WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS

GEOTECHNICAL INVESTIGATION REPORT FOR SITE EVALUATION AND MASTER PLANNING

Hobsonville Point Primary #2

279 Hobsonville Point Road

Hobsonville, Auckland

Prepared for:

MINISTRY OF EDUCATION
ACQUISITIONS & DESIGNATIONS
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01 February 2021

Project Number: 1422-01-20

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SUMMARY OF FINDINGS AND CONCLUSIONS

Project Type	Educational
Nature of Project	Site evaluation and master planning for new school
Investigations undertaken	Desktop study, 7 cone penetrometer tests (CPTs) to 13-28m; 7 hand auger holes to 3m + dynamic cone penetrometer (DCP) test over 1m below base of auger holes. Previous investigations by T&T (2009) included 2 CPTs to 12m and 2 machine-drilled boreholes to 13-16m.
Subsurface soils	The site appears to be covered with a layer of clay fill (presumed to be engineered) with an inferred thickness ranging from 0.5m to at least 1.6m – thickness increasing toward the south-eastern corner of the site. The maximum depth of fill was found within a backfilled stormwater basin. The fill is underlain by firm to stiff clay and clayey silt (Puketoka Formation) to depth of 6-10m, then stiff / medium dense sandy silt and medium dense to dense silty sand and sand (residual East Coast Bays Formation). CPT refusal encountered at depths ranging from about 13 to 28m, with shallower refusal (~13-17m) occurring in central and southern portion of site.
Groundwater	Wet soils were hand auger holes HA04 and HA07 at depths of 2.6 and 2.2m. Depth to groundwater inferred from CPT data ranged from 2 to 3m.
Potential Geotechnical Hazards	• Engineered clay fill potentially moderately reactive (moderately expansive). Native clays potentially moderately to highly reactive. • Some liquefaction predicted to occur below a depth of 5 to 9m under ULS IL2 and IL3 levels of ground shaking. Little if any ground surface damage is anticipated to occur as a result of this liquefaction.
Foundation options	• Conventional shallow foundations considered feasible for relatively light structures. settlement-controlled foundation bearing pressures are in the order of 100-175 kPa for strip foundations, 150-350 kPa for isolated foundations. • Deep piles end-bearing in East Coast Bays Formation “rock” (SPT N-value >50) will likely be required for heavier structures. • Bored cast in-situ piles embedded 3 pile diameters into ECBF rock are considered feasible. • Based on the results of site investigation, the depth to ECBF rock can be assumed to vary across the site from about 16 – 30 m with the deeper depths in the northern portion of the site.
Further work required	• Standard shallow investigations (DCP/hand auger) to confirm bearing capacities for shallow foundations and parameters for pavement design. • Laboratory testing to determine expansivity of near-surface clays – including clay fill for shallow foundation design. • Machine-drilled boreholes to confirm depth to ECBF rock if deep piles are to be used. • The additional work should be completed once building locations are identified.

1.0 INTRODUCTION

This report presents the findings, conclusions and recommendations from Wentz-Pacific Ltd's (WP's) geotechnical investigation of an undeveloped site being considered for a new primary school (the project), located at 279 Hobsonville Point Road in the Hobsonville suburb of Auckland[1] (refer to Plate A-1, Appendix A). The work described herein was commissioned by the Ministry of Education (MoE) and was completed in accordance with WP's proposal to the MoE dated 25 November 2020.

1.1 PROJECT DESCRIPTION

The currently proposed development of the site includes a 3-storey building (~4,000 m^2 floor space) containing teaching and learning space, wellbeing, library and administration, a school hall (500 m^2) and an ECE building (300 m^2). The majority of the site outside of the building footprints will contain a sports field and carpark.

WP's understanding of the project is based on our discussions with Bronte Pierson of the MoE and on our review of various bulk and location plans prepared by Jasmax Ltd. The latest potential plan provided to us is 'Option F', a copy of which is contained in Appendix A.

1.2 PURPOSE

The purpose of WP's geotechnical investigation was to identify potential geotechnical issues that could significantly impact the development of the site, and to inform the Master Planning phase of the project.

[1]Note that the Auckland Council property information website shows the site address as 2 Waka Moana Drive.

2.0 INVESTIGATIONS

2.1 DESKTOP STUDY

A review of select and available information pertaining to the site and/or surrounding vicinity was conducted. Specifically, this information included:

- Aerial photographs contained on the Auckland Council (AC) and Retrolens websites.
- Natural hazard information contained on the AC website.
- Regional geological information published by the Institute of Geological & Nuclear Sciences Limited (GNS).
- A May 2009 geotechnical investigation report by Tonkin & Taylor Ltd (T&T) for the much larger subdivision site of which the subject site is part of.

2.2 FIELD INVESTIGATIONS

Deep Investigations

Seven cone penetrometer tests (CPTs) were performed at the site on 12 December 2020, at the approximate locations shown in Plate A-2 in Appendix A. The CPTs were advanced to depths of between about 13 and 28 m below existing ground (bgl). All CPTs encountered practical refusal of the cone penetrometer on inferred dense sandy soils. The CPT investigation results are presented in Appendix B.

Shallow Investigations

Eight hand auger boreholes were drilled the site on 21 December 2020 to characterise the near-surface soils at the site. Seven of the boreholes were advanced to the target depth of 3.0m bgl, and one (HA02) encountered immediate refusal on hard ground (including in several close by locations). Shear vane tests were conducted at 0.5m intervals in each borehole. Dynamic cone penetrometer (DCP) testing was carried out from the base of seven of the boreholes to assess the soil density and stiffness within 1.0m below the bottom of the holes.

The locations of the hand auger boreholes and DCP tests are shown in Plate A-2 in Appendix A and the borehole logs and the results of the DCP testing are contained in Appendix C.

Previous Investigations

As part of a geotechnical investigation for the original development of the much larger subdivision site in 2009, Tonkin & Taylor Ltd (T&T) conducted two CPTs (CPT10 and CPT11) and drilled two machine-drilled boreholes (BH10 and BH11) on the subject site. The CPTs were carried out to depths of about 12m bgl, and the boreholes were drilled to depths of about 13 and 16m bgl.

The locations of the previous T&T site investigations are shown on Plate A-2 in Appendix A, and the logs of the CPTs and boreholes are contained in Appendix D.

3.0
SITE AND GROUND CONDITIONS

3.1 SITE CONDITIONS

The approximately 2.5 ha site is located just east of the intersection of Hobsonville Point Road and Waka Moana Drive in suburb of Hobsonville in Auckland. The site's legal description is LOT 1005 DP 528384.

The site was part of a larger development known as the Hobsonville Marine Industry Precinct, which was in turn part of the redevelopment of the old Hobsonville Airbase. At the time of WP's field investigations, the site was nearly level with a gentle slope downward toward the western boundary. It appeared to have been graded to final subdivision level but was otherwise undeveloped except for a small portable development showroom located in the west corner.

The site is bordered on the north and west by Hobsonville Point Road, on the south by Waka Moana Drive, and on the east by Wallace Road.

An aerial photograph of the site taken in 2017 that clearly shows the bulk subdivision earthworks in progress is contained in Appendix A. Two relatively large stormwater detention basins are clearly visible in the northern portion of the site. The basins are presumed to have been backfilled with engineered fill as part of the completion of the bulk earthworks, but a record of this has not been sighted by WP. The approximate locations of the stormwater basins are also shown on the site investigation plan (Plate A-2, Appendix A).

3.2 SUBSURFACE CONDITIONS

3.2.1 Geology

Published geological information (Edbrooke, 2001) shows the site to be underlain by late Pliocene to middle Pleistocene-aged alluvial sediments of the Puketoka Formation (Pup). These sediments are described as "pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvial deposits; massive micaceous sand".

The nearby harbour margins of Hobsonville Point are shown to be underlain by the Miocene-aged sedimentary deposits of the East Coast Bays Formation (Mwe), and residual Mwe soils were found to underlie the younger Puketoka silts at the project site. The East Coast Bays Formation (ECBF) is described as "alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits".

3.2.2 Generalised Ground Conditions

The field investigations indicate that the site is covered with a layer of clay fill of generally medium plasticity with an inferred thickness ranging from about 0.5 to at least 1.6m. The depth of the fill appears to generally increase toward the south-eastern corner of the site (toward the intersection of Waka Moana Drive and Wallace Road). The deepest fill (1.6m) was found in

HA01 located within the location of one of the stormwater detention basins (refer to Section 3.1).

CPT tip resistances in the fill ranged from about 4 to over 8 MPa, and the average undrained vane shear strength was in the order of 150 kPa with several values in the 180 to 200+ kPa range indicating that the material has been compacted as engineered fill.

The fill was underlain by firm to stiff silty clays and clayey silts of the Puketoka Formation to depths of between approximately 6 and 10m bgl. The clays and plastic silts were underlain by stiff / medium dense sandy silts, and medium dense to dense to silty sands and sands inferred to be residual soils associated with weathering of the upper part of the ECBF.

The near-surface silty clays were visually classified as having generally medium to high plasticity.

Practical refusal of the CPT soundings (defined as a CPT tip resistance of about 25 MPa) was encountered at all test locations. The CPTs in the central and southern portion of the site (CPT03-CPT07) encountered refusal at shallower depths (~13 to 17m) than those located in the northern half of the site (CPT01 and CPT02, ~ 28 and 20m, respectively).

Two subsurface cross sections through the site are included in Appendix A (Plates A-3 and A-4).

3.2.3 Groundwater

The depth to groundwater was inferred from CPT pore pressure measurements to range from approximately 2 to 3 m bgl. Wet soils were found in hand auger boreholes HA04 and HA07 at a depth of 2.6 and 2.2 m bgl, respectively.

Groundwater levels at the site may fluctuate over time due to variations in rainfall, irrigation practices (both on- and off-site), runoff conditions, and other factors. The groundwater levels presented in this report may not be the same as those found during, or after, construction.

4.0
GEOLOGIC, SEISMIC AND OTHER HAZARDS

4.1 LANDSLIDING, EROSION, SUBSIDENCE

The site is essentially level and not bordered by steeply sloping terrain or ground that otherwise appears to be potentially unstable or prone to slippage. At the time of our site investigation, no evidence of erosion or ground subsidence was observed.

4.2 SURFACE FAULT RUPTURE

The Active Faults Database (2021) do not show any active faults (generally defined as faults which have deformed the ground surface within the past 125,000 years) running through, or close to the site, and WP did not observe geomorphic features indicative of active faulting at the site. Therefore, we consider the probability of ground surface rupture along a fault trace at the site to be low.

4.3 EARTHQUAKE GROUND SHAKING

For liquefaction assessment, the earthquake ground motions for the Serviceability Limit State (SLS) and Ultimate Limit State (ULS) design scenarios were derived using the method recommended in the NZTA Bridge Manual (2018). These are summarized in Table 4-1.

Table 4-1 – Ground Motions for Liquefaction Assessment

Design Case	Return Period (years)	Magnitude (M_w)	PGA (g)[1]
SLS – IL2, IL3	25	5.9	0.04
SLS2 – IL2	100	5.9	0.08
SLS2 – IL3	250	5.9	0.12
ULS – IL2	500	5.9	0.15
ULS – IL3	1000	5.9	0.20

[1]Peak ground acceleration assuming site subsoil class C.

4.4 LIQUEFACTION

4.4.1 Liquefaction Assessment

The liquefaction potential of the site soils was analysed using the CPT-based simplified triggering procedure developed by Boulanger and Idriss (2014). No laboratory testing of subsurface soils was performed as part of WP's investigation, hence a fines content fitting parameter (C_{FC}) of 0.0 was adopted for the analysis. A groundwater depth of 2.5 m bgl was adopted for the assessment. The results of WP's analyses are contained in Appendix E.

The analyses indicate that no liquefaction is expected to occur as a result of SLS-level ground shaking. Some liquefaction of the susceptible soils is predicted to occur under both ULS-IL2 and IL3 levels of ground shaking. All of the liquefaction is predicted to occur below a depth of 5 to 9 m bgl.

4.4.2 Potential Consequences of Liquefaction

The post-earthquake settlement of the liquefiable layers identified was computed using the CPT-based methodology of Zhang et al (2002). Table 4-2 summarises the liquefaction-induced free-field ground surface settlements computed for each design earthquake scenario.

Table 4-2 – Computed Free-Field Liquefaction-Induced Settlements

Design Case	Ground Surface Settlement (mm)		LSN
	Total	Upper 10 m	
SLS – IL2, IL3	<5	<5	0
SLS2 – IL2, IL3	<5	<5	0
ULS – IL2	10-50 (30)	5-45 (20)	1-7 (4)
ULS – IL3	40-125 (90)	10-100 (45)	4-16 (9)

Average values shown in brackets.

The majority of the settlement is predicted to result from liquefaction at a depth greater than 5m in CPT04, and below a depth of 7 to 9m in the other CPTs. The majority of the soils identified as potentially liquefiable are thinly interbedded silty soils exhibiting some plasticity based on the inferred soil behaviour type. The soils are also Pleistocene-age or older. Such soils have been shown to be less susceptible to triggering in general (Youd et al, 1978), but also undergo less liquefaction-induced volumetric strain which results in less ground surface settlement (Cubrinovski, 2018).

The potential for ground surface damage as a result of the computed liquefaction settlements was evaluated using a depth-weighted analysis that provides an index parameter termed the *Liquefaction Severity Number* (LSN). The LSN was developed in Christchurch and validated using site investigation data and structure / land damage observations across the Christchurch region following the 2010-2011 Canterbury earthquakes (van Ballegooy et al., 2014).

Table 4-2 summarises the CPT-based LSN values for the various design earthquake scenarios. The higher the LSN number, the greater potential for ground surface damage. General descriptors of the typical ground surface damage that might occur for a given range of LSN are shown in Table 4-3.

Table 4-3 – General Performance Levels for Liquefied Deposits[1]

Performance Level / Effects	Characteristics of Liquefaction and its Consequences	Characteristic LSN
L0 / Insignificant	No significant excess pore pressures (no liquefaction)	<10
L1 / Mild	Limited excess pore water pressures; negligible deformation of the ground and small settlements	5 - 15
L2 / Moderate	Liquefaction occurs in layers of limited thickness (small proportion of the deposit, say 10% or less) and lateral extent; ground deformation results in relatively small differential settlements.	10 - 25
L3 / High	Liquefaction occurs in significant portion of the deposit (say 30 to 50%) resulting in transient lateral displacements, moderate differential movements, and settlements of the ground in the order of 100mm to 200mm.	15 - 35
L4 / Severe	Complete liquefaction develops in most of the deposit resulting in large lateral displacements of the ground, excessive differential settlements and total settlement of over 200mm.	>30
L5 / Very Severe	Liquefaction resulting in lateral spreading (flow), large permanent lateral ground displacements and/or significant ground distortion (lateral strain/stretch, vertical offsets and angular distortion).	

[1]From New Zealand Geotechnical Society (2016)

Based on the LSN values calculated for the site, and the age and interbedded and generally silty nature of the potentially liquefiable soils, the ULS–IL2 and IL3 levels of ground shaking are predicted to result in little, if any ground surface damage at the site.

4.5 LATERAL SPREADING

Lateral spreading occurs during or shortly after an earthquake when liquefied soil moves laterally toward a free face (e.g., stream bank or slope of an open channel), or when a non-liquefied "crust" moves laterally toward a free face on an underlying layer of liquefied soil. The greatest displacements typically occur near to the free face, and gradually reduce with increasing distance from the free face.

There are not presently any streams, open drains or other significant free faces within the vicinity of the site that would cause lateral spreading. Therefore, the probability of the site being affected by lateral spreading during either a SLS or ULS event is considered to be low.

4.6 COMPRESSIBLE SOILS

The results of the field investigations did not indicate evidence that the site is underlain by widespread or thick layers of peat or other highly compressible soils.

4.7 EXPANSIVE SOILS

Expansive soils are defined as soils that undergo large volume changes (shrink or swell) due to variations in soil moisture content. Such volume changes may cause damaging settlement

and/or heave of foundations, slabs-on-grade, pavements, etc. The clayey fill found in the site investigations was of low to medium plasticity and is not considered capable of generating significant expansive pressures. However, the near-surface native silty clays found in the investigations was visually classified having moderate to high plasticity.

Laboratory testing will be required to determine the expansive soil class for the site. Until that is done, Class H should be assumed for preliminary design purposes.

4.8 FLOODING

An Auckland Council-identified 'flood plain' is shown to be located along portions of the eastern boundary of the site, and two overland flow paths draining between 4,000 m^2 and 3 ha are shown as running northward through the western and eastern portions of the site (Geomaps, 2021) as shown in Figure 4-1. The Auckland Council should be consulted for information on minimum floor levels for the site.

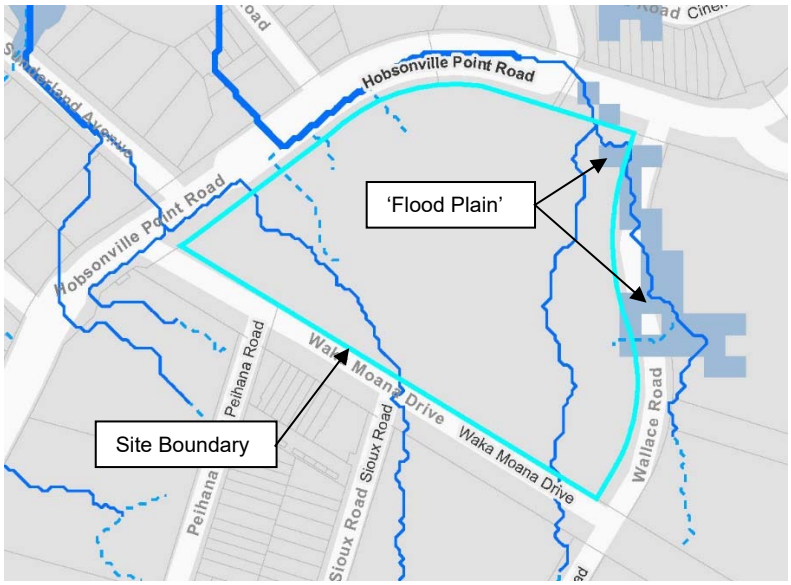

Figure 4-1 – Site location showing overland flow paths (dark blue lines) and 'flood plain'

4.9 TSUNAMI

The site is not located within a Tsunami Evacuation Zone (Auckland Council Hazard Viewer, 2021).

4.10 VOLCANIC ERUPTION

The site is not located within the Auckland Volcanic Field (Auckland Council Hazard Viewer, 2021).

5.0 RECOMMENDATIONS

Based on the results of our site investigations and geotechnical assessment, WP makes the following recommendations for foundation design.

5.1 SITE SUBSOIL CLASS

Based on the consistency and depth of soils found in WP's site investigation, and the geology in the site area, WP recommends a site subsoil class of 'Class C – shallow soil' as defined by NZS 1170.5 (2004) be used for seismic design.

5.2 FOUNDATION DESIGN

5.2.1 Shallow Foundations

It is anticipated that 1- and 2-storey buildings can be supported on conventional shallow foundations. For foundations up to 2m wide with a maximum depth of embedment of 400mm below existing ground level, the criteria in Table 5-1 can be used for preliminary design.

Table 5-1 – Preliminary Shallow Foundation Design Parameters

Design Parameter	
Geotechnical ultimate bearing capacity	400 kPa
ULS design bearing capacity[1]	200 kPa
Design working bearing pressure (FOS ~ 3)	130 kPa

The ULS design bearing capacity is based on geotechnical strength reduction factor (ϕ_g) of 0.5 for all load combinations including earthquake overstrength.

Static bearing capacities are controlled to some degree by the soft soils underlying the site, however they are likely high enough not to govern design. Settlement-controlled bearing pressures are lower; particularly for strip foundations where they range from about 175 kPa to less than 100 kPa for foundation widths of between 0.4 and 1.0m. Allowable foundation bearing pressures to limit estimated static settlement to 25 mm are provided in Appendix F.

5.2.2 Pile Foundations

Bored cast in-situ piles can used to support structures should structural loads preclude the use of shallow foundations. Piles should be embedded a minimum distance of 3 pile diameters (3xD) into ECBF rock – defined as ECBF material having a minimum SPT N-value of 50. Piles can be designed using a geotechnical ultimate end-bearing capacity of 4 MPa and a geotechnical strength reduction factor (ϕ_g) of 0.45.

Based on the results of the site investigations, the anticipated minimum depth to the top of the ECBF rock can be assumed to vary across the site from in the about 16 to 30m bgl, and the transition from the 'shallower' to 'deeper' pile depths may occur over a relatively short distance (refer to Plates A-3 and A-4 in Appendix A). The area of the site where piling depths are considered likely to be greater than 20m is shown in Figure 5-1 below.

Figure 5-1 – Area of site likely to require pile depth of > 20m bgl – possibly up to 30m

5.3 FURTHER WORK

WP recommends that further investigation work be undertaken at the Preliminary Design stage to confirm the foundation conditions and geotechnical design criteria presented in this report, as well as to inform the design of pavements for roads and parking. For shallow foundations and pavement, the additional investigation is anticipated to comprise of shallow hand augers and DCP testing, and laboratory plasticity / shrinkage testing.

If deep pile foundations are considered, it is recommended that deep investigation using machine-drilled boreholes be undertaken within the proposed building footprint(s) to confirm the required depth of piling. The information from the drilling program can also be used to assess the suitability of pile types other than bored piles (e.g., driven steel UC piles).

6.0
APPLICABILITY AND LIMITATIONS

This report was prepared solely for the benefit of Ministry of Education (the Client) with respect to the particular brief given to WP. The use by other parties of the information, opinions and recommendations contained in this report shall be at such parties' sole risk.

WP's services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. There is no other warranty, either expressed or implied.

The opinions and recommendations in this report are based on subsurface information collected from discrete investigation / test locations, and the subsurface conditions away from these locations are inferred. It must be appreciated that the actual soil conditions could vary from those described in this report.

During site preparation and construction of bulk earthworks, the site should be examined by a geotechnical professional with the appropriate skills and experience to determine whether the exposed subsoils are compatible with the inferred conditions on which the recommendations in this report are based. If the ground conditions found at the site are found to differ from those described in this report, WP should be contacted immediately so that we can review our recommendations and if revise them if necessary.

7.0
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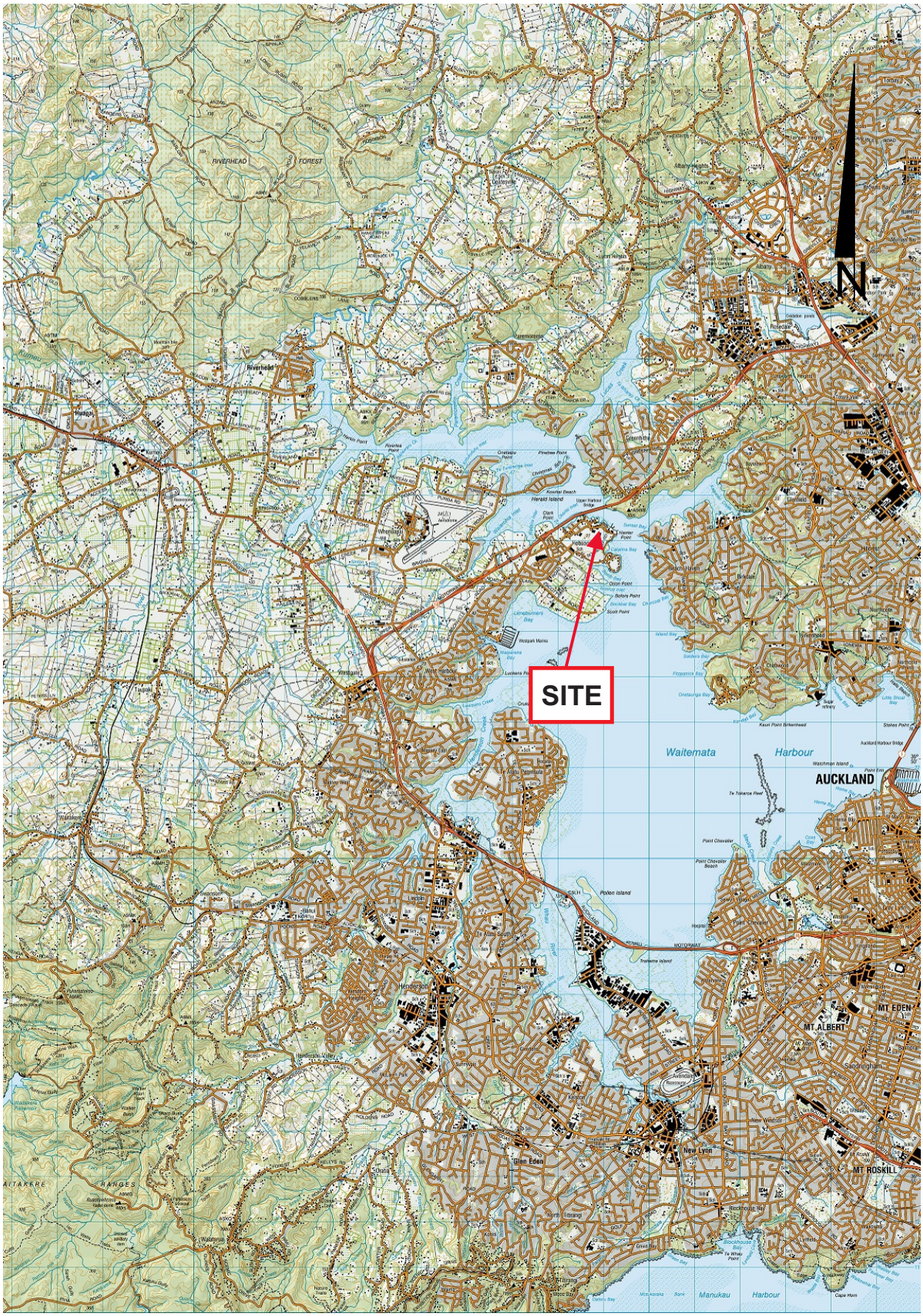
APPENDIX A

PLATES



Not to scale

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS	Project No.: 1422-01-20 Reviewed: DD Drawn: RW Date: January 2021	**SITE LOCATION MAP** **279 Hobsonville Point Road** **Auckland**	PLATE A-1

Scale at A4: 1:1500

- APPROXIMATE LOCATION OF WENTZ-PACIFIC CPT
- APPROXIMATE LOCATION OF WENTZ-PACIFIC HAND AUGER AND DCP TEST
- APPROXIMATE LOCATION OF 2009 TONKIN & TAYLOR CPT
- APPROXIMATE LOCATION OF 2009 TONKIN & TAYLOR BOREHOLE

A — A LOCATION OF SUBSURFACE CROSS-SECTION A-A

WENTZ-PACIFIC
GEOTECHNICAL ENGINEERS

Client: Ministry of Education
Project: 279 Hobsonville Point Rd
Project No.: 1422-01-20

SITE INVESTIGATION PLAN

279 Hobsonville Point Road
Auckland

PLATE A-2

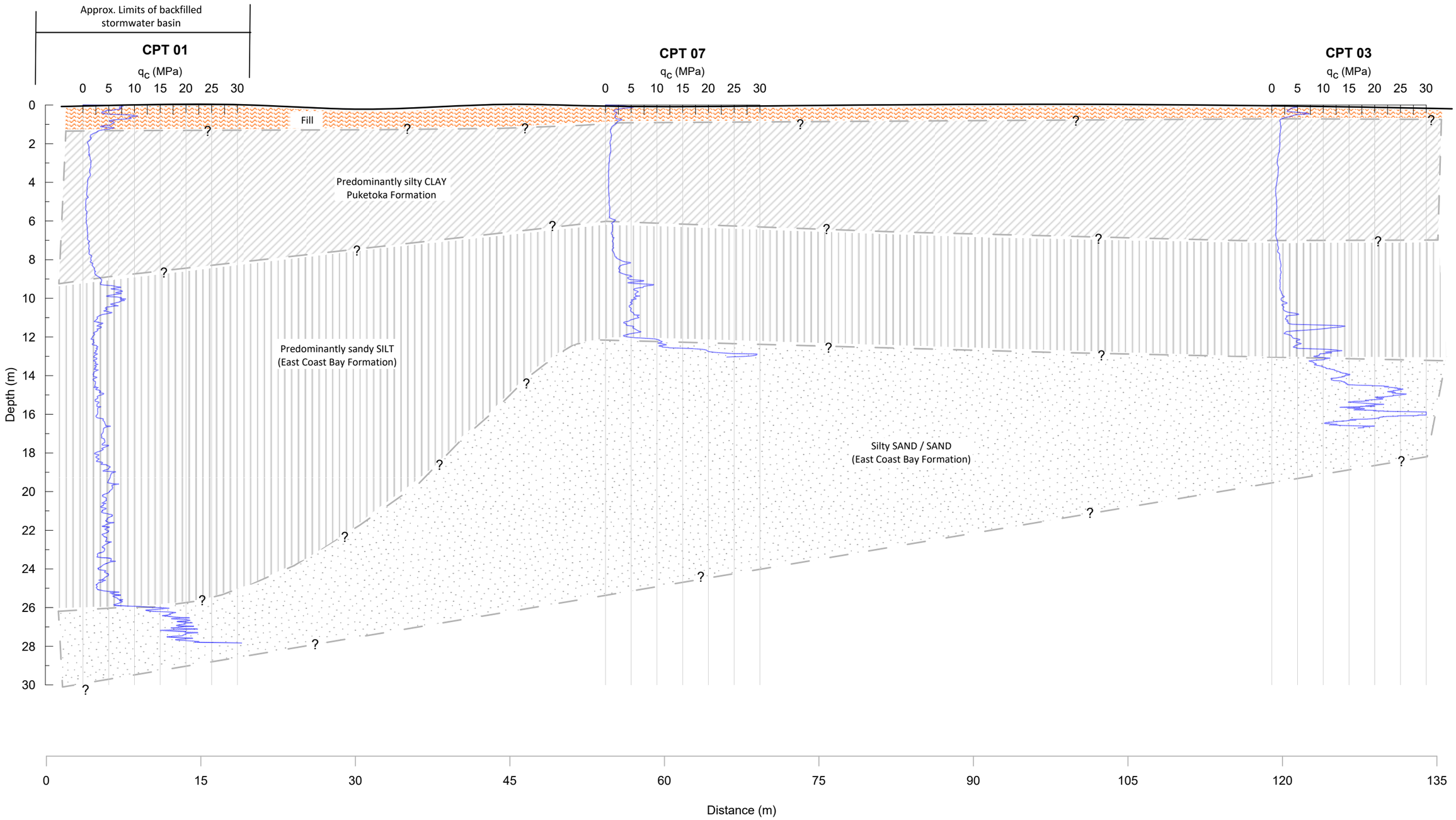
0 10 20 30
Meters

Scale @ A3
= 1:1,000

Date Printed:
29/01/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Northwest **Southeast**



NOTE: The ground conditions shown are inferred only and not intended to be relied upon for design or construction.

SCALE: Vert. = 1:200, Horiz. = 1:400

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS	Client: Ministry of Education Project: 279 Hobsonville Point Road Project No.: 1422-01-20	Drawn by: RC Checked by: RW Date: Jan. 2021	**GENERALISED SUBSURFACE CROSS-SECTION A-A** **279 Hobsonvile Point Road Auckland**	PLATE A-3

Southwest **Northeast**

Approx. Limits of backfilled stormwater basin

TT CPT 11 **CPT 05** **CPT 01**

q_c (MPa)

Predominantly silty CLAY
Puketoka Formation

Predominantly Sandy SILT
East Coast Bays Formation

Silty SAND / SAND
East Coast Bays Formation

Depth (m)

Distance (m)

SCALE: Vert. = 1:200, Horiz. = 1:400

NOTE: The ground conditions shown are inferred only and not intended to be relied upon for design or construction.

WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS

Client: Ministry of Education
Project: 279 Hobsonville Point Road
Project No.: 1422-01-20

Drawn by: RC
Checked by: RW
Date: Jan. 2021

GENERALISED SUBSURFACE CROSS-SECTION B-B

279 Hobsonvile Point Road
Auckland

PLATE
A-4

APPENDIX B

CONE PENETRATION TEST LOGS

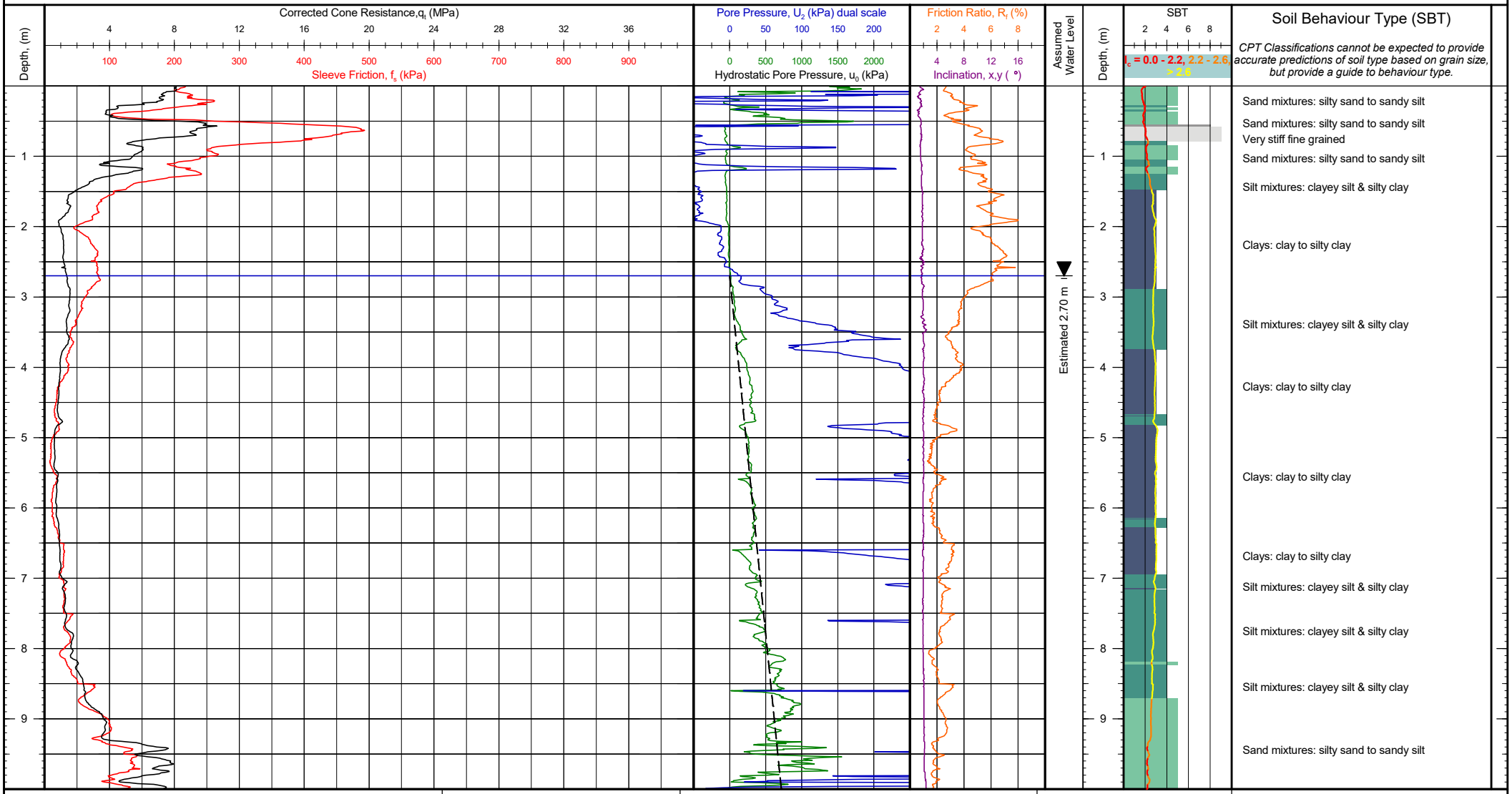
CONE PENETRATION TESTS

Seven cone penetration tests (CPTs) were advanced at the site by Ground Investigation Ltd under the commission of Wentz Pacific Ltd on 17 December 2020. The soundings were conducted with a truck-mounted cone rig with a 20-ton push capacity. All CPTs were performed utilizing an integrated electronic piezocone system (cone tip area of 15 cm^2). The tests were performed in general accordance with ASTM standard D 5778-12 - *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils*.

The approximate locations of the CPT soundings are shown on Plate A-2, and the CPT logs produced by Ground Investigation Ltd are contained herein.

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Very stiff fine grained
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927257.97, 1748604.92	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.788842,174.665506	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	27.92
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

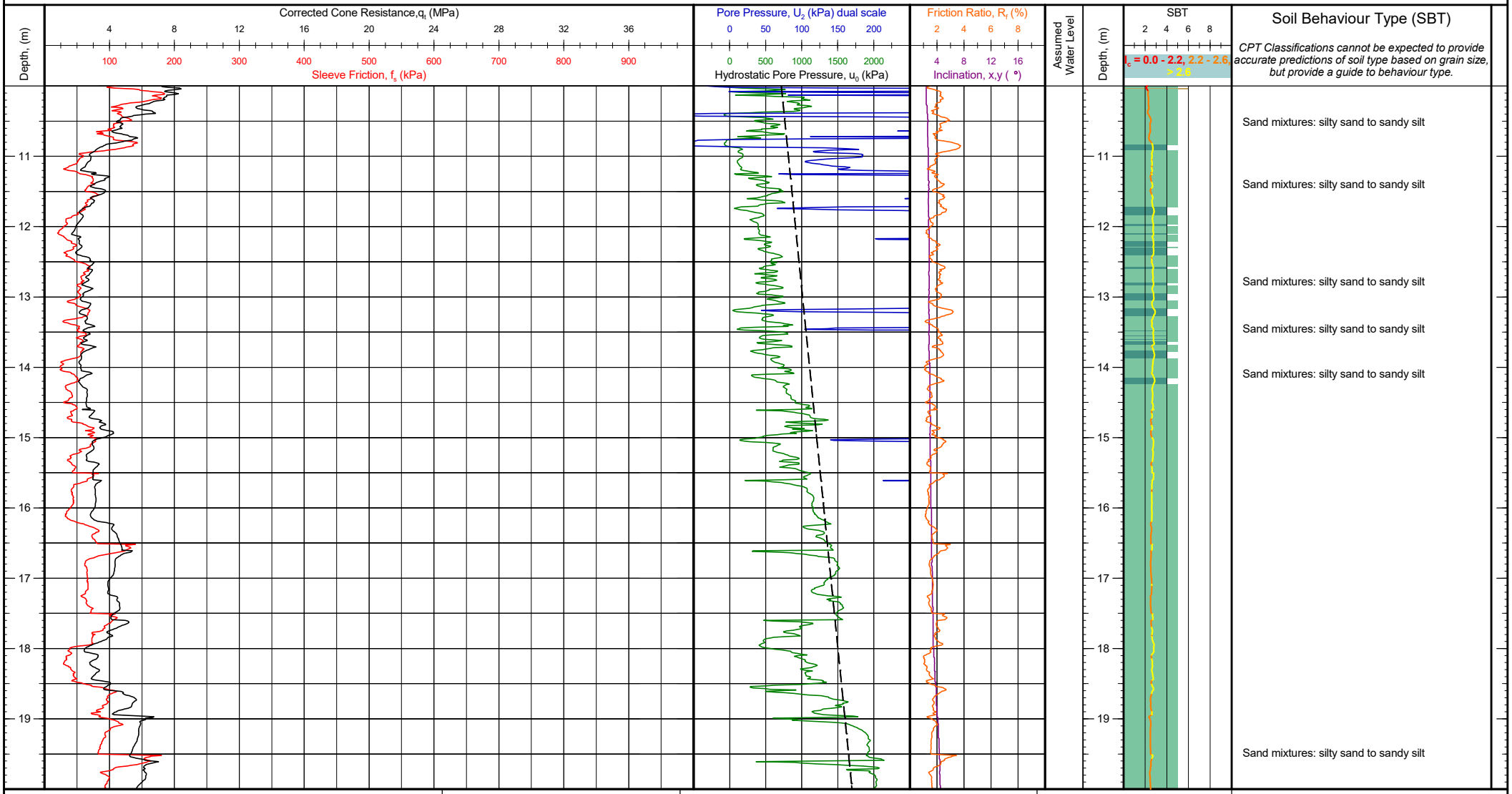
Test Number: WP-CPT-01

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION

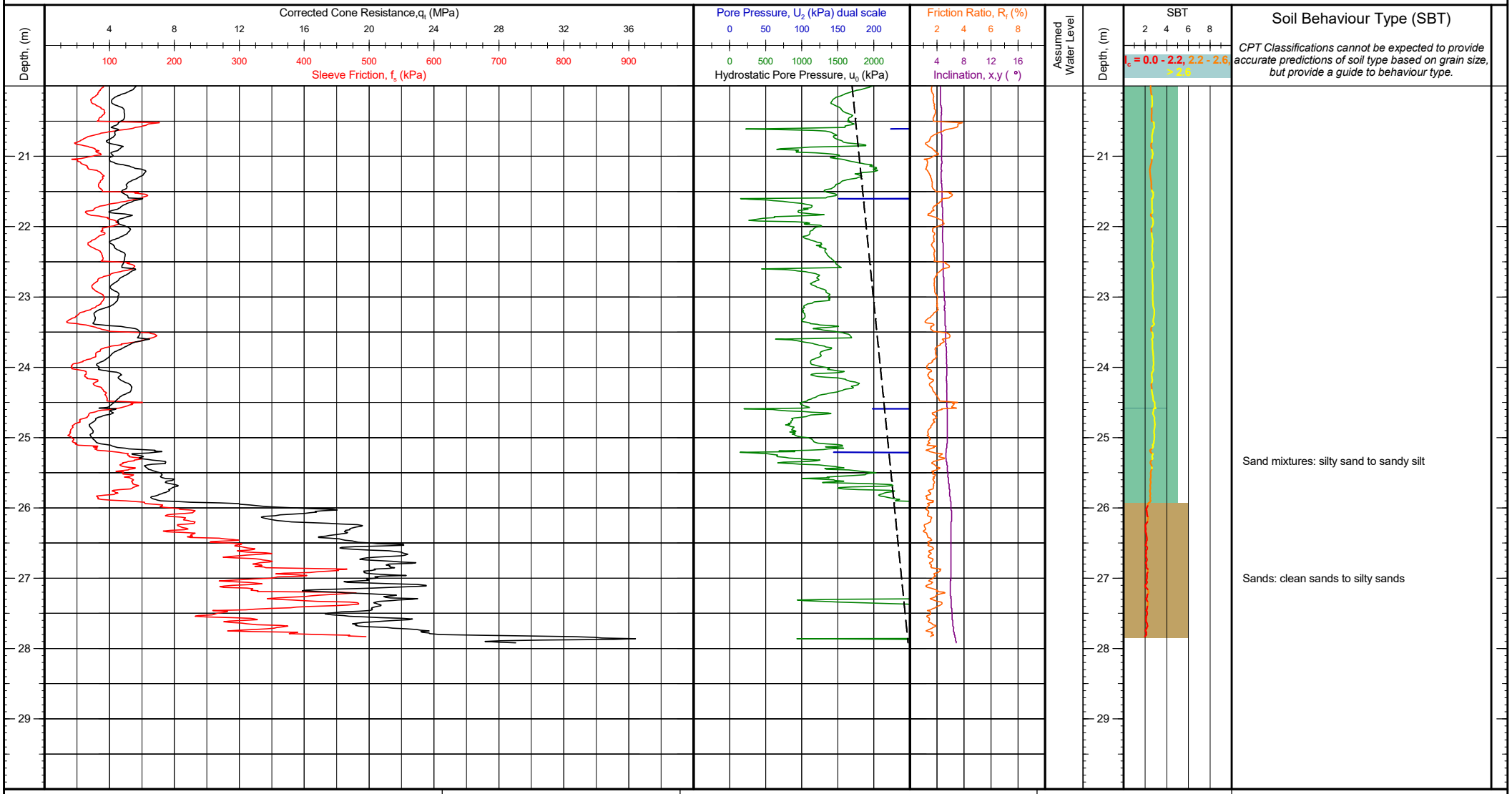


Client: Wentz-Pacific Ltd	**Operator:** Carlos Prieto	**NZTM 2000 N, E (m):** 5927257.97, 1748604.92	**Elevation (m):** Unknown	**Client Reference:**	
Project: 279 Hobsonville Point Road	**Cone Ref:** 71062	**WGS84 (deg):** -36.788842,174.665506	**Date of Test:** 17/12/2020		
Location: Hobsonville, Auckland	**Cone Type:** 15cm^2 Subtraction	**Location Method:** Handheld GPS	**Depth (m):** 27.92	**Test Number:** **WP-CPT-01**	
Engineer: Frederick Wentz	**Area Ratio:** 0.75	**Surveyor:**	**Pre Drill (m):** N/A		
Contractor: Ground Investigation Ltd	**Filter Type:** u_2	**Termination Reason:** High pore water pressure		**G.I. Job Ref:** 201648	

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927257.97, 1748604.92	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.788842,174.665506	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	27.92
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

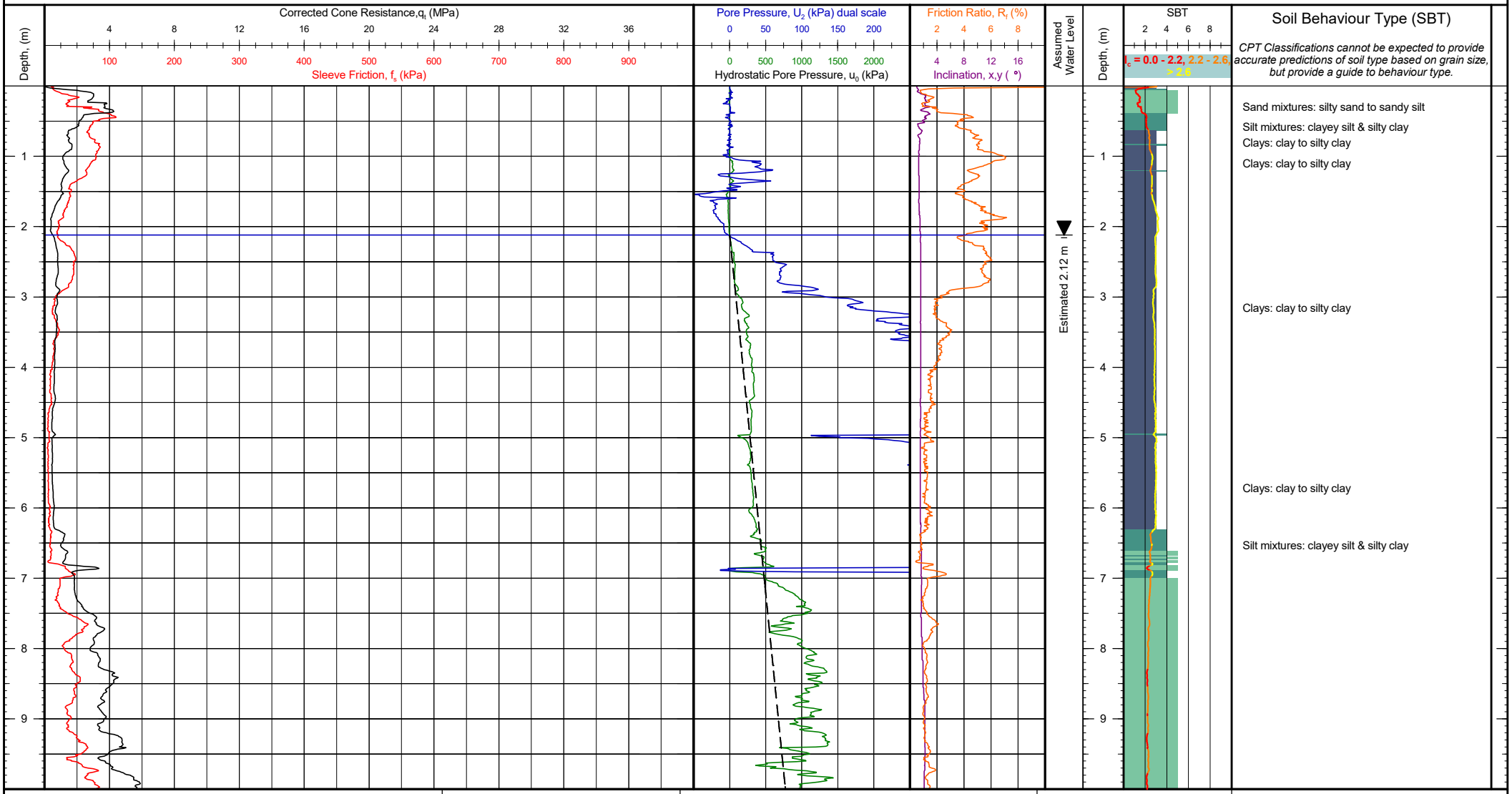
Test Number: **WP-CPT-01**

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927260.48, 1748683.78	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.788807,174.666389	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	19.89
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

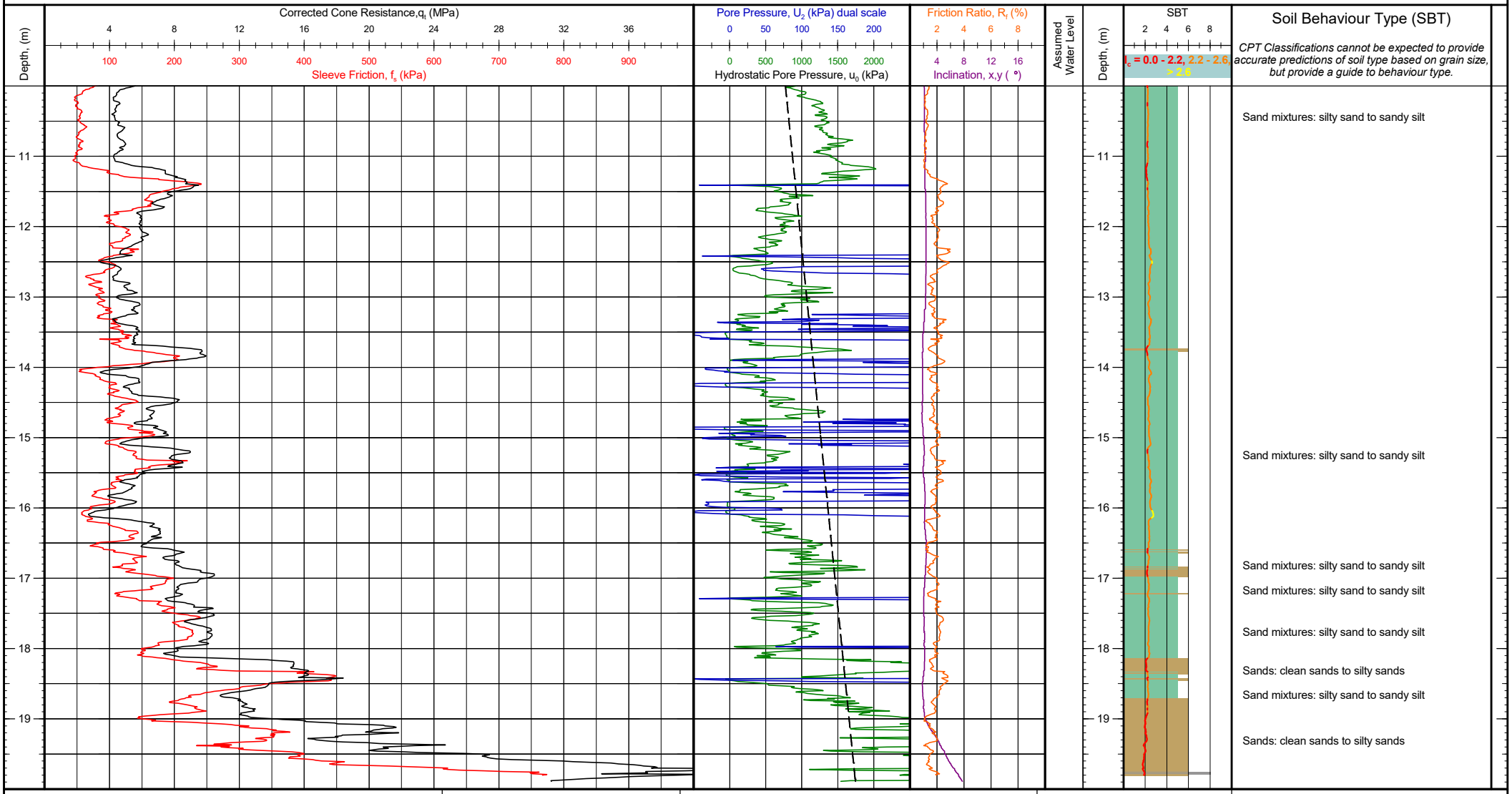
Test Number: WP-CPT-02

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927260.48, 1748683.78	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.788807,174.666389	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	19.89
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

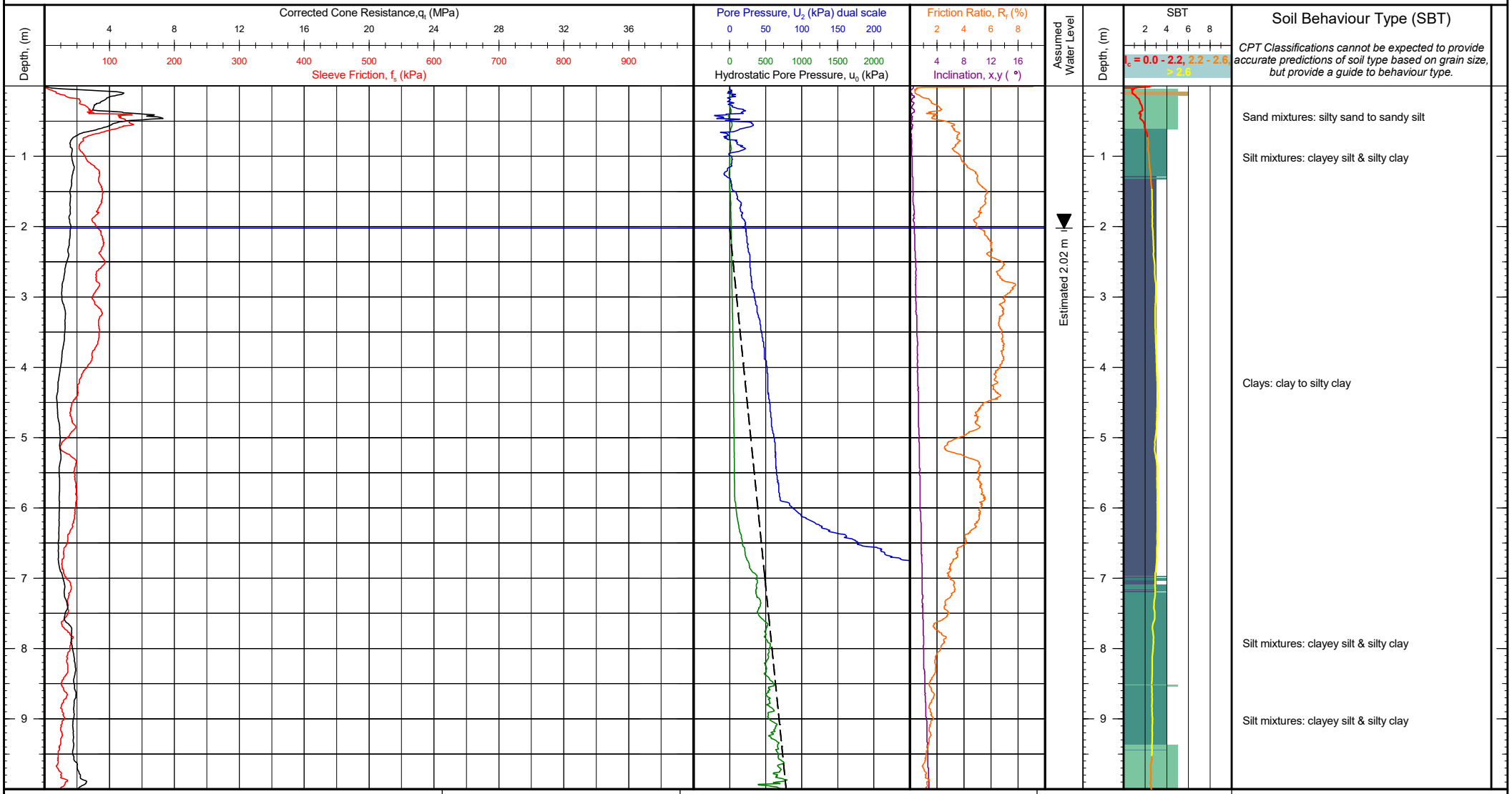
Test Number: WP-CPT-02

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927178.24, 1748690.74	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	70169	**WGS84 (deg):**	-36.789547,174.666483	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.79
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

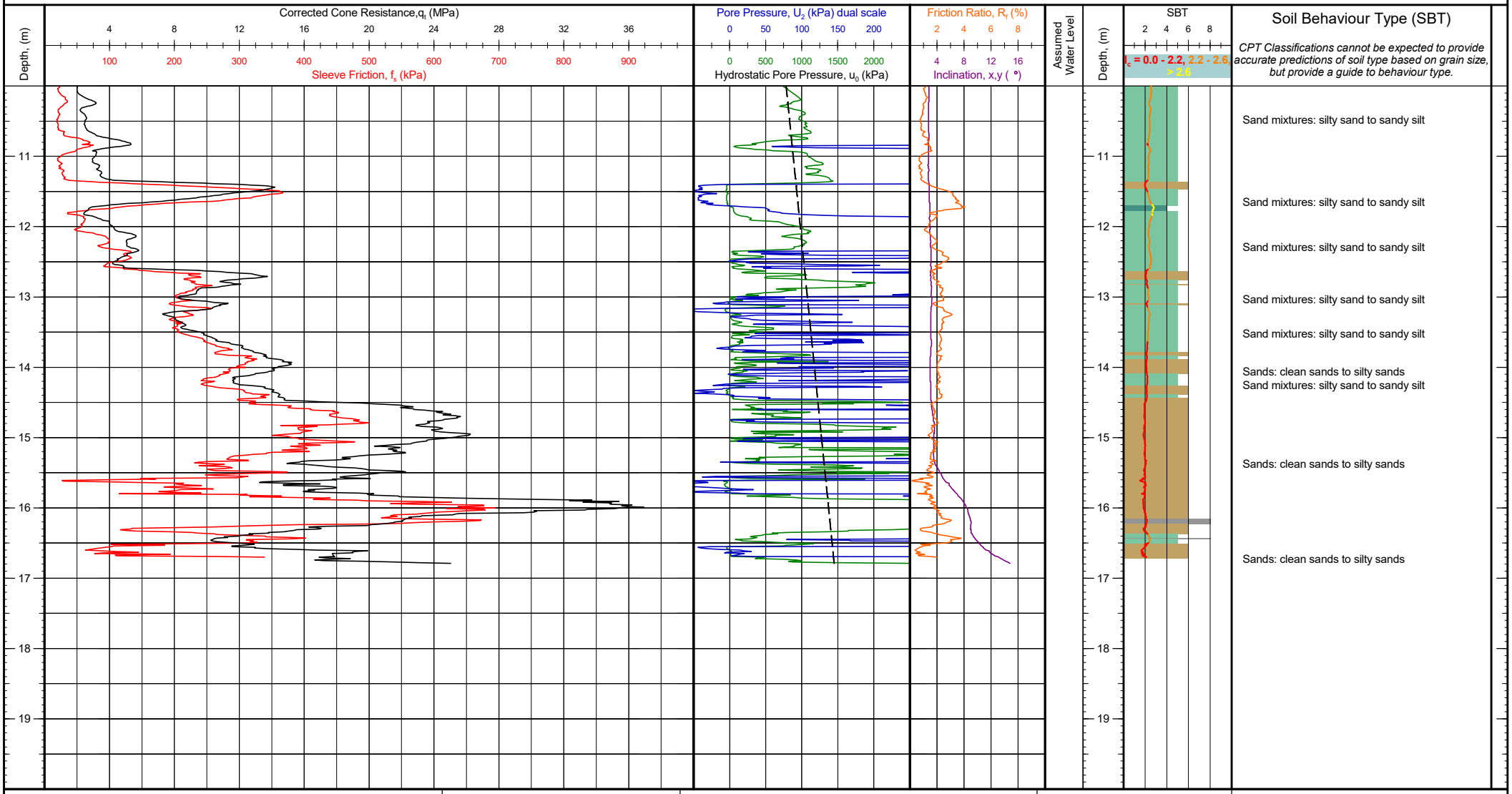
Test Number: WP-CPT-03

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927178.24, 1748690.74	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	70169	**WGS84 (deg):**	-36.789547,174.666483	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.79
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

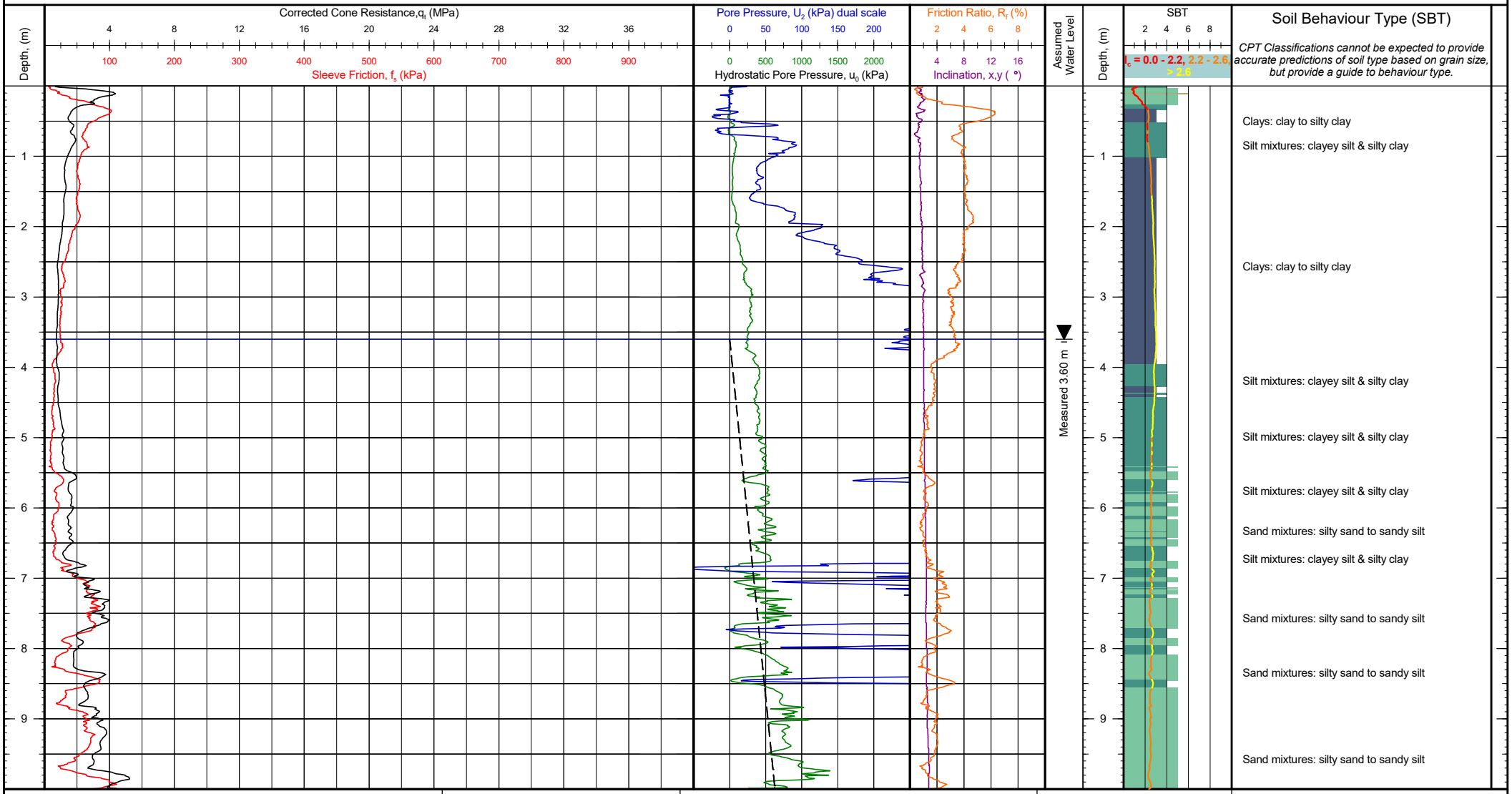
Test Number: WP-CPT-03

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927180.26, 1748587.41	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.789545,174.665325	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	14.64
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

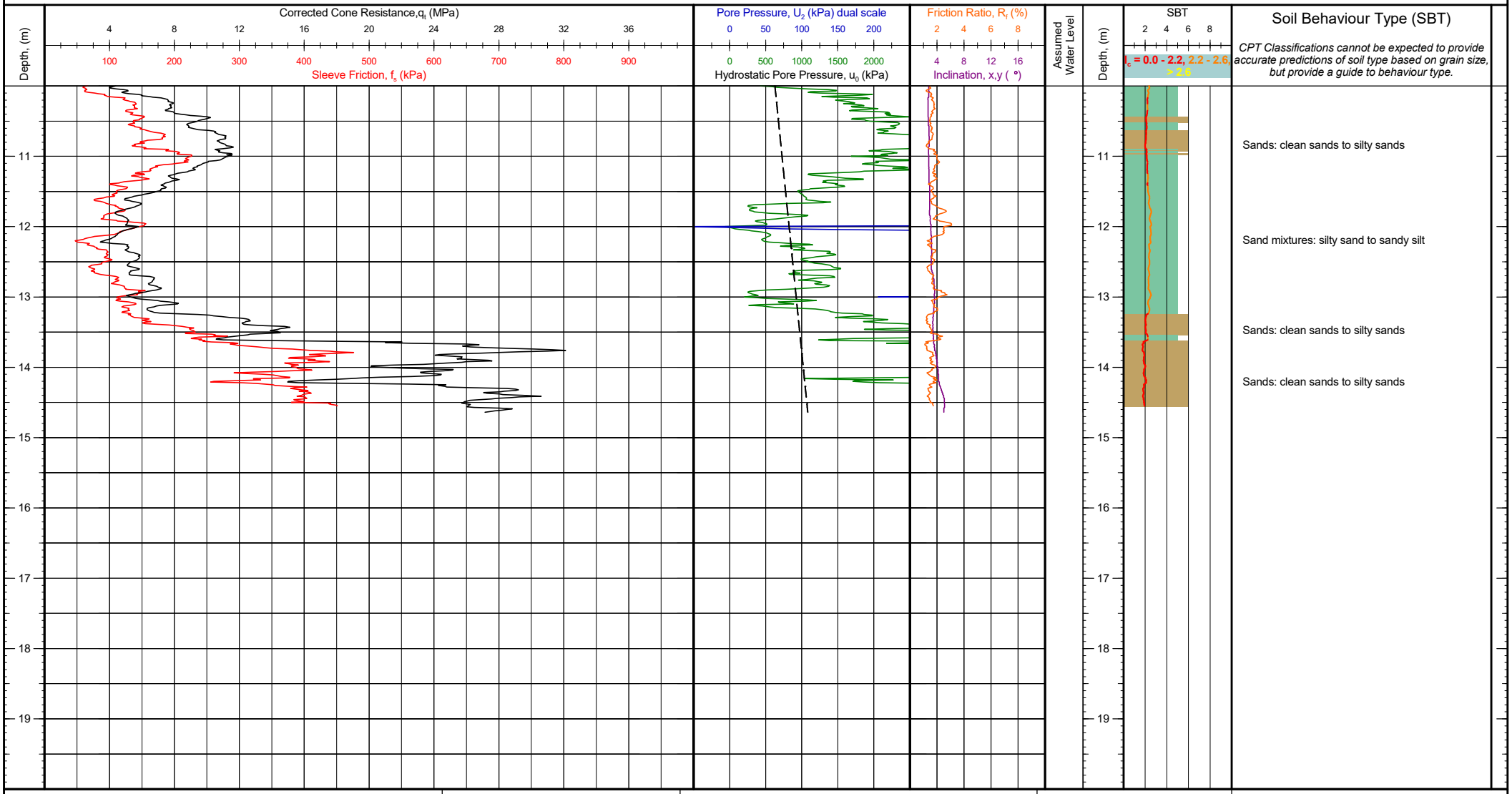
Test Number: WP-CPT-04

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927180.26, 1748587.41	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.789545,174.665325	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	14.64
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

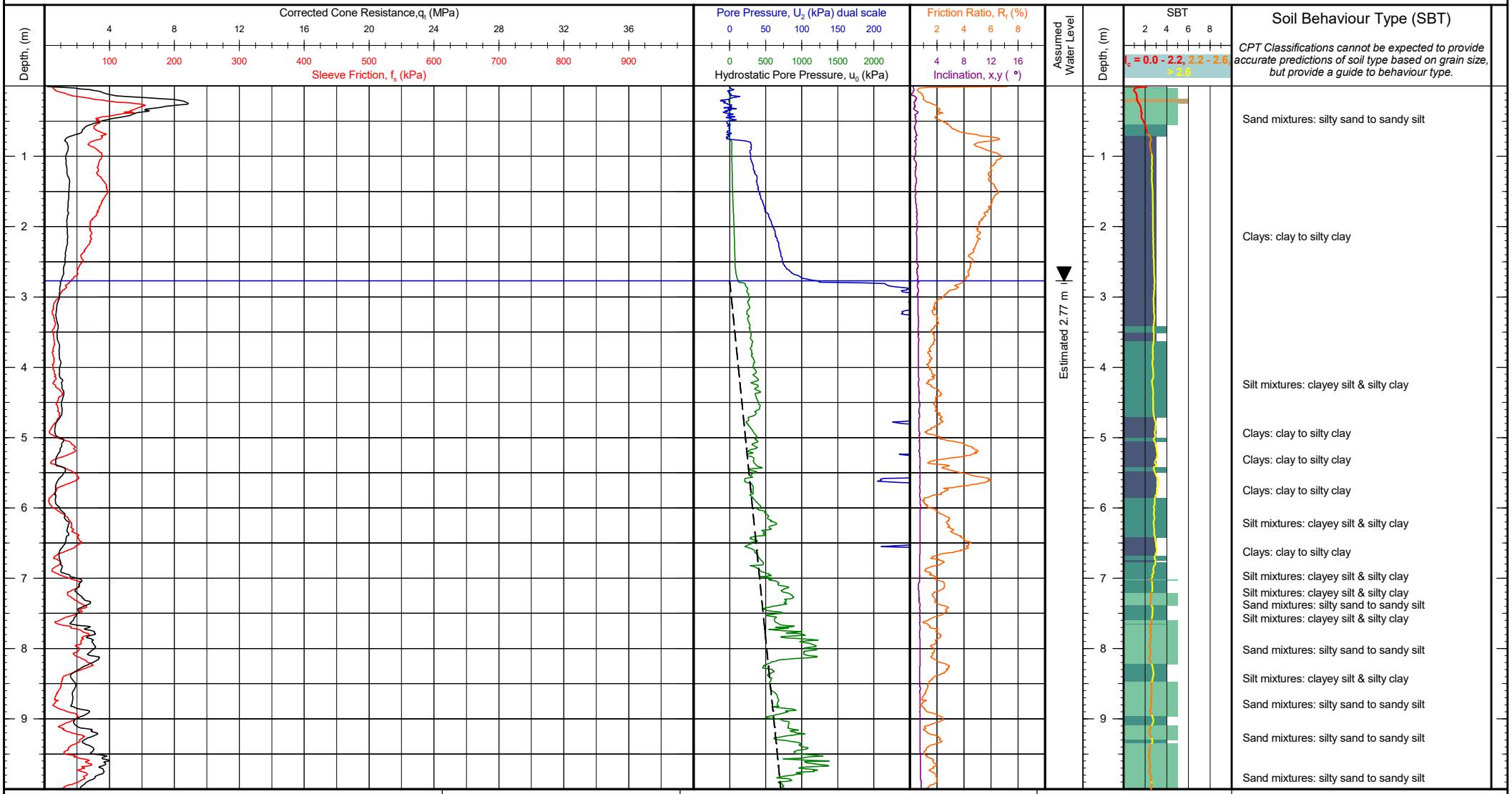
Test Number: WP-CPT-04

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927228.00, 1748541.83	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	70169	**WGS84 (deg):**	-36.789122,174.664805	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.79
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

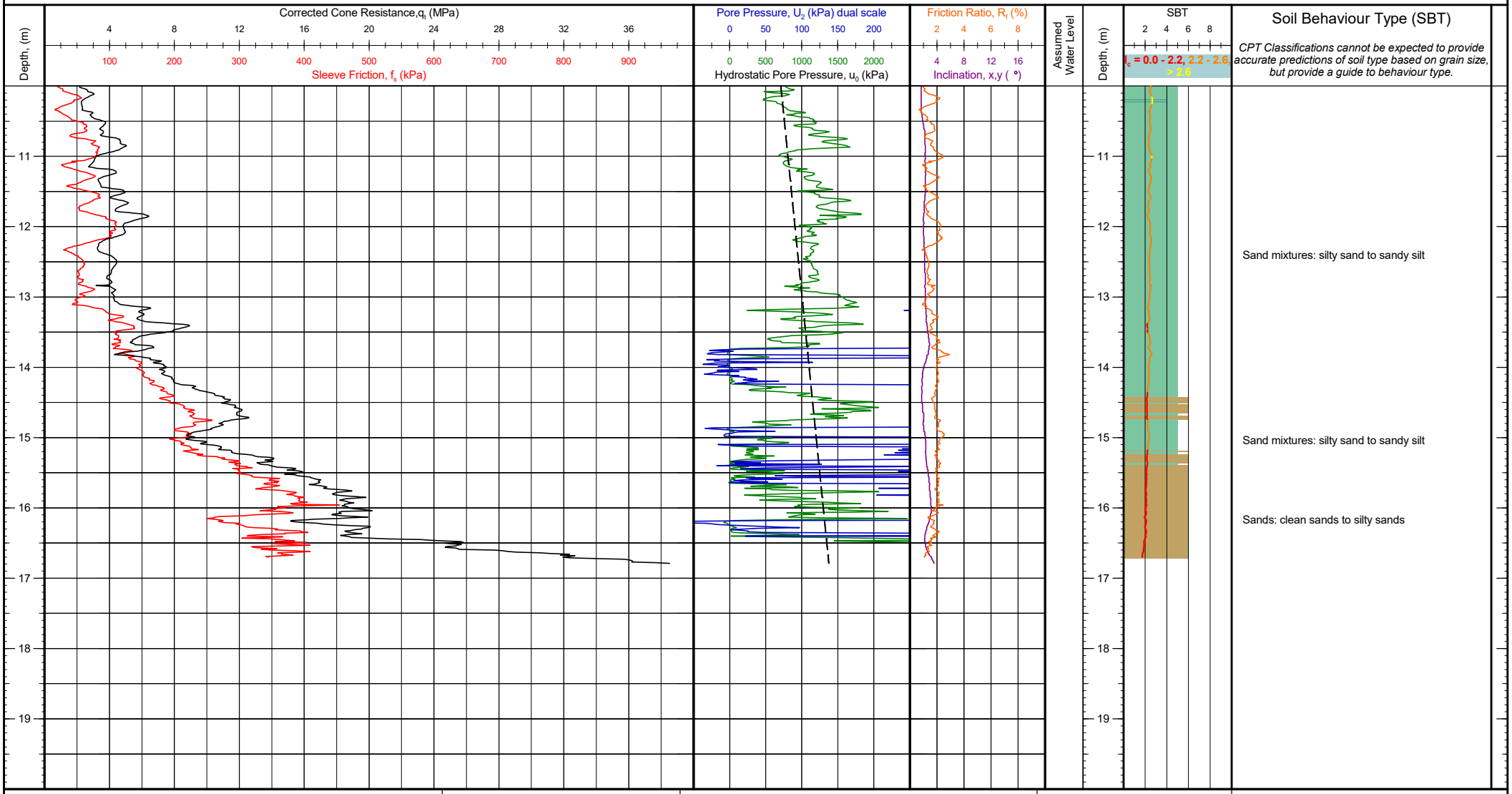
Test Number: WP-CPT-05

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Sand mixtures: silty sand to sandy silt

Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927228.00, 1748541.83	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	70169	**WGS84 (deg):**	-36.789122,174.664805	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.79
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

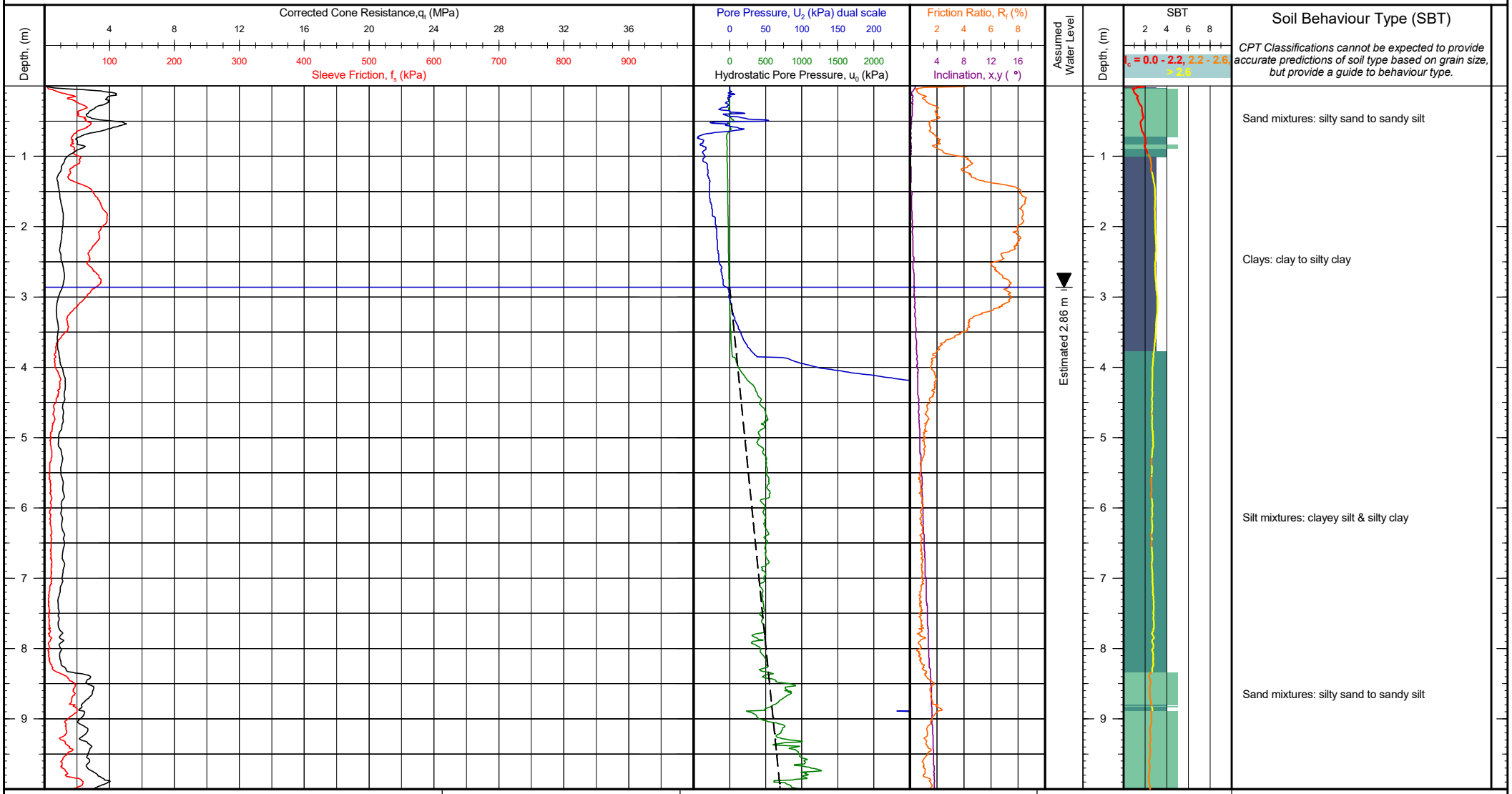
Test Number: WP-CPT-05

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Clays: clay to silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927117.05, 1748699.49	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.790097,174.666593	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.21
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

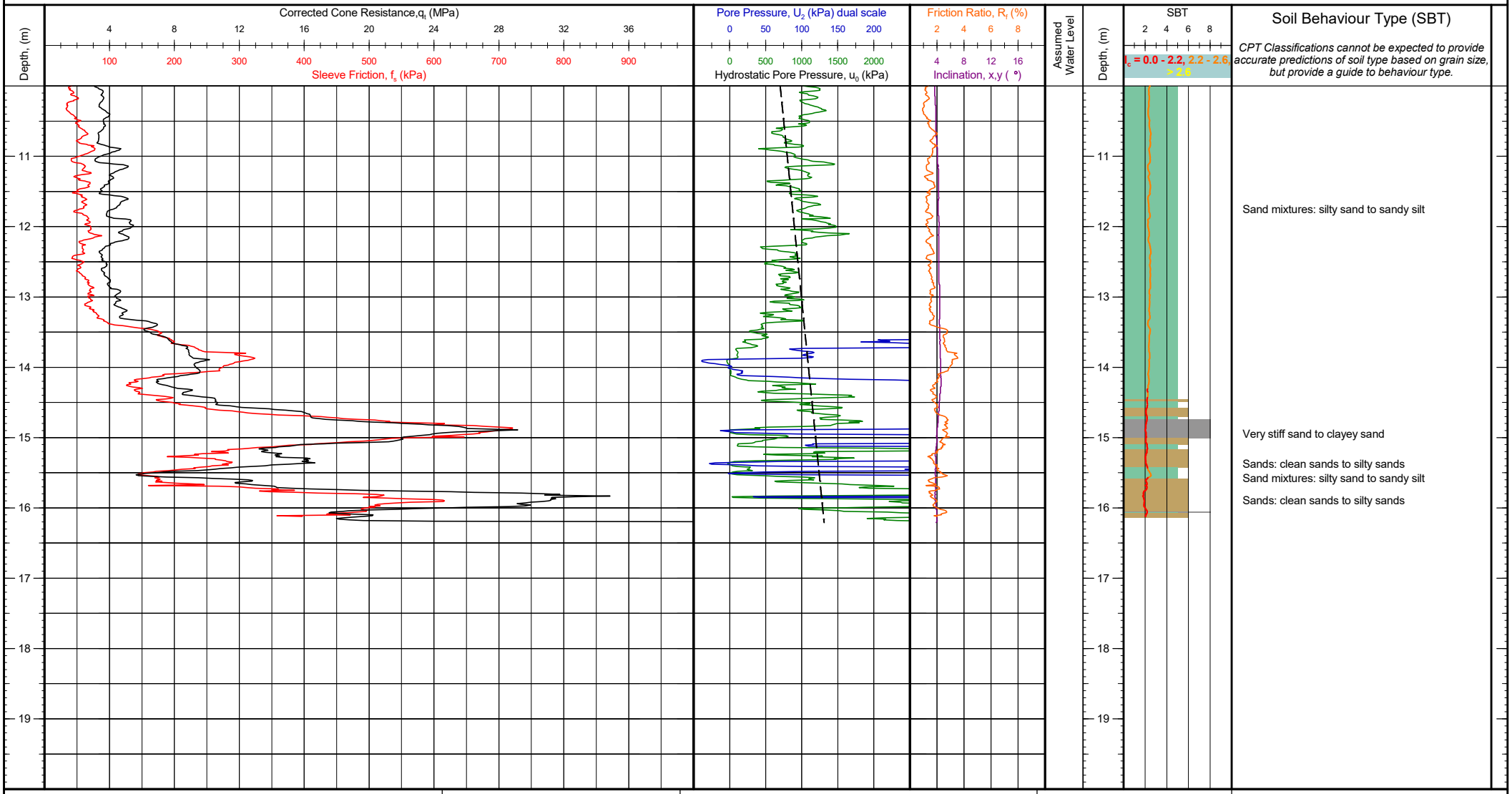
Test Number: WP-CPT-06

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

- Sand mixtures: silty sand to sandy silt
- Very stiff sand to clayey sand
- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927117.05, 1748699.49	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	71062	**WGS84 (deg):**	-36.790097,174.666593	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	16.21
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	Danger of buckling rods		

Client Reference:

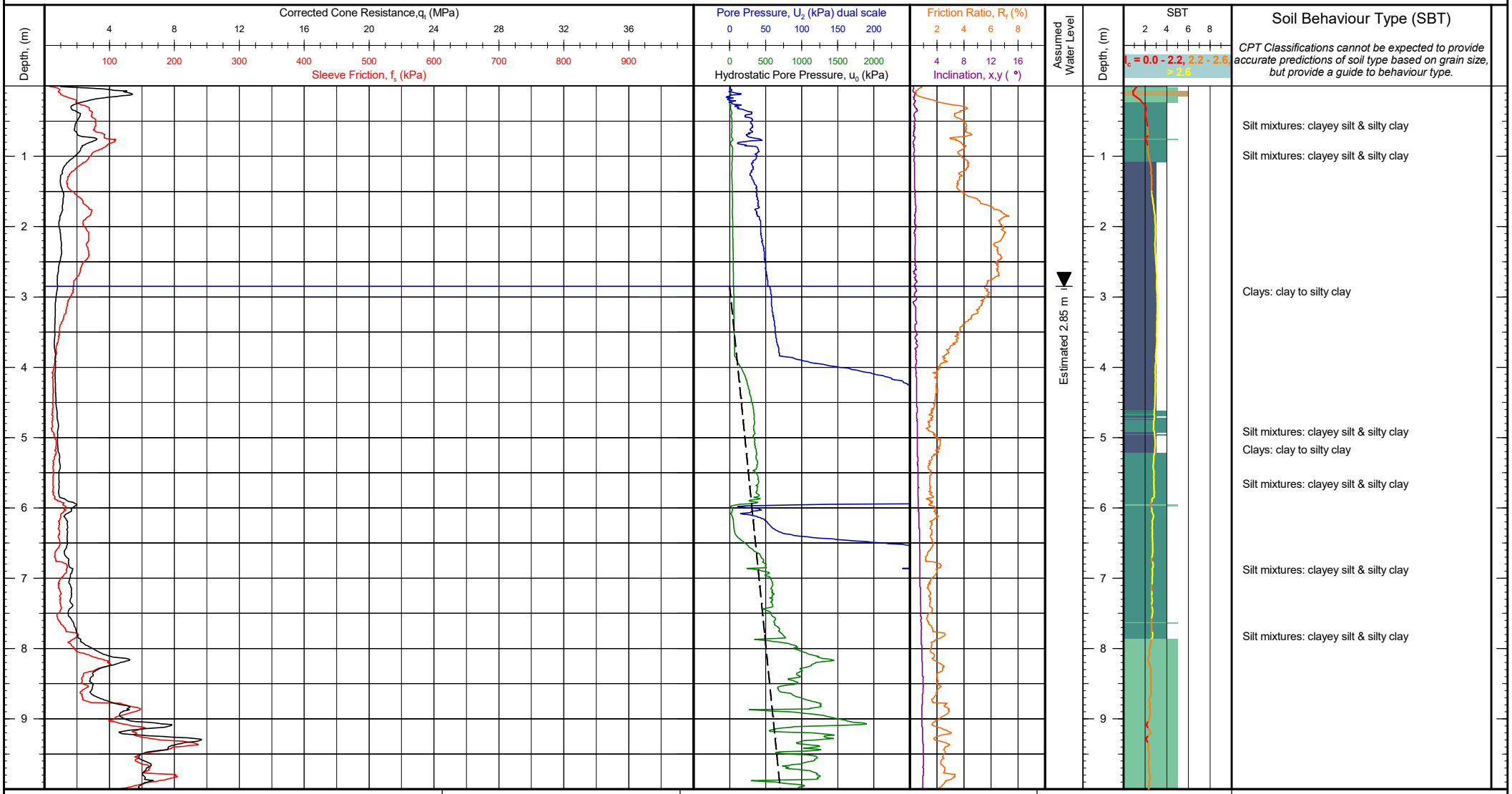
Test Number: WP-CPT-06

G.I. Job Ref: 201648

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION

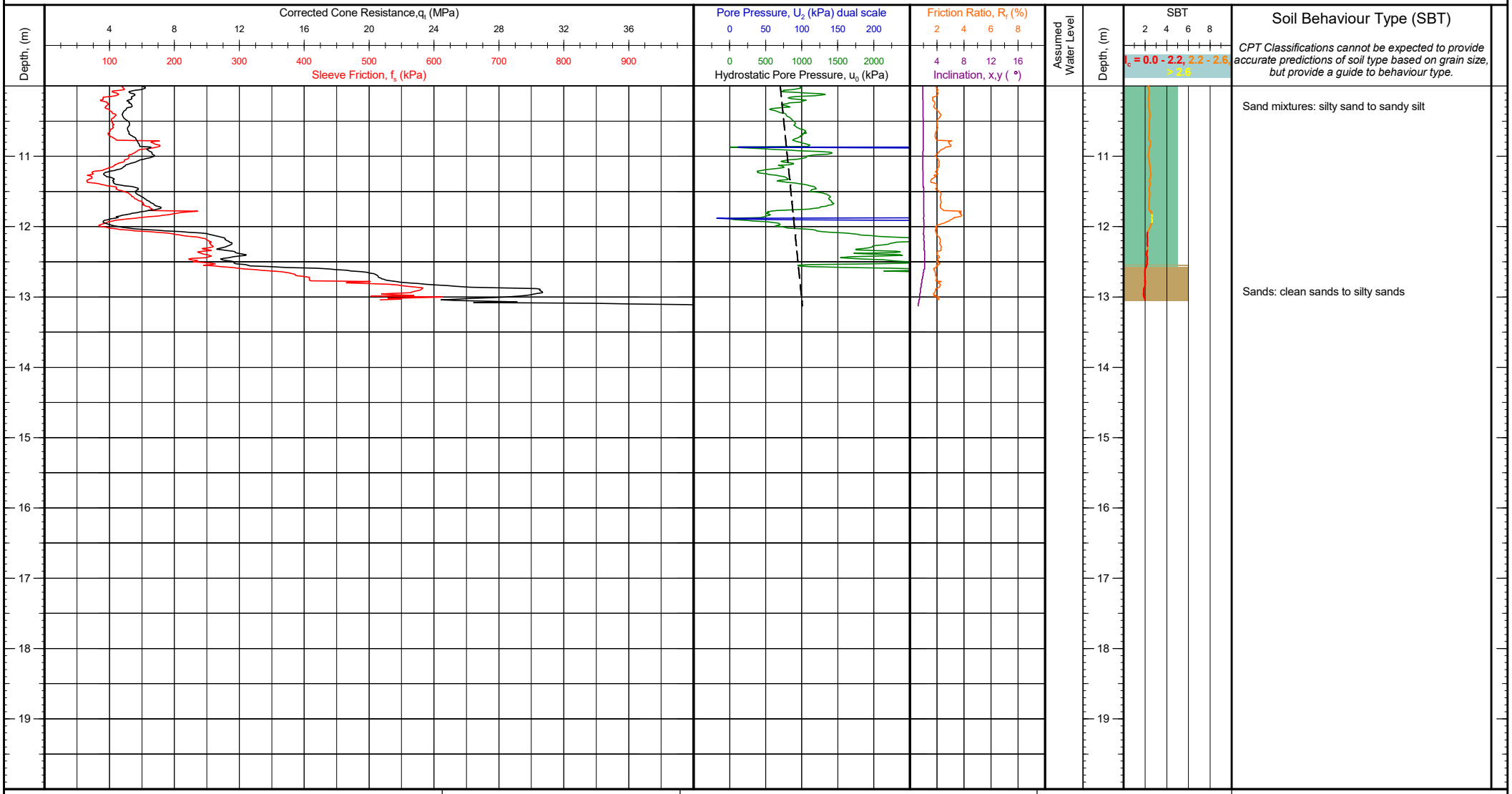


Client: Wentz-Pacific Ltd	**Operator:** Carlos Prieto	**NZTM 2000 N, E (m):** 5927224.10, 1748637.98	**Elevation (m):** Unknown	**Client Reference:**	
Project: 279 Hobsonville Point Road	**Cone Ref:** 70169	**WGS84 (deg):** -36.789142,174.665883	**Date of Test:** 17/12/2020		
Location: Hobsonville, Auckland	**Cone Type:** 15cm^2 Subtraction	**Location Method:** Handheld GPS	**Depth (m):** 13.13	**Test Number:** **WP-CPT-07**	
Engineer: Frederick Wentz	**Area Ratio:** 0.75	**Surveyor:**	**Pre Drill (m):** N/A		
Contractor: Ground Investigation Ltd	**Filter Type:** u_2	**Termination Reason:** High pore water pressure		**G.I. Job Ref:** 201648	

Comments:

CONE PENETRATION TEST (CPT) LOG

GROUND INVESTIGATION



Soil Behaviour Type (SBT)

CPT Classifications cannot be expected to provide accurate predictions of soil type based on grain size, but provide a guide to behaviour type.

Sand mixtures: silty sand to sandy silt

Sands: clean sands to silty sands

Client:	Wentz-Pacific Ltd	**Operator:**	Carlos Prieto	**NZTM 2000 N, E (m):**	5927224.10, 1748637.98	**Elevation (m):**	Unknown
Project:	279 Hobsonville Point Road	**Cone Ref:**	70169	**WGS84 (deg):**	-36.789142,174.665883	**Date of Test:**	17/12/2020
Location:	Hobsonville, Auckland	**Cone Type:**	15cm^2 Subtraction	**Location Method:**	Handheld GPS	**Depth (m):**	13.13
Engineer:	Frederick Wentz	**Area Ratio:**	0.75	**Surveyor:**		**Pre Drill (m):**	N/A
Contractor:	Ground Investigation Ltd	**Filter Type:**	u_2	**Termination Reason:**	High pore water pressure		

Client Reference:

Test Number: WP-CPT-07

G.I. Job Ref: 201648

Comments:

APPENDIX C

LOGS OF HAND AUGER BOREHOLES AND DYNAMIC CONE PENETROMETER TEST RESULTS

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA01

Sheet 1 of 8

Vane Head:	Logged By:	Processor :	Date:
307	RZ	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Legend	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
					TOPSOIL
					silty CLAY, orange, yellow and brown mottled. Very stiff, moist, medium plasticity, insensitive [FILL]
0.5			118/65	1.9	
1.0			181/147	1.2	
1.5			150/89	1.7	
					silty CLAY, orange streaked grey. Very stiff, moist, medium to high plasticity, insensitive [PUKETOKA FORMATION]
2.0			178/104	1.7	
2.5			164/104	1.6	Scala Penetrometer Test (Blows/100m)
					EOB at 2.8m. Target Depth. Scala Penetrometer test commenced to a depth of 3.9m.
3.0			164/118	1.4	2 3 3 4 3 6 10 10 9 11 15
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA02

Sheet 2 of 8

Vane Head:	Logged By:	Processor :	Date:
307	RZ	RZ	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
TOPSOIL					6 (HB)
EOB at 0.1m. Scala penetrometer test commenced and found effective refusal (ER) immediately.	0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0				Scala Penetrometer Test (Blows/100m) HB = Hammer Bouncing

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA03

Sheet 3 of 8

Vane Head:	Logged By:	Processor :	Date:
307	RZ	RZ	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Soil Description	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
	TOPSOIL				
	silty CLAY, orange and light grey mottled brown. Very stiff, moist, medium plasticity, moderately sensitive [FILL]				
0.5	silty CLAY, light grey and orange mottled. Very stiff, moist, medium to high plasticity, insensitive [PUKETOKA FORMATION]		150/52	2.9	
1.0	becoming orange streaked grey		141/104	1.4	
1.5			173/118	1.5	
2.0			167/104	1.6	
2.5			135/83	1.6	Scala Penetrometer Test (Blows/100m)
3.0	EOB at 3.0m. Target Depth. Scala Penetrometer test commenced to a depth of 3.9m.		150/86	1.7	1 2 3 4 5 7 8 8 7 10
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA04

Sheet 4 of 8

Vane Head:	Logged By:	Processor :	Date:
1750	PL	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Soil Description	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
0.0	silty CLAY, white, orange and light grey streaked dark grey. Hard, dry, medium plasticity, insensitive [FILL]				
	at 0.2m, becoming moist, trace fine sand				
0.5	becoming hard, insensitive		250/138	1.8	
	silty CLAY, orange and brown streaked light grey. Hard, moist, medium to high plasticity, insensitive [PUKETOKA FORMATION]				
1.0	becoming very stiff becoming red and orange streaked light grey, high plasticity		169/96	1.8	
1.5			123/96	1.3	
2.0	becoming orange/brown streaked light grey		142/85	1.7	
2.5	becoming wet		158/134	1.2	Scala Penetrometer Test (Blows/100m)
			138/104	1.3	
3.0	EOB at 2.9m. Target depth. Scala penetrometer test commenced to a depth of 3.9m				1 2 2 4 3 4 8 7 8 10
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA05

Sheet 5 of 8

Vane Head:	Logged By:	Processor :	Date:
1750	DS	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
silty CLAYwith trace coarse sand, grey and orange streaked brown. Hard, dry, medium plasticity, moderately sensitive [FILL]				
at 0.2m, becoming moist, high plasticity				
0.5		211/104	2.0	
silty CLAY, brown and orange streaked grey. Very stiff, moist, medium to high plasticity, moderately sensitive [PUKETOKA FORMATION]				
1.0		131/61	2.1	
becoming insensitive				
1.5		158/100	1.6	
becoming red and orange/brown streaked grey				
2.0		146/104	1.4	
2.5		136/106	1.3	Scala Penetrometer Test (Blows/100m)
3.0		123/106	1.2	1 2 3 4 5 7 8 8 7 10
EOB at 3.0m. Target Depth				
3.5				
4.0				
4.5				
5.0				
5.5				
6.0				

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA06

Sheet 6 of 8

Vane Head:	Logged By:	Processor :	Date:
2784	PL	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
silty CLAY, with trace fine sand, orange and white streaked brown. Hard, dry, medium plasticity [FILL]				
at 0.2m, becoming moist				
at 0.3m, becoming orange brown mottled dark grey				
becoming orange, light grey, dark grey streaked brown	0.5		UTP	
moderately thin bed of red fine to medium sized gravel				
becoming very stiff, insensitive	1.0		132/86	1.5
silty CLAY, orange, brown streaked light grey. Very stiff, moist, medium to high plasticity [PUKETOKA FORMATION]				
at 1.2m, becoming high plasticity				
with trace grey fine gravel sized silt clast inclusions	1.5		110/81	1.4
without silt clast inclusions				
becoming light grey and orange streaked brown/purple, with organic staining				
becoming orange streaked light rey	2.0		148/113	1.3
becoming orange and red streaked light grey				
	2.5		150/115	1.3
				Scala Penetrometer Test (Blows/100m)
			124/105	1.2
EOB at 2.9m. Target Depth. Scala penetrometer test commenced to a depth of 3.9m	3.0			2
				3
				3
				5
				7
	3.5			9
				12
				10
				12
	4.0			13
	4.5			
	5.0			
	5.5			
	6.0			

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic
Fill	Gravel	Siltstone	No Core
Clay	Organic	Limestone	
Silt	Pumice	Volcanic	

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA07

Sheet 7 of 8

Vane Head:	Logged By:	Processor :	Date:
1750	DS	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
SILT, orange mottled light brown. Very stiff, dry, no plasticity, with some fine to medium gravel inculsions [FILL]					
silty CLAY, grey and orange/brown. Very stiff, moist, medium plasticity, moderately sensitive, with trace fine gravel [PUKETOKA FORMATION]	0.5		122/42	2.9	
becoming stiff	1.0		85/38	2.2	
becoming hard	1.5		UTP		
becoming orange mottled dark grey, high plasticity					
becoming very stiff, insensitive	2.0	▽	154/119	1.3	
becoming wet					
becoming saturated	2.5		154/119	1.3	Scala Penetrometer Test (Blows/100m)
at 2.9m, becoming moderately sensitive			150/69	2.1	1 2 3 4 5 7 8 8 7 10
EOB at 2.9m. Target Depth. Scala penetrometer test commenced to a depth of 3.9m.	3.0				
	3.5				
	4.0				
	4.5				
	5.0				
	5.5				
	6.0				

LANDER geotechnical

Comments:
Groundwater encountered at 2.6m.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

Client : WENTZ-PACIFIC LIMITED

Project Location : 279 HOBSONVILLE POINT ROAD HOBSONVILLE

Job Number: J01630

Auger Borehole No. HA08

Sheet 8 of 8

Vane Head:	Logged By:	Processor :	Date:
2784	PL	PL	21.12.20

Borehole Location: mN | mE | Ground R.L.

Description: Refer to site plan

SOIL DESCRIPTION

Depth (m)	Soil Description	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
0.0	silty CLAY, with trace fine sand, orange, brown, white streaked brown. Very stiff, moist, medium plasticity [FILL]				
	becoming orange streaked light grey				
0.5			188+		
	becoming orange streaked dark grey, with minor fine gravel				
	becoming orange streaked brown				
1.0	becoming dark orange streaked dark grey, high plasticity		188+		
	silty CLAY, orange streaked light brown. Very stiff, moist, high platicity, insensitive [PUKETOKA FORMATION]				
1.5	becoming orange and red streaked grey/purple, with trace organic staining		145/94	1.5	
	becoming orange, red streaks grey, without organic staining				
2.0			150/97	1.5	
2.5	becoming orange, brown streaked light grey		115/91	1.3	Scala Penetrometer Test (Blows/100m)
3.0	EOB at 2.9m. Target Depth. Scala penetrometer test commenced and found effective refusal (ER) at 3.6m.		164/134	1.2	3 5 10 10 10 10 20+ (ER)
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					

LANDER geotechnical

Comments:
Groundwater not encountered.
UTP = unable to penetrate.
EOB = end of borehole.

Borehole Diameter: 50mm

Checked: RG

Topsoil	Sand	Sandstone	Plutonic		
Fill	Gravel	Siltstone	No Core		
Clay	Organic	Limestone			
Silt	Pumice	Volcanic			

APPENDIX D

LOGS OF 2009 DEEP INVESTIGATIONS AT THE SITE CONDUCTED BY TONKIN & TAYLOR LTD

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH10
Hole Location: Refer to site plan.

SHEET 1 OF 2

PROJECT: Geotechnical Investigation | LOCATION: Hobsonville Base | JOB No: 25607.001

CO-ORDINATES 810099.6 mN 391203.1 mE | DRILL TYPE: Mobile B57 | HOLE STARTED: 29/9/08

DRILL METHOD: Hollow Stem Auger | HOLE FINISHED: 29/9/08

R.L. 16.20 m | DRILLED BY: Geotech Drilling Ltd

DATUM | DRILL FLUID: N/A | LOGGED BY: LPA | CHECKED: JKK

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY (%) | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

Geological unit	Core recovery (%)	Method	Tests	Classification symbol	Moisture condition	Strength/density classification	Engineering description
TOPSOIL	1000	AUGER		OL	Mst		SILT, organic
FILL (Slightly organic, poorly compacted)			• 116/46kPa	ML		VSt	SILT, clayey, yellow and grey with pockets of organic silt
			• 121/53kPa				
	450	SPT	2 2 3 N=5				
TOPSOIL (Disturbed Appearance)	50	A		OL		St	- dark grey organic silt layer
TAURANGA GROUP ALLUVIUM	300	OB	• 99/31kPa	ML			SILT, clayey, yellow and grey
	200	A					
	400	OB					
	350	A	• 102/53kPa			VSt	
	400	OB	• 118/61kPa	ML			SILT, clayey, light grey with faint yellow staining
	350	A					
	400	OB	• 138/72kPa				
	350	A					
	400	OB	• 94/57kPa			St	- slightly sandy with occasional decomposed organic flecks
	350	A					
	400	OB	• 63/21kPa	MS			- grades sandy, light grey
	1100	AUGER					
	400	OB	• 34/10kPa	ML		F	SILT, slightly sandy, slightly clayey, grey
	1100	AUGER				St	SILT, sandy, light grey/green, with occasional decomposed shell pieces
	400	OB	• 84/23kPa				
	1100	AUGER					- grades less sandy, light grey
	400	OB	• 92/30kPa				

Log Scale 1:50

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH10
Hole Location: Refer to site plan.

SHEET 2 OF 2

PROJECT: Geotechnical Investigation | LOCATION: Hobsonville Base | JOB No: 25607.001

CO-ORDINATES 810099.6 mN, 391203.1 mE | DRILL TYPE: Mobile B57 | HOLE STARTED: 29/9/08

DRILL METHOD: Hollow Stem Auger | HOLE FINISHED: 29/9/08

R.L. 16.20 m | DRILLED BY: Geotech Drilling Ltd

DATUM | DRILL FLUID: N/A | LOGGED BY: LPA | CHECKED: JKK

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
TAURANGA GROUP ALLUVIUM			1100	AUGER				6	11		ML	Mst	VSt				SILT, slightly sandy, slightly clayey, light grey with faint light green staining
			400	OB		• >220kPa		5									
			1100	AUGER				4	12								
			450	SPT		3 4 5 N=9		3	13								
			1050	AUGER				2	14								
			450	SPT		3 4 7 N=11		1	15								
			1050	AUGER													- dark yellow, with very thin light grey, clayey layers
			450	SPT		3 5			16			W					
						7 N=12		0									**END OF BOREHOLE AT 16.05m.**
								-1	17								
								-2	18								
								-3	19								
									20								

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

Log Scale 1:50

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH11
Hole Location: Refer to site plan.

SHEET 1 OF 2

PROJECT: Geotechnical Investigation | LOCATION: Hobsonville Base | JOB No: 25607.001

CO-ORDINATES 809954.4 mN 391293.3 mE | DRILL TYPE: Mobile B57 | HOLE STARTED: 9/10/08

DRILL METHOD: Hollow Stem Auger | HOLE FINISHED: 9/10/08

R.L. 17.80 m | DRILLED BY: Geotech Drilling Ltd

DATUM | DRILL FLUID: N/A | LOGGED BY: LPA | CHECKED: JKK

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY (%) | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | WEATHERING: MOISTURE CONDITION | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

TOPSOIL											OL		VSt			Organic SILT.
PLEISTOCENE SEDIMENTS		1000	AUGER		118/43kPa		17	1		ML						SILT, clayey, grey and yellow.
					113/62kPa											
					113/57kPa						OL					- light grey with light red and yellow.
		400	OB		124/76kPa					MH						- thin layer organic staining.
		200	AUG										St			- grades very clayey.
		400	OB		91/64kPa		16	2								- light grey/light brown with faint organic staining.
		200	AUG													
ESTUARINE SEDIMENTS		400	OB		63/41kPa											SILT, grey with vertical decomposed roots to 5mm diameter.
		350	AUG				15	3					F			
		400	OB		40/12kPa											
		350	AUG													
		400	OB		35/10kPa		14	4								
		350	AUG													
		400	OB		76/21kPa								St			
		350	AUG				13	5		MS						SILT, sandy, grey.
		400	OB		76/26kPa						W					
		1100	AUGER				12	6			M					- thin silty layers.
																- with layers of faint organic staining.
		400	OB		67/21kPa		11	7			W					
EAST COAST BAYS FORMATION		1100	AUGER				10	8		ML			VSt			SILT, slightly clayey, grey.
		400	OB		127/46kPa											- with sandy layers approximately 15° bedding plane.
		900	AUGER				9	9								
		450	SPT		6 10	1	8	10					MD			

Log Scale 1:50

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH11
Hole Location: Refer to site plan.

SHEET 2 OF 2

PROJECT: Geotechnical Investigation	LOCATION: Hobsonville Base	JOB No: 25607.001
CO-ORDINATES 809954.4 mN 391293.3 mE	DRILL TYPE: Mobile B57	HOLE STARTED: 9/10/08
	DRILL METHOD: Hollow Stem Auger	HOLE FINISHED: 9/10/08
R.L. 17.80 m		DRILLED BY: Geotech Drilling Ltd
DATUM	DRILL FLUID: N/A	LOGGED BY: LPA CHECKED: JKK

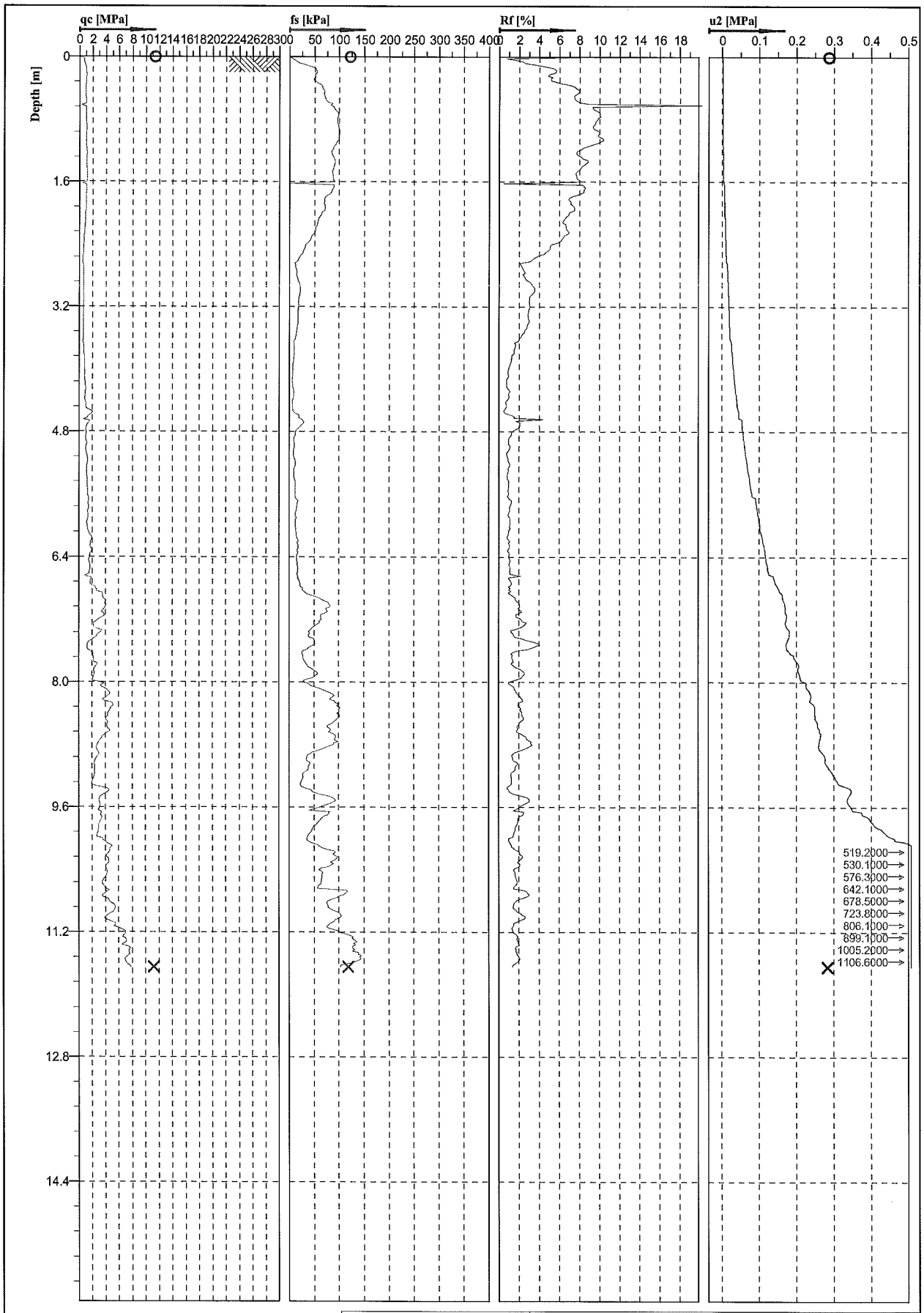
GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
EAST COAST BAYS FORMATION			1050	AUGER		14 N=24		7	11			M	MD				
			300	SPT		19 32 - N>50	2				ML		D VD				- weakly cemented slightly clayey grey SILT.
			1200	AUGER				6	12								
			235	SPT		18 25/85mm N>100	3	5	13								**END OF BOREHOLE AT 12.735m**
								4	14								
								3	15								
								2	16								
								1	17								
								0	18								
								-1	19								
								-2	20								

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

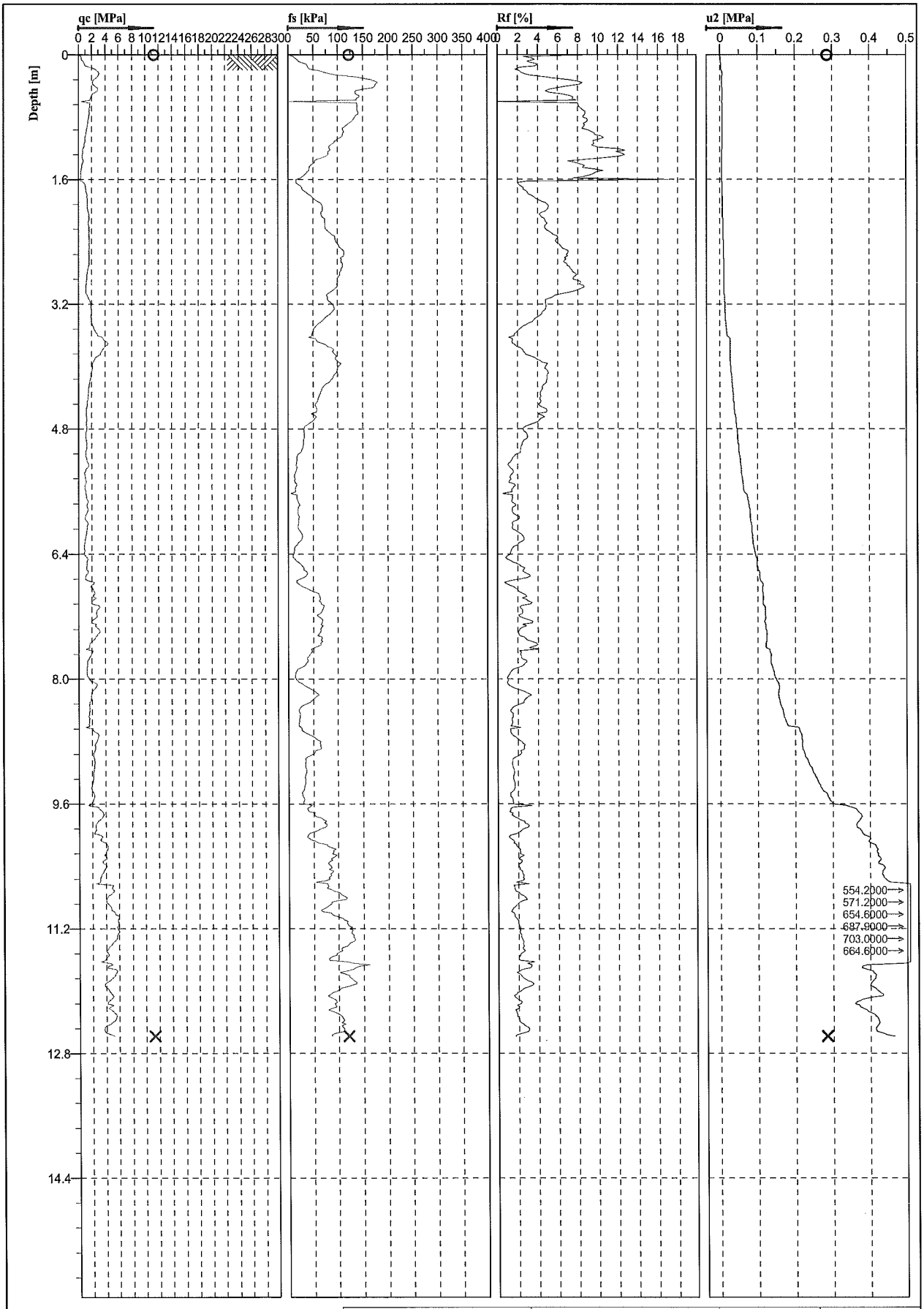
Log Scale 1:50



U2

Location: AUCKLAND	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 10
Project ID:	Client: TONKIN & TAYLOR LTD	Date: 10/10/2008	Scale: 1 : 65
Project:		Page:	Fig:

GEOTECH



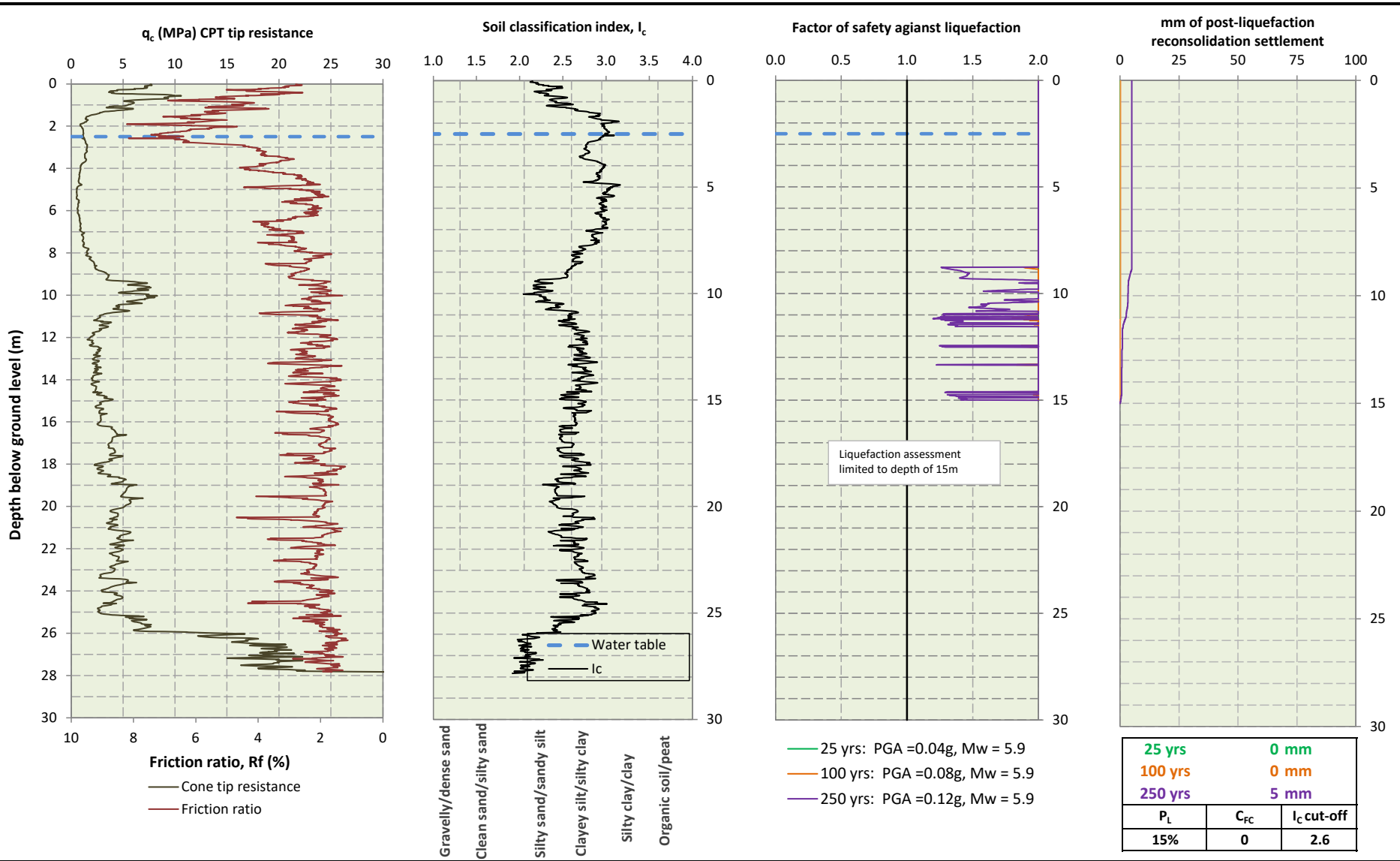
U2

Location: AUCKLAND	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 11
Project ID:	Client: TONKIN & TAYLOR LTD	Date: 10/10/2008	Scale: 1 : 65
Project:		Page:	Fig:

GEOTECH

APPENDIX E

RESULTS OF LIQUEFACTION ASSESSMENT



Liquefaction analysis

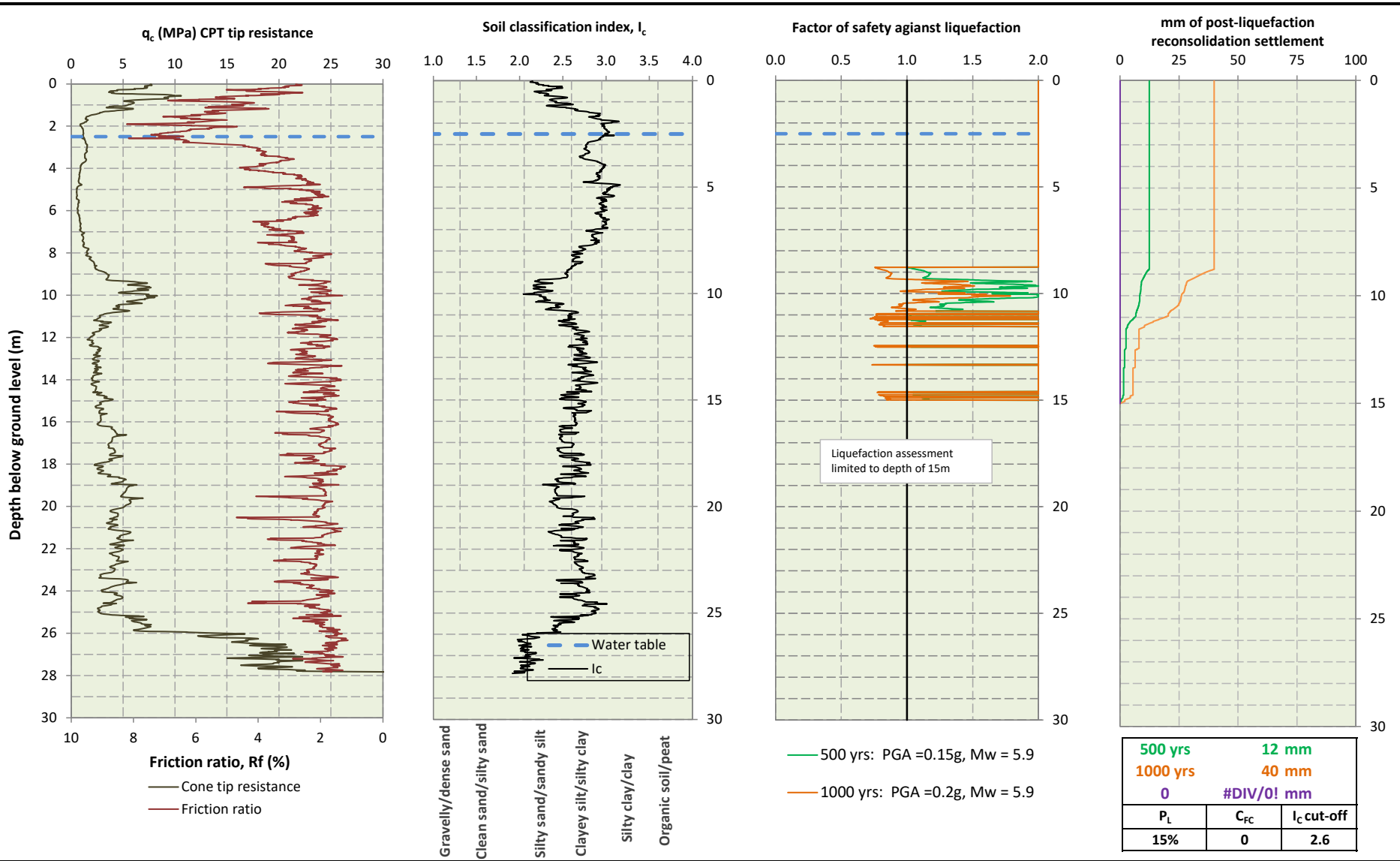
CPT-1

R Boulanger & I Idriss '14 **Plate: E-1**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS



Liquefaction analysis

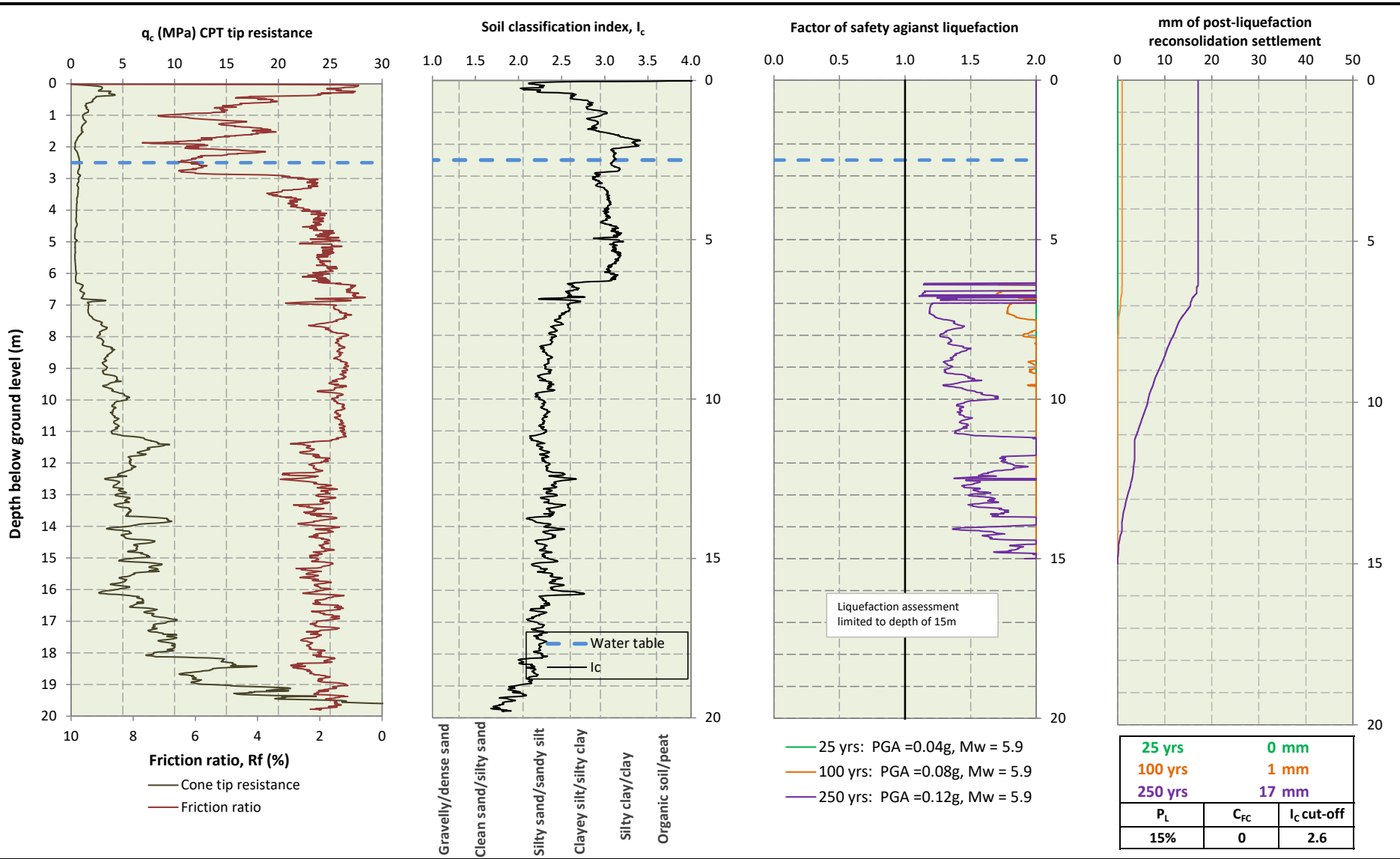
CPT-1

R Boulanger & I Idriss '14 **Plate: E-2**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS



Liquefaction analysis

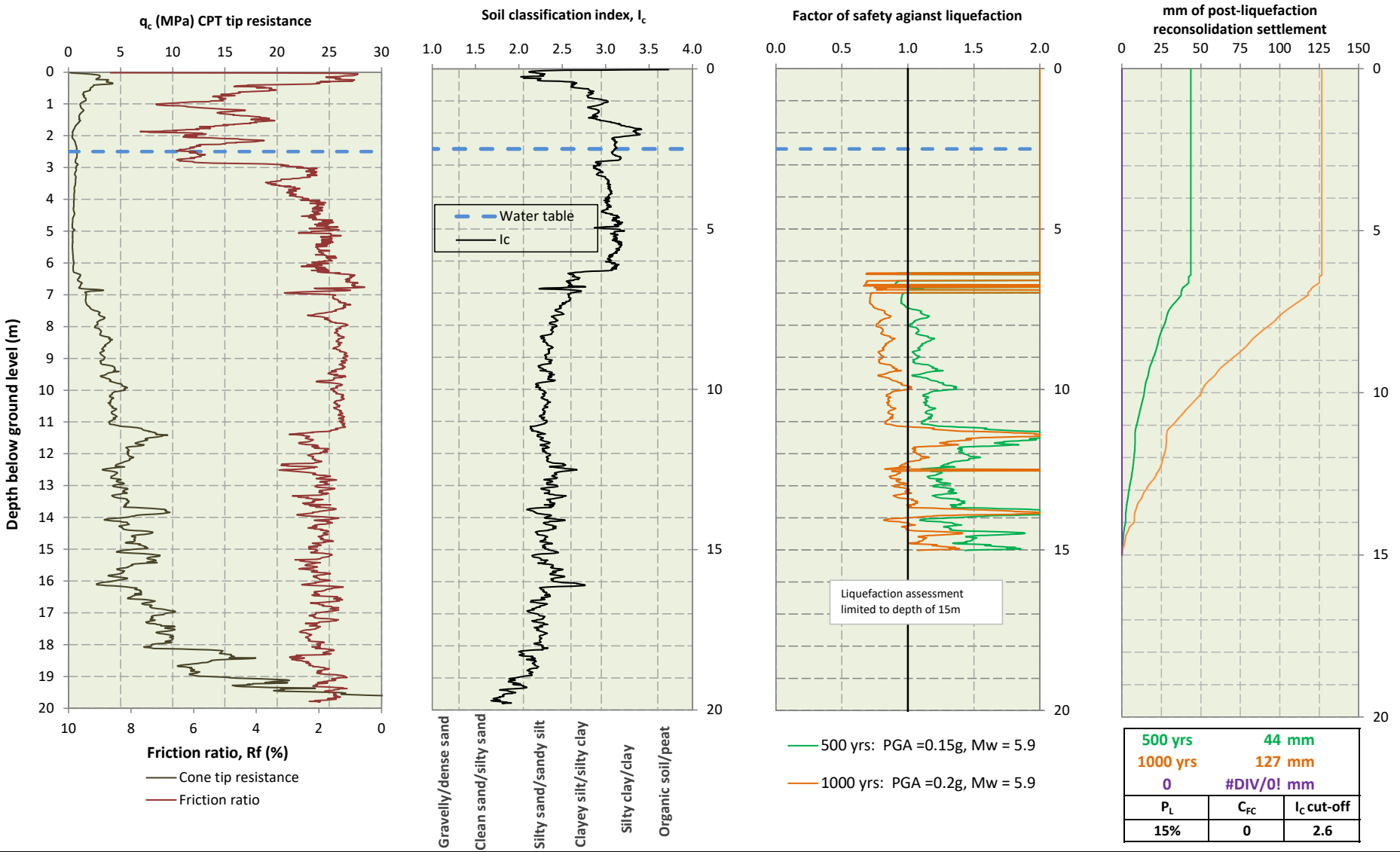
CPT-2

R Boulanger & I Idriss '14 **Plate: E-3**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



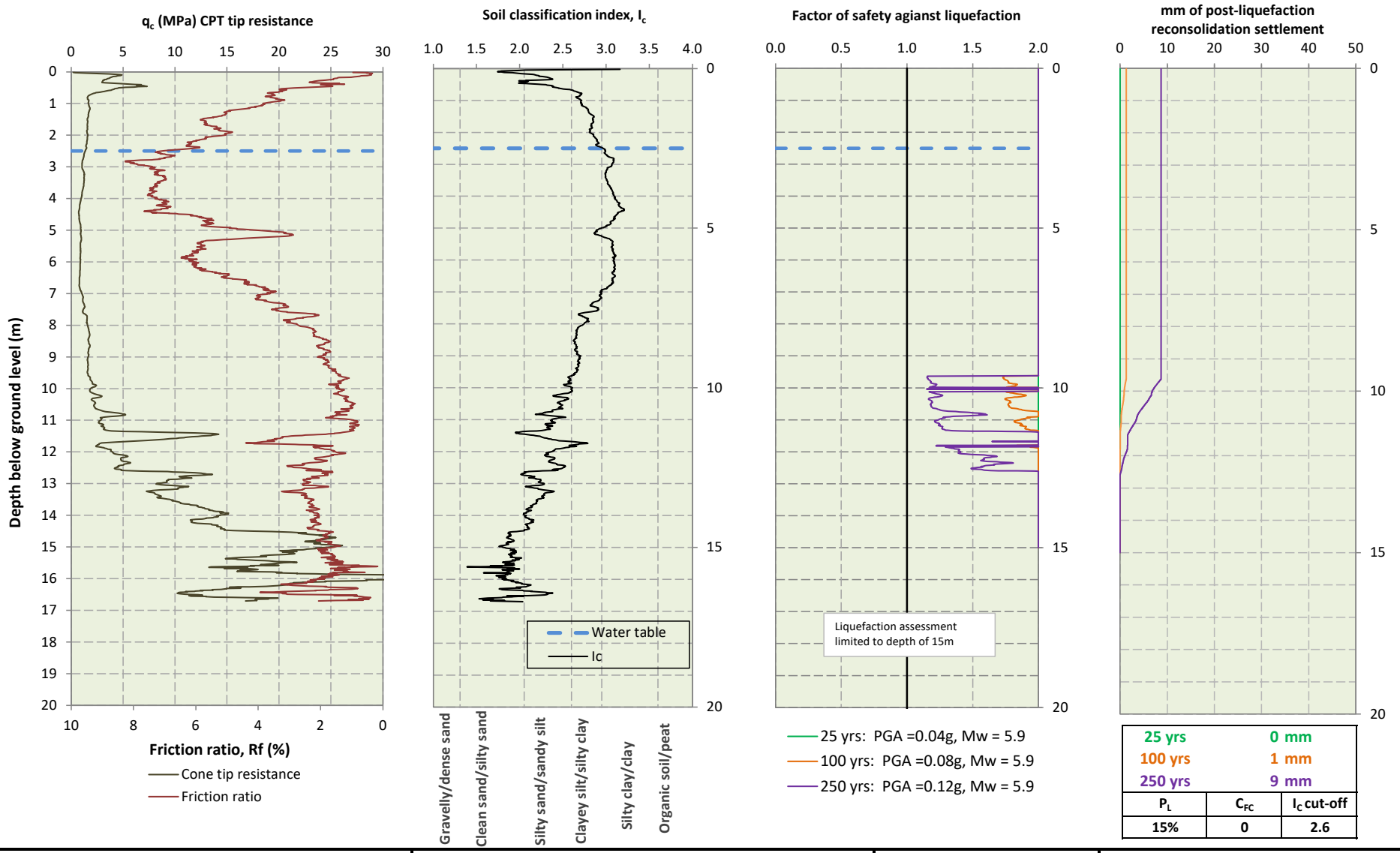
Liquefaction analysis

CPT-2

R Boulanger & I Idriss '14 **Plate: E-4**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS

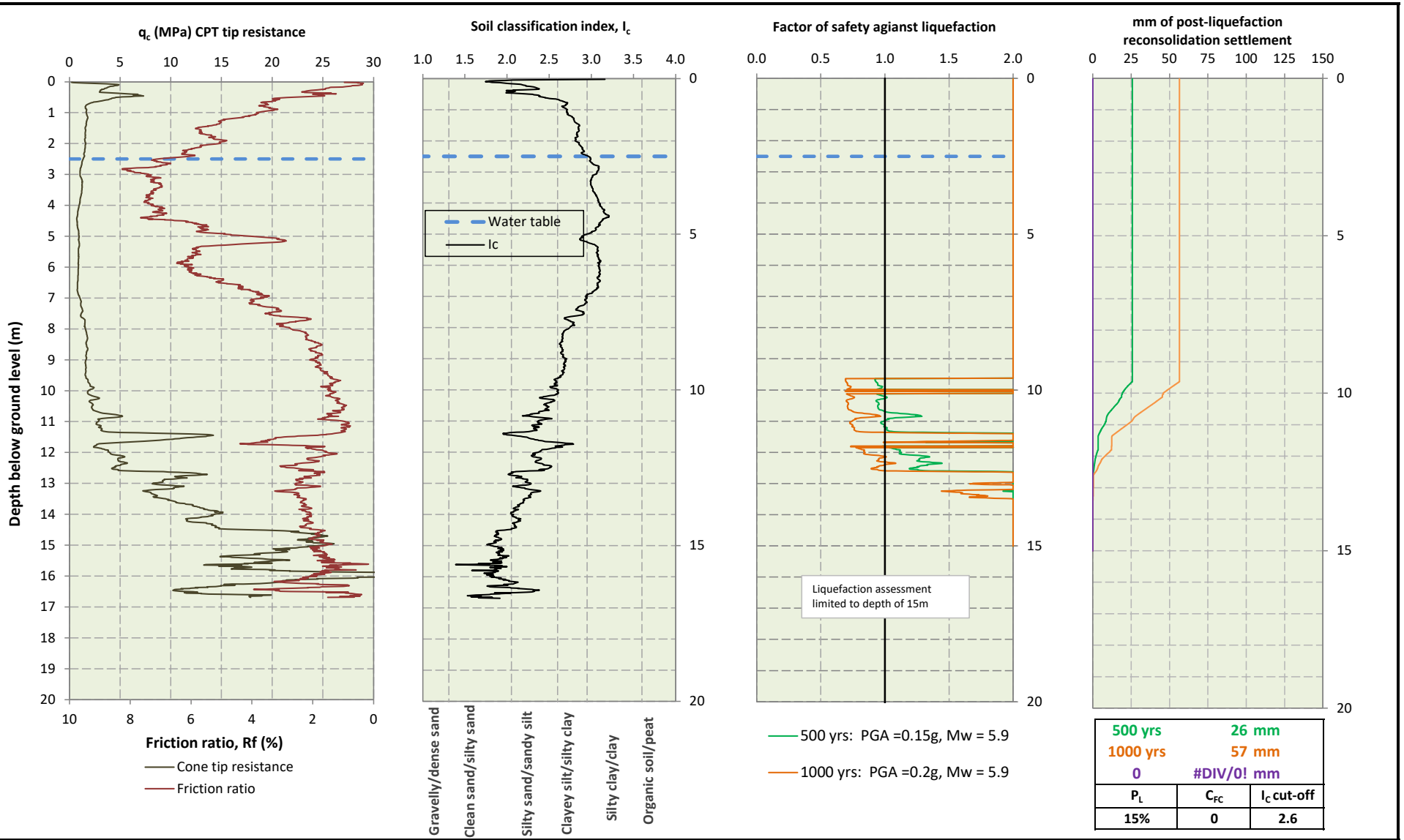


Liquefaction analysis
CPT-3
R Boulanger & I Idriss '14 **Plate: E-5**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

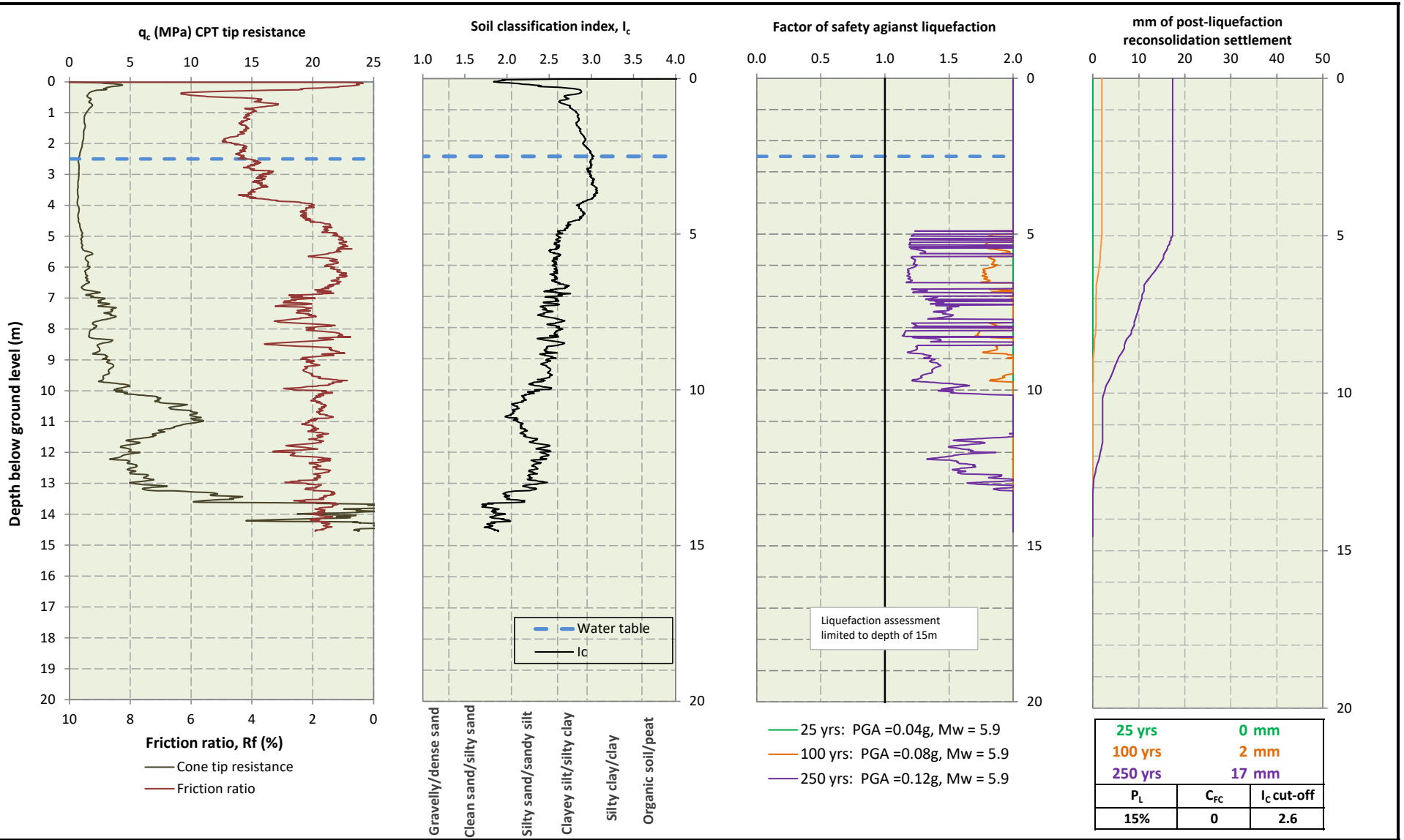
WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



Liquefaction analysis
CPT-3
R Boulanger & I Idriss '14 **Plate: E-6**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



Liquefaction analysis

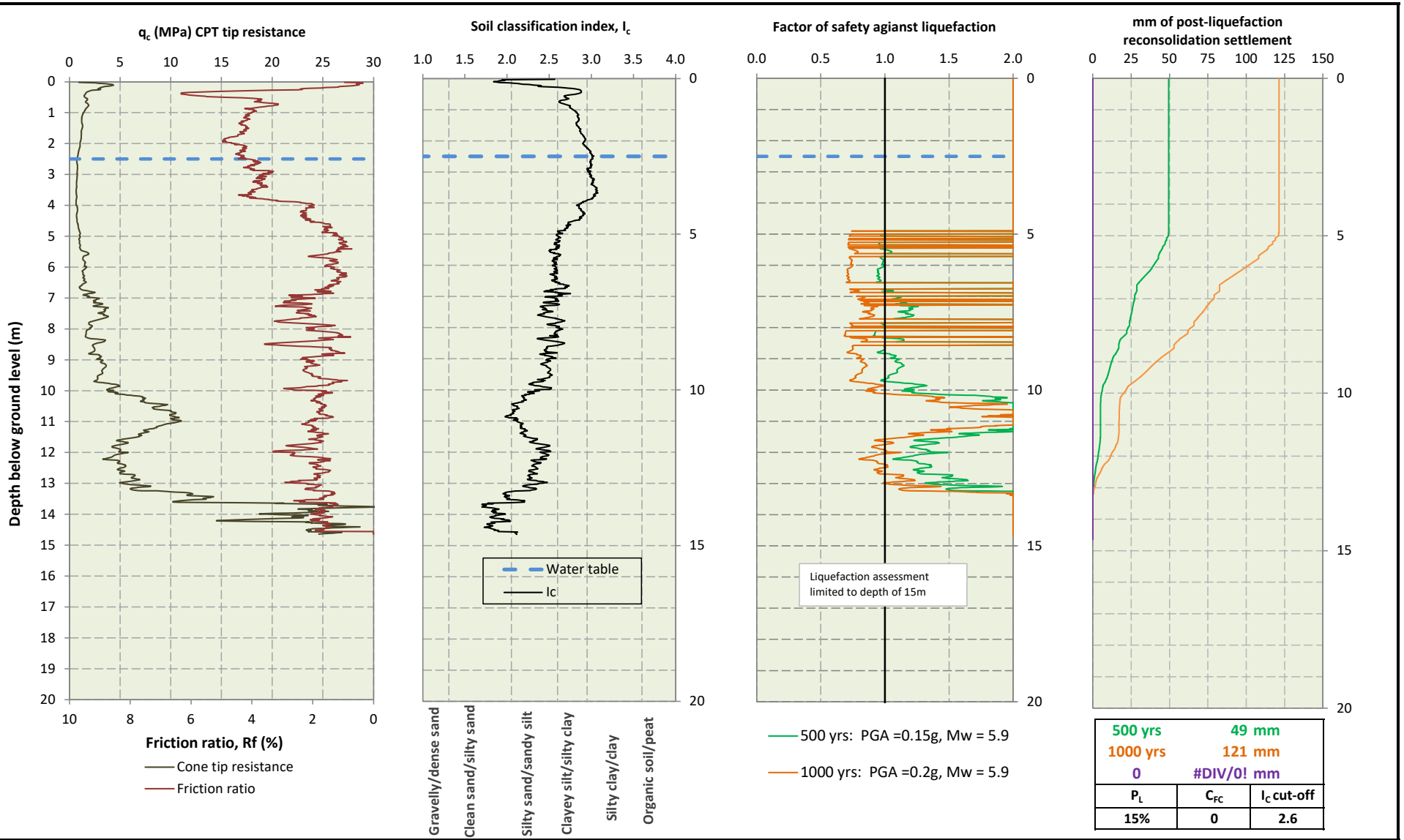
CPT-4

R Boulanger & I Idriss '14 **Plate: E-7**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS



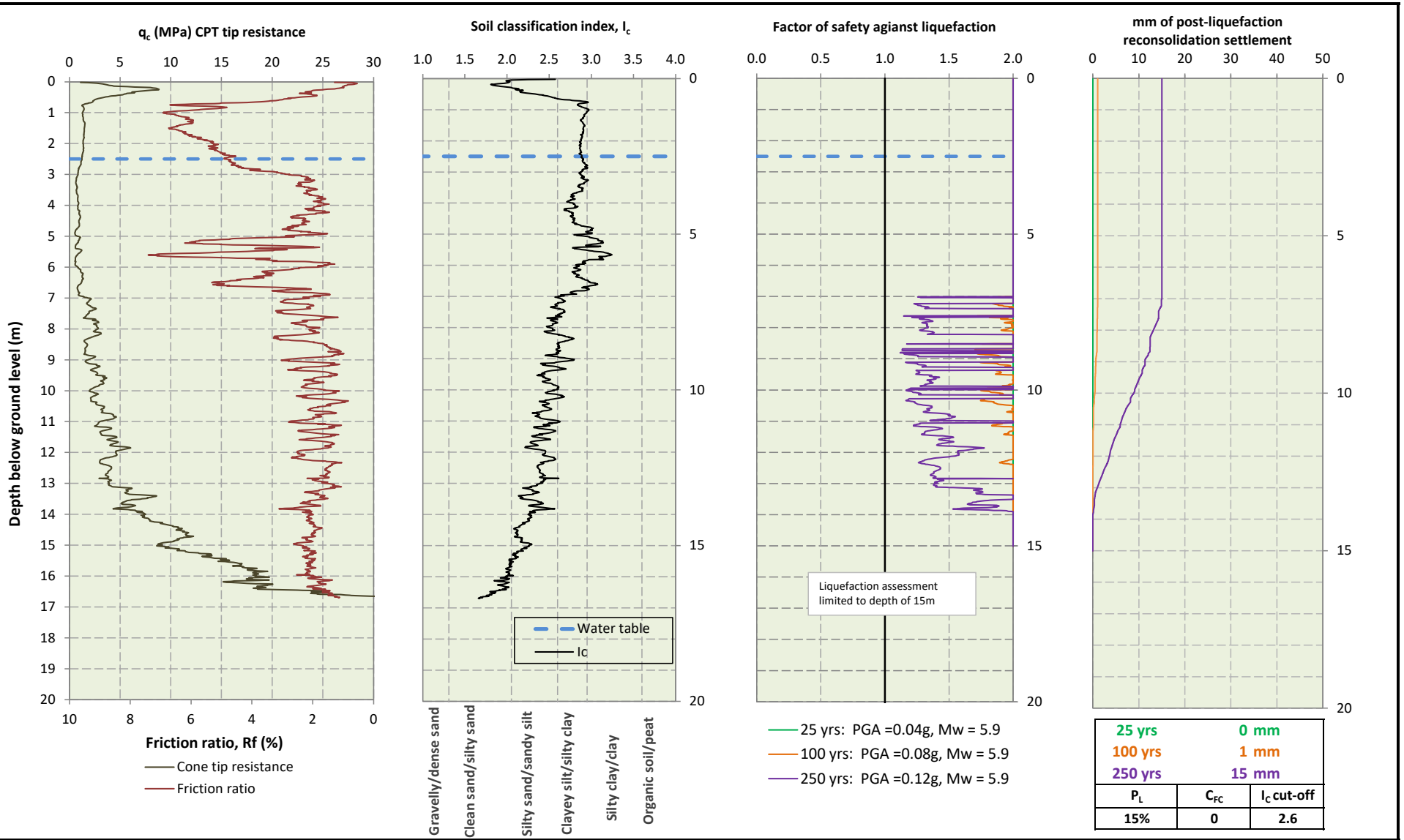
Liquefaction analysis

CPT-4

R Boulanger & I Idriss '14 **Plate: D-8**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



Liquefaction analysis

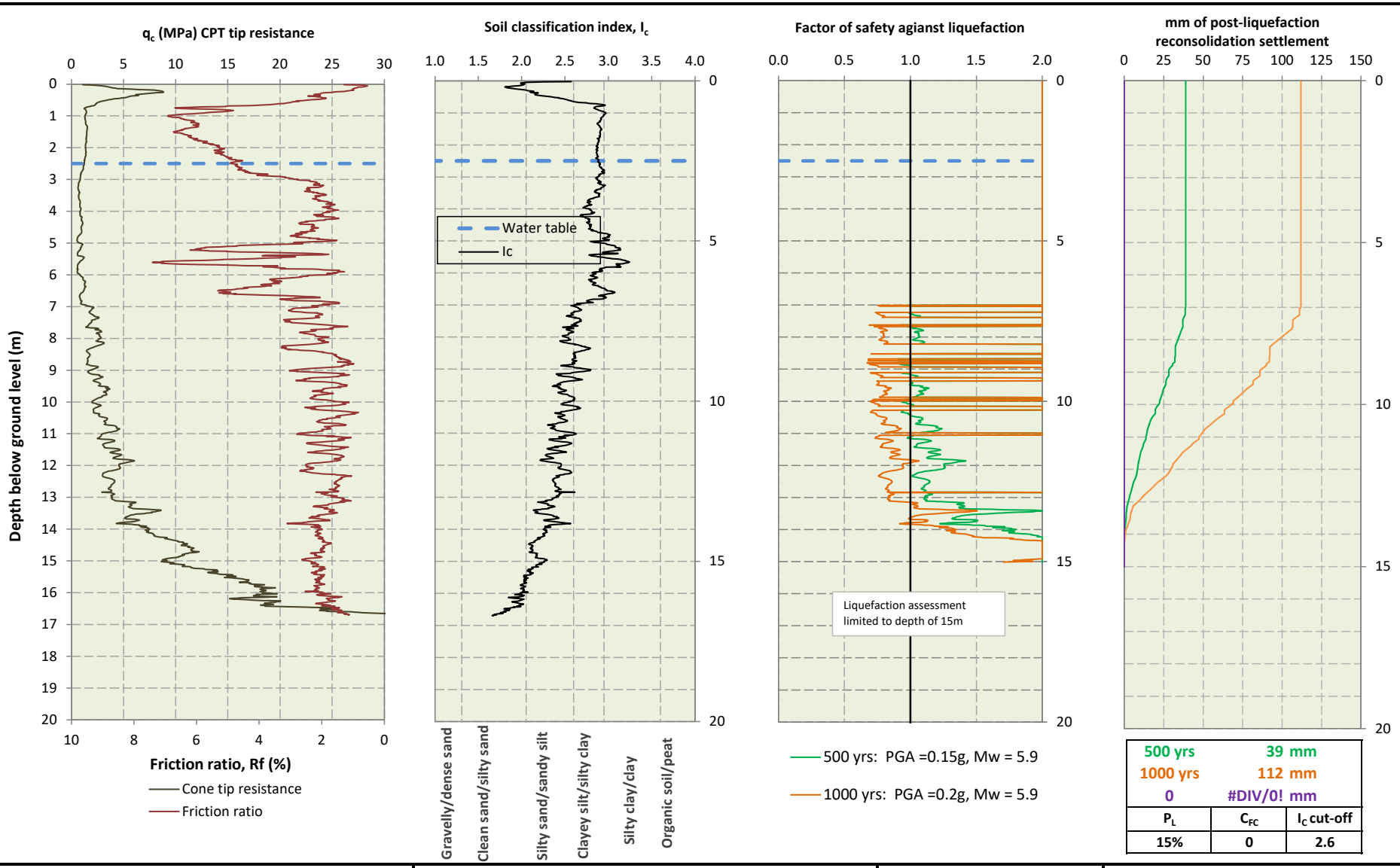
CPT-5

R Boulanger & I Idriss '14 **Plate: E-9**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



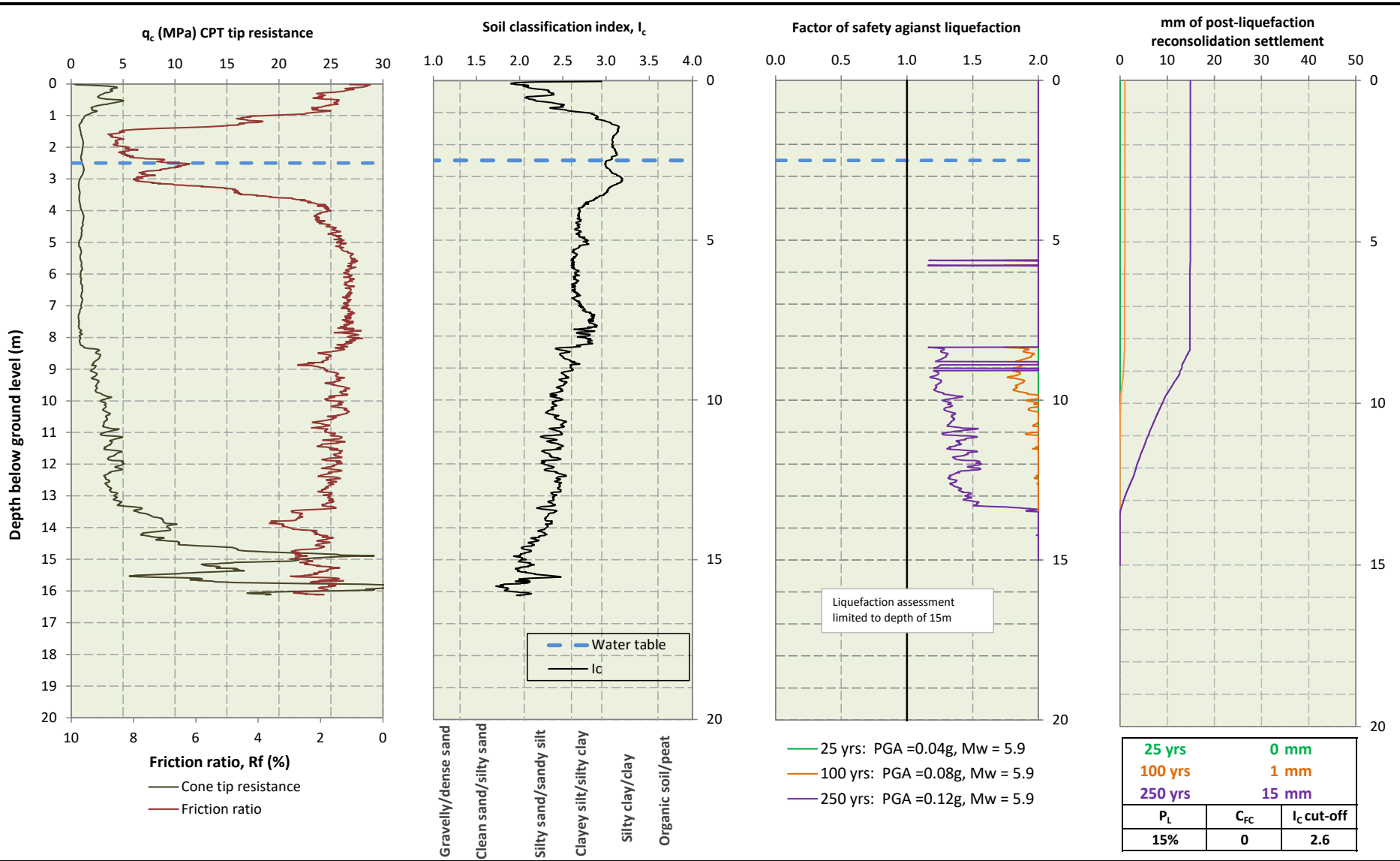
Liquefaction analysis

CPT-5

R Boulanger & I Idriss '14 **Plate: E-10**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS

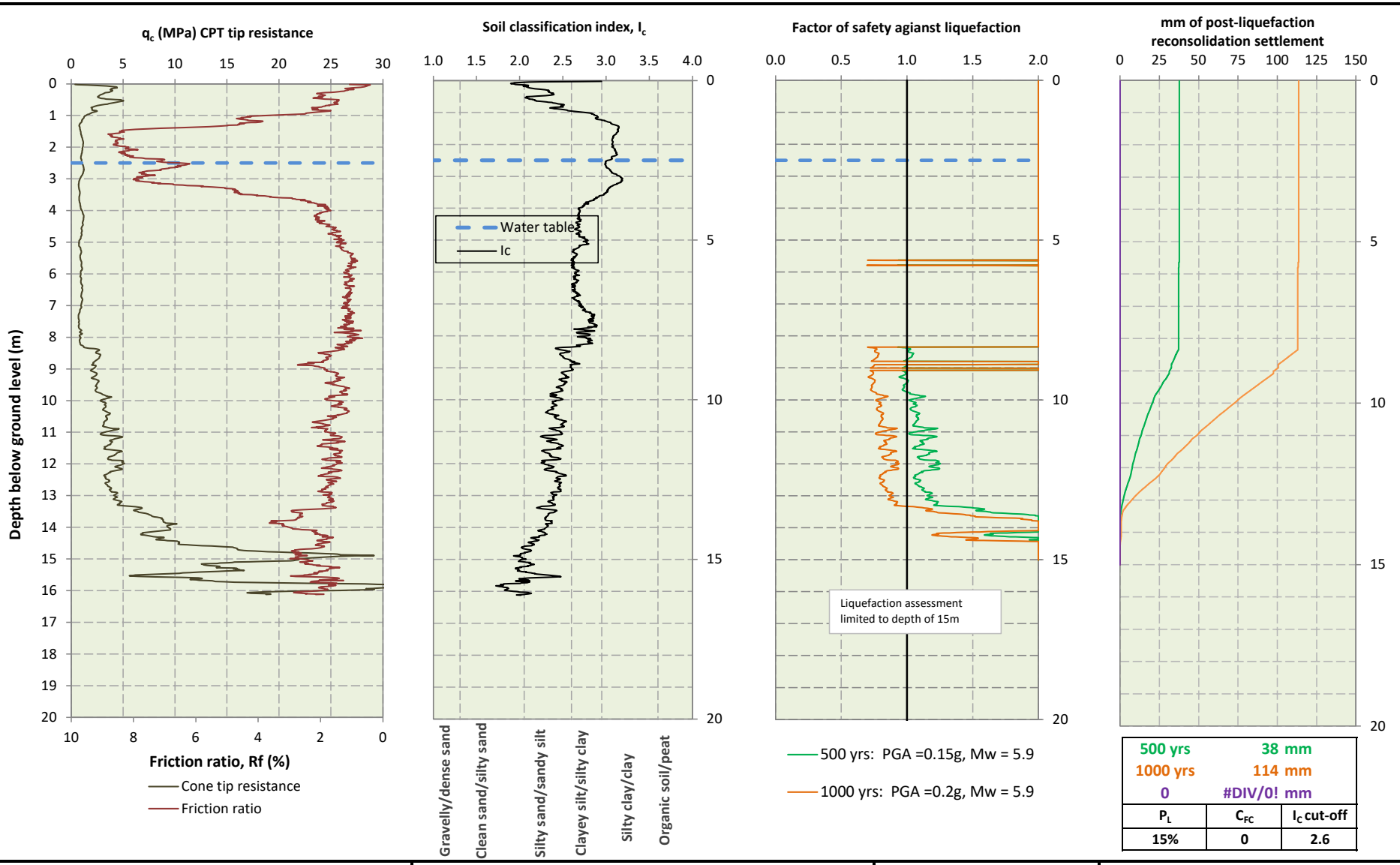


Liquefaction analysis
CPT-6
R Boulanger & I Idriss '14 **Plate: E-11**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

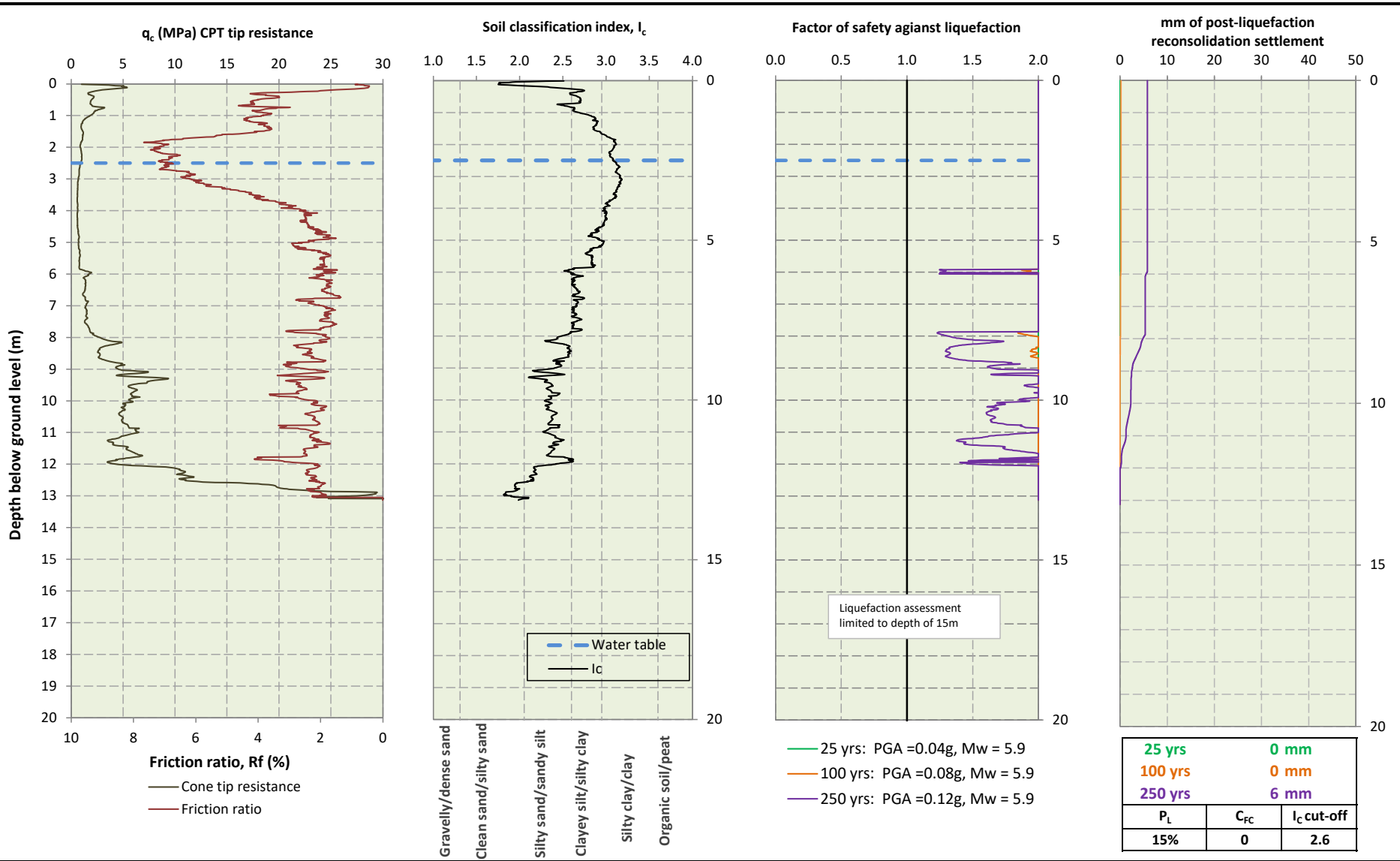
WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



Liquefaction analysis
CPT-6
R Boulanger & I Idriss '14 **Plate: E-12**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS



Liquefaction analysis

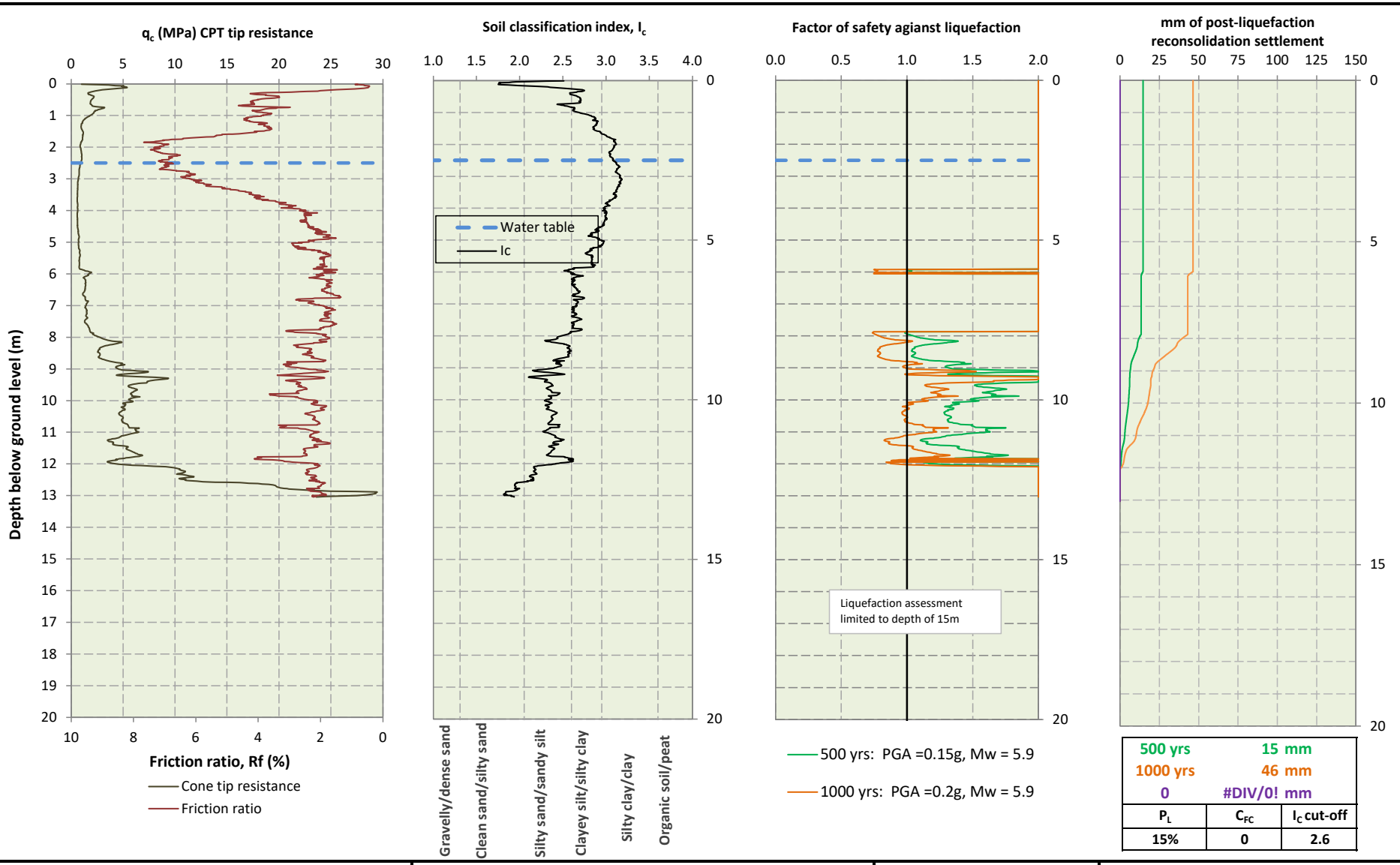
CPT-7

R Boulanger & I Idriss '14 **Plate: E-13**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20

Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC
GEOTECHNICAL ENGINEERS



Liquefaction analysis

CPT-7

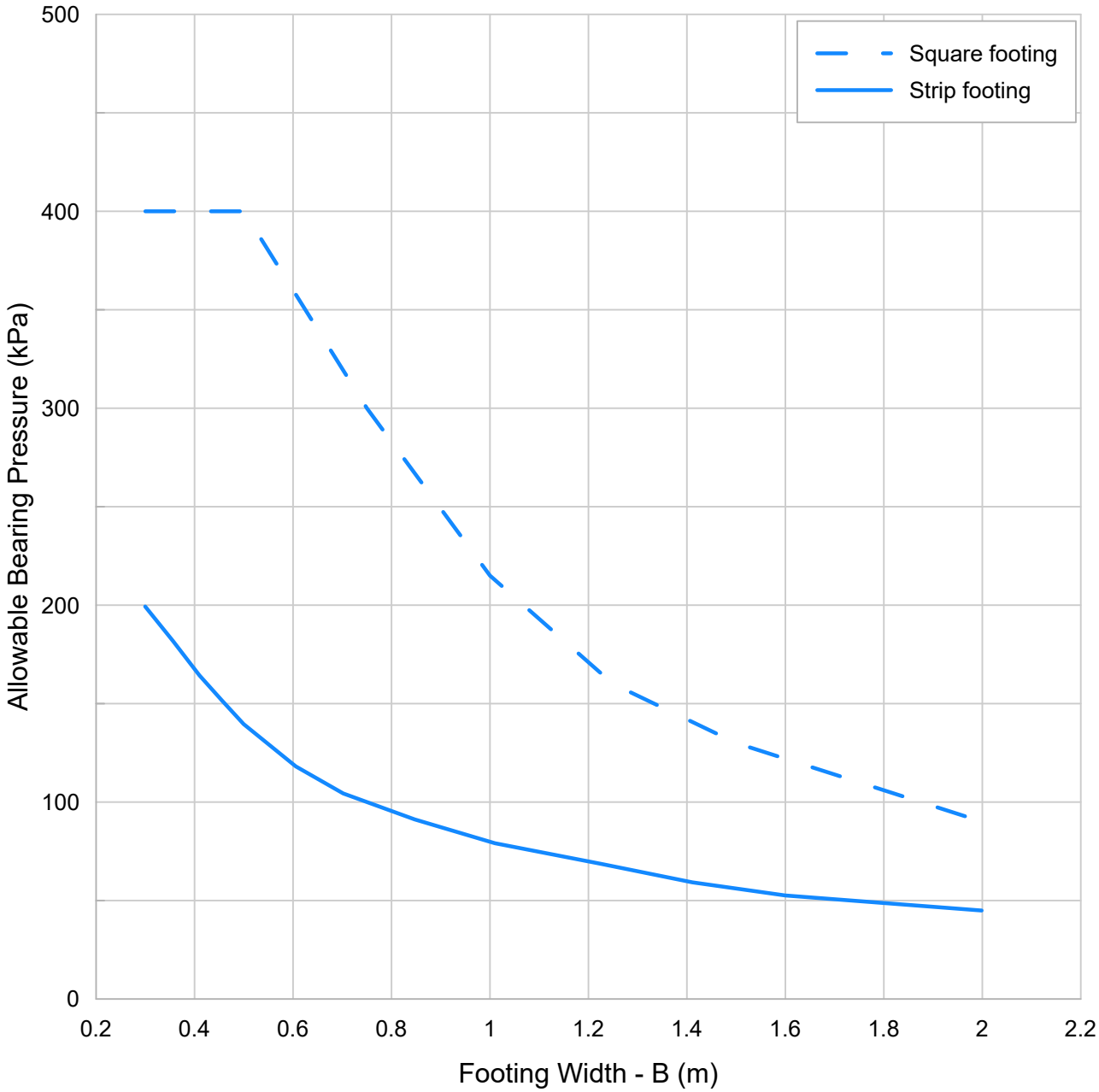
R Boulanger & I Idriss '14 **Plate: E-14**

Client:	Ministry of Education
Project:	279 Hobsonville Point Rd
Job No.	1422-01-20
Analysis By:	RW
Checked By:	DD
Date:	8/01/2021

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS

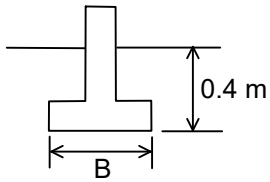
APPENDIX F

SETTLEMENT-CONTROLLED BEARING PRESSURES FOR PRELIMINARY FOUNDATION DESIGN



Notes:

1. The allowable pressures shown are are those calculated limit total settlements to 25 mm.
2. The bearing pressures from this chart can be compared directly with loads computed for the Serviceability Limit State (SLS).



1422-01-20 SLS Fdn sizes

WENTZ - PACIFIC GEOTECHNICAL ENGINEERS	Project No.: 1422-01-20 Reviewed: RW Drawn: DD Date: January 2021	**Settlement-Controlled Bearing Pressures for Foundation Design** 279 Hobsonville Point Road Hobsonville, Auckland	PLATE F-1