Appendix 14: Geotechnical Assessment

Document Set ID: 11598824
Version: 1, Version Date: 17/12/2025

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24 October 2025

Proposed Residential Subdivision

Cambridge

WORDSWORTH STREET DEVELOPMENT

Paul Roycroft

Job No. HAM2021-0032AI | Version 2

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

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Version Control

Document version information	
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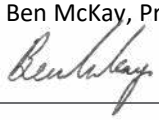
Prepared by	Ben McKay, Project Geotechnical Engineer 
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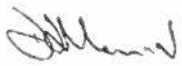
Authorised by	Dave Morton, Principal Geotechnical Engineer CMEngNZ, CPEng 

Review and Update History

Revision	Date	Comments
A	23 August 2021	Initial draft for internal review
0	01 September 2021	Issued to support plan change application
1	13 September 2021	Drawing reference updated
2	24 October 2025	Update to include adjacent block of land and RFI comments

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Version: 1, Version Date: 17/12/2025

EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation and geohazards assessment prepared to support a plan change for a proposed residential subdivision development located off the end of Wordsworth Street in the suburb of Leamington, Cambridge.

The 98.6-hectare site extends some 2km in length from the Waikato River on its northern boundary to Maungatautari Road on its southern boundary. The landform comprises a natural Hinuera Formation terrace at around RL75m, which is intersected by a 20m deep gully with associated steep gully escarpments occupying approximately 9ha of the site. At the northern end, the site steps down towards the Waikato River trench presenting two lower terrace levels at RL50m and RL39m respectively, each separated by steep terrace escarpments.

The landform is considered geotechnically suitable for the proposed development subject to the following specific recommendations:

- The liquefaction risk across the site is considered minor, with Ultimate Limit State (ULS) based vertical settlements of less than 20mm in the upper 10.0m of the ground profile resulting in TC1 type foundation systems being appropriate, with respect to MBIE classification.
- The steep natural river, gully and terrace escarpments do not provide adequate slope stability factors of safety with respect to residential building construction. A preliminary Building Restriction Line (BRL) is recommended to ensure that adequate setback distances are provided from steep slopes.
- Localised areas of uncontrolled fill were observed at isolated locations across the site. Those materials are not suitable to support buildings or future roads and will need to be reworked or removed as part of any future earthworks programs subject to geotechnical engineer observation. Other non-detected existing fill areas may also be present and will need to be treated in a similar manner.
- The north-east corner of the site has been subject to landscaping earthworks where further remedial earthworks, including reworking of existing fill and installation of subsoil drains to capture and divert perched groundwater flows, will be required.
- Elsewhere, the natural soils comprise predominantly sands and gravelly sands with interbedded silt lenses. Those soils are suitable for re-use as engineer certified fill although the silts can be sensitive to disturbance and difficult to earthwork when wet.
- Across the upper terrace, the near-surface silt layers are likely to provide low subgrade CBR values of around 3%. It will be more beneficial to undercut these materials to expose the underlying sand subgrade, which when subjected to moisture conditioning and proof rolling, should provide a subgrade CBR of nominally 8% to 10%.
- Perched groundwater tables were detected at depths of 3m to 7m beneath the upper terrace surface, which will create collapse issues to any deep excavation or trenching works, such as deep sewer lines, manholes or pump stations. Temporary dewatering will be required in those situations.
- The permeable sandy soils beneath the site are suitable for the construction of stormwater soakholes and soakage trenches to discharge concentrated stormwater flows from the development subject to consideration of design soakage rates, perched groundwater limitations and separation distances from steep slopes provided in this report.
- Subject to undercutting and replacing any weak surface silt layers or in-situ compaction of any loose sands, a preliminary geotechnical ultimate bearing pressure of 300kPa should be available for strip and pad foundations designed in accordance with NZS3604. Proprietary raft foundations are also considered appropriate for the ground conditions at this site.
- Final development layouts and designs, together with all future earthworks, should be overseen and certified by a Geotechnical Engineer.

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1.0 INTRODUCTION

CMW Geosciences (CMW) was engaged by Paul Roycroft to carry out a geotechnical investigation and prepare a report to support a plan change application to Waipa District Council for an approximately 98.6-hectare (ha) subdivision located at the end of Wordsworth Street, Cambridge.

As outlined in the Concept Masterplan (***Appendix B***), the proposed development will comprise a medium density residential subdivision, with 3 associated neighbourhood centres/reserve areas over the development area.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced HAM2021-0032AA Rev 1 dated 19 May 2021.

1.1 Scope of Work

As detailed in our proposal, the scope of work to be conducted by CMW was defined as follows:

- Desk top study of available information relevant to the proposed development.
- Arrange and execute a geotechnical site investigation (SI).
- Evaluate and develop an appropriate monitoring programme to confirm seasonal groundwater level fluctuations.
- Prepare and present a geotechnical site investigation plan, a representative geotechnical cross section through the site and site investigation records.
- Undertake geotechnical analyses and prepare a geotechnical investigation report to support a plan change application including liquefaction potential and settlement, slope stability, preliminary building restriction lines, foundation construction and feasibility of stormwater soakage to ground.

1.2 Supplied Reports

We have been supplied with the following reports:

- BCD Geotechnical Investigation Report Foundation, Stormwater and Wastewater Assessment Report, 37 Maungatautari Road, Cambridge, ref. 15-671, dated 6th November 2015.

2.0 SITE DESCRIPTION

2.1 Site Location

The site is located off the end of Wordsworth Street in the suburb of Leamington, Cambridge and has an area of approximately 98.6ha spanning from Maungatautari Road on its southern boundary to the Waikato River along its northern boundary, as shown on ***Figure 1*** below.

2.2 Description

The site spans three addresses along Maungatautari Road and is currently an operating horse stud. Most of site comprises grass covered paddocks.

At 37 Maungatautari Road there is a house, landscaped grounds, and stables; at 85 Maungatautari Road a house, farm buildings and a disused milking shed; and at 97 Maungatautari a house and landscaped grounds. The buildings and structures are generally located close to Maungatautari Road along the southern end of the site with farm buildings and former milking shed along in the southeastern margin.

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Figure 1: Site Location. Source: OpenStreetMap

2.3 Landform

The current general landform, together with associated features located within the site is on the attached Geological Site Plan (***Drawing 02***, ***Appendix A***).

- The site is bound to the north by the Waikato River, to the south by Maungatautari Road, and to the east and west by farmland. Approximately 200m beyond the farmland to the west is the town of Leamington.
- Along the northern boundary the Waikato River has eroded and cutdown the land creating steep riverside escarpments approximately 20m in height with slopes typically at 55°. These are covered with mature vegetation. There is evidence of historic slips in the form of semi-circular crestlines along the riverbank. The scarp is fully vegetated indicating the riverbank has been stable for a period of time.
- The site comprises three terraces, we have termed the lower, middle and upper terraces;
- The lower terrace runs along the northern boundary of site, parallel and adjacent to the river, at around RL39m (Moturiki datum);
- The middle terrace at RL50m is also located along the northern end of site running parallel to the river;
- The upper terrace at RL75m occupies most of the remaining site area to the southern boundary.
- There is evidence of soil creep in the form of stepped “terracettes” on the surface of the slope that separates the lower and mid terrace. This slope gradient ranges between 40° and 55°.
- Groundwater seepages were noted at four locations along that slope that separates the lower and middle terrace at approximately RL54m.
- An incised gully intercepts the site from the west between the middle and upper terrace with the base of the gully at approximately RL50m. The gully covers approximately 9ha of the site and has steeply eroded escarpments on all sides approximately 20m high with slope gradients ranging between 40° and 55°. There is a stream in the base of the gully that flows south to north, discharging into the Waikato River to the northwest corner of the site.

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- There is evidence of slumping on the northern gully slopes. Historic aerial photographs show earthworks were used to flatten and stabilise this section of the slope. This section is now vegetated.
- Three areas of fill have been identified at the site:
  - One is located above the middle terrace in the north-eastern corner of the site where the former steep slope has been regraded to approximately 1V:4H;
  - One is located above the gully in the central area adjacent to a former silage bunker; and
  - One in the southeast of site at the location of a disused milking facility.

3.0 PROPOSED DEVELOPMENT

The current development proposal, as shown on the draft C5 Residential Growth Cell (dated Sept 2025) provided by Cogswell Surveys (see copy in ***Appendix B***), is to create medium density residential blocks, with 3 commercial/reserve areas throughout the development area, as well as associated roads and infrastructure.

With the exception of the previously landscaped terrace slope in the northeastern corner of the site, the remaining terrace slopes and central gully will be left as undeveloped reserves, together with gully restoration planting.

We understand that the development will be serviced by reticulated wastewater discharging to the Council system and that stormwater is to be managed on-site with possible on-site soakage to ground.

Access to the development will be via Wordsworth Street to the west and Maungatautari Road to the south.

4.0 INVESTIGATION SCOPE

4.1 Desktop Study

Prior to the site investigation a review of publicly available data was carried out, this included a review of geological maps, borehole and site investigation data, and historic aerial photographs. Additional desktop study review was undertaken for the lot at 37 Maungatautari Road, Cambridge. The supplied hand auger logs (included in ***Appendix D***) were incorporated into our assessment, along with an expanded review of the publicly available geotechnical information from NZGD, GNS Maps and Retrolens.

The findings and observations made were incorporated in scoping and reporting on the following work.

4.2 Field Investigation

Following a dial before you dig search and onsite service location, the field investigation was carried out between 14 June and 25 June 2021.

- All fieldwork was carried out under the direction of CMW Geosciences in general accordance with the NZGS specification[1] and logged in general accordance with NZGS guidance[2]. The scope of fieldwork completed was as follows:
- A walkover survey of the site to assess the general landform, site conditions, and adjacent structures and infrastructure.

[1] NZ Geotechnical Society (2017) NZ Ground Investigation Specification, Volume 1 – Master Specification
[2] NZ Geotechnical Society (2005), Field Description of Soil and Rock, Guideline for the field classification and description of soil and rock for engineering purposes.

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- Four machine boreholes, denoted MH01 to MH04, were drilled using sonic PQ (85mm) tungsten coring drilling techniques to depths of up to 40m to help us determine the ground conditions. Engineering logs of the boreholes are provided in Appendix C**.**
- 14 hand auger boreholes, denoted HA01 to HA14, were drilled using a 50mm diameter auger to target depths of up to 4.0m below existing ground levels or refusal to visually observe the near surface soil profile and to facilitate in-situ permeability and vane shear strength testing. Engineering logs of the hand auger boreholes, together with peak and remoulded vane shear strengths are presented in ***Appendix D***;
- In-situ falling head permeability tests were carried out in open standpipe piezometers established in HAS01 to HAS12 at depths ranging 0.6m to 2.5mBGL. Results of the permeability tests are presented in ***Appendix E***;
- 13 Cone Penetrometer Tests (CPT) and five seismic CPT's, denoted CPT01 to CPT13 and sCPT01 to sCPT05 respectively were pushed to depths of up to 30.0m to help us define the ground model and to provide parameters for design. Results of the CPT's, presented as traces of tip resistance (qc), friction resistance (fs) and friction ratio are presented in ***Appendix F;***
- Groundwater monitoring was undertaken during a further visit to the site on 21 July 2021, a month following the initial fieldwork. The results of this monitoring is presented on the logs in ***Appendix C***;
- Nine trial pits were planned to assess the extent and quality of previous landscaping earthworks at the northern end of the site. However following receipt of an Archaeology report[3] where the presence of archaeological features including Maori borrow pits were identified, it was agreed with Clough and Cogswell Surveys not to proceed with the trial pits. Additional hand augers were substituted for these test pits as they would not damage the archaeological features.

The locations of the respective boreholes, CPTs and augers referred to above are shown on the Site Investigation Plan (***Drawing 01***, ***Appendix A***). Locations were recorded by topographic survey by Cogswell Surveyors.

5.0 GROUND MODEL

5.1 Published Geology

The published geological maps[4, 5,] for the area depict the regional geology as comprising Holocene aged fluvially reworked pumice of the Taupo Pumice Alluvium, and interbedded silts and sands of the late Pleistocene aged Hinuera Formation as illustrated in ***Figure 2***.

A small outcrop of alluvial soils of the early to mid-Pleistocene aged Walton Sub-group is shown west of the site.

Based on the known history of the site some superficial depths of fill are anticipated along the slope at the northern end of site, along the crest of the gully and to the southeast of the site at the location of the former milking facility.

[3] Clough & Associates Ltd "Cambridge Growth Cell C5, Leamington, Proposed Future Residential Development: Preliminary Archaeological Assessment"
[4] Edbrooke, S.W. (compiler) 2005. Geology of the Waikato Area. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 3. 74 p.

[5] GNS QMap sourced http://data.gns.cri.nz/geology/

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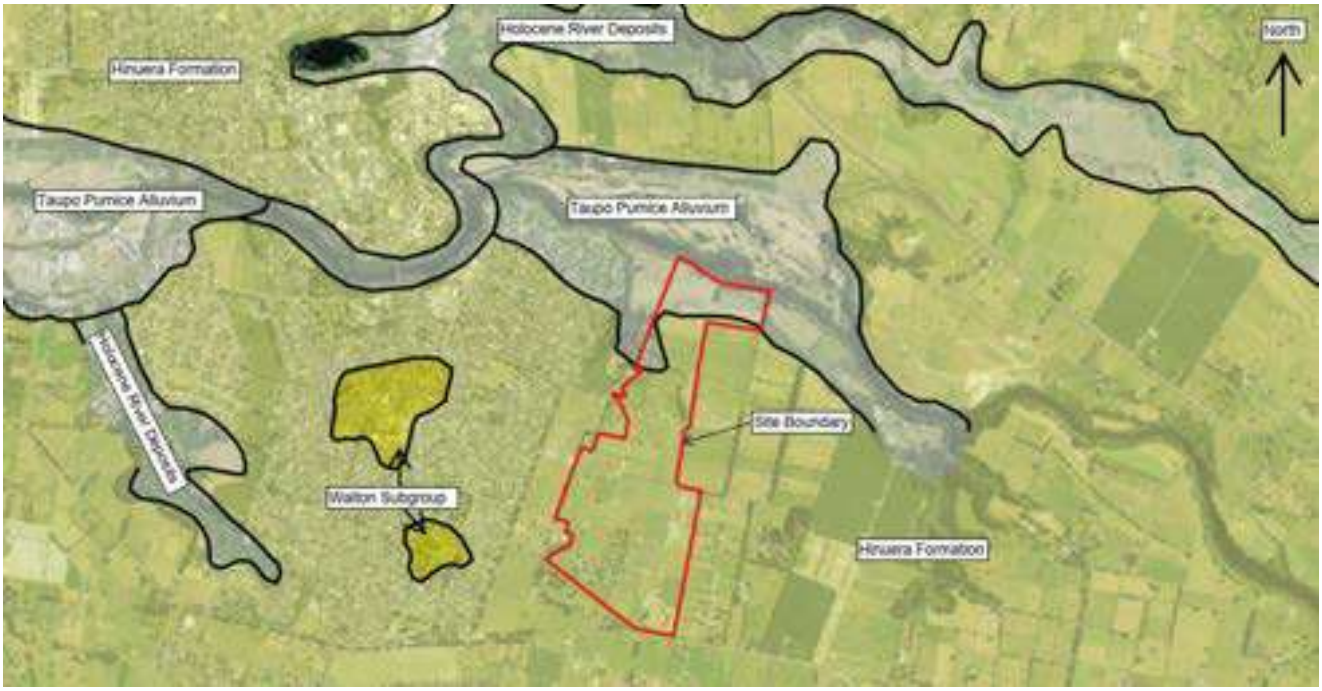
Figure 2: Regional Geology (GNS QMAP)



5.2 Stratigraphic Units

The ground conditions encountered and inferred from the investigation are considered to be generally consistent with the published geology for the area.

A surface geology plan based on the findings of the investigation is presented on our Geological Site Plan, ***Drawing 02, Appendix A.***

The natural strata beneath the site are a sequence of interbedded silts and sands of variable thickness, density and strength. This reflects the alluvial origin of the strata.

In general terms the sand increases in strength and density with depth from loose to very dense.

Gravelly sands were typically encountered within the upper 20.0m is fine to coarse, subangular to subrounded. These soils are typically overlain by 0.6 – 1.2m stiff to very stiff Silt/ Sandy Silt.

The loose sand which makes up the mid terrace is typical of Taupo Pumice Alluvium (TPA) which is thought to be a stranded terrace, a portion of which has been eroded during the cutting down of the Waikato River. The medium dense to very dense (MD-D) sand is typical of the Hinuera formation and seen on the lower and upper terrace.

Firm to very stiff (F VSt) silt/ clayey silt layers are interbedded throughout the sands, with thicknesses ranging 0.5m to 13.0m.

5.2.1 Summary

The distribution of these units is illustrated on the appended Geological Section A-A' (***Drawings 03, 04 and 05***, in ***Appendix A***) and presented in Table 1.

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Table 1: Summary of Strata Encountered

Stratum	Top of Strata (mBGL)		Thickness (m)**	
	Min	Max	Min	Max
Organic SILT (Topsoil)	Ground level (GL) where present		0.1	0.3
Very stiff to hard sandy SILT/ very loose to medium dense silty SAND (Uncontrolled Fill)	GL	0.5	0.85	4.5
Very loose to loose SAND (Taupo Pumice Formation)	0.3	0.6	3.4	11.5*
Medium dense to very dense SAND (Hinuera Formation)	0.2	27.0*	0.3	-
Loose to medium dense Sand (Hinuera Formation)	0.2	9.6*	1.3	3.6*
Firm to stiff clayey SILT (Hinuera Formation)	0.2	6.1*	0.3	2.4*
Firm to stiff SILT/ sandy SILT (Hinuera Formation)	4.5	6.45	0.9	2.3
Notes: * Measurement based on CPT interpretation **Thickness only recorded were base of strata has been confirmed.				

5.3 Groundwater

During the investigation, which was carried out in winter (June 2021), groundwater was encountered within the boreholes at the depths provided in **Error! Reference source not found.**.

Table 2: Groundwater Data

Standpipe	Ground RL (m)	Screen Depth mBGL (RL m)	5 July 2021		27 July 2021		21 November 2023	
			Depth (mBGL)	Elevation (m RL)	Depth (mBGL)	Elevation (m RL)	Depth (mBGL)	Elevation (m RL)
MH01 (shallow)	71.6	1.6 – 7.6 (70.0 – 64.0)	5.6	66.0	6.7	64.9	4.6	67.0
MH01 (deep)*		11.2 – 14.1 (60.4 – 57.5)	n/a	n/a	n/a	n/a	8.4	63.2
MH02 (shallow)	71.3	1.0 – 6.0 (70.3 – 65.3)	Dry	-	Dry	-	5.8	65.5
MH02 (mid)		6.5 – 11.5 (64.8 – 59.8)	10.2	61.1	10.2	61.1	9.0	62.3
MH02 (deep)		18.0 – 24.0 (53.3 – 47.3)	17.6	53.7	17.2	54.1	15.1	56.2
MH03 (shallow)	69.1	4.5 – 8.0 (64.6 – 61.1)	7.7	61.4	7.7	61.4	n/a**	n/a**

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Standpipe	Ground RL (m)	Screen Depth mBGL (RL m)	5 July 2021		27 July 2021		21 November 2023	
			Depth (mBGL)	Elevation (m RL)	Depth (mBGL)	Elevation (m RL)	Depth (mBGL)	Elevation (m RL)
MH03 (deep)		19.4 – 31.4 (49.7 – 37.7)	20.8	48.3	21.0	48.1	n/a**	n/a**
MH04 (shallow)	39.1	14.0 – 16.0 (25.1 – 23.1)	Dry	-	16.3	22.8	16.0	23.1
MH04 (deep)		17.5 – 23.5 (21.6 – 15.6)	18.3	20.8	18.2	20.9	17.4	21.7

Note: mbgl = metres below ground level Datum: Moturiki

* Piezometer installation compromised, therefore GWL unreliable.

**Piezometer could not be located at time of reading.

Further groundwater monitoring was completed using level loggers within MH01, MH02, and MH04 between Mach 2024 and January 2025 to assess seasonal variability across the site. The results of the groundwater monitoring are presented in ***Appendix G***.

Perched groundwater was observed at numerous borehole locations across site and is confirmed by the groundwater readings within the shallower piezometers. The perched groundwater sits within the sands above a semi-continuous silt layer.

The deepest ground water level was recorded in MH04 at the northern extent of site at a depth of RL 20.8m and has been inferred to fall towards the Waikato River where the silt layer is truncated.

6.0 GEOHAZARDS ASSESSMENT

6.1 Context

Section 106 of the Resource Management Act[6] (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).

6.2 Seismicity

Seismic loadings for geotechnical earthquake engineering assessment have been obtained from Module 1 of the MBIE/NZGS Geotechnical Earthquake Engineering Guidelines. The design peak ground acceleration (PGA) and magnitude (M) specified for the Serviceability Limit State (SLS) and the Ultimate Limit State (ULS) design cases are summarised in ***Table 3***.

Table 3: Seismic Design Loads

Limit State	AEP	PGA (g)	$Magnitude_{eff}$
SLS	1/25	0.06	5.9

[6] Resource Management Act (1991), as at 29 October 2019

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Limit State	AEP	PGA (g)	$Magnitude_{eff}$
ULS	1/500	0.25	5.9
Notes: SLS = Serviceability Limit State; ULS = Ultimate Limit State; AEP = Annual Exceedance Probability			

6.3 Fault Rupture

The nearest known active fault is Kerepehi Fault located approximately 30km to the east of site. Therefore, the site is considered 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 guidance[7] [8] the liquefaction susceptibility of the soils at this site was assessed with respect to geological age and compositional (soil fabric and density) criteria, based on the following assumptions:

- Only saturated soils below an assessed seasonal average groundwater level were modelled as being susceptible to liquefaction.
- In accordance with MBIE/NZGS guidance[7] a site-specific assessment was carried out using the seismic CPT's to account for soil microstructure in accordance with Robertson[9]. Results in ***Appendix H*** suggest that soil microstructure is present and justifies the use of an average strength gain factor (K_{DR}) of the following factors for each unit:

Table 4: K_{DR} Factors Adopted

Soil Unit	K_{DR}
Loose Sand (Taupo Pumice Alluvium)	1.0
Medium Dense Sand (Hinuera Formation)	1.25
Medium Dense to Dense Sand (Hinuera Formation)	1.5
Stiff to Very Stiff Silt (Hinuera Formation)	1.2
Firm Silt (Hinuera Formation)	1.3

- 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 (Ic) of 2.6 was used to distinguish between liquefiable (Ic<2.6) and non-liquefiable (Ic>2.6) soils.
- Specific liquefaction analyses were undertaken for an IL2 structure, using the software package CLiq using the Boulanger and Idriss (2014) method. The cyclic stress ratio (CSR), being a function of the earthquake magnitude for the design return period event, was compared to the cyclic resistance ratio (CRR), being a function of the CPT cone resistance (qc) and friction ratio (Fr).

[7] Earthquake Geotechnical Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards", (November 2021)
[8] Ministry of Business, Innovation and Employment (MBIE), & Earthquake Commission (EQC). (2017). *Planning and engineering guidance for potentially liquefaction-prone land: Resource Management Act and Building Act aspects* (Rev. 0.1). Wellington, New Zealand: Author. ISBN: 978-1-98-851770-4
[9] P.K. Robertson (2015). Comparing CPT and Vs Liquefaction Triggering Methods, Journal of Geotechnical and Geoenvironmental Engineering.

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- 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 MBIE[10] guidance (foundation technical categories). These were compared to liquefaction settlement estimates over the full depth range of the CPT's with a depth weighting factor (e_v) applied ranging from 1 at the ground surface to 0 at 20m depth.

6.4.2 Specific Analysis

The results of the liquefaction assessment are presented in ***Appendix I***, and summarised in Table 5. The analysis has been completed using no ageing factor, and with an ageing factor for comparison.

Table 5: Liquefaction Analyses Results

CPT No.	Analysed Saturated Zones (mBGL)	No Ageing Factor		With Ageing Factor		Depth to Liquefaction (mBGL)
		Total Vertical Settlement (mm)	Index Settlement (mm)	Total Vertical Settlement (mm)	Index Settlement (mm)	
CPT01	7.6 – 11.8 14.0 – 23.0	45	45	10	10	8.4
CPT02	4.5 – 7.0 11.2 – 15.0	40	15	25	<5	6.0
CPT03	5.5 –10.6 11.3 – 14.9	15	25	<5	<5	5.5
CPT04	5.9 – 8.3 12.0 – 14.9	25	20	10	5	6.7
CPT05	6.0 – 9.4 13.5 – 15.0	25	45	10	10	6.0
CPT06	1.6 – 3.7 12.0 – 14.9	25	15	20	<5	1.5
CPT07	13.9	<5	-	-	-	-
CPT08	6.8 – 12 14.0 – 14.9	20	25	10	<5	7.7
CPT09	15.1 – 23.5 29.7 – 29.9	<5	-	<5	-	15.2
CPT10	5.1 – 7.5 20.2 – 23.6	15	20	5	<5	5.2
CPT11	13.5 – 14.9	<5	-	-	-	-
CPT12	6.0 – 14.9	40	45	15	10	6.0
CPT13	17.3 - 24.0	-	-	-	-	-
sCPT01	5.5 – 7.5 11.0 – 28.0	35	20	20	10	6.8
sCPT02	19.0 – 30.0	-	-	-	-	-

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

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CPT No.	Analysed Saturated Zones (mBGL)	No Ageing Factor		With Ageing Factor		Depth to Liquefaction (mBGL)
		Total Vertical Settlement (mm)	Index Settlement (mm)	Total Vertical Settlement (mm)	Index Settlement (mm)	
sCPT03	6.7 – 9.8 20.8 – 26.13	35	60	20	15	6.7
sCPT04	16.2	-	-	-	-	-
sCPT05	1.5 – 3.1 12.3 – 13.0	10	10	<5	<5	1.5
Notes: "Aged" analyses included ageing factor between 1.0 and 1.5 for Hinuera Formation Soils based on MEVR analysis results (refer Item 65). Index settlement – that attributable to liquefaction with the upper 10m of soil Settlements and depths are based on the existing ground surface.						

The results show the following:

- No liquefaction is triggered in the SLS case.
- Liquefaction is triggered in the ULS case. With an ageing factor applied, settlement is estimated to be less than 15mm across the site.
- The CRR and Factor of Safety (FoS) Plots in the analyses results show that where liquefaction is triggered, it is in thin isolated layers.

6.5 Slope Stability

6.5.1 Design Criteria

The stability of the natural river and gully escarpment 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 performance standards outlined in ***Table 6*** are recommended for slope stability assessment:

Table 6: Minimum Slope Stability Factor of Safety Criteria

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

6.5.1.1 Effective Stress Parameters

Drained shear strength parameters for the various strata that form the existing natural slopes on the site were inferred from the results of the field investigation, back analyses of the existing slopes, and our experience with these soils.

Back analyses of the natural river and gully slopes were carried out at selected locations to help determine the effective stress shear strength parameters which controls the stability of these slopes. In the analyses,

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elevated porewater pressures were modelled using a porewater pressure ratio ru of 0.1 in the sand layers and 0.2 in the silt layers to simulate wetting fronts moving through the profile under intense rainfall events.

The back analysed drained shear strength parameters required to model a factor of safety of 1 for existing slope gradients with elevated pore water pressures are summarised in ***Table 7***.

Table 7: Summary of Effective Stress Shear Strength Parameters

Geological Unit	Unit Weight (kN/m^3)	c′ (kPa)	Ø′ (deg)
L-MD Sand (Taupo Pumice Alluvium)	16	4	30
MD-D Sand (Hinuera Formation)	16	1	38
MD Sand (Hinuera Formation)	16	10*	33
VSt Silt (Hinuera Formation)	16	8	28
Firm Silt (Hinuera Formation)	16	8	28
Note: c′ = effective cohesion, Ø′ = effective friction angle *to model apparent weak cementation that supports steep riverbank profile			

6.5.1.2 Total Stress Parameters

Cohesive silt layers with the Hinuera soils will behave in an undrained state during short term seismic loading. Undrained soil shear strengths (Su), used for assessing the stability of slopes during seismic loading, were inferred from the CPT data based on the following relationship:

$$Su = \frac{qc - \sigma}{Nk}$$

Where: qc = CPT cone resistance (kPa)

σ = total overburden pressure (kPa)

Nk = factor, typically between 10 and 20, 12 typically adopted for Hinuera Formation silty soils

Undrained shear strength correlations from the CPT data provide a range of values across the project.

Lower bound values used for preliminary seismic assessment, based on the CPT based correlation plots.

Table 8: Summary of Undrained Shear Strength Parameters

Geological Unit	CPT / sCPT	Su (kPa)
St Silt (Hinuera Formation)	sCPT04	100
VSt Silt (Hinuera Formation)	sCPT01, sCPT02, sCPT04, CPT09	120

6.5.2 Slope Stability Analyses

Slope stability analyses were undertaken using the Morgenstern-Price method of slices under both circular and translational failure mechanisms using the proprietary software SLIDE Version 6.

Seismic displacements were estimated based on a Newmark Sliding Block approach using 50th percentile correlations published in Ambraseys & Srbulov[11], Jibson[12] for liquefied soil conditions. For the ULS event, the

[11] Ambraseys, N. and Srbulov, M. (1995) Earthquake induced displacement of slopes, Journal of Soil Dynamics and Earthquake Engineering, Vol 14

[12] Jibson, R.W., (2007) Regression models for estimating coseismic landslide displacement, Journal of Engineering Geology, Vol 91

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earthquake Magnitude 5.9M correlation was adopted. A 30km fault source distance from the Kerepehi Fault was also adopted for the Ambraseys & Srbulov correlations.

6.5.3 Slope Stability Analyses Results

Selected slope stability analyses are presented in ***Appendix H*** and the results are presented below in ***Table 9***.

Table 9: Slope Stability Analyses Results

Condition	Required Minimum Factor of Safety	Factor of Safety Achieved	Setback from Crest to required FoS (m)	Critical Acceleration (Ac) (g)	ULS Displacement (mm)
River Section					
Static long term conditions	1.5	1.18	20.0	-	-
Transient short term conditions	1.2	0.98	12.0	-	-
Ultimate Limit State (ULS) seismic condition	1.0*	0.93	-	0.28	<10
Seismic Yield	1.0	1.0	-	0.22	-
Gully Section					
Static long term conditions	1.5	1.18	5.0	-	-
Transient short term conditions	1.2	1.02	5.0	-	-
Ultimate Limit State (ULS) seismic condition	1.0	0.85	-	0.28	<10
Seismic Yield	1.0	1.02		0.14	-
Middle Terrace Section					
Static long term conditions	1.5	1.5	-	-	-
Transient short term conditions	1.2	1.5	-	-	-
Ultimate Limit State (ULS) seismic condition	1.0*	0.85	-	0.28	<10
Seismic Yield	1.0	1.0	-	0.19	-

6.6 Pumice Soils

Pumice rich soils were encountered within the sands of Taupo Pumice Alluvium and Hinuera Formation.

These soils generally exhibit high permeabilities and could be susceptible to piping erosion and subsequent slope instability due to discharge of stormwater via ground soakage.

The risk of tomos developing in the Hinuera Formation is considered low, in the Taupo Pumice Alluvium it is higher. This will need to be considered as part of stormwater discharge design at detailed design stage.

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6.7 Expansive Soils

No specific laboratory testing has been carried out on the low plasticity silt soils encountered at foundation level during the investigation.

On the basis of the soil descriptions, our knowledge of the soils present and our local experienced the near surface silty soils are considered non-expansive.

6.8 Soil Permeability

The results of our hydraulic conductivity (k) calculations are presented below in ***Table 10*** and in ***Appendix E***.

The results range from approximately 1 x 10^{-4} m/sec to 8 x 10^{-6} m/sec which are considered typical of fine sand (10^{-4} m/sec) through to silts (10^{-6} m/sec).

Table 10: Soakage Test Results

Test Location	Bottom of hole (m)	Material	Hydraulic Conductivity (k)	
			CIRIA 113 (m/sec)	Hvorslev (m/sec)
HAS01	1.0	Sand	1.03 x 10^{-4}	1.54 x 10^{-5}
HAS02	1.0	Sand	6.25 x 10^{-5}	1.76 x 10^{-5}
HAS03	0.9	Sand	1.68 x 10^{-4}	5.20 x 10^{-5}
HAS04	1.7	Sand with gravel	5.64 x 10^{-5}	7.68 x 10^{-6}
HAS05	1.4	Sand with gravel	4.97 x 10^{-5}	7.98 x 10^{-6}
HAS06	0.9	Sand with gravel	9.02 x 10^{-5}	2.31 x 10^{-5}
HAS07	0.9	Sand with gravel	1.91 x 10^{-4}	7.64 x 10^{-5}
HAS08	1.8	Sand	2.06 x 10^{-4}	5.03 x 10^{-5}
HAS09	2.5	Sand	2.04 x 10^{-4}	3.46 x 10^{-5}
HAS10	2.5	Sand	2.39 x 10^{-4}	5.14 x 10^{-5}
HAS11	1.2	Sand	6.39 x 10^{-5}	1.09 x 10^{-5}
HAS12	0.6	Sand with gravel	1.25 x 10^{-4}	4.47 x 10^{-5}

7.0 GEOTECHNICAL RECOMMENDATIONS

7.1 Liquefaction / Lateral Spread Mitigation

With respect to MBIE Module 3 guidance, the liquefaction risk across the site is considered 'insignificant', with nominal settlements (<25mm) and associated low risk of lateral spread, therefore no specific mitigation measures are required. The resulting foundation design class is TC1 in accordance with MBIE guidance.

7.2 Slope Stability Management

Results of the slope stability analyses demonstrate that design landform gradients through the proposed development will not achieve the requisite slope stability factors of safety. Therefore, appropriate setbacks from the crests of those escarpments to any future building will be required.

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Slope stability analyses results show that the distance from the crest of the slope to where the requisite factors of safety are achieved is 20.0m from the river bank crest, and 5.0m at the gully, which equate to a projection line gradient of 1V:2.5H and 1V:1.8H respectively, from the toe of the steep escarpment section.

Building Restriction Lines (BRLs) have been designated on ***Drawing 01*** based on these projection lines.

All structures requiring building consent must be located entirely upslope of the BRL unless supported by further geotechnical investigation and/or assessment by a Chartered Professional Geotechnical Engineer. Alternatively, an in-ground or palisade retaining wall may be constructed to protect some of the landform beyond the BRL and increase the land area available for building construction.

Fill placement downslope of the BRL is not recommended on account of land stability considerations.

A setback from the crest of the slope for stormwater discharge of at least 40m is advised and to be confirmed during detailed design stage.

7.3 Earthworks

All earthwork activities must be carried out in general accordance with the requirements of NZS 4431[13] and the requirements of the Regional Infrastructure Technical Specification (RITS)[14].under the guidance of a Chartered Professional Geotechnical Engineer.

Known areas of uncontrolled fill have been denoted on ***Drawing 02*** and are not suitable to support buildings. These and any other areas of fill identified following topsoil stripping are to be fully undercut in the development area and subject to inspection by a Geotechnical Engineer prior to backfilling with compacted engineered earth fill.

We expect the Hinuera Formation soils likely to be encountered in areas of cut and service trenches to be suitable for reuse as engineering fill subject to the absence of organics, contaminants, and demolition debris.

The silt soils present are sensitive to moisture ingress and reworking. They are generally workable in summer months but may require some conditioning prior to placement. Care will be needed not to overwork the soils and lose shear strength in consequence.

In the northeast corner of site there is an area of fill up to 2.0m thick comprising medium dense to dense sand which overlies buried topsoil. At detailed design stage the choice can be made to found beneath the buried topsoil layer or strip and replace with engineering fill. The choice may be dependent on the final design ground level.

It is recommended that seepages on the terrace escarpment face be intersected before reaching the surface using subsoil drains to improve surface stability.

Perched water tables are present at depths of approximately 3m and 7m below ground level. No earthworks plans are available at present however cuts of these depths are considered unlikely. Should final earthworks excavations encounter perched groundwater subsoil drains may be required.

Further earthwork and drainage recommendations will be provided during detailed design and a full earthworks specification issued at the time of earthworks consent application.

[13] Standards New Zealand (1989) Code of practice for earth fill for residential development, incorporating Amendment No. 1, NZS 4431:1989, NZ Standard

[14] Waikato Local Authority Shared Services 'Regional Infrastructure Technical Specifications (RITS)' (May 2018)

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7.4 Civil Works

7.4.1 Subgrade CBR

Following stripping of topsoil, loose to medium sand or stiff to very stiff silt natural soils are expected to be at subgrade level.

The silt material in upper 0.5m is expected to have a low CBR value of 3%, it is recommended to undercut this material and construct roads over the gravelly sand. Once proof rolled the granular soil should achieve a CBR of 8% to 10% with conventional compaction equipment.

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

7.4.2 Service Trenches

All of natural soils anticipated 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 loose sandy soils.

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

7.4.3 Stormwater Soakage

Results of in-situ permeability tests are presented in ***Appendix E***.

Soakage systems are to be designed by others. Soakage designers should note the presence of a perched water table at between approximately 3m and 7m bgl beneath the upper terrace surface.

Where soakage is proposed near to the crest of the slope consideration must be given to the potential effects on slope stability, and consideration given to locating the soakage device a suitable distance from the slope. Elsewhere if necessary, ensuring that the discharge is below the toe level of the slope. A preliminary set back of 40m from the crest of the slope to mitigate the risk of generating seepage on the slope following a major storm event is recommended. This distance is to be confirmed by soakage designers at detailed design stage.

7.5 Foundations

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:

- At the middle terrace where the loose to medium dense Taupo Pumice Alluvium is likely to be present at finished ground levels the upper 2m should be undercut and replaced with engineered fill. Following which a geotechnical ultimate bearing pressure of 300 kPa should be available for shallow strip and pad foundations for dwellings designed in accordance with NZS3604. The in-situ material should be suitable for re-use as engineered fill, using conventional compaction.
- The near surface soils of the Hinuera Formation are variable, generally ranging from stiff silts to medium dense and dense sands. Some localised thin near surface loose sands are present in the central western part of the site.
- Where medium dense or dense sands are present at foundation level a geotechnical ultimate bearing pressure of 300 kPa should be available for shallow strip and pad foundations and dwellings designed in accordance with NZS3604.

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- Where stiff silts of the Hinuera Formation, or engineered fill are at finished level a preliminary geotechnical ultimate bearing pressure of 300kPa should be available for shallow strip and pad foundations for dwellings designed in accordance with NZS3604.
- Locally loose sands of the Hinuera Formation less than 1m thick may be encountered at foundation level. These may be either compacted insitu or undercut and replaced with engineered fill. The in-situ material should be suitable for re-use as engineered fill. Using conventional compaction techniques to achieve an ultimate bearing pressure of 300kPa shallow strip and pad foundations for dwellings designed in accordance with NZS3604.

As required by section B1/VM4[15] of the New Zealand Building Code Handbook, a strength reduction factor of 0.5 and 0.8 must be applied to all recommended geotechnical ultimate soil capacities in conjunction with their use in factored design load cases for static and earthquake overload conditions respectively.

Commercial buildings are likely to require engineering specific design.

Confirmation of available bearing pressures will be addressed at the time of post earthworks soil testing and preparation of the GCR for the development.

7.6 Conclusion

Based on the findings of our investigation and analyses we consider that the site is geotechnically suitable for the proposed residential subdivision development provided the recommendations outlined in Section 7 of this report are followed.

8.0 COUNCIL RFI AND PEER REVIEW

In 2024, CMW provided response to Waipa District Council RFI's, and revision 1 of this GIR was peer reviewed by Beca. The two CMW Responses to RFI's are presented in ***Appendix K***.

9.0 FURTHER WORK

Once development and earthwork plans have been developed an earthworks specification is to be provided and the recommendations of this report reviewed.

Further assessment of static settlement and bearing capacity is required in the commercial zone when foundation plans and loads are available.

Multiple areas of uncontrolled fill have been identified within the development area. Further contamination testing is recommended to assess any health and safety issues during construction, the possible reuse of these materials and/or determine disposal options.

10.0 CLOSURE

This report has been prepared for use by Paul Roycroft in relation to the Wordsworth Street, Cambridge 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.

[15] Ministry of Business, Innovation and Employment (2019) Acceptable Solutions and verification Methods for NZ Building Code Clause B1 Structure, B1/VM4, Amendment 19

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Where a party other than Paul Roycroft 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.

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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.

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APPENDIX A
Drawings

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Table A.1: CMW Drawings

Title	Reference No.	Date	Revision
Site Investigation Plan	01	September 2021	1
Geological Site Plan	02	July 2021	1
Geological Section A-A’	03	August 2021	0

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LEGEND:

HA01	HAND AUGER (HA) LOCATION
HAS01	HAND AUGER + SOAKAGE (HAS) LOCATION
TP01	TEST PIT (TP) LOCATION
CPT01	CONE PENETROMETER TEST (CPT) LOCATION
SCPT01	SEISMIC CONE PENETROMETER TEST (SCPT) LOCATION
MH01	MACHINE BOREHOLE (MH) LOCATION
BRL	BUILDING RESTRICTION LINE
	SITE BOUNDARY
TB15	WRC RIVER BATHYMETRY CROSS SECTION LOCATION
BCD-HA	BCD HAND AUGER LOCATION

NOTES:

1. AERIAL IMAGE AND EXISTING CONTOURS PROVIDED BY COGSWELL SURVEYRORS 28/05/21.
2. CONTOURS ARE AT 1.0m INTERVALS WITH RESPECT TO MOTURIKI DATUM.
3. TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS.
4. CPT04 AND HAS05 TEST LOCATIONS SURVEYED USING HAND HELD GPS.

1:6000 0 60 120 180 240 300 m

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CLIENT: POWERUP BUSINESS CONSULTING LTD		DRAWN: HV	PROJECT No: HAM2021-0032
PROJECT: WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE		CHECKED: DM	DRAWING: 01
		REVISION: 1	SCALE: 1:6000
TITLE: SITE INVESTIGATION PLAN		DATE: 22/10/2025	SHEET: A3

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LEGEND:

- WATER SEEPAGE
- SLOPE SCARP
- UNCONTROLLED FILL
- TAUPO PUMICE ALLUVIUM SOIL
- RECENT ALLUVIUM SOIL
- UNHATCHED AREA ARE IN HINUERA FORMATION
- SITE BOUNDARY

NOTES:

1. AERIAL IMAGE AND EXISTING CONTOURS PROVIDED BY COGSWELL SURVEYRORS 28/05/21.
2. CONTOURS ARE AT 1.0m INTERVALS WITH RESPECT TO MOTURIKI DATUM.
3. TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS.

1:6000 0 60 120 180 240 300 m

CMW Geosciences

CLIENT: **POWERUP BUSINESS CONSULTING LTD**		DRAWN: HV	PROJECT No: HAM2021-0032
PROJECT: **WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE**		CHECKED: DM	DRAWING: 02
		REVISION: 1	SCALE: 1:6000
TITLE: **GEOLOGICAL SITE PLAN**		DATE: 22/10/2025	SHEET: A3

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Document Set ID: 11598798
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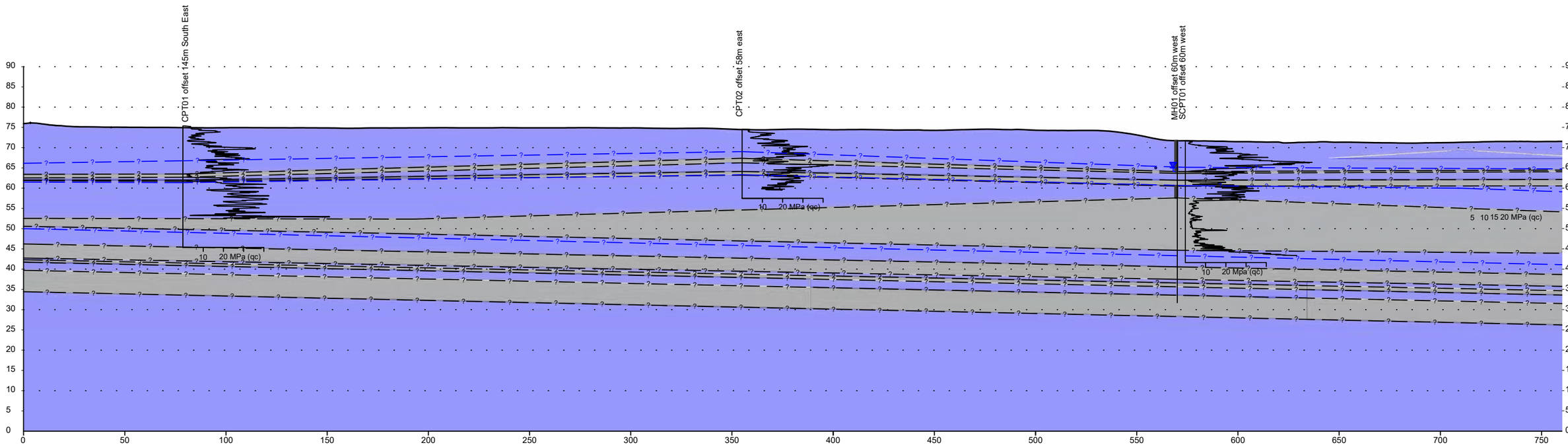

LEGEND:

- LOOSE SAND(TAUPO PUMICE ALLUVIUM)
- MEDIUM DENSE SAND(HINUERA FORMATION)
- MEDIUM DENSE TO DENSE SAND(HINUERA FORMATION)
- STIFF SILT TO VERY STIFF SILT(HINUERA FORMATION)
- FIRM SILT(HINUERA FORMATION)
- PIEZOMETER RESPONSE ZONE AND GROUNDWATER DIP 27/07/21
- INFERRED GEOLOGICAL BOUNDARY
- INFERRED GROUND WATER TABLE
- EXISTING GROUND PROFILE

NOTES:

1. PROFILE AND TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS 28/05/21.
2. GEOLOGICAL BOUNDARIES WHERE SHOWN HAVE BEEN INFERRED BETWEEN KNOWN DATA POINTS TO ASSIST IN GEOLOGICAL INTERPRETATIONS AND SHOULD NOT BE CONSIDERED TO REPRESENT ACTUAL BOUNDARIES WHICH MAY VARY FROM SHOWN.

VERT. SCALE 1:1000 — 0 10 20 30 40 50 m

HORI. SCALE 1:2000 — 0 20 40 60 80 100 m

CMW Geosciences

CLIENT: POWERUP BUSSINESS CONSULTING LIMITED		DRAWN: NK	PROJECT No: HAM2021-0032
PROJECT: WORDSWORTH STREET DEVELOPMENT CAMBRIDGE		CHECKED: LK	DRAWING: 03
		REVISION: 0	SCALE: 1:2000
TITLE: GEOLOGICAL SECTION A-A' - CH0-750		DATE: 02/08/2021	SHEET: A3

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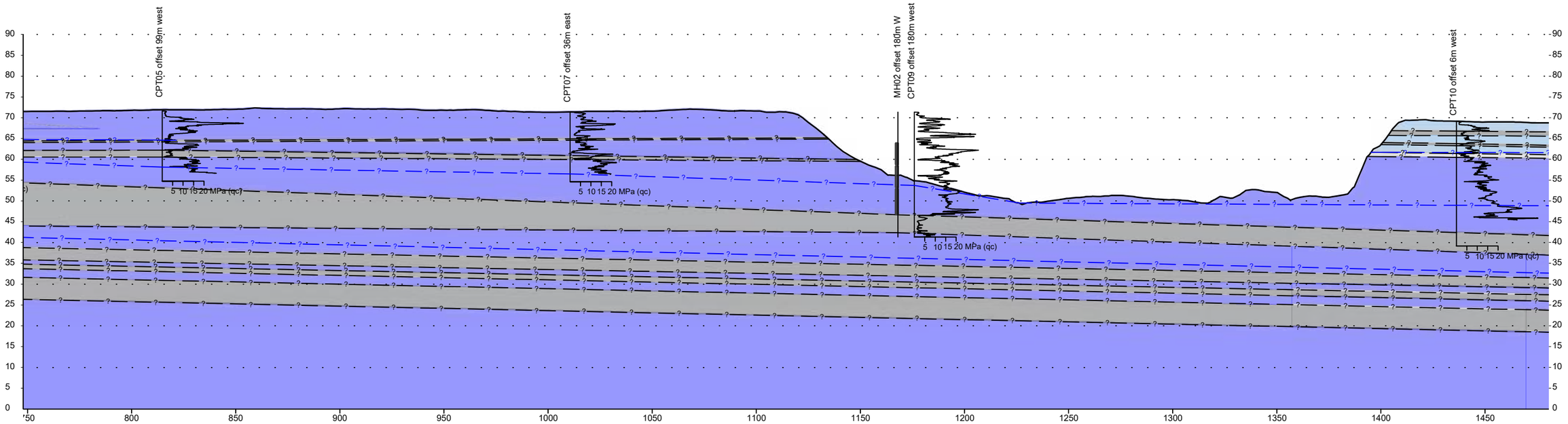
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



LEGEND:

- LOOSE SAND(TAUPO PUMICE ALLUVIUM)
- MEDIUM DENSE SAND(HINUERA FORMATION)
- MEDIUM DENSE TO DENSE SAND(HINUERA FORMATION)
- STIFF SILT TO VERY STIFF SILT(HINUERA FORMATION)
- FIRM SILT(HINUERA FORMATION)
- INFERRED GEOLOGICAL BOUNDARY
- INFERRED GROUND WATER TABLE
- EXISTING GROUND PROFILE

NOTES:

1. SECTION AND TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS 28/05/21.
2. GEOLOGICAL BOUNDARIES WHERE SHOWN ARE INDICATIVE.

VERT. SCALE 1:1000 — 0 10 20 30 40 50 m

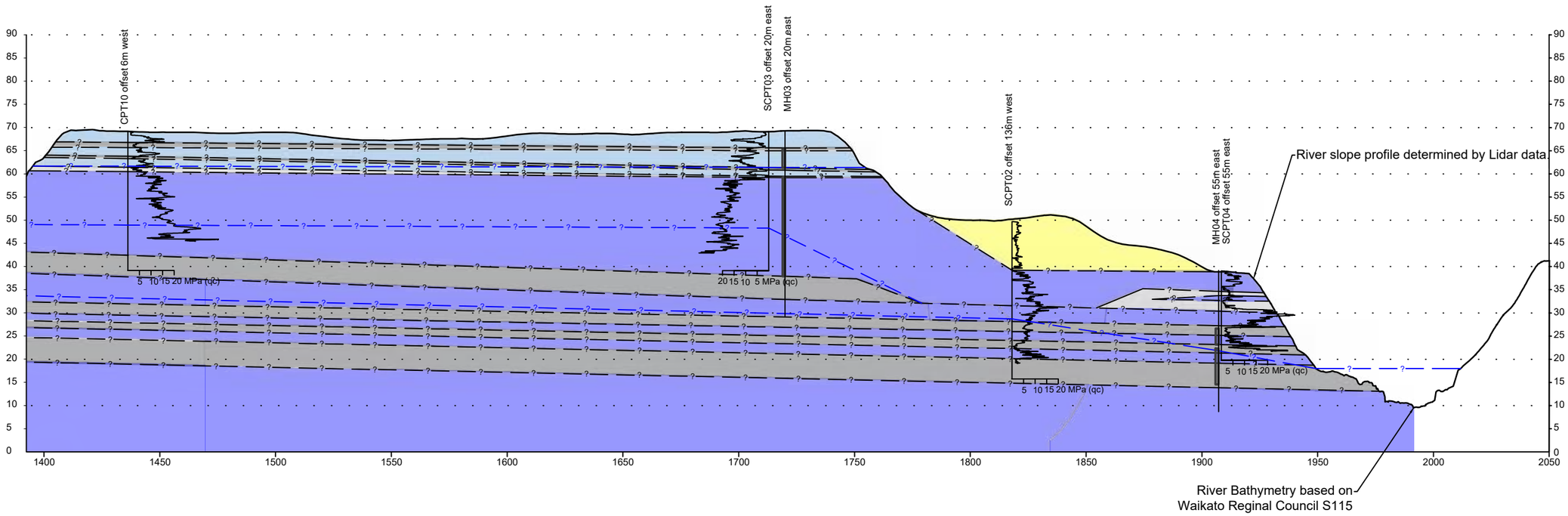
HORI. SCALE 1:2000 — 0 20 40 60 80 100 m

CMW Geosciences

CLIENT: POWERUP BUSSINESS CONSULTING LIMITED		DRAWN: NK	PROJECT No: HAM2021-0032
PROJECT: WORDSWORTH STREET DEVELOPMENT CAMBRIDGE		CHECKED: LK	DRAWING: 04
		REVISION: A	SCALE: 1:2000
TITLE: SECTION PLAN A-A - CH750-1450		DATE: 02/08/2021	SHEET: A3

C:\USERS\NINGKANG\CMW GEOSCIENCES PTY LTD\CMW CONNECT - HAM2021-0032 WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE\DRAWINGS\HAM2021-0032 LONG SECTION CMW HAM26.DWG

Document Set ID: 11598706
Version: 1, Version Date: 17/12/2025



LEGEND:

- LOOSE SAND(TAUPO PUMICE ALLUVIUM)
- MEDIUM DENSE SAND(HINUERA FORMATION)
- MEDIUM DENSE TO DENSE SAND(HINUERA FORMATION)
- STIFF SILT TO VERY STIFF SILT(HINUERA FORMATION)
- FIRM SILT(HINUERA FORMATION)
- INFERRED GEOLOGICAL BOUNDARY
- INFERRED GROUND WATER TABLE
- EXISTING GROUND PROFILE

NOTES:

1. SECTION AND TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS 28/05/21.
2. GEOLOGICAL BOUNDARIES WHERE SHOWN ARE INDICATIVE.

VERT. SCALE 1:1000 — 0 10 20 30 40 50 m

HORI. SCALE 1:2000 — 0 20 40 60 80 100 m

CMW Geosciences

CLIENT: POWERUP BUSSINESS CONSULTING LIMITED		DRAWN: NK	PROJECT No: HAM2021-0032
PROJECT: WORDSWORTH STREET DEVELOPMENT CAMBRIDGE		CHECKED: LK	DRAWING: 05
		REVISION: A	SCALE: 1:2000
TITLE: SECTION PLAN A-A CH1400-2050		DATE: 02/08/2021	SHEET: A3

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Document Set ID: 11592799
Version: 1, Version Date: 17/12/2025

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APPENDIX B
Supplied Drawings

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

A1

LEGEND

- PLAN CHANGE EXTENT
- PEDESTRIAN / CYCLING LINKS
- EXISTING ROADS
- CONNECTOR ROAD
- GEOTECHNICAL SETBACK 20m
- GEOTECHNICAL SETBACK 5m
- CURRENT PROPERTY BOUNDARIES
- MEDIUM DENSITY RESIDENTIAL ZONE
- INDICATIVE NEIGHBOURHOOD CENTRE
- INDICATIVE LOCAL PURPOSE RESERVE
- RIVER / GULLY PROXIMITY QUALIFYING MATTER OVERLAY

NOTE: ENTIRE SITE IS SUBJECT TO THE INFRASTRUCTURE CONSTRAINT QUALIFYING MATTER OVERLAY.

ADDISON STREET
PĀ SITE
WAIKATO RIVER
PĀ SITE
LEAMINGTON DOMAIN
LEAMINGTON CEMETERY
WORDSWORTH STREET
TOP 10 HOLIDAY PARK
CAMBRIDGE NETBALL
LEAMINGTON RUGBY SPORTS CLUB
DOG PARK
CARLYLE STREET
GWYNETH COMMON
PONY CLUB
ADULT RIDING
MAUNGATAUTARI ROAD
LAMB STREET
MAUNGATAUTARI ROAD

COGSWELL SURVEYING | ENGINEERING | PLANNING
www.cogswell.co.nz

CLIENT: CAMBRIDGE C5 STRUCTURE PLAN
REF: 4518

PROJECT: C5 RESIDENTIAL GROWTH CELL

TITLE: ZONING & POLICY AREAS

SCALE: N.T.S
DATE: SEPT 2025
DRAWING: 4518-C5-001
REV: C

THIS DRAWING OR DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED, WITHOUT THE WRITTEN PERMISSION OF COGSWELL SURVEYS LTD.

Document Set ID: 11598798
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PLOTTED: Fri Sep 5 14:50:54 2025

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APPENDIX C
Borehole Logs

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 24/06/2021 - 28/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 1 of 5

Position: 463733.9mE; 685289.4mN Projection: Mount Eden 2000
Elevation: 71.63m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
				71.6			OL: SILT: dark brown. No Plasticity. (Topsoil)						
				71.3			ML: SILT: yellowish brown. Low plasticity. (Hinuera Formation)		St				
				70.8	1		SW: Fine to coarse SAND with minor silt: brown. Well graded; silt, interbedded. (Hinuera Formation)		LP	71			
		1.5	SPT = (8,6,6) N* = 12	70.1	2		SW: Fine to coarse SAND with some gravel and trace silt: brown. Well graded; gravel, fine to coarse., pumiceous (Hinuera Formation)			100			
		3.0	SPT = (6,7,8) N* = 15		3		... at 3.00m, becoming medium to coarse SAND.			100			
		4.5	SPT = (8,8,11) N* = 19		4				MD	100			
	05-07-2021 Shallow Piezo				5			M to W		100			
		6.0	SPT = (8,11,10) N* = 21		6					100			
	05-07-2021 Deep Piezo			64.6	7		SW: Fine to medium SAND with some silt: light yellowish brown. Well graded, pumiceous. (Hinuera Formation)			100			
		7.5	SPT = (4,4,7) N* = 11	64.2			ML: Sandy SILT: light brown. Low plasticity. Sand, fine. (Hinuera Formation)		St	100			
				63.7	8		SP: Silty fine SAND: light greyish brown. Poorly graded. (Hinuera Formation)		LP	100			
				63.1			SW: Fine to coarse SAND with trace gravel: light brown mottled yellowish brown. Well graded; gravel, fine, pumiceous. (Hinuera Formation)						
		9.0	SPT = (4,4,4) N* = 8		9		... at 8.80m, becoming fine to medium SAND.		L to MD	100			
				62.2			SP: Medium to coarse SAND with trace fine gravel: light yellowish brown. Poorly graded, pumiceous. (Hinuera Formation)		LP				
				61.9	10		ML: SILT: light brown mottled grey. Low plasticity, very thinly laminated. (Hinuera Formation)		St	100			

Termination Reason: Target depth

Shear Vane No: DCP No:

Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 24/06/2021 - 28/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 2 of 5

Position: 463733.9mE; 685289.4mN Projection: Mount Eden 2000
Elevation: 71.63m Datum: Moturiki Survey Source: Cogswell Surveys

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Dynamic Cone Penetrometer (Blows/100mm)
		61.3		... at 10.20m, becoming black.				
10.5	SPT = (0,4,8) N* = 12	61.0		SP: Fine to medium SAND with trace silt: grey. Poorly graded. (Hinuera Formation)		MD	100	
			11	ML: SILT: light greyish brown. Low plastcity. (Hinuera Formation)		St		
		60.5		SW: Fine to coarse SAND with trace gravel: light brown. Well graded; gravel, pumiceous. (Hinuera Formation)			100	
				... at 11.60m, becoming grey.				
12.0	SPT = (6,13,12) N* = 25		12			MD	100	
		58.8		SM: Silty fine SAND: light brownish grey. Poorly graded. (Hinuera Formation)			100	
13.5	SPT = (8,7,7) N* = 14		13				100	
		57.6	14	ML: SILT: brown. Low plasticity. (Hinuera Formation)			100	
15.0	SPT = (1,0,0) N* = 0		15			St	100	
			16				100	
16.5	SPT = (2,1,1) N* = 2						100	
			17	... at 17.20m, becoming grey.				
				... at 17.50m, contains minor fine to medium sand.			100	
18.0	SPT = (2,1,0) N* = 1		18			S to F	100	
			19		W to S		100	
19.5	SPT = (0,0,0) N* = 0				W		100	
			20					

Structure & Other Observations

Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 24/06/2021 - 28/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 3 of 5

Position: 463733.9mE; 685289.4mN Projection: Mount Eden 2000
Elevation: 71.63m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
		21.0	SPT = (3,3,4) N* = 7	50.6	21		Pt: PEAT: dark brownish black. Low plasticity; completely decomposed. (Hinuera Formation)		St	71			
										0			
		22.5	SPT = (6,9,11) N* = 20		22		... at 22.40m, 100mm fibrous wood material.			100			
										100			
				48.7	23		ML: SILT: light greenish grey. Low plasticity. (Hinuera Formation)	M		100			
					24				VSt to H	100			
					25					100	PQ		
										100			
				45.7	26		SM: Silty fine to medium SAND: light grey. Uniformly graded. (Hinuera Formation)		TP				
				45.5			ML: SILT with trace fine sand: light bluish grey. Low plasticity. (Hinuera Formation)	W to S	S to F	100			
		27.0	SPT = (12,19,16) N* = 35	44.6	27		SM: Silty fine to medium SAND: grey. Well graded. (Hinuera Formation)			100			
					28					100			
				43.4			SW: Fine to medium SAND with minor silt: light grey. Well graded. (Hinuera Formation)		D to VD				
		28.5	SPT = (20,30,50) N* = 80		29					100			
										100			
		30.0	SPT = (10,50,) N* = 50+		30					100			

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

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Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 24/06/2021 - 28/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 4 of 5

Position: 463733.9mE; 685289.4mN Projection: Mount Eden 2000
Elevation: 71.63m Datum: Moturiki Survey Source: Cogswell Surveys

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			31				100			
		40.4		ML: SILT: dark green. Low plasticity, friable. (Hinuera Formation)						
31.5	SPT = (5,4,3) N* = 7	40.1		ML: SILT with minor fine to coarse sand: light blue. Low plasticity. (Hinuera Formation)			100			
			32				100			
						VS to S				
33.0	SPT = (1,5,14) N* = 19		33				100			
			34				100			
		37.4		SP: Medium to coarse SAND with some silt: greenish grey. Poorly graded. (Hinuera Formation)		D				
34.5	SPT = (12,16,16) N* = 32						100			
		36.7	35	ML: SILT: light brownish grey. Low plasticity. (Hinuera Formation)	M to W	VSt to H	100			
		35.7								
36.0	SPT = (15,22,24) N* = 46		36	SM: Silty fine to coarse SAND: dark greenish grey. Well graded. (Hinuera Formation)			100			
			37			D	100			
37.5	SPT = (13,20,26) N* = 46									
			38				100			
		33.4		ML: SILT: greenish grey. Low plasticity. (Hinuera Formation)			100			
39.0	SPT = (15,22,24) N* = 46		39			St	100			
							100			
			40							

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

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Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 24/06/2021 - 28/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 5 of 5

Position: 463733.9mE; 685289.4mN Projection: Mount Eden 2000
Elevation: 71.63m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
		40.5	SPT = (13,26,30/80mm) N* = 50+		41		Borehole terminated at 40.4 m					5 10 15	
					42								
					43								
					44								
					45								
					46								
					47								
					48								
					49								
					50								

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 1: 0m to 3m

Box 2: 3m to 6m

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Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

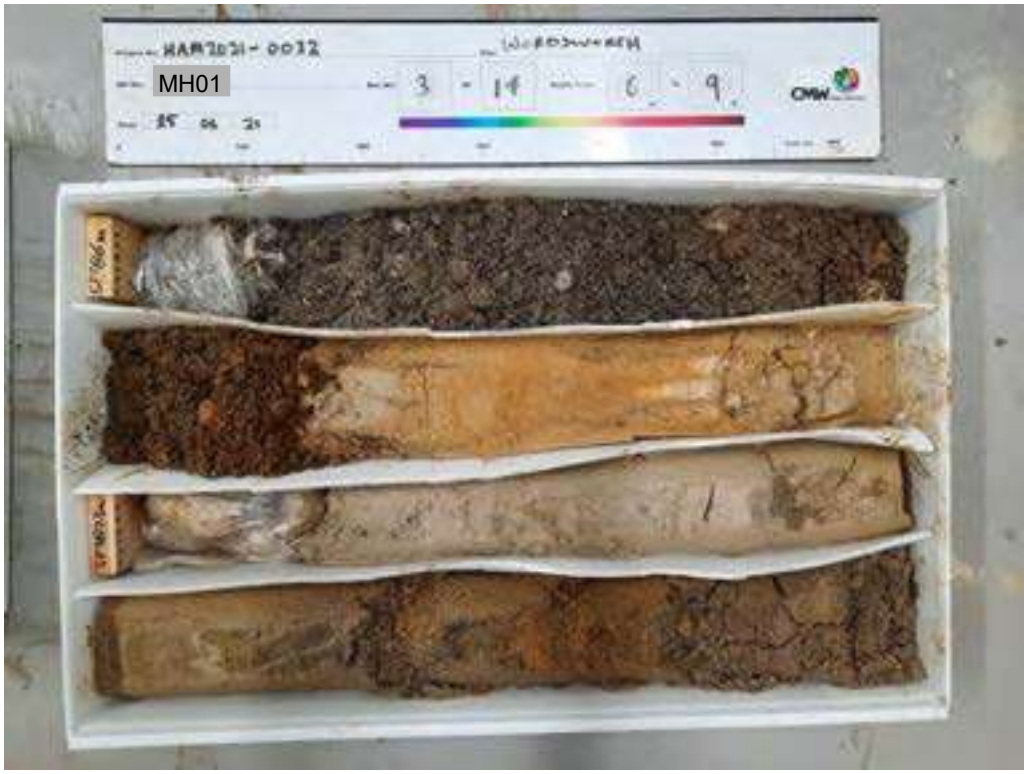
Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore



Box 3: 6m to 9m

Box 4: 9m to 12m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 5: 12m to 15m

Box 6: 15m to 18m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 7: 18m to 24m

Box 8: 21m to 24m

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Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 9: 24m to 30m

Box 10: 27m to 30m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 11: 30m to 33m

Box 12: 33m to 36m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 24/06/2021-28/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 13: 36m to 39m

Box 14: 39m to 40.95m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 1 of 4

Position: 463748.8mE; 685901.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 71.34m Datum: Moturiki Survey Source: Cogswell Surveys

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Consistency/ Relative Density	Recovery	Dynamic Cone Penetrometer (Blows/100mm)
		71.3		OL: SILT: with some fine to coarse sand; dark brown. (Topsoil)			
		71.1		ML: Clayey SILT: with some fine sand; light brownish orange. Low plasticity. (Hinuera Formation)	F		
		70.6		SW: Gravelly Fine to coarse SAND: dark brownish grey. Well graded, subrounded; gravel, fine to coarse. (Hinuera Formation)		80	
1.5	SPT = (4,3,4) N* = 7		1			89	
			2			100	
3.0	SPT = (7,8,7) N* = 15		3		L to MD	100	
			4			100	
4.5	SPT = (2,2,4) N* = 6					100	
		66.4	5	SP: Fine to coarse SAND: with some fine gravel; dark brownish grey. Well graded, subrounded. (Hinuera Formation)		100	
				... from 5.50m to 6.10m, becoming sandy fine to coarse gravel, contains trace cobbles			
6.0	SPT = (5,4,2) N* = 6	65.2	6	ML: Clayey SILT: with minor fine sand; light greyish brown. Low plasticity. (Hinuera Formation)	St		
		64.5	7	SP: Fine SAND: light grey. Poorly graded. (Hinuera Formation)	L	100	
				... from 7.30m to 7.50m, contains lens of silty fine sand			
7.5	SPT = (1,1,2) N* = 3	63.7		SW: Fine to coarse SAND: light brownish grey. Well graded. (Hinuera Formation)		89	
			8			100	
9.0	SPT = (7,10,12) N* = 22		9		MD	100	
			10			100	

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 2 of 4

Position: 463748.8mE; 685901.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 71.34m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
	05-07-2021 Mid Piez	10.5	SPT = (6,10,10) N* = 20		11					100			
				59.8			ML: Clayey SILT: with trace fine sand; light pinkish brown. Low plasticity. (Hinuera Formation)		F to St	100			
		12.0	SPT = (7,9,10) N* = 19	59.4	12		SW: Fine to coarse SAND: light brownish grey. Well graded, subrounded. (Hinuera Formation)			89			
					13					100			
		13.5	SPT = (8,8,8) N* = 16							100			
					14					100			
		15.0	SPT = (10,10,10) N* = 20		15			M		100			
					16				MD	100			
		16.5	SPT = (7,7,9) N* = 16				*... from 16.30m to 17.00m, Becoming yellowish orange, with some fine to medium gravel*			100			
	05-07-2021 Deep Piezo				17					100			
		18.0	SPT = (12,8,10) N* = 18		18					100			
					19								
		19.5	SPT = (9,8,11) N* = 19		20								

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 3 of 4

Position: 463748.8mE; 685901.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 71.34m Datum: Moturiki Survey Source: Cogswell Surveys

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
				... from 20.50m to 22.00m, contains trace fine to coarse pumiceous gravel.	M to W		100			
21.0	SPT = (8,7,11) N* = 18		21							
			22		M		100			
22.5	SPT = (8,12,12) N* = 24									
			23	*... from 22.95m to 23.05m, becoming yellowish brown.*	W		100			
24.0	SPT = (11,11,16) N* = 27	47.4 47.3	24	ML: SILT: grey. Low plasticity. (Hinuera Formation) SM: Silty Fine SAND: grey. Poorly graded. (Hinuera Formation)			100			
		46.7		ML: SILT: dark brown. Low plasiticity. (Hinuera Formation)		St				
		46.3	25	MH: SILT with minor clay: dark grey. High plasticity. (Hinuera Formation)						
25.5	SPT = (9,4,5) N* = 9									
			26		M		100			
27.0	SPT = (1,0,0) N* = 0		27			St to VSt				
		43.4	28	MH: SILT : with some clay; dark green. High plasticity. (Hinuera Formation) *... at 27.95m, becoming dark green.*			95			
28.5	SPT = (8,10,14) N* = 24									
		42.3	29	*... at 28.95m, contains minor fine to coarse sand.* SM: Silty fine to coarse SAND: dark green. Poorly graded. (Hinuera Formation)		TP	66			
			30	*... at 30.00m, Split spoon lost, unable to perform SPT at 30m.*						

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 4 of 4

Position: 463748.8mE; 685901.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 71.34m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
					31		Borehole terminated at 30.5 m					5 10 15	
					32								
					33								
					34								
					35								
					36								
					37								
					38								
					39								
					40								

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)

Structure & Other Observations: Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

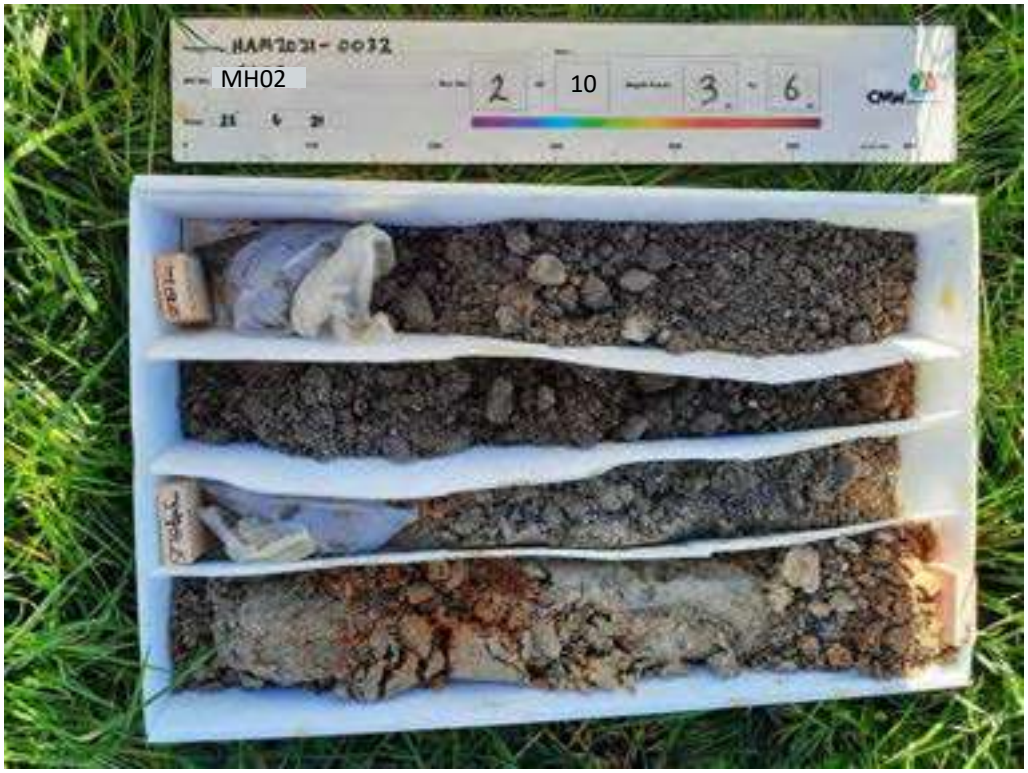
Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021-23/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 1: 0m to 3m



Box 2: 3m to 6m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021-23/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 3: 6m to 9m

Box 4: 9m to 12m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021-23/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 5: 12m to 15m

Box 6: 15m to 18m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021-23/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 7: 18m to 21m

Box 8: 21m to 24m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021-23/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 9: 24m to 27m

Box 10: 27m to 30m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 18/06/2021 - 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: LK Scale: 1:50 Sheet 1 of 5

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
				69.1			OL: Organic SILT: with trace fine to medium gravel; dark brownish black. (Topsoil)						
				69.0			ML: Clayey SILT: with some fine sand; light brownish orange. Low plasticity. (Hinuera Formation)		F to St				
				68.4			SW: Gravelly Fine to coarse SAND: dark brownish grey. Well graded, subangular to subrounded. (Hinuera Formation)			97			
		1.5	SPT = (6,8,6) N* = 14		1		... from 1.60m to 1.65m, contains coarse gravel up to 5cm			22			
					2		... from 2.20m to 2.60m, contains sandy fine to coarse gravel		L to MD	84			
		3.0	SPT = (2,2,1) N* = 3		3					22			
				65.6			SW: Silty Fine to coarse SAND: light pinkish brown mottled grey. Well graded, subangular to subrounded. (Hinuera Formation)		LP				
				65.4			ML: SILT: with some fine sand; light pinkish brown. Low plasticity, Pale. (Hinuera Formation)		F	100			
		4.5	SPT = (2,2,2) N* = 4	64.8	4		SP: Fine SAND: with minor silt; light greyish brown. Poorly graded. (Hinuera Formation)			33			
					5					100			
				63.5			SP: Fine SAND: light brownish grey. Poorly graded, rounded. (Hinuera Formation)						
		6.0	SPT = (4,3,3) N* = 6		6		... at 6.50m, contains some silt, light reddish brown		VL to L	33			
				62.4			SW: Fine to coarse SAND: light grey. Well graded, subrounded. (Hinuera Formation)			98			
					7								
				61.8			SP: Fine SAND: light grey. Poorly graded, rounded. (Hinuera Formation)			56			
		7.5	SPT = (2,3,5) N* = 8										
				61.1	8		ML: Sandy SILT: fine sand; light brownish grey. Low plasticity, sensitive. (Hinuera Formation)		F to St				
				60.6			SW: Fine to coarse SAND: dark grey. Well graded, rounded. (Hinuera Formation)			100			
		9.0	SPT = (2,4,6) N* = 10		9		SP: Fine SAND: with some silt, with trace clay; dark brownish grey. Poorly graded, rounded. (Hinuera Formation)		L	44			
							CL: Sandy CLAY: fine sand; light brownish orange. Low plasticity. (Hinuera Formation)						
				59.4			ML: Sandy SILT: light brownish grey. Low plasticity, sensitive. (Hinuera Formation)		F to St	100			
				59.3									
				59.2	10								
				59.0									

05-07-2021 Shallow Piezo

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 18/06/2021 - 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: LK Scale: 1:50 Sheet 2 of 5

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
		10.5	SPT = (6,10,12) N* = 22	58.5			SP: Fine SAND: with some silt; light greyish brown. Poorly graded. (Hinuera Formation)			56			
					11		SW: Fine to coarse SAND: with minor fine to medium gravel; dark brownish grey. Well graded, subrounded. (Hinuera Formation)			99			
		12.0	SPT = (5,8,12) N* = 20		12		... at 11.00m, contains some fine to coarse gravel			89			
					13		... at 12.90m, Pumice clast, 6cm ... from 13.00m to 13.60m, Orange brown			100			
		13.5	SPT = (3,9,12) N* = 21							100			
					14				MD	96			
							... at 14.50m, Gravel fine and trace						
		15.0	SPT = (8,12,15) N* = 27		15			M		100			
					16					100			
		16.5	SPT = (10,12,17) N* = 29							100			
					17					100			
		18.0	SPT = (14,14,18) N* = 32		18					100			
					19				D	100			
		19.5	SPT = (8,8,11) N* = 19							100			
					20								

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 18/06/2021 - 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: LK Scale: 1:50 Sheet 3 of 5

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
	05-07-2021 Deep Piezo	21.0	SPT = (14,14,16) N* = 30		21				MD	100		5 10 15	
		22.5	SPT = (10,15,14) N* = 29		22			W to S		100			
		24.0	SPT = (14,14,19) N* = 33		23				D	100			
		25.5	SPT = (3,14,13) N* = 27		24			M		100			
		27.0	SPT = (12,14,22) N* = 36		25				MD	100			
		28.5	SPT = (11,16,19) N* = 35		26			W		100			
		30.0	SPT = (6,11,16) N* = 27		27					100			
					28								
					29								
					30								

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 18/06/2021 - 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: LK Scale: 1:50 Sheet 4 of 5

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
		31.5	SPT = (9,15,13) N* = 28	37.7	31		ML: Sandy SILT: fine sand; dark greyish brown. Low plasticity. (Hinuera Formation)	M	VSt	100		5 10 15	
		33.0	SPT = (0,0,0) N* = 0		32					100			
		34.5	SPT = (1,0,1) N* = 1		33					100			
		36.0	SPT = (0,0,6) N* = 6		34					100			
				32.7	35		... at 36.00m, becoming greyish green			100			
		37.5	SPT = (3,23,20) N* = 43		36		SM: Silty Fine to medium SAND: light greyish green. Poorly graded. (Hinuera Formation)		D	100			
		39.0	SPT = (3,9,20) N* = 29	31.1	37		... from 37.90m to 37.95m, becoming dark green			100			
		40.0	SPT = (11,13,16) N* = 29		38		SM: Silty fine SAND: light greyish green. Poorly graded. (Hinuera Formation) ... at 38.00m, contains fine sand			100			
					39		... at 38.80m, contains fine sand, becoming light grey			100			
					40					100			

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 18/06/2021 - 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: LK Scale: 1:50 Sheet 5 of 5

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
					41		Borehole terminated at 40.4 m					5 10 15	
					42								
					43								
					44								
					45								
					46								
					47								
					48								
					49								
					50								

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)

Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 1: 0m to 3m

Box 2: 3m to 6m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 3: 6m to 9m

Box 4: 9m to 12m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 63.5mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 5: 12m to 15m

Box 6: 15m to 18m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 7: 18m to 21m

Box 8: 21m to 24m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 9: 24m to 27m

Box 10: 27m to 30m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 11: 24m to 36m

Box 12: 33m to 36m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 18/06/2021-21/06/2021

Logged by: AMC	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 13: 36m to 39m

Box 14: 39m to 40m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH04

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021 - 15/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 1 of 4

Position: 464108.1mE; 686573.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 39.15m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
				39.1			OL: SILT: with minor fine to coarse gravel; dark brown. Low plasticity. (Topsoil)	M	S				
				39.0					TP				
				38.9					S				
				38.8			SW: Fine to coarse SAND: with trace fine gravel, with trace silt; brown. Well graded. (Hinuera Formation)						
				38.7									
				38.6			ML: SILT: with trace fine gravel; brown. Low plasticity. (Hinuera Formation)			80			
					1		SW: Fine to coarse SAND: with trace fine gravel, with trace silt; brown. Well graded. (Hinuera Formation)	W to S					
		1.5	SPT = (4,6,7) N* = 13	37.6			ML: SILT: with trace fine gravel; brown. Low plasticity. (Hinuera Formation)						
							SW: Fine to coarse SAND: with some fine to coarse gravel, with trace silt; brown. Well graded. (Hinuera Formation)						
					2		SP: Gravelly Medium to coarse SAND: with trace silt; brown. Well graded, gravel; fine to coarse. (Hinuera Formation)		L to MD	90			
		3.0	SPT = (3,3,3) N* = 6		3			W					
					4					90			
		4.5	SPT = (0,0,0) N* = 0	34.6			ML: SILT: with trace fine sand; light brown. Low plasticity. (Hinuera Formation)						
					5			W to S	F	100			
				33.7			SM: Silty Fine SAND: light brown mottled light bluish grey. Poorly graded. (Hinuera Formation)						
		6.0	SPT = (0,0,0) N* = 0		6		*... from 5.40m to 5.60m, Contains trace fine to coarse gravel.*		L				
				32.7			MH: SILT: with minor clay; light bluish grey. High plasticity. (Hinuera Formation)			100			
					7								
		7.5	SPT = (5,3,1) N* = 4						F to St				
					8		*... at 8.05m, 20mm band of medium gravel.*			100			
							... at 8.50m, Becoming orange brown.						
				30.3			SW: Fine to coarse SAND: with minor fine to coarse gravel, with trace silt; grey. Well graded. (Hinuera Formation)						
		9.0	SPT = (11,13,17) N* = 30		9		*... at 9.45m, Becoming brown. Becoming medium to coarse sand.*		MD to D	100			
					10								

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH04

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021 - 15/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 2 of 4

Position: 464108.1mE; 686573.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 39.15m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
		10.5	SPT = (7,11,13) N* = 24	28.6			SW: Fine to medium SAND: with trace silt; dark bluish grey. Well graded. (Hinuera Formation)						
					11				MD	100			
				27.3			ML: SILT: with minor fine sand; dark bluish grey. Low plasticity. (Hinuera Formation)						
		12.0	SPT = (9,13,12) N* = 25		12								
				26.7			ML: SILT: dark greyish brown. Low plasticity. (Hinuera Formation)						
					13		... at 13.00m, Becoming grey.		St to VSt	100			
		13.5	SPT = (4,3,3) N* = 6										
				25.2	14		SP: Fine to coarse SAND: with some fine to coarse gravel, with some silt; greenish grey. Poorly graded. (Hinuera Formation)			53			
		15.0	SPT = (18,18,20) N* = 38		15			M	D				
				23.7			SM: Silty Fine to coarse SAND: with some fine to coarse gravel; orange brown. Well graded. (Hinuera Formation)			97			
					16								
				23.0			ML: Sandy SILT: grey. Low plasticity. (Hinuera Formation)		S				
		16.5	SPT = (7,13,18) N* = 31	22.6			ML: SILT: with some fine sand; light brown. Low plasticity. (Hinuera Formation)						
					17				F to St	100			
	05-07-2021 Deep Piezo	18.0	SPT = (2,2,4) N* = 6	21.1	18		SM: Silty Fine to medium SAND: brownish grey. Well graded, low plasticity. (Hinuera Formation)						
							... at 18.45m, Contains minor fine sand.		F to St				
					19					100			
		19.5	SPT = (22,7,10) N* = 17	19.7			SW: Fine to coarse SAND: with minor fine to coarse gravel, with trace silt; grey. Well graded. (Hinuera Formation)						
				19.4			SW: Silty Fine to medium SAND: brownish grey. Well graded, low plasticity. (Hinuera Formation)	W to S	MD				
				19.1	20		ML: SILT: with trace fine sand; light brown. Low plasticity. (Hinuera Formation)		F				

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH04

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021 - 15/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 3 of 4

Position: 464108.1mE; 686573.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 39.15m Datum: Moturiki Survey Source: Cogswell Surveys

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Dynamic Cone Penetrometer (Blows/100mm)
21.0	SPT = (0,1,5) N* = 6	17.8	21	SM: Silty Fine to coarse SAND: with trace fine gravel. Well graded. (Hinuera Formation)	W	L	100	
				... from 21.75m to 21.80m, 50mm band of coarse gravel.		TP		
		17.2	22	ML: Sandy SILT: dark greyish green. Low plasticity, Sand; fine to coarse. (Hinuera Formation)			100	
22.5	SPT = (9,10,15) N* = 25							
		16.2	23	ML: SILT: with minor fine sand; bluish grey. Low plasticity. (Hinuera Formation)		F		
		15.4		ML: Sandy SILT: brown mottled bluish grey. Low plasticity. (Hinuera Formation)			100	
24.0	SPT = (7,3,6) N* = 9		24					
		14.7		SW: Fine to medium SAND: with minor silt, with trace fine gravel; greenish grey. Well graded. (Hinuera Formation)		St to VSt		
		14.3		... at 24.75m, 100mm diameter cobble.			100	
			25	ML: Gravelly SILT: with minor fine to coarse sand; bluish grey mottled brown. Low plasticity. (Hinuera Formation)		St		
		13.8		SW: Fine to coarse SAND: with trace silt, with minor fine to coarse gravel; greenish grey. Well graded. (Hinuera Formation)				
25.5	SPT = (10,17,13) N* = 30							
			26		M		30	
27.0	SPT = (7,15,19) N* = 34		27	... at 27.00m, Becoming brown.		MD to D		
				... from 27.75m to 27.80m, 50mm band of fine to coarse pumice gravel.			100	
			28					
28.5	SPT = (25,22,20) N* = 42			... at 28.35m, Contains pumice cobbles. ... at 28.50m, Becoming dark brown to black.				
		10.2	29	SP: Medium to coarse SAND: with some fine to coarse gravel; yellowish brown. Poorly graded, Gravel; pumiceous. (Hinuera Formation)			100	
				... at 29.50m, Becoming yellowish brown mottled dark brown				
30.0	SPT = (6,12,16) N* = 28		30					

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE LOG - MH04

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021 - 15/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: LK Scale: 1:50 Sheet 4 of 4

Position: 464108.1mE; 686573.6mN Projection: Mount Eden 2000 Angle from horizontal: 90°
Elevation: 39.15m Datum: Moturiki Survey Source: Cogswell Surveys

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
					31		Borehole terminated at 30.4 m					5 10 15	
					32								
					33								
					34								
					35								
					36								
					37								
					38								
					39								
					40								

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)

Structure & Other Observations: Discontinuities: Depth; Defect Number; Defect Type; Dip; Defect Shape; Roughness; Aperture; Infill; Seepage; Spacing; Block Size; Block Shape; Remarks

Termination Reason: Target depth
Shear Vane No: DCP No:
Remarks: Consistency of cohesive materials based on tactile diagnostic features. Relative density of granular materials based on SPT testing or tactile diagnostic features. Moisture conditions indicative due to drilling fluids.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 1: 0m to 3m

Box 2: 3m to 6m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 3: 6m to 8.2m

Box 4: 8.2m to 10.05m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 5: 10.3m to 13.3m

Box 6: 13.3m to 16.25m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 7: 16.25m to 19.05m

Box 8: 19.05m to 21.9m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 9: 21.9m to 24.45m

Box 10: 24.45m to 28.45m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

BOREHOLE PHOTOGRAPHS (MH04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021-15/06/2021

Logged by: AS	Position: Refer to site plan	Hole Diameter: 85mm	Plant: Eijelkamp Fraste XL MAX 170
Checked by: LK		Angle from Horizontal: 90°	Contractor: DrillCore

Box 11: 28.45m to 30.45m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences – SOIL (Field Logging Guide)

SEQUENCE OF TERMS:
Fine: Soil Symbol – Soil Type – Colour – Structure – (Consistency) – (Moisture) – Bedding – Plasticity – Sensitivity – Additional Comments – Origin/Geological Unit
Coarse: Soil Symbol – Soil Type – Colour – Structure – Grading – Particle shape – (Relative Density) – (Moisture) – Bedding – Additional Comments – Origin/Geological Unit

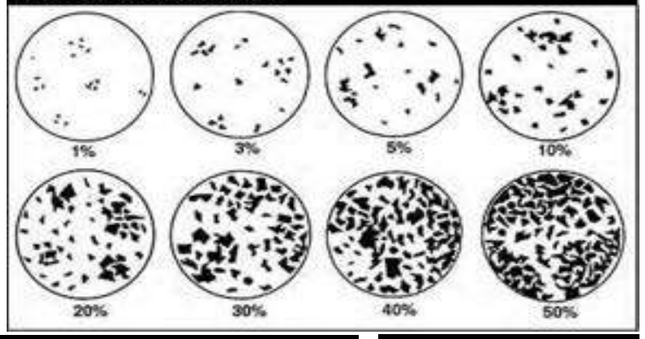
BEHAVIOURAL SOIL CLASSIFICATION SYSTEM

Major Divisions (behaviour based logging)			Soil Symbol	Soil Name
Coarse grained soils more than 65%>0.06mm	Gravel >50% of coarse fraction >2mm	Clean gravel <5% smaller 0.075mm	GW	Well graded gravel, fine to coarse gravel
			GP	Poorly graded gravel
		Gravel with >12% fines	GM	Silty gravel
			GC	Clayey gravel
	Sand ≥50% of coarse fraction <2mm	Clean sand	SW	Well-graded sand, fine to coarse sand
			SP	Poorly graded sand
		Sand with >12% fines	SM	Silty sand
			SC	Clayey sand
Fine grained soils 35% or more <0.06mm	Exhibits dilatant behaviour	inorganic	ML	Silt
			MH	Silt of high plasticity
		organic	OL	Organic silt
	No dilatant behaviour	inorganic	CL	Clay of low plasticity
			CH	Clay of high plasticity
		organic	OH	Organic clay
Highly Organic Soils			Pt	Peat

PROPORTIONAL TERMS DEFINITION

Fraction	Term	% of Soil Mass	Example
Major	(…) [UPPER CASE]	≥50 [major constituents]	GRAVEL
Subordinate	(…) [lower case]	20 – 50	Sandy
Minor	with some…	12 – 20	with some sand
	with minor…	5 – 12	with minor sand
	with trace of (or slightly)	< 5	with trace of sand (slightly sandy)

VISUAL PROPORTION PERCENTAGE



GRAIN SIZE CRITERIA

TYPE	COARSE									FINE		ORGANIC
			Gravel			Sand						
	Boulders	Cobbles	coarse	medium	fine	coarse	medium	fine		Silt	Clay	Organic Soil
Size Range (mm)	200	60	20	6	2	0.6	0.2	0.06		0.002		
Graphic Symbol												

ADDITIONAL GRAPHIC LOG SYMBOLS

Term	Symbol
Topsoil	
Fill	
Bitumen	
Concrete	

ORGANIC SOILS / DESCRIPTORS

Term	Description
Topsoil	Surficial organic soil layer that may contain living matter. However, topsoil may occur at greater depth, having been buried by geological processes or man-made fill, and should be termed a buried topsoil.
Organic clay, silt or sand	Contains finely divided organic matter; may have distinctive smell; may stain; may oxidize rapidly. Describe as for inorganic soils.
Peat	Consists predominantly of plant remains. **Firm:** Fibres already compressed together **Spongy:** Very compressible and open structure **Plastic:** Can be moulded in hand and smears in fingers **Fibrous:** Plant remains recognisable and retain some strength **Amorphous:** No recognisable plant remains
Rootlets	Fine, partly decomposed roots, normally found in the upper part of a soil profile or in a redeposited soil (e.g. colluvium or fill)
Carbonaceous	Discrete particles of hardened (carbonised) plant material.

SHADE AND COLOUR

1	2	3
light dark mottled streaked	pinkish reddish yellowish brownish greenish bluish greyish	pink red orange yellow brown green blue white grey black

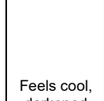
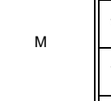
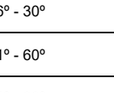
SOIL STRUCTURE

Term	Description
Homogeneous	The total lack of visible bedding and the same colour and appearance throughout
Bedded	The presence of layers
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Polished	Fracture planes are polished or glossy
Slickensided	Fracture planes are striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensoidal	Discontinuous pockets of a soil within a different soil mass

GRADING (GRAVELS & SANDS)

Term	Description	
Well Graded	Good representation of all particle size ranges from largest to smallest	
Poorly Graded	Limited representation of grain sizes – further divided into:	
	Uniformly graded	Most particles about the same size
	Gap graded	Absence of one or more intermediate sizes

ROUNDING/PARTICLE SHAPE

Rounded	Subrounded	Subangular	Angular
			

CONSISTENCY TERMS FOR FINE SOILS

Descriptive term	Undrained Shear Strength (kPa)	Diagnostic Features	Abbreviation
Very Soft	<12	Easily exudes between fingers when squeezed	VS
Soft	12-25	Easily indented by fingers	S
Firm	25-50	Indented by strong finger pressure and can be indented by thumb pressure	F
Stiff	50-100	Cannot be indented by thumb pressure	St
Very Stiff	100-200	Can be indented by thumb nail	VSt
Hard	200-500	Difficult to indent by thumb nail	H

DENSITY INDEX (RELATIVE DENSITY) TERMS FOR COARSE SOILS

Descriptive term	Density Index (RD)	SPT "N" value (blows/300mm)	Dynamic Cone (blows/100mm)	Abbreviation
Very Dense	> 85	> 50	> 17	VD
Dense	65 - 85	30 - 50	7 - 17	D
Medium dense	35 - 65	10 - 30	3 - 7	MD
Loose	15 - 35	4 - 10	1 - 3	L
Very loose	< 15	< 4	0 - 2	VL

Note:
- Where strength data cannot be confirmed Loosely Packed (LP) and Tightly Packed (TP) may be used.
- No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Penetrometer (Scala) Test values.
- SPT "N" values are uncorrected.

MOISTURE CONDITION

Condition	Description	Coarse Soils	Fine Soils	Abbreviation
Dry	Looks and feels dry	Runs freely through hands	Hard, powdery or friable	D
Moist	Feels cool, darkened in colour	Tends to cohere	Weakened by moisture, but no free water on hands when remoulding	M
Wet			Weakened by moisture, free water forms on hands when handling	W
Saturated	Feels cool, darkened in colour and free water is present on the sample			S

BEDDING THICKNESS (Sedimentary)

Term	Bed Thickness
Thinly laminated	< 2mm
Laminated	2mm - 6mm
Very thin	6mm - 20mm
Thin	20mm - 60mm
Moderately thin	60mm - 200mm
Moderately thick	0.2m - 0.6m
Thick	0.6m - 2m
Very thick	> 2m

BEDDING INCLINATION

Term	Inclination (from horizontal)
Sub-horizontal	0º - 5º
Gently inclined	6º - 15º
Moderately inclined	16º - 30º
Steeply inclined	31º - 60º
Very steeply inclined	61º - 80º
Sub vertical	81º - 90º

PLASTICITY (CLAYS & SILTS)

Term	Description
High plasticity	Can be moulded or deformed over a wide range of moisture contents without cracking or showing any tendency to volume change
Low plasticity	When moulded can be crumbled in the fingers; may show quick or dilatant behaviour

SENSITIVITY OF SOIL

Descriptive Term	Shear Strength Ratio = $\frac{undisturbed}{remoulded}$
Insensitive, normal	< 2
Moderately sensitive	2 – 4
Sensitive	4 – 8
Extra sensitive	8 – 16
Quick	> 16

Document Set ID: 11598798
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Revision 3 April 2018

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APPENDIX D
Hand Auger Borehole Logs

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463953.8mE; 685386.5mN Projection: Mount Eden 2000
Elevation: 71.98m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
	0.0	Peak = UTP	72.0			ML: Sandy SILT: with some fine gravel; light grey mottled light brown. Insensitive to sensitive, low plasticity. (Uncontrolled Fill)			
	0.3	Peak = 111kPa Residual = 14kPa						VSt to H	
						... from 0.50m to 0.55m, Band of SILT, reddish brown			
	0.6	Peak = UTP				*... from 0.60m to 0.65m, With some fine to medium gravel*			
			71.1			SM: Silty Fine SAND: light greyish white mottled light brown. Poorly graded. (Uncontrolled Fill)		MD	6
			71.0	1		*... from 0.90m to 1.00m, With some fine to medium gravel*			3
	1.2	Peak = UTP				ML: Sandy SILT: fine to medium sand, with minor fine to medium gravel; dark greyish brown. Low plasticity. (Uncontrolled Fill)			2 2 2
	1.5	Peak = UTP				*... from 1.50m to 1.55m, Band of sandy CLAY, light orange*	D to M		1 2 2 2
	1.8	Peak = UTP							1 2
	2.1	Peak = UTP		2				H	1 2 1 2 1 1 1 1 2 1
	2.5	Peak = UTP							
	2.8	Peak = UTP							
			69.0	3		SM: Silty Fine SAND: dark greyish brown. Poorly graded. (Uncontrolled Fill)	M to W		2 2 1 2 2
			68.5			SP: Fine to medium SAND: with some silt; dark brownish grey. Poorly graded. (Uncontrolled Fill)	W to S	VL	1 2 2 1 2
21-06-2021				4			S		2 3 3
						Borehole terminated at 4.3 m			2 2 3 2 1 2 2
				5					

Termination Reason: Hole collapse in loose, saturated sand.
Shear Vane No: 2955 DCP No: 7
Remarks: Groundwater encountered at 4m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA01)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 21/06/2021

Logged by: AMC	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 4.3m

HAND AUGER BOREHOLE LOG - HA02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463672.4mE; 685732.5mN Projection: Mount Eden 2000
Elevation: 71.65m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			71.6			OL: SILT: with some fine to medium sand; dark brown. (Topsoil)			
			71.4						
	0.3	Peak = 94kPa Residual = 33kPa				ML: Clayey SILT: with some fine sand; light brownish orange. Moderately sensitive to sensitive, low plasticity. (Hinuera Formation)			
	0.6	Peak = 55kPa Residual = 28kPa							
	0.9	Peak = 69kPa Residual = 33kPa						St	
			70.6	1		ML: Sandy SILT: with minor clay; light orange brown. Low plasticity. (Hinuera Formation)	D to M		
	1.2	Peak = 83kPa Residual = 55kPa							
			70.2			SW: Fine to medium SAND: with minor silt, with some fine gravel; dark brownish orange. Well graded; gravel, rounded. (Hinuera Formation)			10
									10
						... from 1.90m to 1.95m, Contains some pumice fine clasts, <2cm		D	10
				2		*... at 2.00m, Becoming gravelly fine to medium SAND; fine to medium gravel*			8
									11
									10
						Borehole terminated at 2.3 m			15
									20
									9
									6
				3					20
				4					
				5					

Termination Reason: Equipment refusal on dense to very dense sand and gravel.
Shear Vane No: 2955 DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA02)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021

Logged by: AMC	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 2.3m

HAND AUGER BOREHOLE LOG - HA03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 22/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463900.0mE; 685703.9mN Projection: Mount Eden 2000
Elevation: 71.40m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			71.4			OL: TOPSOIL: SILT: with some fine to medium sand; dark brown. (Topsoil)			
			71.2			ML: Gravelly SILT: with minor fine to medium sand, medium to coarse gravel; light brownish orange. Low plasticity. (Hinuera Formation)			
	0.3	Peak = UTP					D to M	H	
	0.6	Peak = UTP							
	0.9	Peak = UTP							
				1		Borehole terminated at 1.0 m			7, 6, 10, 10, 18, 20, 22
				2					
				3					
				4					
				5					

Termination Reason: Equipment refusal at 1m on coarse gravel. DCP refusal at 1.5m.
Shear Vane No: 2955 DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA03)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 22/06/2021

Logged by: AMC | Position: Refer to Site Plan | Hole Diameter: 30mm | Plant: Hand auger

Checked by:

Box 1: 0m to 1m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA04 A

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463985.6mE; 685972.6mN Projection: Mount Eden 2000
Elevation: 65.37m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
21-06-2021			65.4	0		OL: SILT: with some roots, with some fine to coarse gravel; dark brown. Low plasticity. (Uncontrolled Fill)	M to W		1
			65.3			GW: Silty Fine to coarse GRAVEL: dark brown. Well graded. (Uncontrolled Fill)	S	VD	22
						... from 0.18m to 0.20m, Fine sand, light white			
						Borehole terminated at 0.2 m			

Termination Reason: Equipment refusal at 0.2m on very dense gravel. DCP refusal at 0.3m.
Shear Vane No: DCP No: 7
Remarks: Perched water table at 0.1m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA04 B

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463971.6mE; 685980.8mN Projection: Mount Eden 2000
Elevation: 65.00m Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			65.0	0		OL: SILT: with some roots, with some fine to coarse gravel; dark brown. (Topsoil)			
			64.8			SW: Fine to coarse SAND: with trace fine gravel; dark orange brown. Well graded. (Hinuera Formation)	M to W		
				1			M	MD to D	6, 10, 6, 5, 4, 10, 12, 15, 6, 9, 14
				2		... at 2.00m, Becoming fine to coarse SAND with some fine to coarse gravel			
						Borehole terminated at 2.2 m			10, 20, 18, 24
				3					
				4					
				5					

Dynamic Cone Penetrometer (Blows/100mm): 5, 10, 15

Termination Reason: Equipment refusal at 2.2m on very dense gravelly sand. DCP refusal at 2.3m.
Shear Vane No: DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA04 C

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 21/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463975.2mE; 685964.4mN Projection: Mount Eden 2000
Elevation: 65.30m Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
21-06-2021 ▼			65.3			GW: Silty Fine to coarse GRAVEL: fine to coarse gravel; dark brown. (Uncontrolled Fill)	M to W / S	D to VD	6
						Borehole terminated at 0.2 m			20

Termination Reason: Equipment refusal at 0.2m on very dense gravel. DCP refusal at 0.3m.
Shear Vane No: DCP No: 7
Remarks: Perched water table at 0.1m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA04)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 21/06/2021

Logged by: AMC	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 2.2m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA05

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 23/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 463864.2mE; 686330.5mN Projection: Mount Eden 2000
Elevation: 68.20m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			68.2			OL: SILT with minor gravel: dark brown. No plasticity; gravel, fine to coarse. (Topsoil)			
	0.3	Peak = 88kPa Residual = 27kPa	67.9			ML: SILT: light brown. Low plasticity, moderately sensitive. (Hinuera Formation)		St	
	0.6	Peak = 59kPa Residual = 19kPa							
			67.4			SW: Fine to coarse SAND with trace silt: light brown. Well graded. (Hinuera Formation)	D to M		
				1				MD to D	
						... at 1.20m, contains some fine to coarse gravel; subangular to subrounded.			
						Borehole terminated at 1.6 m			
				2					
				3					
				4					
				5					

Dynamic Cone Penetrometer (Blows/100mm): 5, 10, 15

Dynamic Cone Penetrometer (Blows/100mm): 1, 2, 4, 4, 5, 9, 8, 4, 7, 8, 10, 7, 10, 9, 9, 14, 12, 16, 14, 9, 7, 3, 7, 8, 8, 9, 12, 15, 14, 9, 10, 6, 5, 4, 4, 8, 8, 7, 8, 6, 5, 6

Termination Reason: Refusal on coarse gravel. Hand auger spinning.
Shear Vane No: 2532 DCP No: 7
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.

Hand Auger PHOTOGRAPHS (HA05)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 23/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 1.6m

HAND AUGER BOREHOLE LOG - HA06

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464345.0mE; 686312.4mN Projection: Mount Eden 2000
Elevation: 66.35m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			66.3			OL: SILT: dark brown. Low plasticity. (Topsoil)			
			66.1			ML: SILT: with trace fine gravel; brown. Low plasticity. (Hinuera Formation)			
	0.3	Peak = UTP						H	
			65.8			ML: SILT: light grey. Low plasticity. (Hinuera Formation)			
	0.6	Peak = >230kPa Residual = 34kPa				... at 0.70m, Becoming mottled orange brown			4
			65.4			SP: Fine SAND: with minor silt; light grey. Poorly graded. (Hinuera Formation)		MD to D	4
				1					8
			65.2			SW: Fine to coarse SAND: with trace fine gravel; grey mottled brown. Well graded. (Hinuera Formation)			8
									8
							D to M	D	13
									13
									16
									10
								MD	5
									6
				2					15
								D	15
						... at 2.20m, Contains some fine to coarse pumiceous gravel.			14
						Borehole terminated at 2.7 m			
				3					
				4					
				5					

Termination Reason: Refusal on coarse gravel.
Shear Vane No: 2087 DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA06)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 14/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 2.7m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA07

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 06/07/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464352.8mE; 686366.5mN Projection: Mount Eden 2000
Elevation: 53.92m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			53.9			OL: Organic SILT with some gravel: dark brown. No plasticity; gravel, fine to medium. (Topsoil)			3, 4, 5, 5, 8
			53.4			SW: Fine to coarse SAND with trace silt and trace gravel: light greyish brown. Well graded; gravel, fine, pumiceous. (Uncontrolled Fill)			8, 5, 7, 5, 3, 4, 5, 7, 7, 7, 6, 6, 4, 3, 4, 4, 4, 4, 5, 4, 3, 3, 3, 4
			51.1			ML: SILT with minor sand: brown. Low plasticity; sand, fine to coarse. (Uncontrolled Fill)	M	MD	
	3.0	Peak = 115kPa Residual = 53kPa							
			50.7			ML: Sandy SILT: bluish grey. Low plasticity; sand, fine to coarse. (Hinuera Formation)		VSt to H	
	3.4	Peak = >230kPa Residual = 76kPa							
						Borehole terminated at 3.5 m			

Termination Reason: Refusal on dense silt.
Shear Vane No: 2087 DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA07)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 06/07/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 3.5m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA08

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 10/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464363.1mE; 686401.8mN Projection: Mount Eden 2000
Elevation: 45.59m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			45.6			ML: SILT: (Uncontrolled Fill)	D to M	MD to D	2, 2, 5, 7, 7, 7, 8, 6, 5, 6, 8
			45.3			ML: Sandy SILT: light white. (Uncontrolled Fill)			
			45.3			SW: Fine to coarse SAND: with trace fine to medium gravel; dark orange brown. Well graded, subrounded. (Uncontrolled Fill)			
			44.5	1		OL: Sandy SILT: with some rootlets; dark brownish black. (Topsoil)			9
			44.3			SP: Fine to medium SAND: with some silt; dark brownish grey. Poorly graded. (Hinuera Formation)			
			43.3	2		SP: Fine SAND: with some silt; greyish brown. Poorly graded. (Hinuera Formation)	M	TP	
						... at 2.50m, Silt becoming trace, sand light grey			
			42.0	3		SW: Fine to medium SAND: with trace silt; light brown. (Hinuera Formation)			
			41.7			SW: Fine to coarse SAND: with minor silt, with trace fine gravel; light brownish grey. gravel; pumiceous. (Hinuera Formation)	W		
				4		Borehole terminated at 4.2 m			
				5					

Termination Reason: Hole collapsing
Shear Vane No: DCP No: 7
Remarks: Groundwater not encountered. Hole collapse at 4.2m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA08)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 10/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 4.2m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA09

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464254.2mE; 686336.4mN Projection: Mount Eden 2000
Elevation: 67.21m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			67.2			OL: SILT: with some fine to coarse gravel; dark brown. Low plasticity. (Topsoil)			3
									3
									5
			66.9			ML: SILT: light grey mottled orange. Low plasticity, sensitive. (Hinuera Formation)			4
	0.4	Peak = >230kPa Residual = 34kPa							3
									5
	0.7	Peak = 119kPa Residual = 17kPa							3
								VSt	3
									4
	1.0	Peak = 152kPa Residual = 30kPa		1			M		3
									4
									5
			66.0			SW: Fine to coarse SAND: with minor silt; grey mottled brown. Well graded. (Hinuera Formation)			6
									16
									14
						... at 1.50m, Contains some fine to coarse gravel; pumiceous.			15
								D to VD	14
									13
									16
				2					19
						Borehole terminated at 2.2 m			
				3					
				4					
				5					

Termination Reason: Equipment refusal
Shear Vane No: 2087 DCP No: 7
Remarks: Groundwater not encountered. DCP refusal at 1.9m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA09)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 17/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 2.2m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA10

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 21/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464262.1mE; 686392.2mN Projection: Mount Eden 2000
Elevation: 55.36m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			55.4			OL: Organic SILT: dark brown. No plasticity. (Topsoil)			2, 2
			55.1	1		SW: Fine to coarse SAND with trace gravel: light brown. Well graded; gravel, fine. (Uncontrolled Fill)	M	MD	3, 5, 6, 4, 5, 4, 4, 4, 5, 6, 6, 6, 4, 4, 3, 5, 4
			53.4	2		ML: SILT with minor sand: dark brown to black. Low plasticity. (Uncontrolled Fill)			5
			53.3			SW: Silty fine to coarse SAND: dark brownish grey. Well graded. (Hinuera Formation)			5, 5, 7, 8, 8, 8
						... at 2.80m, becoming dark grey.	M to W	MD to D	5, 5, 4, 3, 3, 3, 3, 3
						... at 3.40m, contains medium to coarse sand.	S		4, 6, 18, 11, 13
				4		Borehole terminated at 4.0 m			11, 9, 11, 12, 15, 13, 11, 12
				5					

Termination Reason: Hole collapsing.
Shear Vane No: DCP No: 7
Remarks: Groundwater encountered at 3.4m.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA10)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 21/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 4m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA11

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 10/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464281.0mE; 686427.6mN Projection: Mount Eden 2000
Elevation: 49.50m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			49.5			OL: SILT: dark brown. Low plasticity. (Topsoil)			2, 2, 3
			49.2			SP: Fine to medium SAND: with trace silt; light brown. Poorly graded. (Taupo Pumice Alluvium)			3, 3, 4, 5, 4, 3, 3, 3, 4, 3, 4, 4, 4, 4
			47.8			SP: Fine SAND: with trace silt; light grey mottled orange brown. Poorly graded. (Taupo Pumice Alluvium)	M	VL to L	5, 2, 2, 3, 3, 3, 3, 3, 1, 2, 2, 2, 1
			46.4			SM: Silty Fine SAND: grey. Poorly graded. (Hinuera Formation)	M to W		2, 2, 3
			45.6			SM: Silty Fine to coarse SAND: grey. Well graded. (Hinuera Formation)	W		16, 20
						Borehole terminated at 4.0 m	S	VD	20

Termination Reason: Equipment refusal
Shear Vane No: DCP No: 7
Remarks: Groundwater not encountered. DCP refusal at 3.4m. Hand auger refusal at 4m on very dense sand.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA11)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 10/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 4m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA12

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464170.8mE; 686343.5mN Projection: Mount Eden 2000
Elevation: 67.73m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			67.7			OL: SILT: with minor fine to coarse gravel; dark brown. Low plasticity. (Topsoil)			2
									3
			67.4						4
						SW: Fine to coarse SAND: with some fine to coarse gravel; greyish brown. Well graded. (Hinuera Formation)	M	MD	4
						Borehole terminated at 0.8 m			
				1					
				2					
				3					
				4					
				5					

Dynamic Cone Penetrometer (Blows/100mm): 5, 10, 15

Termination Reason: Equipment refusal on dense gravel
Shear Vane No: DCP No: 7
Remarks: Groundwater not encountered. Hand auger refusal at 0.8m on coarse gravel.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA12)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 17/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 0.8m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA13

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 10/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464164.5mE; 686403.9mN Projection: Mount Eden 2000
Elevation: 56.09m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			56.1			ML: SILT: dark brown. (Uncontrolled Fill)			3
			55.9			SP: Fine to medium SAND: dark greyish brown. Poorly graded, subangular to subrounded. (Uncontrolled Fill)		MD	6, 6, 6, 7, 7
			55.6			SW: Fine to medium SAND: with minor fine to coarse gravel; dark orange brown. Well graded, subangular to subrounded. (Uncontrolled Fill)			11, 20
			55.2	1		SP: Silty Fine to medium SAND: with trace fine to coarse gravel; dark brownish brown. Poorly graded. (Uncontrolled Fill)			
			54.8			SP: Silty Fine to medium SAND: with trace rootlets; dark brown to dark bluish black. Poorly graded. (Uncontrolled Fill) *... at 1.30m, Glass fragment*	M	TP	
			54.3			SP: Fine to medium SAND: with some silt, trace fine to coarse gravel; dark grey. (Uncontrolled Fill)			
			54.1	2		OL: Sandy SILT: dark brownish black. Low plasticity. (Topsoil)			
			54.0			SP: Fine to medium SAND: with some silt; dark brownish grey. (Hinuera Formation)		TP	
				3			M to W		
						Borehole terminated at 3.5 m			
				4					
				5					

Termination Reason: Equipment refusal
Shear Vane No: DCP No: 17
Remarks: Groundwater not encountered. DCP refusal at 0.7m. Hand auger refusal at 3.5m on coarse gravel.

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

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Hand Auger PHOTOGRAPHS (HA13)

Client: Powerup Business Consulting Ltd

Project: Wordsworth Street Development, Cambridge

Location: 49 Maungatautiri Road, Cambridge

Project No: HAM2021-0032

Date: 10/06/2021

Logged by: AS	Position: Refer to Site Plan	Hole Diameter: 30mm	Plant: Hand auger
Checked by:			

Box 1: 0m to 3.5m

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HA14

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 15/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AMC Scale: 1:25 Sheet 1 of 1

Position: 464185.4mE; 686450.6mN Projection: Mount Eden 2000
Elevation: 50.70m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			50.7			OL: SILT: dark brown. (Topsoil)	D		2, 3, 4, 3
			50.3			SP: Fine to medium SAND: with minor silt; light greyish brown mottled reddish brown. Poorly graded. (Taupo Pumice Alluvium)	M	L to MD	4, 3, 4, 5, 6, 6, 10, 8, 9, 5, 4, 5, 4, 4, 4, 5, 5, 5, 7, 5, 4, 4, 4, 5, 4, 5, 6, 6, 7, 5, 5, 5, 5, 4, 5, 7, 7, 6, 6, 5, 4
			49.1			SP: Fine SAND: with minor silt; light grey. Poorly graded. (Taupo Pumice Alluvium)	M to W		3, 3, 3, 3
				5		Borehole terminated at 5.0 m			

Termination Reason: Target depth
Shear Vane No: DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Soil Description

Log Identification: HA01

Investigation method	Geological Unit	Field Description	Depth (metres)
HAND AUGER	T/S	TOPSOIL. Dark brownish black, dry.	0.0
	POSSIBLE FILL	SILT. Brown, loose, dry-moist.	0.5
		Gravelly SAND with some silt. Brown, very loose-loose, dry-moist.	1.0
	HINUERA FORMATION	Gravelly SAND. Light brownish grey, loose-dense, dry-moist.	1.5
		Below 1.9m, moist.	2.0
		Below 2.3m, wet.	2.5
		End of borehole at 2.4m - Obstruction (large gravel).	3.0
			3.5
			4.0
			4.5
			5.0
			5.5

Field Test Data

Undrained Shear Strength (kPa) Peak / Residual	Scala Penetrometer (blows per 100mm drop)		Groundwater Level
	Blow count	Plot of Scala results (Very loose / Loose / Medium Dense / Dense / Dense)	
	4 2 3 2 2		NOT ENCOUNTERED DURING DRILLING
	2 2 3 3 2		
	1 1 2 4 5		
	6 6 8 7 5		
	7 2 3 5 5		
	5 8 12 10		

Notes:
1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "*Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*", December 2005.
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "*Guideline for Hand Held Shear Vane Test*", August 2001.
4. Scala Penetrometer testing (where reported) has been carried out in general accordance with NZS 4402 Test 6.5.2.

BCD GEOTECH

Job name: Rider Residence	**Job Number:** 15-671
Site location: 37 Maungatautari Road, Cambridge	**Shear Vane ID:** 1791
	Logged By: C.D.
Date of investigation: 01-10-2015	**Checked By:** J.H.

Document Set ID: 6159798
Version: 1, Version Date: 27/04/2016

Soil Description

Log Identification: HA02

Investigation method	Geological Unit	Field Description	Depth (metres)
HAND AUGER	TS	TOPSOIL: Dark brownish black, dry.	0.0
	POSSIBLE FILL	SILT: Brown, very loose-medium dense, dry-moist. Below 0.5m, some gravel.	0.5
		Gravelly SAND: Brown, very loose-loose, moist.	1.0
	H FMN	Gravelly SAND: Light brownish grey, medium dense-dense, moist.	1.5
		End of borehole at 2.2m - Obstruction (gravel).	2.0
			2.5
			3.0
			3.5
			4.0
			4.5
			5.0
			5.5

Field Test Data

Undrained Shear Strength (kPa) Peak / Residual

Scala Penetrometer (blows per 100mm drop)

Blow count: 2 2 2 2 3 | 3 3 2 4 1 | 1 1 2 3 3 | 4 7 7 7 7 | 5 8 5 5 5 | 3 1 3 4

Plot of Scala results: Very loose | Loose | Medium Dense | Dense (0 1 2 3 4 5 6 7 8 9 10)

Groundwater Level: NOT ENCOUNTERED DURING DRILLING

Notes:
1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "*Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*", December 2005
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "*Guideline for Hand Held Shear Vane Test*", August 2001.
4. Scala Penetrometer testing (where reported) has been carried out in general accordance with NZS 4402 Test 6.5.2.

BCD GROUP

Job name: Rider Residence	**Job Number:** 15-671
Site location: 37 Maungatautari Road, Cambridge	**Shear Vane ID:** 1791
	Logged By: C.D.
Date of investigation: 01-10-2015	**Checked By:** J.M.

Document Set ID: 6159798
Version: 1, Version Date: 27/04/2016

Soil Description

Log Identification: HA03

Investigation method	Geological Unit	Field Description	Depth (meters)
HAND AUGER	T/S	TOPSOIL. Dark brownish black, dry.	
	POSSIBEL FILL	SILT with minor gravel. Brown, very loose-loose, moist.	0.5
	HINUERA FORMATION	Gravelly SAND. Brown, loose-mediumd dense, moist.	1.0
		Below 1.4m, moist-wet.	1.5
		Below 1.8m, minor SILT.	2.0
		End of borehole at 2.6m - Continual collapse.	2.5
			3.0
			3.5
			4.0
			4.5
			5.0
			5.5

Field Test Data

Undrained Shear Strength (kPa) Peak / Residual

Scala Penetrometer (blows per 100mm drop)

Blow count

Plot of Scala results: Very loose, Loose, Medium Dense, Dense (0 1 2 3 4 5 6 7 8 9 10)

Groundwater Level: NOT ENCOUNTERED DURING DRILLING

Notes:
1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "*Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*", December 2005.
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "*Guideline for Hand Held Shear Vane Test*", August 2001.
4. Scala Penetrometer testing (where reported) has been carried out in general accordance with NZS 4402 Test 6.5.2.

BCD GROUP

Job name:	**Rider Residence**	**Job Number:**	**15-671**
Site location:	**37 Maungatautari Road, Cambridge**	**Shear Vane ID:**	**1791**
		Logged By:	**B.M.**
Date of investigation:	**01-10-2015**	**Checked By:**	J.H.

Soil Description

Log Identification: HA04

Investigation method	Geological Unit	Field Description	Depth (metres)
HAND AUGER	TS	TOPSOIL: Dark brownish black, dry.	0.0
	POSSIBLE FILL	SILT with trace clay. Brown, loose, moist.	0.3
		Sandy SILT with some gravel.	0.5
	HINUERA FORMATION	Gravelly SAND. Greyish brown, very loose-medium dense, moist.	1.0
		Silty SAND with some gravel. Greyish brown, very loose, moist-wet.	1.5
		Gravelly SAND. Greyish brown, loose, moist-wet.	2.0
		Silty SAND with some gravel. Brownish grey, very loose-loose, wet.	2.5
		Gravelly SAND with minor silt. Brownish grey, loose, wet.	3.0
		End of borehole at 3.0m - Target depth.	3.5
			4.0
			4.5
			5.0
			5.5

Field Test Data

Undrained Shear Strength (kPa) Peak / Residual	Scala Penetrometer (blows per 100mm drop) Blow count	Plot of Scala results (Very Loose / Loose / Medium Dense / Dense)	Groundwater Level
	3 2 2 2 2		NOT ENCOUNTERED DURING DRILLING
	2 3 2 3 4		
	4 5 4 5 3		
	2 1 0.5 0.5 2		
	2 2 3 2 1		
	1 1 3 2		

Notes:
1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "*Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes*", December 2005
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "*Guideline for Hand Held Shear Vane Test*", August 2001.
4. Scala Penetrometer testing (where reported) has been carried out in general accordance with NZS 4402 Test 6.5.2

BCD GROUP

Job name: Rider Residence
Site location: 37 Maungatautari Road, Cambridge
Date of investigation: 01-10-2015

Job Number: 15-671
Shear Vane ID: 1791
Logged By: B.M.
Checked By: J.H.

Document Set ID: 6159879
Version: 1, Version Date: 27/04/2016

APPENDIX E

Soakage Test Logs and Results

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS01

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463809.0mE; 684754.0mN Projection: Mount Eden 2000
Elevation: 75.36m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			75.4	0		OL: SILT: with some fine sand; dark brown. (Topsoil)			2
			75.2						3
	0.3	Peak = 87kPa Residual = 46kPa				ML: Clayey SILT: with minor fine sand; light brownish orange. Low plasticity, insensitive. (Hinuera Formation)		St	3 3 3
			74.9			SW: Gravelly Fine to coarse SAND: fine to medium gravel; light brownish orange. Well graded; gravel, subangular to subrounded. (Hinuera Formation)	D		3 3
				1				L	3 3 3 3 3
						Borehole terminated at 1.0 m			5 7 8 6 8 7 8 5 5 2
				2					3 4 9 11 9 6 4 4 4 5
				3					
				4					
				5					

Termination Reason: Dry hole collapse in loose sand.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge** **49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS01**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	1.64	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.64	m

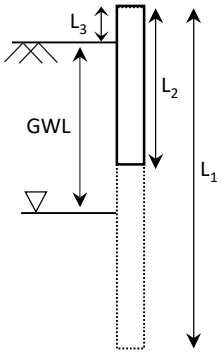
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.00 m BGL



Hydraulic Conductivity (k)

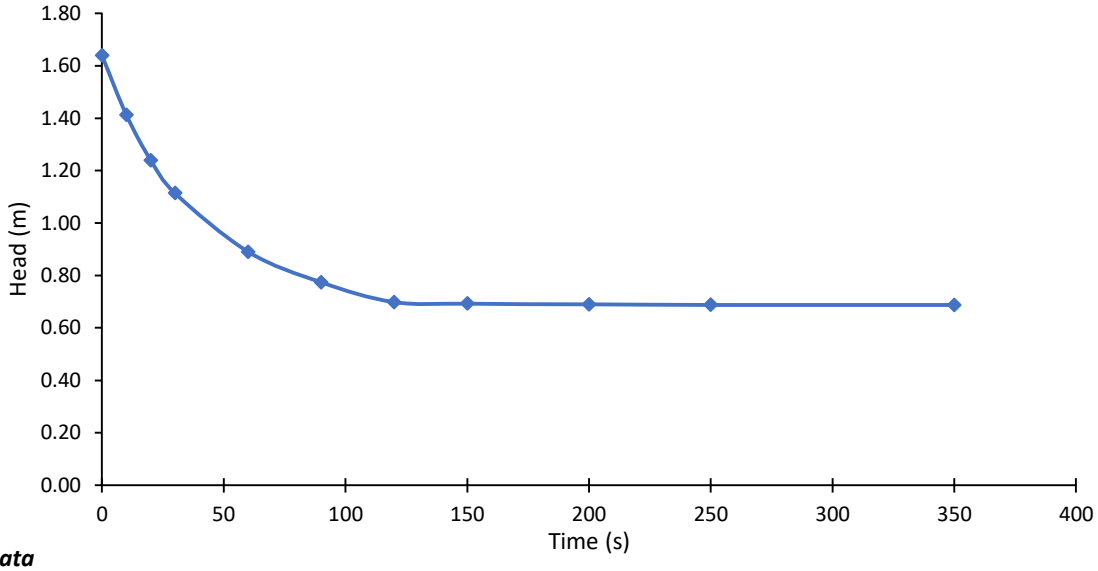
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

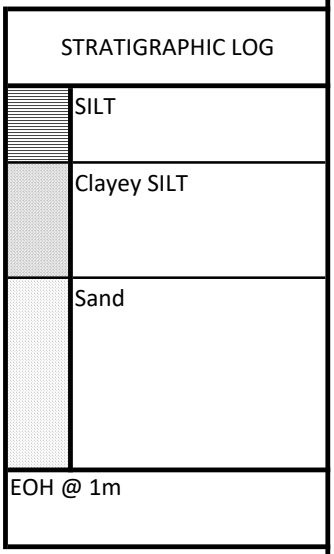
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.03E-04 ms^{-1} = 8.92 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L} ln\frac{H_1}{H_2} =$$ 1.54E-05 ms^{-1} = 1.33 m/day





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	1.640				
10	0.228	1.412	1.526		3.50E-05	2.85E-04
20	0.400	1.240	1.326		3.36E-05	2.47E-04
30	0.526	1.114	1.177		3.01E-05	2.02E-04
60	0.749	0.891	1.002		2.33E-05	1.40E-04
90	0.866	0.774	0.832		1.67E-05	8.74E-05
120	0.942	0.698	0.736		1.32E-05	6.33E-05
150	0.947	0.693	0.696		9.95E-07	4.57E-06
200	0.950	0.690	0.691		3.83E-07	1.75E-06
250	0.952	0.688	0.689		1.87E-07	8.52E-07
350	0.953	0.687	0.688		5.26E-08	2.40E-07

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS02

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463784.2mE; 685057.1mN Projection: Mount Eden 2000
Elevation: 74.51m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			74.5			OL: SILT: with some fine sand; dark brown. (Topsoil)			2
			74.3			ML: Clayey SILT: with some fine sand; light brownish orange. Low plasticity, moderately sensitive. (Hinuera Formation)			2
	0.3	Peak = 99kPa Residual = 46kPa							2
						... at 0.50m, Contains some fine to medium gravel	D	St	3
									3
									3
			73.8			SW: Gravelly Fine to coarse SAND: fine to coarse gravel; dark greyish brown. Well graded; gravel, subangular to subrounded. (Hinuera Formation)			3
								L	3
									3
				1		Borehole terminated at 1.0 m			8
				2					
				3					
				4					
				5					

Termination Reason: Equipment refusal on gravel.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS02**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	1	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

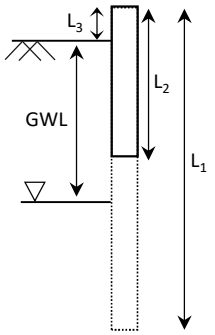
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.00 m BGL



Hydraulic Conductivity (k)

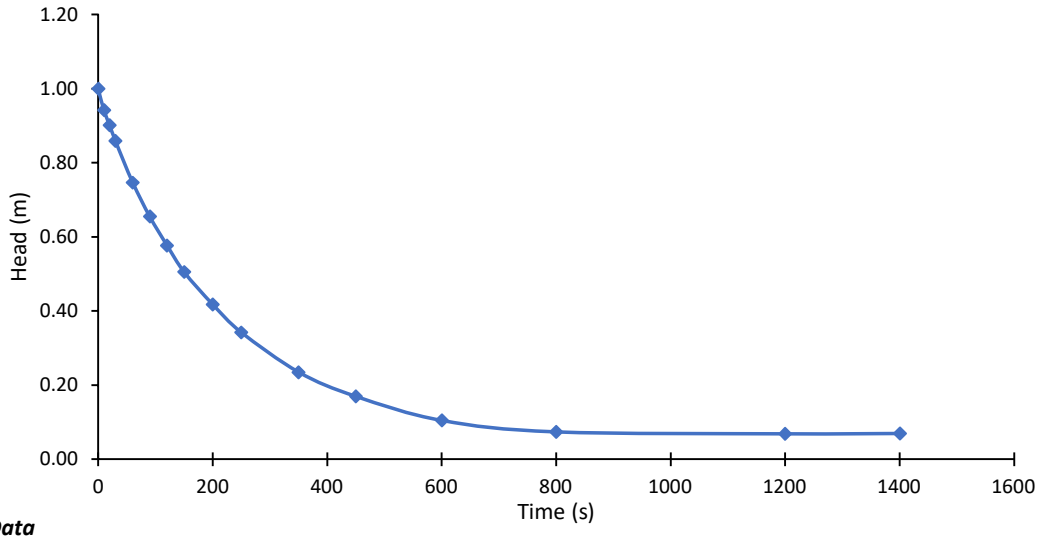
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

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

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right).\frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 6.25E-05 ms^{-1} = 5.40 m/day

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

$$k = \frac{d^2\, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{\quad} ln\frac{H_1}{\quad} =$$ 1.76E-05 ms^{-1} = 1.52 m/day



STRATIGRAPHIC LOG

- Topsoil
- Clayey SILT
- SAND

EOH @ 1m

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	1.000				
10	0.058	0.942	0.971		1.91E-05	1.11E-04
20	0.099	0.901	0.922		1.47E-05	8.27E-05
30	0.141	0.859	0.880		1.66E-05	9.01E-05
60	0.253	0.747	0.803		1.70E-05	8.66E-05
90	0.345	0.655	0.701		1.73E-05	8.03E-05
120	0.423	0.577	0.616		1.82E-05	7.71E-05
150	0.495	0.505	0.541		2.07E-05	8.04E-05
200	0.582	0.418	0.461		1.95E-05	6.80E-05
250	0.658	0.342	0.380		2.28E-05	7.00E-05
350	0.765	0.235	0.289		2.48E-05	6.47E-05
450	0.831	0.169	0.202		2.54E-05	5.30E-05
600	0.895	0.105	0.137		2.86E-05	4.84E-05
800	0.926	0.074	0.089		1.74E-05	2.30E-05
1200	0.931	0.069	0.071		1.89E-06	2.19E-06
1400	0.931	0.069	0.069		-3.77E-07	-4.29E-07

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HAND AUGER BOREHOLE LOG - HAS03

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463379.5mE; 685339.9mN Projection: Mount Eden 2000
Elevation: 71.32m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			71.3			OL: SILT: with some fine sand; dark brown. (Topsoil)			1
			71.1			ML: Clayey SILT: with some fine sand; light brownish orange. Low plasticity, moderately sensitive. (Hinuera Formation)			2
	0.3	Peak = 87kPa Residual = 32kPa					D	St	2
						... at 0.50m, Contains some fine to coarse gravel			3
									3
			70.7						4
						SW: Gravelly Fine to coarse SAND: medium to coarse gravel, trace clayey silt; light greyish brown. Well graded. (Hinuera Formation)			3
						... from 0.60m to 0.65m, Contains trace clayey SILT		L	2
						... at 0.70m, Poor recovery			3
						Borehole terminated at 0.9 m			3
				1					4
									4
				2					
				3					
				4					
				5					

Termination Reason: Dry hole collapse in loose sand.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS03**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	0.95	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:	0.05	m

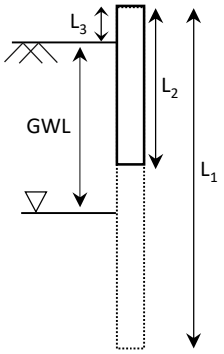
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 0.90 m BGL



Hydraulic Conductivity (k)

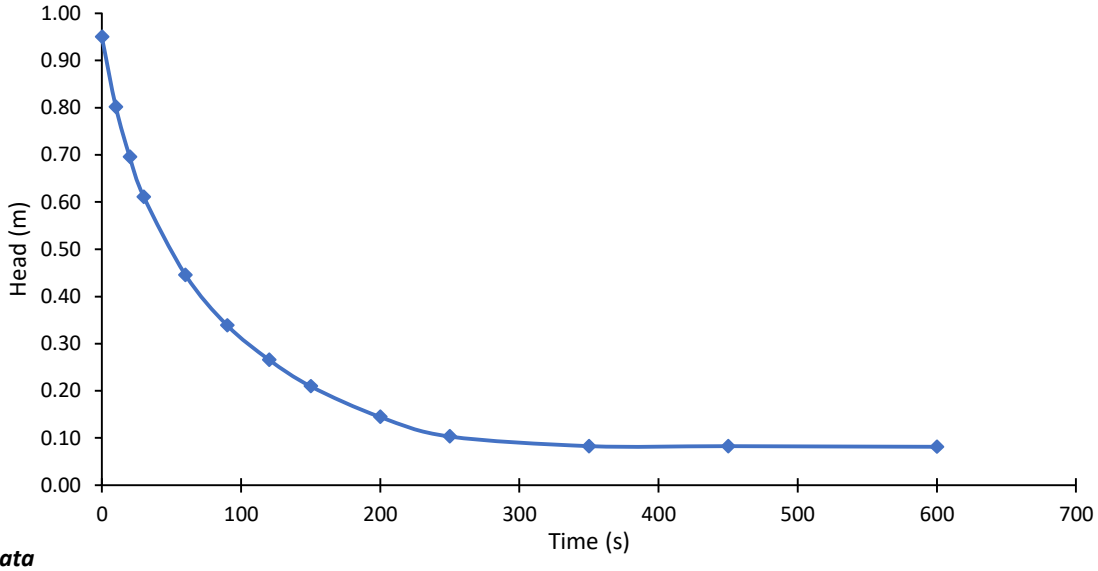
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

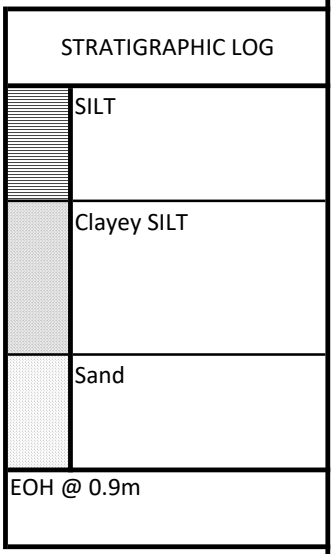
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.68E-04 ms^{-1} = 14.55 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L} ln\frac{H_1}{H_2} =$$ 5.20E-05 ms^{-1} = 4.50 m/day





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	0.950				
10	0.149	0.801	0.876		5.84E-05	3.18E-04
20	0.254	0.696	0.749		5.38E-05	2.61E-04
30	0.339	0.611	0.654		5.38E-05	2.38E-04
60	0.504	0.446	0.529		4.97E-05	1.92E-04
90	0.611	0.339	0.392		5.15E-05	1.62E-04
120	0.684	0.266	0.303		5.18E-05	1.38E-04
150	0.740	0.210	0.238		5.76E-05	1.32E-04
200	0.805	0.145	0.177		6.08E-05	1.18E-04
250	0.846	0.104	0.124		6.13E-05	9.68E-05
350	0.867	0.083	0.093		2.15E-05	2.89E-05
450	0.867	0.083	0.083		7.29E-07	9.17E-07
600	0.868	0.082	0.082		5.72E-07	7.17E-07

Document Set ID: 11598798
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HAND AUGER BOREHOLE LOG - HAS04

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 16/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:50 Sheet 1 of 1

Position: 463727.3mE; 685532.1mN Projection: Mount Eden 2000
Elevation: 71.64m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
	0.3	Peak = 87kPa Residual = 26kPa	71.6	0		OL: SILT: with some fine to medium sand, trace fine gravel; dark brown. (Topsoil)	D		4
			71.4			ML: Sandy SILT: fine sand, with minor clay; light brownish orange. Low plasticity, moderately sensitive. (Hinuera Formation)		St	3 3
			71.2			SP: Silty Fine SAND: light brownish orange. Poorly graded. (Hinuera Formation)			4
			71.1			SP: Fine to coarse SAND: light brownish orange. Poorly graded. (Hinuera Formation)		VL to L	2 1 2 2
			70.6	1		SW: Fine to coarse SAND: with some fine to coarse gravel; light brownish white. Well graded. (Hinuera Formation) *... at 1.20m, Becoming orange brown*	D to M	L to MD	3 3 5 7 5 5 8 7 9 14
						Borehole terminated at 1.7 m			4 4 9 8 6 7 7 7 6 7 5 5
				2					
				3					
				4					
				5					
				6					
				7					
				8					
				9					
				10					

Termination Reason: Equipment refusal on gravel.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	4
	TITLE: **Falling Head Permeability Test - HAS04**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	1.7	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:	0	m

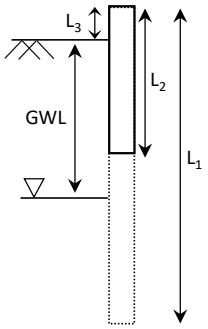
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.70 m BGL



Hydraulic Conductivity (k)

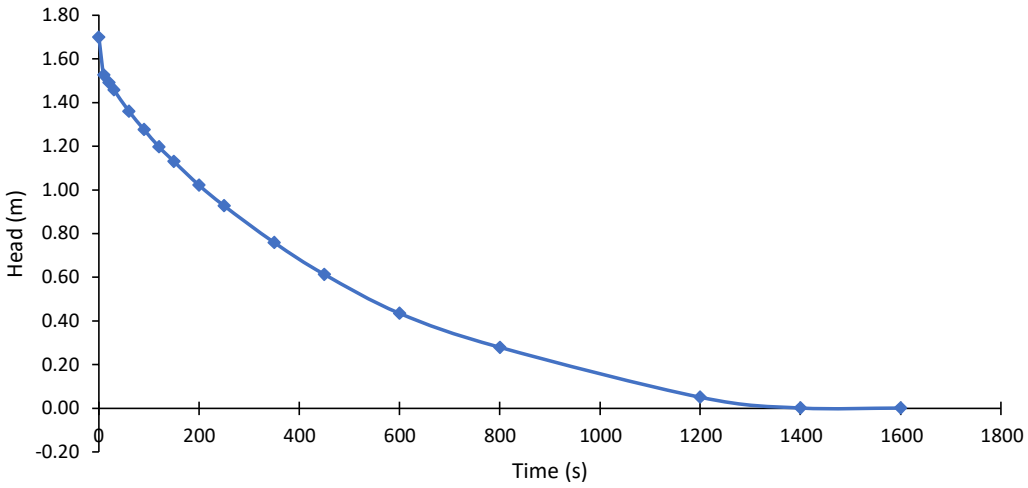
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

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

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 5.64E-05 ms^{-1} = 4.87 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L} ln\frac{H_1}{H_2} =$$ 7.68E-06 ms^{-1} = 0.66 m/day



STRATIGRAPHIC LOG

- SILT
- sandy SILT
- Sand
- Sand with gravel

#N/A

EOH @ 1.7m

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	1.700				
10	0.173	1.527	1.613		2.42E-05	2.05E-04
20	0.208	1.492	1.509		5.36E-06	4.31E-05
30	0.242	1.459	1.475		5.49E-06	4.35E-05
60	0.339	1.361	1.410		5.71E-06	4.37E-05
90	0.423	1.277	1.319		5.49E-06	4.01E-05
120	0.502	1.198	1.237		5.82E-06	4.05E-05
150	0.570	1.130	1.164		5.47E-06	3.63E-05
200	0.678	1.022	1.076		6.01E-06	3.78E-05
250	0.772	0.928	0.975		6.16E-06	3.61E-05
350	0.941	0.759	0.844		7.09E-06	3.76E-05
450	1.087	0.613	0.686		8.58E-06	3.93E-05
600	1.265	0.435	0.524		1.09E-05	4.21E-05
800	1.421	0.279	0.357		1.31E-05	3.95E-05
1200	1.650	0.050	0.165		3.60E-05	8.76E-05
1400	1.699	0.001	0.026		2.12E-04	1.72E-04
1600	1.699	0.001	0.001		-1.74E-05	-8.51E-07

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HAND AUGER BOREHOLE LOG - HAS05

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 17/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463465.2mE; 685564.2mN Projection: Mount Eden 2000
Elevation: 78.00m Datum: Moturiki Survey Source: Hand Held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			78.0			TOPSOIL: SILT: with some fine sand; dark brown. (Topsoil)			1
			77.8						2
	0.3	Peak = 46kPa Residual = 29kPa				ML: Sandy SILT: with minor clay; light brownish orange. Low plasticity, insensitive. (Hinuera Formation)		St	2
									2
			77.5						5
						SP: Fine SAND: light brown. Poorly graded. (Hinuera Formation)	D		2
									2
									2
				1				VL	2
									1
									2
			76.9			SW: Gravelly Fine to coarse SAND: light brownish orange. Well graded. (Hinuera Formation)			3
						... at 1.20m, Contains some fine to coarse gravel		MD	6
									6
						Borehole terminated at 1.4 m			5
									7
									12
				2					10
									11
									10
				3					
				4					
				5					

Termination Reason: Hole collapse in dry gravelly sand.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS05**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	1.4	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

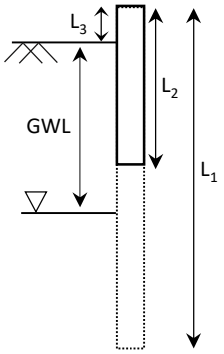
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.40 m BGL



Hydraulic Conductivity (k)

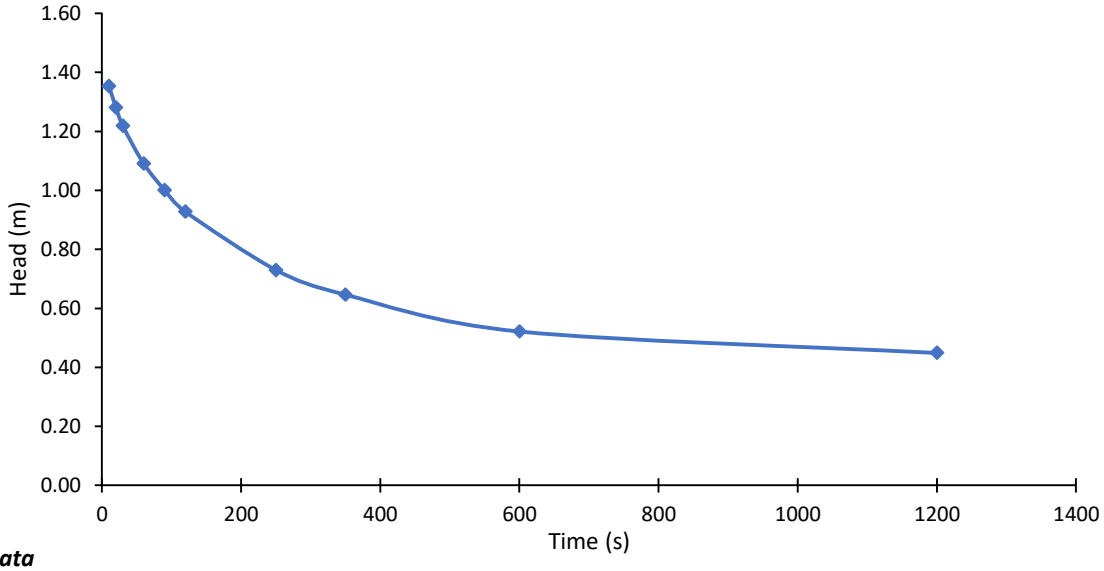
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

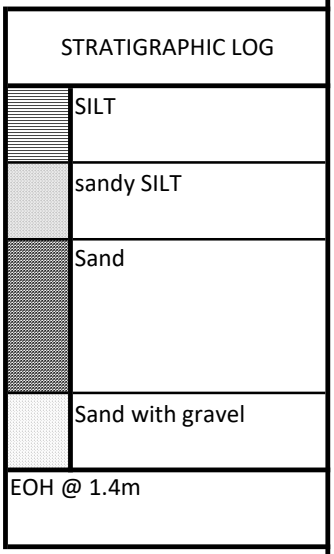
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 4.97E-05 ms^{-1} = 4.29 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{2L} ln\frac{H_1}{\quad} =$$ 7.98E-06 ms^{-1} = 0.69 m/day





Data

Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)		Hvorslev 'k' Case G (ms^{-1})	CIRIA 113 'k' (ms^{-1})
0						
10	0.046	1.354				
20	0.120	1.280	1.317		1.45E-05	1.05E-04
30	0.182	1.218	1.249		1.35E-05	9.44E-05
60	0.310	1.090	1.154		1.05E-05	6.95E-05
90	0.400	1.000	1.045		8.75E-06	5.38E-05
120	0.472	0.928	0.964		8.11E-06	4.71E-05
250	0.670	0.730	0.829		6.57E-06	3.45E-05
350	0.753	0.647	0.688		4.88E-06	2.23E-05
600	0.879	0.521	0.584		3.84E-06	1.57E-05
1200	0.951	0.449	0.485		1.24E-06	4.48E-06

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS06

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 16/06/2021 - 17/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463748.8mE; 685901.6mN Projection: Mount Eden 2000
Elevation: 71.34m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			71.3	0		TOPSOIL: SILT: with some fine sand; dark brown. (Topsoil)	D	VL to L	3, 3
			71.1			SP: Silty Fine SAND: fine sand; light brownish orange. Poorly graded, low plasticity. (Hinuera Formation)			5, 2, 2, 2, 2, 2, 1
			70.4	1		GW: Sandy Fine to coarse GRAVEL: with some fine to coarse sand; light brownish grey. Well graded, subangular to subrounded. (Hinuera Formation)			2, 5, 6, 9, 9, 15, 6, 4, 3, 5, 6, 7, 6, 6, 6, 7, 6, 8, 8, 5, 6
				2		Borehole terminated at 0.9 m			
				3					
				4					
				5					

Termination Reason: Dry hole collapse in loose to very loose gravel.
Shear Vane No: DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS06**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	0.9	m
Diameter:	90	mm
Non-Perm L_2:	0	m
Above Gnd L_3:	0	m

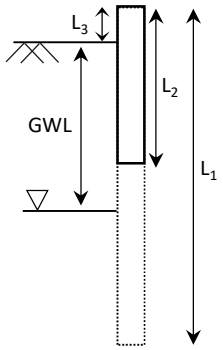
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 0.90 m BGL



Hydraulic Conductivity (k)

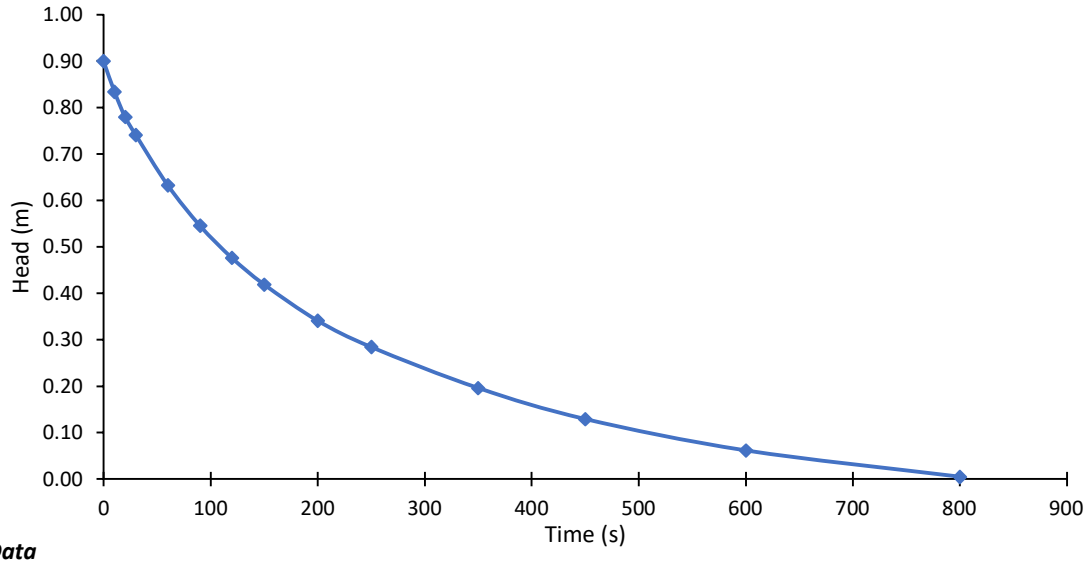
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

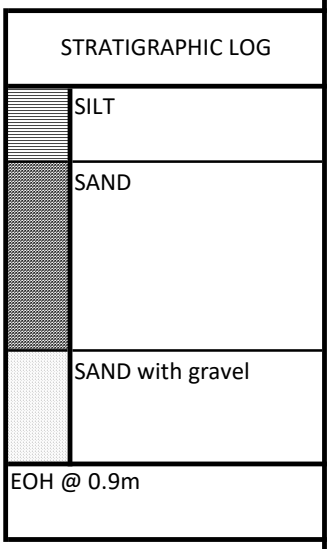
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 9.02E-05 ms^{-1} = 7.80 m/day

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

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L \ln\frac{H_1}{H_2}} =$$ 2.31E-05 ms^{-1} = 1.99 m/day





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	0.900				
10	0.066	0.834	0.867		2.63E-05	1.41E-04
20	0.120	0.780	0.807		2.44E-05	1.24E-04
30	0.159	0.741	0.760		1.94E-05	9.49E-05
60	0.268	0.632	0.687		2.13E-05	9.73E-05
90	0.354	0.546	0.589		2.18E-05	8.95E-05
120	0.424	0.476	0.511		2.19E-05	8.17E-05
150	0.481	0.419	0.448		2.23E-05	7.59E-05
200	0.559	0.341	0.380		2.35E-05	7.23E-05
250	0.616	0.284	0.313		2.31E-05	6.24E-05
350	0.704	0.196	0.240		2.69E-05	6.25E-05
450	0.771	0.129	0.163		3.49E-05	6.47E-05
600	0.838	0.062	0.096		4.84E-05	6.90E-05
800	0.895	0.005	0.033		1.38E-04	1.27E-04

Document Set ID: 11598798
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HAND AUGER BOREHOLE LOG - HAS07

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 16/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463949.7mE; 686122.3mN Projection: Mount Eden 2000
Elevation: 69.17m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			69.2			SILT: with some fine to coarse sand, with minor fine gravel; dark brown. (Topsoil)			1, 2
			69.0			ML: Sandy SILT: with minor clay; light brownish orange. Low plasticity. (Hinuera Formation)			3
	0.3	Peak = UTP							2
							D	St	2
	0.6	Peak = UTP							1
						... at 0.60m, Contains minor fine to medium gravel			2
						... at 0.70m, Contains fine to coarse gravel, up to 8cm			2
			68.4			SW: Gravelly Fine to coarse SAND: fine to coarse gravel; light orange brown. Well graded. (Hinuera Formation)		L to MD	7
				1		Borehole terminated at 0.9 m			7
									12
									28
				2					
				3					
				4					
				5					

Termination Reason: Equipment refusal at 0.9m. DCP refusal at 1.1m.
Shear Vane No: 2993 DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences

CLIENT:	Powerup Business Consulting Ltd
PROJECT:	Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge
TITLE:	Falling Head Permeability Test - HAS07

DESIGNER:	AMC
CHECKED:	JCW
REVISION:	0
DATE:	25/06/2021
PROJECT:	HAM2021-0032

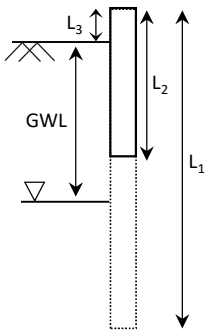
Specifications - Open-Ended Tube

Length L_1: 0.9 m
Diameter: 90 mm
Non-Perm L_2: m
Above Gnd L_3: m

Ground Conditions

GWL: m BGL (Blank = Bottom of hole)
Permeability Anisotropy
m: 1 $m = \sqrt{k_h / k_v}$

Bottom of Test Hole: 0.90 m BGL



Hydraulic Conductivity (k)

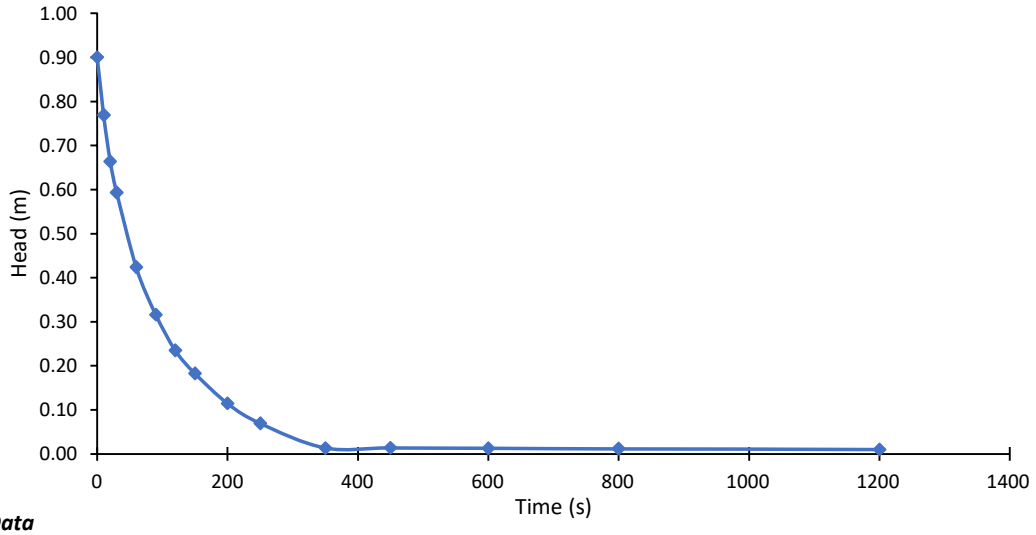
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

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

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) . \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.91E-04 ms^{-1} = 16.46 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{\quad} ln\frac{H_1}{\quad} =$$ 7.64E-05 ms^{-1} = 6.60 m/day



STRATIGRAPHIC LOG

- SILT
- Sandy SILT
- SAND with gravel

EOH @ 0.9m

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	0.900				
10	0.131	0.769	0.834		5.59E-05	2.94E-04
20	0.237	0.663	0.716		5.77E-05	2.72E-04
30	0.307	0.593	0.628		4.80E-05	2.06E-04
60	0.477	0.424	0.508		5.43E-05	2.05E-04
90	0.584	0.316	0.370		5.68E-05	1.72E-04
120	0.665	0.235	0.275		6.69E-05	1.68E-04
150	0.717	0.183	0.209		6.39E-05	1.35E-04
200	0.785	0.115	0.149		8.10E-05	1.43E-04
250	0.831	0.069	0.092		9.99E-05	1.36E-04
350	0.887	0.013	0.041		1.79E-04	1.75E-04
450	0.886	0.014	0.014		-4.14E-06	-1.67E-06
600	0.887	0.013	0.013		6.21E-06	2.46E-06
800	0.888	0.012	0.012		4.60E-06	1.71E-06
1200	0.890	0.010	0.011		5.26E-06	1.76E-06

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS08

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 464031.1mE; 686389.2mN Projection: Mount Eden 2000
Elevation: 69.12m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			69.1			OL: SILT: dark brown. Low plasticity. (Topsoil)			
			68.7			ML: SILT: with trace fine sand; brown. Low plasticity, extra sensitive to sensitive. (Hinuera Formation)			
	0.6	Peak = 102kPa Residual = 10kPa							
	0.9	Peak = 119kPa Residual = 17kPa		1			D to M	VSt	
	1.2	Peak = 129kPa Residual = 30kPa							
			67.7			SW: Fine to coarse SAND: with minor silt, with minor fine to coarse gravel; Well graded, subangular to subrounded. (Hinuera Formation)		TP	
						Borehole terminated at 1.8 m			
				2					
				3					
				4					
				5					

No photos available

Termination Reason: Refusal on coarse gravel
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge** **49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS08**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	1.8	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

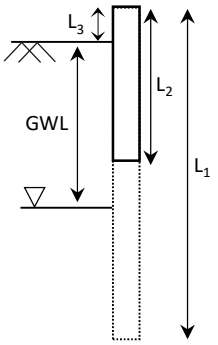
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.80 m BGL



Hydraulic Conductivity (k)

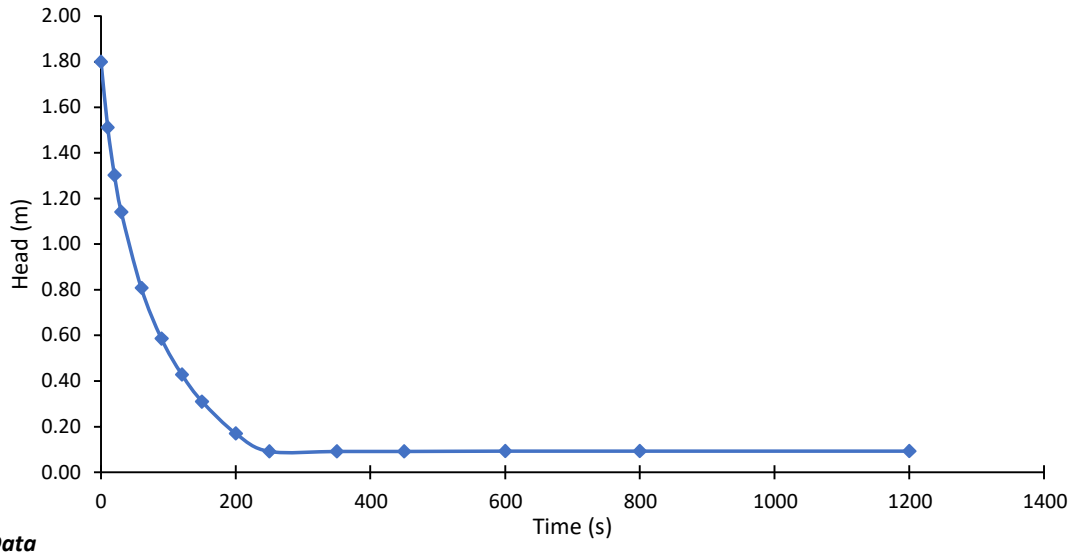
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

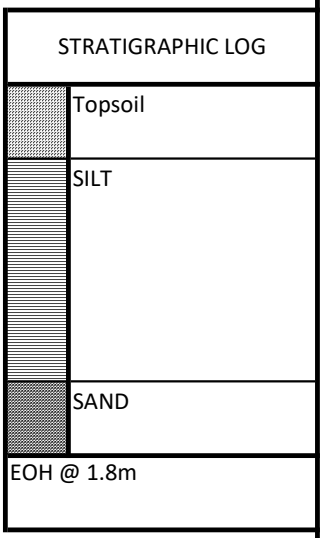
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.06E-04 ms^{-1} = 17.80 m/day

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

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{2L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$ 5.03E-05 ms^{-1} = 4.35 m/day





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	1.800				
10	0.288	1.512	1.656		3.85E-05	3.34E-04
20	0.498	1.302	1.407		3.69E-05	2.83E-04
30	0.658	1.142	1.222		3.60E-05	2.49E-04
60	0.993	0.807	0.975		3.69E-05	2.20E-04
90	1.215	0.585	0.696		4.27E-05	2.00E-04
120	1.372	0.428	0.507		5.05E-05	1.90E-04
150	1.490	0.310	0.369		6.28E-05	1.91E-04
200	1.630	0.170	0.240		8.67E-05	2.07E-04
250	1.709	0.091	0.130		1.12E-04	1.88E-04
350	1.708	0.092	0.091		-5.40E-07	-7.16E-07
450	1.708	0.092	0.092		0.00E+00	0.00E+00
600	1.708	0.092	0.092		-5.00E-07	-6.65E-07
800	1.707	0.093	0.093		-3.19E-07	-4.26E-07
1200	1.707	0.093	0.093		-2.65E-08	-3.54E-08

Document Set ID: 11598798
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HAND AUGER BOREHOLE LOG - HAS09

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463907.6mE; 686509.7mN Projection: Mount Eden 2000
Elevation: 49.71m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			49.7	0		OL: SILT: dark brown. Low plasticity. (Topsoil)	M	VL to L	2, 3, 3
			49.4			SW: Fine to medium SAND: with trace silt; brown. Well graded. (Taupo Pumice Alluvium)			4, 3, 3, 2, 3, 2, 3
				1					2, 2, 3, 2, 3, 2, 3, 3, 2, 3
				2					2, 3, 3, 5, 3, 3, 3, 2, 2
				3		Borehole terminated at 3.0 m			
				4					
				5					

Termination Reason: Soakage pipe broken while trying to retrieve. Cou,d not hand auger any further.
Shear Vane No: DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge** **49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS09**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	2.5	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

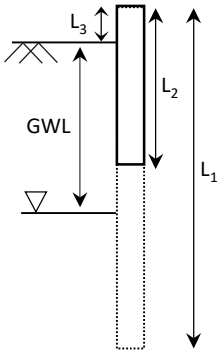
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 2.50 m BGL



Hydraulic Conductivity (k)

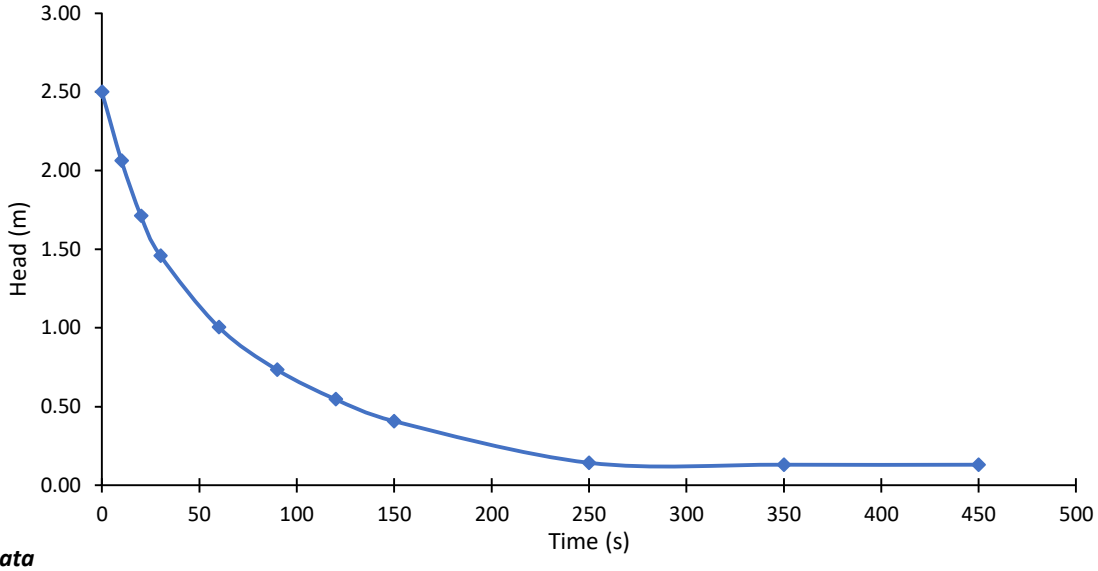
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

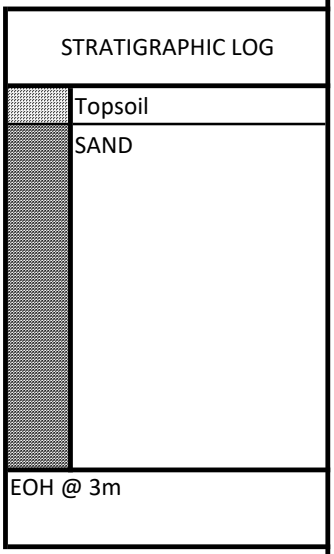
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.04E-04 ms^{-1} = 17.65 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L} ln\frac{H_1}{H_2} =$$ 3.46E-05 ms^{-1} = 2.99 m/day





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	2.500				
10	0.436	2.064	2.282		3.34E-05	3.70E-04
20	0.788	1.712	1.888		3.75E-05	3.59E-04
30	1.040	1.460	1.586		3.63E-05	3.04E-04
60	1.496	1.004	1.232		3.40E-05	2.41E-04
90	1.766	0.734	0.869		3.60E-05	1.97E-04
120	1.954	0.546	0.640		4.16E-05	1.83E-04
150	2.092	0.408	0.477		4.87E-05	1.75E-04
250	2.357	0.143	0.276		7.07E-05	2.02E-04
350	2.370	0.130	0.137		8.43E-06	1.39E-05
450	2.369	0.131	0.131		-6.23E-07	-1.00E-06

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS10

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 464110.1mE; 686486.3mN Projection: Mount Eden 2000
Elevation: 50.71m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			50.7	0		ML: SILT: dark brown. Low plasticity. (Topsoil)			2, 4, 5
			50.4			SW: Fine to medium SAND: with trace silt; brown. Well graded. (Taupo Pumice Alluvium)		L to MD	5, 4, 3
								VL to L	2, 1, 1, 2
				1				L to MD	4, 4, 4, 3, 3
								VL	2, 2, 2, 2, 2, 2, 2
				2		... at 2.60m, Becoming fine sand.		VL to L	3, 3, 3, 3, 3, 3, 2
				3		Borehole terminated at 3.0 m			
				4					
				5					

Termination Reason: Target depth
Shear Vane No: DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge 49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS10**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	2.5	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

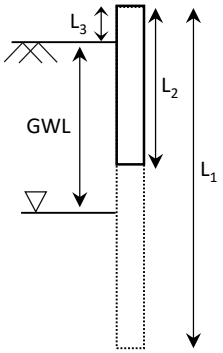
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 2.50 m BGL



Hydraulic Conductivity (k)

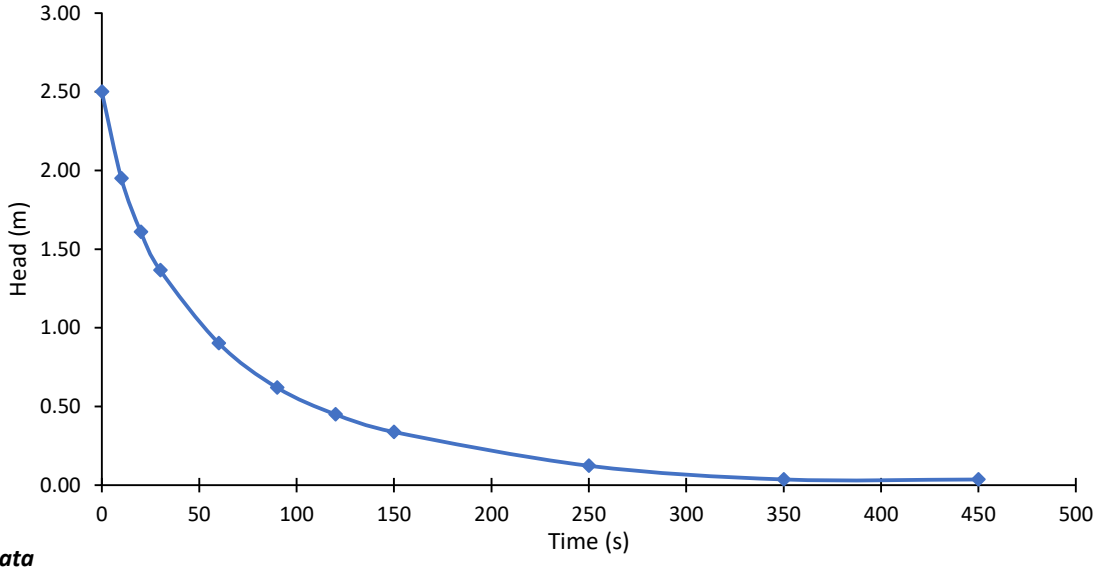
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

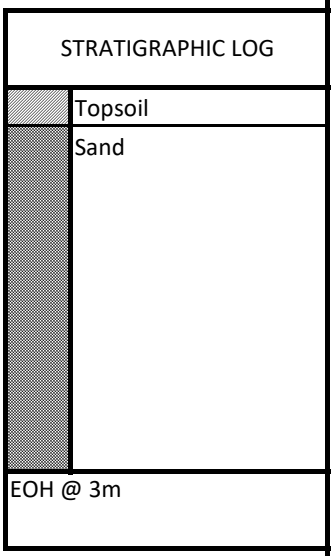
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 2.39E-04 ms^{-1} = 20.64 m/day

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

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{\quad} \ln\frac{H_1}{\quad} =$$ 5.14E-05 ms^{-1} = 4.44 m/day





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	2.500				
10	0.550	1.950	2.225		4.41E-05	4.81E-04
20	0.890	1.610	1.780		4.02E-05	3.68E-04
30	1.135	1.365	1.487		3.92E-05	3.13E-04
60	1.598	0.902	1.134		3.98E-05	2.67E-04
90	1.881	0.620	0.761		4.72E-05	2.36E-04
120	2.050	0.450	0.535		5.02E-05	1.96E-04
150	2.162	0.338	0.394		5.35E-05	1.69E-04
250	2.377	0.123	0.230		7.40E-05	1.87E-04
350	2.464	0.036	0.080		1.24E-04	1.72E-04
450	2.464	0.036	0.036		1.22E-06	9.65E-07

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Version: 1, Version Date: 17/12/2025

HAND AUGER BOREHOLE LOG - HAS11

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 14/06/2021
Borehole Location: Refer to site plan Logged by: AS Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 463979.2mE; 686641.5mN Projection: Mount Eden 2000
Elevation: 38.64m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			38.6			ML: SILT: dark brown. Low plasticity. (Topsoil)			
			38.4						
	0.3	Peak = UTP				ML: SILT: with trace fine gravel; brown. Low plasticity. (Hinuera Formation)		H	
	0.6	Peak = UTP					M		
			37.8			SW: Fine to coarse SAND: with some fine to coarse gravel, with some cobbles; brown. Well graded. (Hinuera Formation)		MD to D	3, 4, 9, 9
				1		Borehole terminated at 1.2 m			12, 6, 5, 6, 5, 4, 3
				2					
				3					
				4					
				5					

Termination Reason: Refusal on coarse gravel.
Shear Vane No: 2087 DCP No: 7
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge** **49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS11**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

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

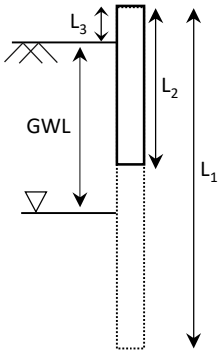
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 1.20 m BGL



Hydraulic Conductivity (k)

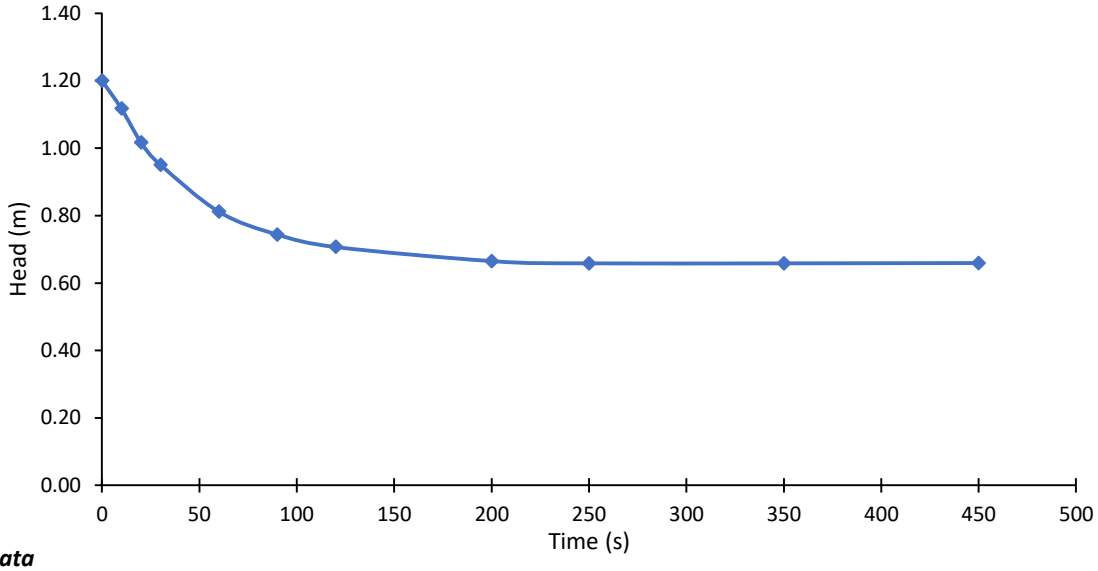
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

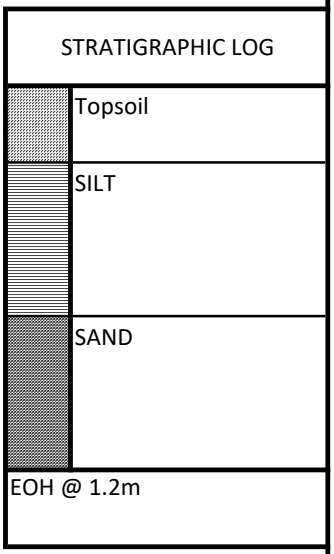
CIRIA 113: Somerville (1986), *Control of groundwater for temporary works,* CIRIA Report 113, Appendix 4

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d} \right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 6.39E-05 ms^{-1} = 5.52 m/day

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

$$k = \frac{d^2 \, ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1} \right)}{2L} ln\frac{H_1}{H_2} =$$ 1.09E-05 ms^{-1} = 0.94 m/day





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				
10	0.083	1.117	1.159		2.03E-05	1.35E-04
20	0.183	1.017	1.067		2.83E-05	1.77E-04
30	0.250	0.950	0.984		2.15E-05	1.26E-04
60	0.389	0.811	0.881		1.81E-05	9.86E-05
90	0.457	0.743	0.777		1.08E-05	5.38E-05
120	0.493	0.707	0.725		6.56E-06	3.11E-05
200	0.535	0.665	0.686		3.06E-06	1.40E-05
250	0.542	0.658	0.661		8.60E-07	3.82E-06
350	0.542	0.658	0.658		-1.26E-08	-5.56E-08
450	0.541	0.659	0.659		-7.53E-08	-3.33E-07

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HAND AUGER BOREHOLE LOG - HAS12

Client: Powerup Business Consulting Ltd
Project: Wordsworth Street Development, Cambridge
Site Location: 49 Maungatautiri Road, Cambridge
Project No.: HAM2021-0032
Date: 16/06/2021
Borehole Location: Refer to site plan Logged by: AMC Checked by: AS Scale: 1:25 Sheet 1 of 1

Position: 464360.0mE; 686494.5mN Projection: Mount Eden 2000
Elevation: 37.94m Datum: Moturiki Survey Source: Cogswell Surveys

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	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)
			37.9			SILT: with some fine to coarse sand, trace fine gravel; dark brown. (Topsoil)			2, 3
			37.7			SW: Fine to coarse SAND: with some fine to coarse gravel; dark brown. Well graded. (Taupo Pumice Alluvium)	D		5, 4
			37.5			SW: Gravelly Medium to coarse SAND: fine to coarse gravel; dark greyish brown. Well graded, subangular. (Taupo Pumice Alluvium)		MD	4, 3, 3
						Borehole terminated at 0.7 m			3, 2, 2
				1					3, 7, 7, 4, 4, 4, 4, 7, 4, 4
				2					
				3					
				4					
				5					

Termination Reason: Hole collapse
Shear Vane No: DCP No: 17
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.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences	CLIENT: **Powerup Business Consulting Ltd**	DESIGNER:	AMC
	PROJECT: **Wordsworth Street Development, Cambridge** **49 Muangatautiri Road, Cambridge**	CHECKED:	JCW
		REVISION:	0
	TITLE: **Falling Head Permeability Test - HAS12**	DATE:	25/06/2021
		PROJECT:	HAM2021-0032

Specifications - Open-Ended Tube

Length L_1:	0.6	m
Diameter:	90	mm
Non-Perm L_2:		m
Above Gnd L_3:		m

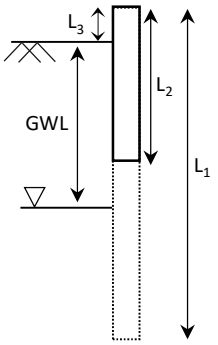
Ground Conditions

GWL: m BGL (Blank = Bottom of hole)

Permeability Anisotropy

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

Bottom of Test Hole: 0.60 m BGL



Hydraulic Conductivity (k)

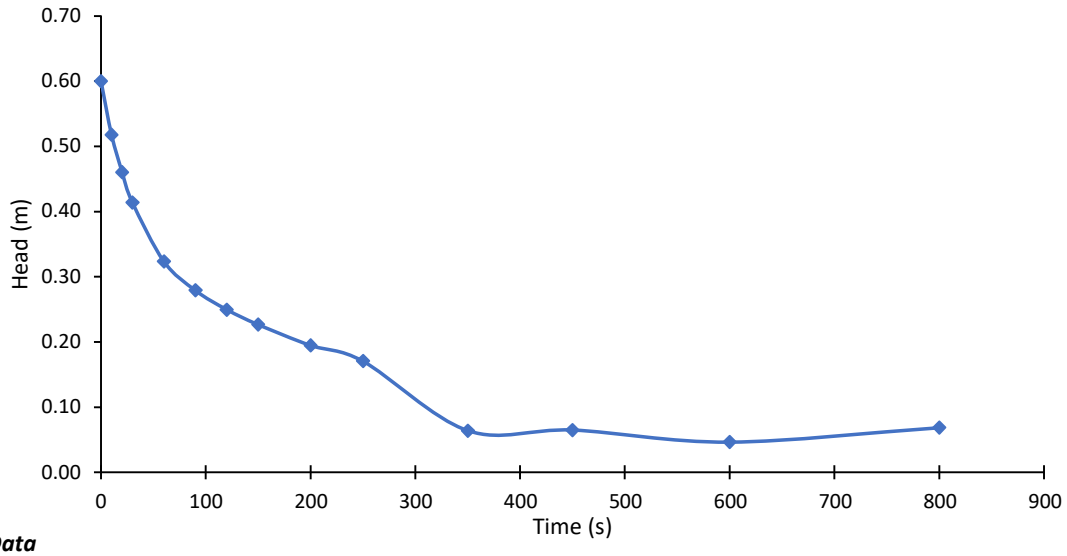
Note: CMW considers the CIRIA 113 value the most appropriate method for most purposes, but also provides the analysis method as outlined by Hvorslev if desired.

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

$$k = \left(log\frac{h_1}{h_2} - log\frac{2h_1 + d}{2h_2 + d}\right) \cdot \frac{(h_1 + h_2)}{2(t_2 - t_1)} =$$ 1.25E-04 ms^{-1} = 10.83 m/day

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

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{2L(\quad)} \ln\frac{H_1}{\quad} =$$ 4.47E-05 ms^{-1} = 3.86 m/day



STRATIGRAPHIC LOG

- Topsoil
- SAND
- SAND with gravel

EOH @ 0.7m

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	0.600				
10	0.082	0.518	0.559		6.74E-05	2.67E-04
20	0.139	0.461	0.489		5.80E-05	2.10E-04
30	0.186	0.414	0.437		5.64E-05	1.89E-04
60	0.277	0.324	0.369		4.78E-05	1.44E-04
90	0.321	0.279	0.301		3.18E-05	8.39E-05
120	0.351	0.250	0.264		2.57E-05	6.25E-05
150	0.373	0.227	0.238		2.32E-05	5.28E-05
200	0.405	0.195	0.211		2.32E-05	4.92E-05
250	0.429	0.171	0.183		2.13E-05	4.14E-05
350	0.536	0.064	0.117		9.19E-05	1.53E-04
450	0.535	0.065	0.064		-1.47E-06	-1.61E-06
600	0.554	0.046	0.055		2.36E-05	2.41E-05
800	0.532	0.068	0.057		-2.07E-05	-2.16E-05
1200						

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APPENDIX F
CPT Investigation Logs

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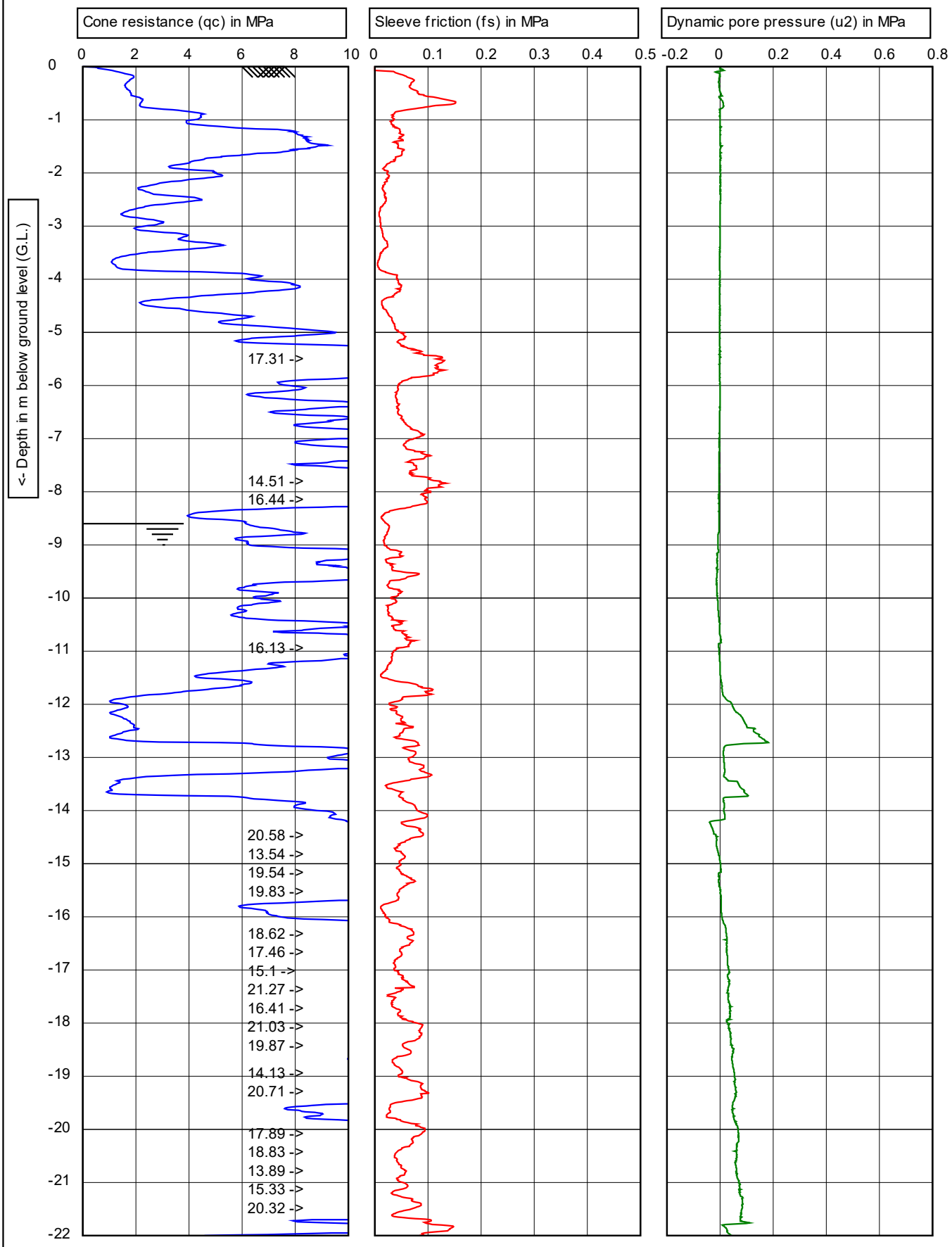
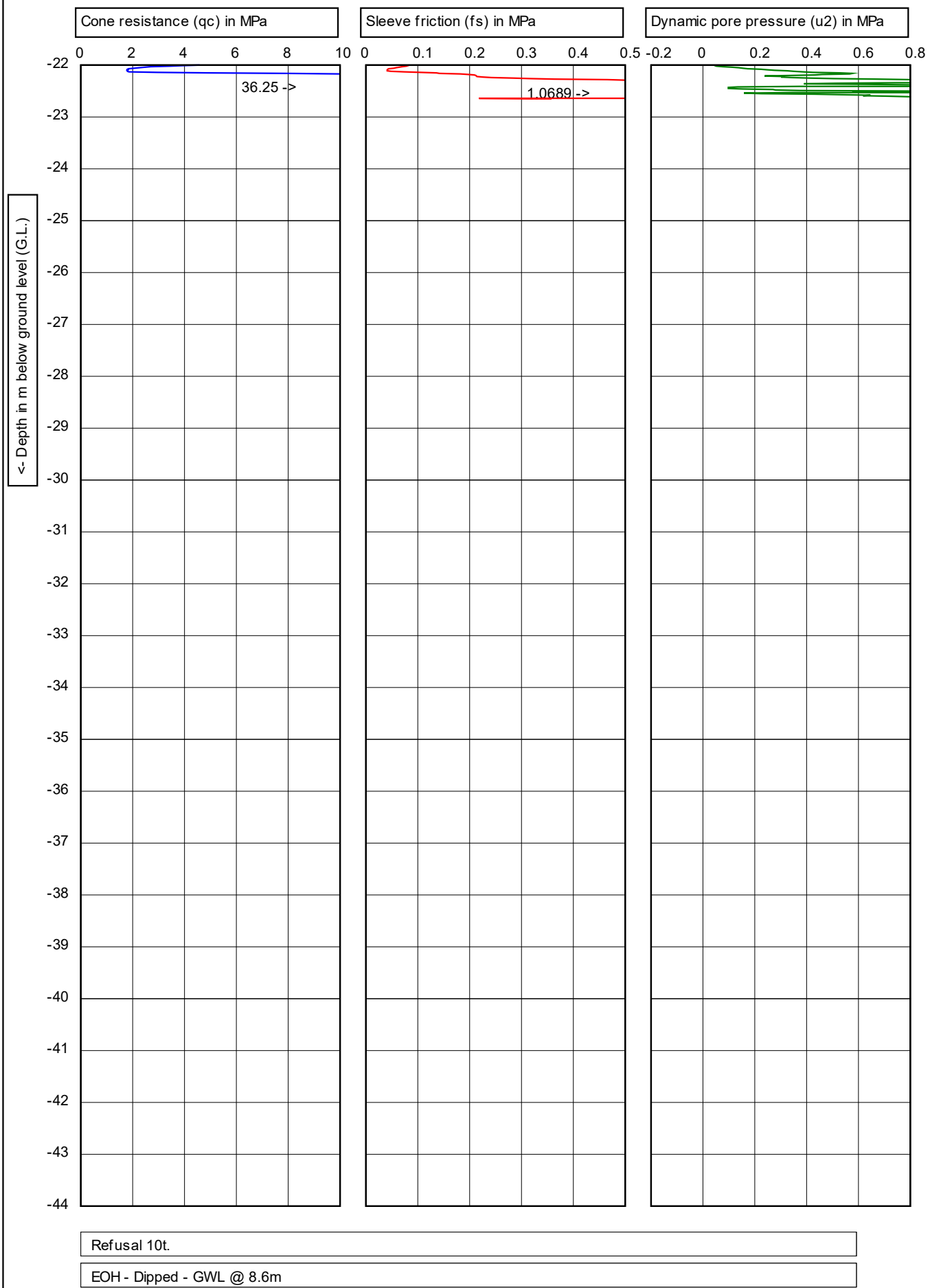


Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-8.60 m**	Date:	**23/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C15211**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818872, 5800581 NZTM**		CPT no.:	**01** **1/12**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - GWL @ 8.6m

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** — W.L.: **-8.60 m**	Date:	**23/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818872, 5800581 NZTM**	CPT no.:	**01** — **2/12**

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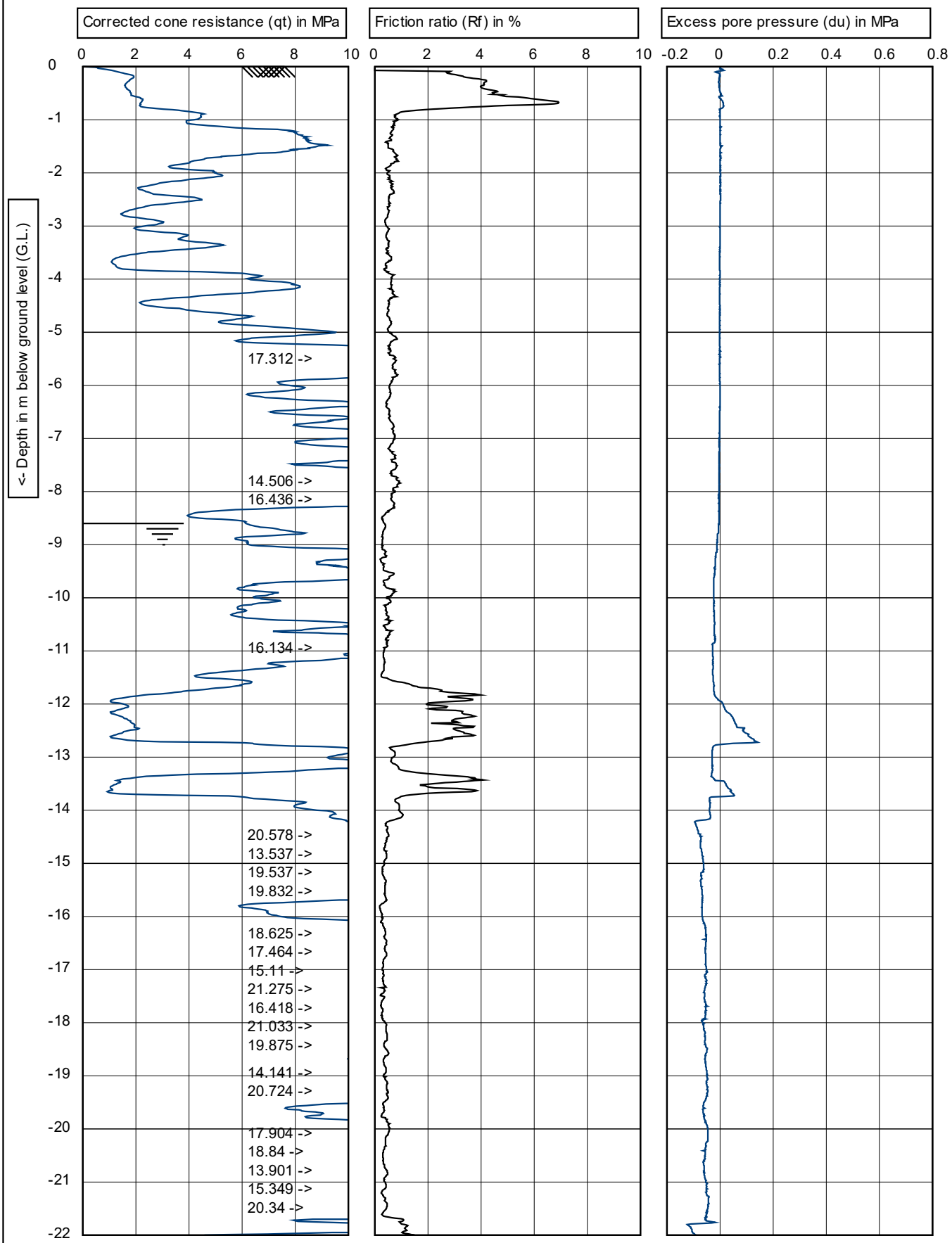
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-8.60 m**	Date:	**23/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C15211**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818872, 5800581 NZTM**		CPT no.:	**01** **3/12**

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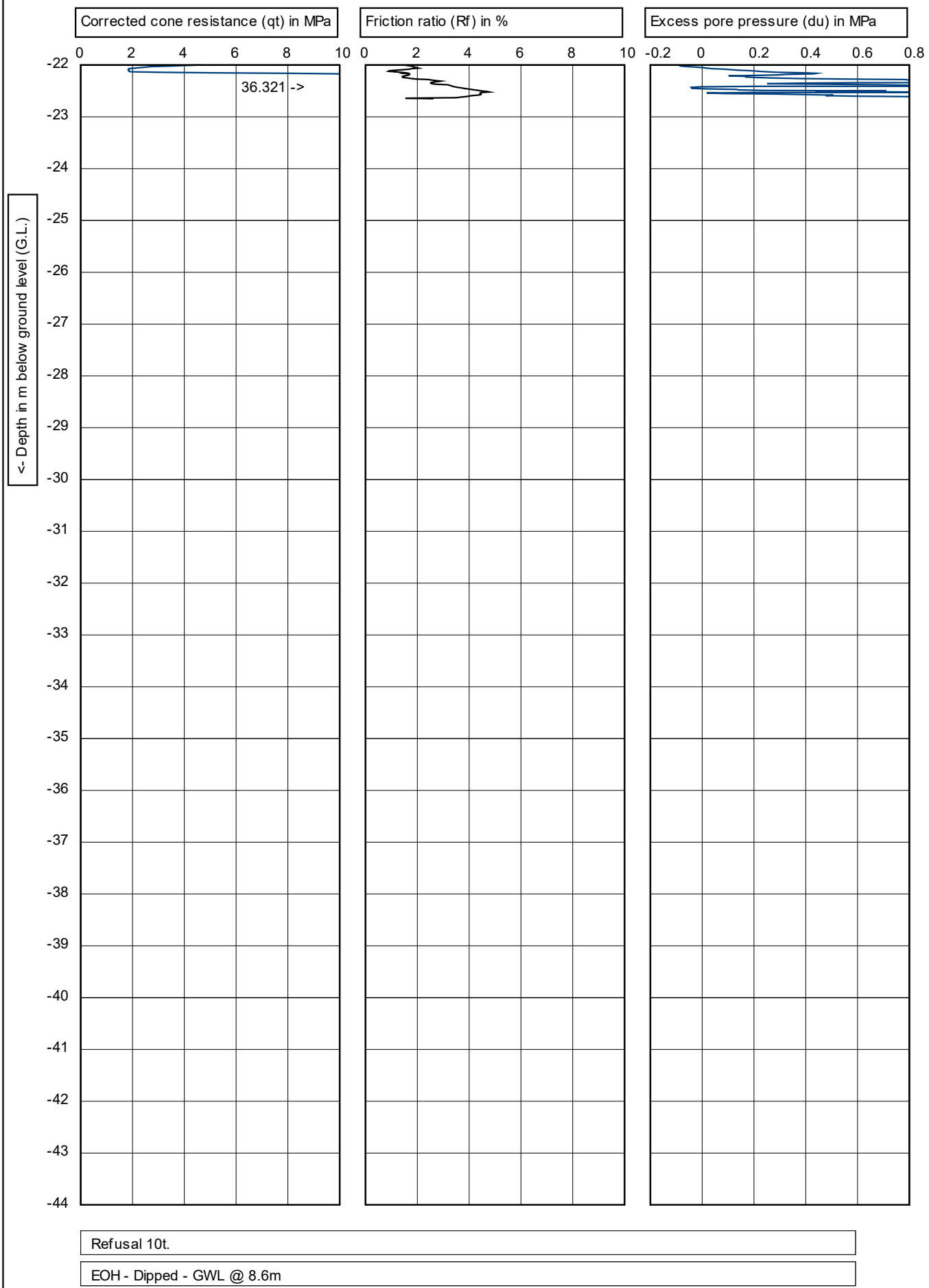
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - GWL @ 8.6m

wsp

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1.49

r u2
L 150 cm²
10 cm²

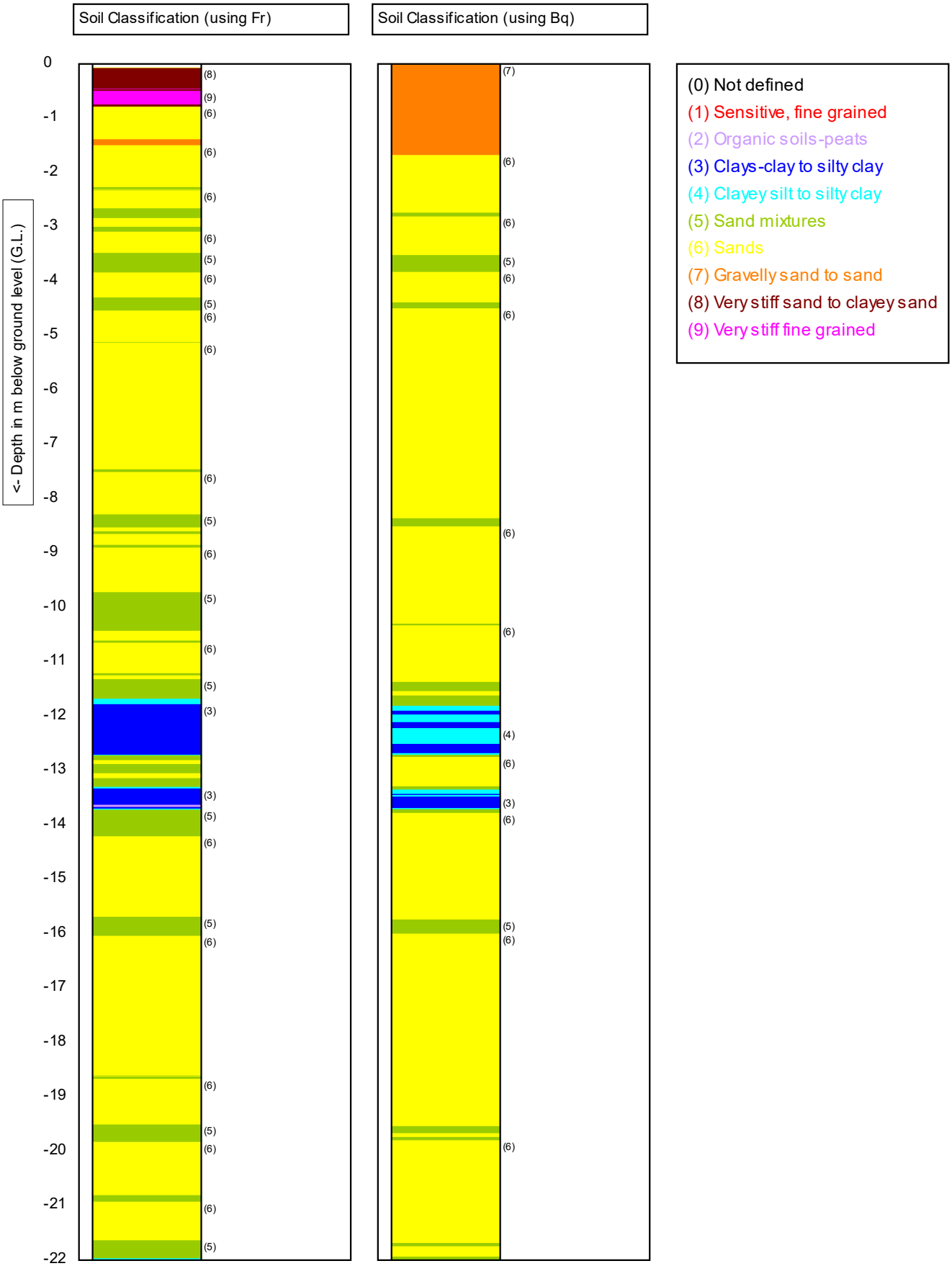
Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: **0.00 m MSL** W.L.: **-8.60 m**

Project: **Wordsworth St Developments**
Location: **Cambridge**
Position: **1818872, 5800581 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C15211**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**01** **4/12**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2 / L 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** W.L.: **-8.60 m**	Date:	**23/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818872, 5800581 NZTM**	CPT no.:	**01** 7/12

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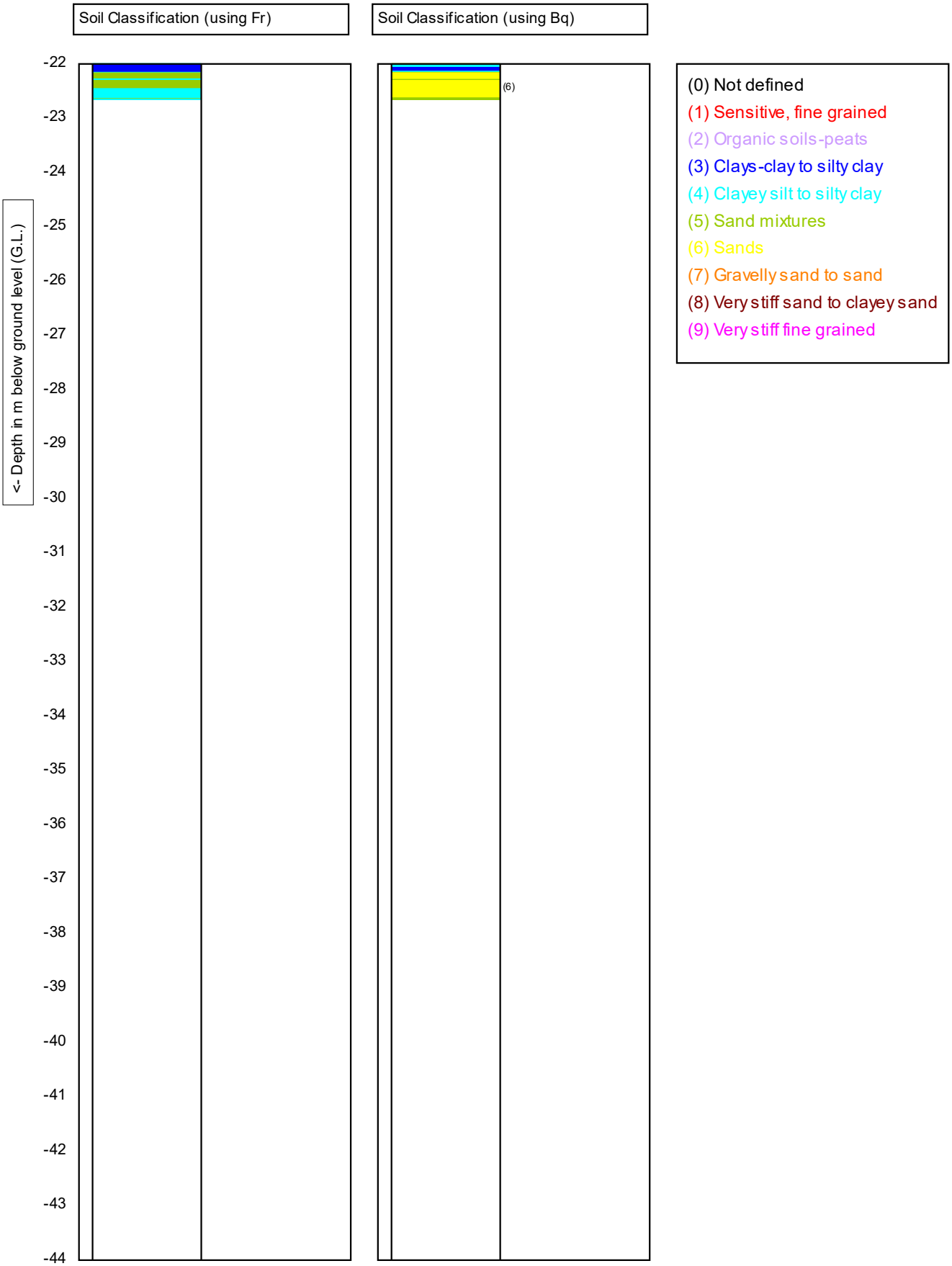
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** W.L.: **-8.60 m**	Date:	**23/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818872, 5800581 NZTM**	CPT no.:	**01** **8/12**

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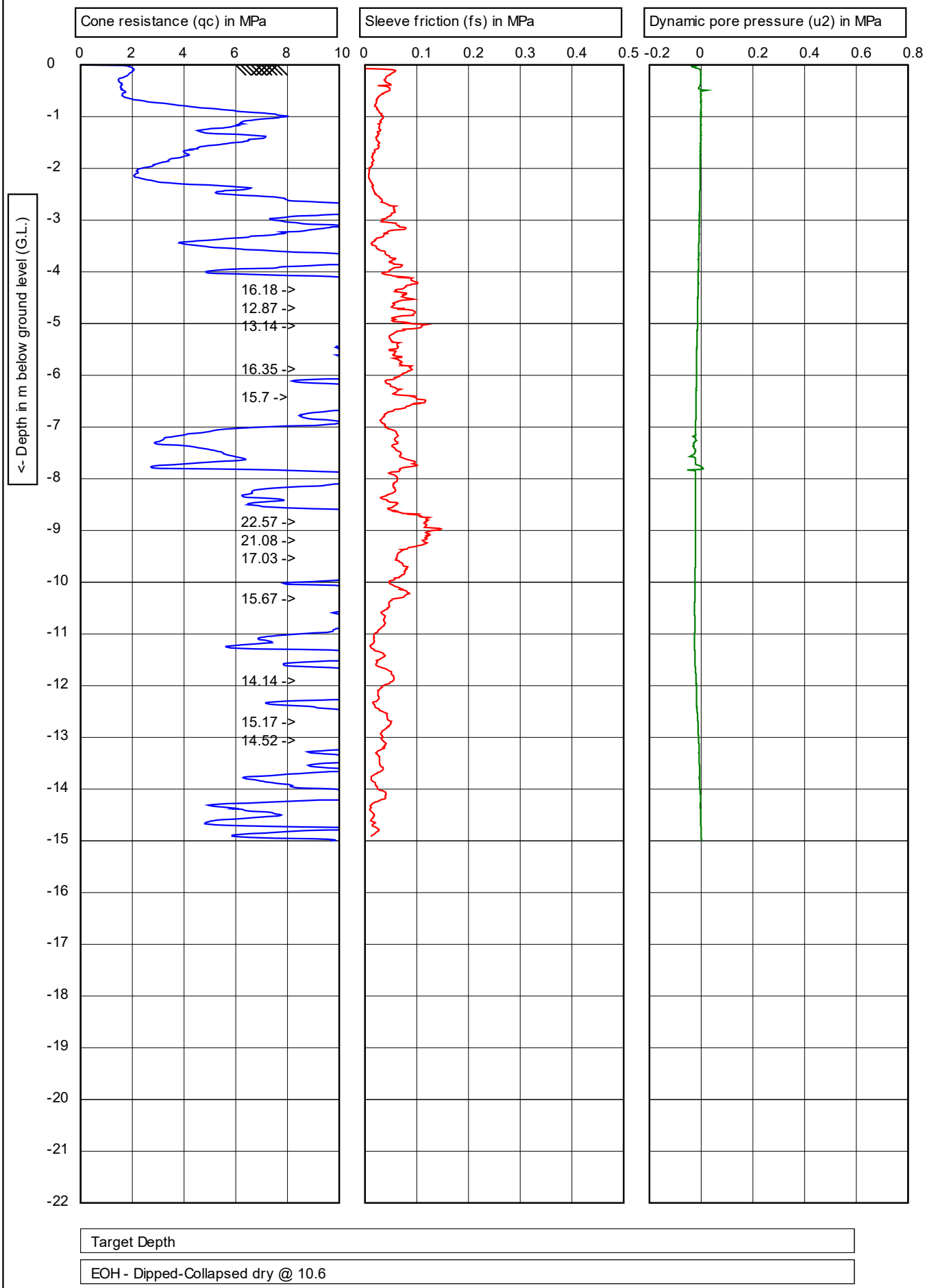
Version: 1, Version Date: 17/12/2025



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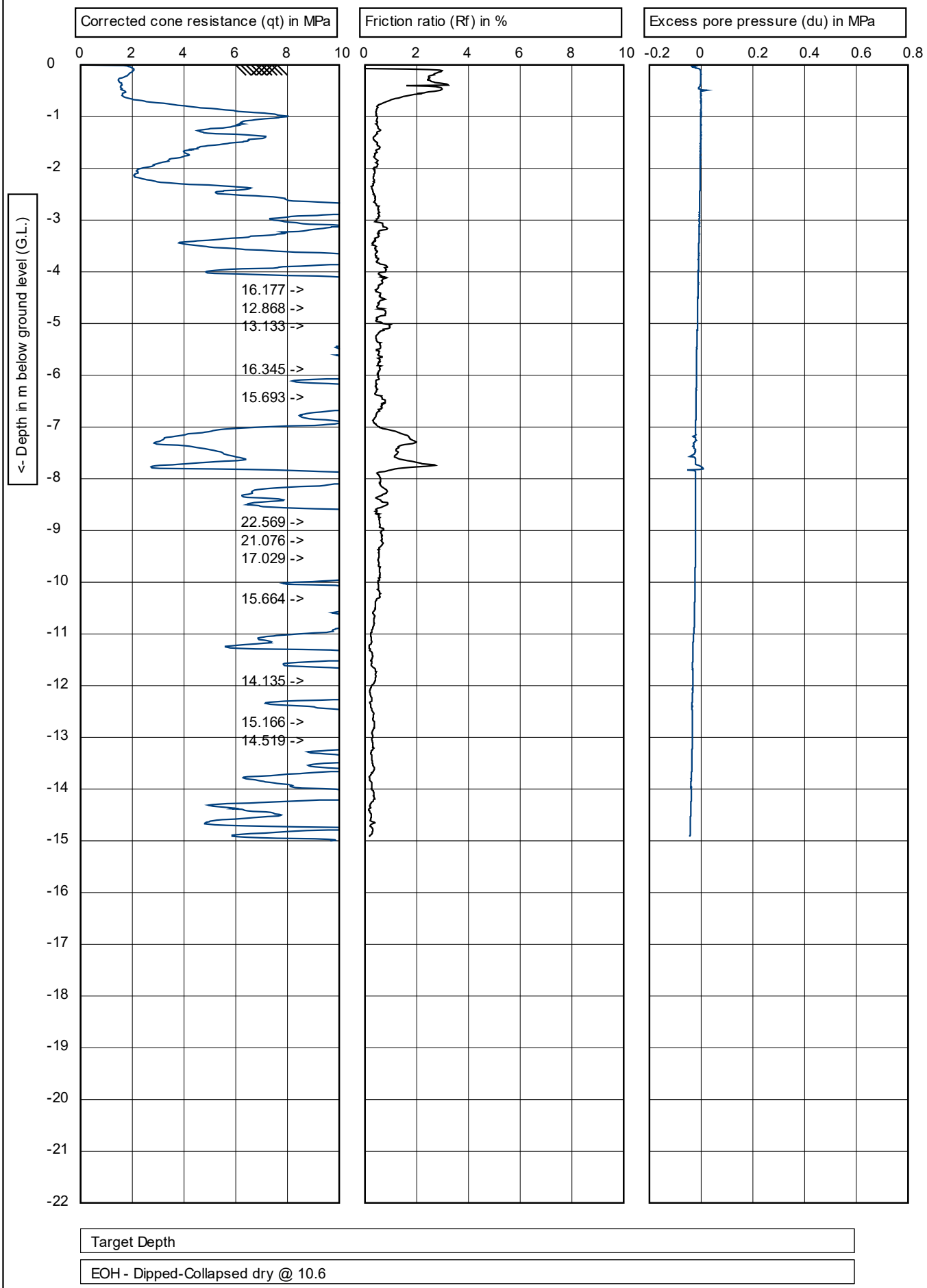
	G.L.: **0.00 m MSL**	Date:	**23/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818854, 5800888 NZTM**		CPT no.:	**02** **1/6**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



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

G.L.: **0.00 m MSL**

Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1818854, 5800888 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**02** **2/6**

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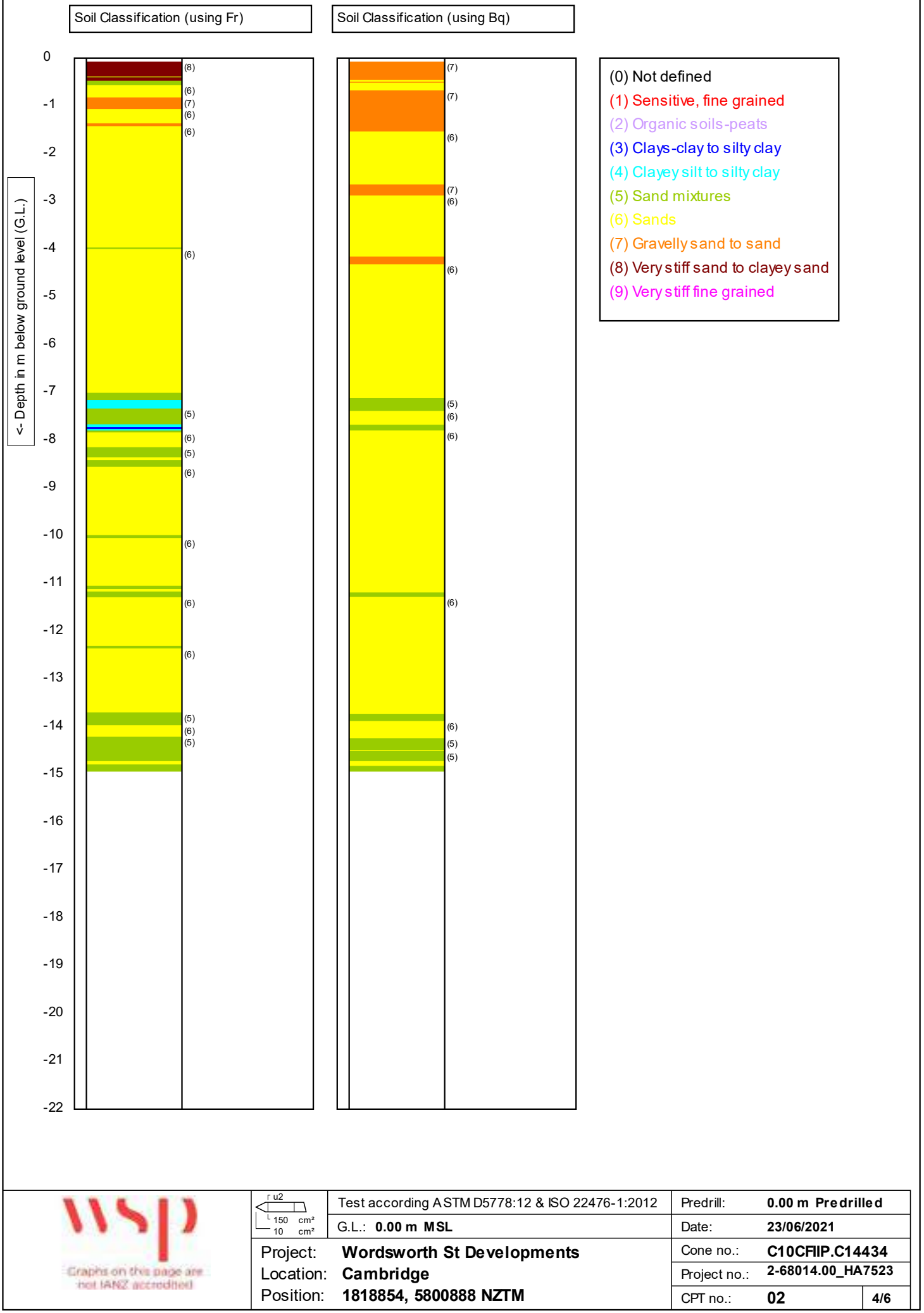
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

r u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

Project: **Wordsworth St Developments**

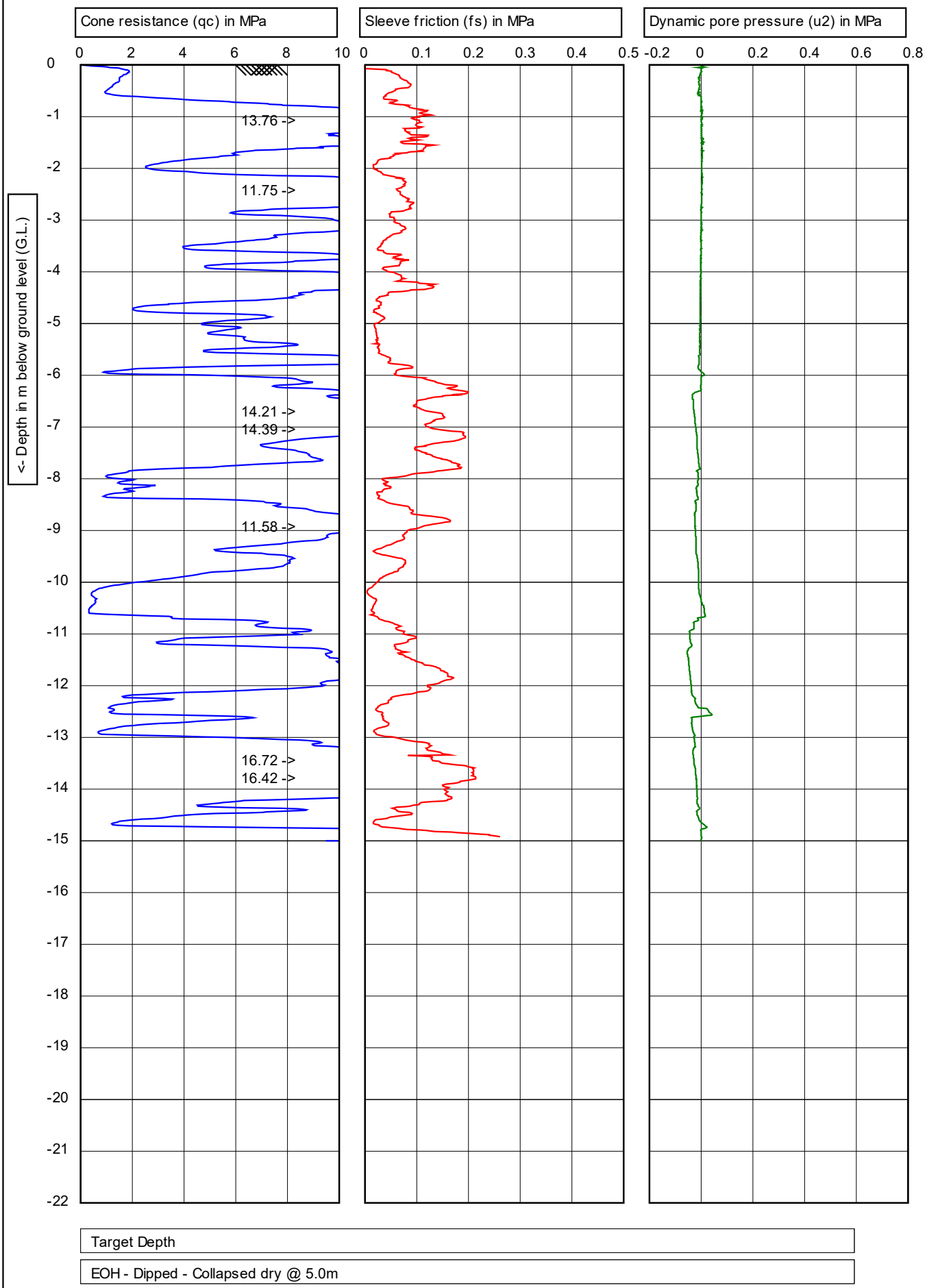
Location: **Cambridge**

Position: **1818854, 5800888 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**02** 4/6

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**23/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818453, 5801178 NZTM**	CPT no.:	**03** **1/6**

1.49

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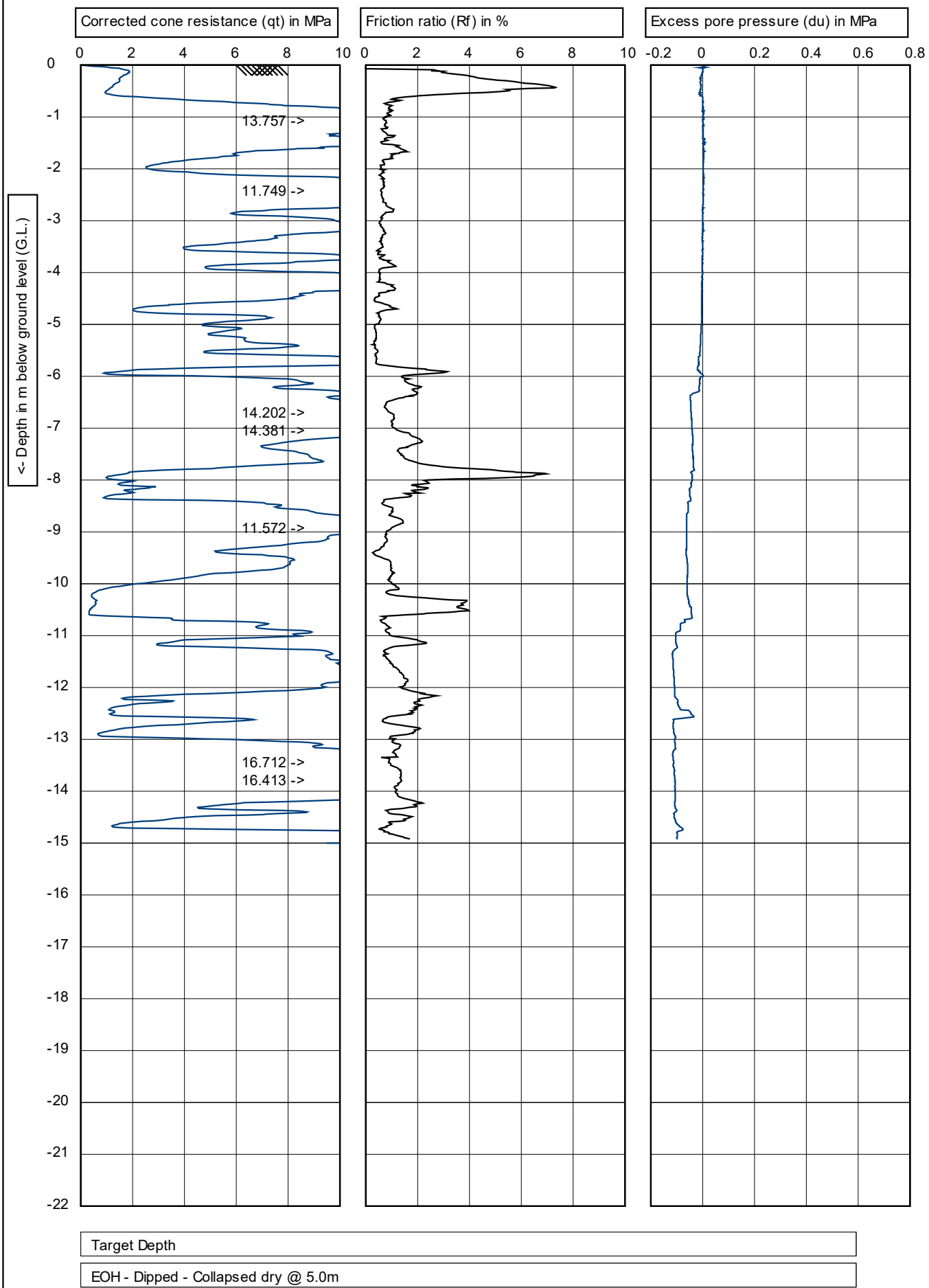
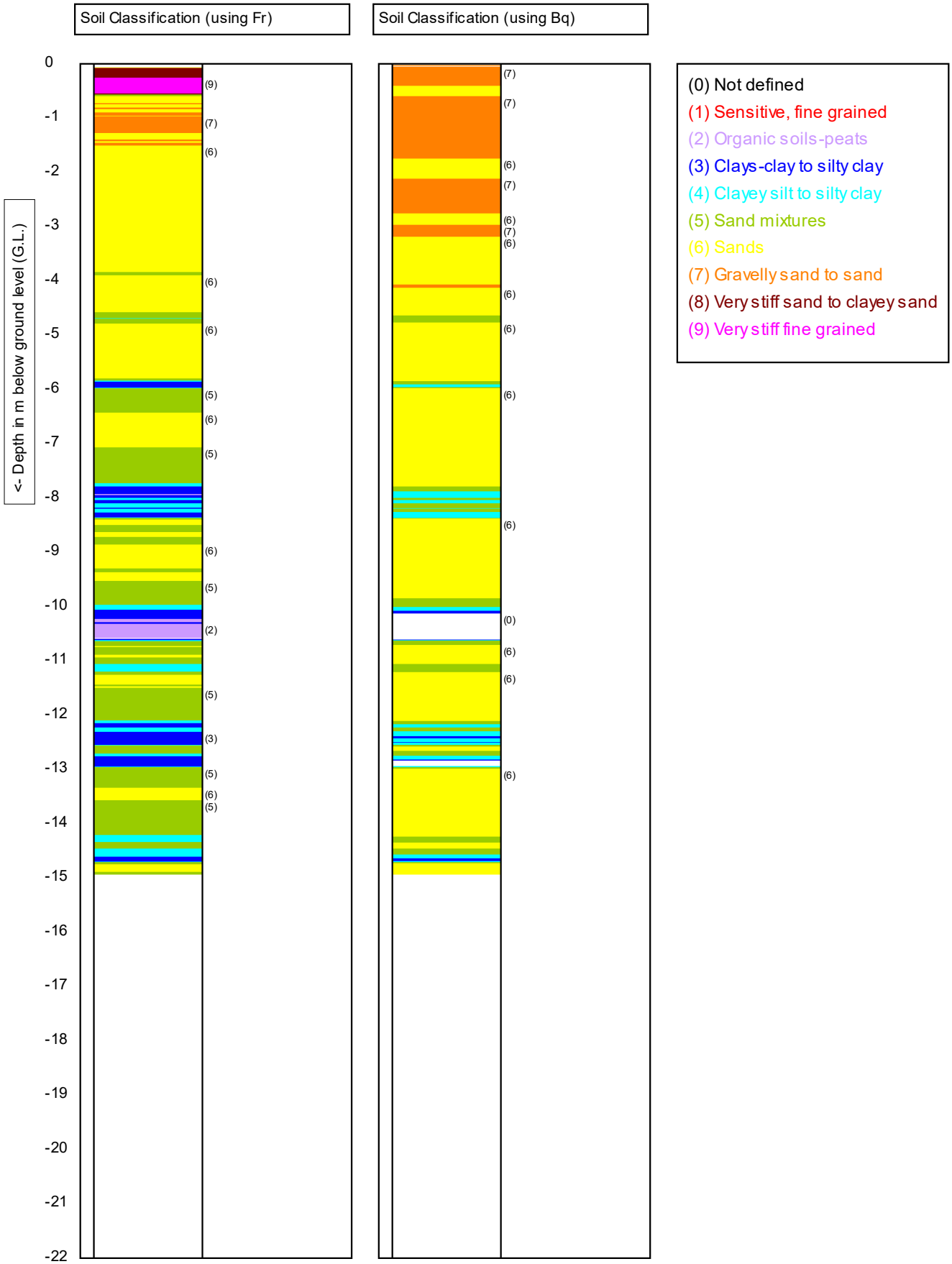
Version: 1, Version Date: 17/12/2025



wsp — 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:	**23/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C15211**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818453, 5801178 NZTM**		CPT no.:	**03** **2/6**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

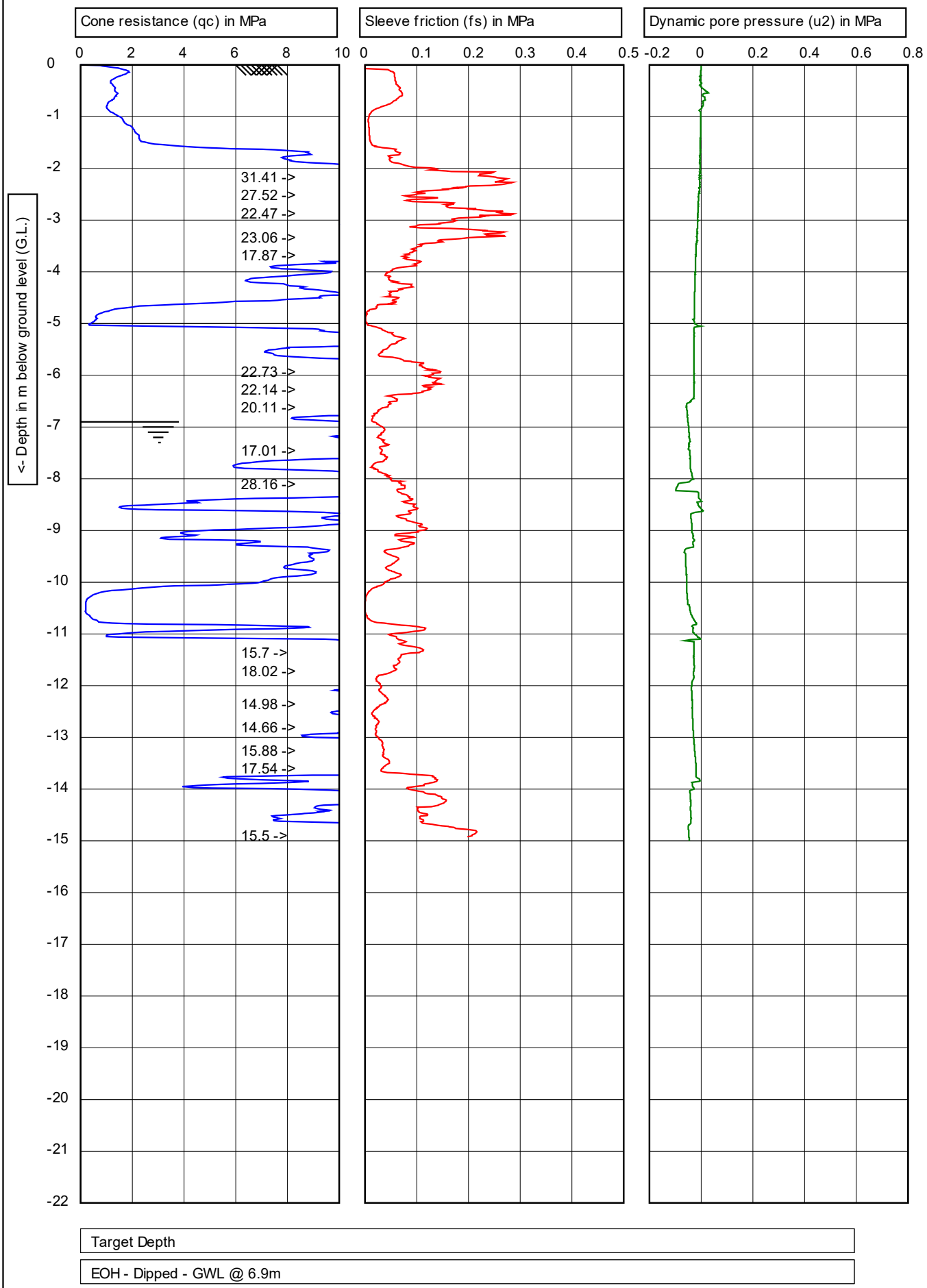
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1818453, 5801178 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C15211**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**03** **4/6**

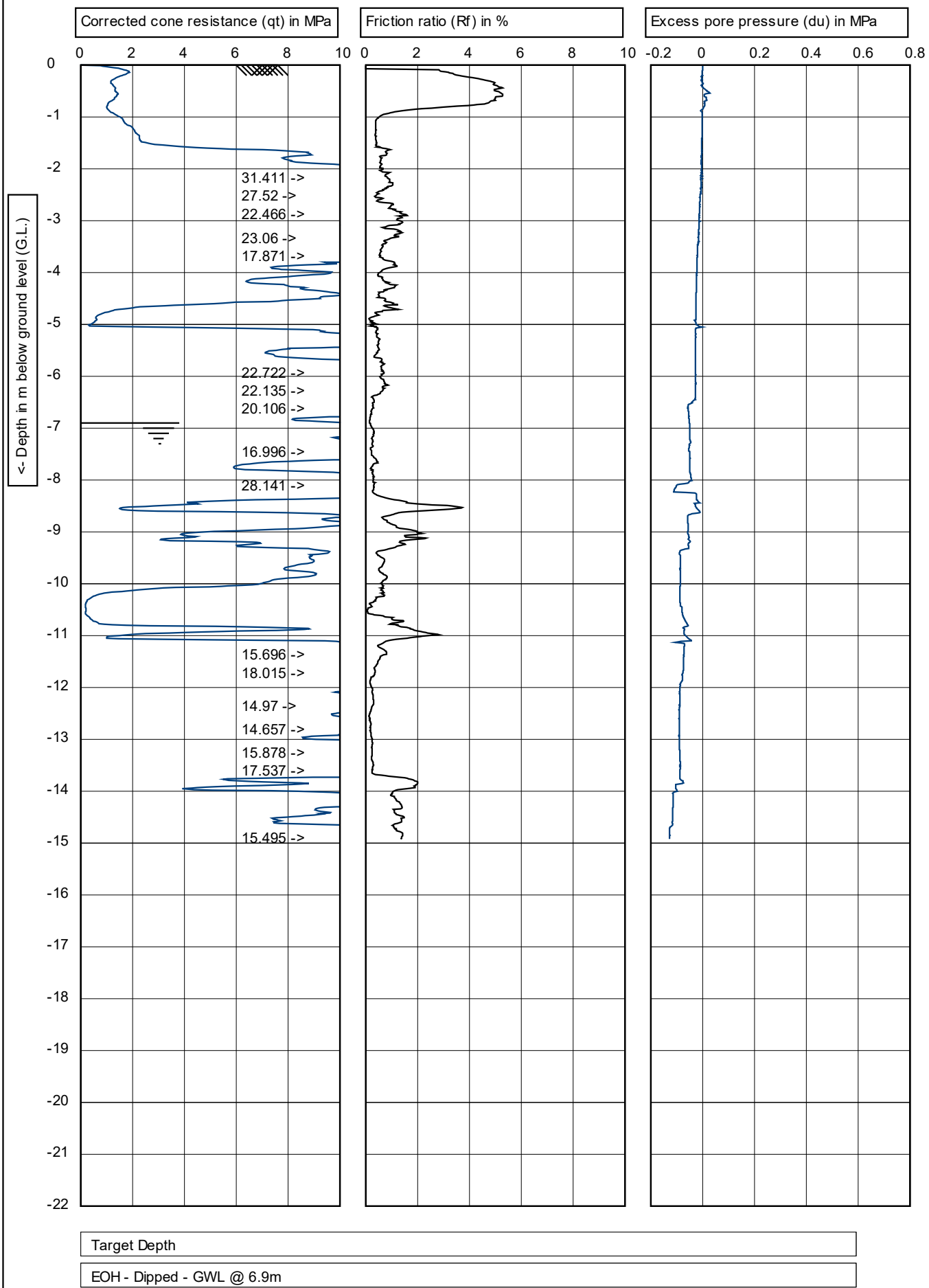
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
r u2 / L 150 cm² / 10 cm²	G.L.: **0.00 m MSL** — W.L.: **-6.90 m**	Date:	**23/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818542, 5801394 NZTM**		CPT no.:	**04** — **1/6**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

r u2
L 150 cm²
10 cm²

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

G.L.: **0.00 m MSL** W.L.: **-6.90 m**

Project: **Wordsworth St Developments**
Location: **Cambridge**
Position: **1818542, 5801394 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**04** **2/6**

1.49

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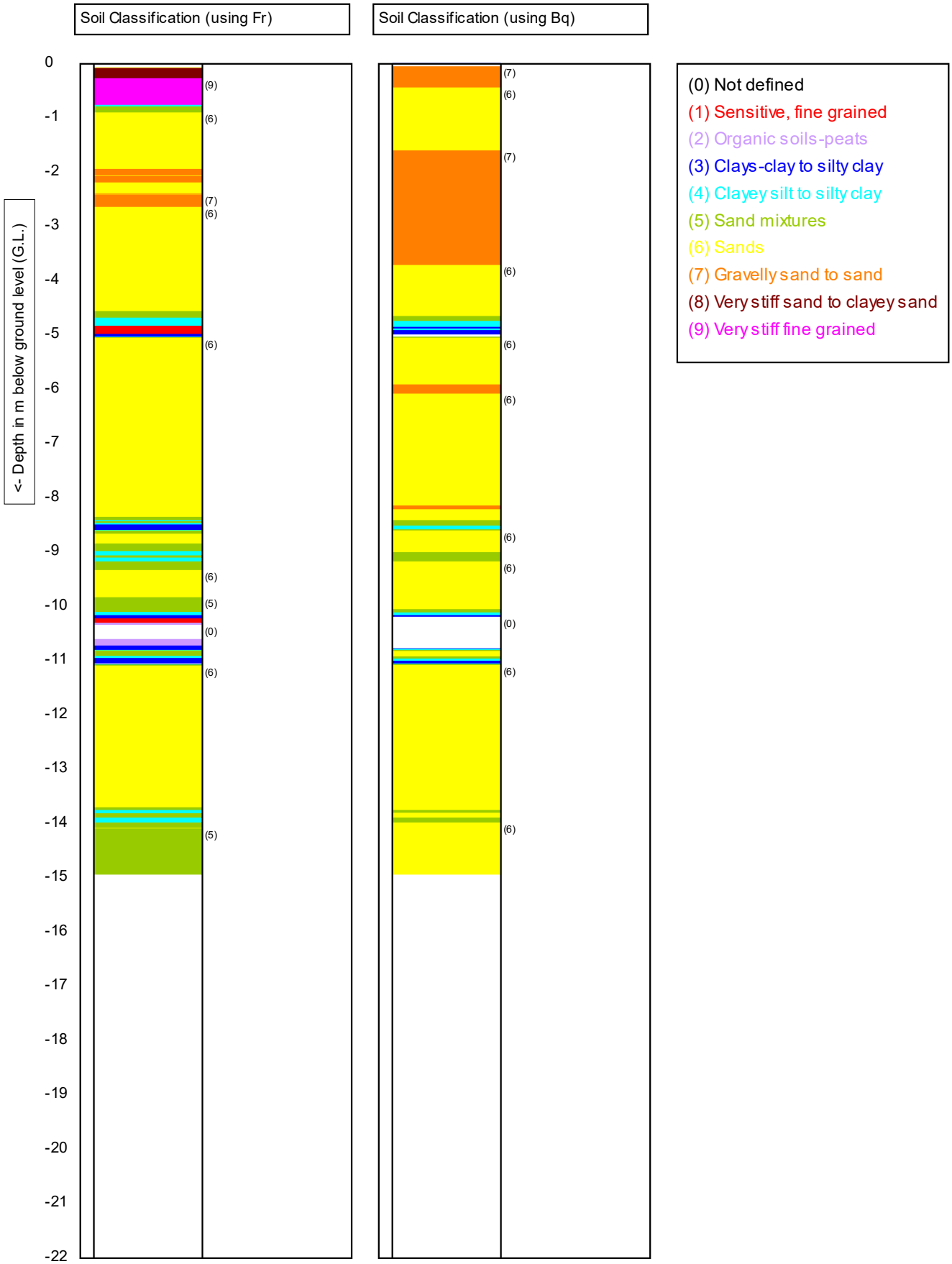
Version: 1, Version Date: 17/12/2025



wsp

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1.49

r u2
L 150 cm²
10 cm²

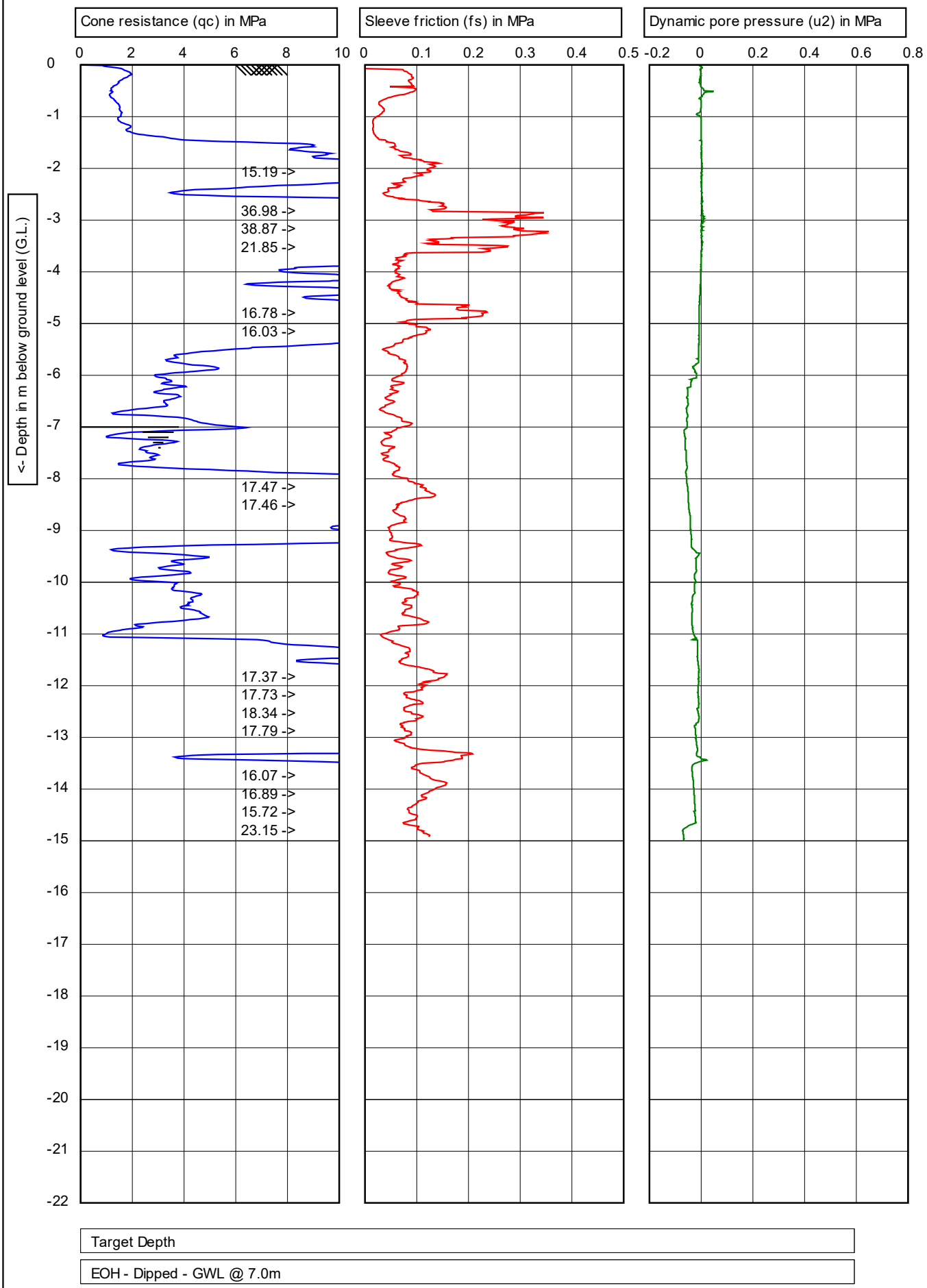
Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: **0.00 m MSL** W.L.: **-6.90 m**

Project: **Wordsworth St Developments**
Location: **Cambridge**
Position: **1818542, 5801394 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**04** **4/6**

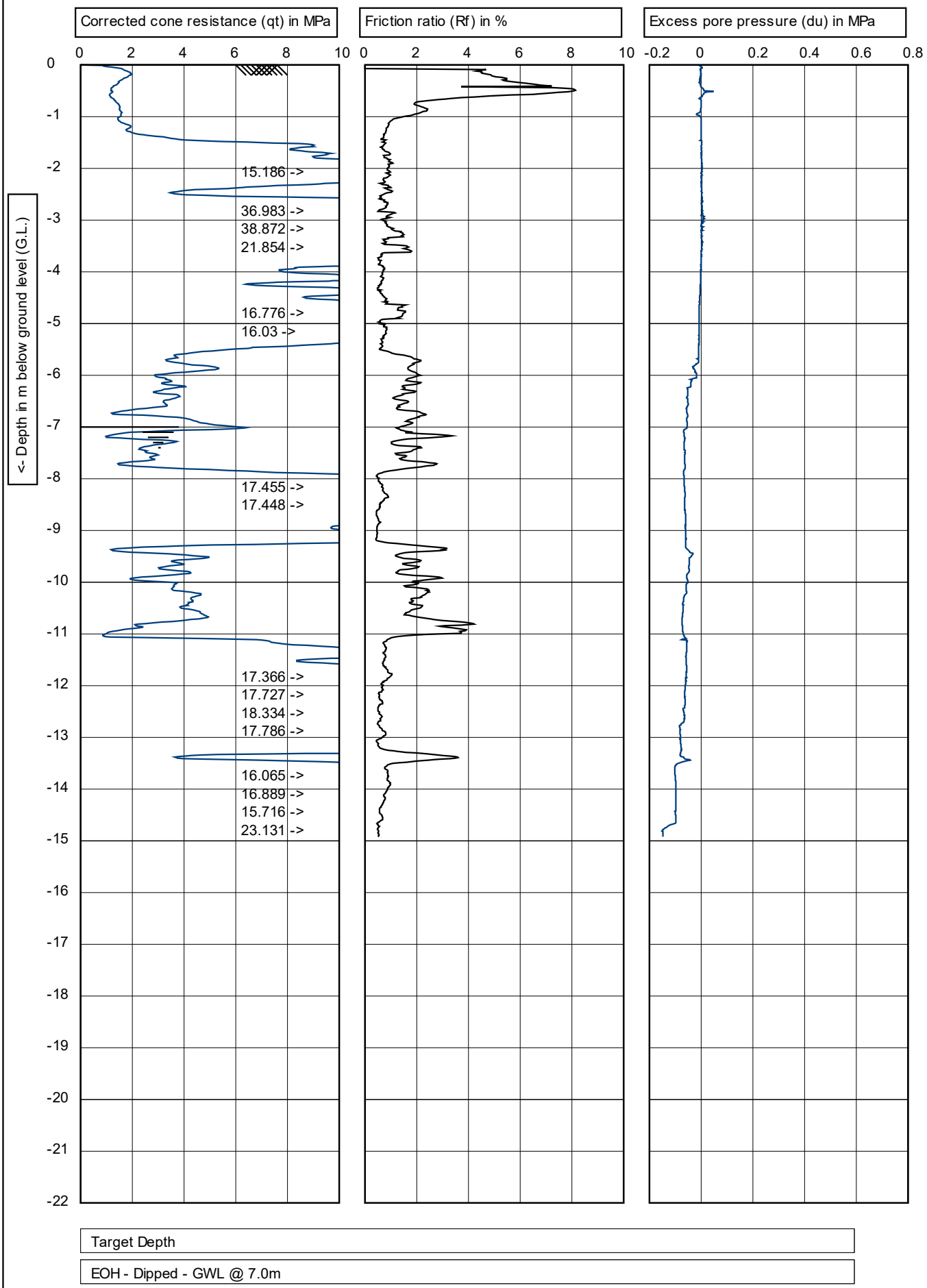
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	0.00 m Predrilled
G.L.: 0.00 m MSL	W.L.: -7.00 m	Date:	23/06/2021
Project: Wordsworth St Developments		Cone no.:	C10CFIIP.C15211
Location: Cambridge		Project no.:	2-68014.00_HA7523
Position: 1818805, 5801362 NZTM		CPT no.:	05 1/6

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



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

G.L.: **0.00 m MSL** W.L.: **-7.00 m**

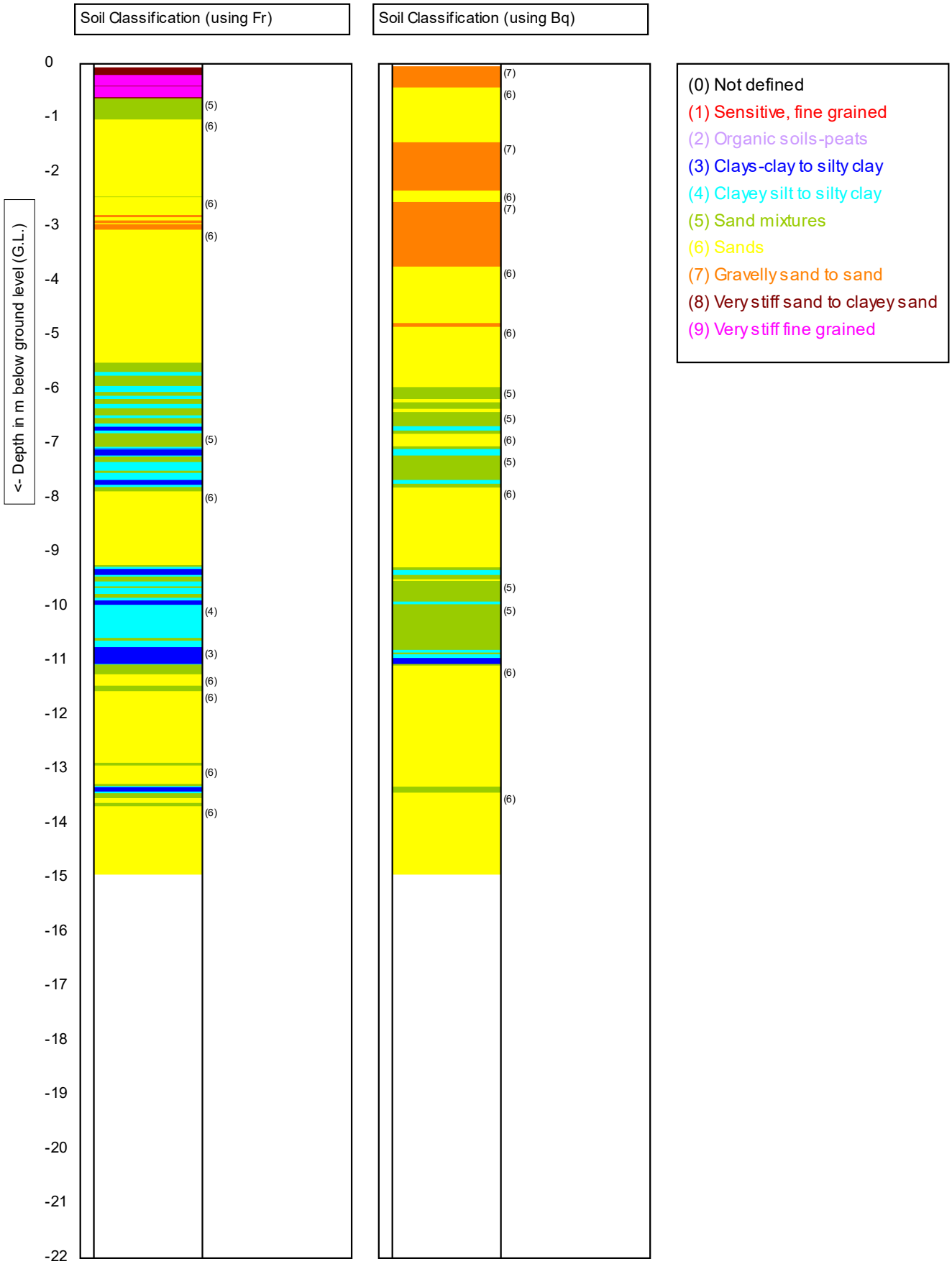
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1818805, 5801362 NZTM**

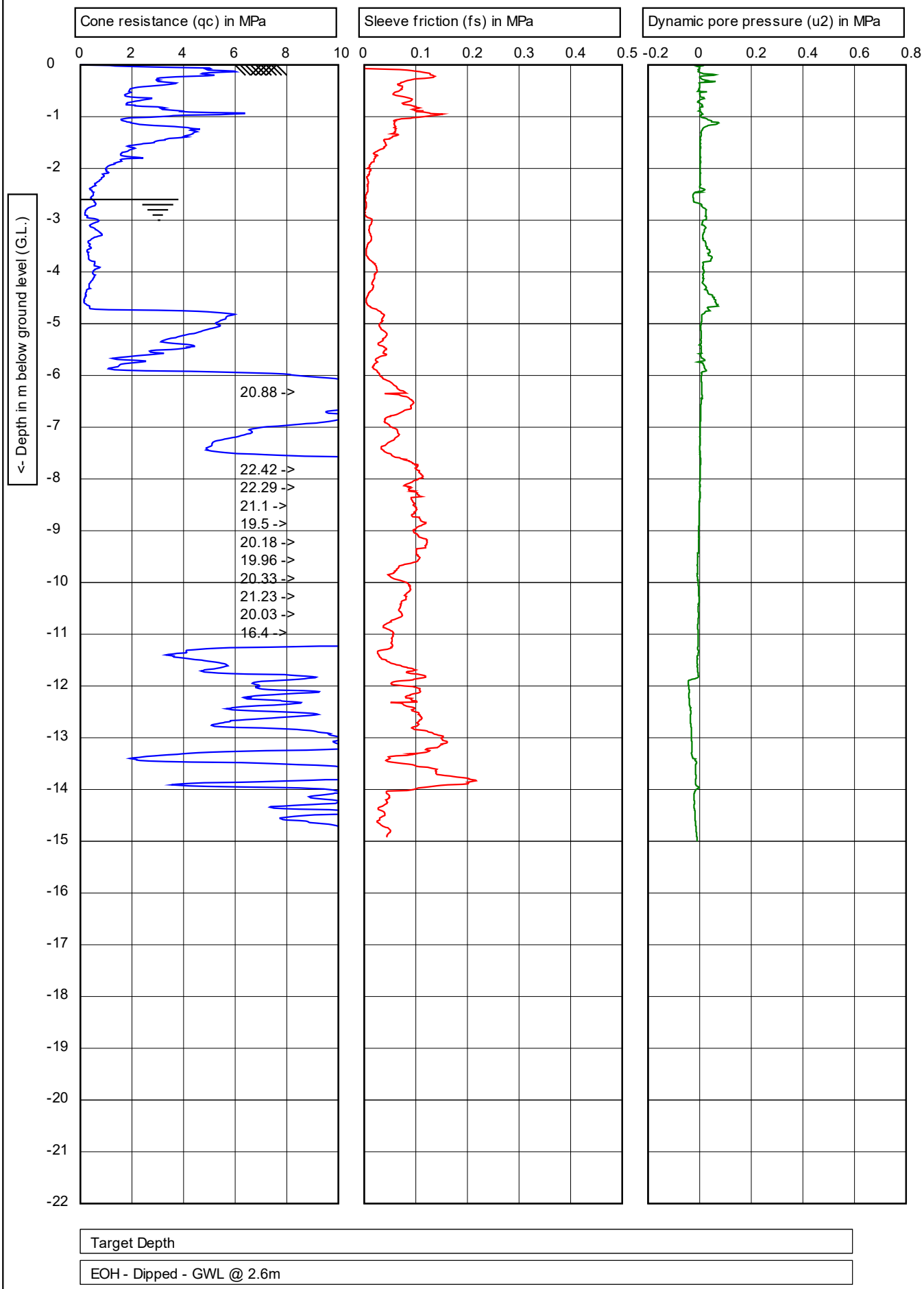
Predrill:	**0.00 m Predrilled**
Date:	**23/06/2021**
Cone no.:	**C10CFIIP.C15211**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**05** **2/6**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited	u2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL** W.L.: **-7.00 m**	Date: **23/06/2021**
	Project: **Wordsworth St Developments**		Cone no.: **C10CFIIP.C15211**
	Location: **Cambridge**		Project no.: **2-68014.00_HA7523**
	Position: **1818805, 5801362 NZTM**		CPT no.: **05** 4/6

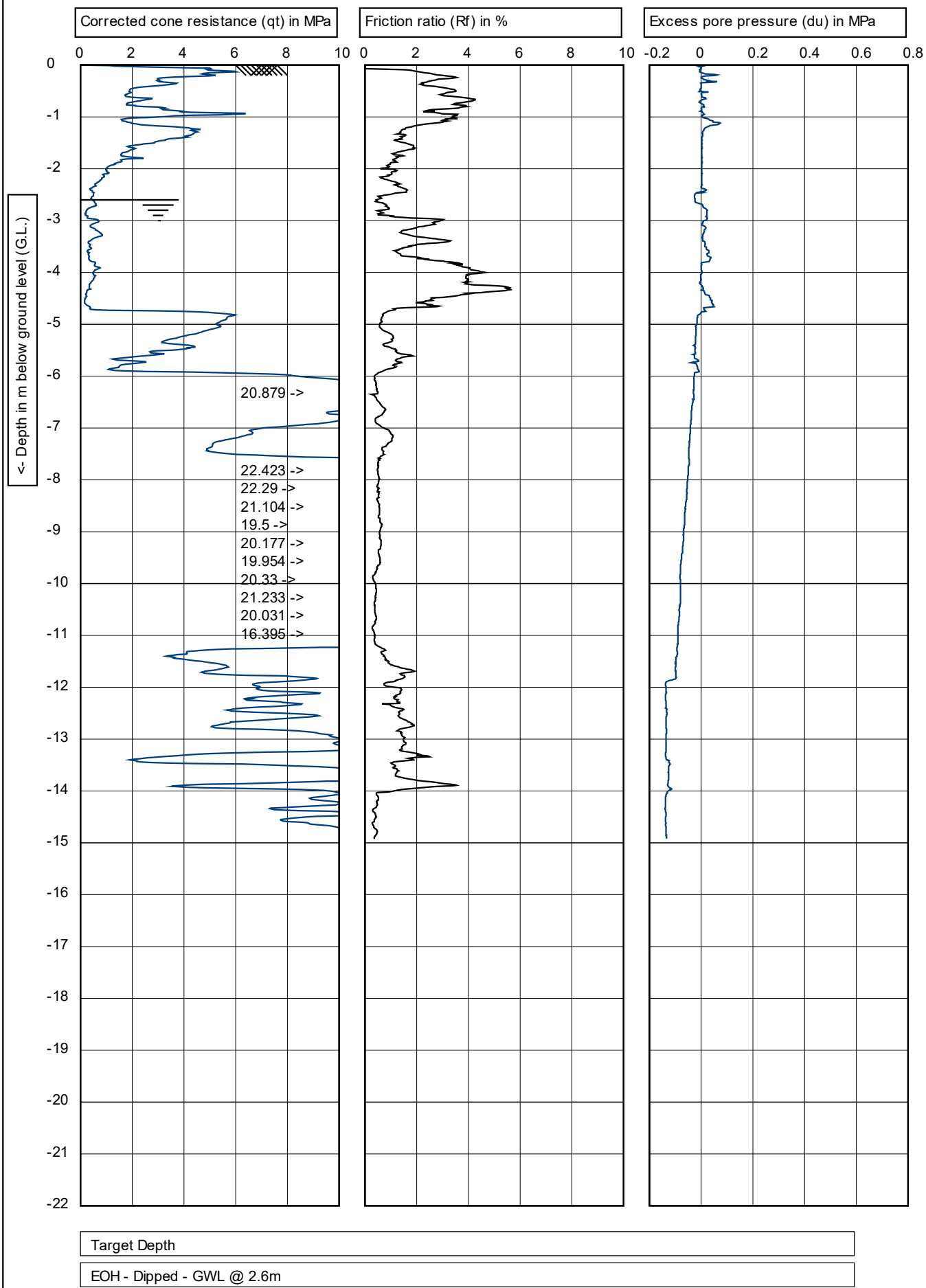
1.49



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:	**22/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819030, 5801216 NZTM**		CPT no.:	**06** **1/6**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

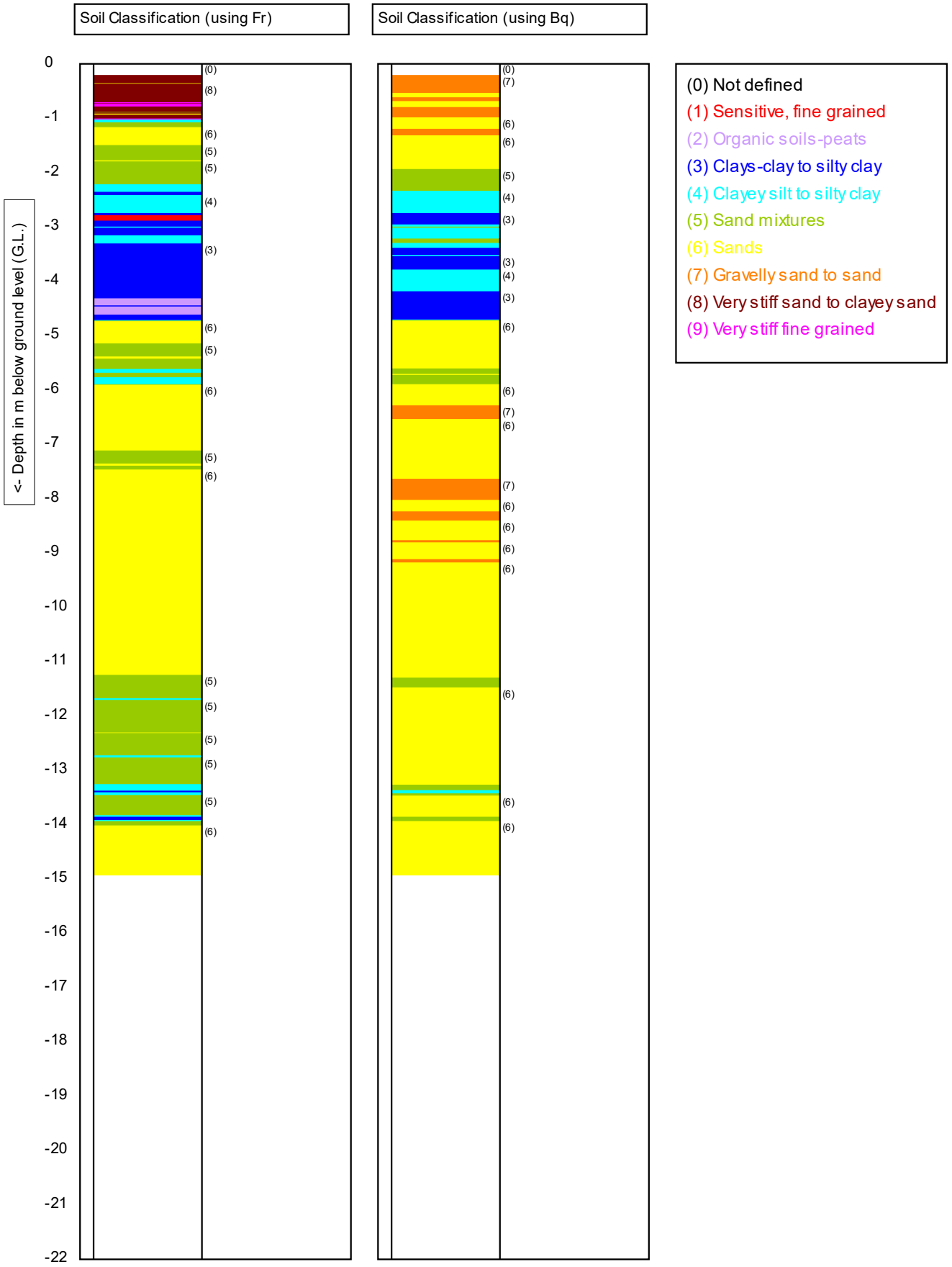


Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-2.60 m**	Date:	**22/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819030, 5801216 NZTM**		CPT no.:	**06** **2/6**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² 10 cm²	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:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819030, 5801216 NZTM**	CPT no.:	**06** 4/6

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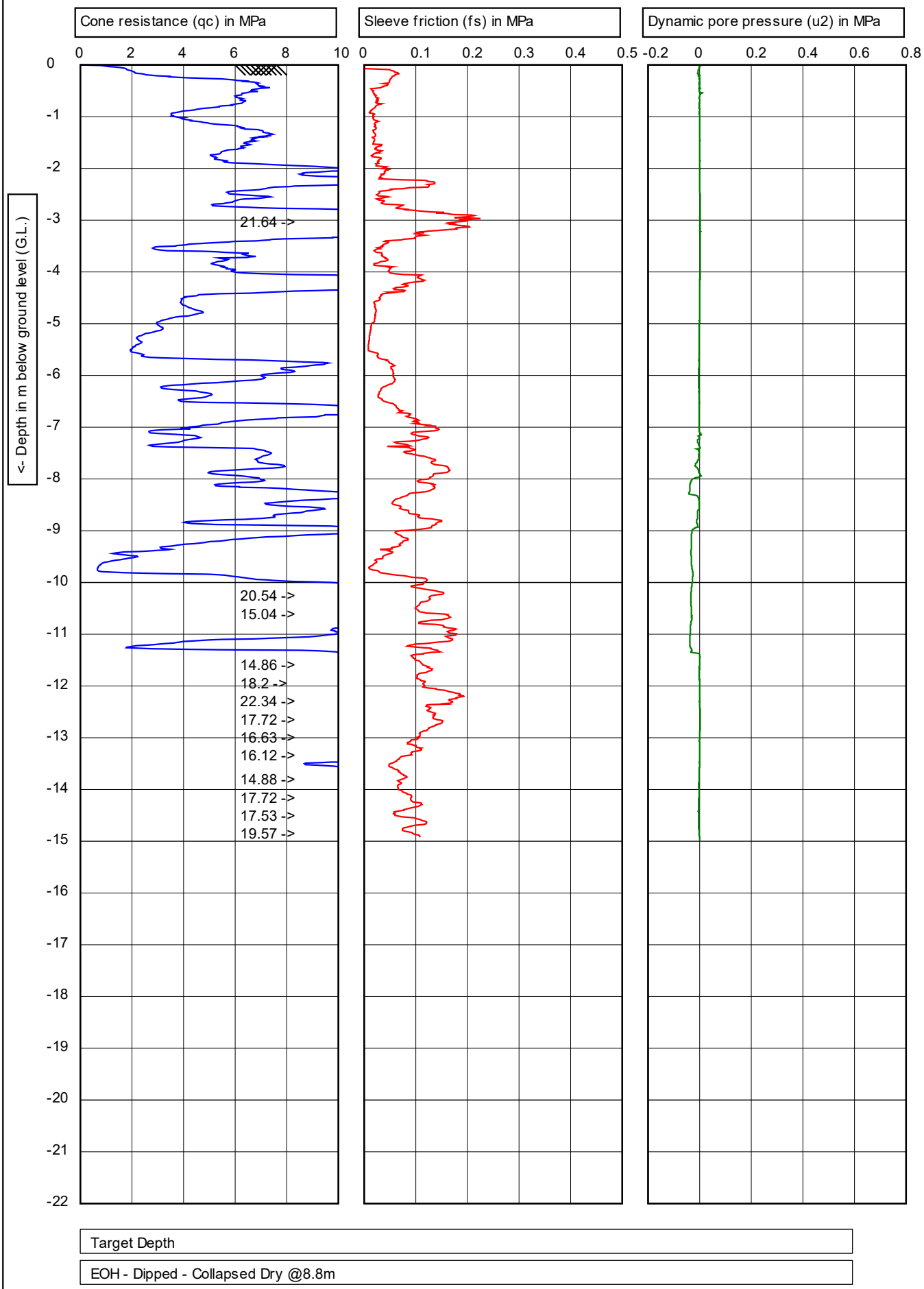
Version: 1, Version Date: 17/12/2025

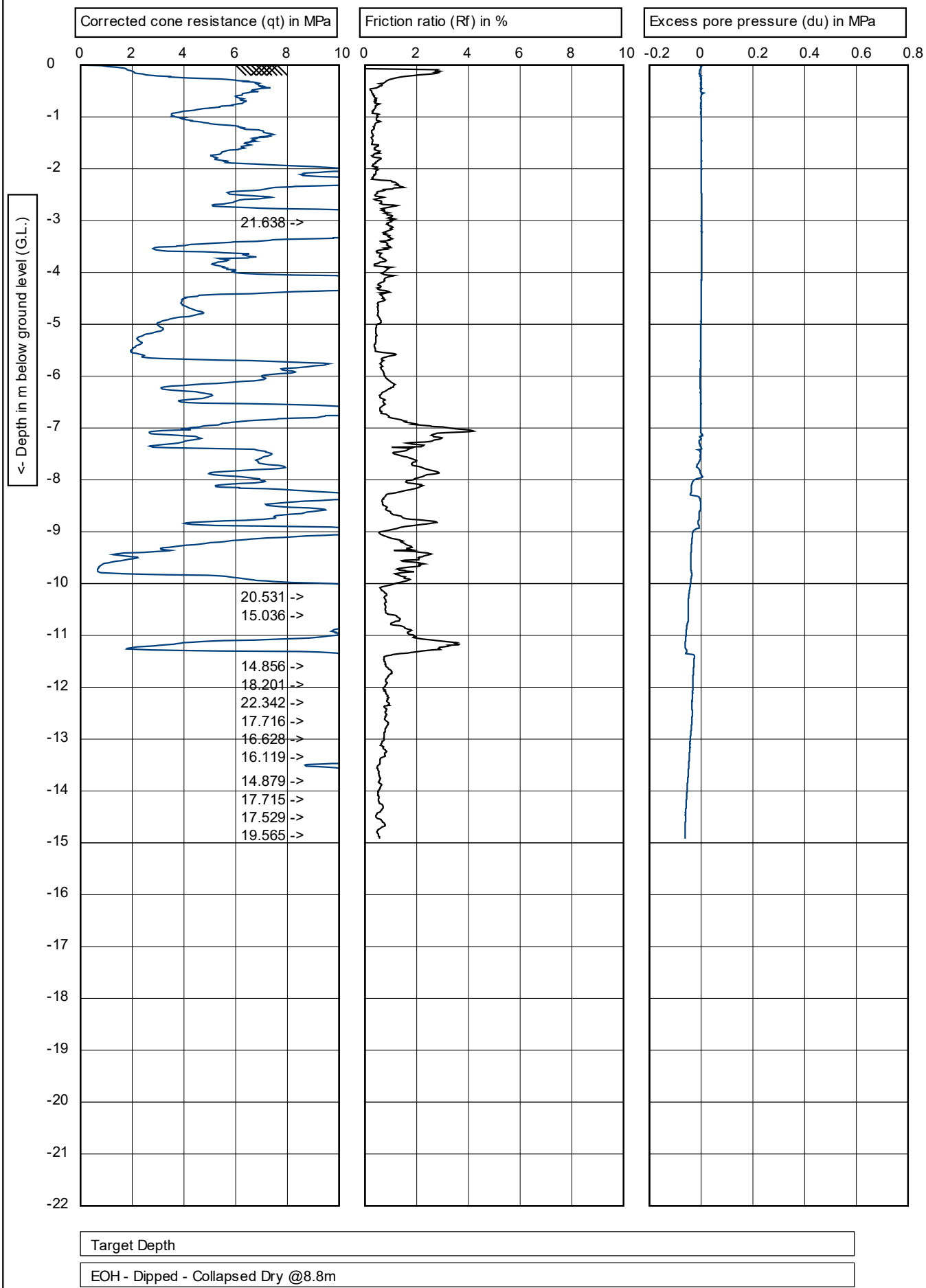


	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818976, 5801533 NZTM**	CPT no.:	**07** 1/6

u2 150 cm² 10 cm²

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

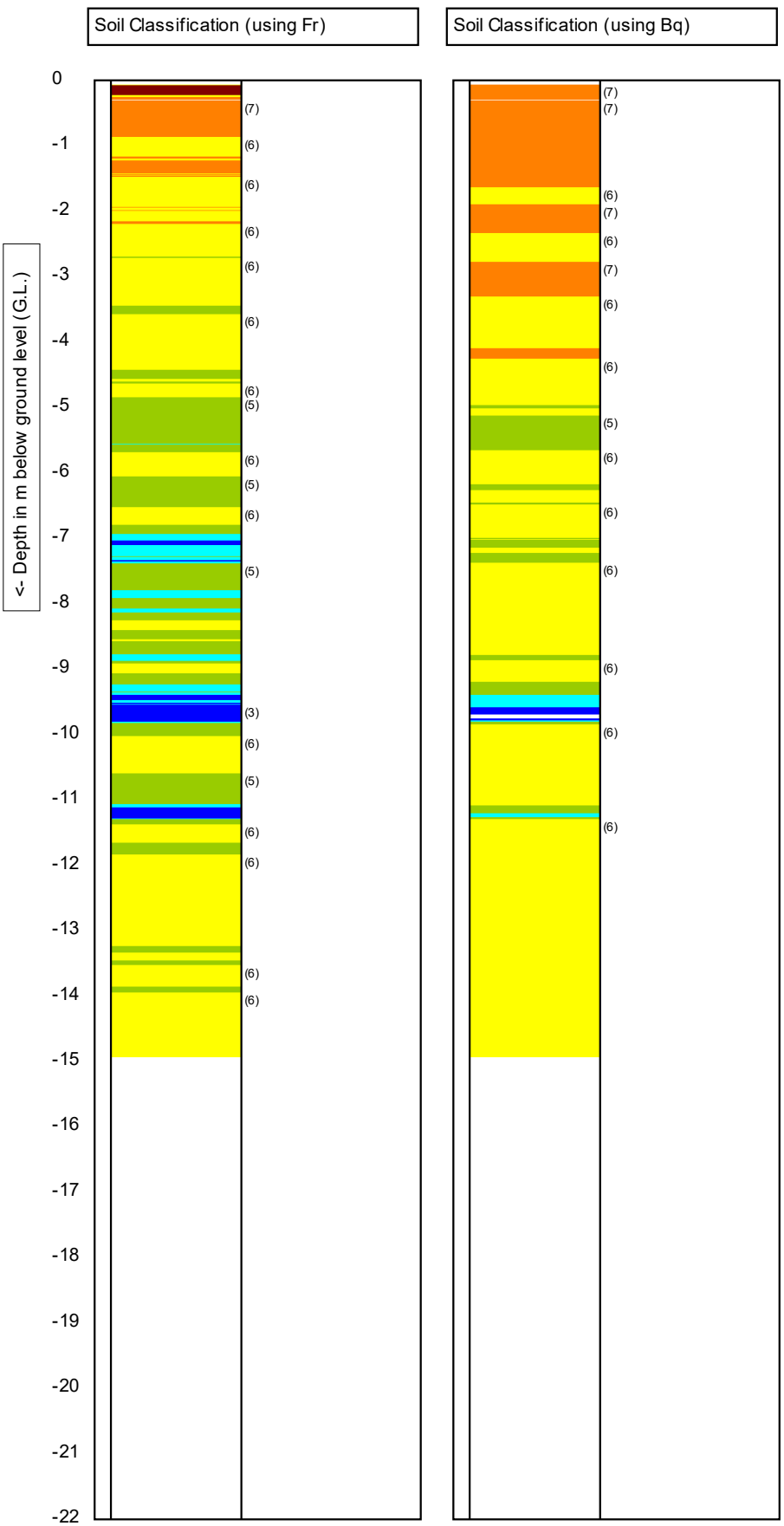


Graphs on this page are not IANZ accredited

1.47

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818976, 5801533 NZTM**	CPT no.:	**07** **2/6**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

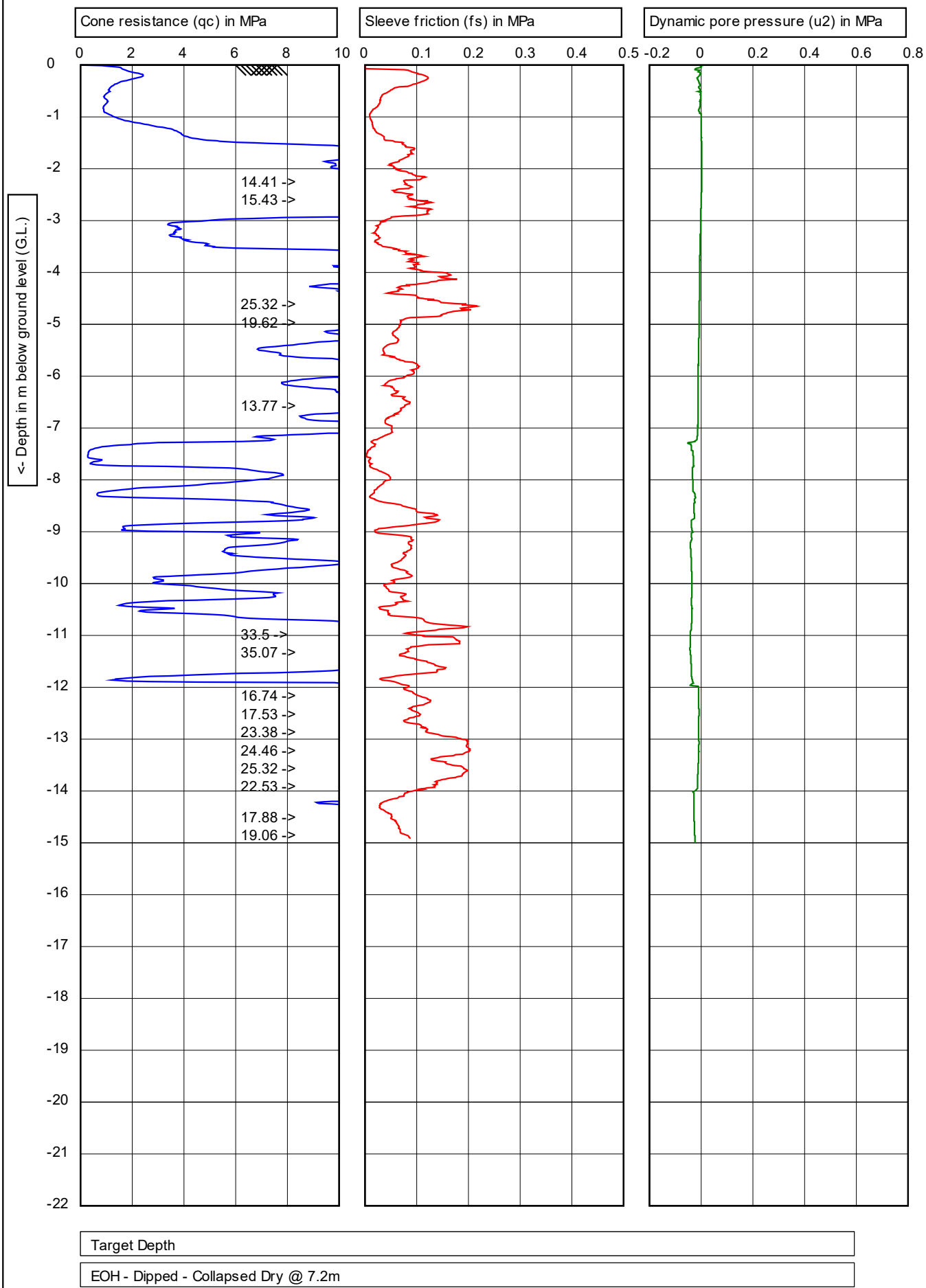


(0) Not defined
(1) Sensitive, fine grained
(2) Organic soils-peats
(3) Clays-clay to silty clay
(4) Clayey silt to silty clay
(5) Sand mixtures
(6) Sands
(7) Gravelly sand to sand
(8) Very stiff sand to clayey sand
(9) Very stiff fine grained

wsp
Graphs on this page are not IANZ accredited

u2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818976, 5801533 NZTM**	CPT no.:	**07** 4/6

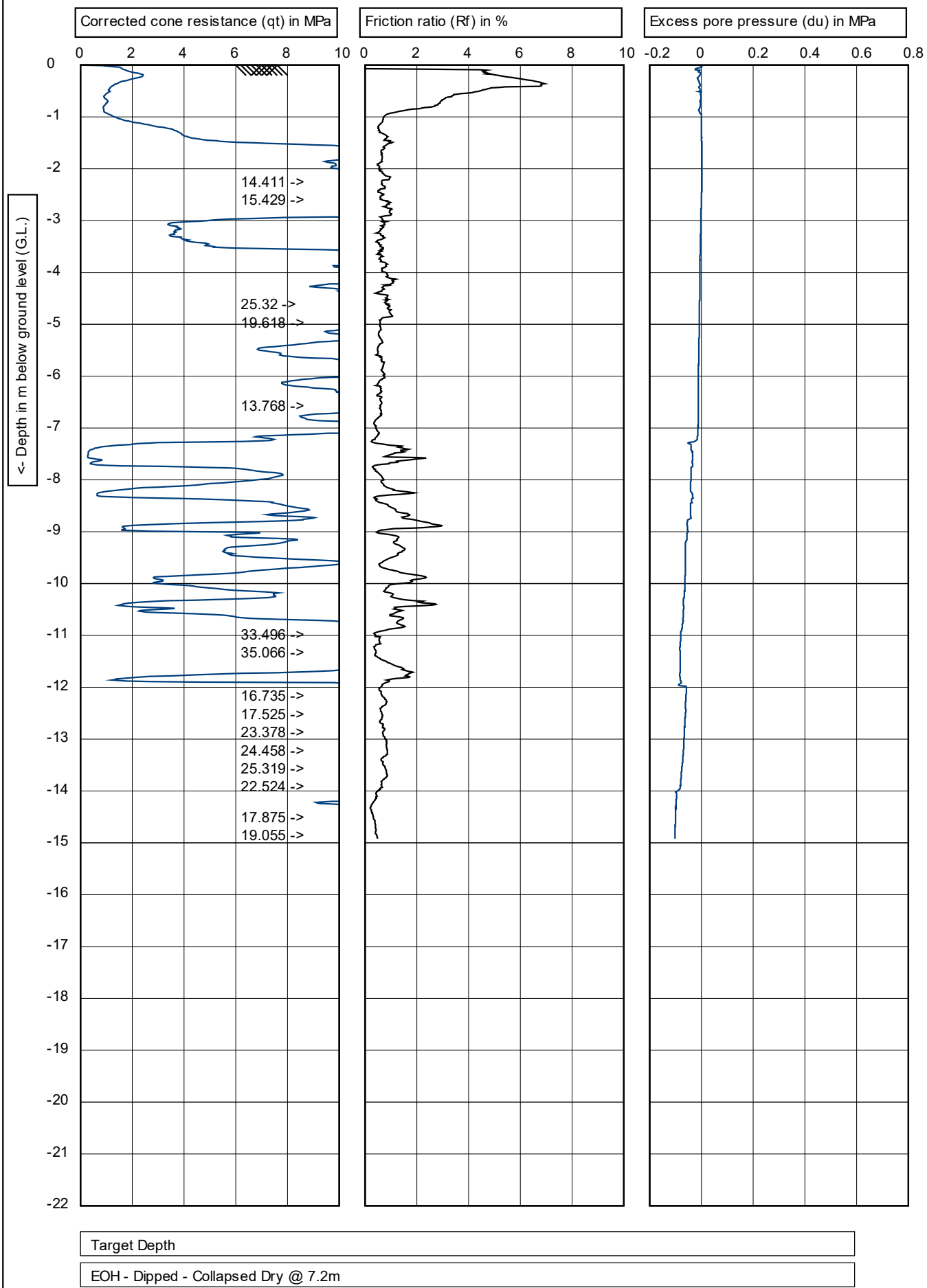
1.47



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818755, 5801562 NZTM**		CPT no.:	**08** 1/6

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

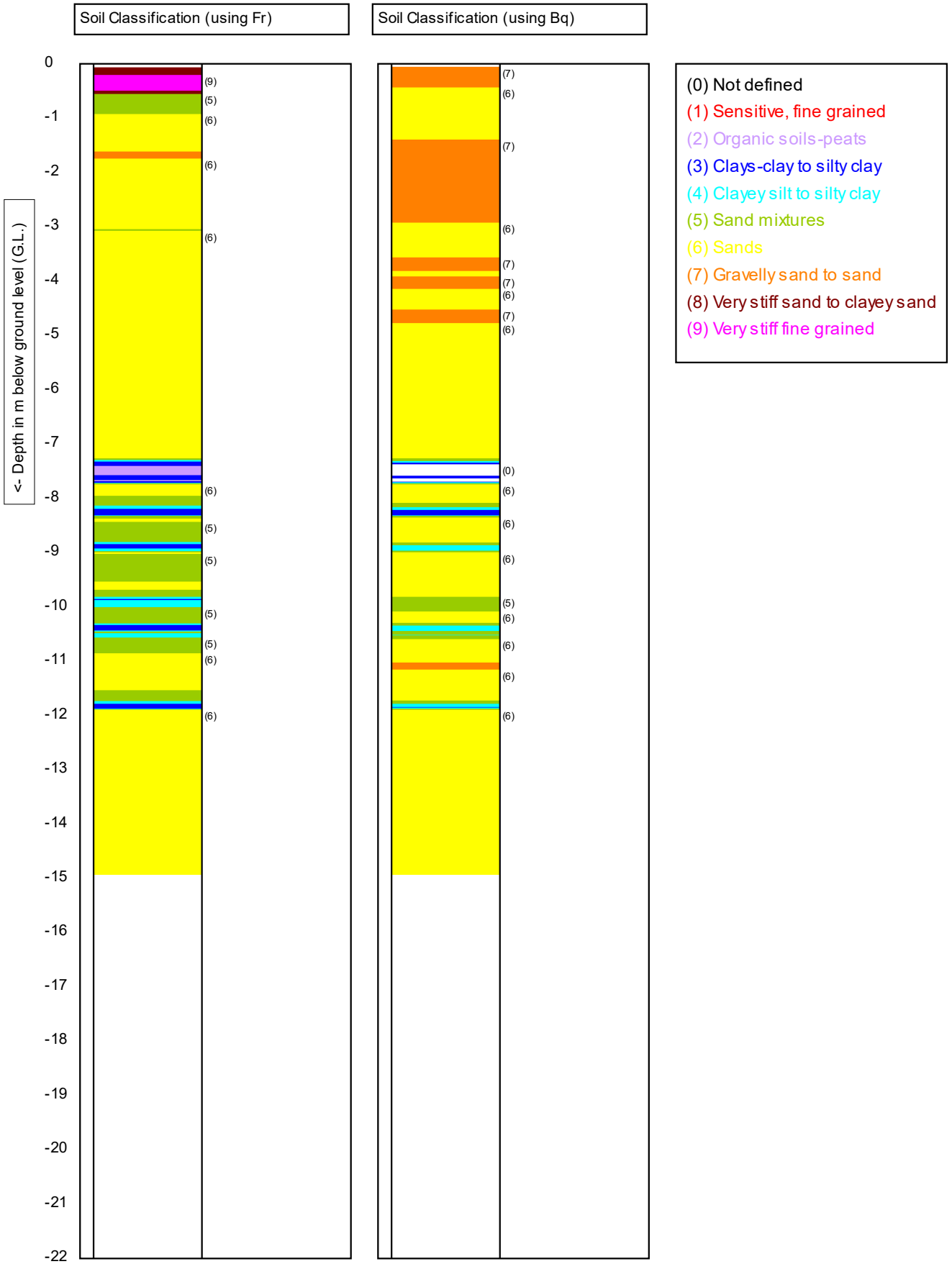


Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818755, 5801562 NZTM**	CPT no.:	**08** **2/6**

1.47

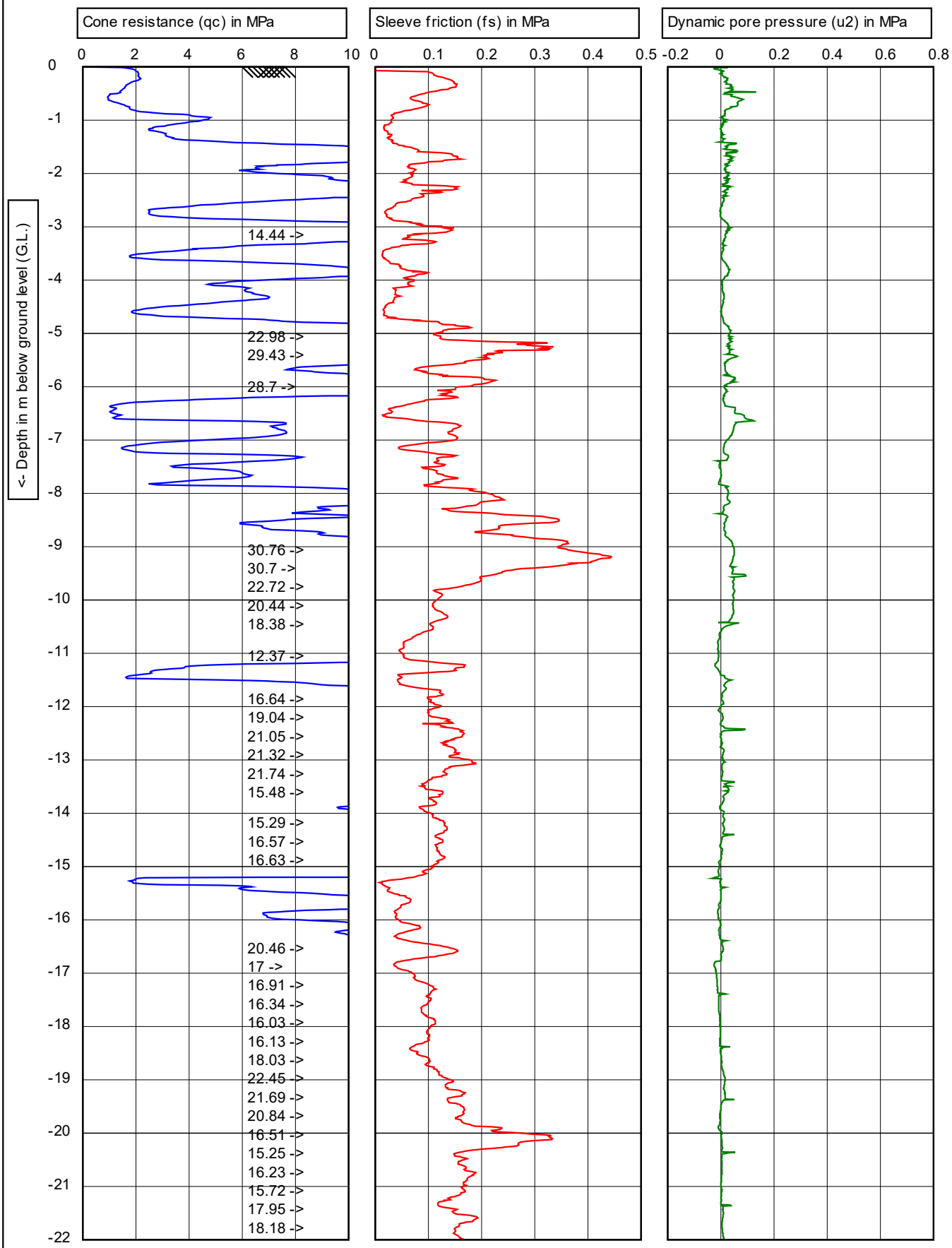
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp Graphs on this page are not IANZ accredited	r u2 / 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL**	Date: **22/06/2021**
		Project: **Wordsworth St Developments**	Cone no.: **C10CFIIP.C14434**
		Location: **Cambridge**	Project no.: **2-68014.00_HA7523**
		Position: **1818755, 5801562 NZTM**	CPT no.: **08** **4/6**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

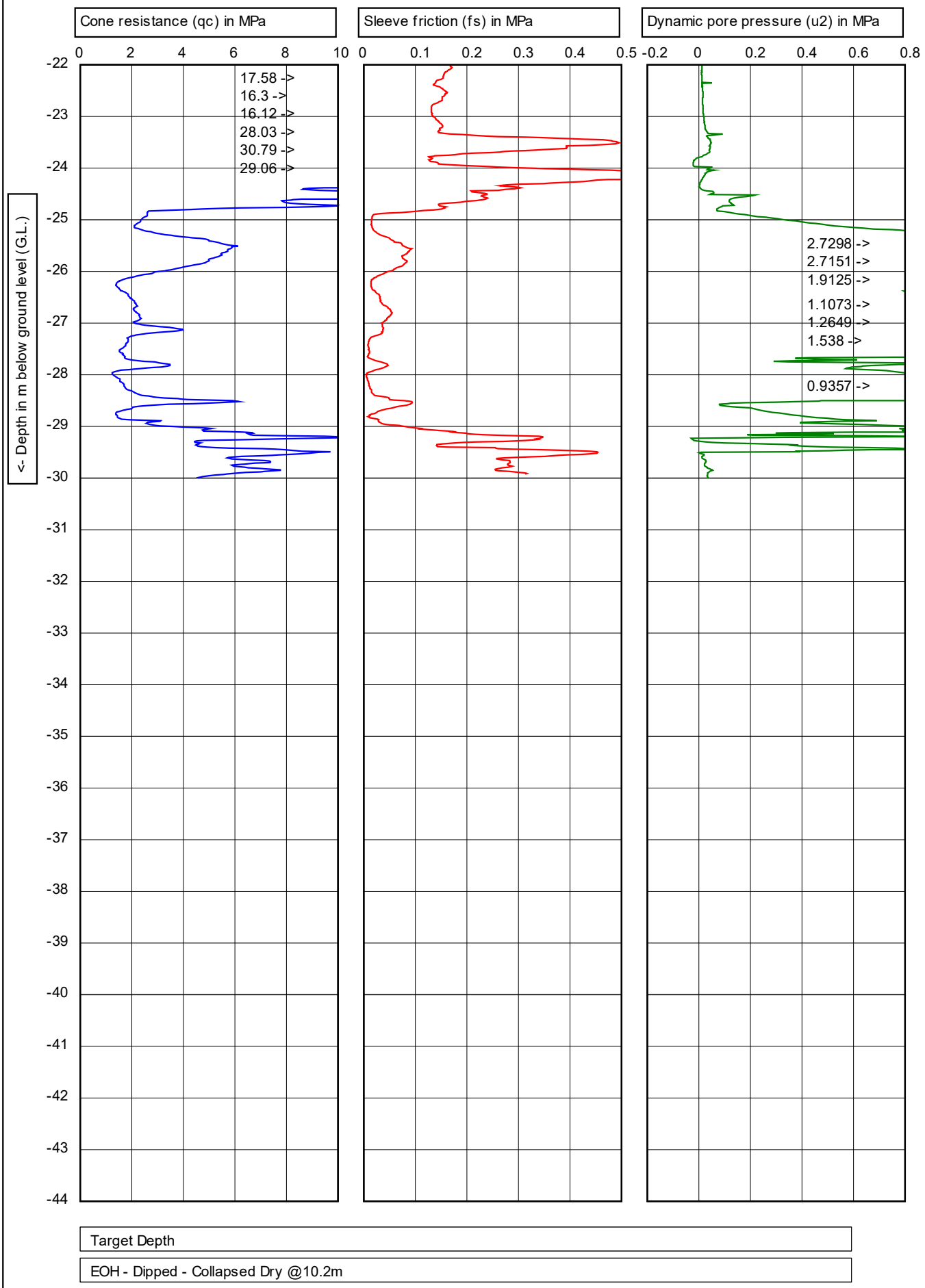


	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818832, 5801723 NZTM**	CPT no.:	**09** 1/12

r u2
150 cm²
10 cm²

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818832, 5801723 NZTM**	CPT no.:	**09** 2/12

1.47

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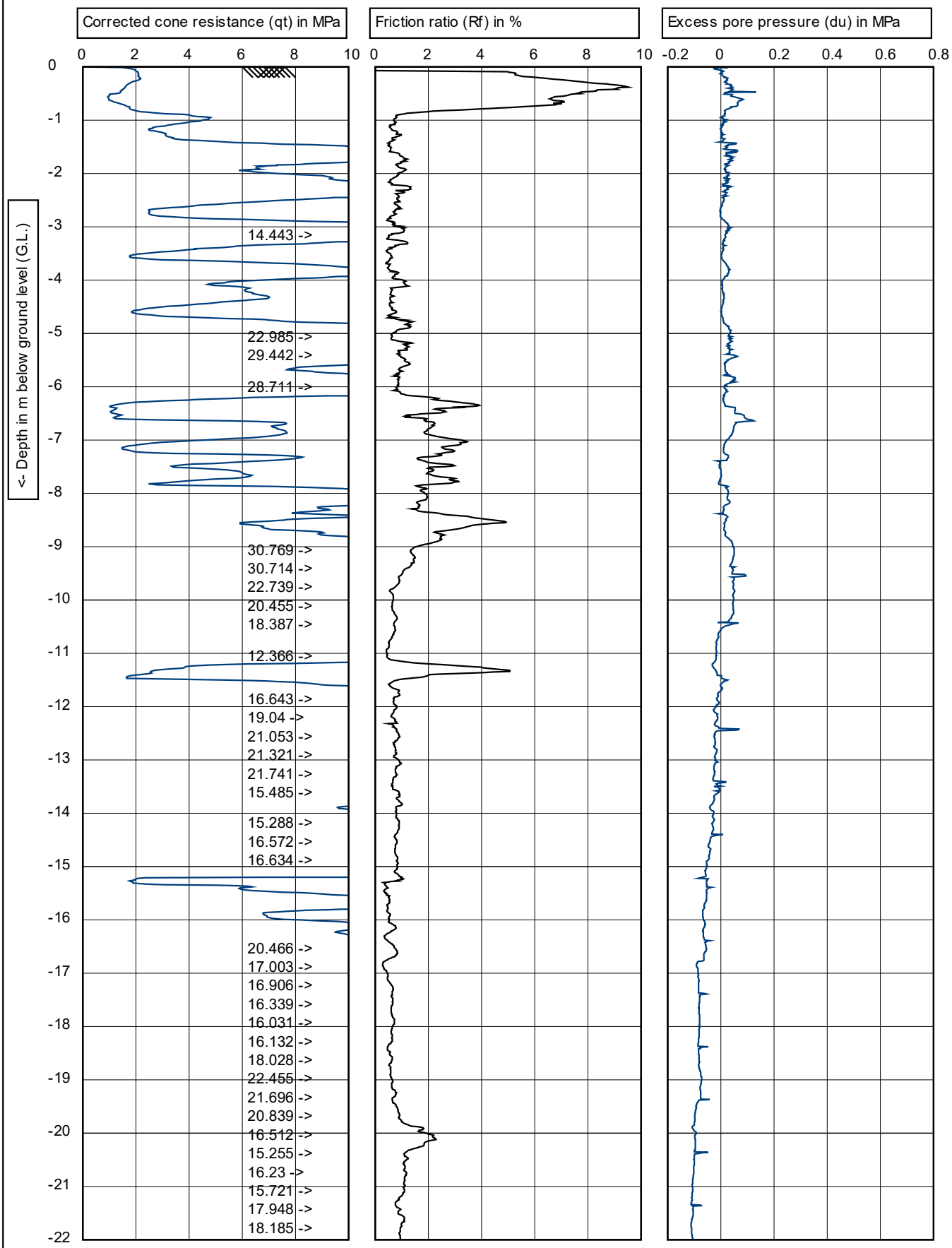
Version: 1, Version Date: 17/12/2025

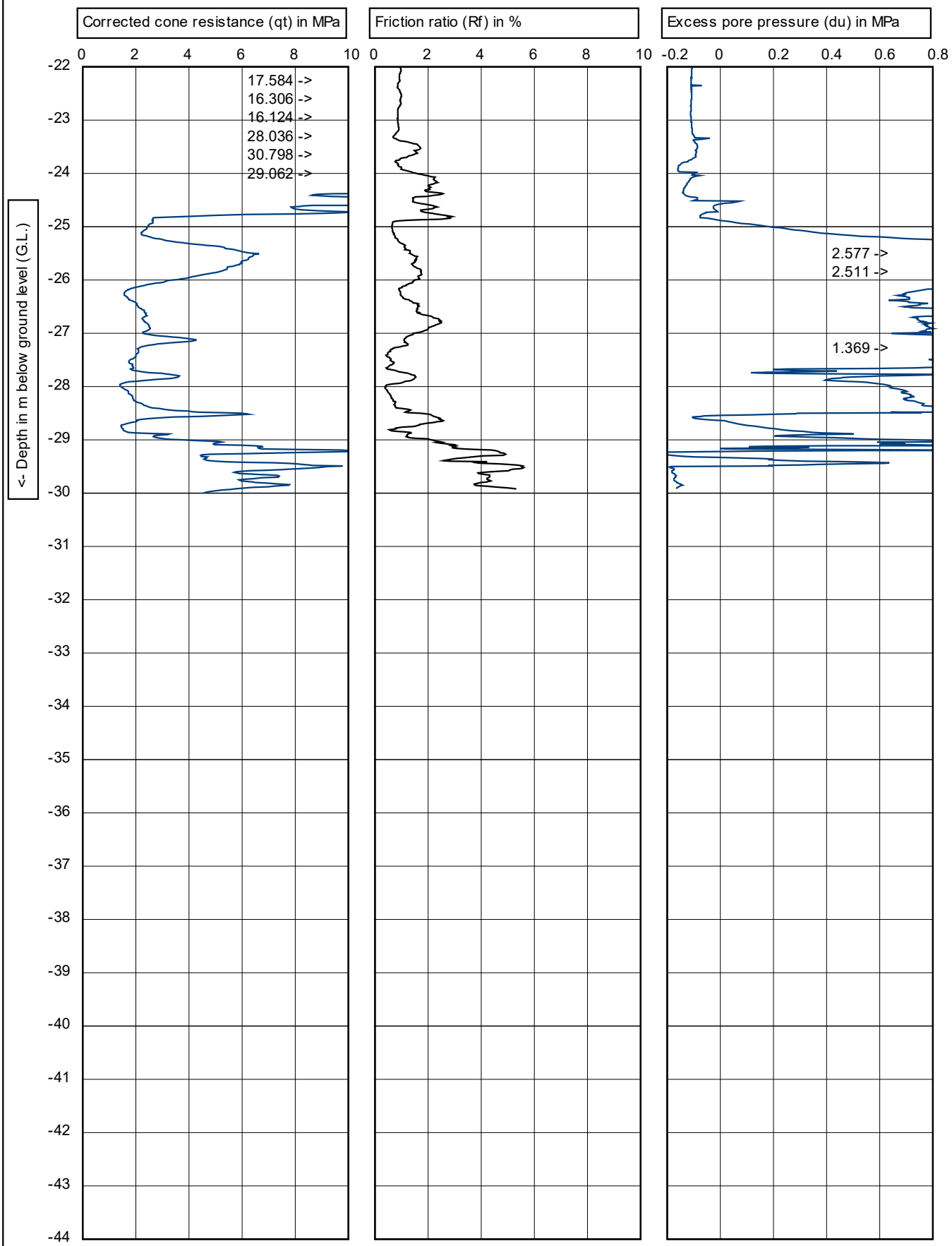


Graphs on this page are not IANZ accredited

1.47

u2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C15211**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818832, 5801723 NZTM**		CPT no.:	**09** 3/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

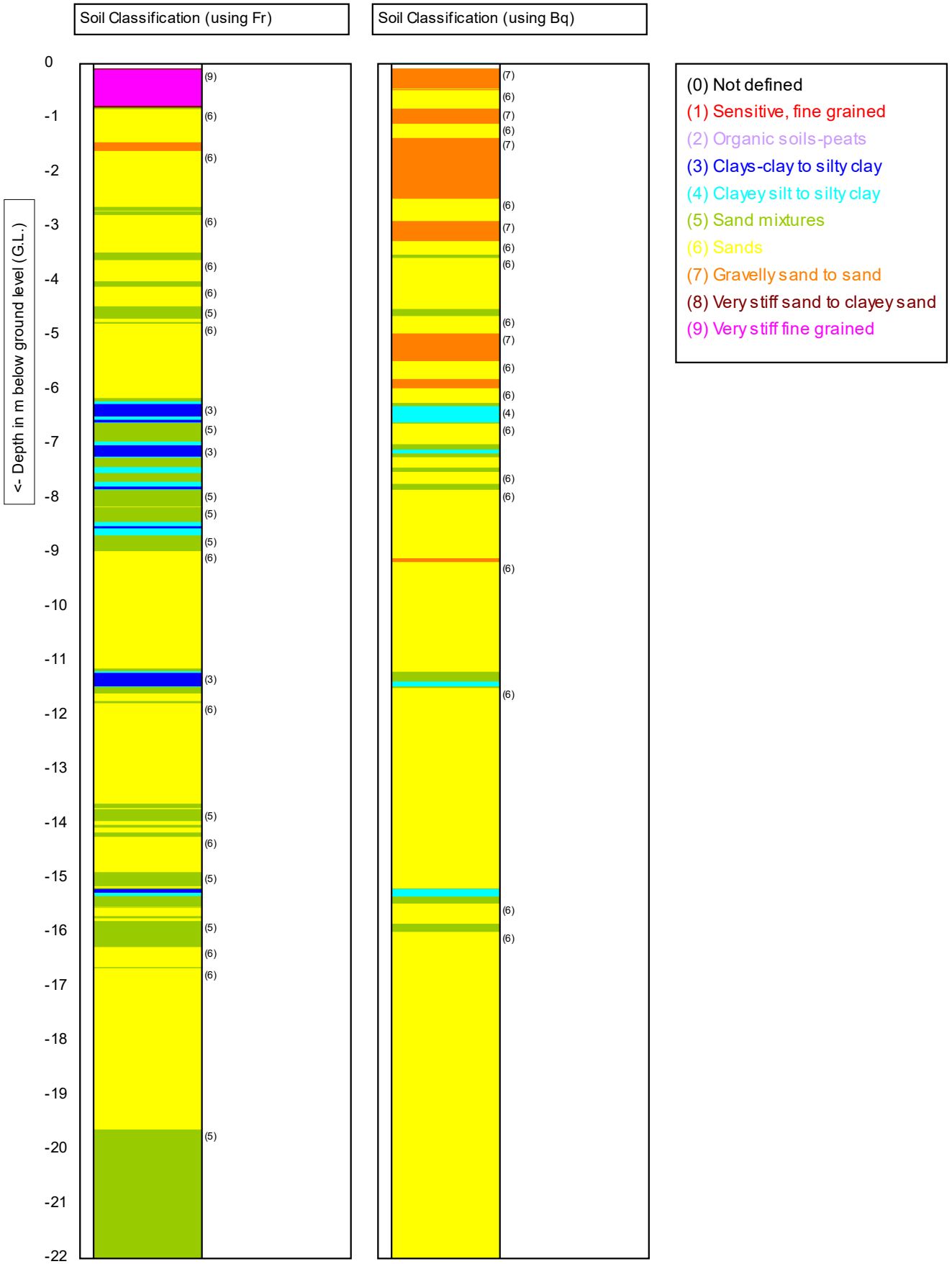


Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818832, 5801723 NZTM**	CPT no.:	**09** 4/12

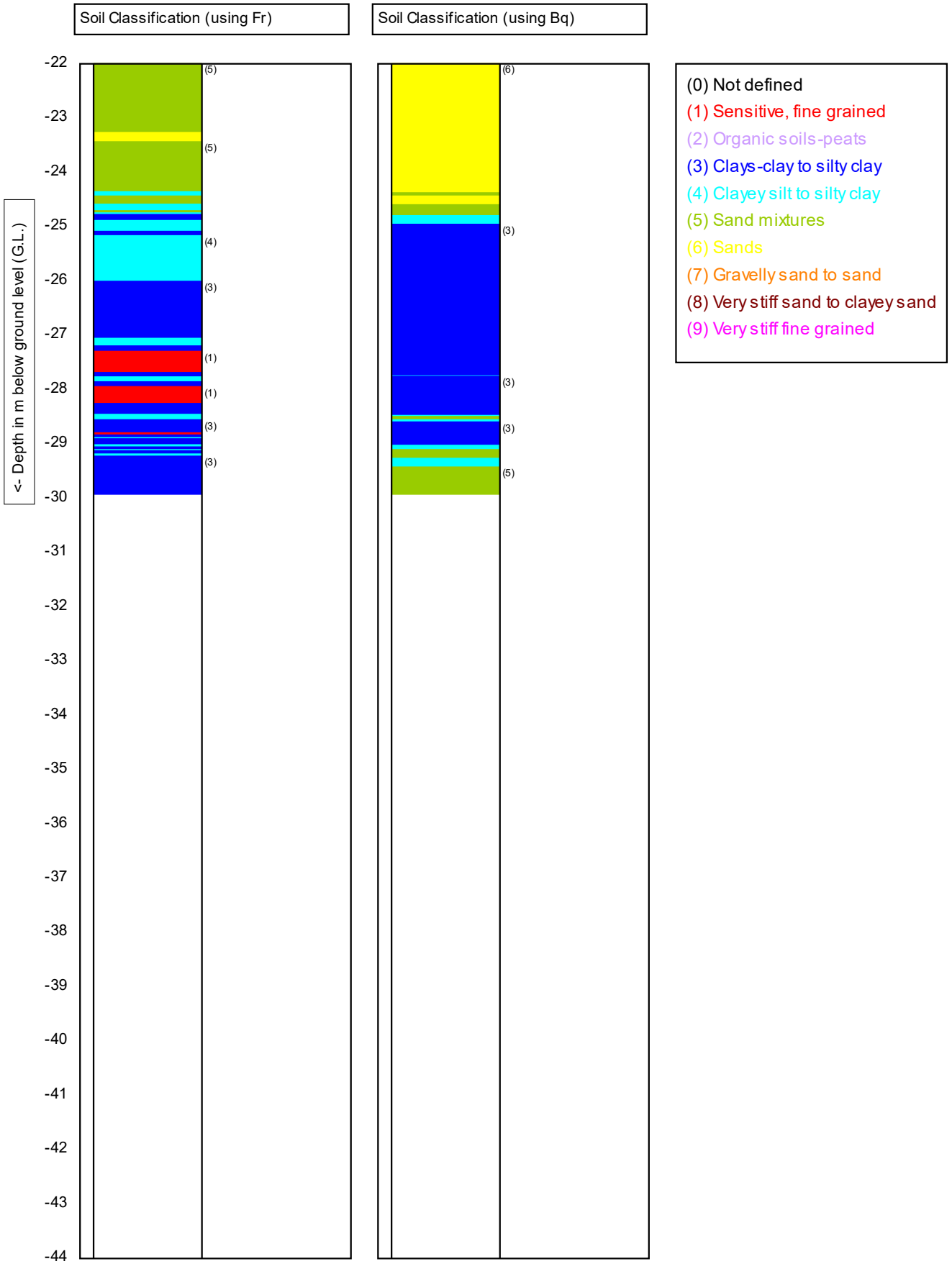
1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited	u2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL**	Date: **22/06/2021**
	Project: **Wordsworth St Developments**		Cone no.: **C10CFIIP.C15211**
	Location: **Cambridge**		Project no.: **2-68014.00_HA7523**
	Position: **1818832, 5801723 NZTM**		CPT no.: **09** 7/12

1.47



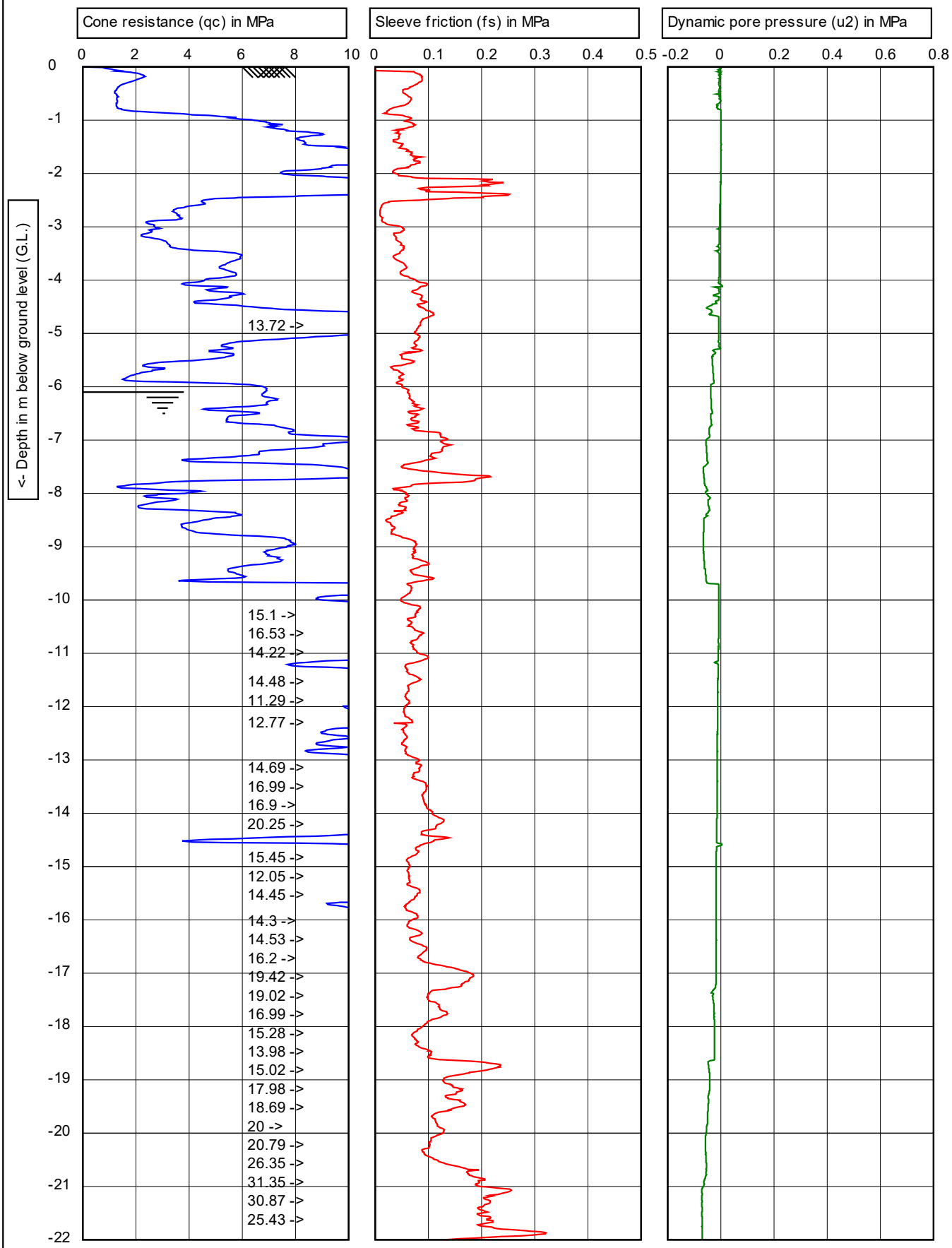
wsp

Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818832, 5801723 NZTM**	CPT no.:	**09** 8/12

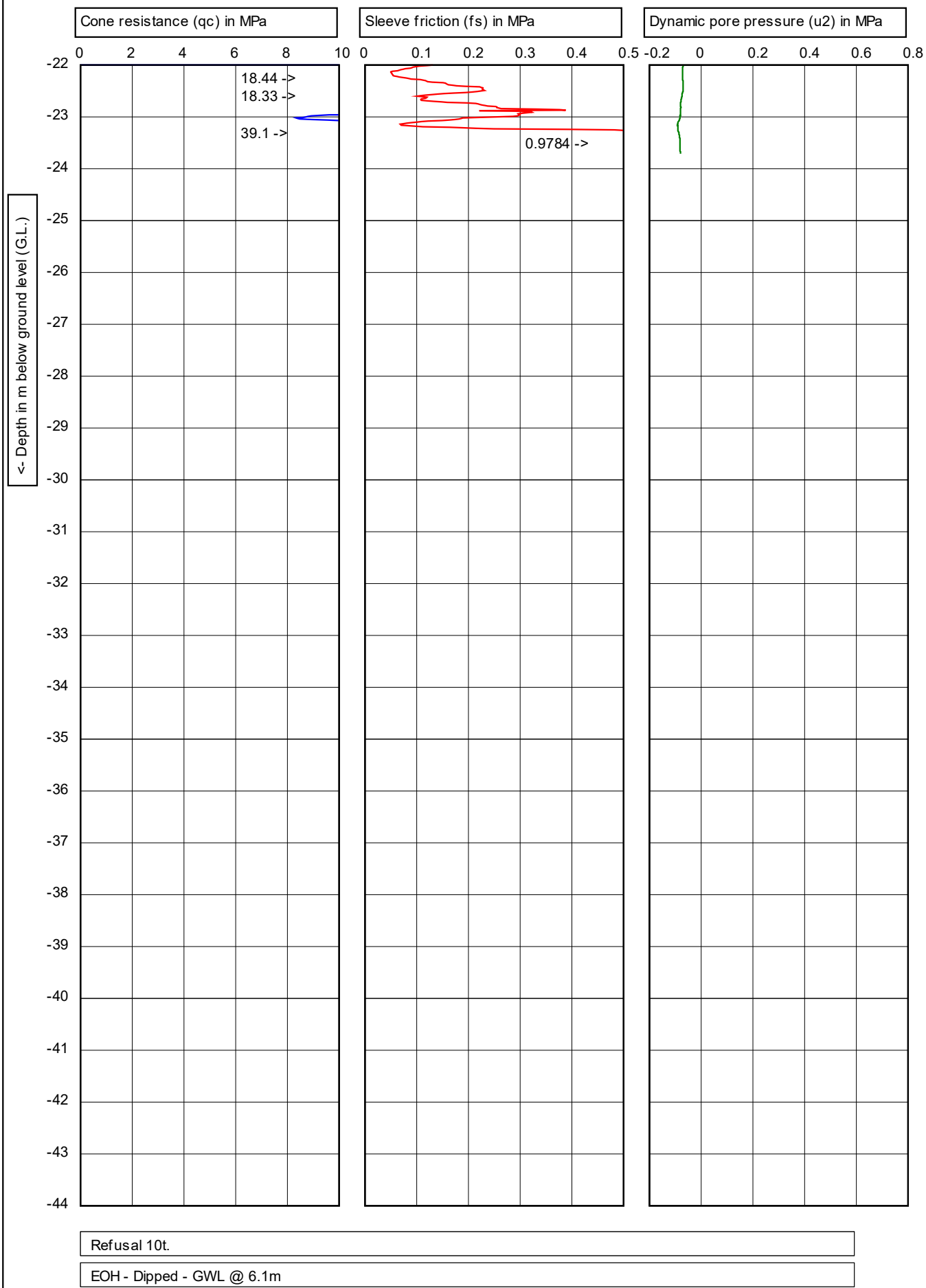
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-6.10 m**	Date:	**22/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14434**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819040, 5801946 NZTM**		CPT no.:	**10** 1/12

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



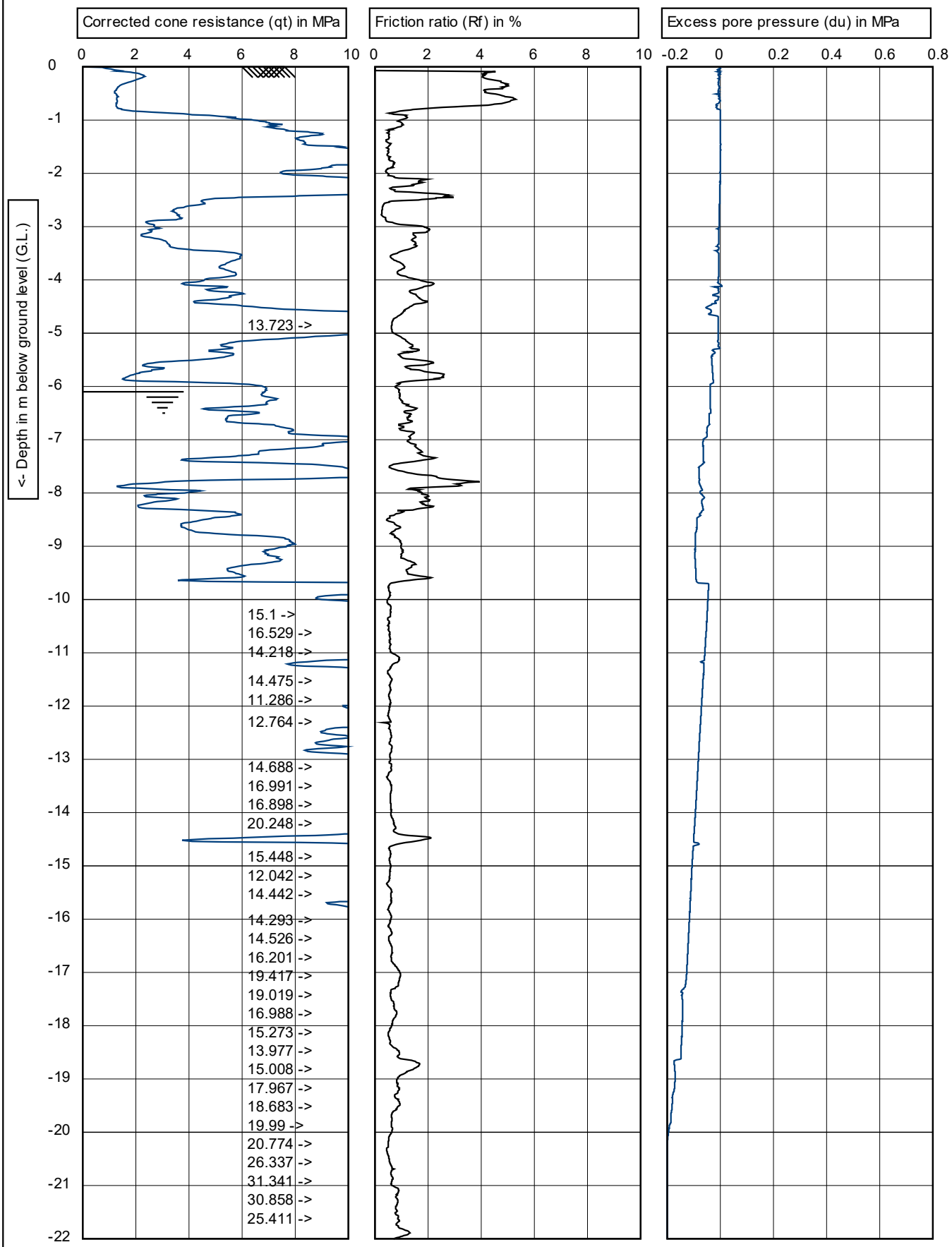
Refusal 10t.

EOH - Dipped - GWL @ 6.1m

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** — W.L.: **-6.10 m**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819040, 5801946 NZTM**	CPT no.:	**10** — **2/12**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp

Graphs on this page are not IANZ accredited

1.47

u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL** W.L.: **-6.10 m**

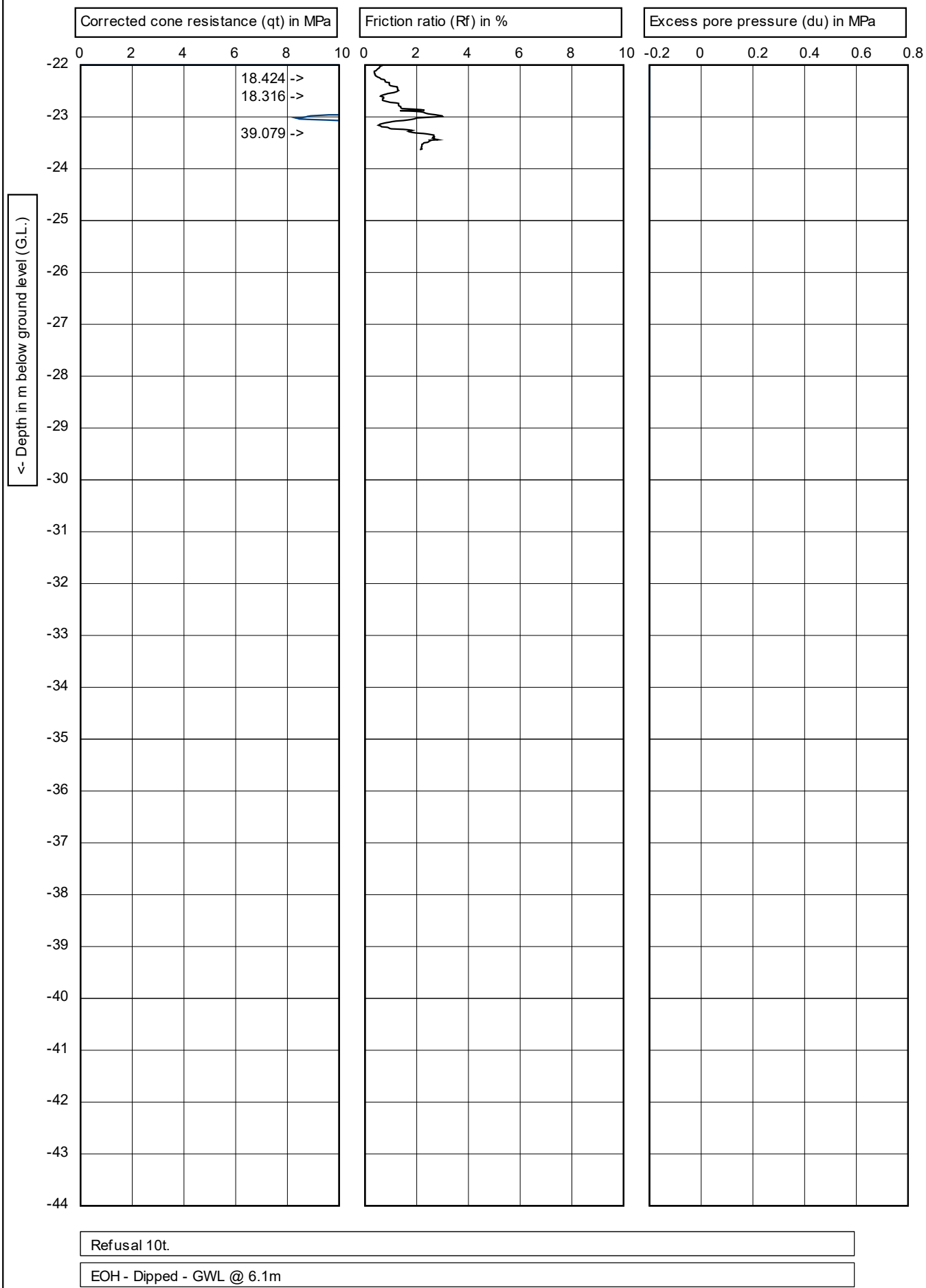
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819040, 5801946 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**22/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**10** 3/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - GWL @ 6.1m

wsp

Graphs on this page are not IANZ accredited

1.47

u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL** W.L.: **-6.10 m**

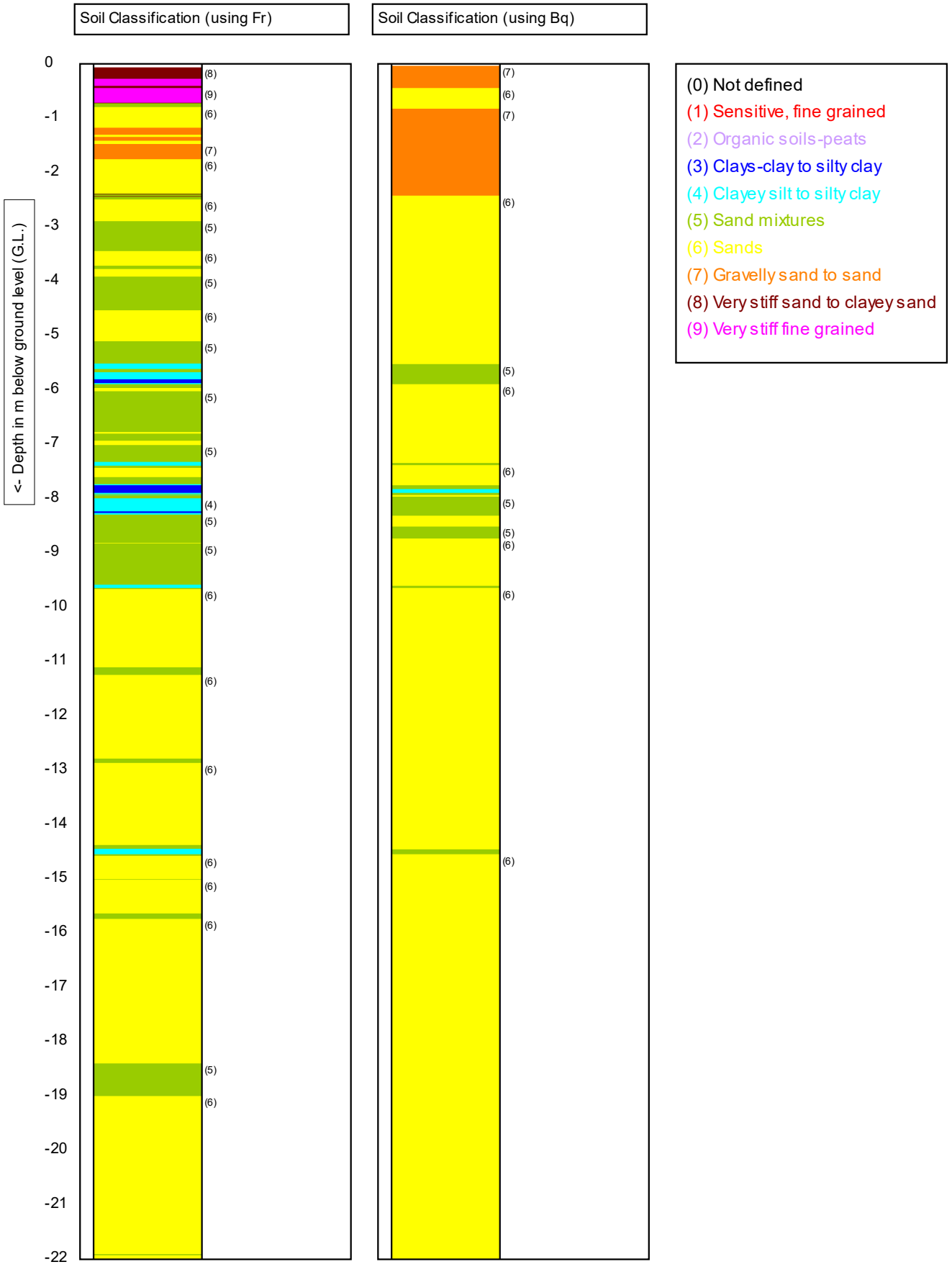
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819040, 5801946 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**22/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**10** **4/12**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

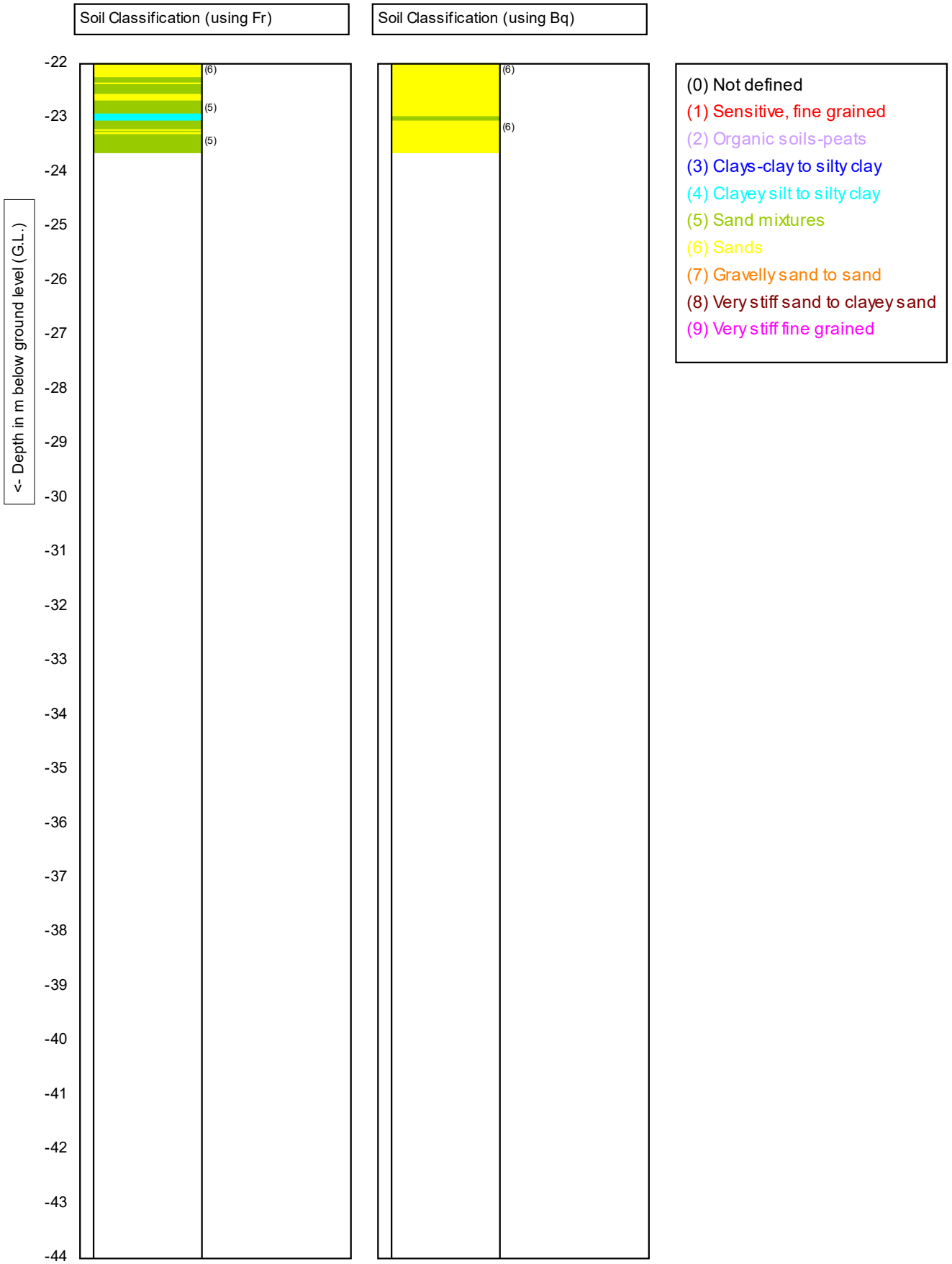


Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** W.L.: **-6.10 m**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819040, 5801946 NZTM**	CPT no.:	**10** 7/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



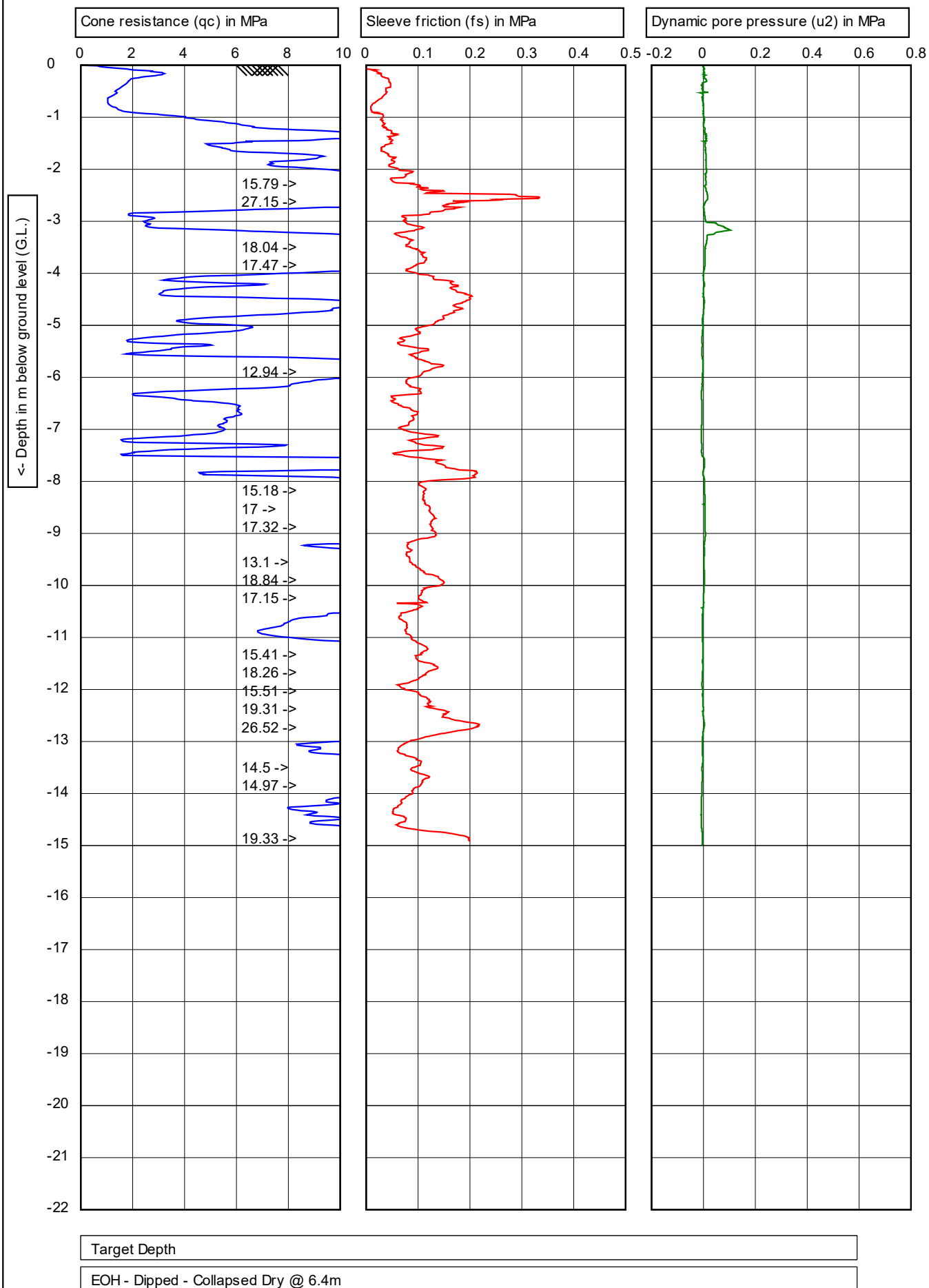
wsp

Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL** W.L.: **-6.10 m**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819040, 5801946 NZTM**	CPT no.:	**10** 8/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818958, 5802159 NZTM**	CPT no.:	**11** **1/6**

1.47

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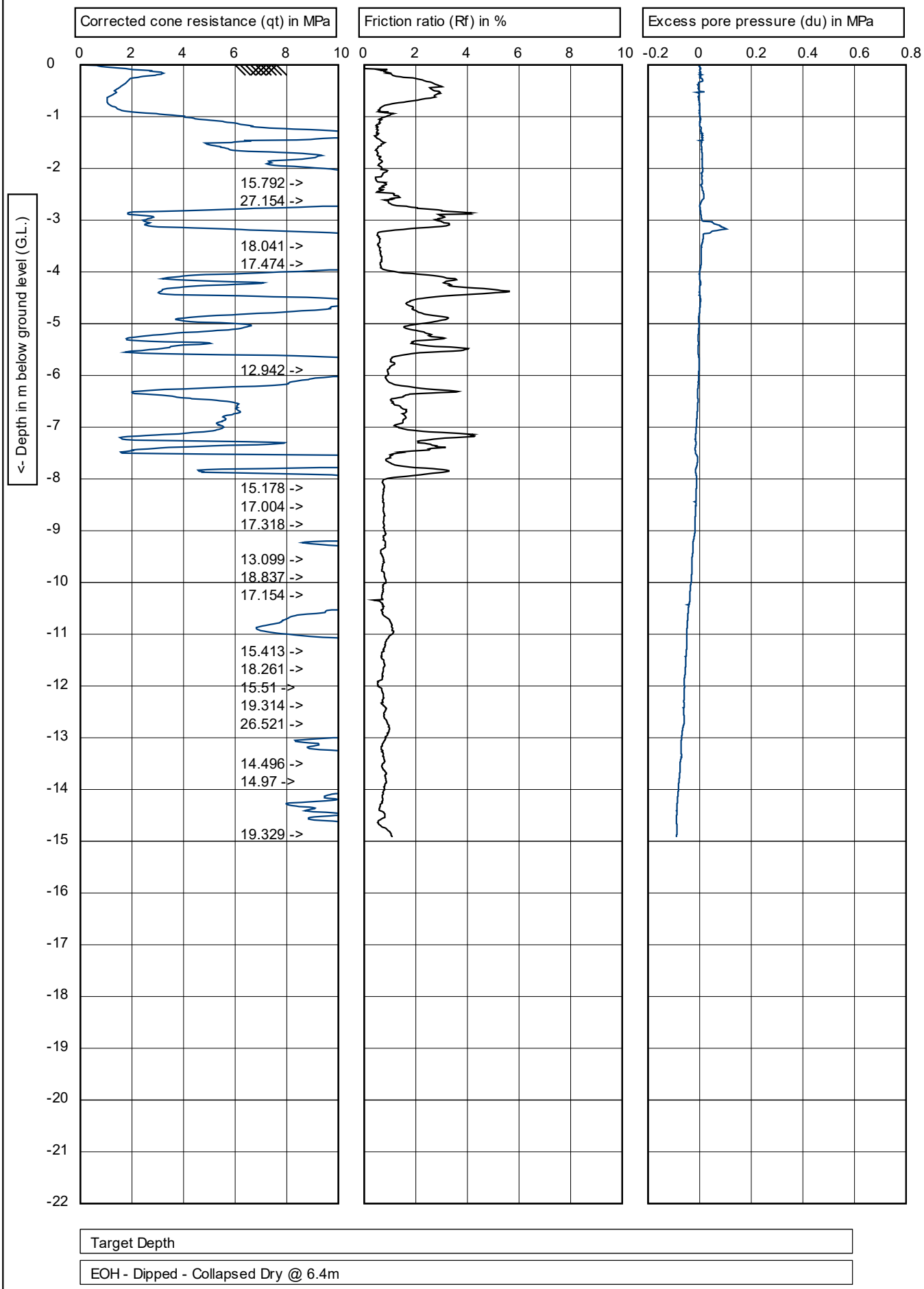
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.47

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

G.L.: **0.00 m MSL**

Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1818958, 5802159 NZTM**

Predrill: **0.00 m Predrilled**

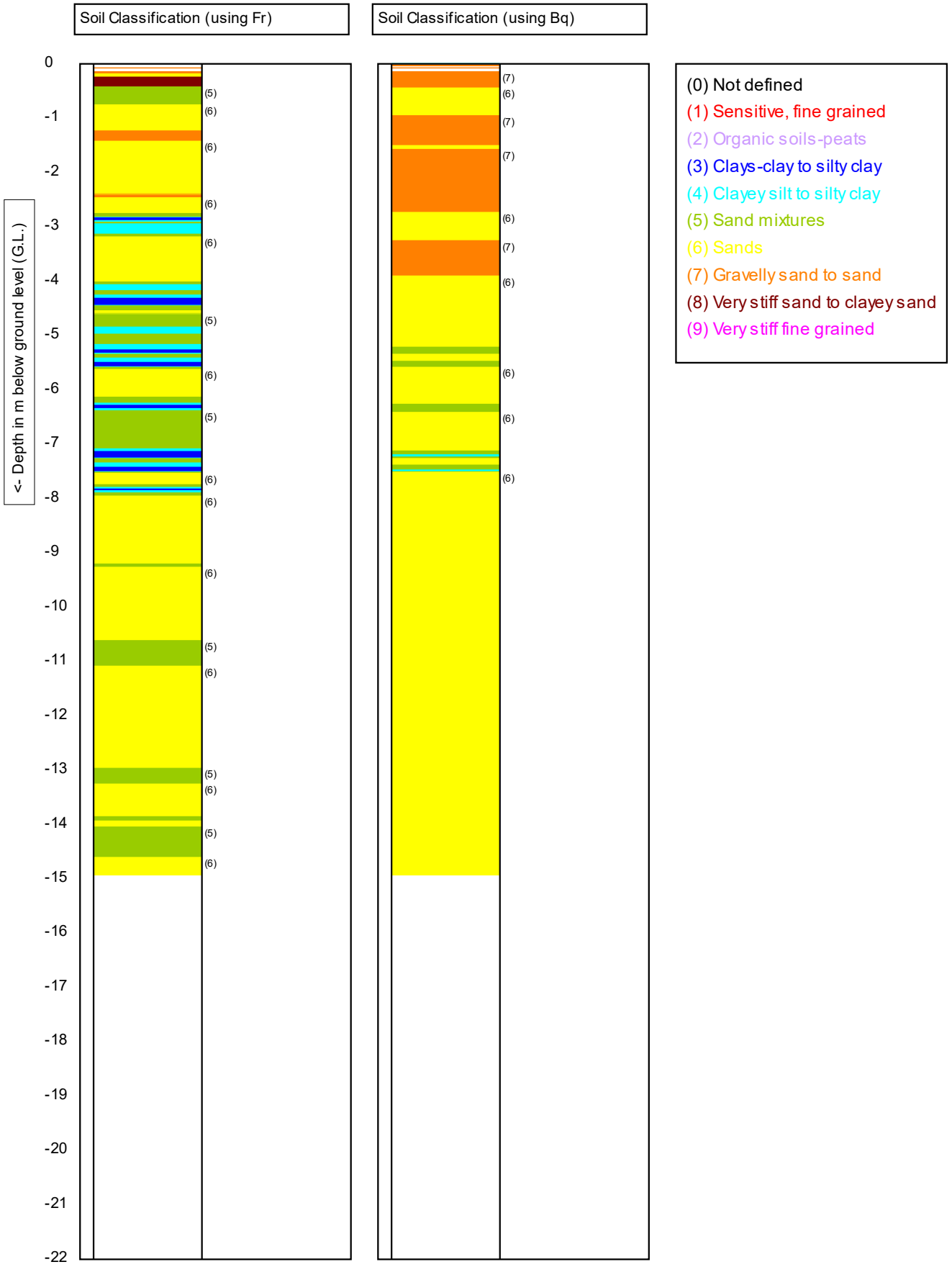
Date: **22/06/2021**

Cone no.: **C10CFIIP.C15211**

Project no.: **2-68014.00_HA7523**

CPT no.: **11** **2/6**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

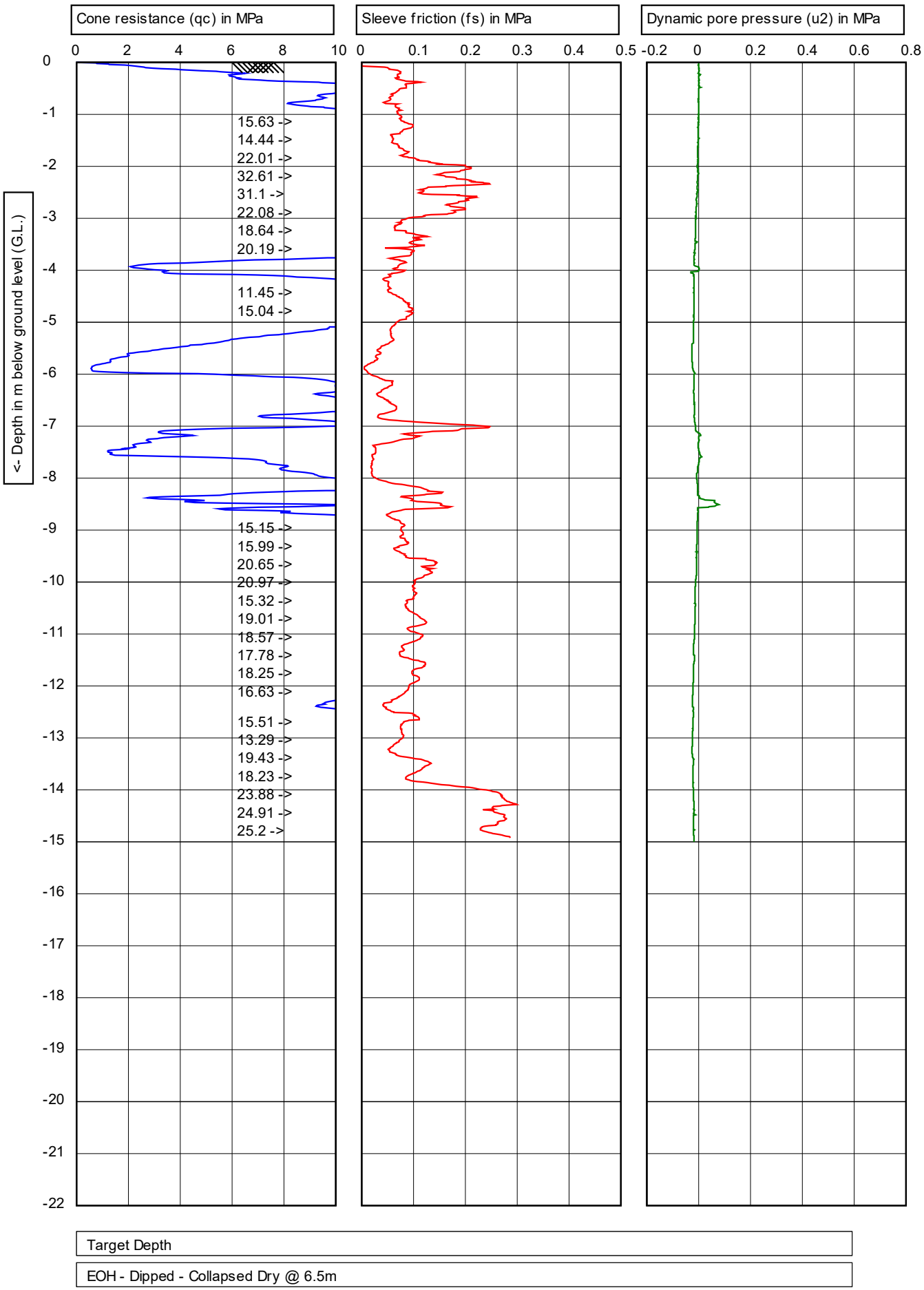


Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1818958, 5802159 NZTM**	CPT no.:	**11** **4/6**

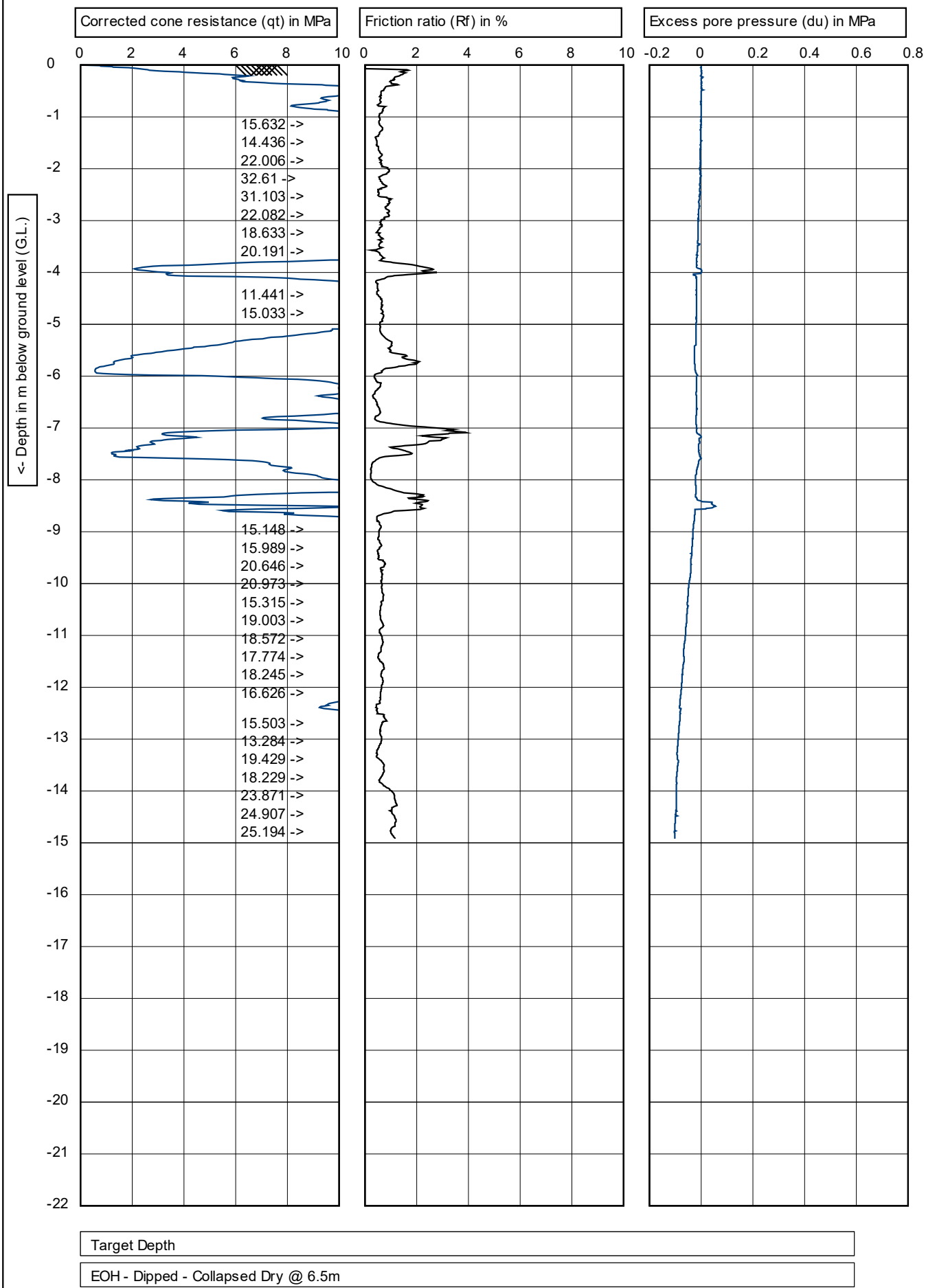
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14434**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819381, 5802144 NZTM**	CPT no.:	**12** **1/6**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.47

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

G.L.: **0.00 m MSL**

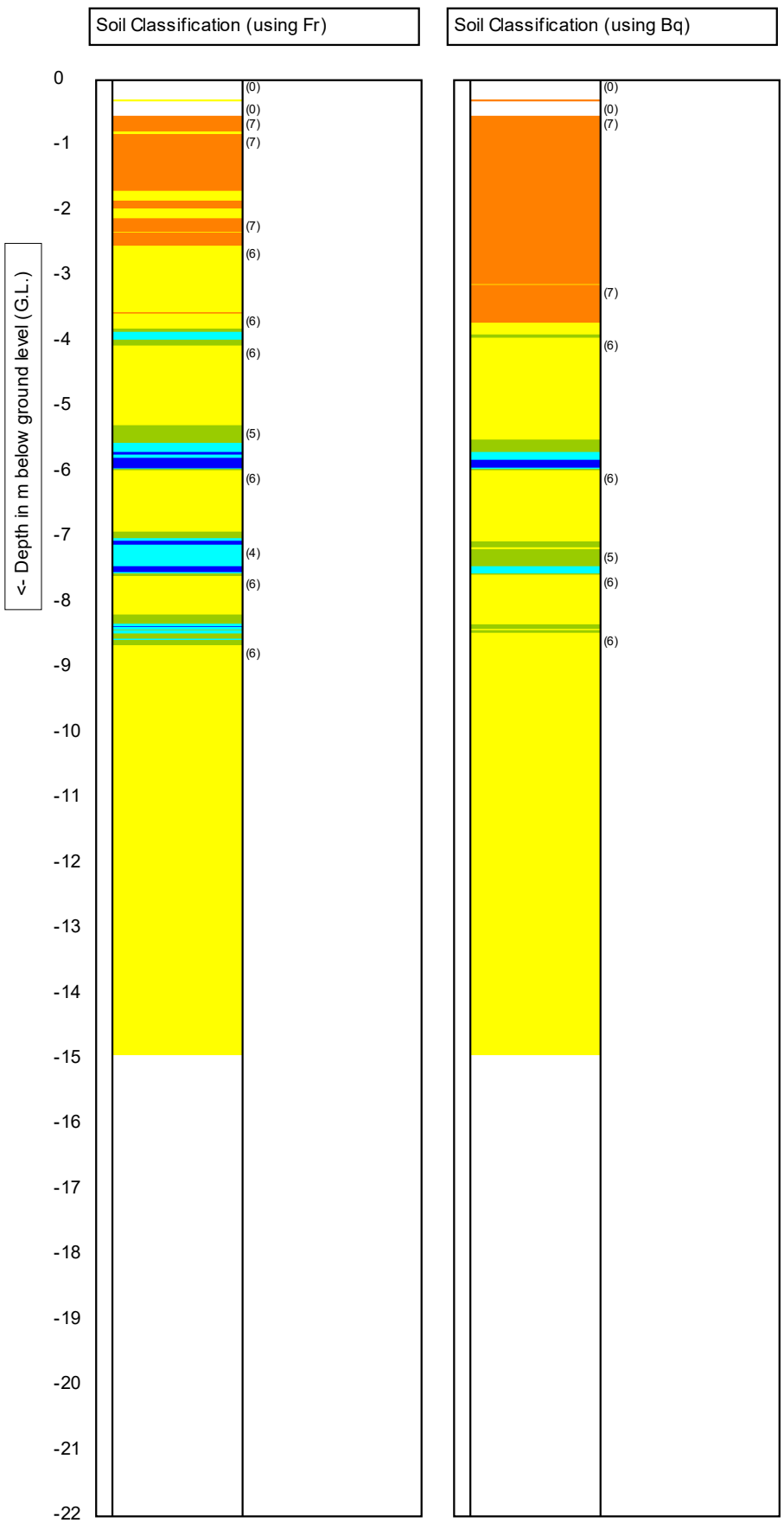
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819381, 5802144 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**22/06/2021**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**12** **2/6**

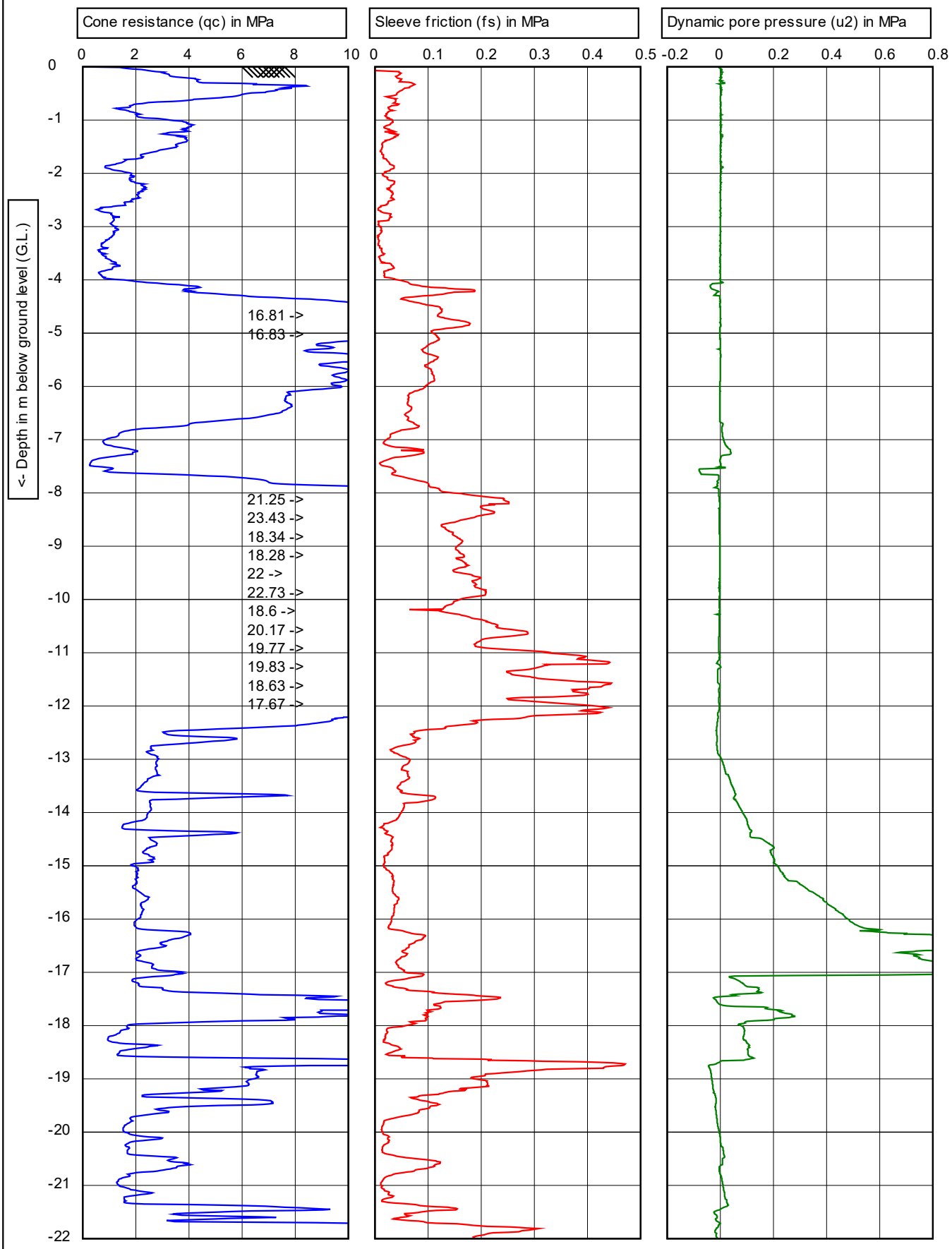
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



(0) Not defined
(1) Sensitive, fine grained
(2) Organic soils-peats
(3) Clays-clay to silty clay
(4) Clayey silt to silty clay
(5) Sand mixtures
(6) Sands
(7) Gravelly sand to sand
(8) Very stiff sand to clayey sand
(9) Very stiff fine grained

wsp Graphs on this page are not IANZ accredited	u2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL**	Date: **22/06/2021**
	Project: **Wordsworth St Developments**		Cone no.: **C10CFIIP.C14434**
	Location: **Cambridge**		Project no.: **2-68014.00_HA7523**
	Position: **1819381, 5802144 NZTM**		CPT no.: **12** 4/6

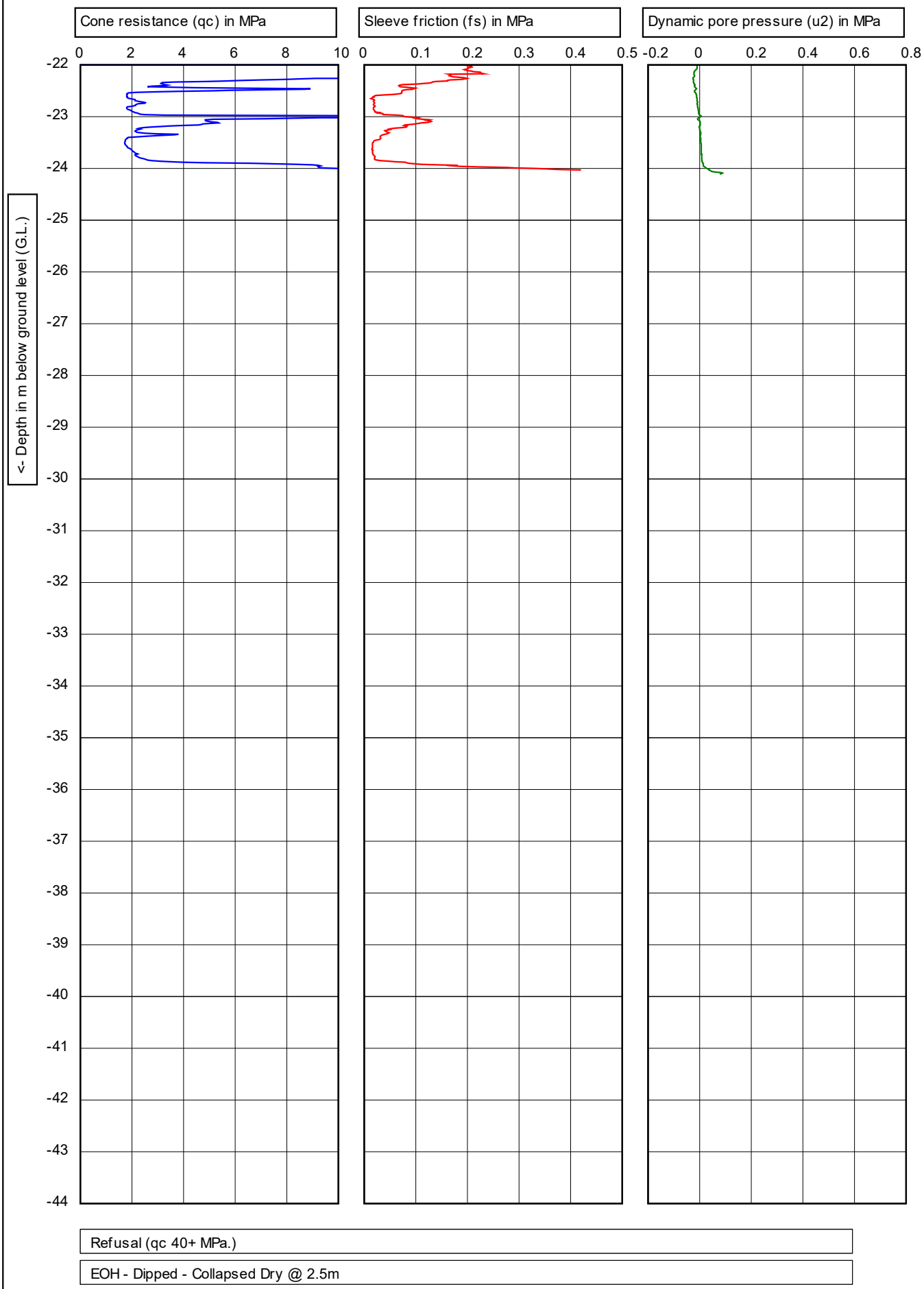
1.47



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819075, 5802467 NZTM**	CPT no.:	**13** **1/12**

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal (qc 40+ MPa.)

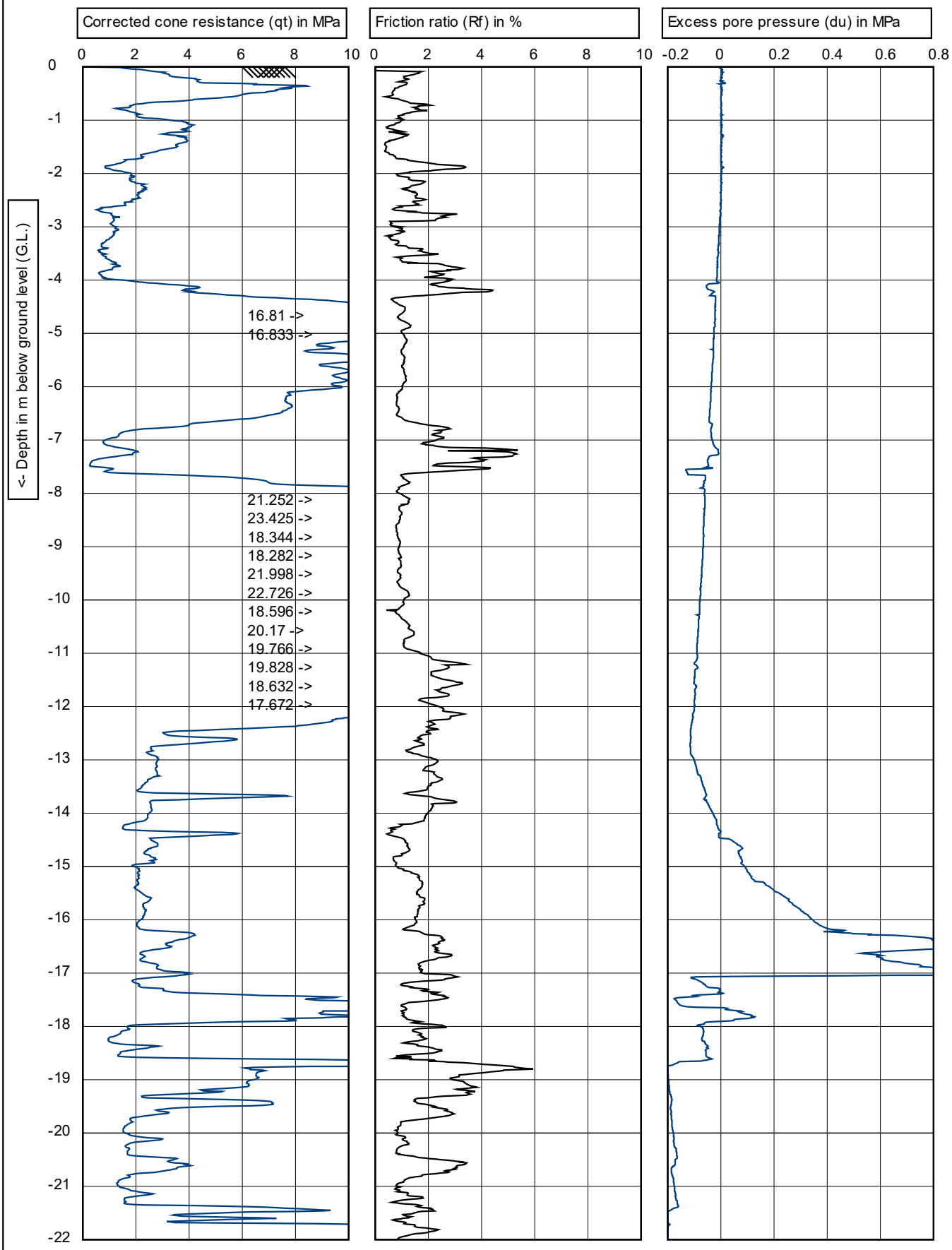
EOH - Dipped - Collapsed Dry @ 2.5m

	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819075, 5802467 NZTM**	CPT no.:	**13** 2/12

u2 150 cm² 10 cm²

1.47

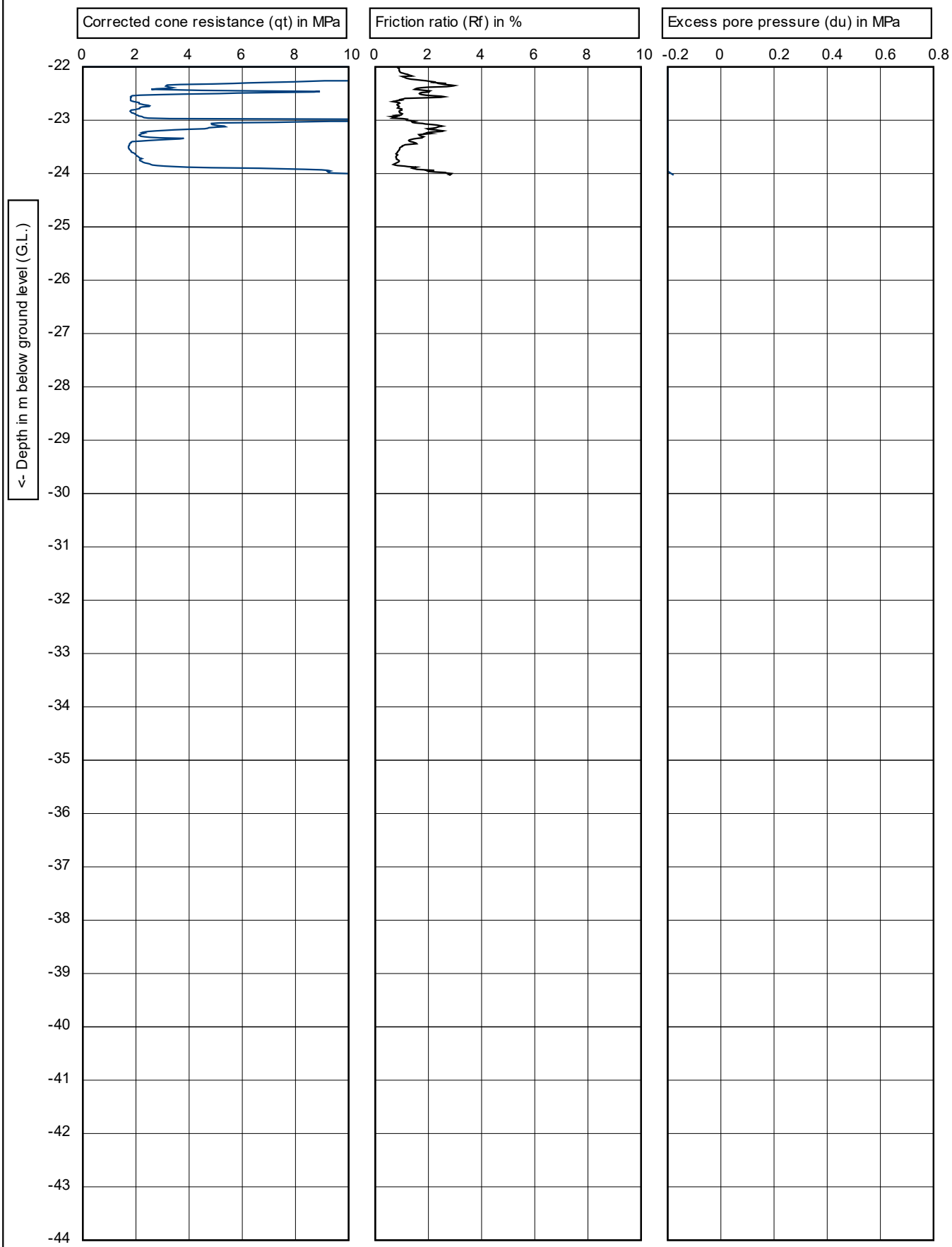
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819075, 5802467 NZTM**	CPT no.:	**13** 3/12

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal (qc 40+ MPa.)

EOH - Dipped - Collapsed Dry @ 2.5m

wsp

Graphs on this page are not IANZ accredited

1.47

u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

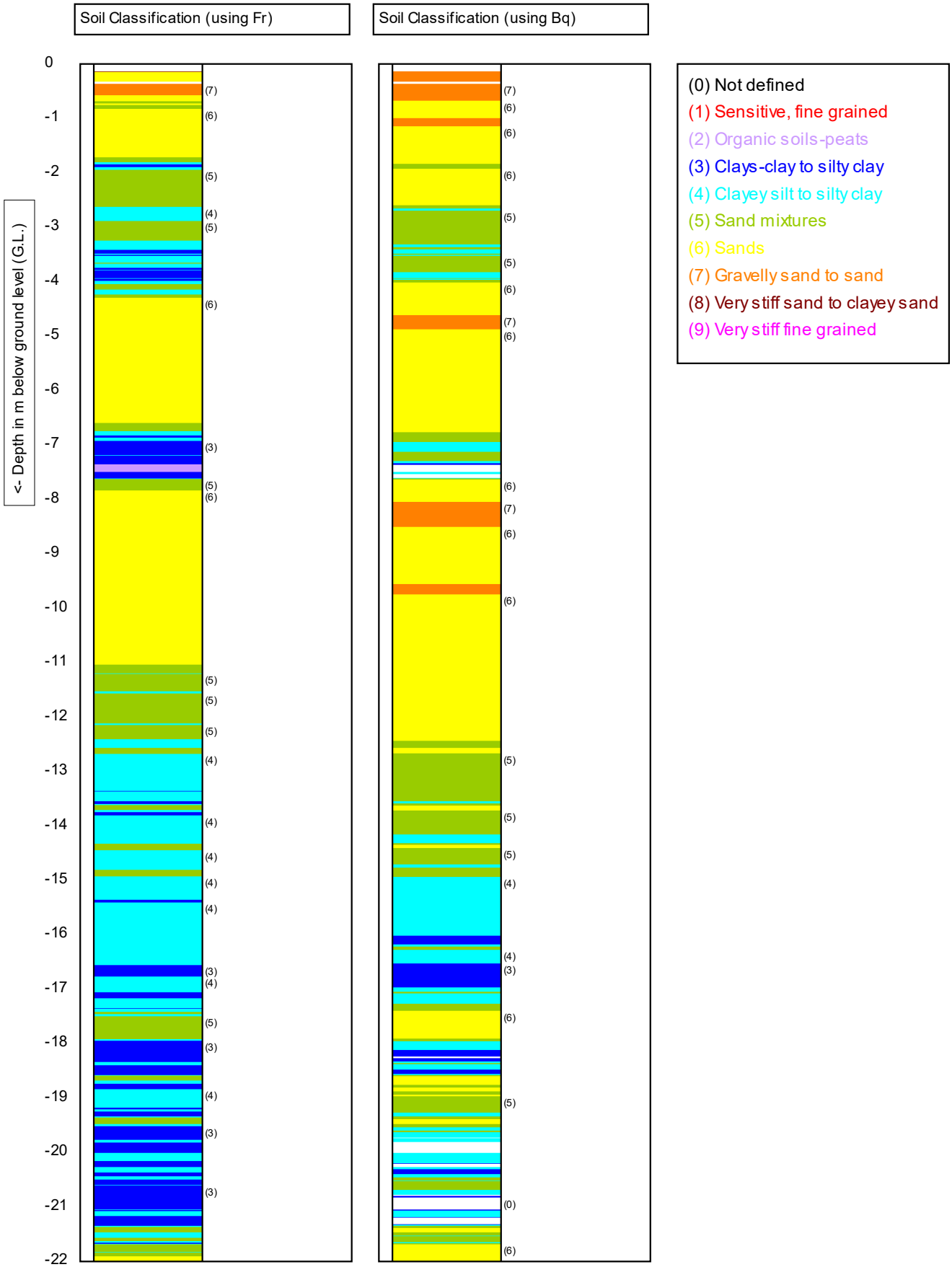
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819075, 5802467 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**22/06/2021**
Cone no.:	**C10CFIIP.C15211**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**13** 4/12

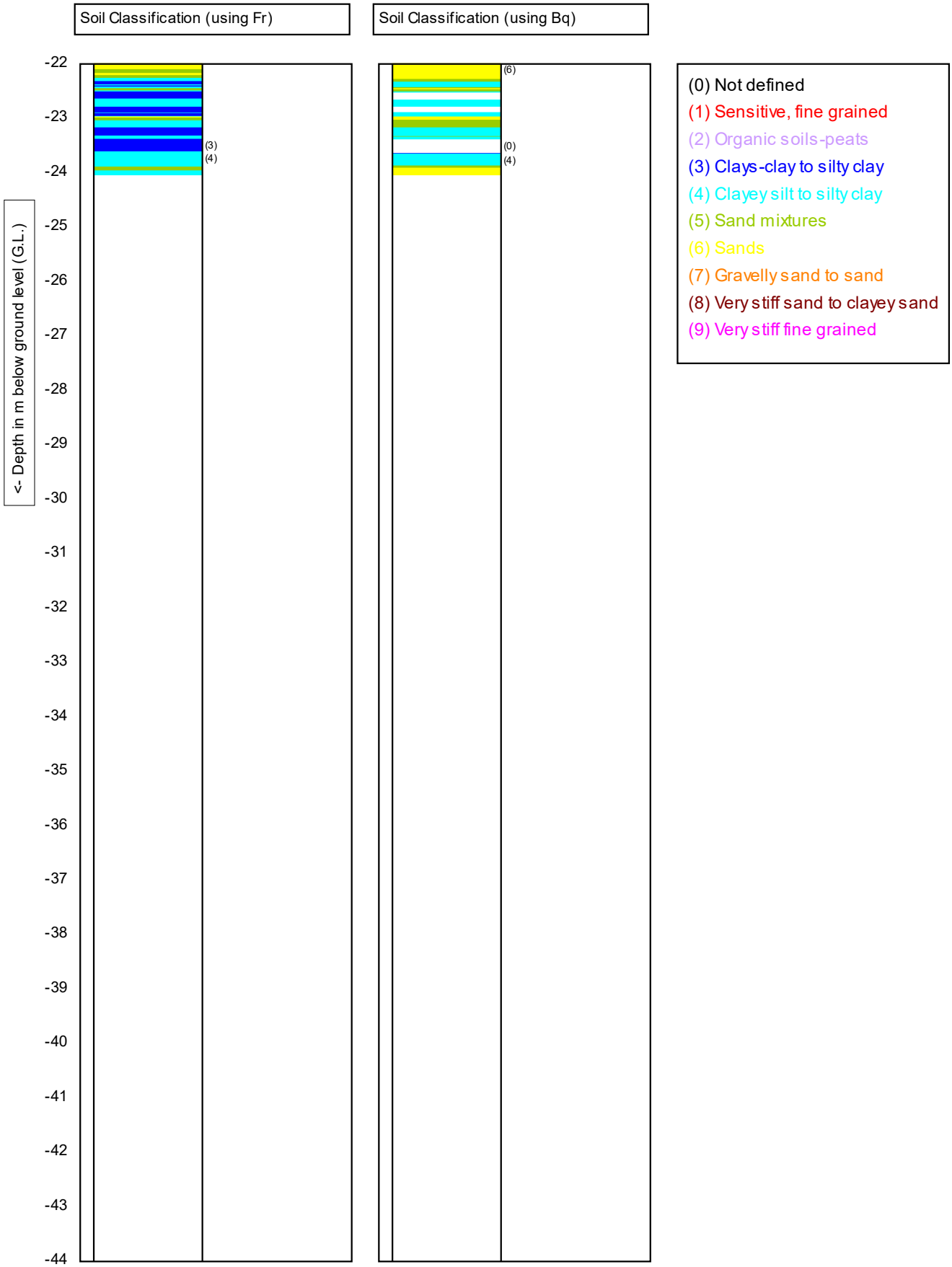
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp Graphs on this page are not IANZ accredited	qu2 150 cm² 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL**	Date: **22/06/2021**
	Project: **Wordsworth St Developments**		Cone no.: **C10CFIIP.C15211**
	Location: **Cambridge**		Project no.: **2-68014.00_HA7523**
	Position: **1819075, 5802467 NZTM**		CPT no.: **13** 7/12

1.47

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



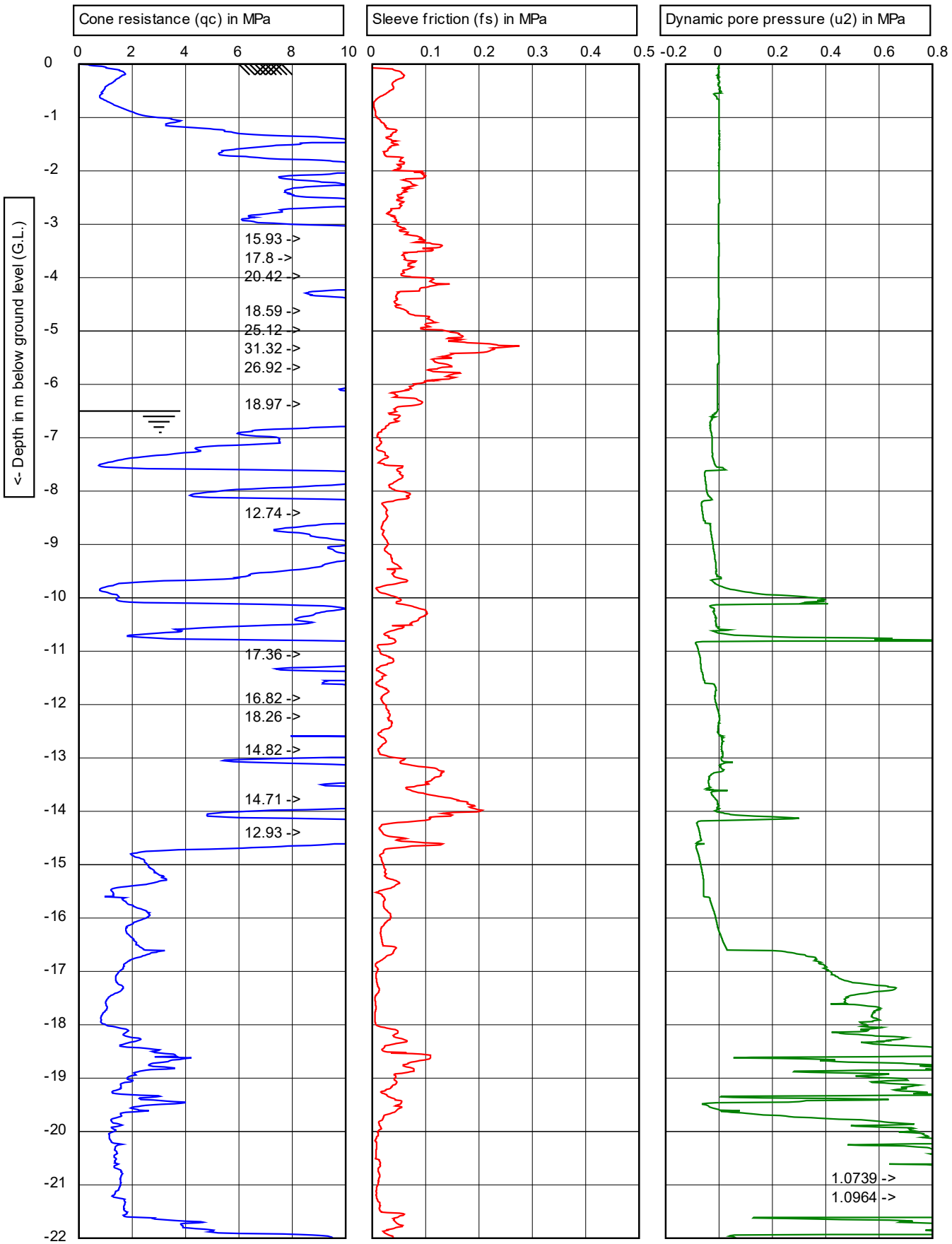
wsp

Graphs on this page are not IANZ accredited

1.47

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**22/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C15211**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819075, 5802467 NZTM**	CPT no.:	**13** 8/12

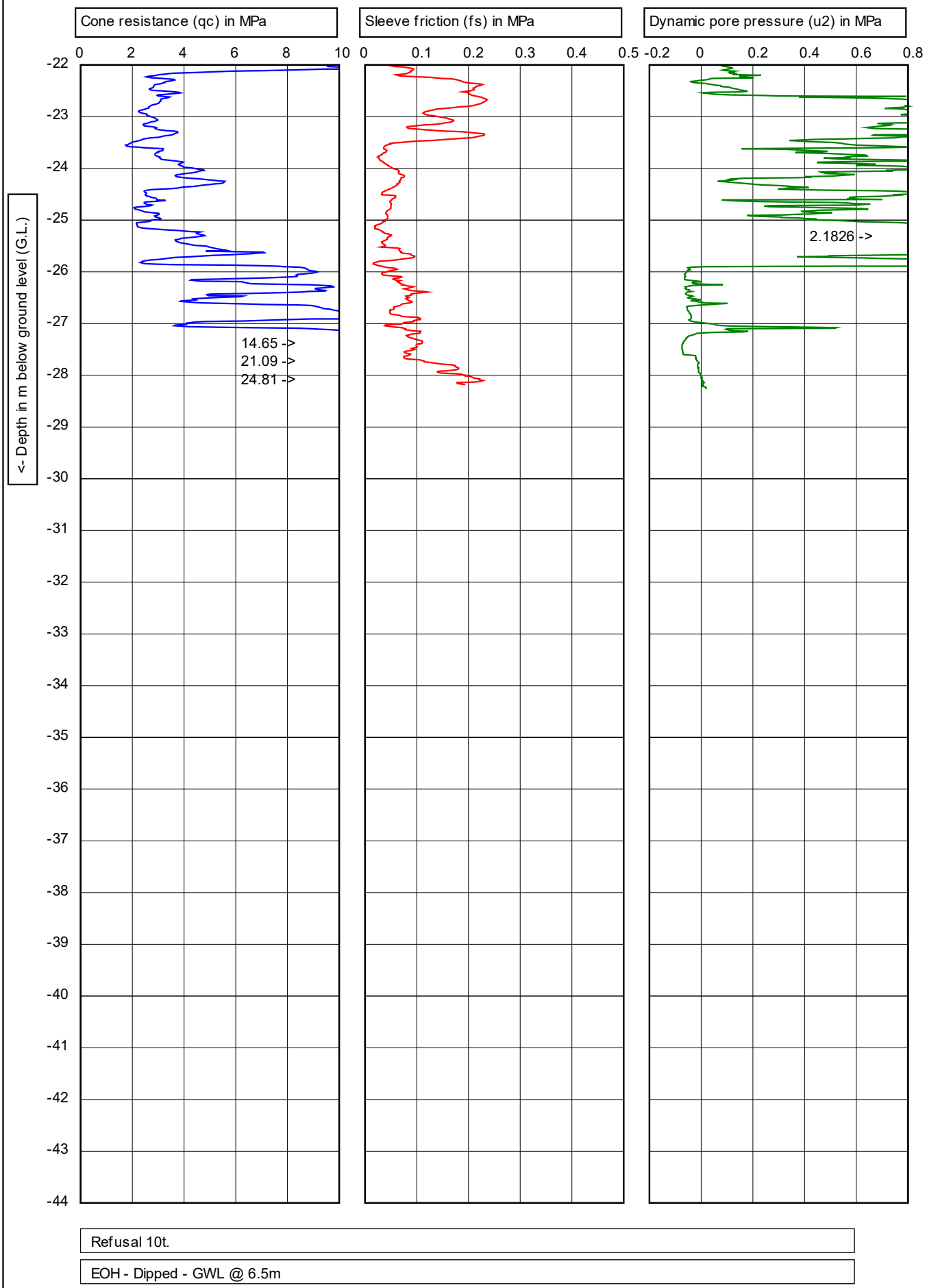
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-6.50 m**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818807, 5801122 NZTM**		CPT no.:	**S01** 1/12

1.49

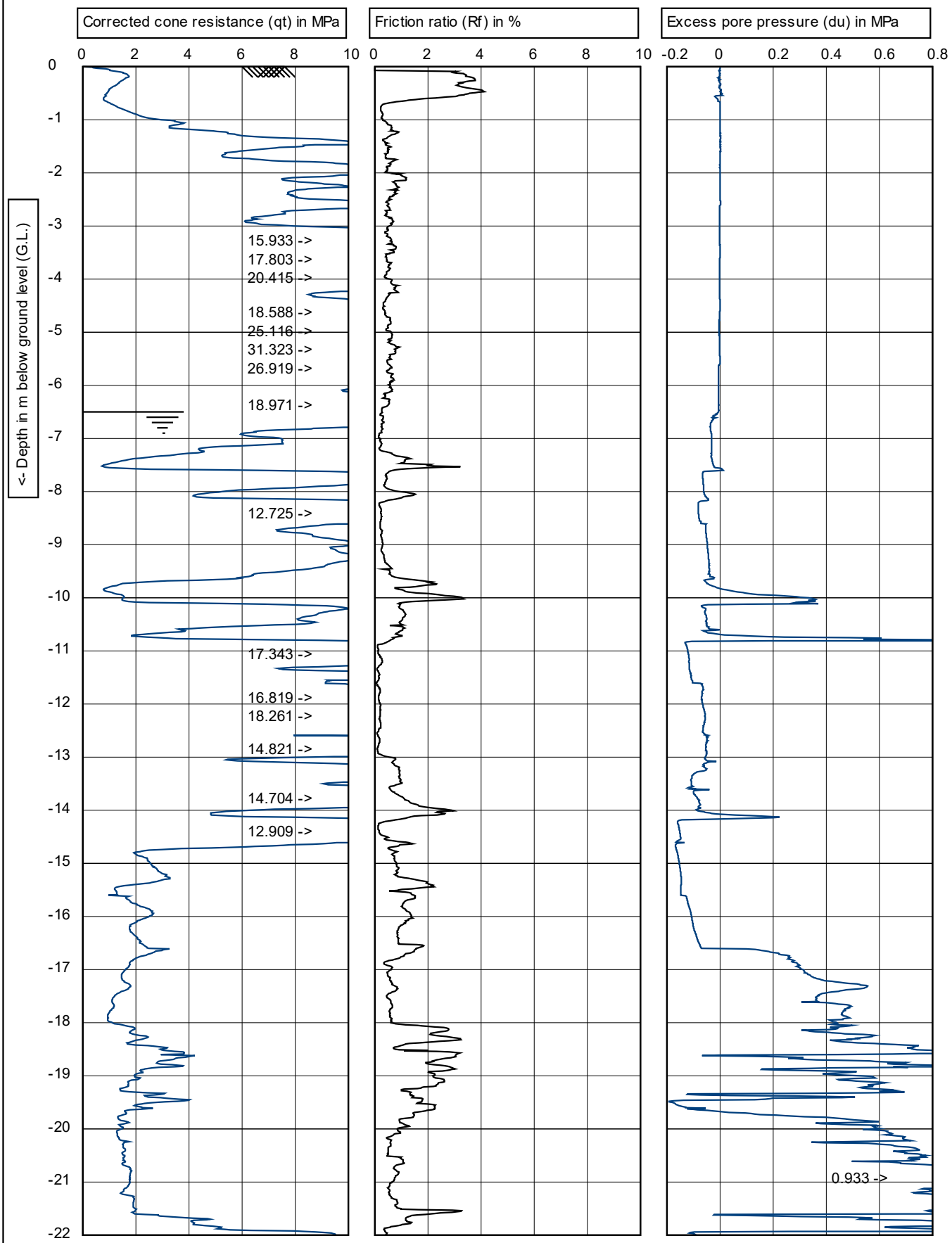
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
r u2 / L 150 cm² / 10 cm²	G.L.: **0.00 m MSL** — W.L.: **-6.50 m**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818807, 5801122 NZTM**		CPT no.:	**S01** — **2/12**

1.49

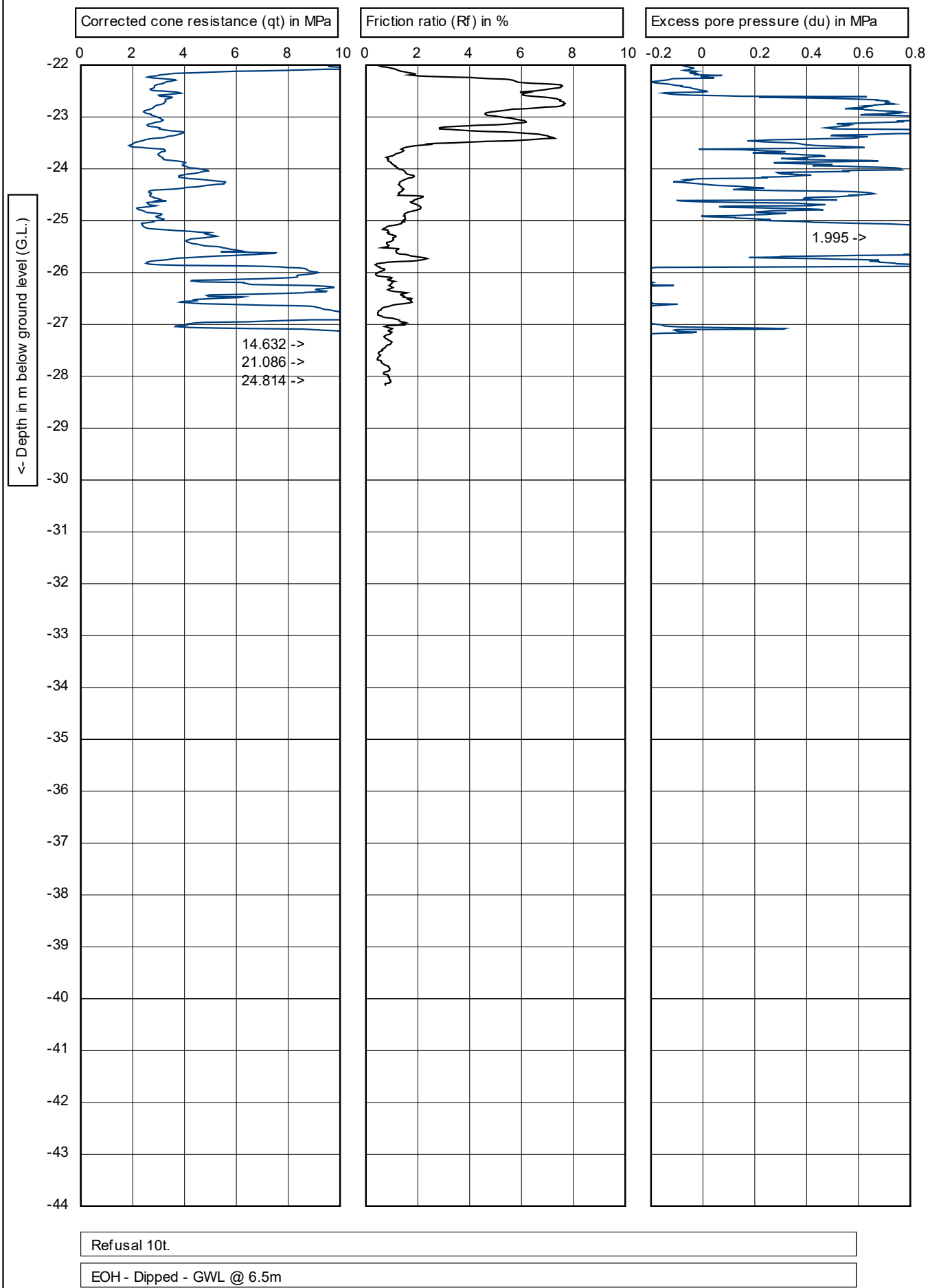
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp Graphs on this page are not IANZ accredited	r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill: **0.00 m Predrilled**
		G.L.: **0.00 m MSL** W.L.: **-6.50 m**	Date: **21/06/2021**
	Project:	**Wordsworth St Developments**	Cone no.: **C10CFIIP.C14427**
	Location:	**Cambridge**	Project no.: **2-68014.00_HA7523**
	Position:	**1818807, 5801122 NZTM**	CPT no.: **S01** 3/12

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

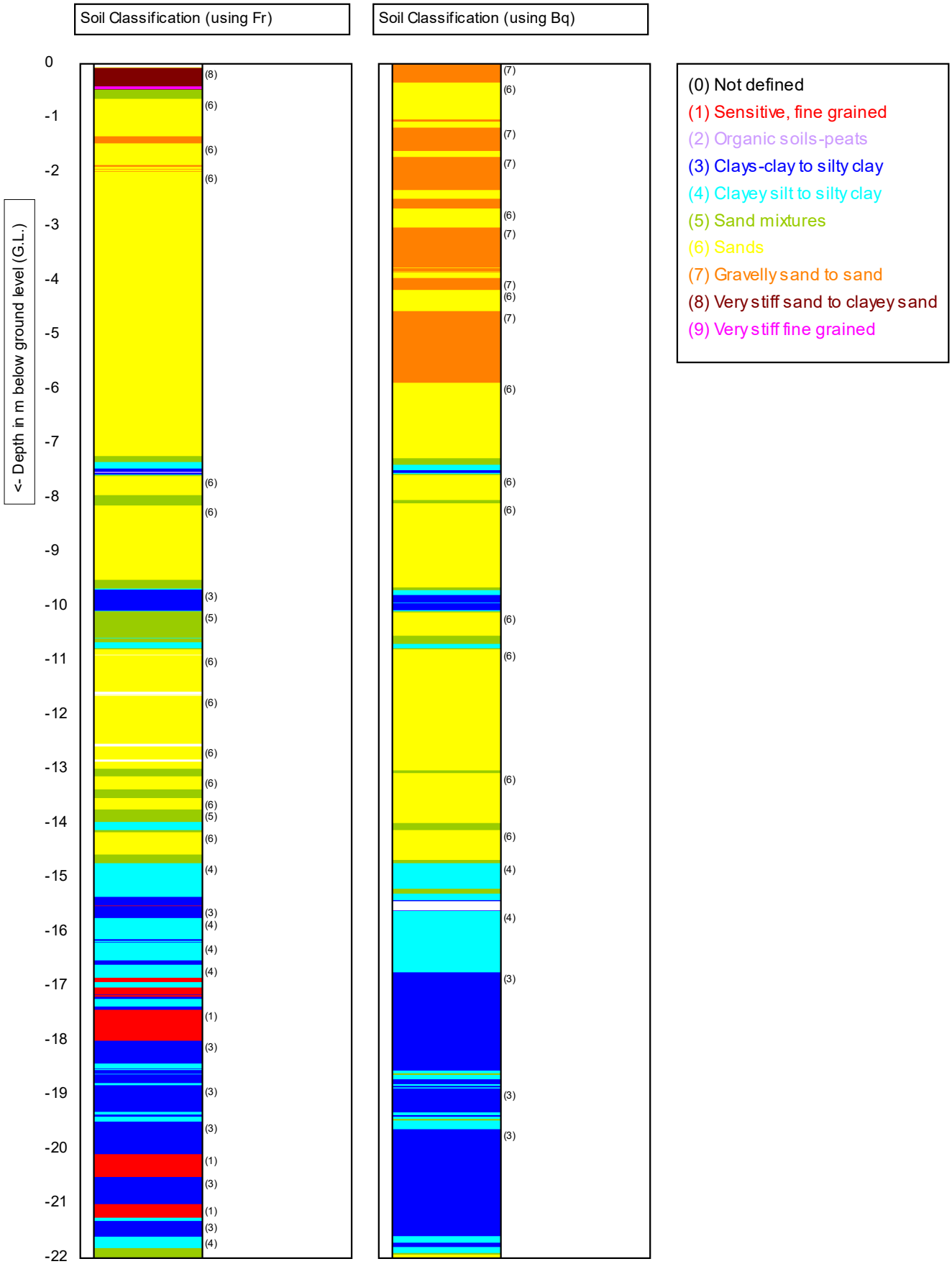


Graphs on this page are not IANZ accredited

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**	W.L.: **-6.50 m**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1818807, 5801122 NZTM**		CPT no.:	**S01** 4/12

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

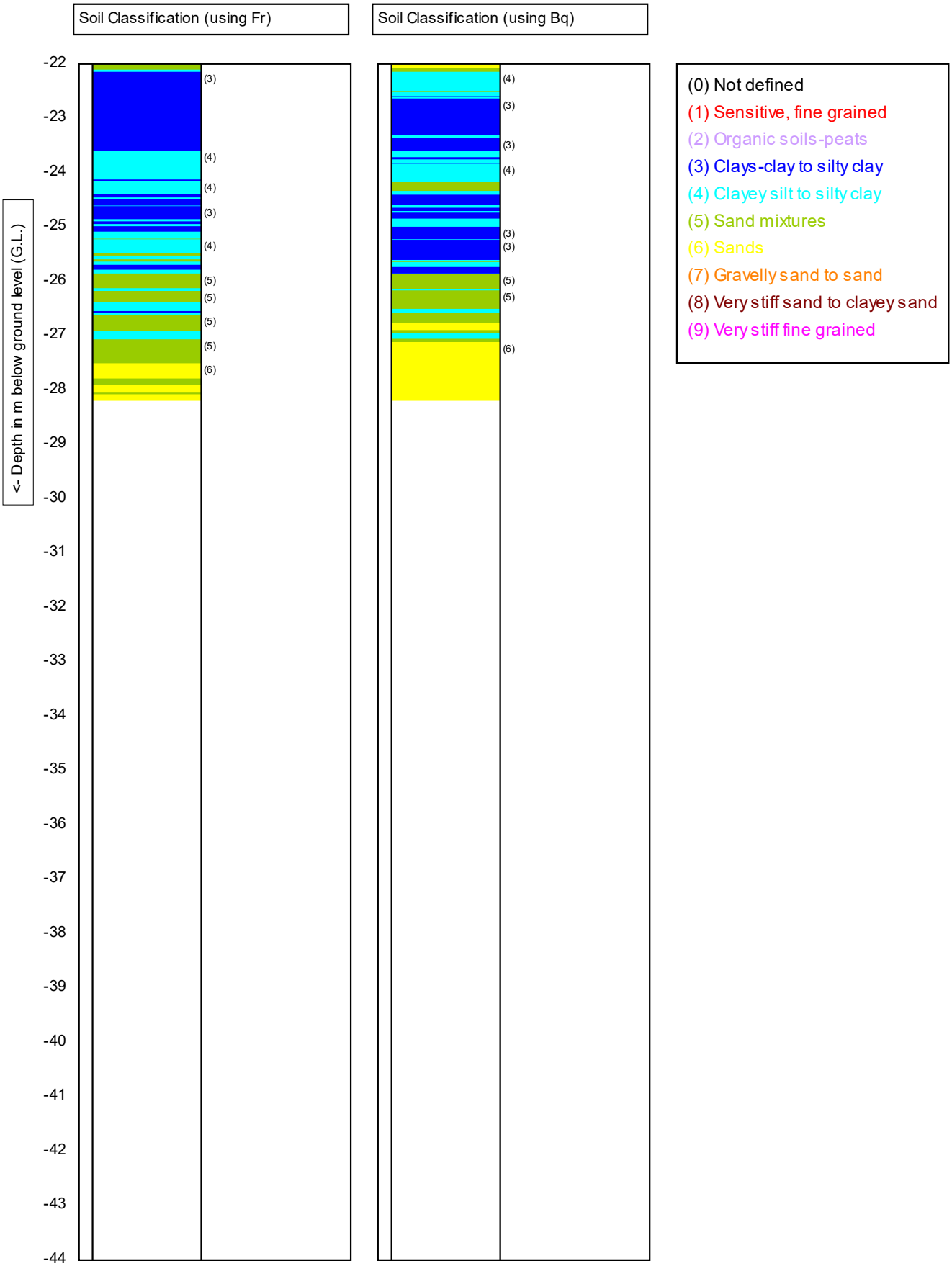
Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: **0.00 m MSL** W.L.: **-6.50 m**

Project: **Wordsworth St Developments**
Location: **Cambridge**
Position: **1818807, 5801122 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S01** 7/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp

Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

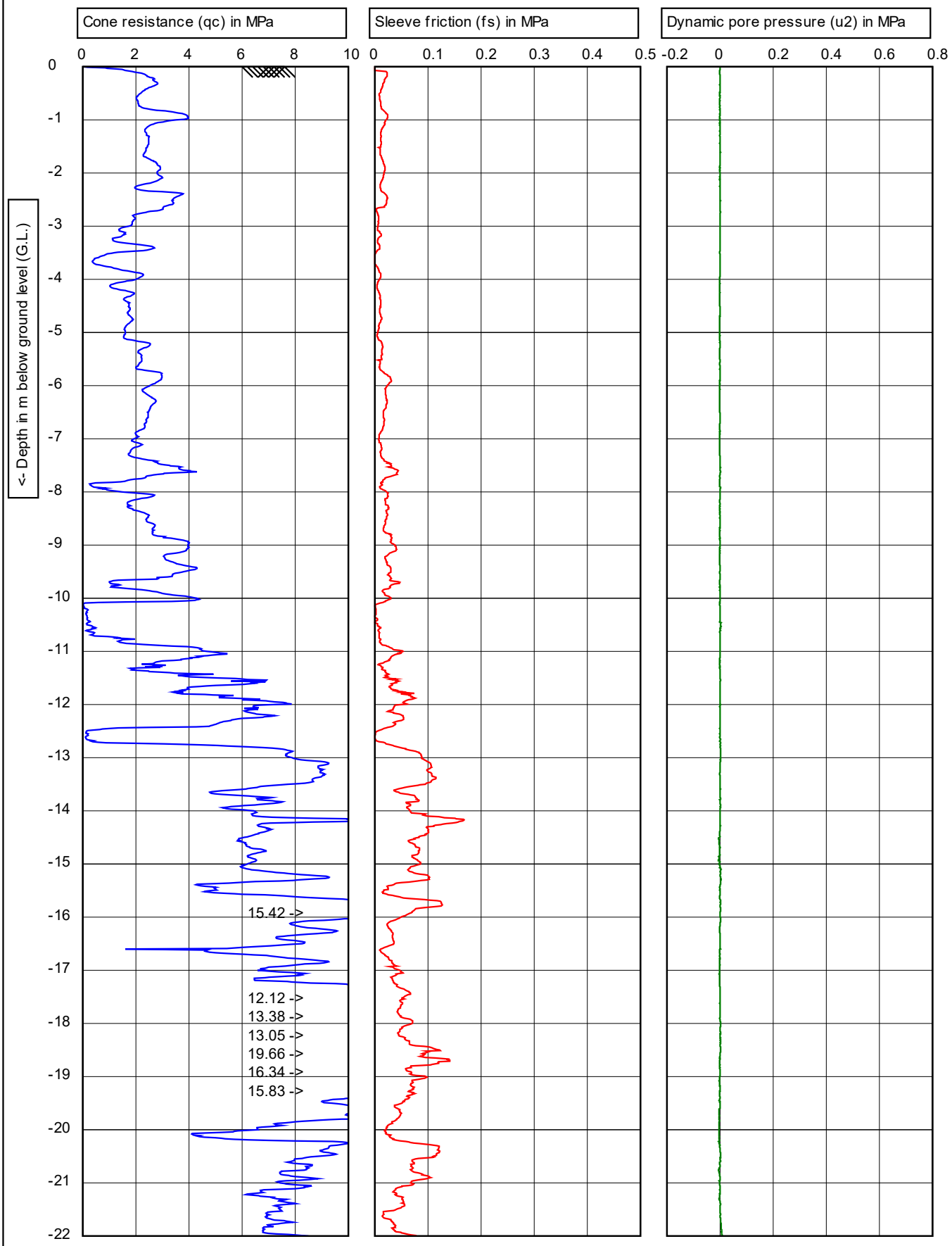
Test according ASTM D5778:12 & ISO 22476-1:2012

G.L.: **0.00 m MSL** W.L.: **-6.50 m**

Project: **Wordsworth St Developments**
Location: **Cambridge**
Position: **1818807, 5801122 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S01** 8/12

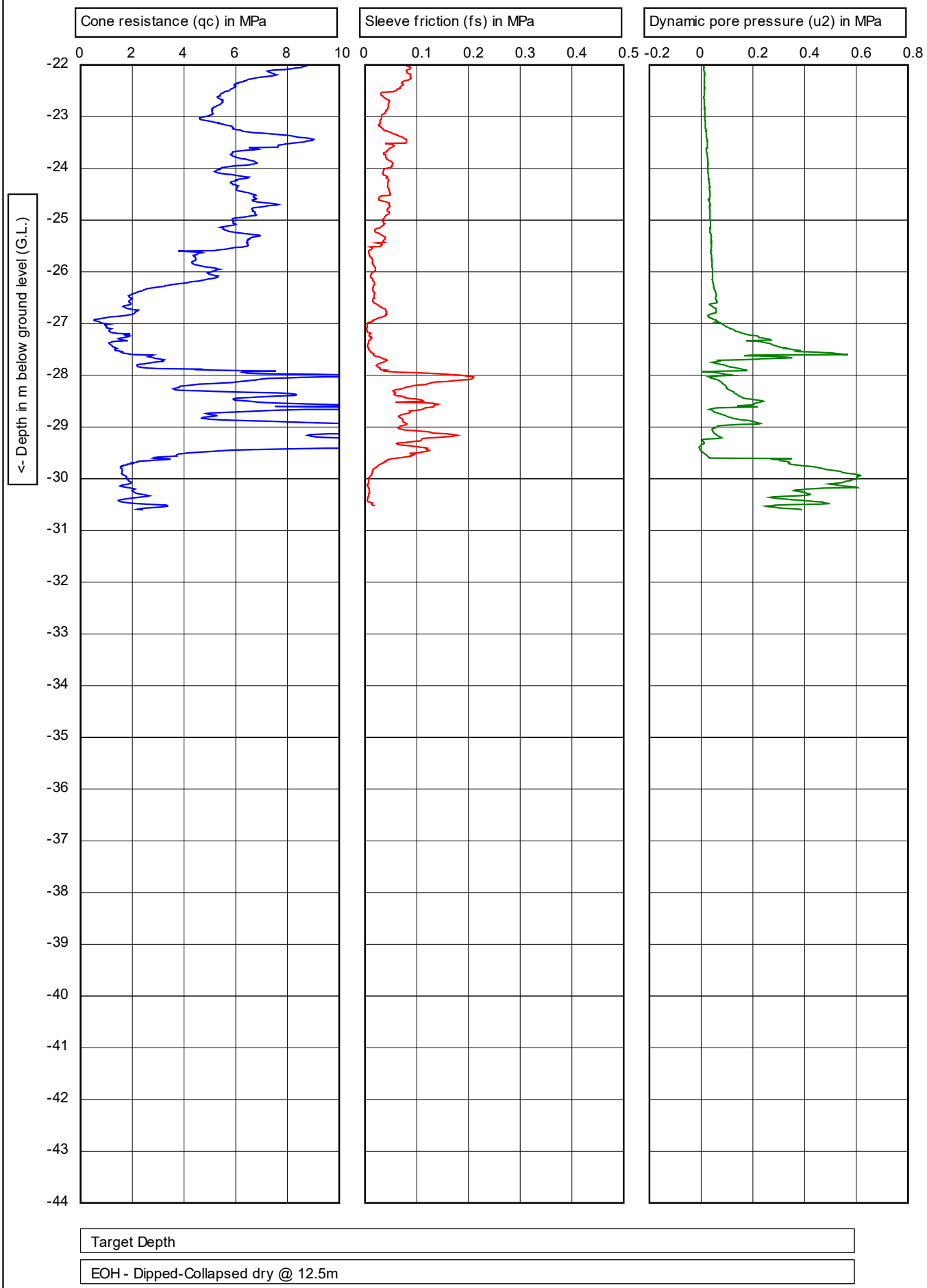
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819006, 5802338 NZTM**	CPT no.:	**S02** **1/12**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



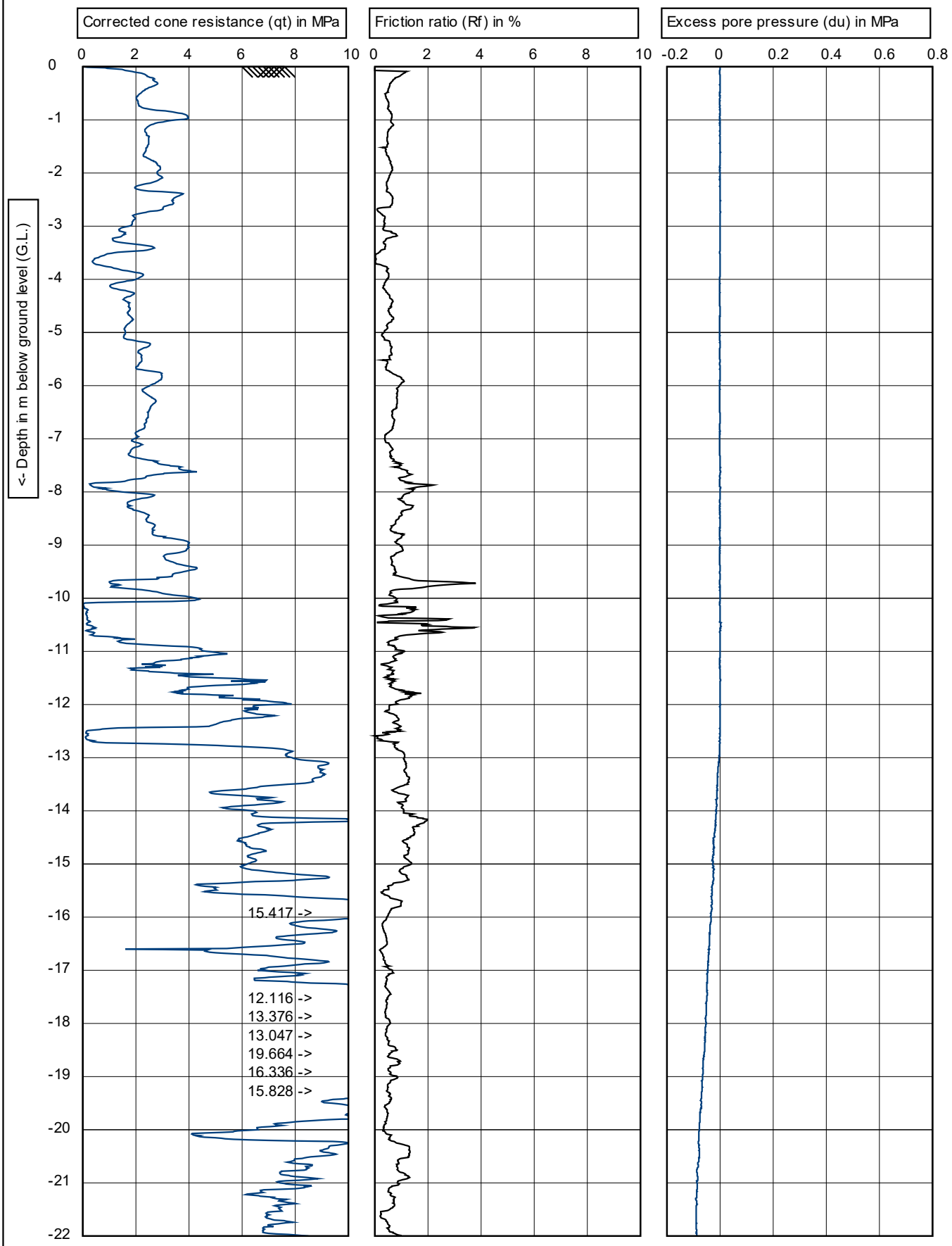
Target Depth

EOH - Dipped-Collapsed dry @ 12.5m

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819006, 5802338 NZTM**	CPT no.:	**S02** 2/12

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



wsp

Graphs on this page are not IANZ accredited

1.49

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819006, 5802338 NZTM**	CPT no.:	**S02** 3/12

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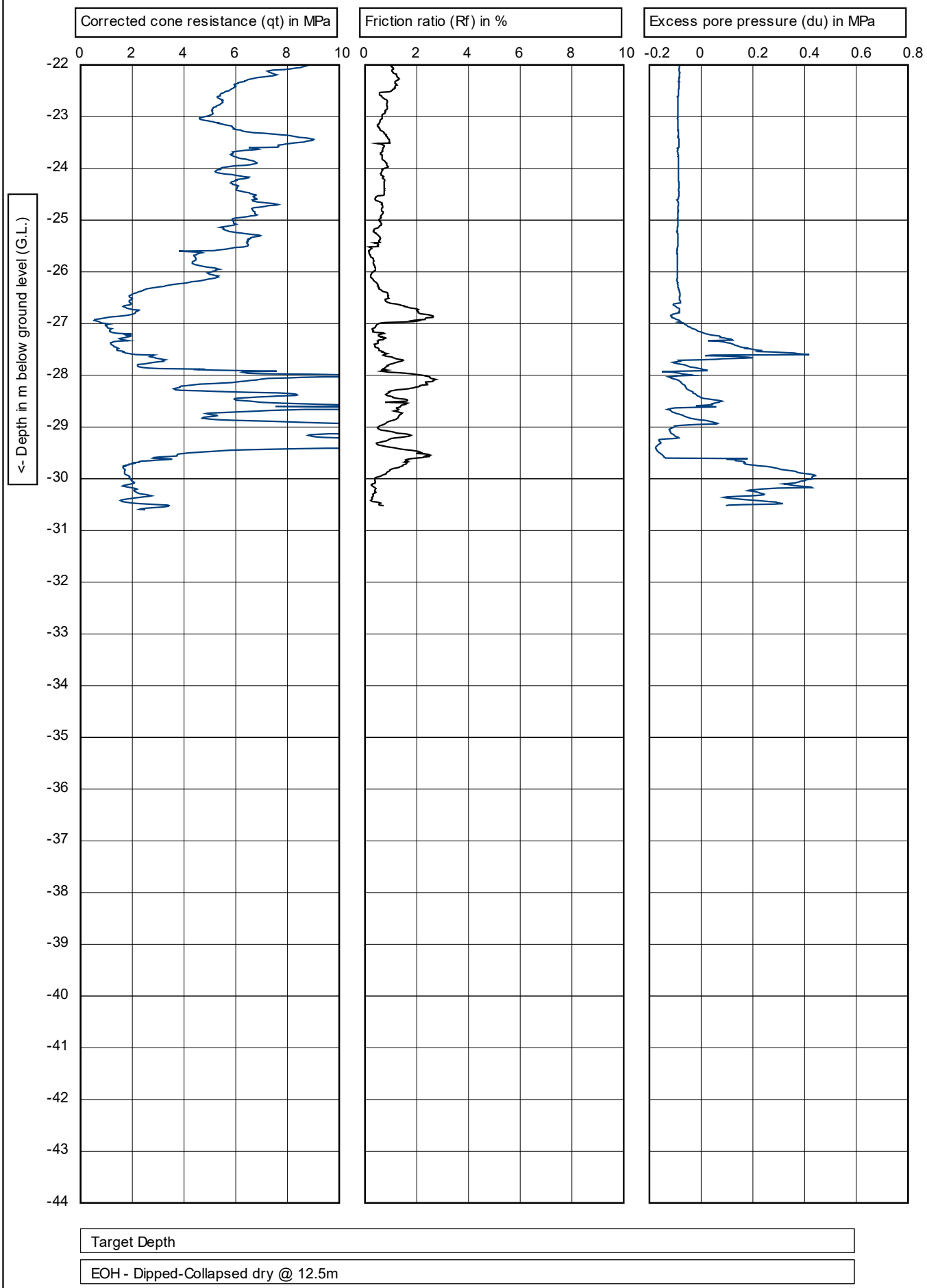
Version: 1, Version Date: 17/12/2025



Target Depth

EOH - Dipped-Collapsed dry @ 12.5m

wsp

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1.49

r u2
L 150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

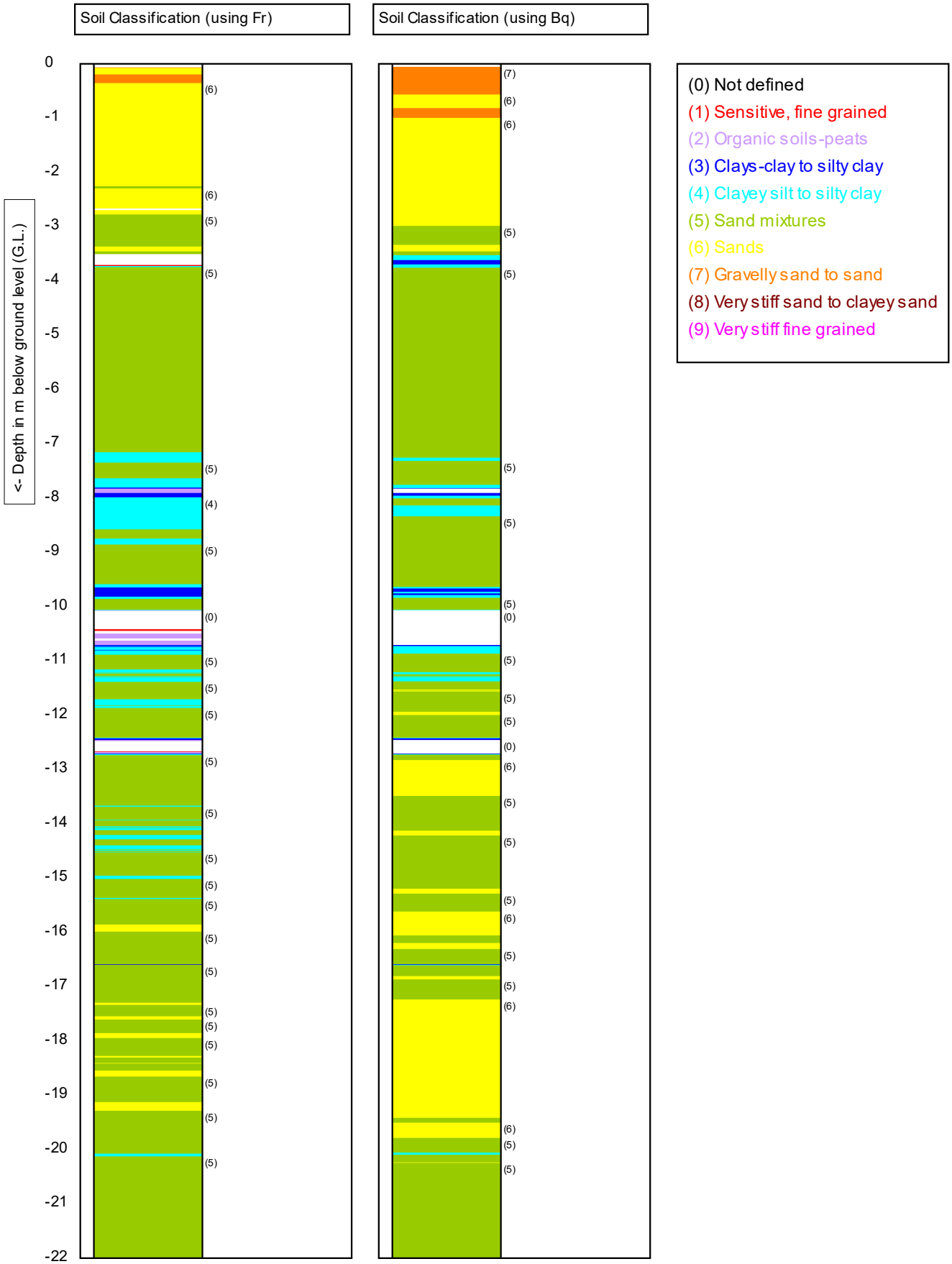
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819006, 5802338 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S02** **4/12**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

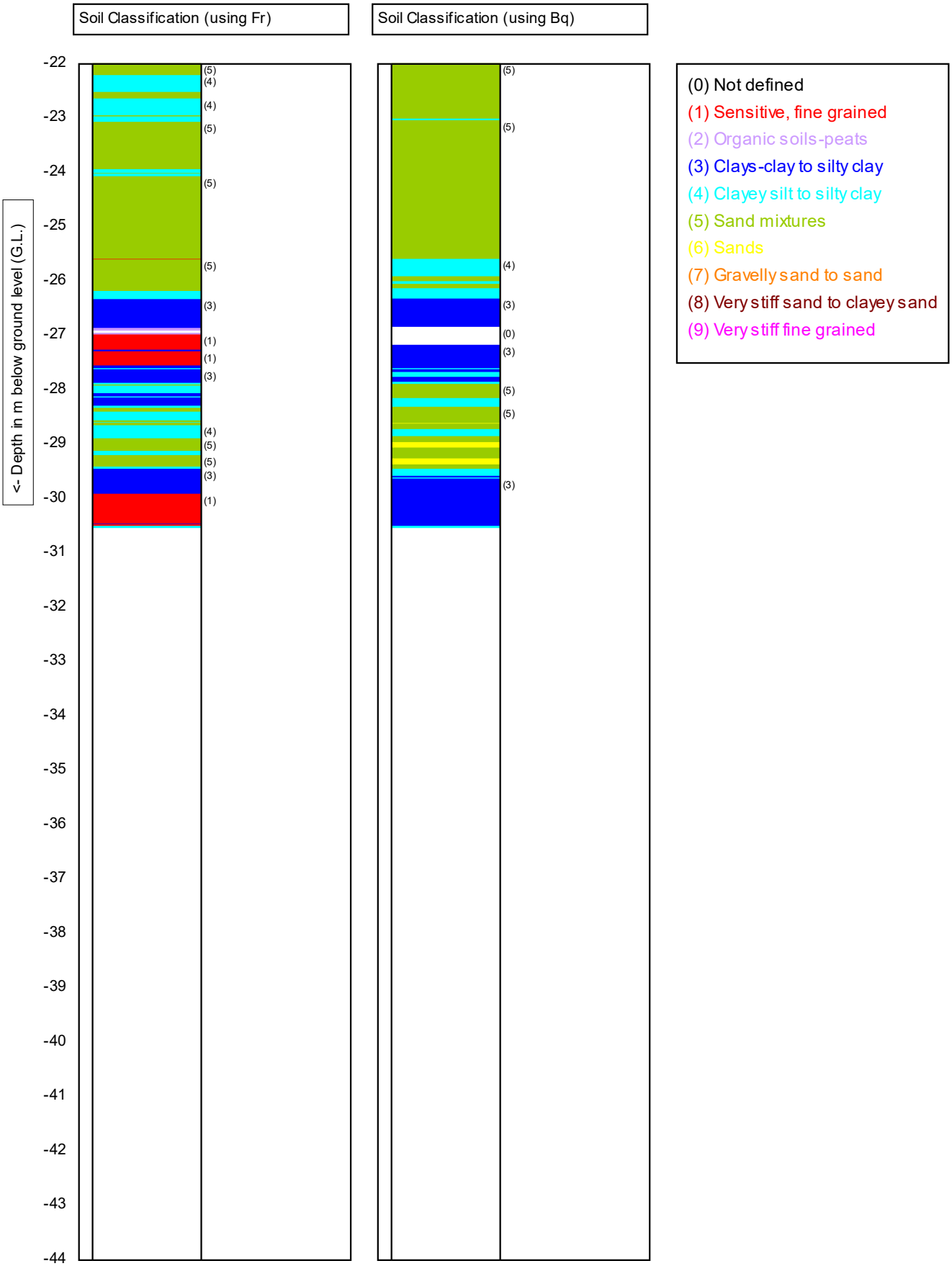
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819006, 5802338 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S02** 7/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

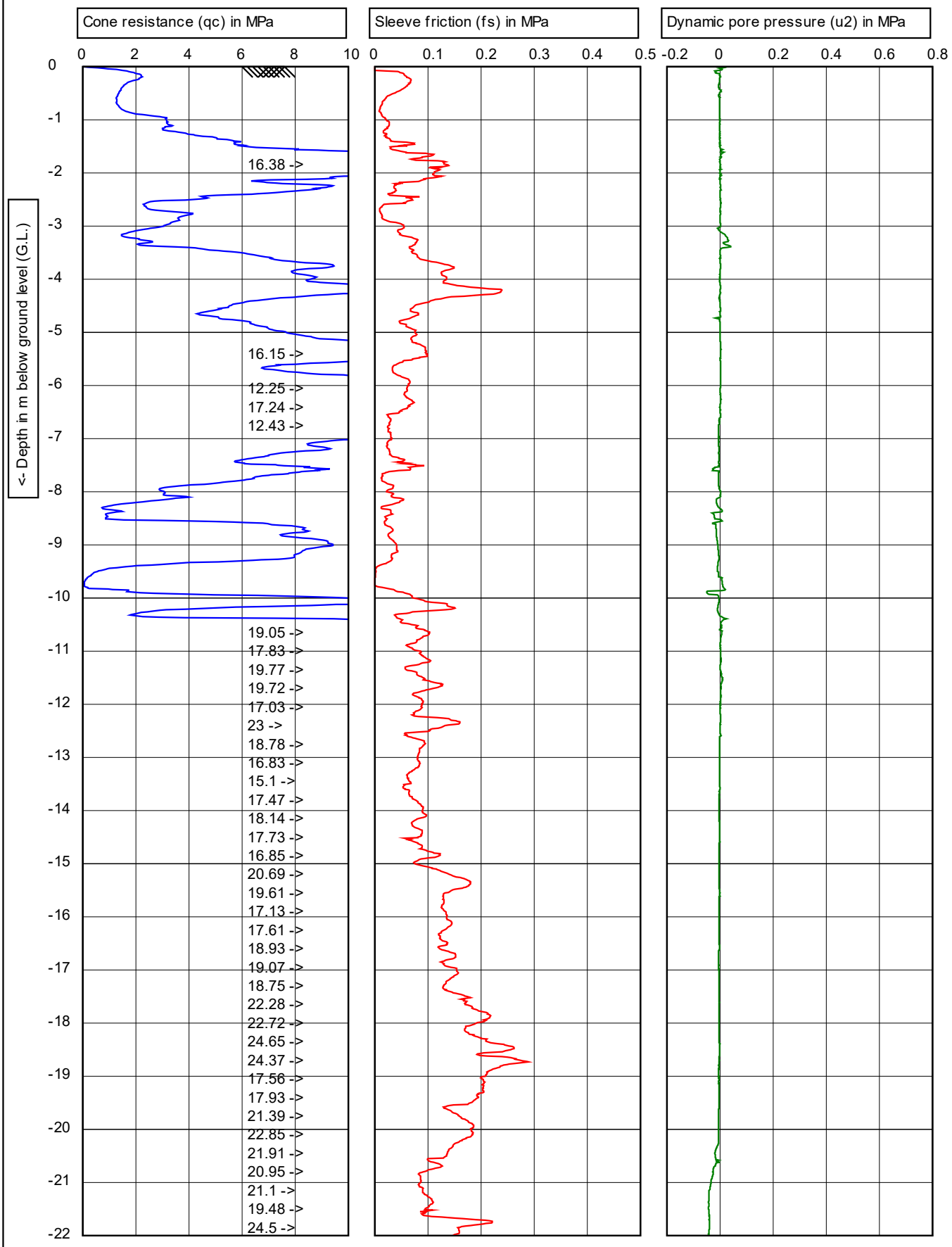


Graphs on this page are not IANZ accredited

1.49

r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819006, 5802338 NZTM**	CPT no.:	**S02** 8/12

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
r u2 150 cm² 10 cm²	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819137, 5802191 NZTM**		CPT no.:	**S03** 1/12

1.49

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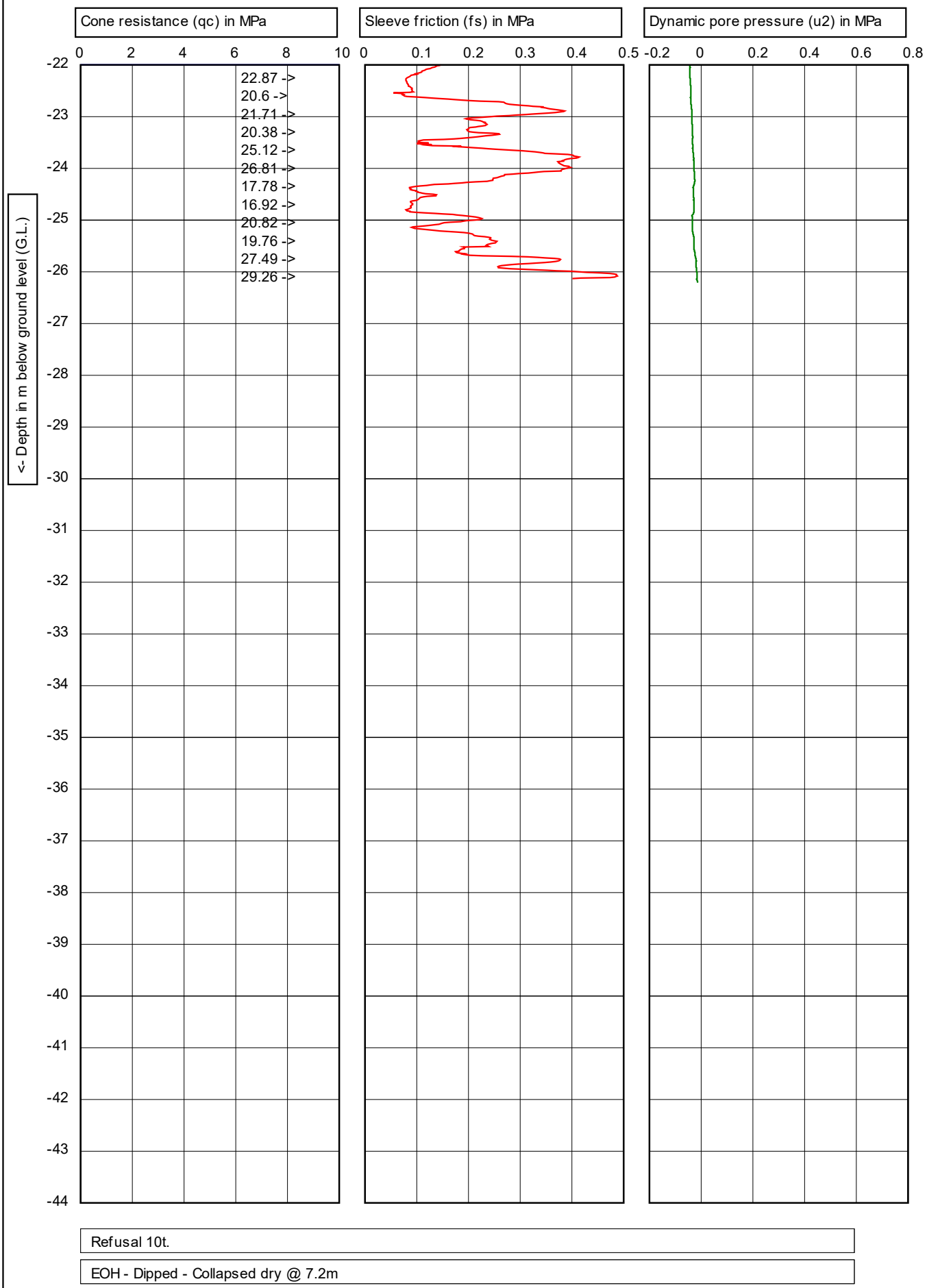
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - Collapsed dry @ 7.2m

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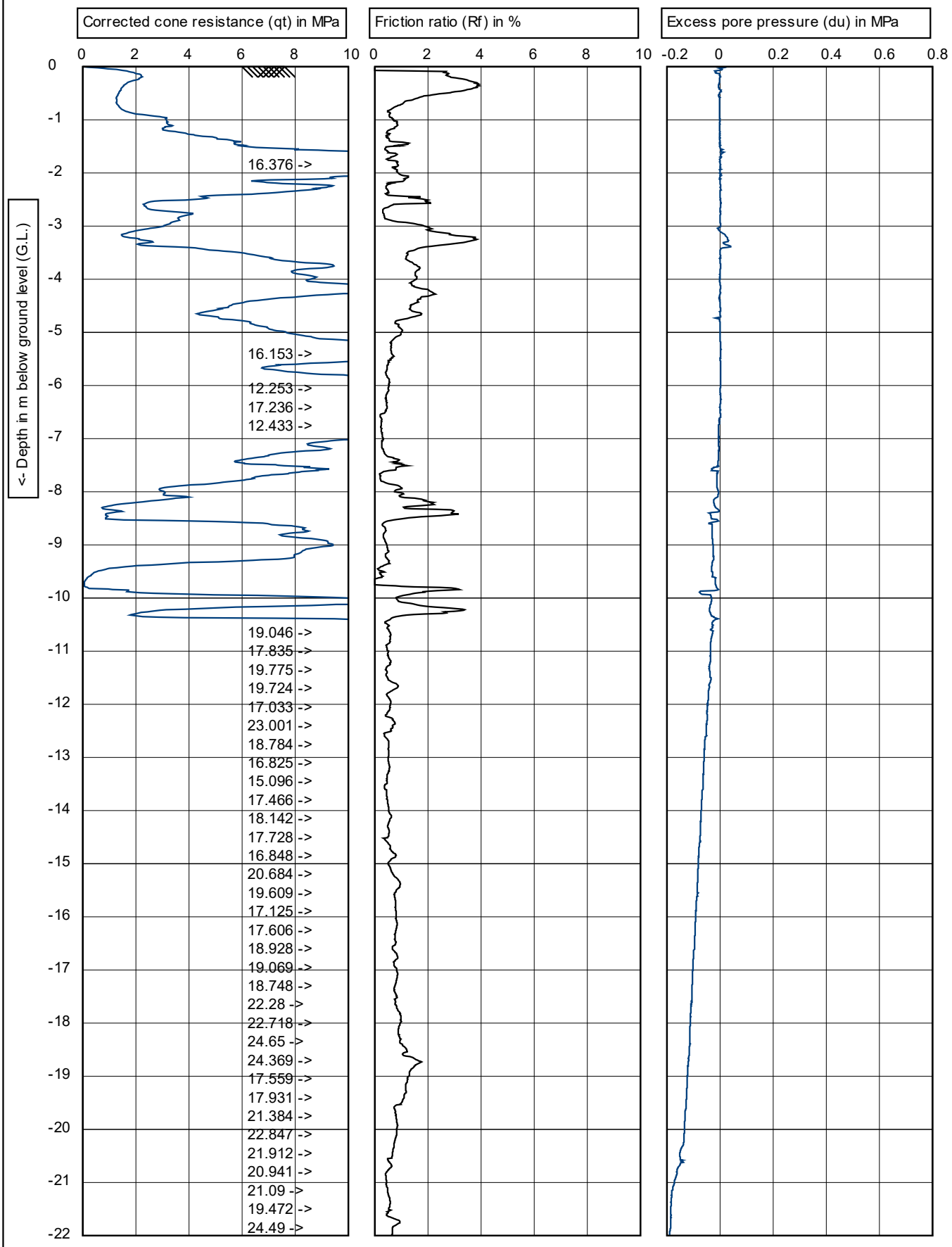
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819137, 5802191 NZTM**	CPT no.:	**S03** **2/12**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

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

G.L.: **0.00 m MSL**

Project: **Wordsworth St Developments**

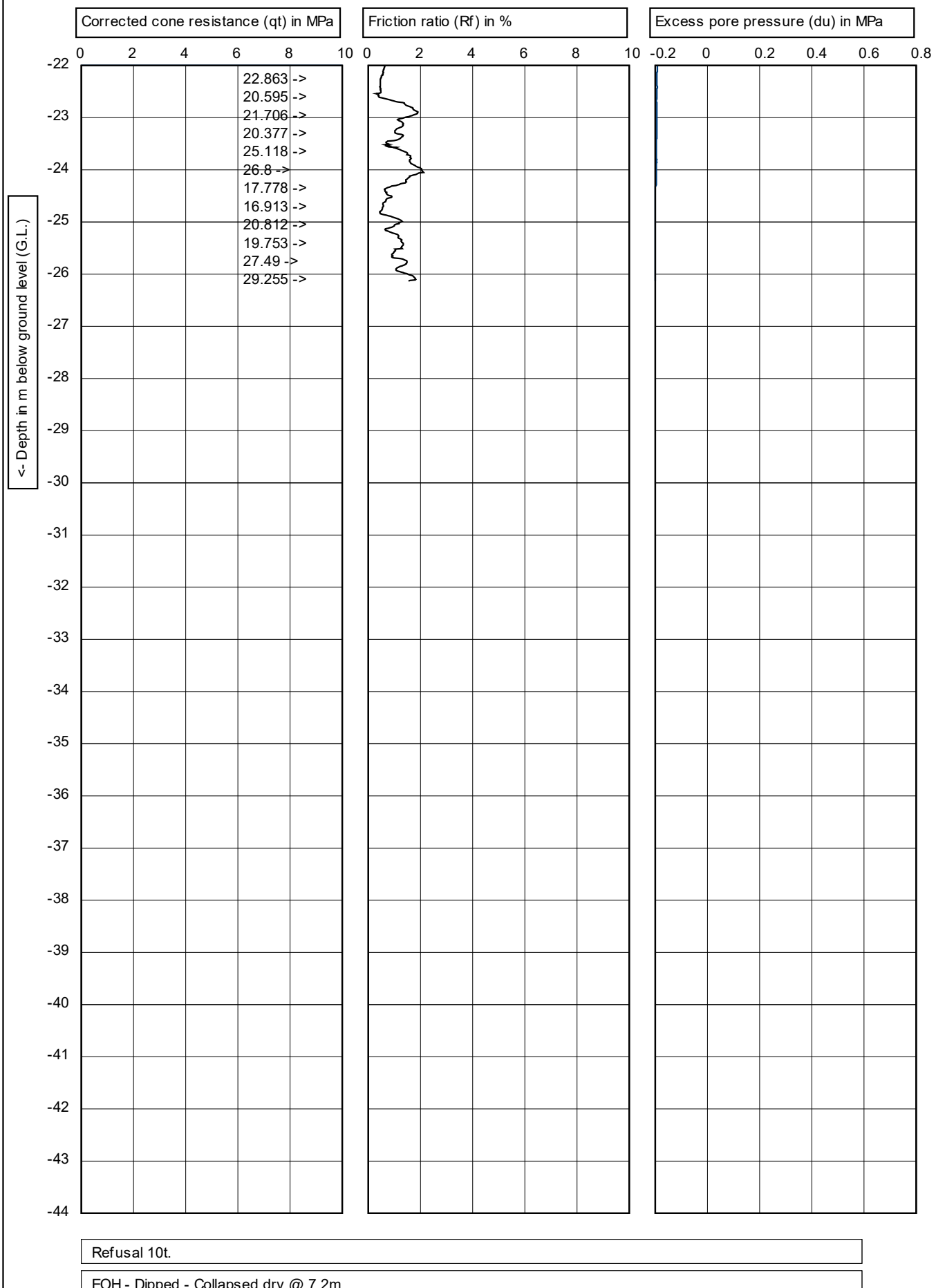
Location: **Cambridge**

Position: **1819137, 5802191 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S03** 3/12

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

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

G.L.: **0.00 m MSL**

Project: **Wordsworth St Developments**

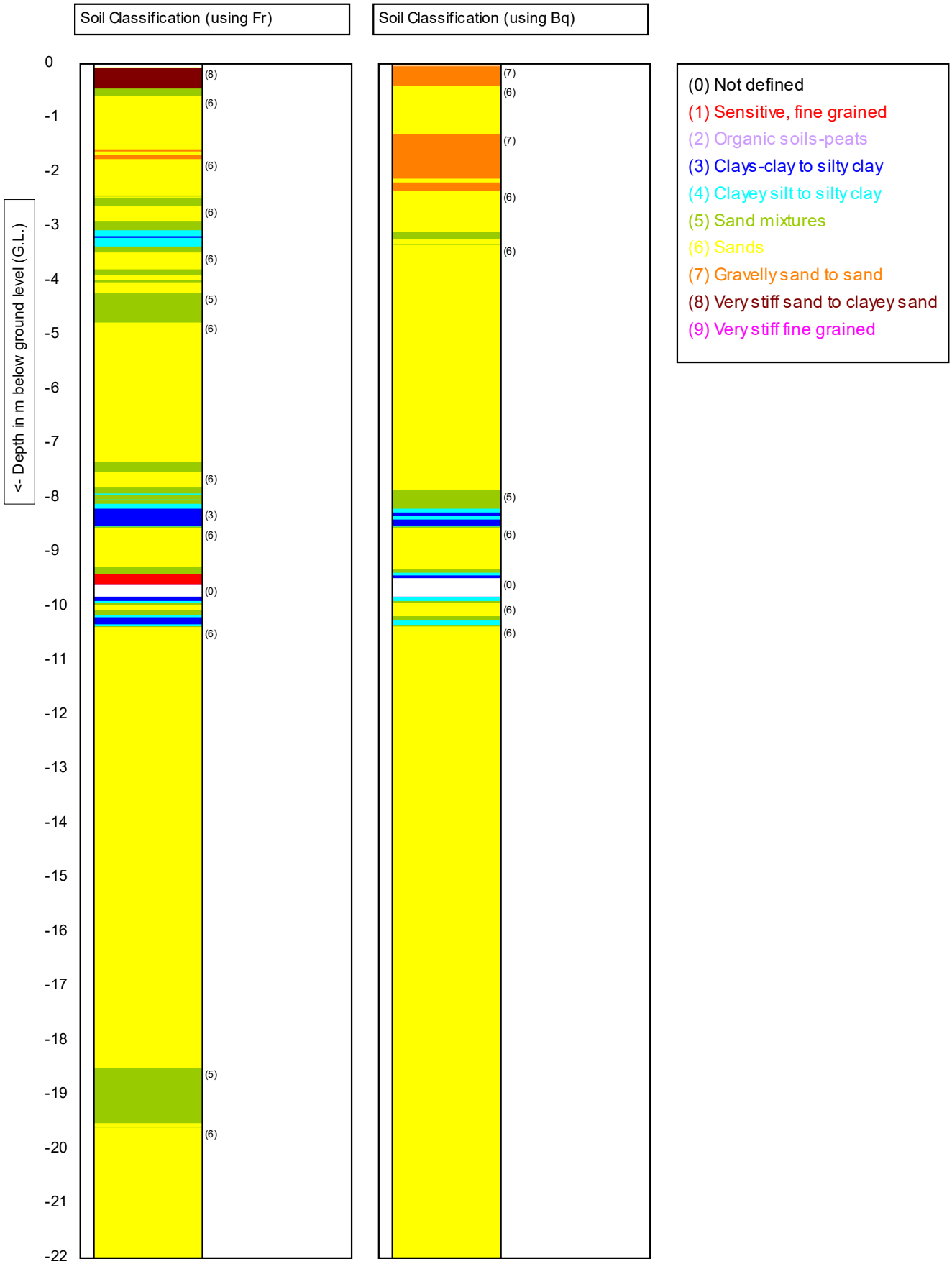
Location: **Cambridge**

Position: **1819137, 5802191 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S03** 4/12

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2 / 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819137, 5802191 NZTM**	CPT no.:	**S03** 7/12

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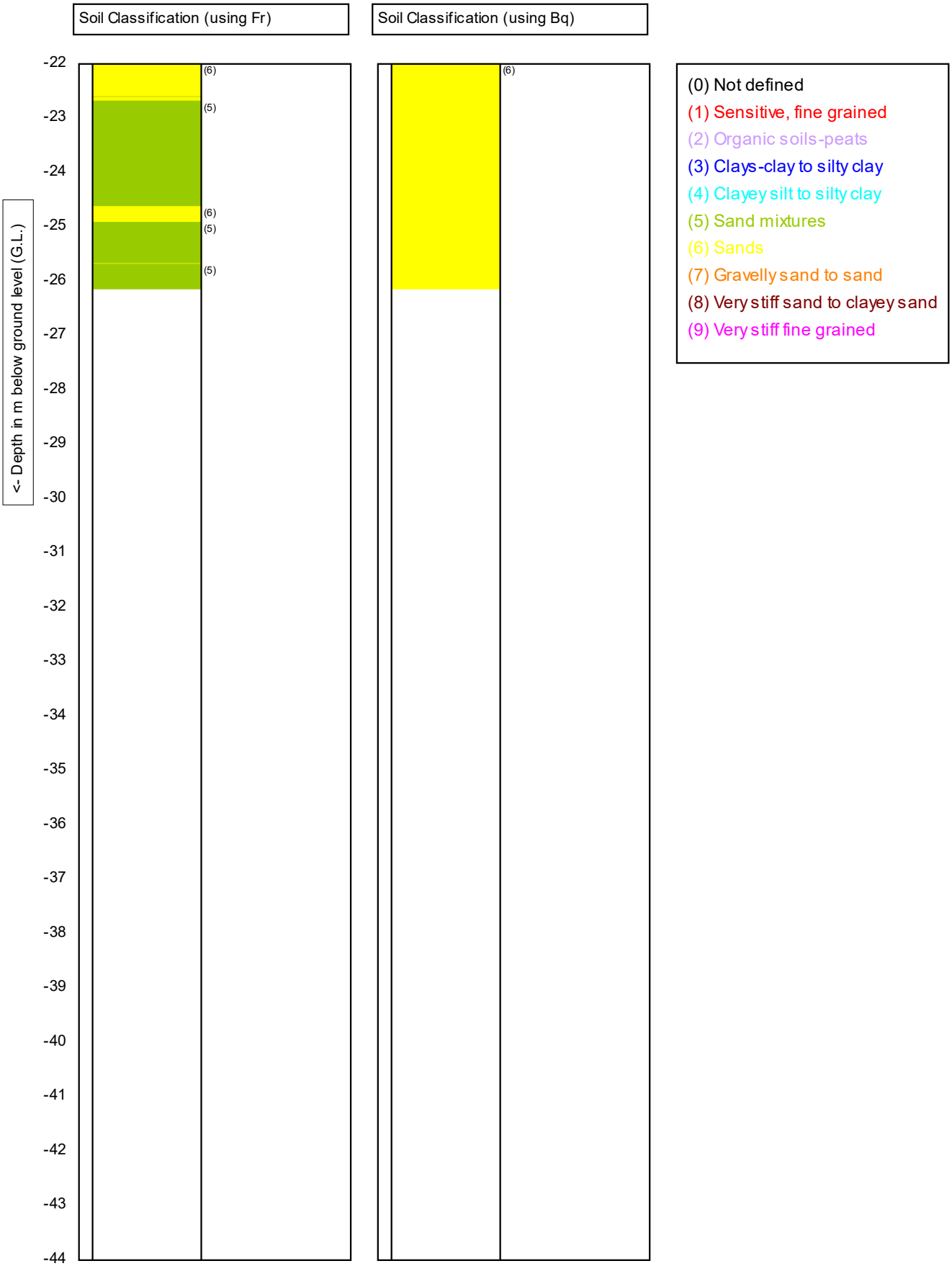


wsp

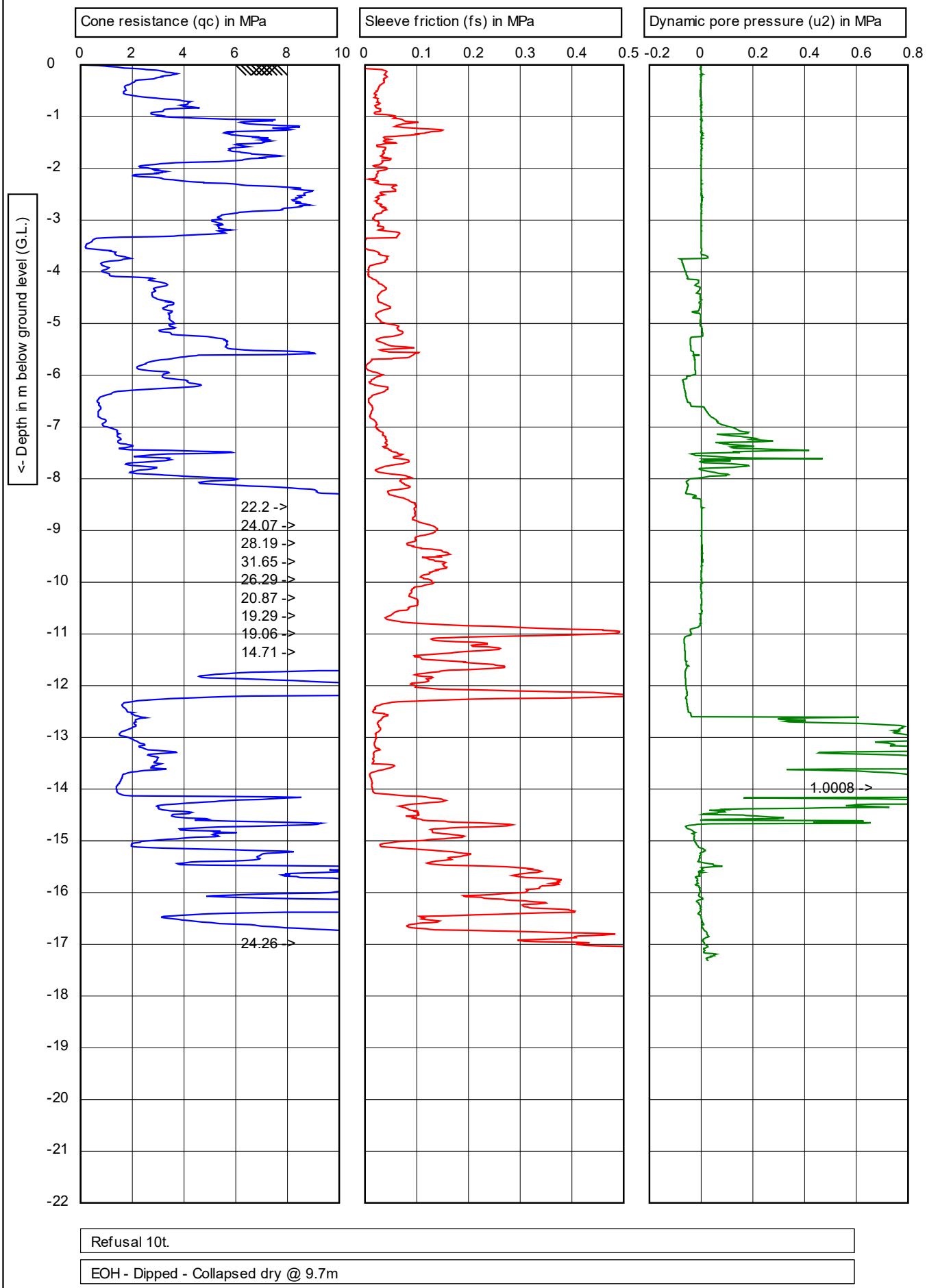
Graphs on this page are not IANZ accredited

1.49

r u2
L 150 cm²
10 cm²

Test according ASTM D5778:12 & ISO 22476-1:2012		Predrill:	**0.00 m Predrilled**
G.L.: **0.00 m MSL**		Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819137, 5802191 NZTM**	CPT no.:	**S03** 8/12

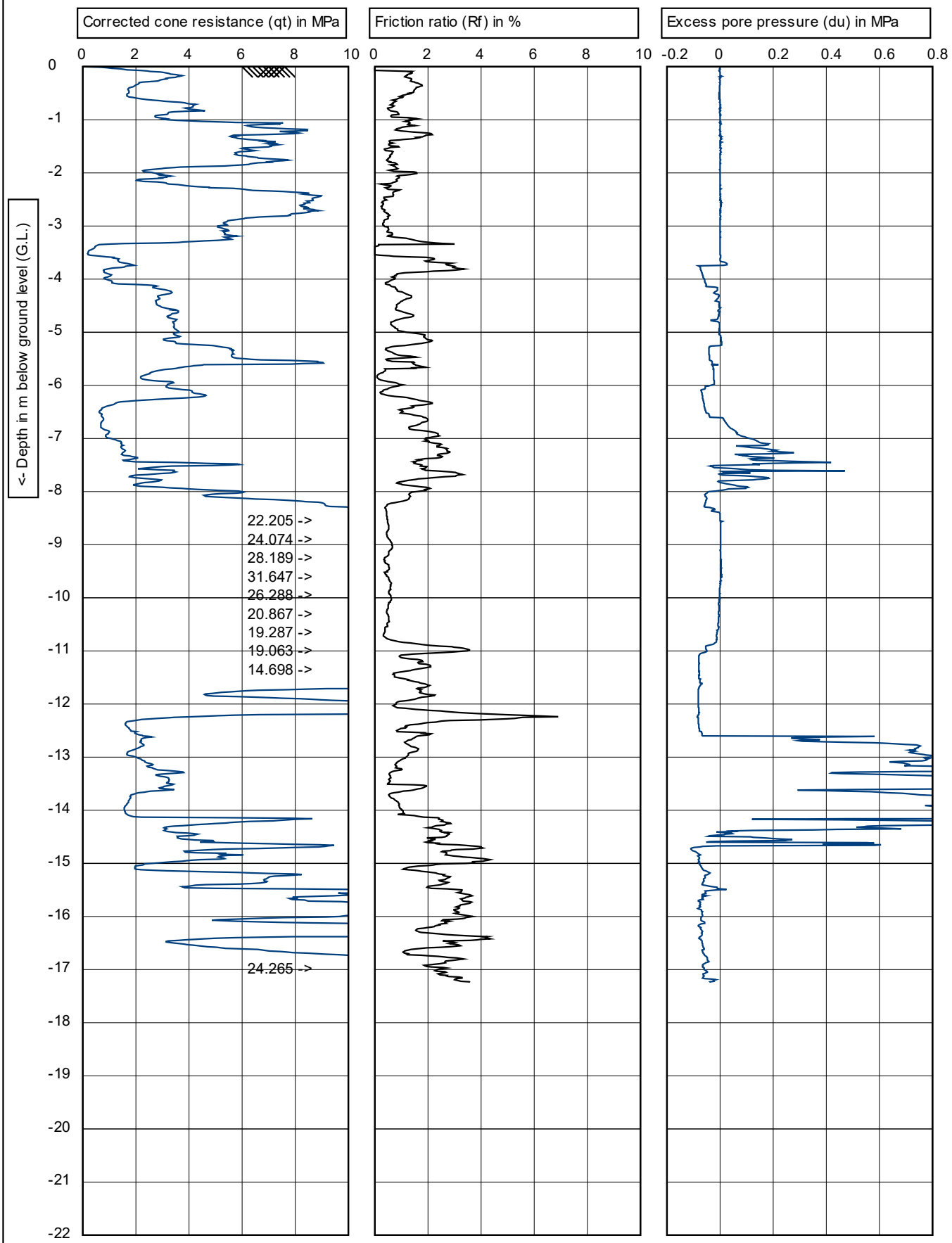
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819214, 5802394 NZTM**		CPT no.:	**S04** 1/6

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - Collapsed dry @ 9.7m

wsp

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1.49

r u2
L 150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

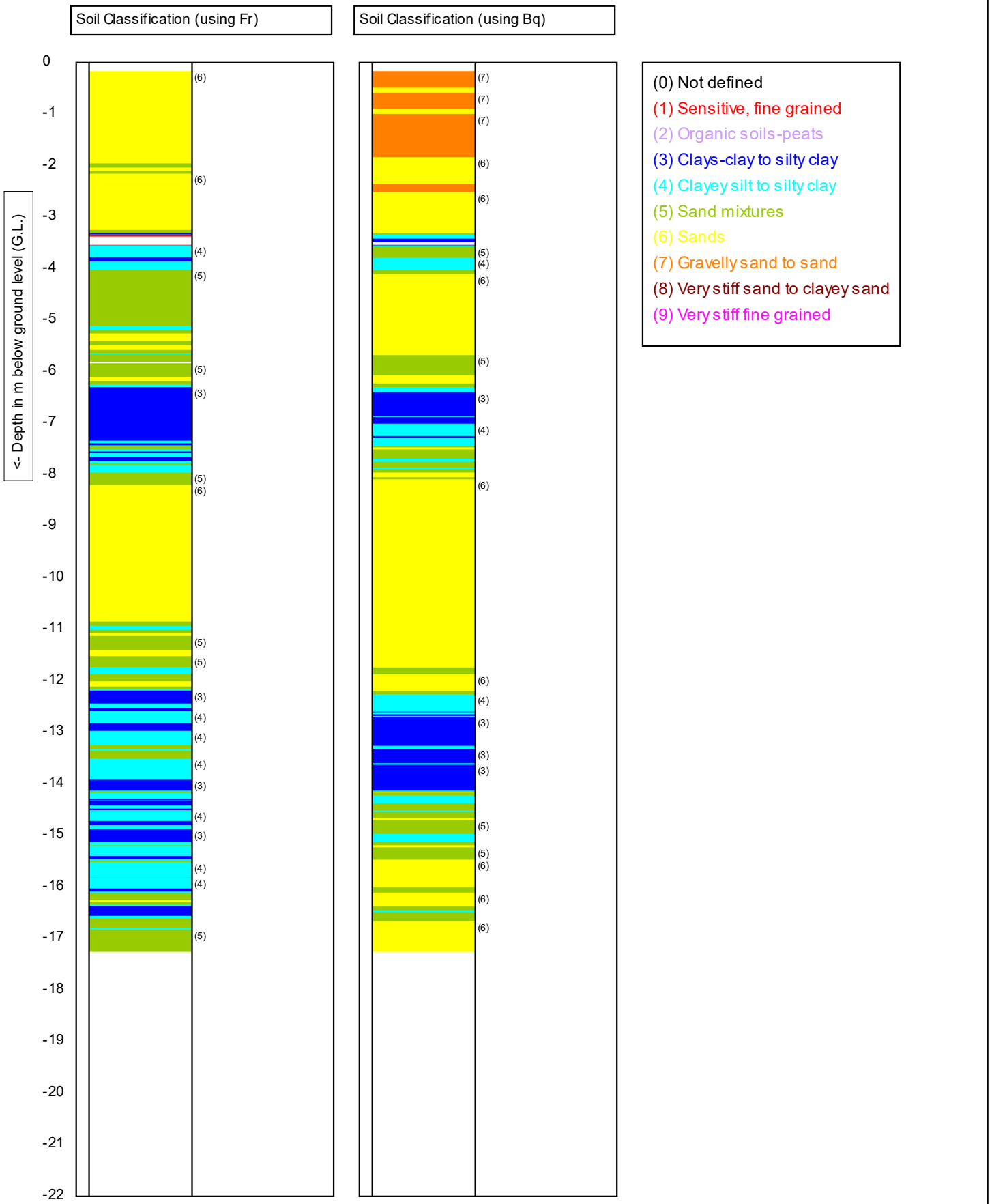
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819214, 5802394 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S04** **2/6**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

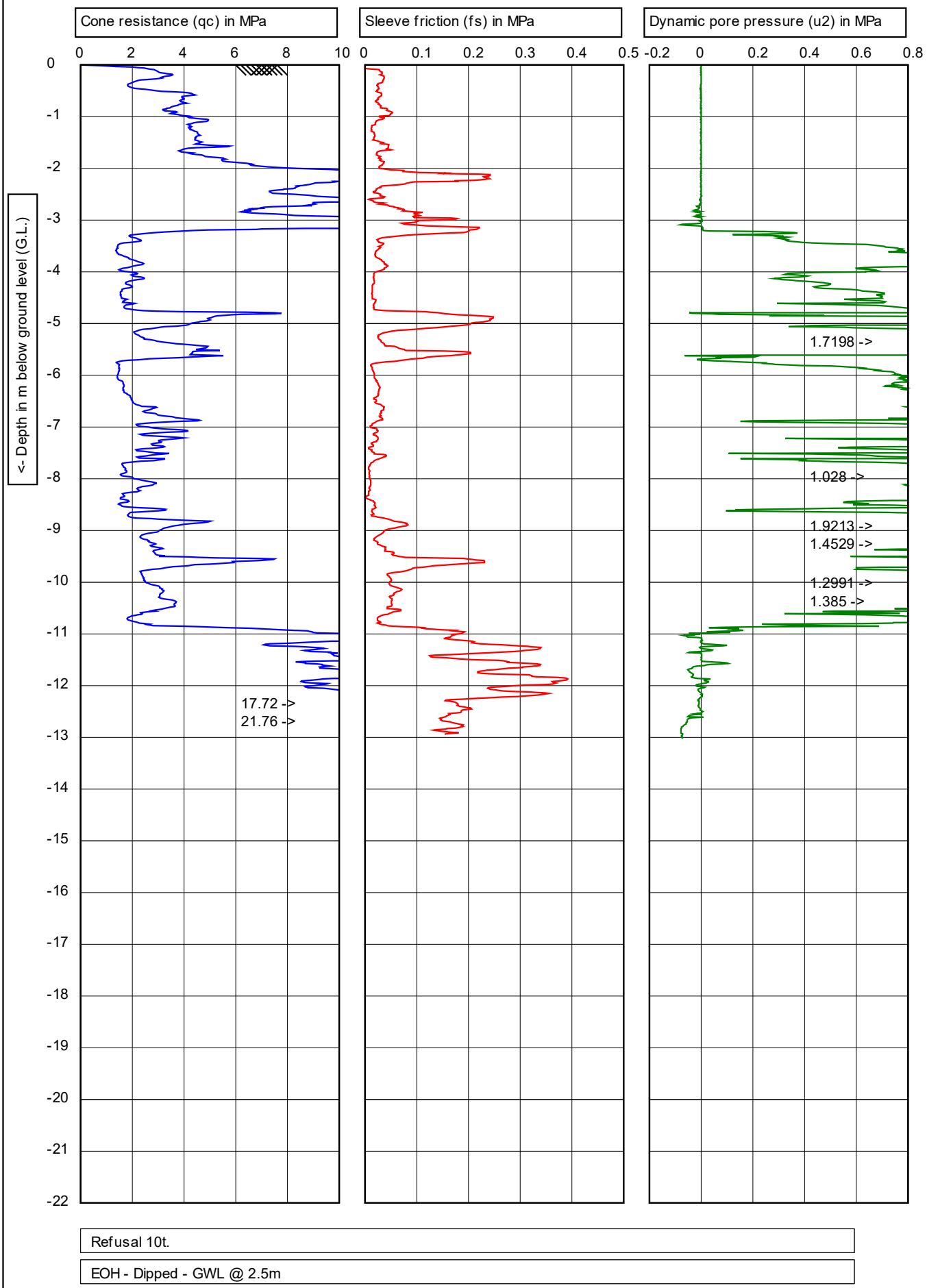
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819214, 5802394 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S04** 4/6

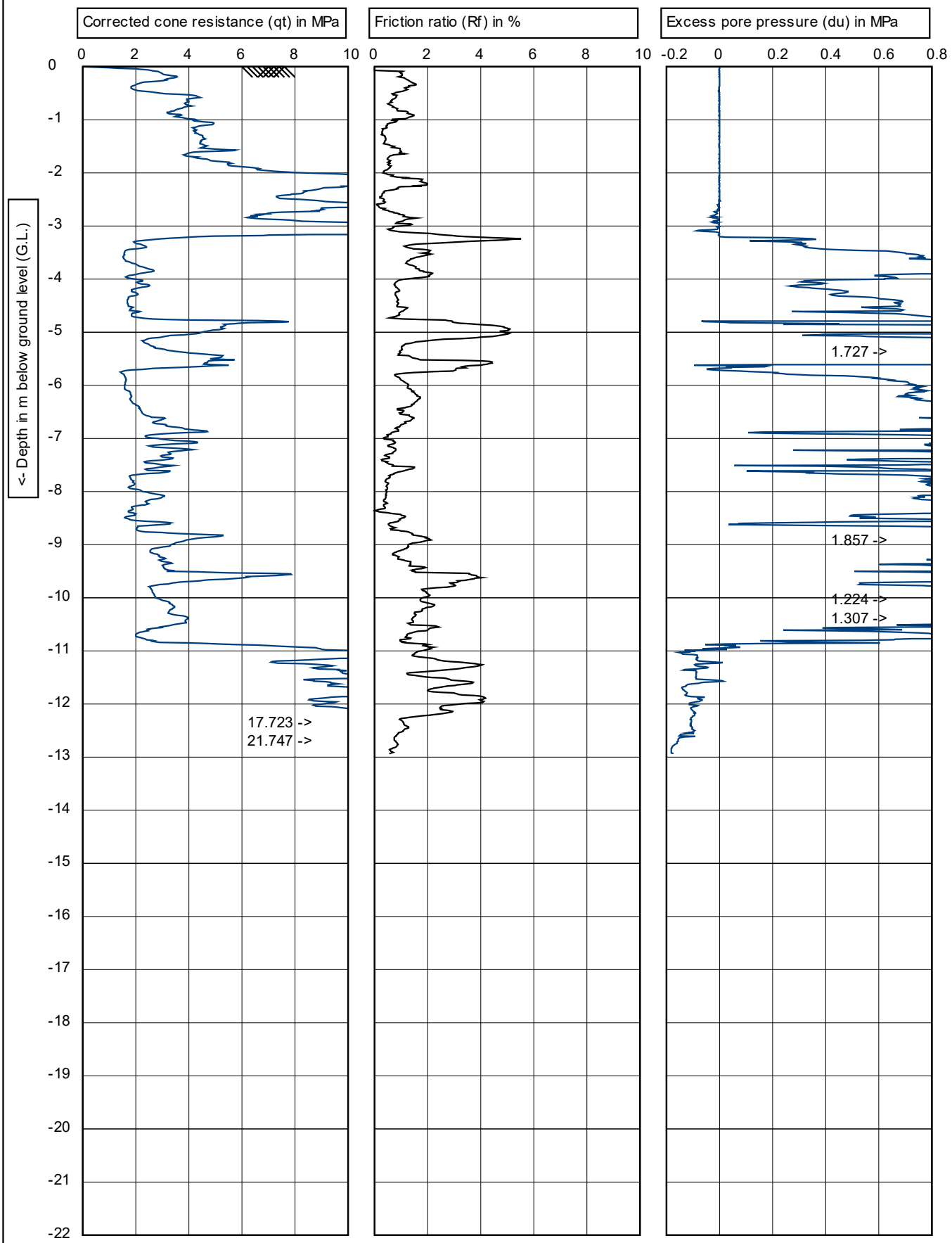
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project: **Wordsworth St Developments**		Cone no.:	**C10CFIIP.C14427**
Location: **Cambridge**		Project no.:	**2-68014.00_HA7523**
Position: **1819459, 5802311 NZTM**		CPT no.:	**S05** **1/6**

1.49

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Refusal 10t.

EOH - Dipped - GWL @ 2.5m

wsp

Graphs on this page are not IANZ accredited

1.49

r u2
150 cm²
10 cm²

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

G.L.: **0.00 m MSL**

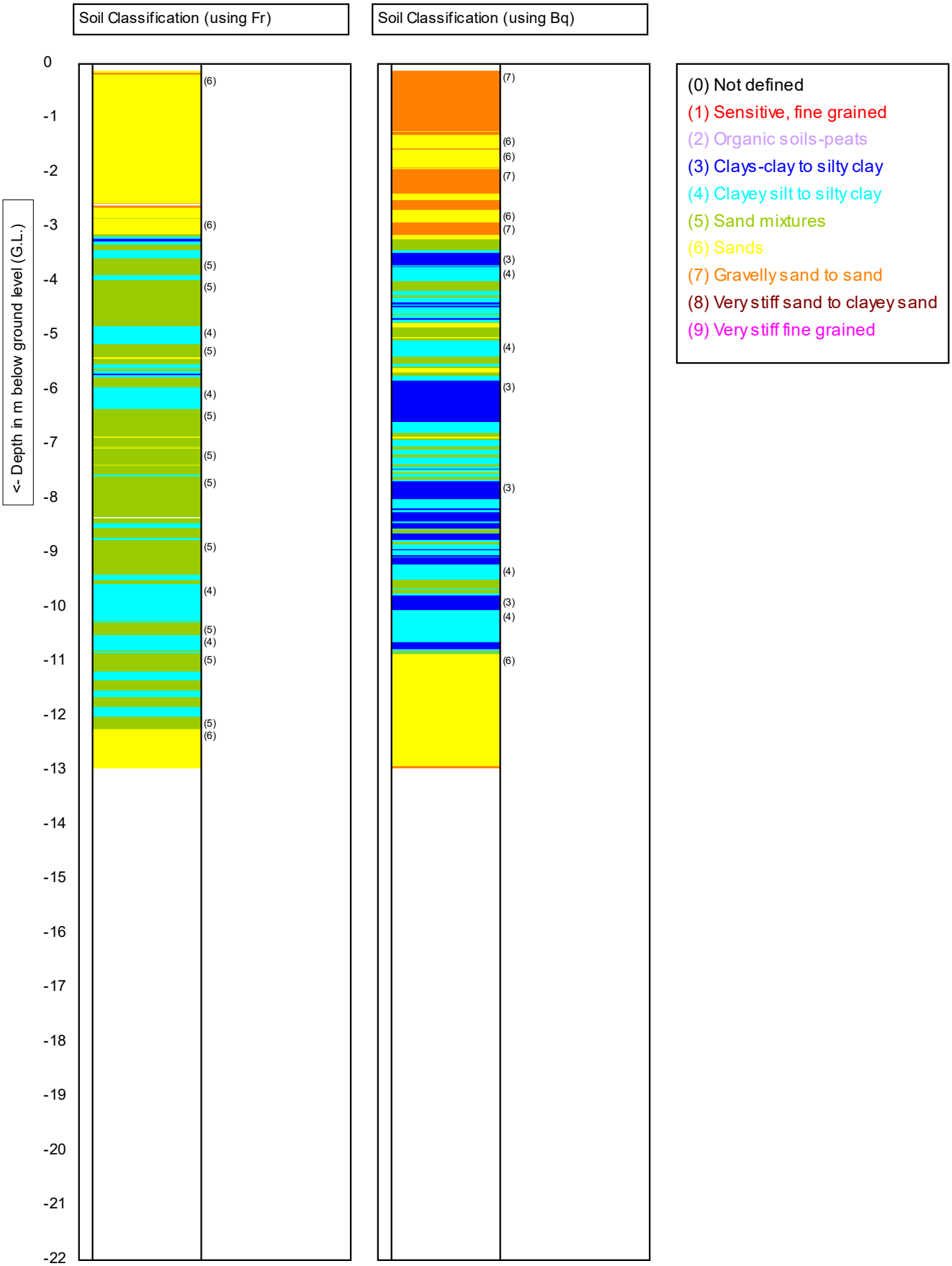
Project: **Wordsworth St Developments**

Location: **Cambridge**

Position: **1819459, 5802311 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**21/06/2021**
Cone no.:	**C10CFIIP.C14427**
Project no.:	**2-68014.00_HA7523**
CPT no.:	**S05** **2/6**

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Graphs on this page are not IANZ accredited

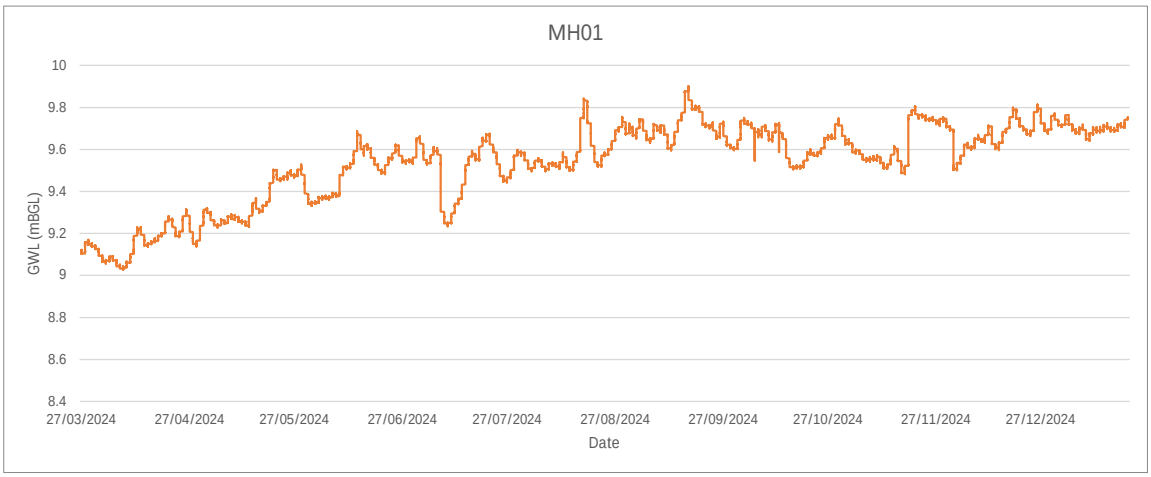
1.49

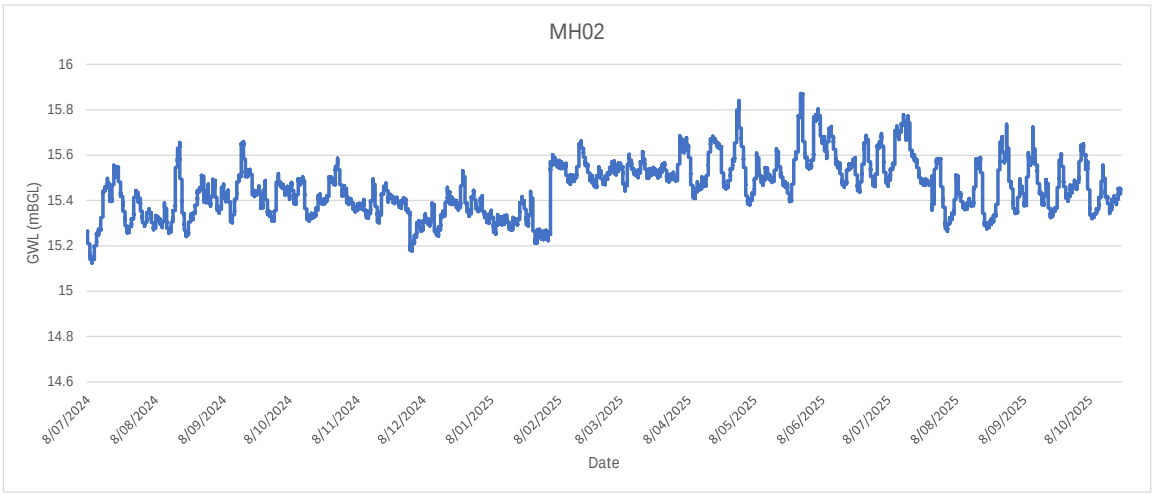
r u2 / L 150 cm² / 10 cm²	Test according ASTM D5778:12 & ISO 22476-1:2012	Predrill:	**0.00 m Predrilled**
	G.L.: **0.00 m MSL**	Date:	**21/06/2021**
Project:	**Wordsworth St Developments**	Cone no.:	**C10CFIIP.C14427**
Location:	**Cambridge**	Project no.:	**2-68014.00_HA7523**
Position:	**1819459, 5802311 NZTM**	CPT no.:	**S05** 4/6

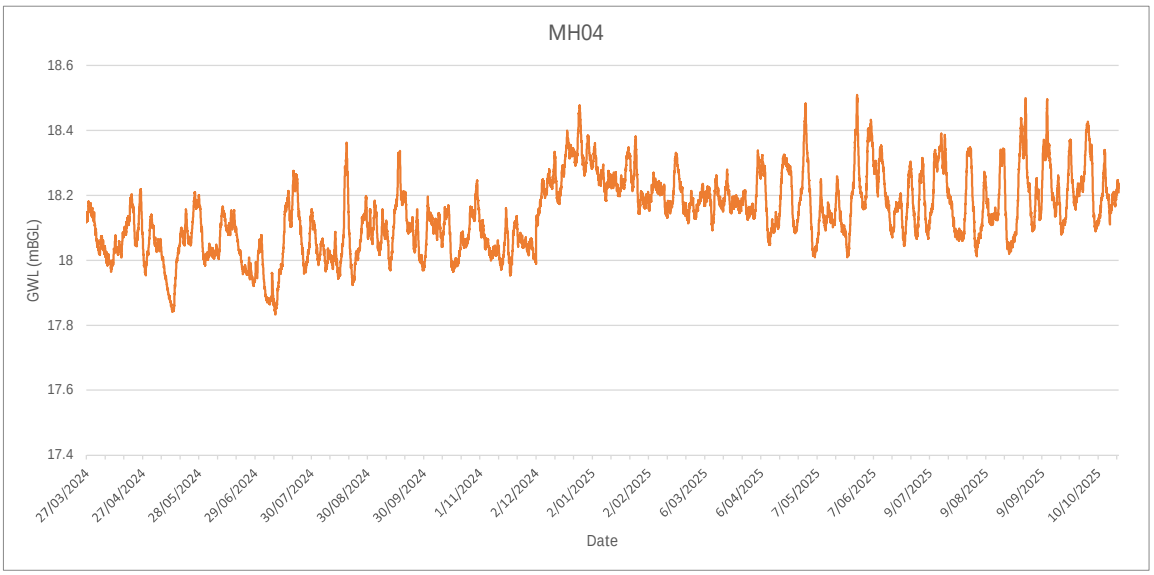
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

APPENDIX G
Groundwater Monitoring

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025







Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

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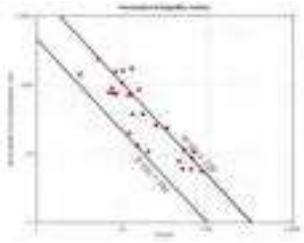
APPENDIX H
Soil Microstructure Assessment

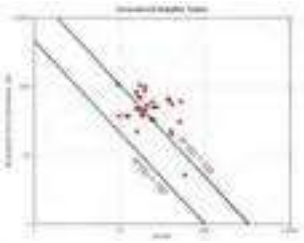
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Depth (m)	Vs (m/s)									
	SCPT01 Meas	SCPT01 MVER	SCPT02 Meas	SCPT02 MVER	SCPT03 Meas	SCPT03 MVER	SCPT04 Meas	SCPT04 MVER	SCPT05 Meas	SCPT05 MVER
1.0	165	1.21	123	0.82	131	0.89	120	0.72	120	0.76
2.0	120	0.62	160	1.13	80	0.38	160	1.02	96	0.56
3.0	225	1.21	232	1.89	225	1.36	169	1.06	225	0.98
4.0	267	1.15	142	1.06	158	0.71	158	1.34	144	0.98
5.0	245	0.95	143	1.09	190	0.91	171	0.96	190	0.83
6.0	347	1.50	150	0.93	224	1.02	214	1.23	199	1.31
7.0	231	1.24	154	1.05	231	1.12	156	1.04	322	2.01
8.0	188	0.91	171	1.06	188	1.05	252	1.15	289	1.80
9.0	204	0.96	191	0.98	212	0.99	272	1.00	238	1.22
10.0	192	1.01	192	0.98	353	1.47	307	1.12	290	1.44
11.0	215	1.02	273	1.27	310	1.20	355	1.06	242	0.87
12.0	278	1.26	386	1.71	338	1.30	280	1.08	399	1.31
12.4	-		-		-		-		377	1.29
13.0	315	1.37	355	1.42	305	1.16	195	1.02	-	
14.0	269	0.97	245	1.02	327	1.20	343	1.89	-	
15.0	272	1.42	284	1.12	302	1.13	339	1.41	-	
16.0	255	1.27	314	1.26	320	1.07	379	1.14	-	
16.7	-		-		-		260	0.91	-	
17.0	210	1.24	271	1.11	342	1.10	-		-	
18.0	198	1.27	349	1.30	329	1.01	-		-	
19.0	297	1.49	337	1.18	364	1.09	-		-	
20.0	253	1.50	407	1.72	297	0.89	-		-	
21.0	233	1.34	287	1.03	330	1.09	-		-	
22.0	165	0.71	248	0.87	293	0.89	-		-	
23.0	165	0.67	196	0.79	276	0.77	-		-	
24.0	166	0.72	195	0.75	301	0.76	-		-	
25.0	293	1.38	181	0.70	244	0.69	-		-	
25.6	-		-		304	0.87	-		-	
26.0	288	1.23	189	0.78	-		-		-	
27.0	283	1.18	192	1.15	-		-		-	
27.6	283	1.06	-		-		-		-	
28.0	-		309	0.91	-		-		-	
29.0	-		359	1.21	-		-		-	
30.0	-		340	1.70	-		-		-	

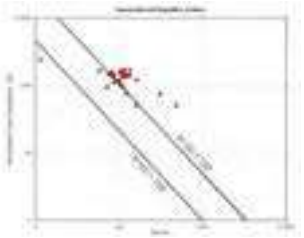
SCPT01



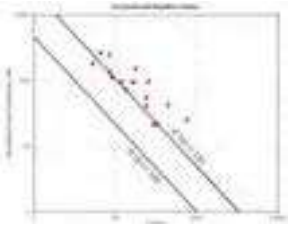
SCPT02



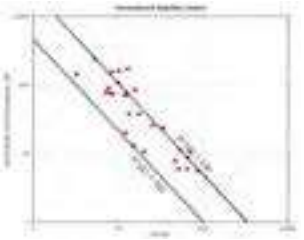
SCPT03



SCPT04



SCPT05



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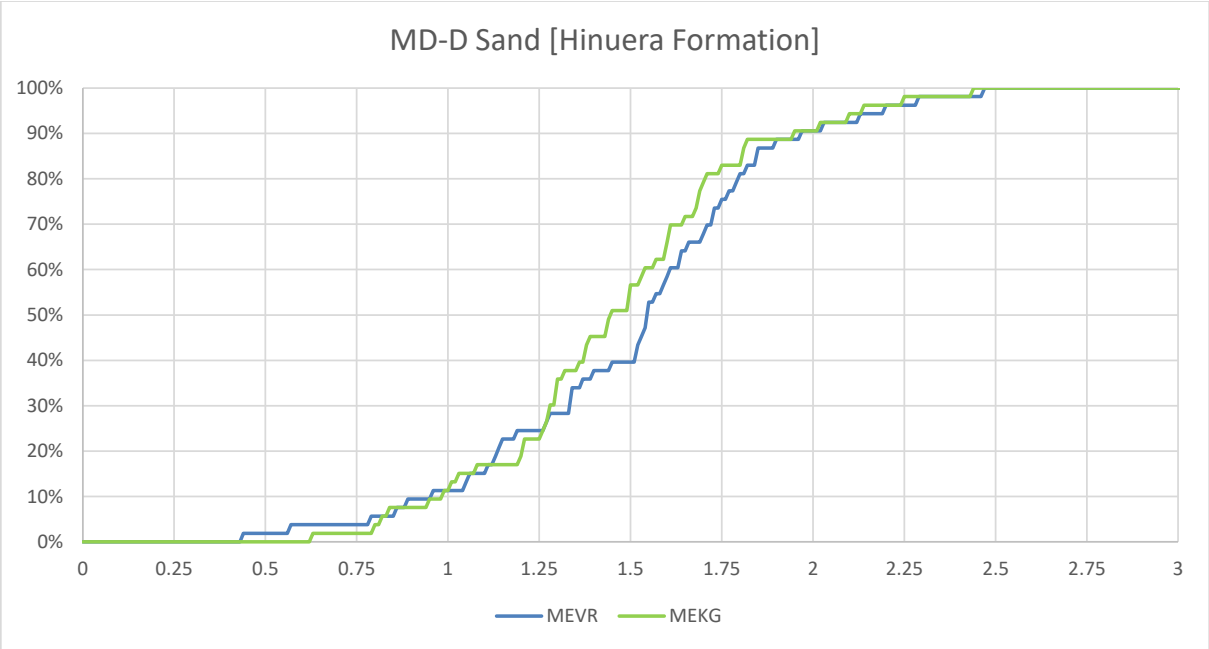
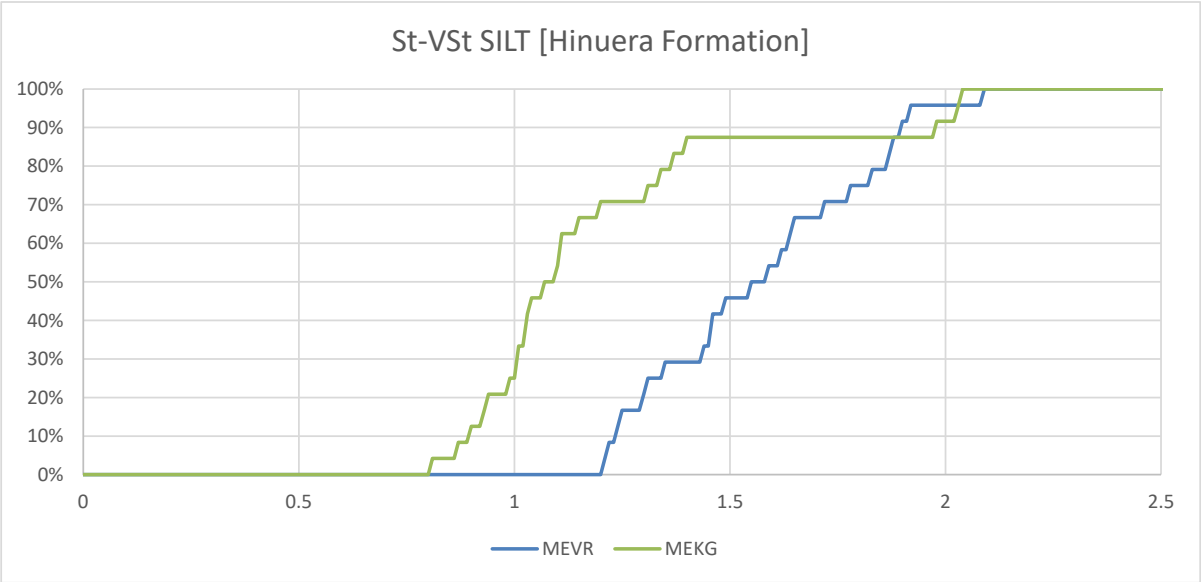
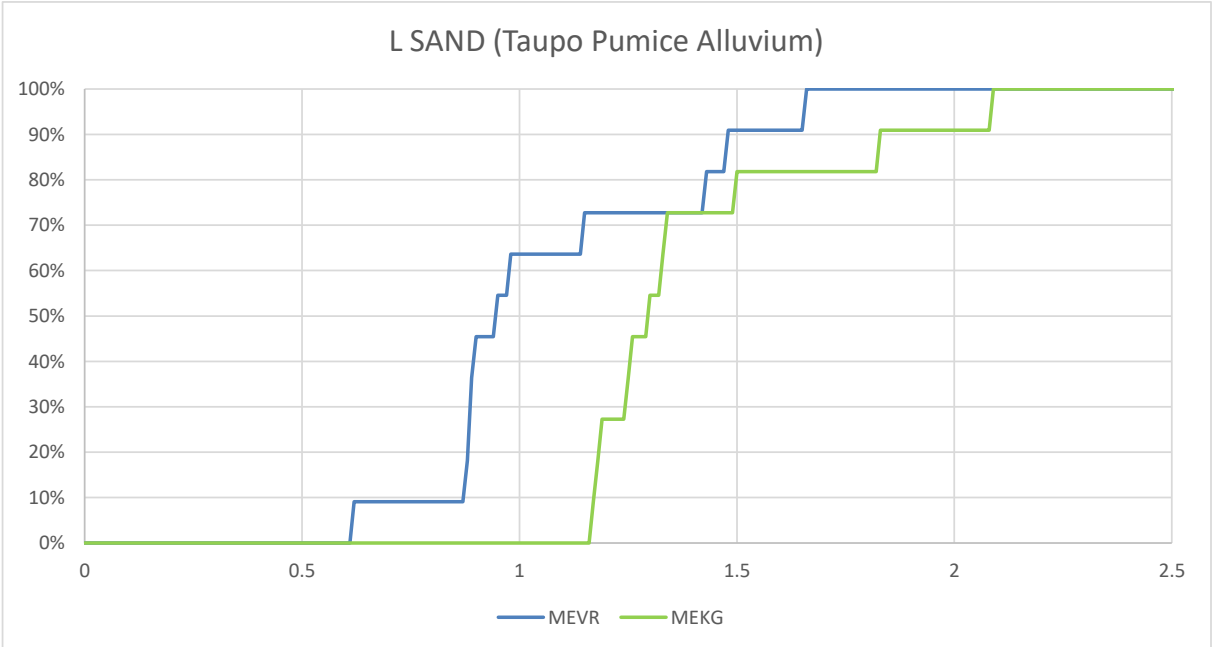
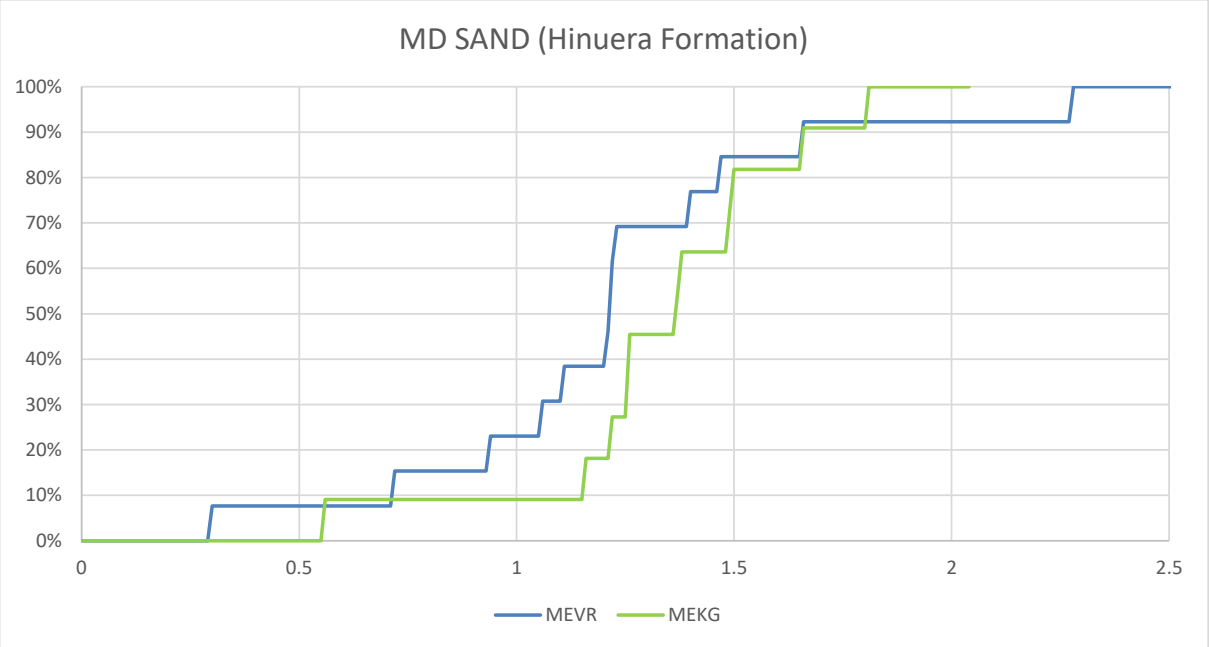
Version: 1, Version Date: 17/12/2025

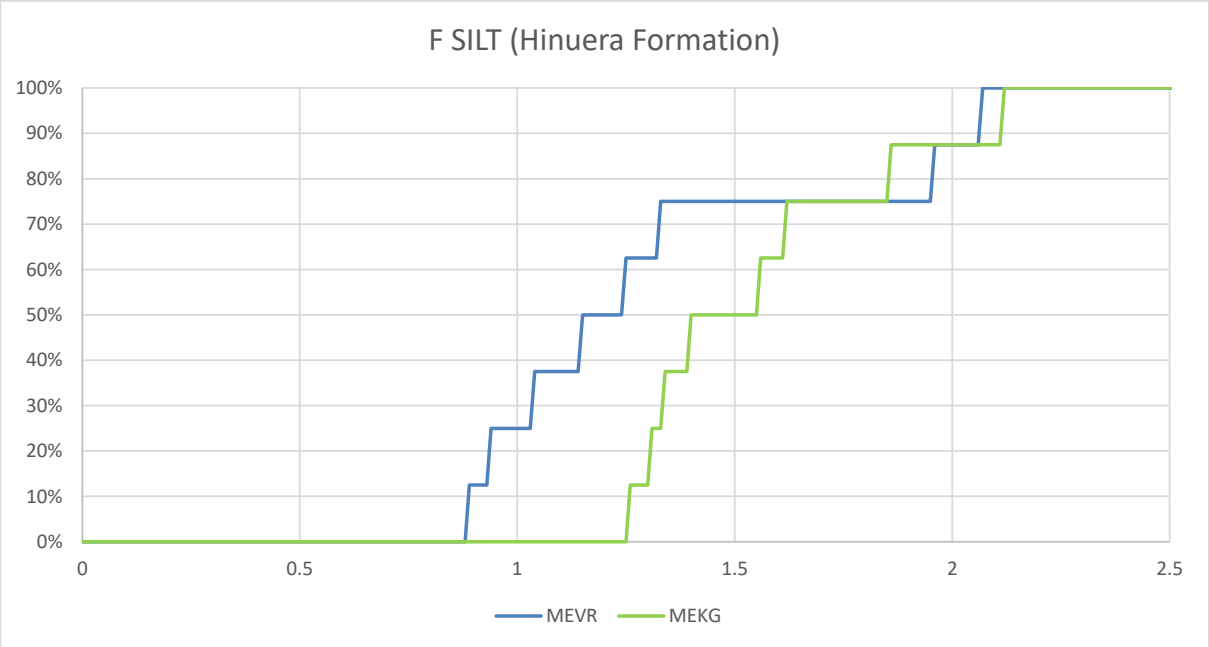






Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



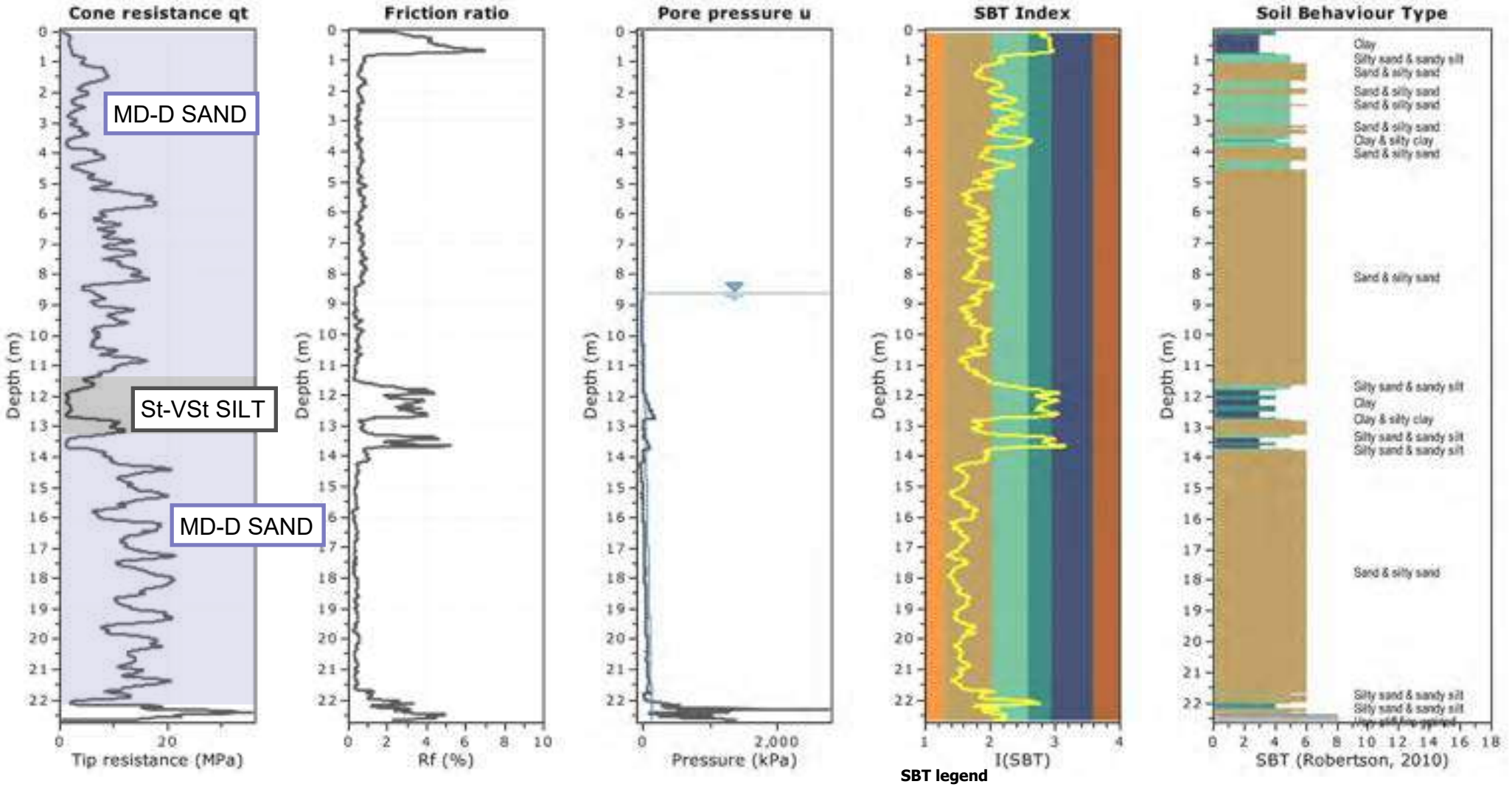


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m, Date: 14/12/2023

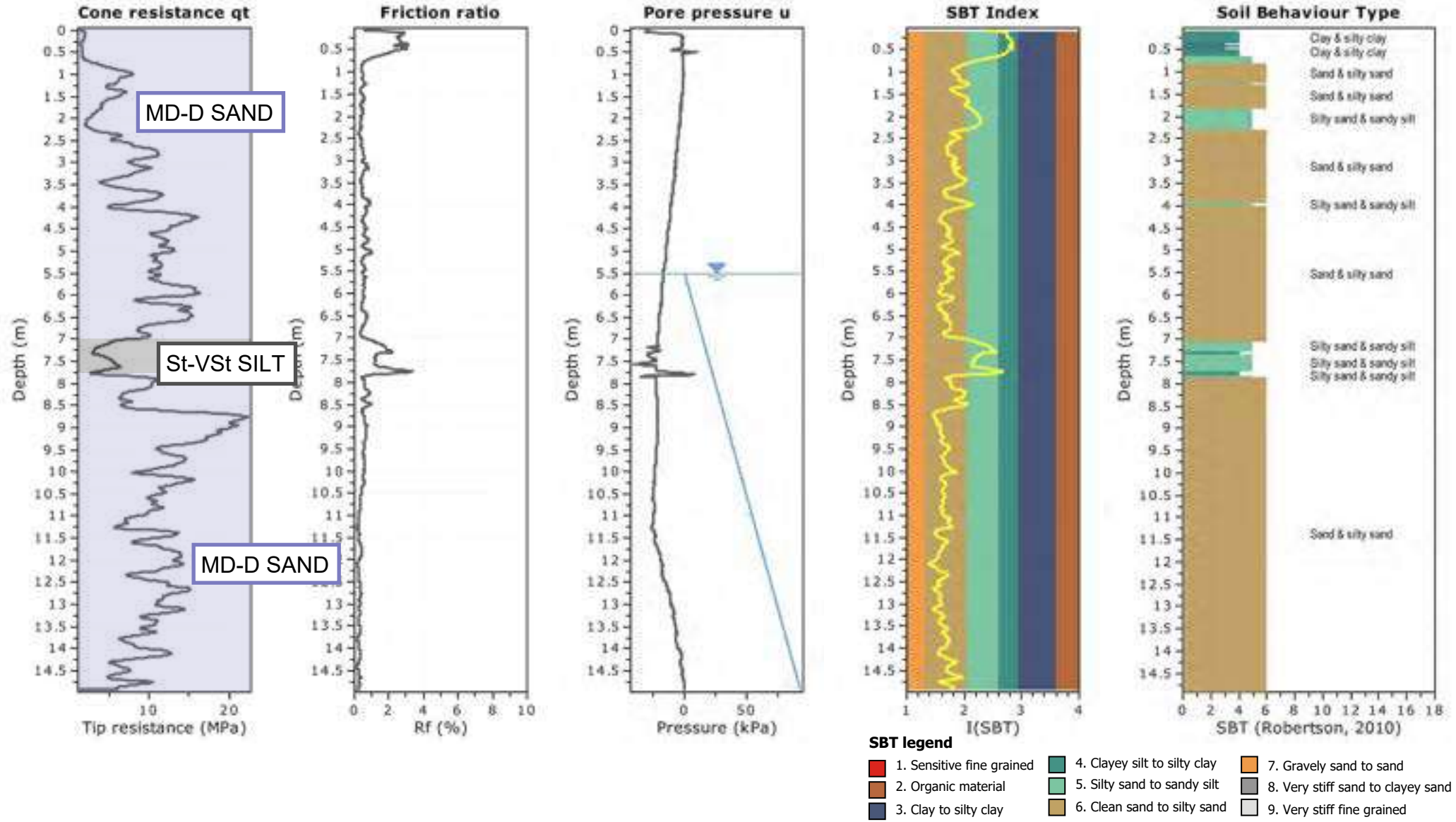


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

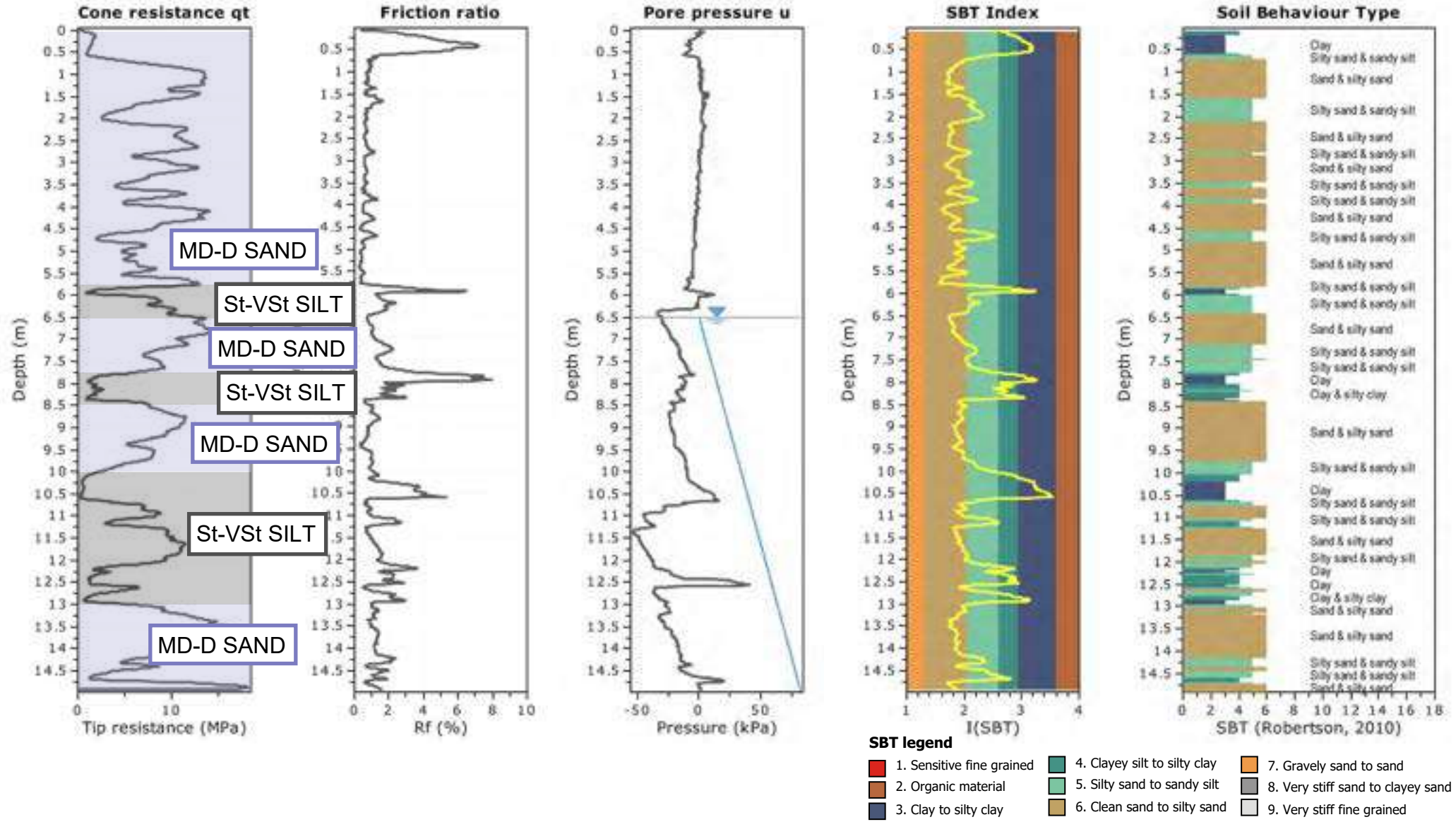


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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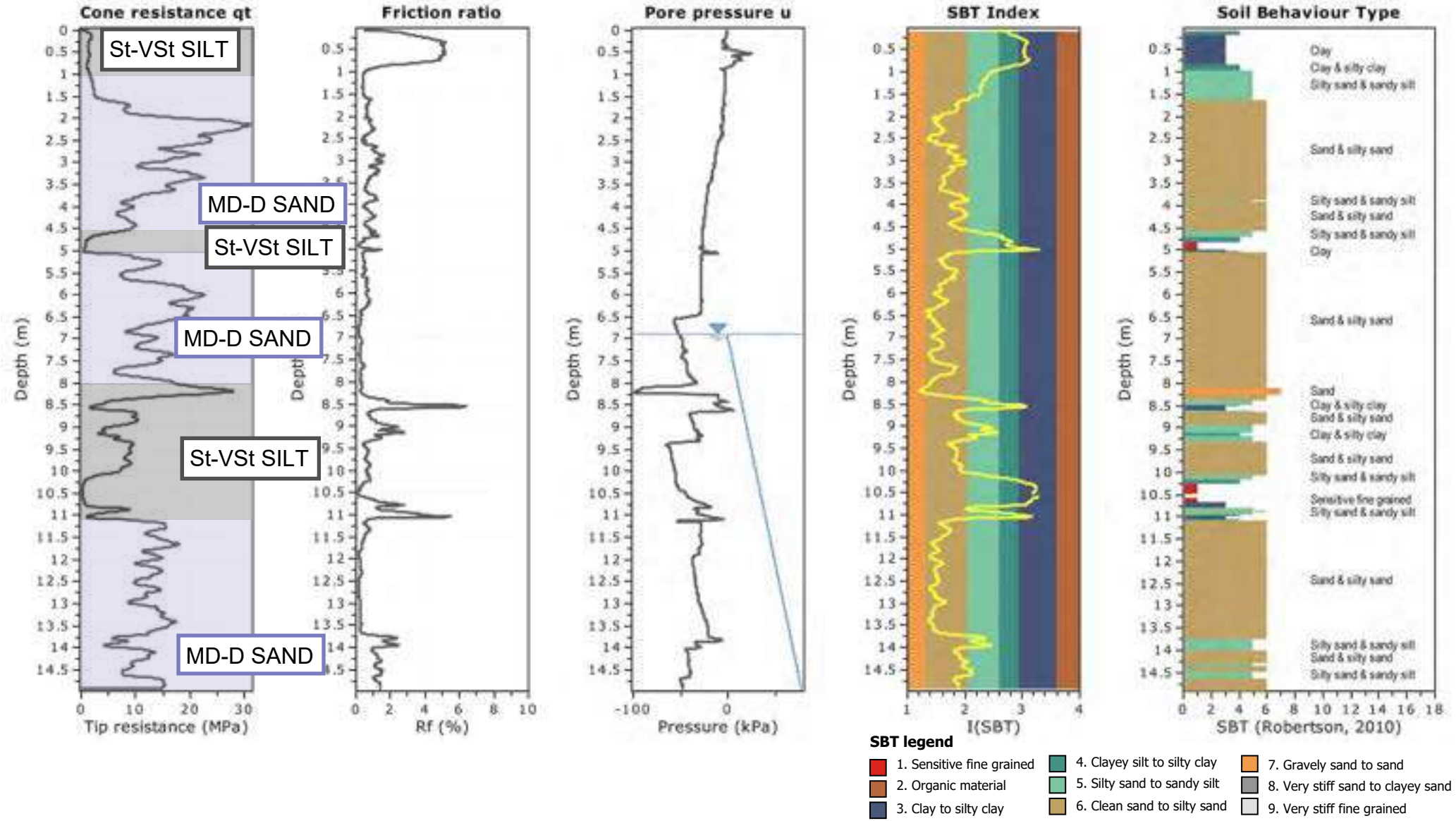
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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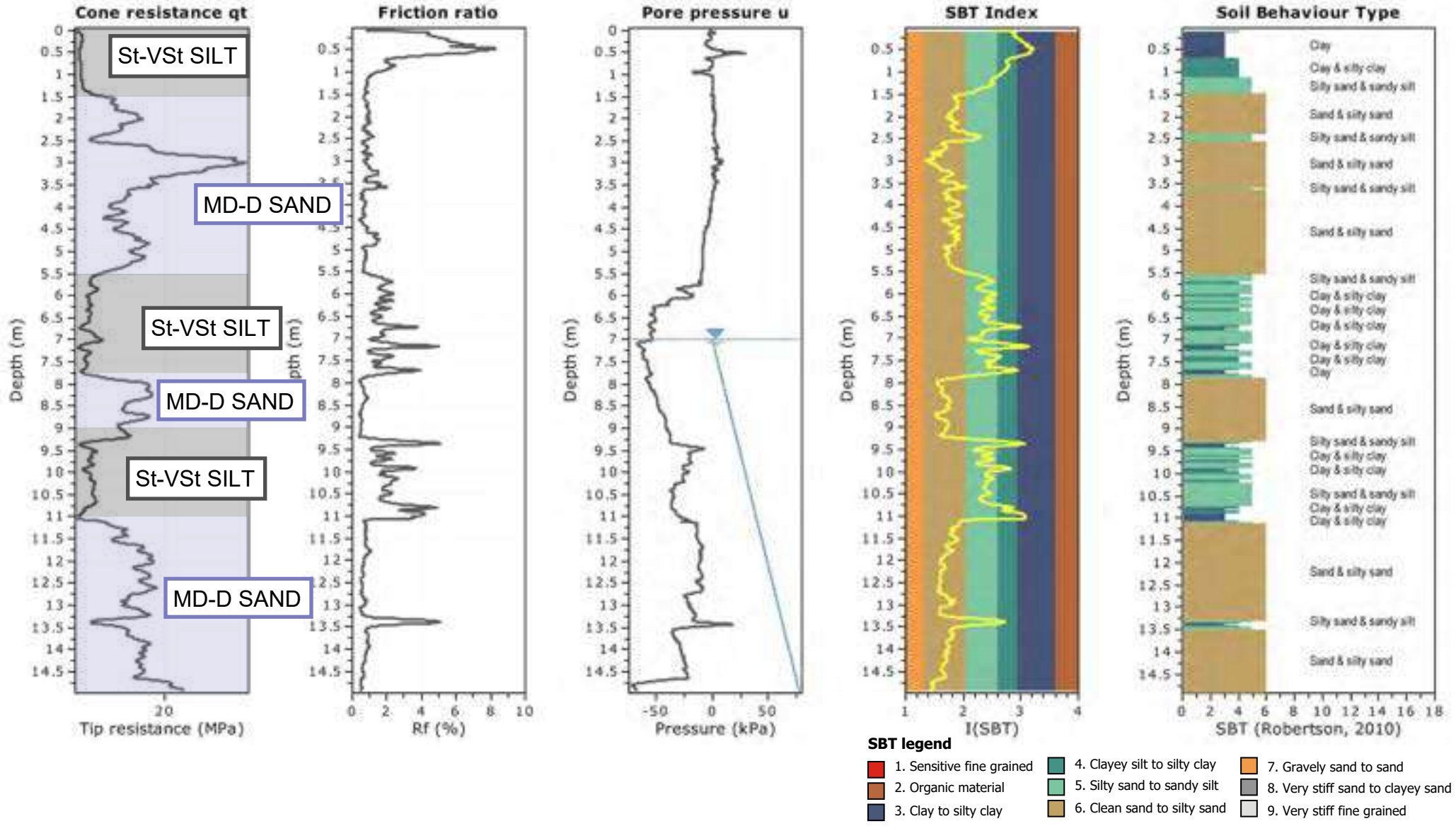
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

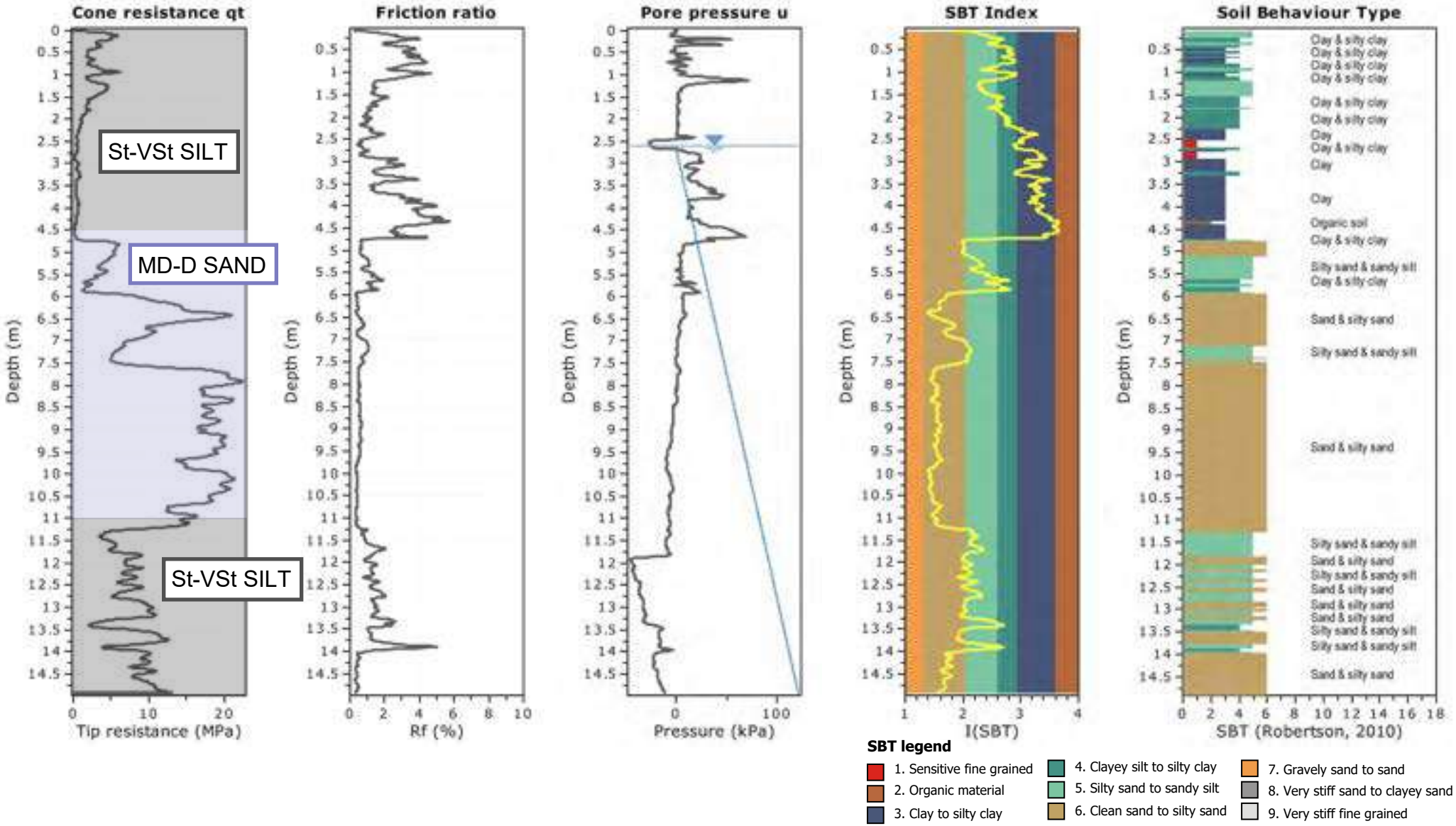


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

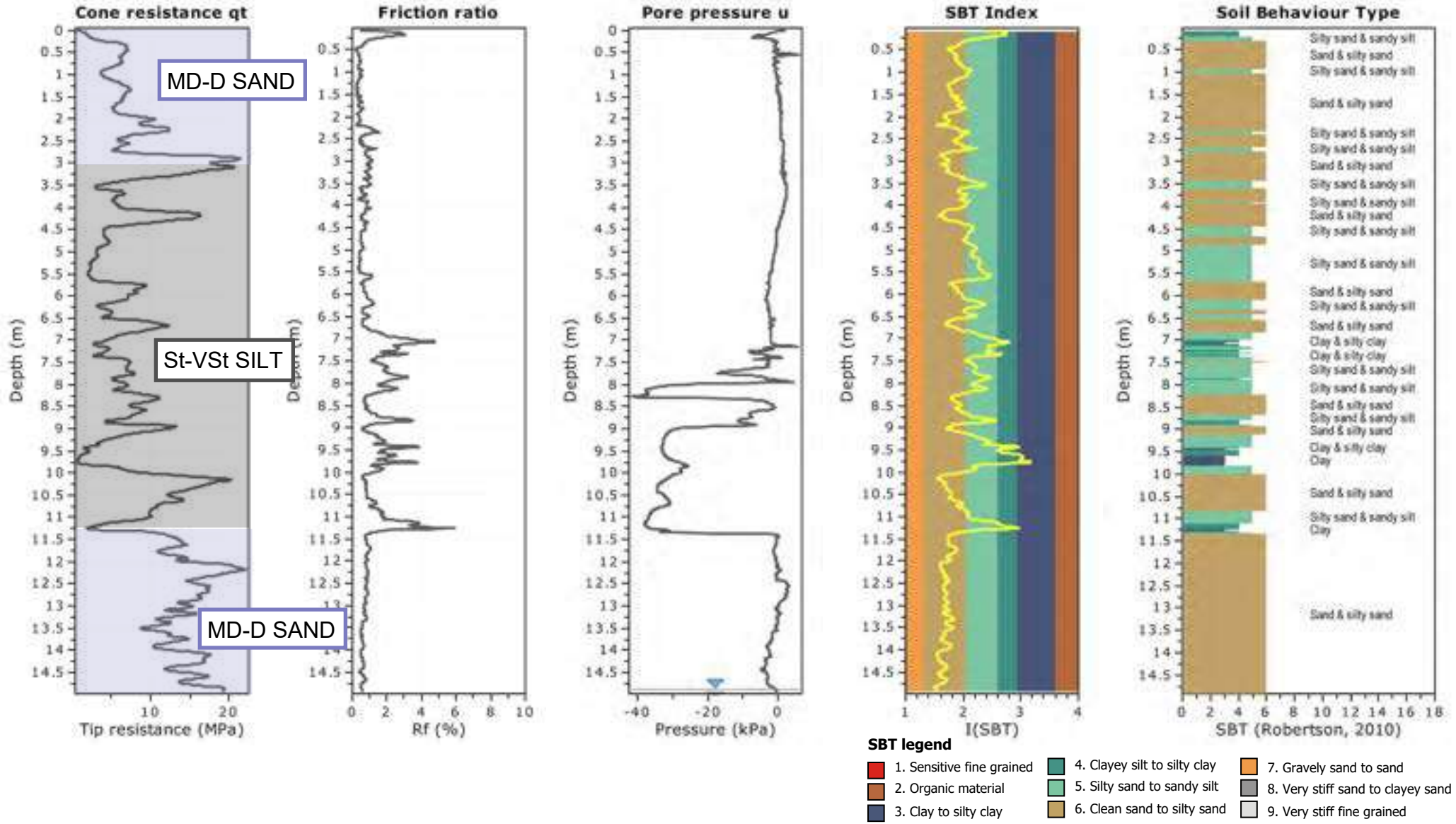


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT07
Total depth: 14.92 m, Date: 14/12/2023

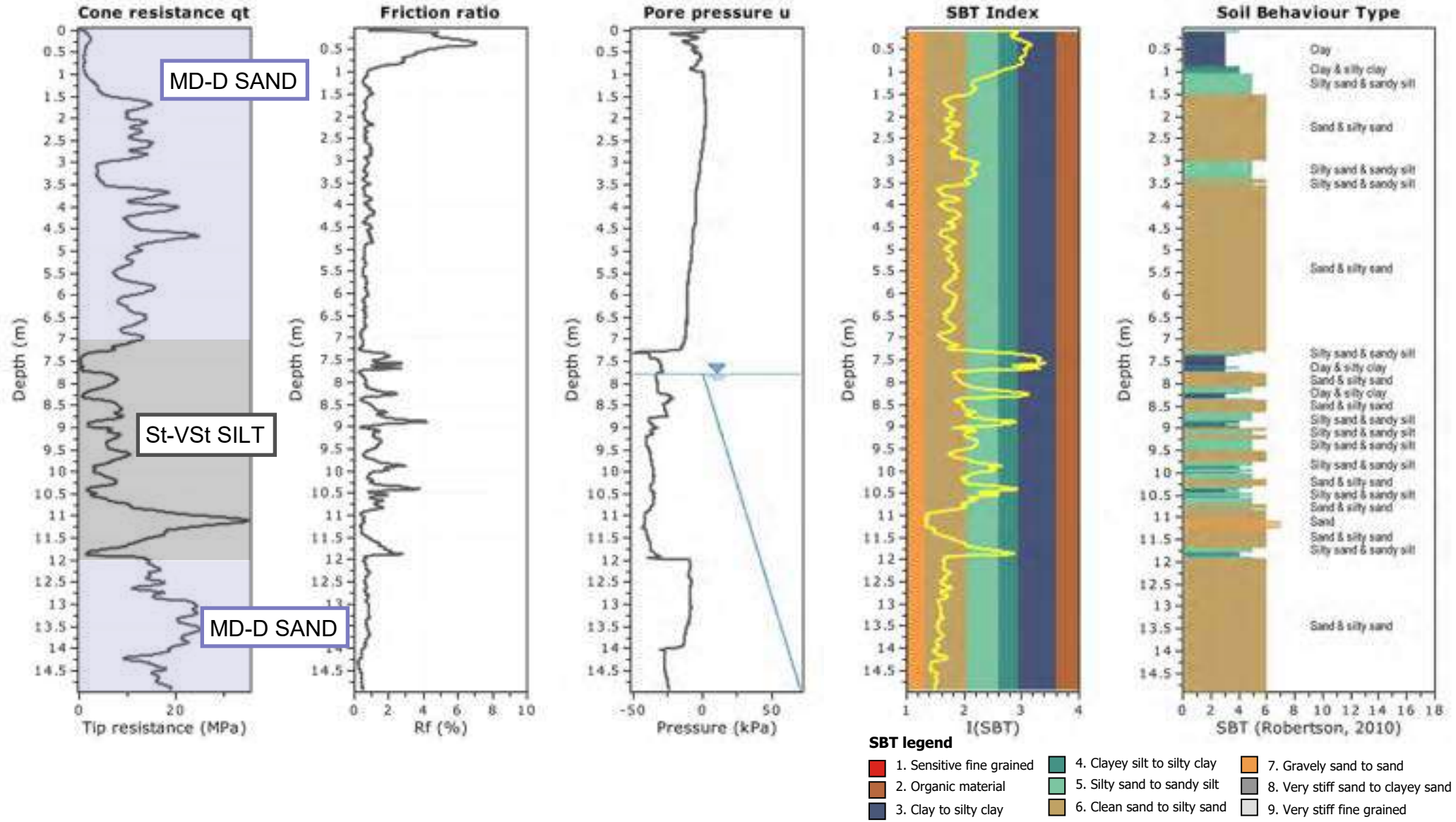


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

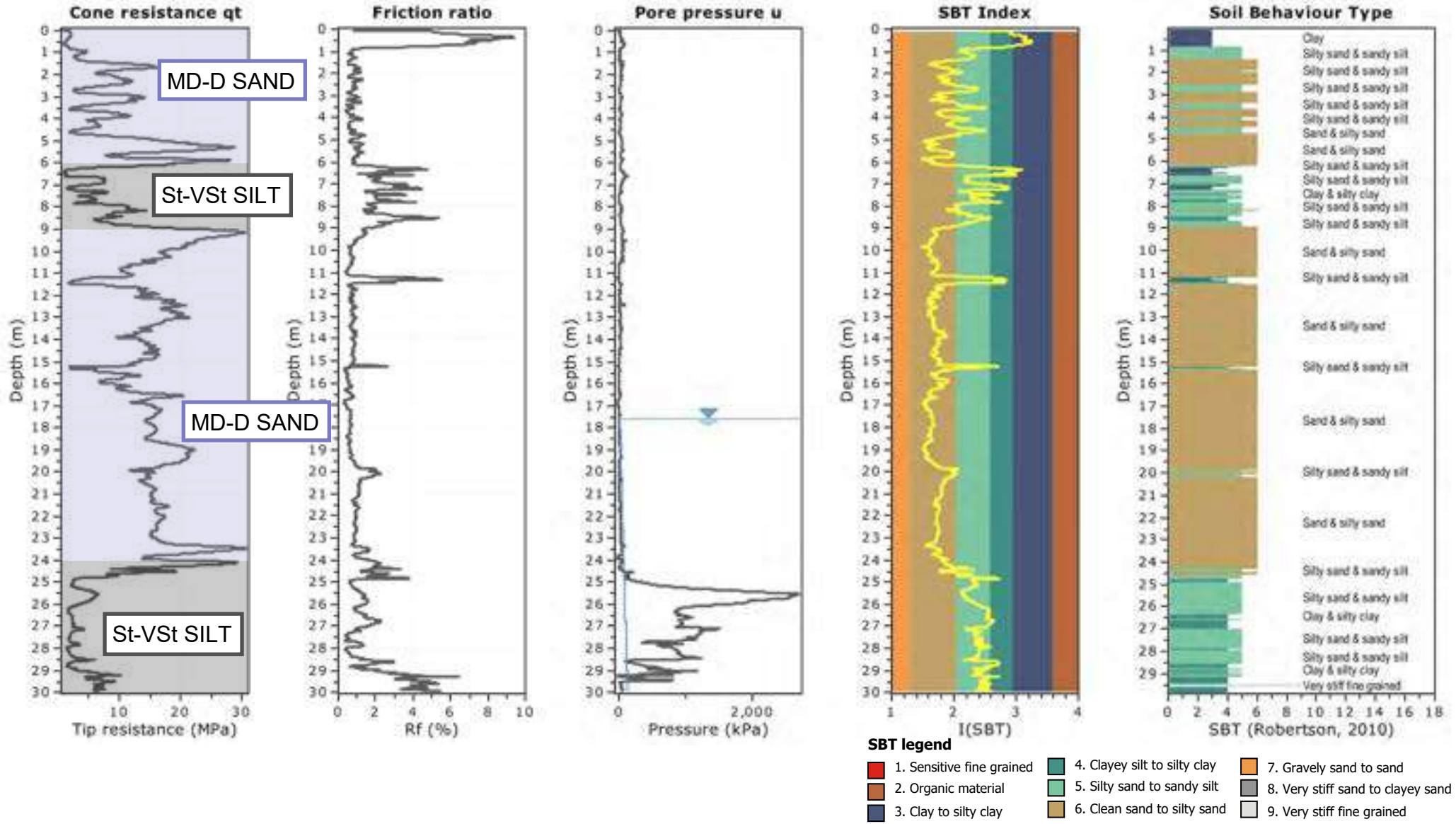


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m, Date: 14/12/2023

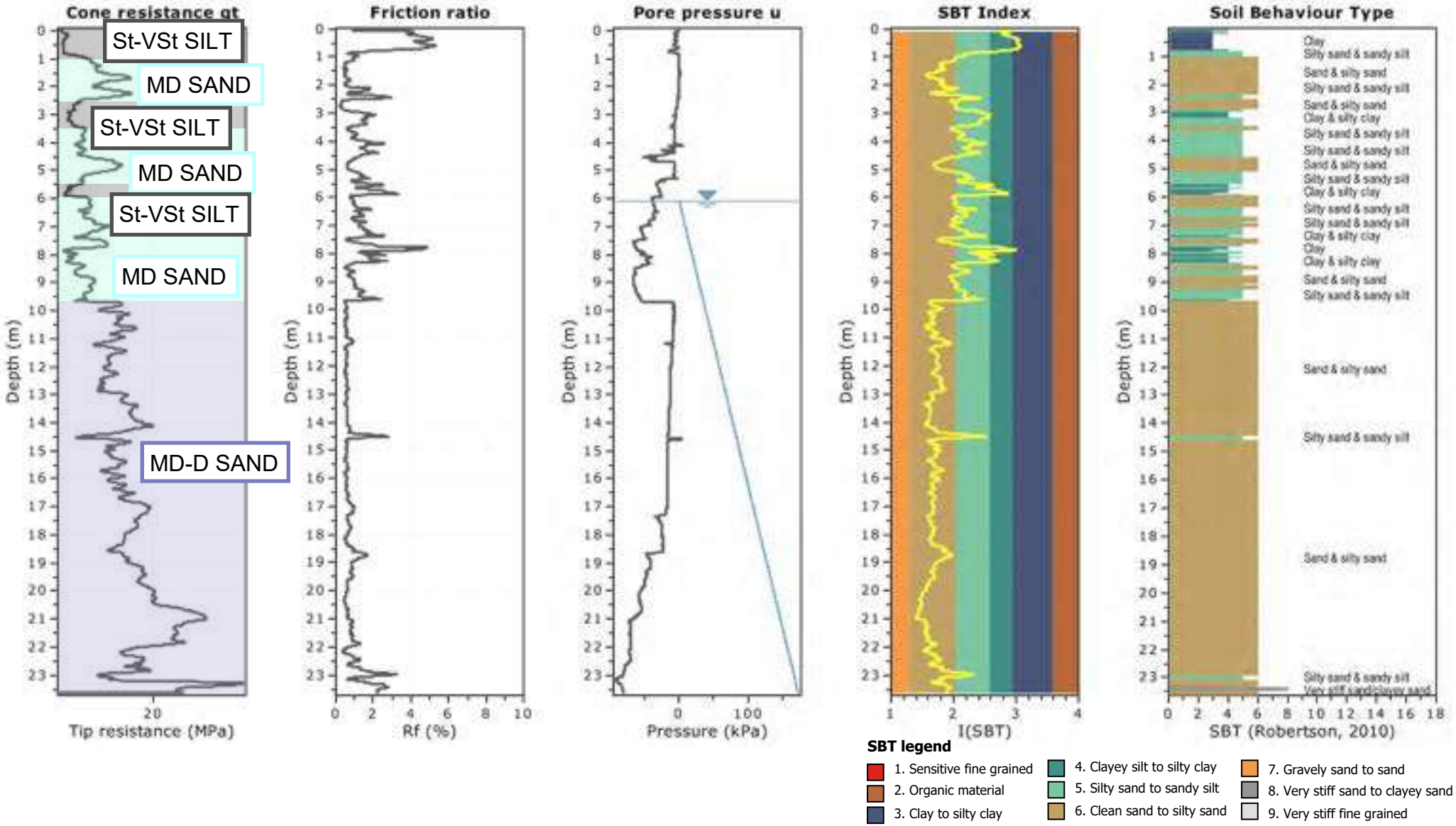


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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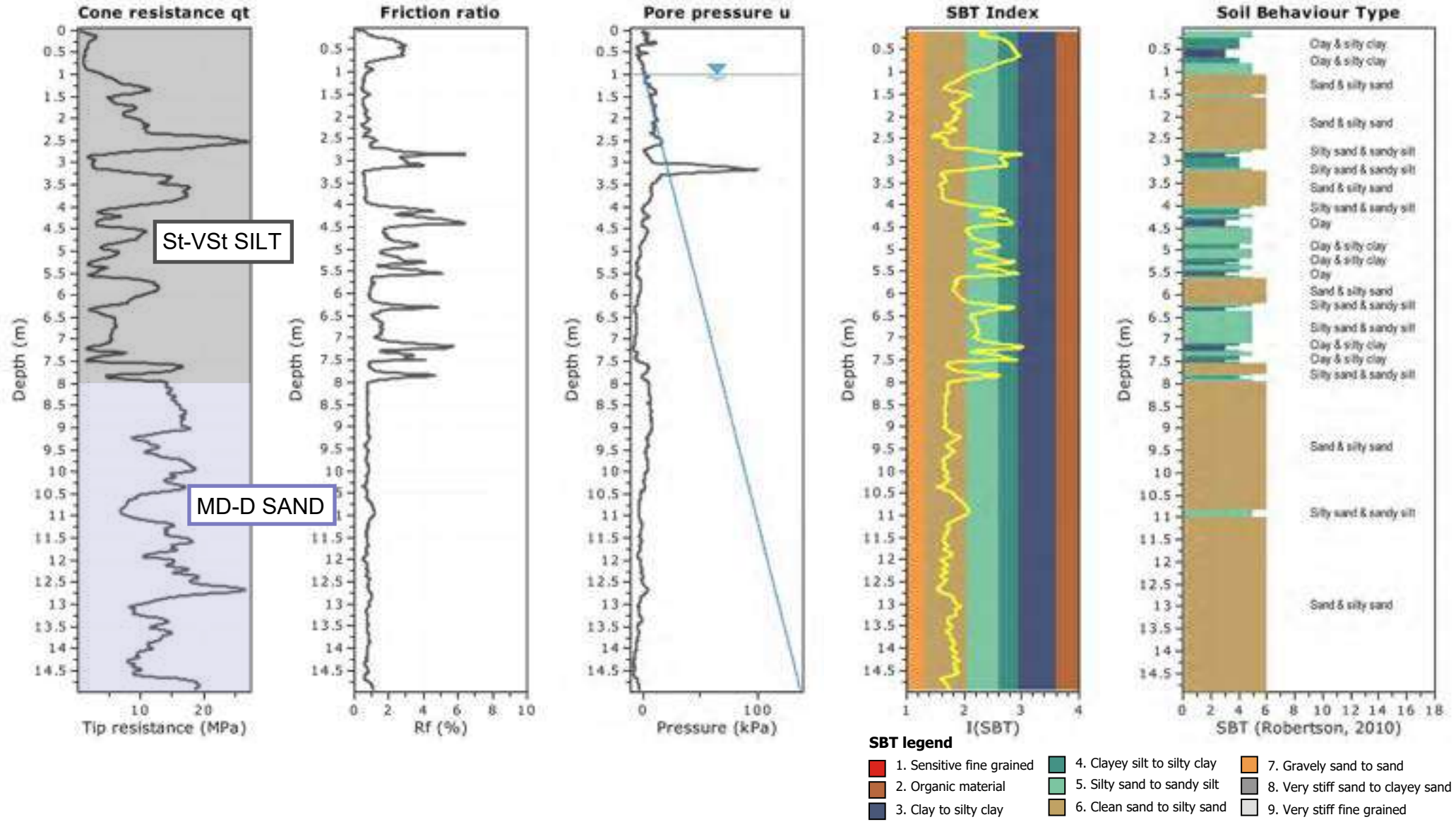
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT11
Total depth: 14.92 m, Date: 14/12/2023

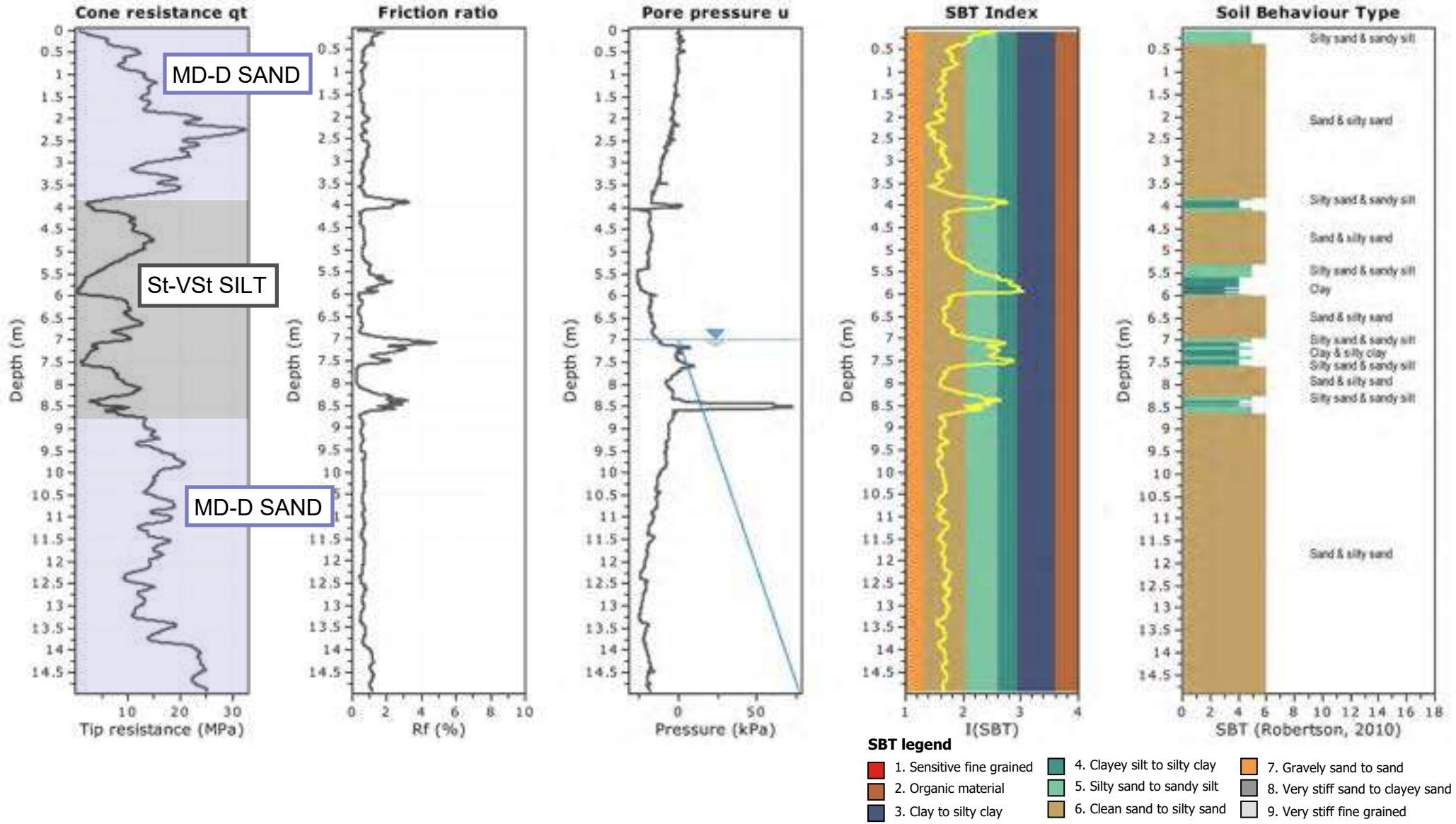


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT12
Total depth: 14.92 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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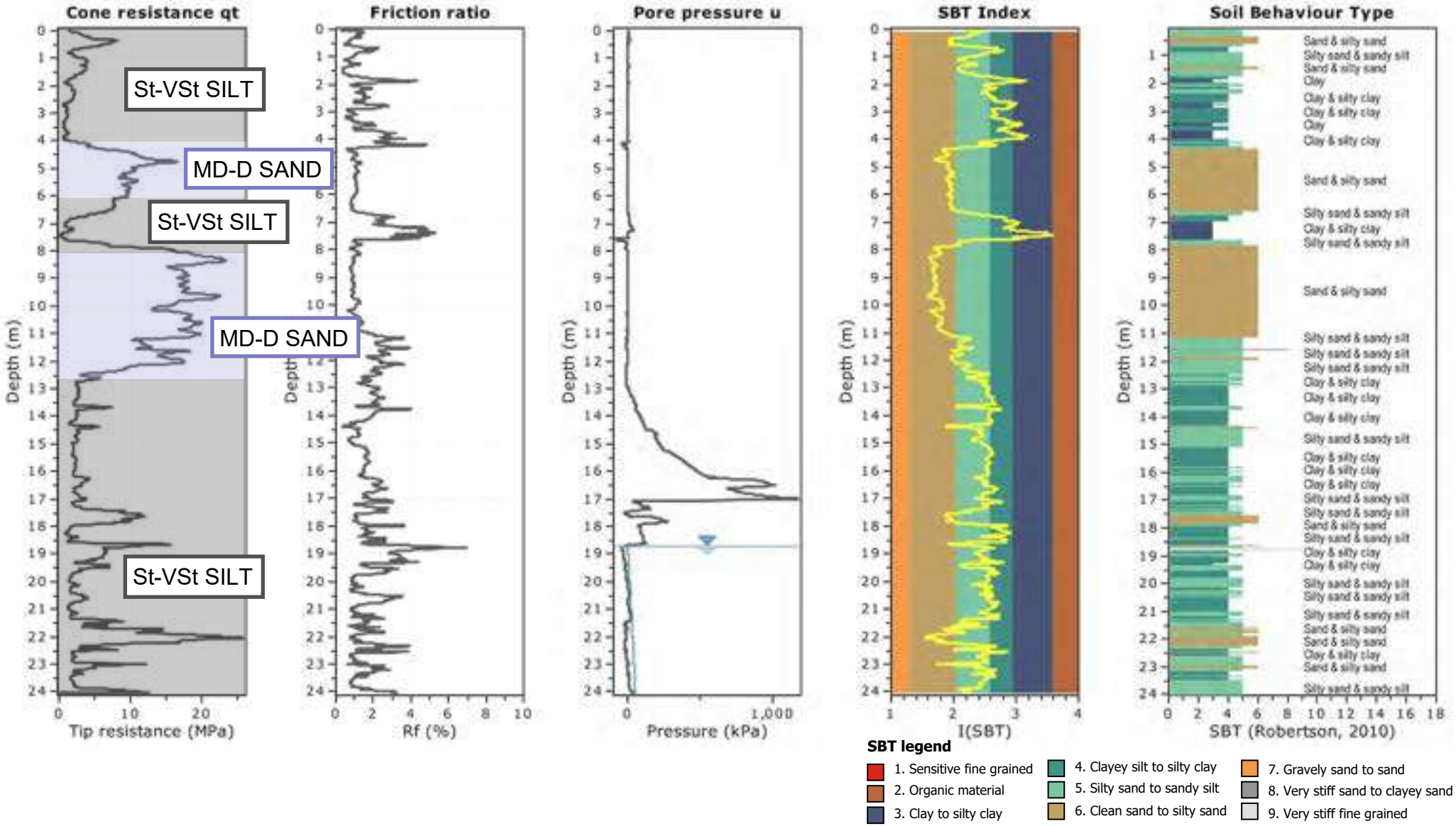
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT13
Total depth: 24.03 m, Date: 14/12/2023

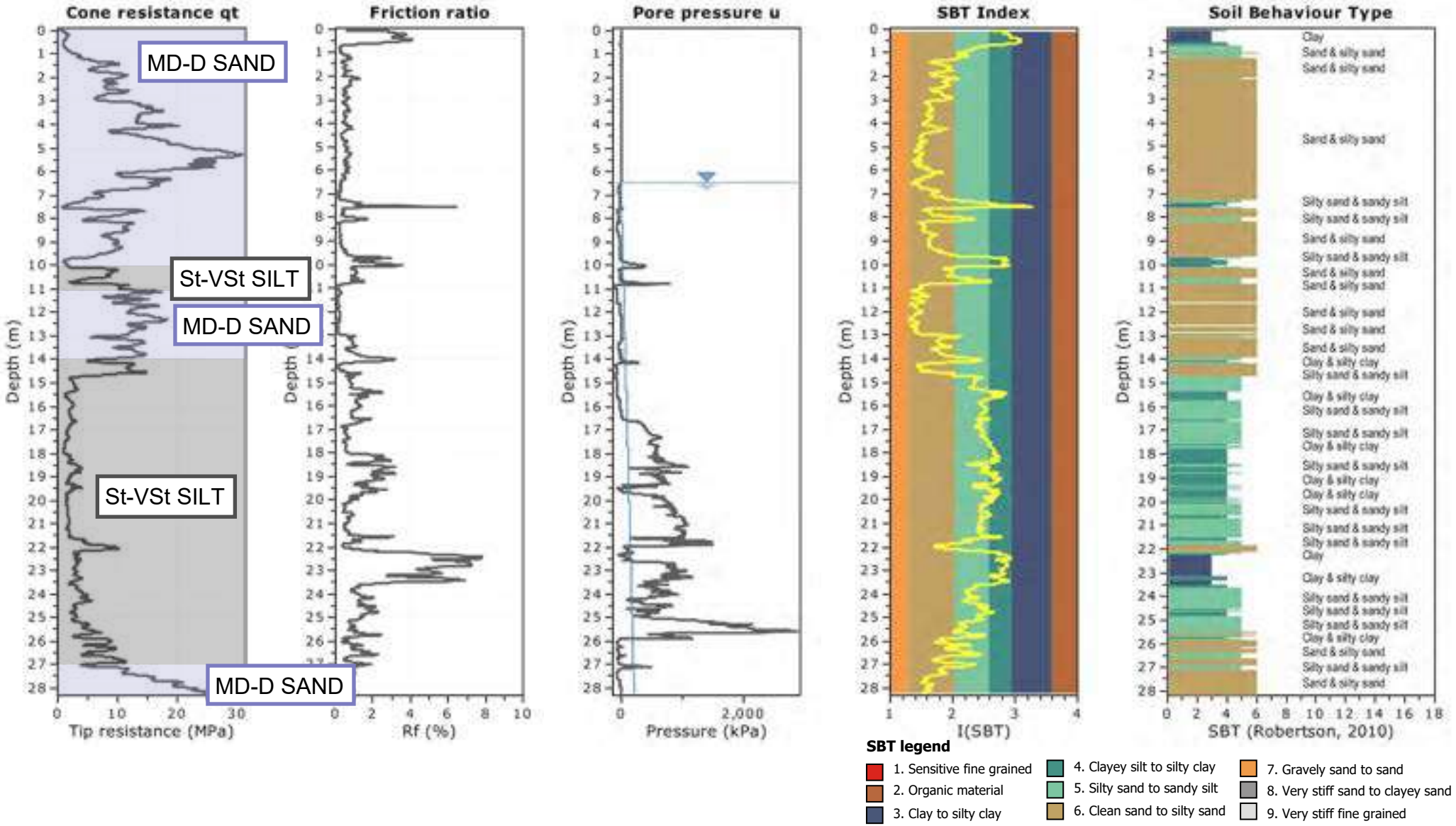


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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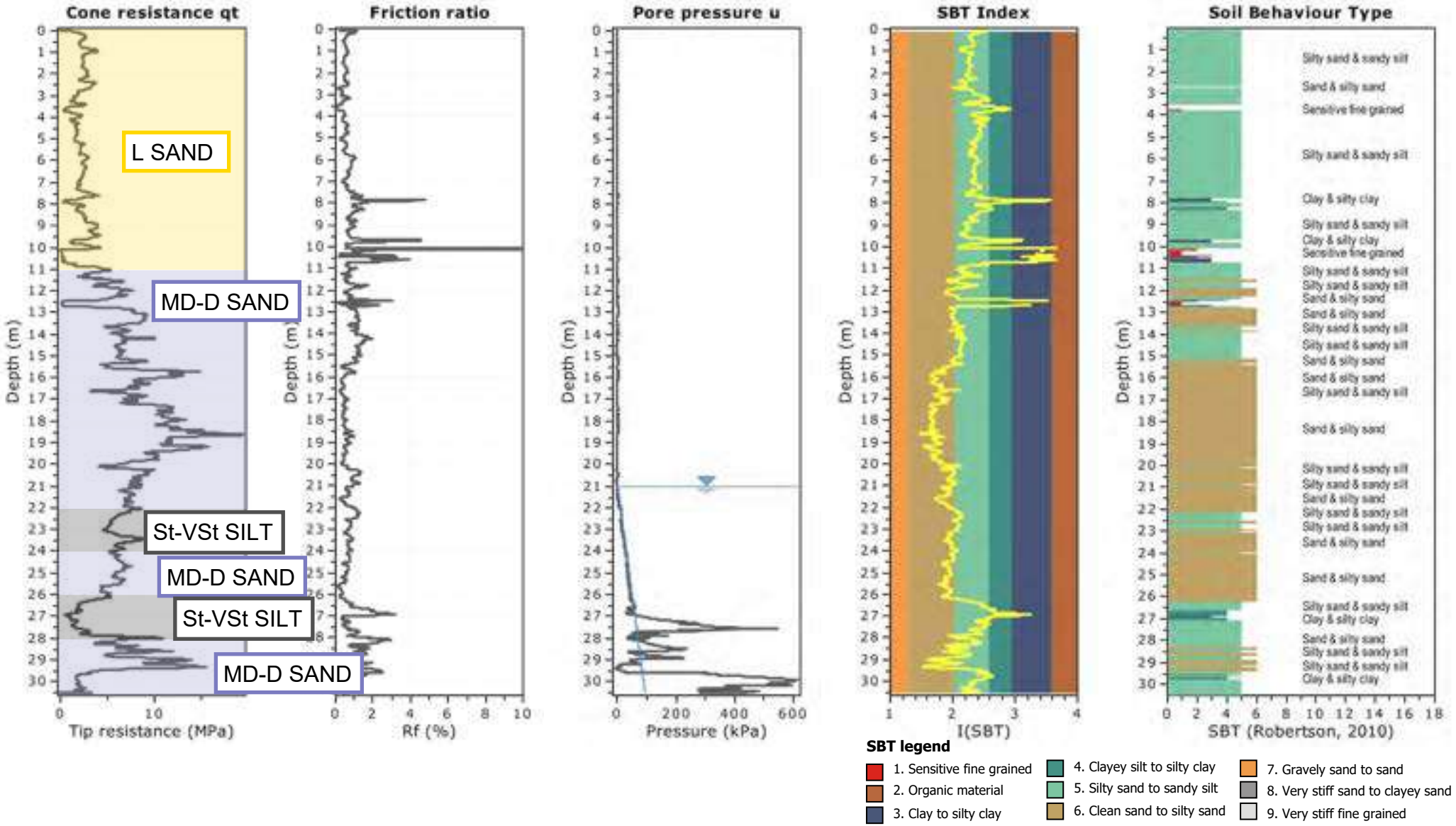
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT02
Total depth: 30.52 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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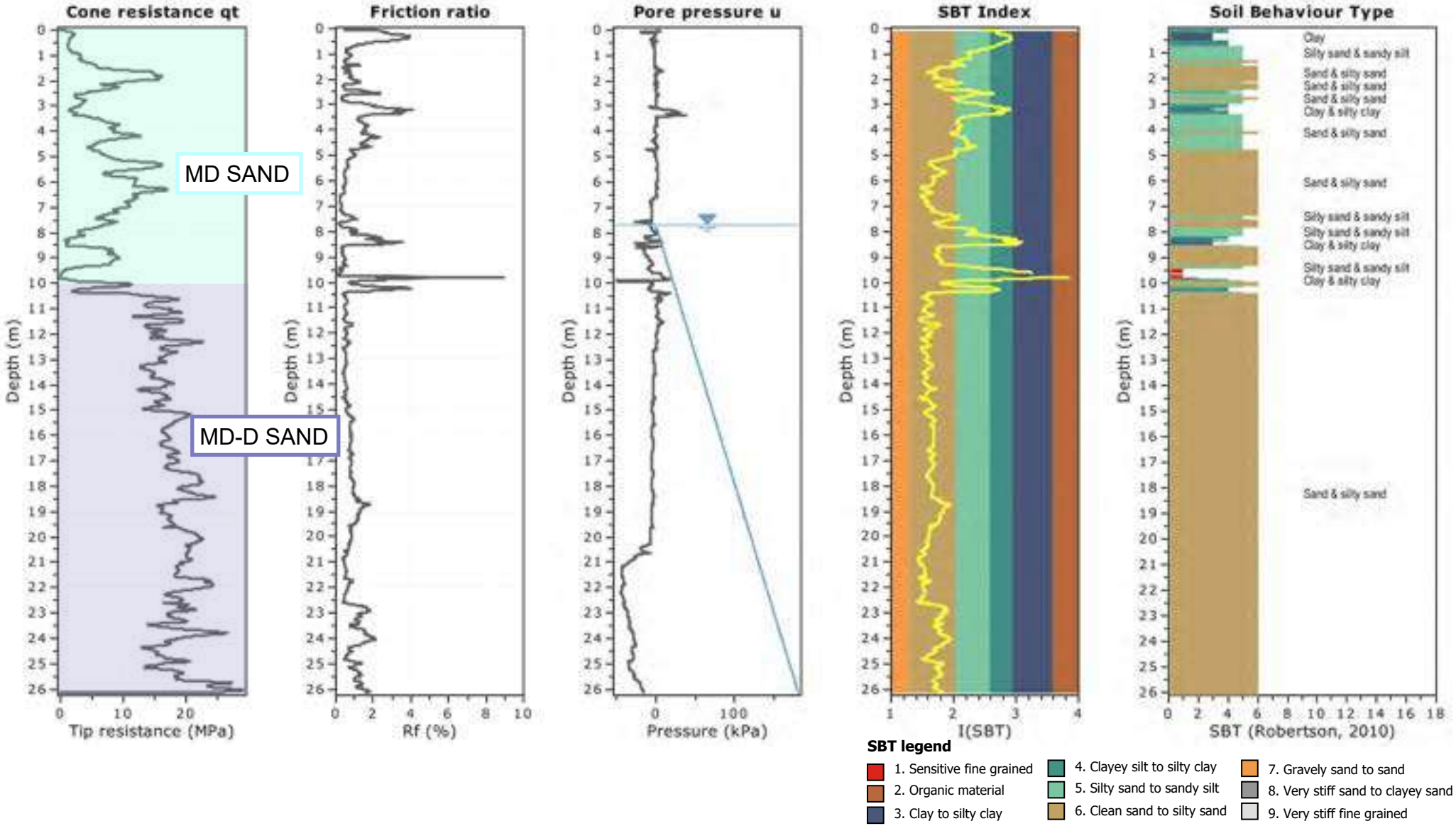
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

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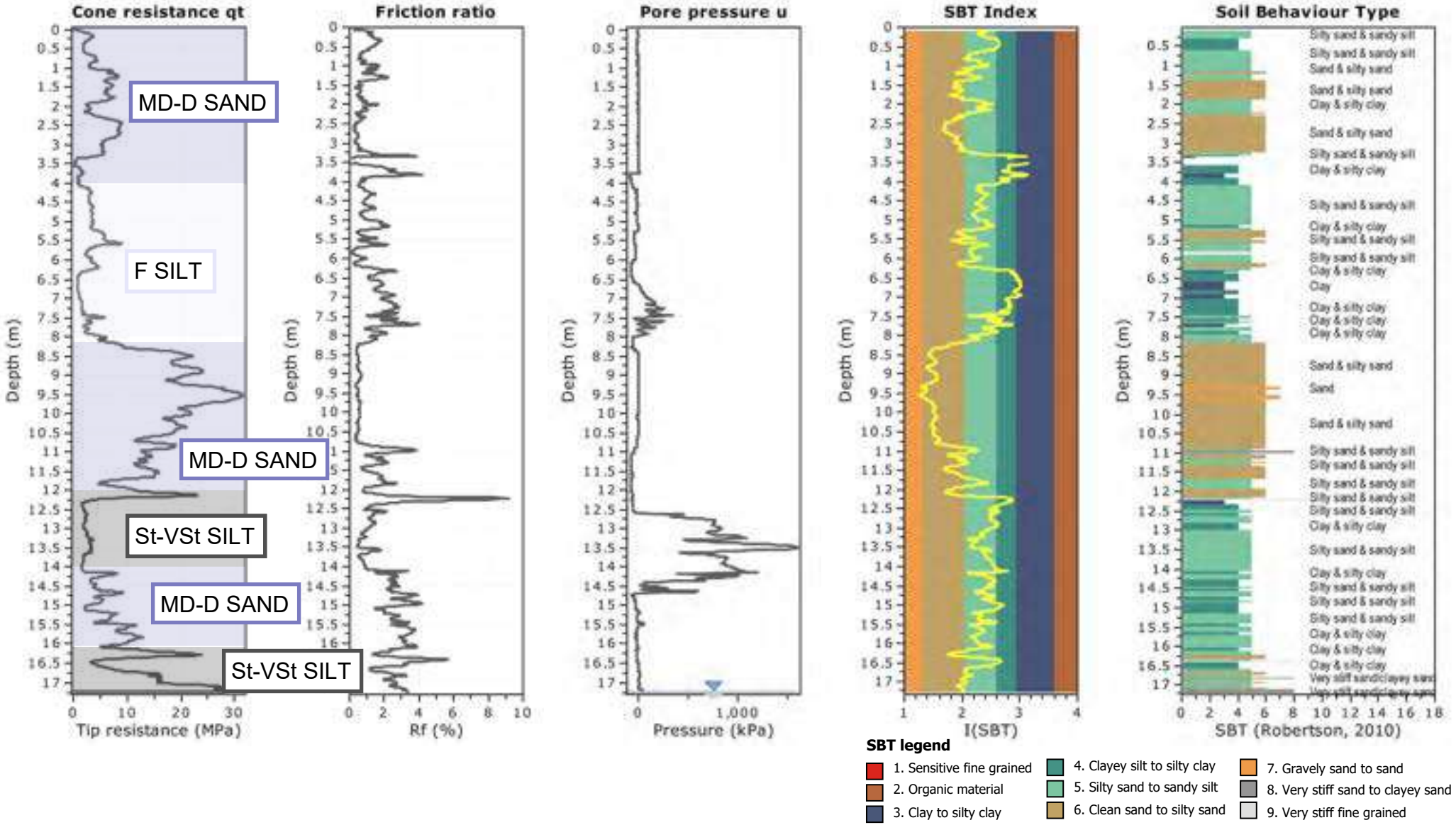
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT04
Total depth: 17.24 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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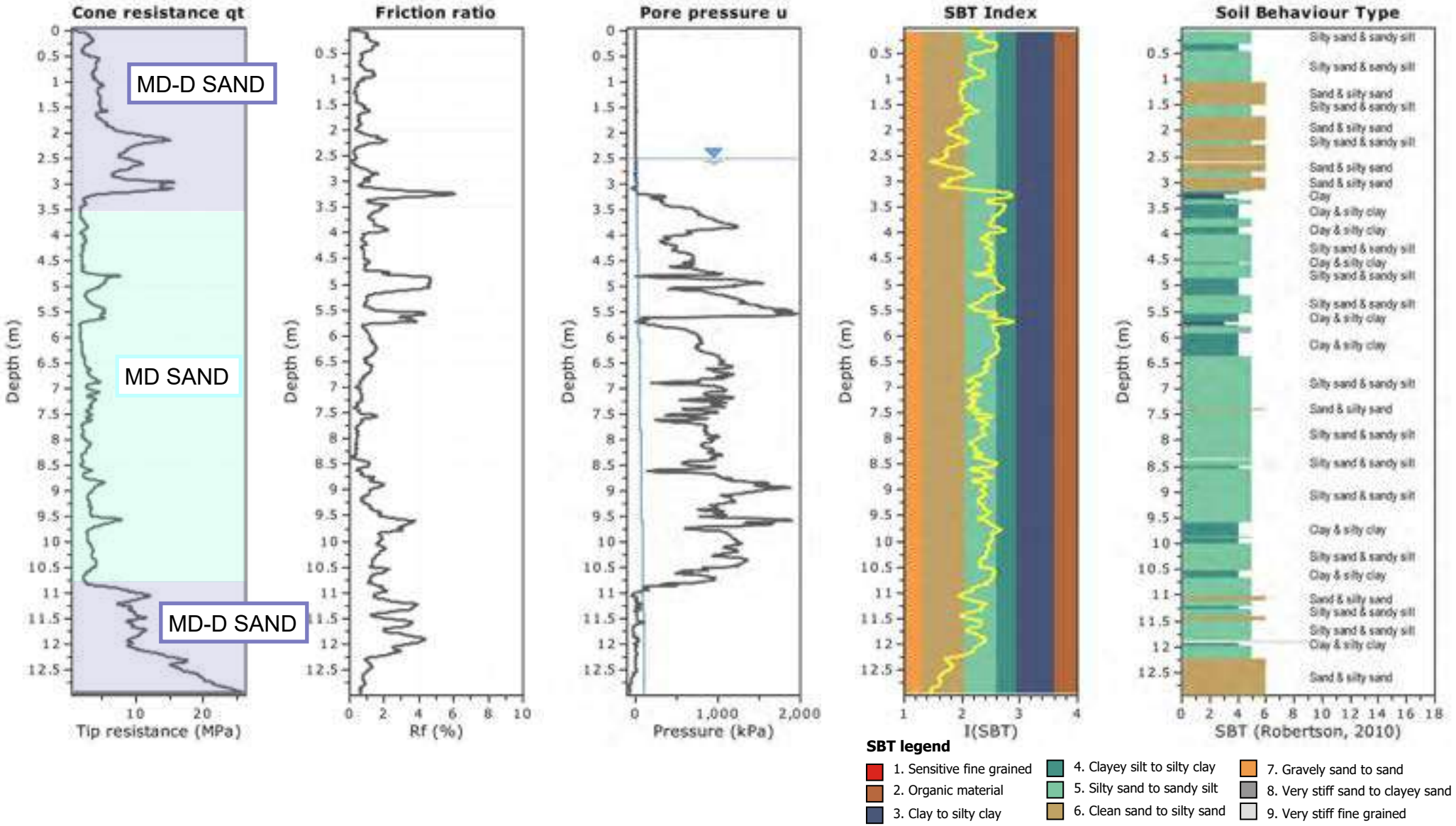
Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

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APPENDIX I
Liquefaction Analysis Results

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Version: 1, Version Date: 17/12/2025

FULL DEPTH ANALYSIS (AGED)

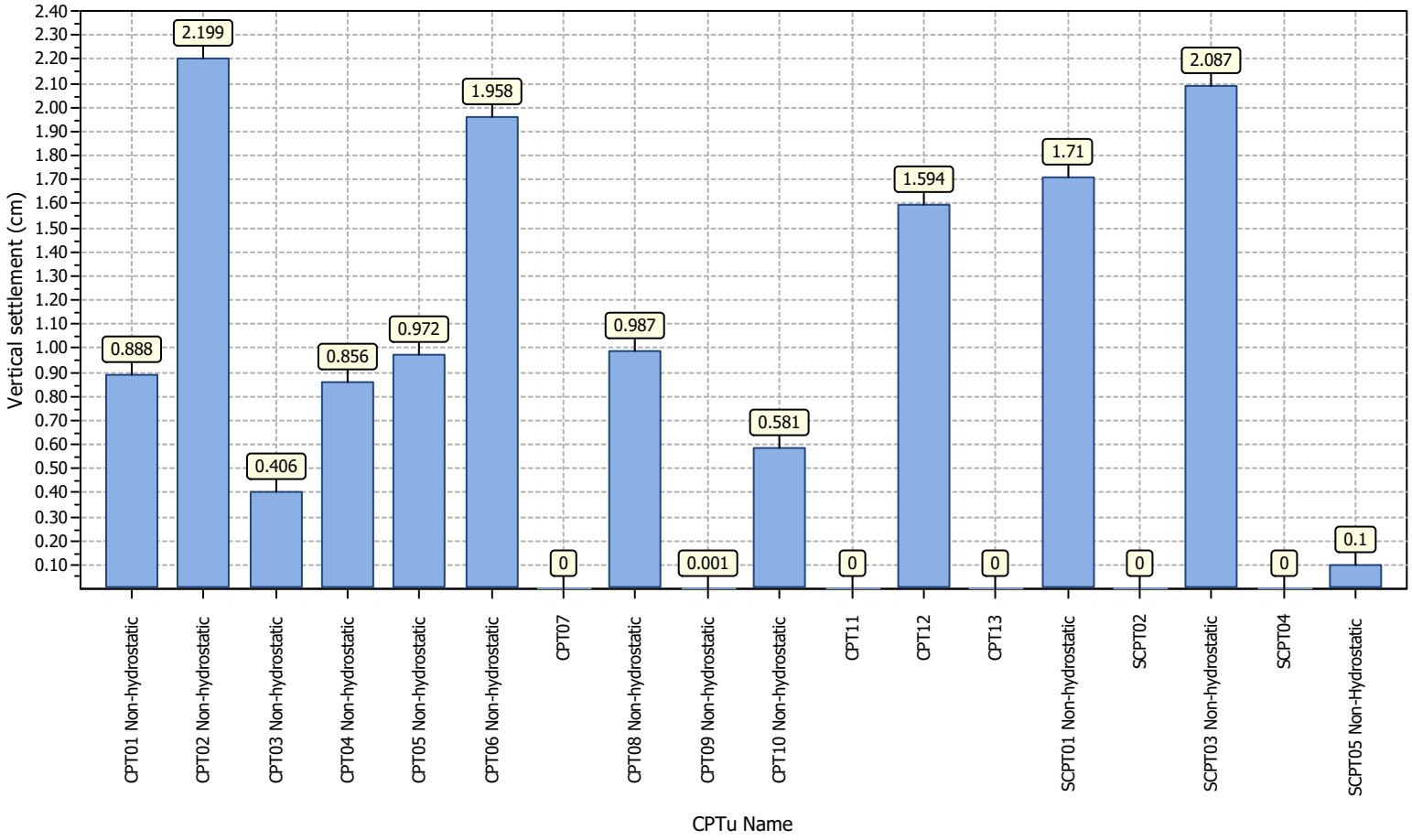
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report

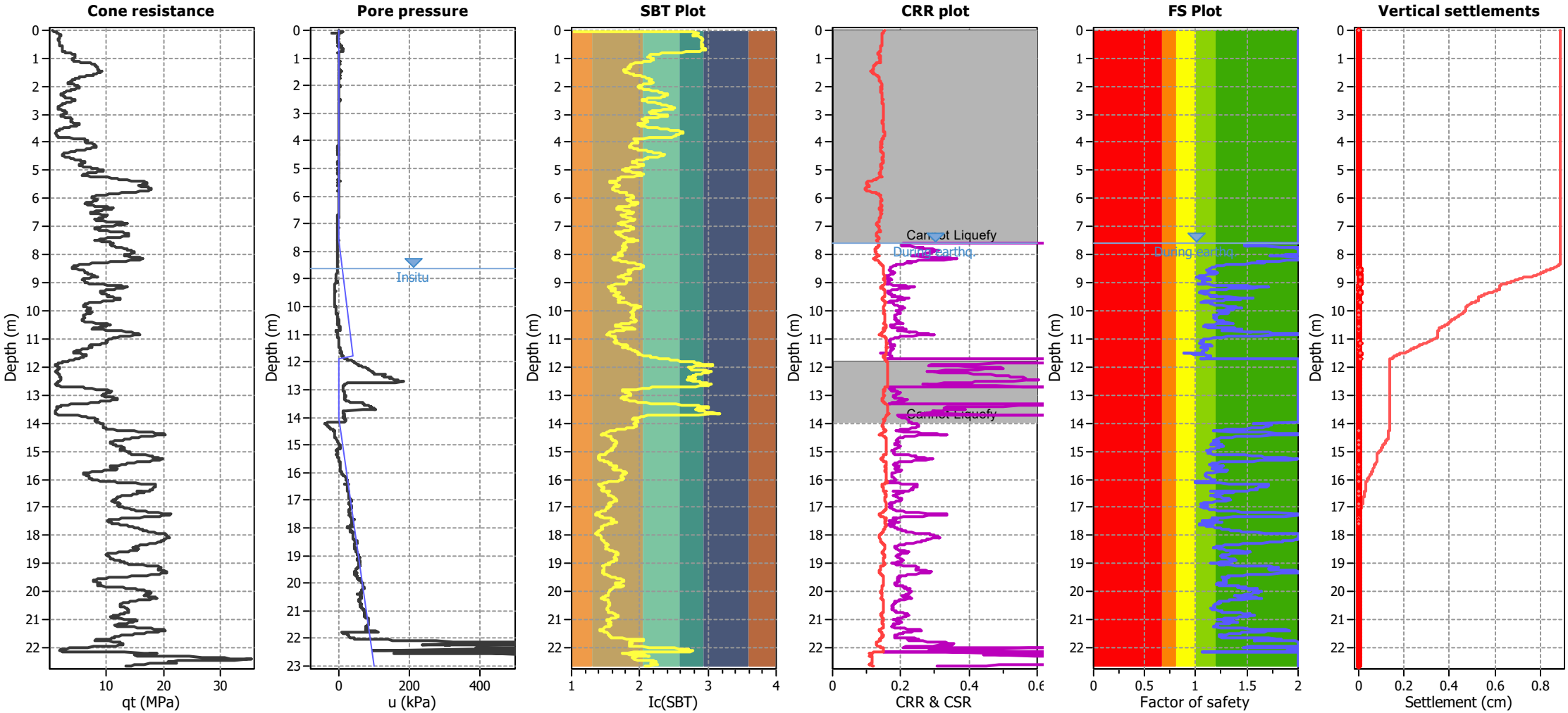


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m

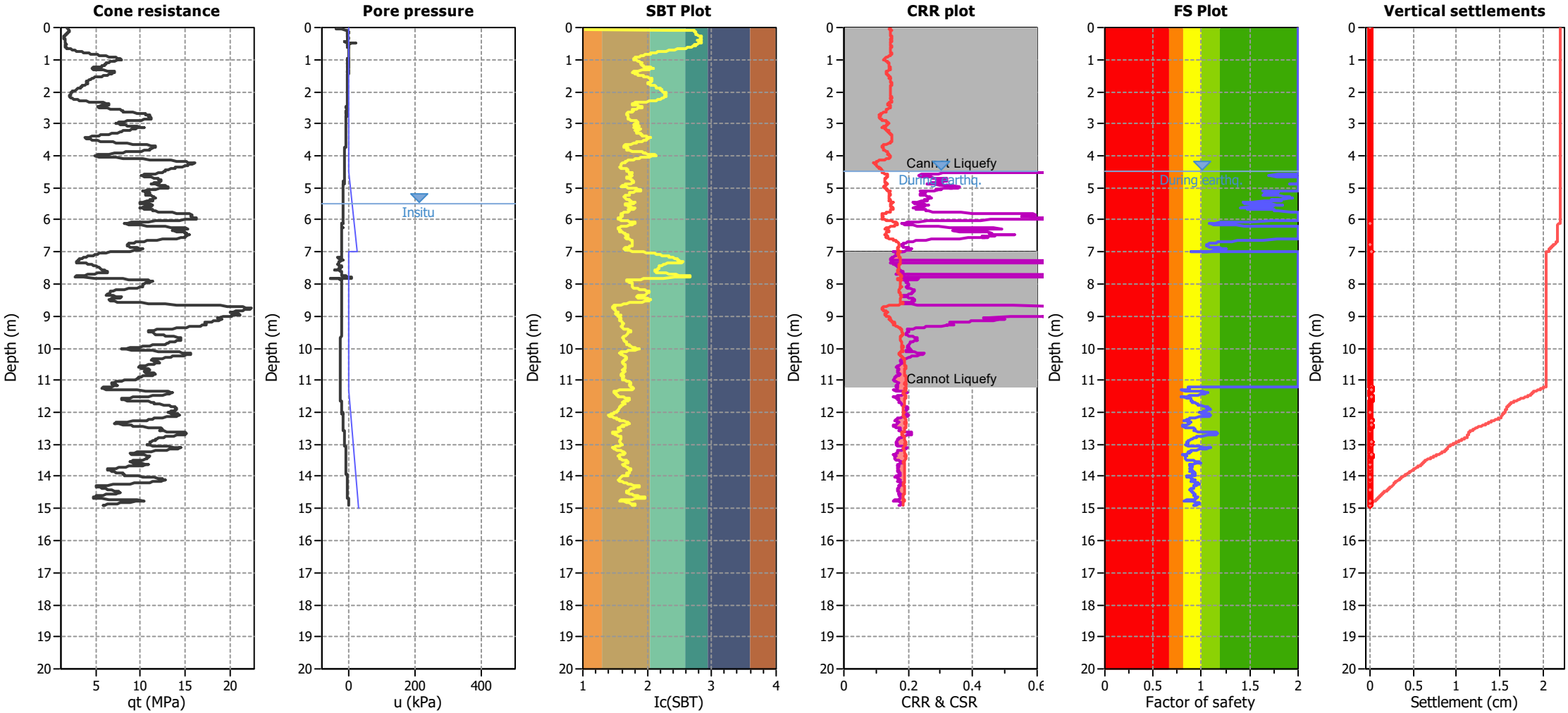


Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m

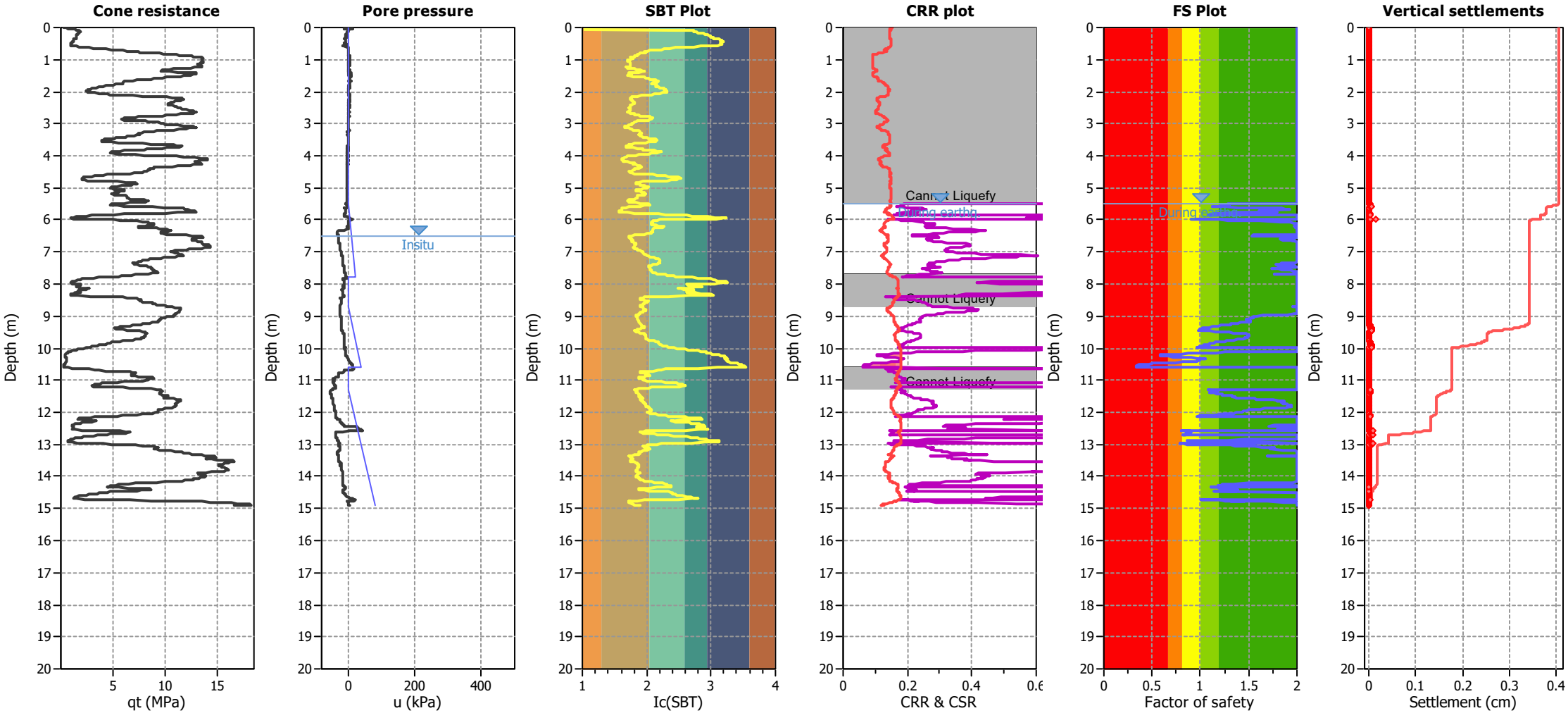


Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m

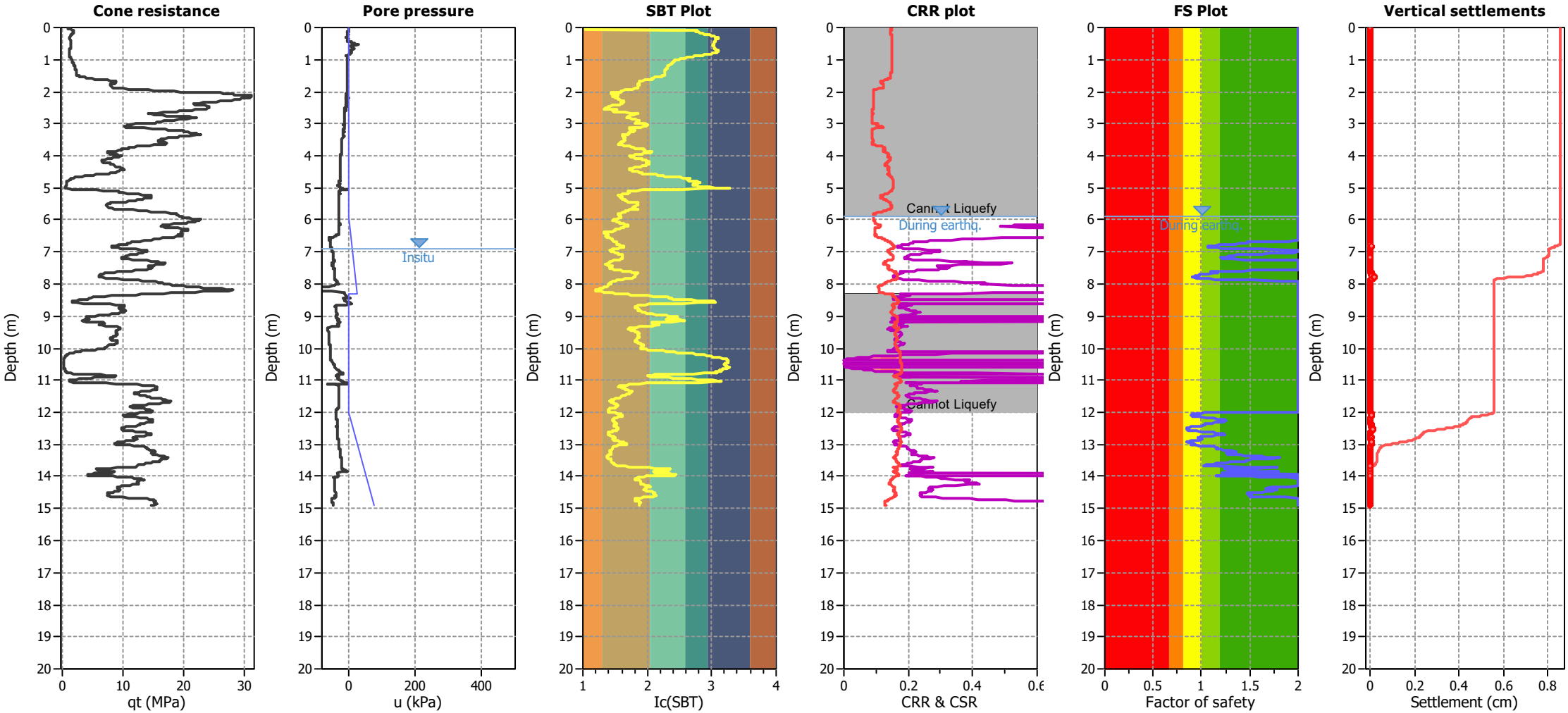


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m

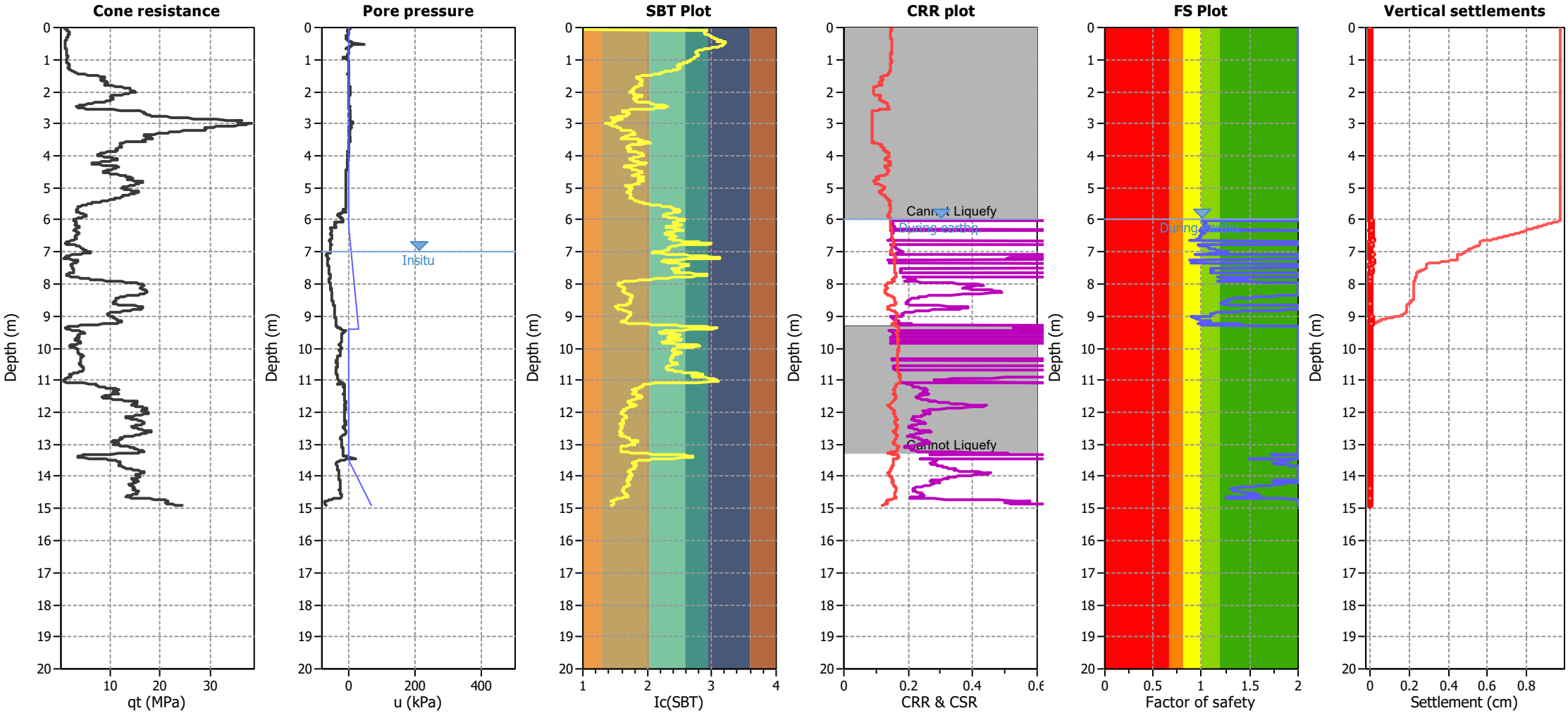


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m

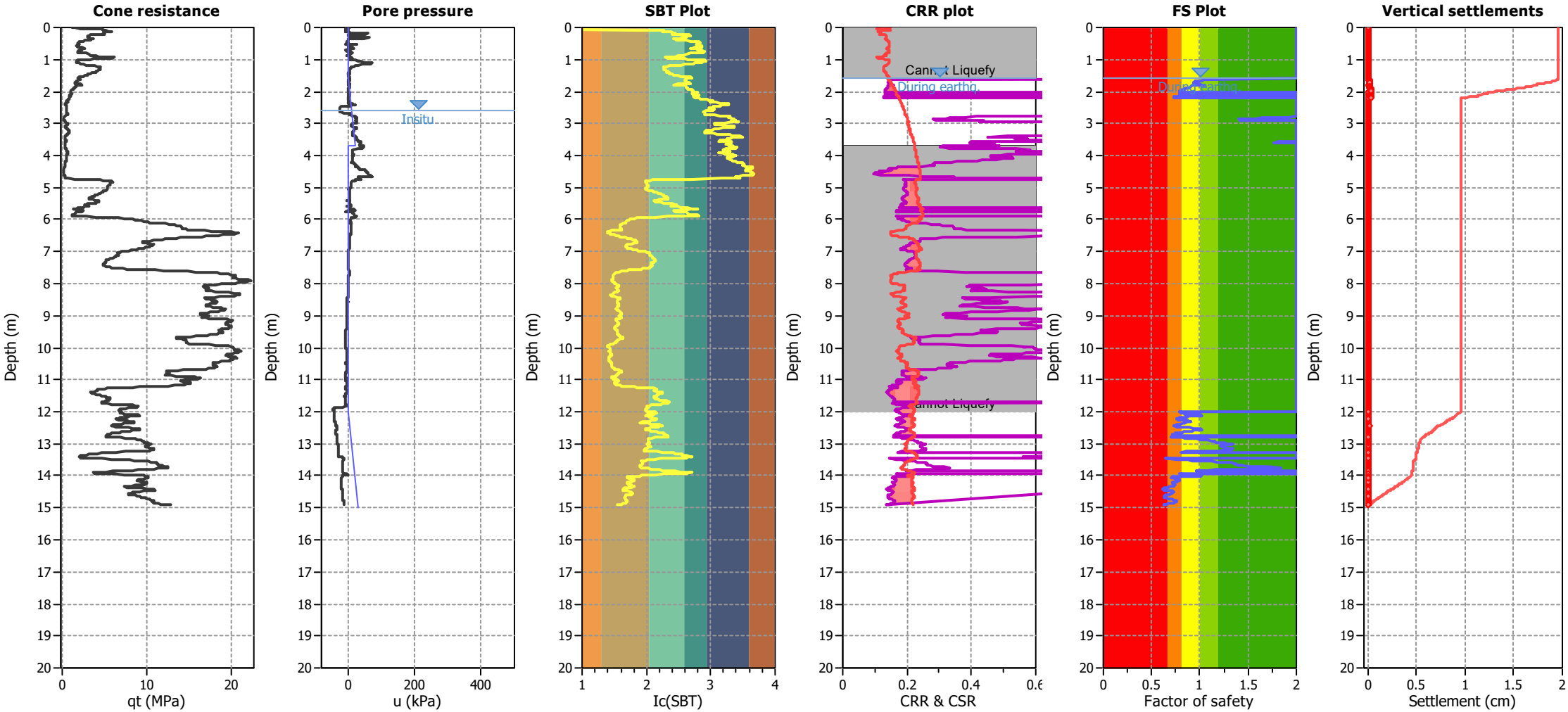


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m

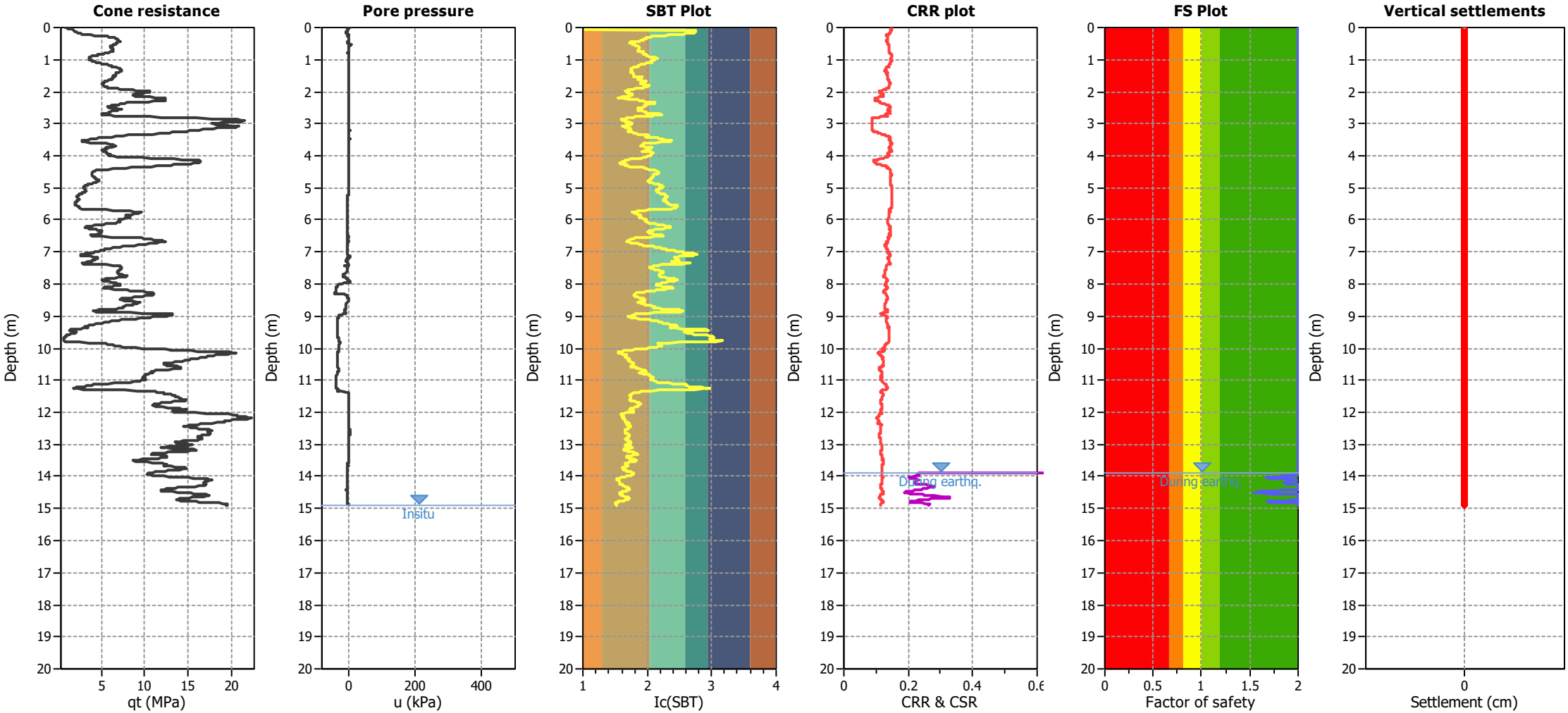


Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m

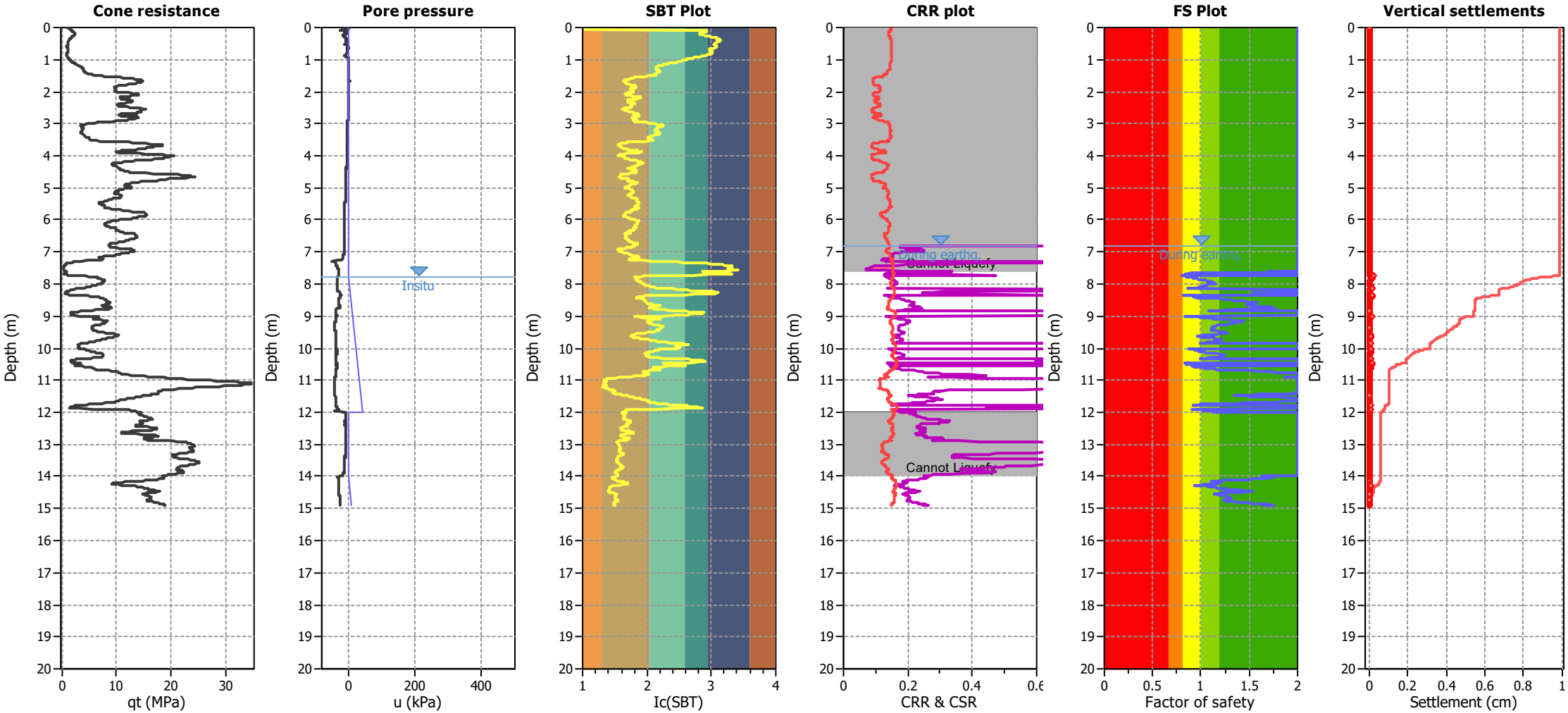


Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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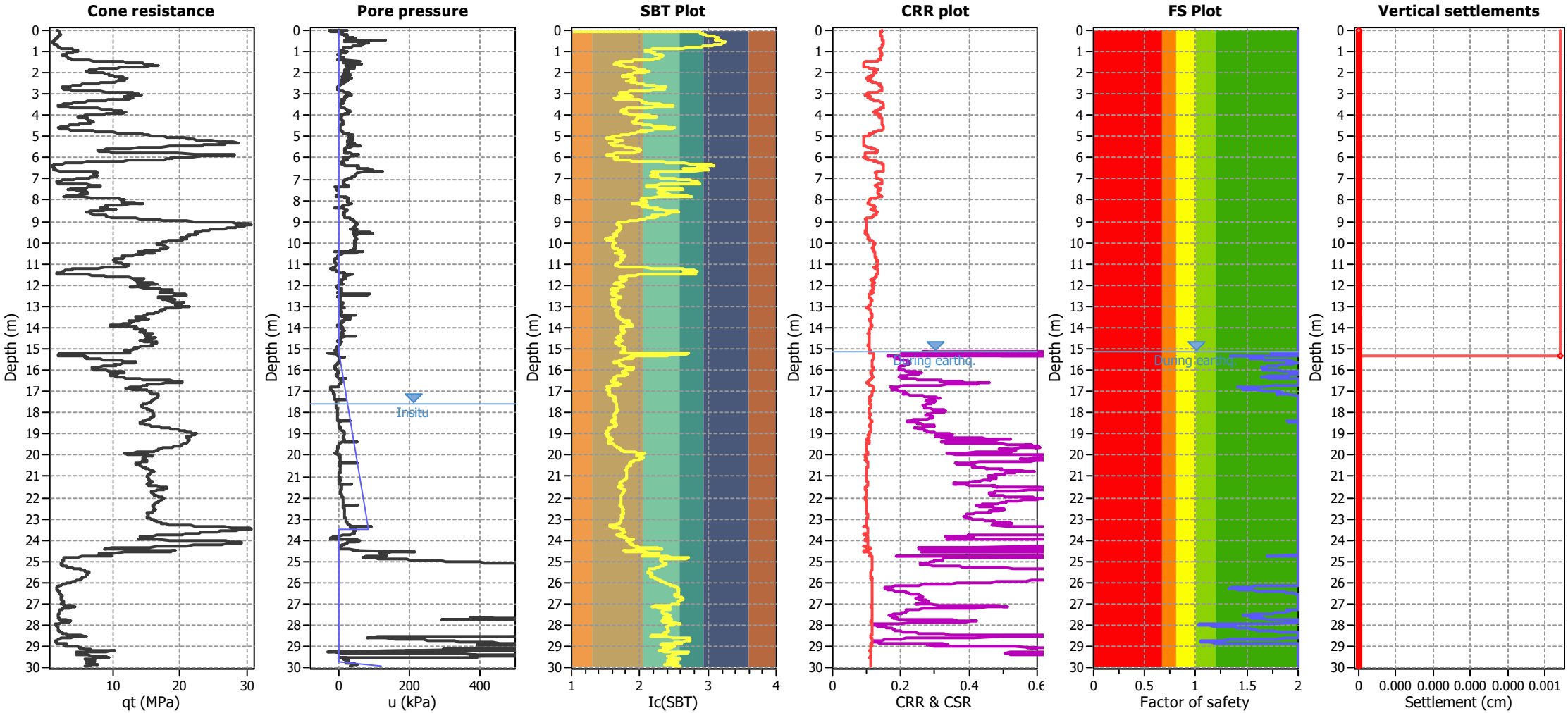
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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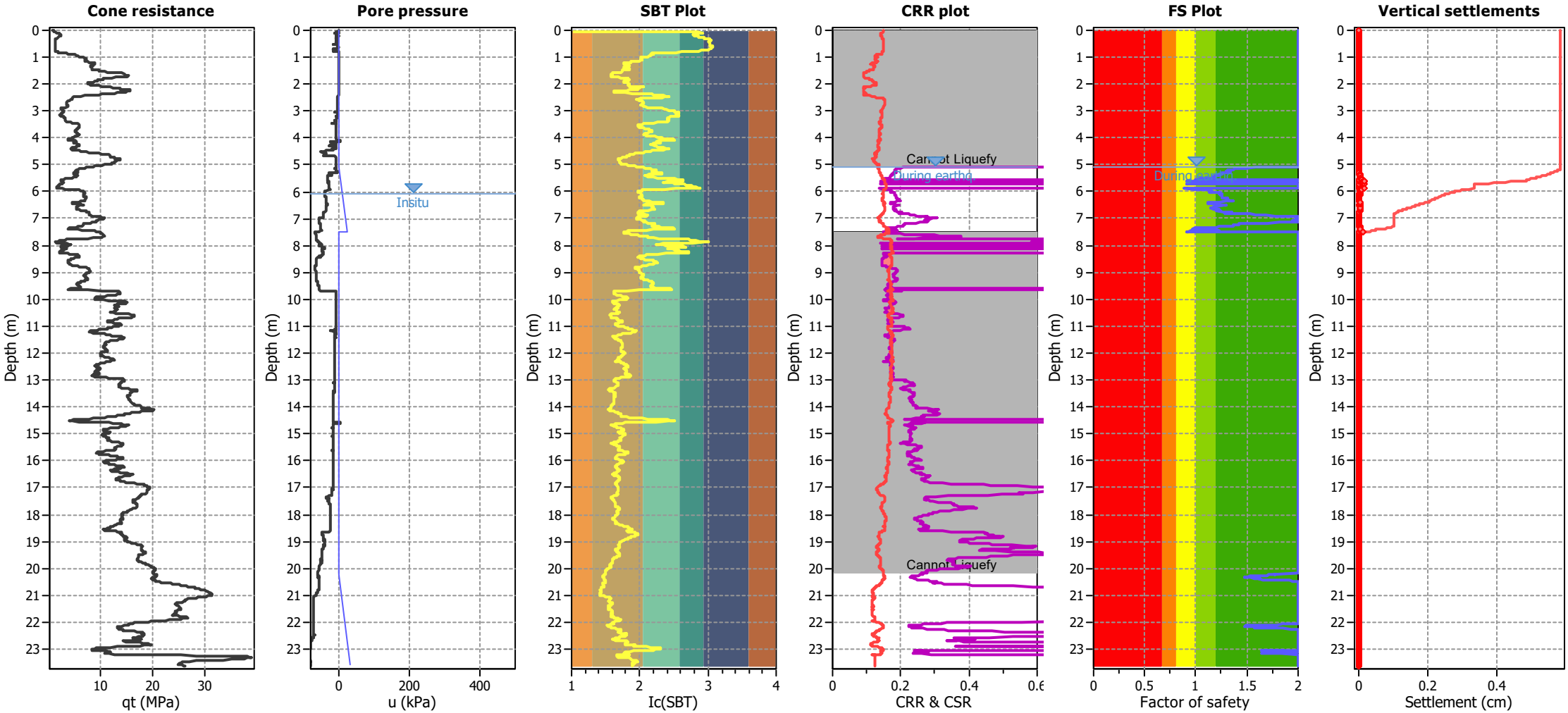
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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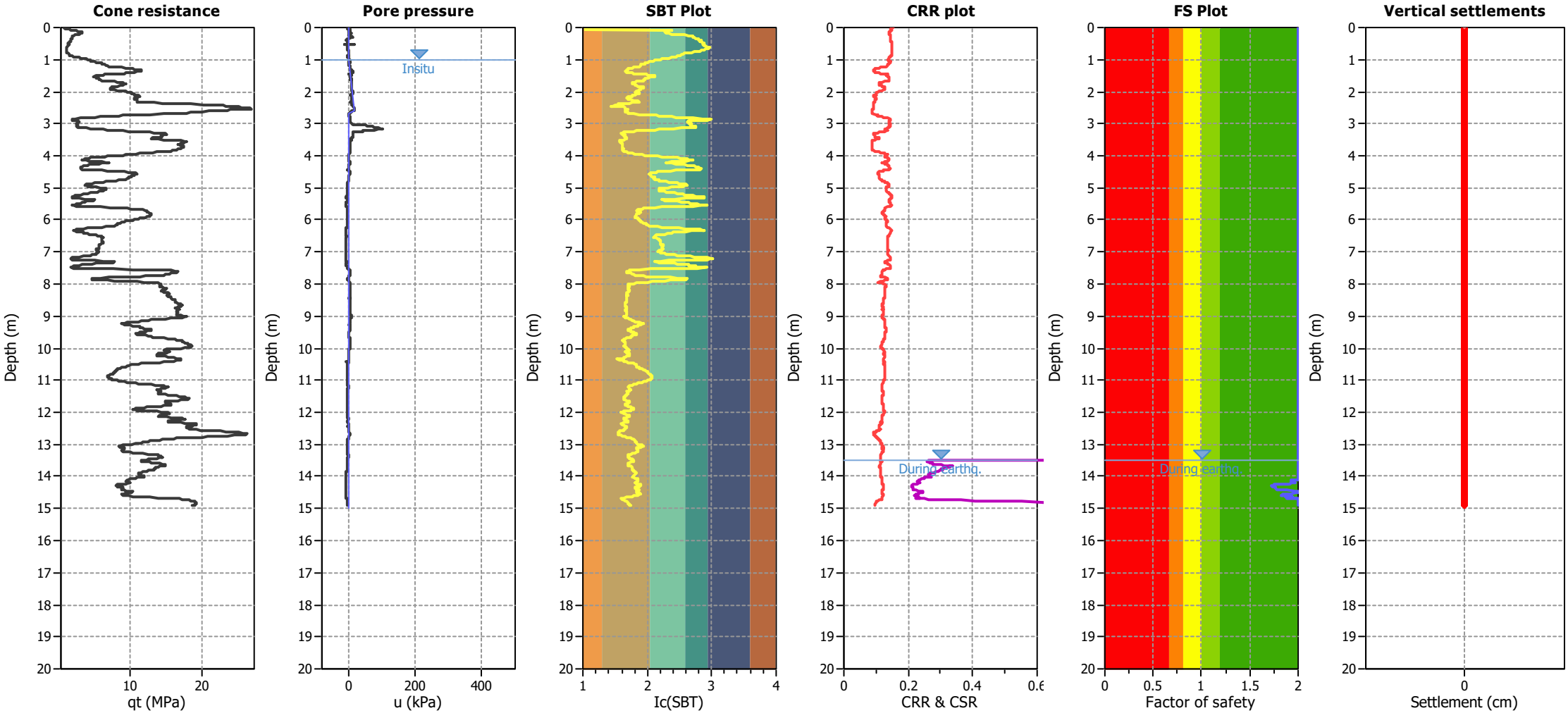
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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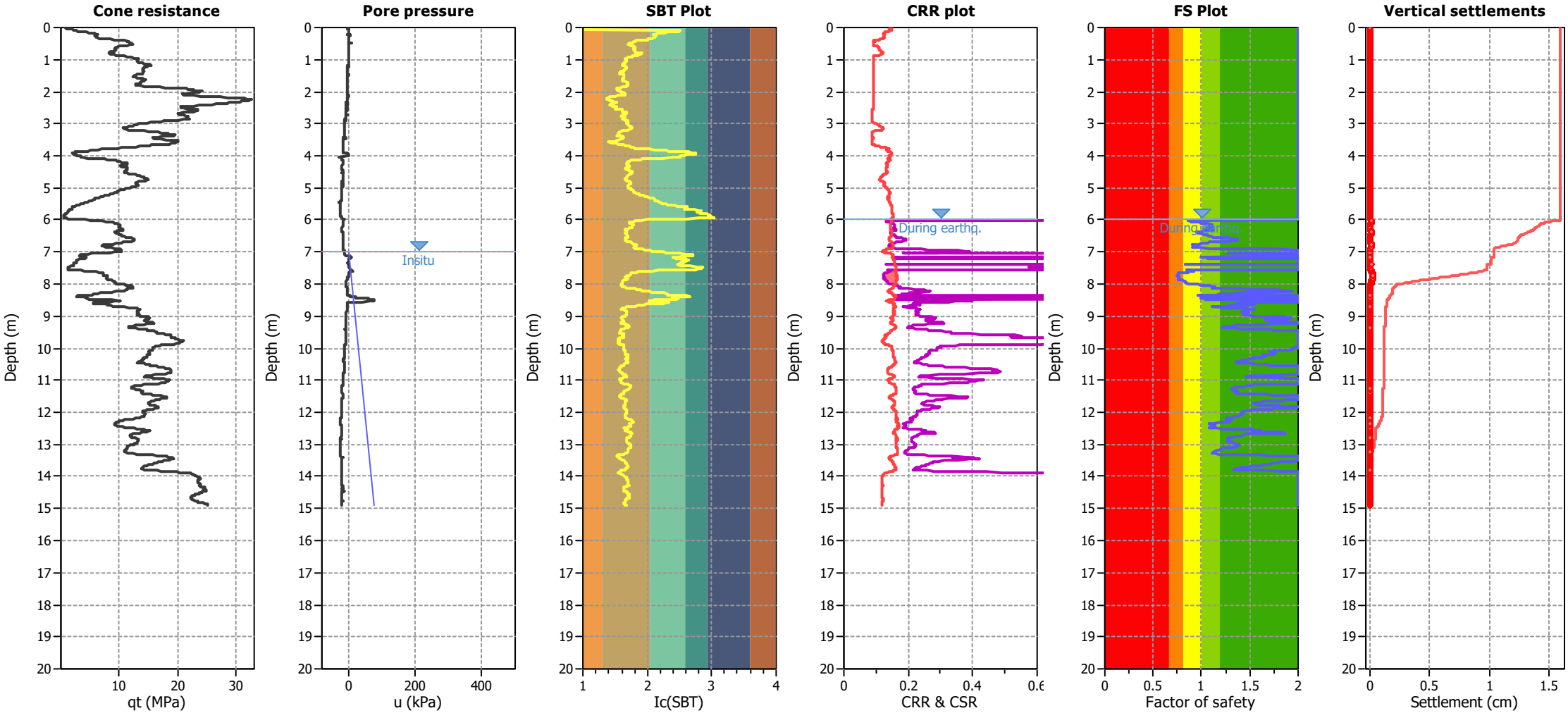
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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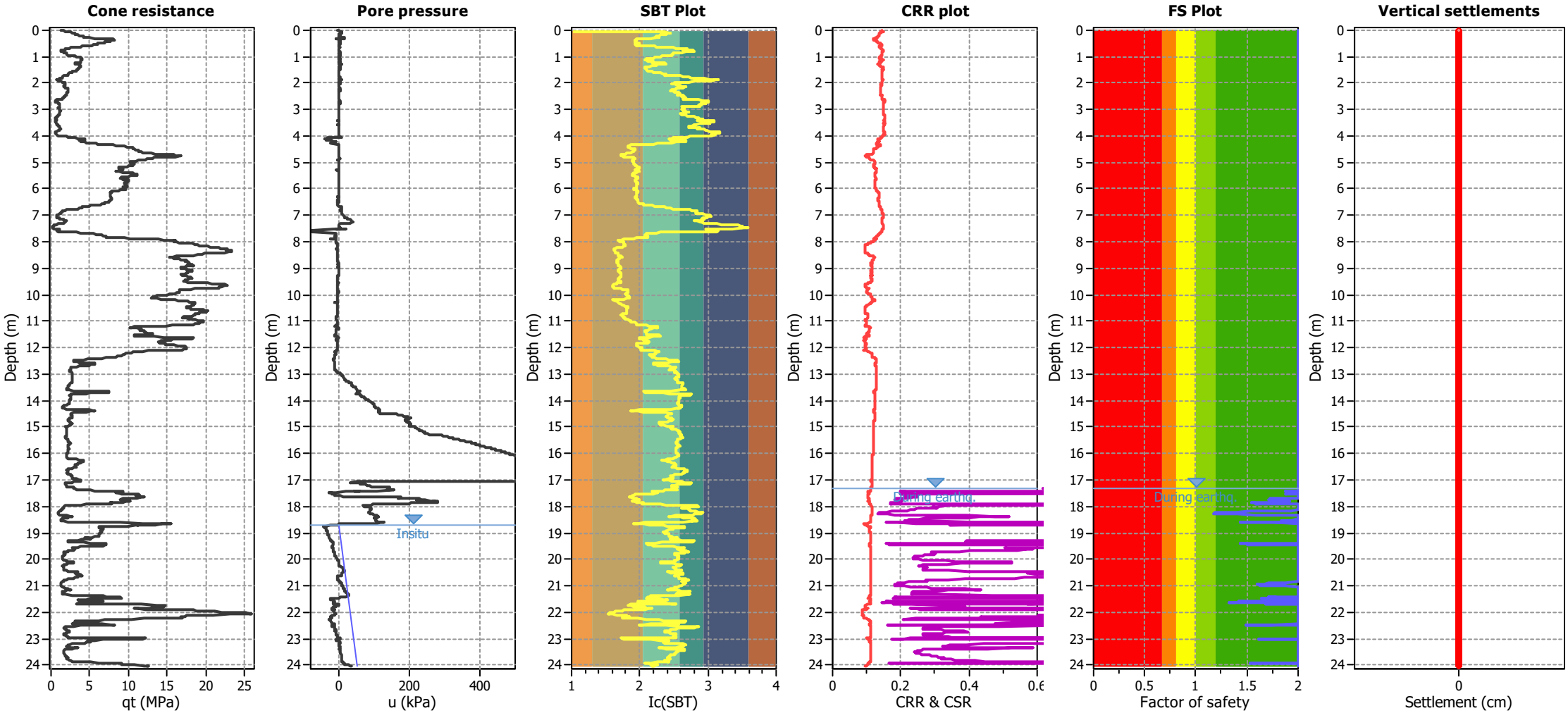
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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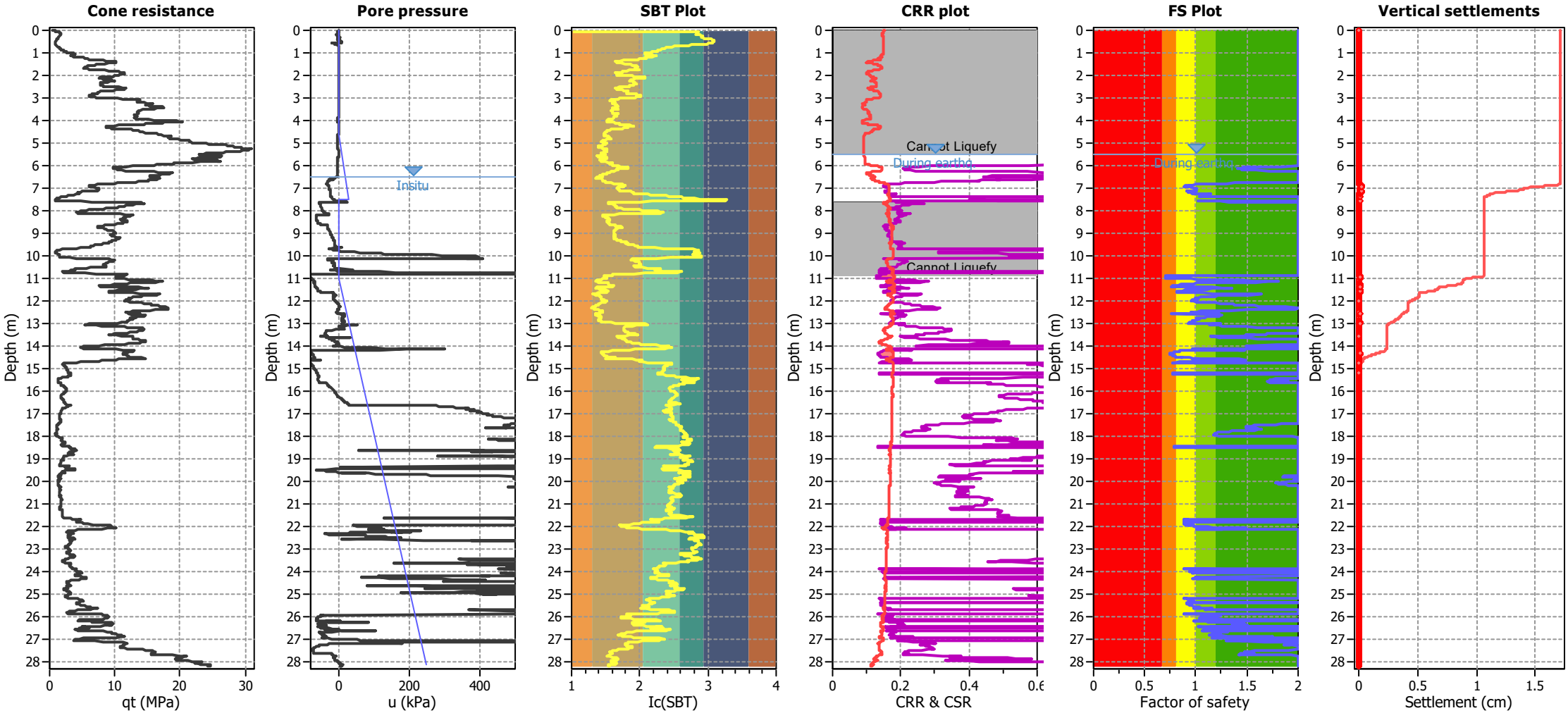
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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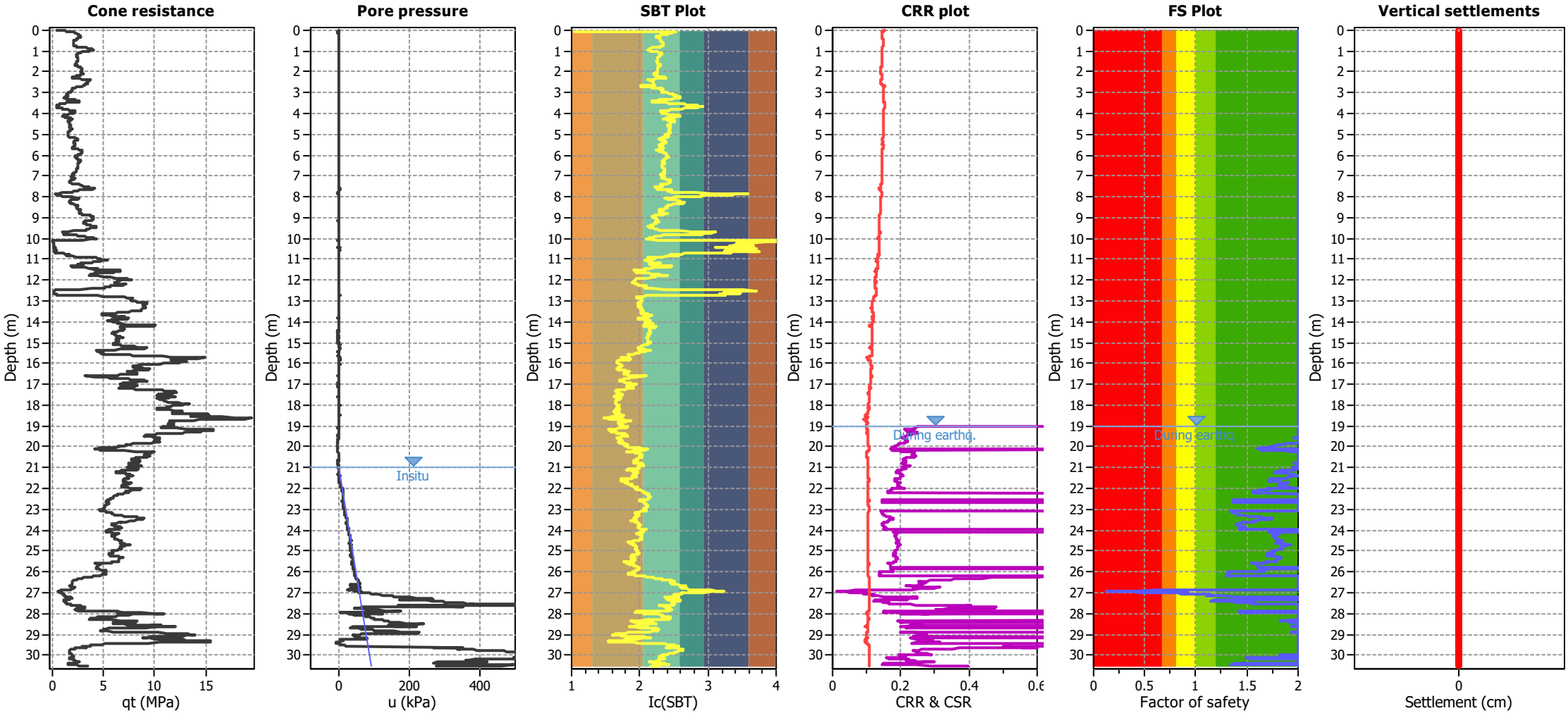
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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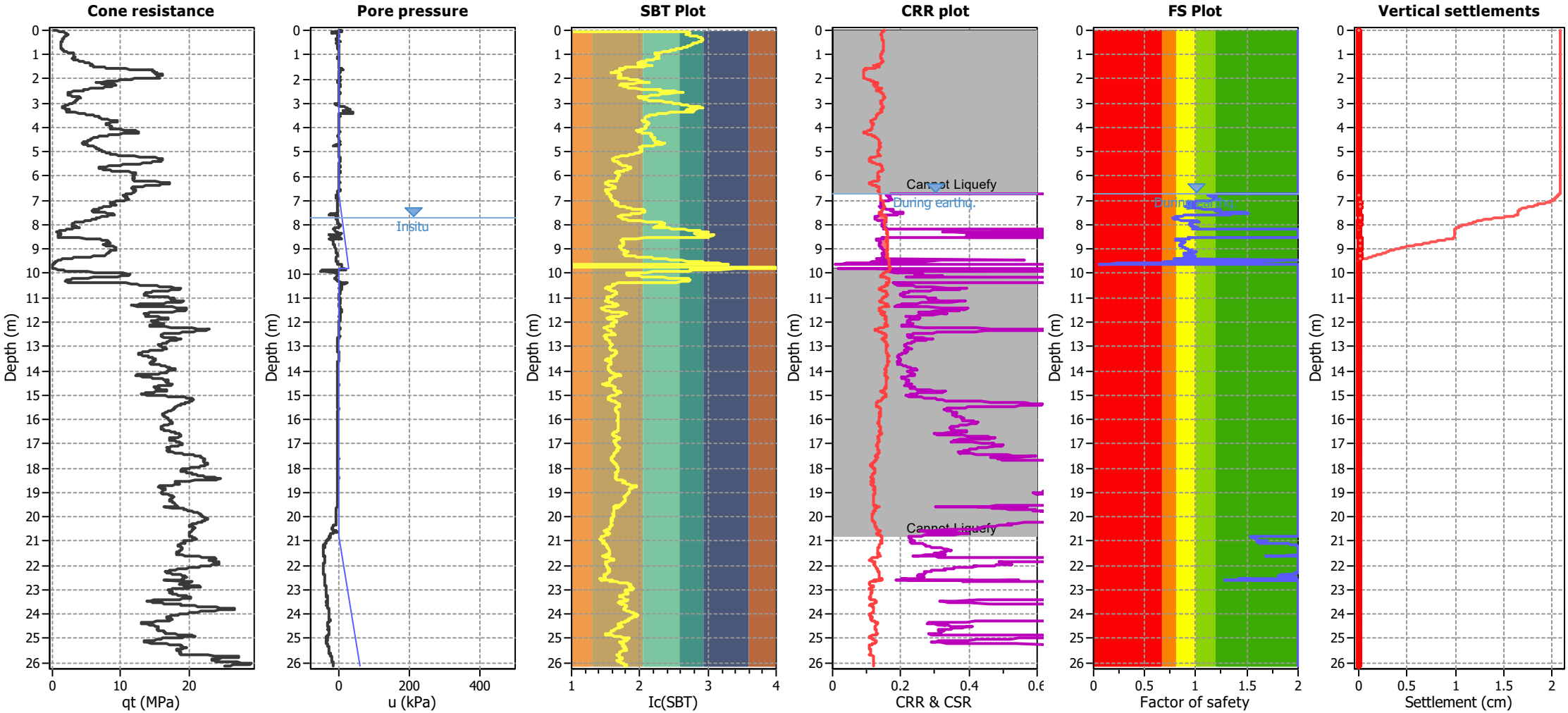
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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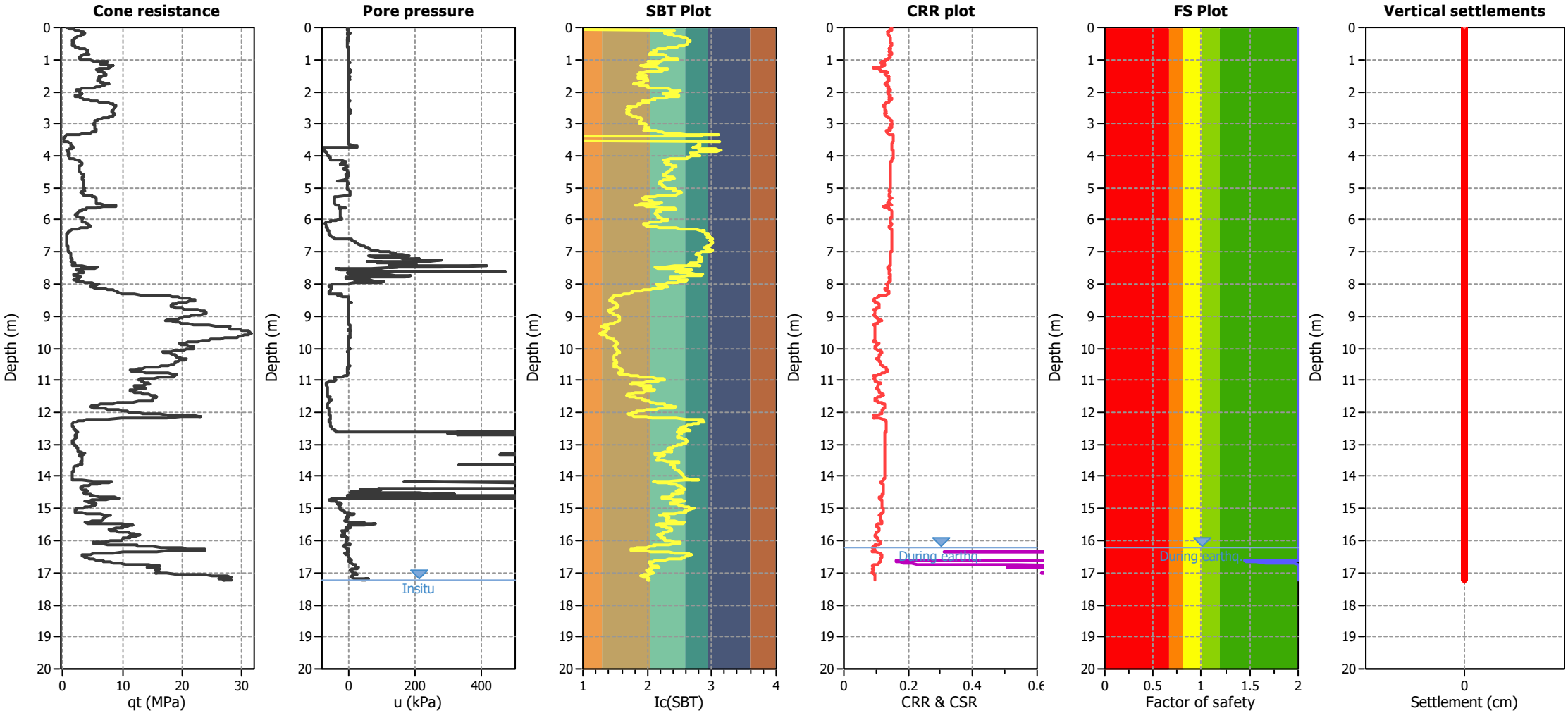
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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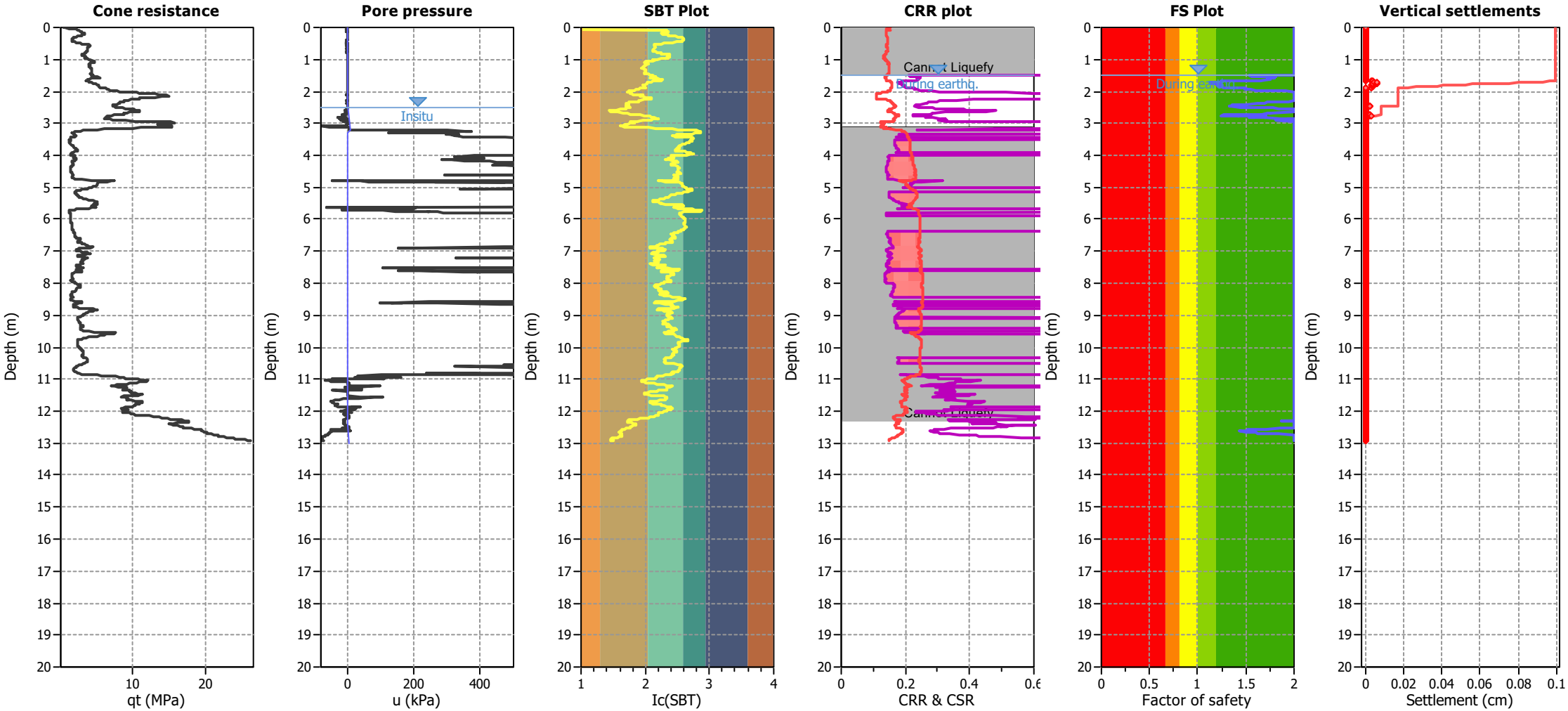
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

10M INDEX ANALYSIS RESULTS (AGED)

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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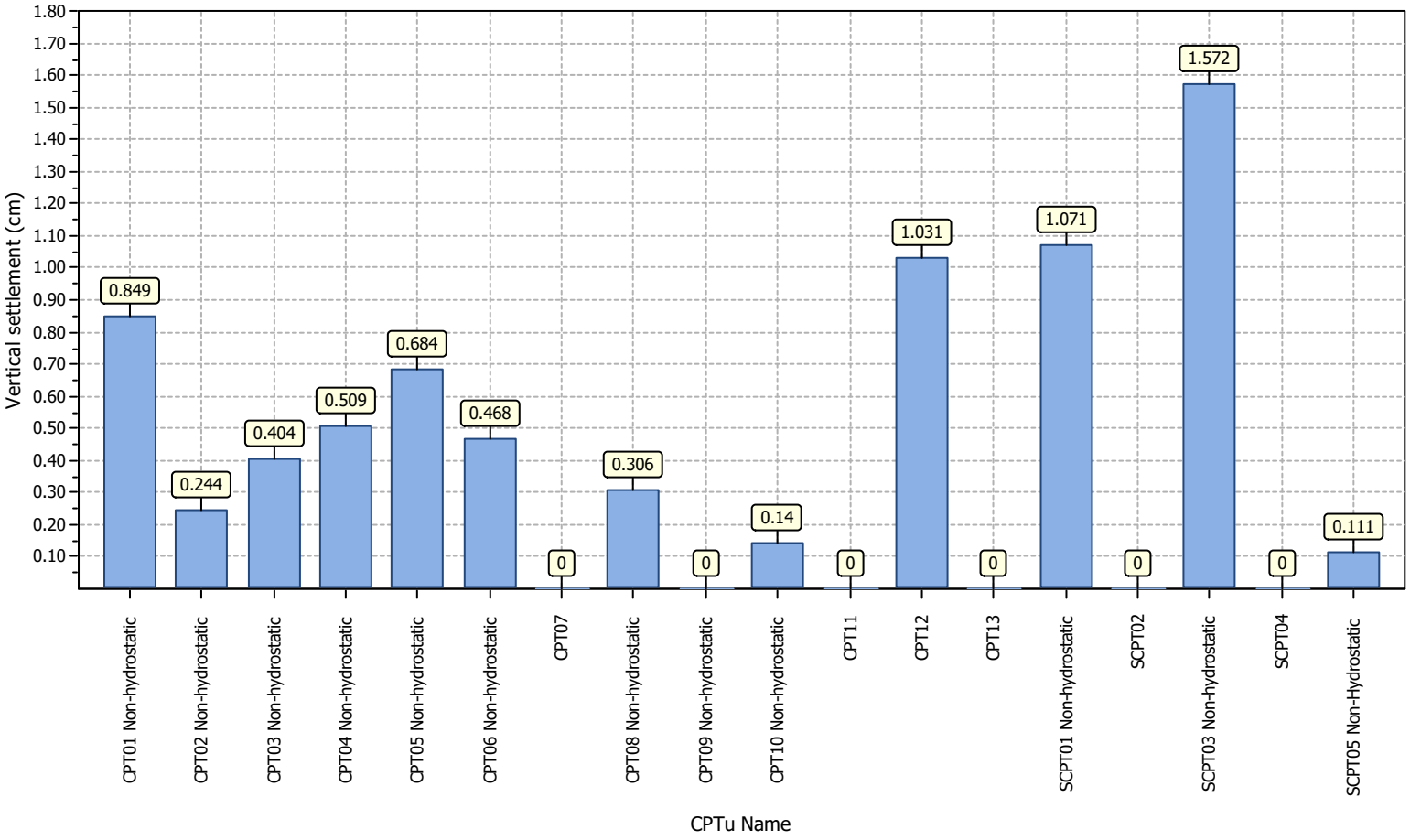
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
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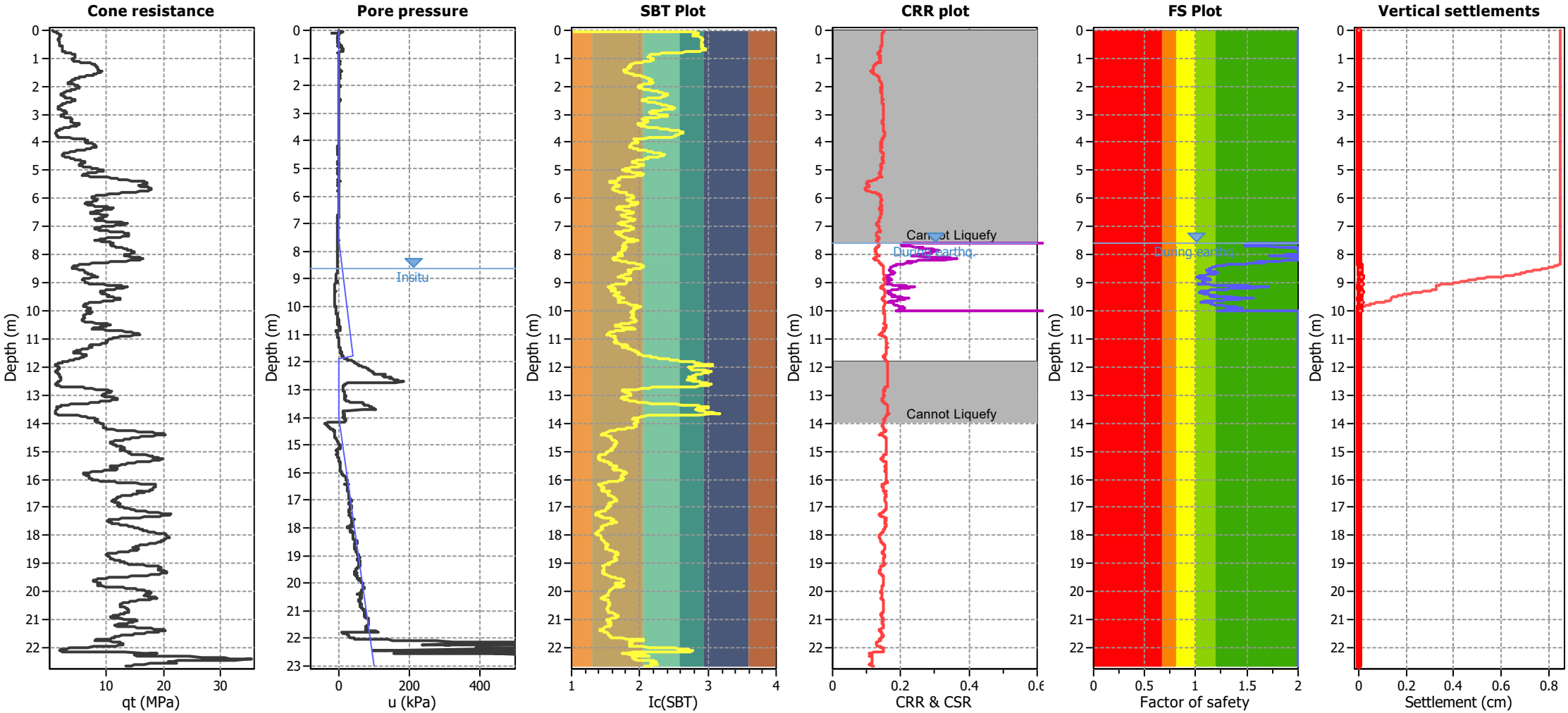
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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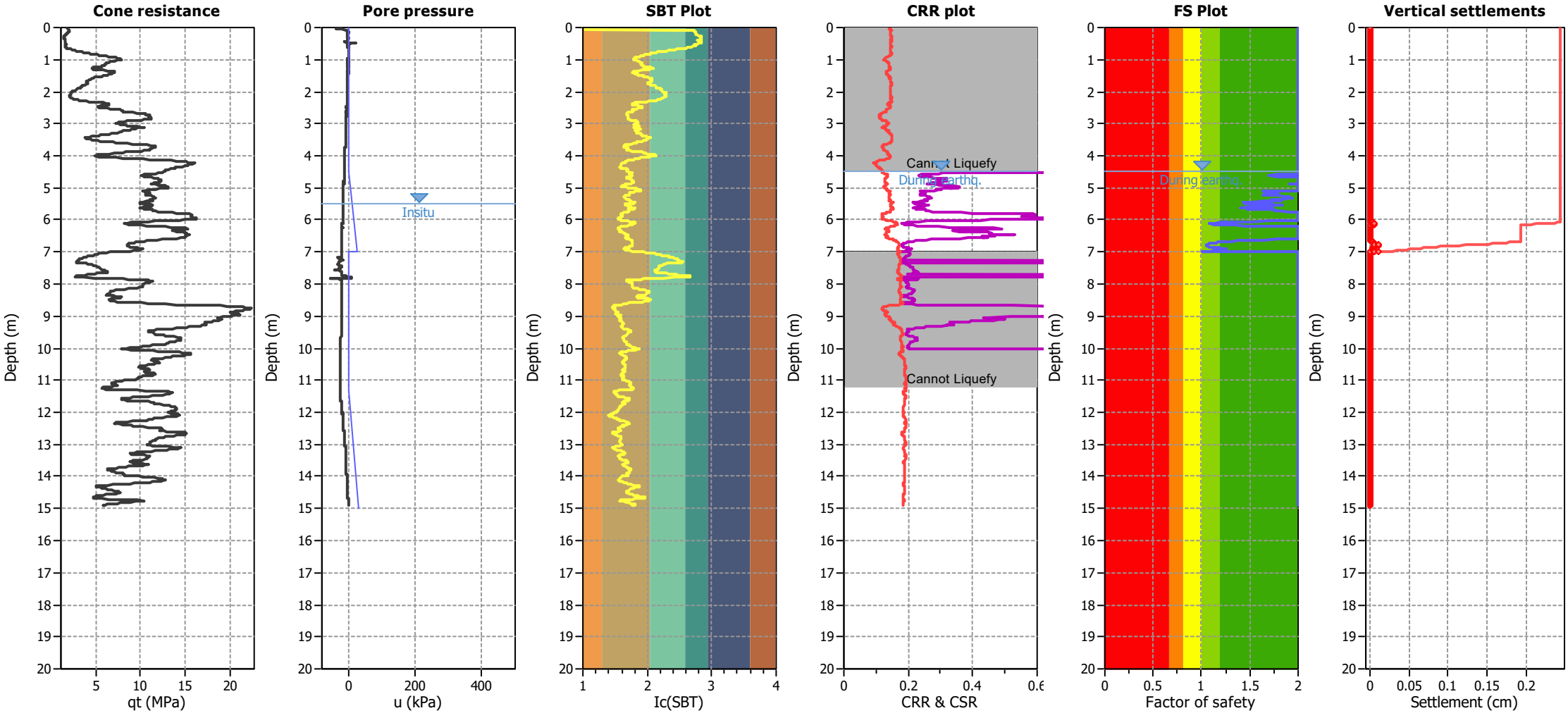
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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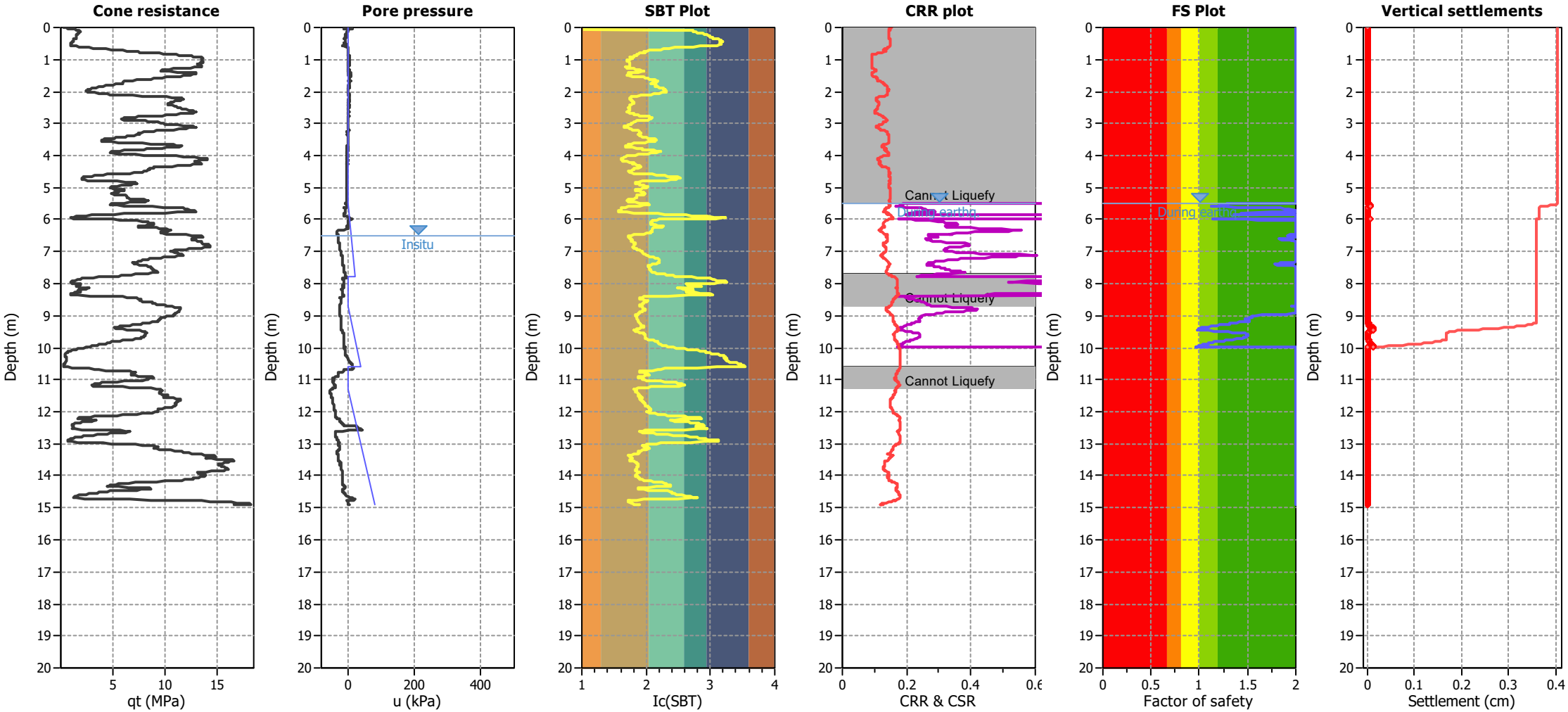
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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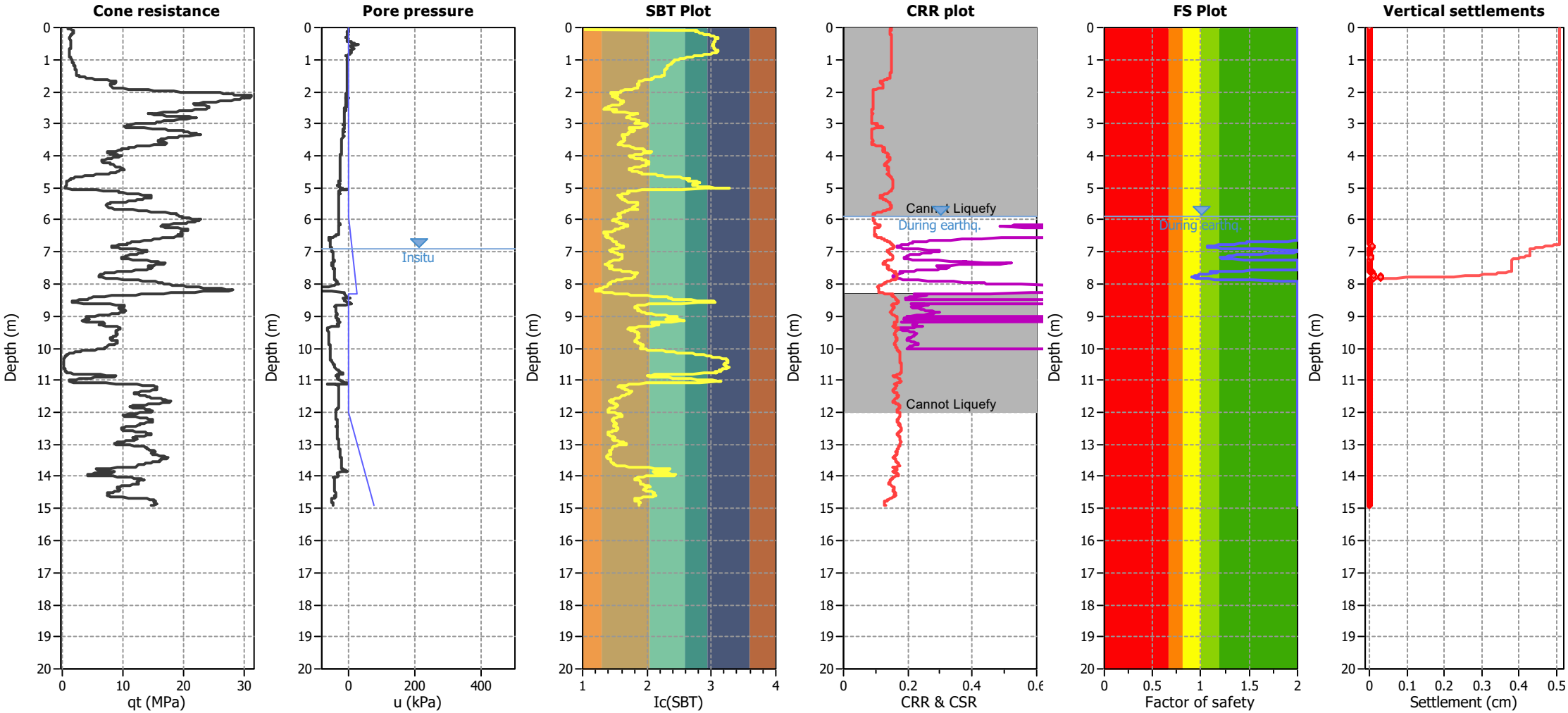
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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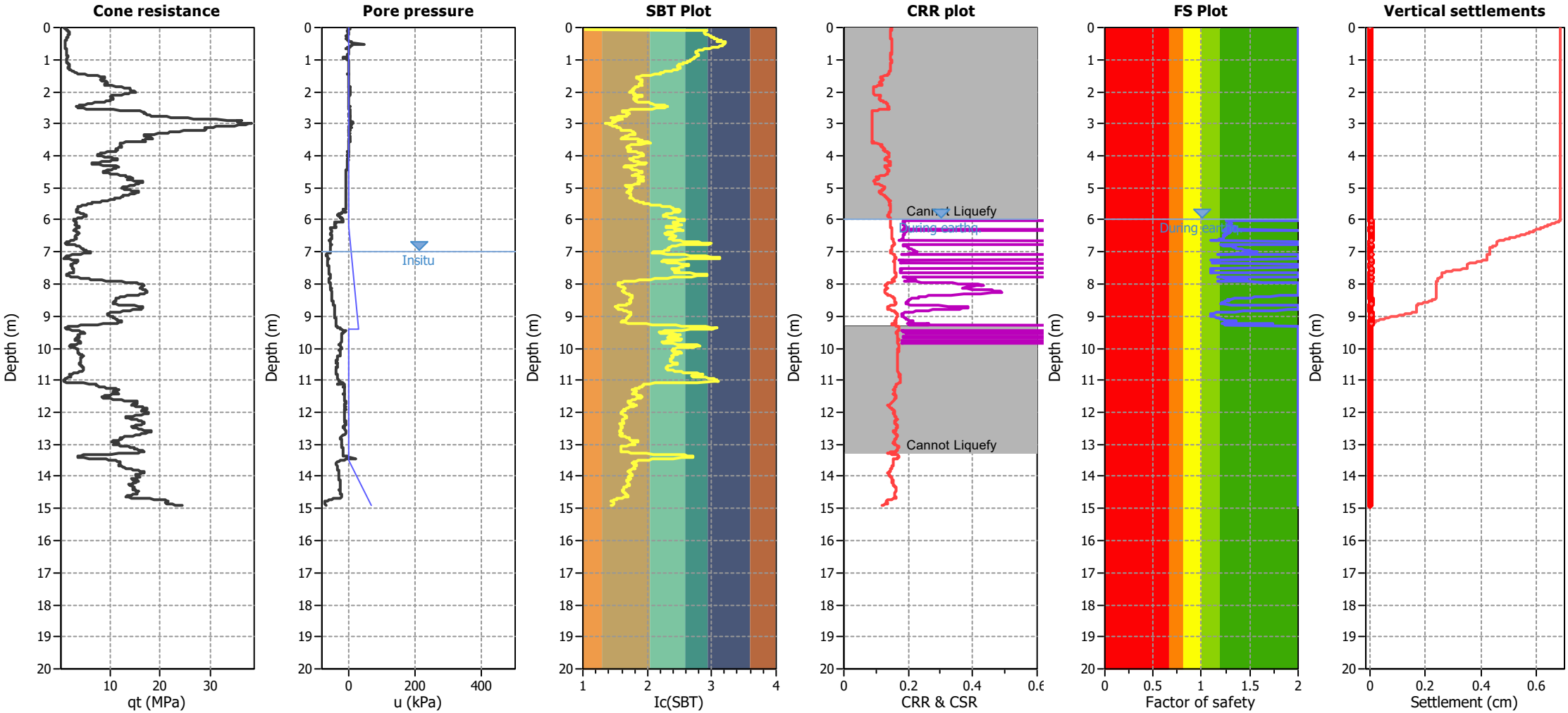
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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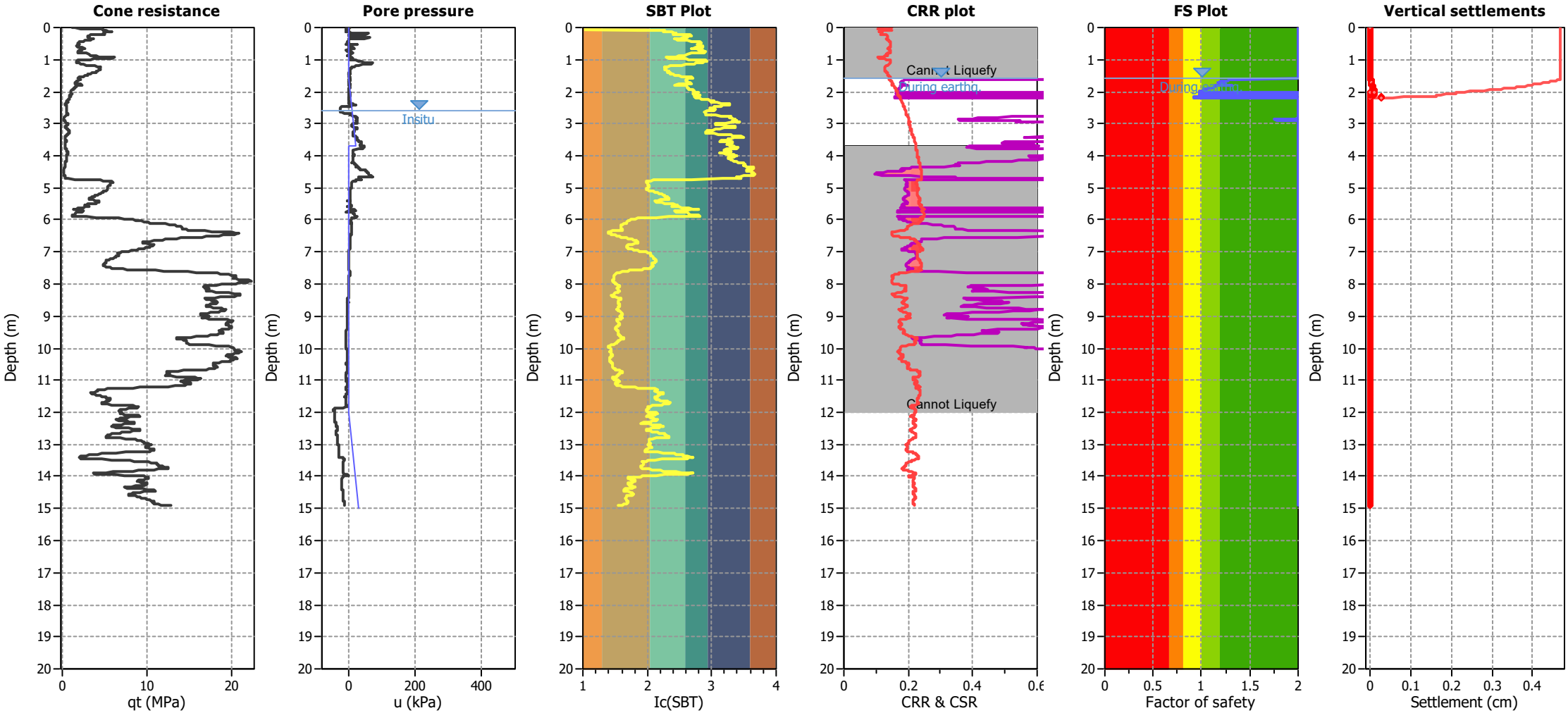
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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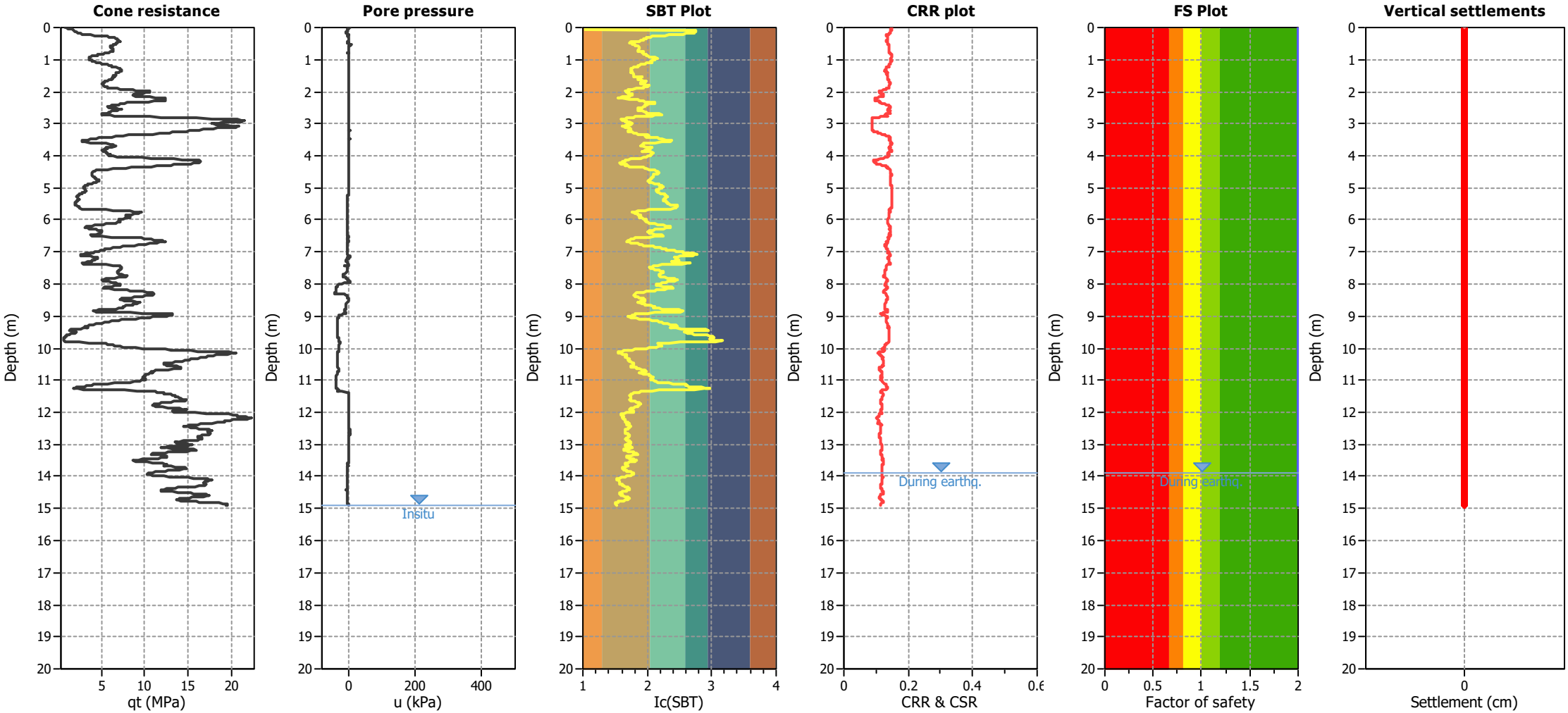
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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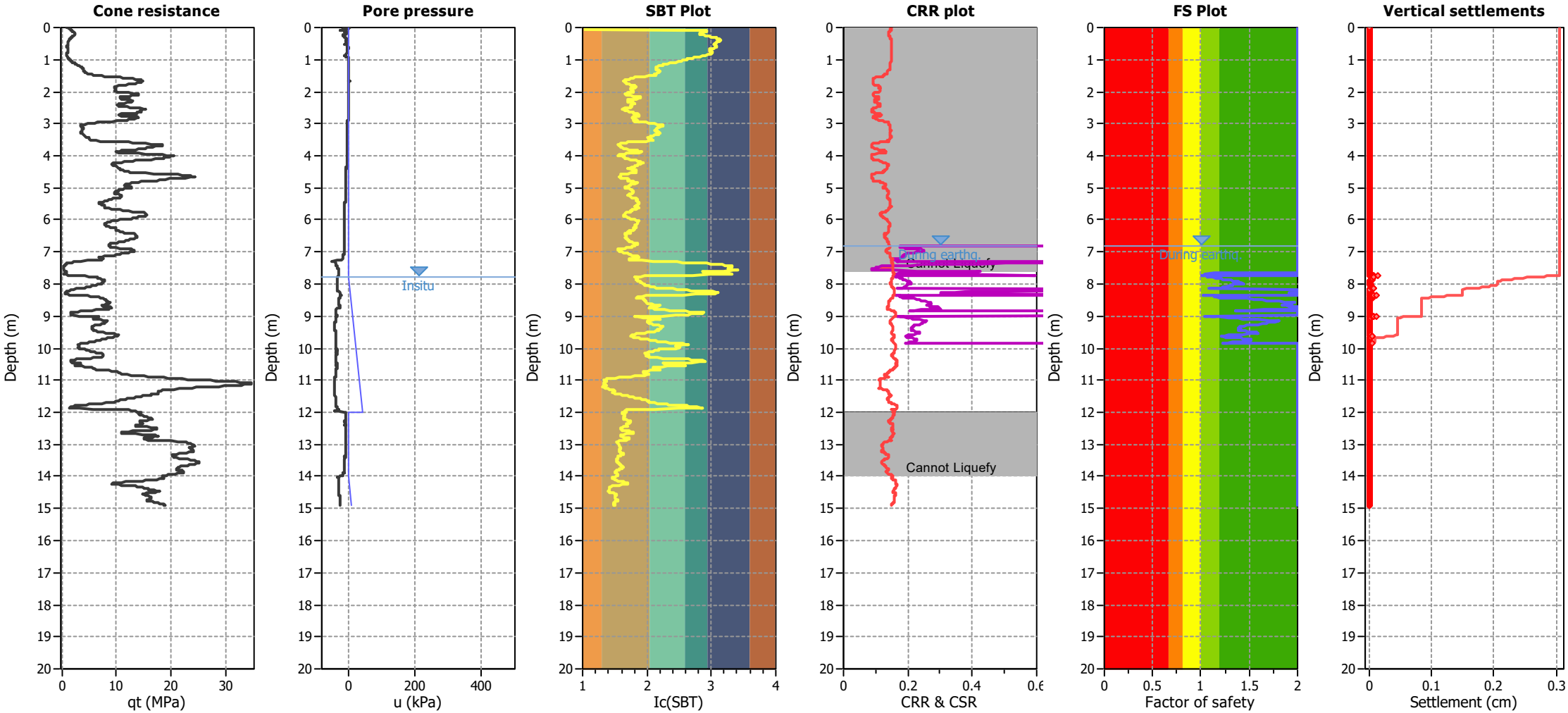
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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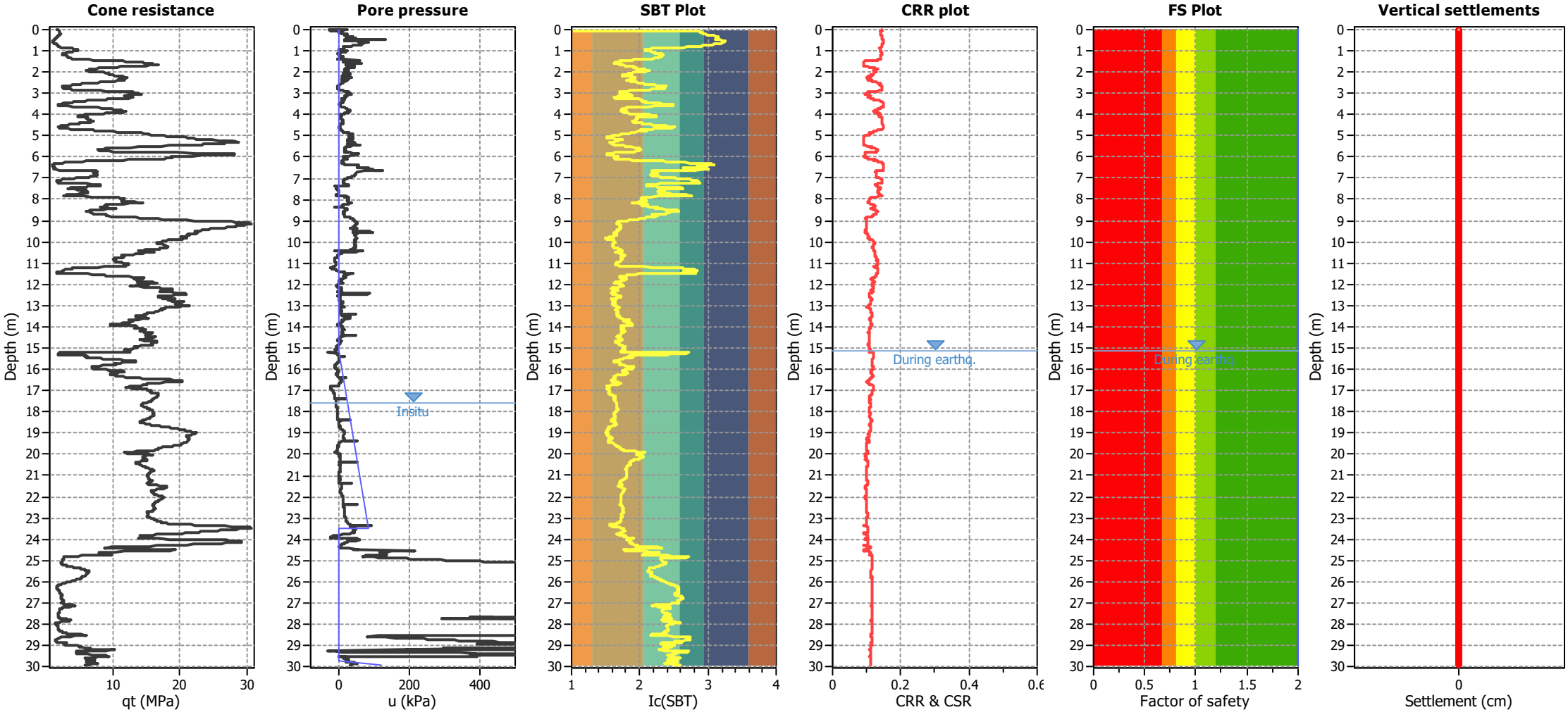
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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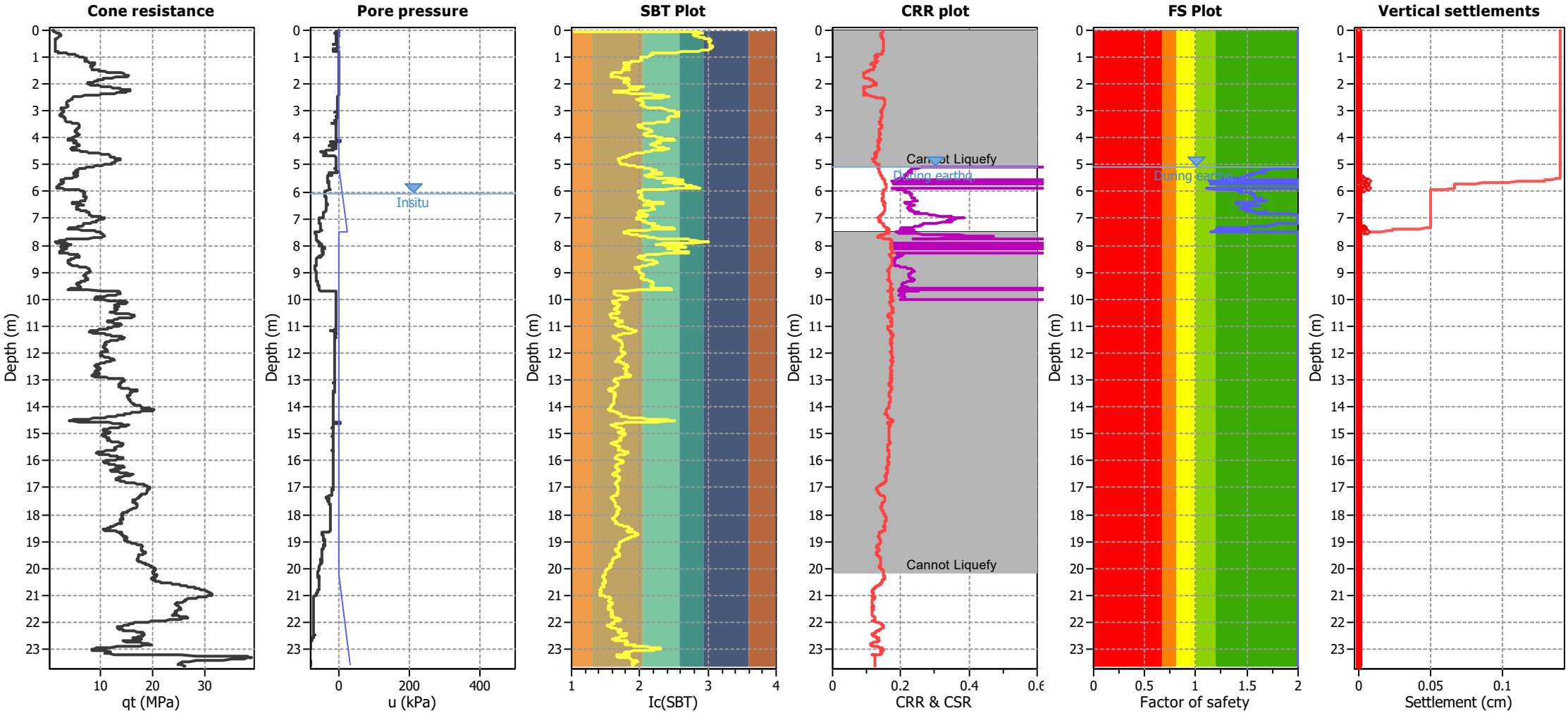
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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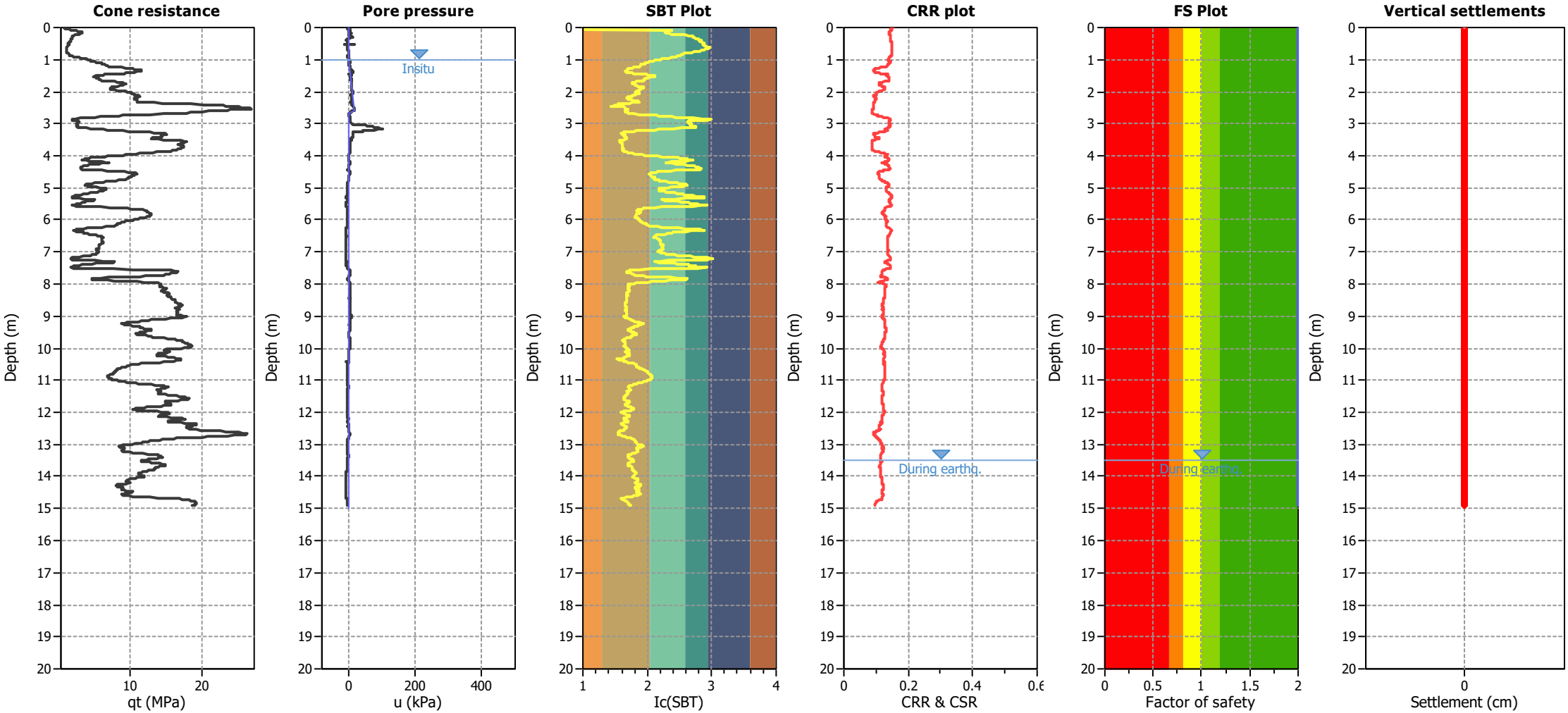
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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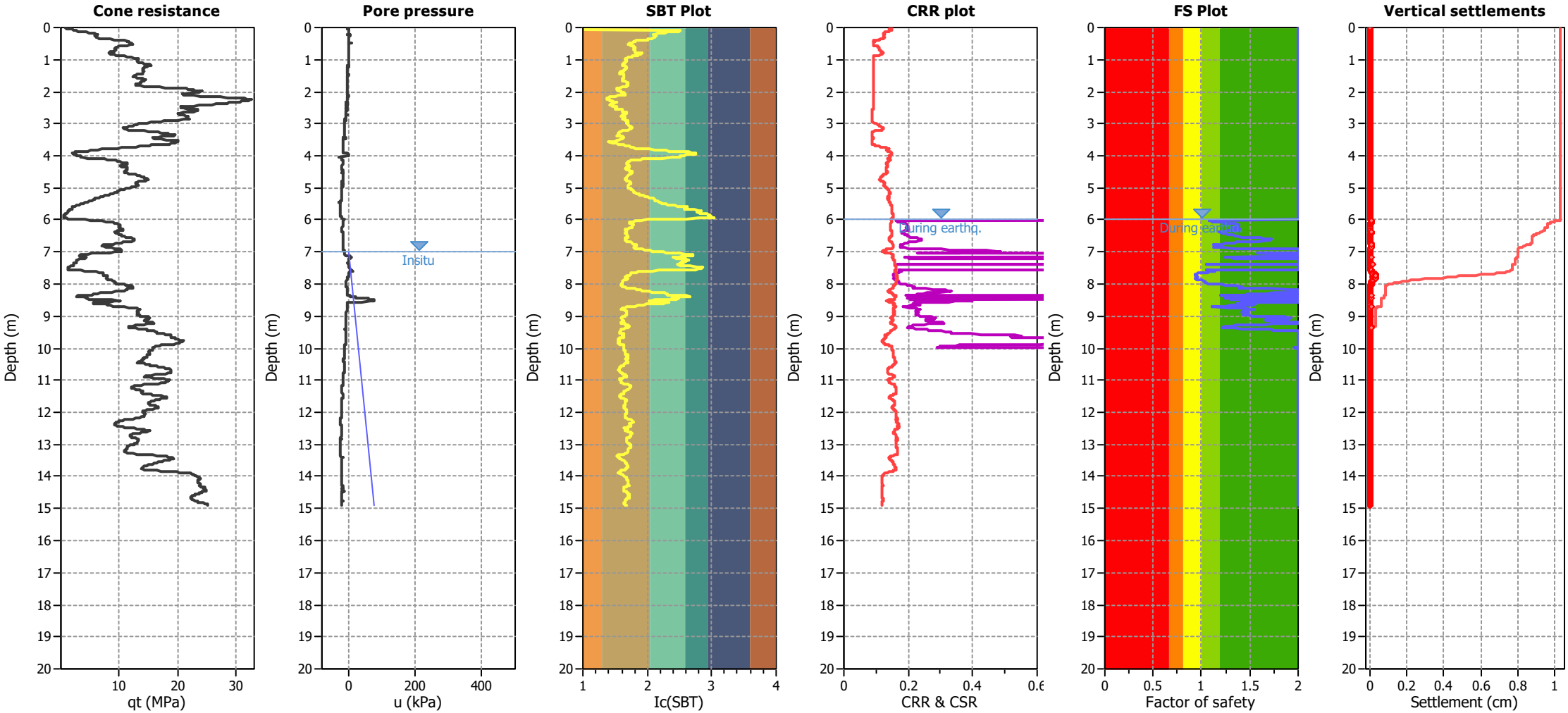
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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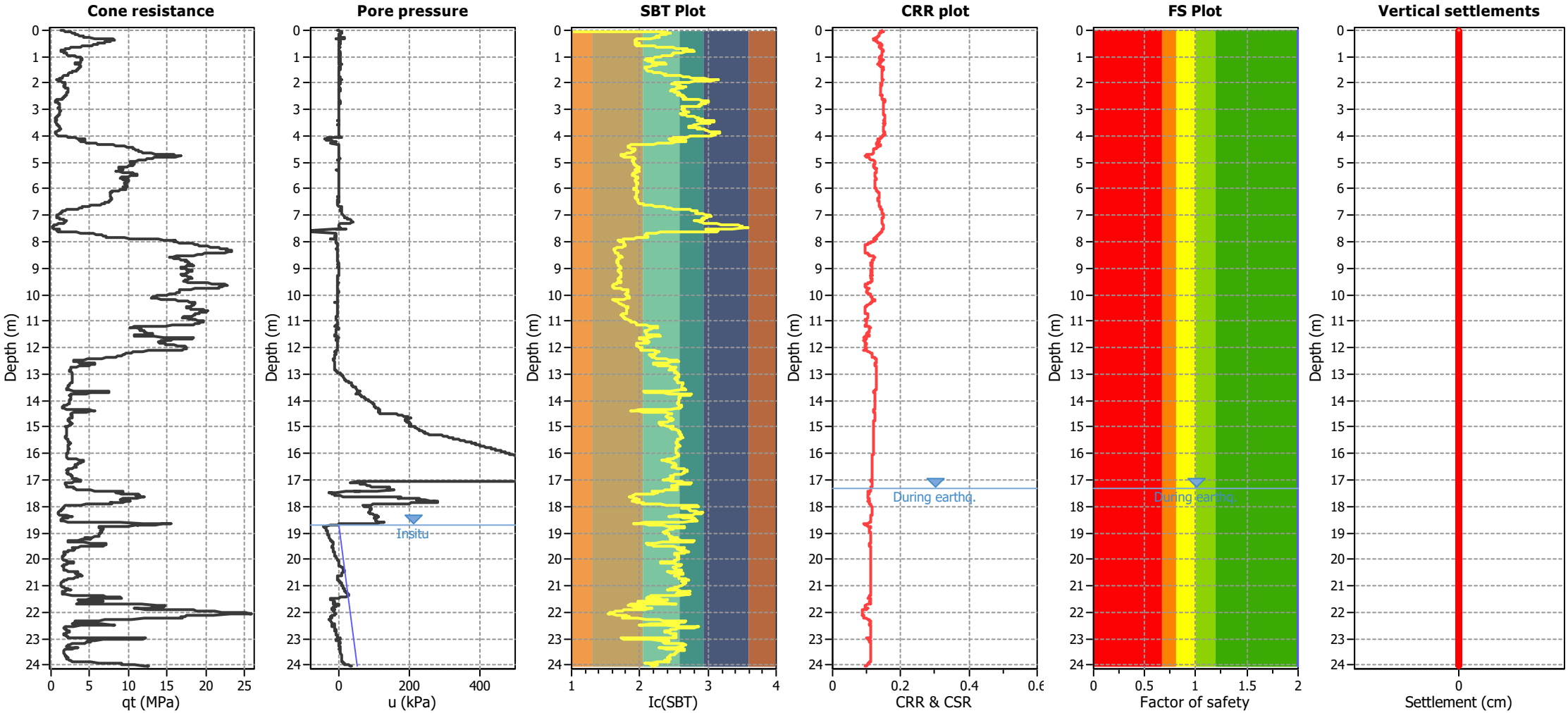
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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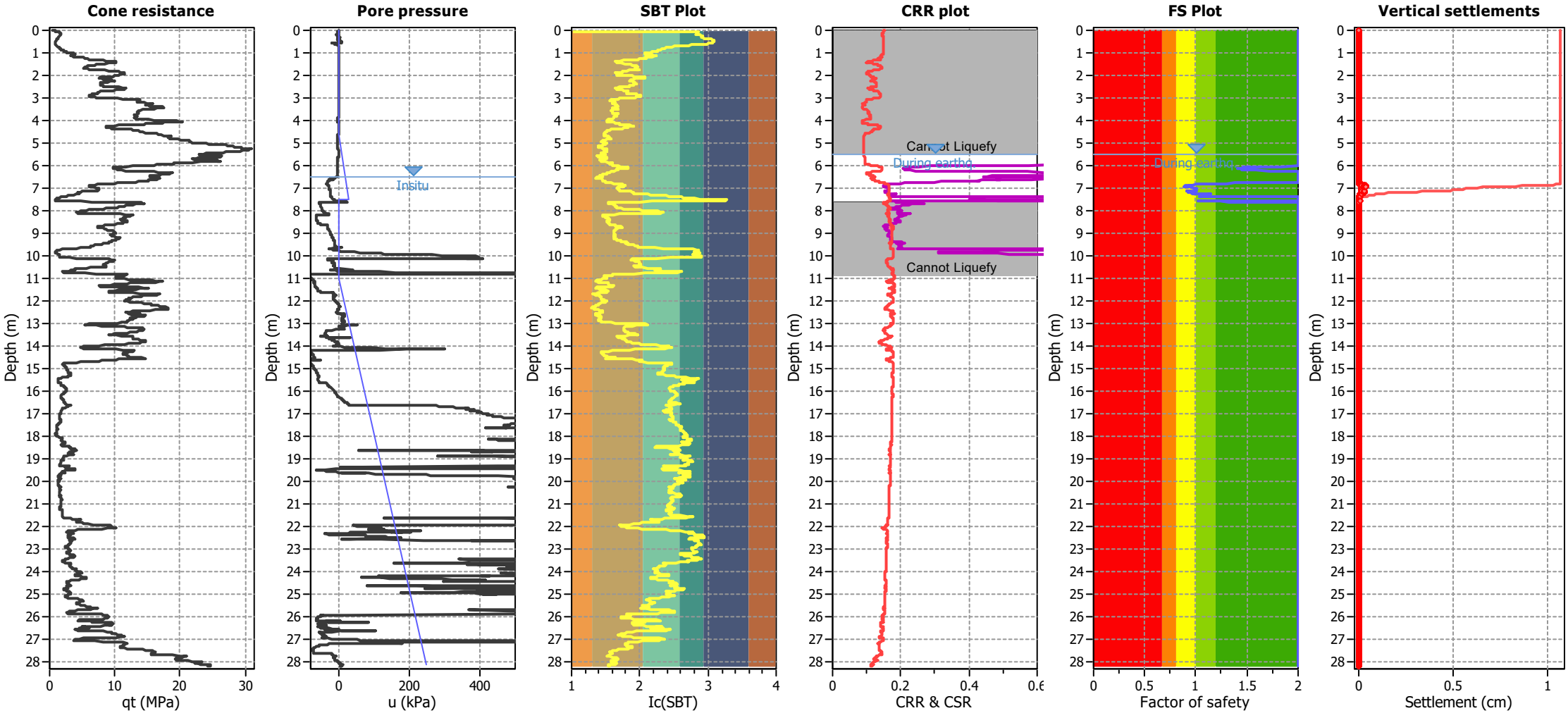
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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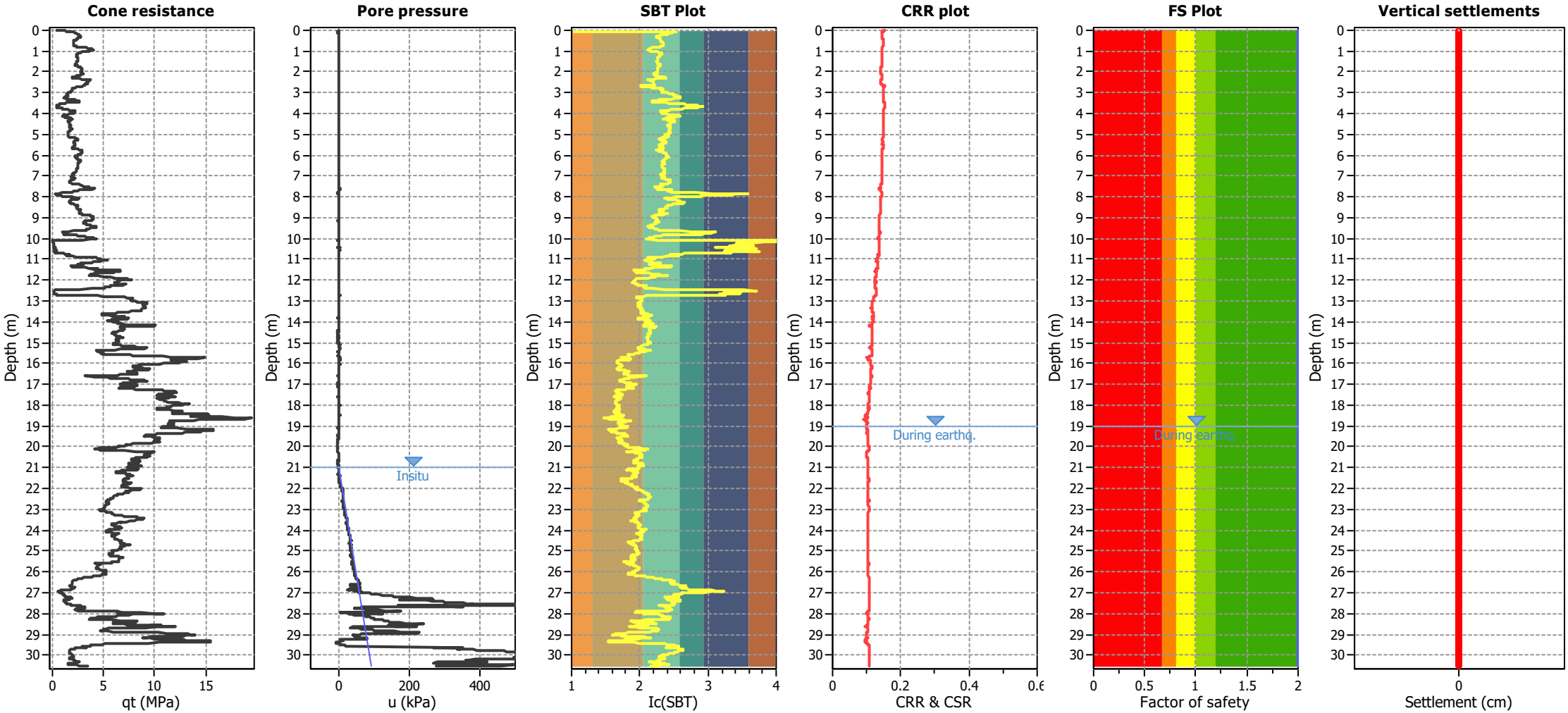
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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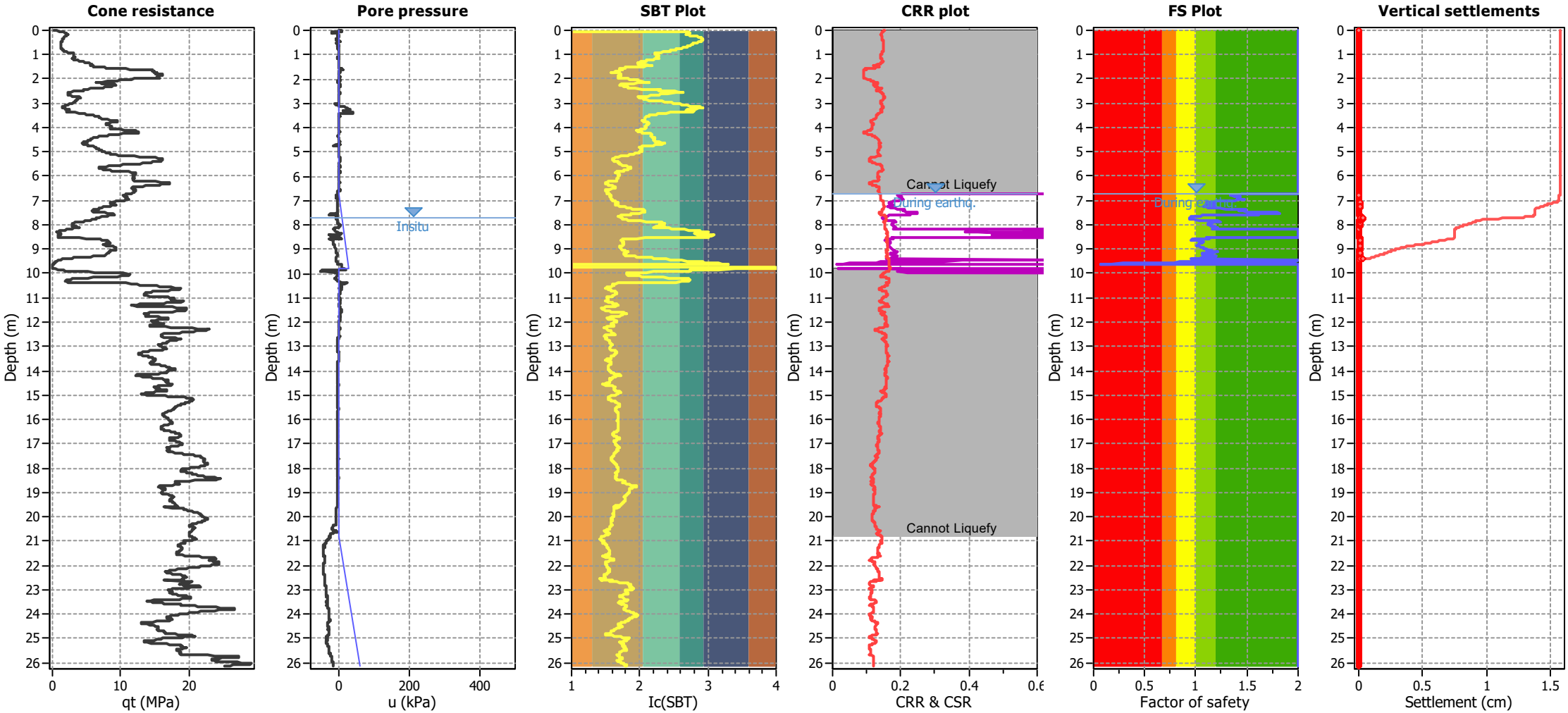
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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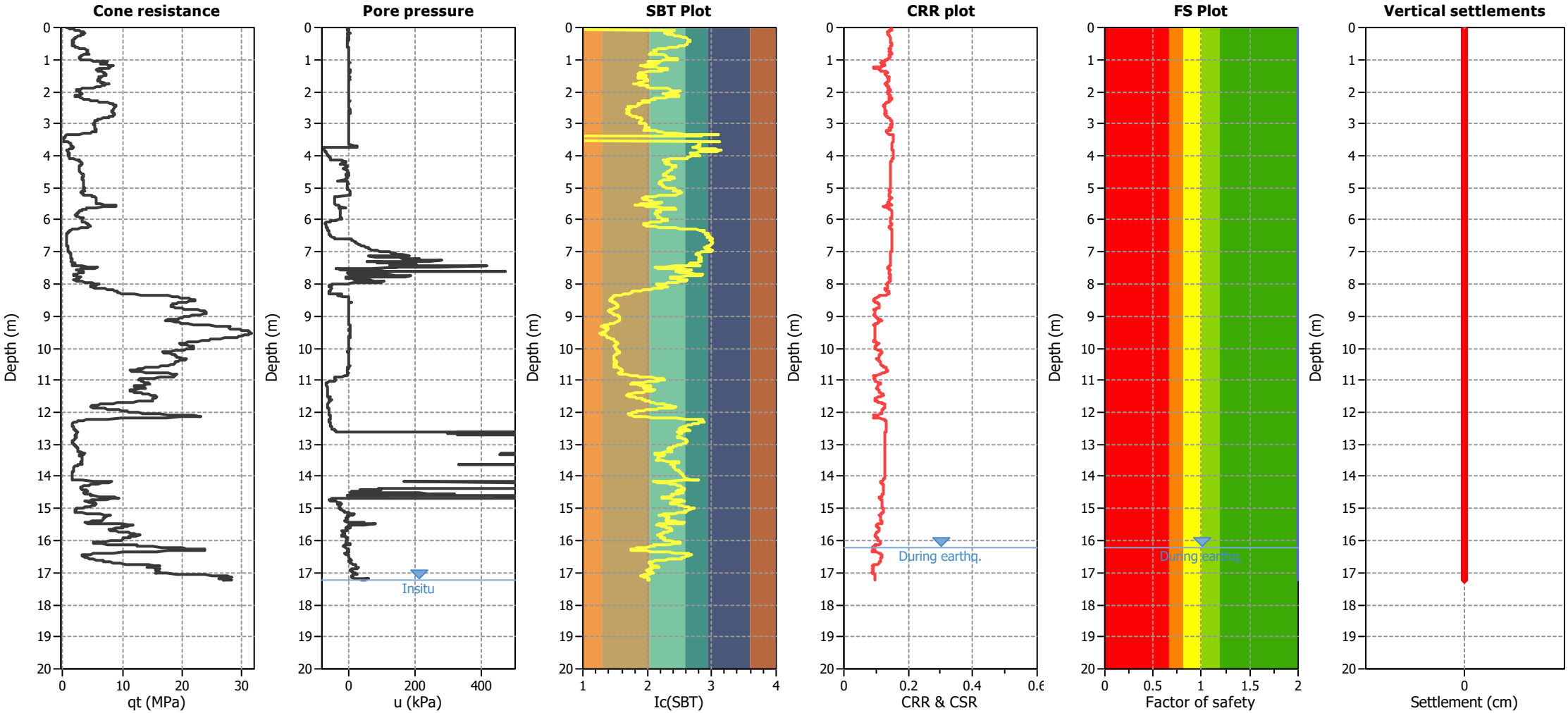
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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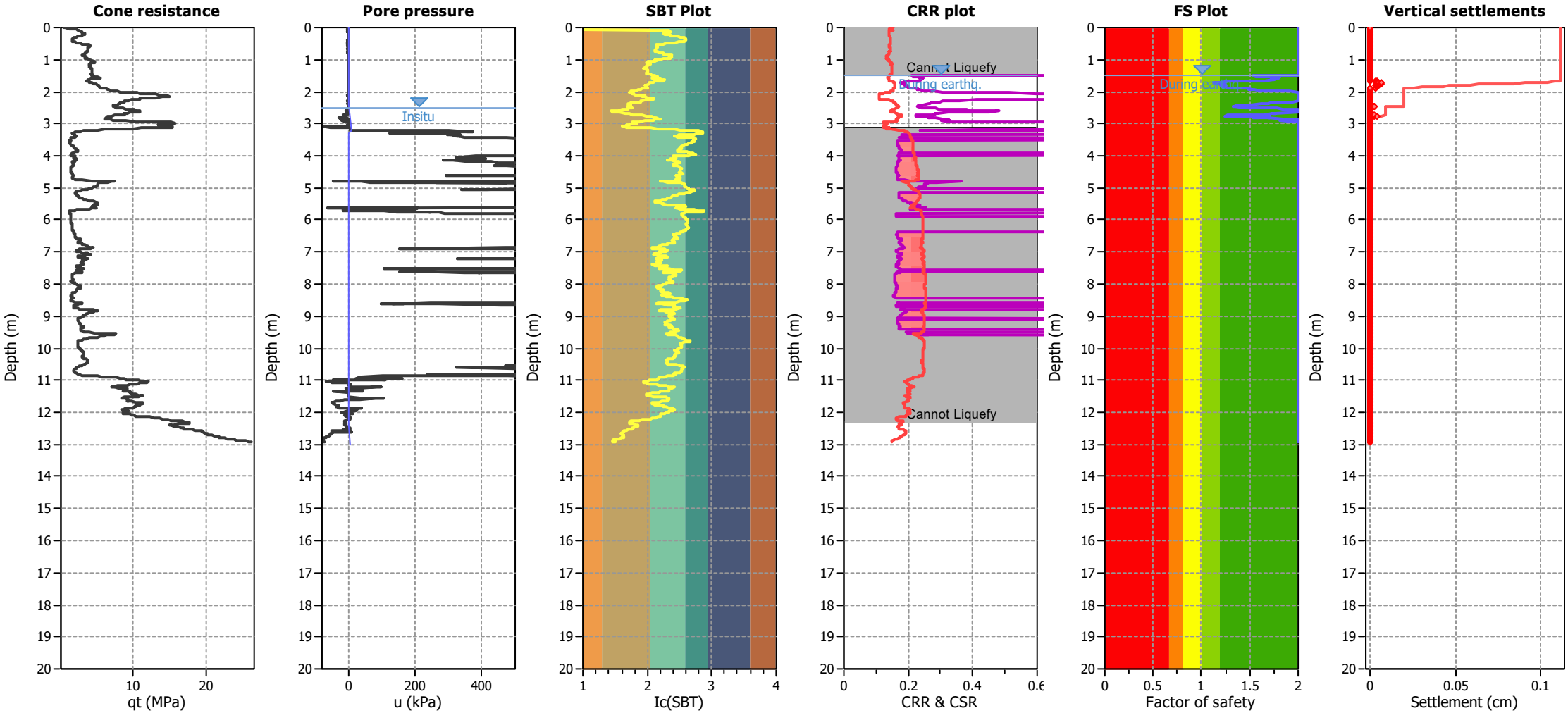
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

FULL DEPTH ANALYSIS

(NON-AGED)

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
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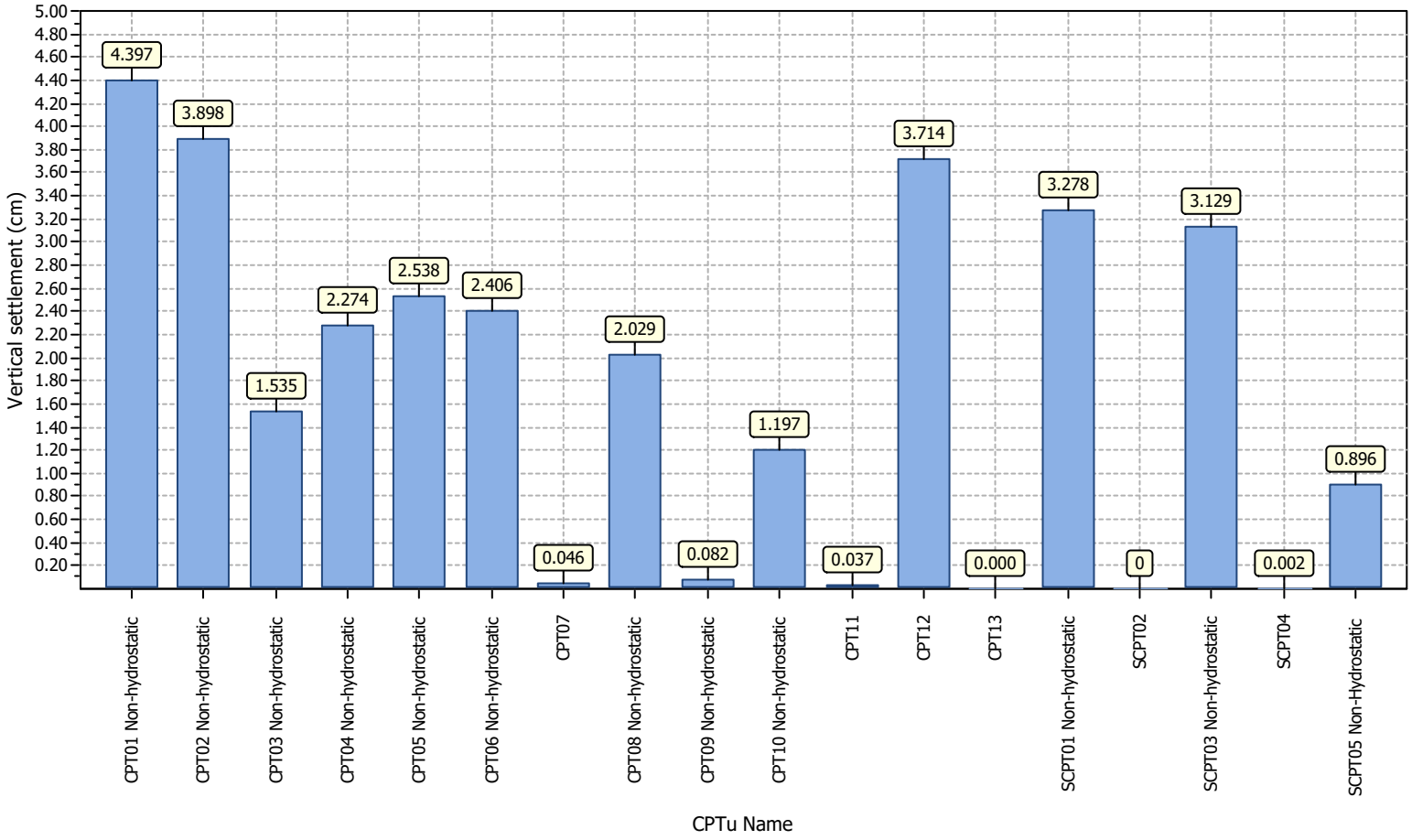
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
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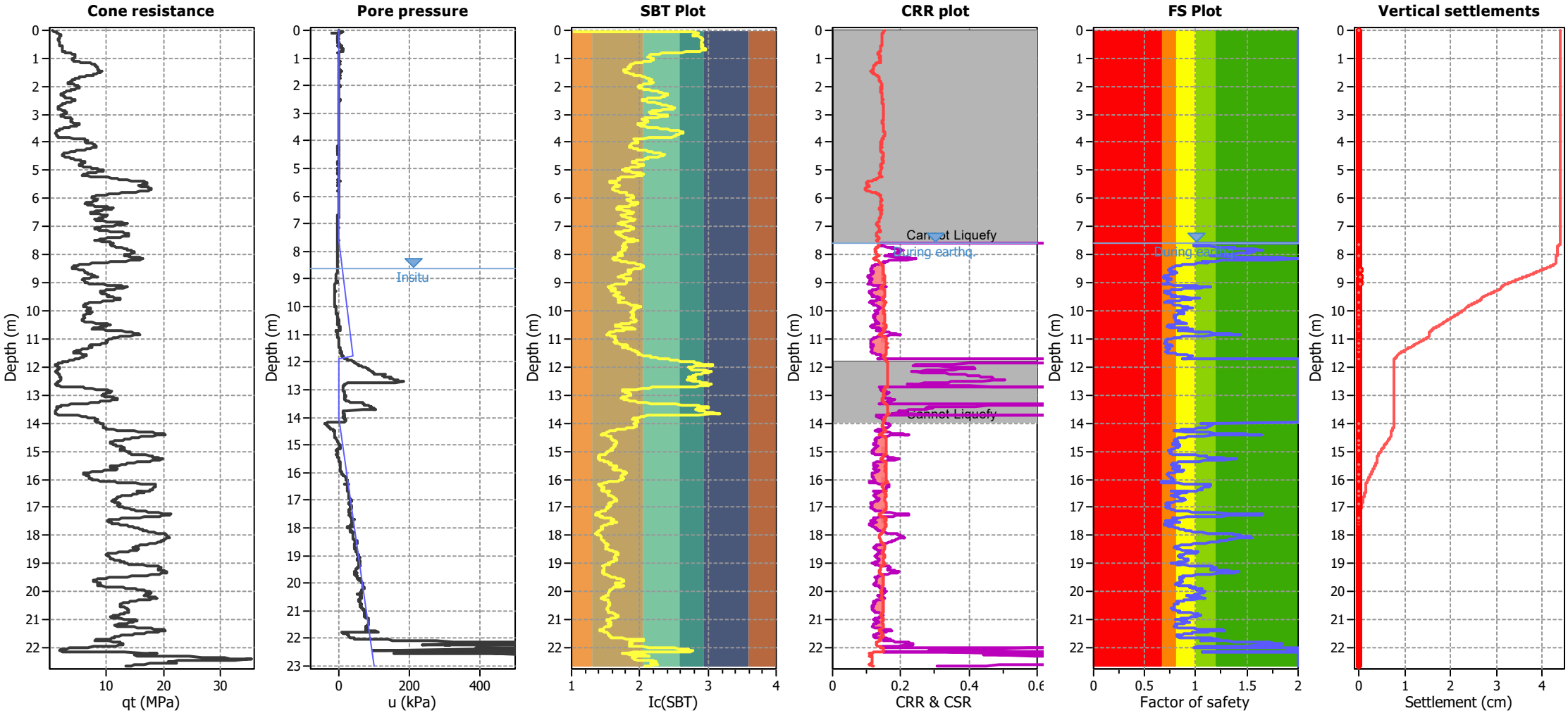
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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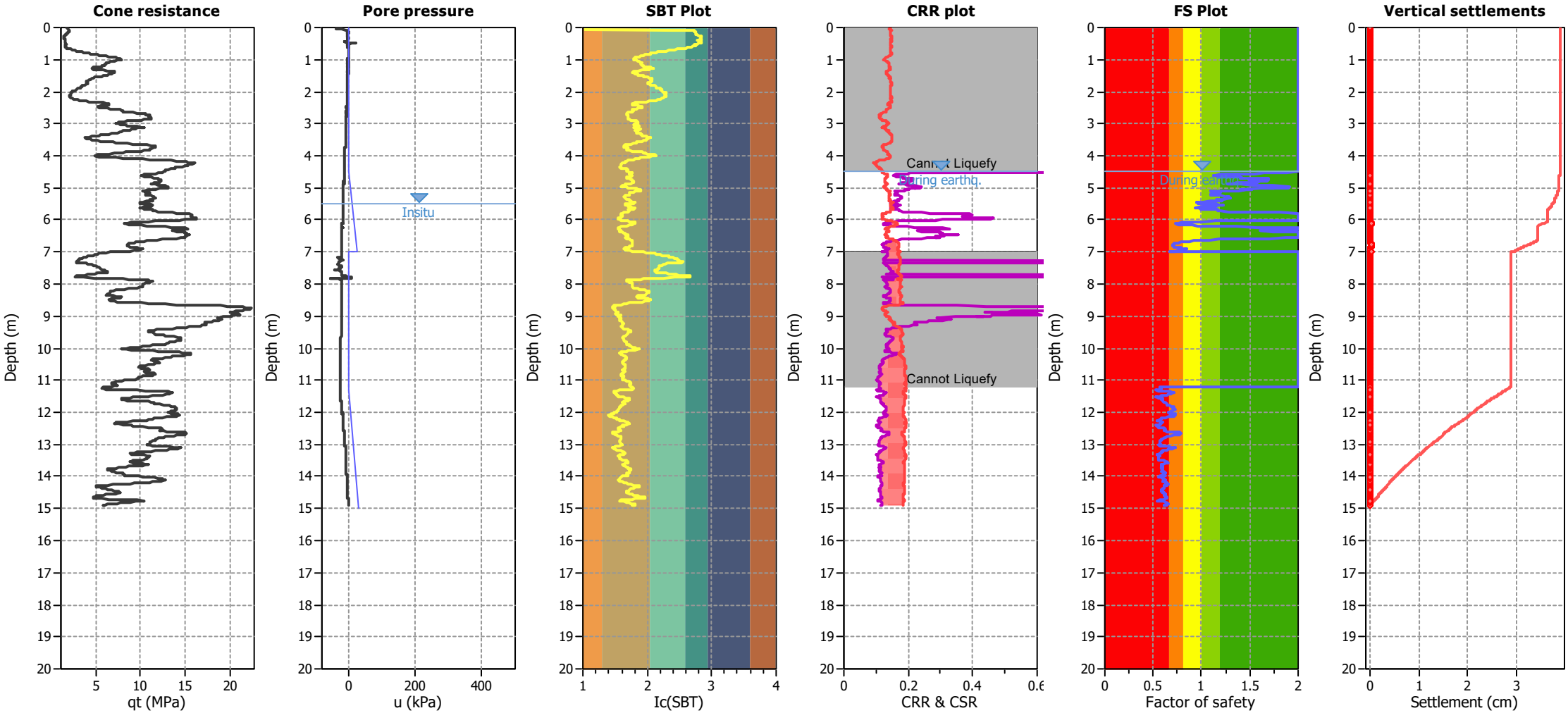
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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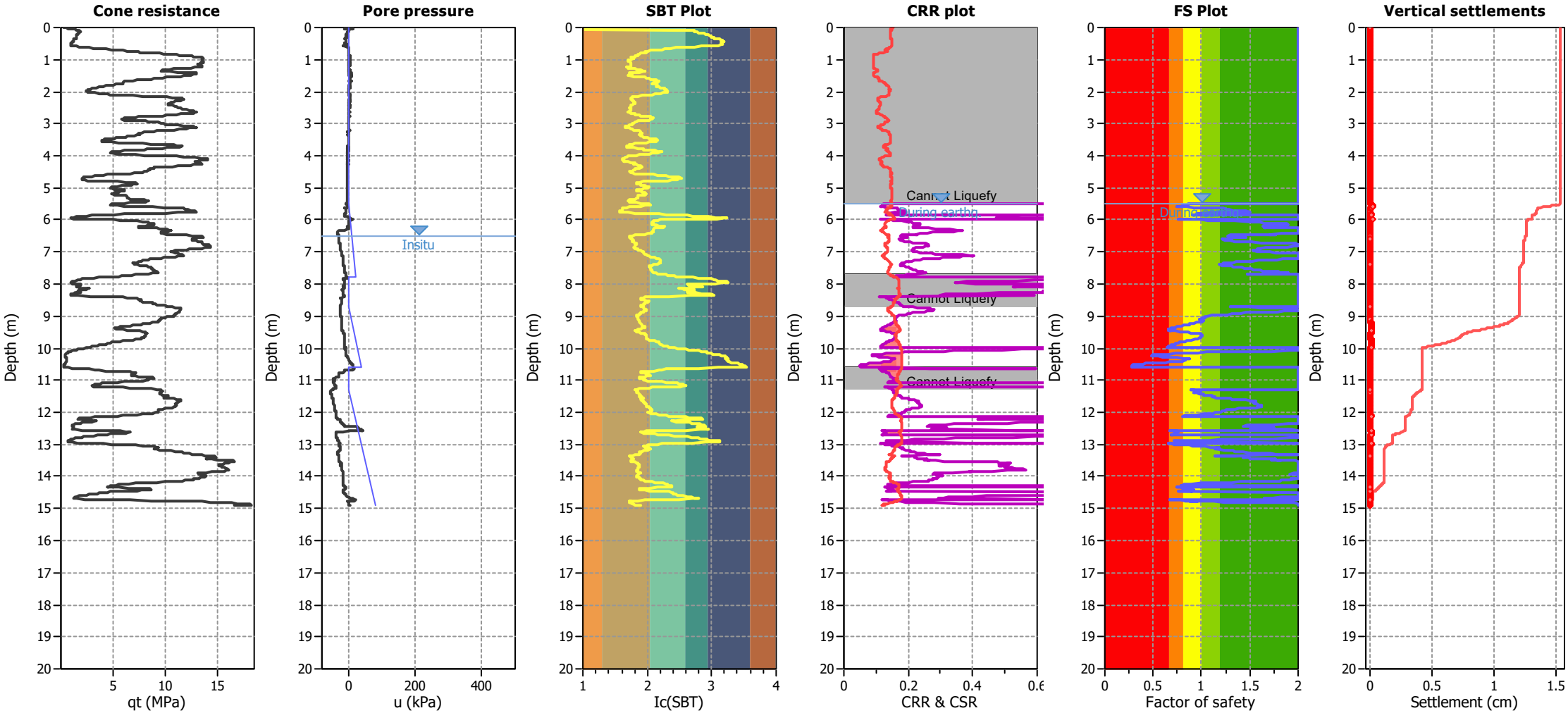
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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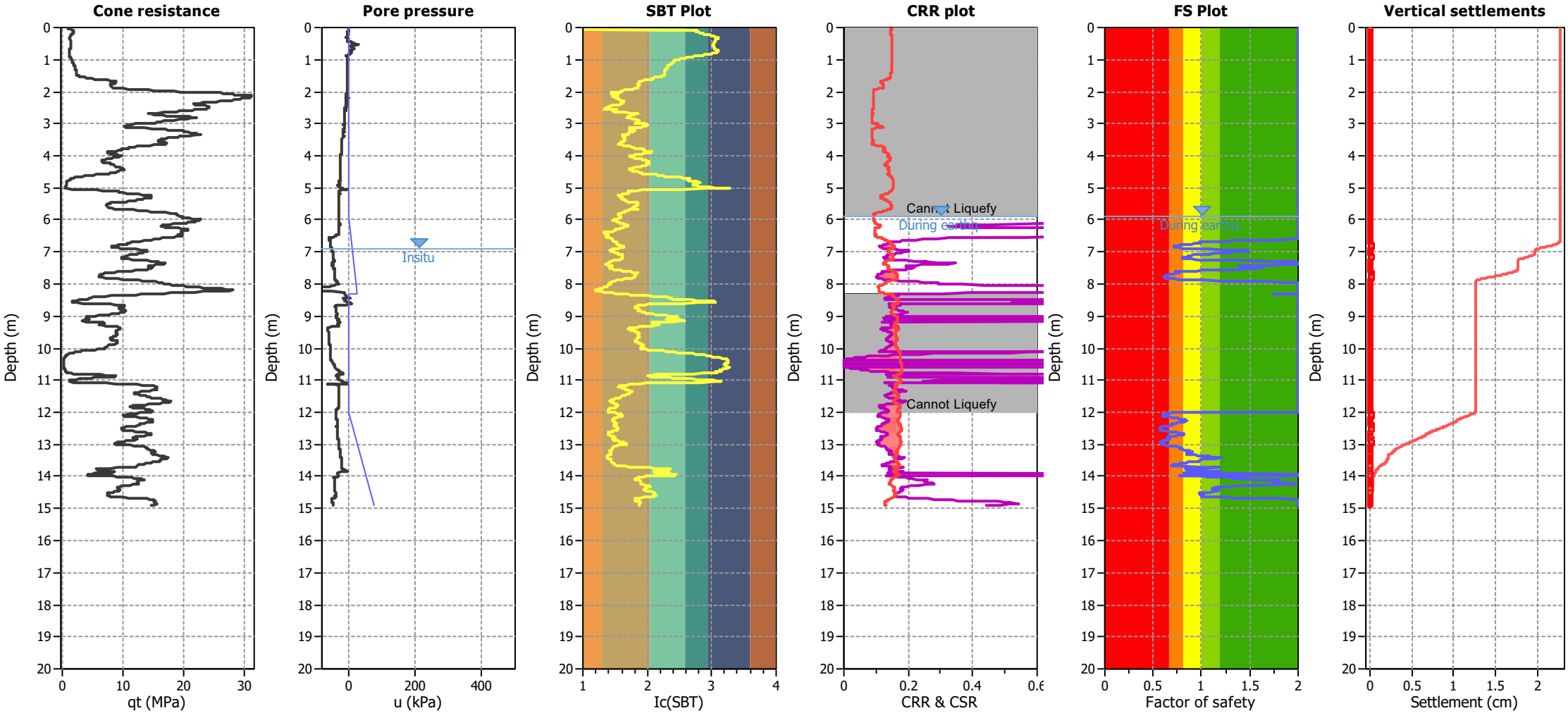
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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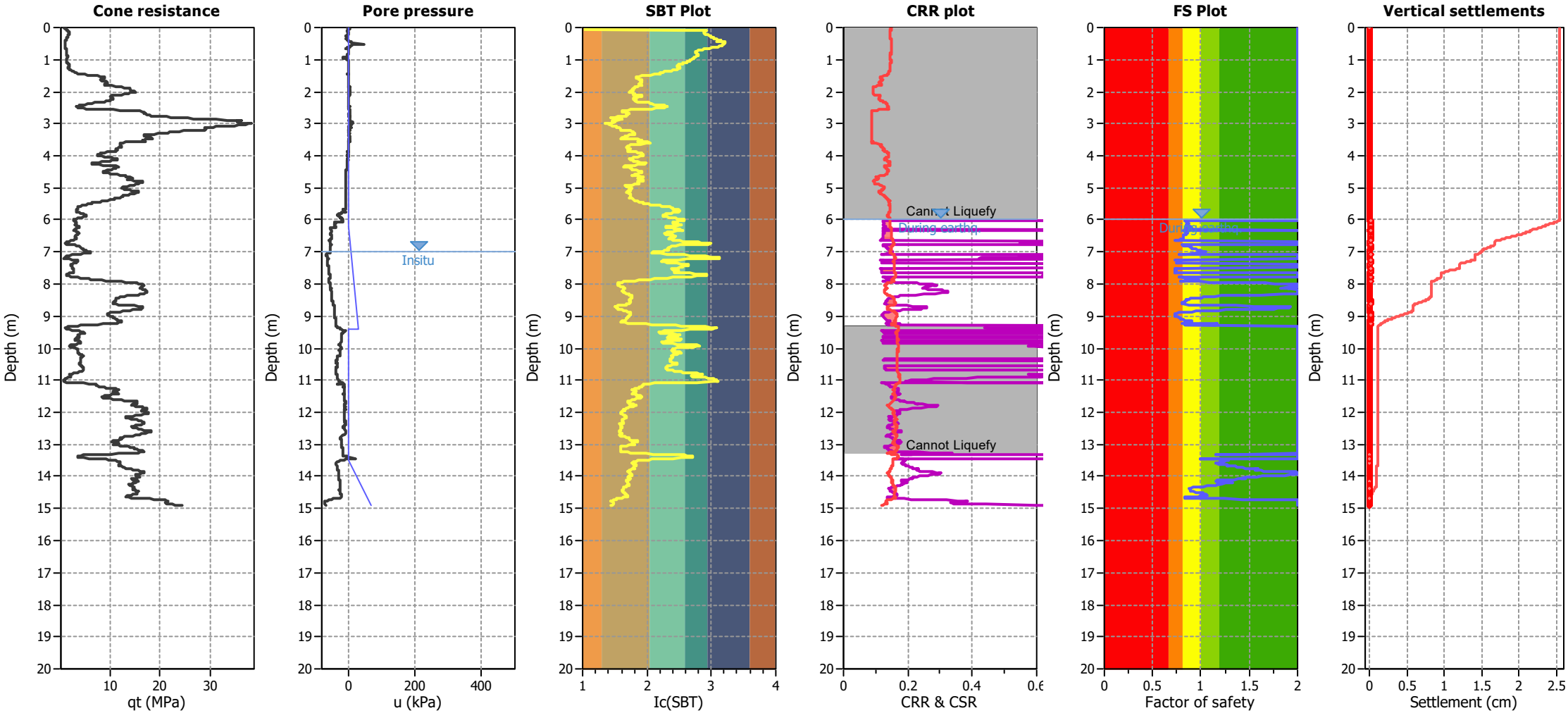
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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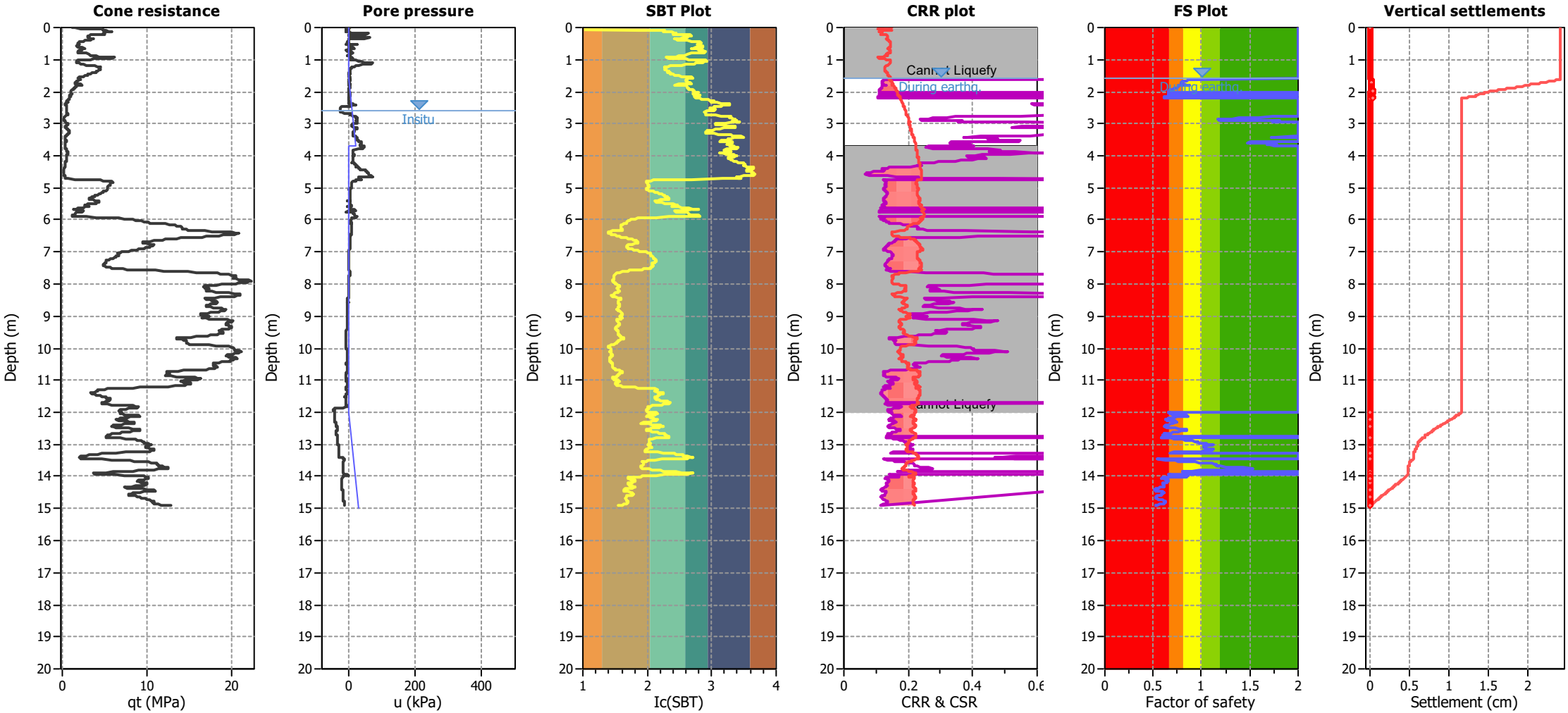
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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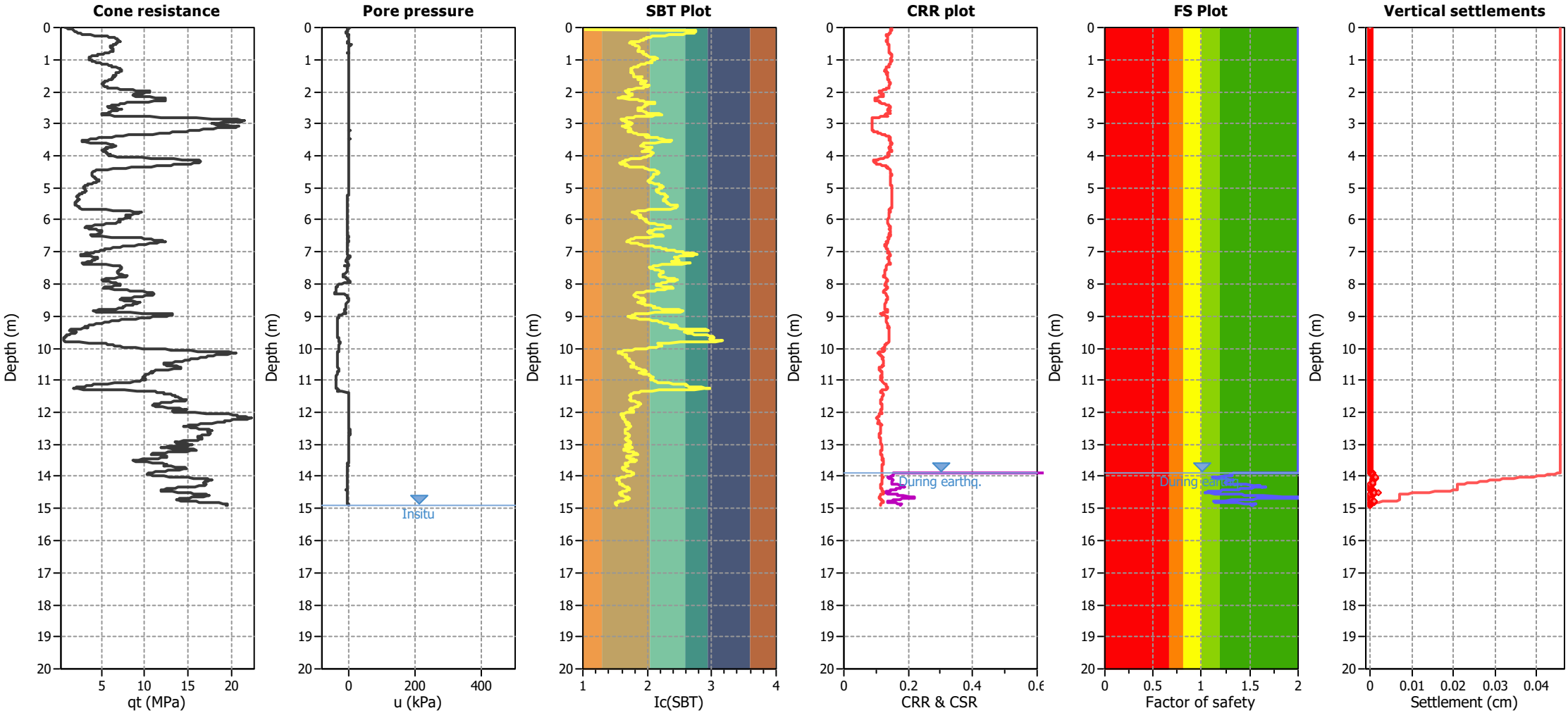
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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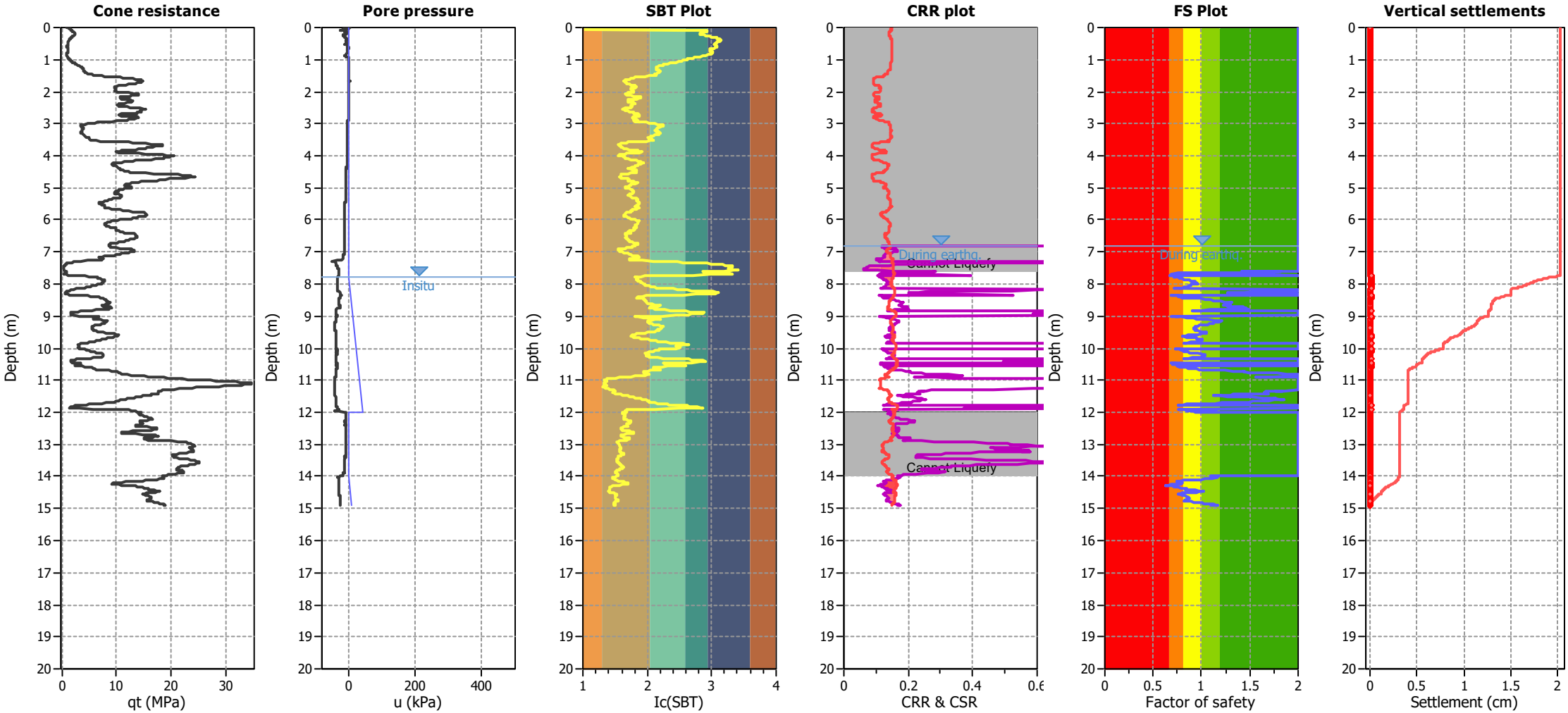
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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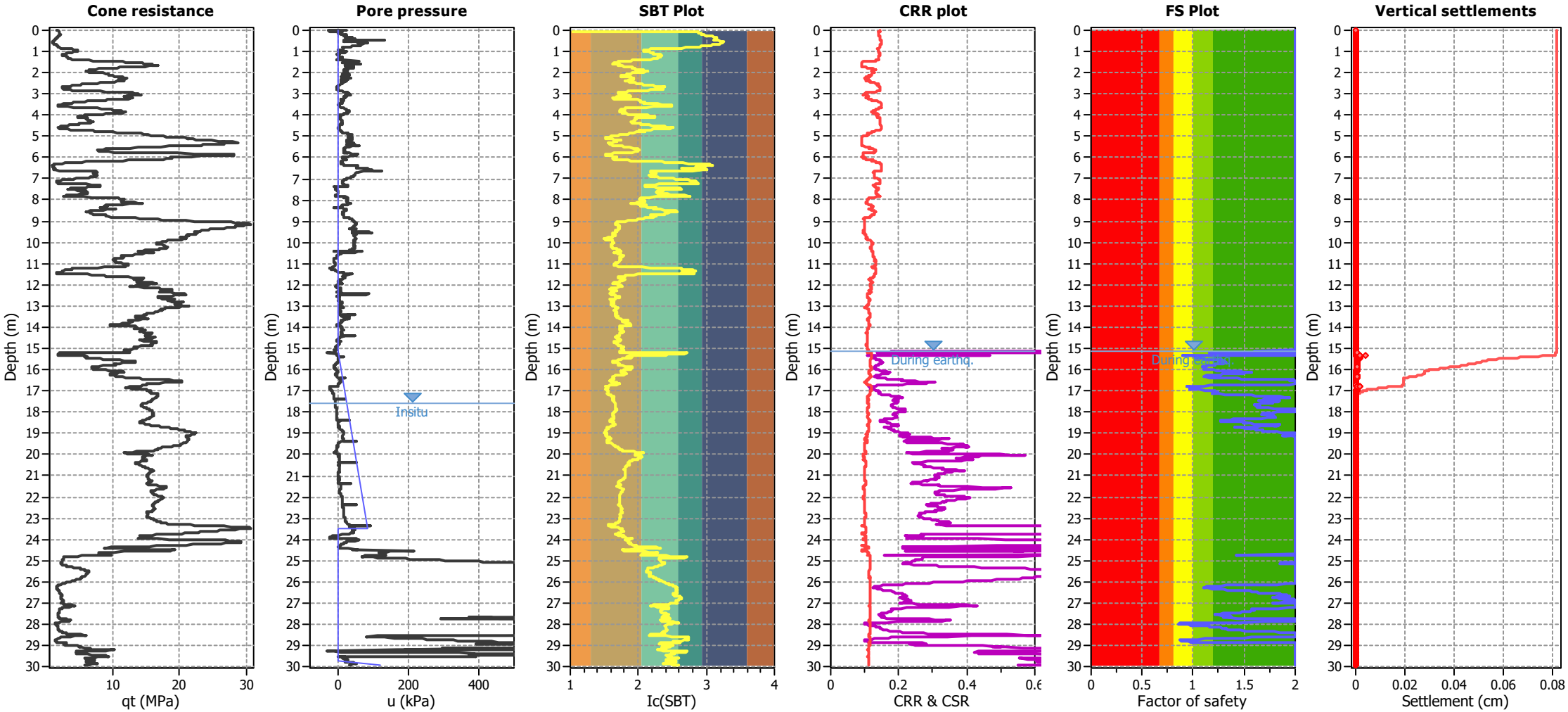
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m

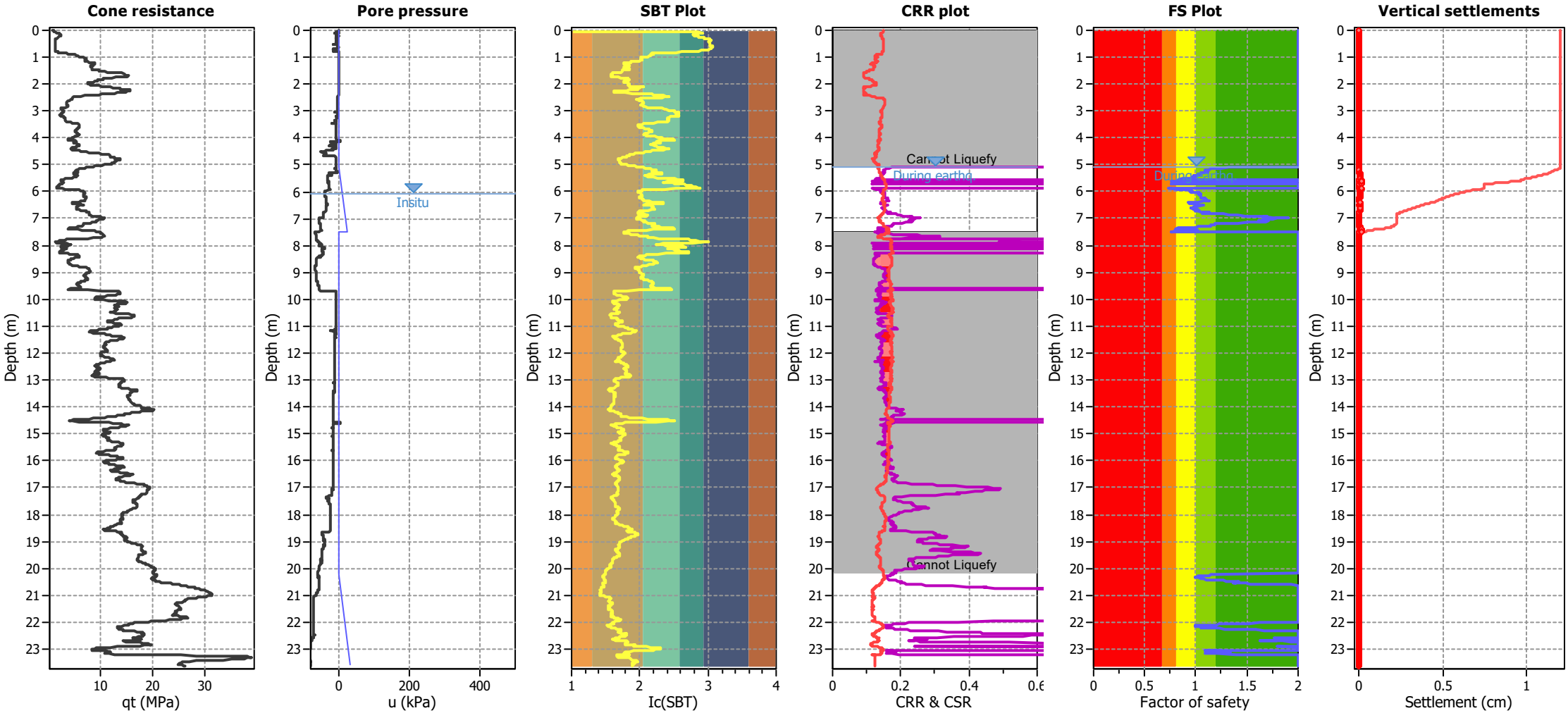


Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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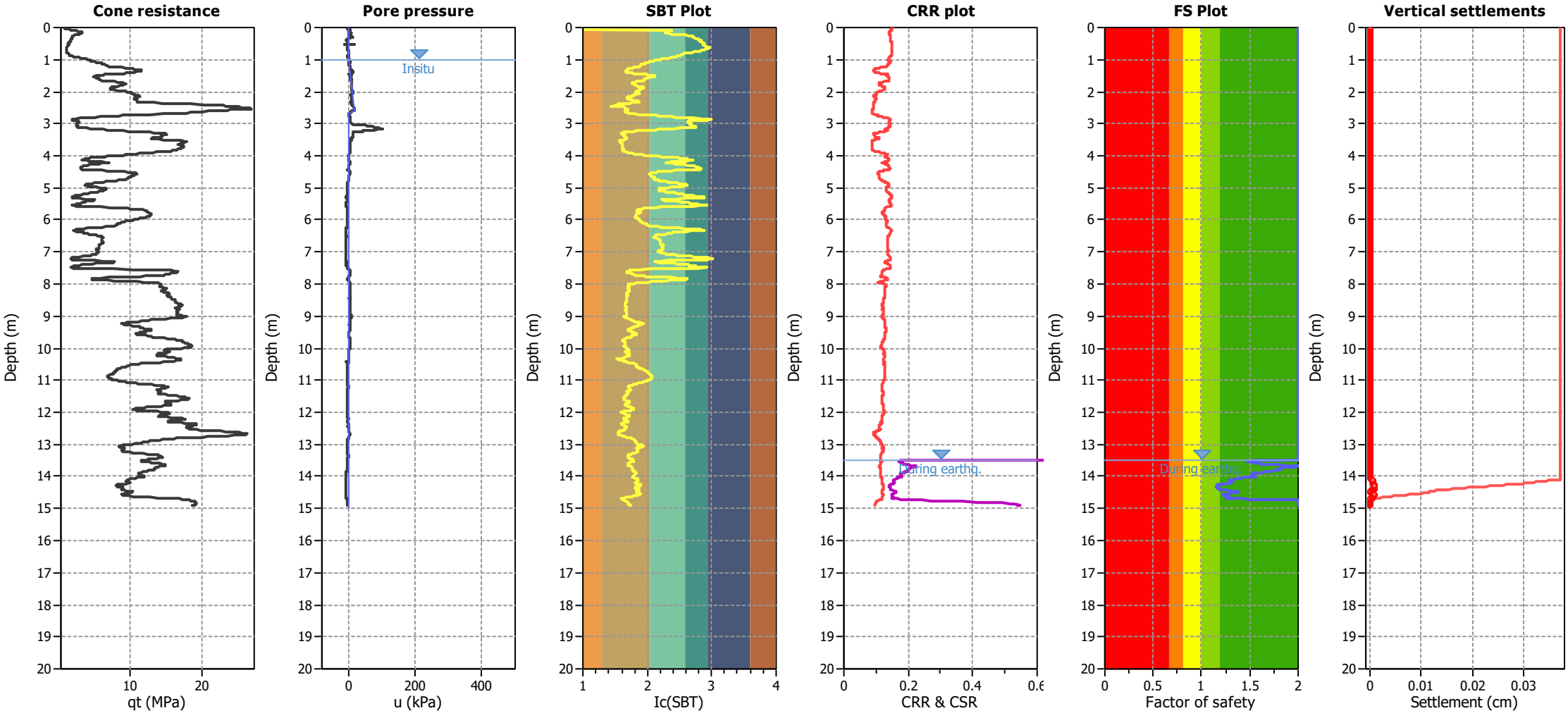
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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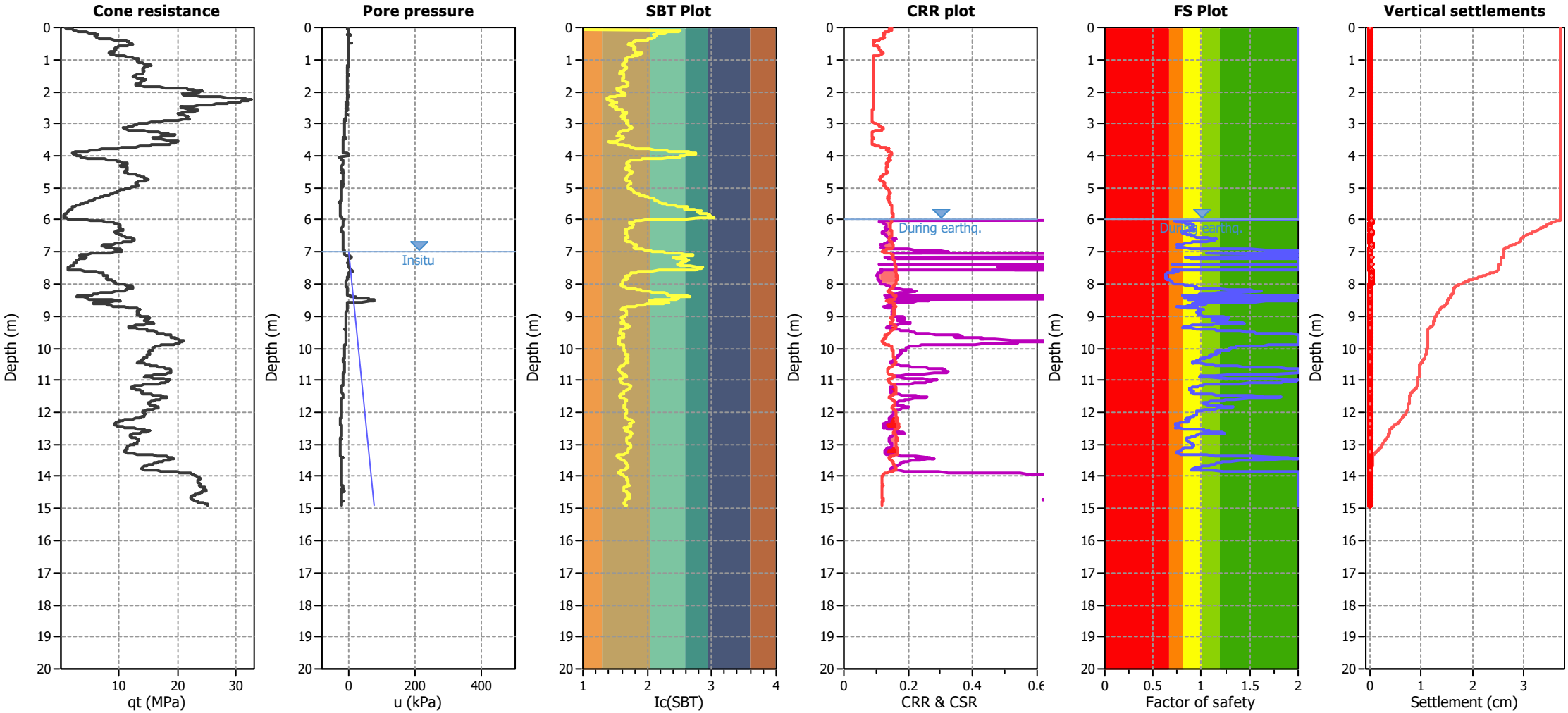
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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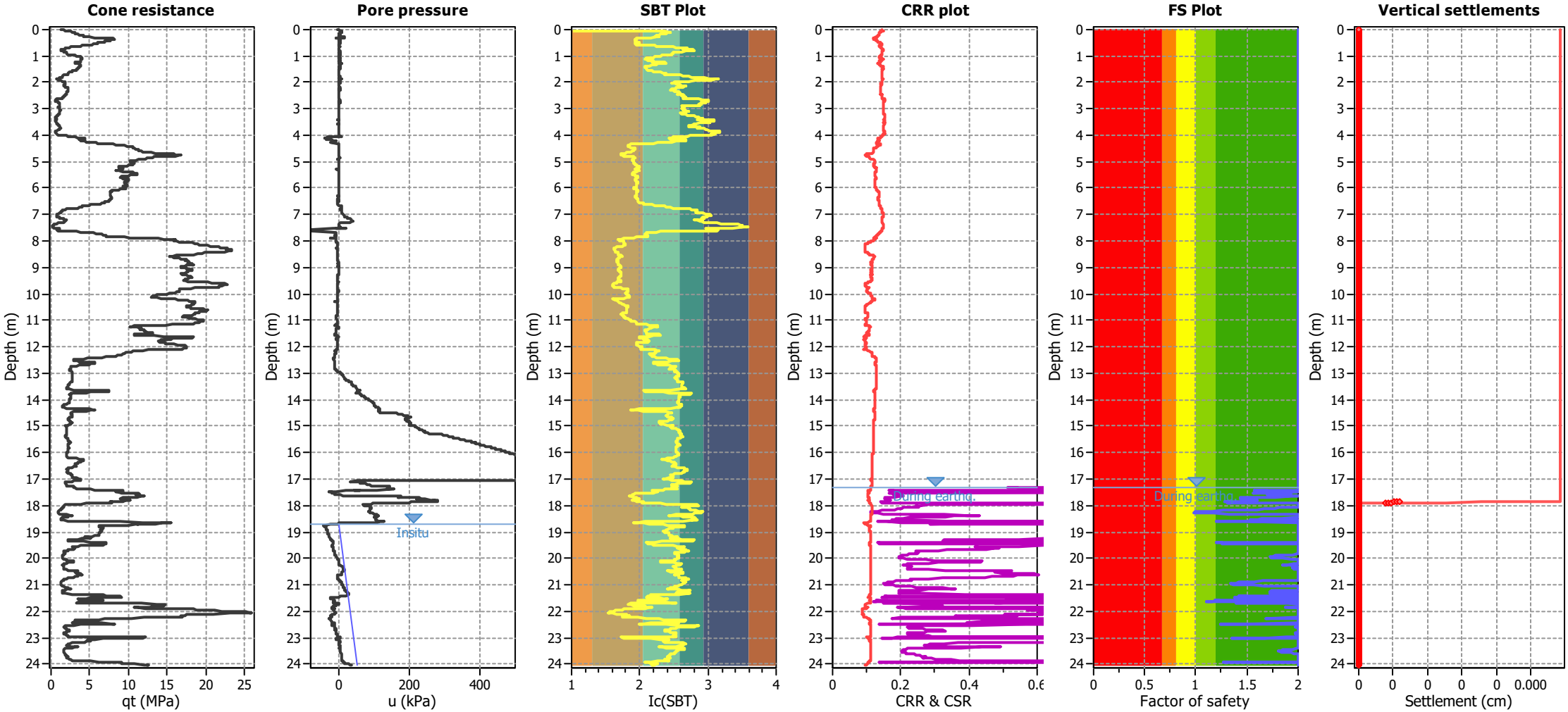
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

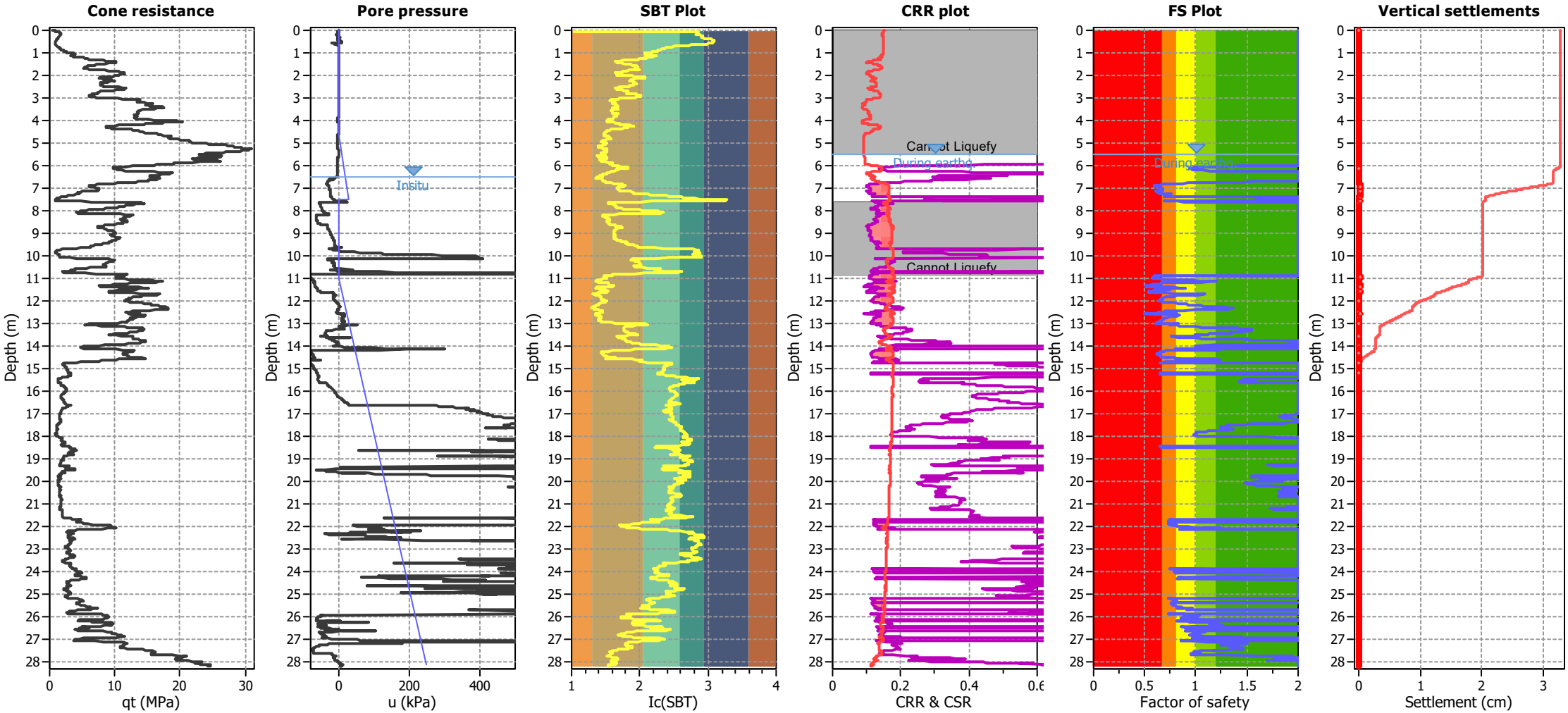


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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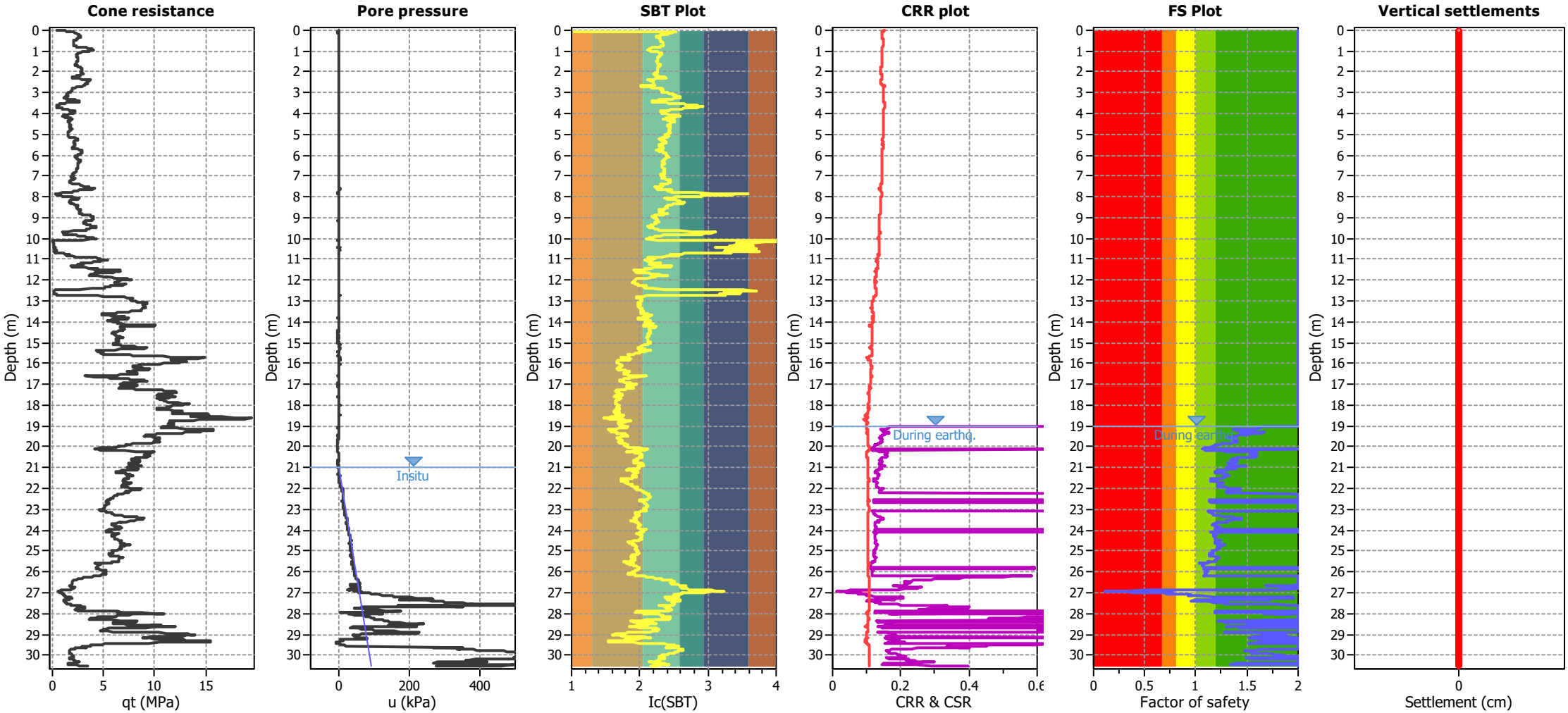
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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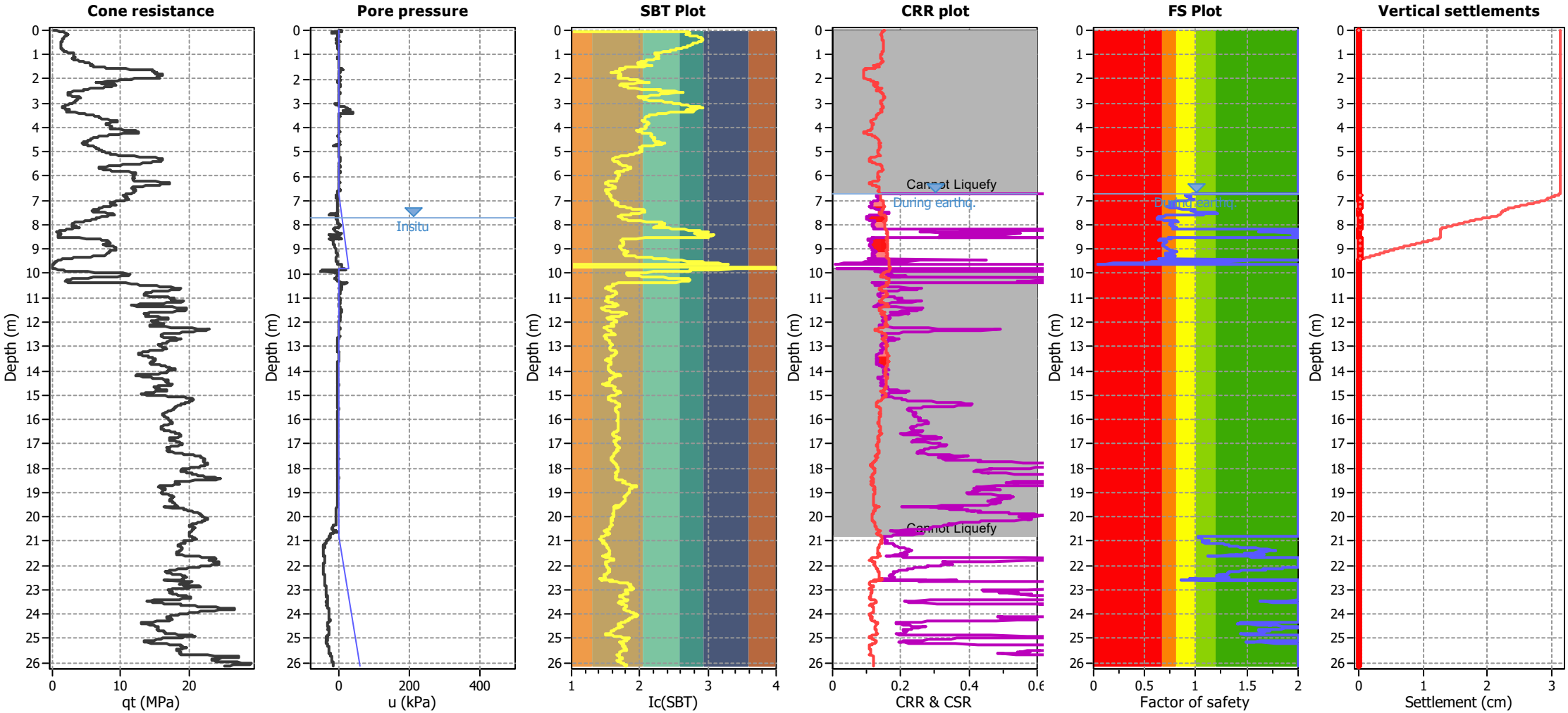
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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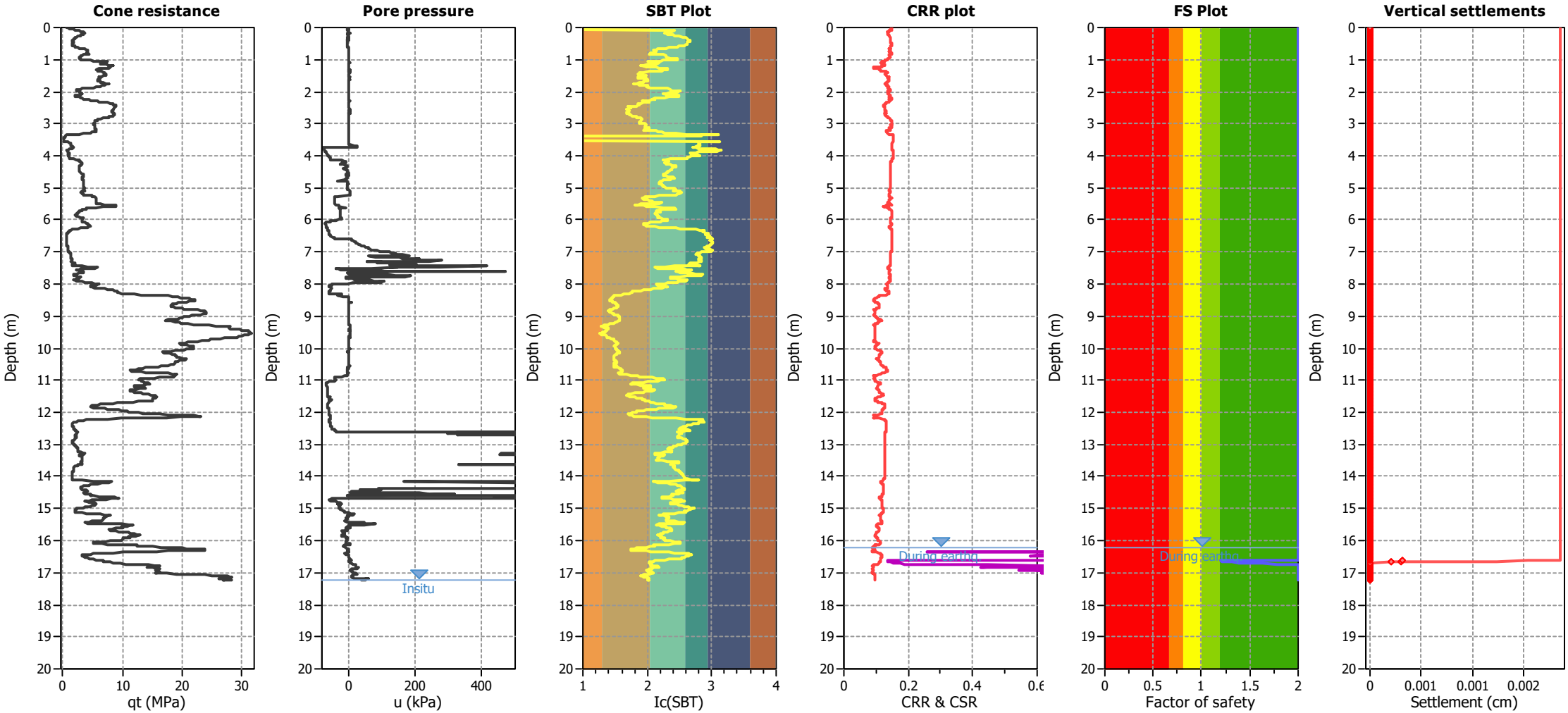
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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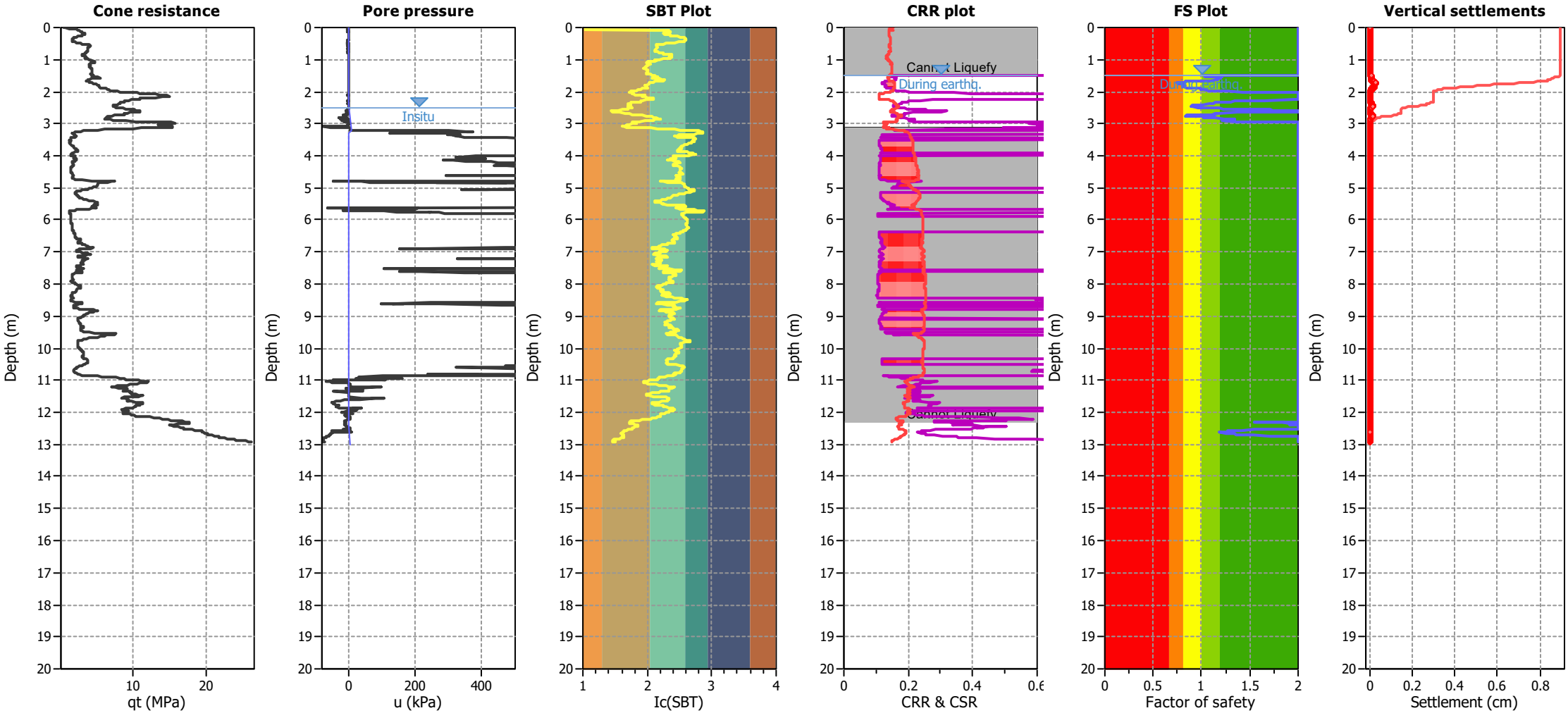
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

10M INDEX ANALYSIS RESULTS (NON-AGED)

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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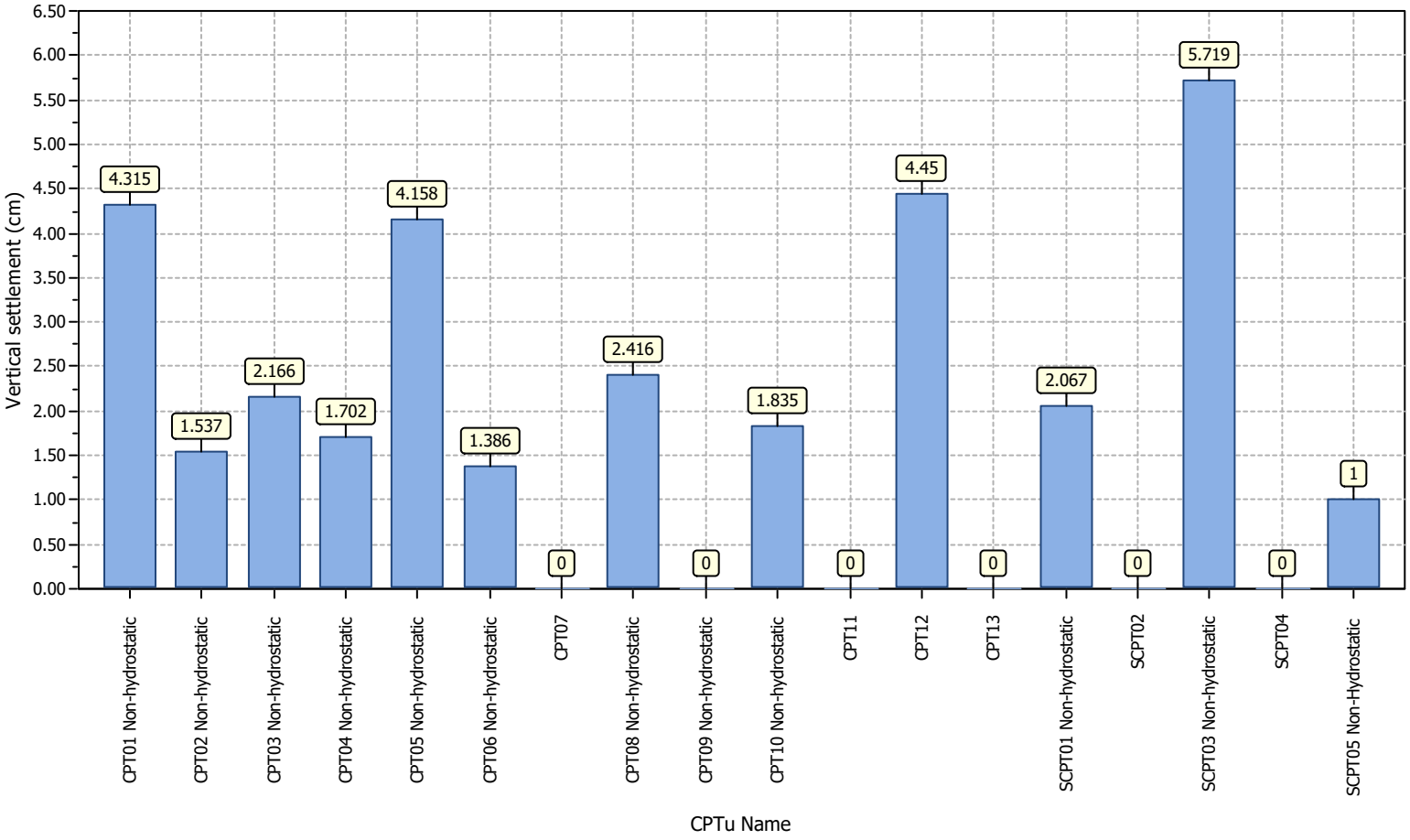
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report

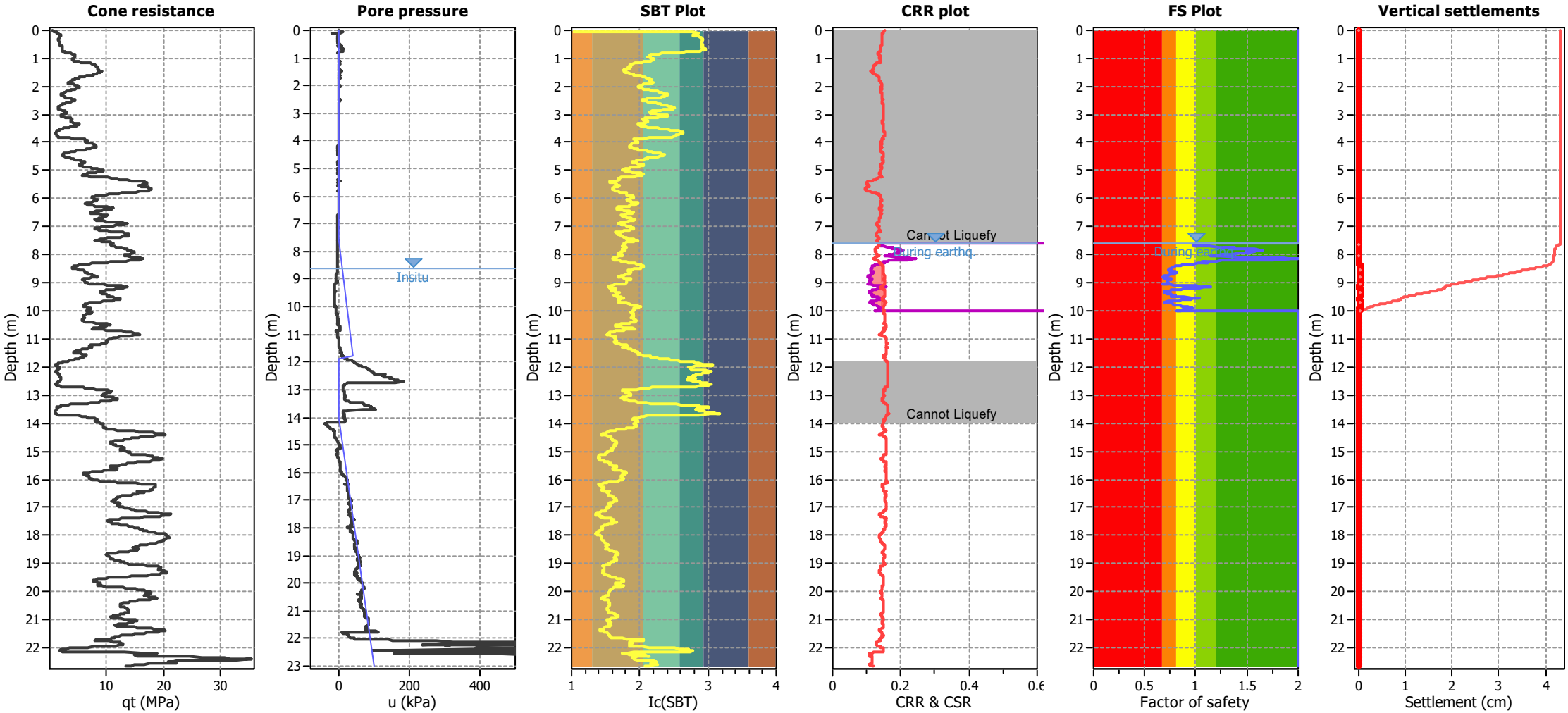


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m

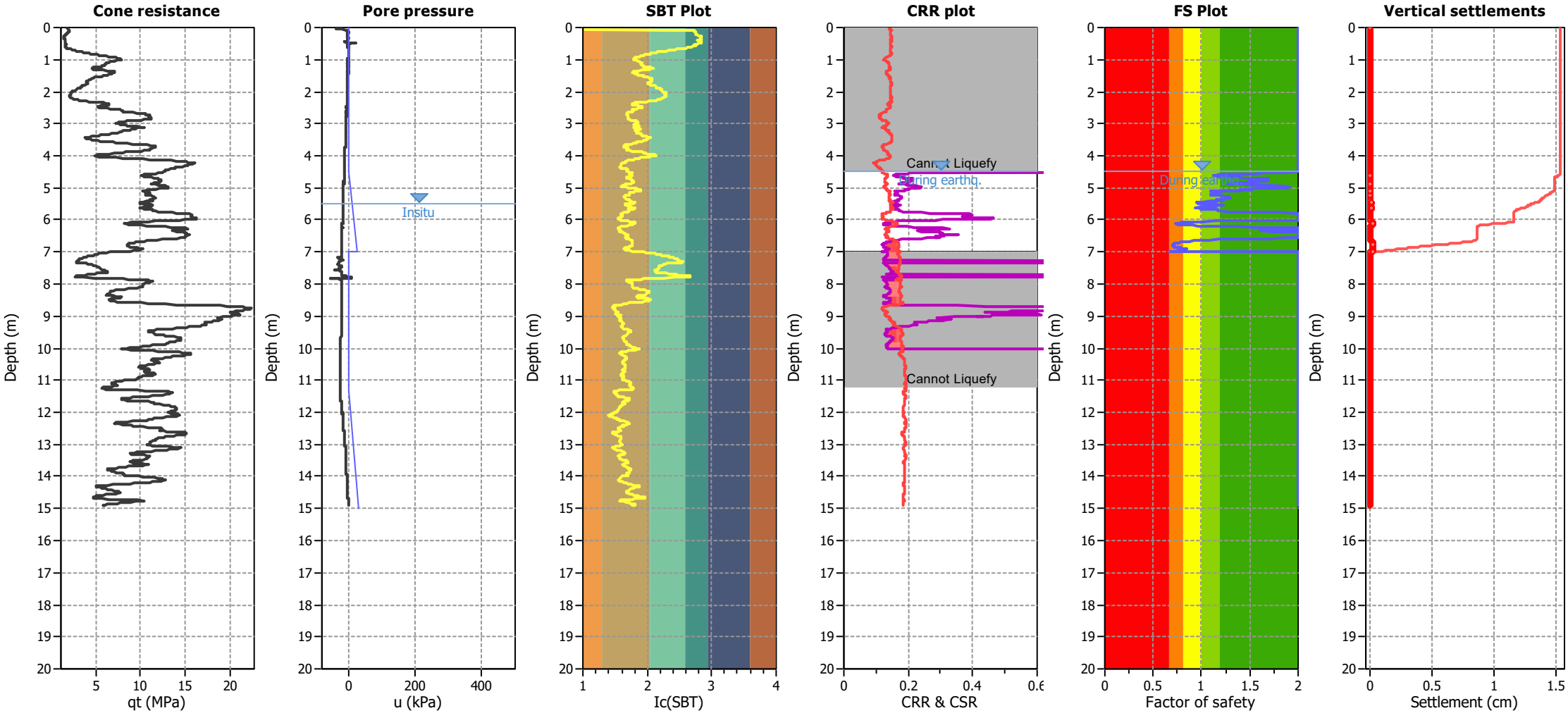


Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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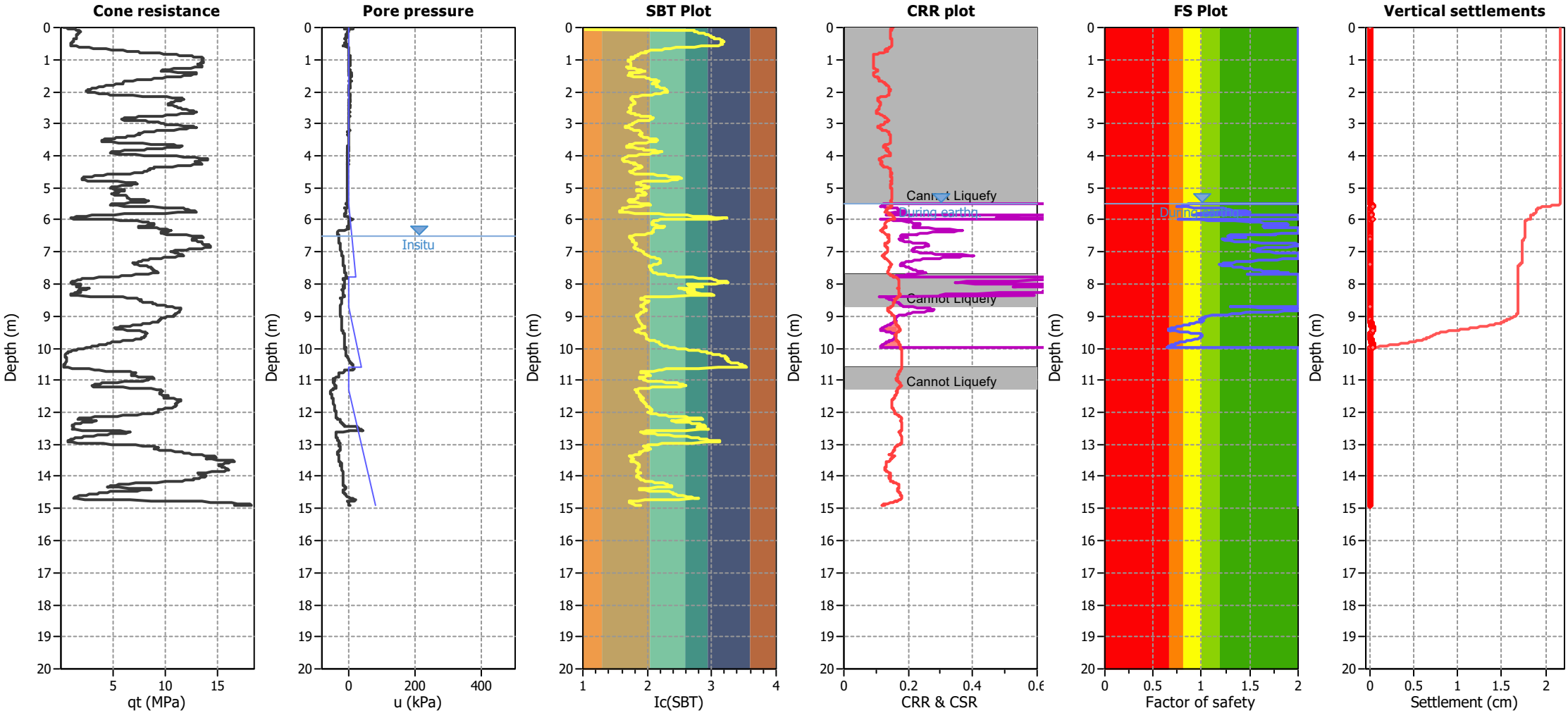
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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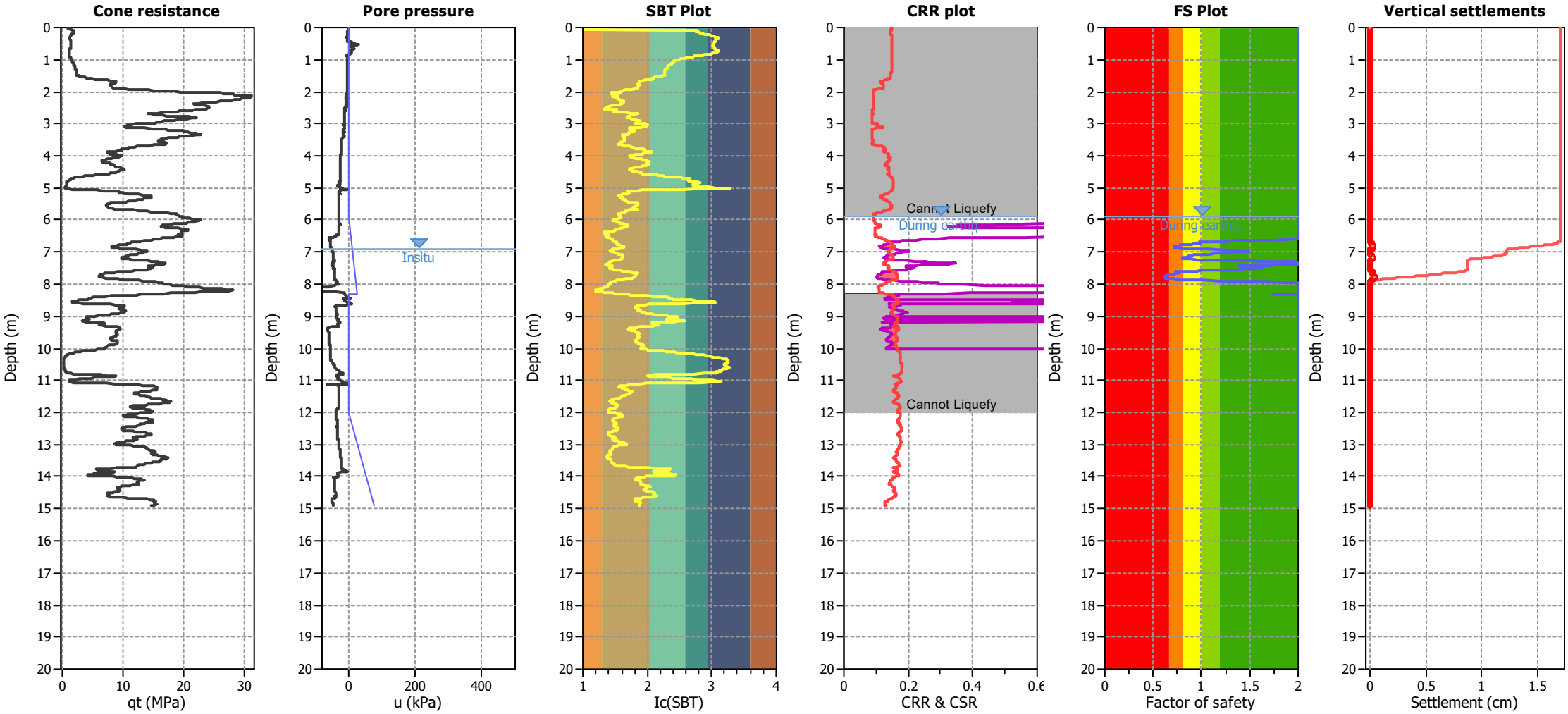
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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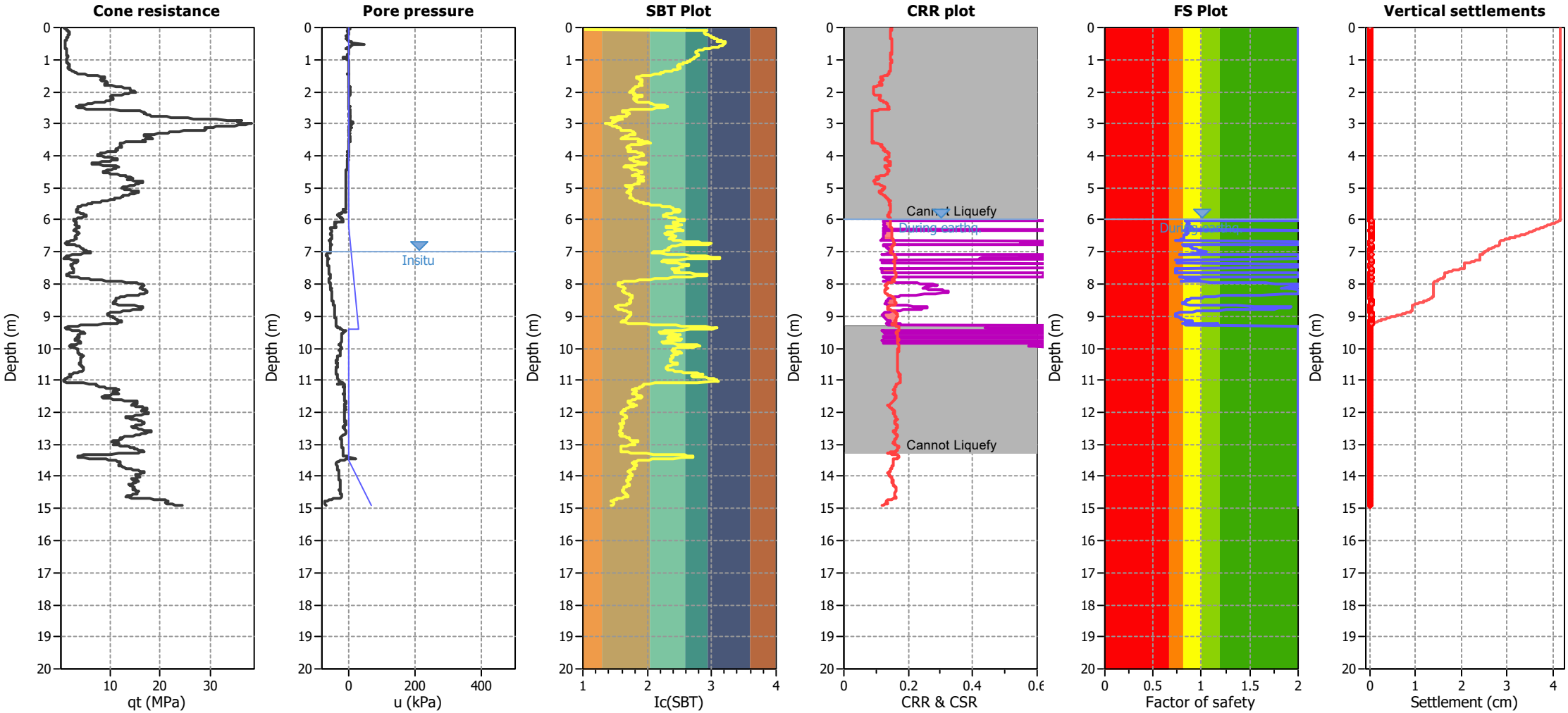
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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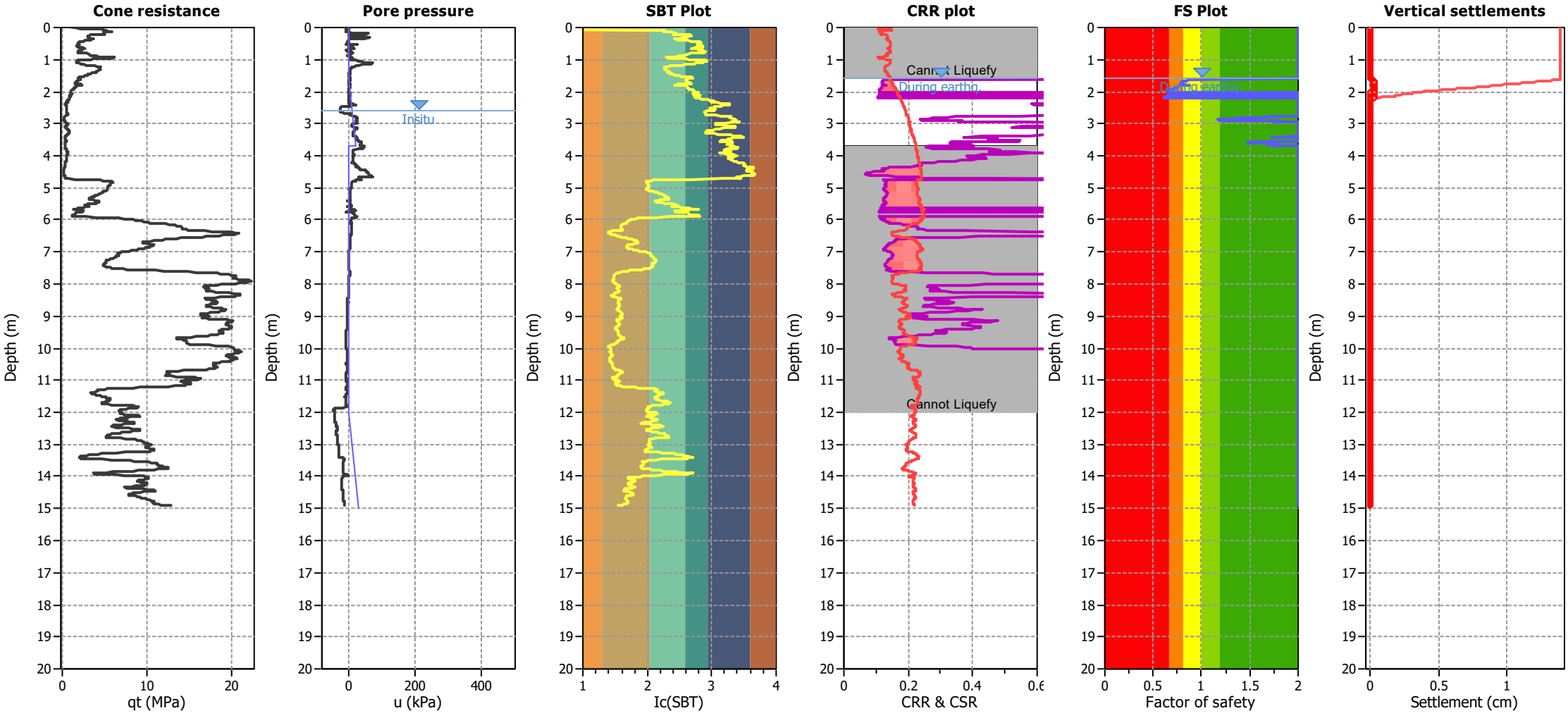
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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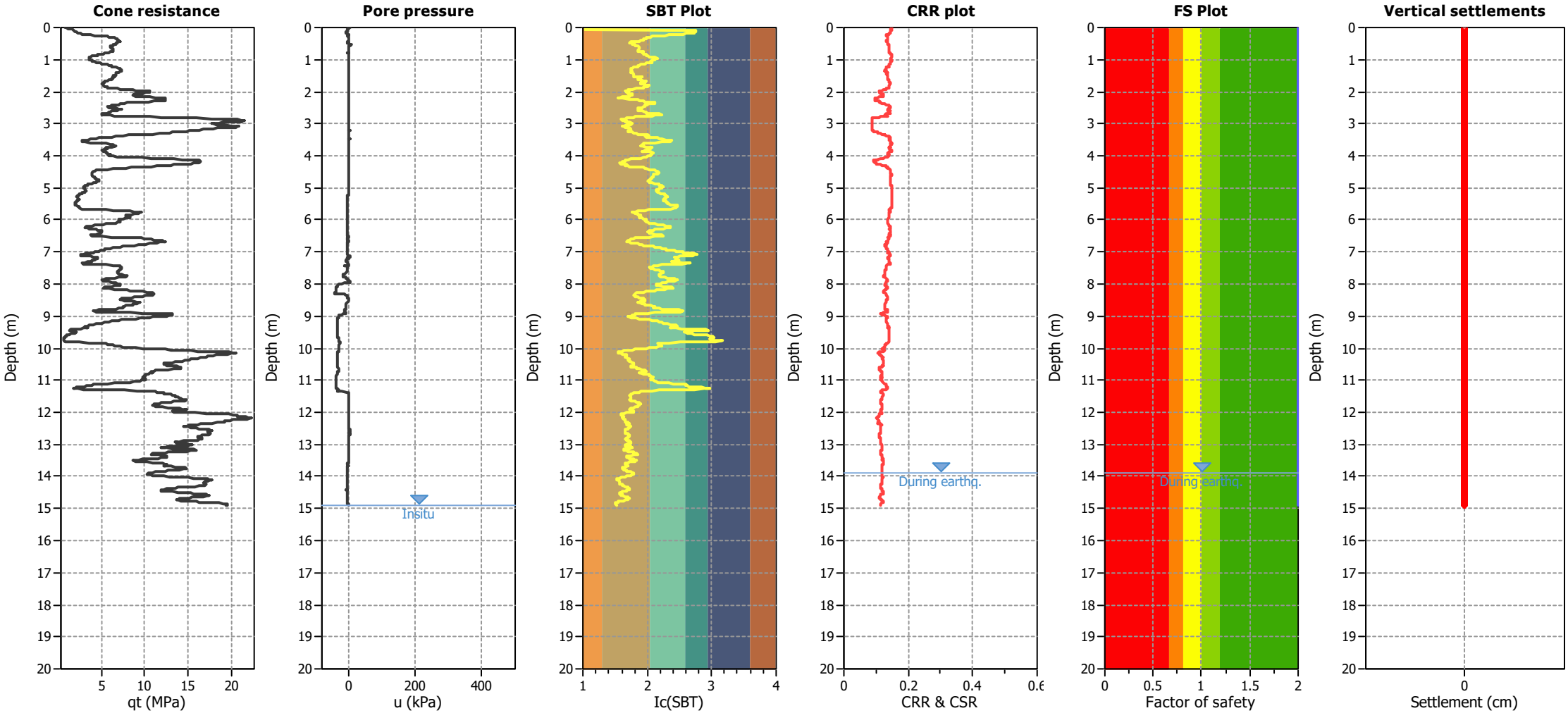
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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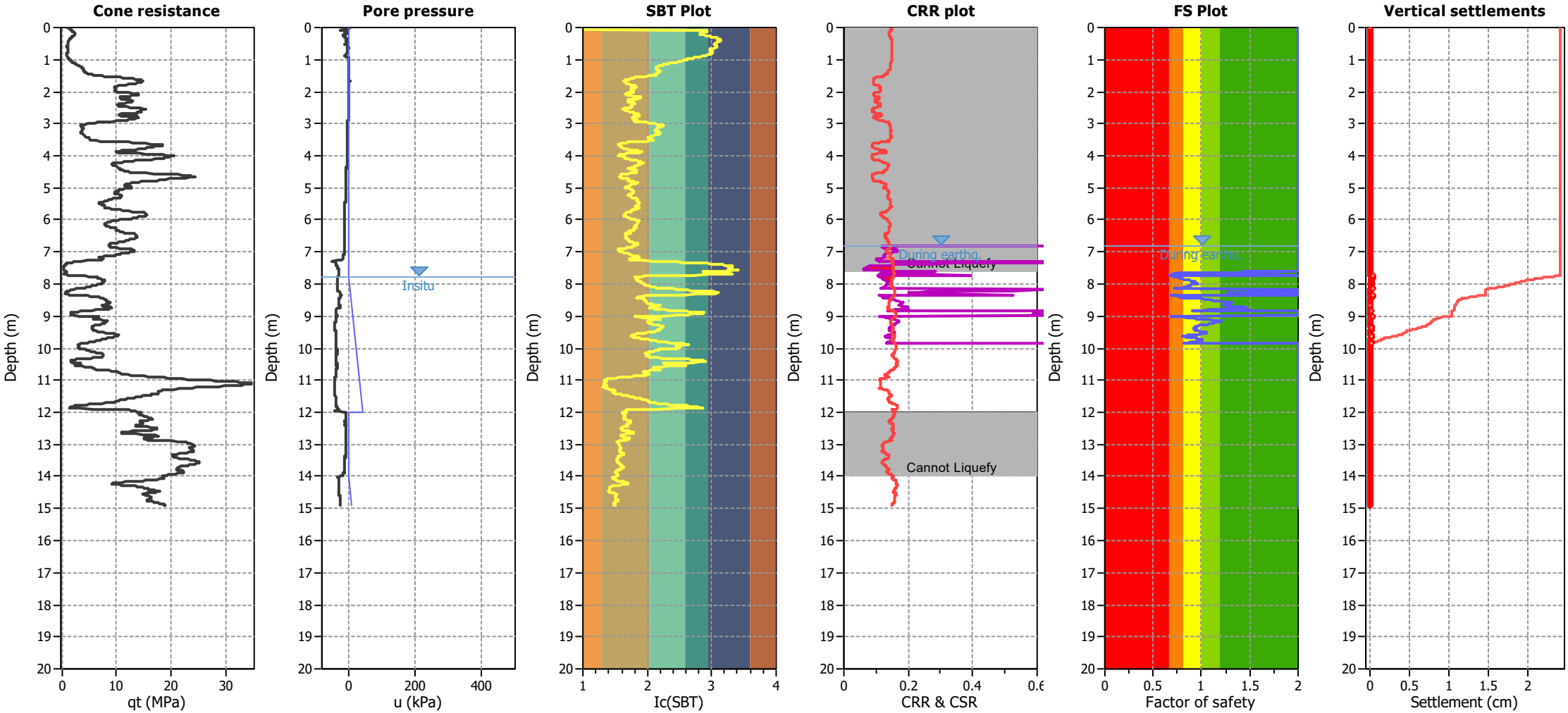
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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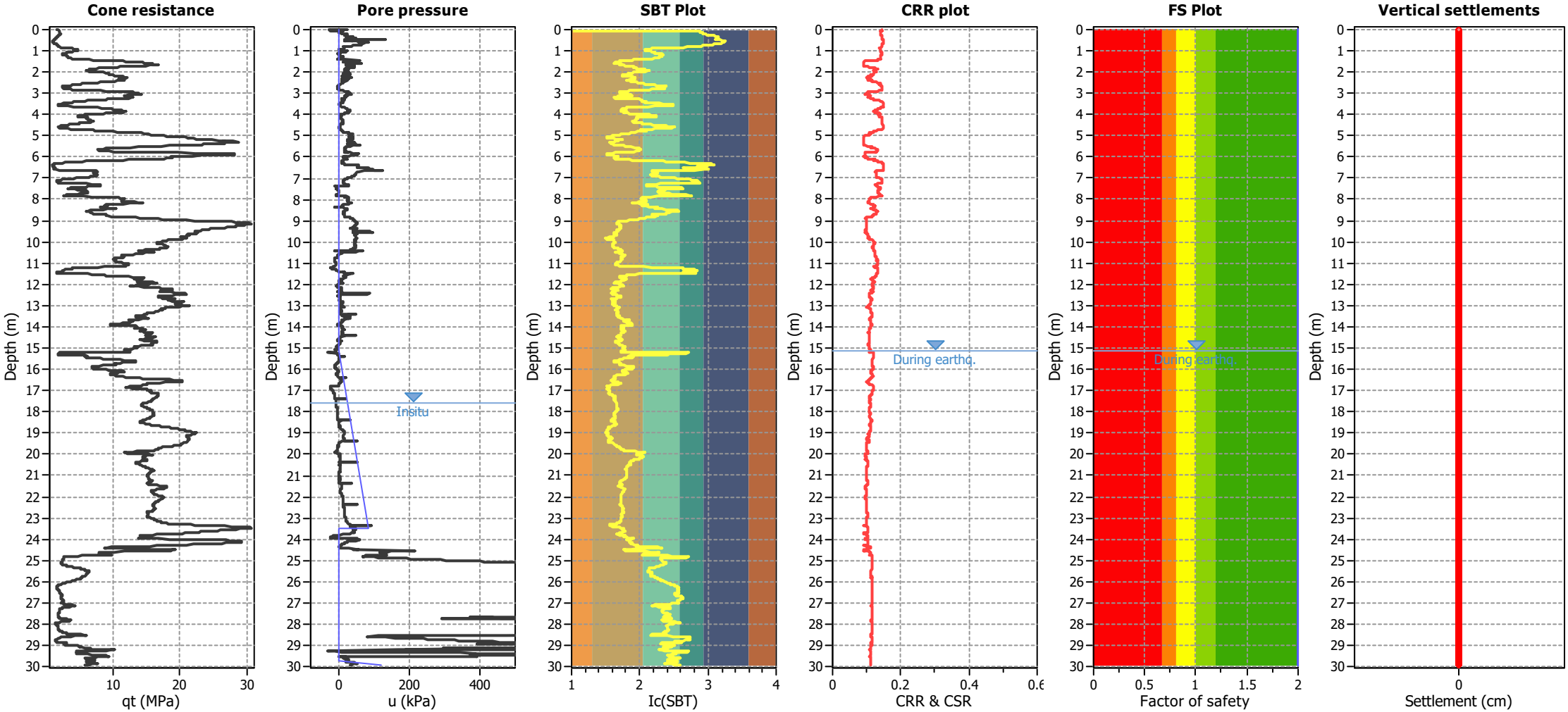
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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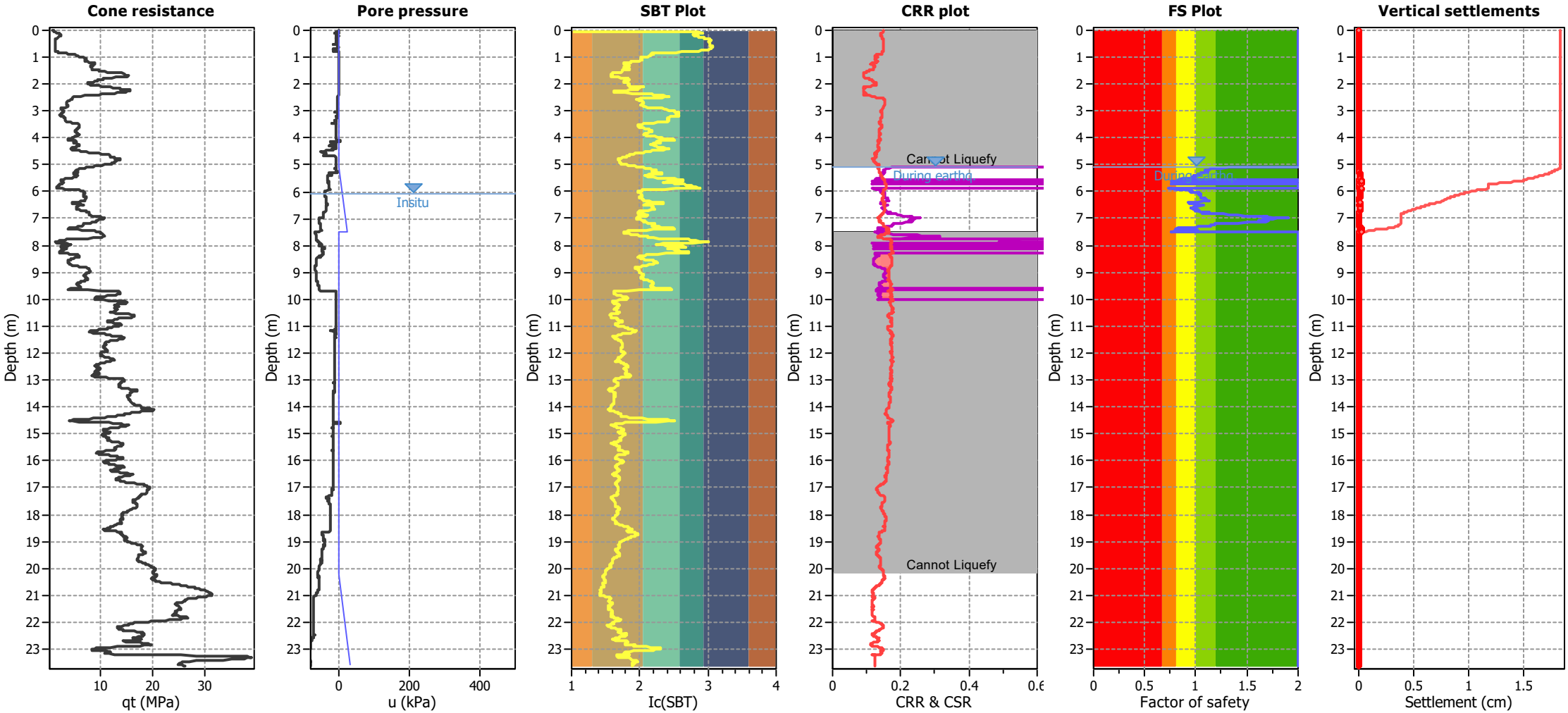
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m

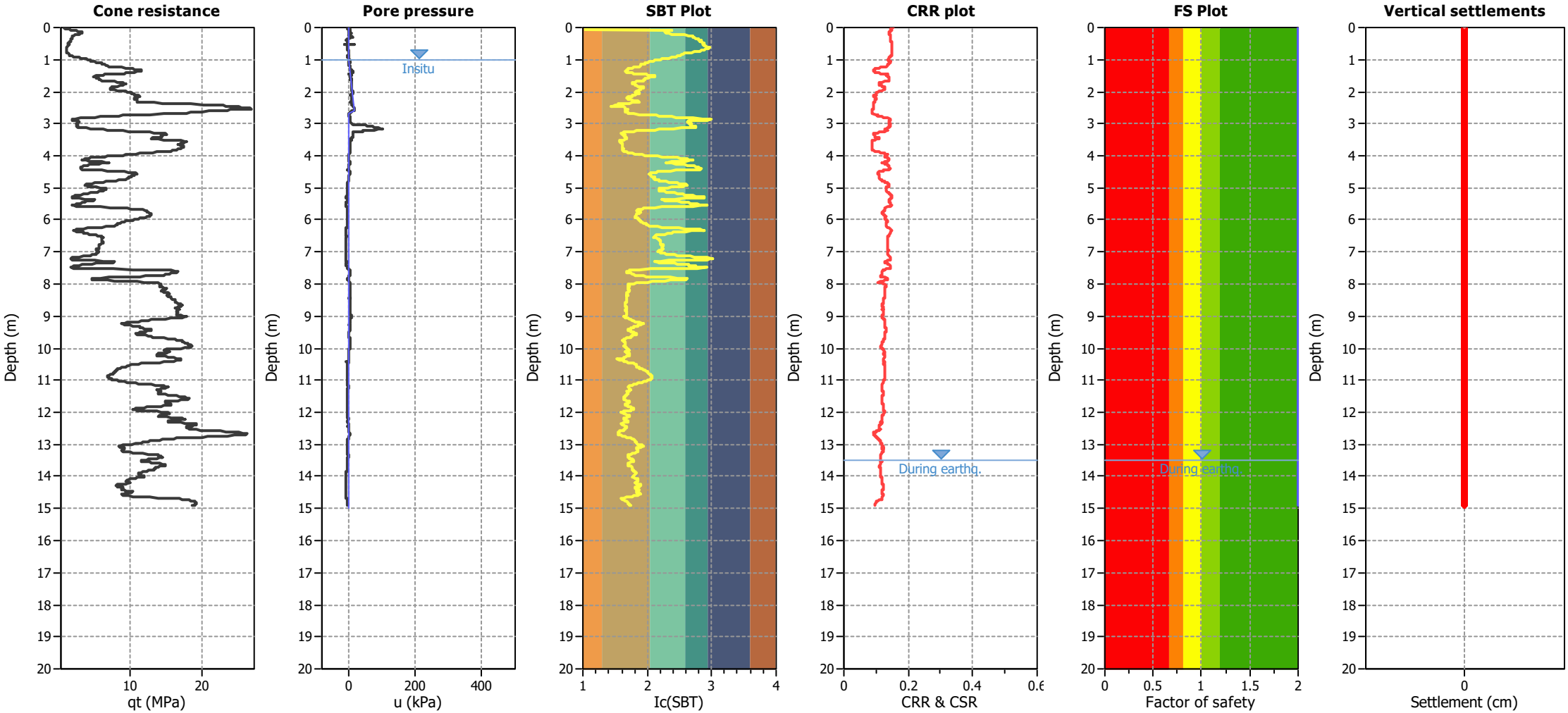


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m

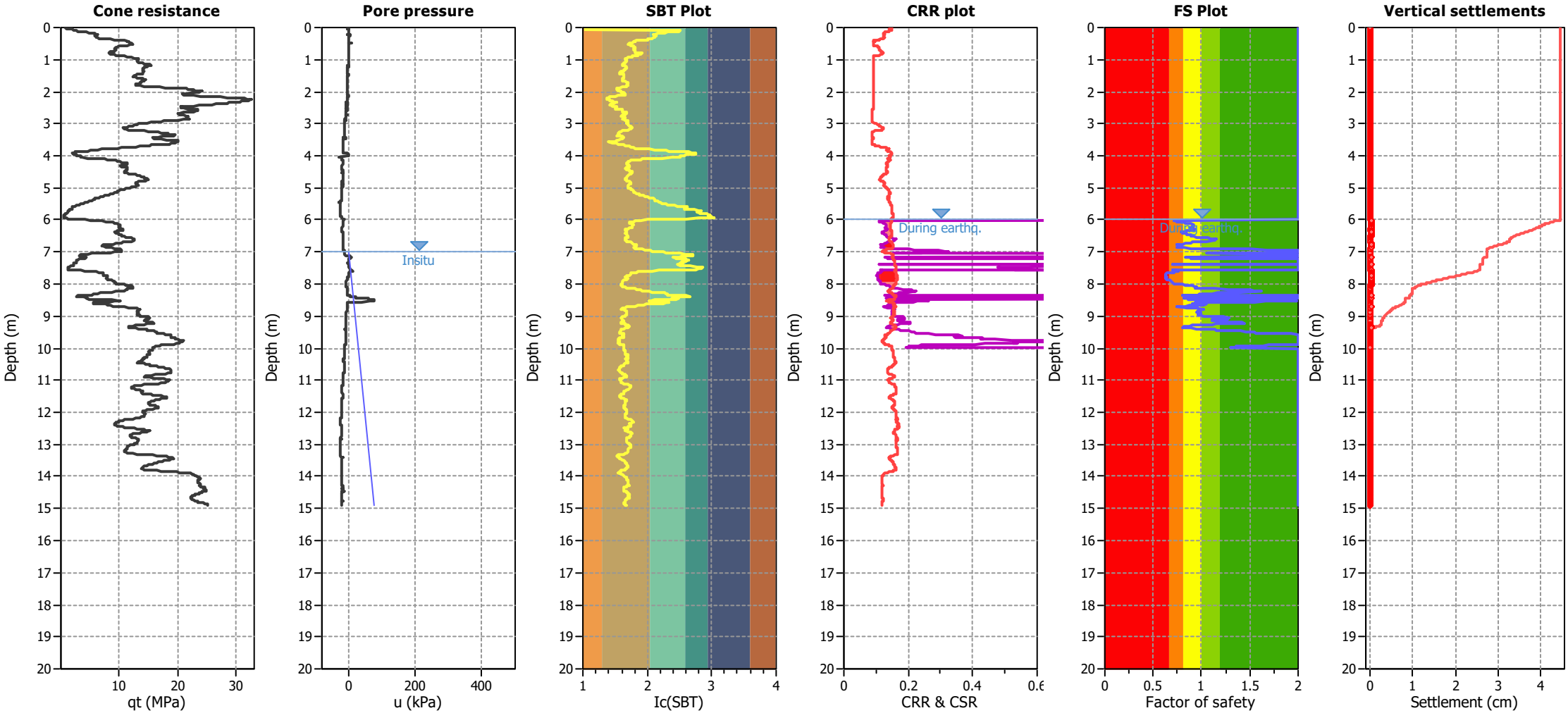


Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m

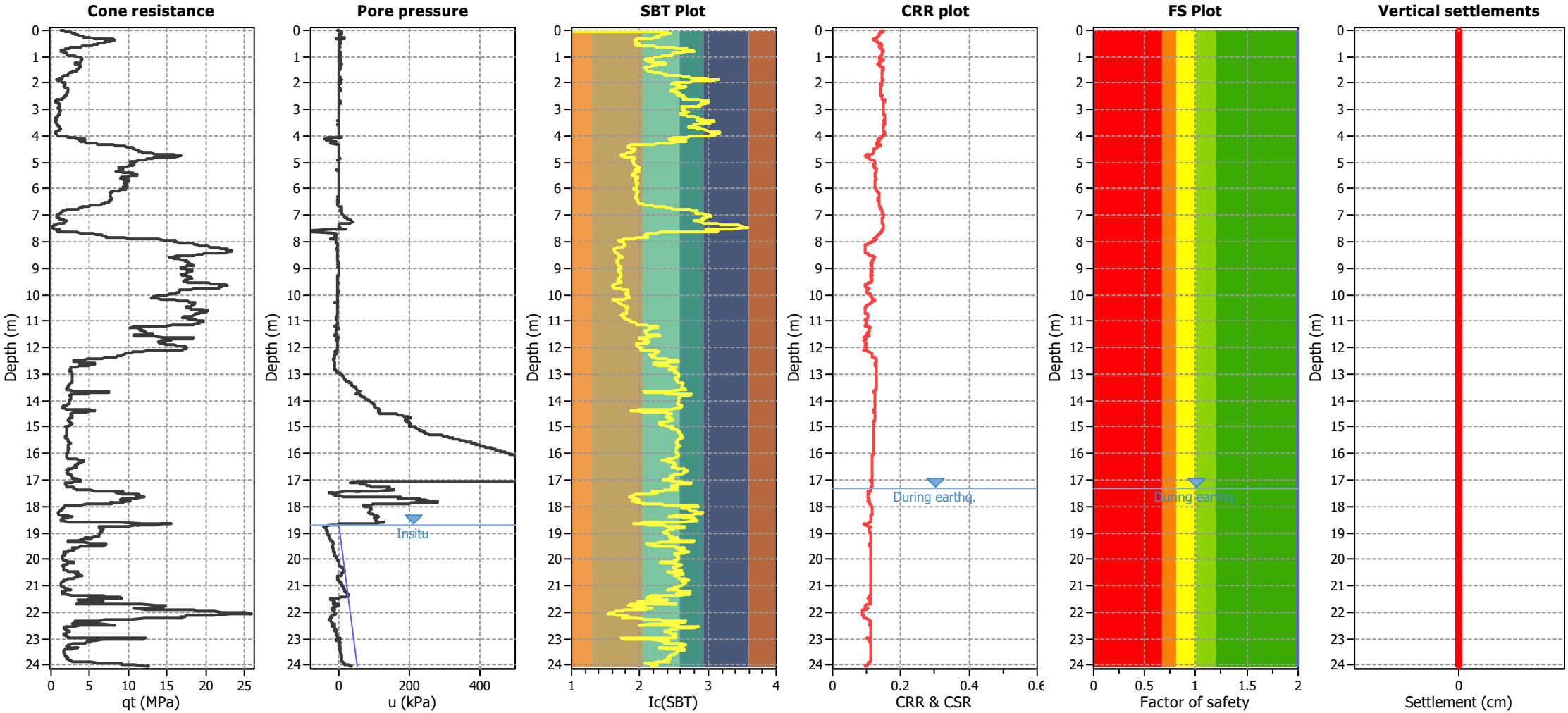


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

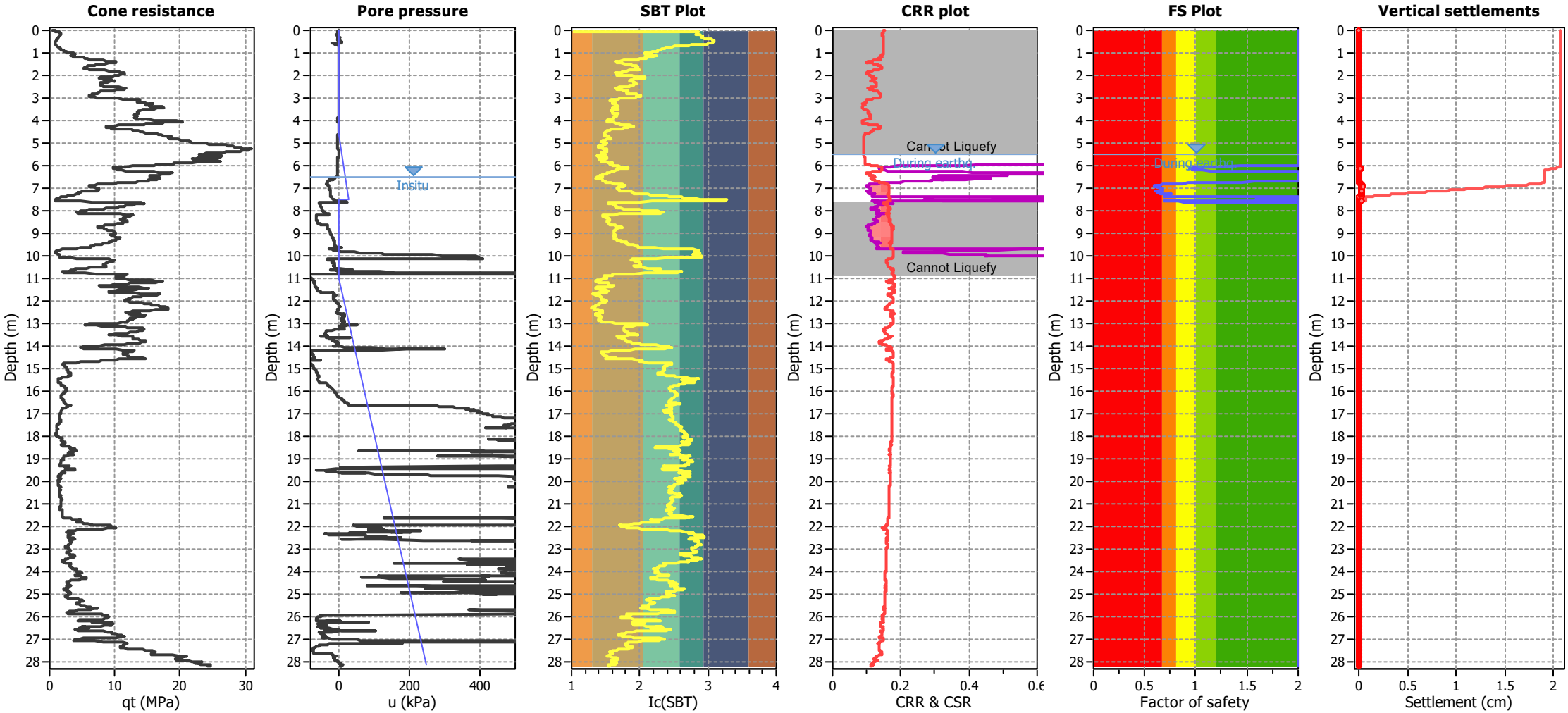


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m

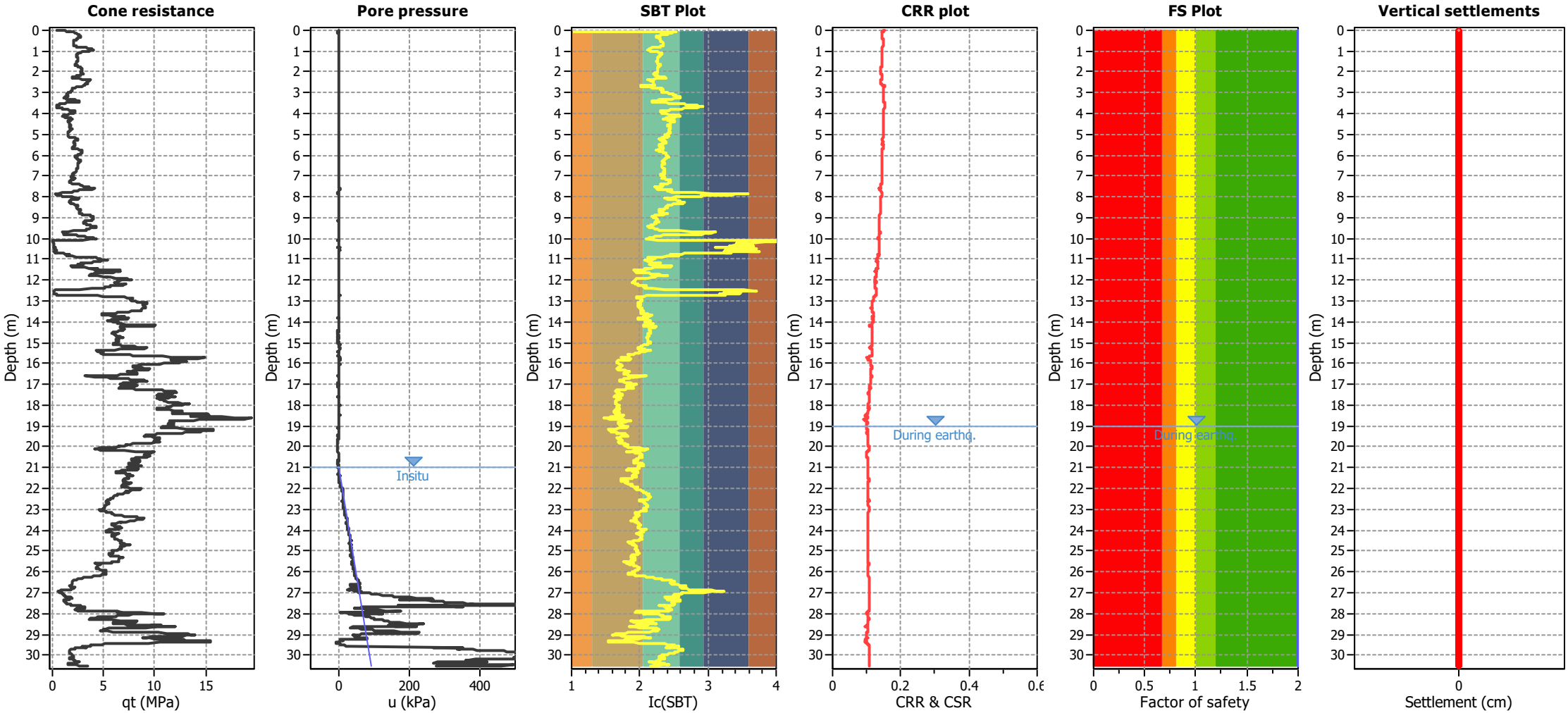


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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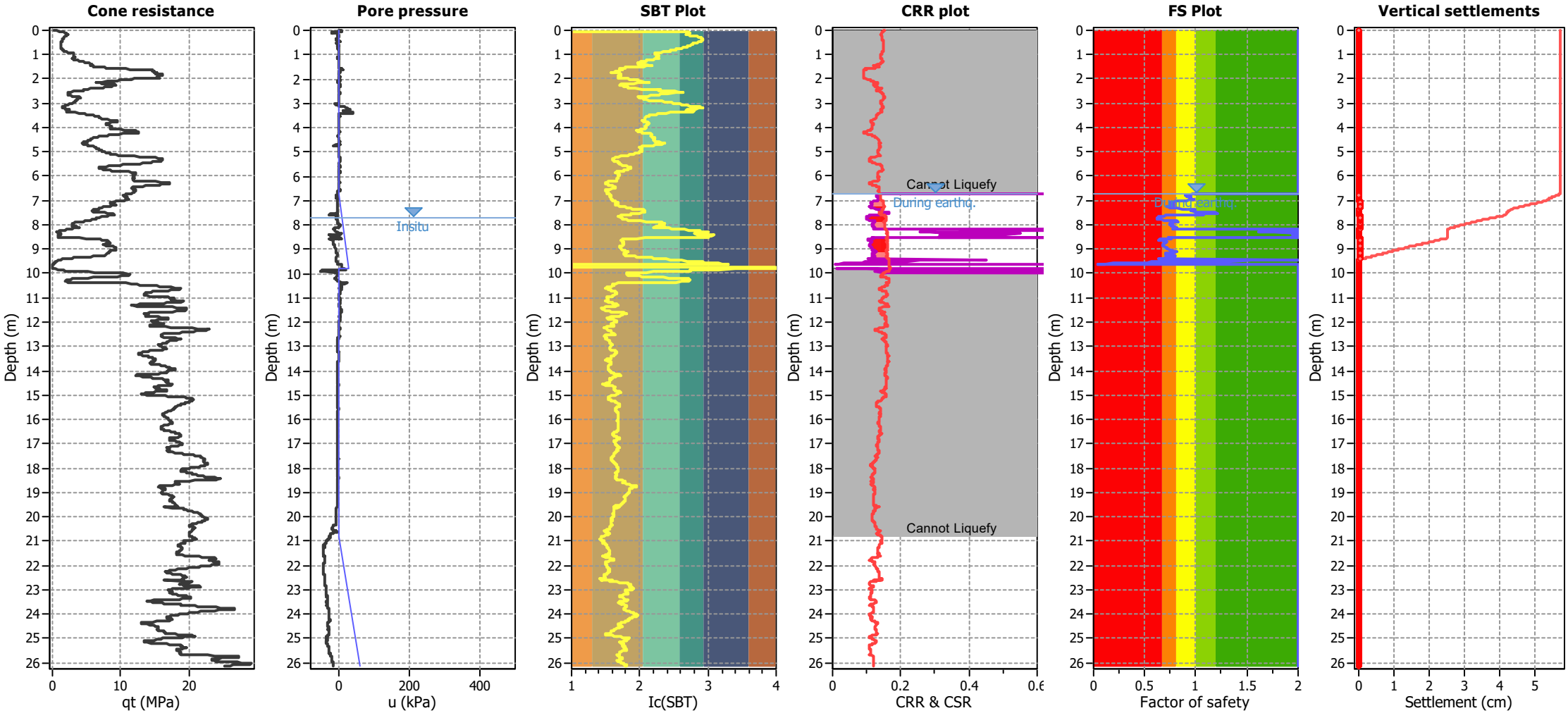
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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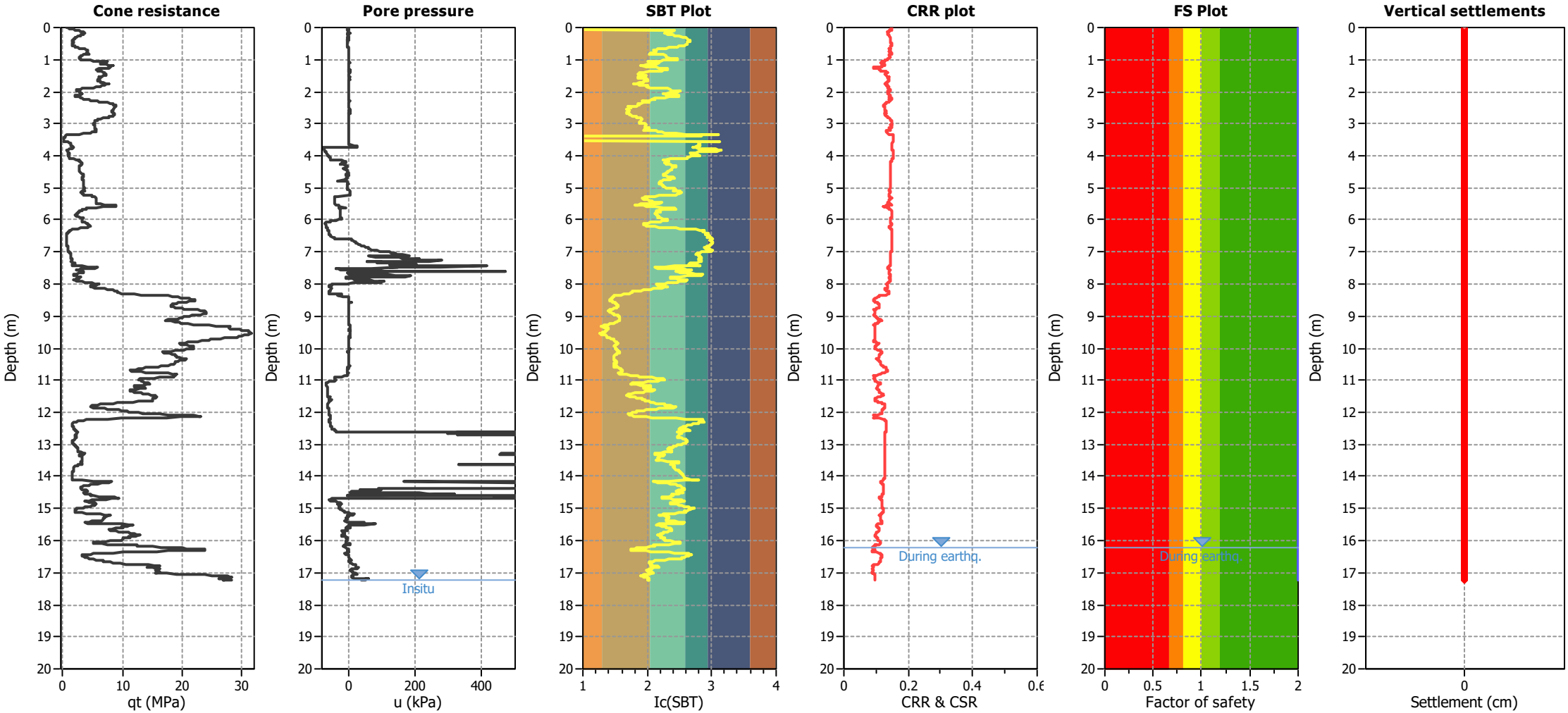
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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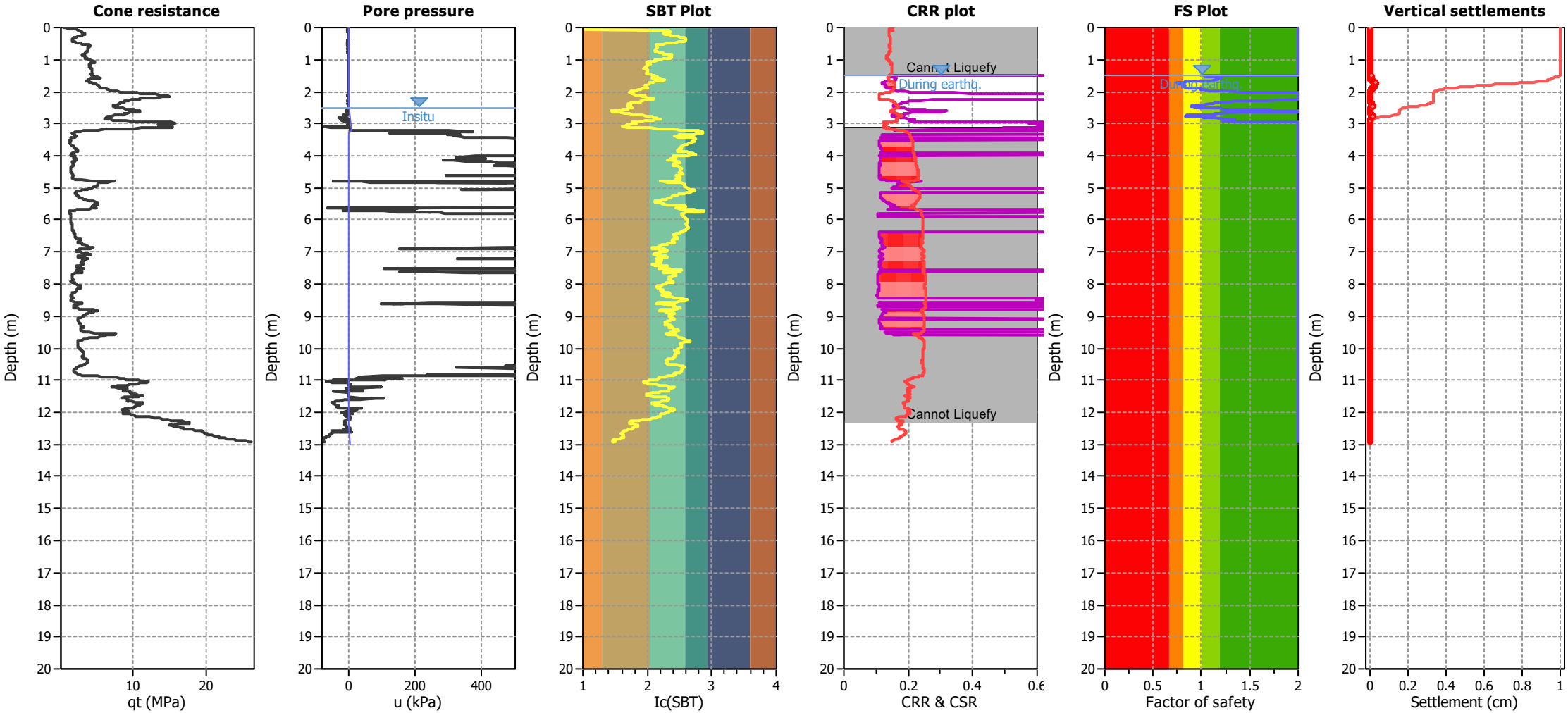
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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APPENDIX J
Slope Stability Analysis

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

River Section

Back Calculation – target FoS =1

Upper Slope

The L-MD sand (TPA) present on the upper slope was isolated and parameters back calculated until a FoS 1.0 was achieved. Based on our experience with these soils a phi of 30° was adopted. Transient elevated groundwater levels/porewater pressures were adopted for the back calculation.

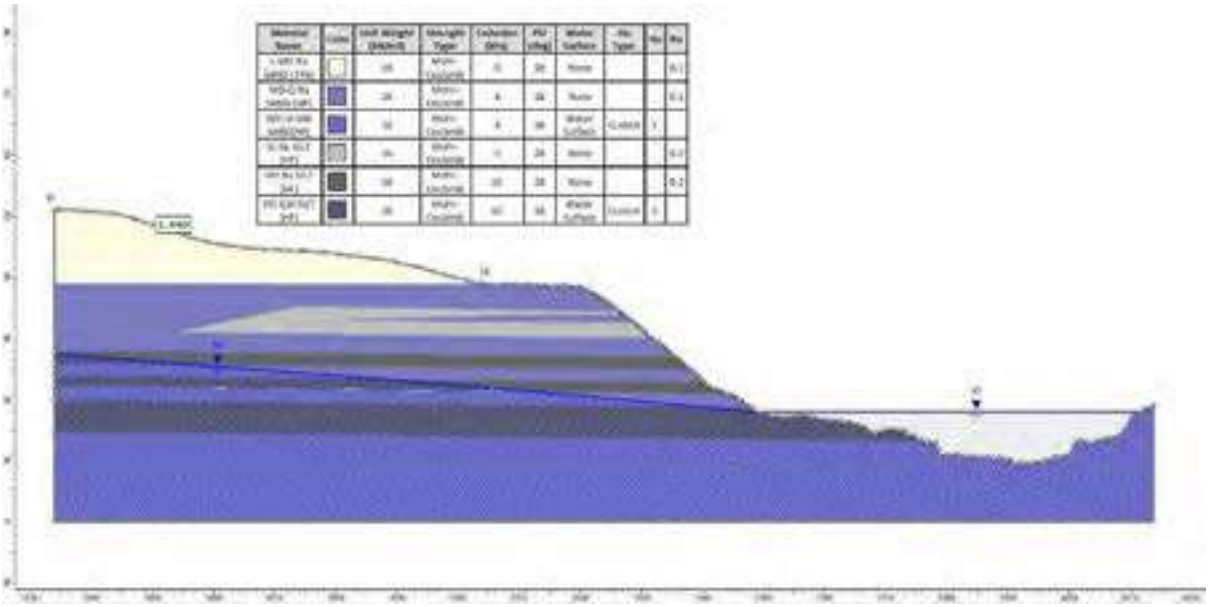


Figure 1 Upper Slope FoS Back Analysis for River Section

Lower Slope

Interbedded MD-D sand (HF), St and VSt silts of the lower slope were then back calculated. The soil parameters were based on our experience of the HF soils and the were altered until a FoS of close to 1 was achieved. Transient porewater conditions were adopted for the back calculation.

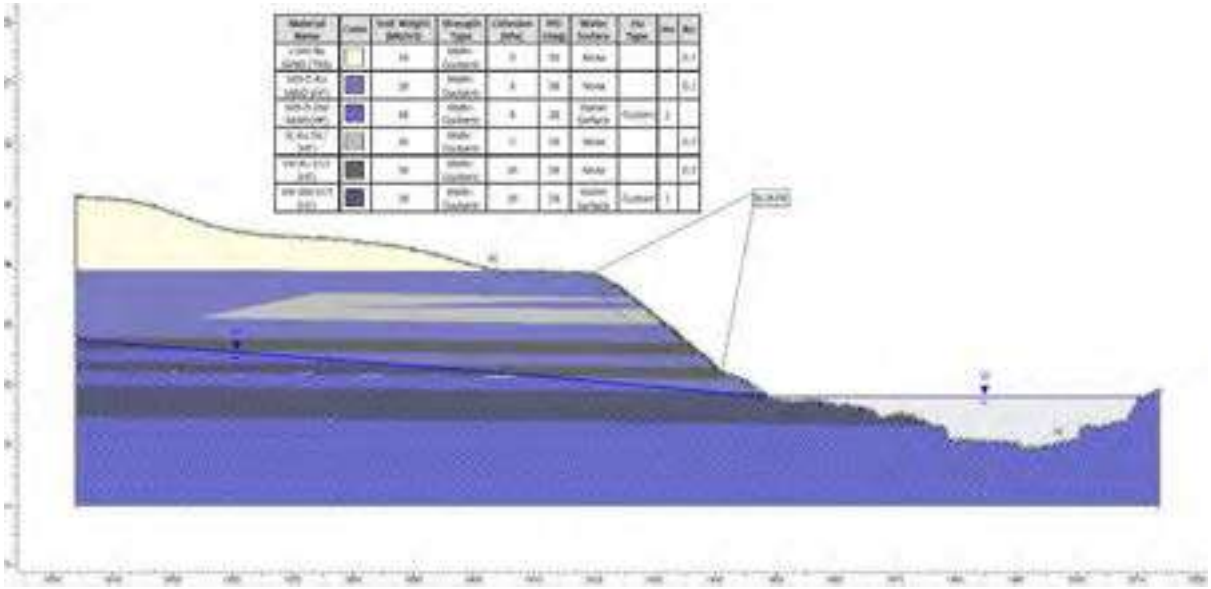


Figure 2 Lower Slope Analysis of River Section

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Overall Slope

The overall slope FoS was then assessed and achieved a FoS of 1.0.

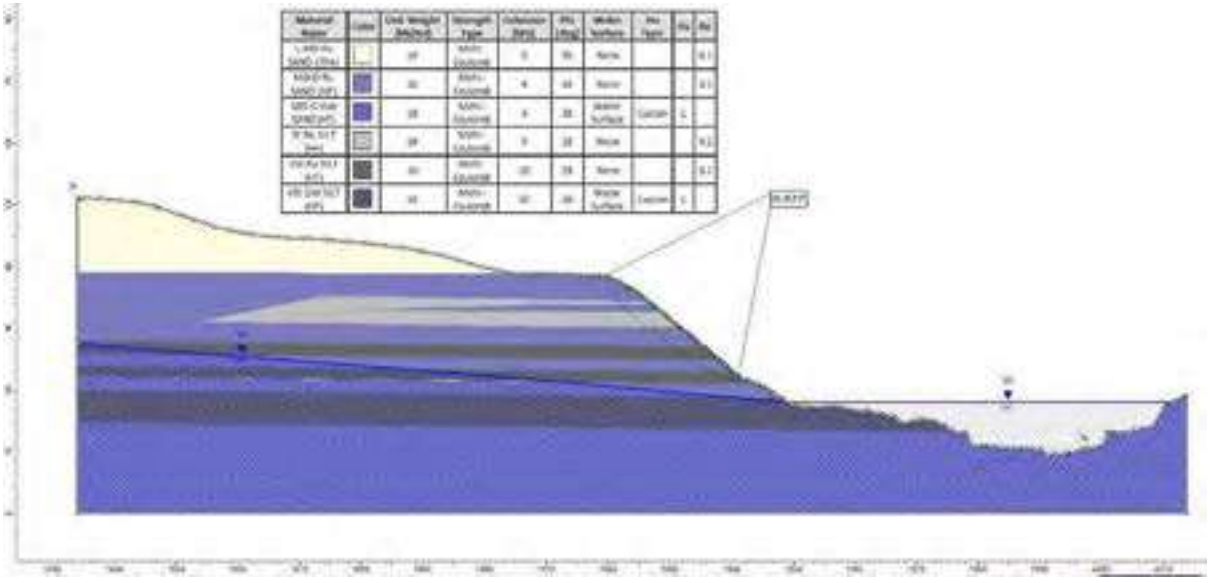


Figure 3 Overall Slope Analysis of River Section

Prevailing Pore Pressures, target FoS 1.5

A FoS of 1.5 is present approximately 20.0m back from the crest of the slope.

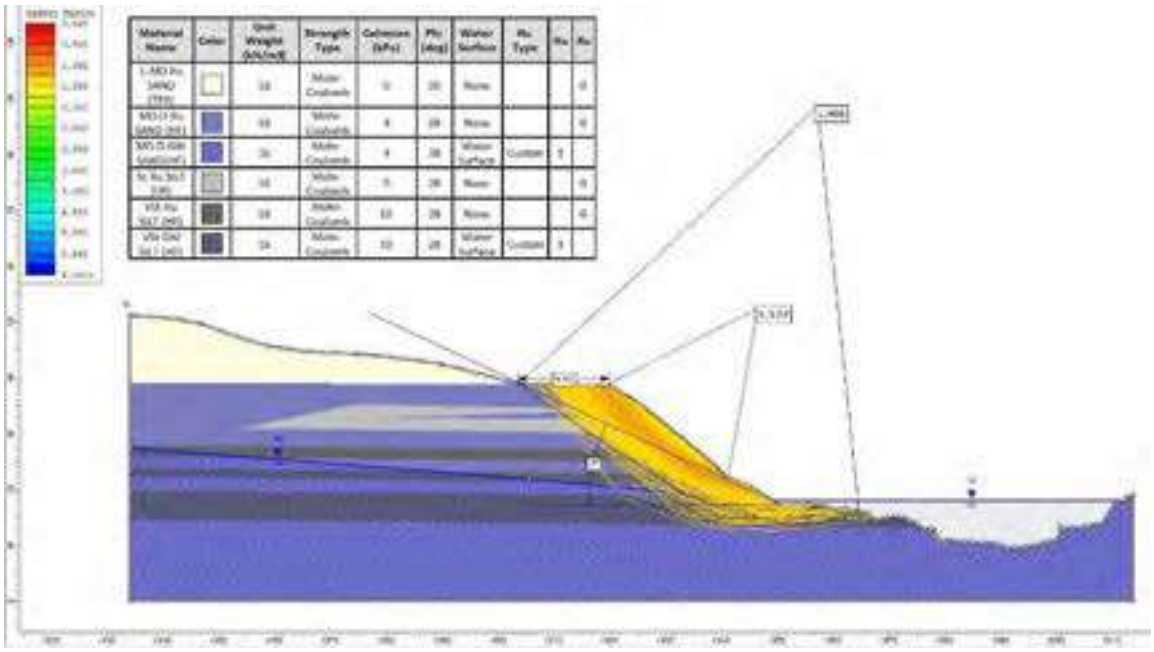


Figure 4 Prevailing Pore Water Conditions River Section

Transient Pore Pressures, target FoS = 1.2

FoS of 1.2 was achieved approximately 12.0m back from the crest of the slope.

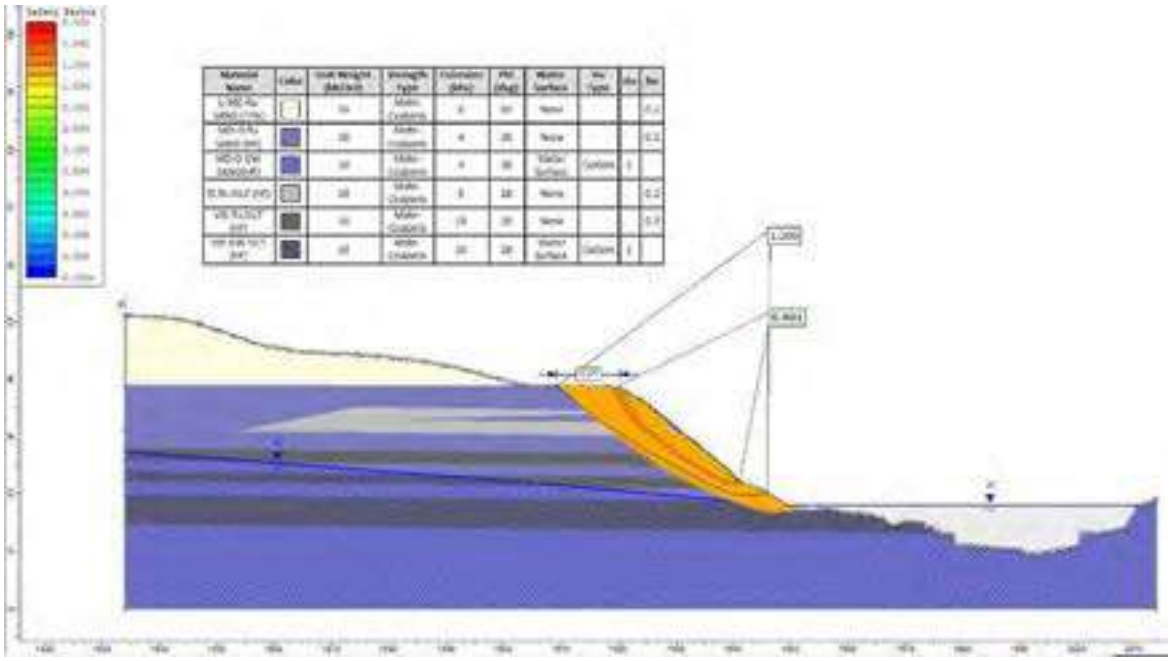


Figure 5 Transient Pore Water Conditions River Section

Seismic ULS Scenario PGA 0.25 – Prevailing conditions - target FoS = 1.0

Prevailing groundwater conditions were used for the ULS seismic analyses.

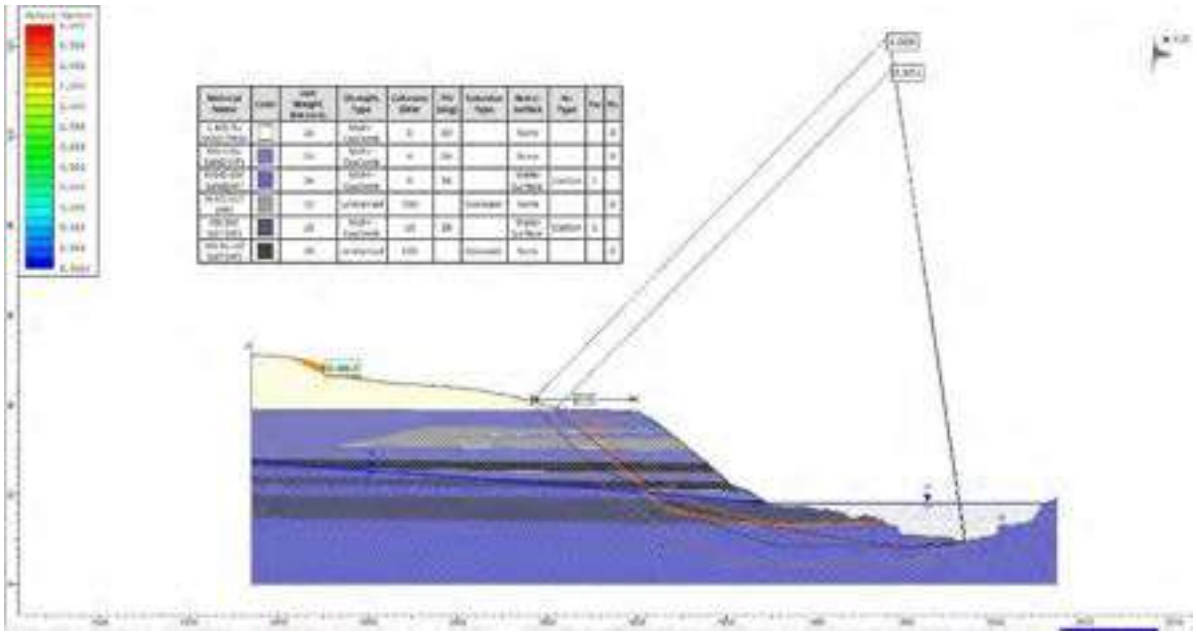


Figure 6 Seismic ULS Scenario River Section

Seismic Yield Scenario PGA 0.22 – Prevailing Pore Water Pressure FoS = 1.0

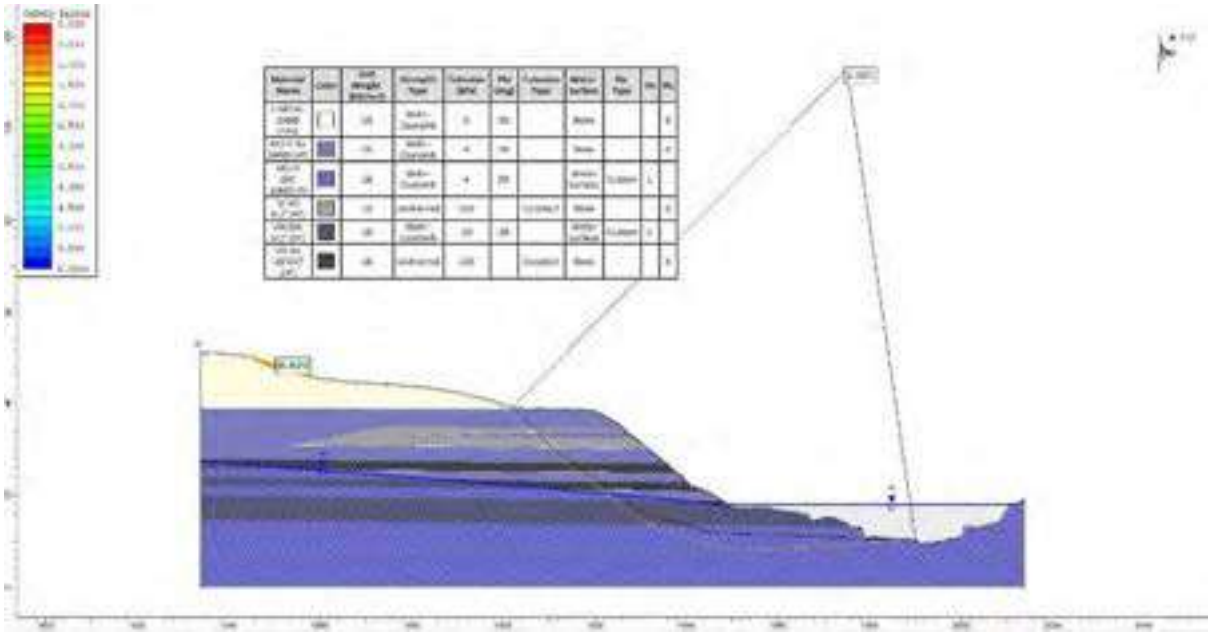


Figure 7 Seismic Yield Scenario River Section

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Gully Section

Back analysis – target FoS = 1

Upper Slope

The upper sands were modelled with a phi of 33° which is the angle of repose and an apparent cohesion of 1kPa. The analysis was limited to the upper profile (Hinuera Formation) to force a failure through the upper material. FoS is 1.3.

There is evidence of slope failure in the upper sand profile potentially caused by perched groundwater above the silt layers. A non-linear failure circle was modelled to represent the observed slope behaviour.

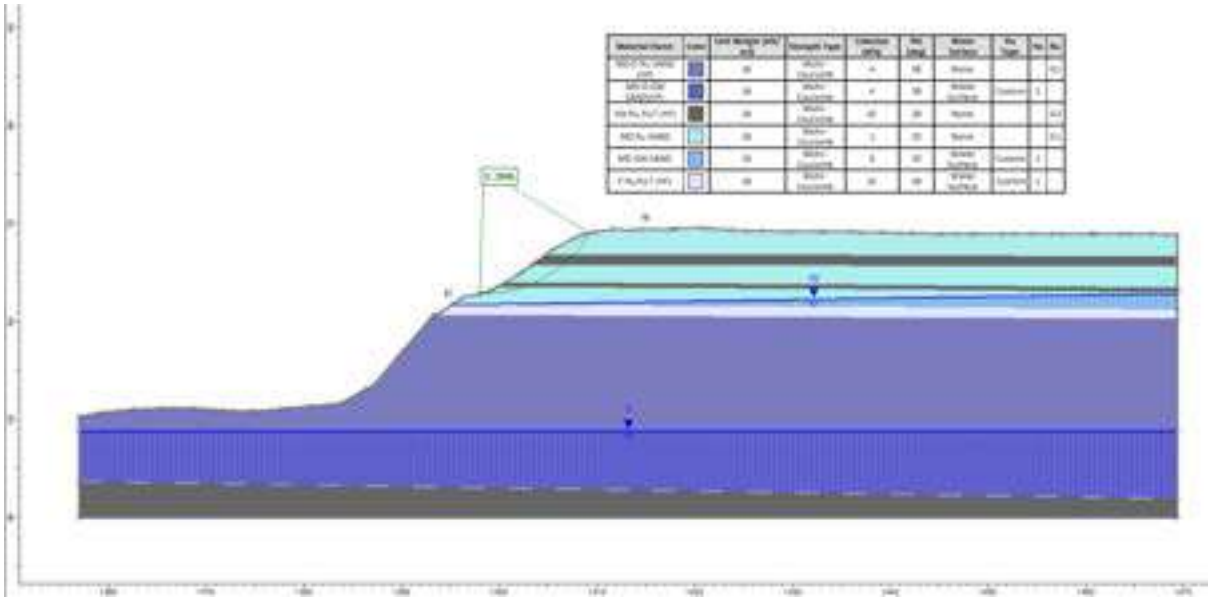


Figure 8 Upper Slope Analysis of Gully Section

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Lower Slope

The lower sands were modelled with a phi of 38° which was back calculated from the river section to the north with an apparent cohesion of 4kPa.

The lower slope is vegetated with mature vegetation suggesting a period of long term stability.

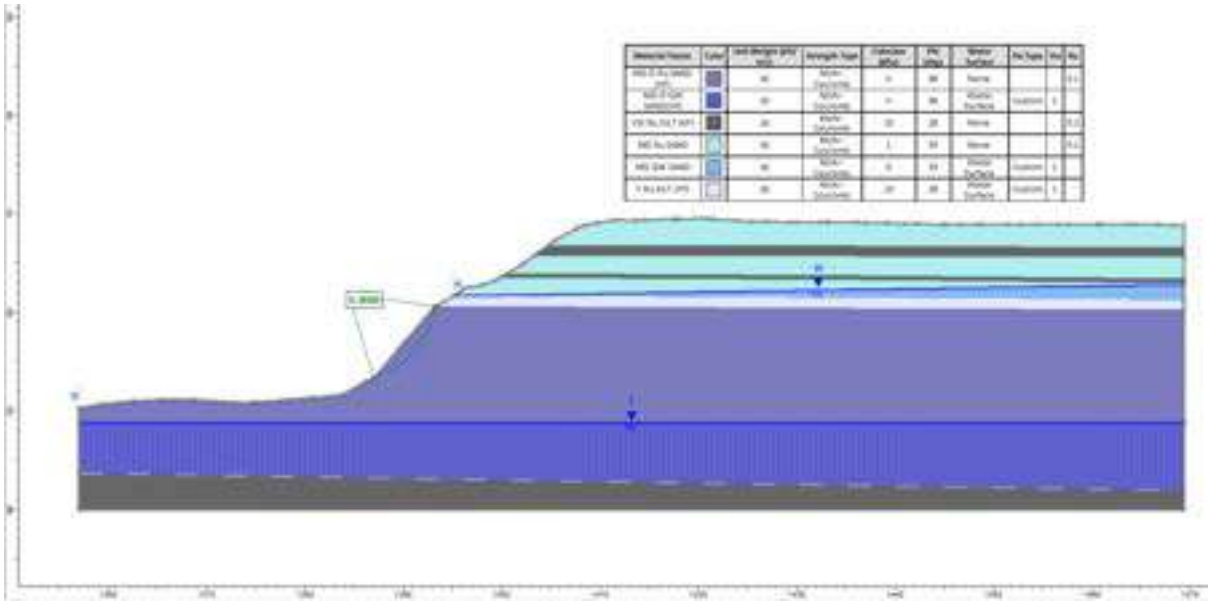


Figure 9 Lower Slope Analysis of Gully Section

Overall Slope

Elevated pore pressures were modelled in the sand and silt material. A perched groundwater was encountered above the silt layer approximately 7.5m bgl (meters below ground level). The lower groundwater was inferred from groundwater strikes to the north in MH04, the river level and groundwater strike to the south in MH01.

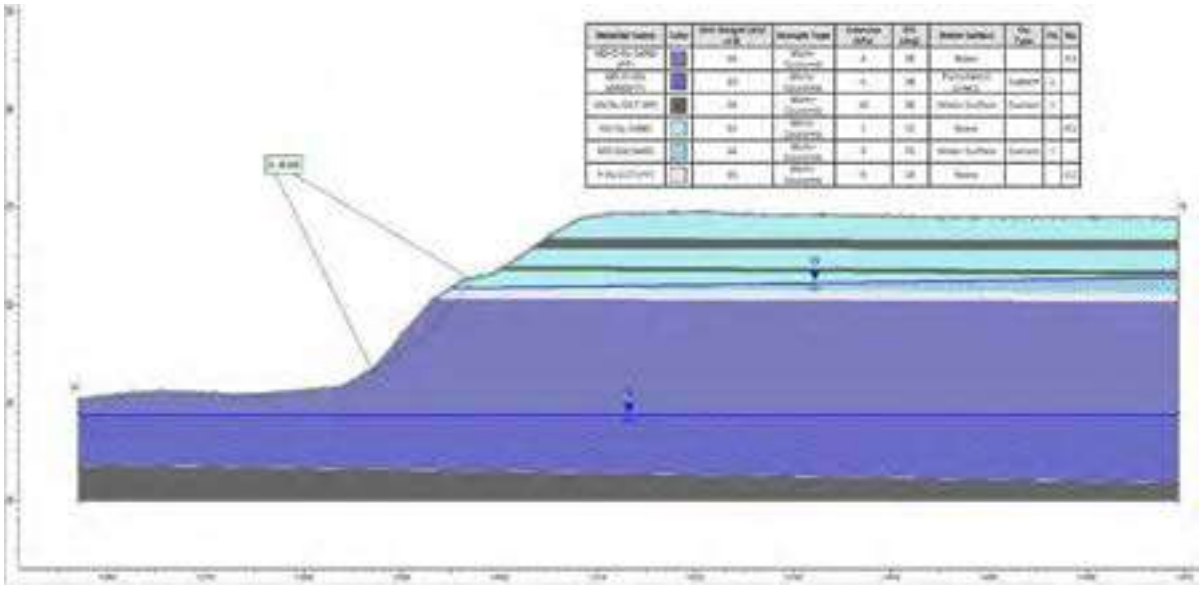


Figure 10 Overall Factor of Safety Back Analysis of Gully Section

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Prevailing Pore Pressures, target FoS 1.5

A FoS of 1.5 is achieved approximately 5.0m back from the crest of the slope.

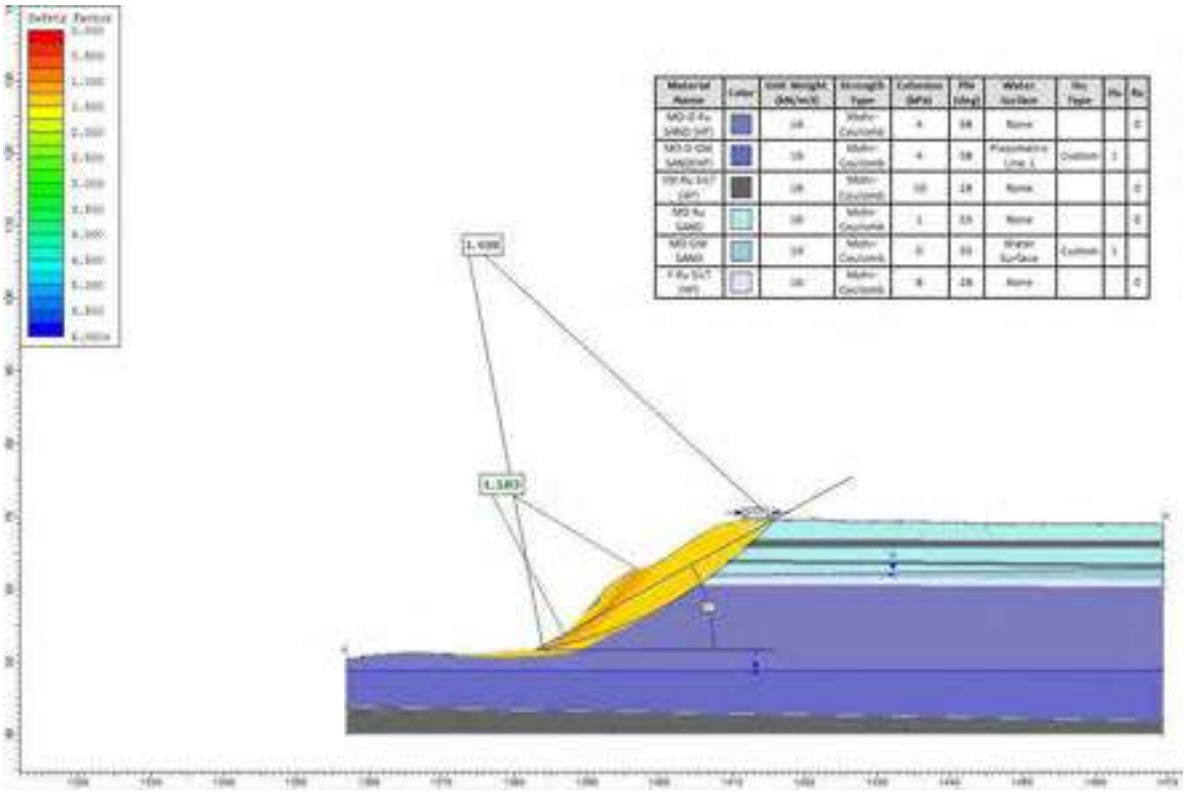


Figure 11 Prevailing Pore Water Conditions Gully Section

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

Transient Pore Pressure, target FoS =1.2

A FoS of 1.2 was achieved approximately 2.0m back from the crest of the slope.

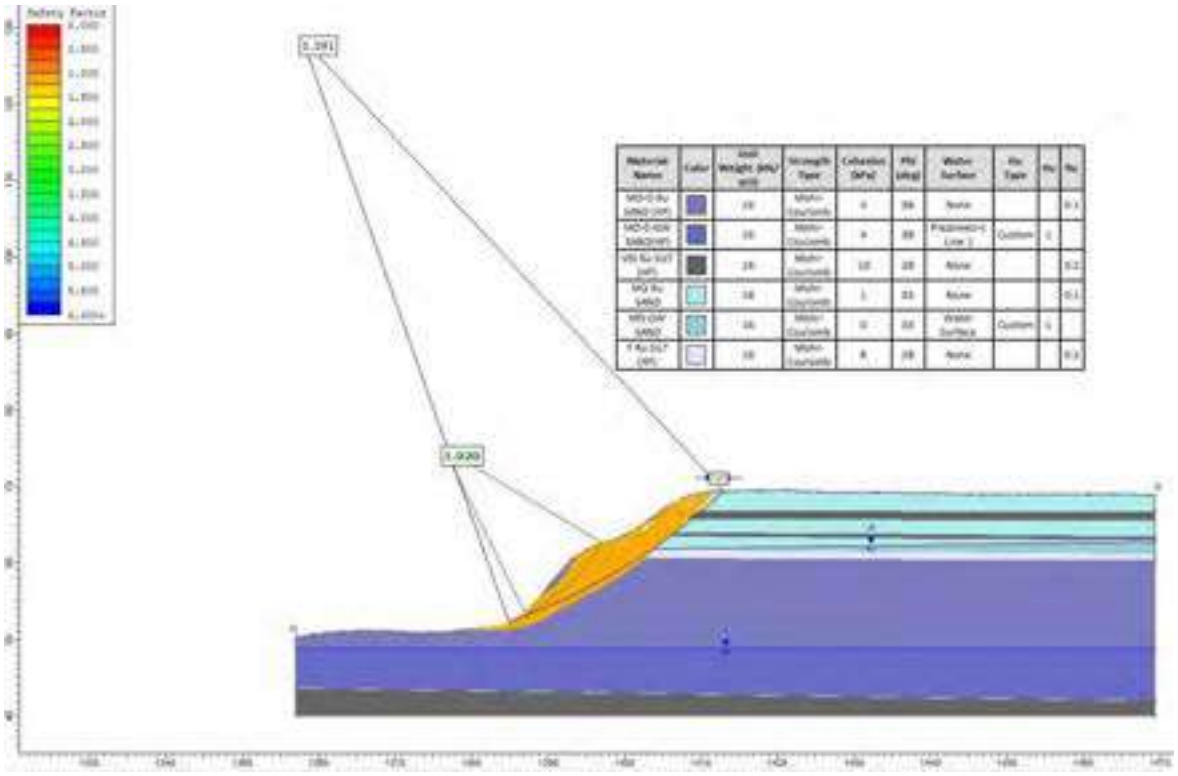


Figure 12 Transient Pore Water Conditions Gully Section

Seismic ULS Scenario PGA 0.25 – Prevailing conditions Target minimum FoS = 1.0

Prevailing groundwater conditions were used for the ULS seismic analyses.

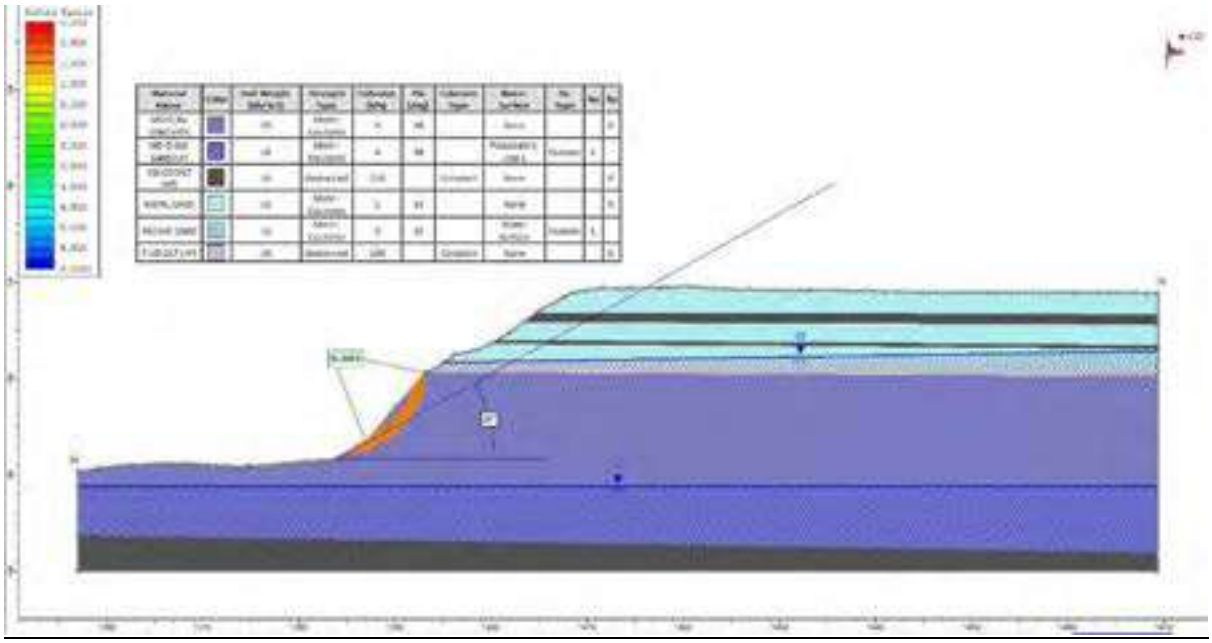


Figure 13 Seismic ULS Scenario Gully Section

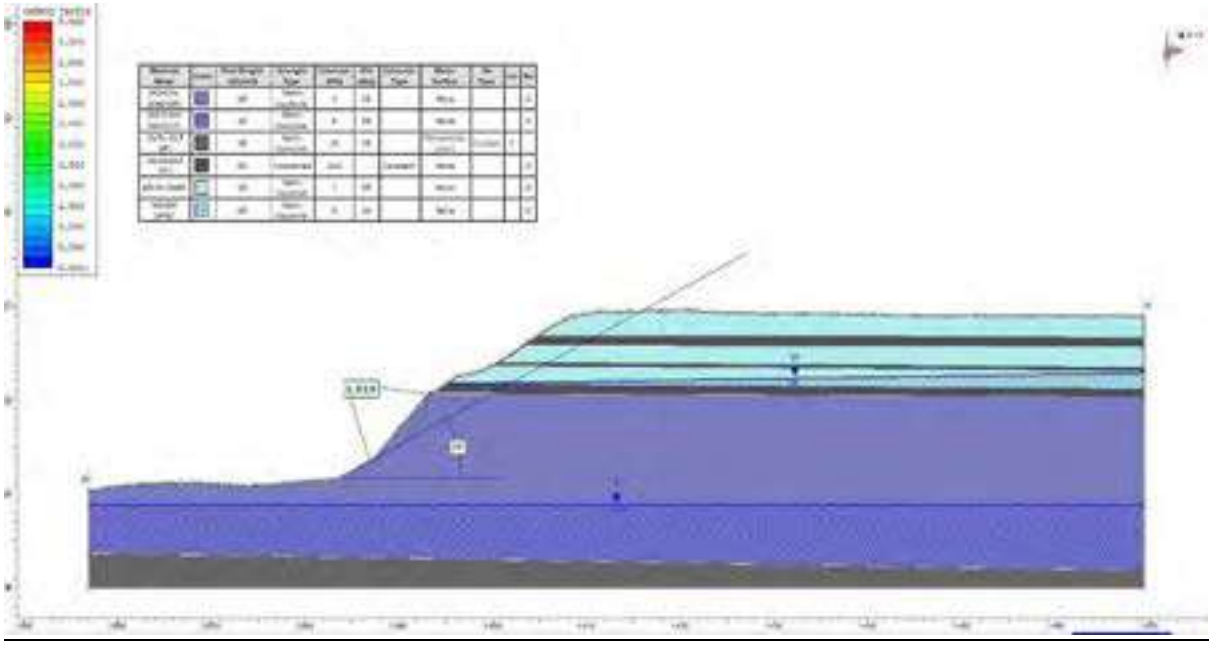
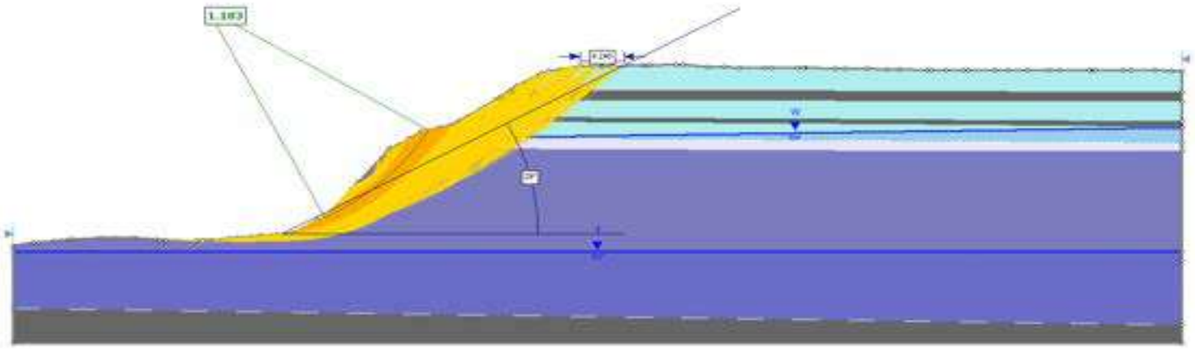
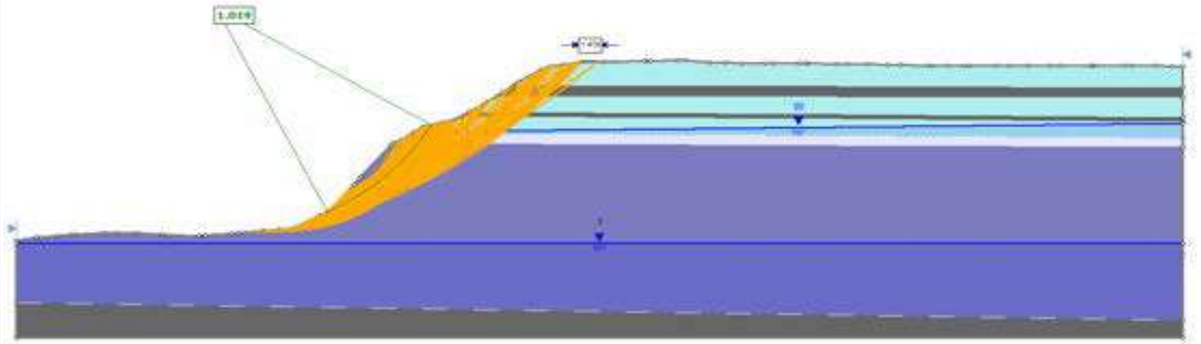


Figure 14 Seismic Yield Scenario Gully Section



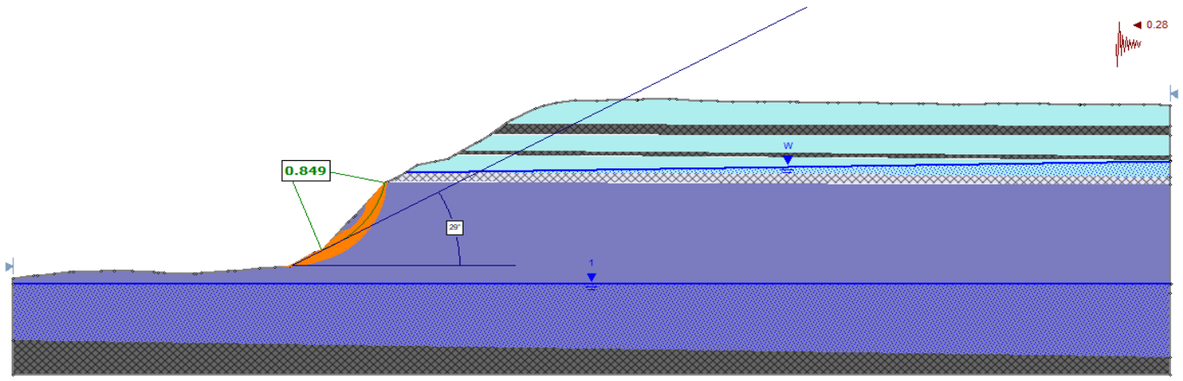
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Piezometric Line 1	Custom	1	
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33	None			0
MD GW SAND		16	Mohr-Coulomb	0	33	Water Surface	Custom	1	
F Ru SILT (HF)		16	Mohr-Coulomb	8	28	None			0

Normal Groundwater Conditions



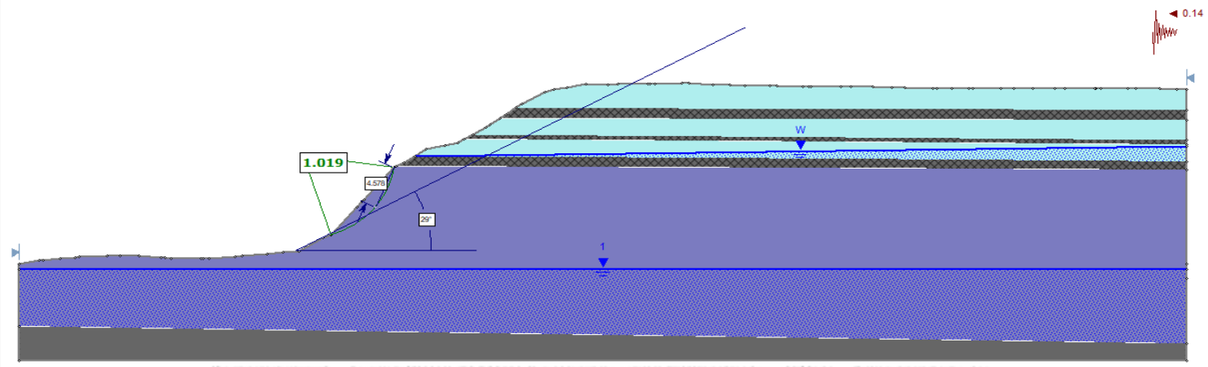
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Piezometric Line 1	Custom	1	
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
MD Ru SAND		16	Mohr-Coulomb	1	33	None			0.1
MD GW SAND		16	Mohr-Coulomb	0	33	Water Surface	Custom	1	
F Ru SILT (HF)		16	Mohr-Coulomb	8	28	None			0.2

Worst Credible Groundwater Conditions



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Piezometric Line 1	Custom	1	
VSt UD SILT (HF)		16	Undrained	120		Constant	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33		None			0
MD GW SAND		16	Mohr-Coulomb	0	33		Water Surface	Custom	1	
F UD SILT (HF)		16	Undrained	100		Constant	None			0

Seismic Event (PGA 0.28g)



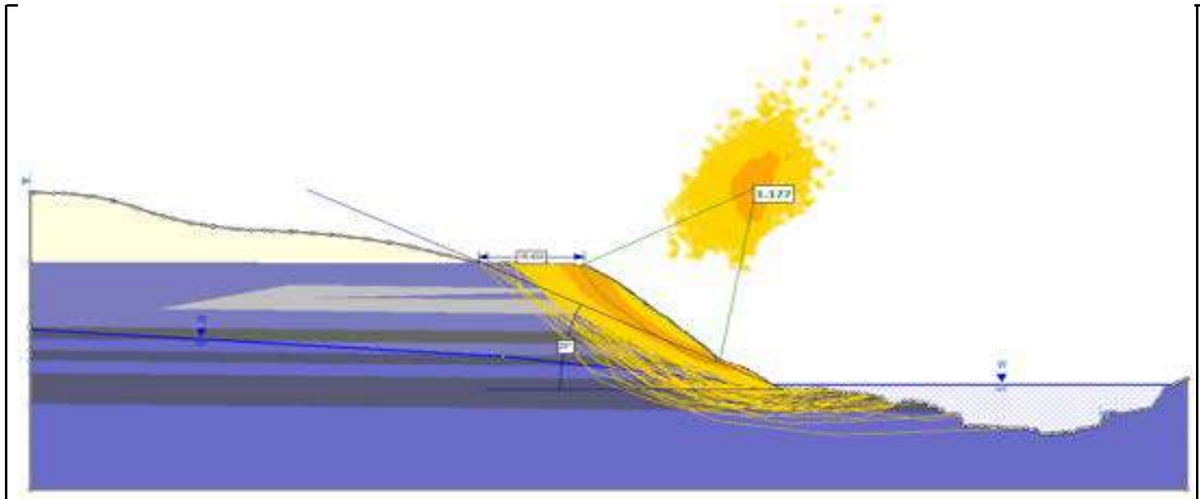
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Piezometric Line 1	Custom	1	
VSt UD SILT (HF)		16	Undrained	120		Constant	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33		None			0
MD GW SAND		16	Mohr-Coulomb	0	33		Water Surface	Custom	1	
F UD SILT (HF)		16	Undrained	100		Constant	None			0

Yeild Seismic Condition (PGA 0.14g)

CMW Geosciences

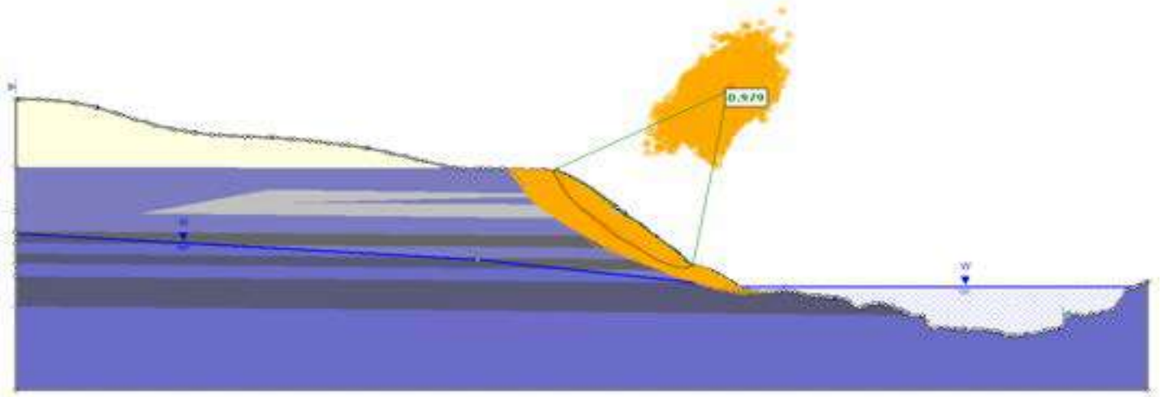
Project Wordsworth St Development	*Analysis* Circular	*Project No.* HAM2021-0032
Title Gully Section - Proposed	*Date* 20/11/2023	*Drawing* STAB 01

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



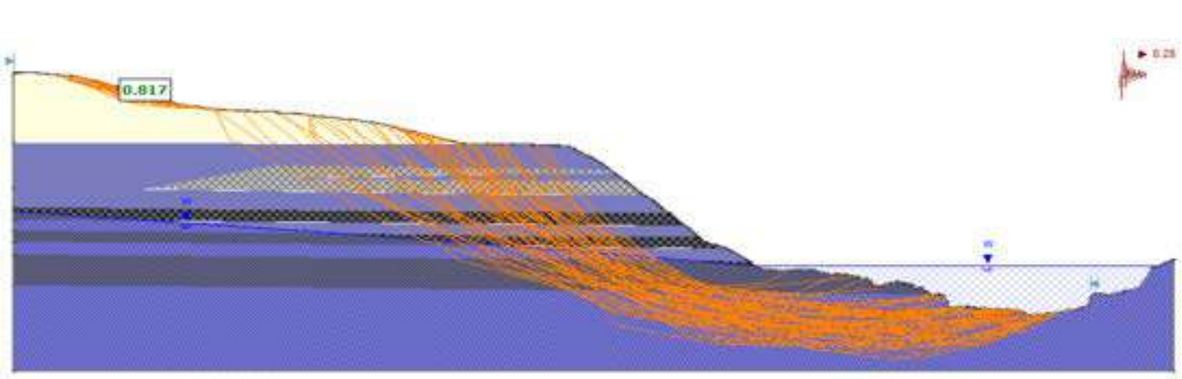
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Normal Groundwater Conditions



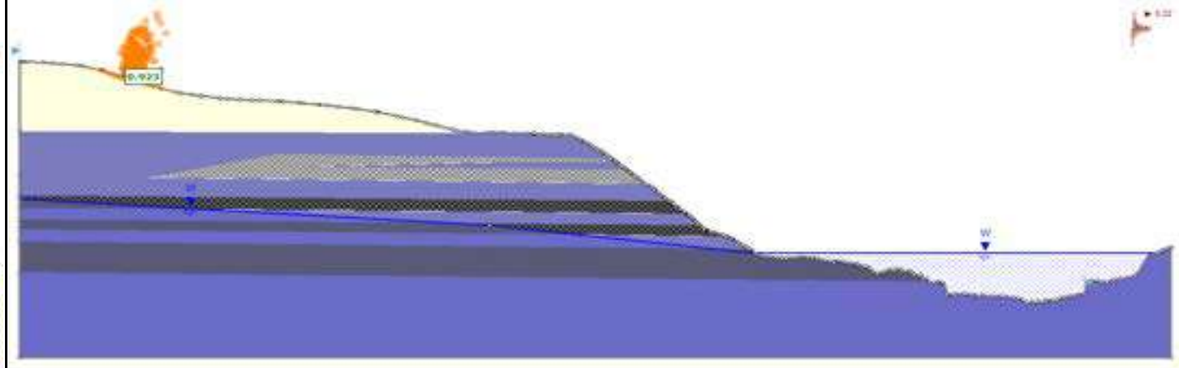
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0.1
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0.2
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Worst Credible Groundwater Conditions



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

Seismic Event



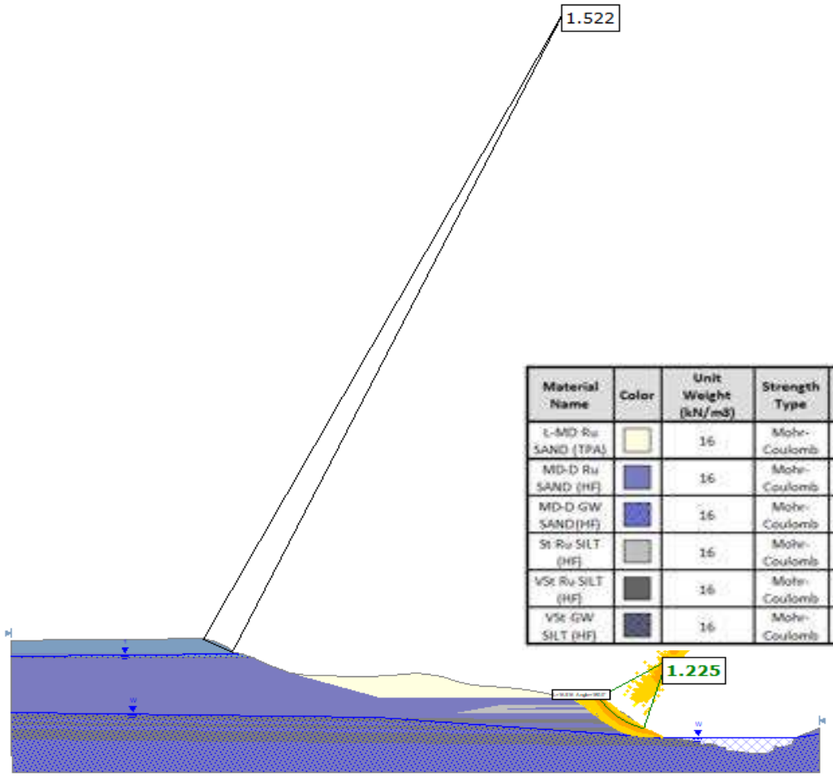
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

Yeild Seismic Condition (PGA 0.23g)

CMW Geosciences

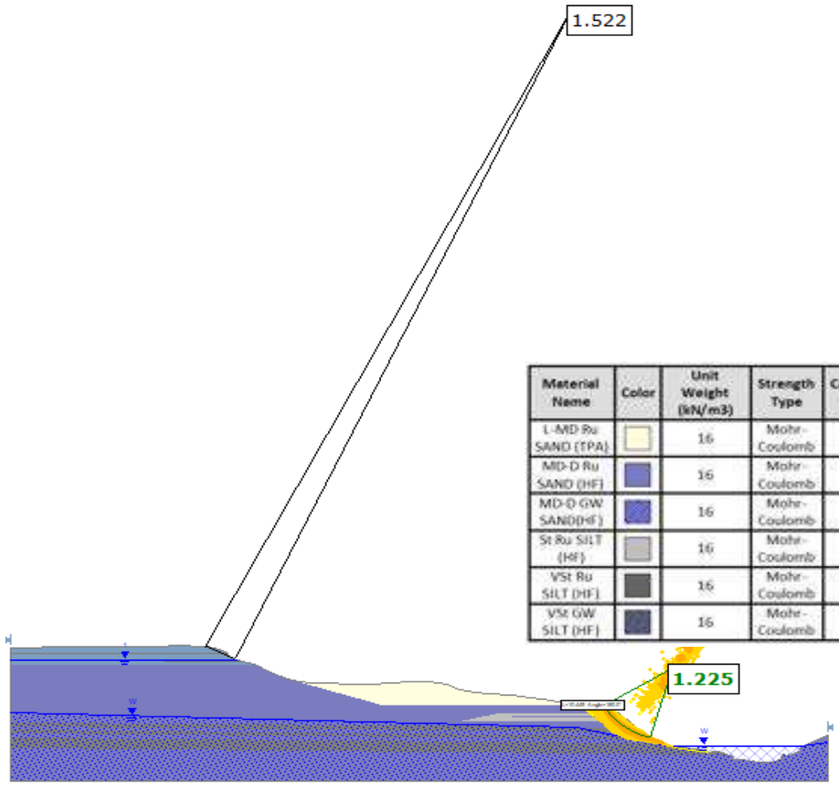
Project Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title River Section - Proposed	*Date* 20/11/2023	*Drawing* STAB 02

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

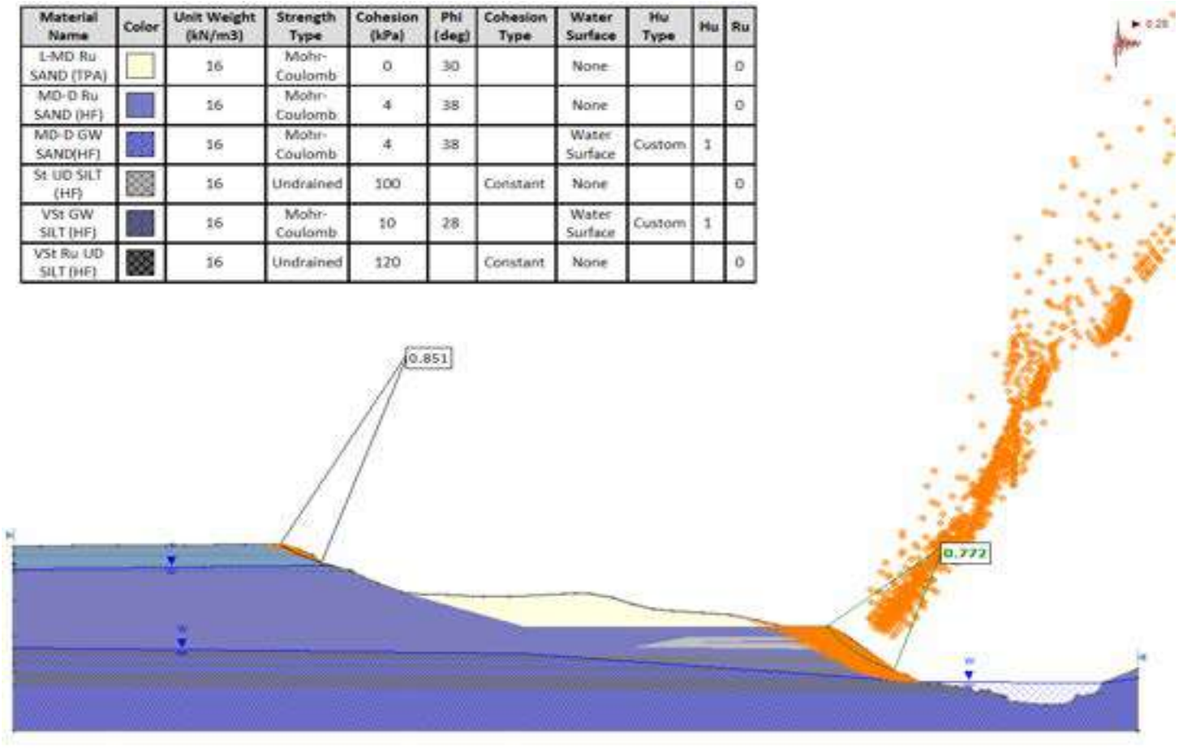
Normal Groundwater Conditions



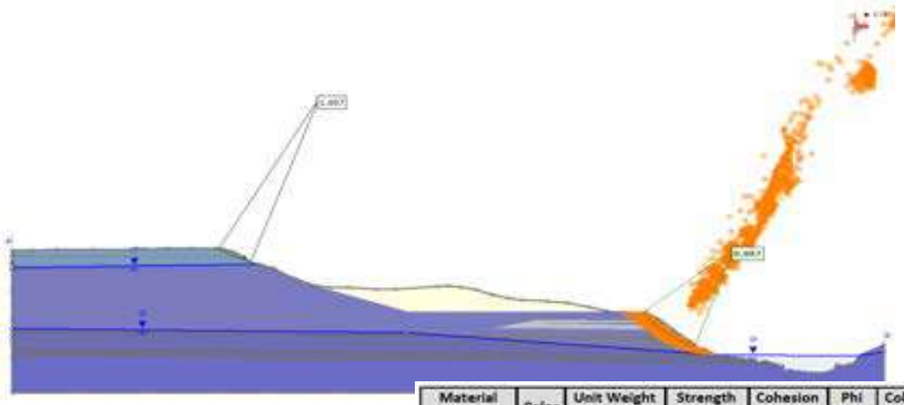
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0.1
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0.2
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Worst Credible Groundwater Conditions

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None		0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None		0



Seismic Event

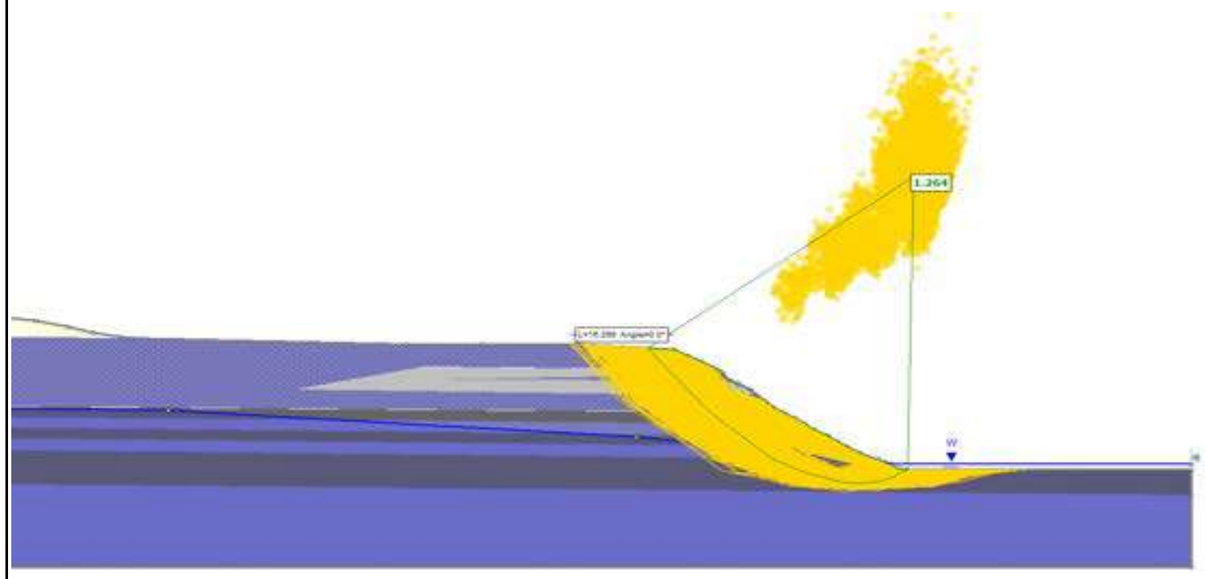


Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

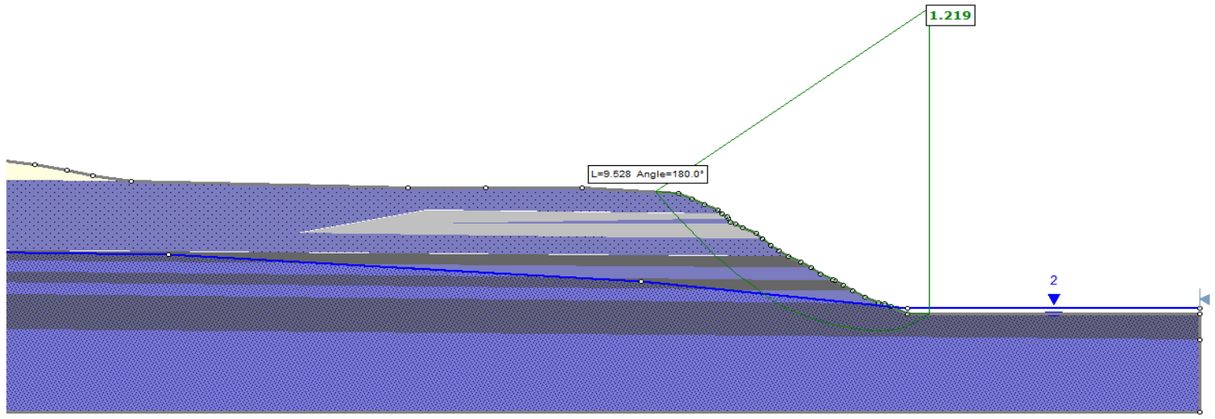
Yeild Seismic Condition (PGA 0.19g)

CMW Geosciences	*Project* Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
	Title Middle Terrace - Proposed	*Date* 20/11/2023	*Drawing* STAB 03

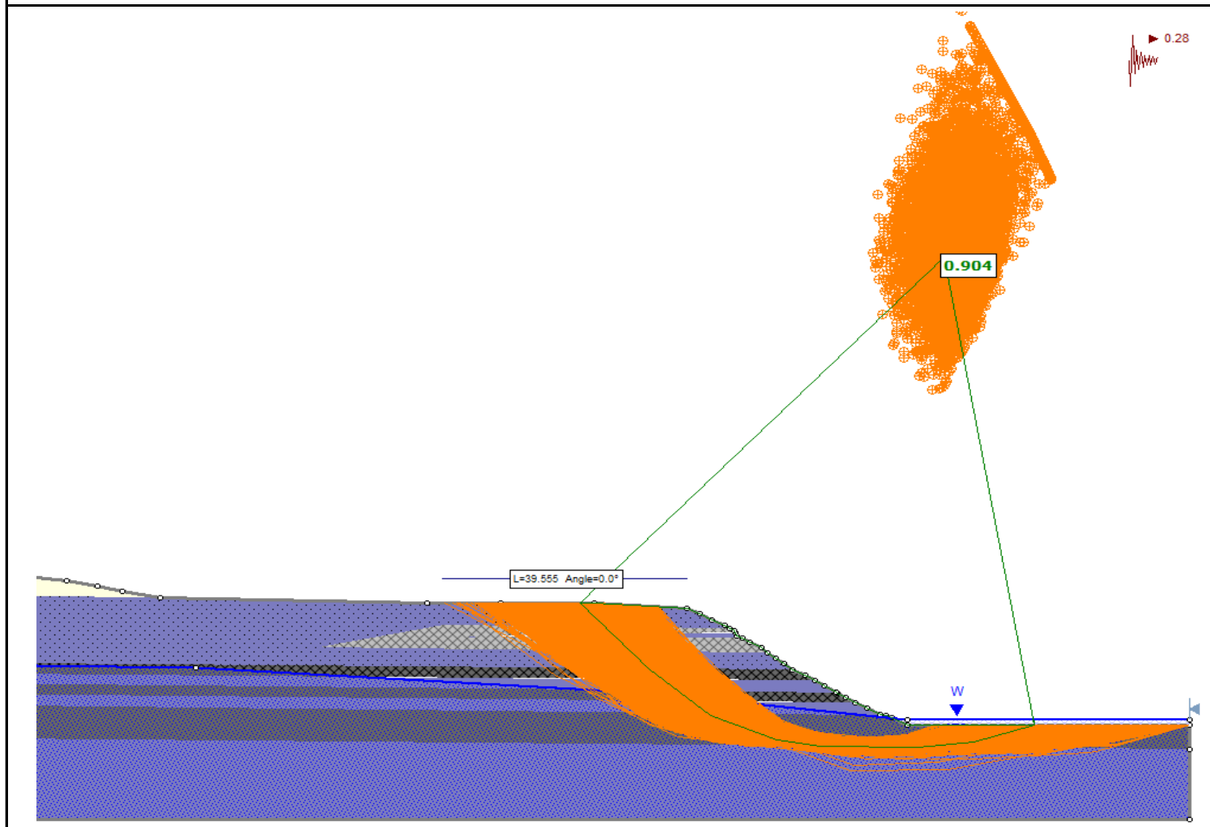
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



SAND Ru 0.05 - Normal Groundwater Conditions



SAND Ru 0.05 - Worst Credible Groundwater Conditions



SAND Ru 0.05 - Seismic Event

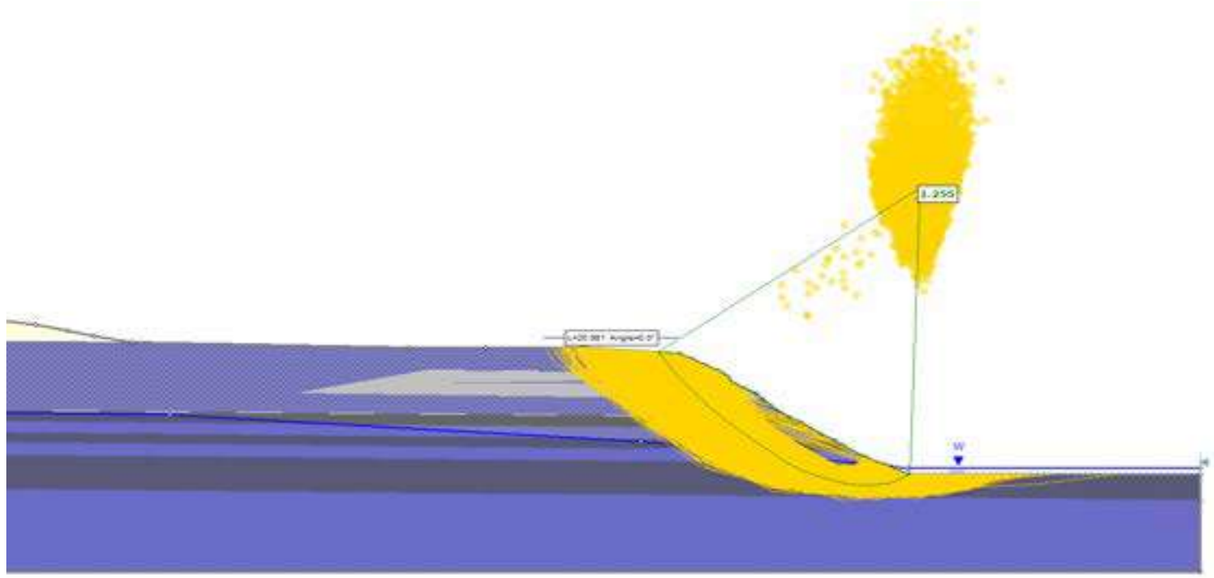
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.05
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

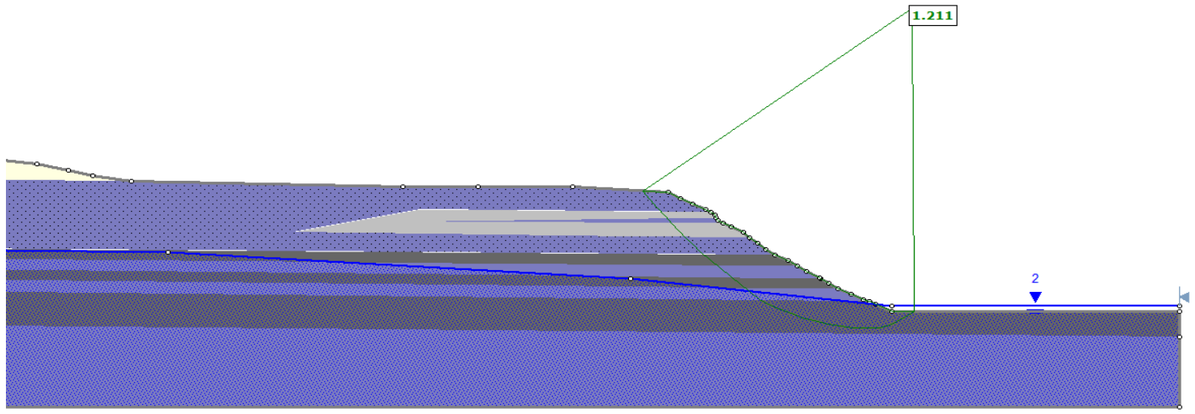
CMW Geosciences
Great People | Practical Solutions

Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 01

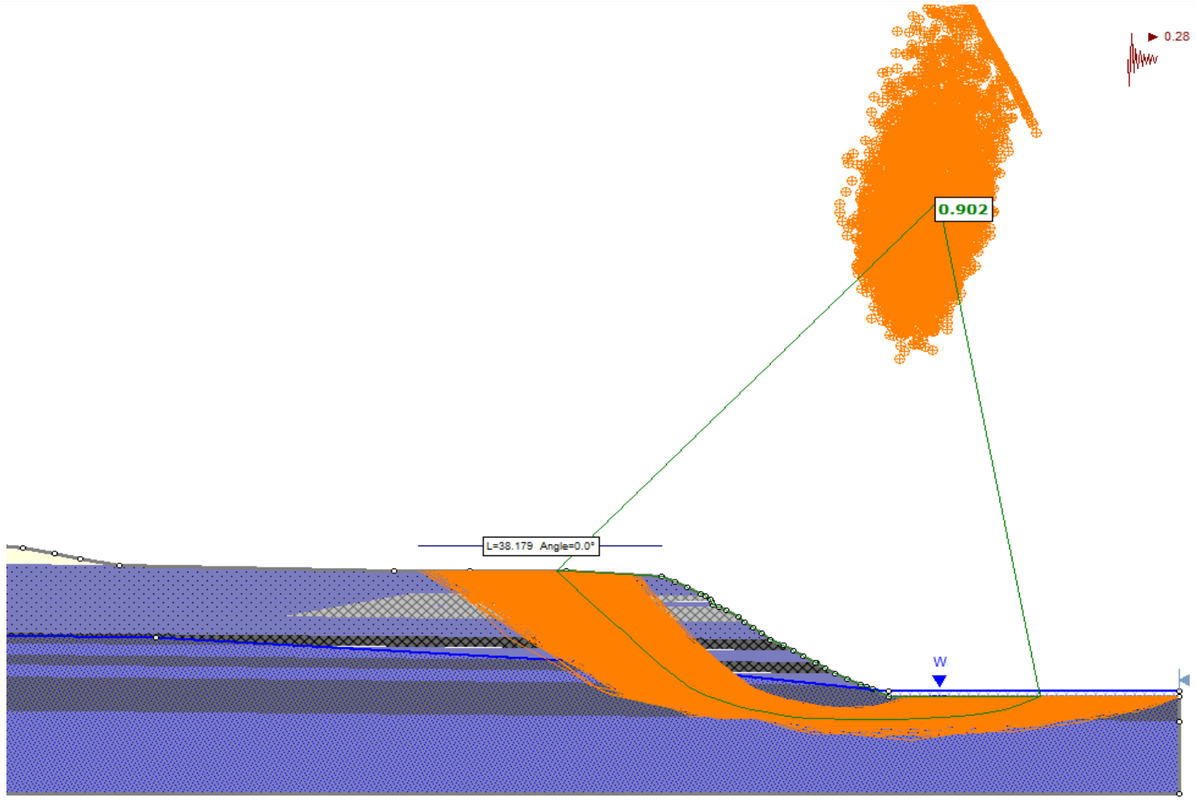
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



SAND Ru 0.1 - Normal Groundwater Conditions



SAND Ru 0.1 - Worst Credible Groundwater Conditions



SAND Ru 0.1 - Seismic Event

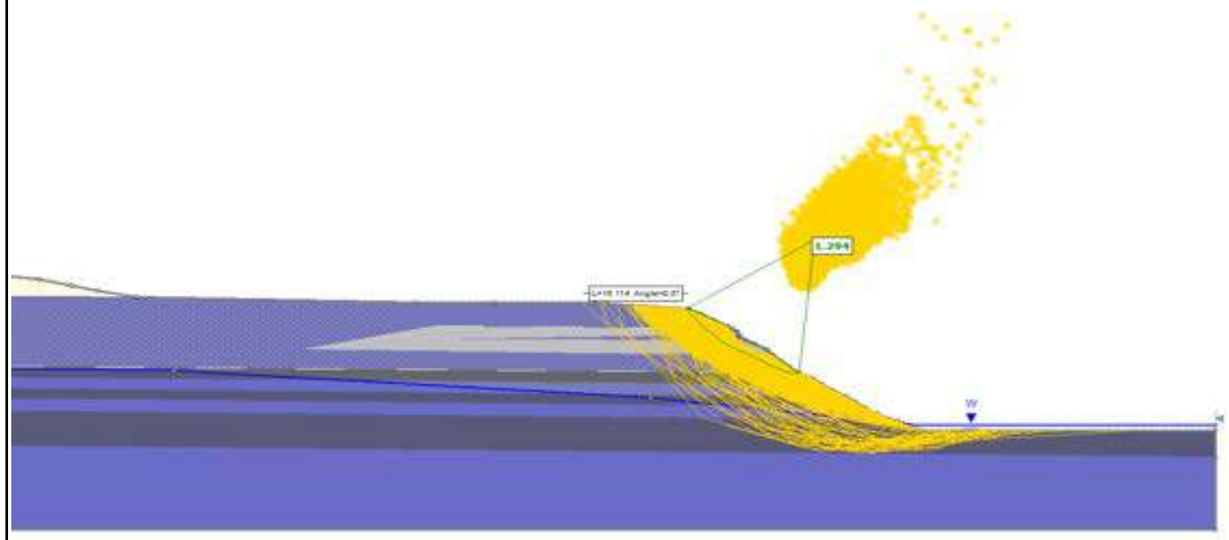
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.1
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

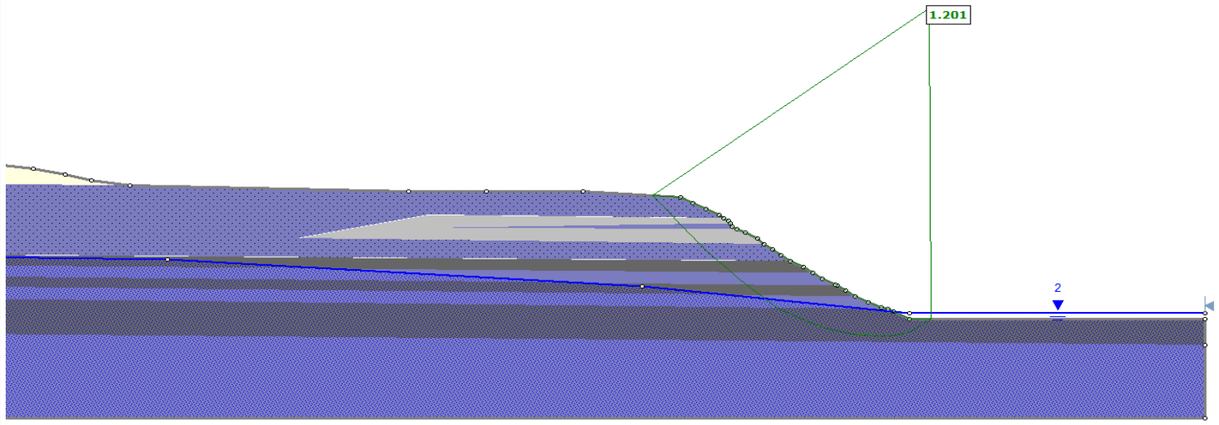
CMW Geosciences
Great People | Practical Solutions

Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 02

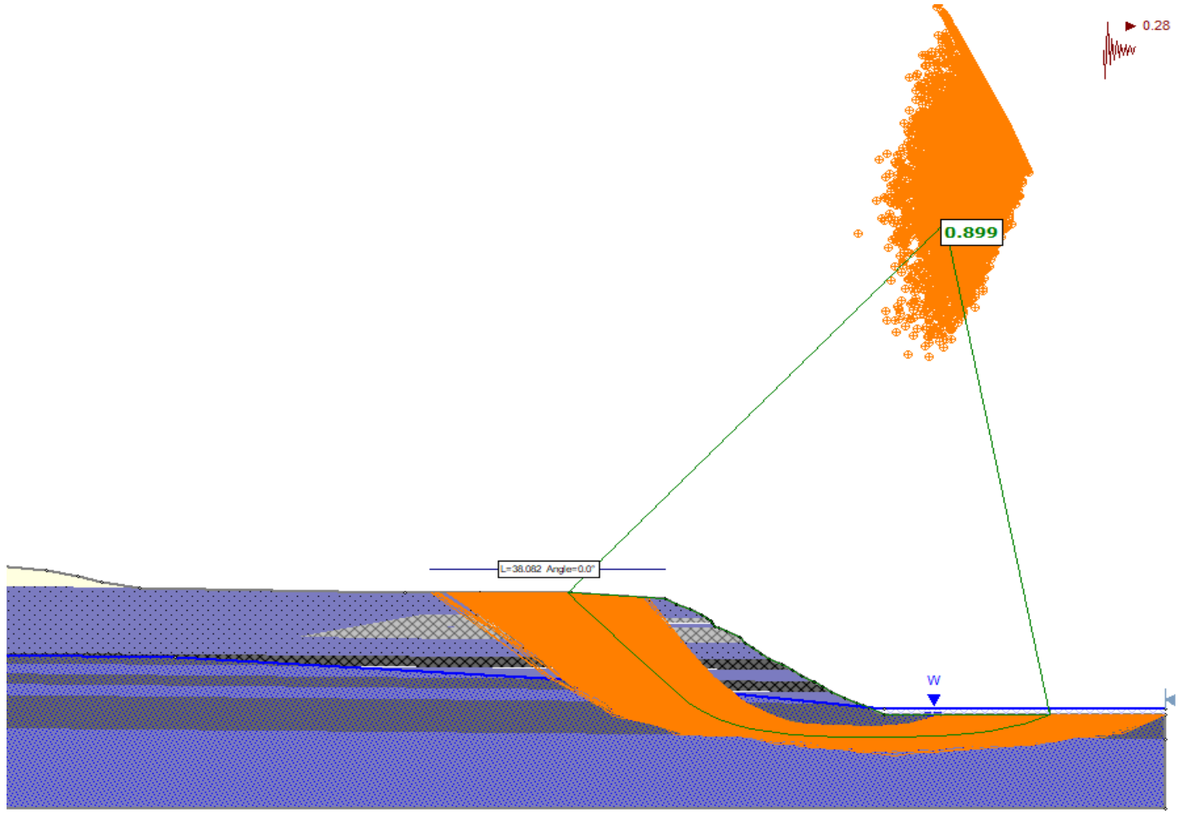
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



SAND Ru 0.15 - Normal Groundwater Conditions



SAND Ru 0.15 - Worst Credible Groundwater Conditions



SAND Ru 0.15 - Seismic Event

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.15
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

CMW Geosciences
Great People | Practical Solutions

Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 03

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

River Section

Back Calculation – target FoS =1

Upper Slope

The L-MD sand (TPA) present on the upper slope was isolated and parameters back calculated until a FoS 1.0 was achieved. Based on our experience with these soils a phi of 30° was adopted. Transient elevated groundwater levels/porewater pressures were adopted for the back calculation.

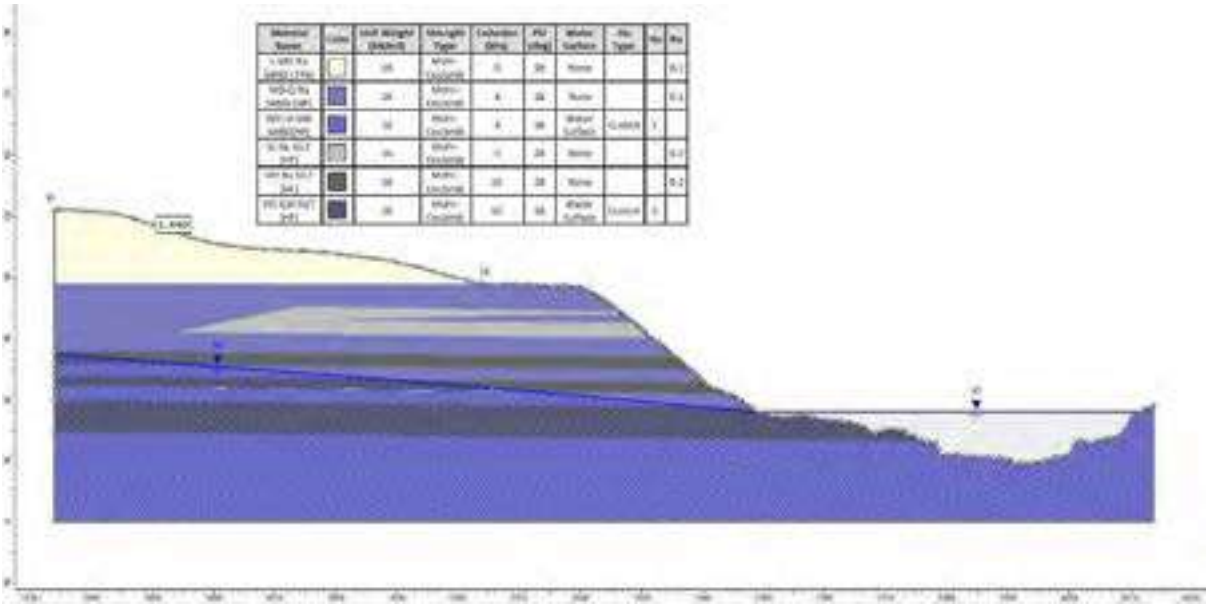


Figure 1 Upper Slope FoS Back Analysis for River Section

APPENDIX K

Waipa District Council RFI Responses

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

19 December 2023 Document Ref: HAM2021-0032AE Rev 0

Cogswell Surveys
5 Milicich Place
Cambridge 3434

Attention: Rebecca Steenstra & Pete McLachlan

RE: PLAN CHANGE RFI RESPONSE LETTER

WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE

1 INTRODUCTION

The purpose of this letter report is to address the comments raised within the Further Information Request (Items 60 through 71 of the geotechnical section only) issued by Waipa District Council on the 7th November 2023 in regard to the Proposed Private Plan Change (PPC), WDC ref. PC/0003/23 for the proposed development at Lamb St, Cambridge.

2 RFI RESPONSES

Item 60

Please confirm if groundwater monitoring been undertaken since July 2021. If so, has this data been considered and what provision has been made for longer term baseline monitoring? ***Note:*** *Two groundwater level monitoring rounds in July 2021 does not provide information on long term groundwater variations and may not be representative of peak design levels or transient groundwater conditions.*

Response: Additional groundwater readings were taken during late spring conditions (21st November 2023) and are summarised in ***Table 1*** below. Rises in the groundwater levels were observed relative to the July 2021 readings, which we consider are due to 2023 being a particularly wet year, and the lag between rainfall and groundwater levels across the Waikato Basin.

The higher 2023 groundwater readings have been considered in the updated slope stability and liquefaction assessments provided in our response to ***Item 64***.

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Table 1: Groundwater Data								
Standpipe	Ground RL (m)	Screen Depth (mbgl)	5 July 2021		27 July 2021		21 November 2023	
			Depth (mbgl)	Elevation (m RL)	Depth (mbgl)	Elevation (m RL)	Depth (mbgl)	Elevation (m RL)
MH01 (shallow)	71.6	1.6 – 7.6 (70.0 – 64.0)	5.6	66.0	6.7	64.9	4.6	67.0
MH01 (deep)*		11.2 – 14.1 (60.4 – 57.5)	n/a	n/a	n/a	n/a	8.4	63.2
MH02 (shallow)	71.3	1.0 – 6.0 (70.3 – 65.3)	Dry	-	Dry	-	5.8	65.5
MH02 (mid)		6.5 – 11.5 (64.8 – 59.8)	10.2	61.1	10.2	61.1	9.0	62.3
MH02 (deep)		18.0 – 24.0 (53.3 – 47.3)	17.6	53.7	17.2	54.1	15.1	56.2
MH03 (shallow)	69.1	4.5 – 8.0 (64.6 – 61.1)	7.7	61.4	7.7	61.4	n/a**	n/a**
MH03 (deep)		19.4 – 31.4 (49.7 -	20.8	48.3	21.0	48.1	n/a**	n/a**
MH04 (shallow)	39.1	14.0 – 16.0	Dry	-	16.3	22.8	16.0	23.1
MH04 (deep)		17.5 – 23.5	18.3	20.8	18.2	20.9	17.4	21.7

Note: mbgl = metres below ground level Datum: Moturiki

* Piezometer installation compromised, therefore GWL unreliable.

**Piezometer could not be located at time of reading.

Item 61

Have potentially higher and / or perched groundwater tables as identified in the geotechnical report been considered in concept development of the swales and centralised soakage systems? Please provide further detail, including any sensitivity assessment undertaken.

Response: Where present, perched groundwater is expected to be at a depth greater than 5m below the existing ground level, or once the stormwater basin has been formed, the base of the stormwater basin is expected to sit at least 2.8m above the nearest silt band/potential perched water table. Refer to Figure 1 below for the location of the proposed stormwater basin plotted against the geological long section (taken from CMW GIR ref HAM2021-0032AC Rev 1, issued 13/09/2021).

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

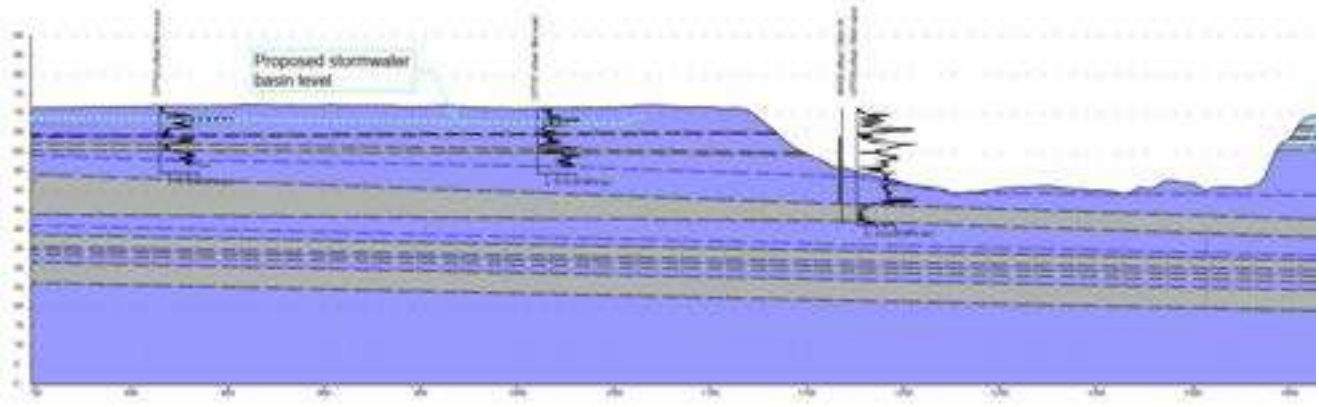

Figure 2: Proposed stormwater basin level plotted against geological longsection for subject site.

It is considered that seasonal fluctuations (expected to be within the order of 1m change) in the measured perched groundwater levels would not affect the feasibility of the proposed swales and centralised soakage systems.

Item 62

Have potentially higher and / or perched groundwater tables as detailed in the geotechnical report been considered as part of the assessment of suitability of on-lot soakage? Please provide details of your sensitivity assessment.

Response: Based on the ground conditions encountered during the site works, CMW considers that areas of the site underlain by Hinuera Formation soils to be suitable for on-lot soakage. Where present, perched groundwater is expected to be at a depth greater than 5m below the existing ground level, or once the stormwater basin has been formed, the base of the stormwater basin is expected to sit at least 2.8m above the nearest silt band/potential perched water table. Seasonal fluctuations in the measured perched groundwater level would not affect the feasibility of on-lot soakage.

Item 63

Surface water swales (Catchment 5 and Catchment 6) and onsite soakage (Catchment 5) are proposed on the stormwater management plan. Parts of these catchments are mapped as underlain by Taupo Pumice Alluvium which is stated to be susceptible to piping erosion, and where adjacent Waikato river-bank slopes have evidence of slope instability. Please provide further detail on assessment of suitability of stormwater swales and onsite soakage on areas underlain by pumiceous soils.

Response: The CMW GIR (HAM2021-0032AC Rev 1) states that on-site soakage is not recommended in areas underlain by Taupo Pumice Alluvium (TPA), or within 20m of the river slope crest. Figure 2 below provides a screenshot of the Proposed Drainage Plan overlaid onto the Geological Plan, which demonstrates that the proposed stormwater swale lies outside of the area underlain by TPA, and is located a minimum of 20m back from the existing crest of the slope leading to the river.

Te Miro Water Consultants Ltd have confirmed that the intention is to not locate stormwater systems on pumice soils other than rain gardens (which will have sealed bases) for the road in Catchment 6. No on-site soakage is proposed for Catchments 5 and 6.

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

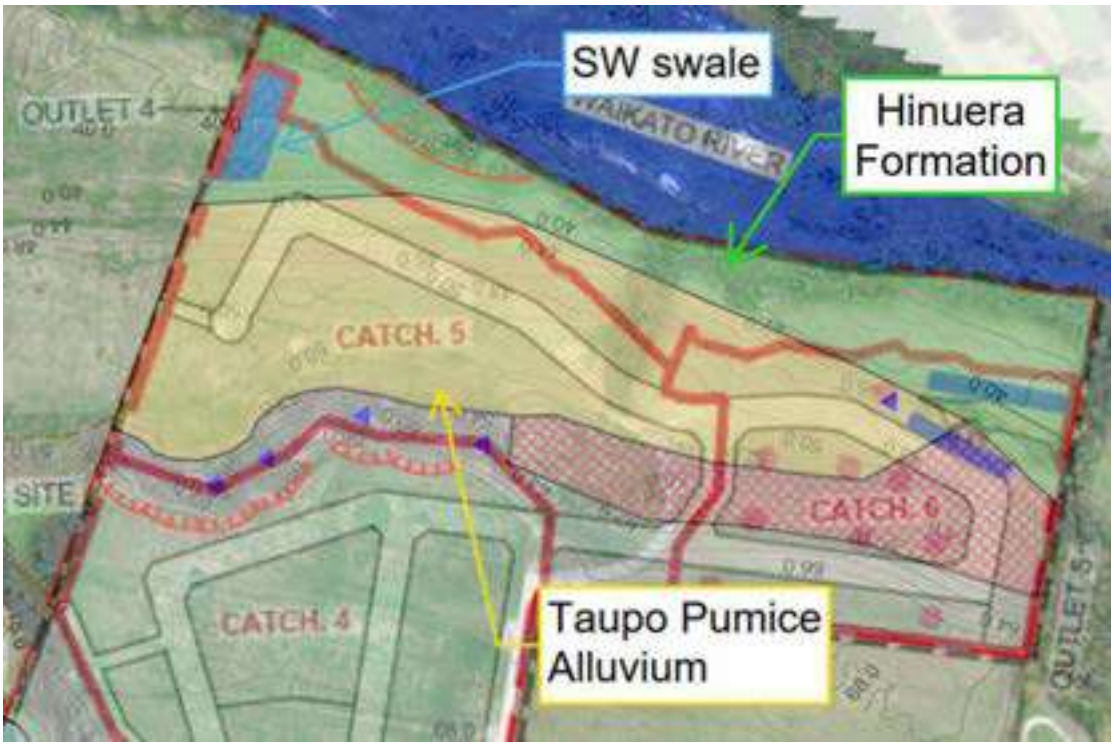

Figure 2: Te Miro Drainage plan overlaid onto CMW GIR Geological Plan

Item 64

Provide updated seismic liquefaction and slope assessments that adopt either current seismic loading for new development or from a site-specific hazard assessment (SSHA).

Response: Please refer to ***Appendices A*** and ***B*** of this letter for updated liquefaction and slope stability assessments. The current design seismic loading has been taken from the MBIE/NZGS document "Earthquake Geotechnical Engineering Practice: Module 1. Overview of the Guidelines". For completeness, the updated summarised liquefaction and slope analyses can be found in Tables 2 and 3 below:

Table 2: Updated Liquefaction Analyses Results

CPT No.	Analysed Saturated Zones (m)	"Non aged"		"Aged"		Depth to Liquefaction (m bgl)
		Total Vertical Settlement (mm)	Index Settlement (mm)	Total Vertical Settlement (mm)	Index Settlement (mm)	
CPT01	7.6 – 11.8 14.0 – 23.0	45	45	10	10	8.4
CPT02	4.5 – 7.0 11.2 – 15.0	40	15	25	<5	6.0
CPT03	5.5 –10.6 11.3 – 14.9	15	25	<5	<5	5.5
CPT04	5.9 – 8.3 12.0 – 14.9	25	20	10	5	6.7
CPT05	6.0 – 9.4 13.5 – 15.0	25	45	10	10	6.0
CPT06	1.6 – 3.7 12.0 – 14.9	25	15	20	<5	1.5
CPT07	13.9	<5	-	-	-	-
CPT08	6.8 – 12 14.0 – 14.9	20	25	10	<5	7.7
CPT09	15.1 – 23.5 29.7 – 29.9	<5	-	<5	-	15.2
CPT10	5.1 – 7.5 20.2 – 23.6	15	20	5	<5	5.2

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Table 2: Updated Liquefaction Analyses Results						
CPT No.	Analysed Saturated Zones (m)	"Non aged"		"Aged"		Depth to Liquefaction (m bgl)
		Total Vertical Settlement (mm)	Index Settlement (mm)	Total Vertical Settlement (mm)	Index Settlement (mm)	
CPT11	13.5 – 14.9	<5	-	-	-	-
CPT12	6.0 – 14.9	40	45	15	10	6.0
CPT13	17.3 - 24.0	-	-	-	-	-
sCPT01	5.5 – 7.5 11.0 – 28.0	35	20	20	10	6.8
sCPT02	19.0 – 30.0	-	-	-	-	-
sCPT03	6.7 – 9.8 20.8 – 26.13	35	60	20	15	6.7
sCPT04	16.2	-	-	-	-	-
sCPT05	1.5 – 3.1 12.3 – 13.0	10	10	<5	<5	1.5
Notes: "Aged" analyses included ageing factor between 1.0 and 1.5 for Hinuera Formation Soils based on MEVR analysis results (refer Item 65). Index settlement – that attributable to liquefaction with the upper 10m of soil Settlements and depths are based on the existing ground surface.						

The predicted free-field liquefaction induced settlements have changed relative to the previous assessment as the ULS peak ground acceleration has increased from 0.25g to 0.28g in the latest guidance, resulting in more liquefaction being predicted. However, the liquefaction induced vertical settlement is reduced when modelling refined strength gain factors based on seismic CPT data.

Based on the findings of the updated liquefaction assessment, then TC1/NZS:3604 foundations would be considered suitable for most of the development area. However, there are limited areas near CPT test locations CPT02/CPT12/sCPT01 that may potentially be subject to TC2 level settlements. Further investigation would be needed to refine the boundaries of areas where TC2 foundations may be necessary.

Table 3: Updated Slope Stability Analysis Summary					
Condition	Required Minimum Factor of Safety	Factor of Safety Achieved	Setback from Crest to required FoS (m)	Critical Acceleration (Ac) (g)	USL Displacement (mm)
River Section					
Static long term conditions	1.5	1.18	20.0	-	-
Transient short term conditions	1.2	0.98	12.0	-	-
Ultimate Limit State (ULS) seismic condition	1.0*	0.93	-	0.28	<10
Seismic Yield	1.0	1.0	-	0.22	-
Gully Section					
Static long term conditions	1.5	1.18	5.0	-	-
Transient short term conditions	1.2	1.02	5.0	-	-
Ultimate Limit State (ULS) seismic condition	1.0	0.85	-	0.28	<10
Seismic Yield	1.0	1.02		0.14	-

The slope stability assessment results have remained unchanged with the exception of the Ultimate Limit State seismic conditions, where minor slope displacements are predicted due to the increase in ULS PGA. This is not considered to have any impact on the proposed development.

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For the gully section, only thin bands of liquefaction were predicted in CPT10. It is considered unlikely that these layers are continuous and that the predicted liquefaction is therefore unlikely to eventuate. On that basis liquefied shear strengths have not been modelled for the thin bands.

Item 65

Provide further details of your assessment of the aging factor using MEVR in accordance with current guidance. This is fundamental to support the use of an aging factor for liquefaction assessment.

Response: A site-specific assessment was carried out using the seismic CPT's to account for soil microstructure in accordance with Robertson[1]. Results in ***Appendix A*** suggest that "soil microstructure is present and justifies the use of an average strength gain factor (K_{DR}) of for the geological units as detailed below:

Table 4: Updated Slope Stability Analysis Summary

Soil Unit	K_{DR}
L SAND (Taupo Pumice Alluvium)	1.0
MD SAND (Hinuera Formation)	1.25
MD-D Sand (Hinuera Formation)	1.5
St-VSt SILT (Hinuera Formation)	1.2
F SILT (Hinuera Formation)	1.3

Annotated CPT logs with expected geology (and consequently the K_{DR} applied for the aged liquefaction analyses) are presented in ***Appendix C***.

Item 66

Have the liquefaction and liquefaction effects assessments considered sensitivity to potentially higher and / or perched groundwater tables? Provide details of your sensitivity assessment.

Response: Yes. Three sets of analyses (regional GWT, perched GWT and custom non-hydrostatic piezometric profile) have been run, with sensitivity checks between the three sets considered (results are presented in ***Appendix A***). The data from the deep/shallow/custom non-hydrostatic piezometric profile analysis methods, as well as the geological model in the vicinity of the test location, has been considered when determining which of the three methods used to model liquefaction is most appropriate to present.

Item 67

Liquefaction risk is stated to have been defined in accordance with MBIE Module 3. Please also confirm liquefaction risk in terms of definitions provided in MBIE / EQC (2017) Planning and Engineering Guidance for Potentially Liquefaction-prone Land, which is applicable to plan change.

Response: We can confirm that the liquefaction risk has been investigated in accordance with the MBIE / EQC (2017) Planning and Engineering Guidance for Potentially Liquefaction-prone Land document, with the liquefaction risk being classified as very low to low liquefaction vulnerability.

Item 68

There are only a limited number of geotechnical and groundwater investigation data points. Has sensitivity to topographic variability, geological variability, geotechnical parameters, and higher or

[1] P.K. Robertson (2015). Comparing CPT and Vs Liquefaction Triggering Methods, Journal of Geotechnical and Geoenvironmental Engineering.

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transient perched groundwater conditions been considered in areas where there is sloping ground and development offsets from crest of slopes are proposed? Provide details of your sensitivity assessment.

Response: The scope of geotechnical investigation completed to date, combined with our experience, observations of soil exposures and groundwater seepages on site, is considered appropriate to develop initial geological models and geotechnical hazards for this initial zone change process.

Soil shear strength parameters and credible worst case groundwater conditions have been developed from robust back analysis methods on existing natural gully and riverbank landforms. Appropriate setbacks from slope crests have been provided based on that process. Should more elevated groundwater or weaker ground conditions exist, this would be reflected in the back analysis process.

Item 69

The report states that the lower and middle terrace slopes have similar slope profile and geology to that of the gully slope so not assessed in detail. However, the site plan reports evidence of groundwater seepage and instability on this slope. Provide specific assessment of these slopes to support the recommendation that a 5m development setback from the crest is appropriate.

Response: We have carried out additional quantitative analysis for this slope and found that the recommendation for a 5m setback distance will be appropriate for this part of the site. Results are presented below for the middle terrace slope, and plots attached in ***Appendix B***.

Table 5: Slope Stability Analysis Summary

Condition	Required Minimum Factor of Safety	Factor of Safety Achieved	Setback from Crest to required FoS (m)	Critical Acceleration (Ac) (g)	USL Displacement (mm)
Middle Terrace Section					
Static long term conditions	1.5	1.5	-	-	-
Transient short term conditions	1.2	1.5	-	-	-
Ultimate Limit State (ULS) seismic condition	1.0*	0.85	-	0.28	<10
Seismic Yield	1.0	1.0	-	0.19	-

Item 70

The stormwater management plan indicates onsite soakage and conveyance swales and rain gardens will be adopted adjacent to the crest of the terrace slopes, gully areas and as close as the proposed development 20m setback from the Waikato River. Have the potential effects from concentrated surface or groundwater discharges from the proposed stormwater management systems been considered in the slope stability analyses and how have the potential effects been considered as part of proposed land use? Provide further detail of your assessment.

Response: Refer Item 63. On-site soakage not recommended in areas underlain by TPA, or within 20m of the crest of the river slope. Where the purpose of stormwater devices such as rain gardens (which are required to be lined when they are located within TPA deposits or within 20m of an existing slope) is to attenuate flow rather than dispose of water via infiltration, they will not impact slope stability. All outlets will require suitable detailing to prevent scour and erosion.

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Item 71

The stormwater system includes stormwater detention basins and conveyance swales. Confirm if any of these proposed structures might result in damming of water and / or potentially be classified as dams under the current regulations.

Response: According to the Building (Dam Safety) Regulations 2022, a classifiable dam is a dam that has either (a) a height of 4 or more metres and stores 20,000m^3 or more of water/other fluid, or (b) a height of 1 or more metres and stores 40,000m^3 or more of water/other fluid. Based on the preliminary storage volumes for the basins (13,544m^3 or less) provided in the 2023 Stormwater Management Plan by Te Miro Water Consultants Limited, none of the proposed basins would be defined as classifiable dams under the current regulations. Shallow swales would also not be defined as classifiable dams.

For and on behalf of CMW Geosciences

Prepared by:	Reviewed and authorised by:
Ben McKay	Bryn Jones
Project Geotechnical Engineer	Principal Geotechnical Engineer
MEngNZ	MEngNZ, BSc, MSc

Distribution: 1 electronic copy to Cogswell Surveys Ltd via email
Original held at CMW Geosciences

Attachments: Appendix A – Revised Liquefaction Analysis Plots
Appendix B – Revised Slope Stability Analysis Plots
Appendix C – Annotated CPT Logs

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APPENDIX A: LIQUEFACTION ANALYSIS

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FULL DEPTH ANALYSIS (AGED)

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Version: 1, Version Date: 17/12/2025

CMW Geosciences
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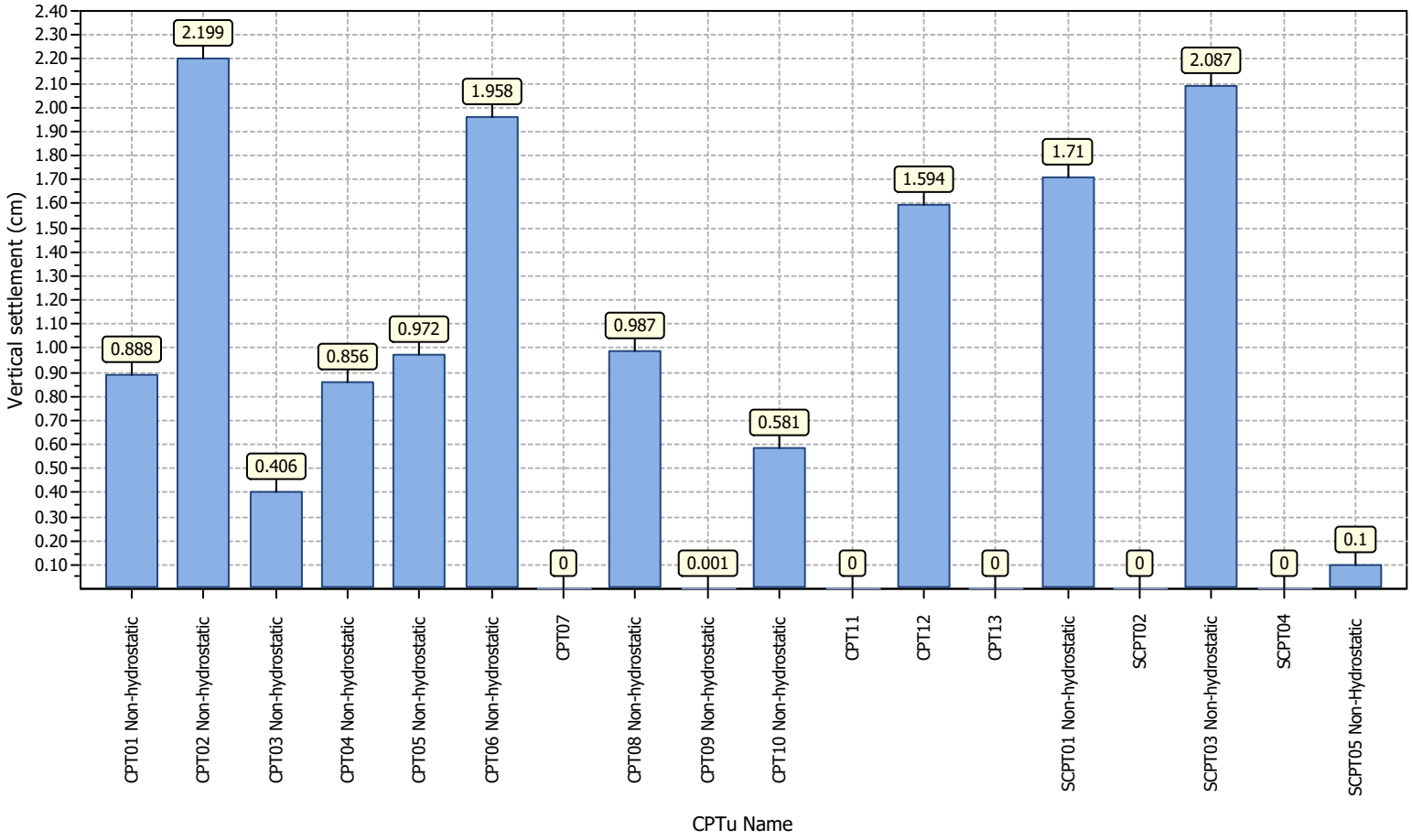
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report



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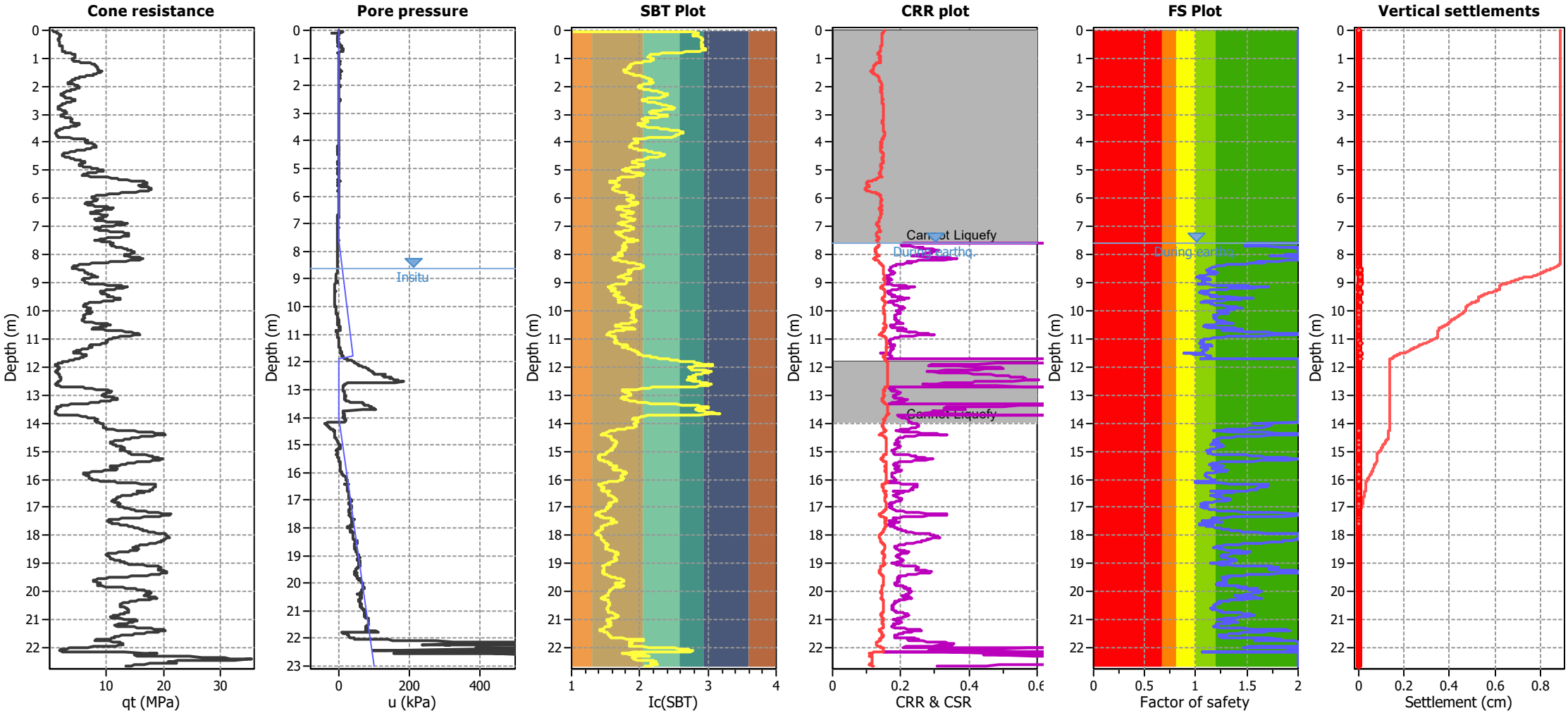
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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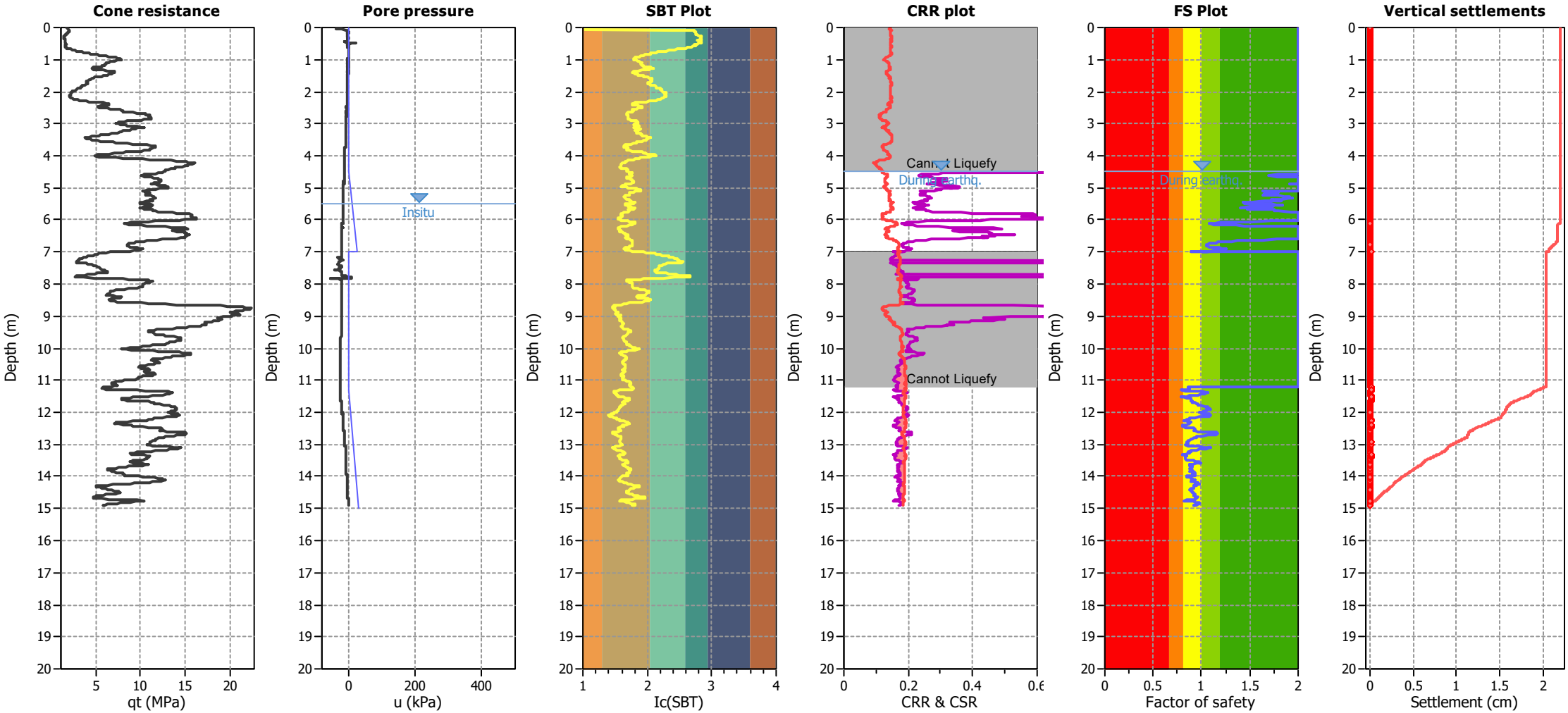
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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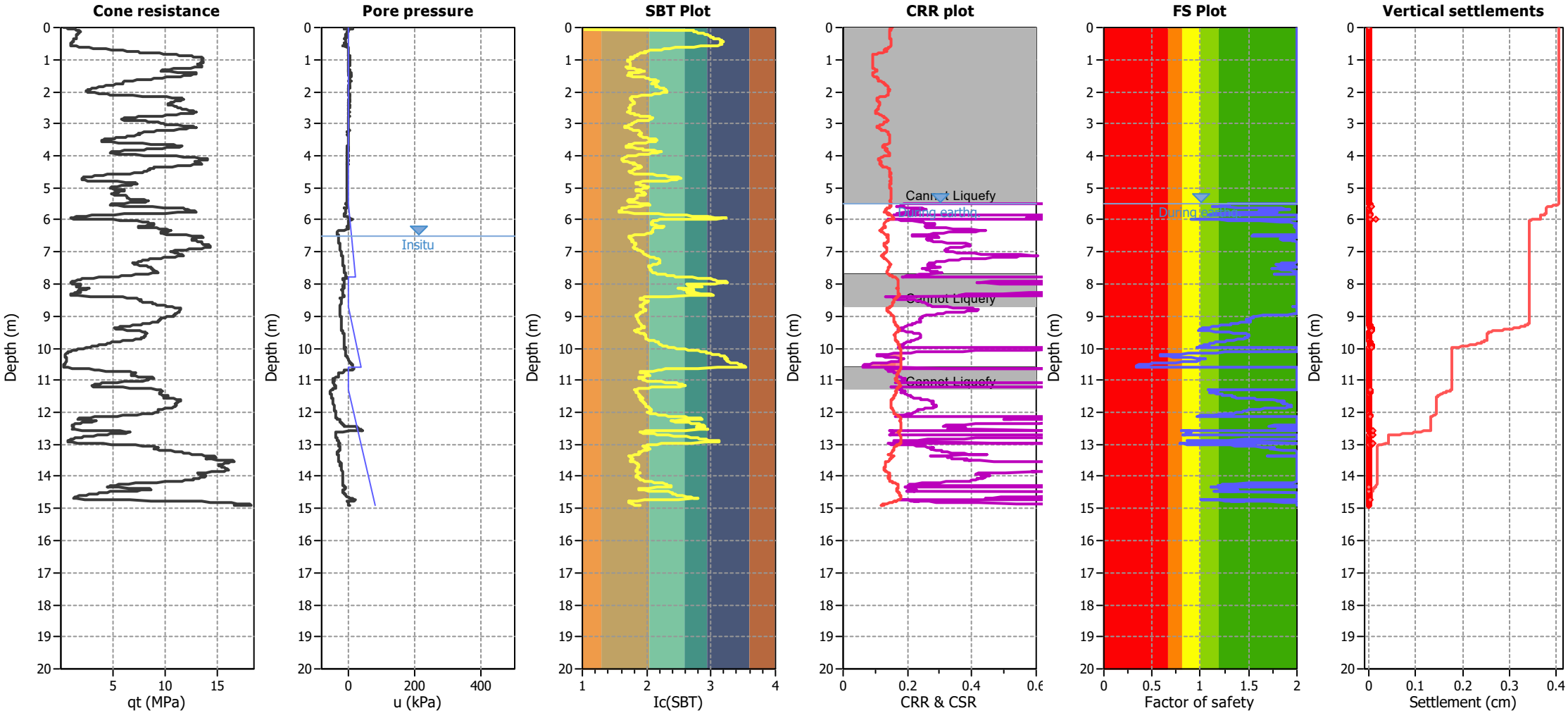
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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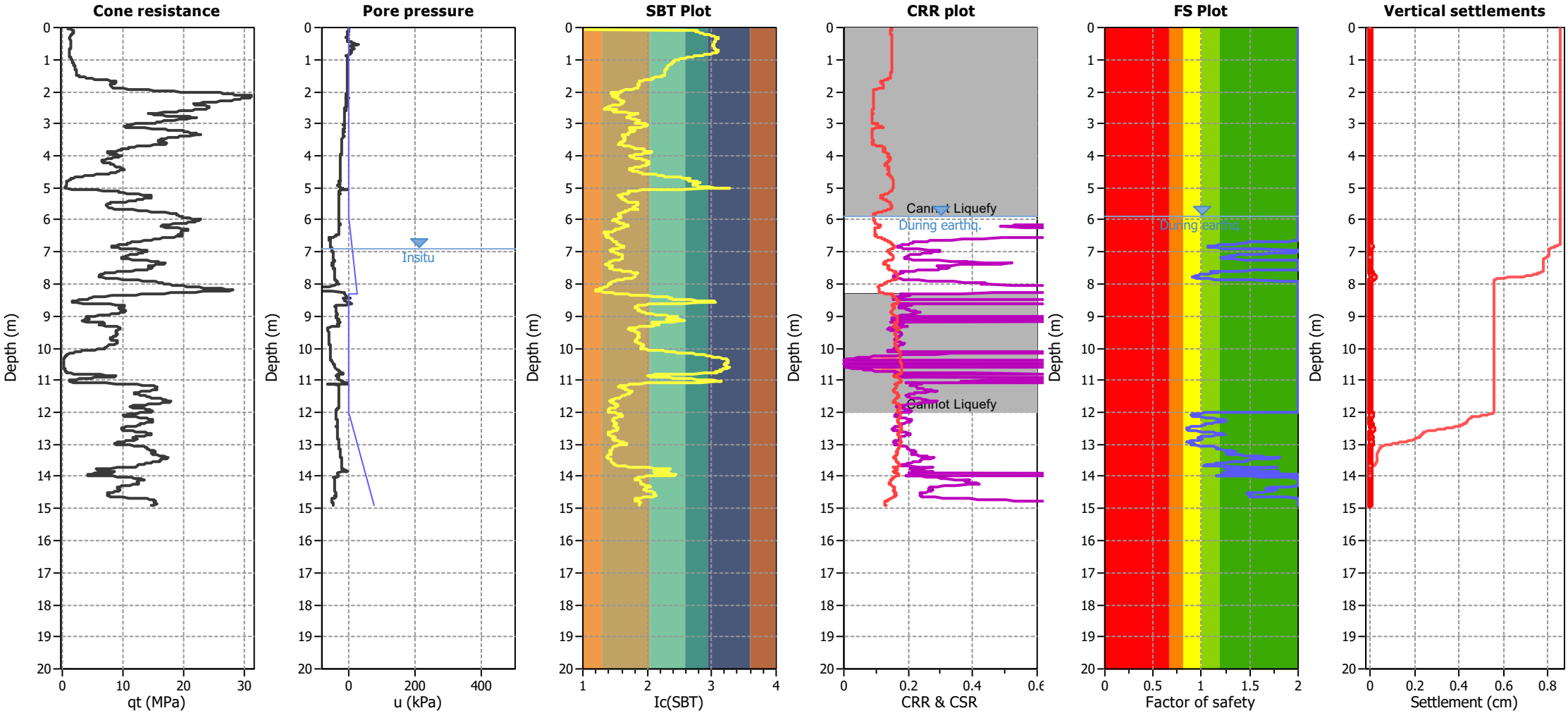
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



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Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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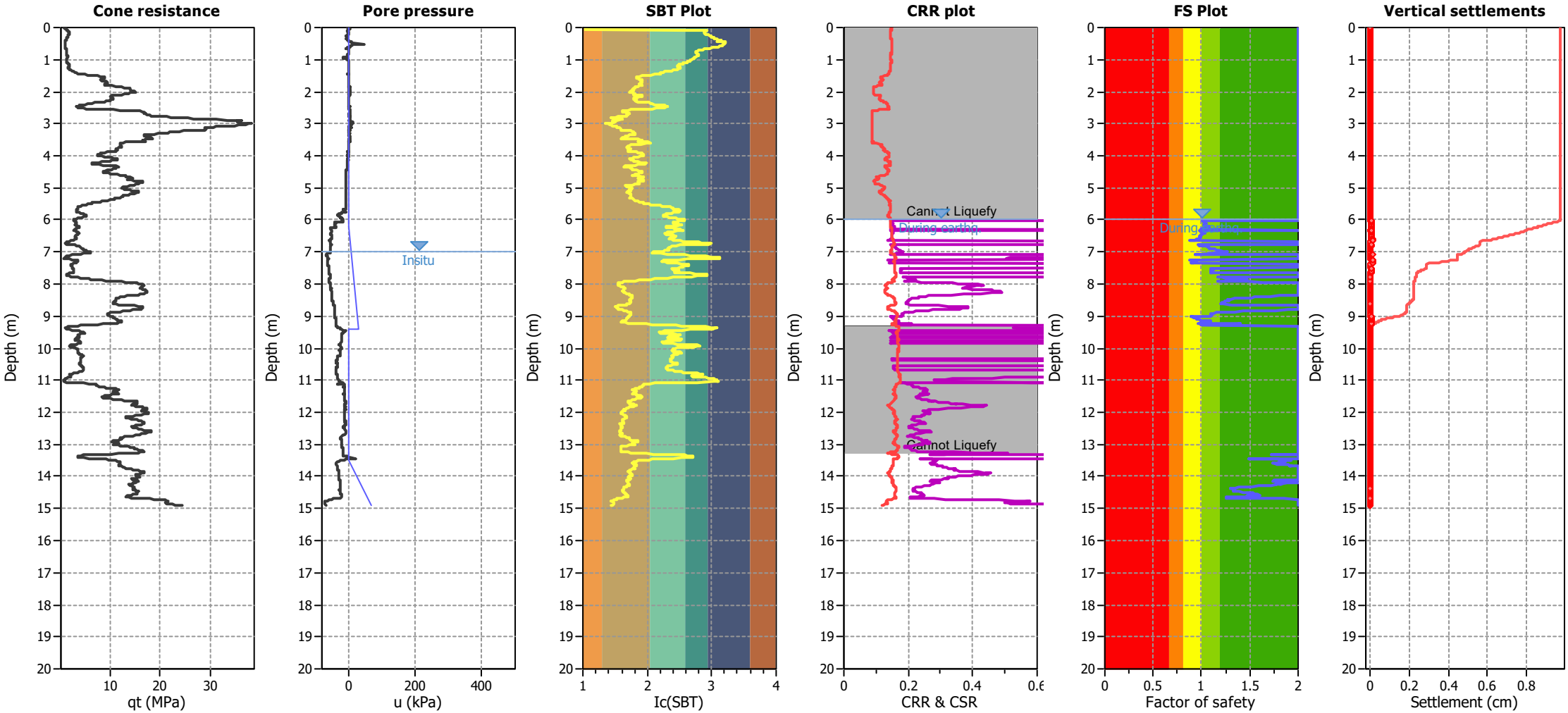
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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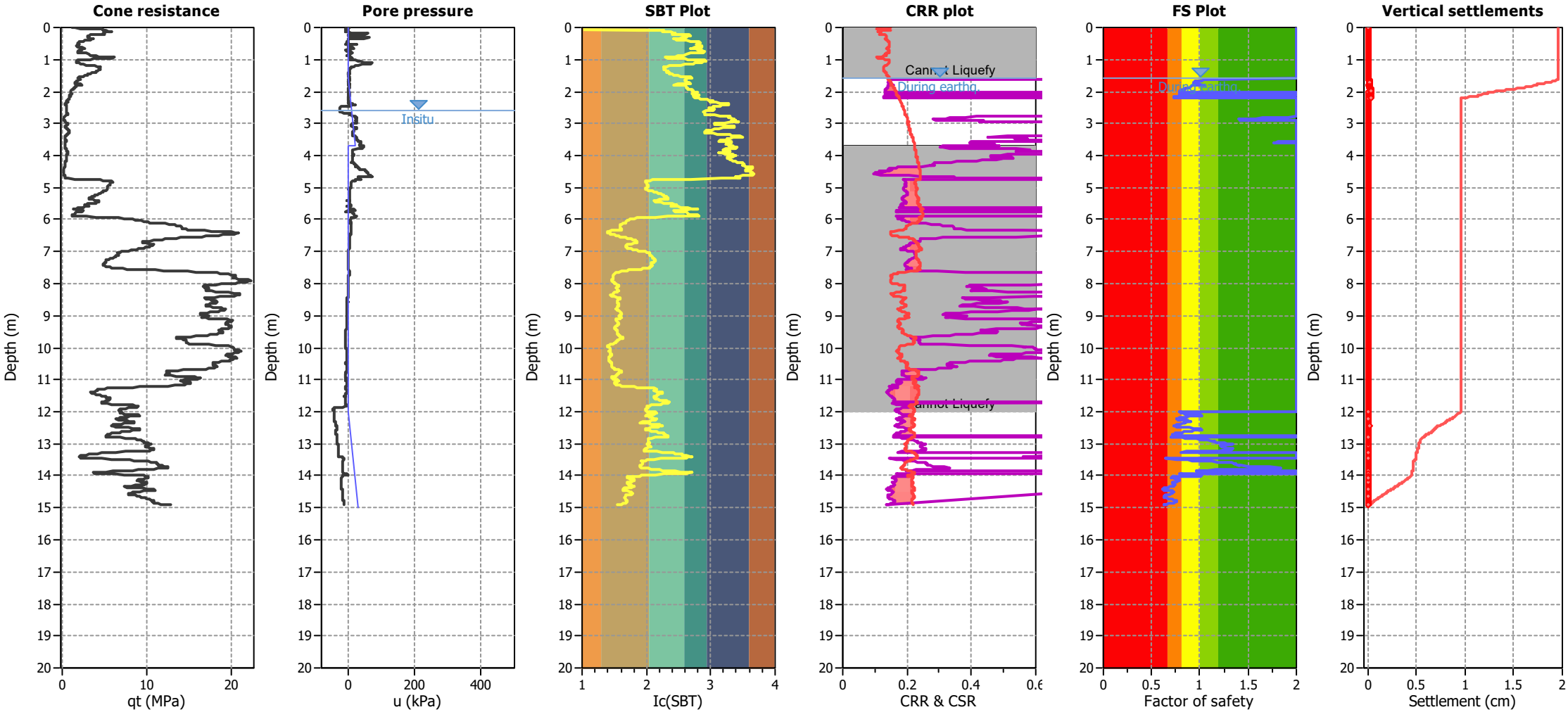
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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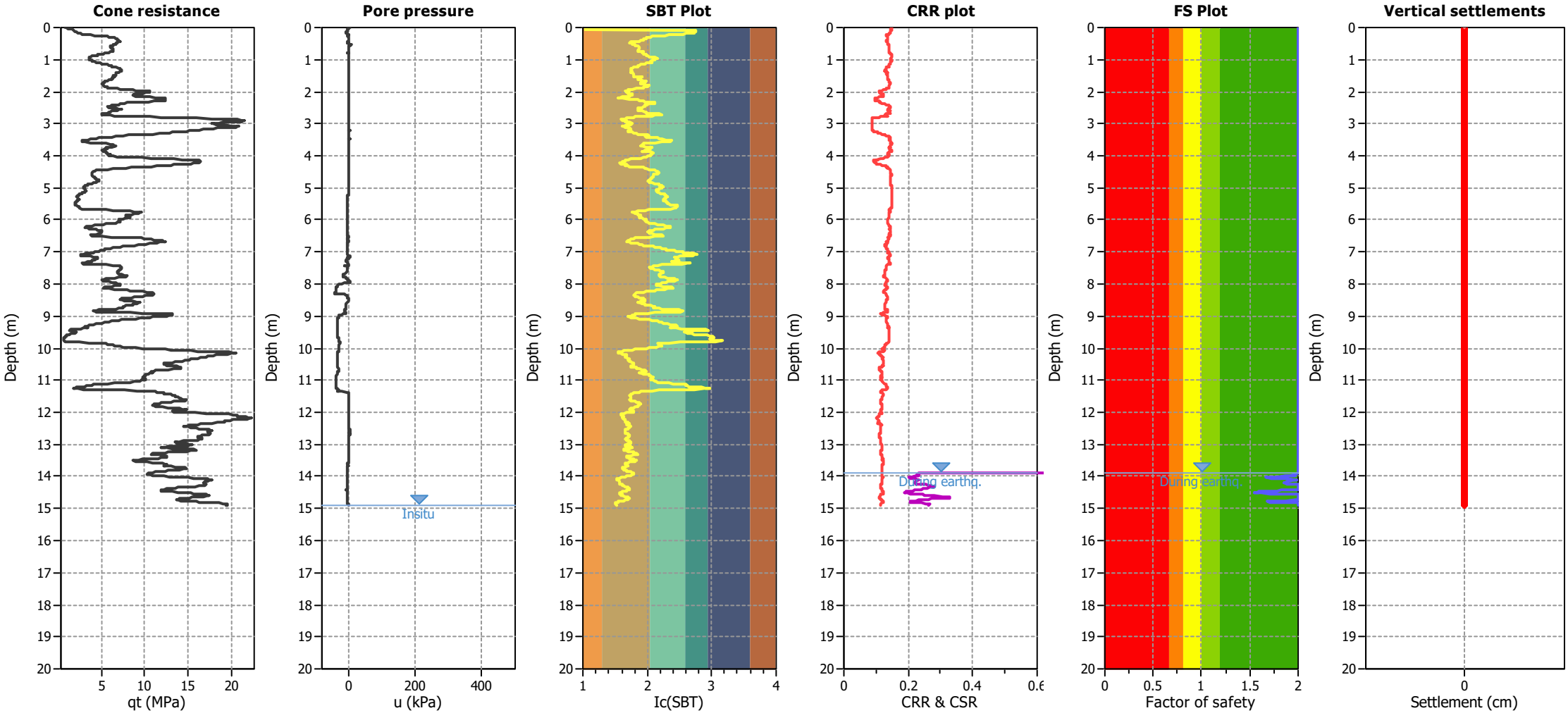
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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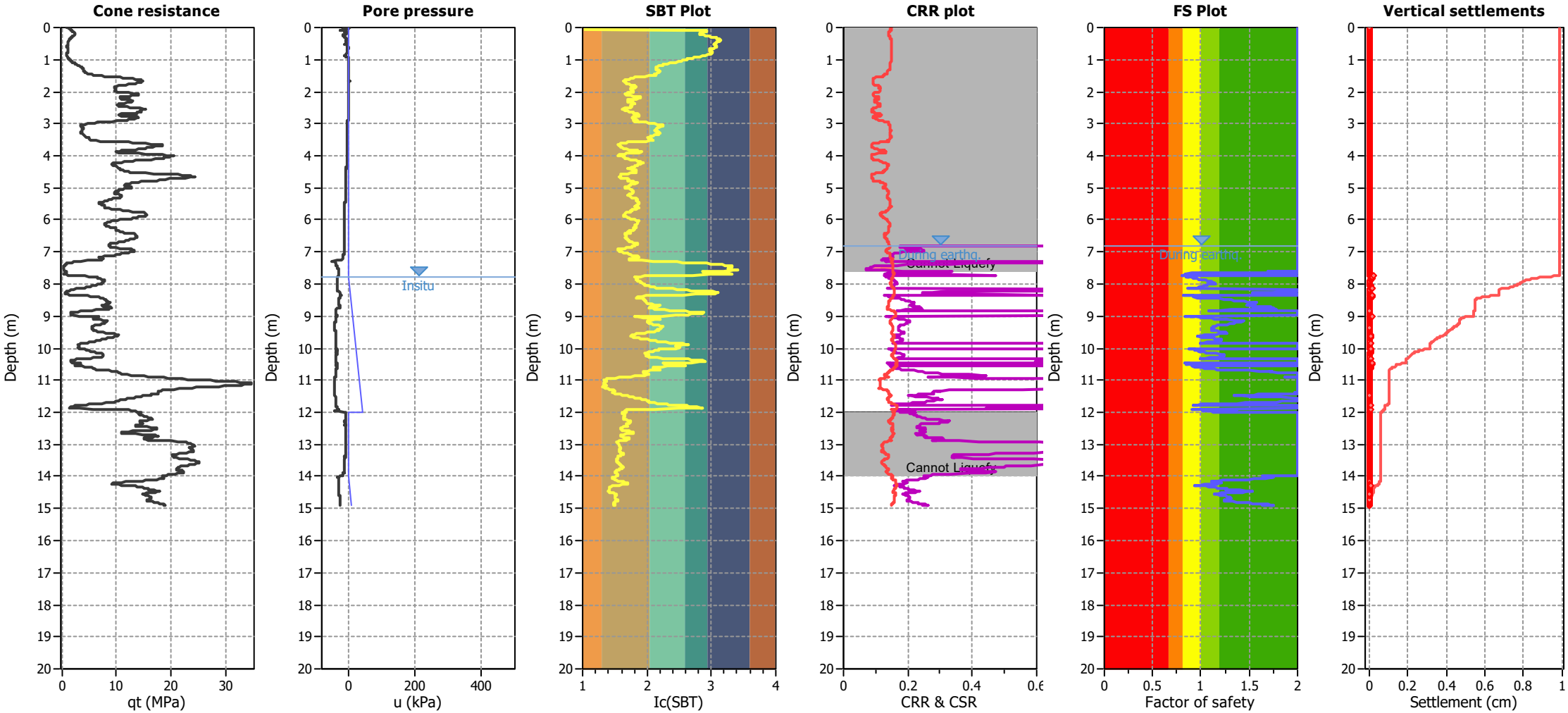
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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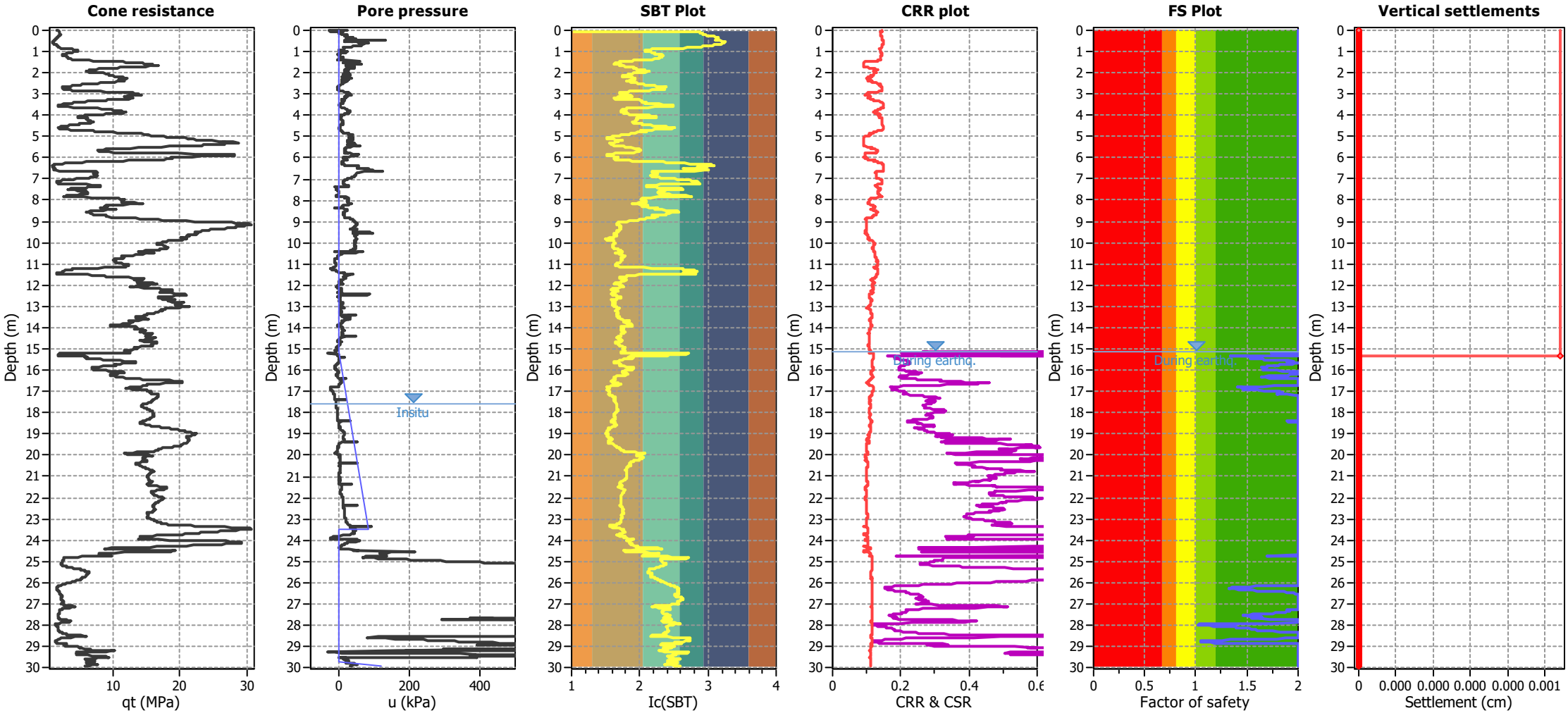
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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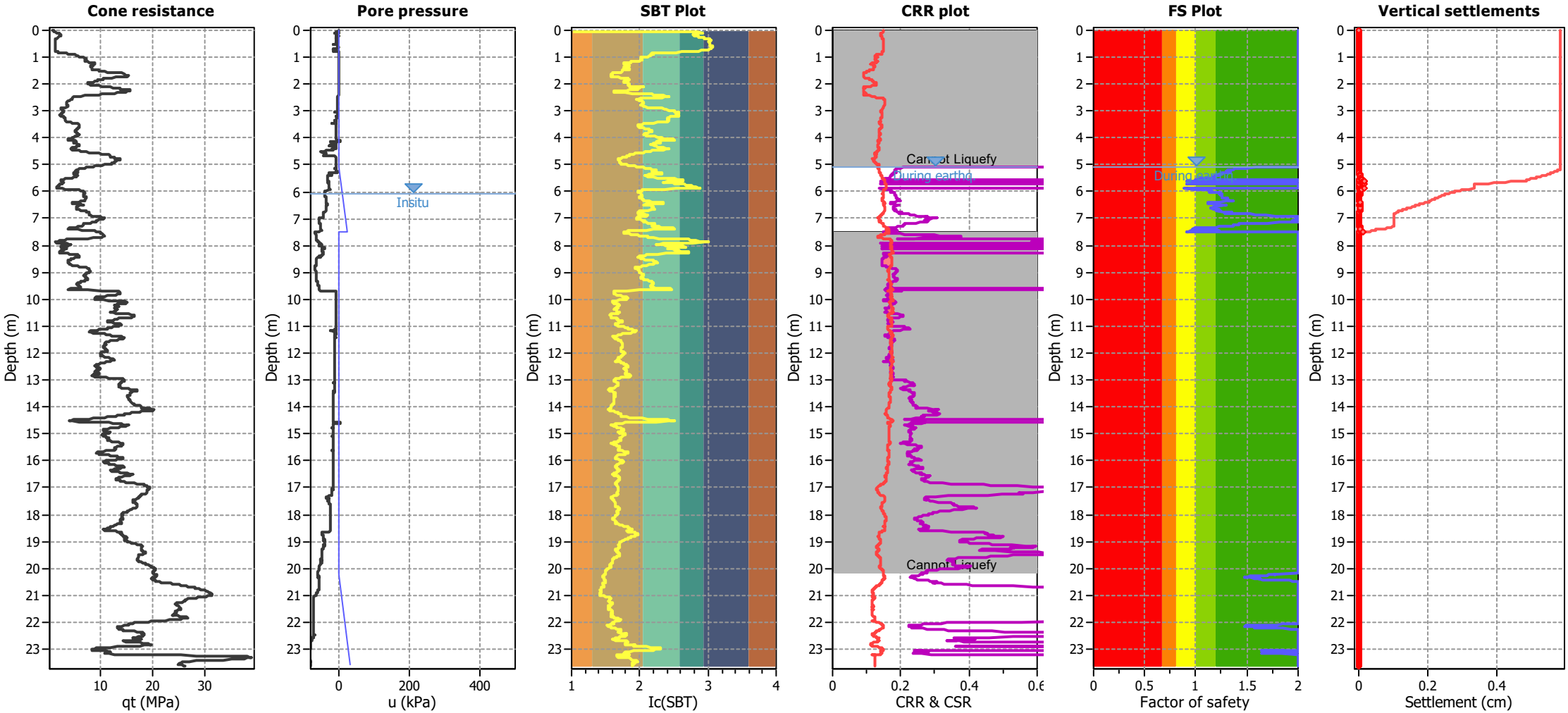
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



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Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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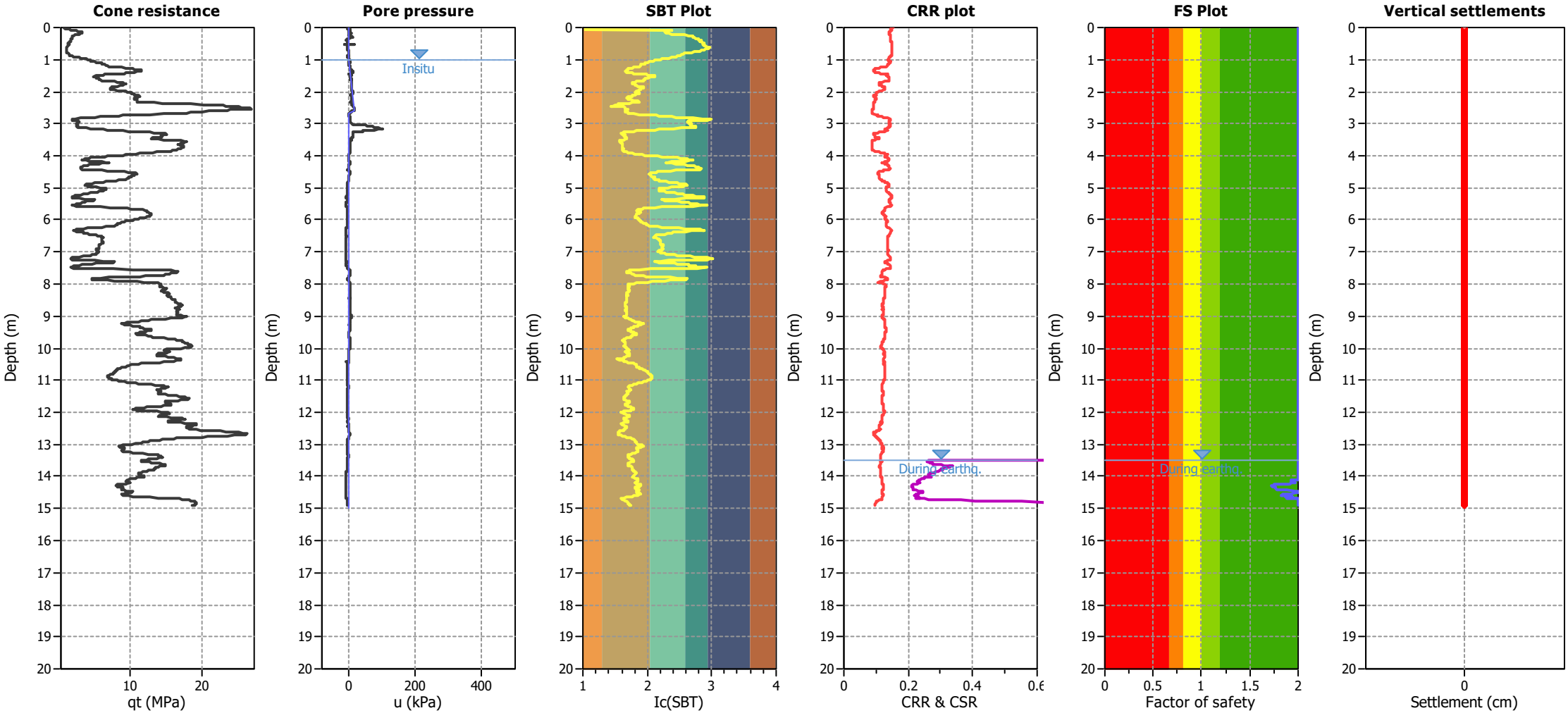
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



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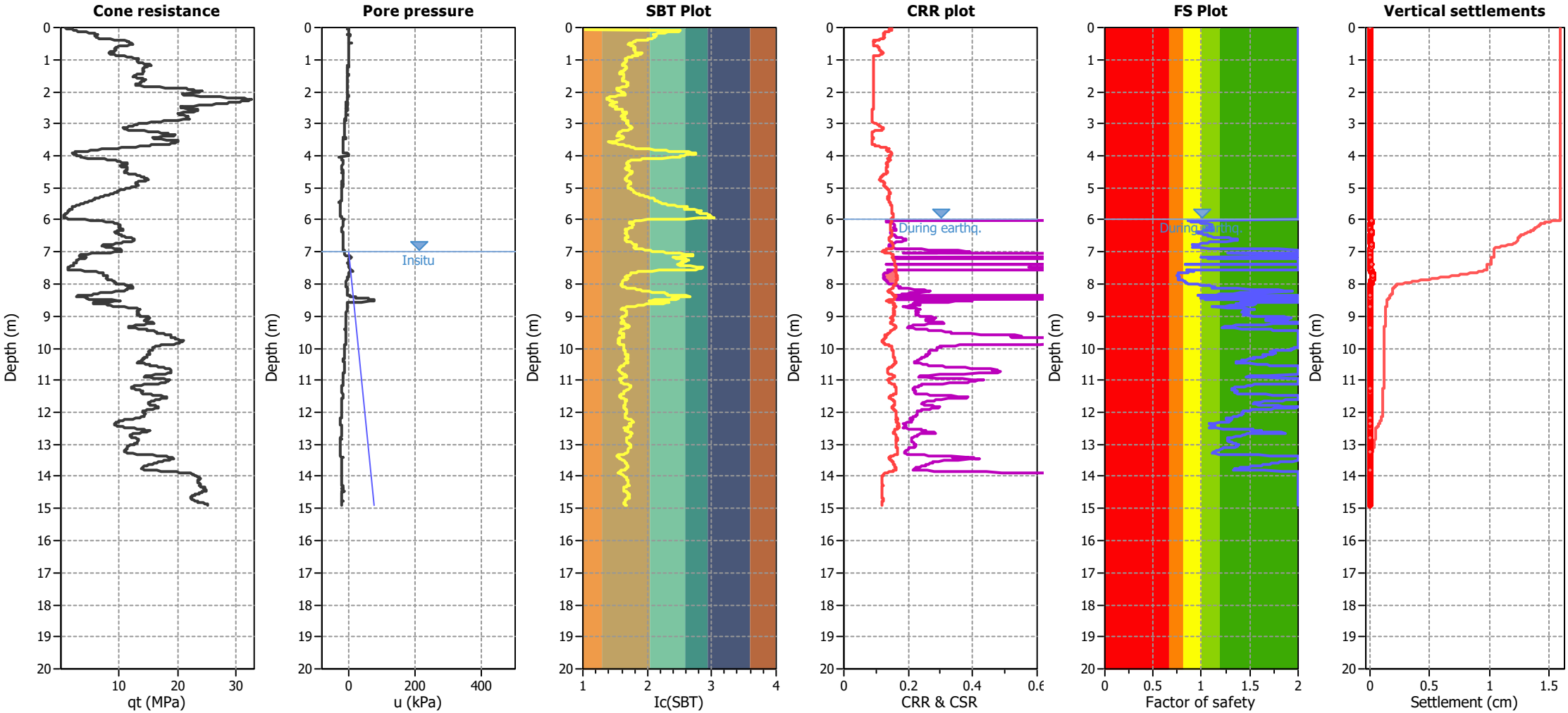
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m

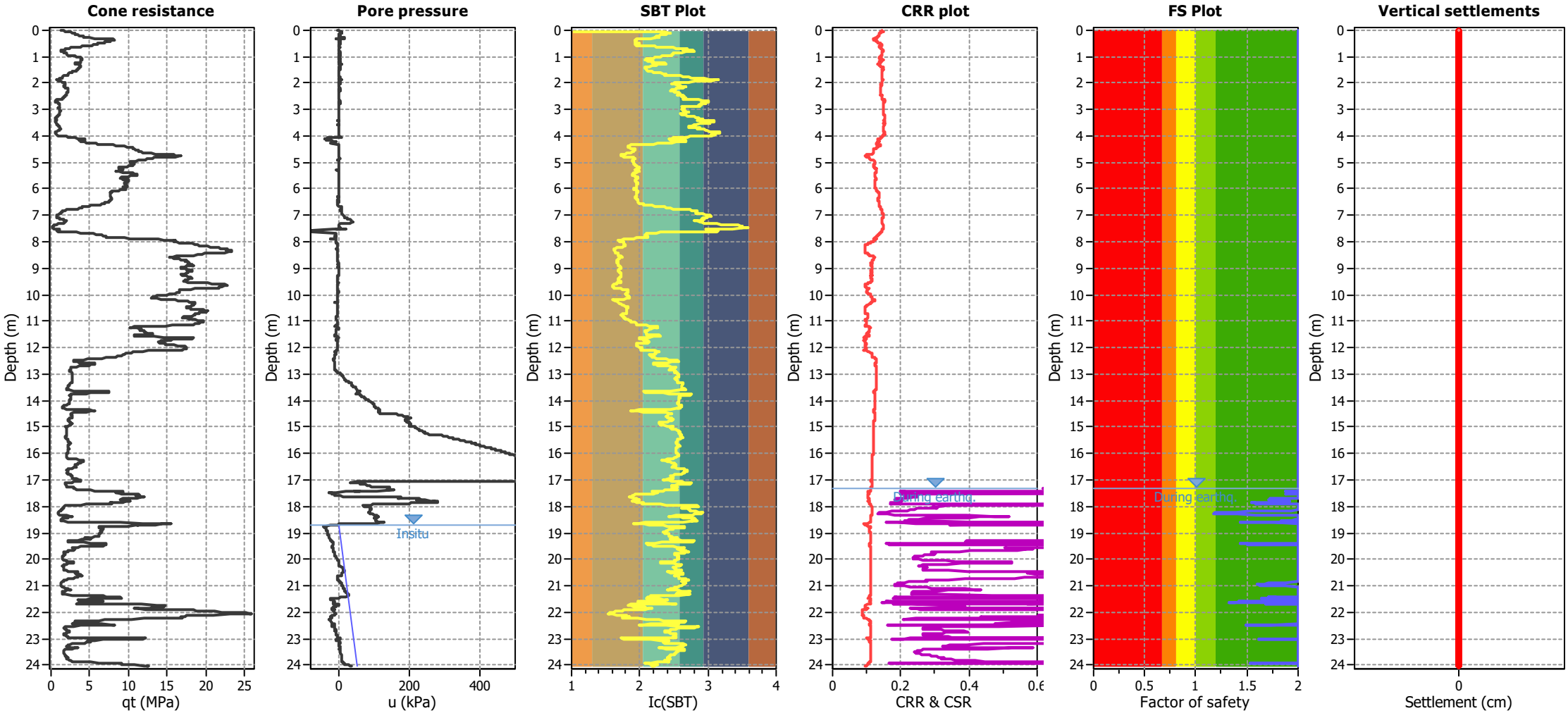


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

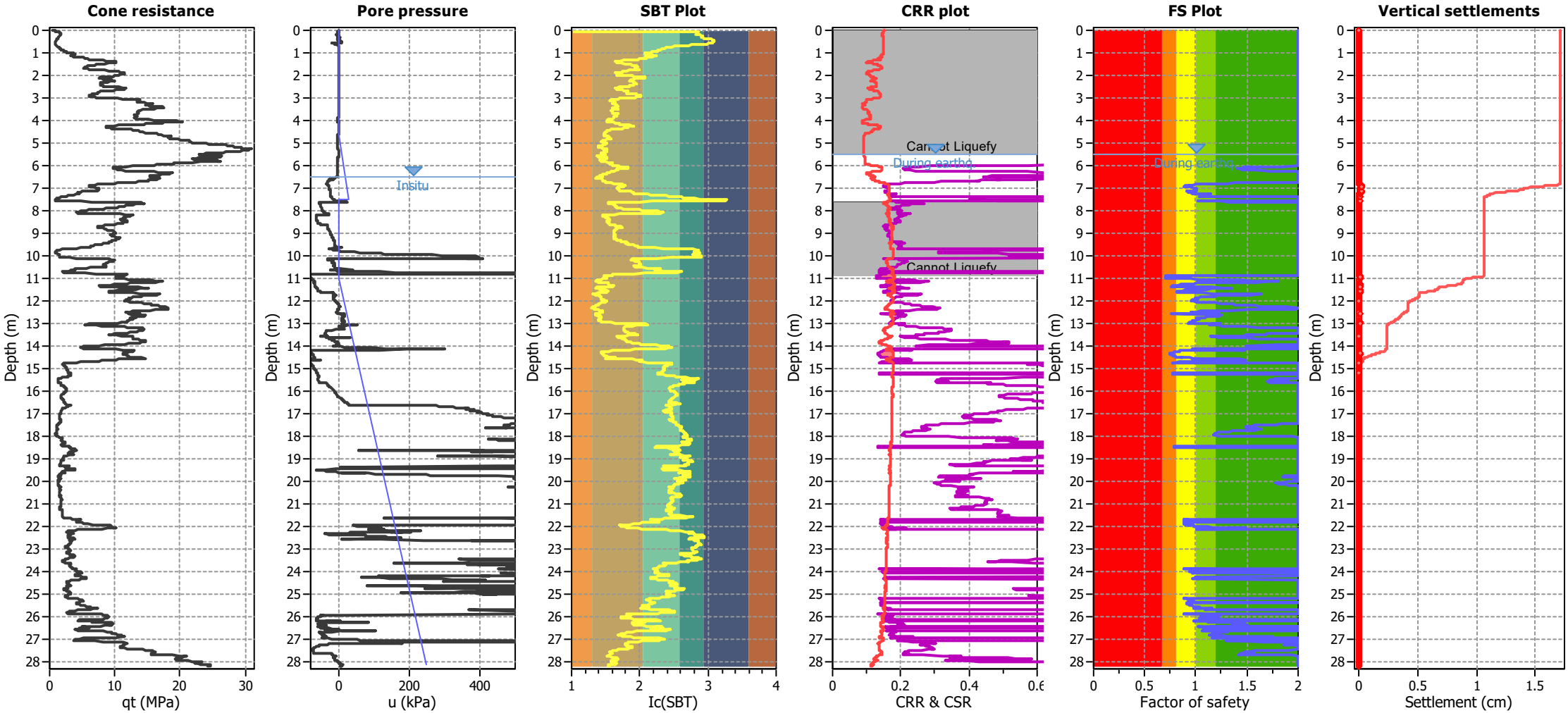


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m

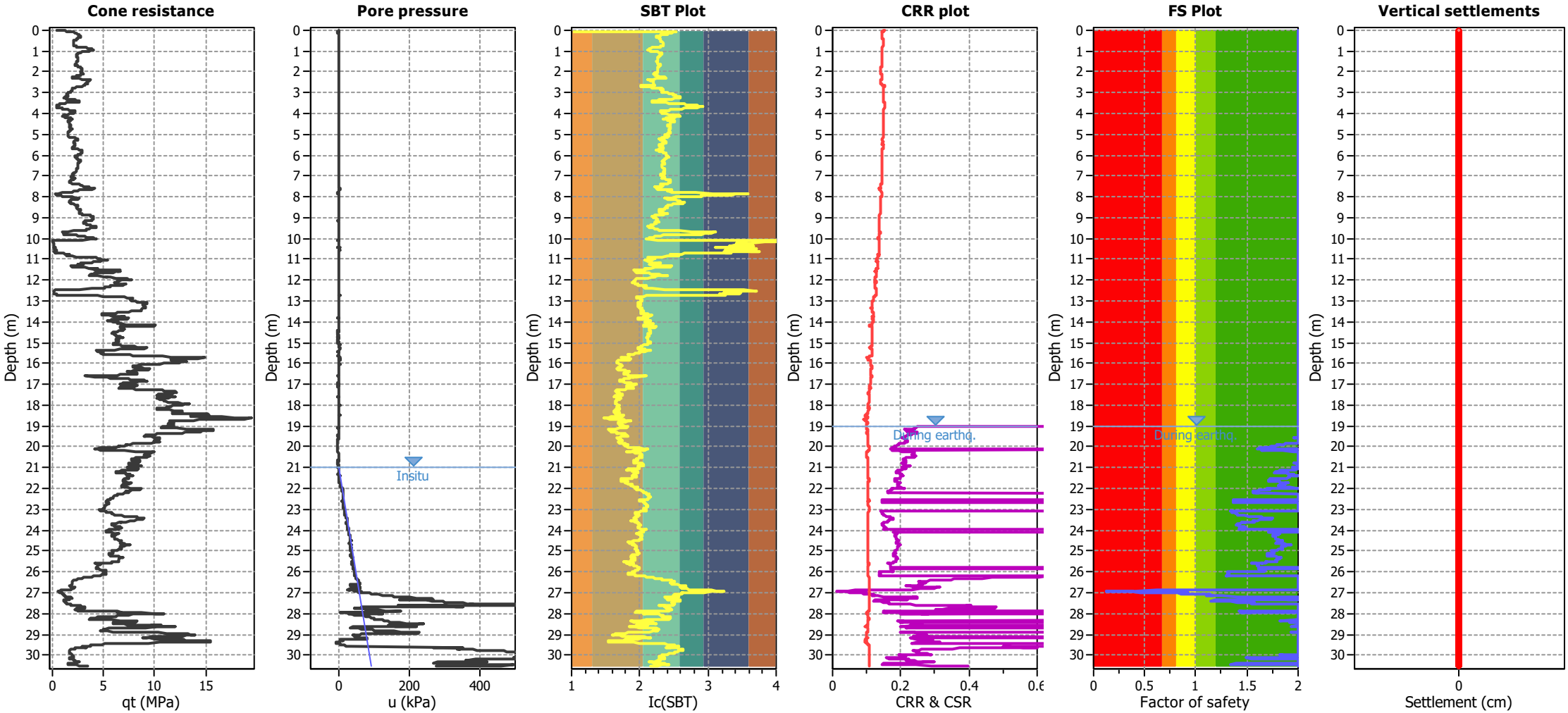


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m

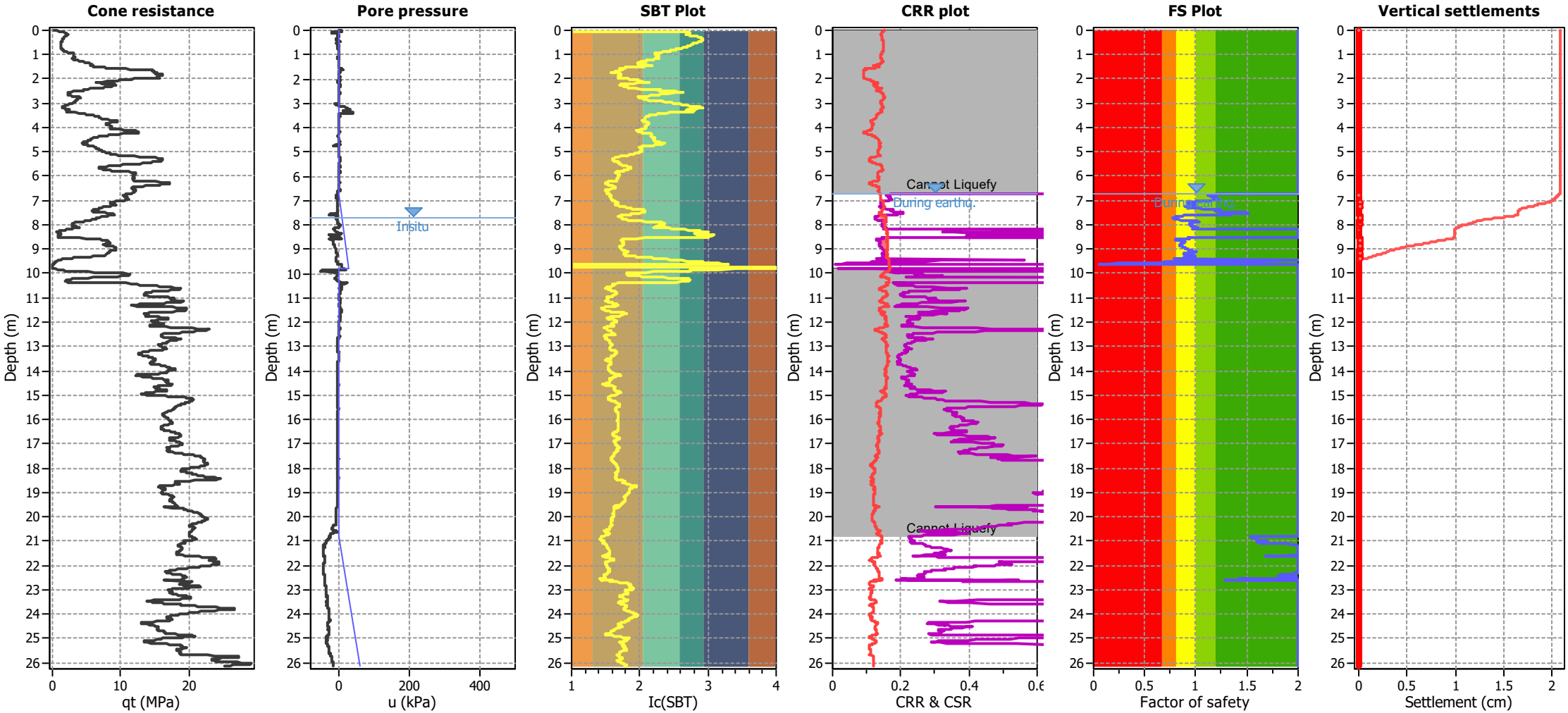


Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m

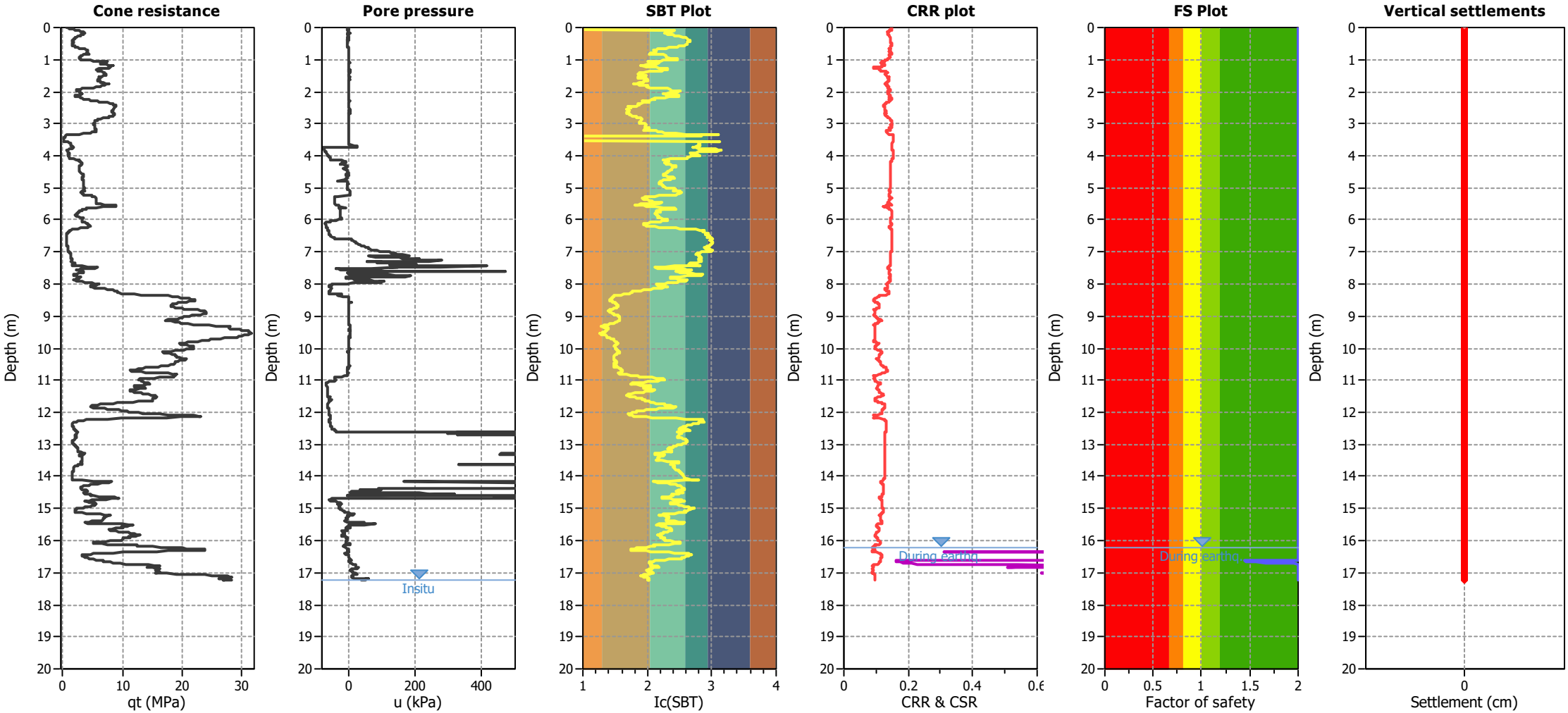


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m

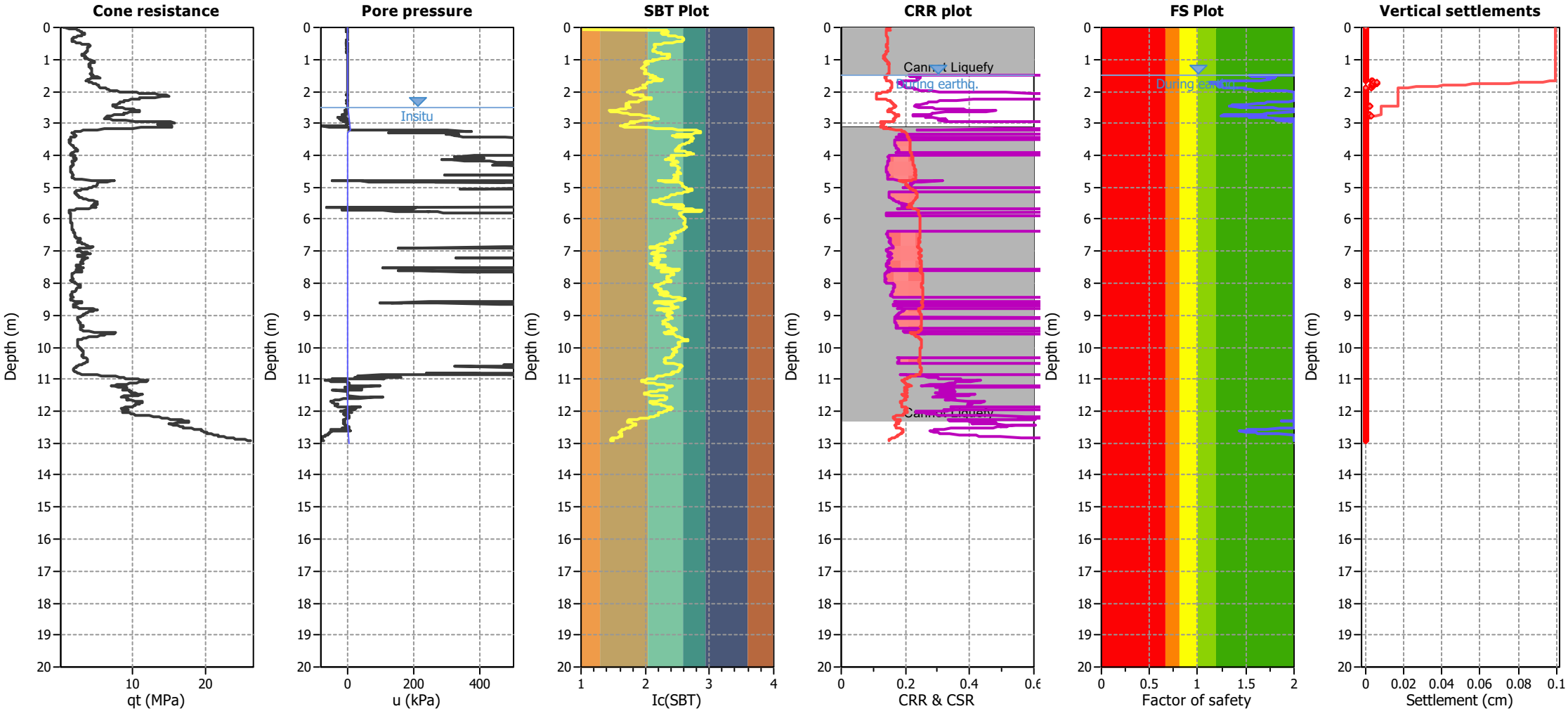


Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

10M INDEX ANALYSIS RESULTS (AGED)

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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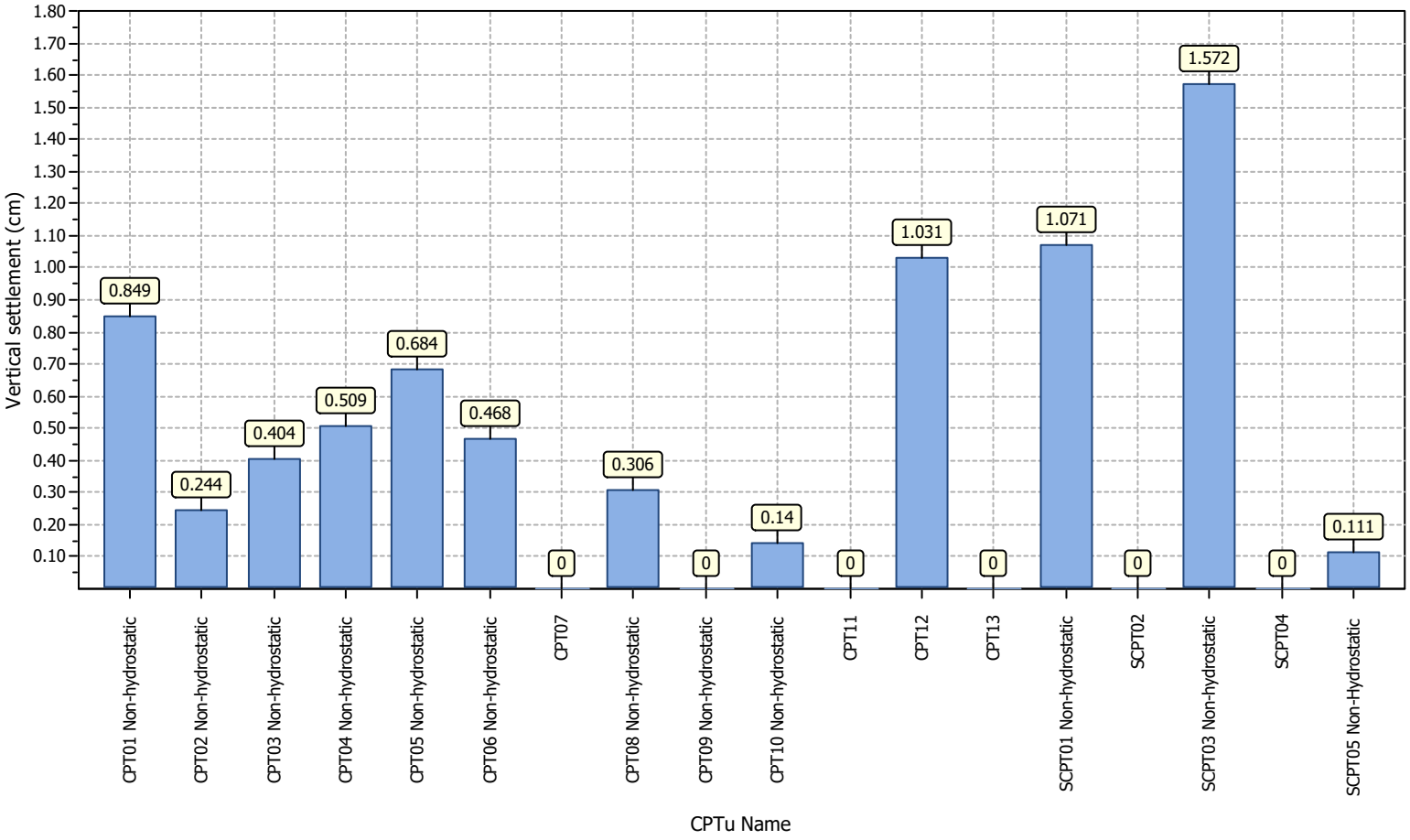
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report

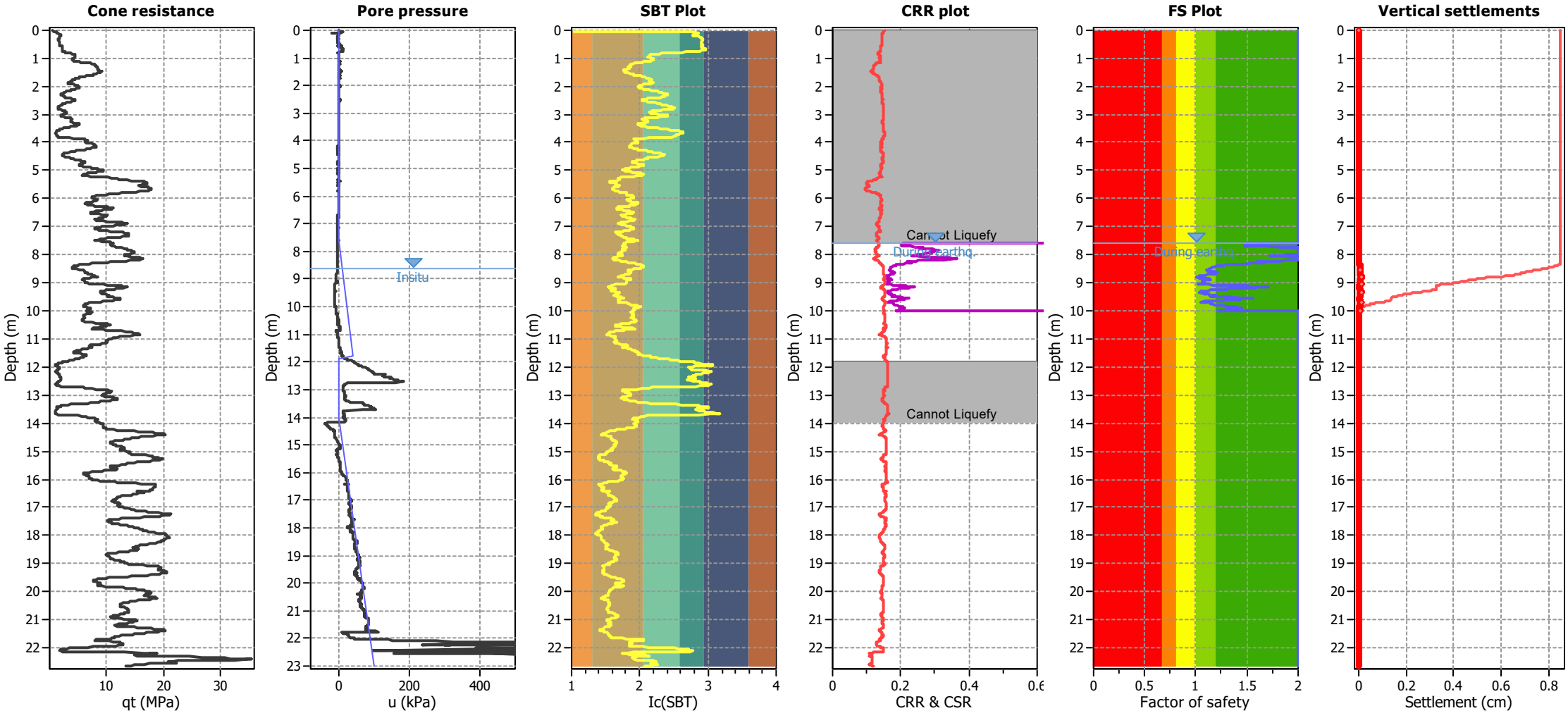


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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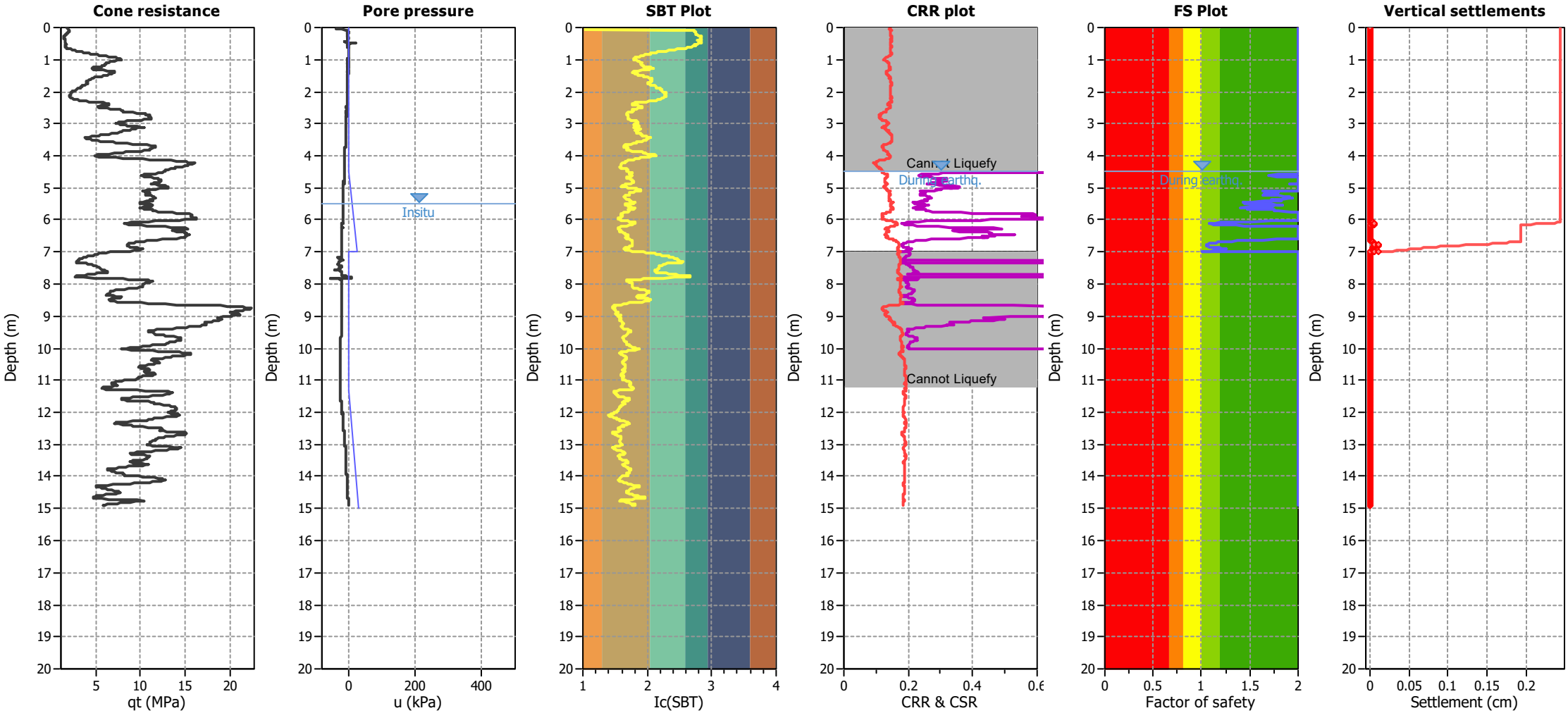
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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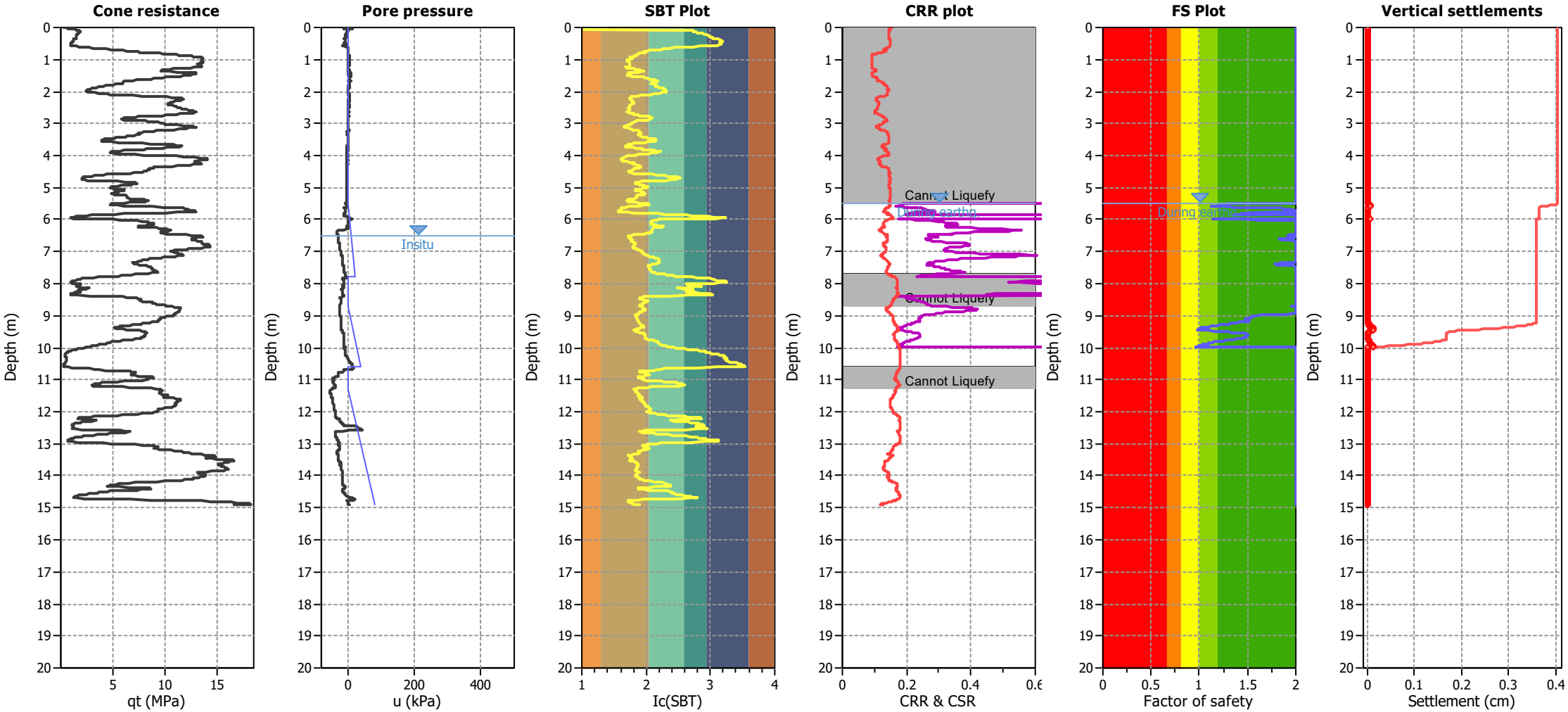
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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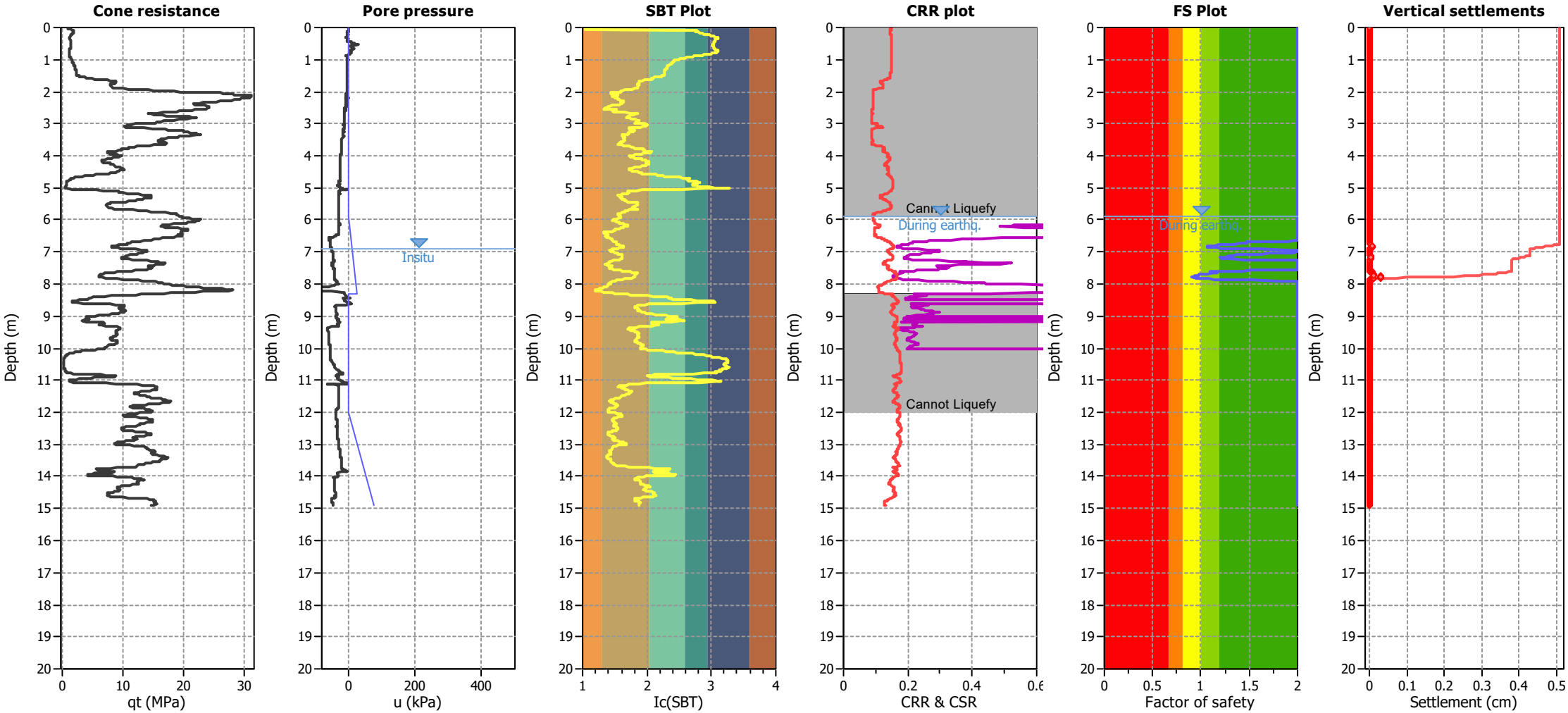
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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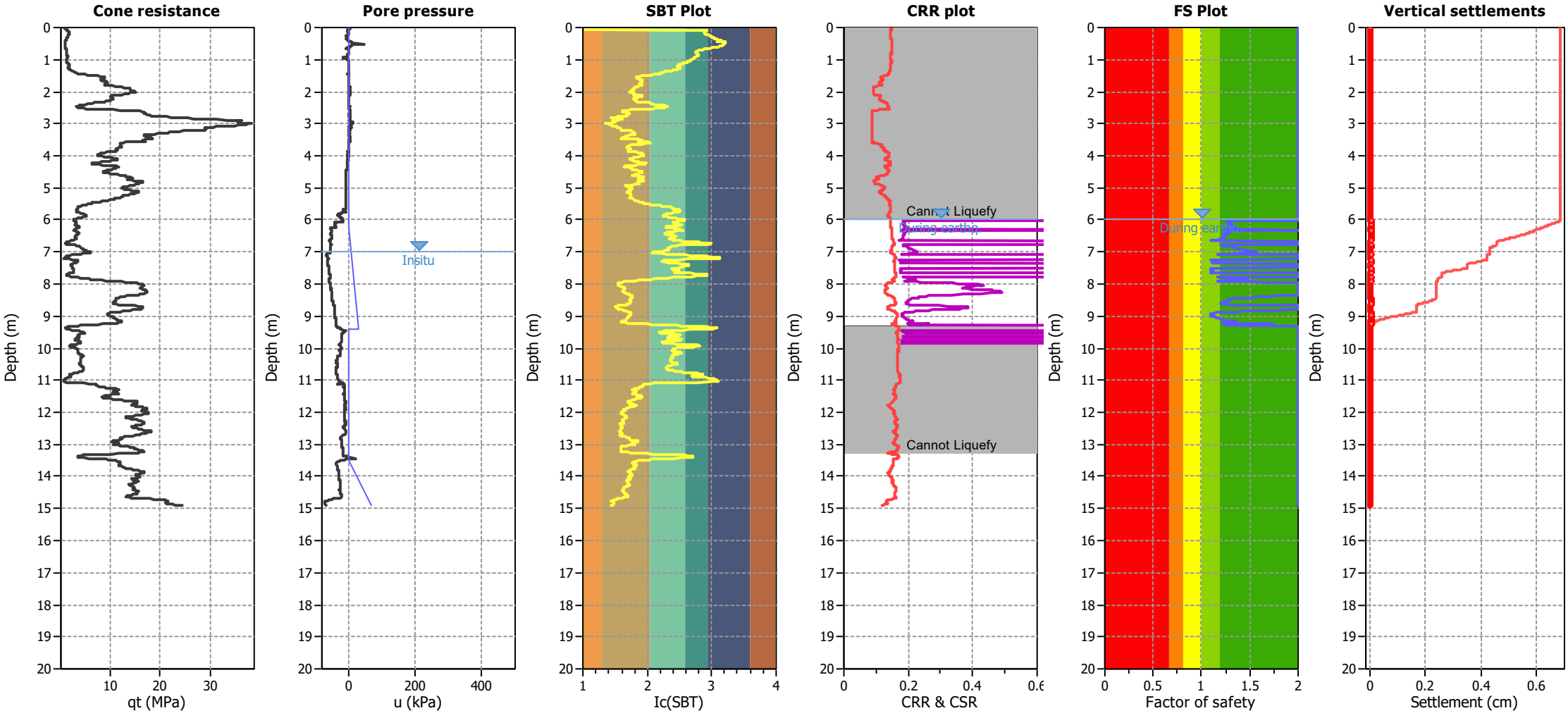
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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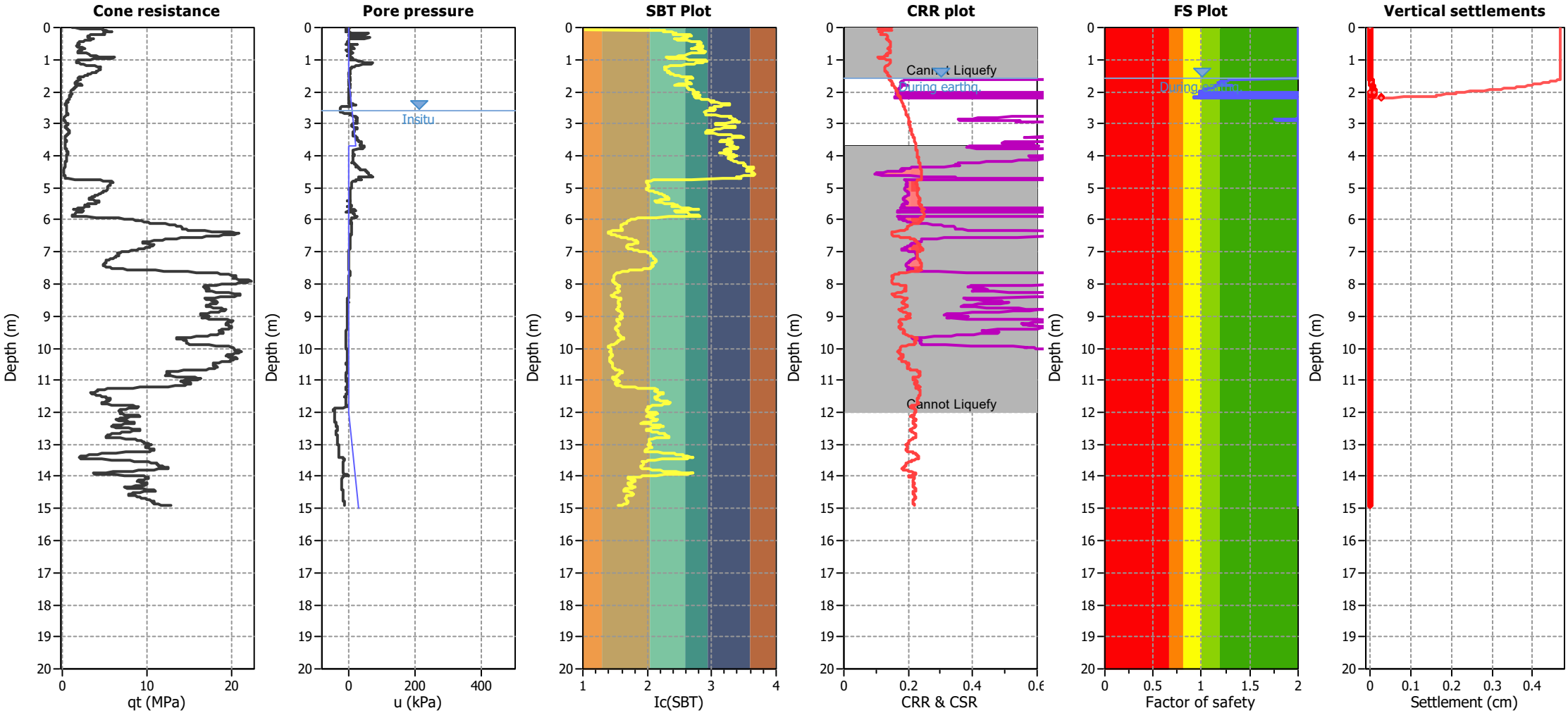
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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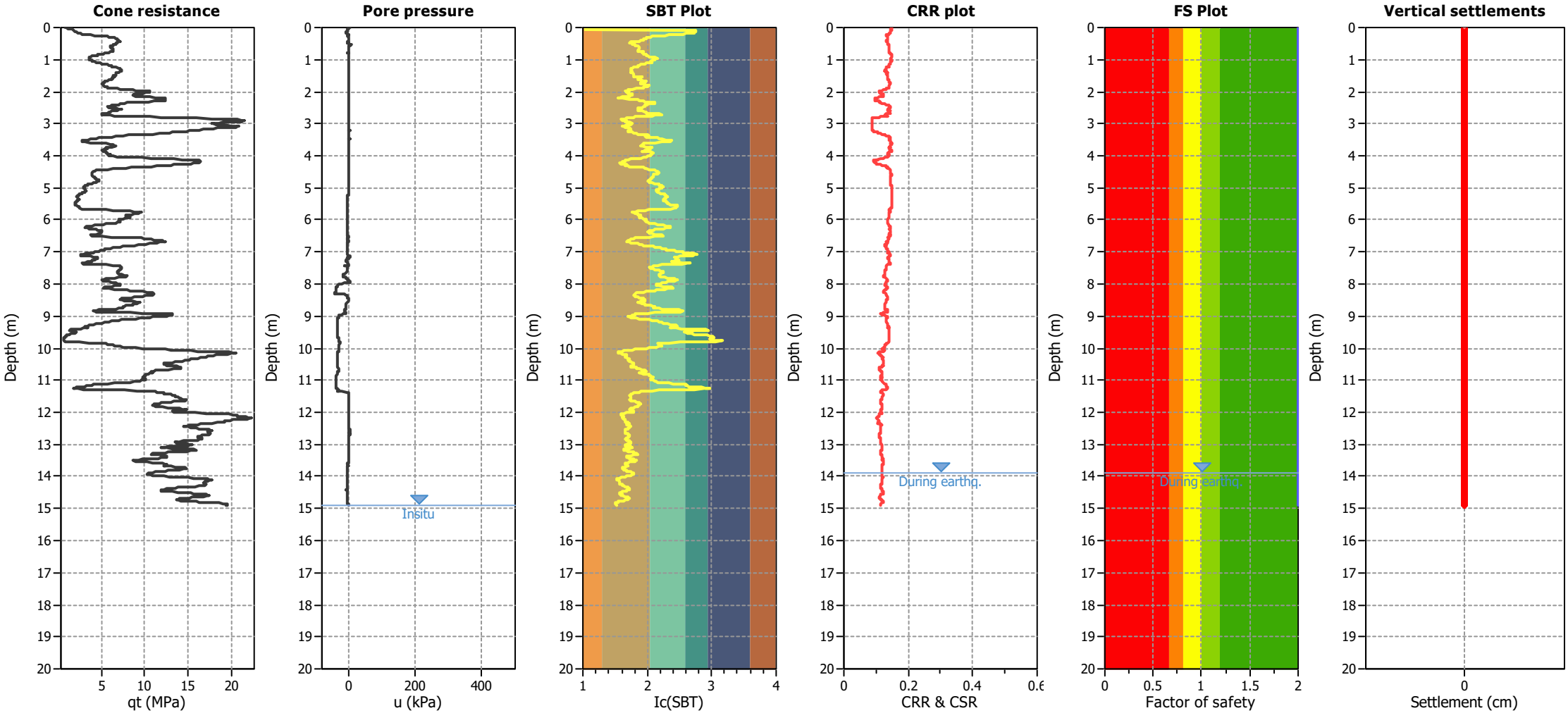
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m

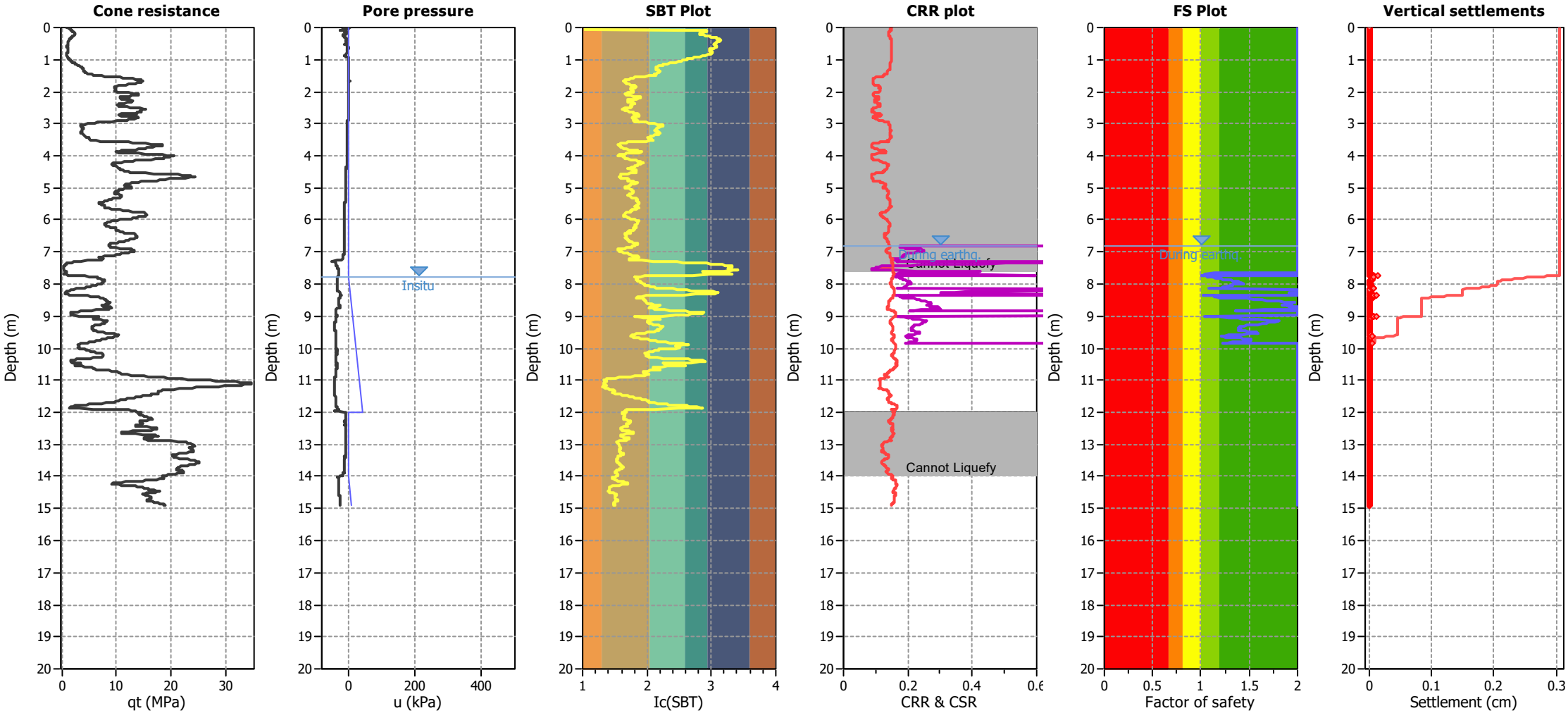


Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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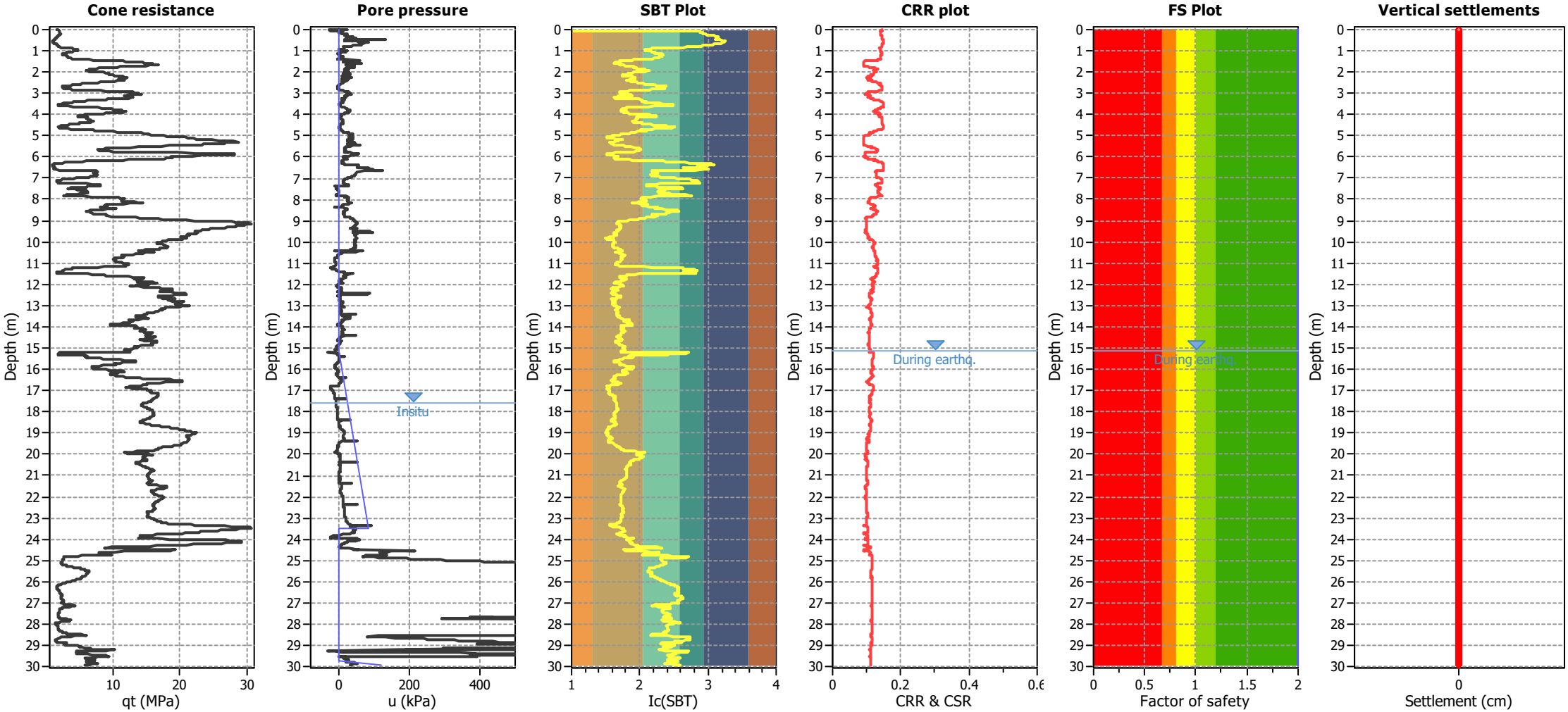
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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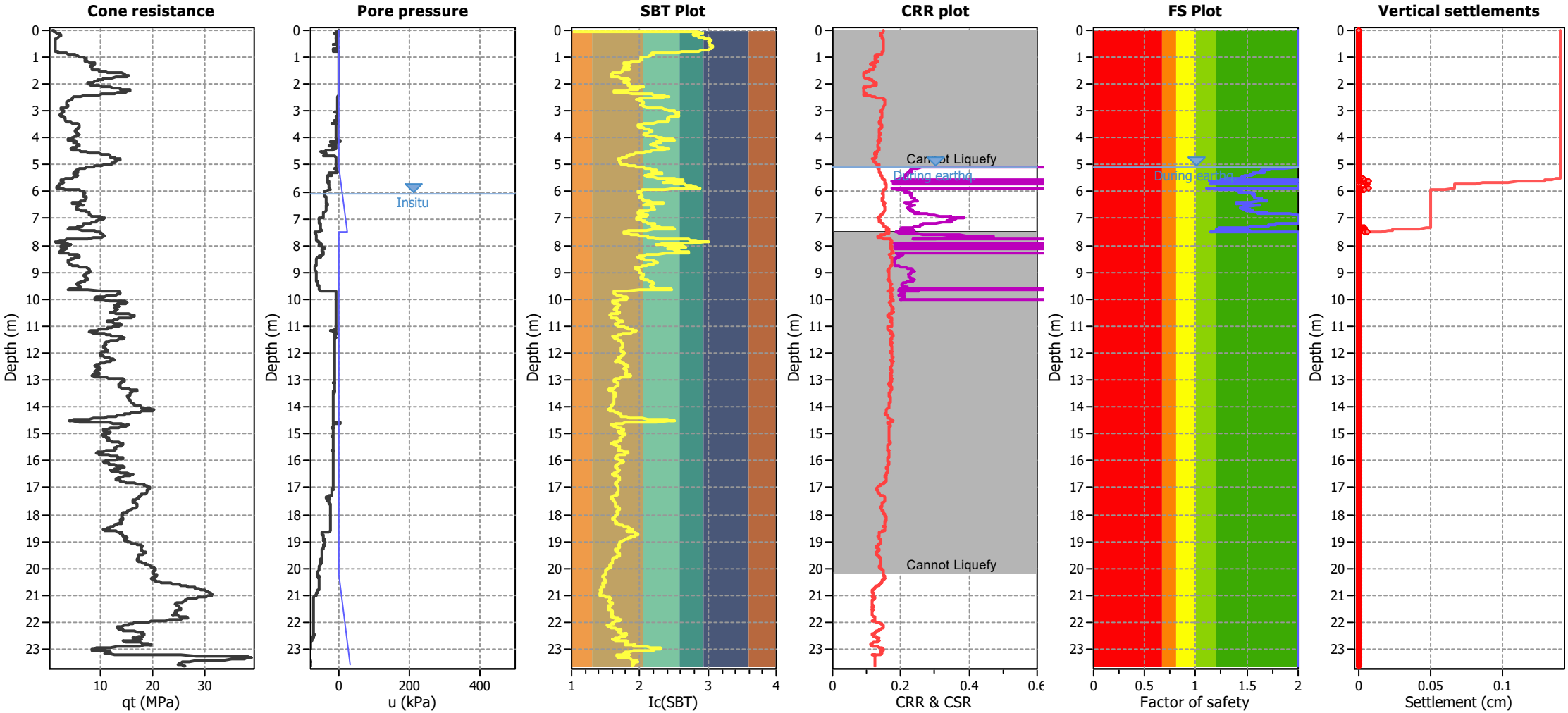
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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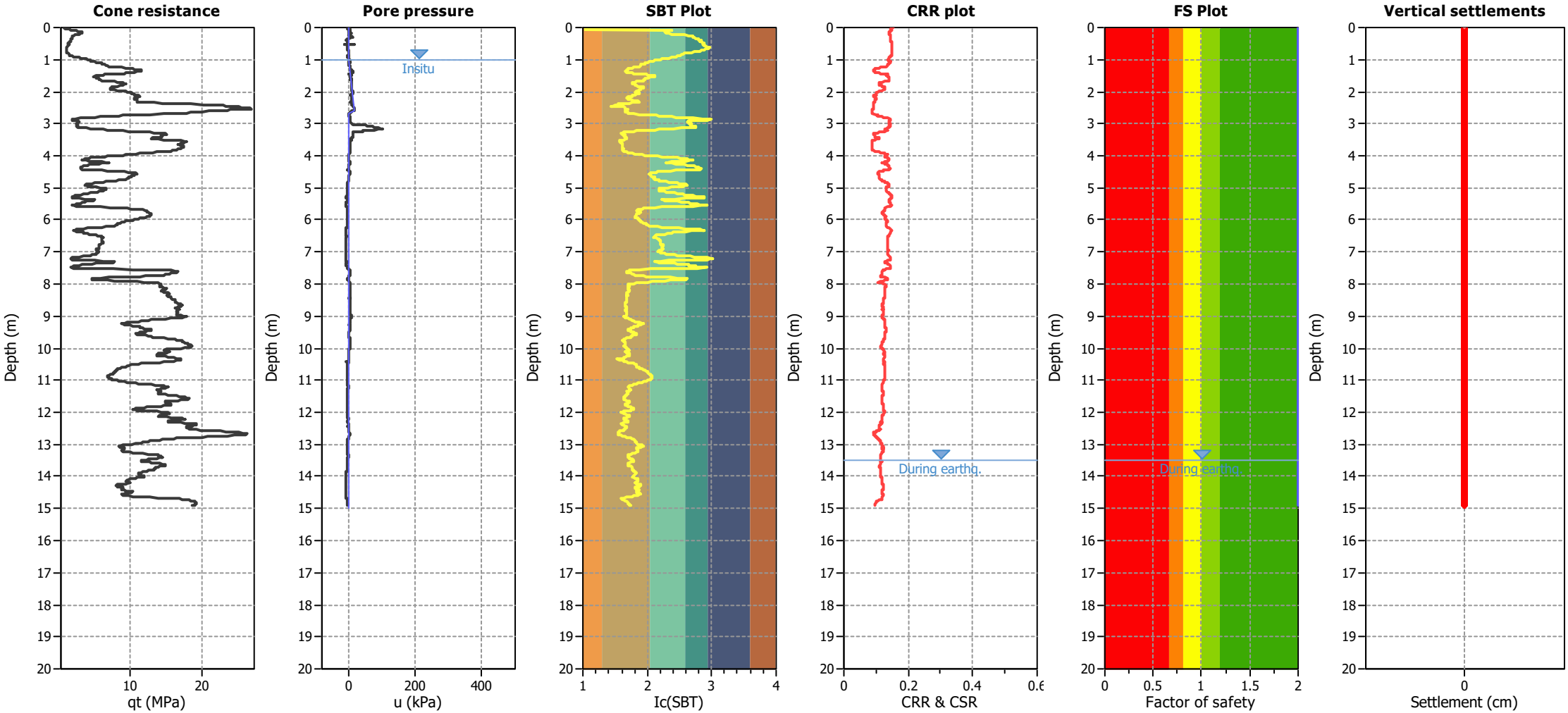
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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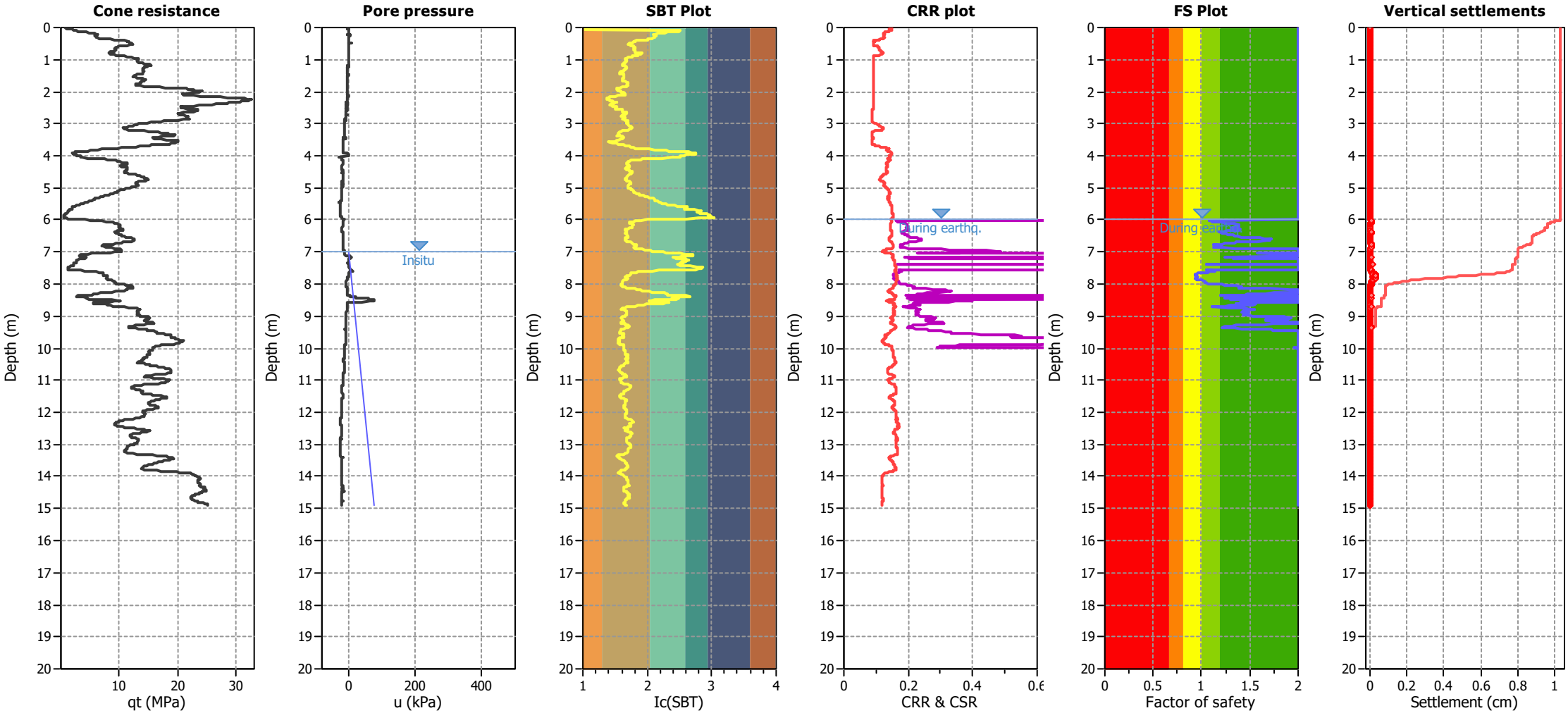
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m

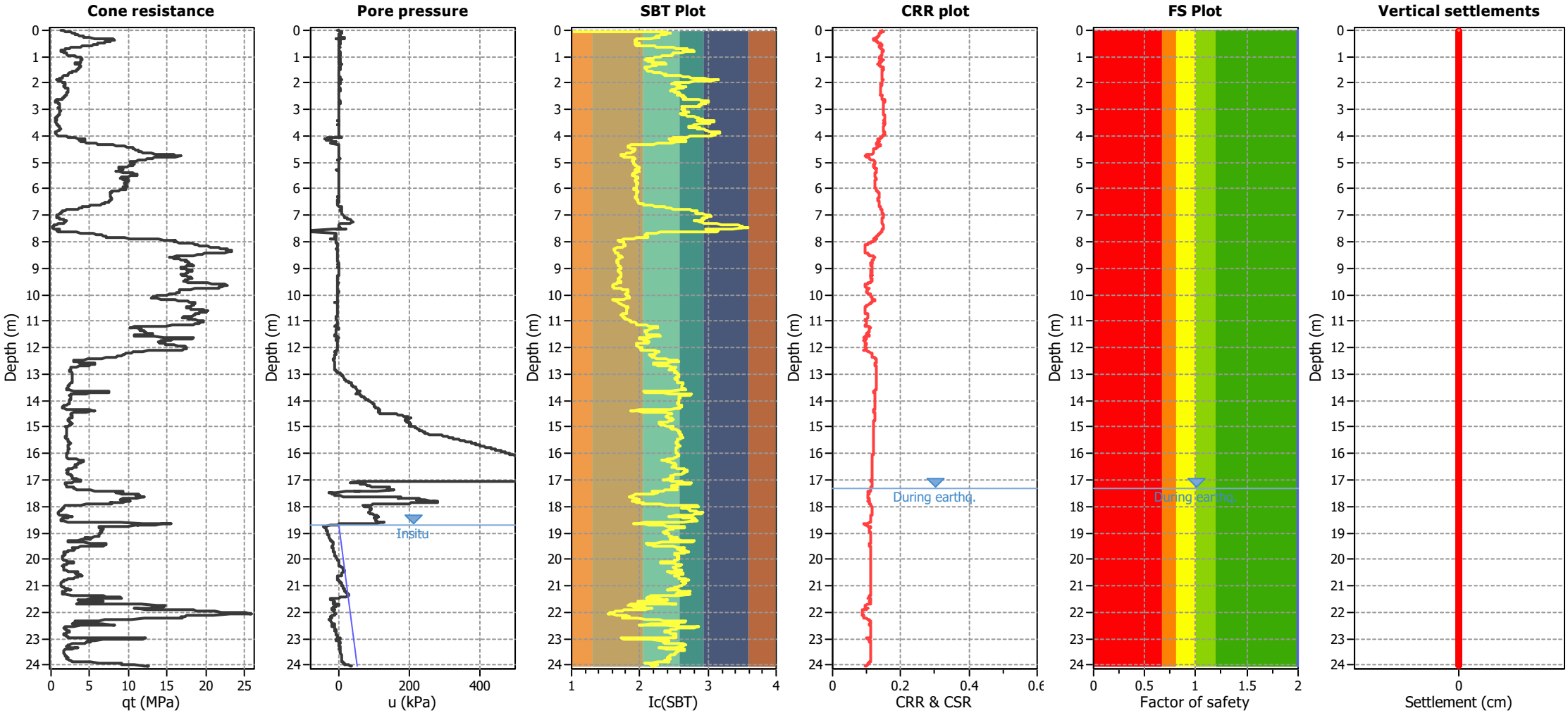


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

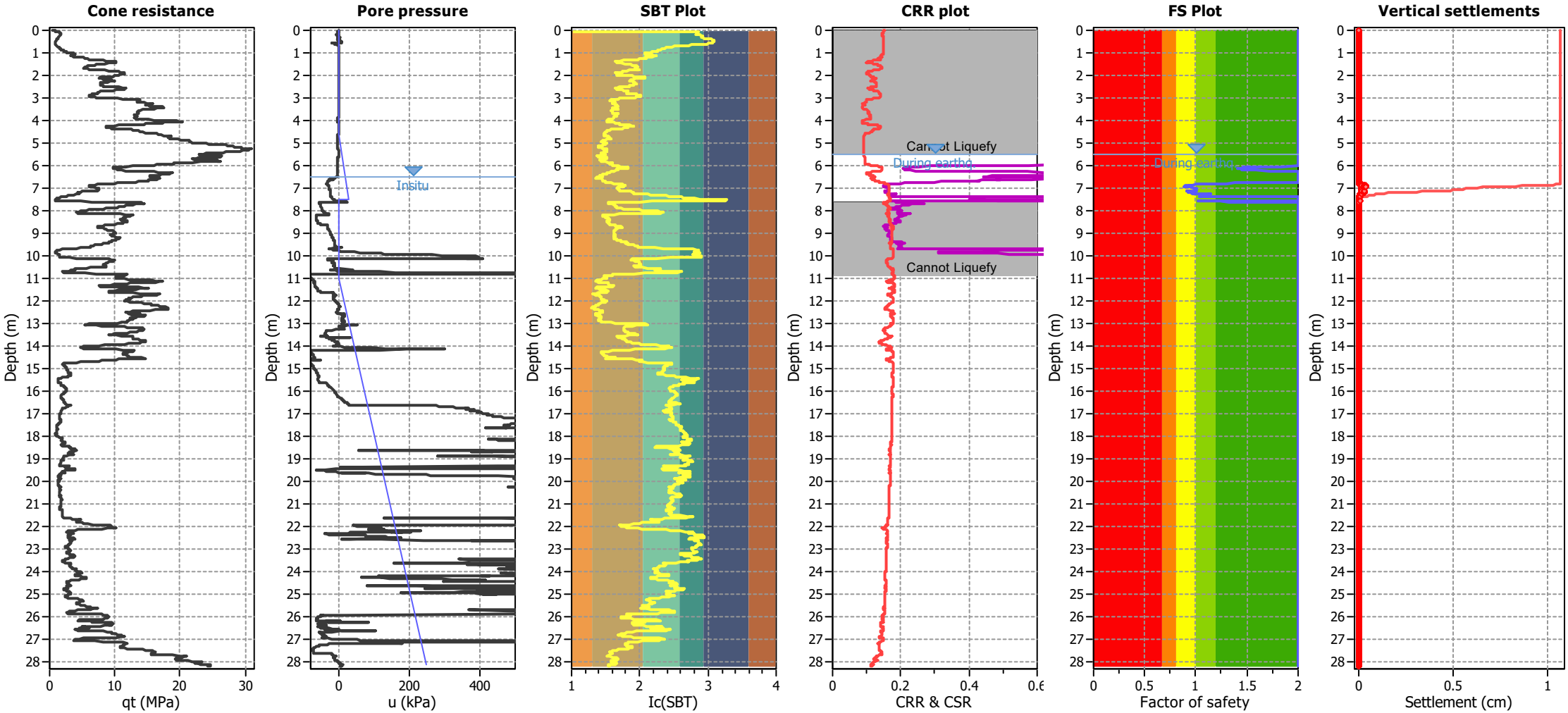


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m

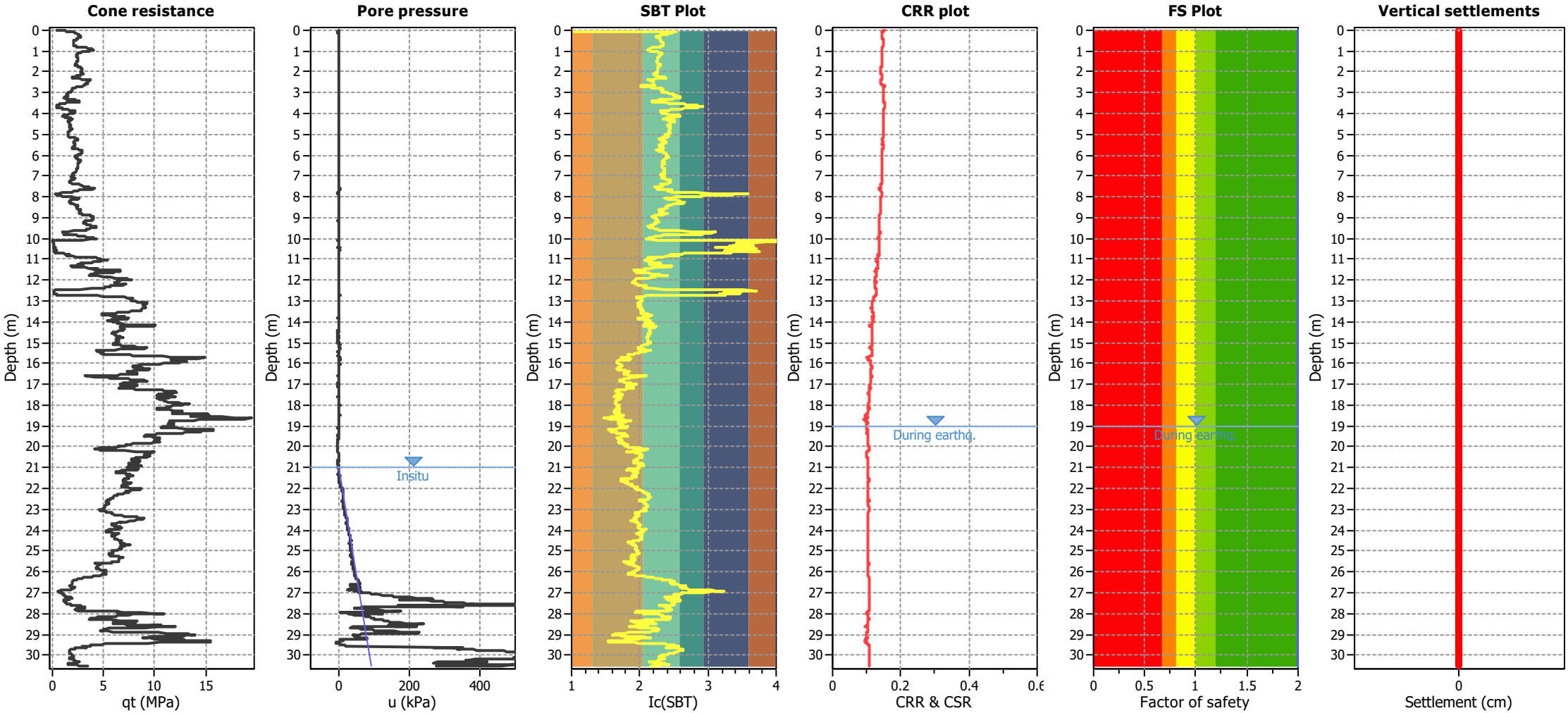


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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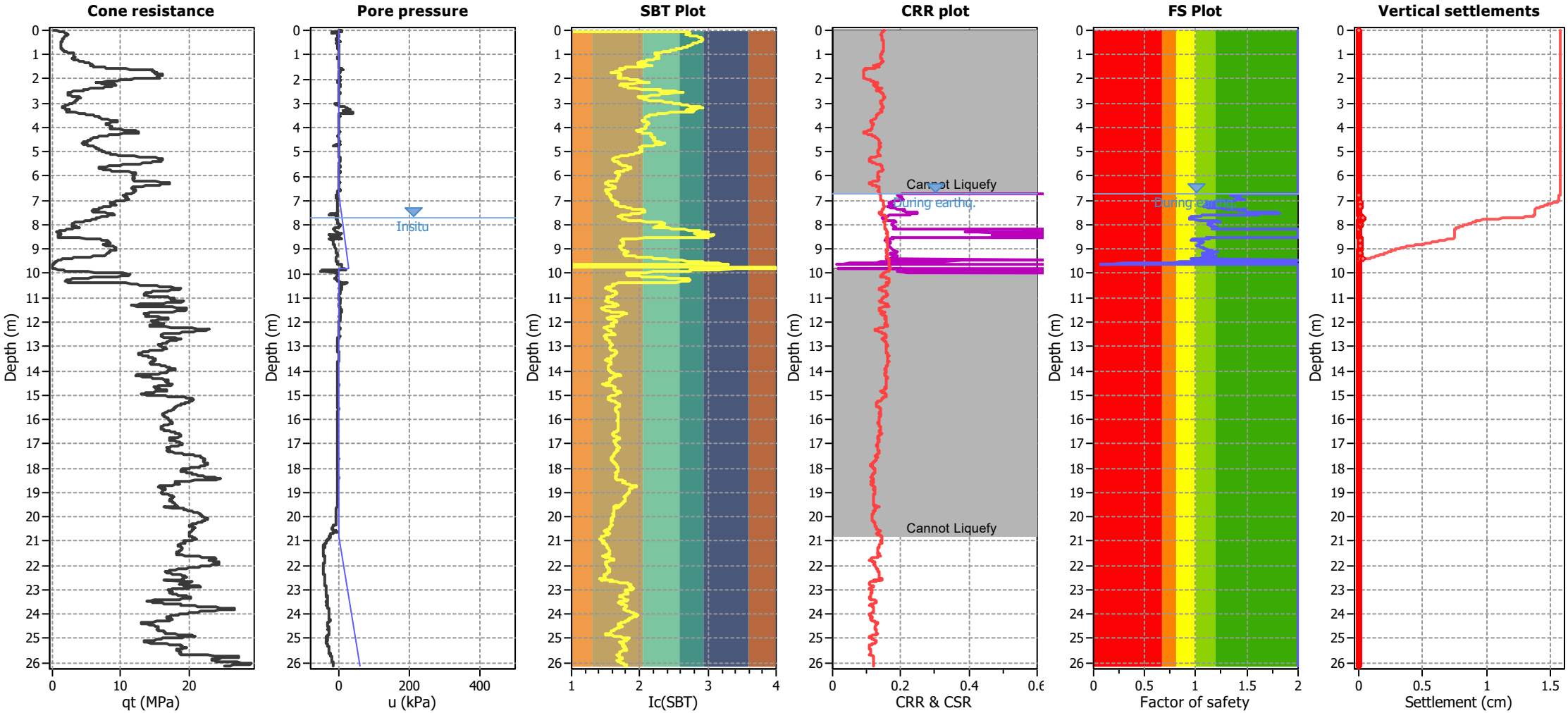
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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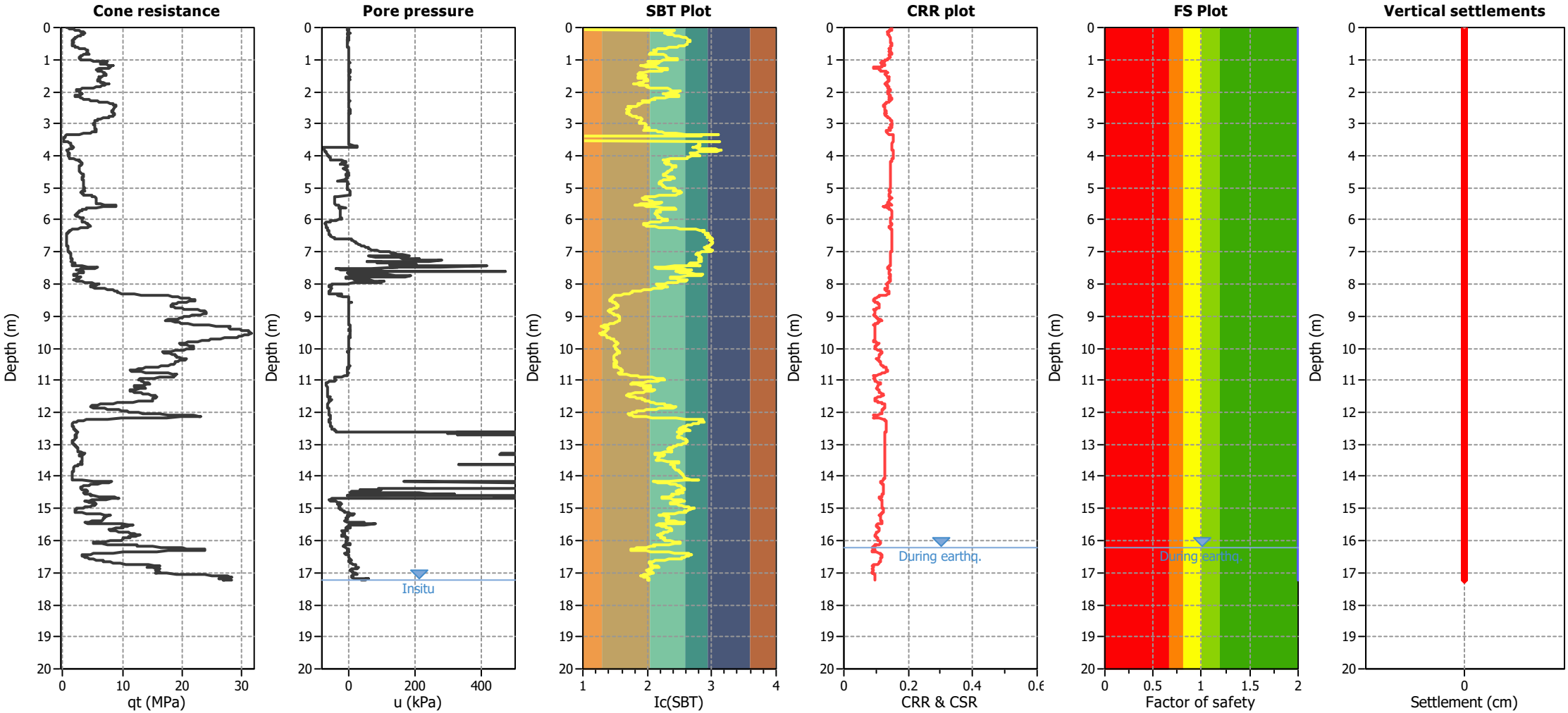
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m

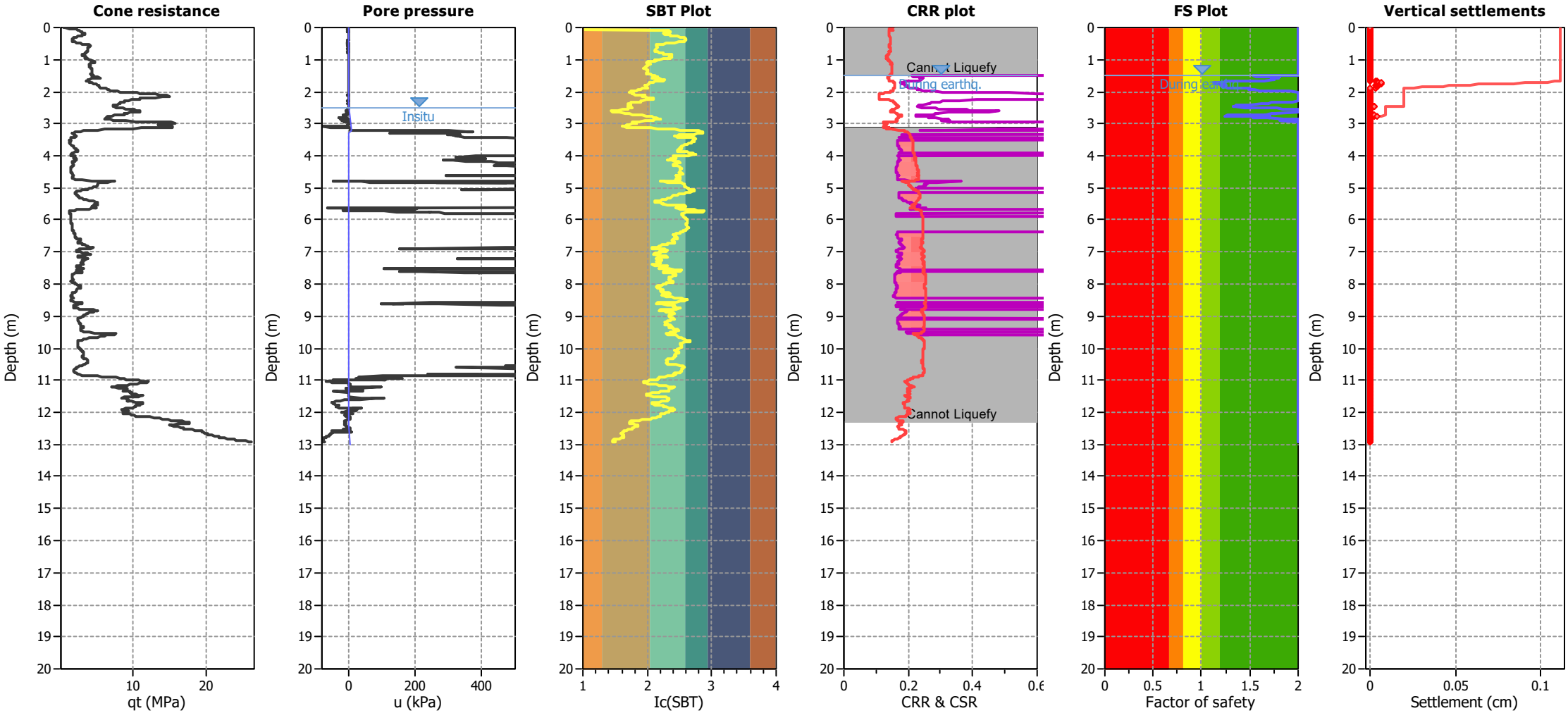


Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

FULL DEPTH ANALYSIS

(NON-AGED)

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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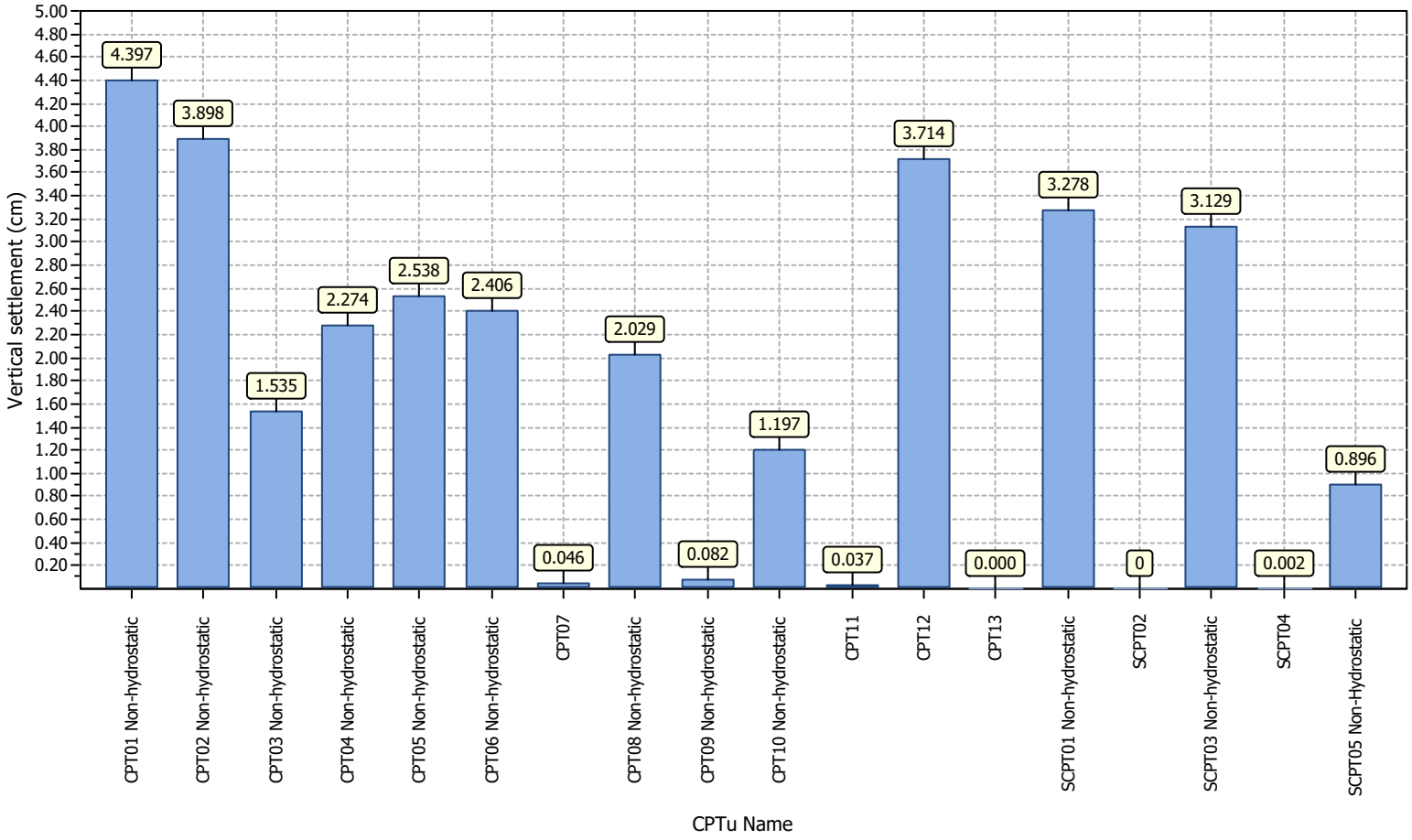
Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report

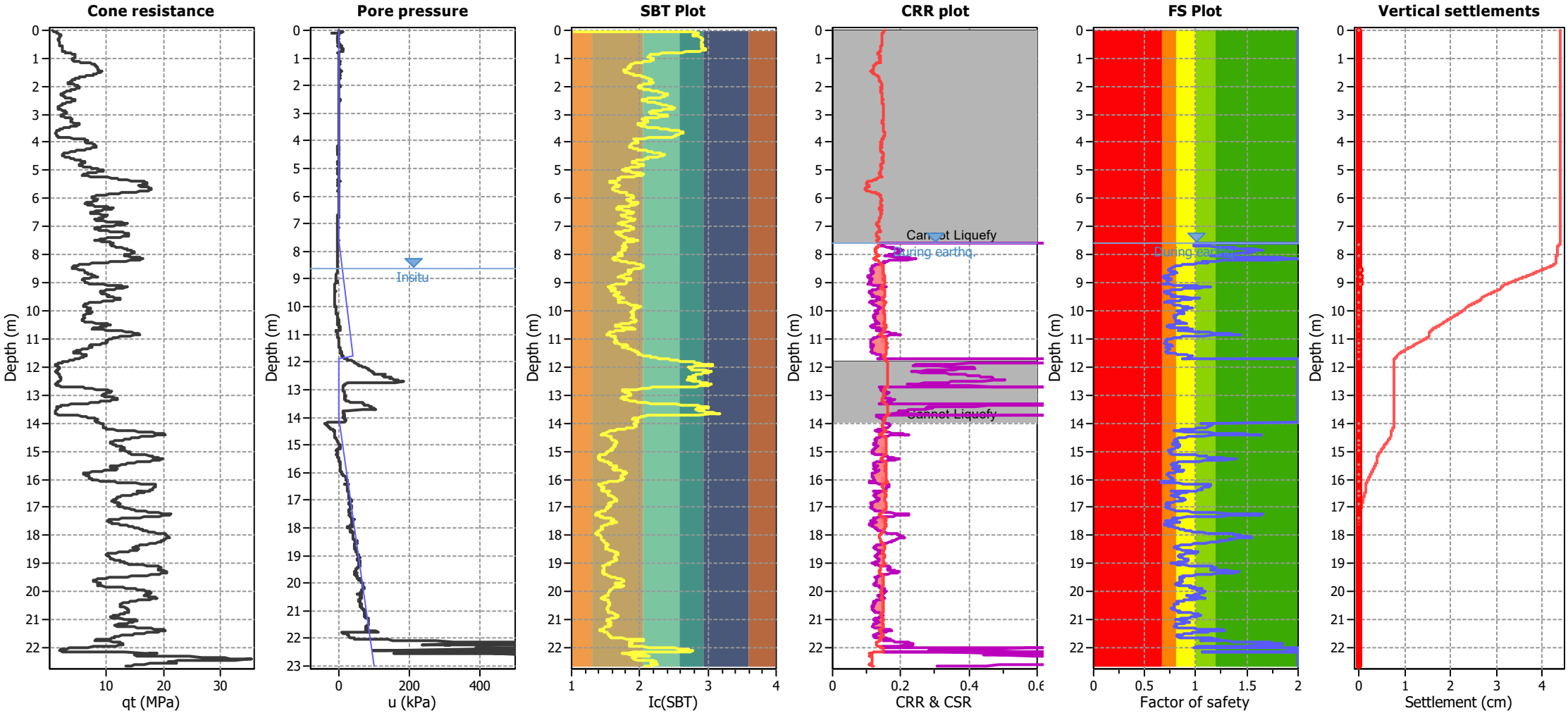


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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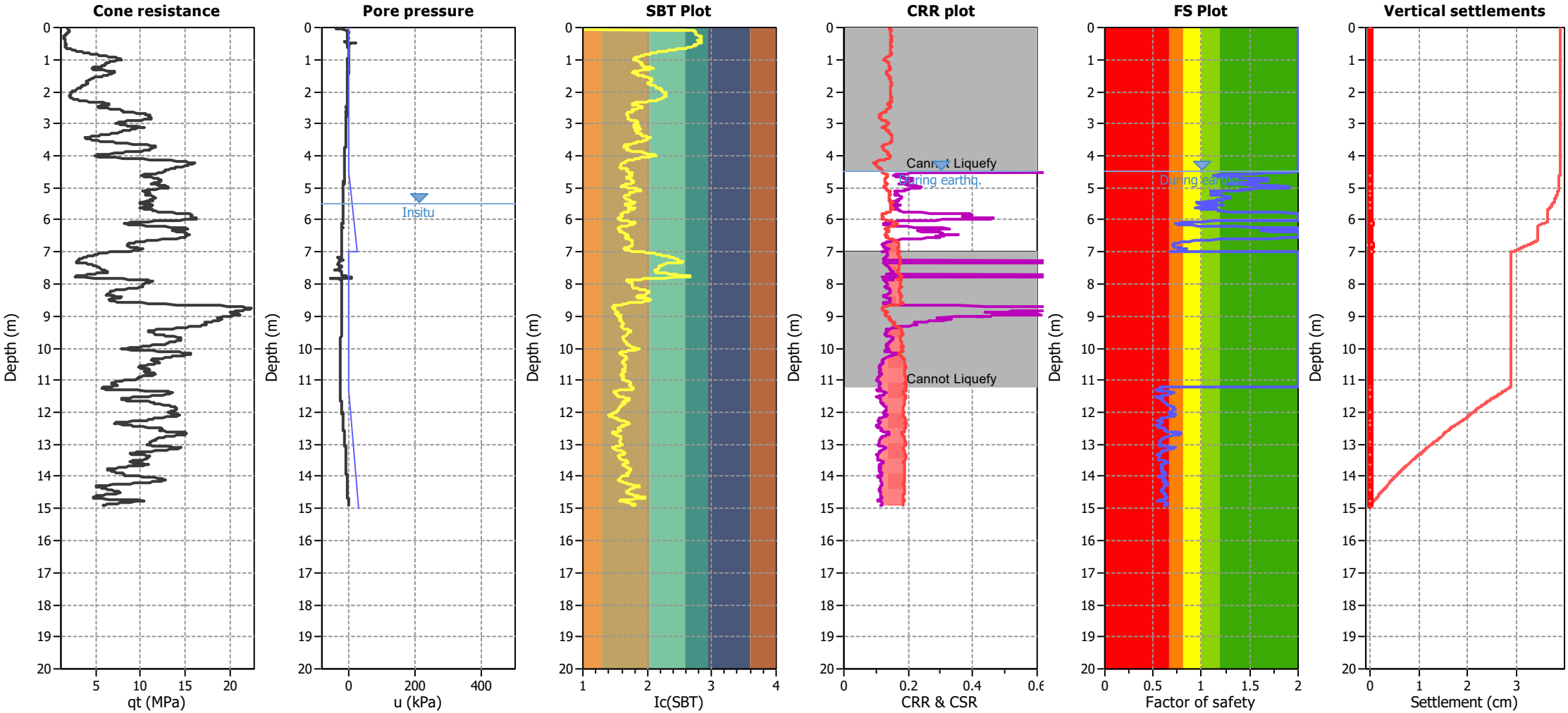
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m

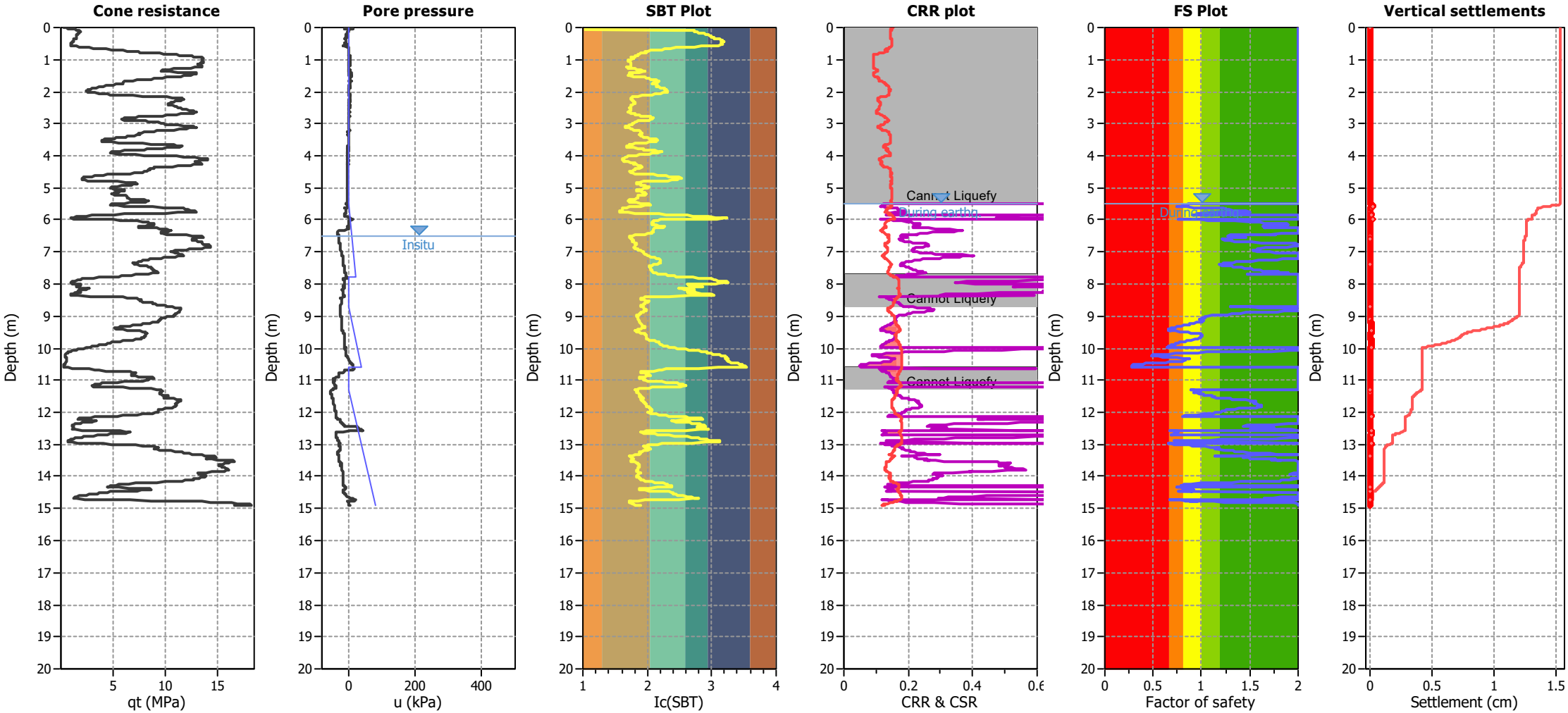


Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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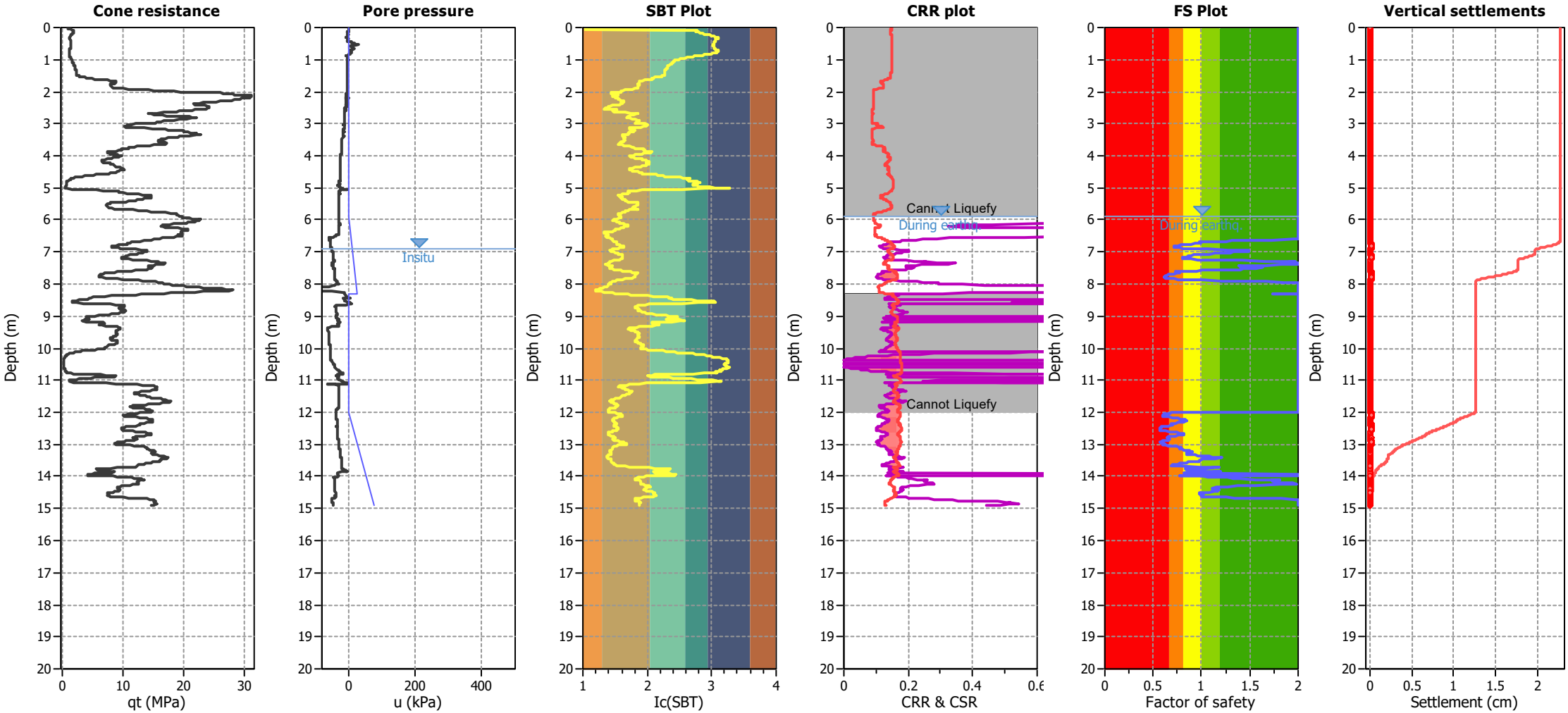
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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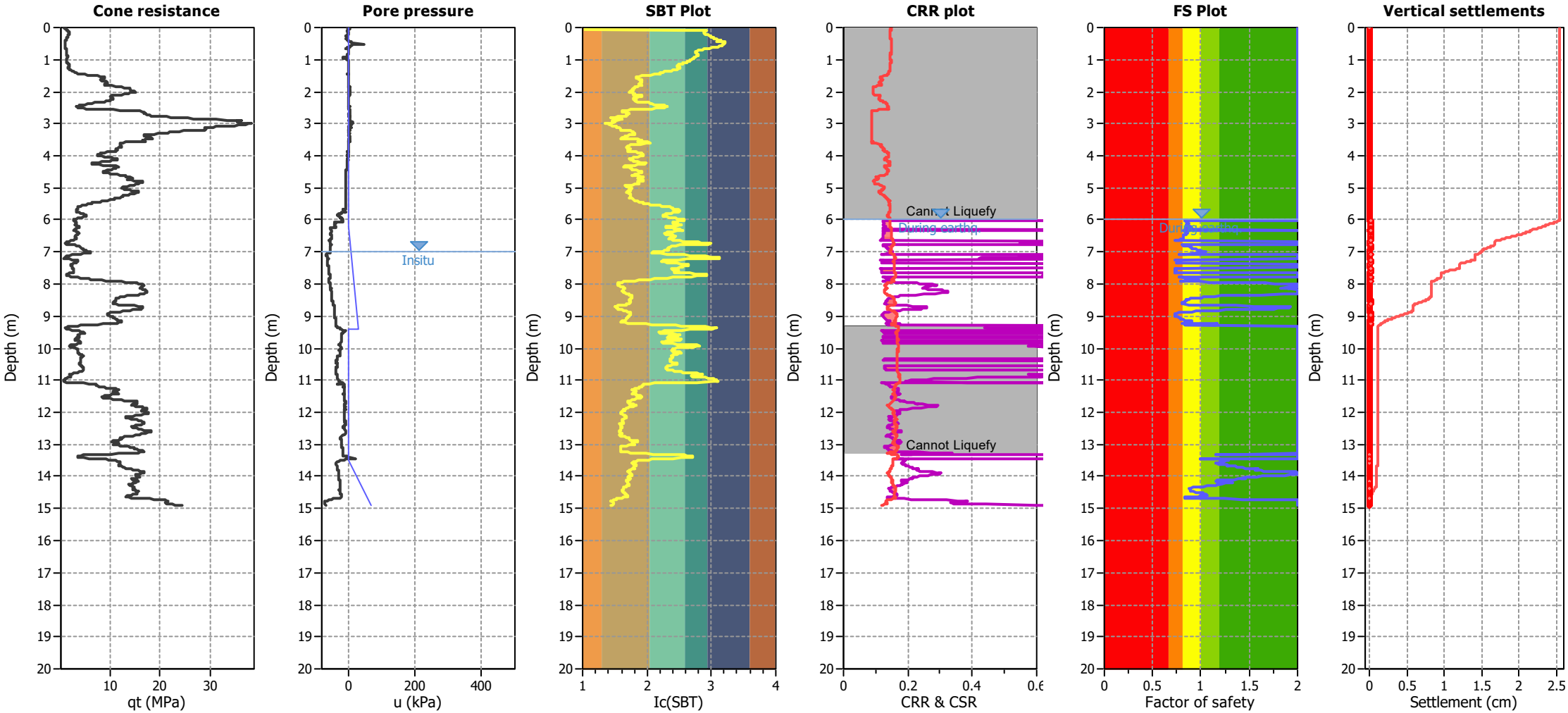
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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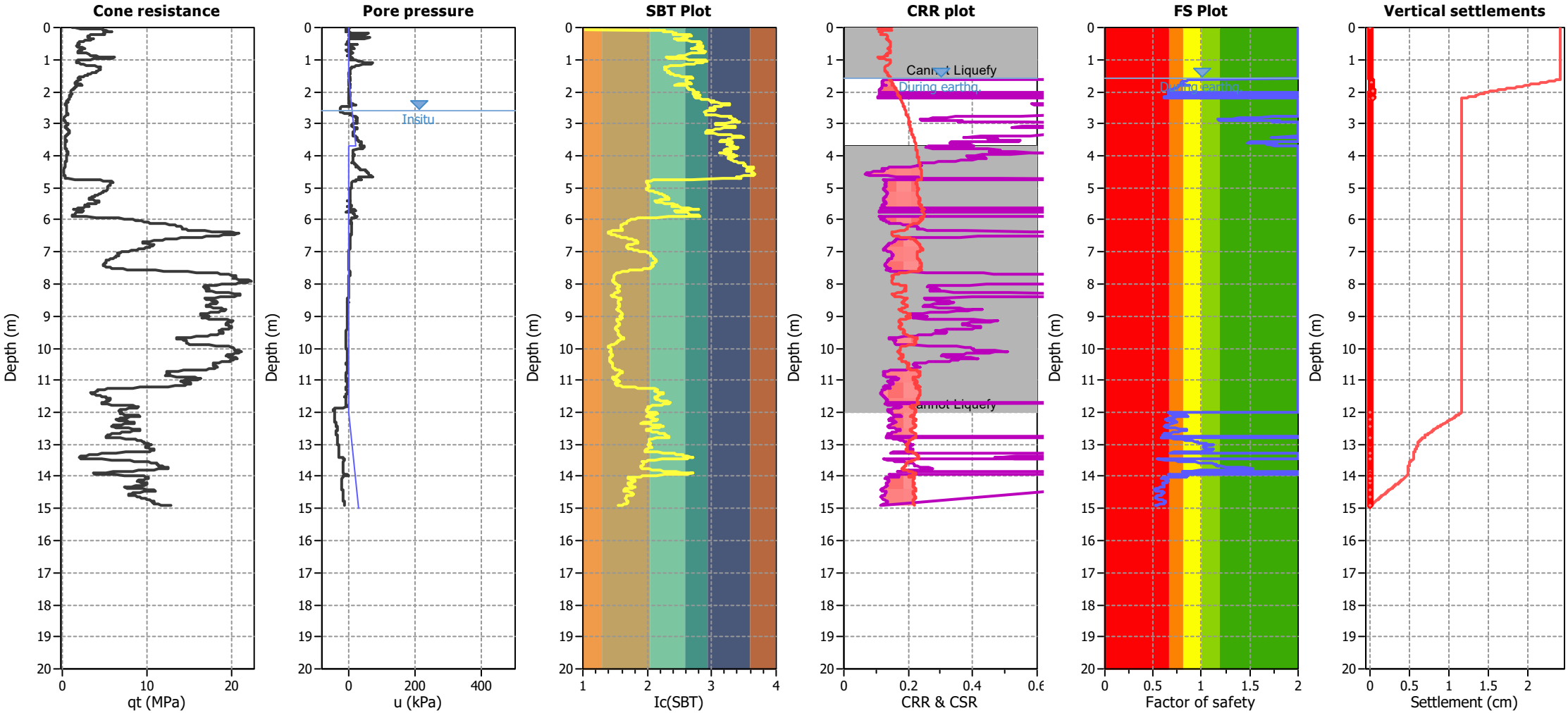
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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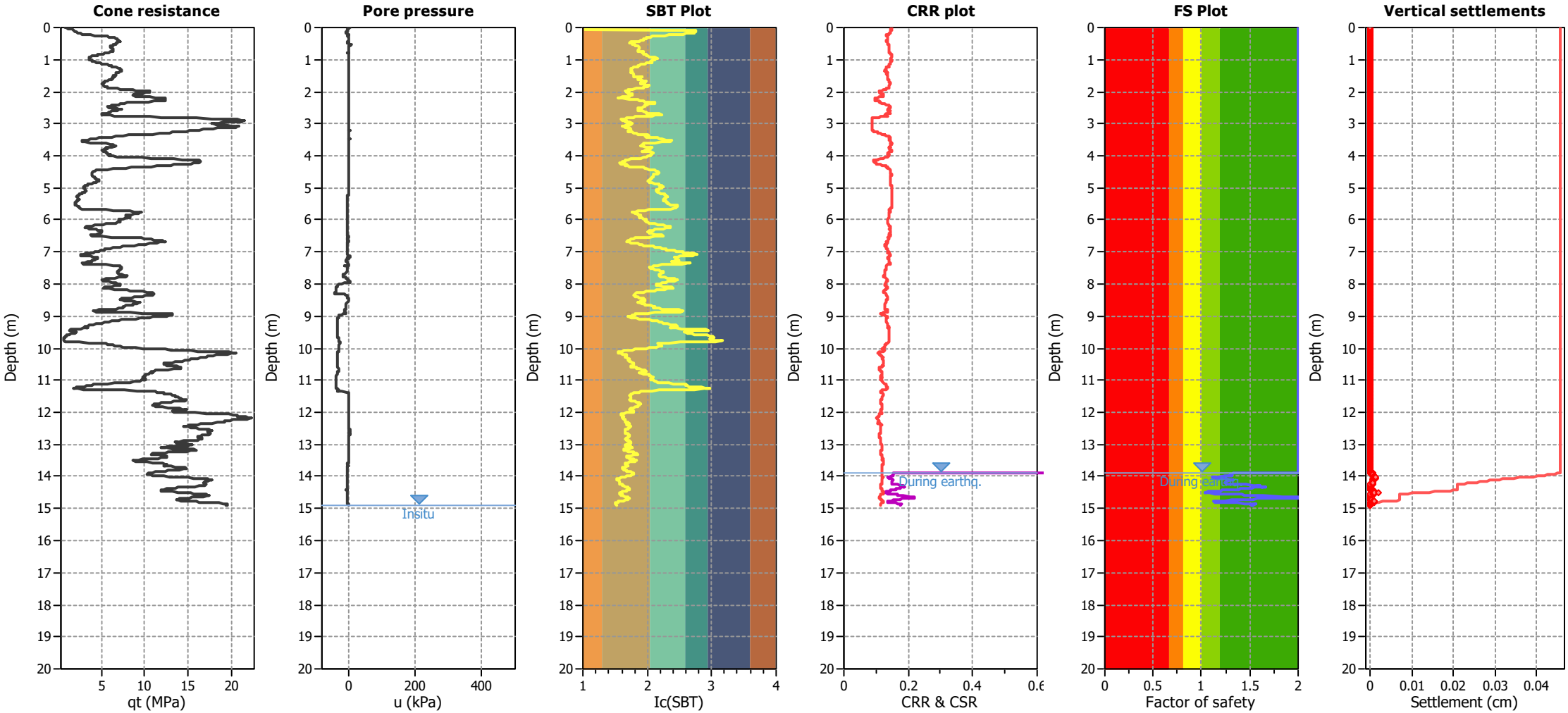
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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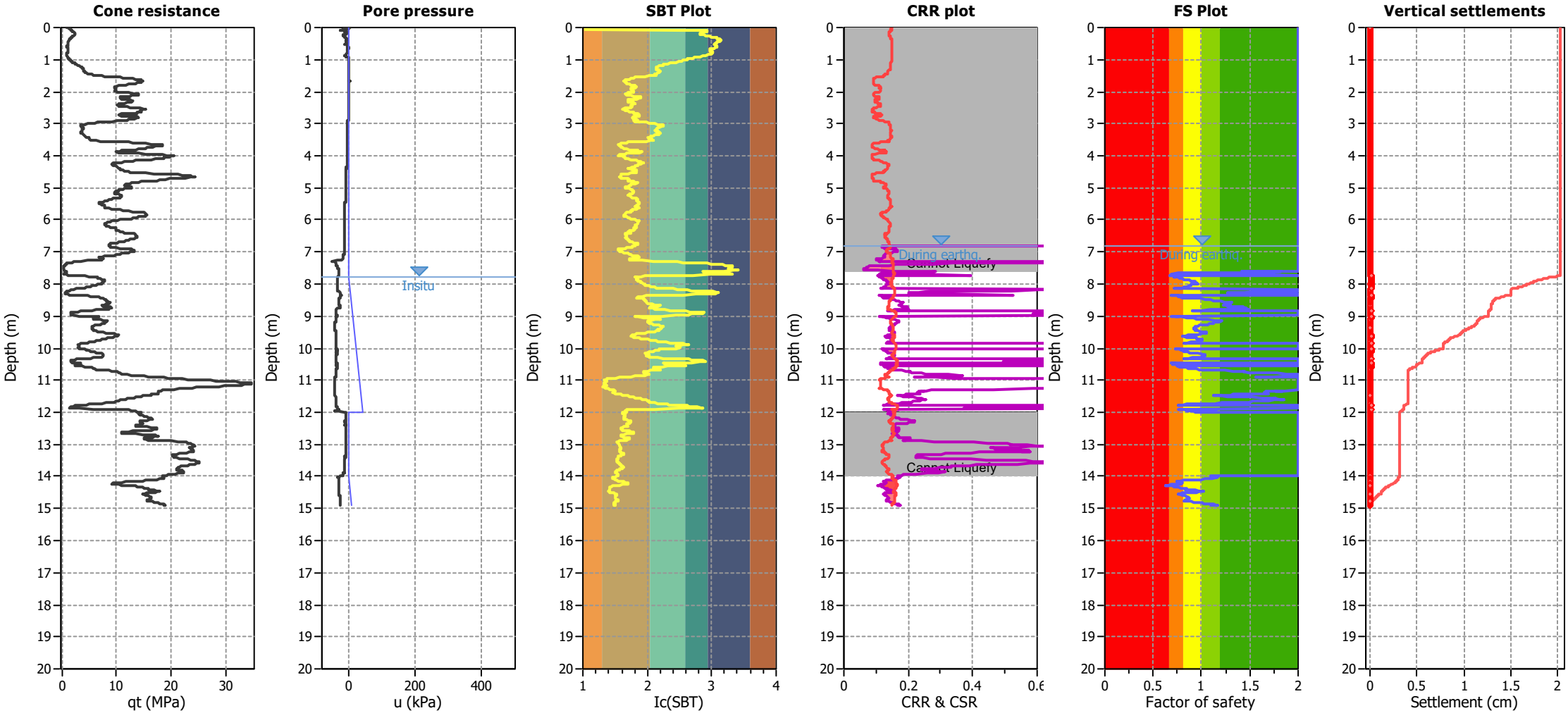
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m

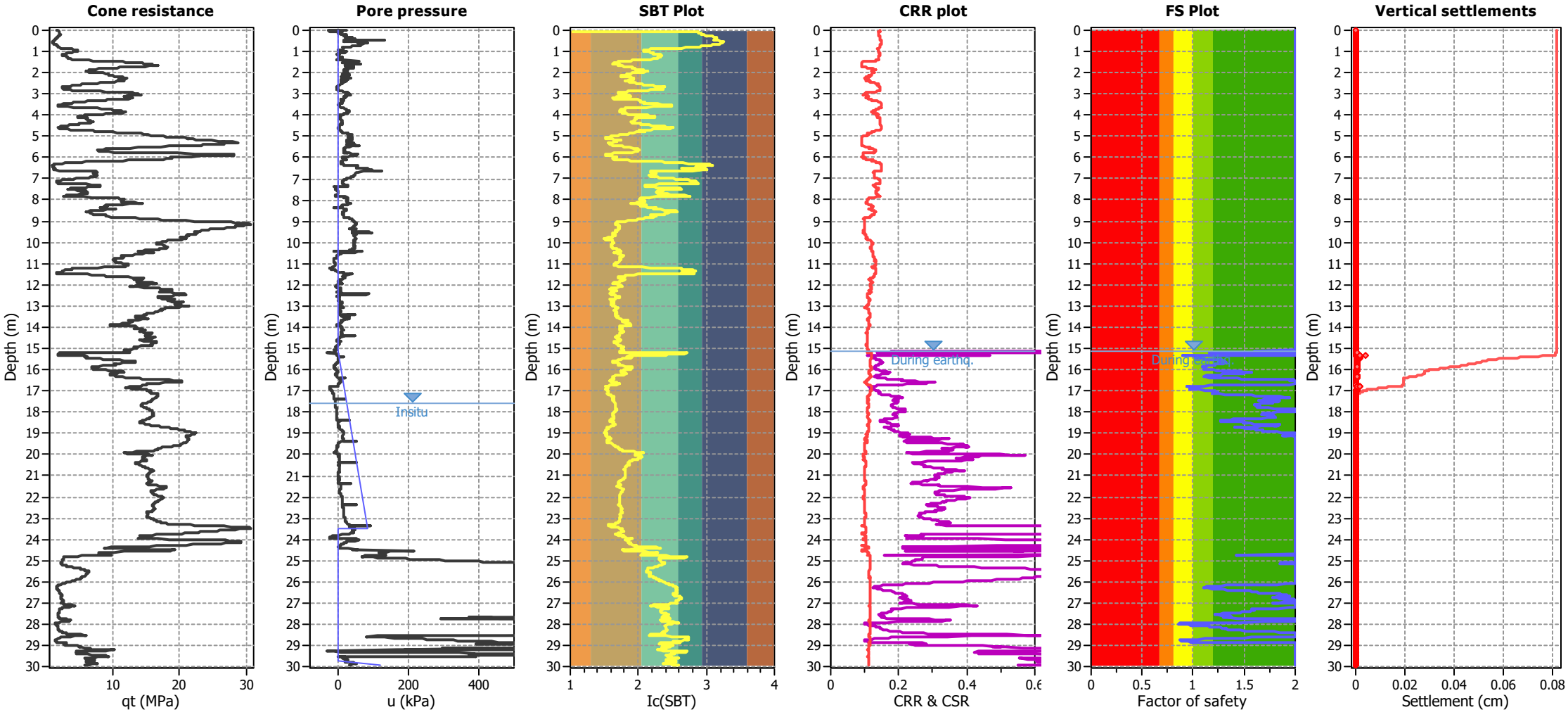


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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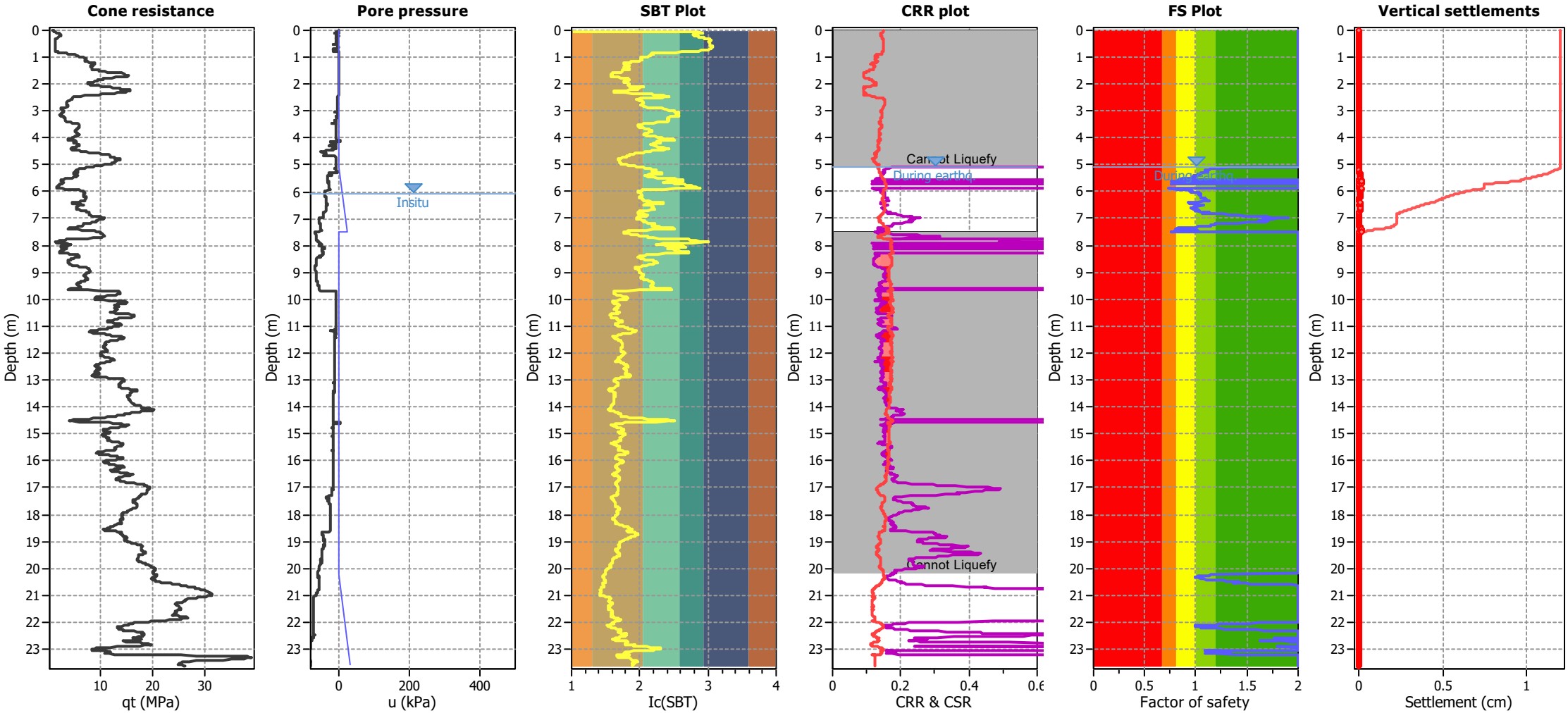
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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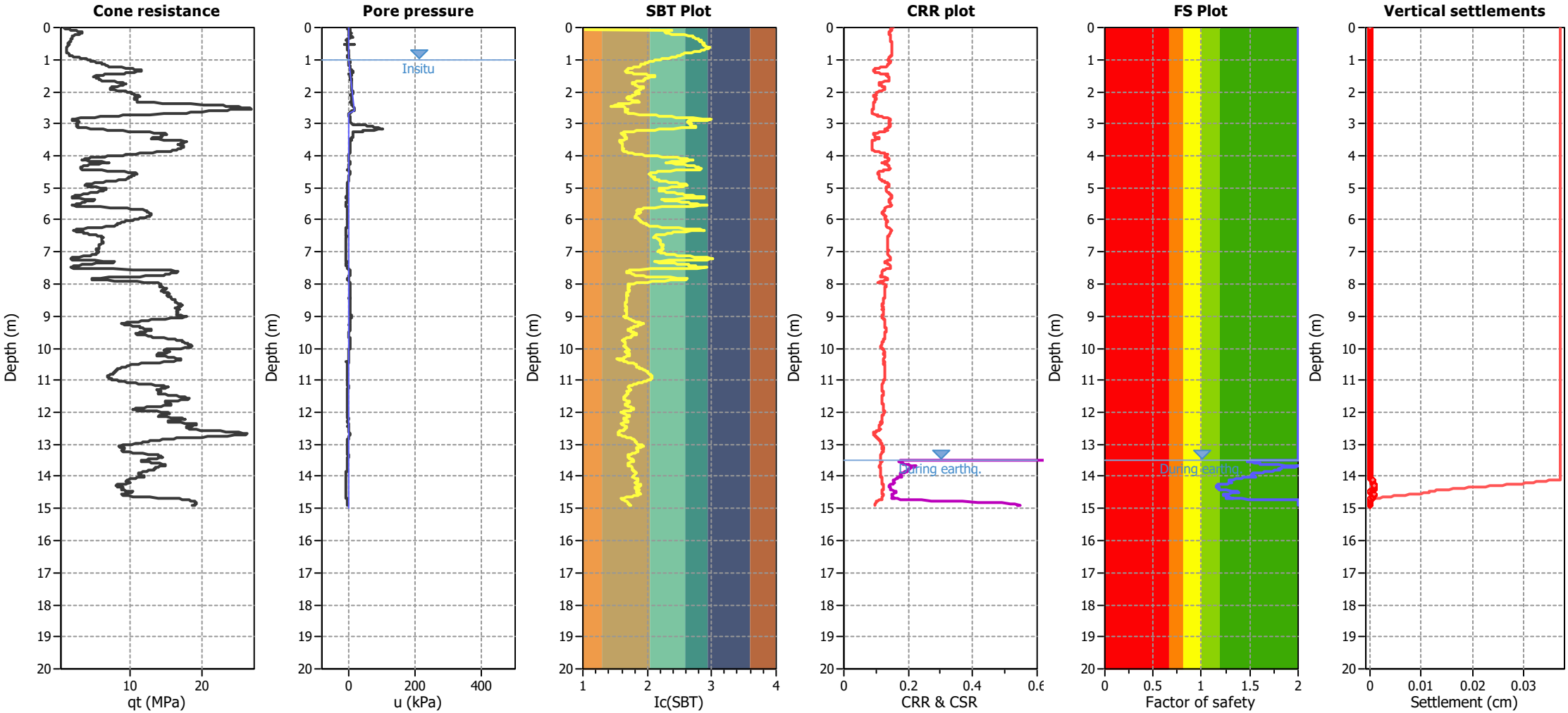
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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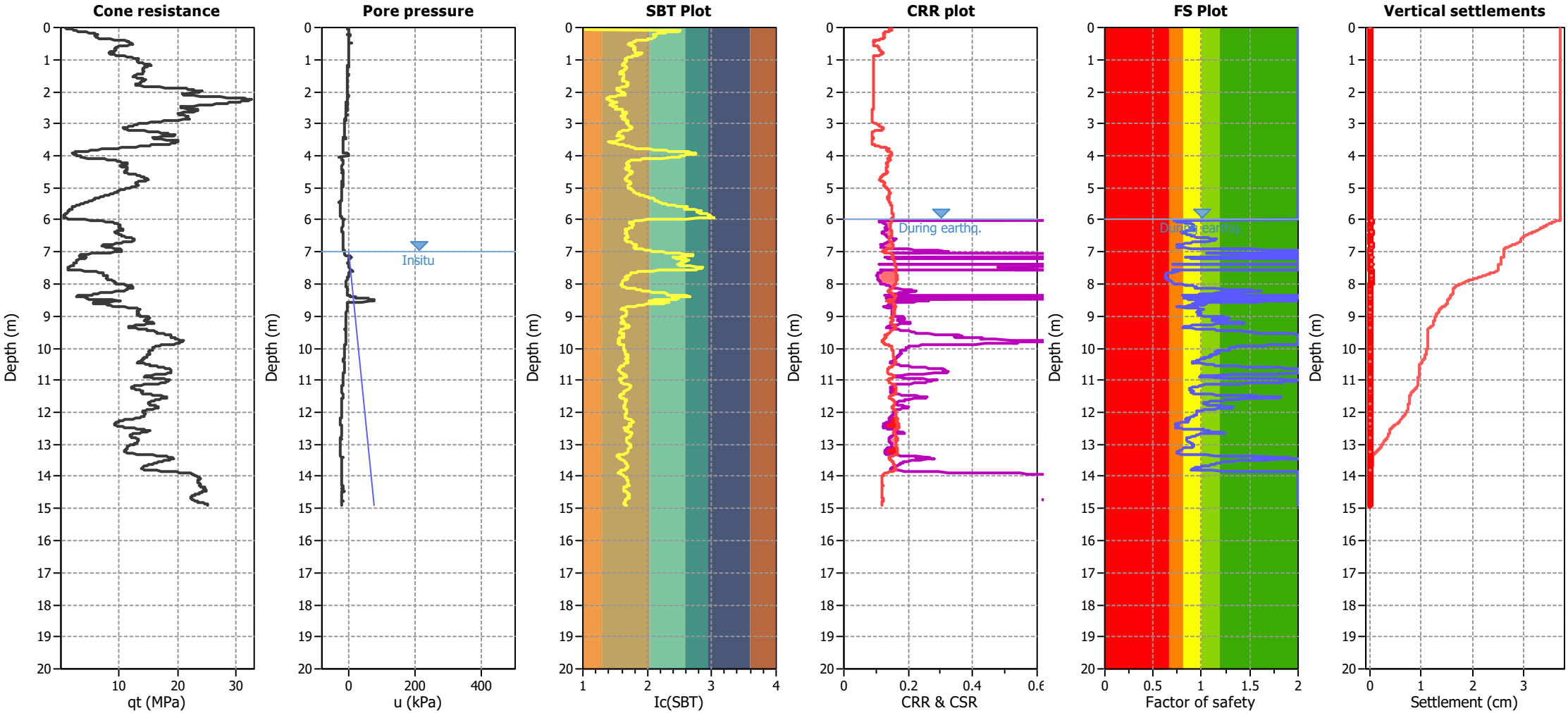
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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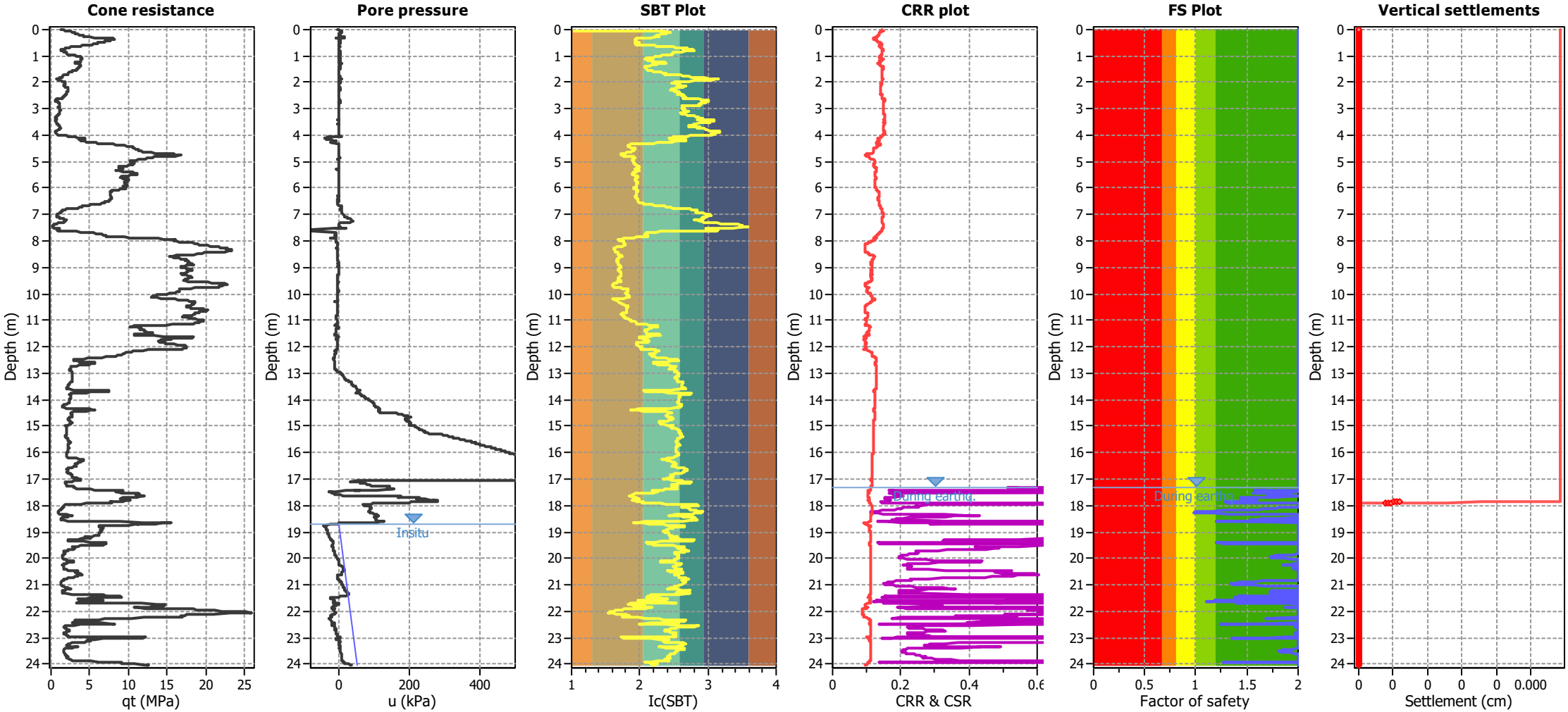
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

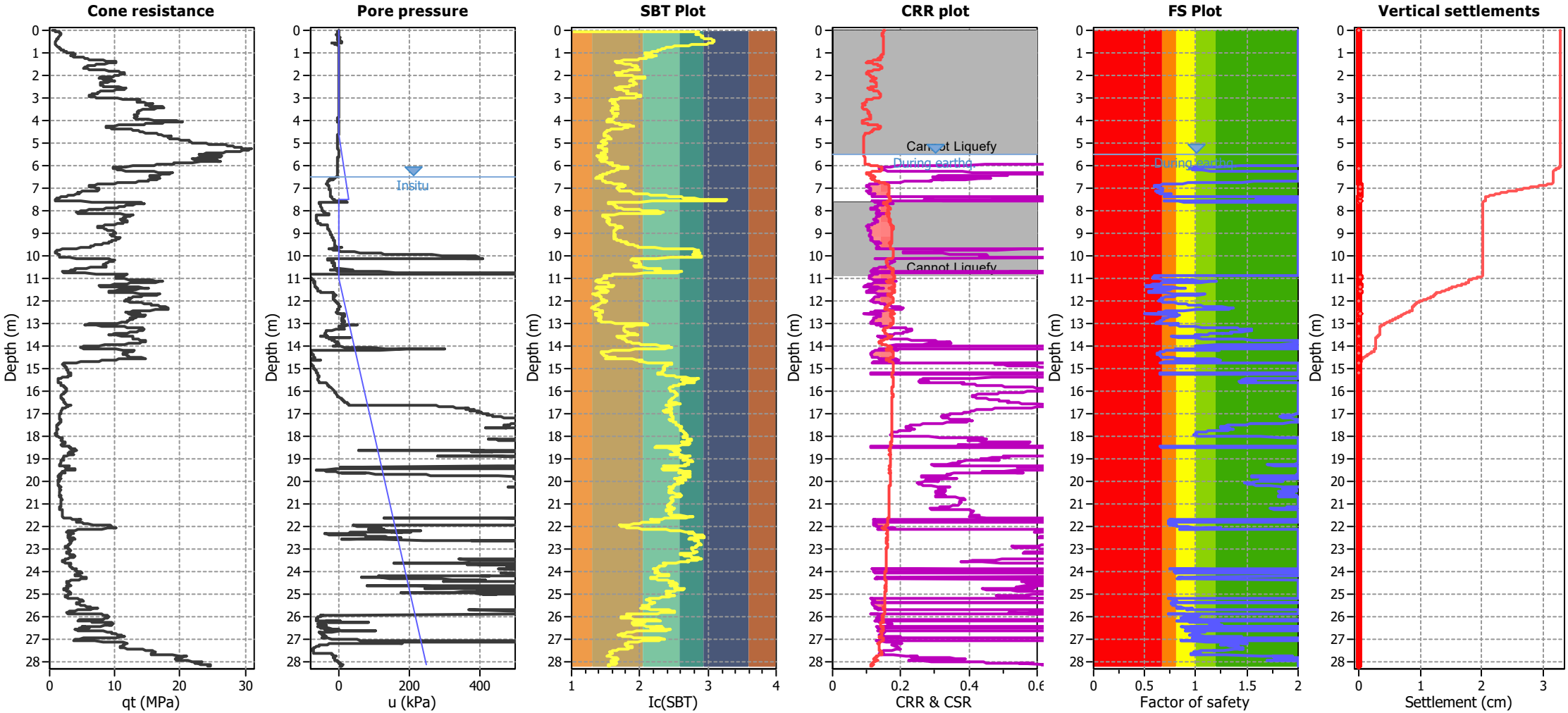


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m

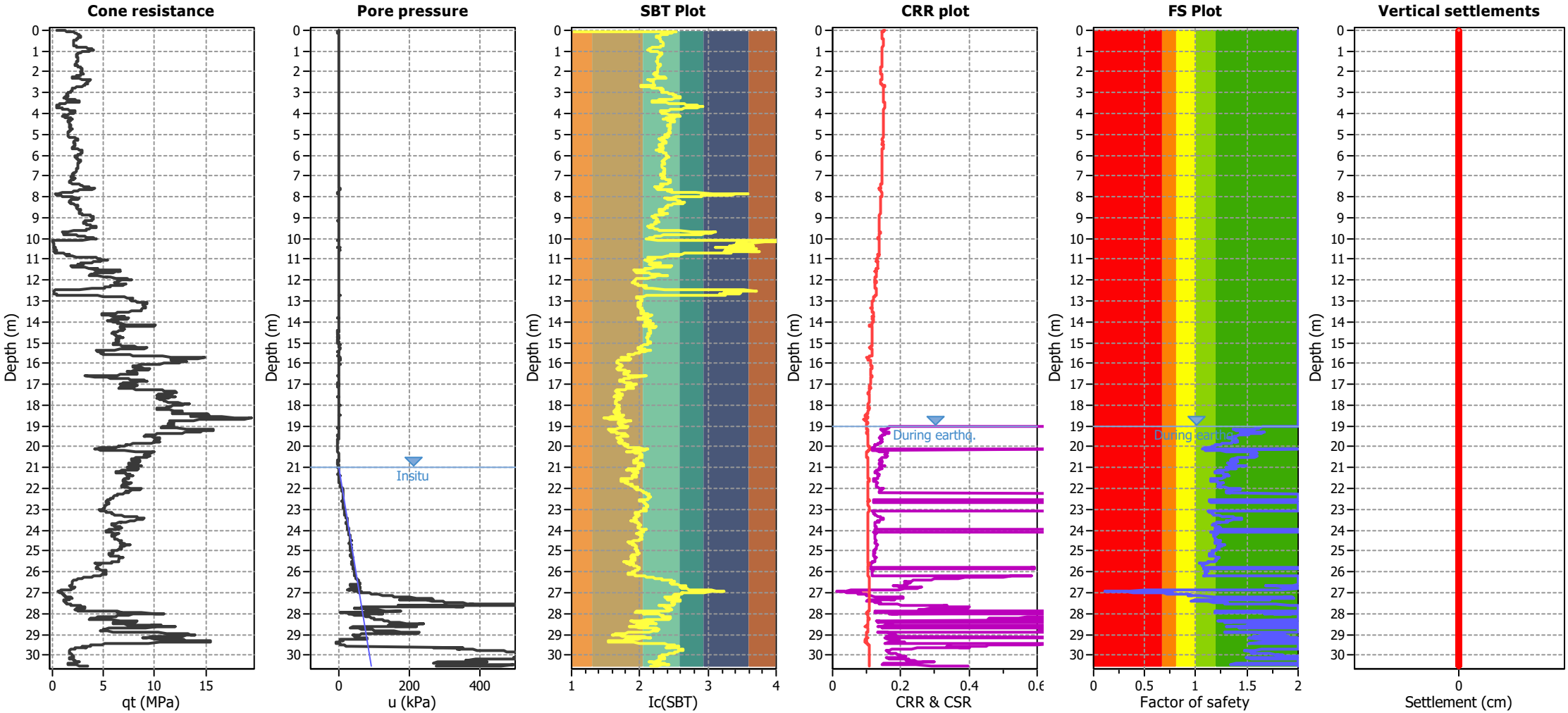


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m

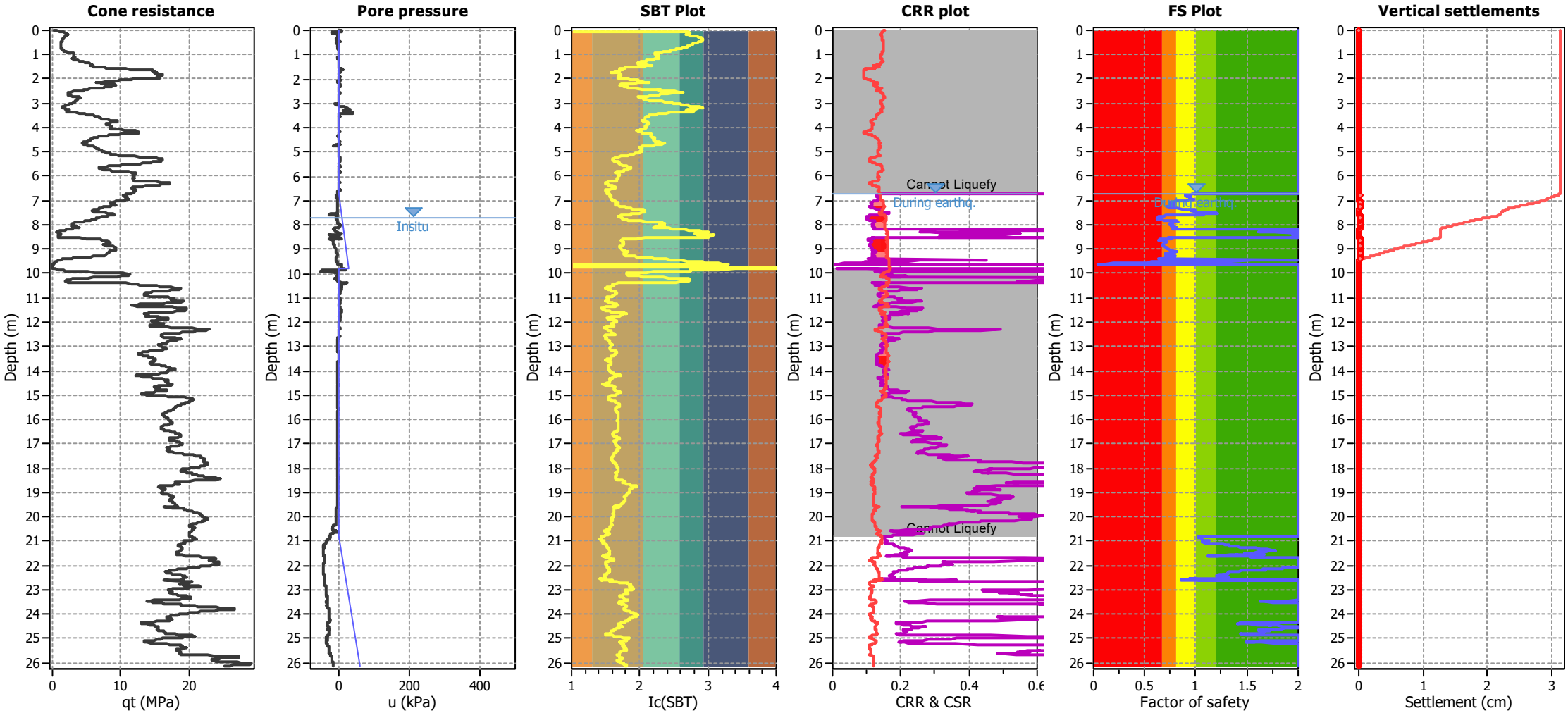


Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m

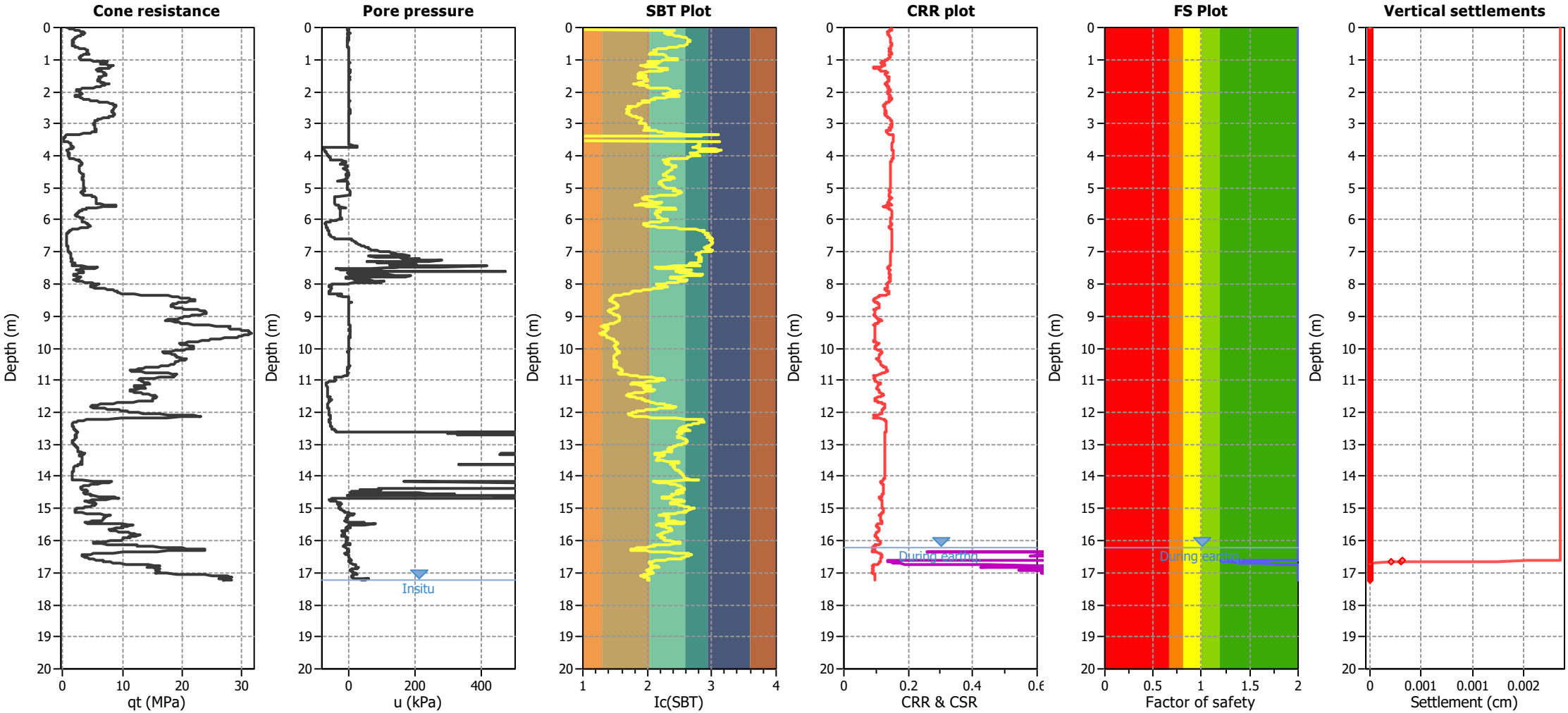


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m

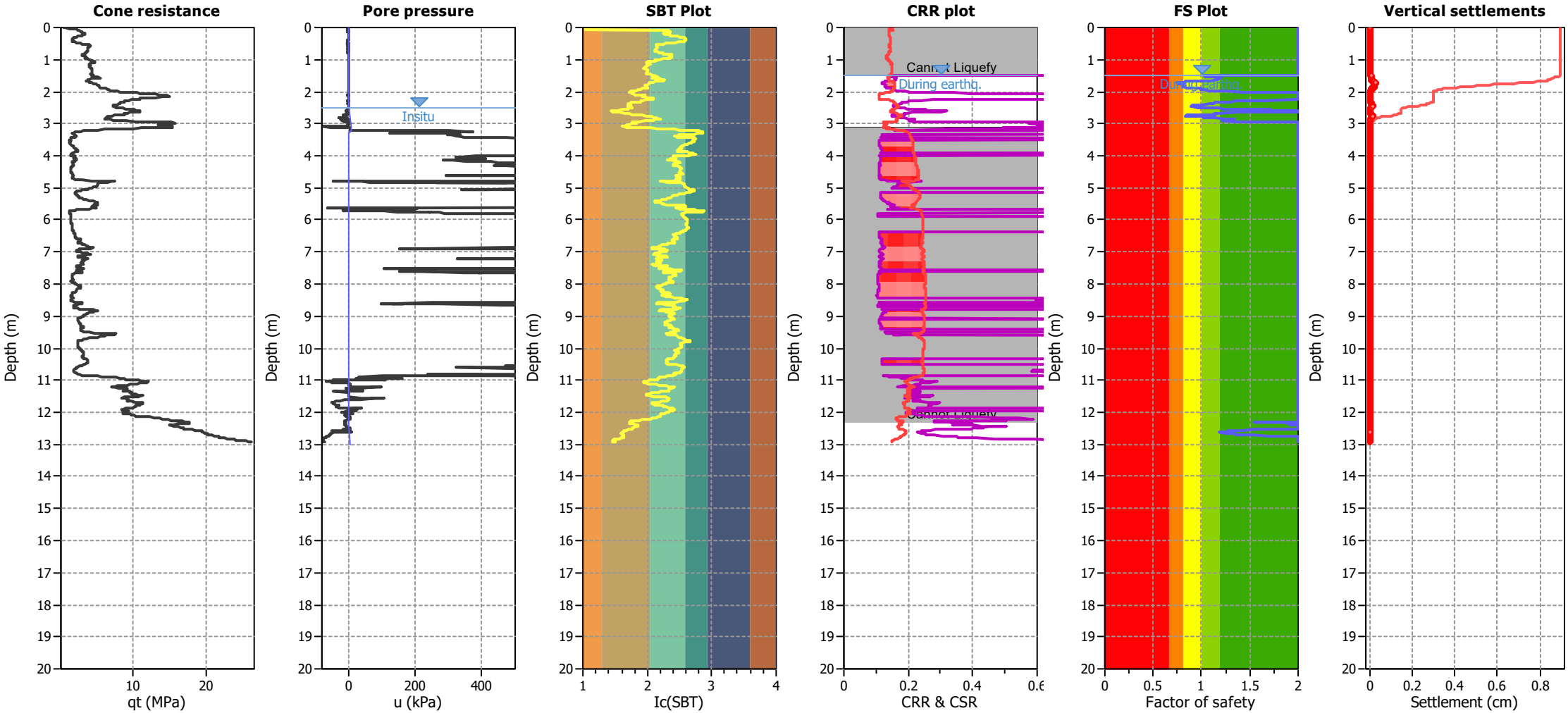


Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

10M INDEX ANALYSIS RESULTS (NON-AGED)

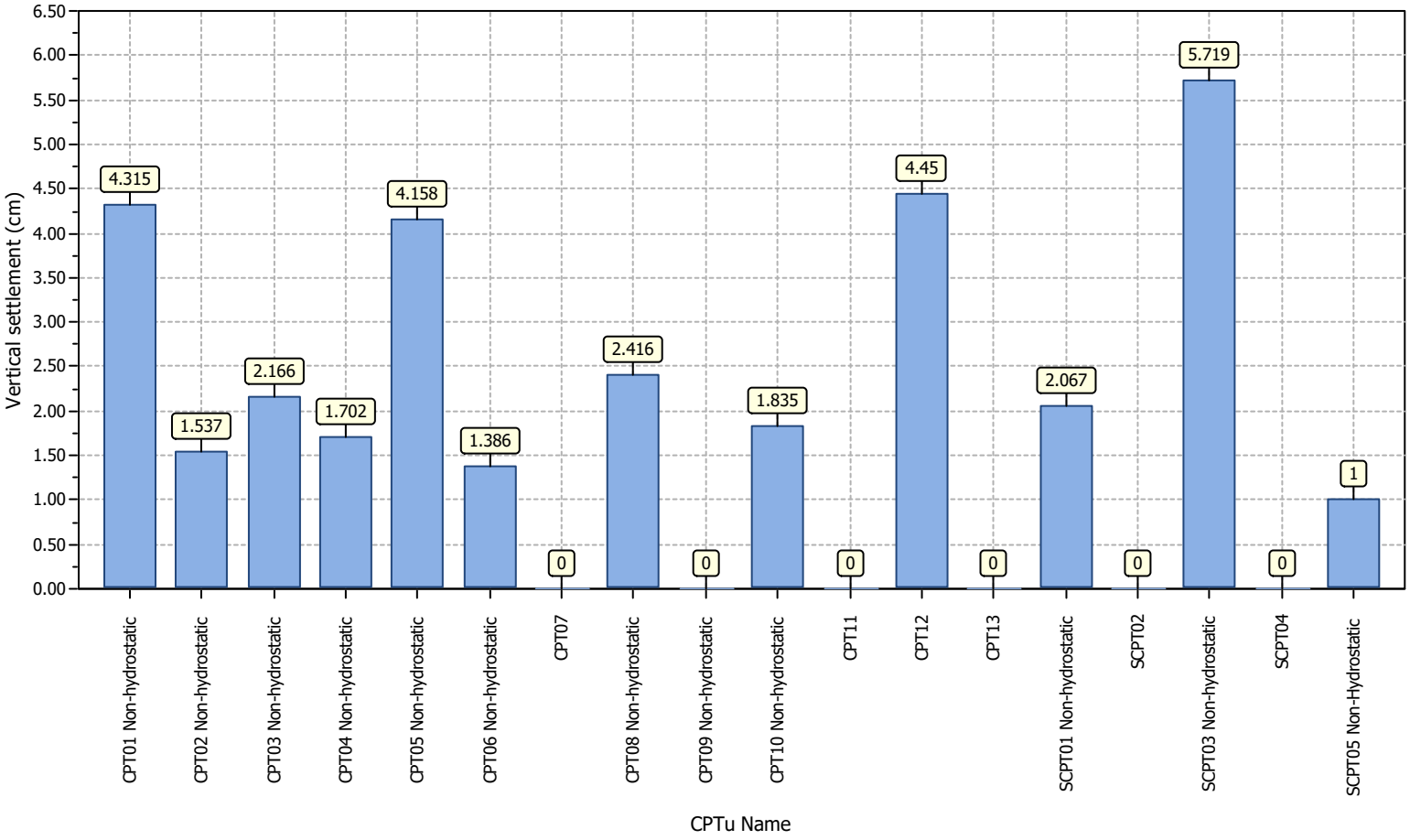
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2021-0032 Wordsworth Street, Cambridge

Location : Cambridge

Overall vertical settlements report

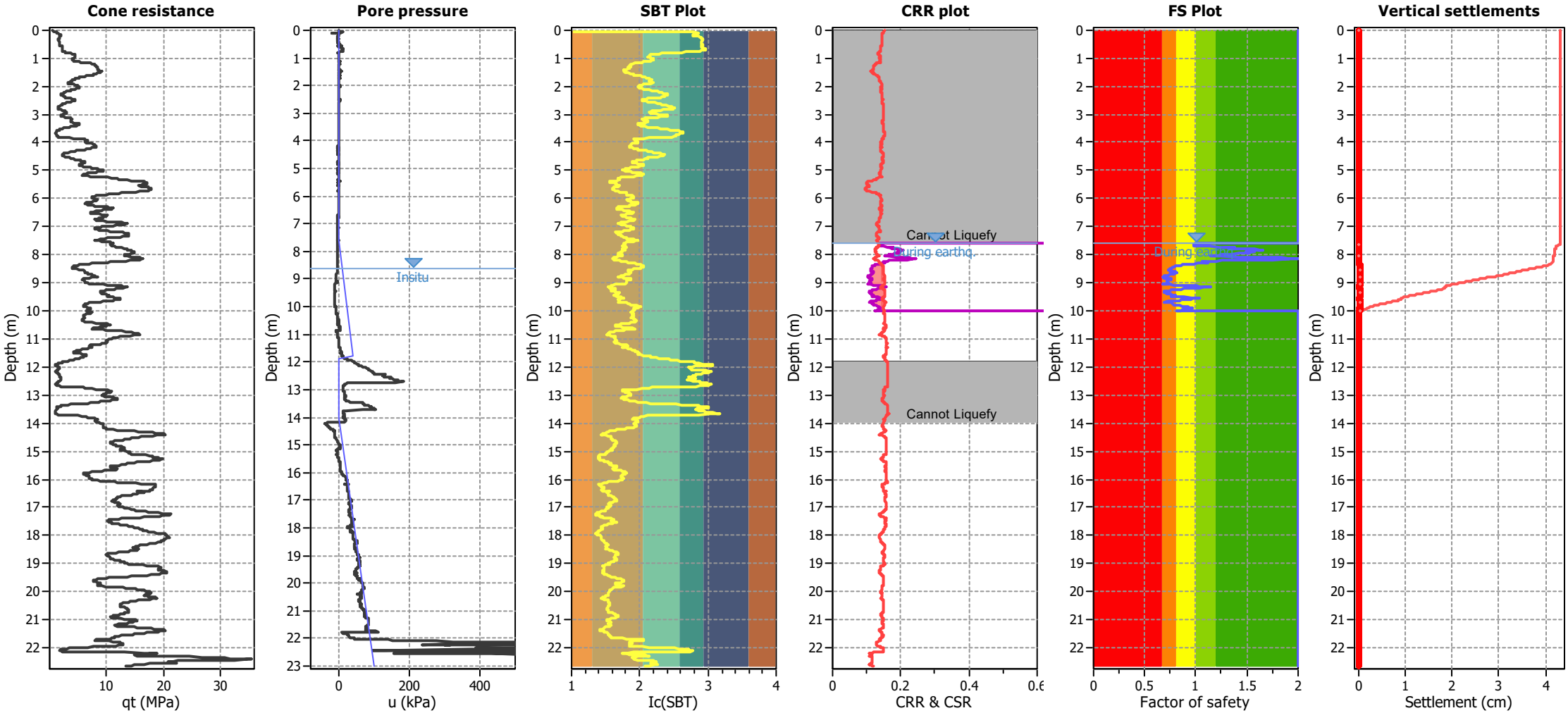


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m

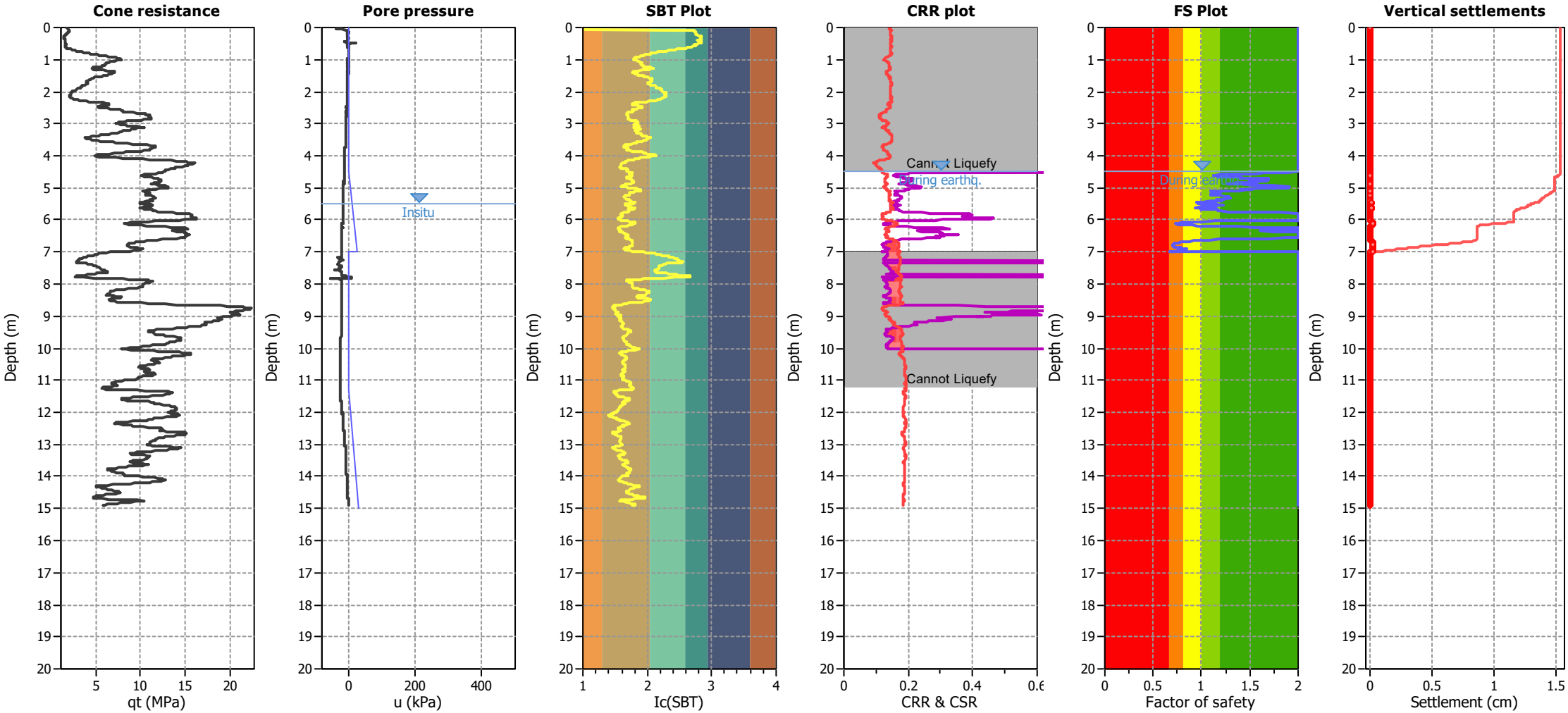


Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m

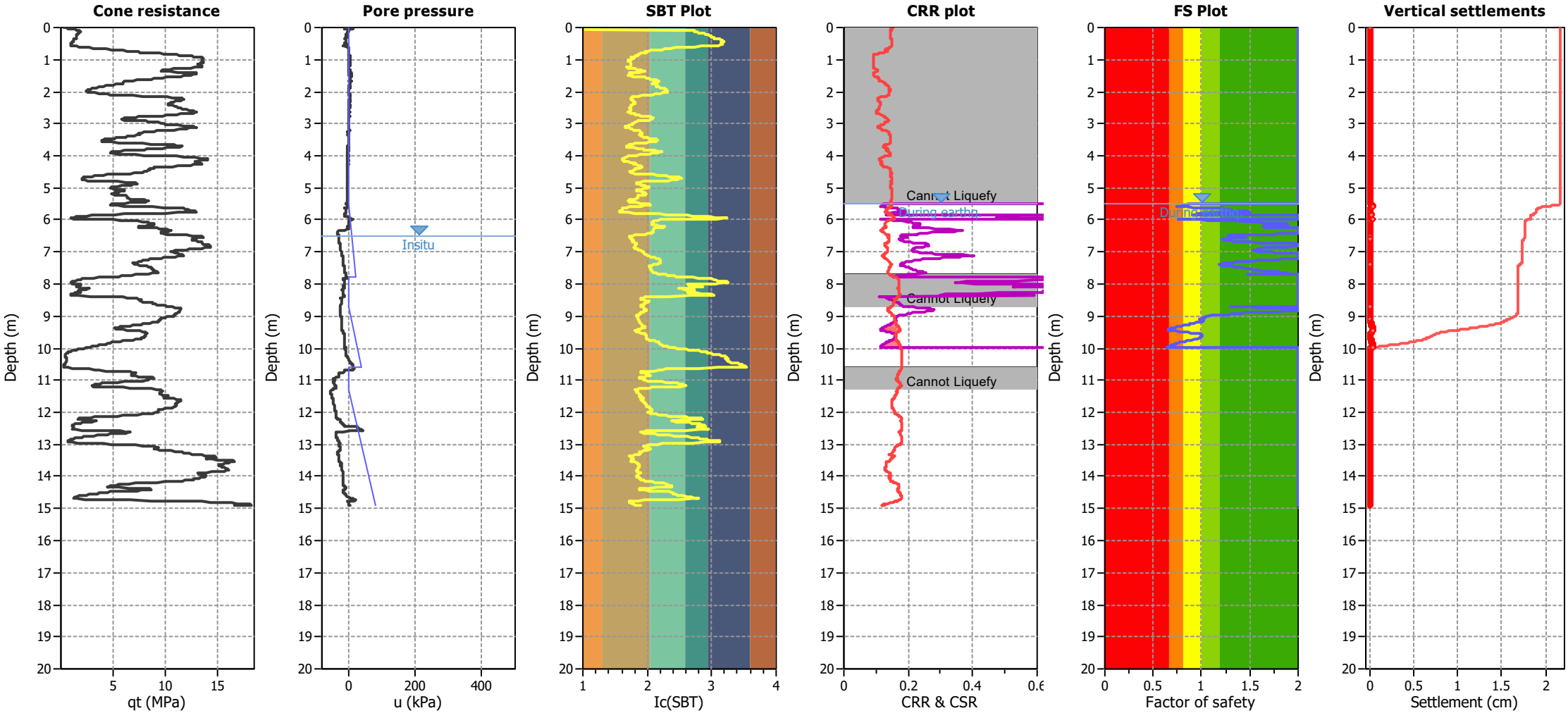


Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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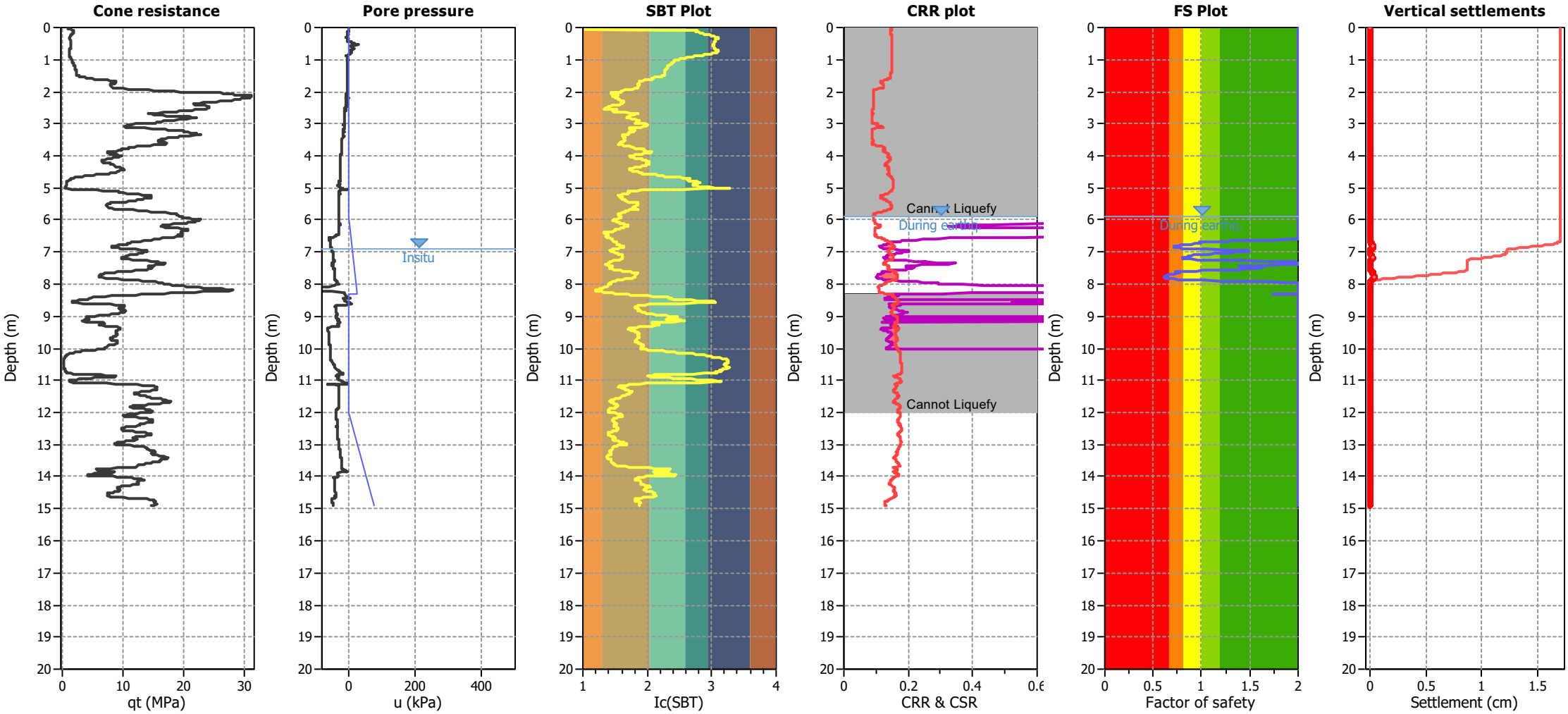
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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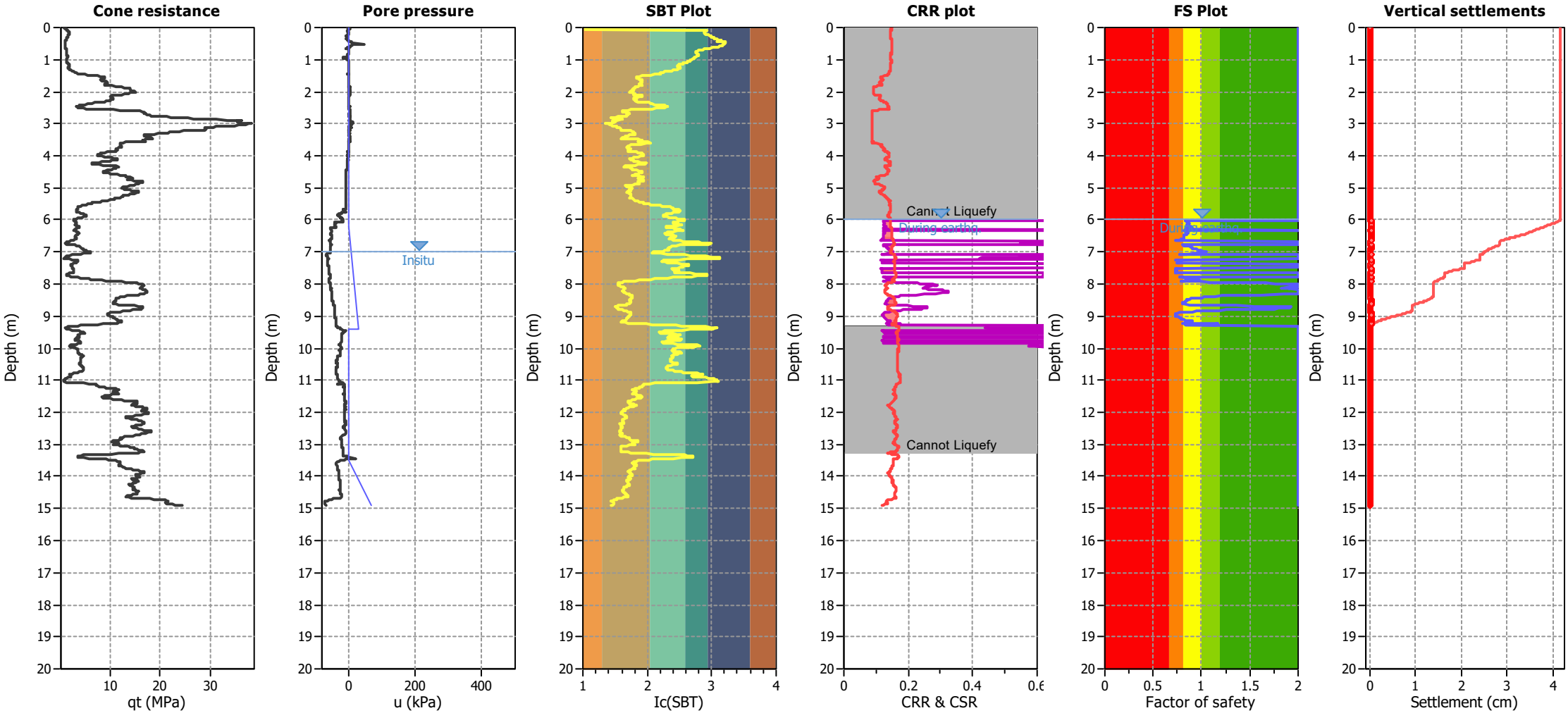
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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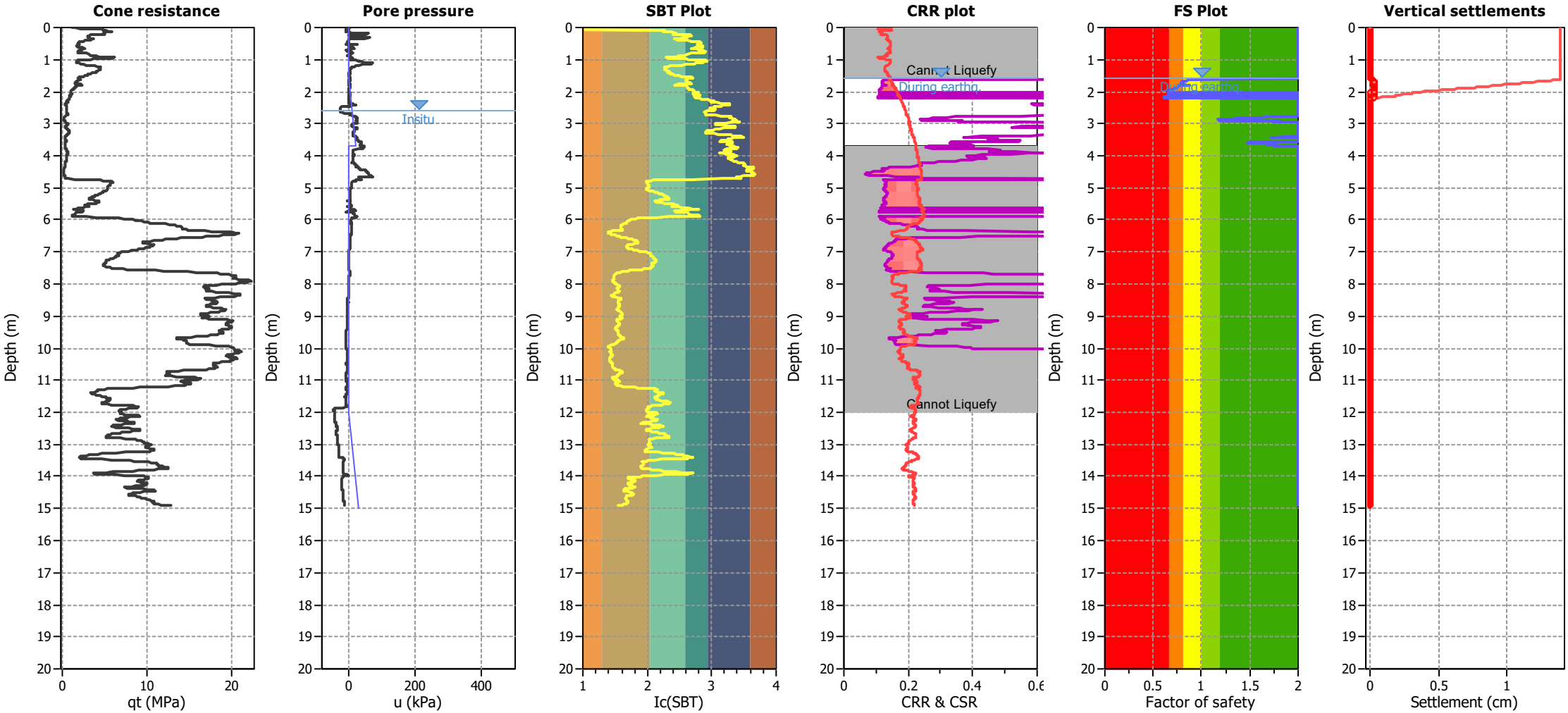
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.60 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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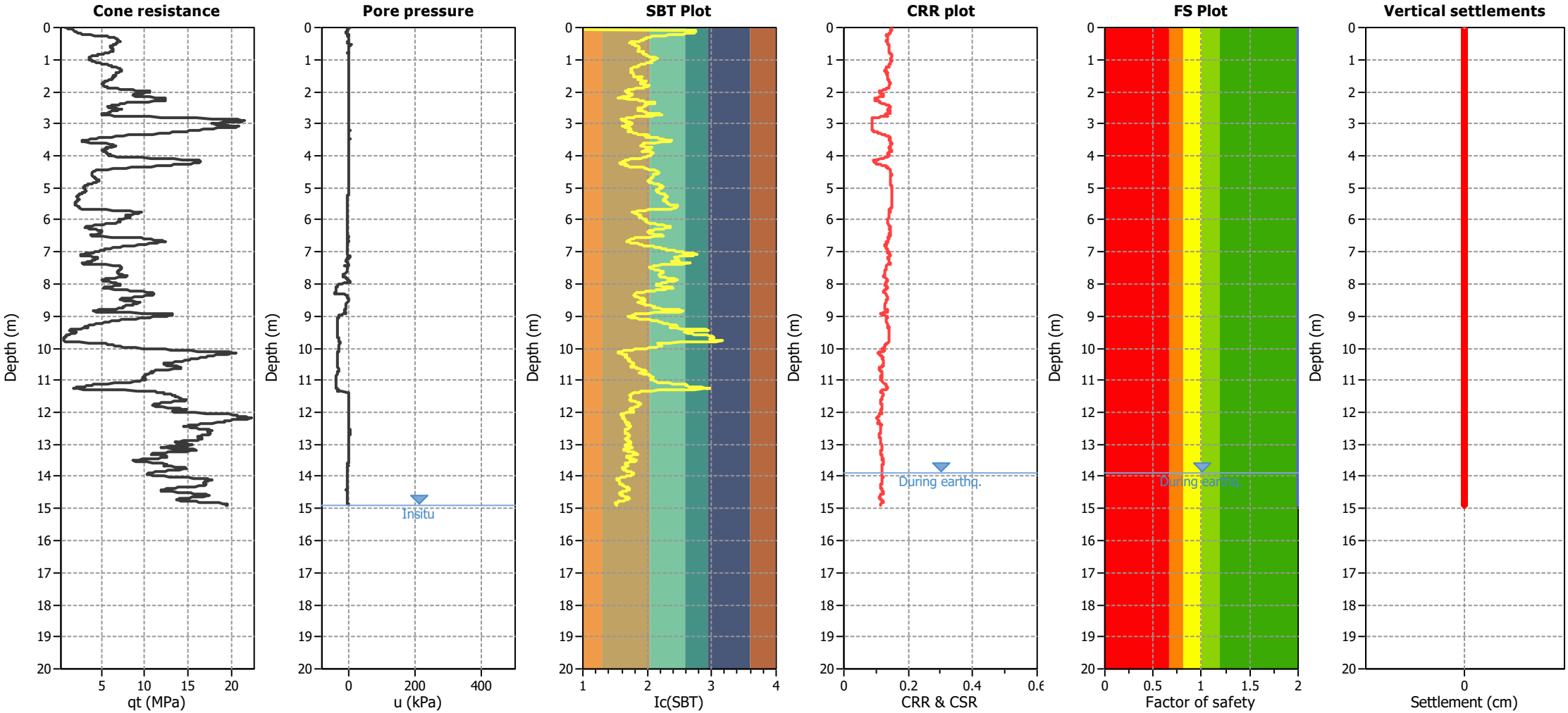
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT07
Total depth: 14.92 m

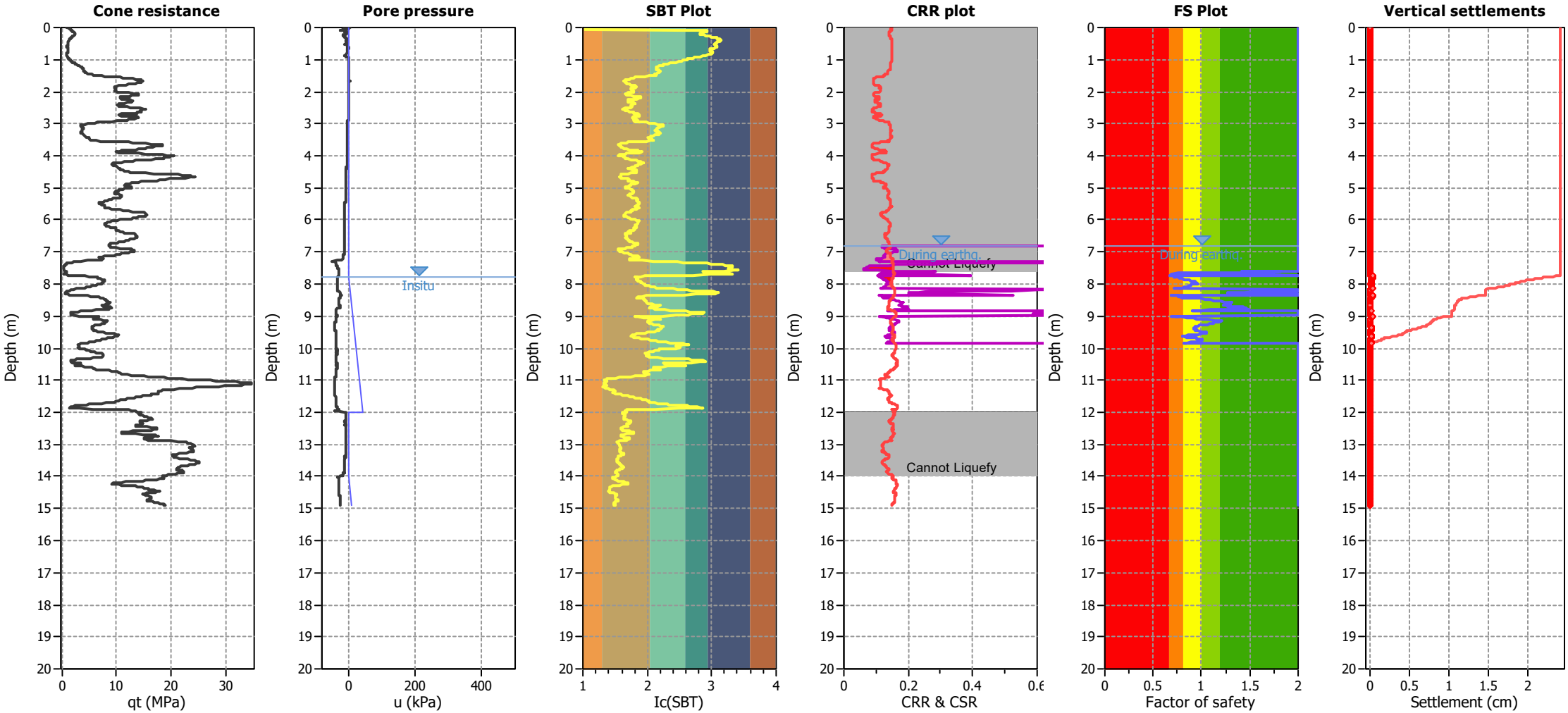


Analysis method:	B&I (2014)	G.W.T. (in-situ):	14.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.90 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT08 Non-hydrostatic
Total depth: 14.92 m

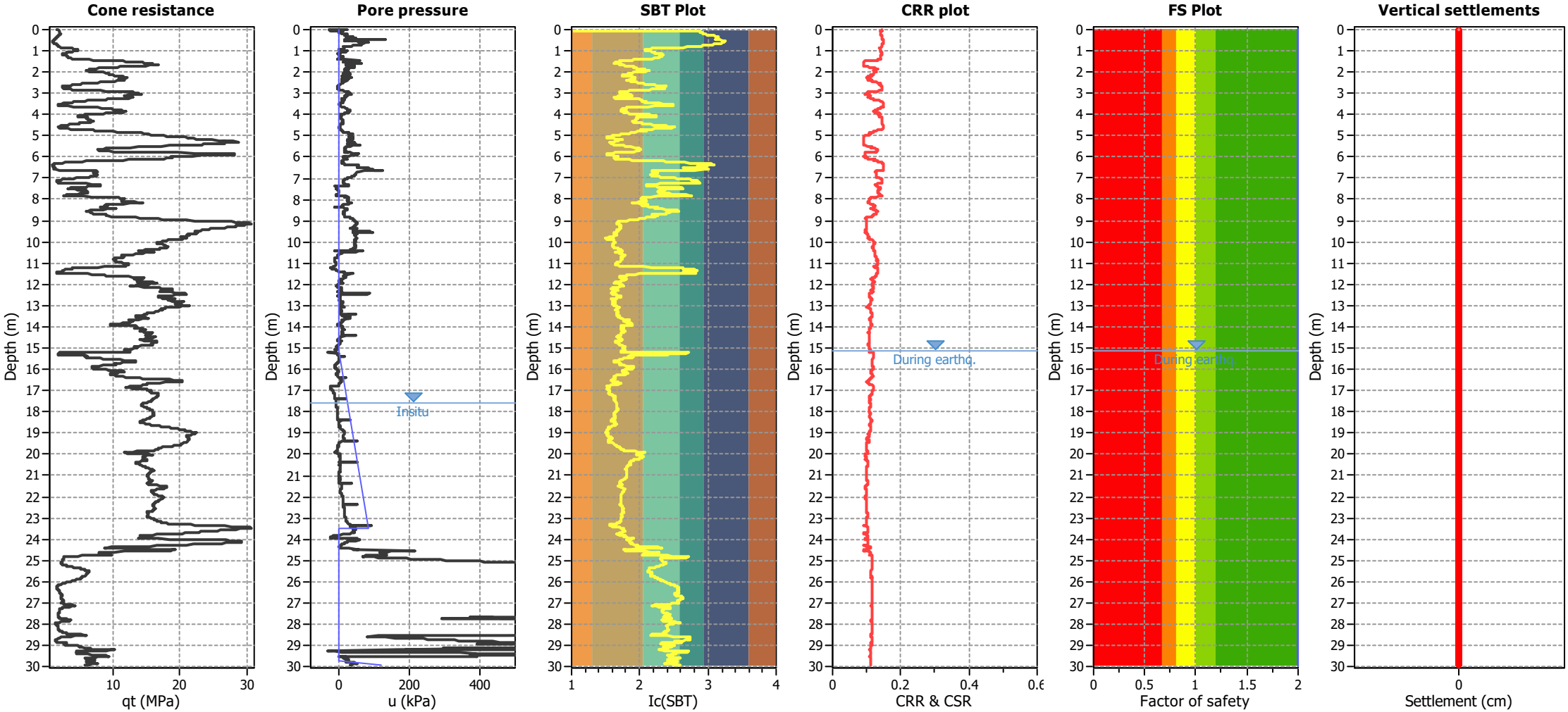


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.80 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	15.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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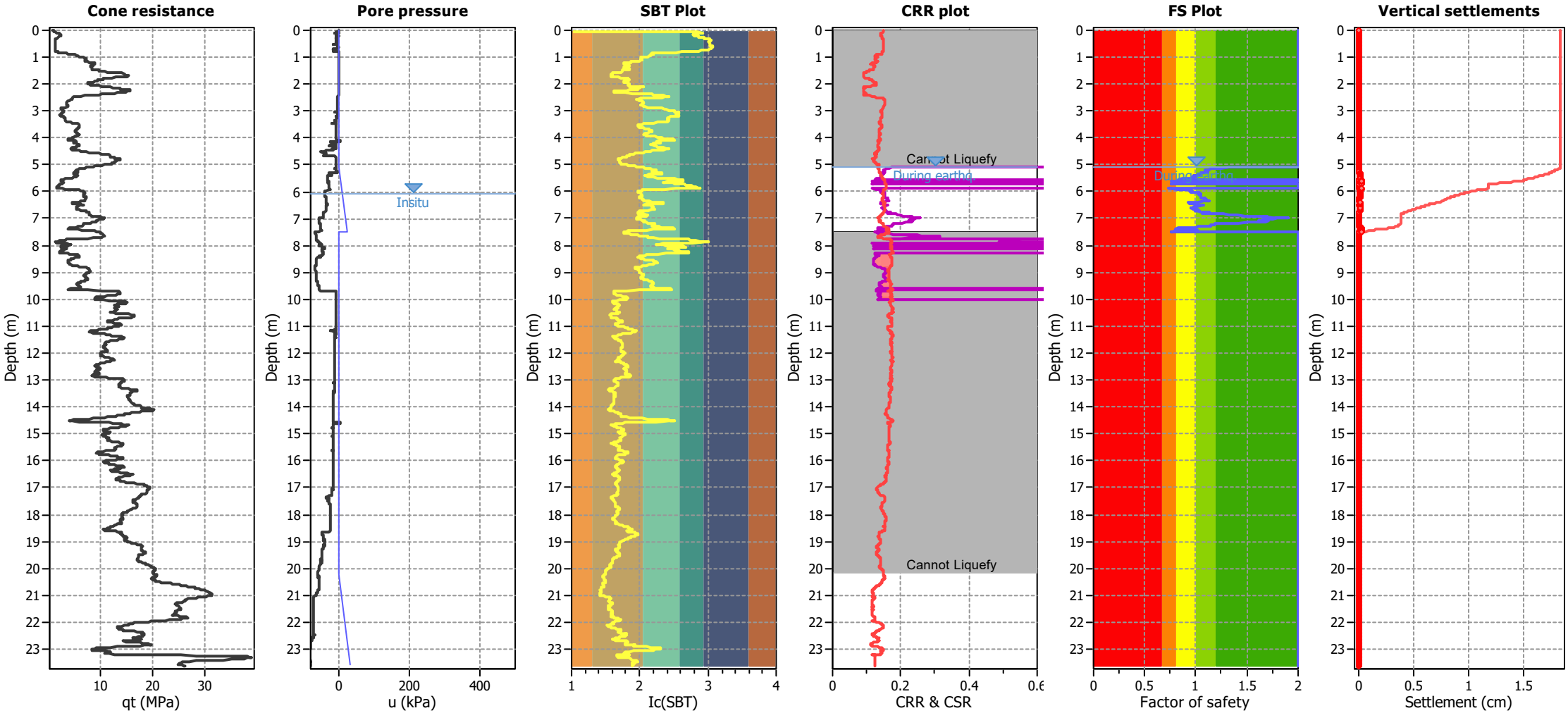
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.10 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
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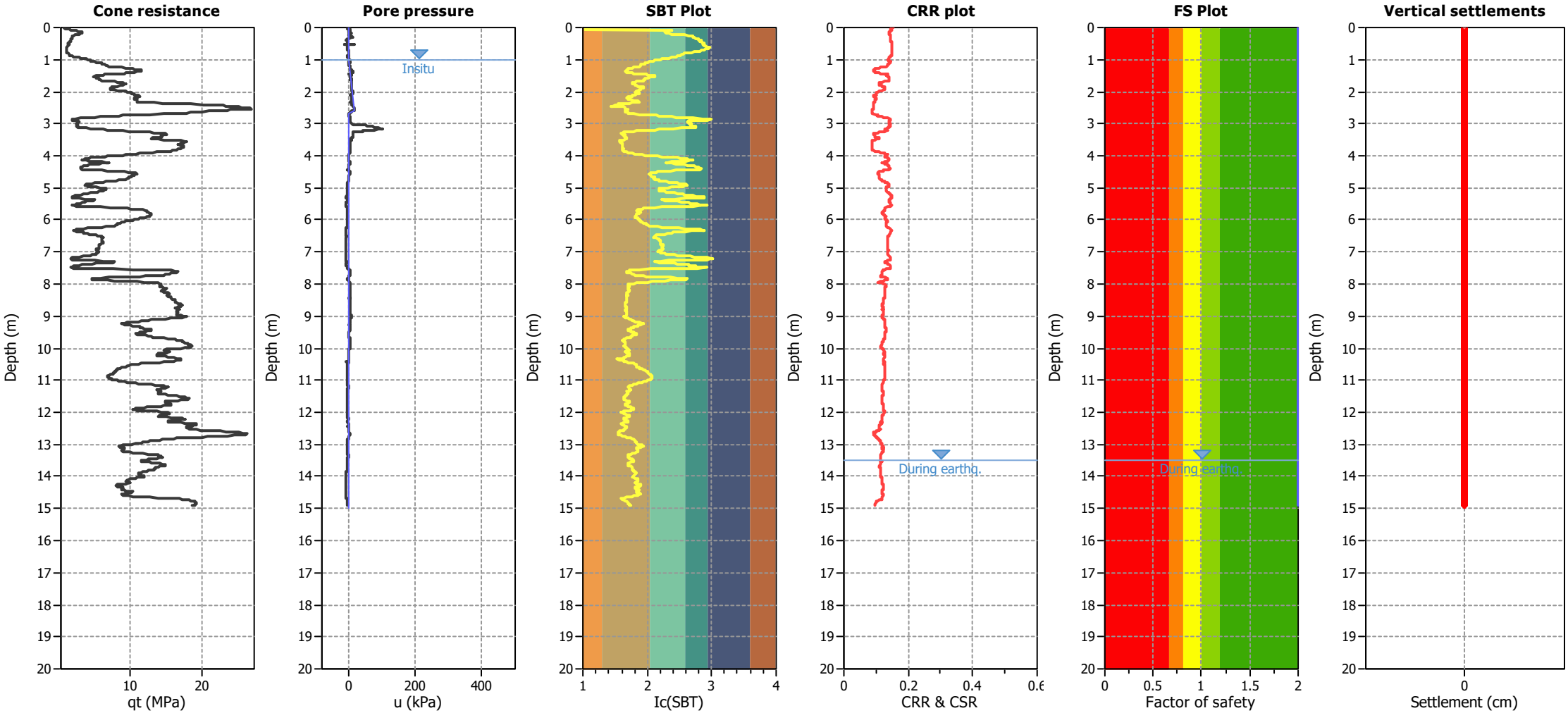
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT11
Total depth: 14.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
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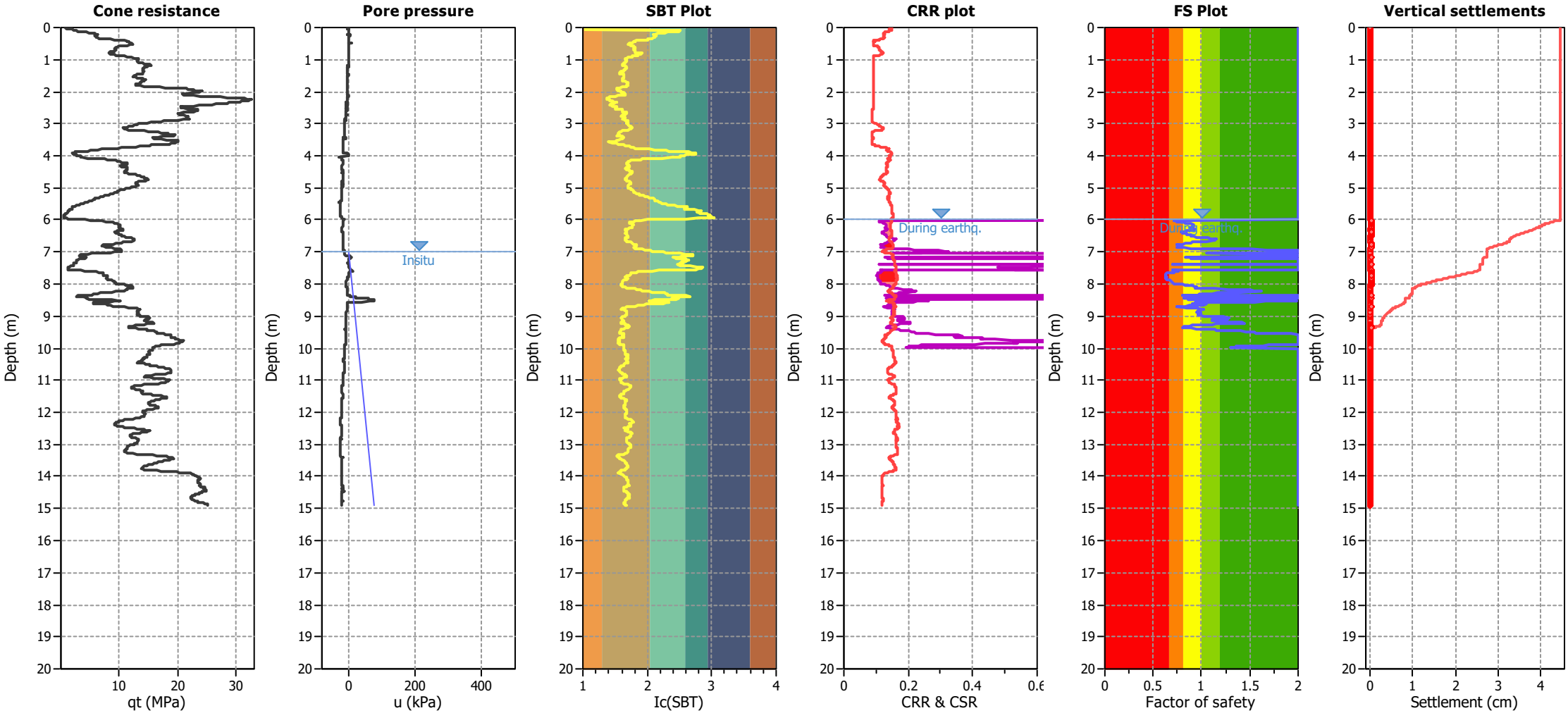
Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT12
Total depth: 14.92 m

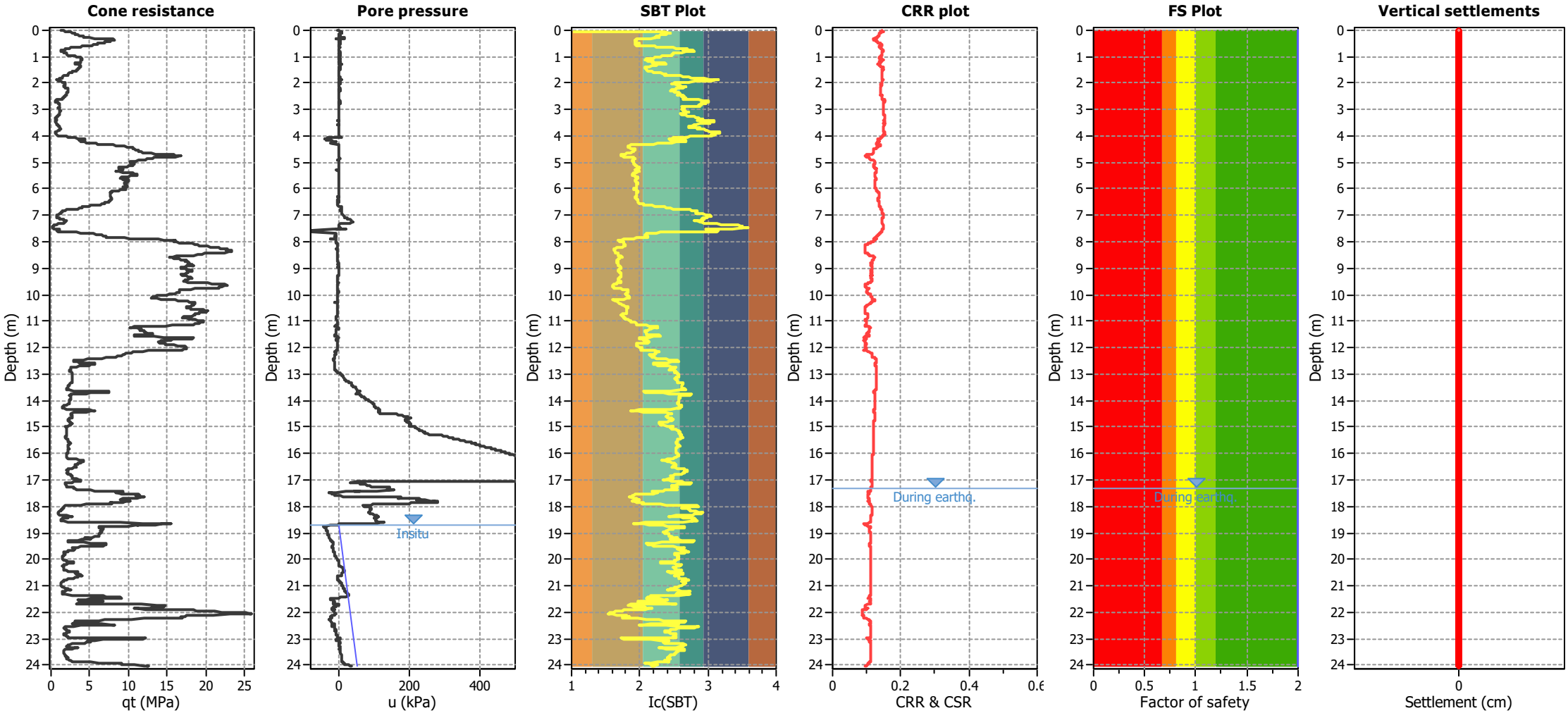


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT13
Total depth: 24.03 m

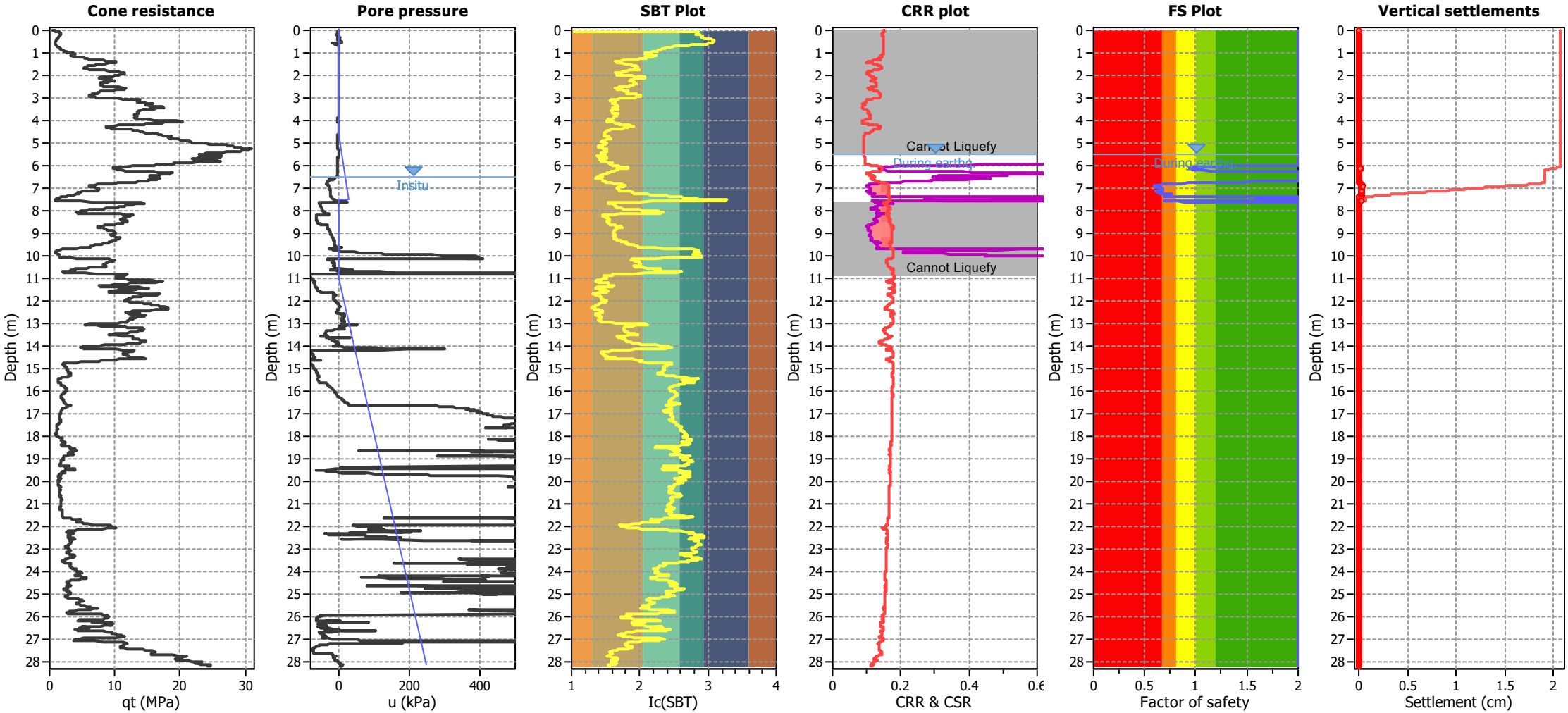


Analysis method:	B&I (2014)	G.W.T. (in-situ):	18.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.30 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m

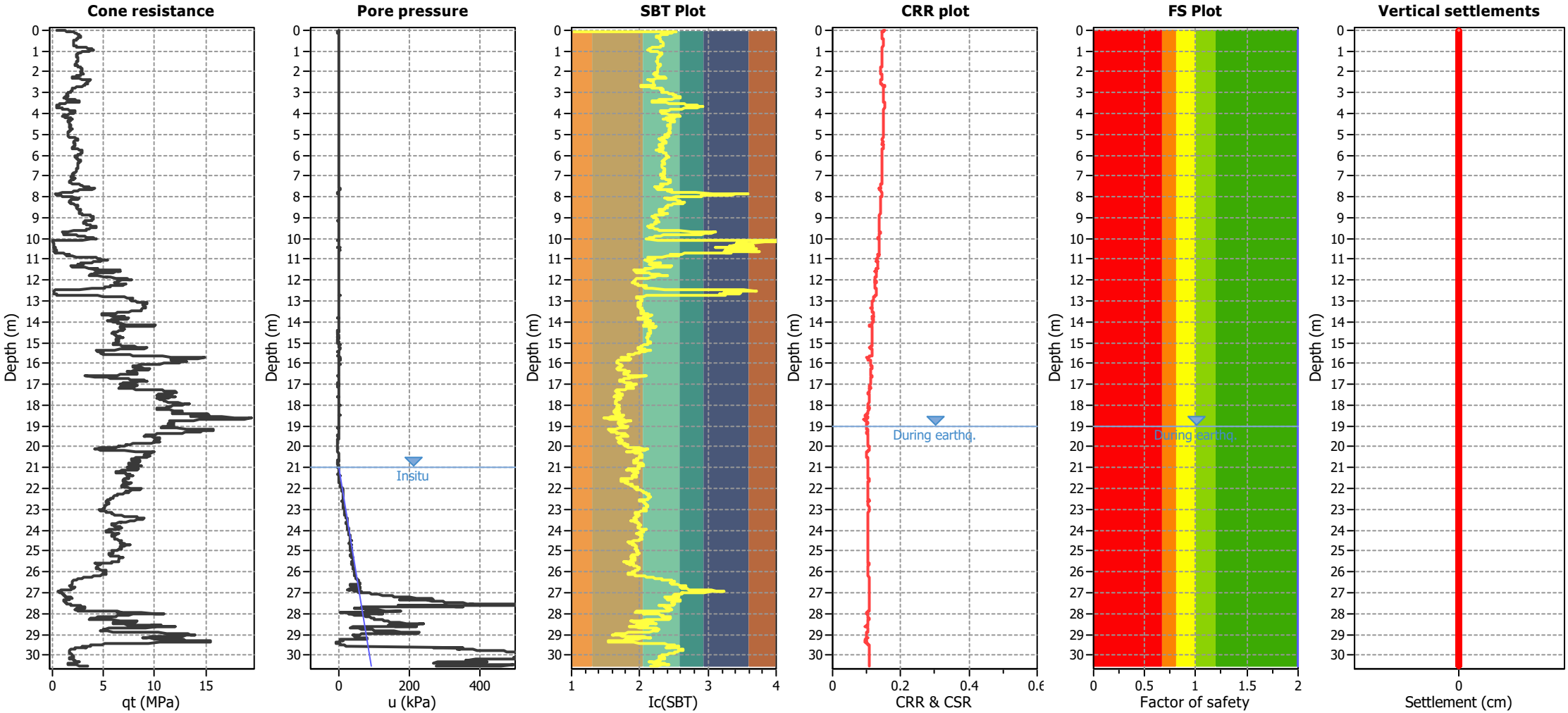


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT02
Total depth: 30.52 m

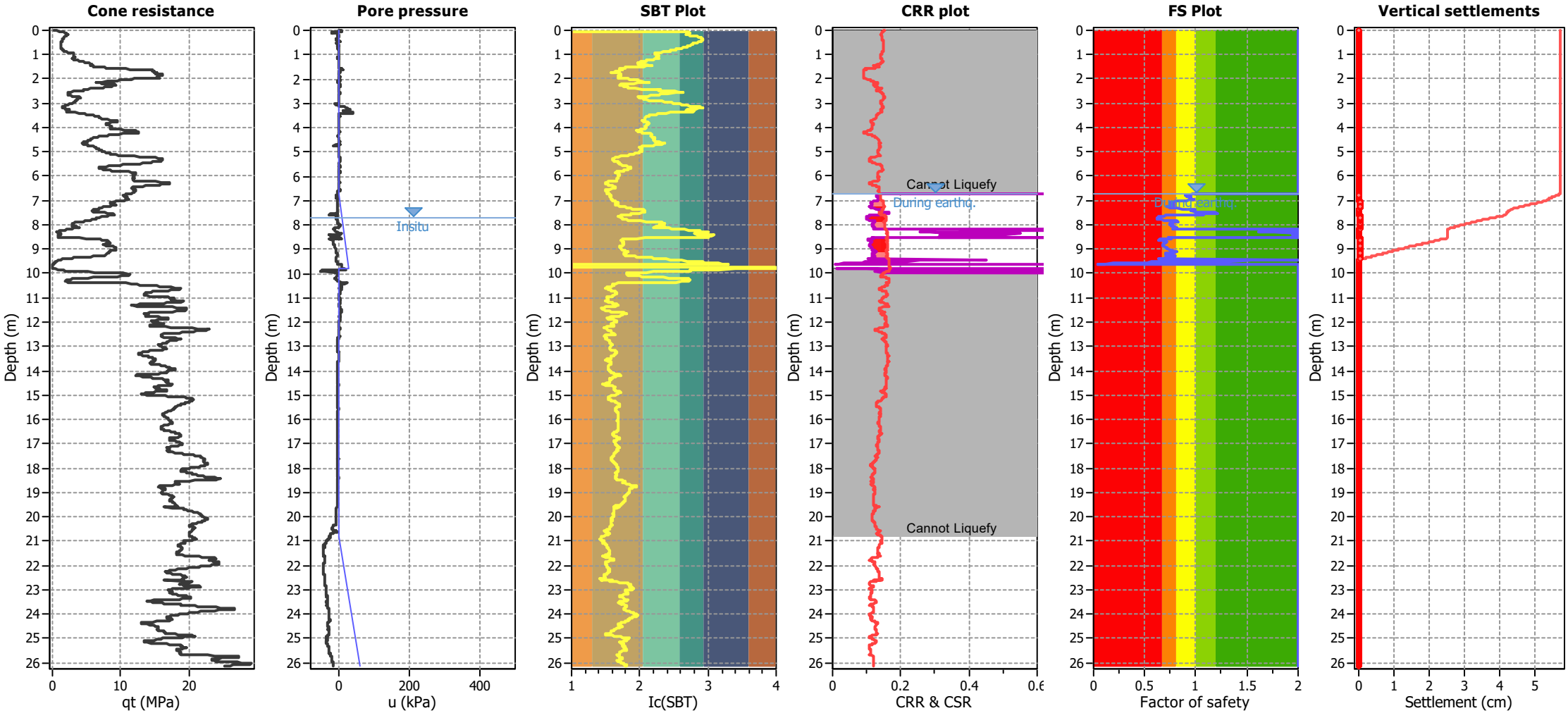


Analysis method:	B&I (2014)	G.W.T. (in-situ):	21.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	19.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m

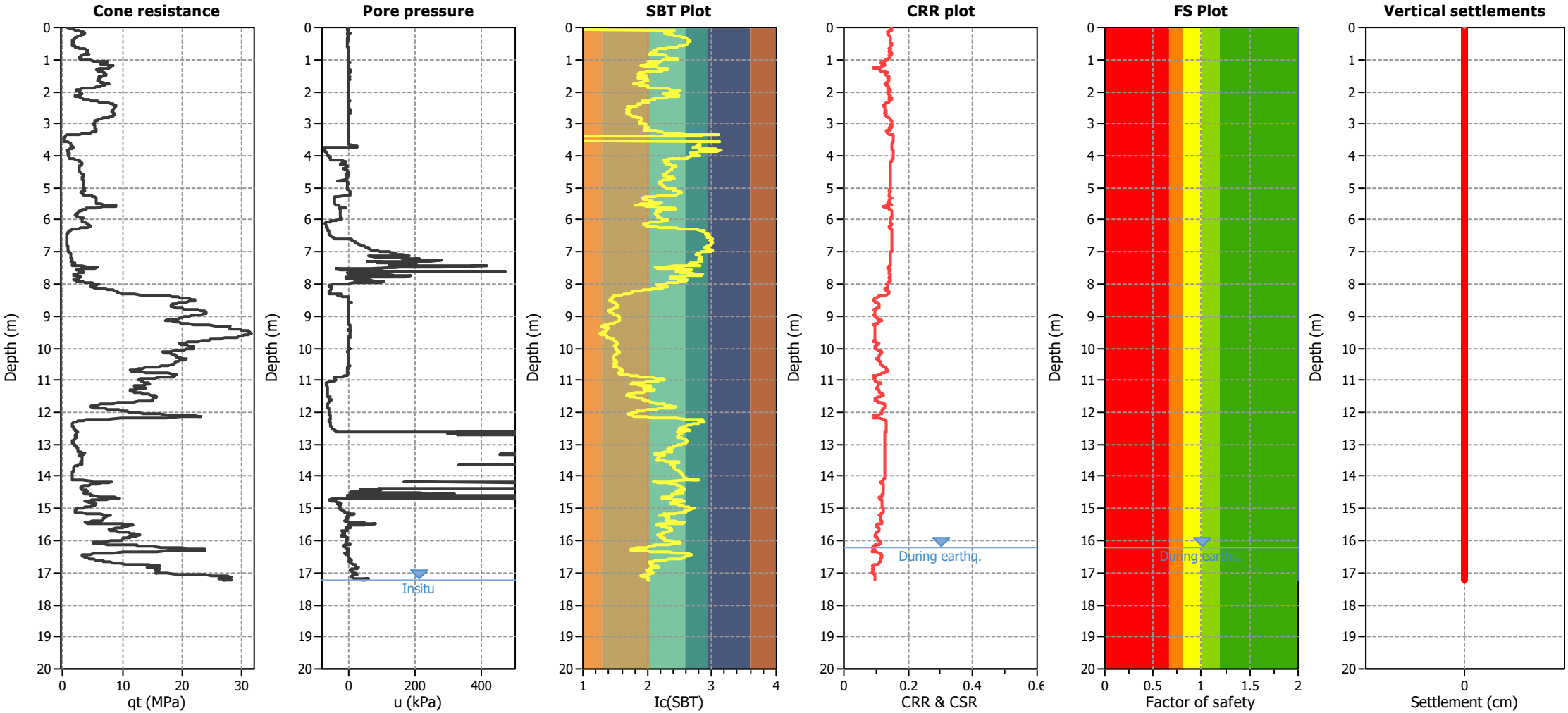


Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.70 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT04
Total depth: 17.24 m

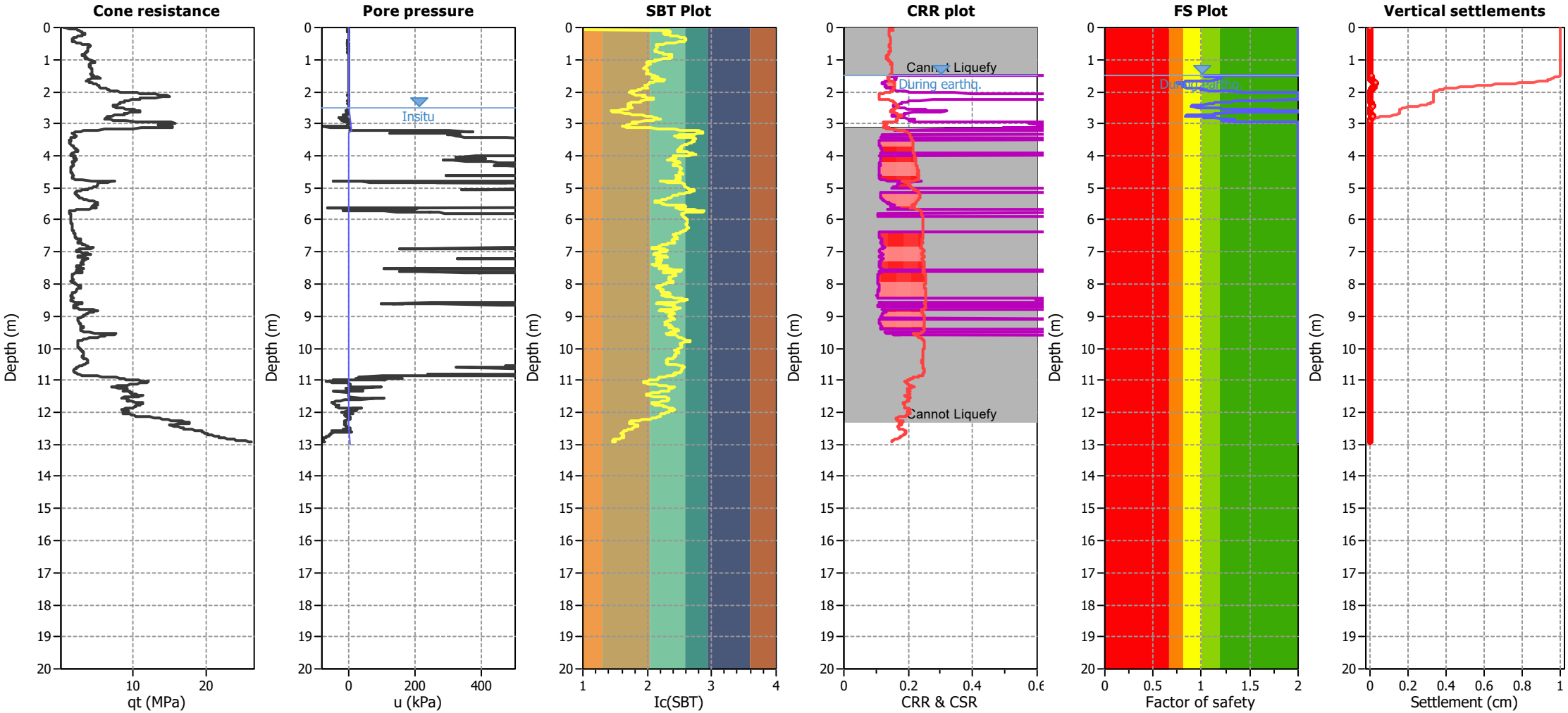


Analysis method:	B&I (2014)	G.W.T. (in-situ):	17.24 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	16.20 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

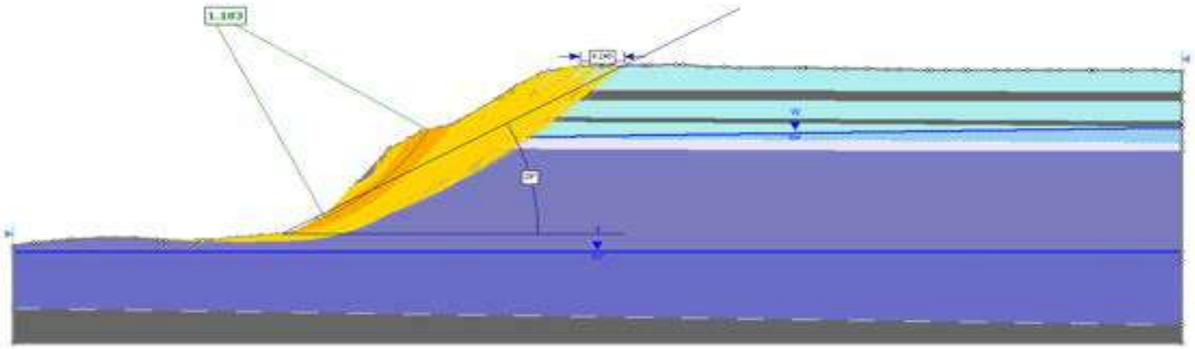
CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.28	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

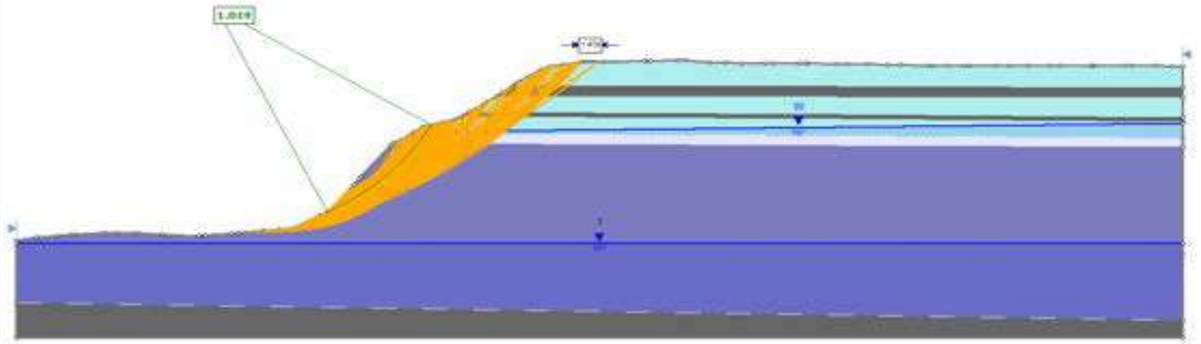
APPENDIX B: SLOPE STABILITY PLOTS

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



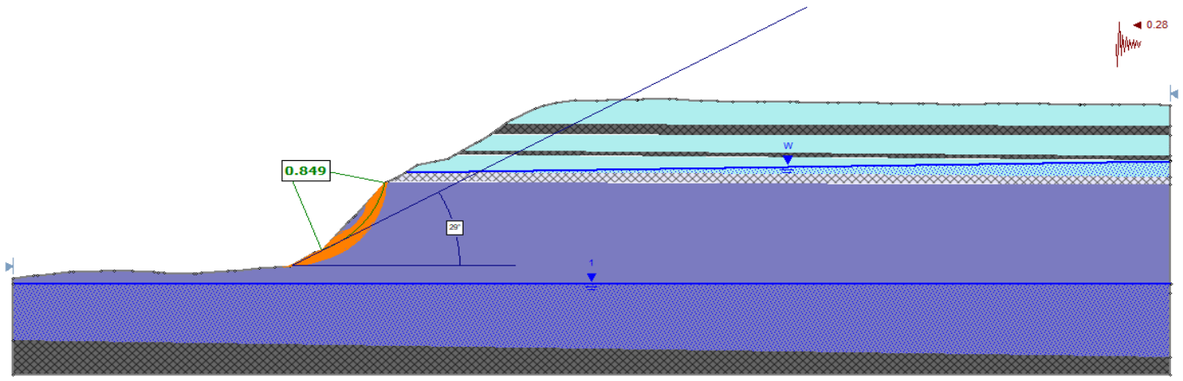
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Piezometric Line 1	Custom	1	
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33	None			0
MD GW SAND		16	Mohr-Coulomb	0	33	Water Surface	Custom	1	
F Ru SILT (HF)		16	Mohr-Coulomb	8	28	None			0

Normal Groundwater Conditions



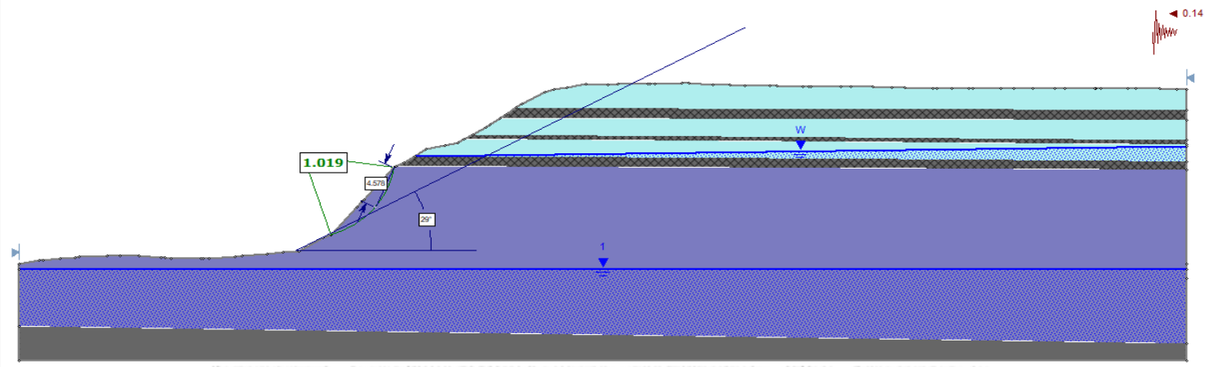
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Piezometric Line 1	Custom	1	
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
MD Ru SAND		16	Mohr-Coulomb	1	33	None			0.1
MD GW SAND		16	Mohr-Coulomb	0	33	Water Surface	Custom	1	
F Ru SILT (HF)		16	Mohr-Coulomb	8	28	None			0.2

Worst Credible Groundwater Conditions



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Piezometric Line 1	Custom	1	
VSt UD SILT (HF)		16	Undrained	120		Constant	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33		None			0
MD GW SAND		16	Mohr-Coulomb	0	33		Water Surface	Custom	1	
F UD SILT (HF)		16	Undrained	100		Constant	None			0

Seismic Event (PGA 0.28g)



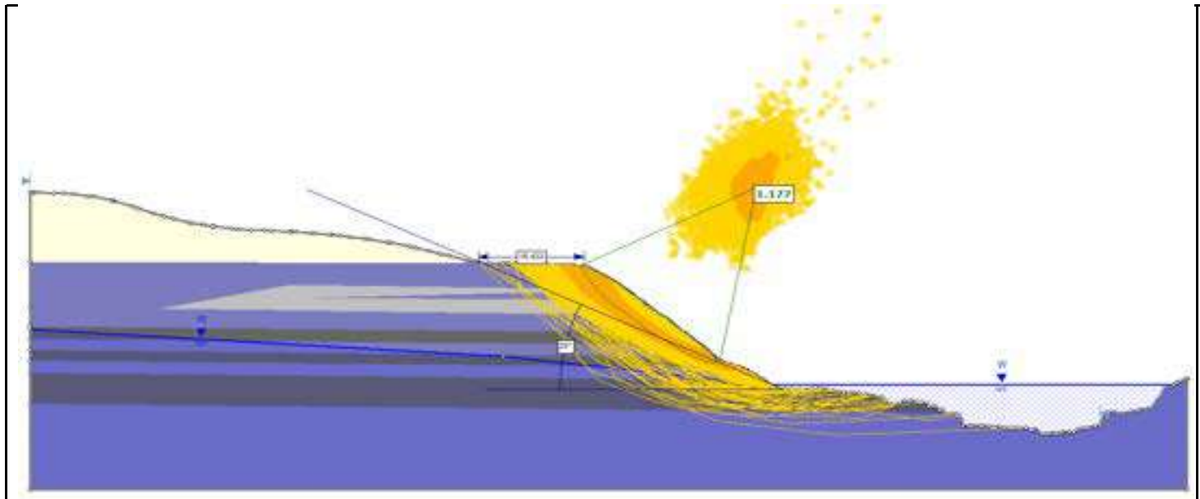
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Piezometric Line 1	Custom	1	
VSt UD SILT (HF)		16	Undrained	120		Constant	None			0
MD Ru SAND		16	Mohr-Coulomb	1	33		None			0
MD GW SAND		16	Mohr-Coulomb	0	33		Water Surface	Custom	1	
F UD SILT (HF)		16	Undrained	100		Constant	None			0

Yeild Seismic Condition (PGA 0.14g)

CMW Geosciences

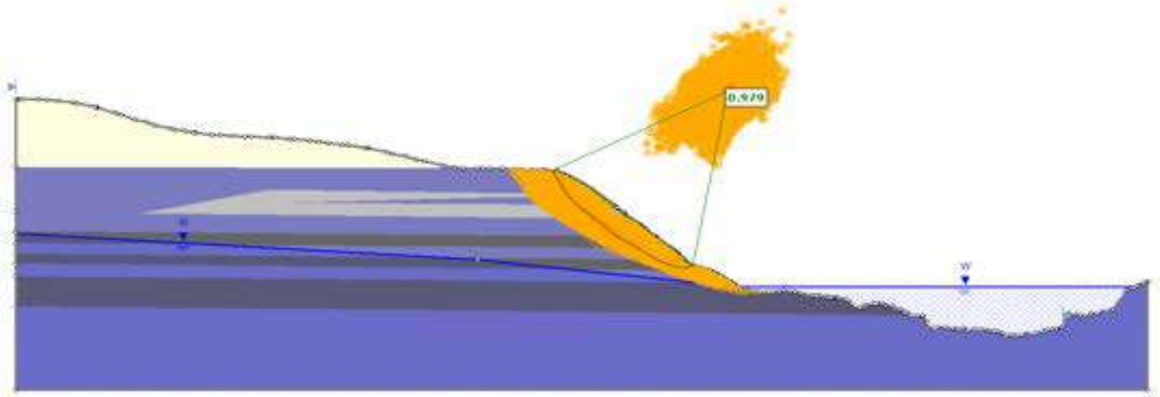
Project Wordsworth St Development	*Analysis* Circular	*Project No.* HAM2021-0032
Title Gully Section - Proposed	*Date* 20/11/2023	*Drawing* STAB 01

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



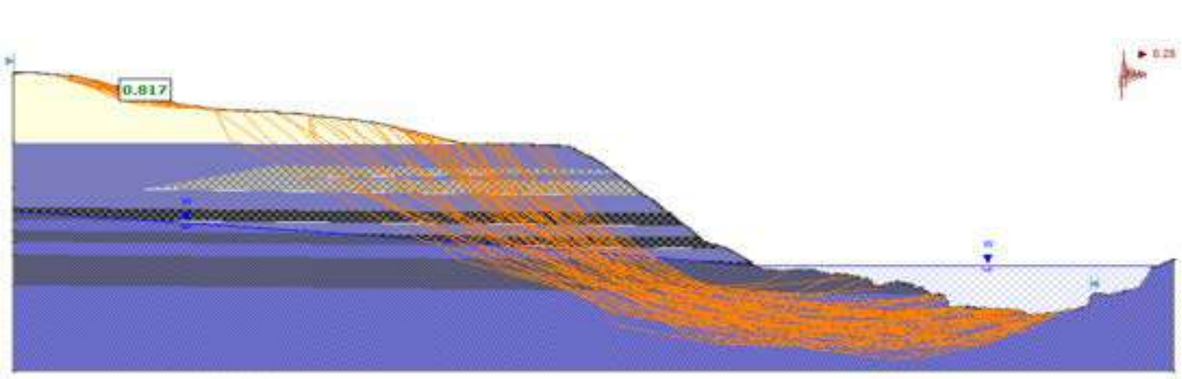
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Normal Groundwater Conditions



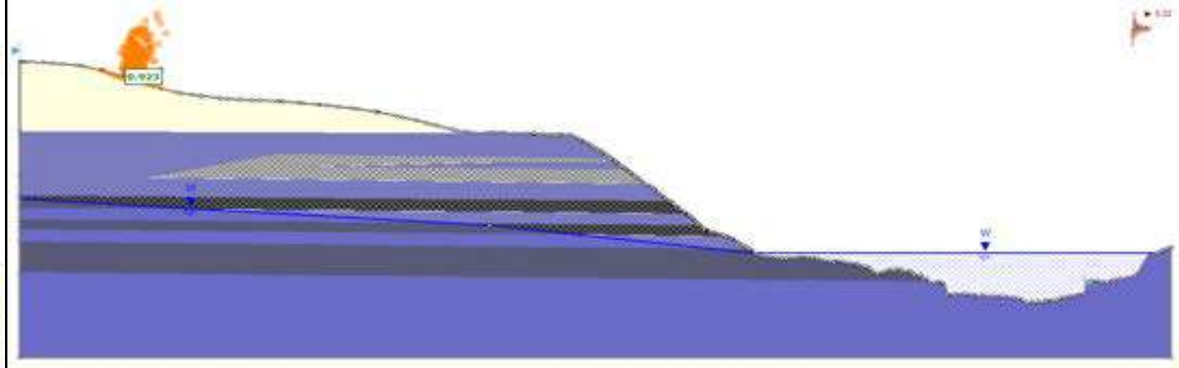
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0.1
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0.2
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Worst Credible Groundwater Conditions



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

Seismic Event



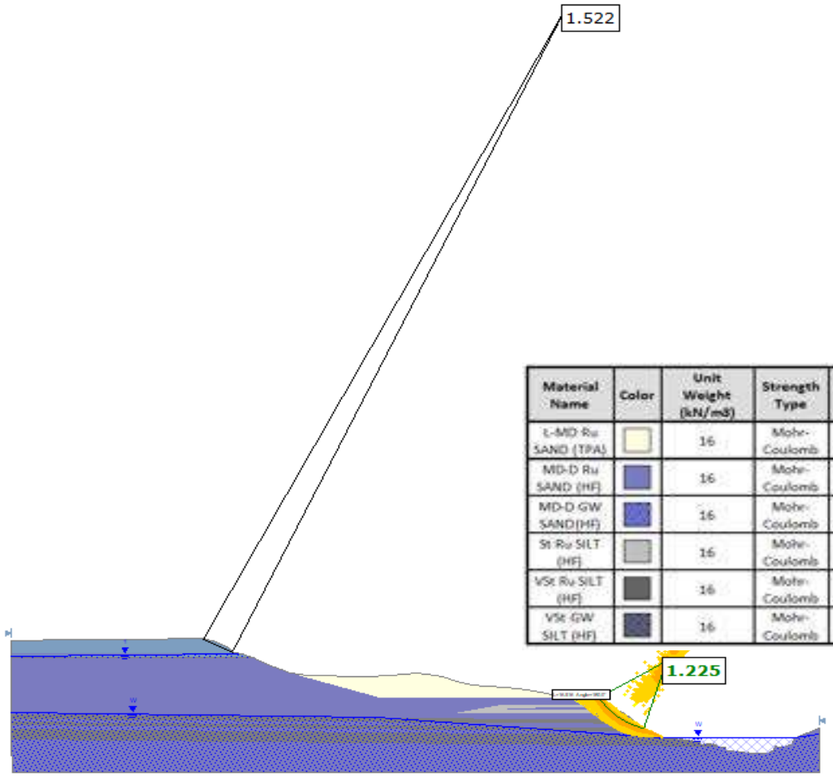
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

Yeild Seismic Condition (PGA 0.23g)

CMW Geosciences

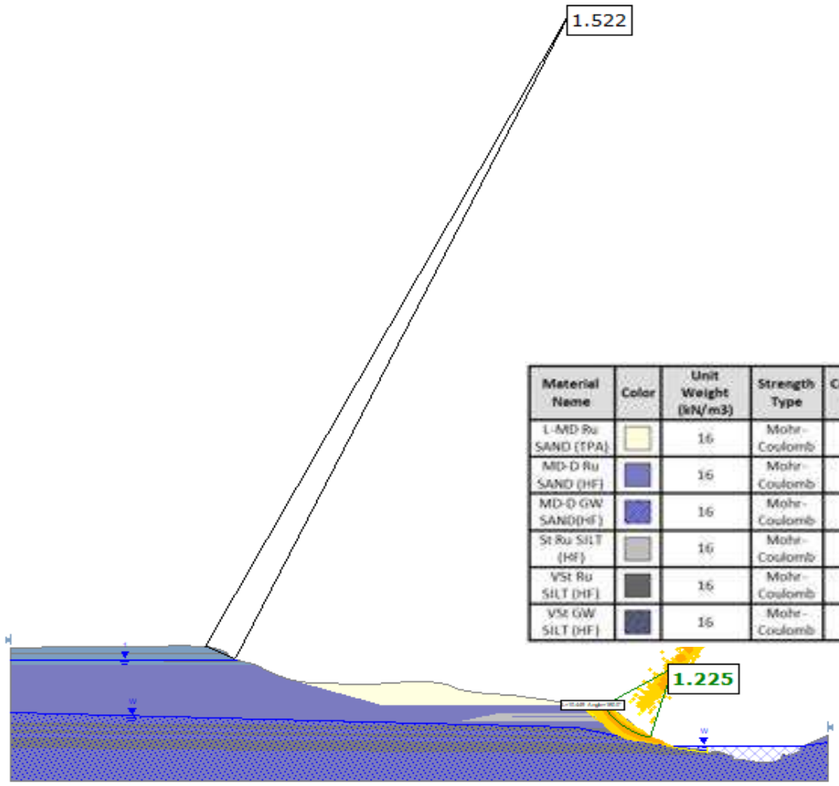
Project Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title River Section - Proposed	*Date* 20/11/2023	*Drawing* STAB 02

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

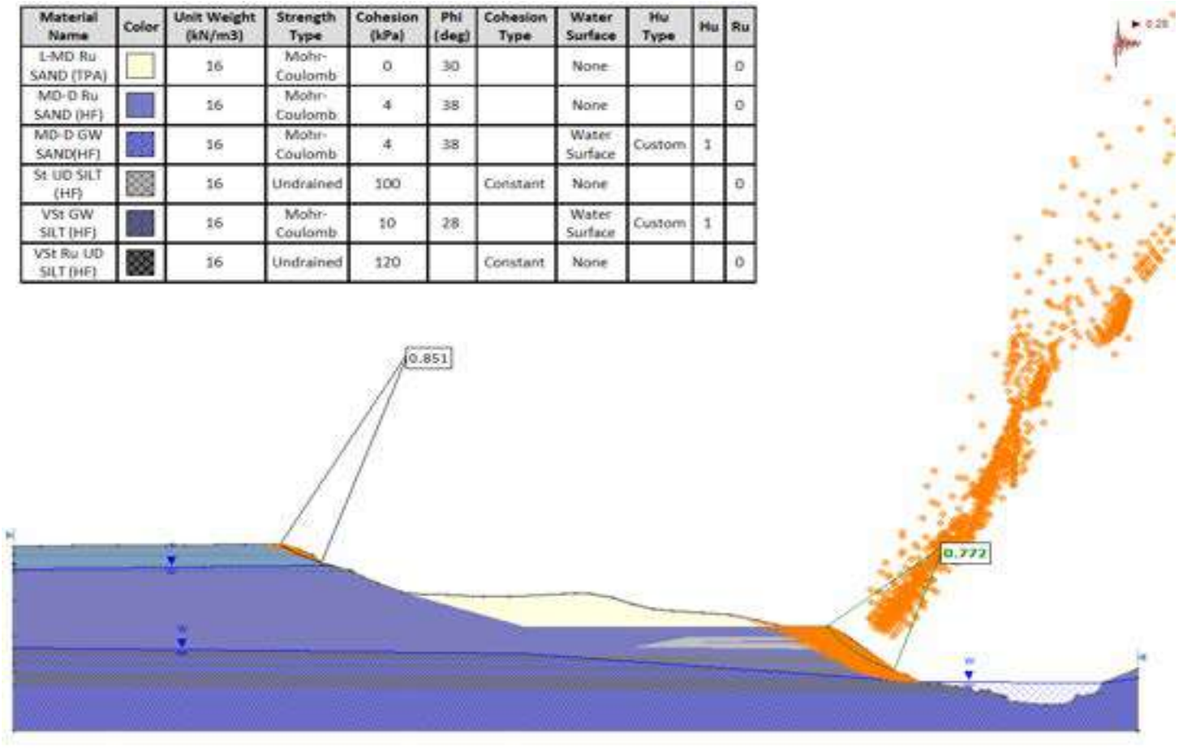
Normal Groundwater Conditions



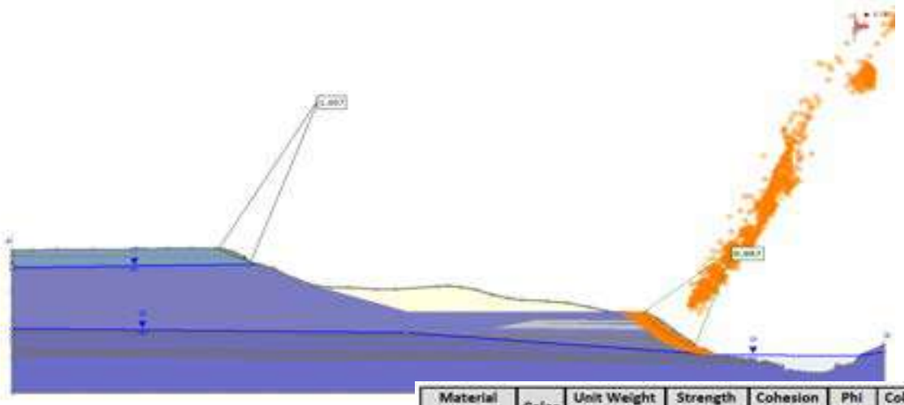
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0.1
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0.1
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St Ru SILT (HF)		16	Mohr-Coulomb	5	28	None			0.2
VSt Ru SILT (HF)		16	Mohr-Coulomb	10	28	None			0.2
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	

Worst Credible Groundwater Conditions

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30	None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38	None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38	Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None		0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28	Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None		0



Seismic Event



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
L-MD Ru SAND (TPA)		16	Mohr-Coulomb	0	30		None			0
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Surface	Custom	1	
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Surface	Custom	1	
VSt Ru UD SILT (HF)		16	Undrained	120		Constant	None			0

Yeild Seismic Condition (PGA 0.19g)

CMW Geosciences	*Project* Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
	Title Middle Terrace - Proposed	*Date* 20/11/2023	*Drawing* STAB 03

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

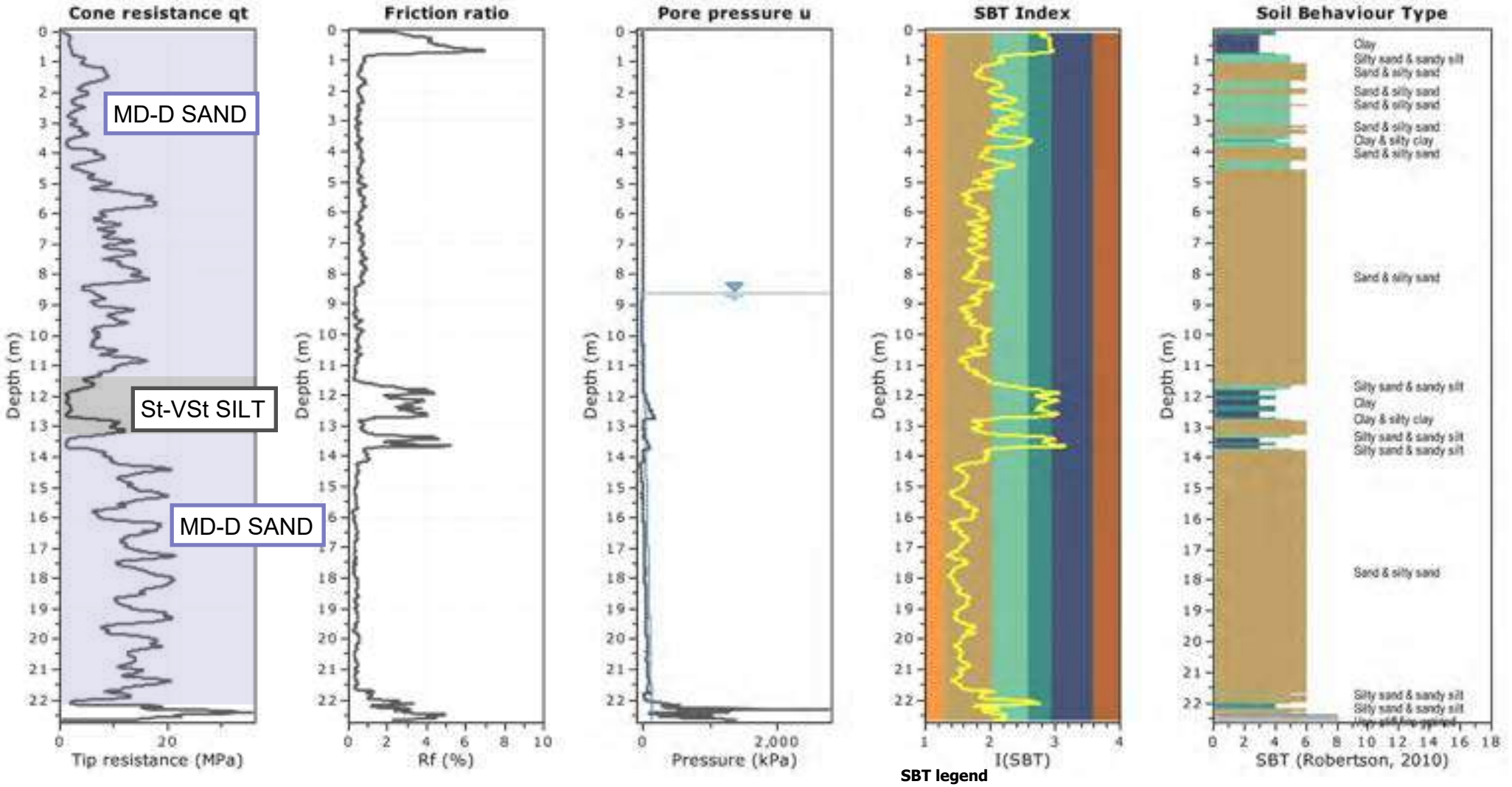
APPENDIX C: ANNOTATED CPT LOGS

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT01 Non-hydrostatic
Total depth: 22.65 m, Date: 14/12/2023

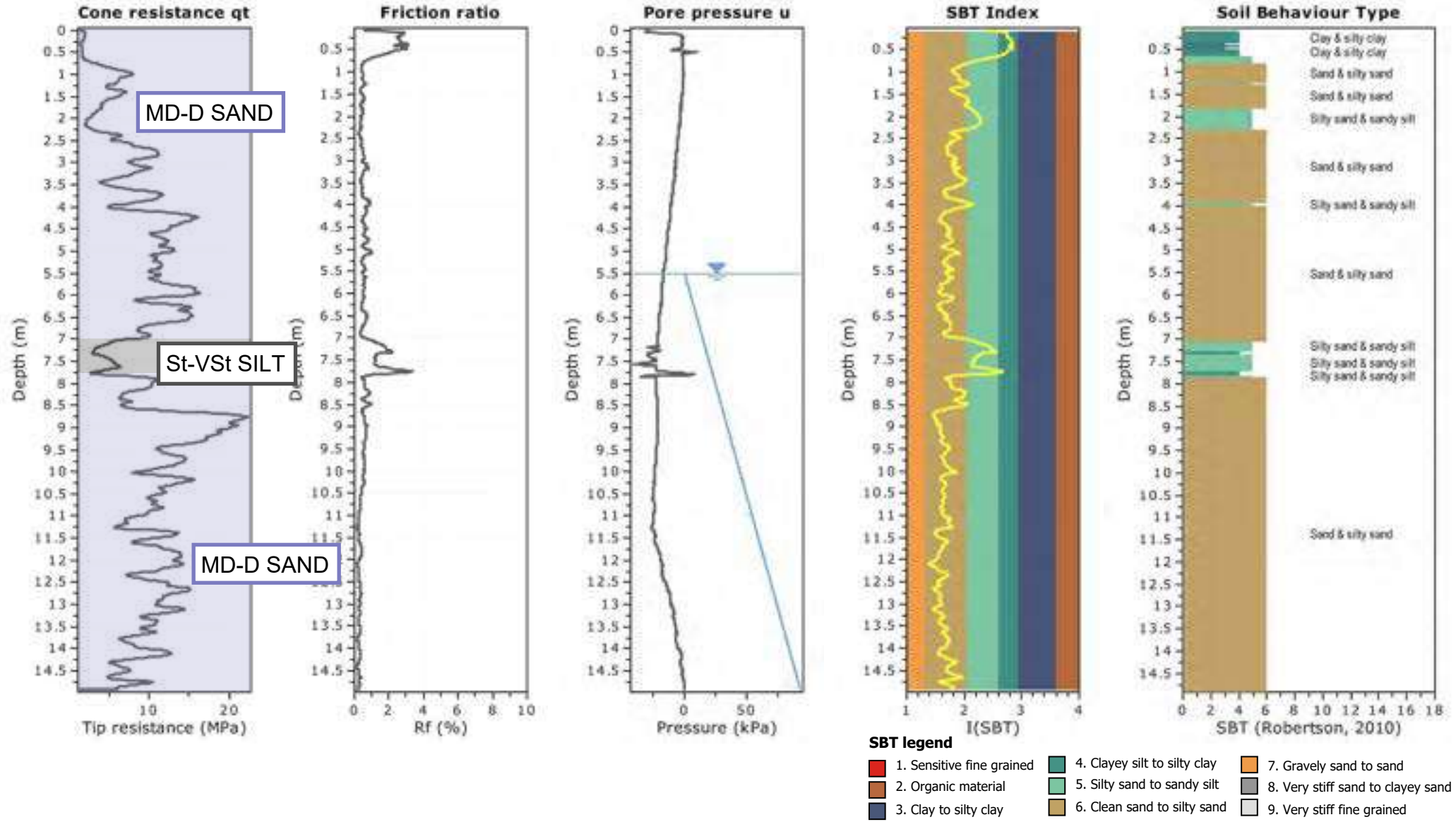


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT02 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

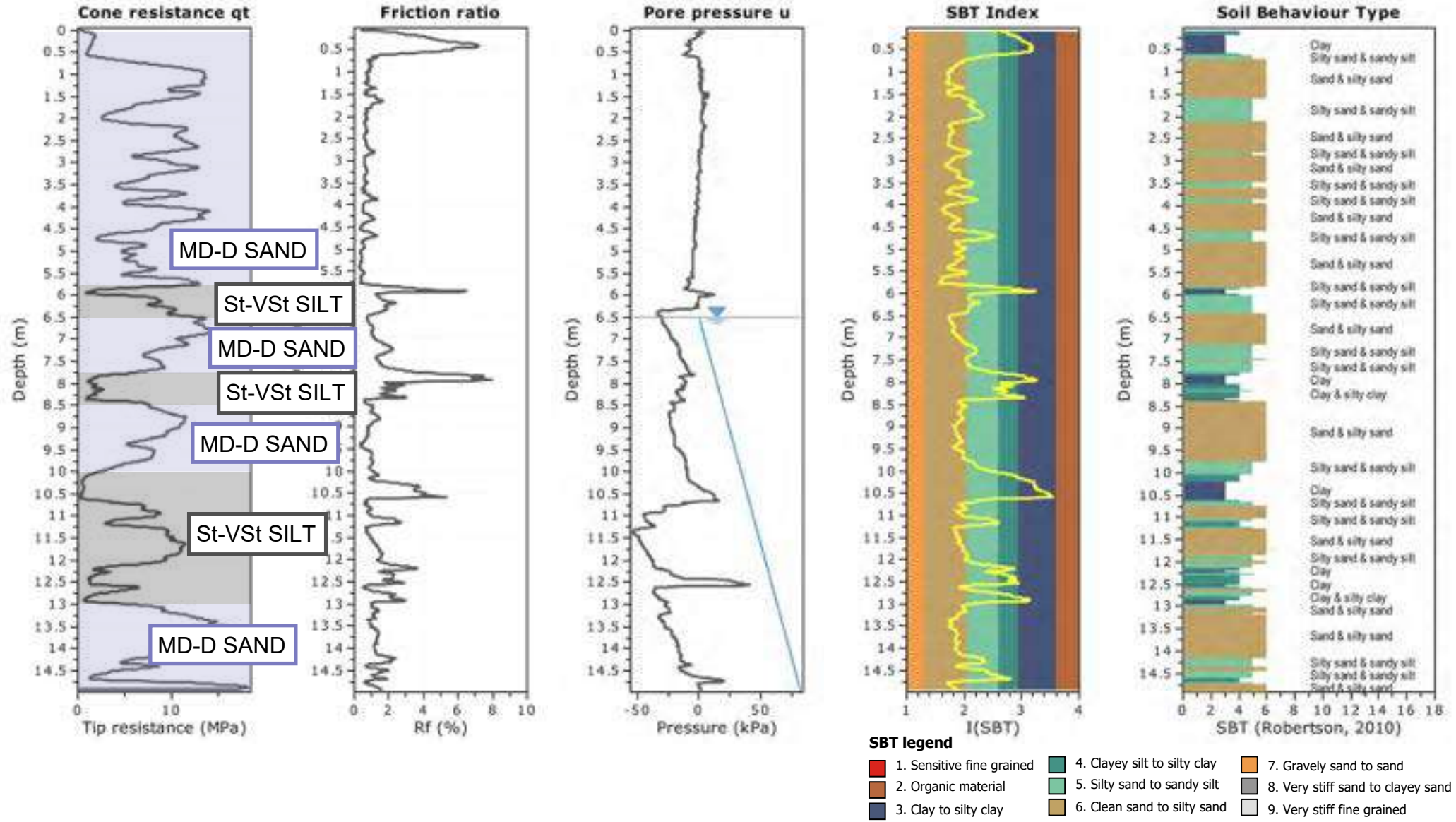


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT03 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

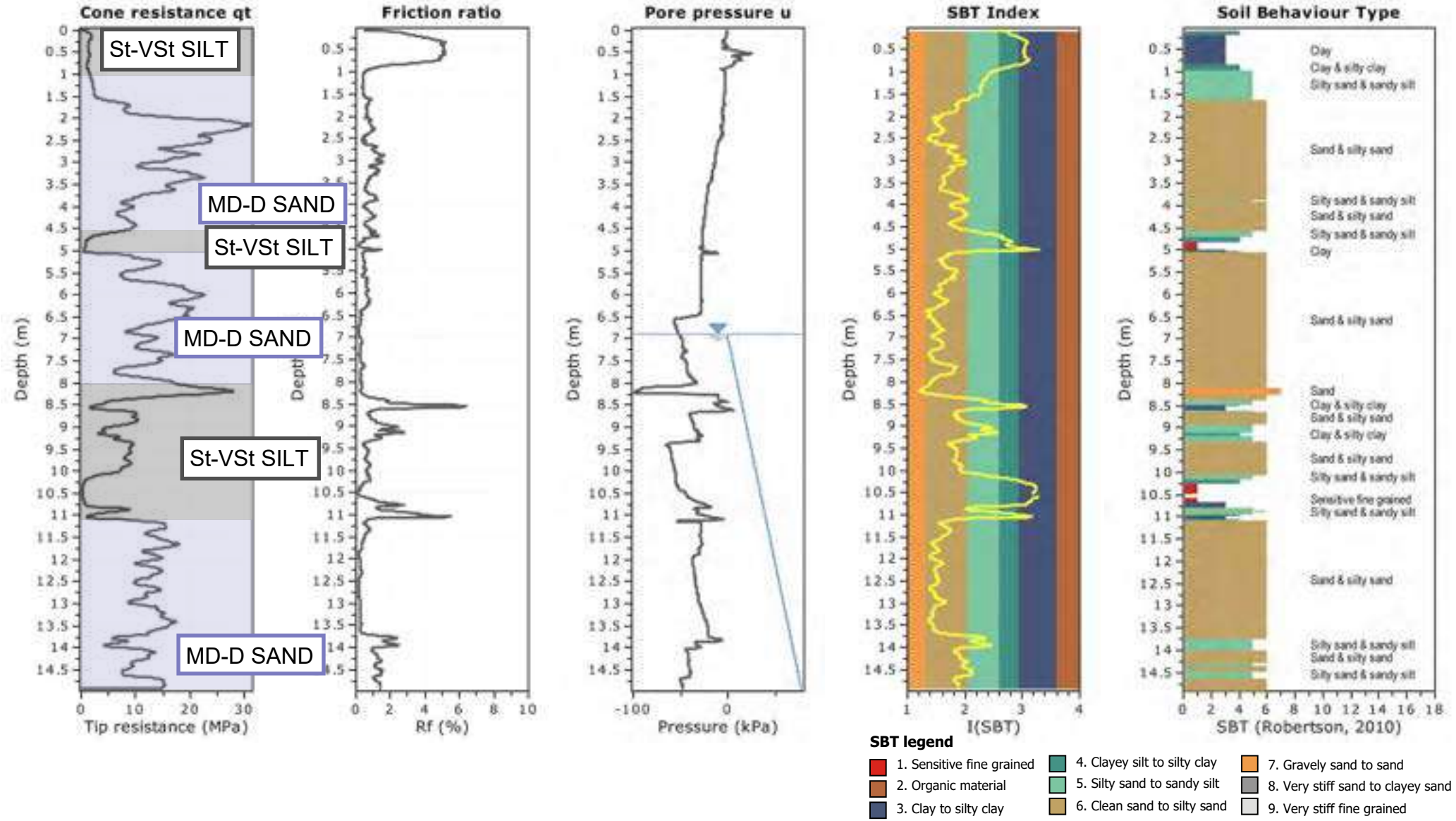


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT04 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

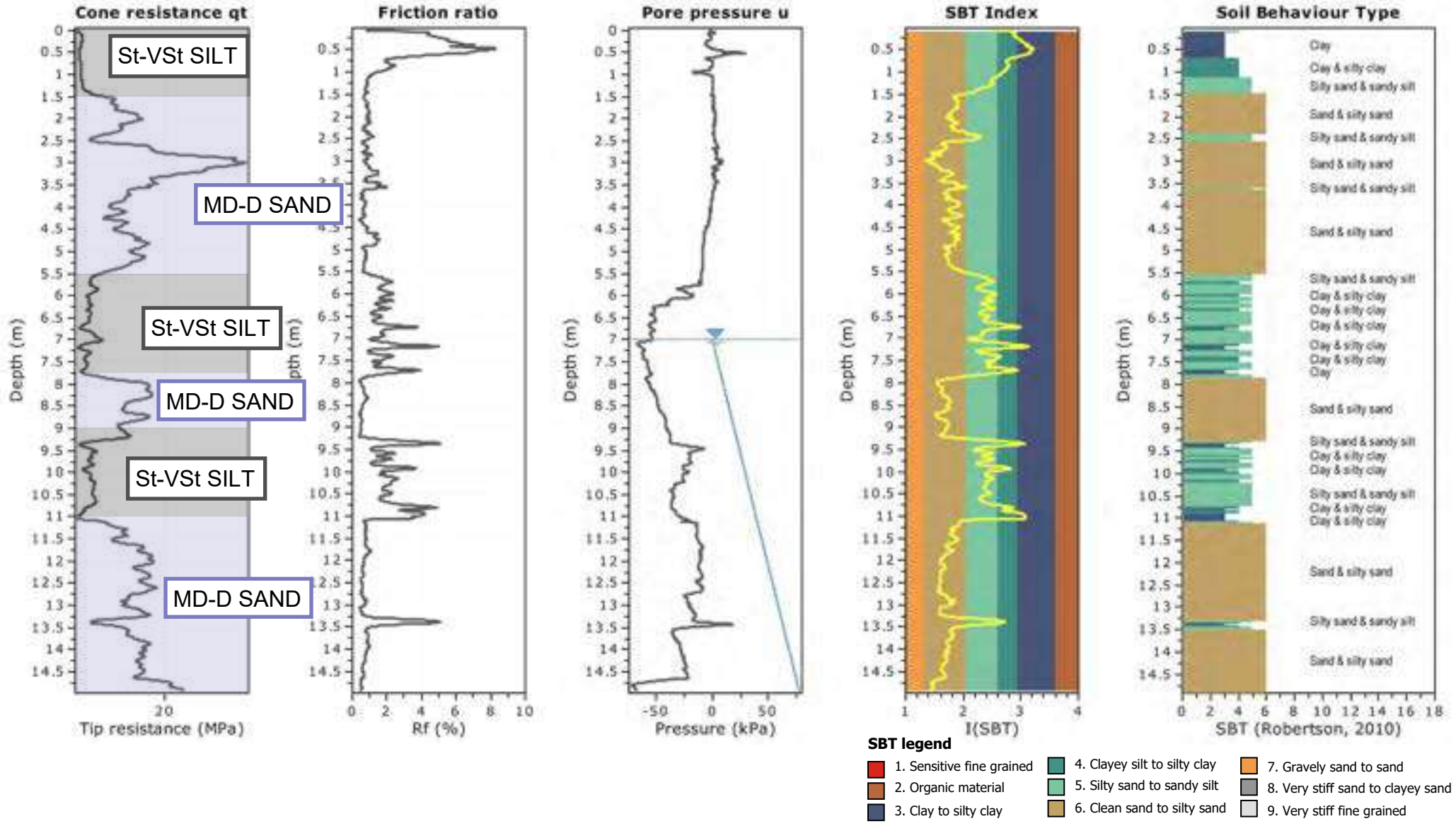


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT05 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

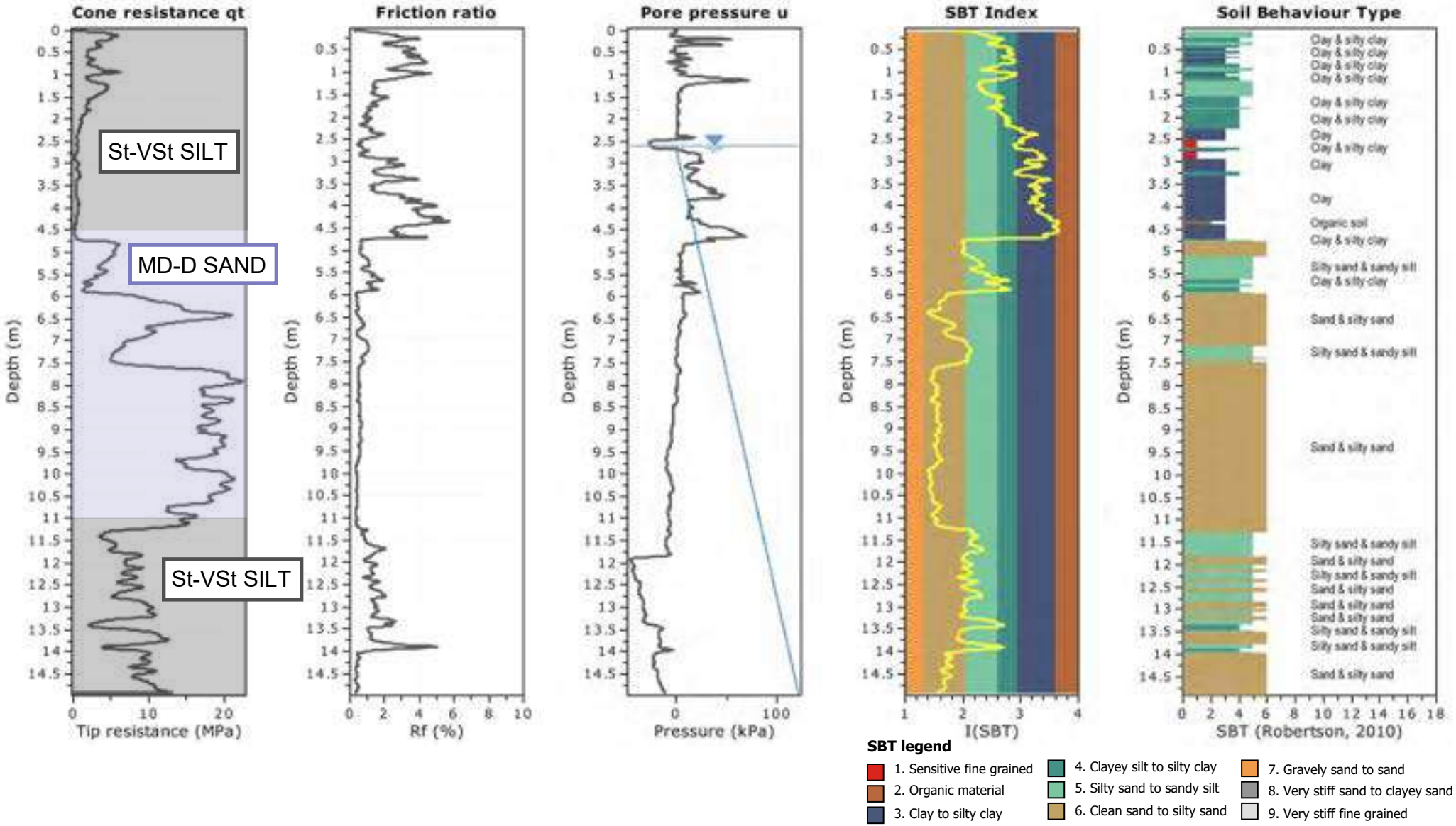


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT06 Non-hydrostatic
Total depth: 14.92 m, Date: 14/12/2023

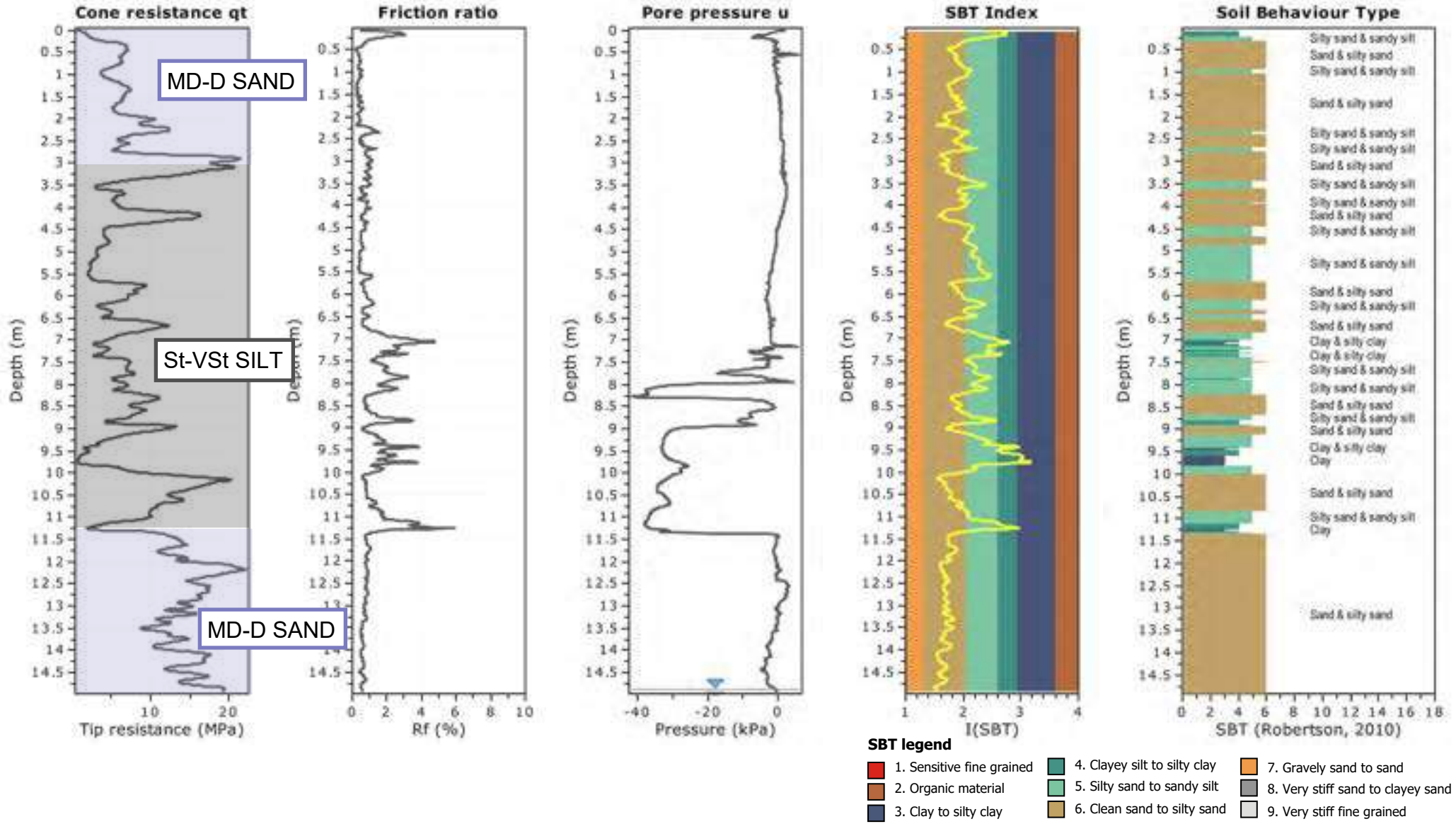


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT07
Total depth: 14.92 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT08 Non-hydrostatic
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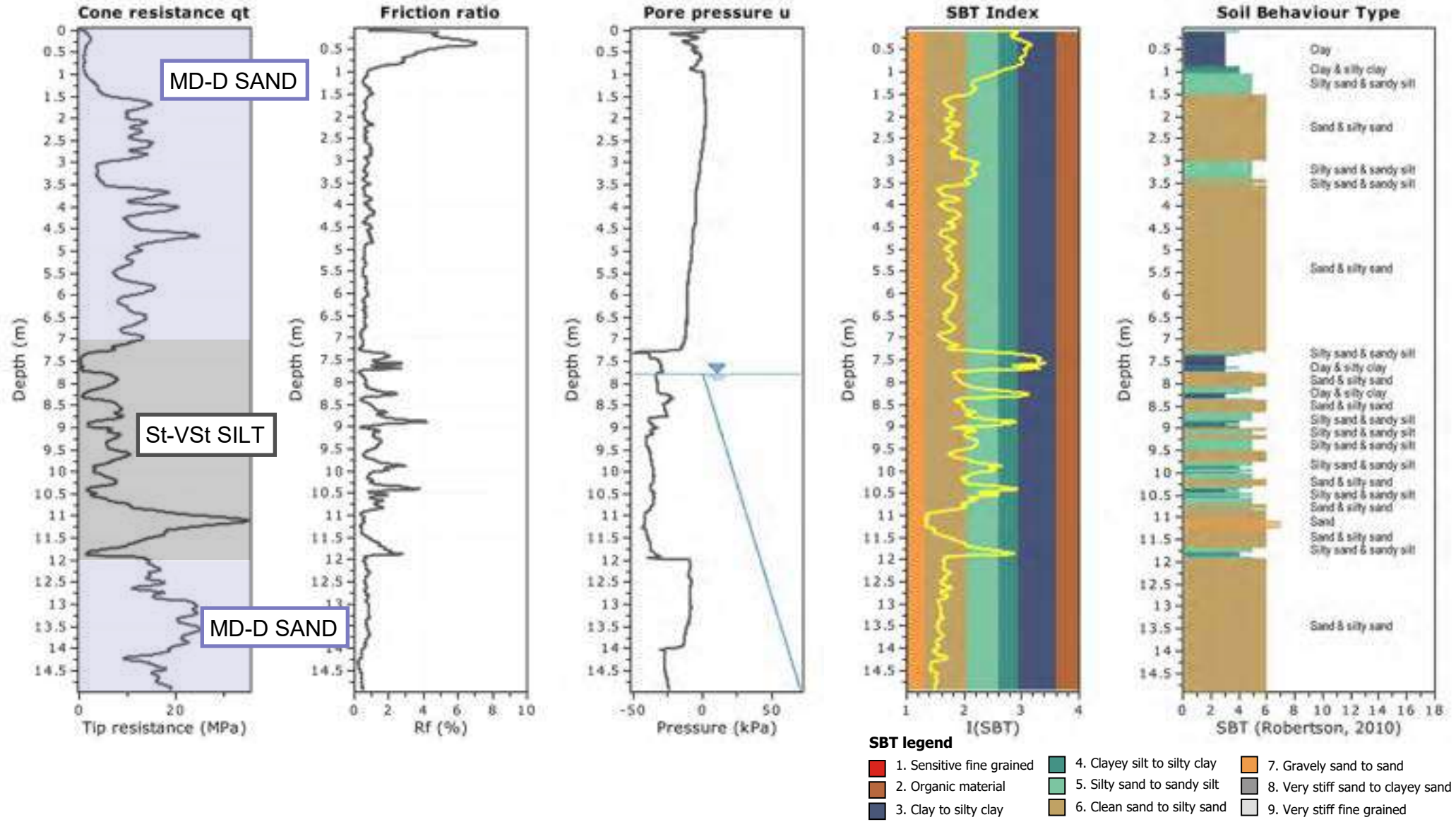
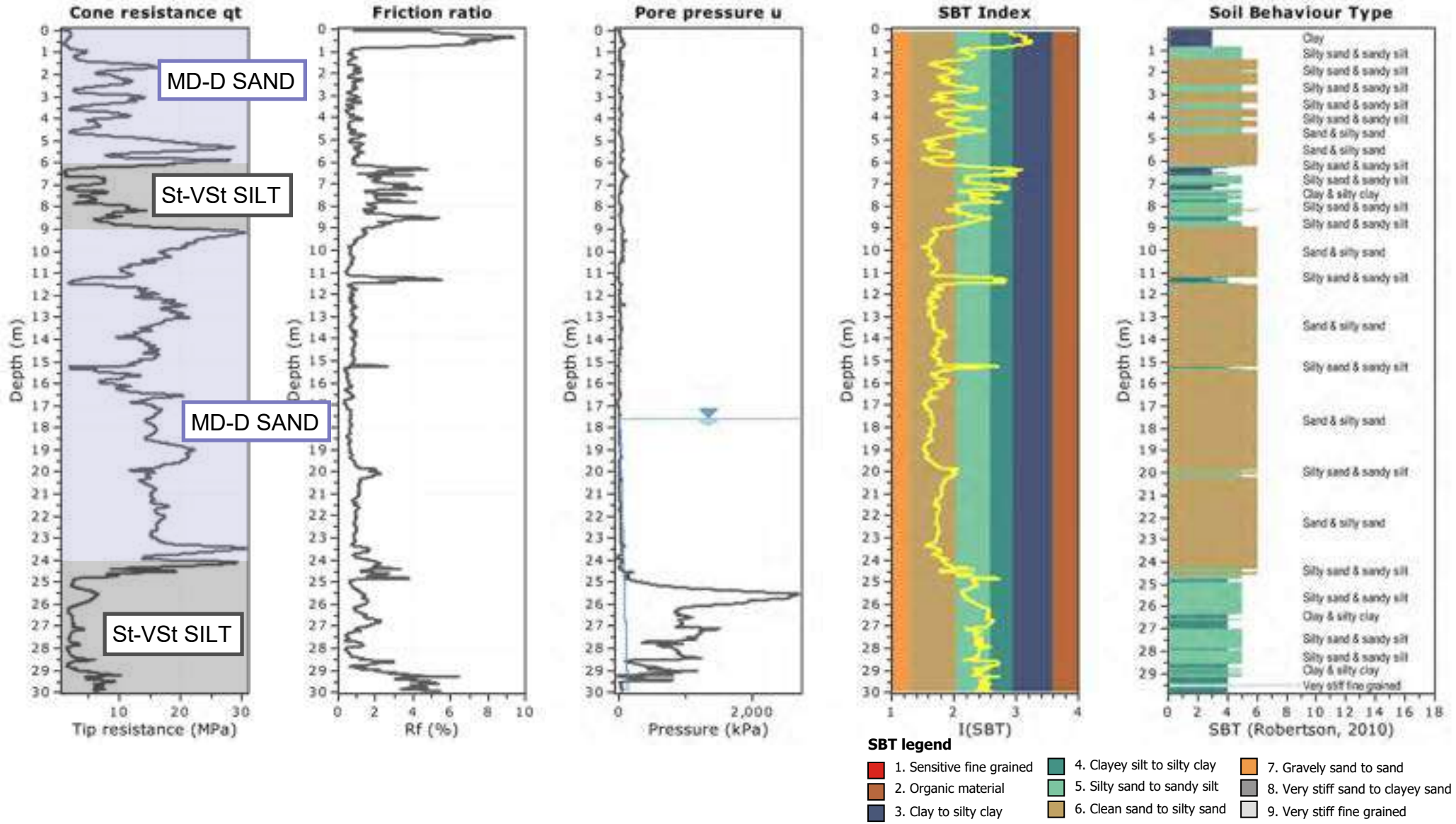


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: CPT09 Non-hydrostatic
Total depth: 29.92 m, Date: 14/12/2023



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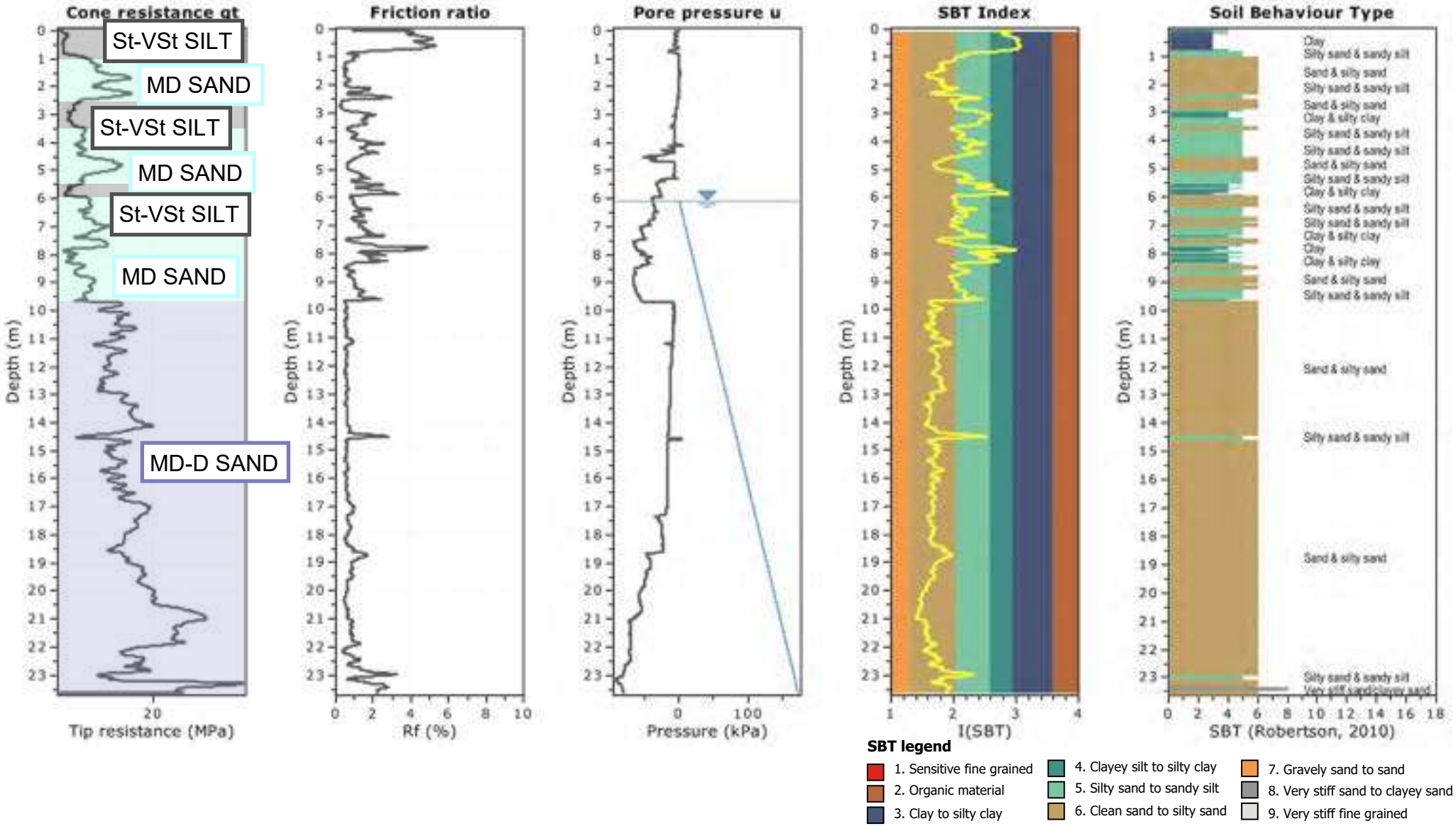
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT10 Non-hydrostatic
Total depth: 23.63 m, Date: 14/12/2023

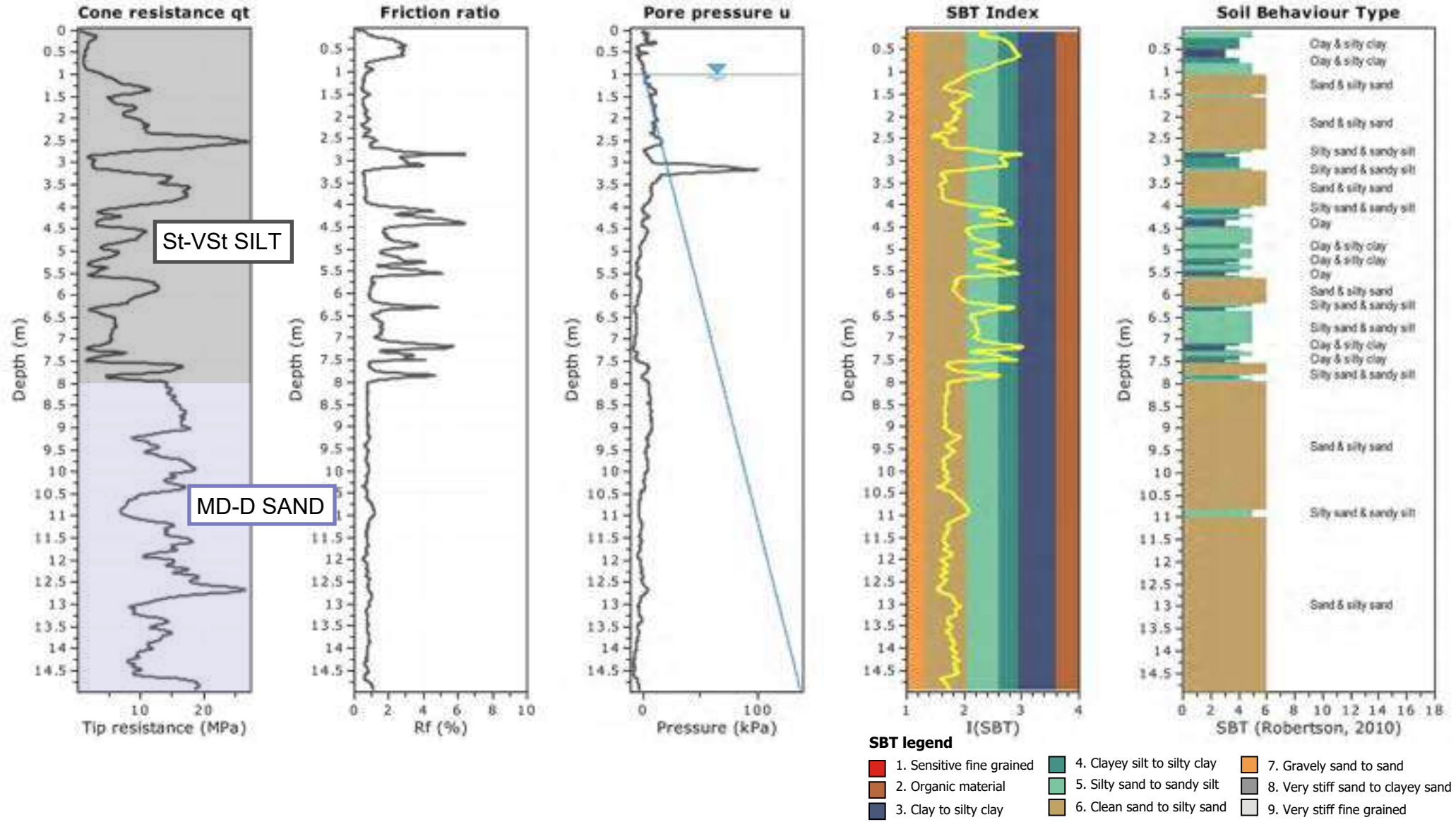


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT11
Total depth: 14.92 m, Date: 14/12/2023

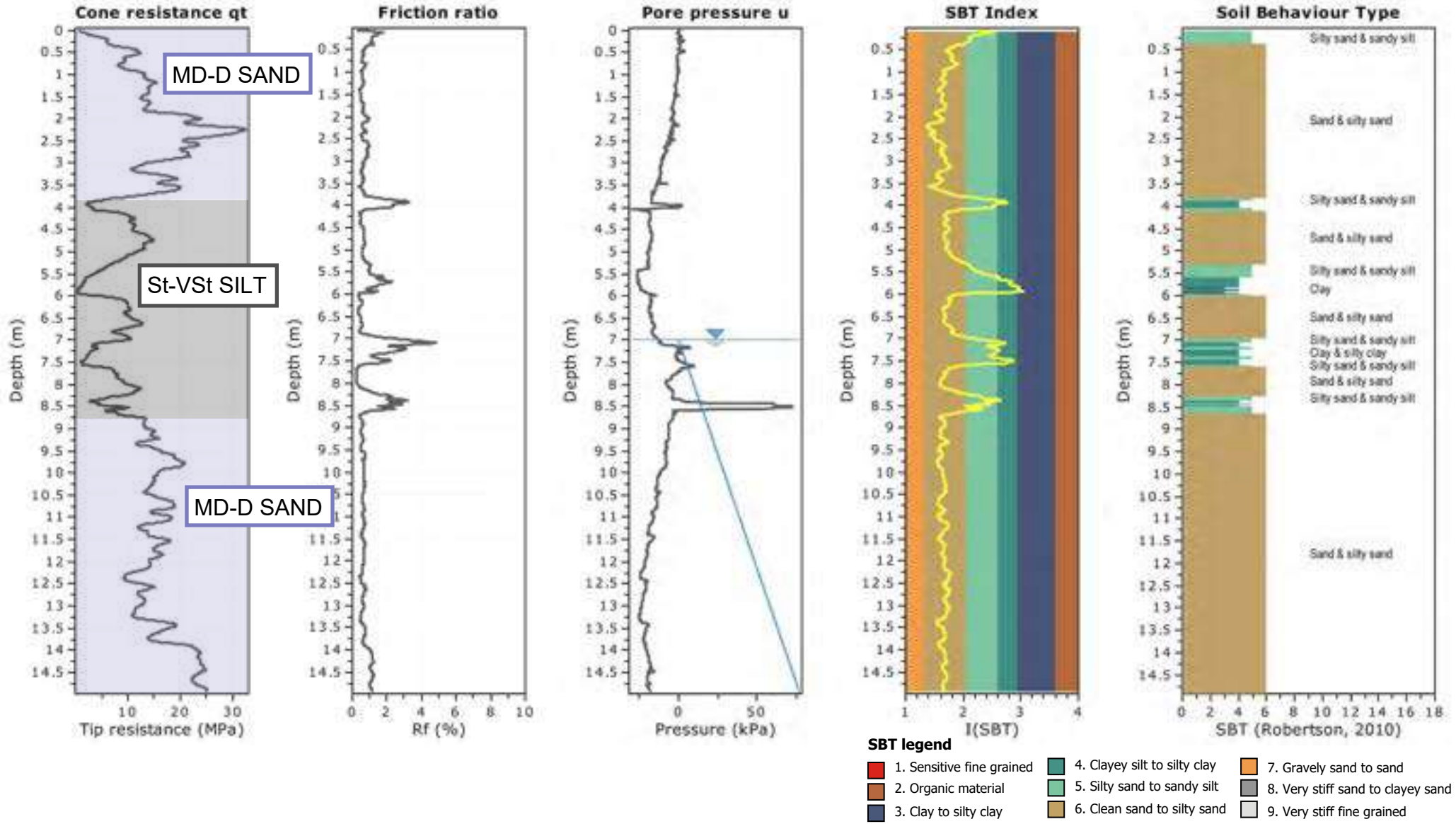


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT12
Total depth: 14.92 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: CPT13
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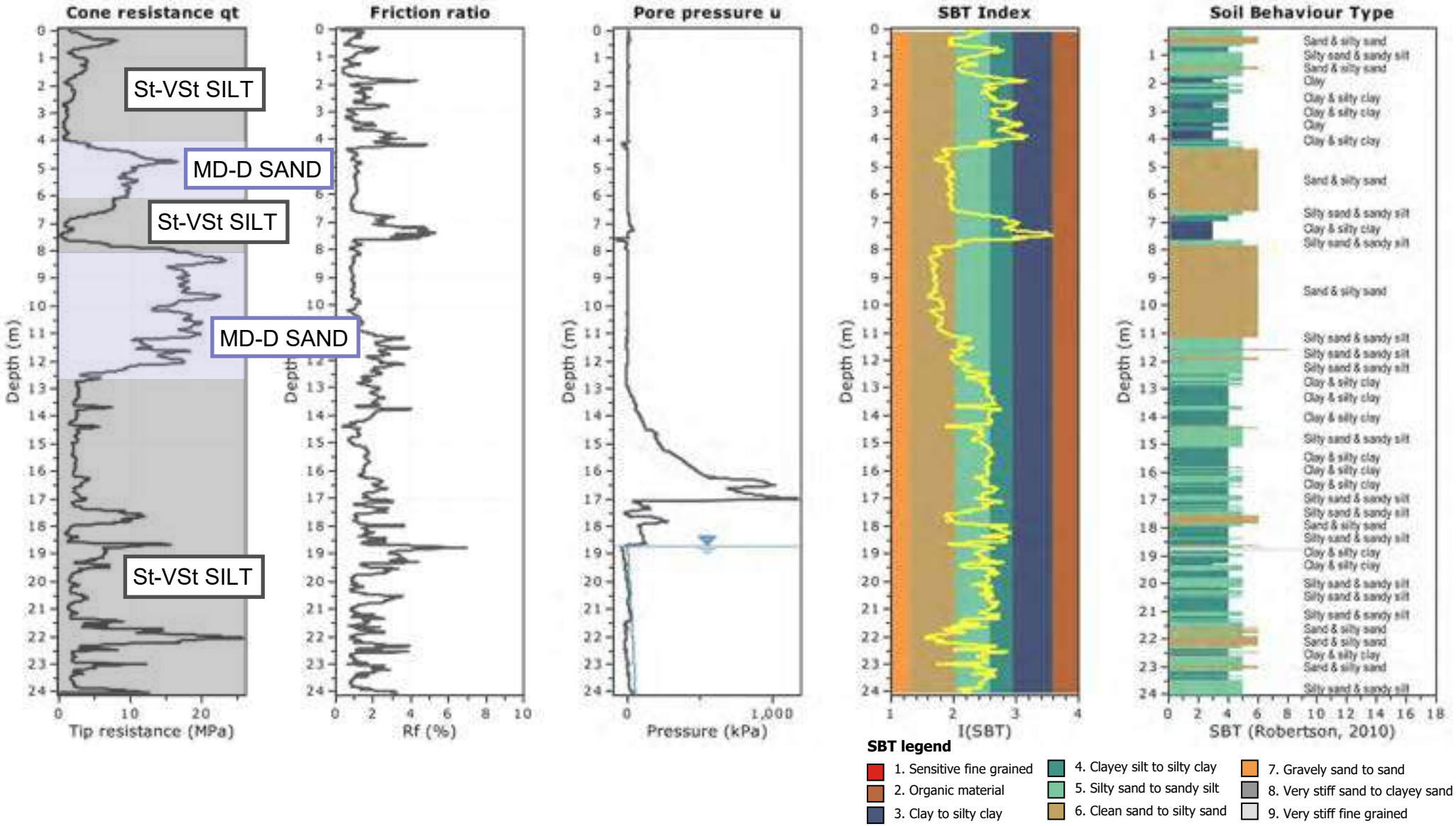
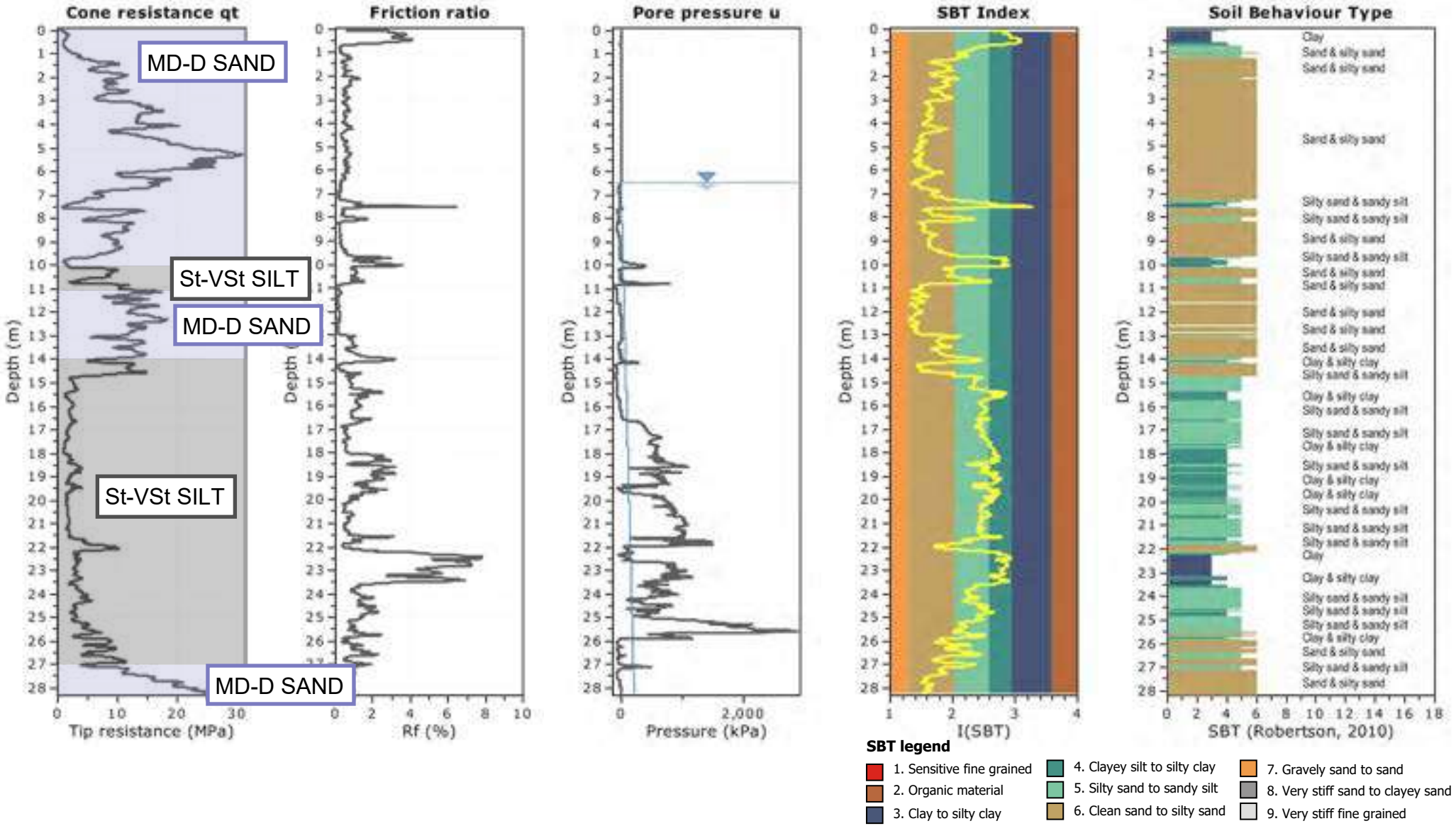


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: HAM2021-0032 Wordsworth Street, Cambridge
Location: Cambridge

CPT: SCPT01 Non-hydrostatic
Total depth: 28.18 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT02
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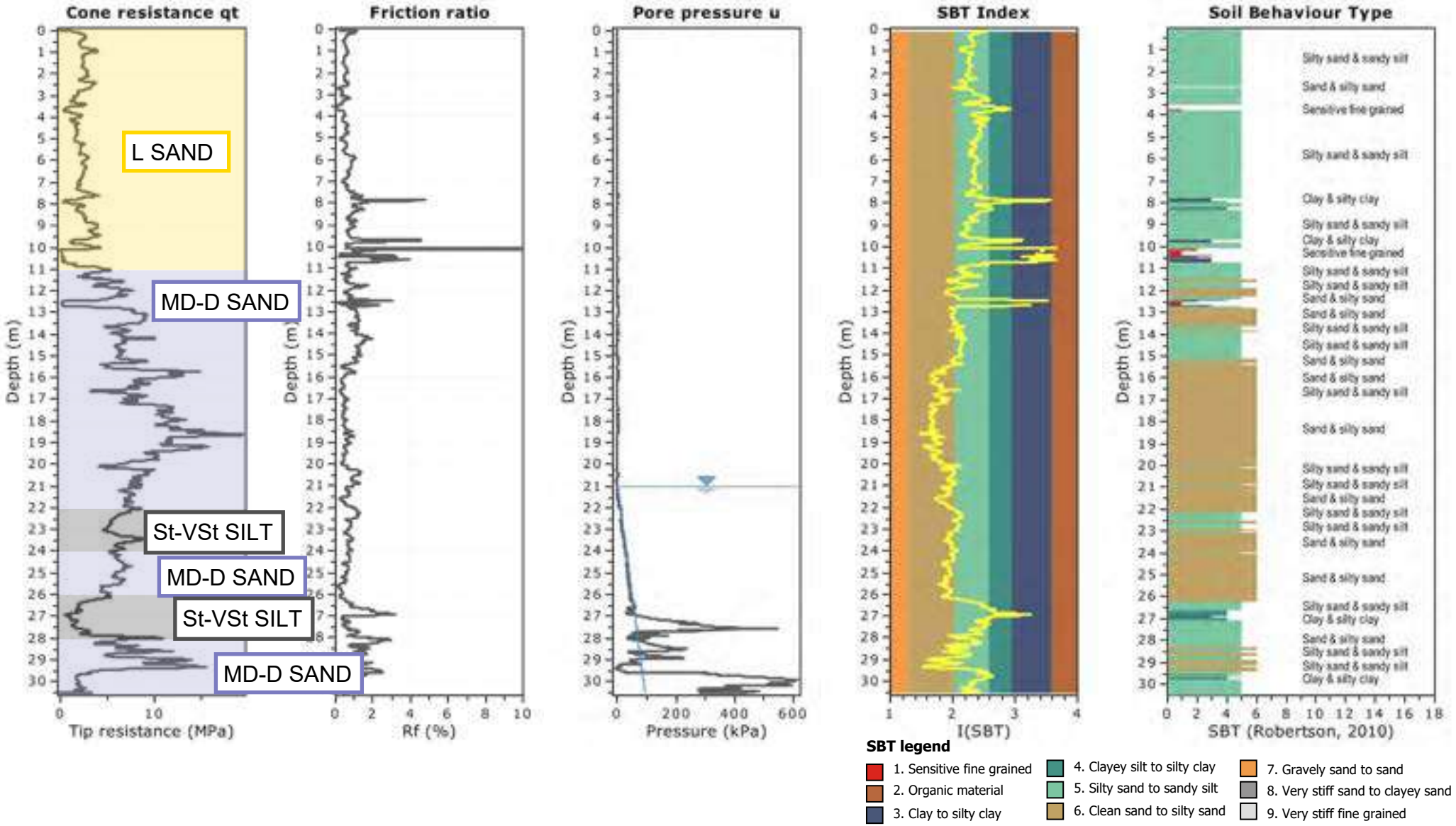
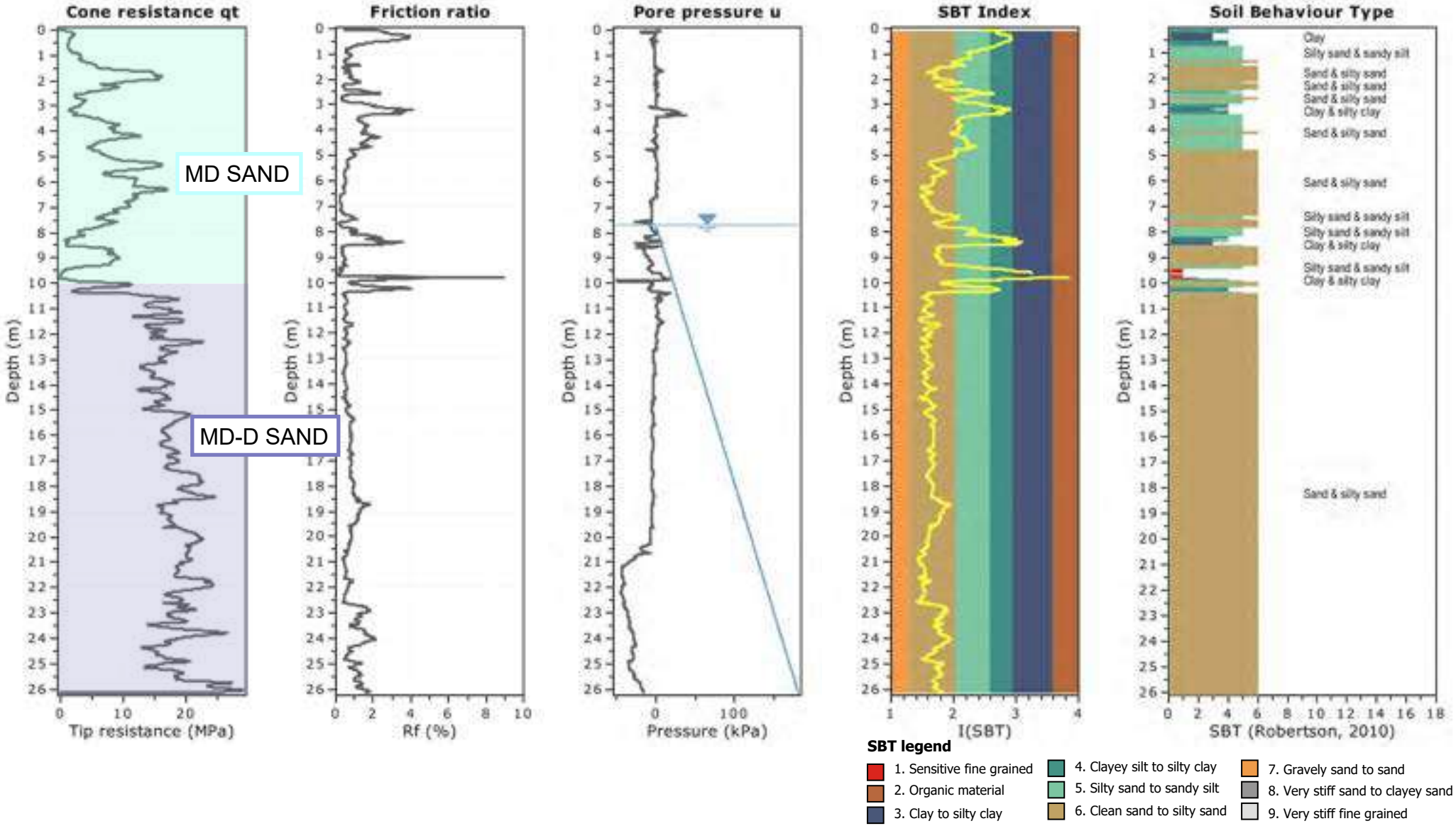


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT03 Non-hydrostatic
Total depth: 26.13 m, Date: 14/12/2023

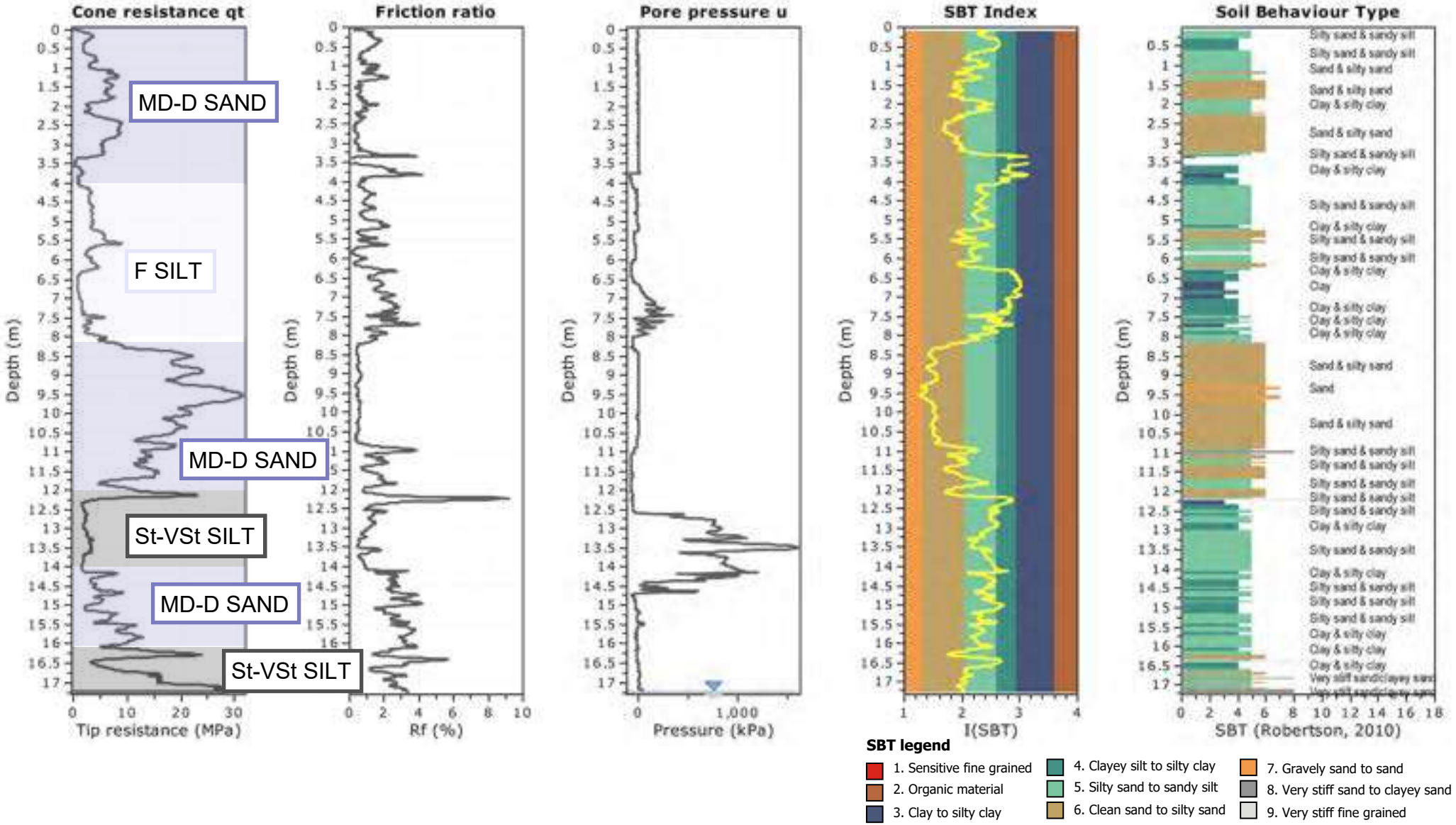


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT04
Total depth: 17.24 m, Date: 14/12/2023

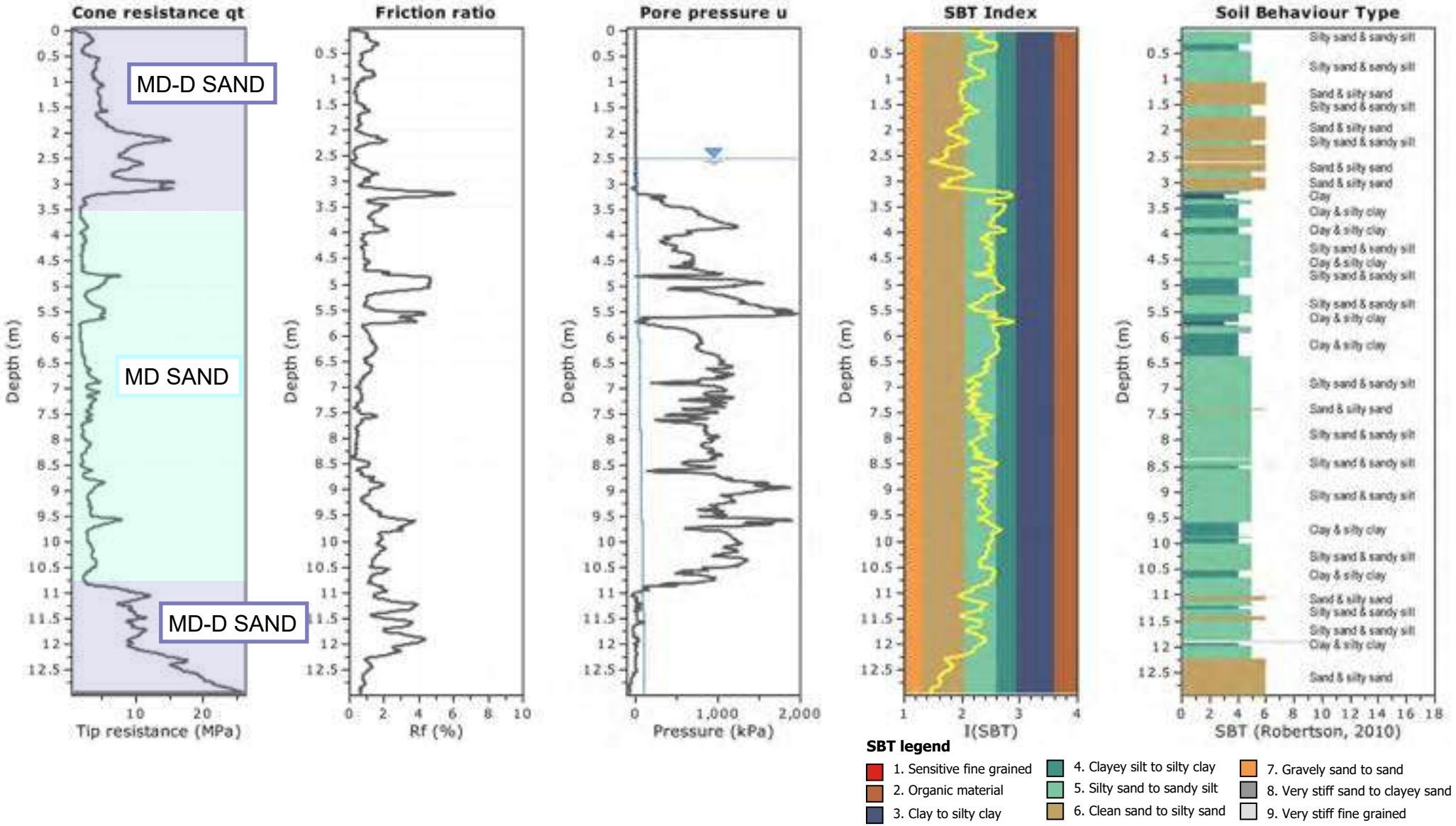


Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

CMW Geosciences
Level 1 Block c, 401 Grey St, Hamilton 3216
www.cmwgeosciences.com

Project: **HAM2021-0032 Wordsworth Street, Cambridge**
Location: **Cambridge**

CPT: SCPT05 Non-Hydrostatic
Total depth: 12.94 m, Date: 14/12/2023



Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025

24 April 2024 Document Ref: HAM2021-0032AG Rev 0

Cogswell Surveys
5 Milicich Place
Cambridge 3434

Attention: Rebecca Steenstra & Pete McLachlan

RE: PLAN CHANGE RFI RESPONSE LETTER

WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE

1 INTRODUCTION

The purpose of this letter report is to address the comments raised within the Memorandum (ref. 4281447-311025474-89) issued by Beca on the 7th February 2024 in regard to the Proposed Private Plan Change (PPC), WDC ref. PC/0003/23 for the proposed development at Wordsworth St, Cambridge.

2 MEMORANDUM RESPONSES

Table 1 below sets out the details of our response on the Beca review of the CMW RFI response, and lays out the additional information/response by CMW to the Beca review.

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Version: 1, Version Date: 17/12/2025

Table 1: RFI/Review Comments from WDC/Beca with CMW Response				
Item	**Query Type**	**WDC Request for Further Information**	**Beca Review of CMW Response**	**CMW Response to Beca Review**
1	Groundwater	*Two groundwater level monitoring rounds in July 2021 does not provide information on long term groundwater variations and may not be representative of peak design levels or transient groundwater conditions.* *Has groundwater monitoring been undertaken since July 2021, has this data been considered, and what provision has been made for longer term baseline monitoring?*	*The additional 21 November 2023 groundwater monitoring round data provided indicates up to 1m higher in shallow GWT up to 1-2.5m higher in deeper GWT. Note CMW state that this has been considered by liquefaction and slope stability assessment.* *Recommend that minimum of one full year of baseline monitoring is completed / required to confirm the peak design levels are appropriate.*	Additional groundwater monitoring for the period March 2024 to March 2025 is to be completed by CMW. Continuous groundwater level monitors to be installed at each deep monitoring station at exploratory locations MH01 to MH04 (as per CMW Drawing 01, ref HAM2021-0032AC Rev 1). Periodic readings to be taken at shallow and mid-depth monitoring stations MH01 to MH04. Following monitoring over the 1-year period, CMW will reassess the peak design groundwater levels over the site, and re-run geotechnical analyses as applicable.
2	Groundwater and Soakage	*Have potentially higher and / or perched groundwater tables as identified in the geotechnical report been considered in concept development of the swales and centralised soakage systems?* *Please provide further detail, including any sensitivity assessment undertaken.*	*In principle no concerns, however refer monitoring recommendation in Item 1.*	No comment and as Item 1.
3	Groundwater and Soakage	*Have potentially higher and / or perched groundwater tables as detailed in the geotechnical report been considered as part of the assessment of suitability of on lot soakage?* *Please provide details of your sensitivity assessment.*	*In principle no concerns, however refer monitoring recommendation in Item 1.*	No comment and as Item 1.
4	Geology and Soakage	*Surface water swales (Catchment 5 and Catchment 6) and onsite soakage (Catchment 5) are proposed on the stormwater management plan. Parts of these catchments are mapped as underlain by Taupo Pumice Alluvium, which is stated to be susceptible to piping erosion, and where adjacent Waikato river-bank slopes have evidence of slope instability.* *Please provide further detail on assessment of suitability of stormwater swales and onsite soakage on areas underlain by pumiceous soils.*	*Agree with no onsite soakage and the rain gardens being fully sealed. Recommend condition no soakage or surface water discharges into areas underlain by Taupo Pumice Alluvium.* *Riverbank slope stability assuming leakage through the swale and / or basins must be assessed.*	See updated slope stability analysis attached in ***Appendix A***. Leaking stormwater pond modelled using a range of Ru values (0.05 to 0.15) to simulate increased porewater pressure from assumed leaking basins. Basins are designed to soak/discharge stormwater during rainfall events, and then remain dry once the stormwater volumes have been disposed of. The modelling indicates a marginal slope stability in the area of the stormwater basin 5. We recommend that this is slope instability mechanism is further investigated during detailed design phase, and a groundwater drawdown analysis is performed following model refinement from additional investigation data.
5	Seismic Loading	*Provide updated seismic liquefaction and slope assessments that adopt either current seismic loading for new development or from a site-specific hazard assessment (SSHA).*	*Noted that slope and liquefaction assessment updated for current seismic loading. Review comment closed.*	No comment.
6	Liquefaction Ageing Factor	*Provide further details of your assessment of the aging factor using MEVR in accordance with current guidance. This is fundamental to support the use of an aging factor for liquefaction assessment.*	*K_{DR} values from Saftner et. al. 2015 have been adopted ranging from 1.25-1.5 in the Hinuera Formation soils.* *MBIE Module 3 states that direct use of generic empirical relationships (to increase the liquefaction resistance due to ageing) without scrutiny is inappropriate and could overestimate liquefaction strength of the soils. MBIE Module 3 recommends that MEVR analysis is used to support adoption of aging factor (Adrus et al, 2009 & Saftner et al 2015).* *Please provide the raw Vs data and MEVR plots to support the aging factors that have been adopted.*	K_{DR} was determined using MEVR analysis following both the Andrus (2009) & Robertson (2015) methods, which was then aggregated into groups based on the geology at each of the measurement depths for all sCPTs. This relationship between geology and a representative K_{DR} was then tested for statistical significance, and a probability plot showing the fit of K_{DR} for each geological unit was produced. A representative K_{DR} was then assigned to each of the geological units and applied to non-seismic CPT traces for the liquefaction analyses. Please refer to attached raw Vs data and MEVR plots in ***Appendix B***.
7	Groundwater and Liquefaction	*Have the liquefaction and liquefaction effects assessments considered sensitivity to potentially higher and / or perched groundwater tables?* *Provide details of your sensitivity assessment.*	*Refer monitoring recommendation in Item 1. More detailed liquefaction assessment is required for resource consent.* *We also note that the liquefaction assessment results have been provided for "full depth analysis," which are not depth limited and "index value" that is limited to upper 10m. Please clarify why greater liquefaction settlement is predicted for a number of the CPT's when depth of liquefactions is limited in the analysis e.g., CPT03 full depth analysis settlement = 30mm and index value analysis = 60mm?*	Once further groundwater data has been gathered, the liquefaction analysis may be revised with updated data as per Item 1. Greater liquefaction settlement for several CPTs under index conditions is the result of the absence of an ev weighting factor on the index analyses.
8	Liquefaction	*Liquefaction risk is stated to have been defined in accordance with MBIE Module 3.*	*Noted that low to very low vulnerability assessed based on Module 3, but this assessment appears to rely on the aging effects.* *Refer to Item 6.*	Refer to Item 6.

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Table 1: RFI/Review Comments from WDC/Beca with CMW Response				
Item	**Query Type**	**WDC Request for Further Information**	**Beca Review of CMW Response**	**CMW Response to Beca Review**
		Please also confirm liquefaction risk in terms of definitions provided in MBIE / EQC (2017) Planning and Engineering Guidance for Potentially Liquefaction-prone Land, which is applicable to plan change.		
9	Slope Stability	*There are only a limited number of geotechnical and groundwater investigation data points.* *Has sensitivity to topographic variability, geological variability, geotechnical parameters, and higher or transient perched groundwater conditions been considered in areas where there is sloping ground and development offsets from crest of slopes are proposed?* *Provide details of your sensitivity assessment.*	*The way the data has been presented does not allow us to understand the distribution of Factor of Safety (FoS) and no back analysis has been provided.* *If the FoS 1.2 failure occurred, then what are the implications for plan change development?*	Please see attached back analysis plot for reference in ***Appendix C***. Further detail and discussion of the back analysis can be found in the CMW geotechnical investigation report ref. HAM2021-0032AC Rev 1 Section 6.5. This includes how parameters have been determined for each soil unit. Stability analysis plots present all slope failure surfaces under the required FoS for the design case, with the most severe slip surface identified with the calculated FoS. If a failure occurred under elevated groundwater conditions, slips within the slope setback areas would be expected to occur, regressing the existing slopes towards development areas. This could lead to damage to any infrastructure located within the slope setback area, and would require reassessment to determine an appropriate setback from the regressed slope.
10	Slope Stability	*The report states that the lower and middle terrace slopes have similar slope profile and geology to that of the gully slope so not assessed in detail. However, the site plan reports evidence of groundwater seepage and instability on this slope.* *Provide specific assessment of these slopes to support the recommendation that a 5m development setback from the crest is appropriate.*	*Noted that additional analyses have been provided.* *The position of the crest is unclear so the 5m proposed setback may or may not be sufficient. We note that effects of failure of the lower portion on the upper part of the slope have not been considered (Refer Item 9).* *Notwithstanding comments against Item 9 it could be helpful to establish the development set back on plans.*	Refer to attached site plan indicating setback location on site in ***Appendix D***. Further detail and discussion of the back analysis can be found in the CMW geotechnical investigation report ref. HAM2021-0032AC Rev 1 Section 7.2. Updated slope stability modelling will be required following any failure/regression of the existing slope on site.
11	Slope Stability	*The stormwater management plan indicates onsite soakage and conveyance swales, and rain gardens will be adopted adjacent to the crest of the terrace slopes, gully areas and as close as the proposed development 20m setback from the Waikato River.* *Have the potential effects from concentrated surface or groundwater discharges from the proposed stormwater management systems been considered in the slope stability analyses and how have the potential effects been considered as part of proposed land use?* *Provide further detail of your assessment.*	*Refer to Item 4.*	Refer to Item 4.
12	Earthworks	*The stormwater system includes stormwater detention basins and conveyance swales.* *Confirm if any of these proposed structures might result in damming of water and / or potentially be classified as dams under the current regulations.*	*Review comment closed.*	No comment.

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For and on behalf of CMW Geosciences

Prepared by:

Ben McKay

Project Geotechnical Engineer

MEngNZ

Reviewed and authorised by:

Bryn Jones

Principal Geotechnical Engineer

MEngNZ, BSc, MSc

Distribution: 1 electronic copy to Cogswell Surveys Ltd via email
Original held at CMW Geosciences

Attachments: Appendix A – Leaking Stormwater Swale Stability Plots

Appendix B – Vs & MEVR Raw Data

Appendix C – Slope Stability Back-Analysis Plot

Appendix D – Geotechnical Site Plan

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APPENDIX A: LEAKING STORM-WATER SWALE STABILITY PLOTS

Document Set ID: 11598798
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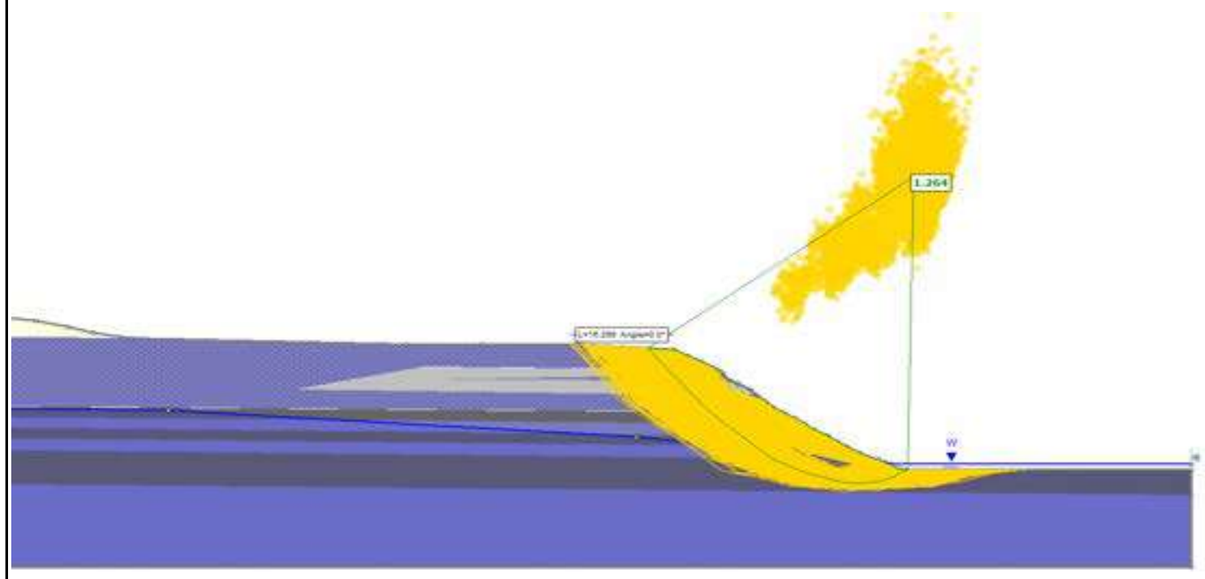
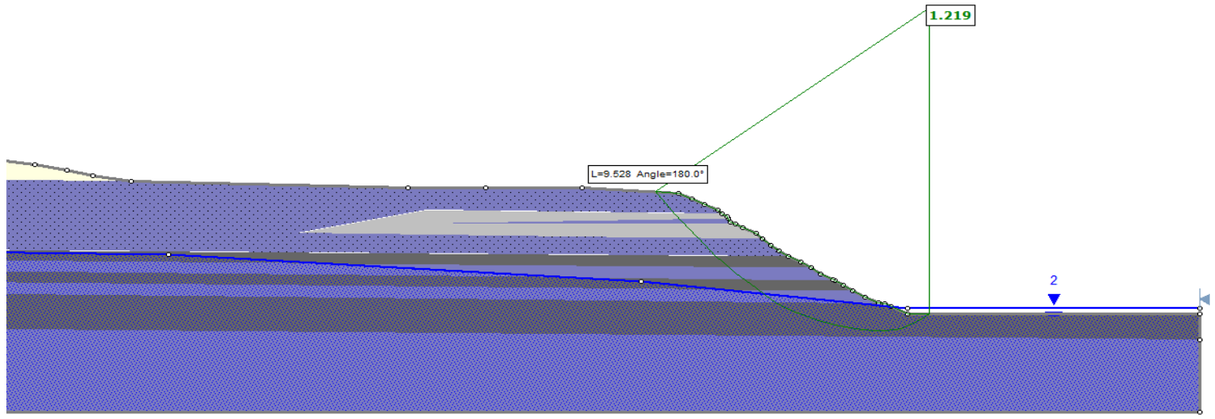
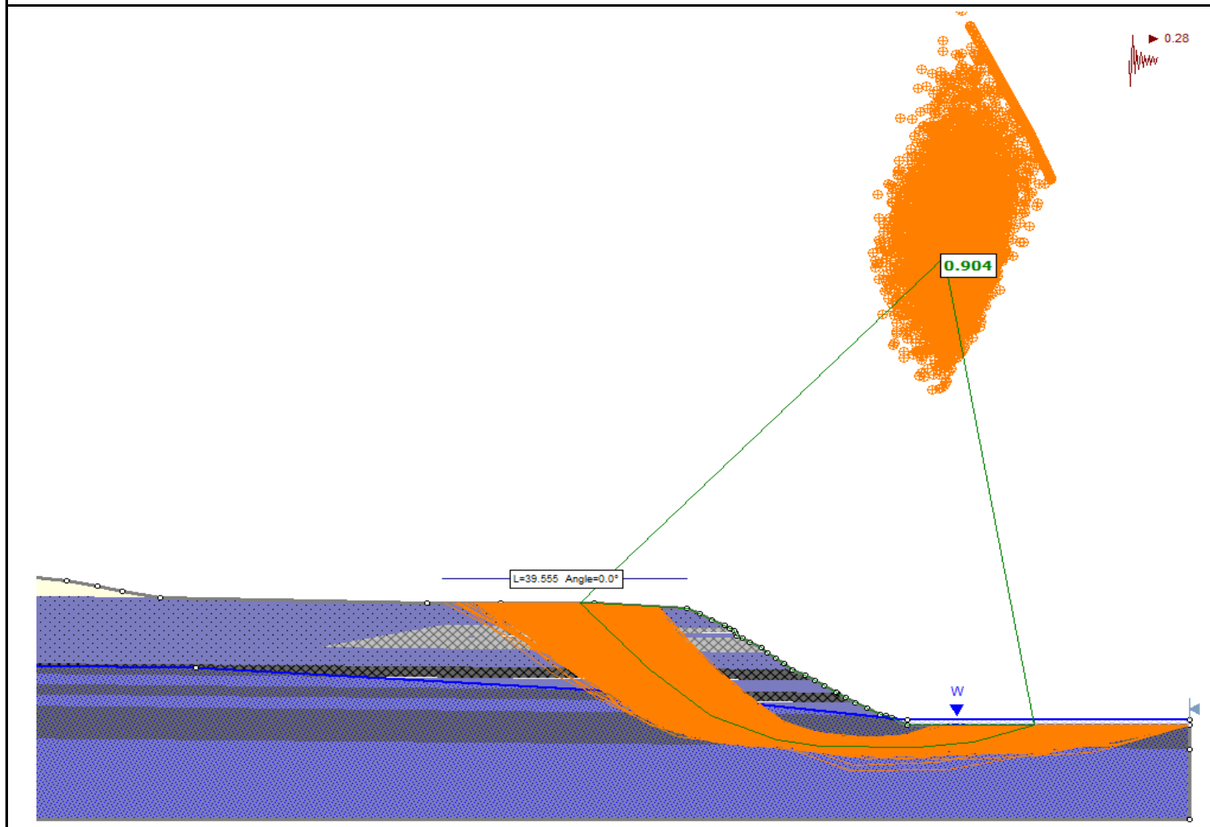


SAND Ru 0.05 - Normal Groundwater Conditions



SAND Ru 0.05 - Worst Credible Groundwater Conditions



SAND Ru 0.05 - Seismic Event

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.05
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

CMW Geosciences
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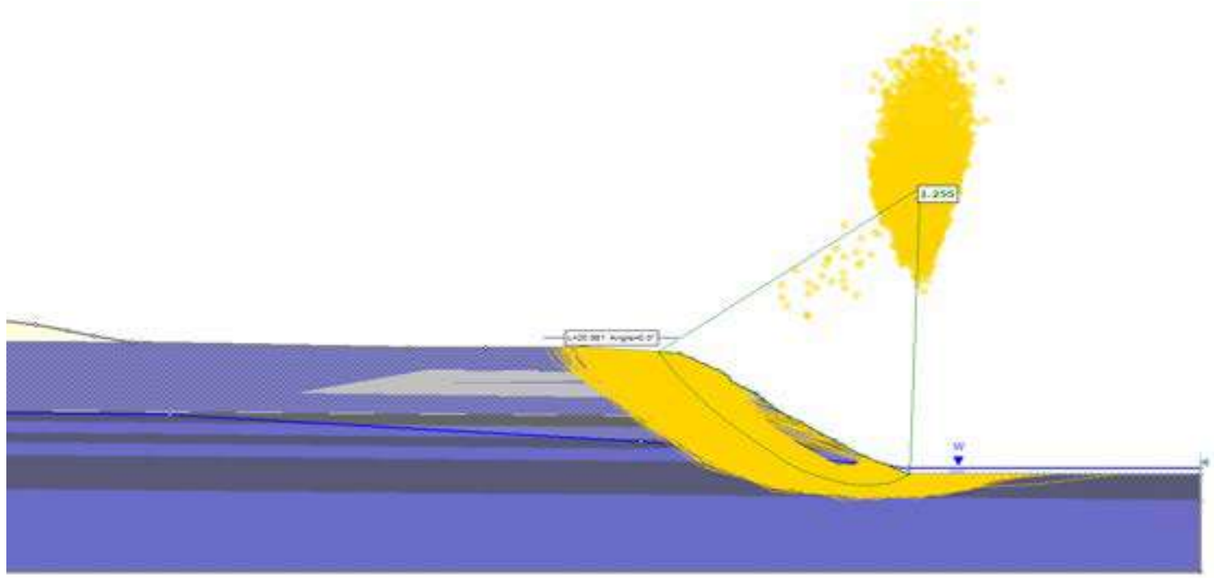
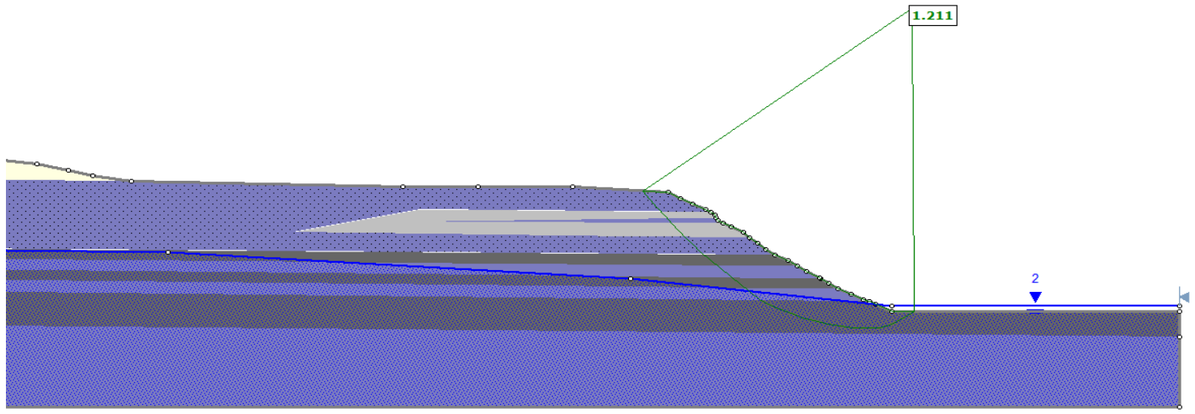
Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 01

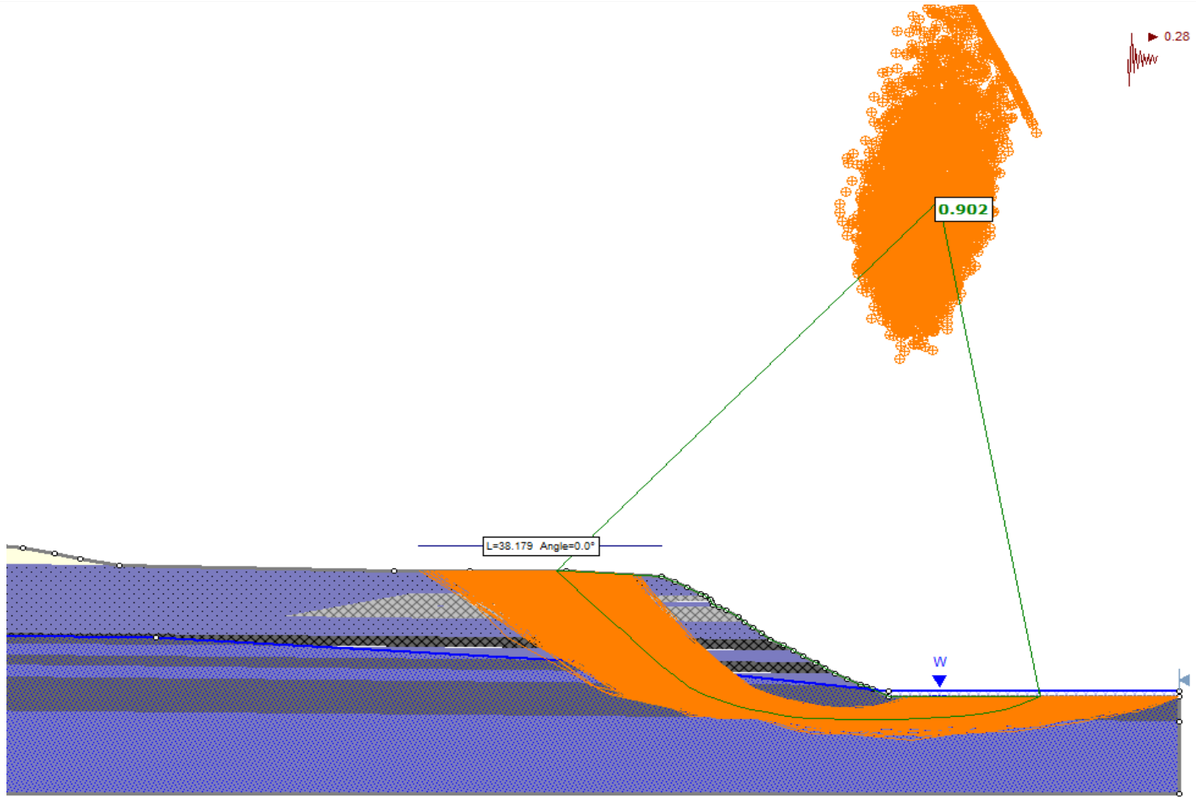
Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



SAND Ru 0.1 - Normal Groundwater Conditions



SAND Ru 0.1 - Worst Credible Groundwater Conditions



SAND Ru 0.1 - Seismic Event

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.1
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

CMW Geosciences
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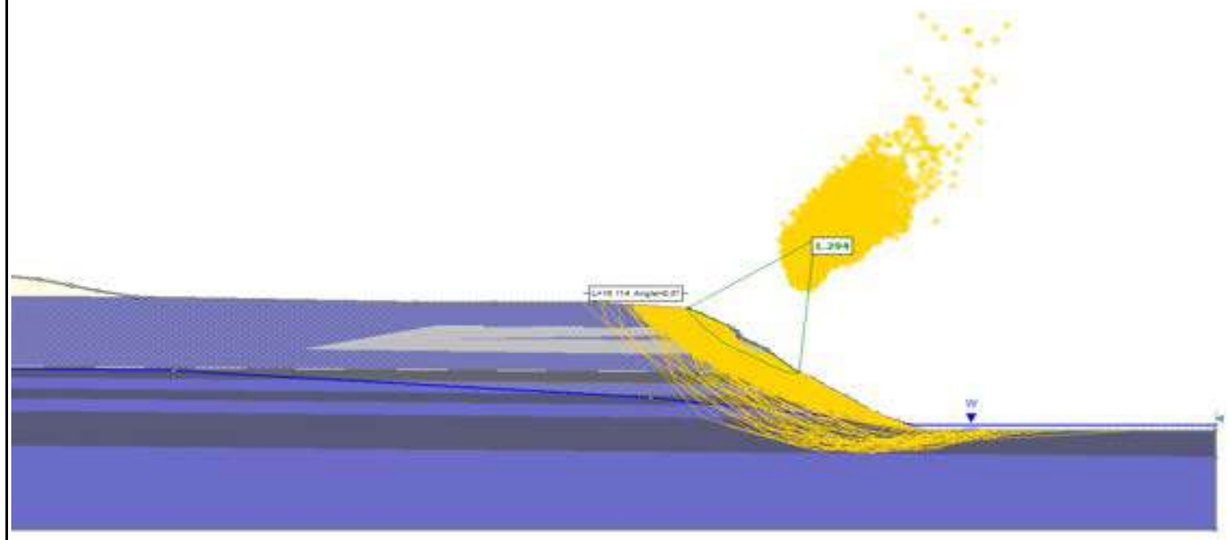
Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 02

Document Set ID: 11598798
Version: 1, Version Date: 17/12/2025



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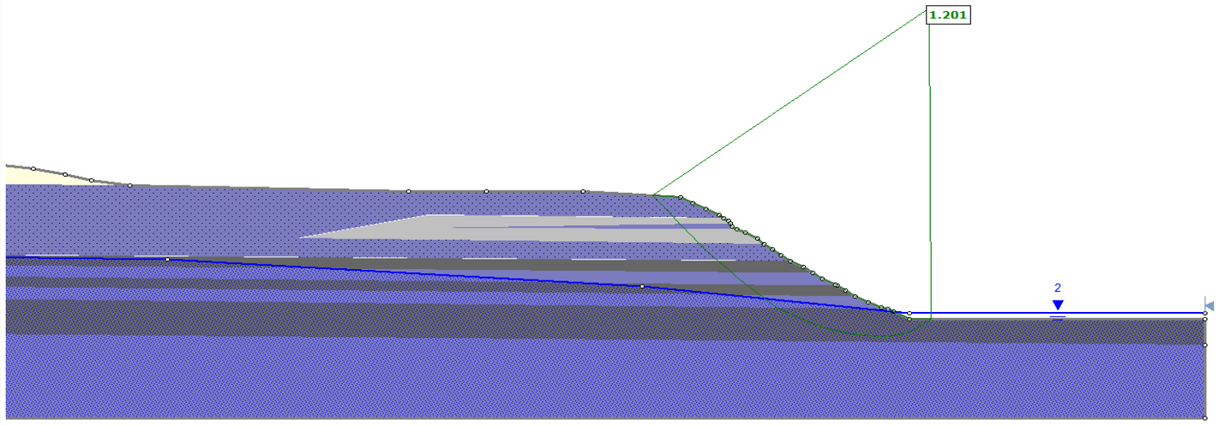
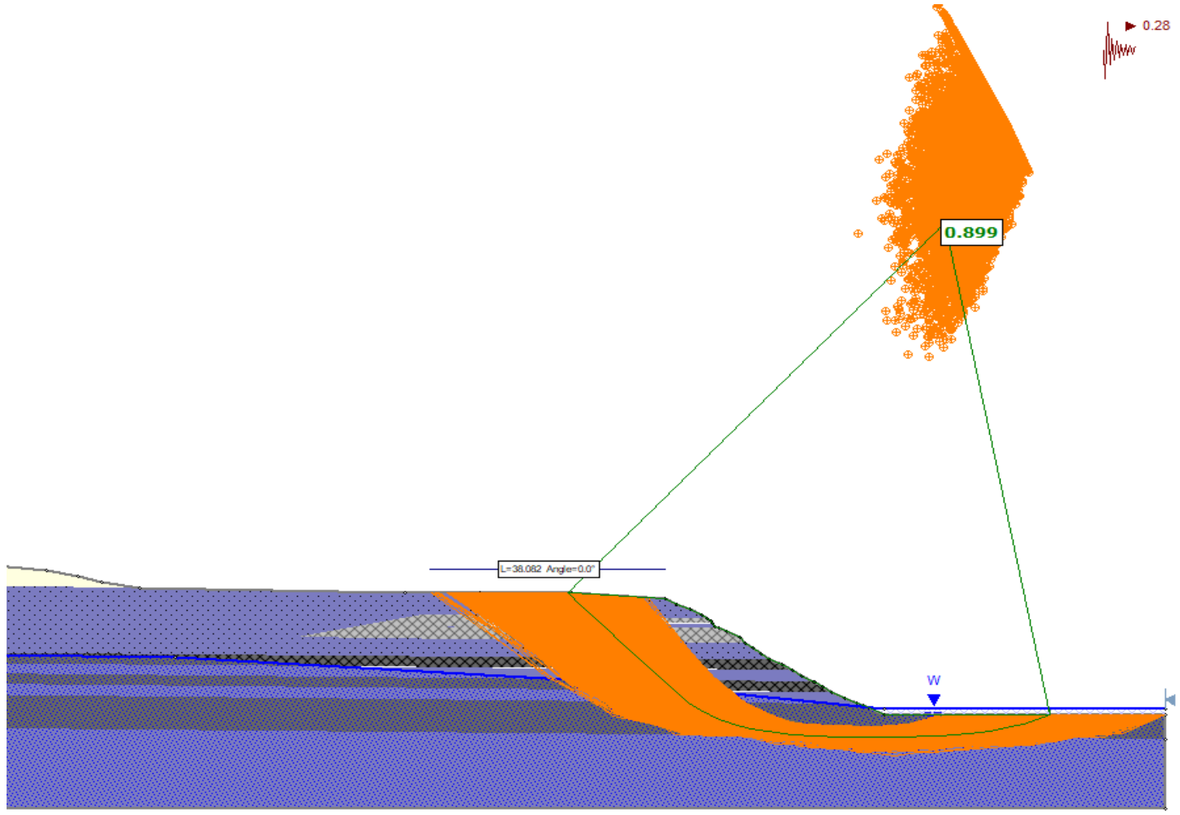


SAND Ru 0.15 - Worst Credible Groundwater Conditions



SAND Ru 0.15 - Seismic Event

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Water Surface	Hu Type	Hu	Ru Value
L-MD SAND (TPA)		16	Mohr-Coulomb	0	30		Water Table	Custom	1	
MD-D SAND (HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D GW SAND(HF)		16	Mohr-Coulomb	4	38		Water Table	Custom	1	
MD-D Ru SAND (HF)		16	Mohr-Coulomb	4	38		None			0.15
St UD SILT (HF)		16	Undrained	100		Constant	None			0
VSt SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW SILT (HF)		16	Mohr-Coulomb	10	28		Water Table	Custom	1	
VSt GW UD SILT (HF)		16	Undrained	120		Constant	Water Table	Custom	0	

Parameters

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Project Cambridge C5 - Wordsworth St Development	*Analysis* Cuckoo	*Project No.* HAM2021-0032
Title Basin 5 Section	*Date* 17/04/2024	*Drawing* STAB 03

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APPENDIX B: VS & MEVR RAW DATA

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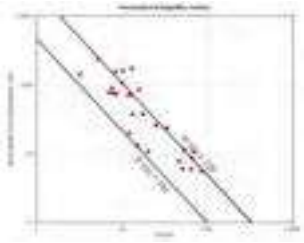
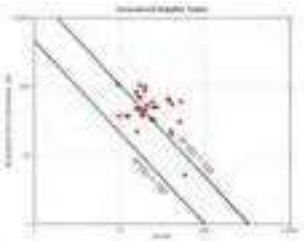
Depth (m)	Vs (m/s)									
	SCPT01 Meas	SCPT01 MVER	SCPT02 Meas	SCPT02 MVER	SCPT03 Meas	SCPT03 MVER	SCPT04 Meas	SCPT04 MVER	SCPT05 Meas	SCPT05 MVER
1.0	165	1.21	123	0.82	131	0.89	120	0.72	120	0.76
2.0	120	0.62	160	1.13	80	0.38	160	1.02	96	0.56
3.0	225	1.21	232	1.89	225	1.36	169	1.06	225	0.98
4.0	267	1.15	142	1.06	158	0.71	158	1.34	144	0.98
5.0	245	0.95	143	1.09	190	0.91	171	0.96	190	0.83
6.0	347	1.50	150	0.93	224	1.02	214	1.23	199	1.31
7.0	231	1.24	154	1.05	231	1.12	156	1.04	322	2.01
8.0	188	0.91	171	1.06	188	1.05	252	1.15	289	1.80
9.0	204	0.96	191	0.98	212	0.99	272	1.00	238	1.22
10.0	192	1.01	192	0.98	353	1.47	307	1.12	290	1.44
11.0	215	1.02	273	1.27	310	1.20	355	1.06	242	0.87
12.0	278	1.26	386	1.71	338	1.30	280	1.08	399	1.31
12.4	-		-		-		-		377	1.29
13.0	315	1.37	355	1.42	305	1.16	195	1.02	-	
14.0	269	0.97	245	1.02	327	1.20	343	1.89	-	
15.0	272	1.42	284	1.12	302	1.13	339	1.41	-	
16.0	255	1.27	314	1.26	320	1.07	379	1.14	-	
16.7	-		-		-		260	0.91	-	
17.0	210	1.24	271	1.11	342	1.10	-		-	
18.0	198	1.27	349	1.30	329	1.01	-		-	
19.0	297	1.49	337	1.18	364	1.09	-		-	
20.0	253	1.50	407	1.72	297	0.89	-		-	
21.0	233	1.34	287	1.03	330	1.09	-		-	
22.0	165	0.71	248	0.87	293	0.89	-		-	
23.0	165	0.67	196	0.79	276	0.77	-		-	
24.0	166	0.72	195	0.75	301	0.76	-		-	
25.0	293	1.38	181	0.70	244	0.69	-		-	
25.6	-		-		304	0.87	-		-	
26.0	288	1.23	189	0.78	-		-		-	
27.0	283	1.18	192	1.15	-		-		-	
27.6	283	1.06	-		-		-		-	
28.0	-		309	0.91	-		-		-	
29.0	-		359	1.21	-		-		-	
30.0	-		340	1.70	-		-		-	

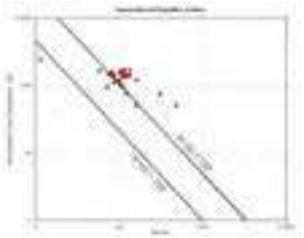
SCPT01



SCPT02



SCPT03



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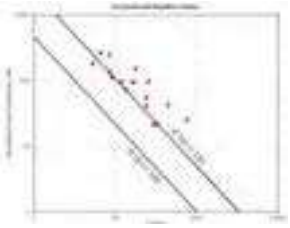
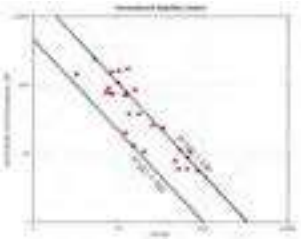


SCPT05



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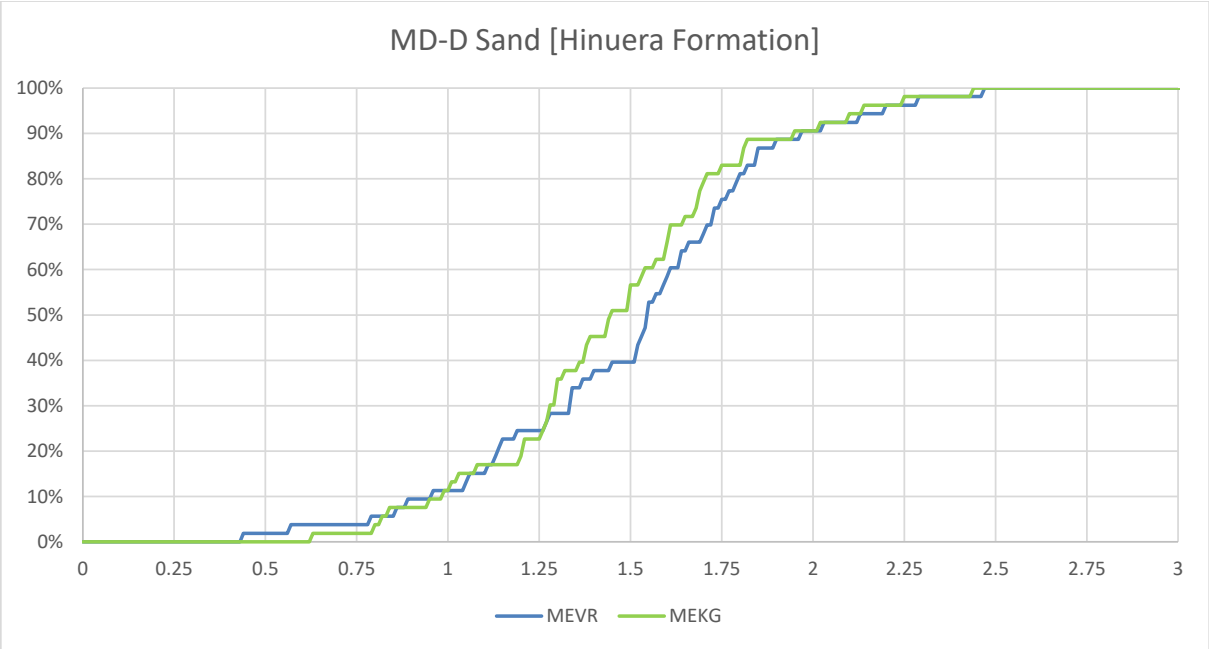

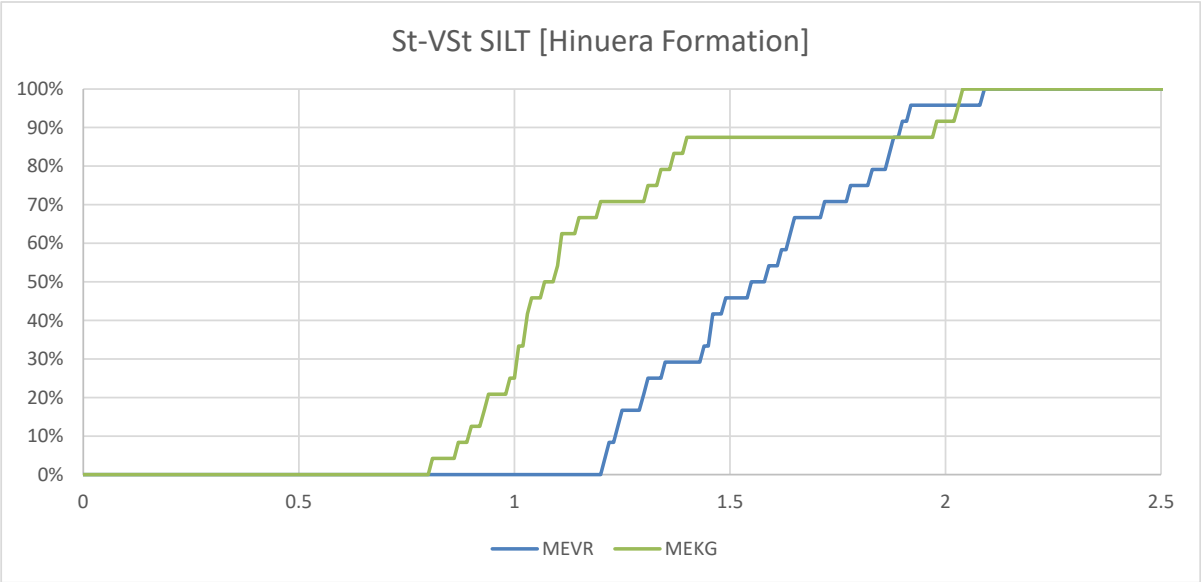

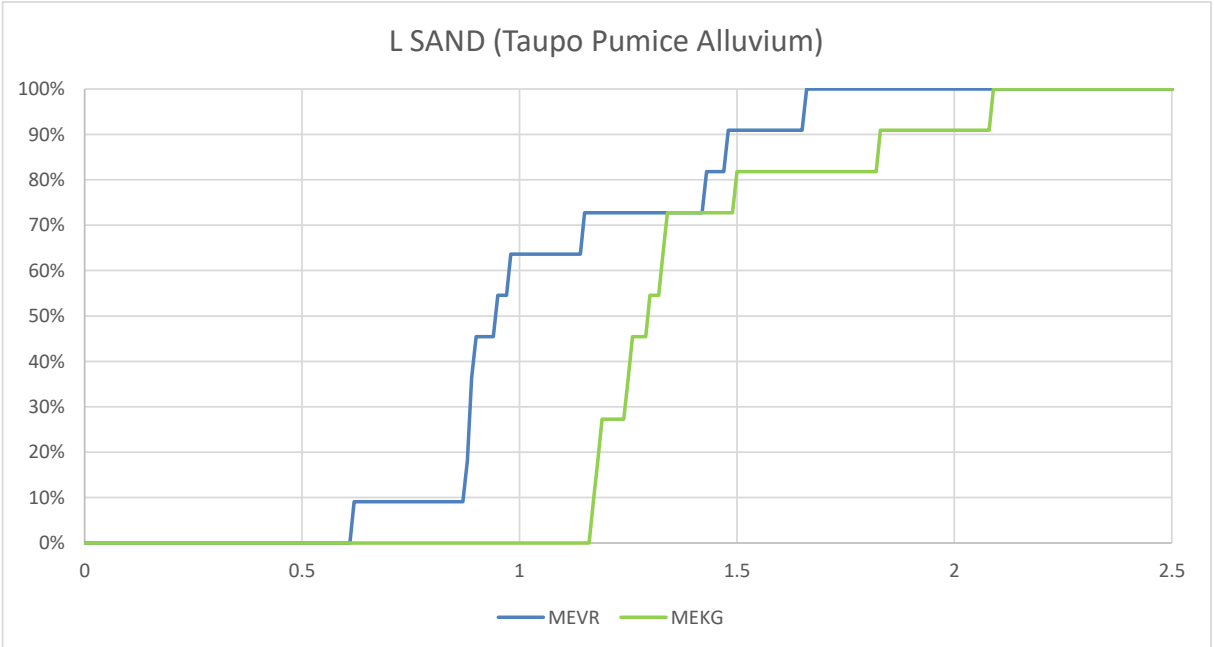

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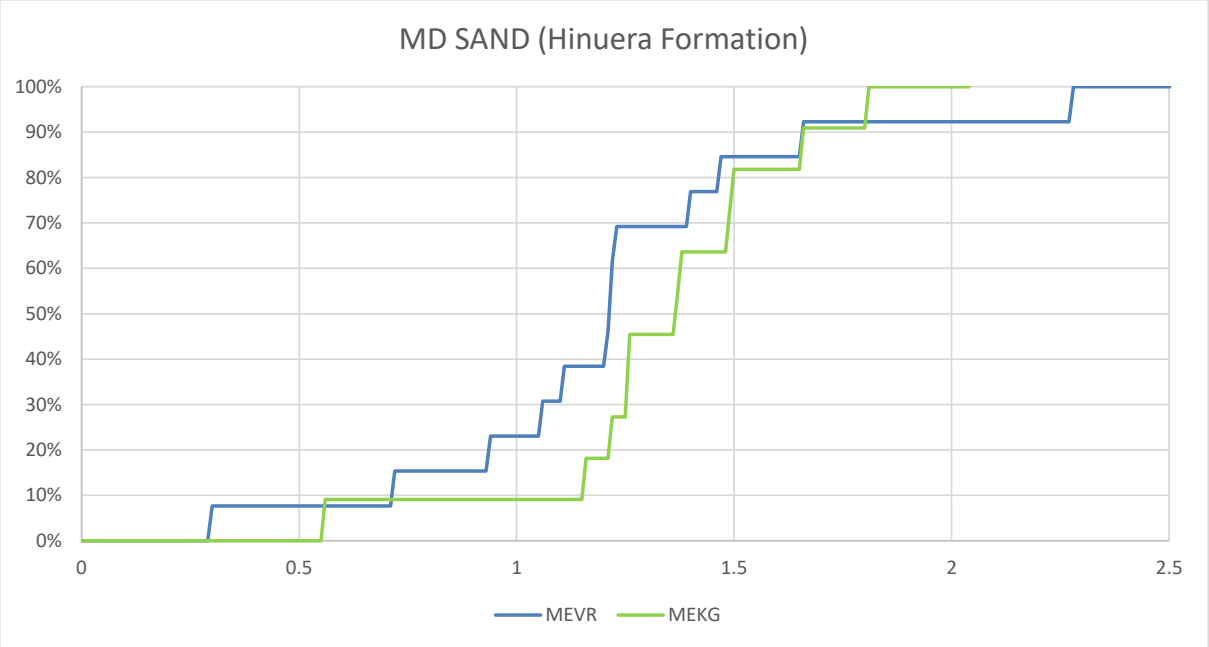

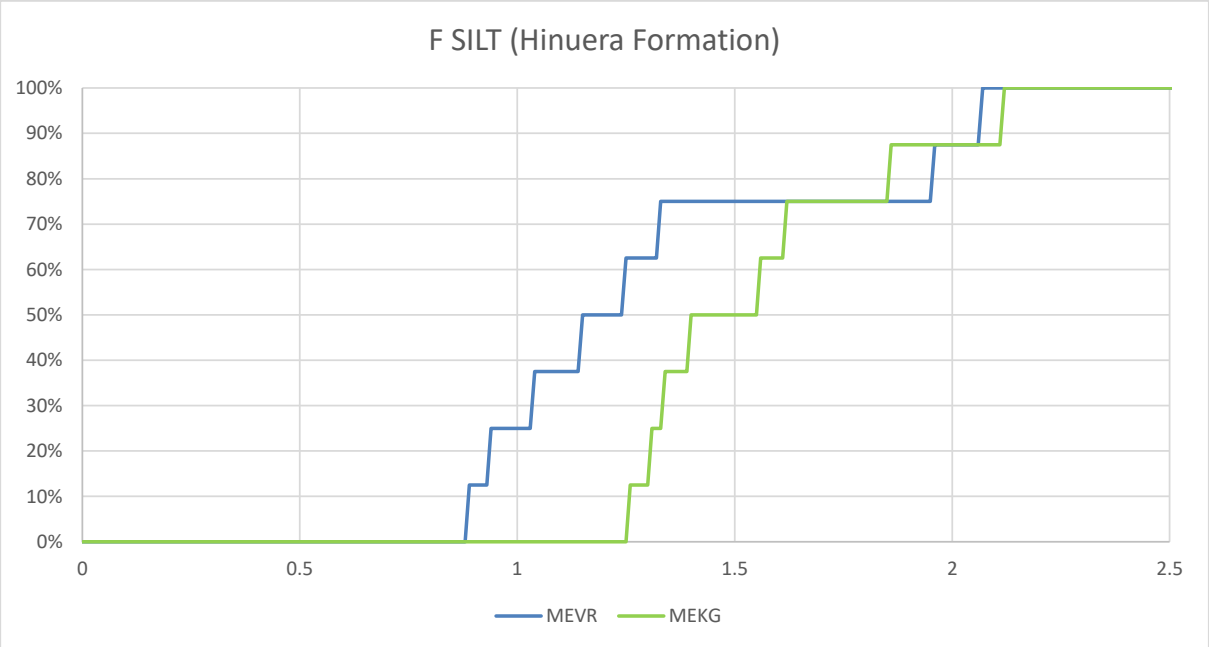

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APPENDIX C: SLOPE STABILITY BACK ANALYSIS PLOT

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River Section

Back Calculation – target FoS =1

Upper Slope

The L-MD sand (TPA) present on the upper slope was isolated and parameters back calculated until a FoS 1.0 was achieved. Based on our experience with these soils a phi of 30° was adopted. Transient elevated groundwater levels/porewater pressures were adopted for the back calculation.

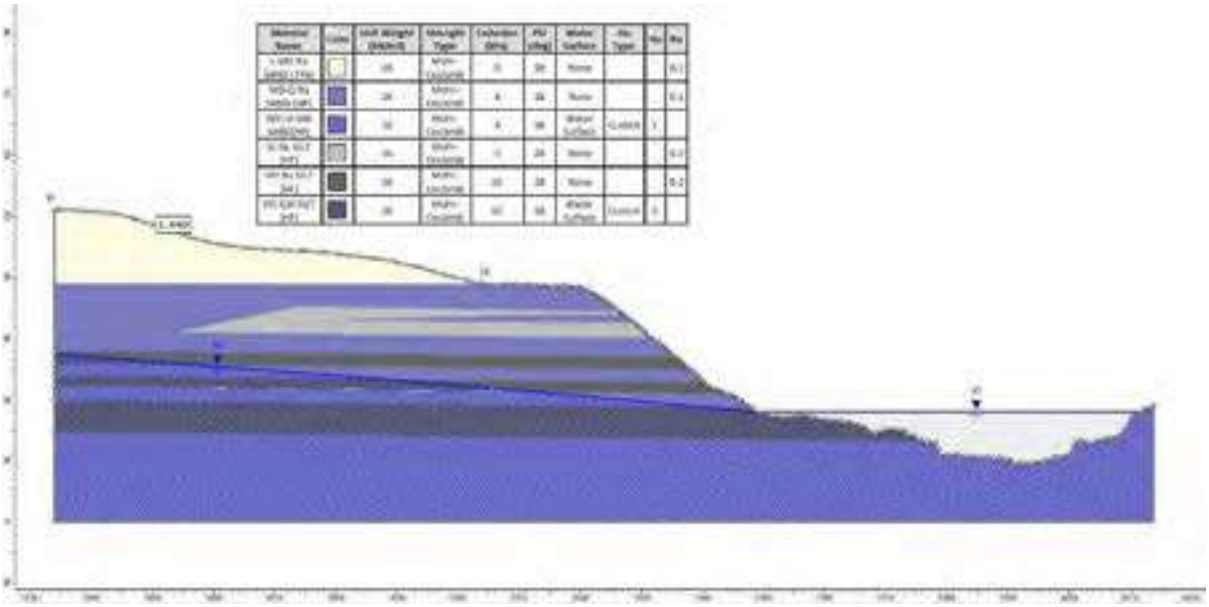

Figure 1 Upper Slope FoS Back Analysis for River Section

APPENDIX D: GEOTECHNICAL SITE PLAN

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LEGEND:

- HA01 — HAND AUGER (HA) LOCATION
- HAS01 — HAND AUGER + SOAKAGE (HAS) LOCATION
- TP01 — TEST PIT (TP) LOCATION
- CPT01 — CONE PENETROMETER TEST (CPT) LOCATION
- SCPT01 — SEISMIC CONE PENETROMETER TEST (SCPT) LOCATION
- MH01 — MACHINE BOREHOLE (MH) LOCATION
- BRL — BUILDING RESTRICTION LINE
- SITE BOUNDARY
- TB15 — WRC RIVER BATHYMETRY CROSS SECTION LOCATION

NOTES:

1. AERIAL IMAGE AND EXISTING CONTOURS PROVIDED BY COGSWELL SURVEYRORS 28/05/21.
2. CONTOURS ARE AT 1.0m INTERVALS WITH RESPECT TO MOTURIKI DATUM.
3. TEST LOCATIONS PROVIDED BY COGSWELL SURVEYORS.
4. CPT04 AND HAS05 TEST LOCATIONS SURVEYED USING HAND HELD GPS.

1:6000 0 60 120 180 240 300 m

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CLIENT: POWERUP BUSINESS CONSULTING LTD		DRAWN: HV	PROJECT No: HAM2021-0032
PROJECT: WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE		CHECKED: JW	DRAWING: 01
		REVISION: 0	SCALE: 1:6000
TITLE: SITE INVESTIGATION PLAN		DATE: 01/09/2021	SHEET: A3

P:\HAM2021\HAM2021-0032 WORDSWORTH STREET DEVELOPMENT, CAMBRIDGE\DRAWINGS\HAM2021-0032 SI PLAN.DWG

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