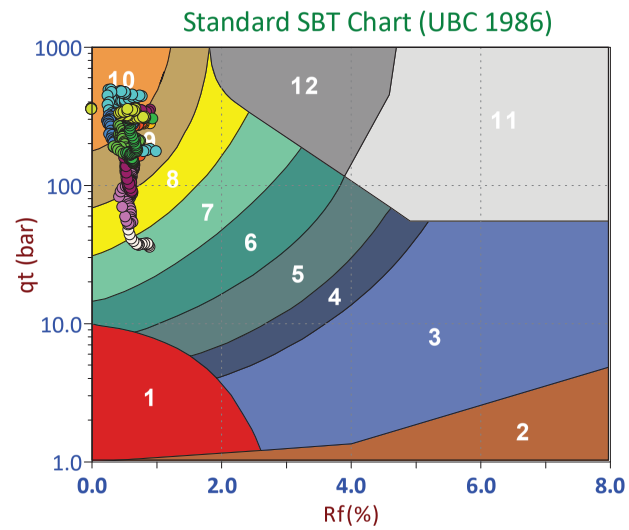
Arcadis

Job No: 21-61-22763
Date: 2021-12-14 09:07
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-29
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

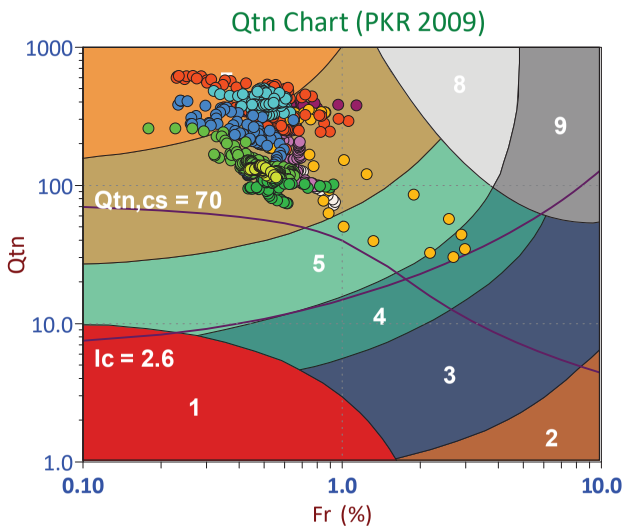
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

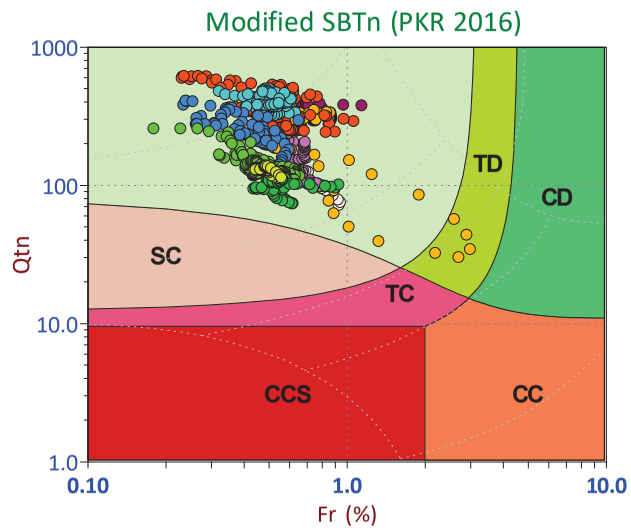
CONETEC

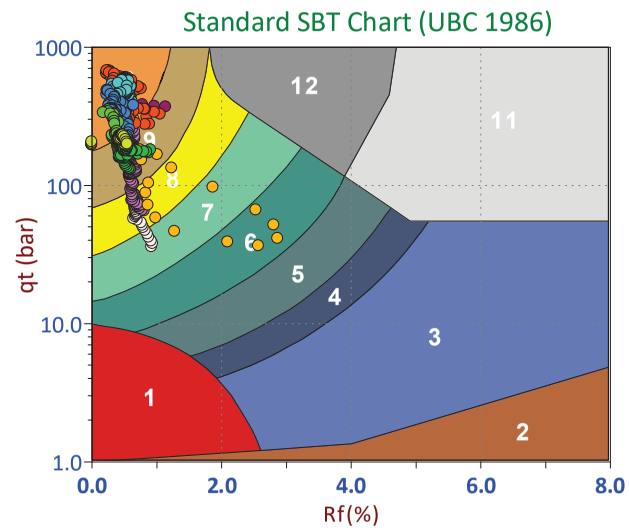
Arcadis

Job No: 21-61-22763
Date: 2021-12-15 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

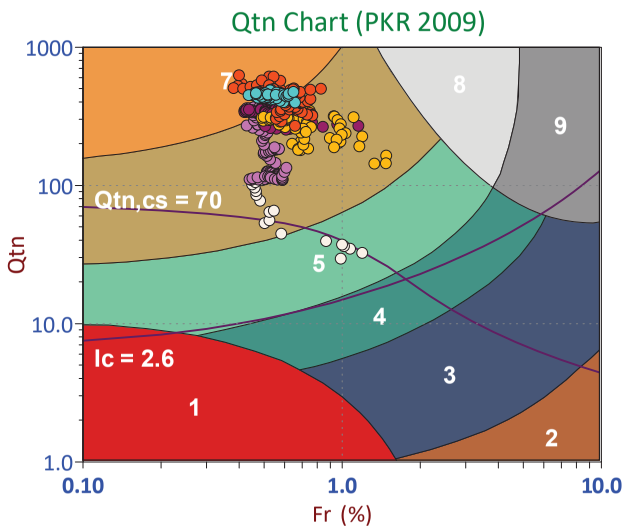
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

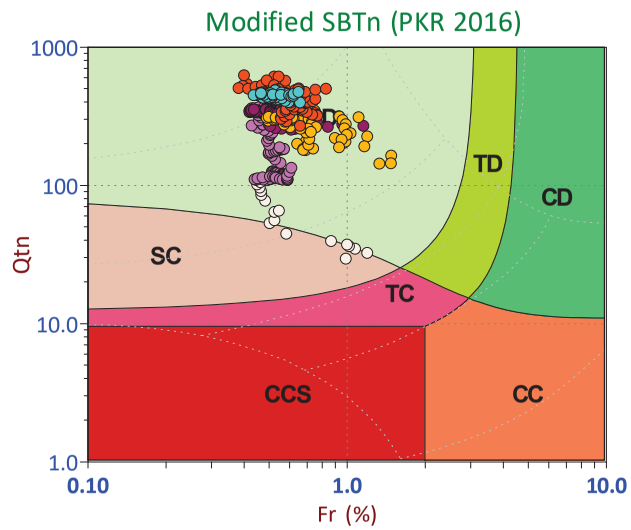
CONETEC

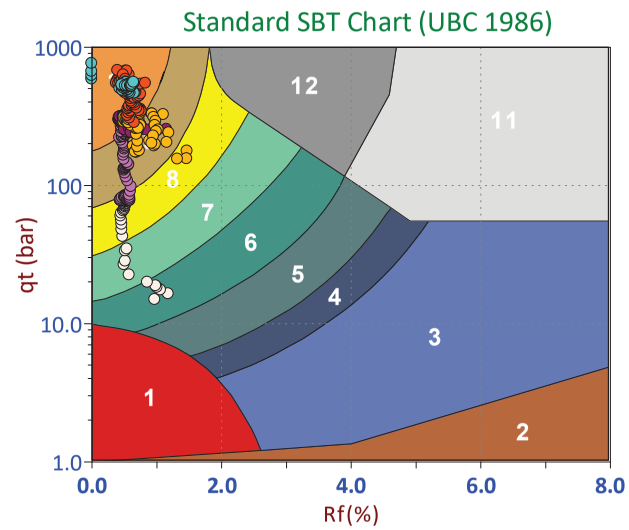
Arcadis

Job No: 21-61-22763
Date: 2021-12-13 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

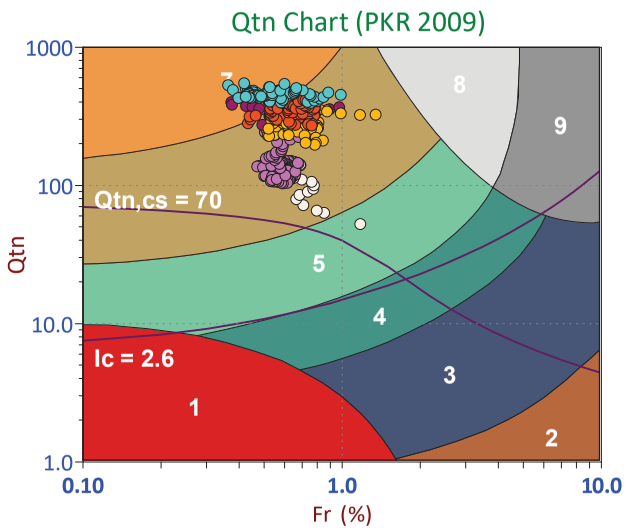
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

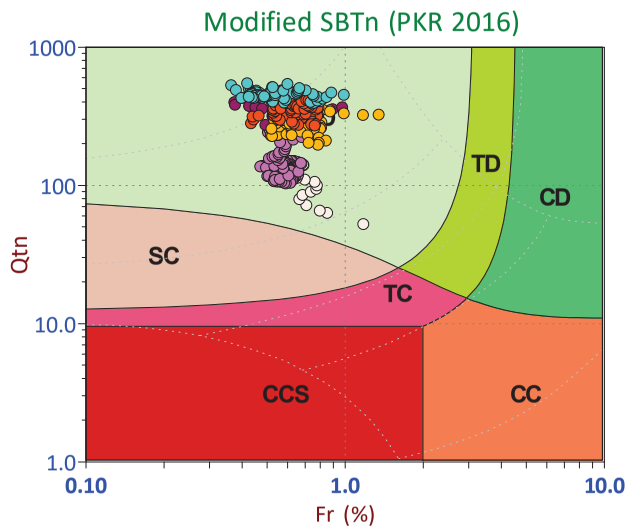
CONETEC

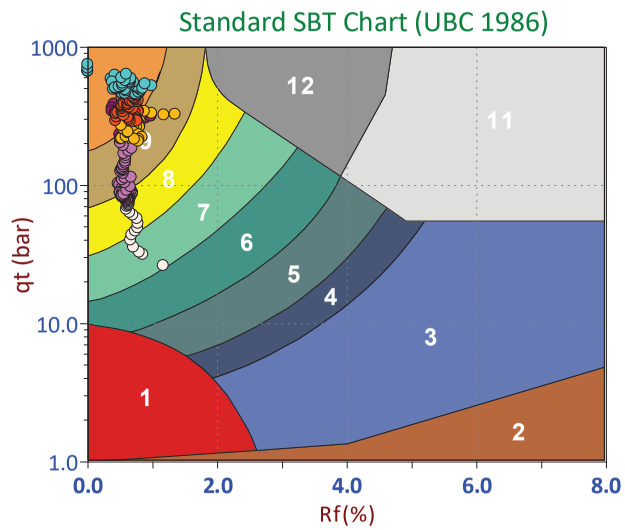
Arcadis

Job No: 21-61-22763
Date: 2021-12-13 13:53
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31A
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

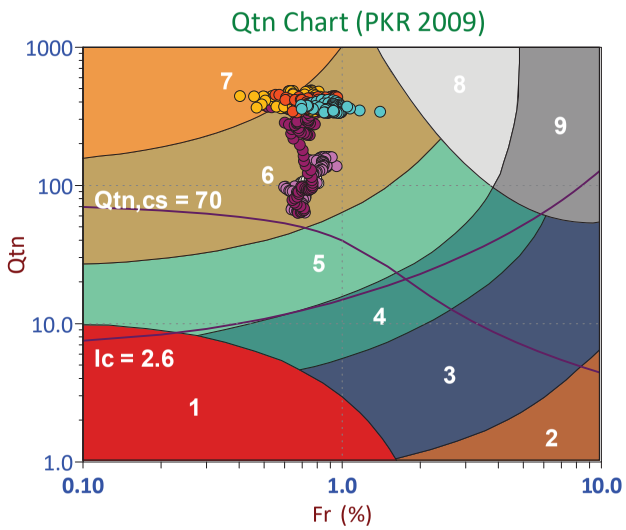
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

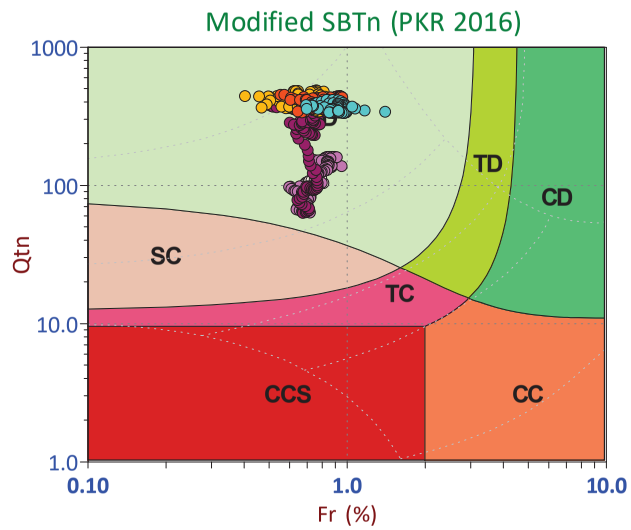
CONETEC

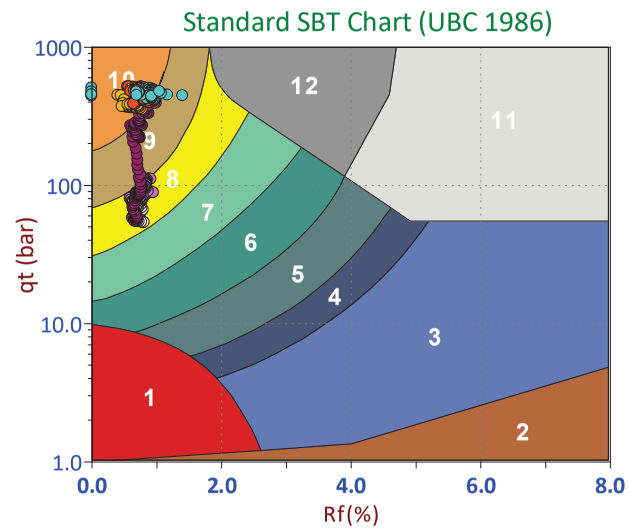
Arcadis

Job No: 21-61-22763
Date: 2021-12-11 09:27
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

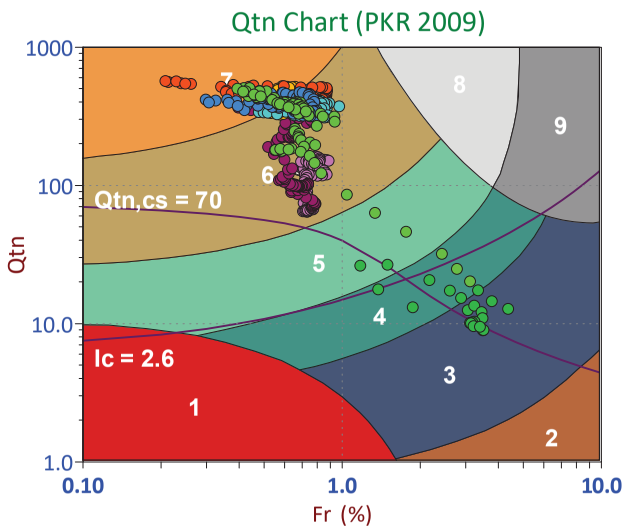
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

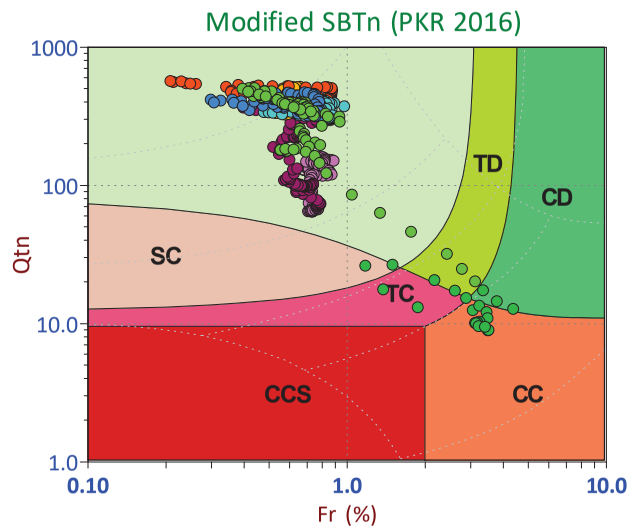
CONETEC

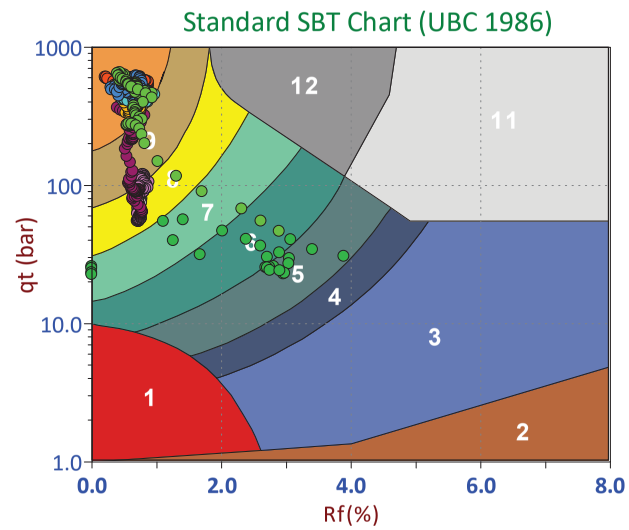
Arcadis

Job No: 21-61-22763
Date: 2021-12-11 10:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-32A
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

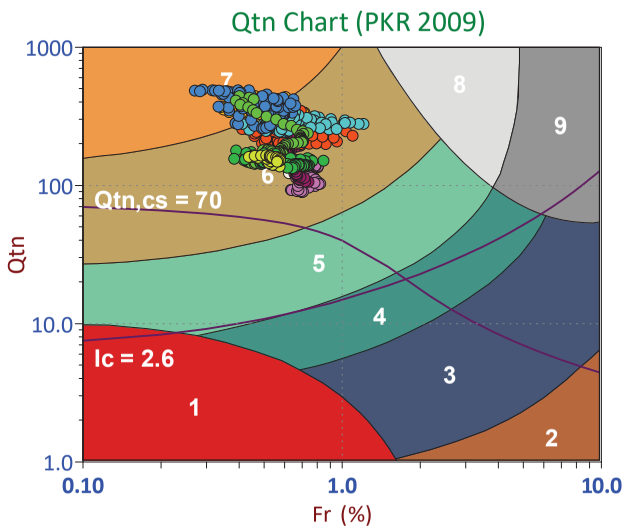
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

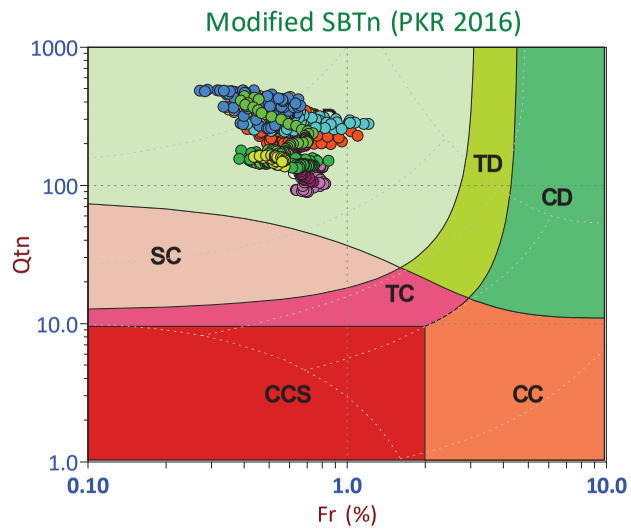
CONETEC

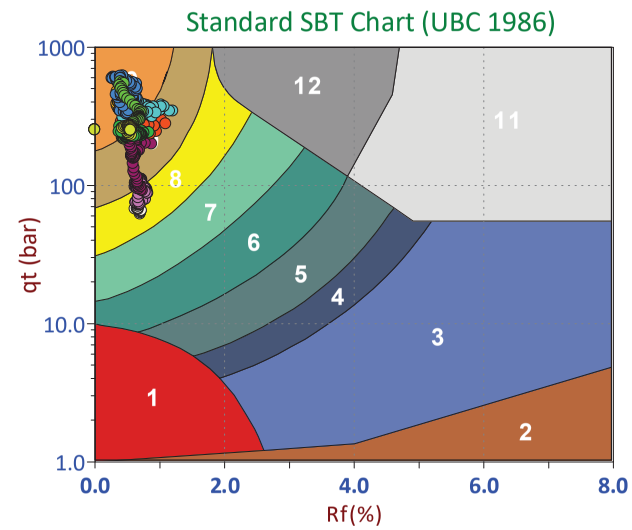
Arcadis

Job No: 21-61-22763
Date: 2021-12-12 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

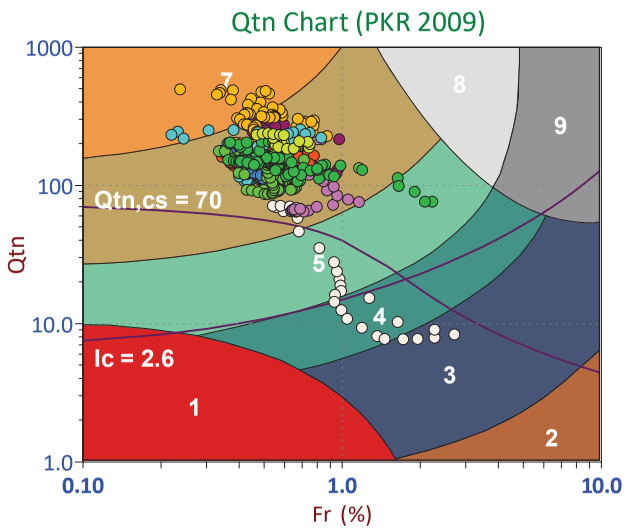
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

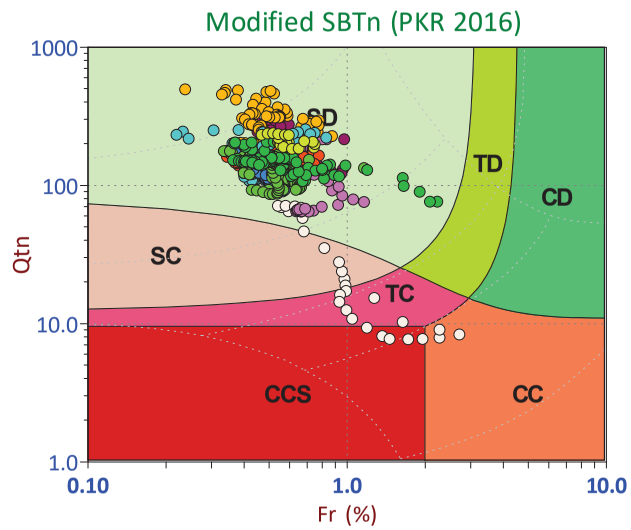
CONETEC

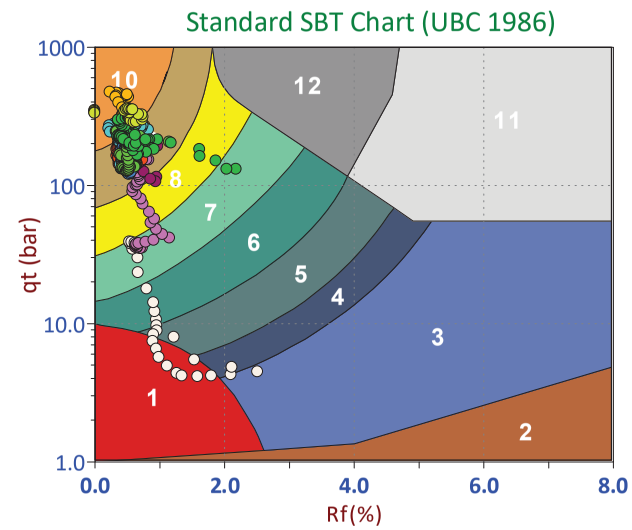
Arcadis

Job No: 21-61-22763
Date: 2021-12-15 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

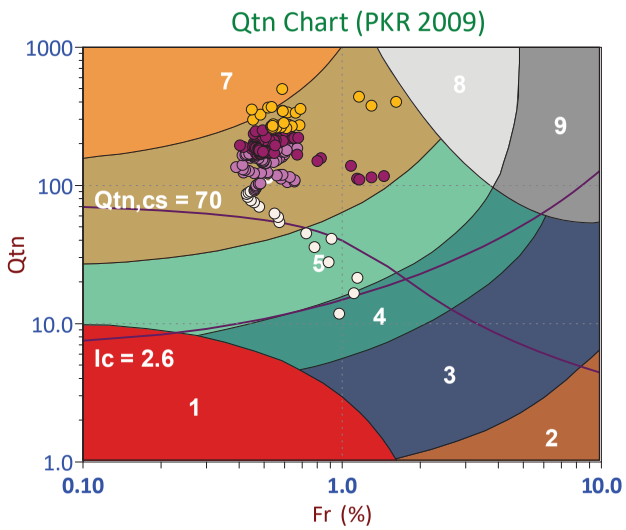
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

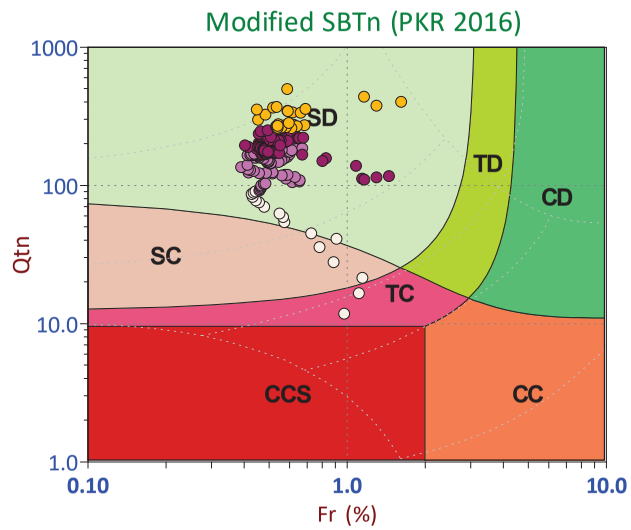
CONETEC

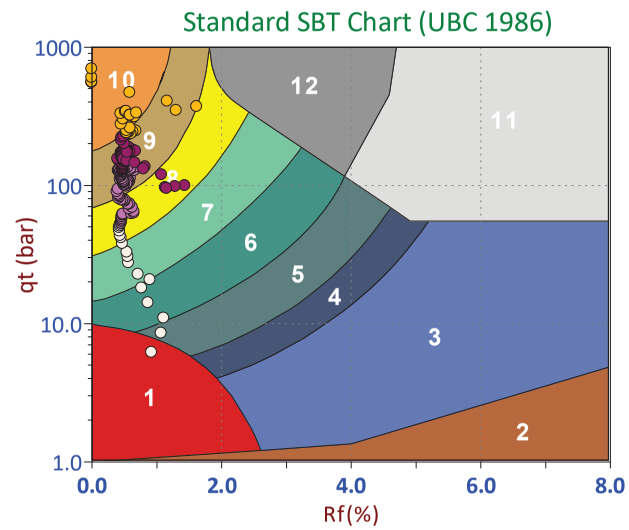
Arcadis

Job No: 21-61-22763
Date: 2021-12-20 10:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

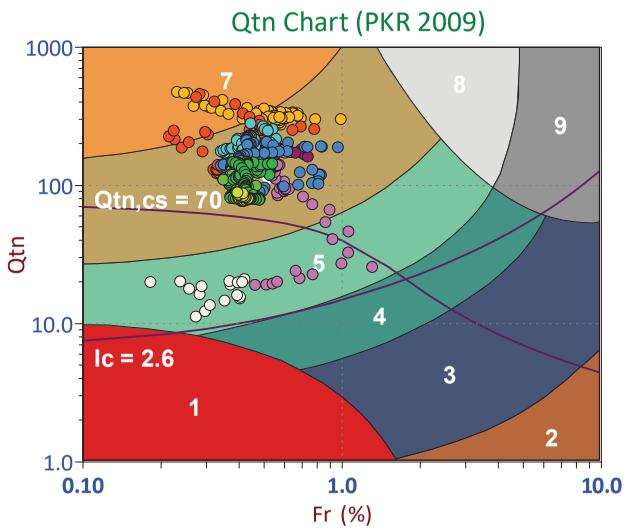
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

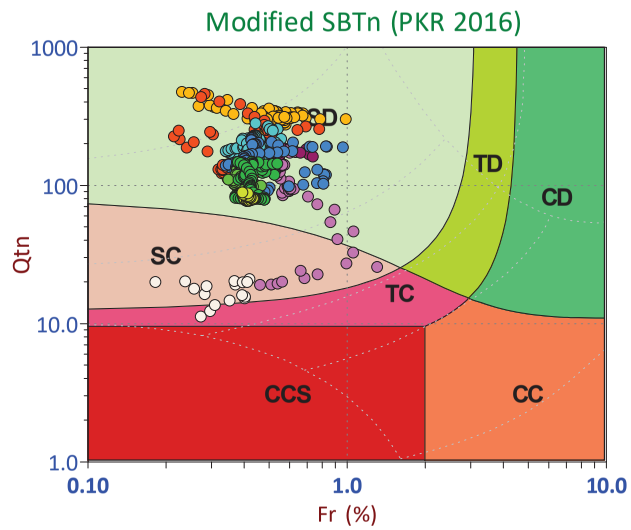
CONETEC

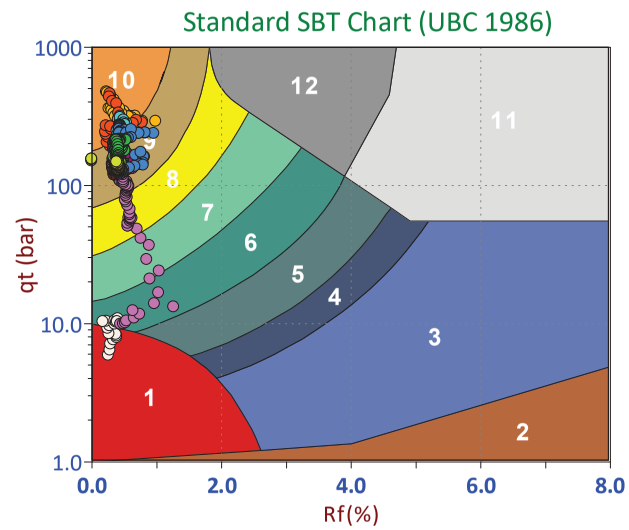
Arcadis

Job No: 21-61-22763
Date: 2021-12-20 11:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-35A
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

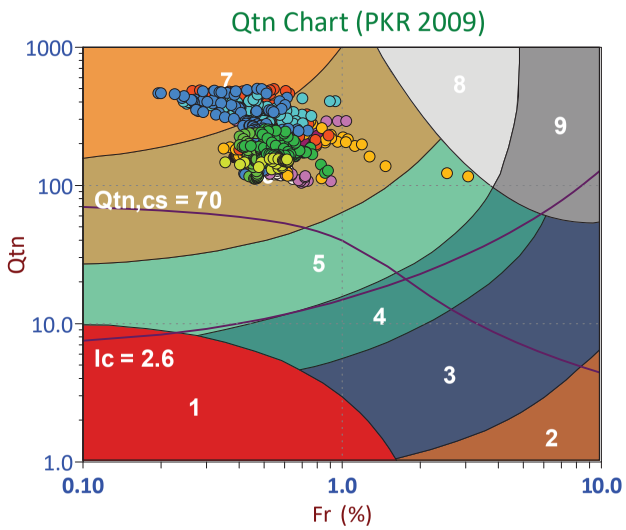
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

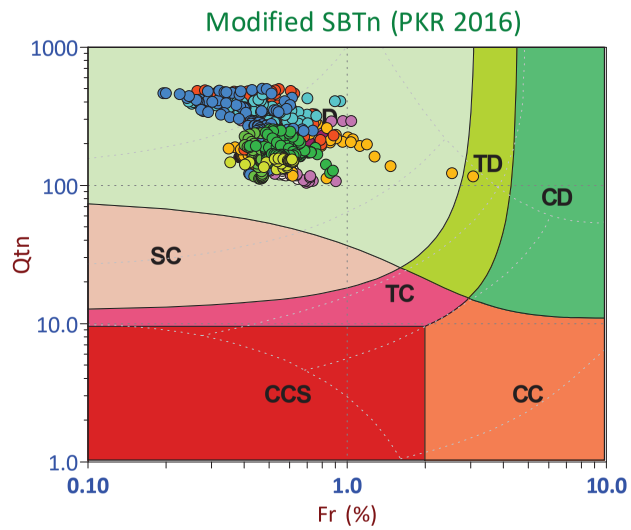
CONETEC

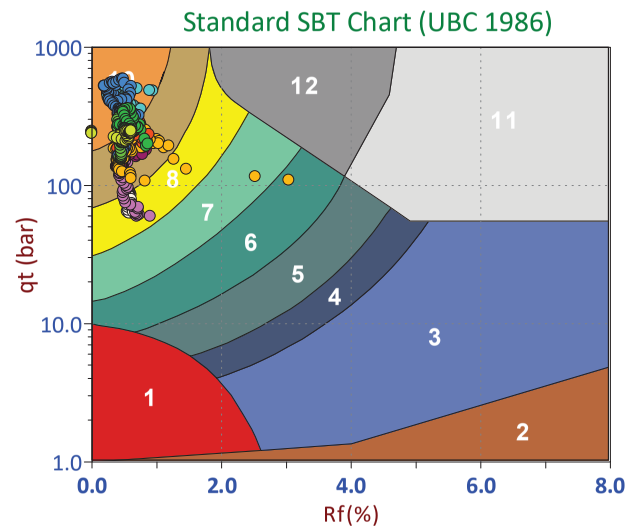
Arcadis

Job No: 21-61-22763
Date: 2021-12-16 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

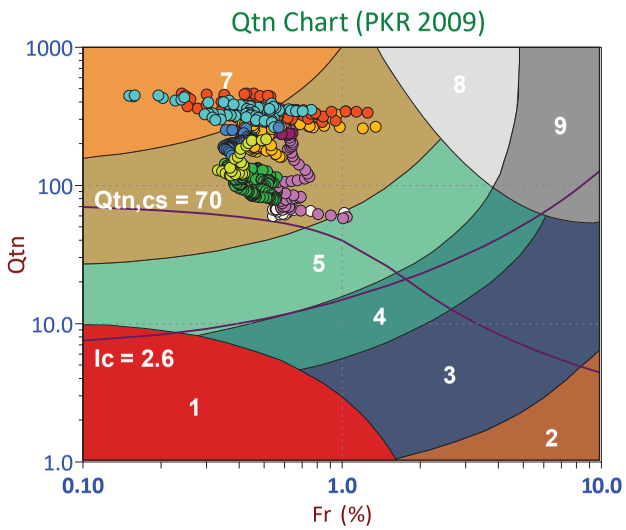
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

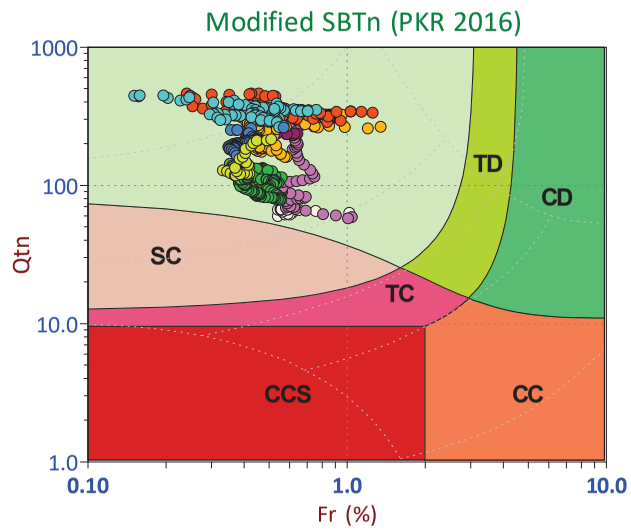
CONETEC

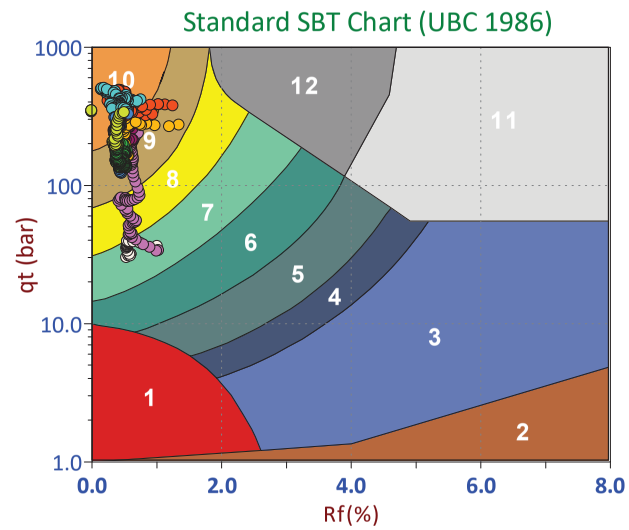
Arcadis

Job No: 21-61-22763
Date: 2021-12-17 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

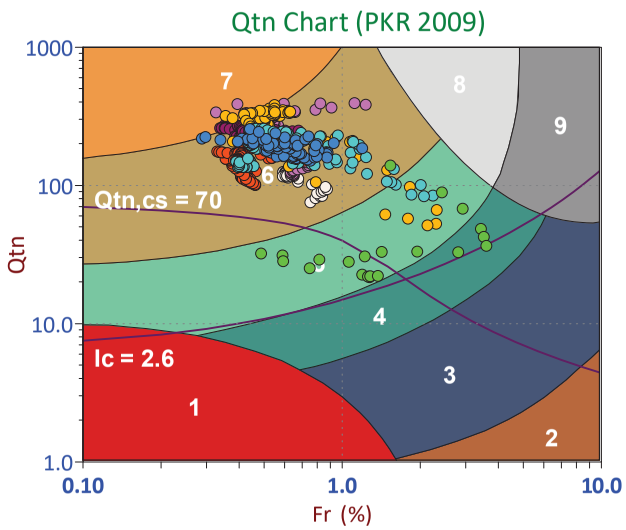
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

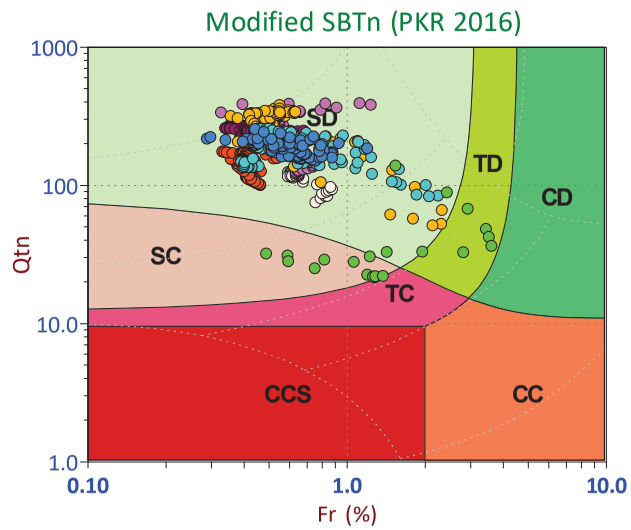
CONETEC

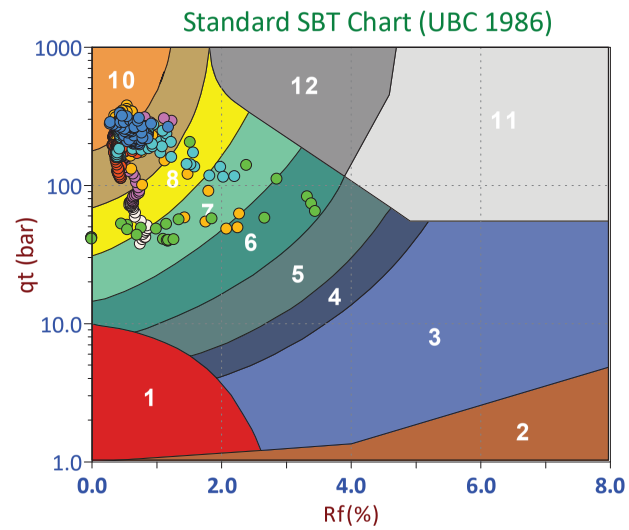
Arcadis

Job No: 21-61-22763
Date: 2021-12-21 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
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- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
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- SC (Cont. sand like)
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- TD (Dil. transitional)
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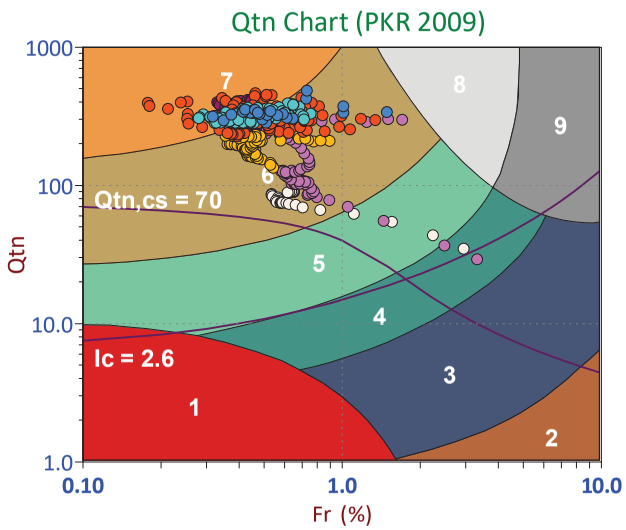
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

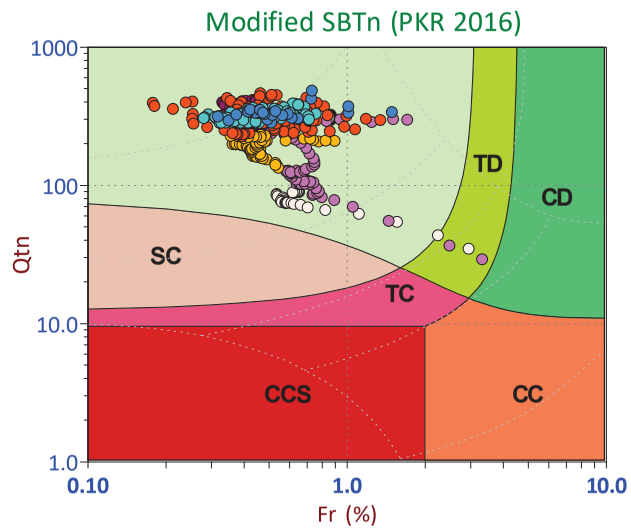
CONETEC

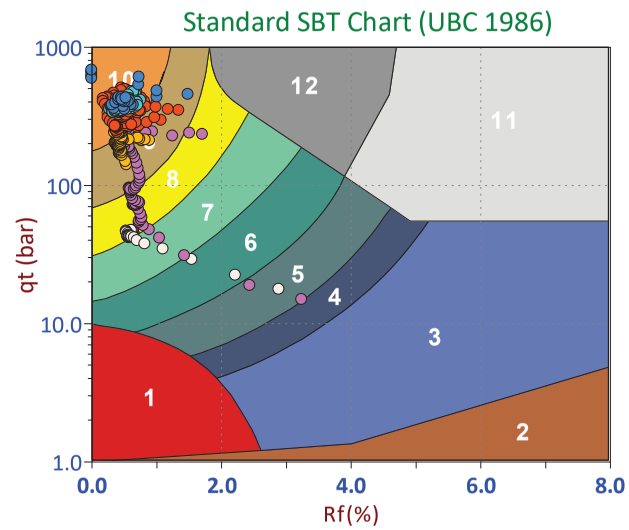
Arcadis

Job No: 21-61-22763
Date: 2021-12-21 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
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- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

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- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

CONETEC

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT21-VAP-13	21-61-22763_CPVAP-13	15	485	18.78	8.3	10.5				
CPT21-VAP-13	21-61-22763_CPVAP-13	15	345	45.03						
CPT21-VAP-16	21-61-22763_CPVAP-16	15	720	19.36	7.3	12.1				
CPT21-VAP-16A	21-61-22763_CPVAP-16A	15	260	41.99	28.8	13.2				
CPT21-VAP-17	21-61-22763_CPVAP-17	15	720	18.95	5.3	13.6				
CPT21-VAP-18	21-61-22763_CPVAP-18	15	780	32.23	19.0	13.2				
CPT21-VAP-19	21-61-22763_CPVAP-19	15	720	35.51	23.2	12.3				
CPT21-VAP-20	21-61-22763_CPVAP-20	15	300	15.67	5.7	9.9				
CPT21-VAP-21	21-61-22763_CPVAP-21	15	420	56.02	45.3	10.7				
CPT21-VAP-22	21-61-22763_CPVAP-22	15	660	25.43	13.6	11.8				
CPT21-VAP-24	21-61-22763_CPVAP-24	15	300	18.95	8.7	10.2				
CPT21-ASTC-VAP-25	21-61-22763_CPVAP-25	15	940	32.56						
CPT21-ASTC-VAP-25A	21-61-22763_CPVAP-25A	15	600	15.58	3.7	11.9				
CPT21-ASTC-VAP-26	21-61-22763_CPVAP-26	15	425	40.03						
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	15	900	25.84	11.2	14.7				
CPT21-ASTC-VAP-27	21-61-22763_CPVAP-27	15	910	35.68	21.0		14.7	745	100	0.9
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	15	1200	26.00	6.6	19.4				
CPT21-ASTC-VAP-28	21-61-22763_CPVAP-28	15	560	47.00	27.6		19.4	523	100	1.3
CPT21-ASTC-VAP-29	21-61-22763_CPVAP-29	15	1800	68.49	53.5	15.0				
CPT21-ASTC-VAP-30	21-61-22763_CPVAP-30	15	1200	29.12	18.4	10.7				

Job No:	21-61-22763
Client:	Arcadis
Project:	Vertical Aquifer Sampling, Traverse City, MI
Start Date:	27-Jul-2021
End Date:	22-Dec-2021

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT21-ASTC-VAP-31	21-61-22763_CPVAP-31	15	1500	25.59	17.1	8.5				
CPT21-ASTC-VAP-32	21-61-22763_CPVAP-32	15	1500	32.15	20.0	12.2				
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	15	1800	35.35	23.9	11.5				
CPT21-ASTC-VAP-33	21-61-22763_CPVAP-33	15	485	70.21						
CPT21-ASTC-VAP-34	21-61-22763_CPVAP-34	15	600	59.63	54.1	5.5				
CPT21-ASTC-VAP-35	21-61-22763_CPVAP-35	15	600	21.65	16.4	5.2				
CPT21-ASTC-VAP-36	21-61-22763_CPVAP-36	15	1500	52.49	47.4	5.1				
CPT21-ASTC-VAP-37	21-61-22763_CPVAP-37	15	595	52.74	44.0	8.7				
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	15	1200	15.91	8.9	7.0				
CPT21-ASTC-VAP-38	21-61-22763_CPVAP-38	15	370	54.54						
CPT21-ASTC-VAP-39	21-61-22763_CPVAP-39	15	900	25.75	16.2	9.5				
Totals	31 dissipations		421.6 min							

a. Time is relative to where umax occurred.

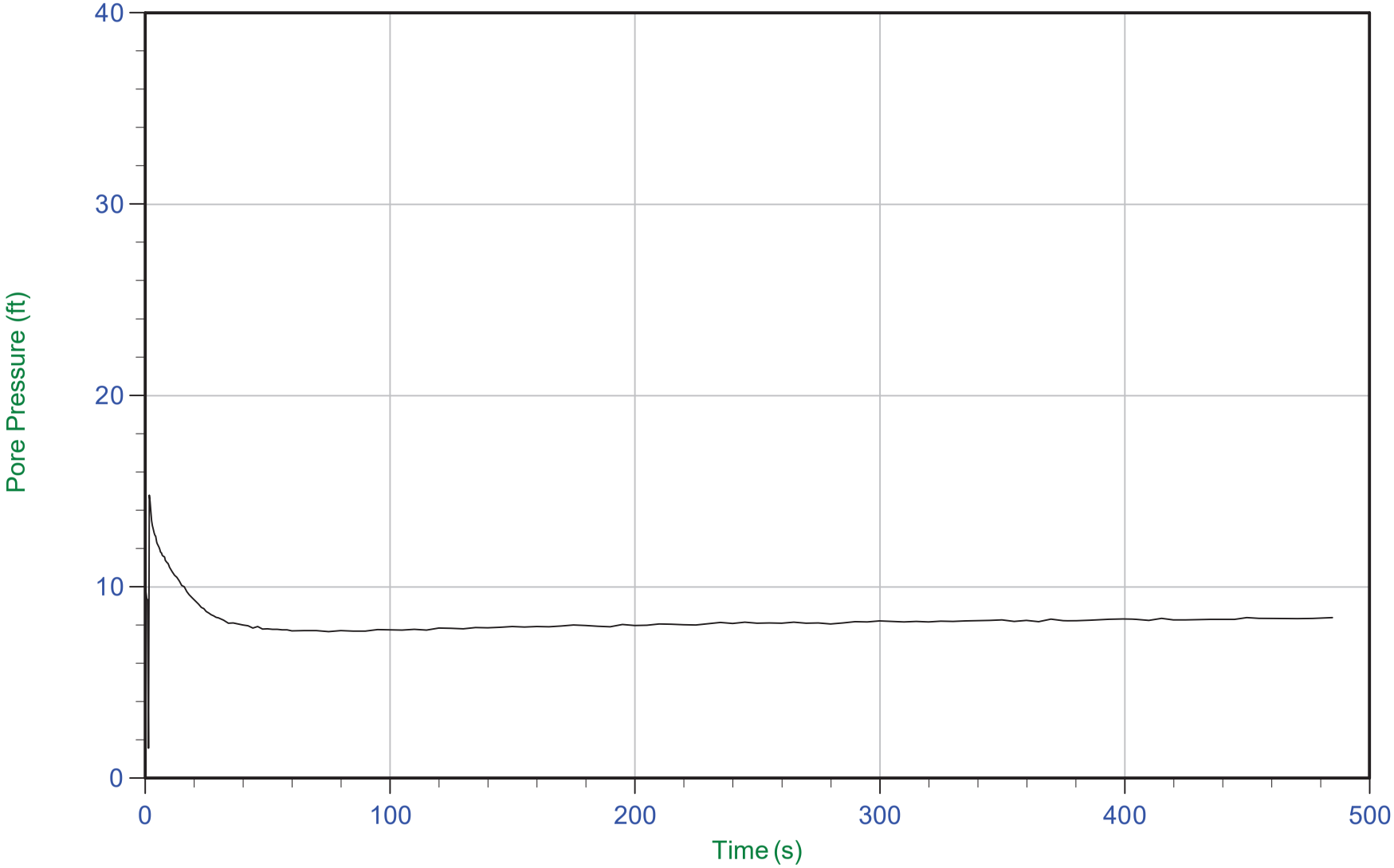
b. Houlsby and Teh, 1991.

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/27/2021 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-13.ppd2
Depth: 5.725 m / 18.783 ft
Duration: 485.0 s

u Min: 1.6 ft
u Max: 14.8 ft
u Final: 8.4 ft

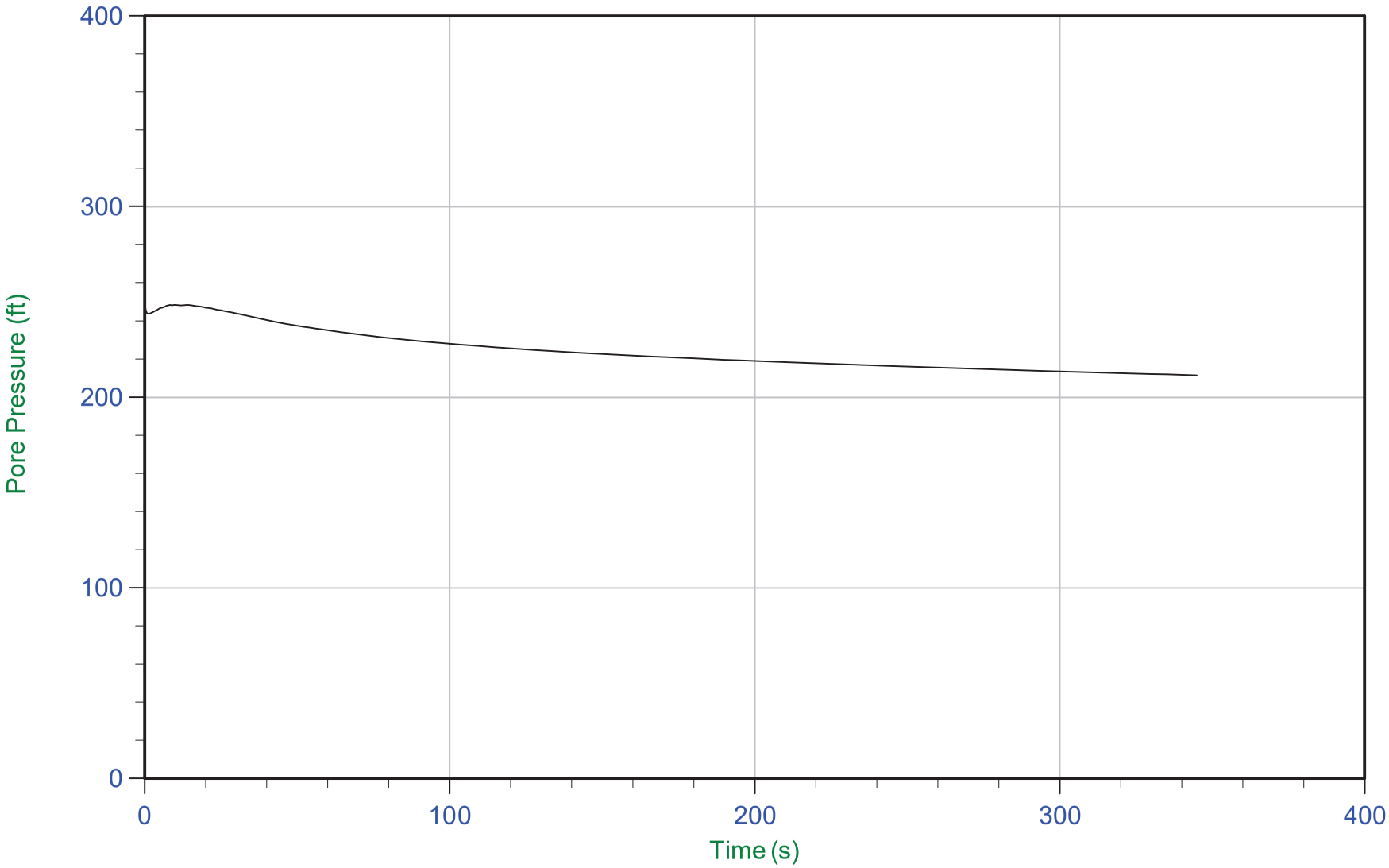
WT: 3.188 m / 10.460 ft
Ueq: 8.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/27/2021 09:30
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-13
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-13.ppd2
Depth: 13.725 m / 45.029 ft
Duration: 345.0 s

u Min: 211.5 ft
u Max: 249.1 ft
u Final: 211.5 ft

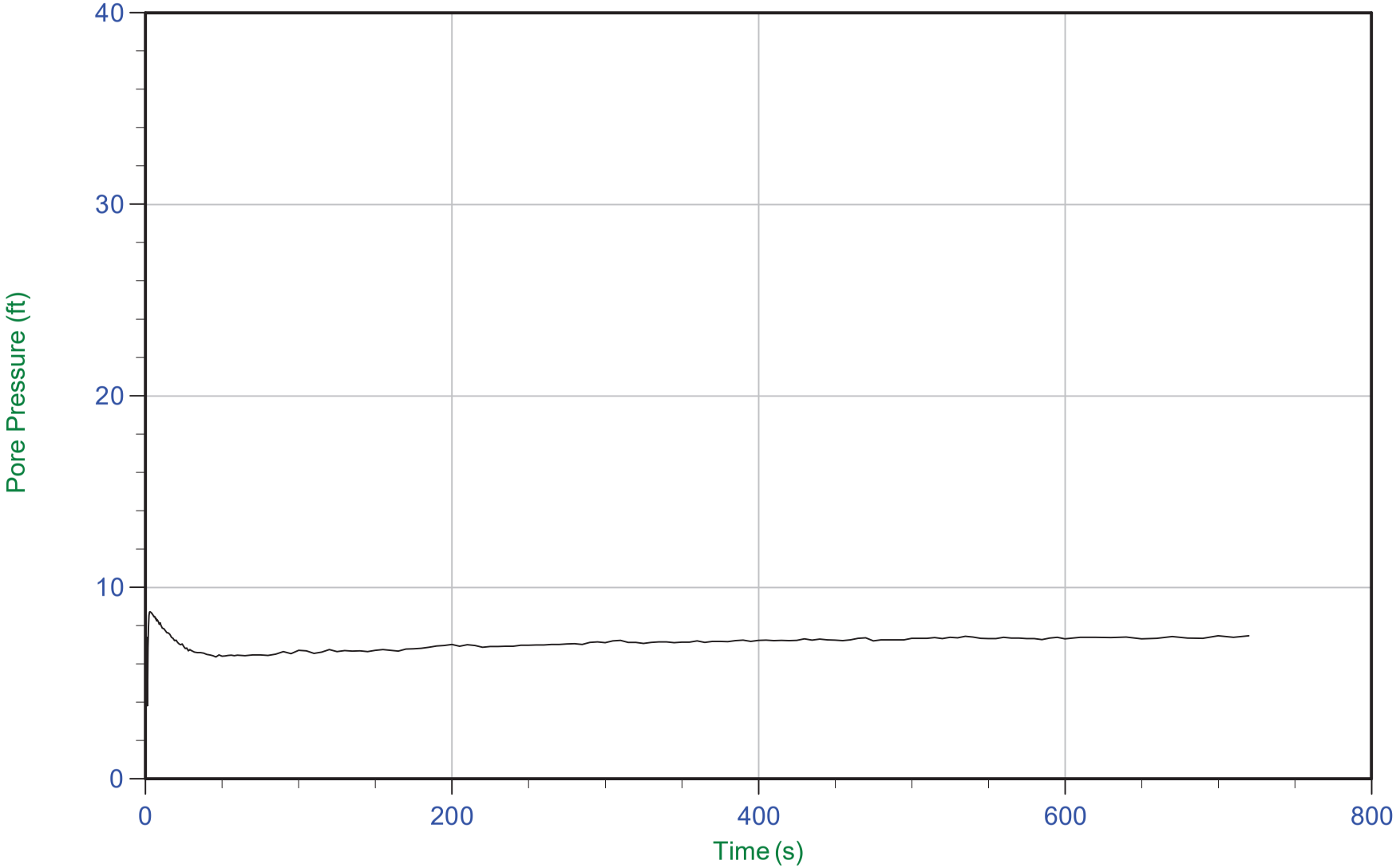
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/28/2021 11:33
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-16.ppd2
Depth: 5.900 m / 19.357 ft
Duration: 720.0 s

u Min: 3.8 ft
u Max: 8.7 ft
u Final: 7.5 ft

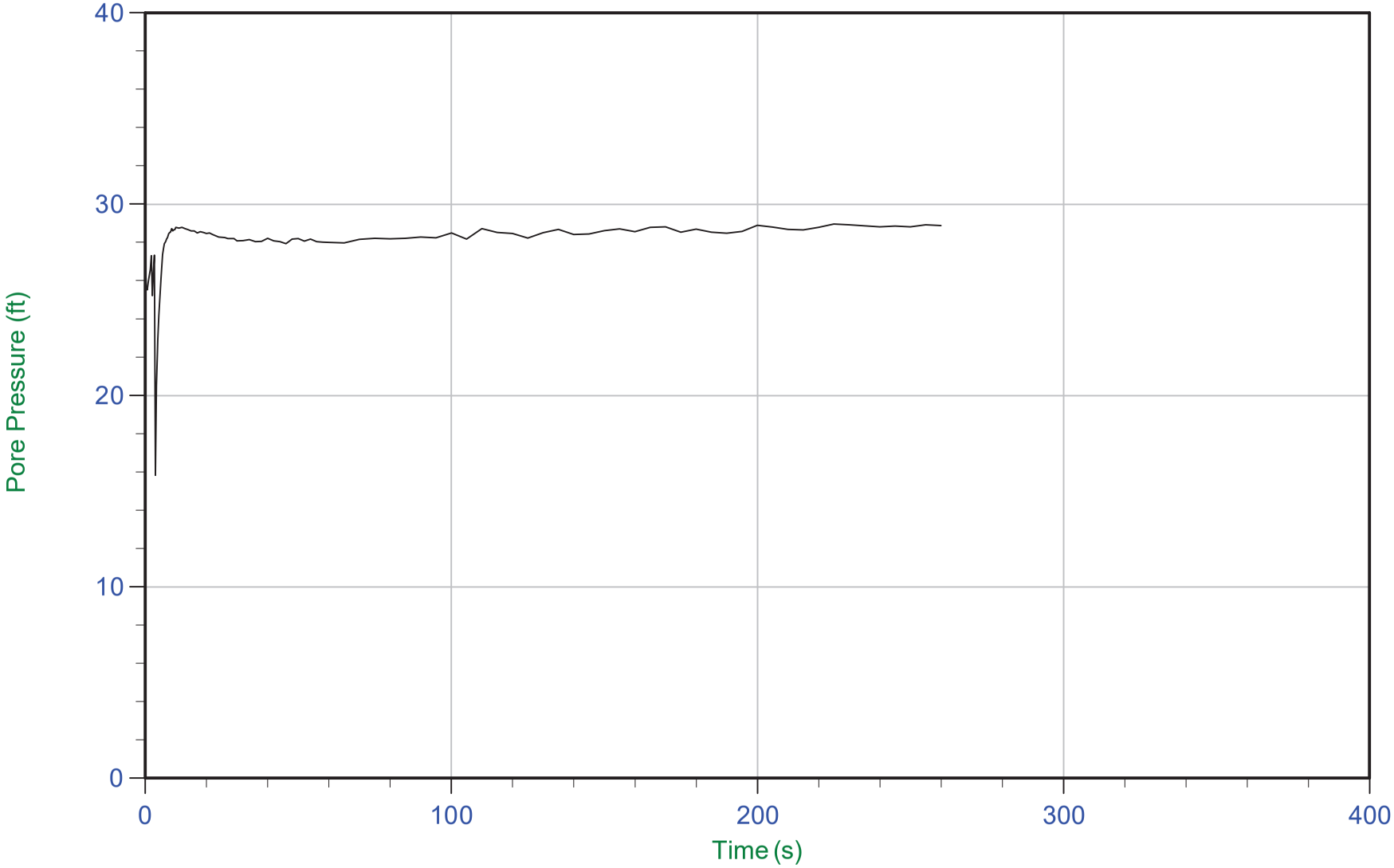
WT: 3.674 m / 12.053 ft
Ueq: 7.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/28/2021 16:14
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-16A
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-16A.ppd2
Depth: 12.800 m / 41.994 ft
Duration: 260.0 s

u Min: 15.8 ft
u Max: 29.0 ft
u Final: 28.9 ft

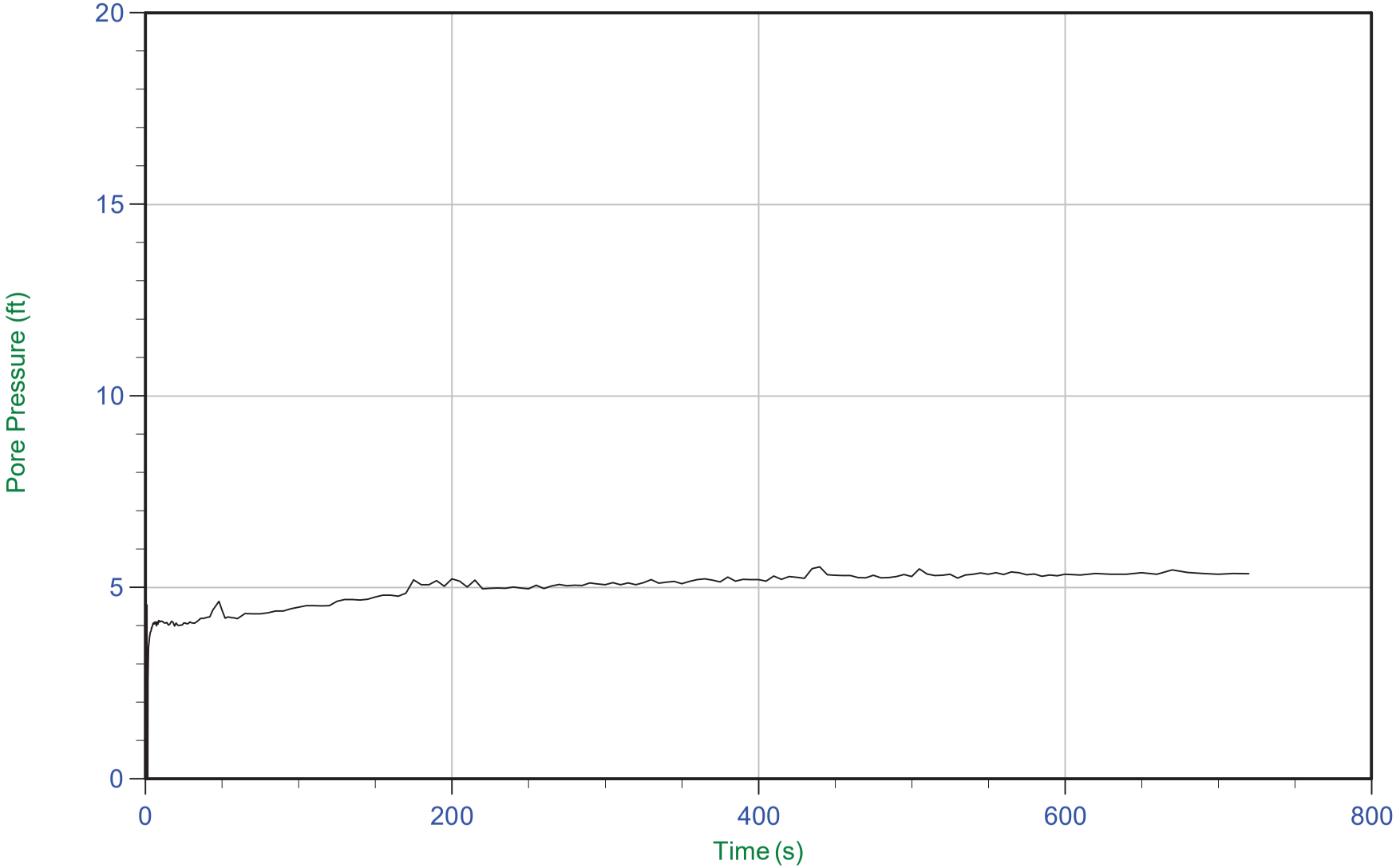
WT: 4.025 m / 13.205 ft
Ueq: 28.8 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/29/2021 12:02
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-17
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-17.ppd2
Depth: 5.775 m / 18.947 ft
Duration: 720.0 s

u Min: -7.1 ft
u Max: 5.5 ft
u Final: 5.4 ft

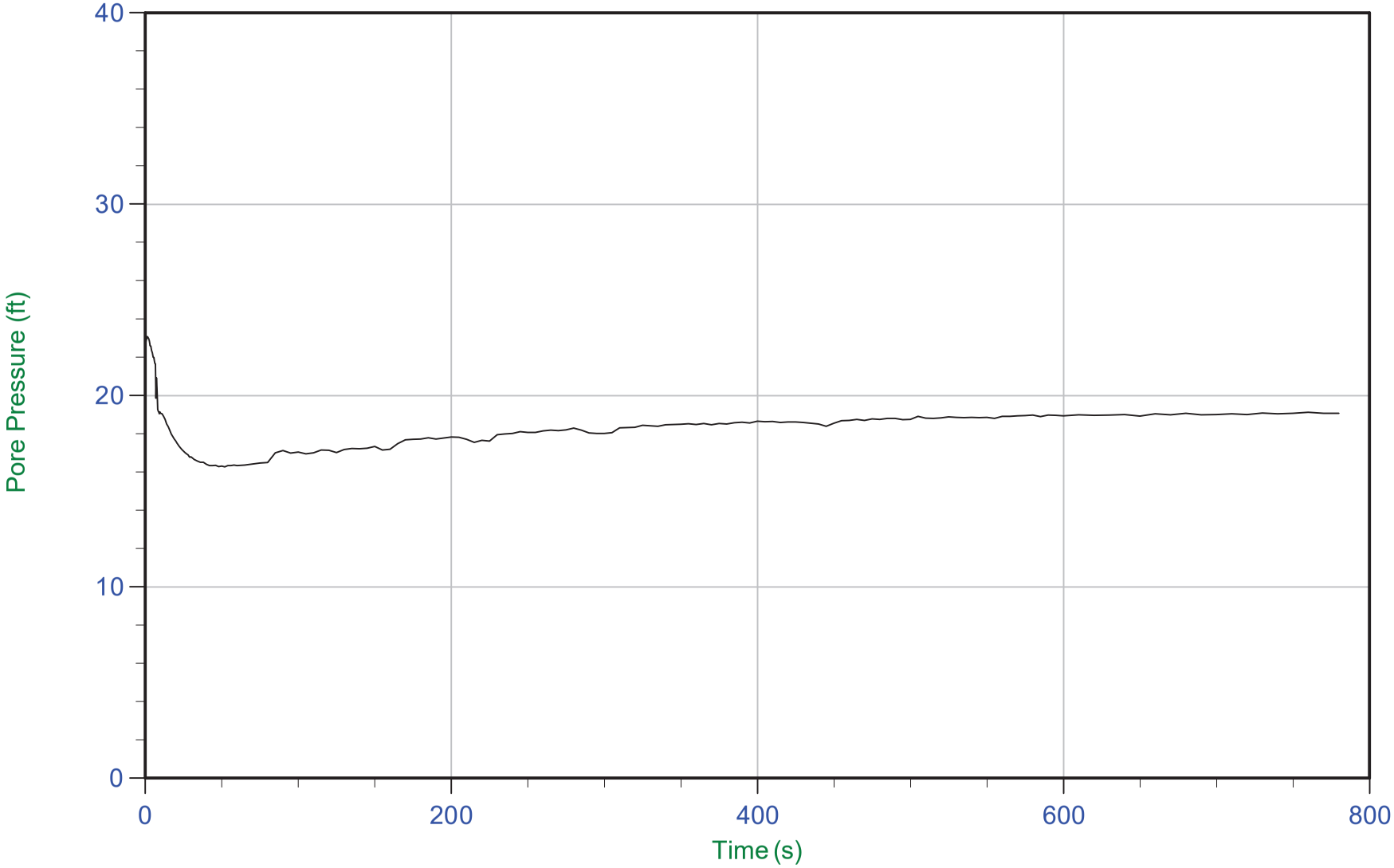
WT: 4.157 m / 13.639 ft
Ueq: 5.3 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 10:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-18
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-18.ppd2
Depth: 9.825 m / 32.234 ft
Duration: 780.0 s

u Min: 16.3 ft
u Max: 23.1 ft
u Final: 19.1 ft

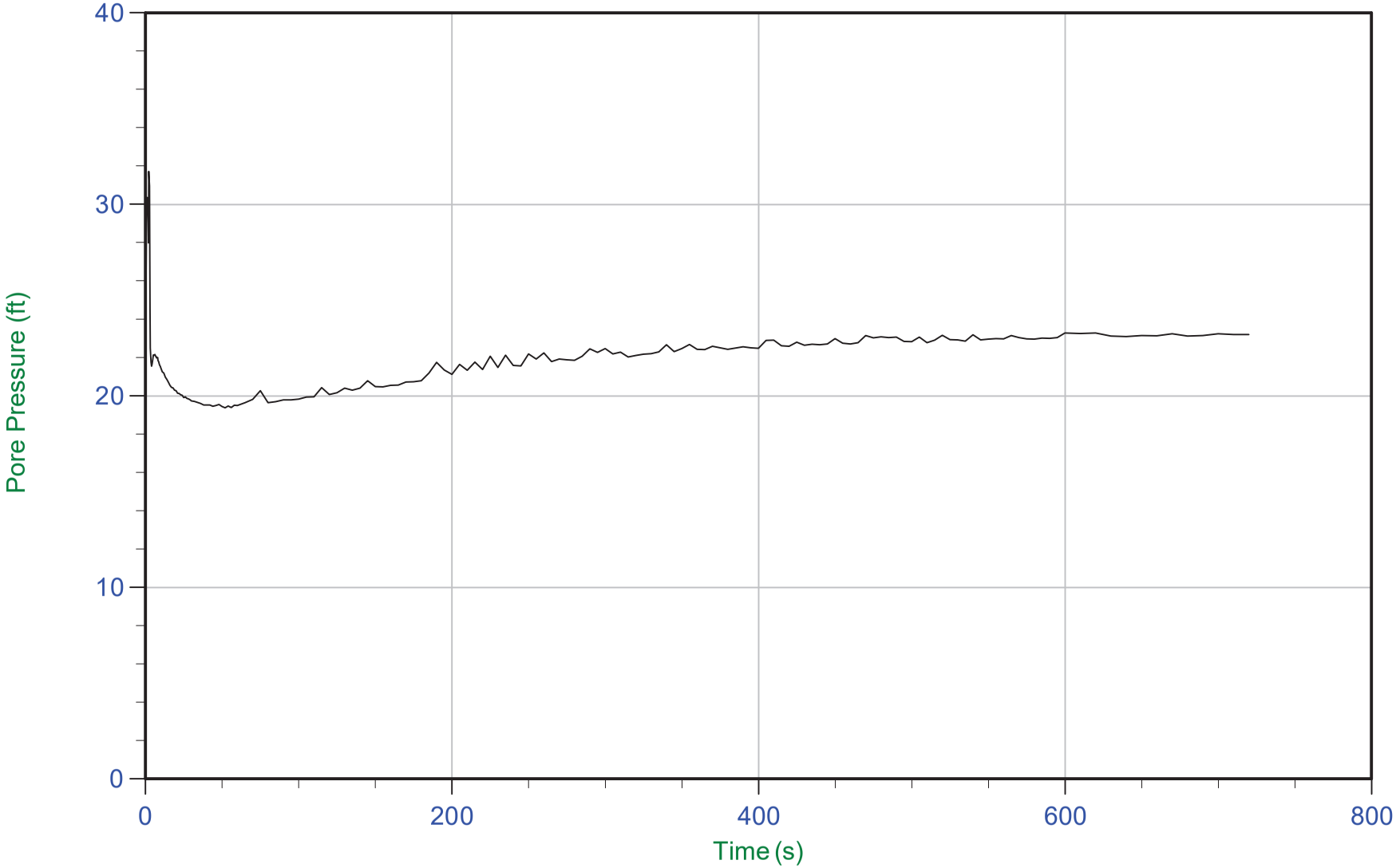
WT: 4.027 m / 13.211 ft
Ueq: 19.0 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 12:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-19
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-19.ppd2
Depth: 10.825 m / 35.515 ft
Duration: 720.0 s

u Min: 19.4 ft
u Max: 31.7 ft
u Final: 23.2 ft

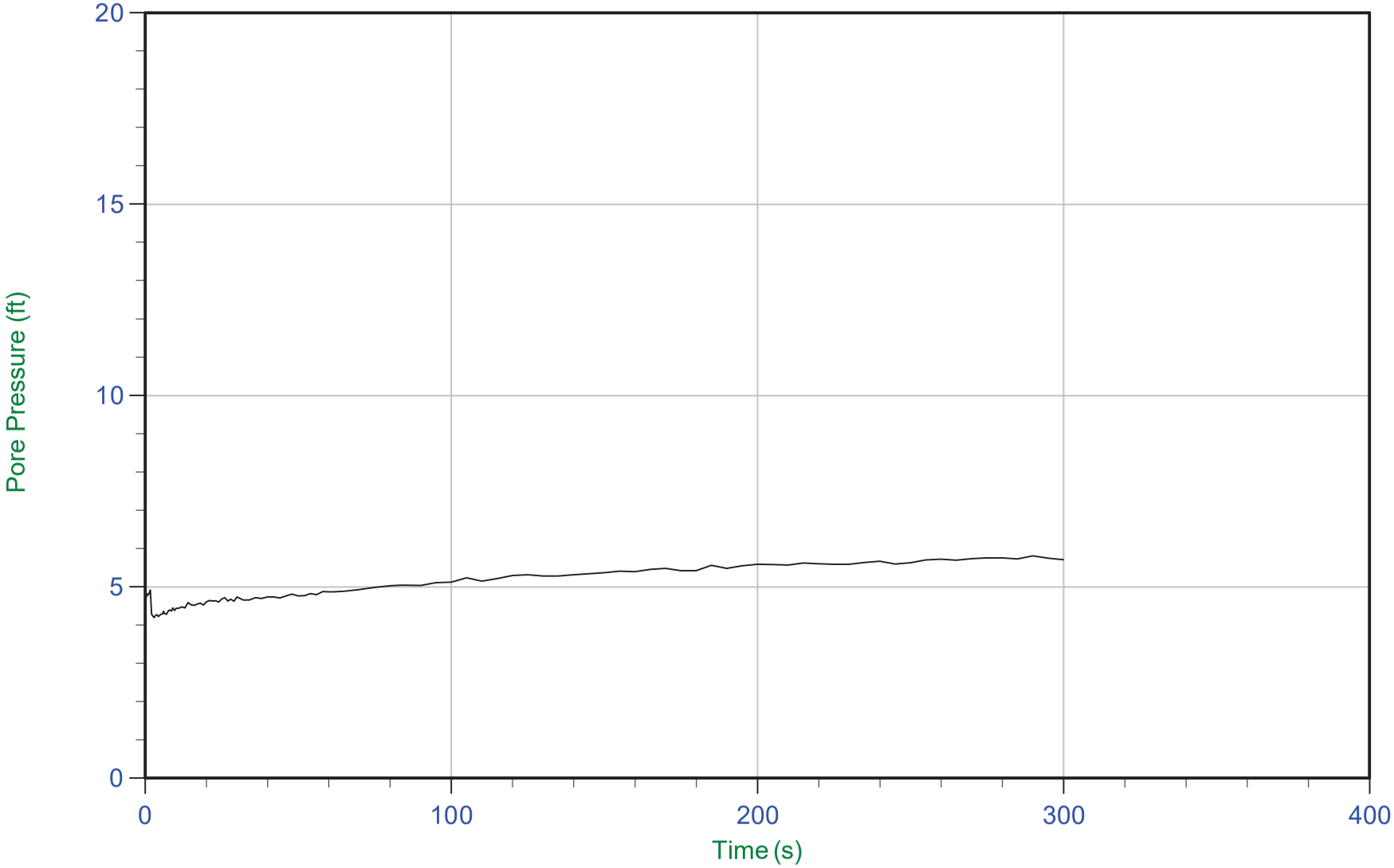
WT: 3.758 m / 12.330 ft
Ueq: 23.2 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 07/30/2021 13:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-20
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-20.ppd2
Depth: 4.775 m / 15.666 ft
Duration: 300.0 s

u Min: 4.2 ft
u Max: 5.8 ft
u Final: 5.7 ft

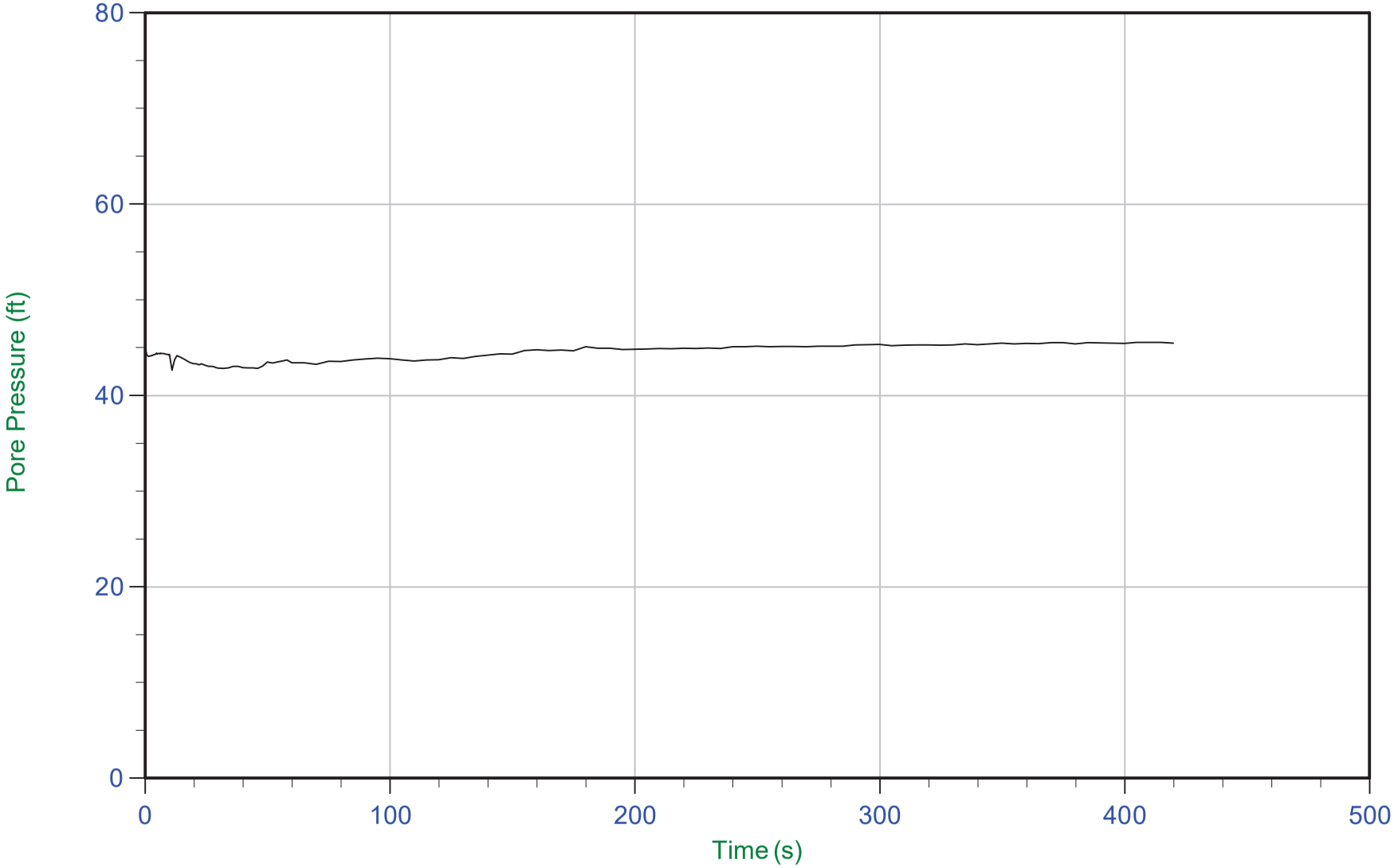
WT: 3.028 m / 9.933 ft
Ueq: 5.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/03/2021 15:04
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-21
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-21.ppd2
Depth: 17.075 m / 56.020 ft
Duration: 420.0 s

u Min: 42.6 ft
u Max: 45.8 ft
u Final: 45.5 ft

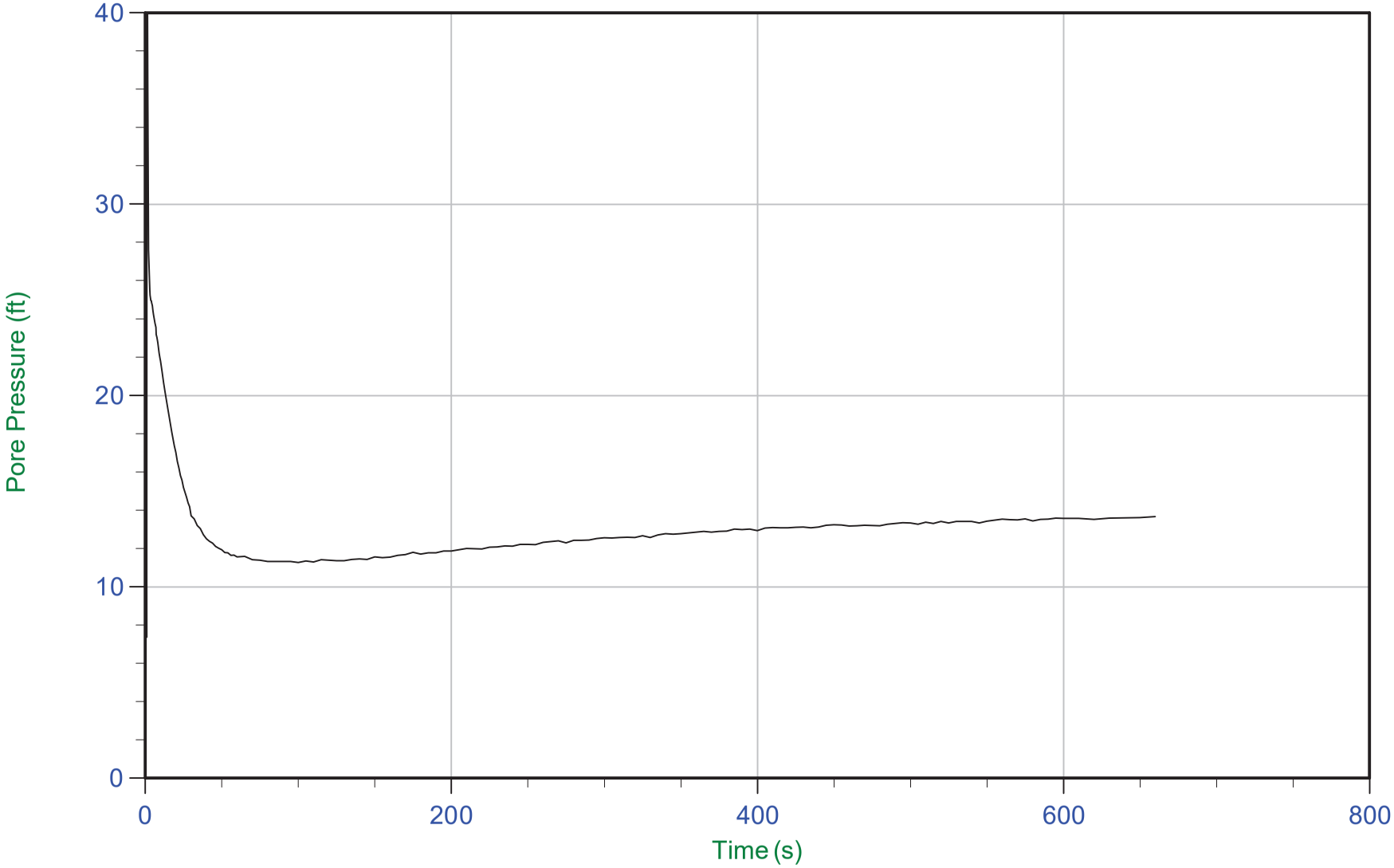
WT: 3.252 m / 10.670 ft
Ueq: 45.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/04/2021 09:47
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-22
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-22.ppd2
Depth: 7.750 m / 25.426 ft
Duration: 660.0 s

u Min: 7.4 ft
u Max: 49.0 ft
u Final: 13.7 ft

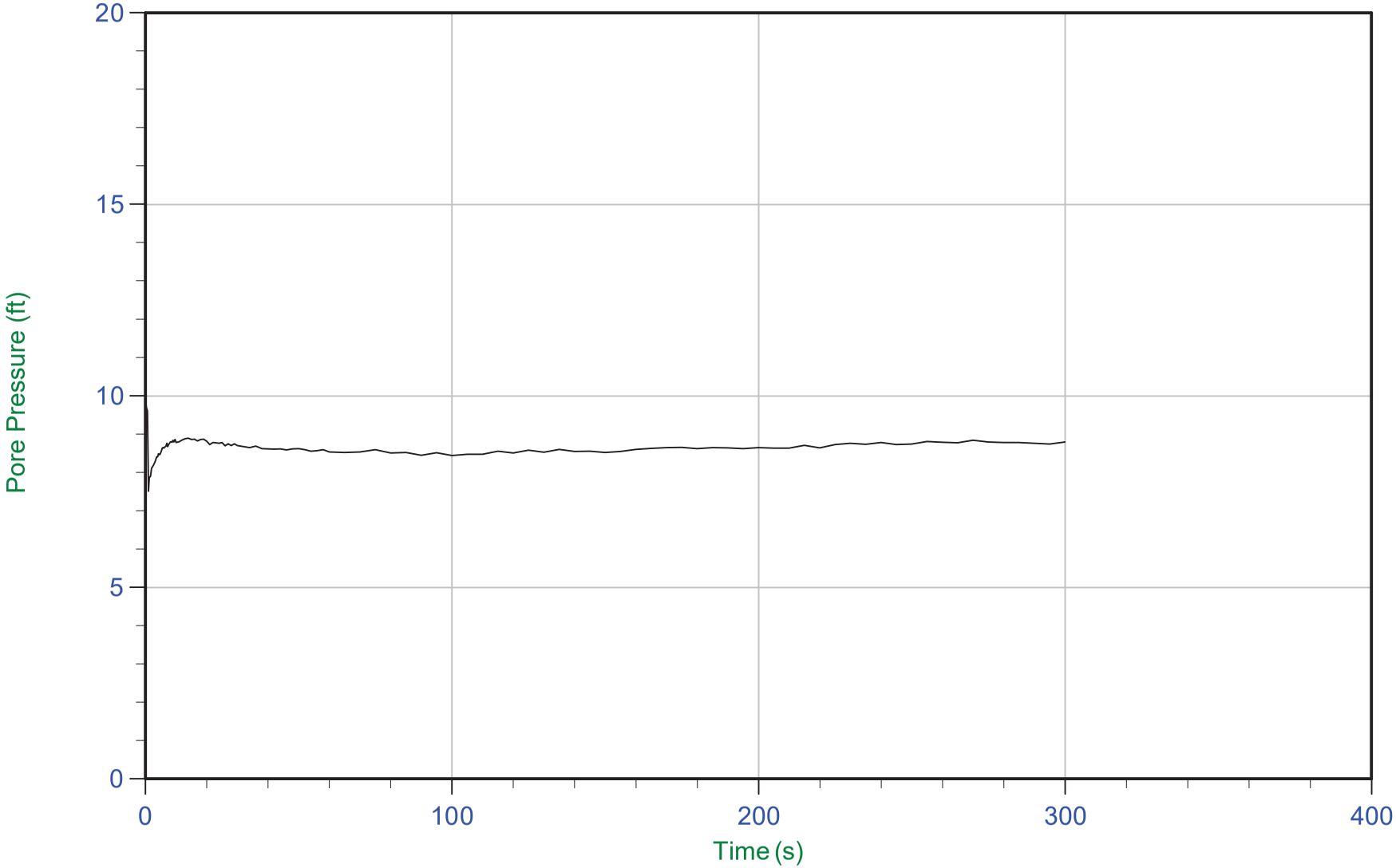
WT: 3.608 m / 11.838 ft
Ueq: 13.6 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 08/06/2021 08:01
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-VAP-24
Cone: 802:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-24.ppd2
Depth: 5.775 m / 18.947 ft
Duration: 300.0 s

u Min: 7.5 ft
u Max: 9.9 ft
u Final: 8.8 ft

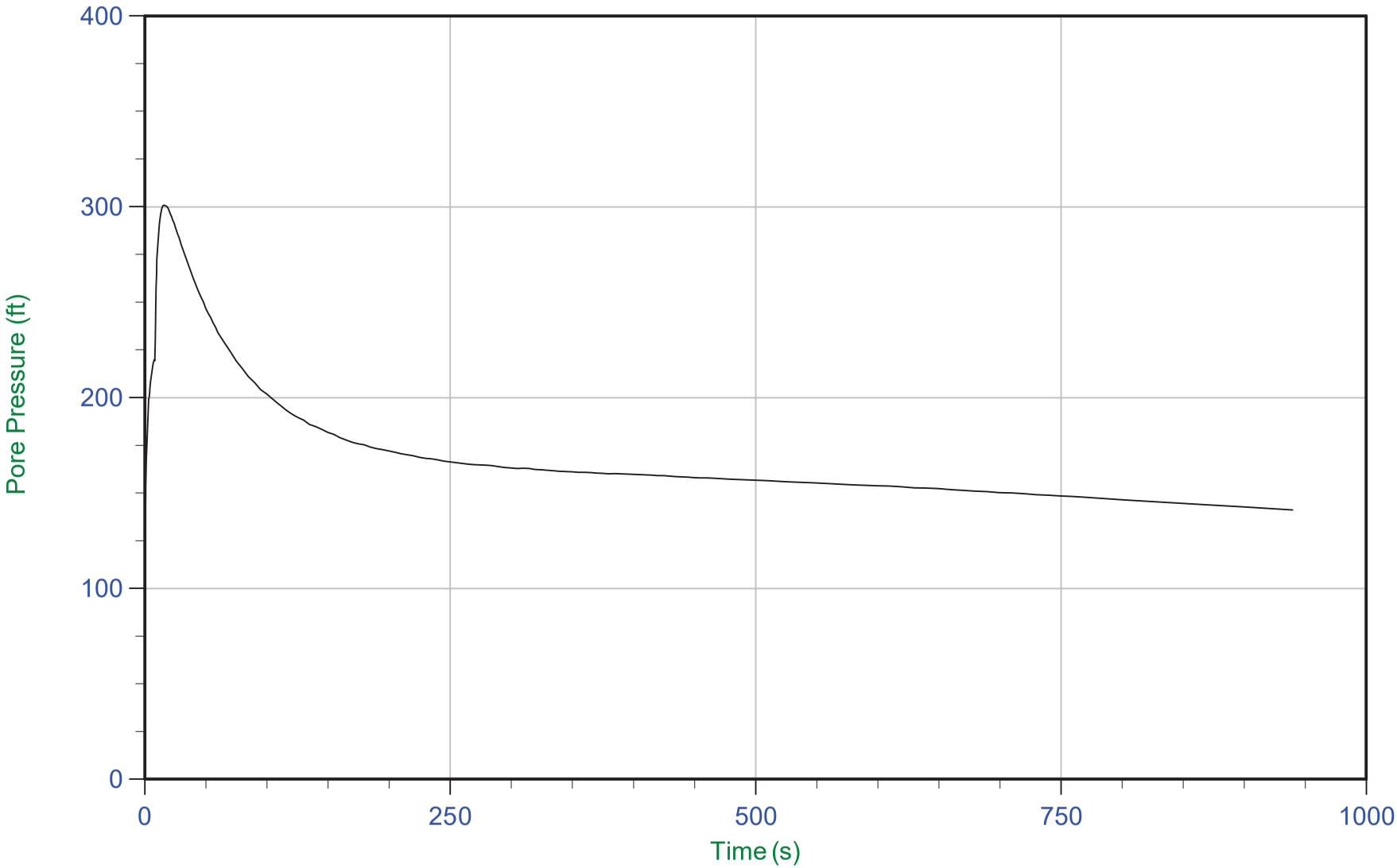
WT: 3.109 m / 10.199 ft
Ueq: 8.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/18/2021 09:05
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-25.ppd2
Depth: 9.925 m / 32.562 ft
Duration: 940.0 s

u Min: 120.8 ft
u Max: 300.8 ft
u Final: 141.2 ft

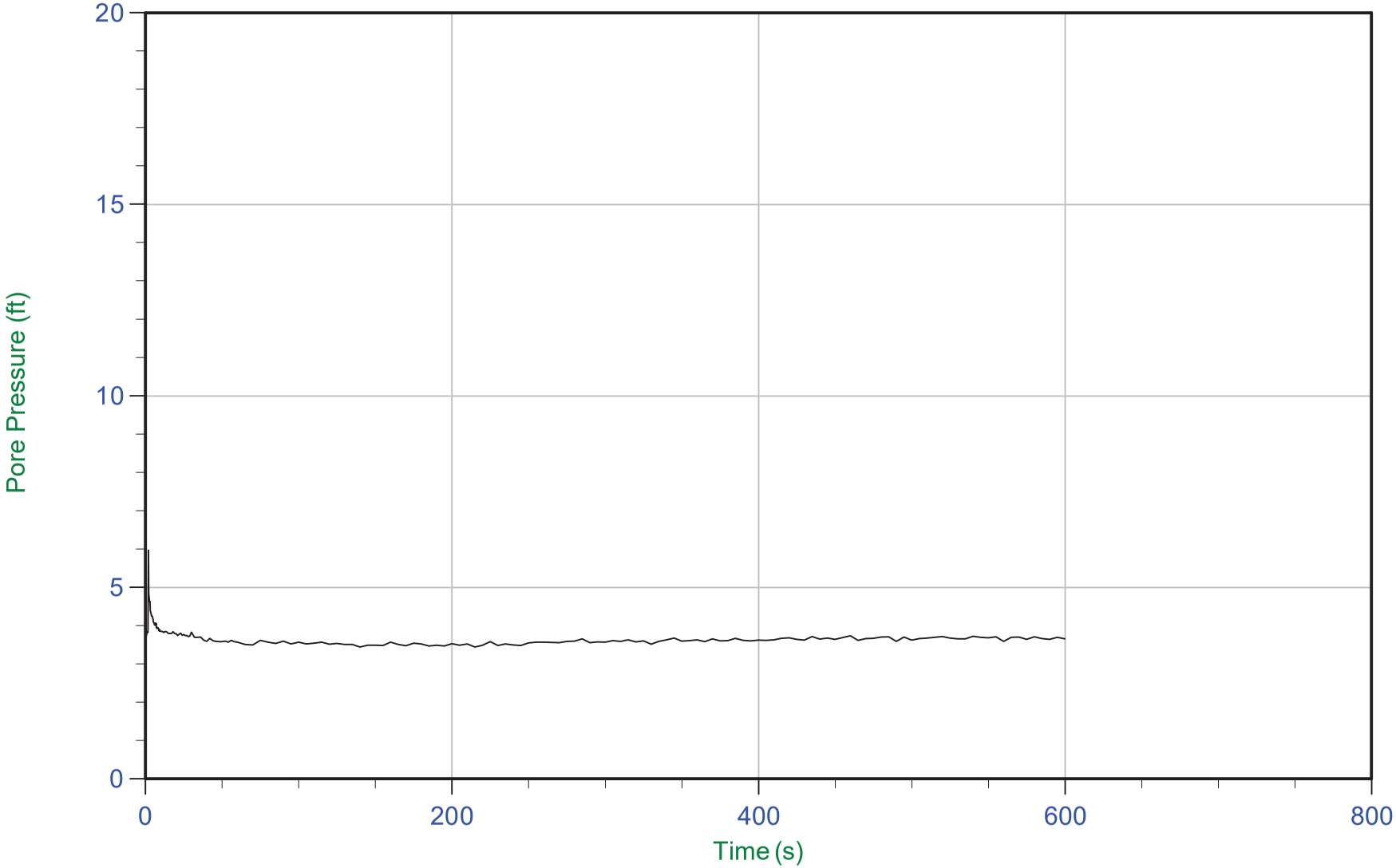
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/18/2021 09:58
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-25A
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-25A.ppd2
Depth: 4.750 m / 15.584 ft
Duration: 600.0 s

u Min: 3.4 ft
u Max: 6.0 ft
u Final: 3.7 ft

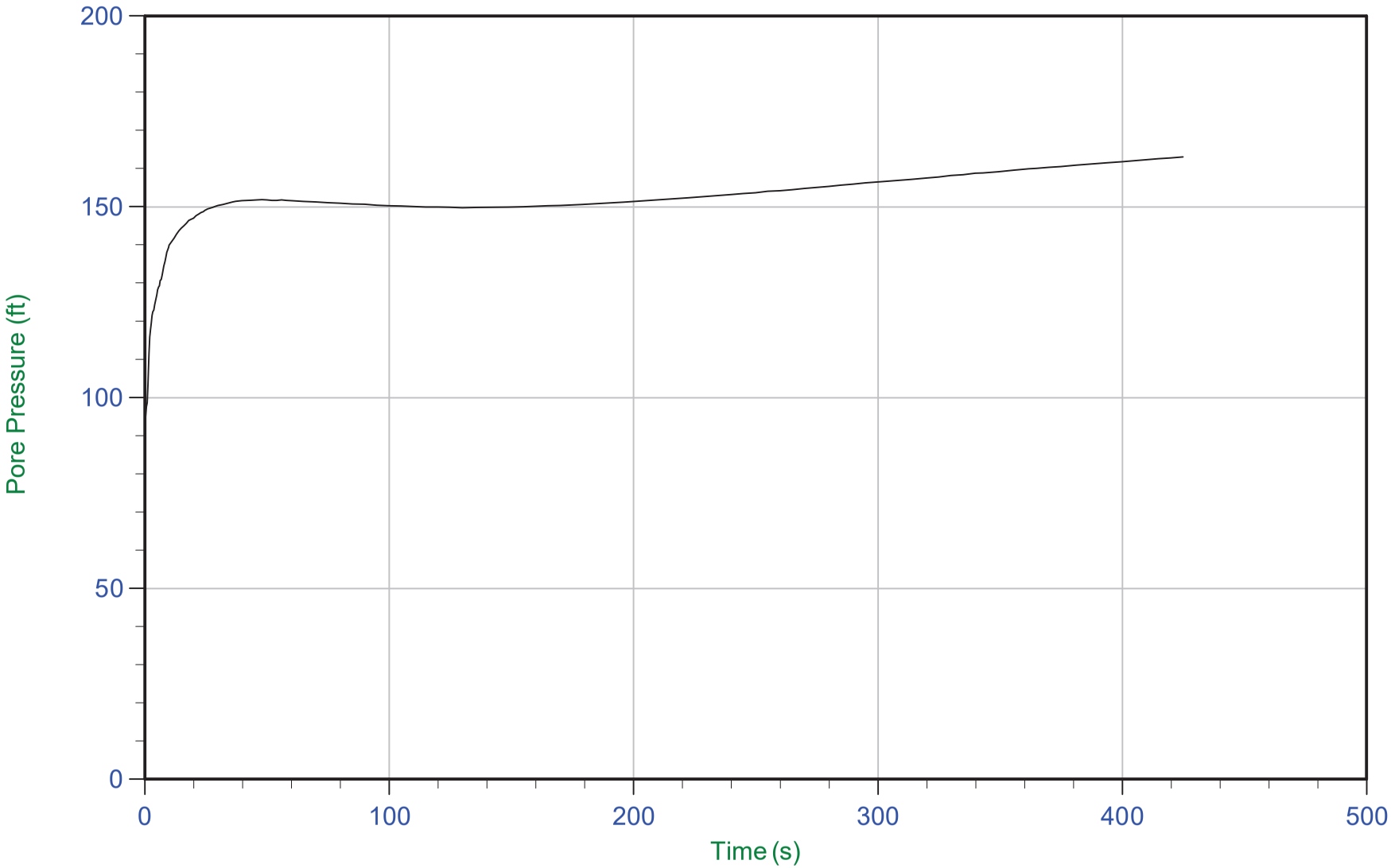
WT: 3.627 m / 11.900 ft
Ueq: 3.7 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/09/2021 15:44
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-26
Cone: 801:T1500F15U35 Area=15 cm²



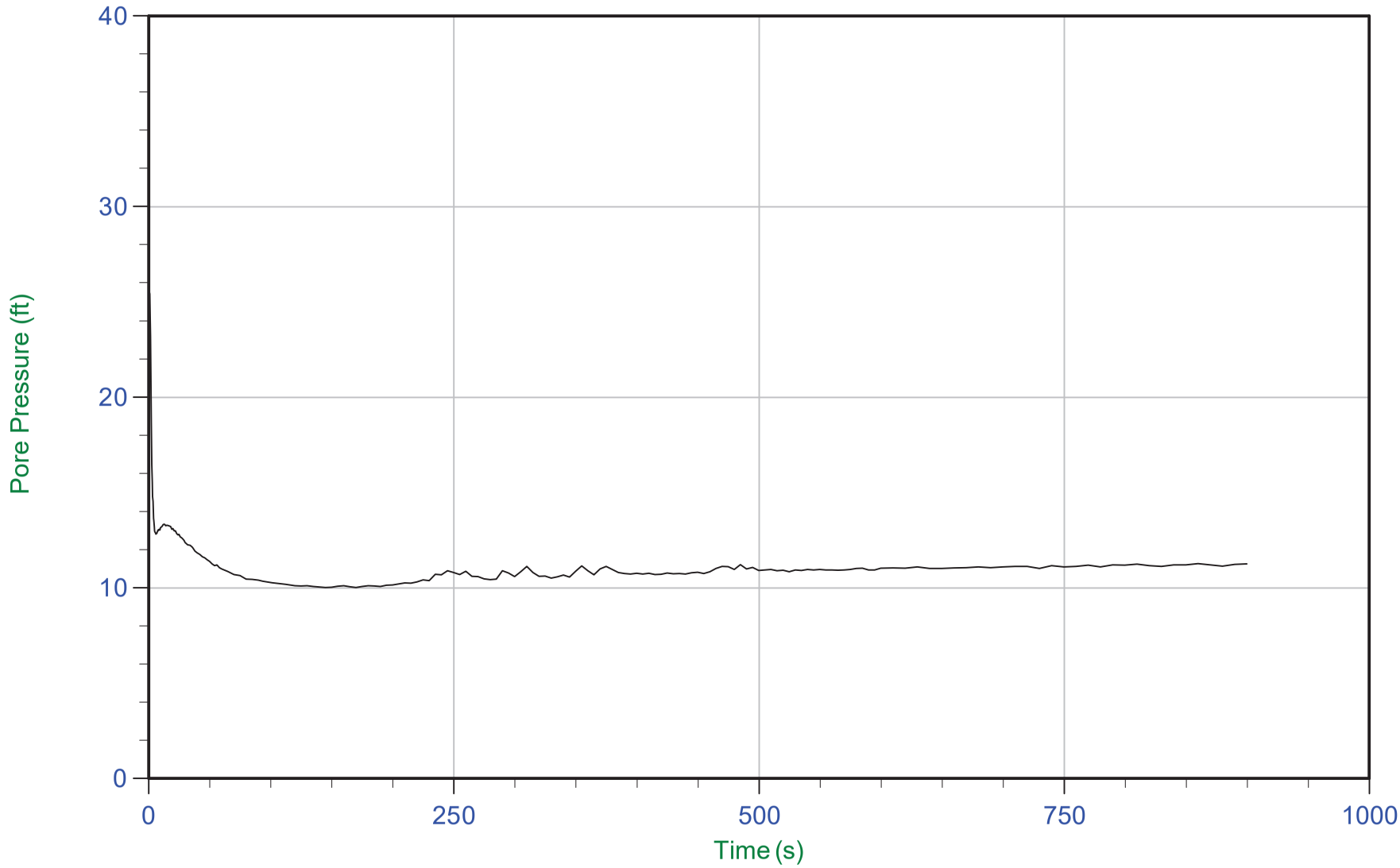
Trace Summary:

Filename: 21-61-22763_CPVAP-26.ppd2
Depth: 12.200 m / 40.026 ft
Duration: 425.0 s

u Min: 93.9 ft
u Max: 163.1 ft
u Final: 163.1 ft

WT: N/A
Ueq: N/A

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/12/2021 09:08 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-27 Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

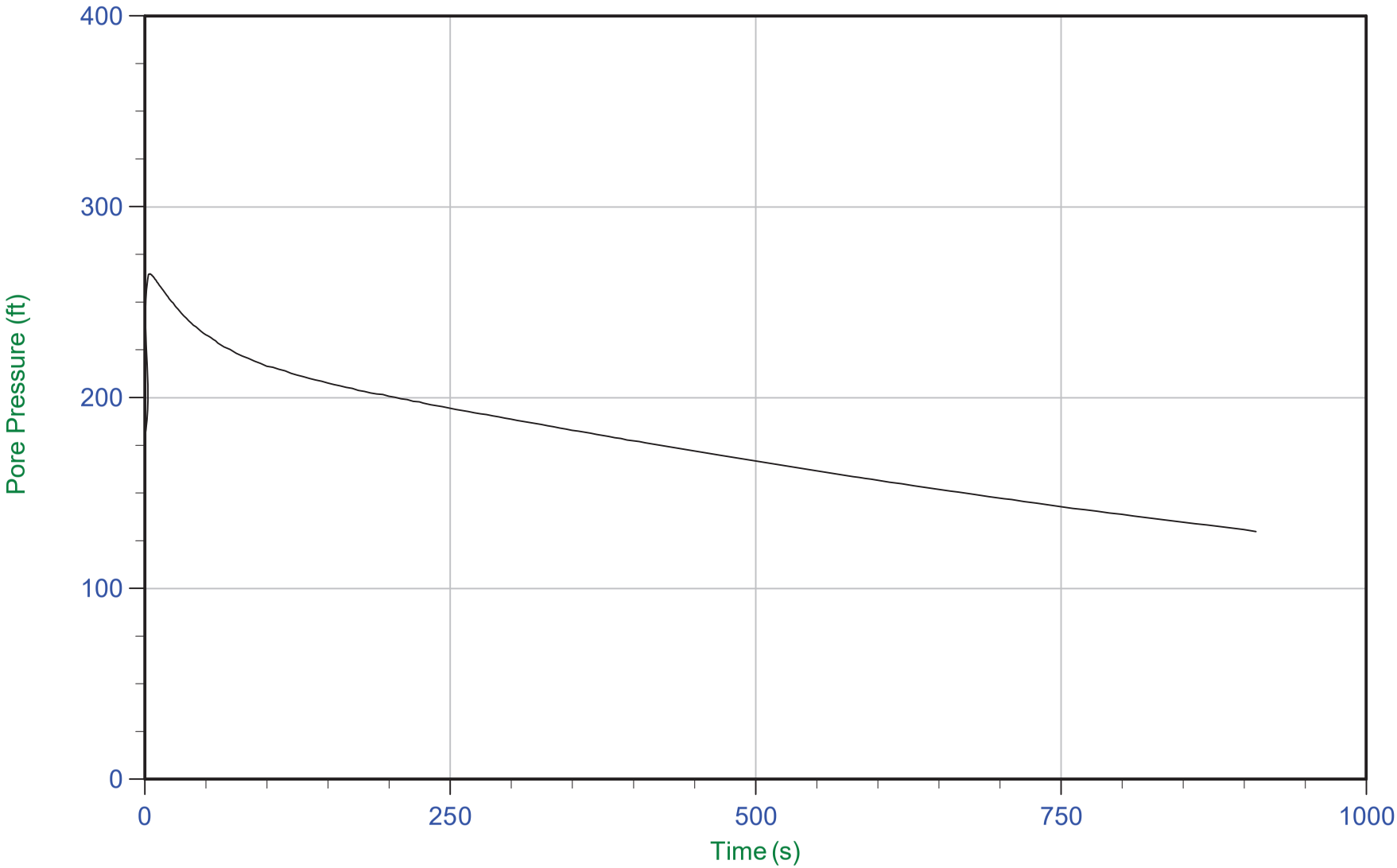
Filename: 21-61-22763_CPVAP-27.ppd2	u Min: 10.0 ft	WT: 4.474 m / 14.679 ft
Depth: 7.875 m / 25.836 ft	u Max: 25.5 ft	Ueq: 11.2 ft
Duration: 900.0 s	u Final: 11.3 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 09:08
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-27
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-27.ppd2
Depth: 10.875 m / 35.679 ft
Duration: 910.0 s

u Min: 129.9 ft
u Max: 264.9 ft
u Final: 129.9 ft

WT: 4.474 m / 14.679 ft
Ueq: 21.0 ft
U(50): 142.94 ft

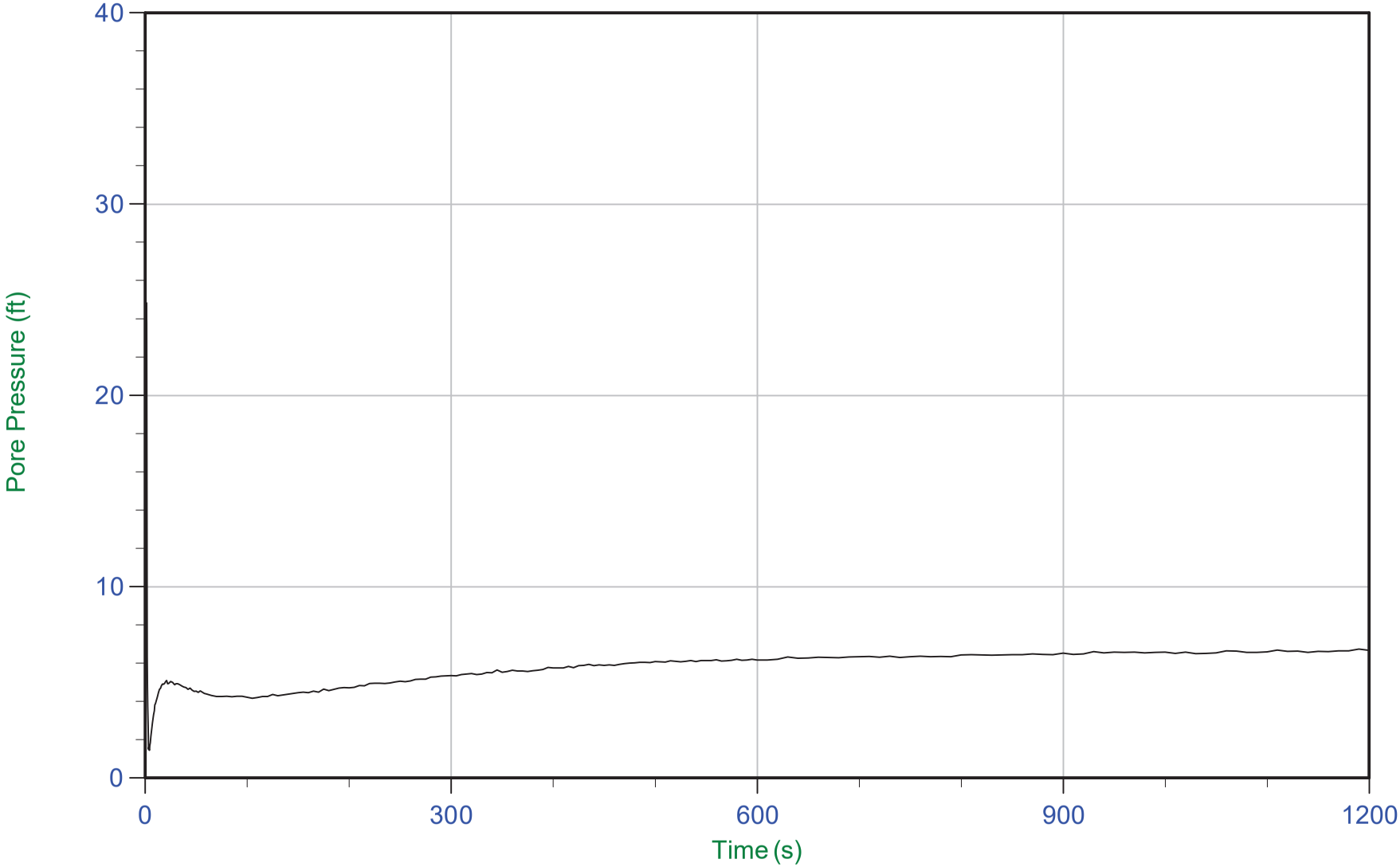
T(50): 744.7 s
Ir: 100
Ch: 0.9 cm²/min

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/10/2021 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-28.ppd2
Depth: 7.925 m / 26.000 ft
Duration: 1200.0 s

u Min: 1.4 ft
u Max: 25.6 ft
u Final: 6.7 ft

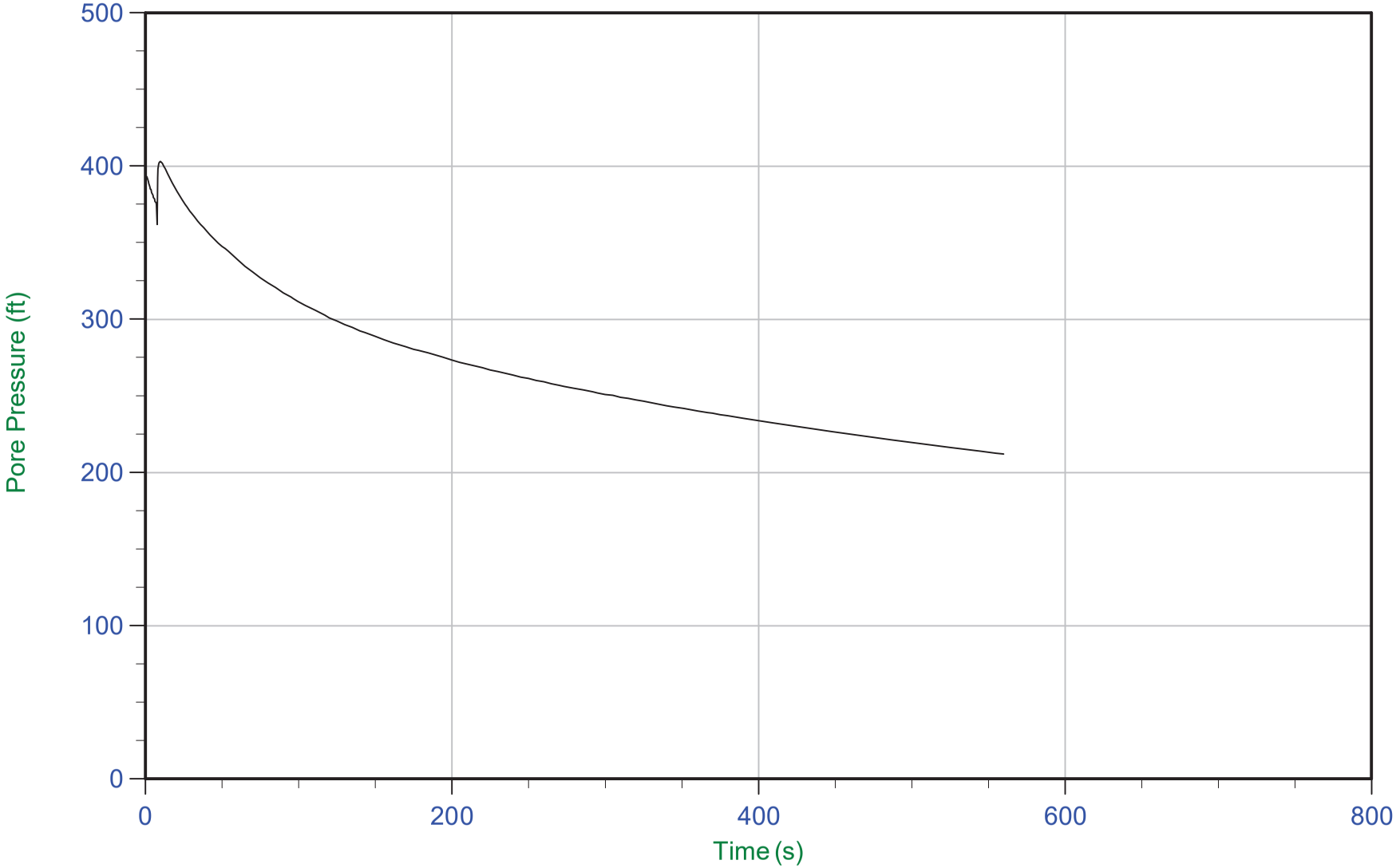
WT: 5.904 m / 19.369 ft
Ueq: 6.6 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/10/2021 13:25
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-28
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

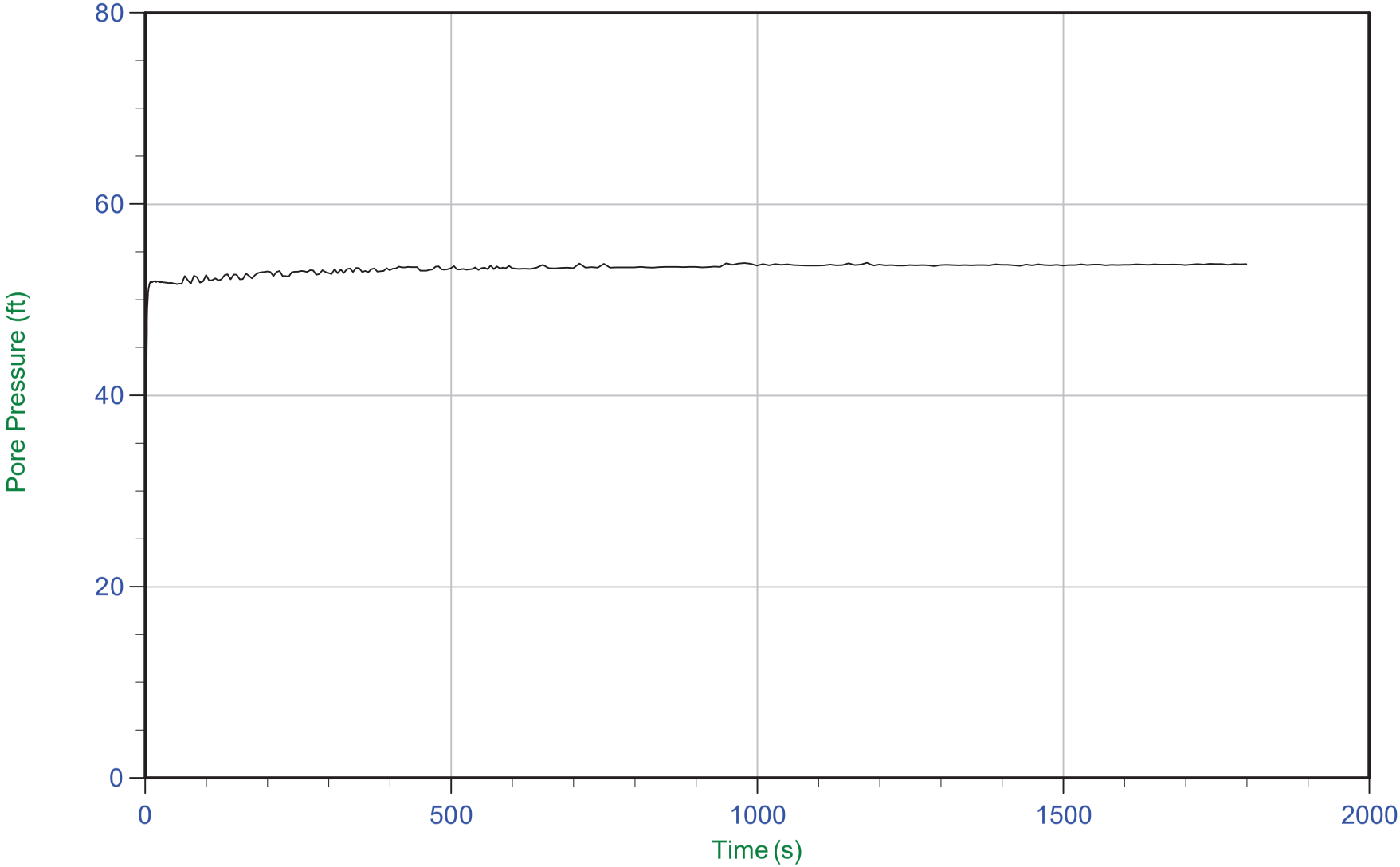
Filename: 21-61-22763_CPVAP-28.ppd2
Depth: 14.325 m / 46.997 ft
Duration: 560.0 s

u Min: 212.1 ft
u Max: 403.0 ft
u Final: 212.1 ft

WT: 5.904 m / 19.369 ft
Ueq: 27.6 ft
U(50): 215.32 ft

T(50): 523.2 s
Ir: 100
Ch: 1.3 cm²/min

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/14/2021 09:07 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-29 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

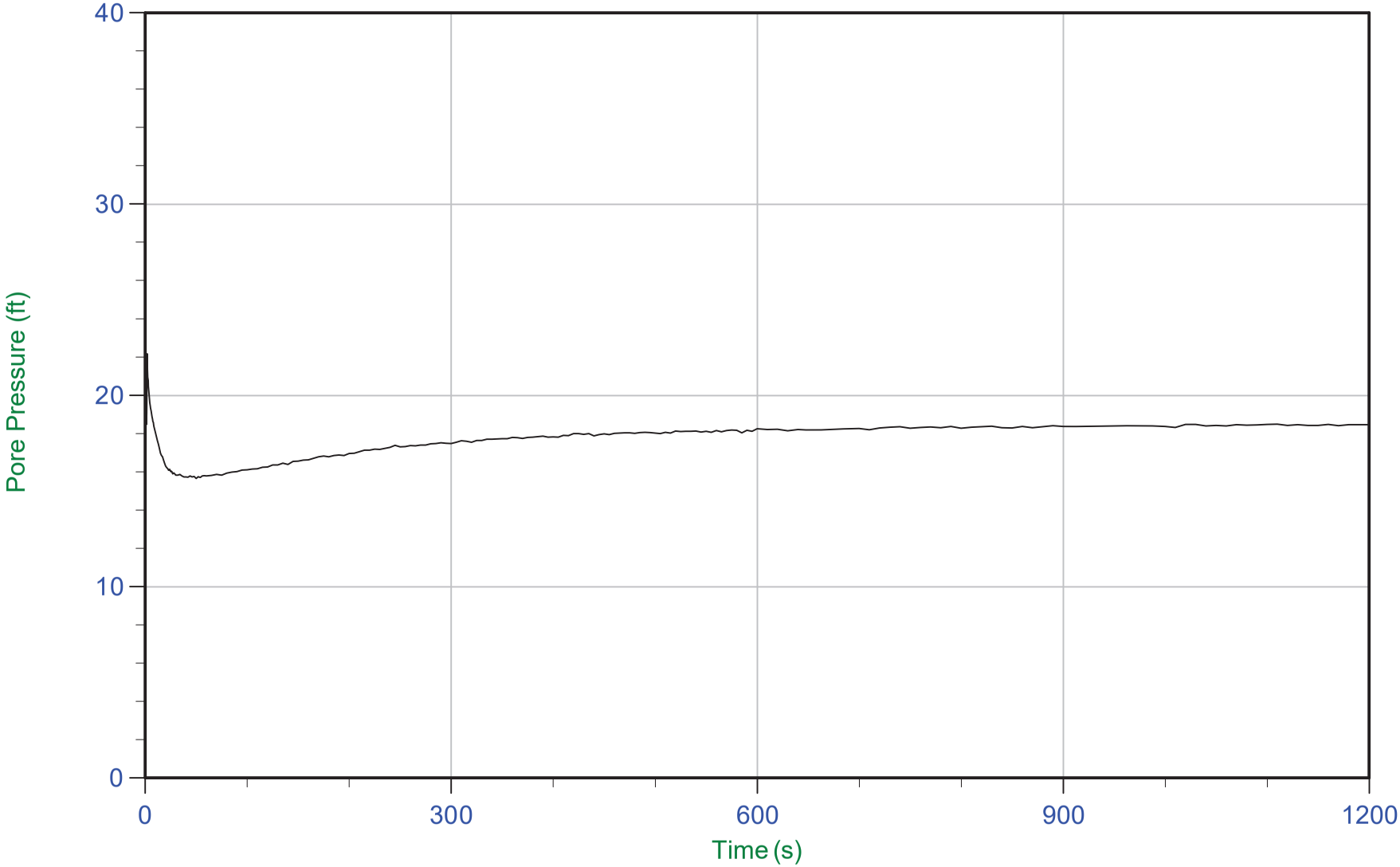
Filename: 21-61-22763_CPVAP-29.ppd2	u Min: 16.3 ft	WT: 4.576 m / 15.014 ft
Depth: 20.875 m / 68.487 ft	u Max: 53.9 ft	Ueq: 53.5 ft
Duration: 1800.0 s	u Final: 53.8 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/15/2021 09:28
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-30
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-30.ppd2
Depth: 8.875 m / 29.117 ft
Duration: 1200.0 s

u Min: 15.7 ft
u Max: 22.2 ft
u Final: 18.5 ft

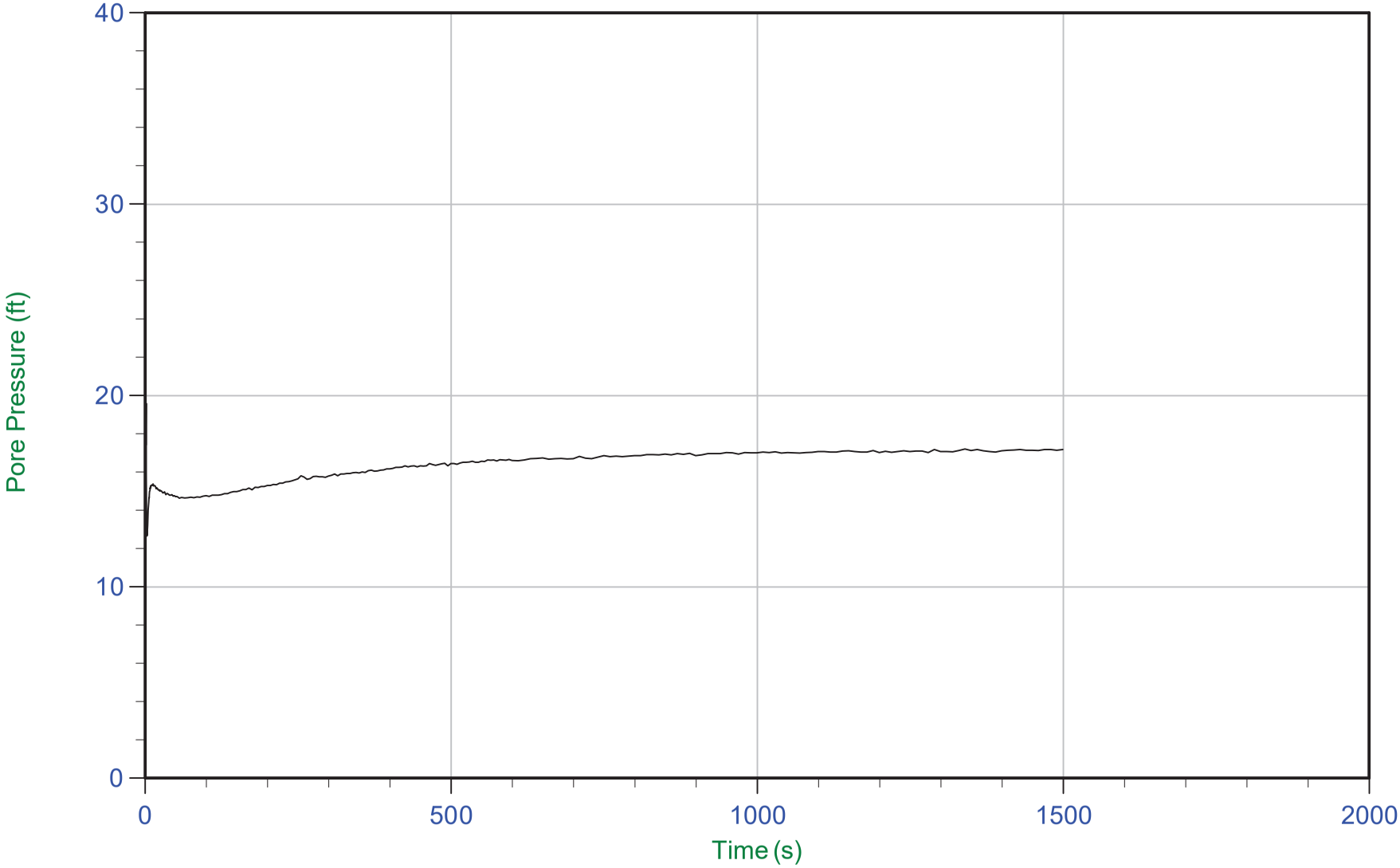
WT: 3.260 m / 10.696 ft
Ueq: 18.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/13/2021 12:34
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-31
Cone: 801:T1500F15U35 Area=15 cm²



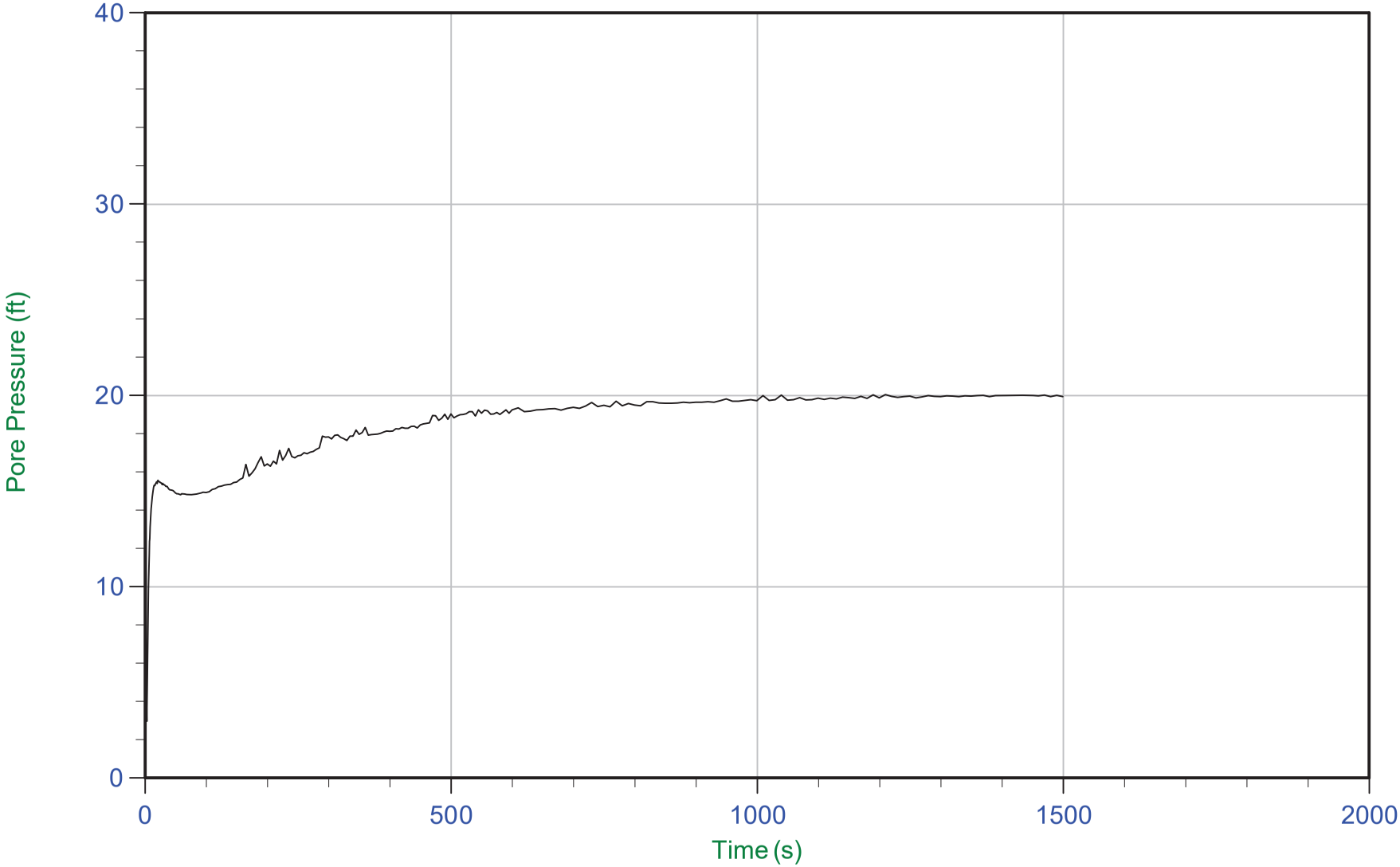
Trace Summary:

Filename: 21-61-22763_CPVAP-31.ppd2
Depth: 7.800 m / 25.590 ft
Duration: 1500.0 s

u Min: 12.7 ft
u Max: 20.3 ft
u Final: 17.2 ft

WT: 2.602 m / 8.538 ft
Ueq: 17.1 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/11/2021 09:27 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-32 Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

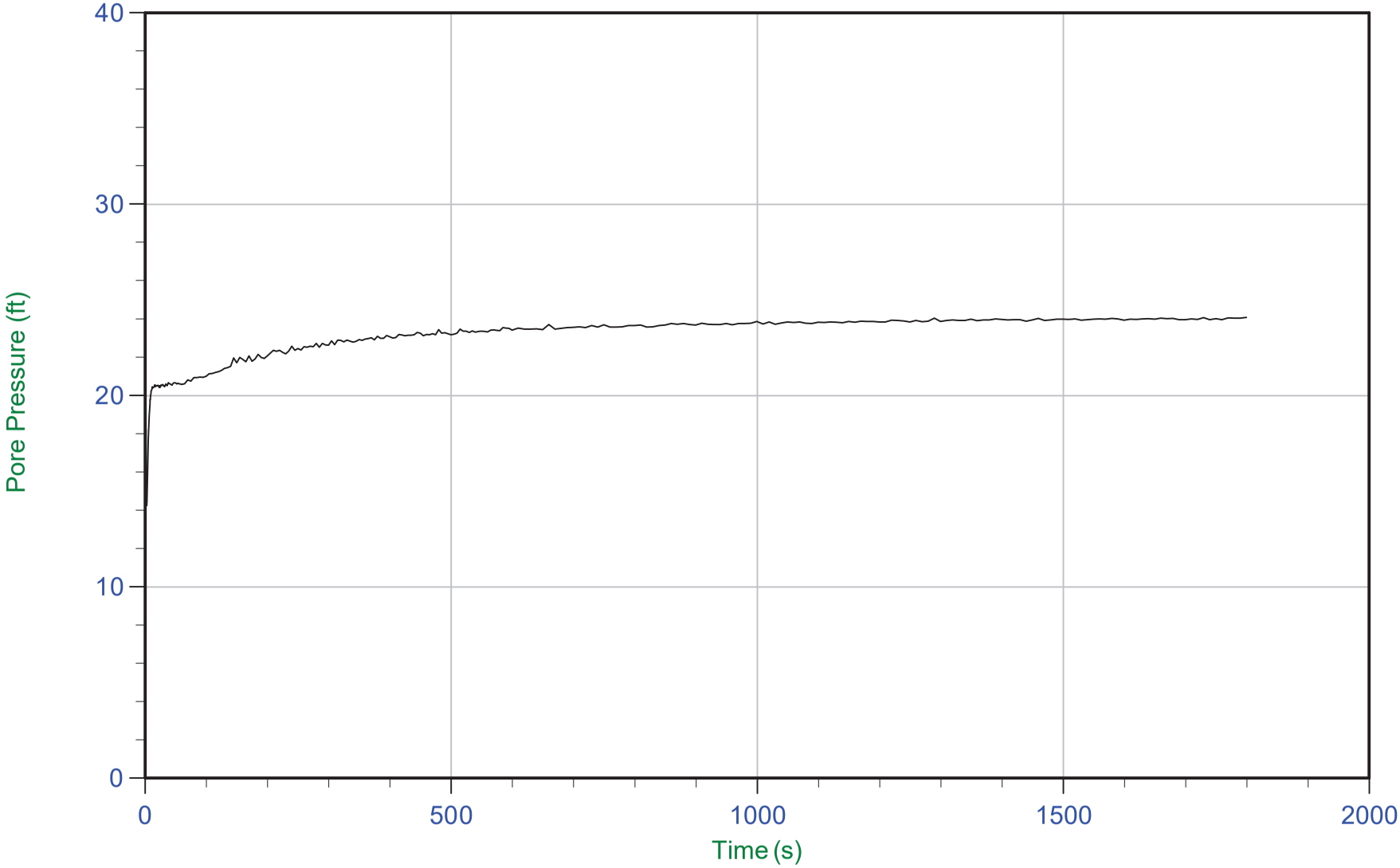
Filename: 21-61-22763_CPVAP-32.ppd2	u Min: 3.0 ft	WT: 3.704 m / 12.152 ft
Depth: 9.800 m / 32.152 ft	u Max: 28.6 ft	Ueq: 20.0 ft
Duration: 1500.0 s	u Final: 19.9 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-33.ppd2
Depth: 10.775 m / 35.351 ft
Duration: 1800.0 s

u Min: 14.3 ft
u Max: 24.6 ft
u Final: 24.1 ft

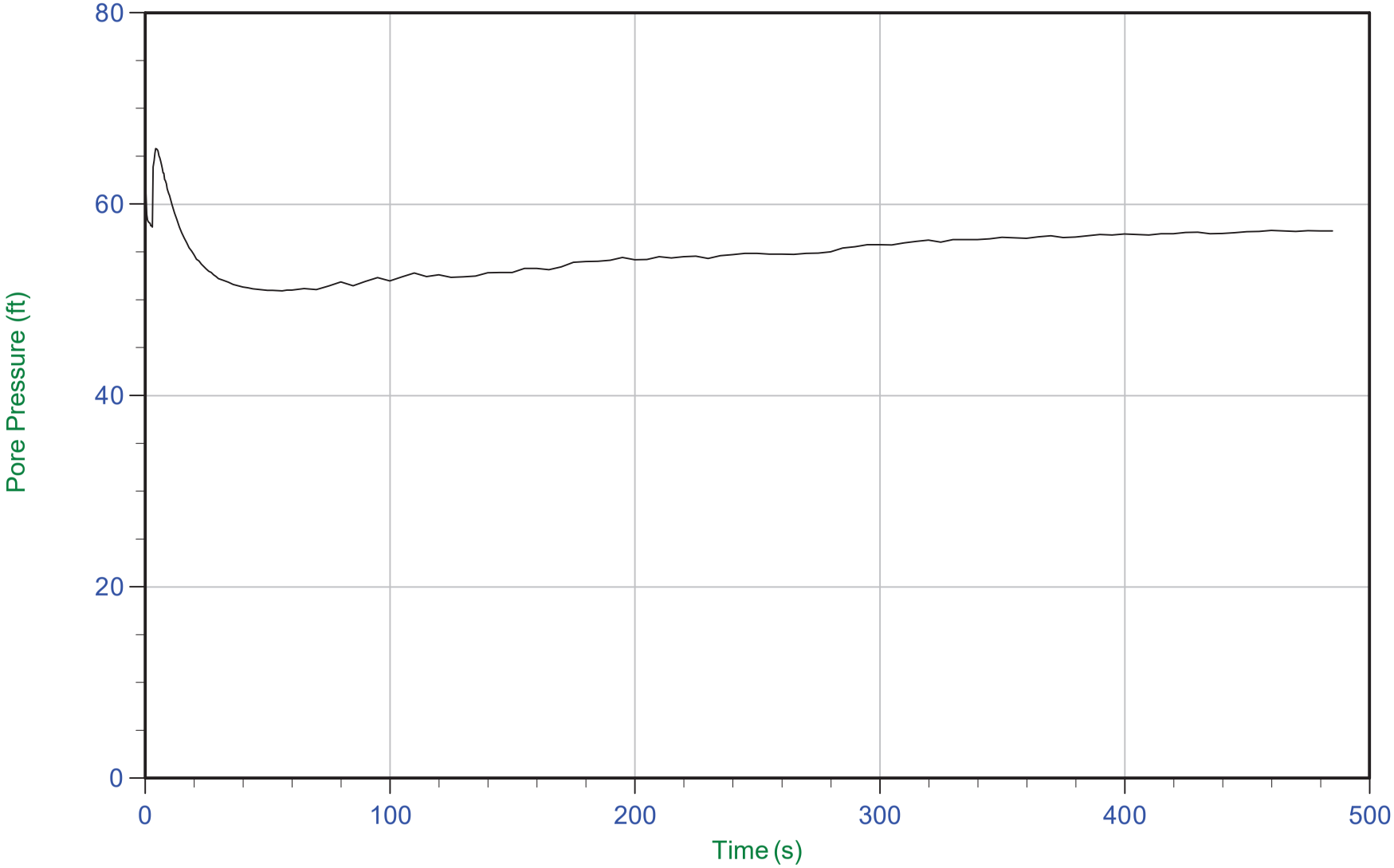
WT: 3.492 m / 11.456 ft
Ueq: 23.9 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/12/2021 12:40
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-33
Cone: 801:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-33.ppd2
Depth: 21.400 m / 70.209 ft
Duration: 485.0 s

u Min: 51.0 ft
u Max: 65.8 ft
u Final: 57.2 ft

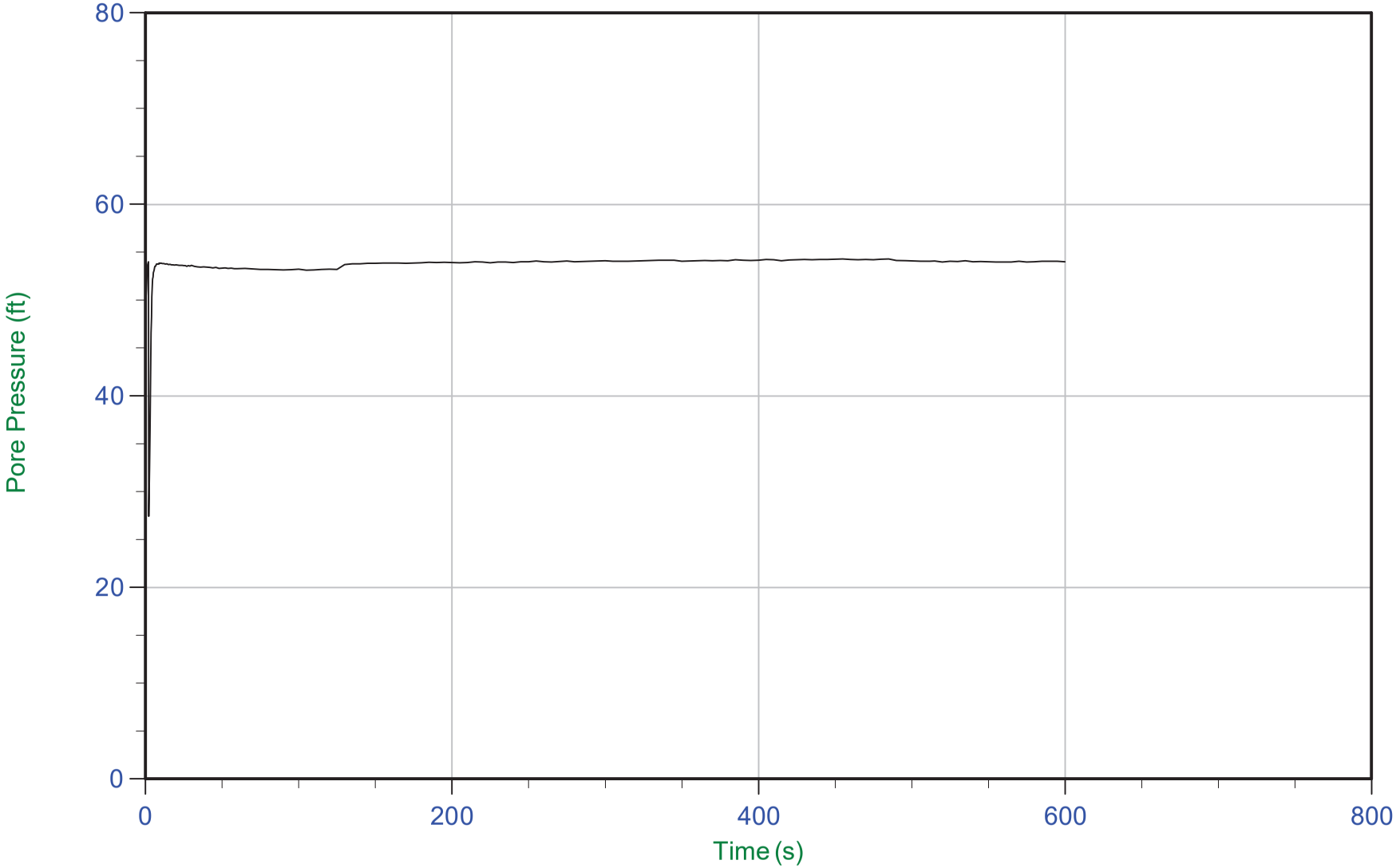
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/15/2021 15:21
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-34
Cone: 661:T1500F15U35 Area=15 cm²



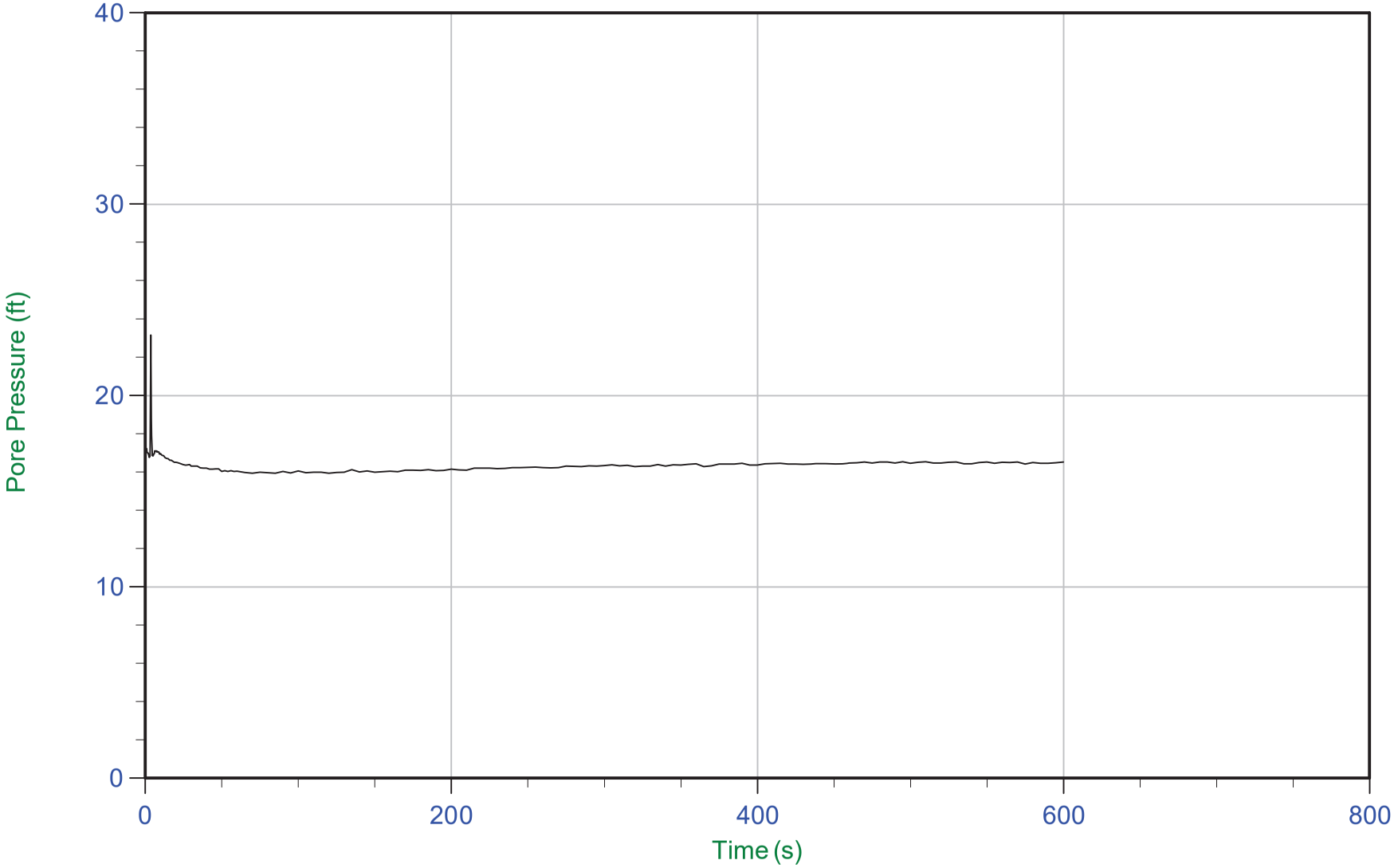
Trace Summary:

Filename: 21-61-22763_CPVAP-34.ppd2
Depth: 18.175 m / 59.629 ft
Duration: 600.0 s

u Min: 27.4 ft
u Max: 54.8 ft
u Final: 54.0 ft

WT: 1.684 m / 5.524 ft
Ueq: 54.1 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/20/2021 10:40 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-35 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

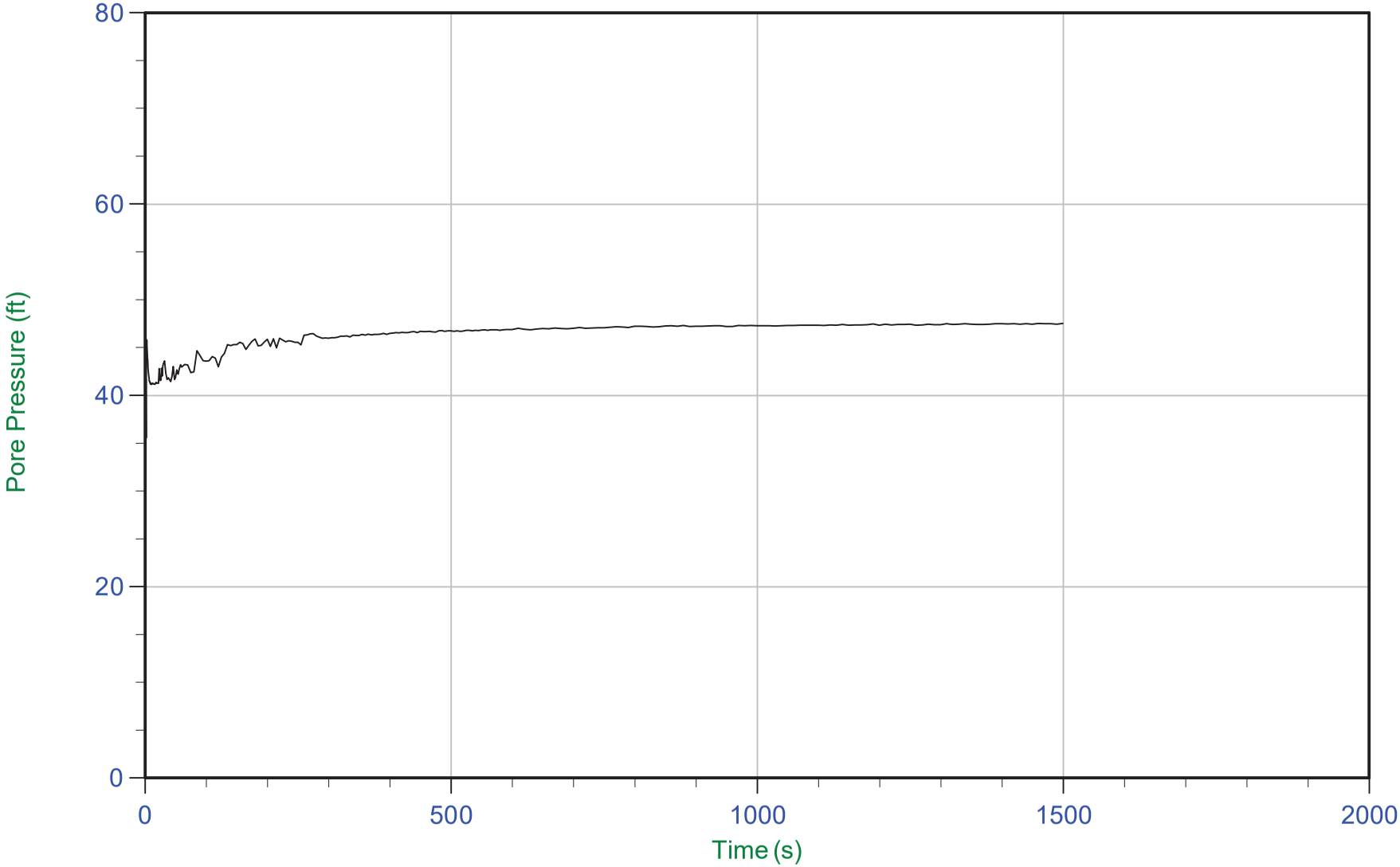
Filename: 21-61-22763_CPVAP-35.ppd2	u Min: 15.9 ft	WT: 1.595 m / 5.232 ft
Depth: 6.600 m / 21.653 ft	u Max: 23.2 ft	Ueq: 16.4 ft
Duration: 600.0 s	u Final: 16.5 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/16/2021 12:54
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-36
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-36.ppd2
Depth: 16.000 m / 52.493 ft
Duration: 1500.0 s

u Min: 35.6 ft
u Max: 47.5 ft
u Final: 47.5 ft

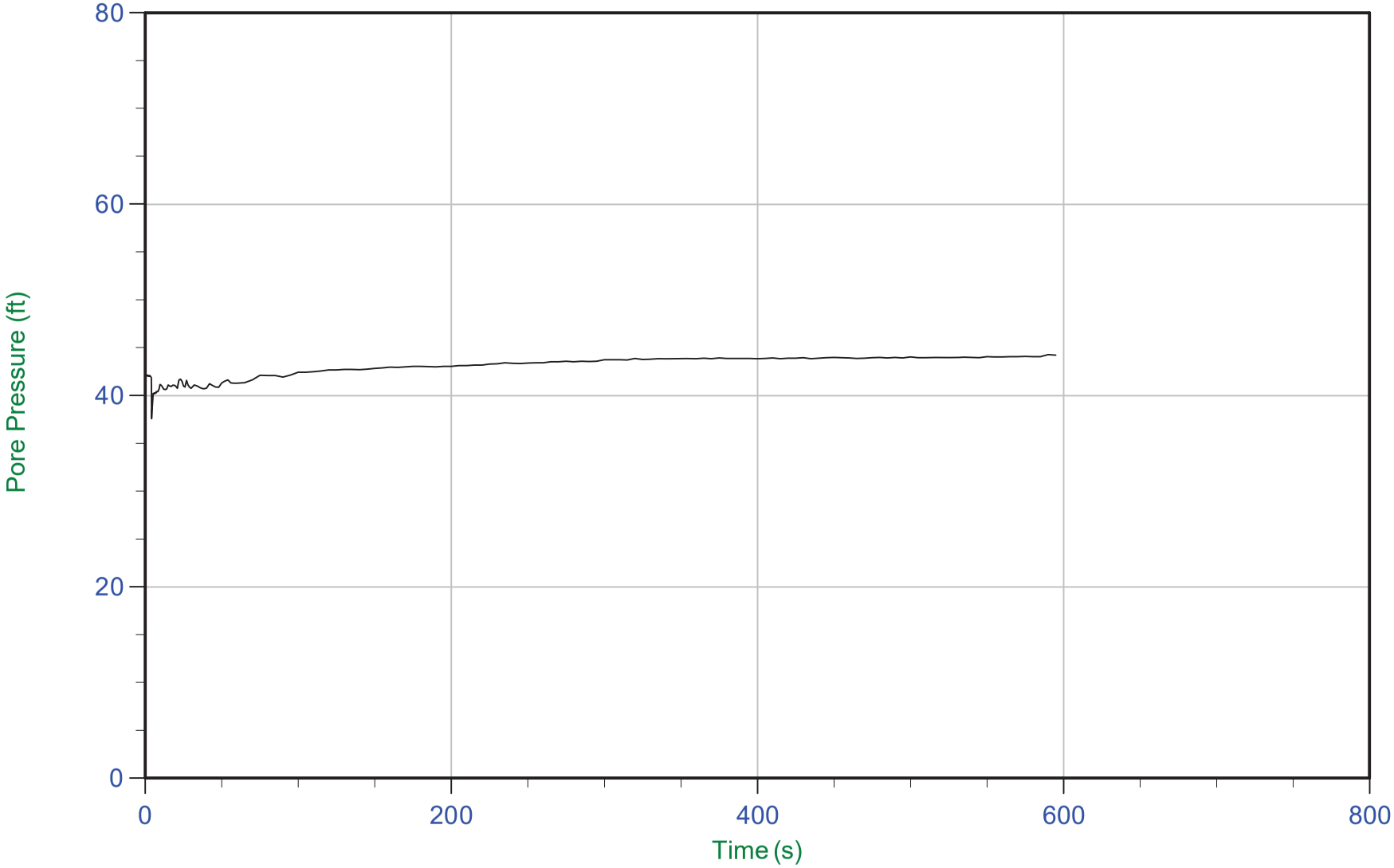
WT: 1.562 m / 5.125 ft
Ueq: 47.4 ft

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/17/2021 12:45
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-37
Cone: 661:T1500F15U35 Area=15 cm²



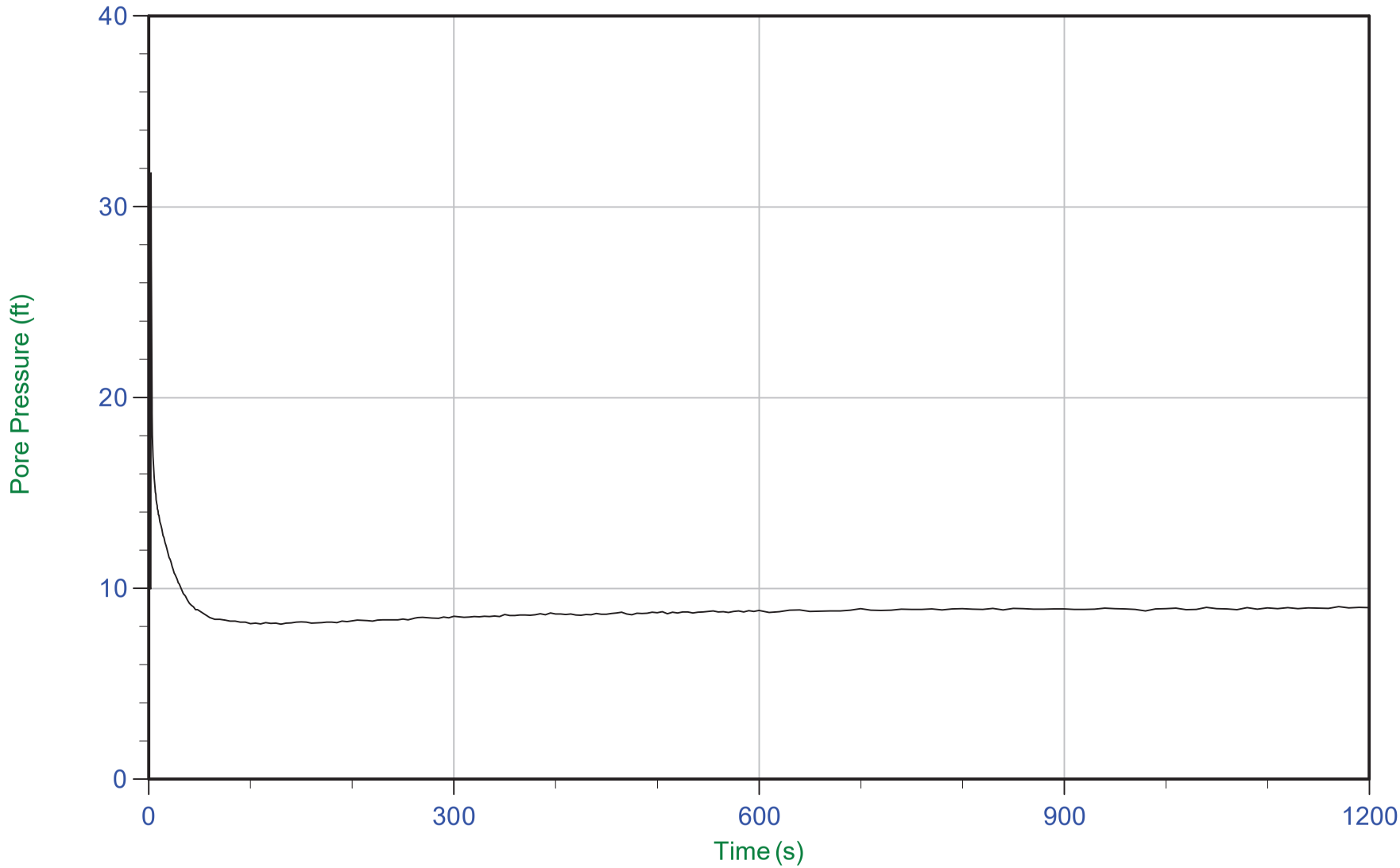
Trace Summary:

Filename: 21-61-22763_CPVAP-37.ppd2
Depth: 16.075 m / 52.739 ft
Duration: 595.0 s

u Min: 37.6 ft
u Max: 44.3 ft
u Final: 44.2 ft

WT: 2.664 m / 8.739 ft
Ueq: 44.0 ft

CONETEC	Arcadis	Job No: 21-61-22763 Date: 12/21/2021 08:50 Site: Vertical Aquifer Sampling, Traverse City, MI
		Sounding: CPT21-ASTC-VAP-38 Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

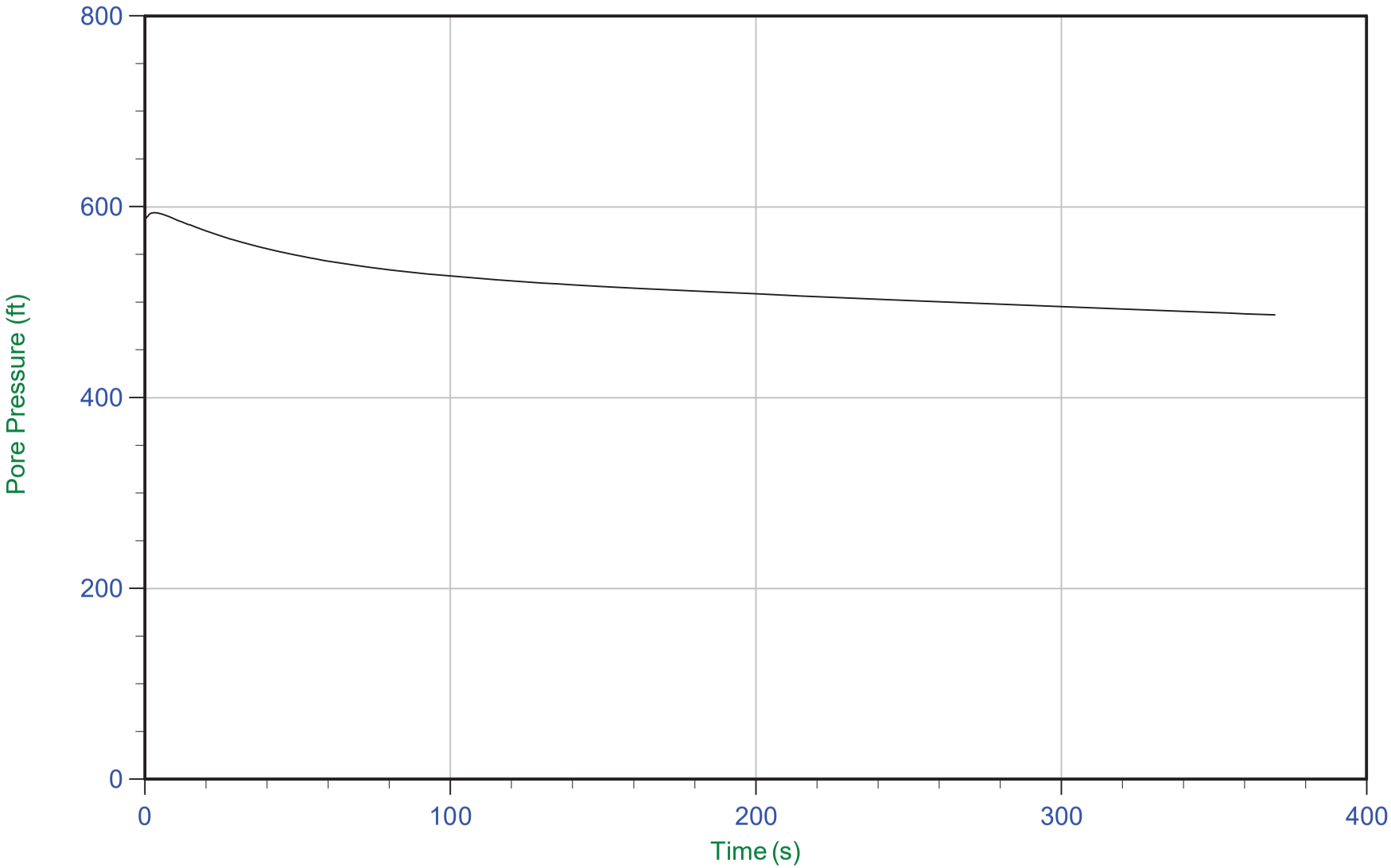
Filename: 21-61-22763_CPVAP-38.ppd2	u Min: 8.1 ft	WT: 2.123 m / 6.965 ft
Depth: 4.850 m / 15.912 ft	u Max: 31.8 ft	Ueq: 8.9 ft
Duration: 1200.0 s	u Final: 9.0 ft	

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/21/2021 08:50
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-38
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-38.ppd2
Depth: 16.625 m / 54.543 ft
Duration: 370.0 s

u Min: 486.7 ft
u Max: 594.0 ft
u Final: 486.7 ft

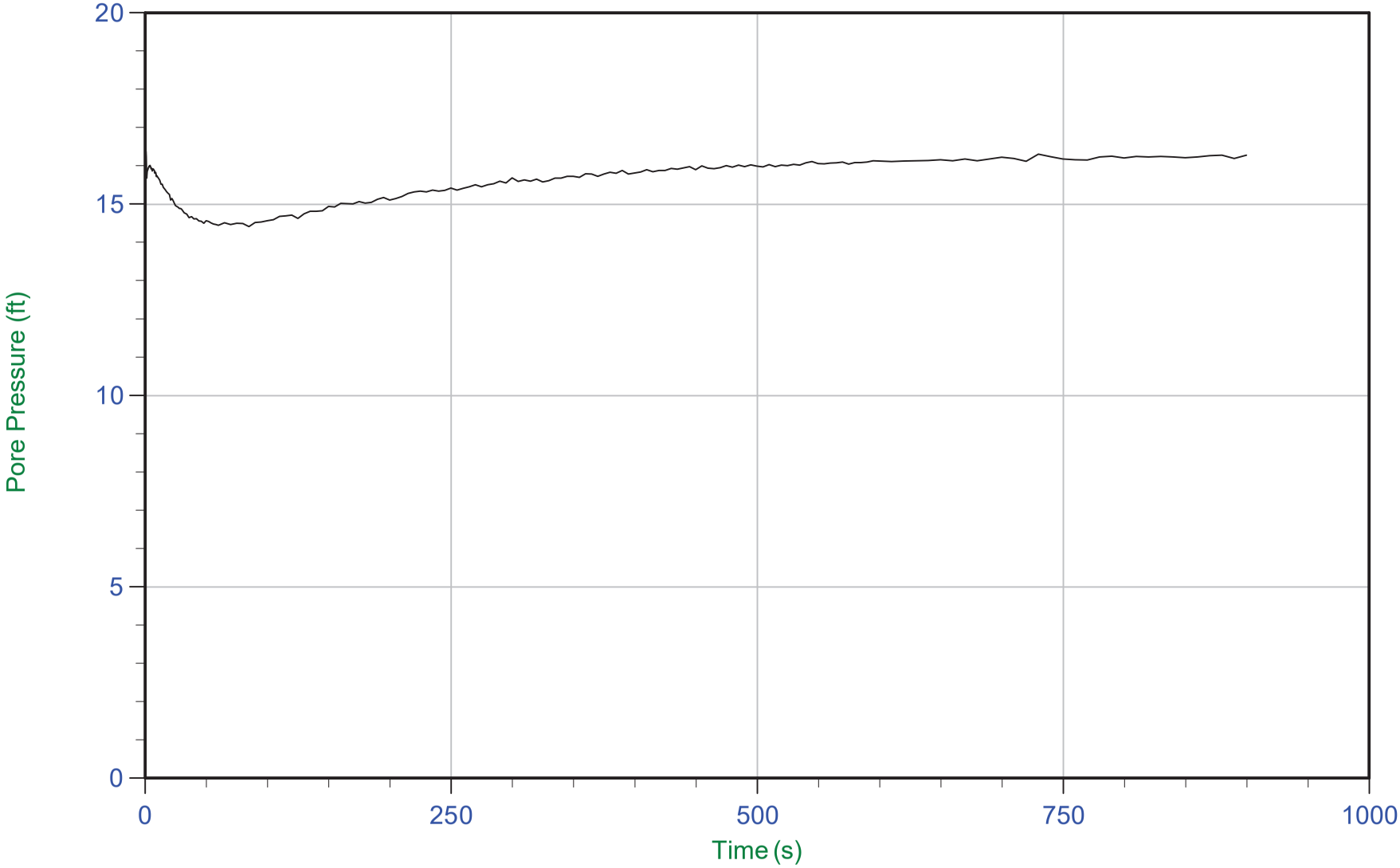
WT: N/A
Ueq: N/A

CONETEC

Arcadis

Job No: 21-61-22763
Date: 12/21/2021 14:57
Site: Vertical Aquifer Sampling, Traverse City, MI

Sounding: CPT21-ASTC-VAP-39
Cone: 661:T1500F15U35 Area=15 cm²



Trace Summary:

Filename: 21-61-22763_CPVAP-39.ppd2
Depth: 7.850 m / 25.754 ft
Duration: 900.0 s

u Min: 14.4 ft
u Max: 16.4 ft
u Final: 16.3 ft

WT: 2.909 m / 9.544 ft
Ueq: 16.2 ft