Proposed Redevelopment of St Michaels School Additional Geotechnical Assessment

12 Sproule Street,
Nelson Bay NSW

NEW19P-0150-AE
24 June 2020

Qualtest
LABORATORY (NSW) PTY LTD

GEOTECHNICAL I LABORATORY I EARTHWORKS I QUARRY I CONSTRUCTION MATERIAL TESTING

24 June 2020

Catholic Diocese of Maitland & Newcastle
984 Hunter Street
Newcastle West, NSW 2302

Attention: Dane Walmsley

Dear Dane

RE: PROPOSED REDEVELOPMENT OF ST MICHAELS SCHOOL
12 SPROULE STREET, NELSON BAY
ADDITIONAL GEOTECHNICAL ASSESSMENT

Please find enclosed our Geotechnical Assessment report for the proposed redevelopment of St Michael's School located at 12 Sproule Street, Nelson Bay NSW.

Qualtest previously carried out a geotechnical assessment for the site (Ref. NEW19P-0150-AB, 7 November 2019). The principle purpose of this additional Geotechnical Assessment is to provide results of additional investigations (CPT tests) to enable deep foundation systems to be assessed. This report should be read in conjunction with the previous report.

The report includes recommendations for foundation design parameters for deep footings, and results of infiltration testing, including permeability of the tested site soils.

If you have any questions regarding this report, please do not hesitate to contact Ben Bunting, Shannon Kelly, or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd

Jason Lee
Principal Geotechnical Engineer

Table of Contents:

1.0 Introduction 1
2.0 Field Work 1
3.0 Site Description 2
3.1 Surface Conditions 2
3.2 Subsurface Conditions 2
4.0 Discussion and Recommendations 5
4.1 General 5
4.2 Deep Footings 5
4.3 Infiltration Rates 7
4.4 Special Requirements and Site Drainage 8
4.4.1 Drainage 8
4.4.2 Construction Vibrations 8
5.0 Limitations 8

Attachments:

Figures: Figure AE1 – Site Plan and Approximate Test Locations

Appendix A: Results of Field Investigations

1.0 Introduction

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present this report to Catholic Diocese of Maitland & Newcastle (Catholic Diocese), for the proposed redevelopment of St Michaels School located at 12 Sproule Street, Nelson Bay NSW (the site).

This report has been carried out to supplement information and recommendations provided in the previous geotechnical assessment by Qualtest (Ref. NEW19P-0150-AB, dated 7 November 2019).

Based on a request from Catholic Diocese and Northrop on 11 May 2020, it is understood that additional geotechnical investigations are requested to enable the deep foundation system to be assessed, and identify suitable founding material as follows:

- '*Confirm medium dense sand layer is of sufficient thickness that results is significantly improved end bearing parameters i.e. > 5000kPa end bearing (appropriate level of investigation should also be sufficient to permit a phi g of 0.61):*
- *If the medium dense sand layer is found to be of insufficient thickness and a clay layer is found below the sands, confirmation of depth to suitable rock should be sought. Indication of ultimate end bearing of rock should also be provided.*'

Deep sand (with no clay or bedrock within depth of investigation), was encountered at the additional test locations. The scope of work for the additional geotechnical assessment included providing discussion and recommendations on the following:

- Foundation design parameters for deep footings, including suitable footing types, recommended bearing pressures, shaft adhesion and anticipated settlements;
- Infiltration testing results, including permeability / infiltration rate for site soils.

This report presents the results of the field work investigations, and provides recommendations for the scope outlined above.

2.0 Field Work

Field work investigations were carried out on 5 June 2020. Field work investigations comprised of:

- 6 no. electric piezocones, CPT01 to CPT06 using a 10 tonne "crawler" CPT rig (NEWSYD) to assess soil profiles and foundation conditions. Piezocones were pushed to depths between 10.0m to 18.6m; and,
- Three boreholes (BHI01 to BHI03) were drilled using a hand auger to depths between 1.10m to 1.15m. Permeability testing was undertaken at each of the borehole locations.

CPT investigations were carried out in the presence of an experienced Geotechnical Engineer from Qualtest. The engineer located the boreholes, carried out the sampling and testing, and provided field logs of the boreholes.

Approximate CPT and borehole locations are shown on the attached Figure AE1 together with locations of previous testing by Qualtest. CPT results and engineering logs of boreholes are presented in Appendix A.

3.0 Site Description

3.1 Surface Conditions

The subject site comprises the proposed development areas shown on Figure AE1 within Lot 2 DP 216064, known as 12 Sproule Street, Nelson Bay. The lot is an irregular but roughly trapezoidal shaped lot with a total area of approximately 2.1ha. The lot is bounded by residential lots to the east, north and west, and by Wahgunyah Road to the south. The lot is accessed by Wahgunyah Road, and from the western end of Sproule Street.

The site is located within a region of gently undulating Aeolian (dune sand) topography. Reference to the Topographical Survey drawing (Ref: 2017115 TS2, dated: 11/09/19) provided by the client in an email on 19/9/19, indicated the elevation of the site ranged from 26m to 38m AHD.

The areas of proposed development generally comprise areas of native bushland, open space sports field, and an area in between the existing school block and carpark.

Existing development on the lot includes administrative and classroom block buildings which are generally located on the western portion of the site, with the existing church located on the north-eastern corner.

On the day of the investigation, the site was judged to be well drained primarily by way of infiltration into the site soils and surface runoff towards the municipal stormwater drains on site.

3.2 Subsurface Conditions

The 1:25,000 Nelson Bay Area Coastal Quaternary Geology Map shows that the site is underlain by Quaternary deposits, on the boundary of Pleistocene dune, marine sand, indurated sand; and Pleistocene bedrock-mantling dune, marine sand, indurated sand. The 1:250,000 Newcastle Geological Map indicates that the site is underlain by the Nerong Volcanics, comprising toscanite, dacite, andesite, ignimbrite, agglomerate, conglomerate sandstone and siltstone.

Assessment of the raw CPTu data was carried out using our in-house software which calculates in-situ density index of sands and consistency of clays based on established correlations.

The CPTu data provides an effectively continuous measurement of the soil profile in the form of tip resistance, skin friction and pore pressure. While the test method is more sensitive than borehole drilling with SPT tests, CPT testing does not recover samples for visual confirmation. Therefore it does not allow verification of soil classification or specific delineation of material origin e.g. fill / alluvium / residual / rock etc.

Interpretation of soil types is carried out by comparing measured parameters to a published soil type index. Interpretation of soil classification was based on the values of soil behaviour type index provided with the CPTu data.

The presence and depths of layers of different origin including topsoil and fill have been estimated at CPT locations based upon nearby boreholes. These should be confirmed by further investigations such as borehole drilling if accurate knowledge of depths at these locations is important to design or construction.

Table 1 presents a summary of the typical soil types encountered at CPT and borehole locations, divided into representative geotechnical units.

Table 2 contains a summary of the distribution of the above geotechnical units at the CPT and borehole locations.

TABLE 1 – SUMMARY OF GEOTECHNICAL UNITS AND SOIL TYPES

Unit	Soil Type	Description
1A	FILL – TOPSOIL	SAND - fine to coarse grained, grey-brown, root affected. Trace fine to medium grained angular to sub-angular gravel, tree mulch in places.
1B	FILL	SAND - fine to coarse grained, grey to dark grey and brown. Sandy GRAVEL - fine to medium grained angular, dark grey / brown, fine to coarse grained sand.
2	TOPSOIL	SAND - fine to coarse grained, grey-brown, root affected.
3A	AEOLIAN DEPOSITS Very Loose (VL) to Loose (L)	SAND - fine to coarse grained, white to dark grey with brown to orange in places.
3B	AEOLIAN DEPOSITS Loose to Medium Dense (MD)	
3C	AEOLIAN DEPOSITS Medium Dense	
3D	AEOLIAN DEPOSITS Dense (D) or better	

TABLE 2 – SUMMARY OF DISTRIBUTION OF INFERRED GEOTECHNICAL UNITS AT CPT & BOREHOLE LOCATIONS

Location	Unit 1A, 2 FILL – TOPSOIL / TOPSOIL	Unit 1B FILL	Unit 3A AEOLIAN SAND (VL to L)	Unit 3B AEOLIAN SAND (L to MD)	Unit 3C AEOLIAN SAND (MD)	Unit 3D AEOLIAN SAND (D or Better)
	Depth (m)					
Current Geotechnical Investigation						
CPT-01	0.00 - 0.50		-	0.50 - 4.70	4.70 - 5.20 14.50 - 18.00	5.20 - 14.50 18.0 - 18.60*
CPT-02	0.00 - 0.50		-	0.50 – 3.20	3.20 - 5.00	5.00 - 10.00*
CPT-03	0.00 - 0.30		0.30 - 0.60	0.60 - 1.60	1.60 - 8.00	8.00 - 13.14*
CTP-04	0.00 - 0.50		0.50 - 0.60	0.60 - 3.20 6.00 - 7.00	3.20 - 6.00	7.00 - 12.16*

Location	Unit 1A, 2 FILL – TOPSOIL / TOPSOIL	Unit 1B FILL	Unit 3A AEOLIAN SAND (VL to L)	Unit 3B AEOLIAN SAND (L to MD)	Unit 3C AEOLIAN SAND (MD)	Unit 3D AEOLIAN SAND (D or Better)
CPT-05	0.00 - 0.30		-	0.90 - 2.30	0.30 - 0.90 2.30 - 10.90	10.9 - 14.04*
CPT-06	0.00 - 0.50		-	-	0.50 - 4.30 8.20 - 8.70	4.30 - 8.20 8.70 - 15.04*
BHI01	0.00 - 0.10	-	0.10 - 1.10		-	-
BHI02	0.00 - 0.30	-	0.30 - 1.10		-	-
BHI03	0.00 - 0.20	-	0.20 - 1.15		-	-
Previous Geotechnical Investigation (NEW19P-0150-AB, dated 7 November 2019)						
BH01	0.00 - 0.15	0.15 - 0.50	-	1.95 - 2.00	0.50 - 1.95	-
BH02	0.00 - 0.15	-	0.15 - 0.75 1.35 - 2.00		0.75 - 1.35	-
BH03	0.00 - 0.15	0.15 - 0.60	-	0.60 - 1.00	1.00 - 2.00	-
BH04	0.00 - 0.50	-	0.50 - 1.65	1.65 - 2.00	-	-
BH05	0.00 - 0.30	-	0.30 - 1.20	1.20 - 1.80	1.80 - 2.00	-
BH06	-	0.00 - 0.25		1.35 - 1.95	0.60 - 1.35 1.95 - 2.00	0.25 - 0.60
BH07	0.00 - 0.10	0.10 - 0.20	0.20 - 1.20	1.20 - 2.00	-	-
BH08	0.00 - 0.10	-	0.10 - 0.90	0.90 - 1.20	1.20 - 2.00	-
Notes:	* = CPT terminated due to high tip resistance / practical refusal on dense to very dense sand.					

Groundwater levels were not encountered within any of the six CPT locations either during testing nor following withdrawal of the CPT probe, nor were groundwater or inflows encountered in the boreholes in the limited time that they remained open on the day of investigation.

It should be noted that groundwater conditions can vary due to rainfall and other influences including tidal fluctuation, regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

4.0 Discussion and Recommendations

4.1 General

As discussed in the previous geotechnical report (Ref. NEW19P-0150-AB, 7 November 2019), it is assessed that very loose to loose layers exist to depths ranging from 0.6m to 1.2m in all or part of the three proposed building areas, and that loose to medium dense layers exist to depths of up to about 3.5m in some test locations. Some areas of the site have been altered by filling to depths in the order of 0.5m to 0.6m.

Therefore, the site is judged to be unsuitable for shallow footings in its current condition. It is recommended that structural footings and any other settlement sensitive elements of the proposed development be founded in the medium dense or better natural sand soils beneath all uncontrolled fill, very loose and loose material.

It is generally envisaged that footing options will include piles founded within the medium dense or better natural sands at depths in the order of 2m to 4m or deeper.

Alternatively, if all uncontrolled fill, very loose and loose material is removed, and replaced to design foundation level as controlled fill where necessary, compacted to a minimum density index of 70% (AS1289 5.6.1), the site may be suitable for shallow footings. Refer to the previous report for further advice regarding shallow footings etc.

4.2 Deep Footings

Piled footing systems may include the following options:

- Displacement type hardwood timber or precast concrete piles driven into medium dense or better sands;
- Displacement type "Atlas" Screw Piles founded into medium dense or better sands;
- Non-Displacement type Grout Injected Piles founded into medium dense or better sands;
- Non-Displacement type Steel "Screw Piles" founded into medium dense or better sands.

Driven piles of large capacities may not be suitable in some areas of this site due to possible vibration effects on nearby structures. Driven piles may need to be pre-bored through the upper fill depending on pile type and allowance for this should be made, particularly in any areas with remnant footings or slabs.

Conventional bored piers are likely to be problematic due to the presence of deep loose sands. Allowance would need to be made to progressively case the holes during drilling.

Care should be taken to found piles within suitable material with the pile toe at least three pile diameters above the top of any underlying Units with lower base resistance. Based upon available CPT test results, it is judged that Unit 3C Medium Dense (or better) soil was encountered below depths ranging from 1.60m at CPT03 to 4.70m at CPT01; however, a loose to medium dense (Unit 3B) layer was assessed to be present at CPT04 between depths of 6.0m and 7.0m.

Table 3 presents a summary of ultimate pile design parameters that have been adopted for the relevant site materials. These values are for pile footings founded at depths of greater than 3m; however, the parameters for Unit 3B Loose to Medium Dense Sand may be adopted for Unit 3C Medium Dense Sand founded at depths of between 2m and 3m.

TABLE 3 – SUMMARY OF ULTIMATE PILE DESIGN PARAMETERS

Unit	Soil Description	E (MPa)	ν	Displacement Piles		Non Displacement Piles	
				f_b (kPa)	f_s (kPa)	f_b (kPa)	f_s (kPa)
1, 2	Fill / Fill-Topsoil	-	-	-	-	-	-
3A	Aeolian SAND - Very Loose to Loose	3 to 8	0.3	-	25	-	10
3B	Aeolian SAND – Loose to Medium Dense	8 to 15	0.3	3000	35	1600	16
3C	Aeolian SAND - Medium Dense	12 to 25	0.3	5000	50	3000	25
3D	Aeolian SAND - Dense or Better	25 to 35	0.3	7000	65	4200	35

f_b = Ultimate End Bearing Capacity f_s = Ultimate Shaft Adhesion

E = Young's Modulus ν = Poisson's Ratio

Notes:

- Ultimate values occur at large settlements (>5% of minimum footing dimensions);
- The ultimate pile parameters presented in Table 3 should be used in limit state pile design in accordance with Australian Standard AS 2159-2009, *Piling – Design and Installation*;
- A geotechnical strength reduction factor should be adopted for use with the above ultimate soil parameters. Based upon a calculated Design Average Risk Rating (ARR) of 2.4, a geotechnical strength reduction factor of 0.60 is recommended for medium redundancy pile systems based on available information at this stage;
- With the exception of steel "Screw-Piles", it is expected that the settlement of deep footings proportioned as recommended above should be in the order of about 1% of the effective pile diameter;
- Piles should be no closer than 2.5 pile diameters apart. If closer than this, interaction effects between piles should be taken into account and pile group settlement assessed;
- More accurate ultimate bearing capacities and settlement estimates can be obtained by undertaking static load tests on trial piles; and,
- These recommendations do not preclude the use of established correlations for specific pile types and may be upgraded by carrying out pile load testing.

The values presented in Table 3 are for the purposes of calculating minimum geotechnical capacities. These values may be exceeded in site soils, particularly if layers of dense or very dense sands are encountered during activities such as pile driving. It is recommended that pile driving equipment and piles have some additional capacity to allow piles to be driven to the design depths if higher resistance is encountered.

Softwood timber mini-piles of 125mm toe diameter driven to a design set in dense sands generally achieve working loads of about 75kN. A test pile may be carried out to assess the depth at which the design capacity may be achieved.

4.3 Infiltration Rates

Values of hydraulic conductivity, K, were assessed for the soil profiles at the test locations using the following equation (from Kessler & Oosterbaan, 1974, p292 in Porchet):

$$K = 1.15xRxF$$

$$where\ F = \frac{Log(h_1 + {}^{R}/_{2}) - Log(h_2 + {}^{R}/_{2})}{t_2 - t_1}$$

Where, K = hydraulic conductivity (m/s);
h_i = height of water column at a time t_i (m);
t_i = time at which measurement h_i was taken (s); and,
R = radius of borehole (m).

The results of falling head permeability testing are summarised in Table 4.

TABLE 4 – PERMEABILITY TEST RESULTS

Test Location	Depth (m)	R (m)	h_1 (m)	h_2 (m)	t_1 (s)	t_2 (s)	K (m/s)	K (m/day)	K (mm/hr)
BHI01	1.00	0.05	1.00	0.00	0	66	1.41×10^{-3}	121	5.0×10^{3}
BHI02	1.00	0.05	1.00	0.00	0	45	2.16×10^{-3}	186	7.7×10^{3}
BHI03	1.05	0.05	1.05	0.00	0	68	1.23×10^{-3}	106	4.4×10^{3}

Based on the soil profiles encountered (clean sands beneath topsoil), interpretation of the results of in situ permeability testing, and previous experience in the area, it is recommended that a permeability value of 2.3×10^{-4} metres per second (20 metres per day) be adopted for the Aeolian Sand at this location.

For design purposes it is recommended that a reduction factor be applied to this value to obtain the long-term infiltration rate for design of on-site storm water infiltration systems. This factor may be specified by the consenting authority, or in the absence thereof, a reduction factor of 0.2 (or factor of safety of 5) is recommended.

Therefore, it is recommended that a permeability value of **4.6×10^{-5} metres per second** (about **4 metres per day**) be adopted for storm water infiltration design at this location, subject to any requirements of Port Stephens Council (PSC).

Reference to the Hydrologic Soil Group Map - Sheet HSG_005D published by PSC indicates that the site is located within an area of "Group A" soil conditions. It states:

'Group A soils have high infiltration rates, even when thoroughly wetted consist primarily of deep well drained sands or gravel. These soils have a high rate of water transmission. For design purposes, it is assumed that the Antecedent Moisture Condition is "rather wet" (refer to Australian Rainfall and Runoff (ARR) 2016, Table 5.3.11) and the Horton Maximum (Initial) Infiltration Rate is 83.6 mm/hr, the Minimum (Final) Infiltration Rate is 25 mm/hr and the Shape Factor/Decay Rate k is 2 /hour (refer ARR 2016, Table 5.3.12).'

4.4 Special Requirements and Site Drainage

Inspection should be carried out by a geotechnical authority during construction to confirm the conditions assumed in this report and in the design.

4.4.1 Drainage

Adequate surface and subsurface drainage should be installed and connected to the stormwater disposal system. Surface and subsurface drainage should be carried out in accordance with Council Specifications.

4.4.2 Construction Vibrations

Care should be taken during site earthworks not to induce ground vibrations with the potential to cause damage to nearby structures. Equipment should be selected to restrict such vibrations to levels that are within acceptable limits. Maximum tolerable vibration levels depend on the type of structure affected, its condition, and its proximity to the work area.

It should be noted that there is a risk of causing vibration-induced damage to adjacent buildings or structures with driven displacement piles. Vibration monitoring may be required if driven piles are to be used at the site and a dilapidation survey should be undertaken on nearby structures prior to pile driving.

5.0 Limitations

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practices and standards. To our knowledge, they represent a reasonable interpretation of the general conditions of the site.

The extent of testing associated with this assessment is limited to discrete test locations. It should be noted that subsurface conditions between and away from the test locations may be different to those observed during the field work and used as the basis of the recommendations contained in this report.

If subsurface conditions encountered during construction differ from those given in this report, further advice should be sought without delay.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

If you have any further questions regarding this report, please do not hesitate to contact Shannon Kelly or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd.

Jason Lee
Principal Geotechnical Engineer

FIGURE AE1:

Site Plan and Approximate Test Locations

Image obtained from Sixmaps (https://maps.six.nsw.gov.au/) 19 September 2019

LEGEND:

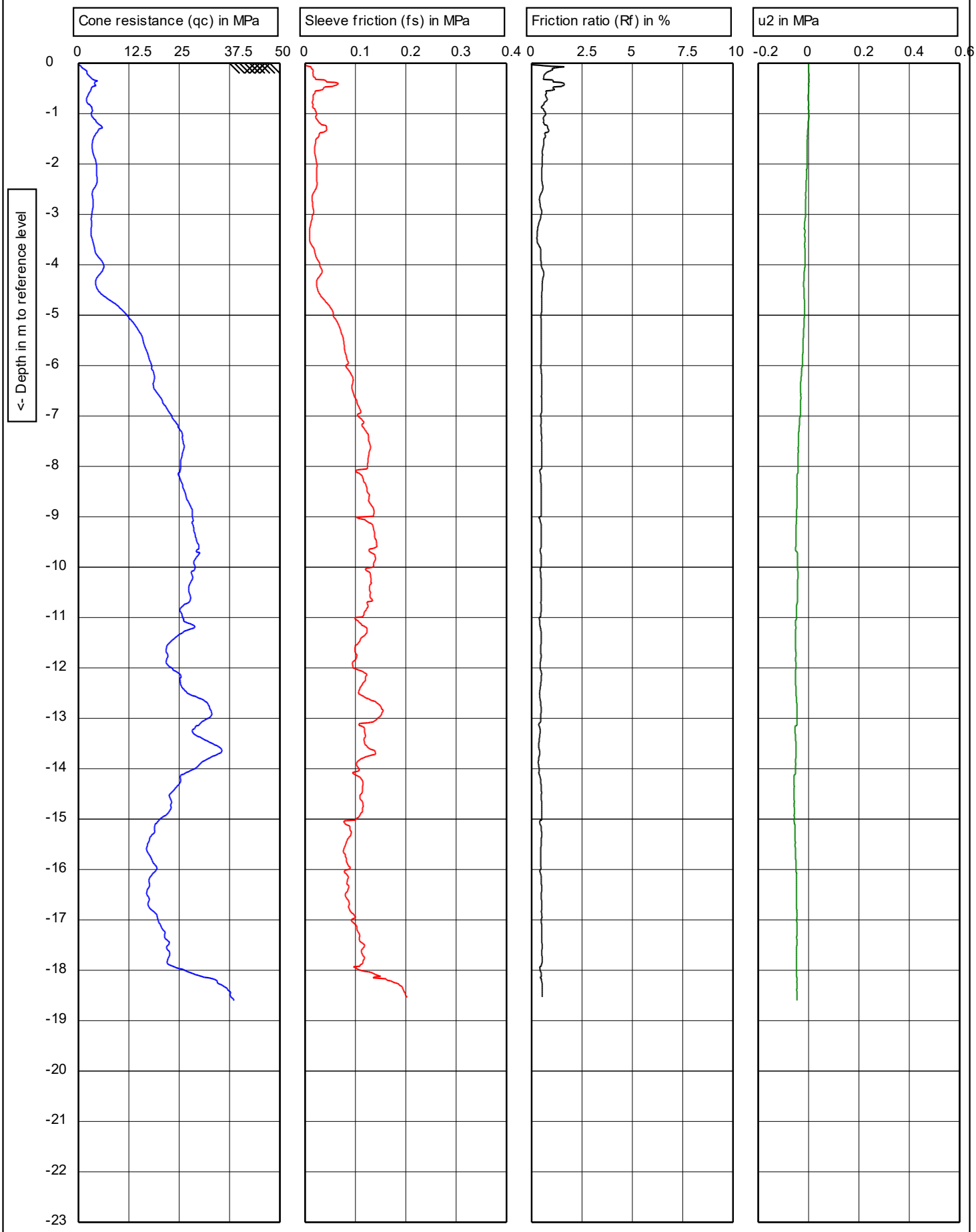
- Approximate proposed development boundary.
- Approximate CPT location (Current Investigation).
- Approximate Borehole (Current Investigation).
- Approximate Borehole and DP location (2019)
- Approximate DP location (2019)

Qualtest LABORATORY (NSW) PTY LTD

Client:	CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE	Drawing No:	FIGURE AE1
Project:	PROPOSED REDEVELOPMENT OF ST MICHAELS SCHOOL	Project No:	NEW19P-0150
Location:	12 SPROULE STREET, NELSON BAY, NSW	Scale:	NOT TO SCALE
Title:	SITE PLAN & APPROXIMATE TEST LOCATIONS	Date:	23/06/2020

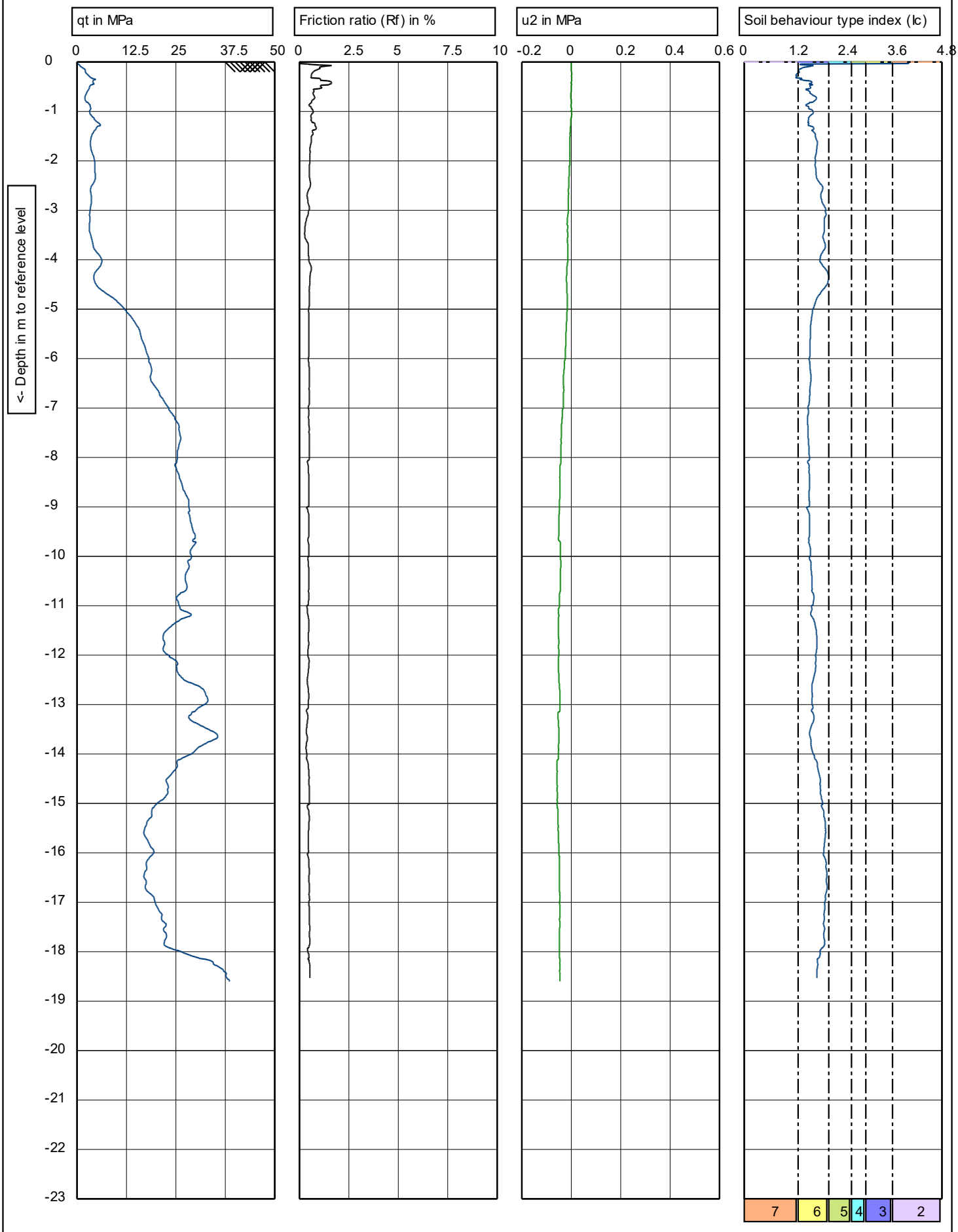
APPENDIX A:

Results of Field Investigations



NEWSYD GEOTECHNICAL TESTING Ph. 0408 292638	ISO 22476-1:2012 Application class 1 Testtype TE1	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m** W.L.: **-18.60 m**	Date:	**5/06/2020**
Project: **GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
Location: **ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
Position: **0, 0**		CPT no.:	**CPT-01** 1/3

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

r u2
L 150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-18.60 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

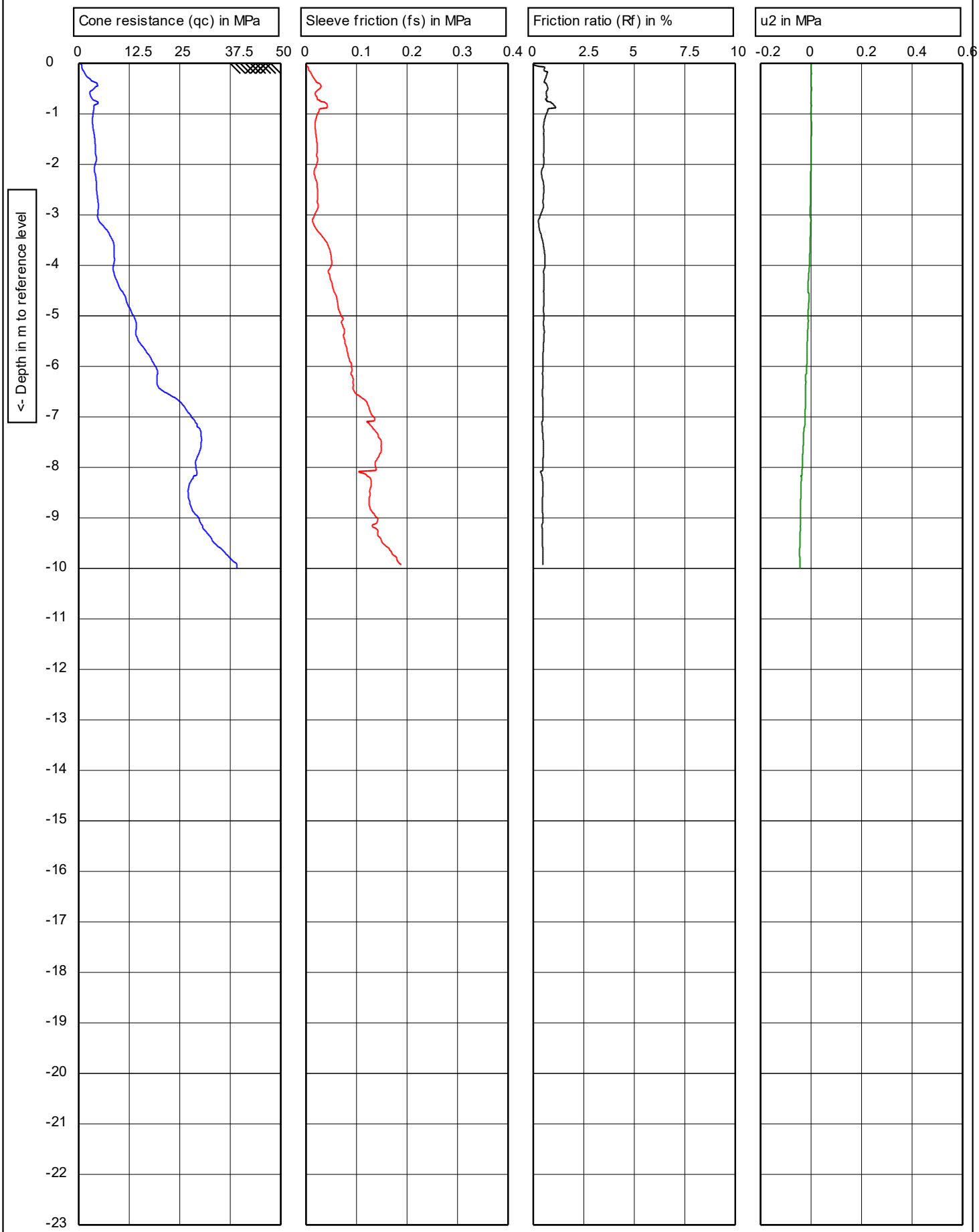
Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-01** **2/3**

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	⌜ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m**	W.L.: **-18.60 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0**		CPT no.:	**CPT-01** **3/3**

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

u2
150 cm²
10 cm²

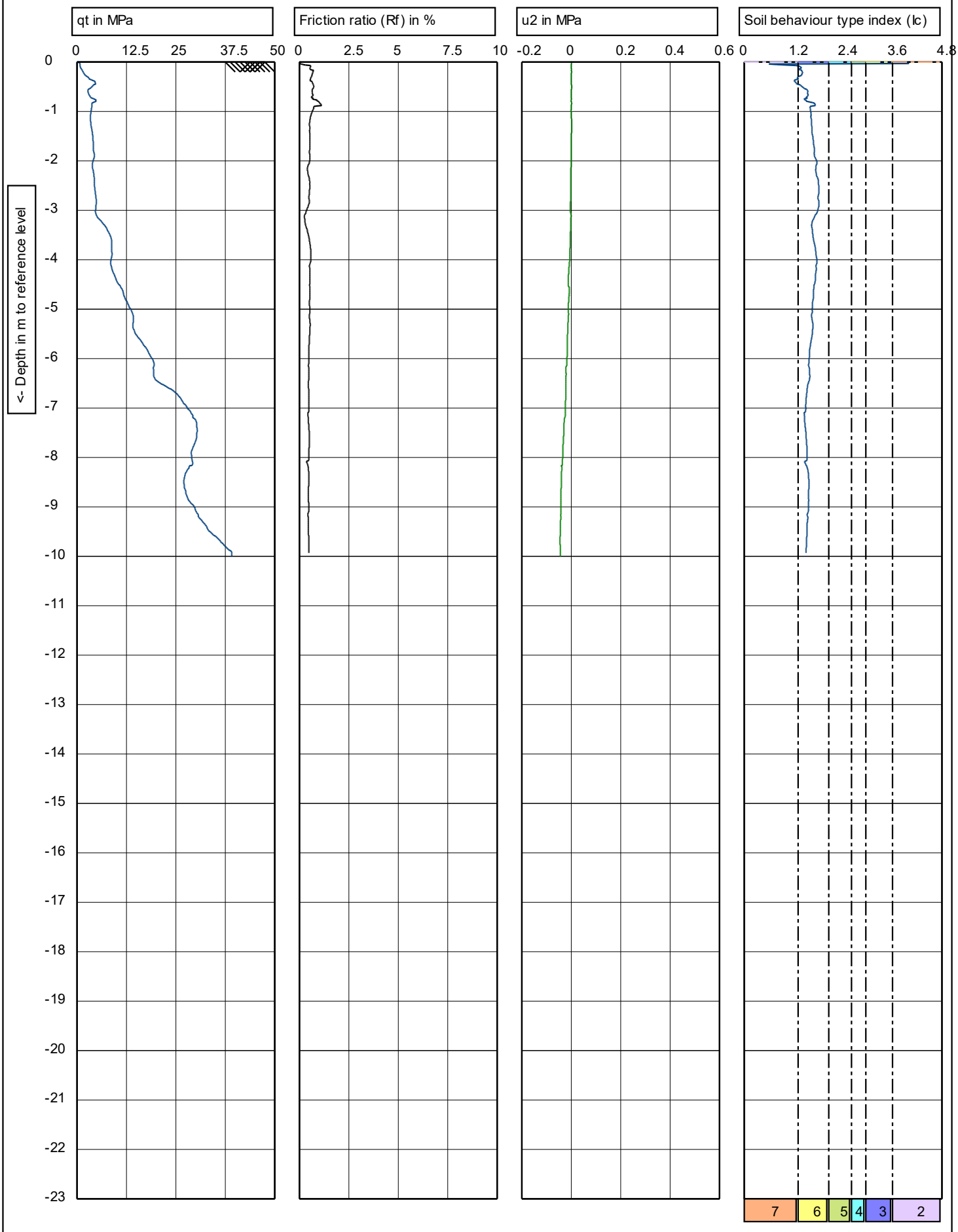
ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m NAP** W.L.: **-10.00 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0 RD**

Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-02** **1/3**

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

r u2
L 150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m NAP** | W.L.: **-10.00 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0 RD**

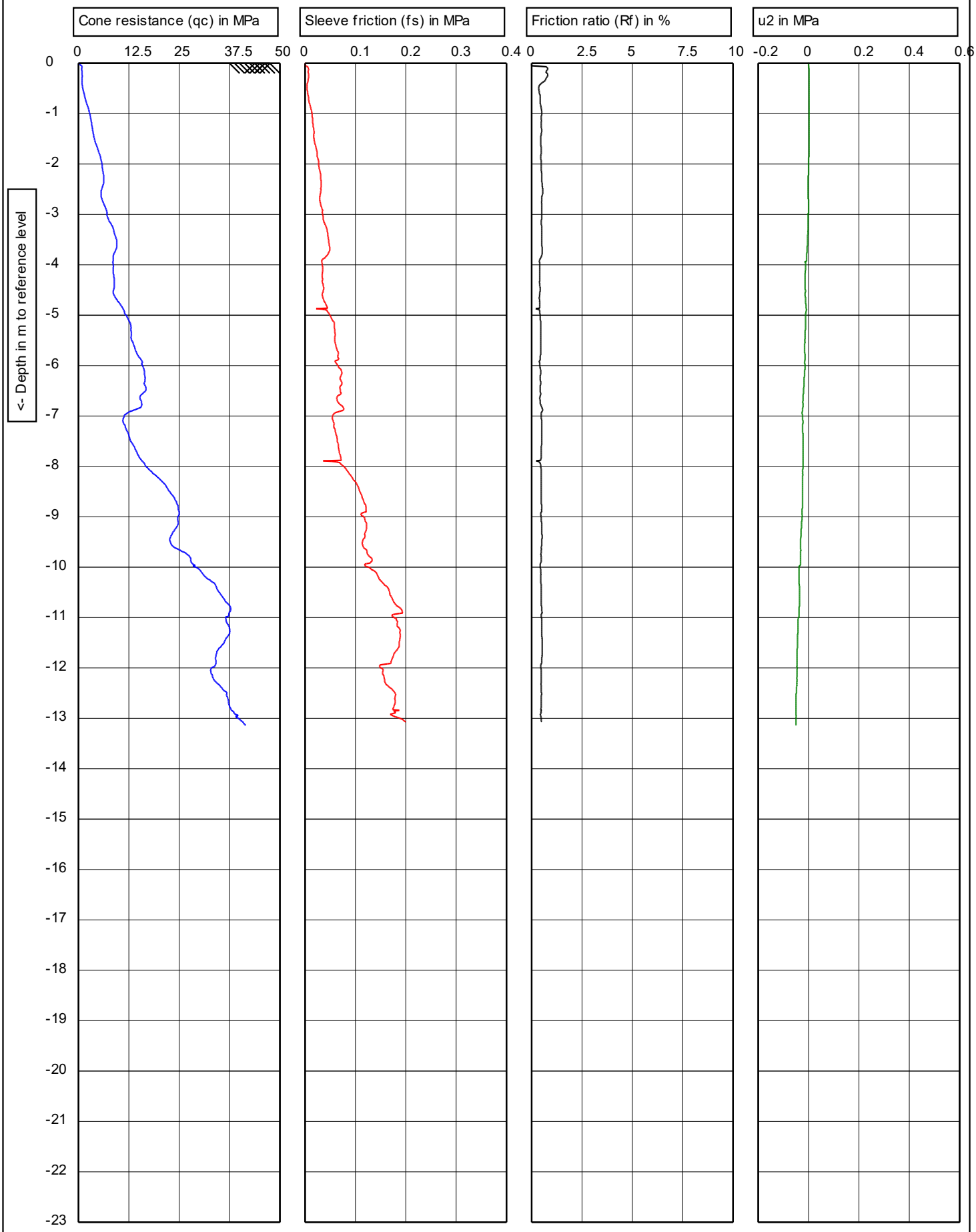
Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-02** 2/3

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

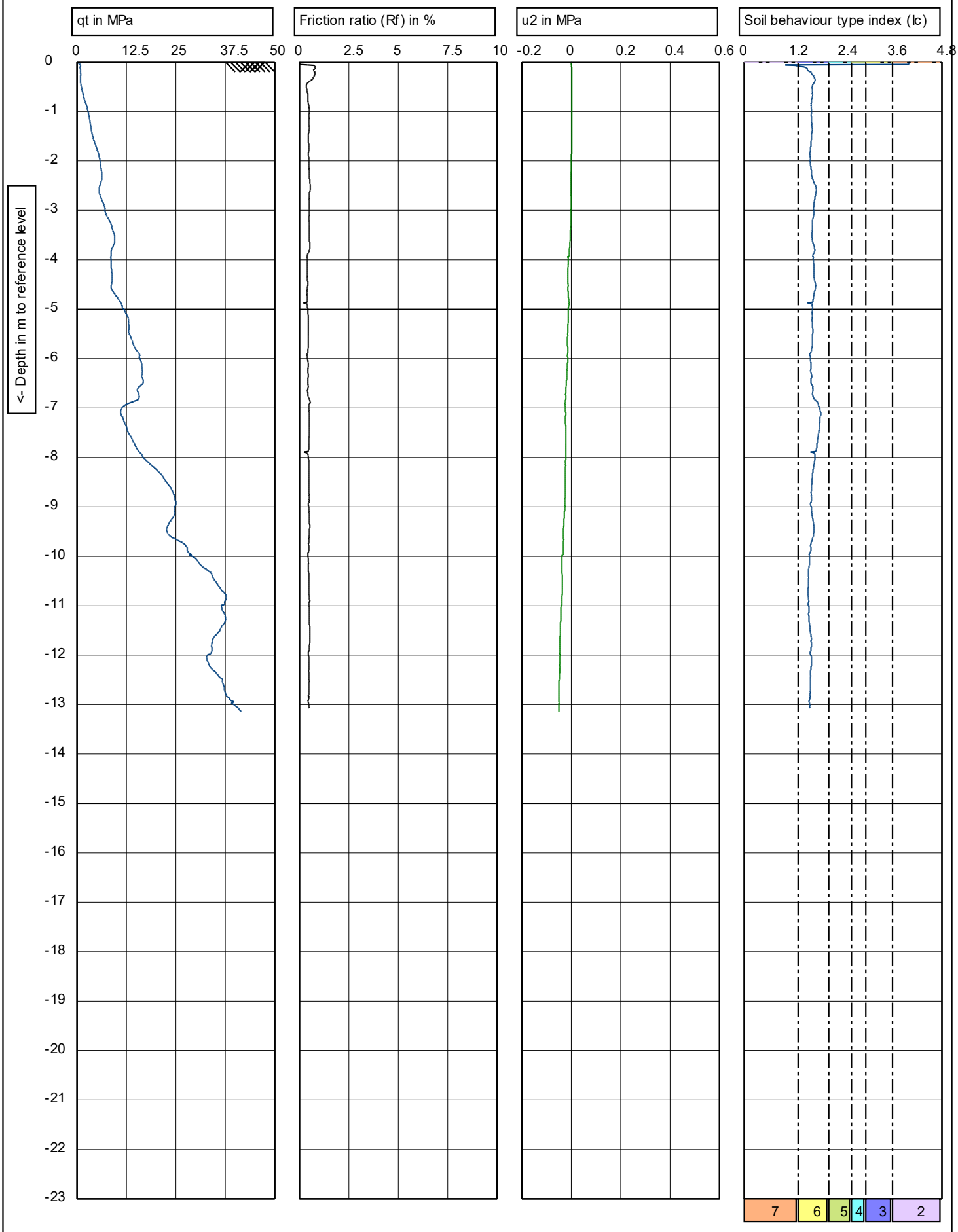
NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	┌ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m NAP**	W.L.: **-10.00 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0 RD**		CPT no.:	**CPT-02** **3/3**

1.44



NEWSYD GEOTECHNICAL TESTING Ph. 0408 292638	ISO 22476-1:2012 Application class 1 Testtype TE1	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m** W.L.: **-13.14 m**	Date:	**5/06/2020**
Project: **GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
Location: **ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
Position: **0, 0**		CPT no.:	**CPT-03** 1/3

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

r u2
L 150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-13.14 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

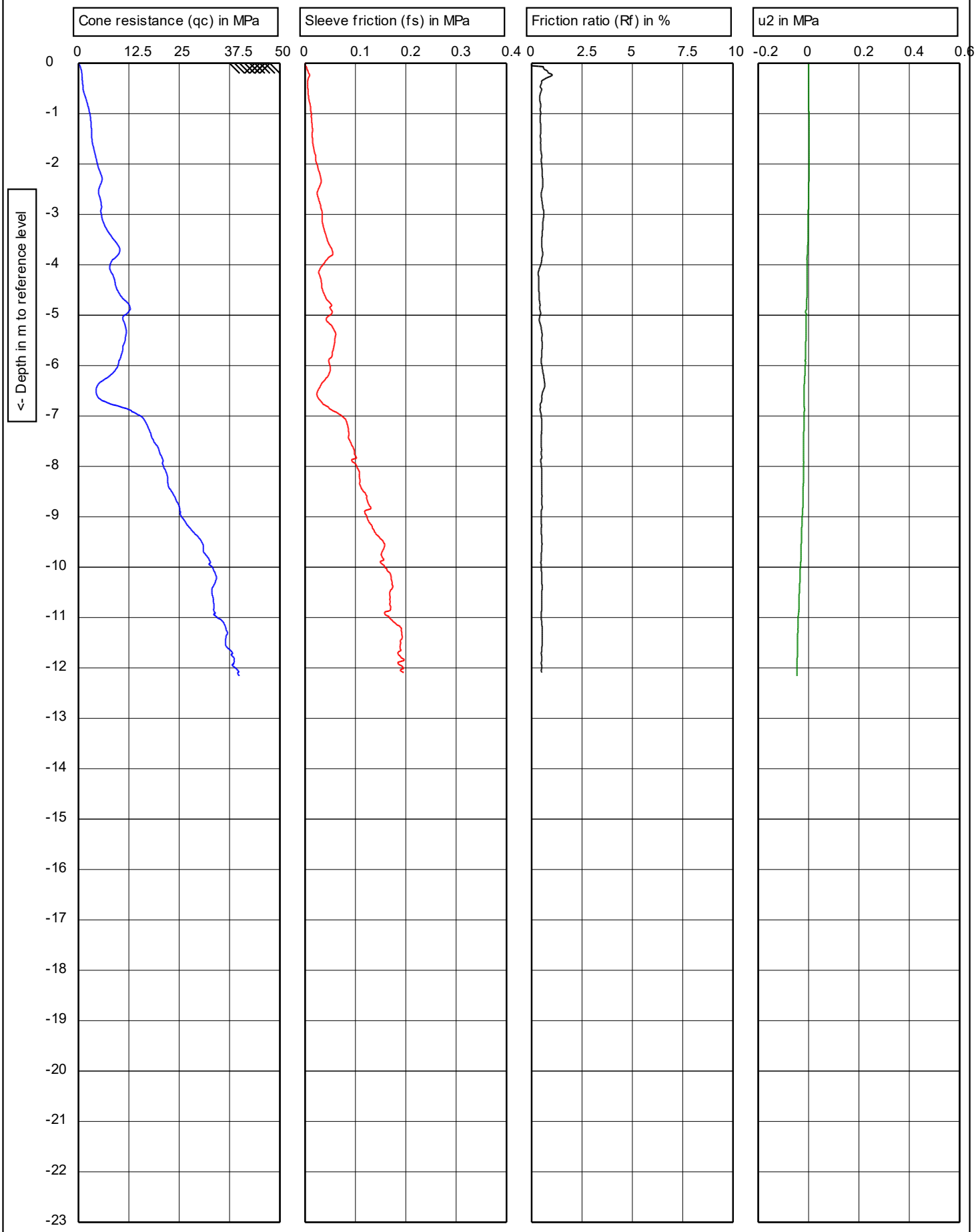
Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-03** 2/3

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	⌜ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m**	W.L.: **-13.14 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0**		CPT no.:	**CPT-03** **3/3**

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

u2
150 cm²
10 cm²

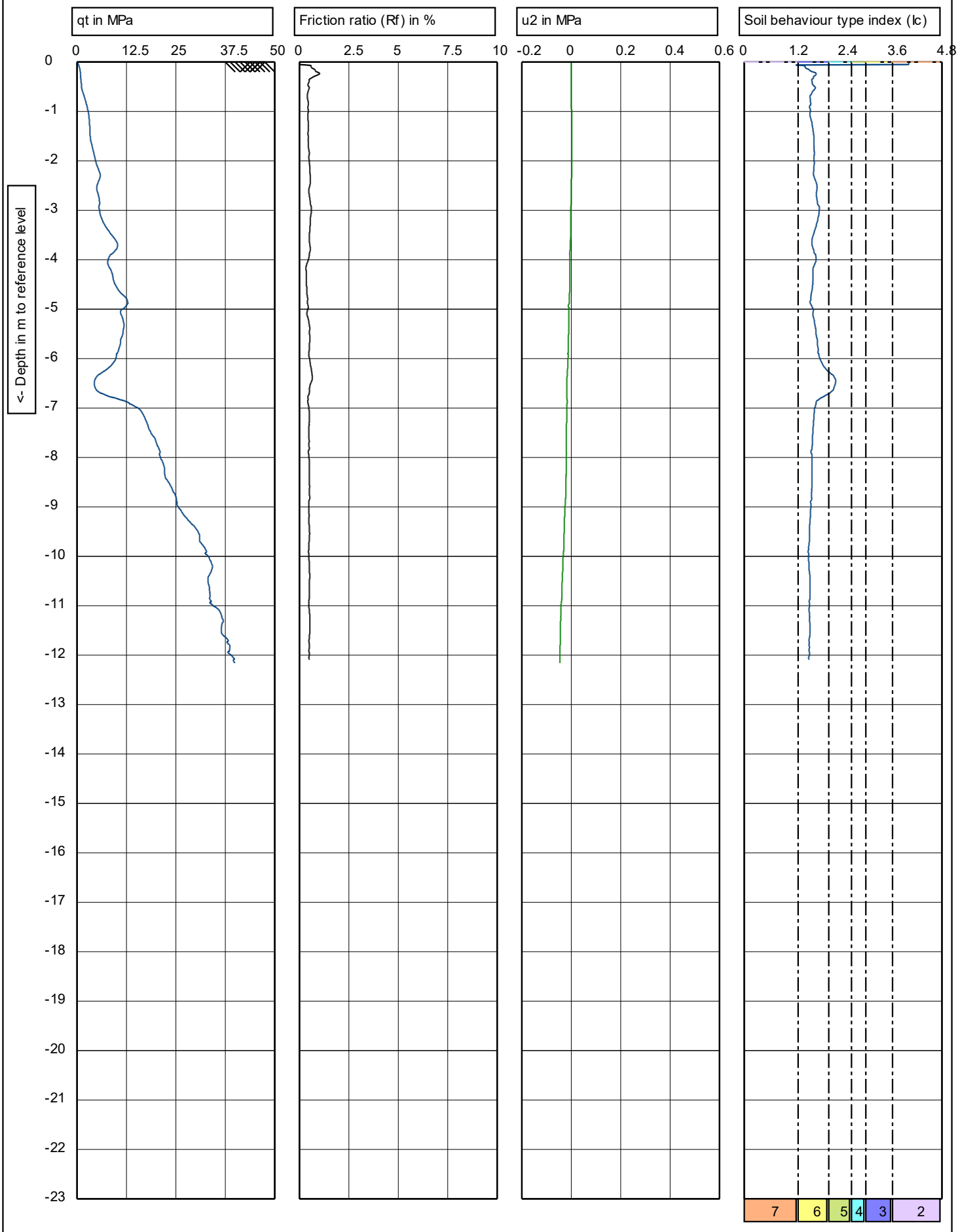
ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-12.16 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-04** **1/3**

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

u2
150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-12.16 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

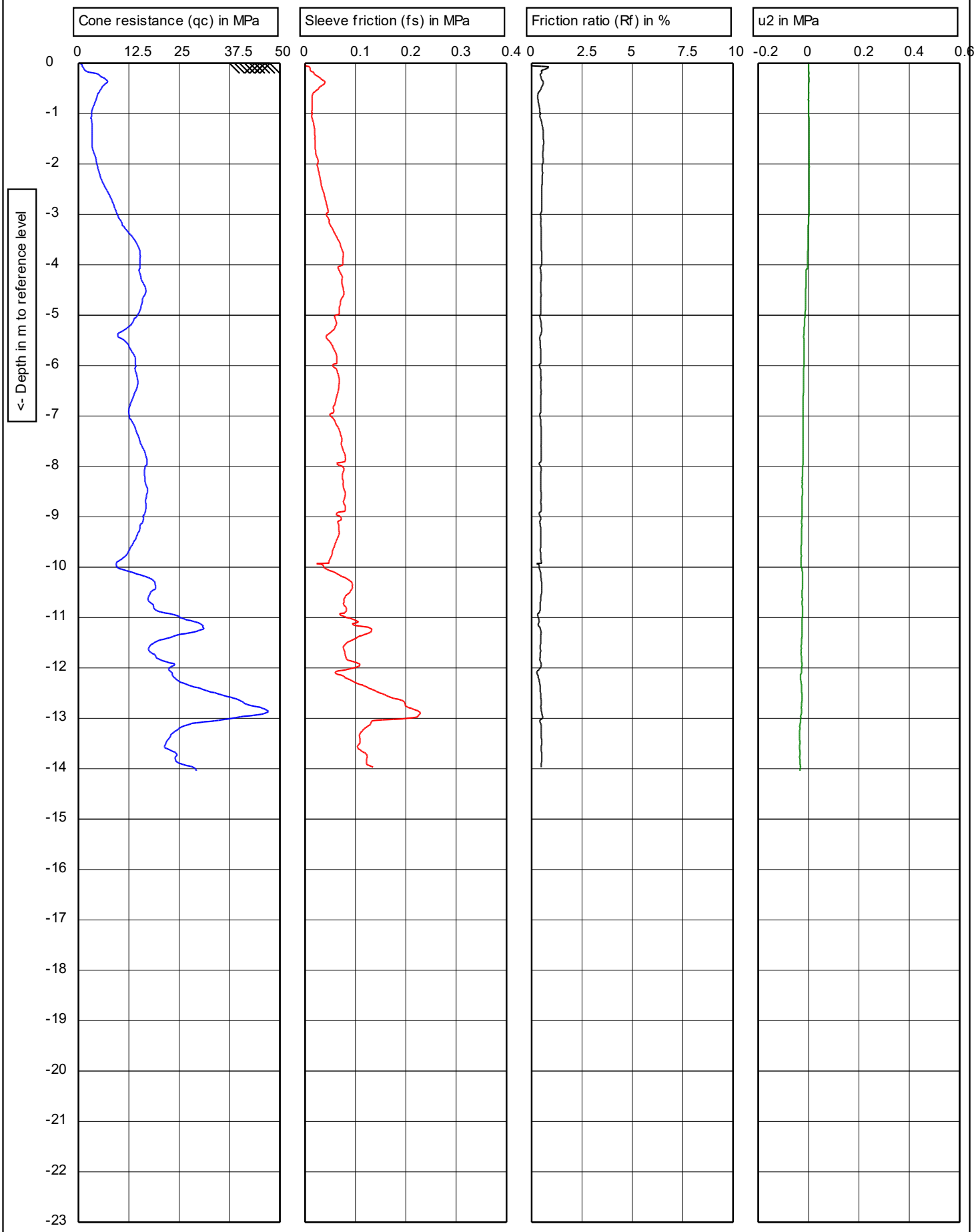
Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-04** 2/3

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

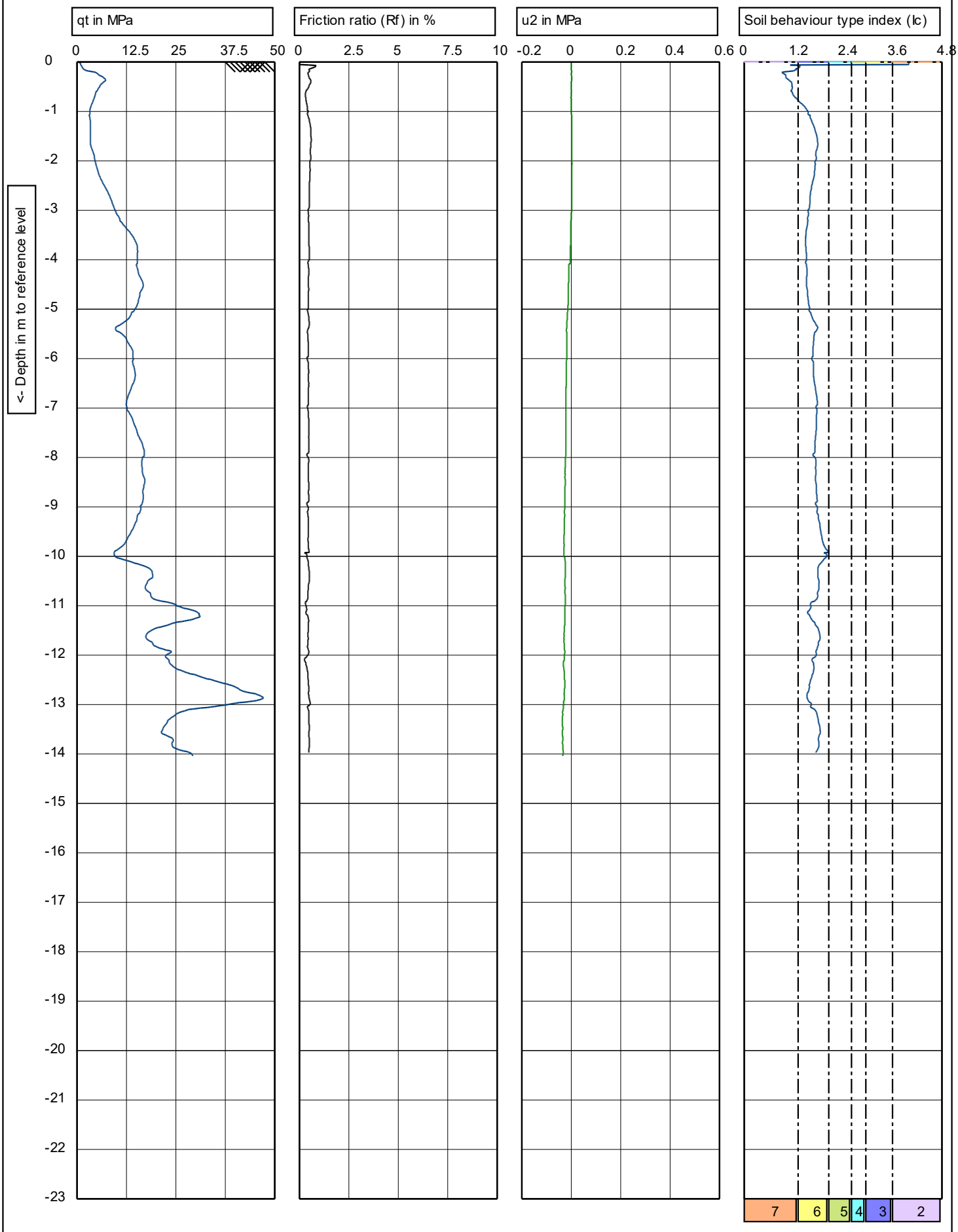
NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	⌜ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m**	W.L.: **-12.16 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0**		CPT no.:	**CPT-04** **3/3**

1.44



NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill: **0.00 m Predrilled**
	G.L.: **0.00 m**	W.L.: **-14.04 m**	Date: **5/06/2020**
Project: **GEOTECHNICAL INVESTIGATION**			Cone no.: **C10CFIIP.C19137**
Location: **ST MICHAELS SCHOOL**			Project no.: **NEW19P-0150**
Position: **0, 0**			CPT no.: **CPT-05** **1/3**

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

u2
150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-14.04 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

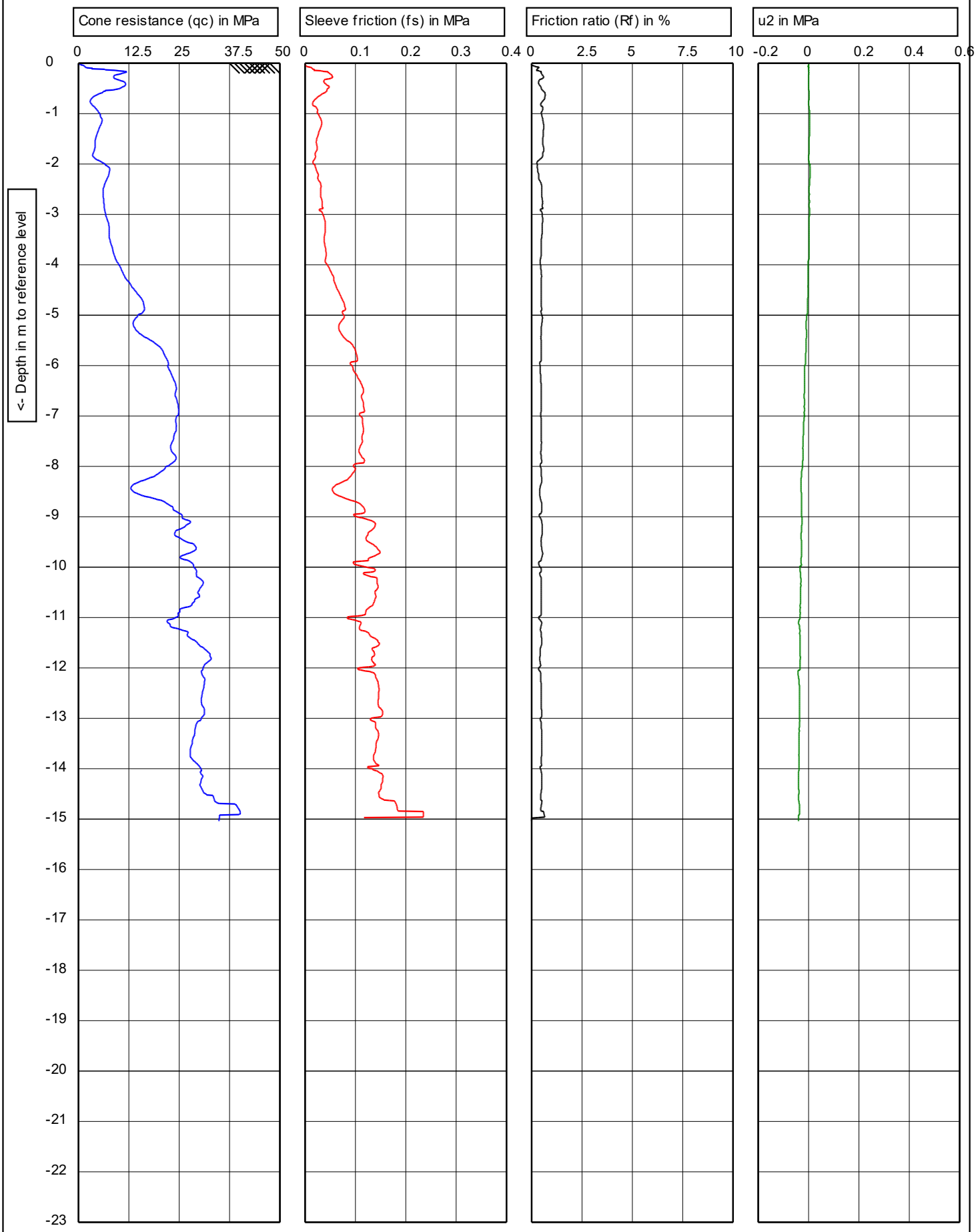
Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-05** 2/3

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

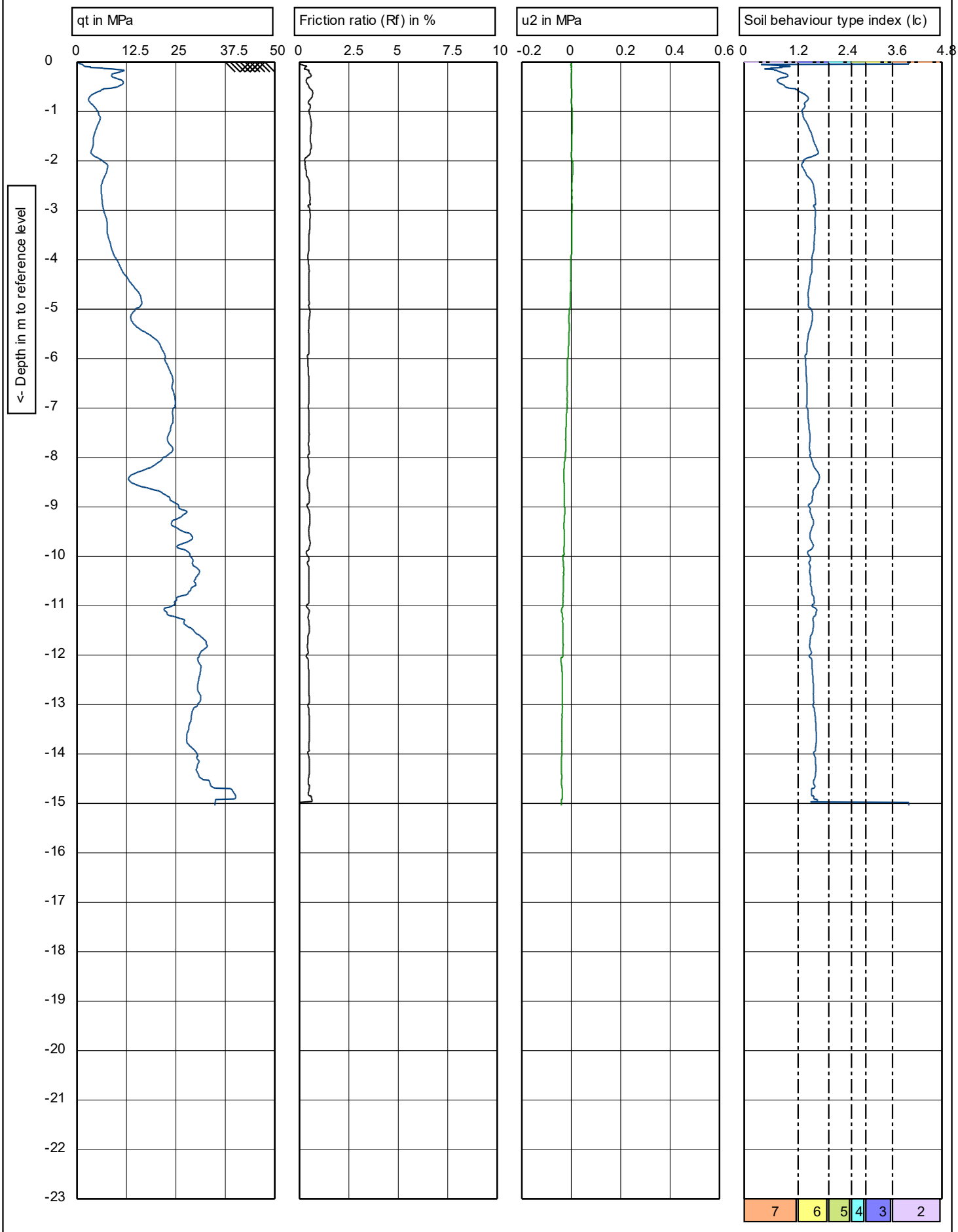
NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	⌜ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m**	W.L.: **-14.04 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0**		CPT no.:	**CPT-05** **3/3**

1.44



NEWSYD GEOTECHNICAL TESTING Ph. 0408 292638	ISO 22476-1:2012 Application class 1 Testtype TE1	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m** W.L.: **-15.04 m**	Date:	**5/06/2020**
	Project: **GEOTECHNICAL INVESTIGATION**	Cone no.:	**C10CFIIP.C19137**
	Location: **ST MICHAELS SCHOOL**	Project no.:	**NEW19P-0150**
	Position: **0, 0**	CPT no.:	**CPT-06** 1/3

1.44



NEWSYD GEOTECHNICAL TESTING
Ph. 0408 292638

r u2
L 150 cm²
10 cm²

ISO 22476-1:2012 Application class 1 Testtype TE1

G.L.: **0.00 m** W.L.: **-15.04 m**

Project: **GEOTECHNICAL INVESTIGATION**
Location: **ST MICHAELS SCHOOL**
Position: **0, 0**

Predrill:	**0.00 m Predrilled**
Date:	**5/06/2020**
Cone no.:	**C10CFIIP.C19137**
Project no.:	**NEW19P-0150**
CPT no.:	**CPT-06** 2/3

1.44

(2) Organic soils
(3) Clay
(4) Silt mixture
(5) Sand mixture
(6) Sand clean to silty
(7) Gravelly sand

NEWSYD GEOTECHNICAL TESTING **Ph. 0408 292638**	⌜ u2 └ 150 cm² 10 cm²	ISO 22476-1:2012 Application class 1 Testtype TE1		Predrill:	**0.00 m Predrilled**
		G.L.: **0.00 m**	W.L.: **-15.04 m**	Date:	**5/06/2020**
	Project:	**GEOTECHNICAL INVESTIGATION**		Cone no.:	**C10CFIIP.C19137**
	Location:	**ST MICHAELS SCHOOL**		Project no.:	**NEW19P-0150**
	Position:	**0, 0**		CPT no.:	**CPT-06** **3/3**

1.44

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BHI01

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BB

DATE: 5/6/20

DRILL TYPE: HAND AUGER
SURFACE RL:

BOREHOLE DIAMETER: 100 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SC	0.10m FILL-TOPSOIL: Clayey SAND - fine to medium grained, dark brown to black, fines of low plasticity, root affected.	D - M				FILL - TOPSOIL
							SAND - fine to medium grained, pale brown, trace fines of low plasticity.					AEOLIAN DEPOSITS
							Pale grey to grey.					
				1.0		SP	Dark grey.					
							Pale grey to white.					
							1.10m Hole Terminated at 1.10 m					
				1.5								
				2.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BHI02

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BB

DATE: 5/6/20

DRILL TYPE: HAND AUGER
SURFACE RL:

BOREHOLE DIAMETER: 100 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
HA	Not Encountered			0.5		SP	FILL-TOPSOIL: SAND - fine to medium grained, dark brown to black, with some fines of low plasticity, root affected.					FILL - TOPSOIL
							0.30m SAND - fine to medium grained, pale grey to white.	D - M				AEOLIAN DEPOSITS
				1.0		SP	1.10m Hole Terminated at 1.10 m					
				1.5								
				2.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BHI03

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BB

DATE: 5/6/20

DRILL TYPE: HAND AUGER
SURFACE RL:

BOREHOLE DIAMETER: 100 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SC	FILL-TOPSOIL: Clayey SAND - fine to medium grained (mostly fine grained), brown to dark brown, fines of low plasticity, root affected.	D - M				FILL - TOPSOIL
							0.20m					
						SP	SAND - fine to medium grained, dark grey, trace fines of low plasticity.					AEOLIAN DEPOSITS
							0.30m					
						SP	SAND - fine to medium grained, pale grey to white.					
				1.0								
							1.10m					
						SP	1.15m SAND - fine to medium grained, orange-brown to brown, with some fines of low plasticity.					
							Hole Terminated at 1.15 m					
				1.5								
				2.0								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH01

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered	E 0.10m				SP	FILL-TOPSOIL: SAND - fine to coarse grained, grey-brown, root affected.	D - M				FILL - TOPSOIL
							0.15m					
						SP	FILL: SAND - fine to coarse grained, grey to dark grey and brown.					FILL / POSSIBLE AEOLIAN DEPOSITS
		0.40m										
		E 0.50m		0.5					MD - D			
							0.50m					
							SAND - fine to coarse grained, pale grey and grey.					AEOLIAN DEPOSITS
		0.90m										
		E 1.00m		1.0				M				
							Orange-brown to brown.					
						SP			MD			
				1.5								
				2.0			2.00m		L - MD			
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH02

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
		E 0.10m				SP	TOPSOIL: SAND - fine to coarse grained, grey-brown, root affected.	D - M				TOPSOIL
							0.15m					
							SAND - fine to medium grained, pale grey.					AEOLIAN DEPOSITS
		0.40m										
		E 0.50m		0.5			Trace rootlets.		L			
		0.80m										
		E 0.90m										
E	Not Encountered			1.0		SP	Brown to dark brown.	M	MD			
				1.5					L			
				2.0			2.00m					
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH03

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered	E 0.10m				SP	FILL: SAND - fine to coarse grained, grey-brown, trace fine to medium grained angular to sub-angular gravel, root affected in top 0.15m.	D - M				FILL
		0.40m					0.25m					
		E 0.50m		0.5		SP	FILL: SAND - fine to coarse grained, pale orange-brown. Grey-brown, trace fine to coarse grained angular gravel.		L - MD			
		0.60m					0.60m					AEOLIAN DEPOSITS
		CBR					SAND - fine to coarse grained, pale grey.					
		1.00m		1.0			Trace medium to coarse grained angular gravel.	M				
		1.40m				SP						
		E 1.50m		1.5					MD			
				2.0			2.00m					
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH04

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered	E 0.10m				SP	FILL-TOPSOIL: SAND - fine to coarse grained, brown to dark brown, trace tree mulch, with some plastic, root affected.	M	VL - L			FILL - TOPSOIL
		0.40m										
		E 0.50m		0.5			0.50m					
		0.60m					SAND - fine to medium grained, pale grey with some dark grey.					AEOLIAN DEPOSITS
		E		1.0		SP			L			
				1.5					L - MD			
				2.0			2.00m					
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH05

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered	E 0.10m				SP	FILL-TOPSOIL: SAND - fine to coarse grained, grey-brown to dark brown, root affected.					FILL - TOPSOIL
							0.30m					
		0.40m				SP	SAND - fine to medium grained, grey and brown.		VL - L			AEOLIAN DEPOSITS / POSSIBLE FILL
		E 0.50m		0.5			0.50m					
		0.60m					SAND - fine to medium grained, pale grey with some dark grey.					AEOLIAN DEPOSITS
		E 0.70m										
				1.0				M	L			
						SP						
				1.5					L - MD			
									MD			
				2.0			2.00m					
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH06

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered					GP	FILL: Sandy GRAVEL - fine to medium grained angular, dark grey and brown, fine to coarse grained sand.					FILL
							0.25m					
							SAND - fine to coarse grained, pale grey to grey.		D			AEOLIAN DEPOSITS
							With some dark brown, trace fine to medium grained angular gravel.					
				0.5			Pale grey.					
				1.0		SP		M	MD			
				1.5			Brown to dark brown.		L - MD			
				2.0			2.00m		MD - D			
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH07

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: 2.7 TONNE EXCAVATOR
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered			0.5		SP	FILL: SAND - fine to coarse grained, grey-brown, root affected.	D - M	VL			FILL
						GP	0.10m FILL: Sandy GRAVEL - fine to medium grained angular, pale brown to brown, fine to coarse grained sand.					
						SP	0.20m SAND - fine to medium grained, grey to dark grey.					AEOLIAN DEPOSITS / POSSIBLE FILL
				1.0		SP	0.40m SAND - fine to medium grained, pale grey.	M	L - MD			AEOLIAN DEPOSITS
				1.5								
				2.0			2.00m Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH08

CLIENT: CATHOLIC DIOCESE OF MAITLAND & NEWCASTLE
PAGE: 1 OF 1

PROJECT: PROPOSED REDEVELOPMENT
JOB NO: NEW19P-0150

LOCATION: ST MICHAEL SCHOOL, SPROULE STREET, NELSON BAY
LOGGED BY: BE

DATE: 1/10/19

DRILL TYPE: HAND AUGER
SURFACE RL:

BOREHOLE DIAMETER: 300 mm
DATUM:

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
E	Not Encountered	E 0.10m				SM	0.10m TOPSOIL: Silty SAND - fine to coarse grained, grey-brown, fines of low plasticity, root affected.	D - M				TOPSOIL
							SAND - fine to medium grained, pale grey trace dark grey.					AEOLIAN DEPOSITS
		E 0.50m		0.5					VL			
				1.0		SP		M	L - MD			
							Dark orange-brown.					
				1.5					MD			
				2.0			2.00m					
							Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample (Glass jar, sealed and chilled on site)
ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Qualtest
LABORATORY (NSW) PTY LTD

8 Ironbark Close Warabrook NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

DYNAMIC PENETROMETER - TEST REPORT

Client:	**Catholic Diocese of Maitland & Newcastle**	**Project Number:**	*NEW19P-0150*
Principal:		**Sheet No:**	*1 of 2*
Project:	**Geotechnical Investigation - Proposed Redevelopment**	**Test Date:**	1/10/2019
Location:	**Sproule Street, Nelson Bay**	**Tested By:**	BE

Test Method: **AS1289 6.3.2** ☐ **Cone Tip**
Drop Height: **510 ± 5mm** ☑ **Blunt Tip**

Depth Below Surface (mm)	Test Number								Test Location / Comments
	DP1	DP2	DP3	DP4	DP5	DP6	DP7	DP8	
									DP locations are as shown on Figure AB1.
150	7	4	4	1	1	-	5	1	
300	7	2	6	1	2	15	1	1	
450	7	2	3	2	2	10	1	1	
600	6	2	3	1	1	7	1	1	
750	5	1	3	2	2	5	1	2	
900	5	6	4	3	3	5	1	3	
1050	5	4	4	2	2	5	1	4	
1200	6	5	7	3	3	6	2	4	
1350	7	5	8	3	4	5	5	5	
1500	6	3	6	3	3	4	3	5	
1650	4	3	6	3	3	4	3	6	
1800	5	2		5	4	4	4	7	
1950	3	2		4	6	6	4	6	
2100	4	2		4	6	8	4	6	
2250	4	3		4	7	8	5	8	
2400	5	3		5	9	8	5	7	
2550	5	4		5	9	9	5	9	
2700	5	4		6	10	8	5	10	
2850	5	4		7	10	10	6	11	
3000	6	4		10	11	10	6	11	
3150	8	6		9	12		6	12	
3300	8	5		10	13		7	14	
3450	8	5		10	13		9	16	
3600		7		11	13			20	
3750		9		10	12			18	
3900		11			13			20	
4050		12						18	
4200		17							
4350		17							
4500									

Test results continued on next page.

Comments: Readings recorded in blows per 150mm increments.

Qualtest
LABORATORY (NSW) PTY LTD

8 Ironbark Close Warabrook NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

DYNAMIC PENETROMETER - TEST REPORT

Client:	**Catholic Diocese of Maitland & Newcastle**	**Project Number:**	*NEW19P-0150*
Principal:		**Sheet No:**	*2 of 2*
Project:	**Geotechnical Investigation - Proposed Redevelopment**	**Test Date:**	1/10/2019
Location:	**Sproule Street, Nelson Bay**	**Tested By:**	BE

Test Method: **AS1289 6.3.2** ☐ **Cone Tip**
Drop Height: **510 ± 5mm** ☑ **Blunt Tip**

Depth Below Surface (mm)	Test Number								Test Location / Comments
	DP9	DP10	DP11	DP12	DP13				
									DP locations are as shown on Figure AB1.
150	3	3	2	1	1				
300	5	4	1	1	1				
450	6	8	2	1	2				
600	6	9	3	3	2				
750	6	7	2	2	6				
900	6	8	2	3	6				
1050	5	7	4	2	8				
1200	7	7	3	4	6				
1350	6	7	4	6	6				
1500	6	12	4	6	8				
1650	5	12	5	6	9				
1800	6		6	6					
1950	5		6	7					
2100	6		7	6					
2250	5		8	7					
2400	6		7	7					
2550	6		8	6					
2700	7		7	8					
2850	7		7	7					
3000	8		7	7					
3150			7	7					
3300			6	6					
3450			6	6					
3600									
3750									
3900									
4050									
4200									
4350									
4500									

Test results continued on next page.

Comments: Readings recorded in blows per 150mm increments.