Attachment E

Structural Evaluation Results – Pacific Avenue Properties

September 5, 2018

PPG
440 College Park Drive
Monroeville, PA USA 15146

Attn: Mark Terril, Richard Feinberg, Jody Overmyer *via email*

Re: Excavation Offset to Protect Adjacent Properties
78 Halladay Street (Halsted Building) Demolition and Remediation
Jersey City, N.J.
MRCE File 11972B

Dear Mr. Terril:

This letter serves as a follow-up to a geotechnical evaluation that was completed by MRCE and summarized in a letter dated April 25, 2018. Additional calculation and analysis was conducted using data collected during a July 2018 subsurface investigation to assess the recommended offset and side slopes for remedial excavation at 78 Halladay St, Jersey City, New Jersey. The offset restricts excavation within 15-ft of the adjacent structures at 101-105 Pacific St. and 107 Pacific St., and limits excavation slopes to 1.5:1 (horizontal to vertical).

EXHIBITS

The following exhibits are attached in this Report:

Exhibit	Title
Figure No. 1	CPT Location Plan
Figure No. 2	Geologic Section A-A
Figure No. 3A	Slope Stability Results – 5 ft offset (FS = 1.2)
Figure No. 3B	Slope Stability Results – 10 ft offset (FS = 1.3)
Figure No. 3C	Slope Stability Results – 15 ft offset (FS = 1.4)
Figure No. 4a	Ultimate Bearing Capacity for Shallow Footing Placed on or Near a Slope (NAVFAC DM-7.02)
Figure No. 4b	Bearing Capacity Factors for Shallow Footing Placed on or Near a Slope (NAVFAC DM-7.02)
Appendix A	CPT Investigation Data Report

PROJECT DESCRIPTION

The structure represented by 101-105 Pacific St. is unoccupied. The structure at 107 Pacific St. houses the active Fresenius Kidney Care medical clinic. Both structures show signs of past settlement and deformation. Little is known of the structure at 101-105 Pacific St. It is believed the structures are pile supported, with the ground floor slabs supported on grade, similar to the Halsted and the former Al Smith structures. Mr. Rod Donnelly, owner of 107 Pacific has provided evidence (available in our files) that mud jacking was conducted approximately 10 to 15 years ago to fill voids beneath the slab and level the ground floor slabs.

The remedial excavation subgrade ranged from 2-ft to 10-ft below existing grade. Excavation was performed using open cut slopes around the perimeter with localized dewatering achieved using sump pumps. In order to minimize impacts to adjacent structures to remain and following preliminary studies, MRCE recommended no excavation within 15-ft of the adjacent structures, and limiting excavation slopes initially to 1.5H:1V. With these guidelines, the point at which the initial excavation reaches 10-ft depth was to be 25-ft from adjacent structures. See AECOM Drawing SOE-1 for final slope configurations. It is the background or base file for Figure No. 1 attached to this report.

INSTRUMENTATION AND MONITORING

MRCE performed a baseline building condition assessment of the 101-105 and 107 structures, and installed, baselined and is currently monitoring instruments to measure building response, if any, during and following demolition and excavation. Seismographs are used to monitor vibrations during demolition, and tilt meters and crack gauges are used to monitor building movement which may result from excavation. In addition, optical prisms were installed outside of the building to periodically measure changes in horizontal or vertical position of the monitoring points, if any, should the automated tilt sensors, crack gauges or seismographs suggest a need to do so. The instruments were generally placed on the wall closest to the Halsted structure. Approximate instrument as-built locations and threshold values are summarized in our Monitoring Reports submitted to PPG and the project team on an as needed basis and are available upon request. All monitoring data are maintained on our server for archiving and purposes.

GENERAL SUBSURFACE CONDITIONS

Our geotechnical subsurface investigation consisted of performing five cone-penetrometer tests (CPT). The CPT probes were performed by ConeTec, Inc. on July 19, 2018, using a truck-mounted rig. An MRCE field engineer Mr. Jimmy Cheung, was on-site to coordinate and observe the investigation work. A CPT location plan is included as Figure No. 1. Four to five seismic cone penetrometer tests (SCPT) were performed at each CPT location measuring in-situ shear wave velocity. A total of four pore pressure dissipation tests (CPTu) were conducted to determine the phreatic surface. Each CPT was advanced, pushing an instrumented cone penetrometer into the ground to continuously obtain cone tip resistance, sleeve friction, and pore water pressure in accordance with ASTM D5778. Down-hole shear wave velocity measurements were collected at about ten foot intervals. Groundwater was typically encountered at approximate Elev. 4.5 NAVD88. The CPT probes indicate that site subsurface conditions in order of increasing depth generally consist of miscellaneous fill, compressible clay or peat, natural sands, and fine-grained silt and clay. Our interpretation of the subsurface conditions is illustrated in the geologic section shown on Figure No. 2. The complete CPT Data Report provided by ConeTec is included as Appendix A.

INFLUENCE OF EXCAVATION ON ADJACENT STRUCTURES

MRCE evaluated the benefit of the excavation offset previously described using two methods of analysis: (1) a slope stability study using geotechnical software and (2) established ultimate bearing capacity theory for foundations built near the top of a slope.

The slope stability analysis was performed to evaluate the reduction of the factor of safety (FS) due to the encroachment of the excavation's slope on existing adjacent structures. The computer program SLOPE/W, developed and published by GEO-SLOPE International Ltd., was used to conduct the analysis. SLOPE/W evaluates a number of potential failure surfaces with a specified range of slip surface positions and shapes. Factors of safety were evaluated using the limit equilibrium based Spencer method of slices approach [Spencer, 1967], though a similar conclusion would be drawn using other methods of analysis such as Modified Bishop or Morgenstern Price.

The site subsurface profile was divided into three representative soil layers for the purpose of our analysis. Soil properties and layer thicknesses were determined from CPT data collected during the subsurface investigation and using correlations published in the latest literature. Geotechnical parameters used in the analysis are presented in Table 1 for Strata F (Fill), O (Organic clay/peat), and S (Sand). The phreatic surface in the model was set at Elev. 4.5 beneath the horizontal ground surface sloped to Elev. 0 at the toe of the slope to model dewatering within the excavation area.

Table 1 - Geotechnical Parameters

	Stratum F	**Stratum O**	**Stratum S**
Effective Unit Weights: **Above Water Table** **Below Water Table**	120 pcf 58 pcf	100 pcf 38 pcf	120 pcf 58 pcf
Angle of Internal Friction	32°	0°	35°
Cohesion	0 psf	350 psf	0 psf

When a foundation located near the face of a slope is loaded to failure, the zones of plastic flow in the soil on the side of the slope are smaller than those of a similar foundation on level ground and the ultimate bearing capacity is correspondingly reduced.[1] The bearing capacity of a foundation located near a slope is represented by Equation 2 in Figure No. 4a (NAVFAC DM-7.02). While the resultant bearing capacity factors Ncq and Nγq decrease with greater inclination of the slope, they increase rapidly with greater foundation distance from the edge of the slope.

Analysis Results

Three entry and exit specified scenarios were evaluated as part of the slope stability analysis. Entry point ranges were set at greater than or equal to 5 feet, greater than 10 feet, and greater than 15 feet from the top of the excavation slope, each representing a possible offset for the start of excavation activities for the Halsted demolition phase. The resulting critical slip surface for each of the three scenarios is shown on Figures No. 3A, 3B, and 3C. Minimum factors of safety for each scenario are displayed below in Table 2.

Table 2 – Factors of Safety against Slope Failure

Entry Point Range	FS
>5 Feet from Top of Slope	1.2
>10 Feet from Top of Slope	1.3
>15 Feet from Top of Slope	1.4

Generally, the minimum acceptable factor of safety for slope stability ranges between 1.3 for temporary conditions with substantiated design parameters, to greater than 1.5 for permanent conditions. The lower

[1] Meyerhof, G.G. (1957). *The Ultimate Bearing Capacity of Foundations on Slopes*. 4th International Conference on Soil Mechanics and Foundation Engineering, 3, 384-386.

range of factor of safety generally results in larger ground deformations. Our analysis suggests that the excavation should not be conducted within 15 feet of the buildings to maintain a minimum safety factor of 1.4. We believe a reduction in the offset distance from 15-ft to 10-ft with corresponding reduction in the factor of safety to 1.3 might result in measureable building deformations given inherent and likely variability in soil parameters and localized conditions along the alleyway abutting the Halsted demolition phase remediation. In addition, while we believe the building frame and outer walls and columns may be pile supported, prior slab settlement resulted where slabs are likely supported directly on grade, as are the loading dock and generator pads which are located west of the building superstructure in the alleyway.

Interpretation of the relationship presented in Figure No. 4B (NAVFAC DM-7.02), which evaluates the bearing capacity factor Nyq based on soil friction angle and ratio of footing distance from slope to footing width, indicates as much as a 10% reduction in ultimate or allowable bearing capacity if the slope offset is reduced from 15 feet to 10 feet. We therefore recommend that no further excavation occur and that the 15 foot offset remain until the building is removed or otherwise unoccupied and deemed structurally sufficient to tolerate total settlement of an inch or more, or differential settlement of approximately half that value. The 15-ft offset suggests that excavation should not cause measurable or significant deformation or lateral displacement, slope instability, or reduction of bearing capacity of the existing structure foundations.

CLOSING

We will continue to monitor the building using the seismographs, tilt meters, crack gauges and optical prisms until the work is complete within 75-ft of the building and a month of data are recorded to show stable conditions post excavation and backfilling to grade.

Please do not hesitate to contact us should you have any questions.

Very truly yours,
MUESER RUTLEDGE CONSULTING ENGINEERS

Shamus Lefchak

Joel L. Volterra

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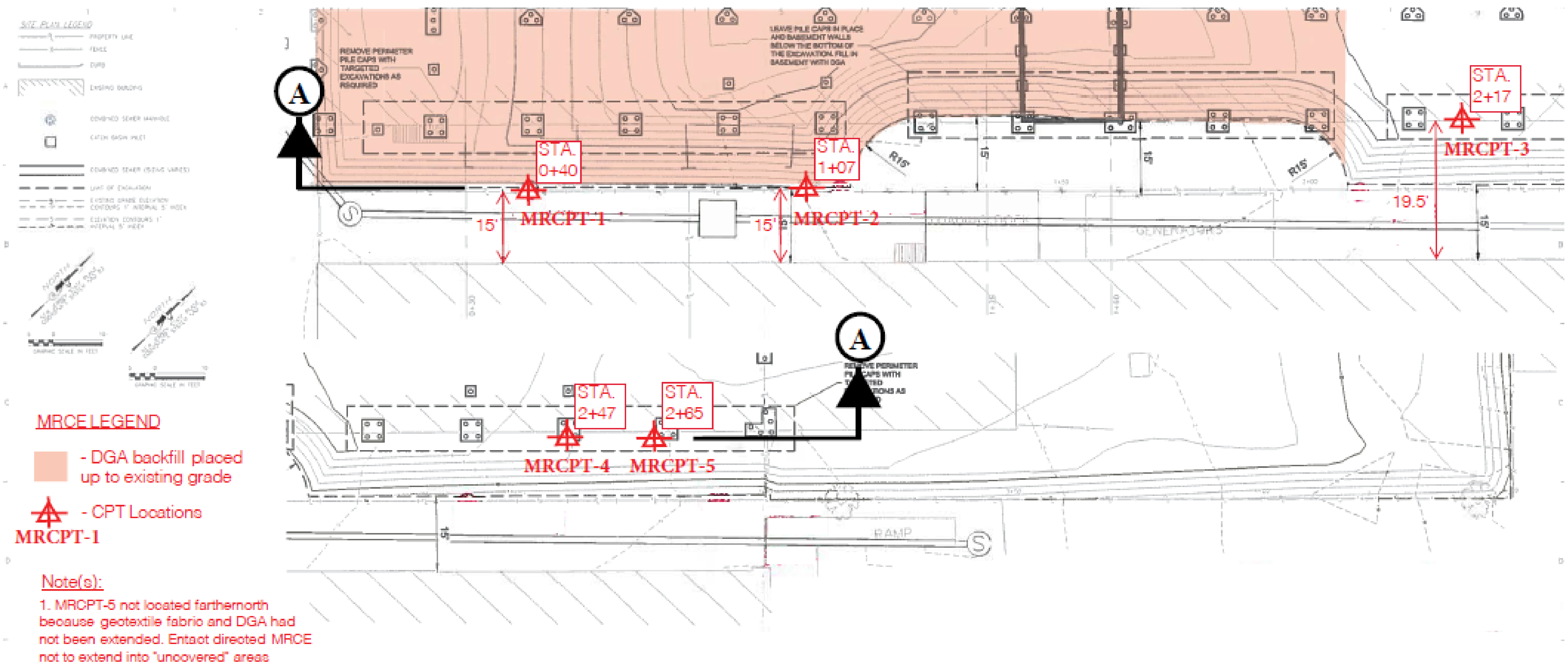
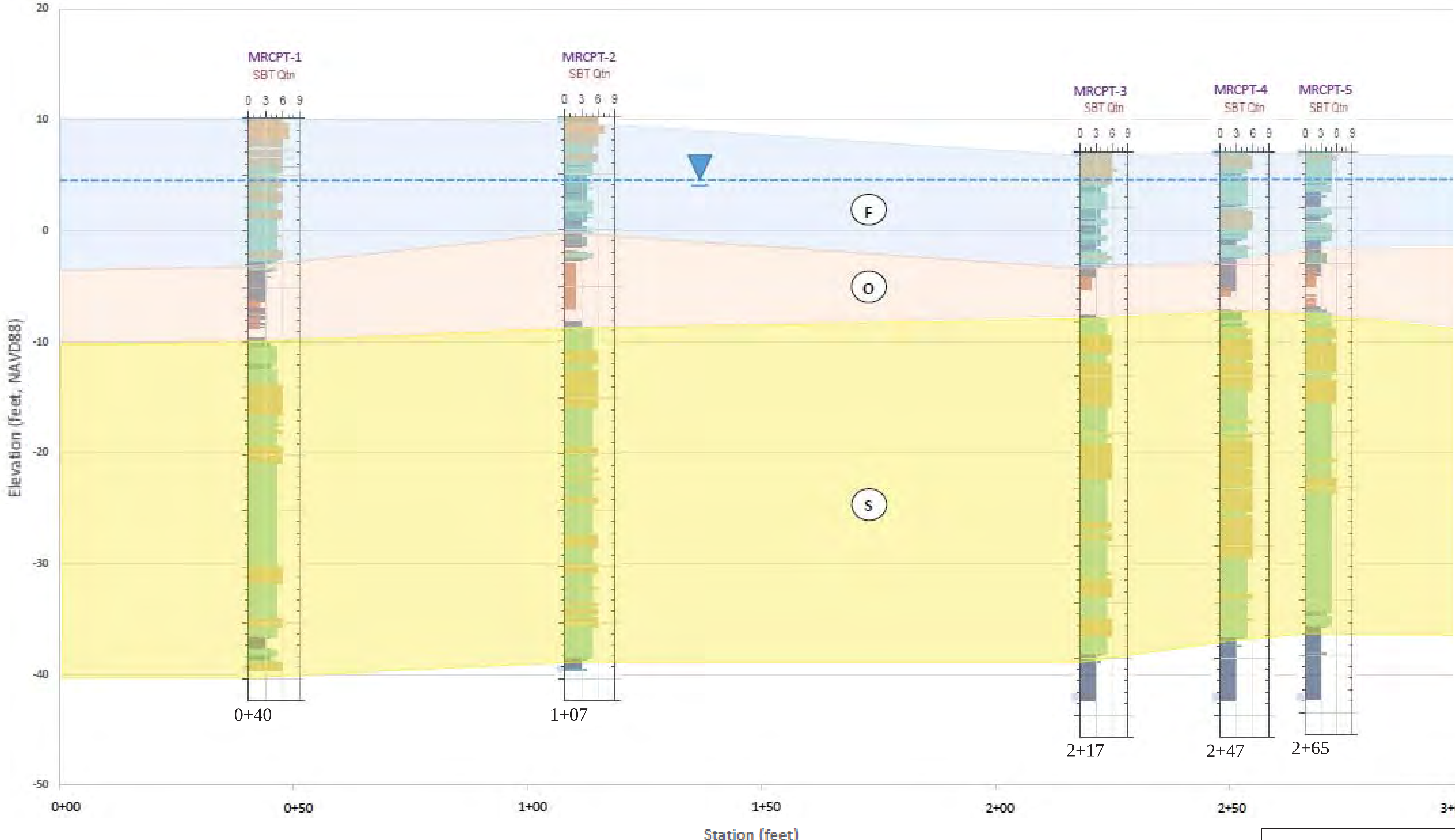


HALSTED BUILDING DEMO. AND REMEDIATION JERSEY CITY NEW JERSEY		
PPG MONROEVILLE PENNSYLVANIA		
MUESER RUTLEDGE CONSULTING ENGINEERS 225 WEST 34TH STREET, NEW YORK, NY 10122		
SCALE NA	MADE BY: SRL DATE: 08-20-18 CH'KD BY: DATE:	FILE NO. 11972B
CPT LOCATION PLAN		FIGURE NO. 1



Note(s):
1. SBT Qtn - Soil behavior type based on normalized CPT tip resistance

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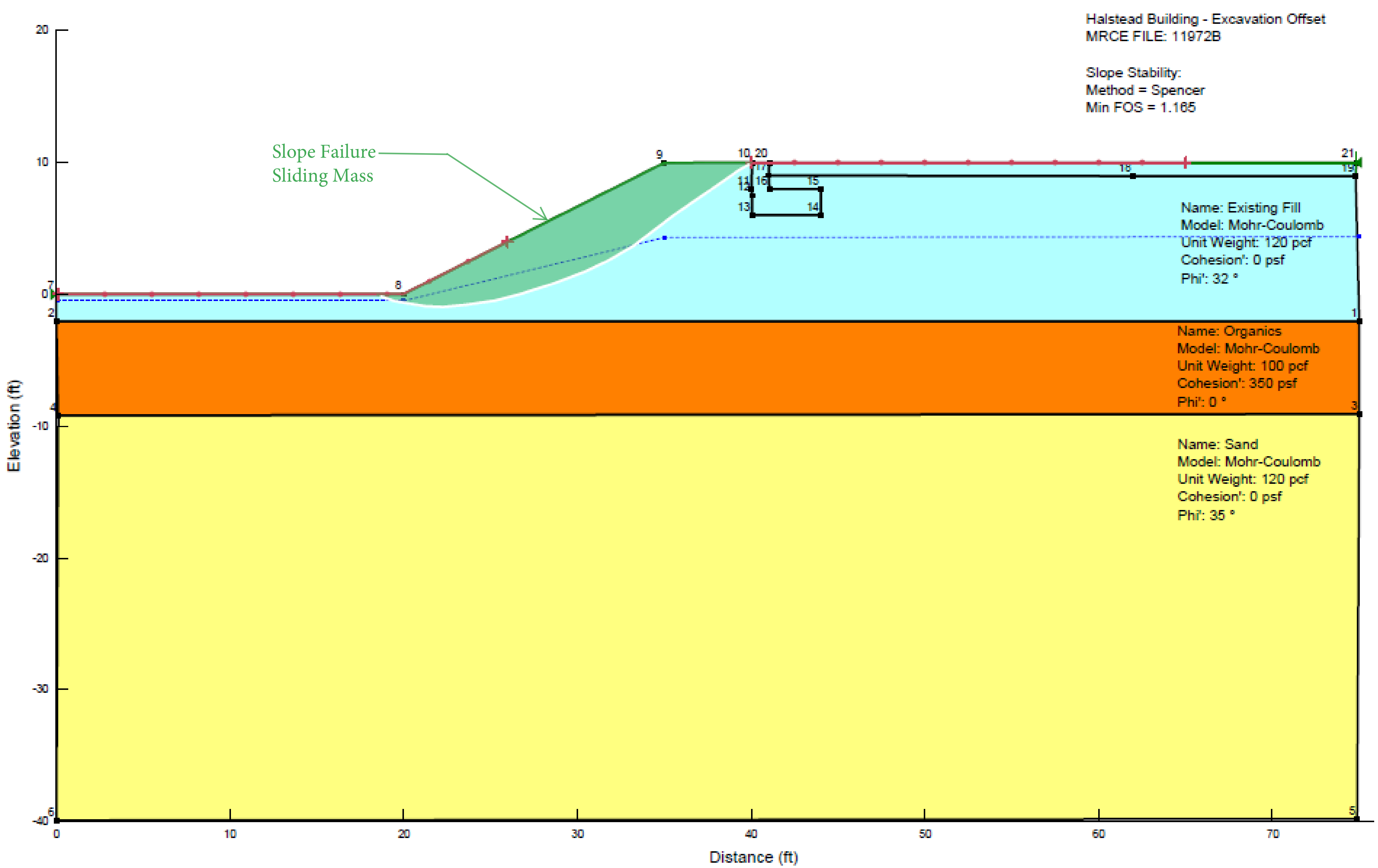
SCALE NA	MADE BY: SRL CH'KD BY:	DATE: 08-20-18 DATE:	FILE NO. 11972B
GEOLOGIC SECTION A-A			FIGURE NO. 2



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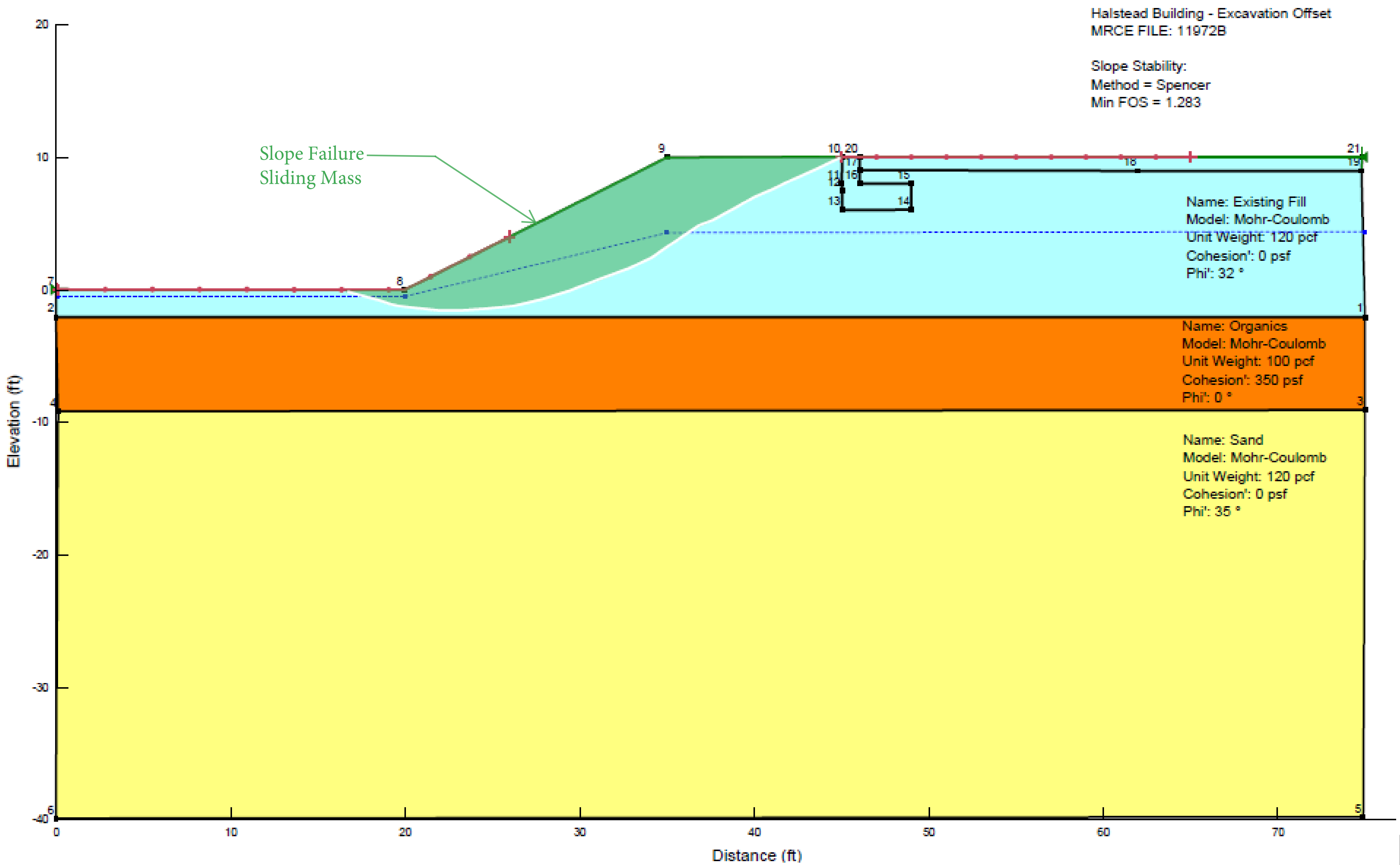
SLOPE STABILITY RESULTS **5-FT. OFFSET FROM TOP OF SLOPE**			FIGURE NO. 3A



HALSTED BUILDING DEMO. AND REMEDIATION

JERSEY CITY NEW JERSEY

PPG

MONROEVILLE PENNSYLVANIA

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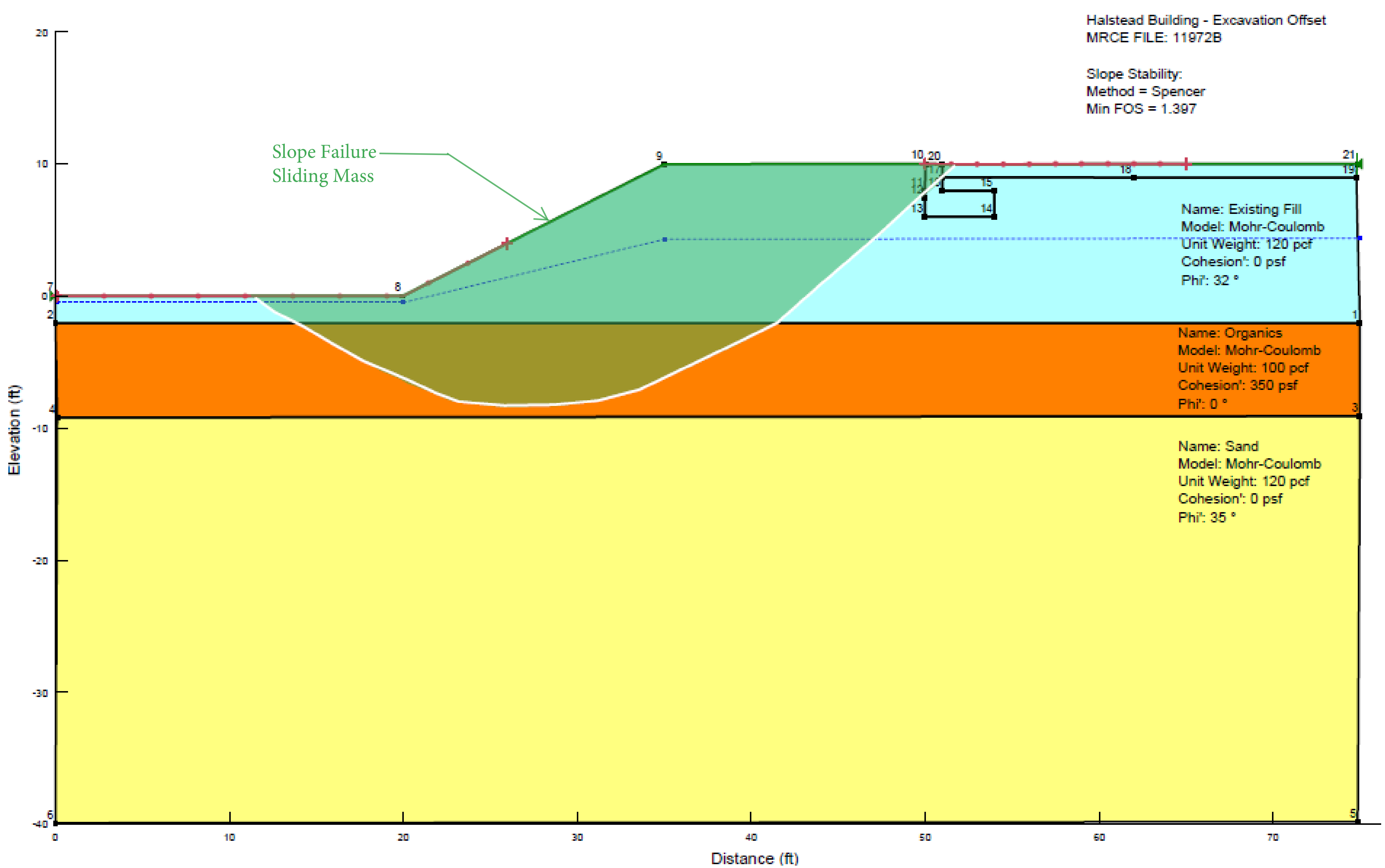
SLOPE STABILITY RESULTS
10-FT. OFFSET FROM TOP OF SLOPE

FIGURE NO. 3B



HALSTED BUILDING DEMO. AND REMEDIATION

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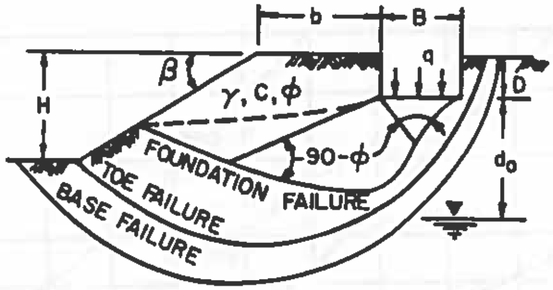
SLOPE STABILITY RESULTS **15-FT. OFFSET FROM TOP OF SLOPE**	FIGURE NO. 3C

CASE I: CONTINUOUS FOOTING AT TOP OF SLOPE



Water at $d_o \geq B$

$$q_{ult} = cN_{cq} + \gamma_T \frac{B}{2} N_{\gamma q} \qquad (1)$$

Water at Ground Surface

$$q_{ult} = cN_{cq} + \gamma_{sub} \frac{B}{2} N_{\gamma q} \qquad (2)$$

If $B \leq H$:

Constants: B & D assumed = 4-ft, d_o = 2-ft (below bot. of ftg.)

Obtain N_{cq} from Figure 4b for Case I with $N_o = 0$.
Interpolate for values of $0 < D/B < 1$

Interpolate q_{ult} between EQ (1) and (2) for water at intermediate level between ground surface and $d_o = B$.

If $B > H$:

Obtain N_{cq} from Figure 4b for Case I with stability number

$$N_o = \frac{\gamma H}{c}.$$

Interpolate for values $0 < D/B < 1$ for $0 < N_o < 1$. If $N_o \geq 1$, stability of slope controls ultimate bearing pressure.

Interpolate q_{ult} between EQ (1) and (2) for water at intermediate level between ground surface and $d_o = B$. For water at ground surface and sudden drawdown: substitute $\emptyset'$ for $\emptyset$ in EQ (2)

$$\emptyset' = \tan^{-1}\left(\frac{\gamma_{sub}}{\gamma_T} \tan \emptyset\right)$$

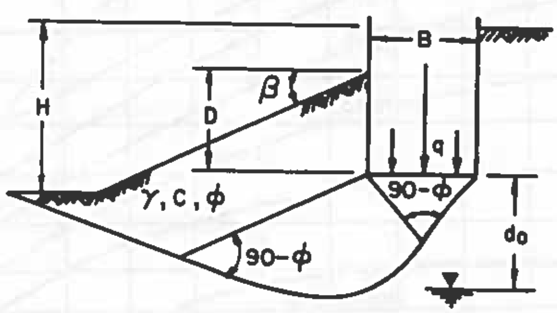
Cohesive soil ($\emptyset = 0$)

Substitute in EQ (1) and (2) D for $B/2$ and $N_{\gamma q} = 1$.

Rectangular, square or circular footing:

$$q_{ult} = \left[q_{ult} \text{ for continuous footing as given above} \right] \times \left[\frac{q_{ult} \text{ for finite footing}}{q_{ult} \text{ for continuous footing}} \right] \text{ from Fig. 1}$$

CASE II: CONTINUOUS FOOTINGS ON SLOPE



Same criteria as for Case I except that N_{cq} and $N_{\gamma q}$ are obtained from diagrams for Case II

FIGURE 4a
Ultimate Bearing Capacity For Shallow Footing Placed on or Near a Slope

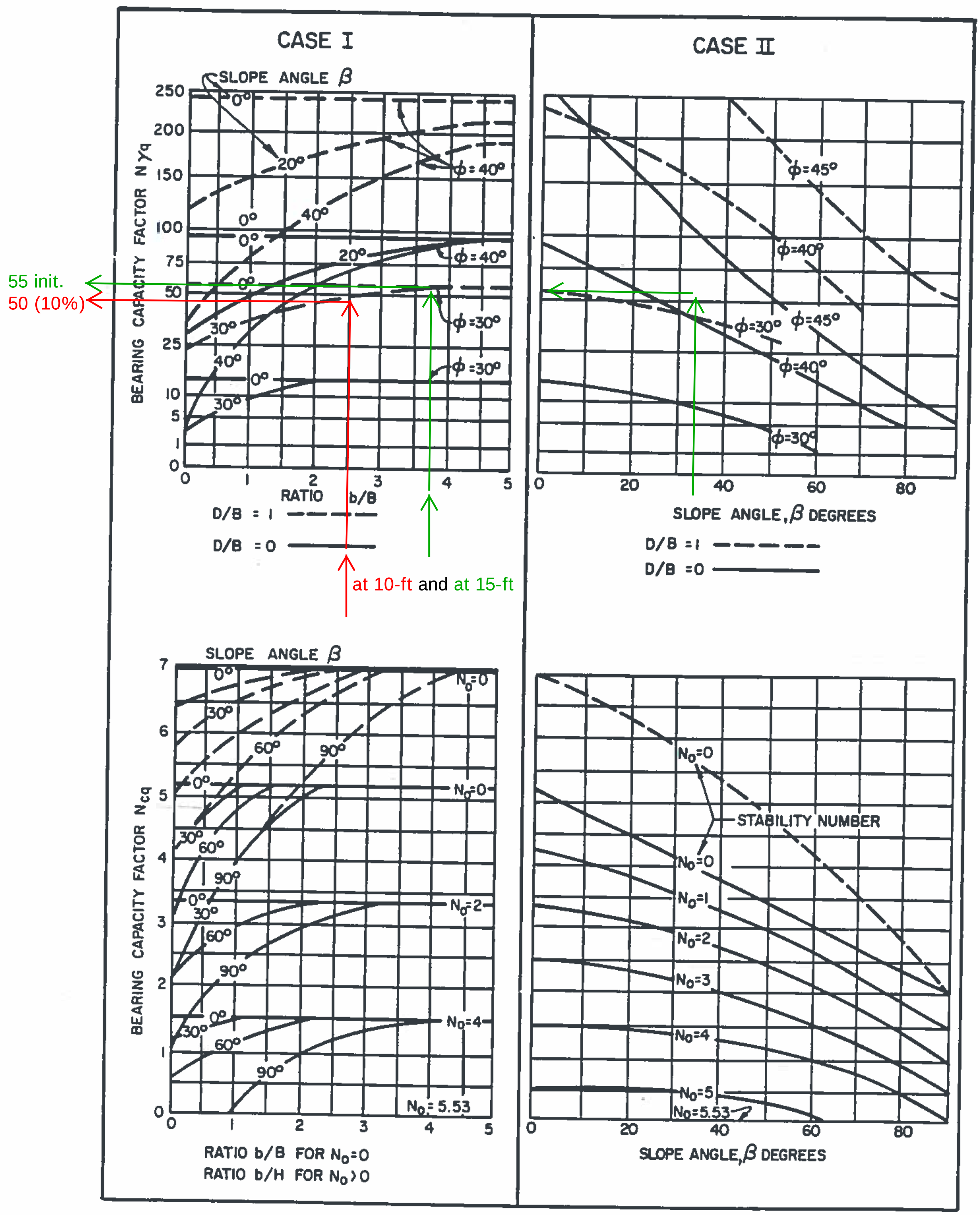


FIGURE 4b
Bearing Capacity Factors for Shallow Footing Placed on or Near a Slope

APPENDIX A

PRESENTATION OF SITE INVESTIGATION RESULTS

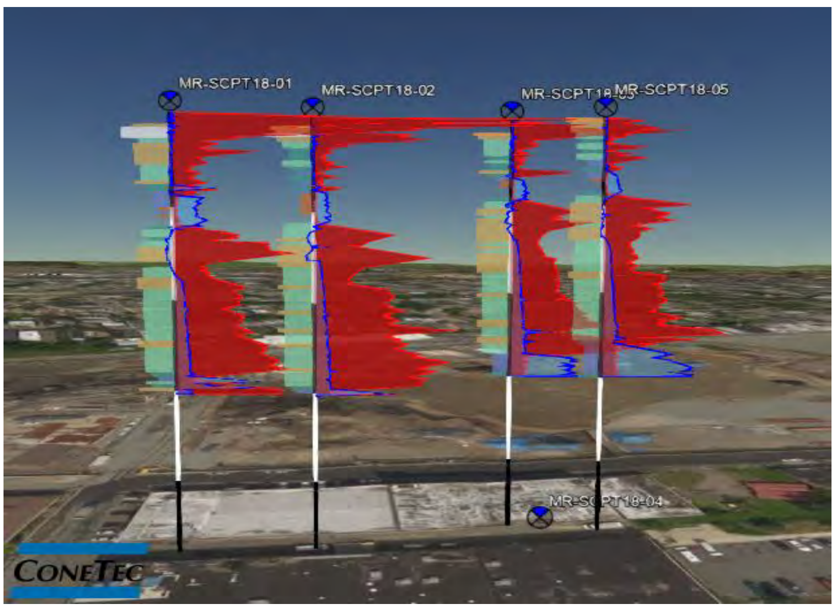
PPG Garfield Avenue
Jersey City, New Jersey

Prepared for:

Mueser Rutledge Consulting Engineers

ConeTec Job No: 18-53075

Project Start Date: 19-Jul-2018
Project End Date: 19-Jul-2018
Report Date: 24-Jul-2018



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Introduction

The enclosed report presents the results of a seismic piezocone penetration testing (SCPTu or SCPT) program carried out at the PPG Garfield Avenue site located in Jersey City, New Jersey. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to Mueser Rutledge Consulting Engineers (MRCE) of New York, New York.

A total of 5 seismic cone penetration tests were completed at 5 locations. The SCPT program was performed to evaluate the subsurface soil conditions. SCPT sounding locations were selected and numbered under supervision of MRCE personnel (Mr. Jimmy Cheung).

Project Information

Project	
Client	Mueser Rutledge Consulting Engineers
Project	PPG Garfield Avenue, Jersey City, NJ
ConeTec project number	18-53075

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)	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	GPS (GlobalSat MR-350)	32618 (WGS 84 / UTM North)

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	Four pore pressure dissipation tests were completed to primarily determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at five foot depth intervals at all locations.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
268:T1500F15U500	268	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of Mueser Rutledge Consulting Engineers (Client) for the project titled “PPG Garfield Avenue, Jersey City, NJ”. 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.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

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 a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface 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 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.

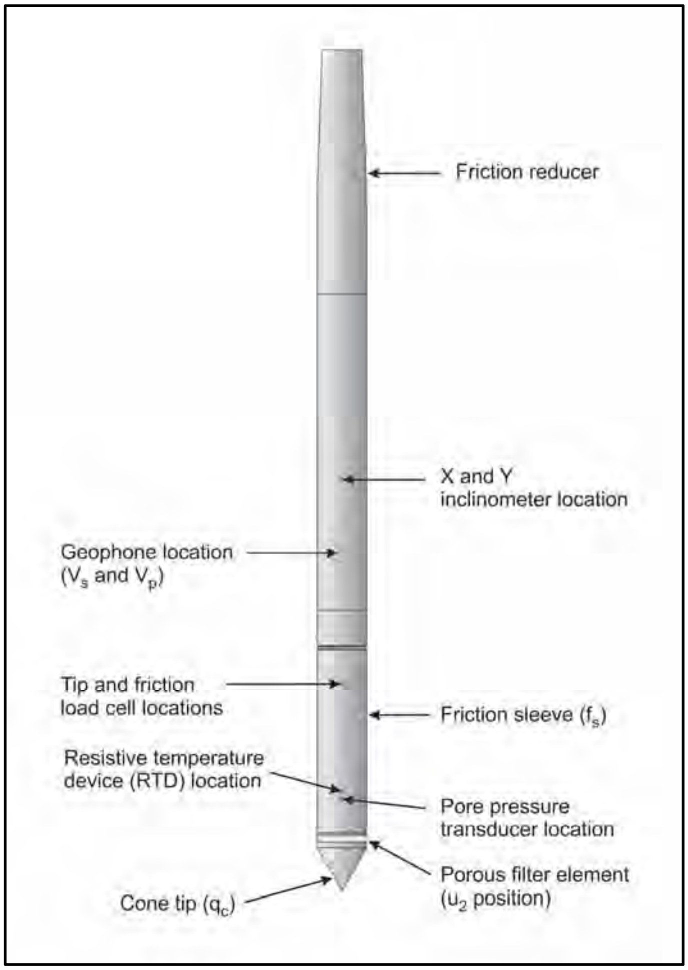


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. 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 intervals are either 2.5 cm or 5.0 cm depending on project requirements; 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 or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- 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 (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil 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 interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, 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.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

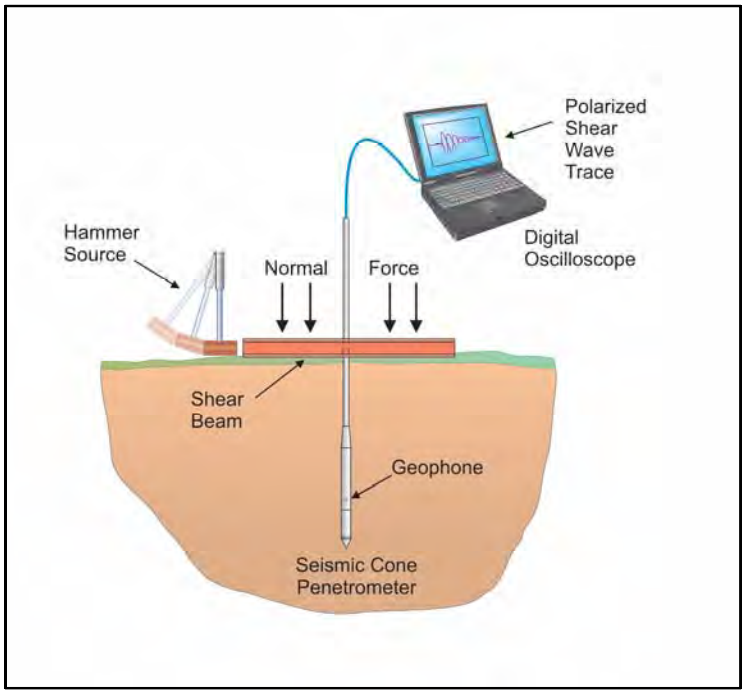


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

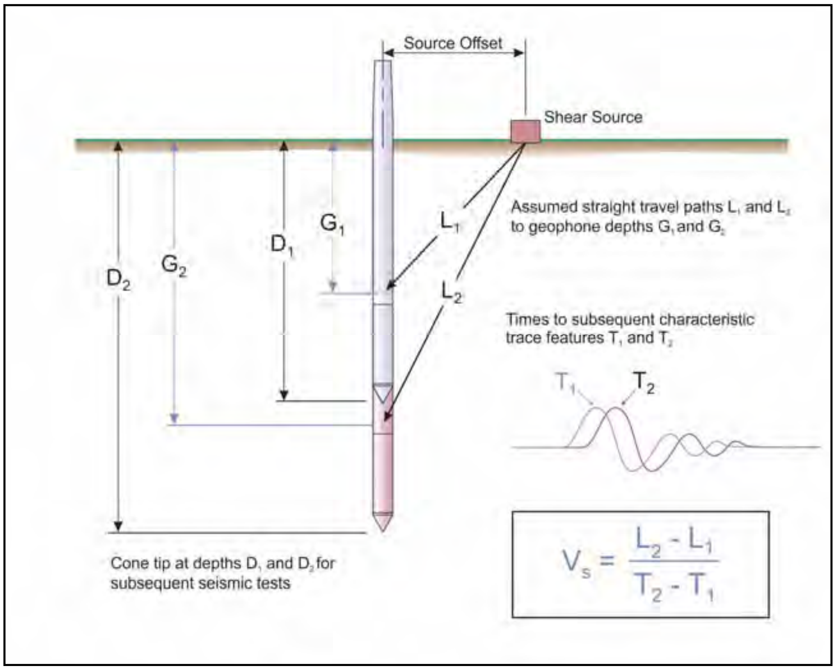


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

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).

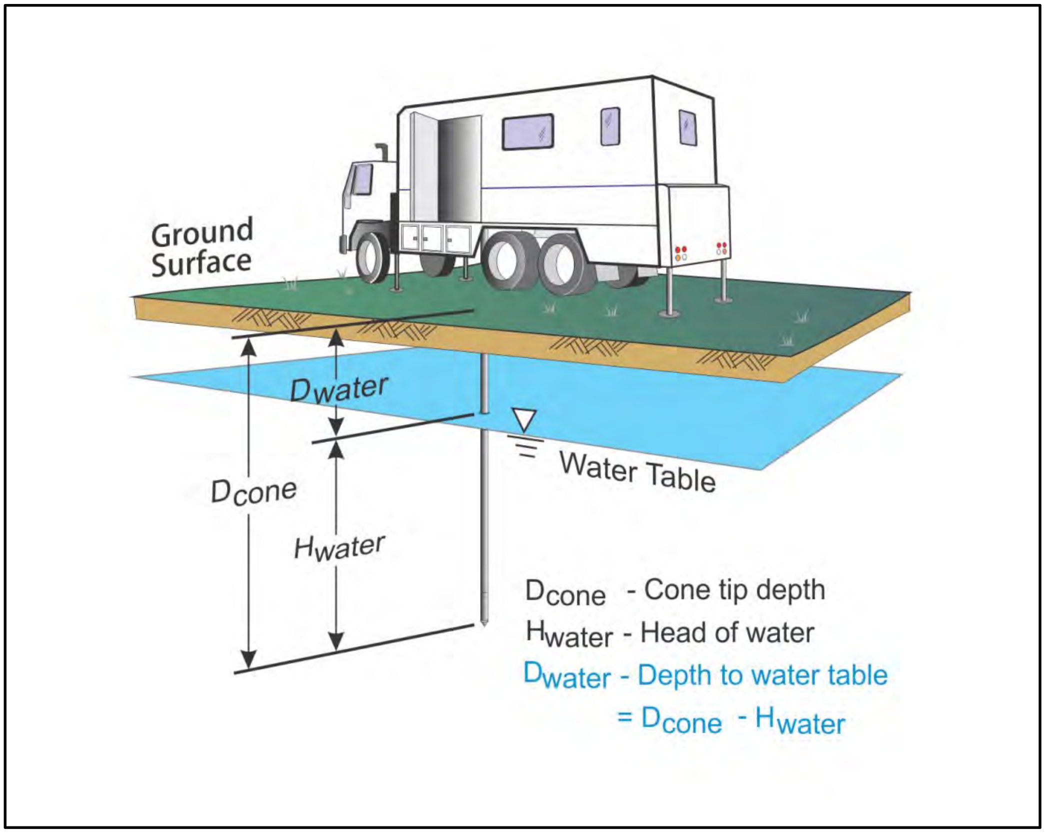


Figure PPD-1. Pore pressure dissipation test setup

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.

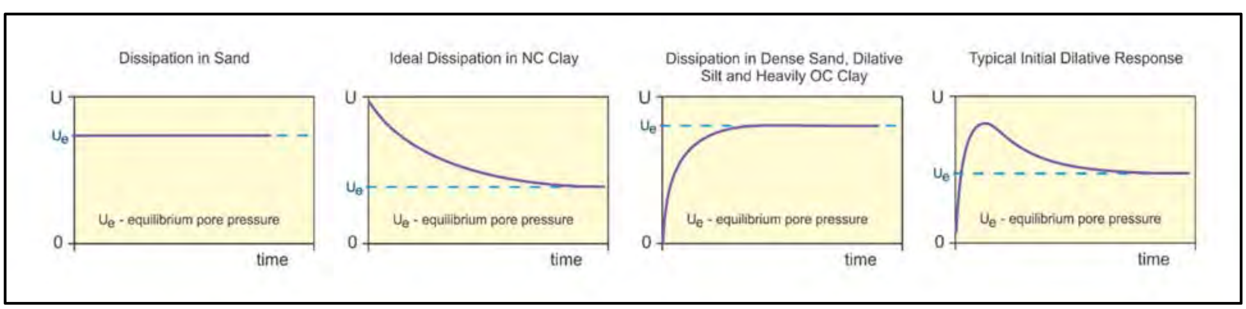


Figure PPD-2. Pore pressure dissipation curve examples

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 of 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
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Time Domain Traces
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Start Date: 19-Jul-2018
End Date: 19-Jul-2018

CONE PENETRATION TEST SUMMARY

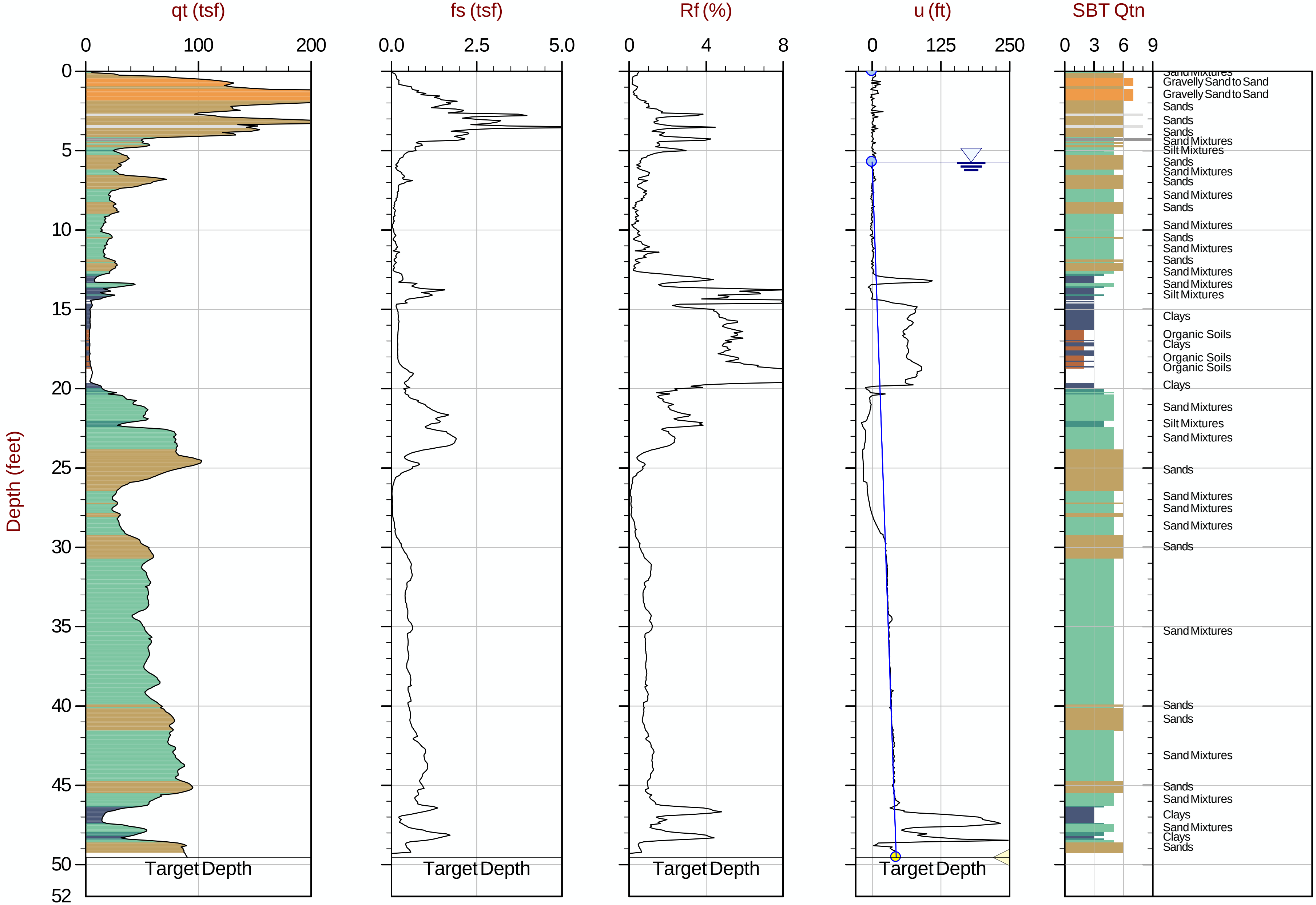
Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Refer to Notation Number
MR-SCPT18-01	18-53075_SP01	7/19/2018	268:T1500F15U500	5.7	49.54	4	4506651	578595	
MR-SCPT18-02	18-53075_SP02	7/19/2018	268:T1500F15U500	5.9	49.54	5	4506666	578611	
MR-SCPT18-03	18-53075_SP03	7/19/2018	268:T1500F15U500	2.1	49.05	5	4506694	578632	
MR-SCPT18-04	18-53075_SP04	7/19/2018	268:T1500F15U500	2.7	49.05	5	4506696	578638	3
MR-SCPT18-05	18-53075_SP05	7/19/2018	268:T1500F15U500	2.7	49.05	5	4506701	578646	3
Totals	5 soundings				246.22	24			

1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are WGS 84 / UTM Zone 18 and were collected using a MR-350 GlobalSat GPS Receiver.
3. Assumed phreatic surface estimated from the dynamic porepressure response.
4. No phreatic surface detected

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 08:11
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-01
Cone: 268:T1500F15U500



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

File: 18-53075_SP01.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506651m E: 578595m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

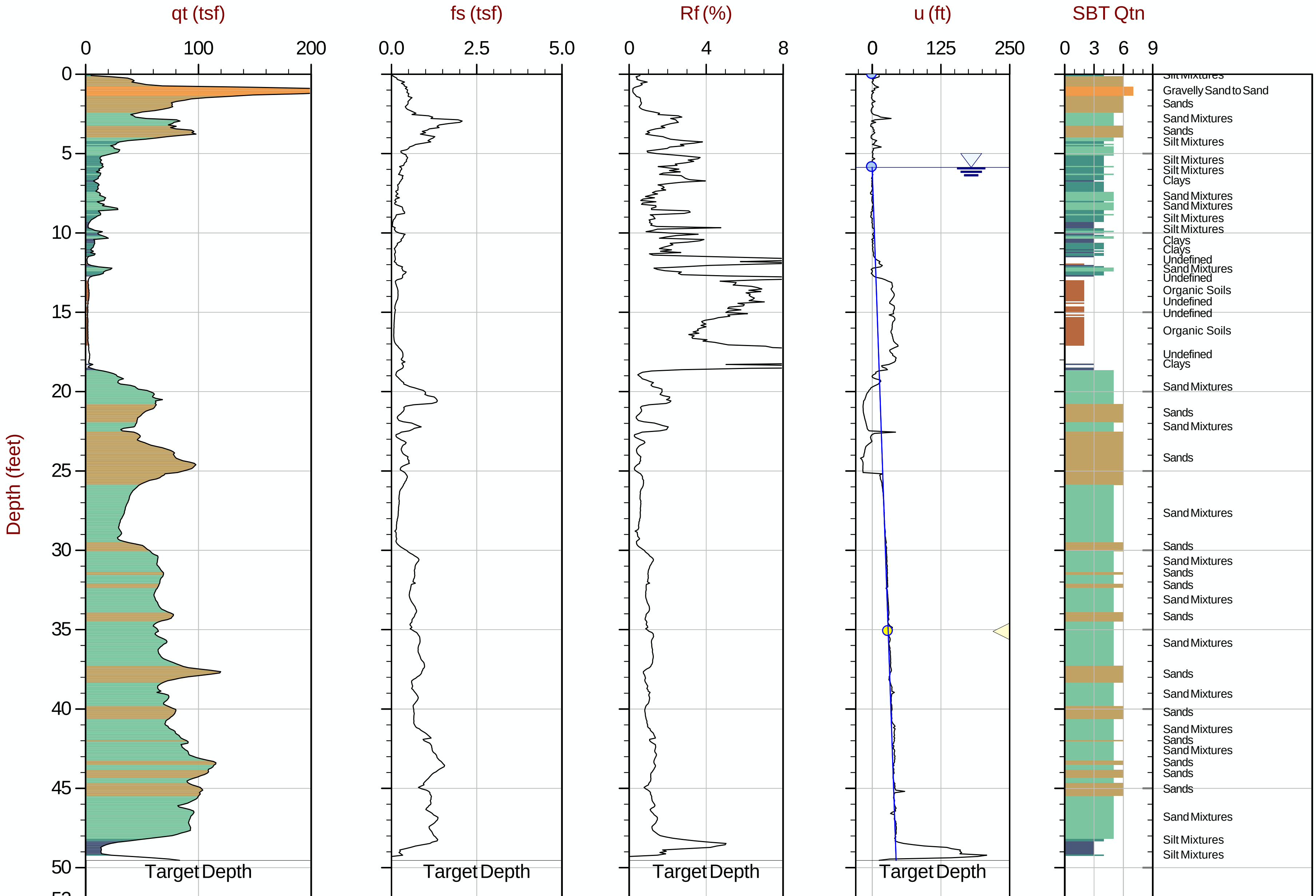
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 09:12
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-02
Cone: 268:T1500F15U500



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

File: 18-53075_SP02.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506666m E: 578611m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

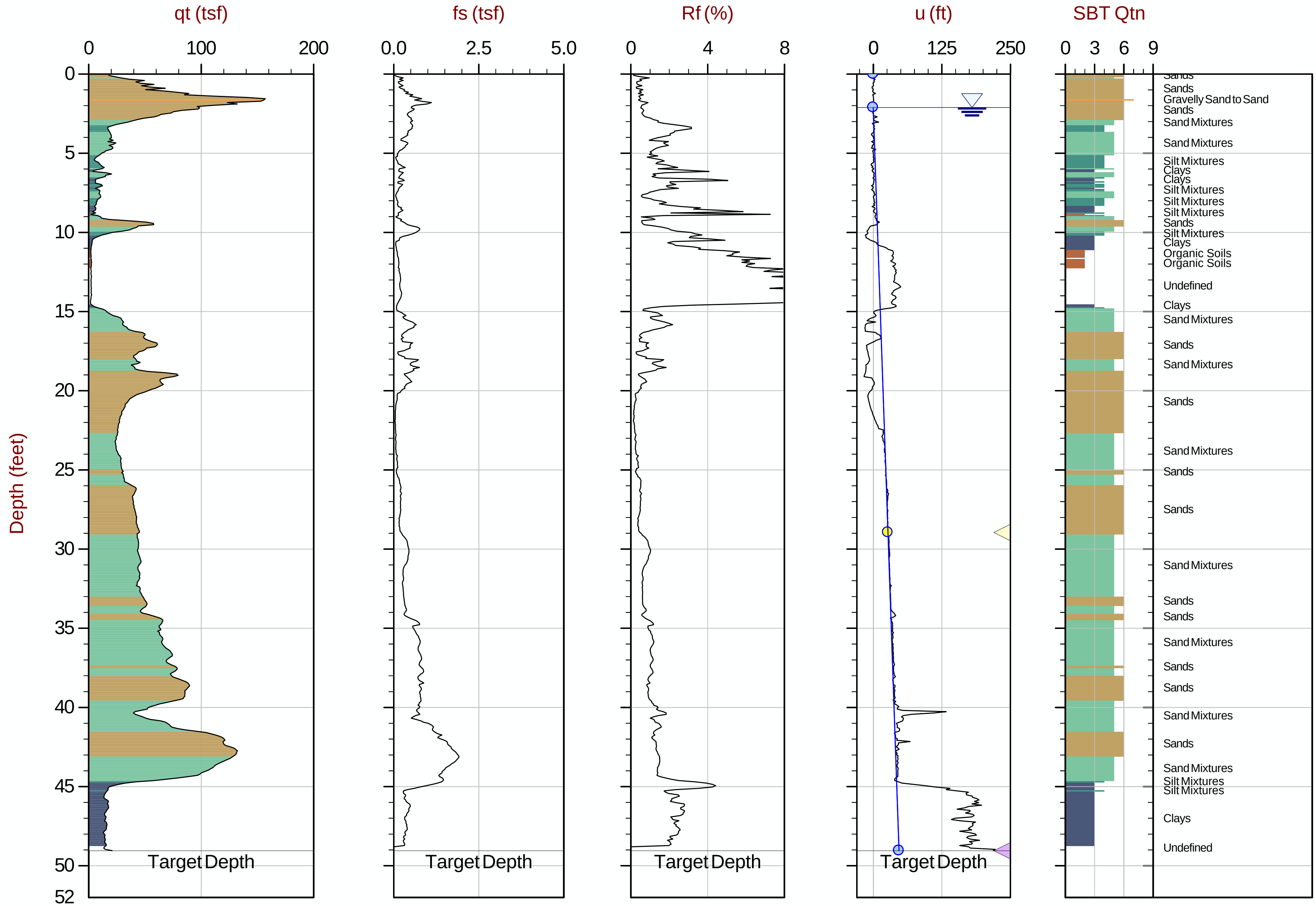
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 10:15
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-03
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP03.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506694m E: 578632m

Hydrostatic Line — Ueq — Assumed Ueq — PPD, Ueq achieved — PPD, Ueq not achieved

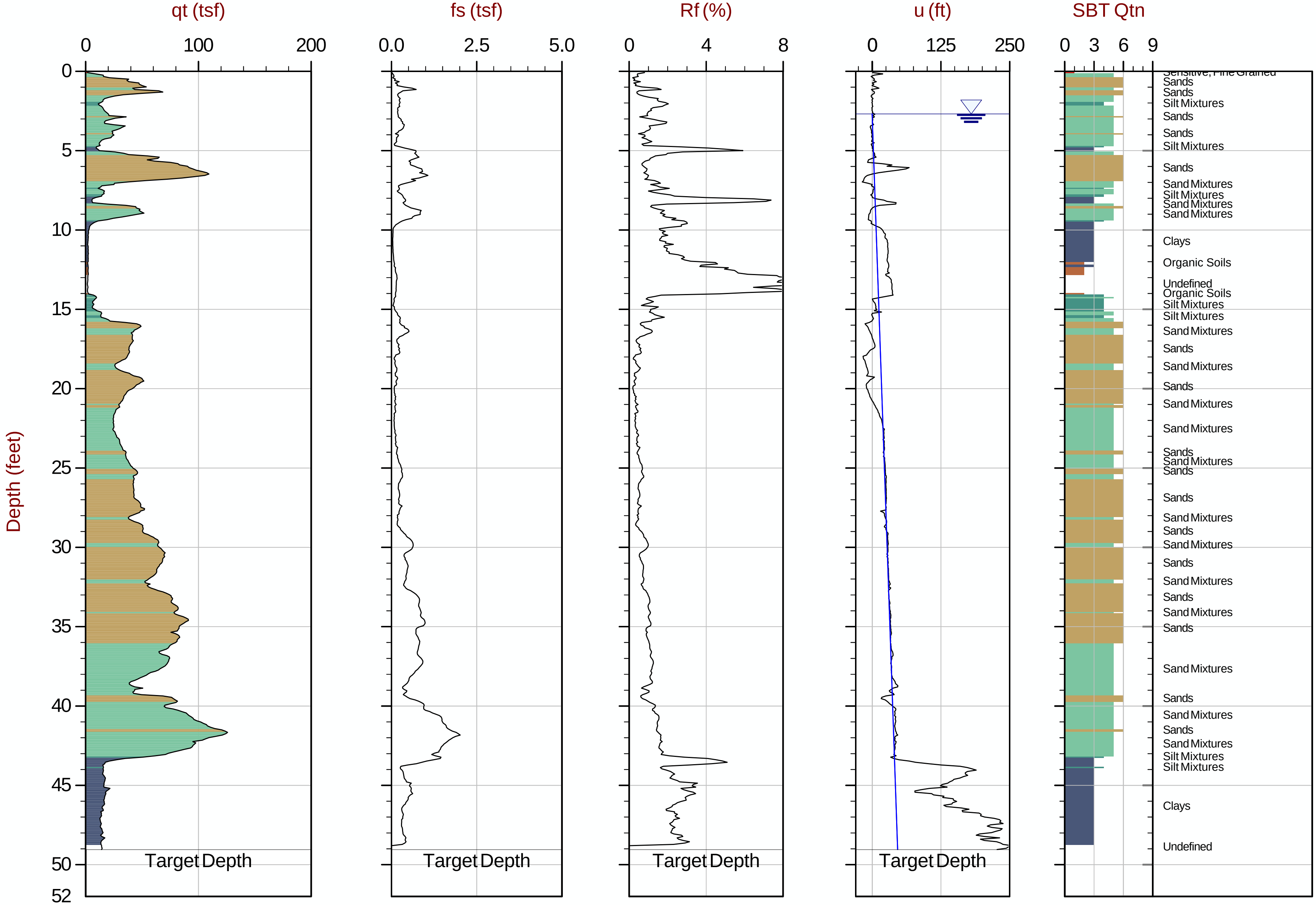
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 11:04
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-04
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP04.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506696m E: 578638m

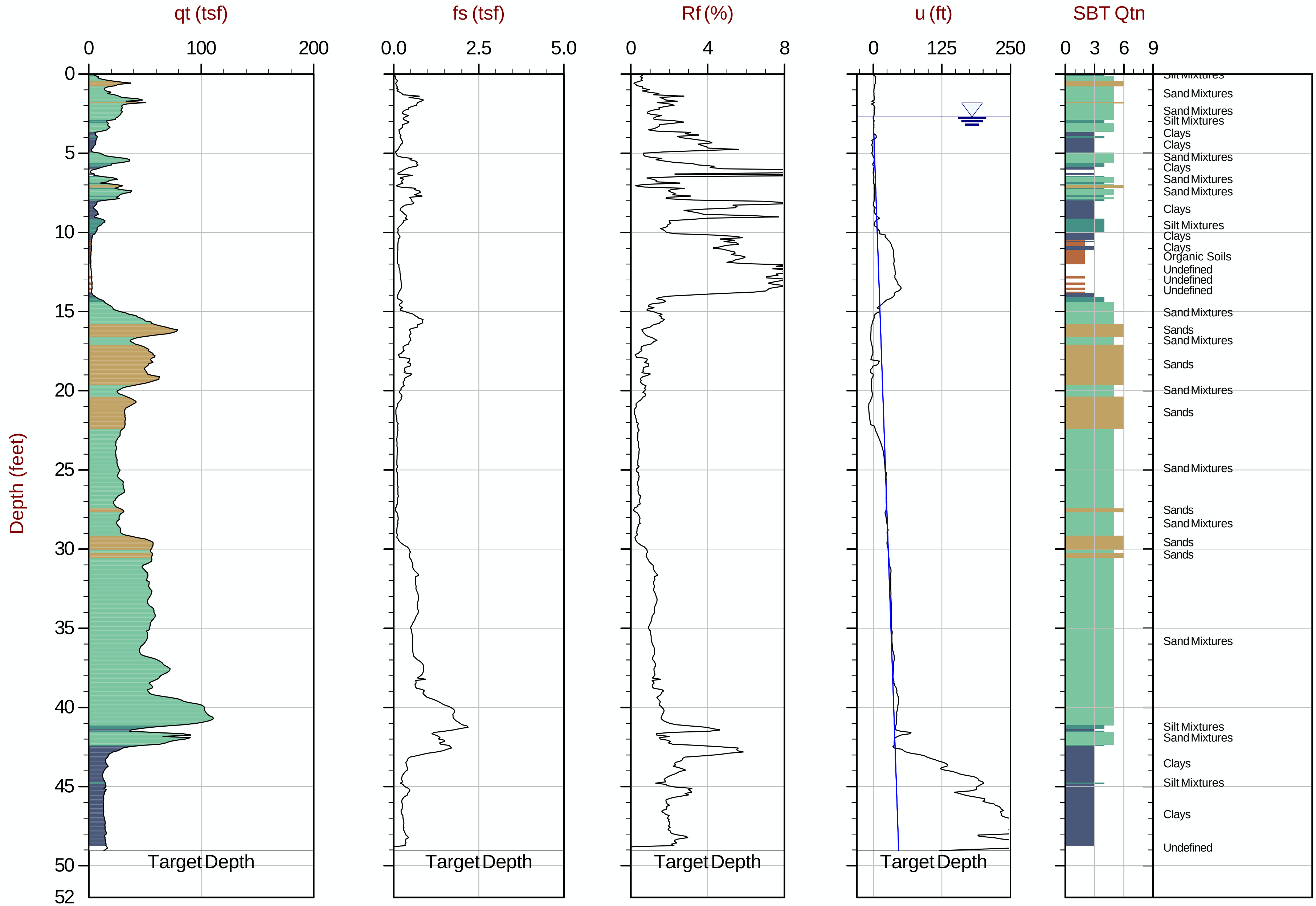
Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

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

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 11:38
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-05
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP05.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506701m E: 578646m

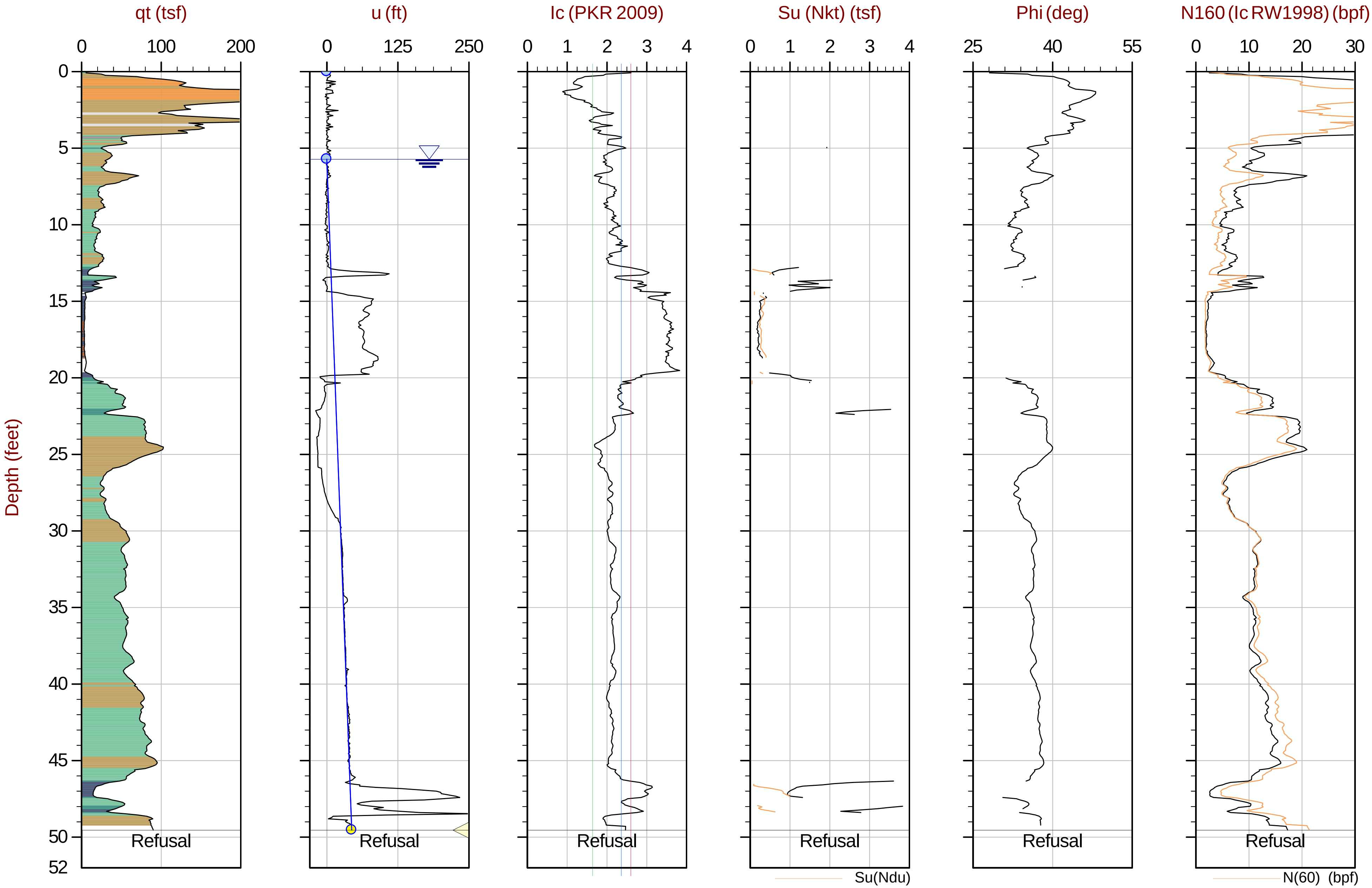
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

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 Test Plots

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 08:11
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-01
Cone: 268:T1500F15U500



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

File: 18-53075_SP01.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506651m E: 578595m

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

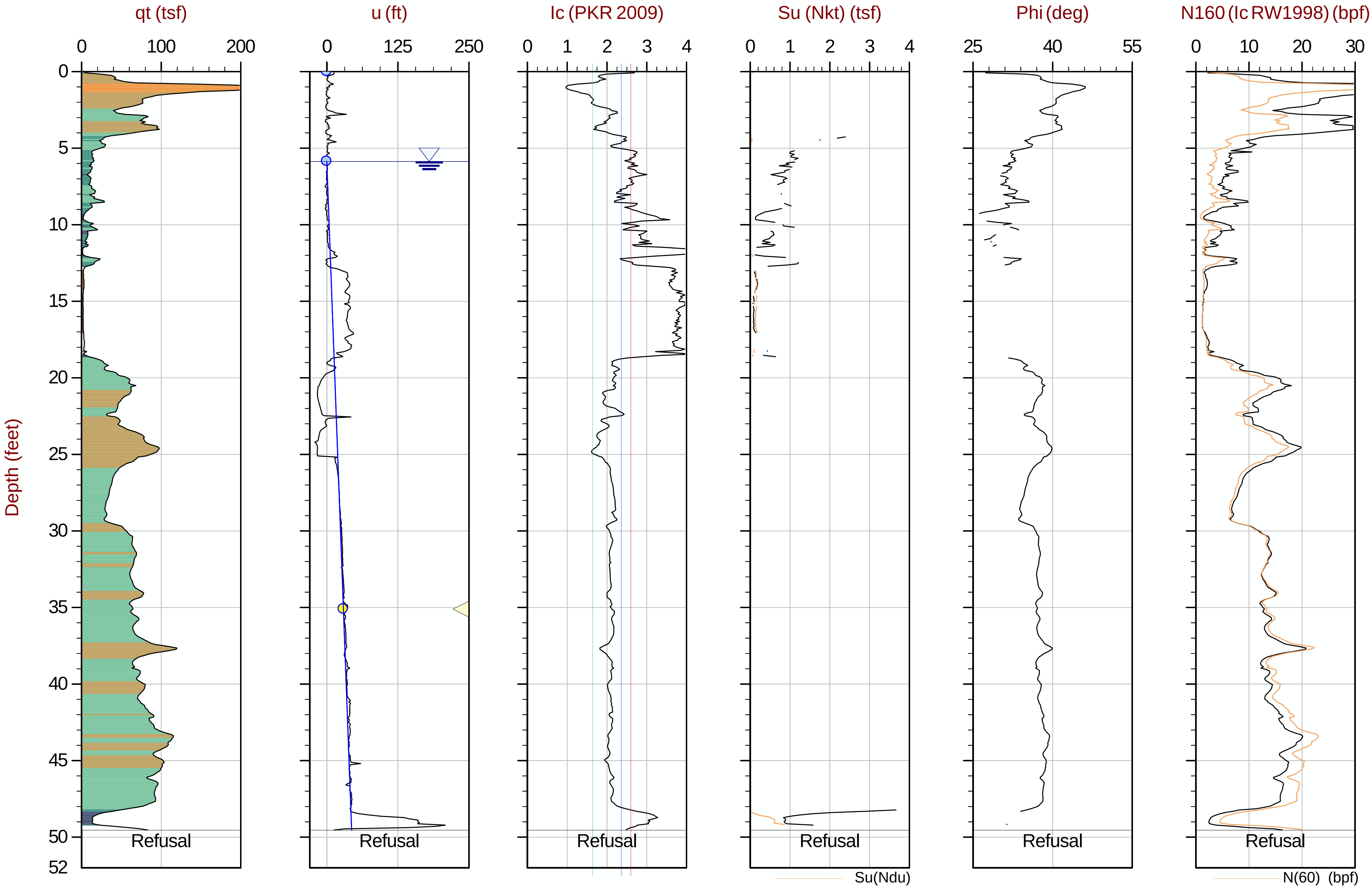
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 09:12
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-02
Cone: 268:T1500F15U500



Max Depth: 15.100 m / 49.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP02.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506666m E: 578611m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

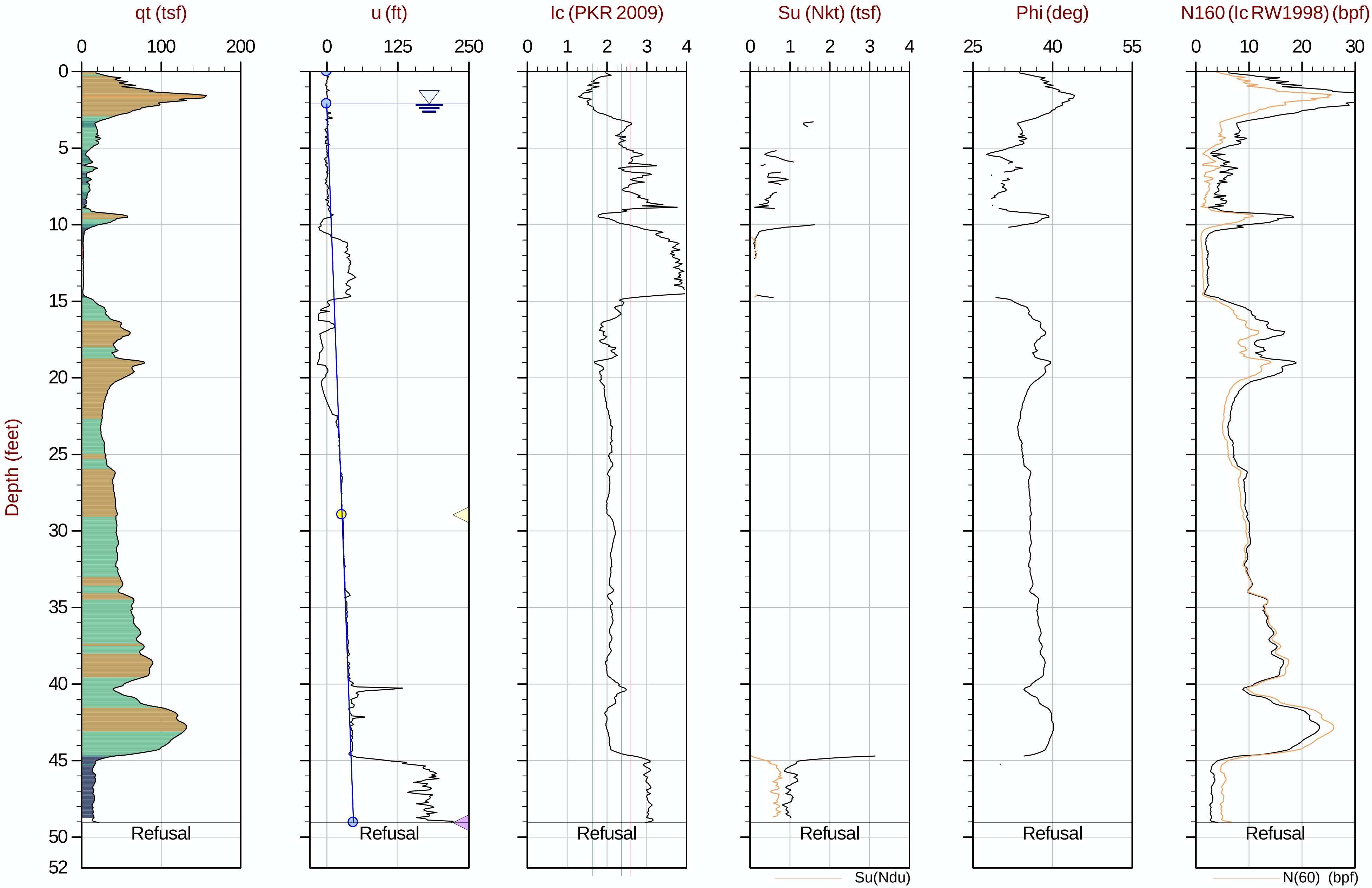
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 10:15
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-03
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP03.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506694m E: 578632m

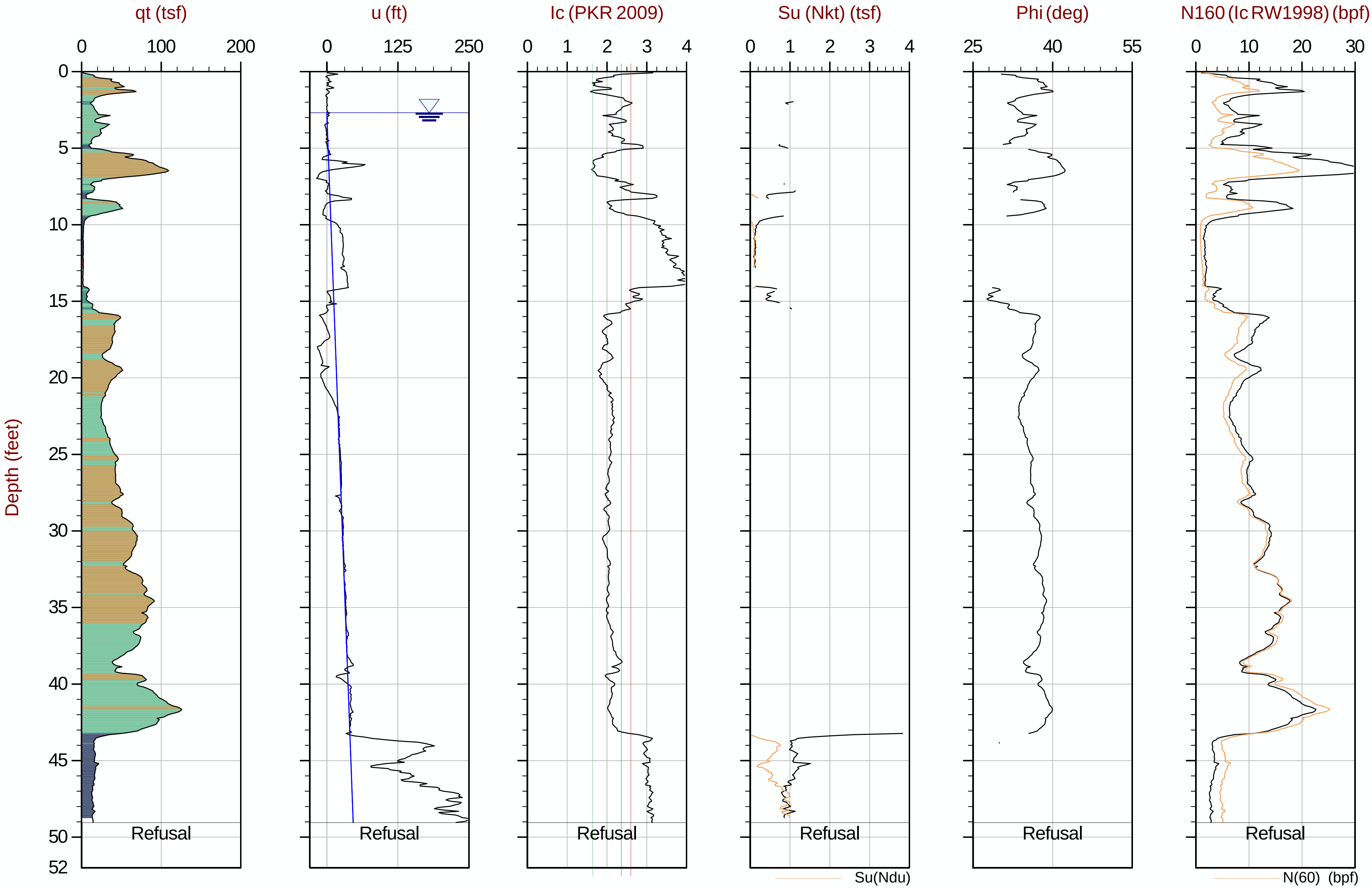
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

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

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 11:04
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-04
Cone: 268:T1500F15U500



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

File: 18-53075_SP04.COR
Su Nkt/Ndu: 12.5 / 6.0

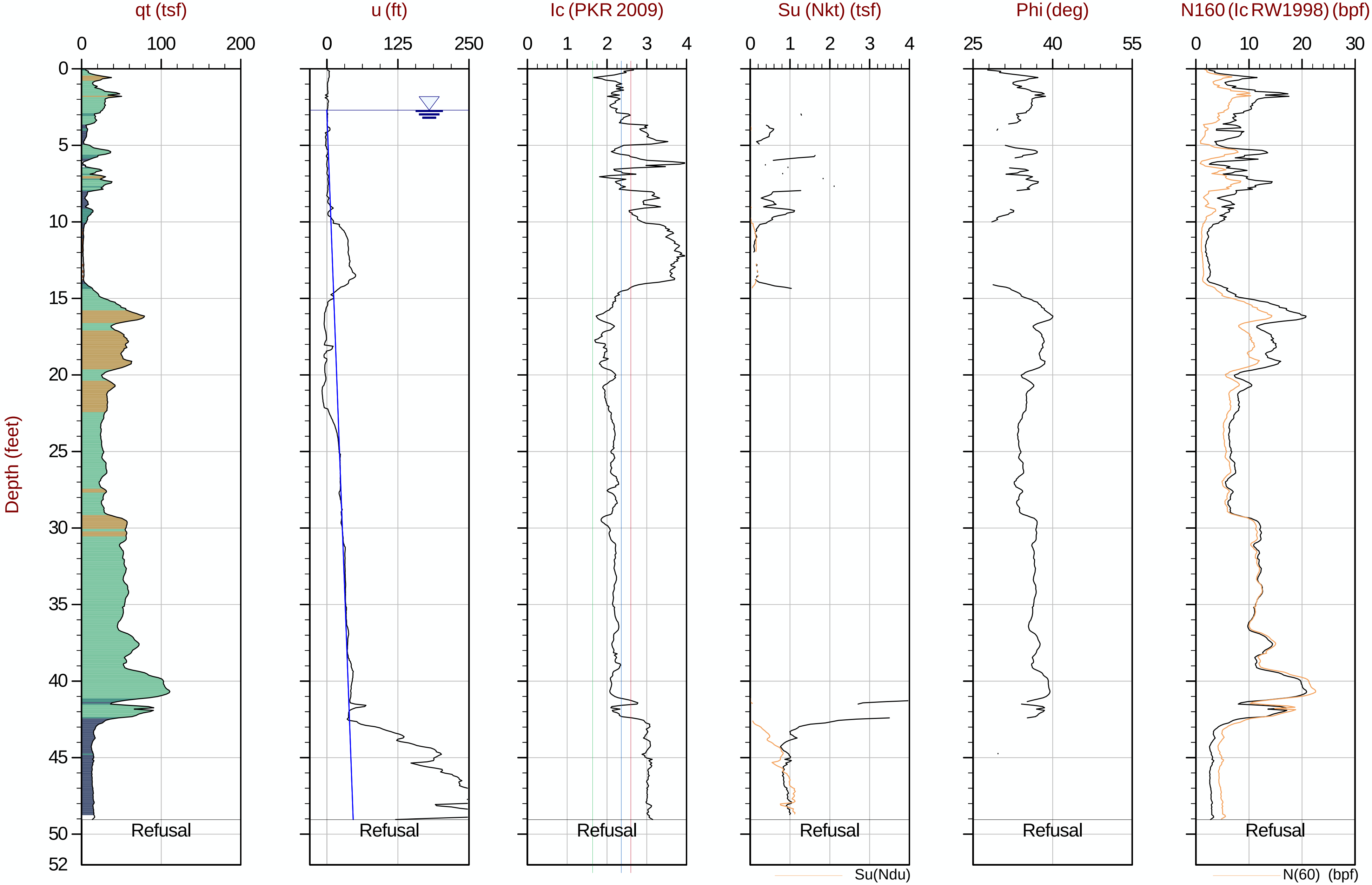
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506696m E: 578638m

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.

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 11:38
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-05
Cone: 268:T1500F15U500



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

File: 18-53075_SP05.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506701m E: 578646m

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.

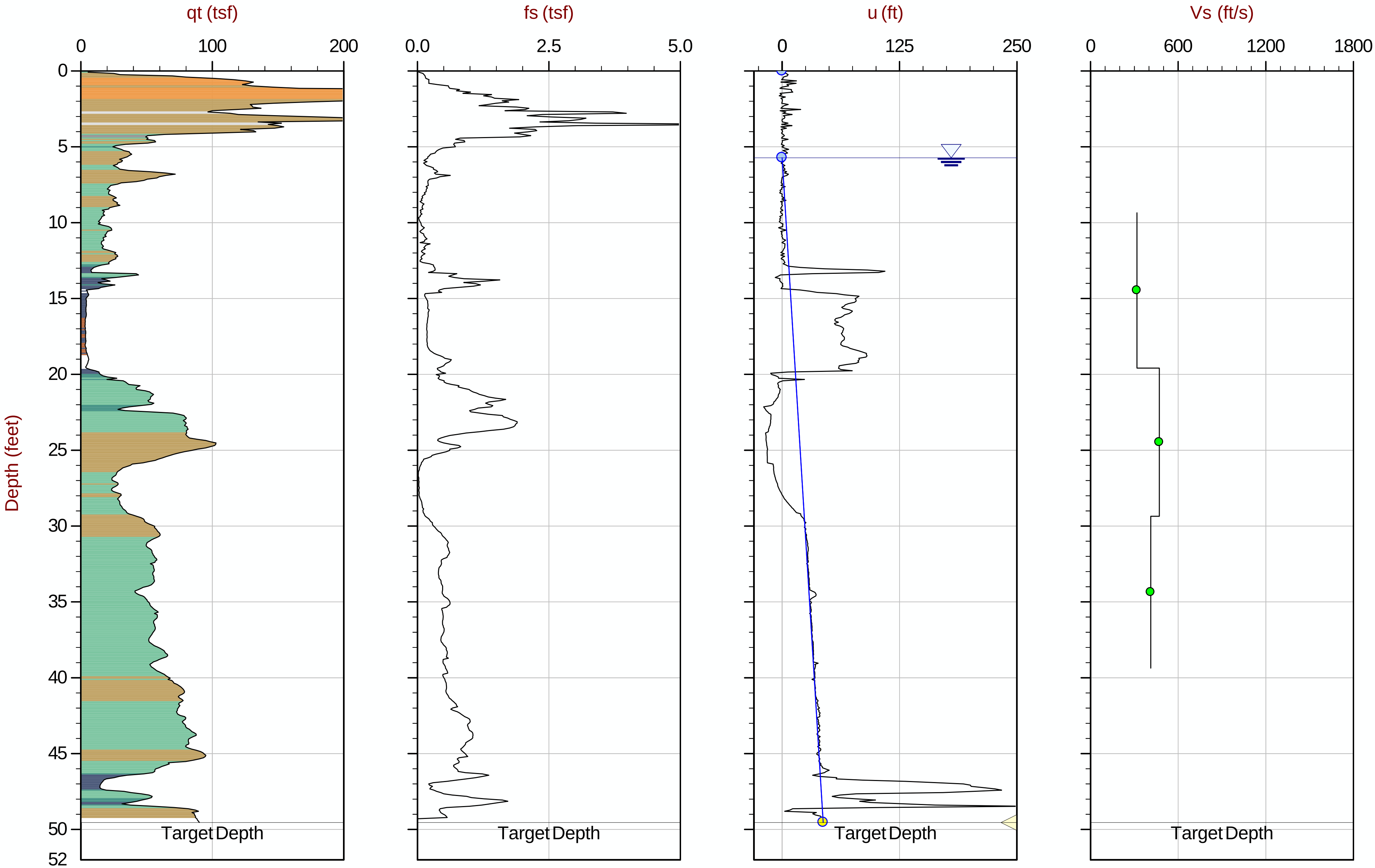
Seismic Cone Penetration Test Plots

ConeTec

ConeTec

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 08:11
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-01
Cone: 268:T1500F15U500



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

File: 18-53075_SP01.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506651m E: 578595m

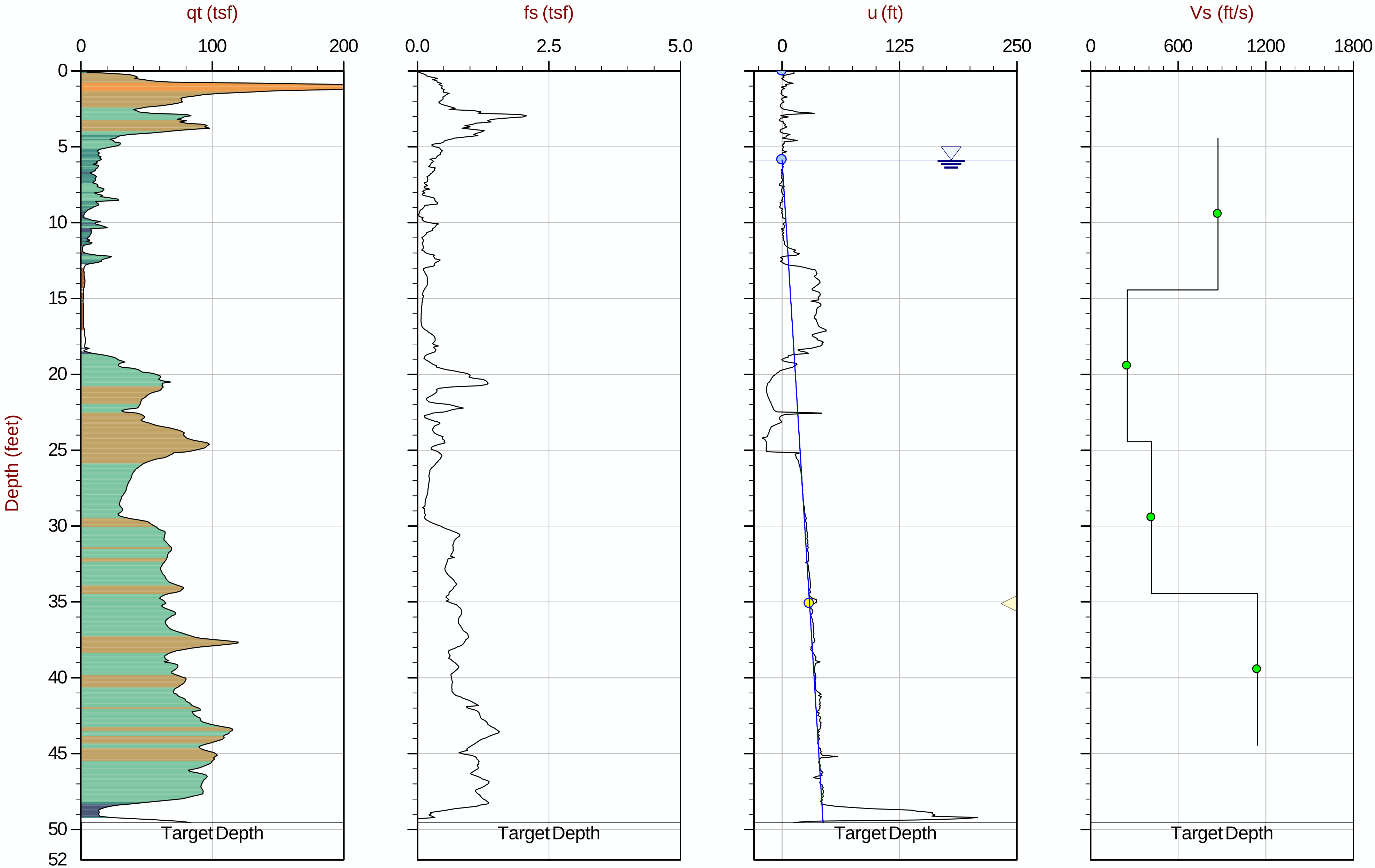
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

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

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 09:12
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-02
Cone: 268:T1500F15U500



Max Depth: 15.100 m / 49.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP02.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506666m E: 578611m

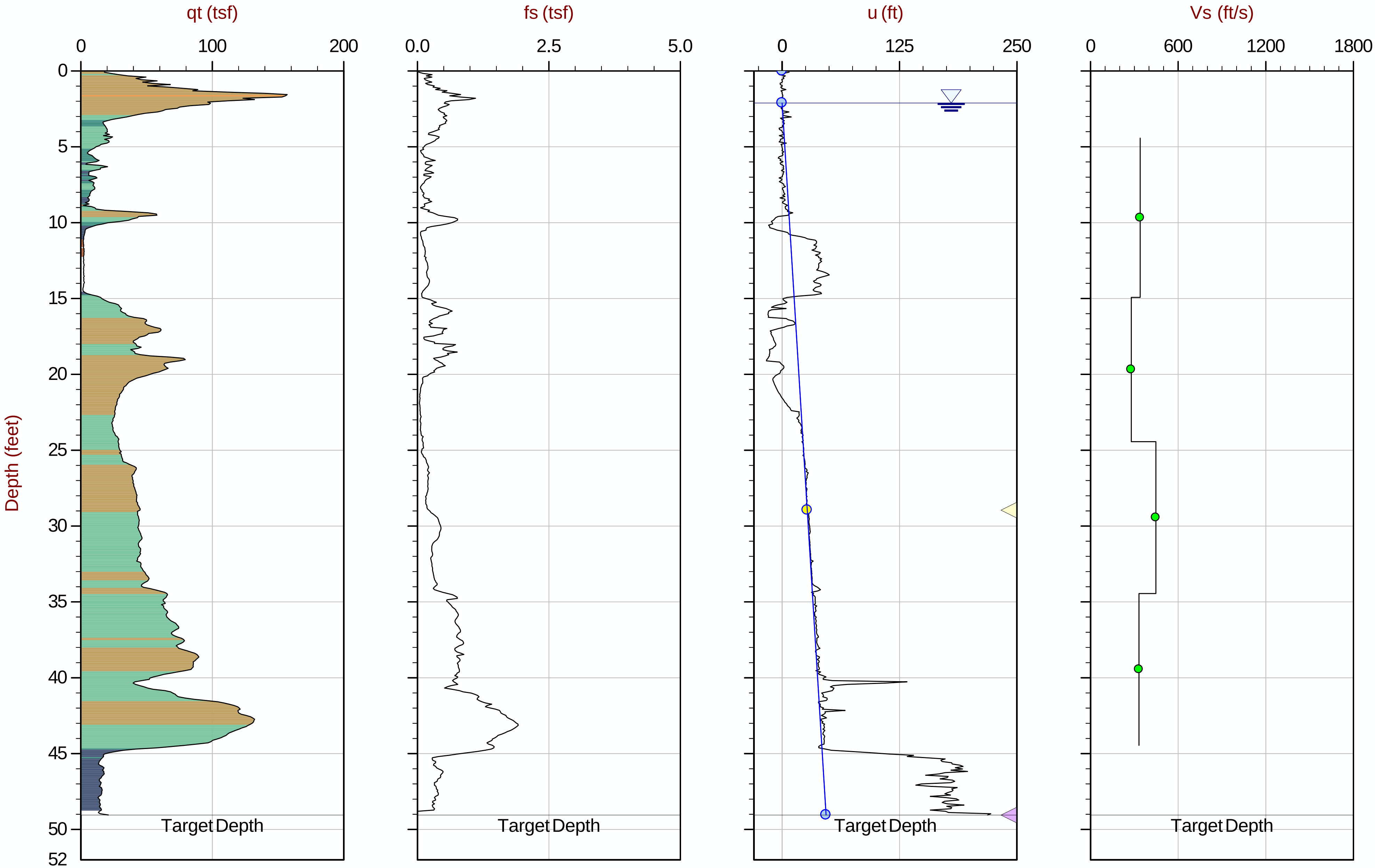
Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

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

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 10:15
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-03
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP03.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506694m E: 578632m

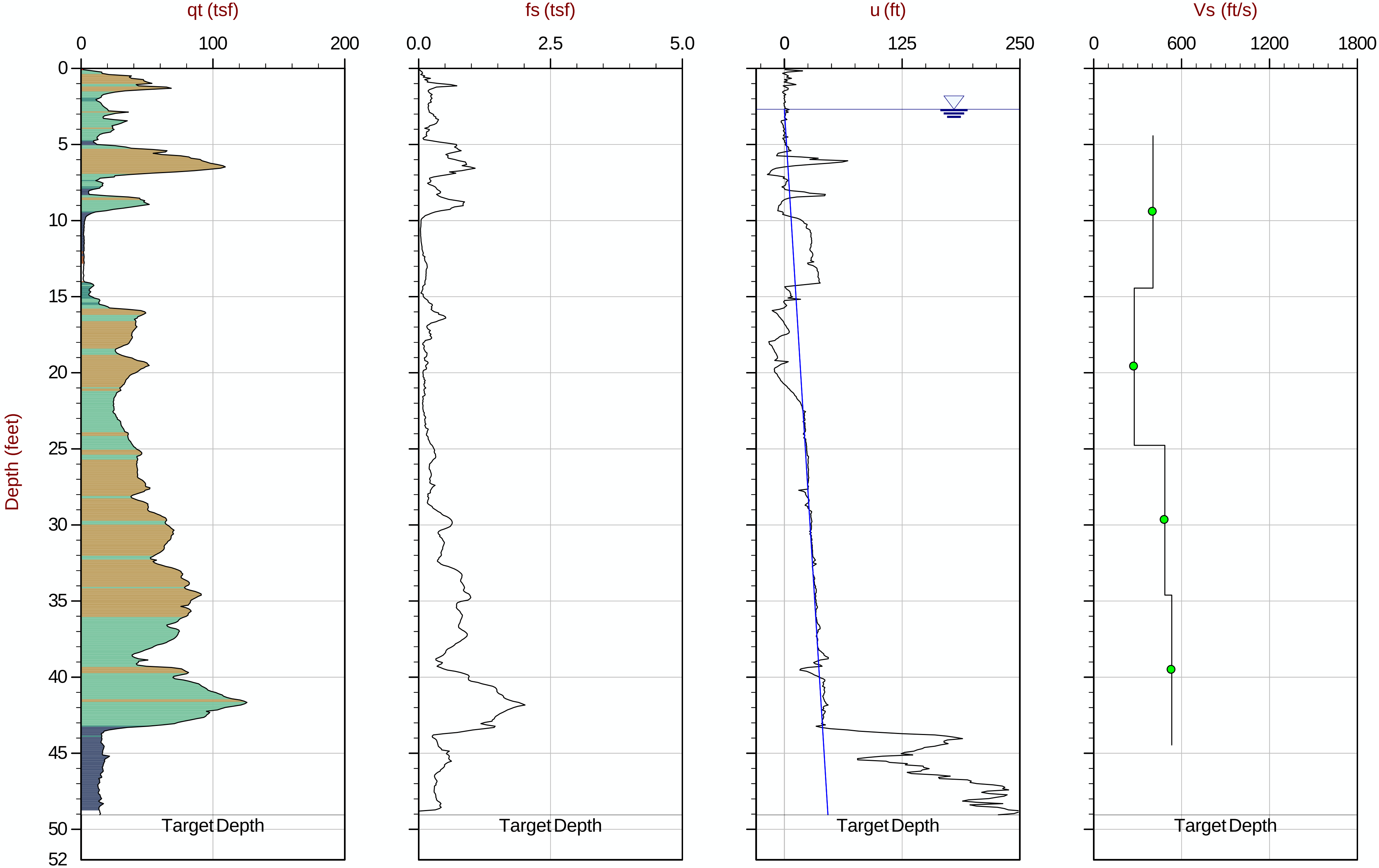
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

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

Mueser Rutledge

Job No: 18-53075
Date: 2018-07-19 11:04
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-04
Cone: 268:T1500F15U500



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP04.COR

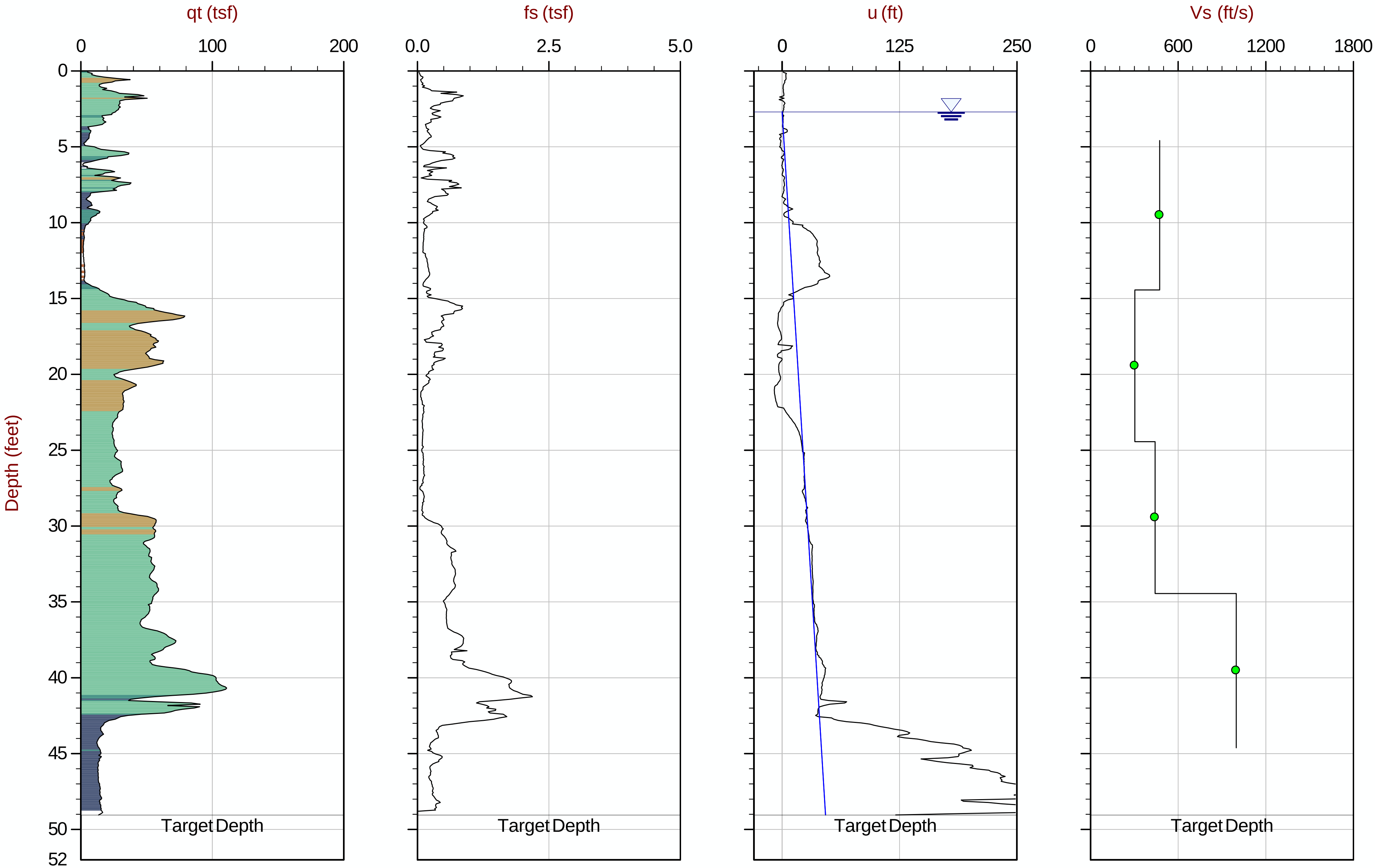
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506696m E: 578638m

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.

Job No: 18-53075
Date: 2018-07-19 11:38
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-05
Cone: 268:T1500F15U500

Mueser Rutledge



Max Depth: 14.950 m / 49.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53075_SP05.COR

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4506701m E: 578646m

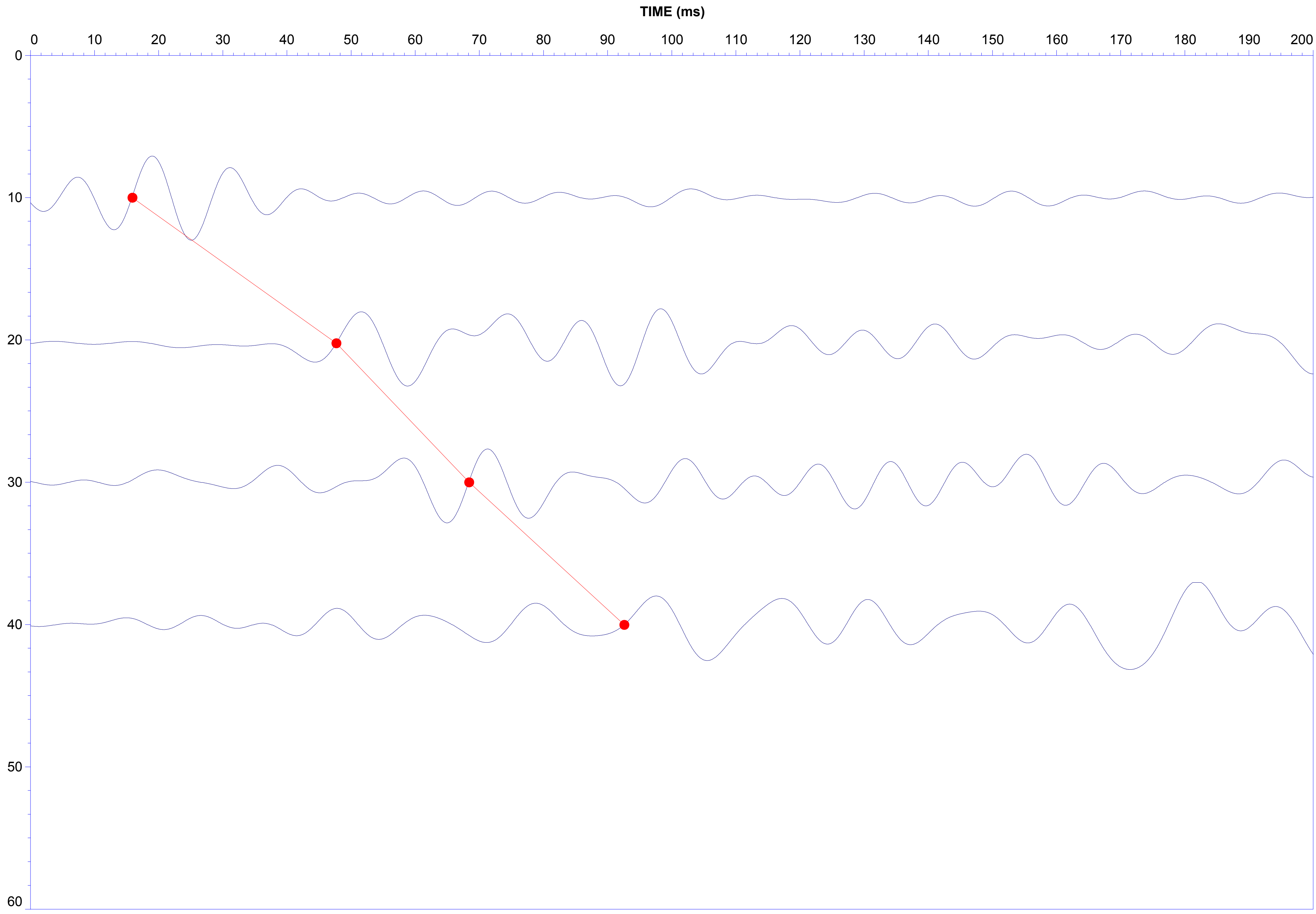
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

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

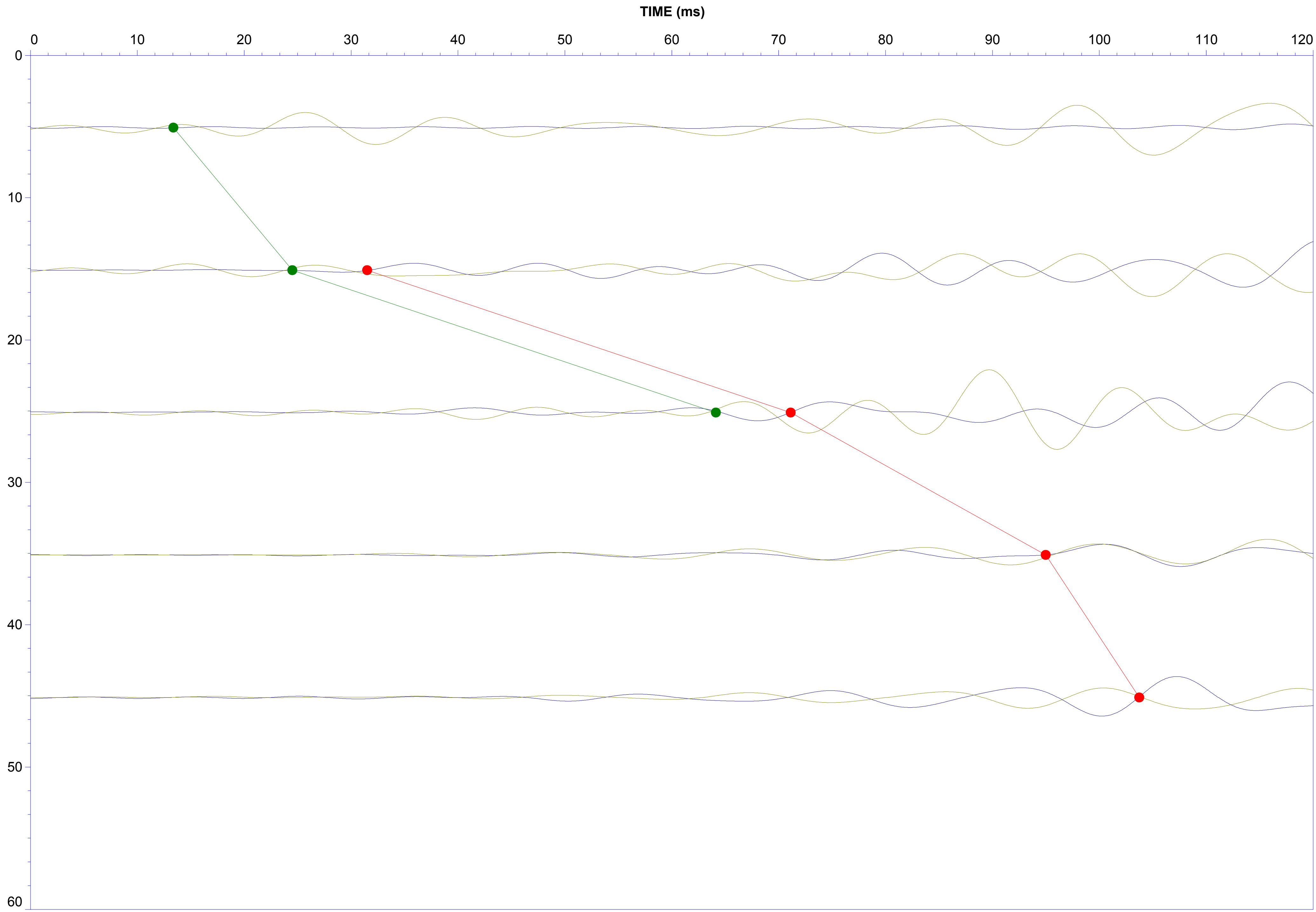
Seismic Cone Penetration Wave Traces

ConeTec

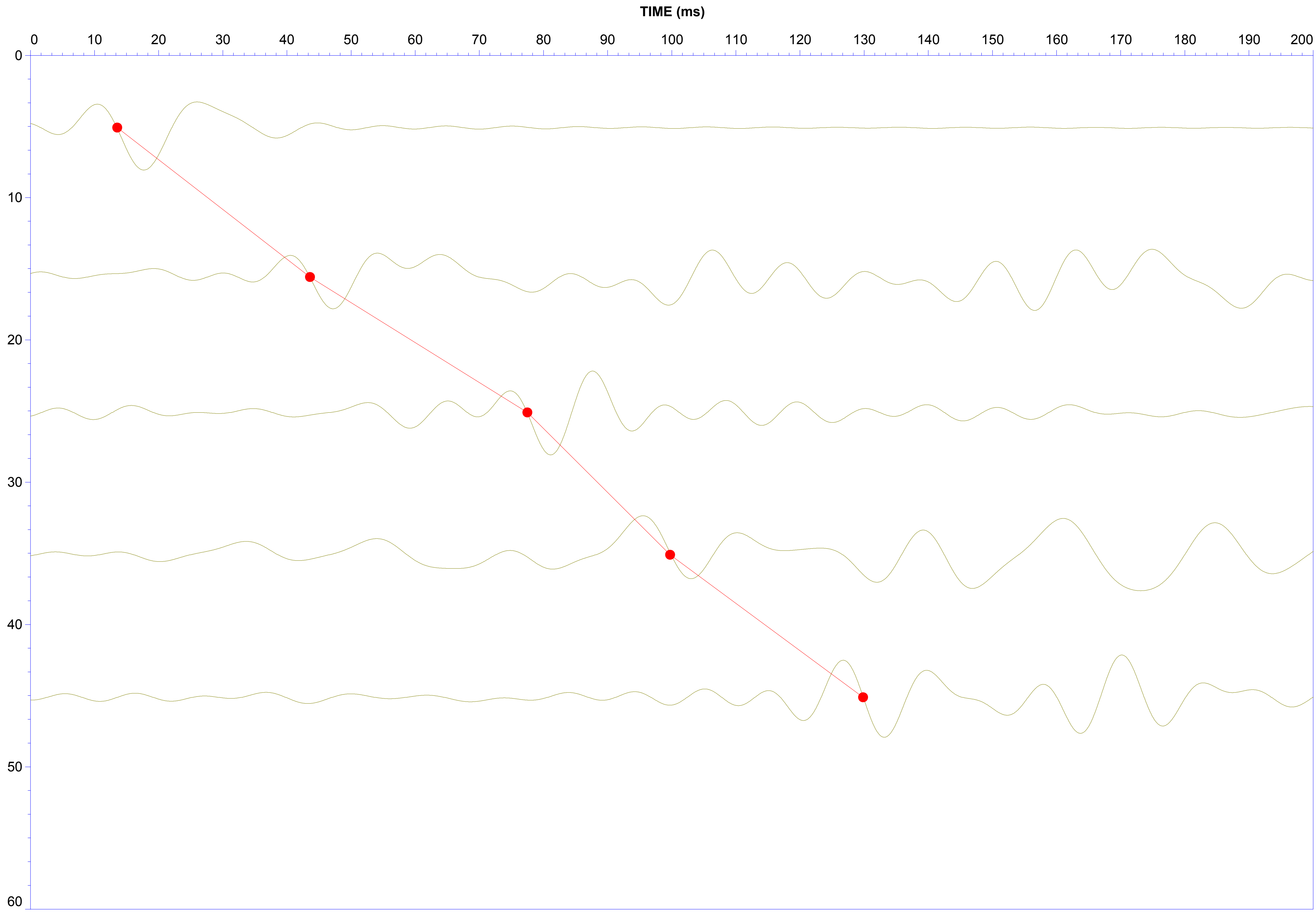
Job No: 18-53075	Client: Mueser Rutledge	Project Title: PPG Garfield Avenue, Jersey City, NJ	Hole: MR-SCPT18-01	Filter: 0-100hz	Date: 7-19-2018



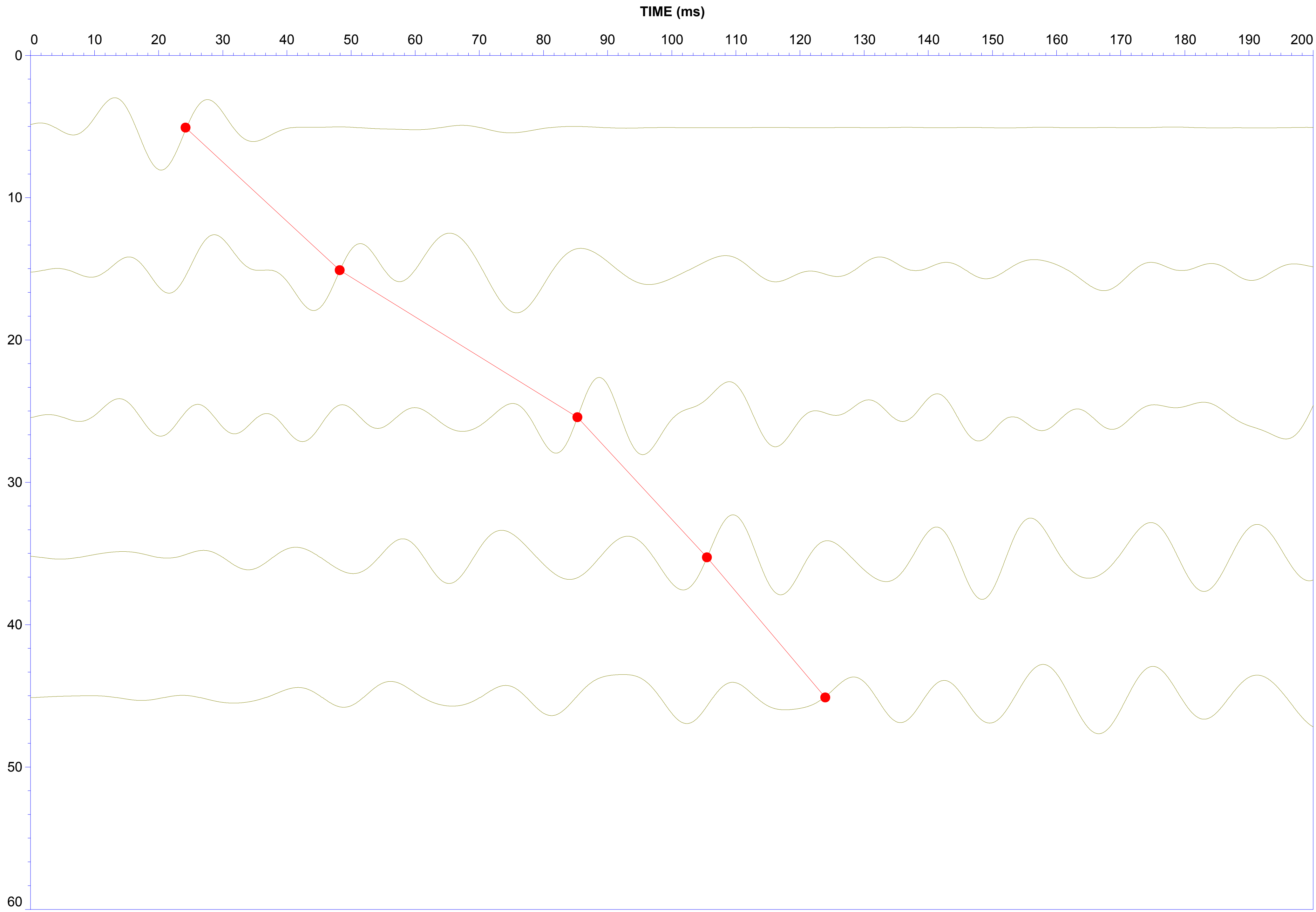
Job No: 18-53075	Client: Mueser Rutledge	Project Title: PPG Garfield Avenue, Jersey City, NJ	Hole: MR-SCPT18-02	Filter: 0-100hz	Date: 7-19-2018



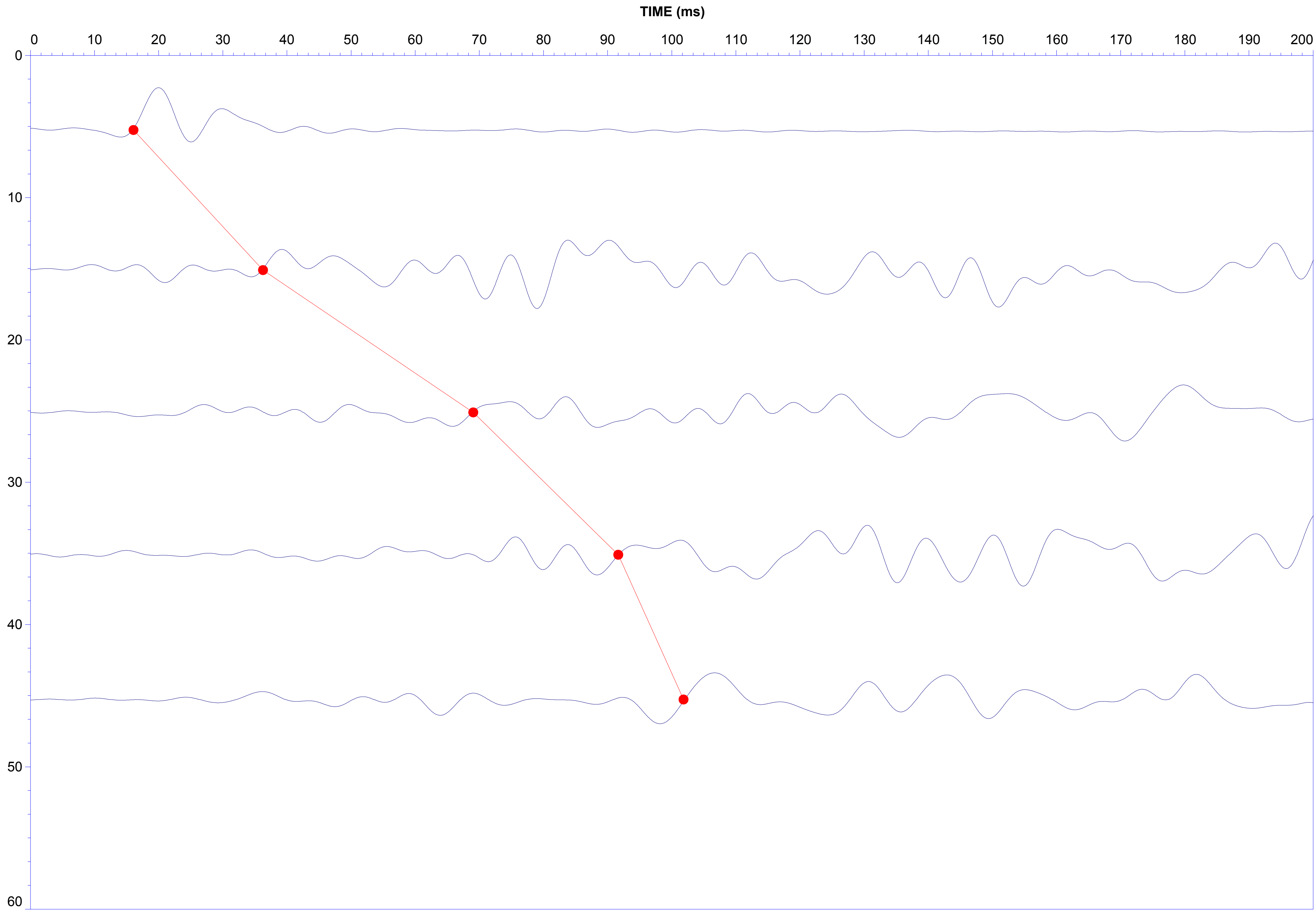
Job No: 18-53075 | Client: Mueser Rutledge | Project Title: PPG Garfield Avenue, Jersey City, NJ | Hole: MR-SCPT18-03 | Filter: 0-100hz | Date: 7-19-2018



Job No: 18-53075 | Client: Mueser Rutledge | Project Title: PPG Garfield Avenue, Jersey City, NJ | Hole: MR-SCPT18-04 | Filter: 0-100hz | Date: 7-19-2018



Job No: 18-53075 | Client: Mueser Rutledge | Project Title: PPG Garfield Avenue, Jersey City, NJ | Hole: MR-SCPT18-05 | Filter: 0-150hz | Date: 7-19-2018



Seismic Cone Penetration Test Tabular Results (Vs)

Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Sounding ID: MR-SCPT18-01
Date: 19-Jul-2018

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
10.01	9.35	9.56			
20.24	19.59	19.69	10.13	31.82	318
30.02	29.36	29.43	9.74	20.68	471
40.03	39.37	39.42	9.99	24.18	413

Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Sounding ID: MR-SCPT18-02
Date: 19-Jul-2018

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.08	4.43	4.85			
15.09	14.44	14.57	9.72	11.14	873
25.10	24.44	24.52	9.95	39.62	251
35.10	34.45	34.50	9.98	23.87	418
45.11	44.46	44.50	9.99	8.75	1142

Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Sounding ID: MR-SCPT18-03
Date: 19-Jul-2018

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.08	4.43	4.85			
15.58	14.93	15.06	10.21	30.07	340
25.10	24.44	24.52	9.46	33.89	279
35.10	34.45	34.50	9.98	22.28	448
45.11	44.46	44.50	9.99	30.07	332

Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Sounding ID: MR-SCPT18-04
Date: 19-Jul-2018

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.08	4.43	4.85			
15.09	14.44	14.57	9.72	24.03	405
25.43	24.77	24.85	10.28	37.07	277
35.27	34.61	34.67	9.82	20.21	486
45.11	44.46	44.50	9.83	18.46	533

Job No:	18-53075
Client:	Mueser Rutledge Consulting Engineers
Project:	PPG Garfield Avenue, Jersey City, NJ
Sounding ID:	MR-SCPT18-05
Date:	19-Jul-2018

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.25	4.59	5.00			
15.09	14.44	14.57	9.57	20.21	474
25.10	24.44	24.52	9.95	32.78	304
35.10	34.45	34.50	9.98	22.59	442
45.28	44.62	44.66	10.16	10.18	998

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

ConeTec

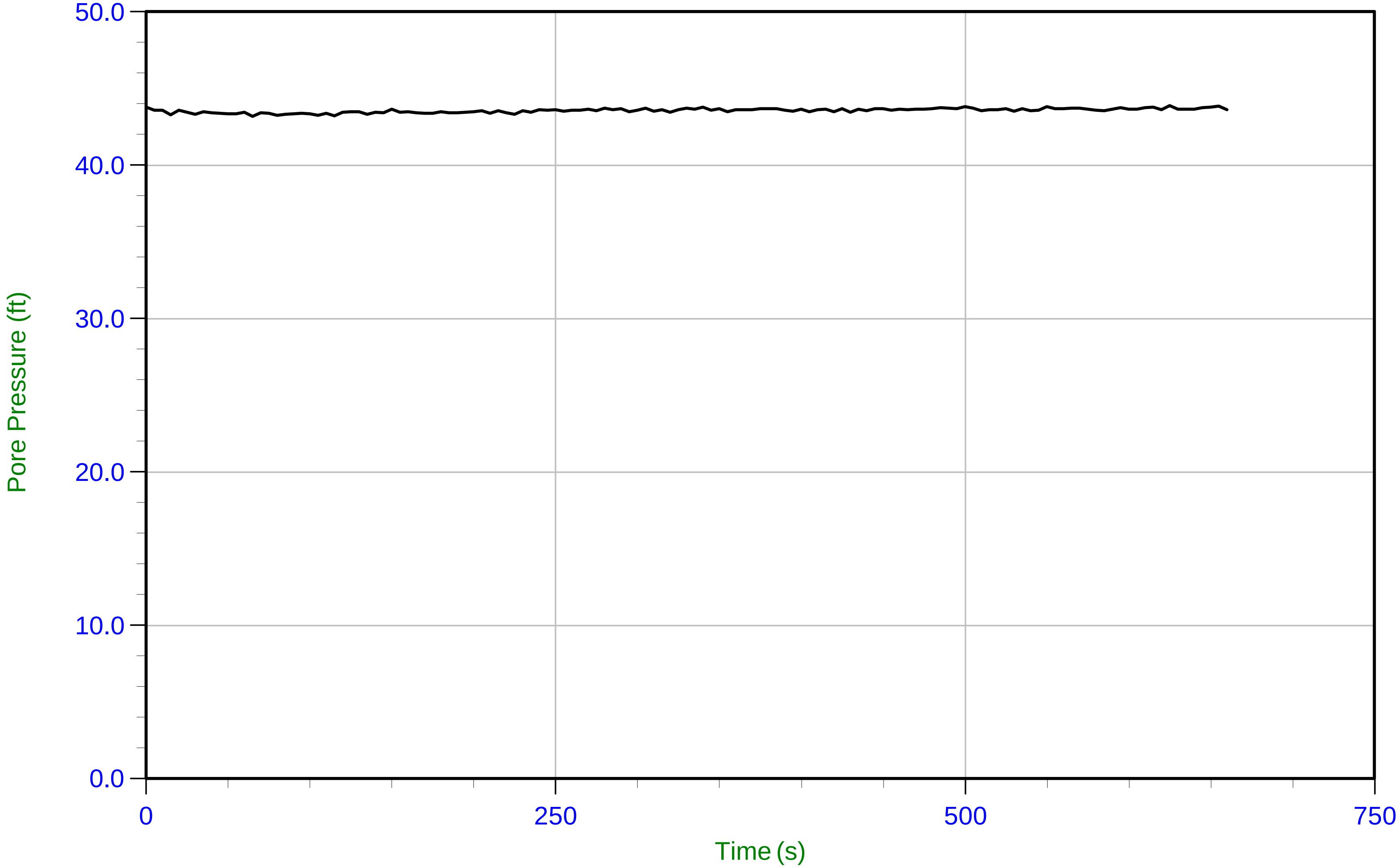
Job No: 18-53075
Client: Mueser Rutledge Consulting Engineers
Project: PPG Garfield Avenue, Jersey City, NJ
Start Date: 19-Jul-2018
End Date: 19-Jul-2018

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)
MR-SCPT18-01	18-53075_SP01.PPD	15	660	49.54	43.82	5.72				
MR-SCPT18-02	18-53075_SP02.PPD	15	105	35.10	29.24	5.87				
MR-SCPT18-03	18-53075_SP03.PPD	15	600	28.95	26.84	2.12				
MR-SCPT18-03	18-53075_SP03.PPD	15	210	49.05	46.93		2.12	32.462	100	21.62
Totals	4 dissipations		26.3 min							

a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991

Mueser Rutledge	Job No: 18-53075 Date: 19-Jul-2018 08:11:10 Site: PPG Garfield Avenue, Jersey City, NJ	Sounding: MR-SCPT18-01 Cone: AD268 Area=15 cm²



Trace Summary:

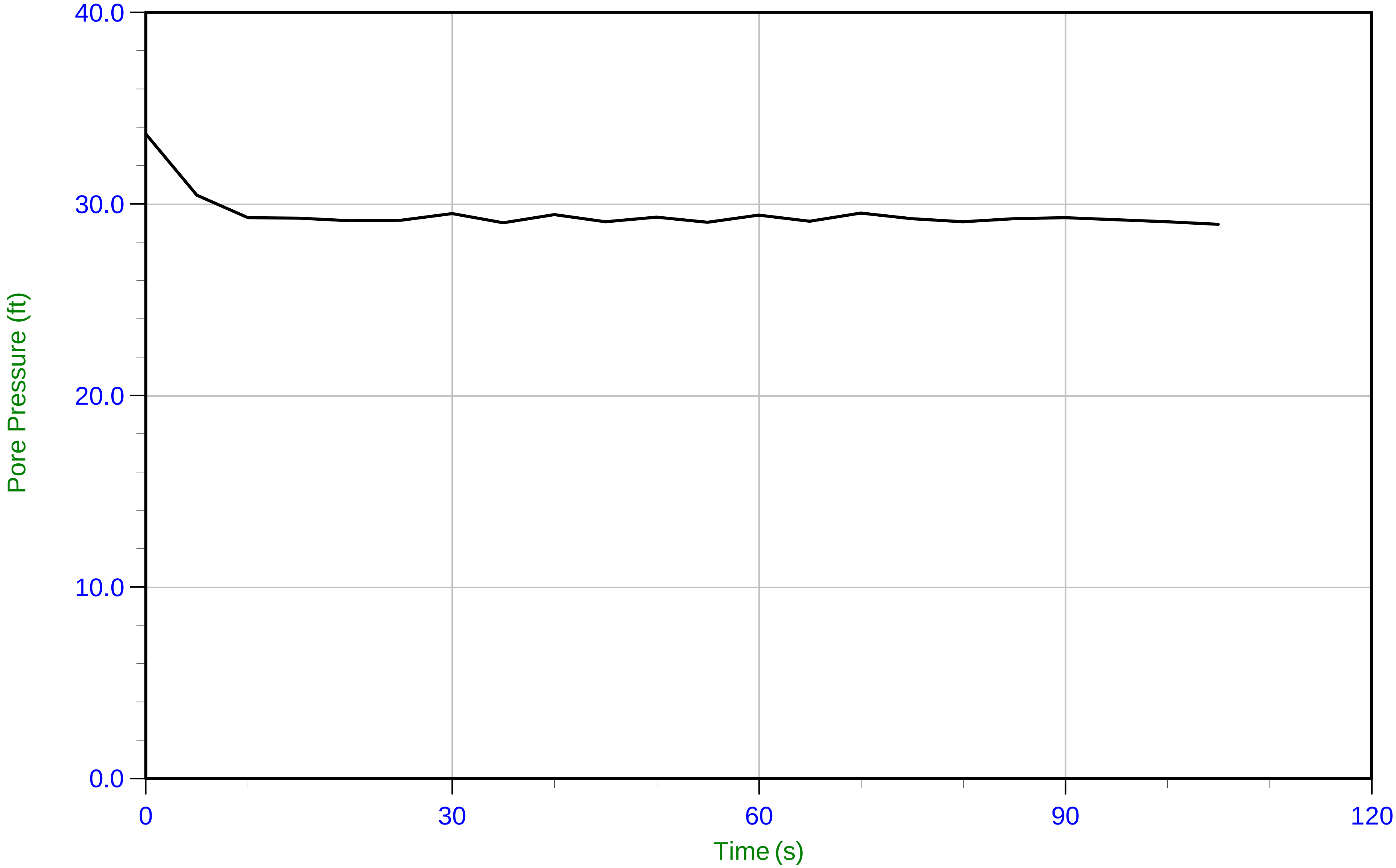
Filename: 18-53075_SP01.PPD	U Min: 43.2 ft	WT: 1.744 m / 5.722 ft
Depth: 15.100 m / 49.540 ft	U Max: 43.9 ft	Ueq: 43.8 ft
Duration: 660.0 s		

ConeTec

Mueser Rutledge

Job No: 18-53075
Date: 19-Jul-2018 09:12:46
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-02
Cone: AD268 Area=15 cm²



Trace Summary:

Filename: 18-53075_SP02.PPD
Depth: 10.700 m / 35.105 ft
Duration: 105.0 s

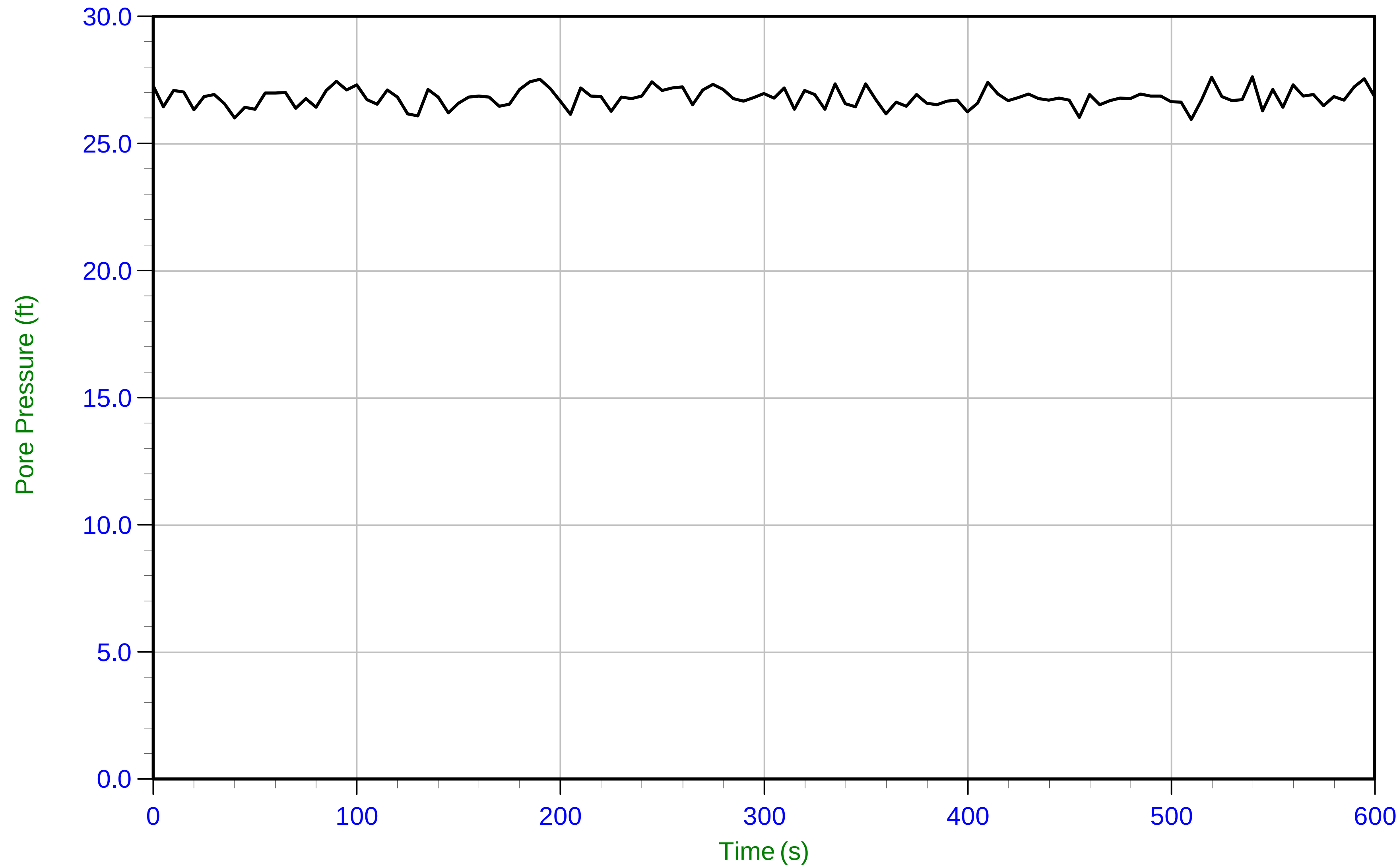
U Min: 29.0 ft
U Max: 33.7 ft

WT: 1.789 m / 5.869 ft
Ueq: 29.2 ft

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 19-Jul-2018 10:15:27
Site: PPG Garfield Avenue, Jersey City, NJ
Sounding: MR-SCPT18-03
Cone: AD268 Area=15 cm²



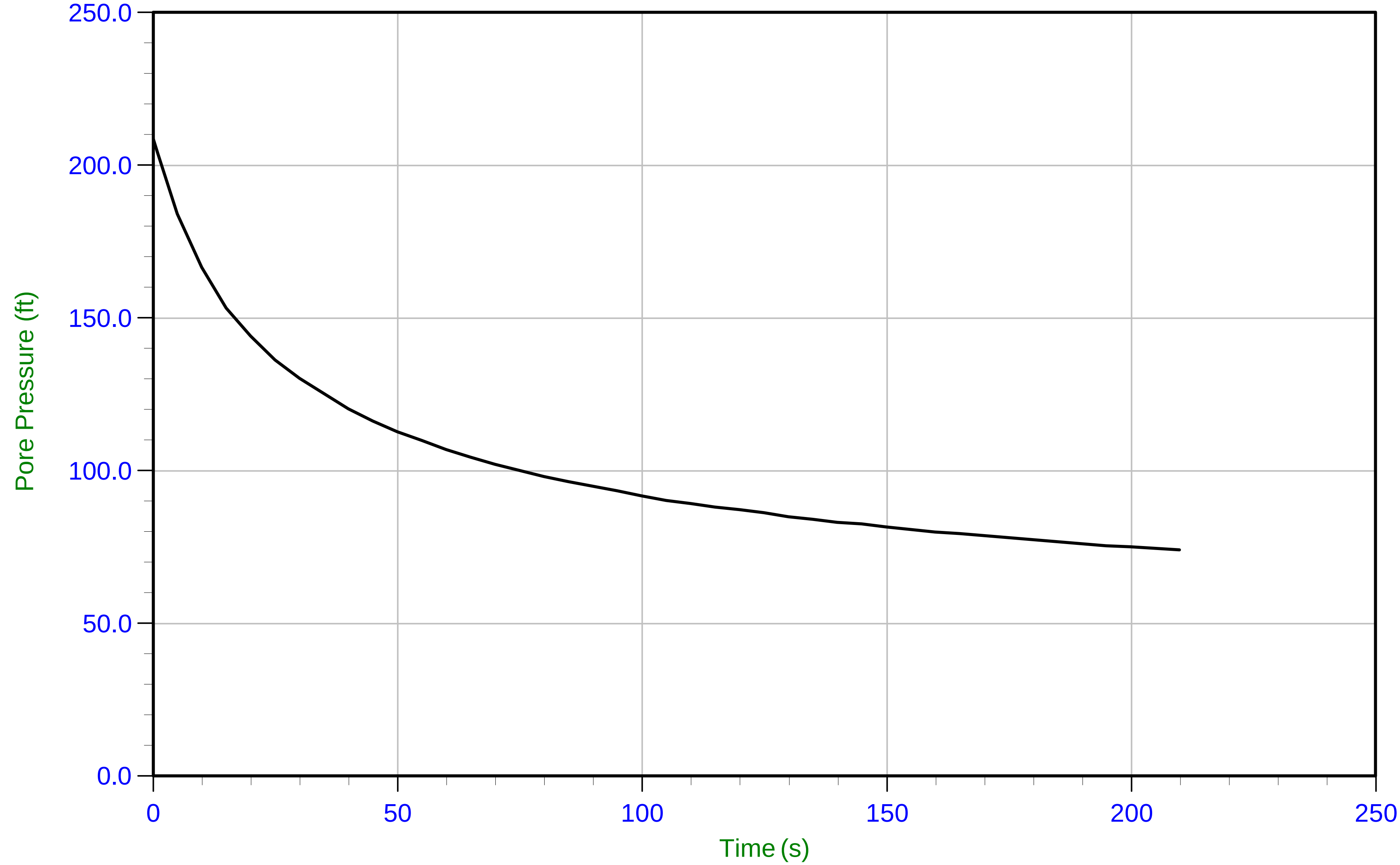
Trace Summary:
Filename: 18-53075_SP03.PPD
Depth: 8.825 m / 28.953 ft
Duration: 600.0 s
U Min: 25.9 ft
U Max: 27.6 ft
WT: 0.645 m / 2.117 ft
Ueq: 26.8 ft

CONETEC

Mueser Rutledge

Job No: 18-53075
Date: 19-Jul-2018 10:15:27
Site: PPG Garfield Avenue, Jersey City, NJ

Sounding: MR-SCPT18-03
Cone: AD268 Area=15 cm²



Trace Summary:

Filename: 18-53075_SP03.PPD
Depth: 14.950 m / 49.048 ft
Duration: 210.0 s

U Min: 74.0 ft
U Max: 208.7 ft

WT: 0.645 m / 2.117 ft
Ueq: 46.9 ft
U(50): 127.80 ft

T(50): 32.5 s
Ir: 100
Ch: 21.6 cm²/min