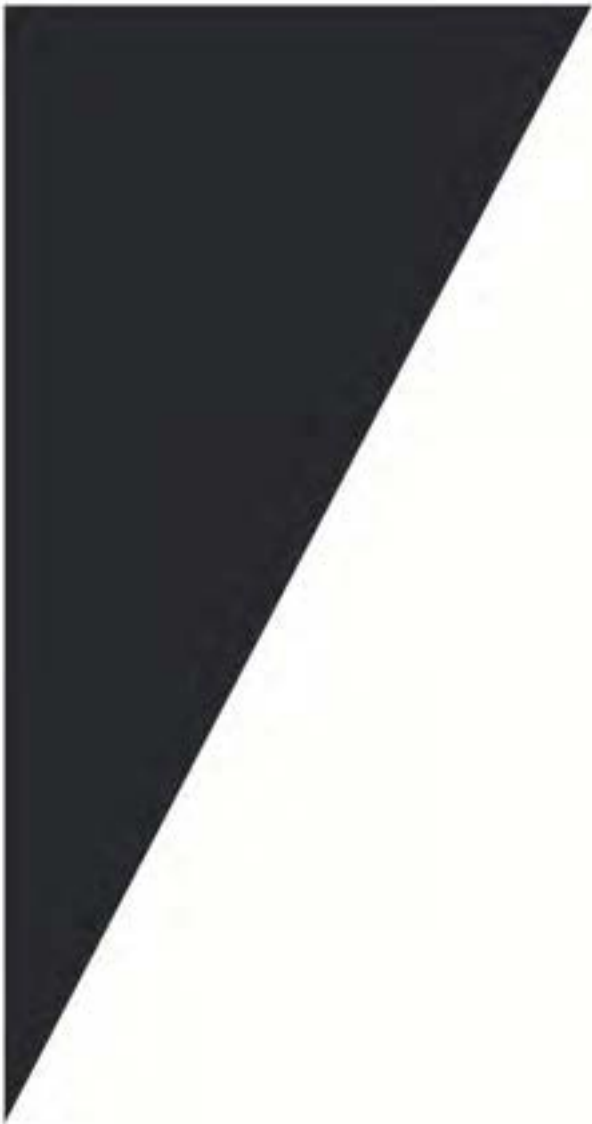




A



APPENDIX A

Geotechnical Investigation Report

31 July 2023

T4 STRUCTURE PLAN

552 PUNIU ROAD, TE AWAMUTU

GEOTECHNICAL INVESTIGATION REPORT

Lyn Cudby & LY&NZ Investment Limited

HAM2022-0065AB Rev 1

HAM2022-0065AB		
Date	Revision	Comments
24 May 2023	A	Initial draft for internal review
26 June 2023	B	Final draft for internal review
25 July 2023	0	Final issue to support Plan Change
31 July 2023	1	Reissue following Client comments

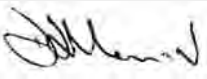
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1 INTRODUCTION

CMW Geosciences (CMW) was engaged by Lyn Cudby & LY&NZ Investment Limited to carry out a geotechnical investigation of a site located at 552 Puniu Road, Te Awamutu, which is being considered for a plan zoning change from 'Deferred Residential Zone' to 'Medium Density Residential Zone'.

Lyn Cudby is the owner of the southern land block within the T4 growth cell (approx. 18 Ha). Subsequent to commissioning Lyn Cudby has formed an agreement with LY&NZ Investment Limited who is the owner of the northern land parcel within the T4 Growth Cell located at 540 Wallace Terrace, Te Awamutu. Under the terms of the agreement Lyn Cudby and LY&NZ Investment Limited has agreed to jointly be one party for the purposes of technical services and planning applications.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter referenced HAM2022-0065AA, Rev 0 dated 31 October 2022.

This report has been prepared to support a plan change application to Waipa District Council. Further investigations and analyses are expected as the project progresses through subdivision consent and detailed design process.

2 SITE DESCRIPTION

2.1 Site Location

The site comprises an area of approximately 29ha and consists of two parcels of land referred to as the Northern Block (18.3ha) and Southern Block (10.7ha) as shown on Figure 1 below.

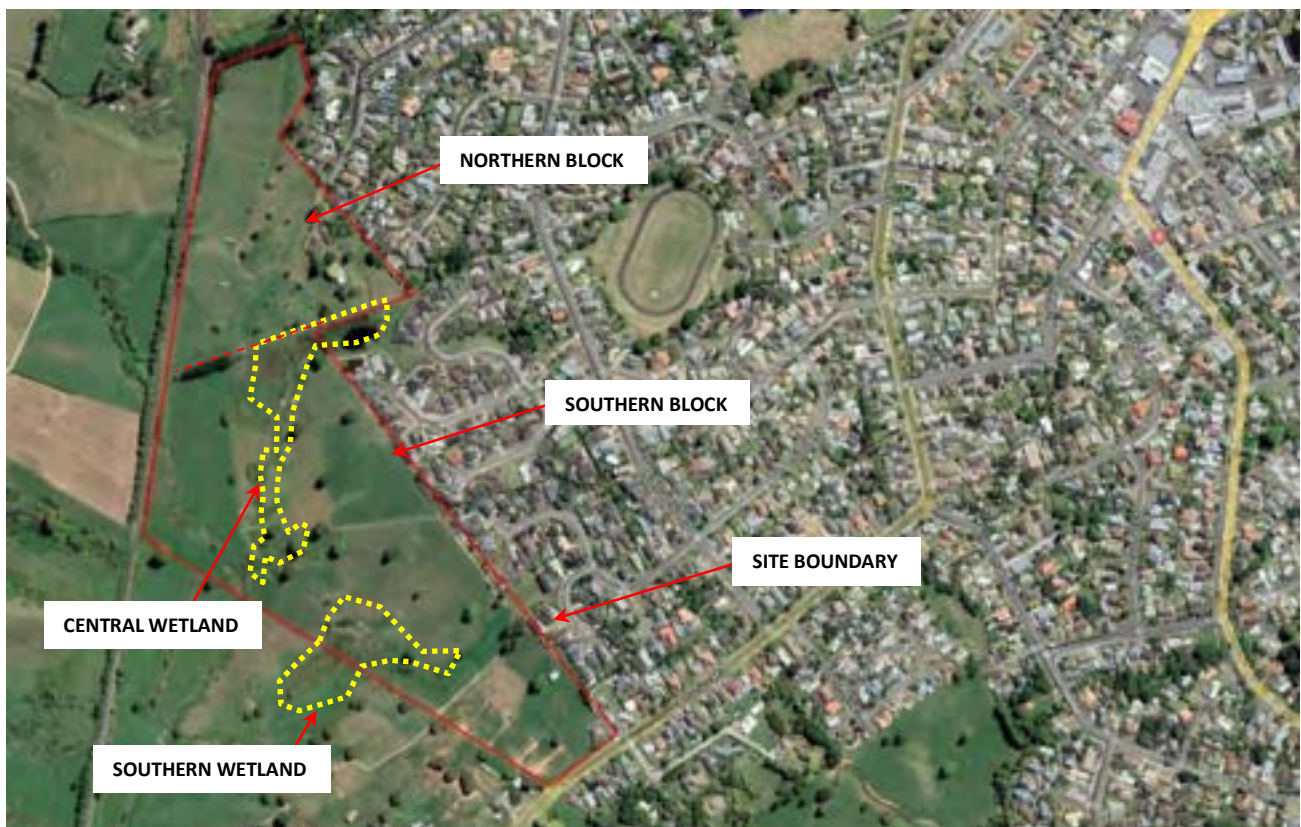


Figure 1: Site Location Plan (Reference i.e. Google Earth)

The site is bound to the east by residential development (Te Awamutu township), to the southeast by Puniu Road, to the southwest and north by pastoral farmland and to the west by the North Island Main Trunk rail line.

2.2 Landform

The current landform, together with associated features located within and adjacent to the site are presented on the attached Geotechnical Investigation Plans as **Drawing 01** and **Drawing 02**.

Within the Southern Block, the site grades variably from residential properties on the northeastern boundary at approximately RL50m to RL60m towards lower ground to the south and west at around RL40m to RL43m. This low-lying ground includes two wetlands (Central Wetland and Southern Wetland) and associated gullies as shown on **Drawing 01**.

The Northern Block consists of two main landforms. The south-eastern portion forms northeast to southwest trending ridge spurs and shallow gullies ranging from RL62m to RL45m while the north-western portion comprises a lower, near level terrace at RL47 to RL50. These two landforms are divided by a steep (1 vertical to 1.5 horizontal) up to 25m high west facing escarpment labelled on **Drawing 02**.

2.3 Site History

Historical aerial photographs¹ indicate the Northern and Southern Blocks have been in grazed pasture since the 1940s. Aerial photography also indicates an approximately 1,500m² area near the southwestern boundary of the Southern Block has previously been earthworked, as shown on Figure 2 below.



Figure 2: Site location plan indicating earth working on southern farm (Reference i.e. Google Earth)

¹ Retrolens website, Sourced from <http://retrolens.nz> and licensed by LINZ CC-BY 3.0

3 PROPOSED DEVELOPMENT

It is proposed to re-zone the site from 'Deferred Residential' to 'Medium Density Residential'. A conceptual scheme plan for the area to support this plan change has been prepared by McCaffery and Cable Consultants, as shown on the draft general arrangement plan and drawings in **Appendix A**.

This scheme includes a collector road along the western and southern boundaries of site connecting local roads servicing approximately 192 residential properties. Four new engineered stormwater ponds/wetlands are to be constructed adjacent to the central and southern wetlands. The existing wetlands are to be largely retained as wetlands.

Conceptual earthworks plans show that the proposed development will require cuts of up to 7m deep and fills of up to 4m deep. The finished landform will be predominantly gently sloping within the housing areas. The steep northern escarpment is shown to remain unaltered apart from minor trimming of the gentle slopes at the toe. Locally steeper slopes with gradients up to 1V:2.5H are also proposed around the margins of the stormwater reserves and ponds/wetlands and on the site boundaries where the proposed works abut existing properties.

4 INVESTIGATION SCOPE

Following a dial before you dig search, and onsite service location, the field investigation was carried out between 7 February 2023 and 13 April 2023. All fieldwork was carried out under the direction of CMW Geosciences in general accordance with the NZGS specifications² and logged in accordance with NZGS guidance³. The scope of fieldwork completed was as follows:

- A walkover survey to assess the general landform, site conditions and geomorphology across site;
- Twenty-four Cone Penetration Tests (CPT);
- Thirty-eight machine excavated trial pits;
- One hand auger borehole;
- Five stormwater soakage tests;

Factual records of the investigations undertaken are presented in the Geotechnical Factual Report (GFR)⁴ and included in **Appendix B** with the respective test locations shown on the Geotechnical Investigation Plans as **Drawing 01 & Drawing 02**.

5 GROUND MODEL

5.1 Published Geology

Published geological maps⁵ for the area depict the elevated rolling hill topography as comprising alluvium dominated by primary and reworked, non-welded ignimbrites of the Walton Subgroup (early to mid-Pleistocene

² NZ Geotechnical Society (2017) NZ Ground Investigation Specification, Volume 1 – Master Specification

³ NZ Geotechnical Society (2005), Field Description of Soil and Rock, Guideline for the field classification and description of soil and rock for engineering purposes.

⁴ CMW Geosciences, "T4 Structure Plan, Te Awamutu, Waikato – Geotechnical Factual Report (draft)", ref: HAM2022-0065AA Rev 0 dated 24 May 2023.

⁵ GNS Geological Map 1:250,000 scale Geological Map No 4 'Waikato'. S.W Edbrooke et al.

aged). The low-lying wetland areas are depicted as locally derived pumiceous clays, sandy clays, and gravels of the Piako Subgroup (mid to late-Pleistocene).

More recent Holocene aged alluvial deposits may be expected in the low-lying parts of the site and localised areas of fill may be encountered due to previous farm activities and earthworks.

5.2 Stratigraphic Units

The ground conditions encountered and inferred from the investigation were generally consistent with the published geology for the area. The distribution of the various units encountered is presented in the appended Geological Sections **Drawings 03 to 08** and summarised below in Table 1.

Table 1: Summary of Strata Encountered				
Unit	Top of Unit (RL m) OR Depth to base (m)		Thickness (m)	
	Min	Max	Min	Max
Organic SILT (Topsoil)	Ground level (GL) where present		0.3	
Soft organic SILT containing construction debris* (Uncontrolled Fill)	GL		2.0	
Stiff to hard clayey SILT, silty CLAY, CLAY & SILT (Walton Subgroup)	0.3		0.5	>4.2
Soft to stiff fibrous organic SILT** (Piako Subgroup)	0.3	2.5	0.2	1.7
Soft to stiff sandy SILT / sandy CLAY / silty SAND (Piako Subgroup)	0.8	3	0.2	>1.2
Dense to very dense SAND / silty SAND / gravelly SAND (Walton Subgroup)	1.6	2.2	0.6	>2.4
Notes: * Strata only encountered in TP09. **Strata only encountered in TP17, TP20, TP21, TP25, TP26 and TP27.				

5.3 Groundwater

During the investigation, which was completed in autumn conditions (March – April 2023), groundwater was encountered within the CPTs, boreholes and trial pits at the depths and levels provided in Table 3.

Table 3: Groundwater Data (March 2023)					
Test Location	Depth (mbgl)	Elevation (m RL)	Test Location	Depth (mbgl)	Elevation (m RL)
TP02	1.3	43.0	TP20	0.8	42.2
TP03	0.5	41.5	TP21	1.5	41.5
TP04	1.0	41.0	TP24	2.0	40.0
TP05	0.5	42.5	TP26	1.0	39.0
TP06	3.0	45.0	TP27	3.8	38.2

TP09	0.5	41.5	TP29	2.7	44.3
TP13	2.0	39.0	TP37	3.9	43.1
TP17	0.5	41.5	TP39	3.8	39.2
CPT01	3.9	46.1	CPT12	0.4	42.2
CPT02	1.6	43.0	CPT16	2.6	43.4
CPT03	1.0	41.0	CPT28	0.6	41.4
CPT04	1.1	42.5	CPT10	0.1	41.5

Note: mbgl = metres below ground level

Elevations are derived from test positions overlain on the existing contour plan and are approximate only

Investigations where groundwater was not recorded are excluded from the table

Groundwater levels were encountered at approximately RL40m to RL41m within the low-lying areas of the site and wetlands. The groundwater table rises beneath the more elevated parts of the site to a maximum measured level at RL46m at the south-eastern end of the Southern Block. Interpreted groundwater levels are shown on the appended geological cross sections.

6 GEOHAZARDS ASSESSMENT

6.1 Context

Section 106 of the Resource Management Act⁶ (RMA) requires an assessment of the risk from natural hazards to be carried out when considering the granting of a subdivision consent. S106 RMA specifically states that the assessment must consider the combined effect of the natural hazard likelihood and material damage to land or structures (consequence).

While this report is to support a plan change application, we have carried out a site-specific hazard assessment per the RMA to confirm site suitability in regard to intended land use. The following sections of this report provide an assessment of the geohazards relevant to this site and provide the basis for the Natural Hazards Risk Assessment presented in **Appendix C**.

6.2 Seismicity

A seismic assessment has been carried out in general accordance with NZGS guidance⁷. The ultimate limit state (ULS) and serviceability state (SLS) peak ground accelerations (PGAs) were assessed based on a 50-year design life and Importance Level (IL) 2 development, in accordance with current MBIE guidance⁸.

Table 1: Design Peak Ground Acceleration (PGA) for Various Limit States

Limit State	AEP	PGA(g)	Magnitude _{eff}
SLS	1/25	0.06	5.9
ULS	1/500	0.25	5.9

⁶ Resource Management Act (1991)

⁷ NZ Geotechnical Society publication "Earthquake geotechnical engineering practice, Module 1: Overview of the standards", (March 2016)

⁸ Ministry of Business, Innovation and Employment, "Earthquake geotechnical engineering practice – Module 1. Overview of the guidelines", November 2021.

Note: SLS = serviceability limit state; ULS = ultimate limit state; AEP = annual exceedance probability

6.3 Fault Rupture

The nearest known active fault to site is the Kerepehi Fault, located approximately 50km to the east. We consider the site to be at 'very low' risk with respect to fault rupture.

6.4 Liquefaction

6.4.1 Methodology

Liquefaction occurs in loose saturated cohesionless soils that are subject to cyclic shear loading during an earthquake. This process leads to pore pressure build-up, soil grains moving into suspension and temporary loss of strength causing vertical and lateral ground deformation.

In accordance with MBIE/NZGS guidance⁹ the liquefaction susceptibility of the soils at this site was assessed with respect to compositional (soil fabric and density) criteria and groundwater levels, based on the following assumptions:

- Only saturated soils below an assessed seasonal average groundwater level shown on Cross Sections A to F (**Drawing 03 to 08**) were modelled as being susceptible to liquefaction.
- In accordance with MBIE/NZGS guidance and in the absence of site-specific shear wave velocity measurements, no aging / strength gain factor has been applied to the Pleistocene aged soils.
- Soils are also classified with respect to their grain size and plasticity to assess liquefaction susceptibility. For this project, a cut-off threshold soil behaviour type index value (I_c) of 2.6 was used to distinguish between liquefiable ($I_c < 2.6$) and non-liquefiable ($I_c > 2.6$) soils.
- Free-field liquefaction induced settlements were determined in accordance with Zhang et al. (2002). With respect to liquefaction response, consideration was given to a 10m cut-off depth to estimate index settlements as per MBIE¹⁰ guidance (foundation technical categories). These were compared to liquefaction settlement estimates over the full depth range of the CPTs with a depth weighting factor (e_v) applied ranging from 1 at the ground surface to 0 at 20m depth.

6.4.2 Analysis Results

Results are presented in **Appendix D** and can be summarised as in Table 5:

Table 2: Liquefaction Analyses Results				
CPT No.	SLS Settlement (mm)	Total ULS Settlement (mm)	Index ULS Settlement	Depth to Liquefied Layer (m)
CPT01	Nil	40	55	4.5
CPT02	Nil	30	40	2.6
CPT03	Nil	40	50	2.0
CPT04	Nil	25	35	3.0
CPT05	No liquefaction triggering in SLS or ULS event.			

⁹ Earthquake Geotechnical Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards", (November 2021)

¹⁰ Repairing and Rebuilding House affected by the Canterbury Earthquakes", (December 2012)

CPT07	No liquefaction triggering in SLS or ULS event.			
CPT08	Nil	85	95	4.0
CPT09	No liquefaction triggering in SLS or ULS event.			
CPT10	Nil	20	30	4.0
CPT11	No liquefaction triggering in SLS or ULS event.			
CPT12	Nil	20	25	3.2
CPT13	Nil	40	25	9.4
CPT14	Nil	20	25	1.5
CPT15	Nil	15	20	3.0
CPT16	Nil	85	45	3.2
CPT17	Nil	10	5	18
CPT19	Nil	10	Nil	8.0
CPT20	Nil	25	45	7.4
CPT22	No liquefaction triggering in ULS event.			
CPT23	No liquefaction triggering in ULS event.			
CPT27	Nil	10	20	5.5
CPT28	Nil	15	15	2.2

Note: All settlements and depths based on existing ground profile.

Index settlements are calculated based on the upper 10m of the soil profile using no depth weighting factor.

Total ULS settlements are based on the full depth of the CPT trace with a depth weighting factor applied.

Index settlements are for assessment of the site against the MBIE site Technical Category guidelines and are not comparable to the total ULS settlements.

The calculations indicate that liquefaction may occur in some soil layers during a ULS earthquake event. Affected layers are shown on the geological cross sections (**Drawings 03 to 08**). Based on the above, the site has been divided into the following two liquefaction hazard categories, as shown on **Drawings 09 and 10**.

Low Liquefaction Risk

The elevated parts of the site are expected to experience total liquefaction-induced free field settlements of less than 25mm. Affected soil layers are relatively deep below the finished ground surface (ie. generally > 5m) or were absent within the CPTs analysed in this zone. These areas would be analogous to the Technical Category 1 (TC1) zones of the Canterbury rebuild¹¹.

Moderate Liquefaction Risk

This zone includes the more low-lying parts of the site where relatively shallow groundwater is present and more significant liquefaction is predicted in some CPTs during a ULS event. Total liquefaction-induced settlements within this zone range from 20mm to 85mm in a ULS earthquake. Index settlements (ie. within the upper 10m and without applying a depth reduction factor) range from 25mm to 45mm and would classify this zone as Technical Category 2 (TC2) per the guidelines developed for the Canterbury earthquake rebuild.

The post-development liquefaction risk at this site will be affected by future earthworks. These effects and options to mitigate residual liquefaction risk, where required, are given below in Section 7.2.

¹¹ Ministry of Business, Innovation and Employment, "Repairing and rebuilding houses affected by the Canterbury earthquakes", Dec 2012.

6.5 Lateral Spread

Following the onset on liquefaction, liquefied soils behave as a very weak undrained material. This can result in lateral spreading at free faces or cut and fill batters over or within soils that are susceptible to liquefaction.

To assess this hazard further, stability analyses of the proposed northern stormwater pond (refer **Section D**) were carried out, which considered the effects of a thin layer of liquefiable soils beneath the floor of the pond, adjacent slope and natural wetland to the south.

Preliminary analyses (refer **Appendix E**) indicate that the liquefied factor of safety against lateral spreading may approach 1.0 however ground displacements should be minor (ie. < 5mm). Further investigation and assessment will be required during the detailed design of the development.

6.6 General Slope Stability

With the exception of the northern escarpment (discussed below), existing slopes in the Southern Block and the Northern Block are gently or moderately sloping with no visible evidence of previous slope failure. The proposed landform in these areas is also predominantly gently sloping, and the risk of large-scale instability affecting future development on these parts of the site is assessed as 'low'.

Smaller steep natural slopes are present around the edges of the low-lying ground and wetlands, and where the topography has been incised by stream erosion. These slopes are generally less than 4m to 6m in height but may be prone to small-scale instability and erosion. Recommendations and options to manage the effect of this localised instability, and to ensure the stability of engineered cut and filled slopes on site, are given in Section 7.3 below.

6.7 Northern Escarpment Stability

The geomorphology of this slope includes several features which may represent previous failure scarps and colluvial deposits. Slope stability analyses were carried out to assess the potential effects of future roading and housing in this area. The analyses considered both the existing and proposed landforms and used the geological model and slope profile shown on Cross Section F (**Drawing 08**).

6.7.1 Design Criteria

The stability of natural or engineered slopes under a range of design conditions is expressed in terms of a factor of safety, which is defined as the ratio of forces resisting failure to the forces causing failure. The following performance standards are commonly accepted for slope stability assessment of residential developments:

Table 3: Slope Stability Factor of Safety Criteria

Condition	Required Factor of Safety
Static long term conditions (drained soil conditions, normal groundwater)	1.5
Transient short term conditions (elevated groundwater condition)	1.2
Ultimate Limit State (ULS) seismic condition	1.0*
Note: *Factor of safety < 1.0 acceptable where displacement-based approach is adopted.	

6.7.2 Methodology

Slope stability analyses were undertaken using the Morgenstern-Price method of slices under both circular and non-circular failure mechanisms using the proprietary software SLIDE Version 9.

Soil parameters used in the stability models have been derived from on-site investigation and experience with the local geological units and similar materials in the area. A back-analysis of the current escarpment was also

carried out to refine these parameters by adopting a minimum factor of safety of 1.0 for the steepest section of the slope under elevated groundwater conditions. The resulting parameters are given in Table 7 below.

Groundwater was represented in the models as a piezometric surface based on water levels measured in the investigations and observed on site. A pore pressure ratio (R_u) of 0.3 was used to represent short-term elevated groundwater conditions within the surficial soils on the slope.

Table 7: Summary of Effective Stress Shear Strength Parameters

Geological Unit	Unit Weight (kN/m ³)	Peak Undrained Shear Strength S_u (kPa)*	Effective Stress Parameters	
			Back Analysis	
			c' (kPa)	ϕ' (deg)
Stiff to hard clayey SILT, silty CLAY, CLAY & SILT (Walton Subgroup)	16	90	6	26
Soft to stiff fibrous organic SILT (Piako Subgroup)	16	40	4	26
Dense to very dense SAND / silty SAND / gravelly SAND (Walton Subgroup)	17	-	1	38
Note: Where c' = effective cohesion, ϕ' = effective friction angle				
* Undrained parameters were used for seismic analyses of cohesive soils only.				

6.7.3 Results

The results of the numerical analyses are summarised on Table 8 below. Selected stability printouts are attached in **Appendix E**.

Table 8: Slope Stability Analyses Results

Location	Slope Stability Factor of Safety		
	Prevailing	Transient	Seismic
Geological Section F – Existing Slope	1.19	0.96	1.79
Geological Section F – Proposed Slope	1.19	0.93	1.56

Analyses results show that the requisite factors of safety are not achieved for the northern escarpment. Shallow-seated slumps of the type indicated by the analyses typically produce slides of material that run out for significant distances downslope, creating a debris inundation risk below the slope. These distances are often approximated by projecting a line at between 1v:3h and 1v:4h from the crest of the slope. The extent of a 1v:4h runoff zone is labelled on the stability model printouts and on Cross Section F.

Specific mitigation recommendations from the development are provided in Section 7.3.

6.8 Load Induced Settlement

The predominantly stiff nature of the subsoils dictates that they are generally not prone to excessive load-induced or 'static' settlement under proposed fill and building loads. More settlement susceptible soils exist across the lower lying wetlands and stream gullies underlain by geologically recent and organic materials.

Load induced settlements below proposed earthworks fills were estimated using the software CPeT-IT using the CPT investigation data. Results are attached in **Appendix F** and summarised below in Table 9.

Settlements across the more elevated parts of the site (eg. CPT01, 02, 04) can generally be managed by appropriate monitoring during and after earthworks to ensure they have reached an acceptable rate before

construction of buildings or infrastructure begins. Long-term settlements after earthworks and monitoring are expected to be within acceptable limits for residential development (ie. less than 25mm).

More significant settlements will occur where fills are placed over weak and compressible soils within the existing wetlands and gully floors, which will require specific design (refer Section 7.4).

Table 9: Preliminary Settlement Analyses Results

CPT No.	Proposed Fill Depth (m)	Fill Load (kPa)	Primary Settlement (mm)	Secondary Settlement (mm)	Total Settlement (mm)
CPT01	2.0	36	20	5	25
CPT02	2.0	36	12	2	14
CPT03	2.0	36	65	8	73
CPT04	4.0	72	24	1	25
CPT08	3.0	54	180	35	215
CPT10	3.0	54	65	5	70
CPT27	3.0	54	40	10	50
CPT28	2.0	36	18	2	20

6.9 Expansive Soils

Seasonal shrinking and swelling results in vertical surface ground movement which can cause significant cracking of floor slabs and walls. There have been instances of concrete floors and/ or foundations that have been poured on dry, desiccated subgrades in summer months on expansive soils and have undergone heaving and cracking requiring extensive repairs or re-building once the soil moisture contents have returned to higher levels. This hazard is addressed by a combination of careful foundation design and site preparation.

NZS 3604:2011¹² excludes from the definition of 'good ground', soils with a liquid limit of more than 50% and a linear shrinkage of more than 15% due to their potential to shrink and swell as a result of seasonal fluctuations in water content. For soils exceeding these limits, NZS 3604 has historically referenced AS 2870¹³ for foundation design advice. However, the November 2019 update of Acceptable Solution B1/AS1¹⁴ provides amendments to NZS 3604 that define a method for testing and classifying the soils and provides foundation designs for specific, simple house configurations across the range of expansive soil conditions.

Nevertheless, there is evidence¹⁵ indicating that the use of the B1/AS1 method of assessment of expansiveness may be inaccurate. Accordingly, our assessments herein have been made in line with our experience, BRANZ Report SR120A¹⁶ and AS2870.

Specific testing for expansive soils has not been carried out for the site at this preliminary stage. With reference to published literature (Lowe & Percival, 1993, Lowe et al., 2014) the Waikato region clay soils of the Walton Subgroup are dominated by Halloysite, Kaolinite and some Allophane clay mineralogy's. Upon exposure to air

¹² Standards New Zealand (2011) Timber-framed buildings, NZS 3604:2011, NZ Standard

¹³ Standards Australia Limited (2011) *Residential slabs and footings*, AS 2870-2011, Australian Standard, NSW

¹⁴ Ministry of Business, Innovation and Employment (2019) *Acceptable Solutions and Verification Methods for NZ Building Code Clause B1 Structure*, B1/AS1, Amendment 19

¹⁵ Rogers, N., McDougall, N., Twose, G., Teal, J. & Smith, T. (2020) The Shrink Swell Test: A Critical Analysis, *NZ Geomechanics News*, Issue 99, pages 66-80.

¹⁶ Fraser Thomas Limited (2008) - Addendum Study Report (BRANZ SR120A), Soil Expansivity in the Auckland Region – Final Report

during periods of dry weather, these clay minerals can undergo non-recoverable shrinkage i.e. the volume of the soil is permanently decreased. In this case significant surface cracking can occur. This behaviour is unique to Halloysite dominant clays and therefore differs from Smectite / Montmorillonite (swelling/shrinking) dominated clays, on which AS2870 and the BRANZ report are based.

Whilst strict application of current standards would class the site soils as expansive soil class M to E (moderately to extremely), based on published research and our visual - tactile identification of soils in accordance with AS2870, foundation design should consider adopting stiffened raft foundation systems or NZ3604 type foundations to comply with expansive soil class M. These recommendations may be subject to change by a suitably qualified geotechnical engineer for specific building foundations.

6.10 Sensitive Soils

The Walton Subgroup clay/silt unit that will be encountered within the proposed earthworks cuts and exposed at or immediately below design subgrade level within the proposed cut areas is typically considered moderately sensitive to sensitive.

These characteristics may make the clay/silt unit challenging to earthwork and will require specific consideration to plant movements during the construction period, where exposed.

7 RECOMMENDATIONS

7.1 Seismic Site Subsoil Category

The geological units encountered beneath the majority of the development area comprise soil strength materials, which with respect to the seismic site subsoil category defined in Section 3.1.3 of NZS1170.5, is defined as having a UCS < 1MPa. Undrained shear strengths in these units are more than 12.5kPa and estimated Standard Penetration Test (SPT) 'N' values are more than 6 blows per 100mm penetration.

Based on those ground conditions and specific geophysical data gathered by the University of Waikato and Auckland University, the typical site period for the site is expected to be about 3 seconds where the seismic site subsoil category is assessed as being Class D (deep soil site) in accordance with NZS1170.5.

Although not encountered in the investigations to date, it is possible that the low-lying parts of the site and existing wetlands may be underlain by more than 10m depth of weak or very loose alluvial soils. Localised parts of the site may therefore be classified as Class E (very soft soils), although this would need to be confirmed by further investigation if sensitive infrastructure or services are to be located in these areas.

7.2 Liquefaction Mitigation

The areas of low liquefaction risk shown on **Drawings 09** and **10** would be suitable for standard shallow foundations and development practices consistent with the Technical Category 1 (TC1) parts of the Canterbury earthquake rebuild (subject to appropriate non-seismic bearing capacity etc. and the other recommendations in this report). No specific engineering of typical residential building foundations or buried infrastructure should therefore be required to account for liquefaction in these zones.

The post-development liquefaction hazard within the moderate risk zones shown on the drawings will be affected by the future earthworks. Where significant depths of fill are to be placed, this will form a crust of non-liquefiable soils beneath the site and may reduce the liquefaction risk to the point where standard foundations may be used (ie. per NZS3604 or using common waffle-slab type systems). In areas where the crust thickness is not sufficient and/or in areas of proposed cut, development options may include foundation systems such as those developed for the TC2 rebuild zones (eg. stiffened slab foundations, etc.).

Buried services and utilities may need to be specifically designed within the moderate liquefaction risk zones. Options to reduce the risk of excessive adverse effects may include locating key infrastructure away from the areas of highest risk and/or using continuous or welded PVC pipework, where possible. Manholes and pump stations located in potentially liquefiable areas should be subject to specific geotechnical assessment and may need to include buoyancy reducing measures to reduce the risk of 'floating' following a large earthquake. Such measures are commonly applied to residential developments on similar sites in the Waikato region.

Initial analyses indicate that no lateral spread mitigation is required. The extent of the liquifiable soils and their lateral spreading effect on the proposed wetlands will require further investigation and analyses during the detailed design process to confirm any mitigation measures required.

7.3 Slope Stability Management

Where the development is located within the northern escarpment slope debris runout zone, a debris protection bund at the foot of the slope will be required to direct debris away from dwellings, etc. A debris collection area upslope of the bund is required, with future access to be maintained to this area so that debris can be removed if needed. Bunds must also be constructed to facilitate future stormwater flows and to prevent ponding behind the bund.

Details of the landslide debris protection measures must be subject to specific design and Council approval prior to construction.

7.4 Load Induced Settlement Design

Where fill is to be placed within the low-lying parts of the site and which may be underlain by more settlement-prone soils, a range of options may be considered, including the following:

- Over-excavation of low strength surface soils and replacement with engineered fill.
- Construction of temporary pre-load embankments to induce short-term settlements during construction and reduce long-term settlements below finished lots or roadways, etc.
- Reinforcement of road embankments or other fill embankments with specifically designed geogrid reinforcing to reduce differential settlements to an acceptable level.

Options should be further assessed following confirmation of final design contours.

7.5 Earthworks

7.5.1 Excavatability & Borrow Materials

The soils which underlie this site can generally be excavated using normal earthworks plant.

Within the deeper cuts, soils of the underlying Walton Subgroup silt unit may be encountered, which typically contain high moisture contents and are highly sensitive to disturbance, which can make them particularly challenging to earthwork. These materials can be used within engineered fills but typically will require block cutting and top loading techniques followed by drying to reduce their natural moisture content before compaction. The amount of drying, blending and compaction effort required should not be underestimated.

Young alluvial soils encountered within the existing wetlands and stream gullies may not be suitable for re-use as engineered fill due to their high organic content. These materials may be used in landscaping or reserve areas where the long-term settlement of the finished landform is acceptable.

7.5.2 Subgrade Preparation

Preparation of the stiff to hard subgrade beneath the proposed fill areas should comprise stripping of all vegetation, topsoil, any pre-existing fill materials or weak colluvium followed by benching of the exposed

subgrade where natural slopes beneath the fill exceed gradients of nominally 1:5 (vertical to horizontal). The subgrade should then be scarified, and moisture conditioned where necessary and then proof rolled to verify the subgrade stiffness and consistency.

Where any particularly weak materials are encountered that weave excessively during the proof rolling process, they should be undercut and removed prior to placing engineered fill.

For all existing farm ponds, allowance should be made to drain them, provide temporary dewatering measures to manage any groundwater seepage and facilitate cleaning out of all accumulated sediment, placement of drainage layers and bulk engineered fill above.

7.6 Civil Works

7.6.1 Subgrade CBR

Following stripping of topsoil, stiff to very stiff clay is expected to be at subgrade level. Based on shear vane testing results obtained during trial pit excavation within the upper 1.0m of soil profile we recommend a preliminary CBR value of 4%.

Subgrade CBR's should be confirmed during earthworks at final levels based on in-situ testing.

7.6.2 Service Trenches

All of the materials to be exposed during the excavation of service trenches should be readily removed using an excavator.

Localised trench support or battering of trench sides may be required in saturated sandy soils.

Trench collapse is expected to pose problems where excavations extend below the water table. Temporary dewatering, in the form of regularly spaced sump pumps or well point dewatering spears may also be required in association with trench support.

7.6.3 Stormwater Disposal

We understand that the proposed ponds and wetlands are intended to store and detain stormwater. This is considered appropriate for the site and development, subject to specific geotechnical design of the various pond embankments and other works during detailed design.

Results of the in-situ permeability tests are presented in the GFR. The site and proposed development would also be generally suitable for disposal or stormwater to ground soakage, although it should be understood that the extent of testing to date is limited and further testing would be needed for the detailed system design.

7.7 Foundations

At the completion of the works, a Geotechnical Completion Report (GCR) should be prepared. The GCR will advise on anticipated foundation design parameters and any restrictions that require further engineering investigation and/ or design on individual lots to address any remaining natural hazards as described in Section 71(3) of the Building Act, ie. erosion, falling debris, subsidence, slippage, and inundation. The certification for residential lots is based on compliance with the "good ground" definition of NZS 3604 at finished ground levels.

On this site our provisional expectation is that, provided earthworks are completed in accordance with the standards and recommendations described herein, the following will apply:

- The areas of 'Low' liquefaction risk shown on **Drawings 09** and **10** should be suitable for standard (i.e. TC1) foundations designed in accordance with NZS3604 or using common waffle-slab type systems (e.g. RibRaft).

- The areas of 'Moderate' liquefaction risk would be suitable for either standard TC1-type foundations where further investigation indicates a reduced liquefaction risk and/or where proposed earthworks reduce the liquefaction risk to an acceptable level. Where the liquefaction risk remains 'Moderate', TC2-type foundations may be appropriate.

8 FURTHER WORK

The following items may require further geotechnical input as the project progresses:

- Additional investigation and analyses to better define risks such as liquefaction, lateral spreading and static settlements below housing areas and infrastructure, particularly within the low-lying parts of the site.
- Specific design and/or retaining of some slopes including pond and road embankments where steeper batter angles are required.
- Confirmation of building setback distances or other recommendations around minor slopes where these are located near housing or infrastructure and are not addressed by specific slope design.
- Assessment and design of debris protection measures at the toe of the northern escarpment where landslide debris may pose a risk to housing or infrastructure.
- Design of undercuts, pre-loading or other measures to manage static settlement below fill embankments across the existing streams and wetland areas.
- Preparation of Geotechnical Design Reports and an earthworks specification for future earthworks, followed by observations, testing and certification and preparation of a Geotechnical Completion Report for the development.

9 CLOSURE

Subject to the recommendations presented in this report being implemented we consider that the site is suitable for the proposed development.

Additional important information regarding the use of your CMW report is provided in the '*Using your CMW Report*' document attached to this report.

This report has been prepared for use by Lyn Cudby & LY&NZ Investment Limited in relation to the T4 Structure Plan, 552 Puniu Road, Te Awamutu project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Where a party other than Lyn Cudby & LY&NZ Investment Limited seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

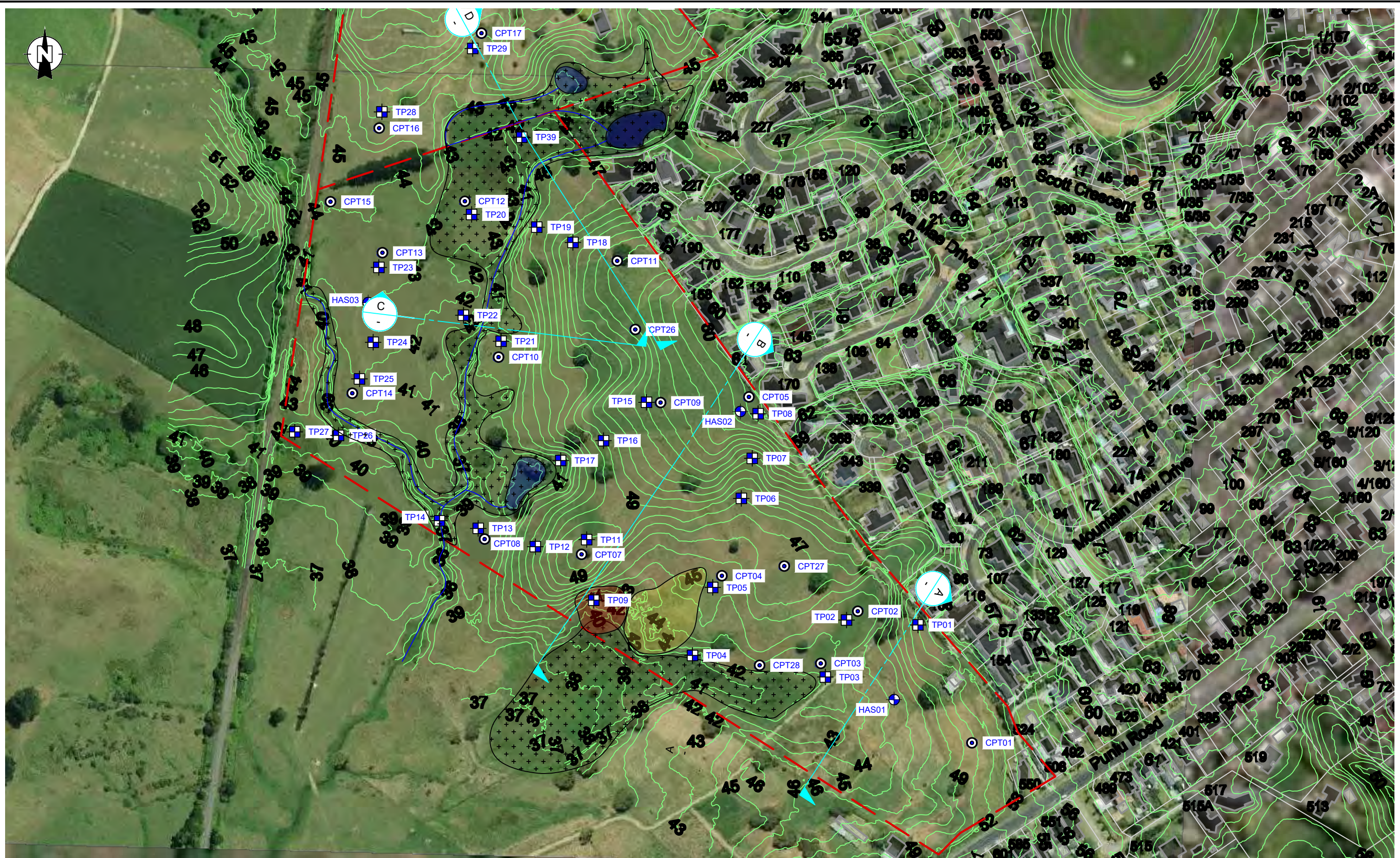
Environmental Matters Are Not Covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

DRAWINGS

Title	Reference No.	Date	Revision
Site Investigation Plan (Southern Block)	DG01	21/06/2023	0
Site Investigation Plan (Northern Block)	DG02	21/06/2023	0
Geological Cross Section A	DG03	21/06/2023	0
Geological Cross Section B	DG04	21/06/2023	0
Geological Cross Section C	DG05	04/07/2023	0
Geological Cross Section D	DG06	04/07/2023	0
Geological Cross Section E	DG07	04/07/2023	0
Geological Cross Section F	DG08	04/07/2023	0
Liquefaction Hazard Plan (Southern Block)	DG09	21/06/2023	0
Liquefaction Hazard Plan (Northern Block)	DG10	21/06/2023	0



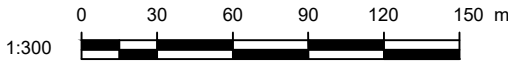
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- PERMEABILITY TESTING LOCATION
- CONE PENETROMETER TEST (CPT) LOCATION
- TEST PIT (TP) LOCATION
- GEOLOGICAL LONG SECTION LOCATION
- SITE BOUNDARY

- POTENTIAL UNCONTROLLED FILL
- UNCONTROLLED FILL
- WETLAND AREA
- FARM DRAIN/STREAM

NOTES:

1. BASE PLAN ADAPTED FROM: WAIPA DISTRICT COUNCIL LIDAR CONTOURS



CLIENT:	LYN CUDBY & LY&NZ INVESTMENT LTD	
PROJECT:	T4 STRUCTURE PLAN T4 GROWTH CELL, TE AWAMUTU	
TITLE:	SITE INVESTIGATION PLAN	
DRAWN:	AS	PROJECT: HAM2022-0065
CHECKED:	RT	DRAWING: 01
REVISION:	0	SCALE: 1:3000
DATE:	24/03/2023	SHEET: A3 L



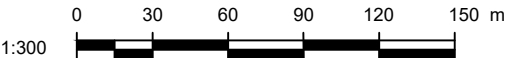
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- TP01 TEST PIT (TP) LOCATION
- GEOLOGICAL LONG SECTION LOCATION
- SITE BOUNDARY

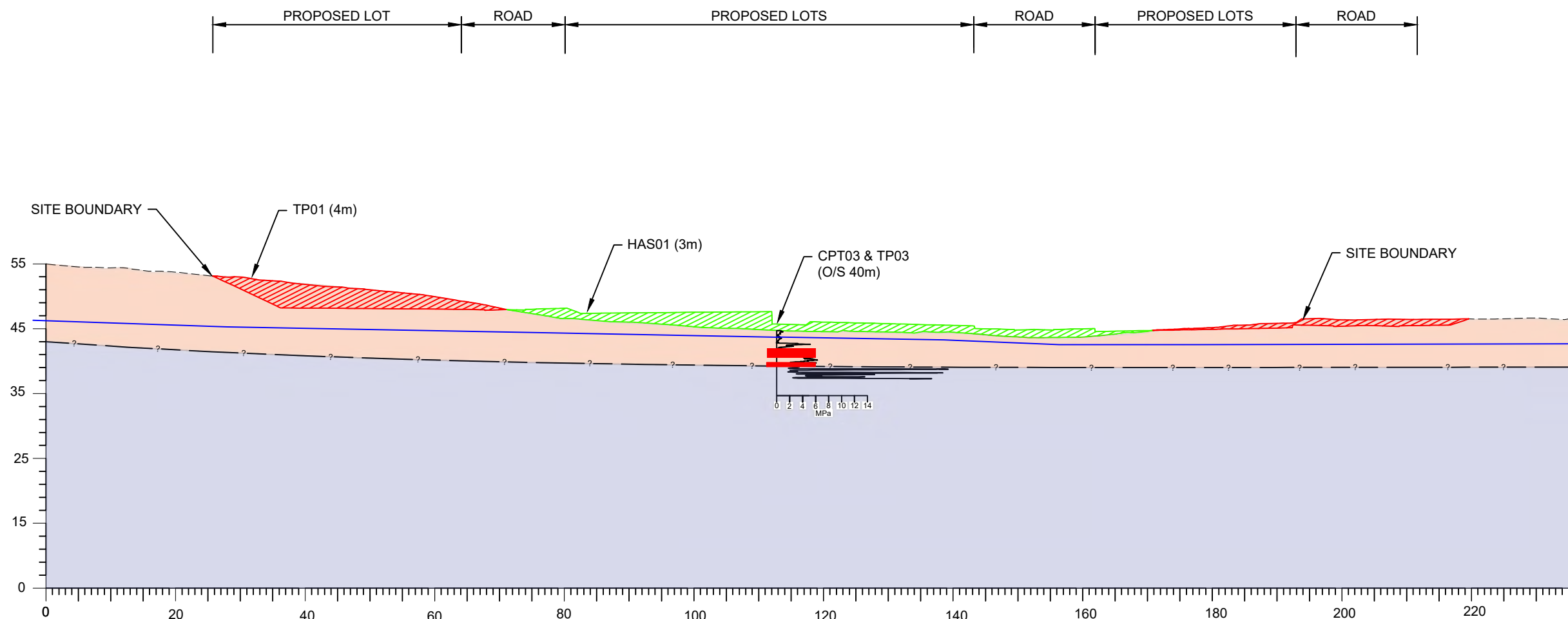
- WETLAND AREA
- FARM DRAIN/STREAM

NOTES:

1. BASE PLAN ADAPTED FROM: WAIPA DISTRICT COUNCIL LIDAR CONTOURS



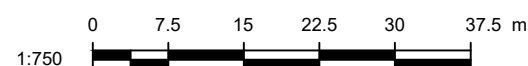
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	DATE: 24/03/2023	SHEET: A3 L



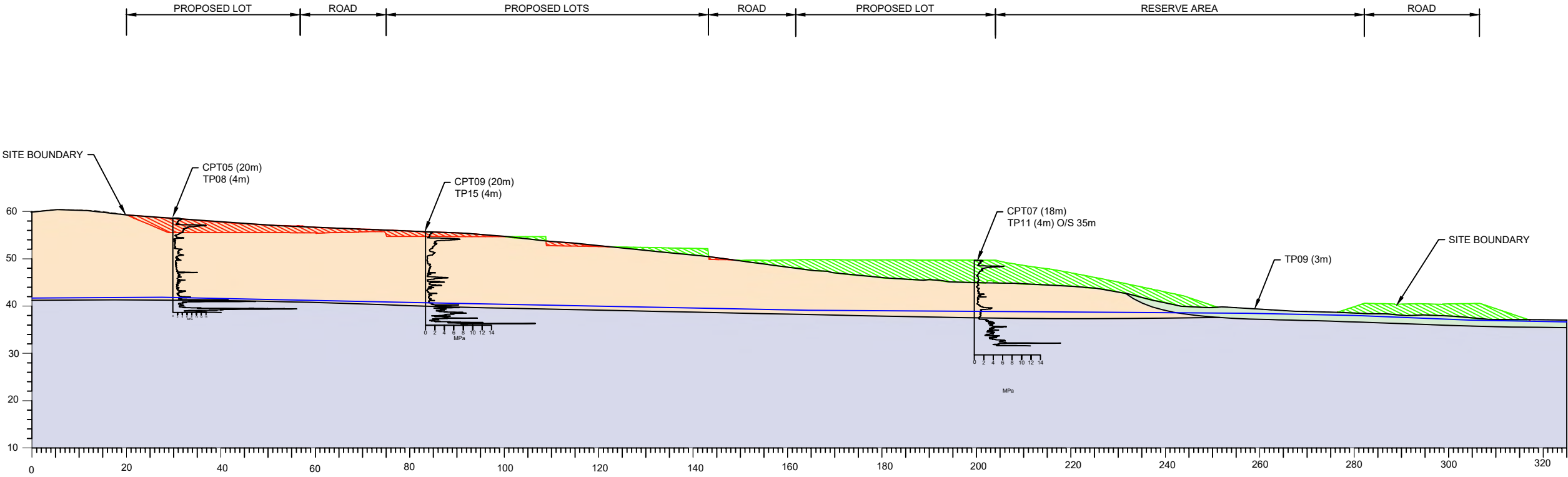
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- SILTY FINE TO COARSE GRAVEL / SANDY FINE TO COARSE GRAVEL (WALTON SUBGROUP)
- SOFT TO FIRM SILT / CLAYEY SILT / ORGANIC SILT / LOOSE SANDS (ALLUVIUM - PIAKO SUBGROUP)
- PROPOSED CUT
- PROPOSED FILL
- ULS LIQUEFIABLE SOIL LAYERS (EXCLUDING LAYERS <0.5m THICK)

GROUNDWATER TABLE



CLIENT: LYN CUDBY & LY&NZ INVESTMENT LTD	DRAWN: AS	PROJECT: HAM2022-0065
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	DATE: 04/07/2023	SHEET: A3 L

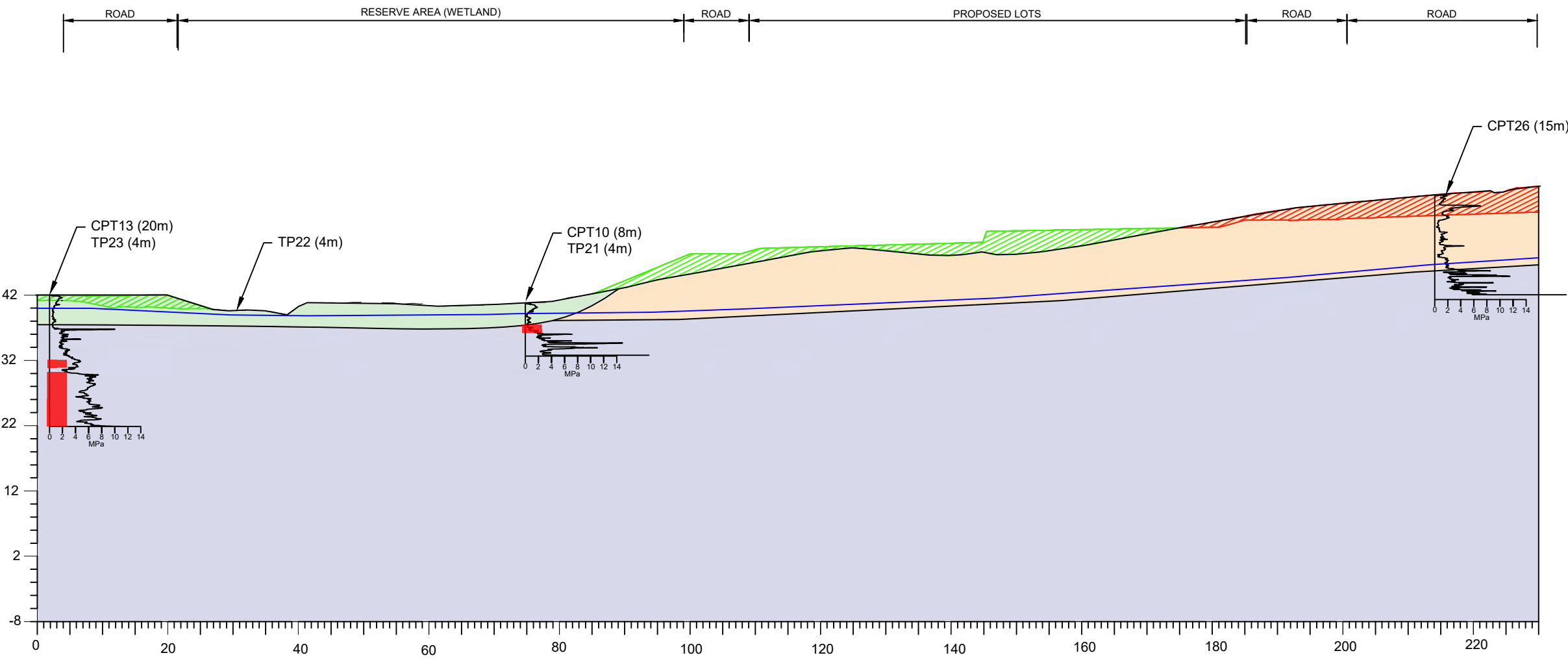


LEGEND:

- VERY STIFF TO HARD SILTY CLAY / CLAY (VOLCANIC ASHES)
- SILTY FINE TO COARSE GRAVEL / SANDY FINE TO COARSE GRAVEL (WALTON SUBGROUP)
- SOFT TO FIRM SILT / CLAYEY SILT / ORGANIC SILT / LOOSE SANDS (ALLUVIUM - PIAKO SUBGROUP)
- PROPOSED CUT
- PROPOSED FILL
- GROUNDWATER TABLE



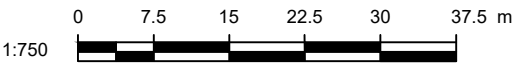
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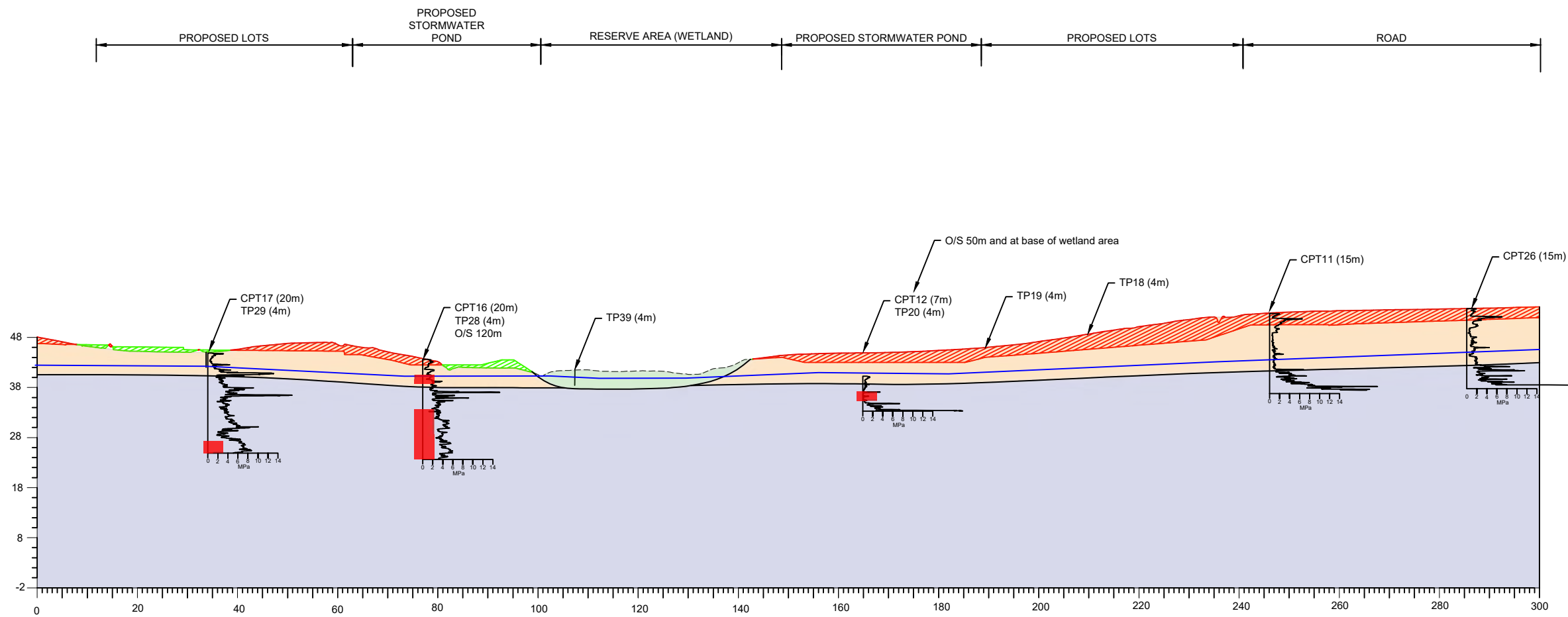
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- SILTY FINE TO COARSE GRAVEL / SANDY FINE TO COARSE GRAVEL (WALTON SUBGROUP)
- SOFT TO FIRM SILT / CLAYEY SILT / ORGANIC SILT / LOOSE SANDS (ALLUVIUM - PIAKO SUBGROUP)
- PROPOSED CUT
- PROPOSED FILL
- ULS LIQUEFIABLE SOIL LAYERS (EXCLUDING LAYERS <0.5m THICK)

GROUNDWATER TABLE



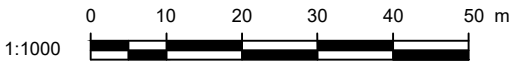
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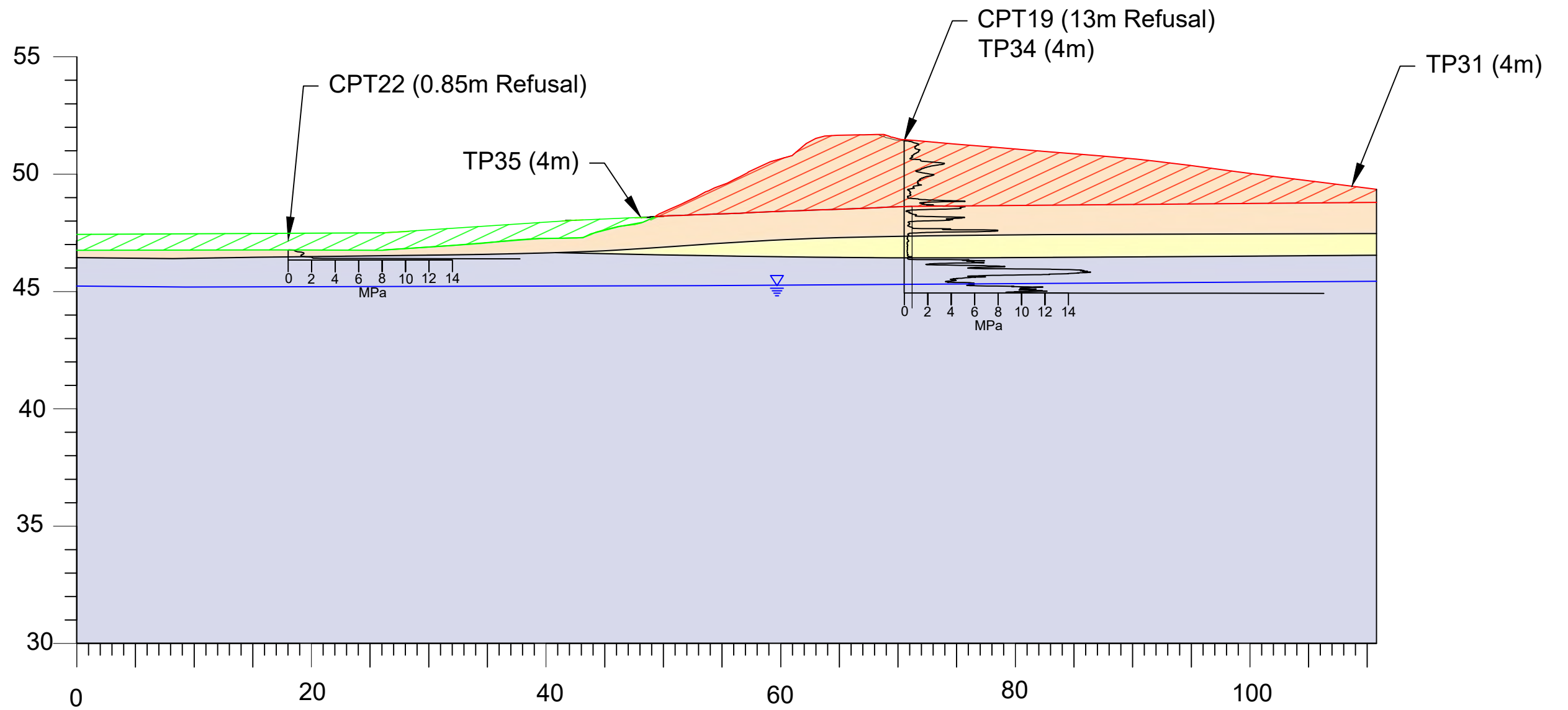
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- SILTY FINE TO COARSE GRAVEL / SANDY FINE TO COARSE GRAVEL (WALTON SUBGROUP)
- SOFT TO FIRM SILT / CLAYEY SILT / ORGANIC SILT / LOOSE SANDS (ALLUVIUM - PIAKO SUBGROUP)
- PROPOSED CUT
- PROPOSED FILL
- ULS LIQUEFIABLE SOIL LAYERS (EXCLUDING LAYERS <0.5m THICK)

GROUNDWATER TABLE



CLIENT: LYN CUDBY & LY&NZ INVESTMENT LTD	DRAWN: AS	PROJECT: HAM2022-0065
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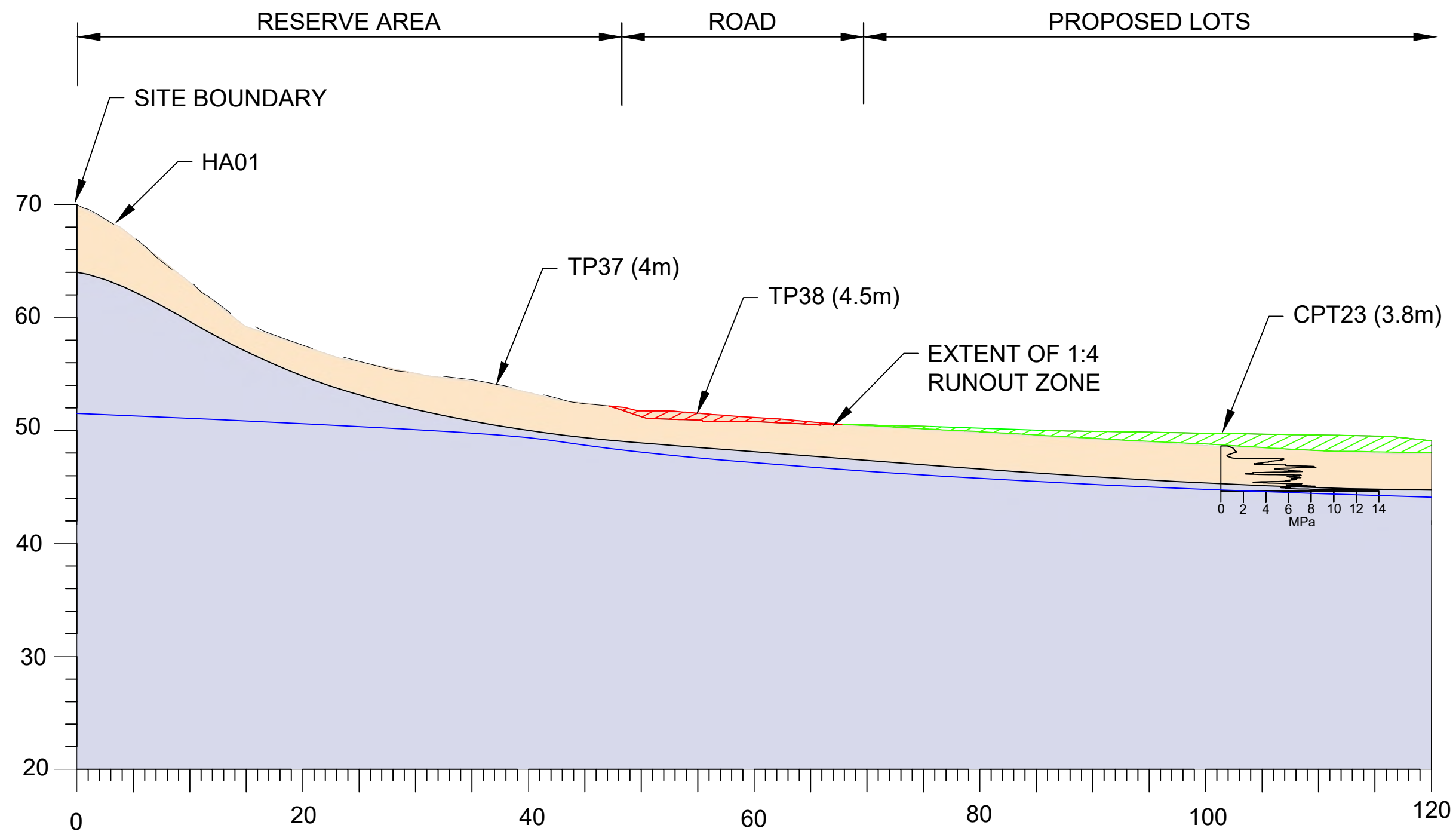
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- SOFT TO STIFF SILT / SANDY SILT (WALTON SUBGROUP)
- FINE TO COARSE GRAVEL / SANDY FINE TO COARSE GRAVEL (WALTON SUBGROUP)
- GROUNDWATER TABLE

NOTES:

- CROSS SECTION PROVIDED BY MCCAFFREY & CABLE CONSULTANTS



CLIENT:	LYN CUDBY & LY&NZ INVESTMENT	DRAWN:	AS	PROJECT:	HAM2022-0065
PROJECT:	T4 STRUCTURE PLAN T4 GROWTH CELL, TE AWAMUTU	CHECKED:	RT	DRAWING:	07
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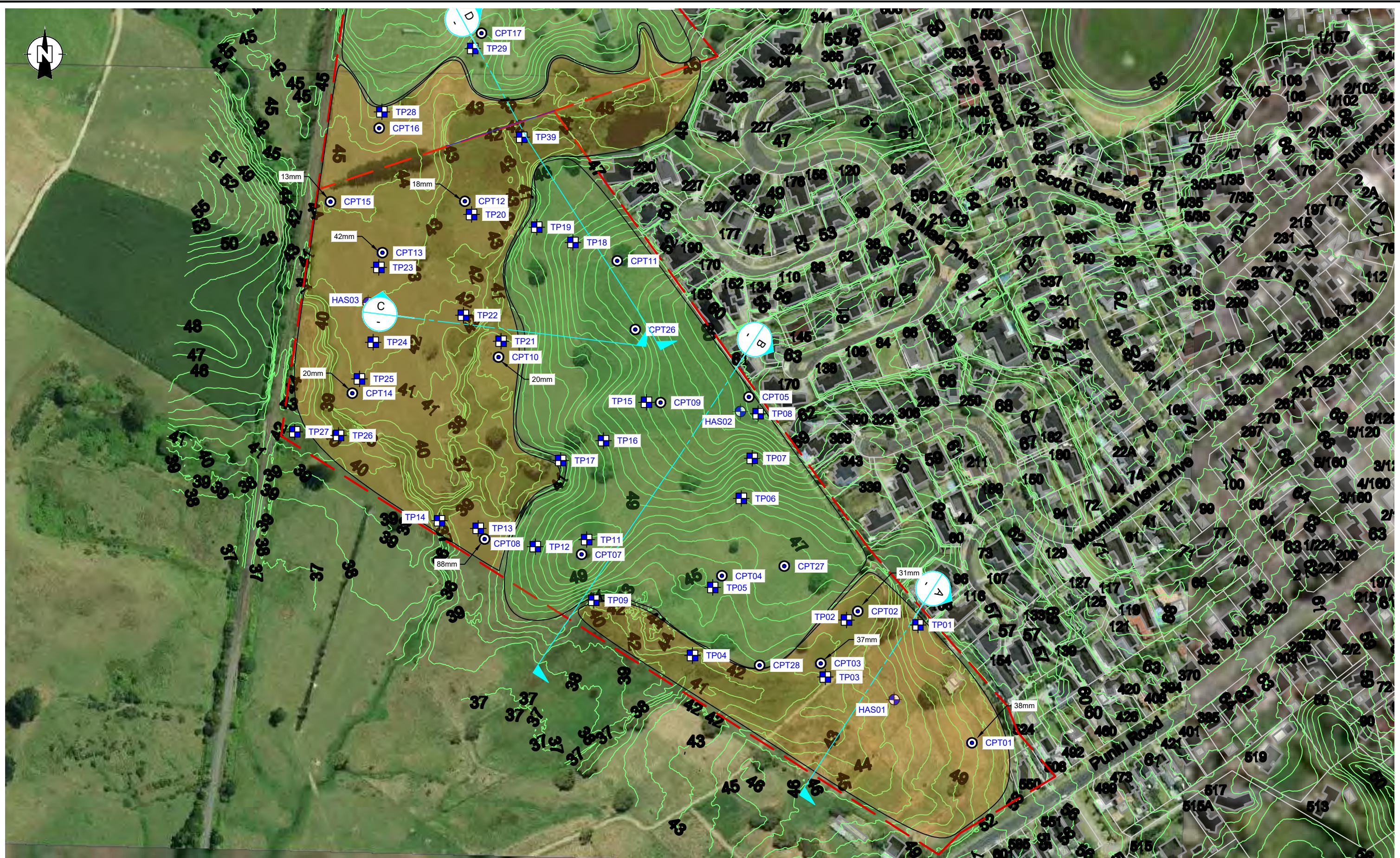


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- SOFT TO FIRM SILT / CLAYEY SILT / ORGANIC SILT / LOOSE SANDS (ALLUVIUM - PIAKO SUBGROUP)
- PROPOSED CUT
- PROPOSED FILL
- GROUNDWATER TABLE



CLIENT:	LYN CUDBY & LY&NZ INVESTMENT LTD		DRAWN:	AS	PROJECT:	HAM2022-0065
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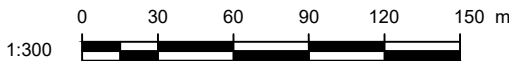
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- HAS01 PERMEABILITY TESTING LOCATION
- CPT01 CONE PENETROMETER TEST (CPT) LOCATION
- TP01 TEST PIT (TP) LOCATION
- GEOLOGICAL LONG SECTION LOCATION
- SITE BOUNDARY

- LOW LIQUEFACTION RISK (VERTICAL SETTLEMENTS <20mm AND >6m DEEP)
- MODERATE LIQUEFACTION RISK (VERTICAL SETTLEMENTS >20mm & <6m DEEP)

NOTES:

1. BASE PLAN ADAPTED FROM: WAIPA DISTRICT COUNCIL LIDAR CONTOURS



CLIENT: LYN CUDBY & LY&NZ INVESTMENT LTD

PROJECT: T4 STRUCTURE PLAN
T4 GROWTH CELL, TE AWAMUTU

TITLE: LIQUEFACTION HAZARD PLAN - SOUTH BLOCK

DRAWN: AS

CHECKED: RT

REVISION: 0

DATE: 18/05/2023

PROJECT: HAM2022-0065

DRAWING: 09

SCALE: 1:3000

SHEET: A3 L



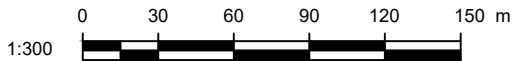
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- GEOLOGICAL LONG SECTION LOCATION
- SITE BOUNDARY

- LOW LIQUEFACTION RISK (VERTICAL SETTLEMENTS <20mm AND >6m DEEP)
- MODERATE LIQUEFACTION RISK (VERTICAL SETTLEMENTS >20mm & <6m DEEP)

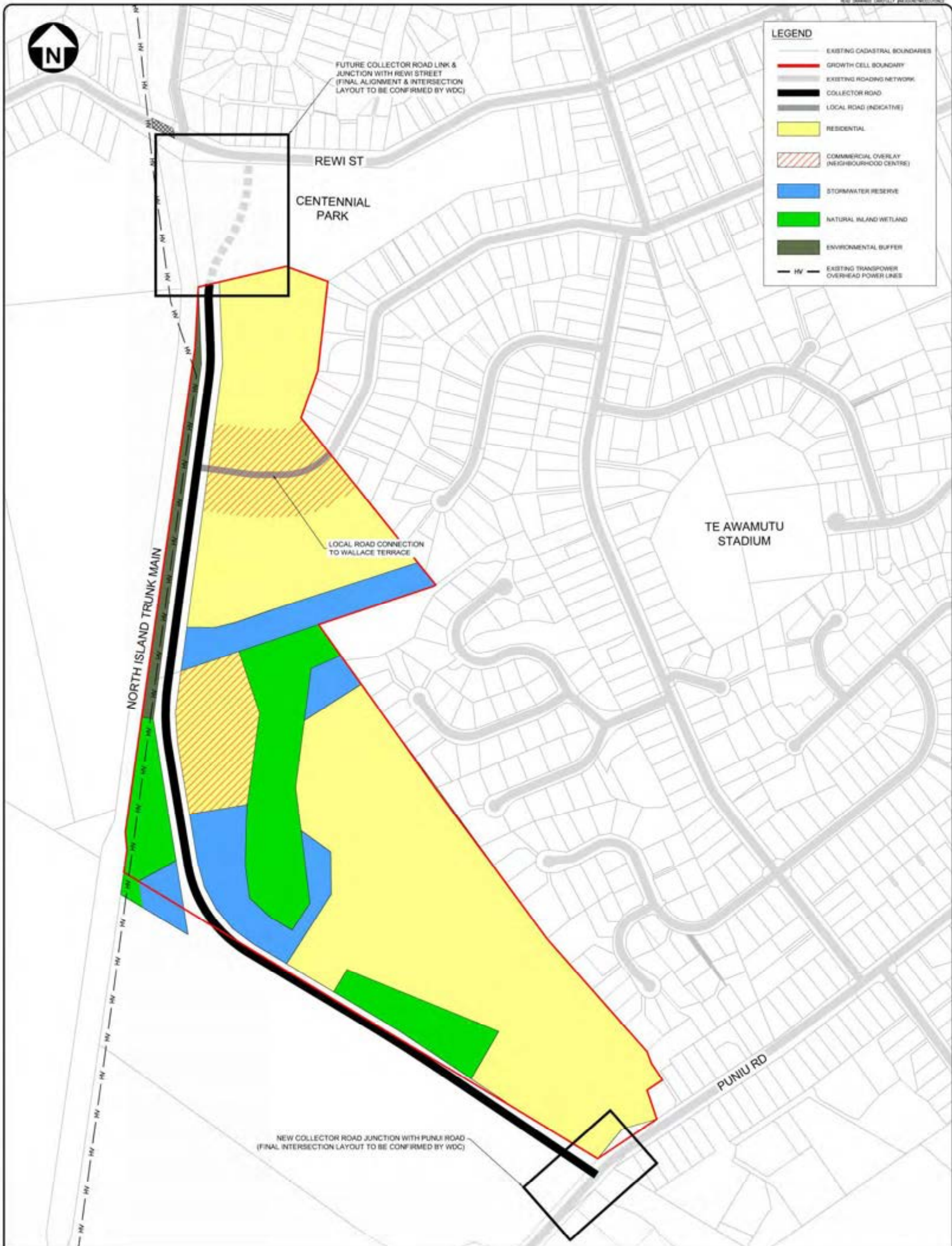
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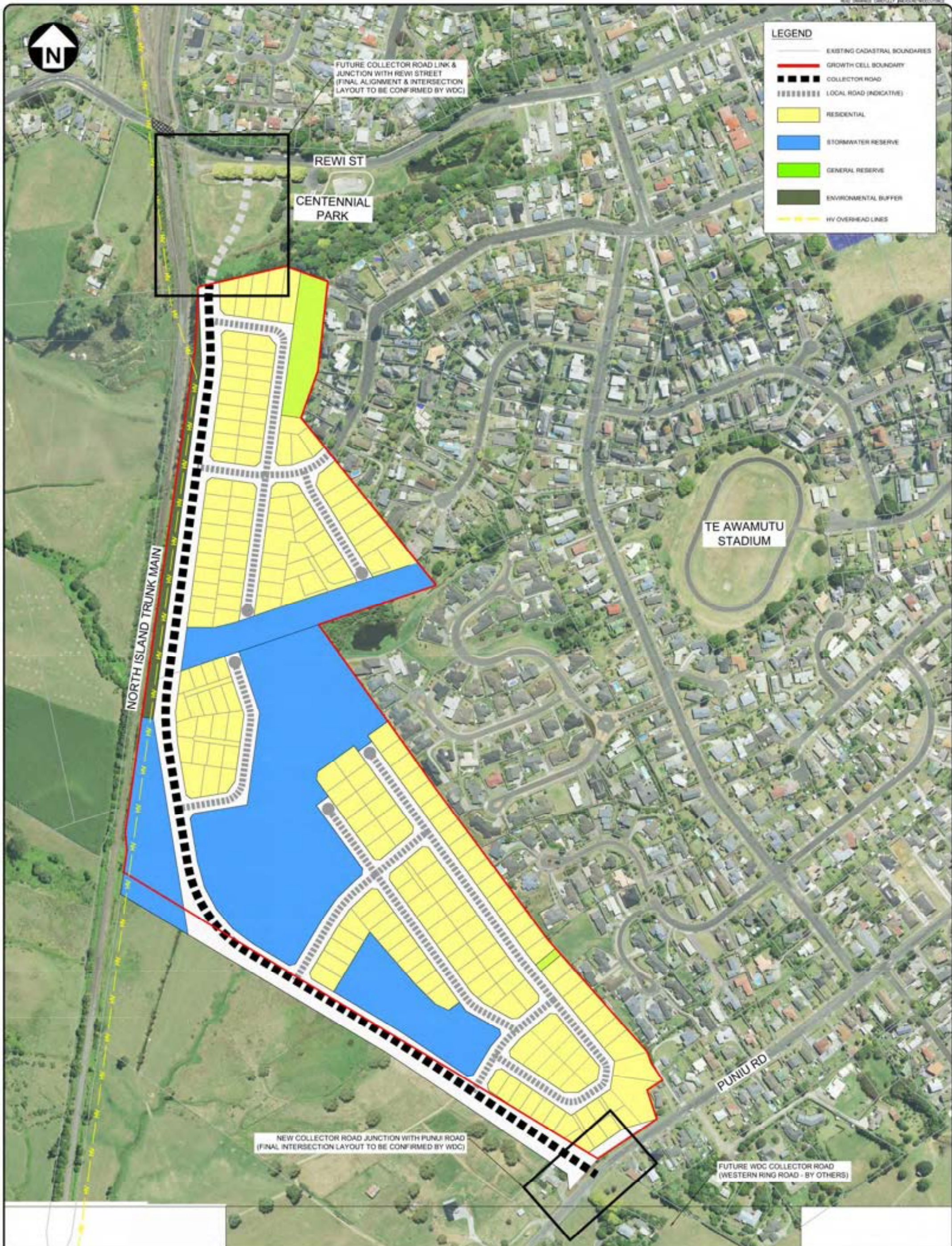
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CLIENT:	LYN CUDBY & LY&NZ INVESTMENT		DRAWN:	AS	PROJECT:	HAM2022-0065
PROJECT:	T4 STRUCTURE PLAN T4 GROWTH CELL, TE AWAMUTU		CHECKED:	RT	DRAWING:	10
			REVISION:	0	SCALE:	1:3000
TITLE:	LIQUEFACTION HAZARD PLAN - NORTH BLOCK		DATE:	24/03/2023	SHEET:	A3 L

APPENDIX A: DEVELOPMENT PLANS





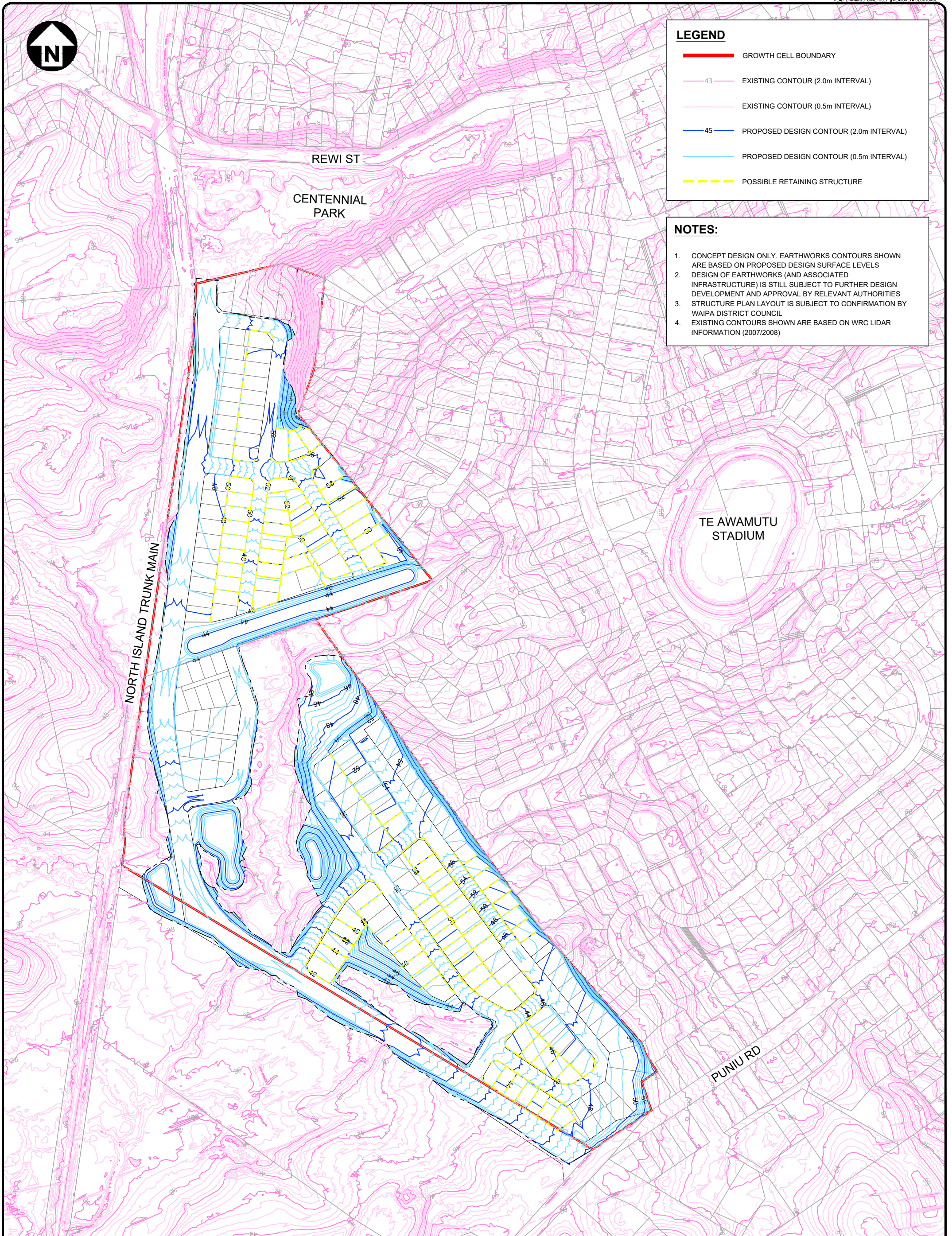


LEGEND

- GROWTH CELL BOUNDARY
- 43 EXISTING CONTOUR (2.0m INTERVAL)
- EXISTING CONTOUR (0.5m INTERVAL)
- 45 PROPOSED DESIGN CONTOUR (2.0m INTERVAL)
- PROPOSED DESIGN CONTOUR (0.5m INTERVAL)
- POSSIBLE RETAINING STRUCTURE

NOTES:

1. CONCEPT DESIGN ONLY. EARTHWORKS CONTOURS SHOWN ARE BASED ON PROPOSED DESIGN SURFACE LEVELS
2. DESIGN OF EARTHWORKS (AND ASSOCIATED INFRASTRUCTURE) IS STILL SUBJECT TO FURTHER DESIGN DEVELOPMENT AND APPROVAL BY RELEVANT AUTHORITIES
3. STRUCTURE PLAN LAYOUT IS SUBJECT TO CONFIRMATION BY WAIPA DISTRICT COUNCIL
4. EXISTING CONTOURS SHOWN ARE BASED ON WRC LIDAR INFORMATION (2007/2008)

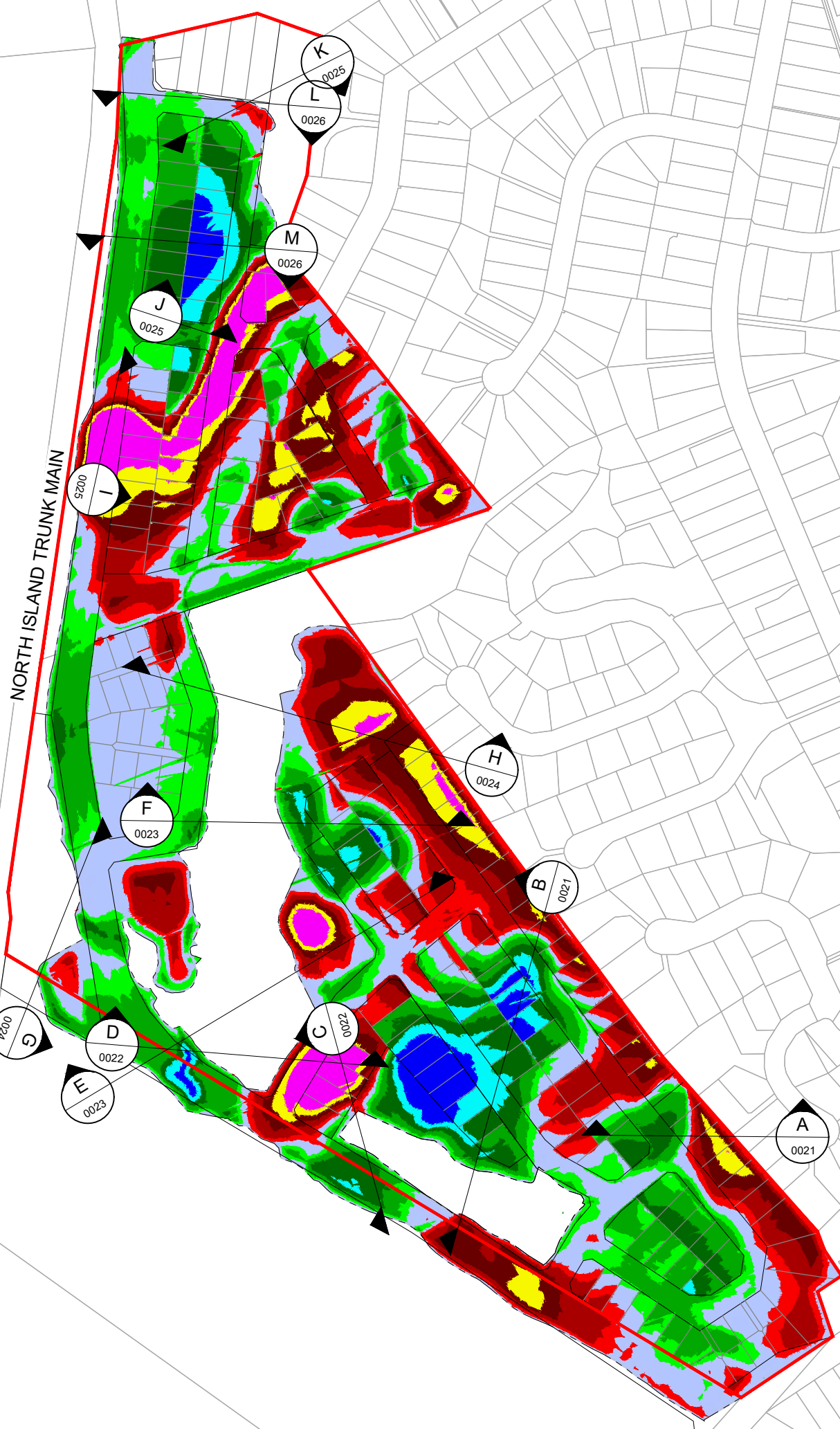


T4 STRUCTURE PLAN

EARTHWORKS INDICATIVE LEVELS



REWI ST
CENTENNIAL PARK



LEGEND

- GROWTH CELL BOUNDARY**
- EARTHWORKS (CUT FILL AREAS)**
- > 4m CUT
 - 3.0m TO 4.0m CUT
 - 2.0m TO 3.0m CUT
 - 1.0m TO 2.0m CUT
 - 0.5m TO 1.0m CUT
 - SITE CONTOURING (<0.5m)
 - 0.5m TO 1.0m FILL
 - 1.0m TO 2.0m FILL
 - 2.0m TO 3.0m FILL
 - 3.0m TO 4.0m FILL
 - >4.0m FILL

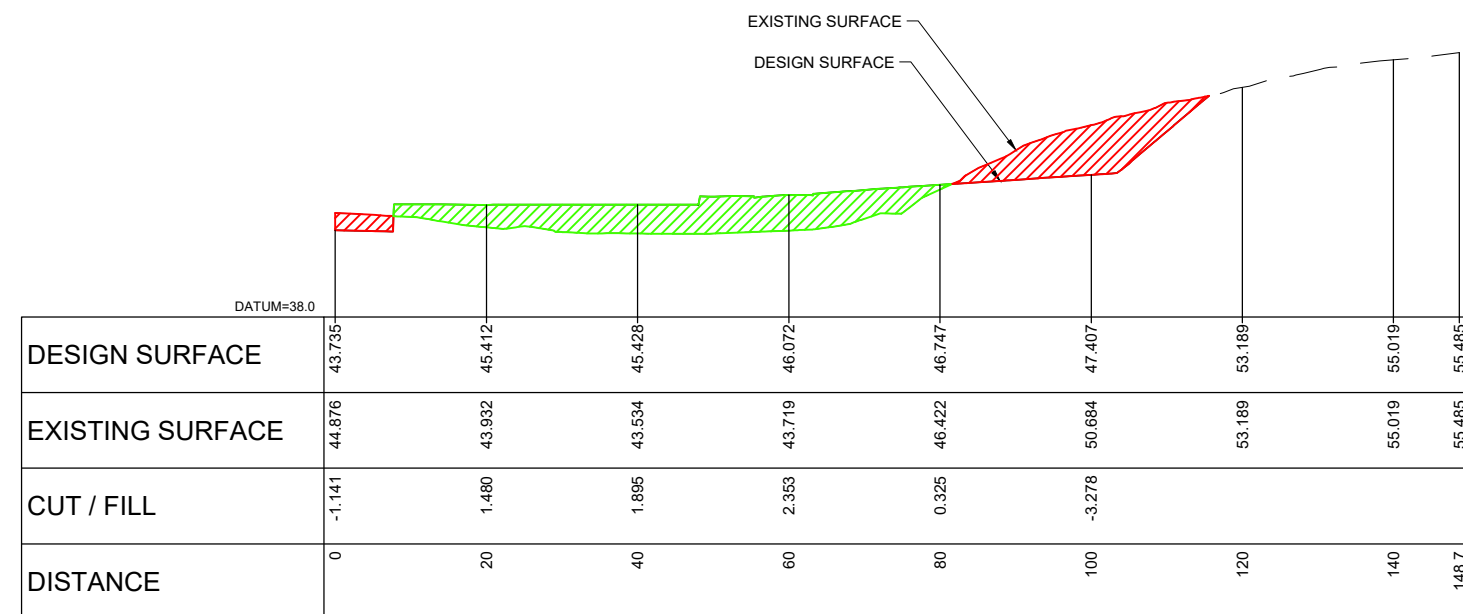
NOTES:

1. CUT FILL DIAGRAM SHOWN IS INDICATIVE AND BASED ON AND INITIAL CONCEPT DEVELOPMENT FOR COMPARISON PURPOSES. FINAL EARTHWORKS IS SUBJECT TO FURTHER DESIGN
2. CUT FILL AREAS SHOWN ARE BASED ON SURFACE TO SURFACE LEVELS WITH NO ALLOWANCE FOR VOLUMETRIC ADJUSTMENTS OF ANY KIND
3. THE FINAL MASTER PLAN LAYOUT IS SUBJECT TO CONFIRMATION BY WAIPA DISTRICT COUNCIL
4. EXISTING LEVELS USED ARE BASED ON WRC LIDAR INFORMATION (2007/2008)

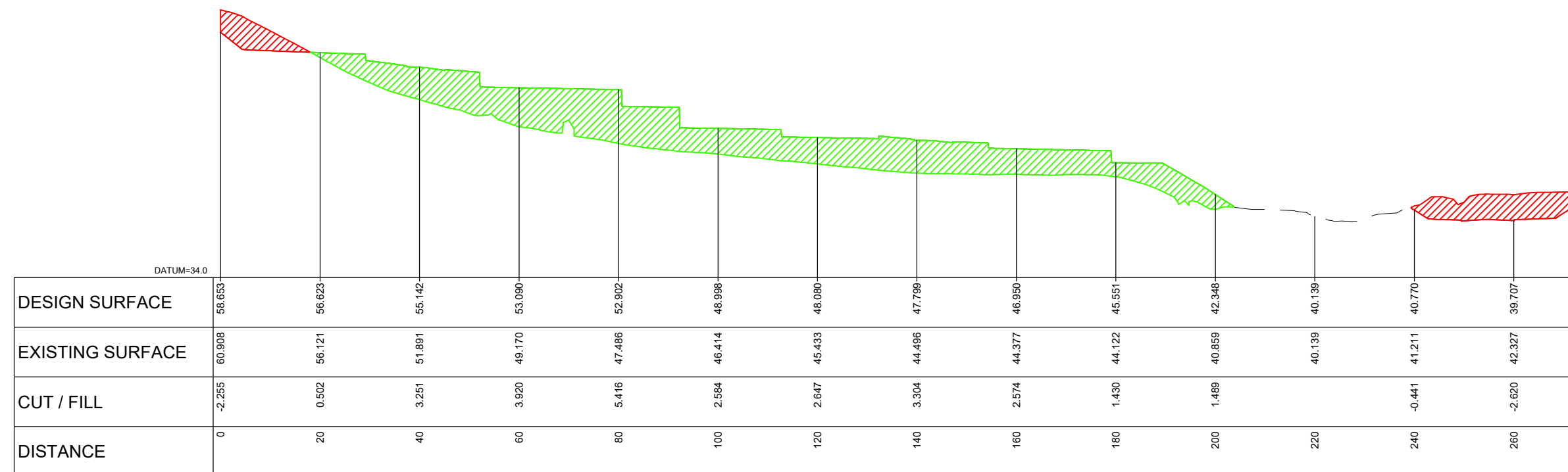


T4 STRUCTURE PLAN

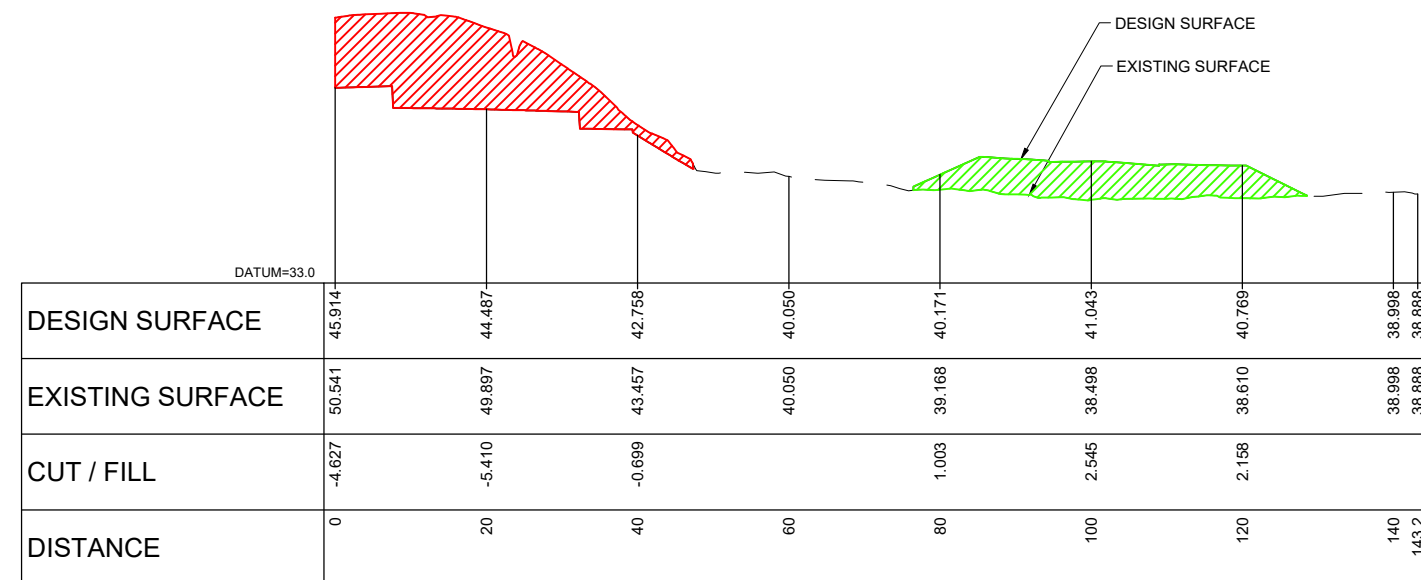
**EARTHWORKS
CUT FILL DIAGRAM**



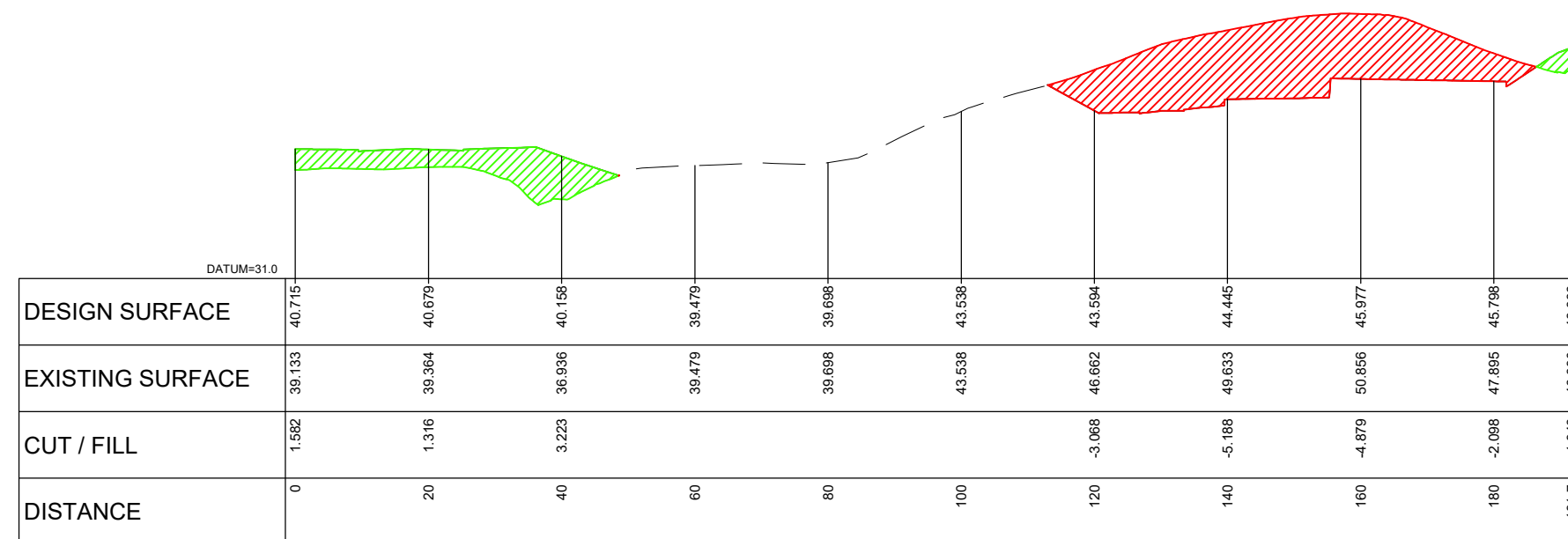
A EARTHWORKS CROSS SECTION A-A
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



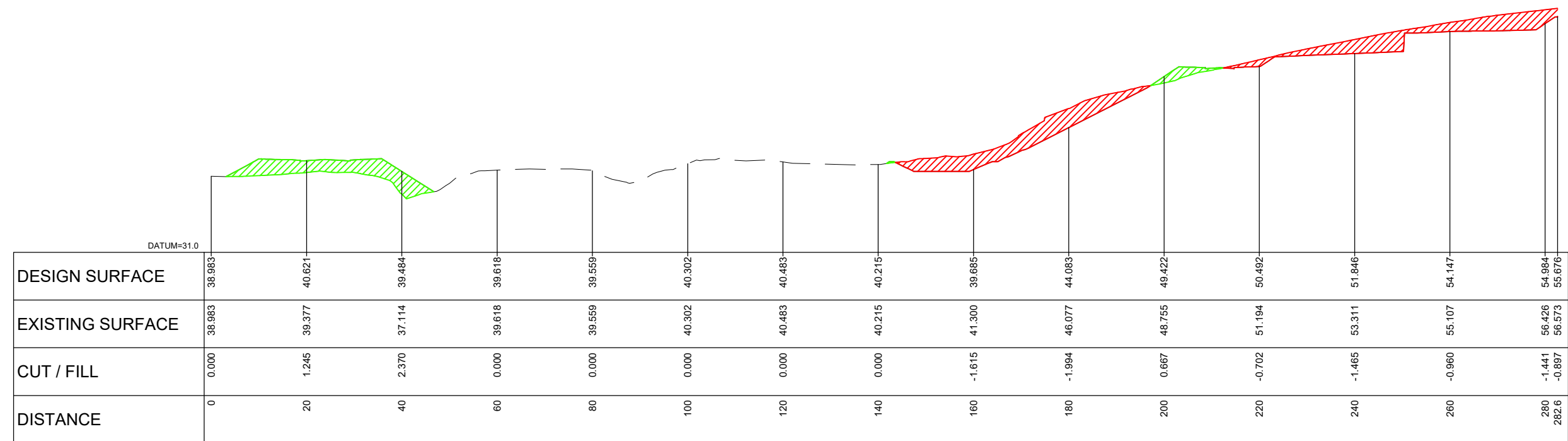
B EARTHWORKS CROSS SECTION B-B
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



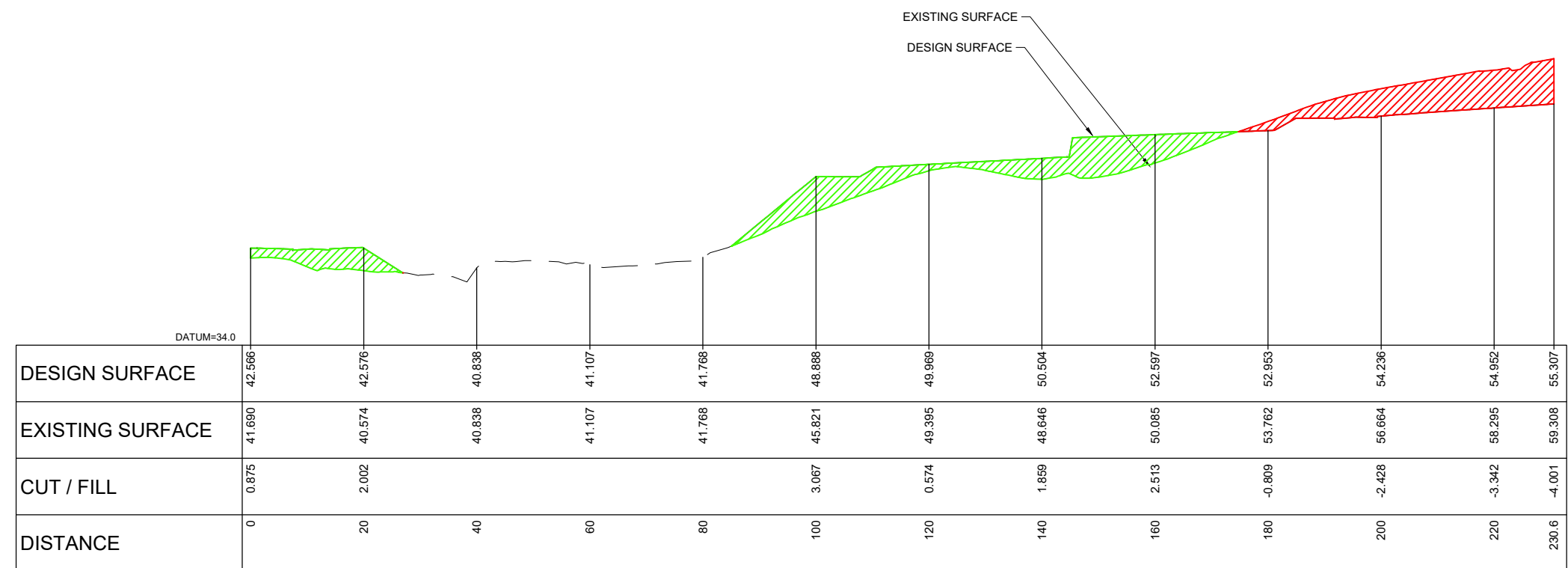
C EARTHWORKS CROSS SECTION C-C
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



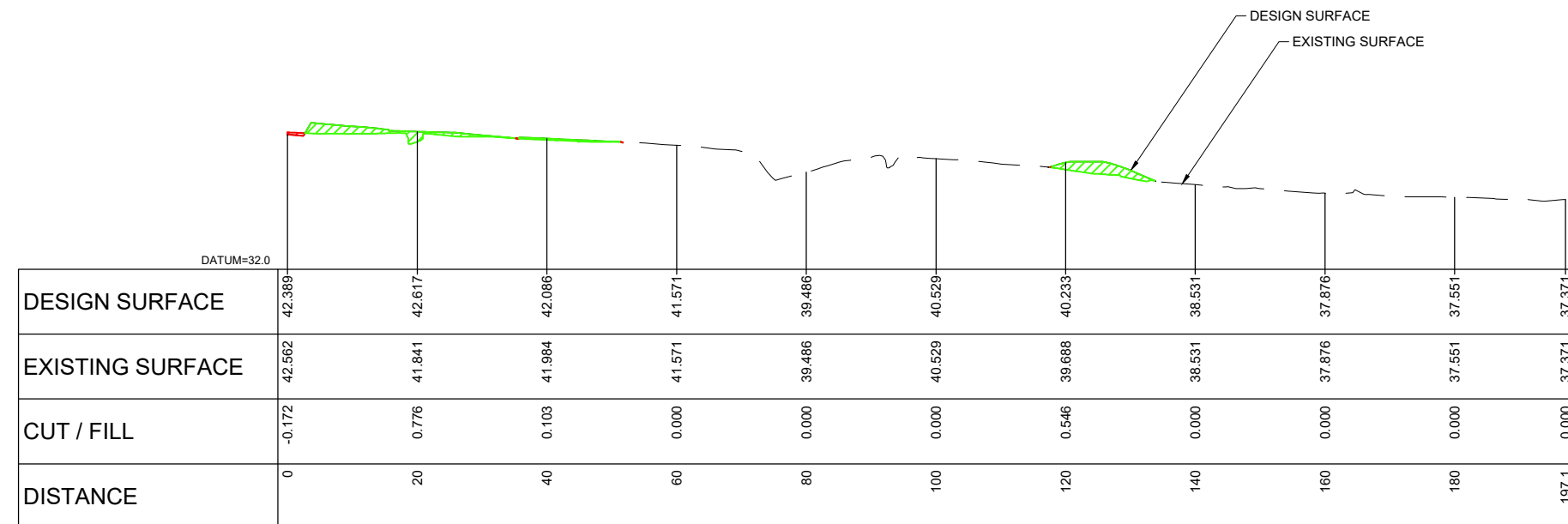
D EARTHWORKS CROSS SECTION D-D
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



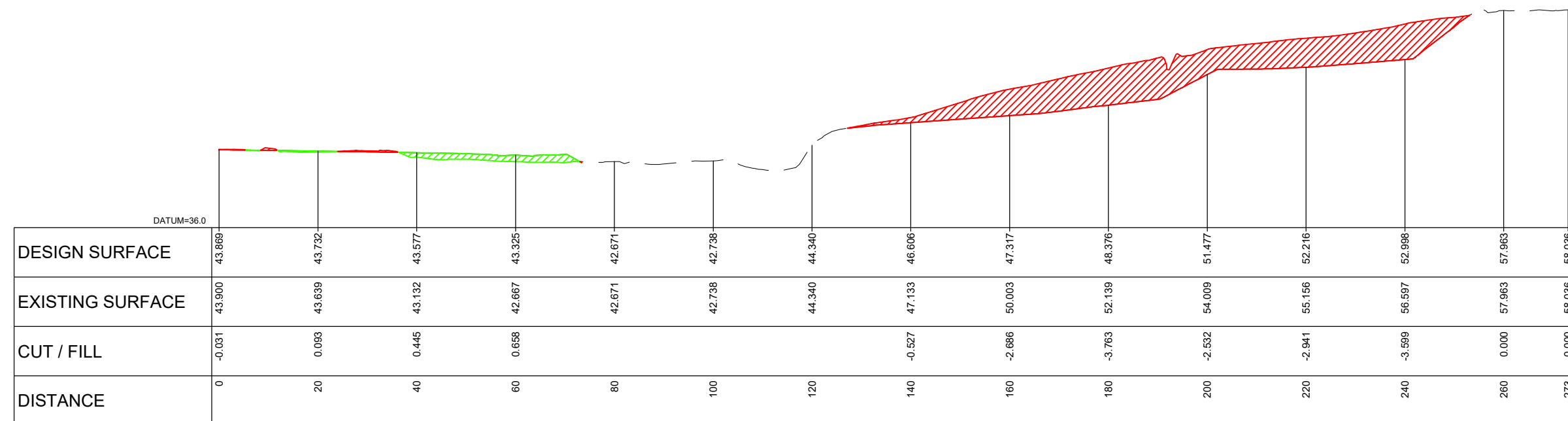
E EARTHWORKS CROSS SECTION E-E
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



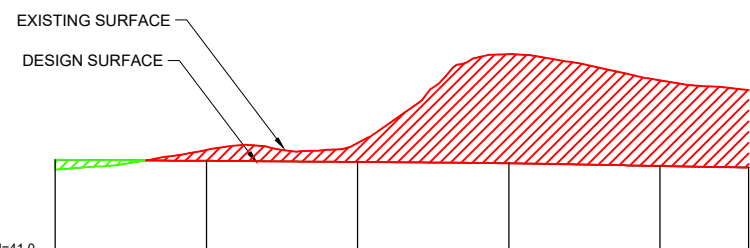
F EARTHWORKS CROSS SECTION F-F
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



G EARTHWORKS CROSS SECTION G-G
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500

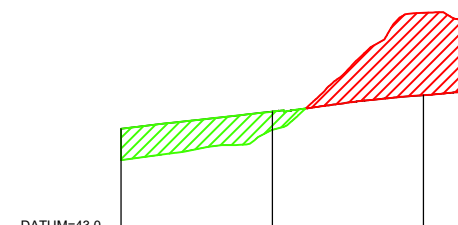


H EARTHWORKS CROSS SECTION H-H
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



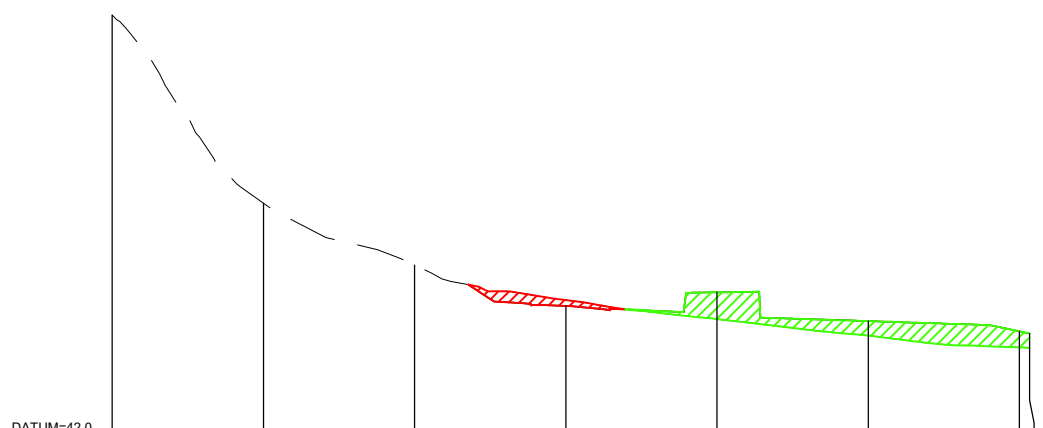
DATUM=41.0					
DESIGN SURFACE	47.569	47.494	47.418	47.330	47.157
EXISTING SURFACE	46.914	48.210	48.673	54.547	52.820
CUT / FILL	0.655	-0.716	-1.255	-7.216	-5.663
DISTANCE	0	20	40	60	80
					91.7

I EARTHWORKS CROSS SECTION I-I
0020 SCALE; HORIZONTAL = 1:1000 & VERTICAL = 1:500



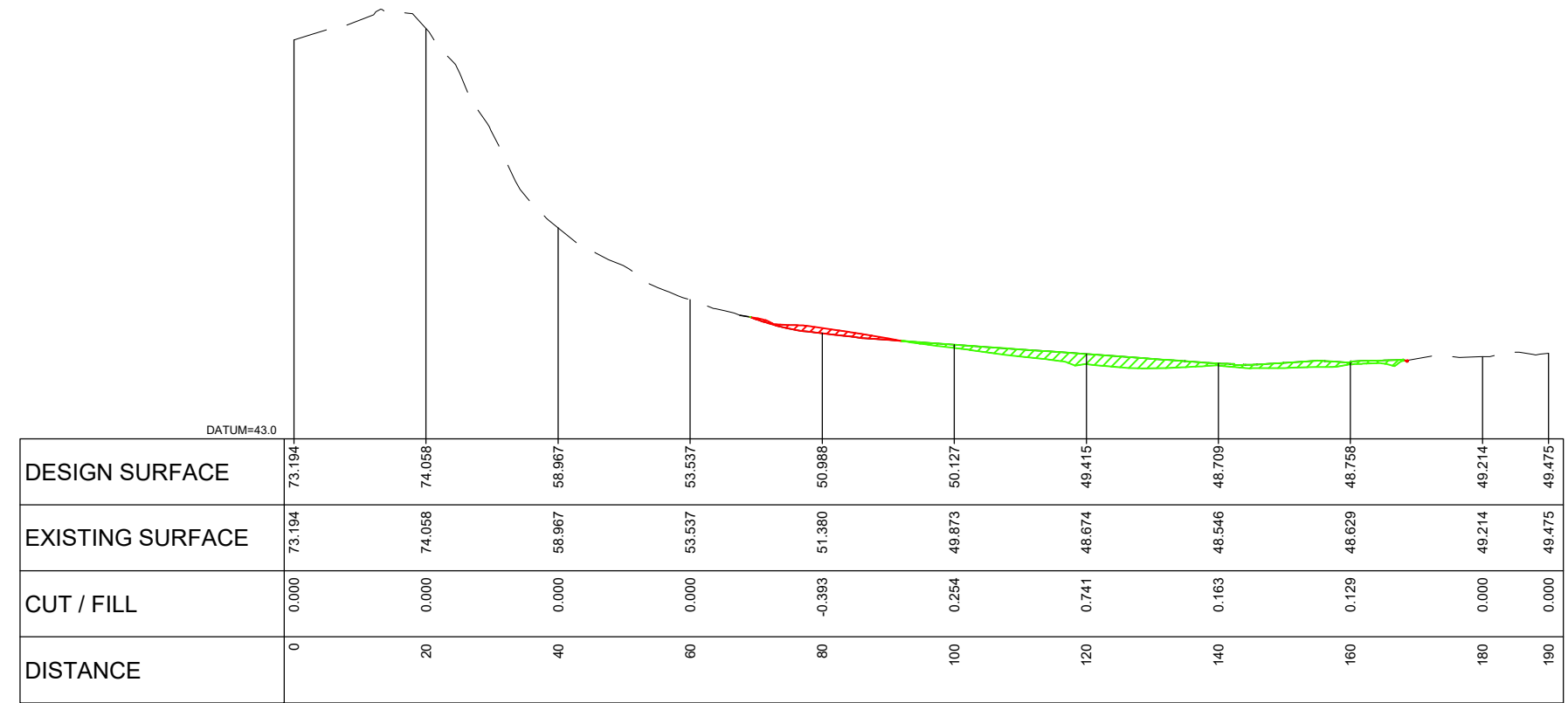
DATUM=43.0			
DESIGN SURFACE	50.100	51.226	52.307
EXISTING SURFACE	48.019	50.030	57.765
CUT / FILL	2.082	1.196	-5.458
DISTANCE	0	20	40
			45.1

J EARTHWORKS CROSS SECTION J-J
0020 SCALE; HORIZONTAL = 1:1000 & VERTICAL = 1:500

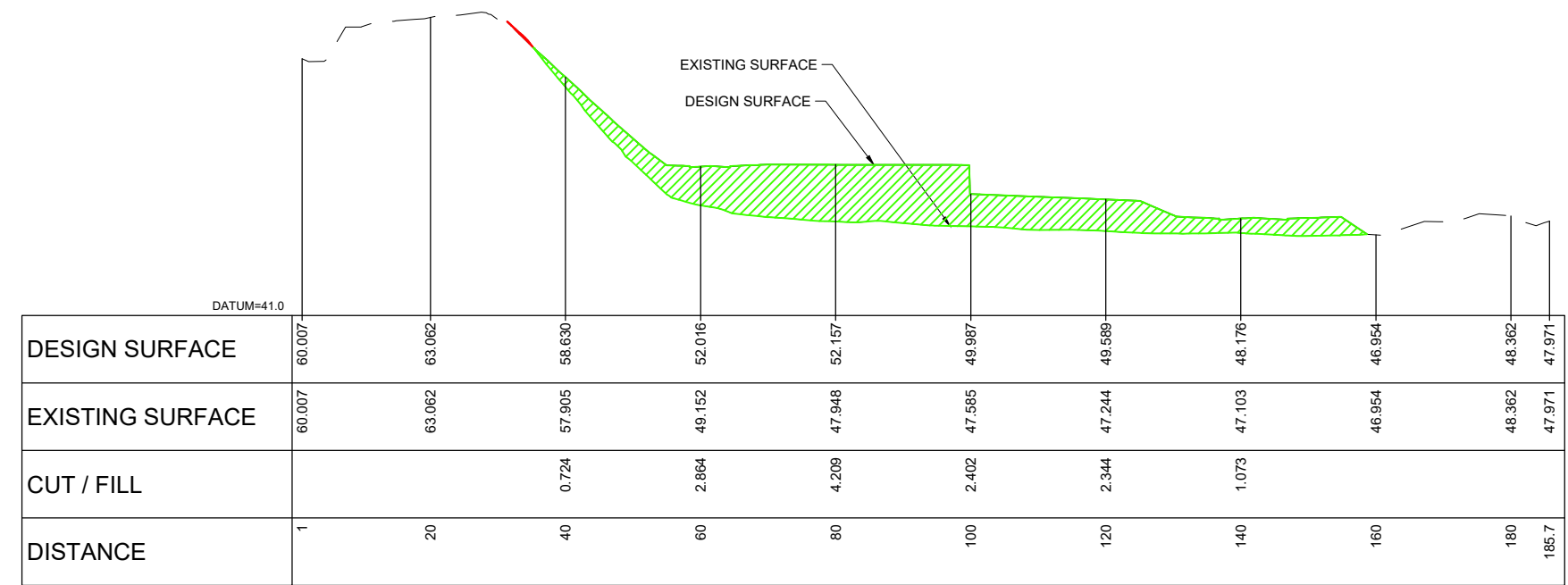


DATUM=42.0							
DESIGN SURFACE	69.982	57.531	53.436	50.747	51.638	49.736	49.059
EXISTING SURFACE	69.982	57.531	53.436	51.125	49.872	48.781	47.994
CUT / FILL				-0.379	1.766	0.955	1.065
DISTANCE	0	20	40	60	80	100	120
							121.4

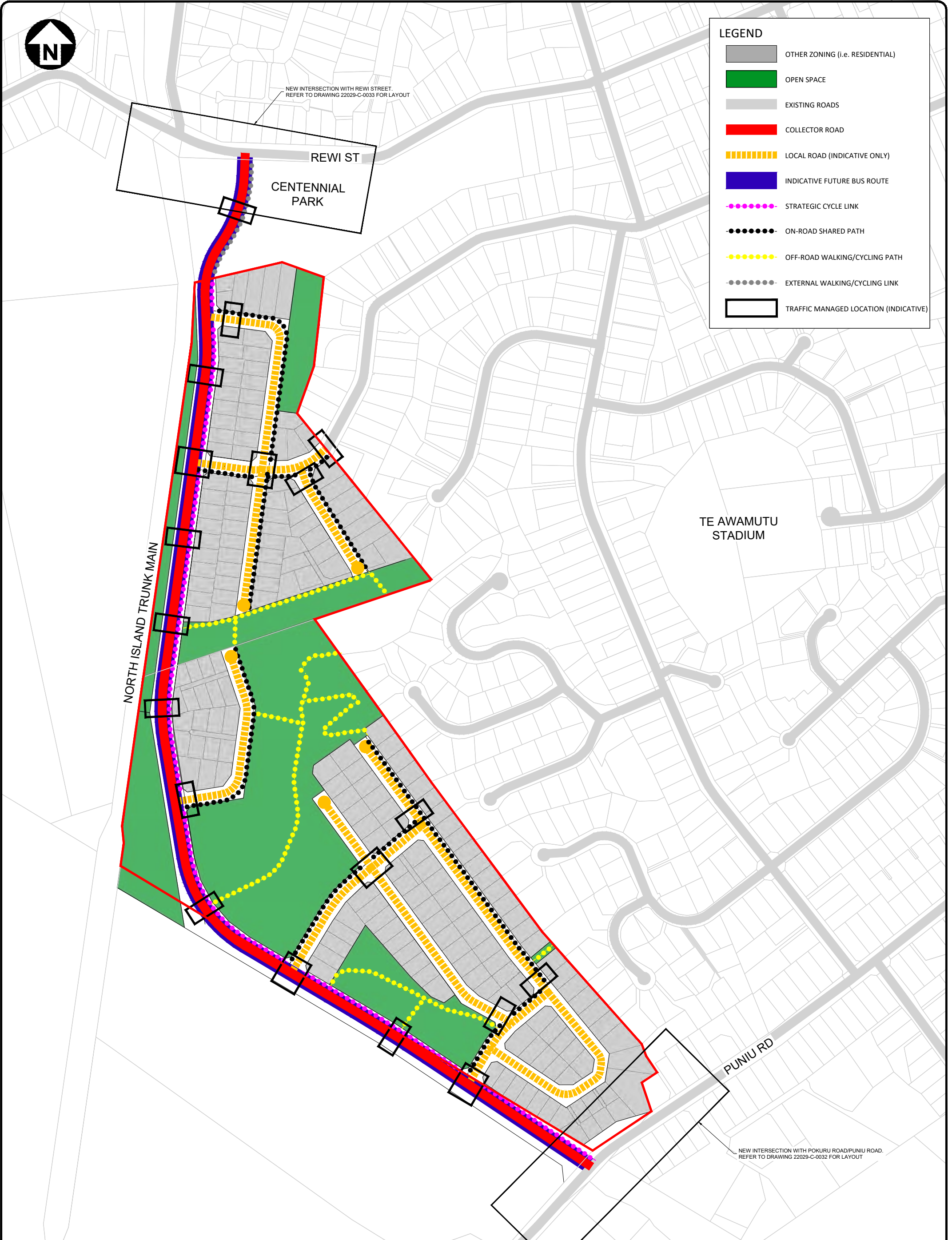
K EARTHWORKS CROSS SECTION K-K
0020 SCALE; HORIZONTAL = 1:1000 & VERTICAL = 1:500

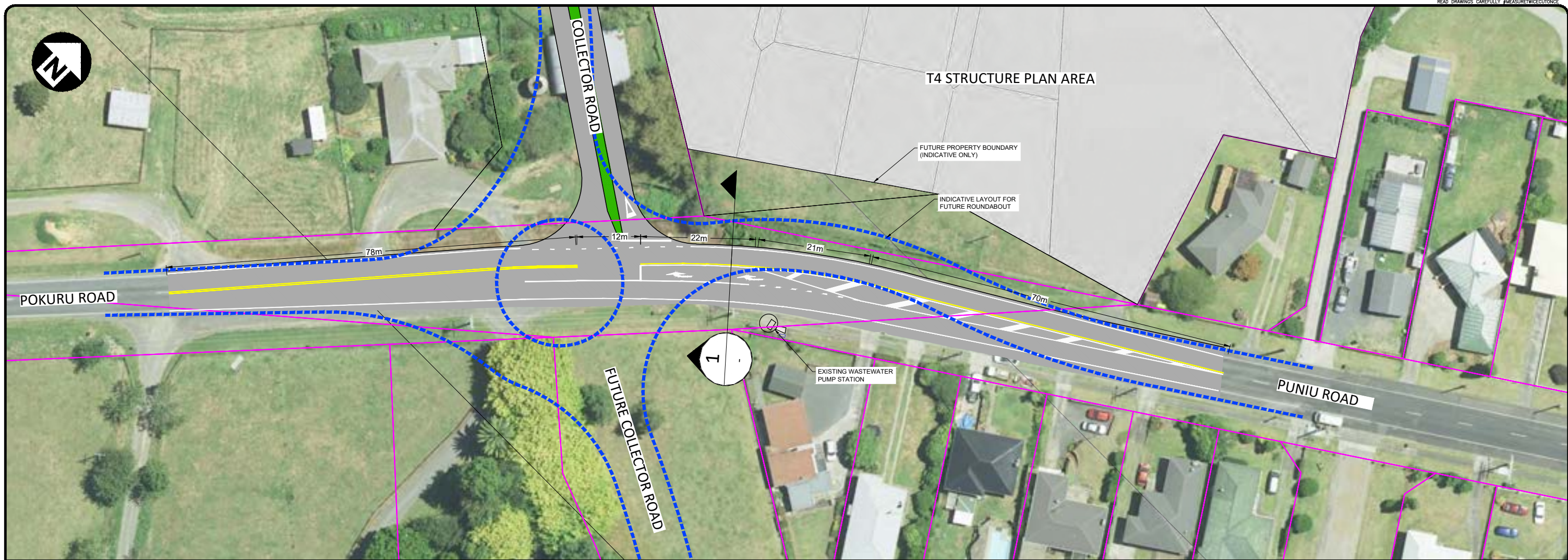


L EARTHWORKS CROSS SECTION L-L
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



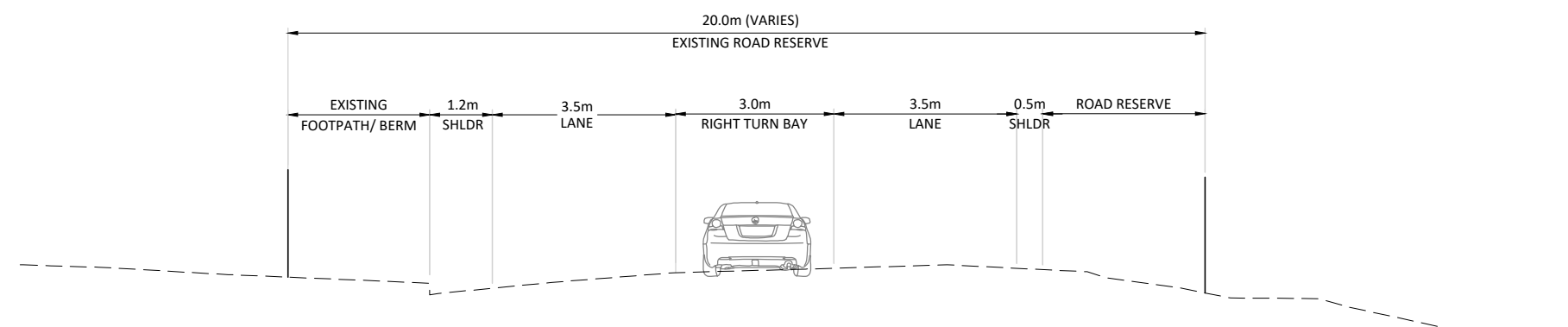
M EARTHWORKS CROSS SECTION M-M
0020 SCALE: HORIZONTAL = 1:1000 & VERTICAL = 1:500



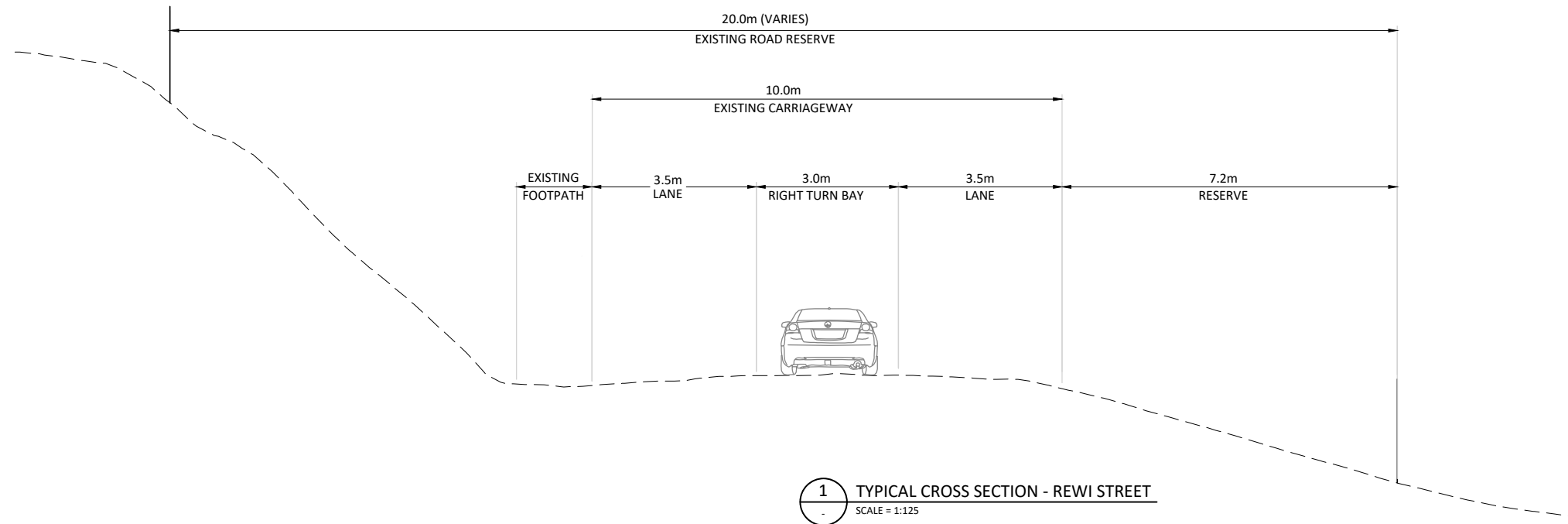
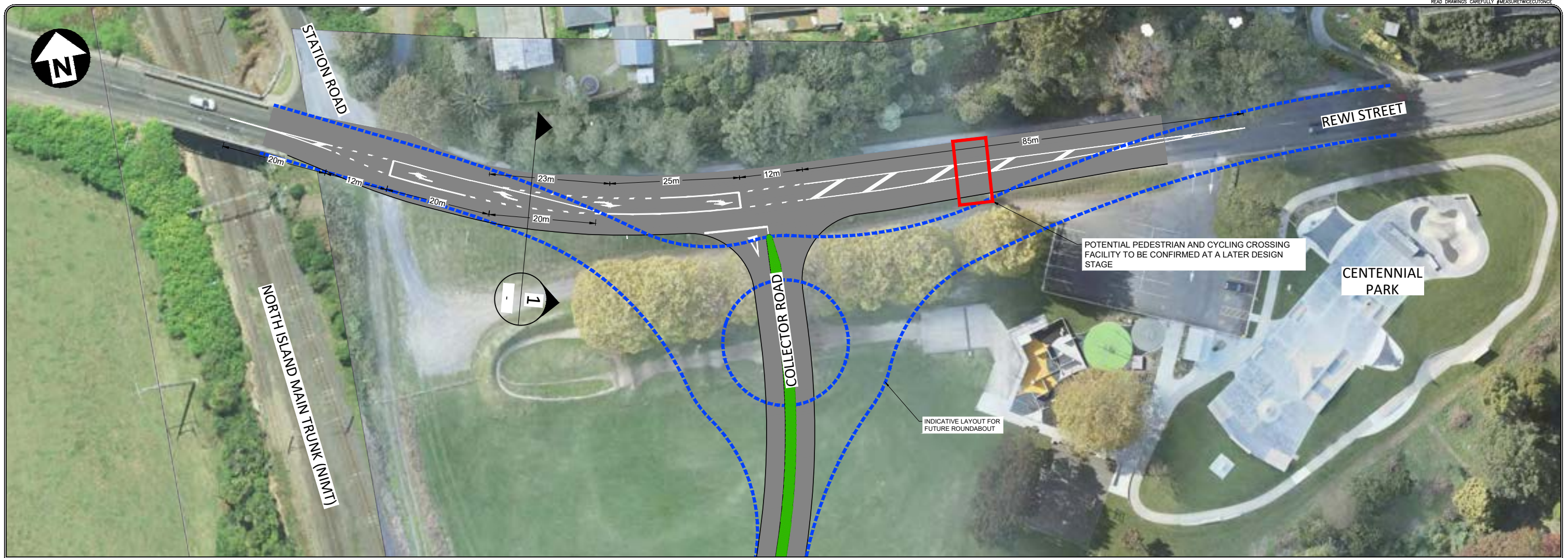


NOTES:

1. INDICATIVE PROOF OF CONCEPT ONLY, SUBJECT TO DEVELOPED DESIGN AND CONFIRMATION WITH WAIPA DISTRICT COUNCIL

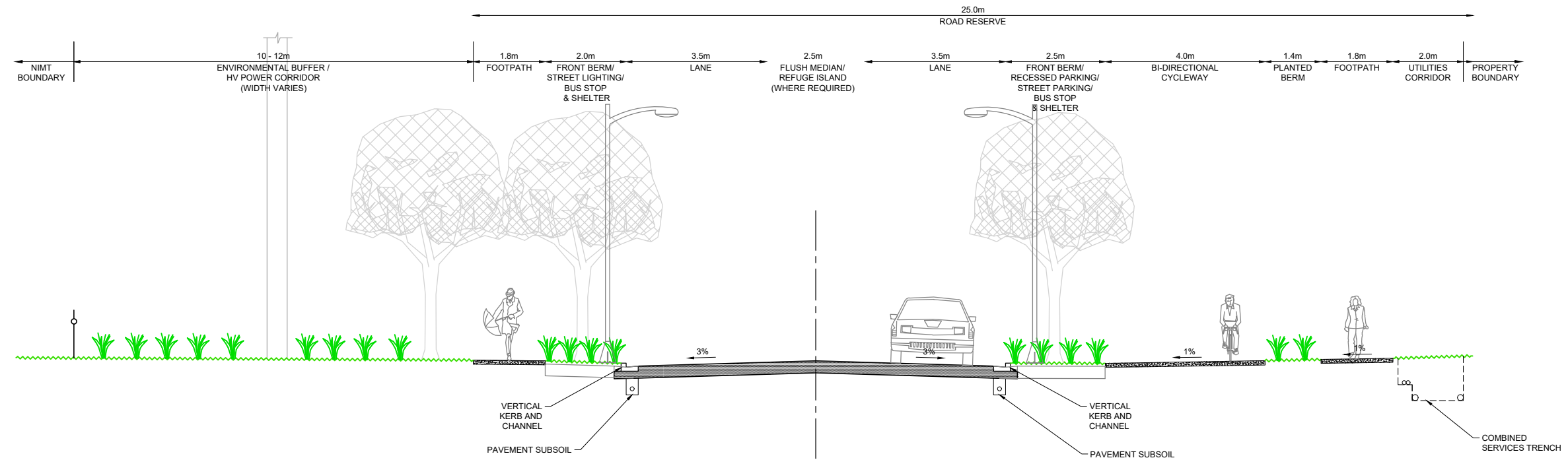


1 TYPICAL CROSS SECTION - POKURU STREET
SCALE = 1:125

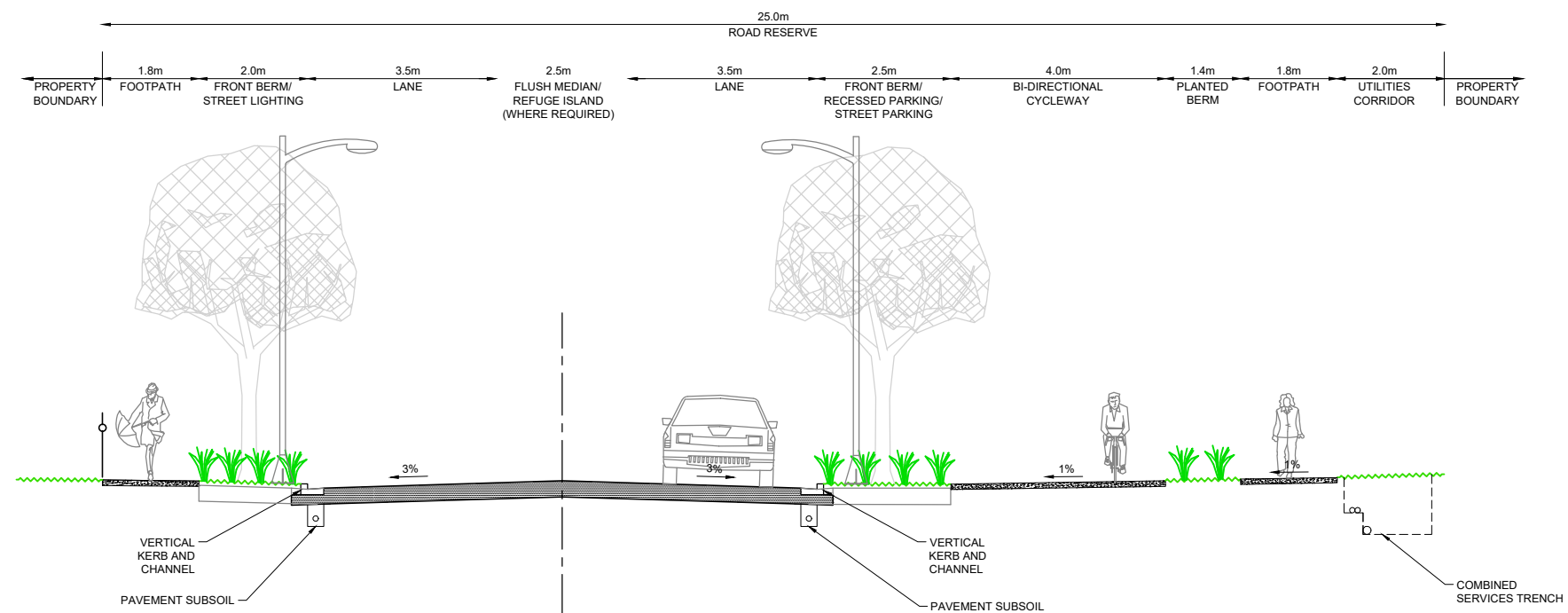


NOTES:

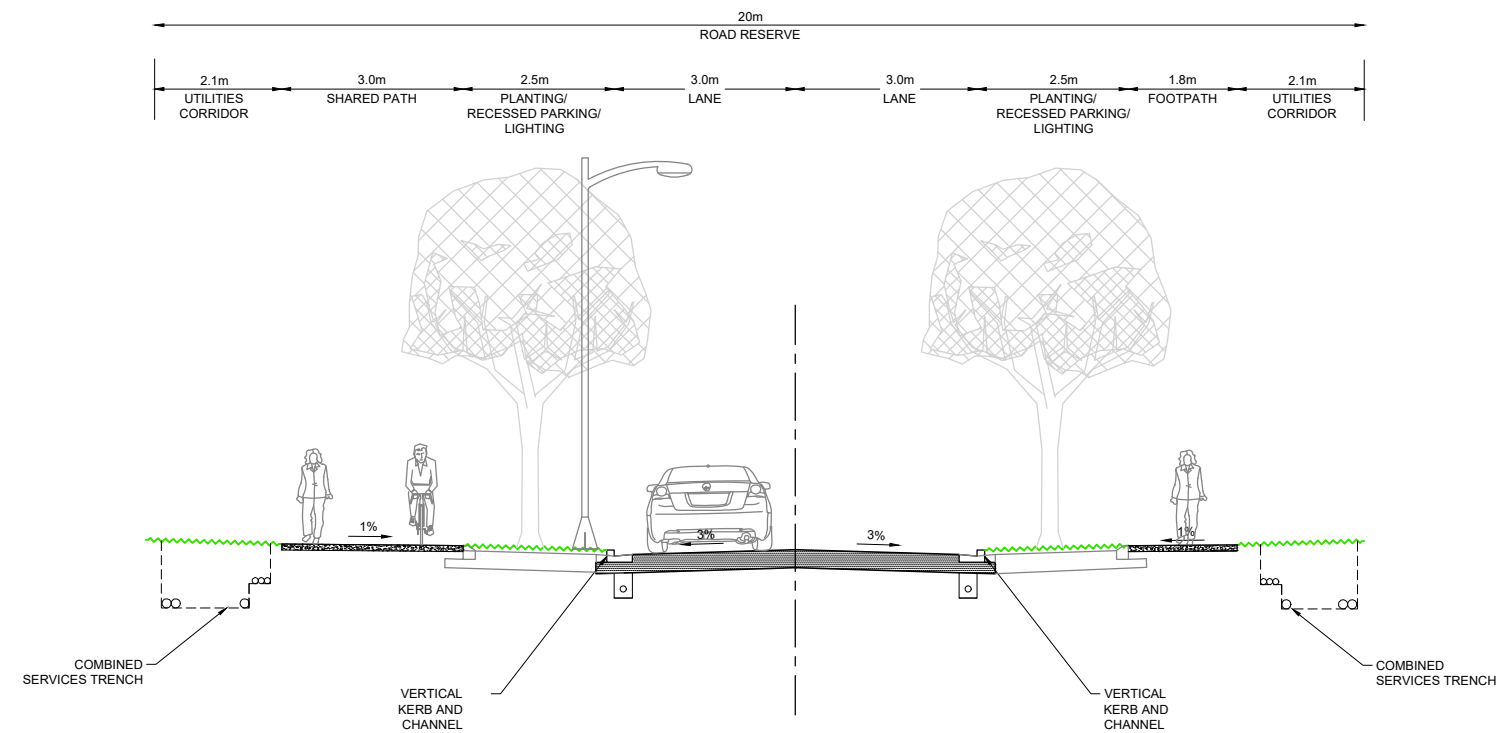
1. INDICATIVE PROOF OF CONCEPT ONLY. SUBJECT TO DEVELOPED DESIGN AND CONFIRMATION WITH WAIPA DISTRICT COUNCIL.
2. THE ROADING CONCEPT IS SUBJECT TO THE RECREATIONAL RESERVE STATUS.



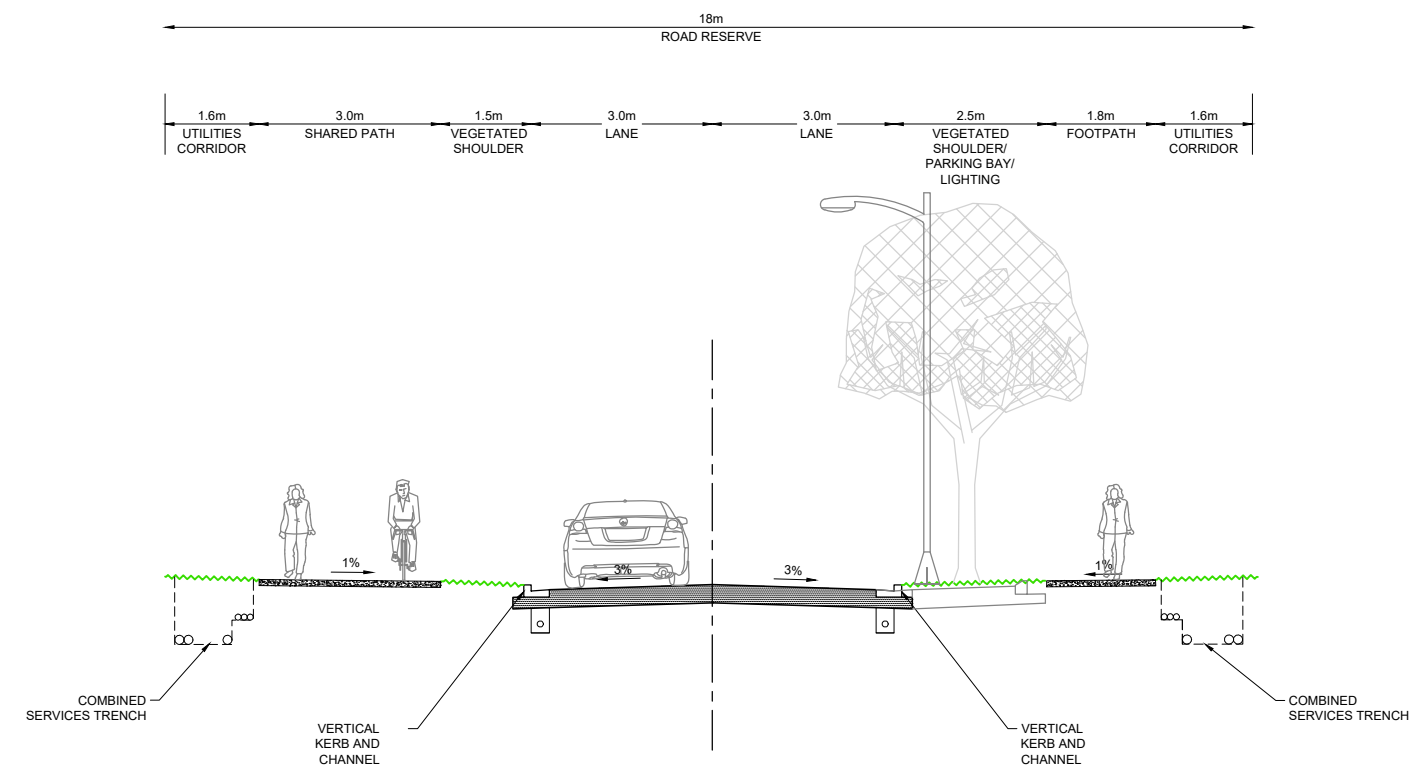
TYPICAL CROSS SECTION - COLLECTOR ROAD (25m / 50km/hr)
SCALE = 1:100



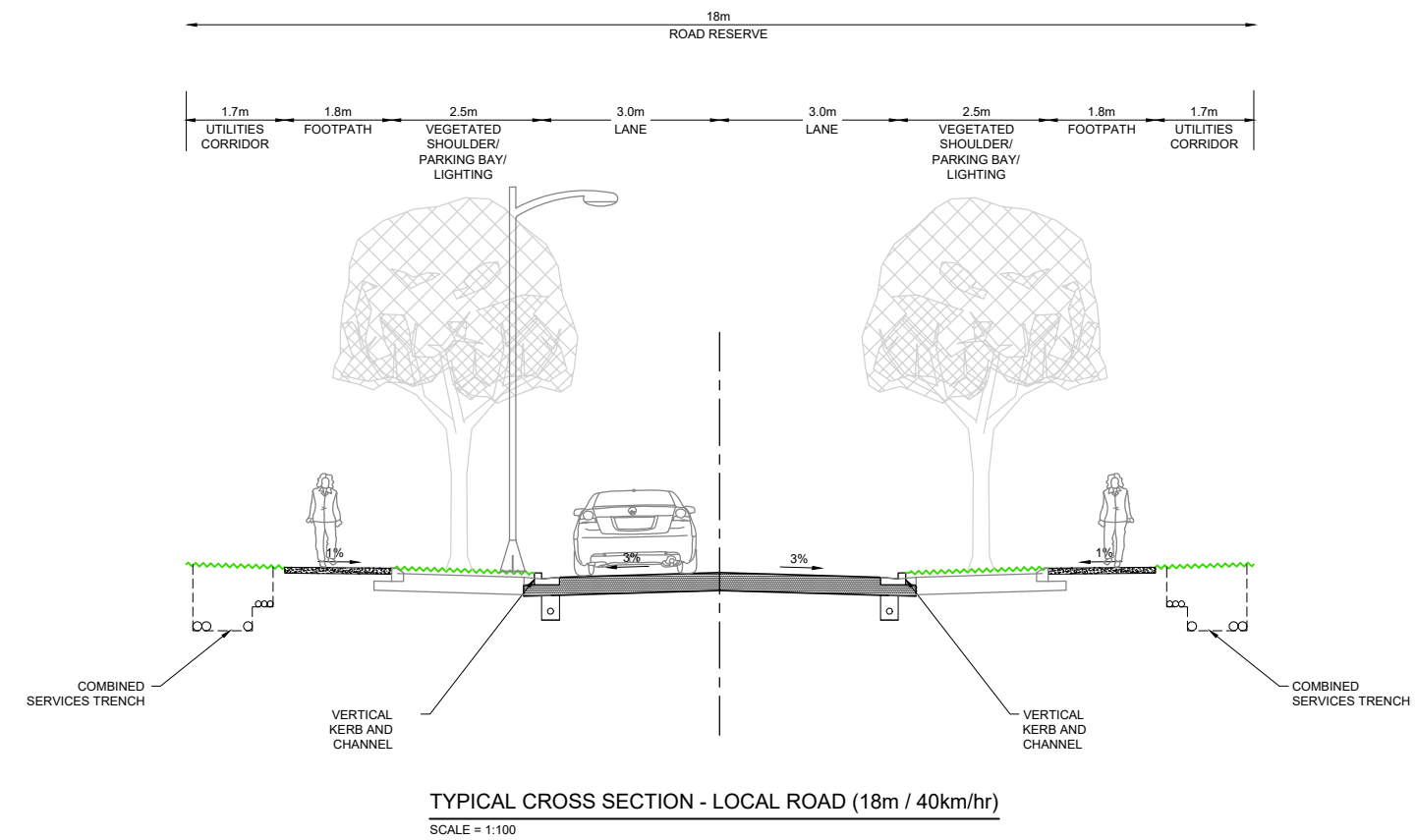
TYPICAL CROSS SECTION - COLLECTOR ROAD (25m / 50km/hr)
SCALE = 1:100



TYPICAL CROSS SECTION - LOCAL ROAD (20m / 50km/hr)
SCALE = 1:100



TYPICAL CROSS SECTION - LOCAL ROAD (18m / 40km/hr)
SCALE = 1:100





LEGEND

- OTHER ZONING (i.e. RESIDENTIAL)
- OPEN SPACE
- EXISTING NATURAL WETLANDS (TO BE RETAINED)
- EXISTING NATURAL WETLANDS (TO BE REMOVED)
- NEW NATURAL WETLANDS (INDICATIVE ONLY)
- NEW ARTIFICIAL STORMWATER WETLAND (INDICATIVE ONLY)
- EXISTING STREAM
- NEW CULVERT
- OVERLAND FLOW PATH (INDICATIVE)

WETLAND AREA ASSESSMENT

TOTAL NATURAL WETLANDS (PRE-DEVELOPMENT)	1.73 Ha
EXISTING NATURAL WETLANDS TO BE RETAINED	1.23 Ha
EXISTING NATURAL WETLANDS TO BE REMOVED	0.50 Ha
REPLACEMENT/ADDITIONAL NATURAL WETLANDS	1.90 Ha (+110%)
TOTAL NATURAL WETLANDS (POST DEVELOPMENT)	3.13 Ha (+81%)
NEW ARTIFICIAL WETLANDS (STORMWATER)	1.36 Ha

TE AWAMUTU STADIUM

REWI ST

CENTENNIAL PARK

NORTH ISLAND TRUNK MAIN

NORTHERN ARTIFICIAL WETLAND #1 (STORMWATER)

NATURAL WETLAND #4

SOUTHERN ARTIFICIAL WETLAND #3 (STORMWATER)

SOUTHERN ARTIFICIAL WETLAND #1 (STORMWATER)

NATURAL WETLAND #2

SOUTHERN ARTIFICIAL WETLAND #4 (STORMWATER)

NATURAL WETLAND #2.1

NATURAL WETLAND #3

SOUTHERN STORMWATER WETLAND #2

NATURAL WETLAND #1

PUNI RD



T4 STRUCTURE PLAN

STORMWATER

APPENDIX B: INVESTIGATION RECORDS

HAND AUGER BOREHOLE LOG - HA01

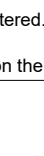
Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 13/04/2023



Borehole Location: Refer to site plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

Position: 448022.8mE; 674061.0mN Projection: Mt Eden 2000
Datum: Moturiki

Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)		
	Depth	Type & Results							Relative Density		
									5	10	15
	0.3	Peak = 222kPa Residual = 54kPa				TOPSOIL: (Topsoil)					
	0.6	Peak = 193kPa Residual = 38kPa				MH: SILT: orange brown. High plasticity, moderately sensitive to sensitive. (Walton Subgroup)					
	0.9	Peak = 190kPa Residual = 63kPa		1							
	1.2	Peak = 171kPa Residual = 51kPa									
	1.5	Peak = 222kPa Residual = 82kPa									
	1.8	Peak = 222kPa Residual = 63kPa		2							
	2.1	Peak = 222kPa Residual = 111kPa									
	2.4	Peak = 222kPa Residual = 63kPa									
	2.7	Peak = 222kPa Residual = 95kPa				... at 2.60m, becoming brown.					
	3.0	Peak = UTP		3							
	3.3	Peak = 222kPa Residual = 70kPa									
	3.6	Peak = 222kPa Residual = 114kPa				ML: SILT: orange brown. Low plasticity, insensitive to moderately sensitive. (Walton Subgroup)					
	3.9	Peak = 222kPa Residual = 82kPa		4							
	4.2	Peak = 222kPa Residual = 127kPa				MH: SILT: orange brown. High plasticity, insensitive to moderately sensitive. (Walton Subgroup)					
	4.5	Peak = 95kPa Residual = 79kPa									
	4.9	Peak = 63kPa Residual = 44kPa									
				5		Borehole terminated at 5.0 m					

Termination Reason: Target Depth Reached

Shear Vane No: 2087 DCP No:

Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Position: 448349.5mE; 673232.4mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 2.0m
	Datum: Moturiki	Survey Source: Hand Held GPS

Termination Reason: Target depth reached
Shear Vane No: 2993 DCP No:
Remarks: Groundwater not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP02

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448299.7mE; 673224.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
08-02-2023 ▼						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)	M			
	0.5	Peak = 87kPa Residual = 26kPa				ML: Clayey SILT: with minor fine to medium sand; brown. High plasticity. Moderately sensitive. (Walton Subgroup)	St			
	1.0	Peak = 133kPa Residual = 29kPa		1		ML: Sandy SILT: light grey mottled orange. Low plasticity. Sensitive. (Walton Subgroup)	VSt			
	1.5	Peak = 113kPa Residual = 17kPa				SW: Silty Medium to coarse SAND: with some organic inclusions, with minor fine to medium gravel; light brown and light grey. Well graded, subangular. (Walton Subgroup)	M to W			
				2			TP			
				3						
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 1.30m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP03

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448275.0mE; 673200.9mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
08-02-2023 						OL: Organic SILT: dark brown. (Topsoil)	M						
	0.5	Peak = 75kPa Residual = 12kPa				MH: Clayey SILT: light grey mottled orange. High plasticity. (Walton Subgroup)		St to VSt					
	1.0	Peak = 182kPa Residual = 23kPa		1		GW: Silty Fine to coarse GRAVEL: trace boulders; light brown. Well graded, subangular. (Walton Subgroup)							
	1.5	Peak = UTP											
				2									
				3		... from 2.40m to 3.20m, With some boulders							
				4									
				5									
						Test pit terminated at 3.20 m							

Termination Reason: Hole collapse

Shear Vane No: 2993

DCP No:

Remarks: Groundwater encountered at 0.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP04

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448191.4mE; 673197.1mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
08-02-2023 ▼						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	0.5	Peak = 84kPa Residual = 26kPa				ML: Clayey SILT: brownish orange. Low plasticity. Moderately sensitive. (Walton Subgroup)	M			
	1.0	Peak = 61kPa Residual = 20kPa		1		CH: Silty CLAY: with trace fine sand; brown. High plasticity. Moderately sensitive. (Walton Subgroup)		St		
	1.5	Peak = 84kPa Residual = 17kPa				MH: Clayey SILT: with trace fine sand; light brownish brown streaked white. High plasticity. Sensitive. (Walton Subgroup)				
	2.0	Peak = UTP		2			S			
	2.5	Peak = UTP								
	3.0	Peak = UTP		3		ML: Sandy SILT: with some gravel; light brownish grey mottled grey. Low plasticity. (Walton Subgroup)	H			
						Test pit terminated at 3.50 m				
				4						
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993

DCP No:

Remarks: Groundwater encountered at 1.0m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP05

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448195.3mE; 673262.3mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
08-02-2023	0.5	Peak = 63kPa Residual = 14kPa			OL: Organic SILT: dark brown. Low plasticity. (Topsoil)					
					ML: Clayey SILT: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)	M				
	1.0	Peak = 43kPa Residual = 17kPa		1	CH: Sandy CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)	F to St				
	1.5	Peak = 150kPa Residual = 42kPa				W	VSt			
				2	GW: Silty Fine to coarse GRAVEL: with some fine to coarse sand; light brown mottled grey. Well graded, subangular. (Walton Subgroup)	S	TP			
				3						
				4						
					Test pit terminated at 4.00 m					
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 1.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP06

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448200.9mE; 673319.8mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
08-02-2023						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 121kPa Residual = 23kPa				ML: Clayey SILT: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)							
	1.0	Peak = 144kPa Residual = 35kPa		1		CH: Silty CLAY: trace fine sand, with some; brown mottled white. High plasticity. Sensitive. (Walton Subgroup)							
	1.6	Peak = 130kPa Residual = 23kPa				ML: Sandy SILT: with some clay; brown. Low plasticity. Moderately sensitive. (Walton Subgroup)	M						
	2.1	Peak = 87kPa Residual = 20kPa		2		CH: Sandy CLAY: with some silt; light brown. High plasticity. (Walton Subgroup)							
	2.7	Peak = 164kPa Residual = 49kPa				ML: Sandy SILT: with some clay; brown. Low plasticity. Moderately sensitive. (Walton Subgroup)	W to S						
	3.2	Peak = UTP				CH: Sandy CLAY: with some silt; light brown. High plasticity. (Walton Subgroup)							
	3.7	Peak = UTP				ML: Sandy SILT: with some clay; brown. Low plasticity. Moderately sensitive. (Walton Subgroup)	M to W	H					
	4.3	Peak = UTP				ML: Sandy SILT: with some clay; brown. Low plasticity. Moderately sensitive. (Walton Subgroup)							
						Test pit terminated at 4.30 m							

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 3.0m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP07

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448214.0mE; 673364.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	0.5	Peak = 144kPa Residual = 29kPa				ML: Clayey SILT: with some; brownish orange. Low plasticity. Sensitive. (Walton Subgroup)				
	1.0	Peak = 113kPa Residual = 43kPa		1		CH: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)				
	1.5	Peak = 92kPa Residual = 29kPa				CH: Silty CLAY: with some sand; brown. High plasticity. Moderately sensitive to sensitive. (Walton Subgroup)				
	2.0	Peak = 121kPa Residual = 29kPa		2			M			
	2.5	Peak = UTP								
	3.2	Peak = 105kPa Residual = 40kPa		3		ML: Sandy SILT: light brown mottled orange. Low plasticity. Moderately sensitive. (Walton Subgroup)				
	4.0	Peak = 136kPa Residual = 35kPa		4						
						Test pit terminated at 4.20 m				
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP08

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448220.9mE; 673415.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 133kPa Residual = 27kPa				ML: Clayey SILT: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)							
	1.0	Peak = 190kPa Residual = 22kPa		1		CH: Silty CLAY: brown. High plasticity. Sensitive to extra sensitive. (Walton Subgroup)		VSt					
	1.5	Peak = UTP				ML: Clayey SILT: brown. Low plasticity. (Walton Subgroup)		H					
	2.0	Peak = 188kPa Residual = 36kPa		2		CH: Silty CLAY: brownish orange. High plasticity. Moderately sensitive to sensitive. (Walton Subgroup)	M						
	2.5	Peak = 144kPa Residual = 29kPa											
	3.0	Peak = 115kPa Residual = 43kPa		3				VSt					
	3.5	Peak = 144kPa Residual = 36kPa											
	4.0	Peak = 72kPa Residual = 35kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP09

Client: McCaffrey & Cable Consultants
 Project: T4 Structure Plan, Te Awamutu
 Site Location: Te Awamutu
 Project No.: HAM2022-0065
 Date: 08/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448074.7mE; 673245.7mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
 Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
08-02-2022 						OL: Organic SILT: dark brown. Contains blocks of concrete (Uncontrolled Fill)	W						
				1				VS					
				2		ML: Sandy SILT: grey mottled orange. Low plasticity. (Piako Subgroup)		S					
						SW: Silty Fine to coarse SAND: brownish grey mottled orange. Well graded. Subangular. (Walton Subgroup)		LP					
				3		Test pit terminated at 3.00 m							
				4									
				5									

Termination Reason: Hole collapse

Shear Vane No: DCP No:

Remarks: Groundwater encountered at 0.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP11

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448063.2mE; 673288.9mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
	0.5	Peak = 72kPa Residual = 14kPa			OL: Organic SILT: dark brown. Low plasticity. (Topsoil)					
	1.0	Peak = UTP		1	ML: Silty CLAY: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)		St			
	1.5	Peak = UTP			CH: Silty CLAY: brown. High plasticity. (Walton Subgroup)		H			
	2.0	Peak = UTP		2						
	2.5	Peak = UTP			CH: CLAY: light brown mottled orange. High plasticity. Moderately sensitive. (Walton Subgroup)	M				
	3.0	Peak = UTP		3						
	3.5	Peak = 139kPa Residual = 38kPa					VSt to St			
	4.0	Peak = 55kPa Residual = 43kPa		4						
	4.5	Peak = 127kPa Residual = 58kPa			Test pit terminated at 4.50 m					
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP12

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448025.6mE; 673290.3mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 121kPa Residual = 23kPa				ML: Clayey SILT: light brown. Low plasticity, Sensitive. (Walton Subgroup)		VSt					
	1.0	Peak = UTP		1		CH: Silty CLAY: brown. High plasticity. (Walton Subgroup)							
	1.5	Peak = UTP						VSt to H					
	2.0	Peak = 130kPa Residual = 29kPa		2		CH: Silty CLAY: light brown. High plasticity. Moderately sensitive to sensitive. (Walton Subgroup)	M						
	2.5	Peak = 87kPa Residual = 29kPa						St					
	3.3	Peak = 139kPa Residual = 32kPa		3		CH: CLAY: with trace fine sand; light greyish brown mottled orange. High plasticity. Sensitive. (Walton Subgroup)		VSt					
	4.0	Peak = 104kPa Residual = 29kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP13

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447981.6mE; 673311.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
19-02-2023	0.5	Peak = 150kPa Residual = 35kPa			OL: Organic SILT: dark brown. Low plasticity. (Topsoil)					
					ML: Clayey SILT: orange brown. Low plasticity. Sensitive. (Walton Subgroup)					
					CL: Silty CLAY: brownish white mottled brownish orange. Low plasticity. Sensitive. (Walton Subgroup)	M	VSt			
	1.0	Peak = 118kPa Residual = 29kPa								
					ML: Sandy SILT: brown. Low plasticity. Sensitive. (Walton Subgroup)		St			
	1.5	Peak = 87kPa Residual = 17kPa			CH: CLAY: dark grey. High plasticity. Insensitive. (Walton Subgroup)	W	F			
					SW: Fine to coarse SAND: dark grey. Well graded. Subangular to subrounded. (Walton Subgroup)		TP			
					SW: Silty Fine to medium SAND: dark grey. Well graded. Subangular. (Walton Subgroup)		LP			
	2.0	Peak = 43kPa Residual = 26kPa			CH: Sandy CLAY: with minor organic inclusions; dark bluish grey. Low plasticity. Moderately sensitive to sensitive. (Walton Subgroup)	S				
							St			
	4.5	Peak = 65kPa Residual = 26kPa			Test pit terminated at 4.50 m					

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 2.0m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Position: 447934.6mE; 673312.3mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 2.0m
	Datum: Moturiki	Survey Source: Hand Held GPS

Termination Reason: Target depth reached
Shear Vane No: 2993 DCP No:
Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP15

Client: McCaffrey & Cable Consultants
 Project: T4 Structure Plan, Te Awamutu
 Site Location: Te Awamutu
 Project No.: HAM2022-0065
 Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448133.0mE; 673380.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
 Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 101kPa Residual = 29kPa				ML: Clayey SILT: light brown. Low plasticity. Moderately sensitive to sensitive. (Walton Subgroup)							
	1.0	Peak = 72kPa Residual = 14kPa		1				VSt to St					
	1.5	Peak = UTP				CH: Silty CLAY: dark brown. High plasticity. (Walton Subgroup)							
	2.0	Peak = UTP		2			M	H					
	2.5	Peak = UTP											
	3.0	Peak = 87kPa Residual = 32kPa		3		CH: Silty CLAY: light brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	3.5	Peak = 101kPa Residual = 29kPa						VSt to St					
	4.0	Peak = 87kPa Residual = 29kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP16

Client: McCaffrey & Cable Consultants
 Project: T4 Structure Plan, Te Awamutu
 Site Location: Te Awamutu
 Project No.: HAM2022-0065
 Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448077.8mE; 673383.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
 Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 115kPa Residual = 23kPa				ML: Clayey SILT: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)							
	1.0	Peak = 110kPa Residual = 20kPa		1				VSt					
	1.5	Peak = >200kPa Residual = 49kPa				CH: Silty CLAY: brown. High plasticity. Moderately sensitive to sensitive. (Walton Subgroup)							
	2.0	Peak = UTP		2			M						
	3.0	Peak = 75kPa Residual = 43kPa		3		CH: Silty CLAY: with trace fine sand; light brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	3.5	Peak = 144kPa Residual = 58kPa						VSt to St					
	4.0	Peak = 139kPa Residual = 40kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP17

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448042.5mE; 673372.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
09-02-2023 						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)	W						
	0.5	Peak = 58kPa Residual = 12kPa				ML: Clayey SILT: orange brown. Low plasticity. (Piako Subgroup)							
						CH: Sandy CLAY: with some silt; light grey mottled orange. High plasticity. Sensitive. (Piako Subgroup)							
	1.0	Peak = 43kPa Residual = 14kPa		1		CH: CLAY: with some fine sand; grey mottled orange. High plasticity. Moderately sensitive. (Piako Subgroup)	S						
	1.5	Peak = 72kPa Residual = 22kPa						F to St					
	2.0	Peak = 29kPa Residual = 14kPa		2									
	2.7	Peak = 32kPa Residual = 29kPa				OL: Organic SILT: dark greyish brown. Fibrous. Insensitive. (Piako Subgroup)	M to W						
								S to F					
	3.2	Peak = 32kPa Residual = 29kPa				CH: CLAY: with some fine sand; dark grey. High plasticity. Moderately sensitive. (Walton Subgroup)		St					
	4.0	Peak = 69kPa Residual = 26kPa		4	Test pit terminated at 4.00 m								
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 0.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP18

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448070.5mE; 673545.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	0.5	Peak = 69kPa Residual = 26kPa				ML: Clayey SILT: sand; brownish orange. Low plasticity. Moderately sensitive. (Walton Subgroup)	St			
	1.0	Peak = UTP		1		CH: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)				
	1.5	Peak = UTP					H			
	2.0	Peak = UTP		2			M			
	2.5	Peak = 144kPa Residual = 50kPa								
	3.1	Peak = 98kPa Residual = 29kPa		3			VSt to St			
	3.8	Peak = 121kPa Residual = 43kPa								
				4	Test pit terminated at 4.00 m					
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP19

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448023.7mE; 673561.1mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 63kPa Residual = 14kPa				ML: Clayey SILT: brownish orange. Low plasticity. Sensitive. (Walton Subgroup)		St					
	1.0	Peak = 110kPa Residual = 17kPa		1		CH: CLAY: brown. High plasticity. Sensitive. (Walton Subgroup)							
	1.5	Peak = 137kPa Residual = 40kPa				CH: CLAY: with minor fine sand; brown. High plasticity. Moderately sensitive. (Walton Subgroup)	M	VSt					
	2.0	Peak = UTP		2		CH: Sandy CLAY: light brown mottled orange. High plasticity. (Walton Subgroup)		H					
	2.5	Peak = UTP											
	3.0	Peak = UTP		3		CH: CLAY: with some fine sand; light brown mottled orange. High plasticity. Moderately sensitive. (Walton Subgroup)							
	3.5	Peak = 87kPa Residual = 23kPa					M to W	VSt to H					
	4.0	Peak = 118kPa Residual = 29kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP20

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447966.9mE; 673573.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
09-02-2023 ▼						OL: Organic SILT: dark brown; low plasticity. (Topsoil)	M						
	0.5	Peak = 55kPa Residual = 12kPa				ML: Clayey SILT: grey mottled orange; low plasticity. Sensitive. (Piako Subgroup)		St					
	1.0	Peak = 40kPa Residual = 9kPa		1		ML: Sandy SILT: light grey mottled orange; low plasticity. Sensitive. (Piako Subgroup)		F					
	1.5	Peak = 40kPa Residual = 14kPa				ML: Sandy SILT: dark blueish grey; low plasticity. Moderately sensitive. (Piako Subgroup)							
	2.0	Peak = 49kPa Residual = 17kPa		2		OL: Organic SILT: dark brown; low plasticity. Fibrous. Tree roots. Moderately sensitive. (Piako Subgroup)							
	2.7	Peak = 63kPa Residual = 23kPa		3		SW: Silty fine to coarse SAND: dark blueish grey; well graded. subangular. (Walton Subgroup)							
						CH: Sandy CLAY: blueish grey; high plasticity. (Walton Subgroup)		F					
	4.0	Peak = 49kPa Residual = 20kPa		4	Test pit terminated at 4.00 m								
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 0.8m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP21

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447994.5mE; 673466.7mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
10-02-2023						OL: Organic SILT: dark brown. (Topsoil)							
	0.5	Peak = 167kPa Residual = 32kPa				ML: Sandy SILT: with trace clay; light brown mottled orange. Low plasticity. Sensitive. (Piako Subgroup)	M	VSt					
	1.0	Peak = 40kPa Residual = 12kPa		1		CH: CLAY: bluish grey. High plasticity. Moderately sensitive. (Piako Subgroup)	W	F					
	1.5	Peak = 49kPa Residual = 20kPa				ML: Sandy SILT: bluish grey. Low plasticity. Moderately sensitive. (Piako Subgroup)							
	2.0	Peak = 55kPa Residual = 17kPa		2				St					
	2.5	Peak = 29kPa Residual = 14kPa				ML: Organic SILT: dark brown. Fibrous. Low plasticity. (Piako Subgroup)	S	S					
	3.0	Peak = 72kPa Residual = 23kPa		3		ML: SILT: with some fine to medium sand; light brownish grey with orange. High plasticity. Moderately sensitive. (Walton Subgroup)		VSt to St					
	3.5	Peak = UTP					W						
	4.0	Peak = 170kPa Residual = 35kPa		4		ML: Sandy SILT: with trace cobbles; dark brownish orange. Low plasticity. Sensitive. (Walton Subgroup)							
						Test pit terminated at 4.00 m							

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 1.50m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Position: 447968.8mE; 673496.9mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 2.0m
	Datum: Moturiki	Survey Source: Hand Held GPS

Termination Reason: Target depth reached
Shear Vane No: 2993 DCP No:
Remarks: Groundwater was not encountered

Document Set ID: 11324602
Version: 2, Version Date: 26/02/2026

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Position: 447892.8mE; 673532.3mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 2.0m
	Datum: Moturiki	Survey Source: Hand Held GPS

Termination Reason: Target depth reached
Shear Vane No: 2993 DCP No:
Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP24

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447877.7mE; 673473.7mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
10-02-2023						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
						CH: Silty CLAY: light orange brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	0.5	Peak = 101kPa Residual = 36kPa					M	VSt					
	1.0	Peak = 94kPa Residual = 29kPa		1		ML: Clayey SILT: light orange brown mottled white. Low plasticity. Sensitive. (Walton Subgroup)							
	1.5	Peak = 82kPa Residual = 14kPa											
	2.0	Peak = 69kPa Residual = 26kPa		2		CH: CLAY: light orange brown. High plasticity. Moderately sensitive. (Walton Subgroup)	W	St					
	2.5	Peak = 58kPa Residual = 29kPa				SW: Fine to coarse SAND: light brownish grey. Well graded. Subangular. (Walton Subgroup)							
						SP: Fine to medium SAND: light bluish grey. Poorly graded. subrounded to subangular. (Walton Subgroup)	S	TP					
				3									
				4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 2.10m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP25

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Test Pit Location: Refer to site plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447862.4mE; 673439.4mN Projection: Mt Eden 2000 Pit Dimensions: 4.5m by 1.5m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 153kPa Residual = 46kPa				ML: Clayey SILT: dark orange brown. Low plasticity. Moderately sensitive. (Piako Subgroup)		VSt					
	1.0	Peak = 101kPa Residual = 32kPa		1		... at 1.00m, Becoming light grey	M						
	1.5	Peak = 98kPa Residual = 20kPa				ML: Silty CLAY: dark orange brown mottled grey. Low plasticity. Sensitive. (Piako Subgroup)		St					
	2.0	Peak = 107kPa Residual = 17kPa		2		SW: Silty Fine to coarse SAND: dark orange brown. Well graded, subangular. (Piako Subgroup)		LP					
	2.5	Peak = 49kPa Residual = 14kPa				OL: Organic SILT: dark brown. Low plasticity, Fibrous. Moderately sensitive. (Piako Subgroup)		F					
	3.0	Peak = 66kPa Residual = 26kPa		3		ML: Sandy SILT: dark grey. Low plasticity. Moderately sensitive. (Walton Subgroup)	W						
	4.0	Peak = 35kPa Residual = 14kPa		4		Test pit terminated at 4.00 m		F to St					
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater was not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP26

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Test Pit Location: Refer to site plan Logged by: MW Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447863.6mE; 673382.6mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
10-02-2023						OL: Organic SILT: dark brown. (Topsoil)				
	0.5	Peak = 43kPa Residual = 14kPa				OL: Organic PEAT: dark brown. Fibrous. Low plasticity. Moderately sensitive. (Piako Subgroup)	W			
	1.0	Peak = 16kPa Residual = 7kPa		1		ML: Sandy SILT: light bluish grey. Low plasticity. Insensitive. (Piako Subgroup)	F			
	1.5	Peak = 14kPa Residual = 12kPa				ML: Sandy SILT: light grey. Low plasticity. Moderately sensitive. (Piako Subgroup)	VS			
	2.0	Peak = 58kPa Residual = 22kPa		2		SP: Silty Fine to medium SAND: light yellowish grey mottled orange. Well graded. Subangular. (Walton Subgroup)	St			
	2.5	Peak = 144kPa Residual = 43kPa				SW: Clayey Fine to medium SAND: light orange. Well graded. Subangular. (Walton Subgroup)	S			
				3						
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 1.0m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP27

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 10/02/2023



Test Pit Location: Refer to site plan Logged by: MW Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447816.9mE; 673391.1mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
10-02-2023 ▼						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 14kPa Residual = 13kPa				OL: Organic SILT: dark brown. Low plasticity. Insensitive. (Piako Subgroup)		S					
	1.0	Peak = 22kPa Residual = 14kPa		1		SW: Silty Fine to medium SAND: light bluish grey. Well graded. Subangular. (Walton Subgroup)							
						SW: Silty Fine to medium SAND: with trace wood; light yellowish orange. (Walton Subgroup)	M	TP					
	2.0	Peak = 199kPa Residual = 29kPa		2		ML: Sandy SILT: brownish orange. Low plasticity. Moderately sensitive to sensitive. (Walton Subgroup)							
	2.4	Peak = 140+											
	3.0	Peak = 81kPa Residual = 43kPa		3				St to VSt					
	3.5	Peak = 87kPa Residual = 43kPa					W						
				4									
	4.3	Peak = 101kPa Residual = 58kPa					S						
						Test pit terminated at 4.30 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2993 DCP No:

Remarks: Groundwater encountered at 3.80m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP28

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447910.7mE; 673663.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
	0.5	Peak = 69kPa Residual = 41kPa				OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	1.0	Peak = 97kPa Residual = 28kPa		1		ML: Clayey SILT: light brown. Low plasticity. (Walton Subgroup)				
	1.5	Peak = 55kPa Residual = 28kPa				ML: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)	St			
	2.0	Peak = UTP		2		CH: CLAY: brown. High plasticity. (Walton Subgroup)	H			
	2.7	Peak = 138kPa Residual = 41kPa		3		CH: CLAY: with some fine to medium sand; light brown. High plasticity. Moderately sensitive. (Walton Subgroup)				
	3.3	Peak = 124kPa Residual = 35kPa					VSt to St			
	4.0	Peak = 97kPa Residual = 28kPa		4			M to W			
						Test pit terminated at 4.50 m				
				5						

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater not encountered

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP29

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447974.2mE; 673731.2mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
17-03-2023						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 90kPa Residual = 28kPa				ML: Clayey SILT: light brown. Low plasticity. Moderately sensitive. (Walton Subgroup)							
	1.0	Peak = 97kPa Residual = 28kPa		1				St					
	1.7	Peak = 97kPa Residual = 21kPa				CH: CLAY: light brown. High plasticity. Sensitive. (Walton Subgroup)	M						
	2.3	Peak = 117kPa Residual = 41kPa		2				VSt to St					
	2.8	Peak = 135kPa Residual = 28kPa					W						
	3.0	Peak = 97kPa Residual = 21kPa		3		CH: Sandy CLAY: grey. High plasticity. Sensitive. (Walton Subgroup)		St					
	3.5	Peak = 97kPa Residual = 25kPa					S						
				4		GC: Clayey Fine to coarse GRAVEL: greyish brown. Well graded, subrounded. (Walton Subgroup)		TP					
						Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater encountered at 2.7m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Position: 448126.8mE; 673761.6mN	Projection: Mt Eden 2000	Pit Dimensions: 4.0m by 2.0m
	Datum: Moturiki	Survey Source: Hand Held GPS

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP31

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448126.6mE; 683251.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
				1		OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	1.0	Peak = 97kPa Residual = 30kPa				ML: Clayey SILT: light brown. Low plasticity. Moderately sensitive. (Walton Subgroup)		St					
	1.5	Peak = 70kPa Residual = 28kPa				CH: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	2.0	Peak = 111kPa Residual = 30kPa		2			M						
	2.5	Peak = 111kPa Residual = 41kPa						VSt to St					
	3.3	Peak = 90kPa Residual = 28kPa		3									
	4.0	Peak = 111kPa Residual = 41kPa		4		CH: CLAY: light grey. High plasticity. Moderately sensitive. (Walton Subgroup)		VSt					
						Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater was not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP32

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447889.6mE; 673765.6mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 90kPa Residual = 28kPa				CH: Silty CLAY: light brown. High plasticity. Moderately sensitive. (Walton Subgroup)		St					
	1.0	Peak = 90kPa Residual = 25kPa		1									
	1.5	Peak = UTP				CH: CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	2.0	Peak = 135kPa Residual = 55kPa		2			M	VSt to H					
	2.5	Peak = 111kPa Residual = 41kPa											
	3.0	Peak = 180kPa Residual = 55kPa		3		CH: Silty CLAY: light brown and grey. High plasticity. Insensitive to moderately sensitive. (Walton Subgroup)		St					
	3.5	Peak = 97kPa Residual = 28kPa											
	4.0	Peak = 69kPa Residual = 21kPa		4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached

Shear Vane No: 2955 - 19mm blade DCP No:

Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP33

Client: McCaffrey & Cable Consultants
 Project: T4 Structure Plan, Te Awamutu
 Site Location: Te Awamutu
 Project No.: HAM2022-0065
 Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447912.8mE; 673797.3mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
 Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = 135kPa Residual = 28kPa				CH: Silty CLAY: brown. High plasticity. Sensitive. (Walton Subgroup)		VSt					
	1.0	Peak = 135kPa Residual = 28kPa		1		CH: Sandy CLAY: with some gravel; light yellowish brown. High plasticity. Sensitive. (Walton Subgroup)		VSt to H					
	1.5	Peak = UTP				SW: Gravelly Fine to coarse SAND: with minor clay; dark reddish brown. Well graded, subrounded (Walton Subgroup)	M						
				2									
				3				TP					
				4		Test pit terminated at 4.00 m							
				5									

Termination Reason: Target depth reached
 Shear Vane No: 2955 - 19mm blade DCP No:
 Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP34

Client: McCaffrey & Cable Consultants
 Project: T4 Structure Plan, Te Awamutu
 Site Location: Te Awamutu
 Project No.: HAM2022-0065
 Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447997.6mE; 673847.9mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
 Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)							
	0.5	Peak = UTP				CH: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)							
	1.2	Peak = UTP											
	1.8	Peak = 193kPa											
	2.5	Peak = UTP											
	3.0	Peak = 193kPa											
	3.7	Peak = 166kPa Residual = 41kPa											
						Test pit terminated at 4.00 m							

Termination Reason: Target depth reached

Shear Vane No: 2955 DCP No:

Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP35

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447979.5mE; 673867.0mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown, Low plasticity. (Topsoil)							
	0.5	Peak = UTP				CH: Silty CLAY: brown. High plasticity. (Walton Subgroup)							
	1.0	Peak = 193kPa		1		CH: Silty CLAY: light brownish grey. High plasticity. Moderately sensitive. (Walton Subgroup)		VSt to H					
	1.5	Peak = UTP					M						
	2.0	Peak = 115kPa Residual = 29kPa		2									
	2.5	Peak = 55kPa Residual = 28kPa				ML: Sandy SILT: grey. Low plasticity. (Walton Subgroup)							
	3.0	Peak = 55kPa Residual = 28kPa		3				F to St					
	3.5	Peak = 41kPa Residual = 14kPa					M to W						
						SW: Gravelly Medium to coarse SAND: with trace boulders; yellowish brown. Well graded, subrounded. (Walton Subgroup)	M	TP					
				4	Test pit terminated at 4.00 m								
				5									

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP37

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 448006.4mE; 674035.7mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
17-03-2023						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	0.5	Peak = UTP				CH: Silty CLAY: light brown. High plasticity. (Walton Subgroup)				
	1.0	Peak = UTP		1			H			
	1.7	Peak = UTP				CH: Silty CLAY: brown. High plasticity. (Walton Subgroup)	M			
	2.3	Peak = 166kPa Residual = 55kPa		2		ML: Clayey SILT: with some fine sand; grey. Low plasticity. Moderately sensitive. (Walton Subgroup)	VSt			
	3.0	Peak = 138kPa Residual = 41kPa		3		SW: Silty Fine to medium SAND: grey with orange. Well graded, subrounded. (Walton Subgroup)	W	TP		
				4		Test pit terminated at 4.00 m	S			
				5						

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater encountered at 3.9m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP38

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 17/03/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 447991.6mE; 674009.4mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results								
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)				
	0.5	Peak = 111kPa Residual = 35kPa				CH: Silty CLAY: brown. High plasticity. Moderately sensitive. (Walton Subgroup)				
	1.0	Peak = 166kPa Residual = 35kPa		1						
	1.5	Peak = 111kPa Residual = 28kPa								
	2.2	Peak = 111kPa Residual = 41kPa		2						
	2.8	Peak = 69kPa Residual = 41kPa								
	3.4	Peak = 55kPa Residual = 28kPa		3		ML: Sandy SILT: grey. Low plasticity. Insensitive. (Walton Subgroup)				
						SW: Gravelly Fine to coarse SAND: trace boulders; brownish yellow. Well graded, subrounded. Pumice fragments.				
				4						
						Test pit terminated at 4.50 m				
				5						

Termination Reason: Target depth reached
Shear Vane No: 2955 - 19mm blade DCP No:
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

TEST PIT LOG - TP39

Client: McCaffrey & Cable Consultants
Project: T4 Structure Plan, Te Awamutu
Site Location: Te Awamutu
Project No.: HAM2022-0065
Date: 09/02/2023



Test Pit Location: Refer to Site Plan Logged by: PM Checked by: AS Scale: 1:25 Sheet 1 of 1
Position: 448034.7mE; 673647.5mN Projection: Mt Eden 2000 Pit Dimensions: 4.0m by 2.0m
Datum: Moturiki Survey Source: Hand Held GPS

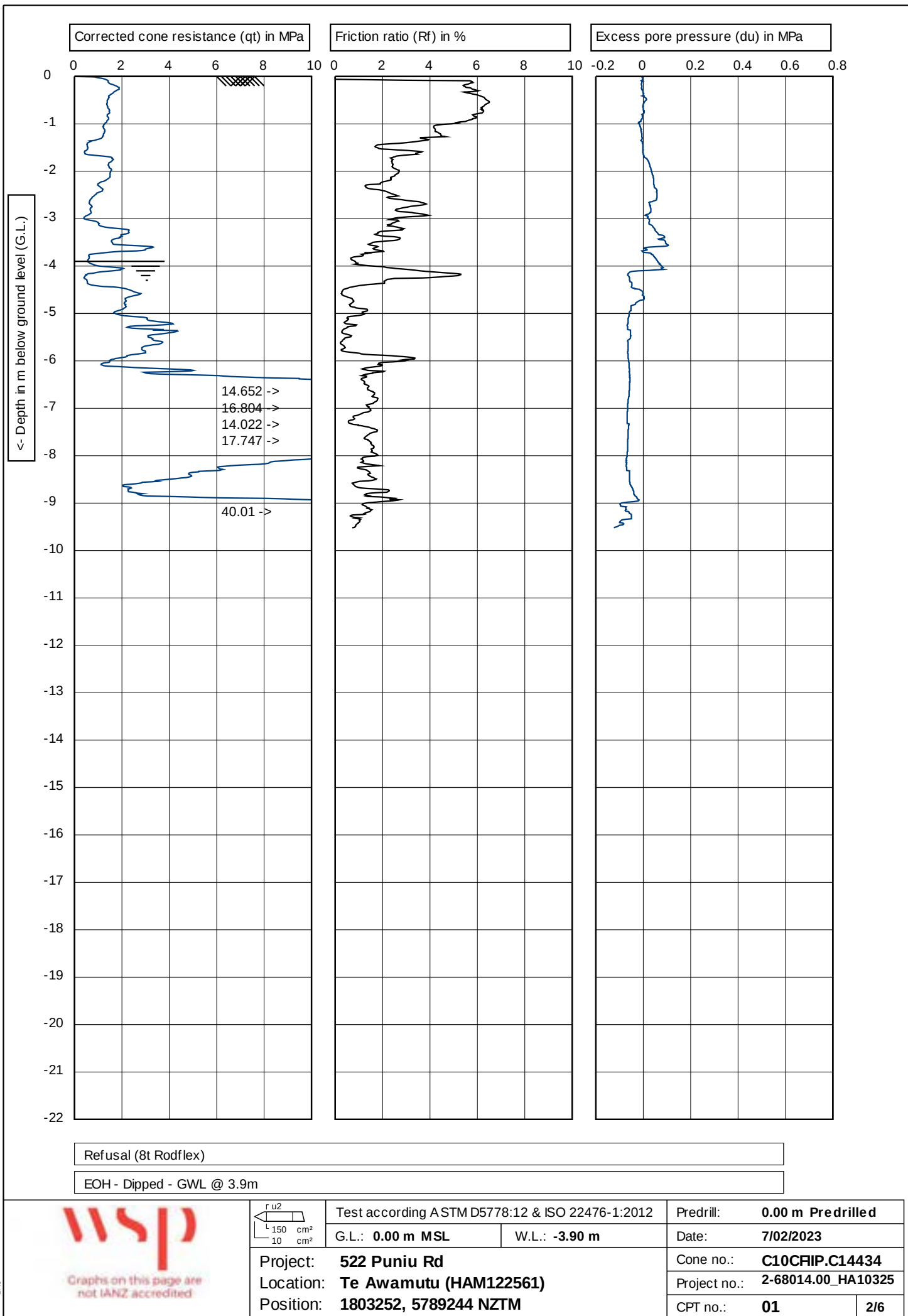
Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/Relative Density	Dynamic Cone Penetrometer (Blows/100mm)				Structure & Other Observations Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks
	Depth	Type & Results							5	10	15	20	
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)	M to W						
	0.5	Peak = 46kPa Residual = 13kPa				ML: Sandy SILT: with some organic inclusions; dark grey. Low plasticity. Moderately sensitive. (Piako Subgroup)	F						
	1.0	Peak = 63kPa Residual = 17kPa		1		CH: CLAY: with minor fine to medium sand; blueish grey. High plasticity. Tree roots. Sensitive to extra sensitive. (Piako Subgroup)	W						
	1.5	Peak = 32kPa Residual = 3kPa					F to St						
	2.0	Peak = 55kPa Residual = 20kPa		2		CH: Silty CLAY: brownish orange mottled grey. High plasticity. Insensitive to moderately sensitive. (Piako Subgroup)	M						
	2.5	Peak = 49kPa Residual = 26kPa											
				3		SW: Silty fine to coarse SAND: brownish orange. Well graded. Subangular. (Walton Subgroup)	W	TP					
							S						
				4		Test pit terminated at 4.00 m							
				5									

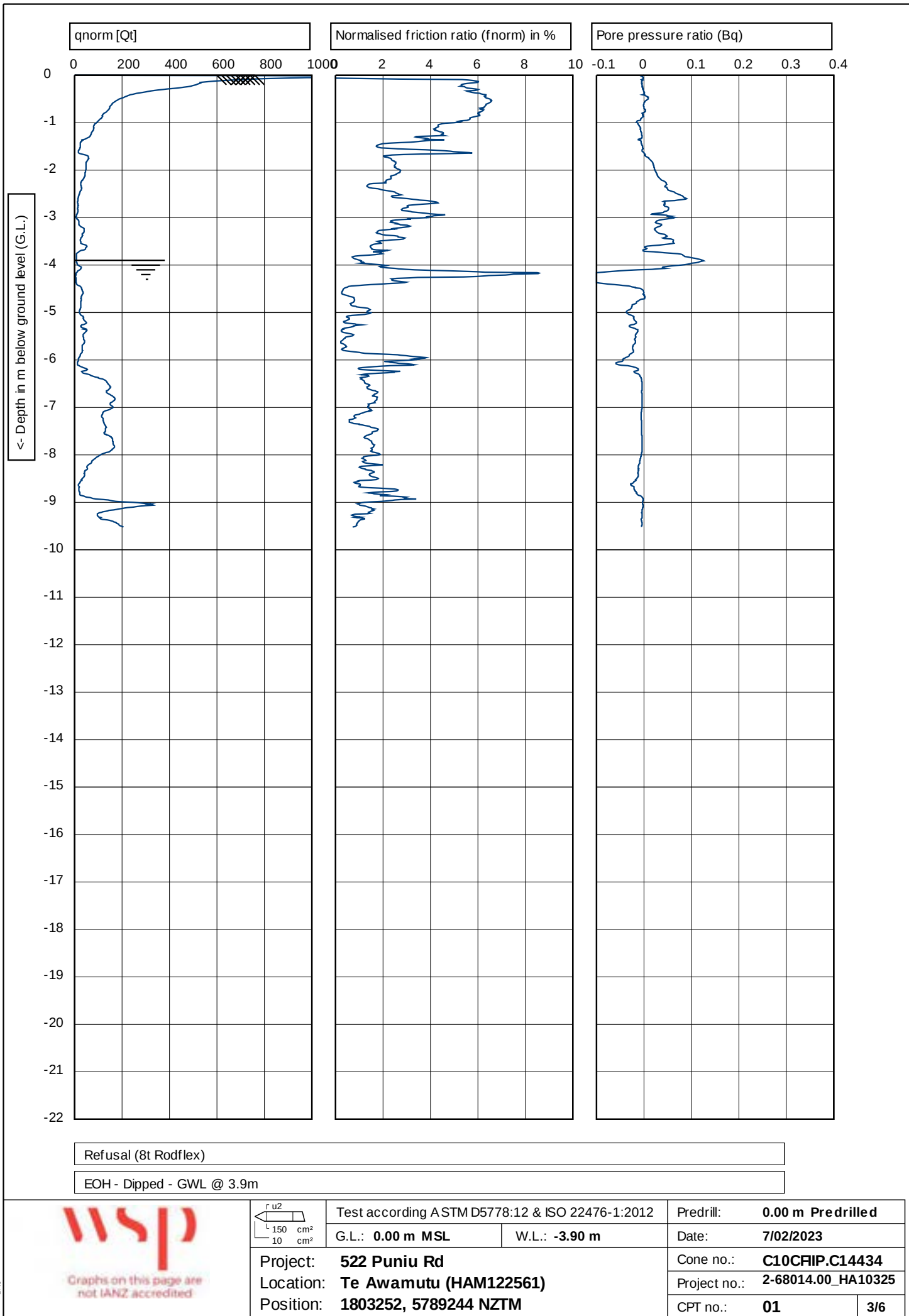
Termination Reason: Target depth reached

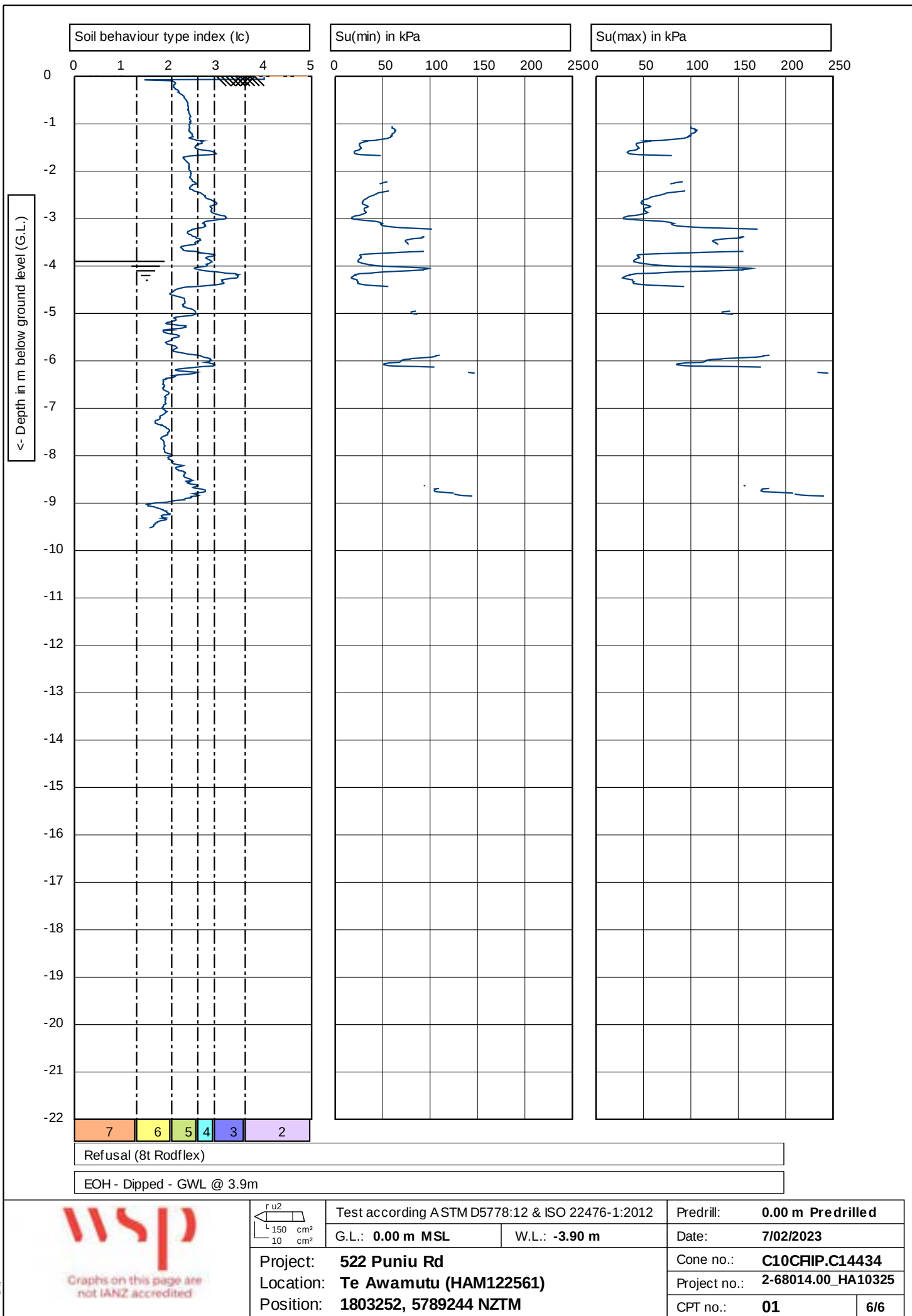
Shear Vane No: 2993 DCP No:

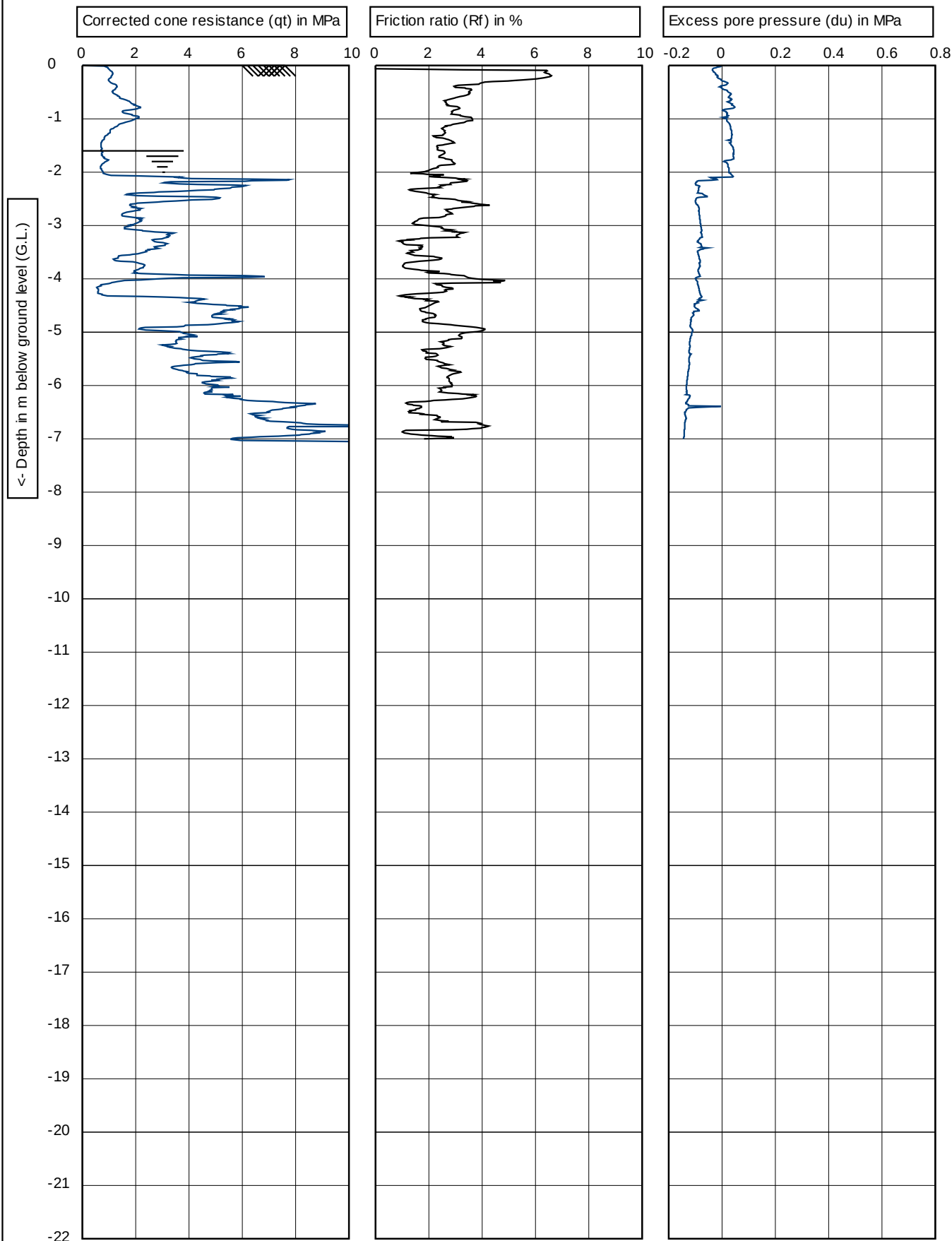
Remarks: Groundwater encountered at 3.80m.

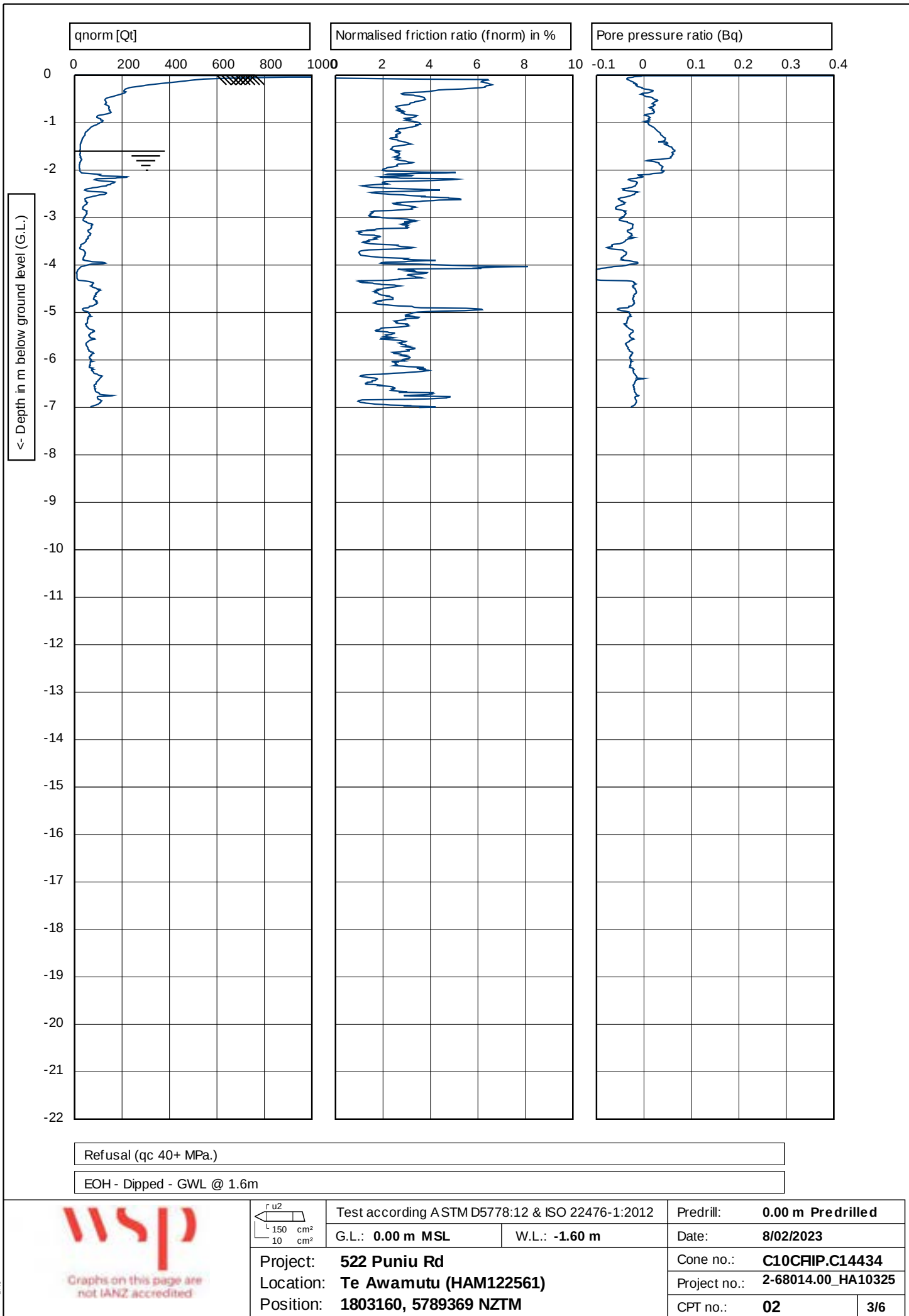
This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

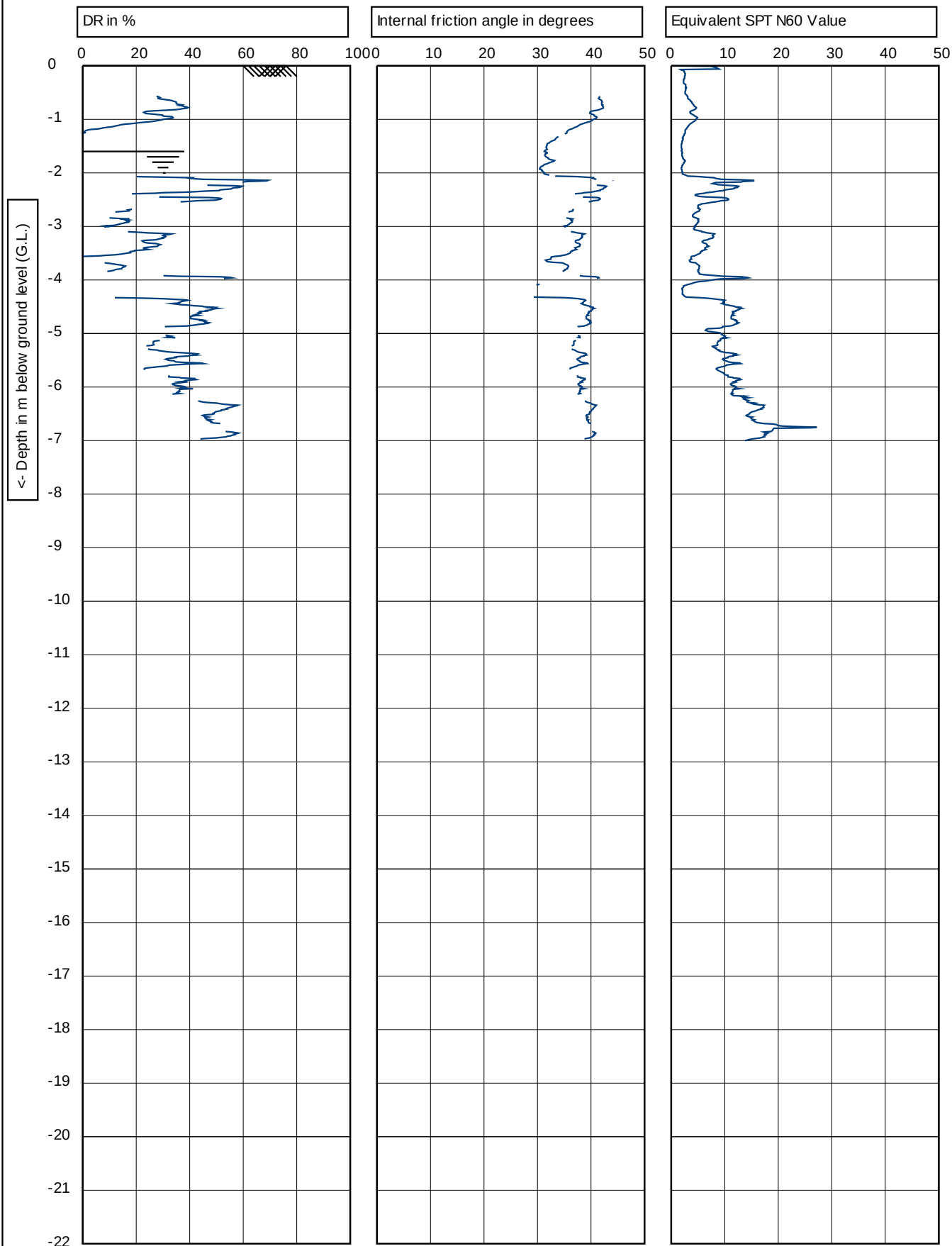












Refusal (qc 40+ MPa.)

EOH - Dipped - GWL @ 1.6m



Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: -1.60 m

Predrill:	0.00 m	Predrilled
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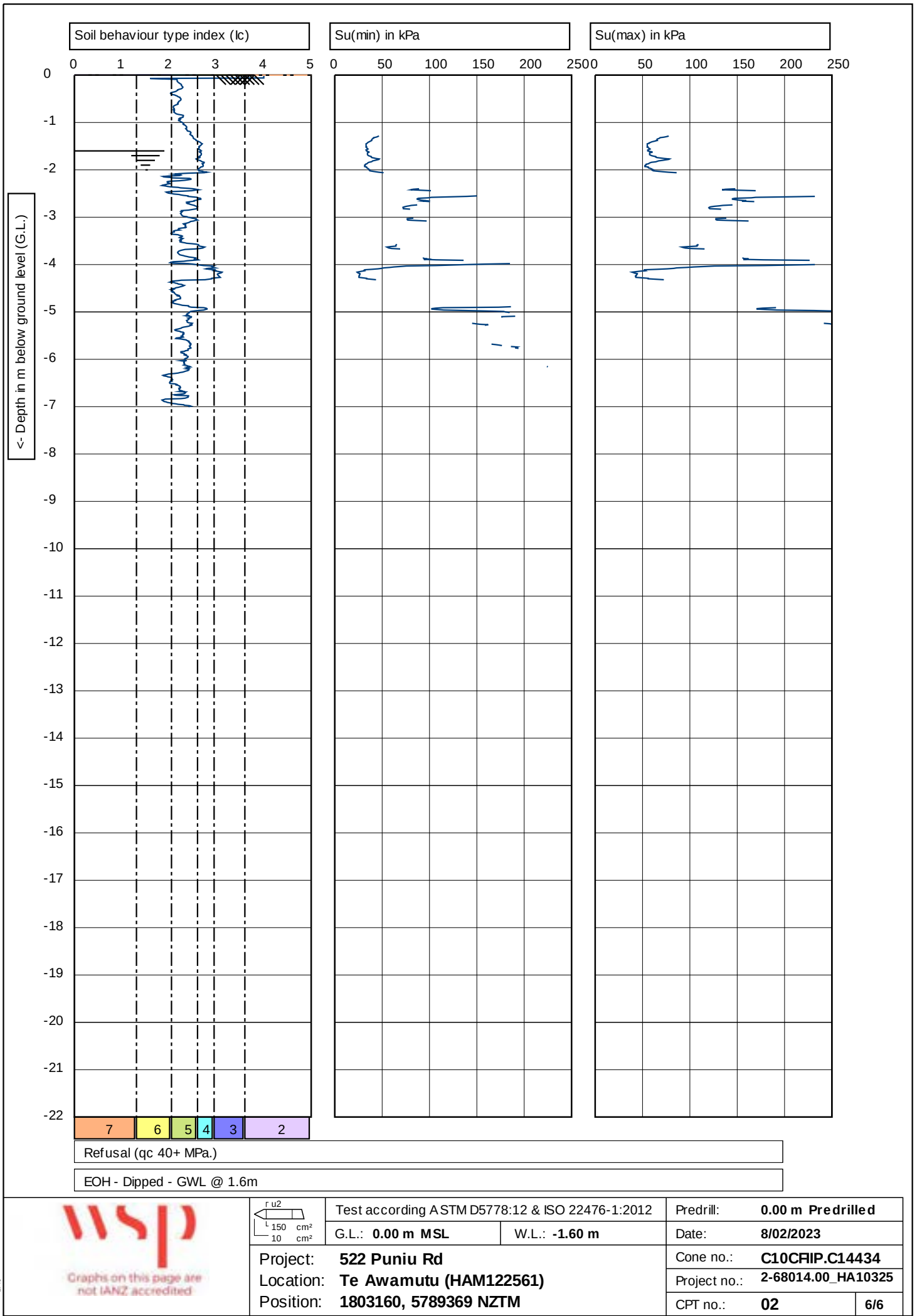
Date:	8/02/2023
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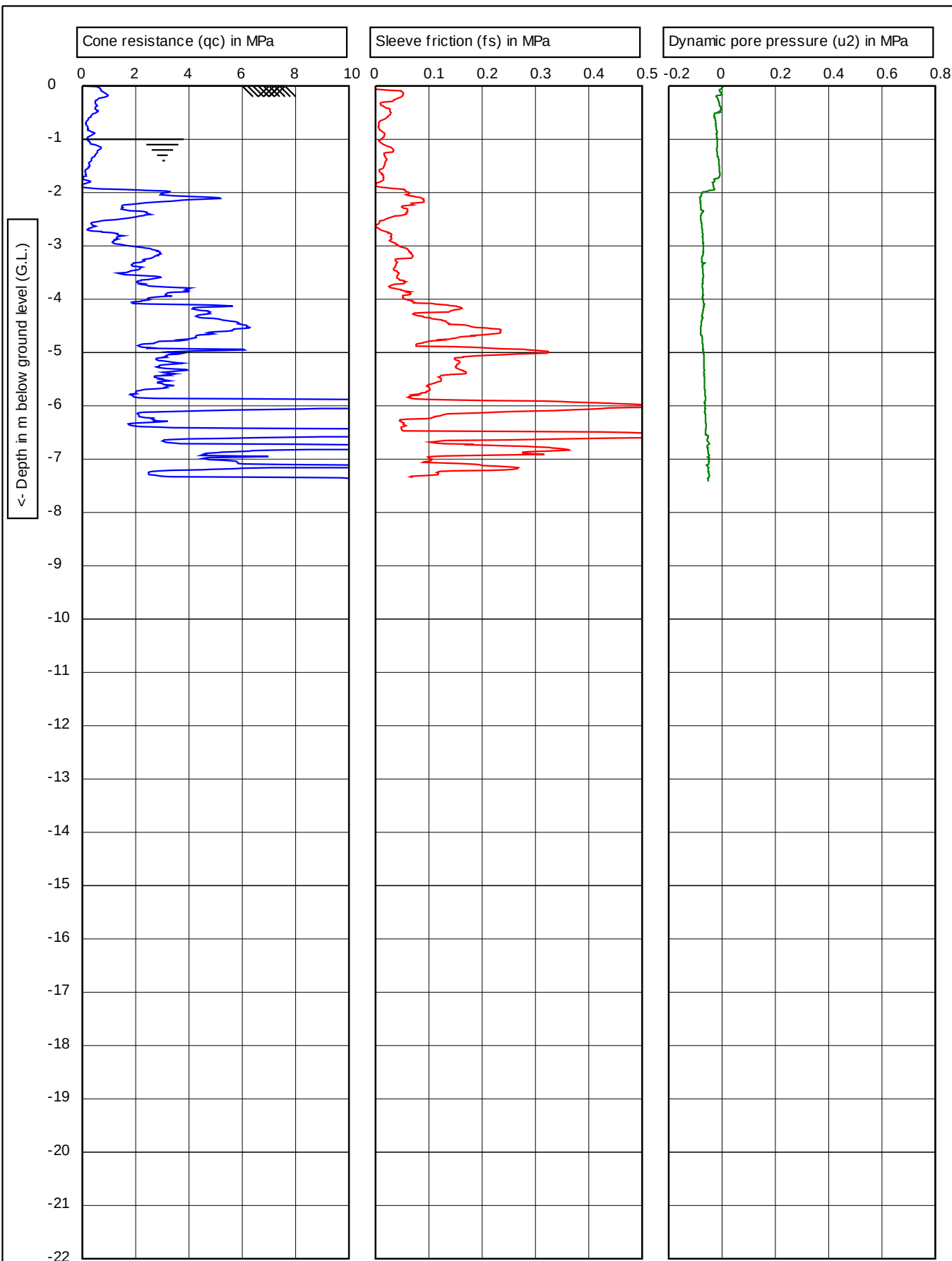
Cone no.: **C10CFIP.C14434**

Project no.:	2-68014.00_HA10325
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CPT no.:	02
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5/6





Refusal (Inclination)

EOH - Dipped - GWL @ 1.0m



Test according ASTM D5778:12 & ISO 22476-1:2012

Predrill:	0.00 m	Predrilled
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G.L.: 0.00 m MSL

W.L.: -1.00 m

Date:	8/02/2023
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Project: **522 Puniu Rd**

Location: **Te Awamutu (HAM122561)**

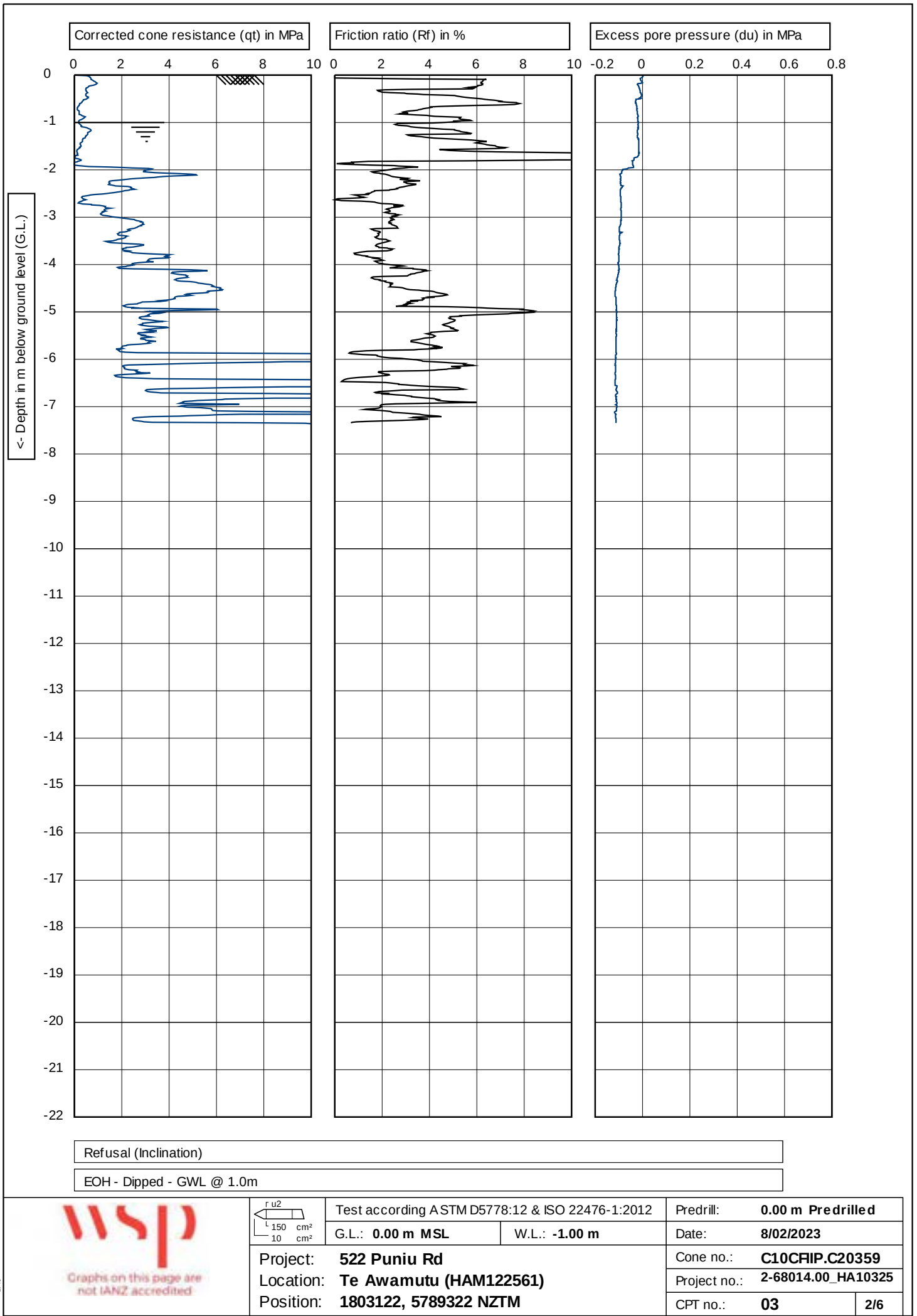
Position: **1803122, 5789322 NZTM**

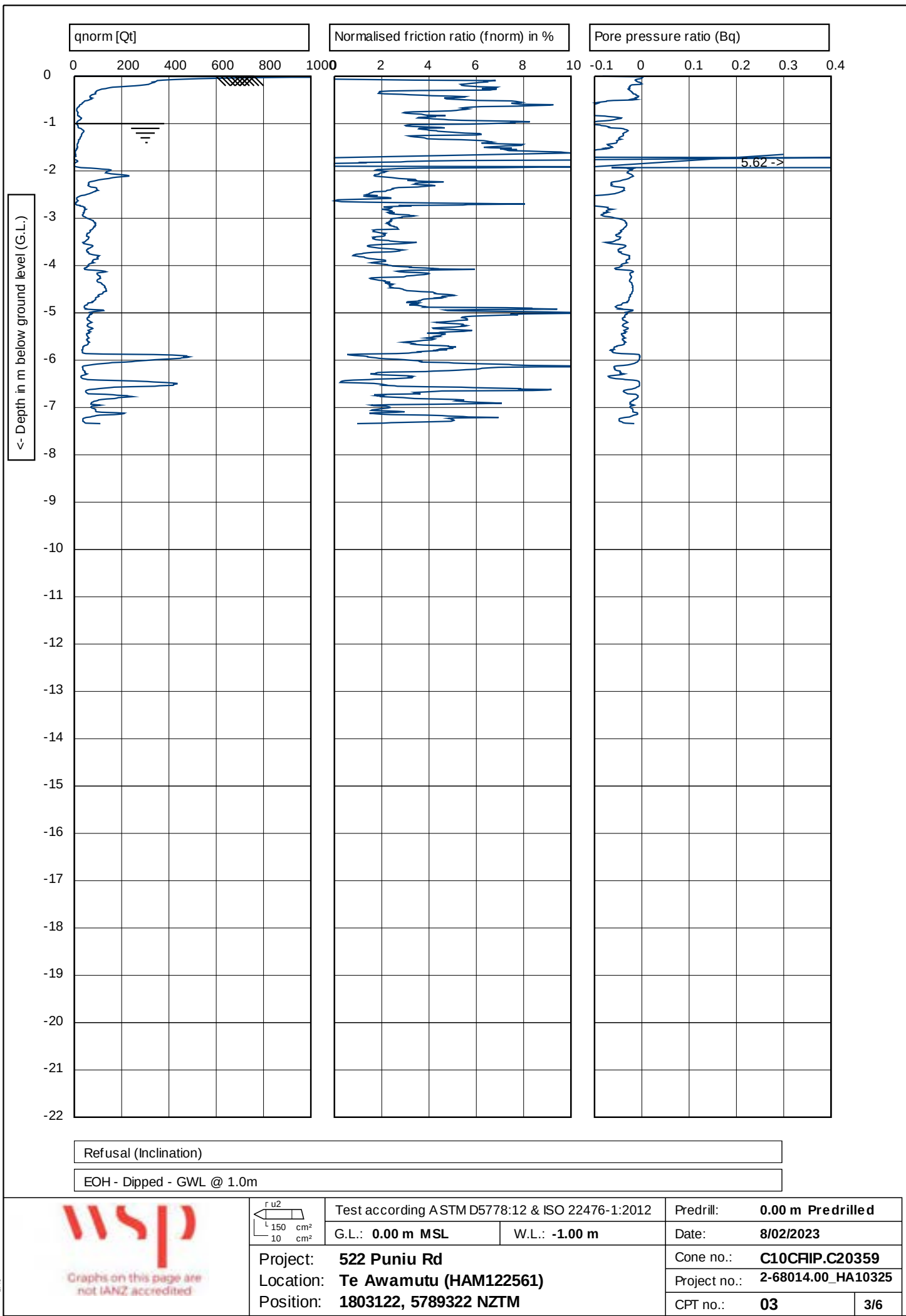
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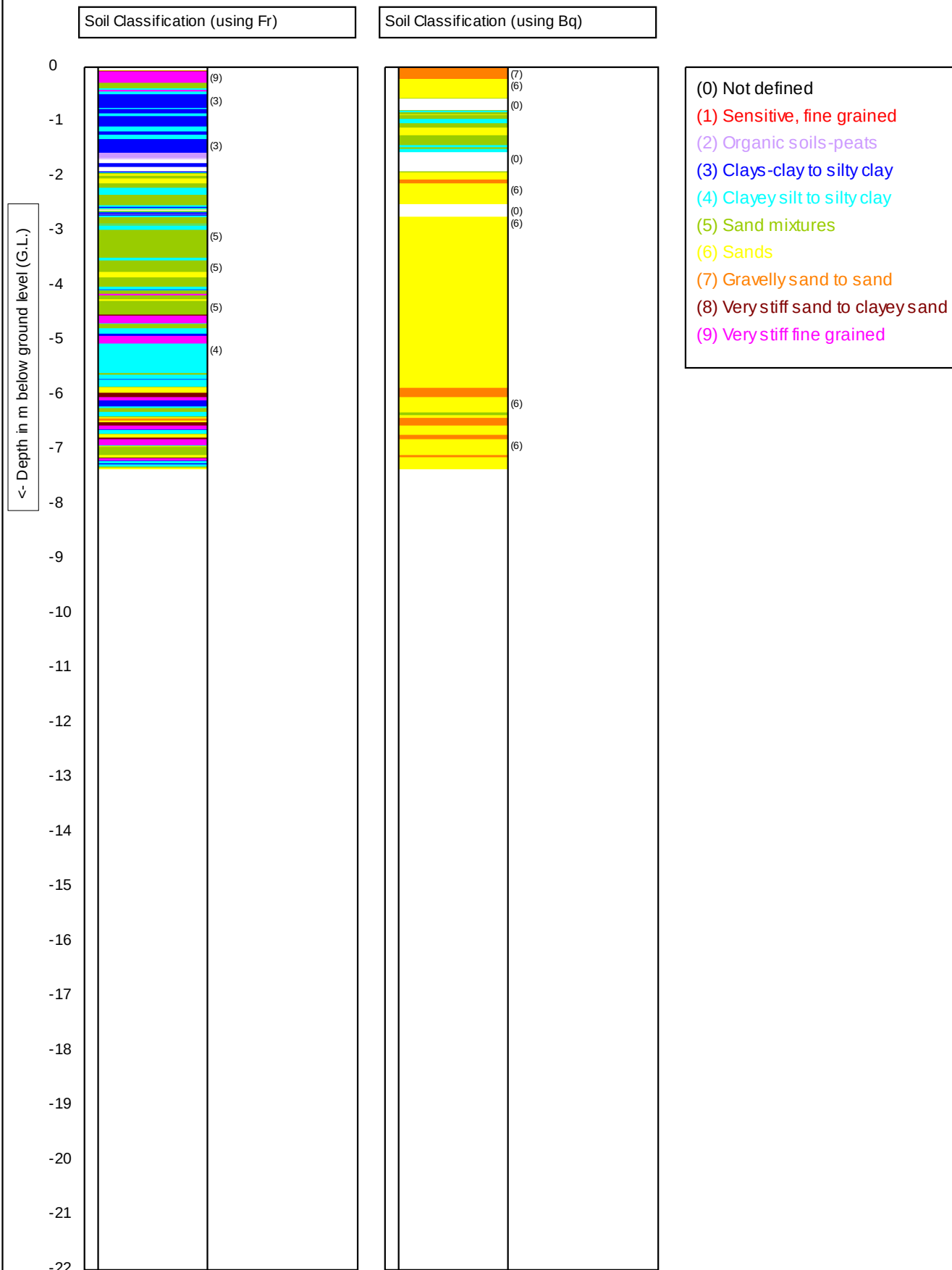
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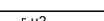
CPT no.:	03
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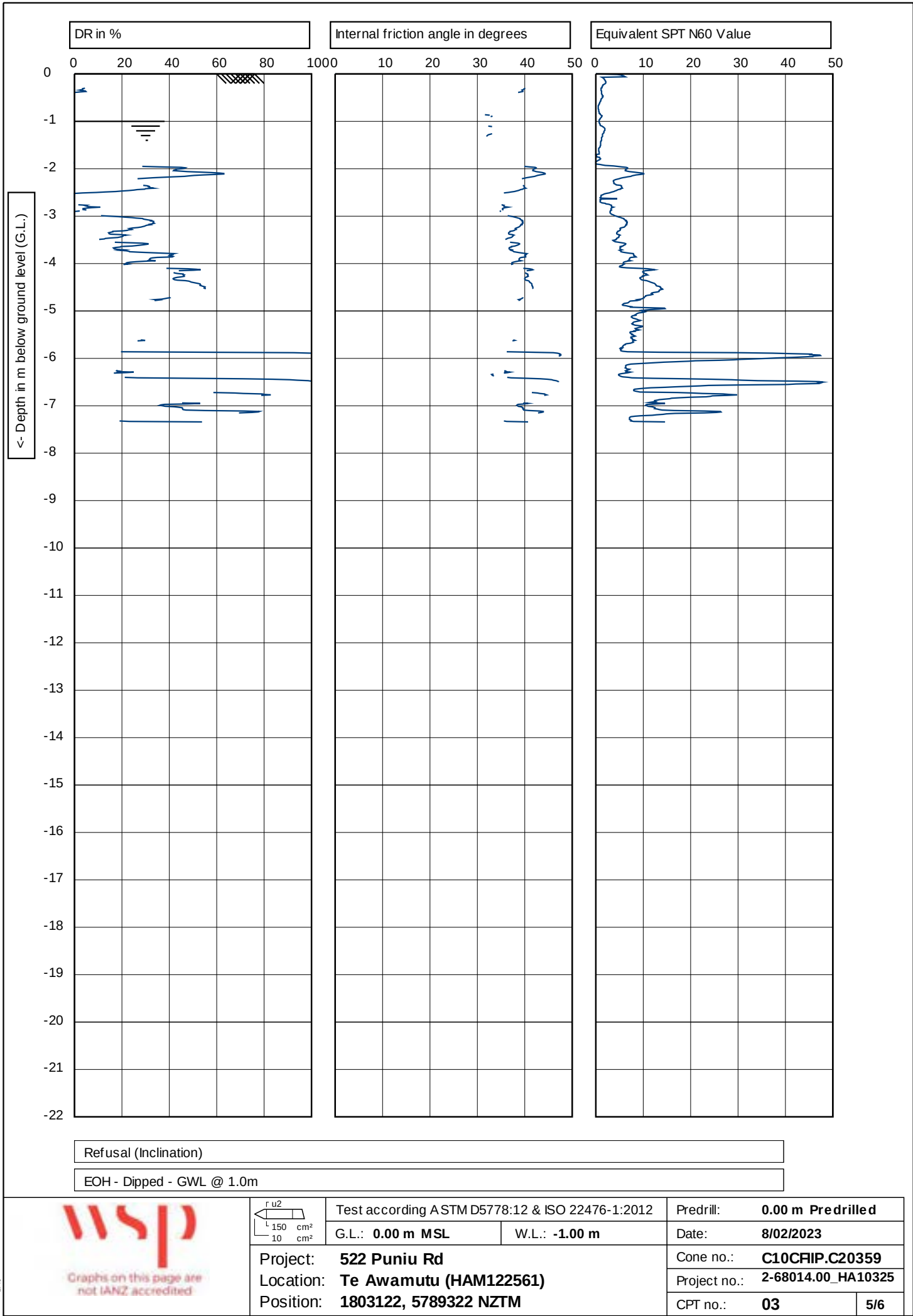
1/6

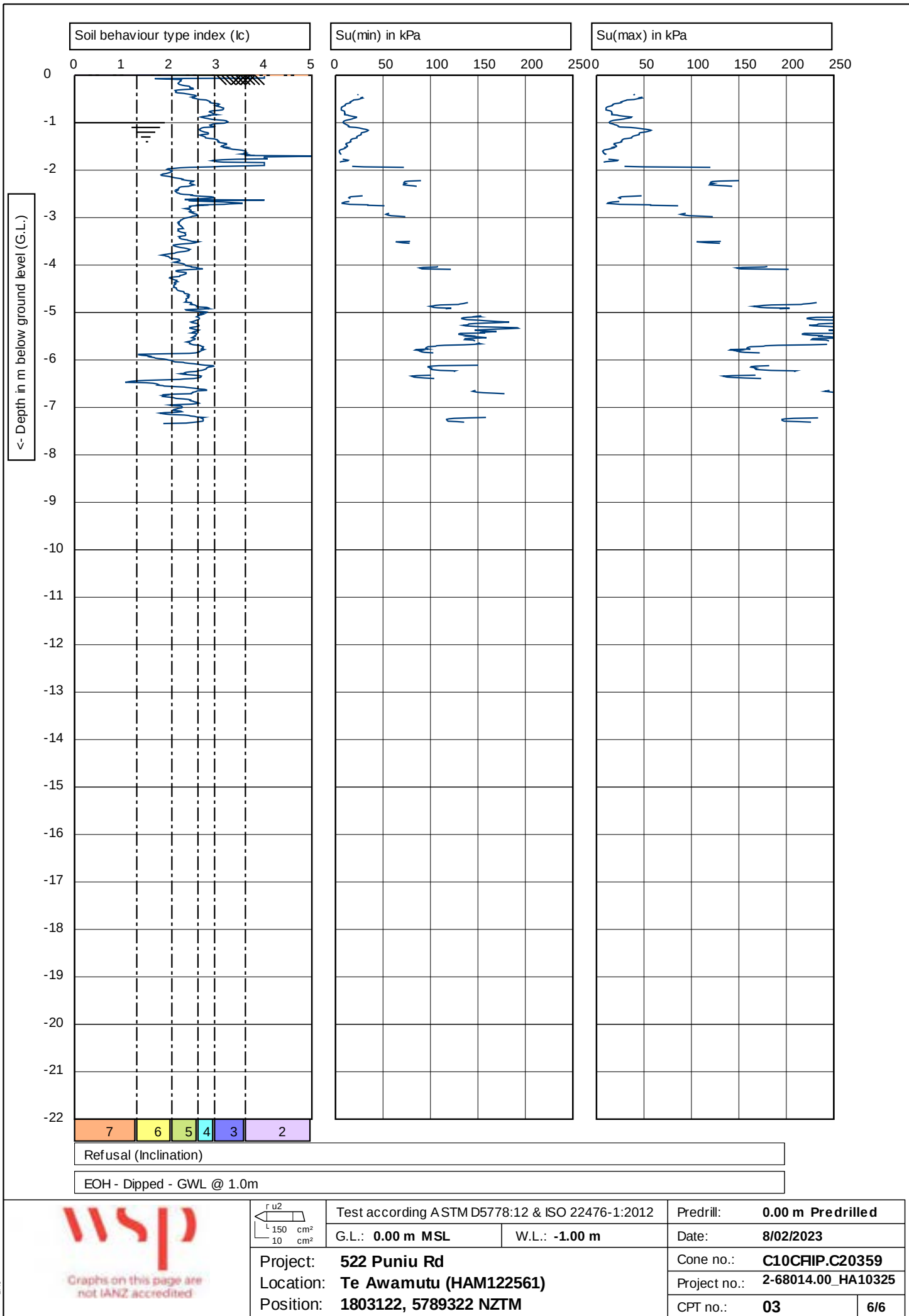


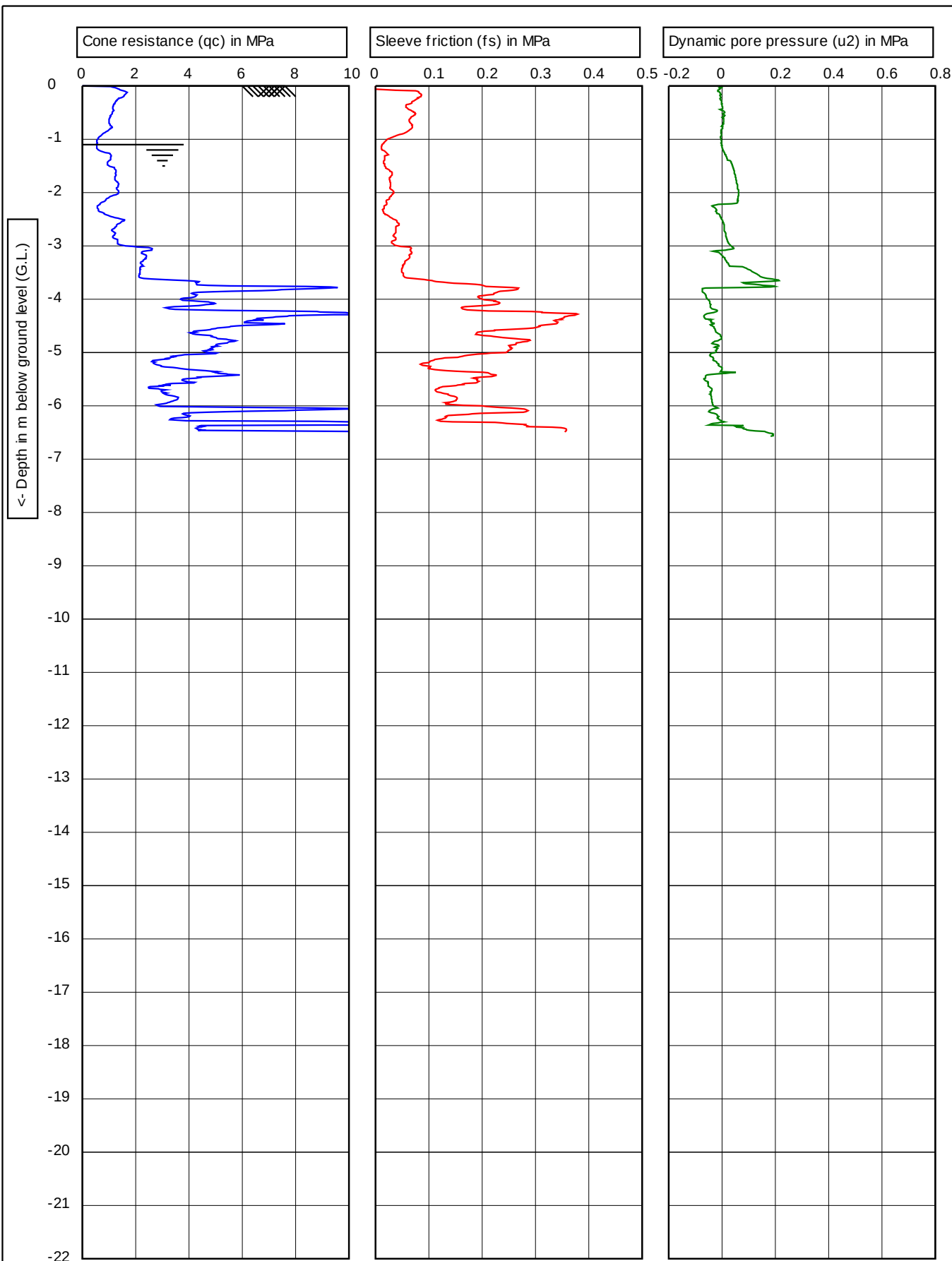




	Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	0.00 m Predrilled	
	G.L.: 0.00 m MSL	W.L.: -1.00 m	Date:	8/02/2023	
Project: 522 Puniu Rd			Cone no.:	C10CHIP.C20359	
Location: Te Awamutu (HAM122561)			Project no.:	2-68014.00_HA10325	
Position: 1803122, 5789322 NZTM			CPT no.:	03	4/6







Refusal (8t Rodflex)

EOH - Dipped - GWL @ 1.1m



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: -1.10 m

Predrill:	0.00 m	Predrilled
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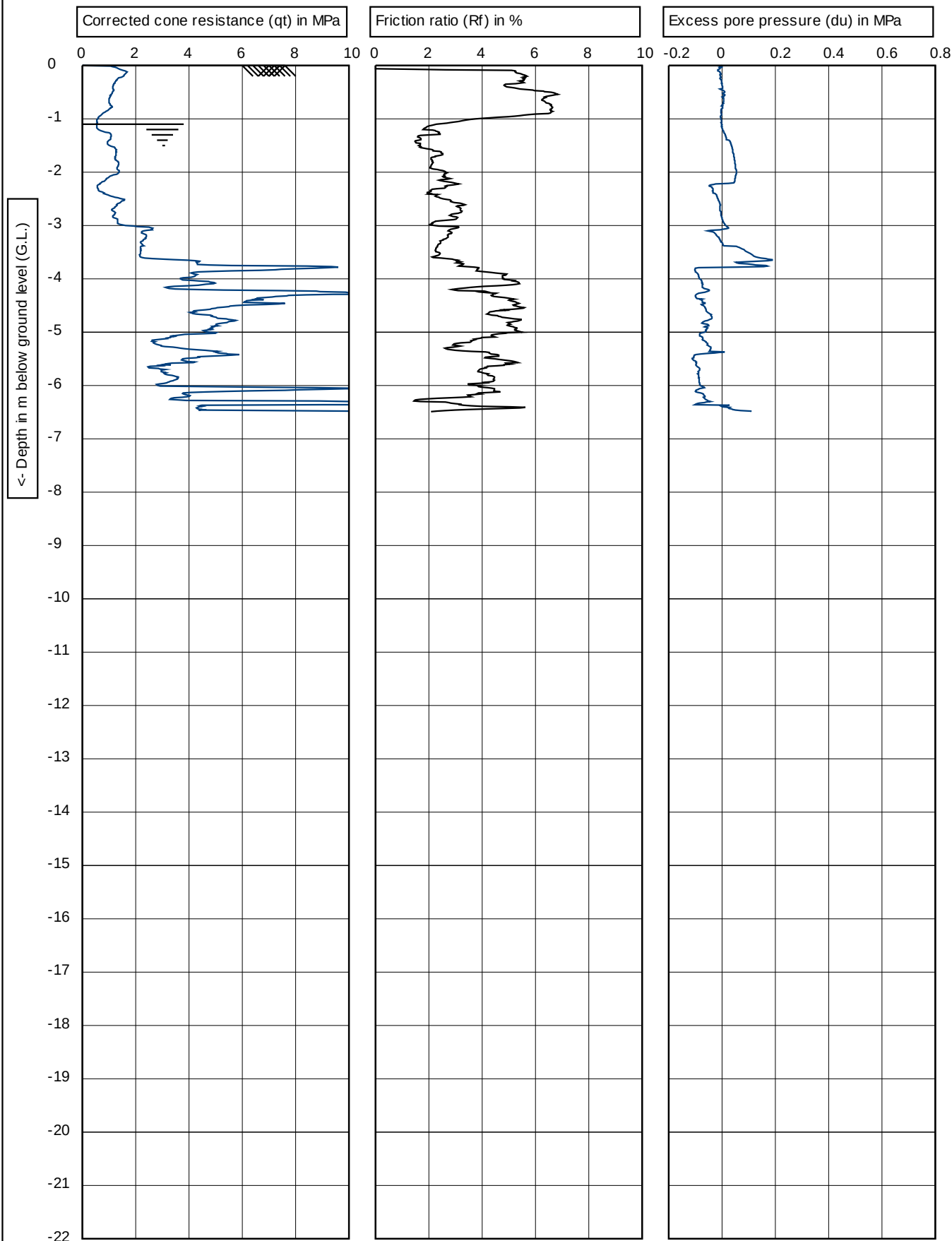
Date:	7/02/2023
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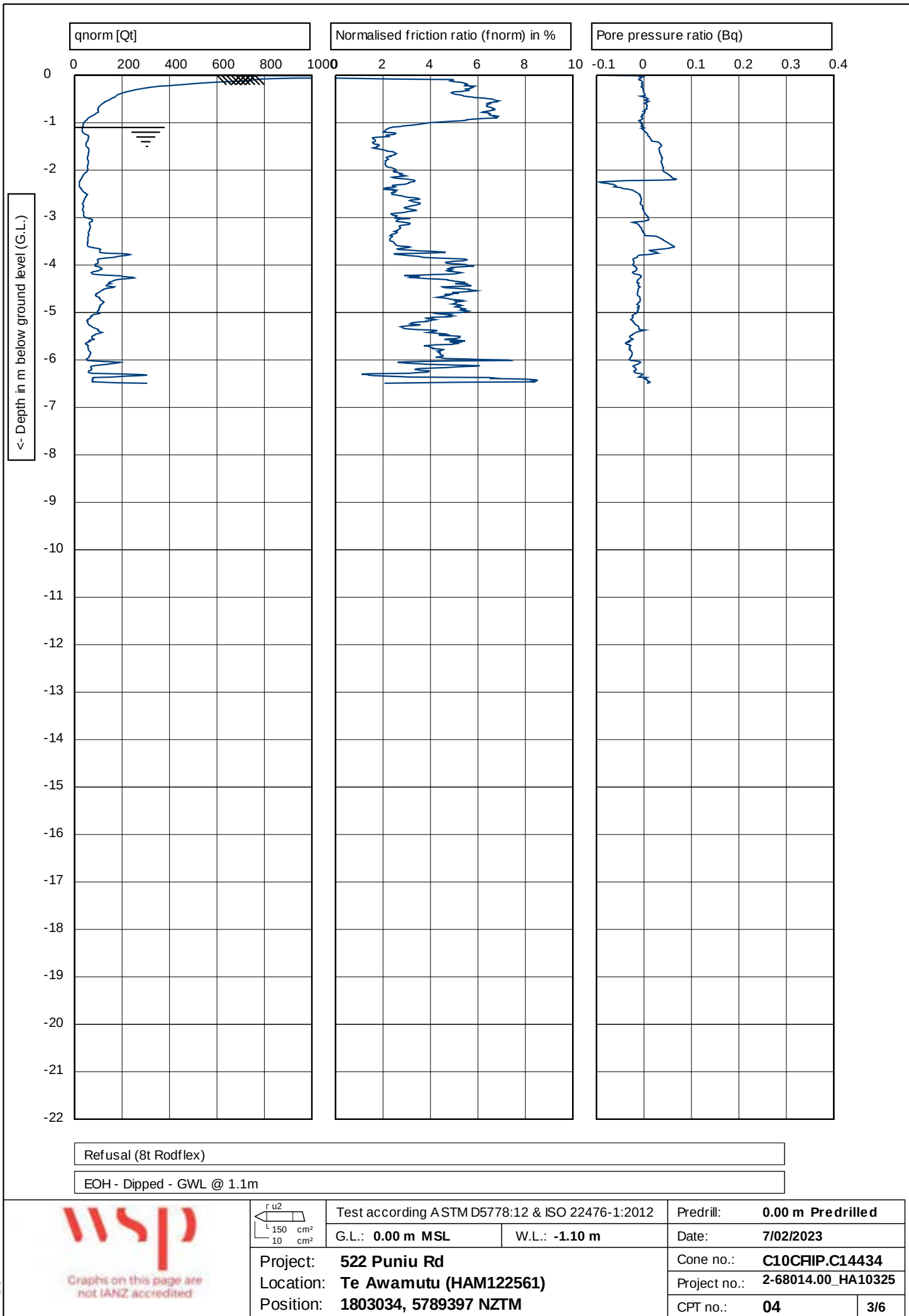
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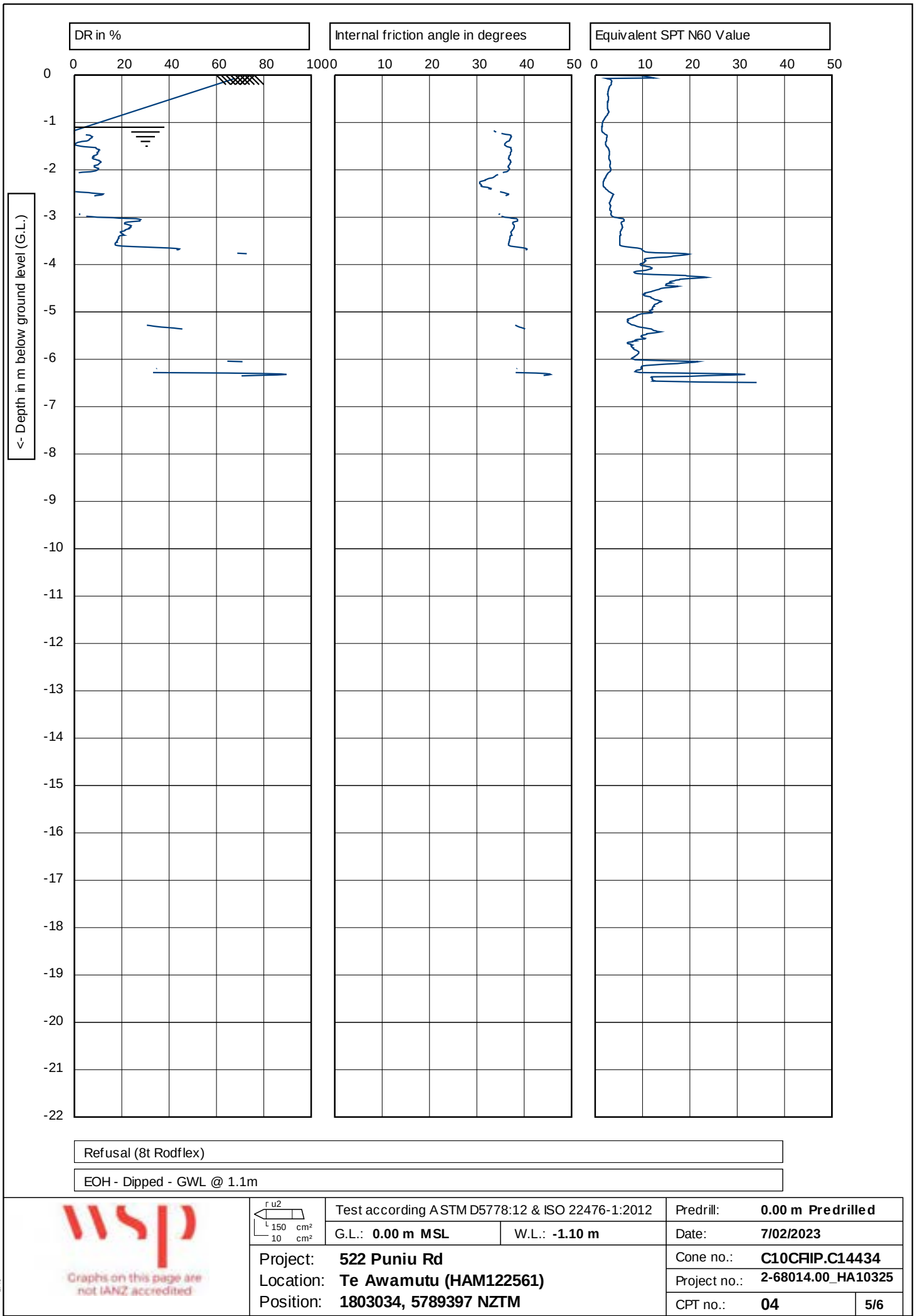
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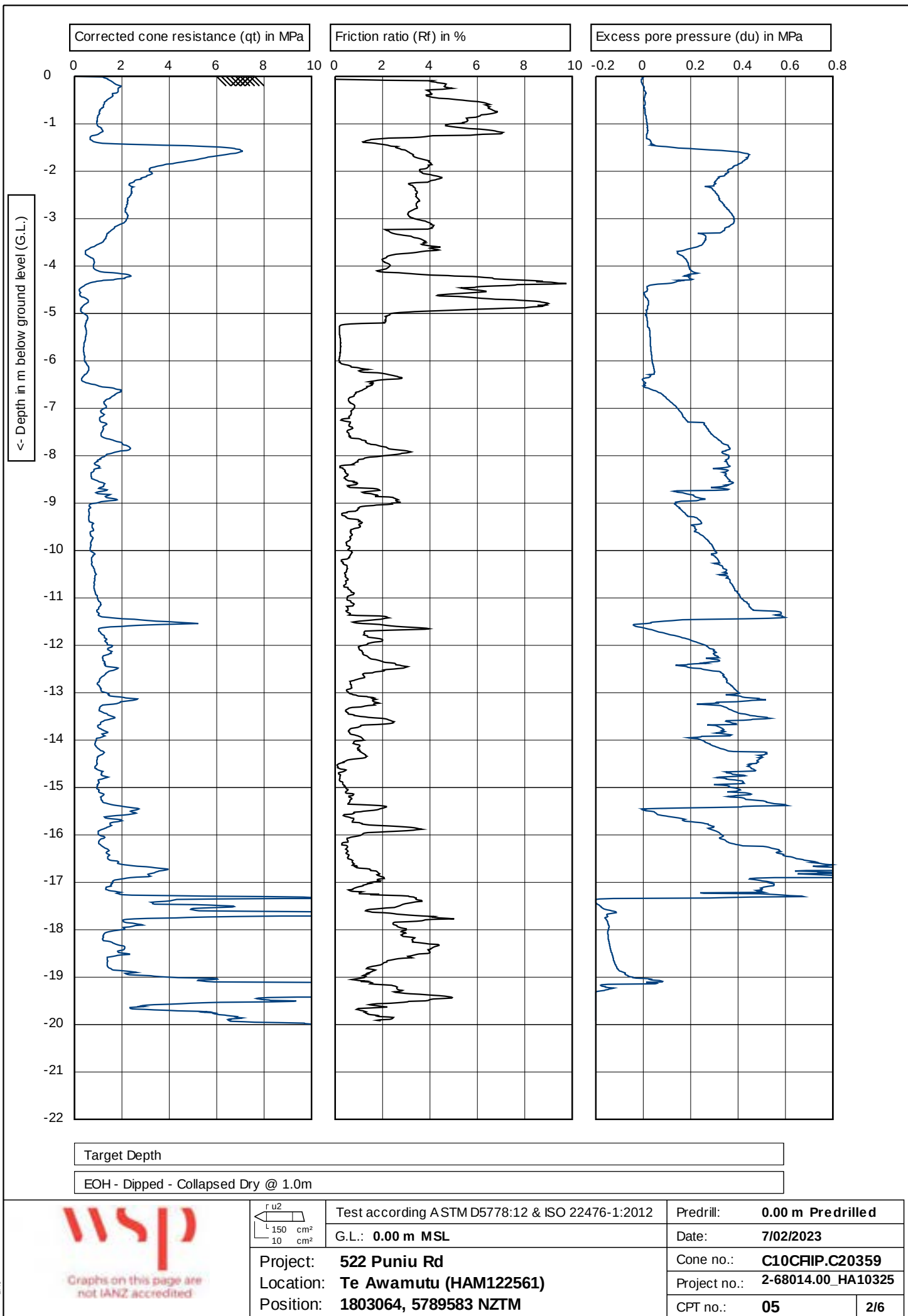
CPT no.:	04
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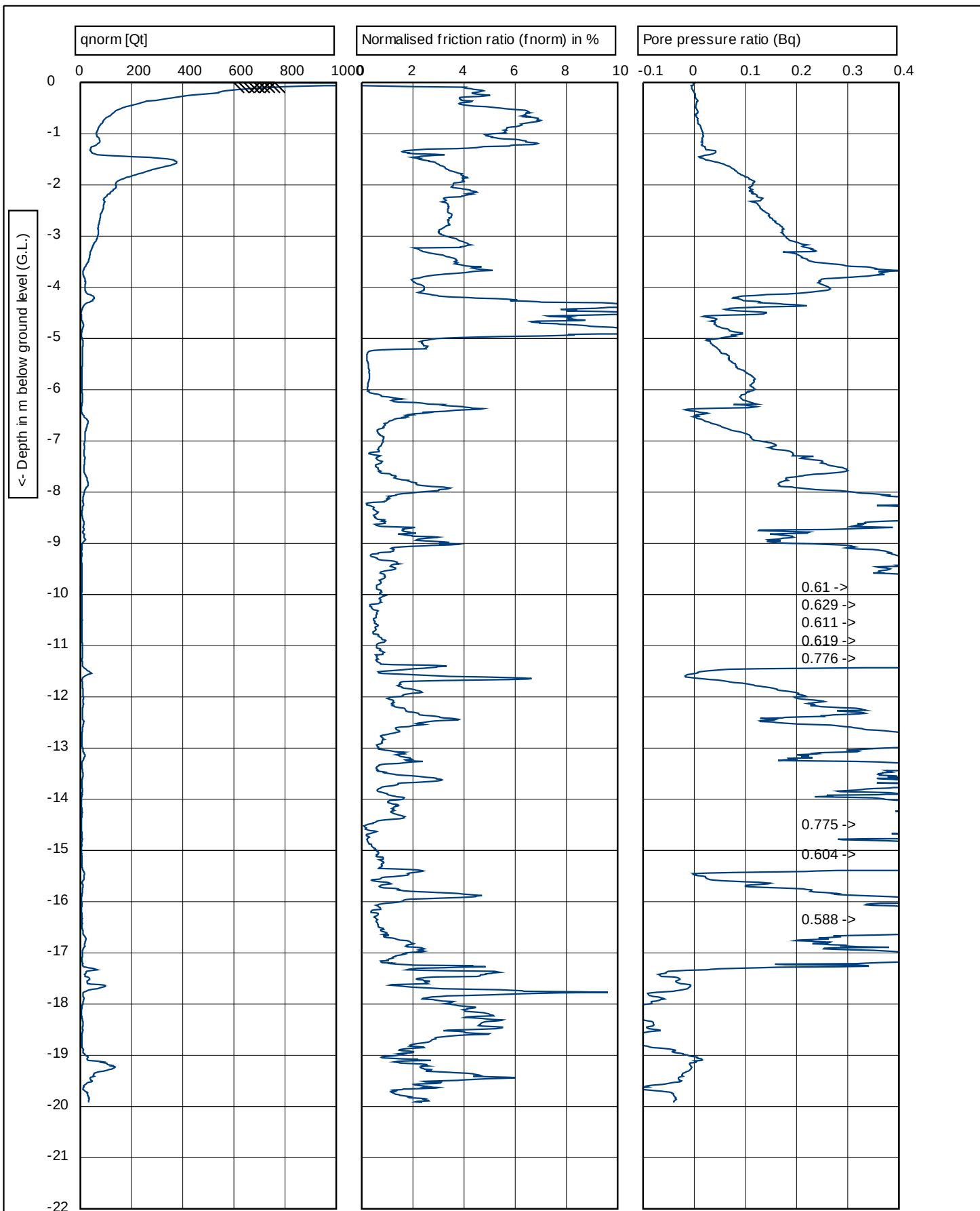
1/6











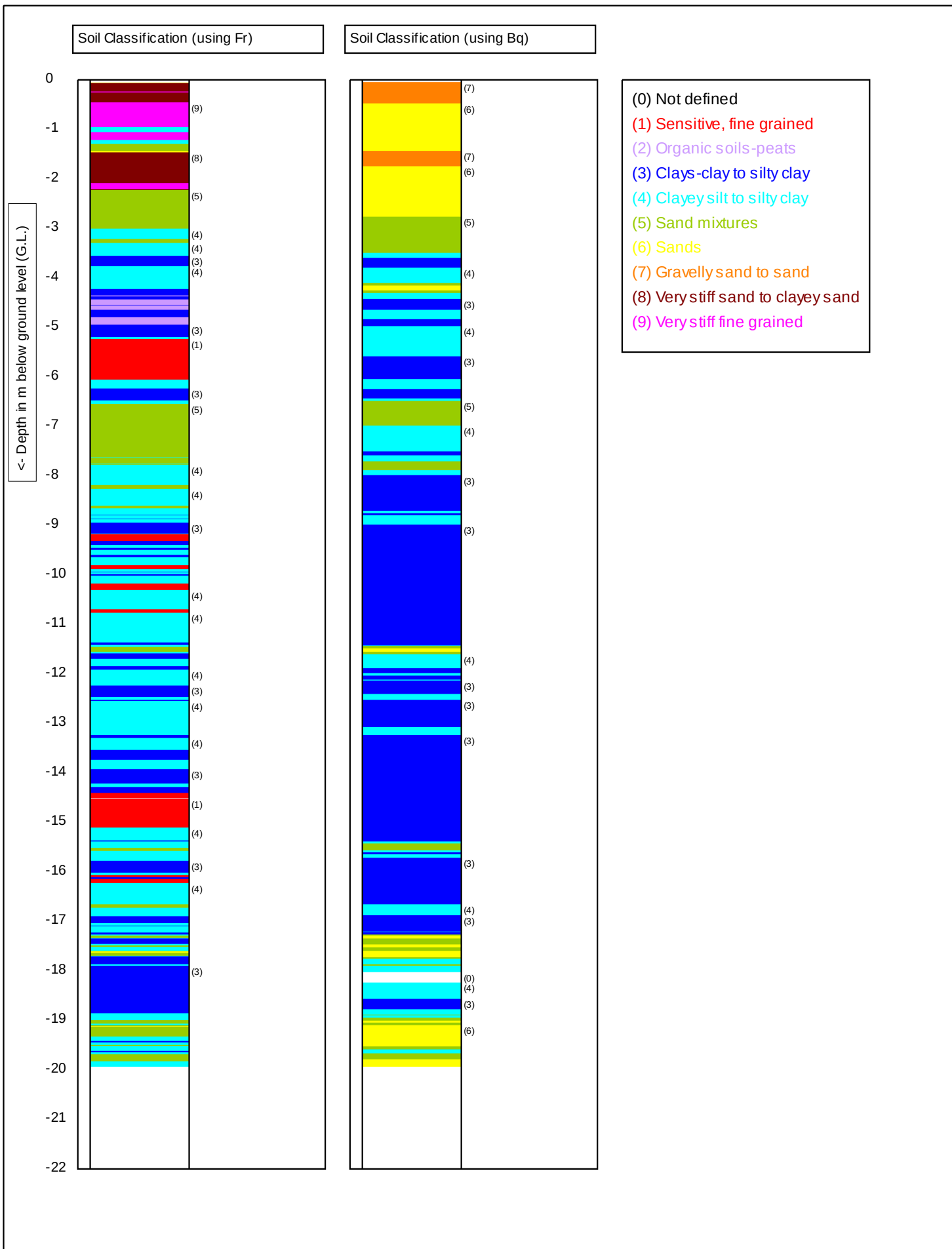
Target Depth

EOH - Dipped - Collapsed Dry @ 1.0m

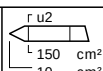


Graphs on this page are not IANZ accredited

150 10 cm² cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: 0.00 m Predrilled	
	G.L.: 0.00 m MSL	Date: 7/02/2023	
	Project: 522 Puniu Rd	Cone no.: C10CFIP.C20359	
	Location: Te Awamutu (HAM122561)	Project no.: 2-68014.00_HA10325	
	Position: 1803064, 5789583 NZTM	CPT no.: 05	3/6



Graphs on this page are not IANZ accredited



Test according ASTM D5778:12 & ISO 22476-1:2012

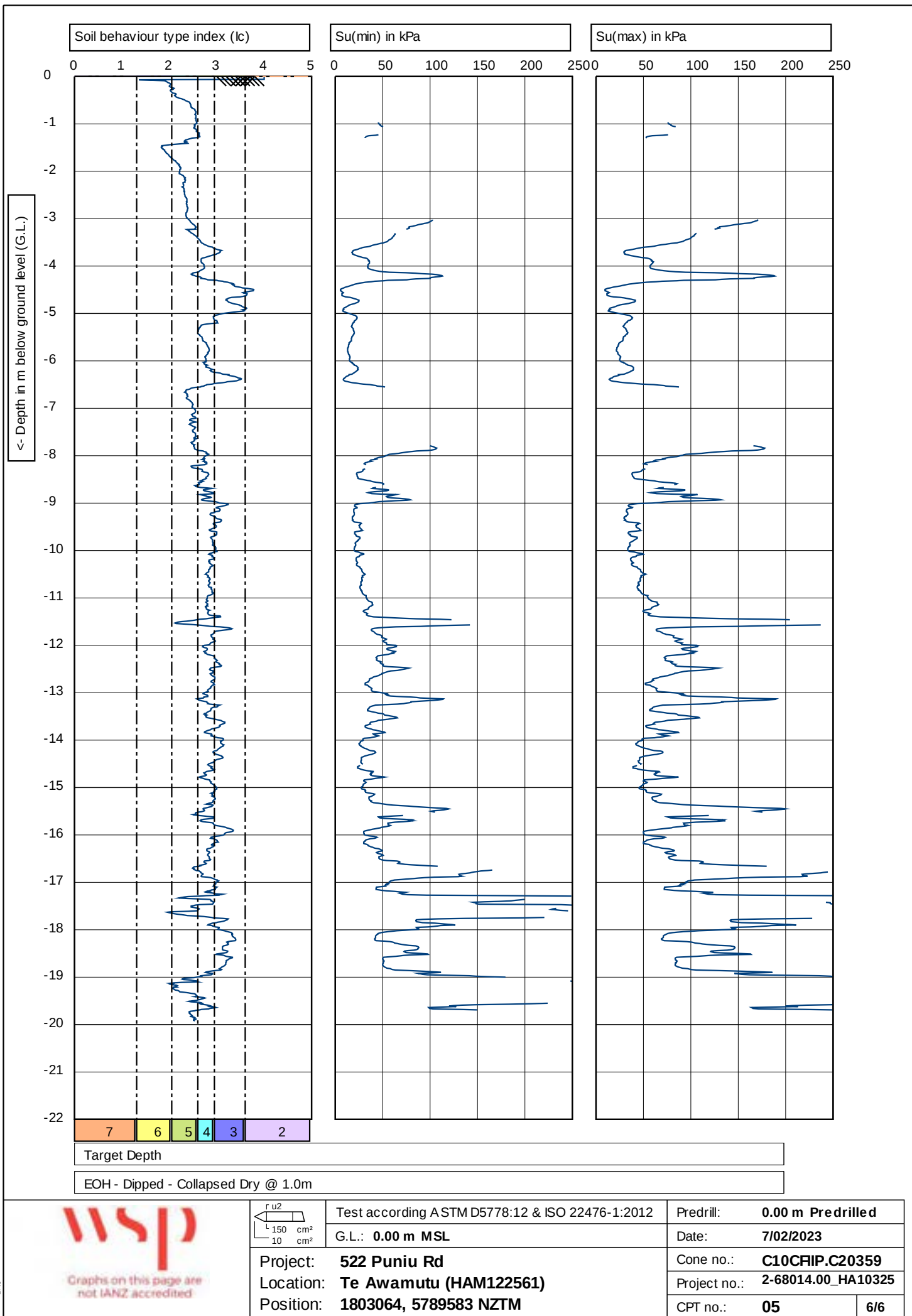
G.L.: 0.00 m MSL

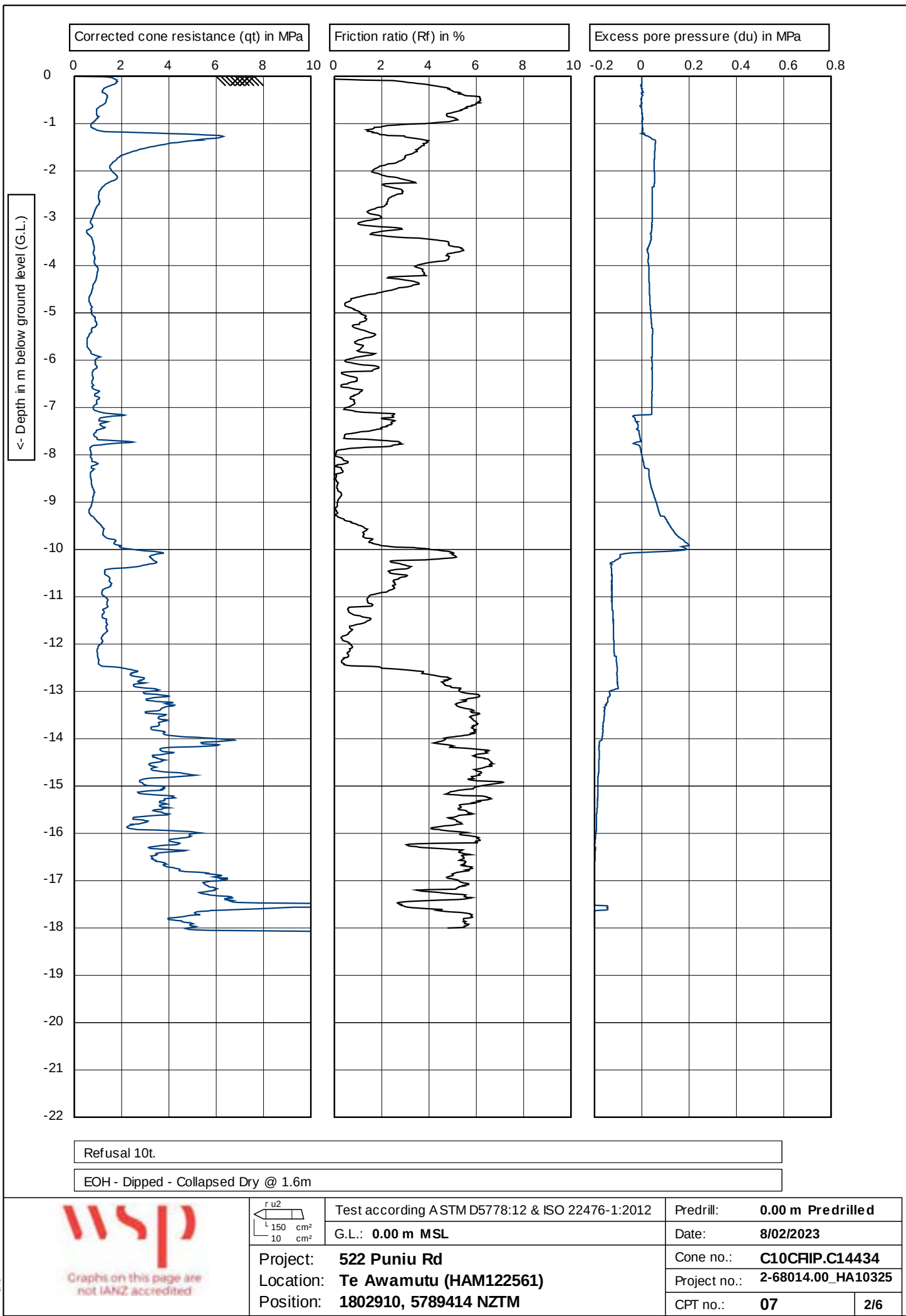
Predrill: 0.00 m Predrilled

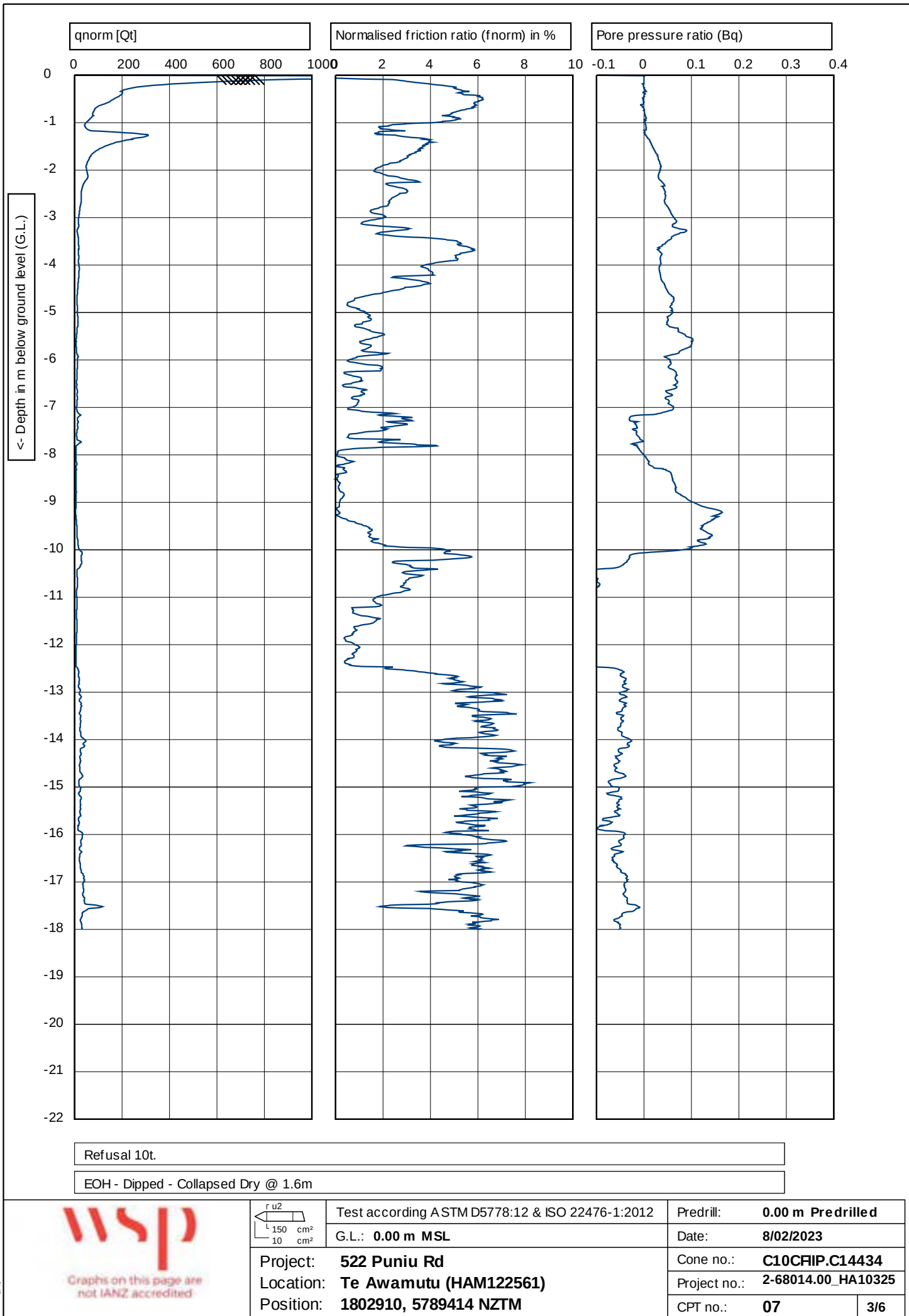
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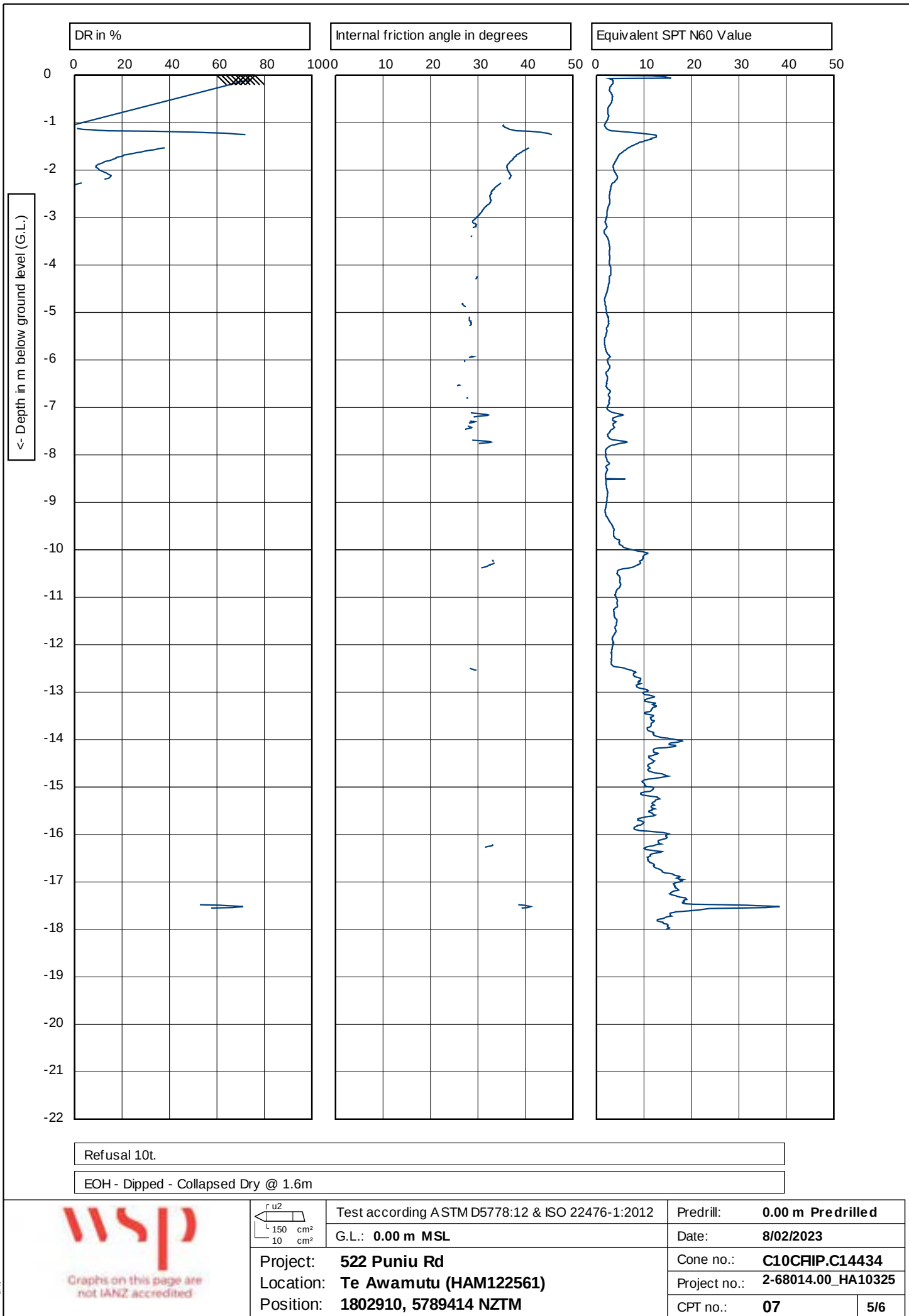
Project: 522 Puniu Rd
 Location: Te Awamutu (HAM122561)
 Position: 1803064, 5789583 NZTM

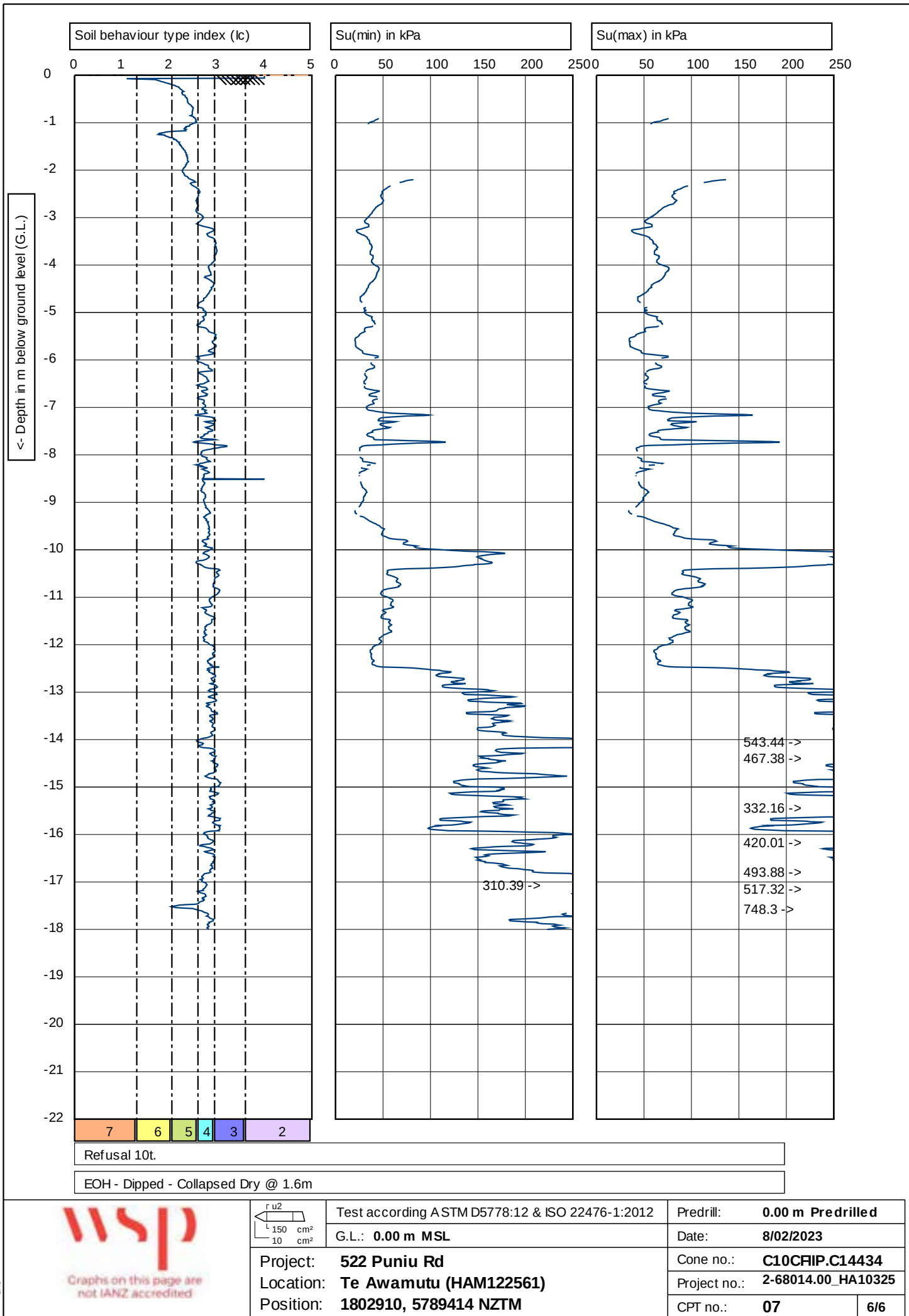
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 CPT no.: 05

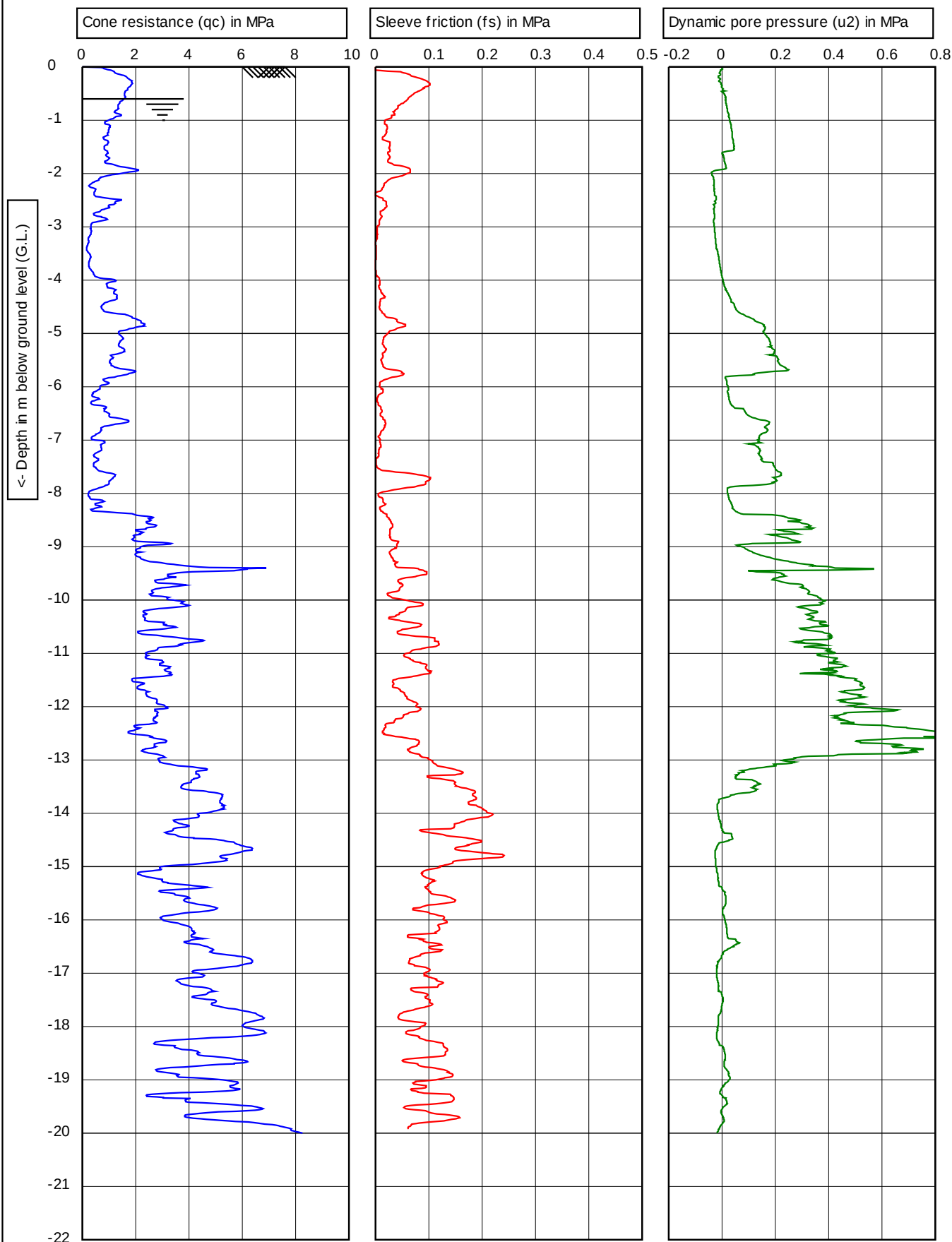












Target Depth

EOH - Dipped - GWL @ 0.6m



Diagram of a pencil with a conical tip and a cylindrical body. The conical tip has a radius of 2 cm and a height of 150 cm. The cylindrical body has a radius of 10 cm and a height of 150 cm.

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: -0.60 m

Predrill:	0.00 m	Predrilled
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Date:	8/02/2023
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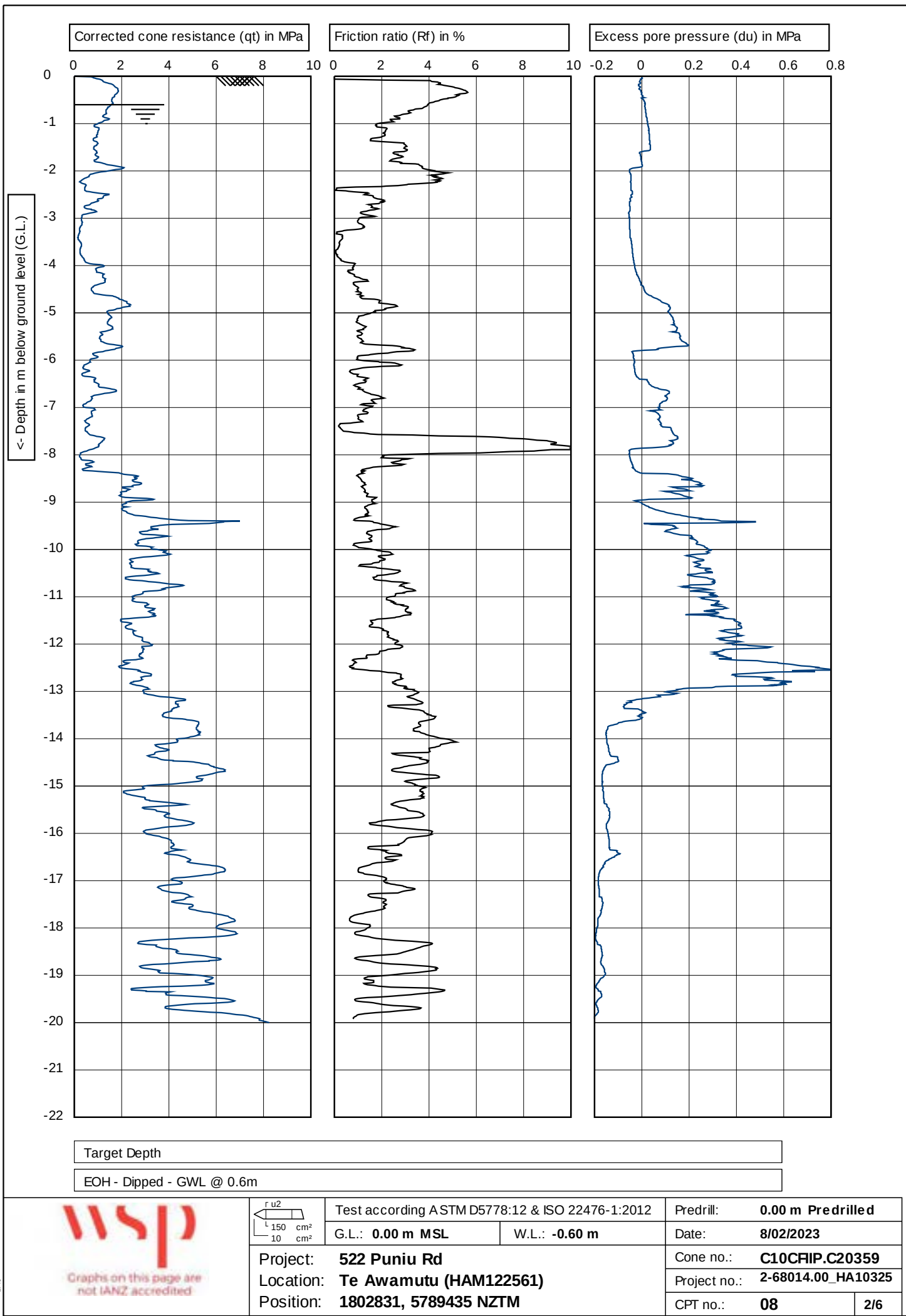
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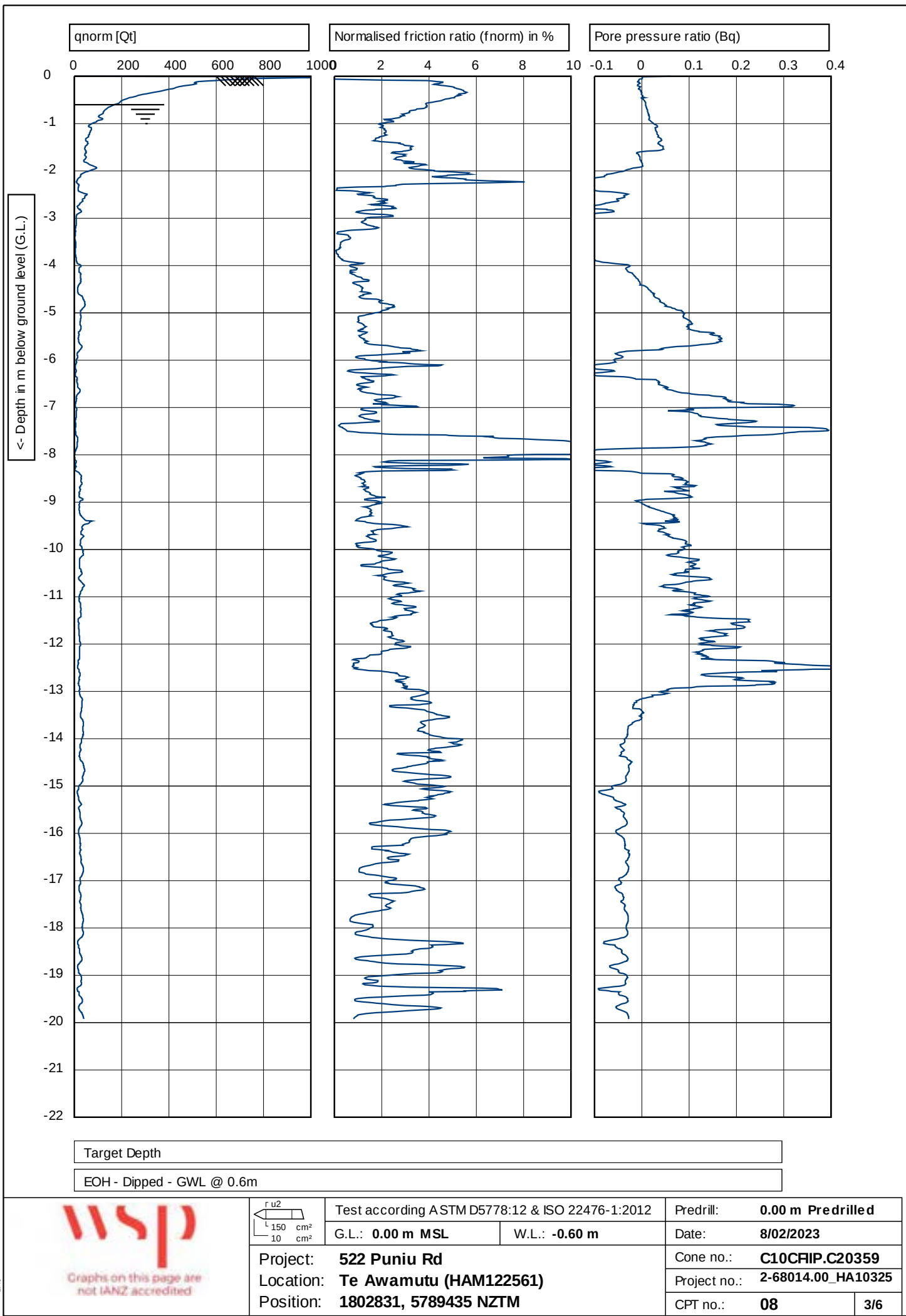
Project no.:	2-68014.00_HA10325
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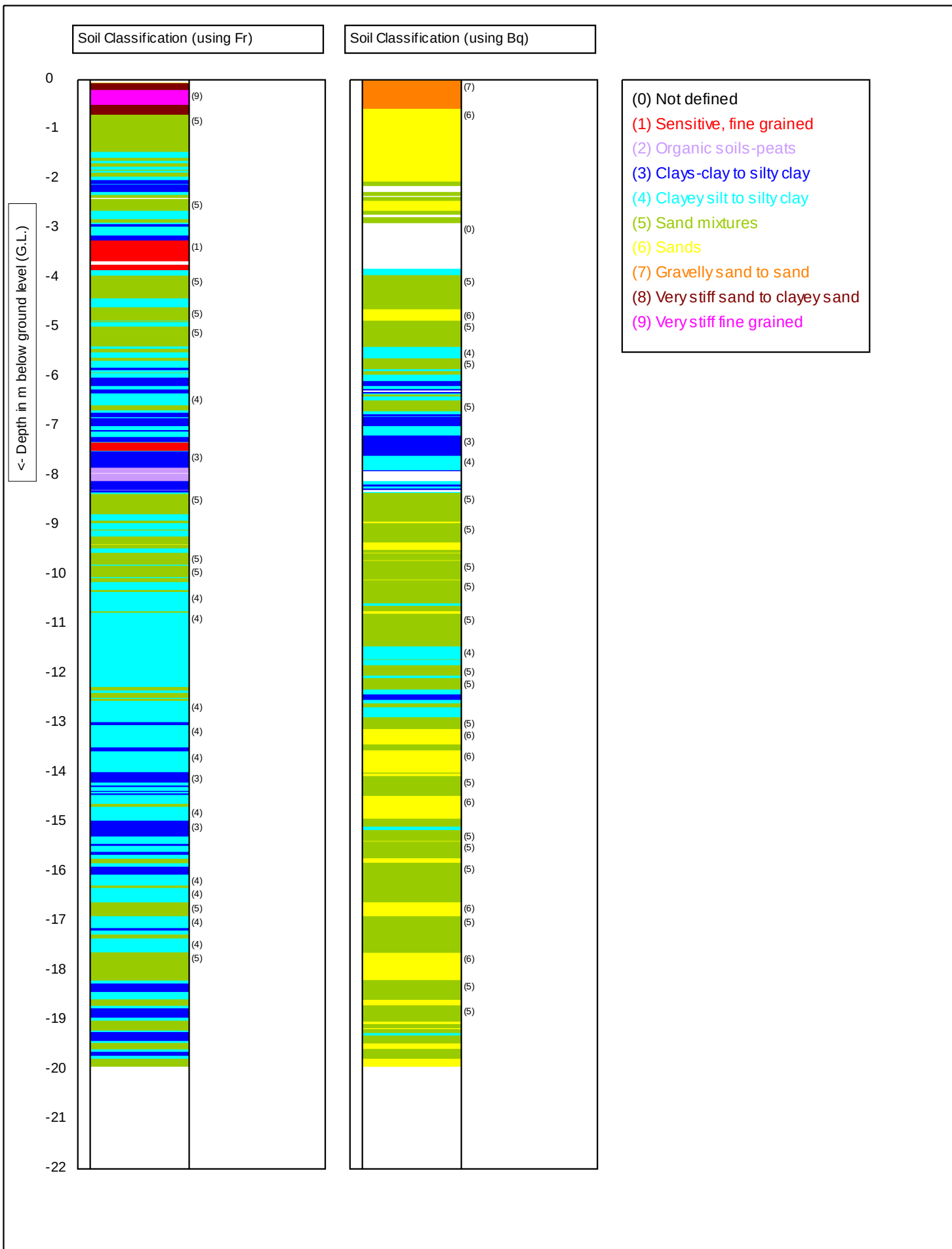
CPT no.:	08
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1/6

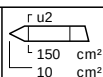
Project: **522 Puniu Rd**
Location: **Te Awamutu (HAM122561)**
Position: **1802831, 5789435 NZTM**







Graphs on this page are not IANZ accredited



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: -0.60 m

Predrill: 0.00 m Predrilled

Date: 8/02/2023

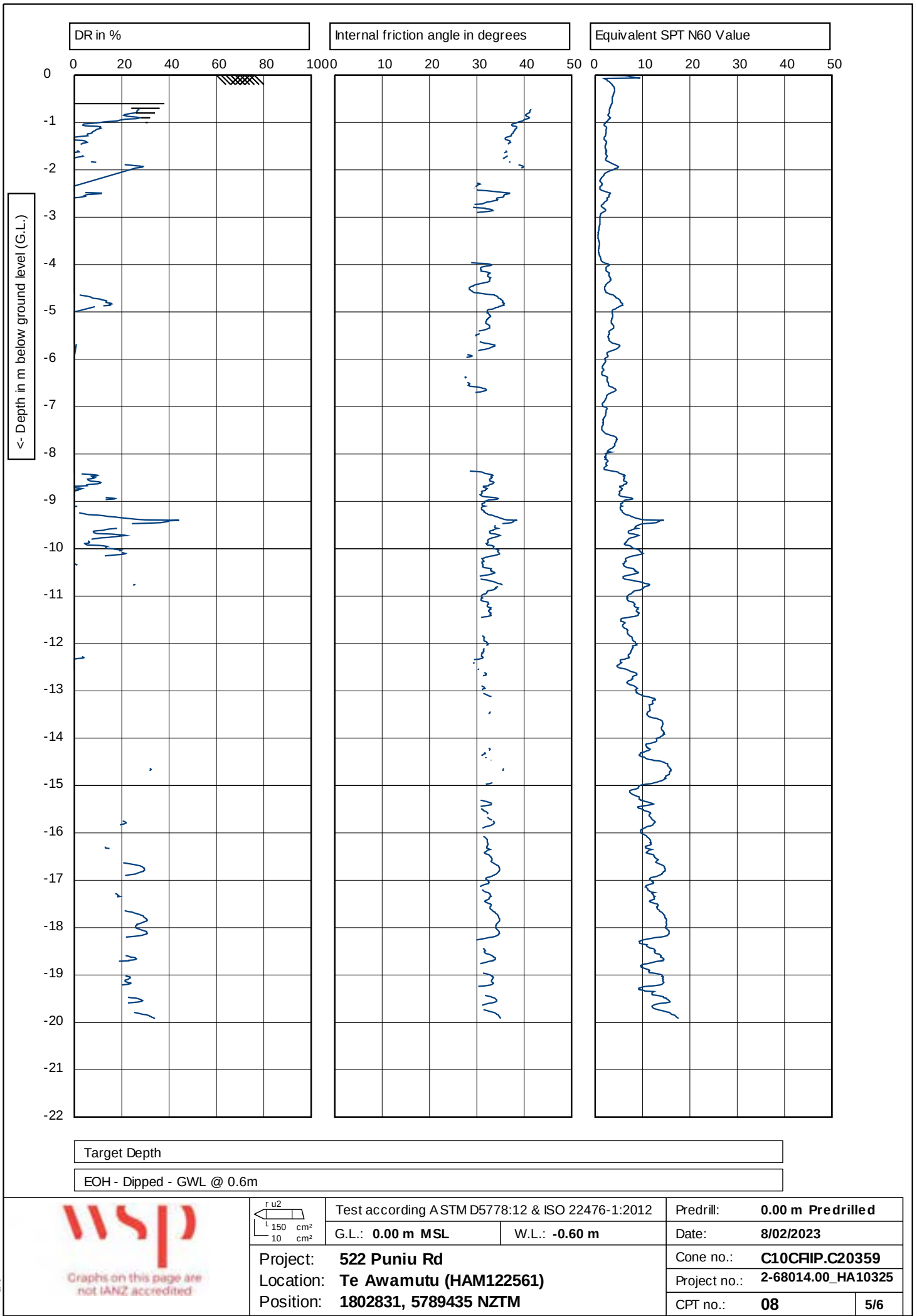
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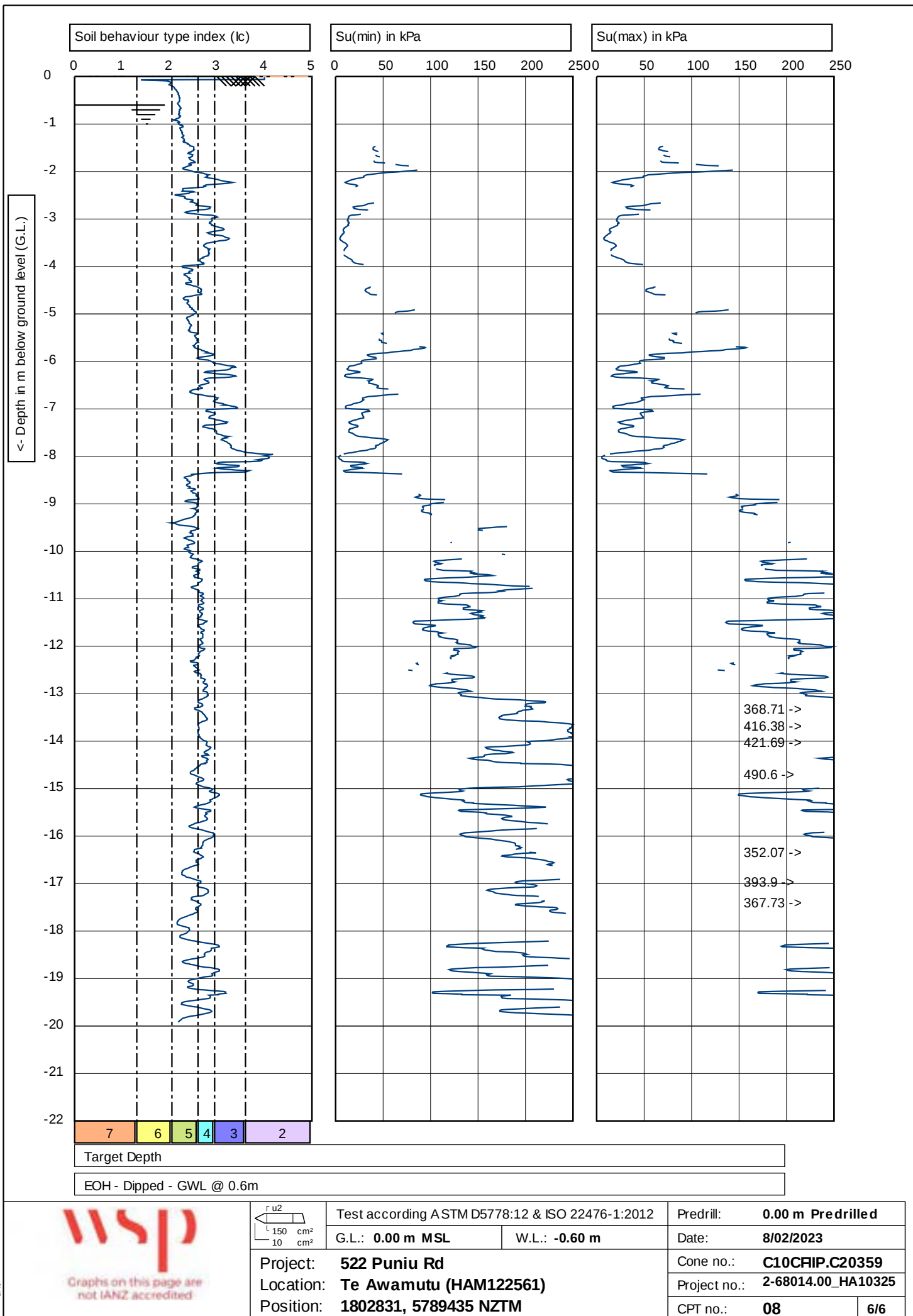
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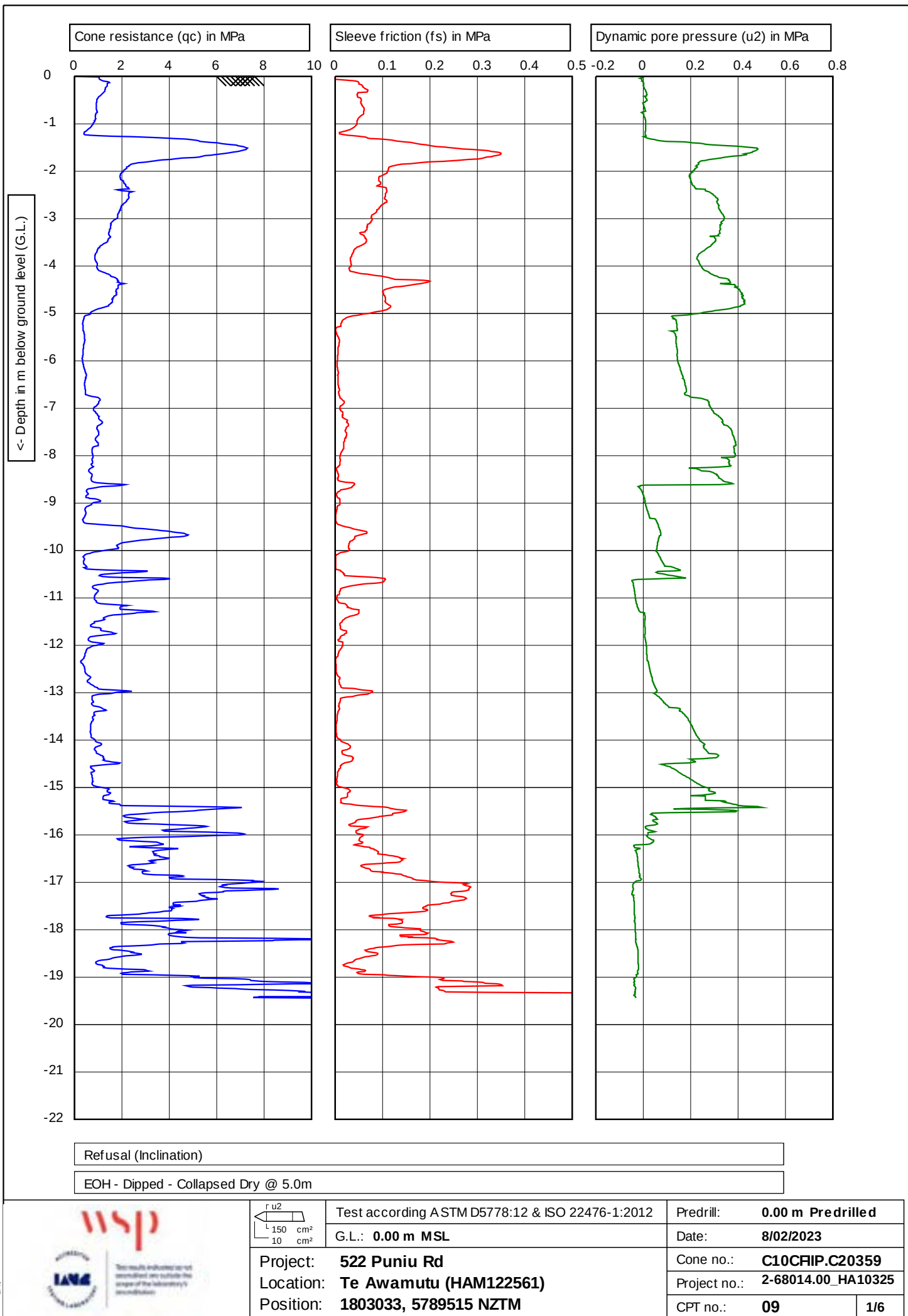
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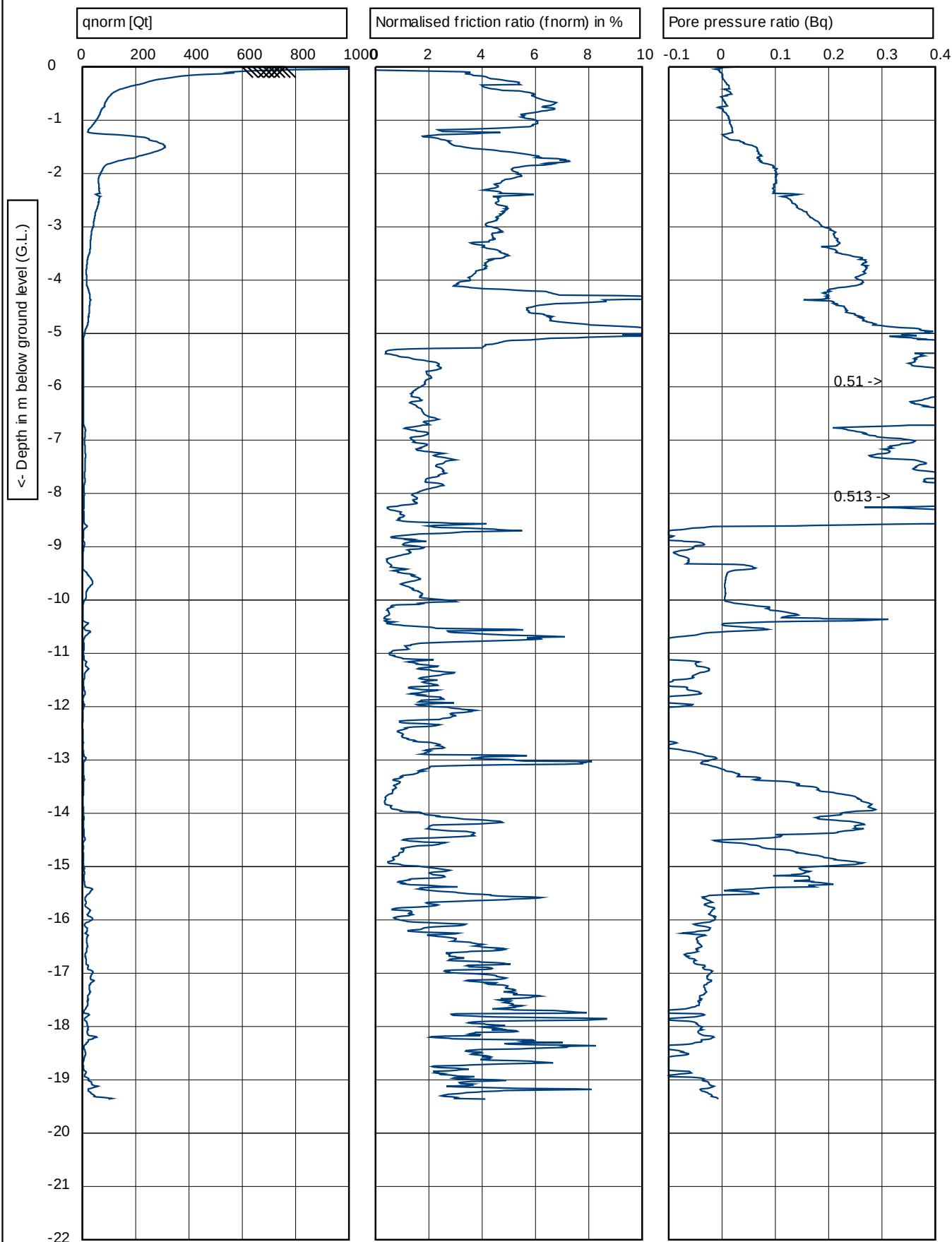
4/6

Project: 522 Puniu Rd
 Location: Te Awamutu (HAM122561)
 Position: 1802831, 5789435 NZTM









Refusal (Inclination)

EOH - Dipped - Collapsed Dry @ 5.0m



Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: **522 Puniu Rd**
Location: **Te Awamutu (HAM122561)**
Position: **1803033, 5789515 NZTM**

Predrill:	0.00 m	Predrilled
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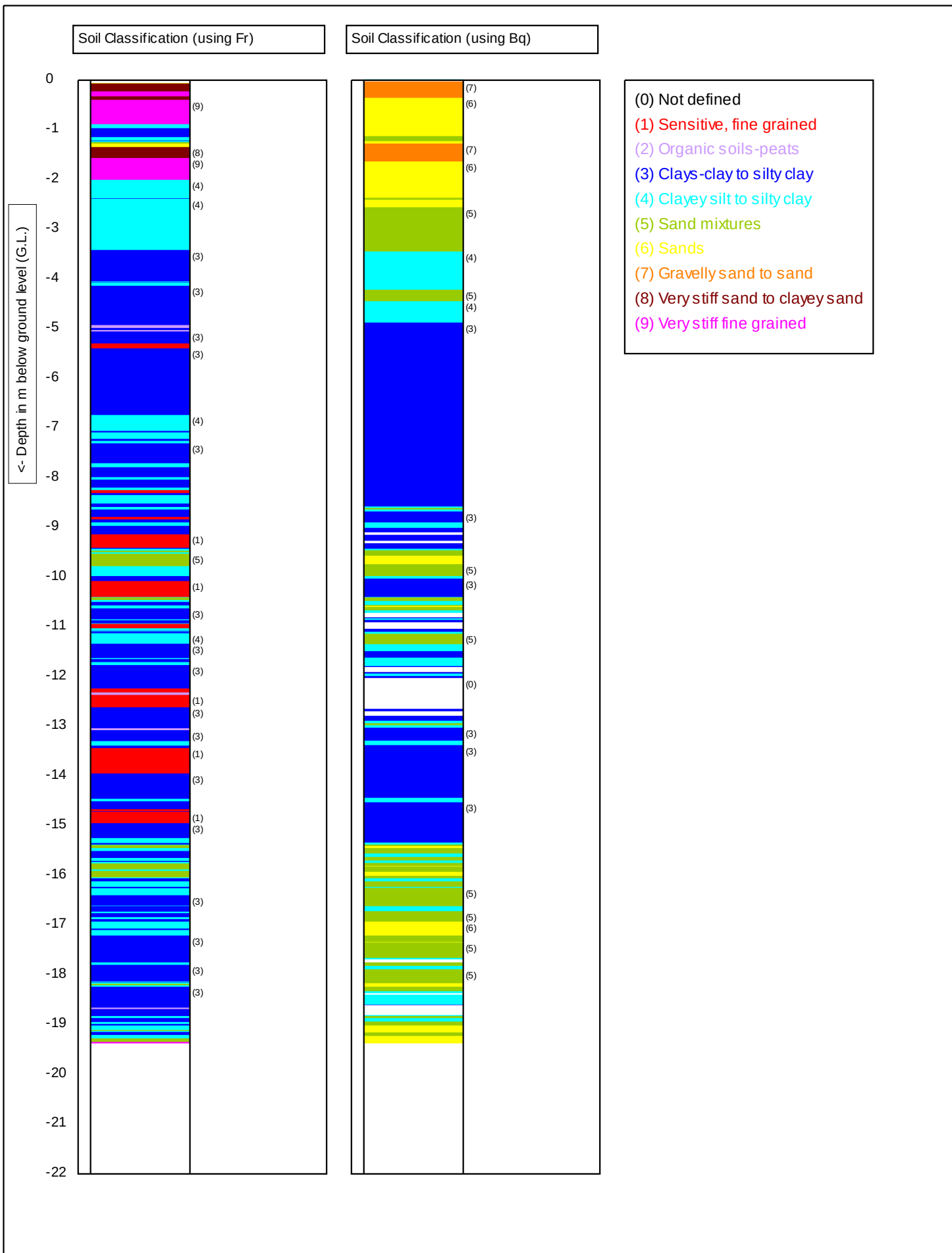
Date:	8/02/2023
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Cone no.: **C10CFIP.C20359**

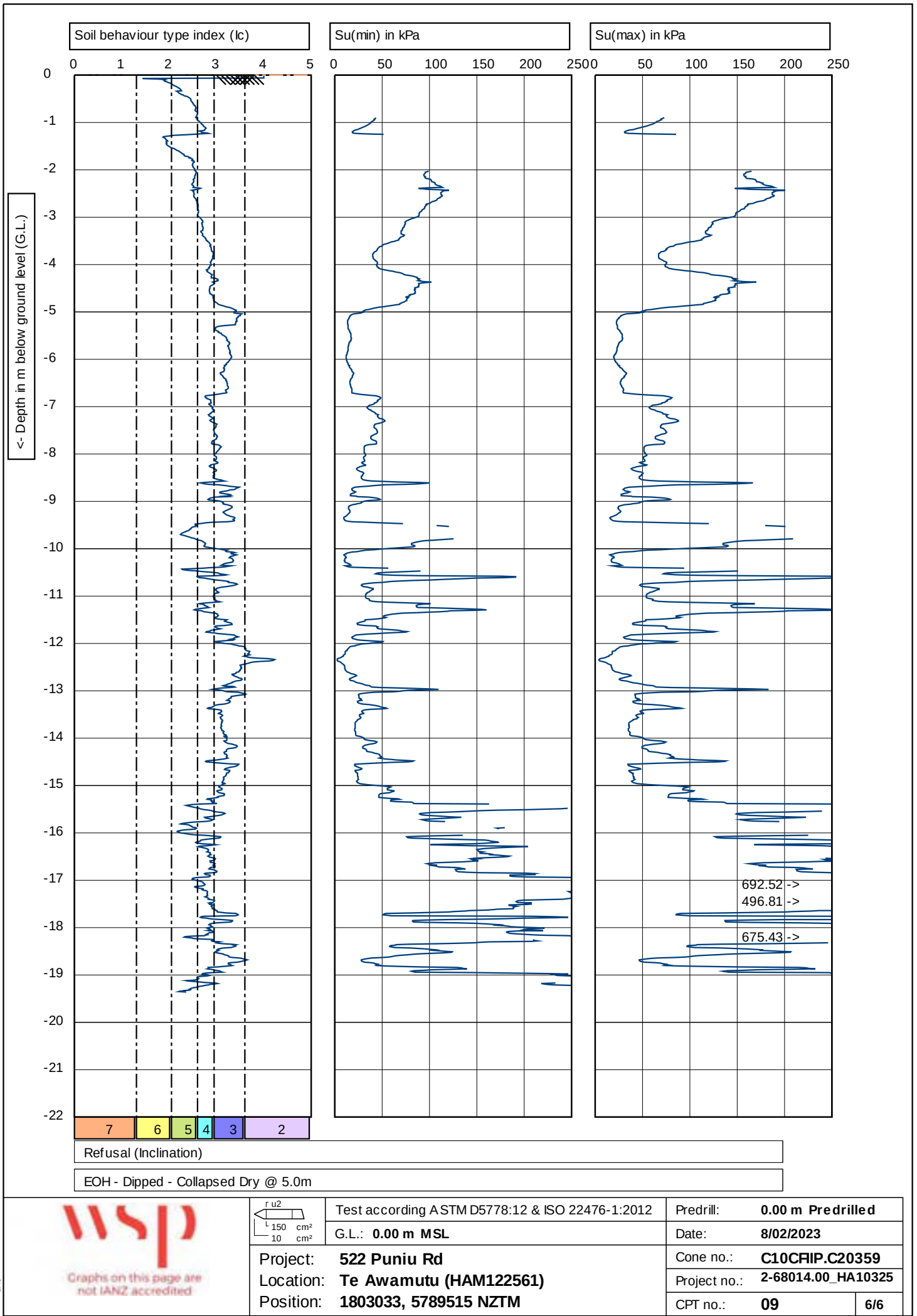
Project no.:	2-68014.00_HA10325
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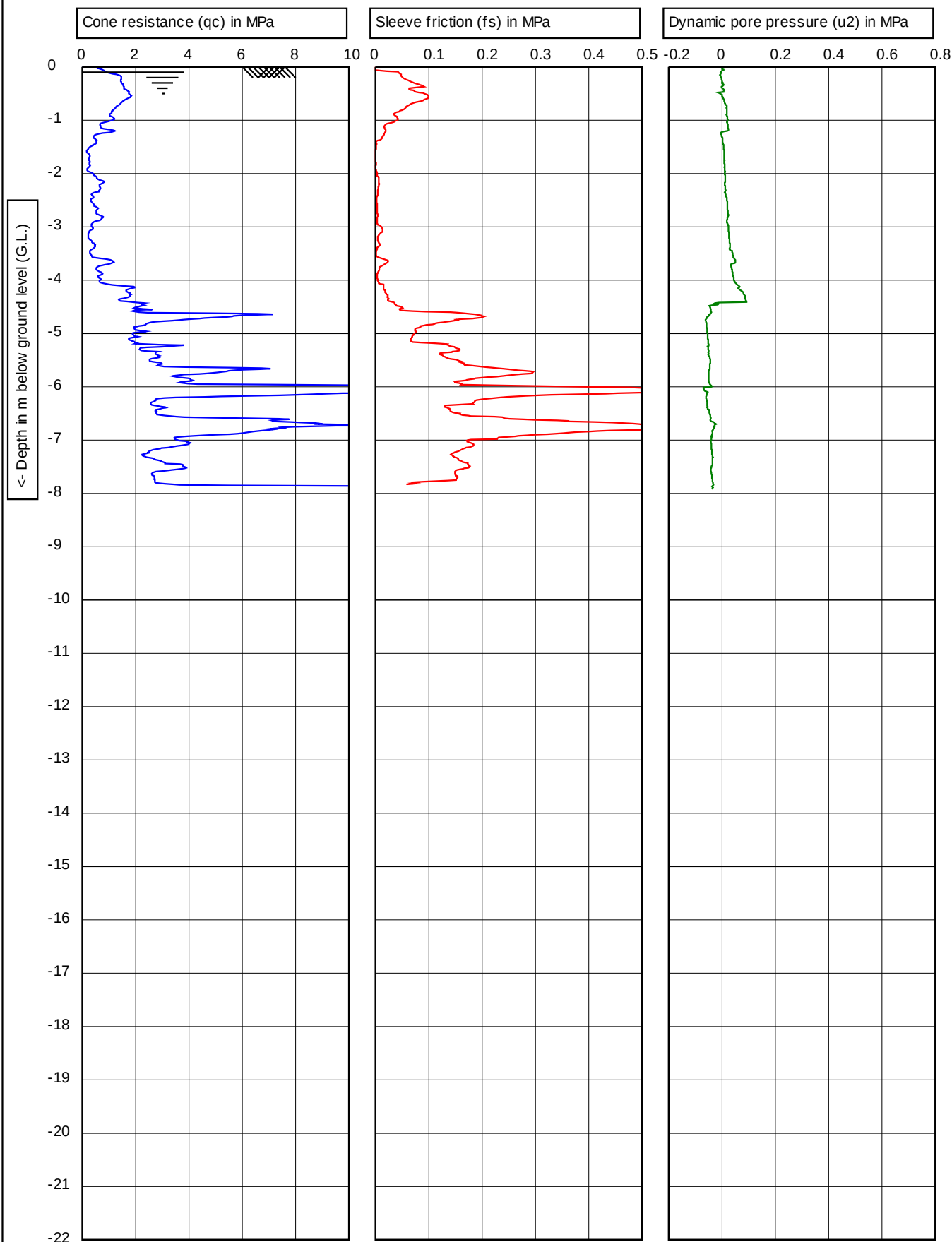
CPT no.:	09
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 Graphs on this page are not IANZ accredited		Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill: 0.00 m Predrilled	
		G.L.: 0.00 m MSL		Date: 8/02/2023	
	Project: 522 Puniu Rd		Cone no.: C10CFIP.C20359		
	Location: Te Awamutu (HAM122561)		Project no.: 2-68014.00_HA10325		
	Position: 1803033, 5789515 NZTM		CPT no.: 09	4/6	

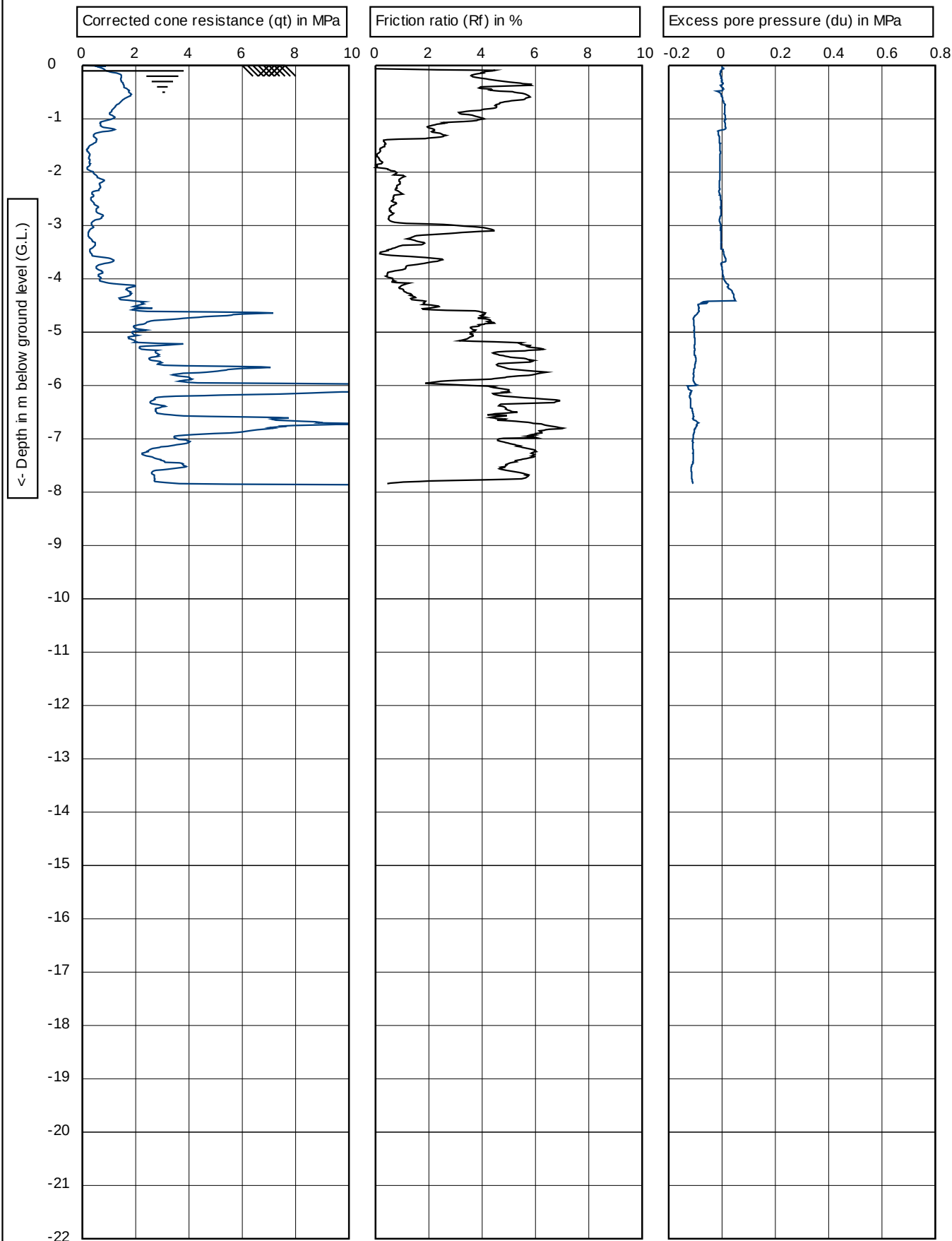


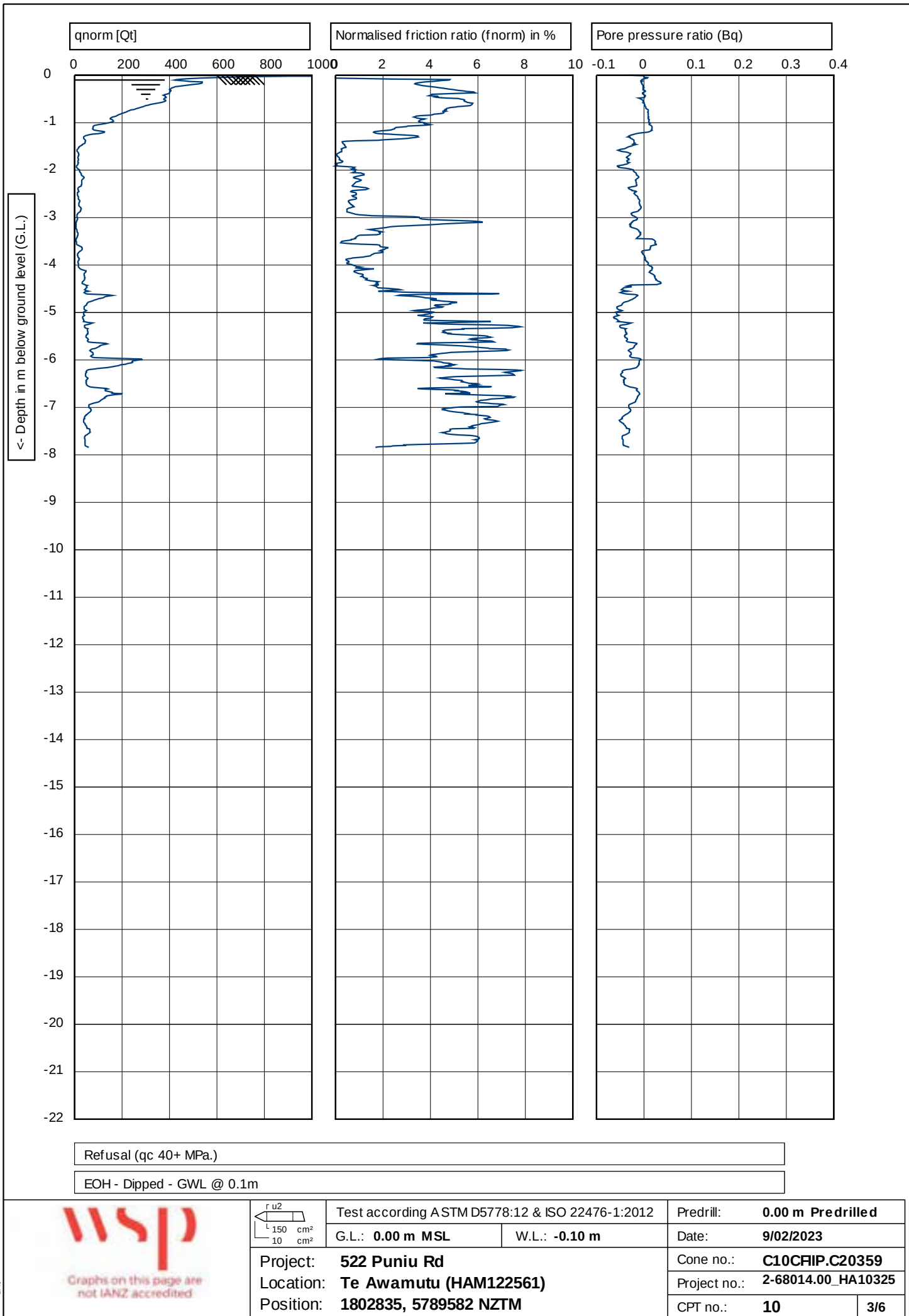


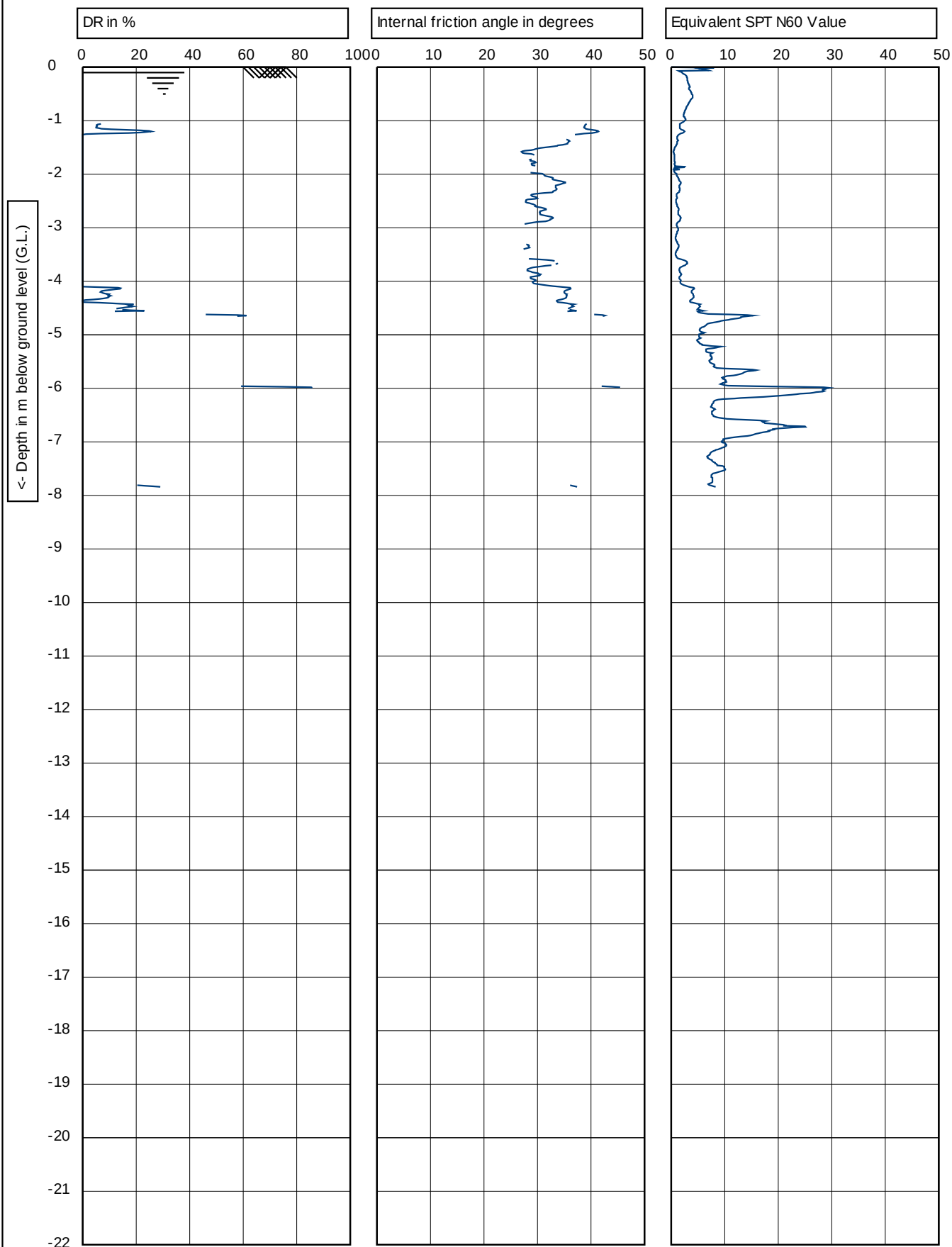
Refusal (qc 40+ MPa.)



Diagram of a pencil with a conical tip and a cylindrical body. The total length is 150 cm and the total surface area is 10 cm².

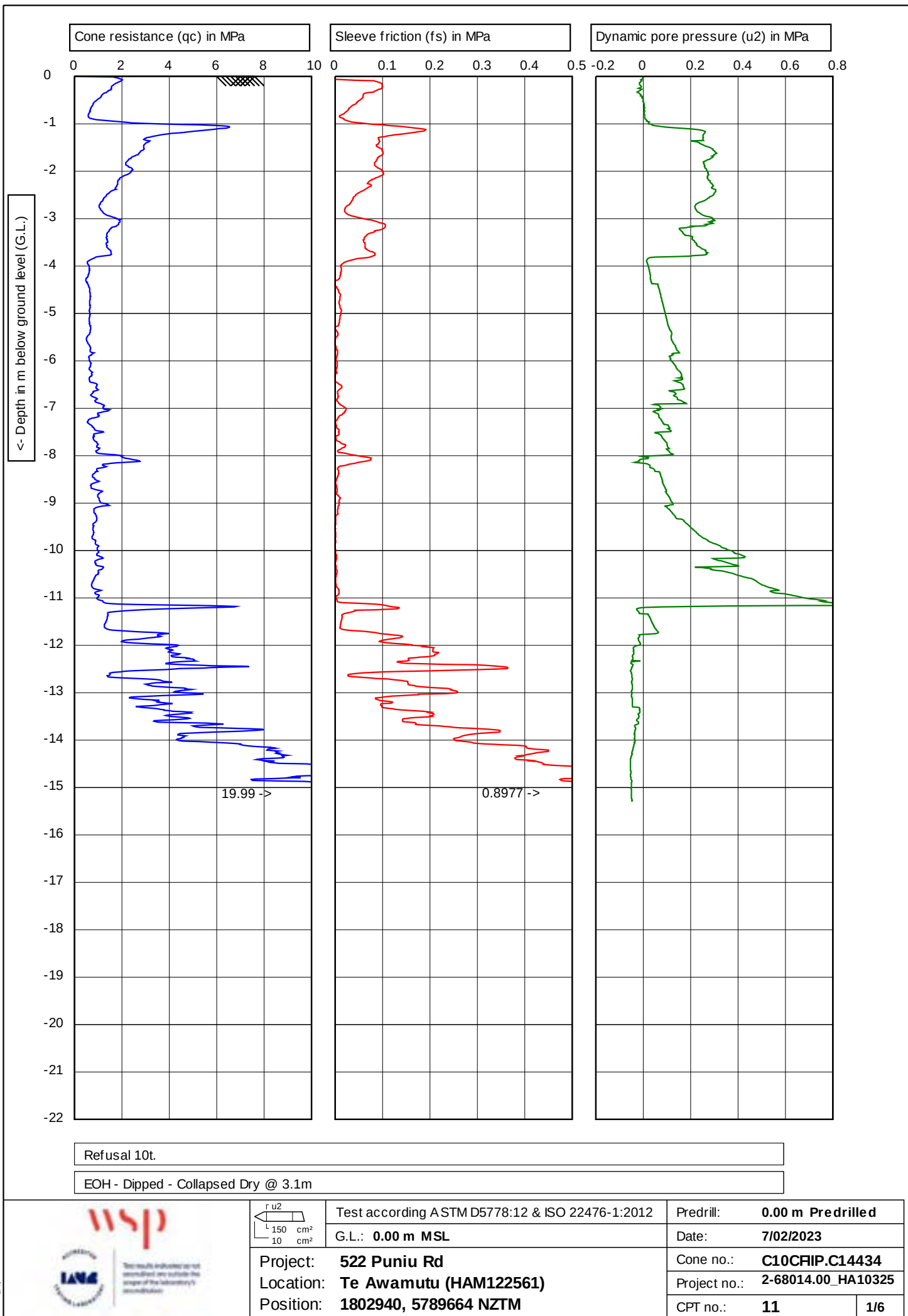


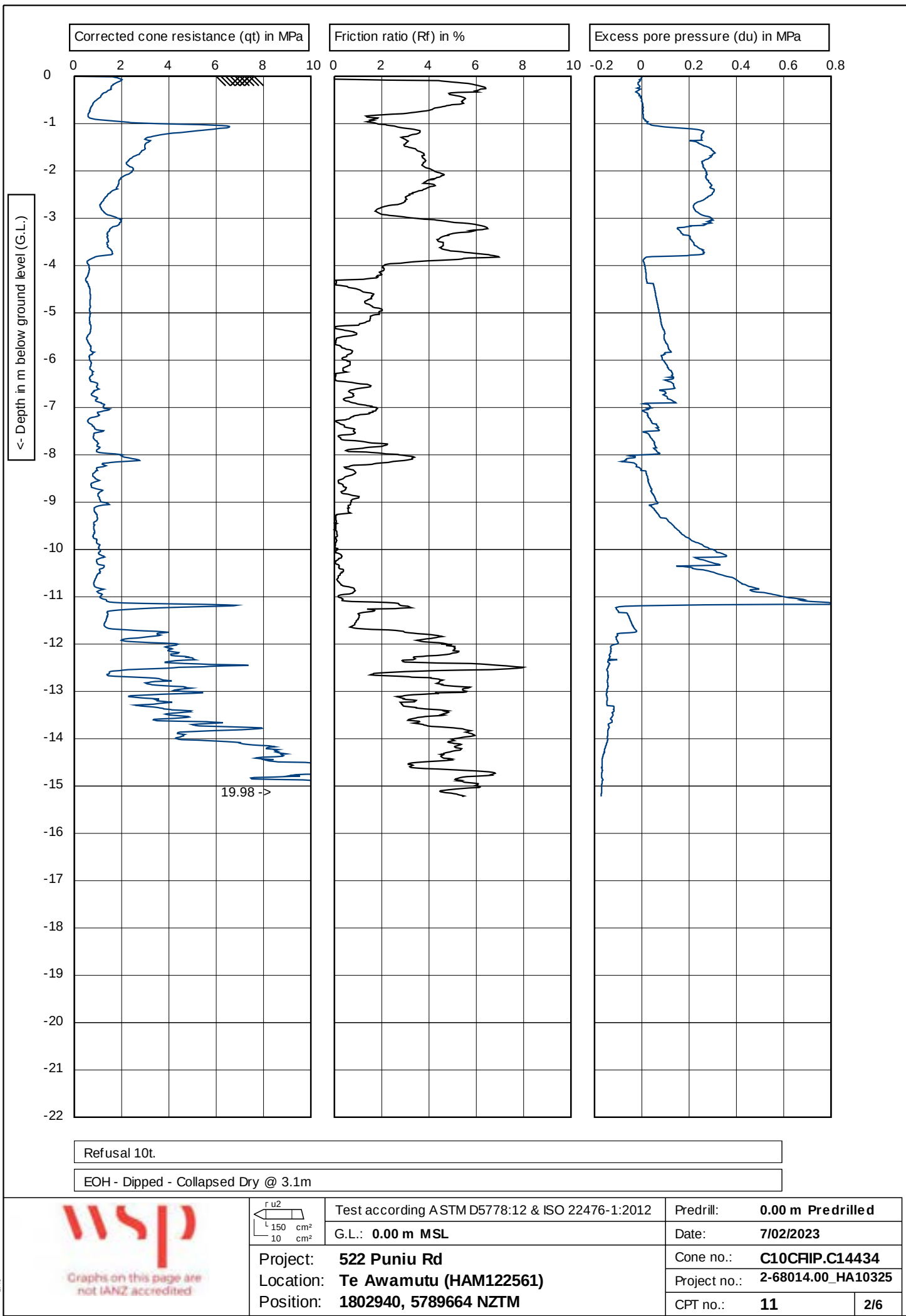


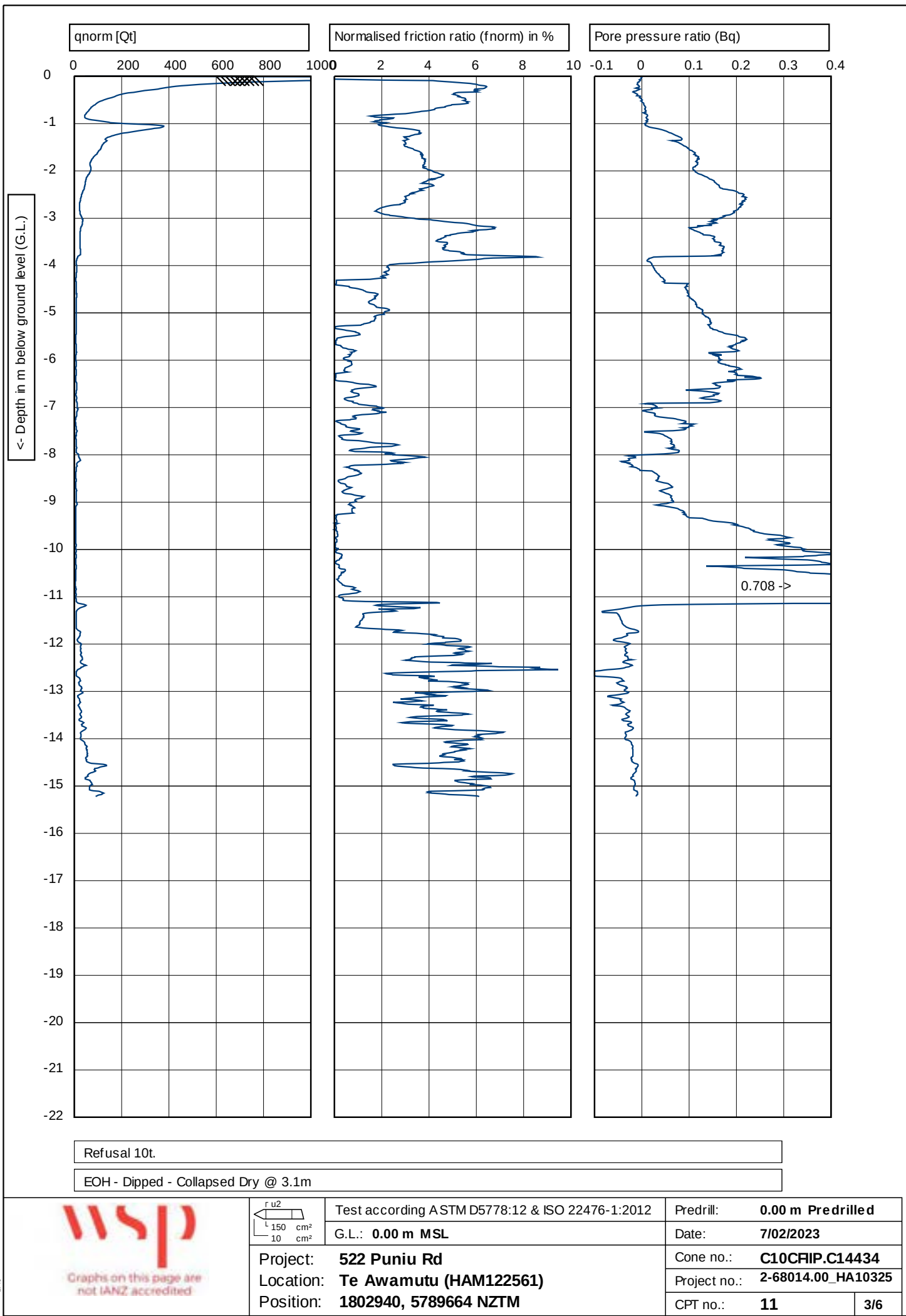


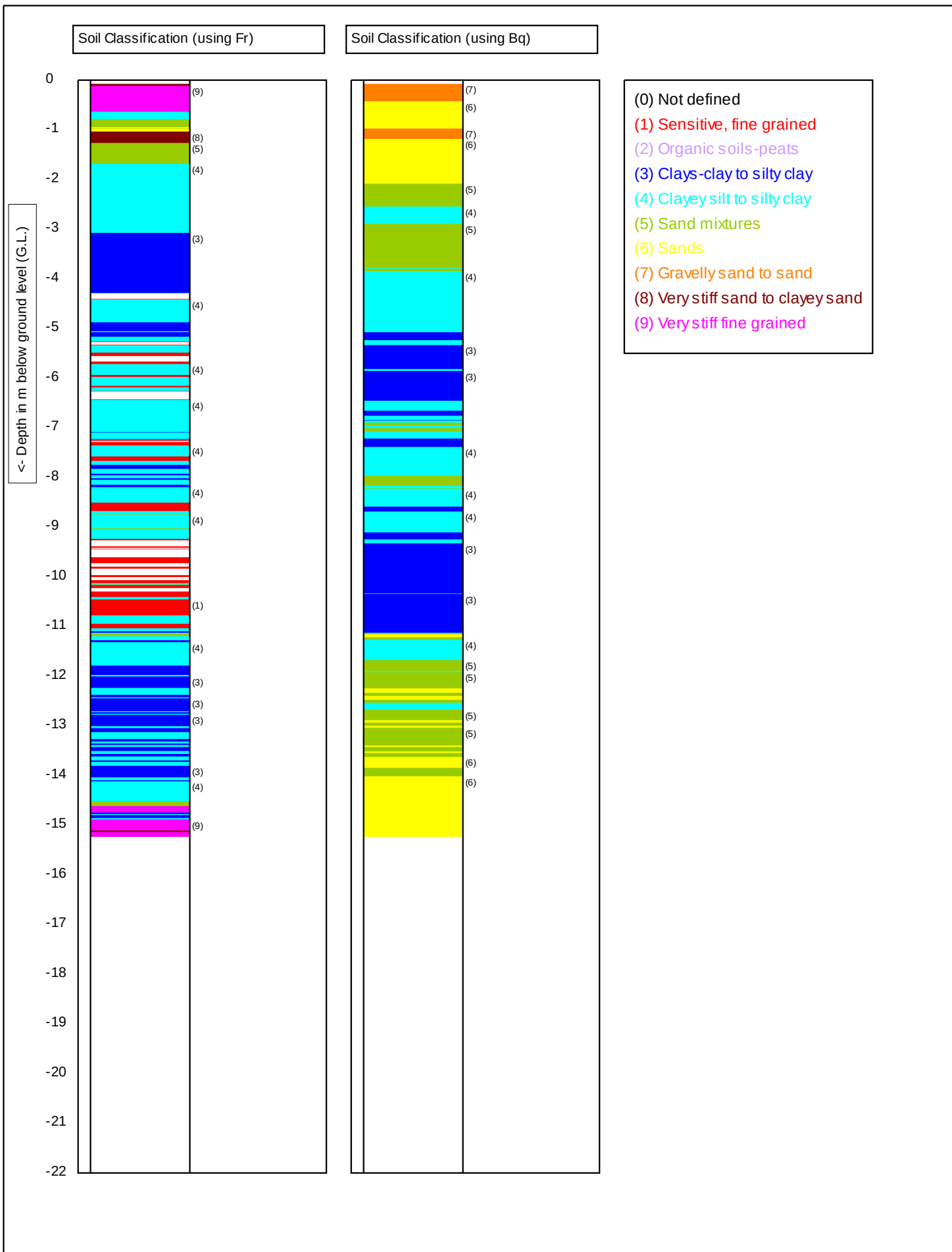
Refusal (qc 40+ MPa.)



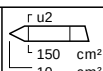








Graphs on this page are not IANZ accredited



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: 522 Puniu Rd
 Location: Te Awamutu (HAM122561)
 Position: 1802940, 5789664 NZTM

Predrill: 0.00 m Predrilled

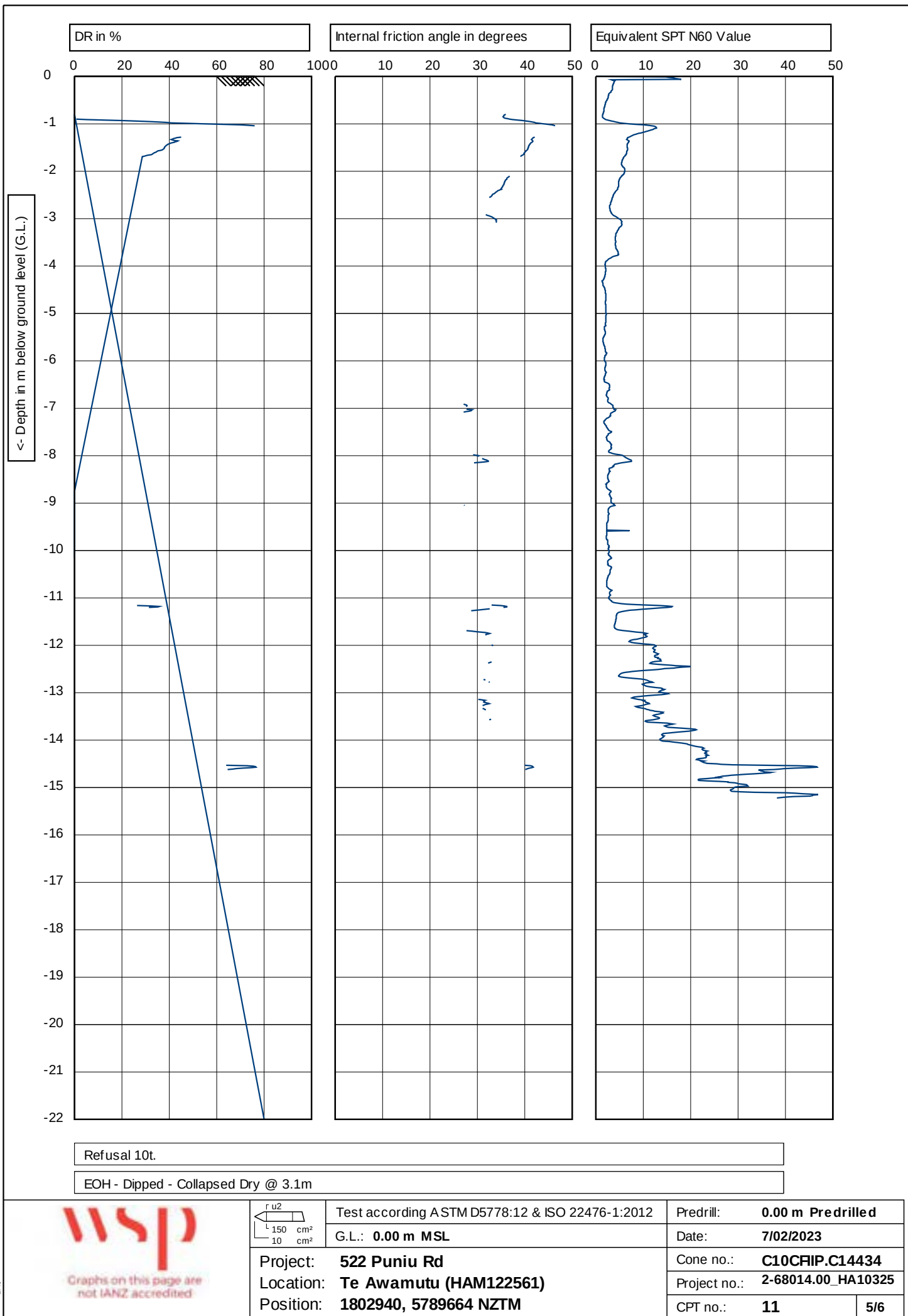
Date: 7/02/2023

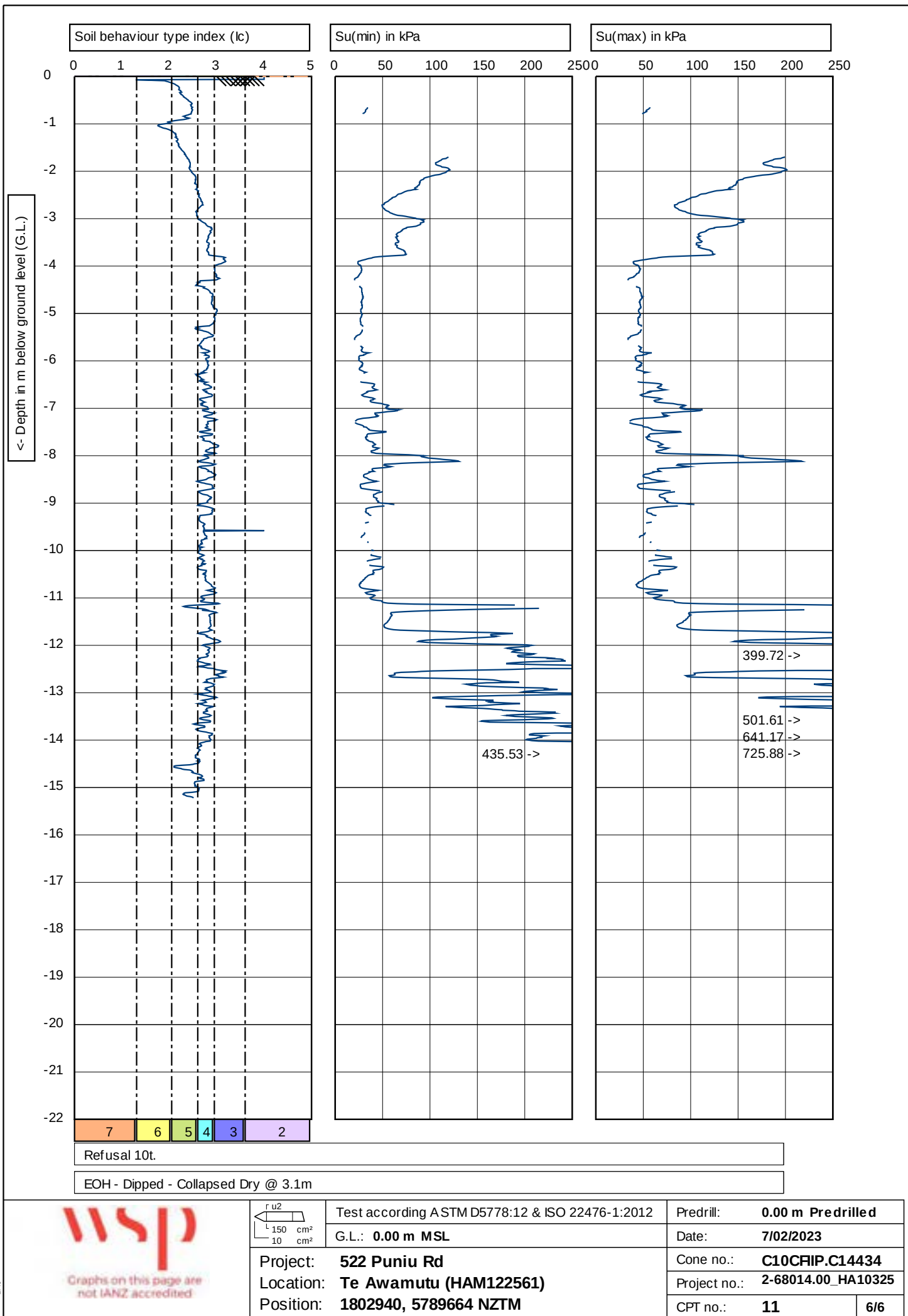
Cone no.: C10CFIP.C14434

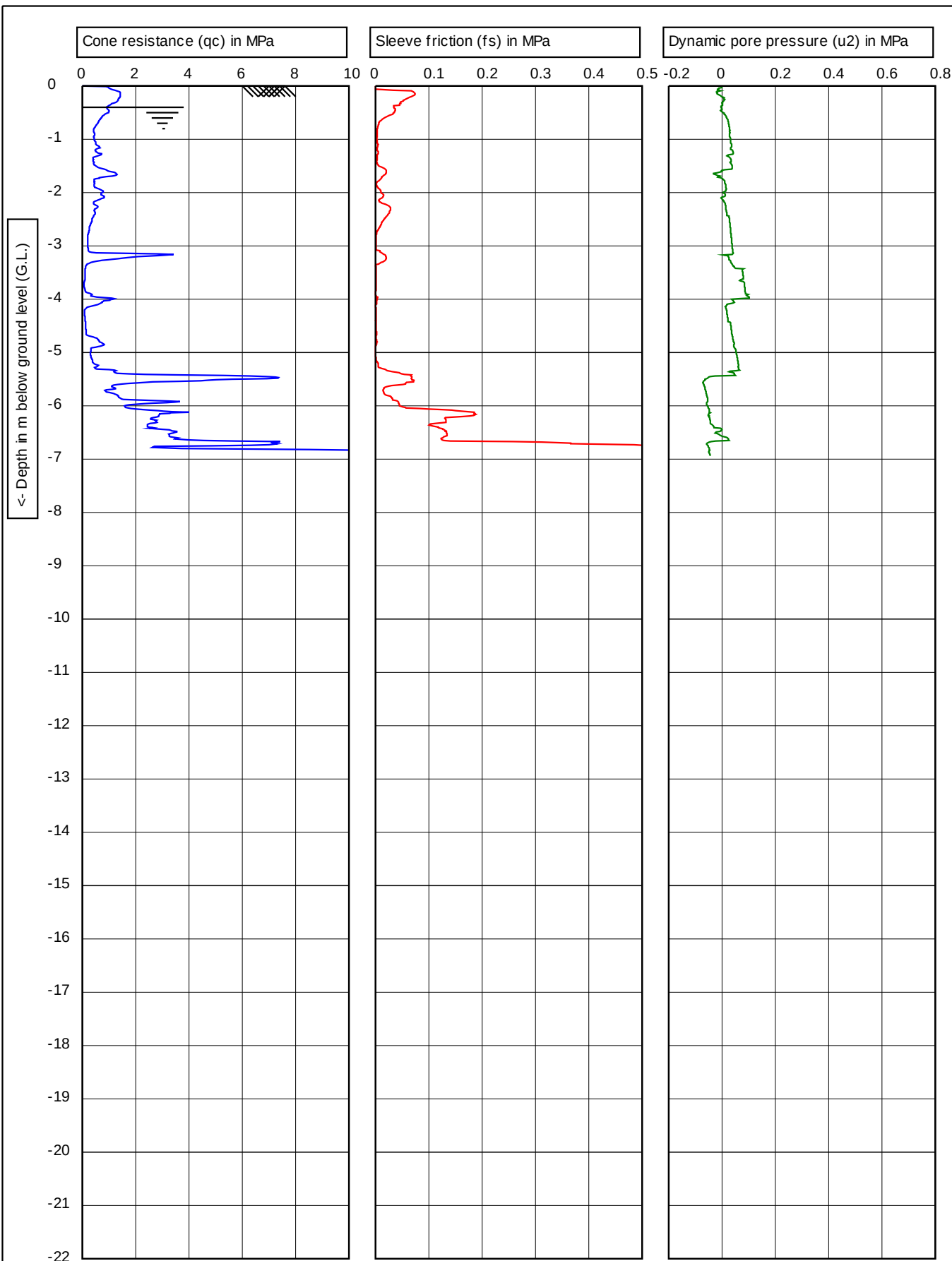
Project no.: 2-68014.00_HA10325

CPT no.: 11

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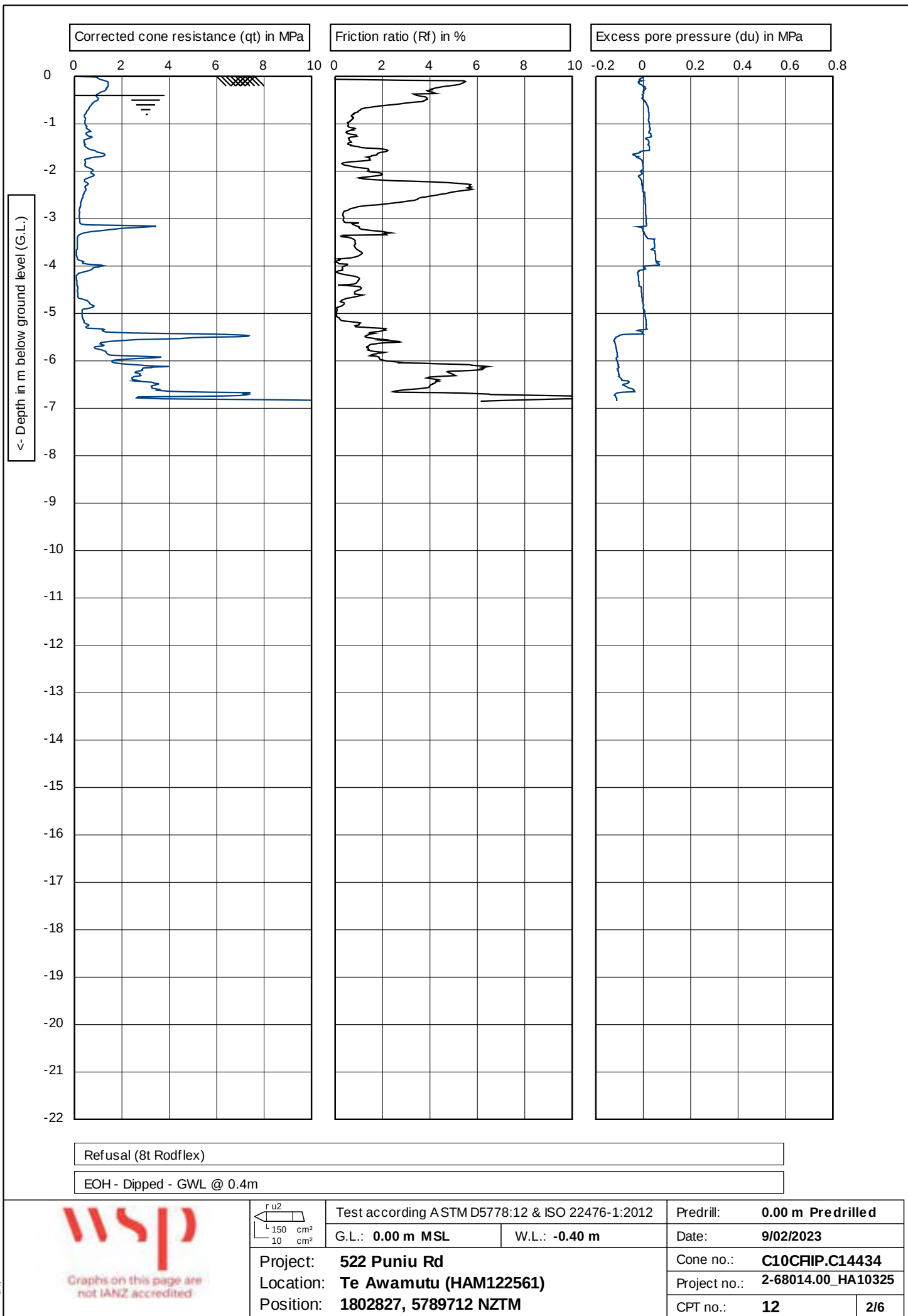


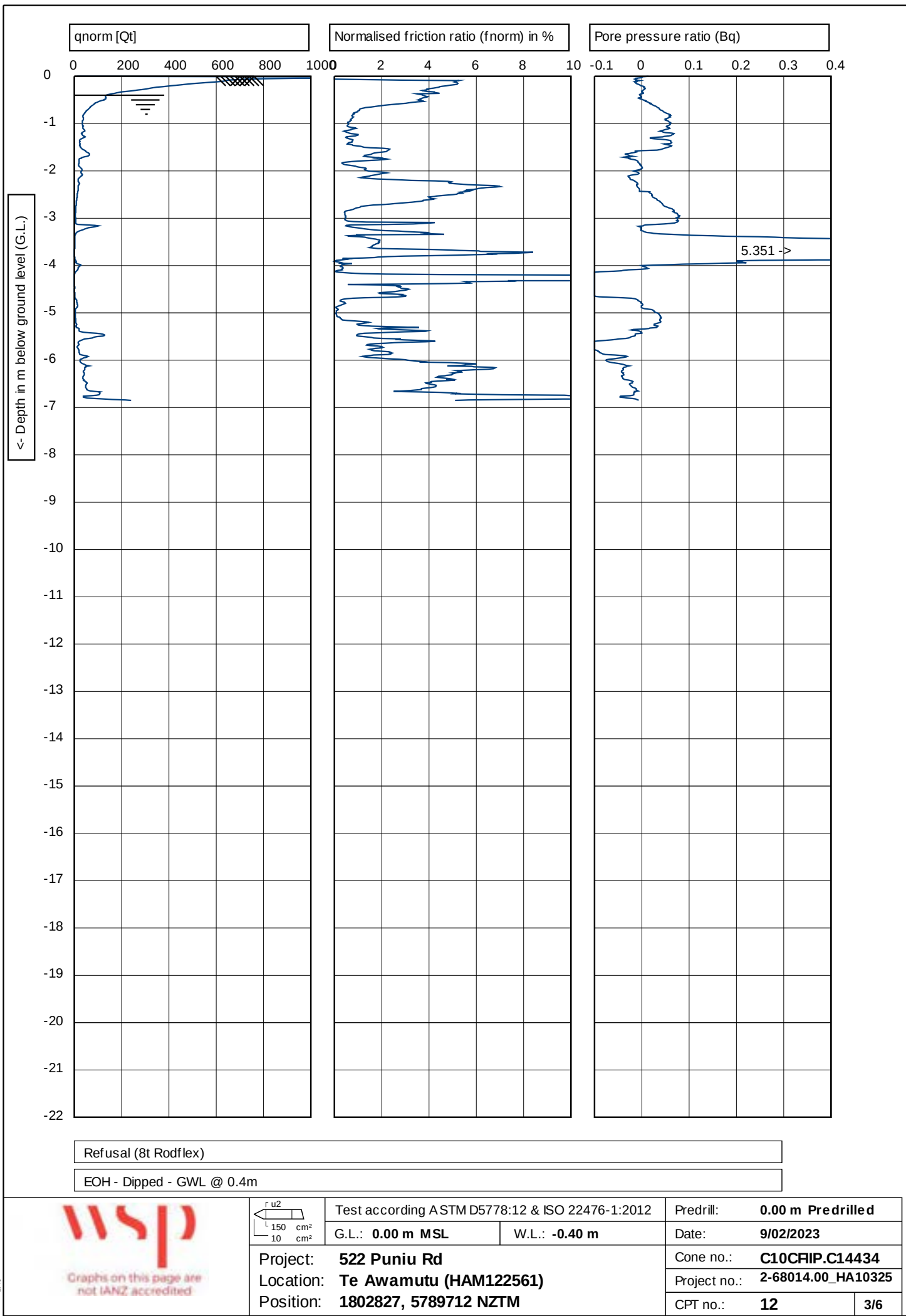


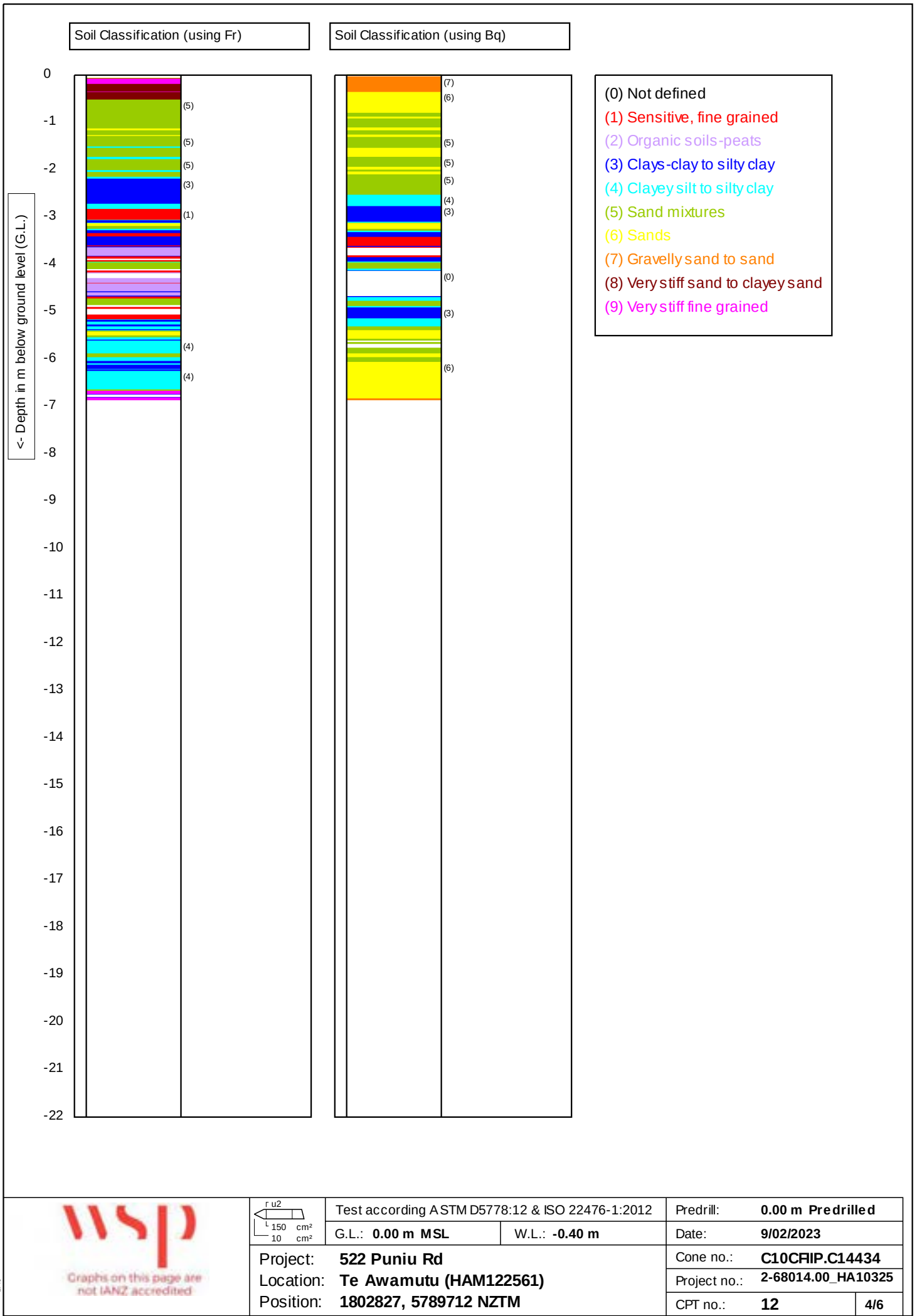


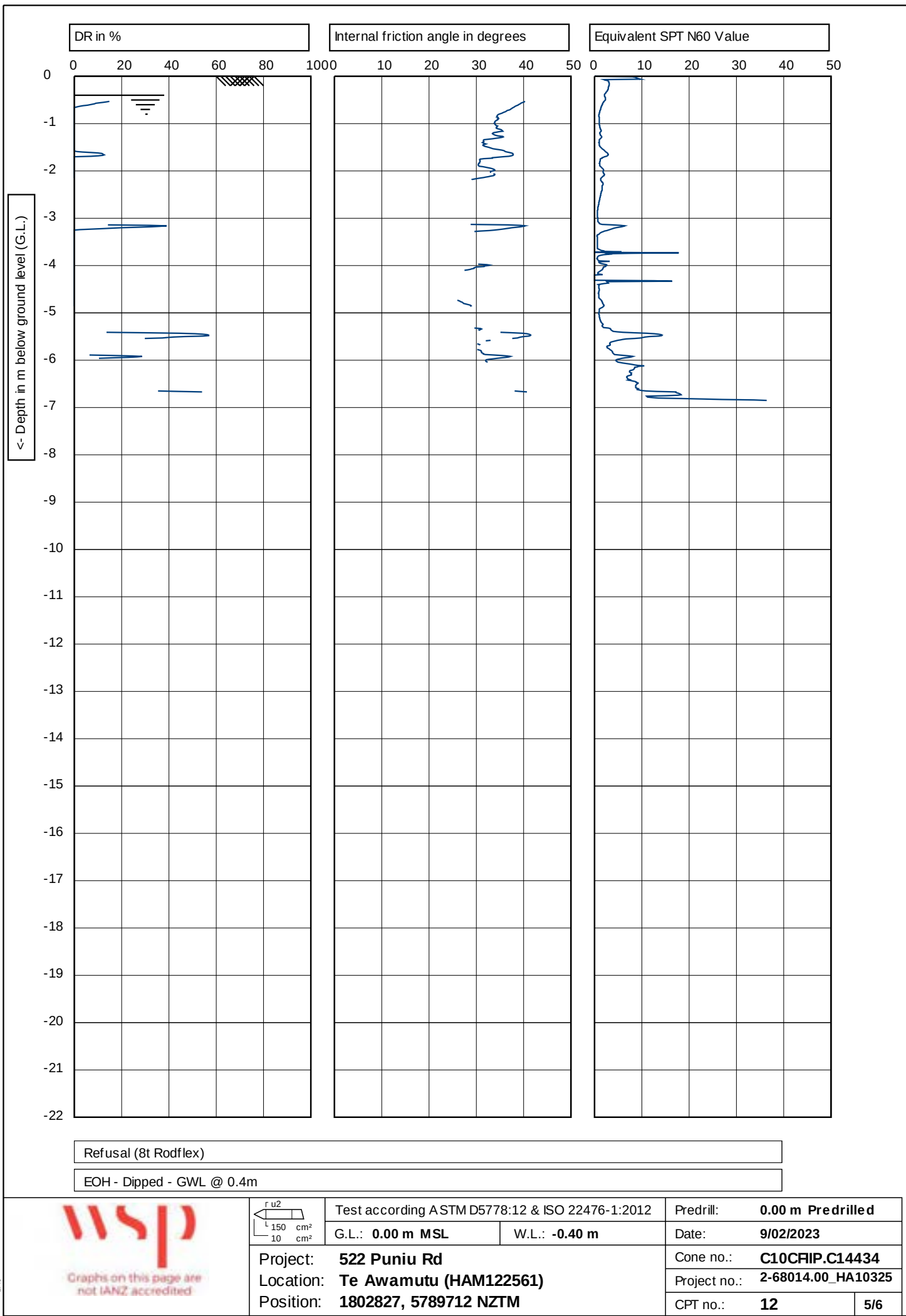
Refusal (8t Rodflex)

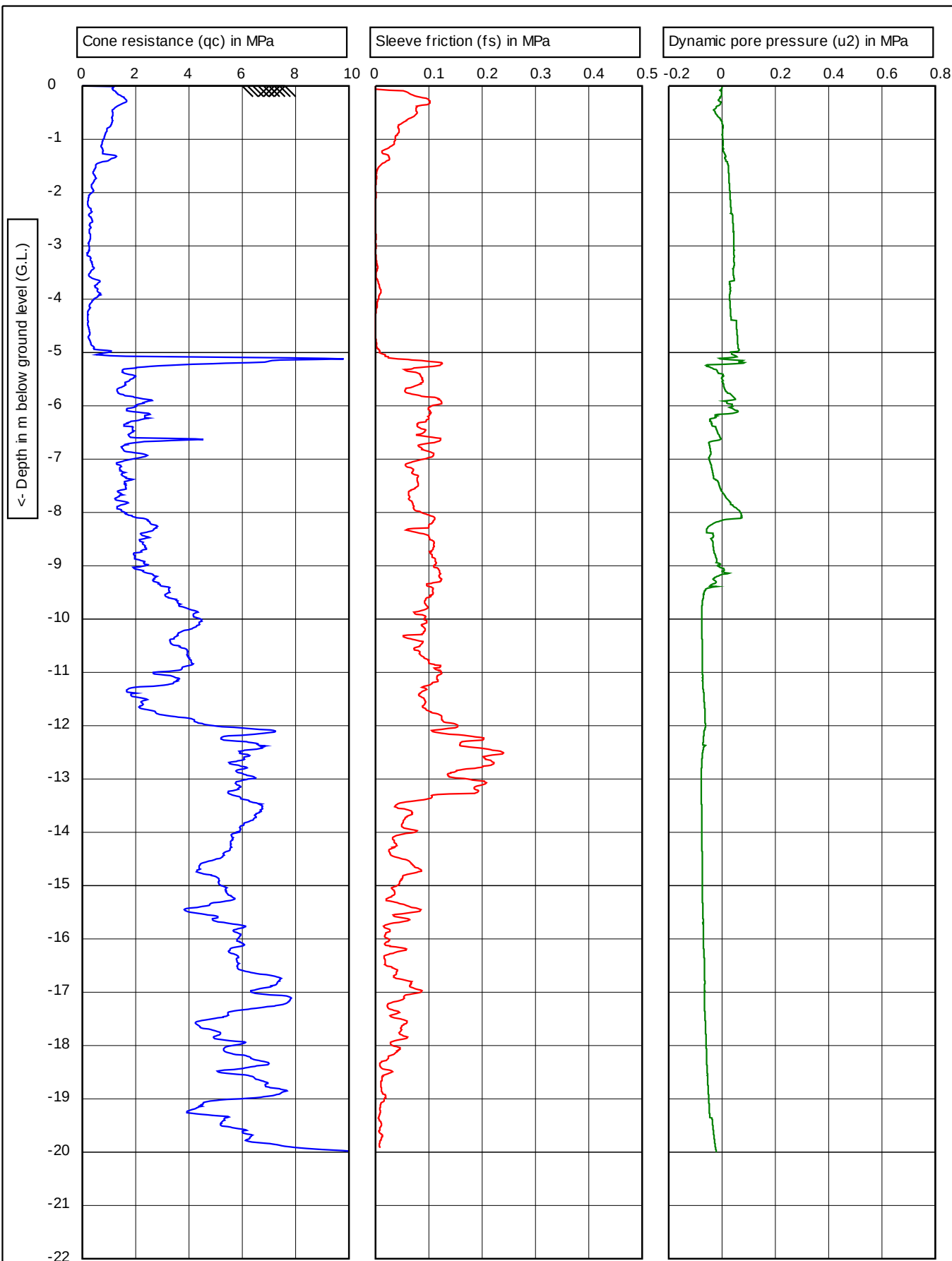












Target Depth

EOH - Dipped - GWL @ 0.4m



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Predrill:	0.00 m	Predrilled
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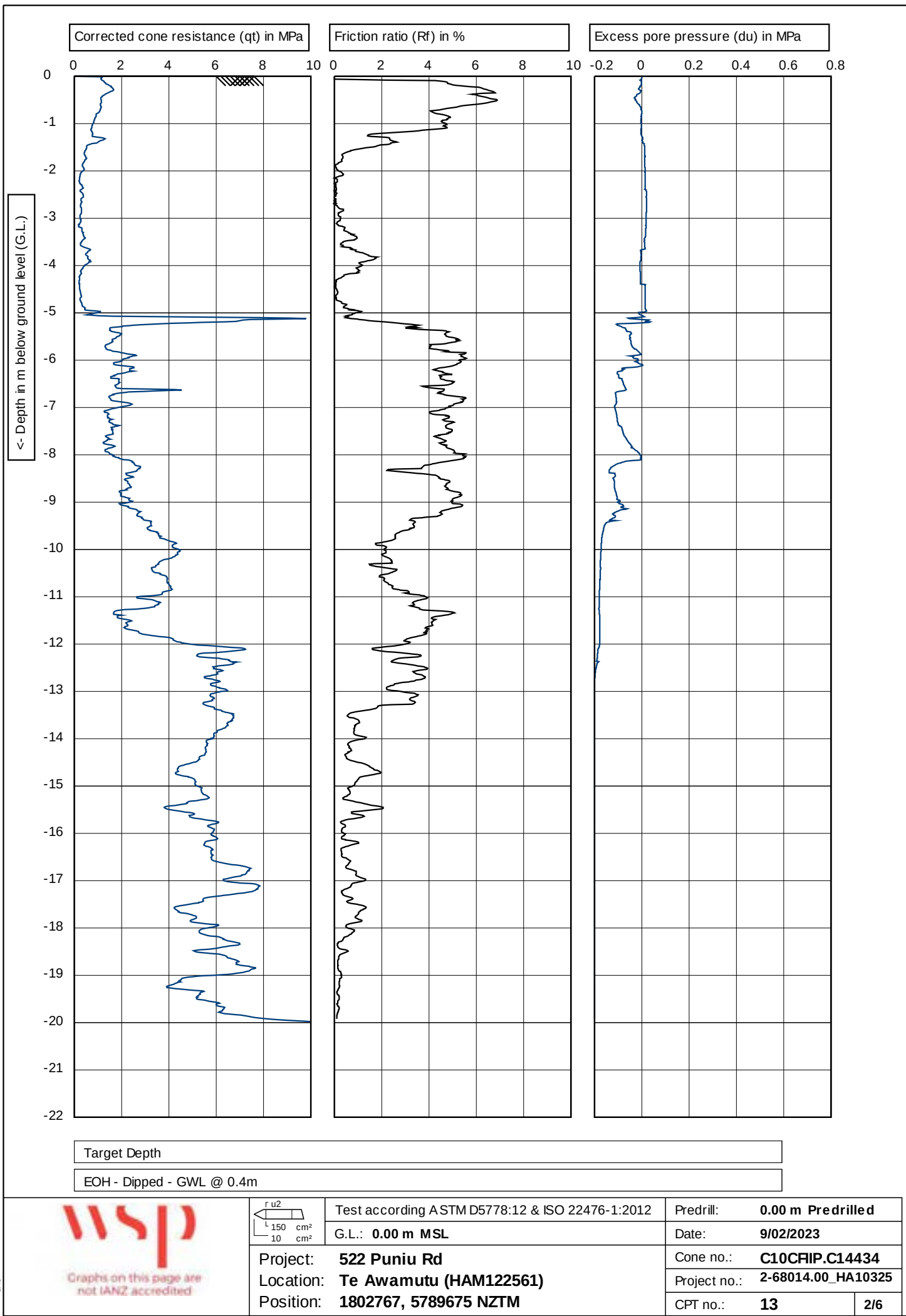
Date:	9/02/2023
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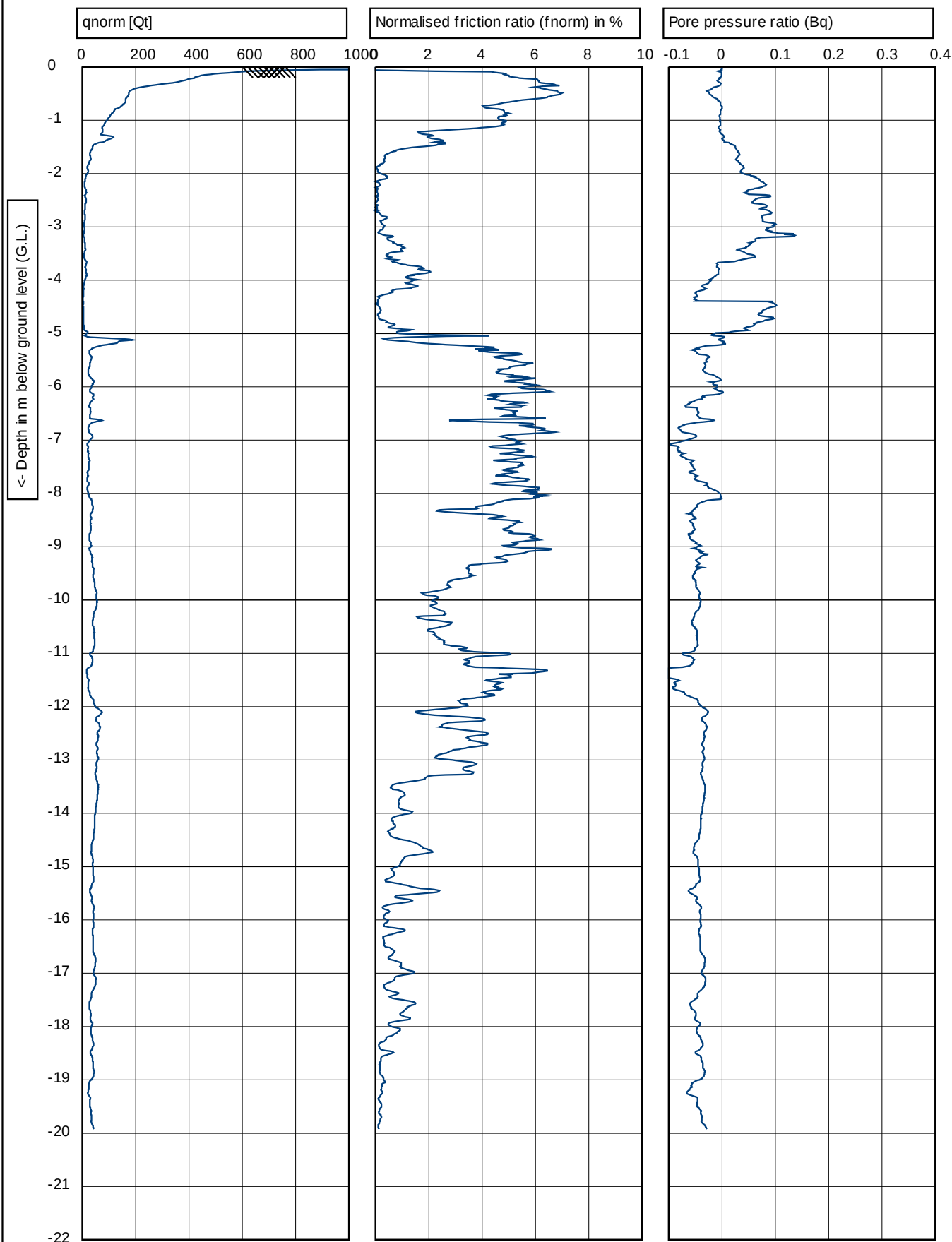
Cone no.: **C10CFIP.C14434**

Project no.:	2-68014.00_HA10325
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CPT no.:	13
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Target Depth

EOH - Dipped - GWL @ 0.4m



Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: **522 Puniu Rd**
Location: **Te Awamutu (HAM122561)**
Position: **1802767, 5789675 NZTM**

Predrill:	0.00 m	Predrilled
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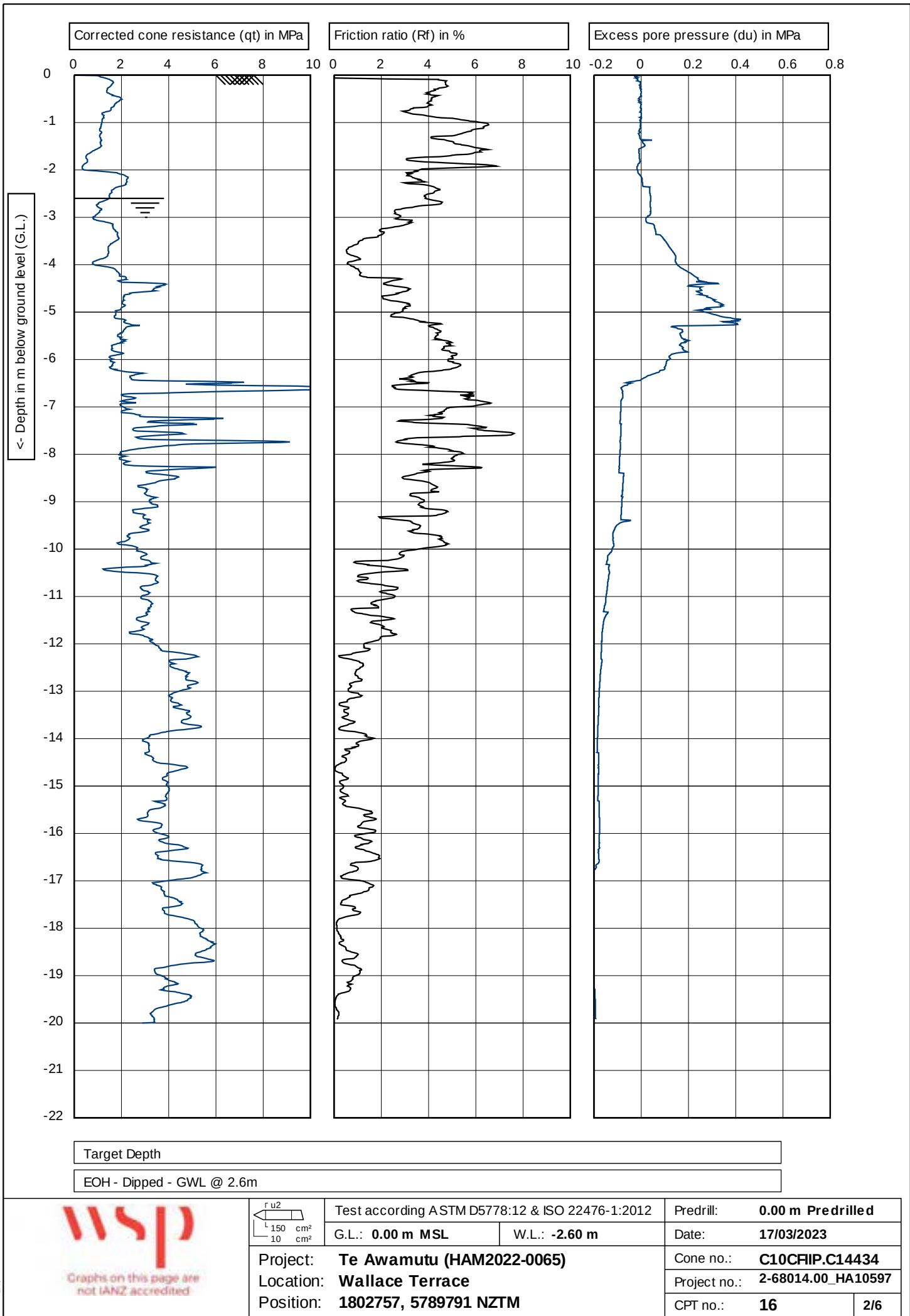
Date:	9/02/2023
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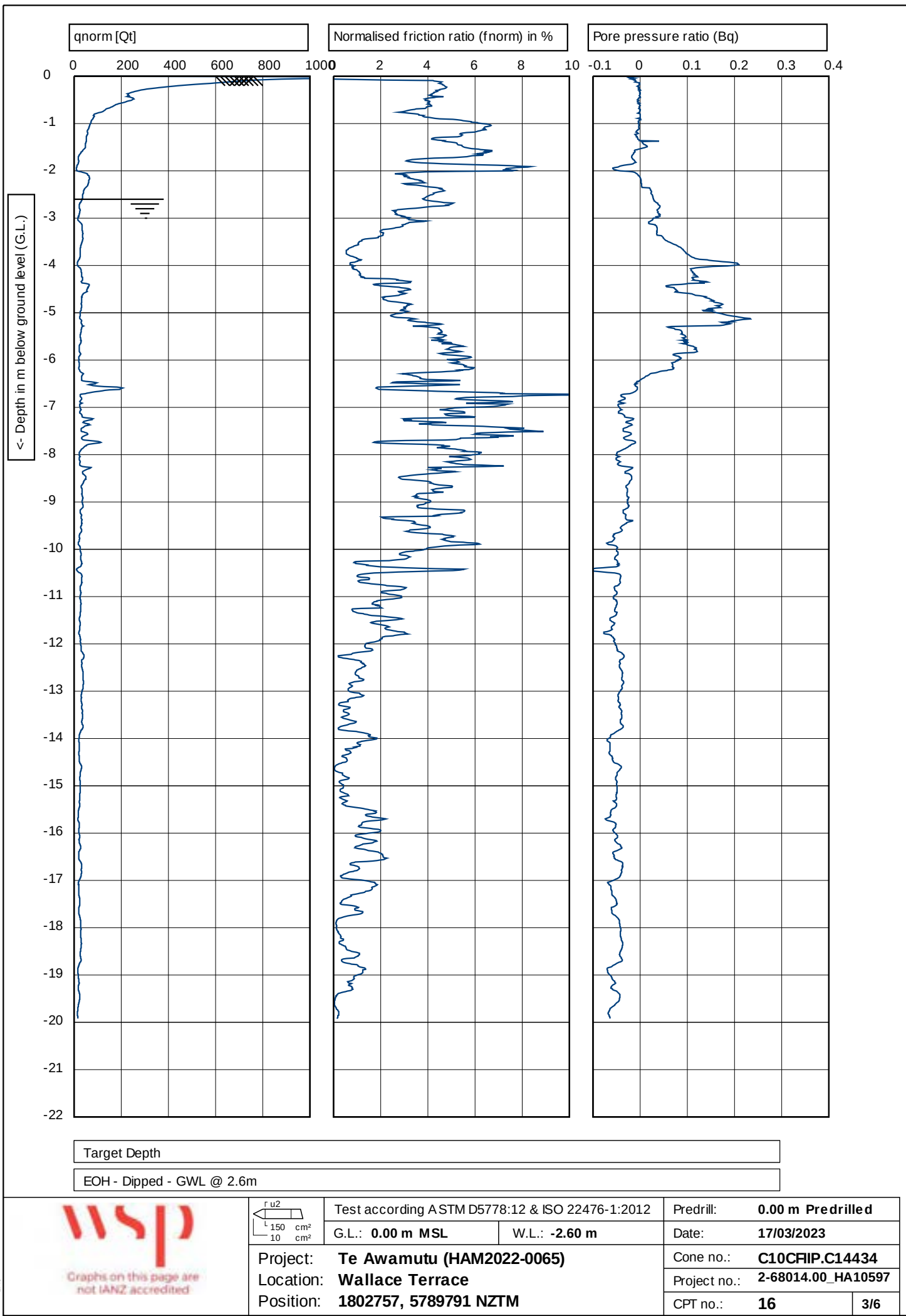
Cone no.: **C10CFIP.C14434**

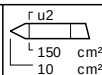
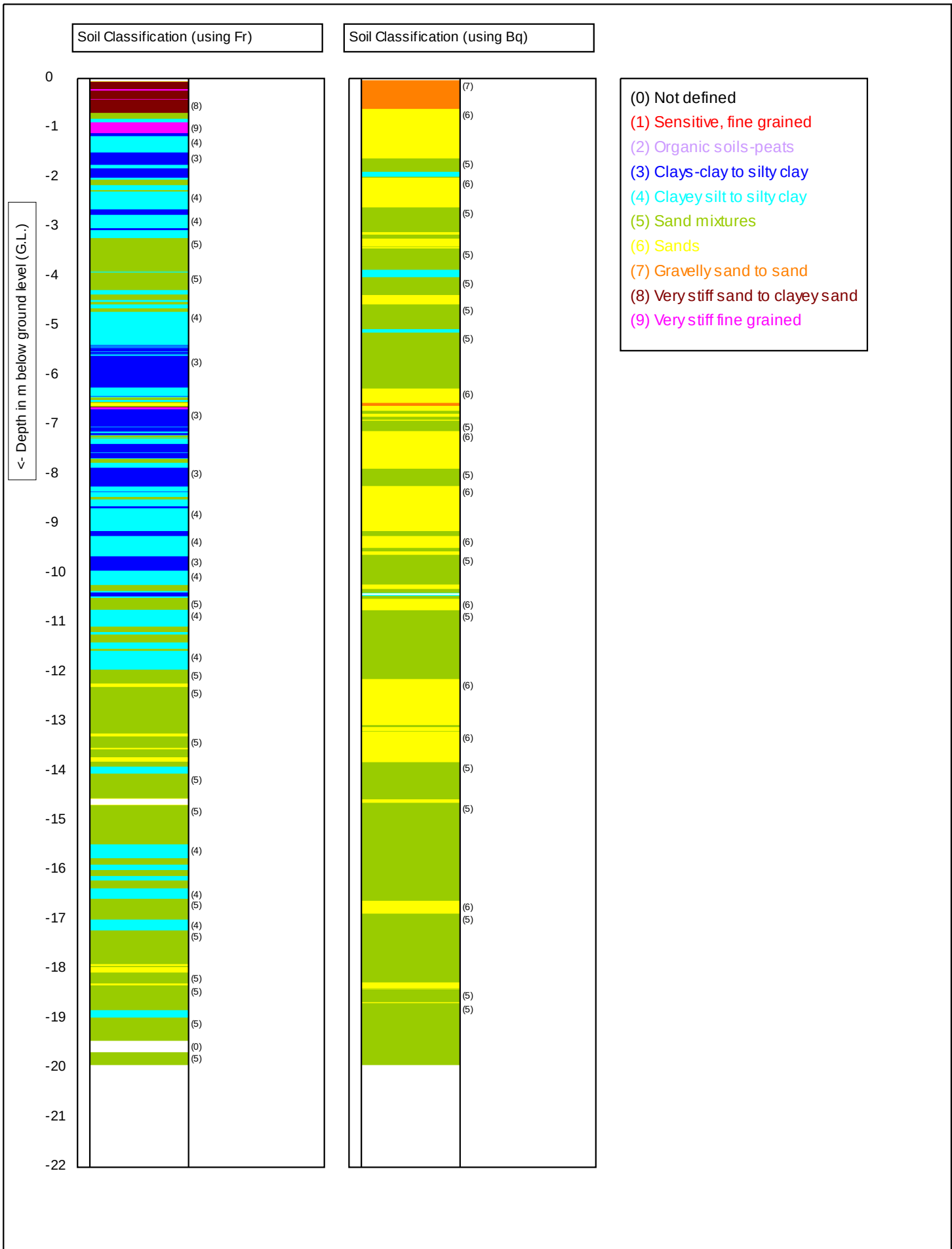
Project no.:	2-68014.00_HA10325
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CPT no.:	13
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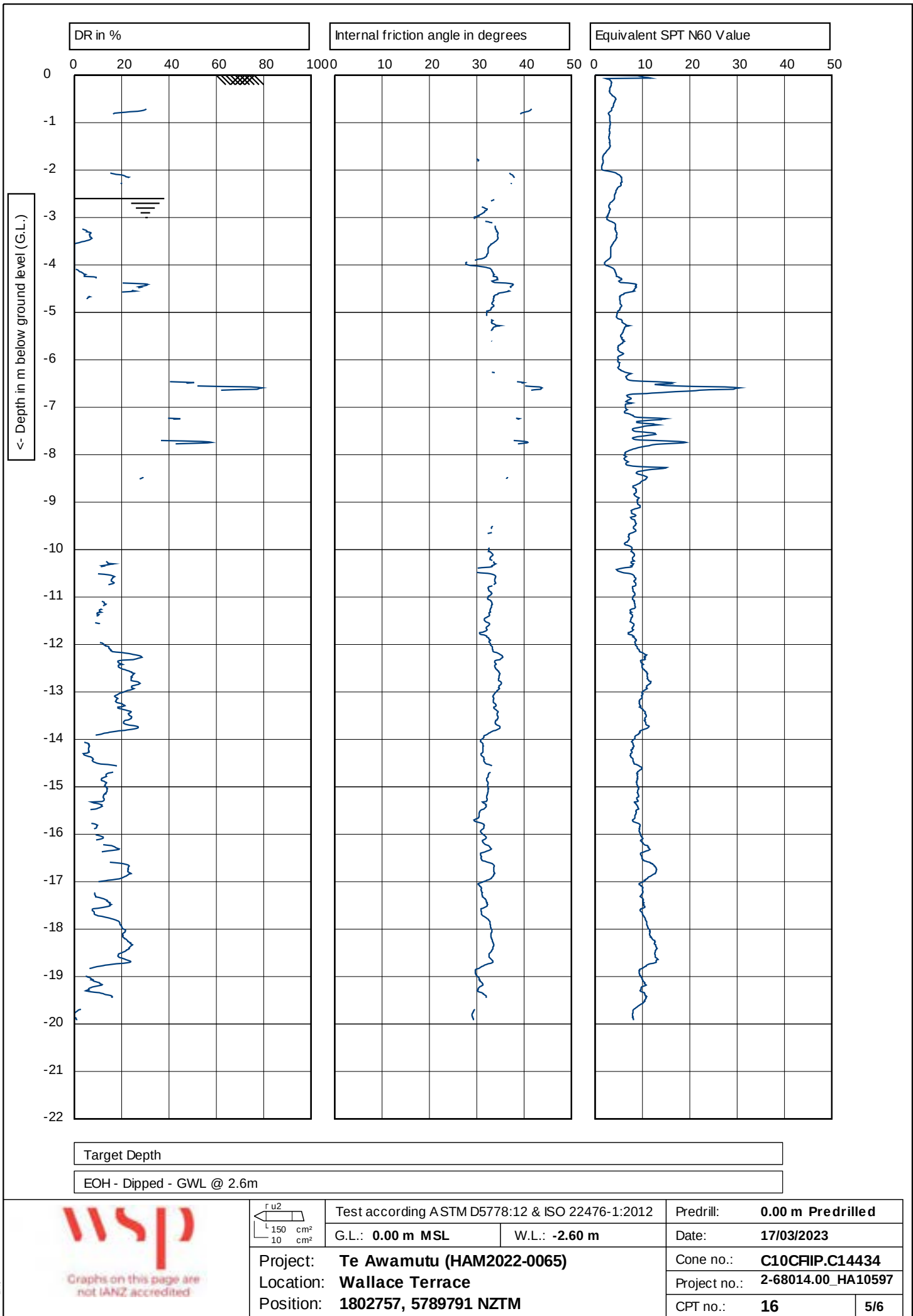
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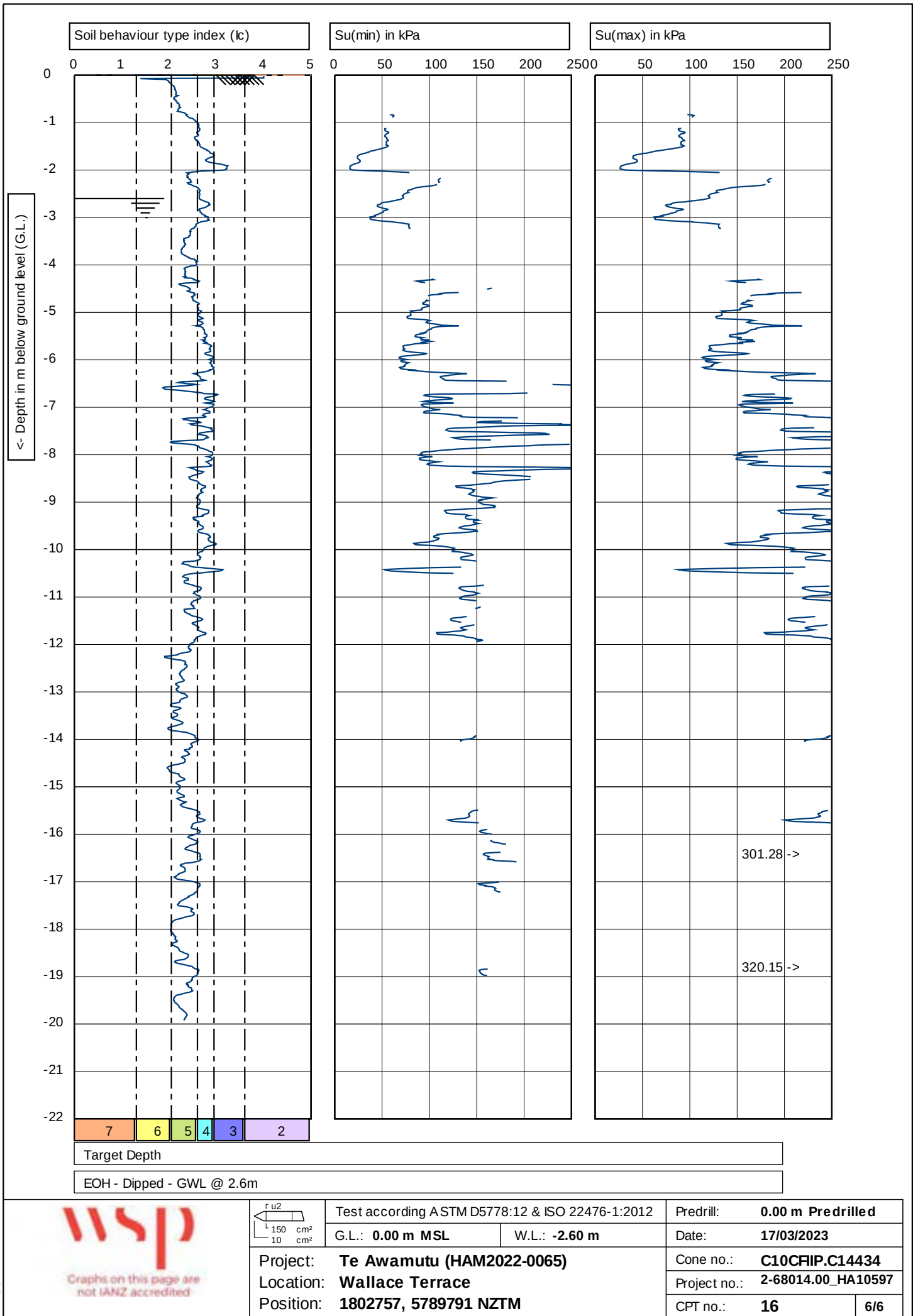


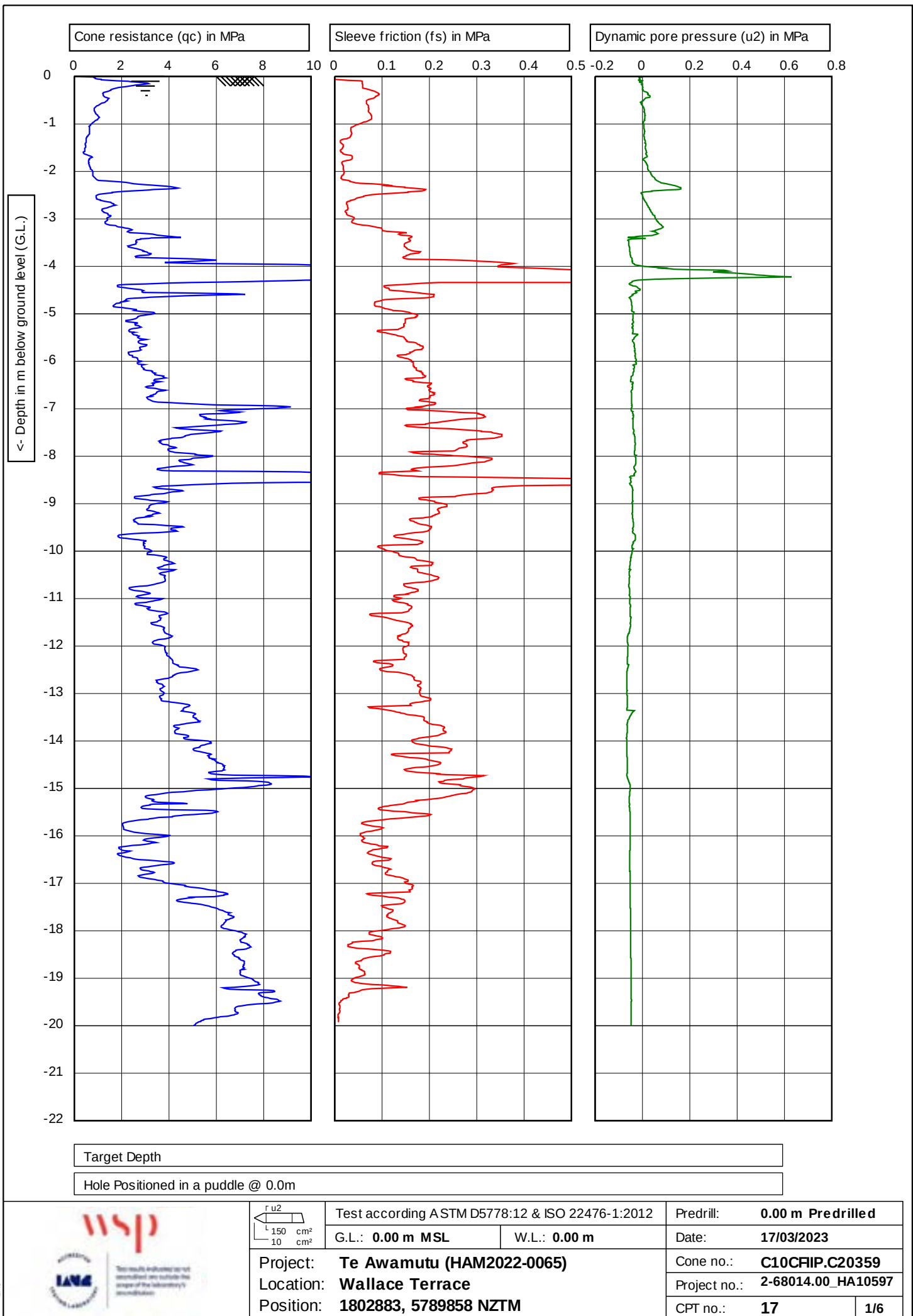


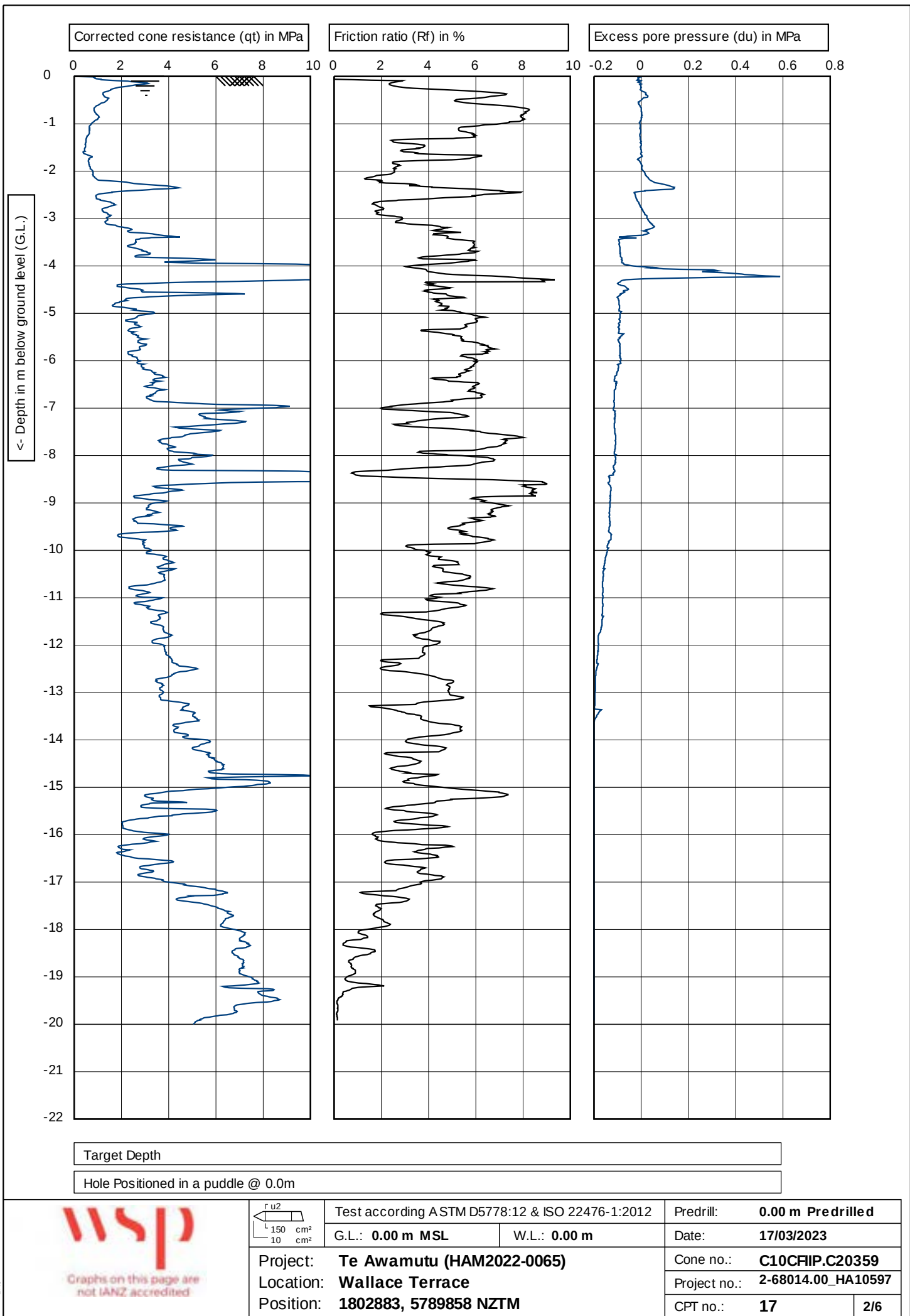


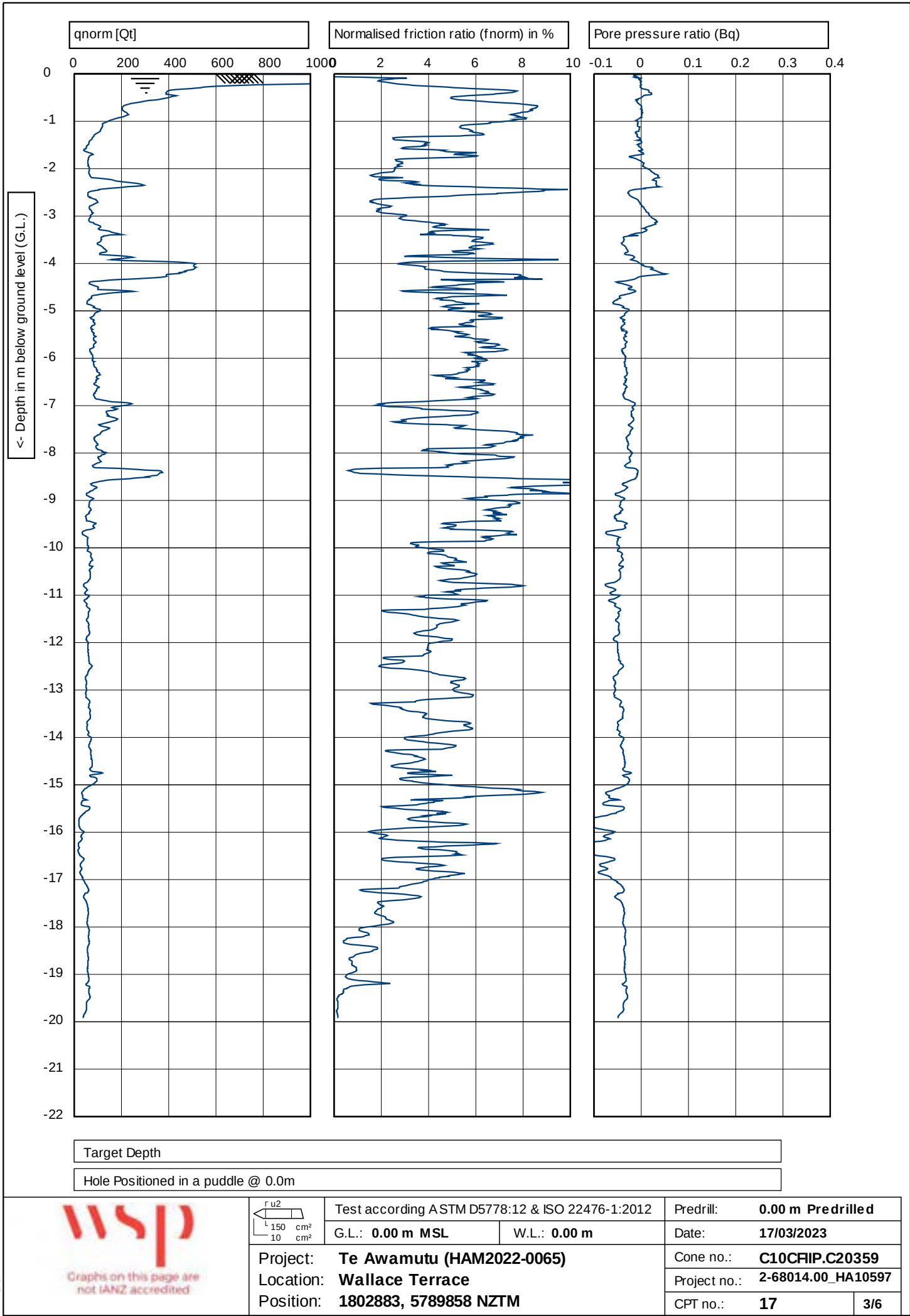
Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill: 0.00 m Predrilled	
G.L.: 0.00 m MSL	W.L.: -2.60 m	Date:	17/03/2023
Project: Te Awamutu (HAM2022-0065)		Cone no.:	C10CFIP.C14434
Location: Wallace Terrace		Project no.:	2-68014.00_HA10597
Position: 1802757, 5789791 NZTM		CPT no.:	16
			4/6

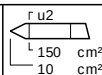
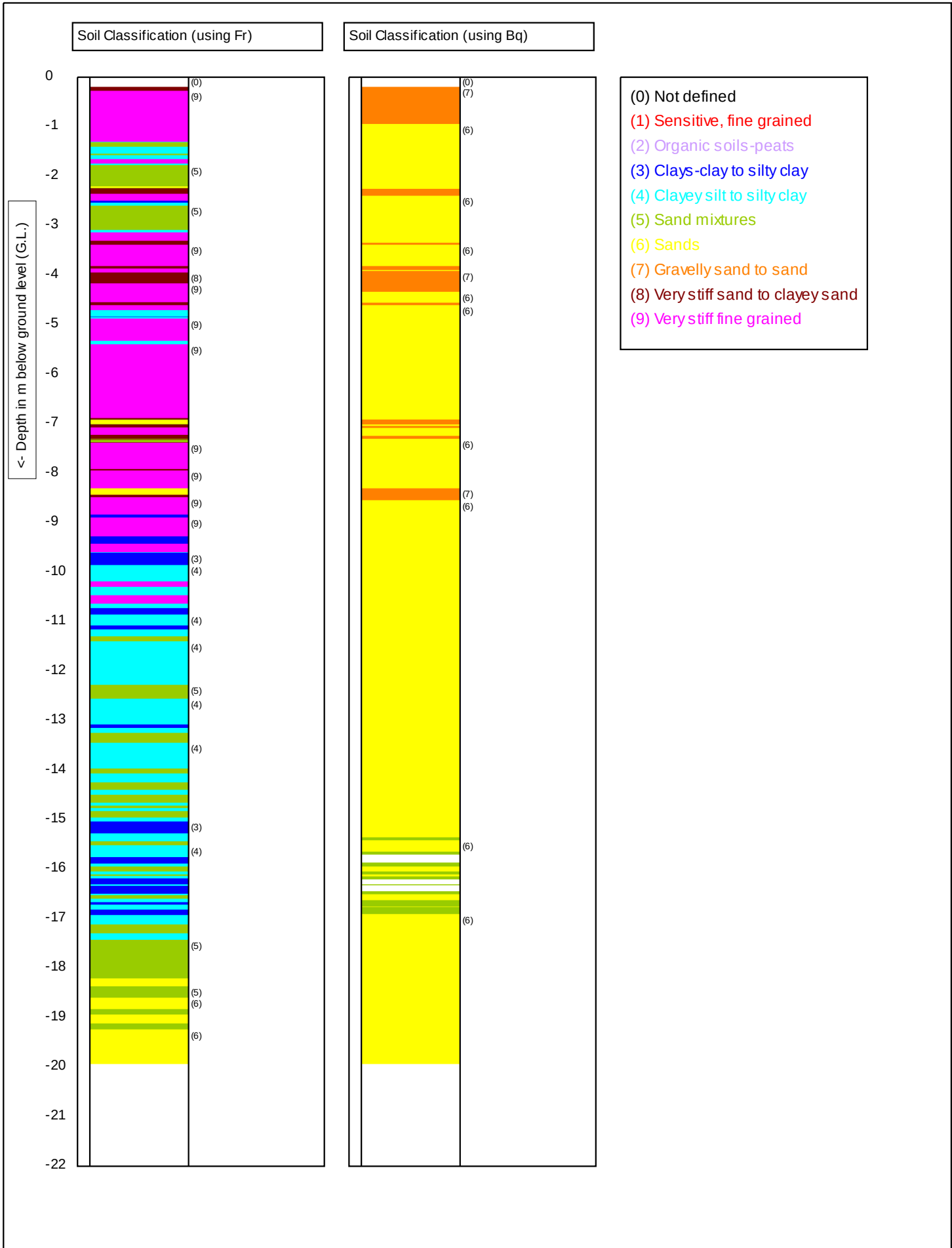












Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: 0.00 m

Predrill: 0.00 m Predrilled

Date: 17/03/2023

Cone no.: C10CFIP.C20359

Project no.: 2-68014.00_HA10597

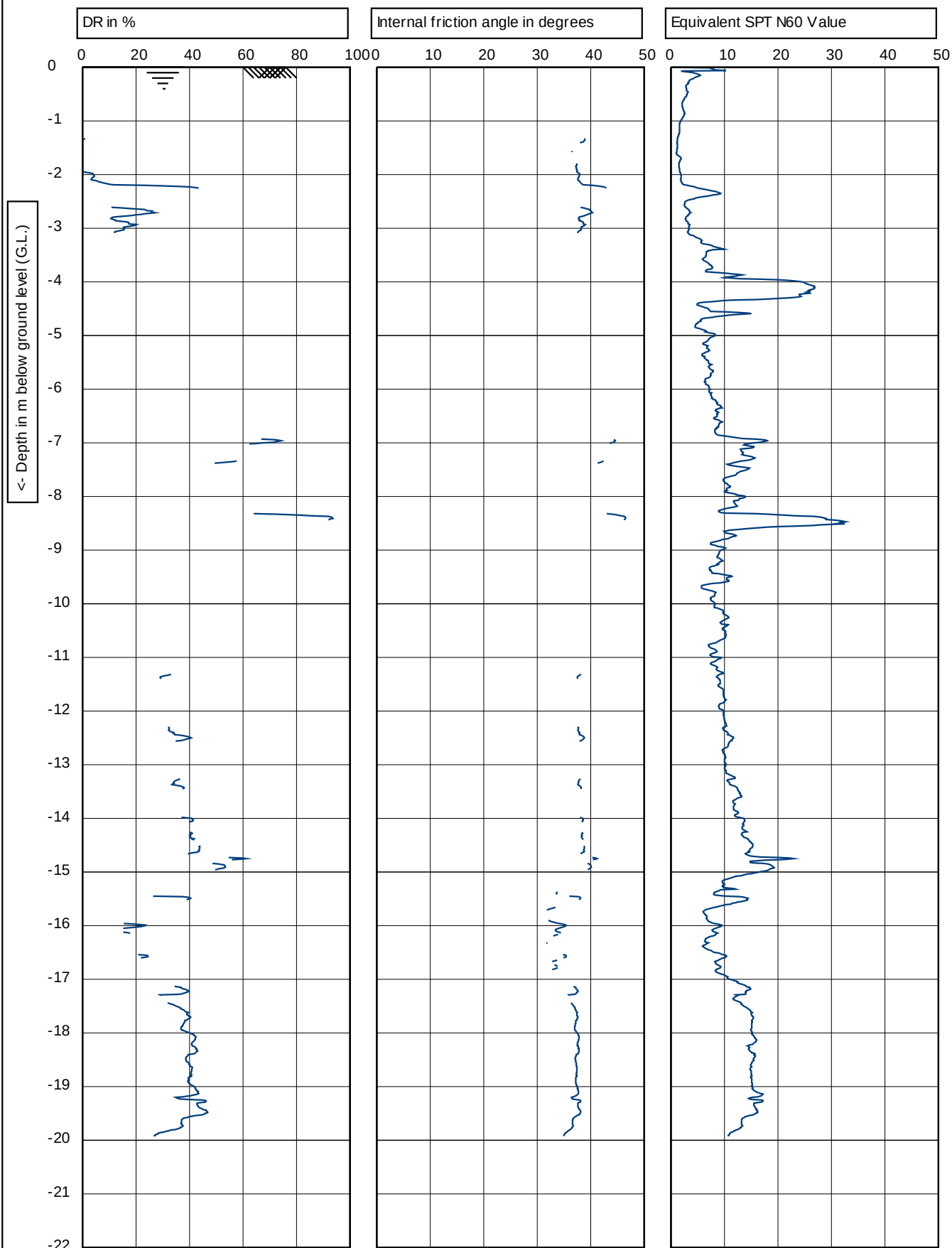
CPT no.: 17

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Project: Te Awamutu (HAM2022-0065)

Location: Wallace Terrace

Position: 1802883, 5789858 NZTM



Target Depth

Hole Positioned in a puddle @ 0.0m



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

W.L.: 0.00 m

Predrill:	0.00 m Predrilled
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Date:	17/03/2023
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Cone no.: **C10CFIP.C20359**

Project no.:	2-68014.00_HA10597
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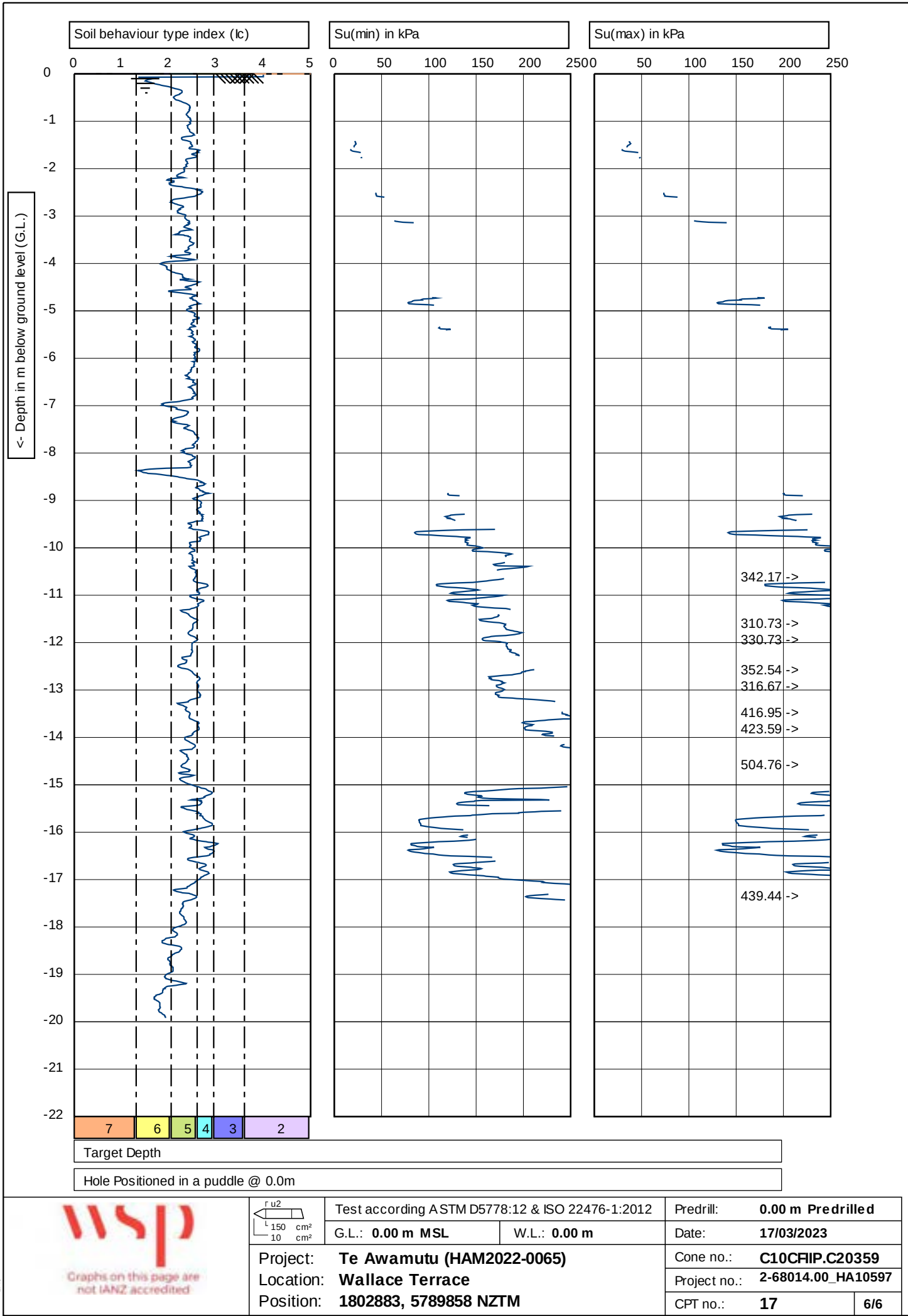
CPT no.:	17
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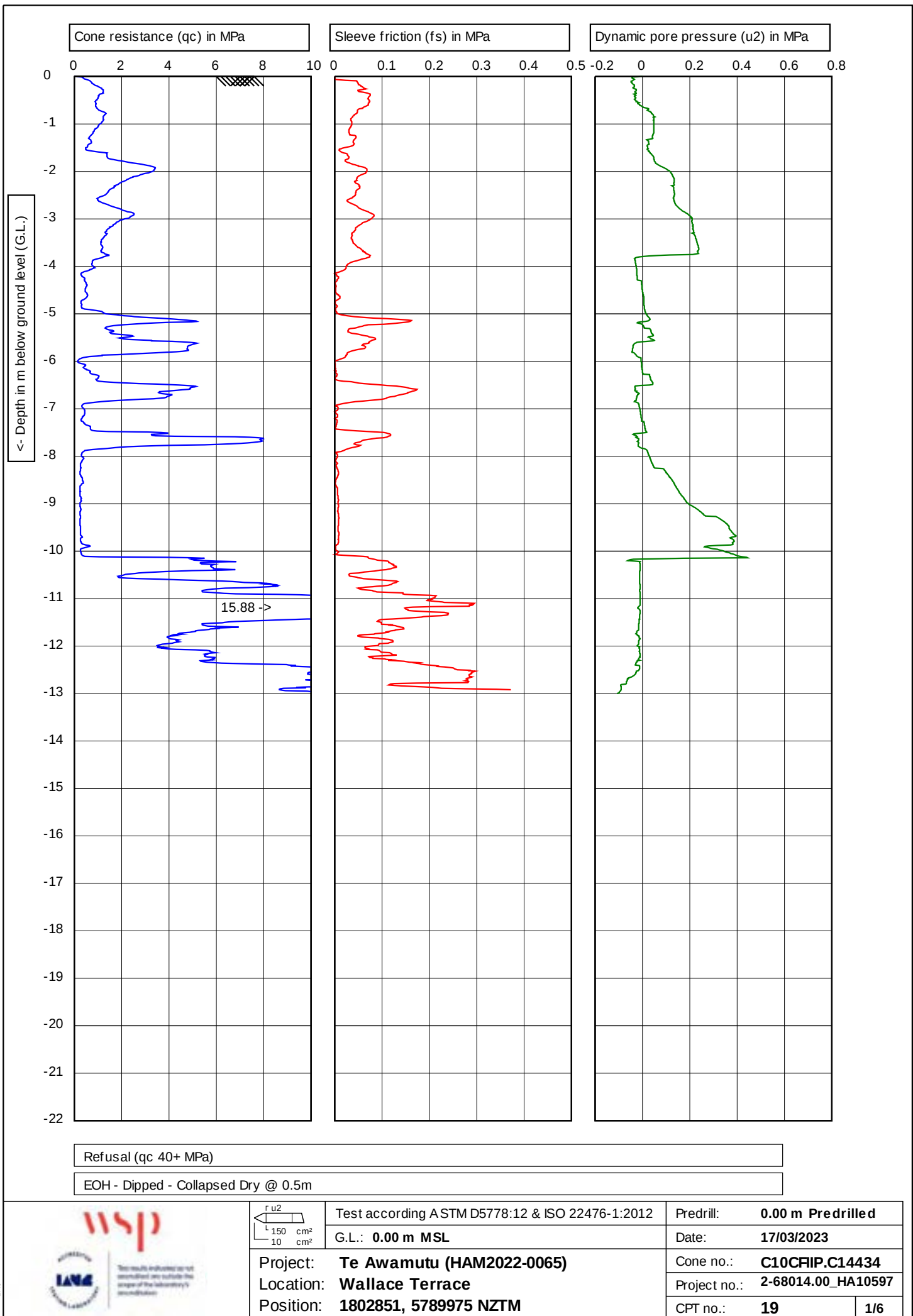
5/6

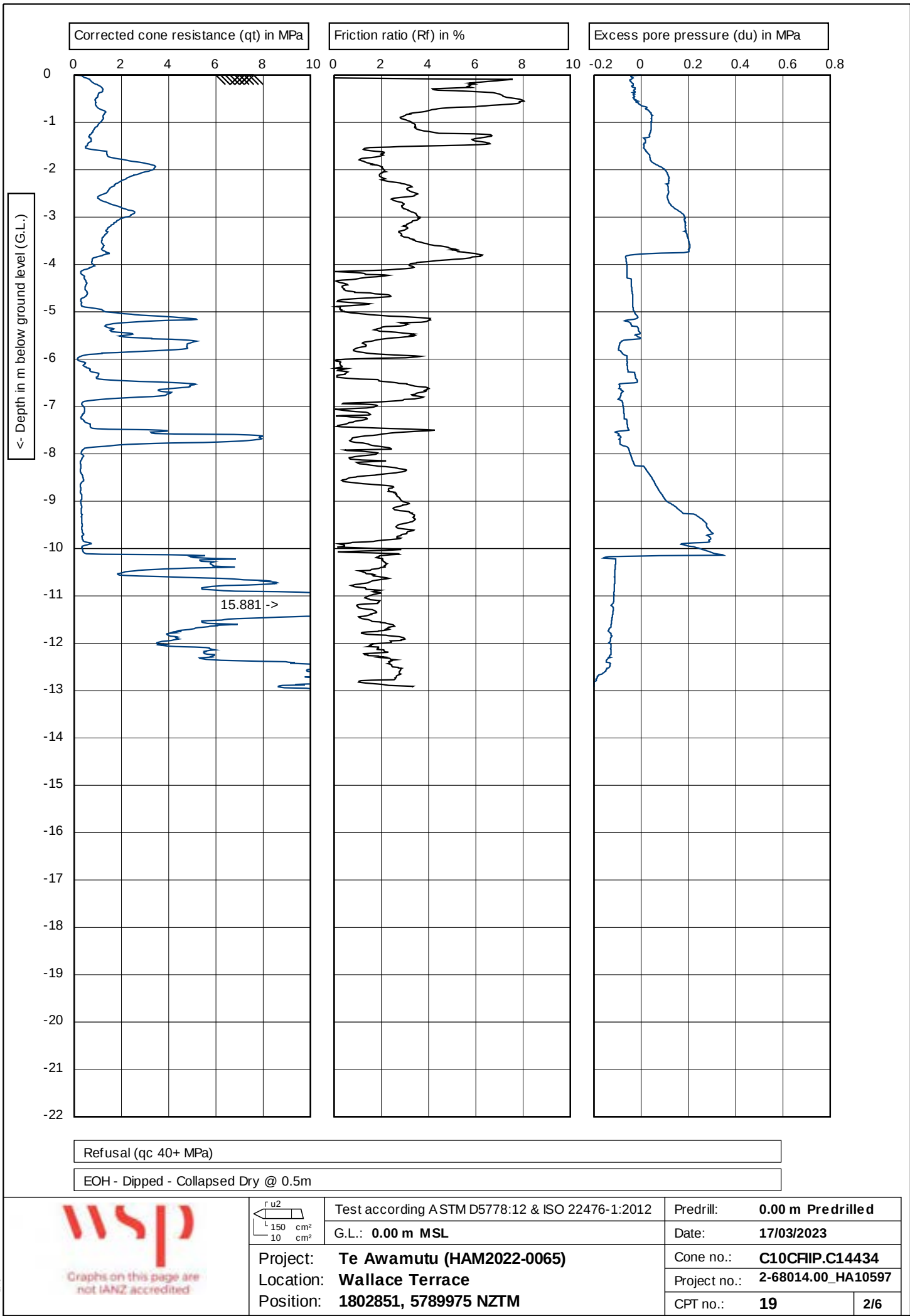
Project: Te Awamutu (HAM2022-0065)

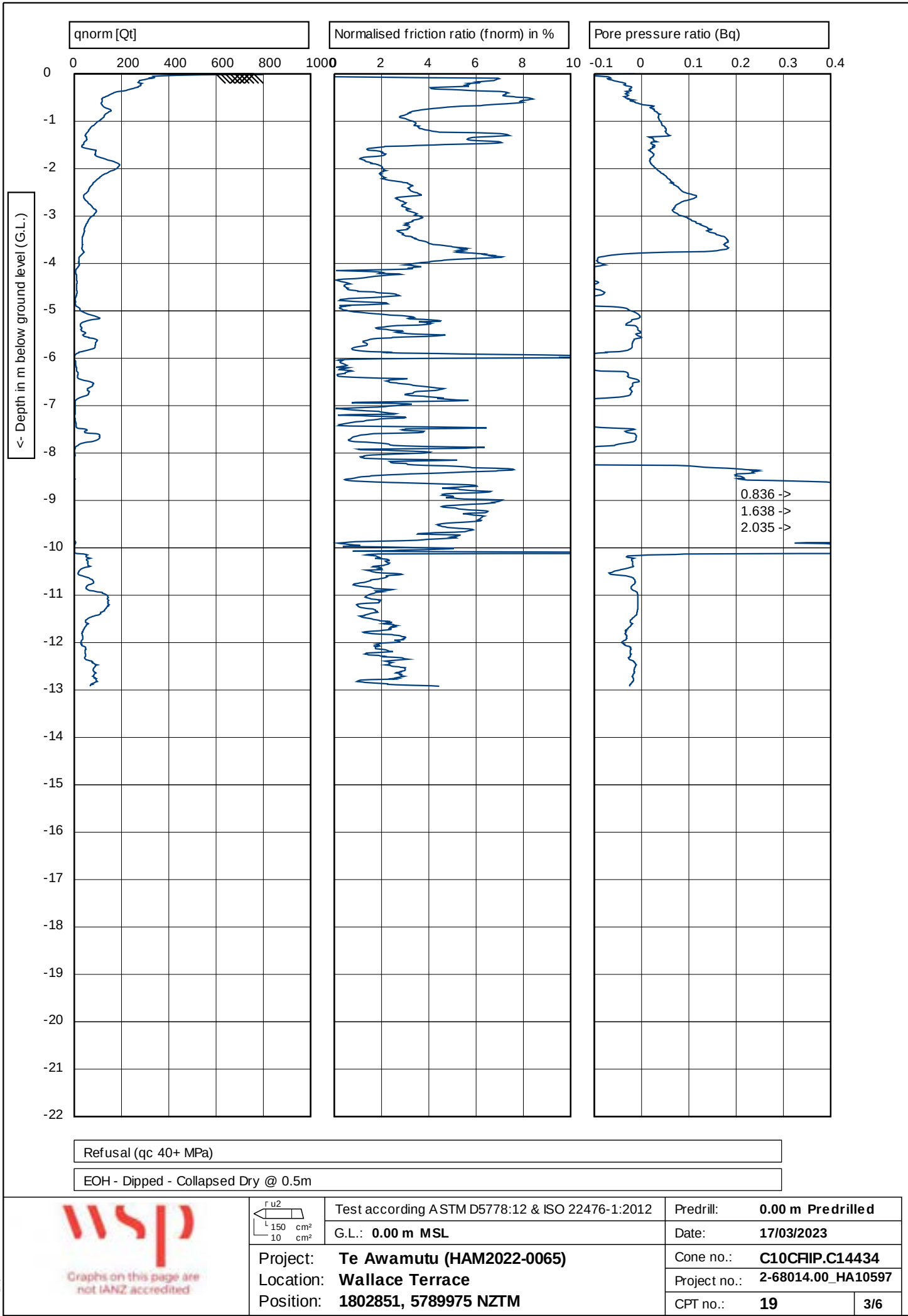
Location: **Wallace Terrace**

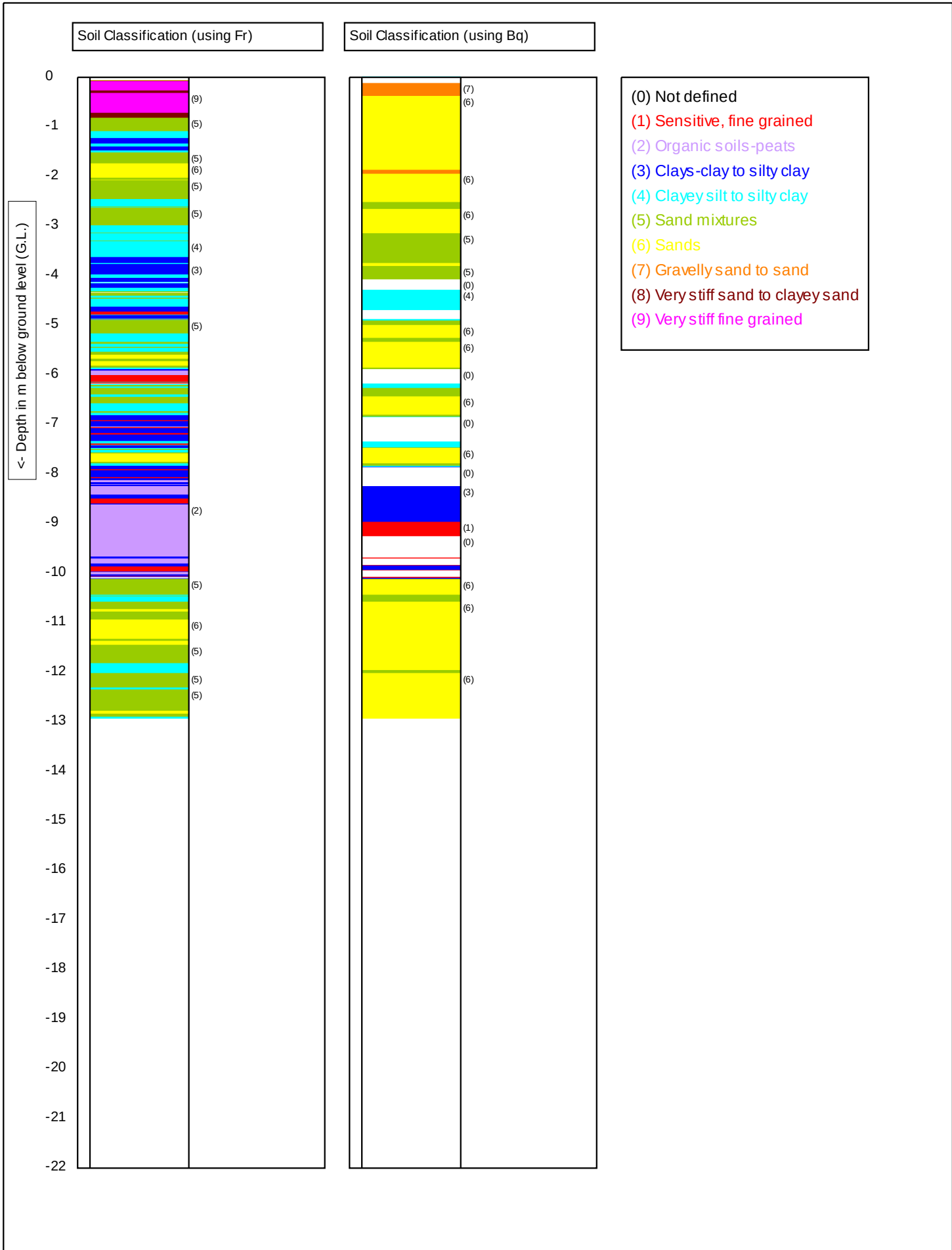
Position: **1802883, 5789858 NZTM**



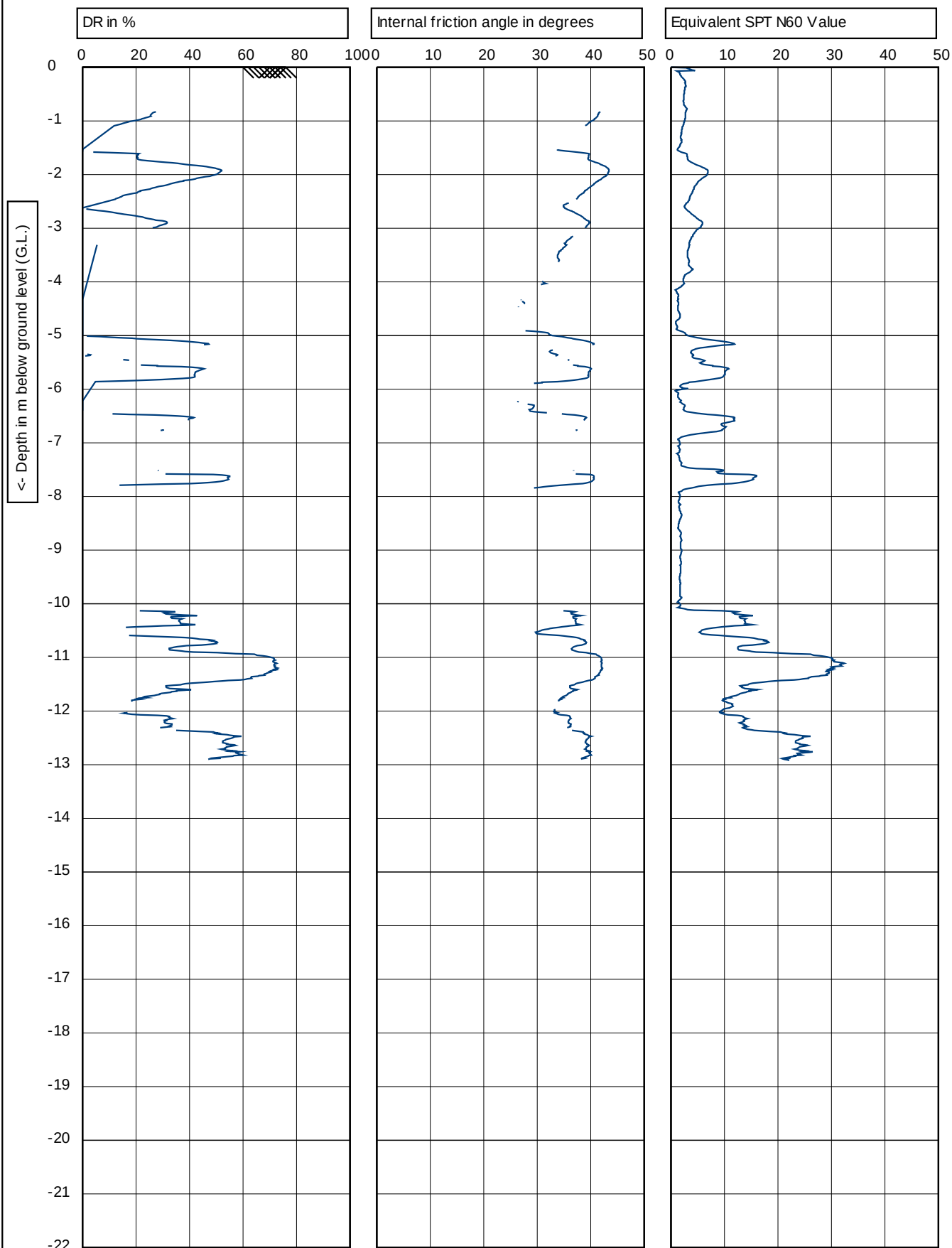






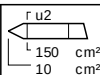


 Graphs on this page are not IANZ accredited		Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill: 0.00 m Predrilled	
		G.L.: 0.00 m MSL		Date: 17/03/2023	
		Project: Te Awamutu (HAM2022-0065) Location: Wallace Terrace Position: 1802851, 5789975 NZTM		Cone no.: C10CFIP.C14434	
				Project no.: 2-68014.00_HA10597	
				CPT no.: 19	4/6



Refusal (qc 40+ MPa)

EOH - Dipped - Collapsed Dry @ 0.5m



Test according ASTM D5778:12 & ISO 22476-1:2012

Predrill:	0.00 m Predrilled
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G.L.: 0.00 m MSL

Date:	17/03/2023
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Project: **Te Awamutu (HAM2022-0065)**

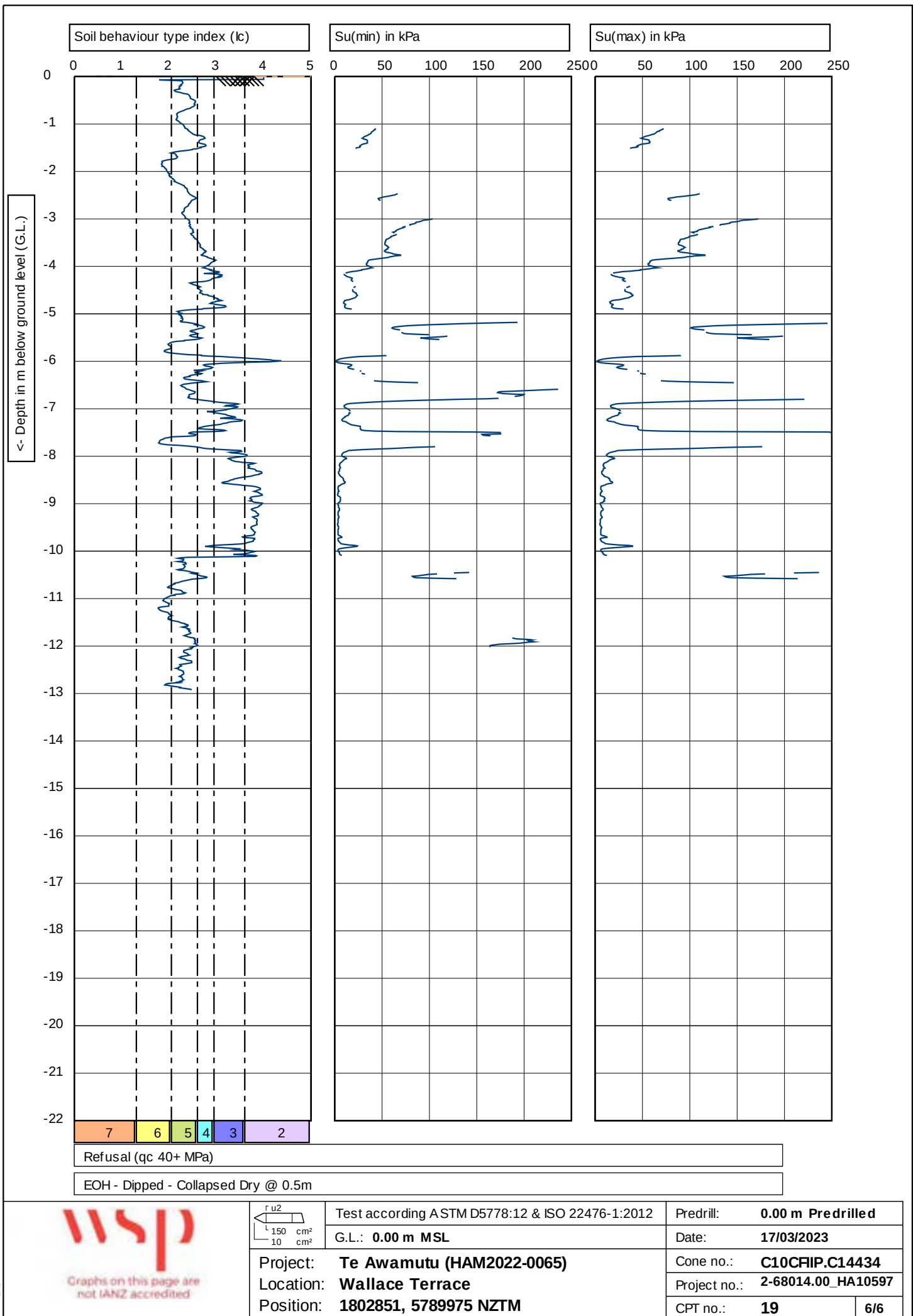
Cone no.: **C10CFIP.C14434**

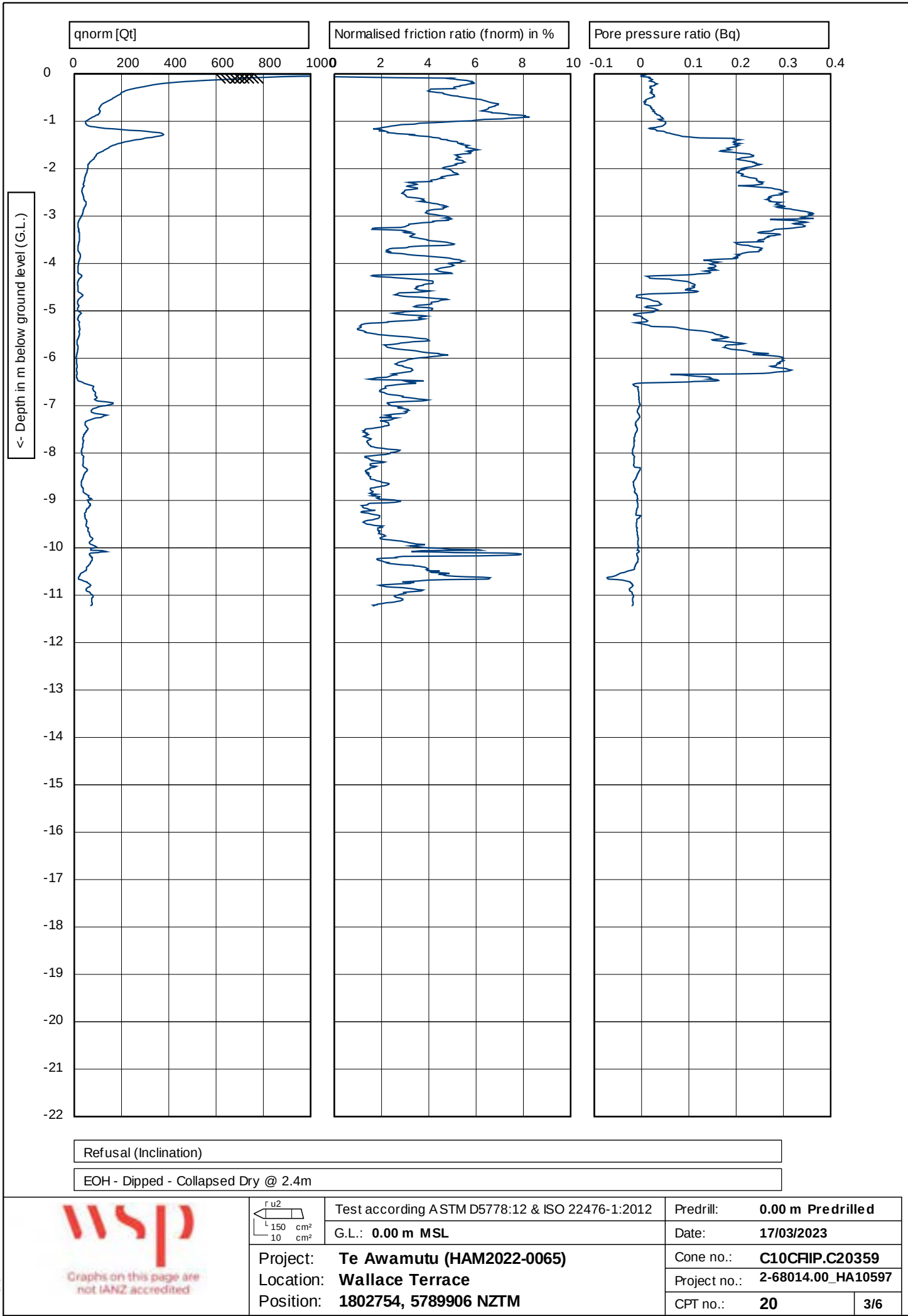
Location: **Wallace Terrace**

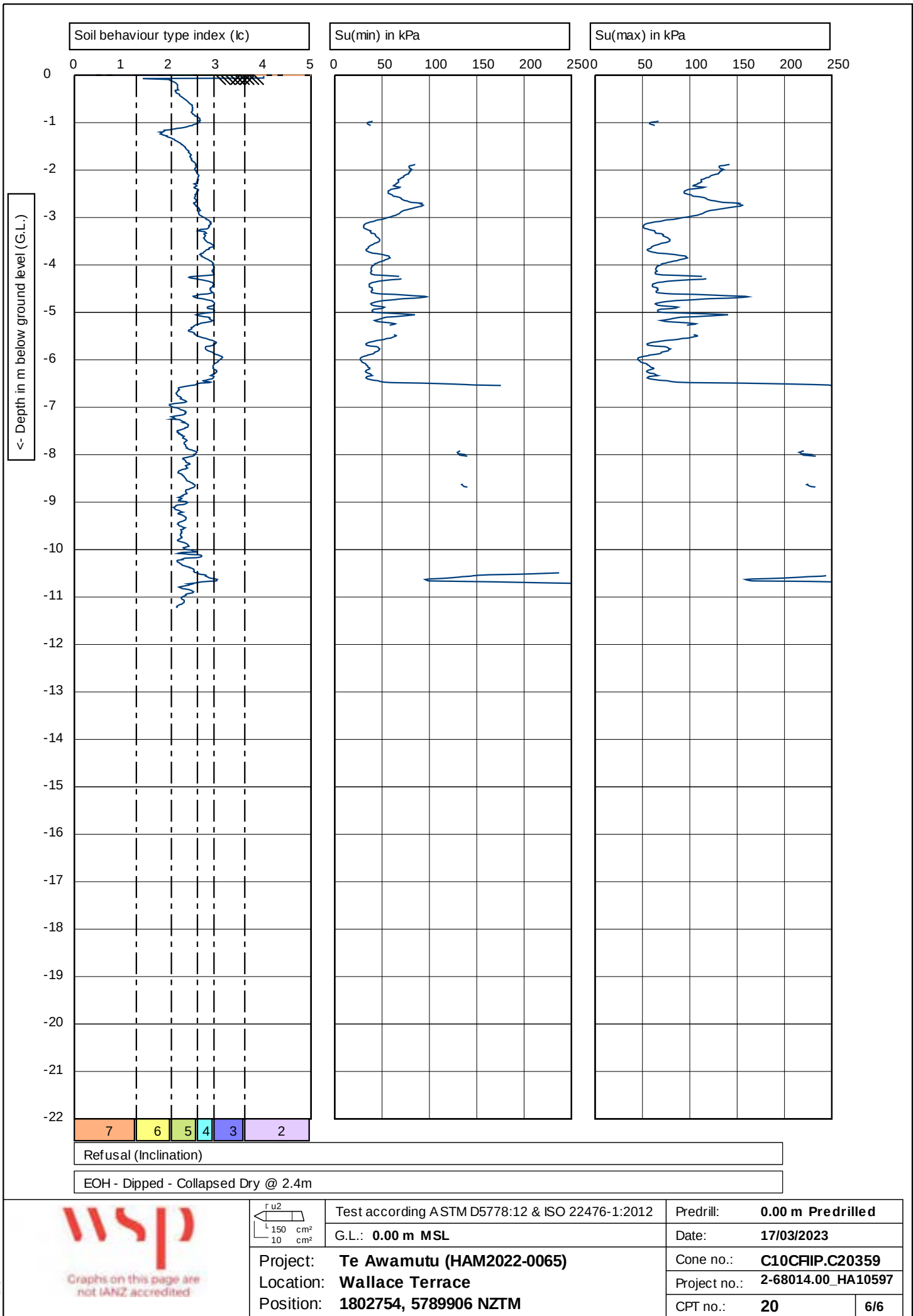
Project no.:	2-68014.00_HA10597
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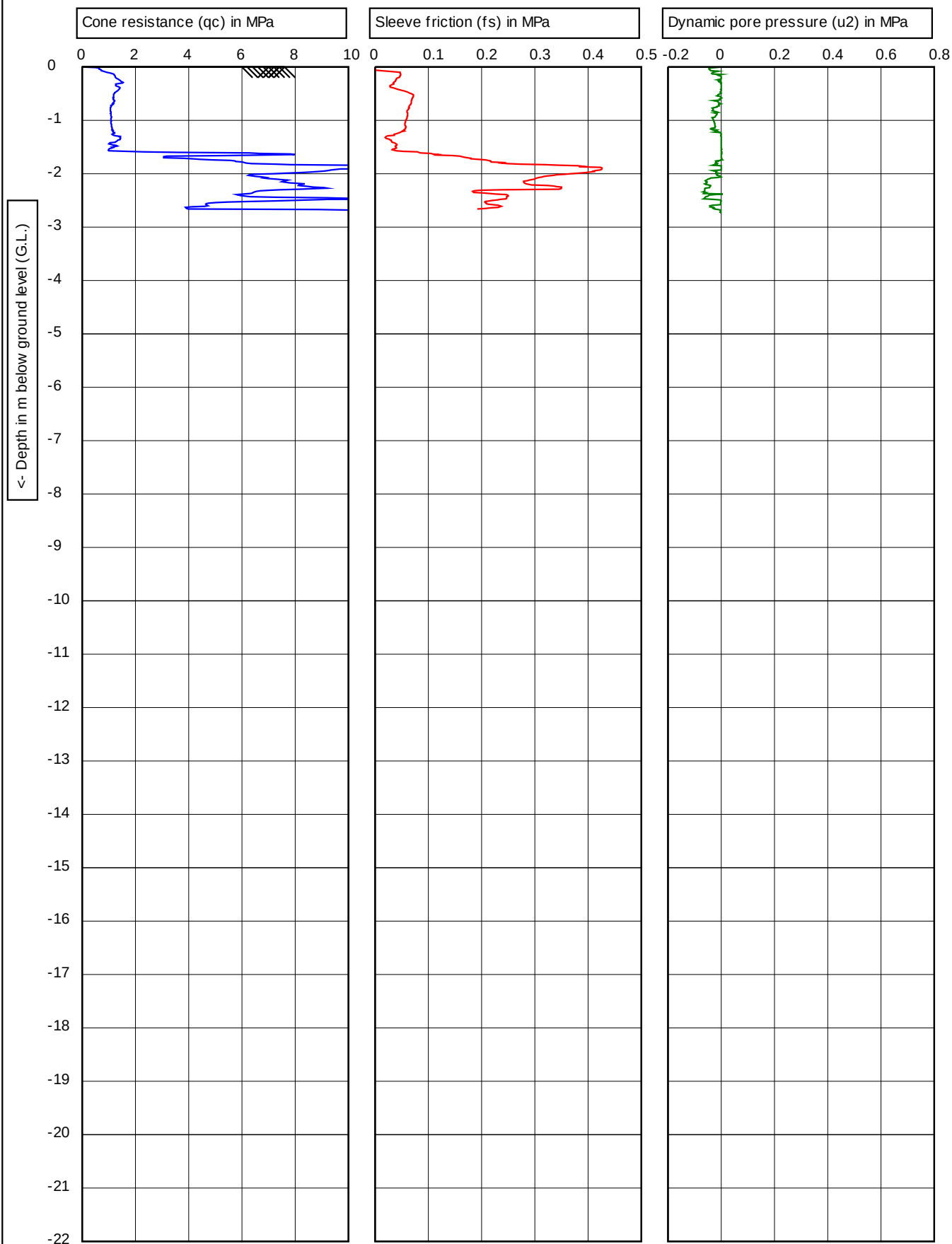
Position: **1802851, 5789975 NZTM**

CPT no.:	19	5/6
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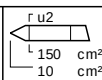


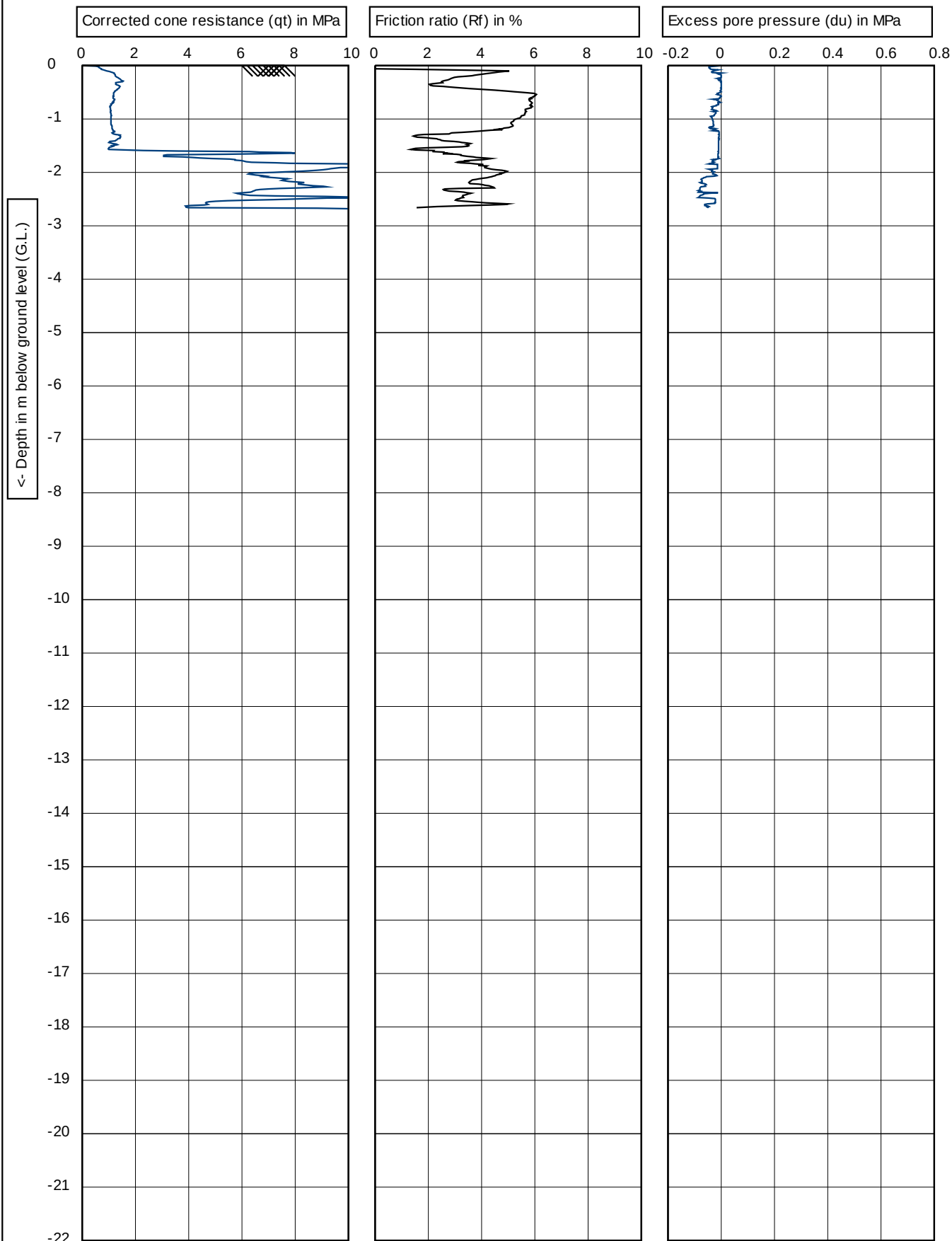


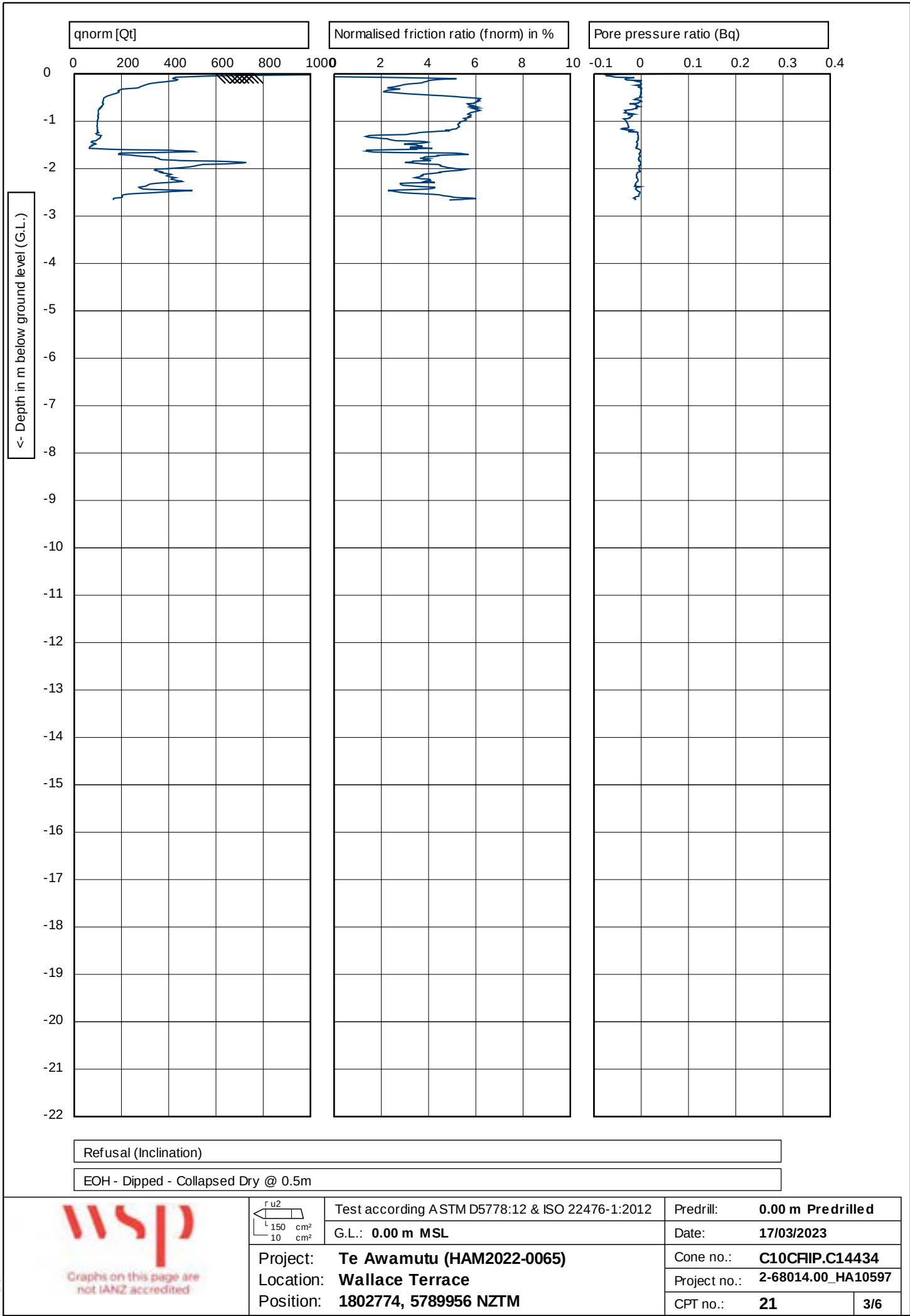


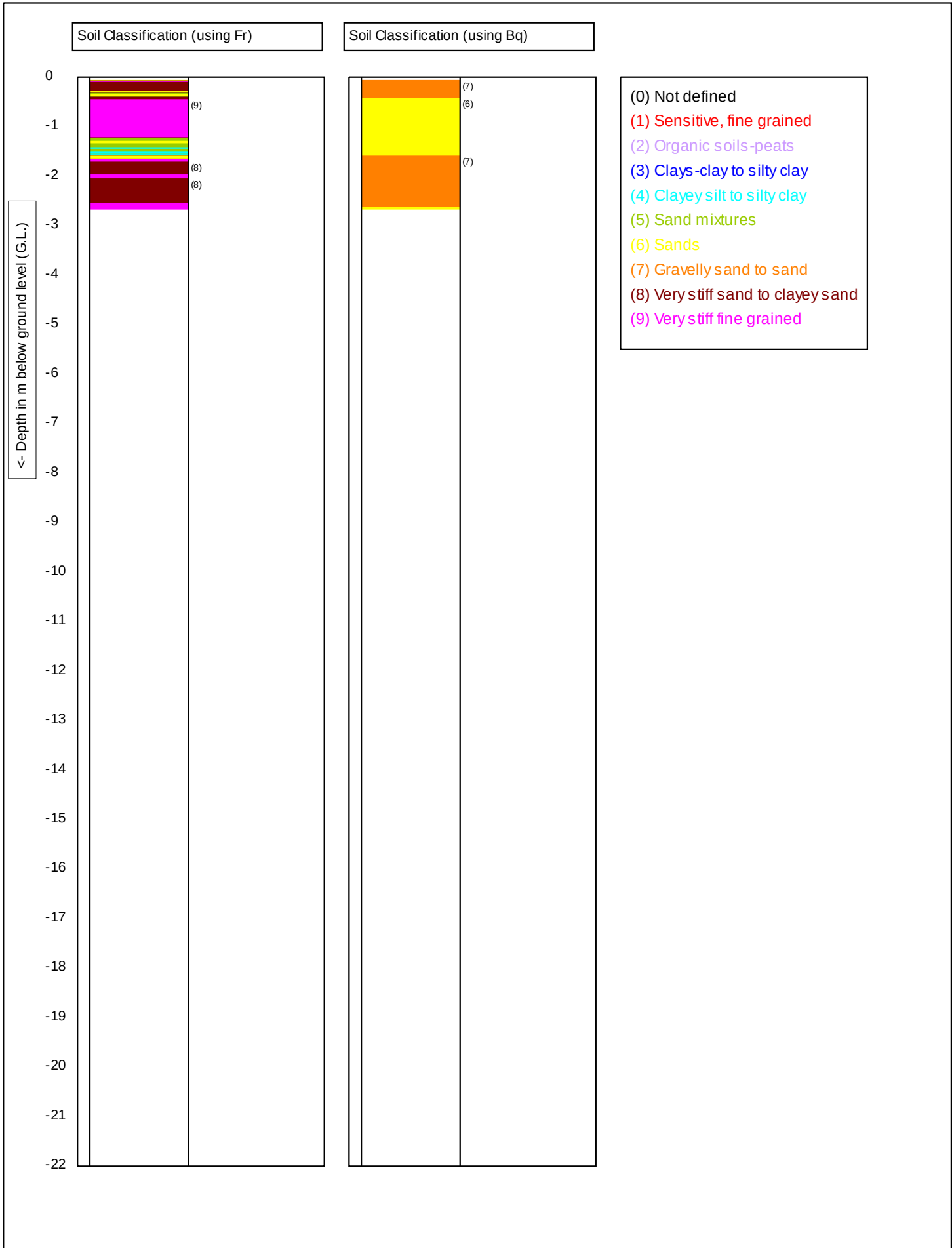


Refusal (Inclination)

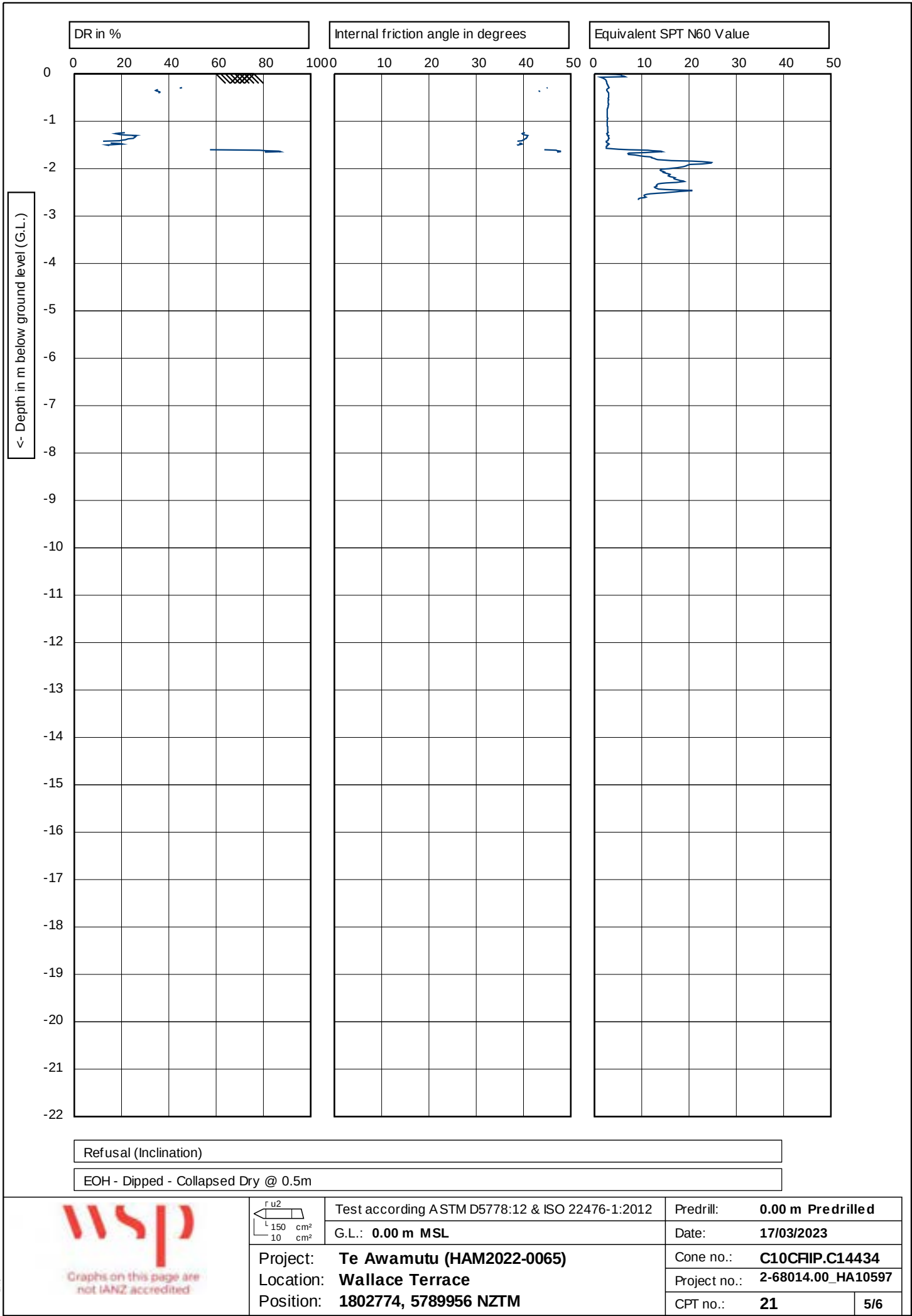


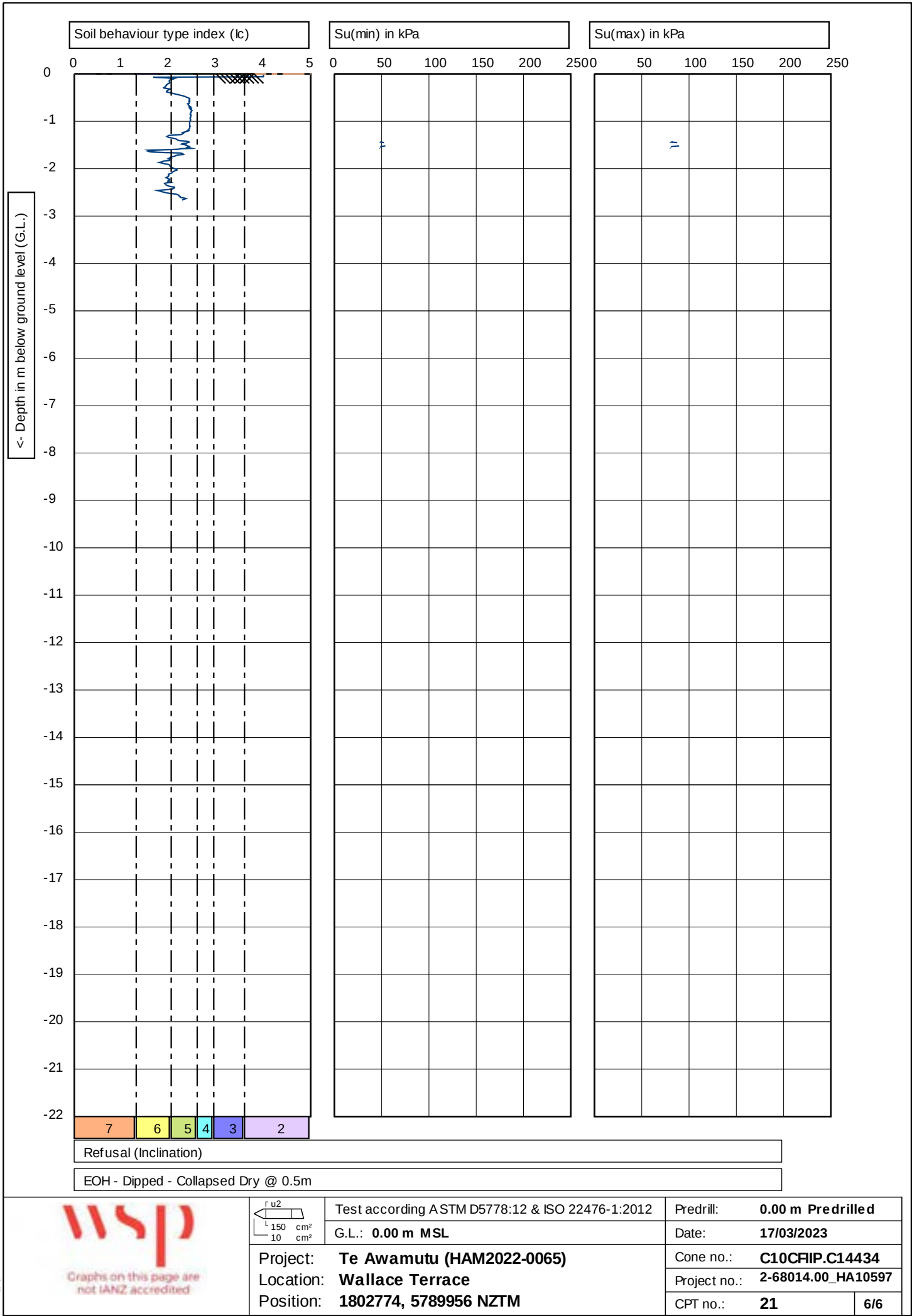


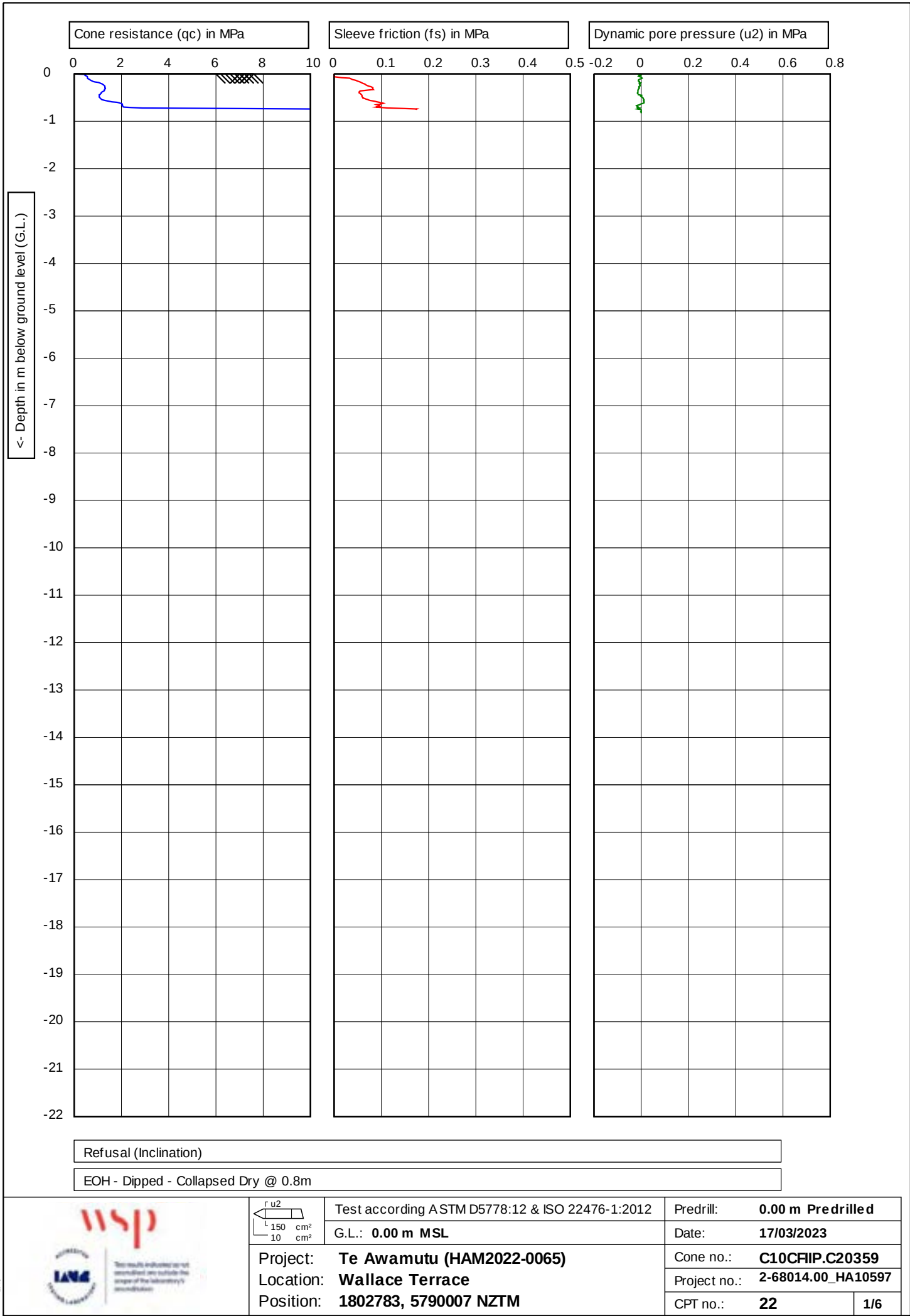


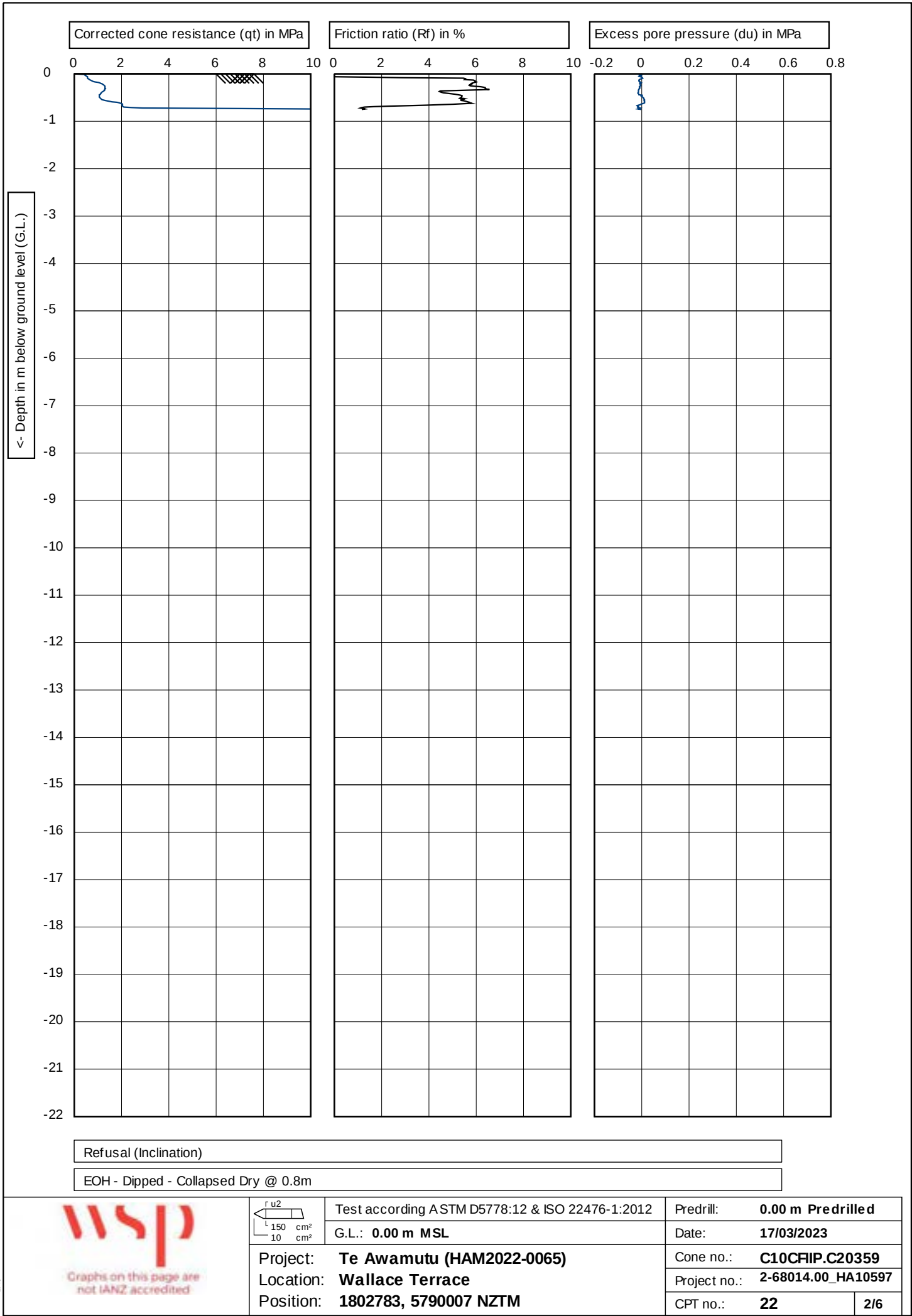


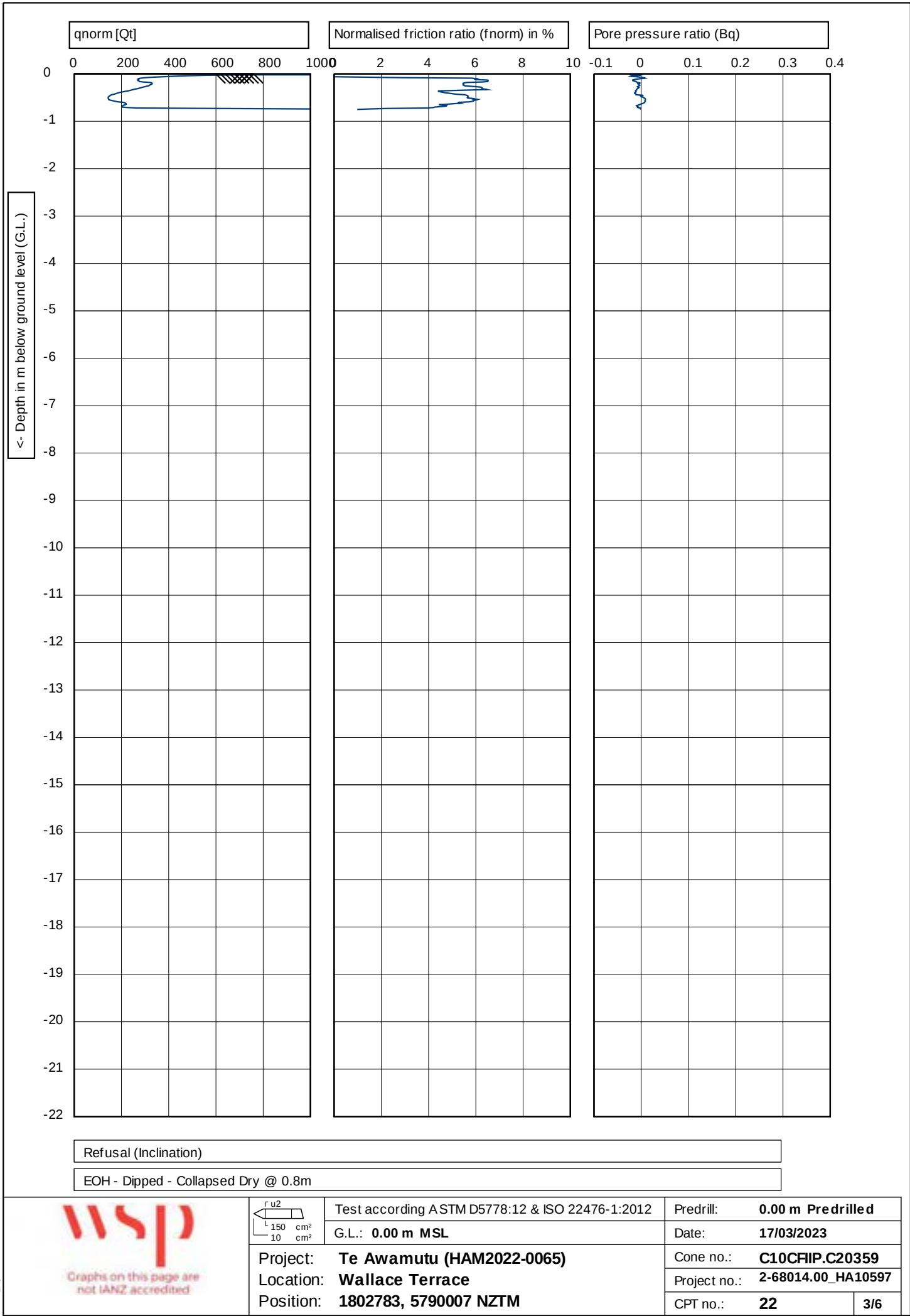
 Graphs on this page are not IANZ accredited		Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: 0.00 m Predrilled	
		G.L.: 0.00 m MSL	Date: 17/03/2023	
		Project: Te Awamutu (HAM2022-0065)	Cone no.: C10CFIP.C14434	
		Location: Wallace Terrace	Project no.: 2-68014.00_HA10597	
		Position: 1802774, 5789956 NZTM	CPT no.: 21	4/6

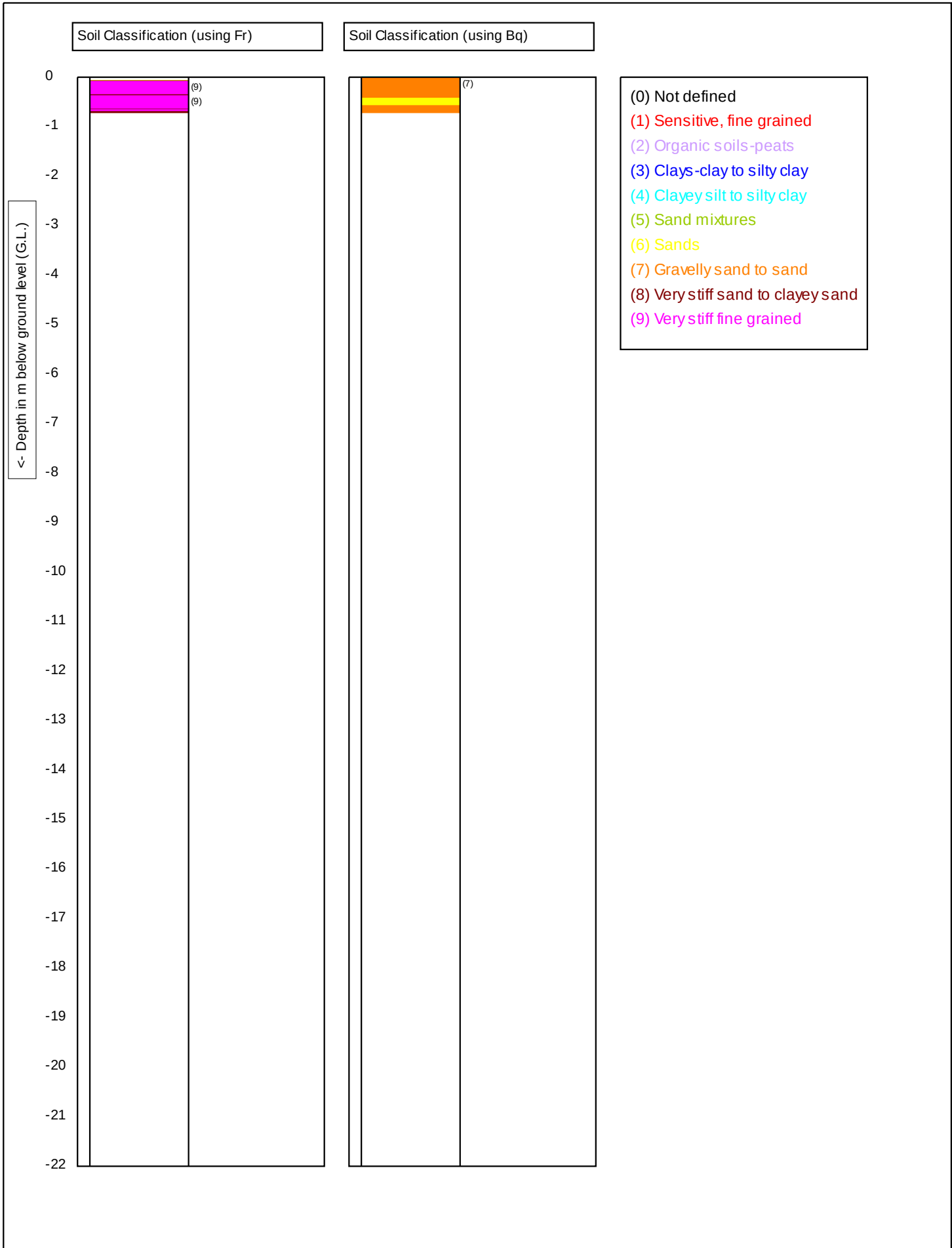












 Graphs on this page are not IANZ accredited		Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: 0.00 m Predrilled	
		G.L.: 0.00 m MSL	Date: 17/03/2023	
		Project: Te Awamutu (HAM2022-0065)	Cone no.: C10CFIP.C20359	
		Location: Wallace Terrace	Project no.: 2-68014.00_HA10597	
		Position: 1802783, 5790007 NZTM	CPT no.: 22	4/6

DR in %		Internal friction angle in degrees		Equivalent SPT N60 Value	
0	1000	10	50	0	50
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3670					
3680					
3690					
3700					
3710					
3720					
3730					
3740					
3					

Soil behaviour type index (Ic)

012345

0

-1

-2

-3

-4

-5

-6

-7

-8

-9

-10

-11

-12

-13

-14

-15

-16

-17

-18

-19

-20

-21

-22

7

6

5

4

3

2

Su(min) in kPa

0501001502002500

0

50

100

150

200

2500

Su(max) in kPa

50100150200250

50

100

150

200

250

<- Depth in m below ground level (G.L.)

Refusal (Inclination)

EOH - Dipped - Collapsed Dry @ 0.8m

149

150

10

u2

cm²

cm²

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: Te Awamutu (HAM2022-0065)

Location: Wallace Terrace

Position: 1802783, 5790007 NZTM

Predrill: 0.00 m Predrilled

Date: 17/03/2023

Cone no.: C10CFIP.C20359

Project no.: 2-68014.00_HA10597

CPT no.: 22

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149

150

10

u2

cm²

cm²

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: Te Awamutu (HAM2022-0065)

Location: Wallace Terrace

Position: 1802783, 5790007 NZTM

Predrill: 0.00 m Predrilled

Date: 17/03/2023

Cone no.: C10CFIP.C20359

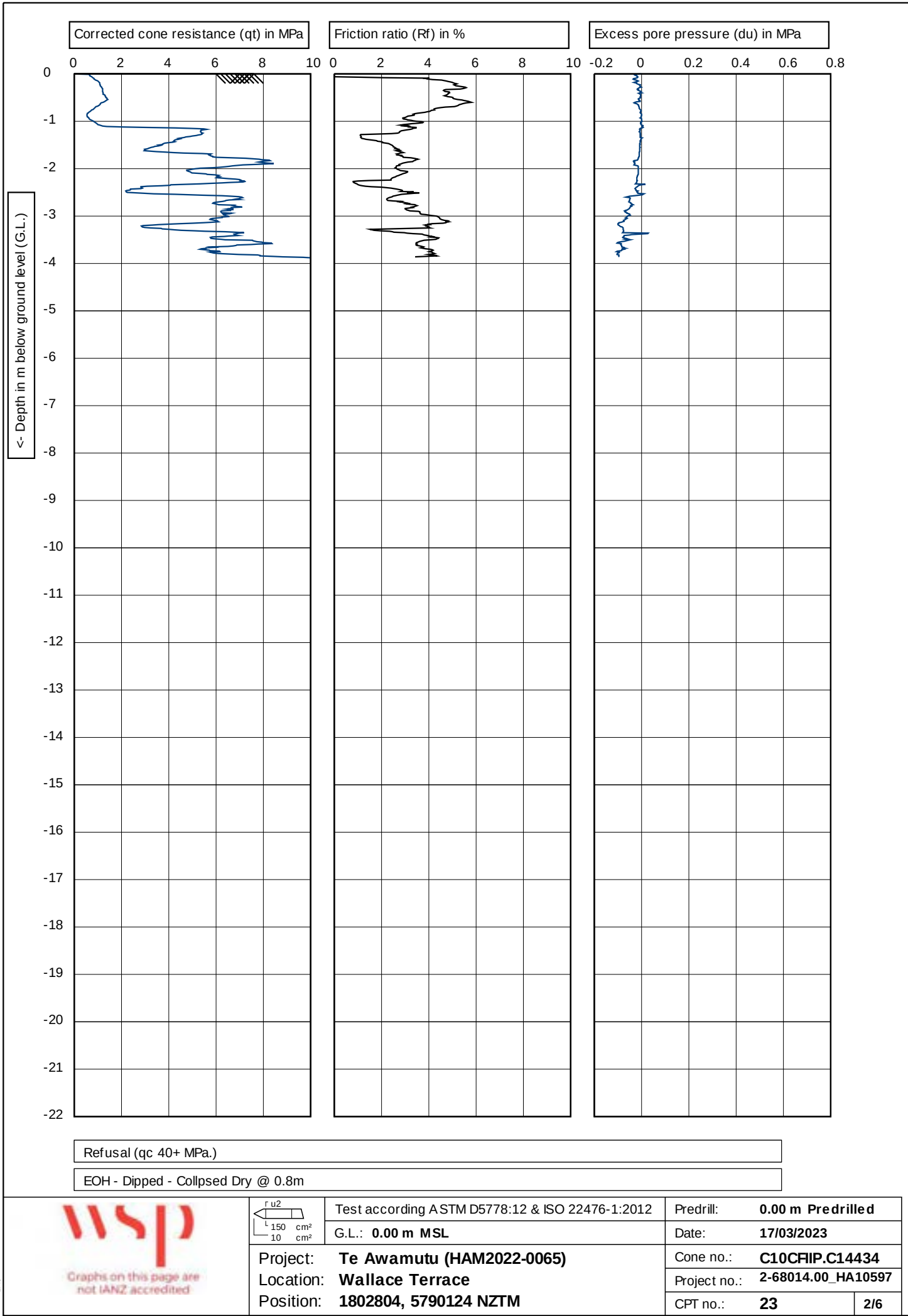
Project no.: 2-68014.00_HA10597

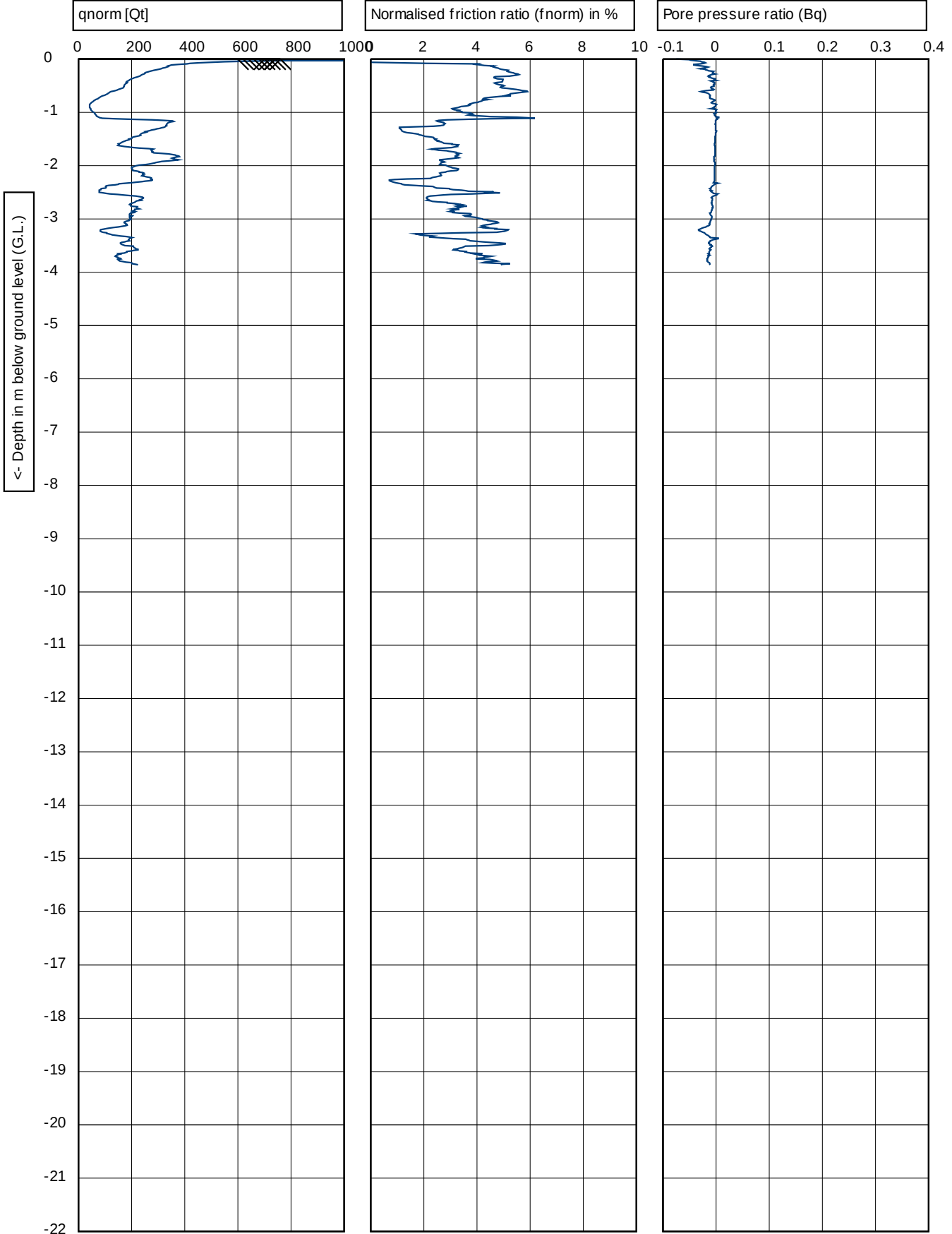
CPT no.: 22

6/6

Document Set ID: 11324602

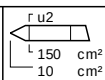
Version: 2, Version Date: 26/02/2026





Refusal (qc 40+ MPa.)

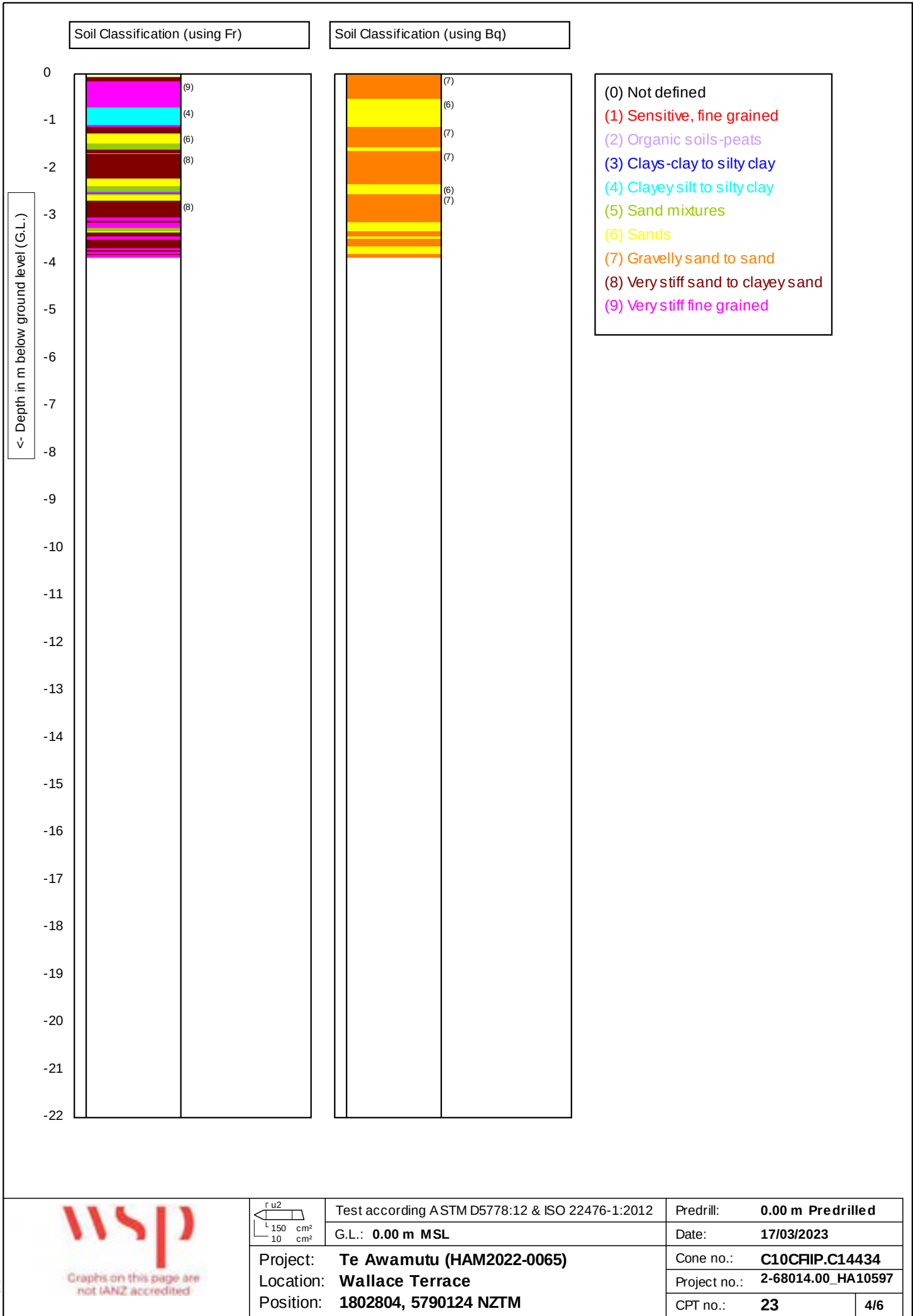
EOH - Dipped - Collpsed Dry @ 0.8m

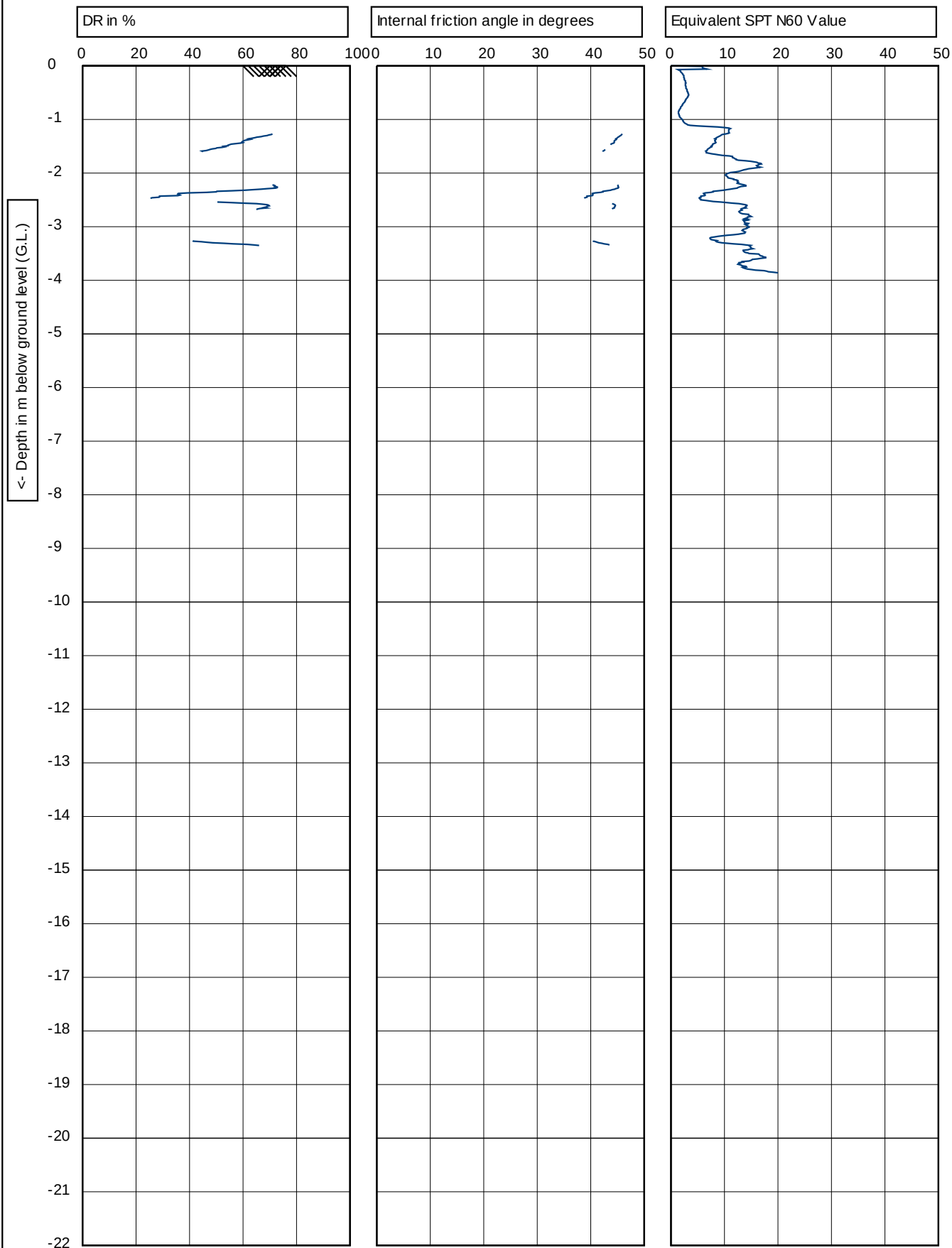


Test according ASTM D5778:12 & ISO 22476-1:2012
G.L.: 0.00 m MSL

Project: **Te Awamutu (HAM2022-0065)**
Location: **Wallace Terrace**
Position: **1802804, 5790124 NZTM**

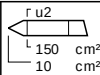
Predrill: **0.00 m Predrilled**
Date: **17/03/2023**
Cone no.: **C10CFIP.C14434**
Project no.: **2-68014.00_HA10597**
CPT no.: **23** 3/6





Refusal (qc 40+ MPa.)

EOH - Dipped - Collpsed Dry @ 0.8m



Test according ASTM D5778:12 & ISO 22476-1:2012

Predrill:	0.00 m	Predrilled
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G.L.: 0.00 m MSL

Date:	17/03/2023
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Project: **Te Awamutu (HAM2022-0065)**

Location: **Wallace Terrace**

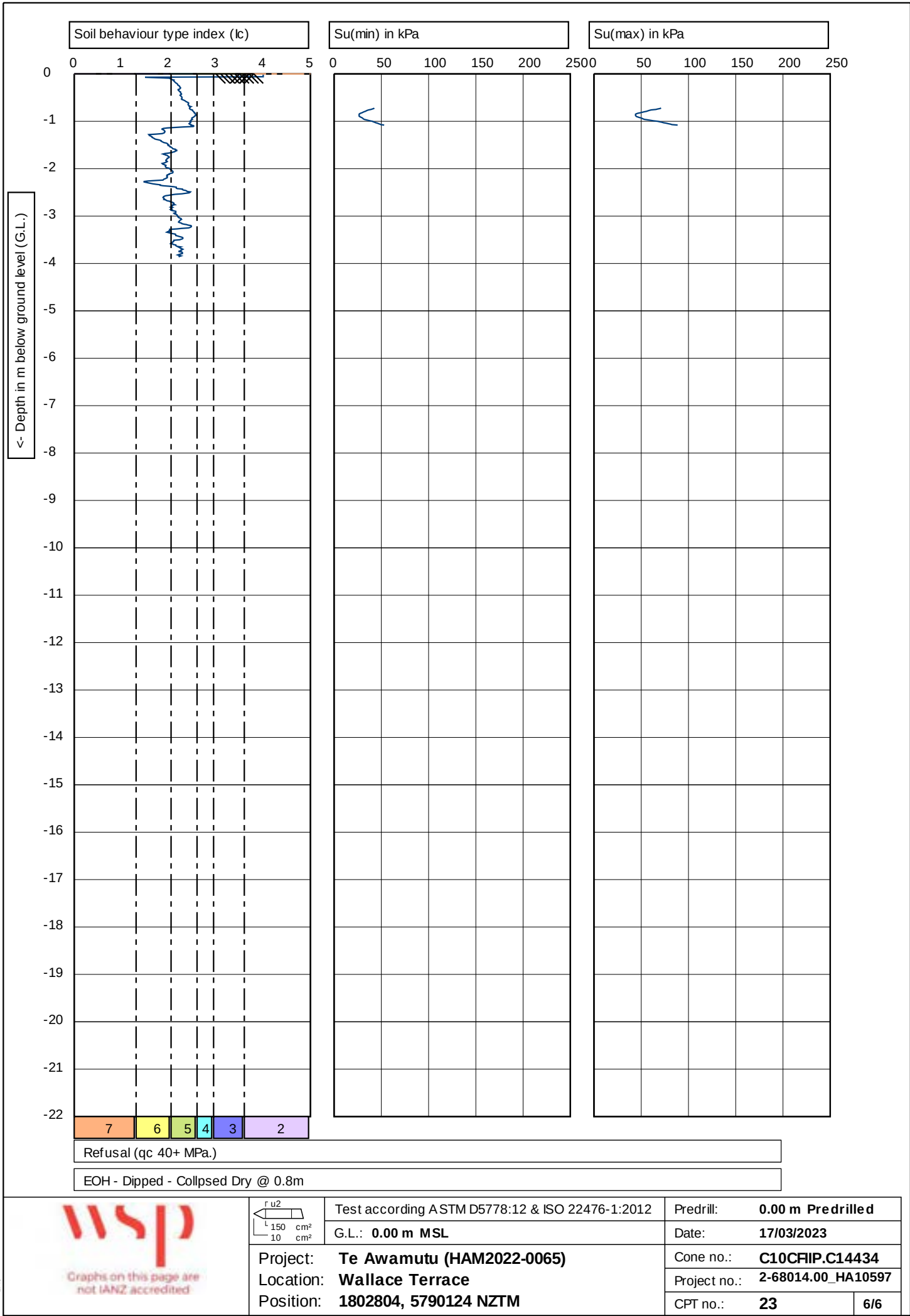
Position: **1802804, 5790124 NZTM**

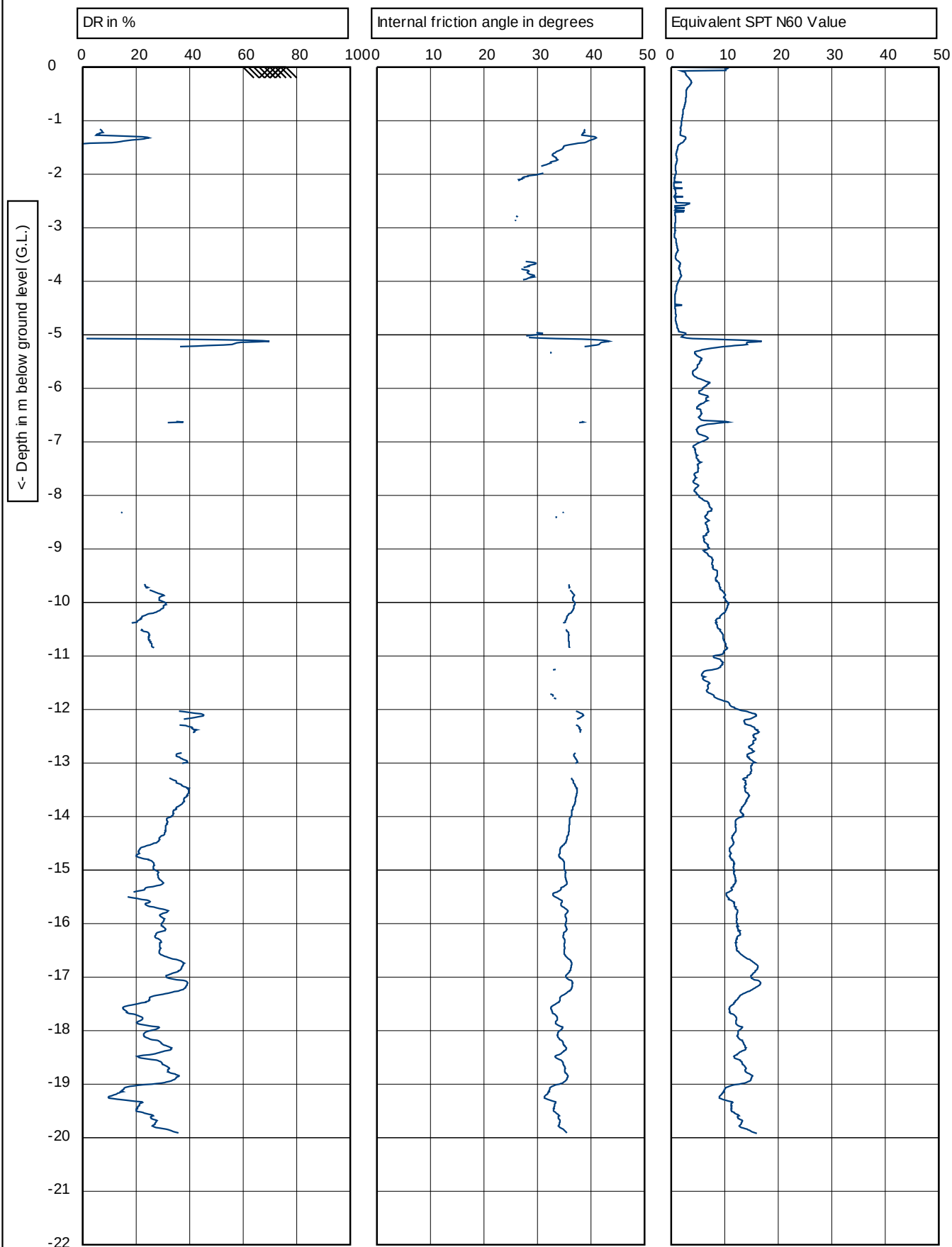
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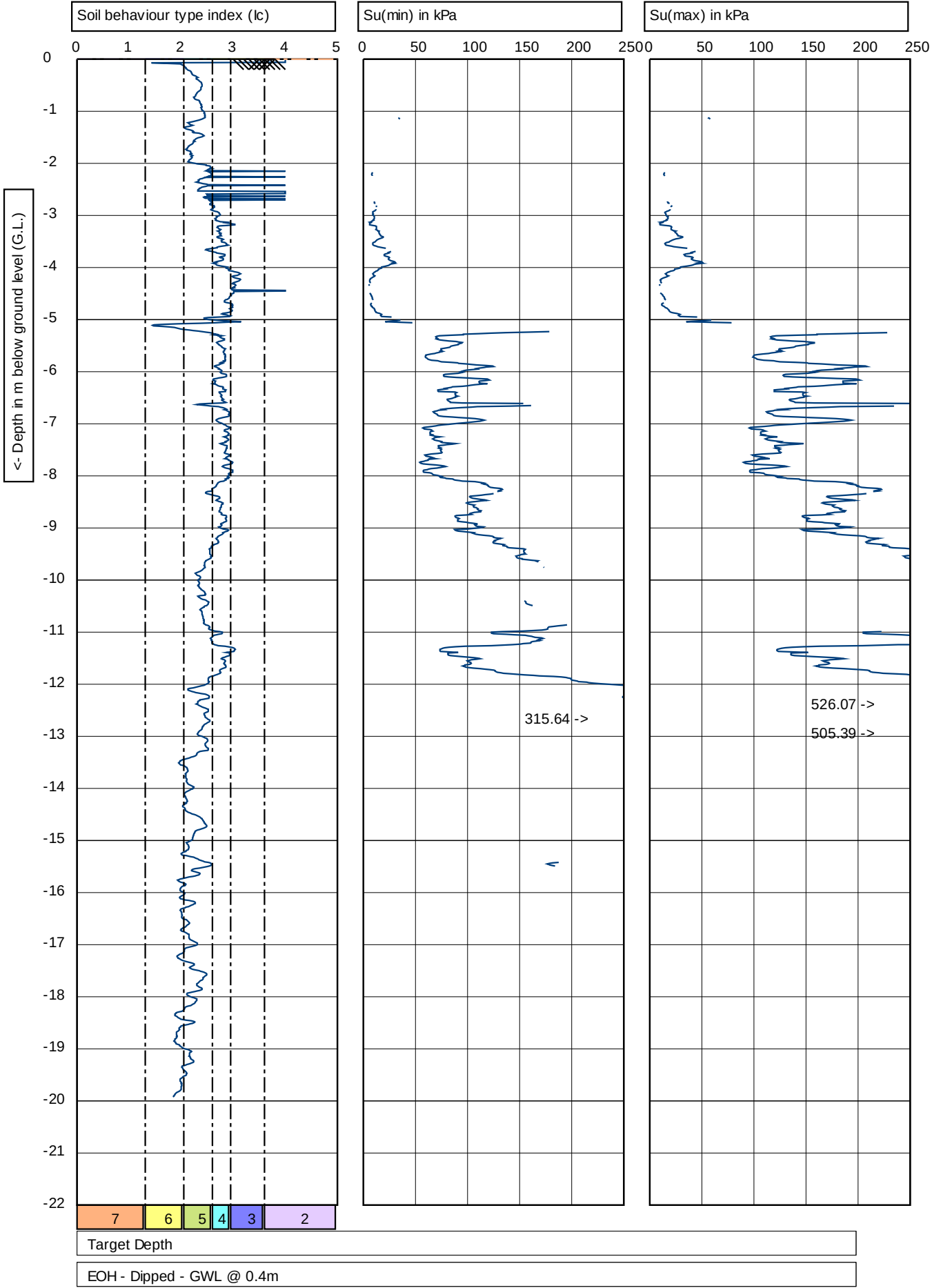
Project no.:	2-68014.00_HA10597
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CPT no.:	23
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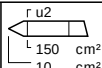
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Graphs on this page are
not IANZ accredited



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: 522 Puniu Rd
Location: Te Awamutu (HAM122561)
Position: 1802767, 5789675 NZTM

Predrill: 0.00 m Predrilled

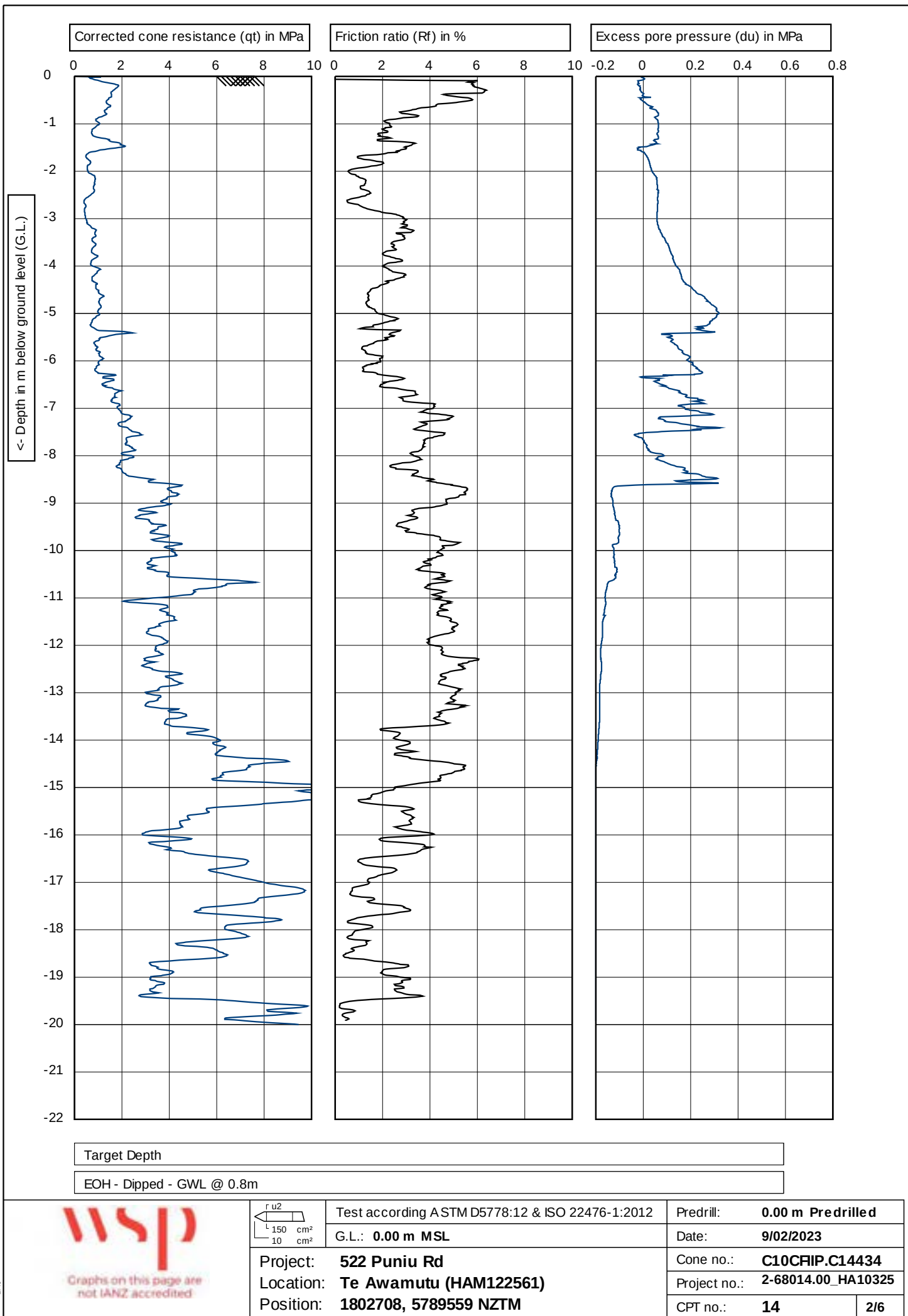
Date: 9/02/2023

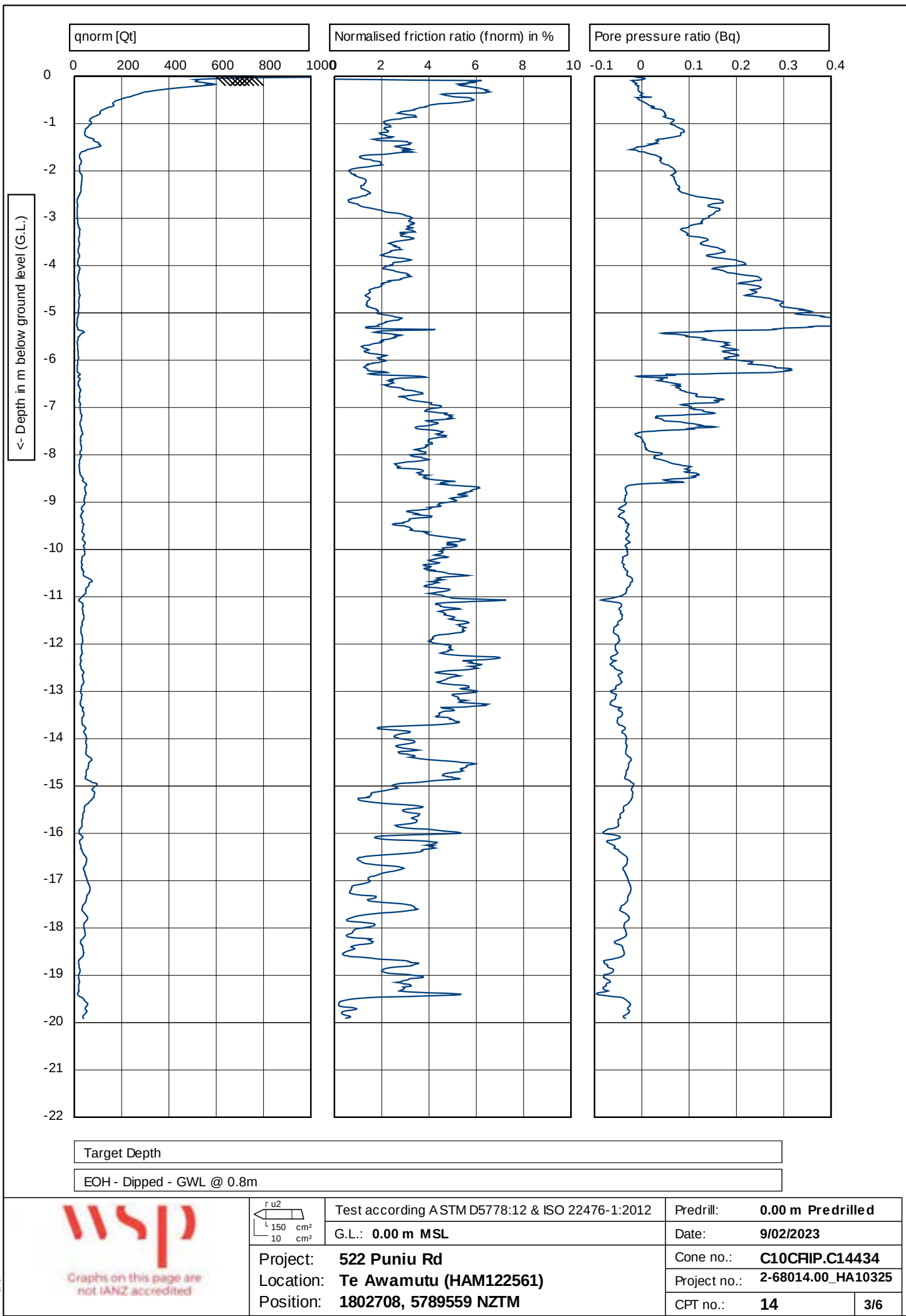
Cone no.: C10CFIP.C14434

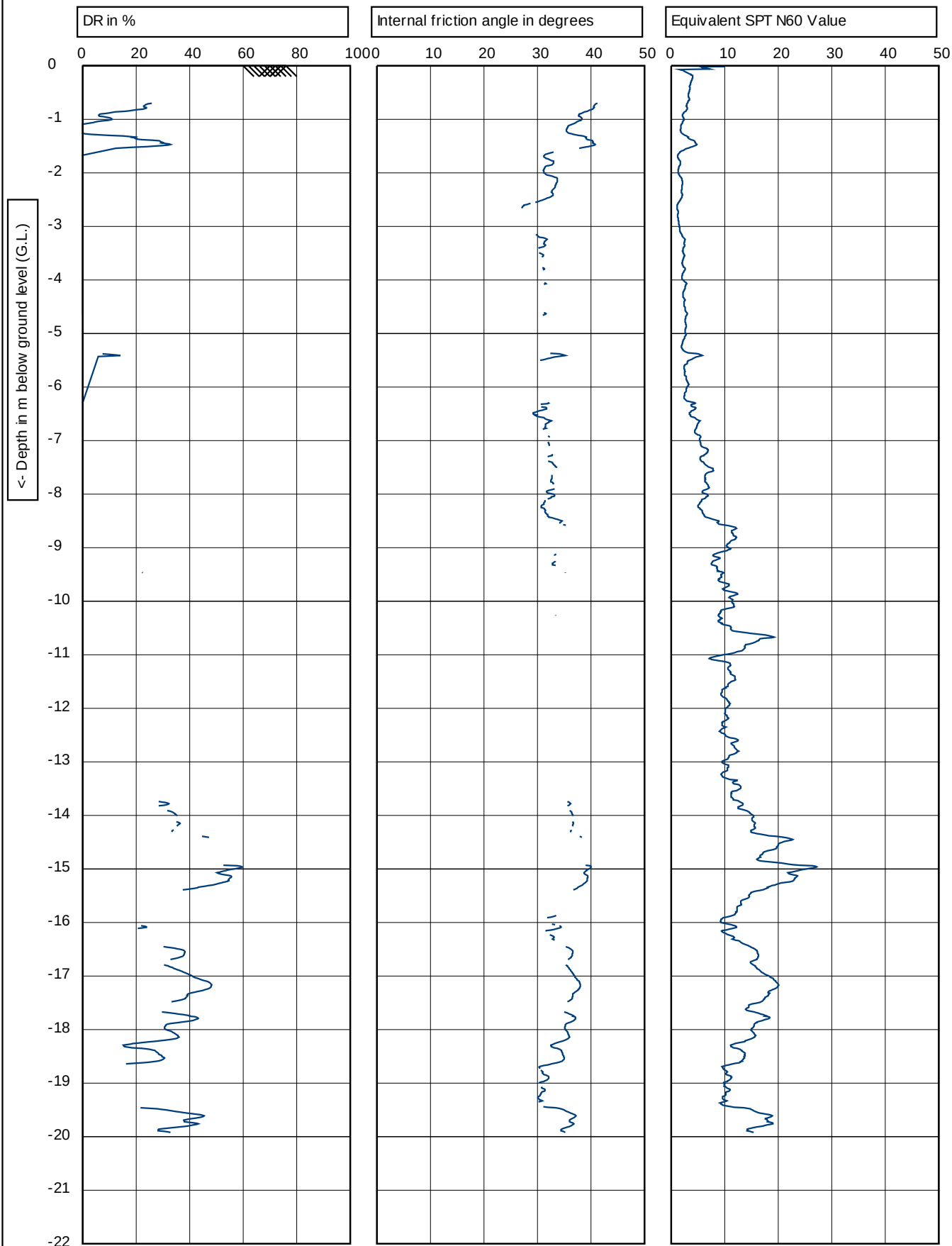
Project no.: 2-68014.00_HA10325

CPT no.: 13

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Target Depth

EOH - Dipped - GWL @ 0.8m



Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: **522 Puniu Rd**
Location: **Te Awamutu (HAM122561)**
Position: **1802708, 5789559 NZTM**

Predrill:	0.00 m	Predrilled
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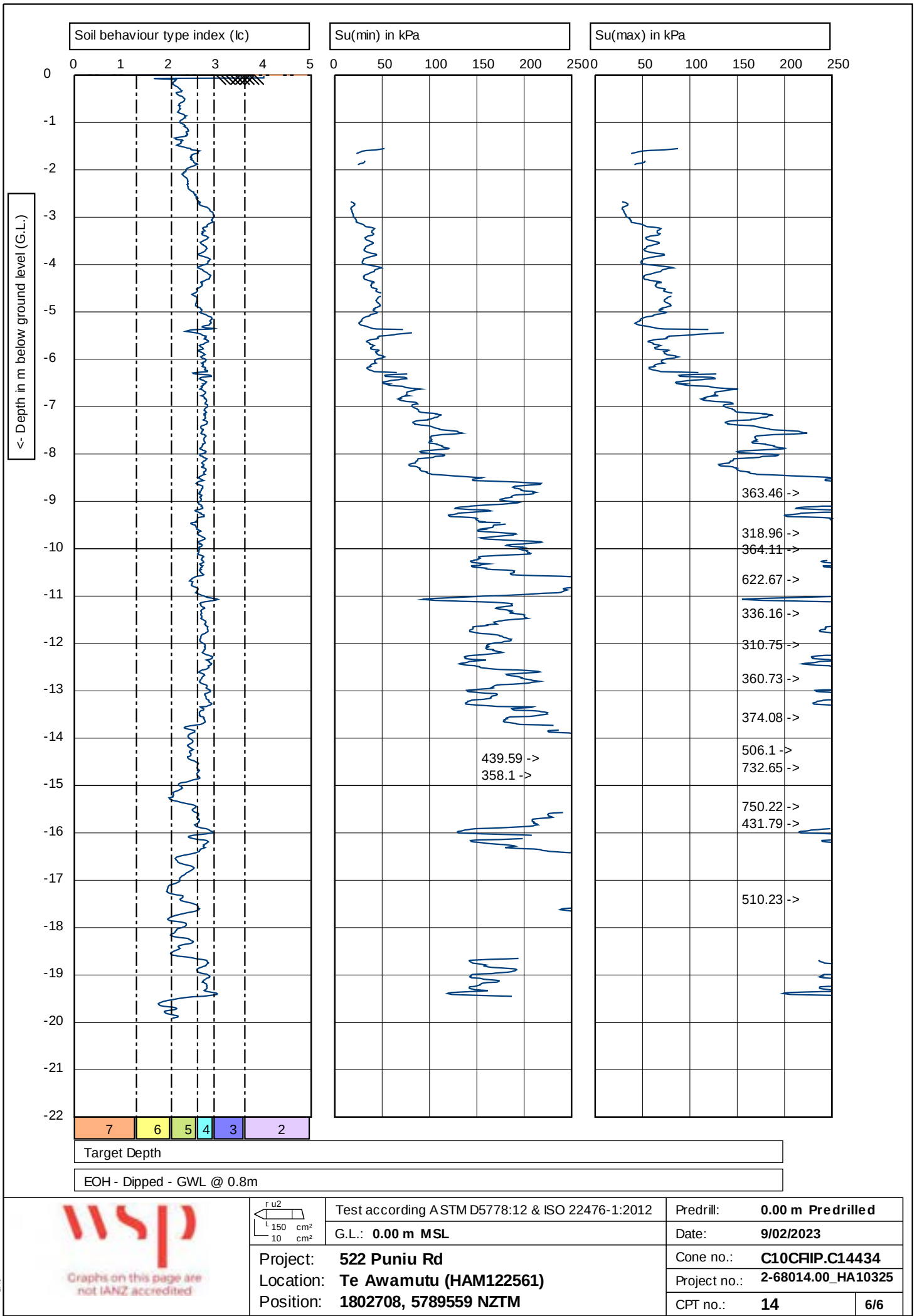
Date:	9/02/2023
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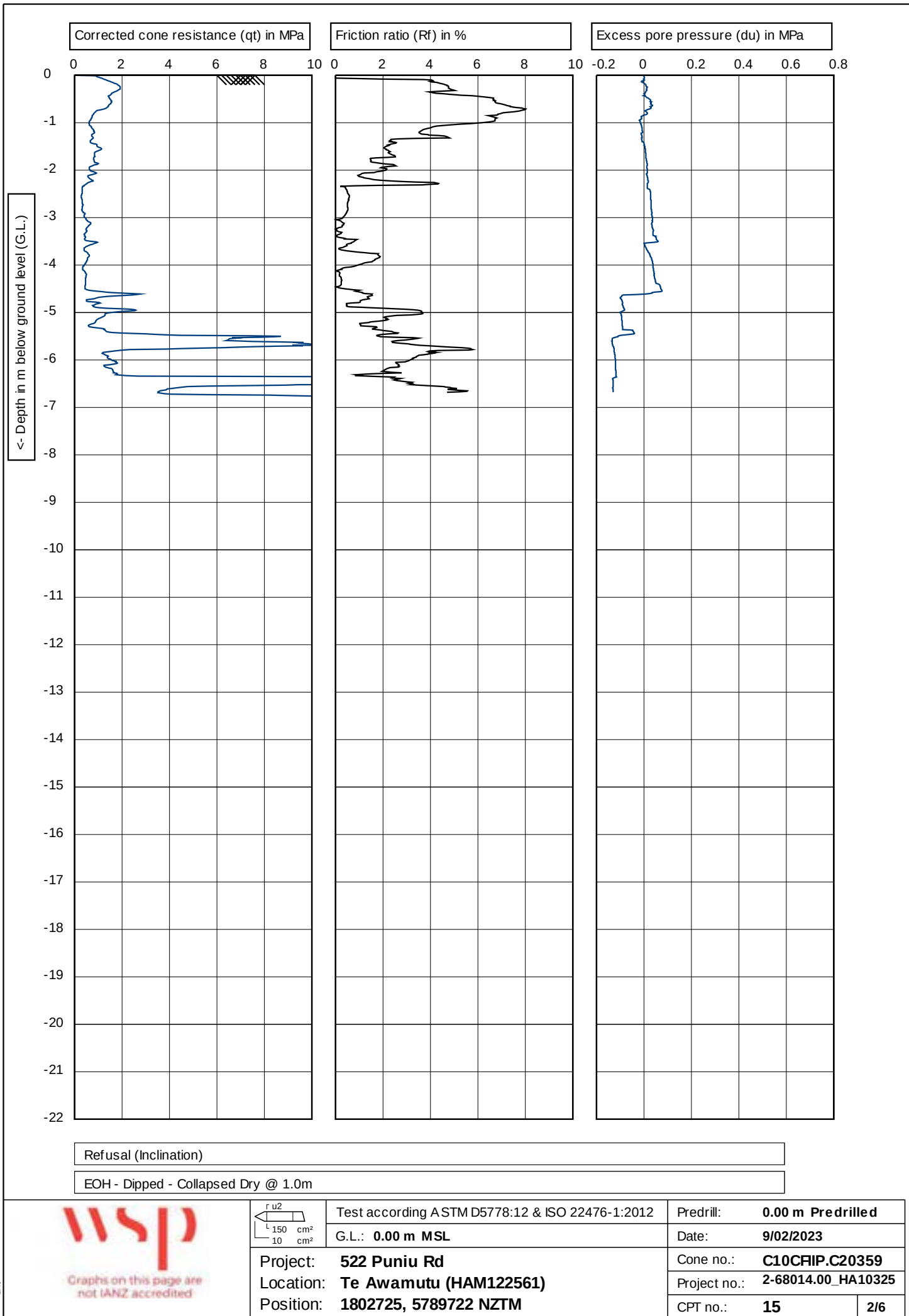
Cone no.: **C10CFIP.C14434**

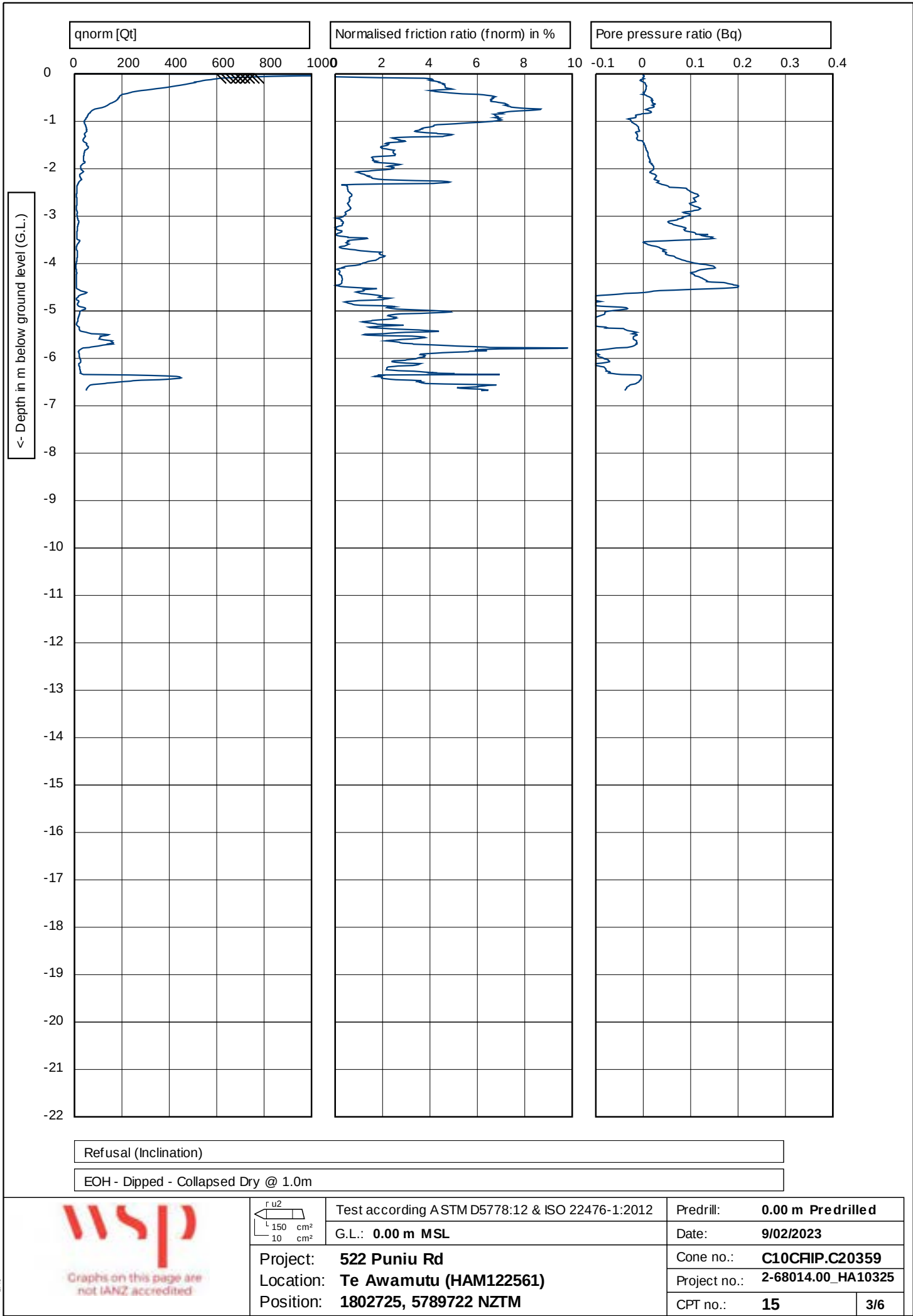
Project no.:	2-68014.00_HA10325
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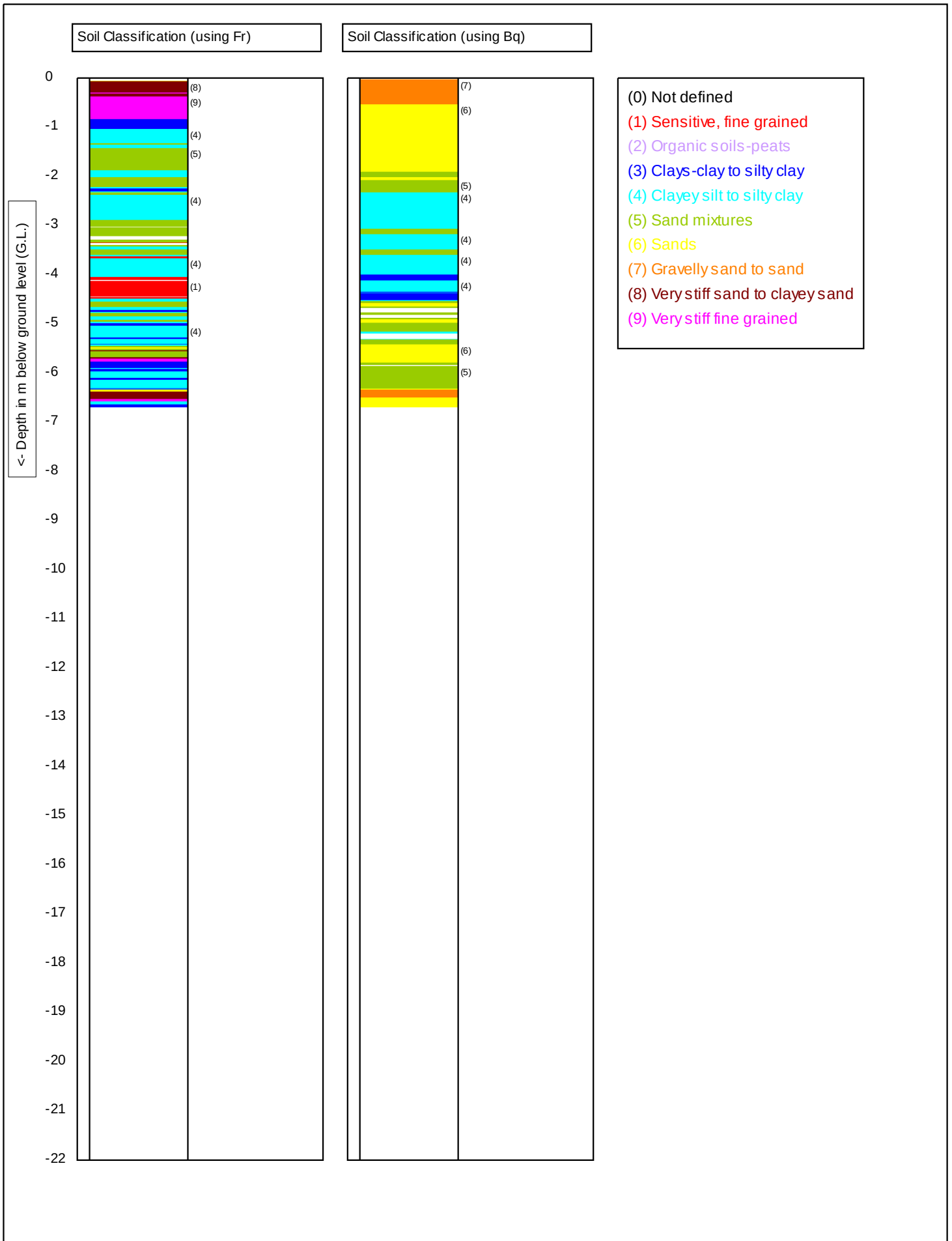
CPT no.:	14
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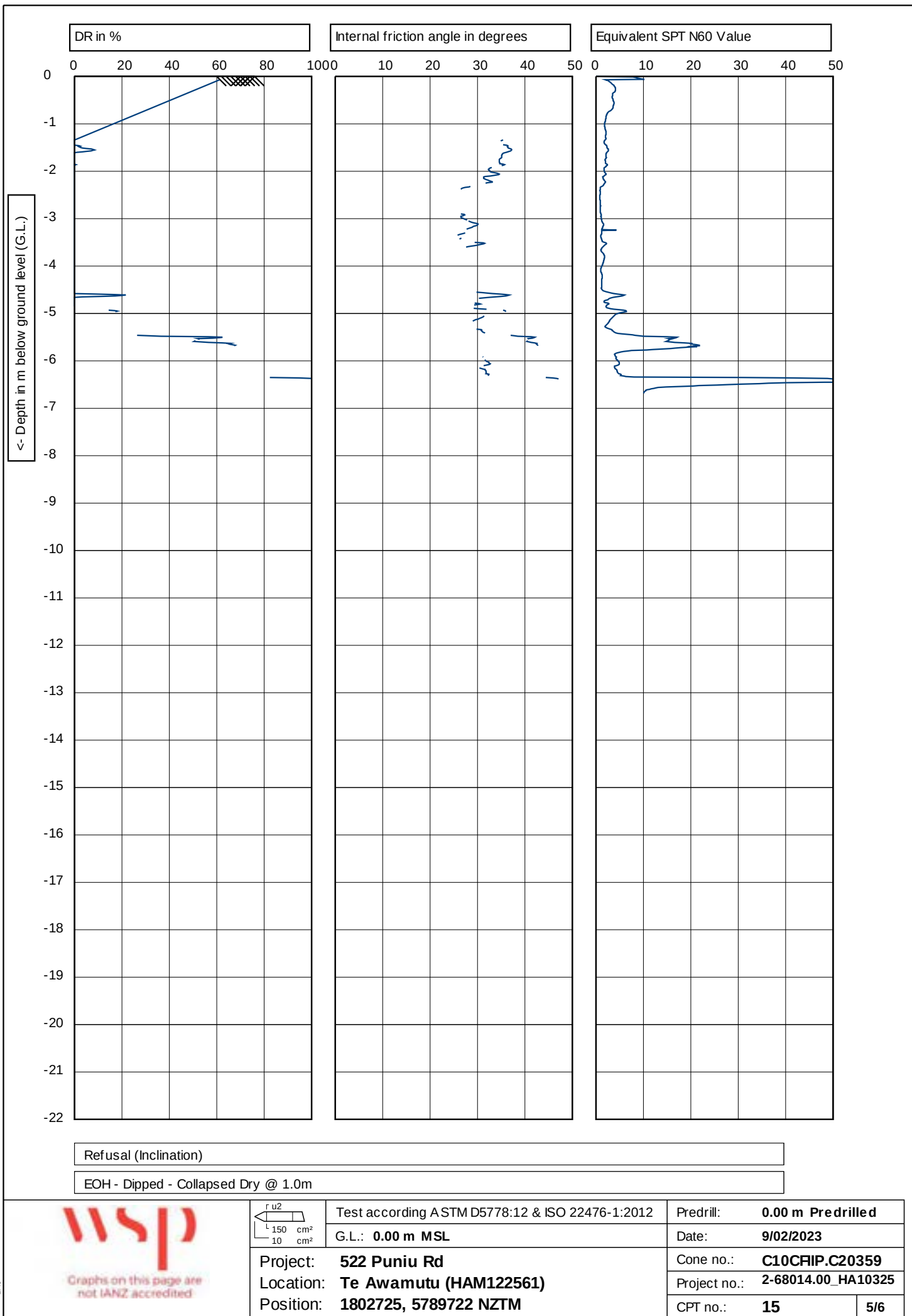


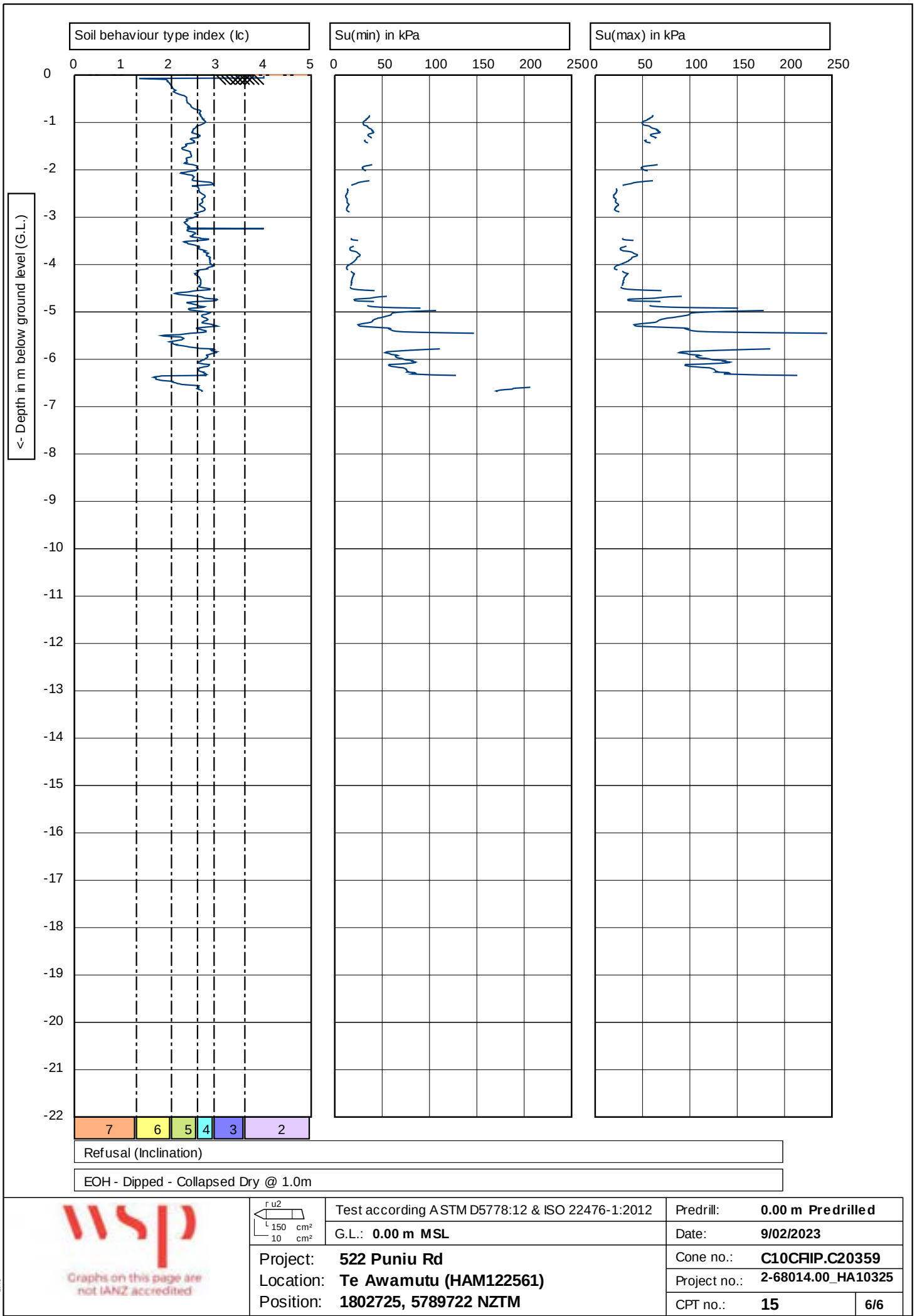


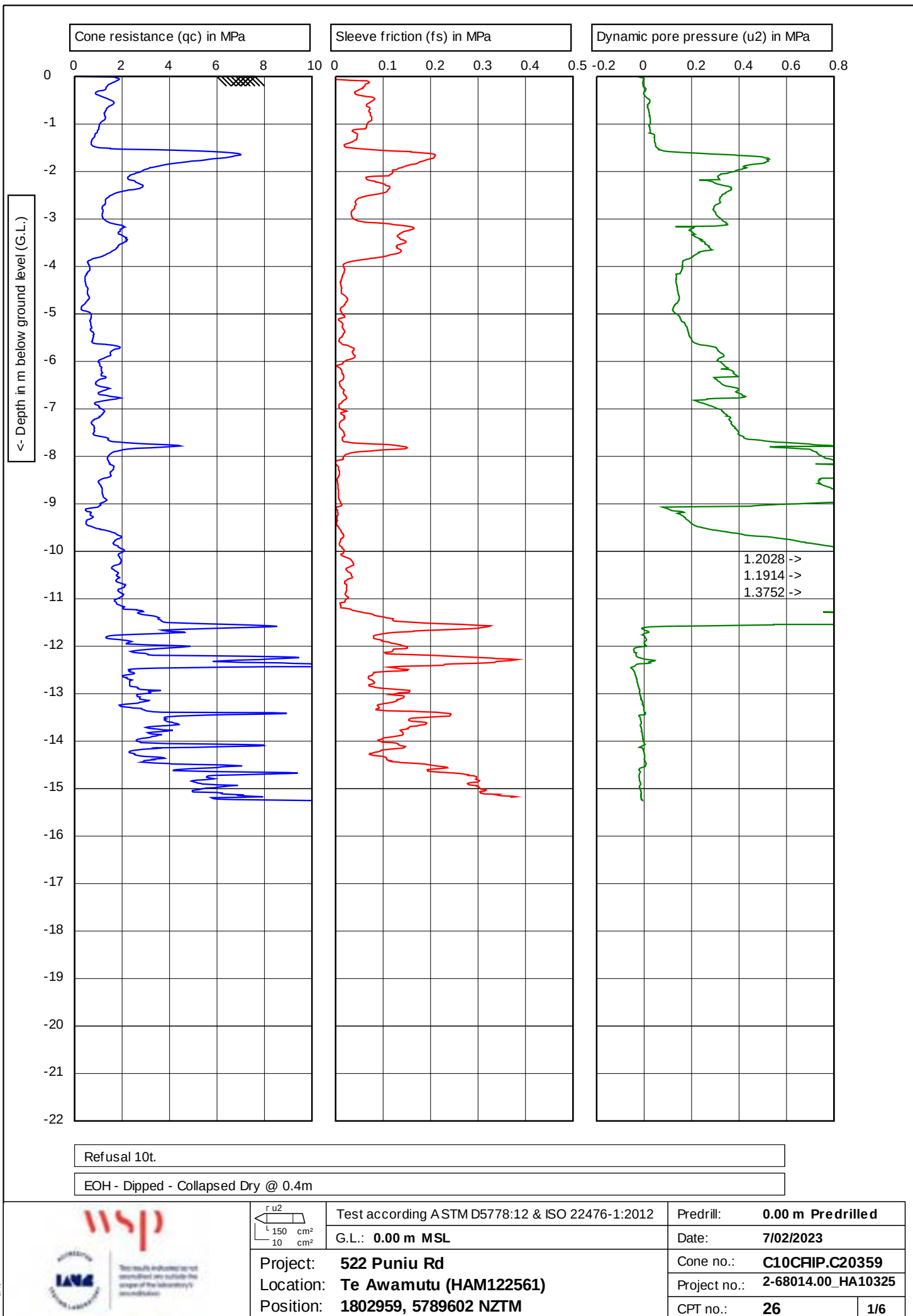


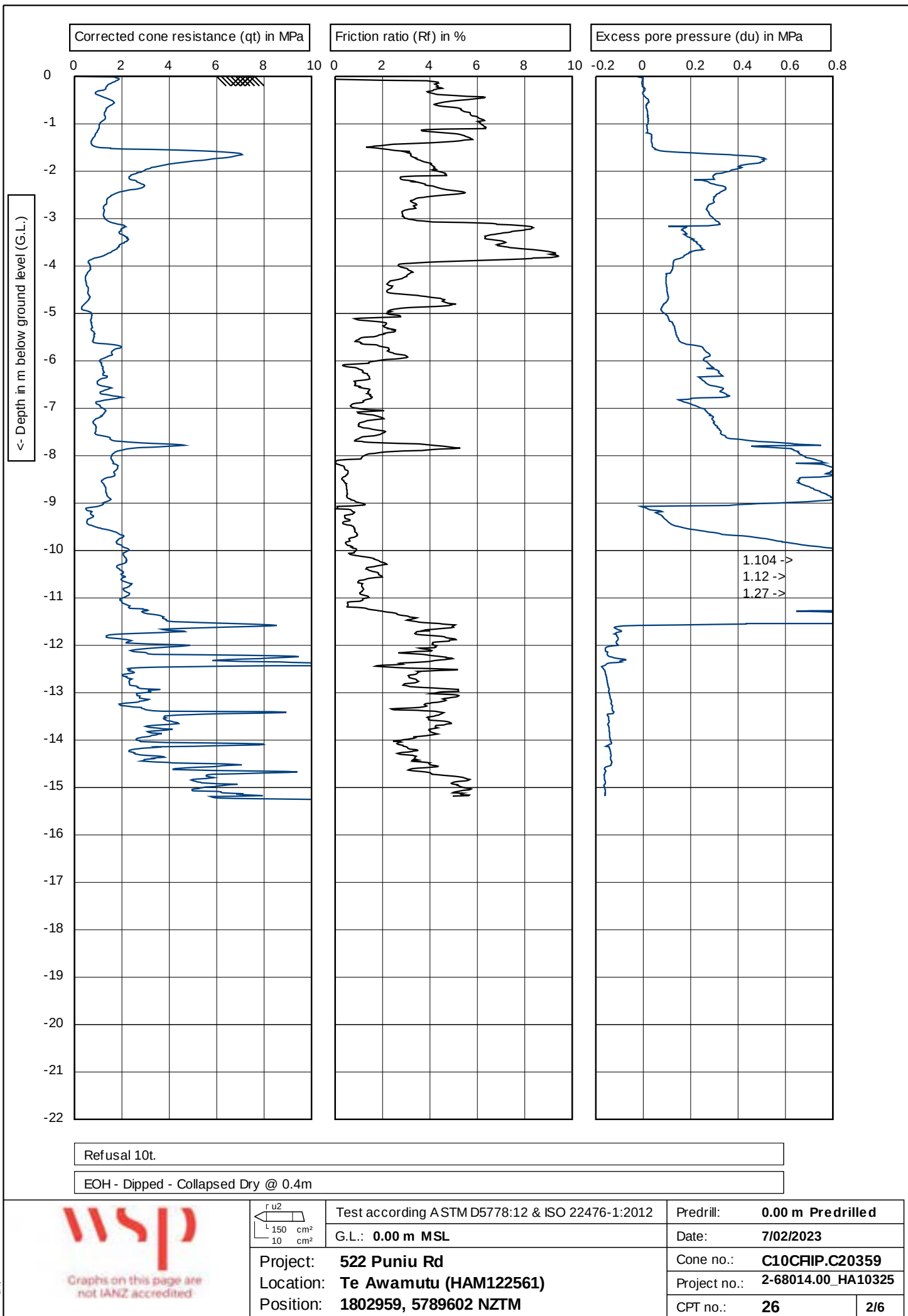


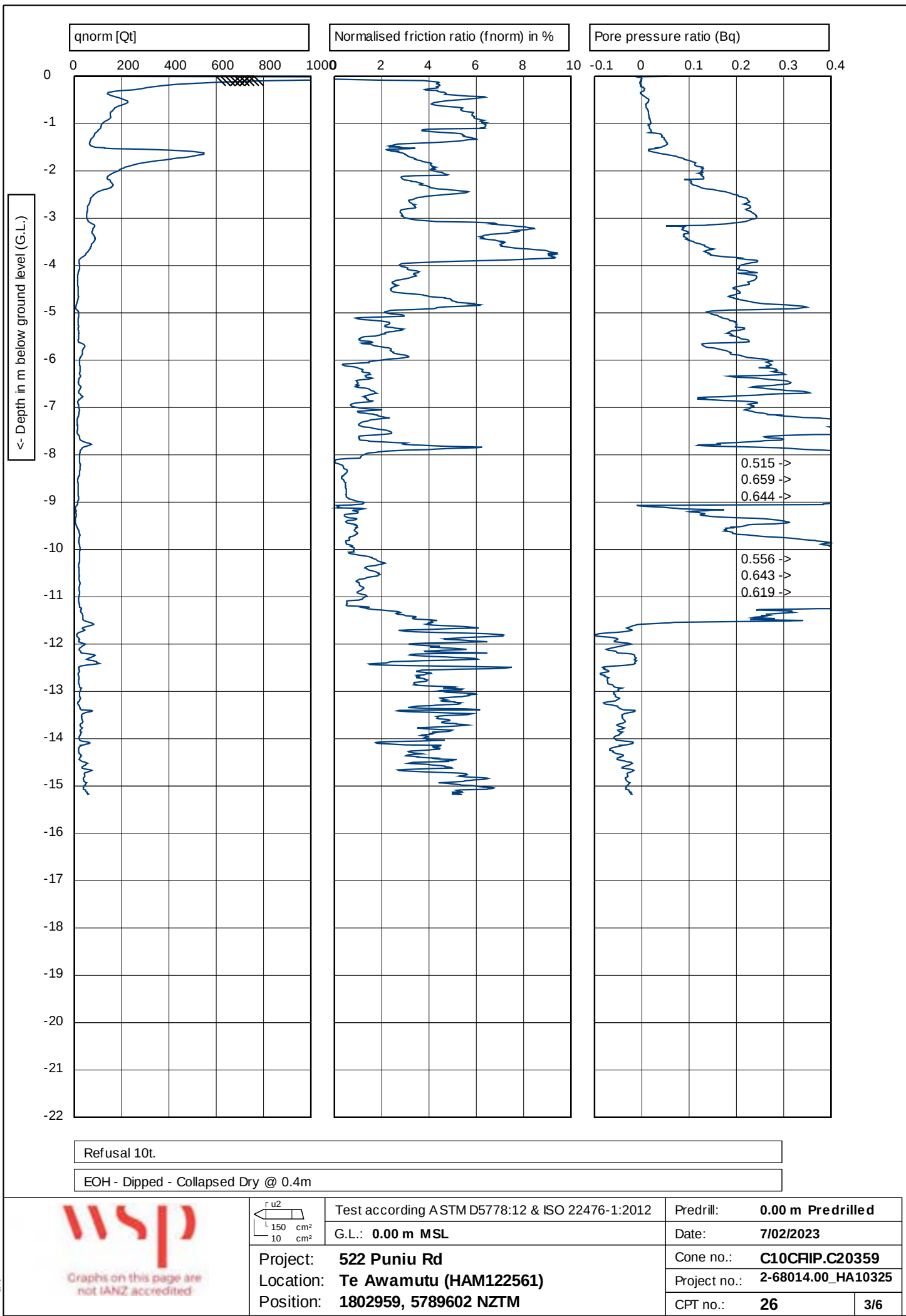
 Graphs on this page are not IANZ accredited		Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: 0.00 m Predrilled	
		G.L.: 0.00 m MSL	Date: 9/02/2023	
	Project: 522 Puniu Rd		Cone no.: C10CFIIP.C20359	
	Location: Te Awamutu (HAM122561)		Project no.: 2-68014.00_HA10325	
	Position: 1802725, 5789722 NZTM		CPT no.: 15	4/6

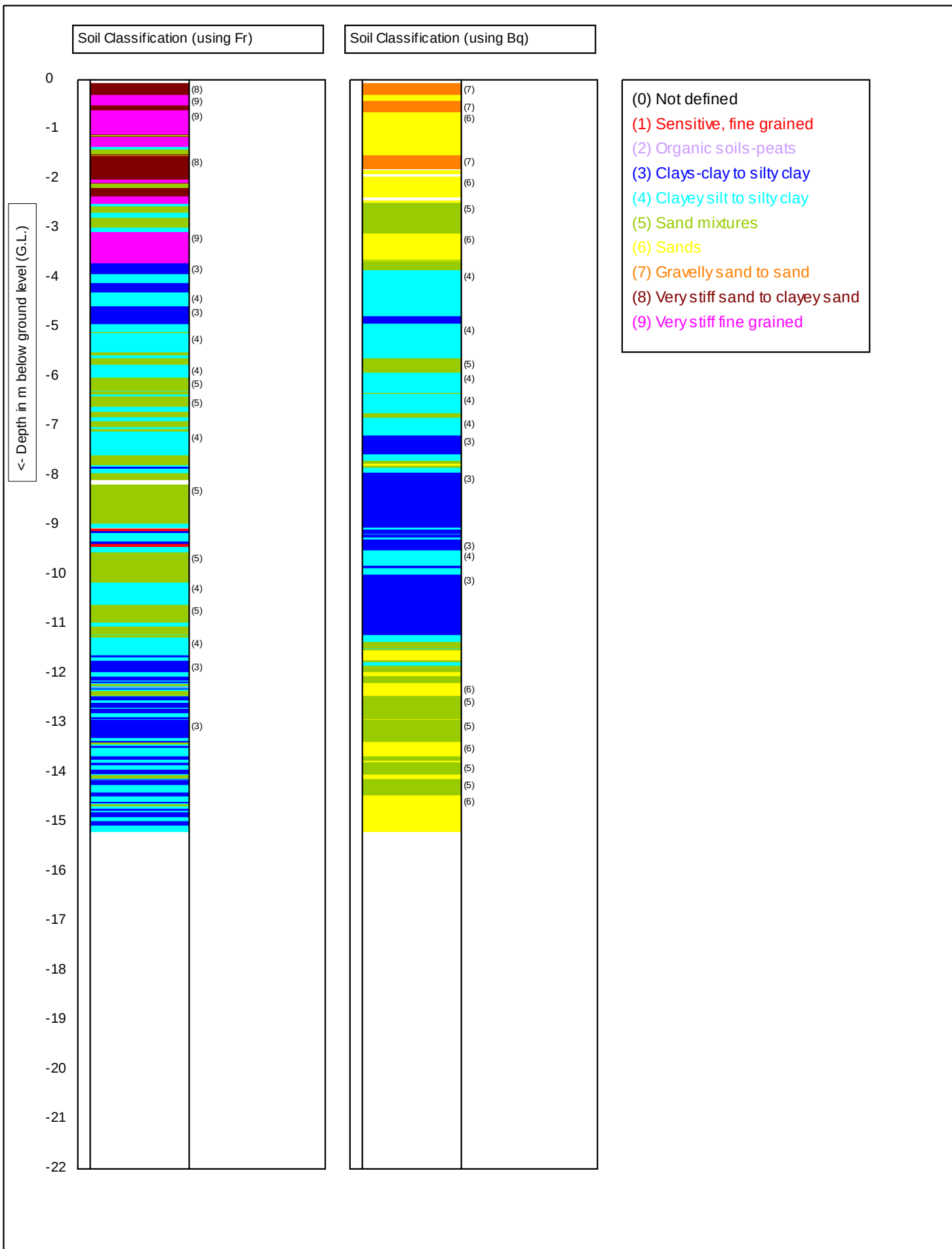


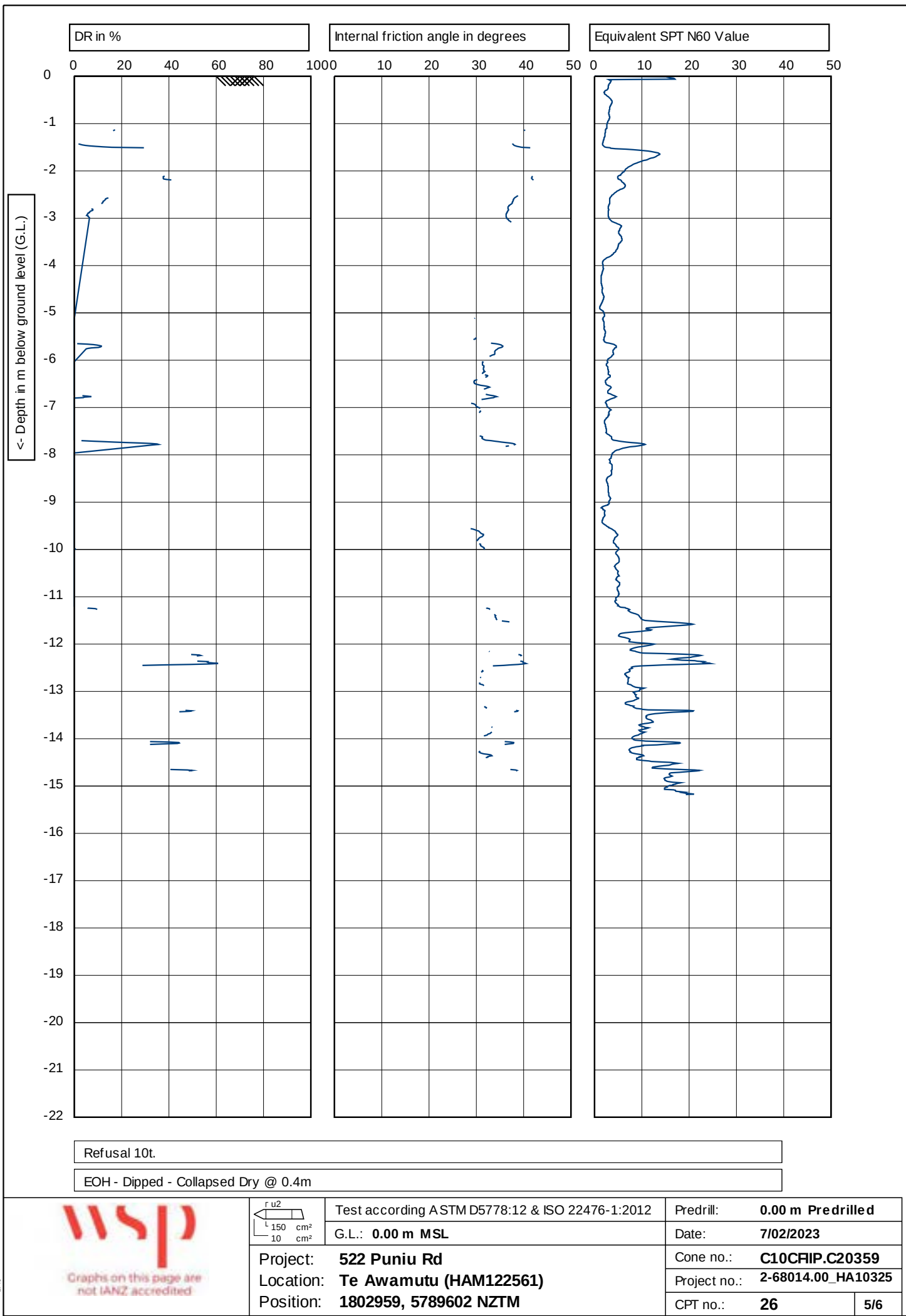


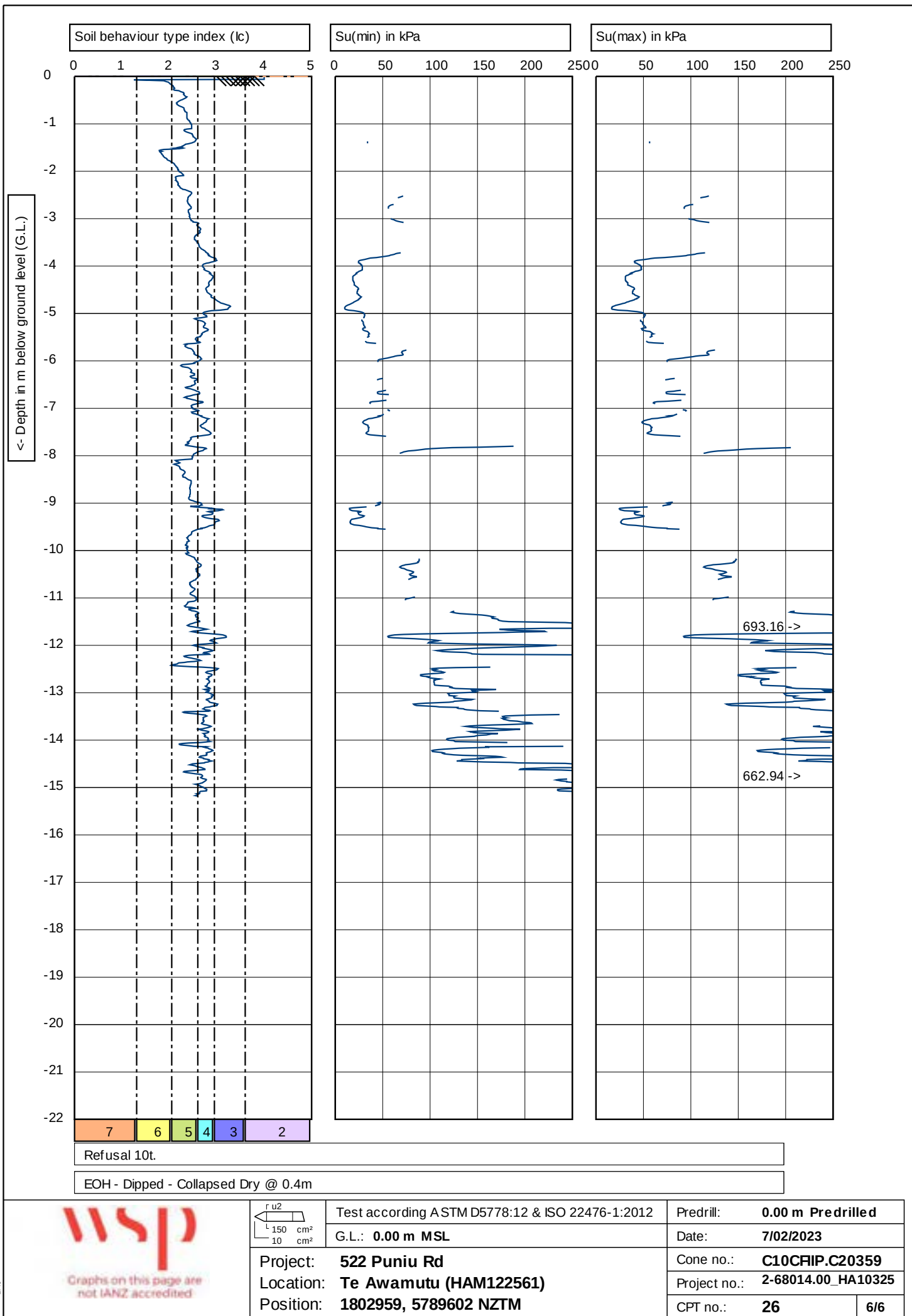


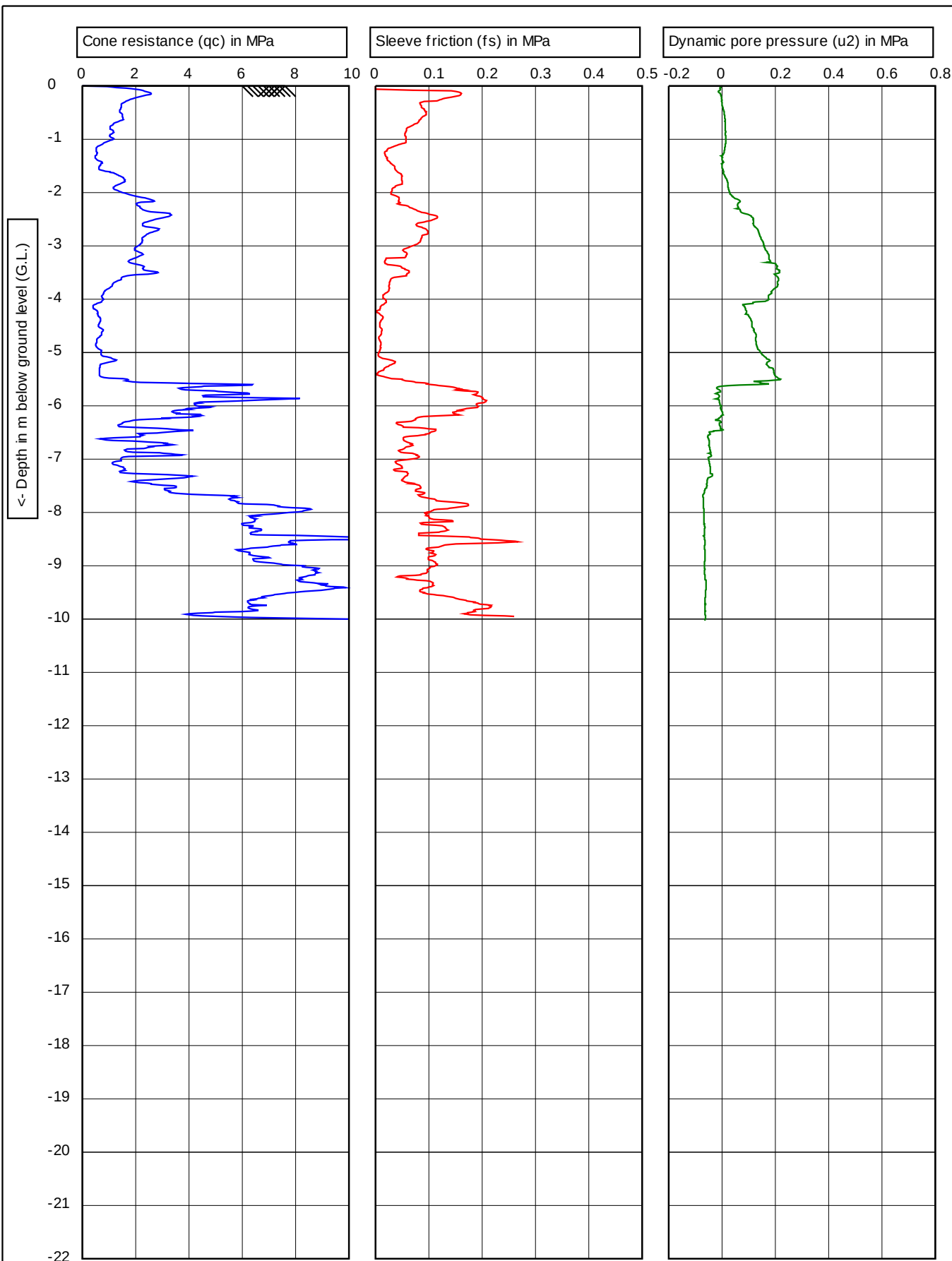












Refusal (qc 40+ MPa.)

EOH - Dipped - Collapsed Dry @ 0.3m



Diagram of a pencil with a conical tip and a cylindrical body. The conical tip has a radius of 2 cm and a height of 15 cm. The cylindrical body has a radius of 1 cm and a height of 10 cm.

Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: 0.00 m MSL

Project: **522 Puniu Rd**
Location: **Te Awamutu (HAM122561)**
Position: **1803124, 5789410 NZTM**

Predrill:	0.00 m	Predrilled
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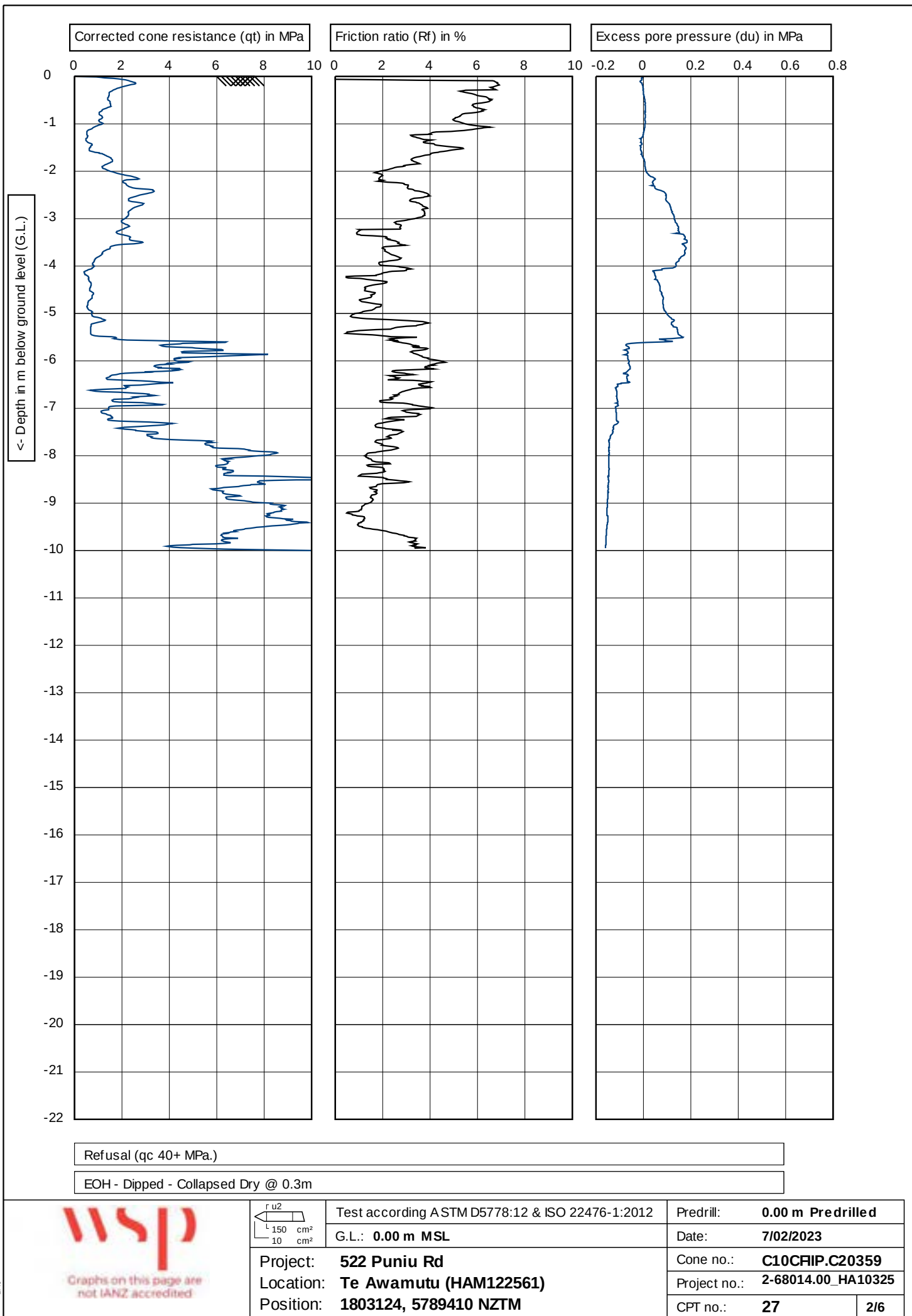
Date:	7/02/2023
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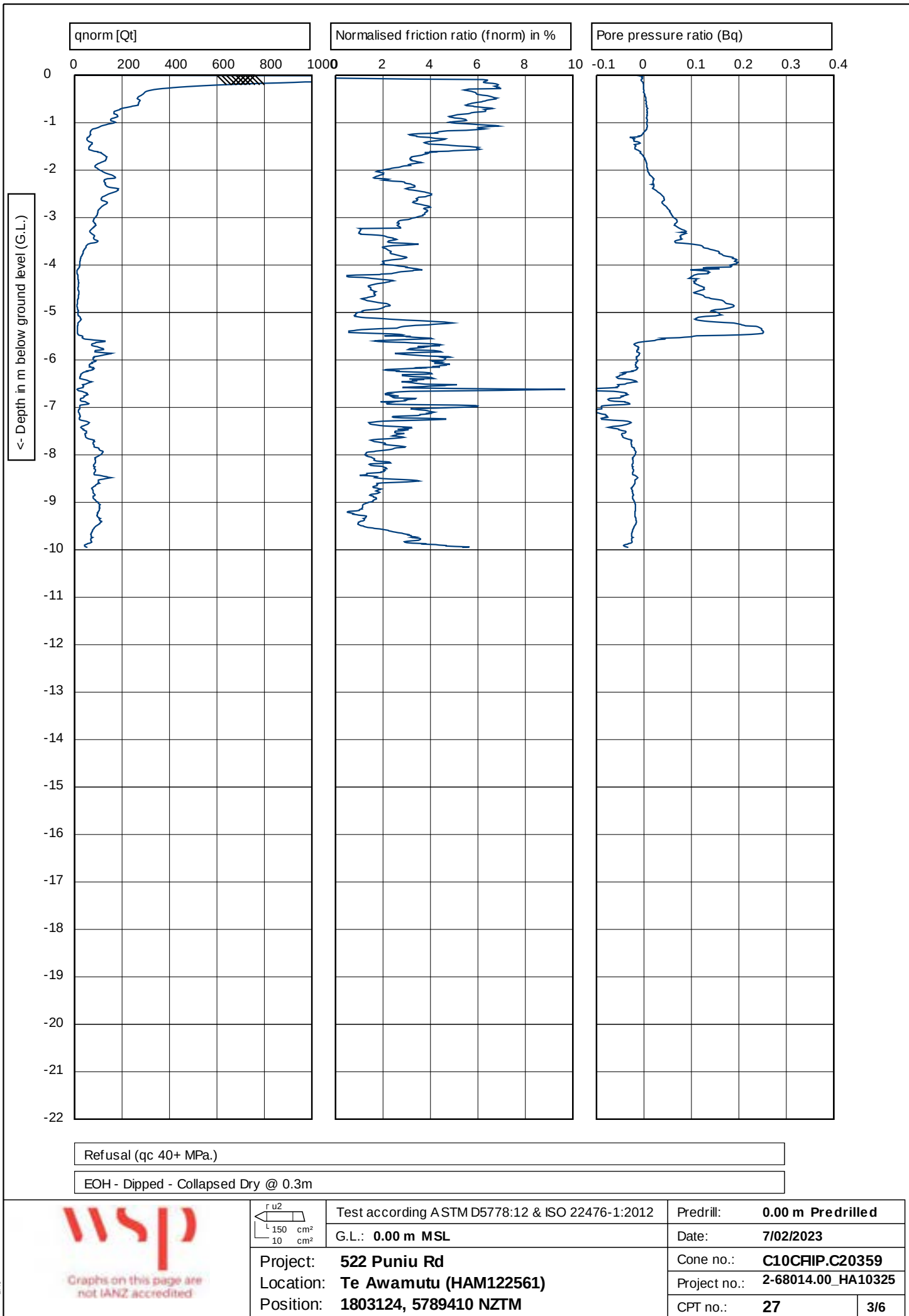
Cone no.: **C10CFIP.C20359**

Project no.:	2-68014.00_HA10325
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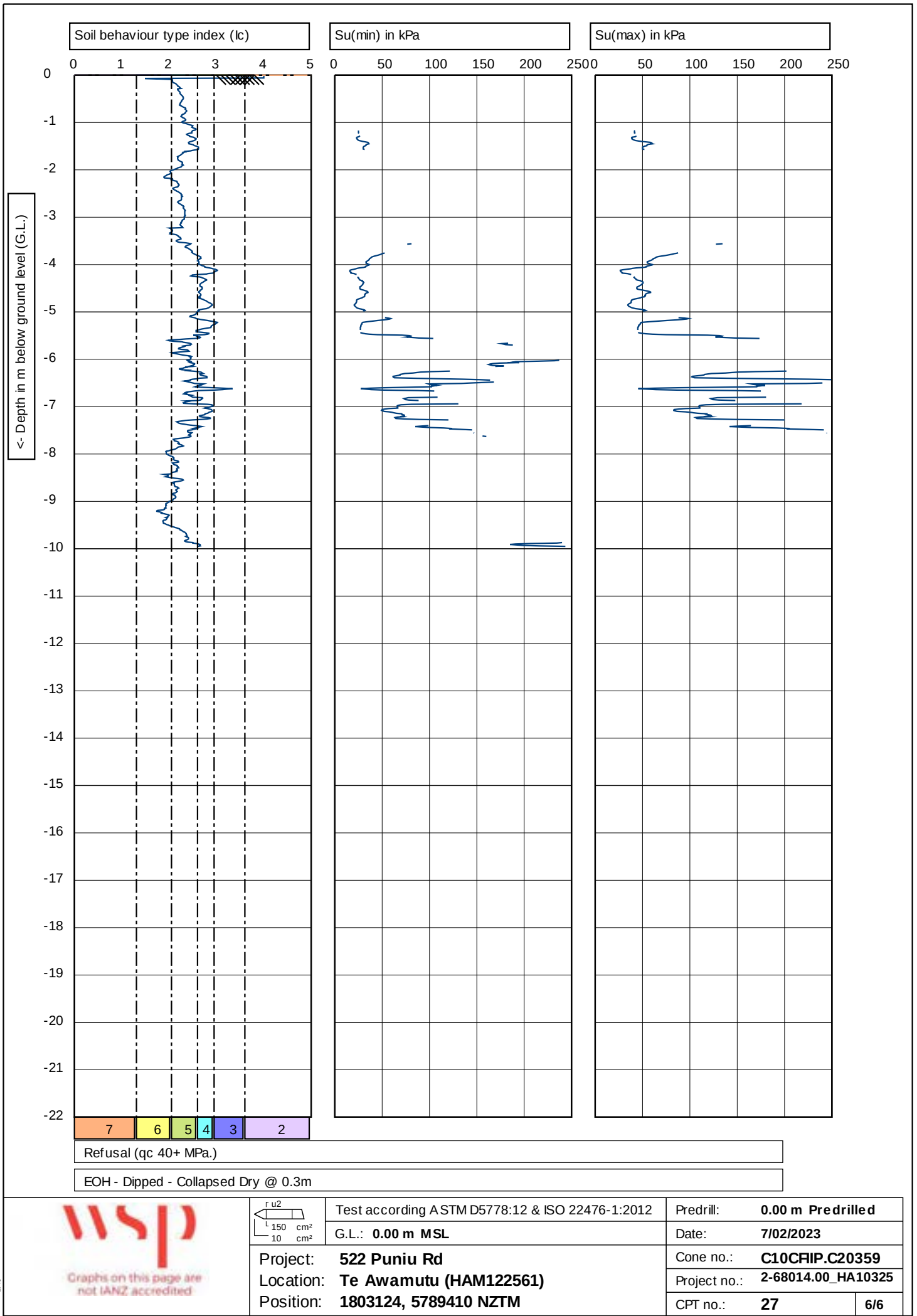
CPT no.:	27
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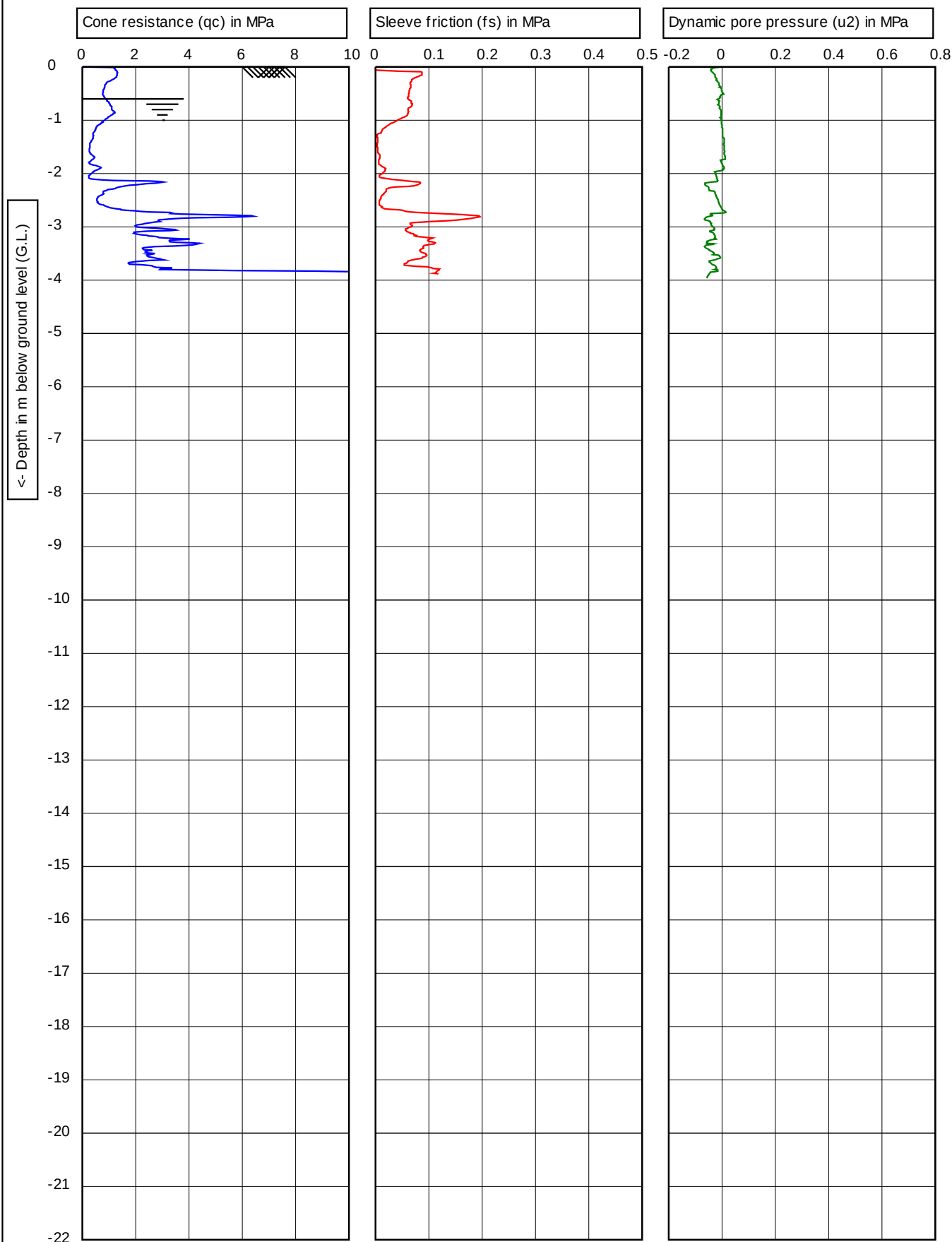
1/6





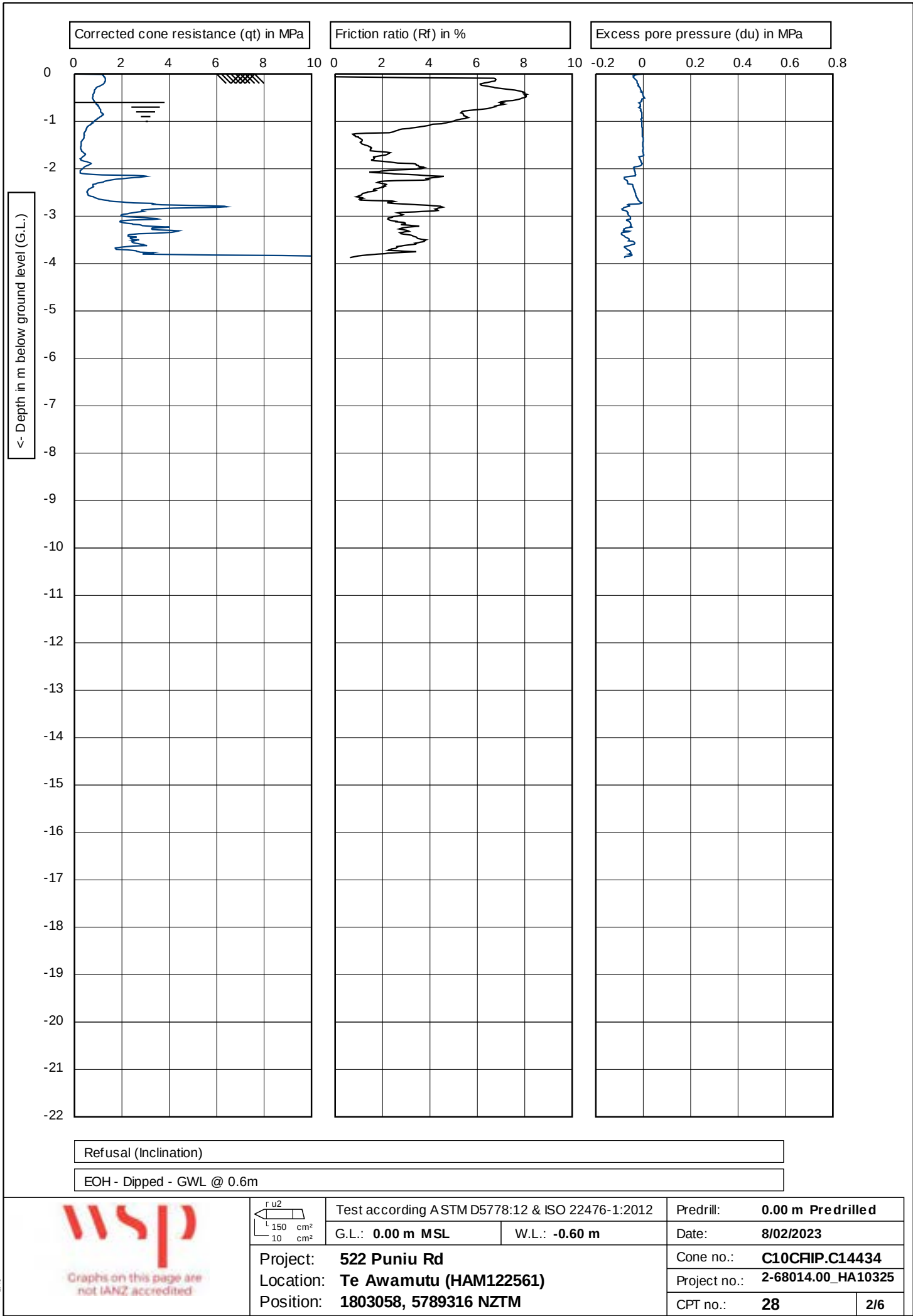


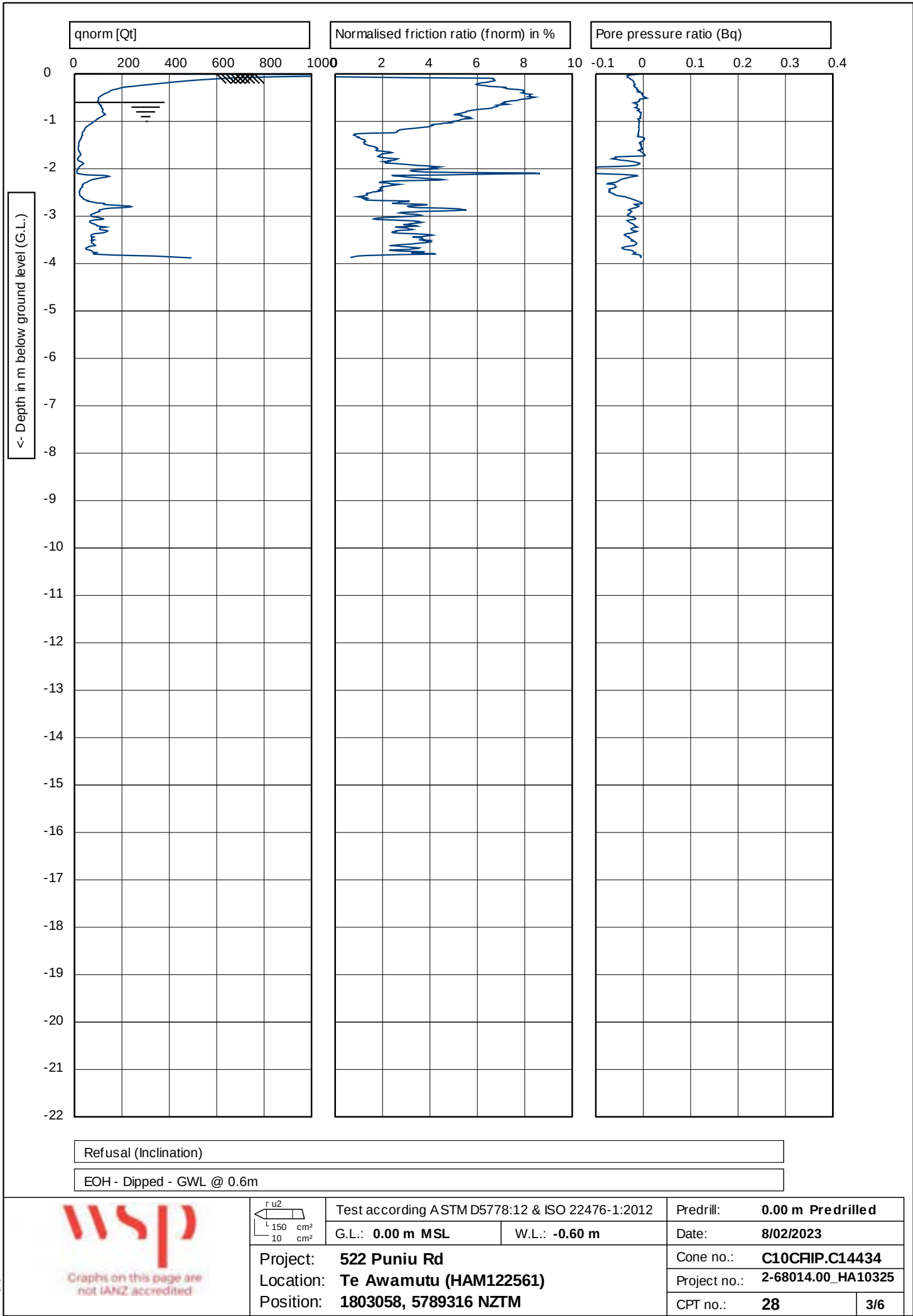


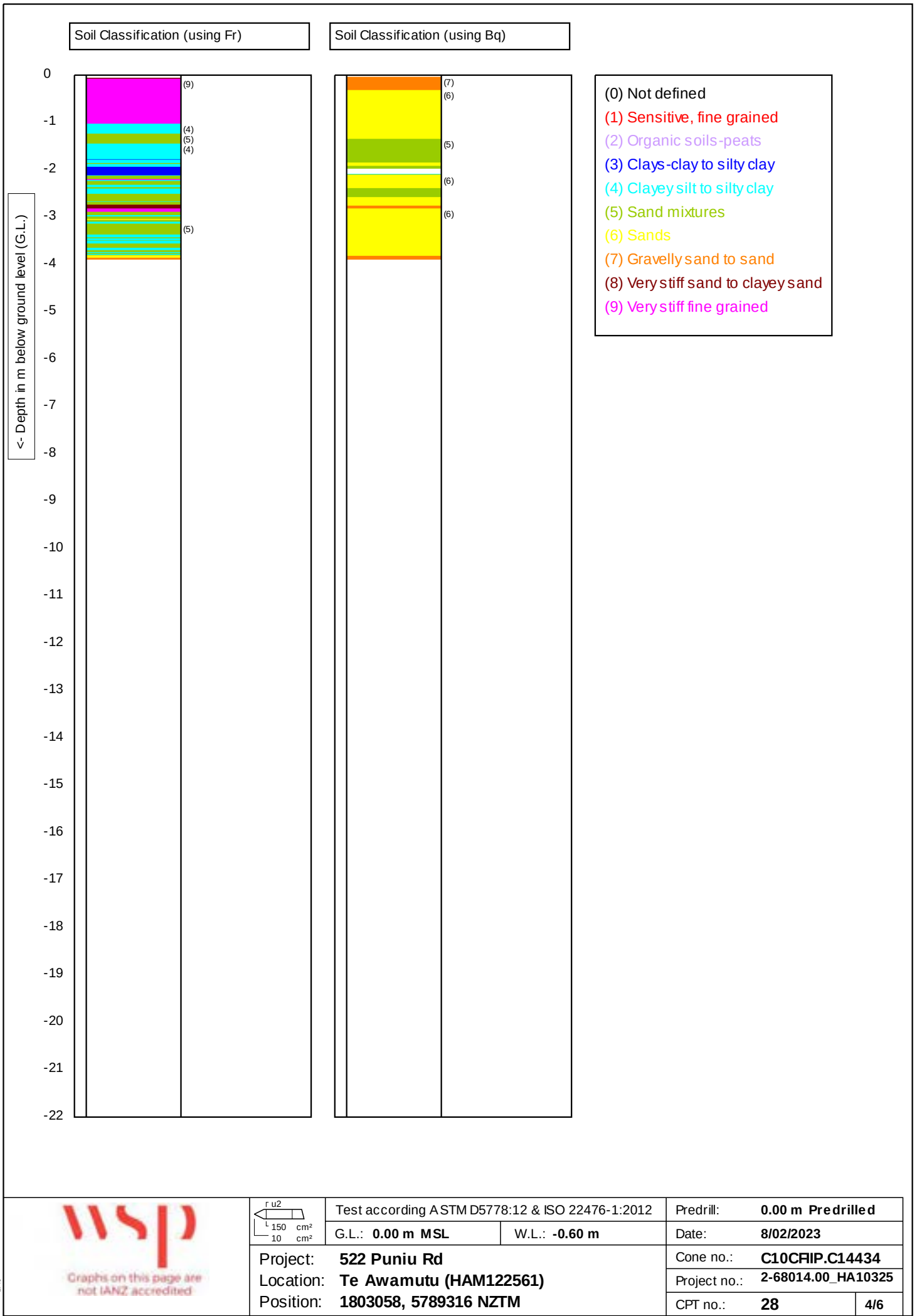


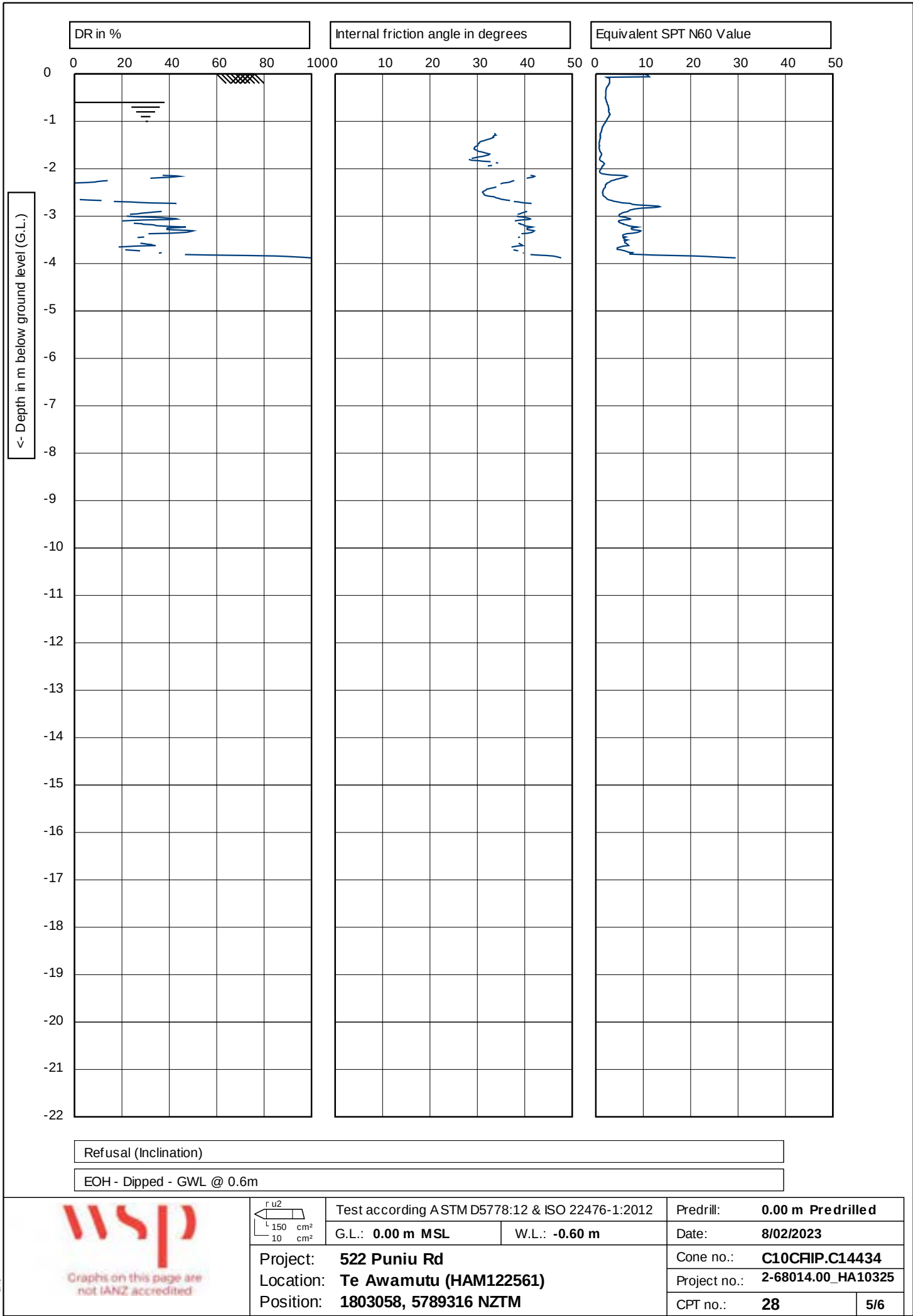
Refusal (Inclination)

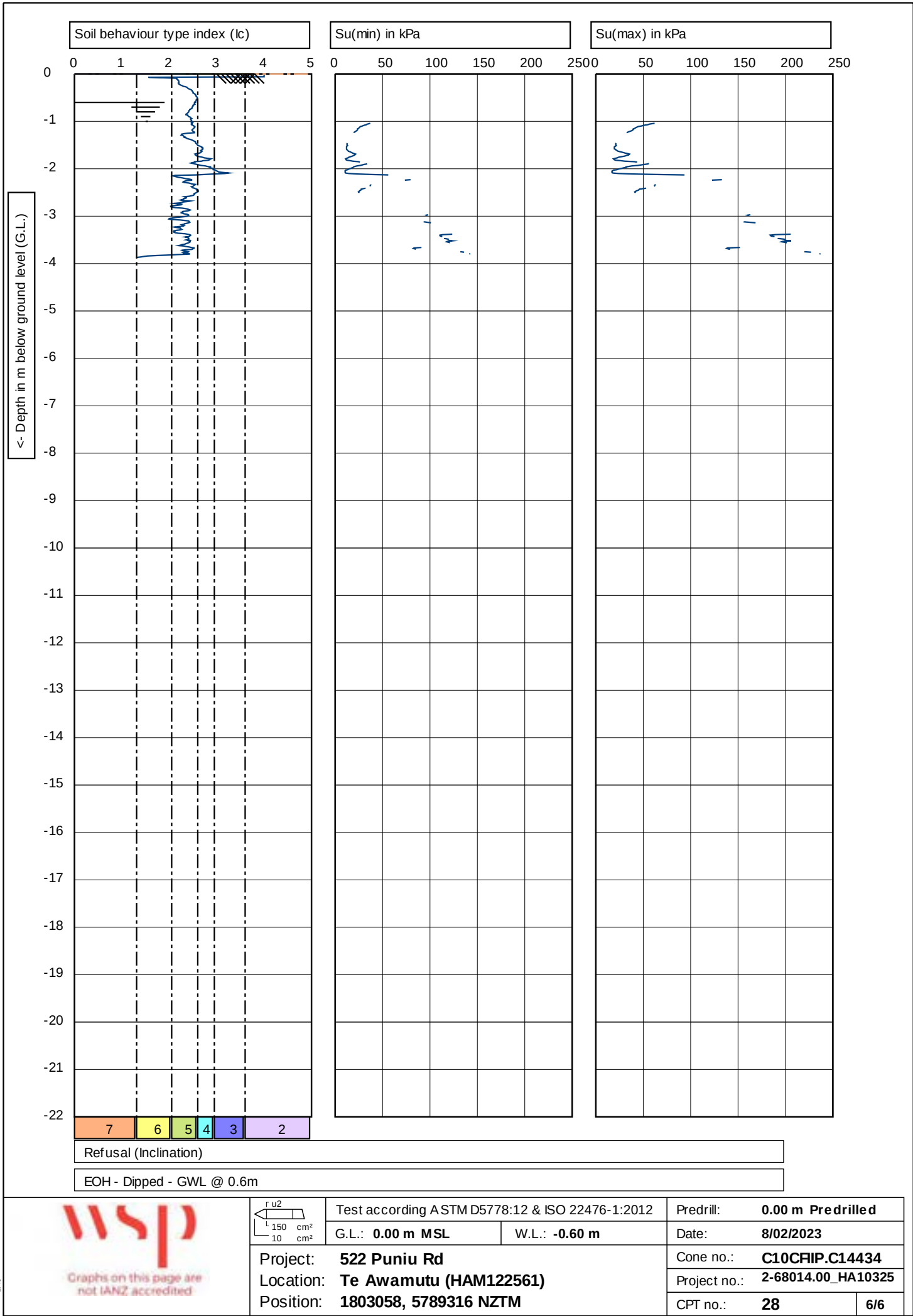












Specifications - Open-Ended Tube

Length L_1 : **2.6 m**
 Diameter: **90 mm**
 Non-Perm L_2 : **0 m**
 Above Gnd L_3 : **0 m**

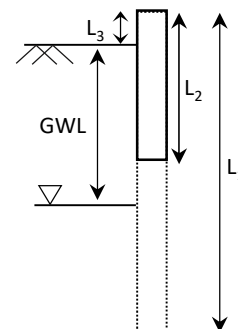
Ground Conditions

GWL: **2.6 m BGL** (Blank = Bottom of hole)

Permeability Anisotropy

m : **1** $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: **3.00 m BGL**



Hydraulic Conductivity (k)

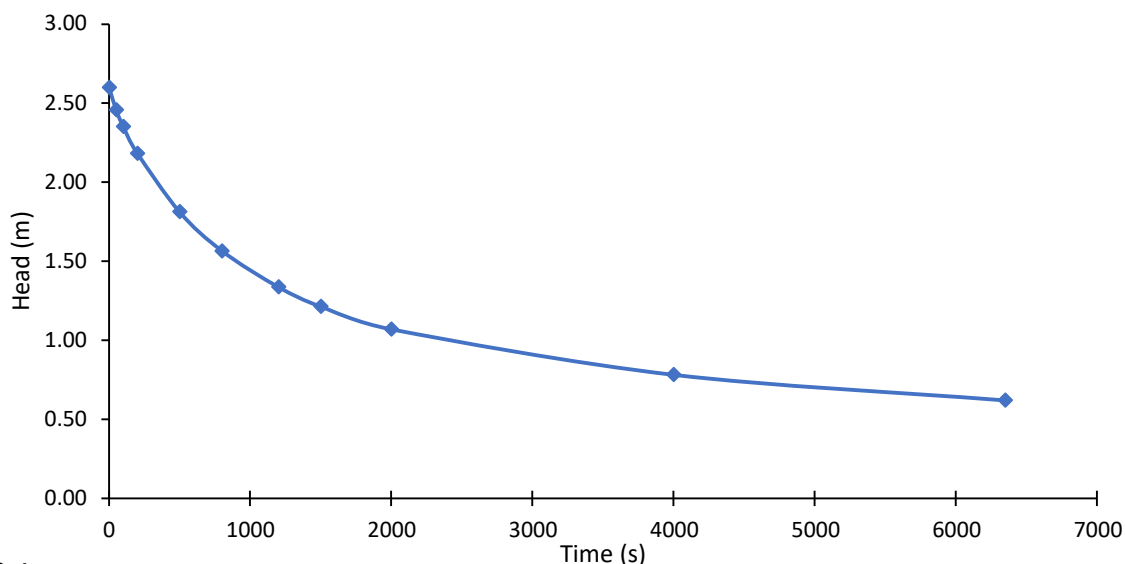
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), Control of groundwater for temporary works, CIRIA Report 113, Appendix 4

$$k = \left(\log \frac{h_1}{h_2} - \log \frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} = 9.71\text{E-}06 \text{ ms}^{-1} = 0.84 \text{ m/day}$$

Hvorslev: Hvorslev (1951) Time Lag and Soil Permeability in Ground-Water Observations, Fig 18, p49

$$k = \frac{d^2 \ln \left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d} \right)^2 + 1} \right)}{8L(t_2 - t_1)} \ln \frac{H_1}{H_2} = 1.03\text{E-}06 \text{ ms}^{-1} = 0.09 \text{ m/day}$$



STRATIGRAPHIC LOG

	Silt
	Sandy Silt
	Silt
EOH @ 2.6m	

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms ⁻¹)	CIRIA 113 'k' (ms ⁻¹)
0	0.000	2.600				
50	0.141	2.459	2.529		1.80E-06	2.15E-05
100	0.247	2.353	2.406		1.48E-06	1.69E-05
200	0.417	2.183	2.268		1.31E-06	1.43E-05
500	0.787	1.813	1.998		1.19E-06	1.19E-05
800	1.035	1.565	1.689		1.07E-06	9.39E-06
1200	1.262	1.338	1.451		9.50E-07	7.46E-06
1500	1.386	1.214	1.276		8.62E-07	6.14E-06
2000	1.530	1.070	1.142		7.23E-07	4.75E-06
4000	1.818	0.782	0.926		5.18E-07	2.96E-06
6350	1.980	0.620	0.701		3.93E-07	1.83E-06

The hydraulic conductivity values above are calculated as an average across the whole data set. Any designer using these values may consider the raw data and other calculation methods, and must satisfy themselves as to their suitability.

Specifications - Open-Ended Tube

Length L_1 : **2 m**
 Diameter: **90 mm**
 Non-Perm L_2 : **0 m**
 Above Gnd L_3 : **0 m**

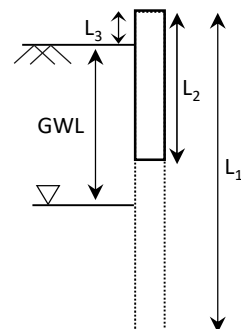
Ground Conditions

GWL: **2 m BGL** (Blank = Bottom of hole)

Permeability Anisotropy

m : **1** $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: **3.00 m BGL**



Hydraulic Conductivity (k)

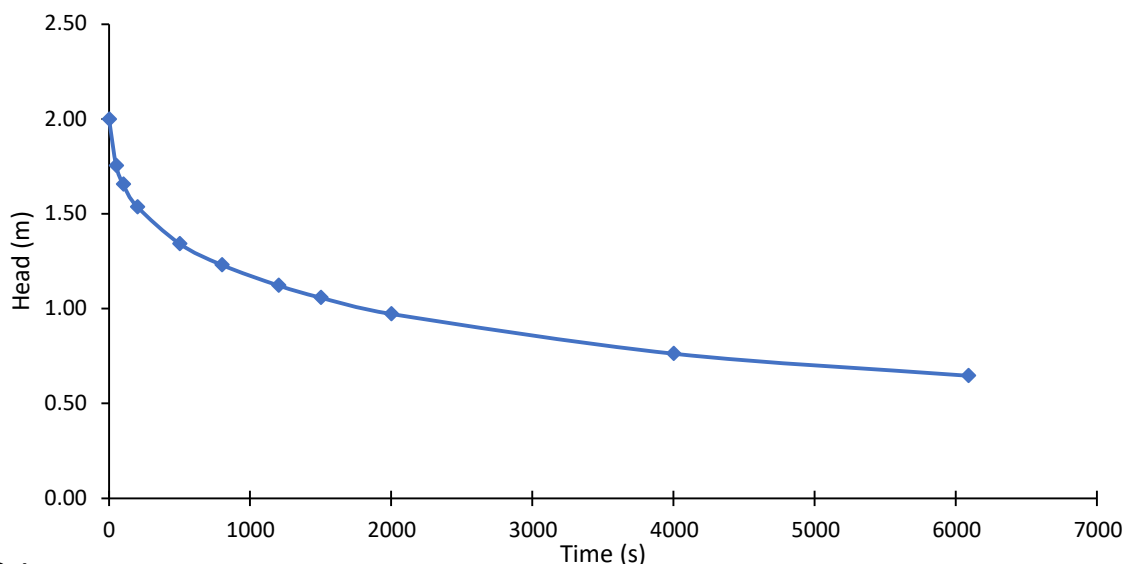
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), Control of groundwater for temporary works, CIRIA Report 113, Appendix 4

$$k = \left(\log \frac{h_1}{h_2} - \log \frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} = 1.15\text{E-}05 \text{ ms}^{-1} = 1.00 \text{ m/day}$$

Hvorslev: Hvorslev (1951) Time Lag and Soil Permeability in Ground-Water Observations, Fig 18, p49

$$k = \frac{d^2 \ln \left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d} \right)^2 + 1} \right)}{8L(t_2 - t_1)} \ln \frac{H_1}{H_2} = 1.38\text{E-}06 \text{ ms}^{-1} = 0.12 \text{ m/day}$$



STRATIGRAPHIC LOG

Silt

EOH @ 2m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms ⁻¹)	CIRIA 113 'k' (ms ⁻¹)
0	0.000	2.000				
50	0.246	1.755	1.877		5.27E-06	5.01E-05
100	0.343	1.657	1.706		2.48E-06	2.19E-05
200	0.463	1.537	1.597		1.69E-06	1.42E-05
500	0.657	1.343	1.440		1.10E-06	8.56E-06
800	0.769	1.231	1.287		7.70E-07	5.51E-06
1200	0.877	1.123	1.177		6.41E-07	4.30E-06
1500	0.941	1.059	1.091		5.84E-07	3.70E-06
2000	1.028	0.972	1.015		5.29E-07	3.19E-06
4000	1.237	0.763	0.868		4.18E-07	2.27E-06
6090	1.354	0.647	0.705		3.14E-07	1.46E-06

The hydraulic conductivity values above are calculated as an average across the whole data set. Any designer using these values may consider the raw data and other calculation methods, and must satisfy themselves as to their suitability.

Specifications - Open-Ended Tube

Length L_1 : **3 m**
 Diameter: **90 mm**
 Non-Perm L_2 : **0 m**
 Above Gnd L_3 : **0 m**

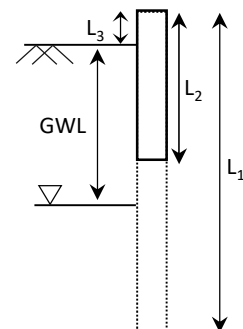
Ground Conditions

GWL: **3 m BGL** (Blank = Bottom of hole)

Permeability Anisotropy

m : **1** $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: **3.00 m BGL**



Hydraulic Conductivity (k)

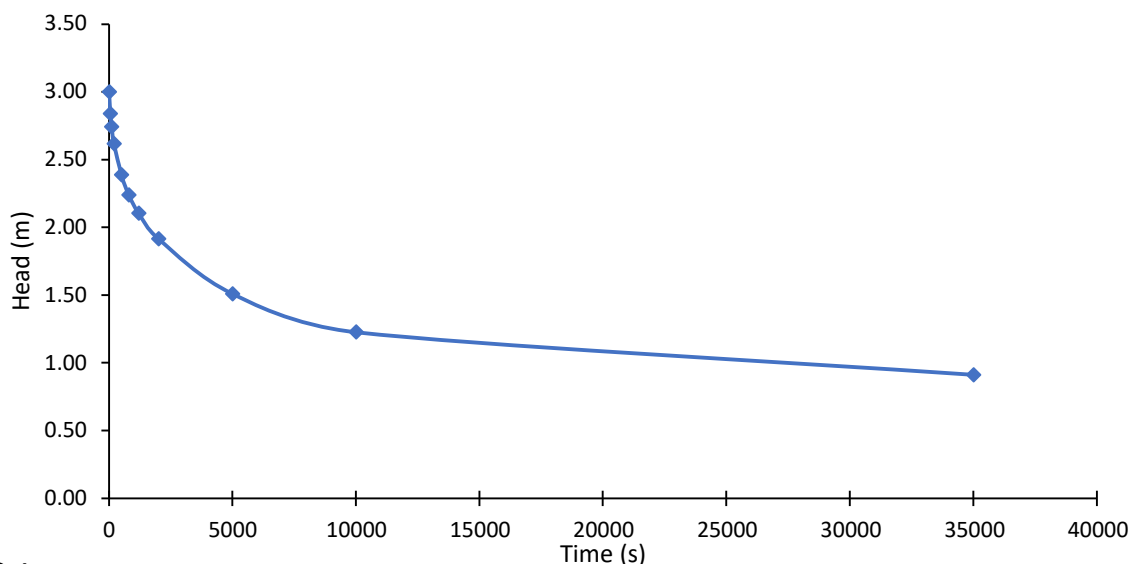
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), Control of groundwater for temporary works, CIRIA Report 113, Appendix 4

$$k = \left(\log \frac{h_1}{h_2} - \log \frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} = 6.13\text{E-}06 \text{ ms}^{-1} = 0.53 \text{ m/day}$$

Hvorslev: Hvorslev (1951) Time Lag and Soil Permeability in Ground-Water Observations, Fig 18, p49

$$k = \frac{d^2 \ln \left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d} \right)^2 + 1} \right)}{8L(t_2 - t_1)} \ln \frac{H_1}{H_2} = 5.04\text{E-}07 \text{ ms}^{-1} = 0.04 \text{ m/day}$$



STRATIGRAPHIC LOG

Silt

Sandy Silt

Silt

EOH @ 3m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)	Hvorslev 'k' Case G (ms ⁻¹)	CIRIA 113 'k' (ms ⁻¹)
0	0.000	3.000			
50	0.162	2.838	2.919	1.60E-06	2.14E-05
100	0.258	2.742	2.790	1.04E-06	1.33E-05
200	0.382	2.618	2.680	7.14E-07	8.89E-06
500	0.613	2.387	2.502	5.01E-07	5.92E-06
800	0.761	2.239	2.313	3.69E-07	4.10E-06
1200	0.897	2.103	2.171	2.82E-07	2.98E-06
2000	1.085	1.915	2.009	2.24E-07	2.24E-06
5000	1.491	1.509	1.712	1.71E-07	1.53E-06
10000	1.773	1.227	1.368	1.05E-07	7.89E-07
35000	2.088	0.912	1.069	3.56E-08	2.25E-07

The hydraulic conductivity values above are calculated as an average across the whole data set. Any designer using these values may consider the raw data and other calculation methods, and must satisfy themselves as to their suitability.

Specifications - Open-Ended Tube

Length L_1 : **3 m**
 Diameter: **90 mm**
 Non-Perm L_2 : **0 m**
 Above Gnd L_3 : **0 m**

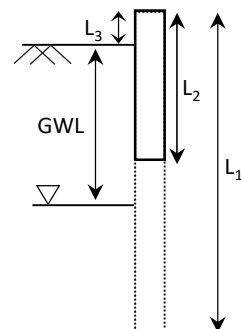
Ground Conditions

GWL: **3 m BGL** (Blank = Bottom of hole)

Permeability Anisotropy

m : **1** $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: **3.00 m BGL**



Hydraulic Conductivity (k)

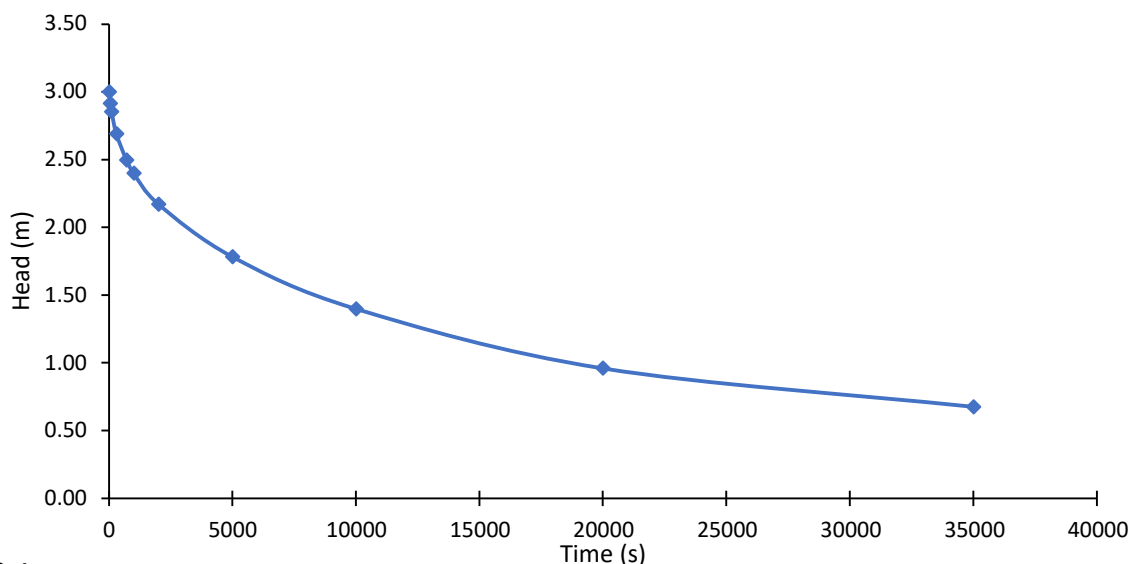
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), Control of groundwater for temporary works, CIRIA Report 113, Appendix 4

$$k = \left(\log \frac{h_1}{h_2} - \log \frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} = 3.65E-06 \text{ ms}^{-1} = 0.31 \text{ m/day}$$

Hvorslev: Hvorslev (1951) Time Lag and Soil Permeability in Ground-Water Observations, Fig 18, p49

$$k = \frac{d^2 \ln \left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d} \right)^2 + 1} \right)}{8L(t_2 - t_1)} \ln \frac{H_1}{H_2} = 3.01E-07 \text{ ms}^{-1} = 0.03 \text{ m/day}$$



STRATIGRAPHIC LOG

Silt

EOH @ 3m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms ⁻¹)	CIRIA 113 'k' (ms ⁻¹)
0	0.000	3.000				
50	0.085	2.915	2.957		8.26E-07	1.11E-05
100	0.147	2.853	2.884		6.29E-07	8.29E-06
300	0.310	2.690	2.771		4.42E-07	5.65E-06
700	0.502	2.498	2.594		2.93E-07	3.57E-06
1000	0.601	2.399	2.448		2.22E-07	2.57E-06
2000	0.829	2.171	2.285		1.74E-07	1.92E-06
5000	1.218	1.782	1.977		1.27E-07	1.27E-06
10000	1.602	1.398	1.590		1.10E-07	9.31E-07
20000	2.040	0.960	1.179		1.05E-07	7.23E-07
35000	2.324	0.676	0.818		8.42E-08	4.42E-07

The hydraulic conductivity values above are calculated as an average across the whole data set. Any designer using these values may consider the raw data and other calculation methods, and must satisfy themselves as to their suitability.

Specifications - Open-Ended Tube

Length L_1 : **1.2 m**
 Diameter: **90 mm**
 Non-Perm L_2 : **0 m**
 Above Gnd L_3 : **0 m**

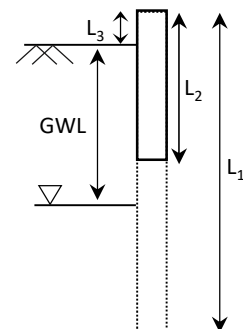
Ground Conditions

GWL: **1.2 m BGL** (Blank = Bottom of hole)

Permeability Anisotropy

m : **1** $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: **3.00 m BGL**



Hydraulic Conductivity (k)

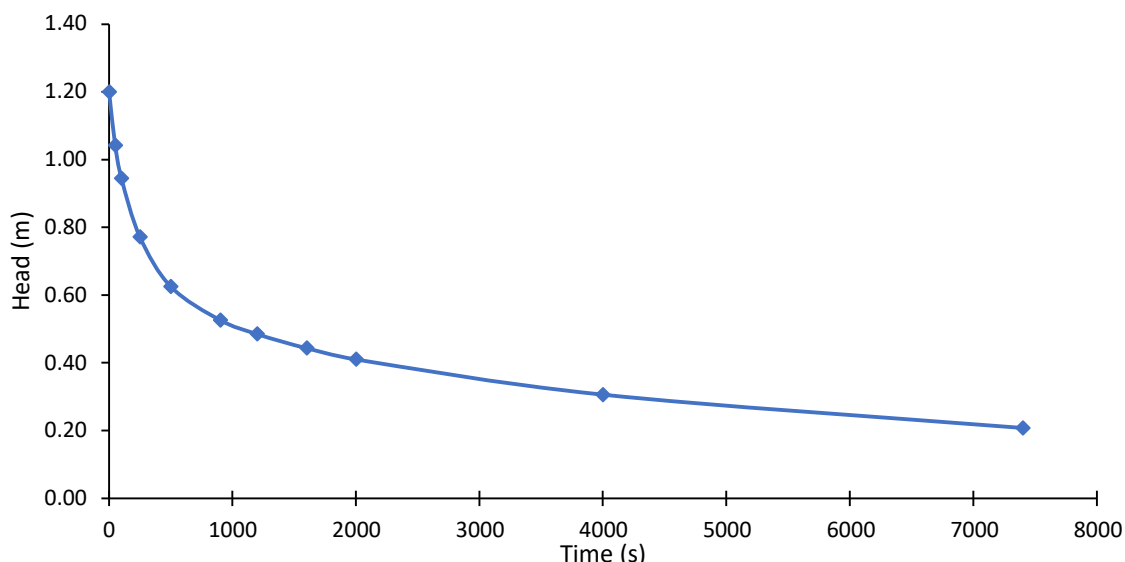
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

CIRIA 113: Somerville (1986), Control of groundwater for temporary works, CIRIA Report 113, Appendix 4

$$k = \left(\log \frac{h_1}{h_2} - \log \frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} = 1.55\text{E-}05 \text{ ms}^{-1} = 1.34 \text{ m/day}$$

Hvorslev: Hvorslev (1951) Time Lag and Soil Permeability in Ground-Water Observations, Fig 18, p49

$$k = \frac{d^2 \ln \left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d} \right)^2 + 1} \right)}{8L(t_2 - t_1)} \ln \frac{H_1}{H_2} = 2.95\text{E-}06 \text{ ms}^{-1} = 0.26 \text{ m/day}$$



STRATIGRAPHIC LOG

Silt

Sand

EOH @ 1.2m

Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)	Hvorslev 'k' Case G (ms ⁻¹)	CIRIA 113 'k' (ms ⁻¹)
0	0.000	1.200	1.121	8.18E-06	5.31E-05
50	0.158	1.042	0.993	6.23E-06	3.69E-05
100	0.256	0.944	0.858	4.67E-06	2.51E-05
250	0.428	0.772	0.699	3.36E-06	1.56E-05
500	0.575	0.625	0.576	1.93E-06	7.84E-06
900	0.674	0.526	0.506	1.32E-06	4.89E-06
1200	0.715	0.485	0.464	1.14E-06	3.99E-06
1600	0.757	0.443	0.427	1.03E-06	3.41E-06
2000	0.790	0.411	0.358	8.67E-07	2.58E-06
4000	0.894	0.306	0.257	7.97E-07	1.94E-06
7400	0.992	0.208			

The hydraulic conductivity values above are calculated as an average across the whole data set. Any designer using these values may consider the raw data and other calculation methods, and must satisfy themselves as to their suitability.

APPENDIX C: NATURAL HAZARD RISK ASSESSMENT

NATURAL HAZARDS RISK ASSESSMENT FOR LAND SUBDIVISION

T4 STRUCTURE PLAN, 552 PUNIU ROAD, TE AWAMUTU

1 CONTEXT

Section 106 of the Resource Management Act (RMA) requires an assessment of the risk from natural hazards to be carried out when considering the granting of a subdivision consent. S106 RMA specifically states that the assessment must consider the combined effect of the natural hazard likelihood and material damage to land, other land or structures (consequence).

Section 2 of the RMA defines natural hazards as any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.

This appendix to CMW report reference HAM2022-0065AB Rev 0 sets out the criteria for and presents the results of an assessment of the geotechnical-related natural hazards associated with this proposed subdivision development. The remaining hazards, i.e. tsunami, wind, drought, fire and flooding hazards are not covered by this assessment.

2 BASIS OF ASSESSMENT

2.1 Risk Classification

The occurrence of natural hazards and their potential impacts on the proposed subdivision development is assessed in terms of risk significance, which is based on likelihood and consequence factors. A risk table is used to help assess the likelihood and consequence factors, the form of which used by CMW for this project is presented in Table B1.

Table B1: Natural Hazard Risk Classification						
Risk Matrix		Consequence				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	Almost Certain 5	Medium 5	High 10	Very high 15	Extreme 20	Extreme 25
	Likely 4	Low 4	Medium 8	High 12	Very high 16	Extreme 20
	Moderate 3	Low 3	Medium 6	Medium 9	High 12	Very high 15
	Unlikely 2	Very low 2	Low 4	Medium 6	Medium 8	High 10
	Rare 1	Very low 1	Very low 2	Low 3	Low 4	Medium 5

2.2 Likelihood

With respect to assessing the likelihood or chance of the risk occurring, the qualitative definitions used by CMW for this project are provided in Table B2 for each likelihood classification.

Table B2: Qualitative Natural Hazard Likelihood Definitions		
1	Rare	The natural hazard is not expected to occur during the design life of the project
2	Unlikely	The natural hazard is unlikely, but may occur during the design life
3	Moderate	The natural hazard will probably occur at some time during the life of the project
4	Likely	The natural hazard is expected to occur during the design life of the project
5	Almost Certain	The natural hazard will almost definitely occur during the design life of the project

2.3 Consequence

In terms of determining the consequence or severity of the natural hazard occurring, the qualitative definitions used by CMW for this project are provided in Table B3 for each consequence classification.

Table B3: Qualitative Natural Hazard Consequence Definitions		
1	Insignificant	Very minor to no damage, not requiring any repair, no people at risk, no economic effect to landowners.
2	Minor	Minor damage to land only, any repairs can be considered normal property maintenance no people at risk, very minor economic effect.
3	Moderate	Some damage to land requiring repair to reinstate within few months, minor cosmetic damage to buildings being within relevant code tolerances, does not require immediate repair, no people at risk, minor economic effect.
4	Major	Significant damage to land requiring immediate repair, damage to buildings beyond serviceable limits requiring repair, no collapse of structures, perceptible effect to people, no risk to life, considerable economic effect.
5	Catastrophic	Major damage to land and buildings, possible structure collapse requiring replacement, risk to life, major economic effect, or possible site abandonment.

2.4 Risk Acceptance

It is recognised that the natural hazard risk assessment provided herein is qualitative and, due to the wide range of possible geohazards that could occur, is somewhat subjective. Other methods are available to quantitatively assess an acceptable level of geotechnical related natural hazard risk, such as defining an acceptable factor of safety with respect to slope stability or acceptable differential ground settlements with respect to recommended building code limits.

Therefore, to give this qualitative natural hazard risk assessment some relevance to more commonly adopted numerical or quantitative geotechnical assessment techniques, a residual risk rating of very low to medium (risk value = 1 to 9 inclusive) is considered an acceptable result for the proposed subdivision development.

A risk rating of high to extreme (risk value ≥ 10) is considered an unacceptable result for the proposed subdivision development.

3 RISK ASSESSMENT

The natural hazards relevant to this proposed subdivision development and adjacent, potentially affected land have been assessed with respect to the criteria outlined above.

Assessment is based on proposed post development ground conditions with and without any geotechnical controls. The latent risk was first assessed with the site in its proposed developed state to consider the risks to the development and surrounding land, including assessment of land modifications from the pre-existing natural state, without any implemented geotechnical controls. The specific geotechnical mitigation measures and engineering design solutions outlined in the table below and CMW report, where relevant, were then considered to determine the natural hazard residual risk remaining after the proposed controls have been implemented.

Results of this assessment are presented in Table C1 below.

Table C1: Natural Hazard Risk Assessment Results

RMA S2 Hazard	Description	Proposed Site Latent Risk of Damage to Land / Structures			Comments and Geotechnical Control	Proposed Site Residual Risk of Damage to Land / Structures OR Acceleration/ Worsening of Hazard with Geotechnical Controls Implemented		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Earthquake	Fault Rupture	1	4	Low 4	Approximately 50km west of active Kerepehi Fault	1	4	Low 4
	Liquefaction Induced Subsidence	3	3	Medium 9	Liquefaction induced settlements should be accounted for in foundation design.	3	3	Medium 9
	Lateral Spread	1	4	Low 4	No free face present in vicinity of liquefiable soils.	1	4	Low 4
Volcanic Activity	Site not within proximity to any active volcano.							
Geothermal Activity	Site not within geothermal area.							
Erosion	Cut Batters	5	2	High 10	Max 1:3 gradient. Stabilisation following construction to prevent long term erosion.	2	2	Low 4
	Fill Batters	5	2	High 10	Max 1:3 gradient. Stabilisation following construction to prevent long term erosion.	2	2	Low 4
Landslip	Global Slope Instability	3	3	Medium 9	Natural gully escarpment should be assessed once development plans confirmed.	3	3	Medium 9
	Soil Creep	5	4	Extreme 20	Soil creep present on steep northern escarpment and is to be buttressed with fill in the location of any development.	1	4	Low 4

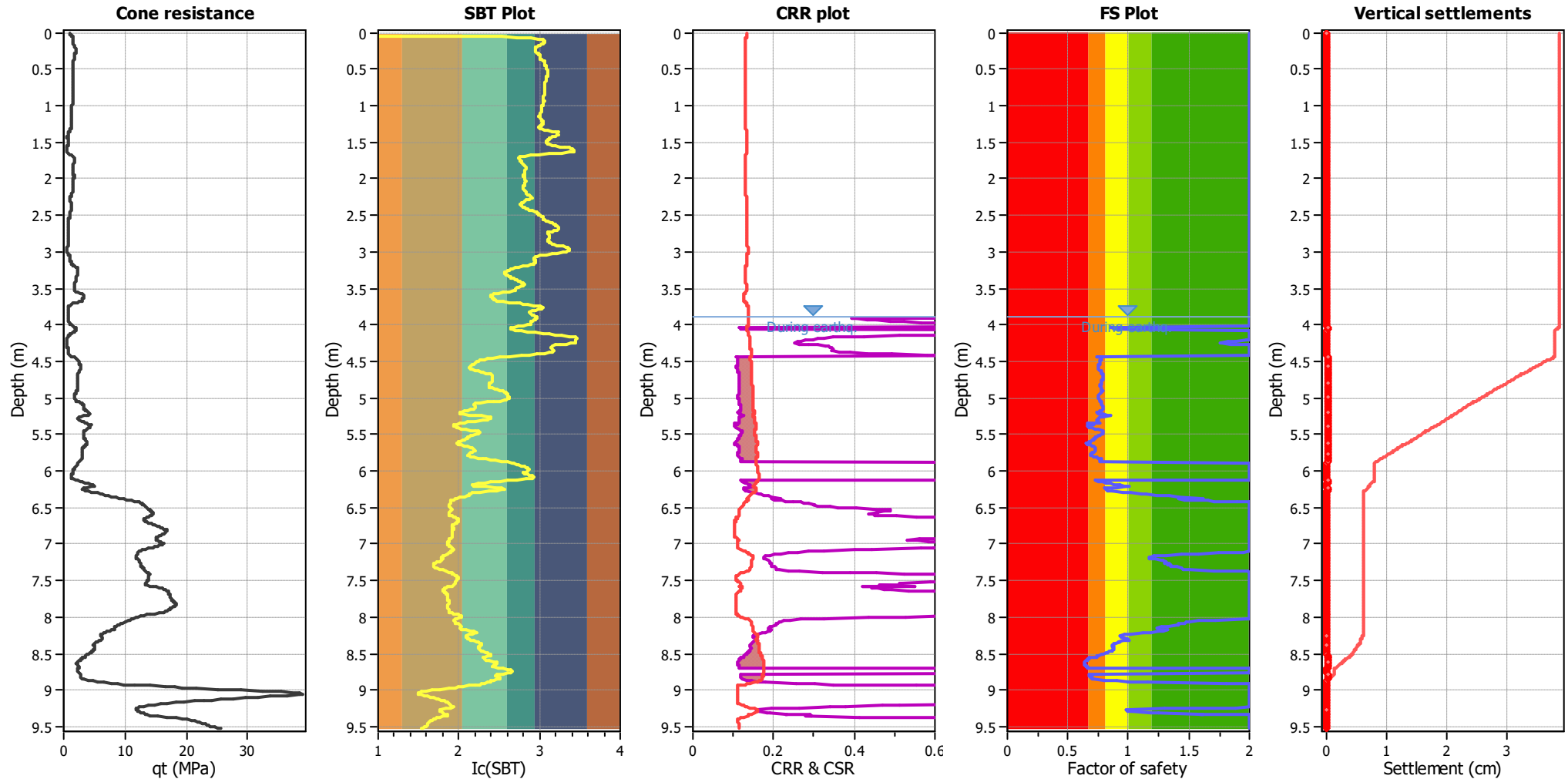
Table C1: Natural Hazard Risk Assessment Results

RMA S2 Hazard	Description	Proposed Site Latent Risk of Damage to Land / Structures			Comments and Geotechnical Control	Proposed Site Residual Risk of Damage to Land / Structures OR Acceleration/ Worsening of Hazard with Geotechnical Controls Implemented		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
	Bearing Capacity Failure	2	3	Medium 6	Undercut and replace low strength soils below future building foundations, use appropriate foundation design.	1	3	Low 3
	Cut & Fill Batter Instability	2	3	Medium 6	Cut/fill batters up to 4.0m high with maximum gradients of 1:3. Detailed design required at location of steep northern escarpment.	2	3	Medium 6
Subsidence	Expansive Soils	2	3	Medium 9	Walton Subgroup silts and clays considered to be expansive. Foundation design to take this into account.	1	3	Low 3
	Soft Soils	2	3	Medium 6	Undercut and replace low strength soils if encountered.	1	3	Low 3
Sedimentation	Debris Inundation	3	3	Medium 9	Debris inundation to be considered at detailed design stage at location of steep escarpment.	3	3	Medium 9

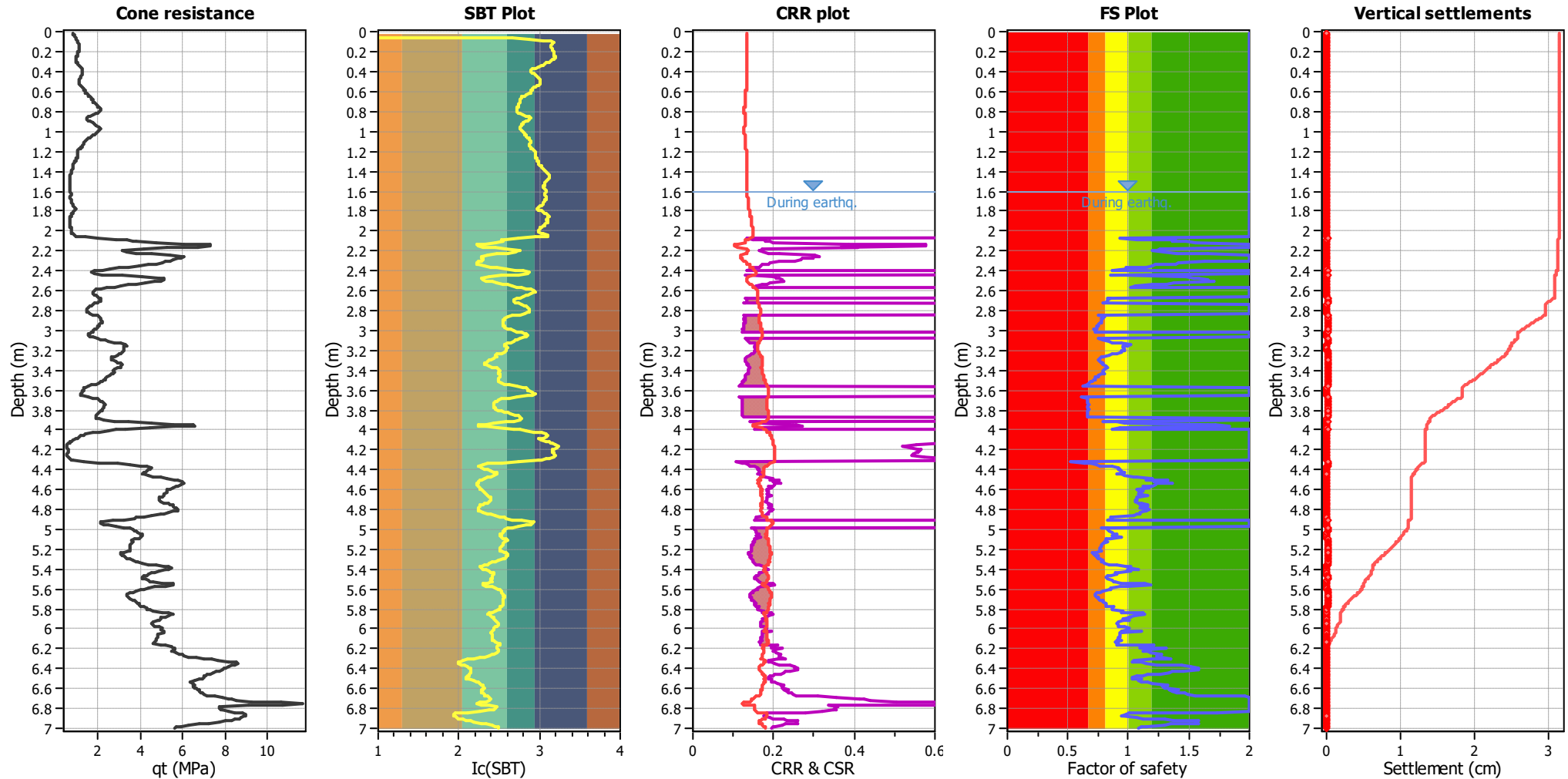
Notes:

- Assessments include the impact of the proposed subdivision works on adjacent properties.
- The following reference(s) contain information on the hazards contained in this assessment and the non-geotechnical hazards that have not been included:
 - Waikato**
<https://waikatoregion.maps.arcgis.com/apps/MapSeries/index.html?appid=f2b48398f93146e8a5cf0aa3fddce92c>

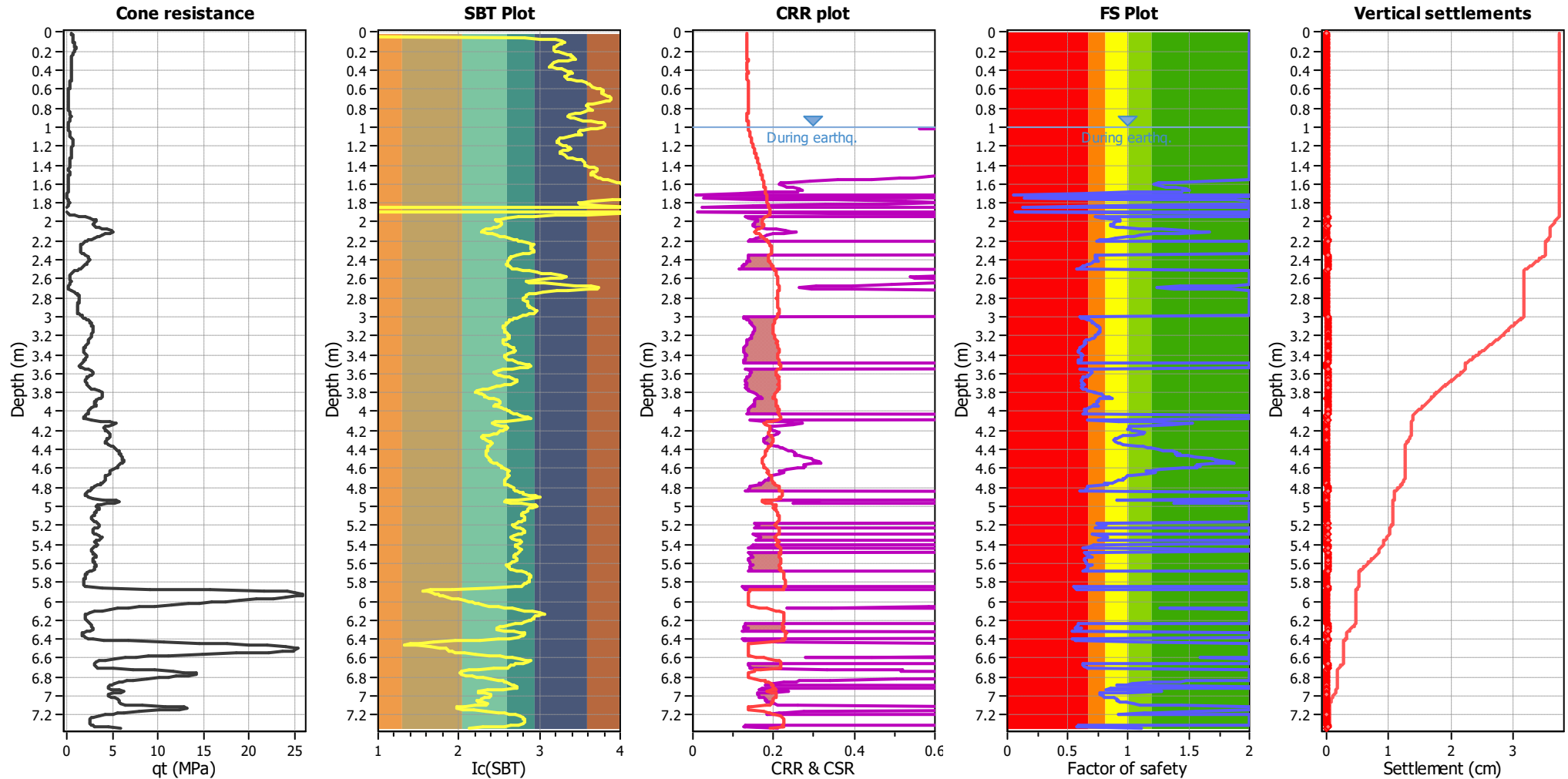
APPENDIX D: LIQUEFACTION ASSESSMENT



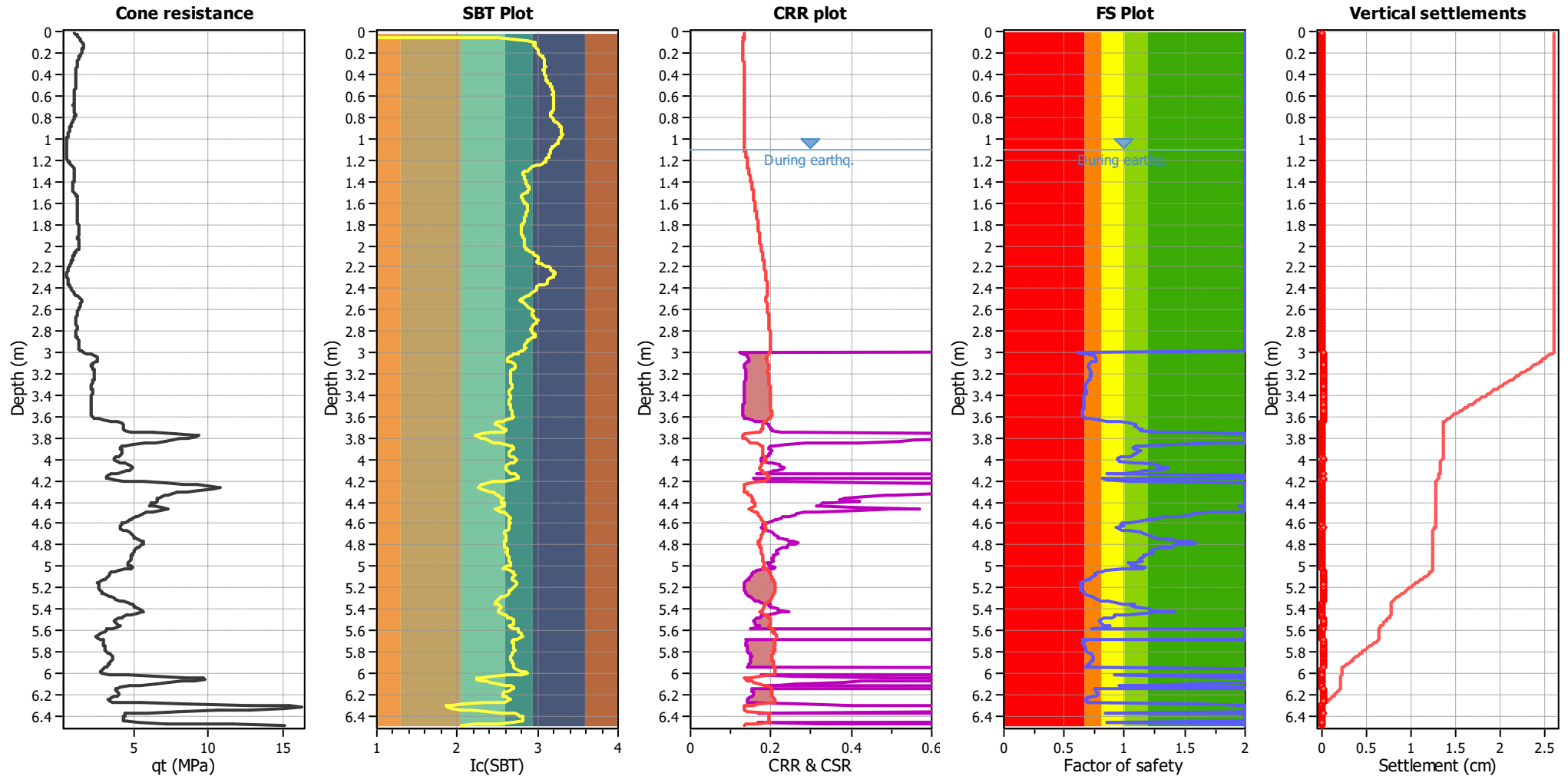
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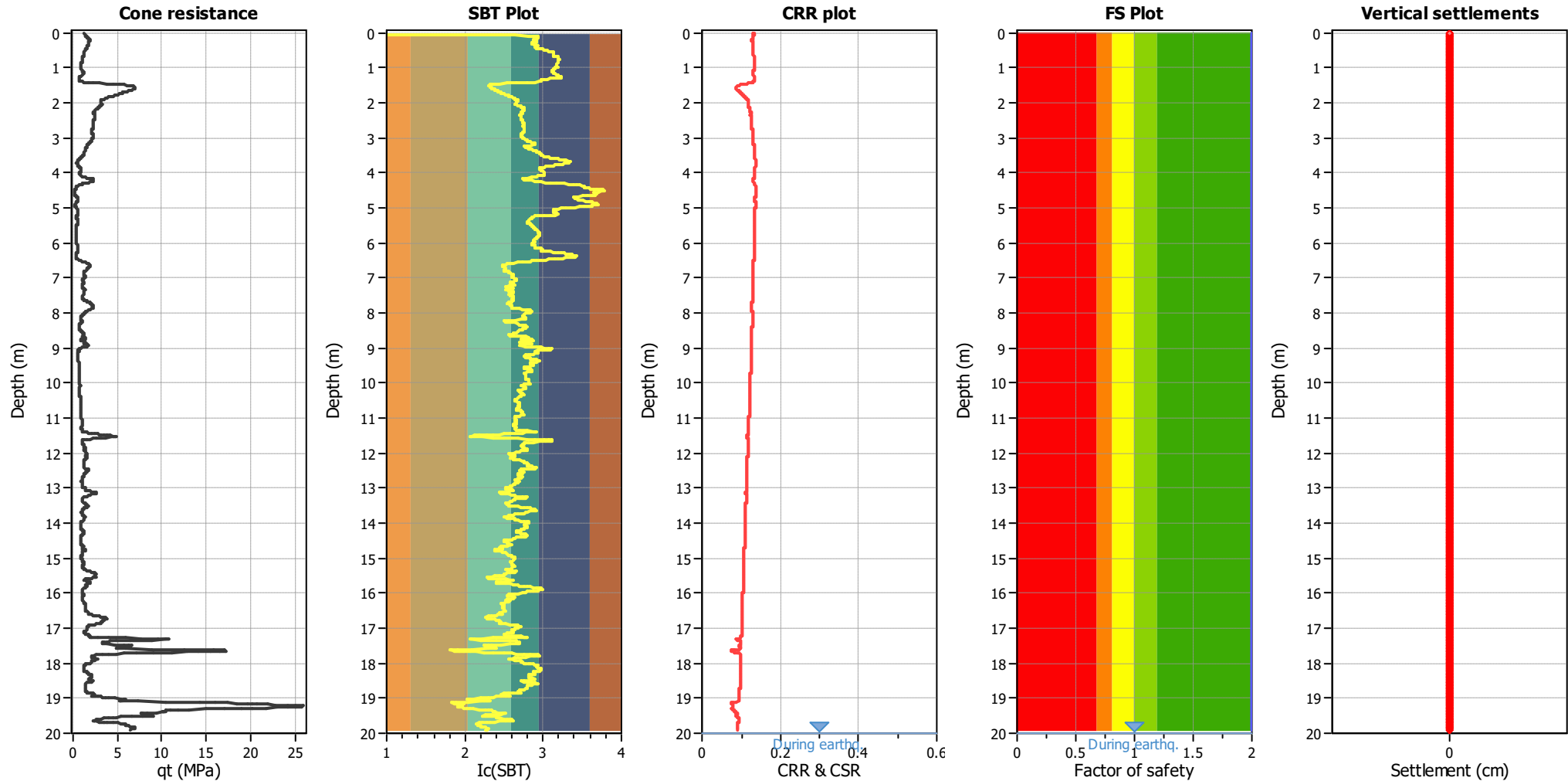
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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



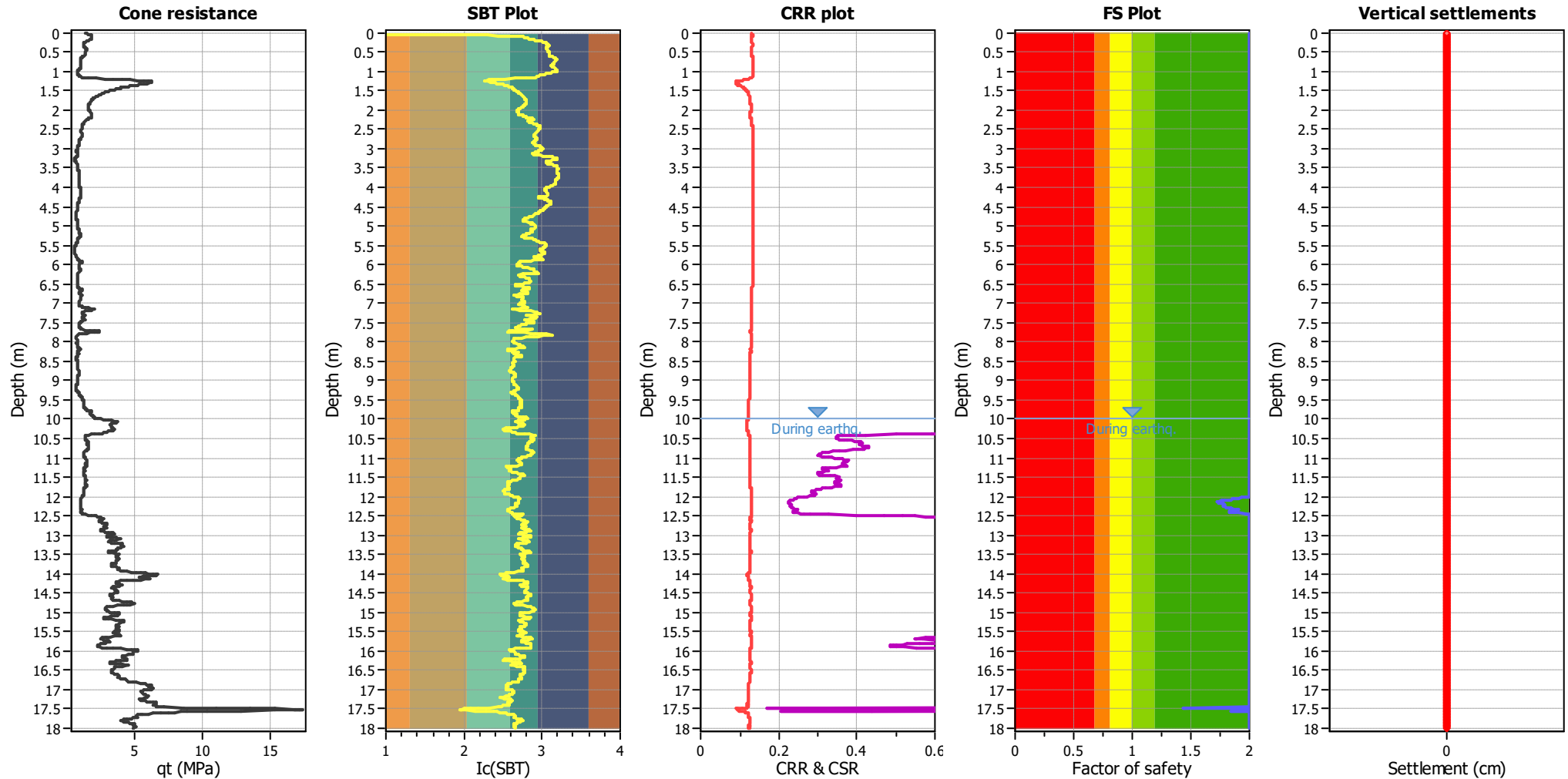
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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



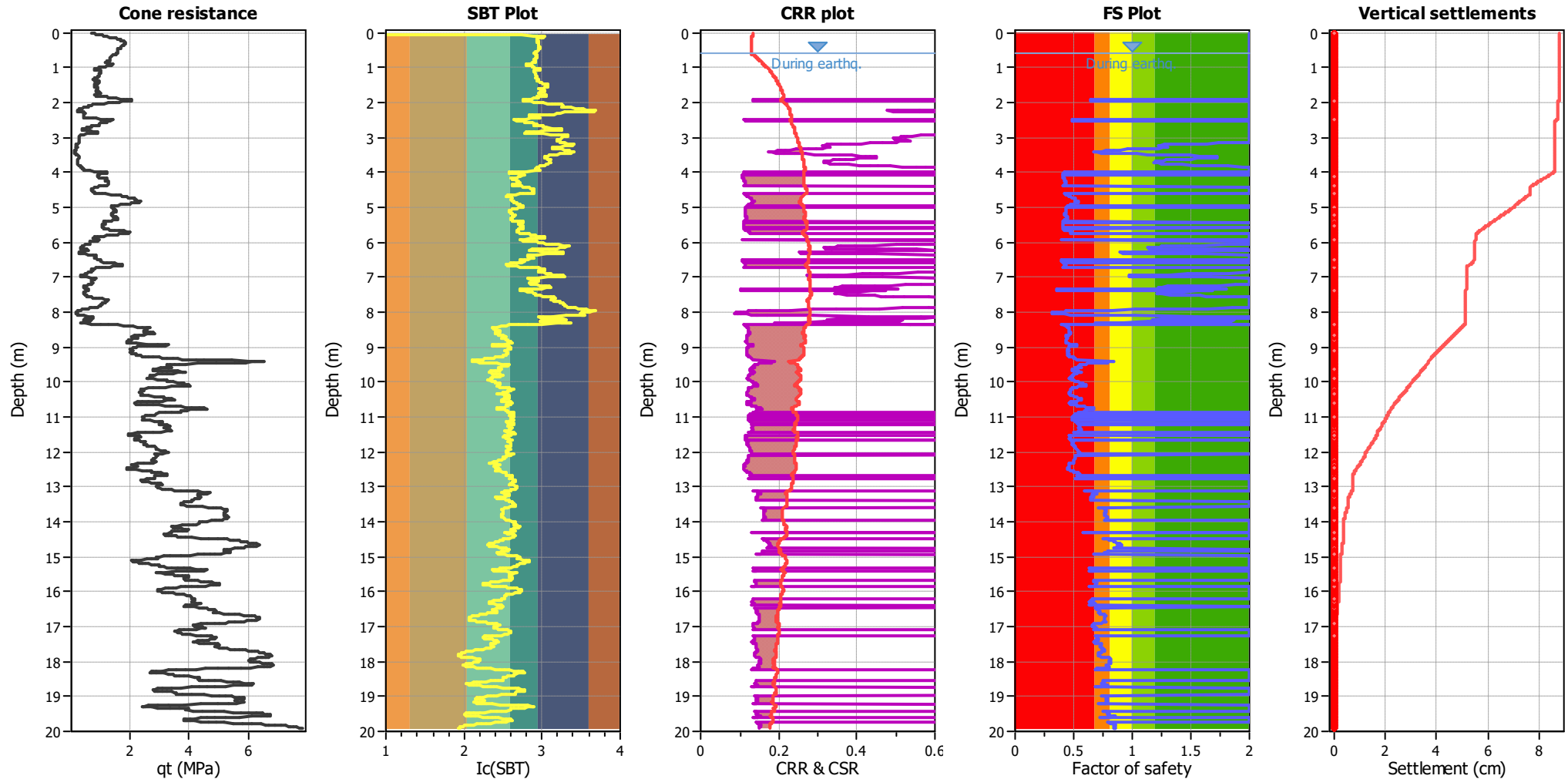
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Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



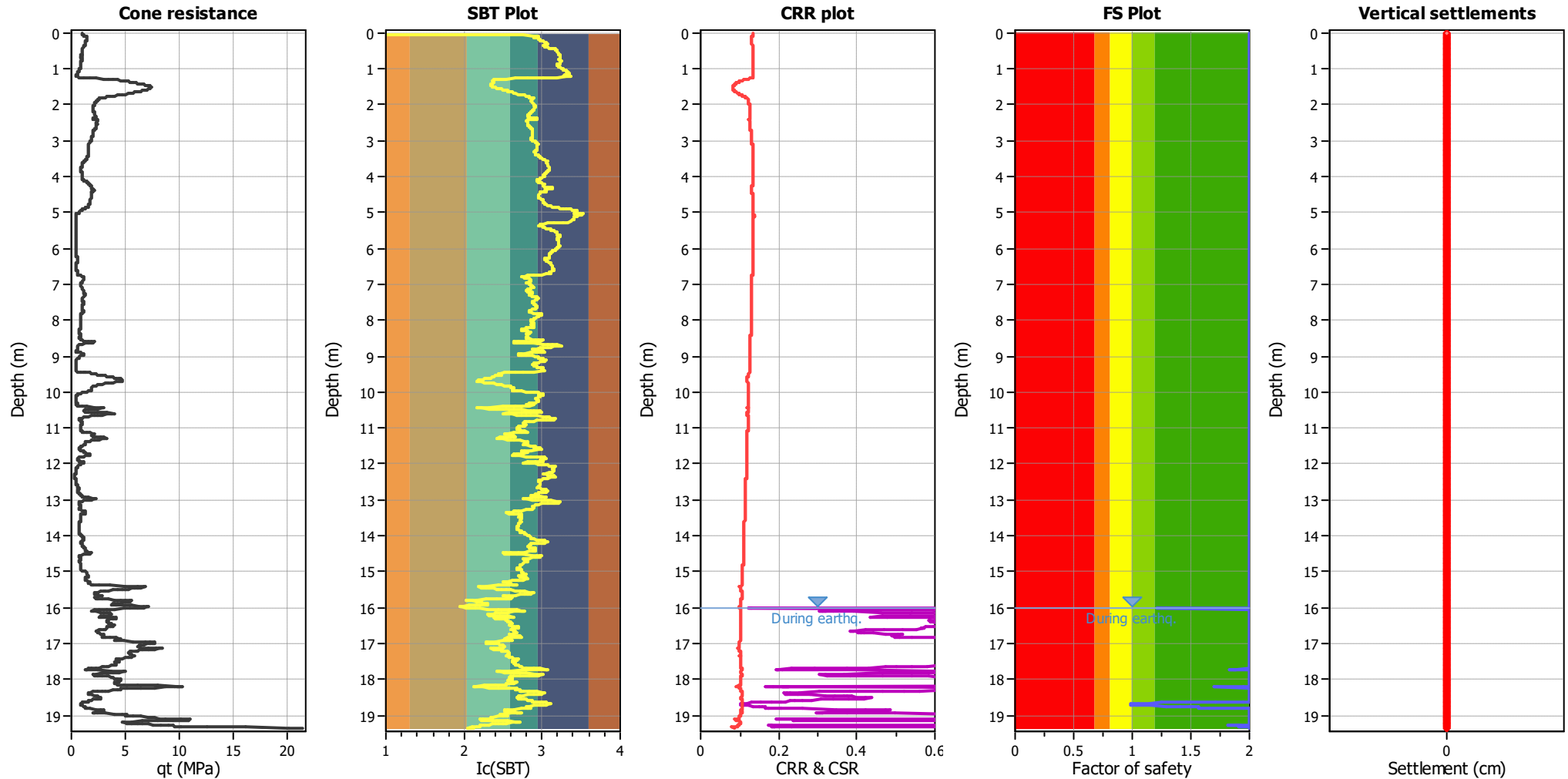
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						Method based



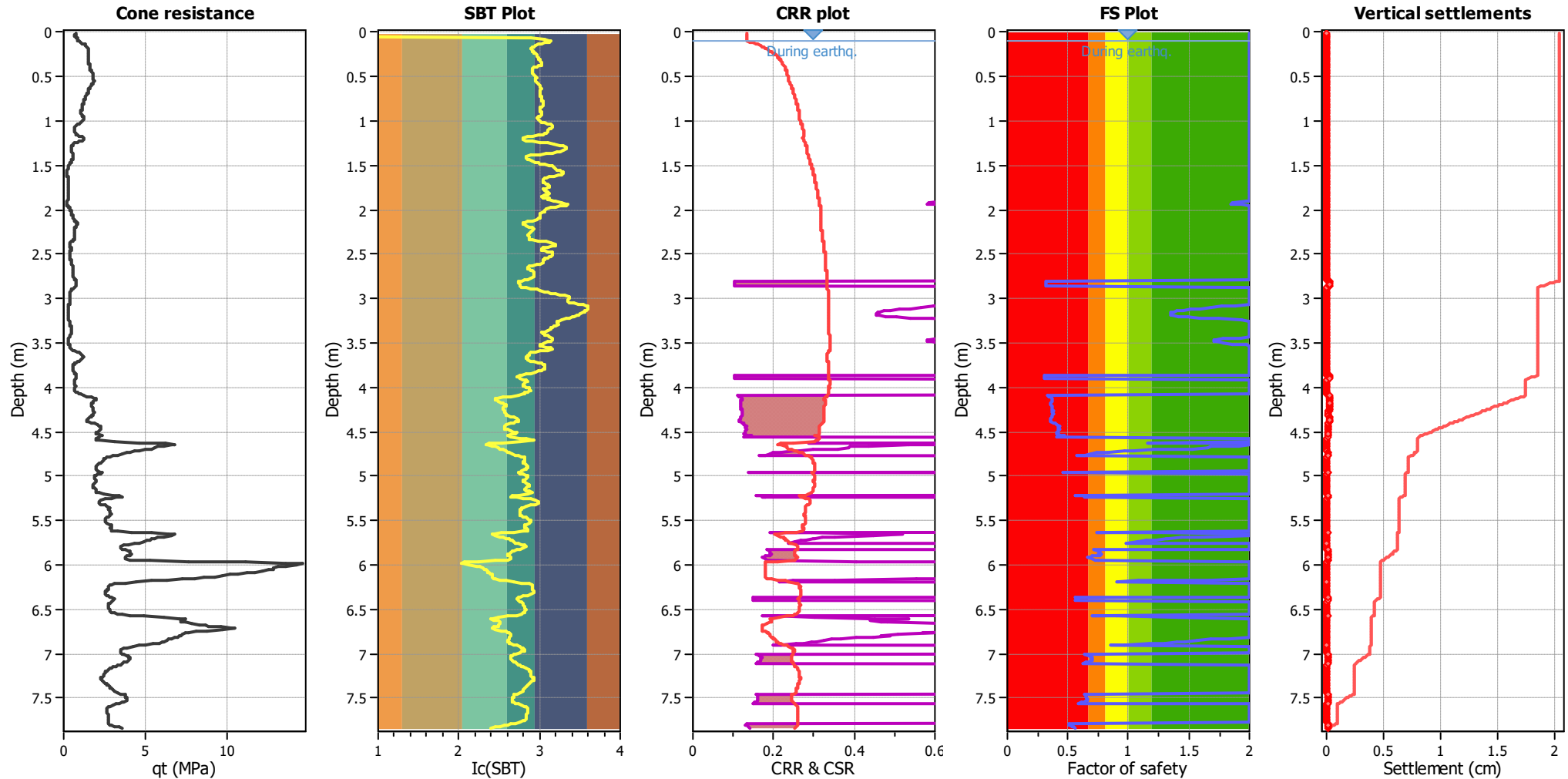
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Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



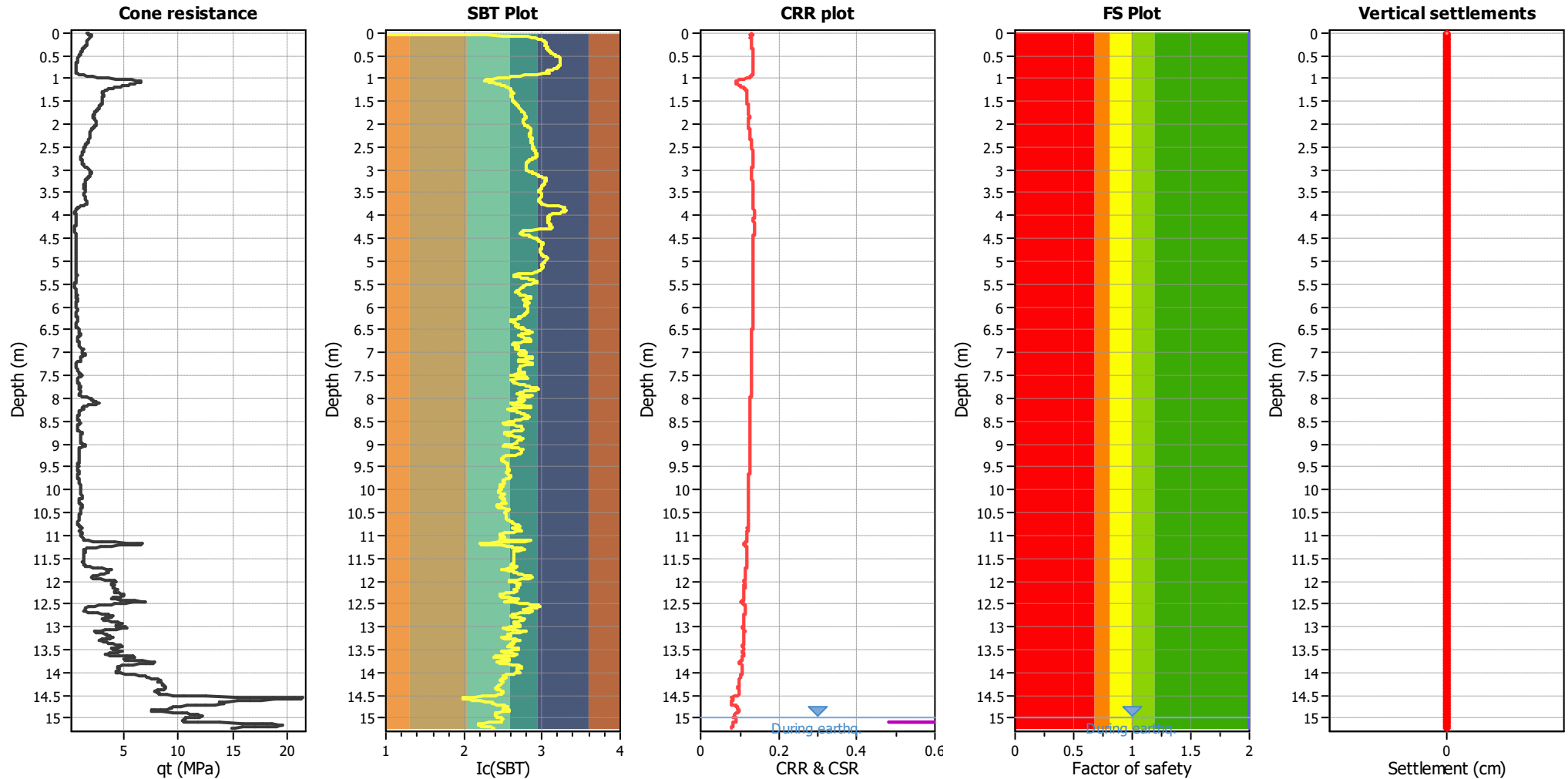
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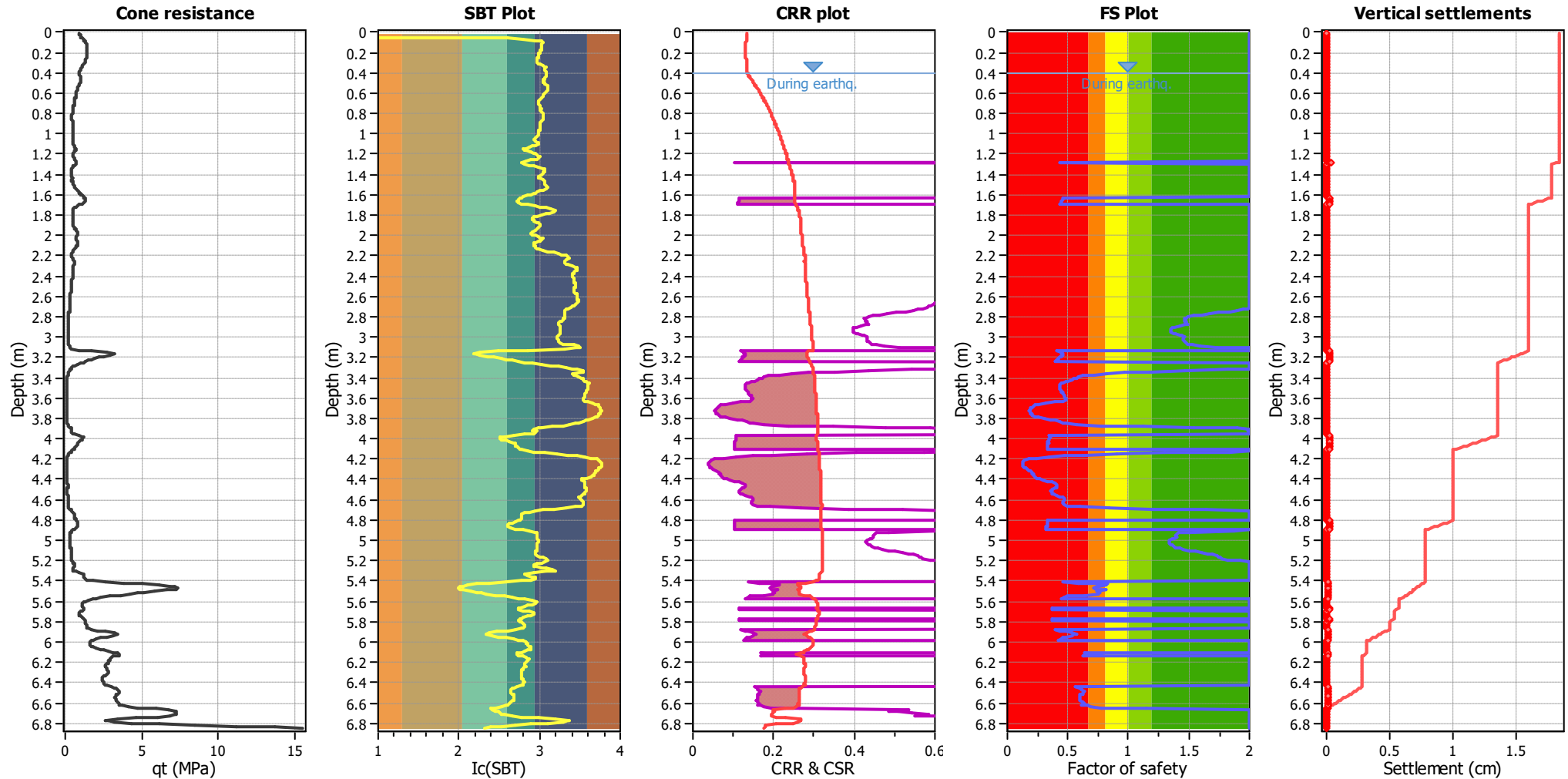
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Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



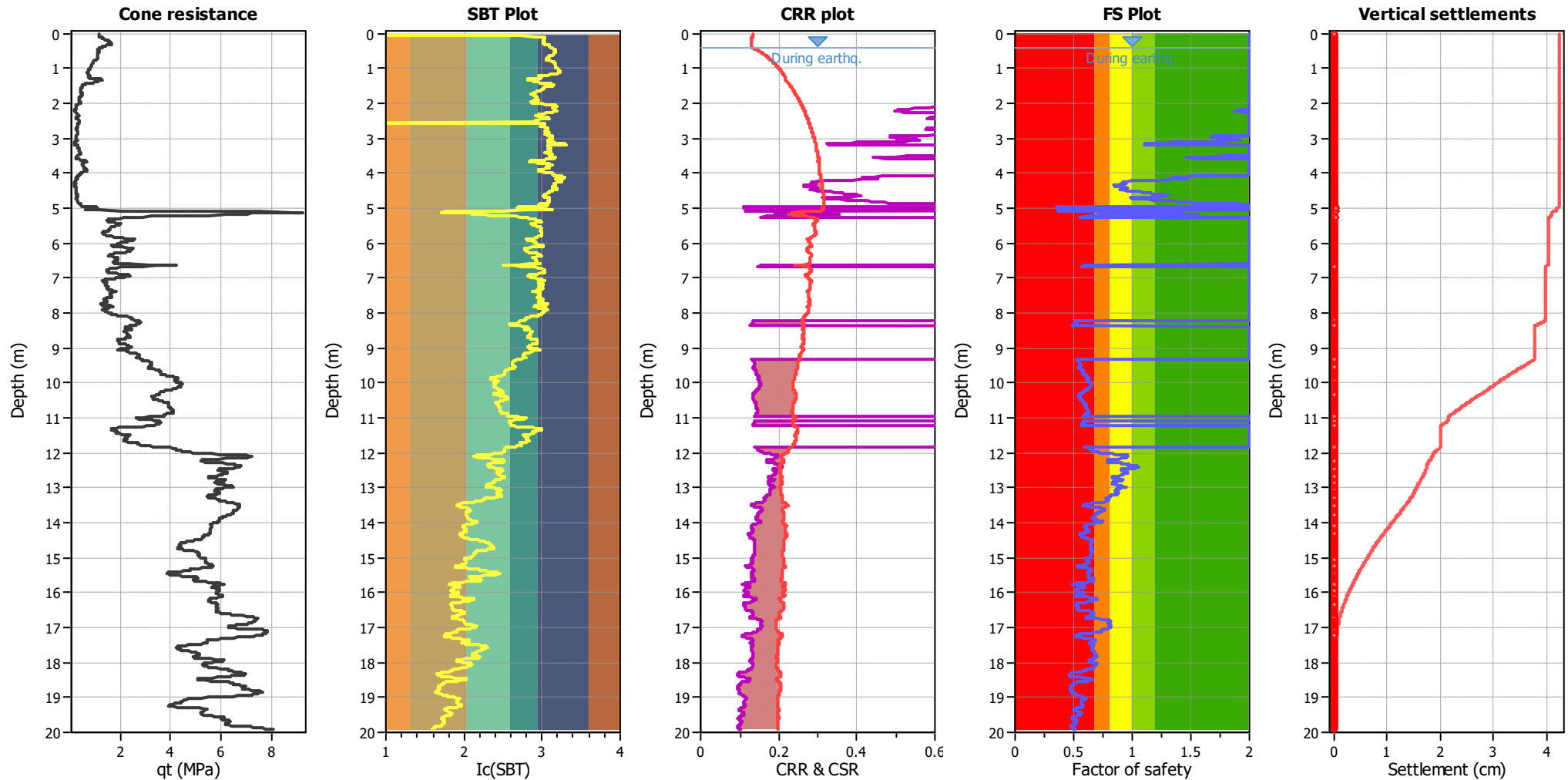
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Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



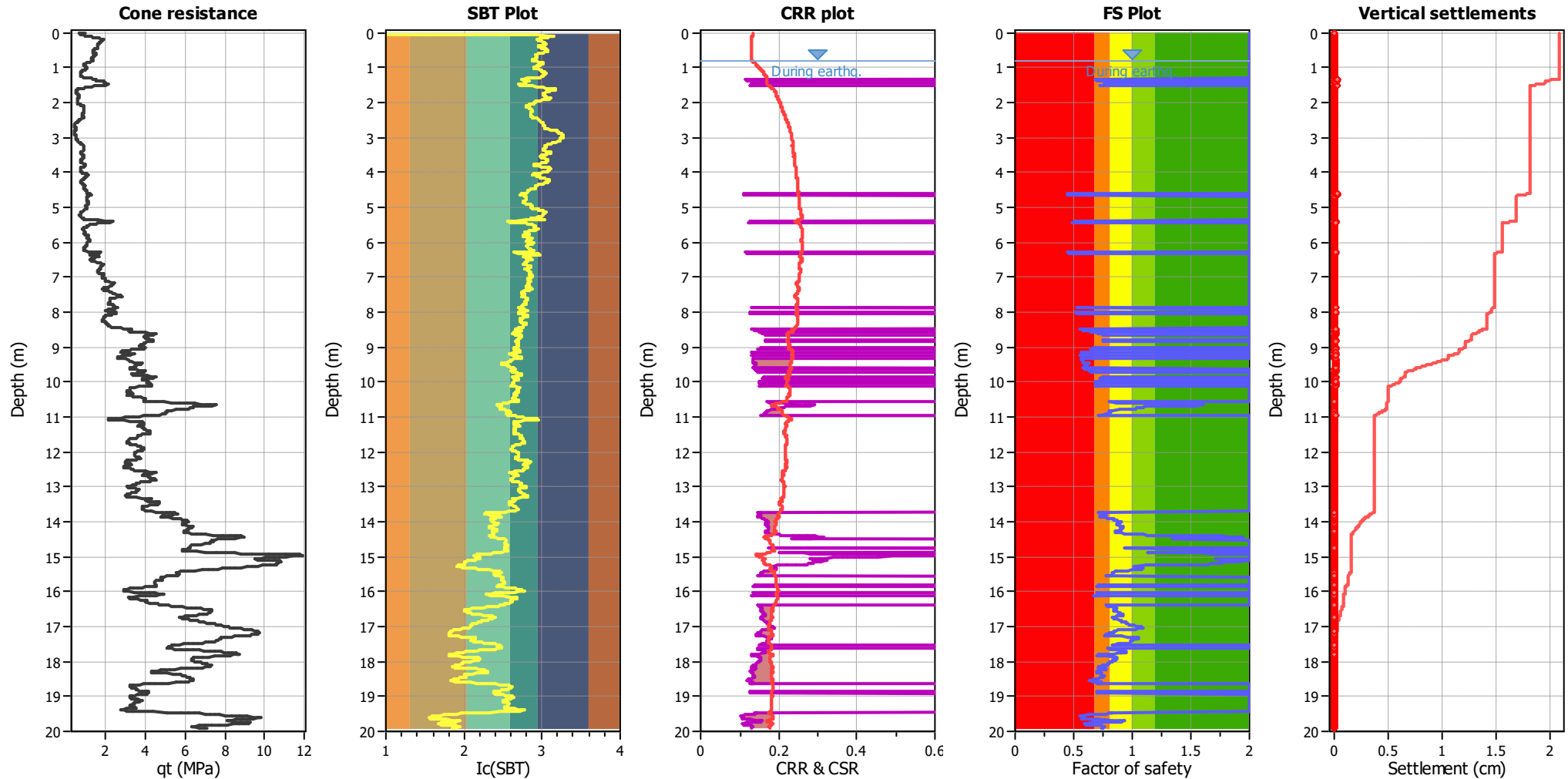
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Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



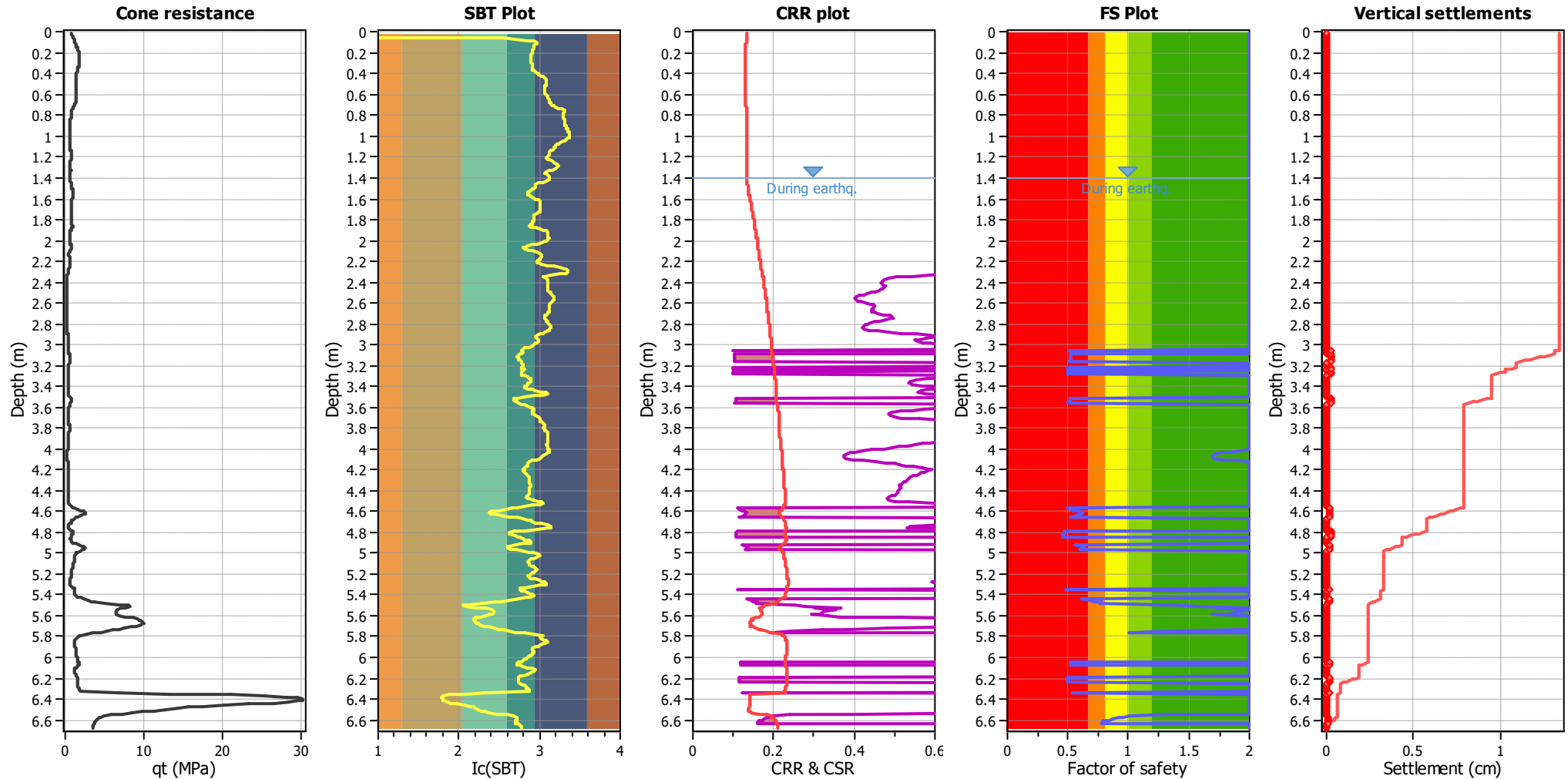
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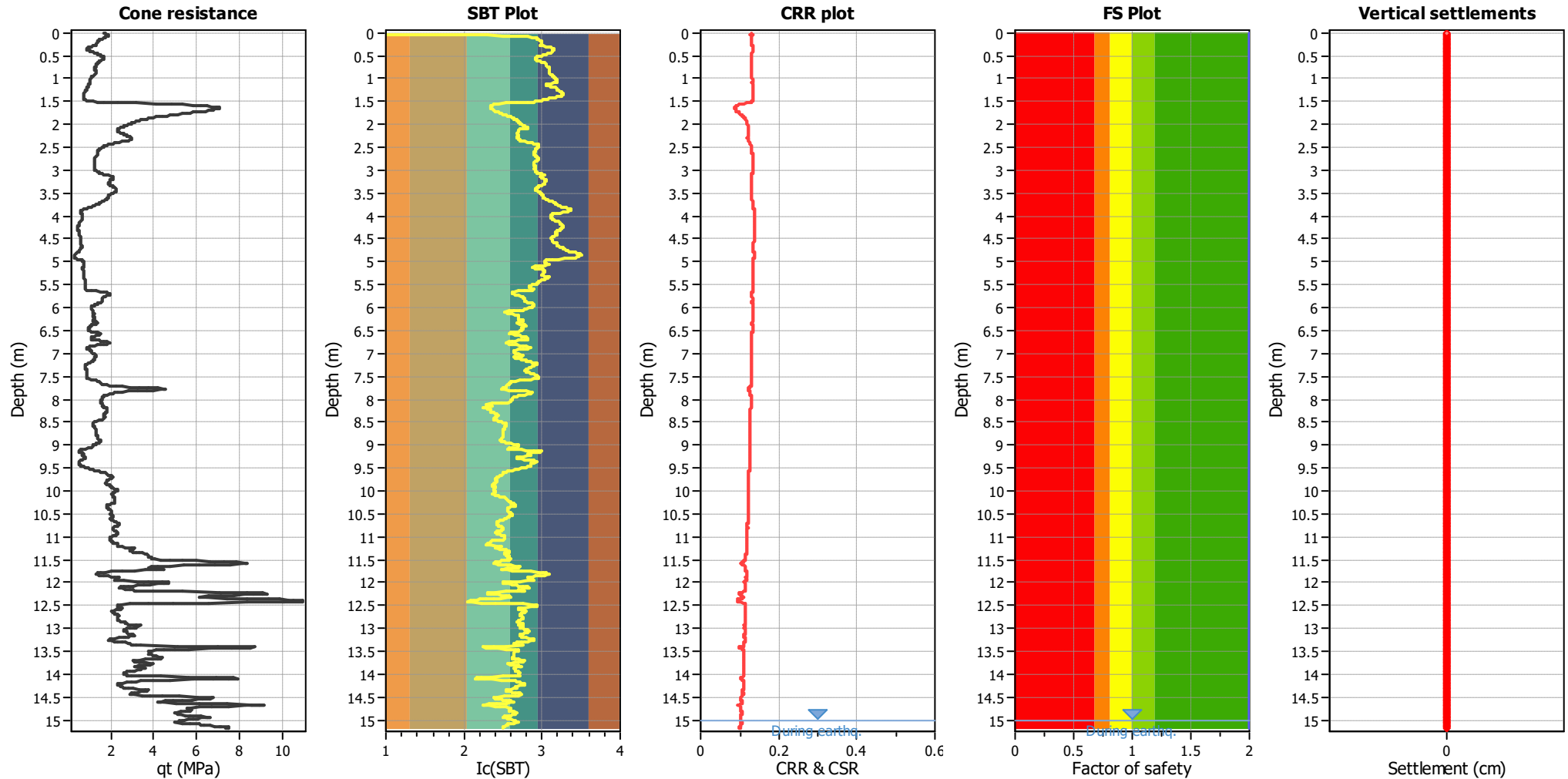
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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



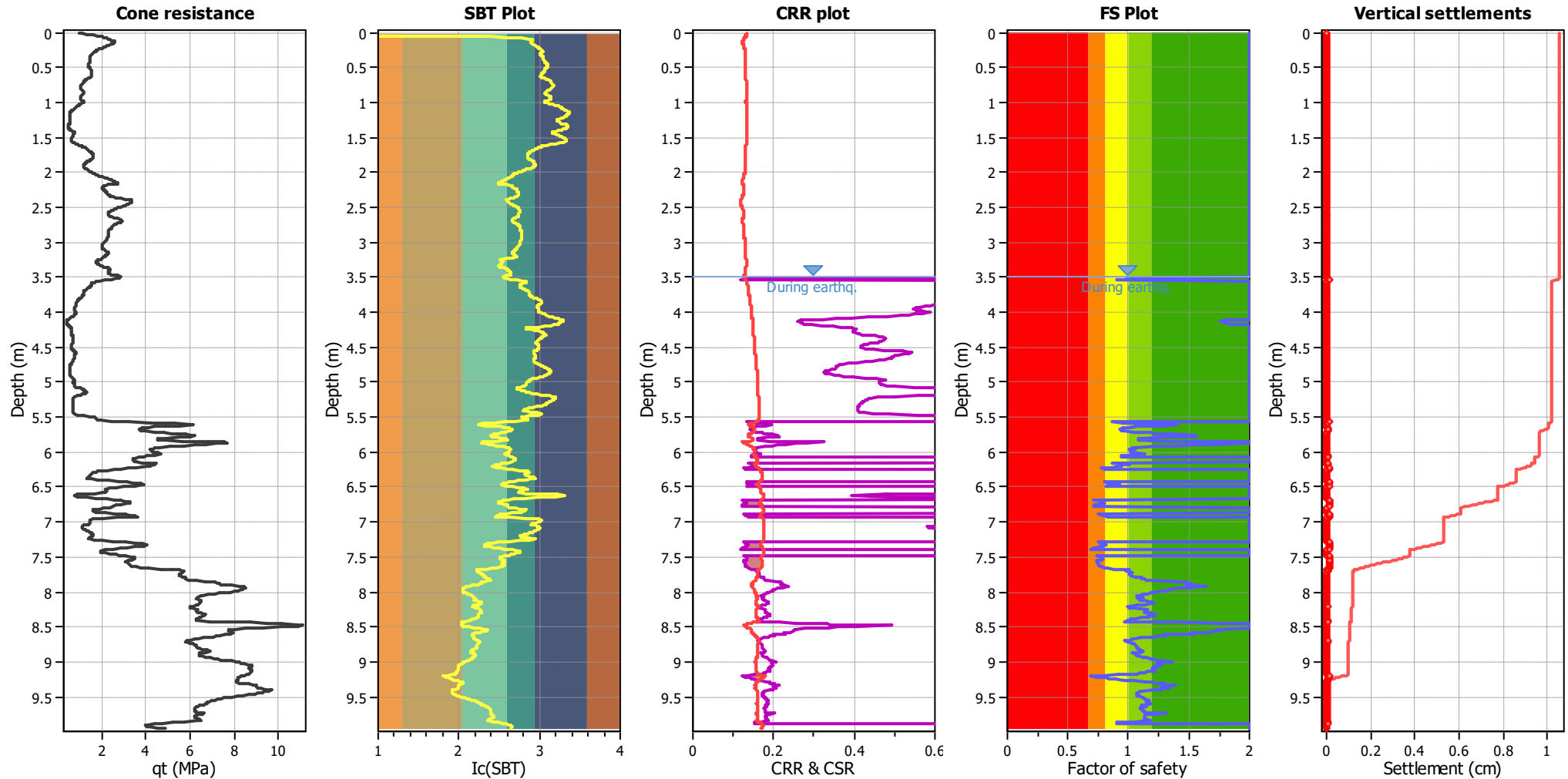
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Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



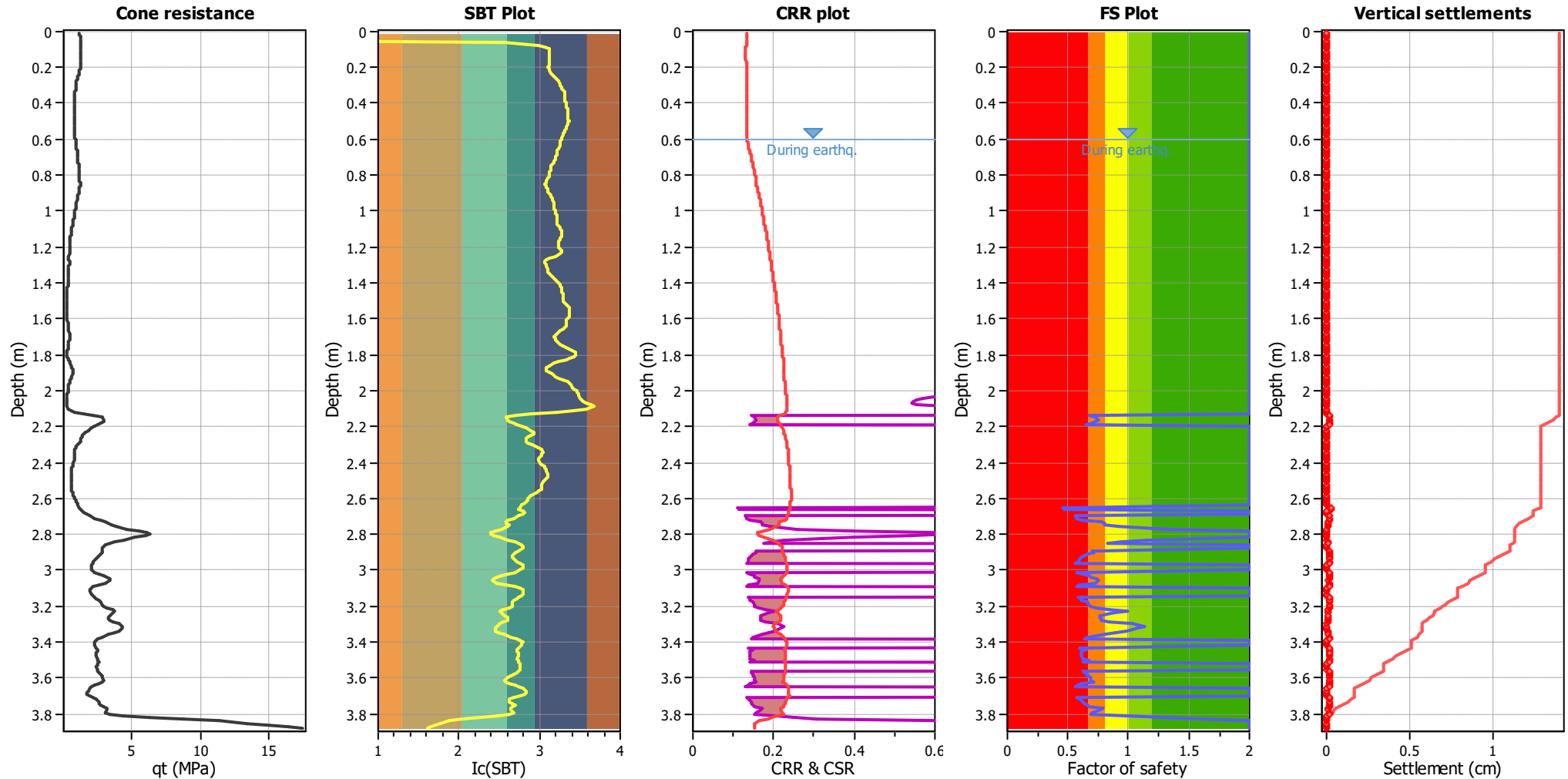
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Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



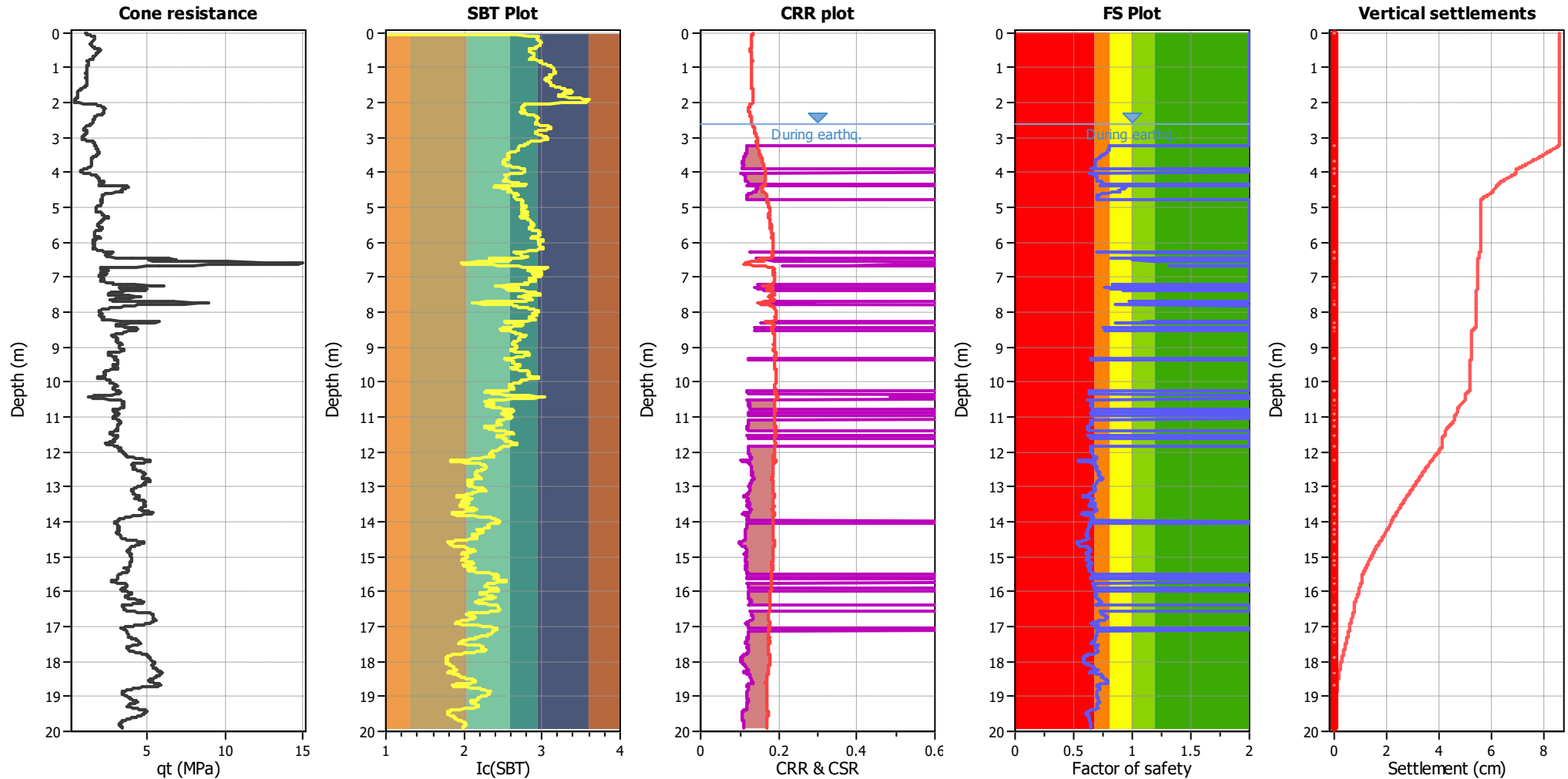
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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.00 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



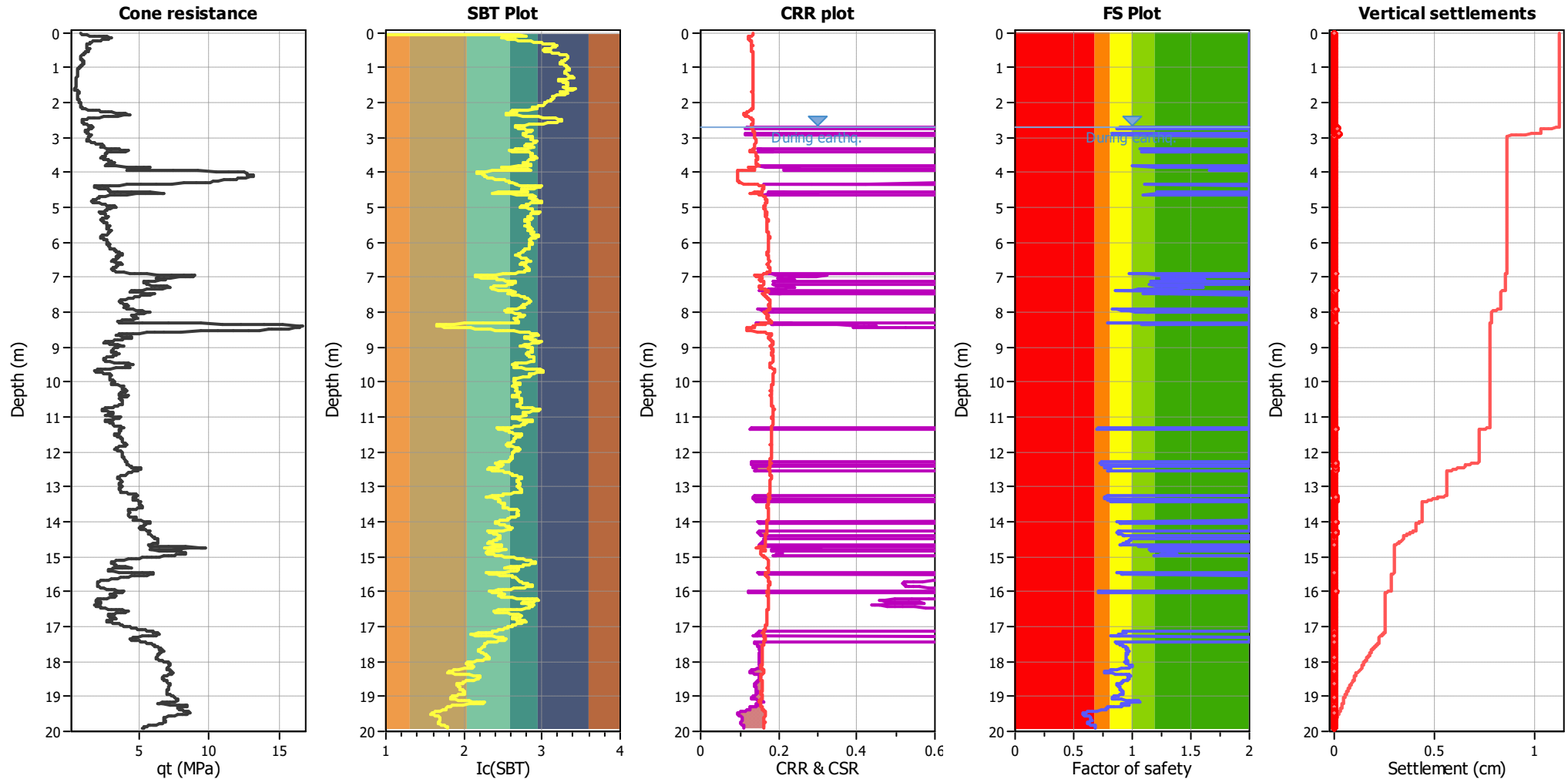
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.50 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



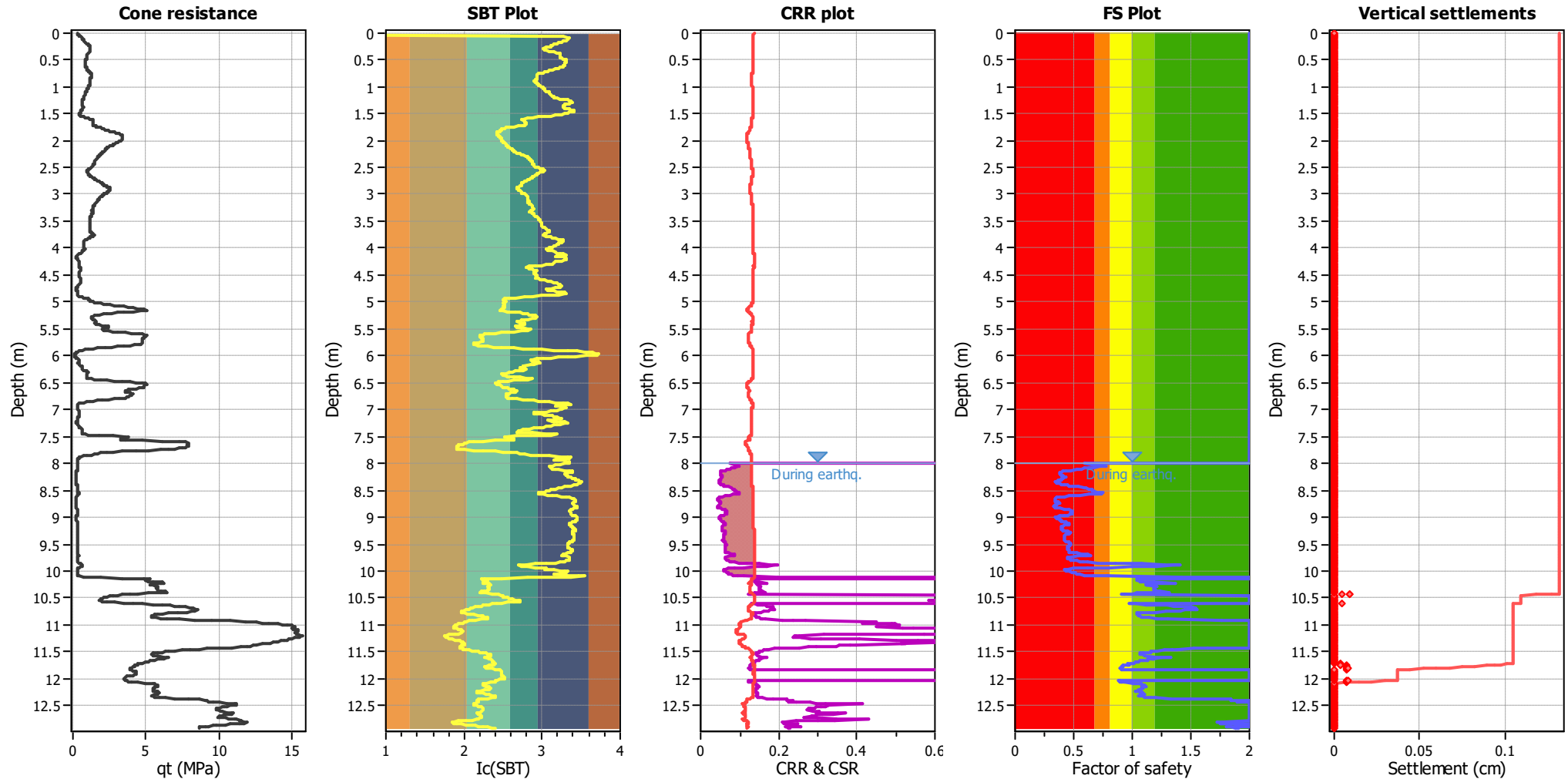
Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.60 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	0.60 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



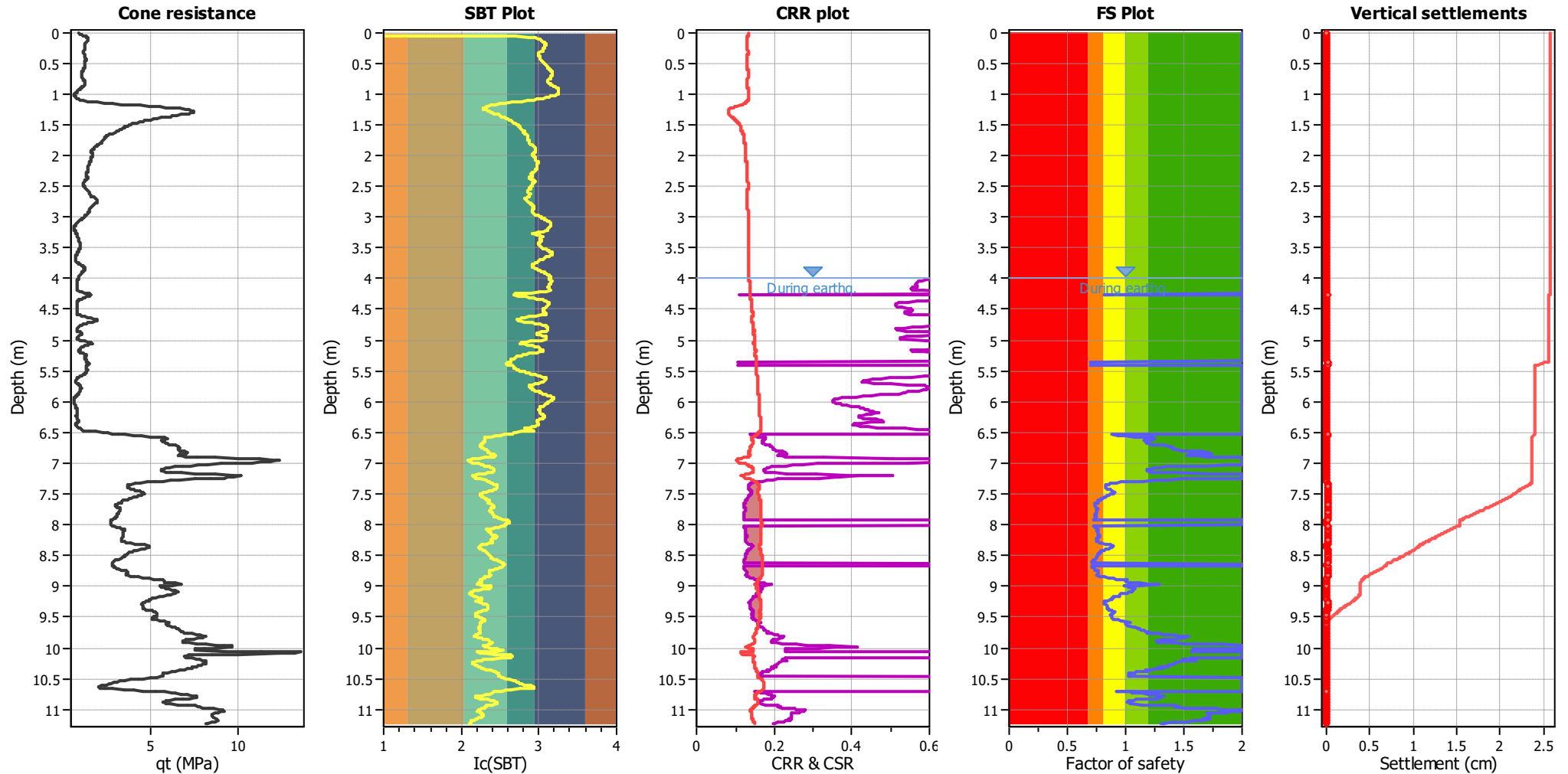
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.60 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



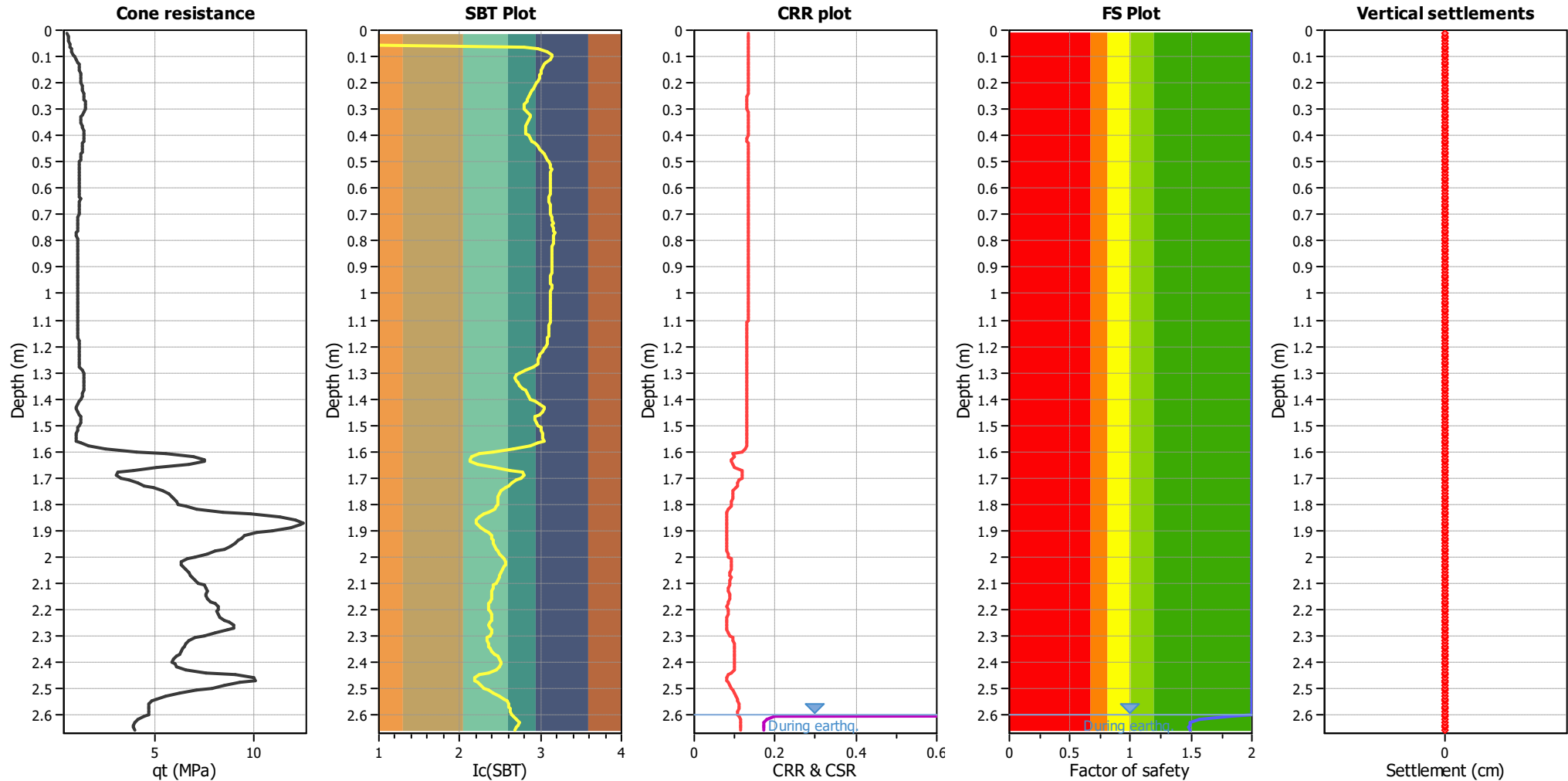
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.70 m	Fill height:	N/A	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



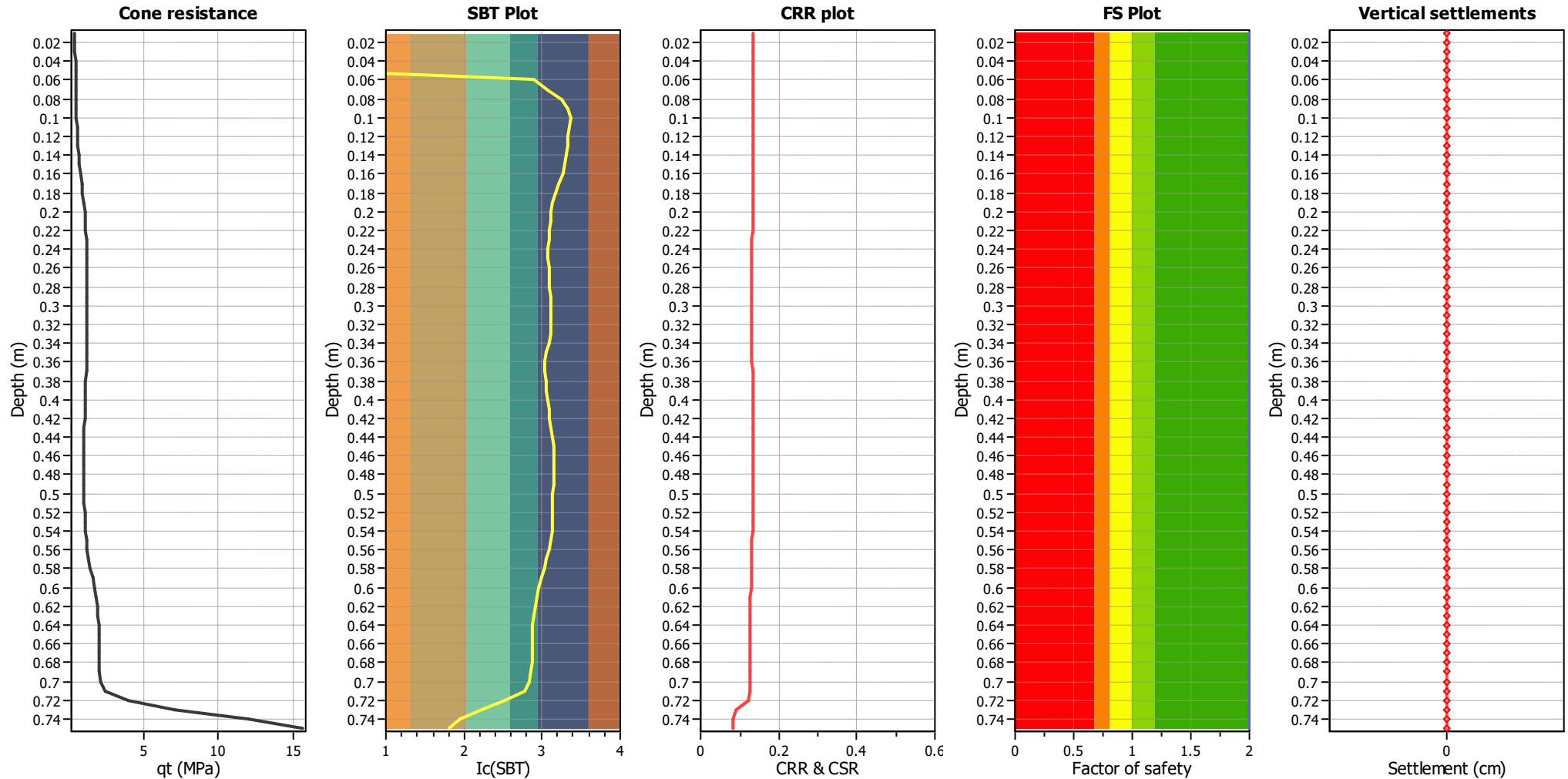
Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based



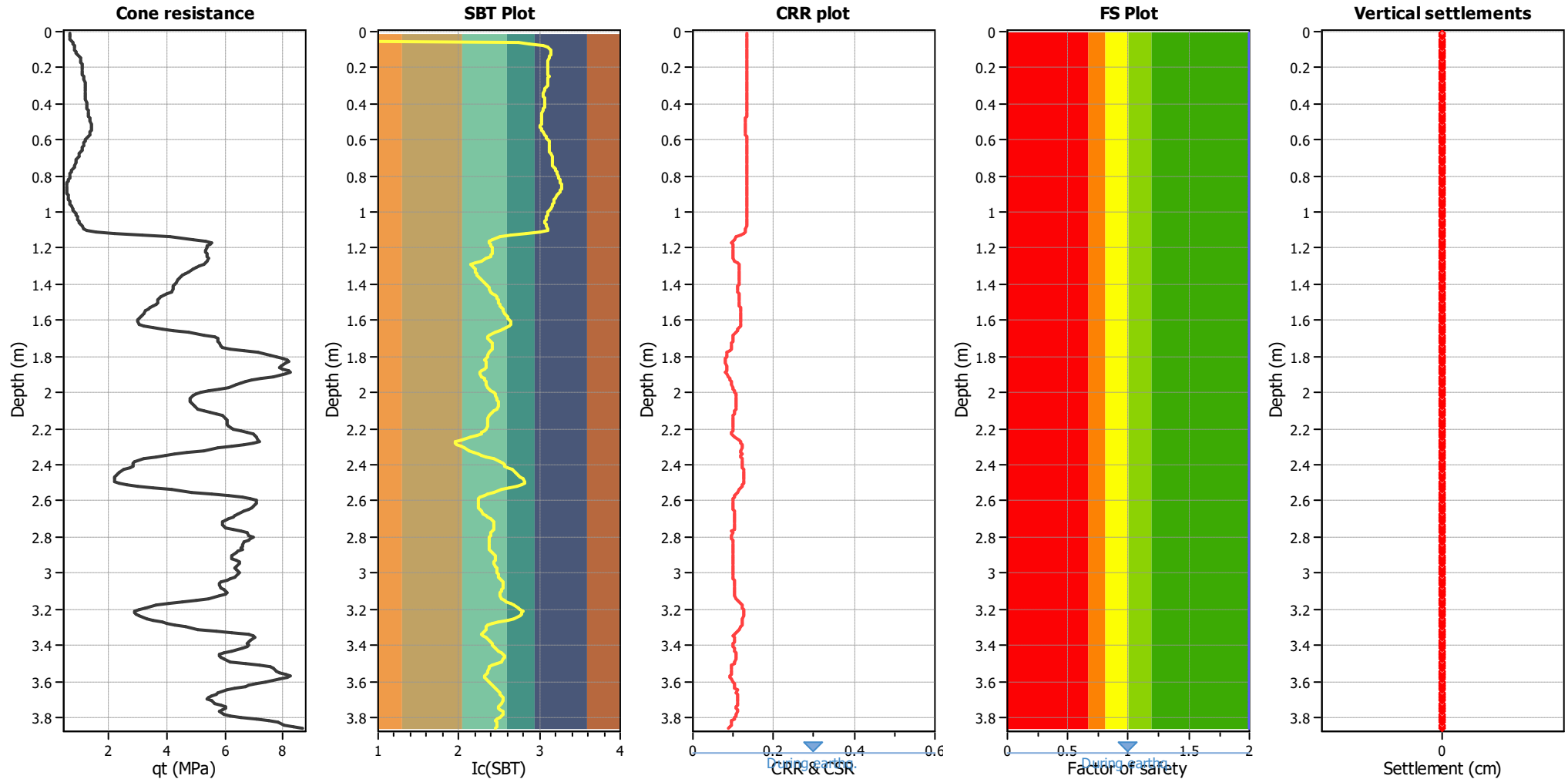
Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.60 m	Fill height:	N/A	applied:	.
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.60 m	Fill height:	N/A	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:
						Method based

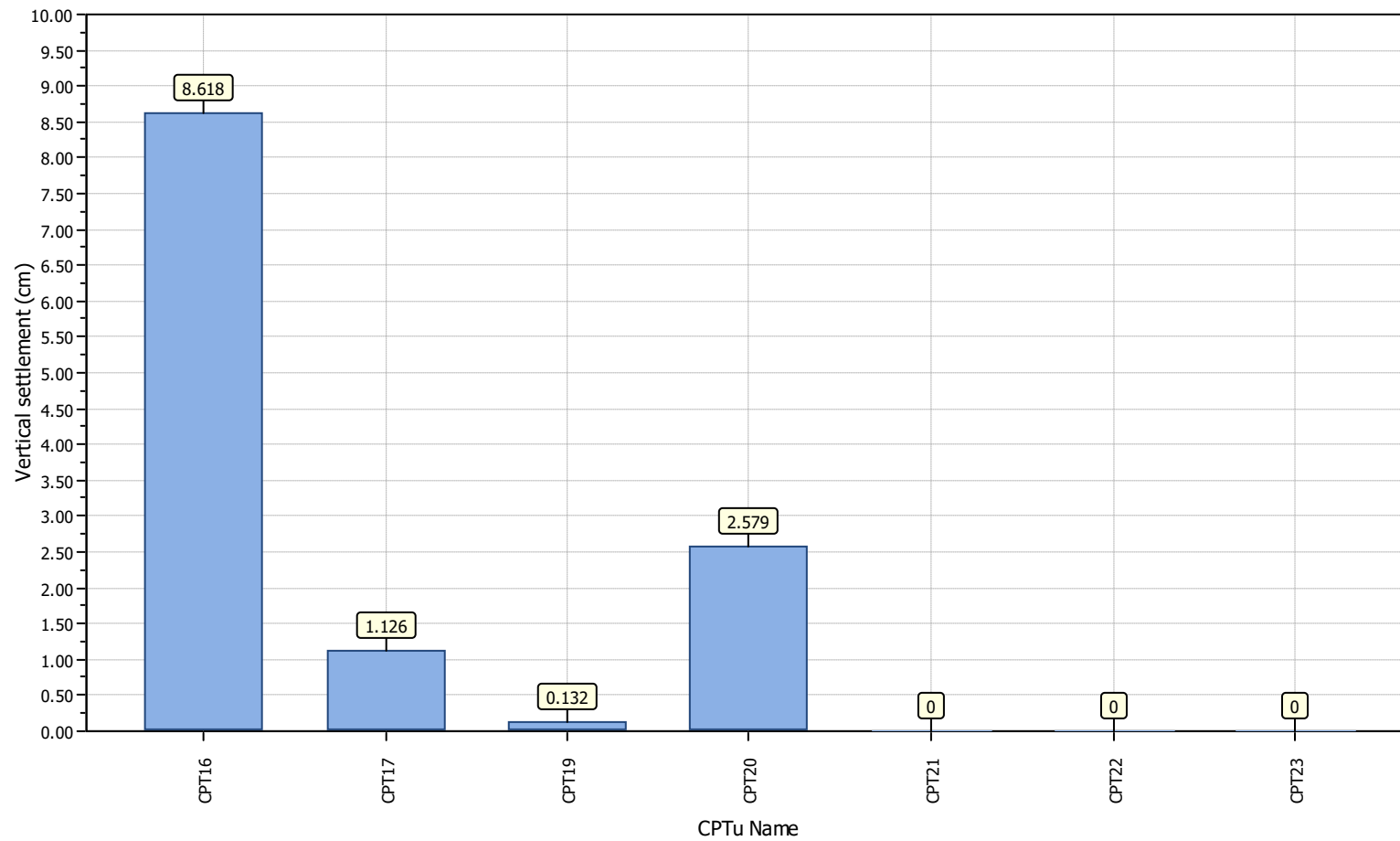


Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Fill height:	N/A	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:
Earthquake magnitude M_w :	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:
						Method based

Project title : T4 Structure Plan

Location : Te Awamutu

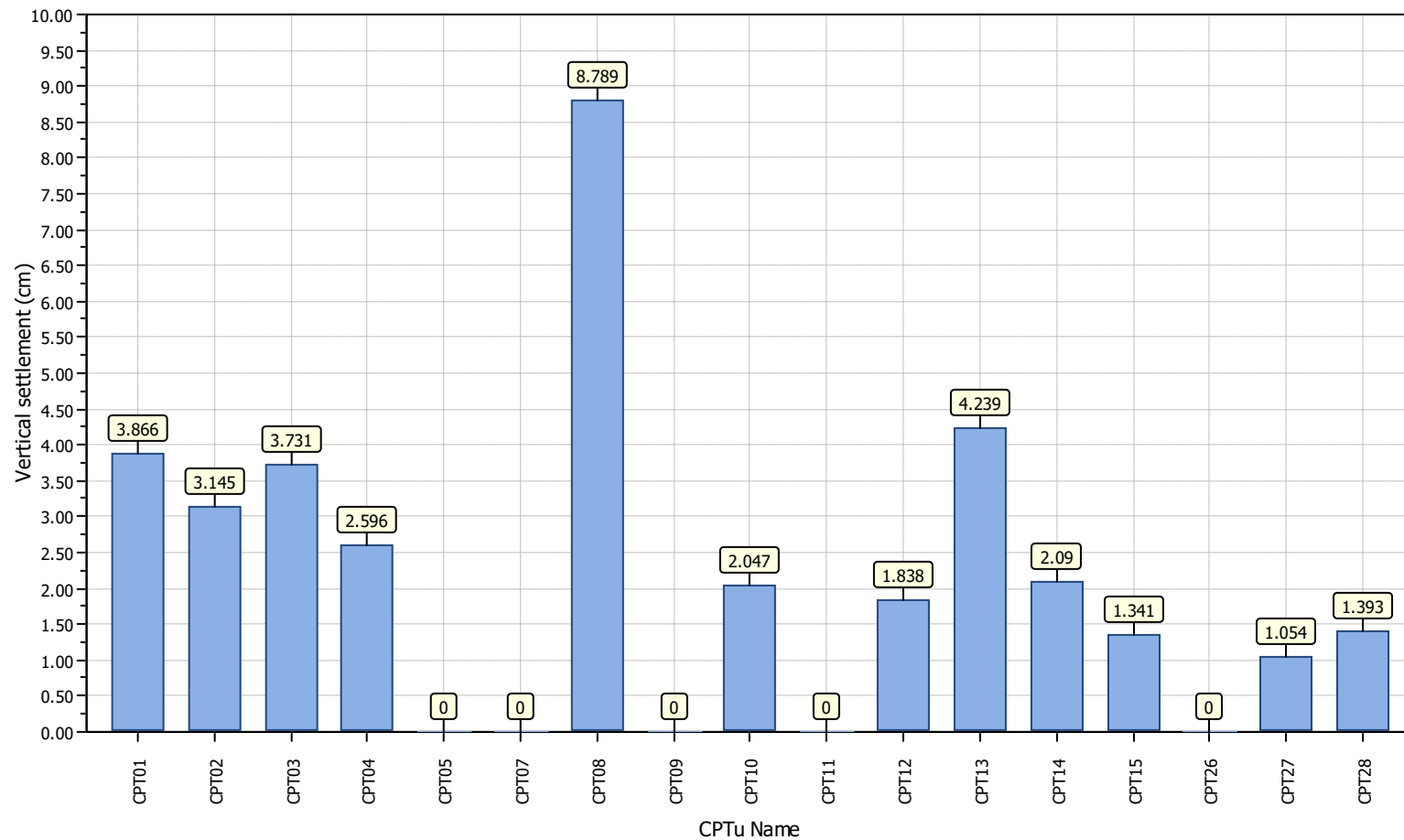
Overall vertical settlements report



Project title : HAM2022-00065 - T4 Structure Plan - Te Awamutu

Location : 552 Puniu Road, Te Awamutu

Overall vertical settlements report

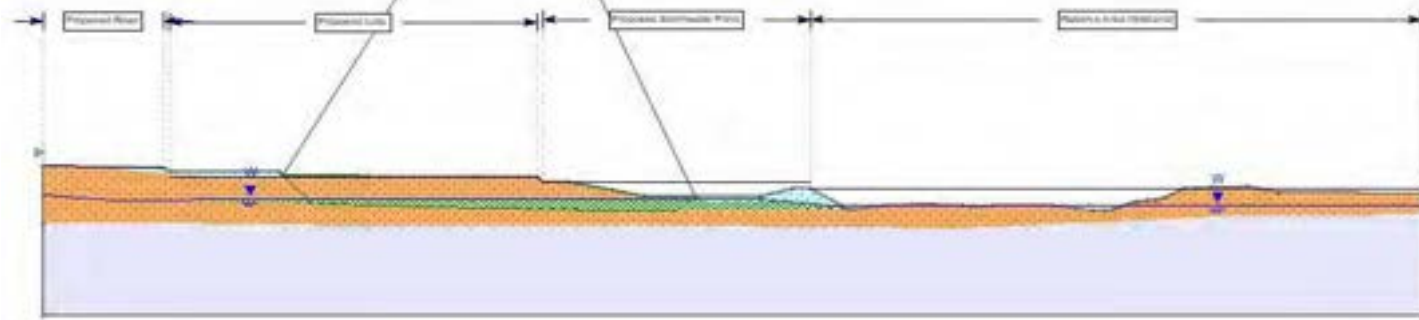


APPENDIX E: SLOPE STABILITY ASSESSMENT



0.25

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)		17	Mohr-Coulomb	1	38				None	0
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP) - Undrained		16	Undrained	90		Constant			None	0
VST TO H CLAY (ENGINEERED FILL) - Undrained		18	Undrained	140		Constant			None	0
SILTY SAND/SANDY SILT (Liq.)		16	Vertical Stress Ratio				0.09	5	None	0
SILTY SAND/SANDY SILT		16	Mohr-Coulomb	2	32				None	0

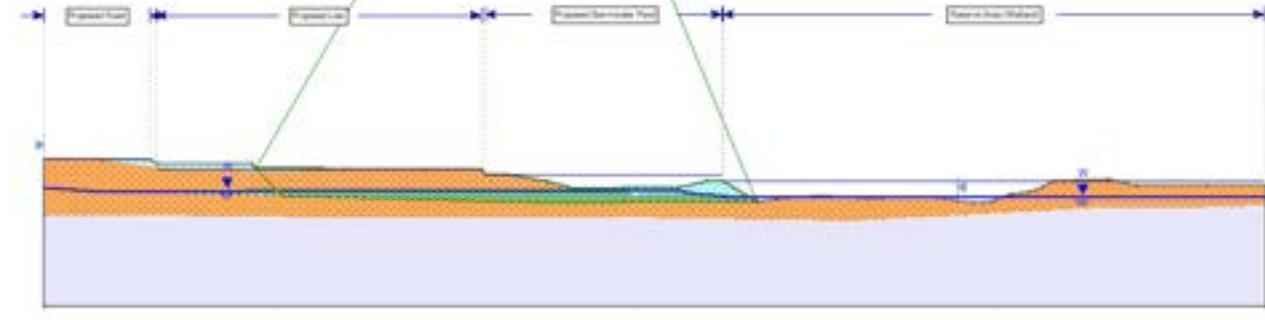


Proposed Profile - ULS Seismic Event



0.25

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)		17	Mohr-Coulomb	1	38				None	0
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP) - Undrained		16	Undrained	90		Constant			None	0
VST TO H CLAY (ENGINEERED FILL) - Undrained		18	Undrained	140		Constant			None	0
SILTY SAND/SANDY SILT (Liq.)		16	Vertical Stress Ratio				0.09	5	None	0
SILTY SAND/SANDY SILT		16	Mohr-Coulomb	2	32				None	0

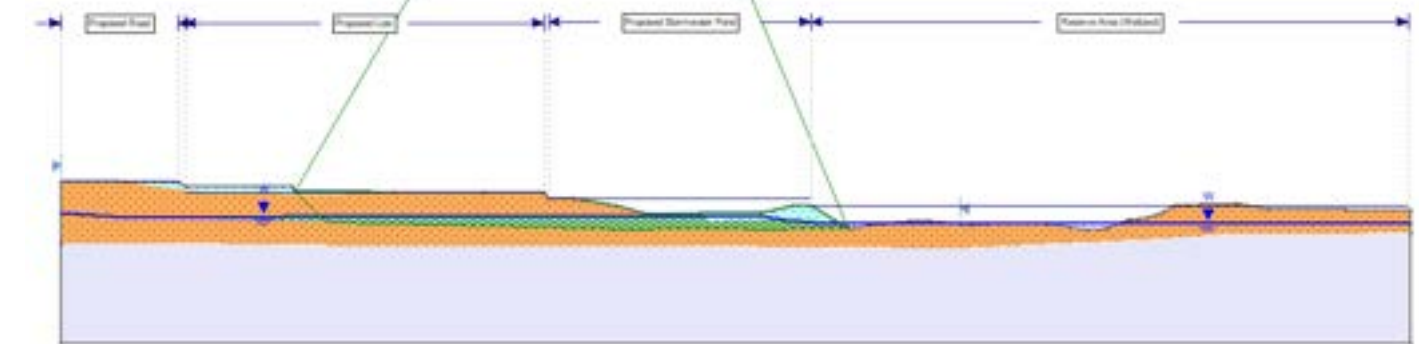


Proposed Profile - ULS Seismic Event Reduced Slope Limits



0.24

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)		17	Mohr-Coulomb	1	38				None	0
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP) - Undrained		16	Undrained	90		Constant			None	0
VST TO H CLAY (ENGINEERED FILL) - Undrained		18	Undrained	140		Constant			None	0
SILTY SAND/SANDY SILT (Liq.)		16	Vertical Stress Ratio				0.09	5	None	0
SILTY SAND/SANDY SILT		16	Mohr-Coulomb	2	32				None	0



Proposed Profile - Yeild Seismic Event

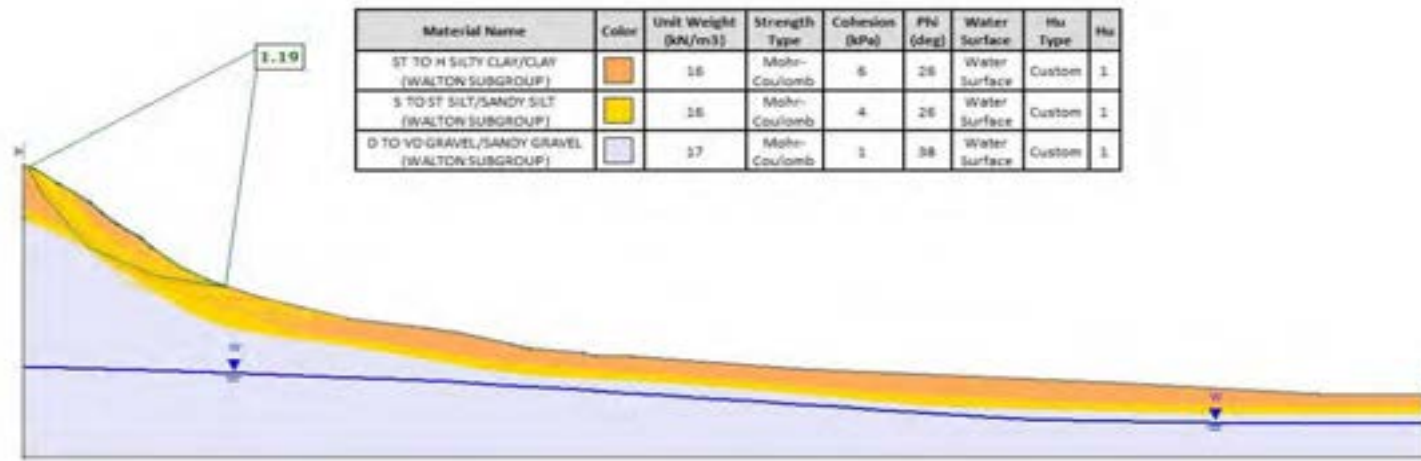
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP)		16	Mohr-Coulomb	6	26	None			0.2
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)		17	Mohr-Coulomb	1	38	Water Surface	Custom	1	
VST TO H CLAY (ENGINEERED FILL)		18	Mohr-Coulomb	5	30	None			0.1
SILTY SAND/SANDY SILT		16	Mohr-Coulomb	2	32	Water Surface	Custom	1	

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)		17	Mohr-Coulomb	1	38				None	0
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP) - Undrained		16	Undrained	90		Constant			None	0
VST TO H CLAY (ENGINEERED FILL) - Undrained		18	Undrained	140		Constant			None	0
SILTY SAND/SANDY SILT (Liq.)		16	Vertical Stress Ratio				0.09	5	None	0
SILTY SAND/SANDY SILT		16	Mohr-Coulomb	2	32				None	0

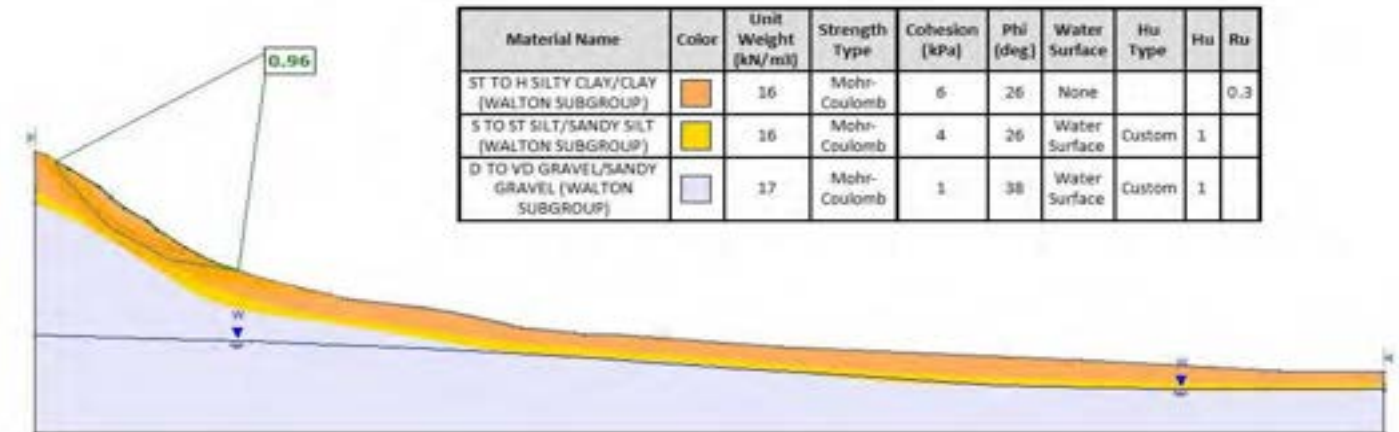
Parameters



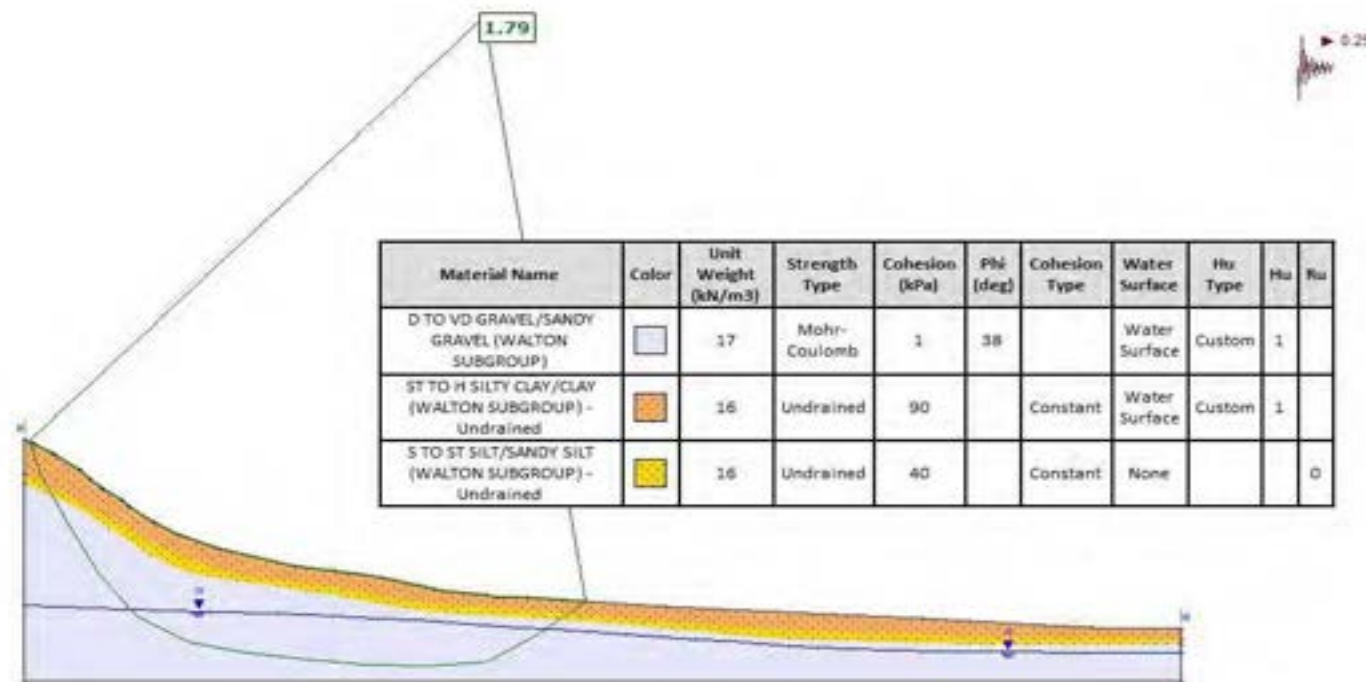
Project	T4 Structure Plan	Analysis	Cuckoo	Project No.	HAM2022-0065
Title	Section A - Proposed	Date	26/06/2023	Drawing	STAB 02



Existing Profile - Normal Groundwater Conditions



Existing Profile - Worst Credible Groundwater Conditions



Existing Profile - Seismic Event

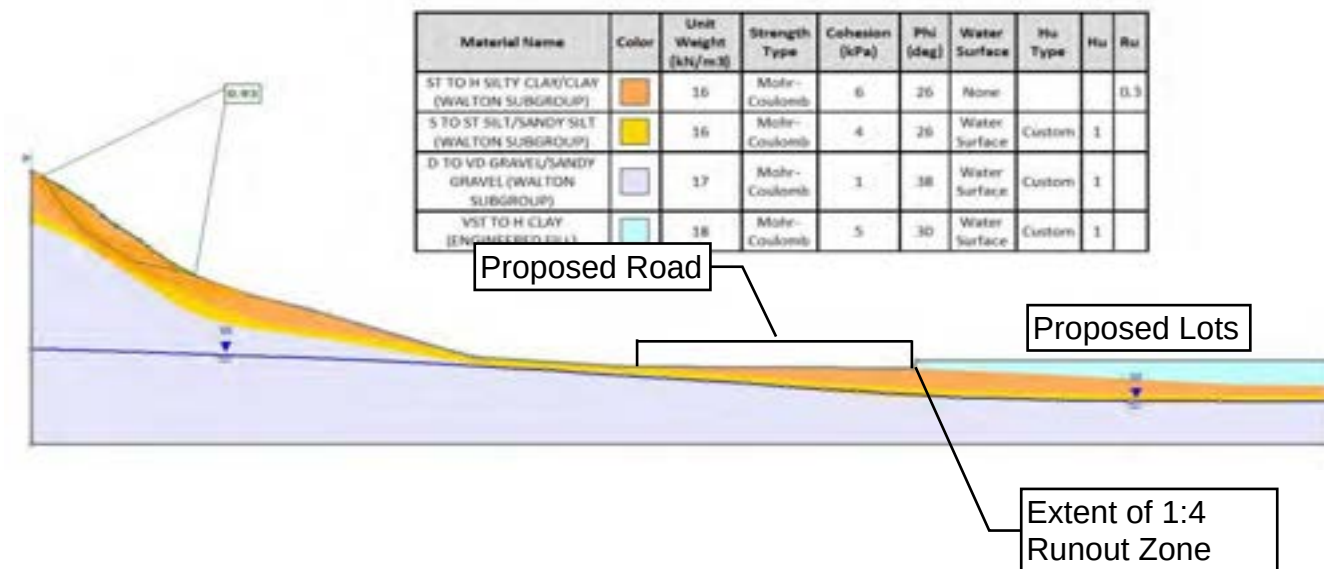
Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP)	Orange	16	Mohr-Coulomb	6	26	Water Surface	Custom	1
S TO ST SILT/SANDY SILT (WALTON SUBGROUP)	Yellow	16	Mohr-Coulomb	4	26	Water Surface	Custom	1
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)	Light Blue	17	Mohr-Coulomb	1	38	Water Surface	Custom	1

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)	Light Blue	17	Mohr-Coulomb	1	38		Water Surface	Custom	1
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP) - Undrained	Orange	16	Undrained	90		Constant	Water Surface	Custom	1
S TO ST SILT/SANDY SILT (WALTON SUBGROUP) - Undrained	Yellow	16	Undrained	40		Constant	Water Surface	Custom	1
VST TO H CLAY (ENGINEERED FILL) - Undrained	Light Green	18	Undrained	140		Constant	Water Surface	Custom	1

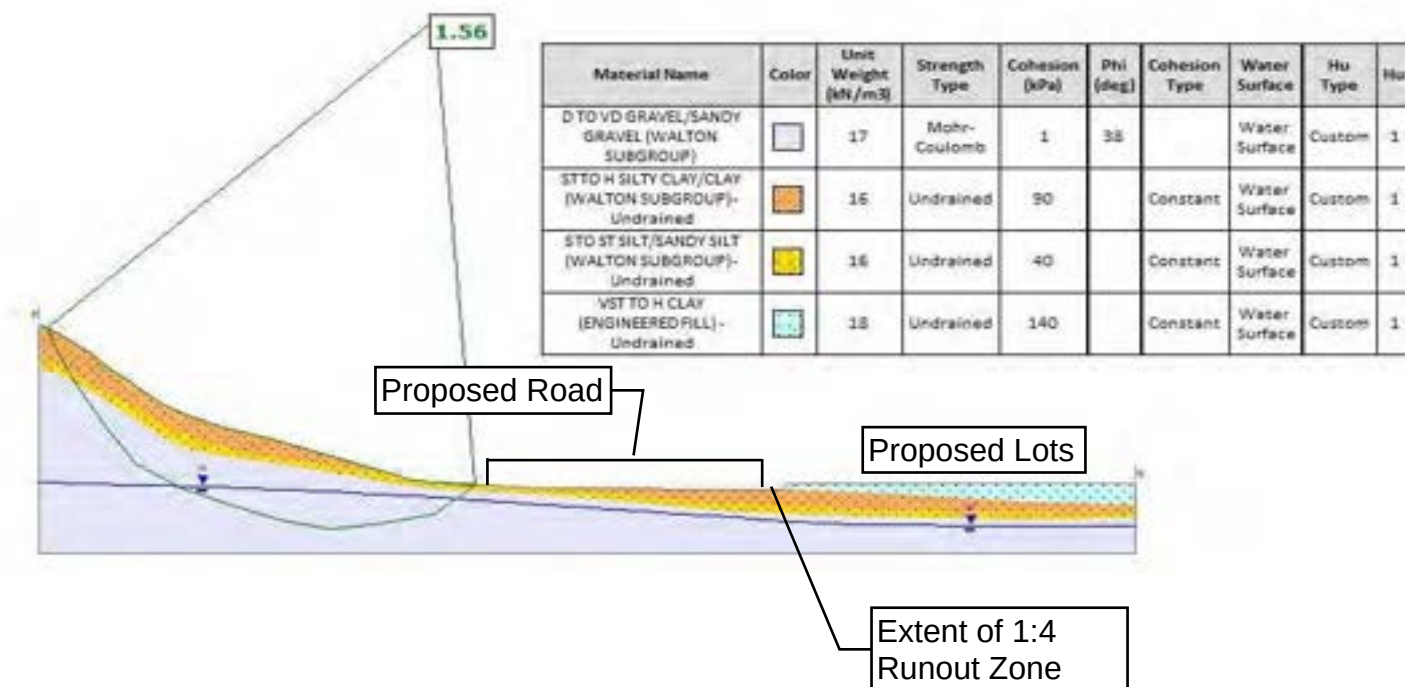
Parameters



Proposed Profile - Normal Groundwater Conditions



Proposed Profile - Worst Credible Groundwater Conditions



Proposed Profile - Seismic Event

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP)	Orange	16	Mohr-Coulomb	6	26	Water Surface	Custom	1
S TO ST SILT/SANDY SILT (WALTON SUBGROUP)	Yellow	16	Mohr-Coulomb	4	26	Water Surface	Custom	1
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)	Light Blue	17	Mohr-Coulomb	1	38	Water Surface	Custom	1

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu
D TO VD GRAVEL/SANDY GRAVEL (WALTON SUBGROUP)	Light Blue	17	Mohr-Coulomb	1	38		Water Surface	Custom	1
ST TO H SILTY CLAY/CLAY (WALTON SUBGROUP)-Undrained	Orange	16	Undrained	90		Constant	Water Surface	Custom	1
S TO ST SILT/SANDY SILT (WALTON SUBGROUP)-Undrained	Yellow	16	Undrained	40		Constant	Water Surface	Custom	1
VST TO H CLAY (ENGINEERED FILL)-Undrained	Light Green	18	Undrained	140		Constant	Water Surface	Custom	1

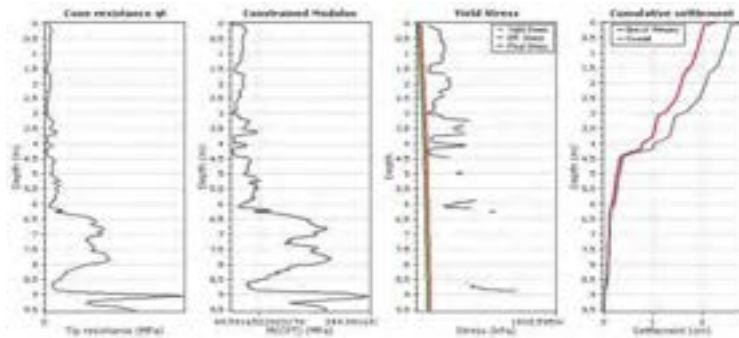
Parameters



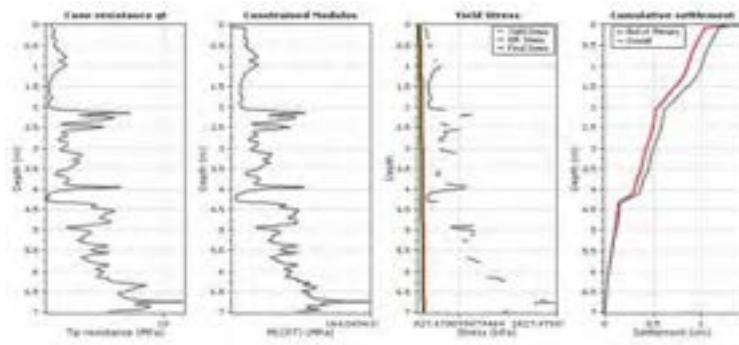
Project	T4 Structure Plan	Analysis	Cuckoo	Project No.	HAM2022-0065
Title	Section F - Proposed	Date	18/05/2023	Drawing	STAB 02

APPENDIX F: SETTLEMENT ASSESSMENT

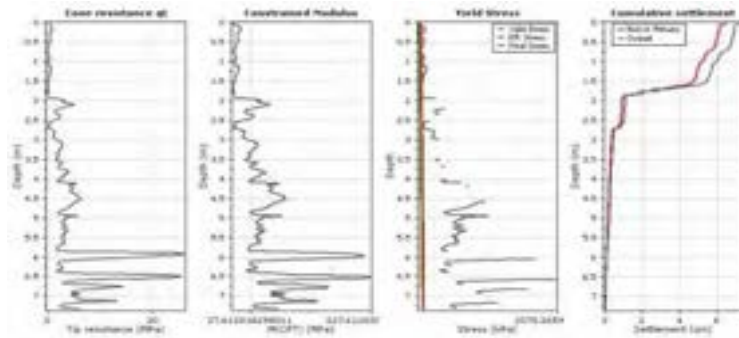
CPT01 - 2.0m Fill



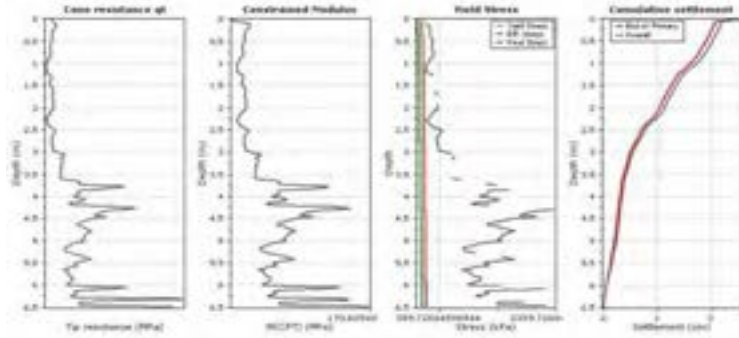
CPT02 - 2.0m Fill



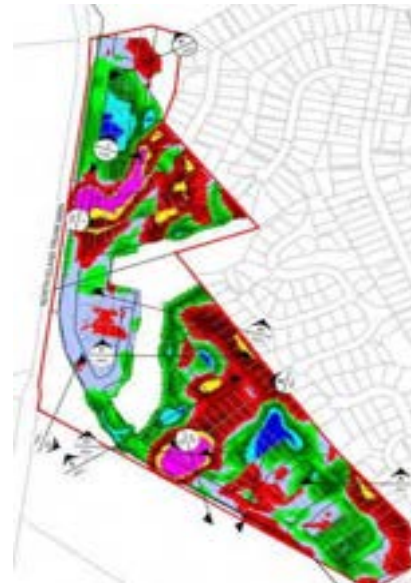
CPT03 - 2.0m Fill



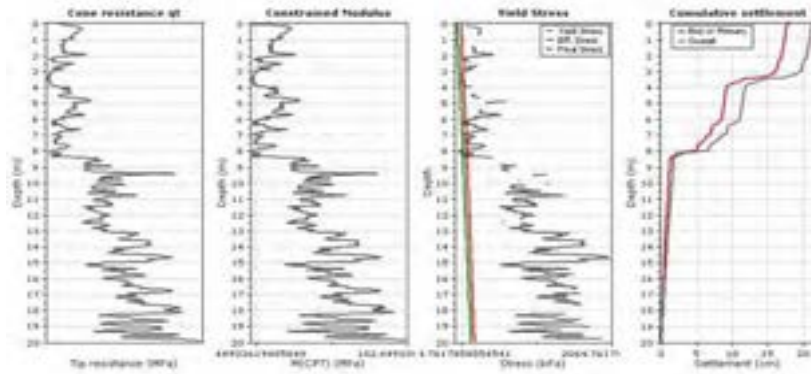
CPT04 - 4.0m Fill



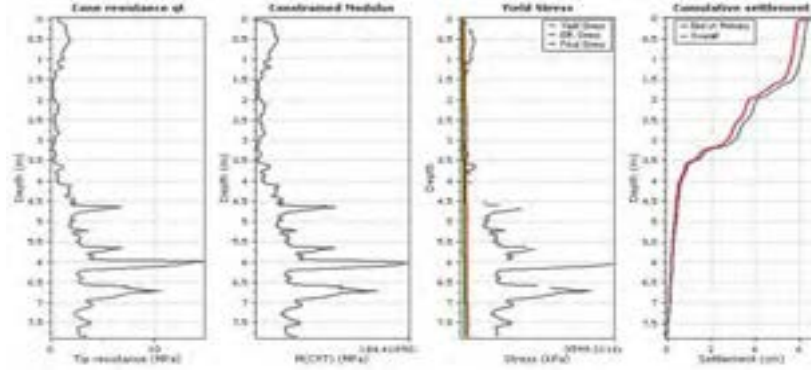
Location	Proposed Fill	Predicted Settlement
CPT01	2m	25mm
CPT02	2m	15mm
CPT03	2m	60mm
CPT04	4m	20mm
CPT08	3m	200mm
CPT10	3m	60mm
CPT27	3m	40mm
CPT28	2m	15mm



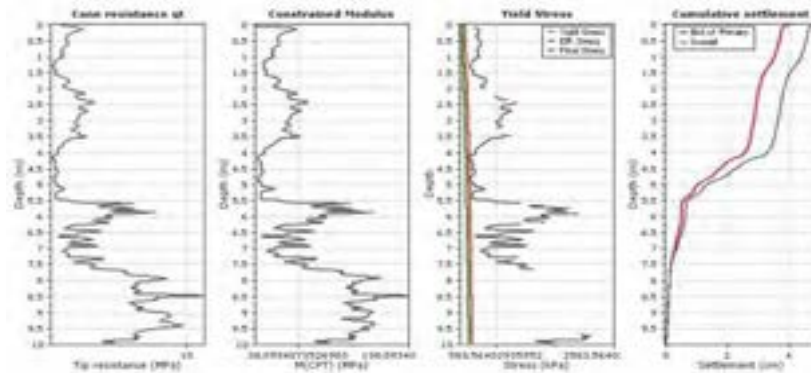
CPT08 - 3.0m Fill



CPT10 - 3.0m Fill



CPT27 - 3.0m Fill



CPT28 - 2.0m Fill

