



Geotechnical Assessment Plan Change

65 and 73 Ratanui Road, Paraparaumu



 **RILEY**

Geotechnical Assessment – Plan Change 65 and 73 Ratanui Road, Paraparaumu

Report prepared for: Welhom Developments Ltd

Report prepared by: Kyle Cole, Geotechnical Engineer



.....

Report reviewed by: Chris Gilbert, Principal Geotechnical Engineer



.....

Report approved for issue by: Brett Black, Project Director, CPEng



.....

Report reference: 220306-C

Date: 29 November 2024

Copies to: Welhom Developments Ltd Electronic copy
Riley Consultants Ltd Electronic copy

Issue	Details	Date
1.0	Geotechnical Assessment	29 November 2024

Contents

Executive Summary.....	1
1.0 Introduction.....	2
2.0 Site Description and Proposed Development.....	2
3.0 Geotechnical Assessment.....	2
3.1 Desktop Review.....	2
3.1.1 Geology.....	3
3.2 Site Investigation.....	3
3.2.1 Site Walkover.....	4
3.2.2 Subsurface Conditions.....	6
3.3 Laboratory Testing.....	7
3.4 Geotechnical Considerations.....	7
3.4.1 Liquefaction.....	7
3.4.2 Liquefaction Induced Lateral Spread.....	8
3.4.3 Stability.....	8
4.0 Geotechnical Recommendations.....	9
4.1 Foundations.....	9
4.2 Earthworks.....	9
4.3 Roading.....	10
4.4 Services.....	10
5.0 Conclusions.....	10
6.0 Limitation.....	11

Appendices

Appendix A:	Machine Borehole Logs (MH01 to MH03)
Appendix B:	Scala Penetrometer Test Results (SC01 to SC15)
Appendix C:	Existing New Zealand Geotechnical Database Investigations
Appendix D:	Geotechnical Laboratory Results
Appendix E:	CPT Data (CPT01 to CPT22)
Appendix F:	CPT Interpretation (CPet-IT) Outputs
Appendix G:	Liquefaction (CLiq) Outputs
Appendix H:	Riley Drawing: 220306-10

Executive Summary

This geotechnical assessment report (to be read in its entirety) is intended to support a private plan change application to Kāpiti Coast District Council (KCDC) for the site situated at 65 and 73 Ratanui Road. Geotechnical site investigation was undertaken in 2023 and 2024 and included site walkovers, cone penetrometer test's, machine boreholes (with corresponding standard penetration testing), surficial Scala Penetrometer testing, discrete groundwater monitoring and laboratory testing.

Aeolian (windblown) sand deposits overlying alluvial material at depth with groundwater levels between 2.1m and 5m below ground level were encountered across the site. The surficial soils are relatively loose, and a reduced geotechnical ultimate bearing capacity of 200kPa is available (as sometimes adopted for residential developments). Earthworks would improve site gradients and improve founding conditions.

The site has been identified as having high liquefaction potential with predicted liquefaction induced settlements predominantly in accordance with TC2/TC3 (hybrid) or TC3 (as governed by lateral spread) levels of predicted ground damage. Building foundations should and can be designed to resist these corresponding levels of liquefaction induced settlement on the site. There is a risk of seismic induced lateral spread affecting the site if free faces are present within the future site development. Protection or mitigation measures would likely be required adjacent to property boundaries where a minimum setback cannot be achieved to avoid increasing the risk of lateral spread hazards and/or effects to neighbouring properties. It is noted that the liquefaction induced settlement and lateral spreading findings are likely to be similar to that of other sites in Paraparaumu given the sandy material, relatively high groundwater table and region's seismic hazard parameters, therefore a development of a similar nature would likely have similar geotechnical considerations.

From a geotechnical perspective provided the recommendations within the report are followed, the site is suitable for residential development consistent with the proposed rezoning to General Residential Zone.

Geotechnical Assessment – Plan Change 65 and 73 Ratanui Road, Paraparaumu

1.0 Introduction

This report has been prepared by Riley Consultants Ltd (Riley) at the request of Welhom Developments Ltd for the proposed plan change at the site situated at 65 and 73 Ratanui Road. It presents geotechnical findings from our desktop studies and site investigation, together with geotechnical considerations and recommendations for managing potential geotechnical matters associated with future residential development of the site. This report is intended to support a private plan change application to Kāpiti Coast District Council (KCDC).

2.0 Site Description and Proposed Development

The site consists of two lots (Lot 4 DP 58017 (No. 65) – to be subdivided and Lot 3 DP 497389 (No. 73)) to the north of Paraparaumu in Kāpiti Coast. The site is surrounded by residential and semi-rural properties (predominately open pasture) while also being bounded to the south by Ratanui Road for the portion of No. 73 with road frontage.

The term 'site' herein refers to No. 73 Ratanui Road and the rear portion of No. 65 (north of the existing dwelling situated on that lot) subject to the proposed plan change. The site excludes the southern relatively narrow portion of No. 65 containing the dwelling and farm sheds with the northern portions of No. 65 intended to be subdivided into a separate lot to then become part of the site. The site is displayed in the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10).

The site is generally undulating consisting of a dwelling, sheds and farm paddocks. There is a stormwater channel dissecting the site (east-west) and several ponds scattered across the site with two relatively larger ponds within No. 73. Refer to the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10).

It is proposed to change the zoning of the site from the current Rural Lifestyle zoning to General Residential Zone to provide for future residential development on the site, including potential for a retirement village. The intention of the assessment is to outline site-specific geotechnical hazards and how these can be adequately mitigated for the proposed rezoning.

3.0 Geotechnical Assessment

3.1 Desktop Review

Previous investigation and a preliminary review of the KCDC maps, geological maps, and New Zealand Geotechnical Database (NZGD) indicate the following:

- The site appears to predominantly be used as pasture and contains a dwelling and sheds within in the north-western corner of No. 73 and central-southern portion of No. 65.

- The KCDC contour map (contours are presented on the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10)) indicates the site is undulating with a scatter of moderate to very steep mounds present. There are more mounds within No. 65 with the steepest mounds on-site located adjacent to the northern boundary with an approximate maximum height of 9m and a slope angle of approximately 35° degrees.
- The NZGD display existing investigations that have been conducted by external consultants (including a machine borehole (NZTA) within 5m from the southern boundary of No. 73 and test pits (CGW) and Scala penetrometer tests (CGW) within the southern portion of No. 73). The investigation data is presented in Appendix C and the existing investigation locations are displayed on the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10). The investigations indicate the material is typically a medium dense fine sand with minor silt beneath the topsoil layer. Based on the previous investigation and available test information on the NZGD, the groundwater appears to be between 2m and 5m depth below ground level (bgl).
- The KCDC three waters maps indicate there is an existing small stormwater channel dissecting the site between the existing dwelling and farm sheds at No. 65.
- From a review of historic aerial imagery, it appears that there could be non-engineered fill (likely material sourced from excavation elsewhere on-site) used to alter localised areas of ponding. It is also evident that several trees have recently been felled within No. 73.

3.1.1 Geology

According to the GNS Science (1:250k scale) Geological Map the site is likely to be underlain by Holocene windblown sand dune deposits. Holocene windblown deposits are typically known to be sands of variable density. Given the site's location in proximity to the Waikanae River the site is potentially underlain by alluvium as well (noting other sites in the Paraparaumu area also tend to have deep deposits of alluvial origin gravels).

3.2 Site Investigation

Site walkover and subsurface investigations were conducted in February 2023 and May 2024.

The combined investigations consisted of:

- Three machine boreholes (MH01 and MH02 in 2023 and MH03 in 2024) with standard penetration testing (SPT) conducted at 1.5m intervals drilled approximately to target depth, 26.35m (MH01), 24.70m (MH02) and 15.65m (MH03).
- Twenty-three cone penetrometer tests (CPT) (CPT01 to CPT07 in 2023 and CPT08 to CPT22 and CPT12A in 2024) conducted to target depth or refused prior to target depth (between 12.96m and 20.75m).
- Fifteen Scala Penetrometer (Scala) tests undertaken to a maximum depth of 950mm below ground level.
- Seven shallow soil samples (S1 to S5 in 2023 and S6 and S7 in 2024) were gathered beneath the topsoil for the purpose of geotechnical laboratory testing.

The machine boreholes and CPT's were undertaken by Pro-Drill acting under Riley direction while geotechnical laboratory testing was undertaken by Geotechnics. Additionally, Riley and Leith Consulting undertook shallow hand-augers for environmental sampling and soakage testing (reported separately), respectively. The geotechnical test locations, soil samples and key site features are shown on the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10) with machine borehole logs and test results displayed within Appendix A to Appendix E.

3.2.1 Site Walkover

The site is typically accessed via a gravel driveway off Ratanui Road which leads to two farm tracks beyond the dwellings at No. 65 and No. 73, respectively. The paddocks were noted to be undulating with existing localised ponding visible in lowlands across the site and as noted in the attached site plan. During the recent site visit in May 2024, the largest pond on-site (Photo 1) in the southern portion of No. 73 and the pond within the north-western corner of No. 81 were the only significant areas ponding water. As seen in Photo 1, there is an existing steep batter (approximately 25°) forming the pond adjacent the western boundary of No. 81. The low-lying areas where ponding had dried out appeared to contain minor organic material.



Photo 1: Within southern portion of No. 73 looking NW at the largest pond present on-site, the steep batter to the boundary and existing dwelling at No. 81 in the background.

Leith Consulting's discussions with the homeowner at No. 73 indicated there could be iron sand and peat (which was historically used to alter an existing pond) within the south-western portion of the site. One of Leith Consulting's hand-augers also identified peat in this same area. Alteration of the pond is consistent with the desktop review of historic aerial imagery indicating some filling was undertaken in the south-western pond area. It is likely that the 'peat' identified is an entrapped organic layer (topsoil) from the infilled pond. A depression feature (Photo 2) was also noted west of the dwelling and sheds at No. 73 that did not appear to be natural. An indication of these areas has been added to the appended Riley Site Plan (Appendix H: Riley Dwg: 220306-10). Anecdotal evidence from the homeowner along with environmental sampling suggests that if these areas are containing non-engineered fill, it is likely to be sourced from natural cut material on-site.

No instability features were observed across the site although there were extensive rabbit burrows as seen in Photo 3, typically grouped across the paddocks of No. 65, it was noted the rabbit burrows were less prevalent in the recent walkover compared to in February 2023 and that the burrows extended further than 1m.



Photo 2: West of No. 73 dwelling looking NW at depression feature (appears unnatural).



Photo 3: Multiple rabbit burrows as typically seen on mounds across the site.

3.2.2 Subsurface Conditions

Subsurface conditions were generally consistent across the site and are summarised below. Detailed descriptions of the material encountered during machine hole drilling along with inferred material from CPT tests are presented within Appendix A, E and F:

- Topsoil was encountered in all testing across the site. Topsoil thickness is likely between 0.15m and 0.50m across the site as indicated in the machine boreholes, environmental sampling and available NZGD test results. There is typically less topsoil in elevated areas with less vegetation cover (as seen in Photo 3 above).
- Aeolian deposits were encountered beneath the topsoil and predominantly consisted of fine sand with varying quantities of silt and trace to minor rounded gravels and/or shells present at depths greater than 7.5m bgl. The material was typically loose to medium dense at shallower depths and became dense from between 4.5m bgl and 6.1m bgl. It became very dense from between 12.2m bgl and 15.2m bgl within MH01 and MH02, however, MH01 showed the density alternates between dense and very dense to the base of the machine hole.
- Gravel with varying quantities of sand and trace shells were present in lenses (i.e. shallow layers) beyond 23m. The gravels and sands were fine to coarse, the gravels and shells were subrounded to rounded indicating its alluvial origin.

The groundwater monitoring undertaken during the February 2023 and May 2024 investigations indicate the groundwater table to be approximately 2.1m to 5.0m bgl. Based on the groundwater monitoring it appeared there was no tidal influence. Extended groundwater monitoring of the existing piezometers can potentially be undertaken in the future (e.g. for Resource and/or Building Consent stages) to better understand the groundwater fluctuation (sensitivity to rainfall).

3.3 Laboratory Testing

Laboratory testing was undertaken on samples gathered during the site walkover in May 2024 (S6 and S7); the laboratory test results have been appended at Appendix D. The particle size distribution indicates material near the top of mounds is typically a fine sand while other key parameters, identified from this testing are shown in Table 1.

Table 1: Geotechnical Laboratory Test Results

Parameter	Result
In-situ water content	8.3 %
Solid density	2.68 t/m ³
Maximum dry density (MDD)	1.52 t/m ³
Optimum moisture content	13 %
Soaked California Bearing Ratio (CBR)	25% (0% cement additive)
	35% (2% cement additive)
	35% (4% cement additive)

Preliminary laboratory reactivity test results indicate subgrade improvement with the addition of cement (which can be mixed into soil to improve its bearing characteristics).

3.4 Geotechnical Considerations

3.4.1 Liquefaction

Liquefaction typically occurs in recent (i.e. typically less than 10,000-years old), normally consolidated silt and sand beneath the groundwater table upon cyclic loading (e.g. earthquake). It is also dependent on soil density, grain size and soil composition.

For the purpose of categorising earthquake damage and liquefaction induced displacements, reference was made to the Technical Categories (TC's) established by MBIE in response to the Canterbury earthquake sequence.

A preliminary liquefaction assessment has been undertaken using the on-site CPT data, inferred groundwater specific to each CPT, seismicity parameters displayed in Table 2, seismic groundwater depth of 2m bgl and the methodology for a liquefaction assessment recommended by MBIE (Boulanger and Idriss (2014)) method, for vertical settlement. The liquefaction analyses and thus induced settlement is limited to 10m bgl as surface manifestation is unlikely to be influenced below this depth.

Table 2: Seismicity Parameters Used for Preliminary Liquefaction Analysis

Case	Limit State	Importance Level	Design Life (years)	Return Period (years)	PGA (g)	Mw
SLS _{25-year}	SLS	N/A	N/A	25	0.13	6.5
ULS _{IL2, 500-year}	ULS	2	50	500	0.68	7.7

Based on this, we make the following comments (Liquefaction (Cliq) Outputs are appended at Appendix G):

- During the SLS_{25-year} case, minor liquefaction induced settlement is likely to occur within the site (<9mm).
- During the ULS_{IL2, 500-year} case, between 60mm and 165mm of liquefaction induced settlement is predicted across the site.

Predicted liquefaction induced settlements are predominantly in accordance with TC3 levels of predicted ground damage in the ULS case across the site, however typically equivalent to TC1 or TC2 levels in the SLS case.

Based on the liquefaction assessment, most **structures**, including those typical of residential development, are likely to require design to resist hybrid TC2/TC3 levels of liquefaction induced settlement (further discussed in Section 4.1). It is anticipated these findings are likely consistent with most sites across Paraparaumu given the region's seismic hazard parameters, high prevalence of sandy material and relatively high groundwater table.

3.4.2 Liquefaction Induced Lateral Spread

Lateral spread is a mechanism for slope instability in which blocks of non-liquified ground are translated on a very low angle failure zone, which is at liquified strength. For lateral spread to occur, it is required that a free face is present (e.g. existing pond batters) and that liquefaction occurs beneath the upslope ground at a depth typically less than two times the height of the free face.

Lateral spreading analysis for all structures located adjacent to any free faces will need to be undertaken during the resource consenting phase of the development, when the proposed thickness of fill and the location and design of the proposed residential buildings has been confirmed. Should further analysis indicate lateral spread presents a significant risk for the site, minimum setback distances, ground improvement, protection and mitigation measures and/or enhanced foundations would likely be required to reduce the risk of damage to building foundations. Additional foundation enhancement measures and/or protection measures would need to be specifically designed.

To mitigate the risk of liquefaction induced lateral spread triggering it is recommended that any potential open face features be designed so the base of the feature is conservatively located above the groundwater table (i.e. conservatively above potentially liquefiable material).

3.4.3 Stability

Based on on-site observations of the ground conditions and topography, we consider that the site is not presently affected by slope instability, however surcharging steep slopes across the site should be avoided.

Lateral spread mitigation measures or the provision of setbacks from open face features (e.g. existing ponds) may be required due to seismic stability. This will potentially need further assessment when any new features of the proposed residential development are detailed.

4.0 Geotechnical Recommendations

4.1 Foundations

Based on CPT, SPT and Scala test data across the site, near surface founding soils are generally suitable to support lightweight structures (including most dwellings) with a geotechnical ultimate bearing capacity (GUBC) of 200kPa.

Given the GUBC and liquefaction analysis outlined above; it is inferred shallow foundations designed to resist TC2/TC3 (hybrid) levels of liquefaction are typically suitable for one to three level residential building platforms on-site. There are also localised areas on the site where it is inferred lightweight structures could found on shallow foundations designed to resist TC2 levels of liquefaction settlement while there may also be areas where foundations should resist TC3 levels of liquefaction (this will be governed by lateral spreading). Shrink and swell of surficial soils is not expected to be an issue on this site, given the soil is Class A in accordance with AS2870.

Therefore, subsurface material is suitable to facilitate structures consistent with those typically proposed within General Residential zoning, subject to future detailed assessments at the Resource Consent stage and detailed design. It is noted, foundations specifically designed to support larger structures are also possible and would be subject to future detailed assessments and design.

4.2 Earthworks

Given the generally undulating nature of the site, it is envisaged considerable earthworks will be required, including cut, and fill design with corresponding specification in accordance with NZS 4431:2022 – Engineered fill construction for lightweight structures.

The risk of static settlement due to the surcharge weight of fill is likely to be low provided filling is less than 1.0m in height. It is anticipated that differential settlements resulting from static building loads would comply with building code limits. Building load induced settlements would be expected to be minor and are unlikely to extend significantly beyond the construction period.

The backfilled test pits (conducted by CGW) in the southern portion of No. 73 and/or any areas of non-engineered fill within the site are unlikely to have been placed and compacted to engineered standards (i.e. NZS 4431:1989 or NZS 4431:2022), therefore there is a risk that these areas do not provide expected density results (and indicative bearing and CBR) in comparison to in-situ material across the site. As discussed above there is potential that mounds and low-lying areas have been historically altered, and organic (topsoil layers) have been trapped. These corresponding non-engineered and buried organic layers are recommended to be undercut (similarly to surficial organic material e.g. topsoil) and replaced with engineered fill where necessary. This should be considered for future development proposed atop those layers.

Further assessment should be undertaken at resource consent stage to determine what mitigation measures (if any) are required and what appropriate engineering solutions should be incorporated into detailed design. It is considered that standard engineering solutions can generally be applied to manage any geotechnical site matters relating to the proposed future residential development.

4.3 Rooding

The natural subgrade CBR depends on the final subgrade levels. Notwithstanding this, based on the subsurface investigation, the natural subgrade CBR when confined can initially be assumed as 3% although when exposed it is expected to significantly decrease as it is susceptible to disturbance. Further investigation may be required once the proposed road layout within the site and pavement depths have been further developed.

4.4 Services

As detailed in the MBIE Guidelines (Module 4. Earthquake resistant foundation design), lateral spread or differential settlement of the ground can result in damage to services, therefore provision must be made for the design and installation of these services to minimise any adverse effects of ground movement. This is particularly important when services penetrate or are attached to concrete floor systems. Flexibility in service lines (i.e. increased resilience against differential movement) is the key to good performance.

Stormwater can potentially be dispersed to subsoils via soak pits and/or a larger stormwater/flood basin given the sandy material which already exists on-site. However, the soakage is subject to testing to determine its feasibility especially with the presence of the groundwater table in the upper soil layer. If soakage pits, stormwater/flood basins, ponds or swales are proposed, they will need to be positioned well clear of building foundations and also consider the potential risk of lateral spread on the site as discussed in Section 3.4.2.

5.0 Conclusions

From a geotechnical perspective provided the recommendations below are followed, the subject site is suitable for residential development consistent with the proposed rezoning to General Residential Zone:

- The site has been identified as having high liquefaction potential. Predicted liquefaction induced settlements are predominantly in accordance with TC2/TC3 (hybrid) levels of predicted ground damage with TC3 zones also identified and as governed by lateral spreading. Building foundations should and can be designed to resist these corresponding levels of liquefaction induced settlement on the site.
- There is a risk of seismic induced lateral spread affecting the site if free faces are present within the future site development. Protection or mitigation measures would likely be required adjacent to property boundaries where a minimum setback cannot be achieved to avoid increasing the risk of lateral spread hazards and/or effects to neighbouring properties.
- Near surface founding soils are likely to have a geotechnical ultimate bearing capacity (GUBC) of 200kPa. The natural subgrade CBR when confined can initially be assumed as 3 although when exposed it is expected to significantly decrease as it is susceptible to disturbance.
- Earthworks are likely to be required to improve gradients across the site for residential development. Site levels may also need to be raised above flood levels.

- Groundwater levels between 2.1m bgl and 5m bgl were encountered across the site.
- It should be noted that the liquefaction induced settlement findings are likely to be similar to that of other sites in Paraparaumu given the sandy material, relatively high groundwater table and region's seismic hazard parameters, therefore a development of a similar nature would likely have similar geotechnical considerations.

6.0 Limitation

This report has been prepared solely for the benefit of Welhom Developments Ltd as our client with respect to the brief and Kāpiti Coast District Council in processing the plan change application. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Recommendations and opinions in this report are based on data from limited test positions. The nature and continuity of subsoil conditions away from the test positions are inferred, and it must be appreciated that actual conditions could vary considerably from the assumed model.



Appendix A

Machine Borehole Logs (MH01 to MH03)

SOIL TYPES AND SYMBOLS

	FILL		CLAY
	TOPSOIL		PEAT
	SILT		GROUNDWATER LEVEL
	SAND		SCALA PENETROMETER LAST 3 NUMBER OF BLOWS PER 50mm INCREMENT 10,11,10
	GRAVEL		

ROCK TYPES AND SYMBOLS

	SANDSTONE		BASALT
	SILTSTONE		TUFF
	MUDSTONE		IGNIMBRITE
	LIMESTONE		GREYWACKE

SOIL STRENGTH CLASSIFICATION

FINE GRAINED COHESIVE SOILS

TERM	FIELD IDENTIFICATION	UNDRAINED SHEAR STRENGTH (kPa)
Very Soft (Vs)	Exudes between fingers when squeezed.	<12
Soft (S)	Easily indented by fingers.	12 – 25
Firm (F)	Indented only by strong finger pressure.	25 – 50
Stiff (St)	Indented by thumb pressure.	50 – 100
Very Stiff (VSt)	Indented by thumbnail.	100 – 200
Hard (H)	Difficult to indent by thumbnail.	200+

SPT & SCALA PENETROMETER RESULTS

TERM	SPT VALUE No. of BLOWS/300mm	SCALA PENETROMETER No. of BLOWS/100mm
very dense	>50	17+
dense	30 – 50	7 – 17
medium dense	10 – 30	3 – 7
loose	4 – 10	1 – 3
very loose	0 – 4	0 – 2

ROCK STRENGTH CLASSIFICATION

TERM	FIELD IDENTIFICATION	UNCONFINED UNIAXIAL COMPRESSIVE STRENGTH (MPa)
Extremely weak (EW)	Indented by thumbnail.	< 1
Very weak (VW)	Crumbles under firm blows with point of geological hammer. Can be peeled with pocket knife.	1 – 5
Weak (W)	Difficult to peel with pocket knife.	5 – 20
Moderately strong (MS)	Cannot be scraped or peeled with pocket knife.	20 – 50
Strong (S)	More than one blow of geological hammer to fracture.	50 – 100
Very strong (VS)	Many blows of geological hammer to break.	100 – 250
Extremely strong (ES)	Can only be chipped with geological hammer.	250+

MOISTURE CONDITION

Dry (D)	Looks and feels dry; powdery and friable.
Moist (M)	Feels cool; darkened in colour; no free water when remoulded.
Wet (W)	Feels cool; darkened in colour; free water forms on hands.
Saturated (S)	Free water is present on sample.

SAMPLE TYPES

	UNDISTURBED
	MACHINE AUGER DISTURBED
	HAND AUGER DISTURBED
	STANDARD PENETRATION TEST (solid cone)
	STANDARD PENETRATION TEST (hollow cone)

DRILLING METHOD

OB	OPEN BARREL
TT	TRIPLE TUBE
WB	WASH BORE
SH	UNDISTURBED SHELBY TUBE
RC	ROCK CORE
SPT	STANDARD PENETRATION TEST

FIELD TESTS

V	SHEAR VANE (corrected to BS:1377)
R	REMOULDED STRENGTH
P	POCKET PENETROMETER
CH	CLEGG HAMMER

INFORMATION BASED ON THE NZ GEOTECHNICAL SOCIETY INC. GUIDELINES FOR THE CLASSIFICATION AND DESCRIPTION OF SOIL AND ROCK FOR ENGINEERING PURPOSES

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 1 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run Box No.	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	Weathering	Field Strength <small>Soil Rock</small>	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	In-Situ Testing Data / Results	Backfill / Installation	
7.20	0.30		0.00			TOPSOIL		TOPSOIL.									
7.00	0.50		80	0		HOLOCENE DUNE DEPOSITS		Fine SAND with minor silt; light brown with dark orange mottles; loose; moist; non-plastic [HOLOCENE WINDBLOWN DUNE DEPOSITS].									
6.50	1.00		0.75	46	0			1.50m: Becomes medium dense.								2, 1 / 2, 1.5 3, 3, 3 N=11	
6.00	1.50		1.50	100	0												
5.50	2.00		1.95	95	0												
5.00	2.50	Sonic core drilling															
4.50	3.00		3.00	80	0			3.45m: Becomes grey-brown with dark orange mottles.							3, 4 / 4, 4, 5, 5 N=18		
4.00	3.50		3.45														
3.50	4.00			91	0												
3.00	4.50		4.60	88	0										3, 5 / 6, 4.5 6, 7, 8 N=27		
2.55	4.95																

RILEY CONSULTANTS LTD. REPORT: RILEY MH-R (rock) - generated with CORE-GS by Geococ

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Backfill: Bentonite Grout/concrete Drill arisings Filter sand Topsoil Clay Peat Silt Sand Gravel Fill Core Loss	Remarks: * Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.
--	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 2 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run Box No.	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	Weathering	Field Strength <small>Soil Rock</small>	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	In-Situ Testing Data / Results	Backfill / Installation
2.0 - 5.5	4.95	Sonic core drilling	100 - 0	100 - 0	0	HOLOCENE DUNE DEPOSITS		Fine SAND, with minor silt; dark grey with white speckles. Medium dense to dense; saturated; non-plastic.								
6.10	84 - 0		0	6.10m: Becomes dense.												
6.55	100 - 0		0													
7.60	86 - 0		4													
8.05	100 - 0		0	8.65m: Grades to 30mm of sandy organic layer; dark brown; sand, fine to medium												
9.10	84 - 0		86	9.10m: Becomes medium dense.												
9.55	100 - 0	0														

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Backfill: Topsoil Clay Peat Fill Core Loss Bentonite Grout/concrete Drill arisings Filter sand	Remarks: * Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.
--	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 3 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation										
			Box 4					In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation						In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation												
-3.0	10.5	Sonic core drilling	10.60	82 - 0	0	HOLOCENE DUNE DEPOSITS		[CONT] 9.10m: Becomes medium dense.							2, 5 / 7, 7, 4, 8 N=26											
-3.5	11.0		11.05	82 - 0	0																					
-4.0	11.5		12.20	82 - 0	0												12.20m: Becomes dense.									
-4.5	12.0		12.65	82 - 0	0																					
-5.0	12.5		13.70	82 - 0	0																					
-5.5	13.0		14.15	82 - 0	0																					
-6.0	13.5																									
-6.5	14.0																									
-7.0	14.5																									

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks:	
Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Peat Fill Core Loss Clay Silt Sand Gravel	Bentonite Grout/concrete Drill arisings Filter sand	* Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.	

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 4 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation
			Box 5	100	0			[CONT] 12.20m: Becomes dense.								
	15.20			100	0			15.20m: Becomes very dense.							5, 11 / 12, 17, 18, 3 N=50	
-8.0	15.5															
	15.59															
-8.5	16.0															
	16.70			100	0										5, 11 / 10, 11, 16, 13 N=50	
-9.5	17.0															
	17.14															
-10.0	17.5															
	18.30			100	0										9, 13 / 16, 16, 18 N=50	
-11.0	18.5															
	18.68															
-11.5	19.0															
	19.80			100	0										7, 10 / 12, 12, 15, 11	
-12.0	19.5															

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Backfill: Topsoil Clay Peat Fill Core Loss Bentonite Grout/concrete Drill arisings Filter sand	Remarks: * Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.
--	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 5 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation
			Box 7	100	0			[CONT] 15.20m: Becomes very dense.							N=50	
-13.0	20.25															
-13.5	21.0			100	0											
-14.0	21.5														3, 5 / 9, 16, 18, 17 N=50	
-14.19	21.69															
-14.5	22.0							Sandy GRAVEL with trace shell fragments; dark grey. Dense; gravel, fine to coarse, subrounded.								
-15.0	22.5			100	0											
-15.5	23.0														9, 15 / 17, 21, 12 N=50	
-16.0	23.5															
-16.5	24.0															
-17.0	24.5			100	0			24.40m: Becomes dense.								
-17.35	24.85							Fine SAND, with trace gravel; dark grey.							6, 8 / 11, 11, 13 N=47	

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Backfill: Topsoil Clay Peat Fill Core Loss Bentonite Grout/concrete Drill arisings Filter sand	Remarks: * Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.
--	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH01			
Client: Summerset Villages	Start Date: 17 Feb 2023 End Date: 17 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769470, N 5471961	Ground Level (m): 8 m	Hole Depth (m): 26.35	Inclination: -90°	Azimuth: N/A	Sheet: 6 of 6	Status: FINAL

Elevation (m)	Depth (m)	Method	Run Box No.	TCR (SCR) / RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation	
-18.0	25.5		Box 9	0	0	HOLOCENE DUNE DEPOSITS		Very dense; gravel, fine, subrounded.							7, 9 / 10, 12, 10 11 N=43		
-18.25	25.75																
-18.5	26.0		25.90	100	0			Fine to coarse sandy GRAVEL with trace shell fragments ; dark grey. Dense; gravel, fine to coarse, subrounded. 25.90m: Becomes dense.									
-18.85	26.35							END OF HOLE: 26.35m									
-19.0	26.5																
-19.5	27.0																
-20.0	27.5																
-20.5	28.0																
-21.0	28.5																
-21.5	29.0																
-22.0	29.5																

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks: * Hole was backfilled and plugged. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater encountered approximately at 5.00m.
Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Clay Peat Fill Core Loss	Bentonite Grout/concrete Drill arisings Filter sand	

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu			No.: MH02
Client: Summerset Villages	Start Date: 16 Feb 2023 End Date: 16 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)			
Co-ordinates : E 1769367, N 5471988	Ground Level (m): 6 m	Hole Depth (m): 24.70	Inclination: -90° Azimuth: N/A	Sheet: 1 of 5 Status: FINAL	

Elevation (m)	Depth (m)	Method	Run Box No.	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	Weathering	Field Strength <small>Soil Rock</small>	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description <small>In accordance with NZGS Guidelines (2005); refer to appended Information sheet and abbreviation explanation</small>	In-Situ Testing Data / Results	Backfill / Installation		
5.75	0.25	Sonic core drilling	0.00			TOPSOIL		TOPSOIL.										
5.5	0.5		80	0			SAND; light brown with trace white speckles; loose; moist; non-plastic. Sand, fine [HOLOCENE WINDBLOWN DUNE DEPOSITS].											
5.25	0.75		0.75				SAND; dark brown; medium dense; moist; non-plastic. Sand, fine to medium.											
5.0	1.0		1.50	46	0		1.50m: Becomes medium dense.									2, 2 / 3, 4, 3, 4 N=14		
4.5	1.5		1.95	100	0		2.50m: Becomes saturated.											
4.0	2.0	3.00	100	0												3, 3 / 6, 7, 6, 7 N=26		
3.5	2.5	3.45	100	0														
3.0	3.0	4.50	100	0													3, 6 / 6, 7, 7, 8 N=28	

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks:	
Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Clay Peat Fill Core Loss	Bentonite Grout/concrete Drill arisings Filter sand	Clay Silt Sand Gravel	* Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.5m.

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH02			
Client: Summerset Villages	Start Date: 16 Feb 2023 End Date: 16 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769367, N 5471988	Ground Level (m): 6 m	Hole Depth (m): 24.70	Inclination: -90°	Azimuth: N/A	Sheet: 2 of 5	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation	
4.95		Sonic core drilling		91 - 0		HOLOCENE DUNE DEPOSITS		4.95m: Becomes dark grey with trace white speckles.									
6.10				100 - 0				6.10m: Becomes dense.							4, 6 / 8, 10, 11, 11 N=40		
6.55				100 - 0				6.55m: Becomes dark grey with trace white and red speckles. Also comes out of the tube as a whole.									
7.60				100 - 0												3, 3 / 5, 7, 9, 10 N=31	
8.05				100 - 0					8.30m: Becomes dark grey with trace white speckles.								
9.10				100 - 0												2, 6 / 11, 9, 8, 9 N=37	
9.55				100 - 0													

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Backfill: Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Clay Peat Fill Core Loss Bentonite Grout/concrete Drill arisings Filter sand	Remarks: * Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.5m.
---	---	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH02			
Client: Summerset Villages	Start Date: 16 Feb 2023 End Date: 16 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769367, N 5471988	Ground Level (m): 6 m	Hole Depth (m): 24.70	Inclination: -90°	Azimuth: N/A	Sheet: 3 of 5	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation	
		Sonic core drilling	Box 4			HOLOCENE DUNE DEPOSITS		[CONT] 8.30m: Becomes dark grey with trace white speckles.									
-4.5	10.5		10.60	100 - 0				10.40m - 10.50m: Lense of some silt; brown; slightly plastic. 10.50m: Becomes dark grey.								2, 1 / 3, 5, 8, 16 N=30	
-5.0	11.0		11.05	100 - 0				11.00m: Becomes dark grey with trace white speckles.									
-5.5	11.5		12.20	100 - 0				12.20m: Becomes very dense.									
-6.0	12.0		12.65	100 - 0													
-6.5	12.5		13.70	100 - 0													
-7.0	13.0		14.13	100 - 0													

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details. Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Backfill: Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Clay Peat Fill Core Loss Bentonite Grout/concrete Drill arisings Filter sand	Remarks: * Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.5m.
---	---	--	--

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

MACHINE HOLE LOG

Project No.: 220306	Project Name: Summerset Paraparumu	Project Location: 65 & 73 Ratanui Road, Paraparumu	No.: MH02			
Client: Summerset Villages	Start Date: 16 Feb 2023 End Date: 16 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769367, N 5471988	Ground Level (m): 6 m	Hole Depth (m): 24.70	Inclination: -90°	Azimuth: N/A	Sheet: 4 of 5	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation	
			Box 5	100	0	HOLOCENE DUNE DEPOSITS		[CONT] 12.20m: Becomes very dense.							6, 9 / 13, 16, 22 N=50		
-9.5	15.20			100	0												
	15.58																
			Box 6														
-10.0	16.70			100	0											5, 7 / 15, 16, 19 N=50	
-10.5																	
-11.0	17.08																
-11.5				100	0												
-12.00	18.30			100	0			SAND with minor gravel and trace shells; dark grey with trace white speckles, very dense, saturated; non-plastic. Sand, fine to medium. Gravel, grey, medium to coarse, subrounded. Shells, white, beach origin.								3, 8 / 15, 18, 17 N=50	
-12.5																	
-12.60	18.67							SAND; dark grey with trace white speckles, very dense; saturated; non-plastic. Sand, fine to medium. 18.60m: Becomes dark grey.									
-13.0																	
-13.5	19.80			100	0											3, 5 / 10, 14, 26 N=50	

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks:	
Initial Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V = Peak, R = Residual UTP = Unable to penetrate PP = Pocket Penetrometer	Topsoil Peat Fill Core Loss	Clay Silt Sand Gravel	Bentonite Grout/concrete Drill arisings Filter sand	* Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.5m.

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

Project No.: 220306	Project Name: Summerset Paraparumu	Project Location: 65 & 73 Ratanui Road, Paraparumu	No.: MH02			
Client: Summerset Villages	Start Date: 16 Feb 2023 End Date: 16 Feb 2023	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)				
Co-ordinates : E 1769367, N 5471988	Ground Level (m): 6 m	Hole Depth (m): 24.70	Inclination: -90°	Azimuth: N/A	Sheet: 5 of 5	Status: FINAL

Elevation (m)	Depth (m)	Method	Run	TCR (SCR) RQD (%)	Core Loss (%)	Geological Unit	Legend	Geological Description	Weathering	Field Strength	Samples	Defect Spacing (mm)	Defect Symbolic Log	Defect Description	In-Situ Testing Data / Results	Backfill / Installation
			Box 7	100	0			[CONT] 18.60m: Becomes dark grey.								
-14.5	20.18			100	0											
-15.0				100	0											
-15.5	21.30			100	0										10, 17 / 17, 23, 10 N=50	
-16.0				100	0											
-16.30	21.68			100	0											
-16.5				100	0											
-16.5	22.80			100	0			GRAVEL with minor sand and shells; dark grey with white speckles; saturated; very dense; non-plastic. Gravel, fine to coarse, dark grey, subrounded and rounded. Sand, fine to coarse.								
-17.0				100	0			22.60m: Gravel becomes fine to medium, rounded.								
-17.50	23.25			100	0											
-17.6				100	0											
-18.0	24.40			100	0			SAND with minor gravel and trace shells; dark grey with trace white speckles, very dense; saturated; non-plastic. Sand, fine to medium. Gravel, grey, medium to coarse, subrounded. Shells, white, beach origin.								
-18.5				100	0											
-18.70	24.70			100	0											
								END OF HOLE: 24.70m								

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks:	
Initial Water Level Out flow In flow	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S)	Topsoil Peat Fill Core Loss	Clay Silt Sand Gravel	Bentonite Grout/concrete Drill arisings Filter sand	* Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 84.9% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.5m.

All dimensions in metres NOT TO SCALE	Drilling Contractor: ProDrill (Wgtn) Ltd	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------

RILEY CONSULTANTS LTD. REPORT: RILEY MH-R (rock) - generated with CORE-GS by Geococ

Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH03
Client: Summerset Villages		Start Date: 06 May 2024 End Date: 06 May 2024	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)
Co-ordinates : E 1769601, N 5471848	Ground Level (m): 6 m	Hole Depth: 15.65 m	Inclination: -90° Azimuth: N/A Sheet: 1 of 4

Elevation (m)	Depth (m)	Method	Run	Core Loss (%)	Geological Unit	Legend	Geological Description	Groundwater	Field Strength	In-Situ Testing Data / Results	Sample / Laboratory Testing	Backfill / Installation
5.10	0.40		0.00		TOPSOIL	TS	TOPSOIL.					
5.0	0.5						Fine SAND; light brown with trace white speckles; very loose; dry to moist; non-plastic [HOLOCENE WINDBLOWN DEPOSITS].	D-M				
4.75	0.75		0.75				Fine SAND with minor silt; dark brown with trace white speckles; loose; moist; non-plastic.					
4.5	1.0						1.50m: Becomes medium dense.	M		SPT 1.50 m 2, 1 / 2, 2, 3, 3 N=10	SPT Rec: ~400 mm	
4.0	1.5		1.50				1.95m: Becomes grey-brown.					
3.5	2.0		1.95				2.37m: Becomes saturated.					
3.0	2.5						2.60m: Becomes grey with trace white speckles.					
2.5	3.0		3.00							SPT 3.00 m 3, 4 / 4, 5, 5, 5 N=19	SPT Rec: ~300 mm	
2.0	3.5		3.45									
1.5	4.0											
1.0	4.5		4.50				4.50m: Becomes dense.			SPT 4.50 m 5, 6 / 8, 8, 9, 10 N=35	SPT Rec: ~310 mm	

RILEY CONSULTANTS LTD. REPORT: RILEY.MHS (soil) - generated with CORE-GS by Geoc

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks * Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 67.2% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.37m.
Standing Water Level Out flow In flow Moisture: M = moist W = wet S = saturated	Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) Vane Shear Strength (kPa) V=Peak, R=Residual UTP=Unable to penetrate PP = Pocket Penetrometer	Topsoil Peat Fill Core Loss	Clay Silt Sand Gravel Bentonite Grout/concrete Drill arisings Filter sand	

All dimensions in metres NOT TO SCALE	Drilling Contractor: Pro-Drill	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
---	--	--	-----------------------	--------------------------	--------------------------

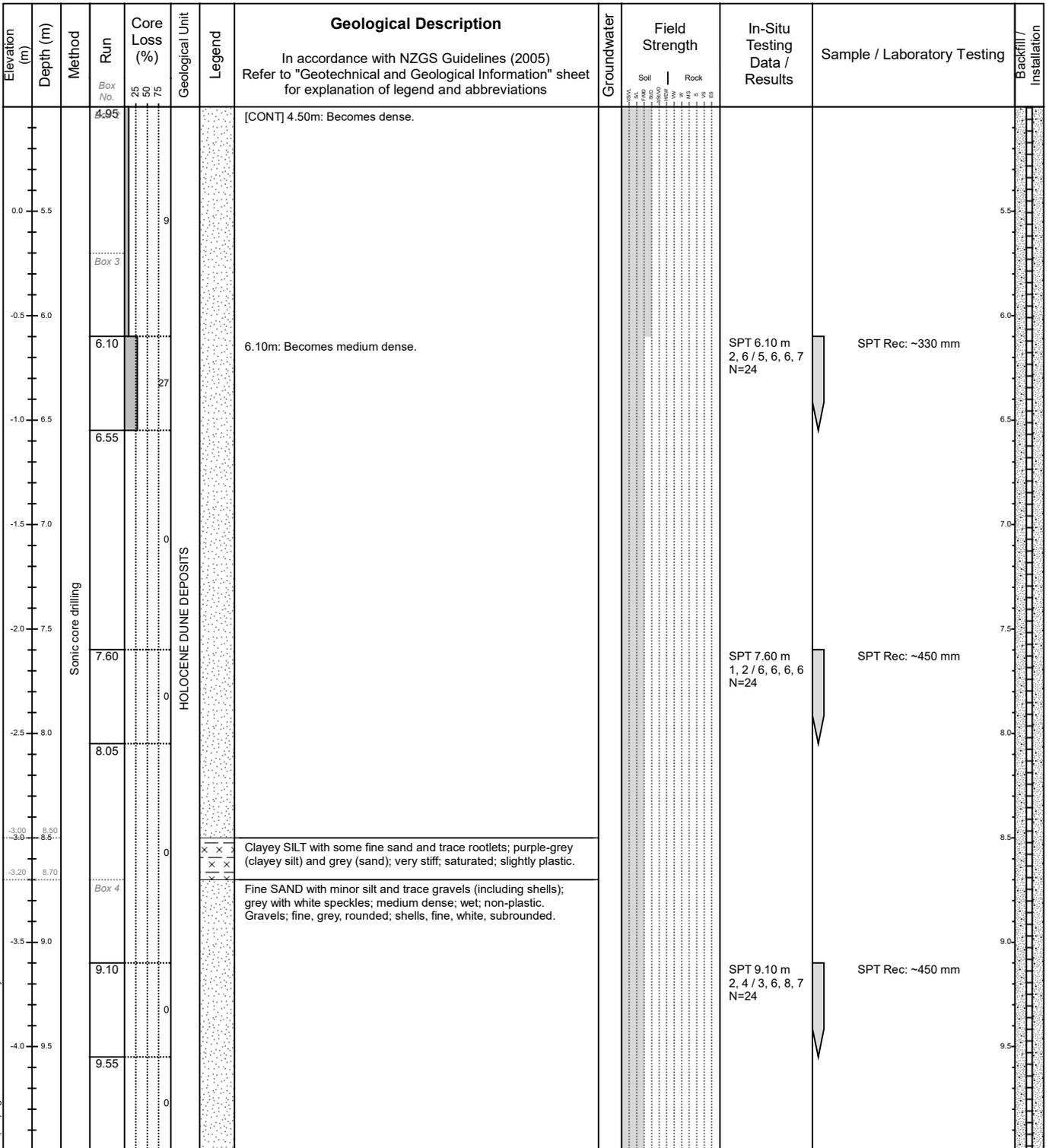


22 Moorhouse Avenue
Addington
CHRISTCHURCH 8011
Ph: 03.379.4402
E: www.rileychch.co.nz

4 Fred Thomas Drive
Takapuna
AUCKLAND 0622
Ph: 09.489.7872
E: www.riley.co.nz

MACHINE HOLE LOG

Project No.: 220306	Project Name: Summerset Paraparaumu	Project Location: 65 & 73 Ratanui Road, Paraparaumu	No.: MH03
Client: Summerset Villages		Start Date: 06 May 2024 End Date: 06 May 2024	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)
Co-ordinates : E 1769601, N 5471848	Ground Level (m): 6 m	Hole Depth: 15.65 m	Inclination: -90° Azimuth: N/A Sheet: 2 of 4



RILEY CONSULTANTS LTD. REPORT: RILEY.MHS (soil) - generated with CORE-GS by Geoc

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.	Backfill:	Remarks
<ul style="list-style-type: none"> Standing Water Level Out flow In flow Moisture: M = moist, W = wet, S = saturated Standard Penetration Test (SPT): Filled = Solid cone (C), No Fill = Split spoon (S) Vane Shear Strength (kPa): V=Peak, R=Residual, UTP=Unable to penetrate, PP=Pocket Penetrometer 	<ul style="list-style-type: none"> Topsoil Peat Fill Core Loss Clay Silt Sand Gravel Bentonite Grout/concrete Drill arisings Filter sand 	<ul style="list-style-type: none"> * Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 67.2% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.37m.

All dimensions in metres NOT TO SCALE	Drilling Contractor: Pro-Drill	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
---	--	--	-----------------------	--------------------------	--------------------------



22 Moorhouse Avenue
Addington
CHRISTCHURCH 8011
Ph: 03.379.4402
E: www.rileychch.co.nz

4 Fred Thomas Drive
Takapuna
AUCKLAND 0622
Ph: 09.489.7872
E: www.riley.co.nz

MACHINE HOLE LOG

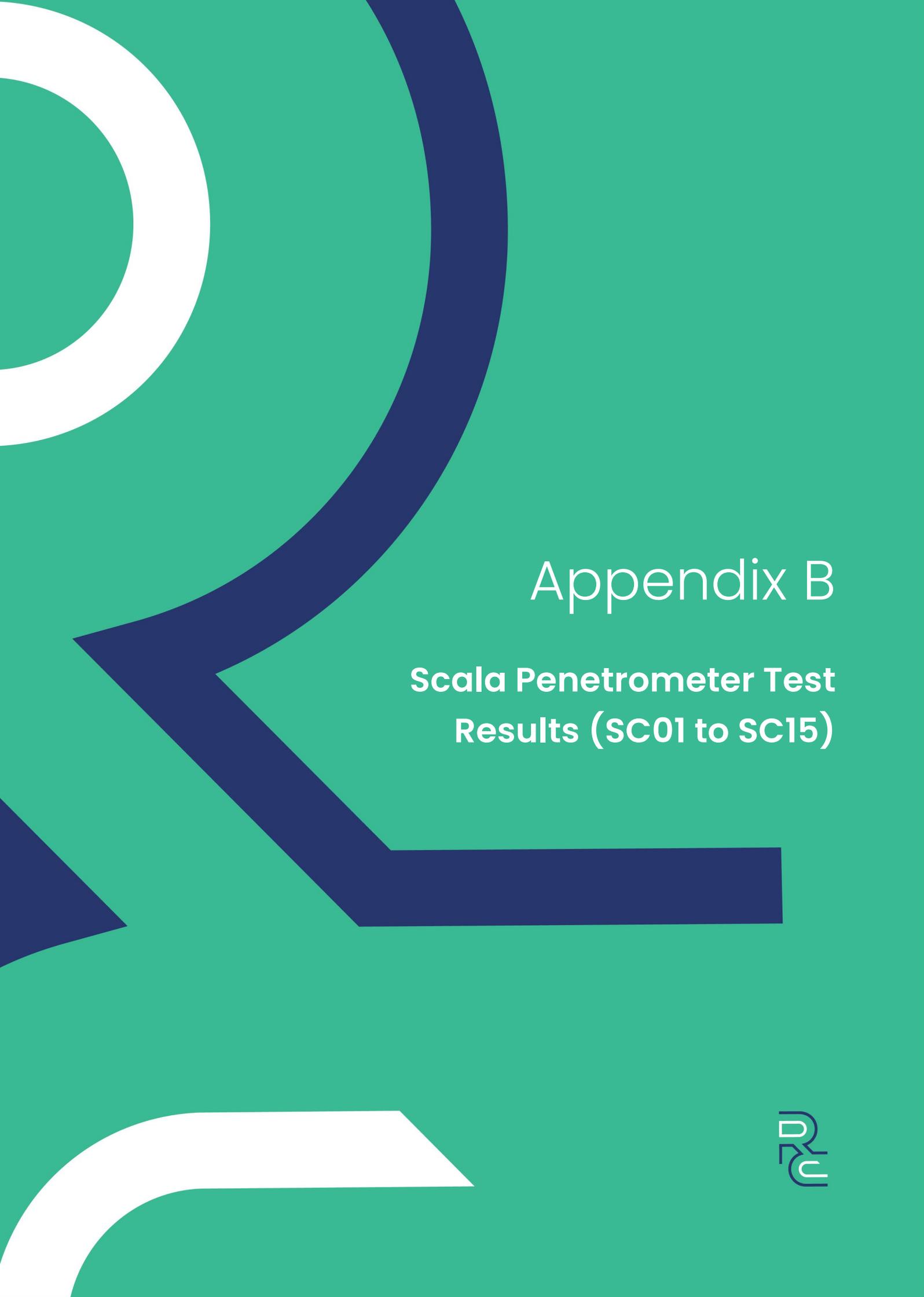
Project No.: 220306	Project Name: Summerset Paraparamu	Project Location: 65 & 73 Ratanui Road, Paraparamu	No.: MH03		
Client: Summerset Villages	Start Date: 06 May 2024 End Date: 06 May 2024	Hole Location: Refer to the Site Plan (Riley Dwg: 220306-1)			
Co-ordinates : E 1769601, N 5471848	Ground Level (m): 6 m	Hole Depth: 15.65 m	Inclination: -90°	Azimuth: N/A	Sheet: 4 of 4

Elevation (m)	Depth (m)	Method	Run	Core Loss (%)	Geological Unit	Legend	Geological Description	Groundwater	Field Strength	In-Situ Testing Data / Results	Sample / Laboratory Testing	Backfill / Installation
			Box 6				[CONT] 10.60m: Becomes dense.			SPT 15.20 m 6, 7 / 12, 12, 11, 13 N=48	SPT Rec: ~450 mm	
-10.0	15.20				HOLOGENE DUNE DEPOSITS							
-10.15	15.65						END OF HOLE: 15.65m					
-10.5	16.0											
-11.0	16.5											
-11.5	17.0											
-12.0	17.5											
-12.5	18.0											
-13.0	18.5											
-13.5	19.0											
-14.0	19.5											

RILEY CONSULTANTS LTD. REPORT: RILEY.MHS (soil) - generated with CORE-GS by Geoc

Explanations: Refer to "Geological and Geotechnical Information" sheet for further details.		Backfill:		Remarks * Piezometer installed after completion of drilling. Single stand-pipe, blank 0m to 1.0m with bentonite backfill 0.5m to 1.0m and gravel backfill 0.5m to 1.0m. Slotted from 1m to 14m with sand backfill. * SPT rig has a 67.2% average Energy Transfer Ratio. * Groundwater dipped afterward and encountered at 2.37m.
<ul style="list-style-type: none"> ▼ Standing Water Level △ Out flow ▽ In flow 	<ul style="list-style-type: none"> Standard Penetration Test (SPT) Filled = Solid cone (C) No Fill = Split spoon (S) 	<ul style="list-style-type: none"> Topsoil Peat Fill Core Loss 	<ul style="list-style-type: none"> Clay Silt Sand Gravel Bentonite Grout/concrete Drill arisings Filter sand 	

All dimensions in metres NOT TO SCALE	Drilling Contractor: Pro-Drill	Drilling Rig ID: MOBILE DRILL 1000	Driller: TG	Logged By: KBC	Checked By: GJ
--	--	--	-----------------------	--------------------------	--------------------------



Appendix B

Scala Penetrometer Test Results (SC01 to SC15)

SCALA PENETROMETER TEST RESULTS

Job No.	220306								
Project	Summerset Paraparaumu								
Test Location	73 Ratanui Road (see Riley Dwg: 220306-10)								
Logged By	KBC								
Date	6/05/2024								
Borehole Number	TABLE OF BLOWS PER 50mm INCREMENT								
	SC01	SC02	SC03	SC04	SC05	SC06	SC07	SC08	
~Start Depth RL (m)	10.5	5.1	6.0	5.0	5.0	7.8	7.0	6.0	
50	0	0	0	0	1	0	0	0	
100	0	1	0	1	1	0	0	1	
150	1	1	1	1	2	0	1	1	
200	1	2	1	1	1	1	1	1	
250	1	1	1	1	2	1	1	1	
300	1	2	2	2	1	1	1	1	
350	2	2	1	1	1	2	1	2	
400	2	4	2	2	1	1	1	1	
450	2	4	1	3	1	1	1	2	
500	3	4	2	2	1	2	1	2	
550	4	4	2	3	1	1	1	3	
600	3	4	1	2	2	2	2	2	
650	4	4	2	3	2	2	1	2	
700	4	5	1	2	2	1	1	2	
750	5		2	3	2	2	2	1	
800				2		1	1	2	
850							1	1	
900							1	1	
950									
1000									
1050									
1100									
1150									
1200									
1250									
1300									
1350									
1400									
1450									
1500									
1550									
1600									
1650									
1700									
1750									
1800									
1850									
1900									
1950									
2000									
~Finish Depth RL (m)	9.75	4.4	5.25	4.20	4.25	7.00	6.10	5.10	
Comments: SC = Scala Penetrometer Test									

SCALA PENETROMETER TEST RESULTS

Job No.	220306							
Project	Summerset Paraparaumu							
Test Location	65 Ratanui Road (see Riley Dwg: 220306-10)							
Logged By	KBC							
Date	6/05/2024							
Borehole Number	TABLE OF BLOWS PER 50mm INCREMENT							
	SC09	SC10	SC11	SC12	SC13	SC14	SC15	
~Start Depth RL (m)	6.0	4.0	6.5	6.0	5.0	7.0	7.5	
50	0	0	0	0	0	0	0	
100	0	0	0	0	1	0	0	
150	1	1	1	1	2	1	1	
200	1	0	1	1	2	1	1	
250	1	1	1	2	1	1	1	
300	1	1	1	1	2	1	1	
350	1	1	1	2	1	1	0	
400	1	1	1	1	1	2	1	
450	2	1	1	2	1	1	0	
500	1	1	1	1	1	1	1	
550	2	1	1	2	1	1	0	
600	1	1	2	2	1	2	1	
650	2	1	1	1	1	2	0	
700	1	1	1	2	1	1	1	
750	1	1	1	1	1	2	1	
800	1	1	2	2	1	1	1	
850		1	1	2	1	1	1	
900		1	2	1	2	2	1	
950		1			2			
1000								
1050								
1100								
1150								
1200								
1250								
1300								
1350								
1400								
1450								
1500								
1550								
1600								
1650								
1700								
1750								
1800								
1850								
1900								
1950								
2000								
~Finish Depth RL (m)	5.2	3.1	5.6	5.1	4.1	6.1	6.6	
Comments: SC = Scala Penetrometer Test								



Appendix C

Existing New Zealand Geotechnical Database Investigations



MACHINE BOREHOLE LOG

PROJECT: Mackays to Peka Peka Expressway JOB NUMBER: 3320901
 SITE LOCATION: Kapiti Coast CLIENT: NZTA

CIRCUIT: NZTM BOREHOLE LOCATION: Ratanui Rd
 COORDINATES: N 5,471,543.9 m R L: 7.1 m
 E 1,769,567.7 m DATUM: Mean sea level

DRILLING				IN-SITU TESTS			SAMPLES	DEPTH (m)	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	INSTRUMENTATION	R.L. (m)
FLUID LOSS	WATER LEVEL	CORE RECOVERY	METHOD	ROD	CASING	SV									
		0 %	Vacuum excavation									No recovery. Vacuum excavation			7
		100 %	TT						SP	W		'Loose', fine to medium SAND, trace rootlets; brown; wet, non plastic. Trace medium gravel (uphole); angular to subangular, SW greywacke.	Holocene Sand		6
		100 %	TT									Trace mica flakes. Trace Fe oxide staining.			5
		100 %	TT							S		Grey; saturated, dilatant			4
		80 %	TT						SP	S		'Medium dense', fine to medium SAND; grey; saturated, non plastic.	Pleistocene Sand		3
		90 %	TT												2
		90 %	TT									Thinly interbedded with very thin beds of medium to coarse sand. Trace medium gravel. Gravel: Rounded to subrounded, SW argillite.			1
		80 %	TT									Trace coarse gravel. Gravel: Subrounded, SW greywacke. 8.5m depth, very thin bed of fine to medium gravel. Gravel: Subangular to subrounded, SW greywacke.			0
		90 %	TT									9.0m depth, very thin bed of firm ORGANIC SILT; brown, non plastic. 9.3m depth, black lamination (3mm); trace brown organics.			-1
		90 %	TT									9.6m depth, very thin bed of SILT; trace organics; grey, moist.			-2

DATE STARTED: 7/6/11 DRILLED BY: Pro Drill (Auck) Ltd COMMENTS: No SPT testing undertaken, bore drilled for groundwater monitoring only.
 DATE FINISHED: 7/6/11 EQUIPMENT: Kubota STV 40 tractor rig
 LOGGED BY: MDH DRILL METHOD: Rotary
 SHEAR VANE No: N/A DRILL FLUID: Water & mud
 DIAMETER/INCLINATION: 90 mm / 90°

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET Revision A



MACHINE BOREHOLE LOG

PROJECT: Mackays to Peka Peka Expressway JOB NUMBER: 3320901
 SITE LOCATION: Kapiti Coast CLIENT: NZTA

CIRCUIT: NZTM BOREHOLE LOCATION: Ratanui Rd
 COORDINATES: N 5,471,543.9 m R L: 7.1 m
 E 1,769,567.7 m DATUM: Mean sea level

DRILLING						IN-SITU TESTS			DEPTH (m)	GRAPHIC LOG	USCS	MOISTURE	SOIL / ROCK DESCRIPTION	GEOLOGICAL UNIT	INSTRUMENTATION	R.L. (m)
FLUID LOSS	WATER LEVEL	CORE RECOVERY	METHOD	ROD	CASING	SV	τ (kPa)	SPT 'N'								
		90 %	TT													-3
													Very thin bed of fine to medium gravel. Gravel: Subangular to subrounded, SW greywacke. 10.45m depth, very thin bed of SILT; trace silt; grey, moist. END OF LOG @ 10.5 m			-4
																-5
																-6
																-7
																-8
																-9
																-10
																-11
																-12

DATE STARTED: 7/6/11 DRILLED BY: Pro Drill (Auck) Ltd
 DATE FINISHED: 7/6/11 EQUIPMENT: Kubota STV 40 tractor rig
 LOGGED BY: MDH DRILL METHOD: Rotary
 SHEAR VANE No: N/A DRILL FLUID: Water & mud
 DIAMETER/INCLINATION: 90 mm / 90°

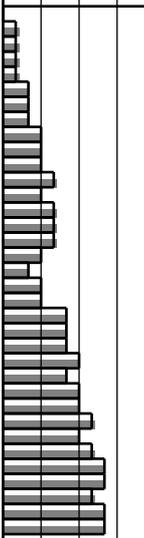
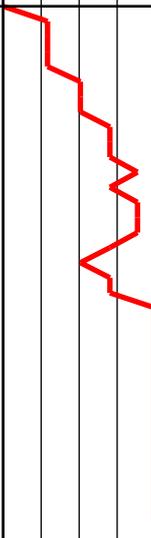
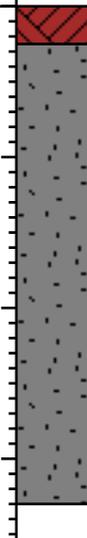
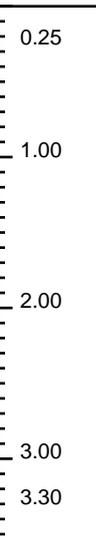
COMMENTS: No SPT testing undertaken, bore drilled for groundwater monitoring only.

FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS SEE KEY SHEET Revision A

MACHINE_BOREHOLE_P:\332\3320901\DESIGN\GEO\TECH\GINT\MACKAYS TO PEKA PEKA EXPRESSWAY.GPJ BECA.GDT 23/9/11

	Project Title: 73 Ratanui Rd, Otaihanga		TP01
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
						Loose organic fine SAND, some rootlets; dark brown; moist. (Topsoil) Medium dense fine SAND, minor silt; brownish grey; moist. (Aeolian sand)	
					3.30	End Of Hole At 3.30 m	

KEY

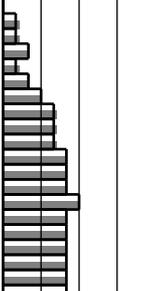
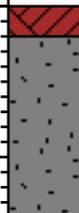
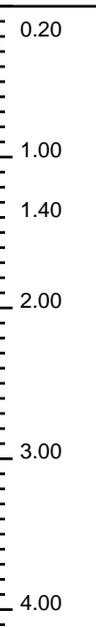
- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
 Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		TP02
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
						Very loose organic fine SAND, some rootlets; dark brown. (Topsoil) Medium dense fine SAND; yellowish brown transitioning to brownish grey at 0.8m; moist. (Aeolian sand) End Of Hole At 1.40 m	

KEY

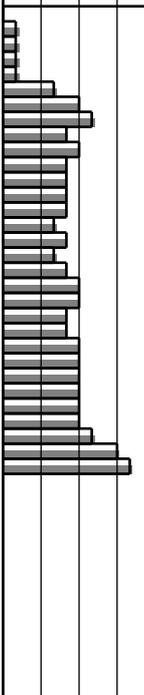
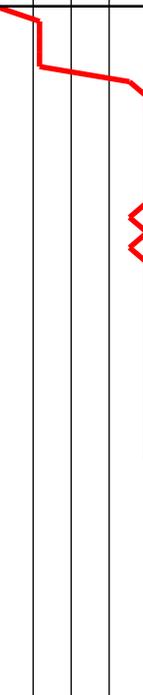
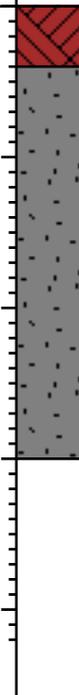
- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
 Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		TP03
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
						Loose organic fine SAND, some rootlets; dark brown; moist. (Topsoil) Medium dense fine SAND, minor silt; brownish grey; moist. (Aeolian sand)	
End Of Hole At 3.00 m							

KEY

- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
 Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		TP04
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
					0.40 1.00 1.30 2.00 3.00 4.00	<p>Loose organic fine SAND, some rootlets; dark brown; moist. (Topsoil)</p> <p>Medium dense organic fine SAND, minor silt; yellowish brown transitioning to brownish grey at 0.8m; moist. (Aeolian sand)</p> <p>End Of Hole At 1.30 m</p>	

KEY

- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
 Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		TP05
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
					0.50 1.00 2.00 3.00 4.00	Loose organic fine SAND, some rootlets; dark brown; moist. (Topsoil) Medium dense fine SAND, minor silt; brownish grey; moist. (Aeolian sand)	
						End Of Hole At 3.00 m	

KEY

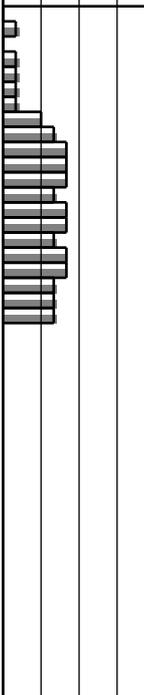
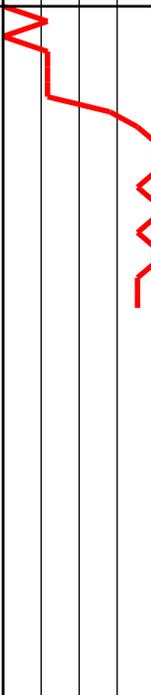
- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		TP06
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Excavator	Logged By: SC	Scale: 1:50 Sheet 1 Of 1



Blows (per 100mm) 3 6 9	UBC (kPa) (Stockwell) 100 200 300	Samples / Testing	Level mAHD	Legend	Depth (m)	Description	Water
					0.50 1.00 1.30 2.00 3.00 4.00	Loose organic fine SAND, some rootlets; dark brown; moist. (Topsoil) Medium dense fine SAND, minor silt; brownish grey; moist. (Aeolian sand) End Of Hole At 1.30 m	

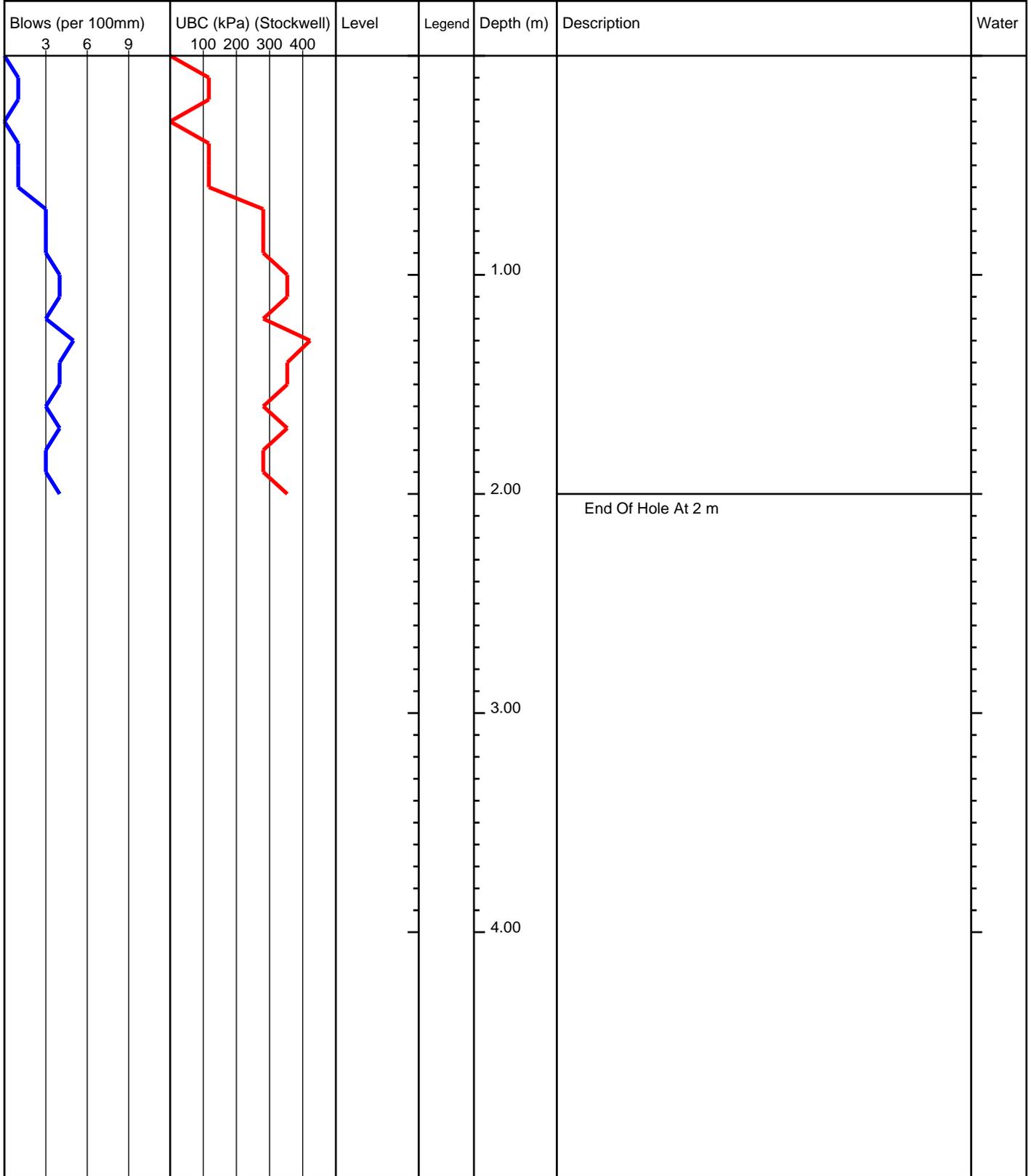
KEY

- D - Disturbed Sample
- B - Bulk Sample
- W - Water Sample
- V - Hand Shear Vane kPa
-  - Groundwater Strike
-  - Groundwater Level

REMARKS

No Groundwater Encountered
 Scala and test pit terminated at target depth.

	Project Title: 73 Ratanui Rd, Otaihanga		SP09
	Project Number: 220656	Client: Bellabby Ltd	
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 30/08/2022	Method: Scala	Logged By: SC	Scale: 1:25 Sheet 1 Of 1



KEY D - Disturbed Sample B - Bulk Sample W - Water Sample V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level	REMARKS No Groundwater Encountered Scala, terminated at target depth.
---	--



Appendix D

Geotechnical Laboratory Results



22 May 2024
 Our Ref: 1094573.0000.1.0/Rep1
 Customer Ref: 220306

Riley Consultants
 PO Box 100253
 North Shore
 Auckland 0745

Attention: Kyle Cole

Ratanui Road, Paraparaumu

Laboratory Test Report

Samples from the above-mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Riley Consultants, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report approved by:

.....
 Alan Benton
 Wellington Manager
 Key Technical Person

Authorised for Geotechnics by:

.....
 Vic O'Connor
 Project Director



All tests reported herein
 have been performed in
 accordance with the
 laboratory's scope of
 accreditation

22-May-24

\\ttgroup.local\corporate\geotechnicsgroup\projects\1094573\1 wlg lab\workingmaterial\20240522.jmg.1094573.0000.1.0.rep1.docx



GEOTECHNICS

11 Torrens Terrace
Mt Cook
Wellington 6011
New Zealand
p. +64 4 381 8584

Geotechnics Project ID

1094573.0000.1.0

Customer Project ID

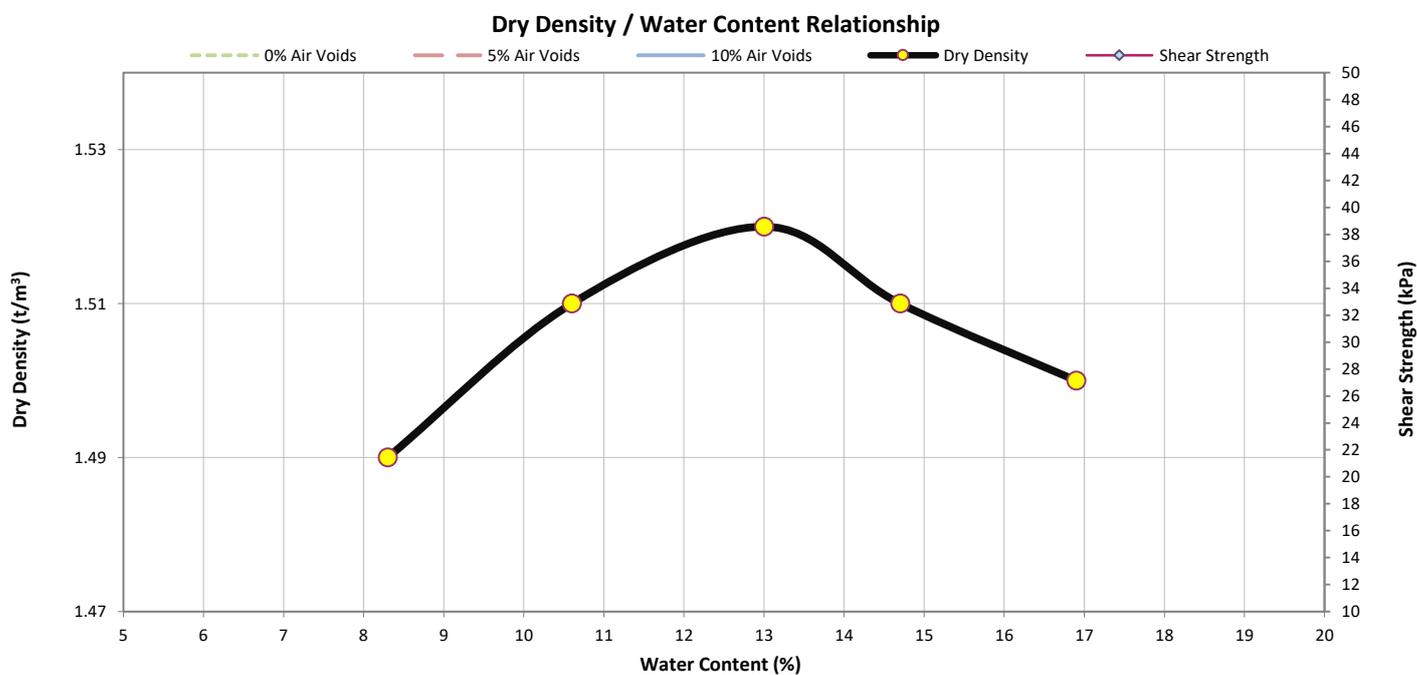
220306

Determination of the Dry Density / Water Content Relationship - NZS 4402:1986 Test 4.1.2 (Heavy Compaction)

TEST DETAILS

LOCATION	ID	Ratanui Road, Paraparaumu		
	Description	Ratanui Road		
	Data	N/A		
SAMPLE	Geotechnics ID	S6 & S7		
	Reference	S6 & S7	Depth	0-1.0m
	Description	Fine to medium SAND, with trace silt; brown. Moist.		
SPECIMEN	Reference	N/A	Depth	N/A
	Description	N/A		

TEST RESULTS



Maximum Dry Density	Optimum Water Content	Solid Density*	Whole Sample NWC
1.52 t/m ³	13%	2.68 t/m ³	N/A

Natural Water Content	(NWC)	✓					
Water Content	(%)	8.3	10.6	13.0	14.7	16.9	
Dry Density	(t/m ³)	1.490	1.510	1.516	1.514	1.503	
Undrained Shear Strength	(kPa)	N/A	N/A	N/A	N/A	N/A	

TEST REMARKS

- The material used for testing was natural, whole soil.
- *The solid density was measured.
- The amount of material retained on a 19mm sieve was 0% by wet mass.

This test result is IANZ accredited.

Approved by KTP

JMG

Date

13/05/2024



GEOTECHNICS

11 Torrens Terrace
Mt Cook
Wellington 6011

p. +64 4 381 8584

Geotechnics Project ID

1094573.0000.1.0

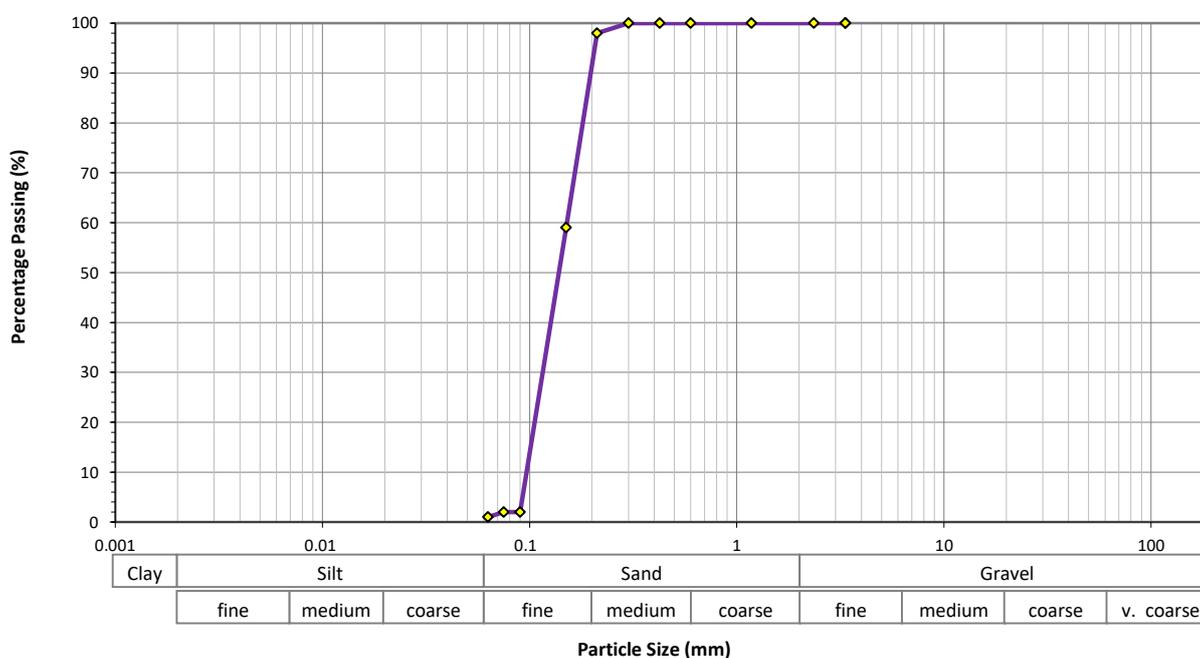
Customer Project ID

220306

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS				
LOCATION	ID	Ratanui Road, Paraparaumu		
	Description	Ratanui Road		
	Data	N/A		
SAMPLE	Geotechnics ID	S6 & S7		
	Reference	S6 & S7	Depth	0-1.0m
	Description	Fine to medium SAND, with trace silt; brown. Moist.		
SPECIMEN	Reference	N/A	Depth	N/A
	Description	N/A		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)						
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	100	0.212	98
75.0	-	16.0	-	2.36	100	0.150	59
63.0	-	13.2	-	1.18	100	0.090	2
53.0	-	9.50	-	0.600	100	0.075	2
37.5	-	6.70	-	0.425	100	0.063	1

TEST REMARKS

- The material used for testing was natural, whole soil.
- The percentage passing the <0.063mm was obtained by difference.

This test result is IANZ accredited.

Approved by KTP

JMG

Date

17/05/2024



27 May 2024
Our Ref: 1094573.0000.2.0/Rep1
Customer Ref: 220306

Riley Consultants
PO Box 100253
North Shore
Auckland 0745

Attention: Kyle Cole

Dear Kyle

Ratanui Road Lab Riley Laboratory Test Report

Samples from the above-mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Riley Consultants, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report approved by:



.....
Eliza Morton
Laboratory Technician

Authorised for Geotechnics by:

.....
Steven Anderson
Project Director
Key Technical Person



All tests reported herein
have been performed in
accordance with the
laboratory's scope of
accreditation

27-May-24

\\\\ttgroup.local\corporate\GeotechnicsGroup\Projects\1094573\2 AKL Lab\IssuedDocuments\Report 1

Determination of Solid Density of Medium & Fine Soils - NZS 4402:1986 Test 2.7.2 (Vacuum)

TEST DETAILS			
LOCATION	ID	S6 and S7	
	Description	Ratanui Road Lab Riley	
	Data	N/A	
SAMPLE	Geotechnics ID	AKL897.1	
	Reference	-	Depth 0-1.0 m
	Description	SAND with some silt, dark brown; dry	
SPECIMEN	Reference	-	Depth -
	Description	-	
TEST RESULT			
Average Solid Density	2.68 t/m³		
TEST REMARKS			
<ul style="list-style-type: none"> The material used for testing was natural, whole soil. Date Tested 15/05/2024 			
This test result is IANZ accredited.			
Approved by KTP	GEGO	Date	16/05/2024



GEOTECHNICS

1 Hill Street
Onehunga
Auckland 1061
New Zealand
p. +64 9 356 3510

Geotechnics Project ID

1094573.0000.0.0

Customer Project ID

220306

Determination of California Bearing Ratio - NZS 4402:1986 Test 6.1.1

TEST DETAILS			
LOCATION	ID	S6 and S7	
	Description	Ratanui Road Lab Riley	
	Data	N/A	
SAMPLE	Geotechnics ID	AKL897.1	
	Reference	-	Depth 0-1.0 m
	Description	SAND with some silt, dark brown; dry	
SPECIMEN	Reference	-	Depth -
	Description	-	
TEST RESULTS			
Test Type	Optimum Water Content, Soaked		
Compacting Effort	100% of NZ Heavy Compaction		
Dry Density Preparation Target	1.52 t/m ³		
Water Content Preparation Target	13.0 %		
Water Content as Received	8.2 %		
Water Content as Compacted	13.0 %		
Dry Density as Compacted	1.52 t/m ³		
Water Content after Tested	27.2 %		
Swell	-0.2 %		
CBR Value	25% at 5 mm penetration.		
TEST REMARKS			
<ul style="list-style-type: none"> The material used for testing was natural, fraction passing 19mm sieve. Mass of surcharge used was 4 kg. Sample was not cured. Sample was soaked for 4 days. The rate of penetration by the plunger was 1 mm/min. 0 % of oversize material was retained on the 19 mm sieve. Date Tested 21/05/2024 			
Approved by KTP	GEGO	Date	27/05/2024



GEOTECHNICS

1 Hill Street
Onehunga
Auckland 1061
New Zealand
p. +64 9 356 3510

Geotechnics Project ID

1094573.0000.0.0

Customer Project ID

220306

Determination of California Bearing Ratio - NZS 4402:1986 Test 6.1.1

TEST DETAILS			
LOCATION	ID	S6 and S7	
	Description	Ratanui Road Lab Riley	
	Data	N/A	
SAMPLE	Geotechnics ID	AKL897.2	
	Reference	-	Depth 0-1.0 m
	Description	SAND with some silt, dark brown; dry	
SPECIMEN	Reference	-	Depth -
	Description	-	
TEST RESULTS			
Test Type	Optimum Water Content, +2 % Cement, Soaked		
Compacting Effort	100% of NZ Heavy Compaction		
Dry Density Preparation Target	1.52 t/m ³		
Water Content Preparation Target	13.0 %		
Water Content as Received	8.2 %		
Water Content as Compacted	13.4 %		
Dry Density as Compacted	1.50 t/m ³		
Water Content after Tested	25.8 %		
Swell	0.0 %		
CBR Value	35% at 5 mm penetration.		
TEST REMARKS			
<ul style="list-style-type: none"> The material used for testing was natural, fraction passing 19mm sieve. Mass of surcharge used was 4 kg. Sample was cured for 3 days. Sample was soaked for 4 days. The rate of penetration by the plunger was 1 mm/min. 0 % of oversize material was retained on the 19 mm sieve. Date Tested 			
Approved by KTP	GEGO	Date	27/05/2024



GEOTECHNICS

1 Hill Street
Onehunga
Auckland 1061
New Zealand
p. +64 9 356 3510

Geotechnics Project ID

1094573.0000.0.0

Customer Project ID

220306

Determination of California Bearing Ratio - NZS 4402:1986 Test 6.1.1

TEST DETAILS

LOCATION	ID	S6 and S7		
	Description	Ratanui Road Lab Riley		
	Data	N/A		
SAMPLE	Geotechnics ID	AKL897.3		
	Reference	-	Depth	0-1.0 m
	Description	SAND with some silt, dark brown; dry		
SPECIMEN	Reference	-	Depth	-
	Description	-		

TEST RESULTS

Test Type	Optimum Water Content, +4 % Cement, Soaked
Compacting Effort	100% of NZ Heavy Compaction
Dry Density Preparation Target	1.52 t/m ³
Water Content Preparation Target	13.0 %
Water Content as Received	8.2 %
Water Content as Compacted	13.1 %
Dry Density as Compacted	1.50 t/m ³
Water Content after Tested	25.4 %
Swell	-0.2 %
CBR Value	35% at 5 mm penetration.

TEST REMARKS

- The material used for testing was natural, fraction passing 19mm sieve.
- Mass of surcharge used was 4 kg.
- Sample was cured for 3 days.
- Sample was soaked for 4 days.
- The rate of penetration by the plunger was 1 mm/min.
- 0 % of oversize material was retained on the 19 mm sieve.
- Date Tested 24/05/2024

Approved by KTP

GEGO

Date

27/05/2024



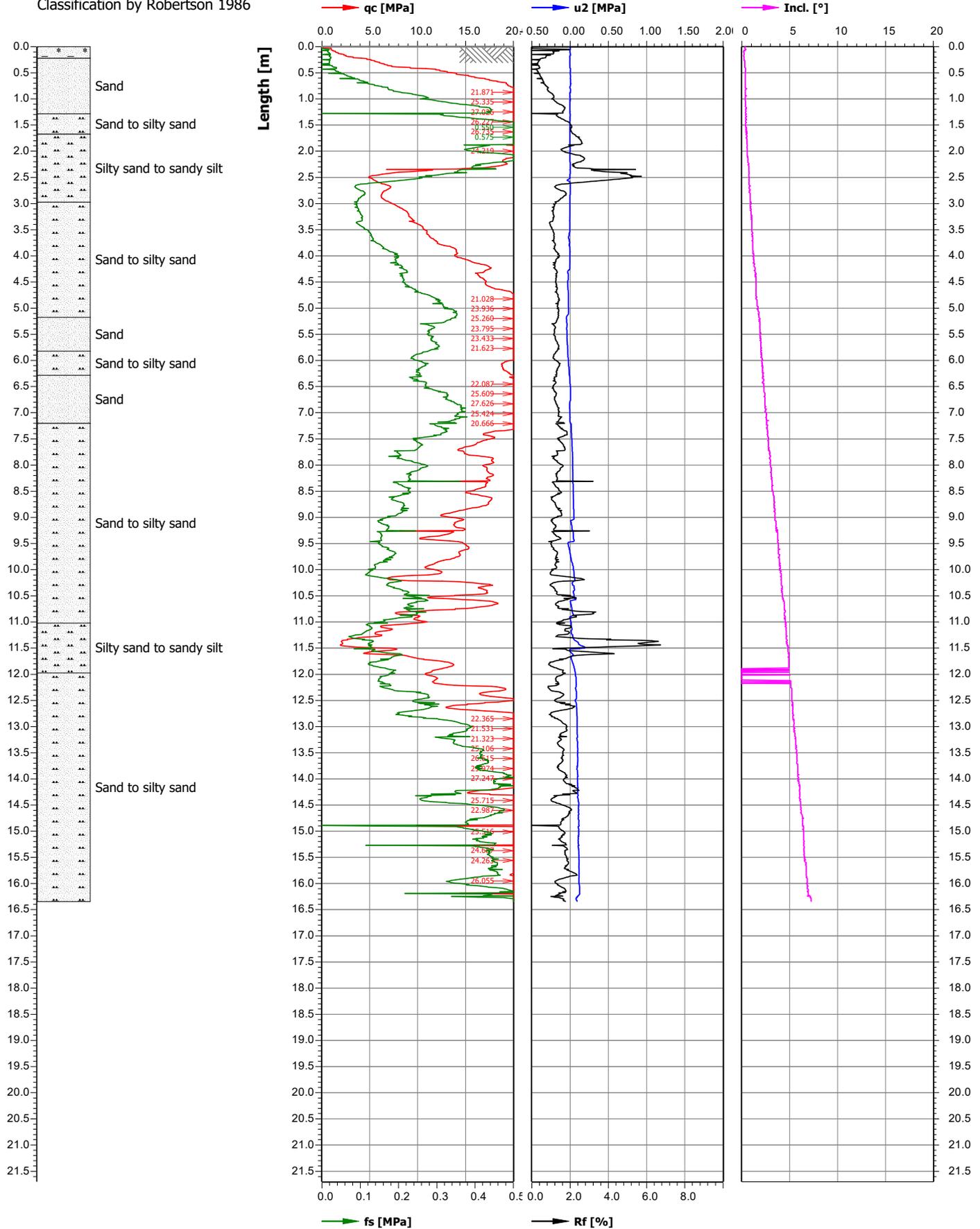
Appendix E

CPT Data (CPT01 to CPT22)

 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT01	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 16.34m

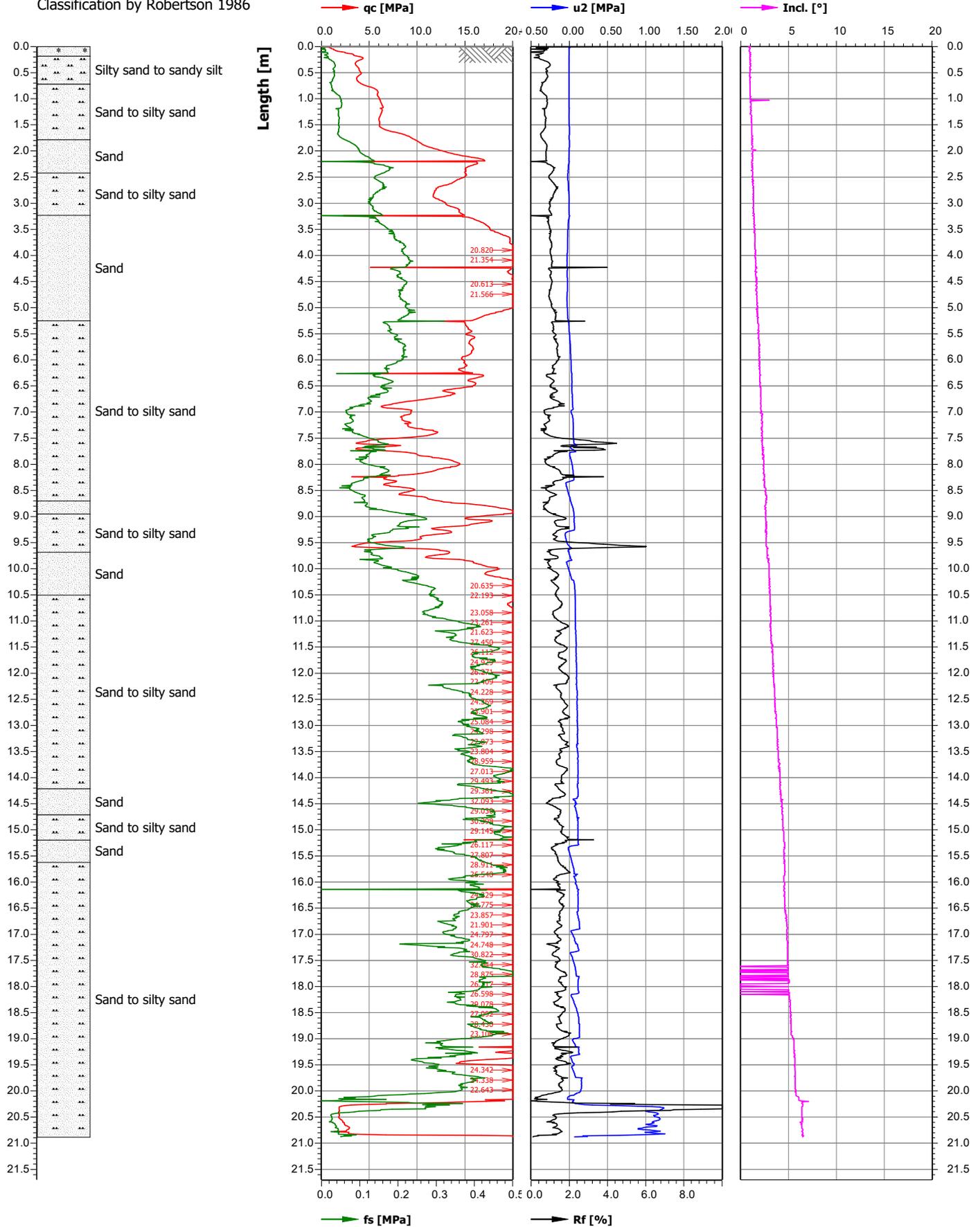
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT02	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Tip Pressure at 20.88m

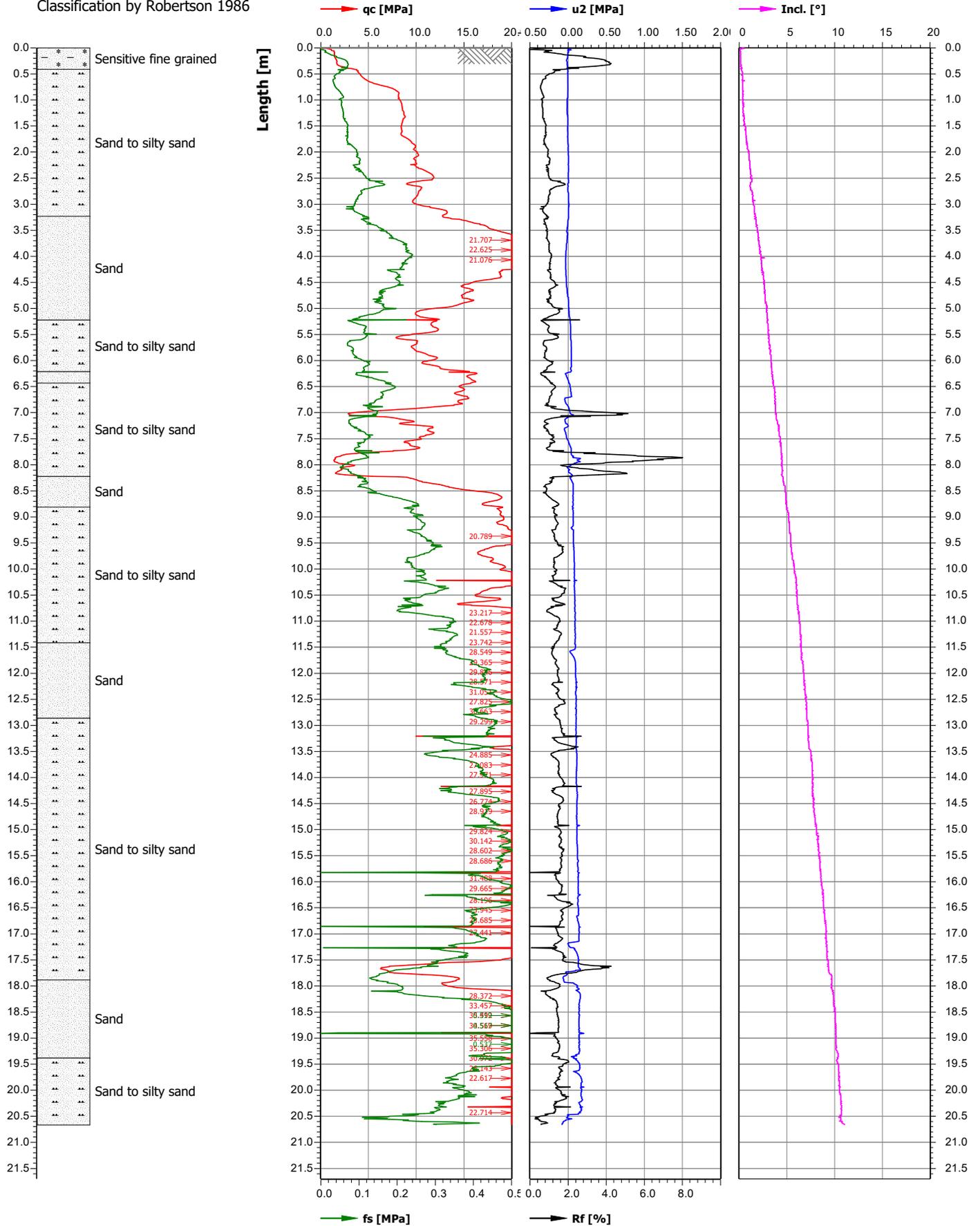
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT03	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Tip Pressure at 20.66m

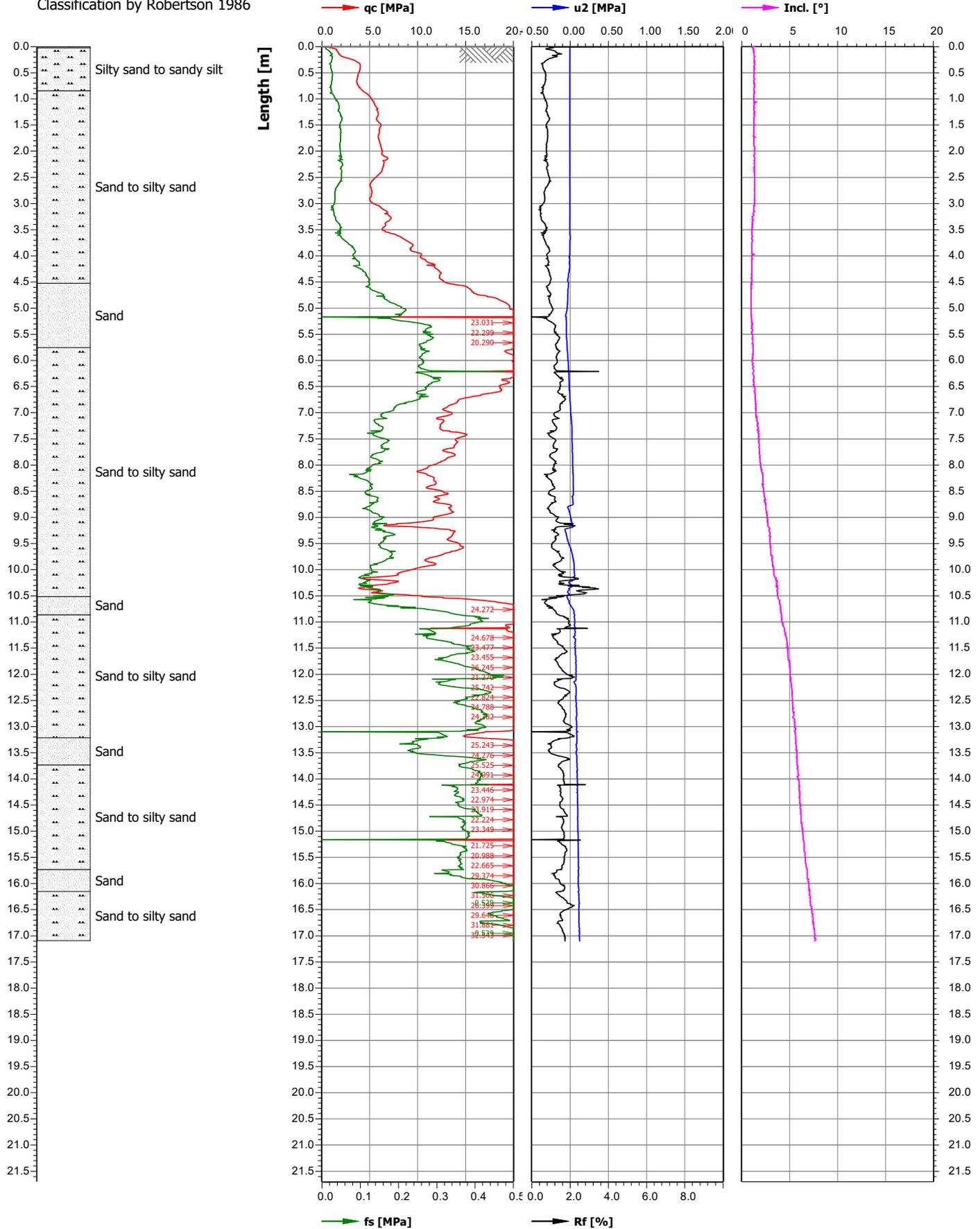
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT04	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 17.1m

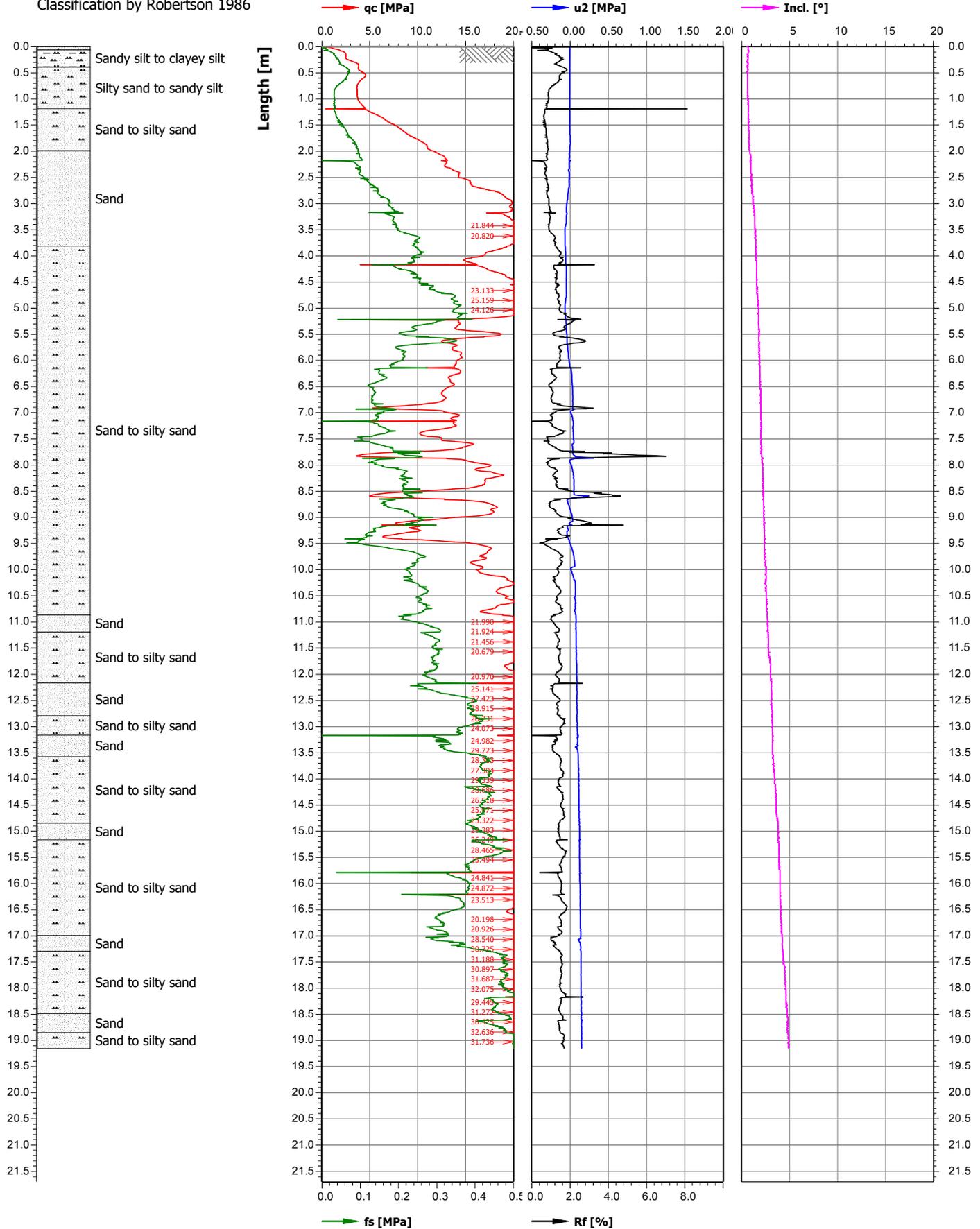
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT05	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 19.15m

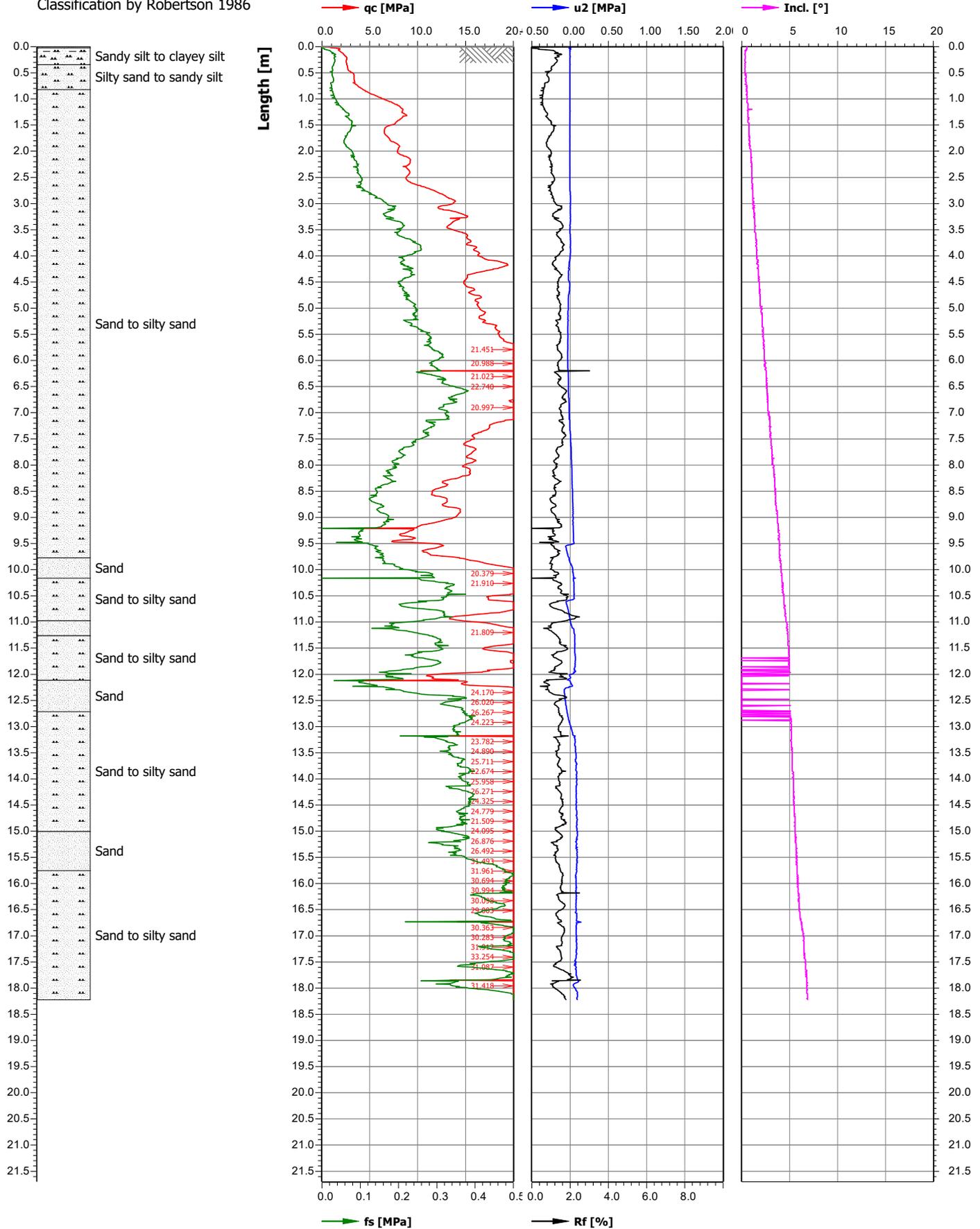
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT06	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 18.22m

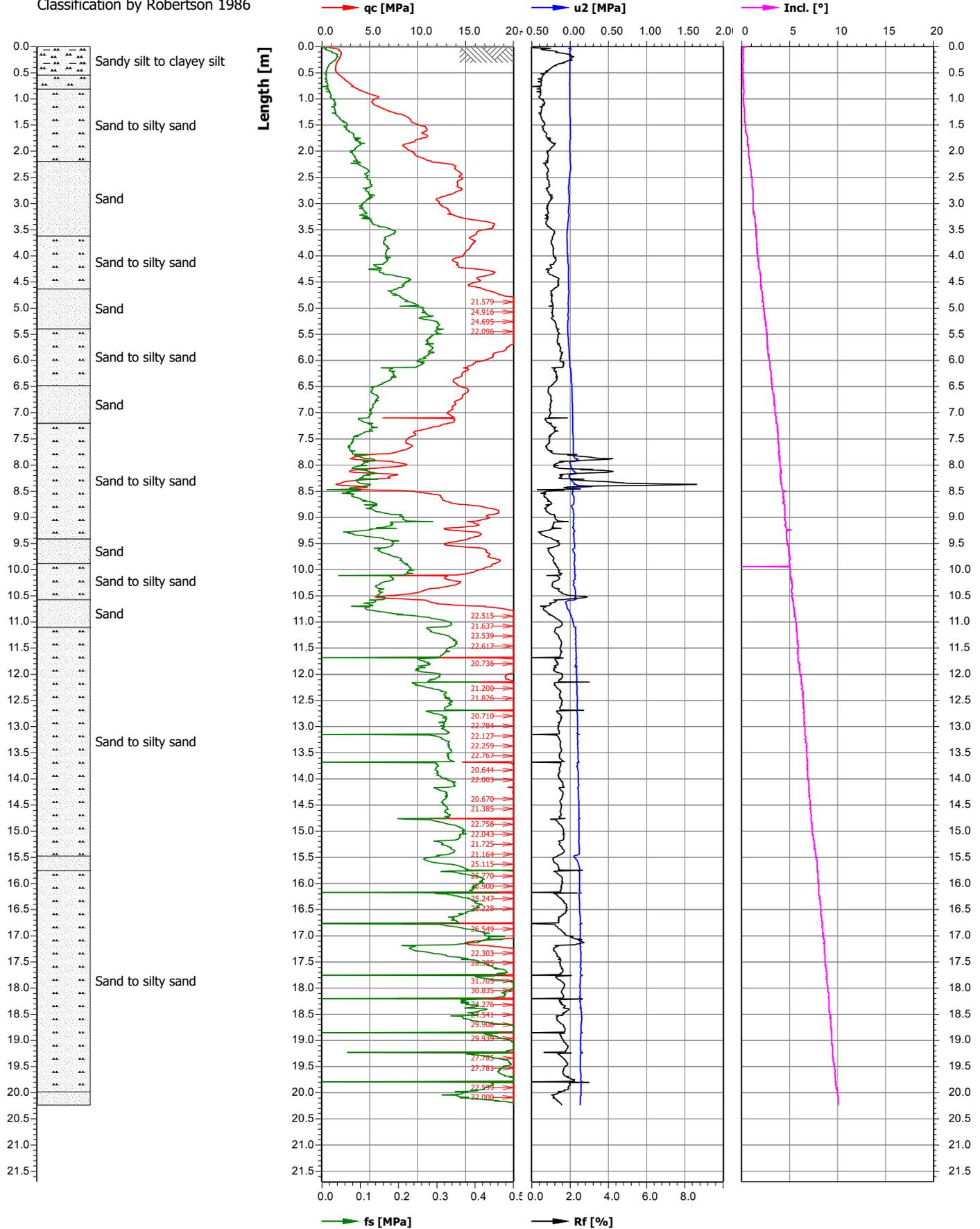
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	17043	Date investigation		21/02/2023
	Test name	CPT07	Cone name		S10-CFIP.1718
Test location name	Client	Riley	Net surface area quotient of ...	Nominal surface area of cone...	
65 Ratanui Rd			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Anchors Pulled at 20.23m

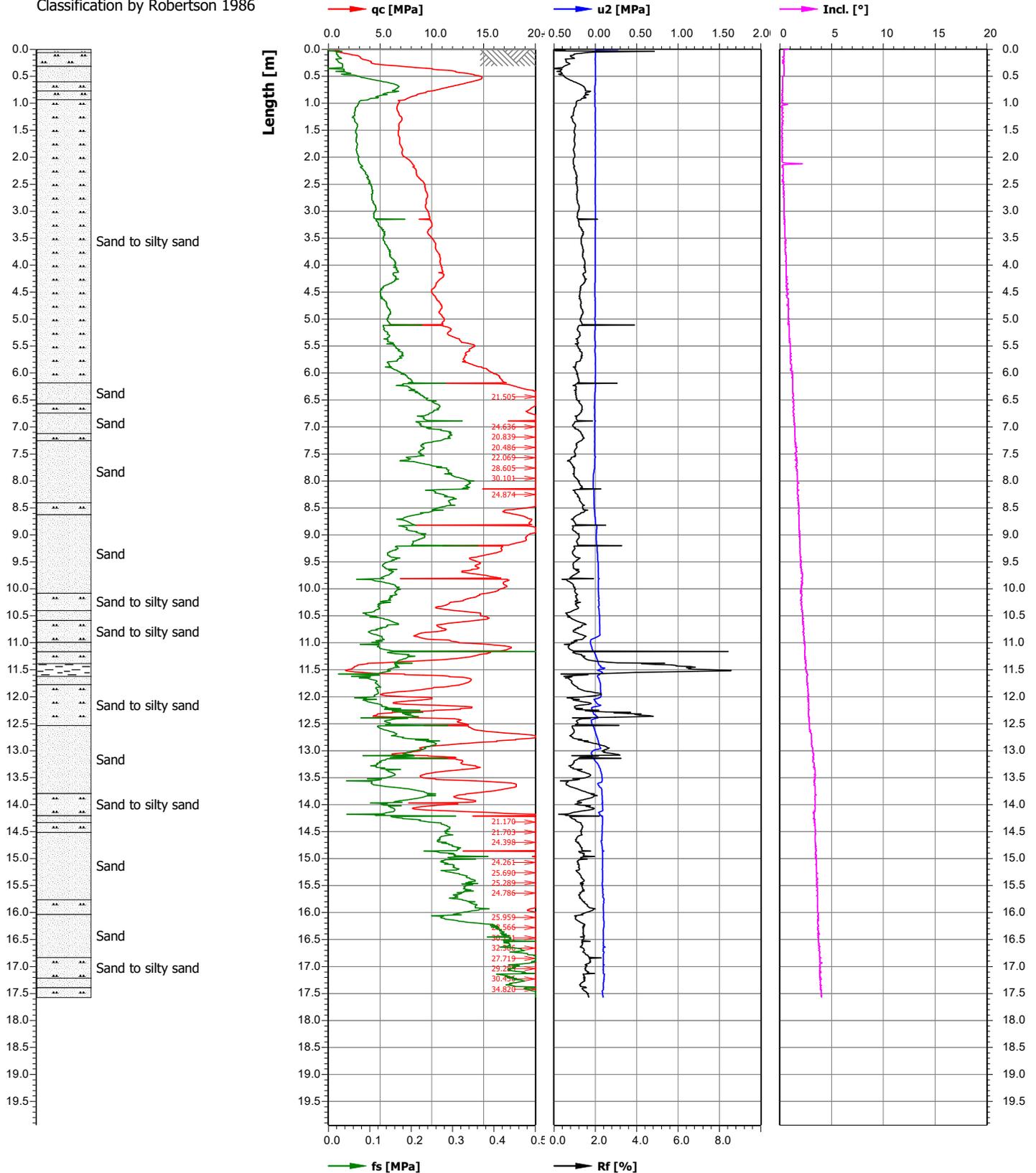
Classification by Robertson 1986



	Project name	0001	Date investigation		3/05/2024
	Test name	CPT08	Cone name		S10-CFIP.1718
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 17.57m - W/L Collapsed at 4.4m

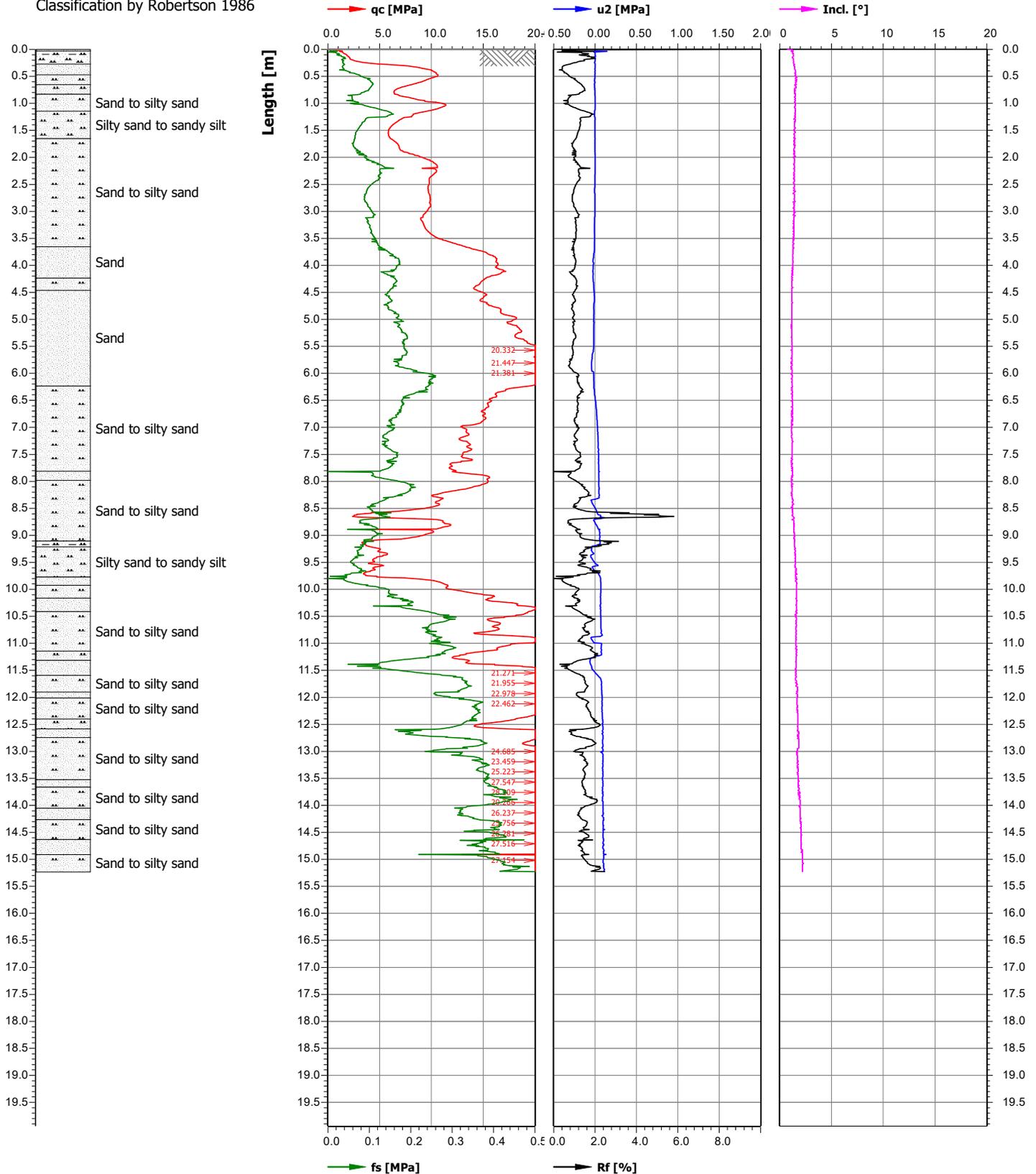
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT09	Cone name		S10-CFIP.1718
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Anchors Pulled at 15.23m - W/L Collapsed at 2.5m

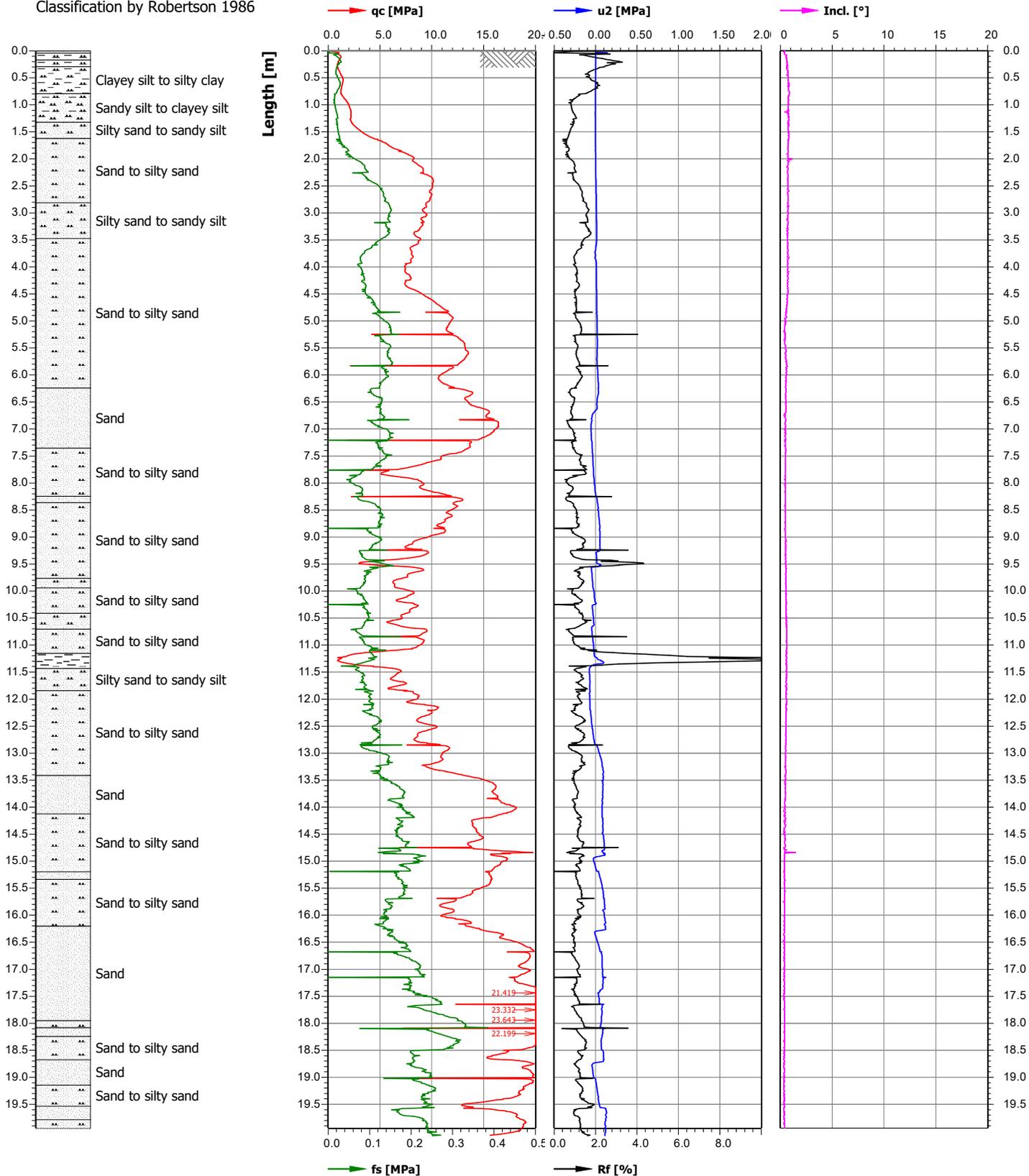
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT10	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 1.5m

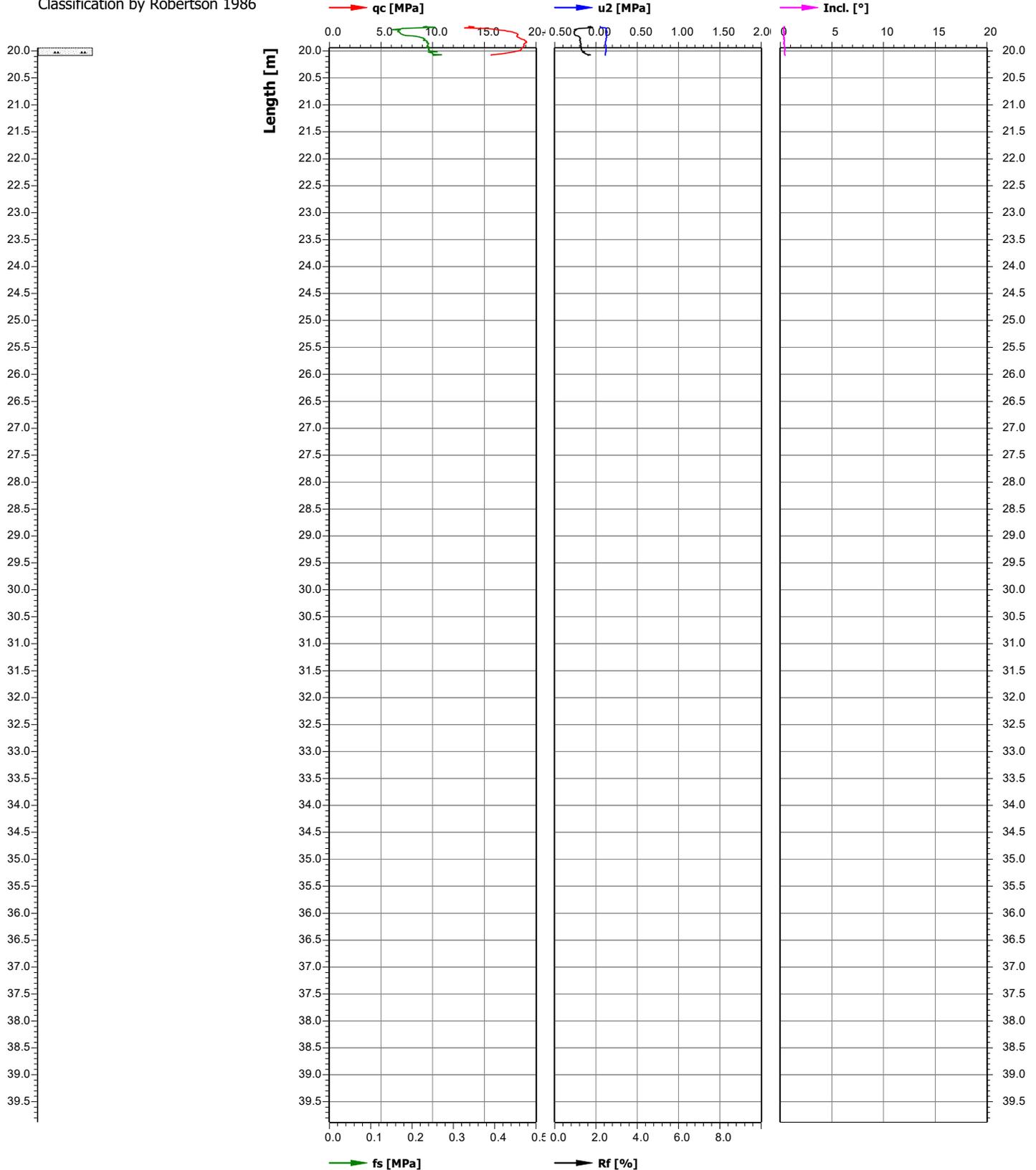
Classification by Robertson 1986



	Project name	0001	Date investigation		3/05/2024
	Test name	CPT10	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 1.5m

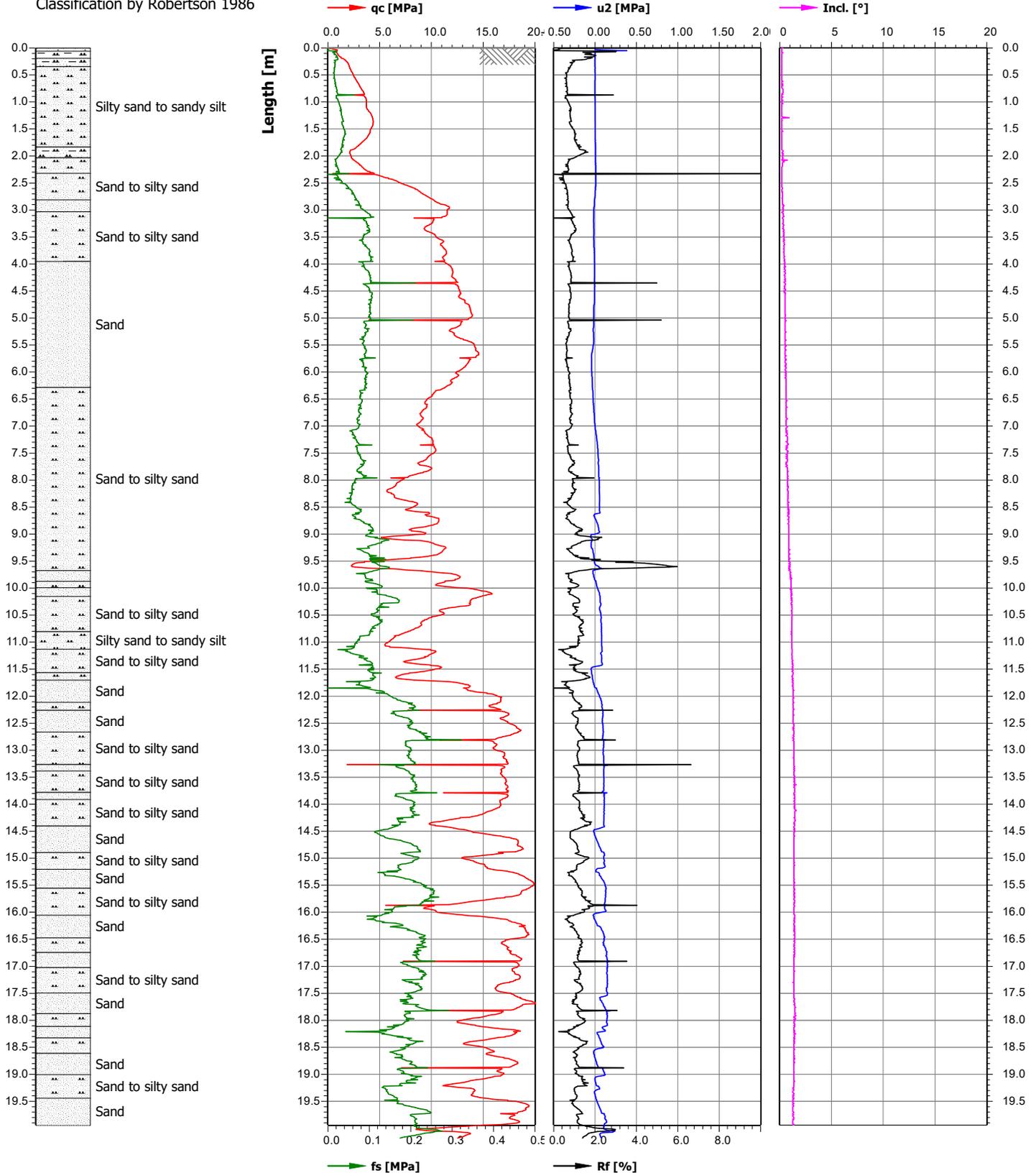
Classification by Robertson 1986



Project name 0001		Date investigation 3/05/2024	
Test name CPT11		Cone name S15-CFIP.1717	
Test location name 65-73 RATANUI RD	Client Riley Consultants	Net surface area quotient of ... 0.790/0.000	Nominal surface area of cone... 15.0/225.0
X coordinate [m]/Y coordinat...	Project contractors	Fig. no.:	
Z value [m] 0.00	Project engineer	Scale 1:100	Page 1/2
Remarks1			

Target Depth Reached at 20m - W/L Collapsed at 2.3m

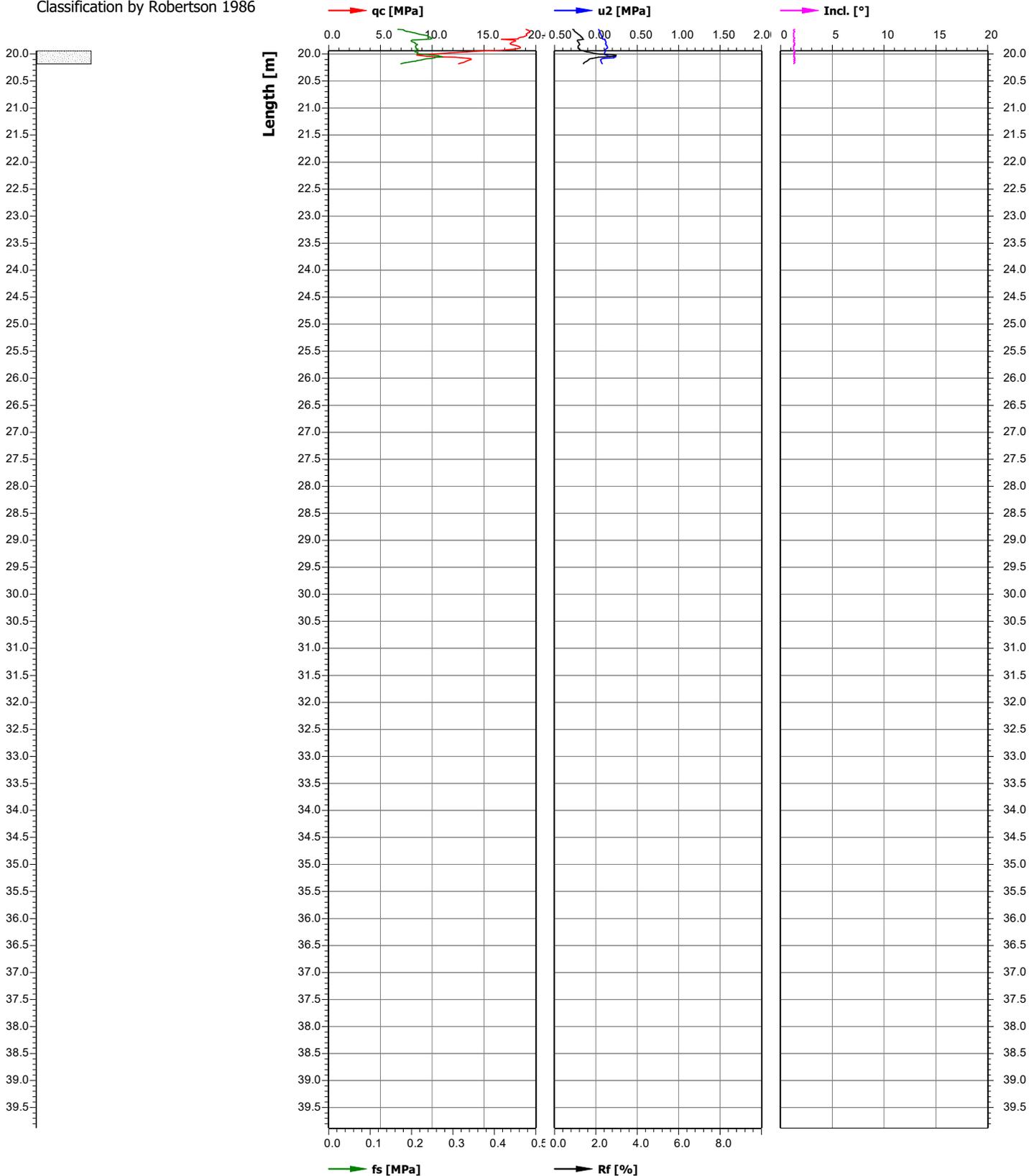
Classification by Robertson 1986



	Project name	0001	Date investigation		3/05/2024
	Test name	CPT11	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2.3m

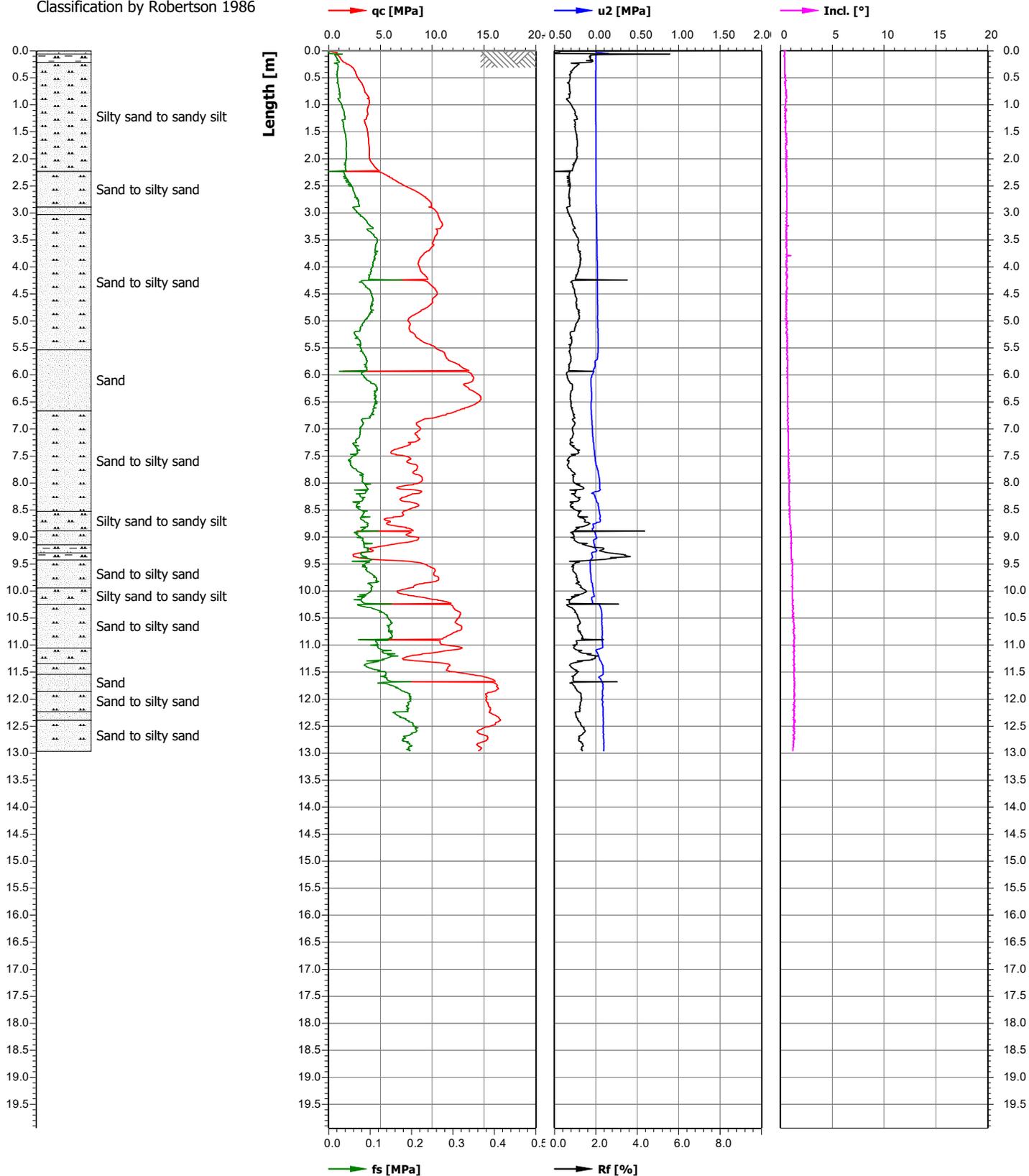
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT12	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Target Depth Reached at 12.96m - W/L Collapsed

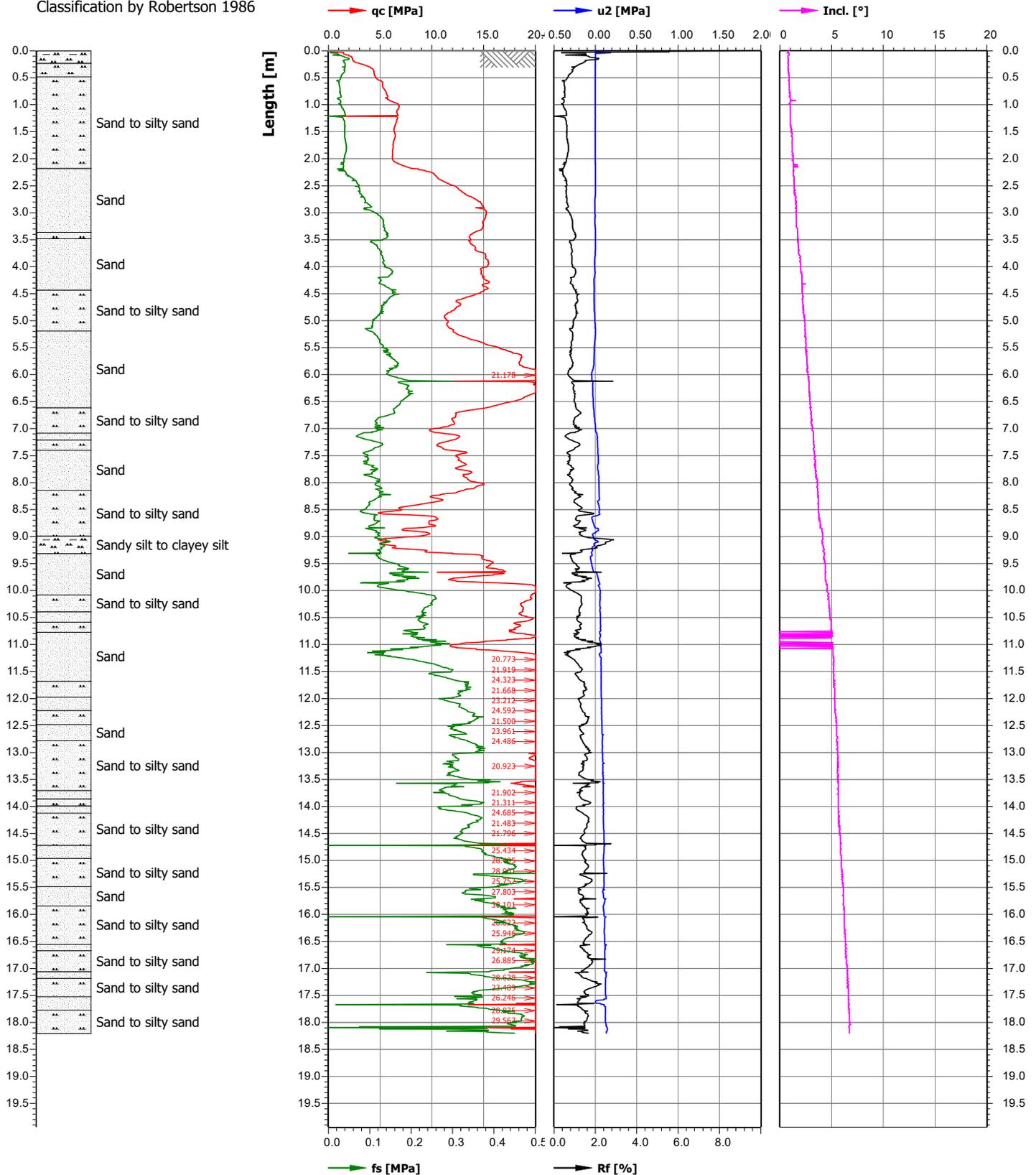
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT12A	Cone name		S10-CFIP.1718
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.800/0.000	10.0/150.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Rod Deflection at 18.2m - W/L Collapsed at 2.5m

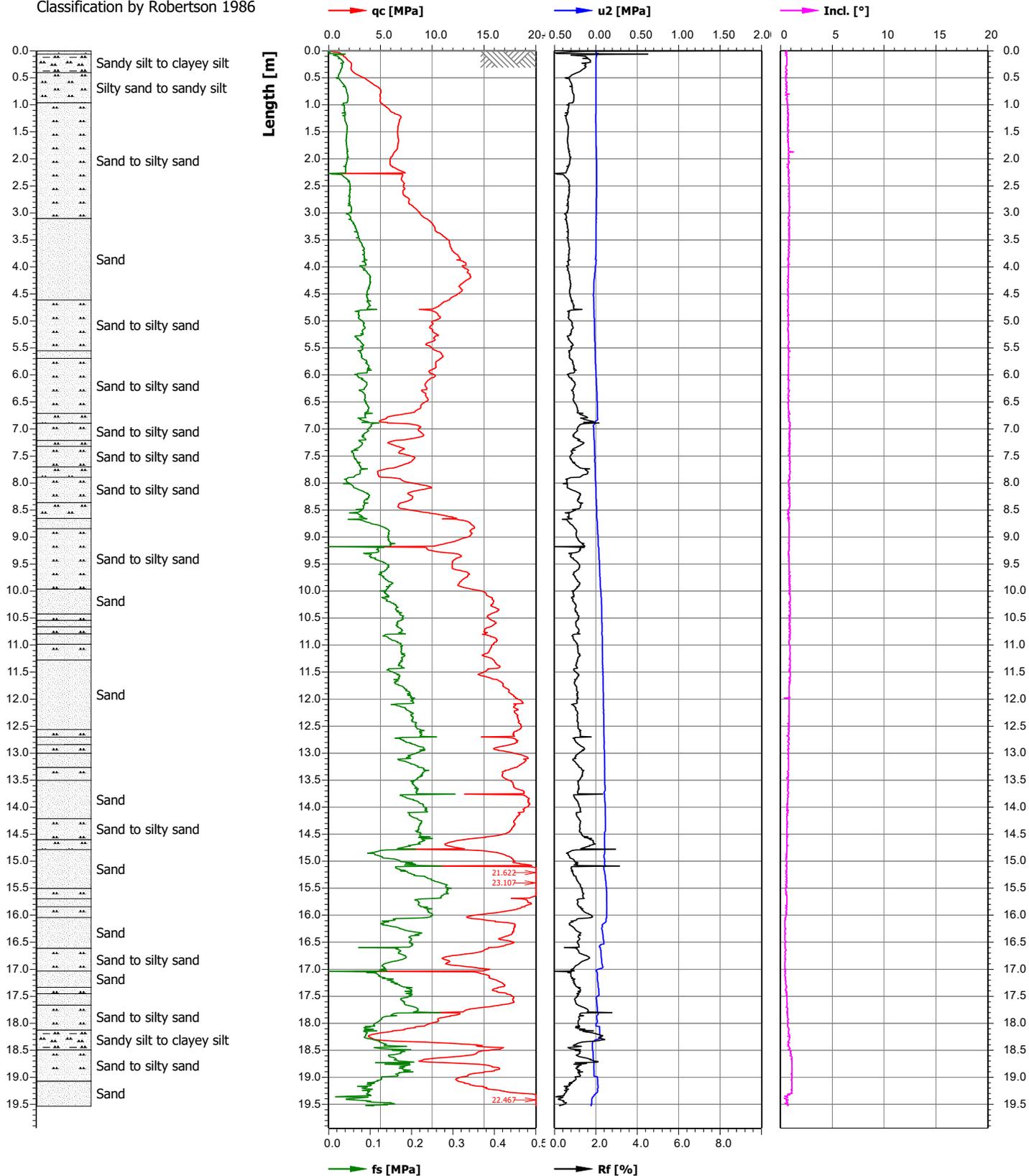
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT13	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Tip Pressure at 19.5m - W/L Collapsed at 1.0m

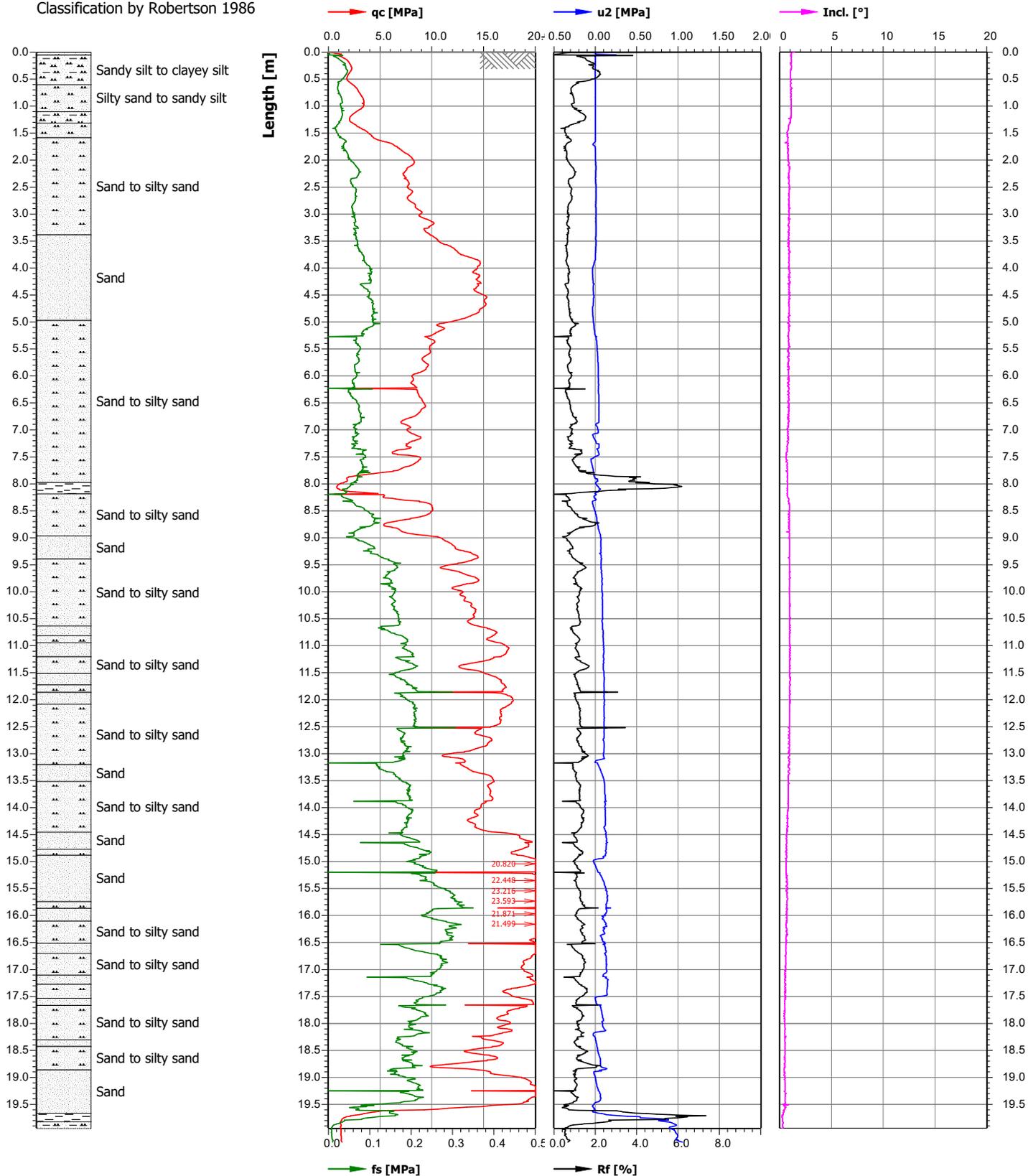
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT14	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 1.5m

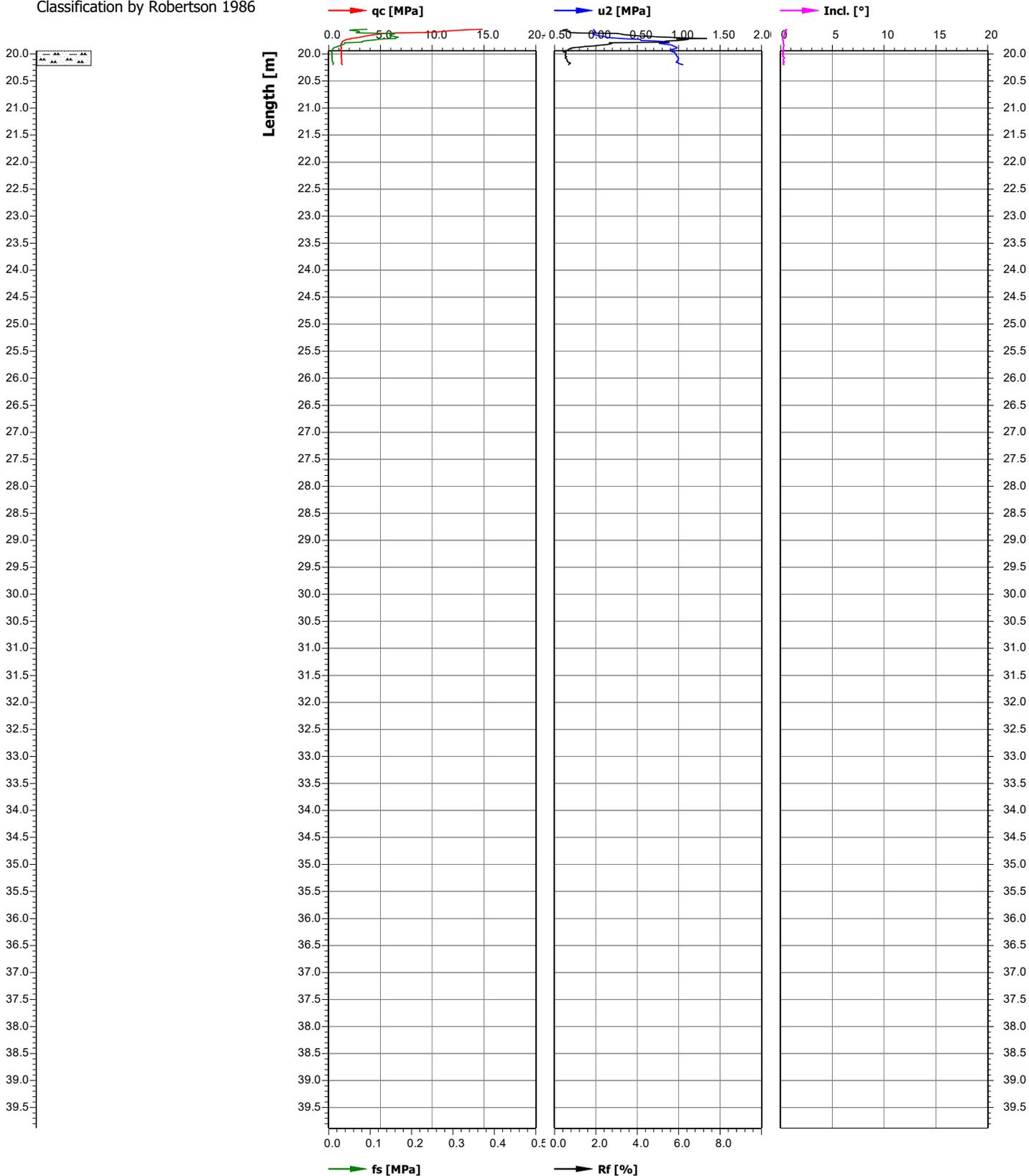
Classification by Robertson 1986



	Project name	0001	Date investigation		3/05/2024
	Test name	CPT14	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 1.5m

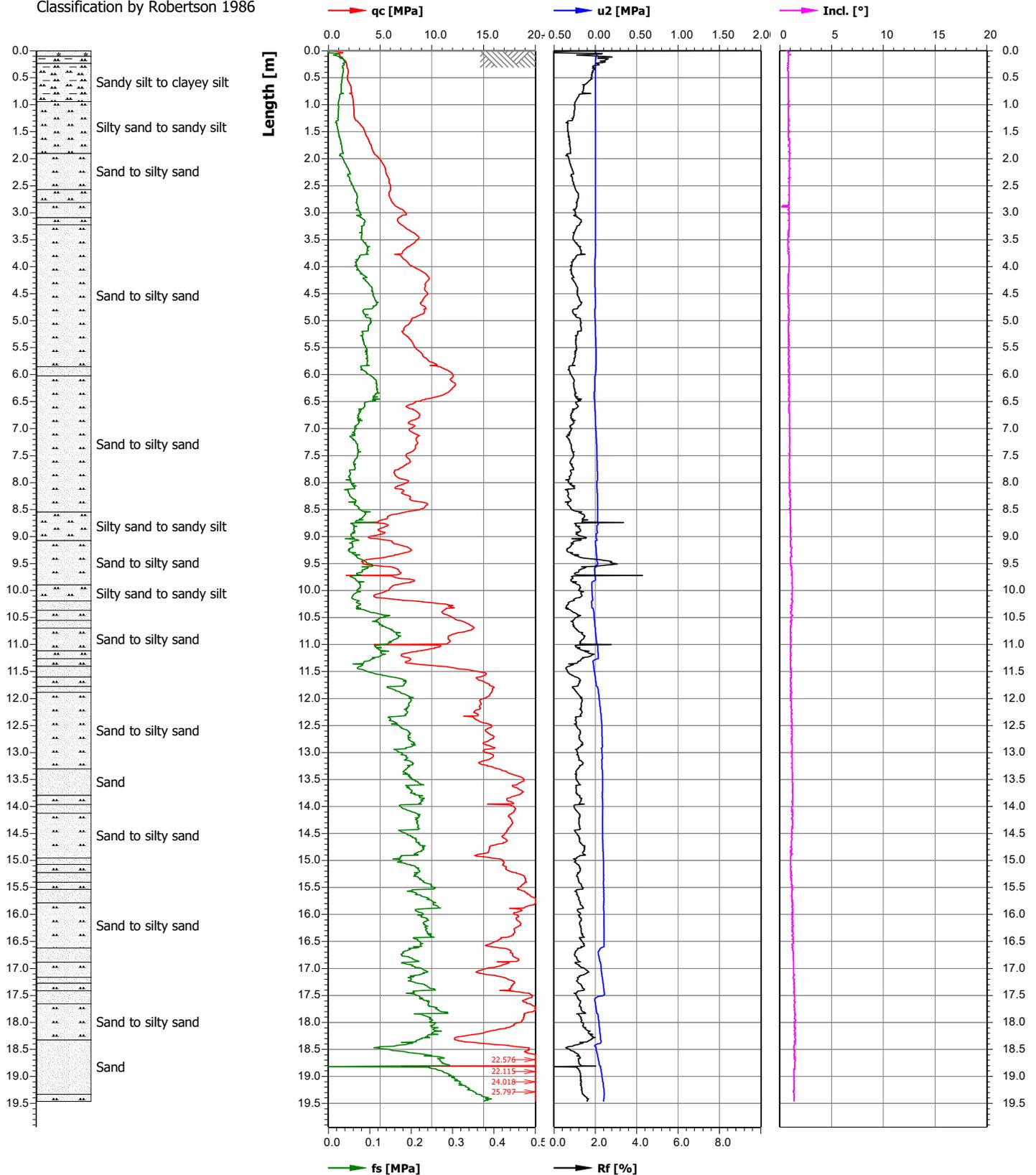
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		3/05/2024
	Test name	CPT15	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/1	
Remarks1					

Refusal Max Friction Pressure at 19.45m - W/L Collapsed at 3.2m

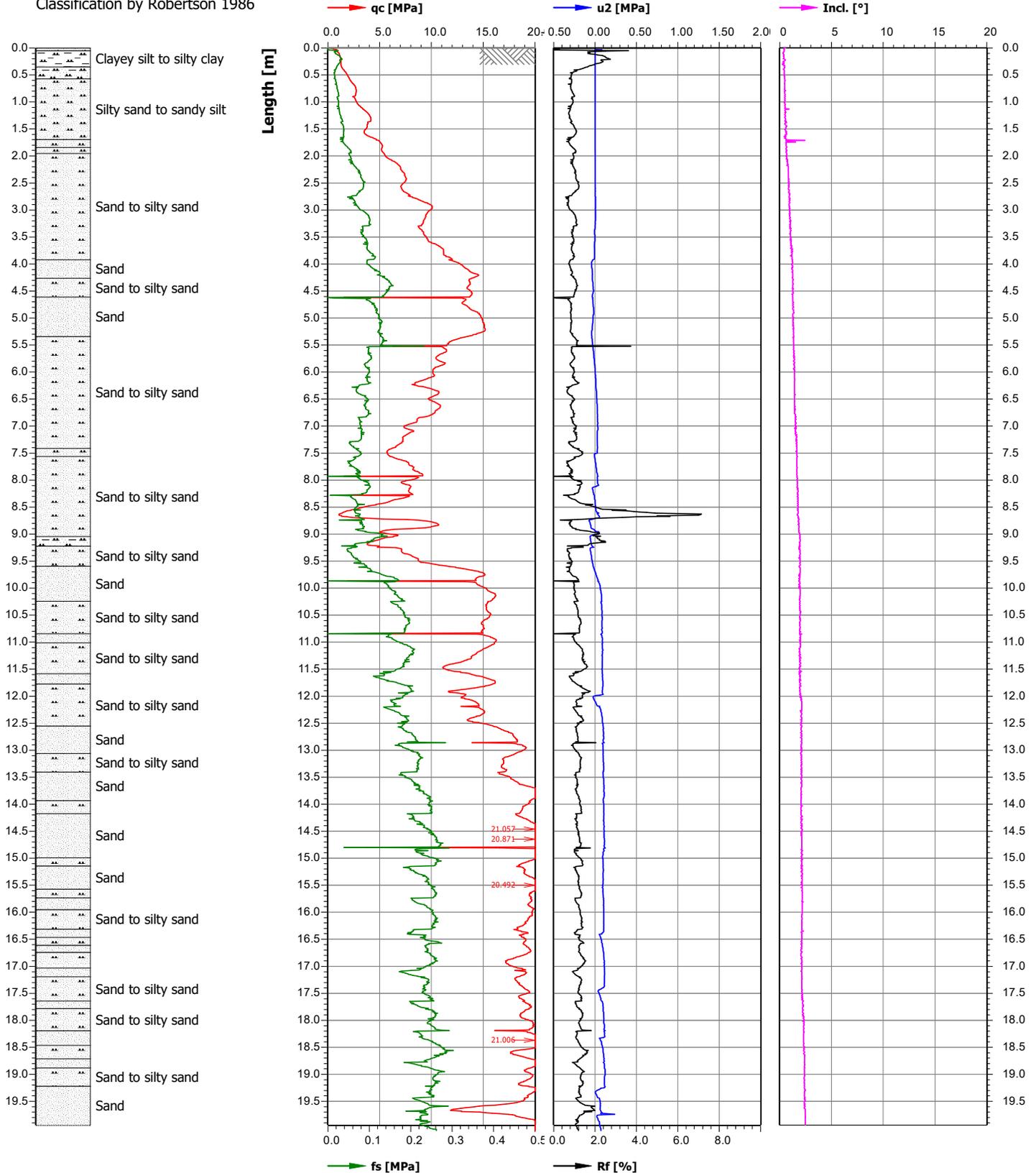
Classification by Robertson 1986



Project name	0001	Date investigation	2/05/2024	
Test name	CPT16	Cone name	S15-CFIP.1717	
Test location name	65-73 RATANUI RD	Client	Riley Consultants	Net surface area quotient of ... 0.790/0.000
X coordinate [m]/Y coordinat...	Project contractors	Project engineer	Scale	Nominal surface area of cone... 15.0/225.0
Z value [m]	0.00	Project engineer	1:100	Page 1/2
Remarks1				

Target Depth Reached at 20m - W/L Collapsed at 2.7m

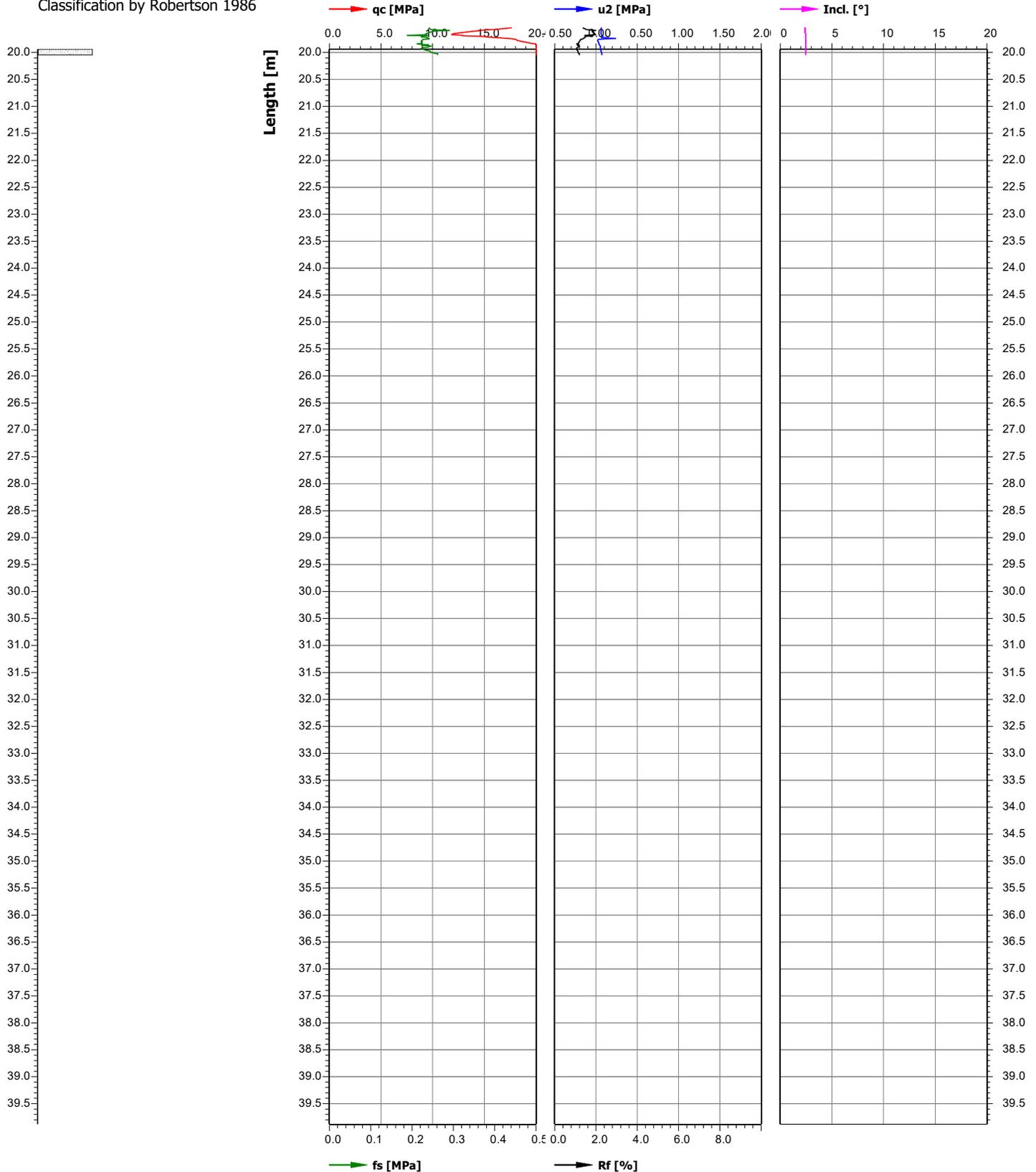
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT16	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2.7m

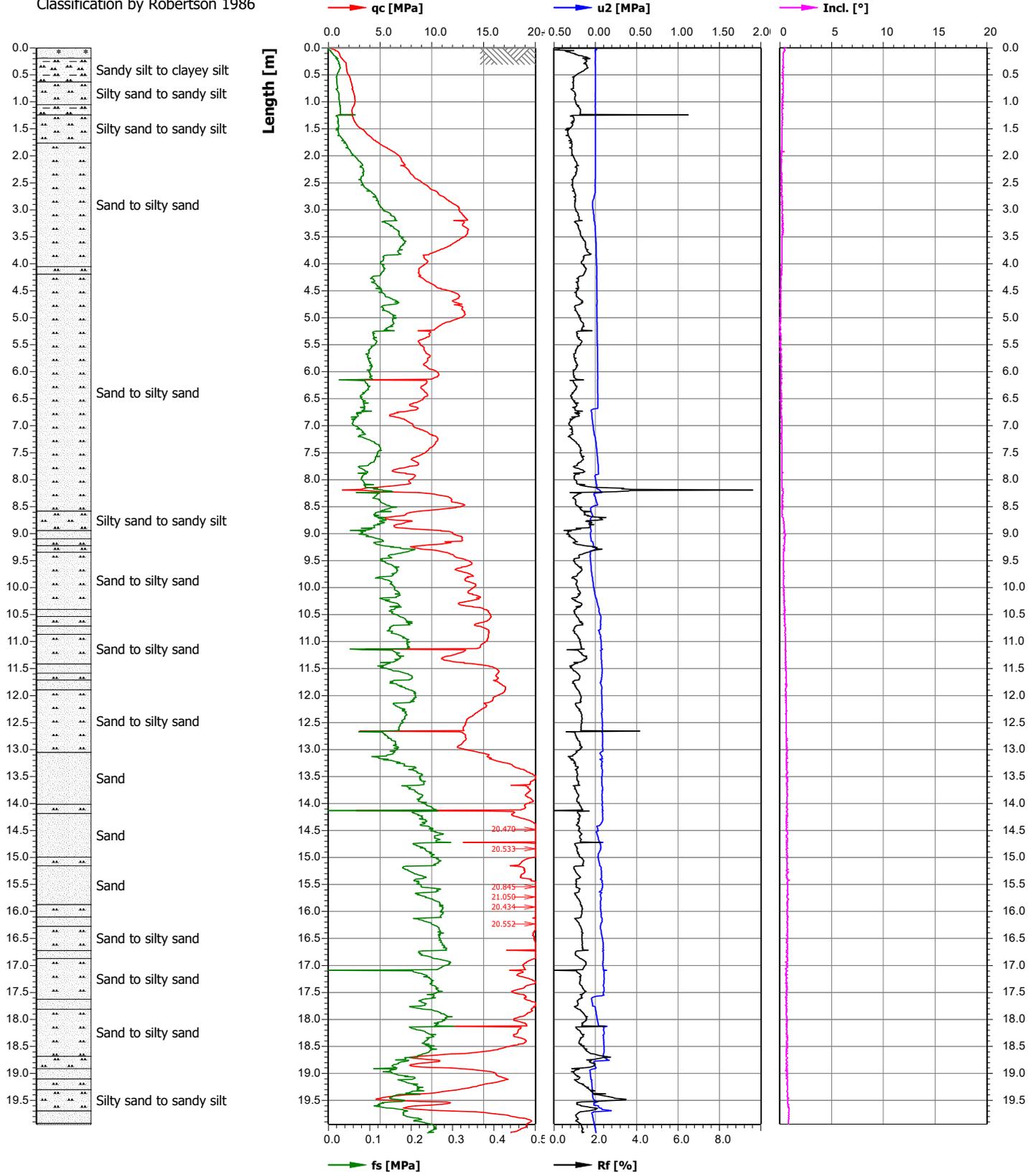
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT17	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2.3m

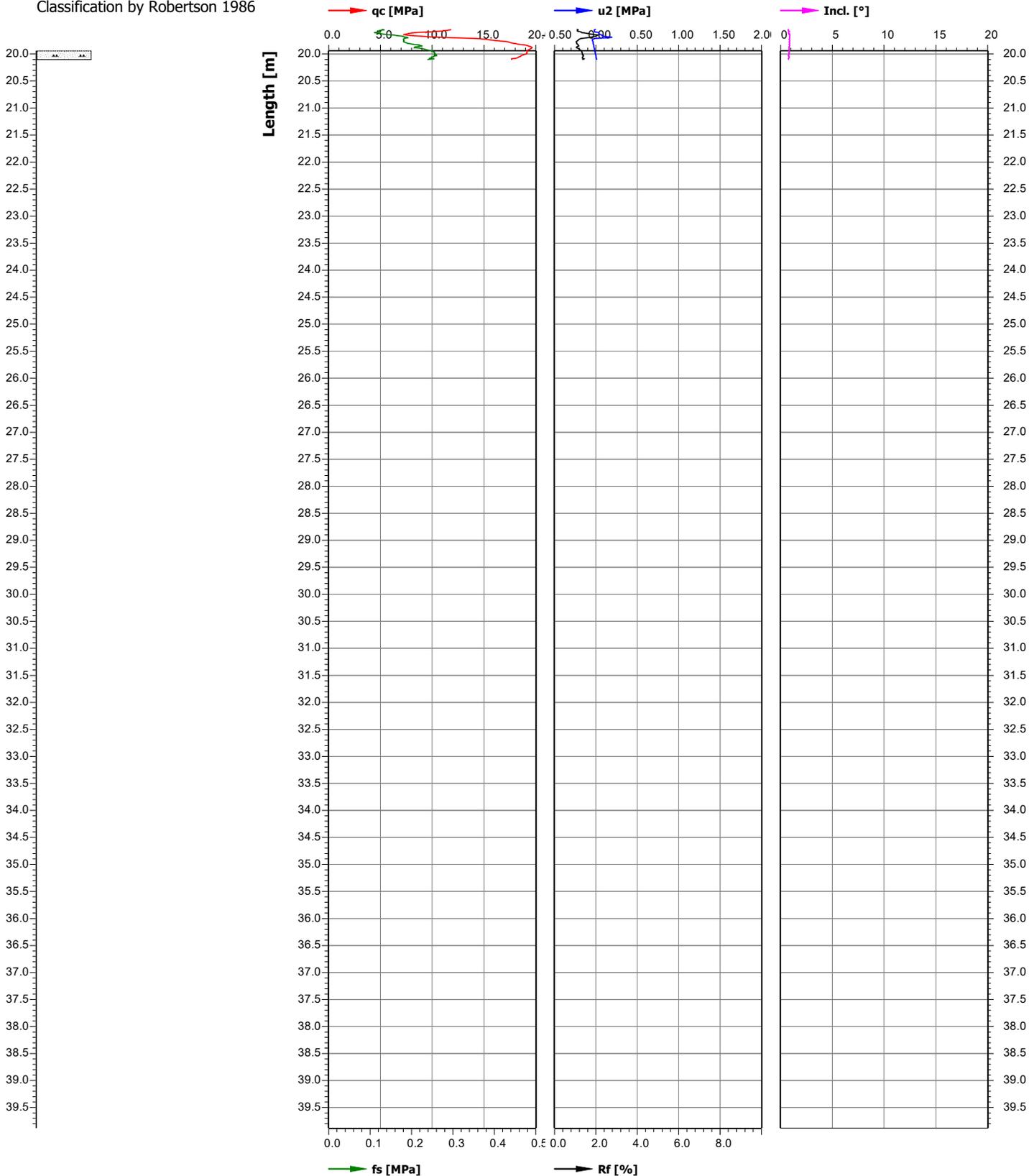
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT17	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2.3m

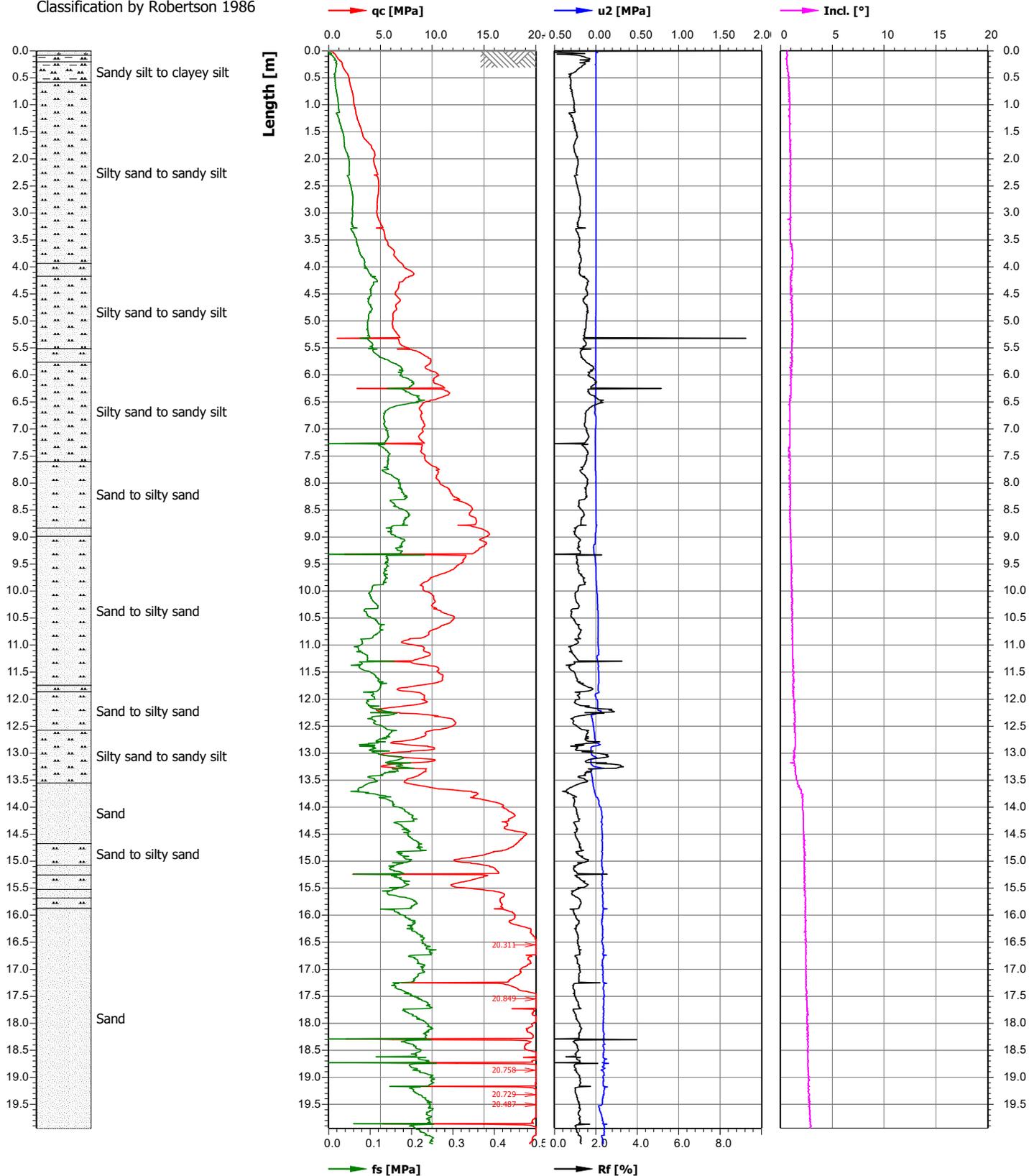
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT18	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed

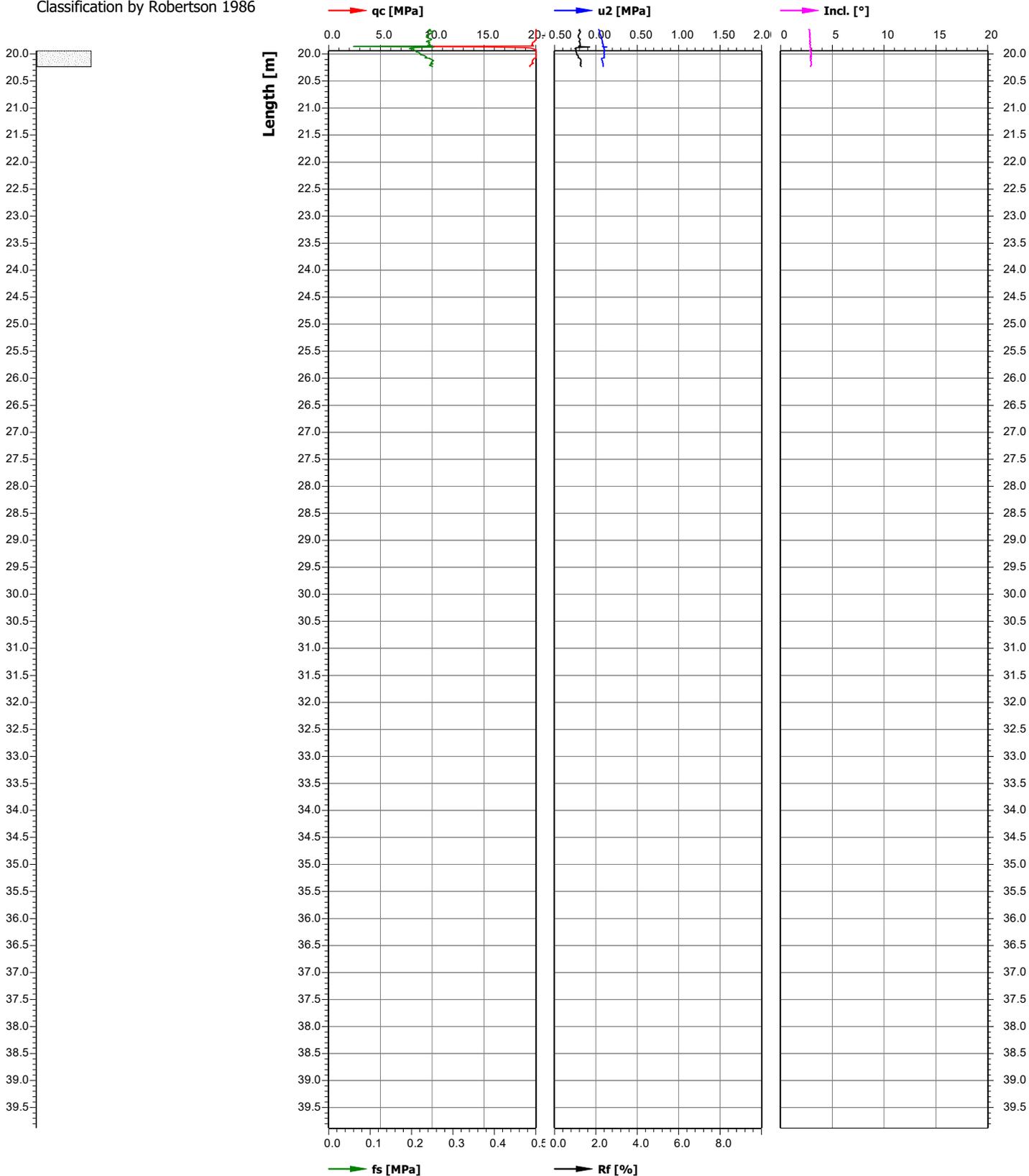
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT18	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed

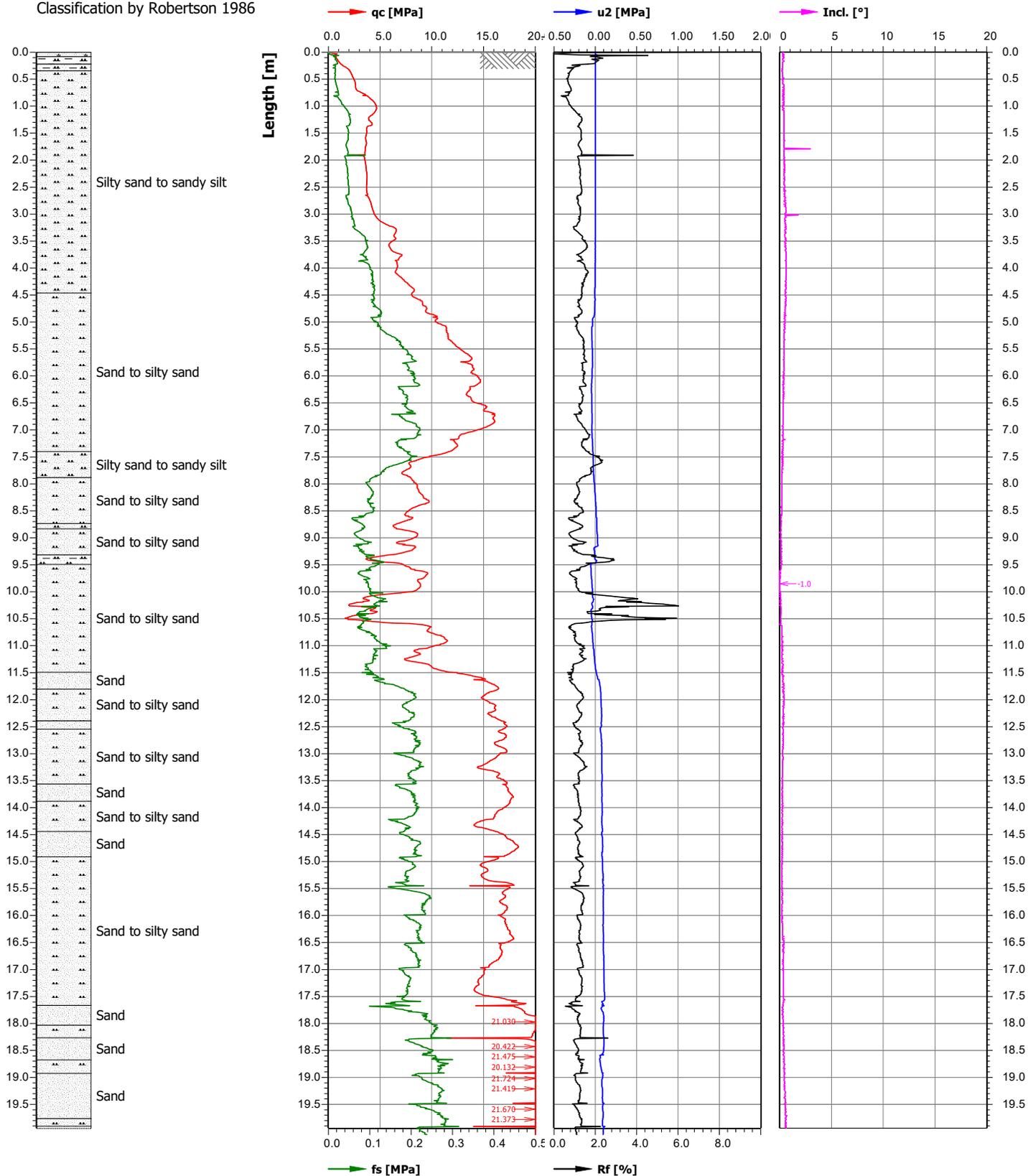
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT19	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.2m

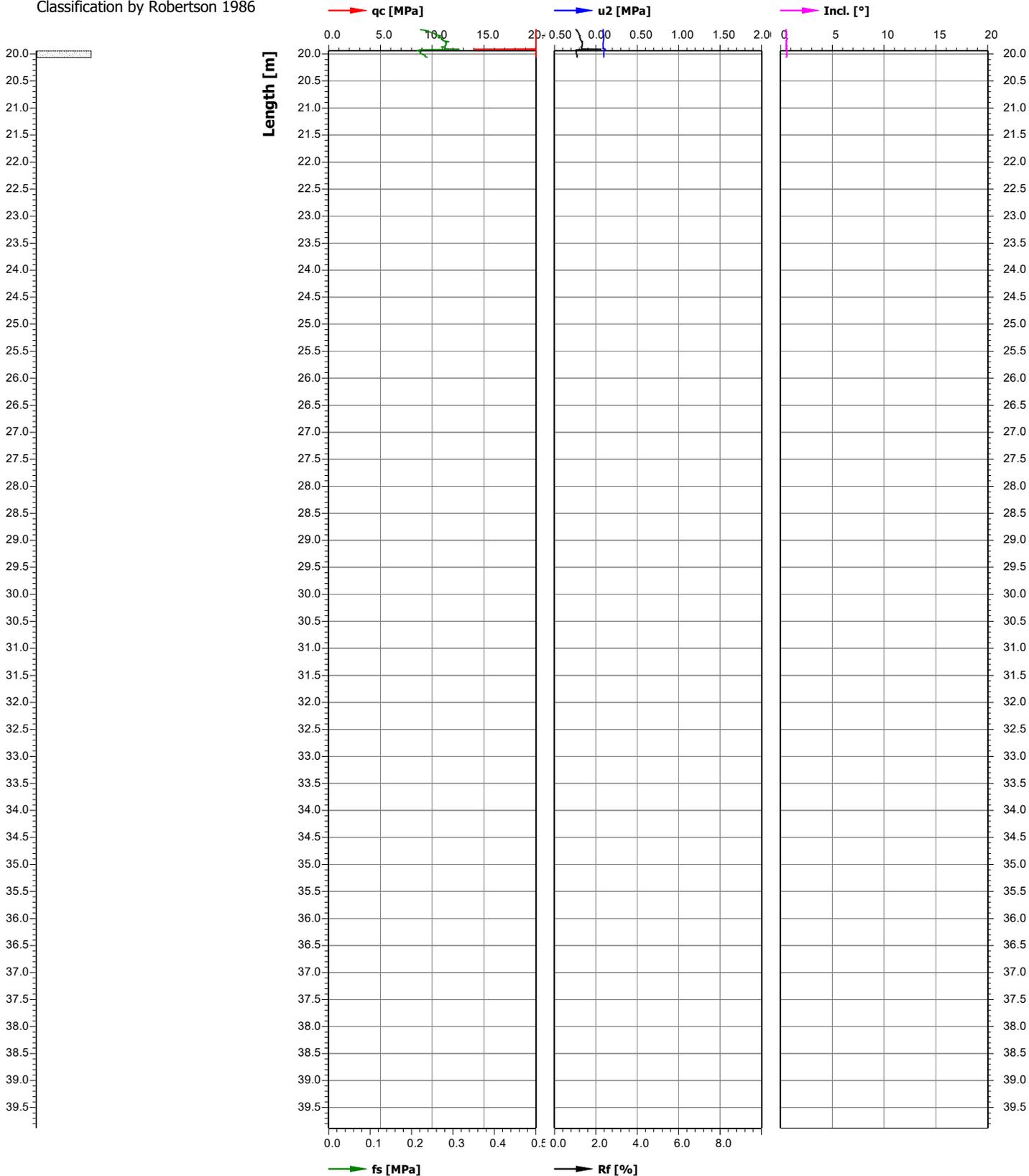
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT19	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.2m

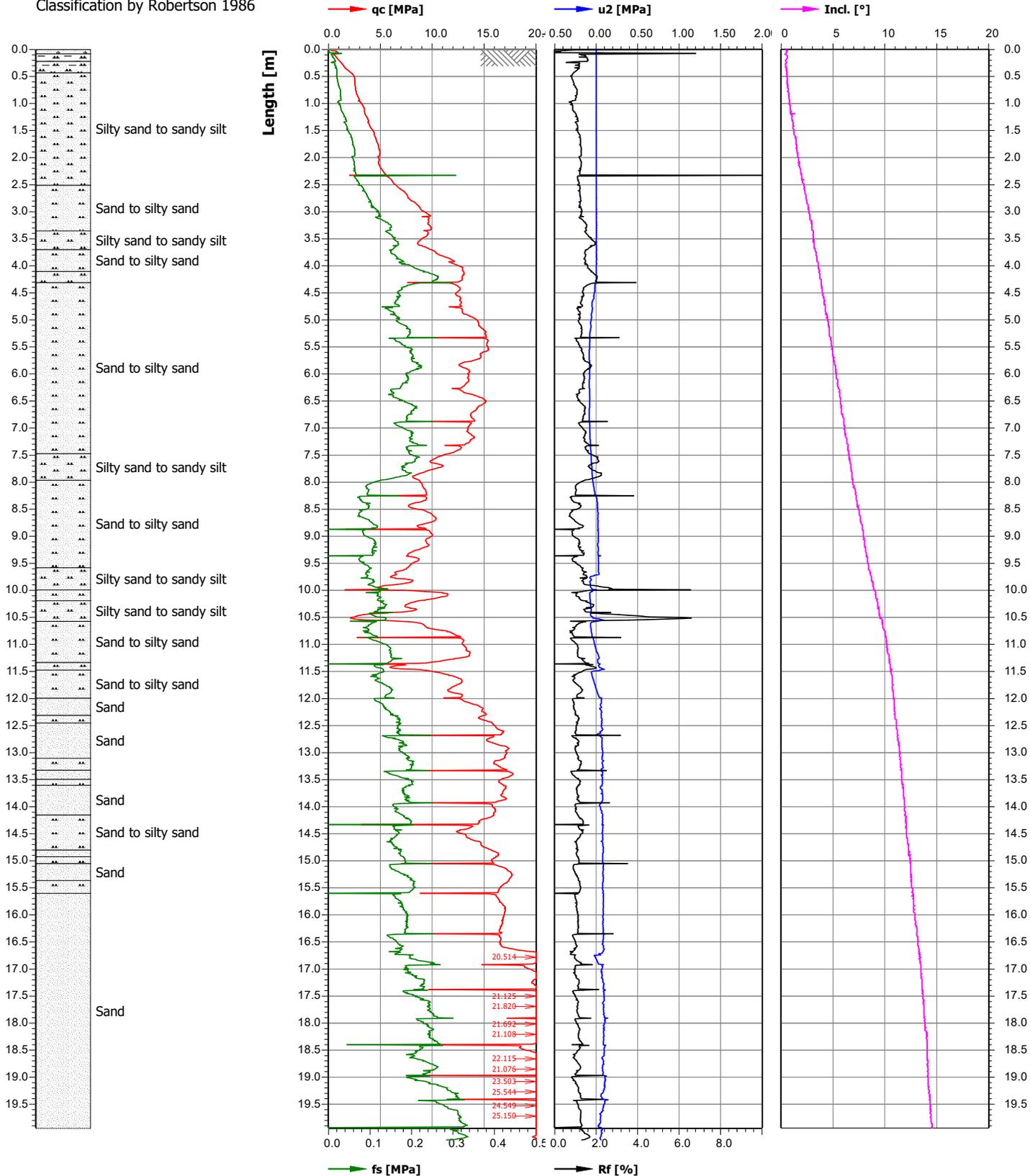
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT20	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.2m

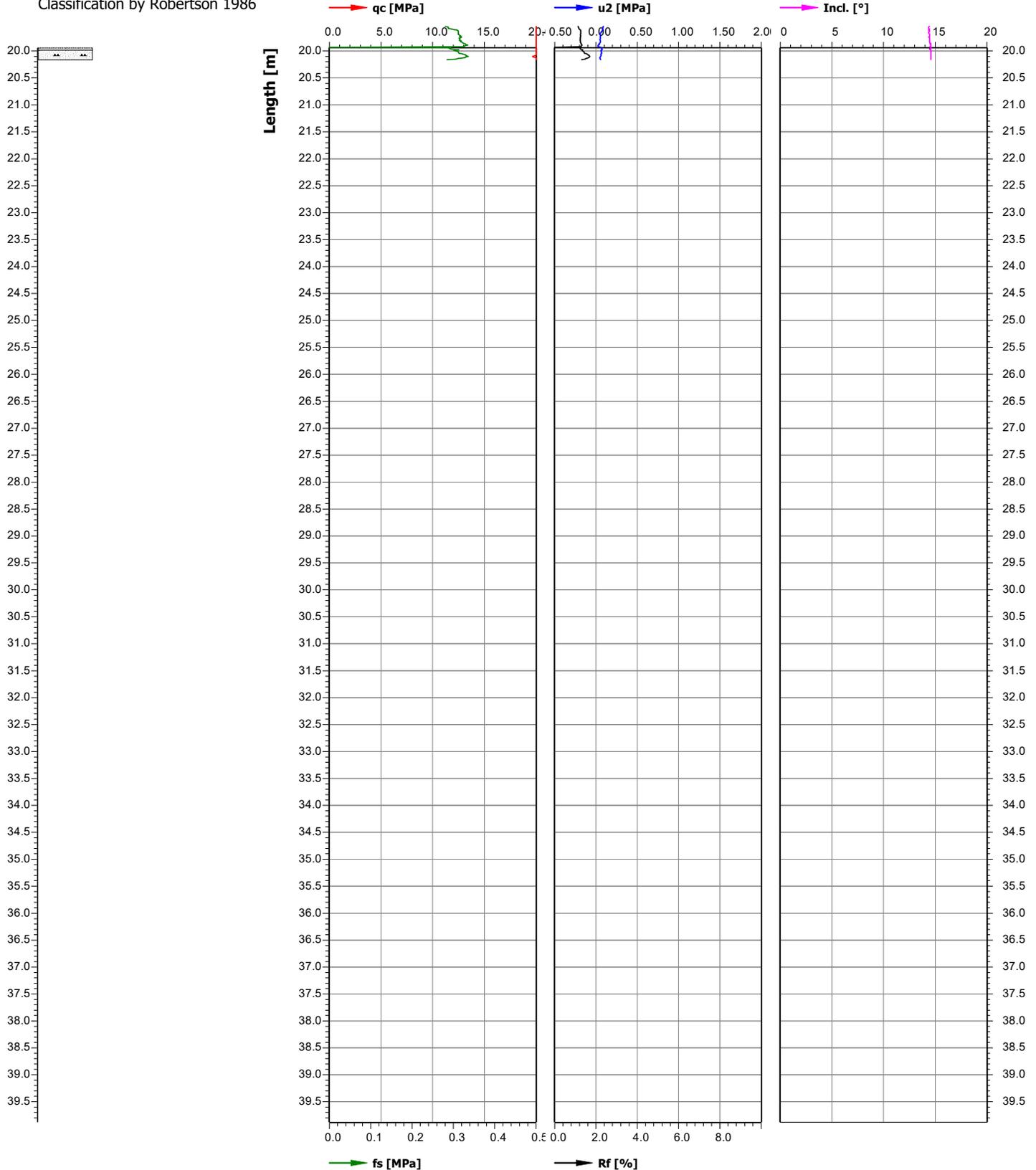
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT20	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.2m

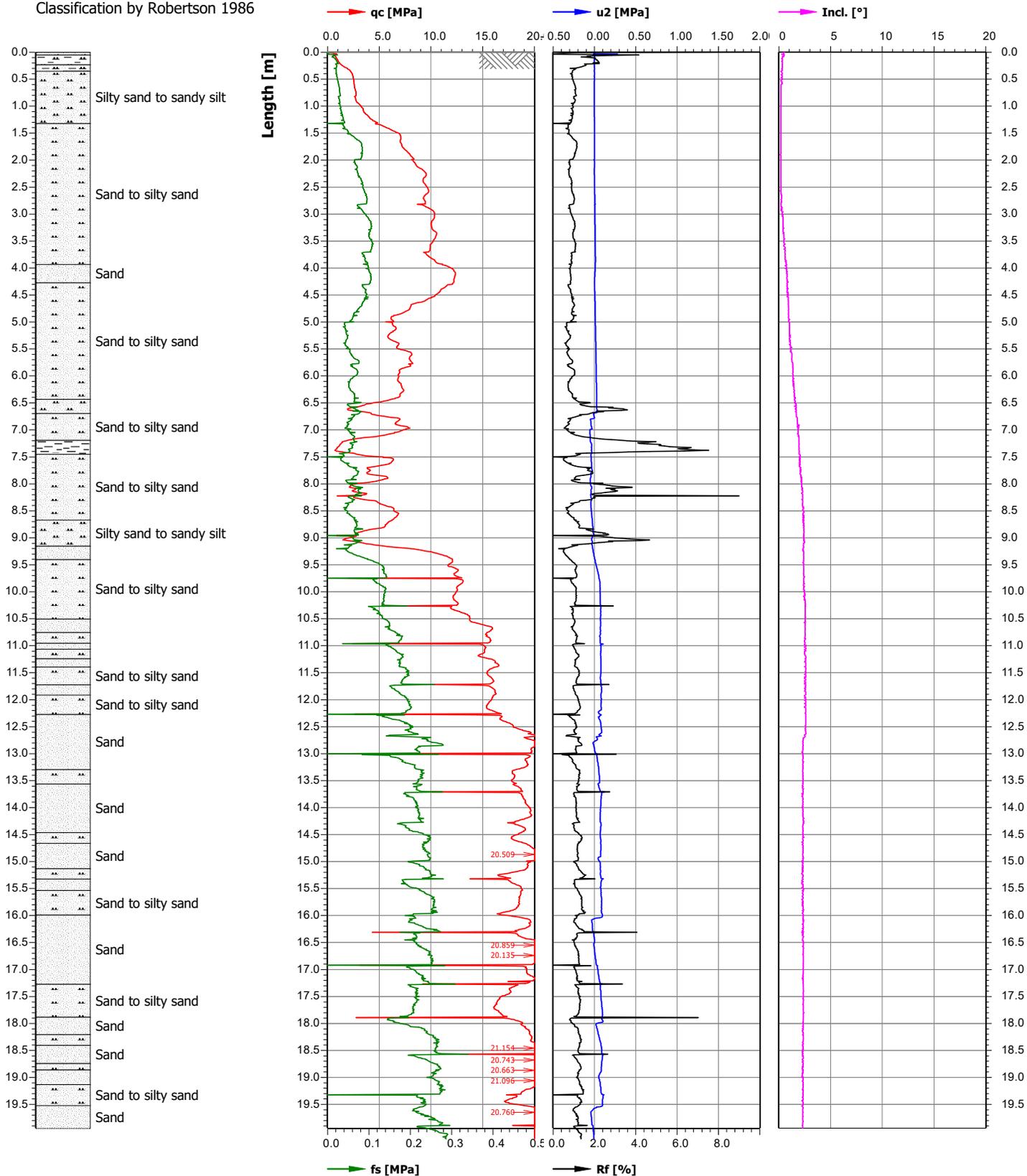
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT21	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2m

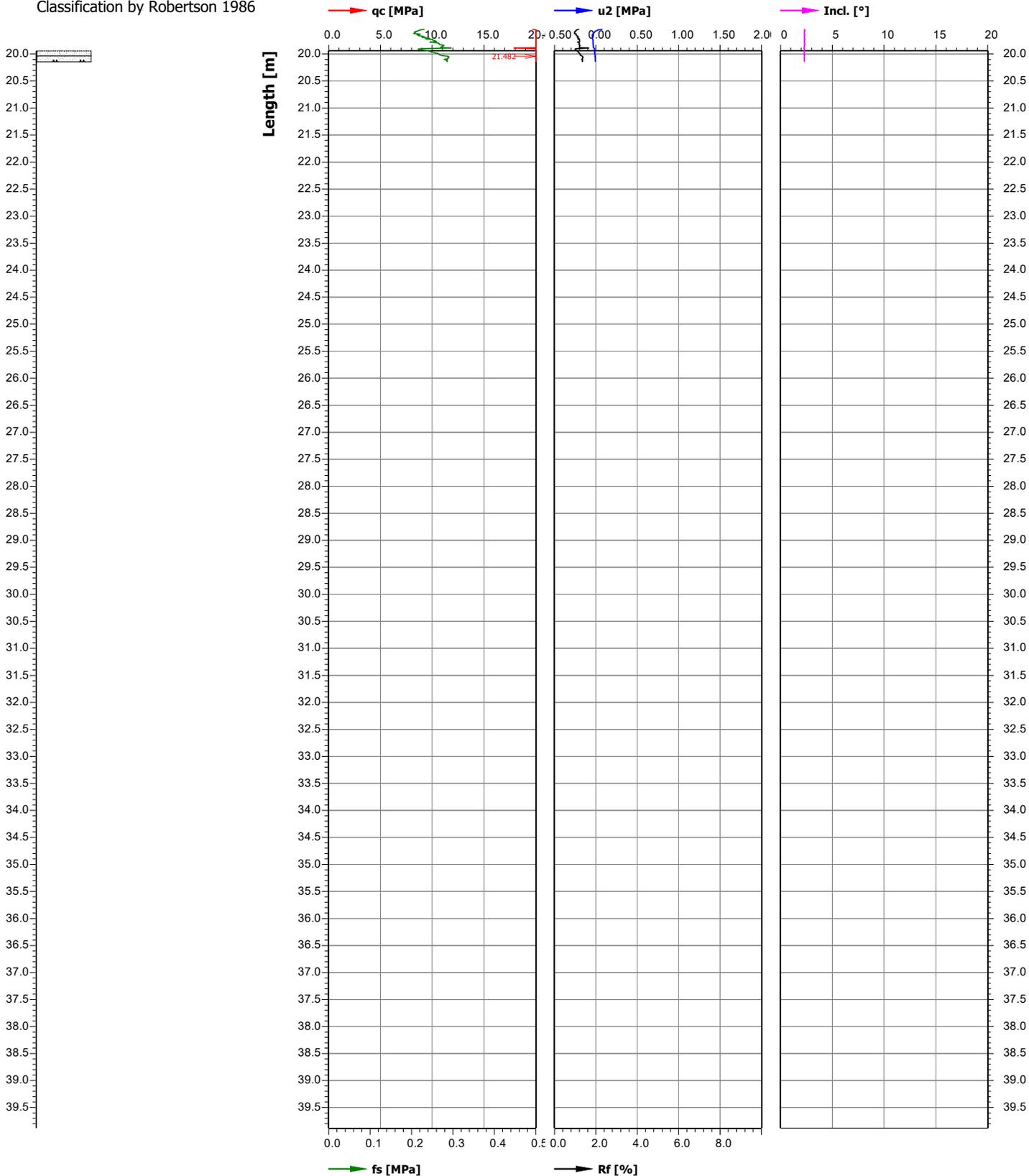
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT21	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 2m

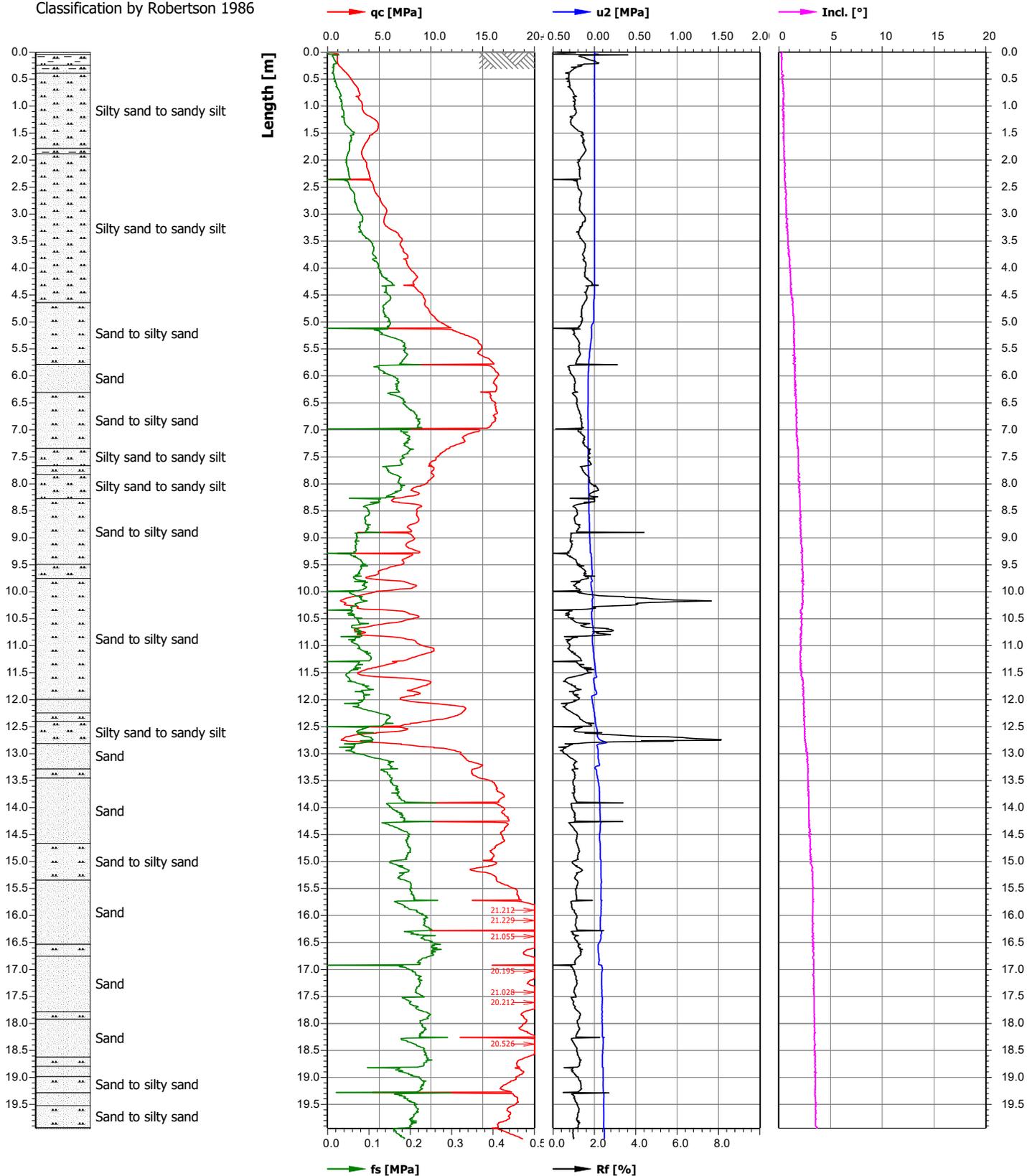
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	0001	Date investigation		2/05/2024
	Test name	CPT22	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	1/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.5m

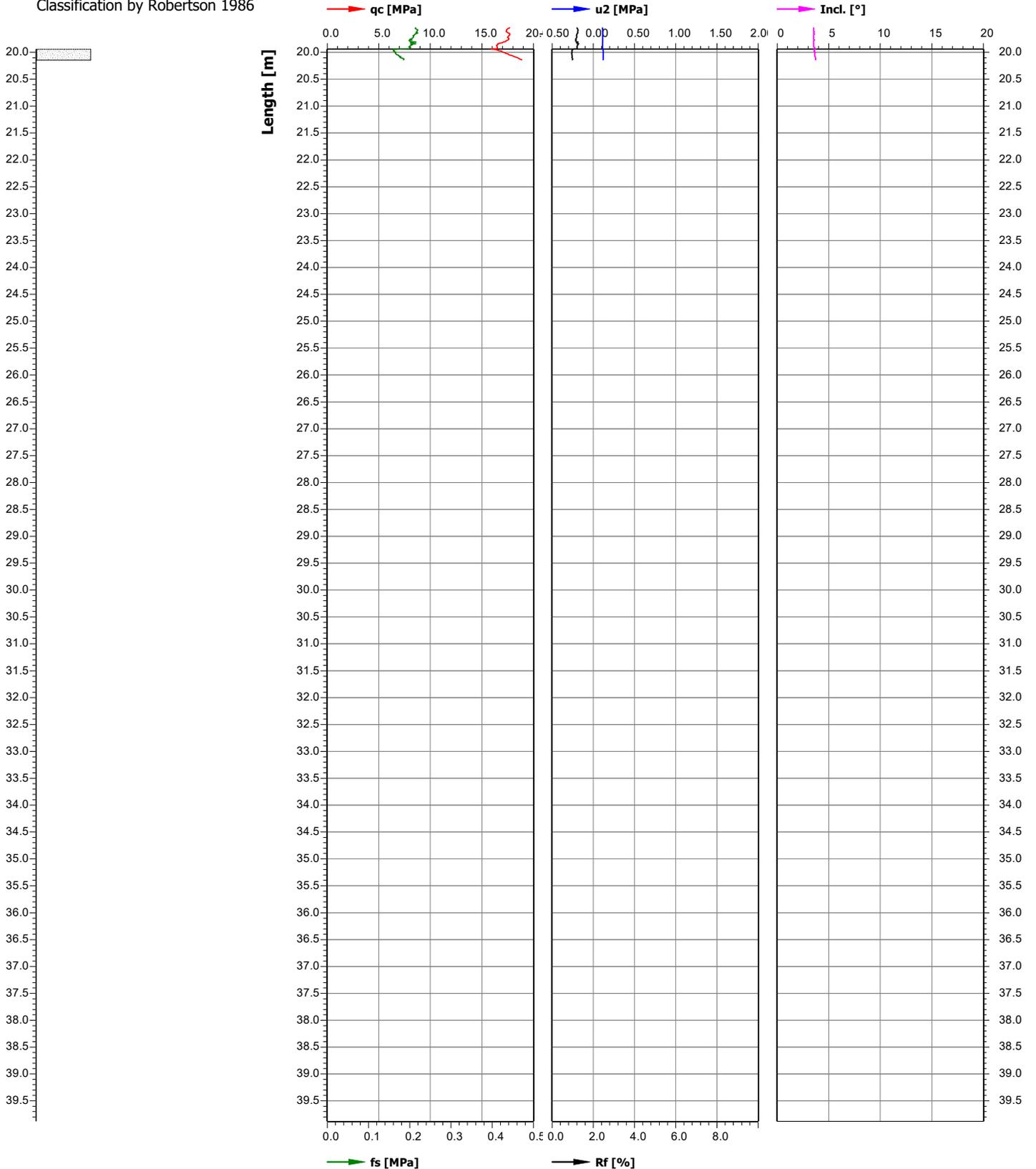
Classification by Robertson 1986



	Project name	0001	Date investigation		2/05/2024
	Test name	CPT22	Cone name		S15-CFIP.1717
Test location name	Client	Riley Consultants	Net surface area quotient of ...	Nominal surface area of cone...	
65-73 RATANUI RD			0.790/0.000	15.0/225.0	
X coordinate [m]/Y coordinat...	Project contractors		Fig. no.:		
Z value [m]	Project engineer		Scale	Page	
0.00			1:100	2/2	
Remarks1					

Target Depth Reached at 20m - W/L Collapsed at 4.5m

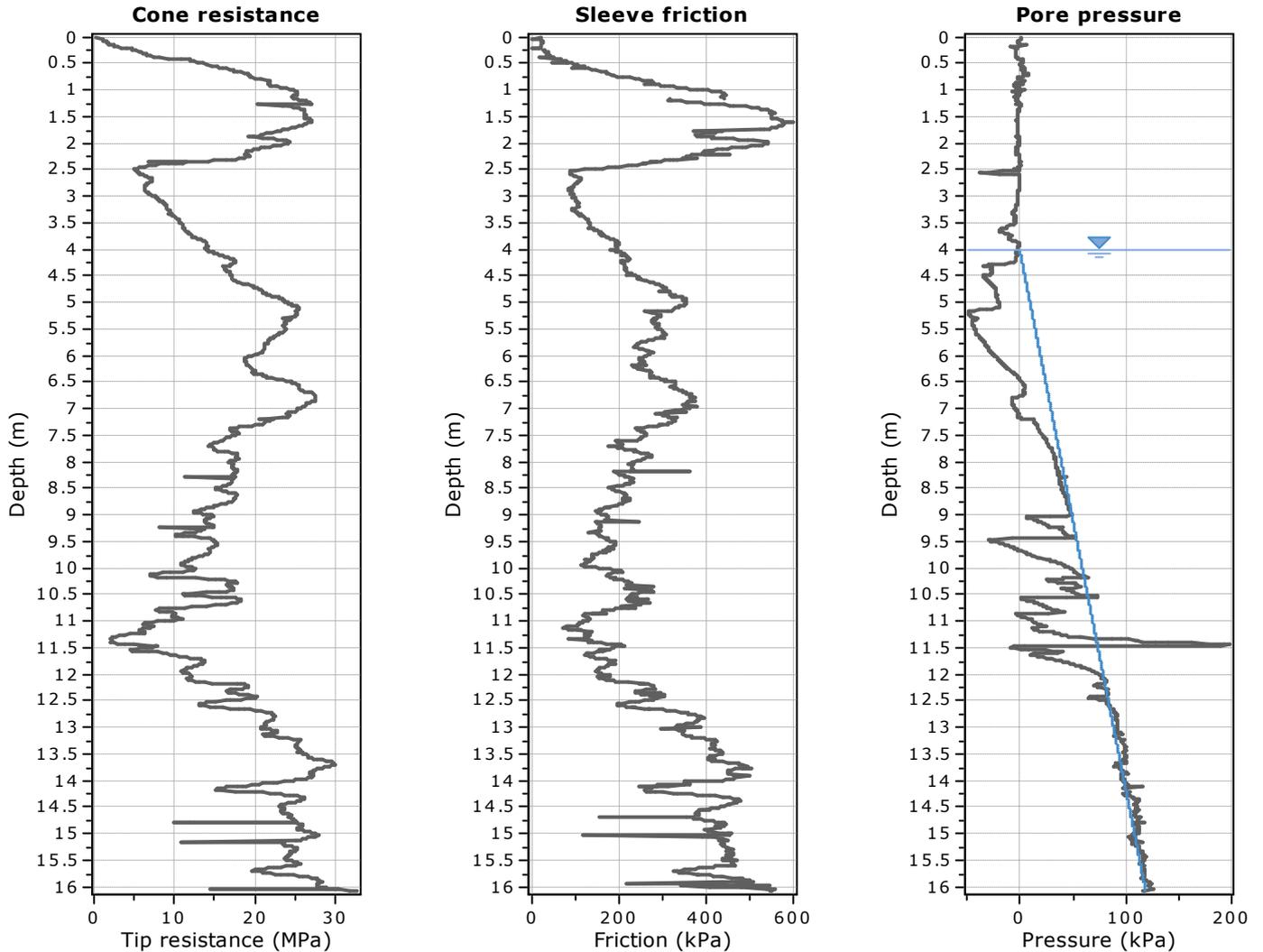
Classification by Robertson 1986





Appendix F

CPT Interpretation (CPet-IT) Outputs

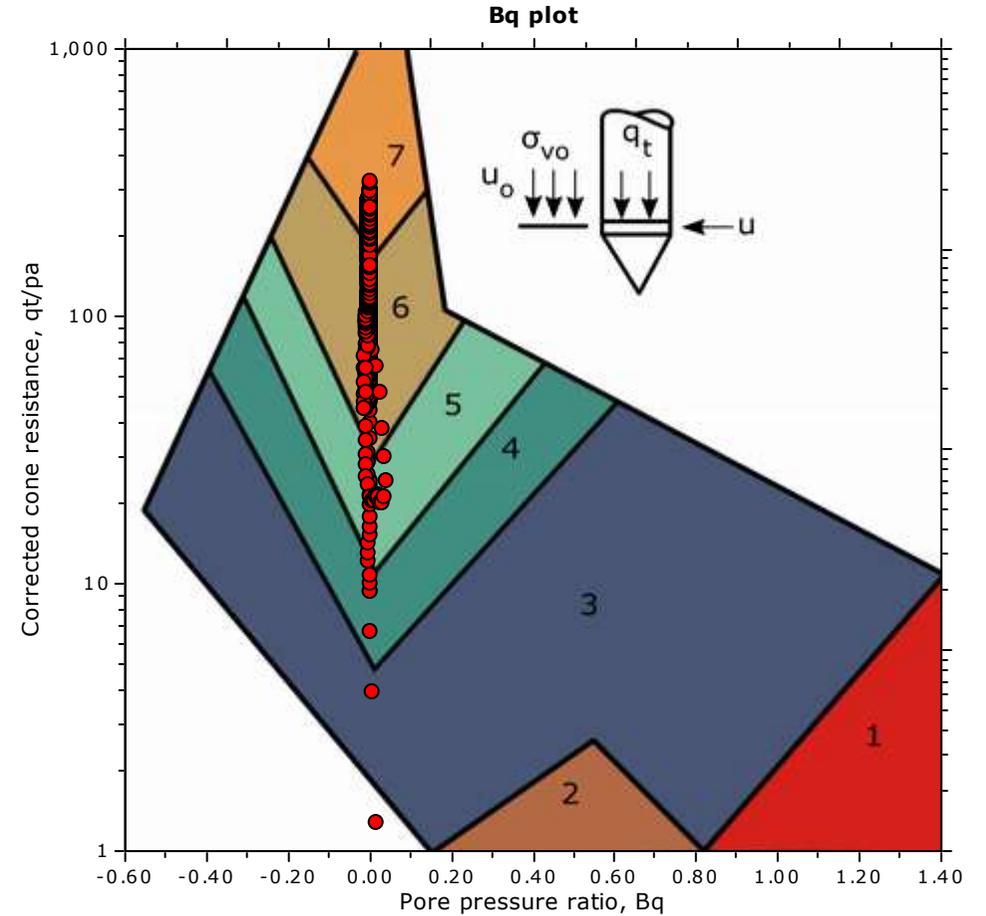
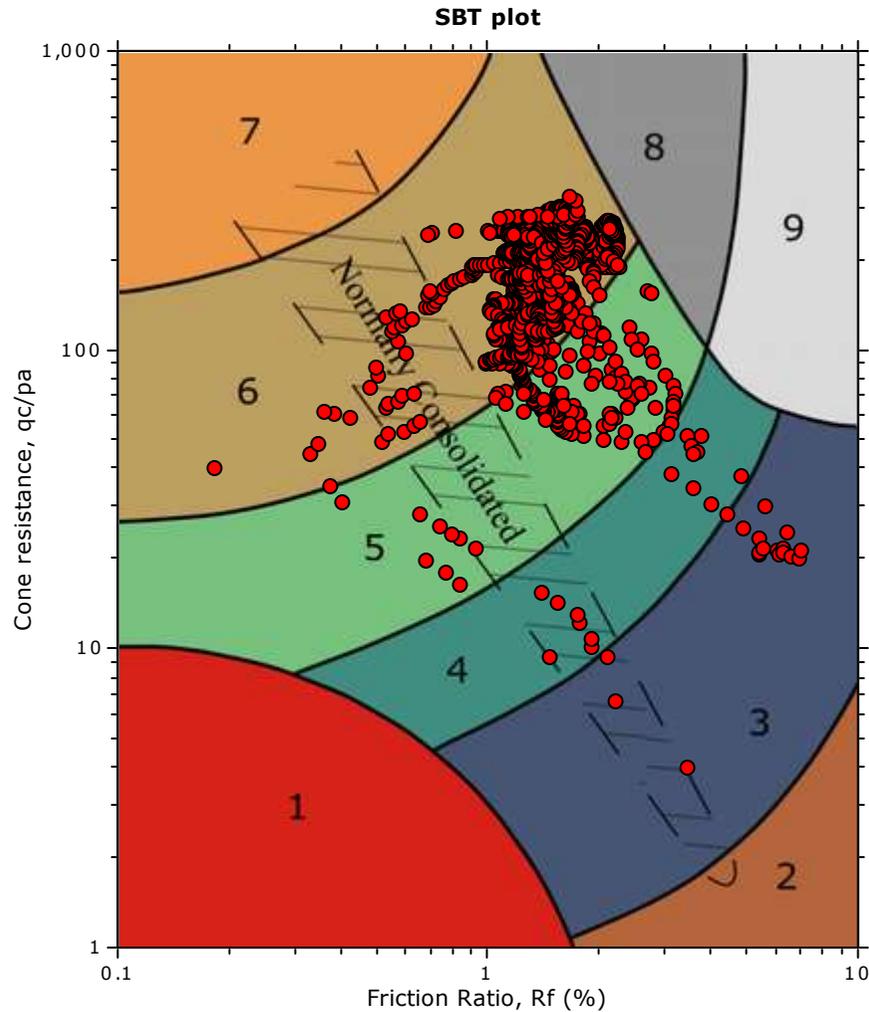


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

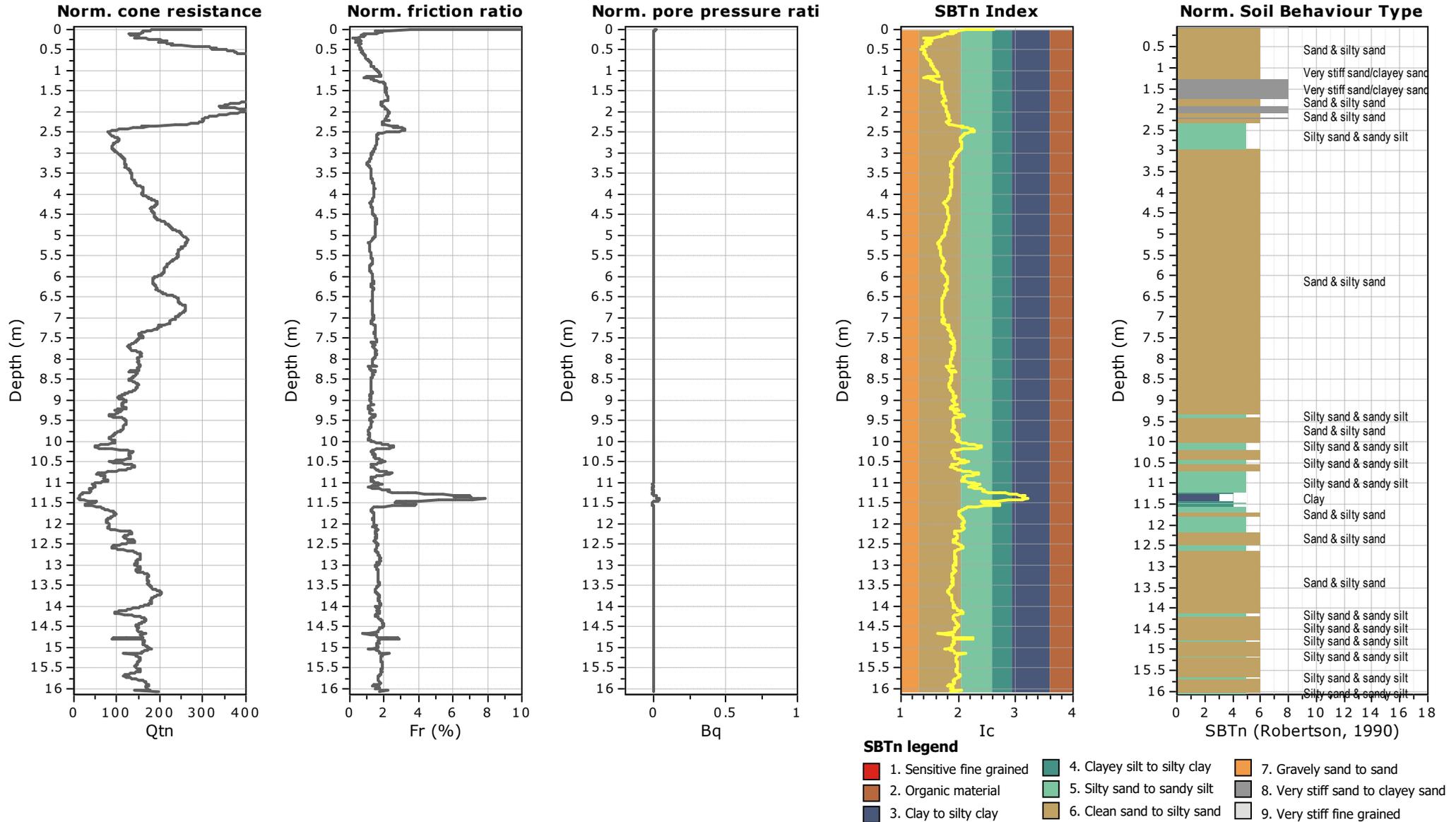


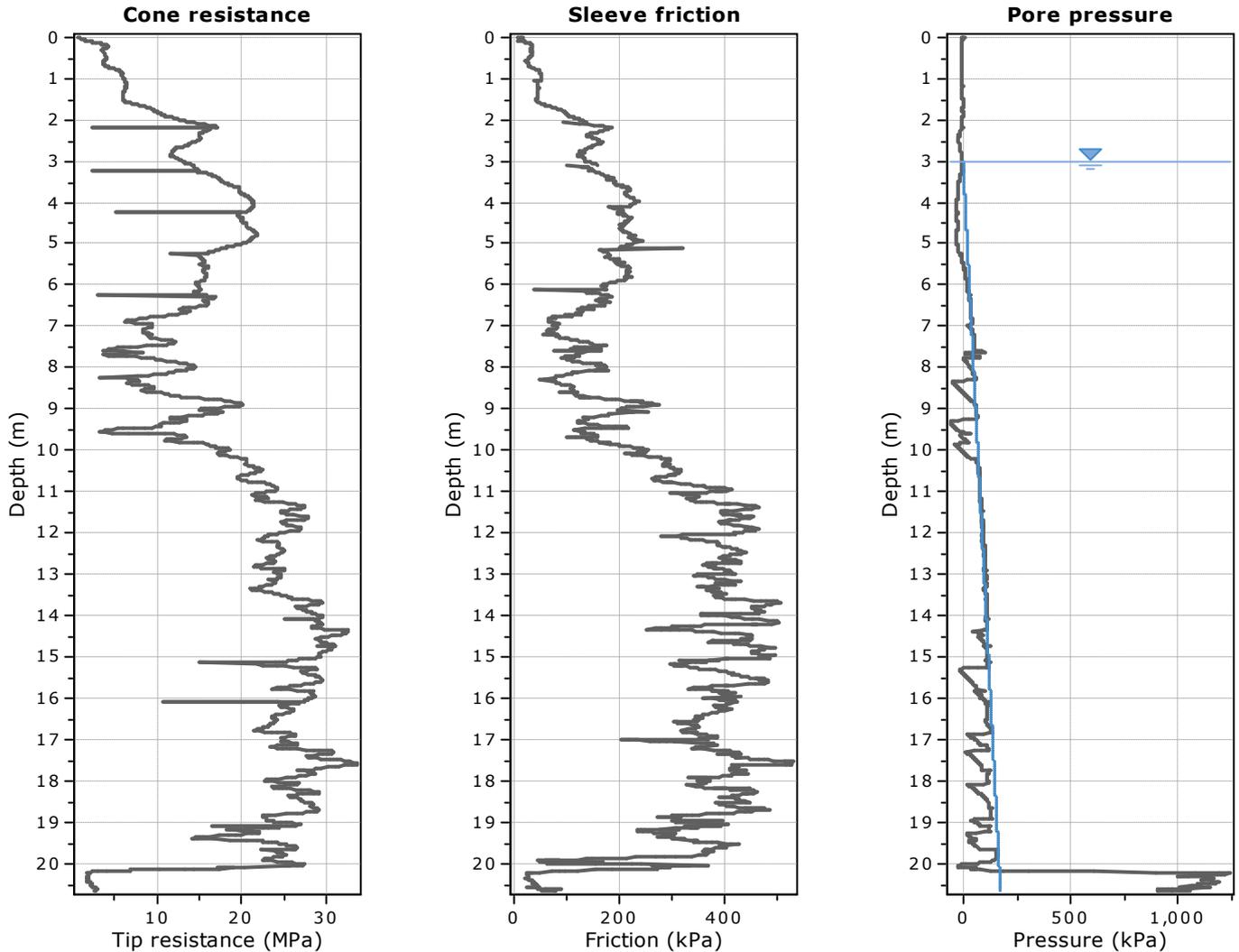
SBT - Bq plots



SBT legend

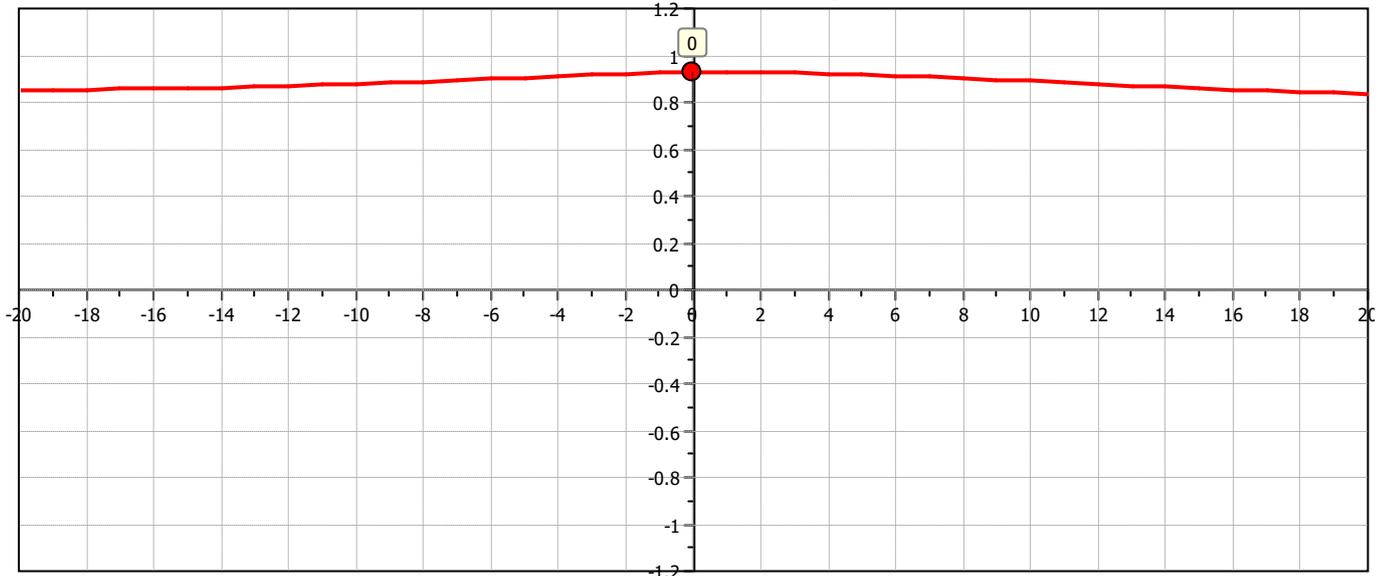
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



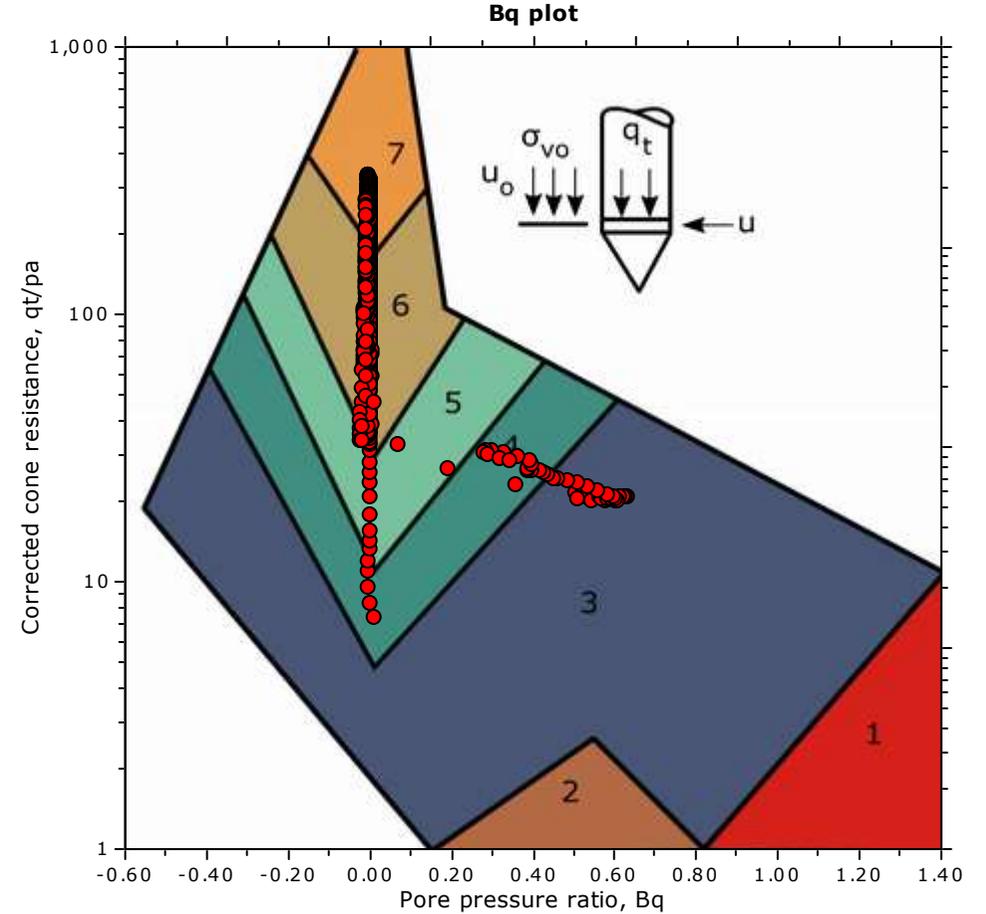
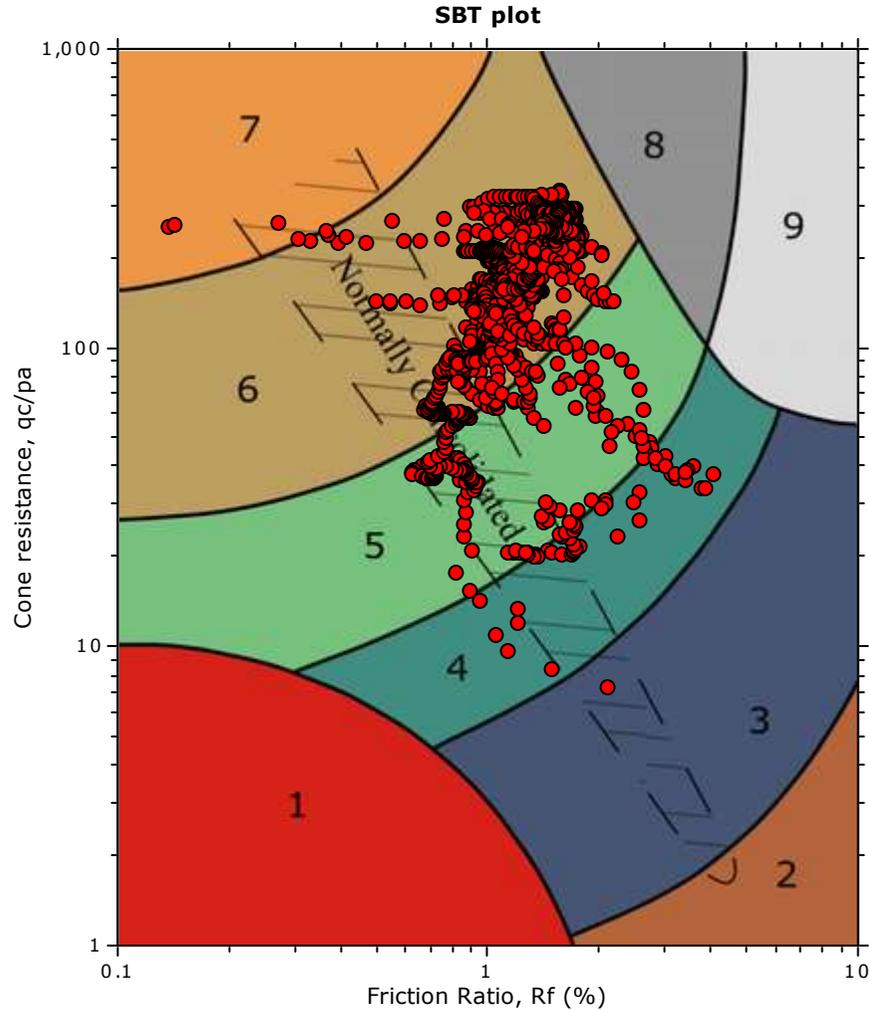


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

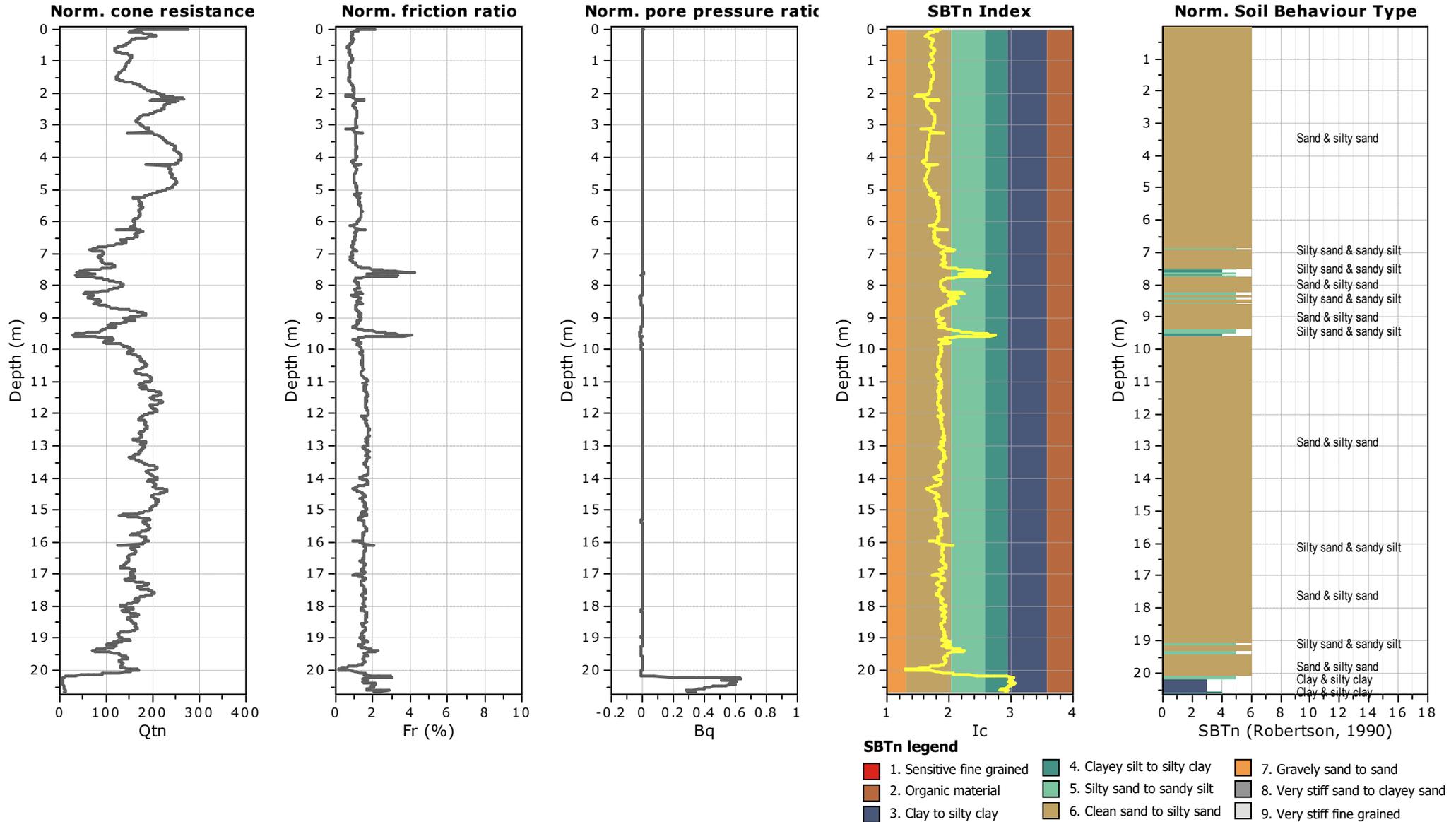


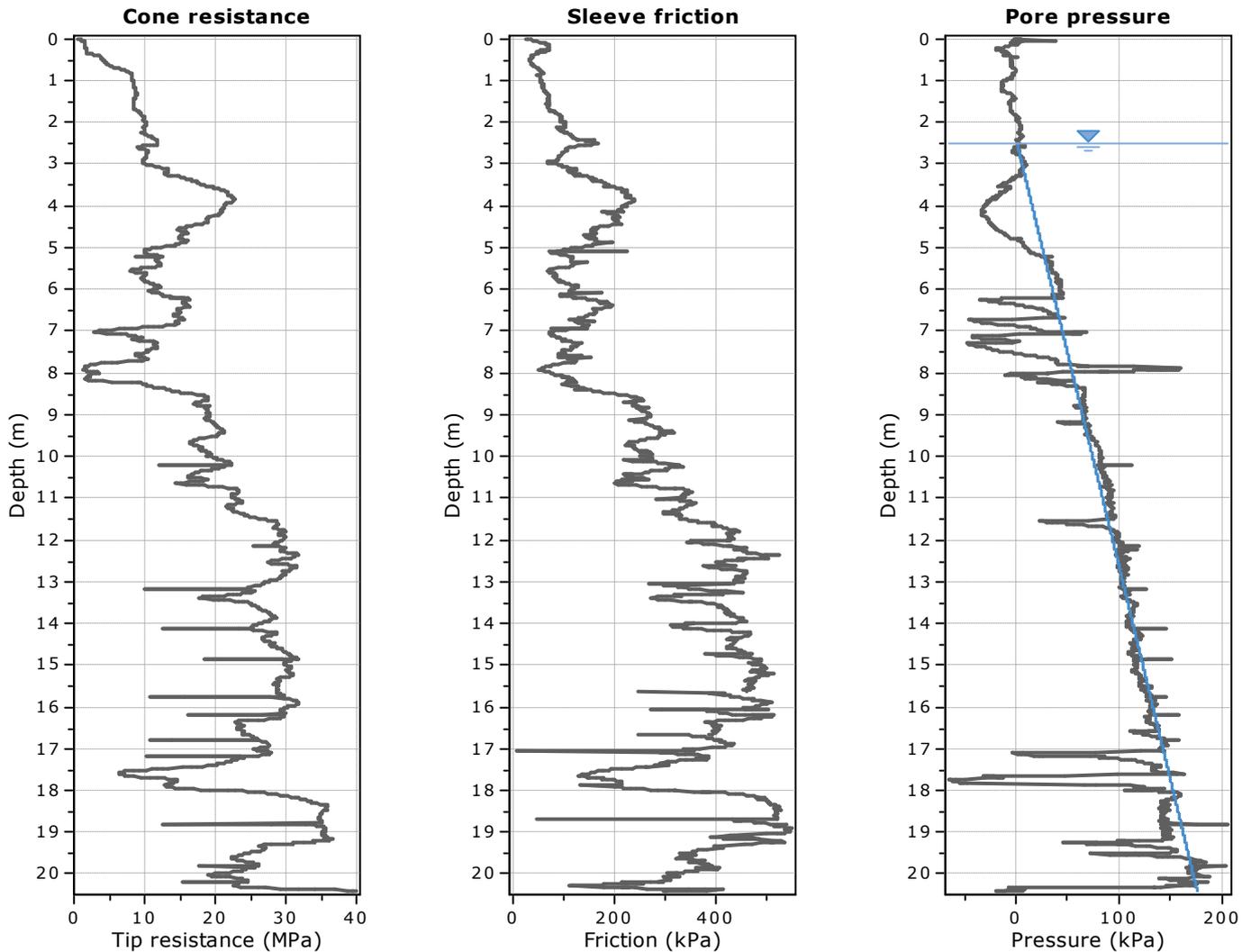
SBT - Bq plots



SBT legend

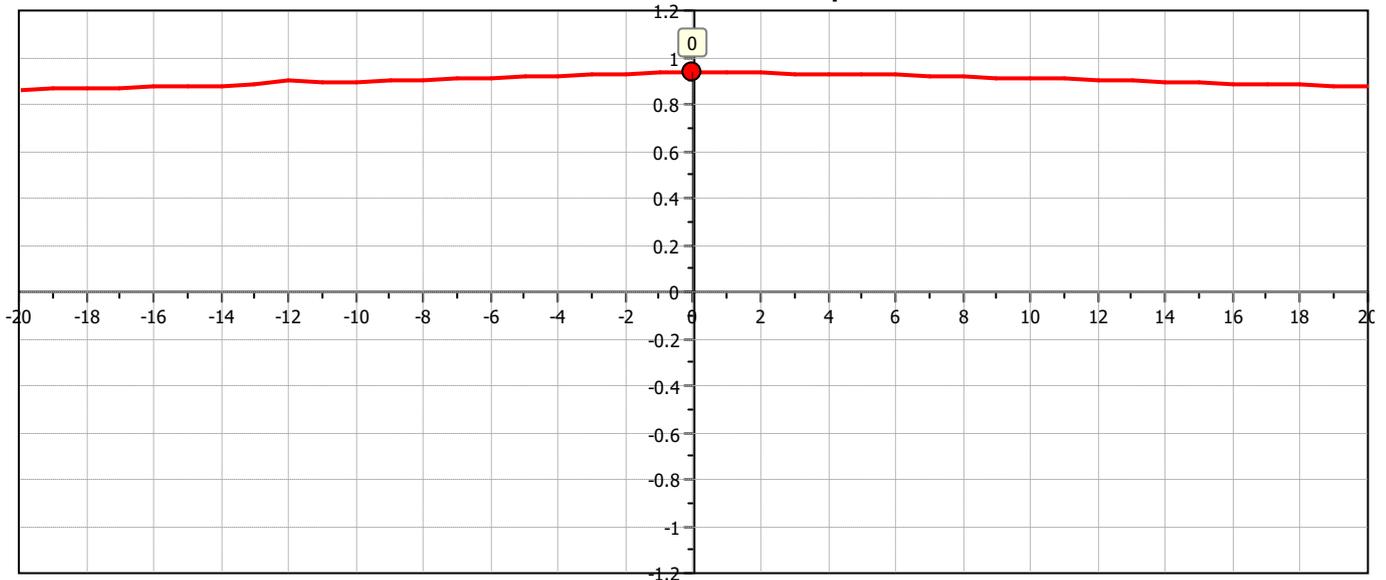
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



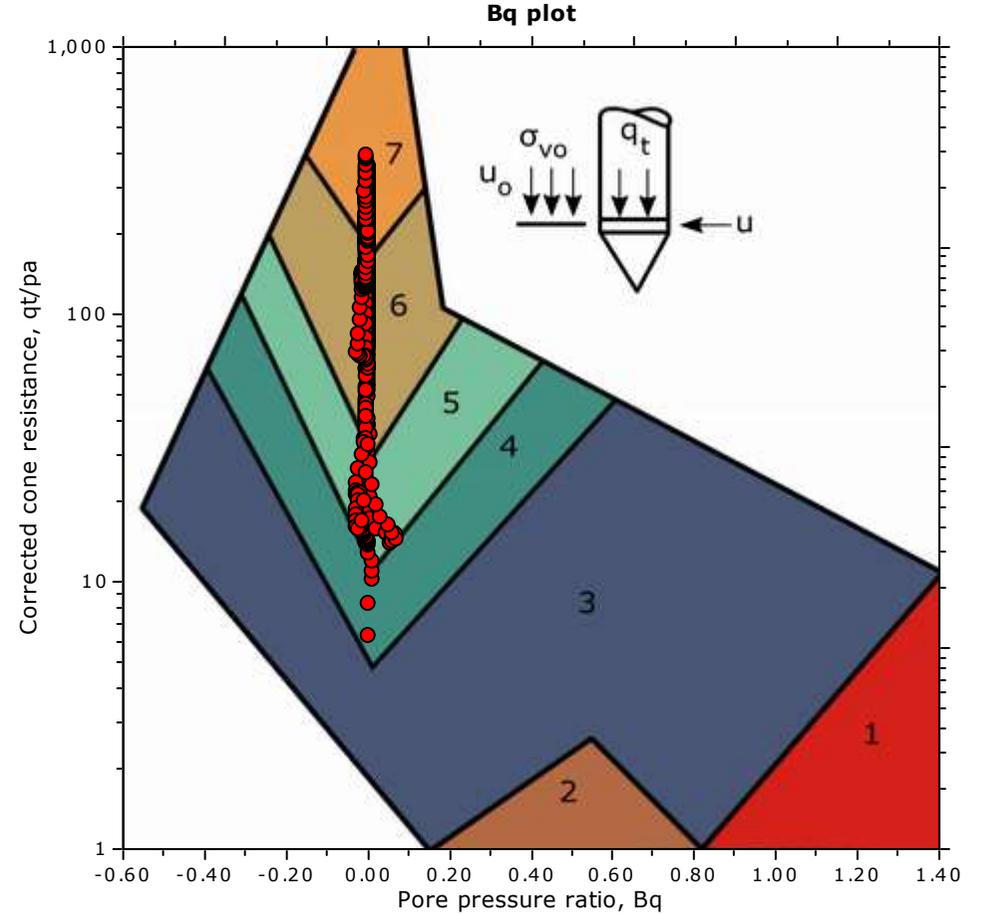
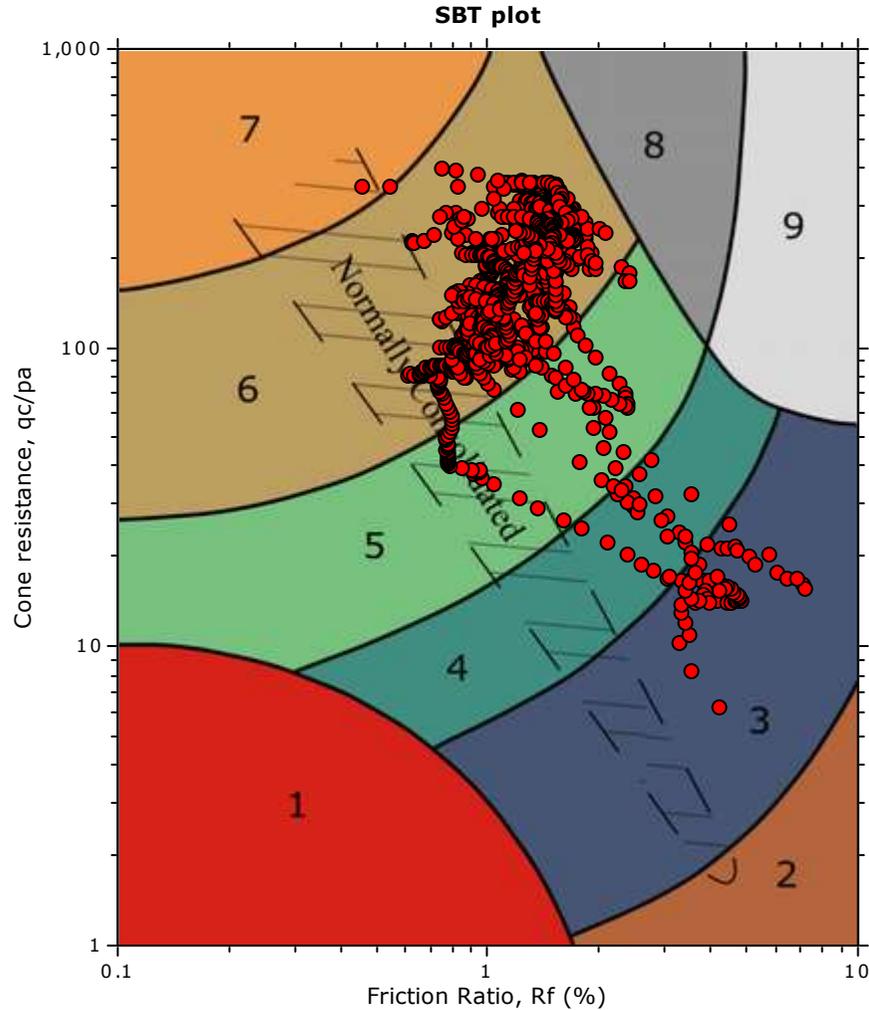


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

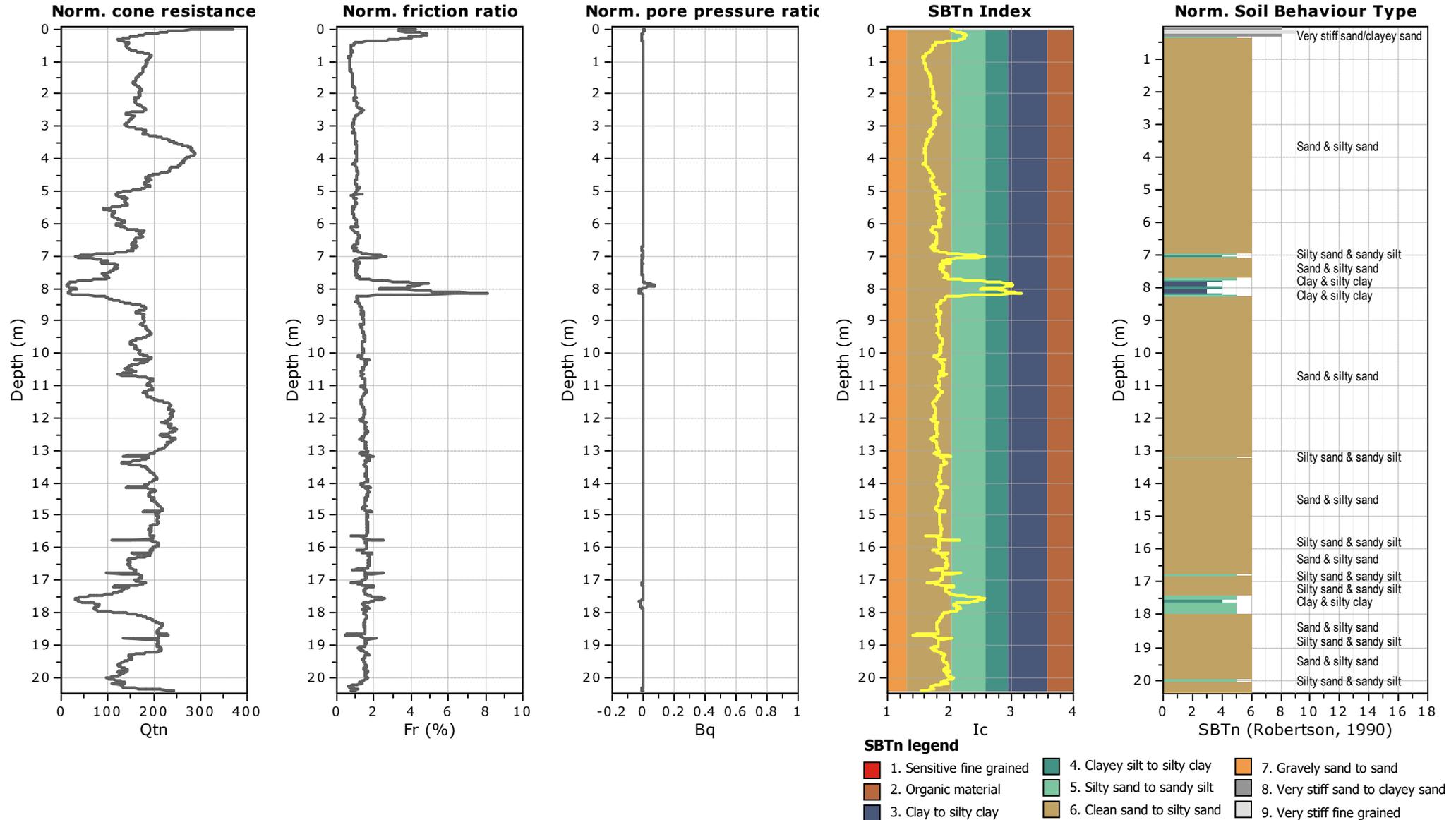


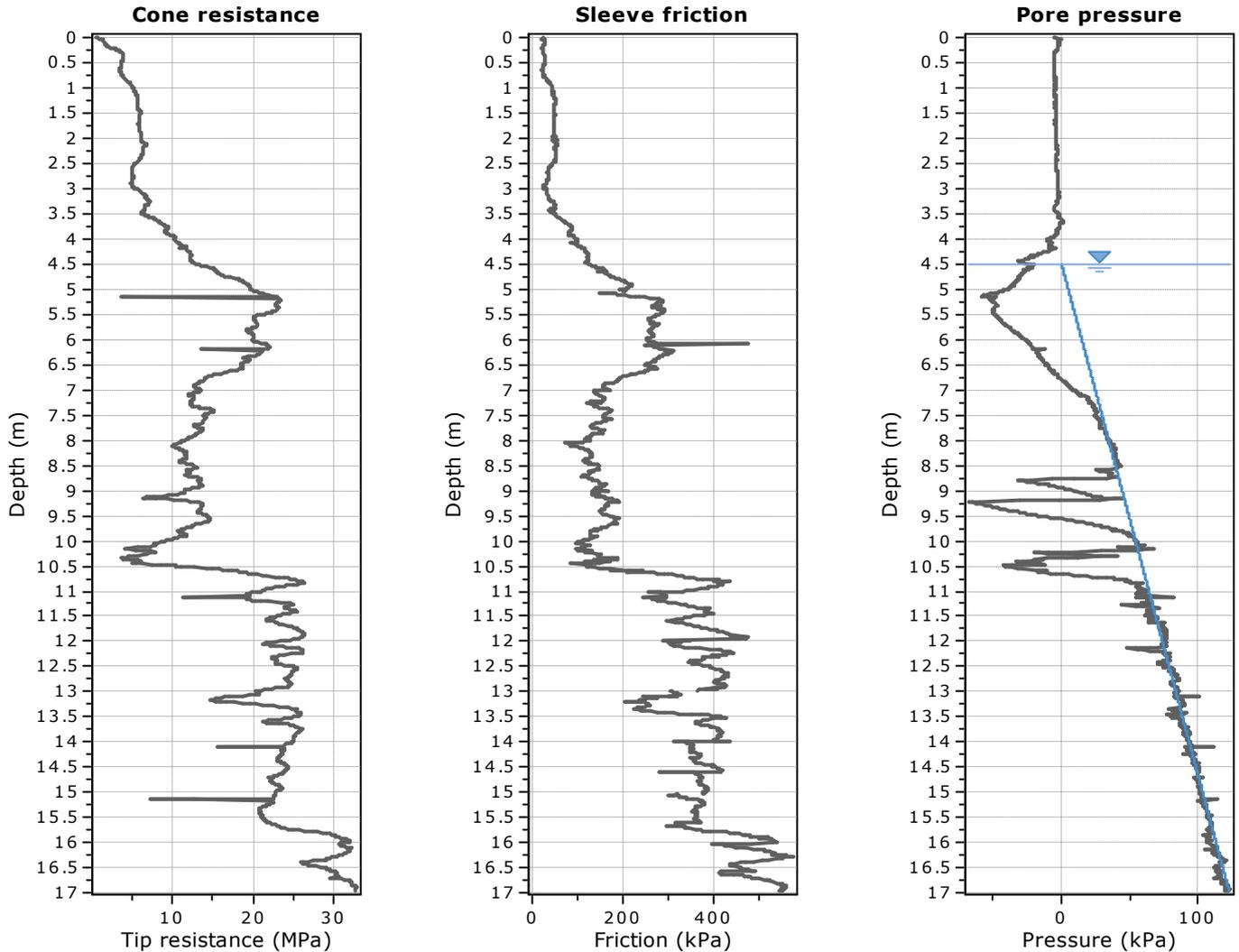
SBT - Bq plots



SBT legend

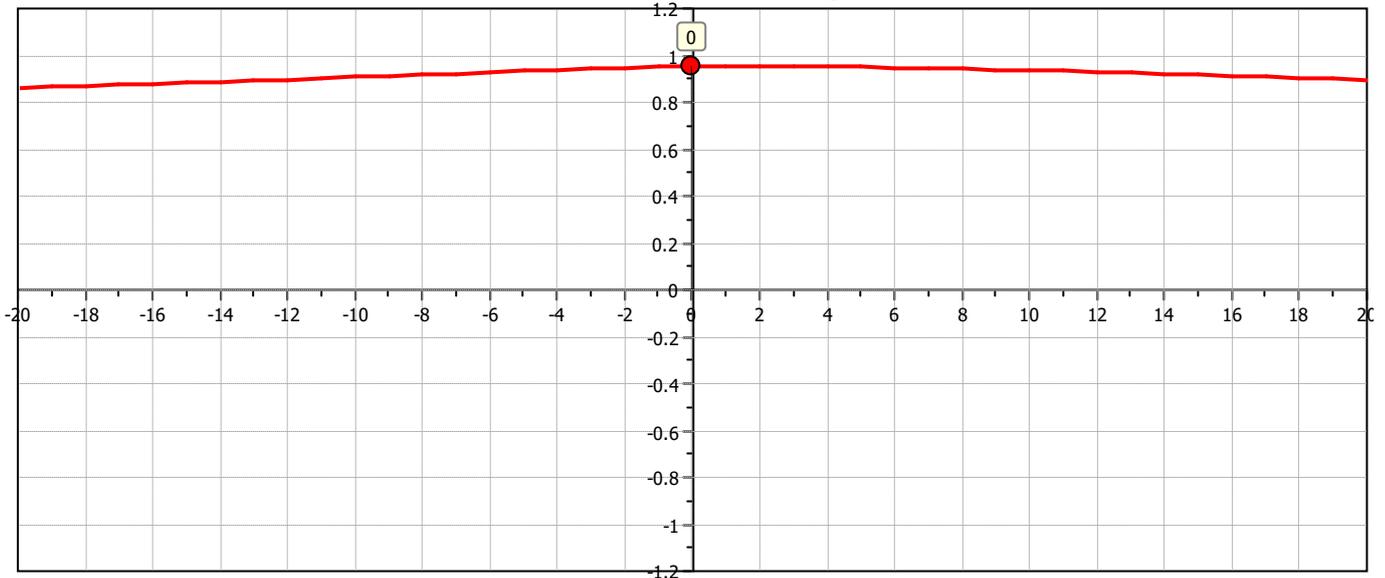
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



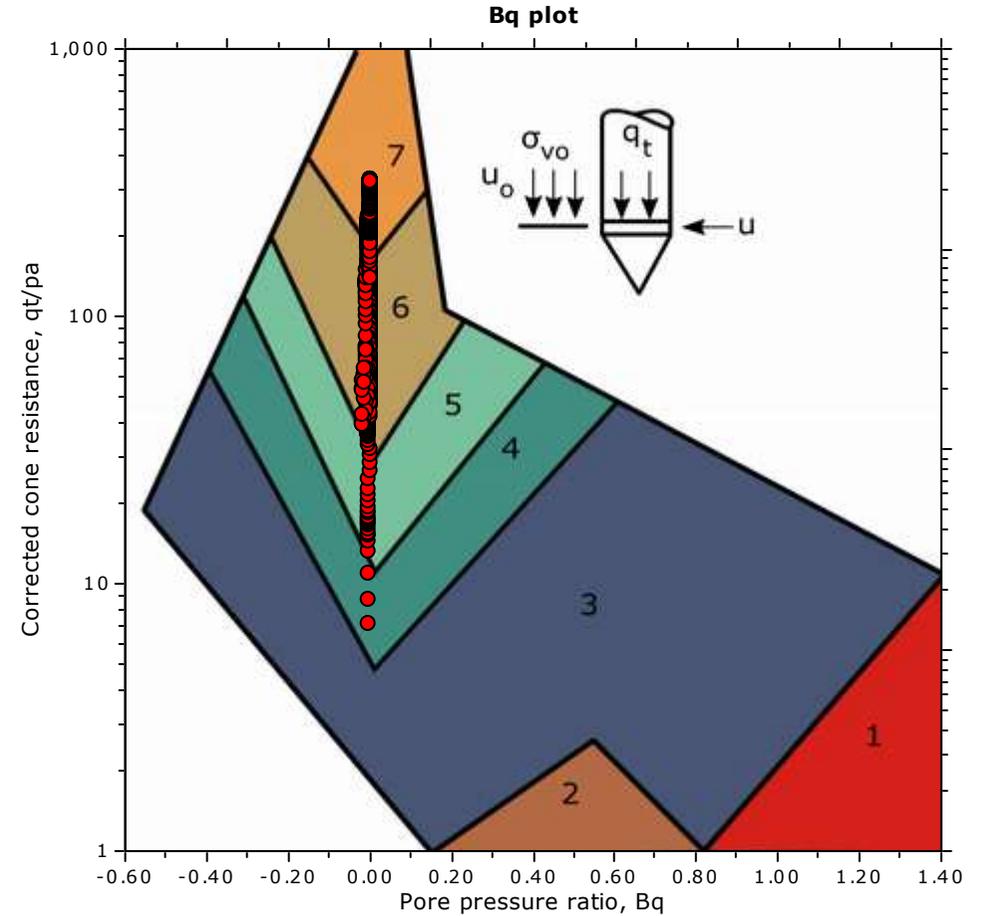
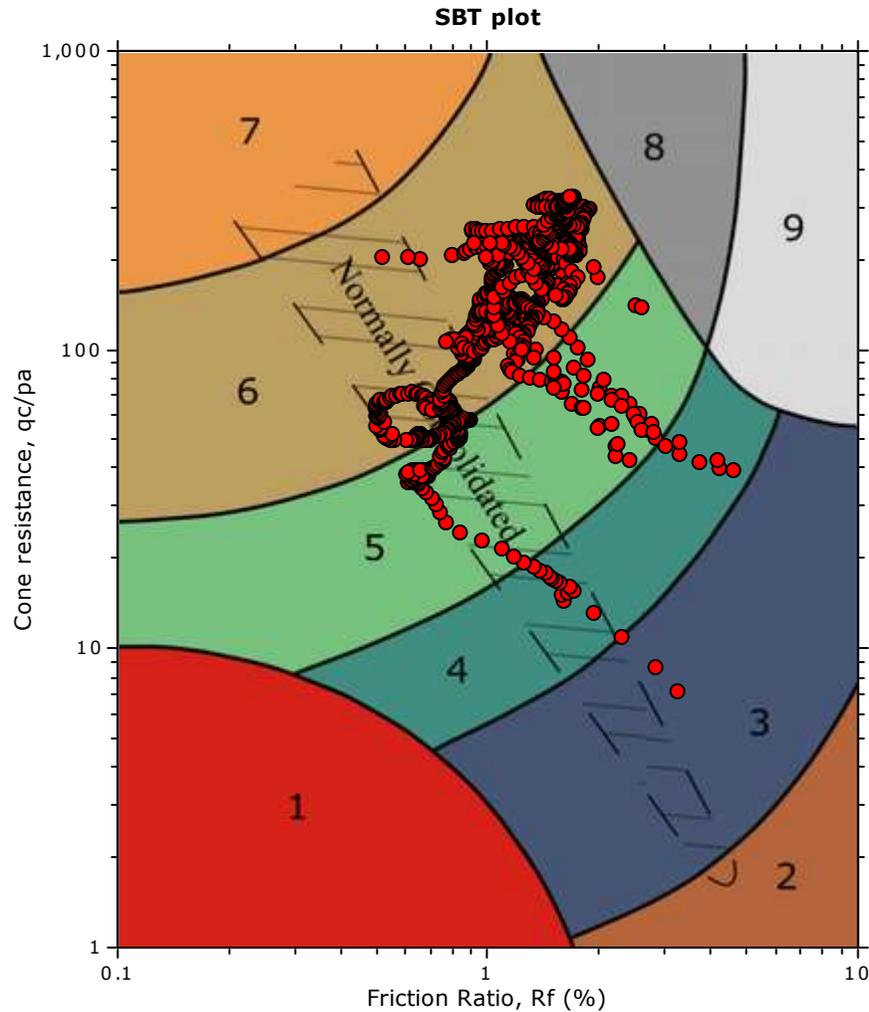


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s



SBT - Bq plots

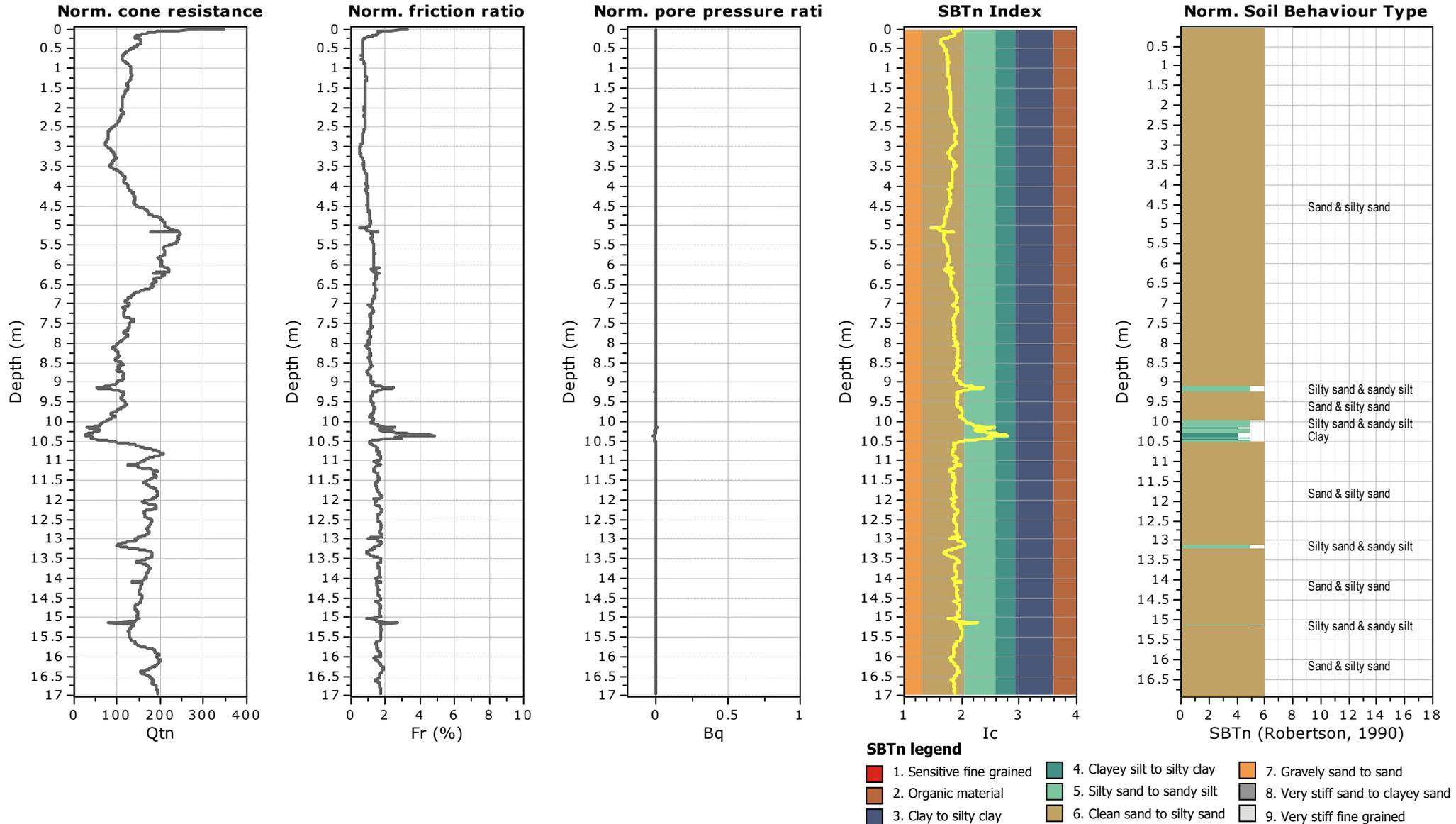


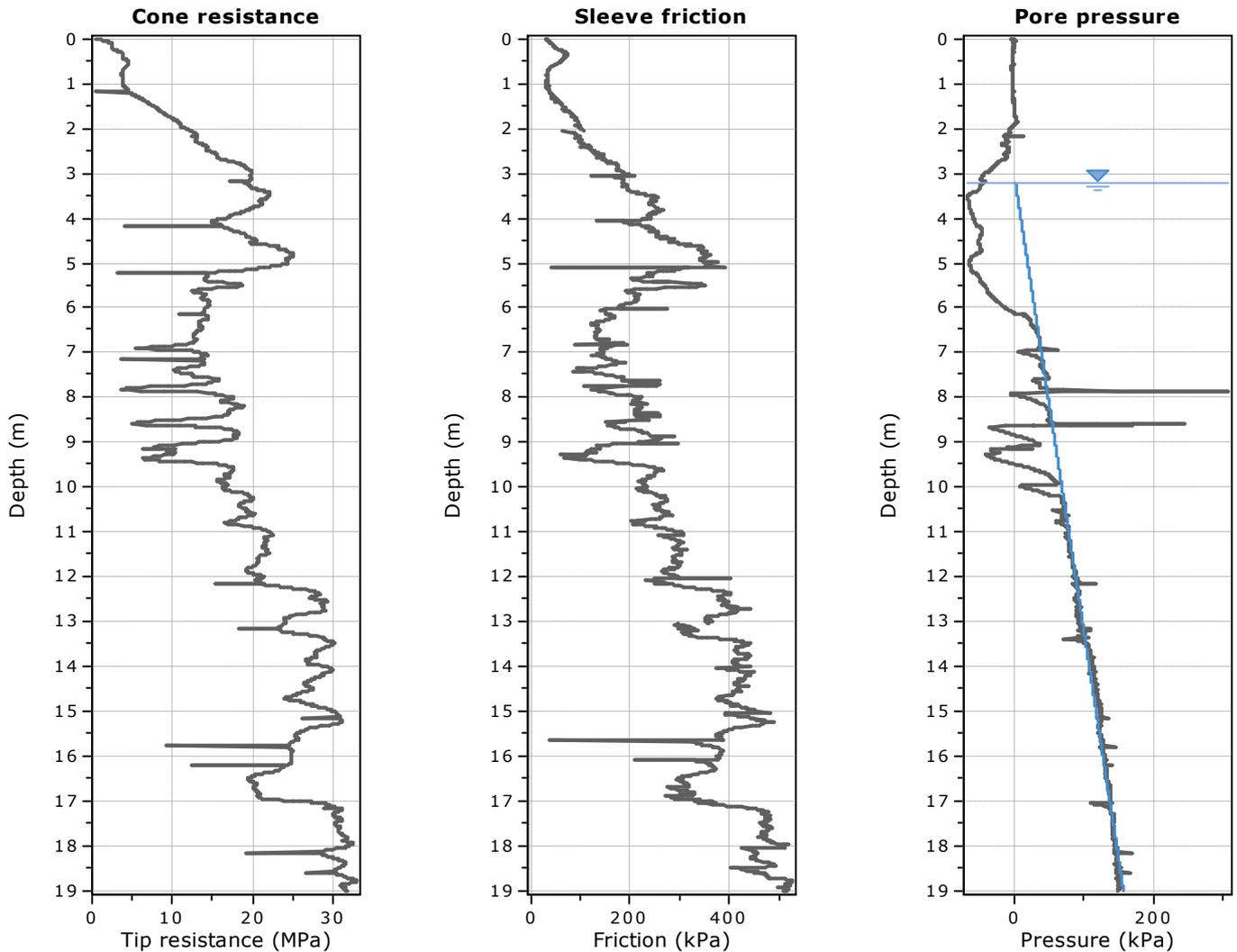
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

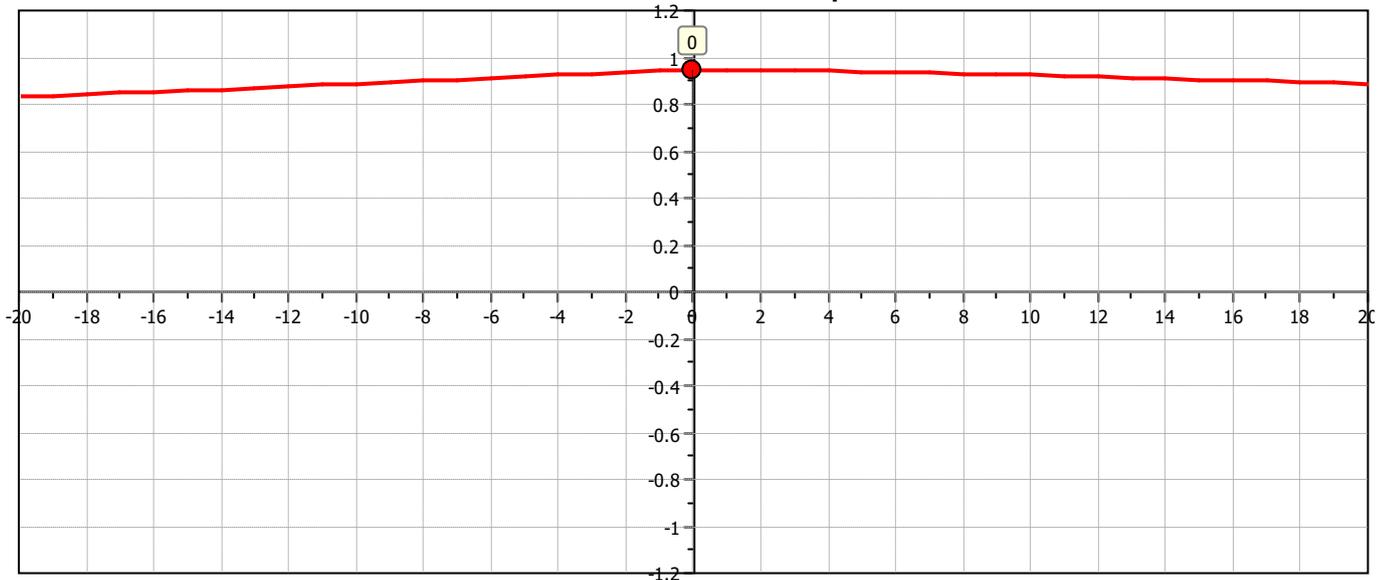
Location: 65 & 73 Ratanui Road, Paraparaumu



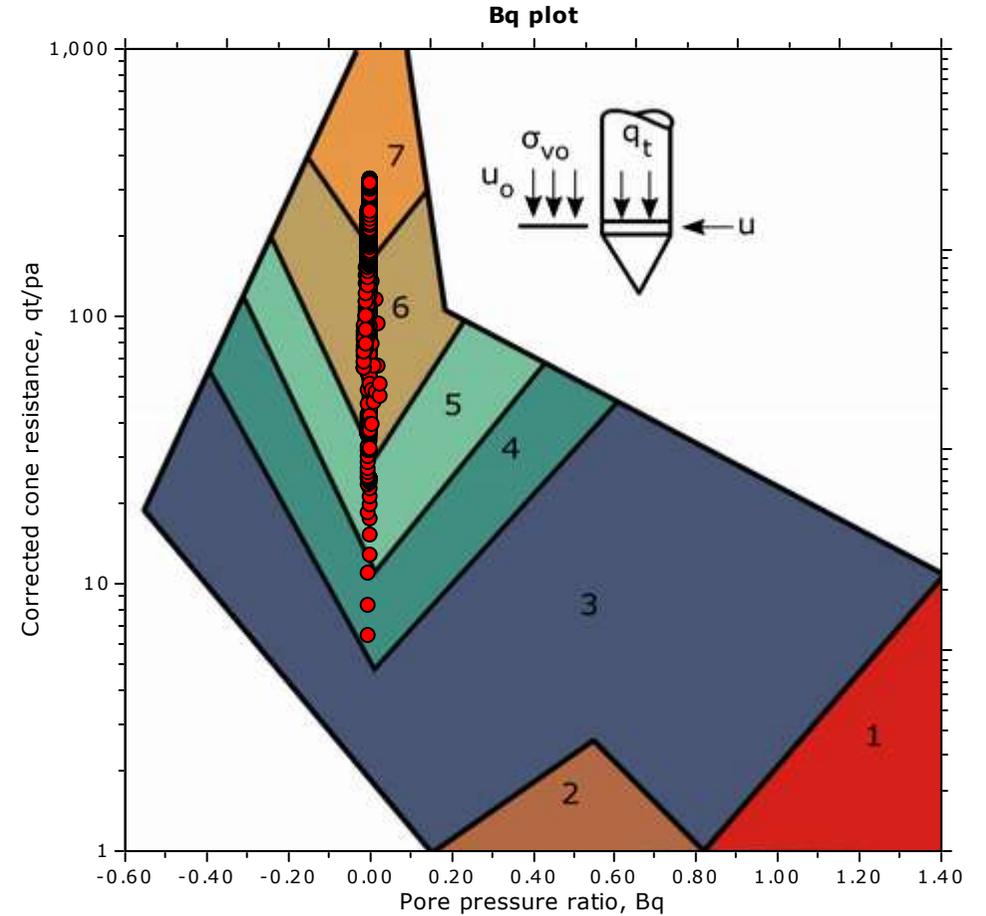
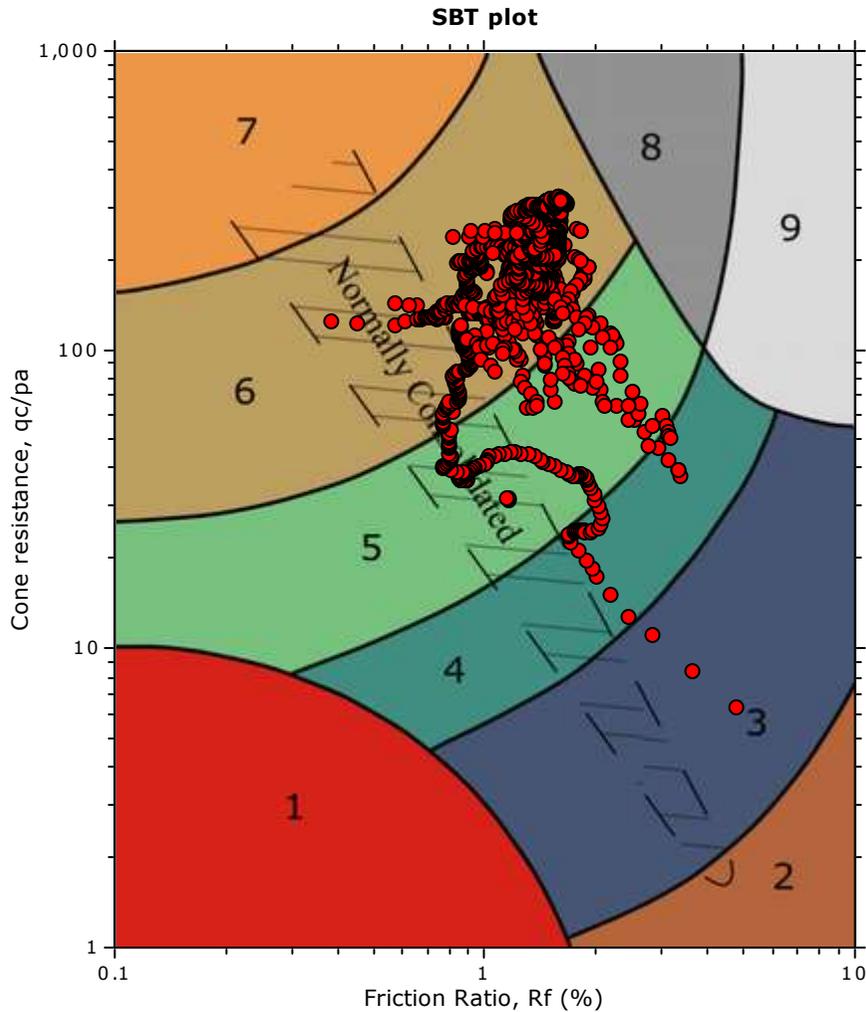


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

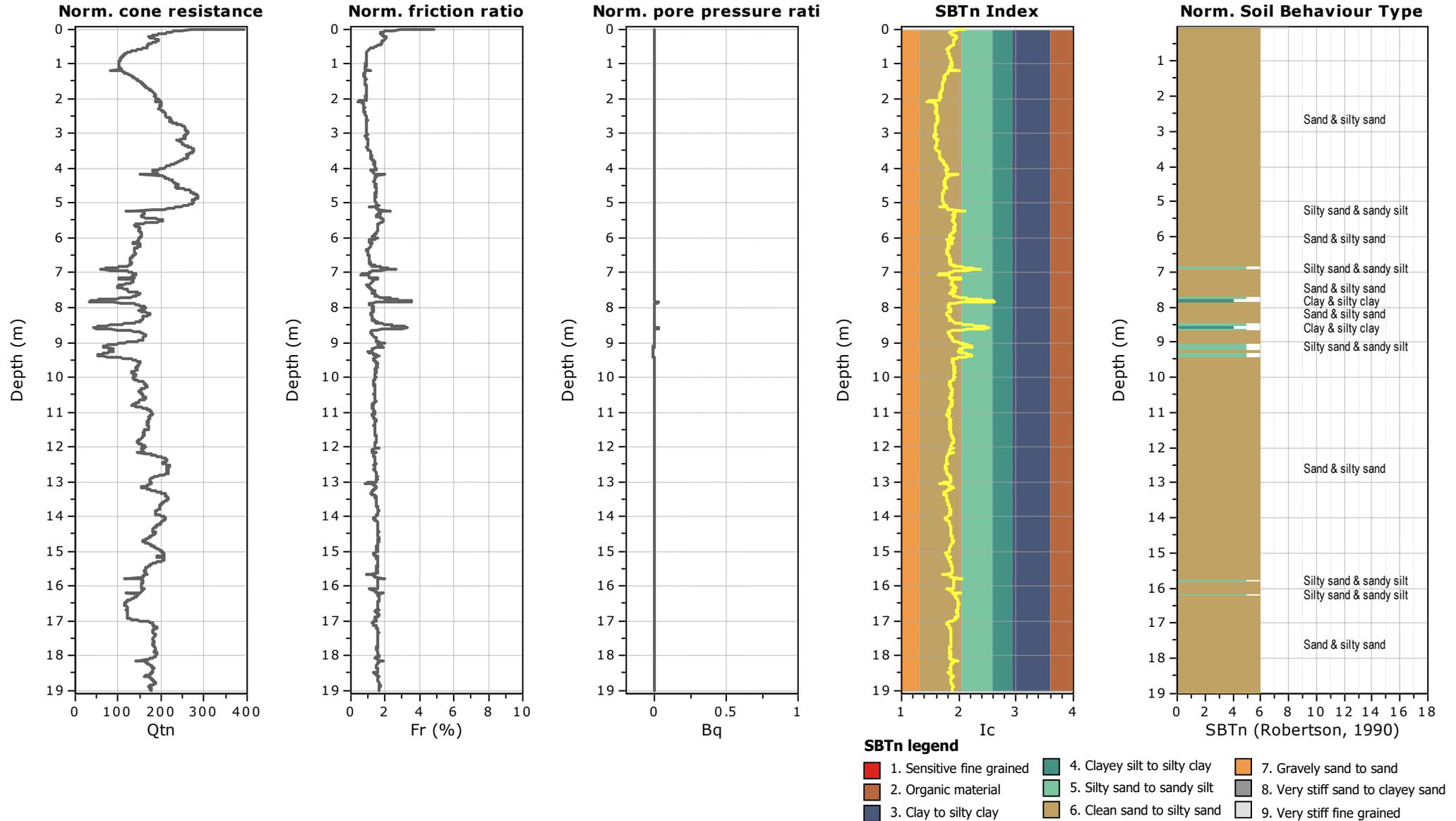


SBT - Bq plots

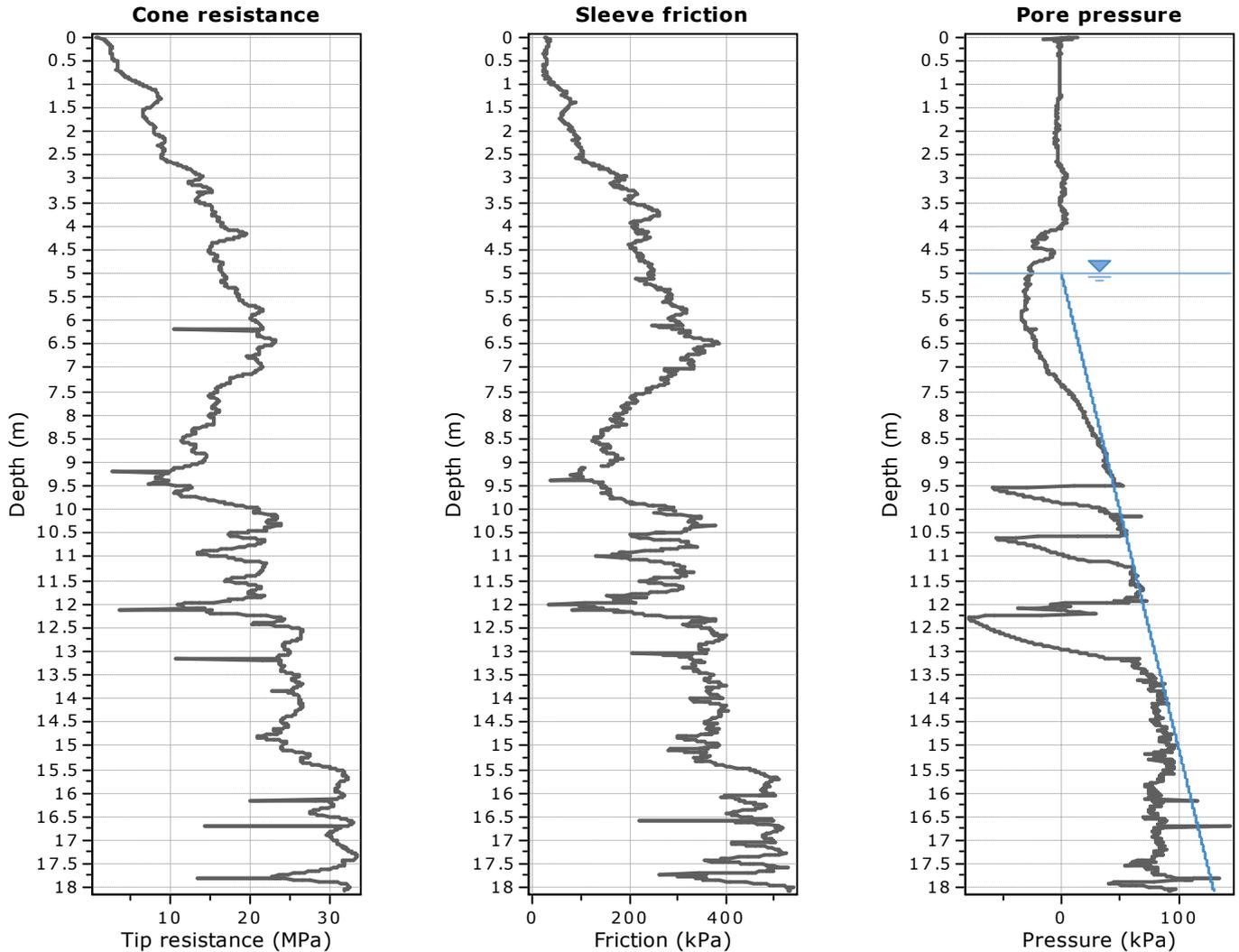


SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

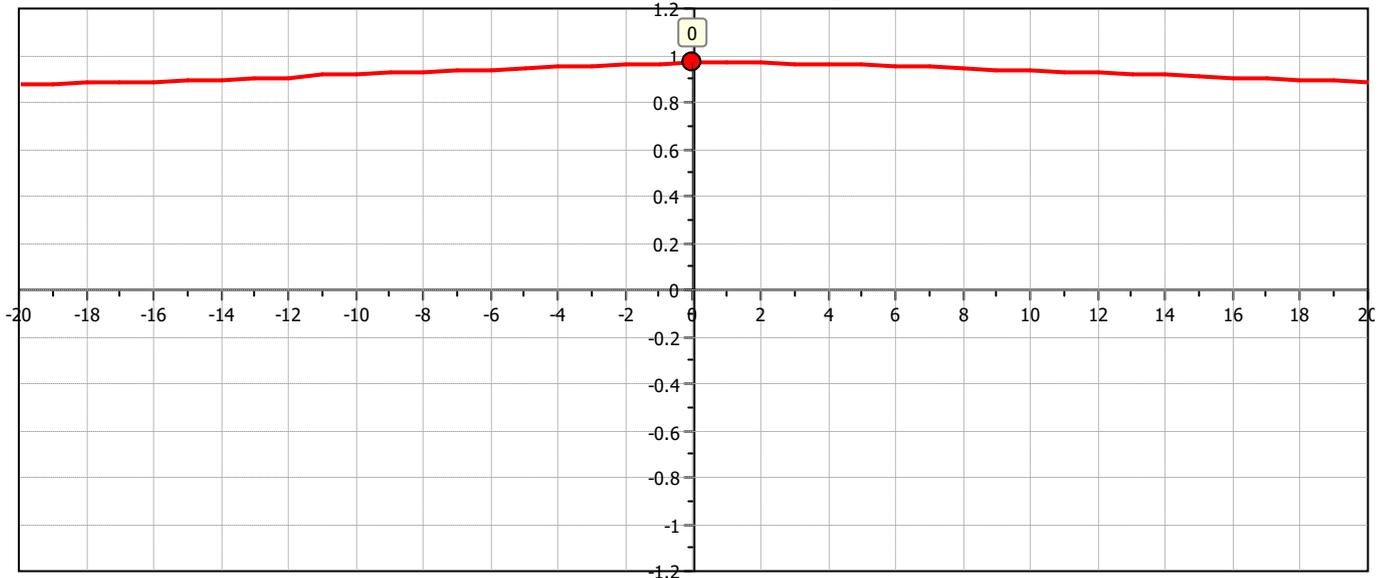


Project: Summerset Paraparaumu
Location: 65 & 73 Ratanui Road, Paraparaumu

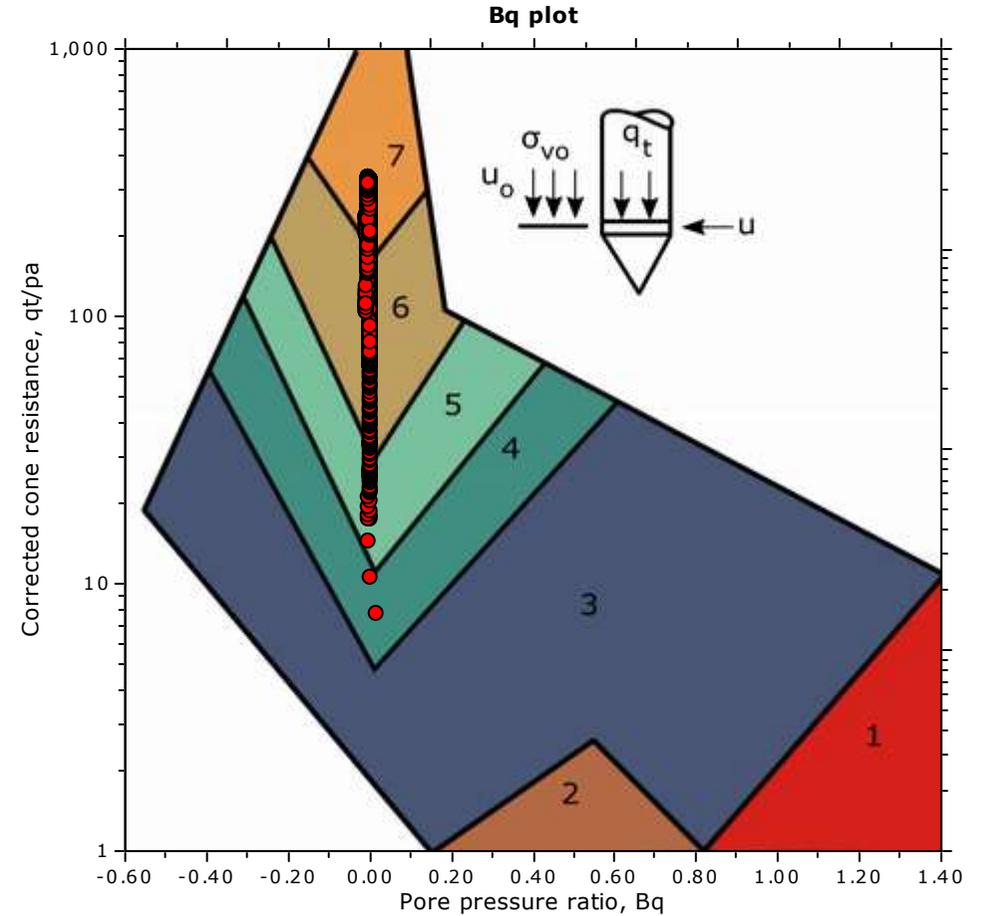
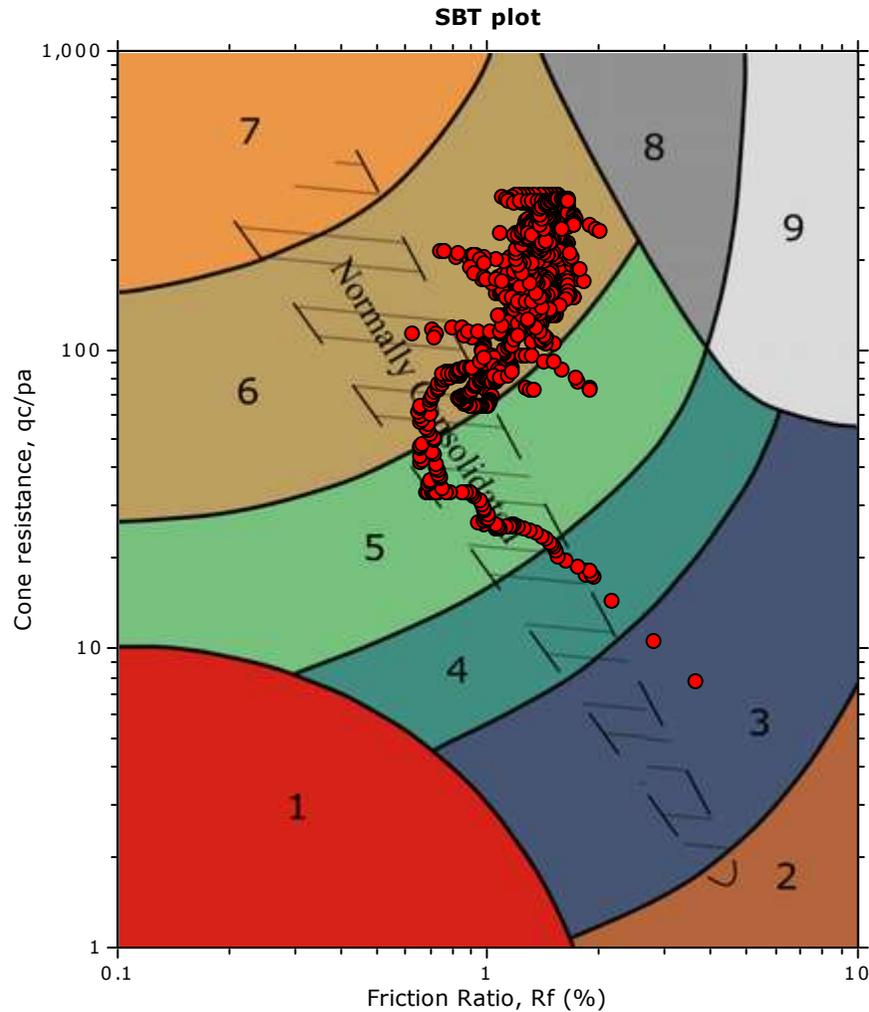


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s

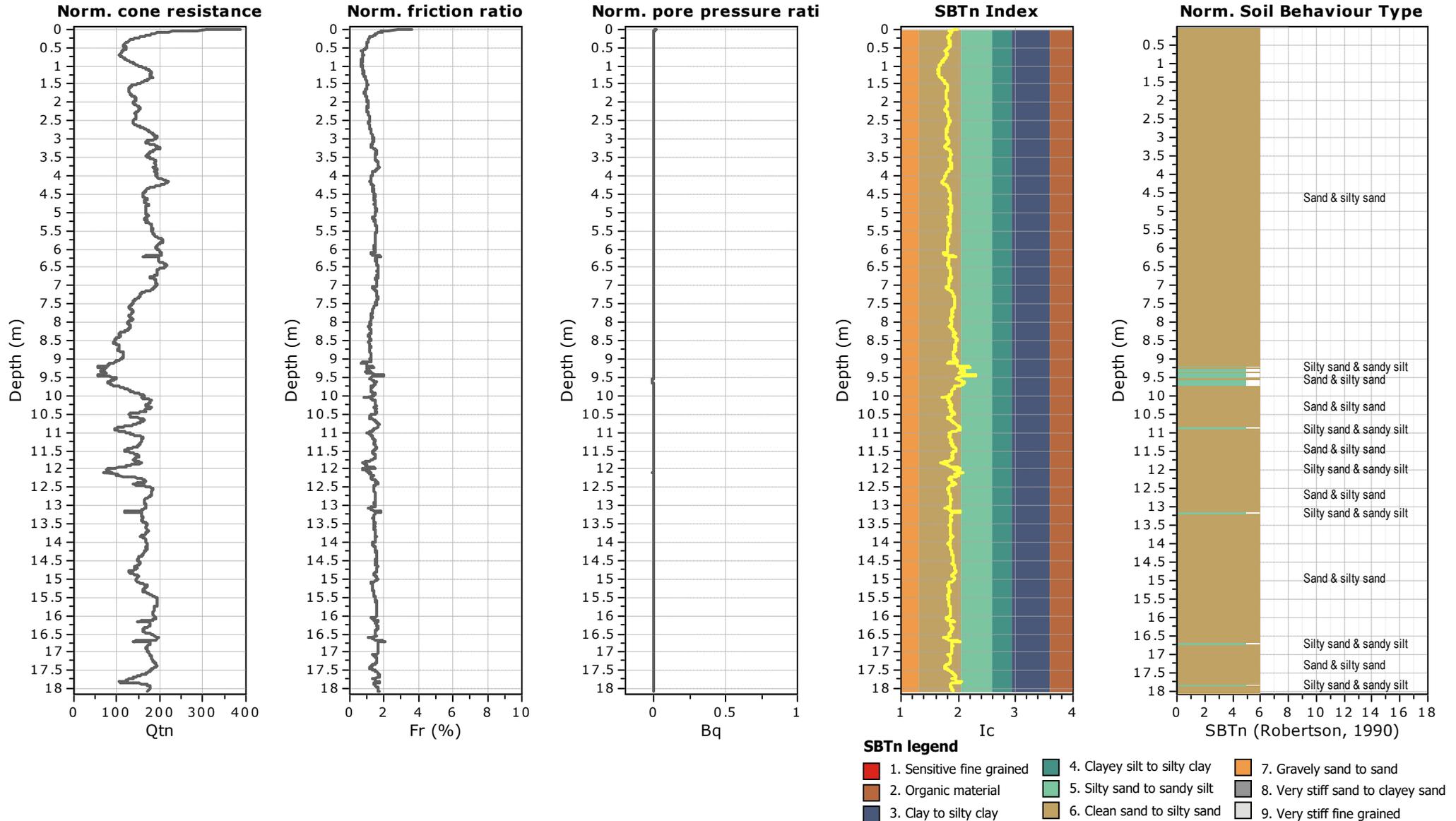


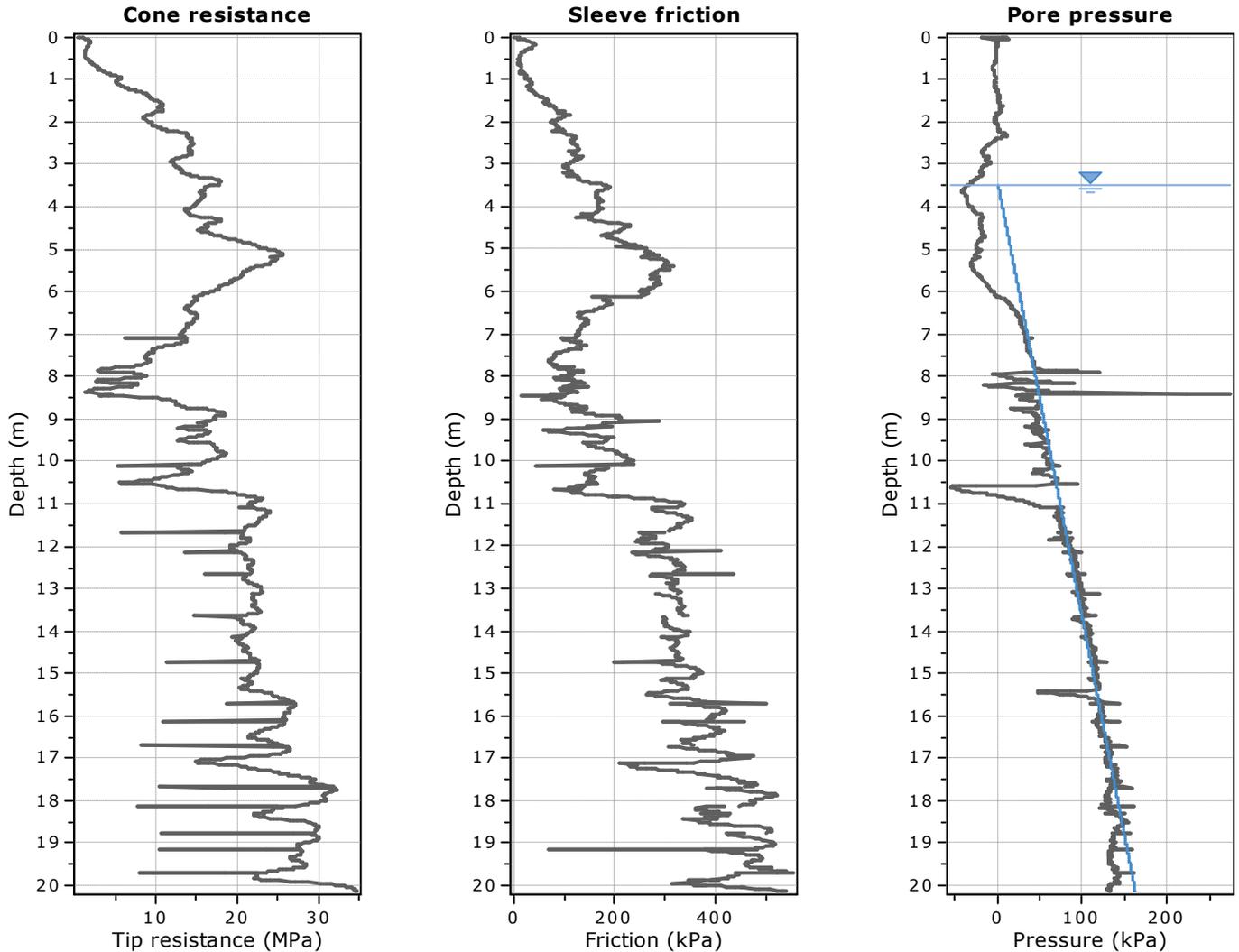
SBT - Bq plots



SBT legend

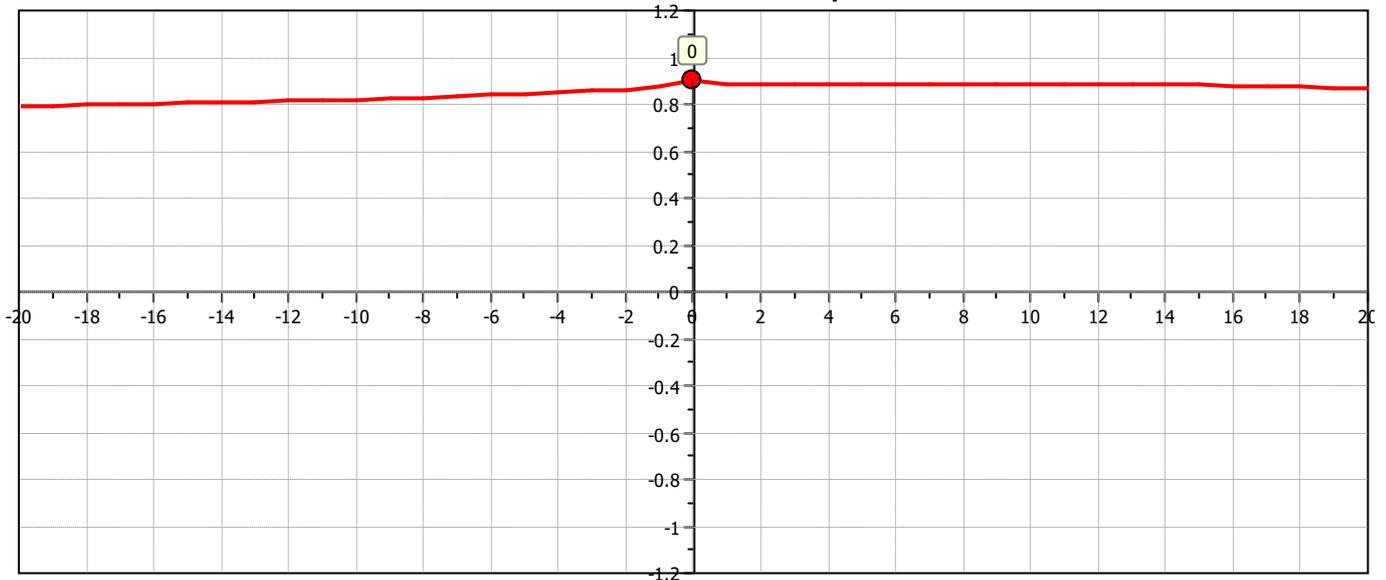
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



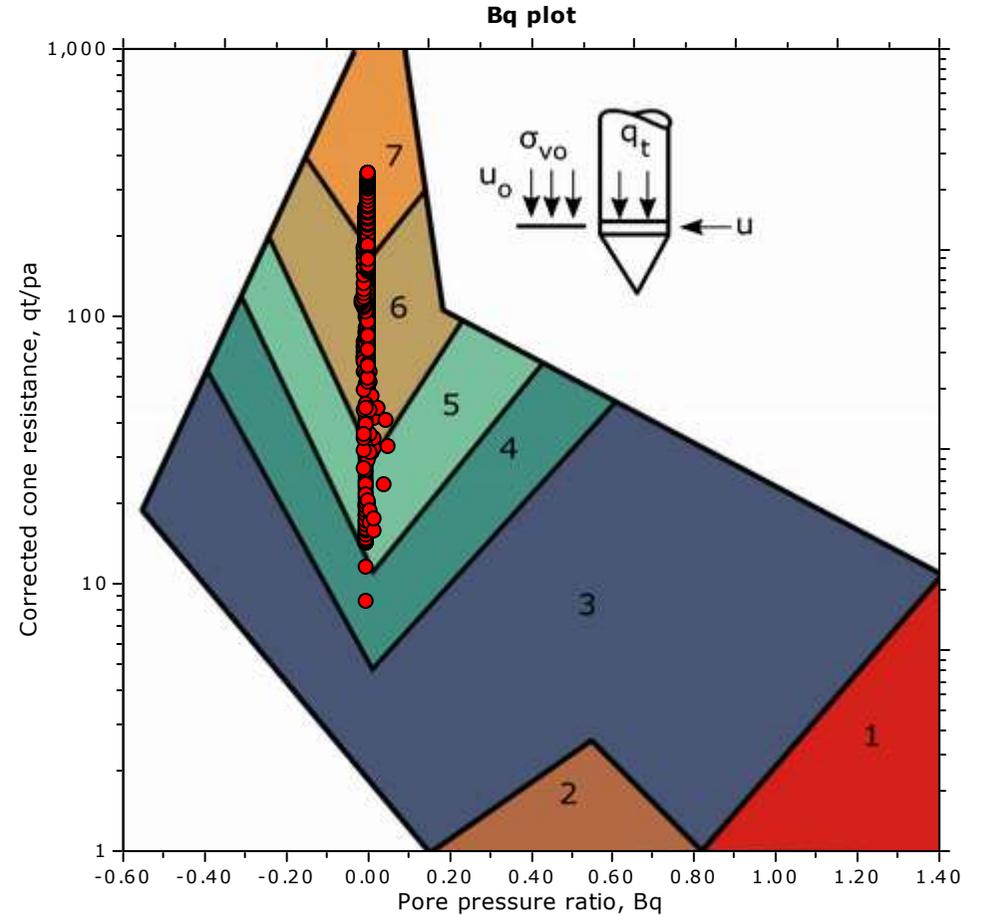
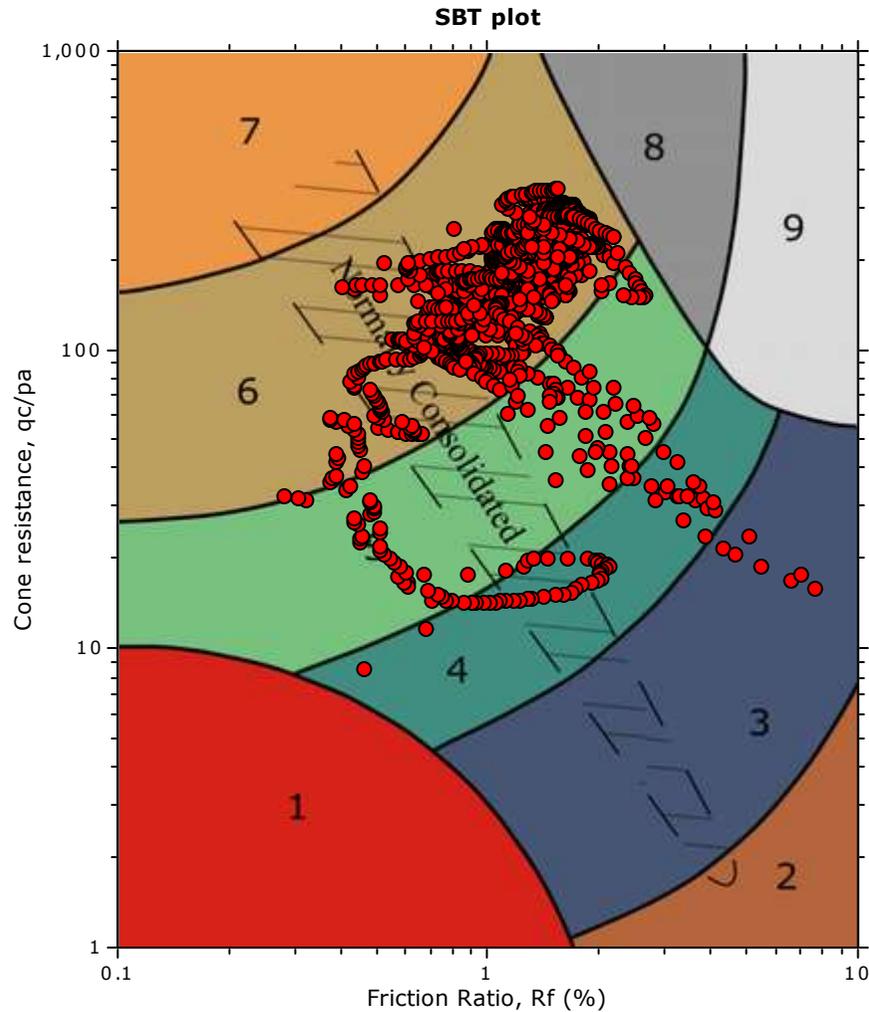


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

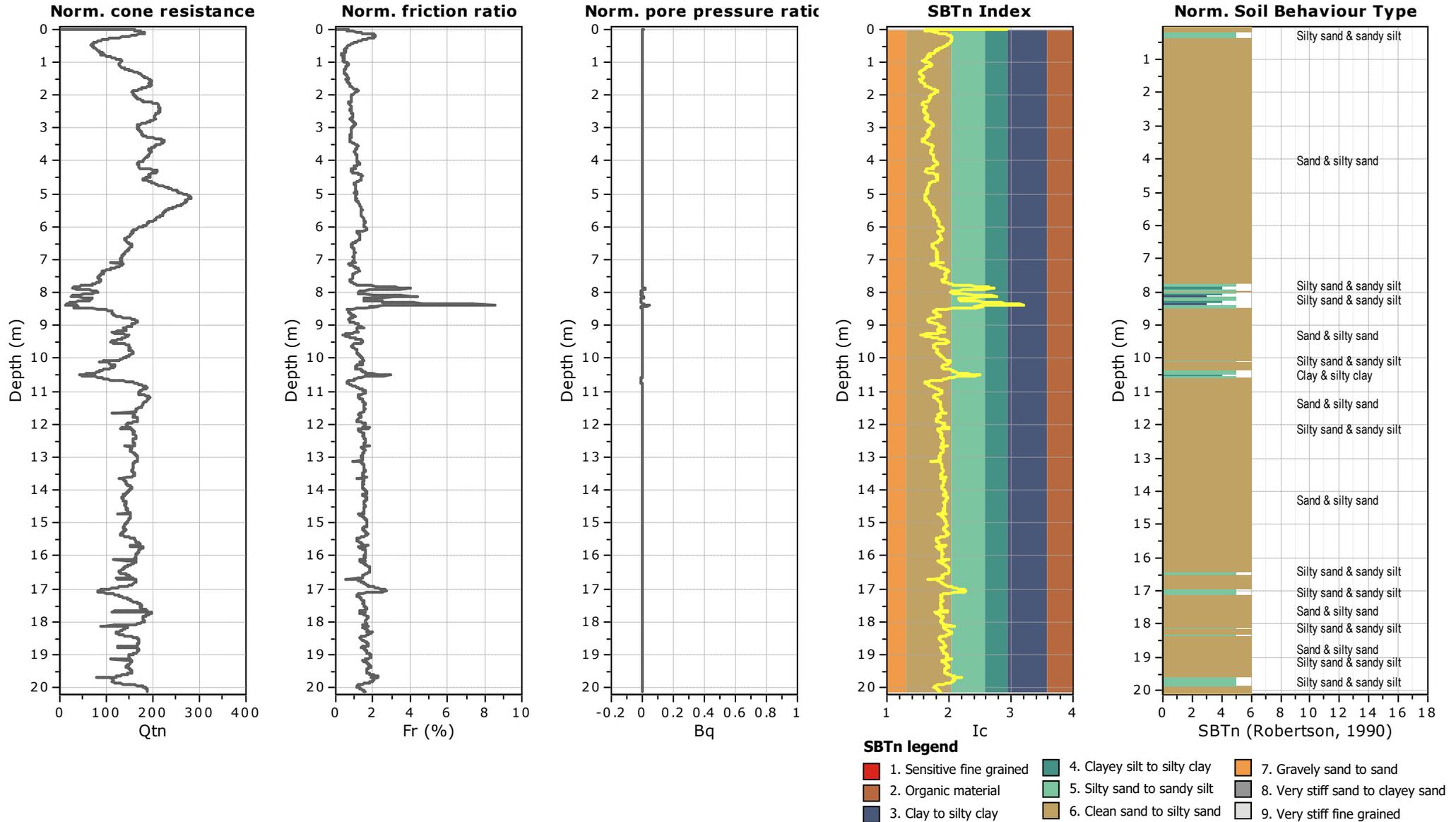


SBT - Bq plots



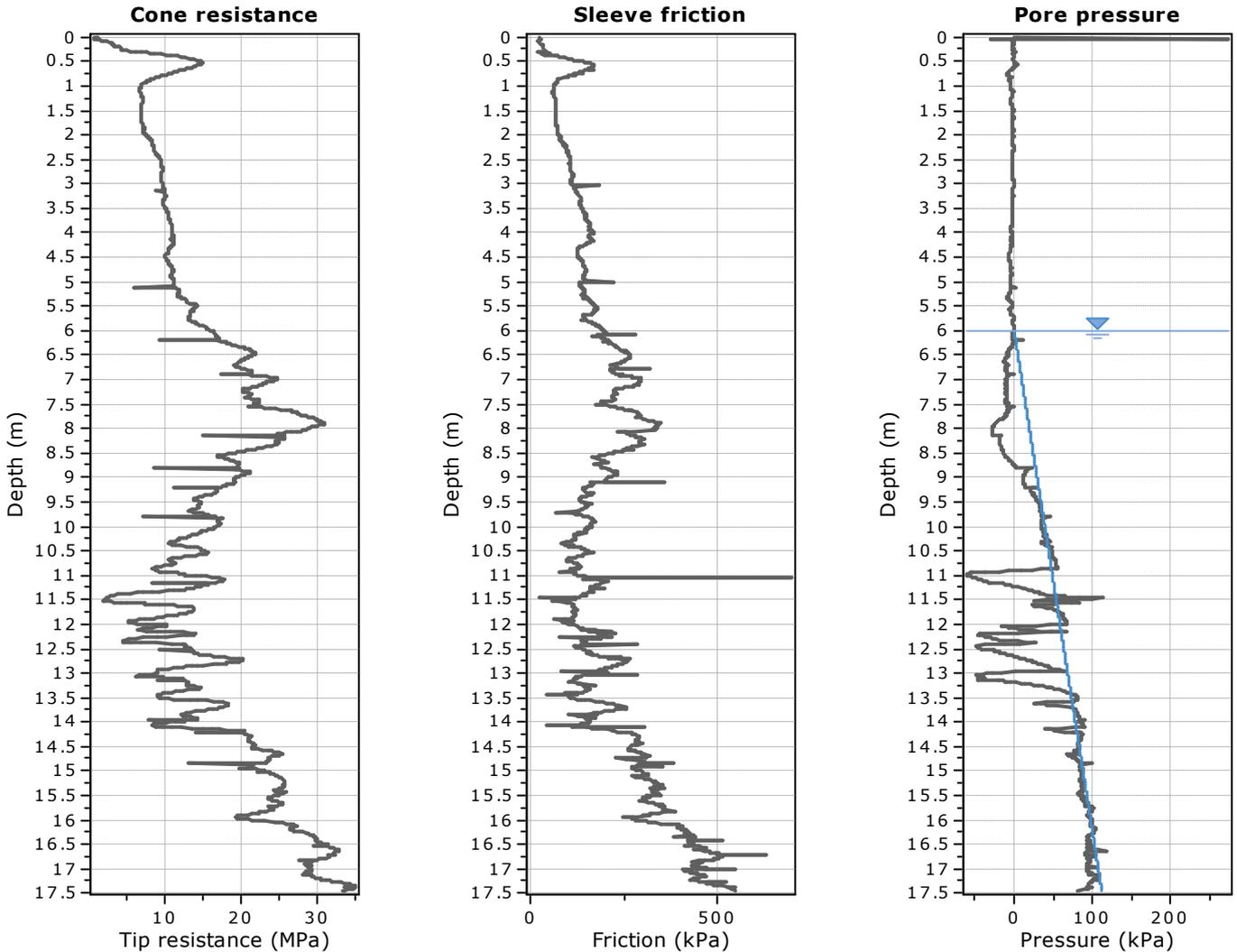
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



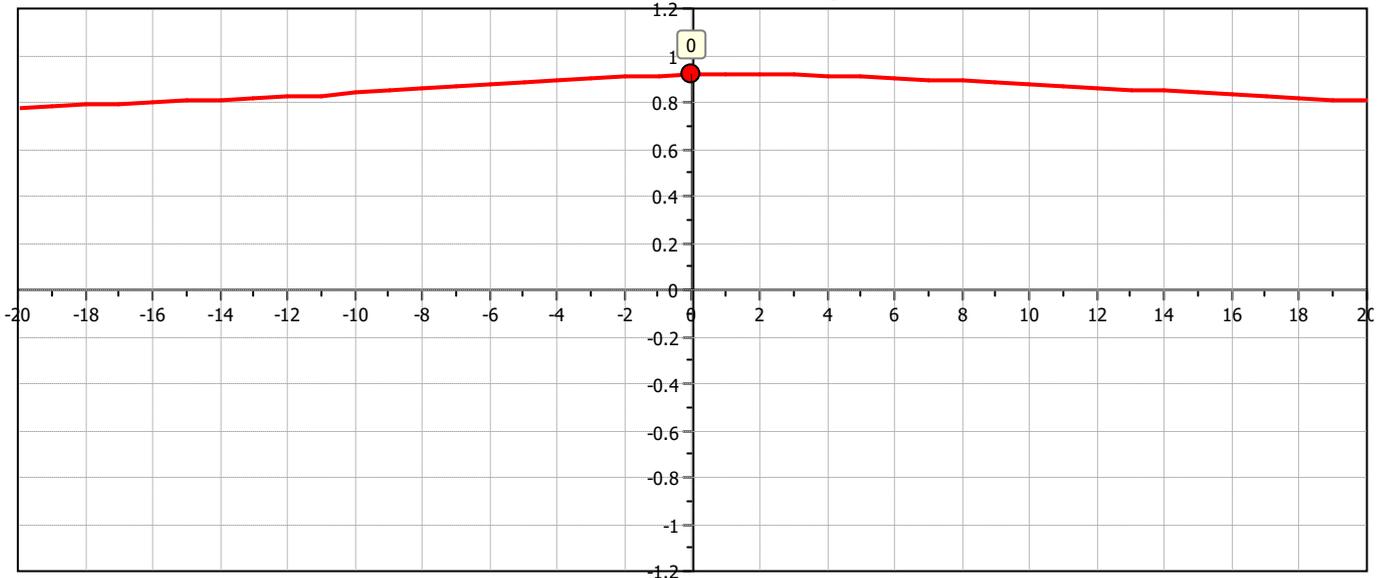
Project: Summerset Paraparaumu

Location: 65 & 73 Ratanui Road, Paraparaumu

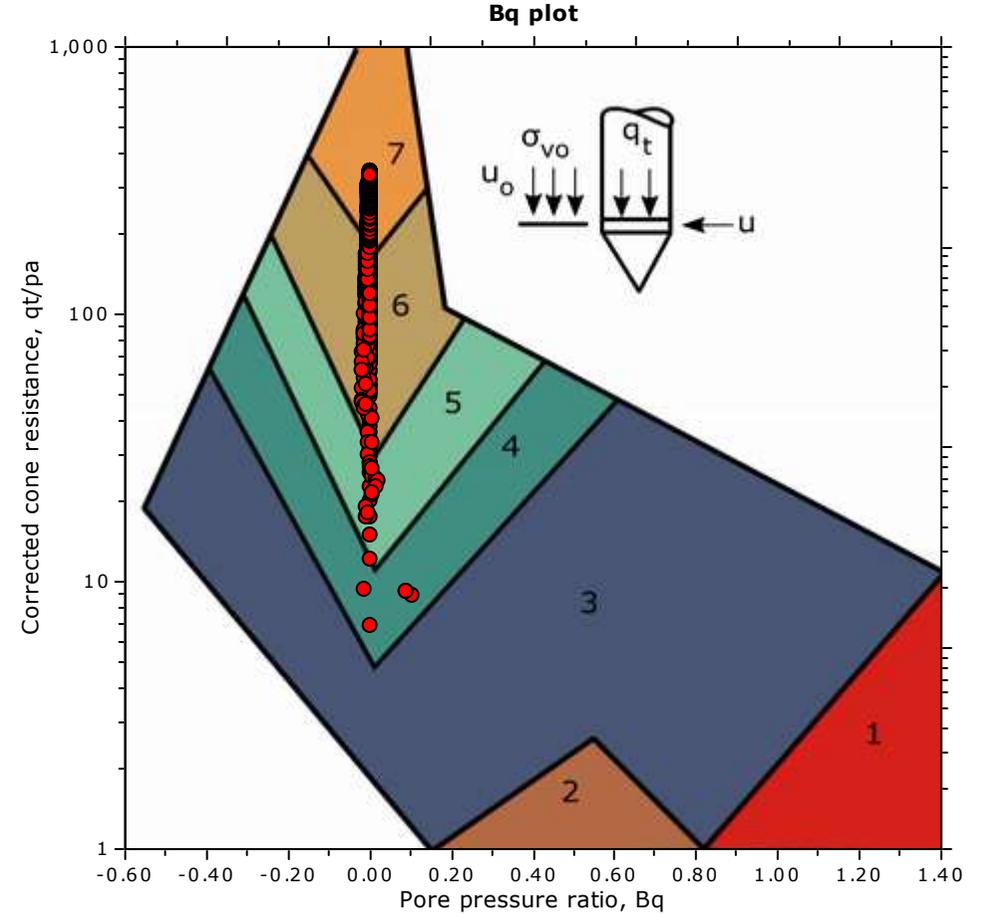
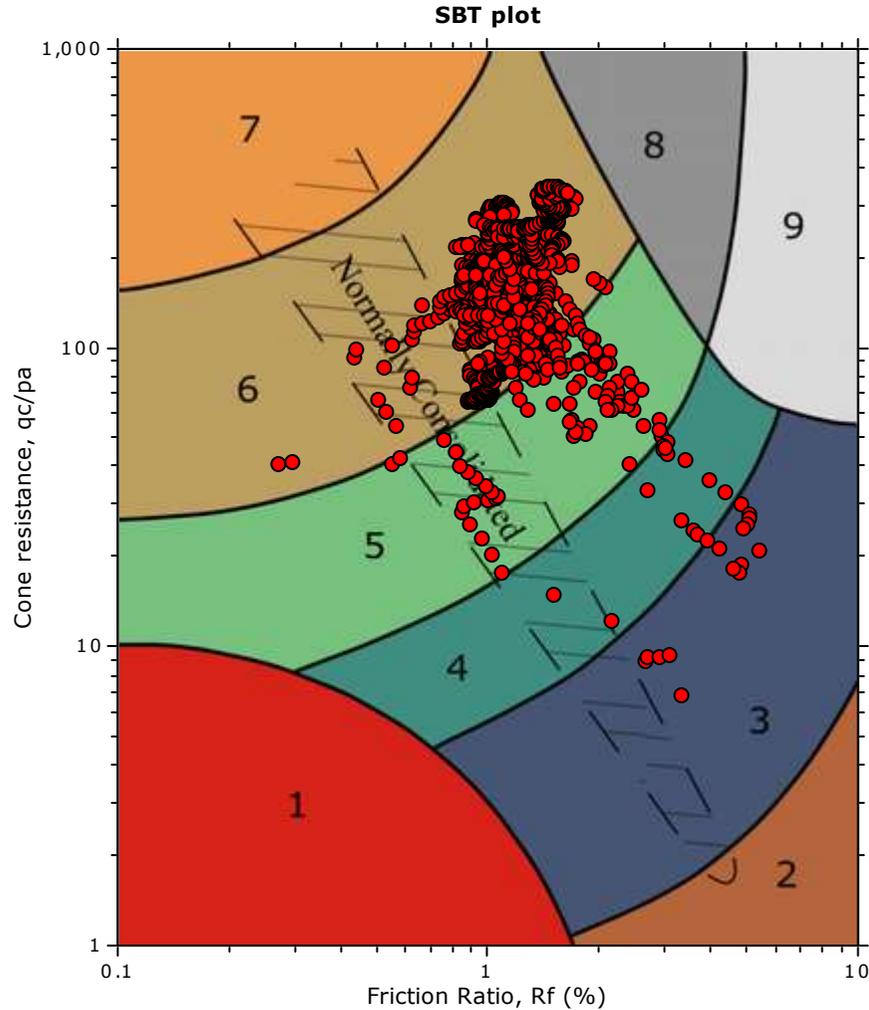


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

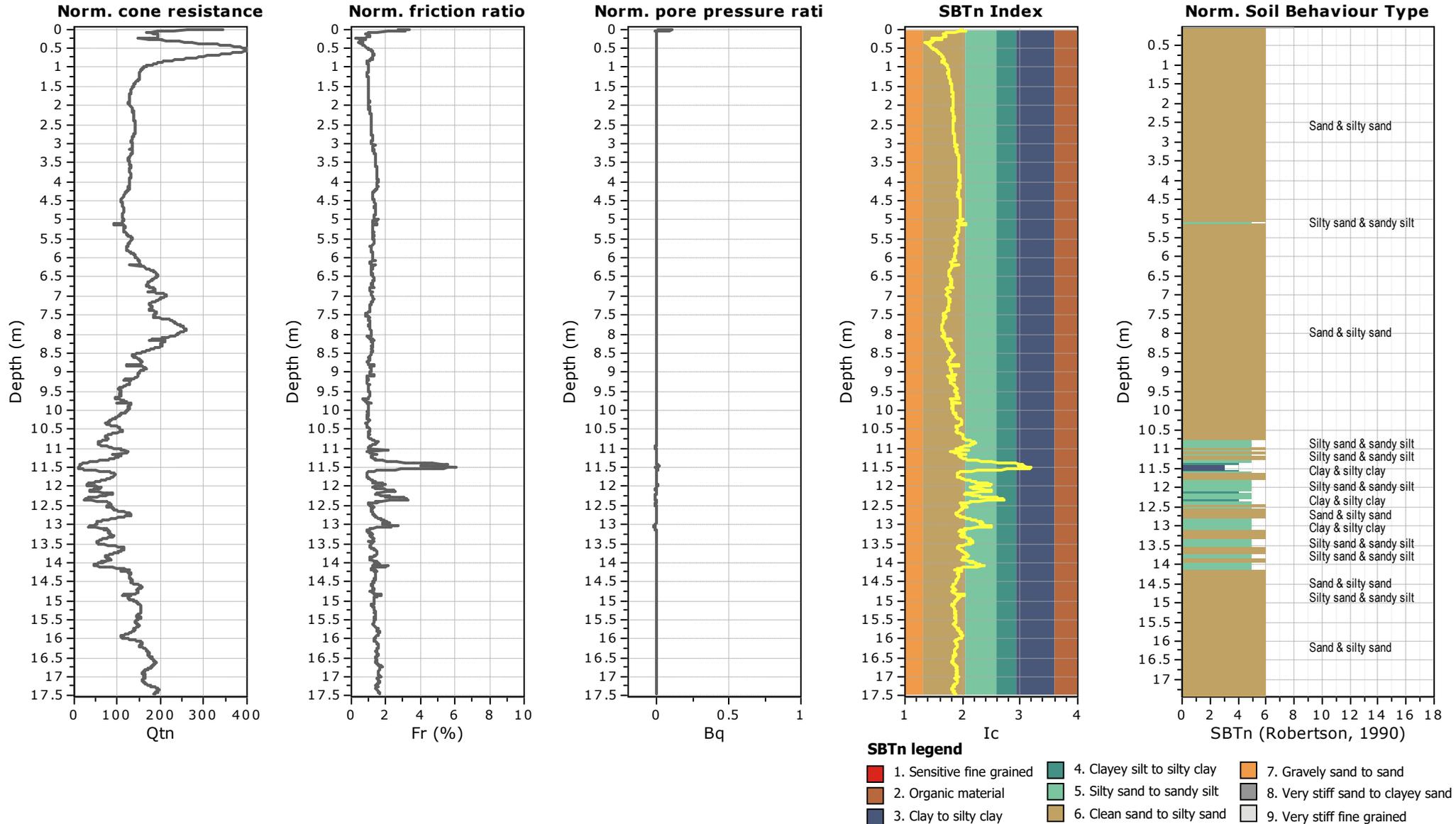


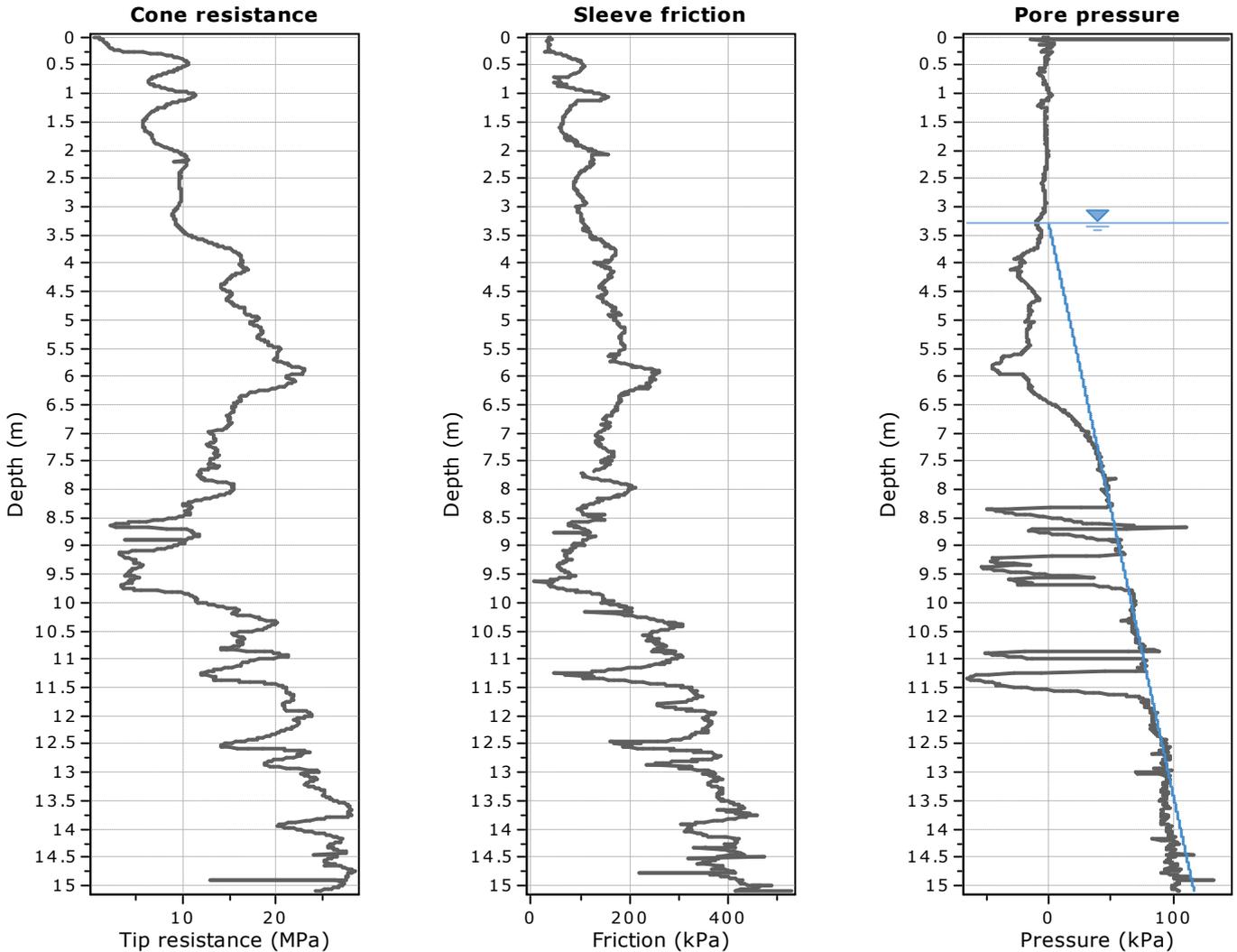
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

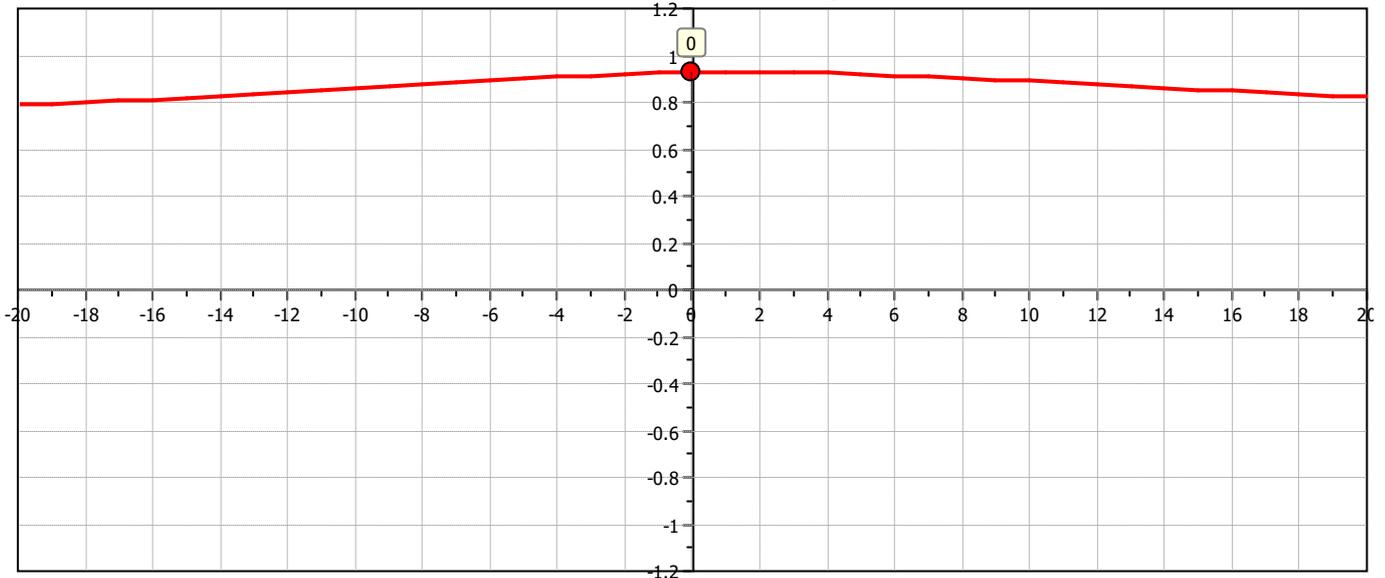
Location: 65 & 73 Ratanui Road, Paraparaumu



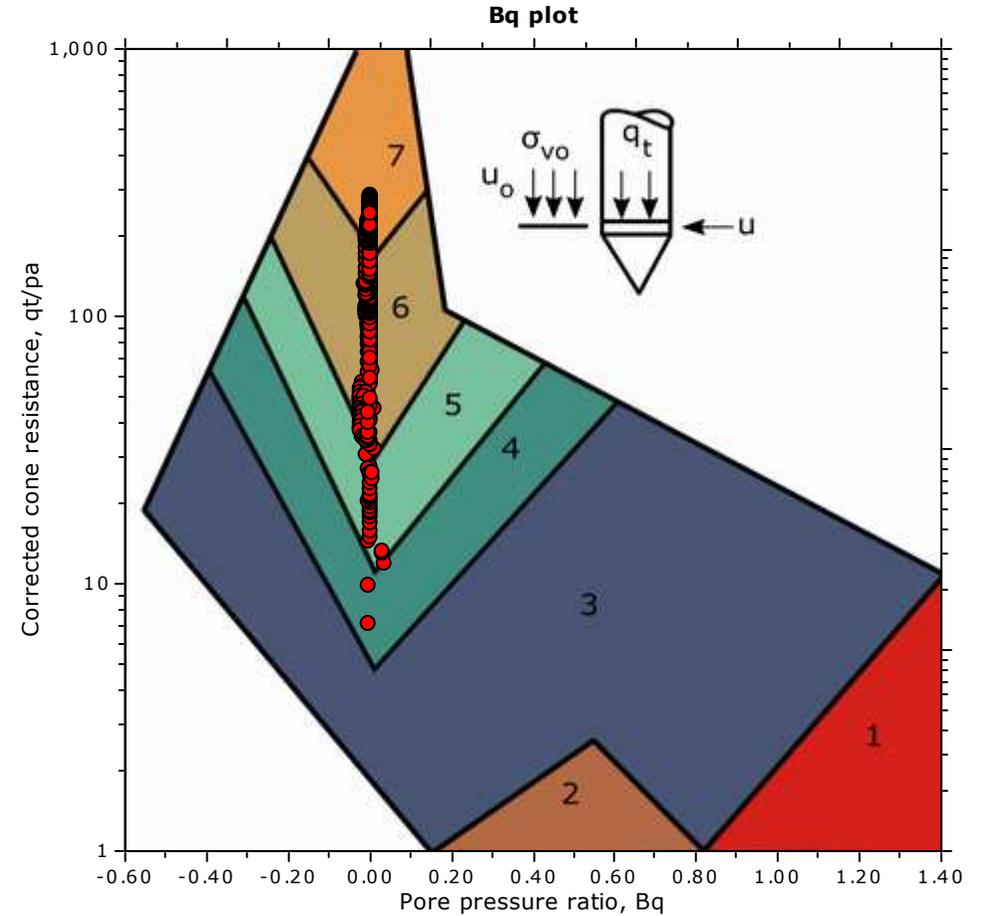
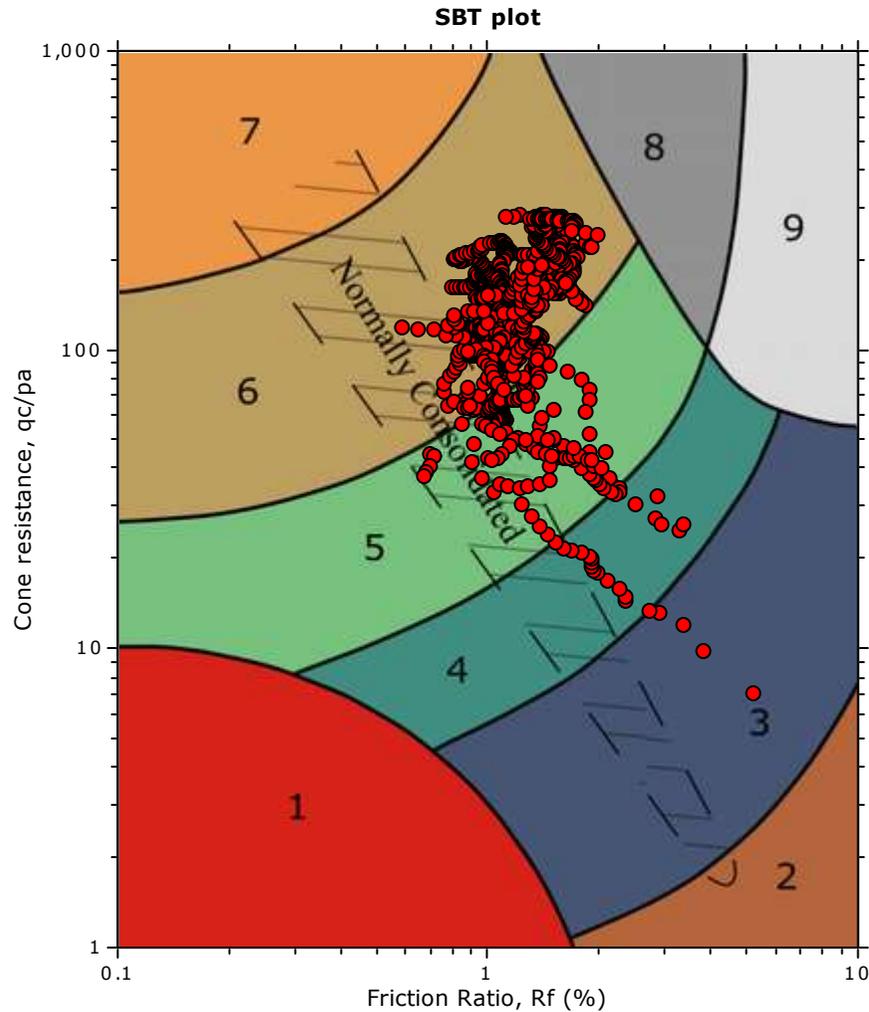


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

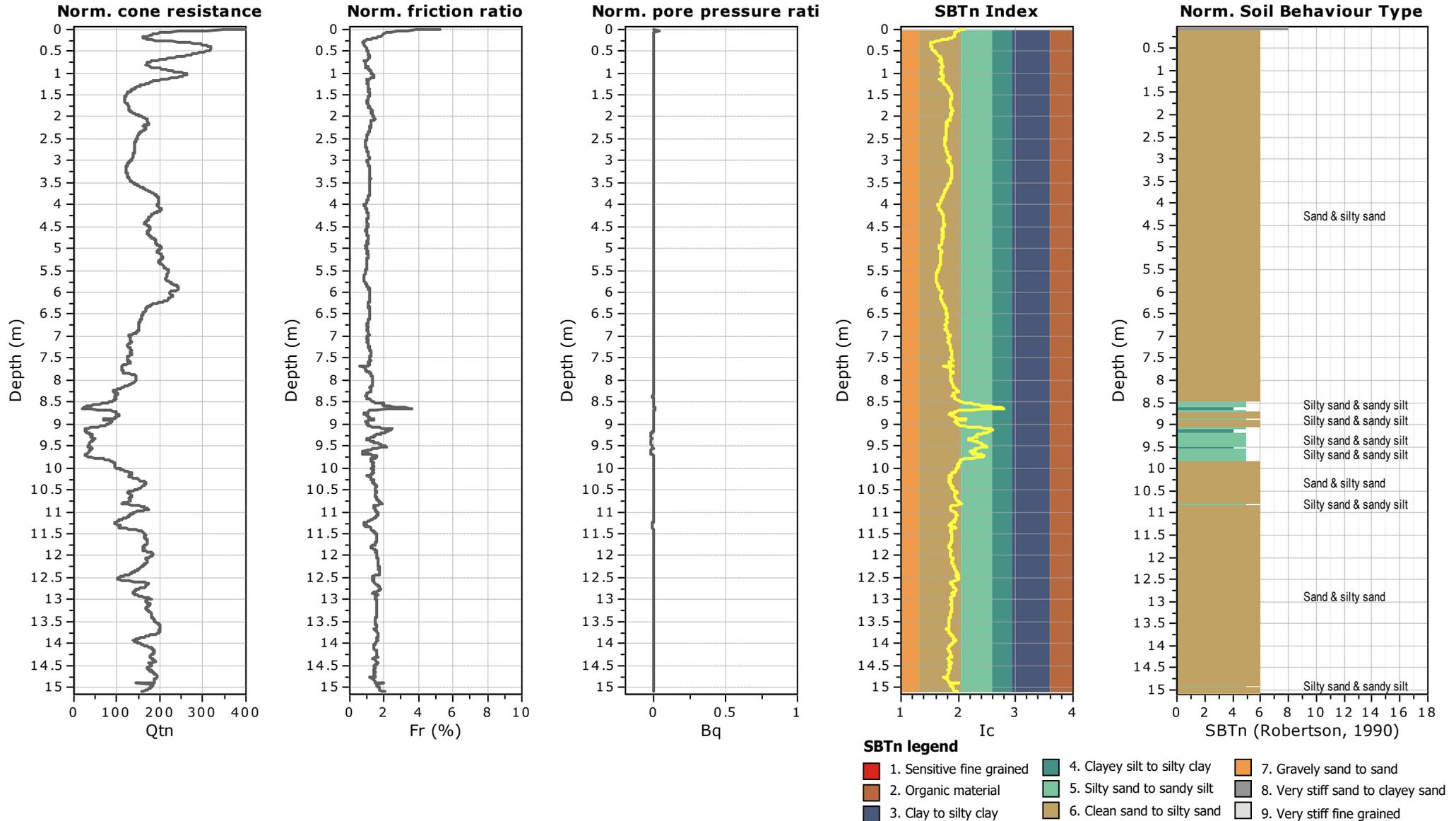


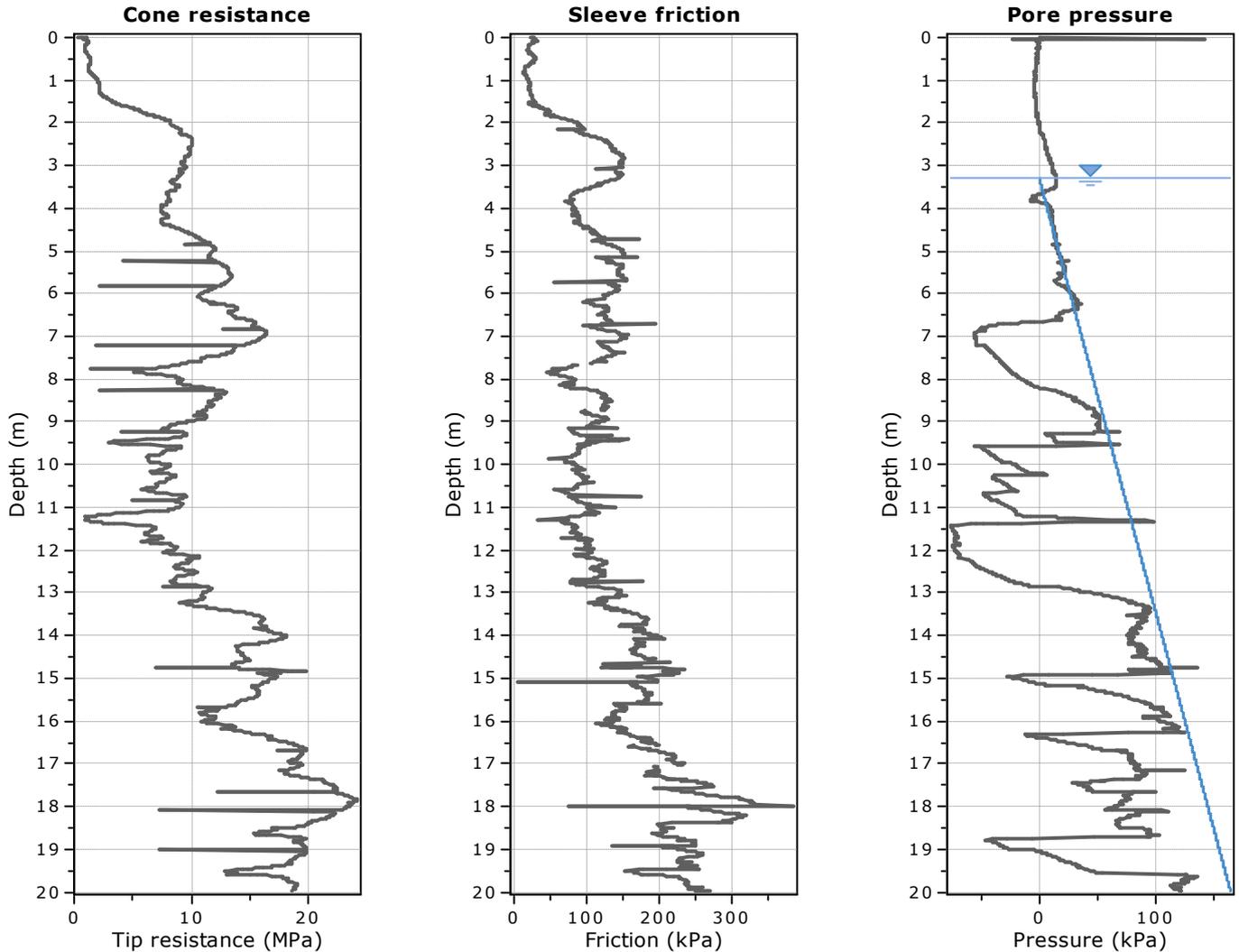
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

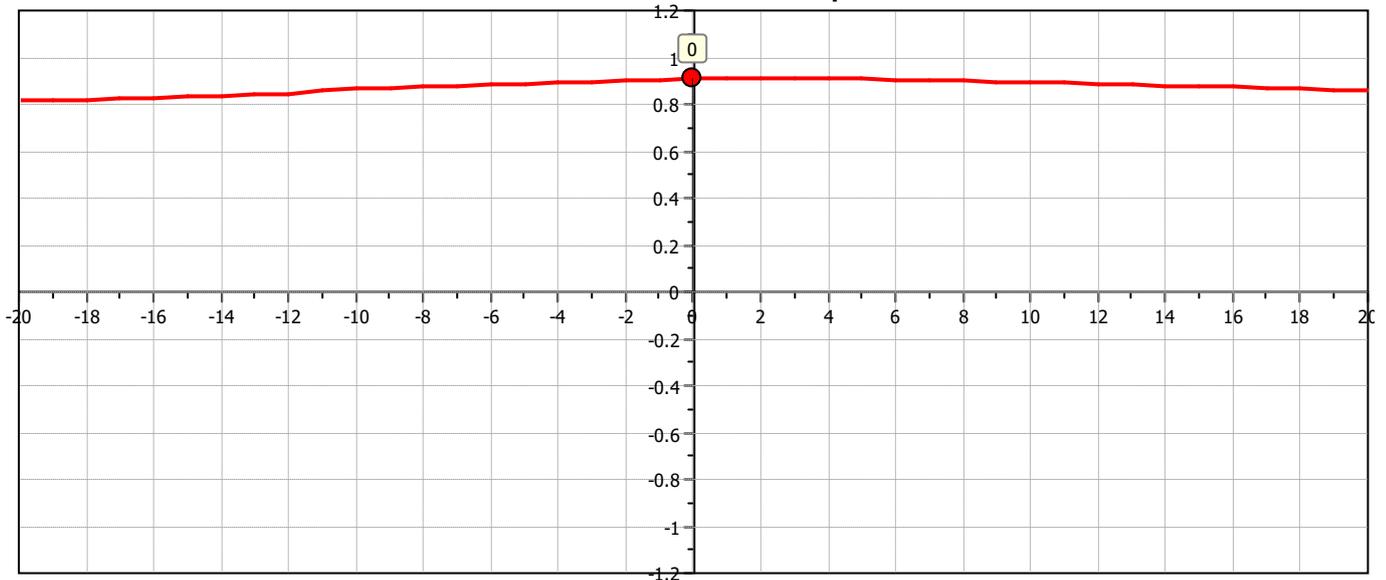
Location: 65 & 73 Ratanui Road, Paraparaumu



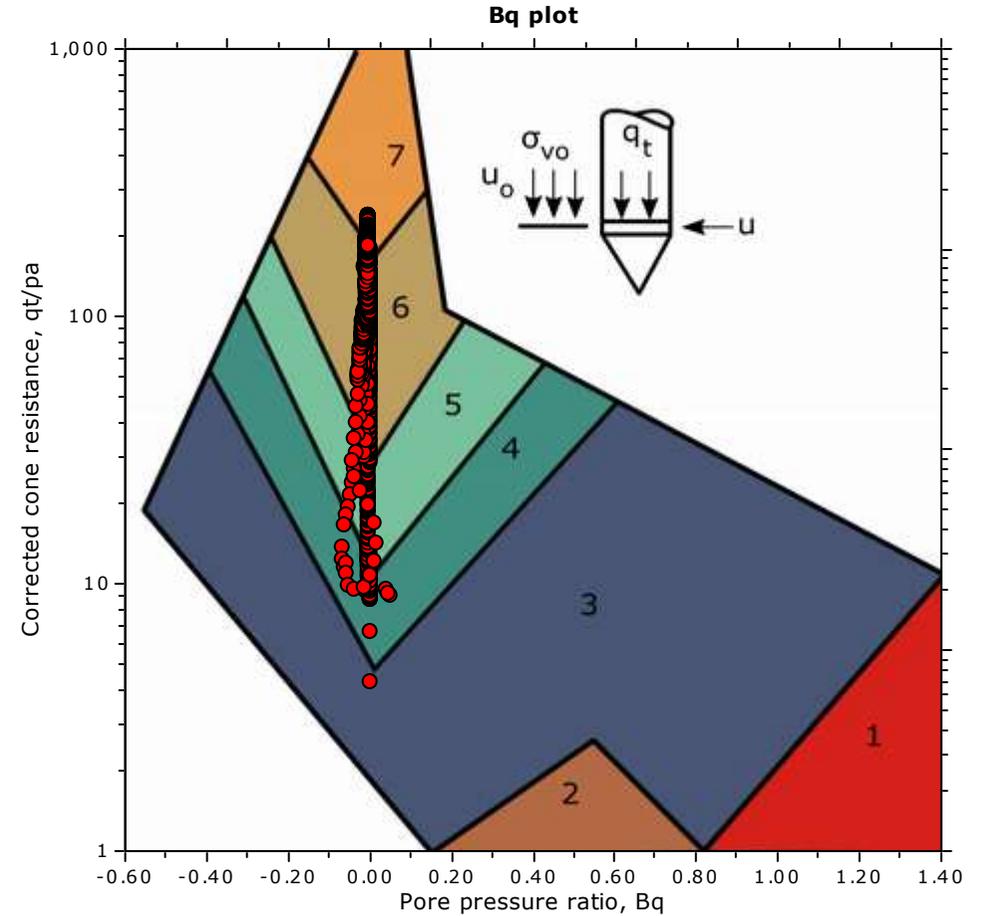
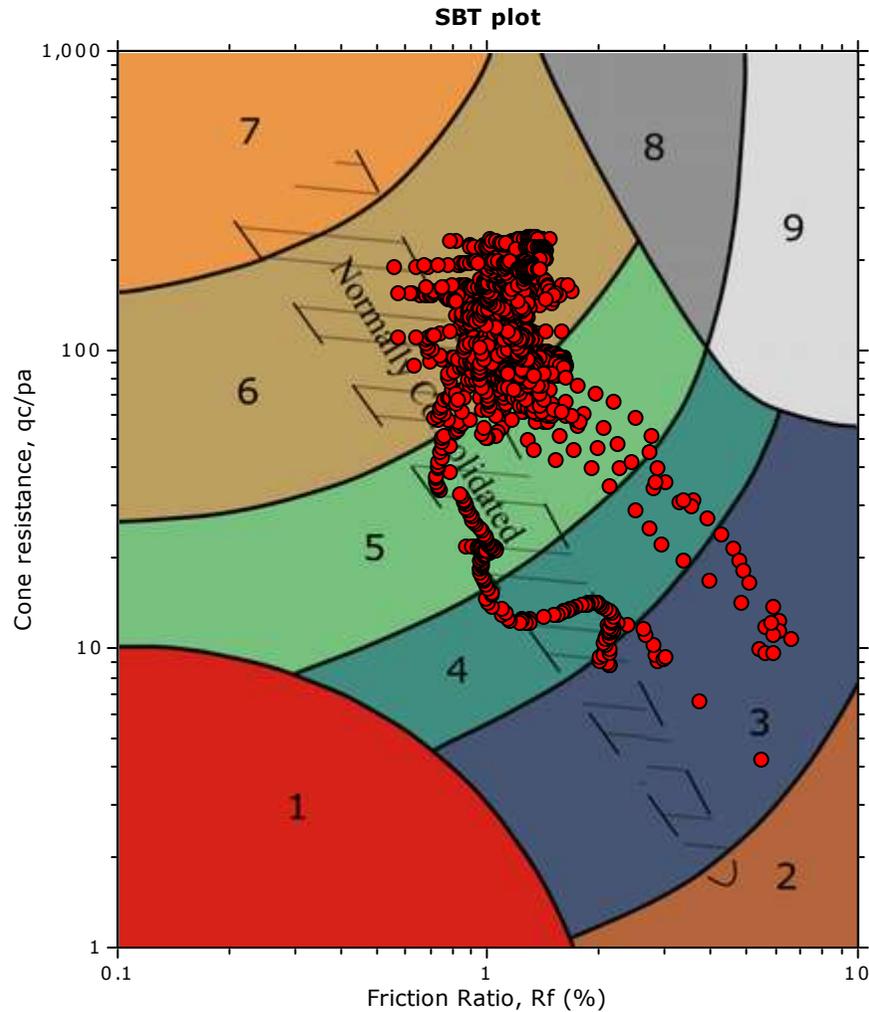


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

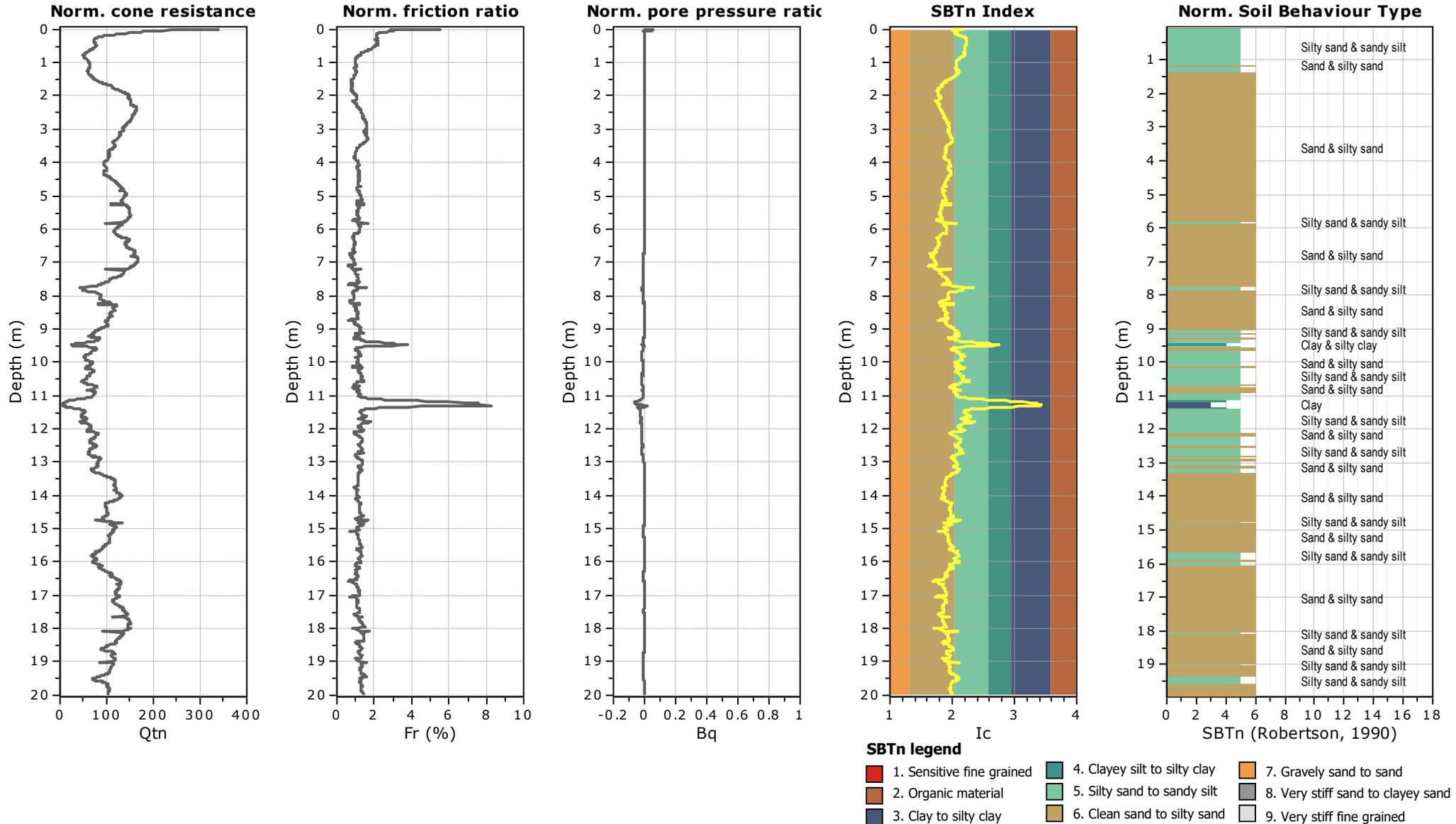


SBT - Bq plots

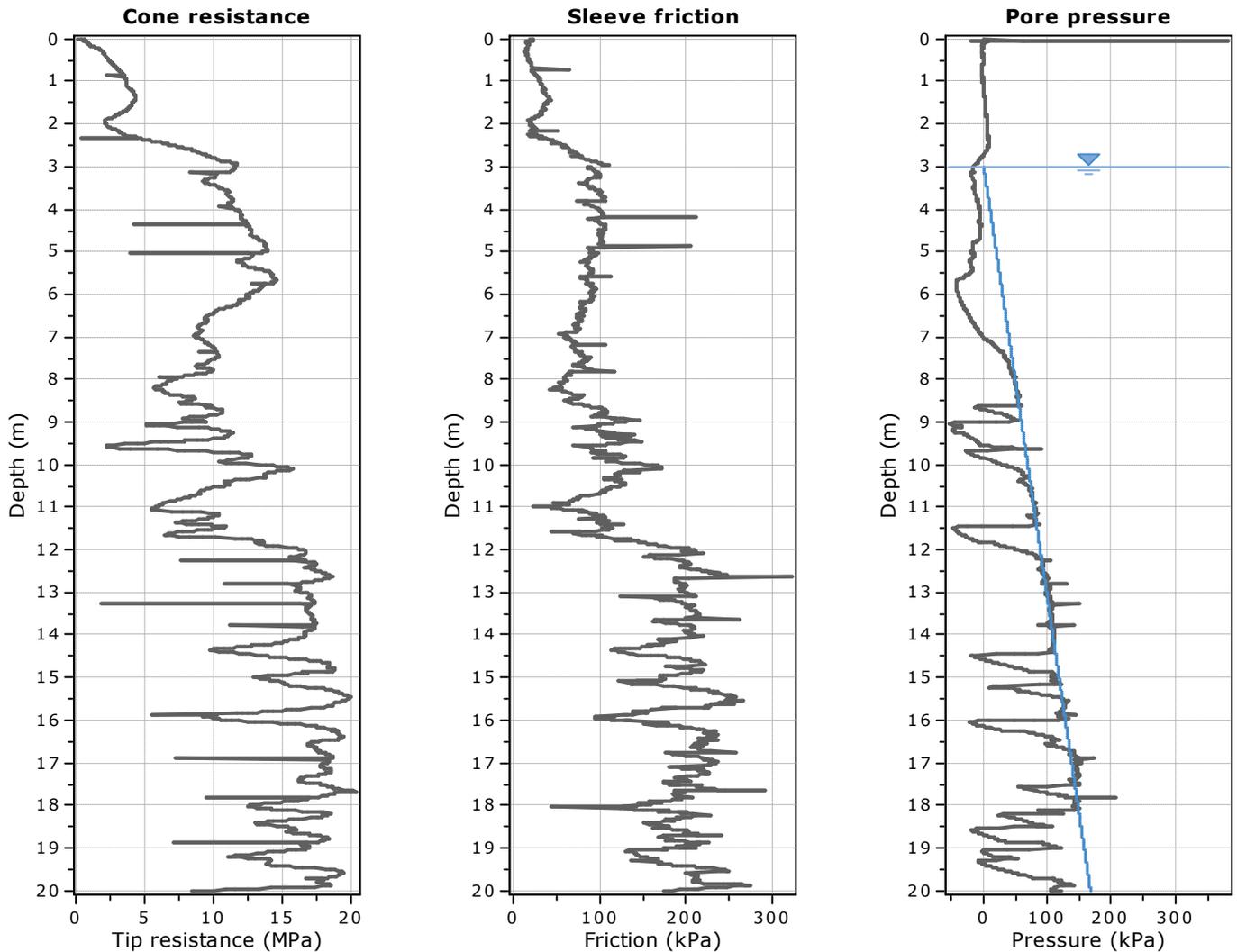


SBT legend

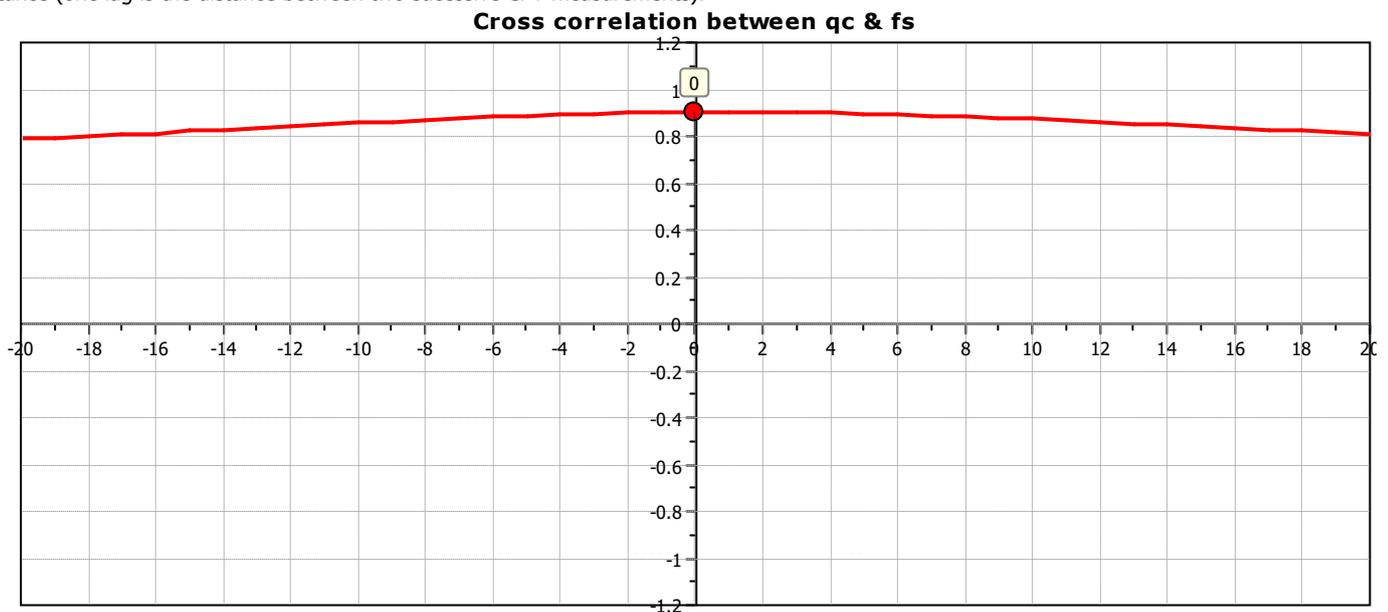
- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |



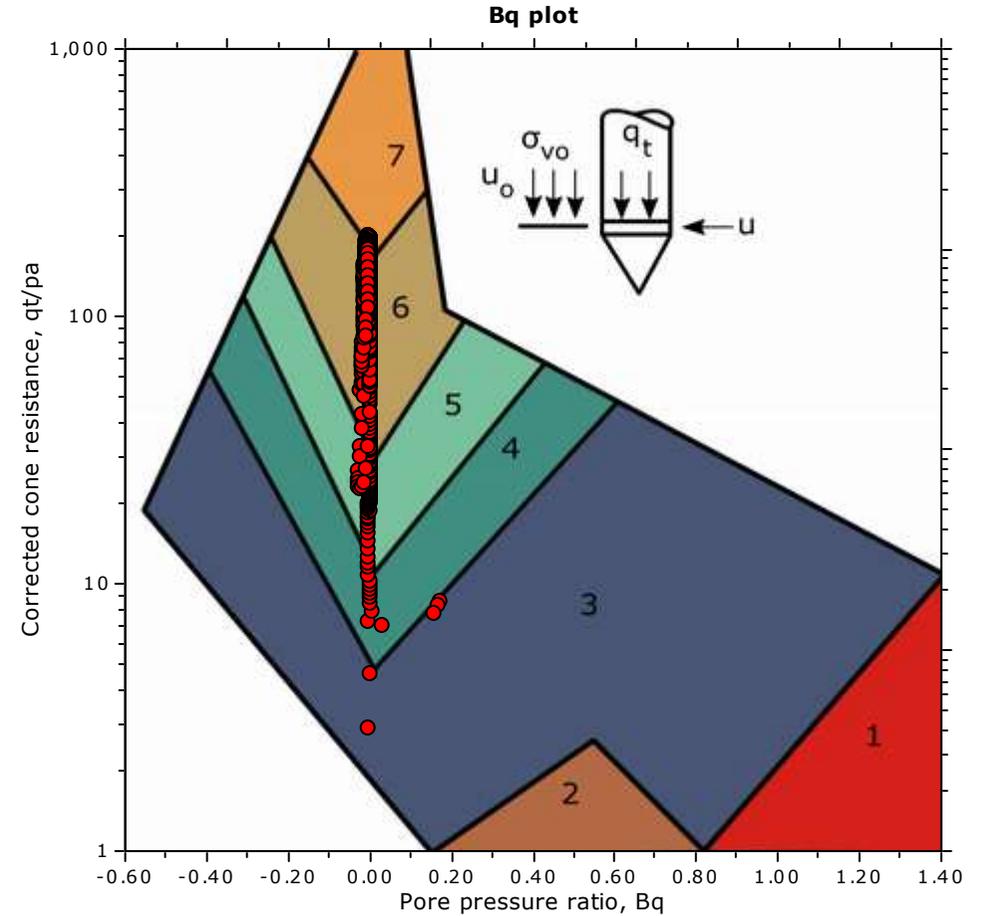
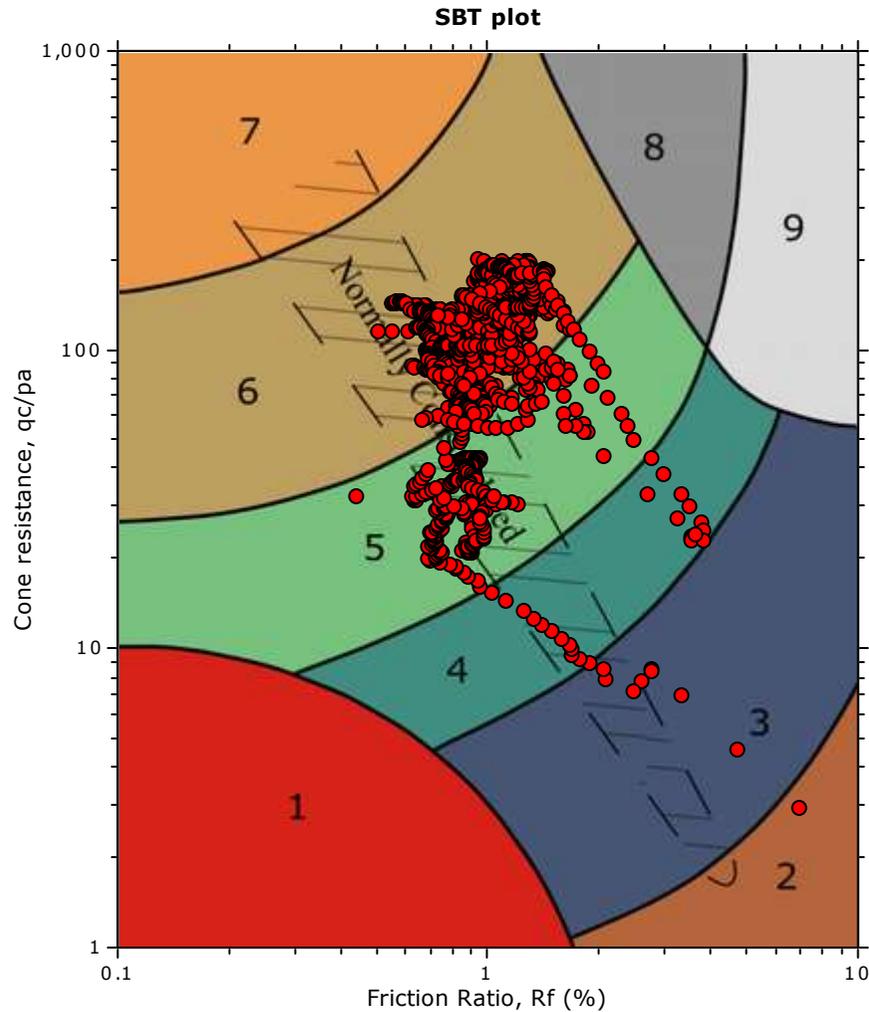
Project: Summerset Paraparaumu
Location: 65 & 73 Ratanui Road, Paraparaumu



The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



SBT - Bq plots

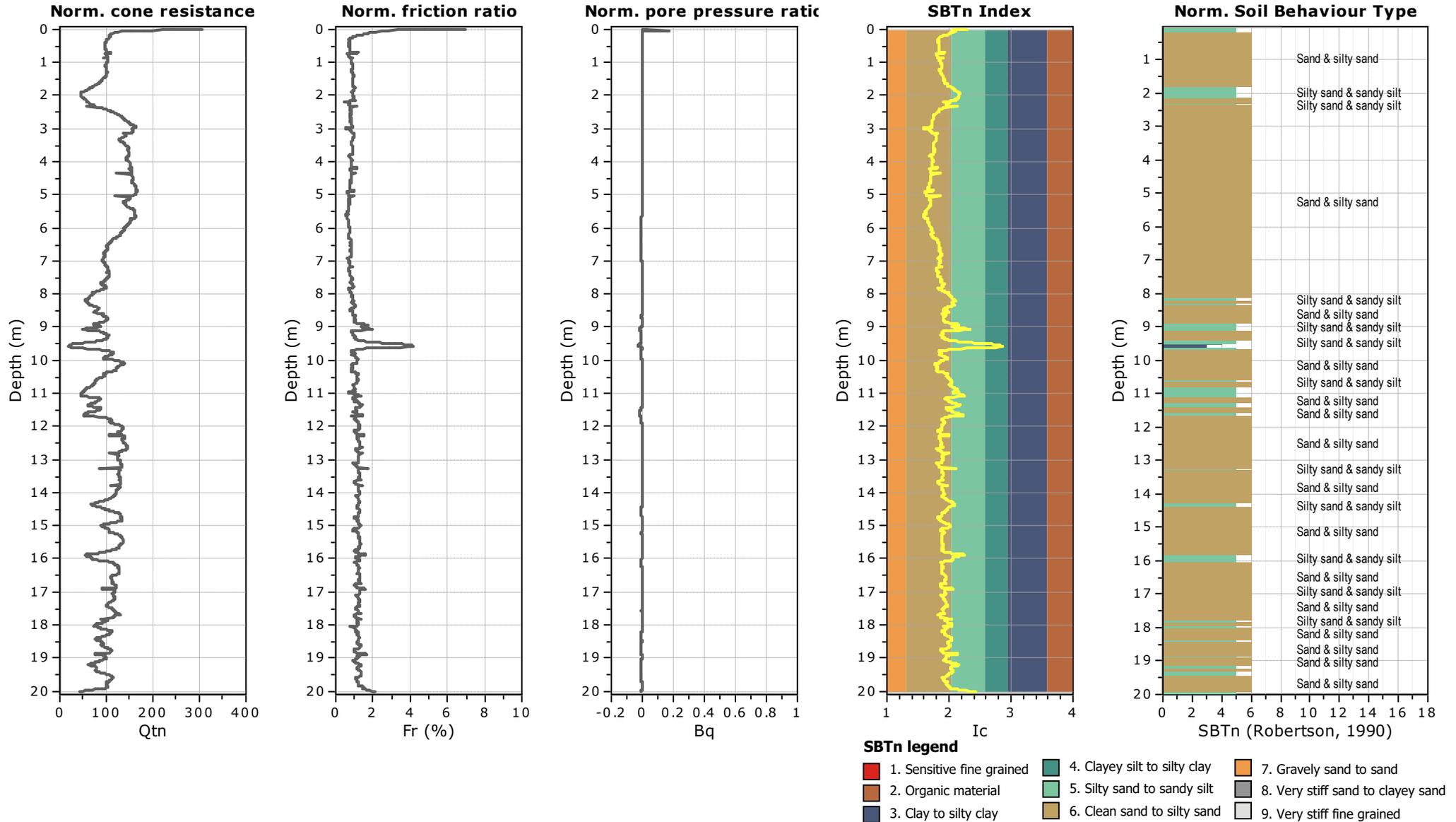


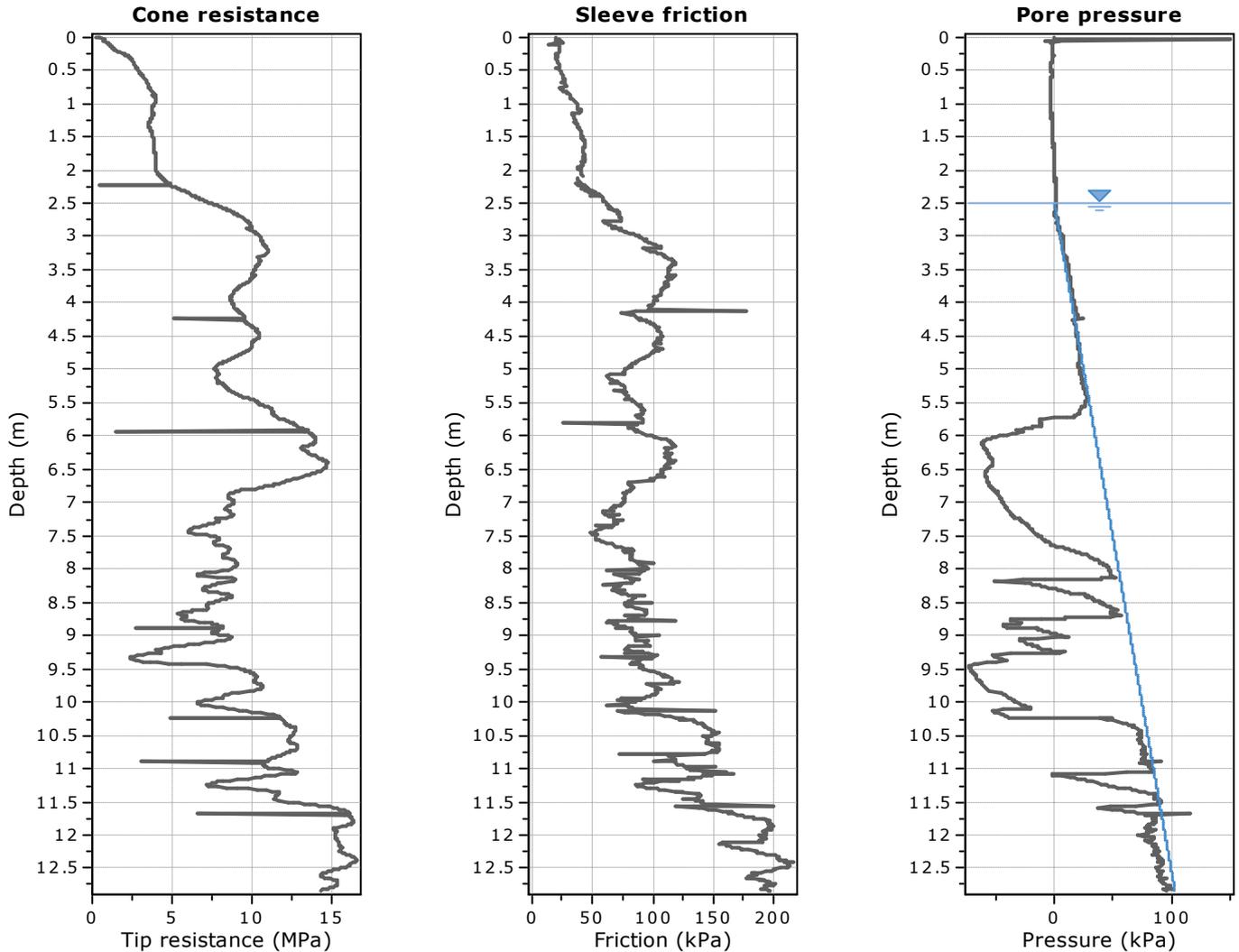
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

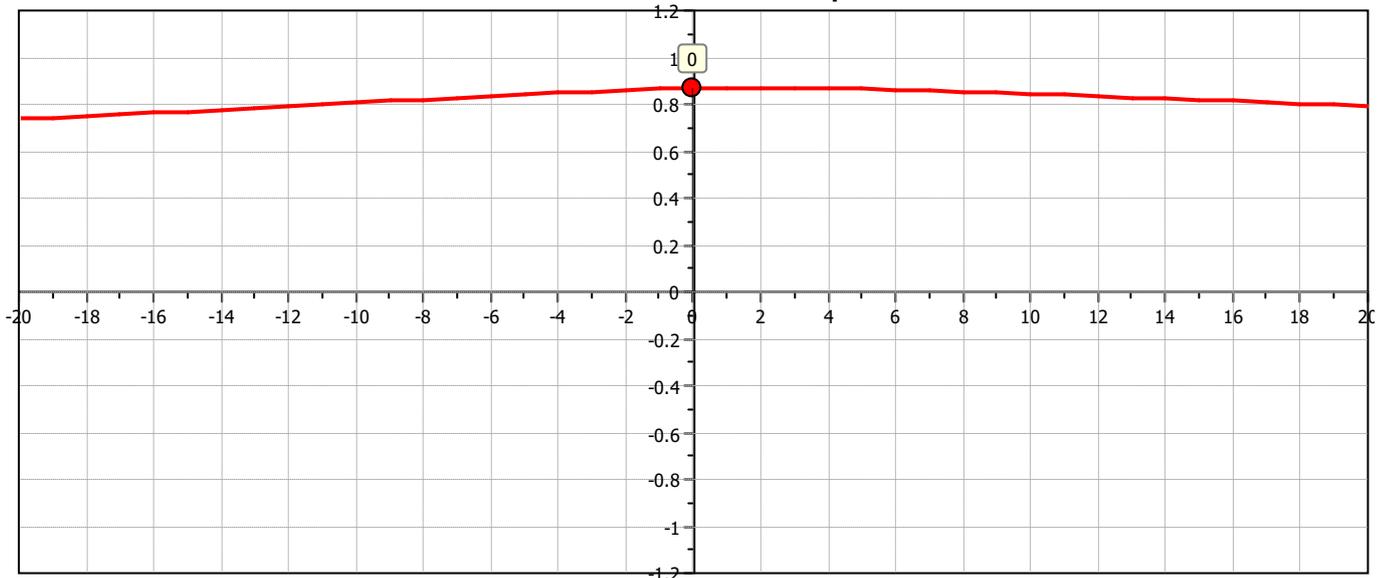
Location: 65 & 73 Ratanui Road, Paraparaumu



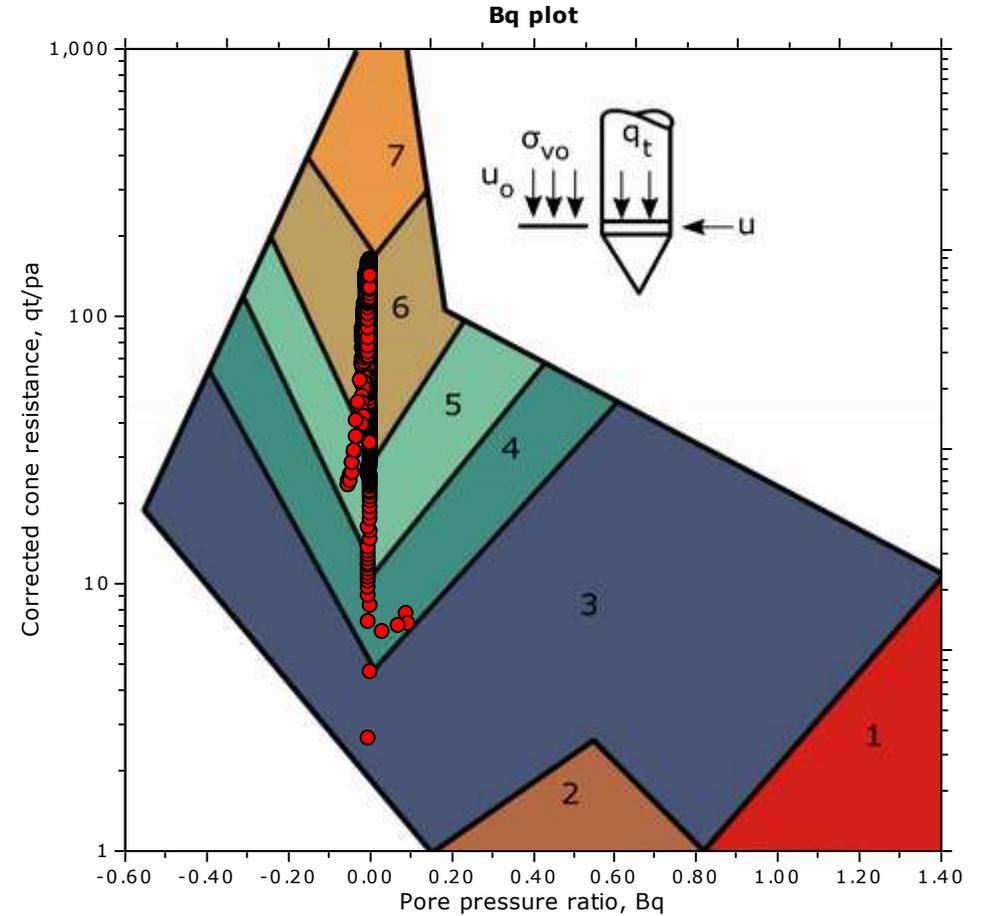
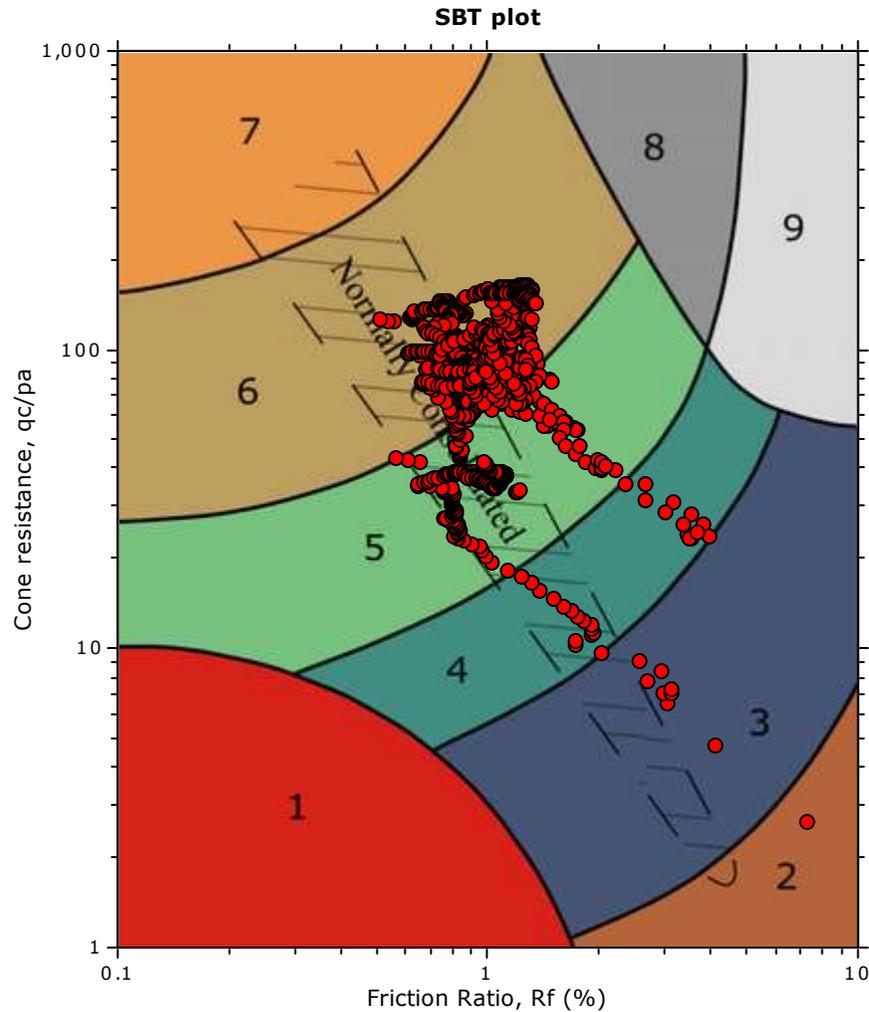


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

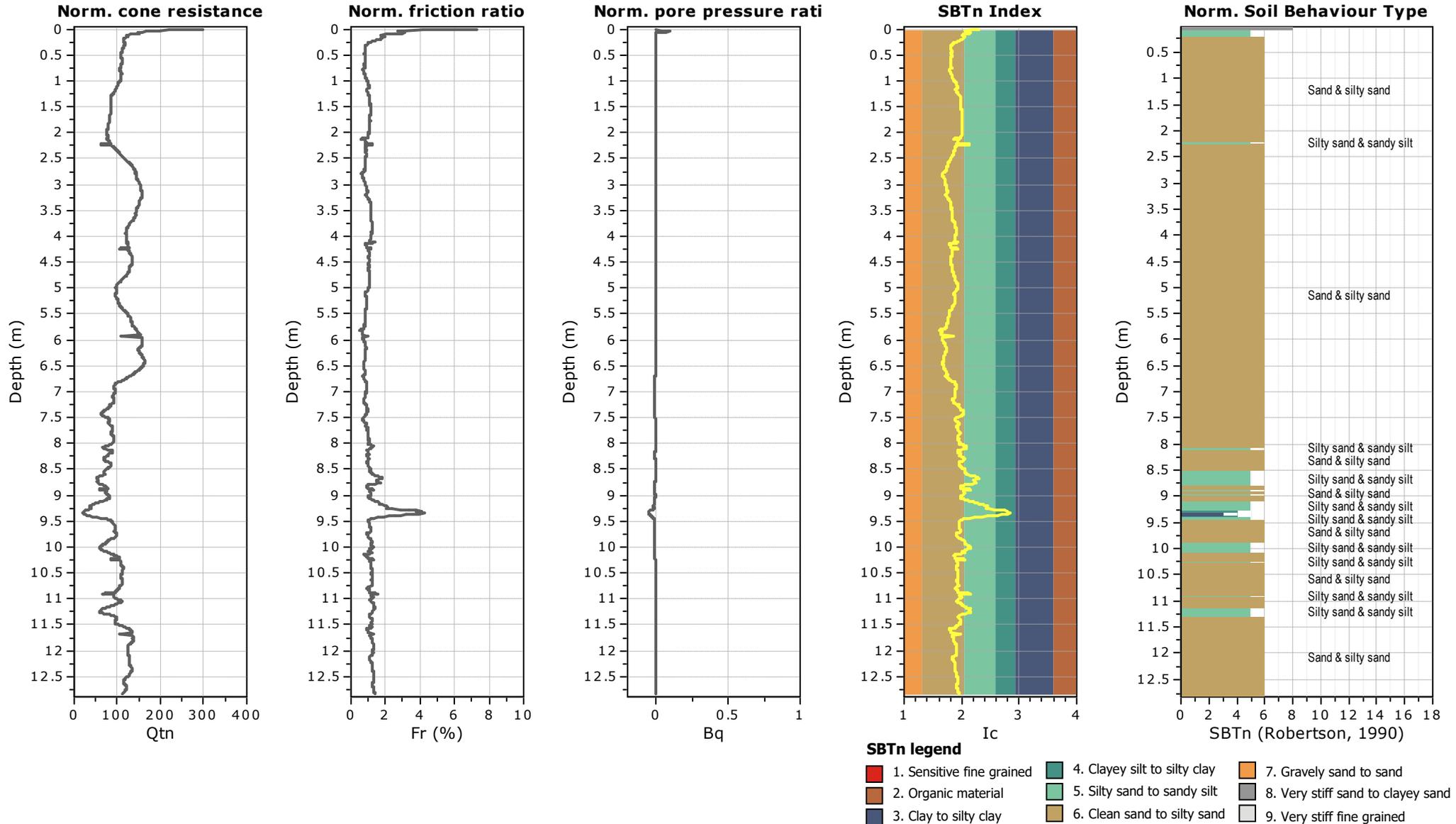


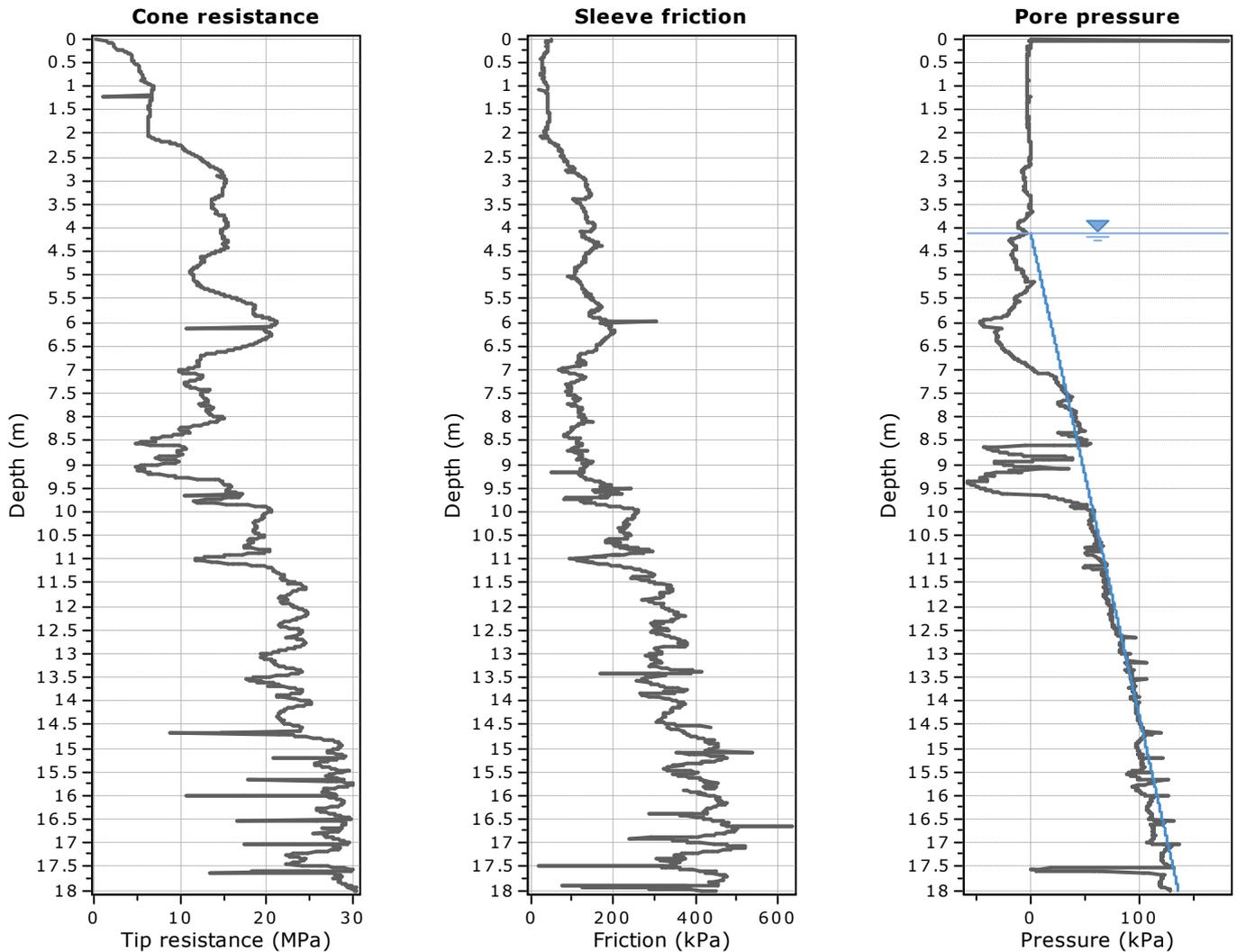
SBT - Bq plots



SBT legend

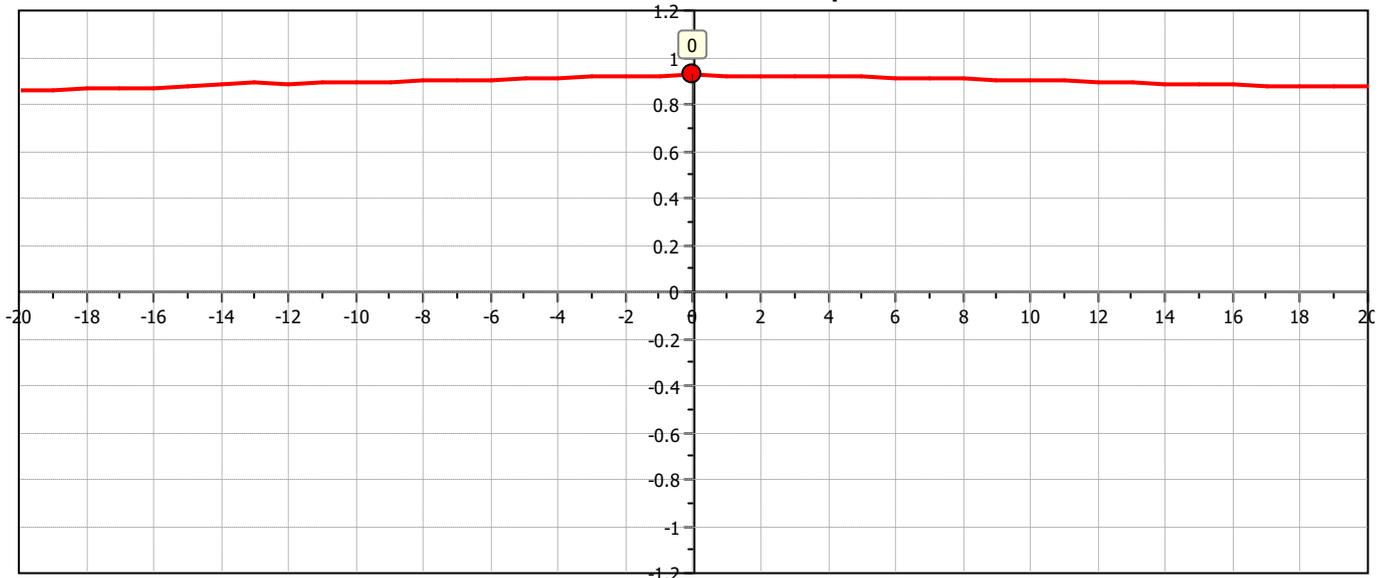
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |



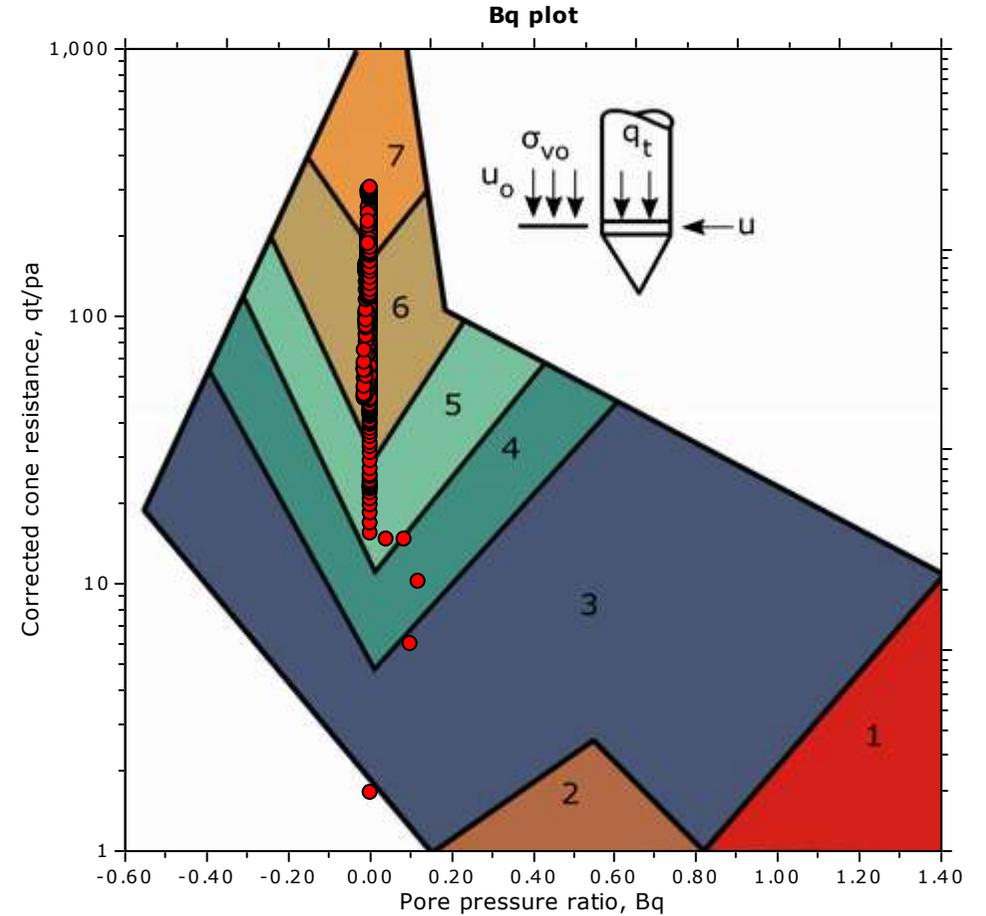
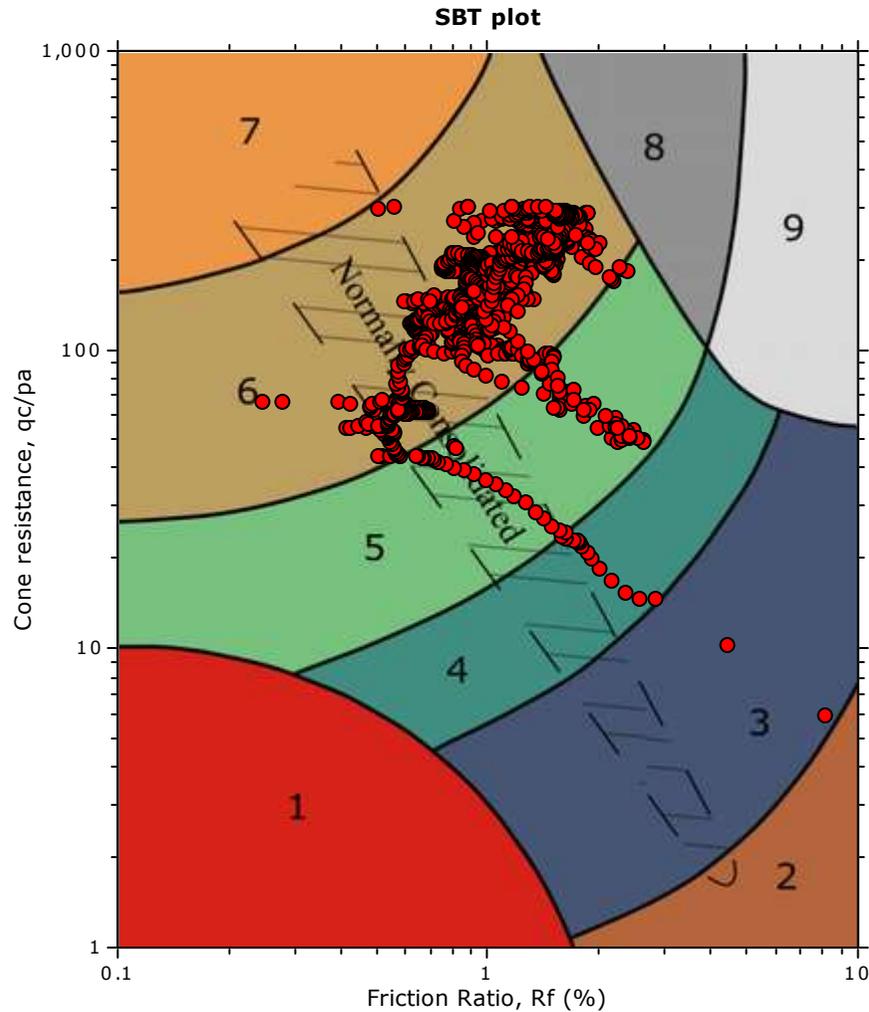


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

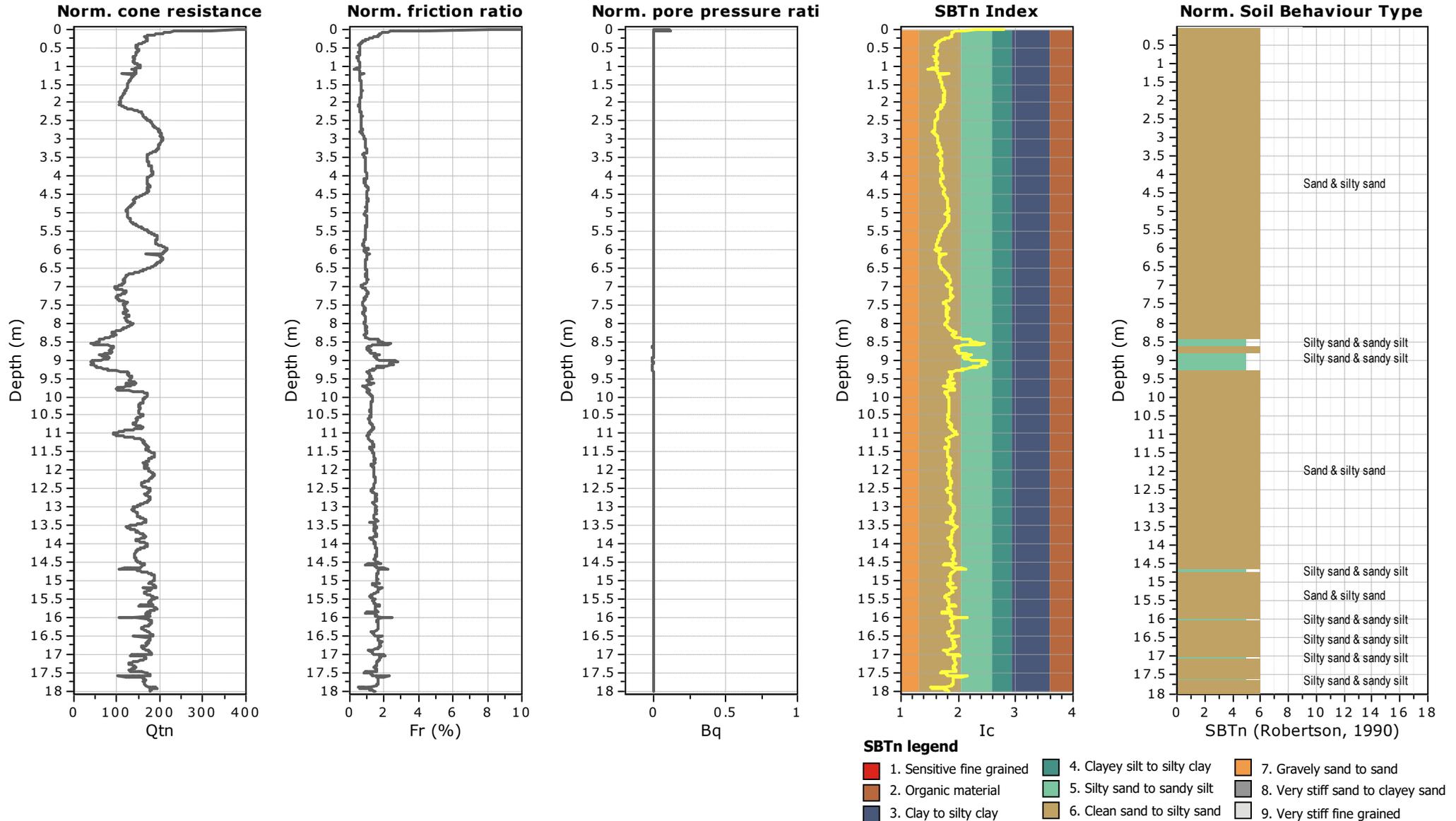


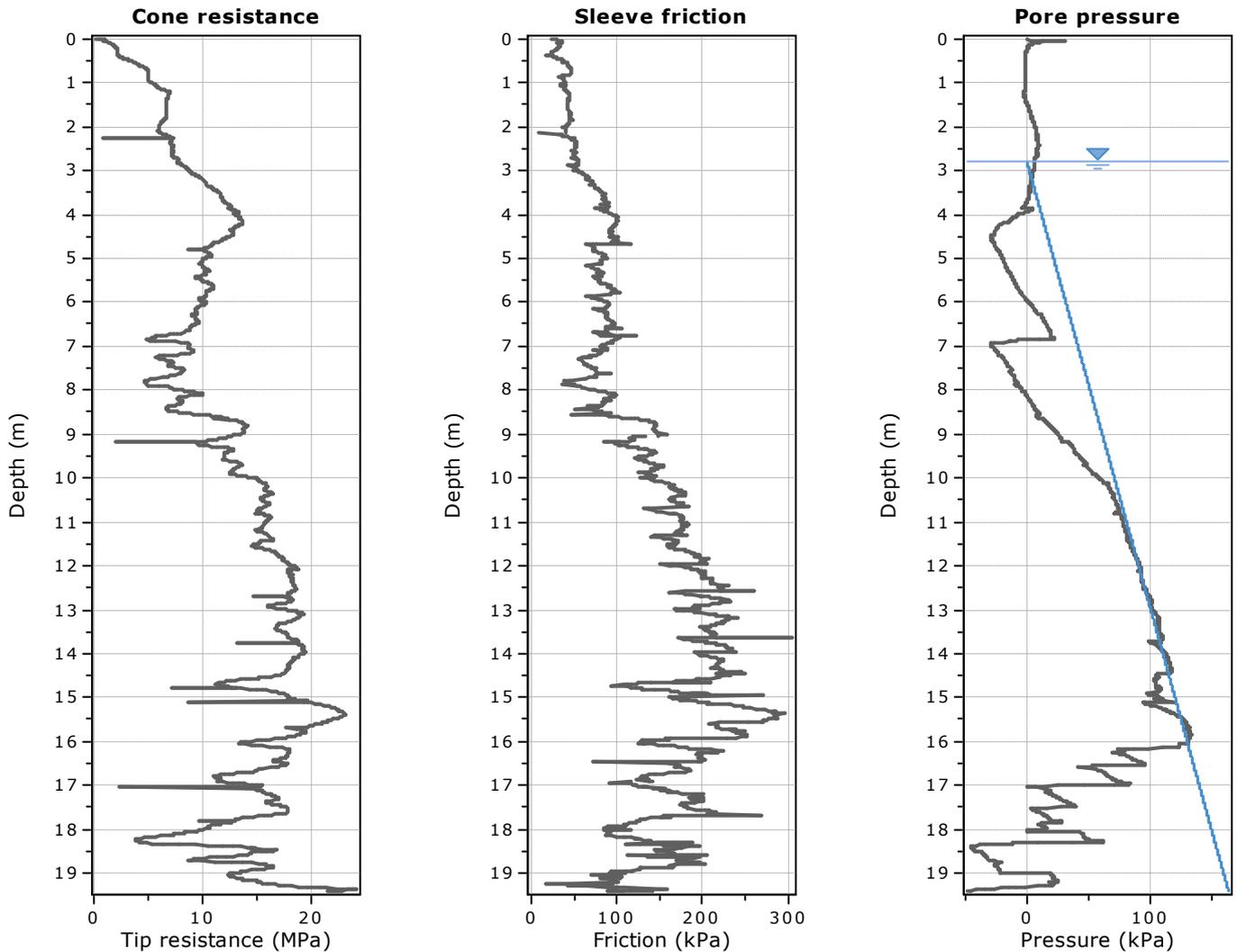
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

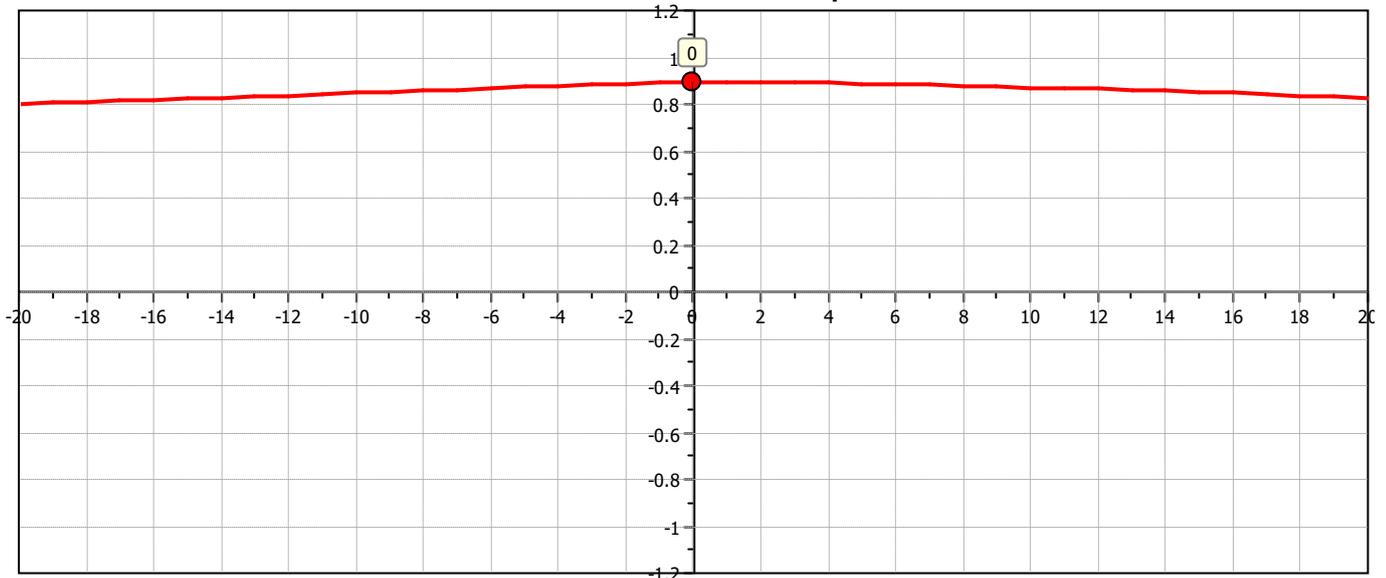
Location: 65 & 73 Ratanui Road, Paraparaumu



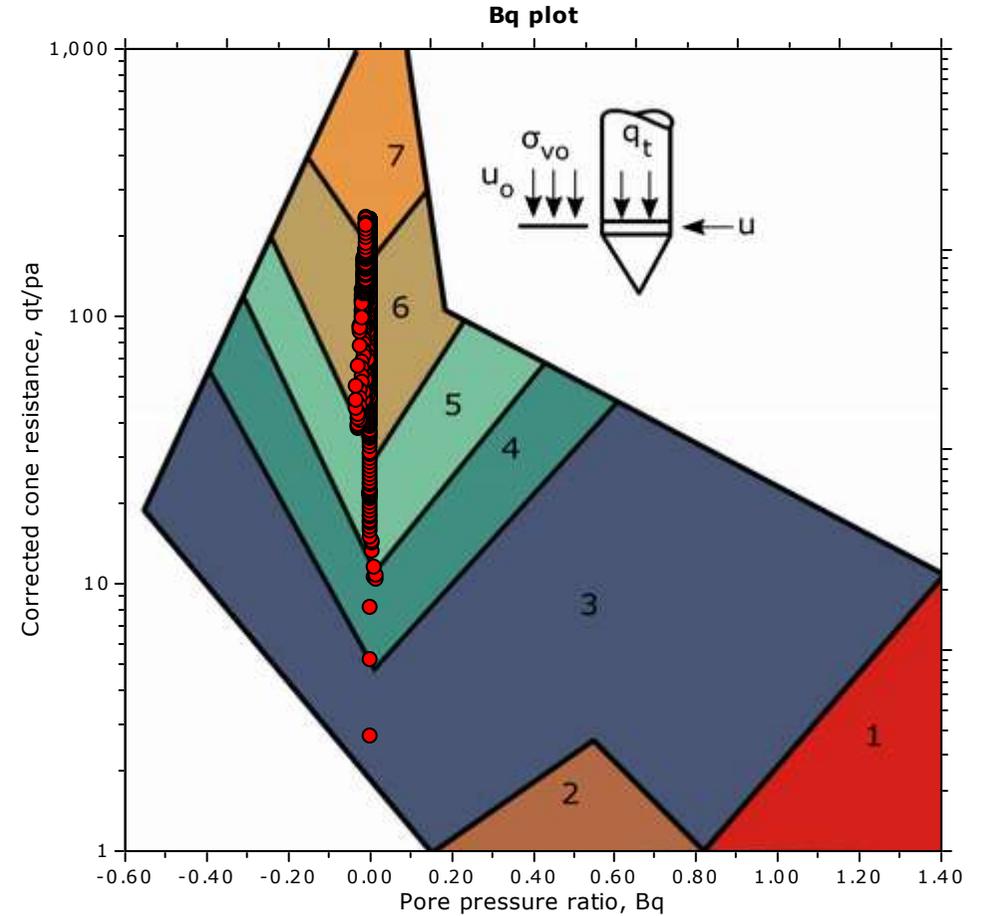
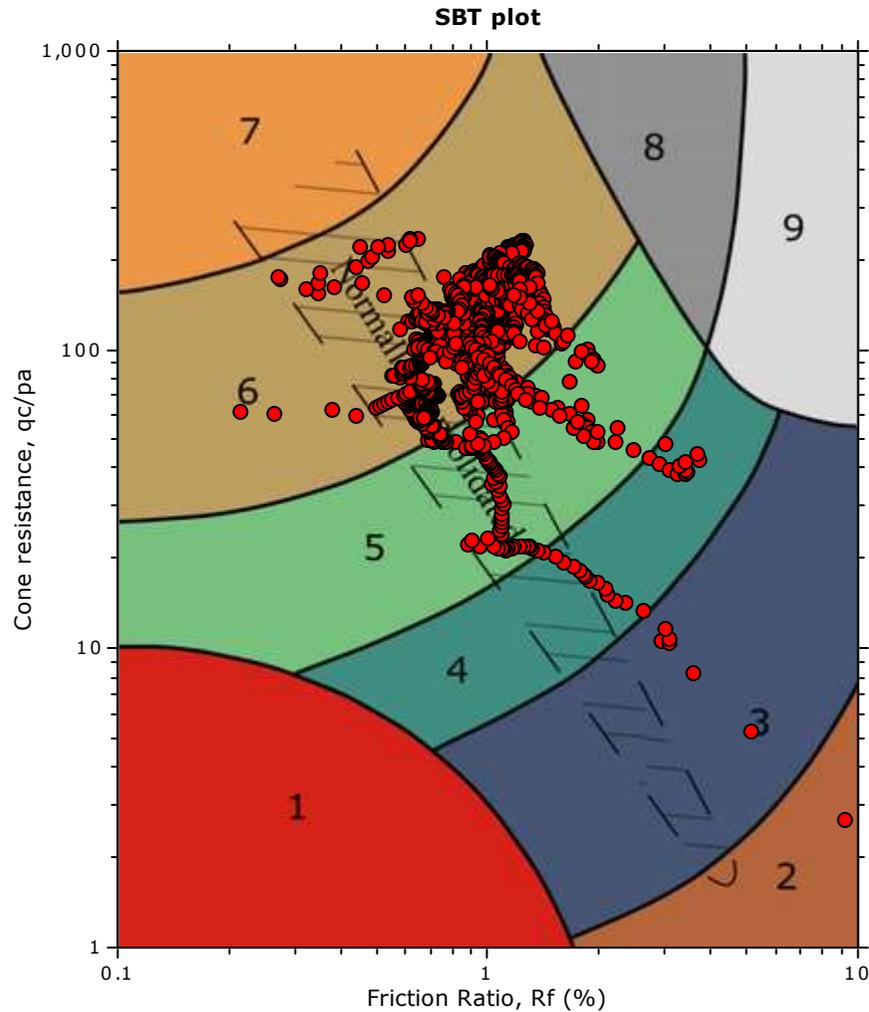


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

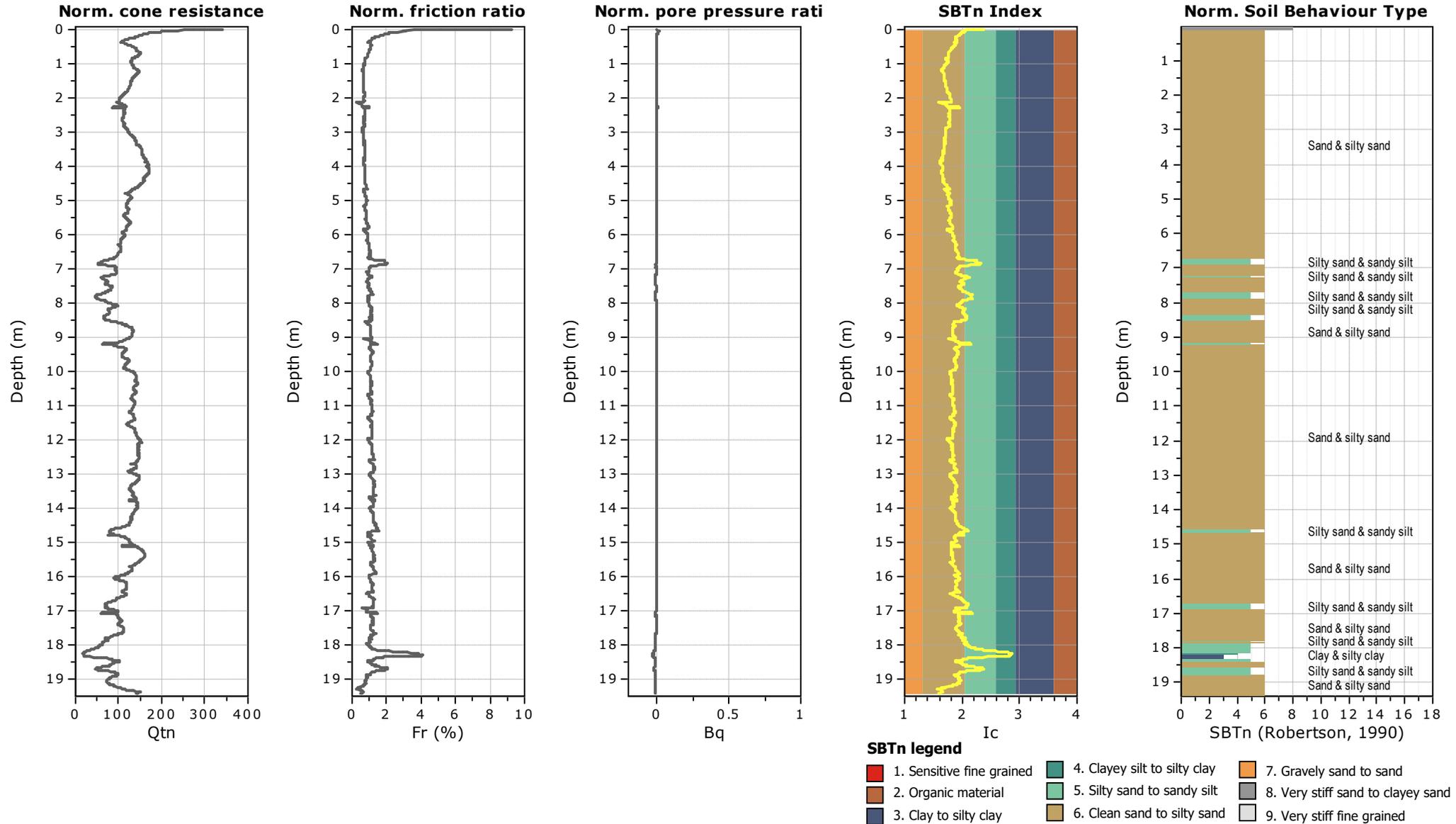


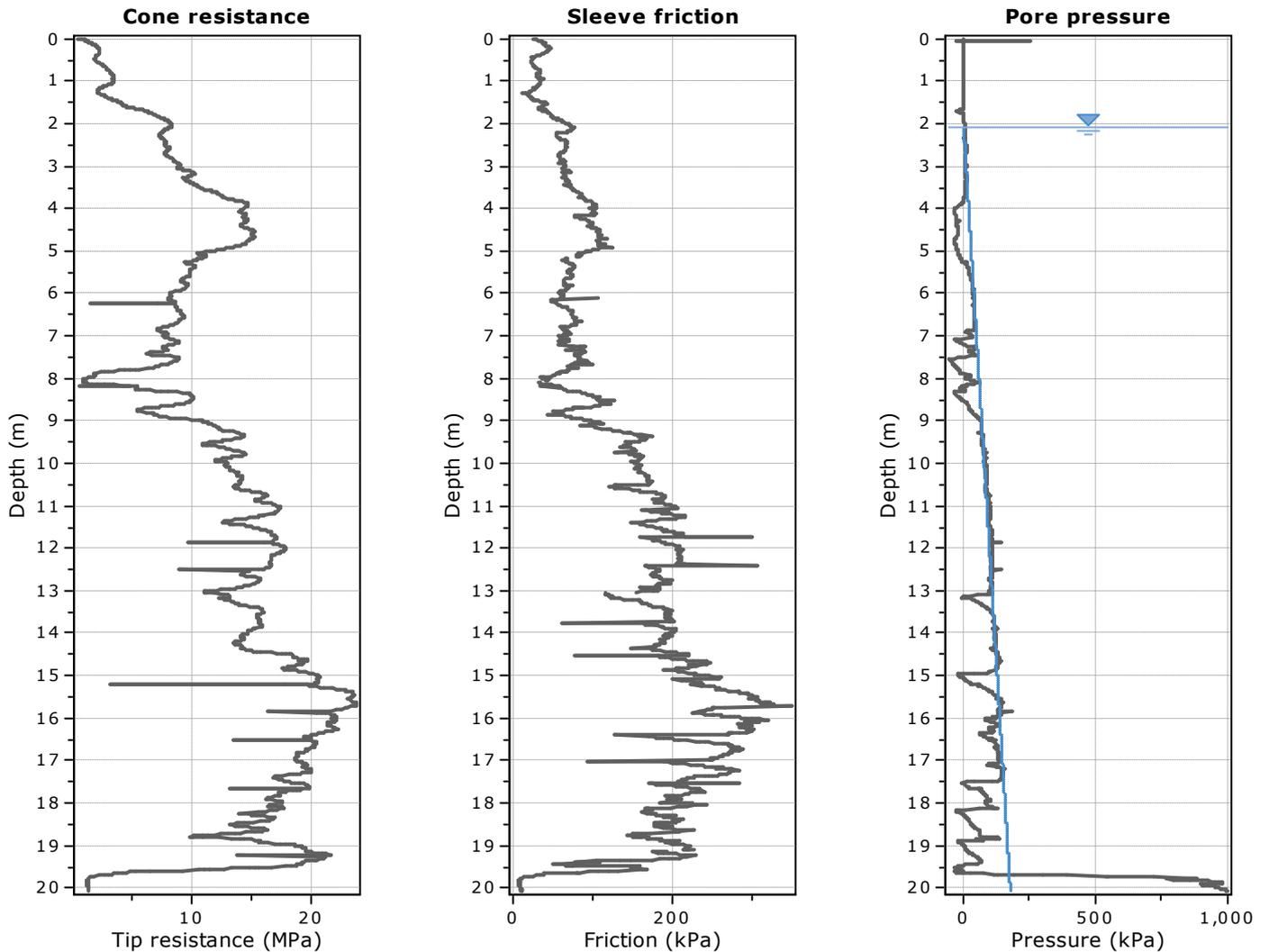
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

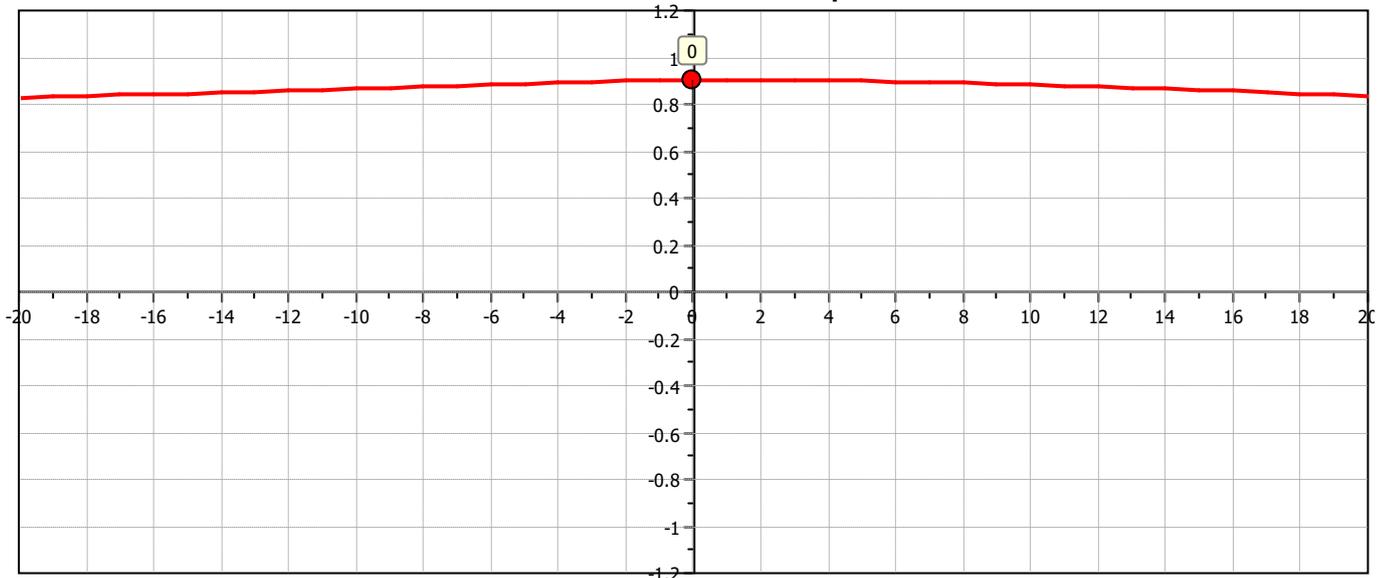
Location: 65 & 73 Ratanui Road, Paraparaumu



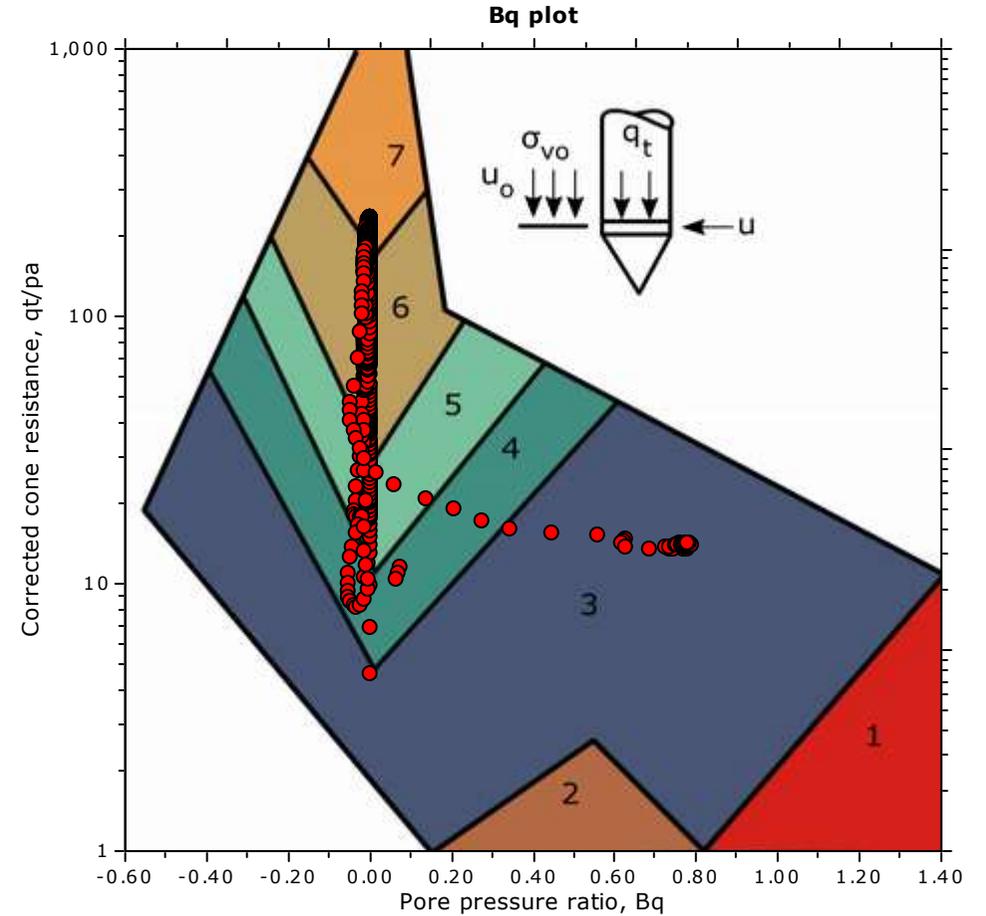
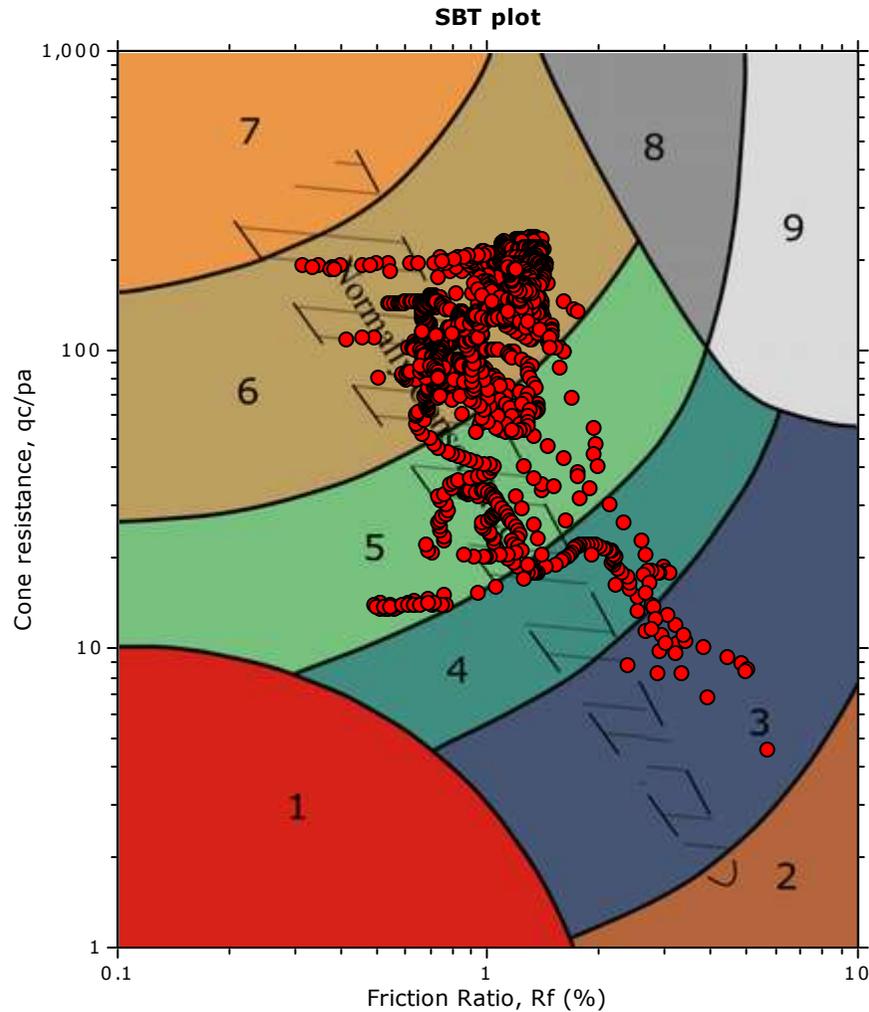


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

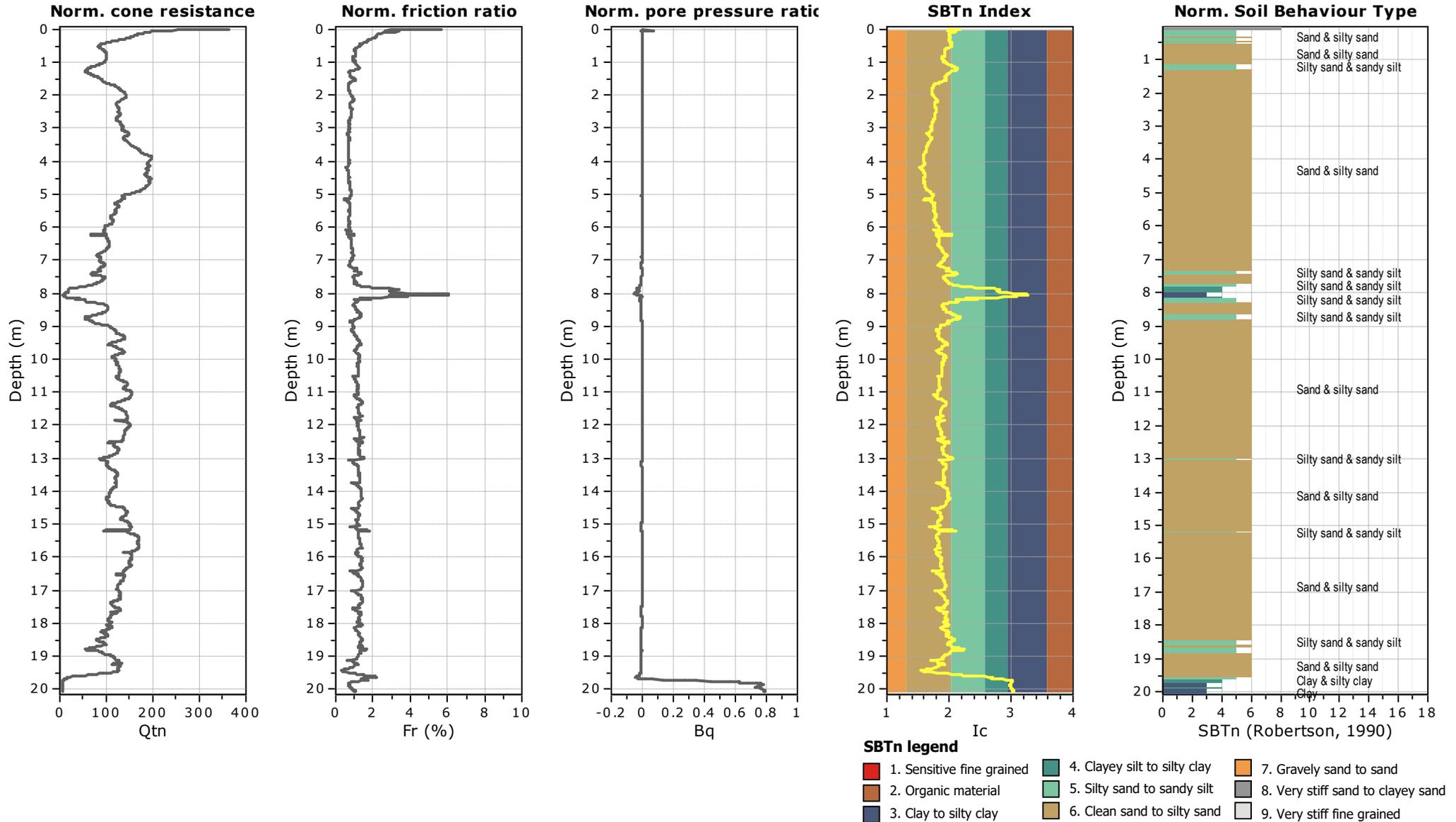


SBT legend

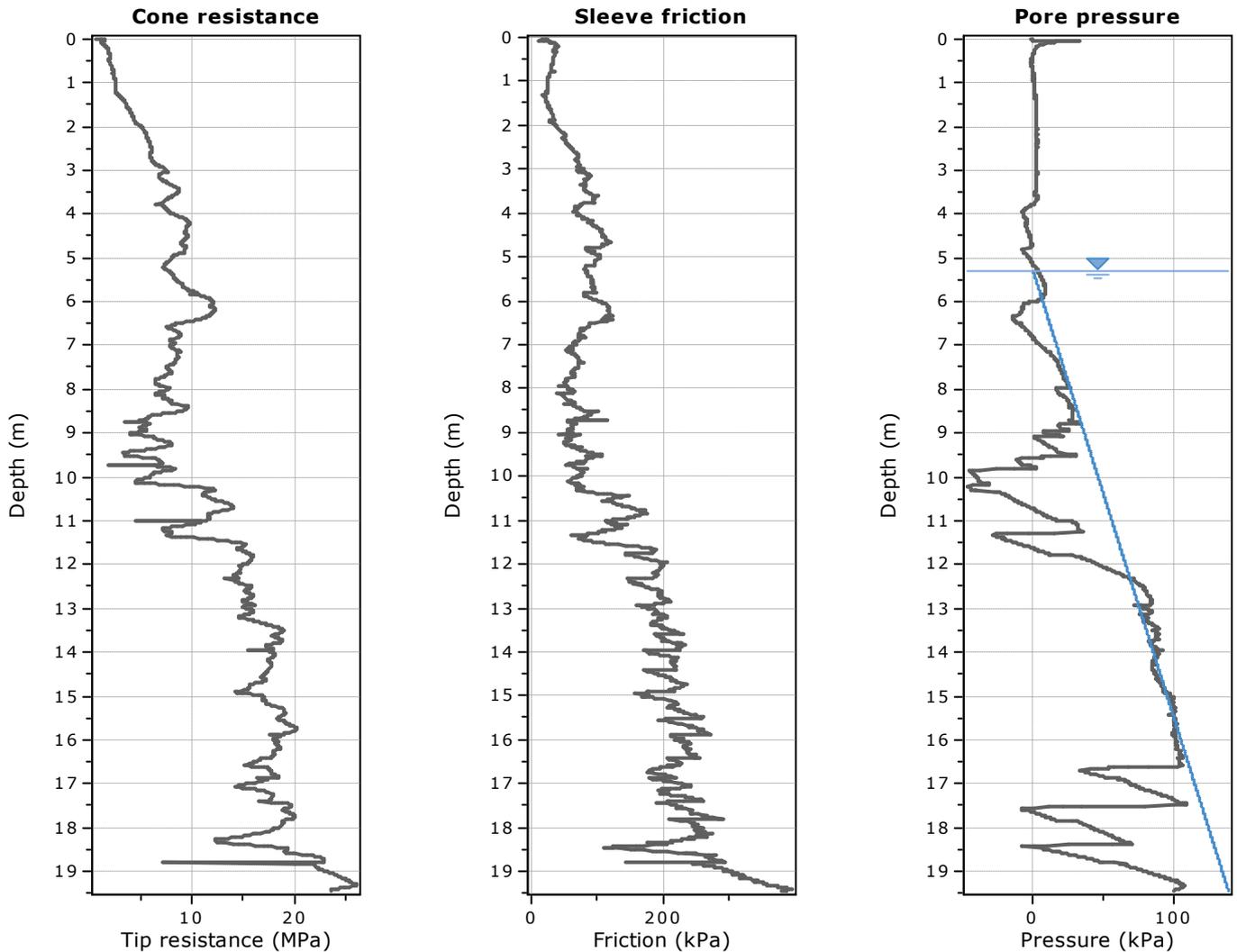
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

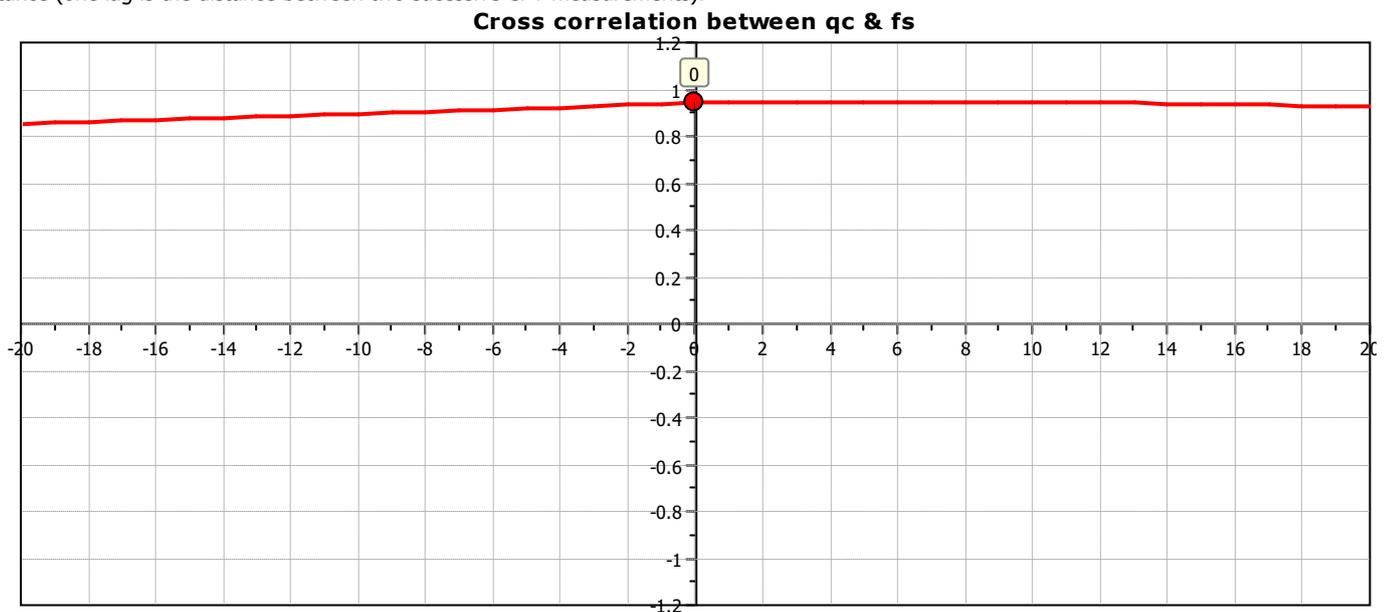
Location: 65 & 73 Ratanui Road, Paraparaumu



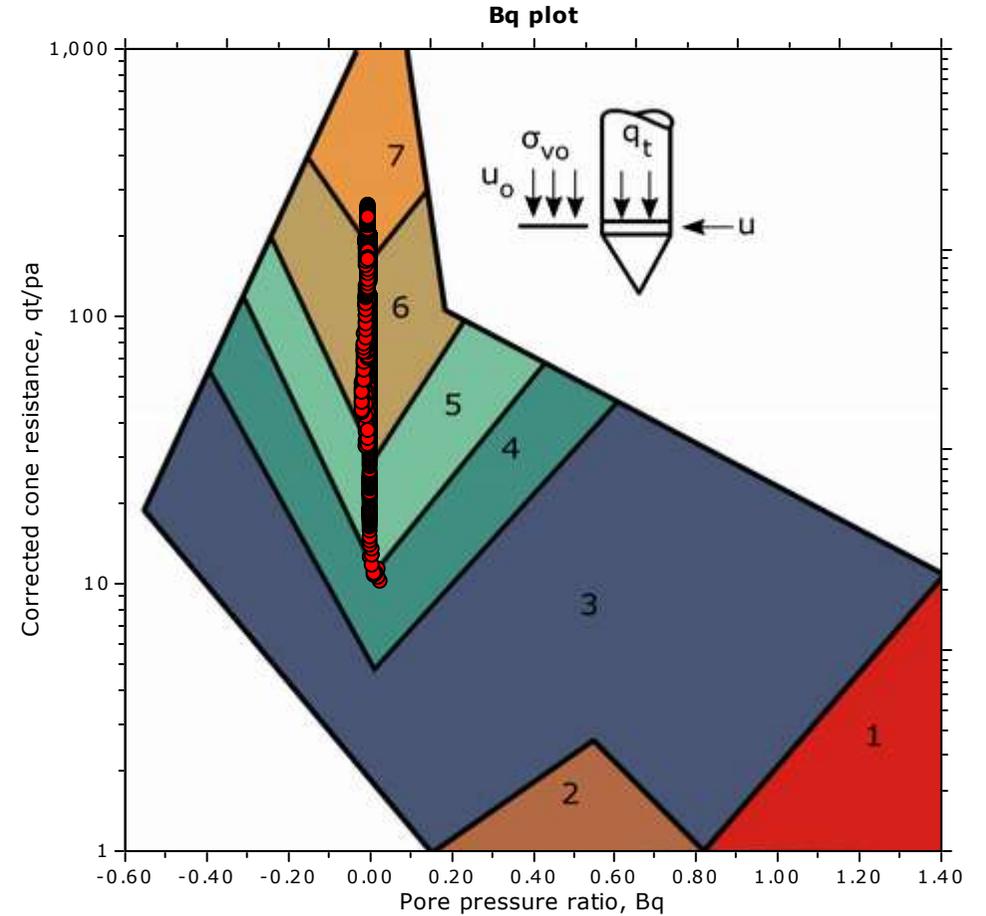
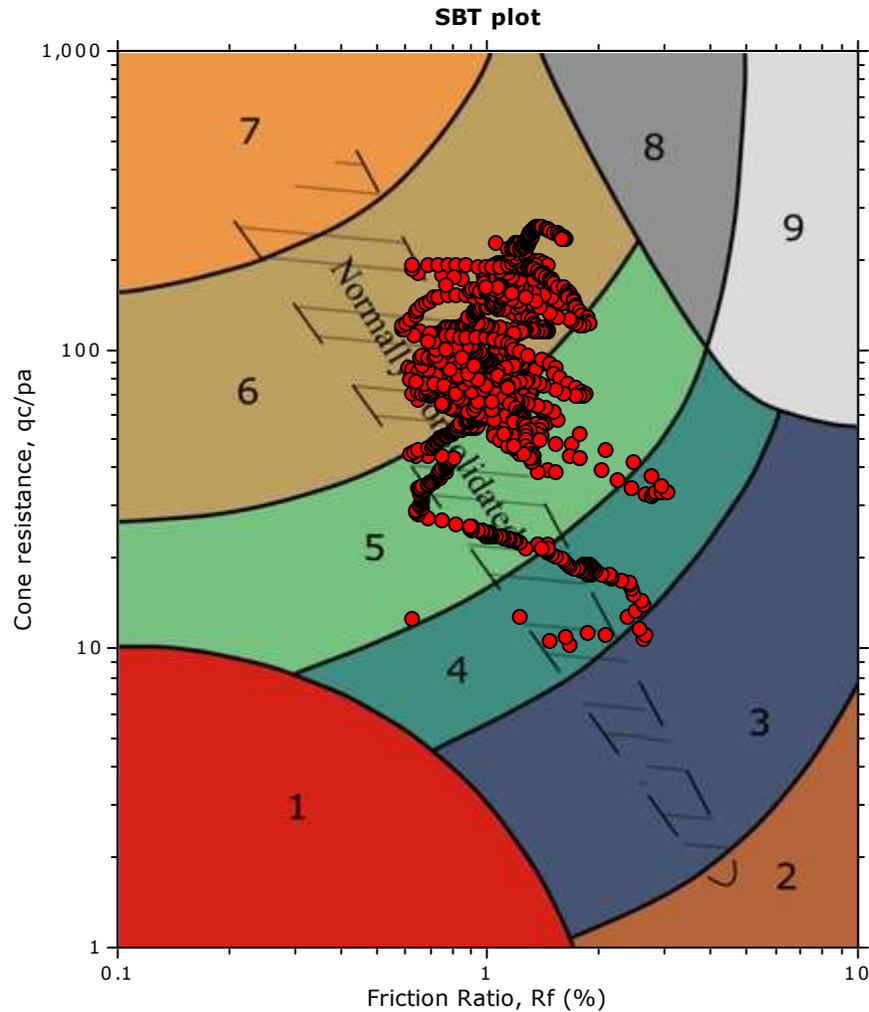
Project: Summerset Paraparaumu
Location: 65 & 73 Ratanui Road, Paraparaumu



The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



SBT - Bq plots

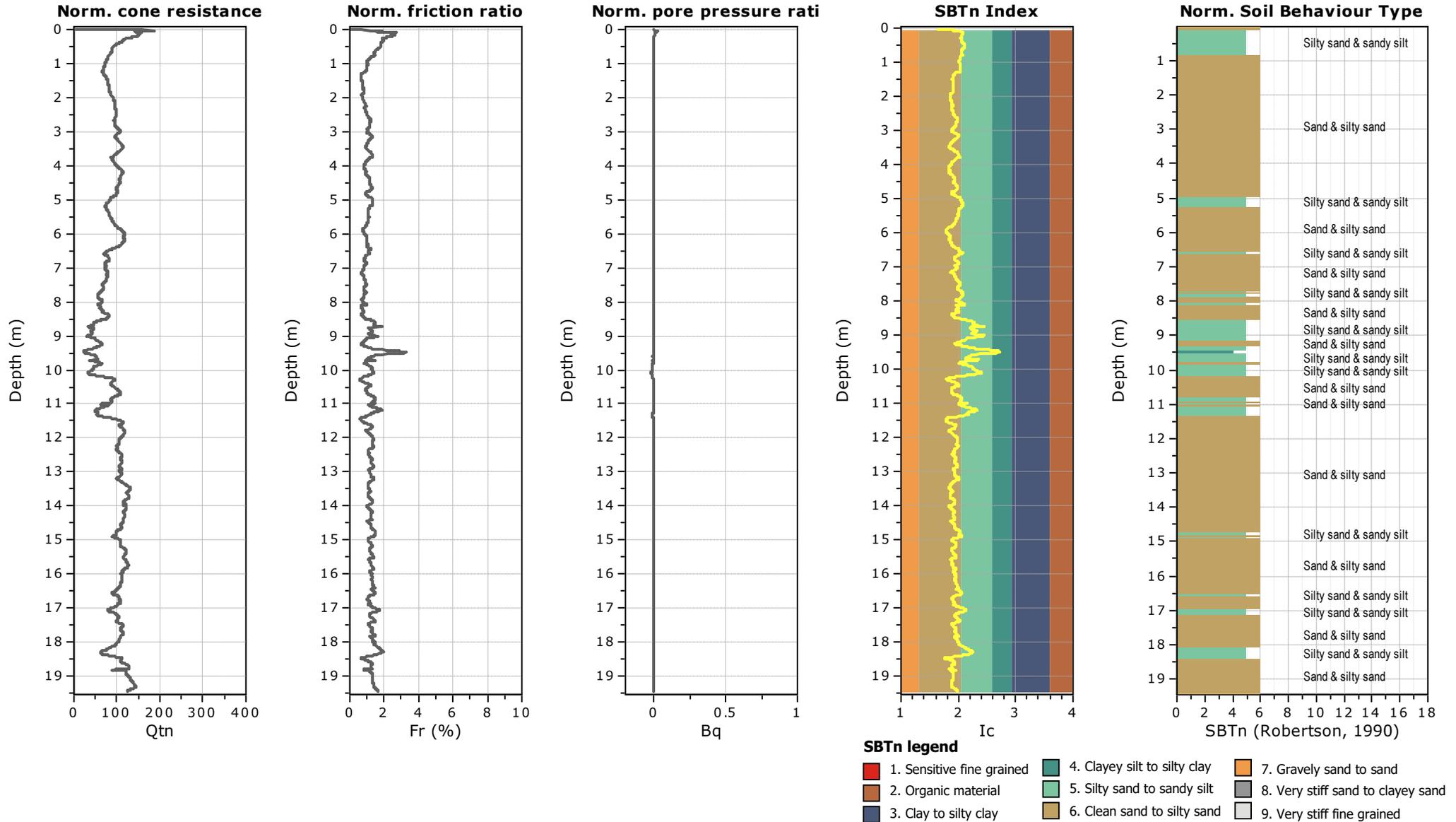


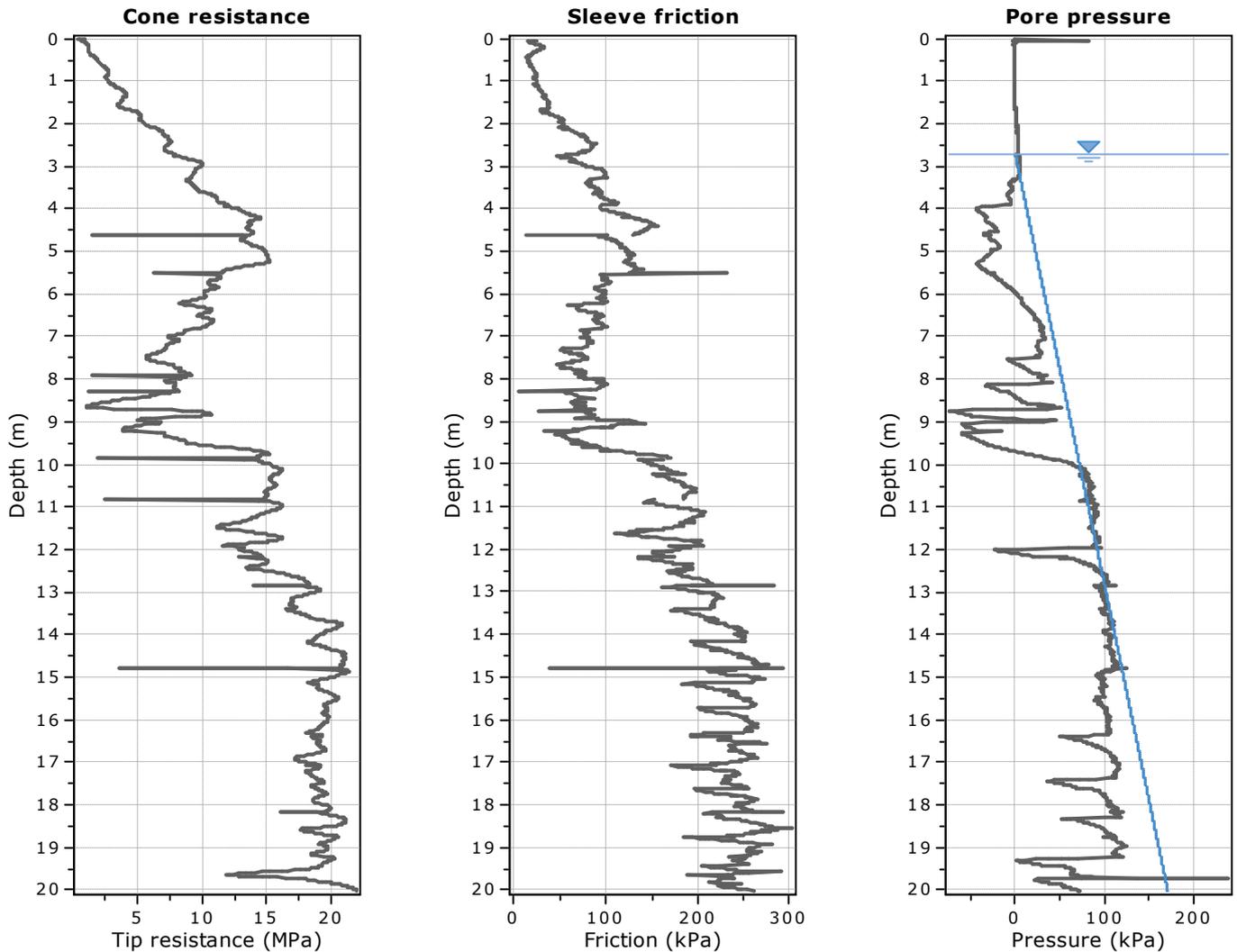
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

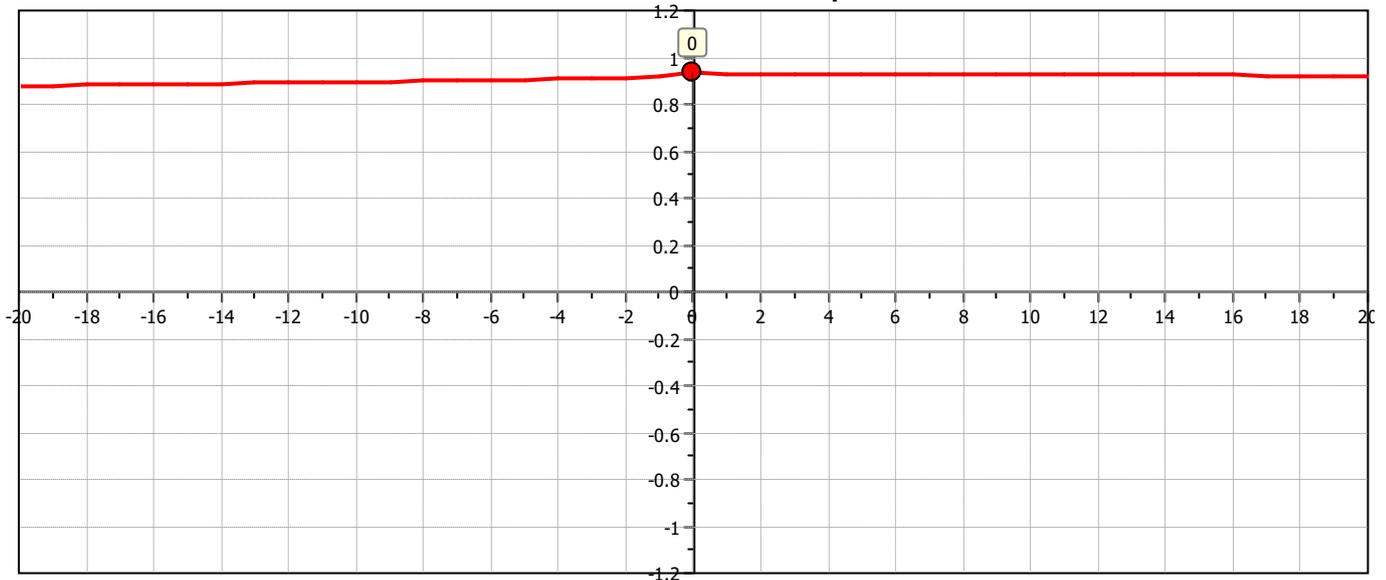
Location: 65 & 73 Ratanui Road, Paraparaumu



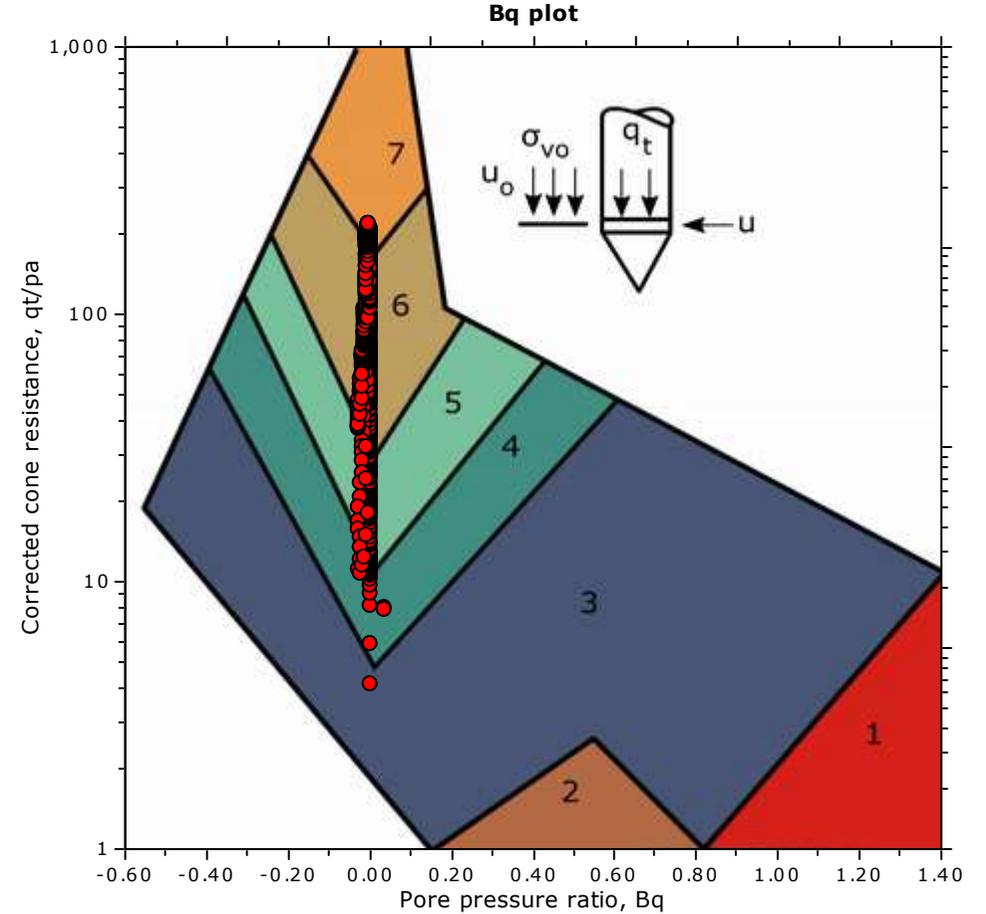
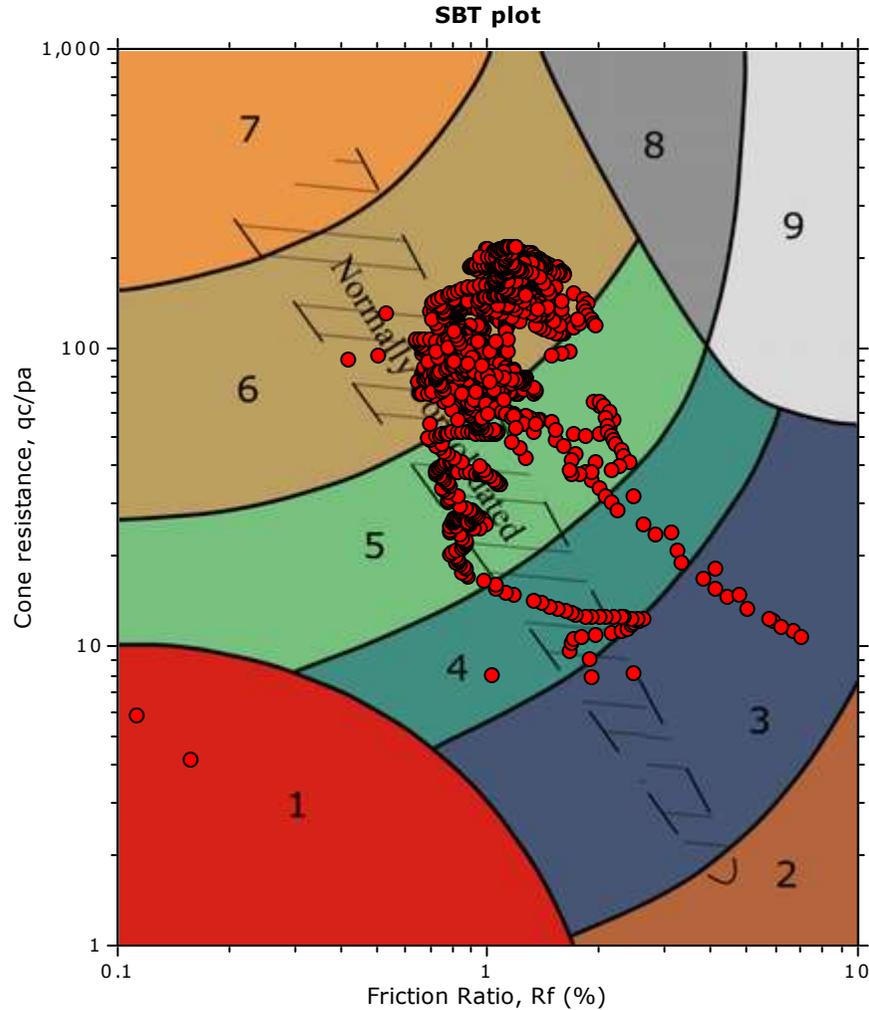


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

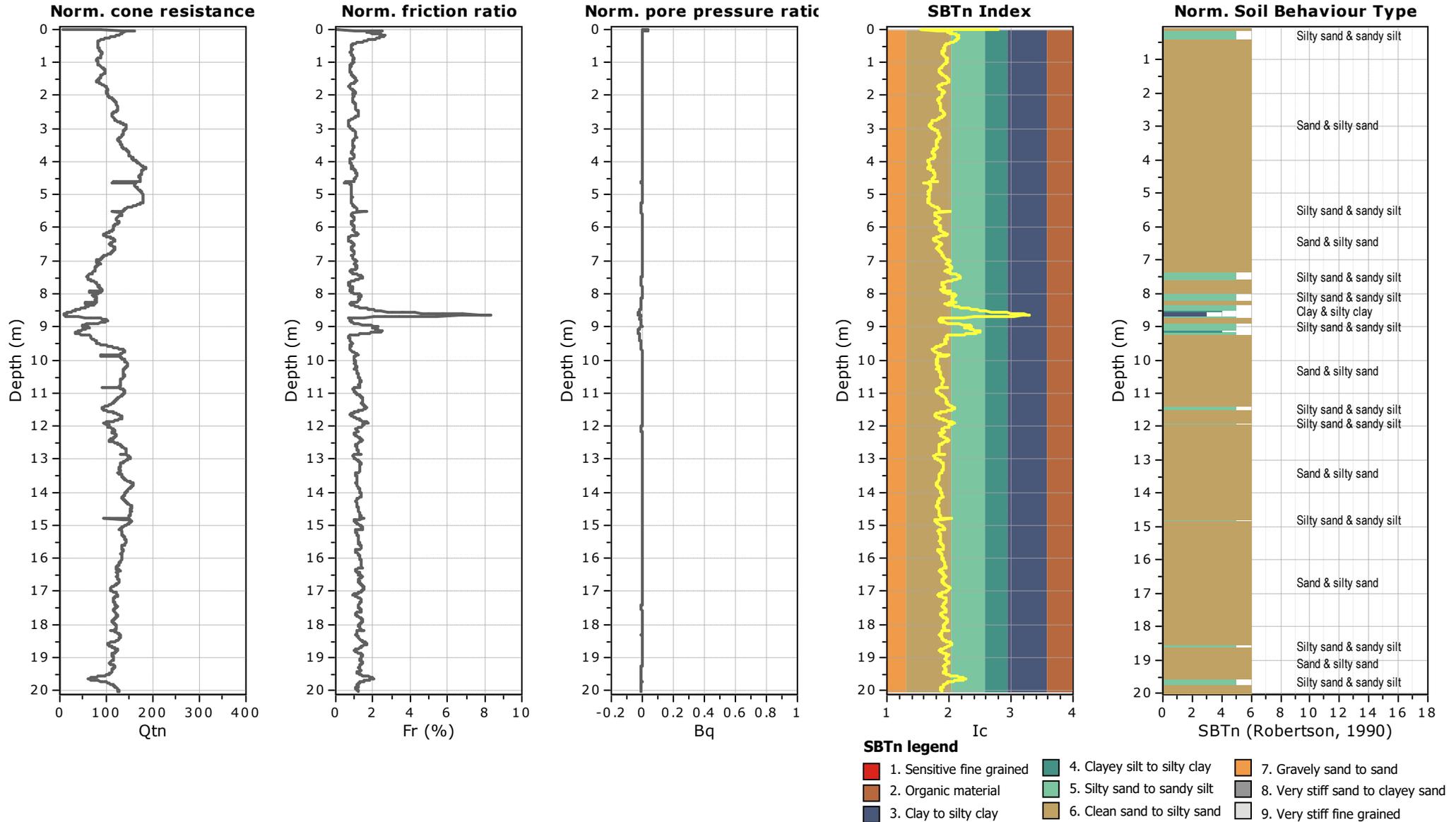


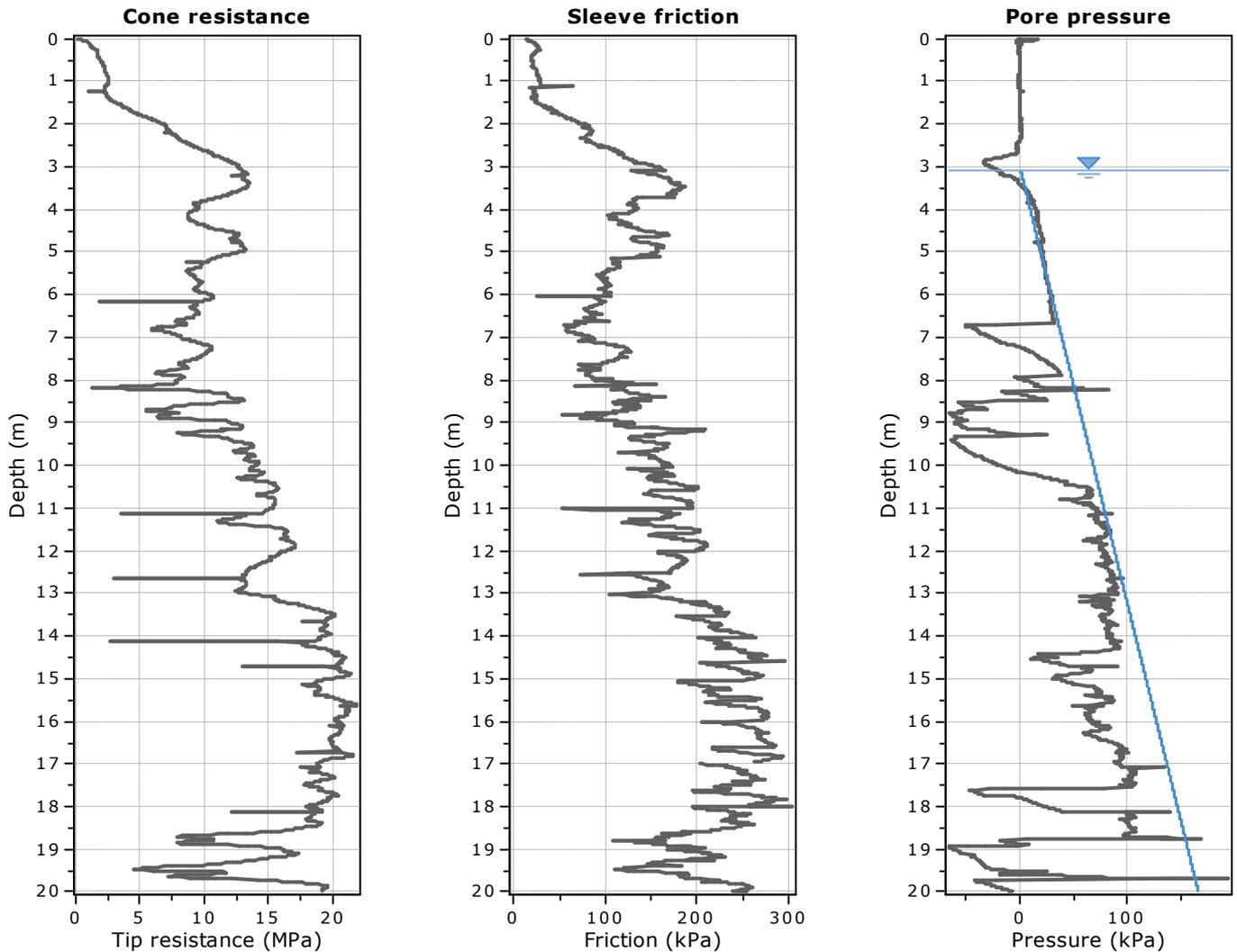
SBT - Bq plots



SBT legend

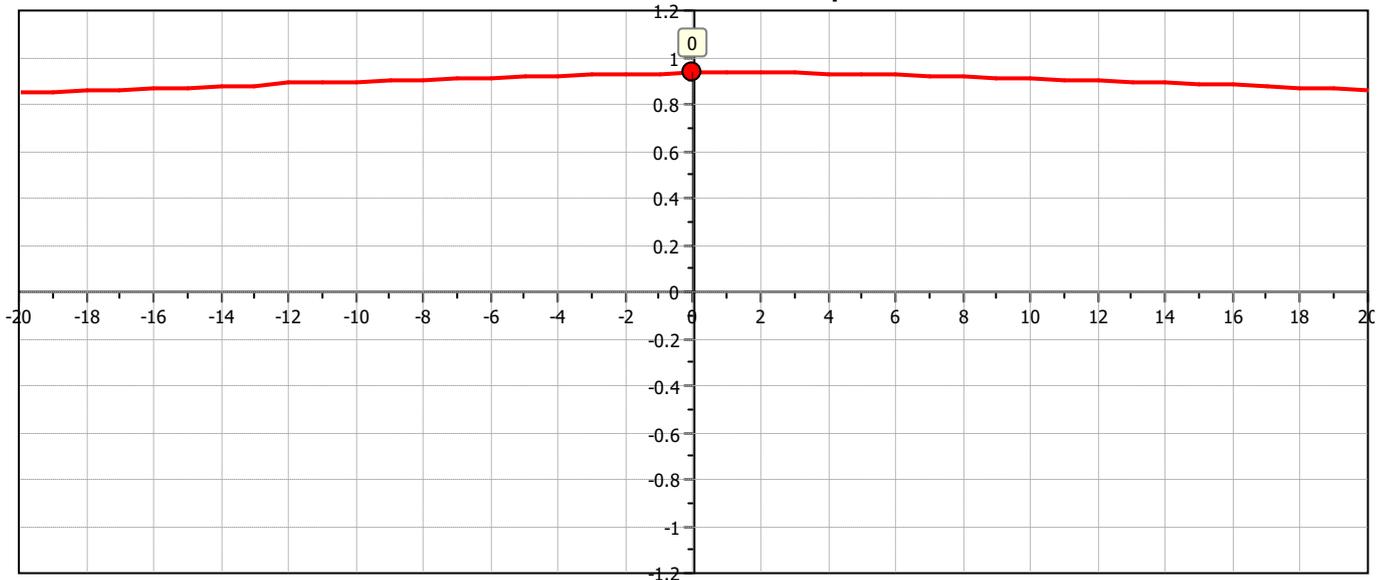
- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |



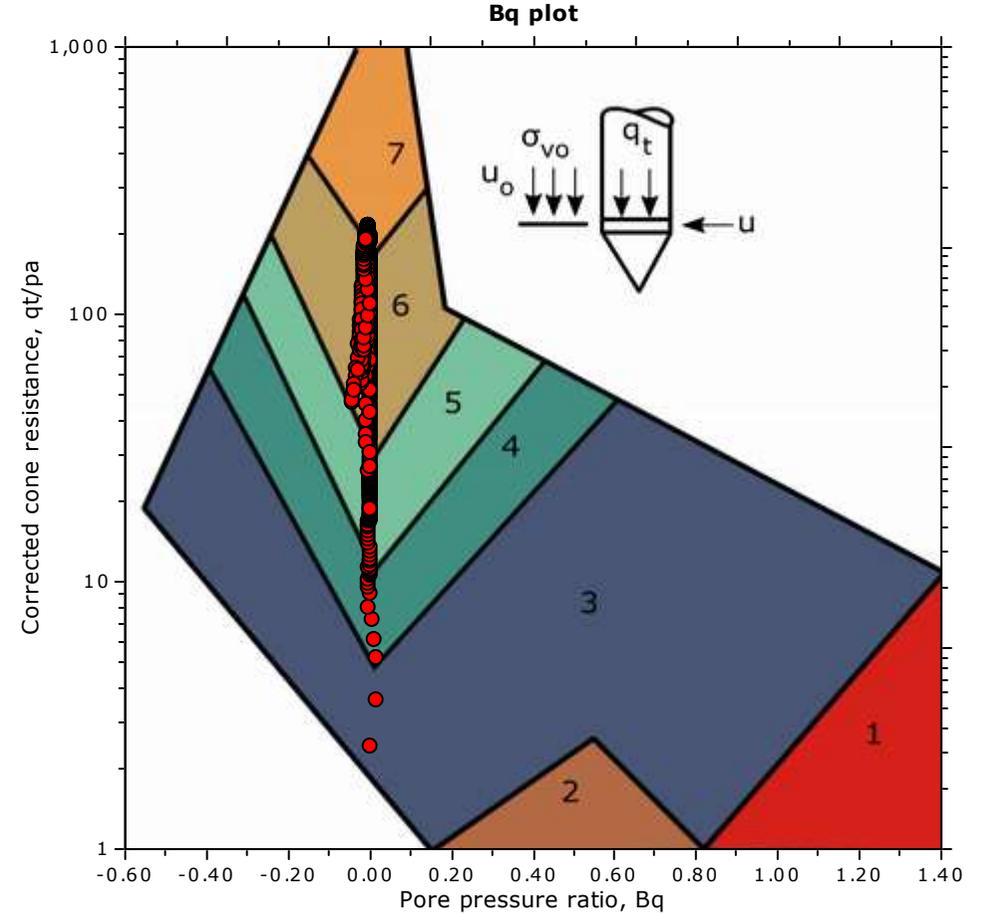
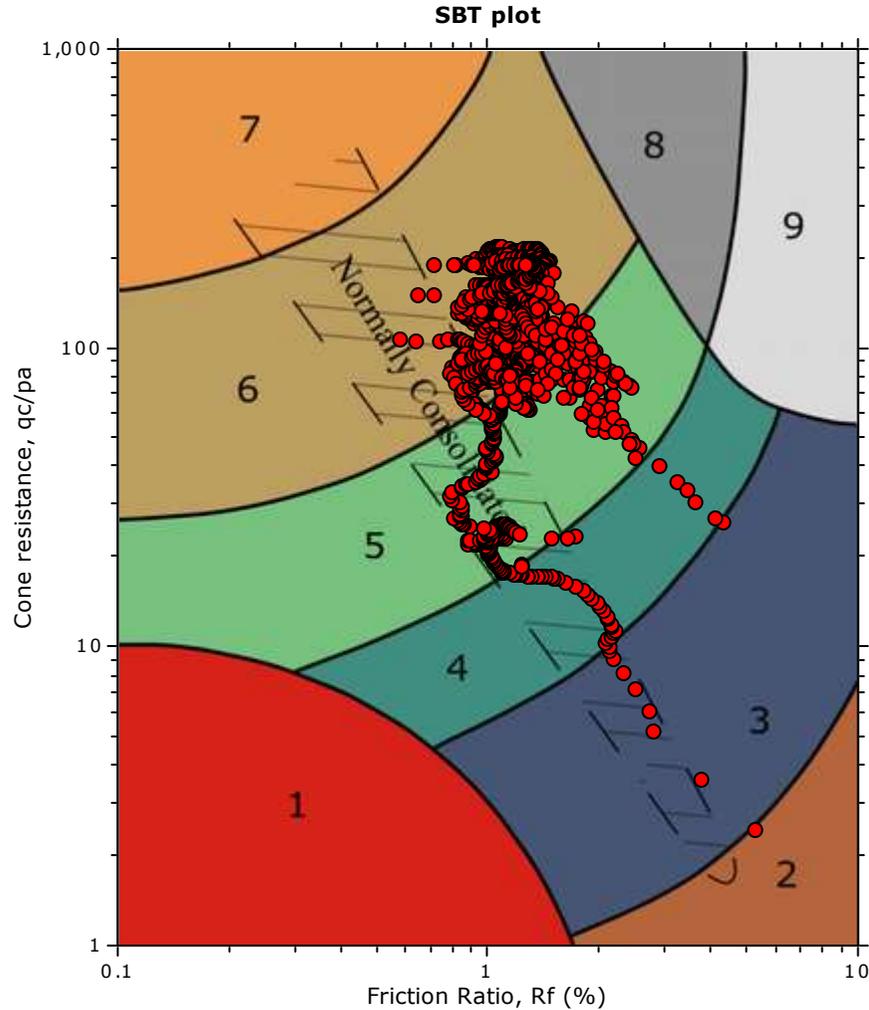


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

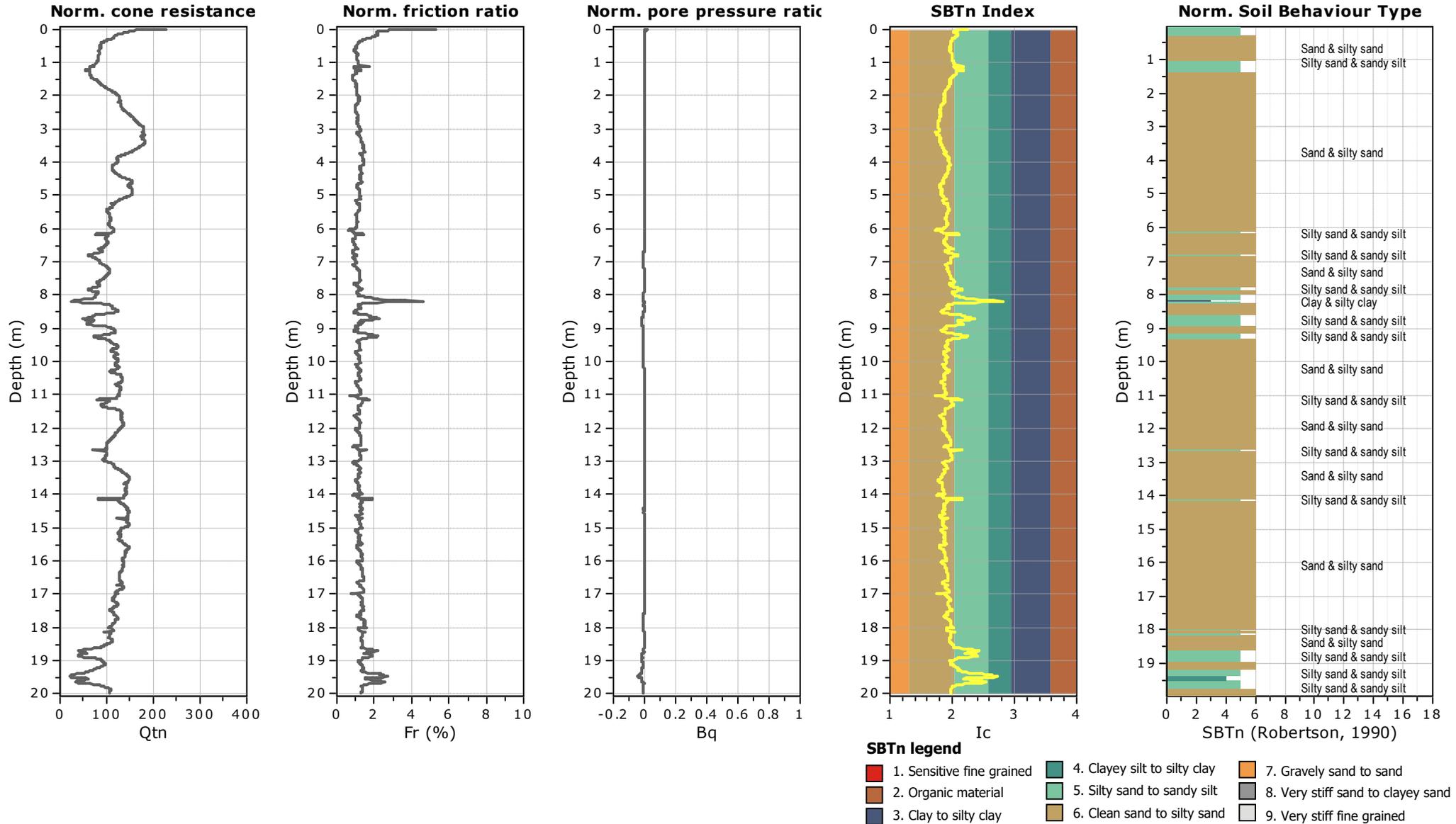


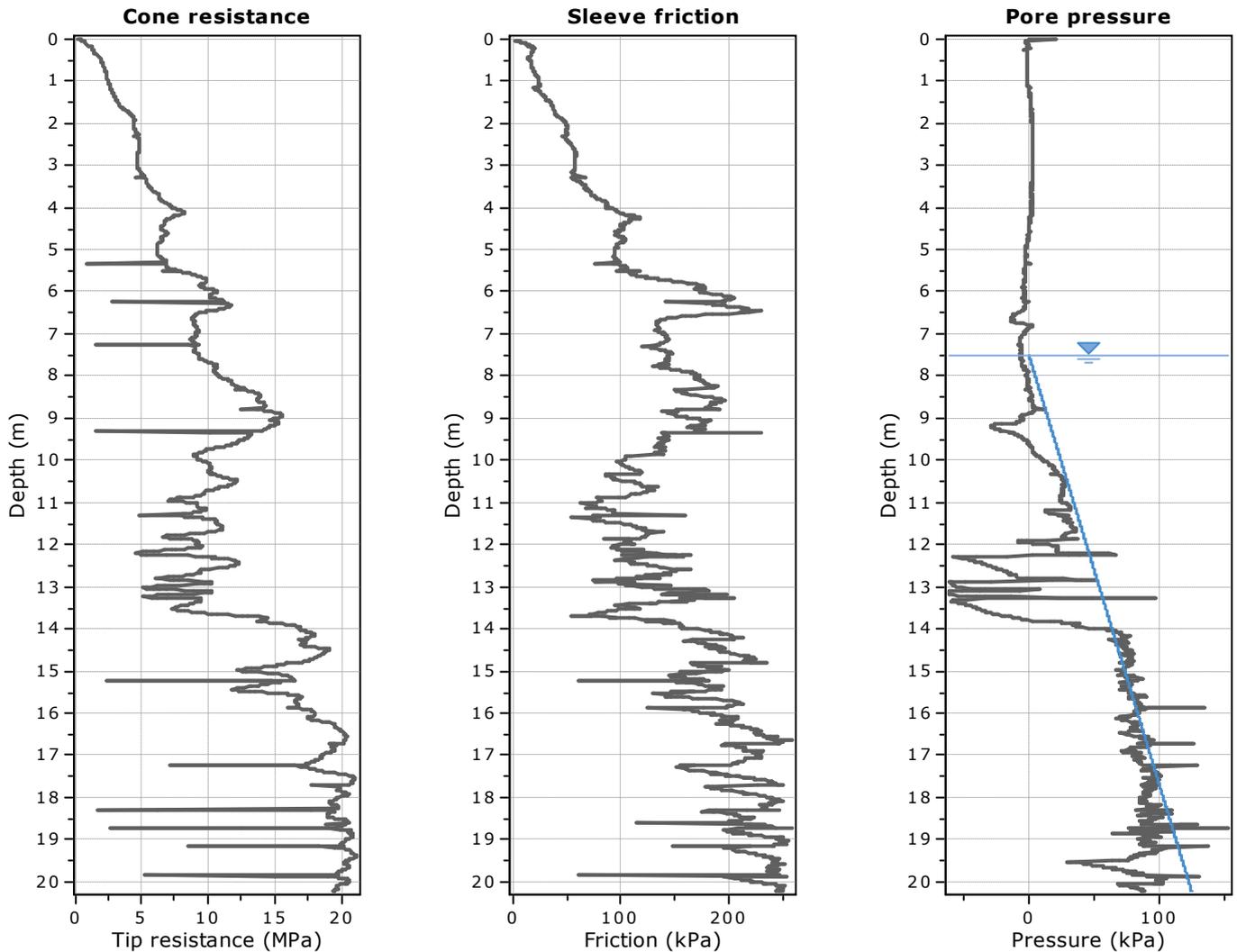
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

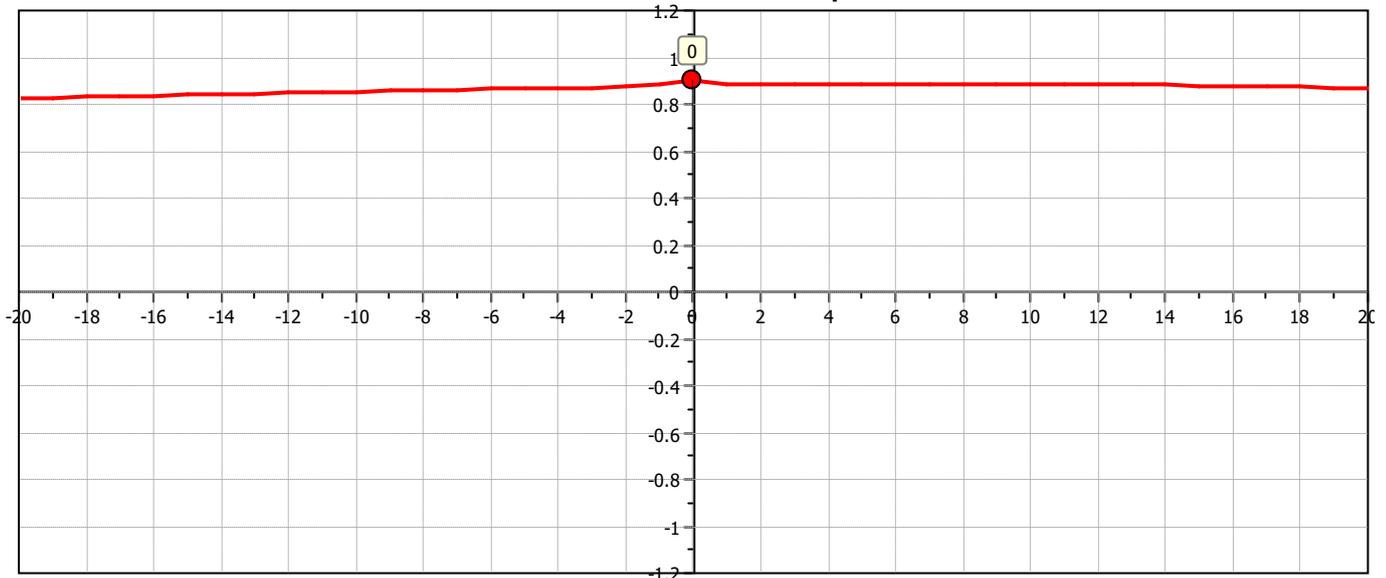
Location: 65 & 73 Ratanui Road, Paraparaumu



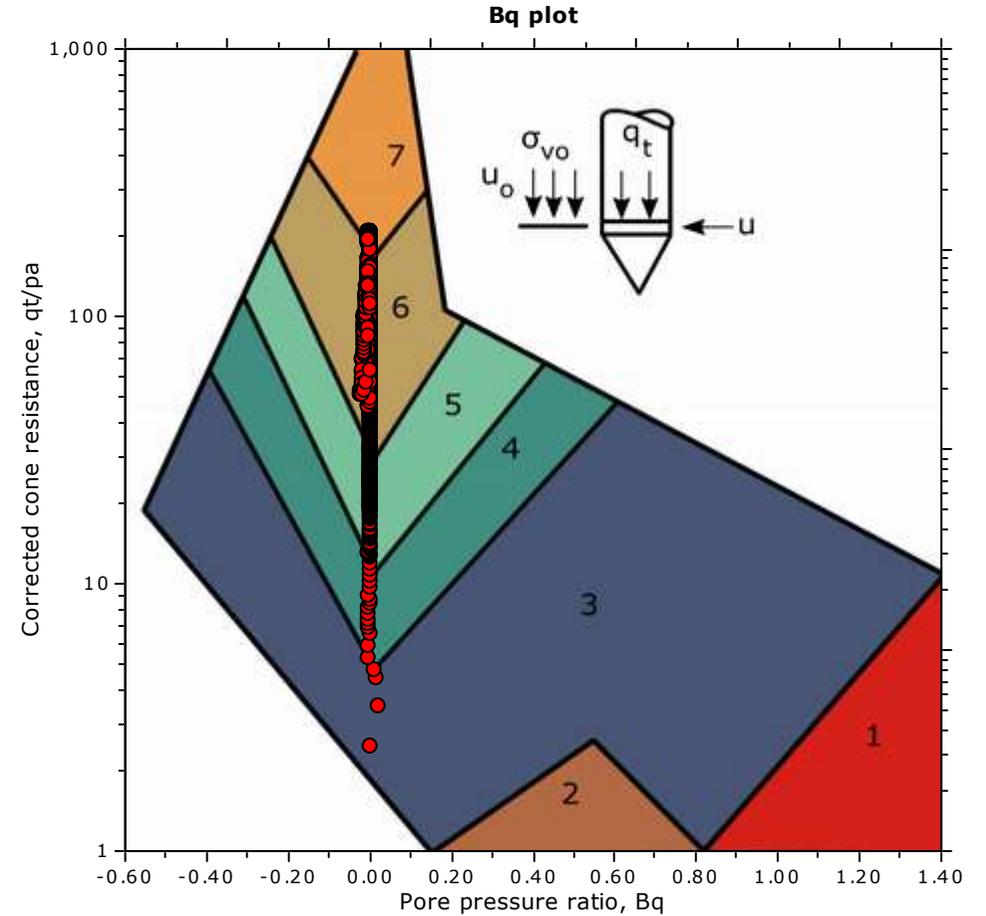
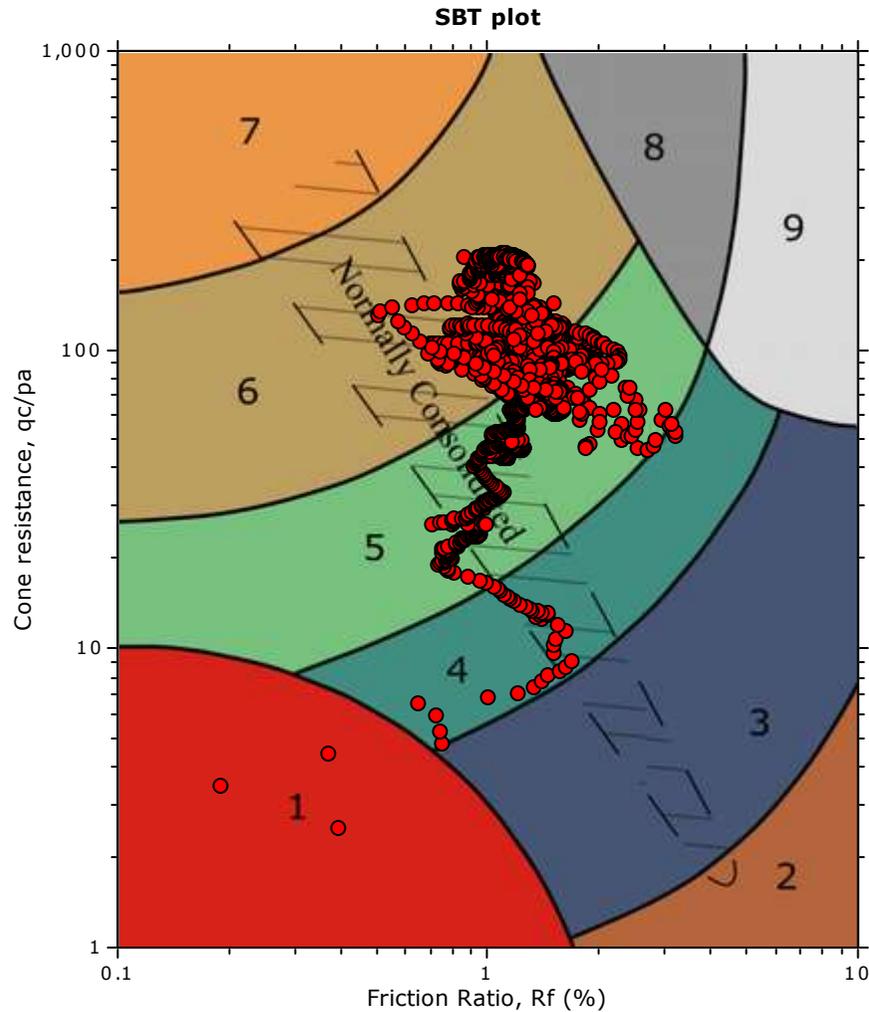


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs



SBT - Bq plots

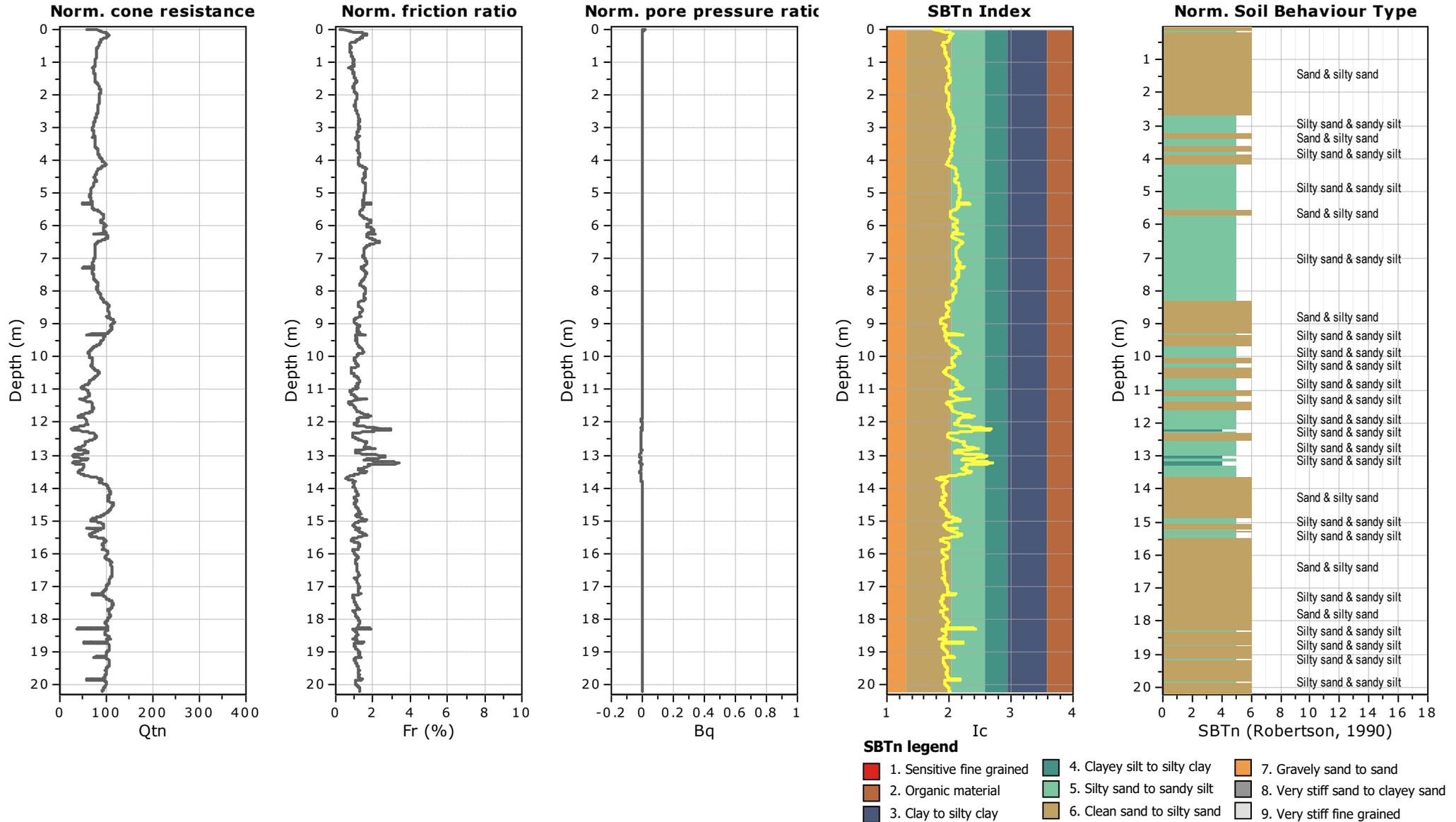


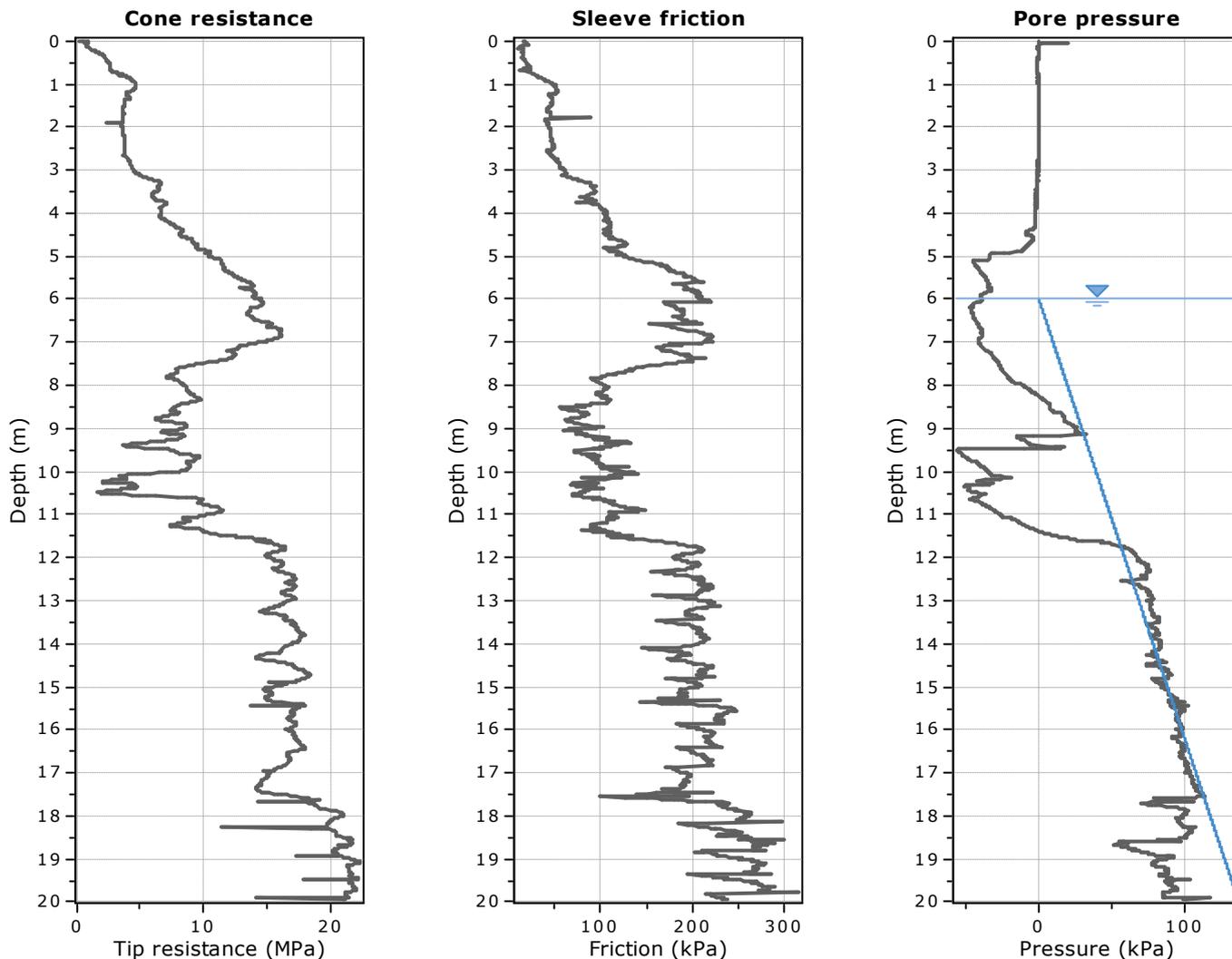
SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

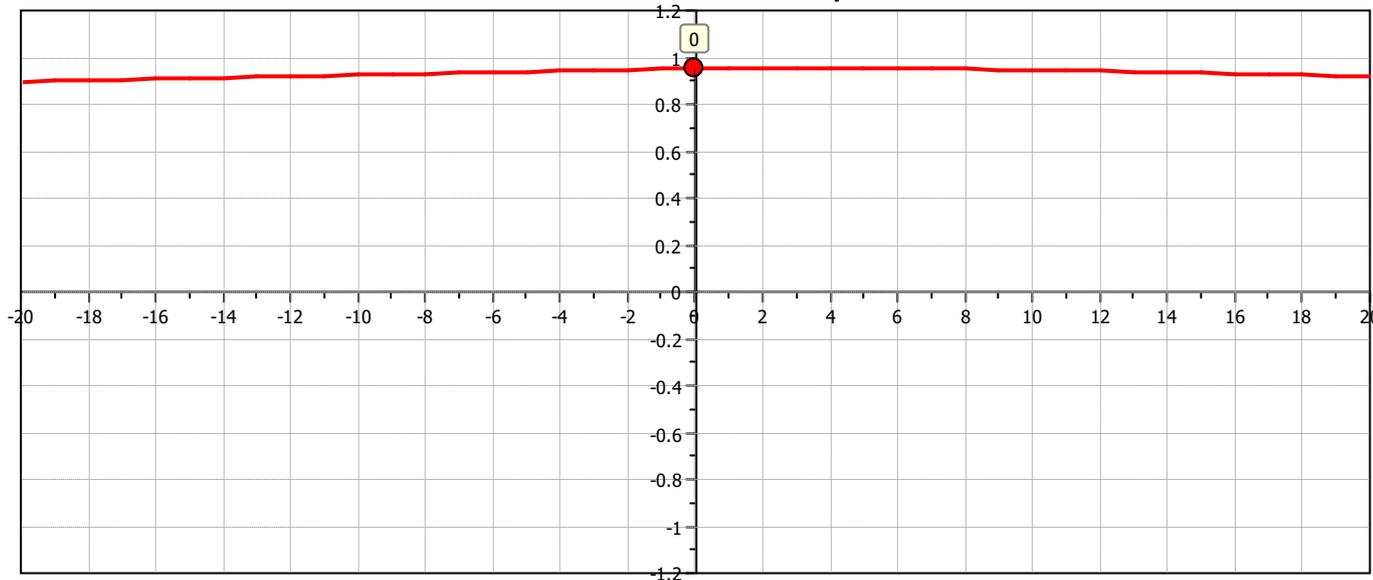
Location: 65 & 73 Ratanui Road, Paraparaumu



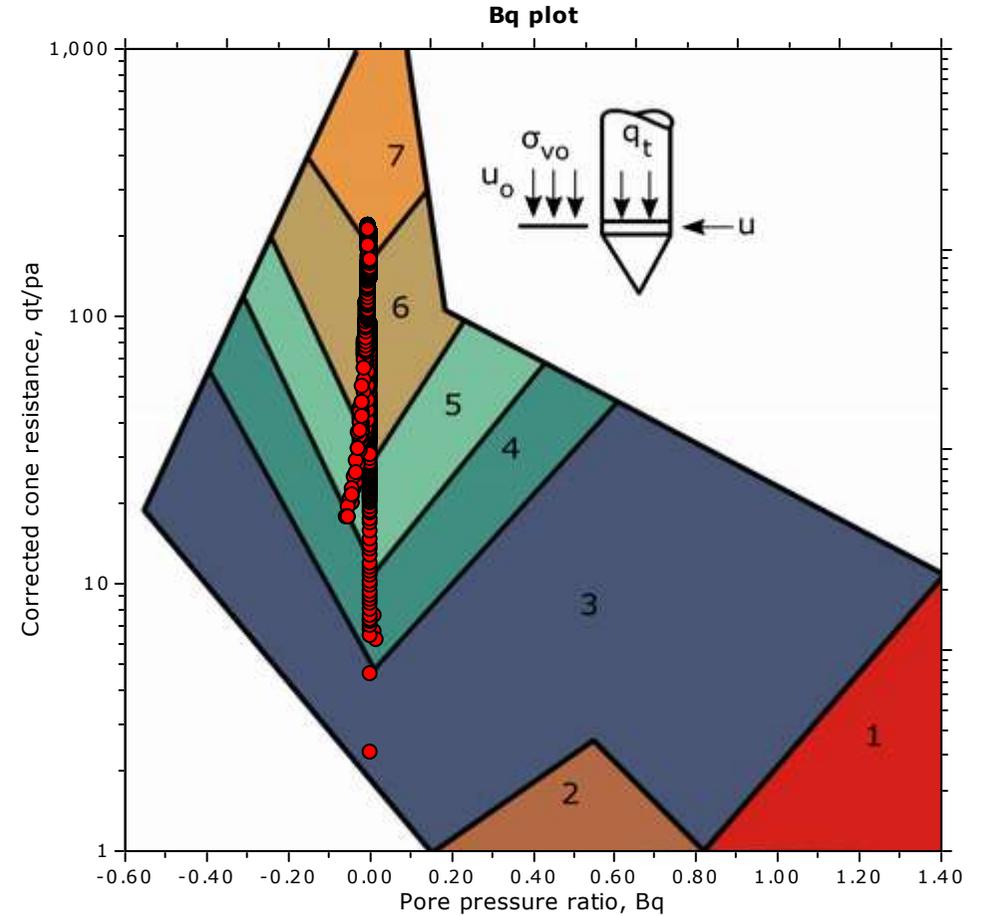
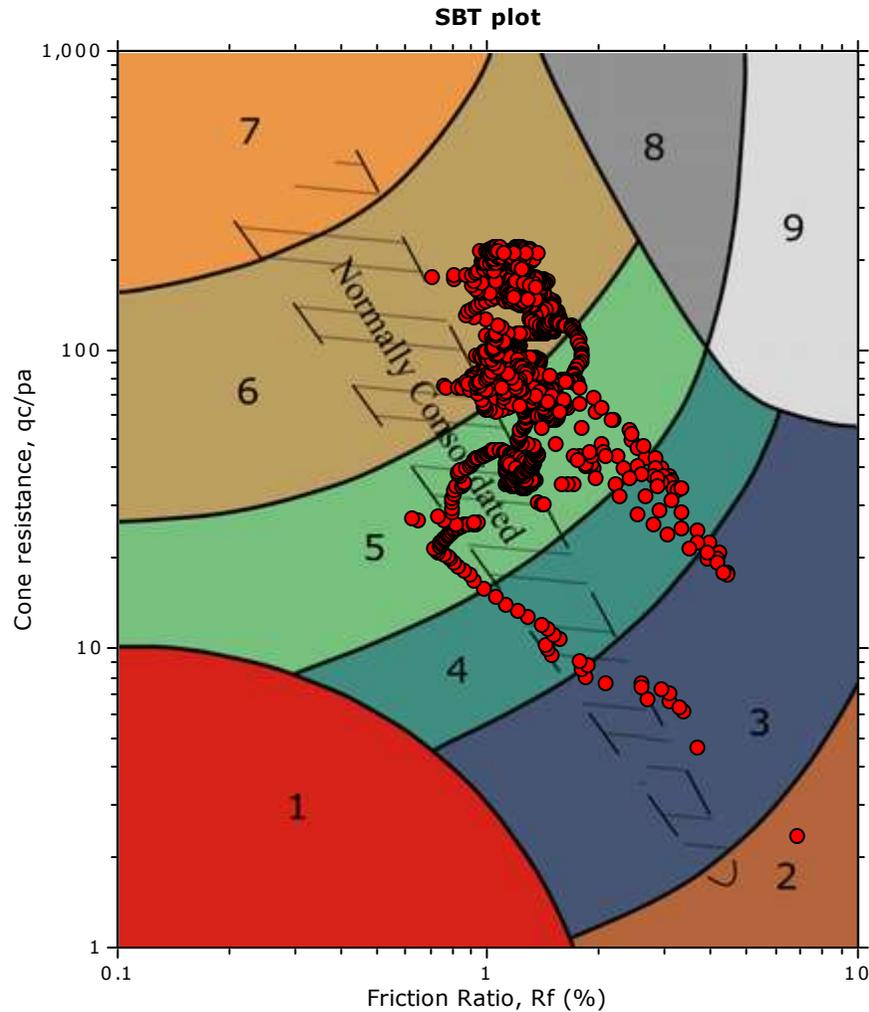


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s



SBT - Bq plots

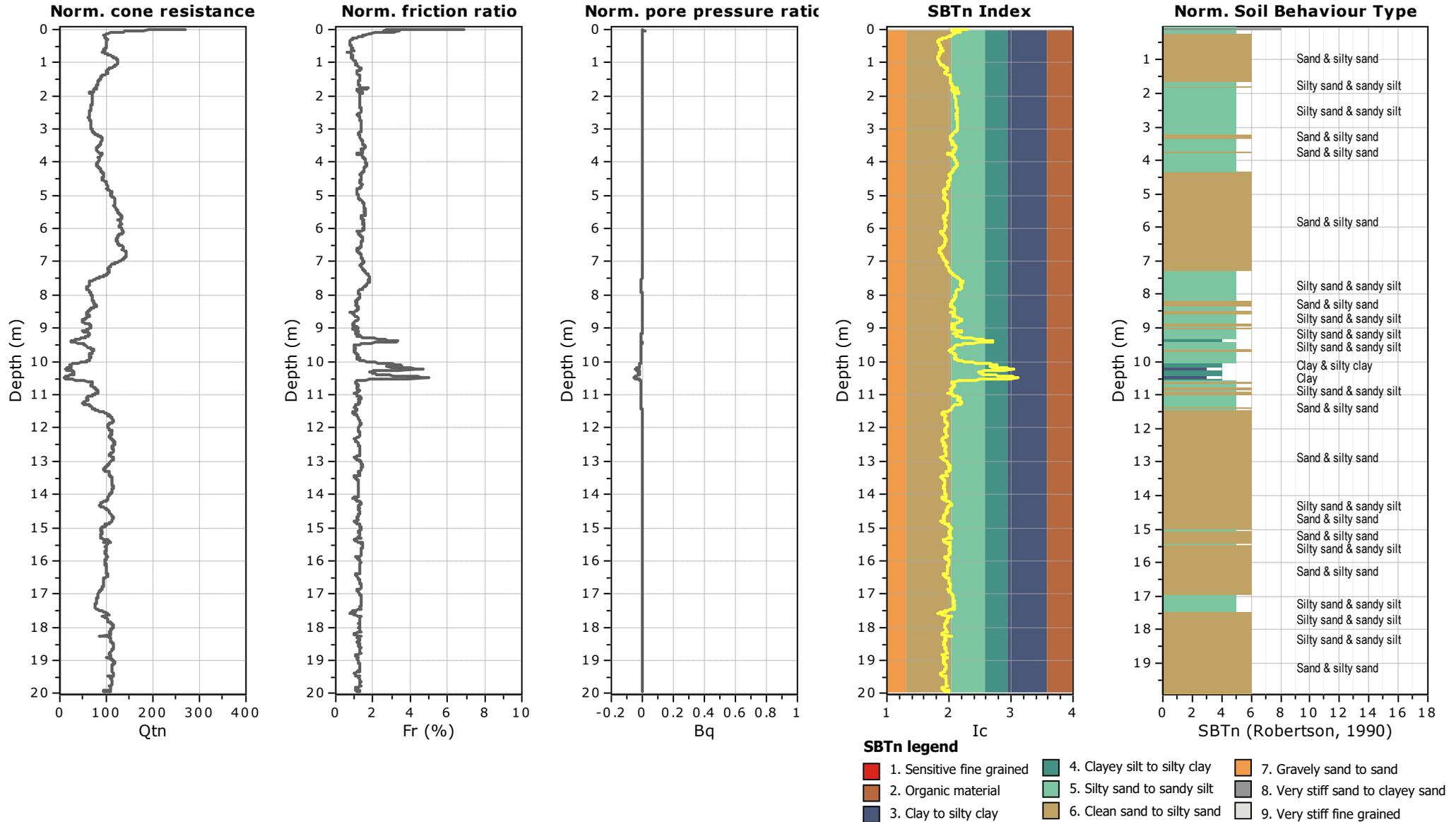


SBT legend

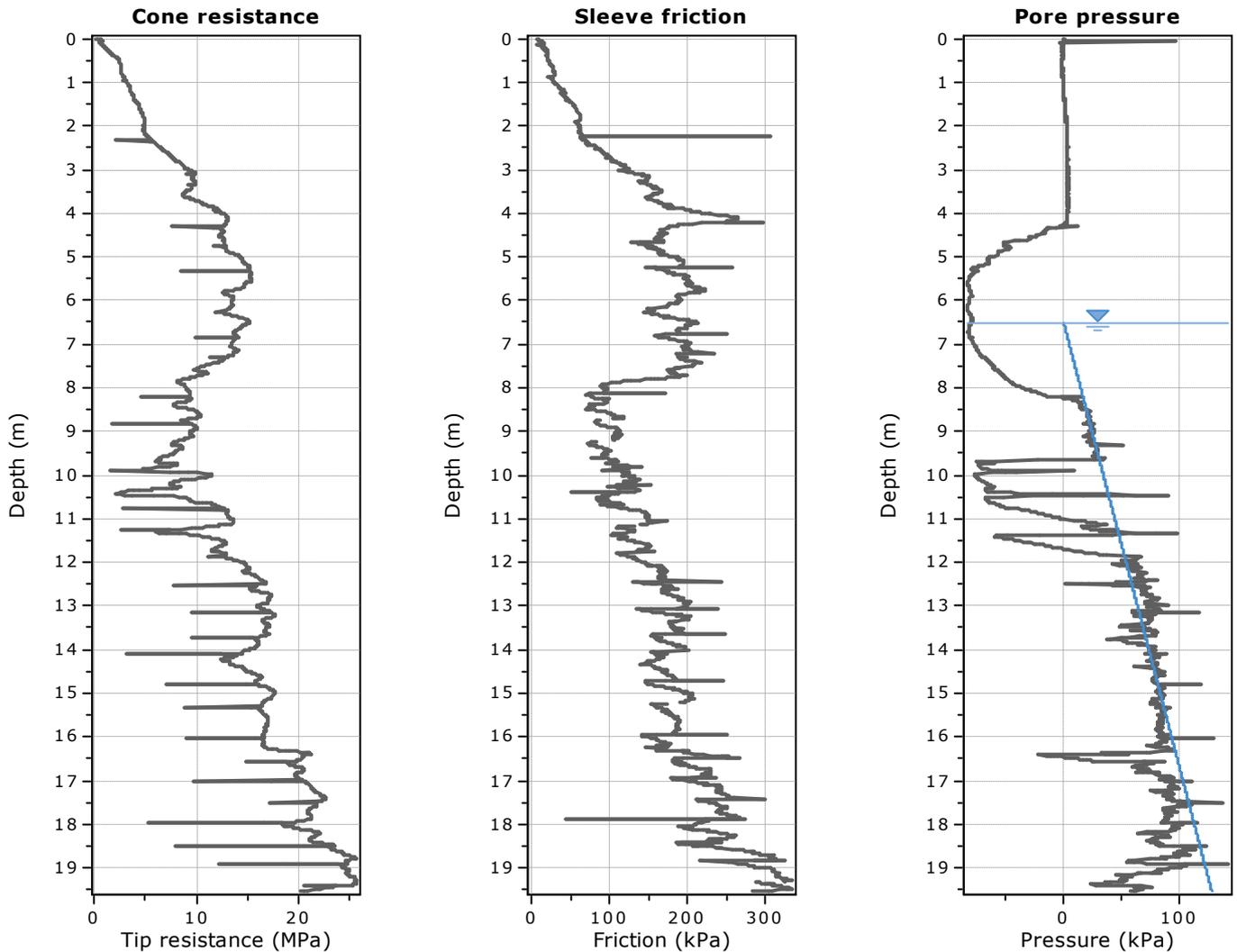
- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

Project: Summerset Paraparaumu

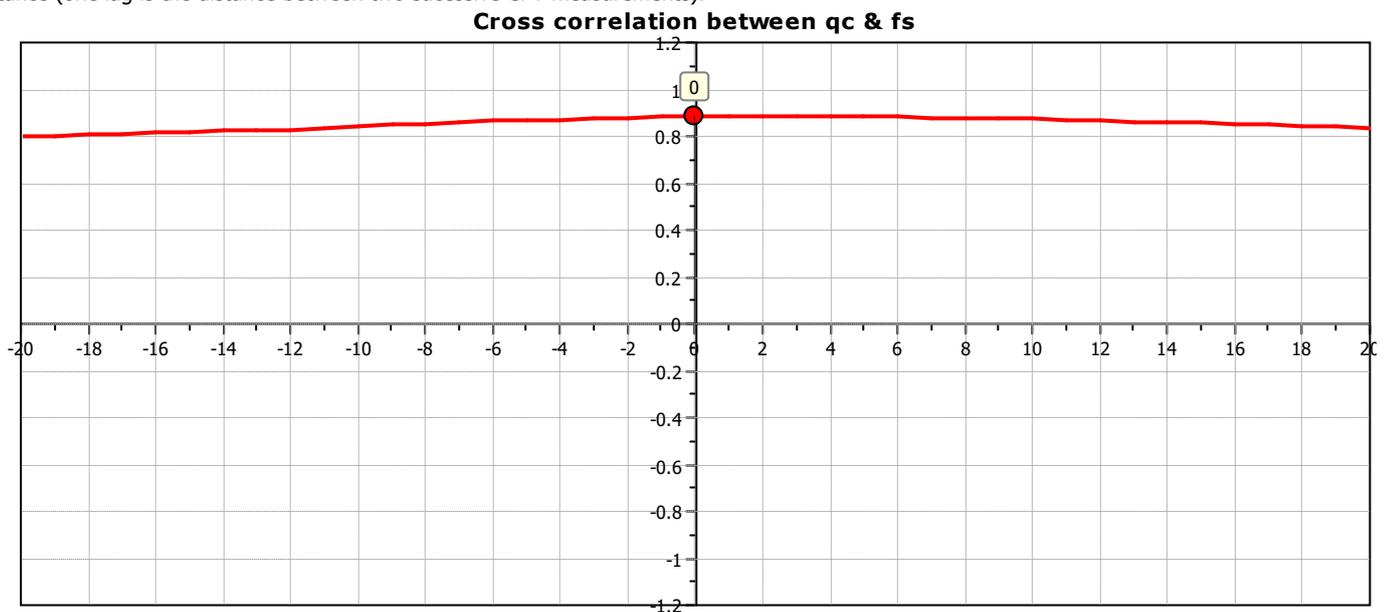
Location: 65 & 73 Ratanui Road, Paraparaumu



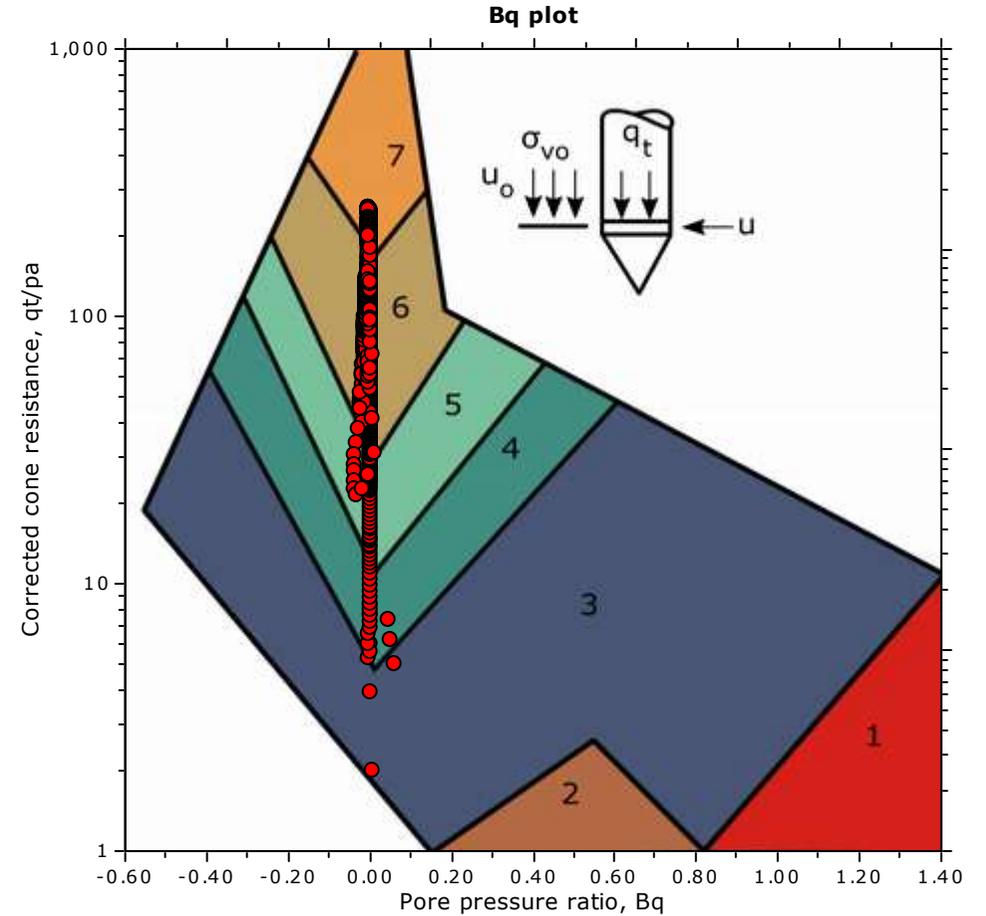
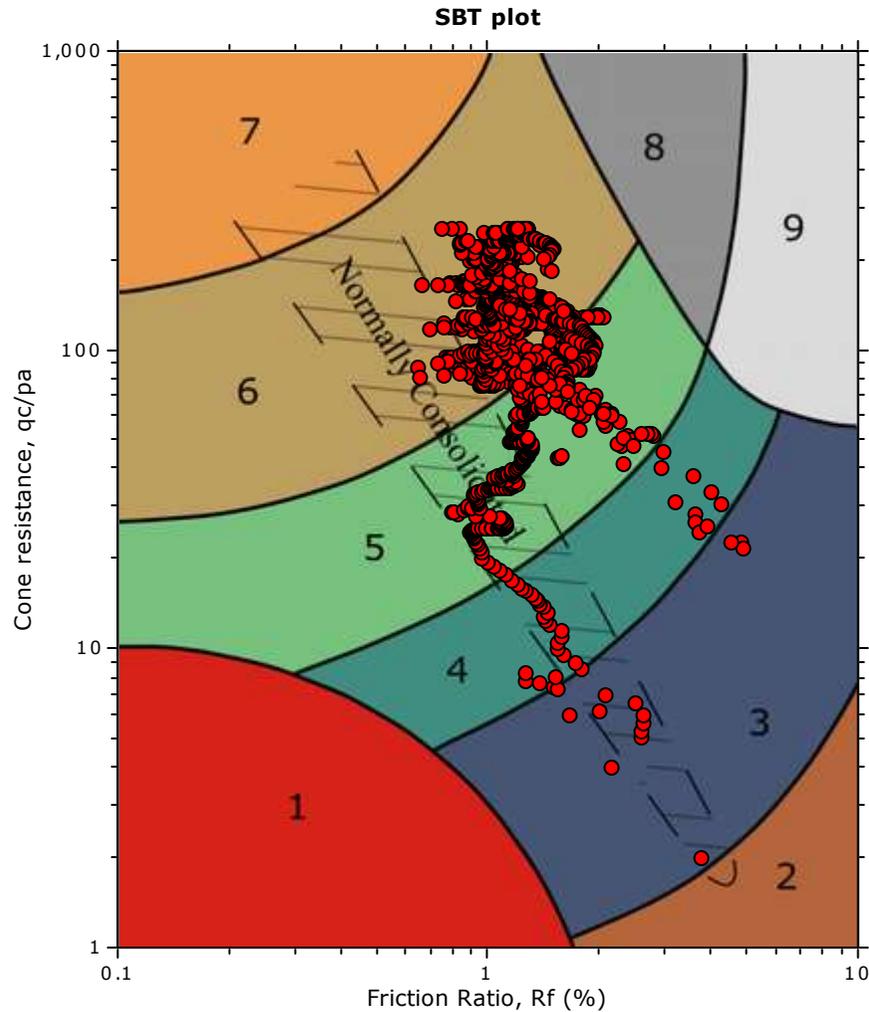
Project: Summerset Paraparaumu
Location: 65 & 73 Ratanui Road, Paraparaumu



The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).



SBT - Bq plots

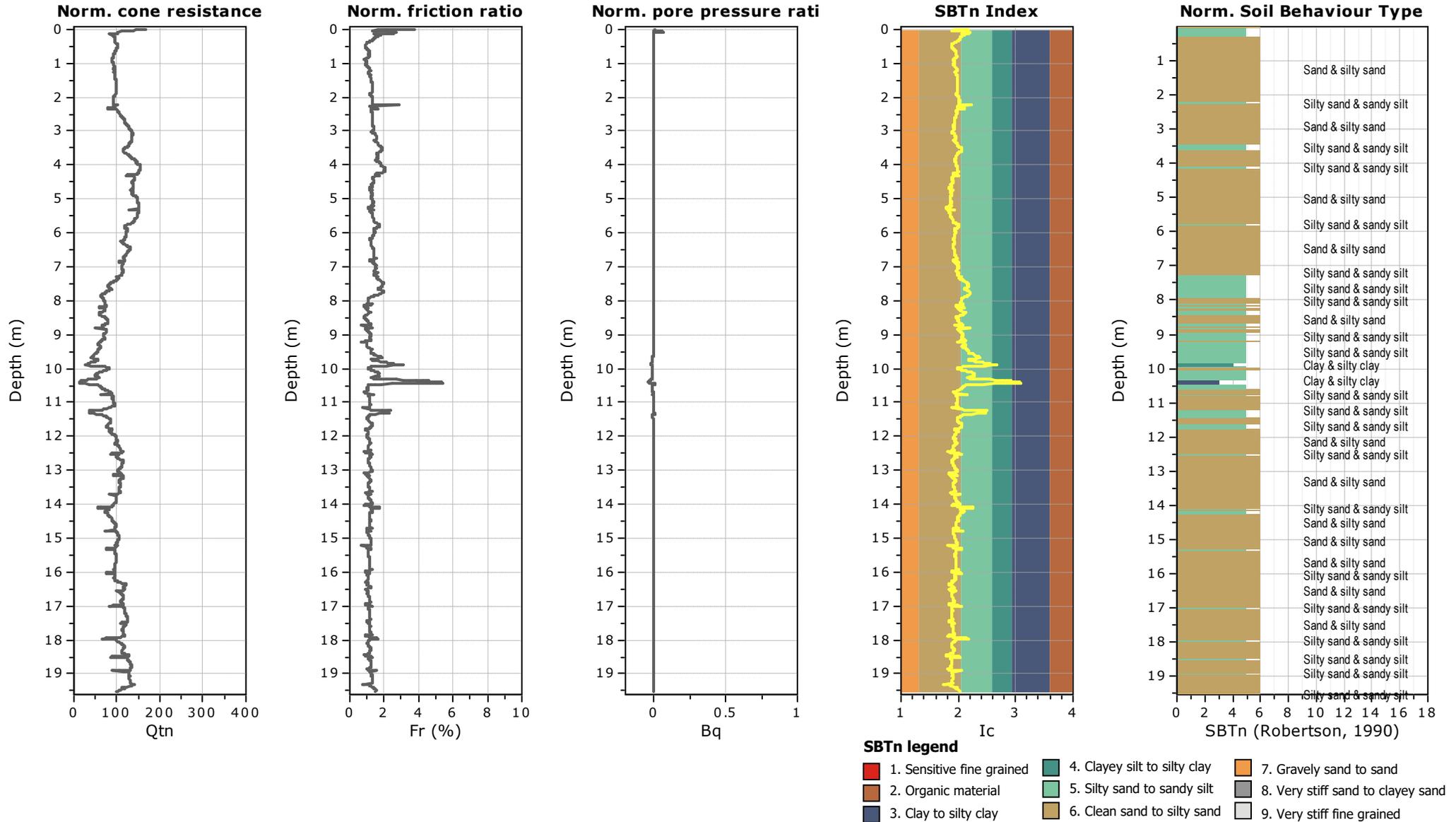


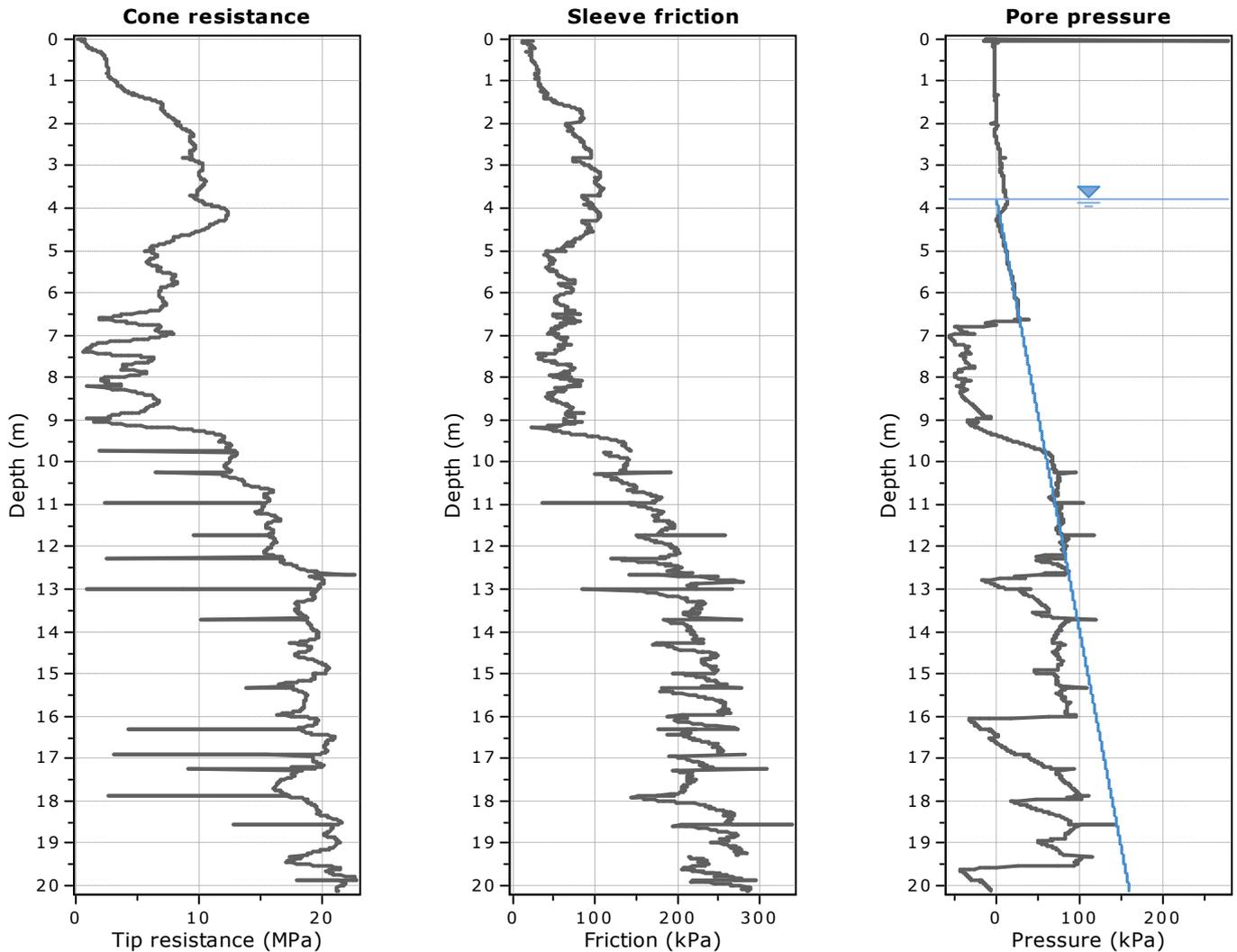
SBT legend

- | | | |
|---------------------------|------------------------------|-----------------------------------|
| 1. Sensitive fine grained | 4. Clayey silt to silty clay | 7. Gravelly sand to sand |
| 2. Organic material | 5. Silty sand to sandy silt | 8. Very stiff sand to clayey sand |
| 3. Clay to silty clay | 6. Clean sand to silty sand | 9. Very stiff fine grained |

Project: Summerset Paraparaumu

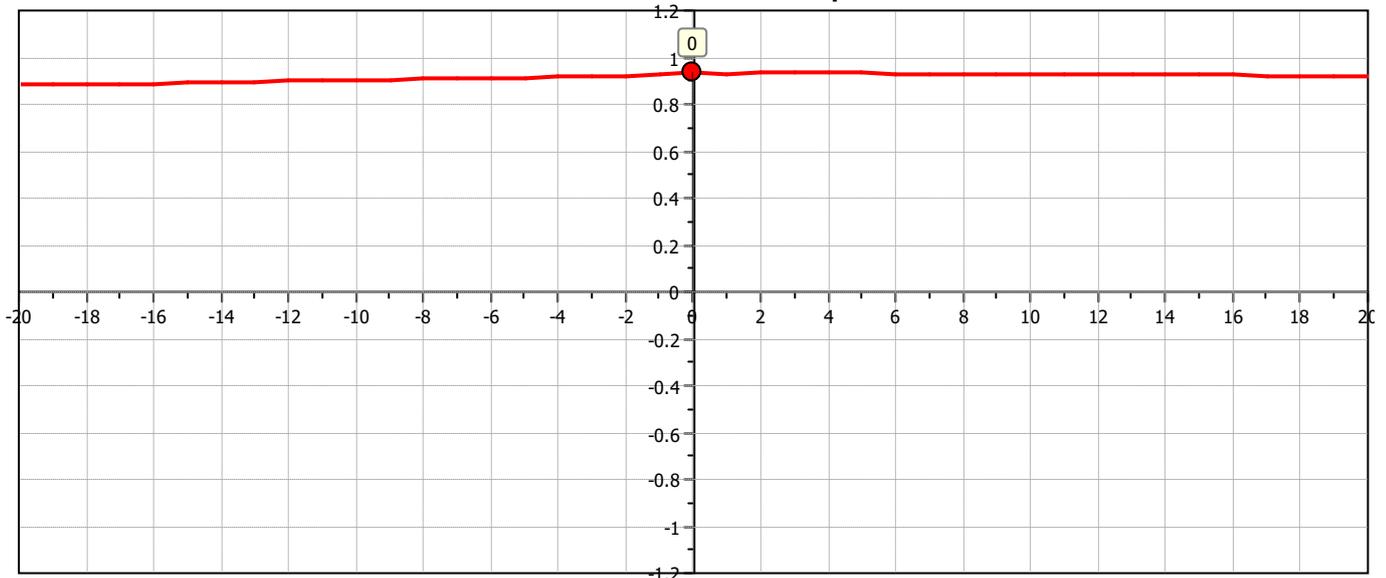
Location: 65 & 73 Ratanui Road, Paraparaumu



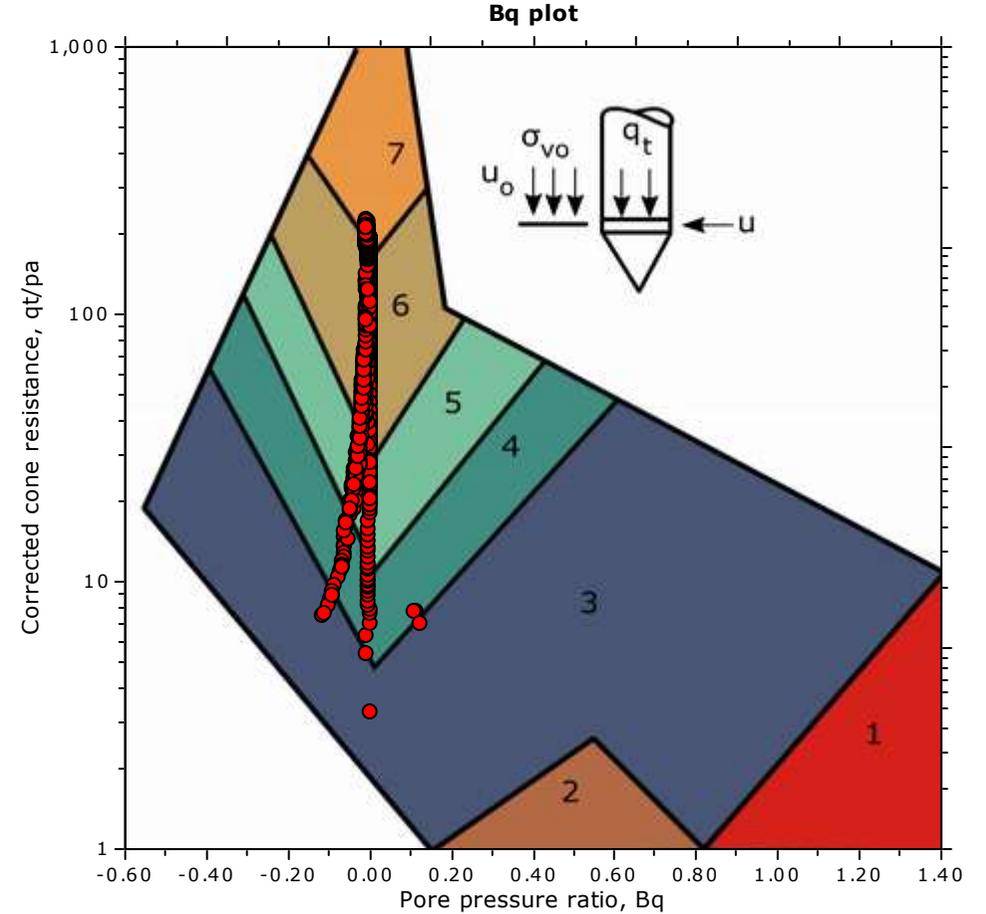
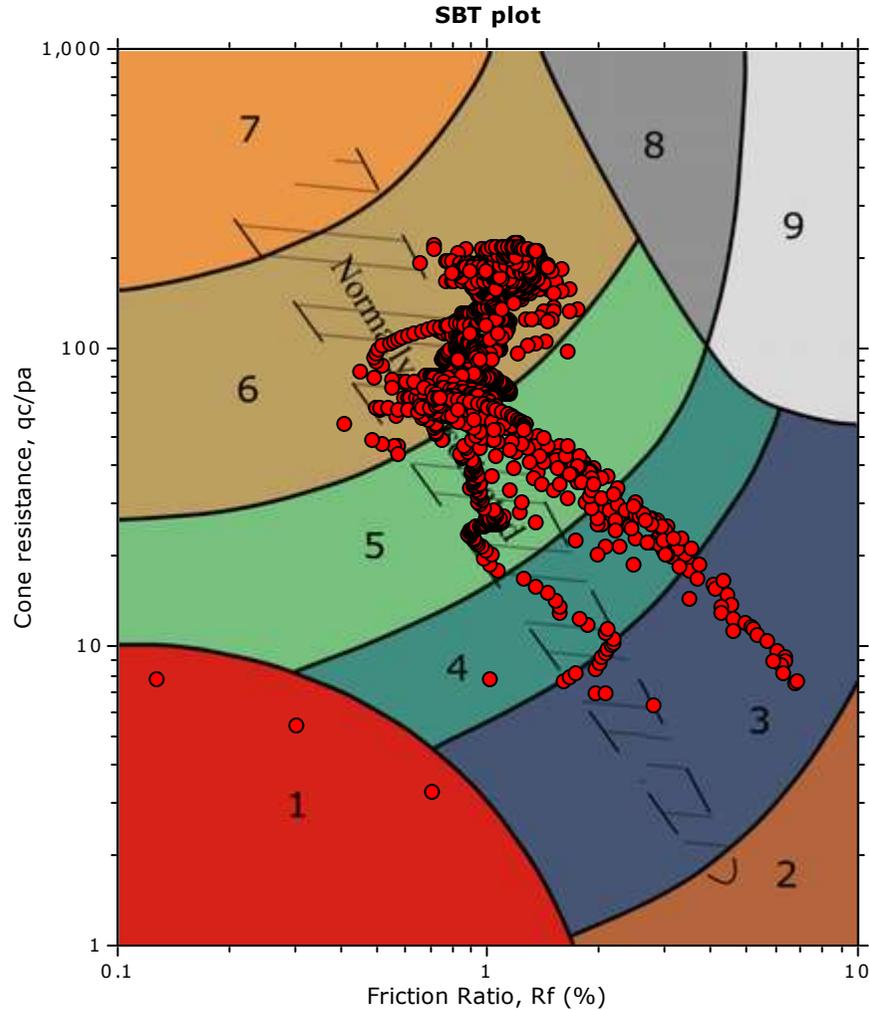


The plot below presents the cross correlation coefficient between the raw q_c and f_s values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between q_c & f_s



SBT - Bq plots

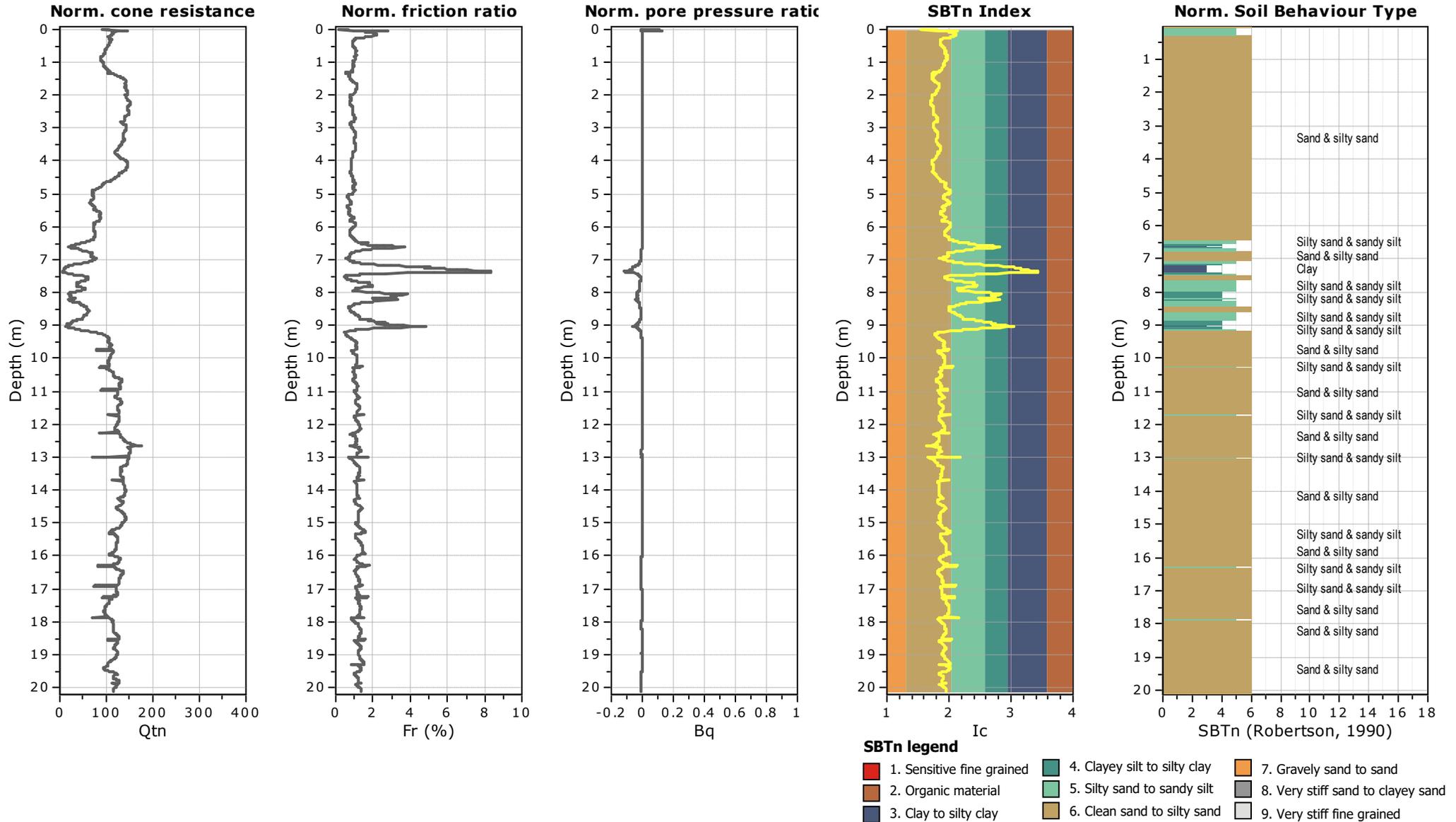


SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |

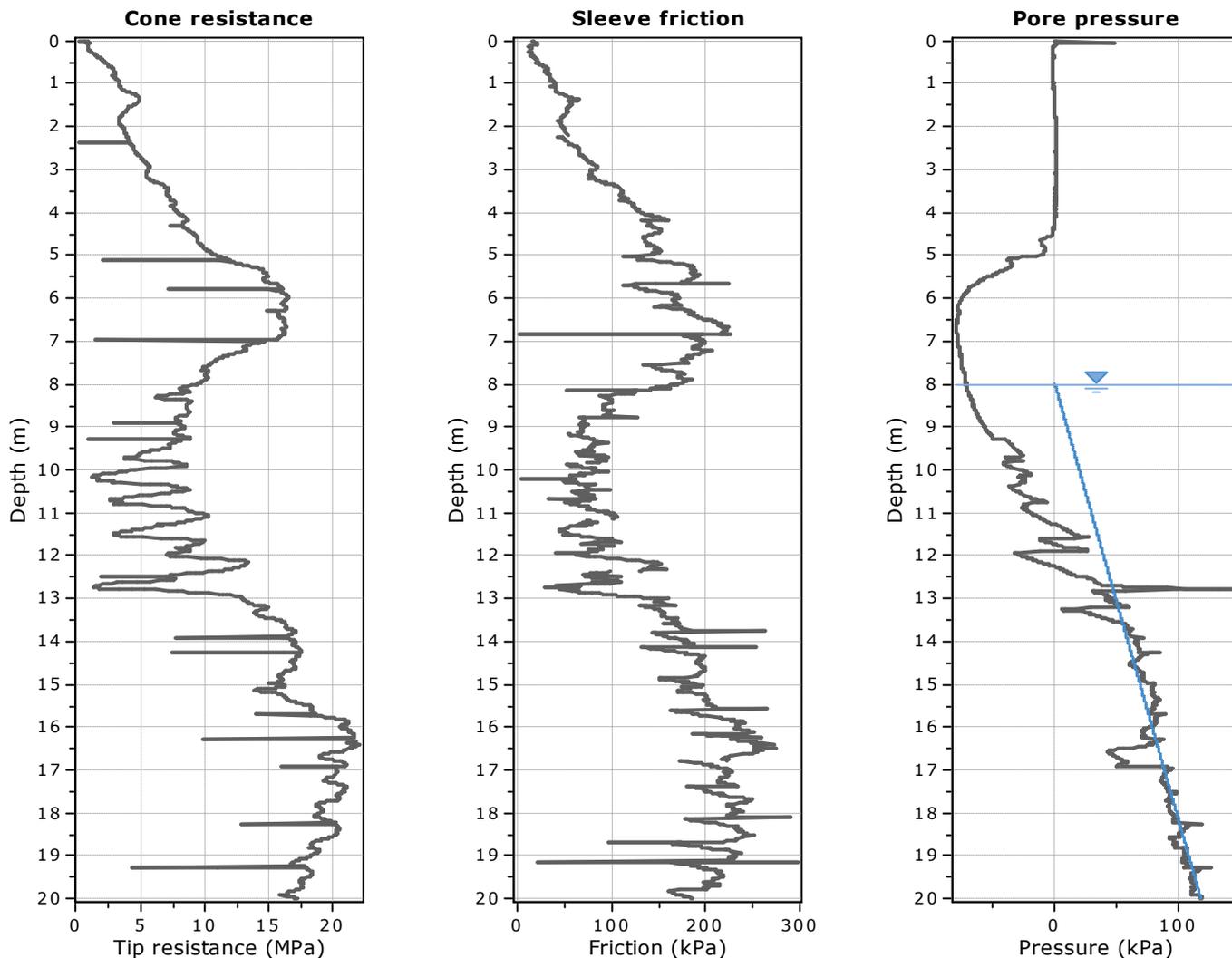
Project: Summerset Paraparaumu

Location: 65 & 73 Ratanui Road, Paraparaumu



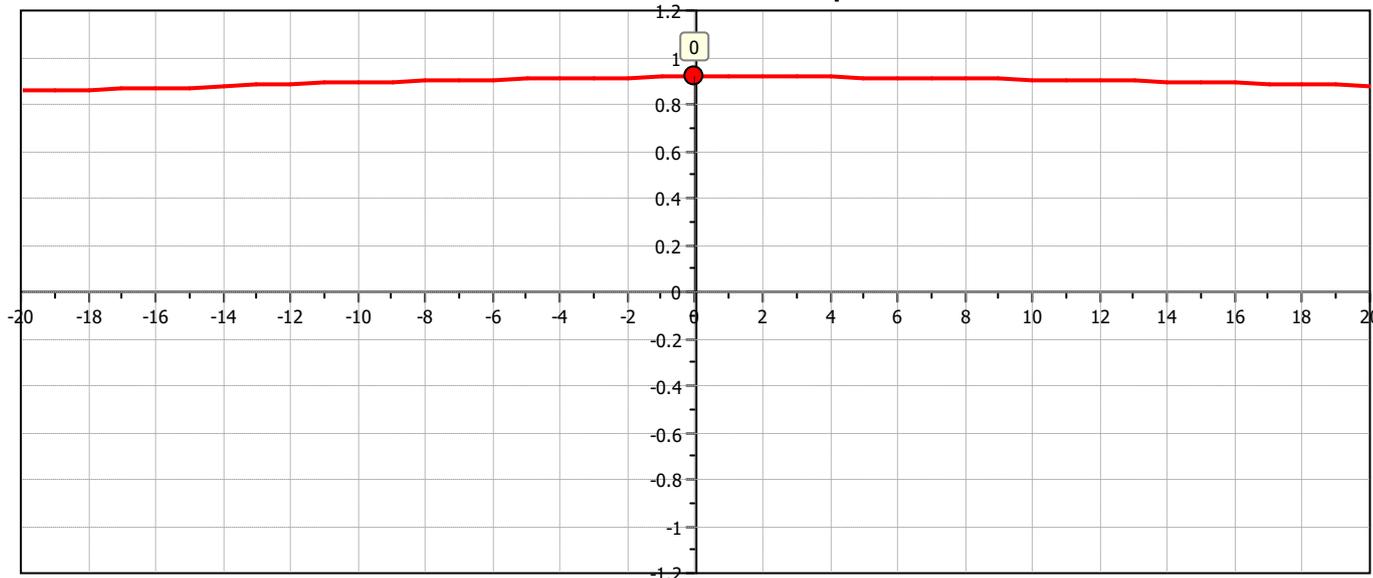
Project: Sunmerset Paraparaumu

Location: 65 & 73 Ratanui Road, Paraparaumu

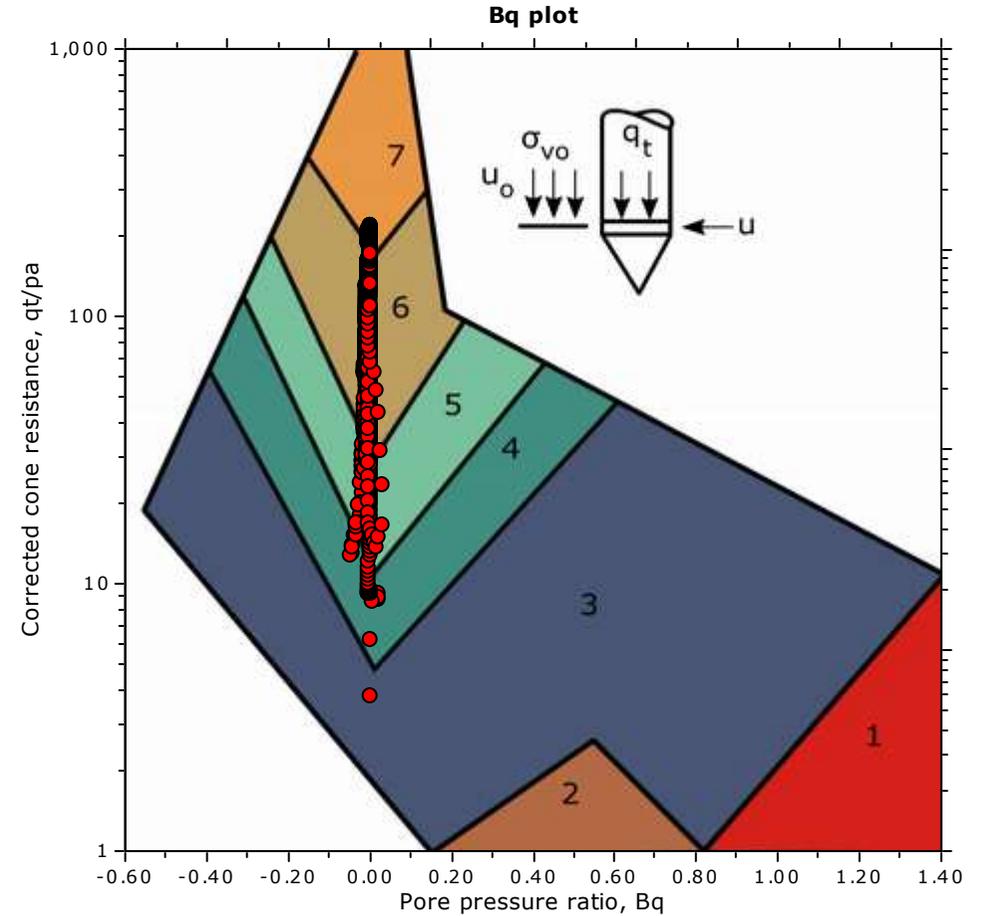
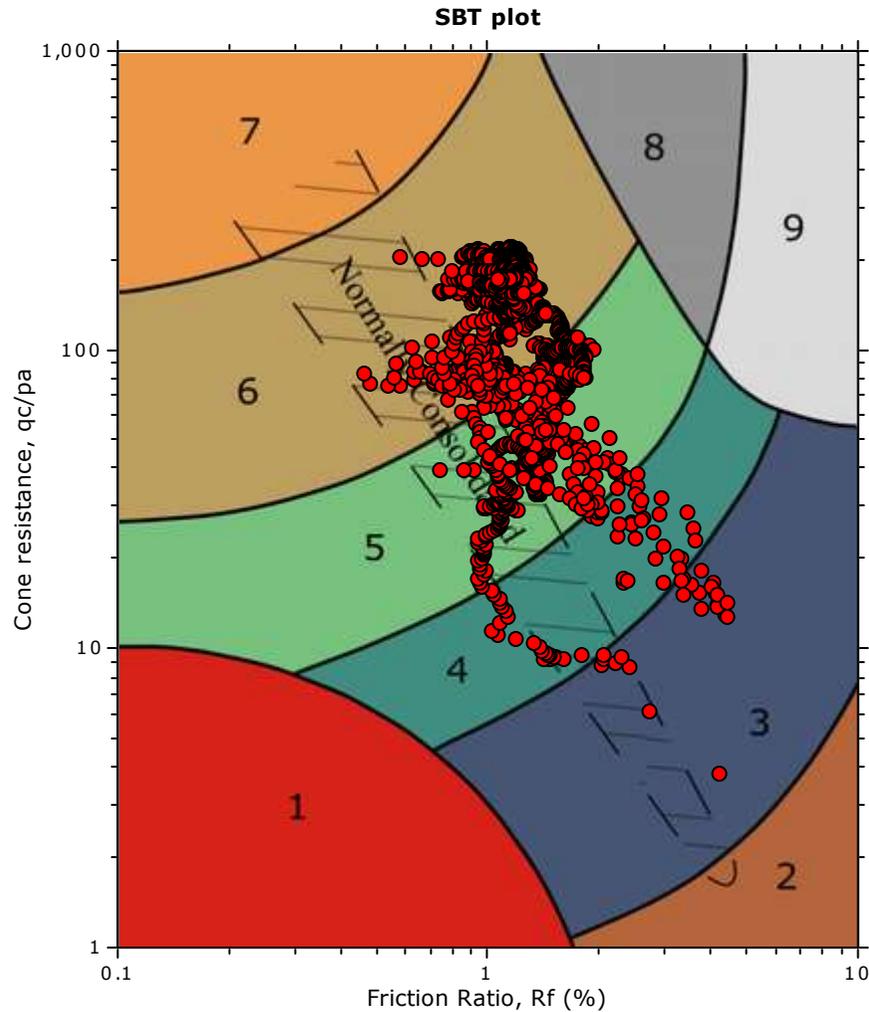


The plot below presents the cross correlation coefficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two successive CPT measurements).

Cross correlation between qc & fs

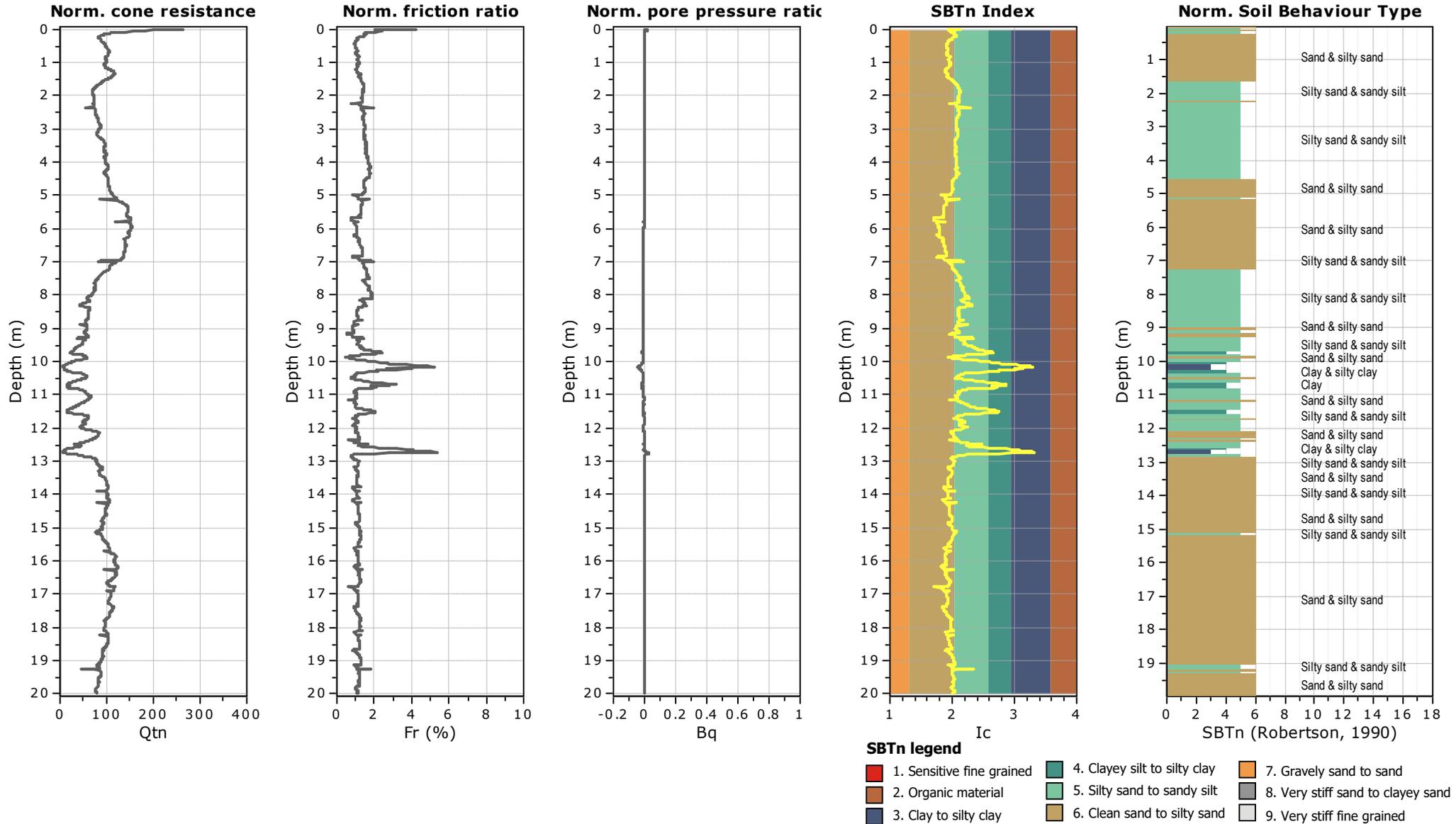


SBT - Bq plots



SBT legend

- | | | |
|--|---|---|
| ■ 1. Sensitive fine grained | ■ 4. Clayey silt to silty clay | ■ 7. Gravelly sand to sand |
| ■ 2. Organic material | ■ 5. Silty sand to sandy silt | ■ 8. Very stiff sand to clayey sand |
| ■ 3. Clay to silty clay | ■ 6. Clean sand to silty sand | ■ 9. Very stiff fine grained |





Appendix G

Liquefaction (CLiq) Outputs

LIQUEFACTION ANALYSIS REPORT

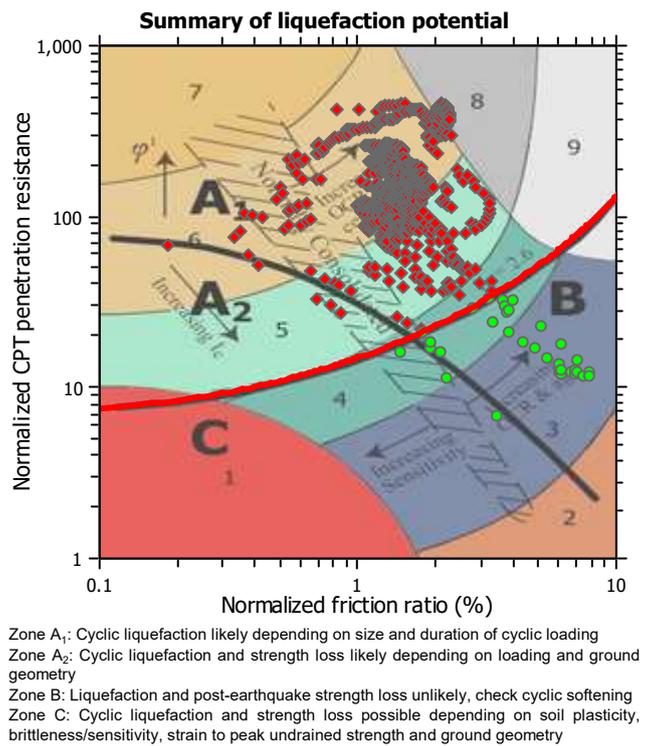
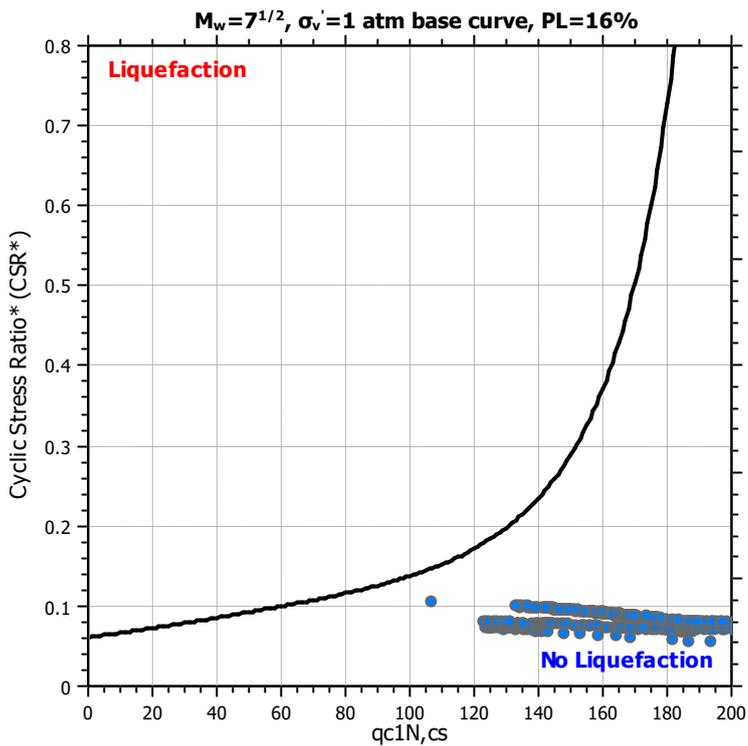
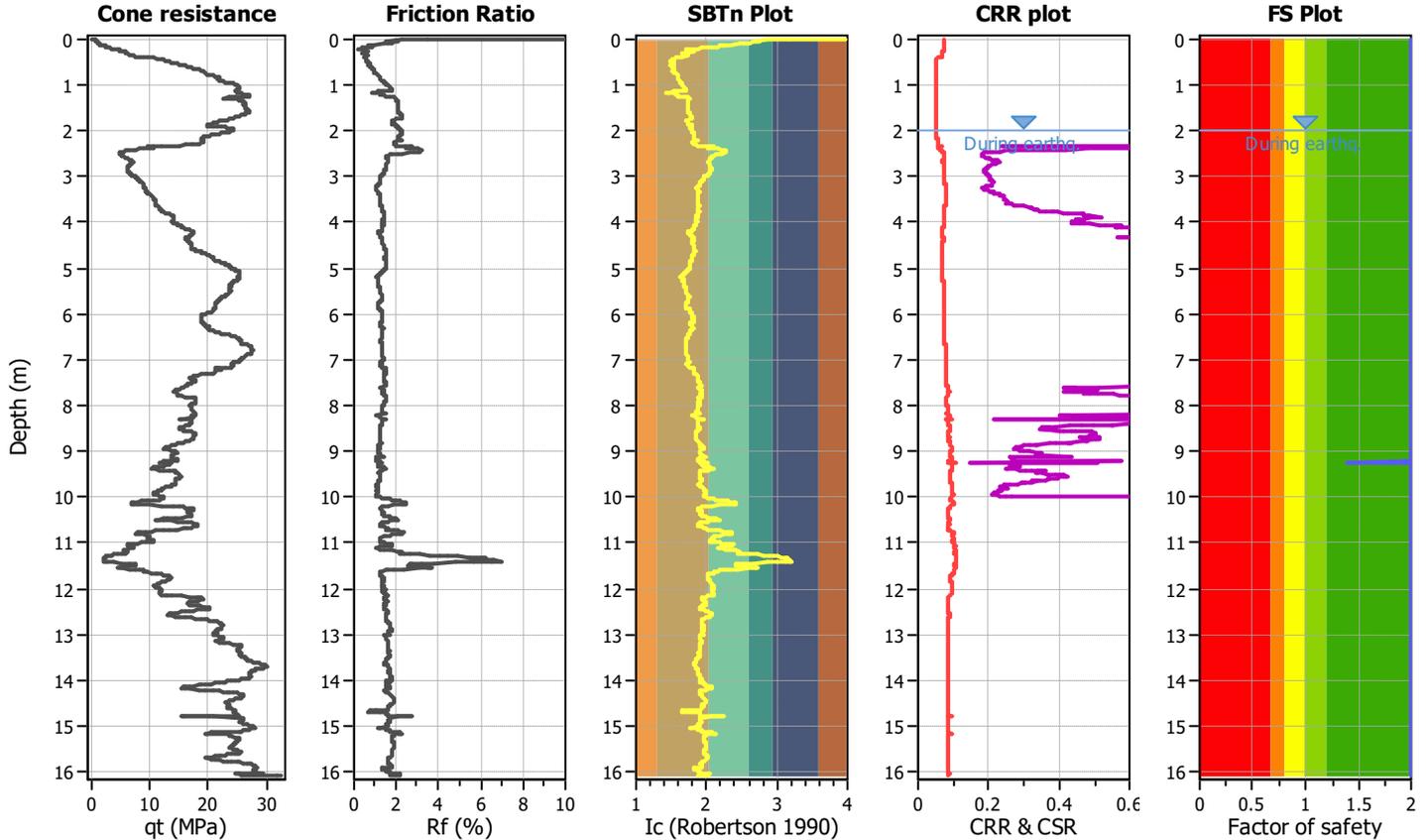
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

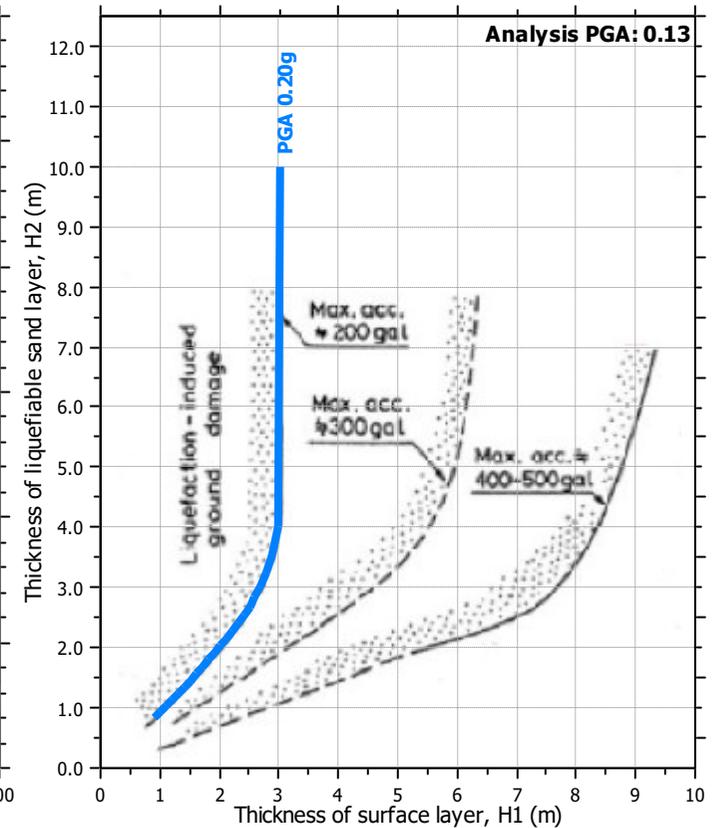
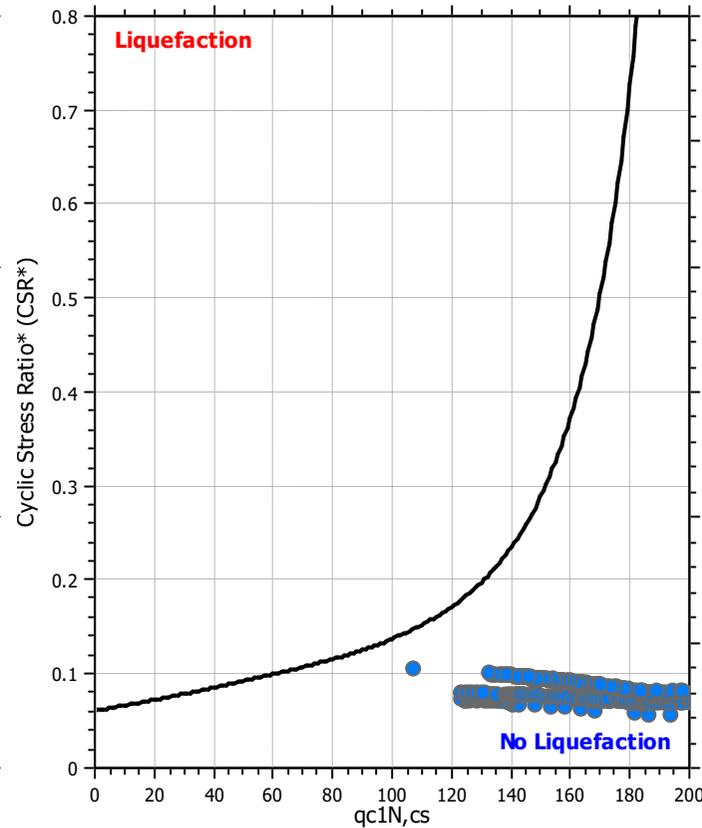
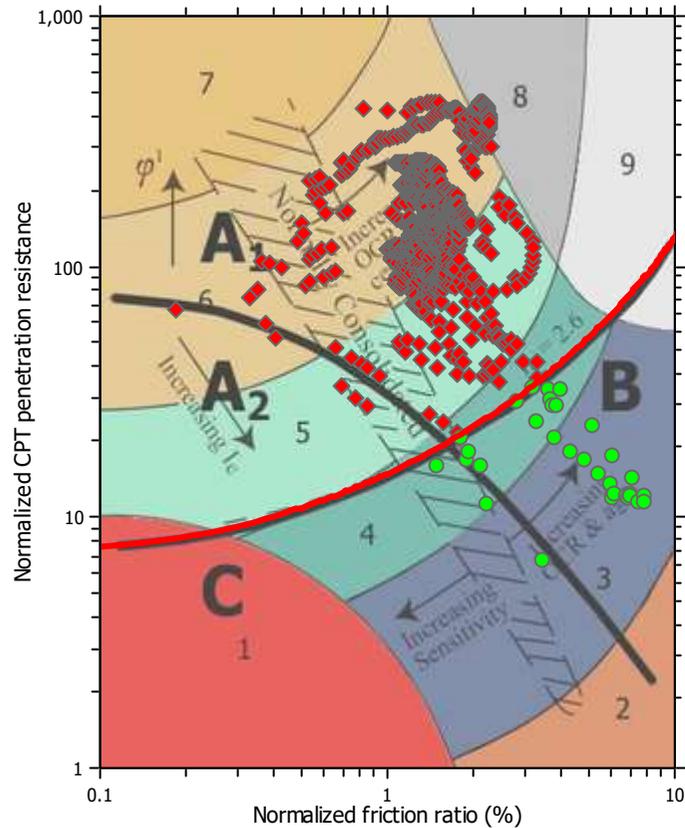
CPT file : 65 Ratanui Rd CPT01

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



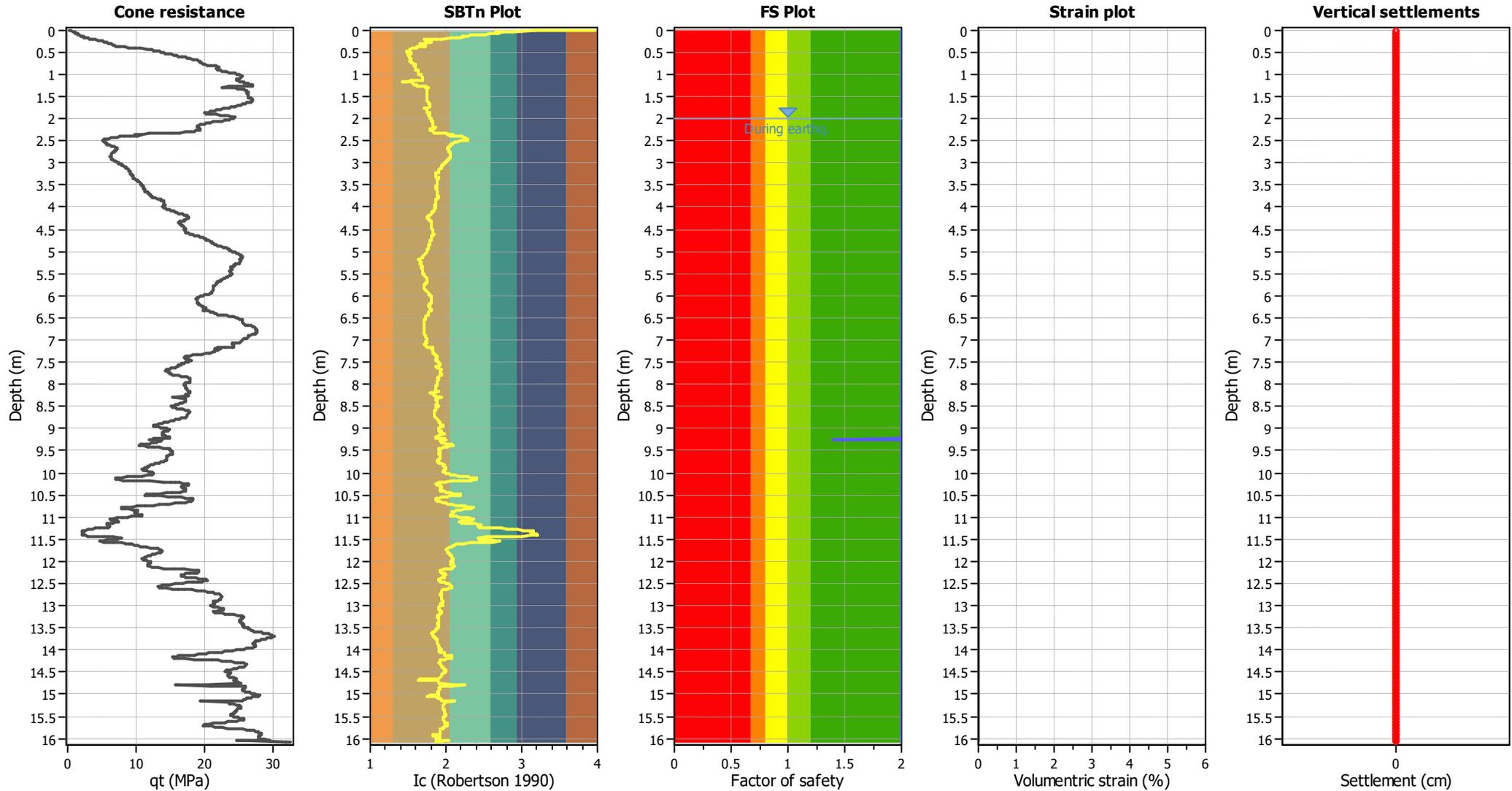
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

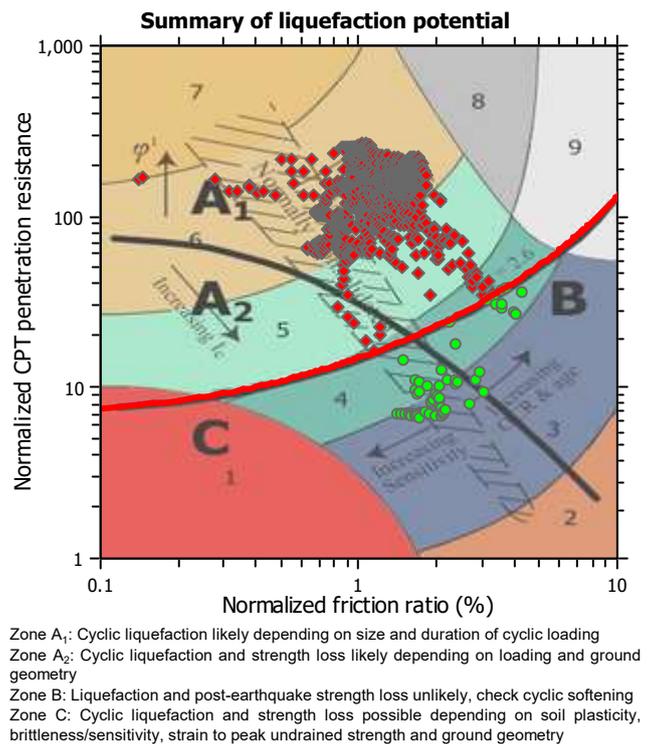
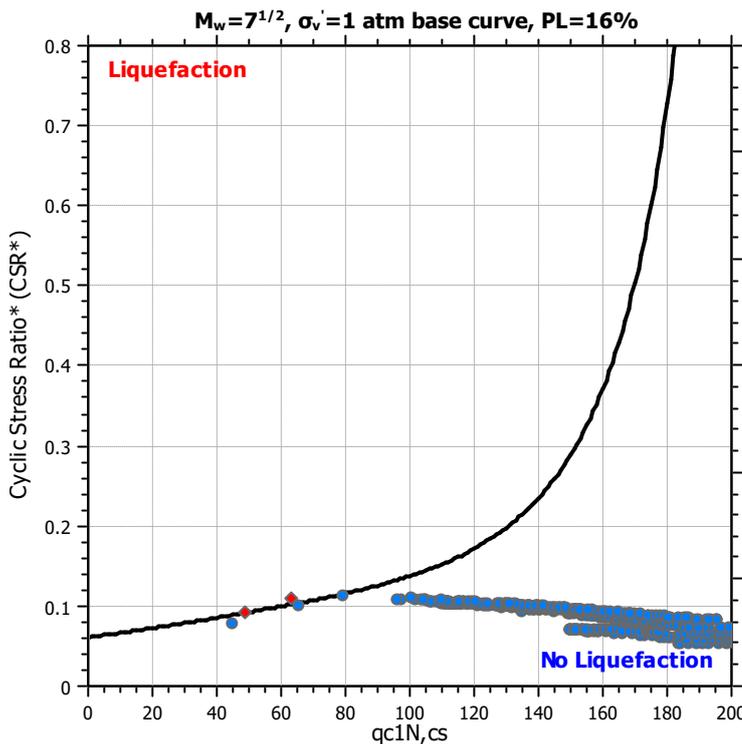
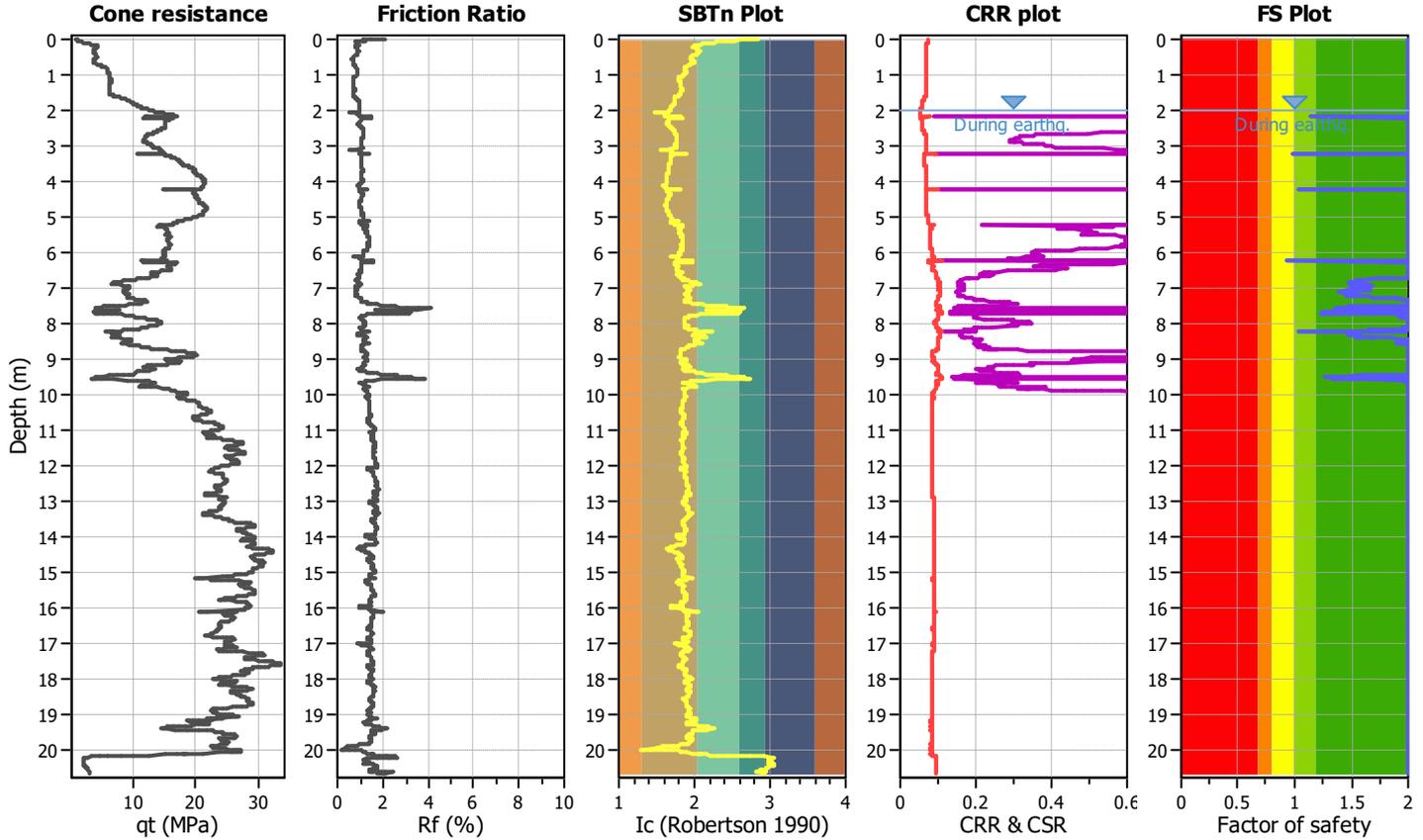
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

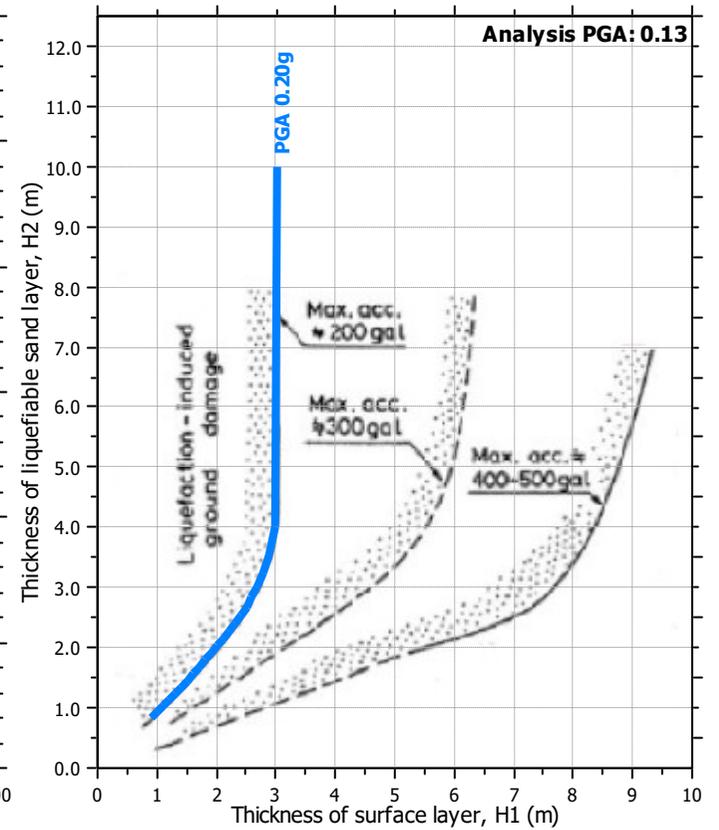
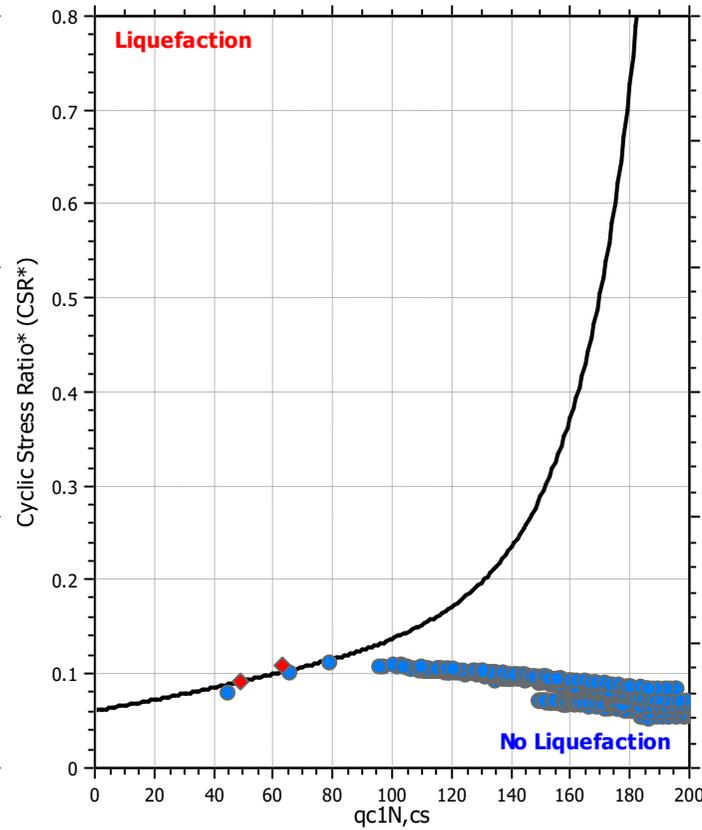
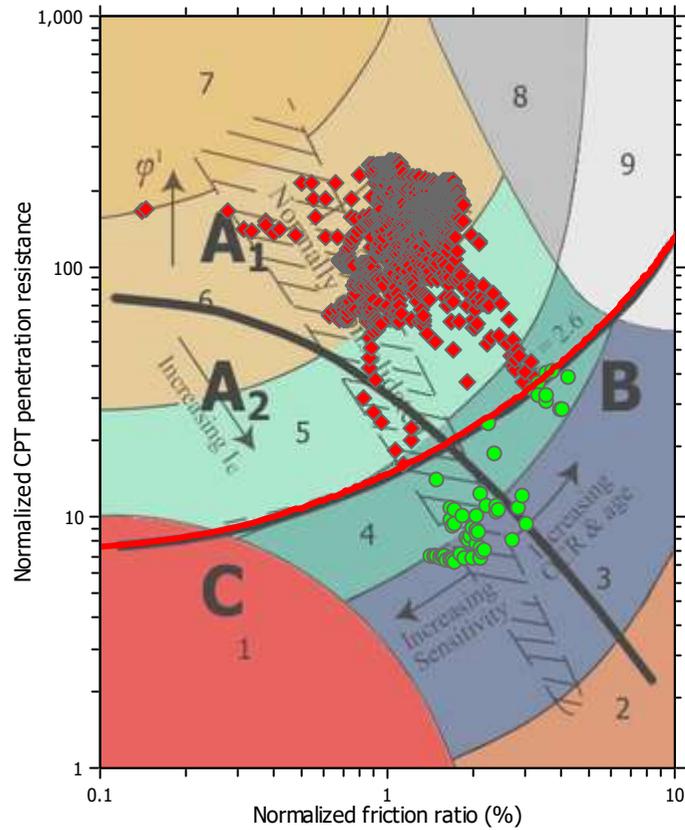
CPT file : 65 Ratanui Rd CPT02

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



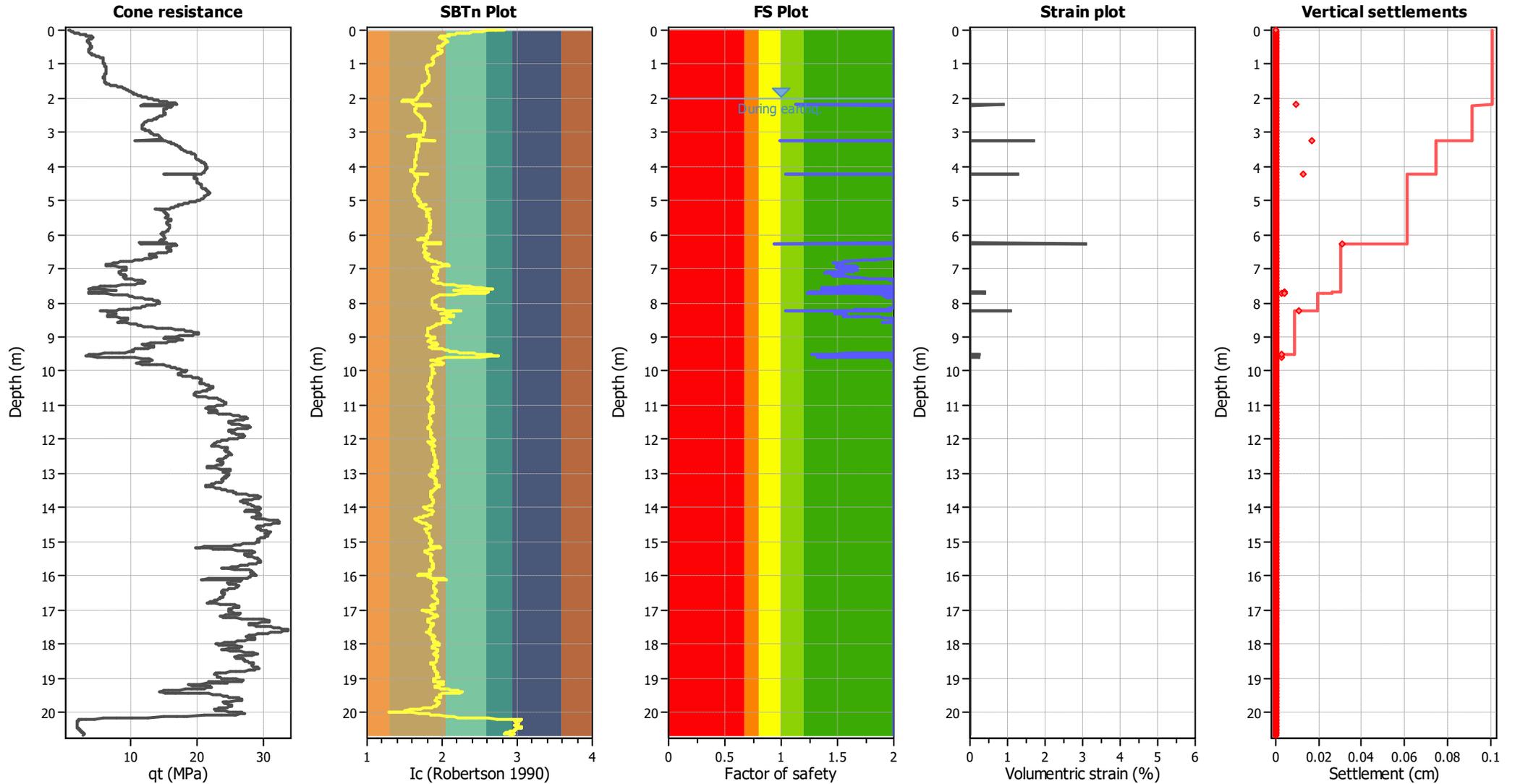
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

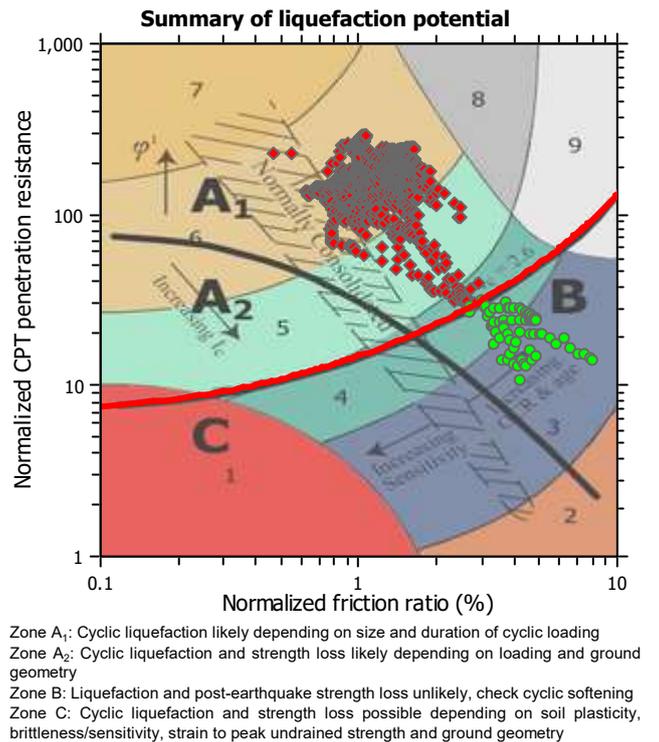
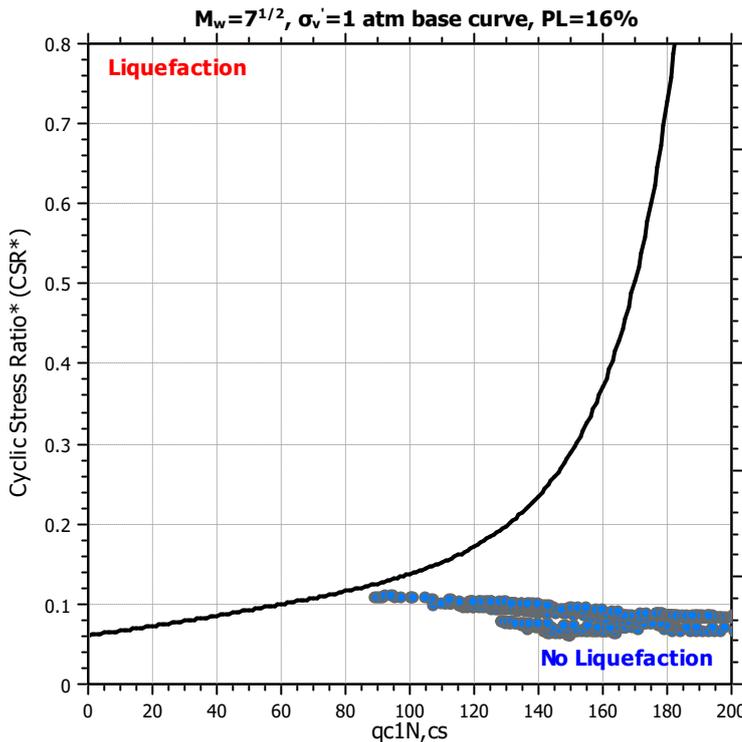
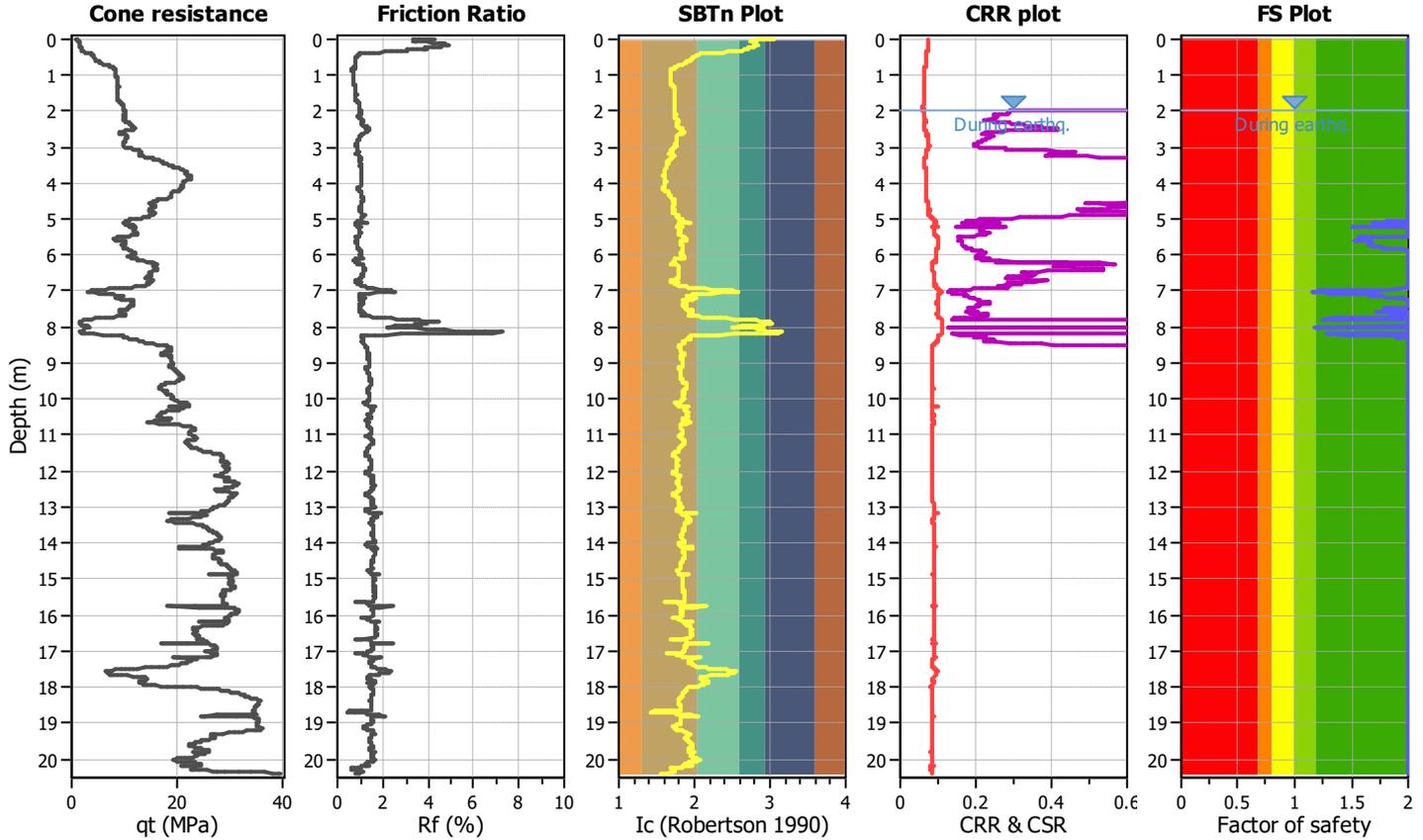
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

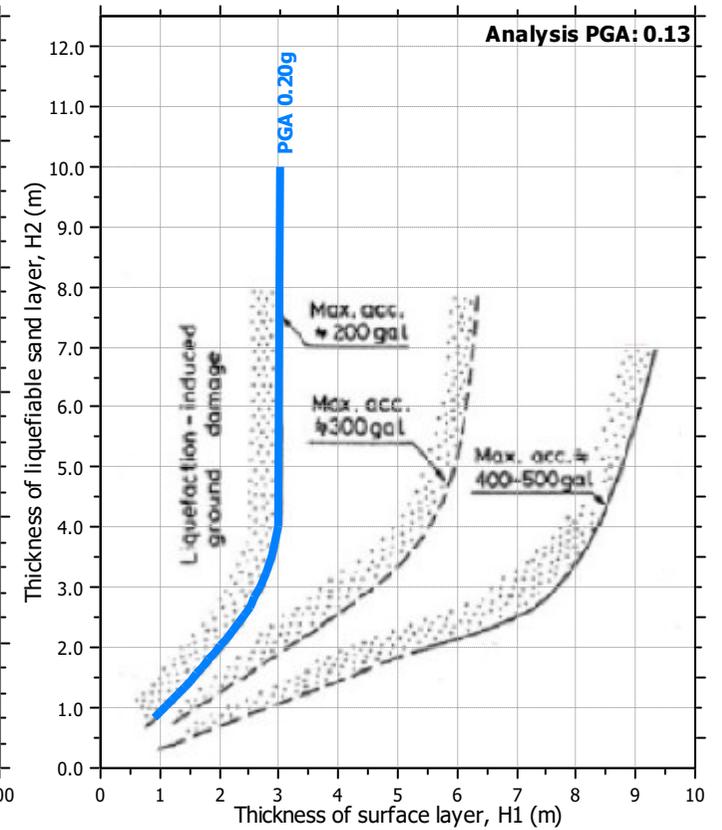
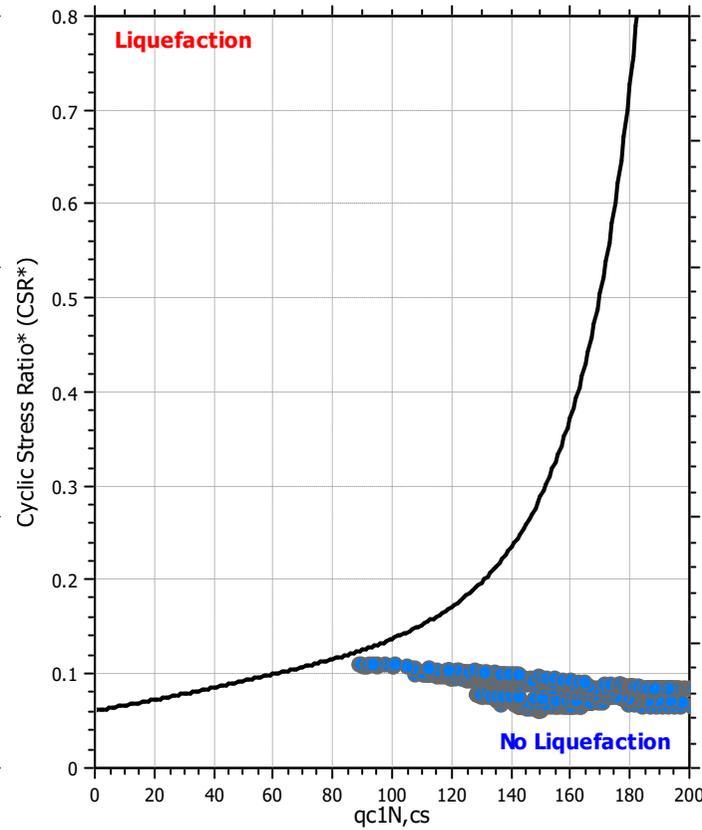
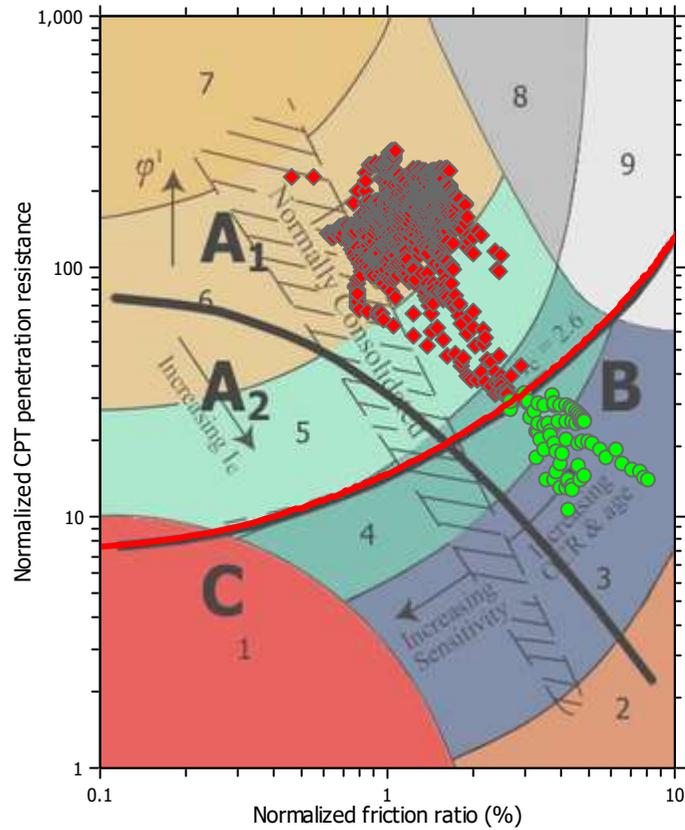
CPT file : 65 Ratanui Rd CPT03

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



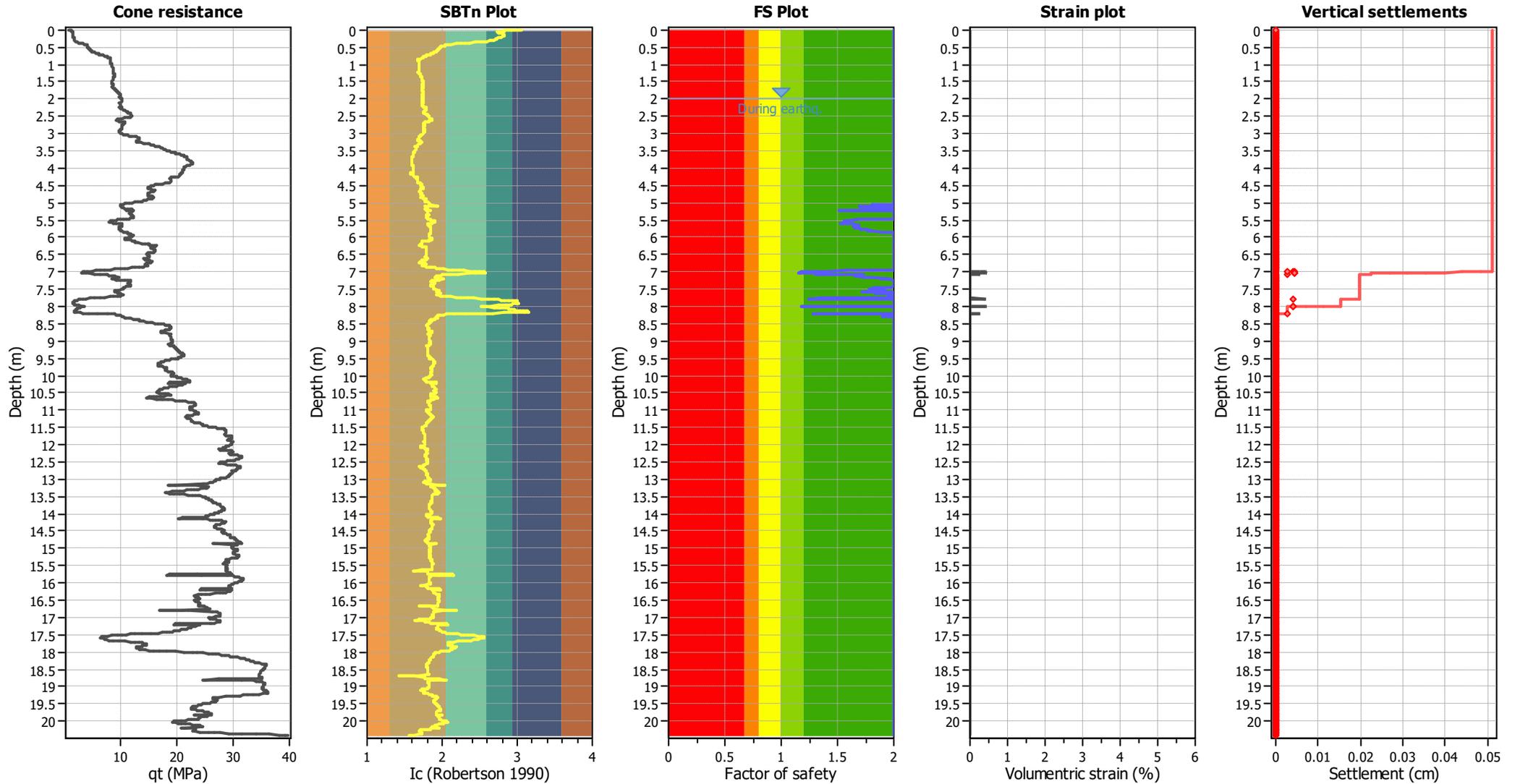
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

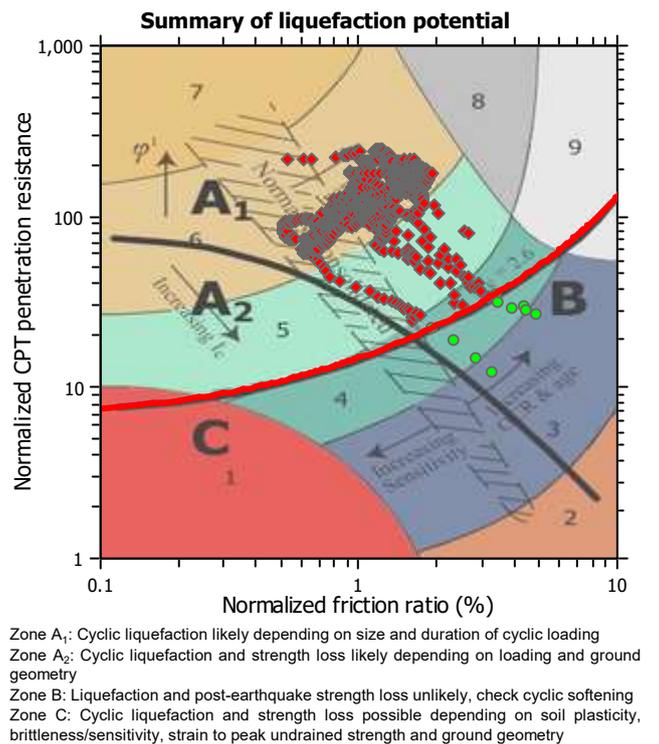
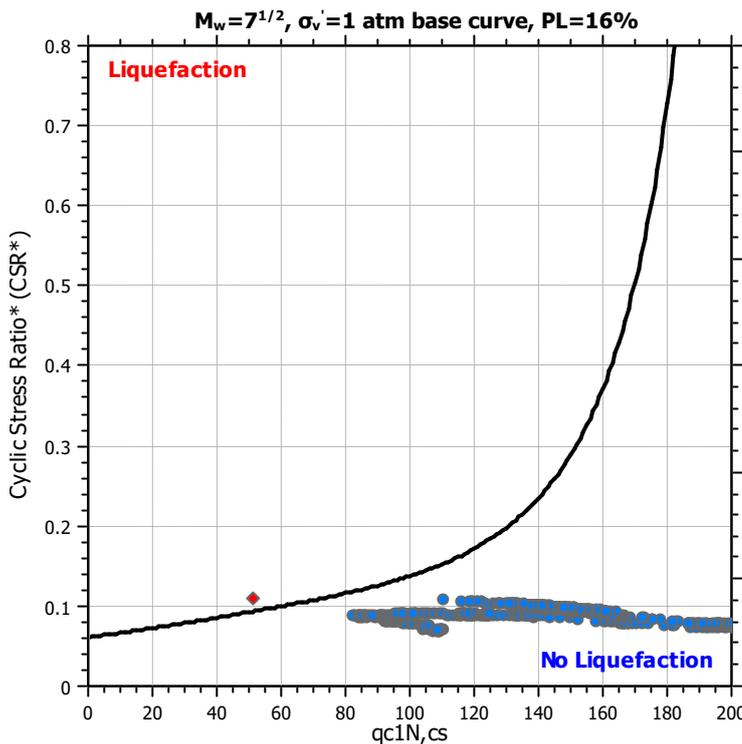
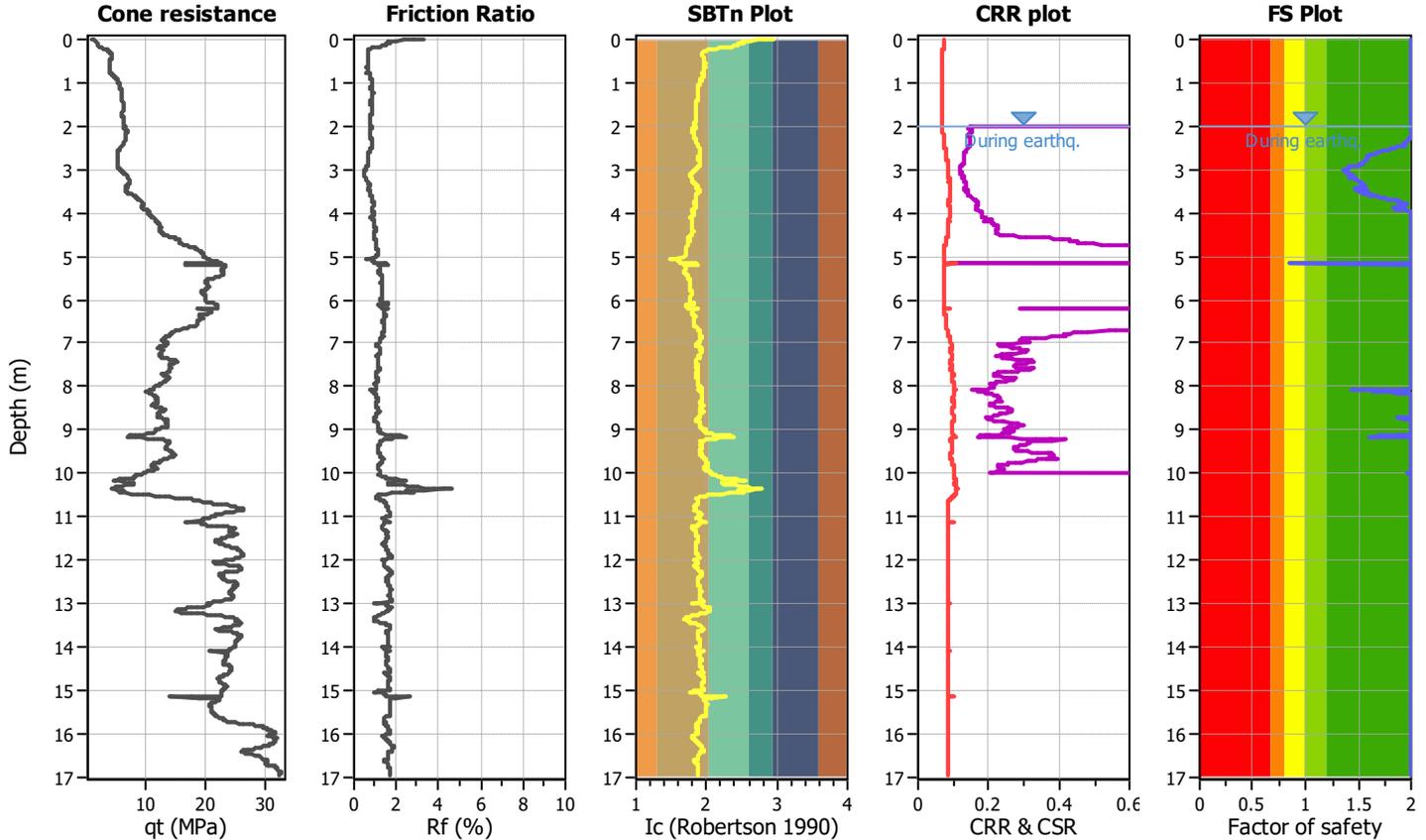
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

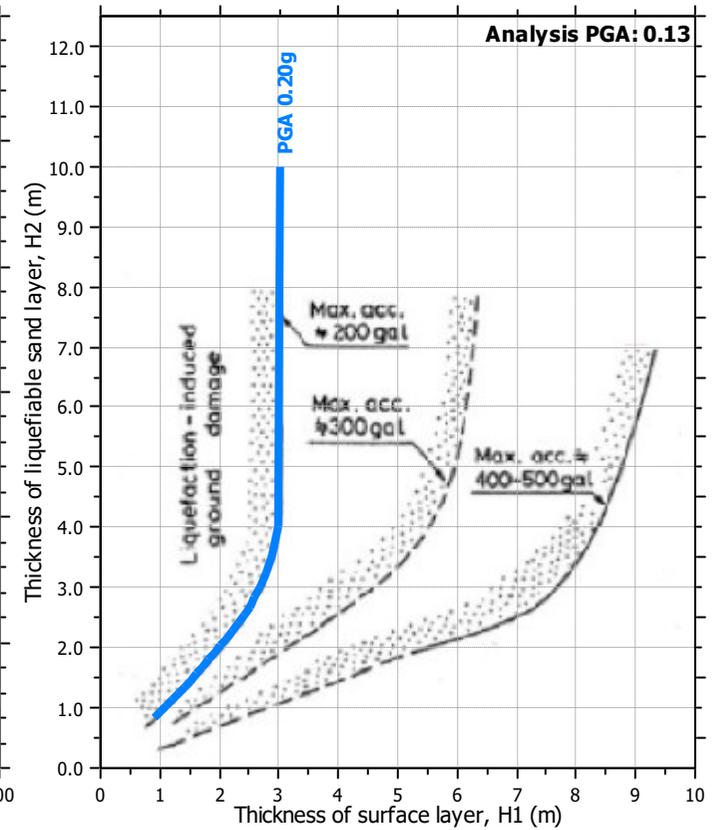
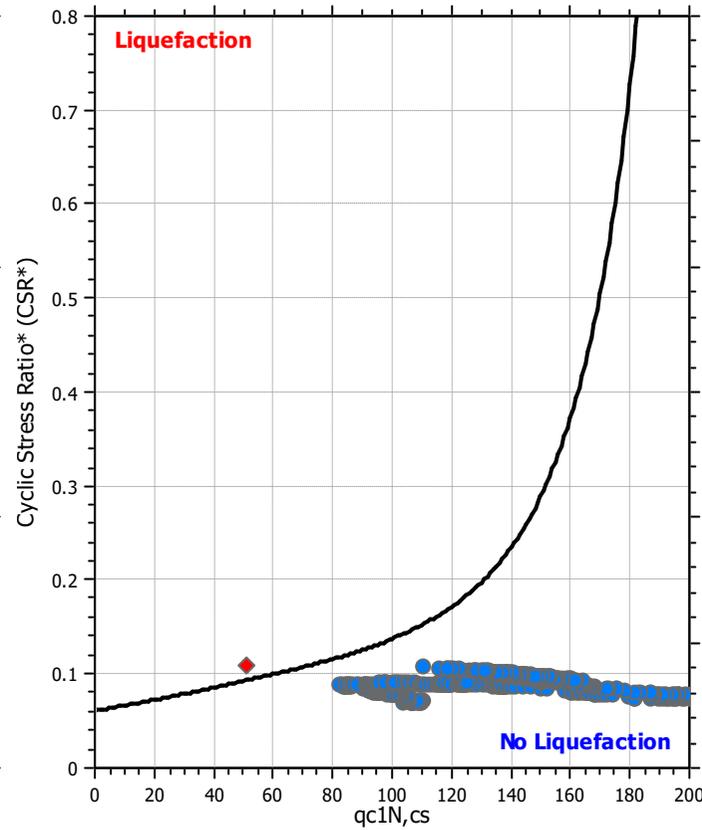
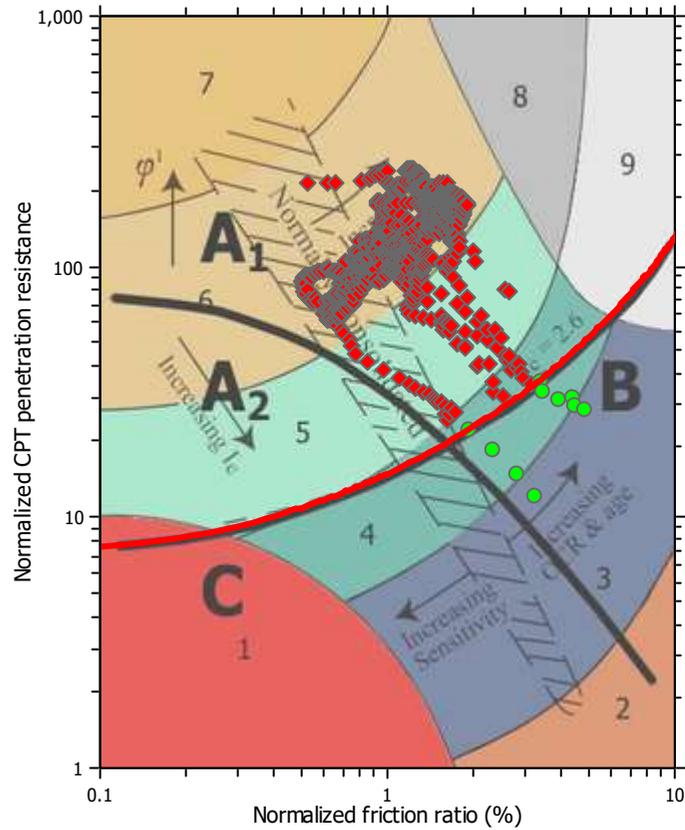
CPT file : 65 Ratanui Rd CPT04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



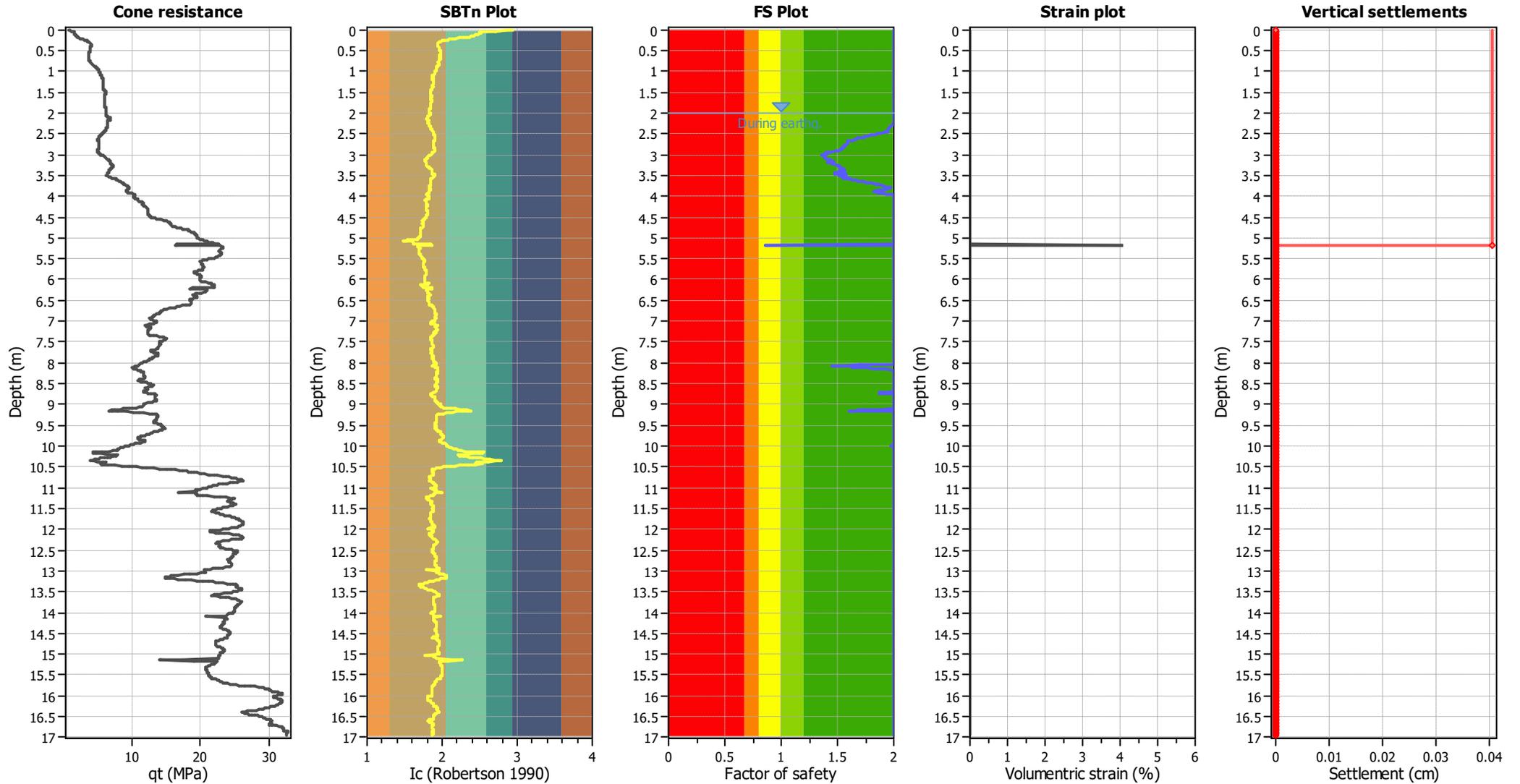
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_f applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

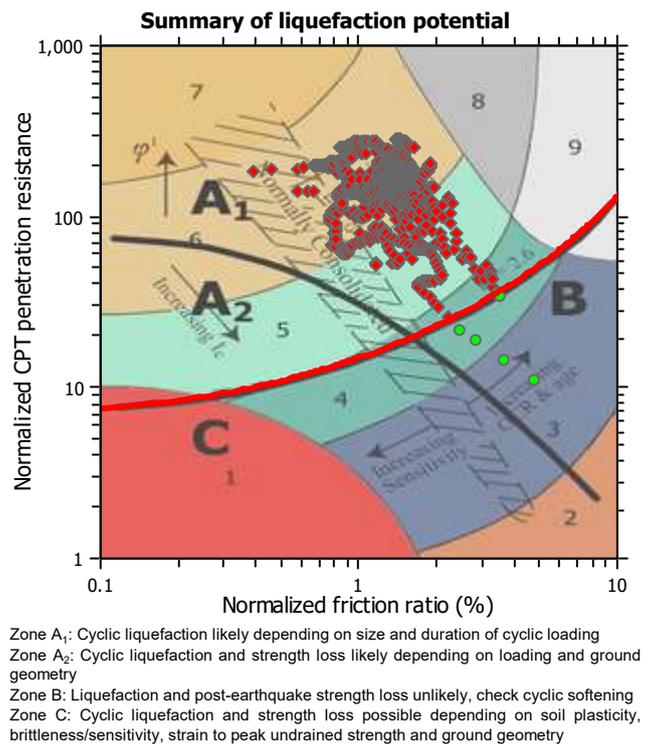
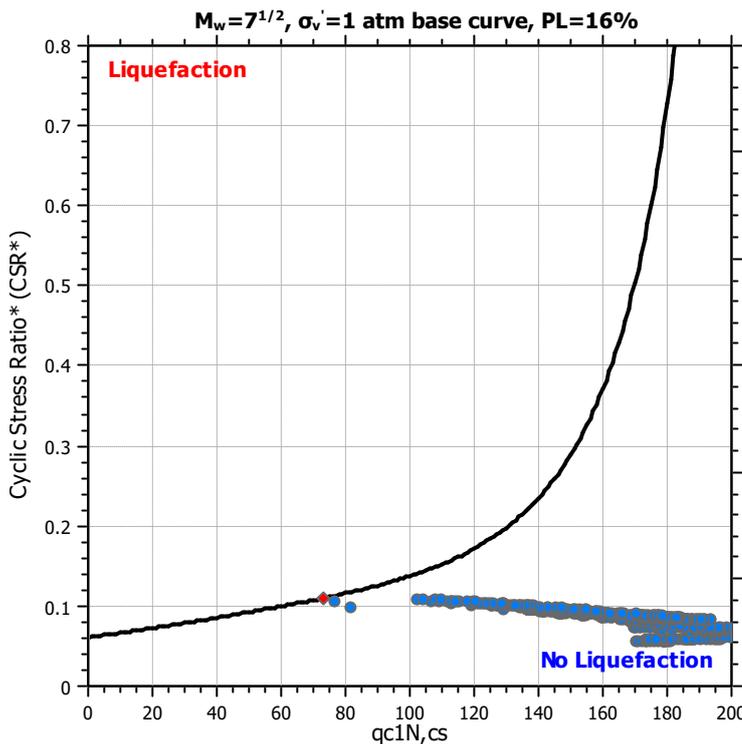
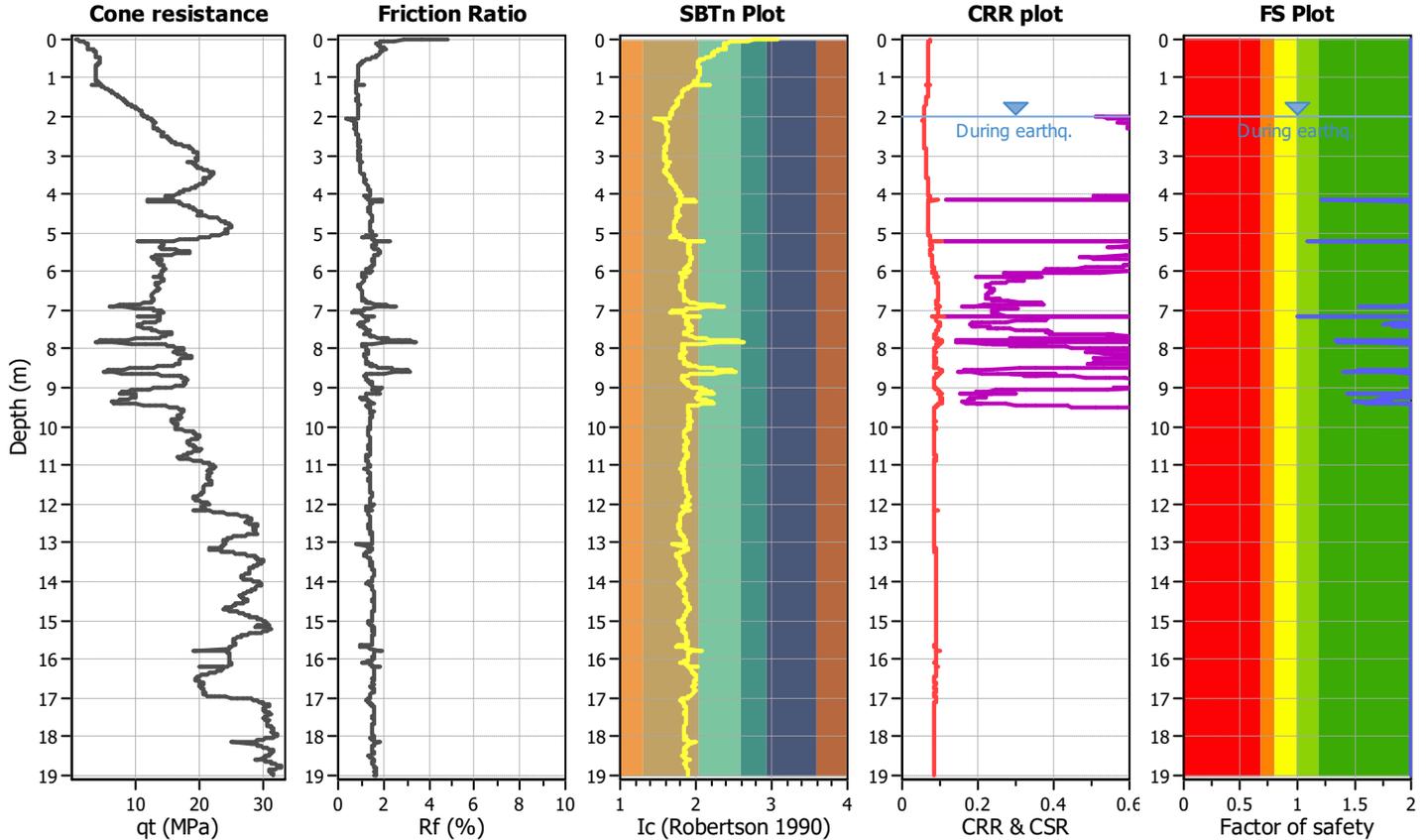
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

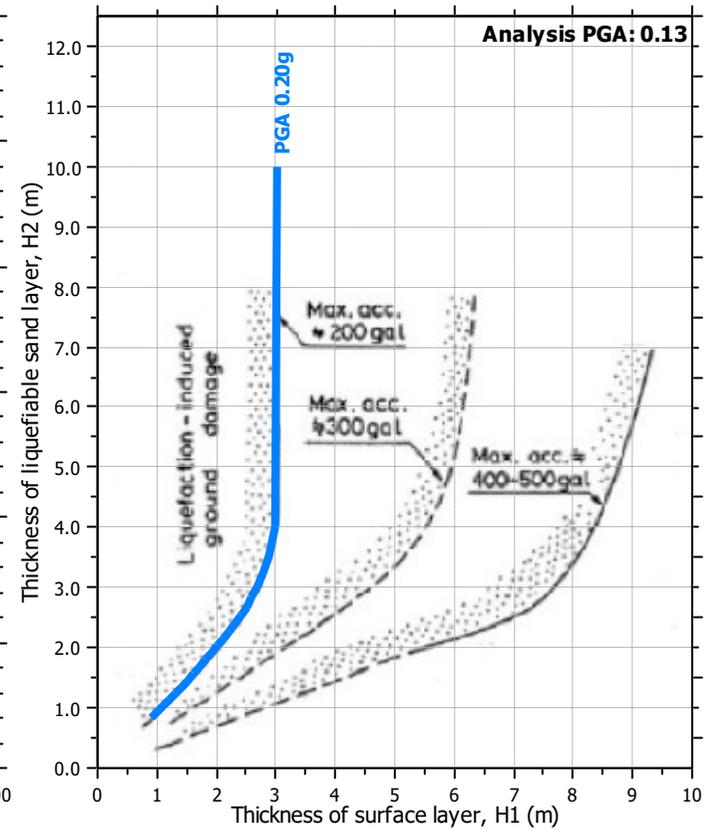
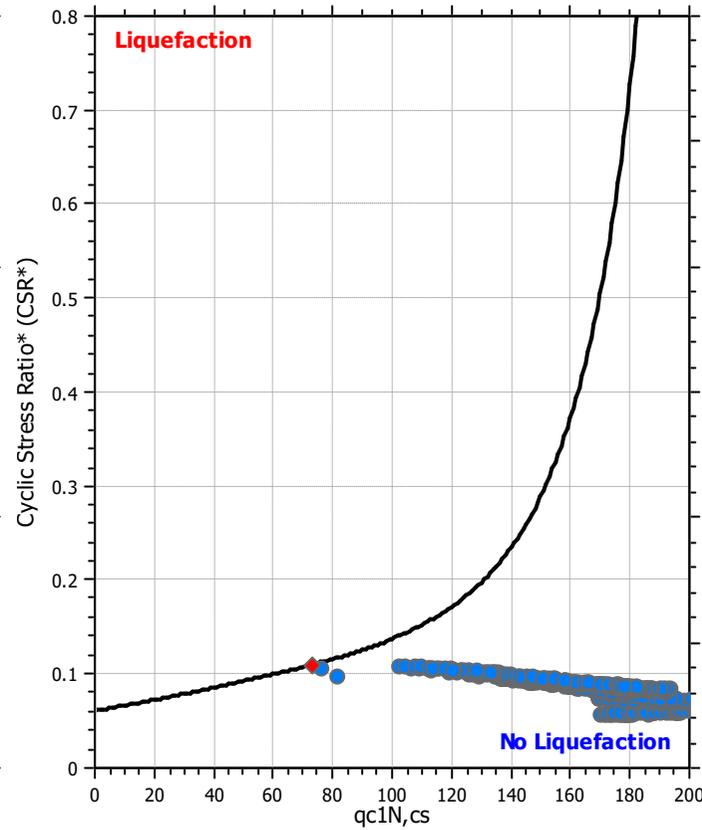
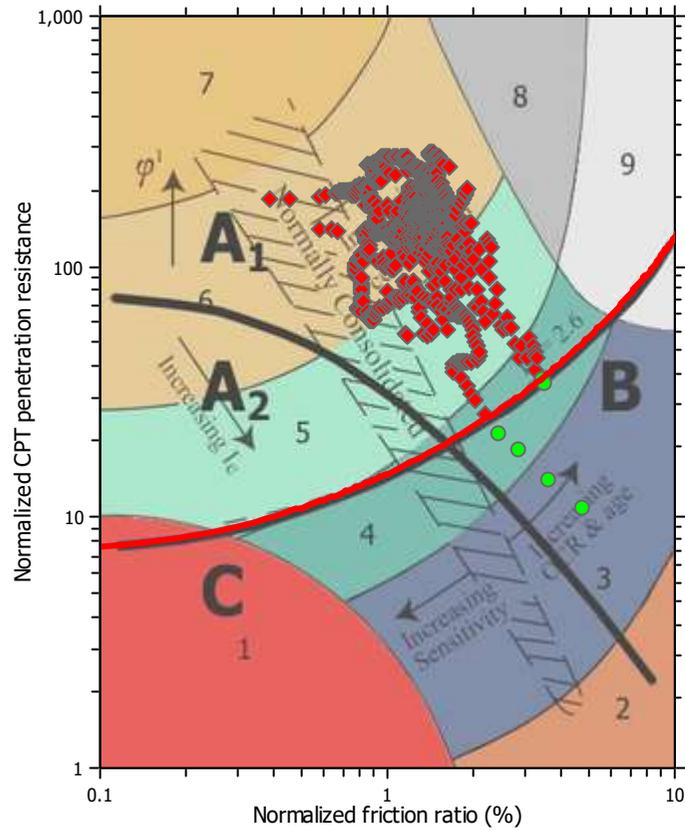
CPT file : 65 Ratanui Rd CPT05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



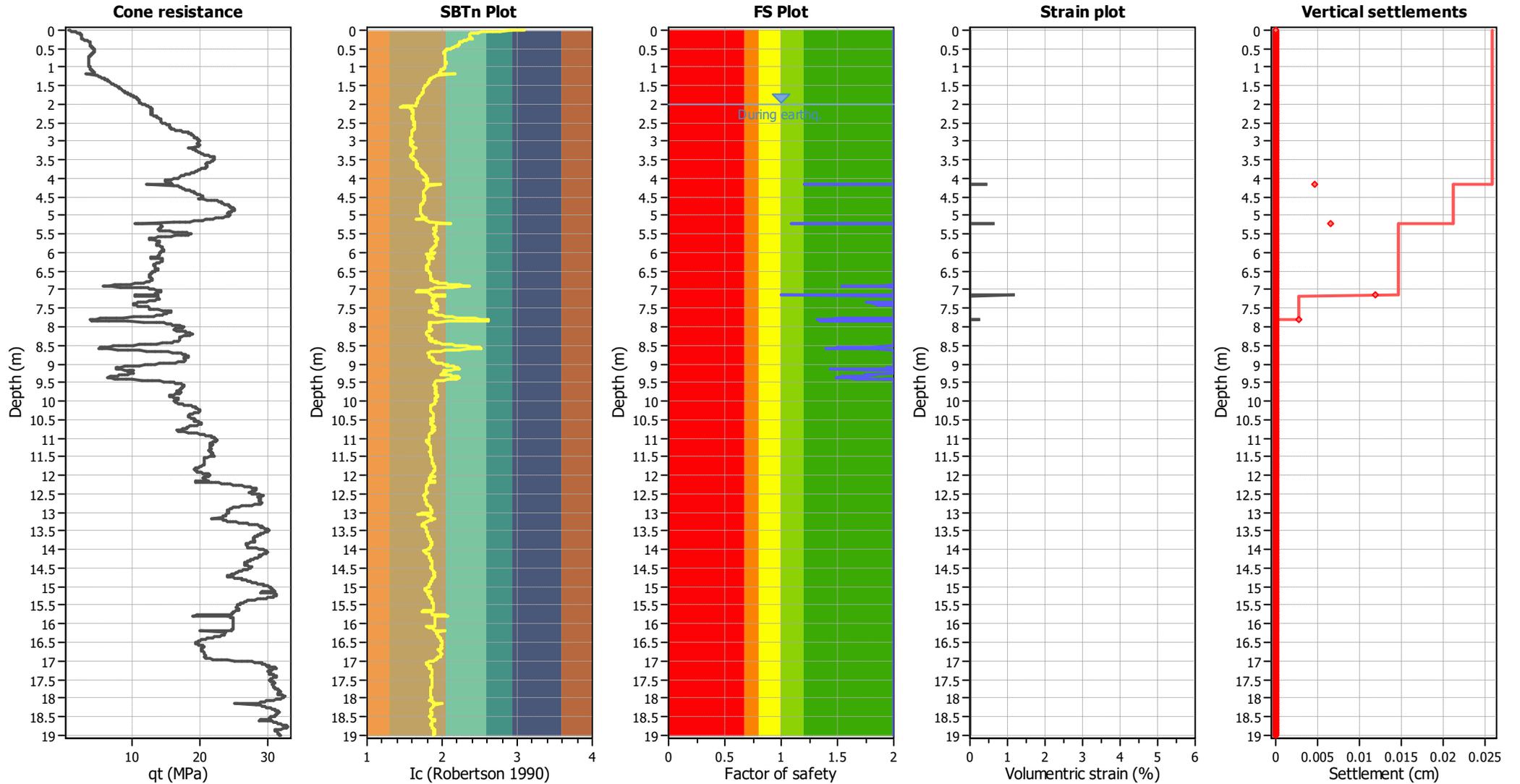
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.20 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

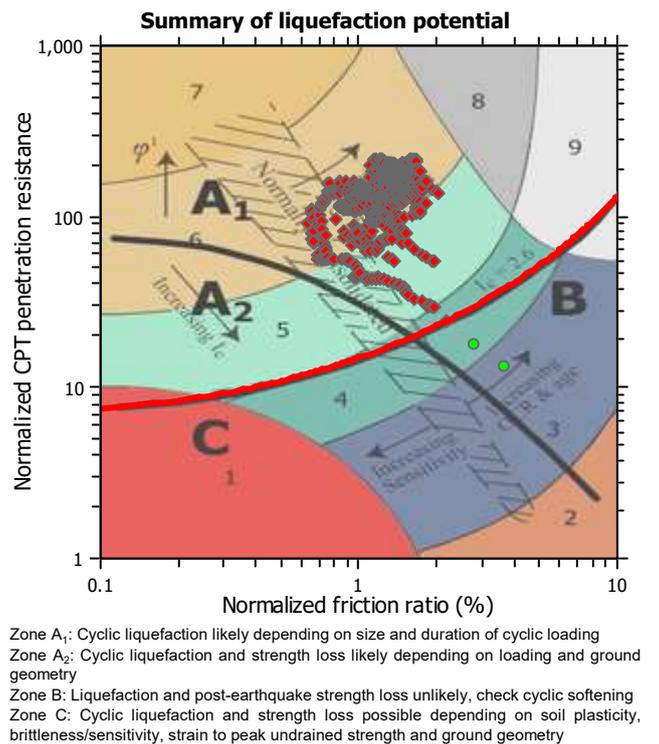
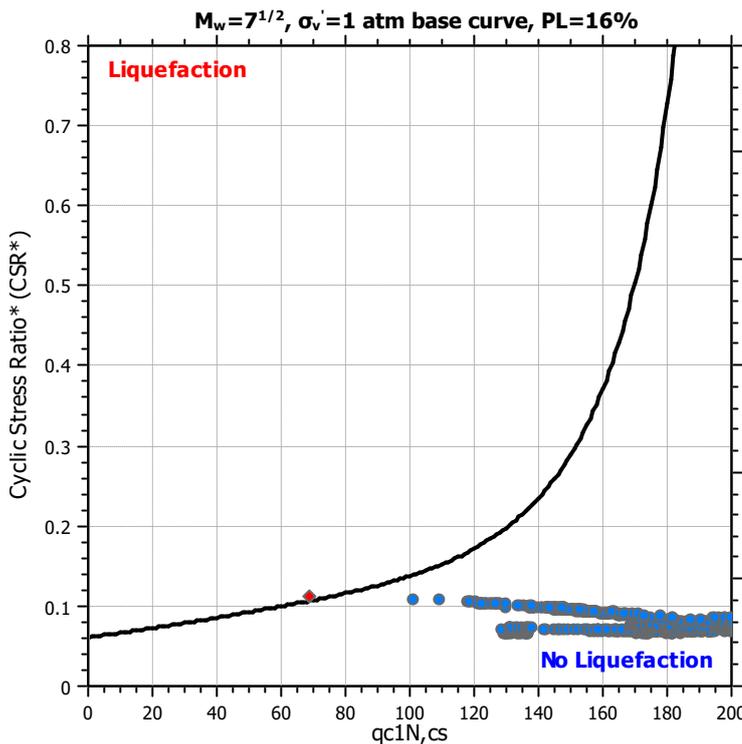
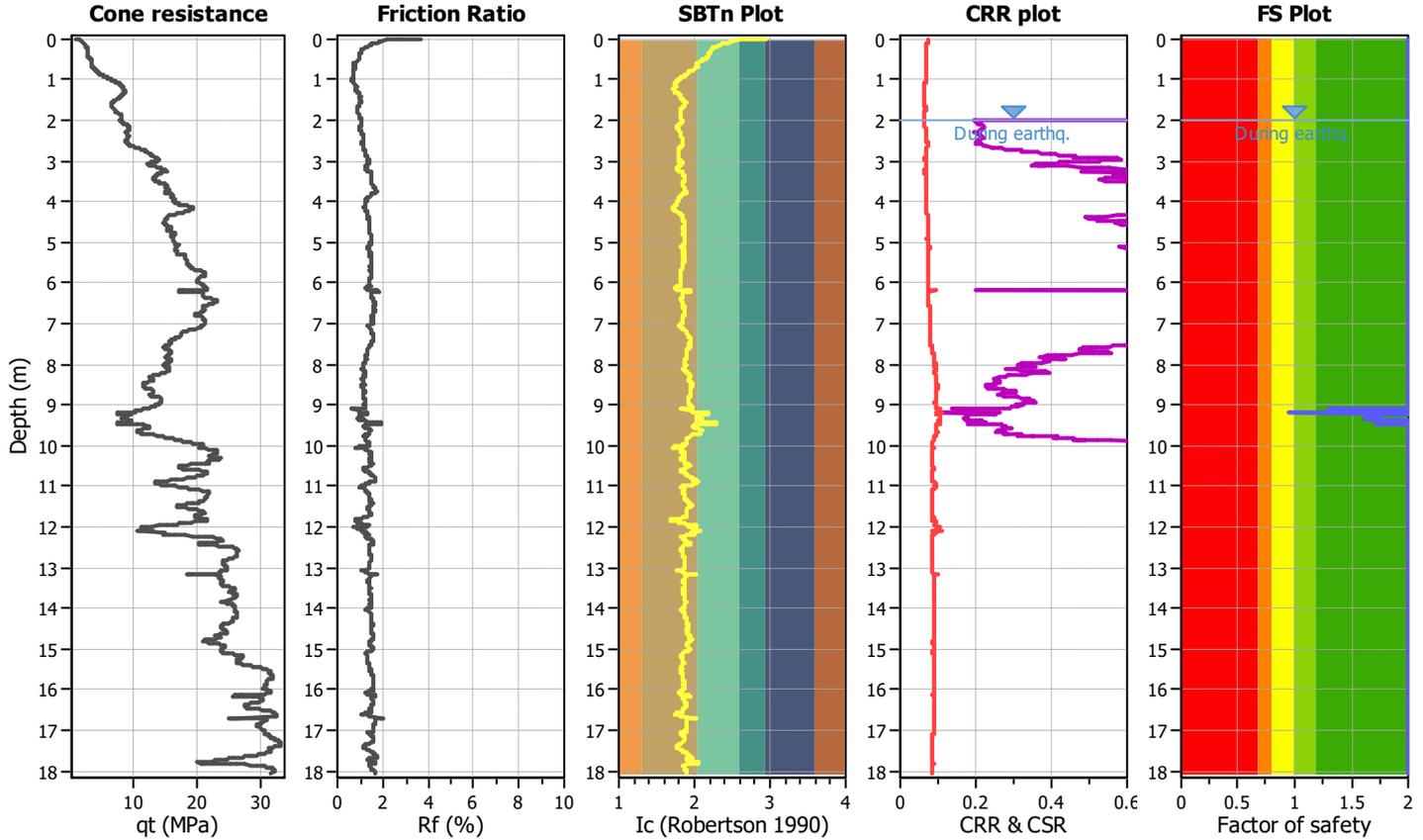
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

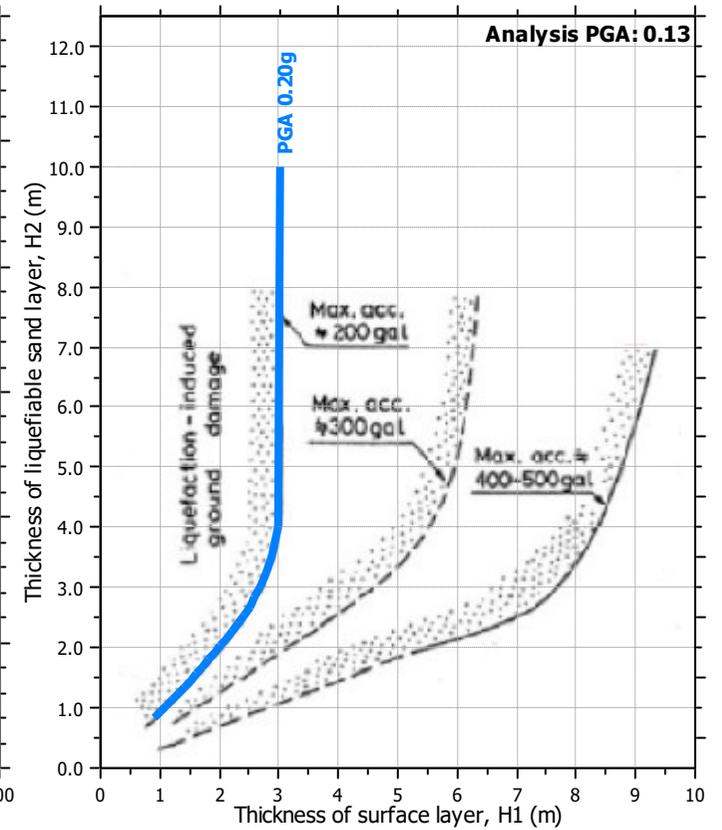
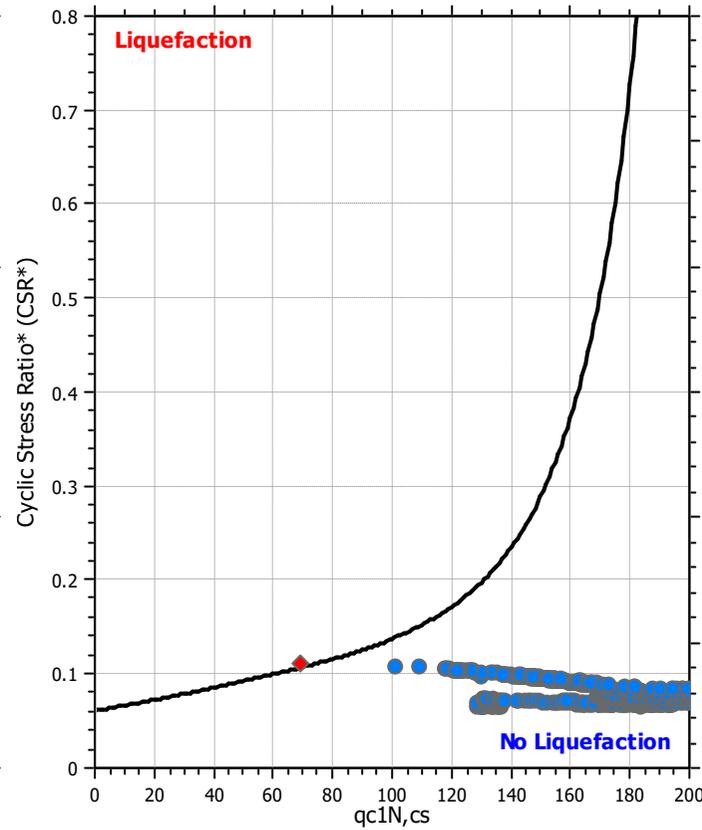
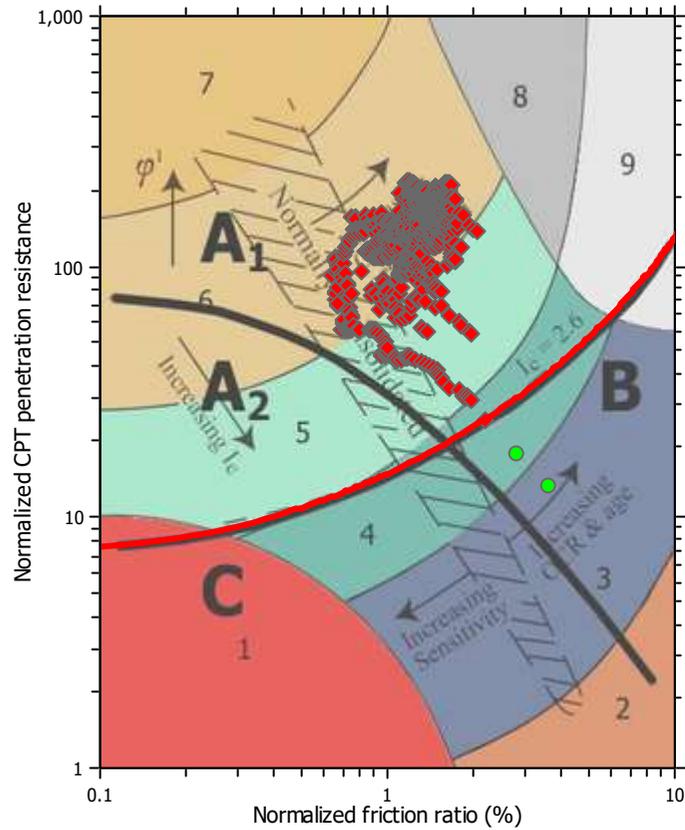
CPT file : 65 Ratanui Rd CPT06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



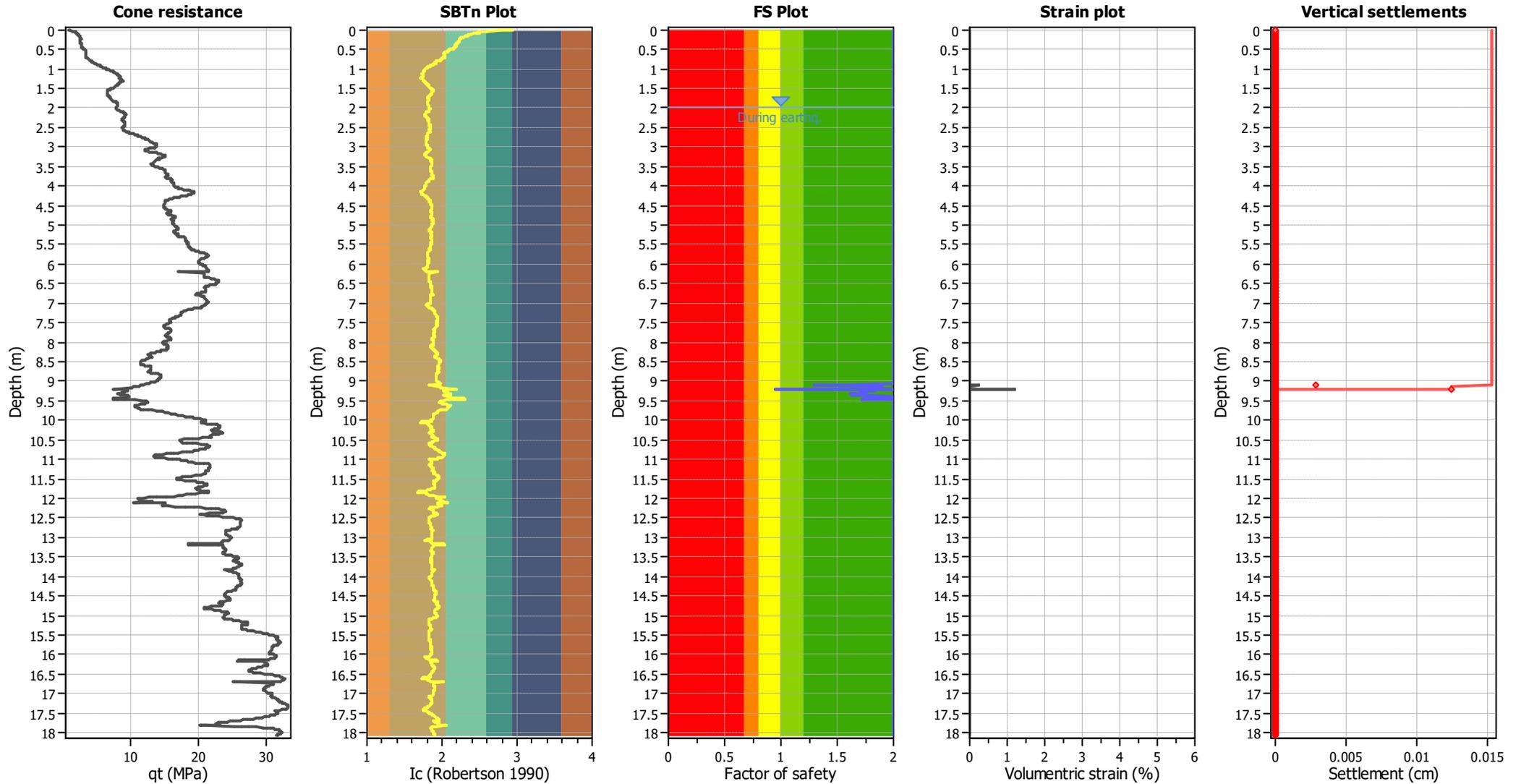
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	5.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

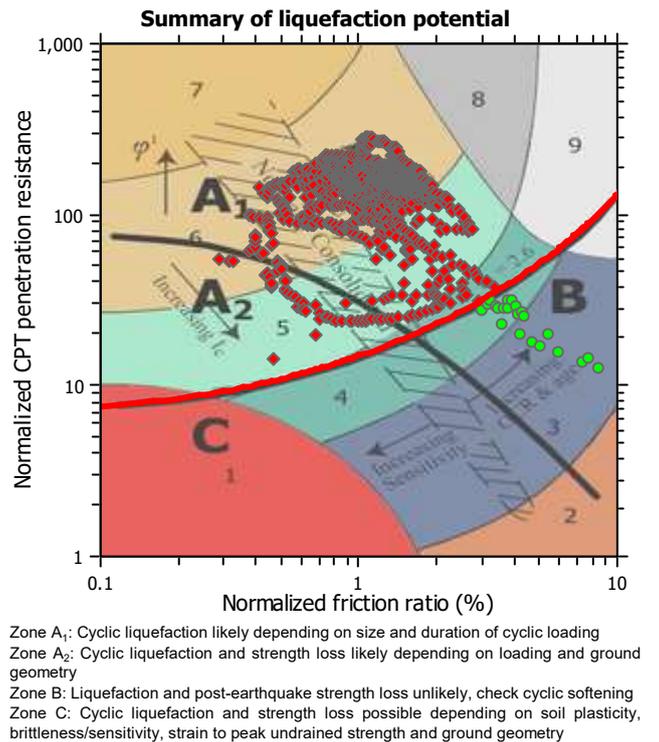
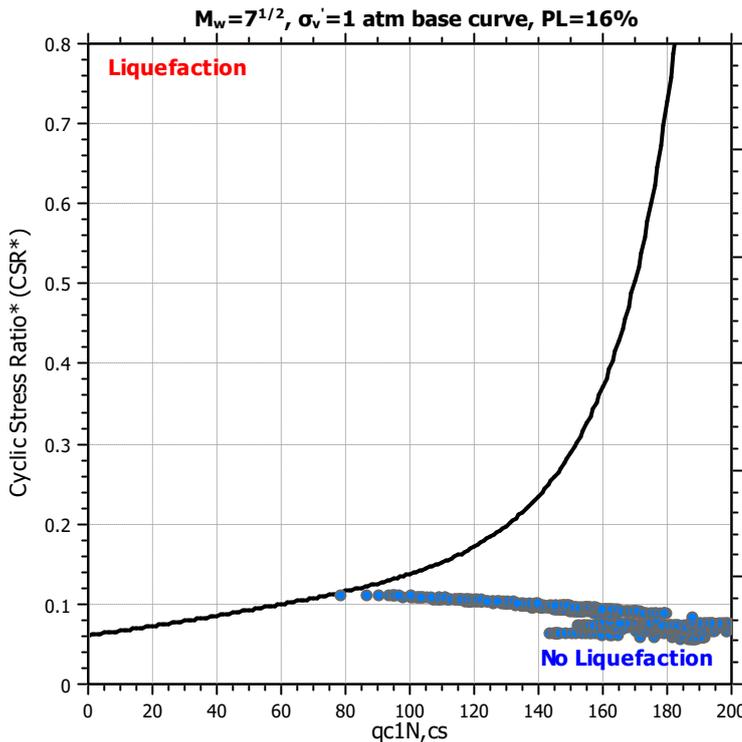
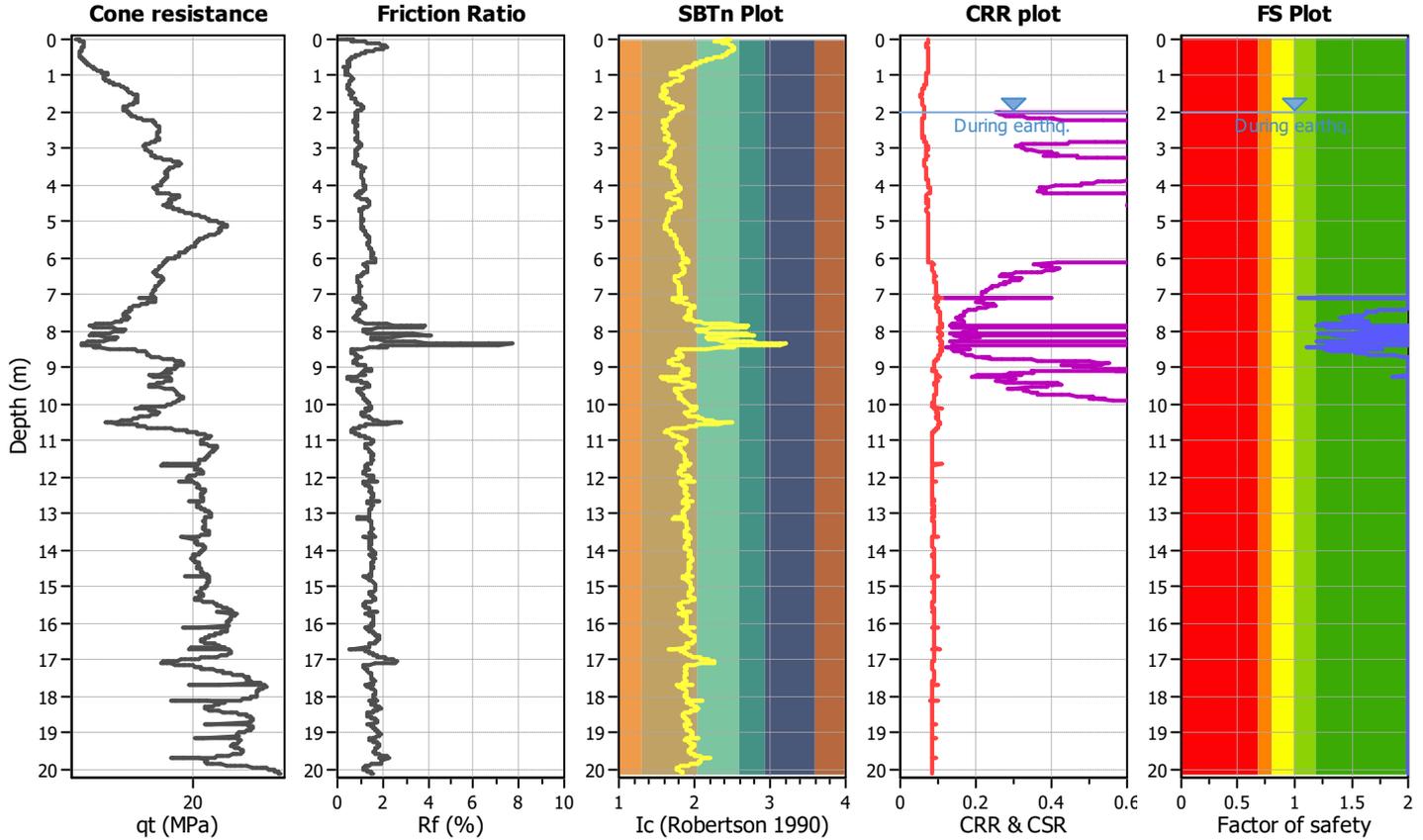
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

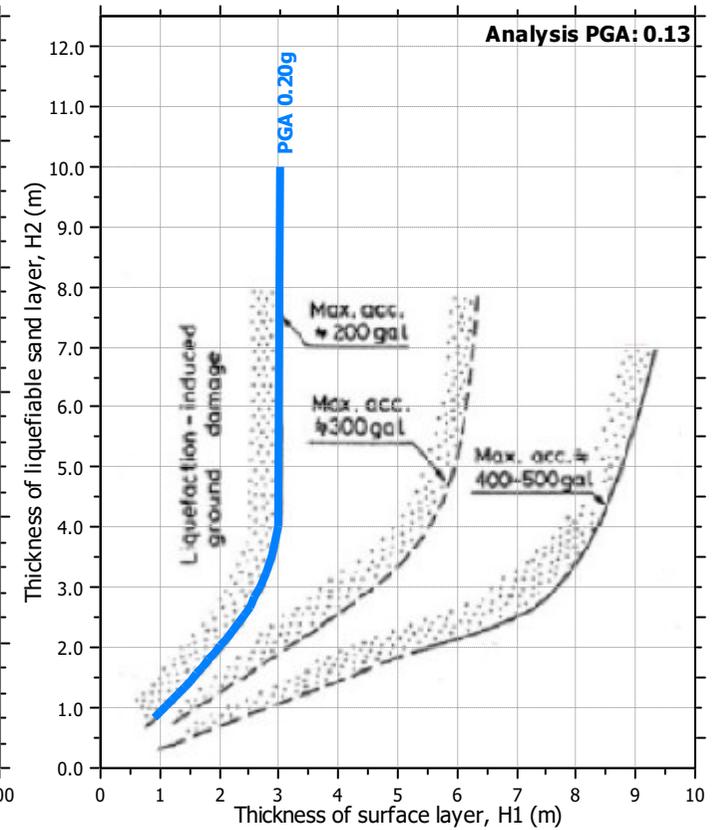
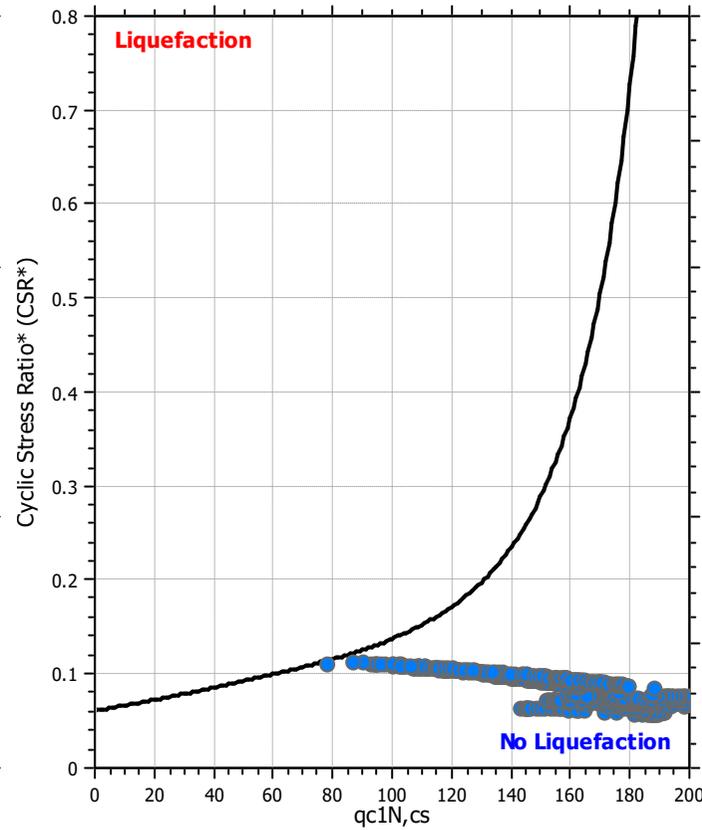
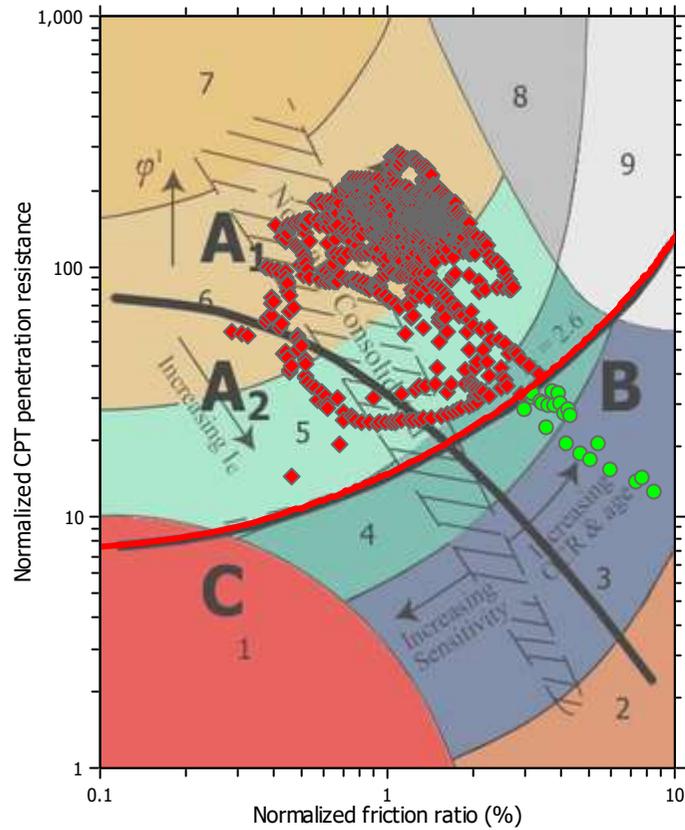
CPT file : 65 Ratanui Rd CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.50 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



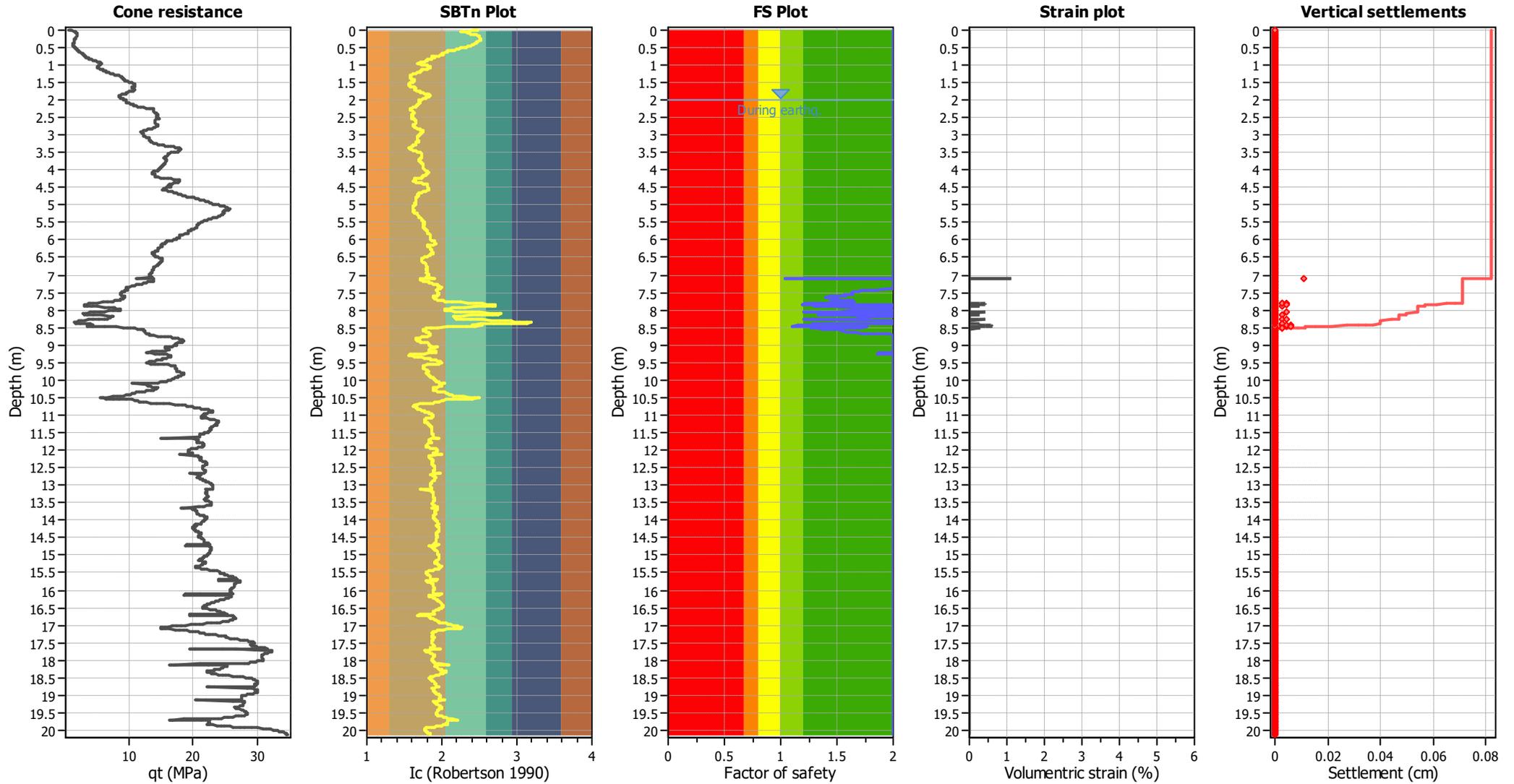
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

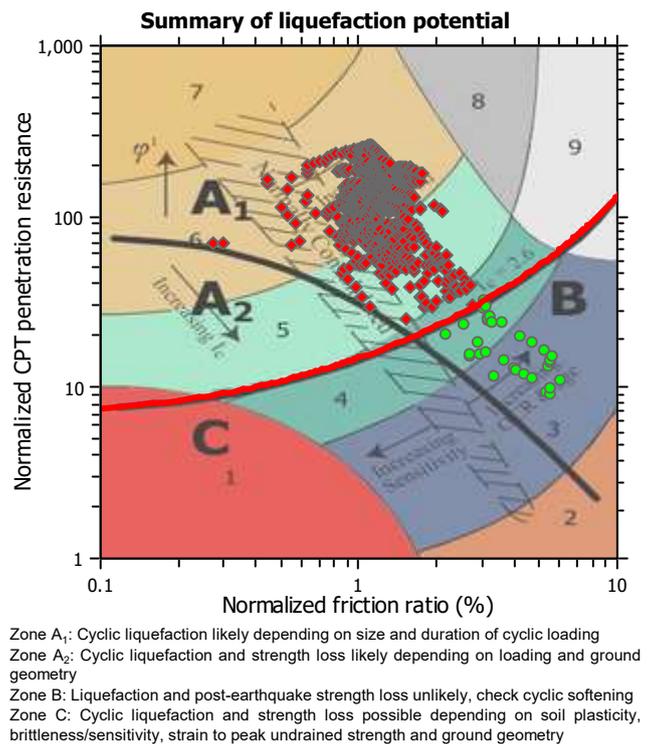
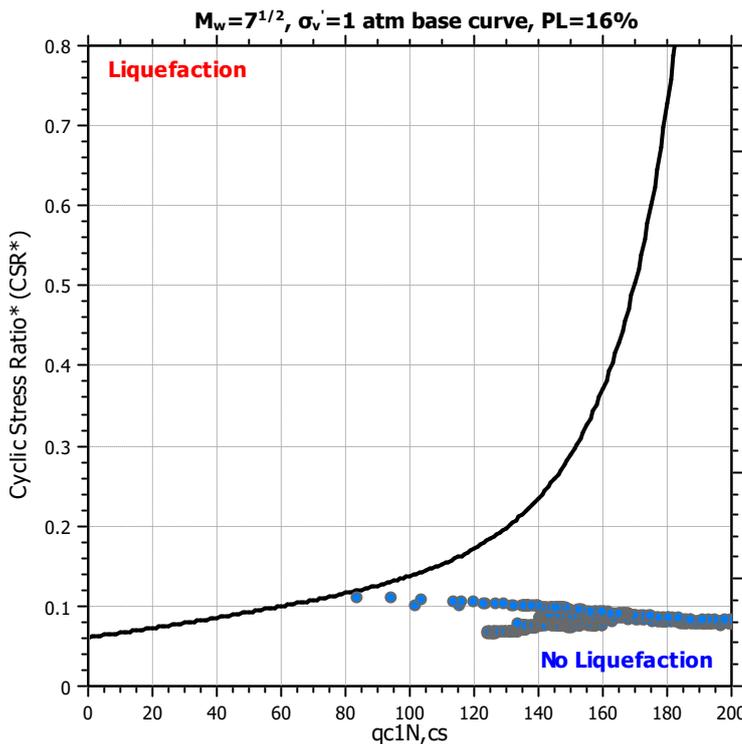
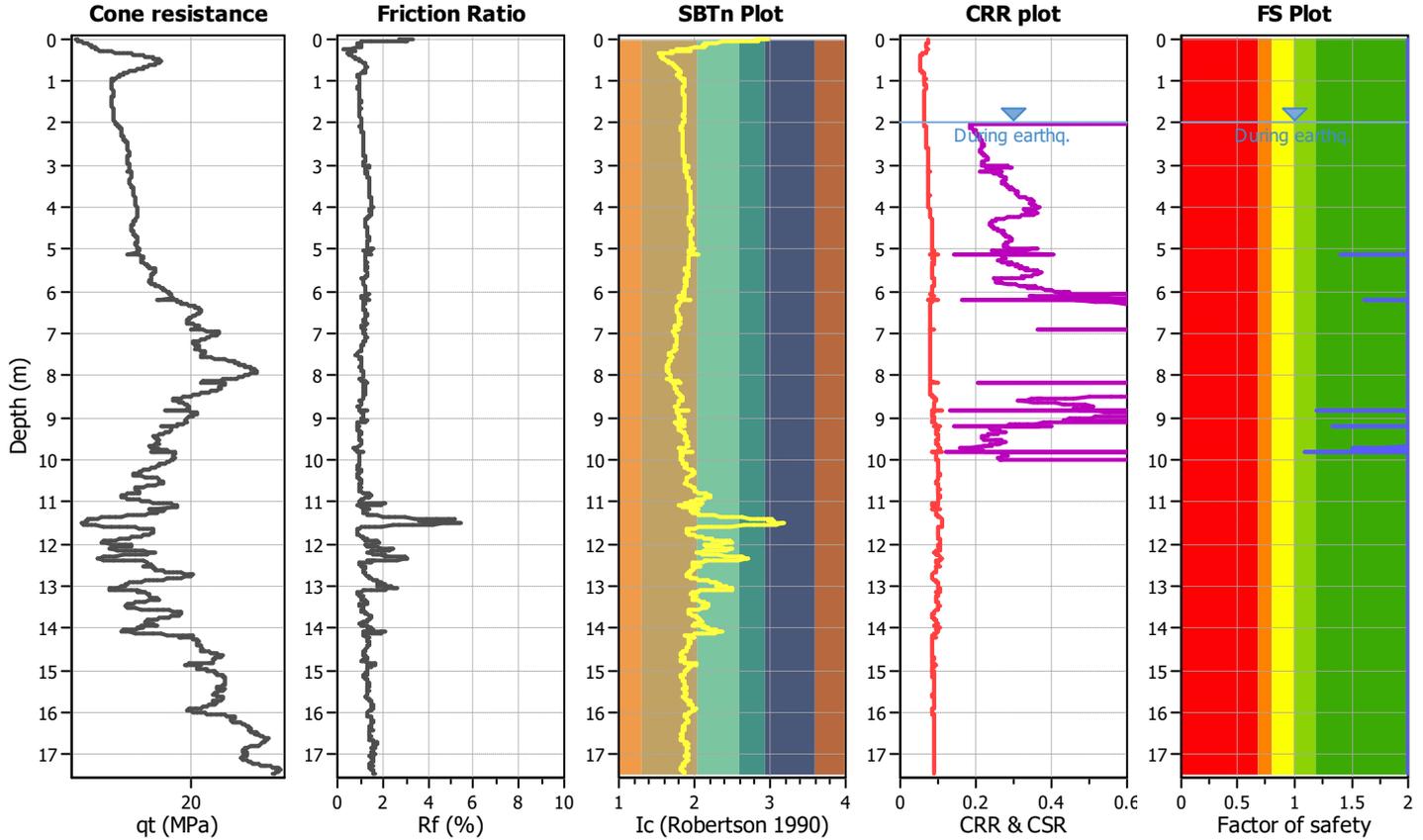
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

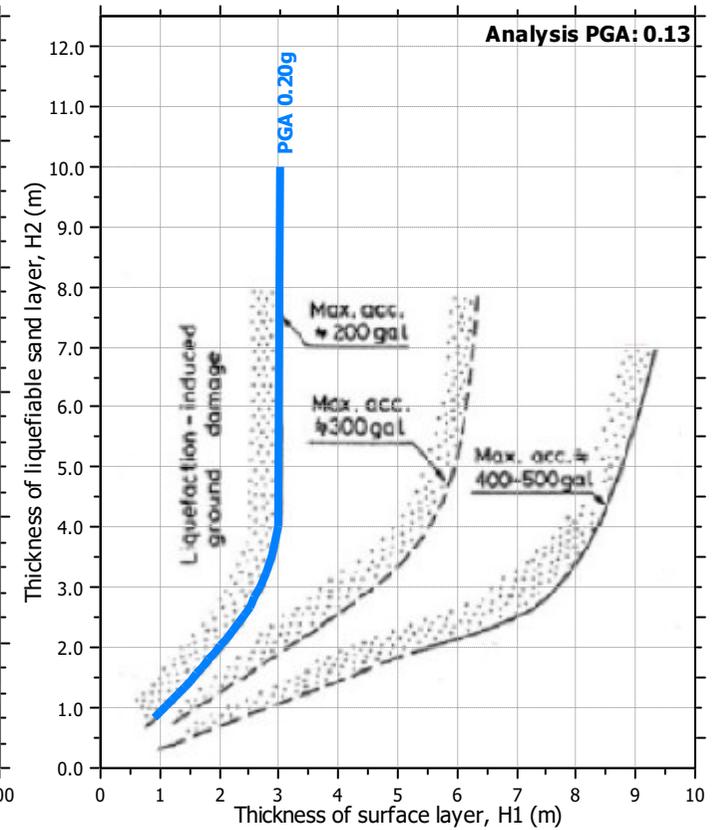
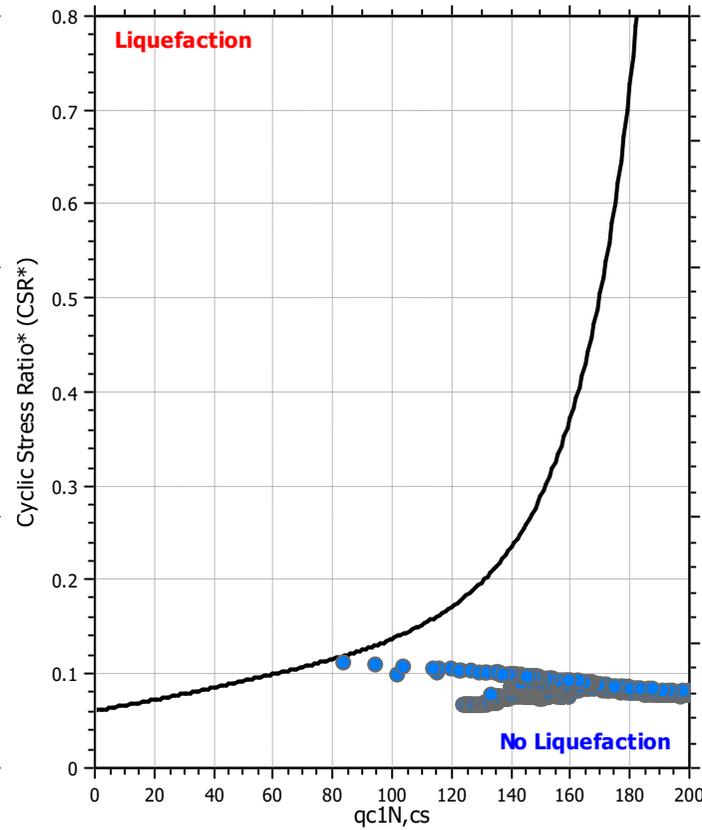
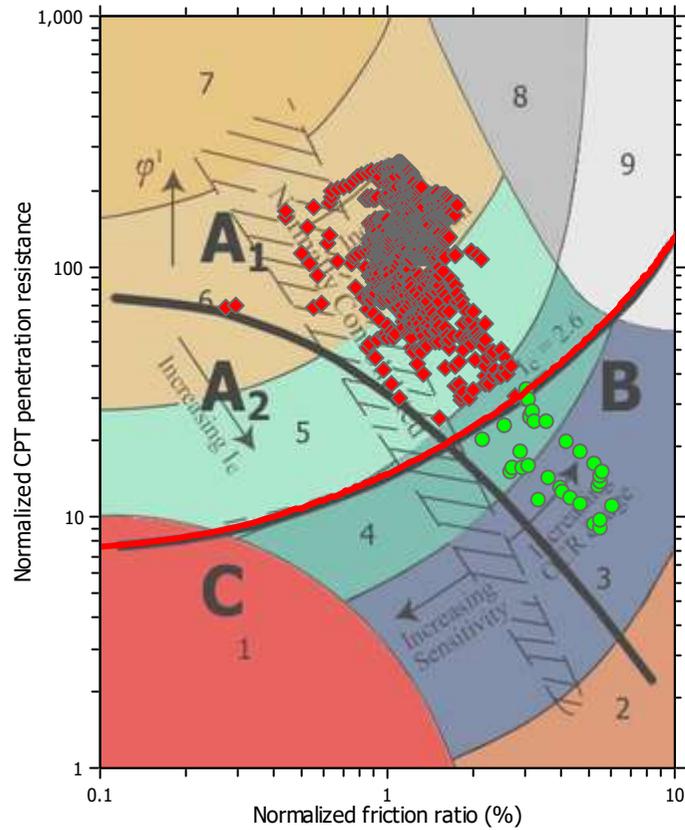
CPT file : 65-73 Ratanui Rd CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



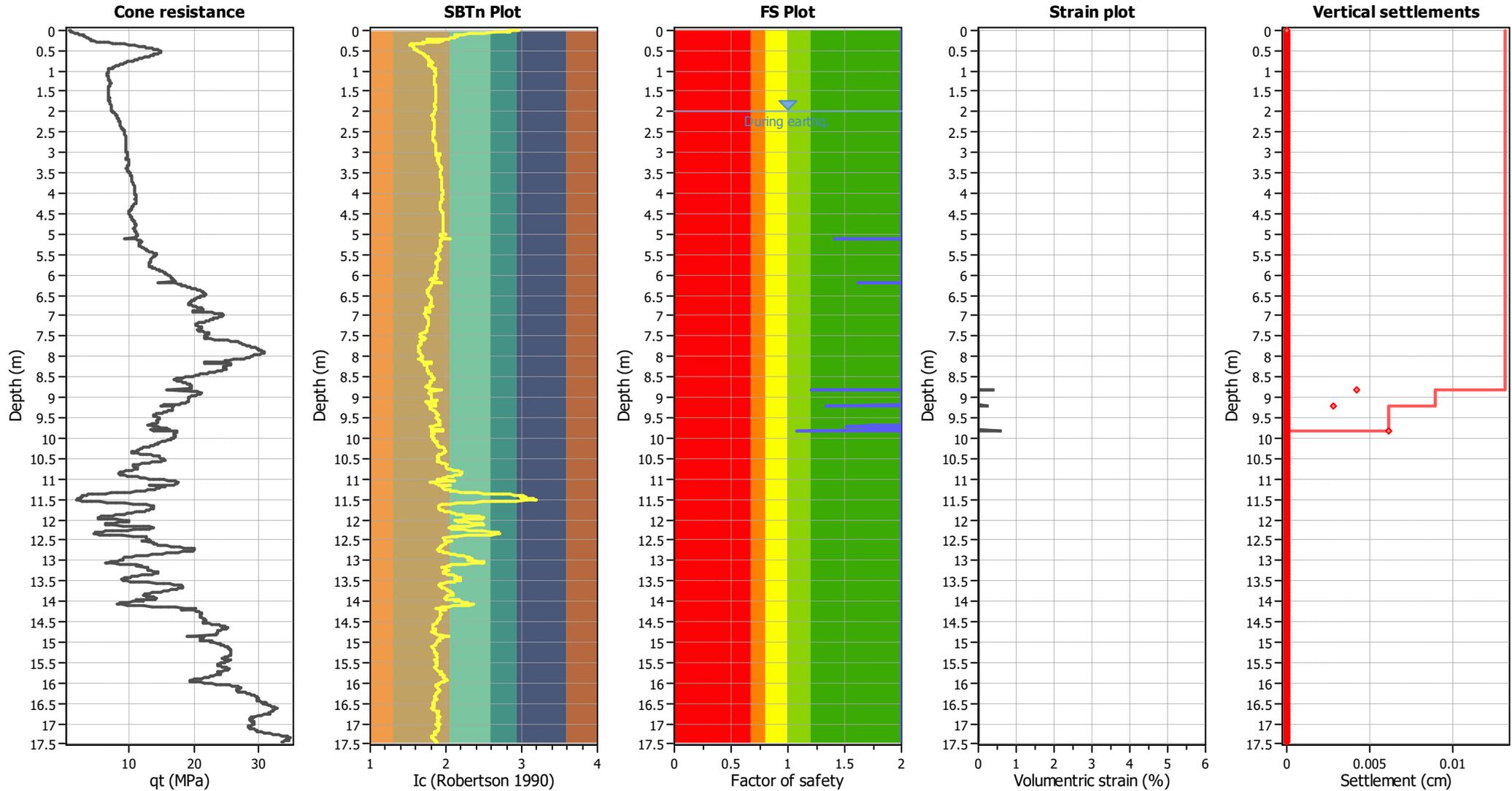
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

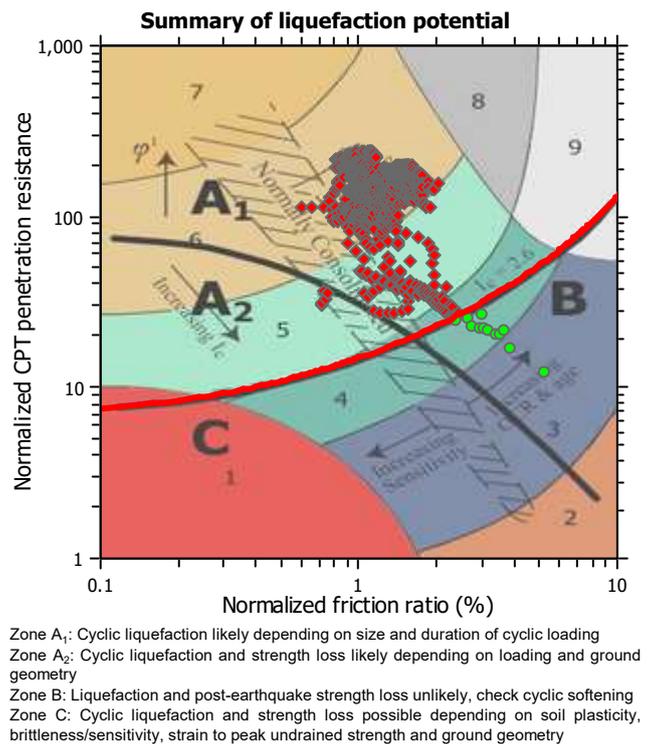
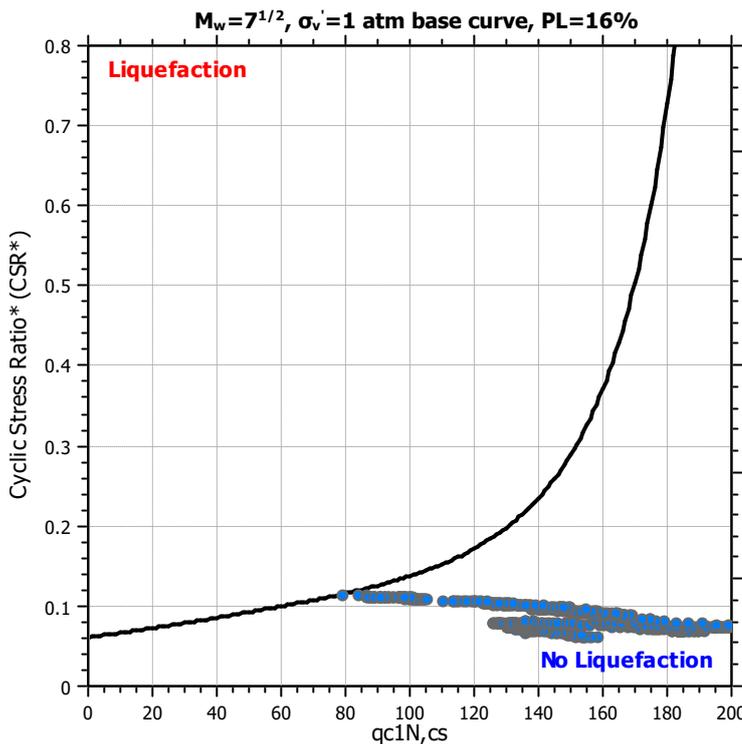
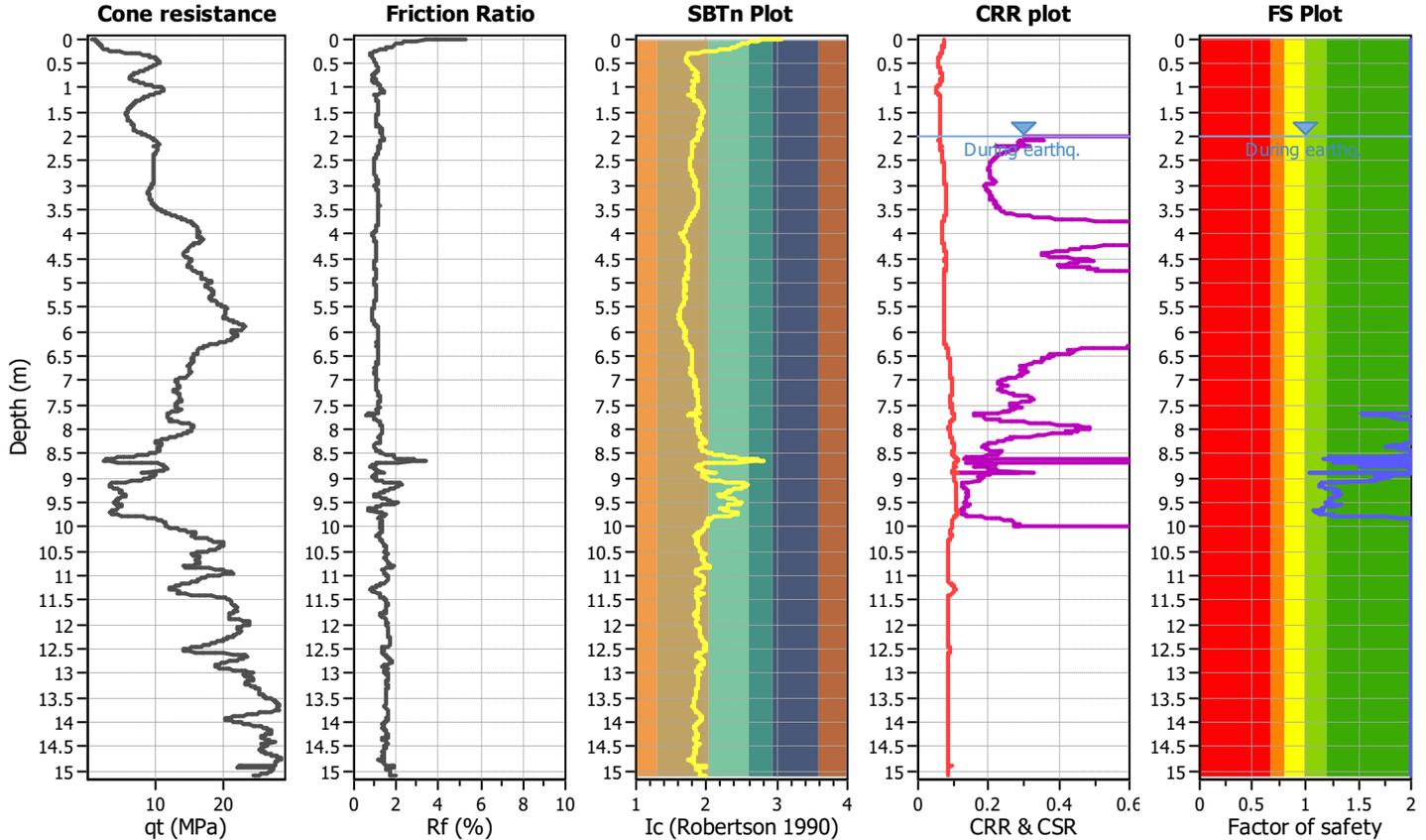
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

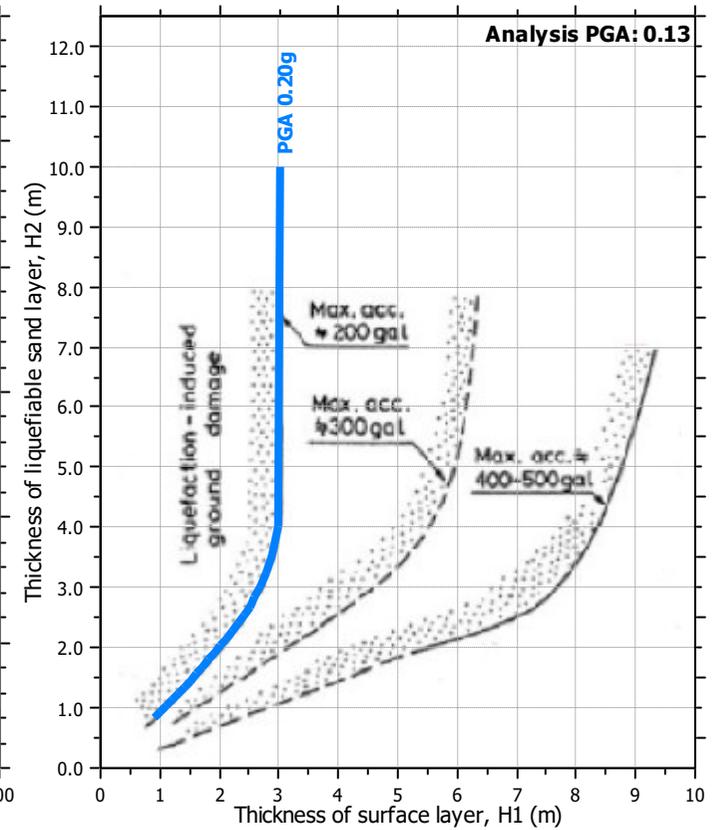
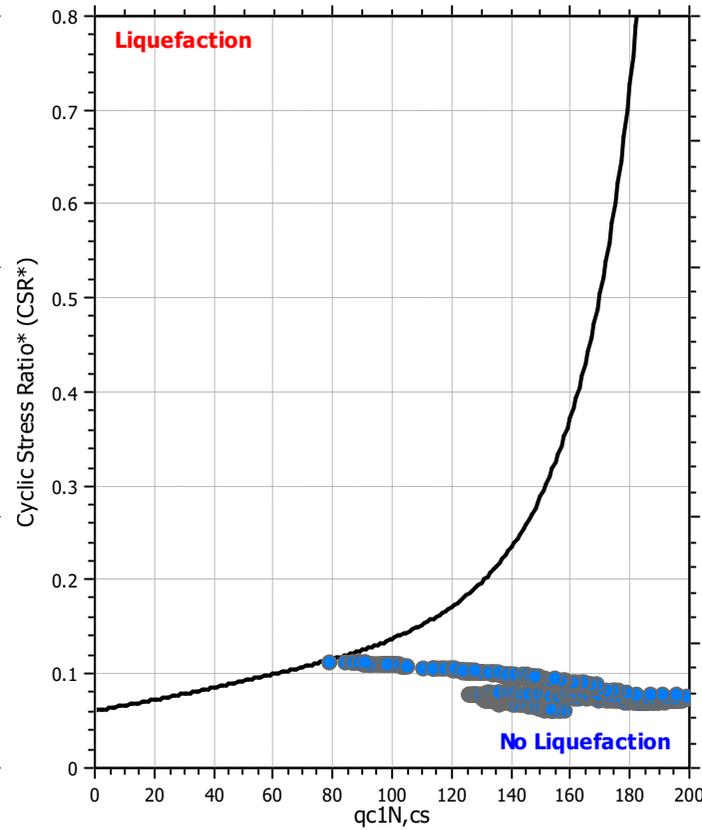
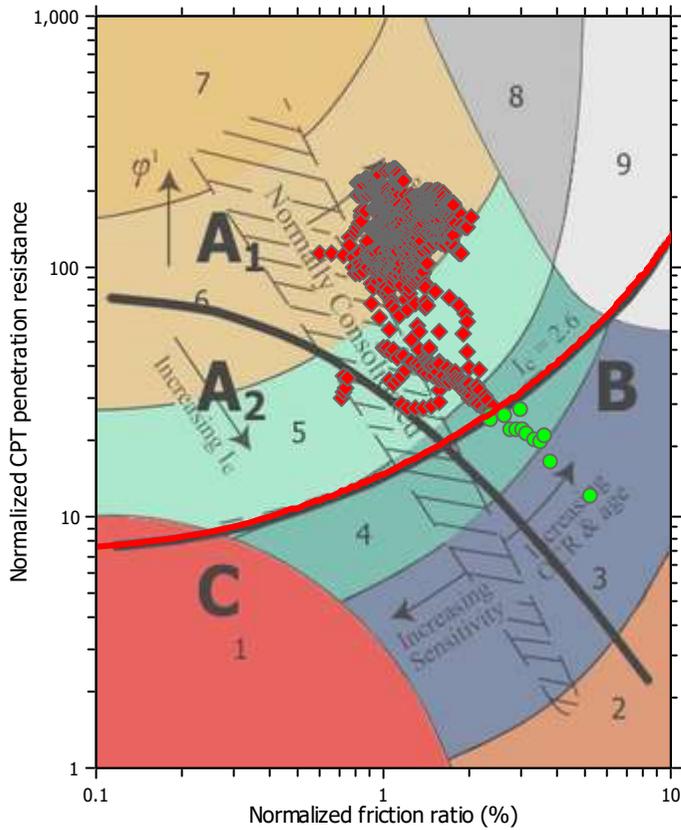
CPT file : 65-73 Ratanui Rd CPT09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



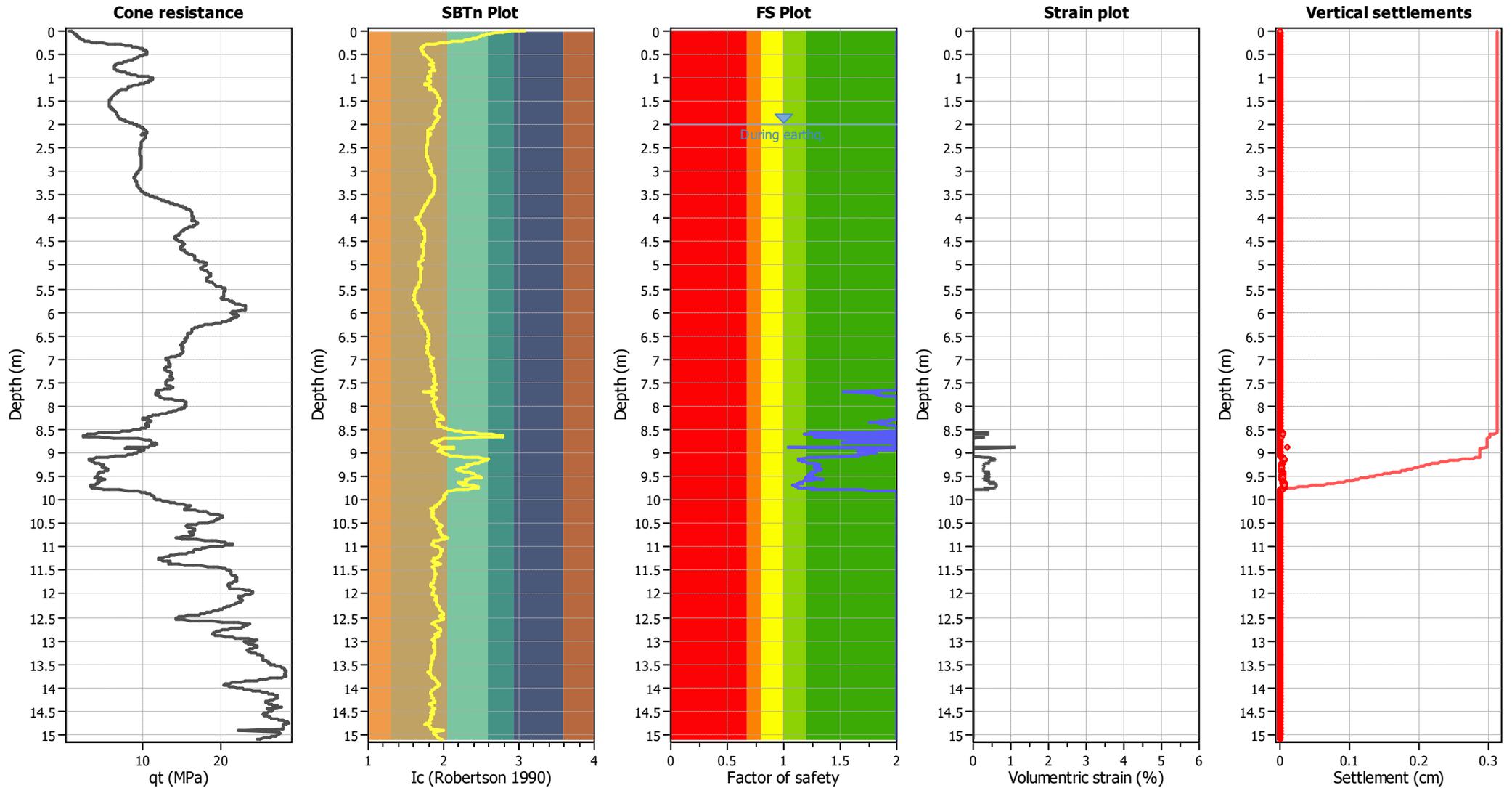
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_q applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

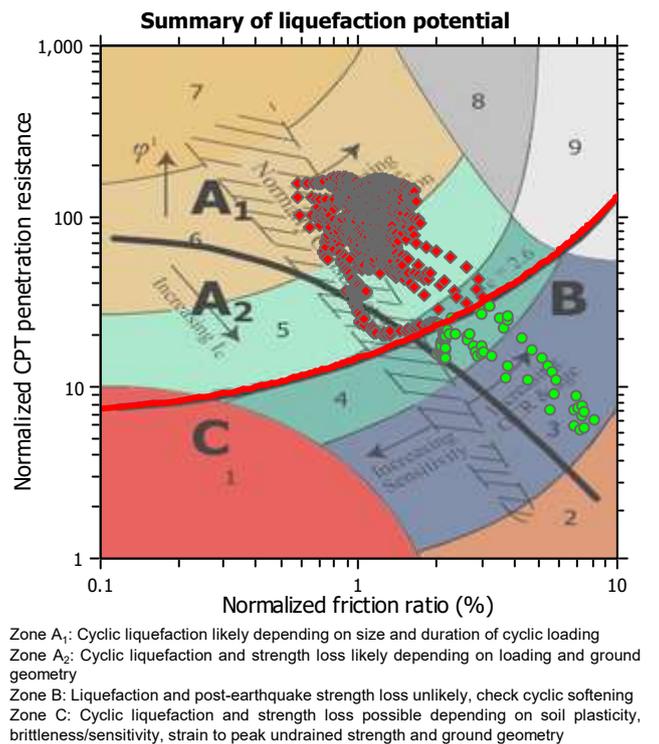
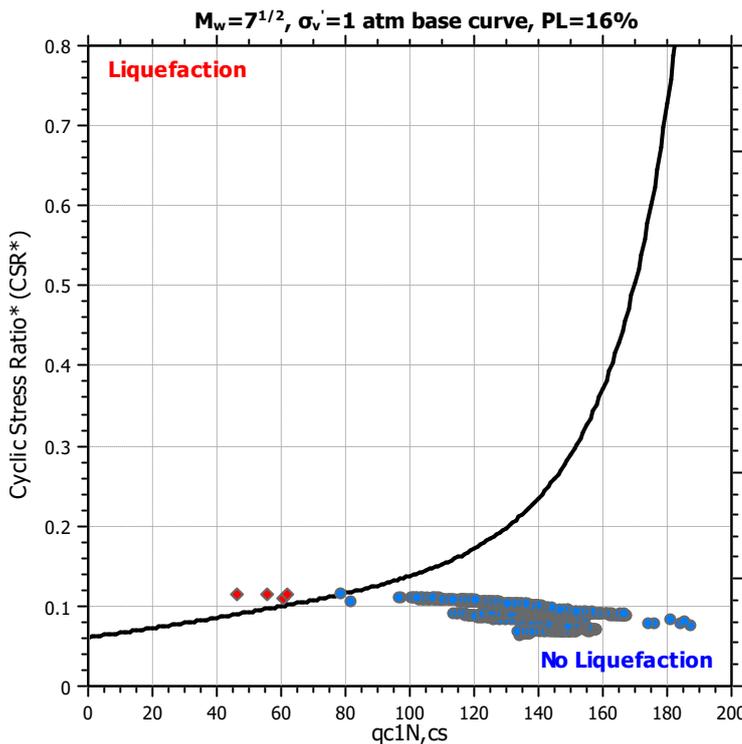
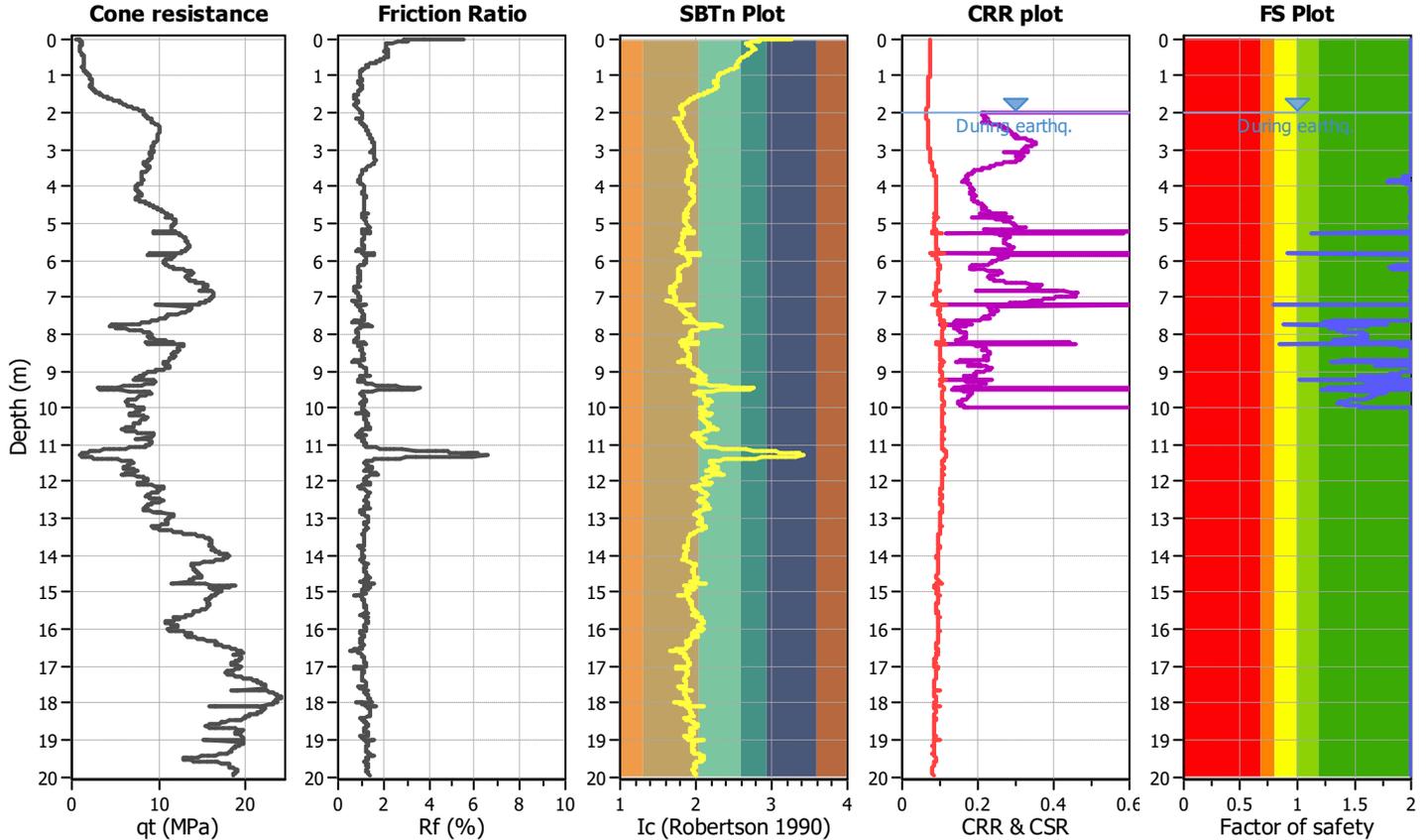
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

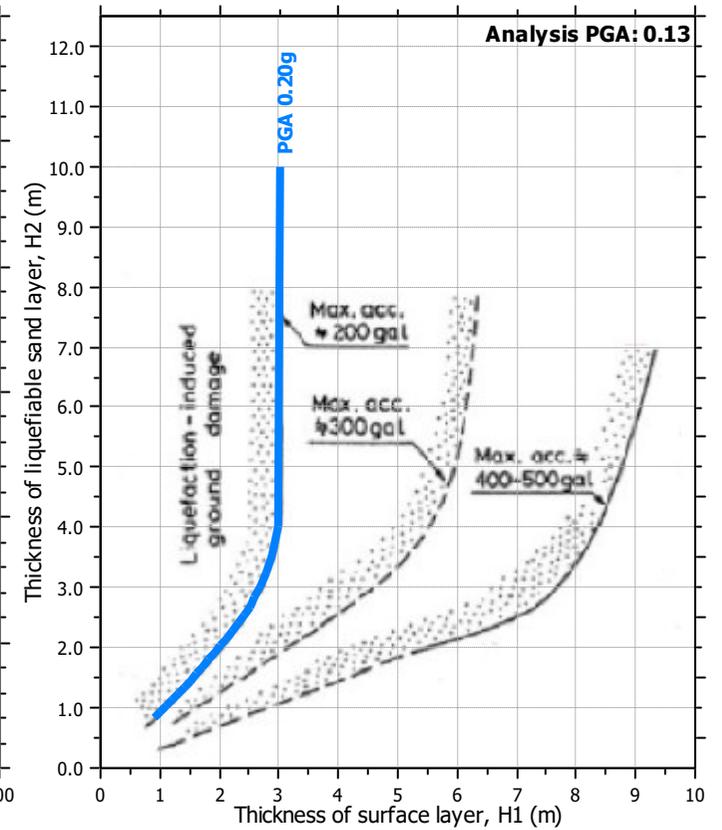
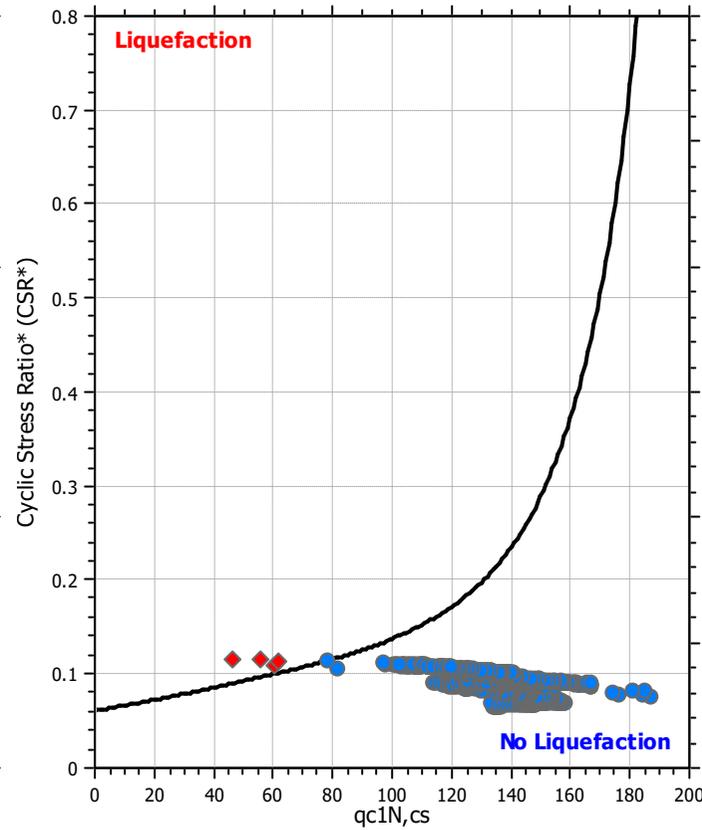
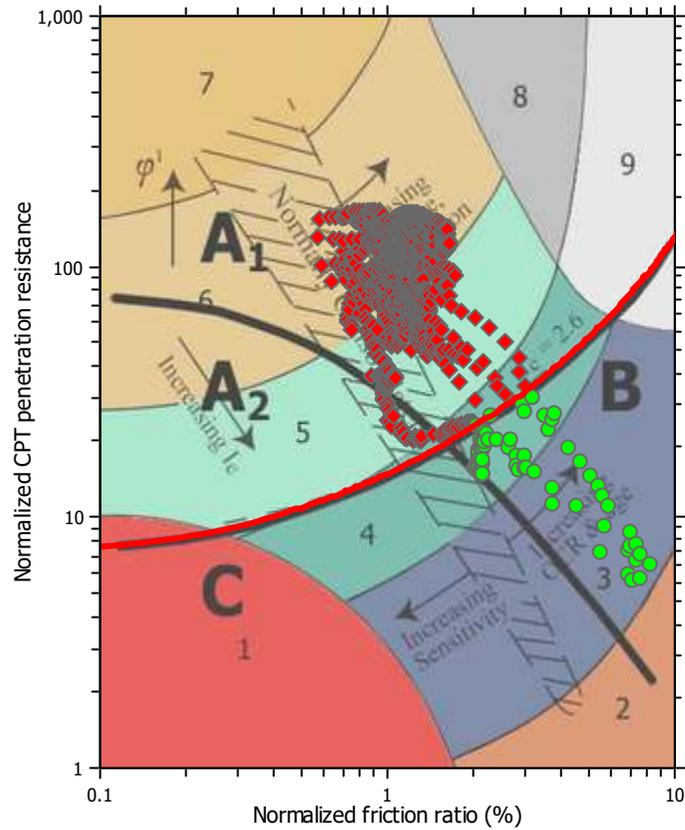
CPT file : 65-73 Ratanui Rd CPT10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



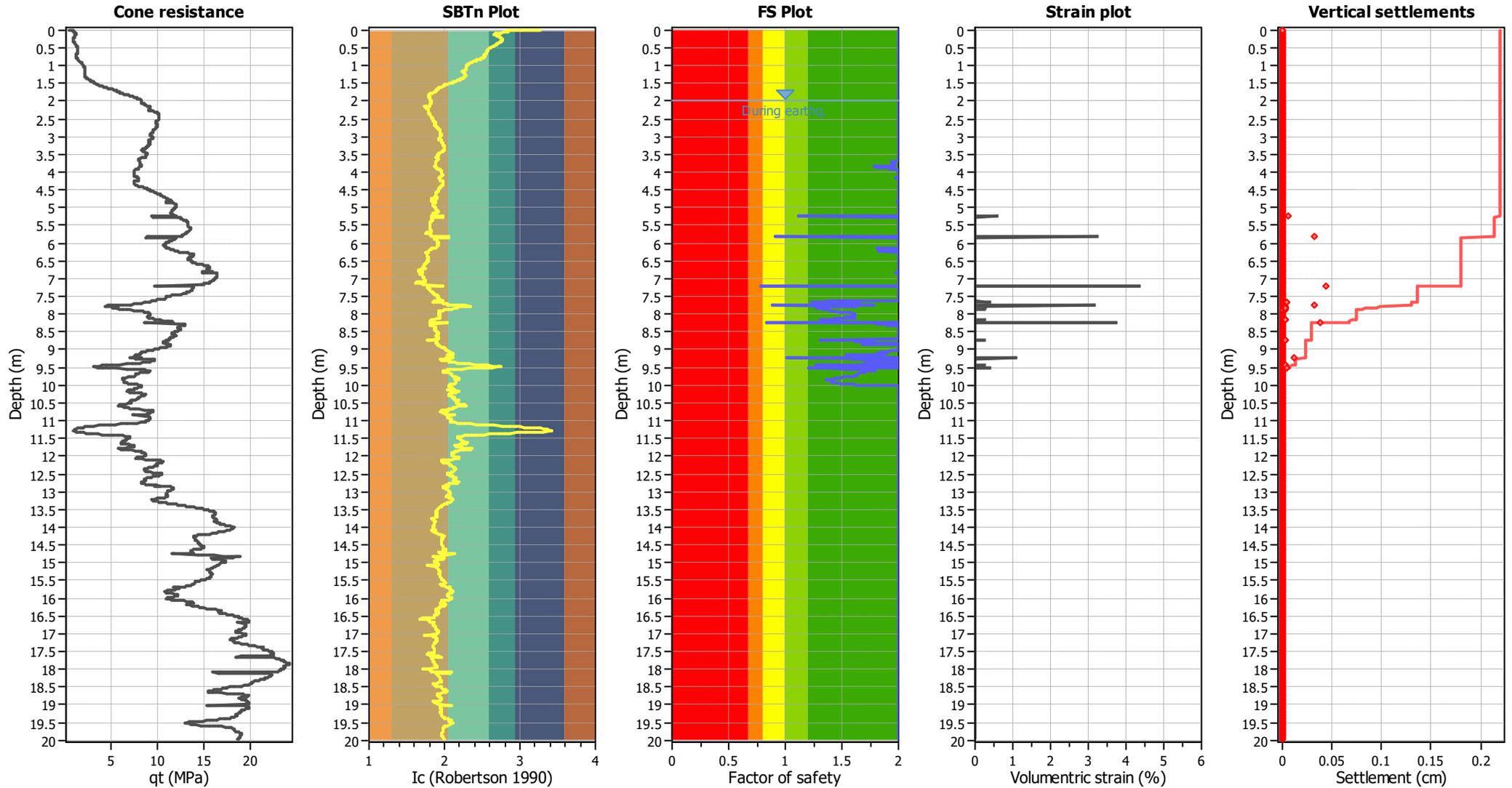
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_f applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

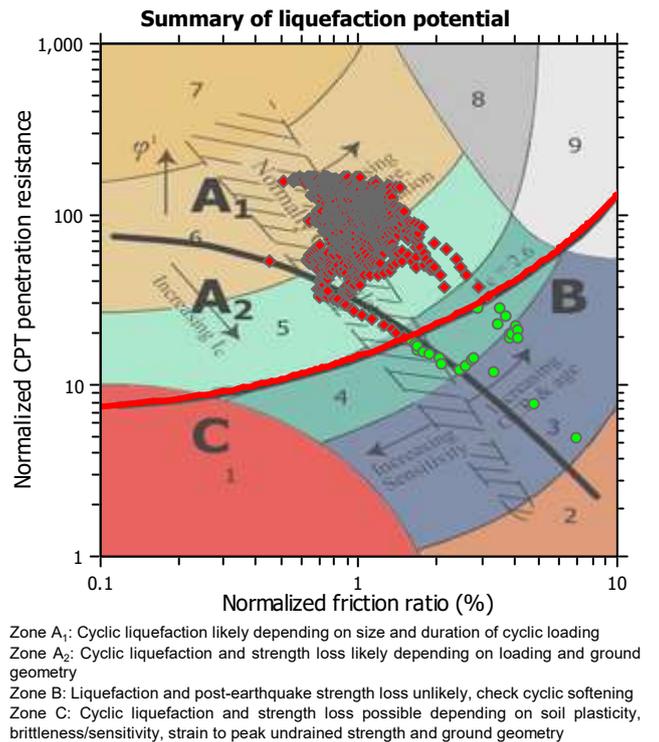
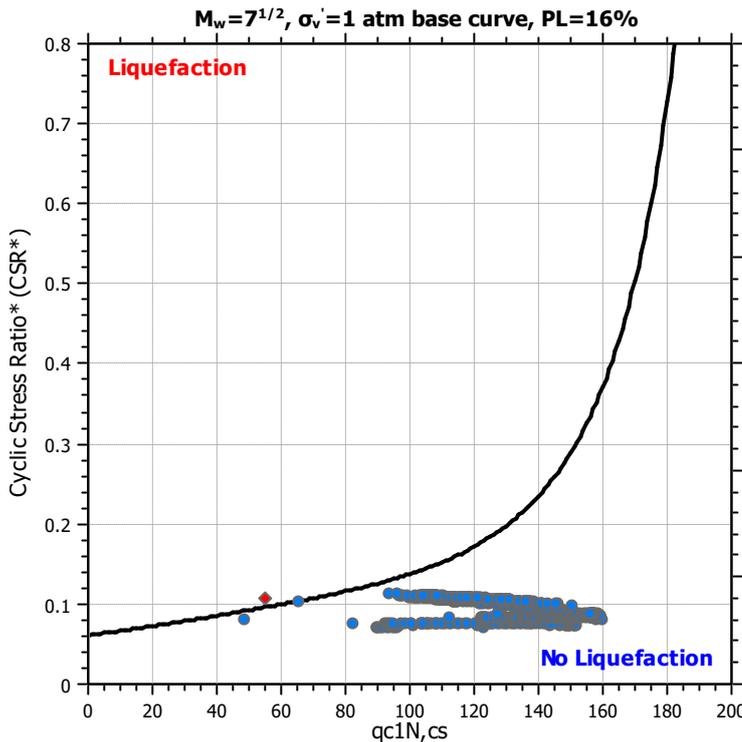
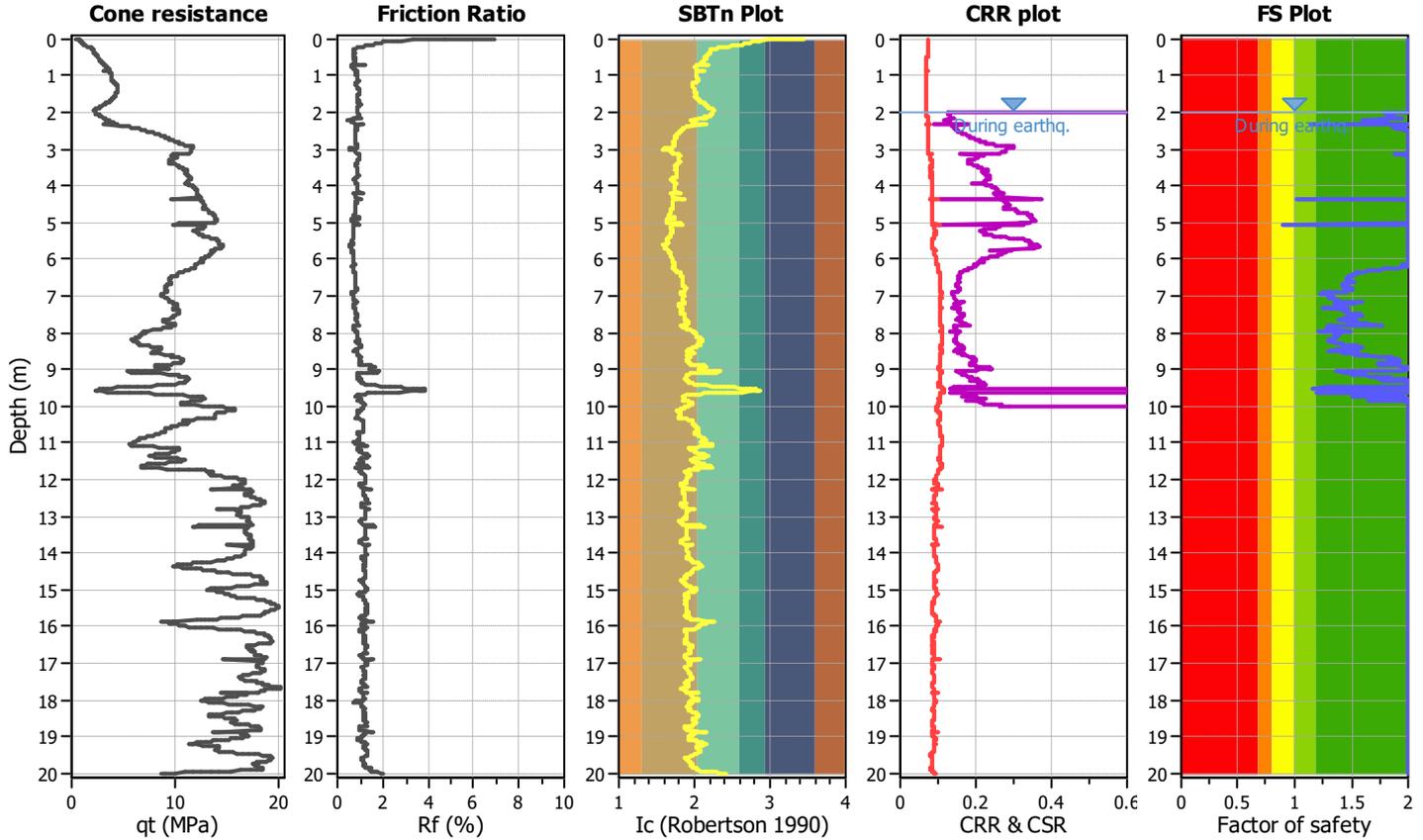
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

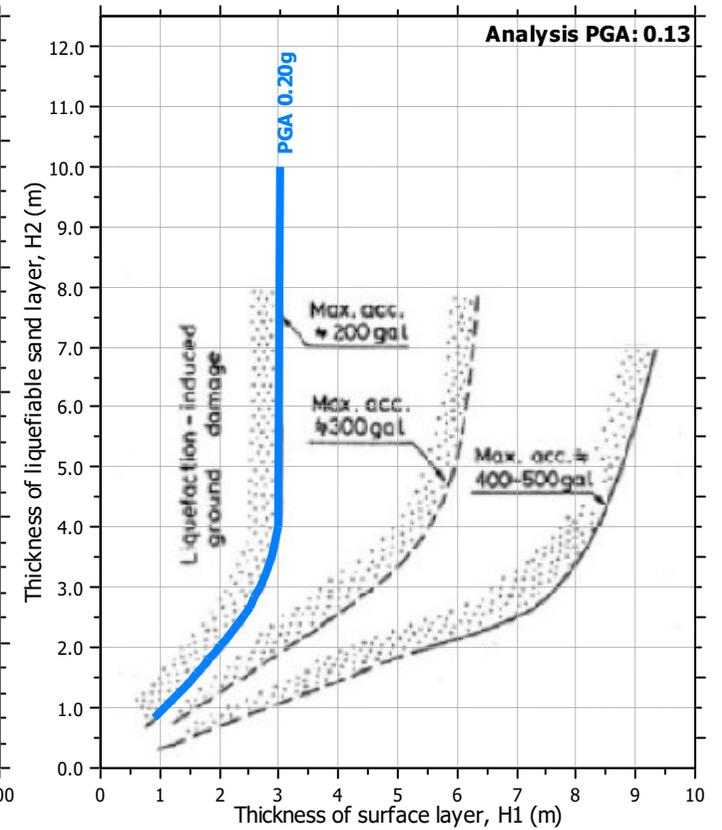
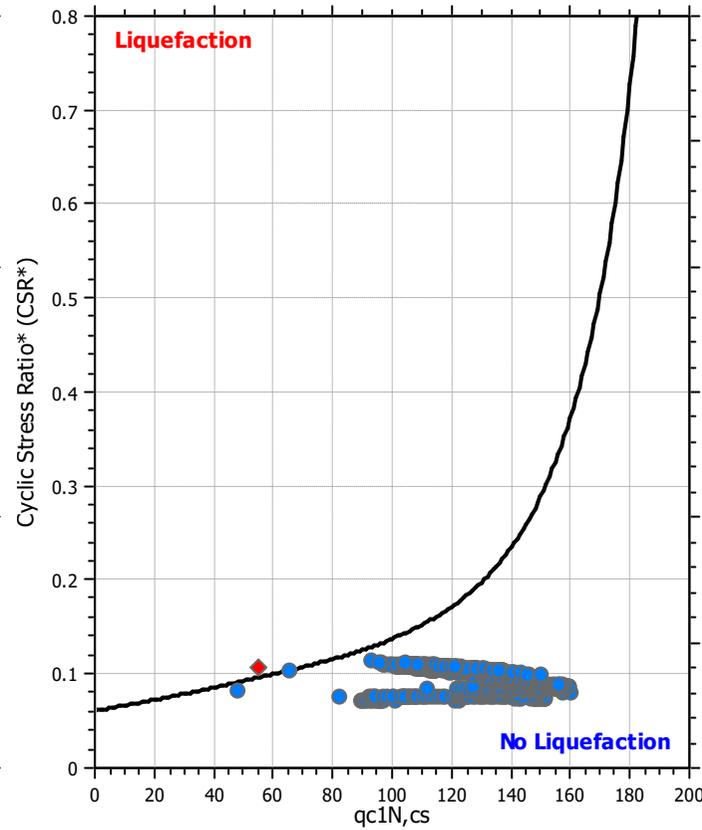
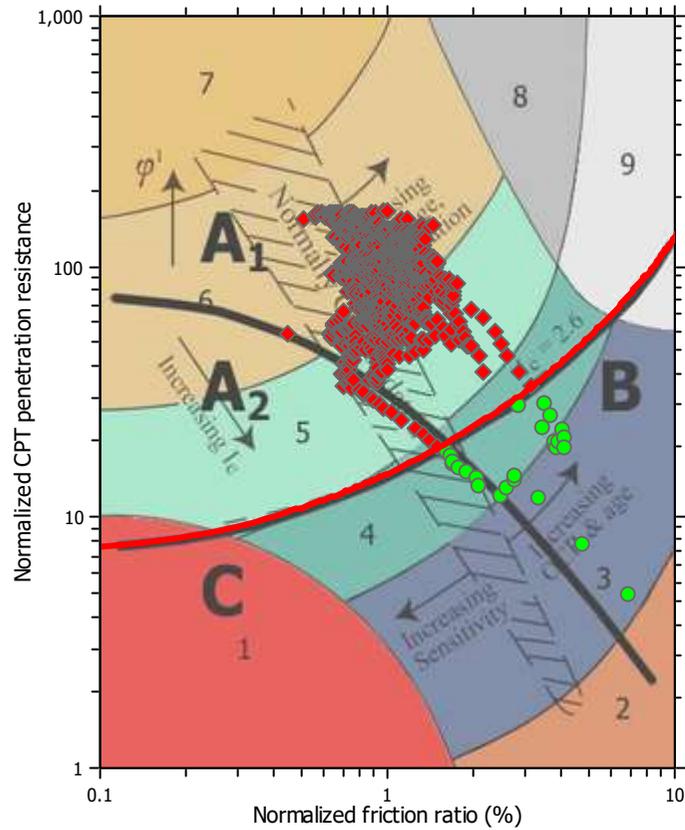
CPT file : 65-73 Ratanui Rd CPT11

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



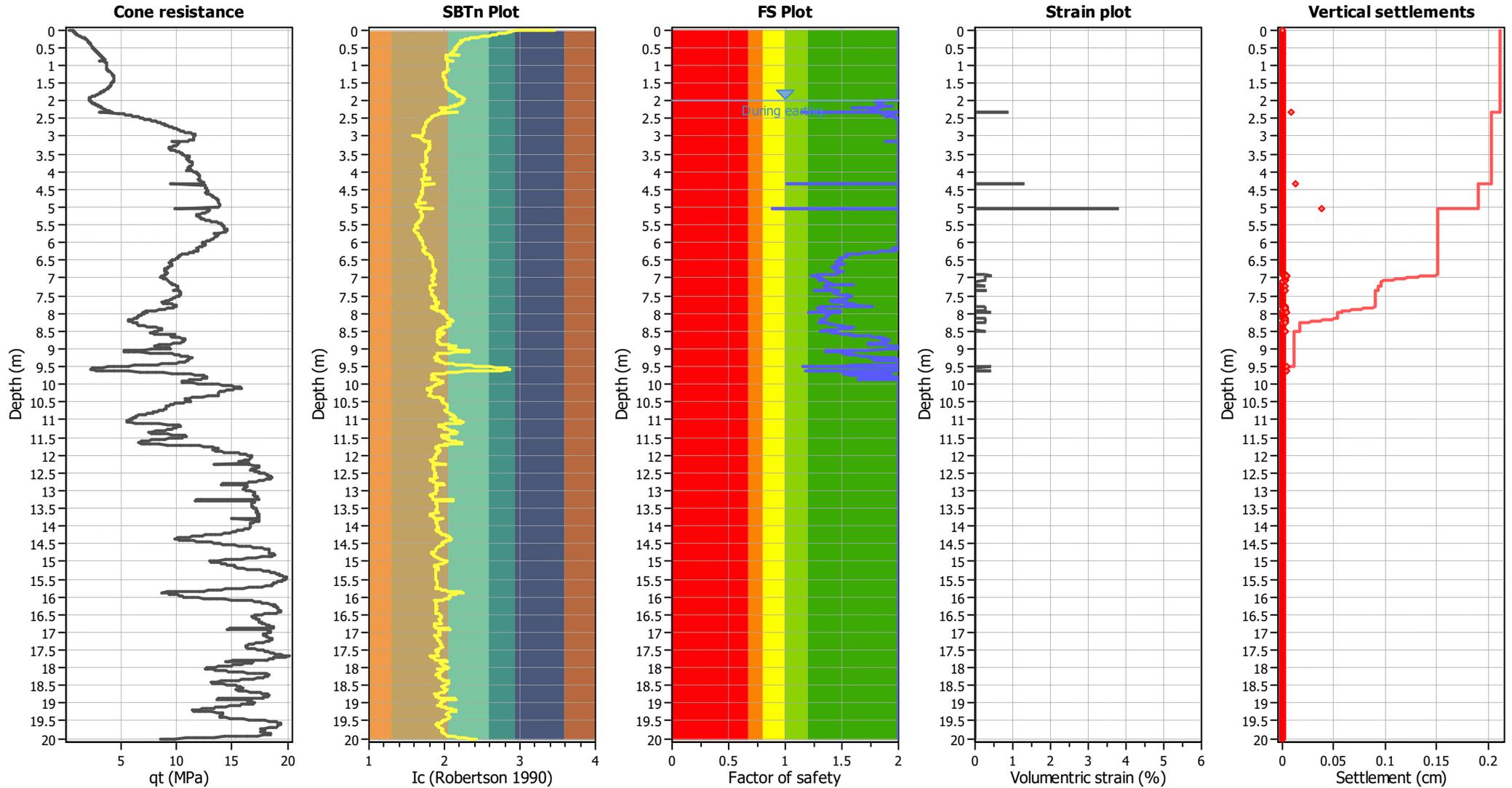
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

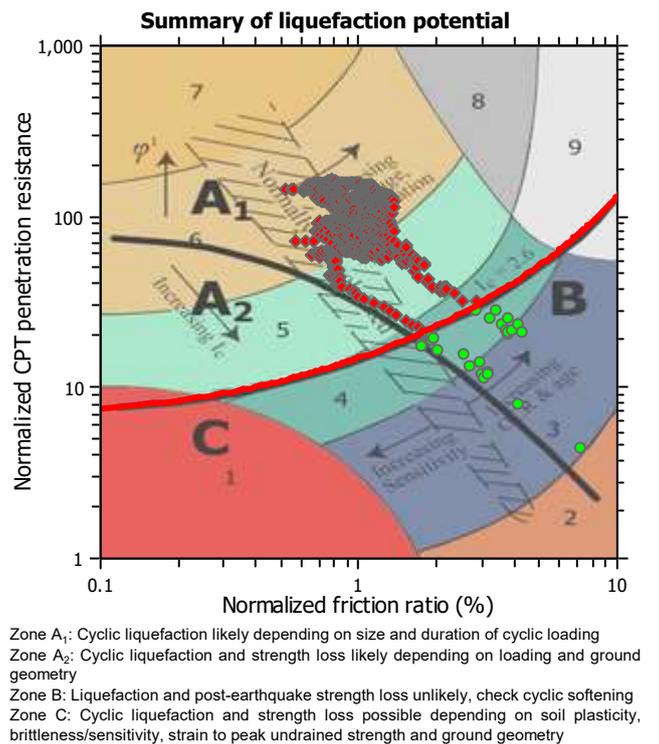
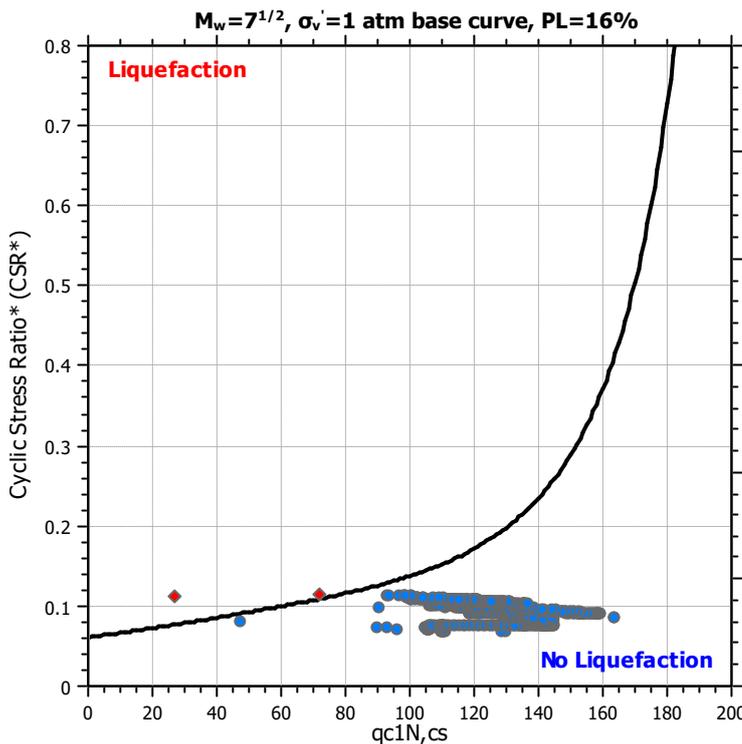
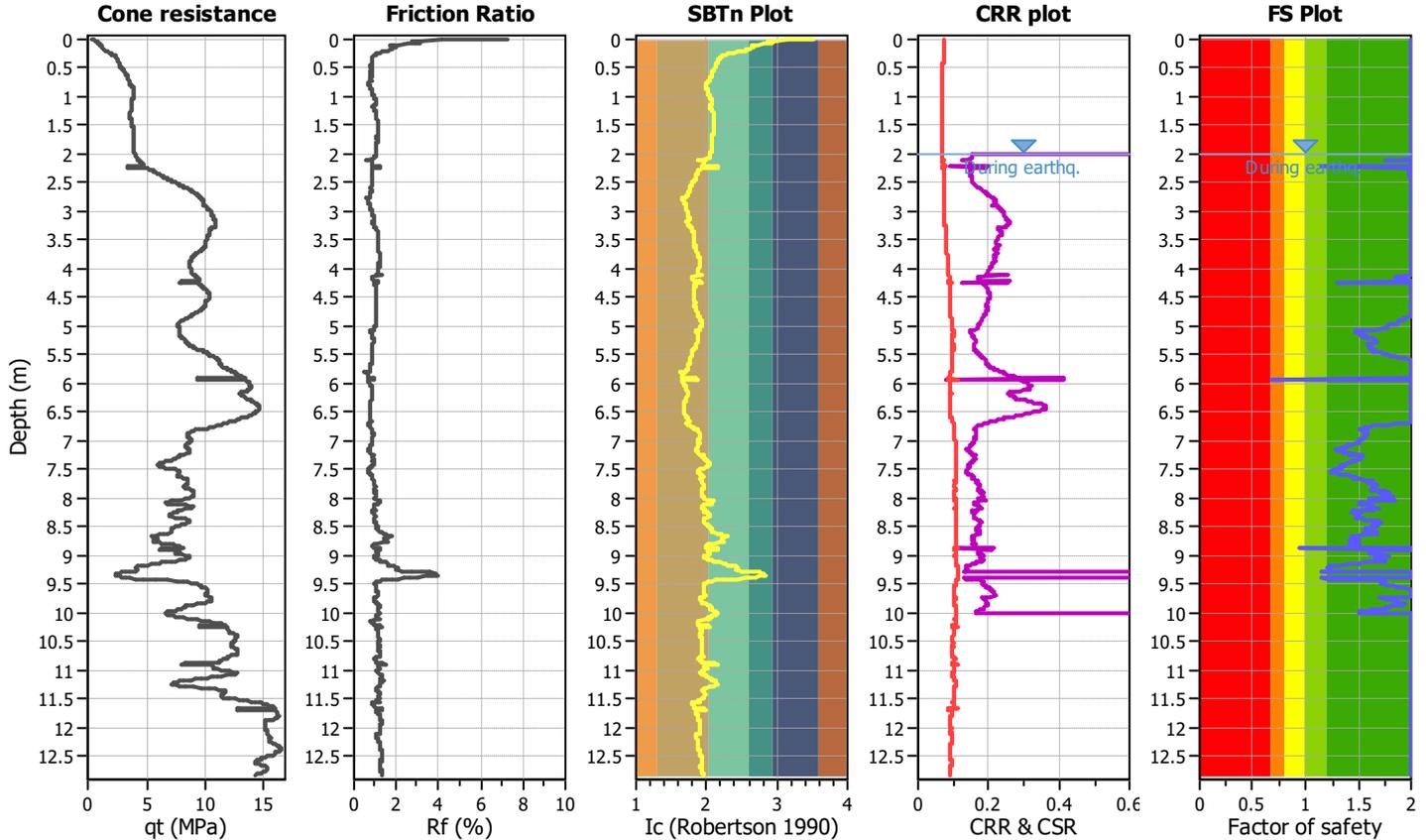
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

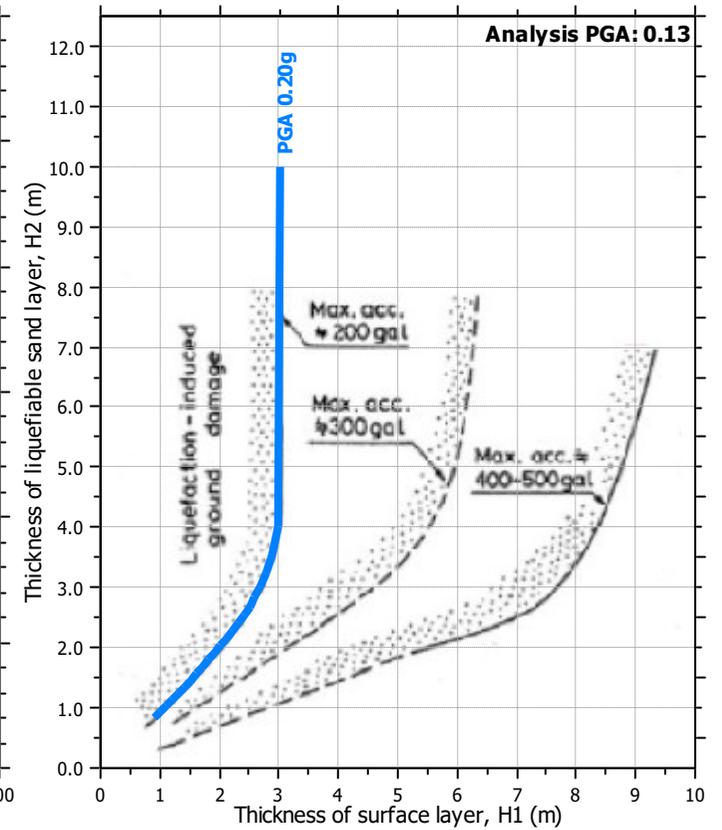
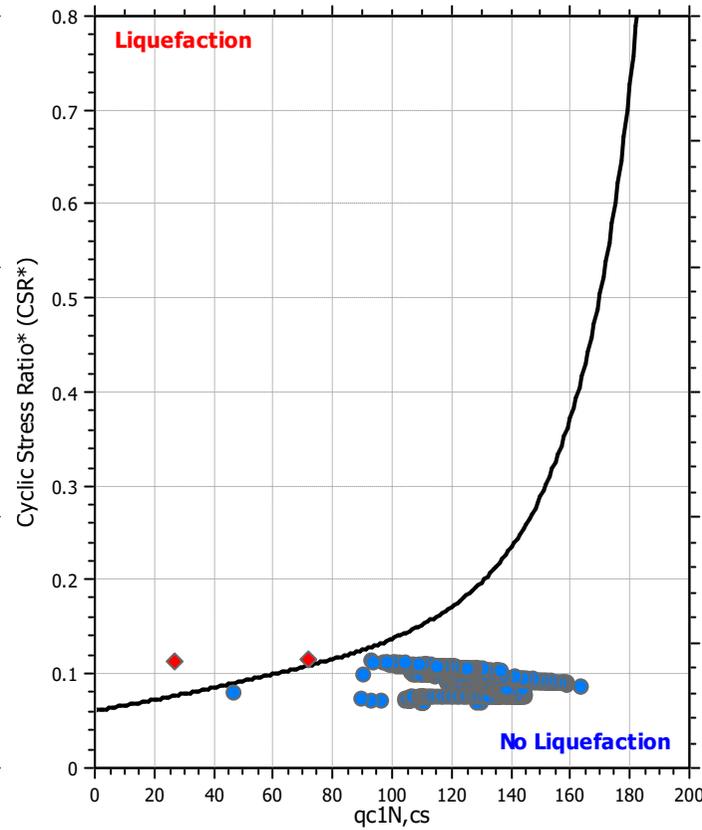
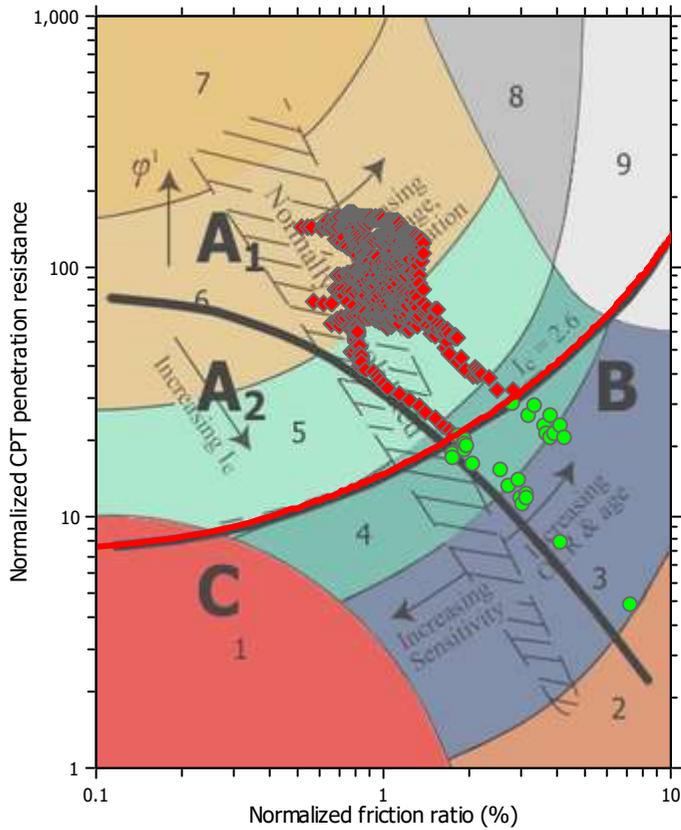
CPT file : 65-73 Ratanui Rd CPT12

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



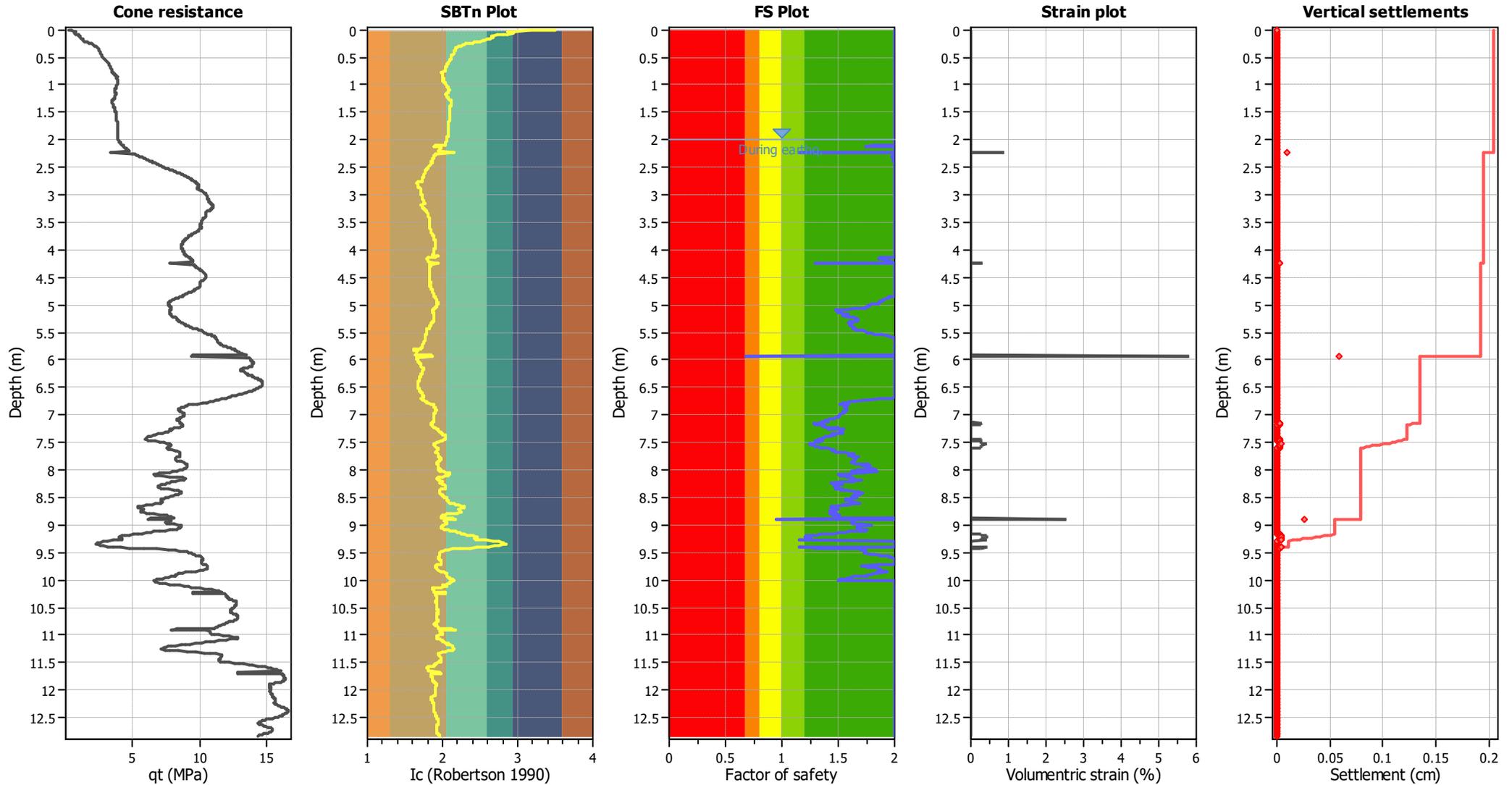
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- q_t : Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

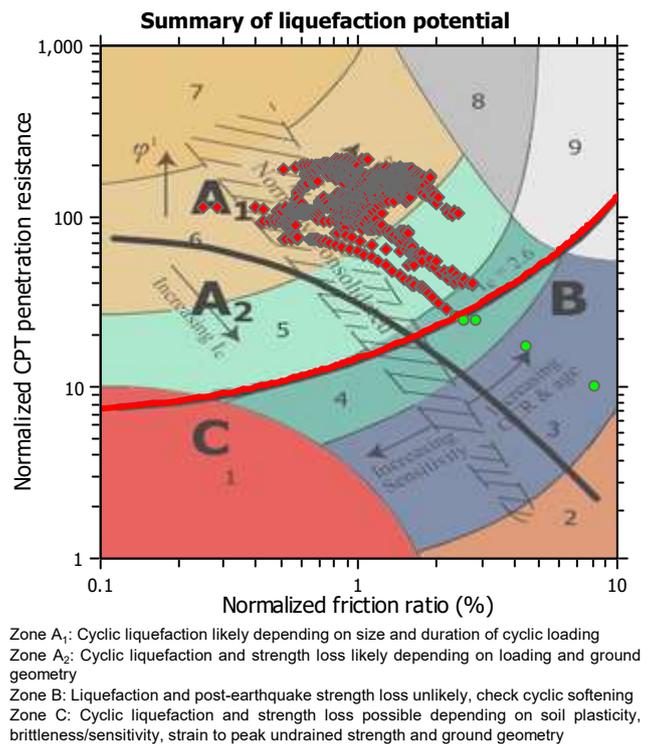
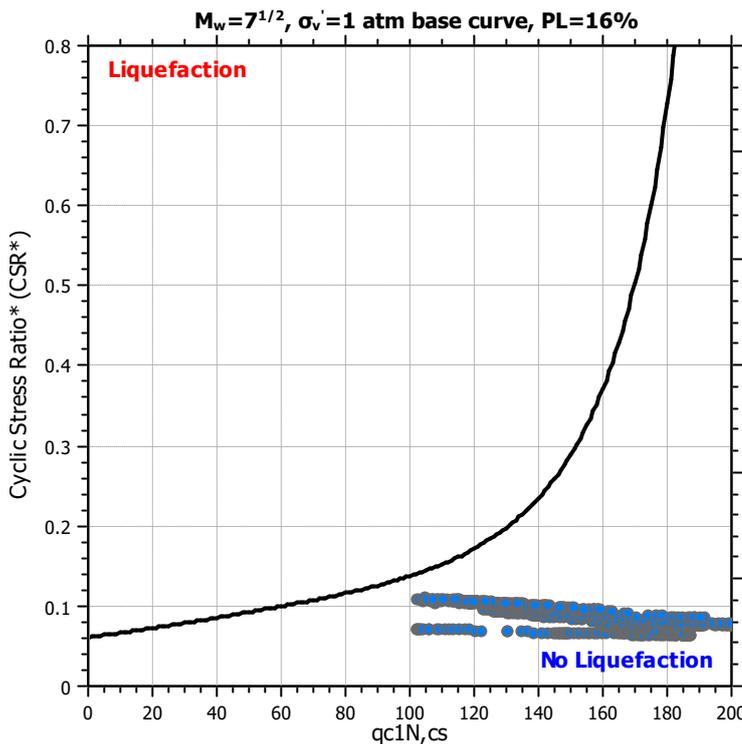
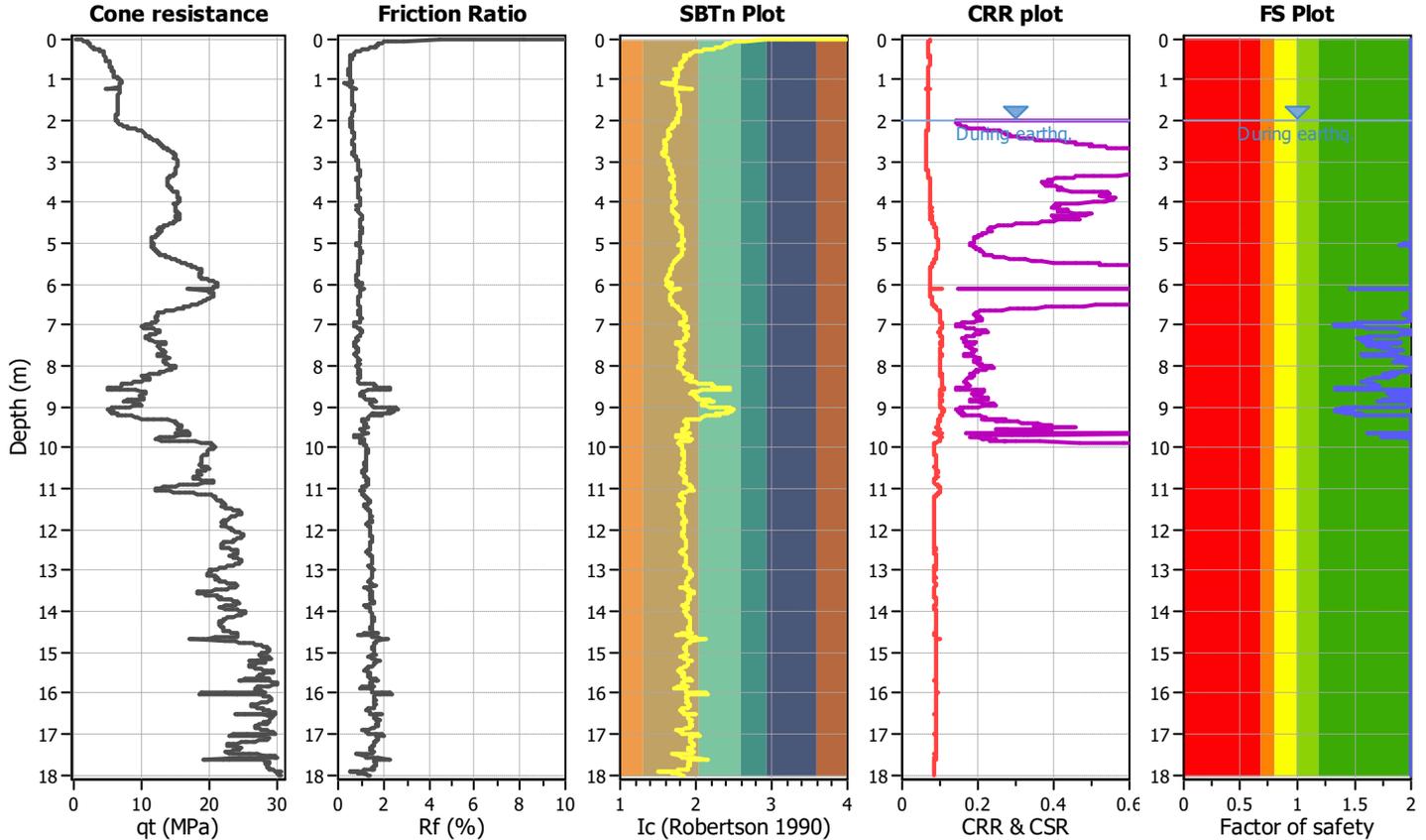
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

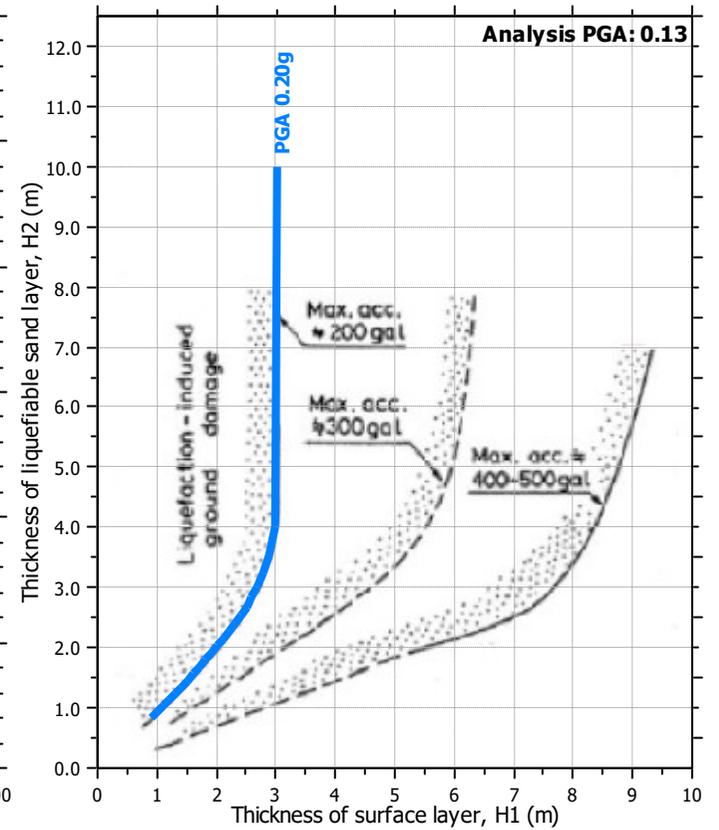
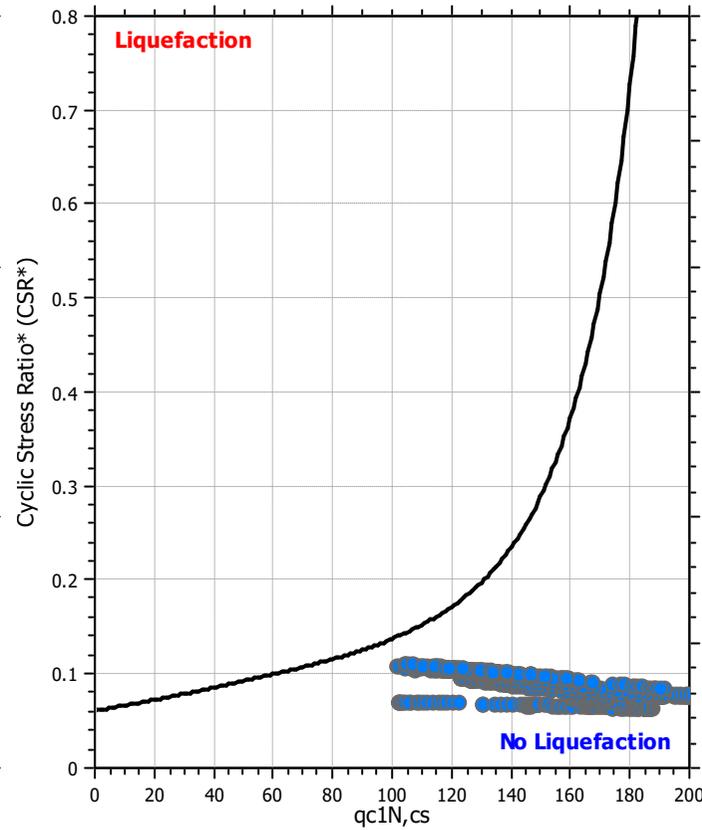
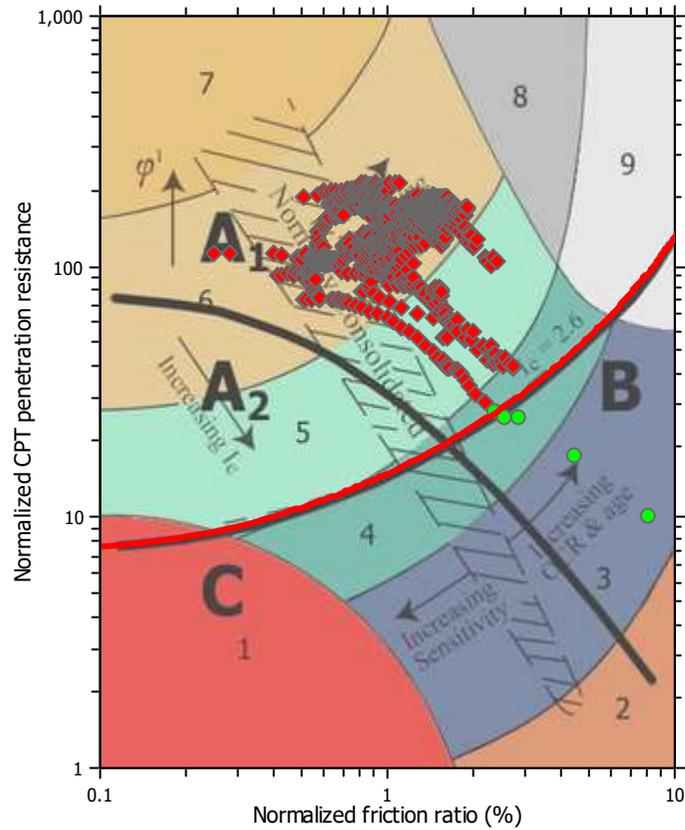
CPT file : 65-73 Ratanui Rd CPT12A

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



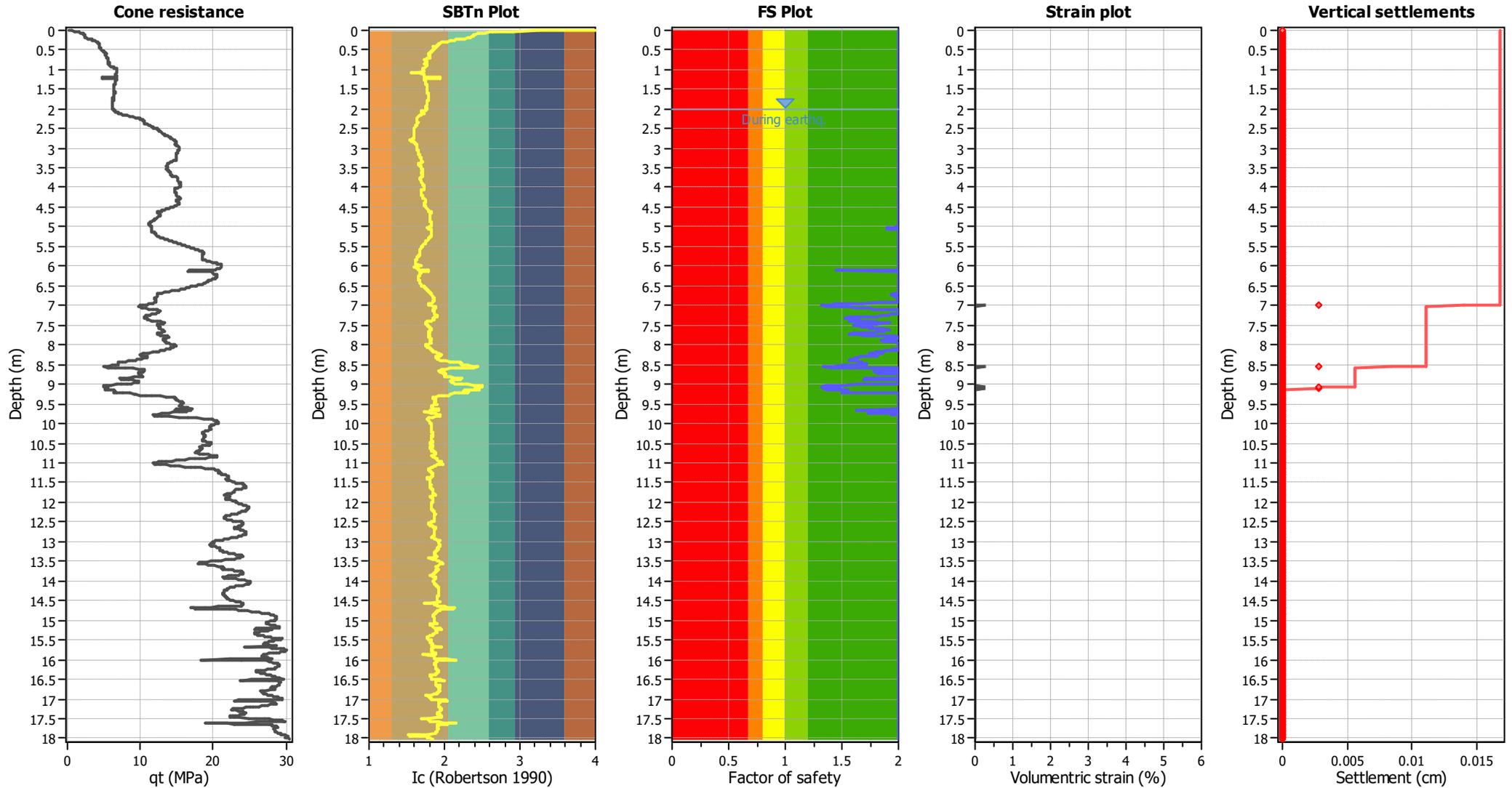
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

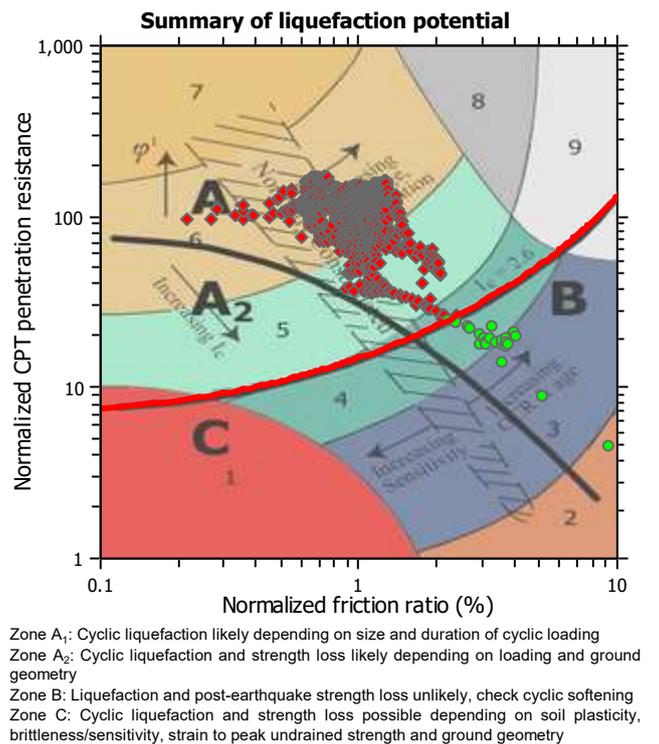
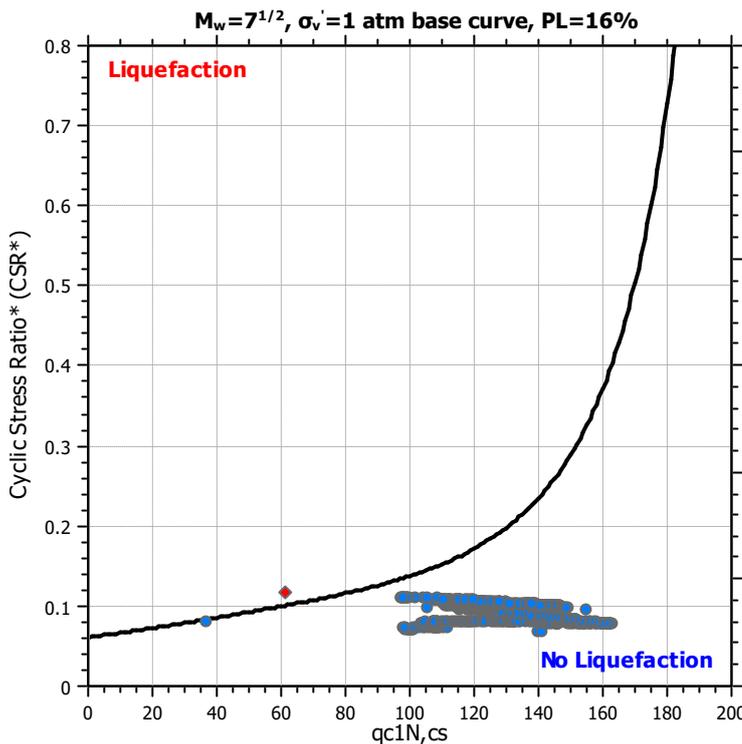
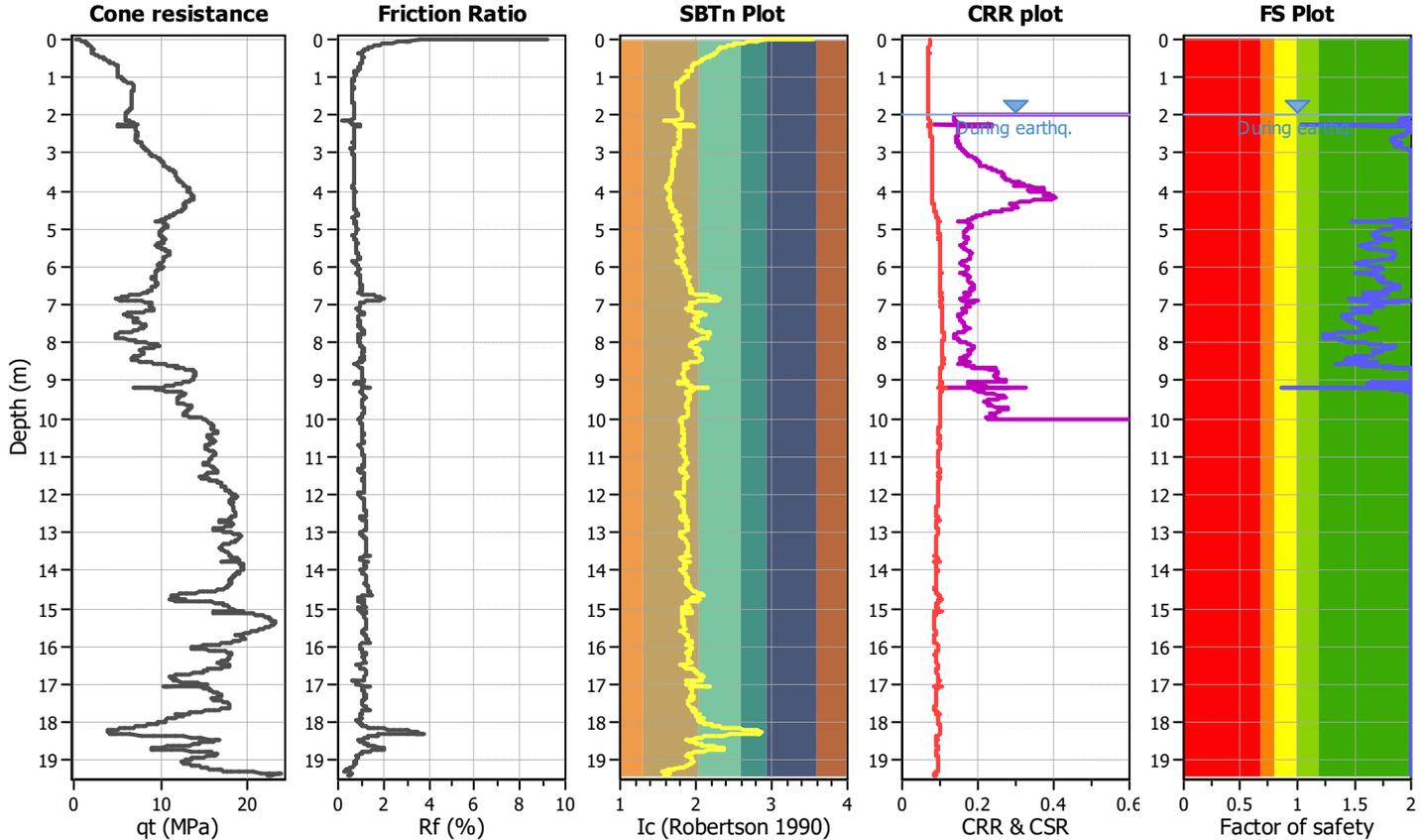
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

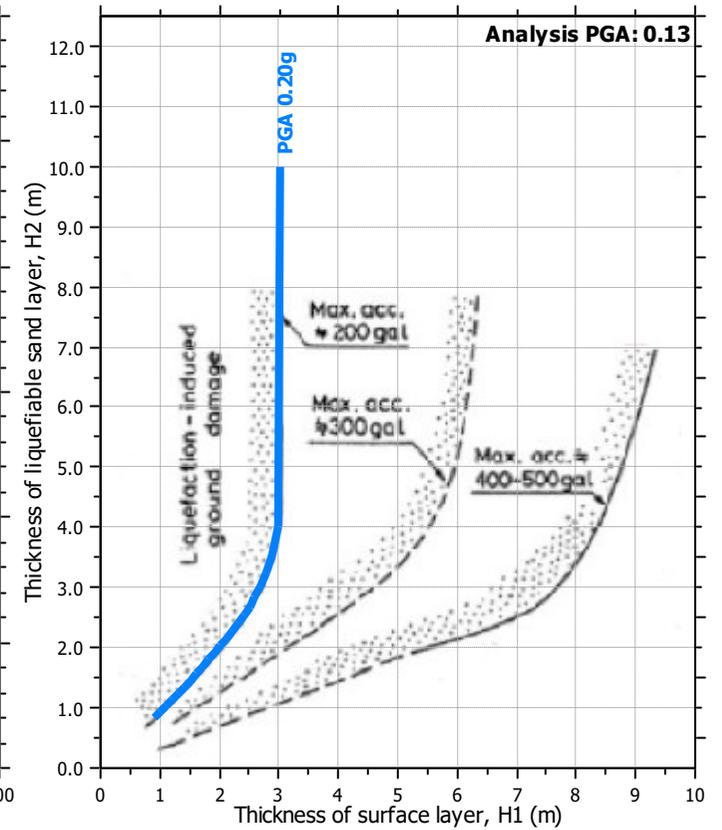
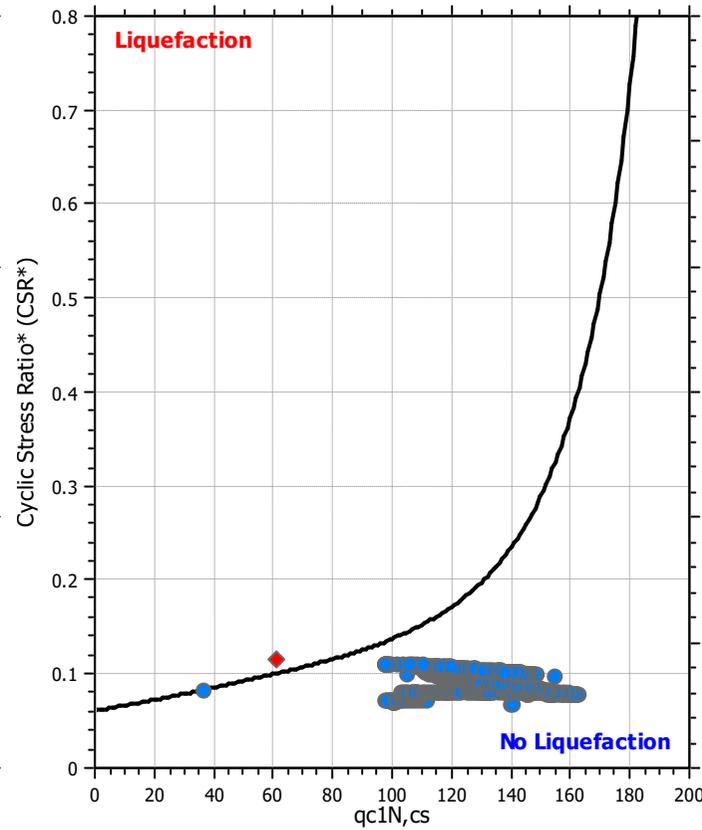
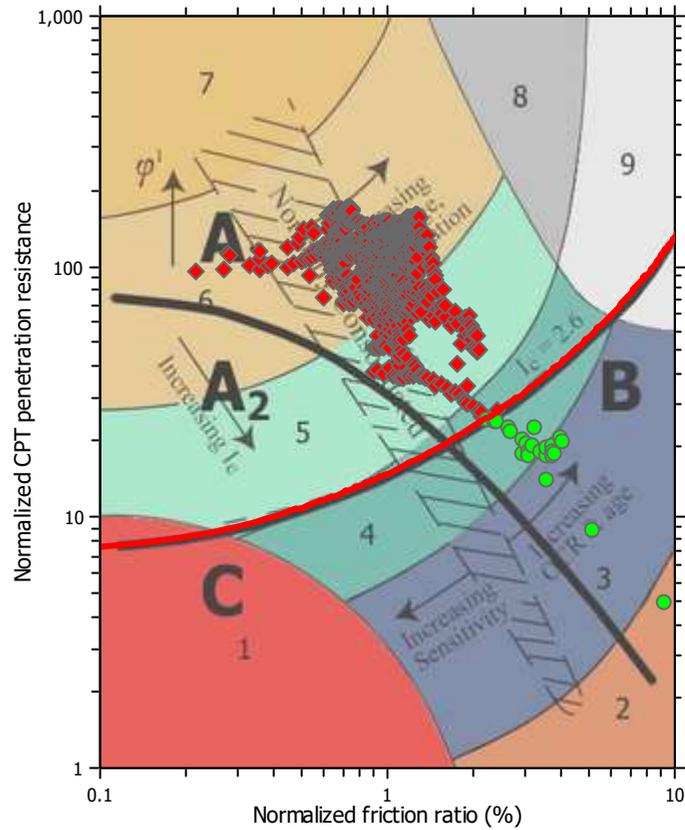
CPT file : 65-73 Ratanui Rd CPT13

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.80 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



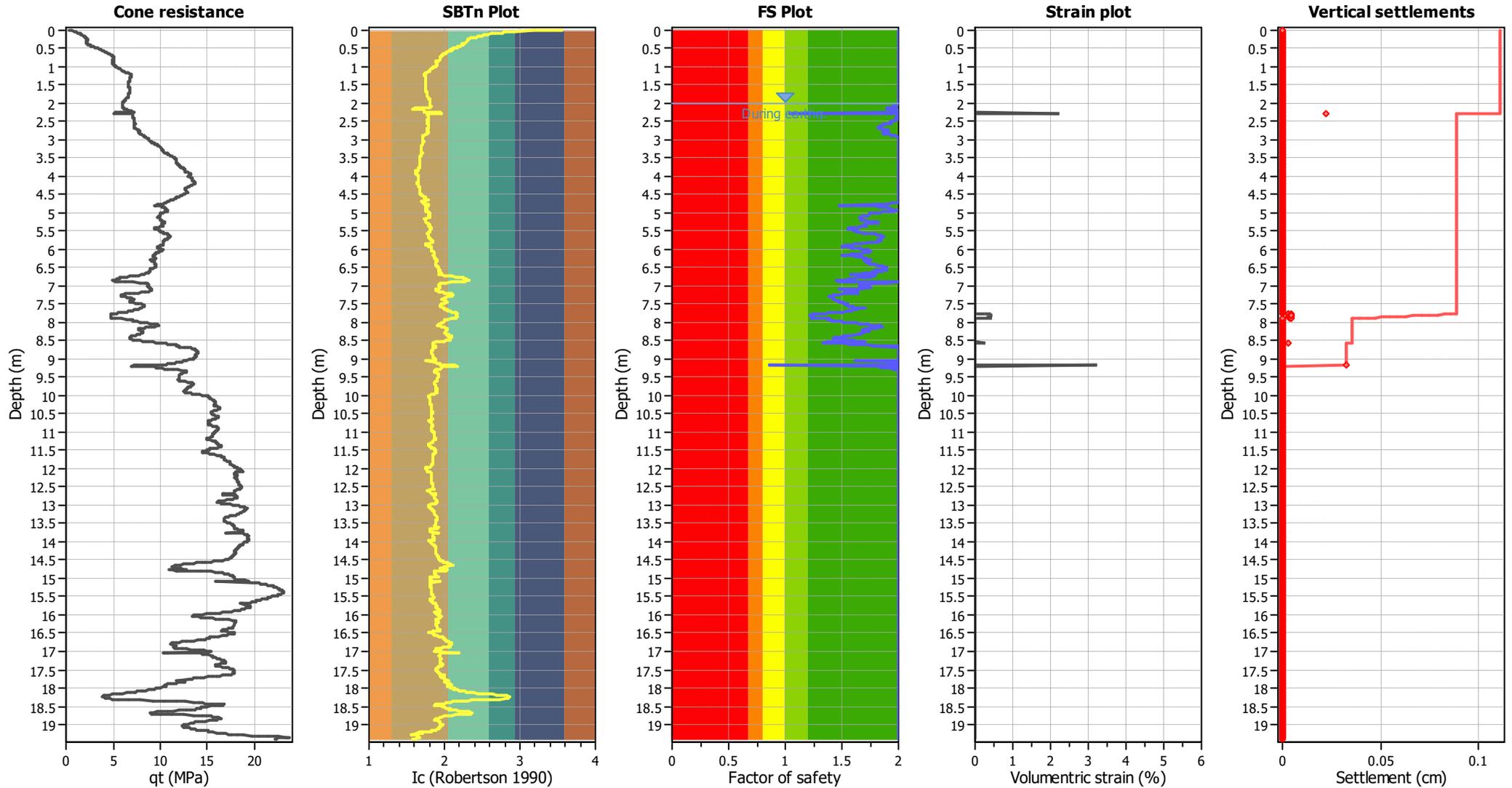
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

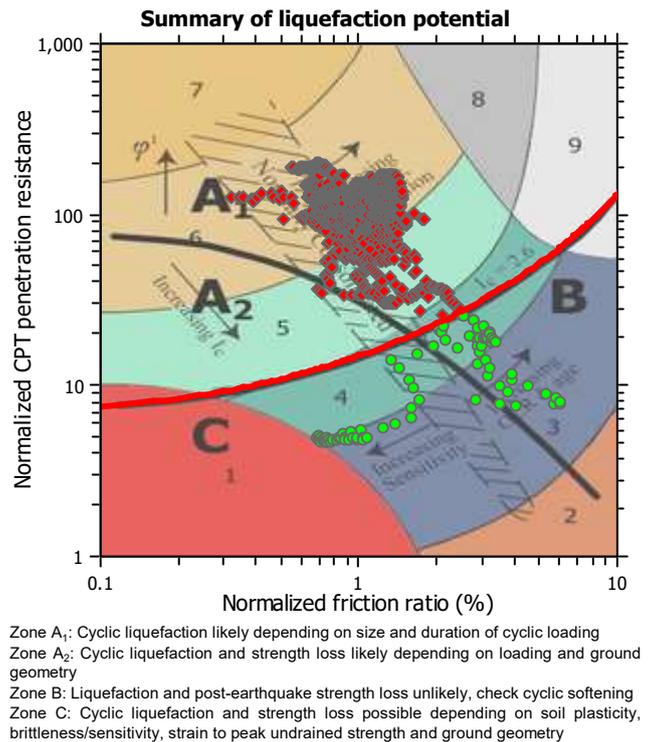
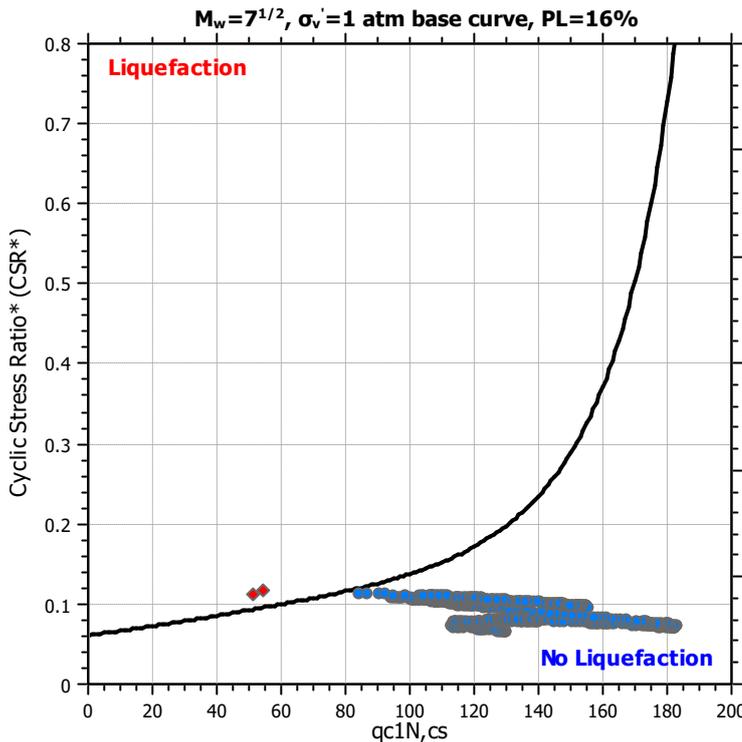
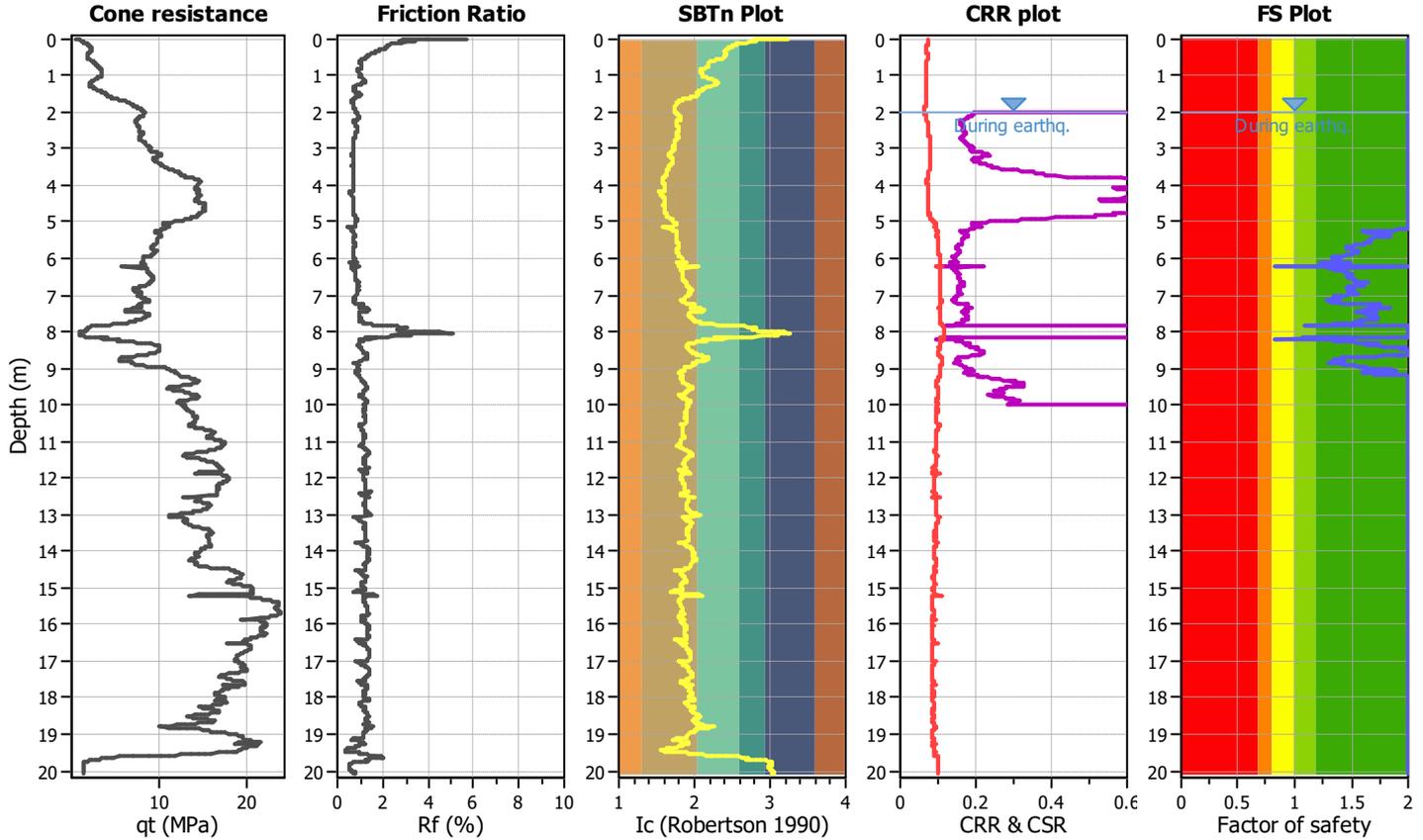
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

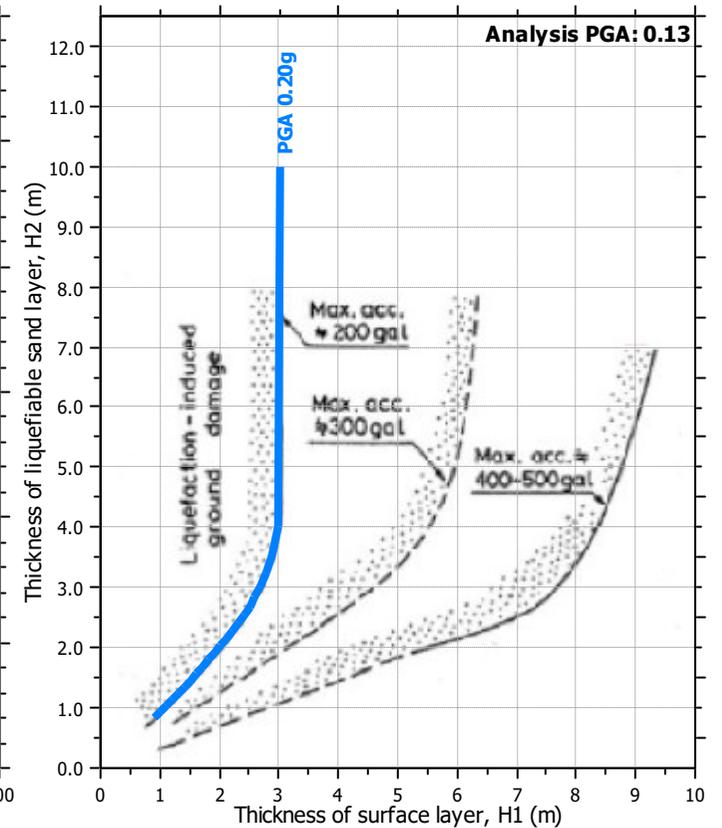
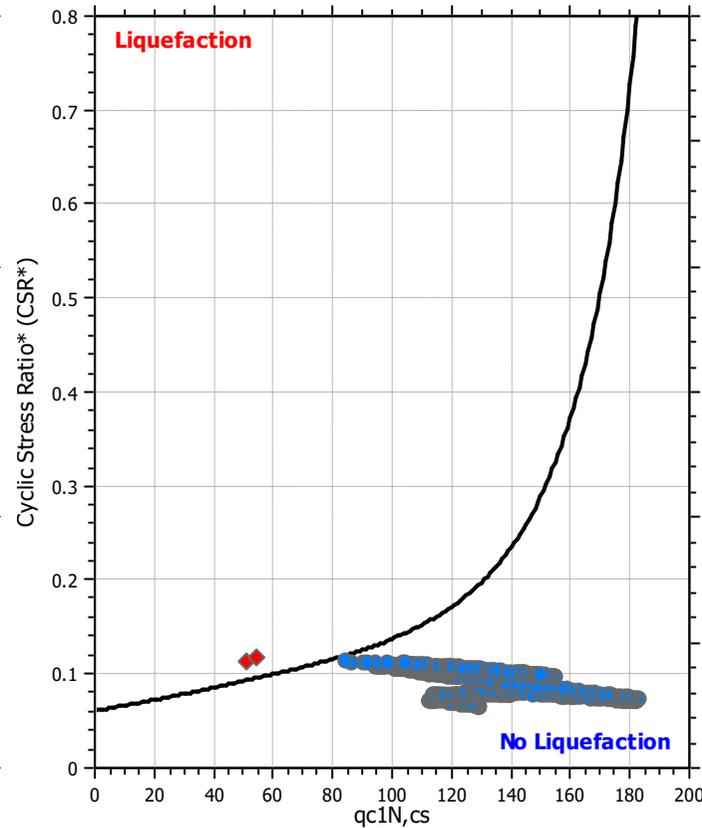
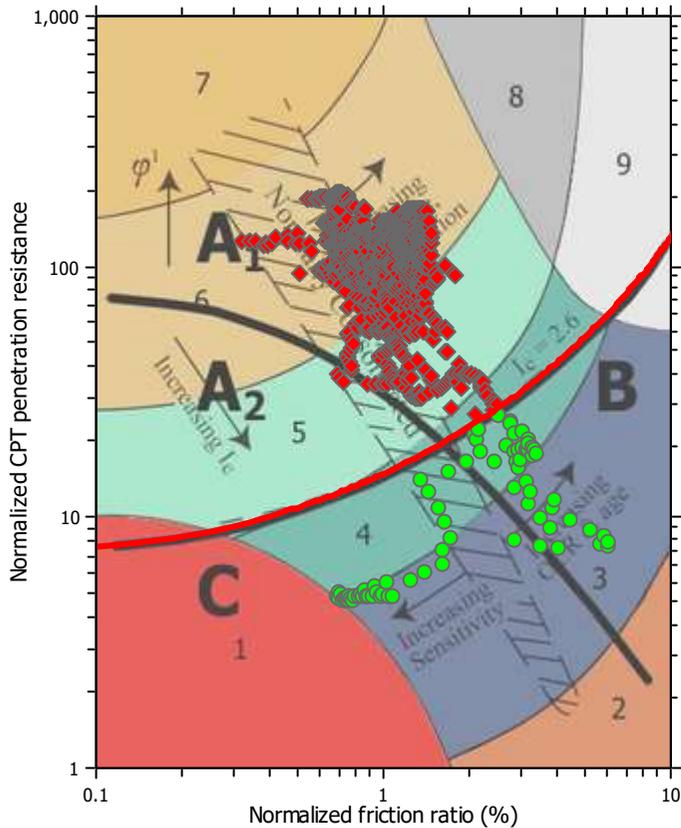
CPT file : 65-73 Ratanui Rd CPT14

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



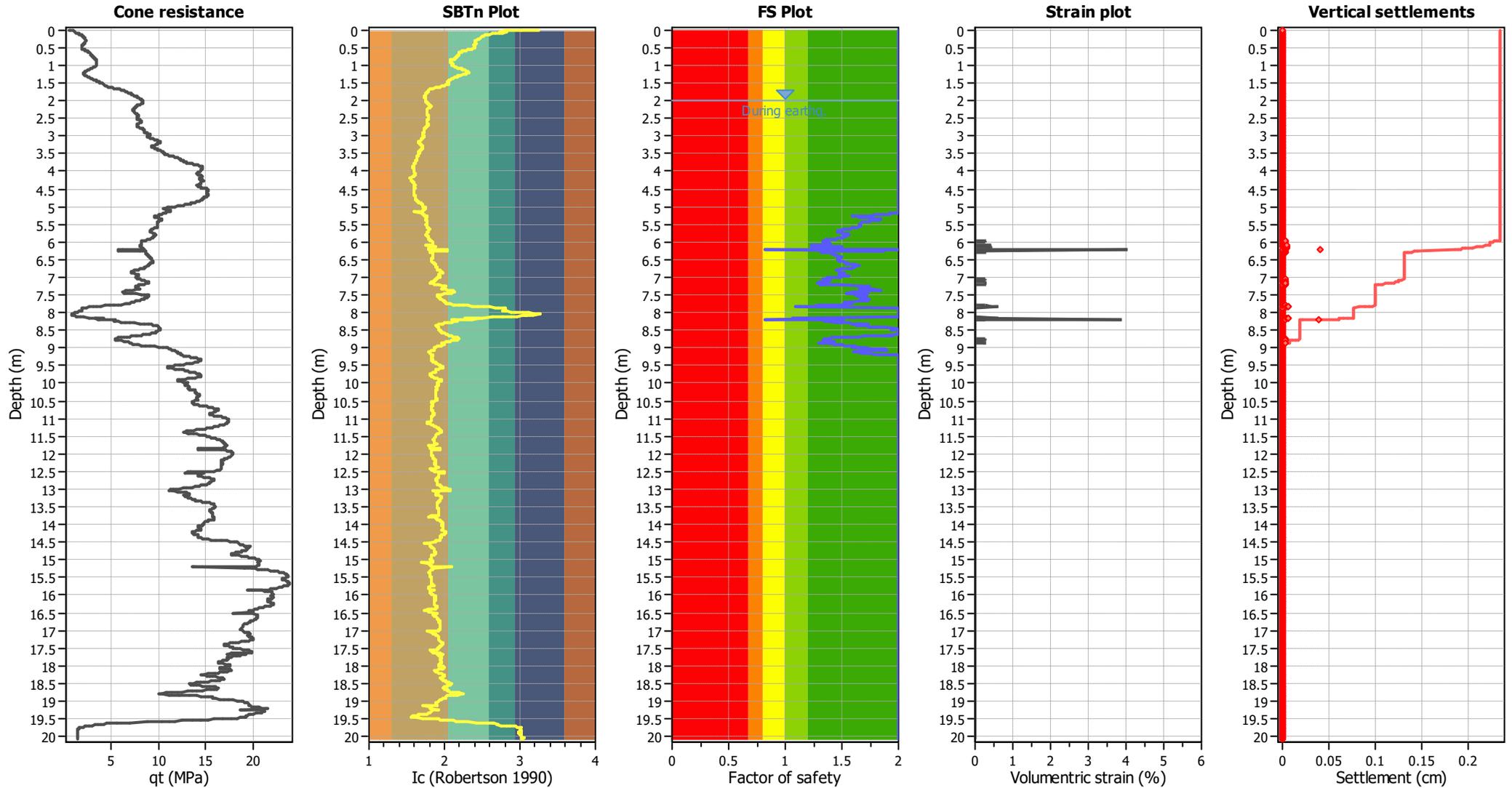
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

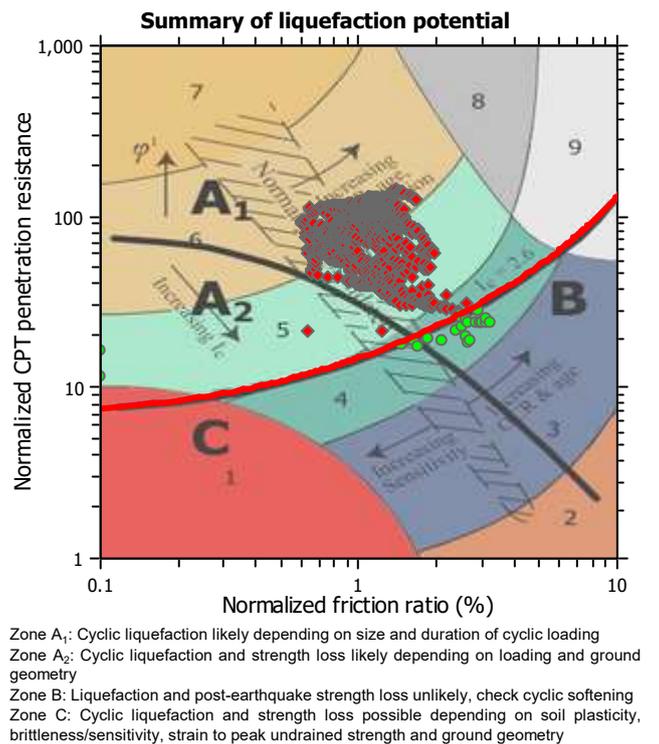
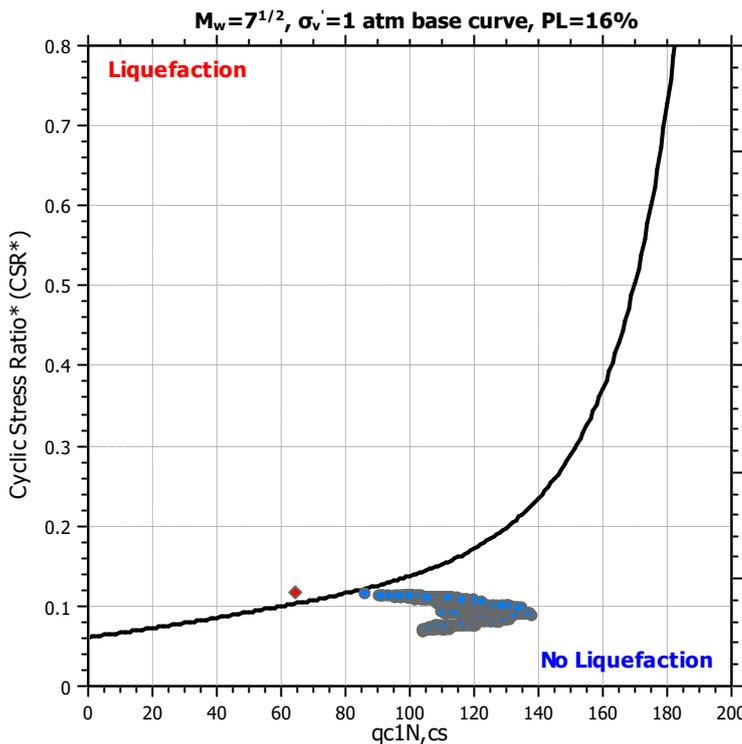
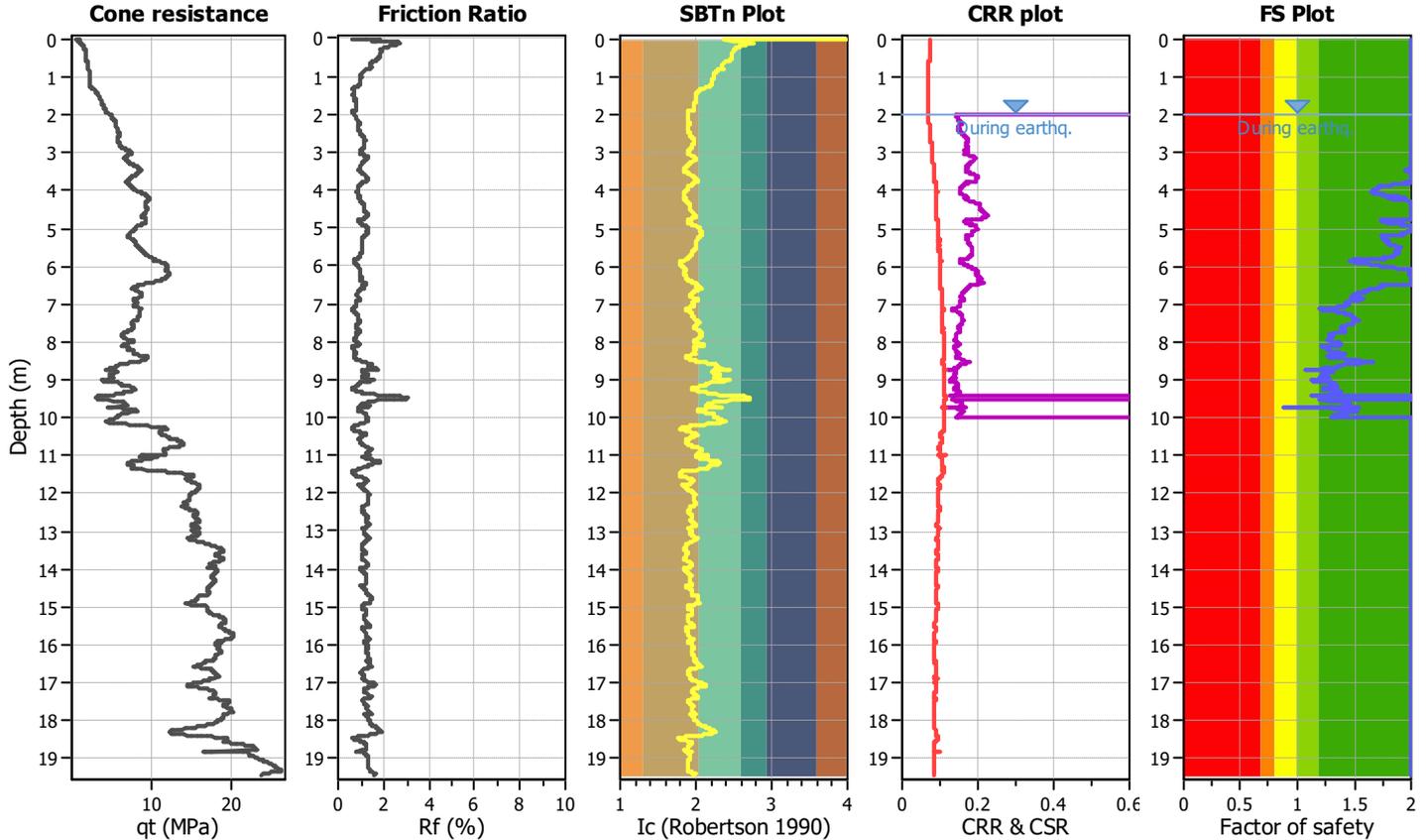
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

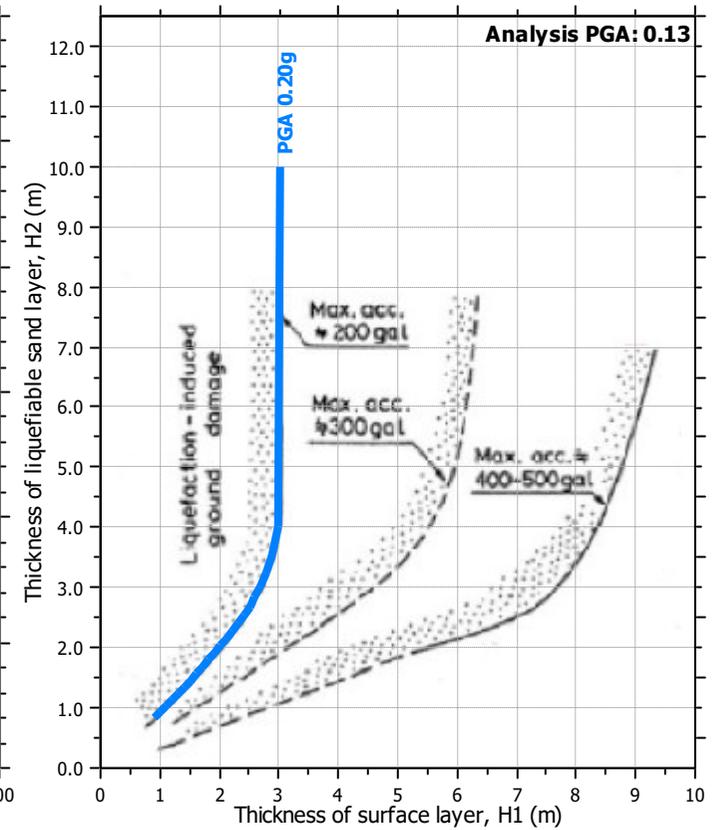
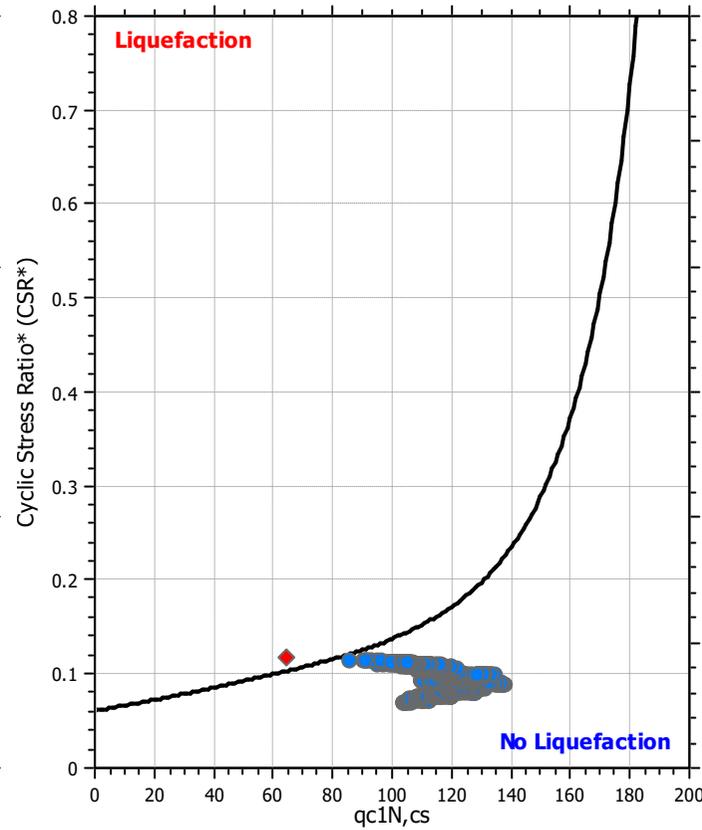
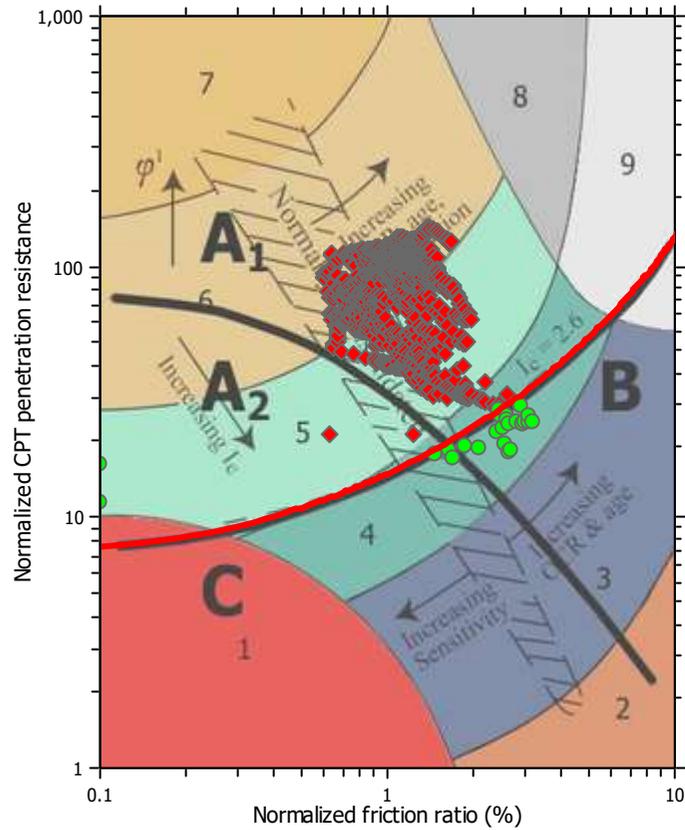
CPT file : 65-73 Ratanui Rd CPT15

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



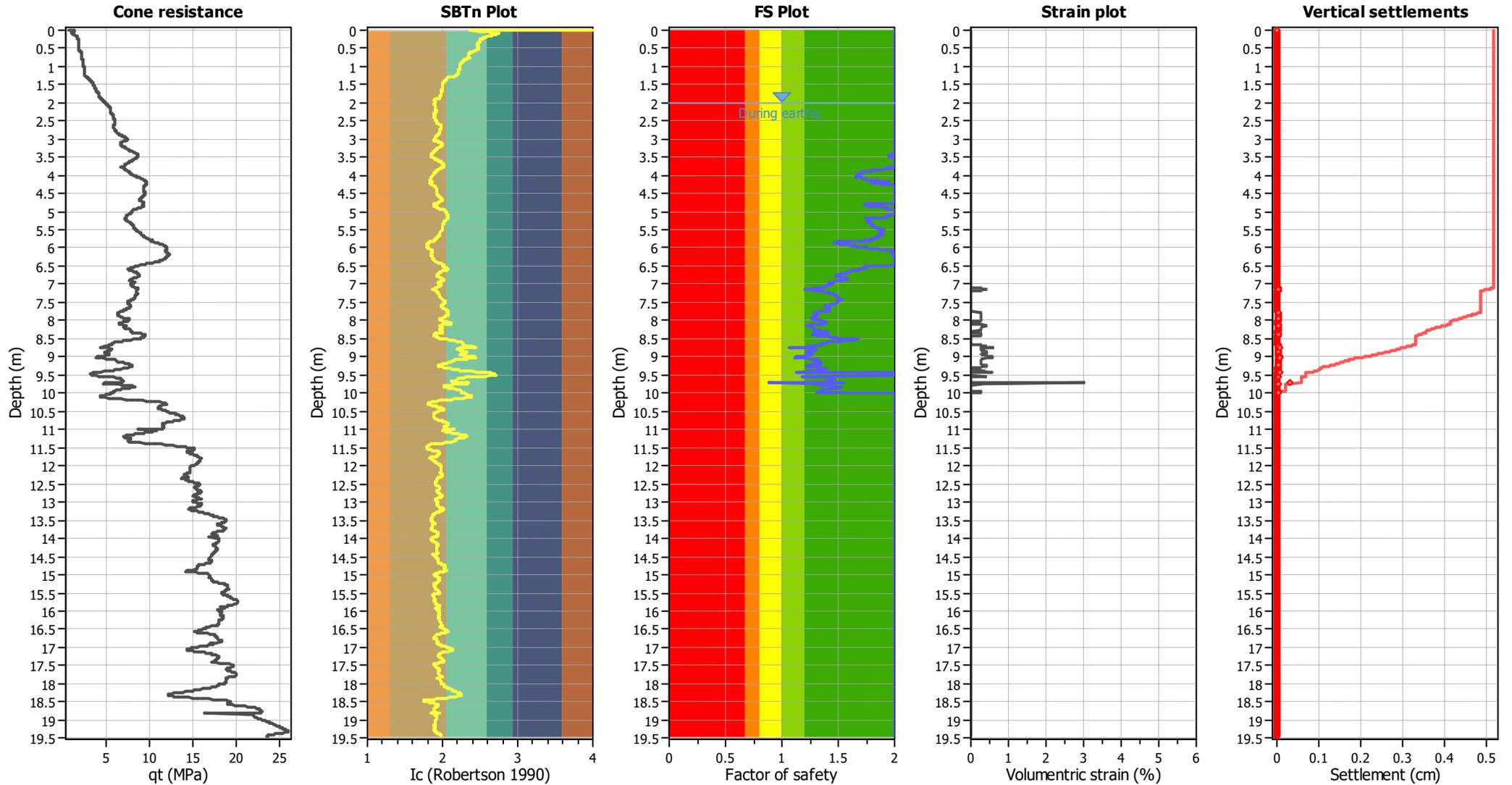
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

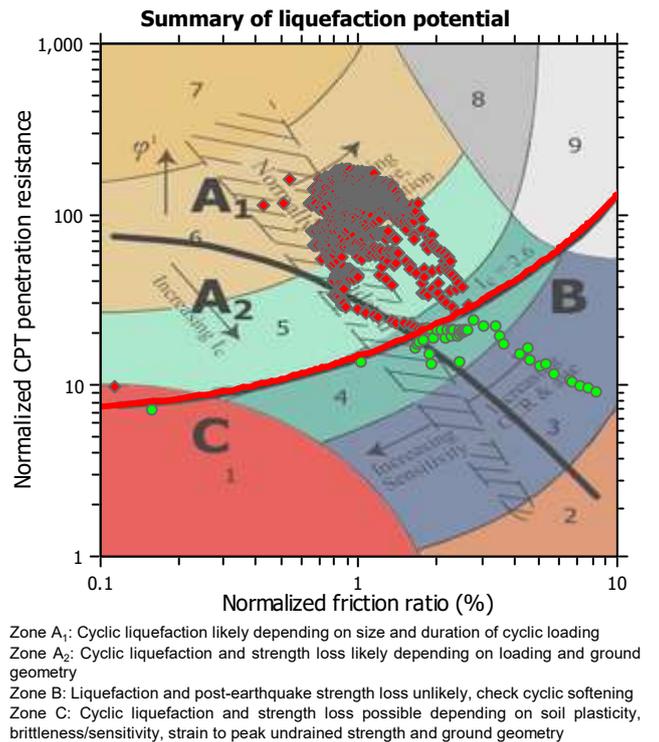
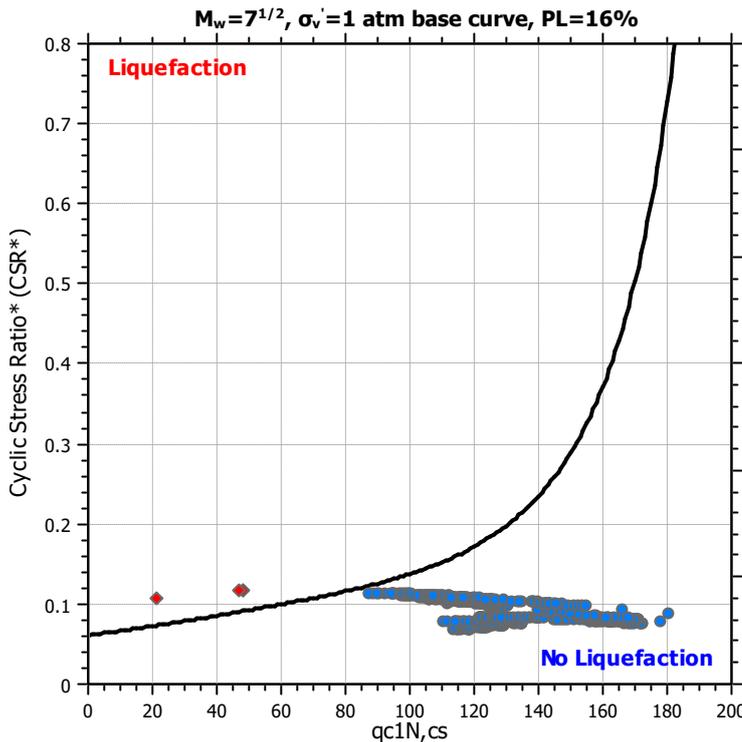
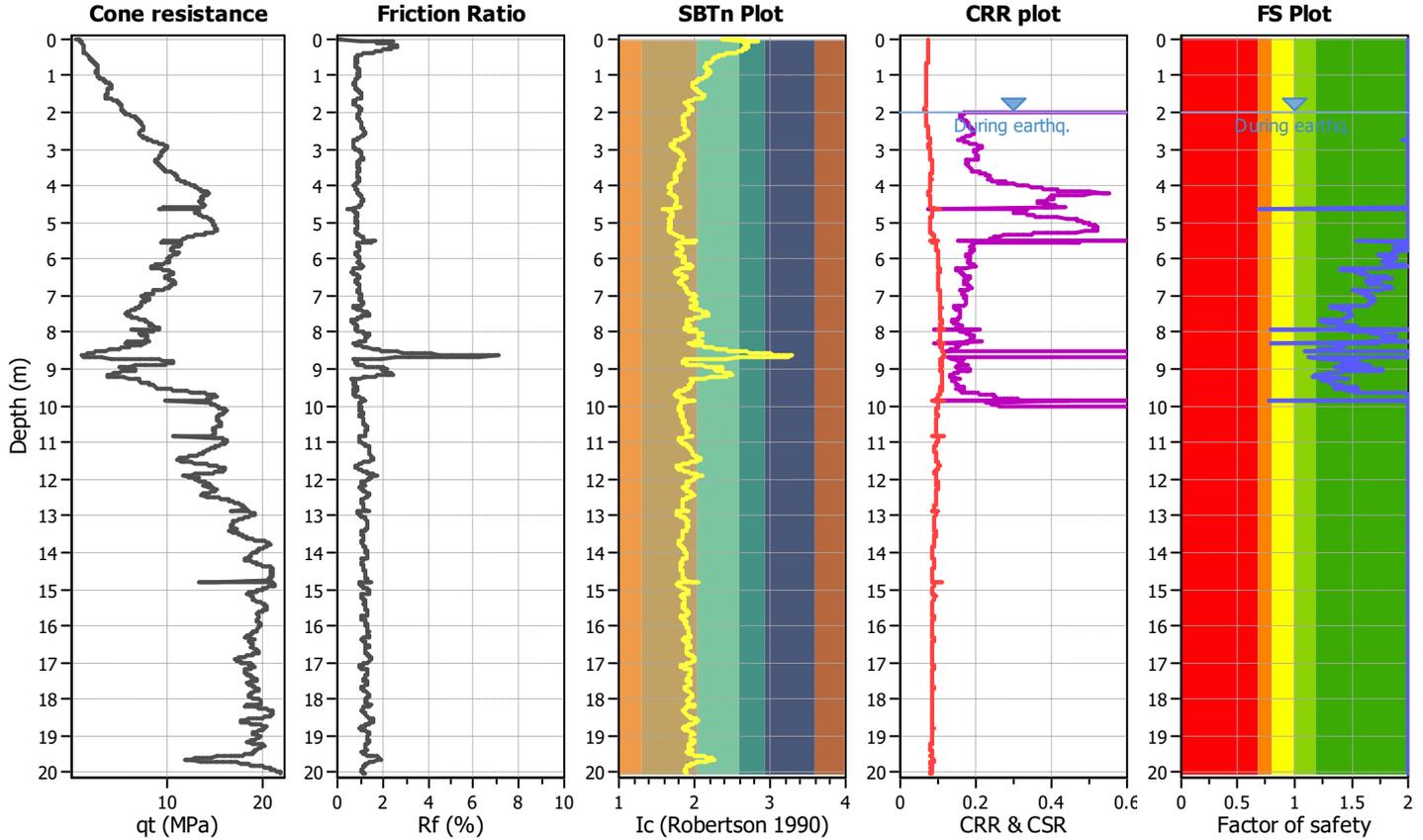
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

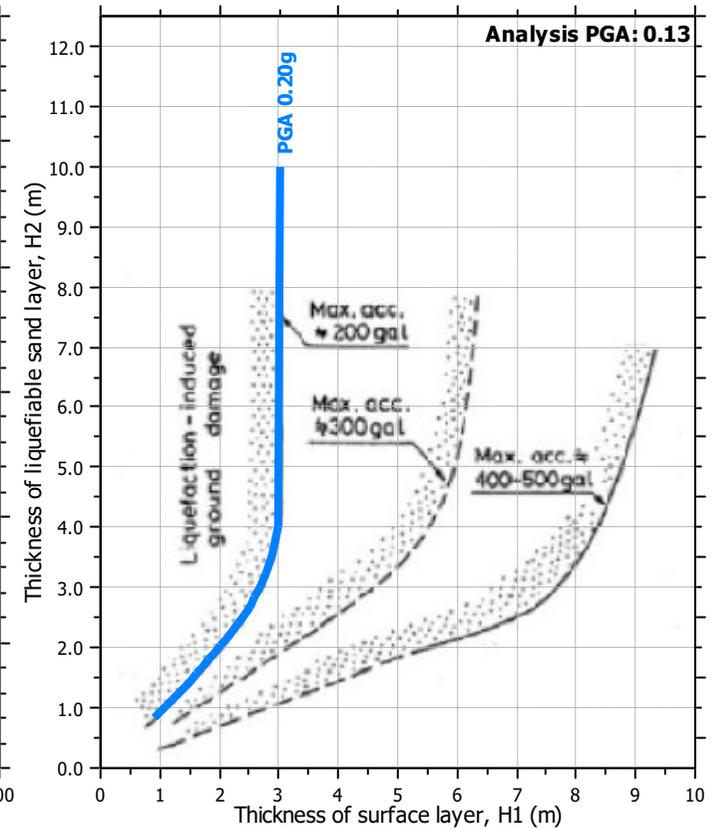
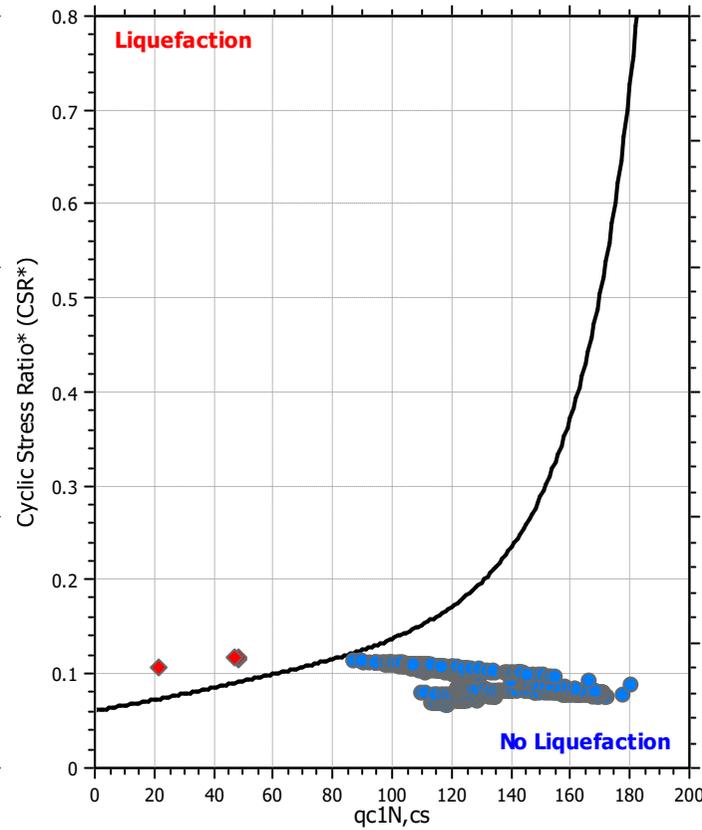
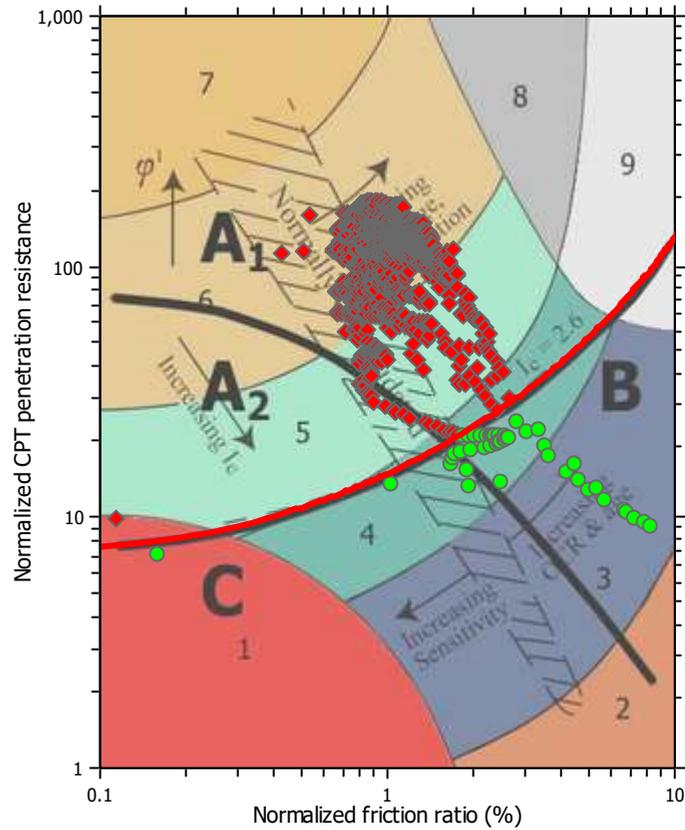
CPT file : 65-73 Ratanui Rd CPT16

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



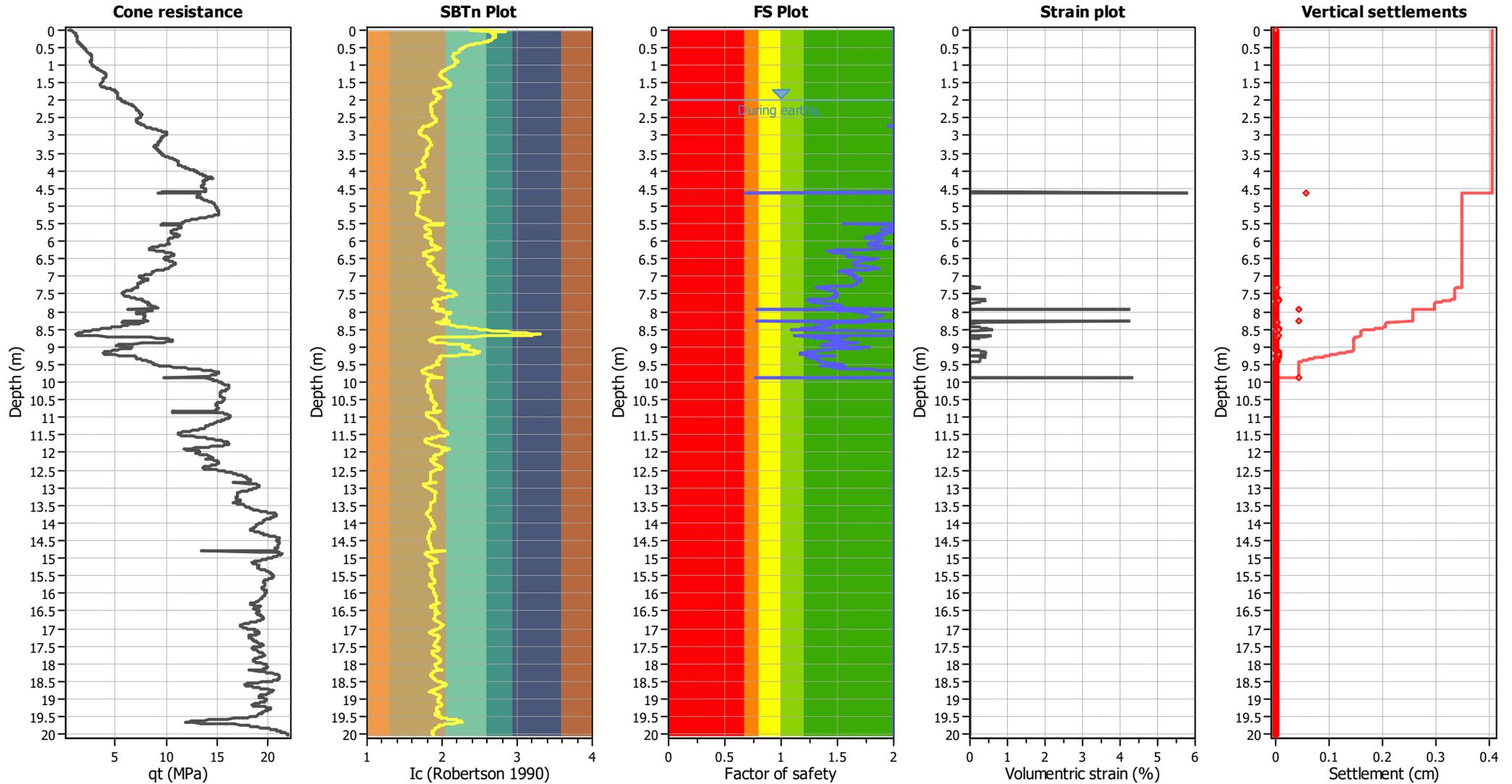
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_f applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

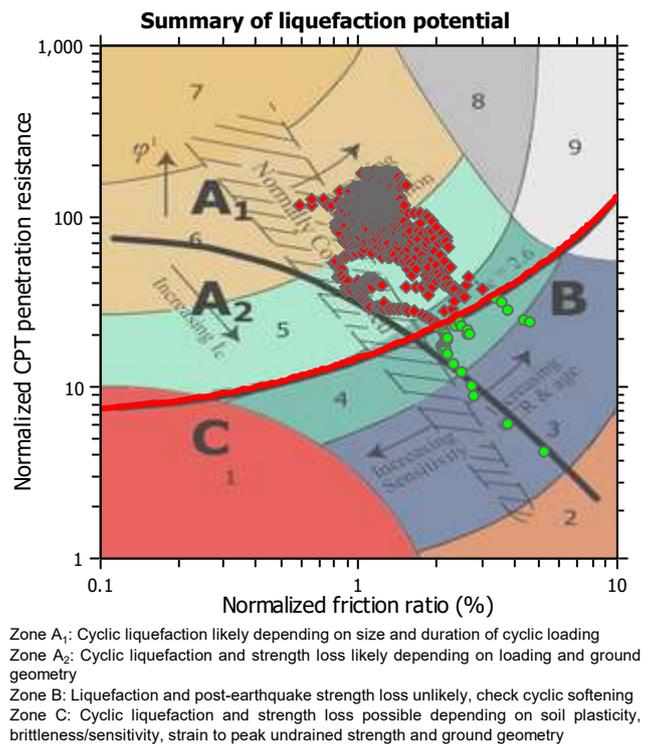
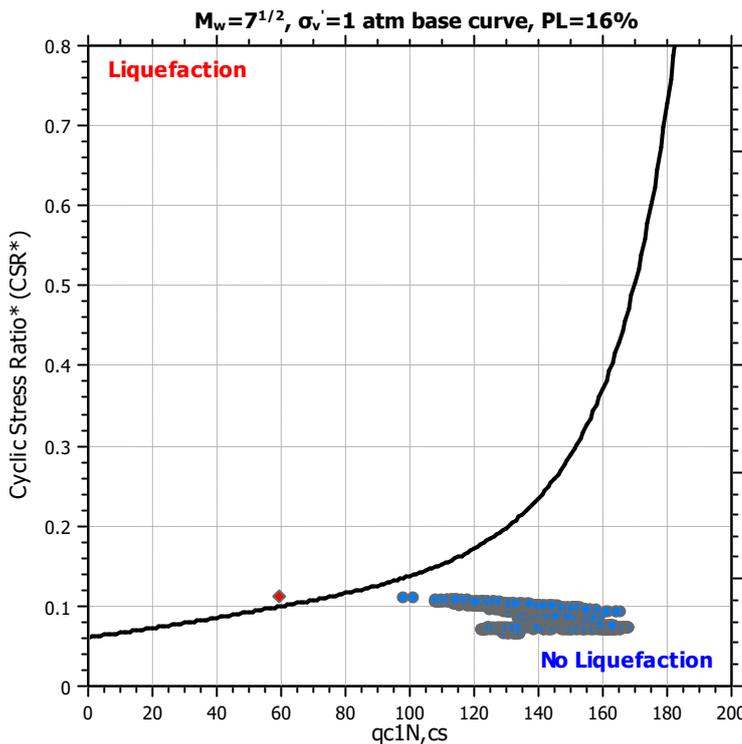
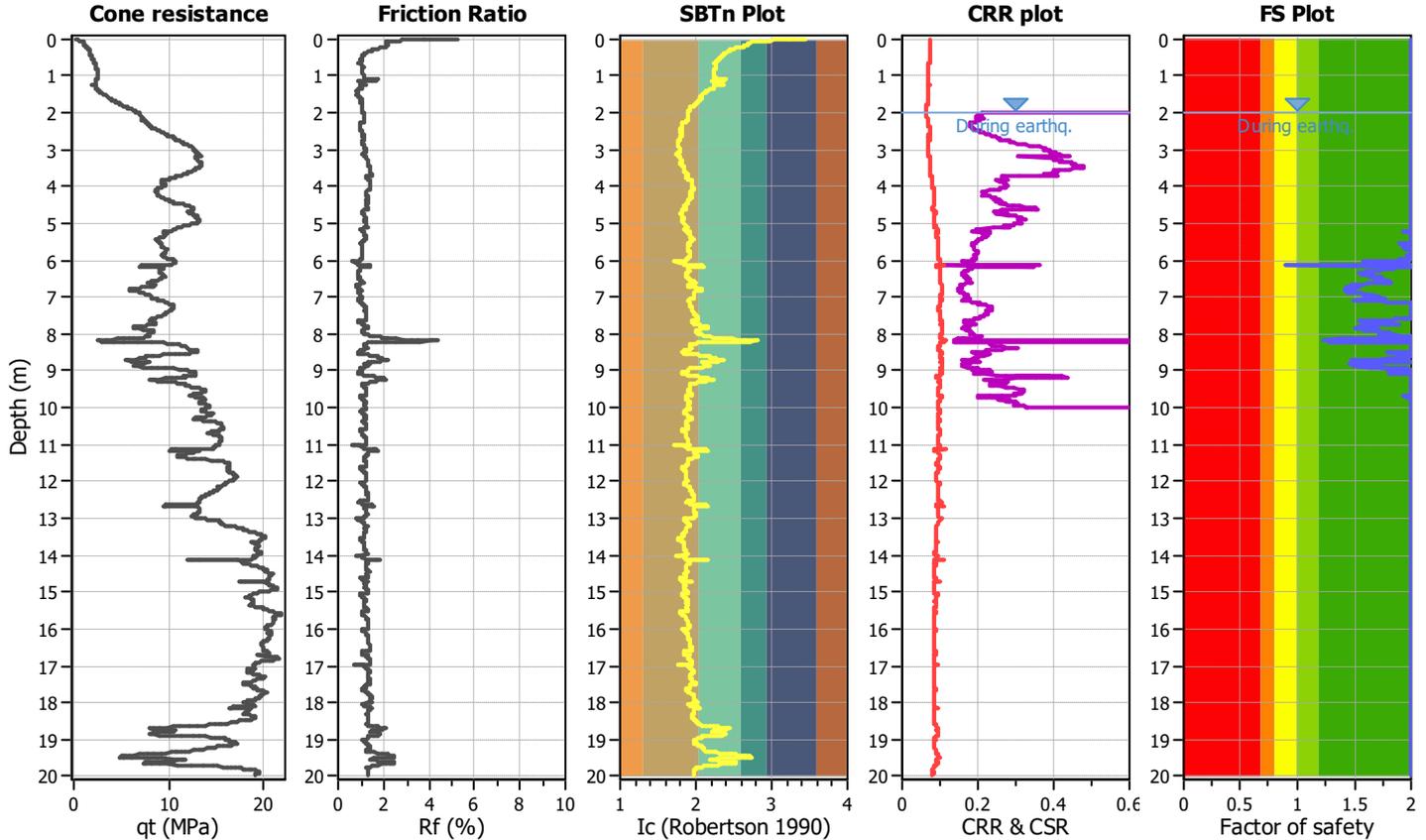
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

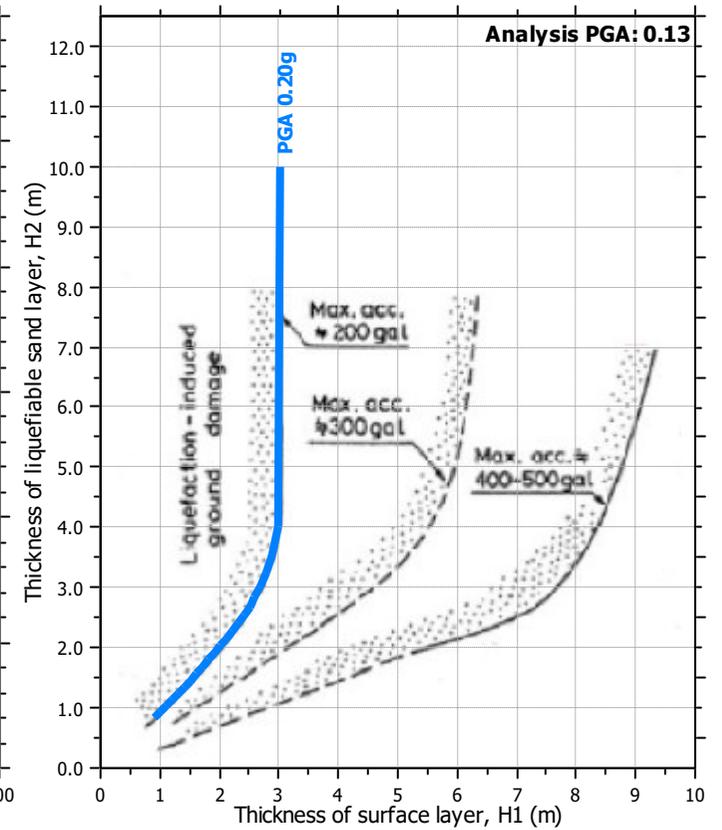
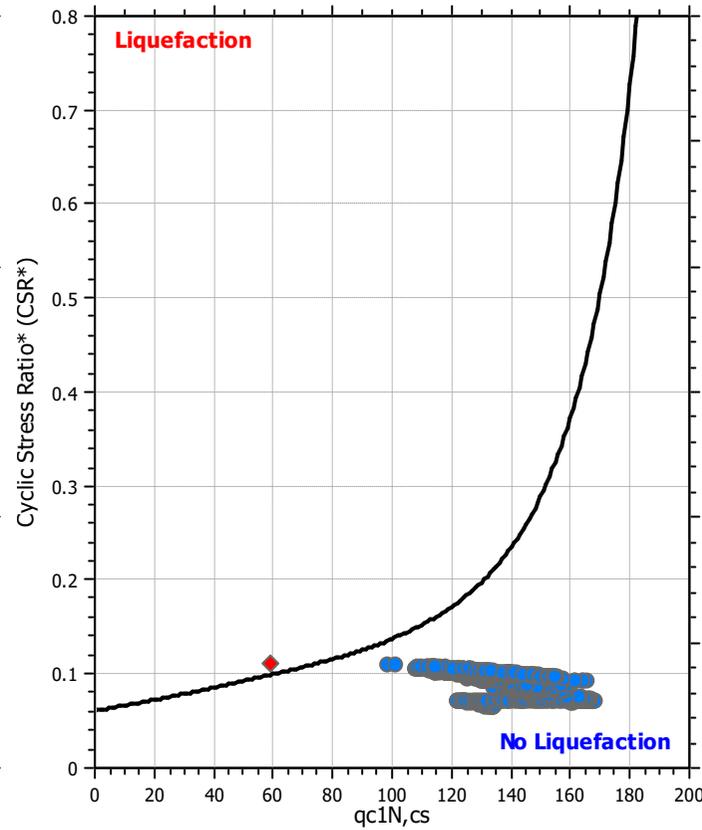
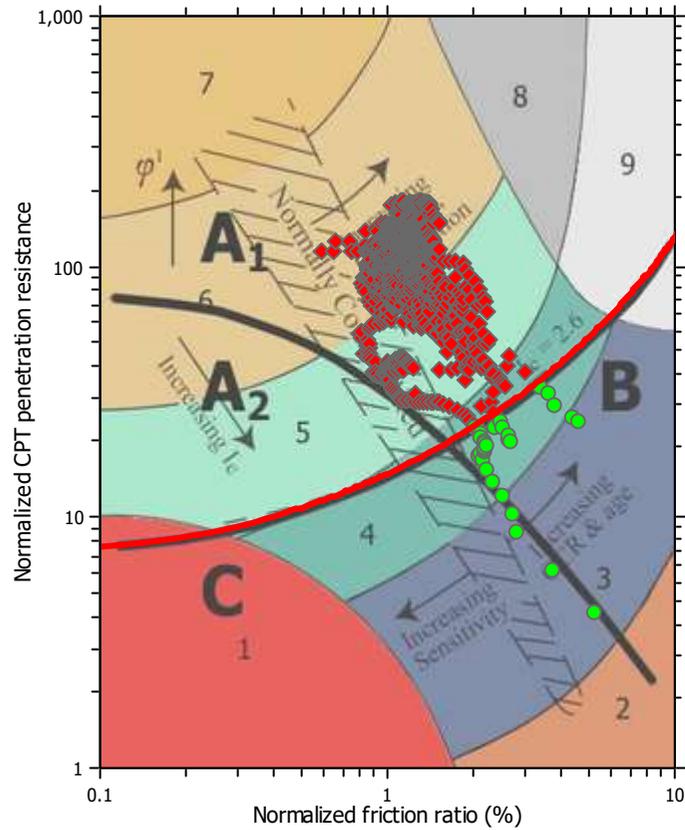
CPT file : 65-73 Ratanui Rd CPT17

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_g applied:	Yes		



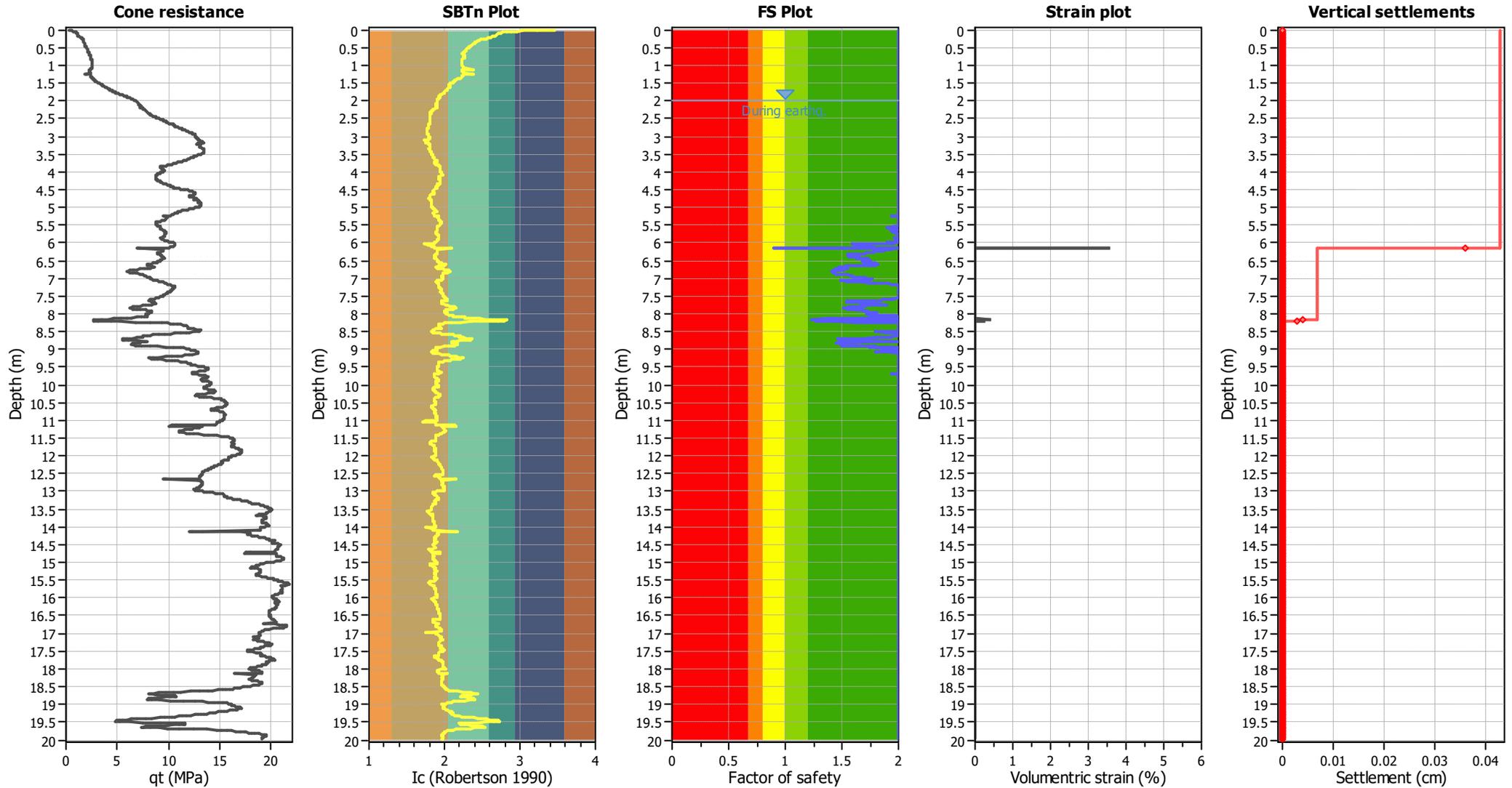
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

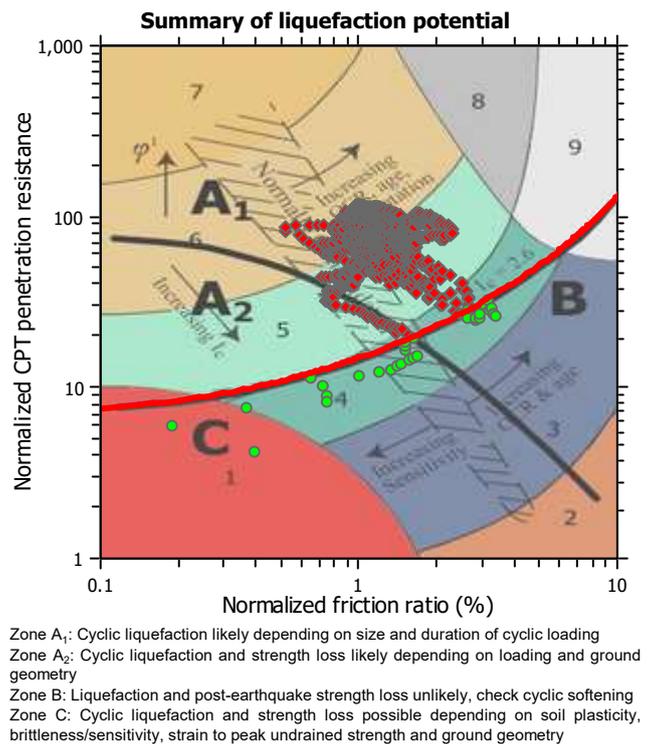
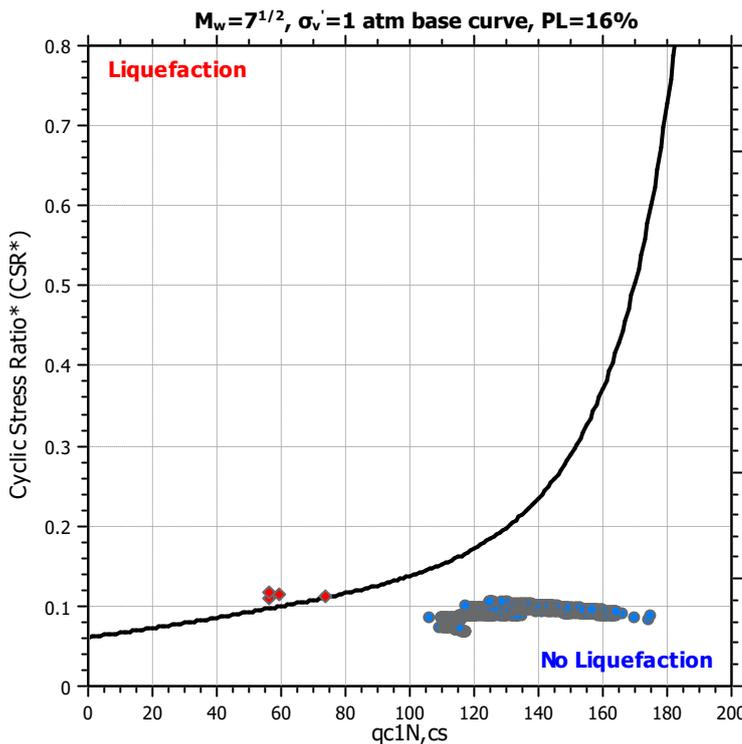
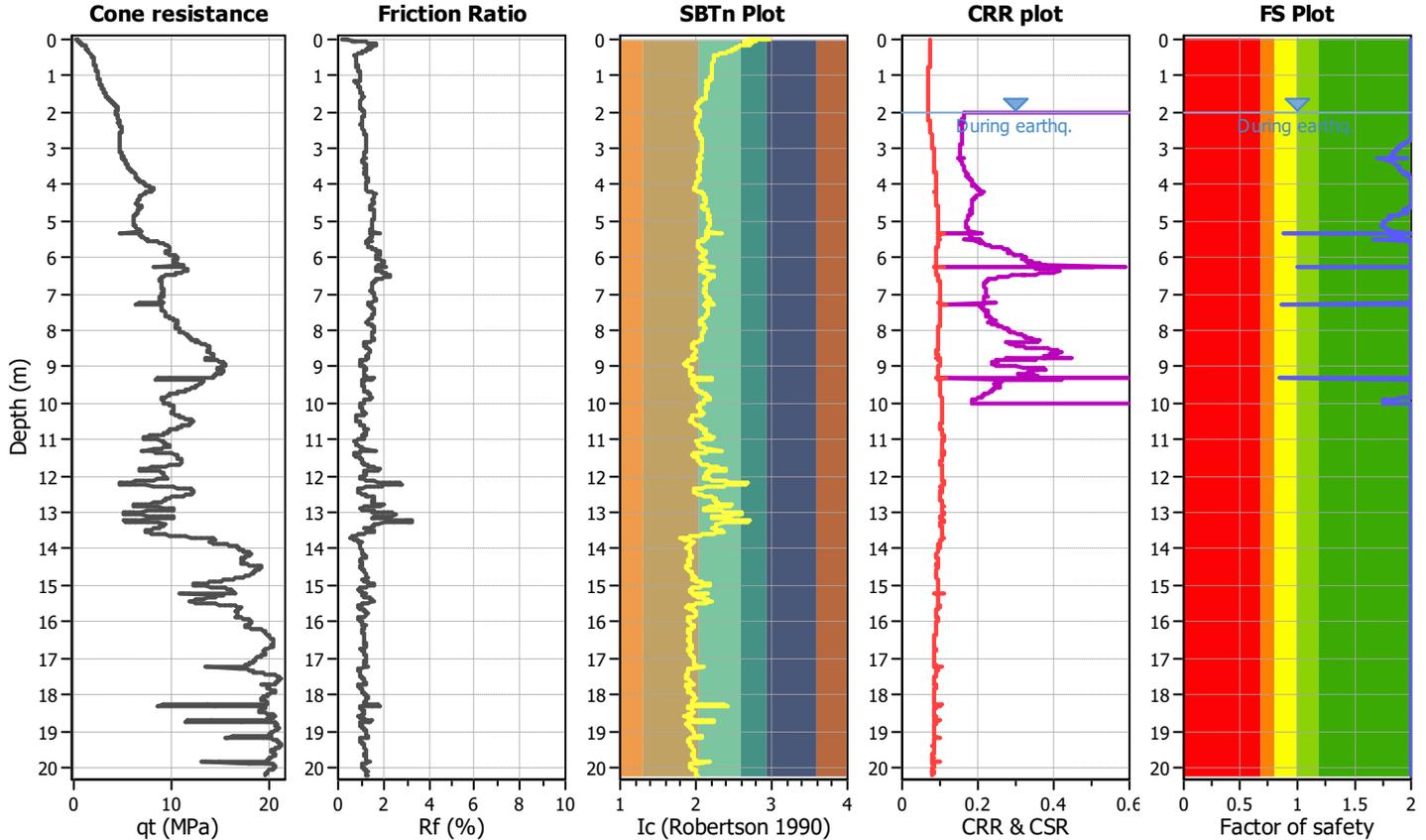
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

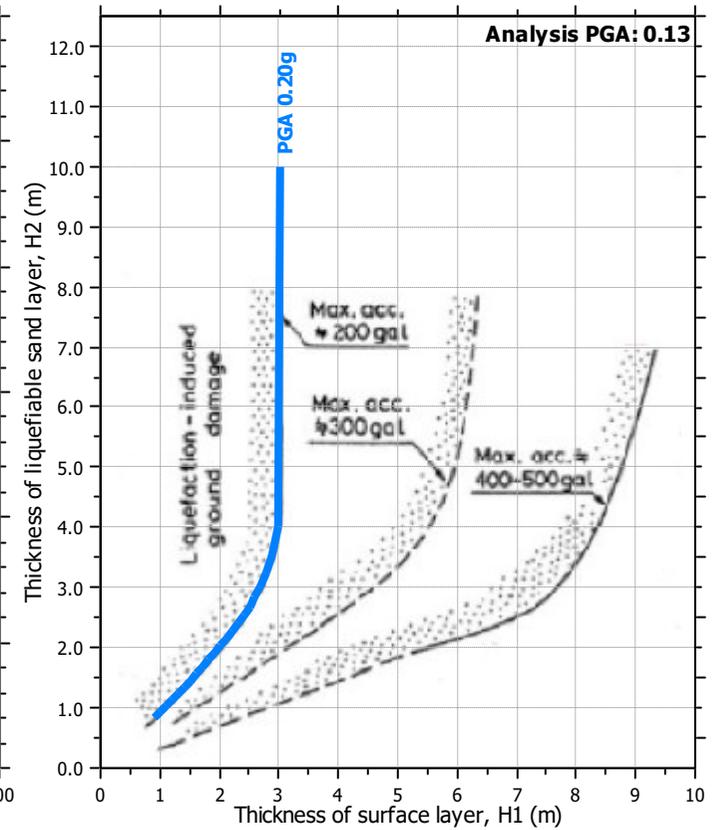
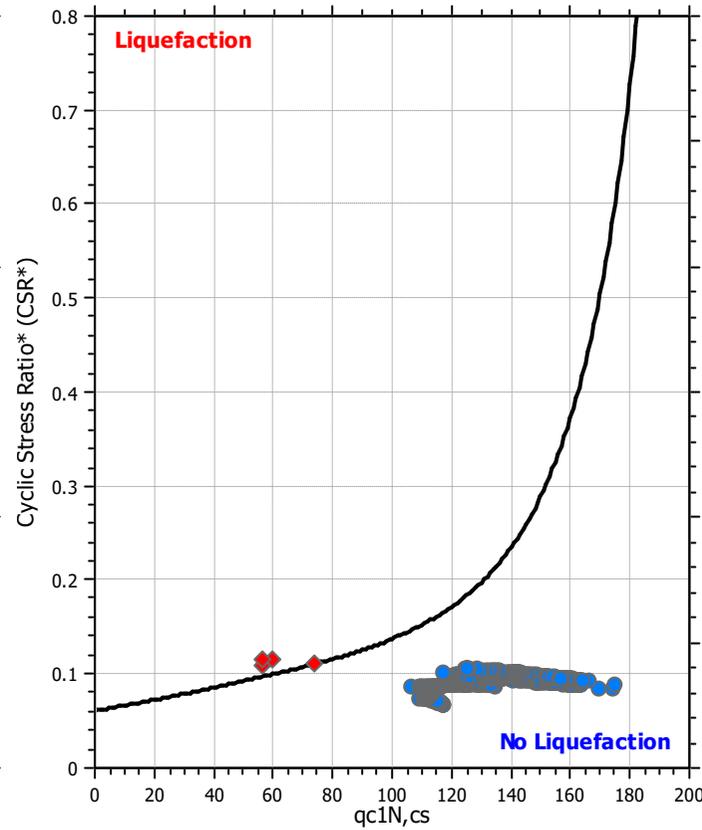
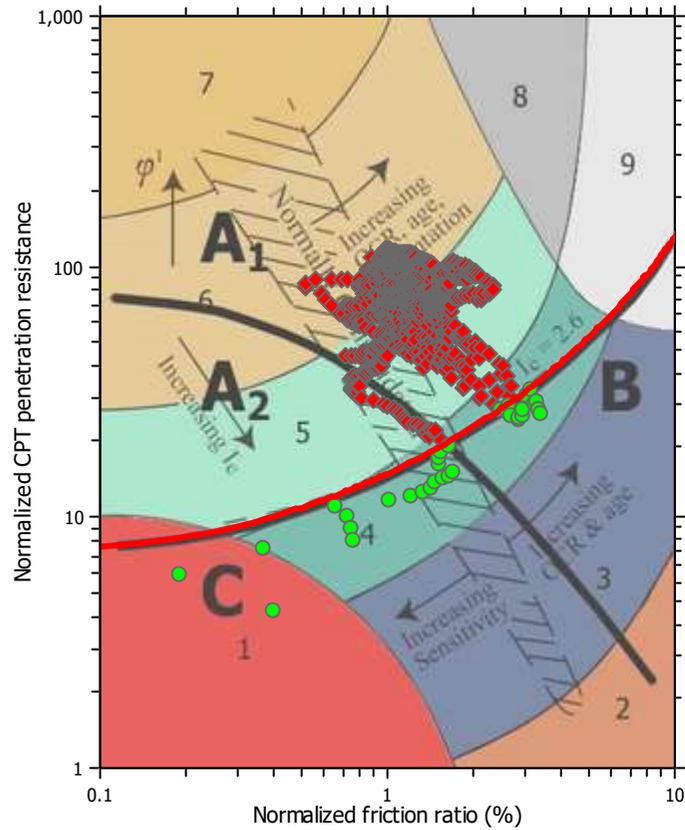
CPT file : 65-73 Ratanui Rd CPT18

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



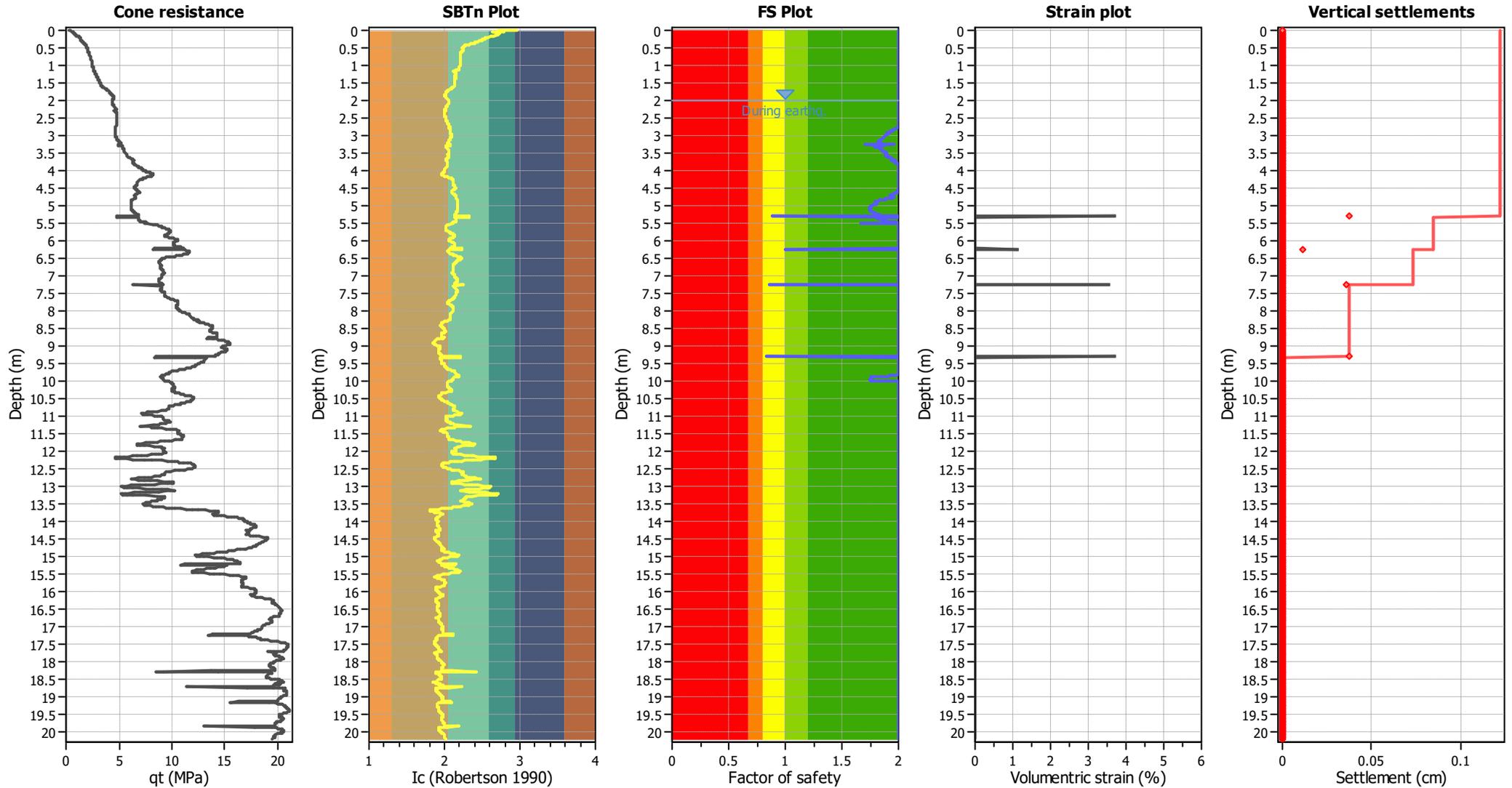
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

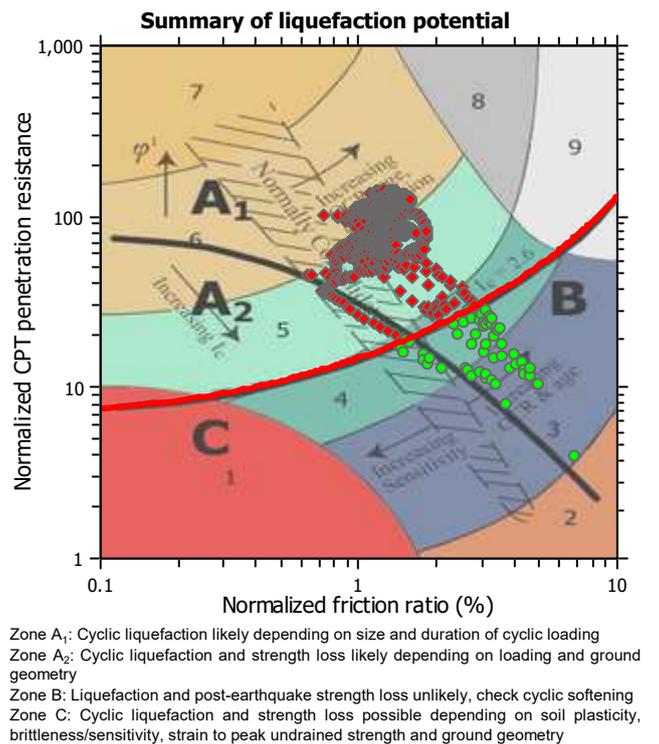
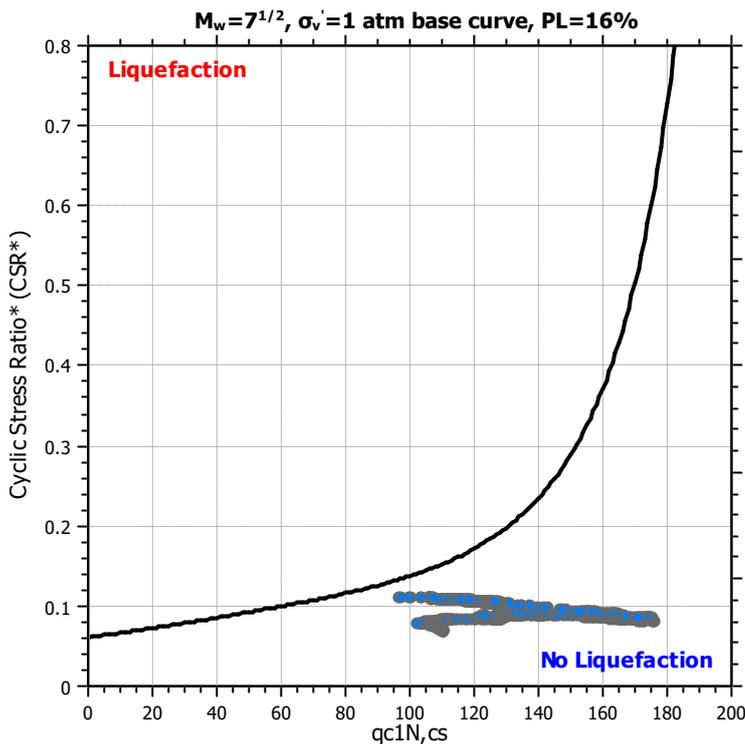
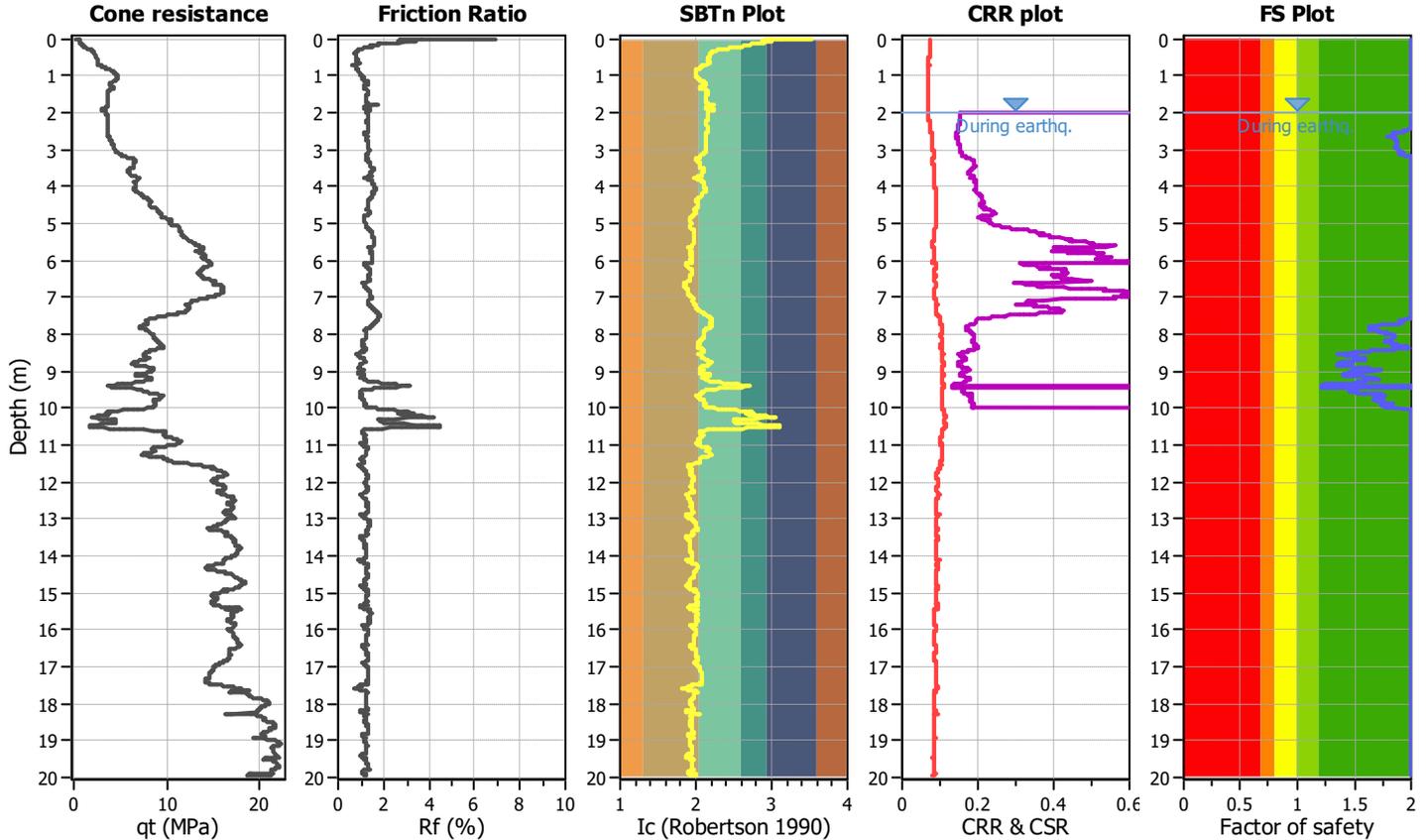
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

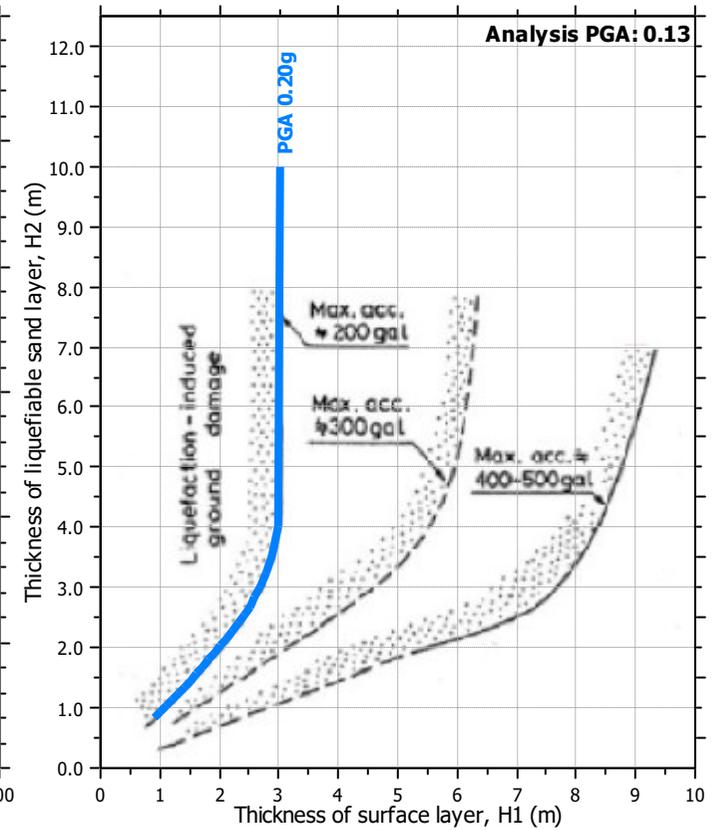
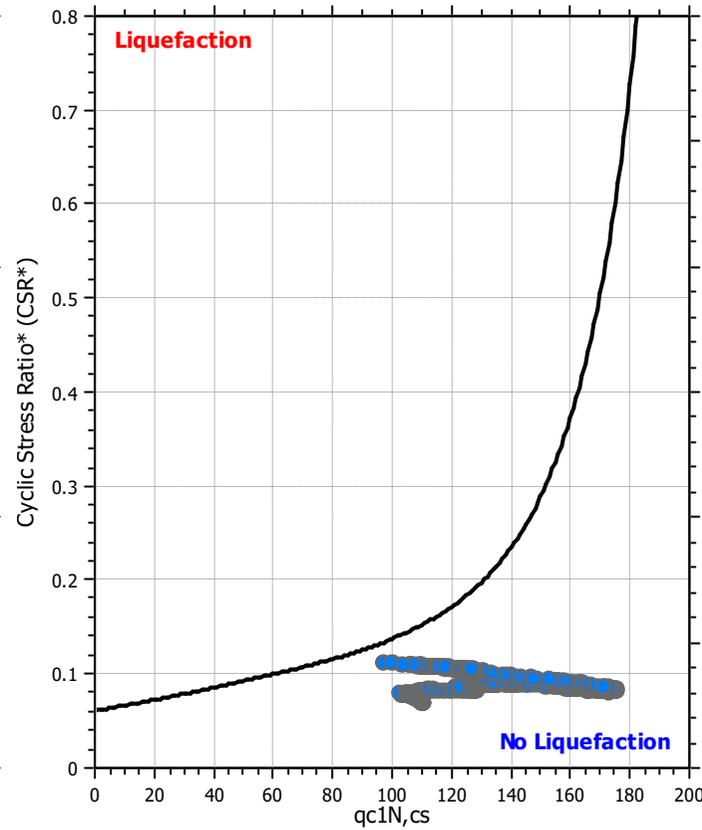
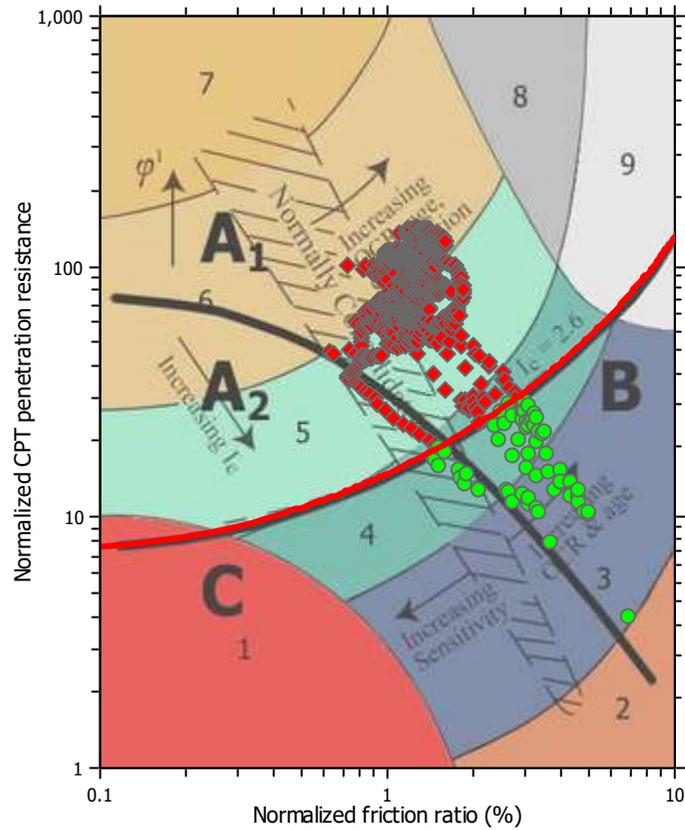
CPT file : 65-73 Ratanui Rd CPT19

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



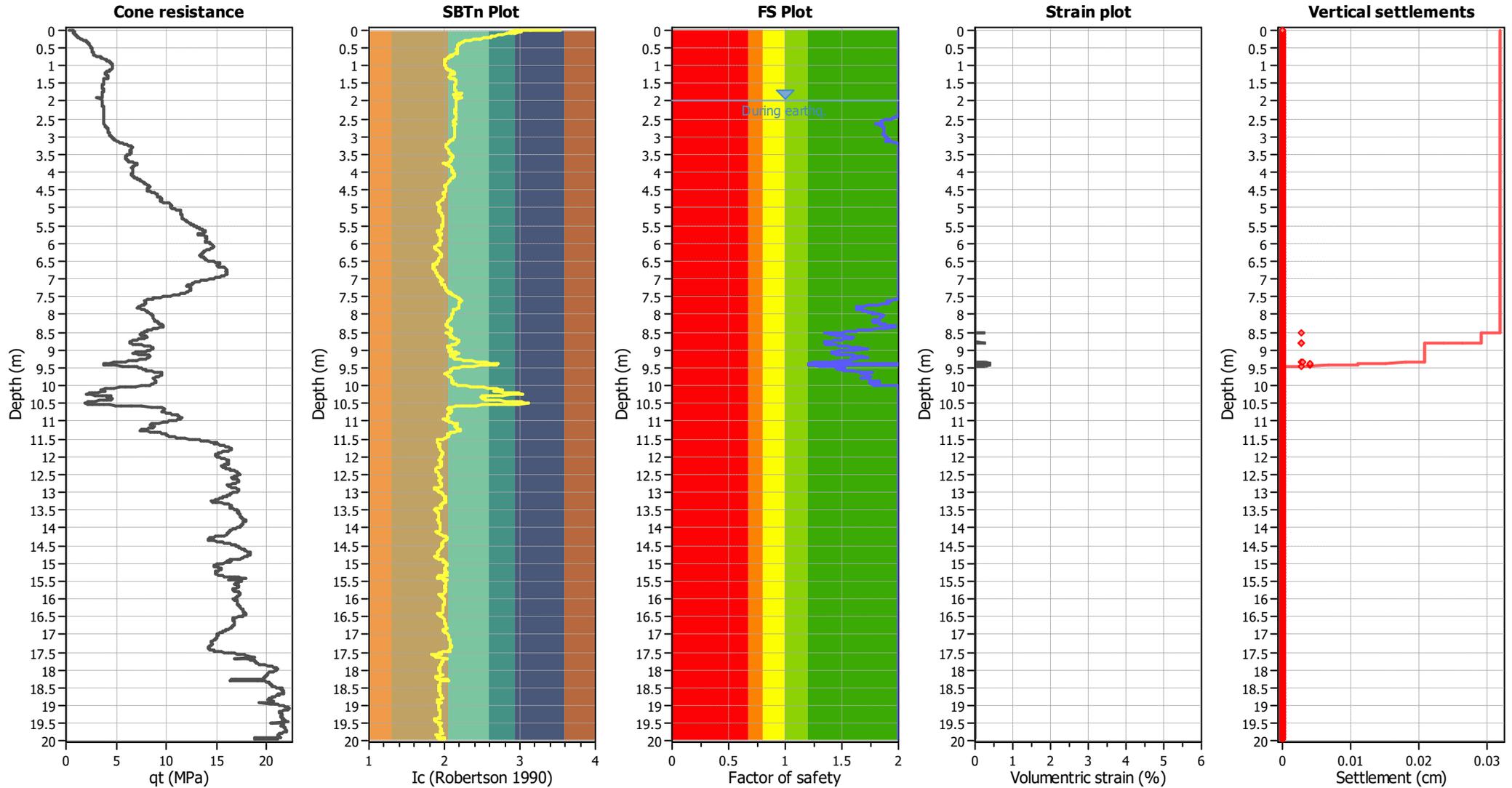
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

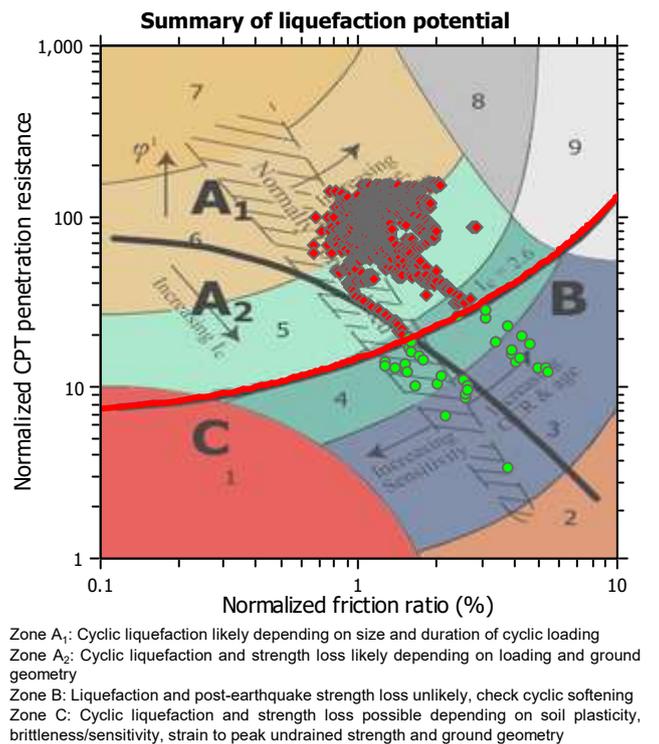
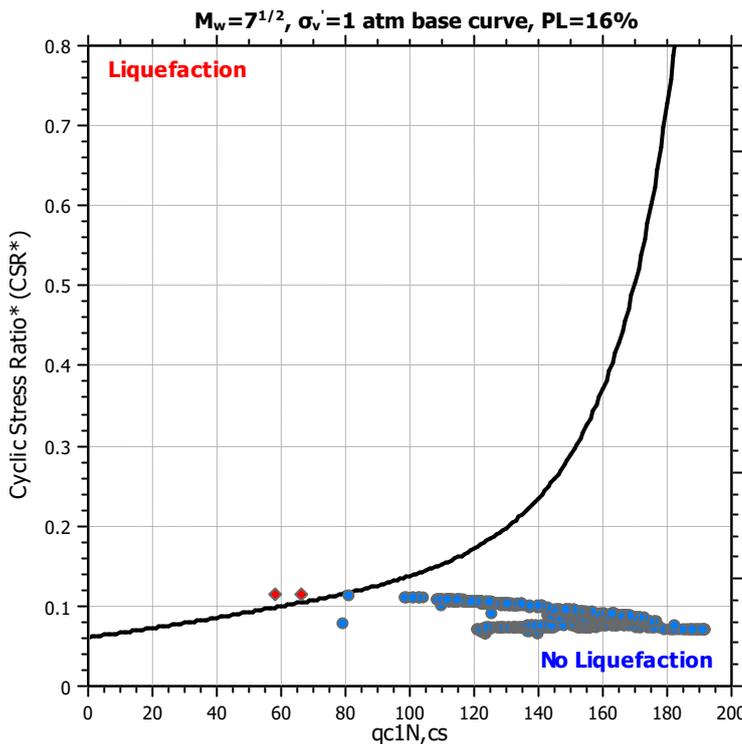
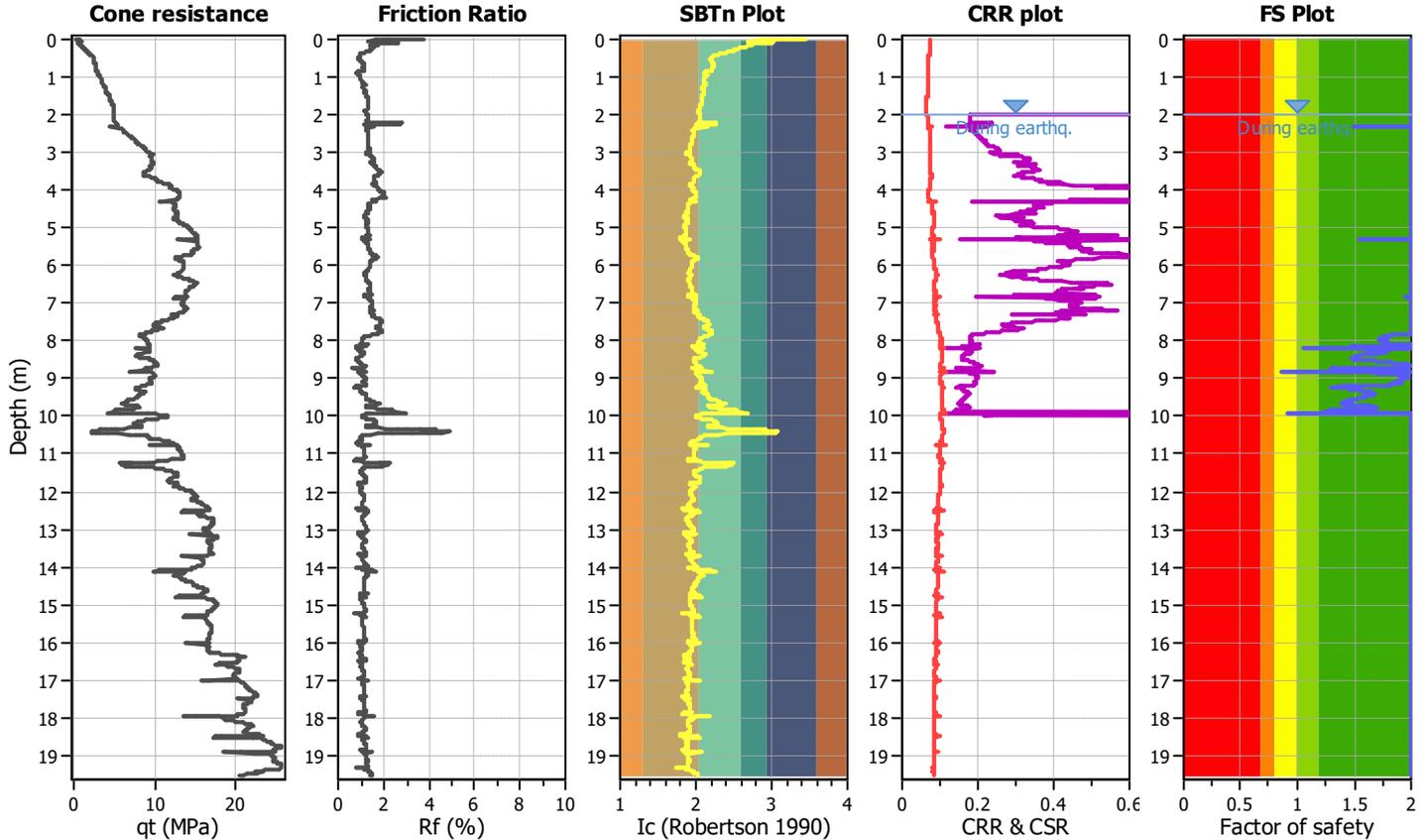
Project title : Summerset Paraparamu - 25yr

Location : 65 & 73 Ratanui Road, Paraparamu

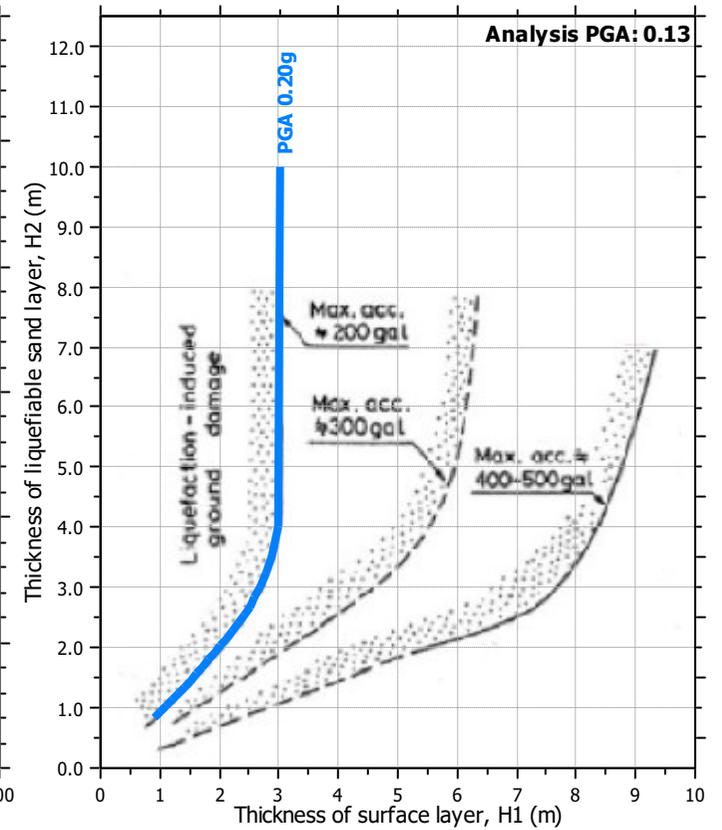
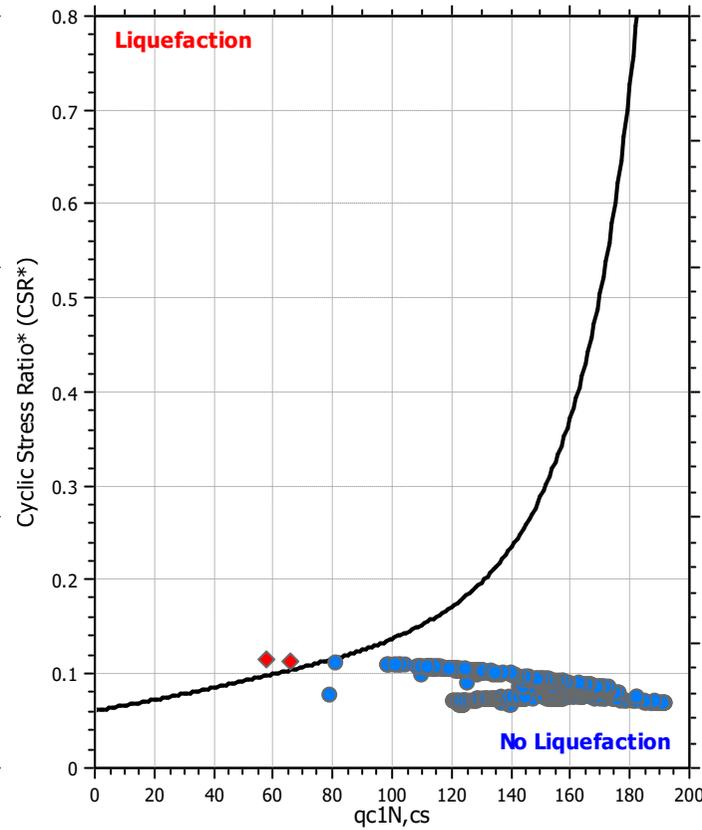
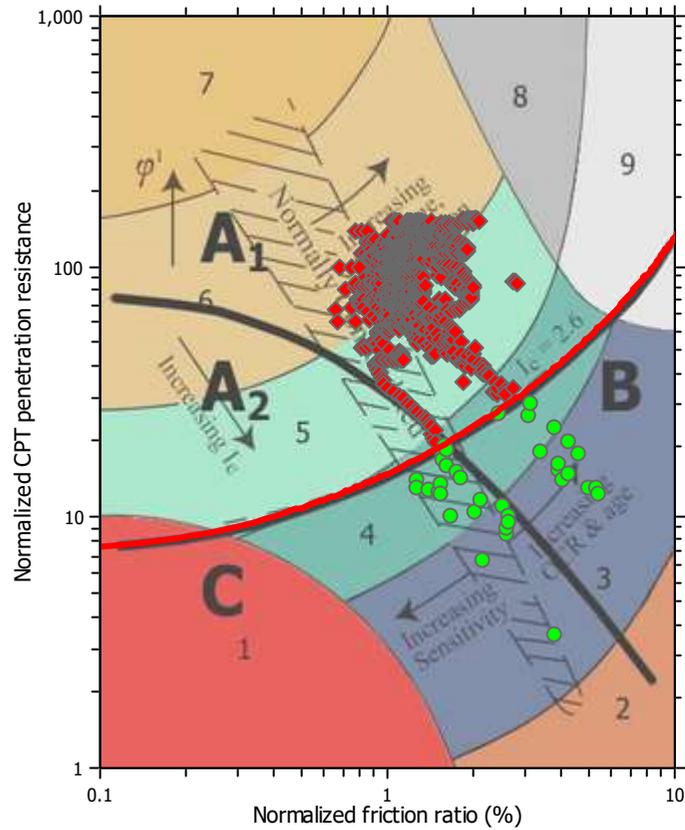
CPT file : 65-73 Ratanui Rd CPT20

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



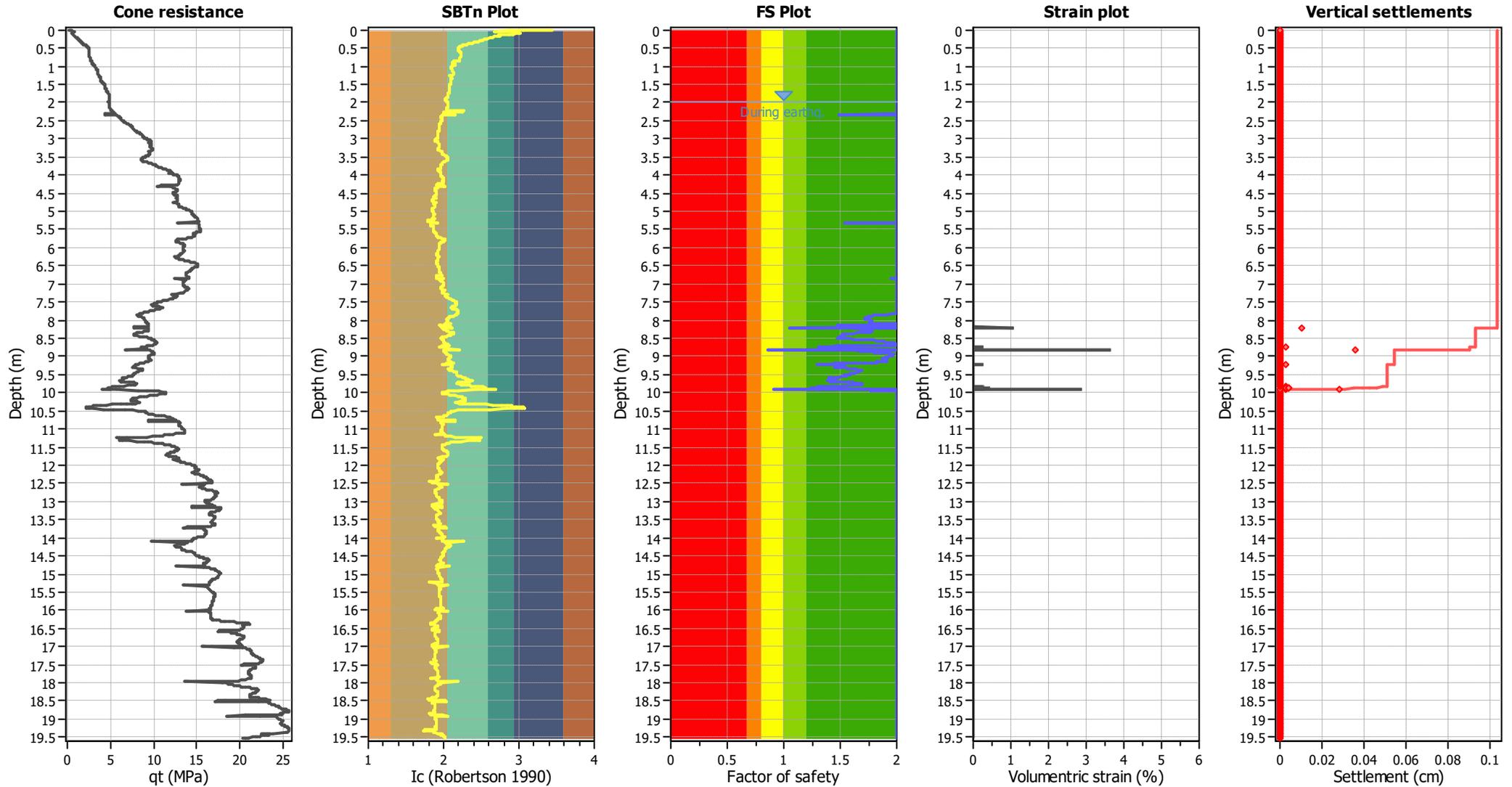
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

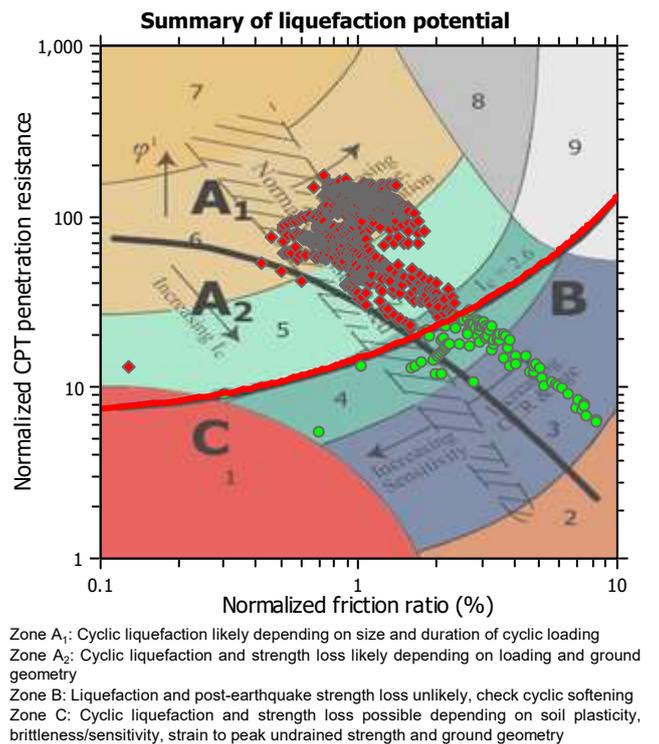
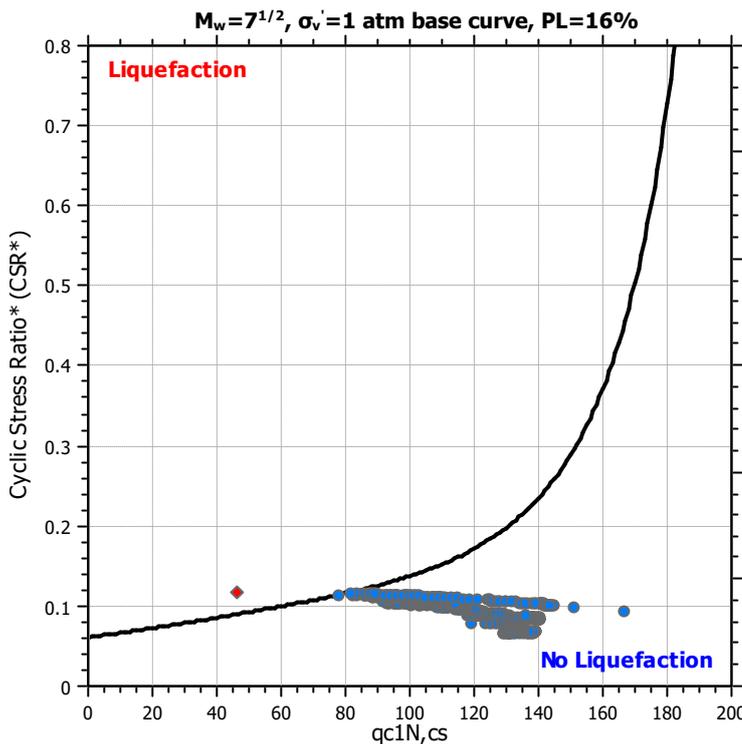
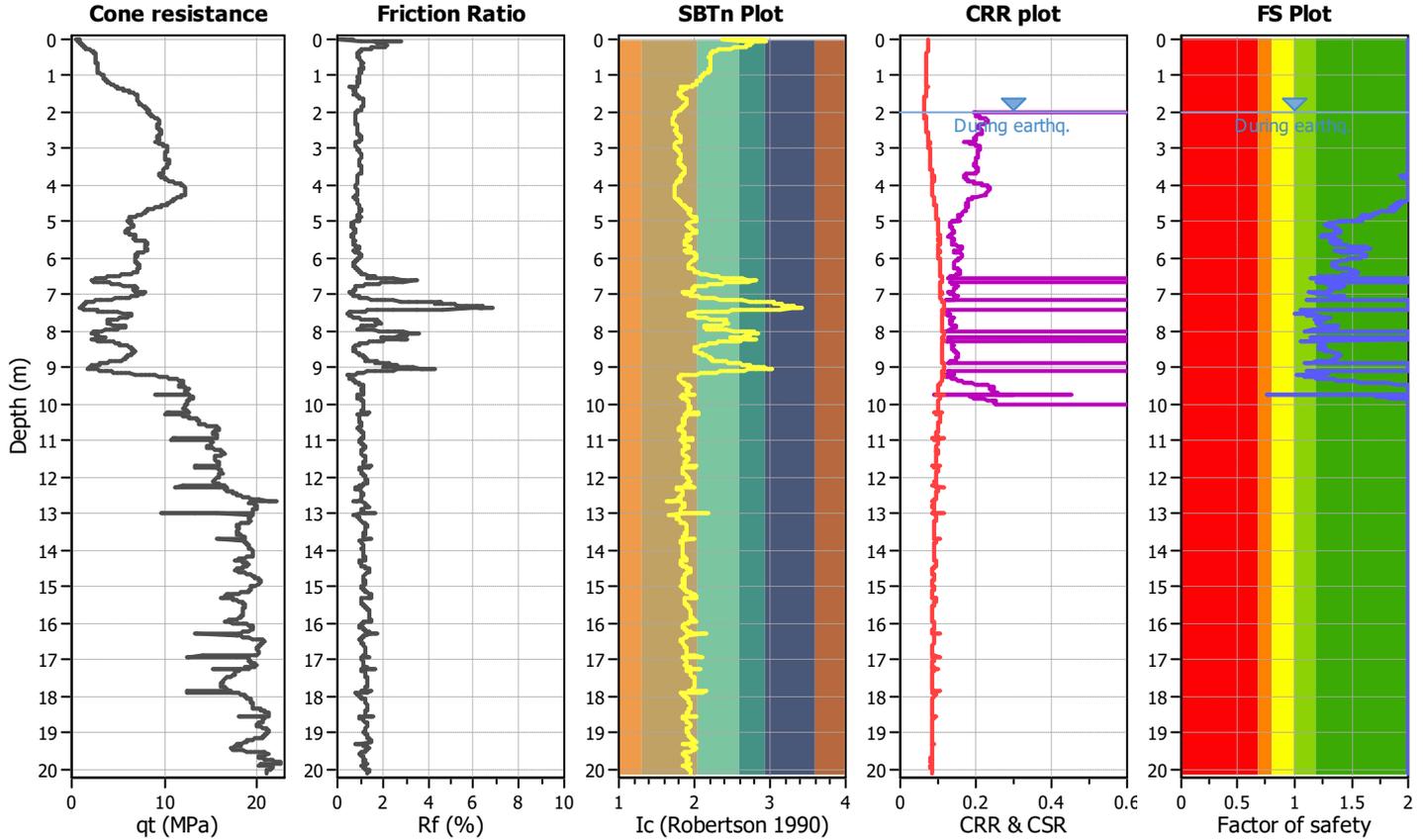
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

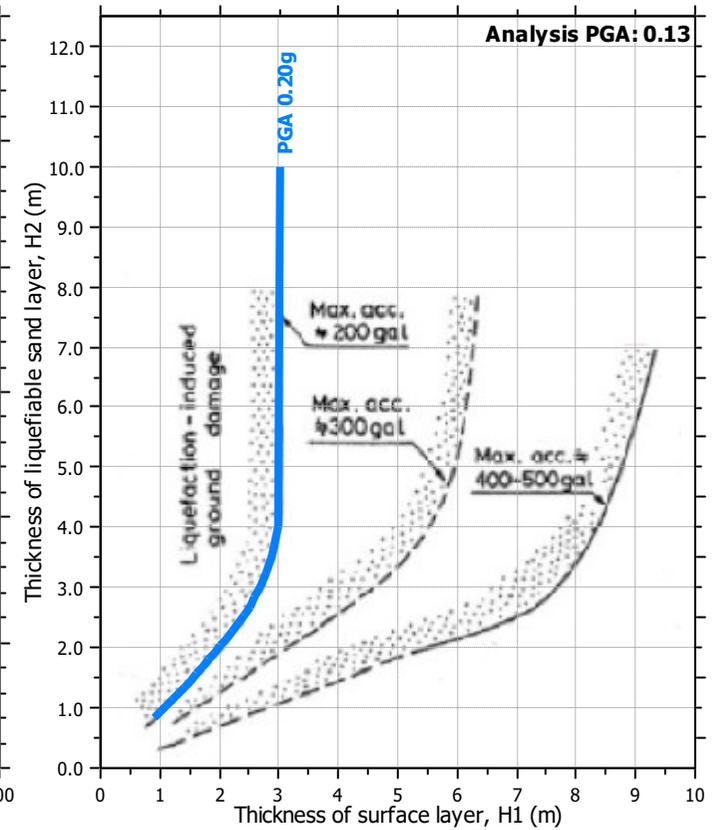
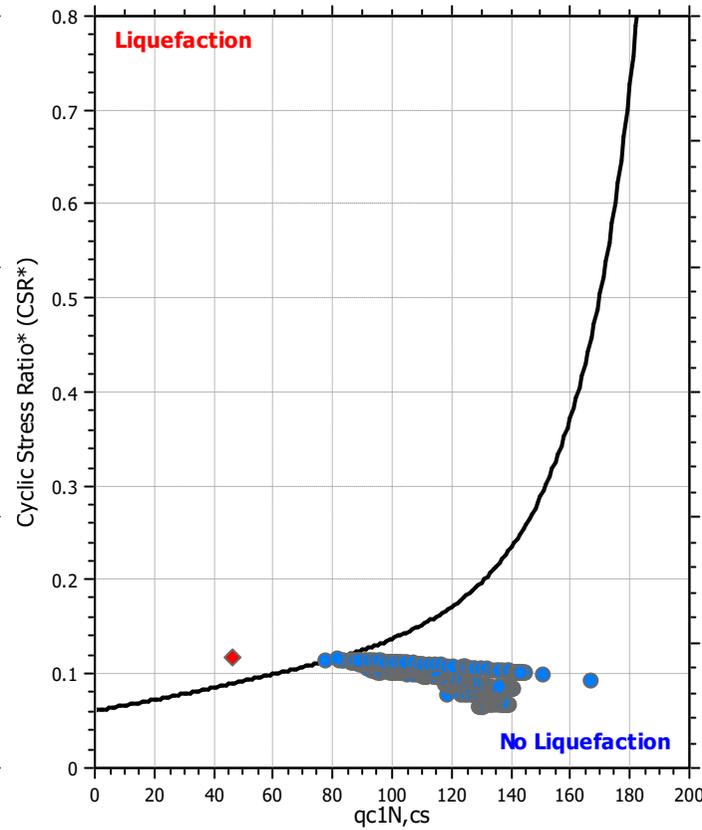
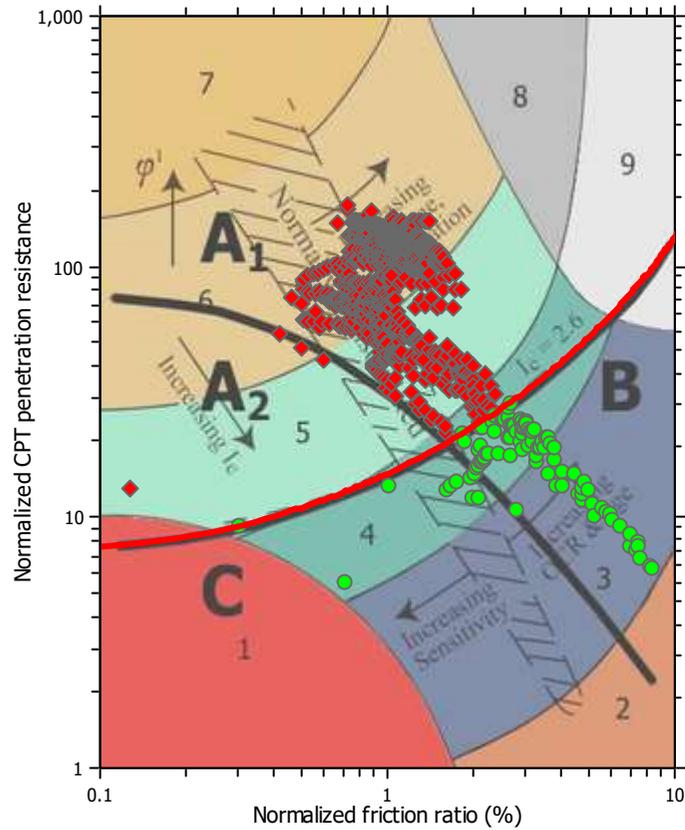
CPT file : 65-73 Ratanui Rd CPT21

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.80 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



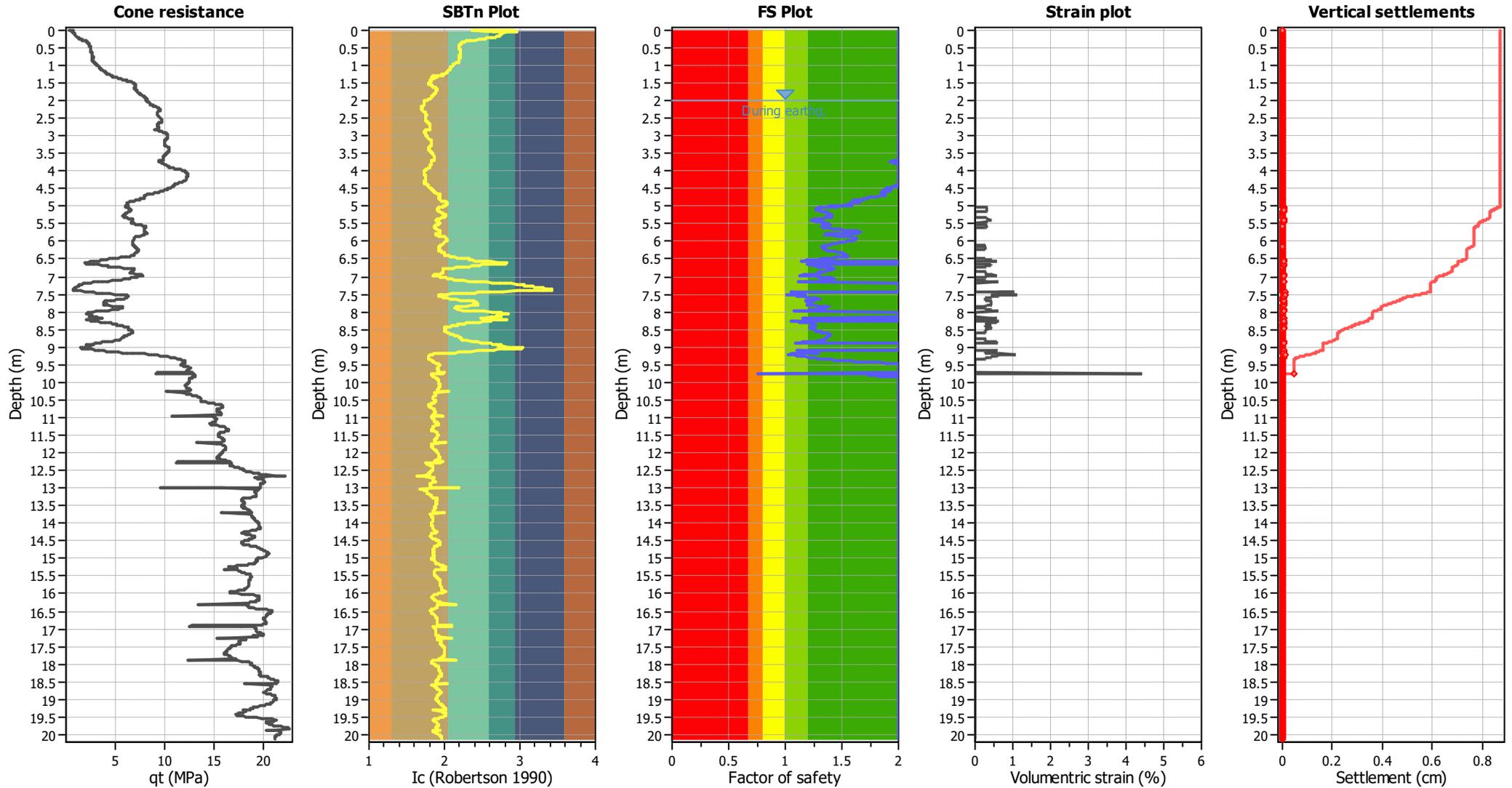
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.80 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

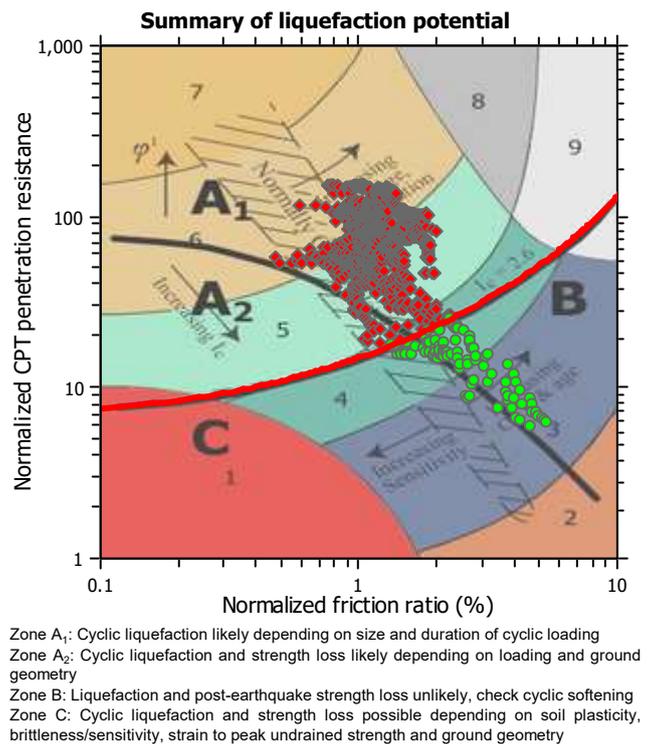
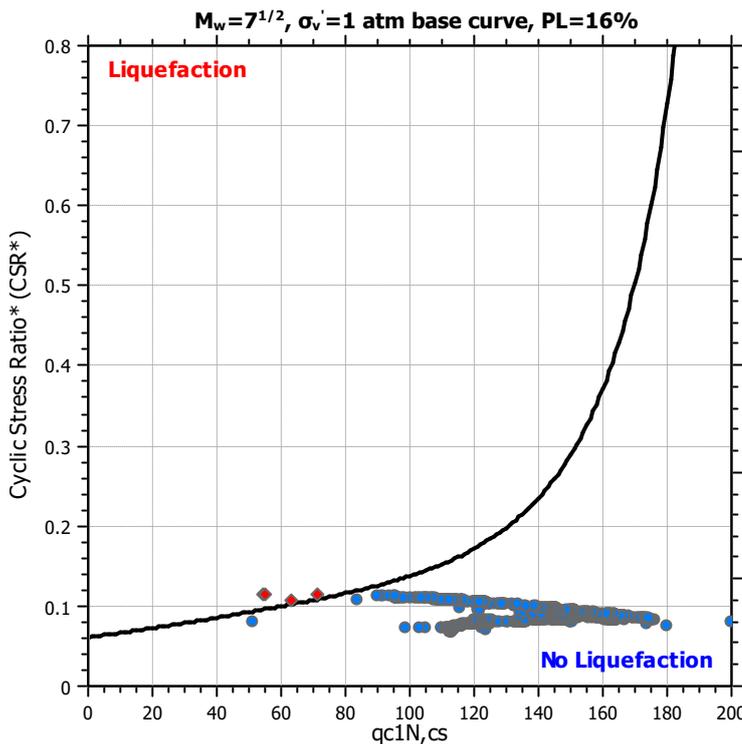
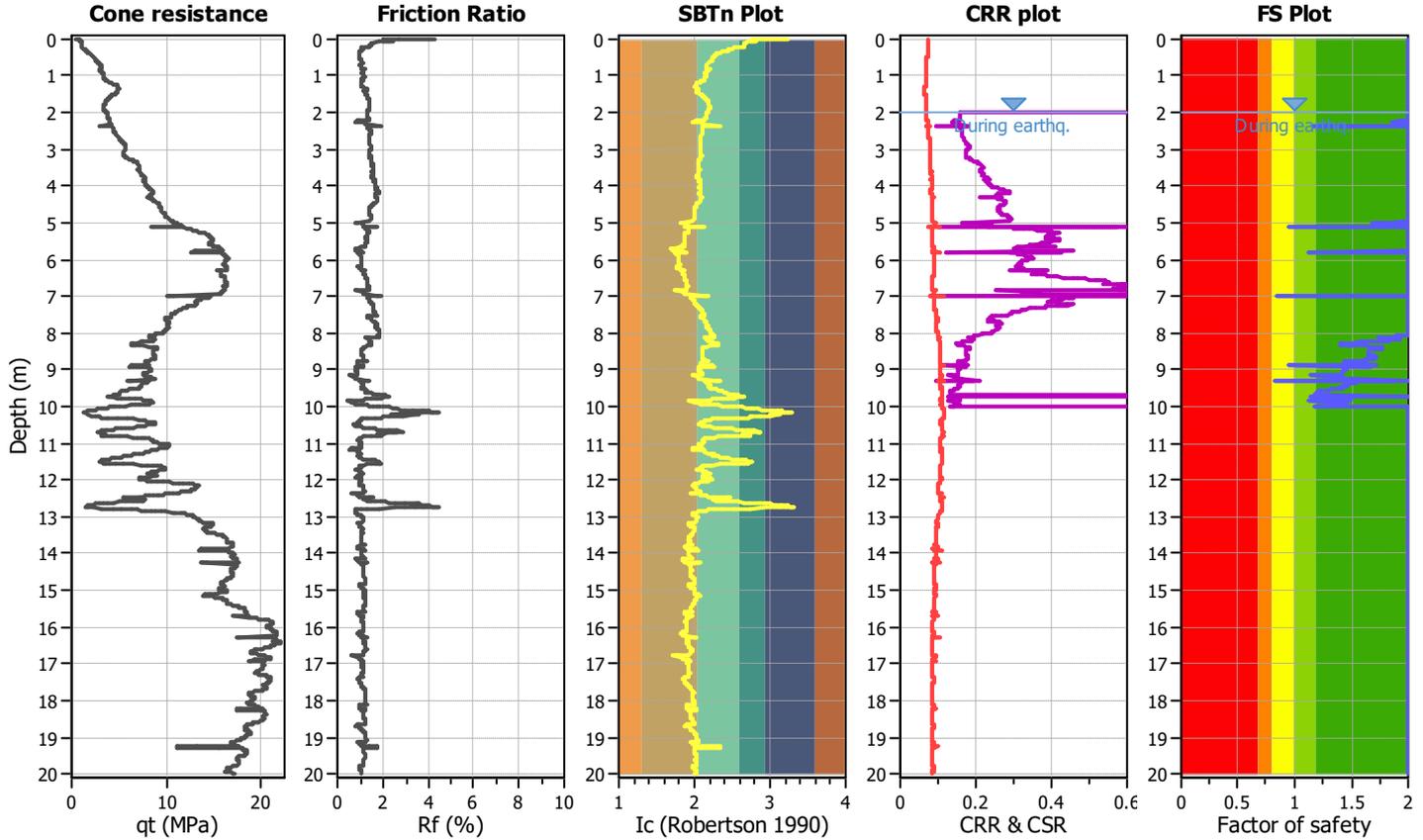
Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

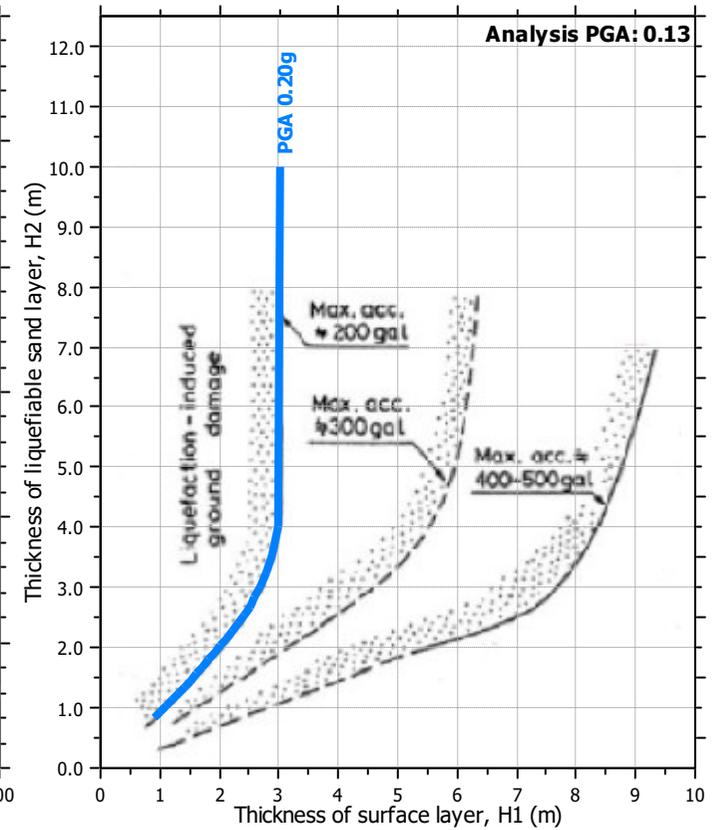
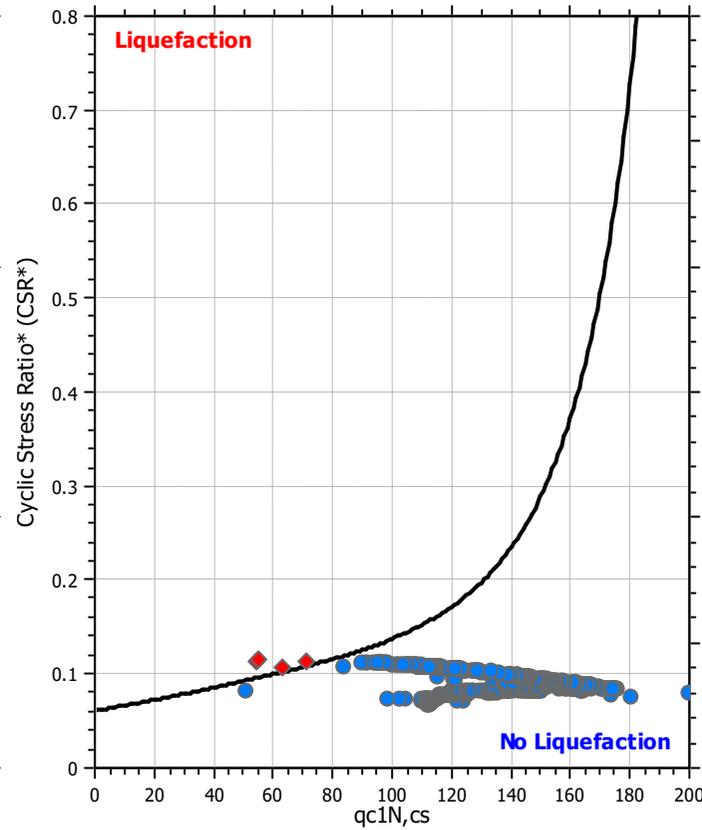
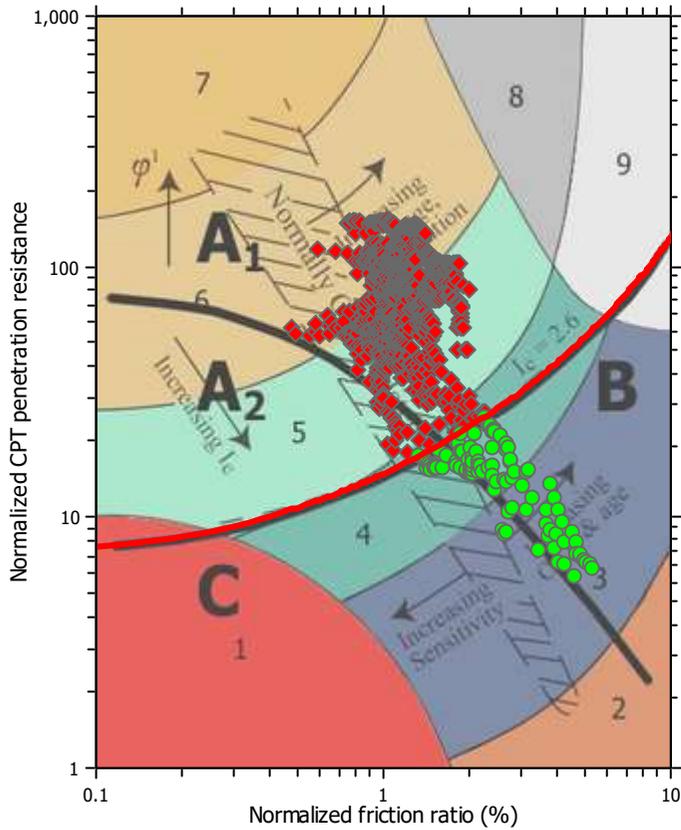
CPT file : 65-73 Ratanui Rd CPT22

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.13	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



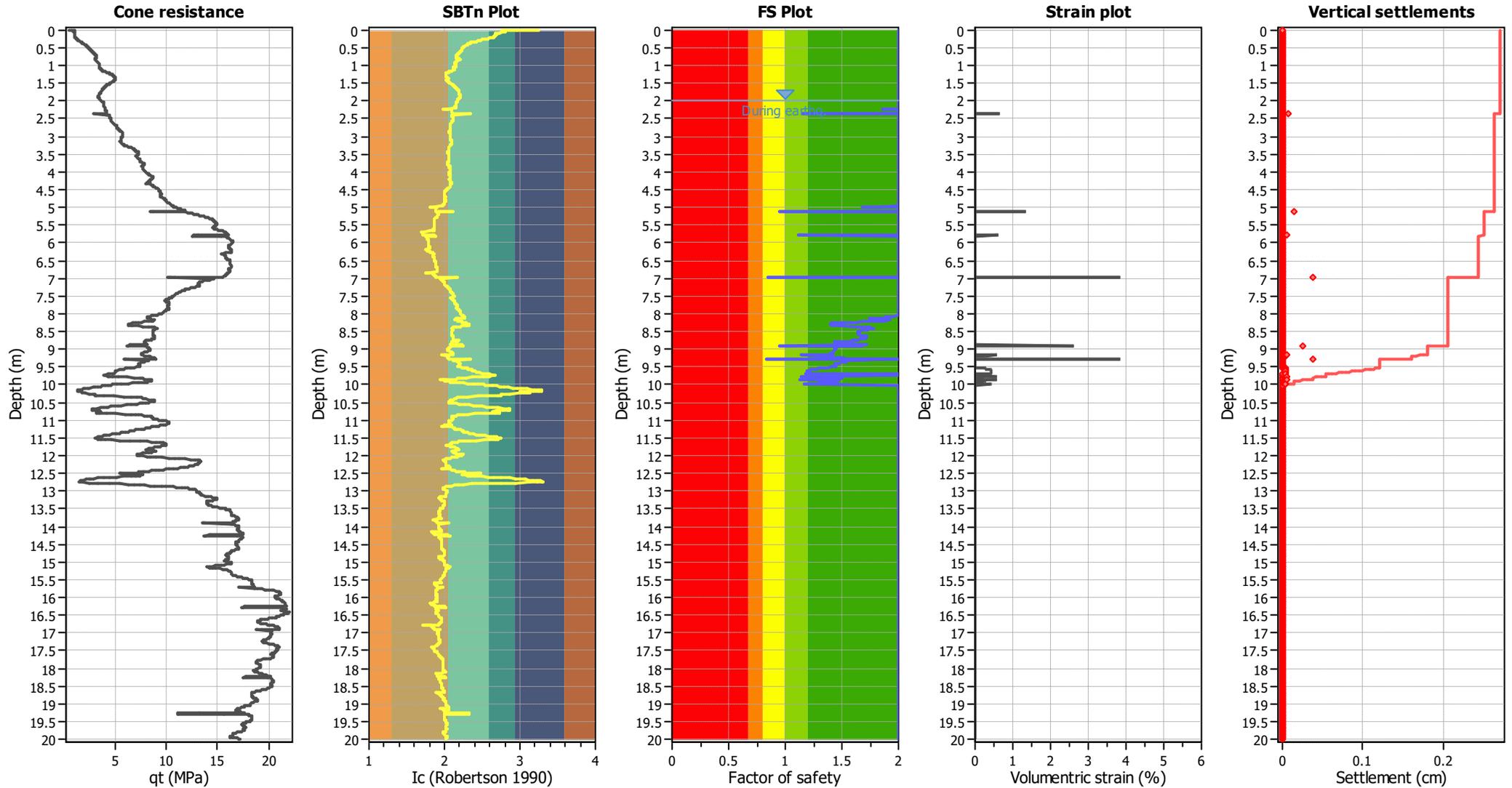
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

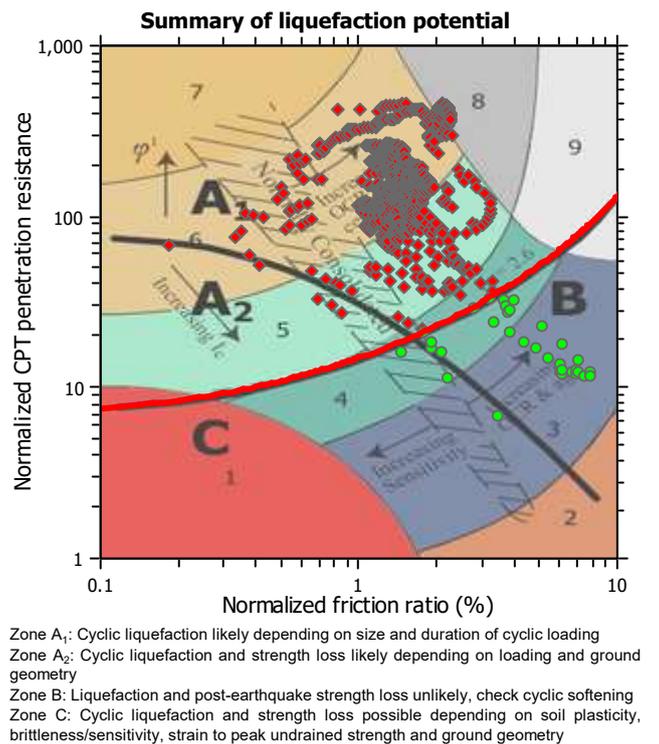
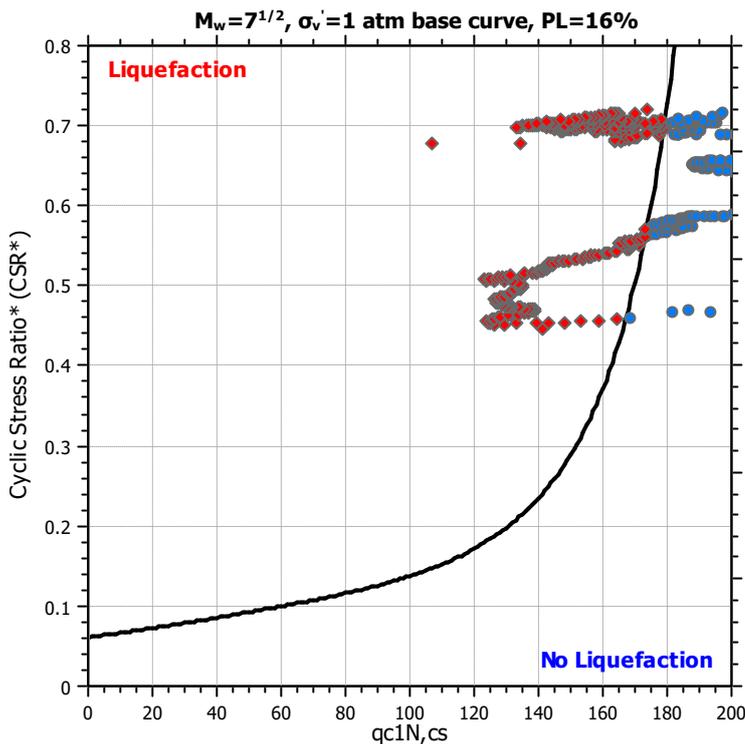
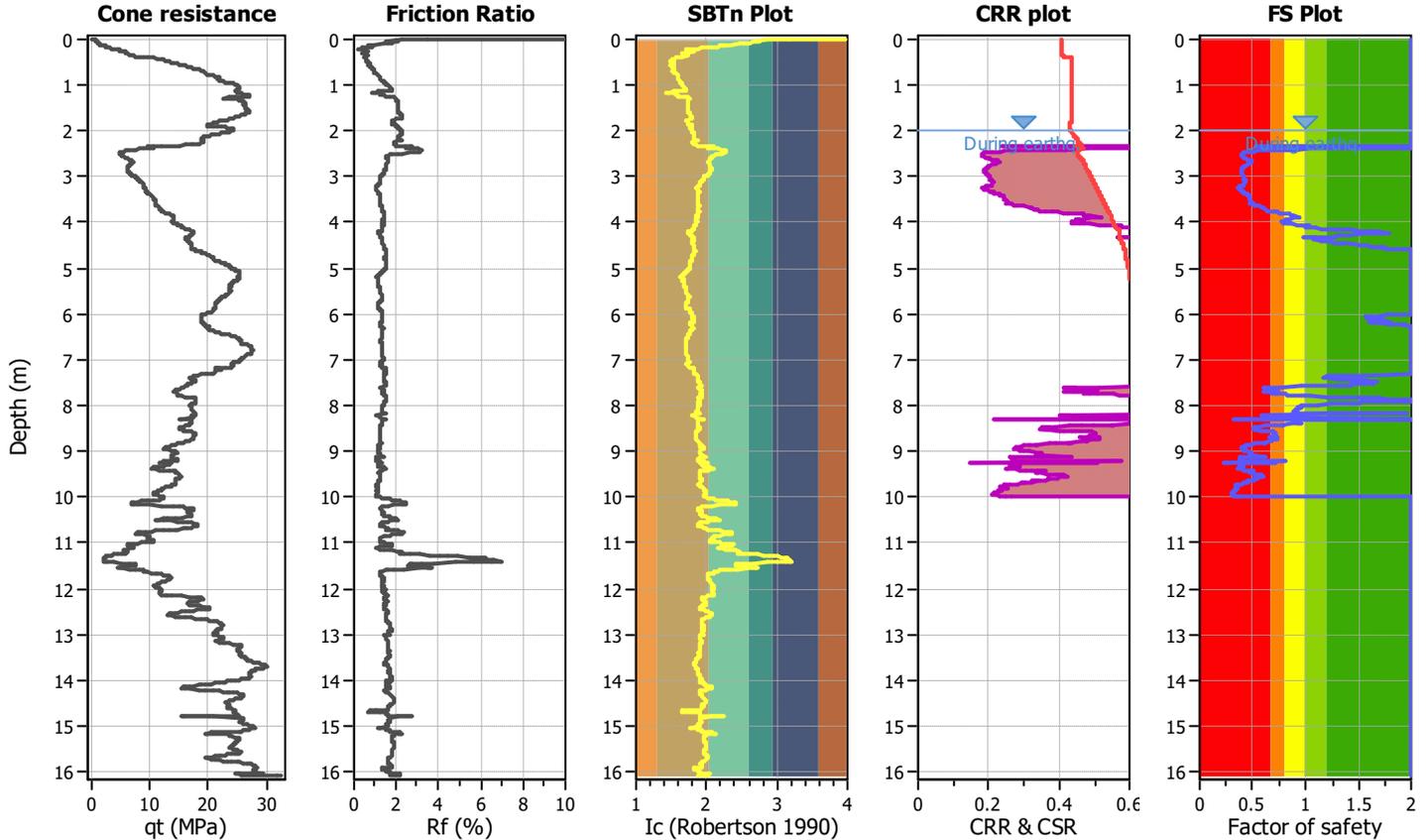
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparamu - 500yr
CPT file : 65 Ratanui Rd CPT01

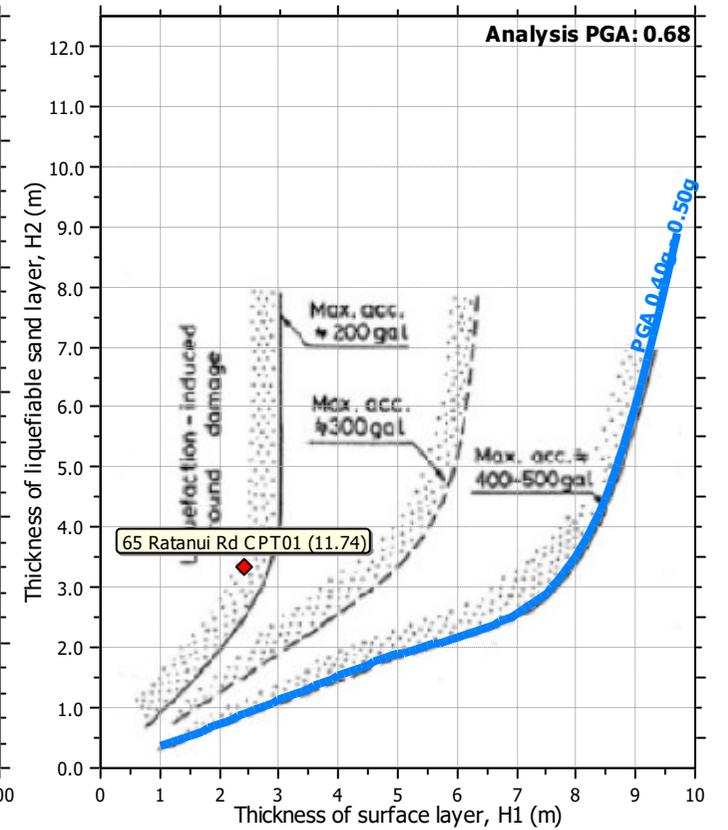
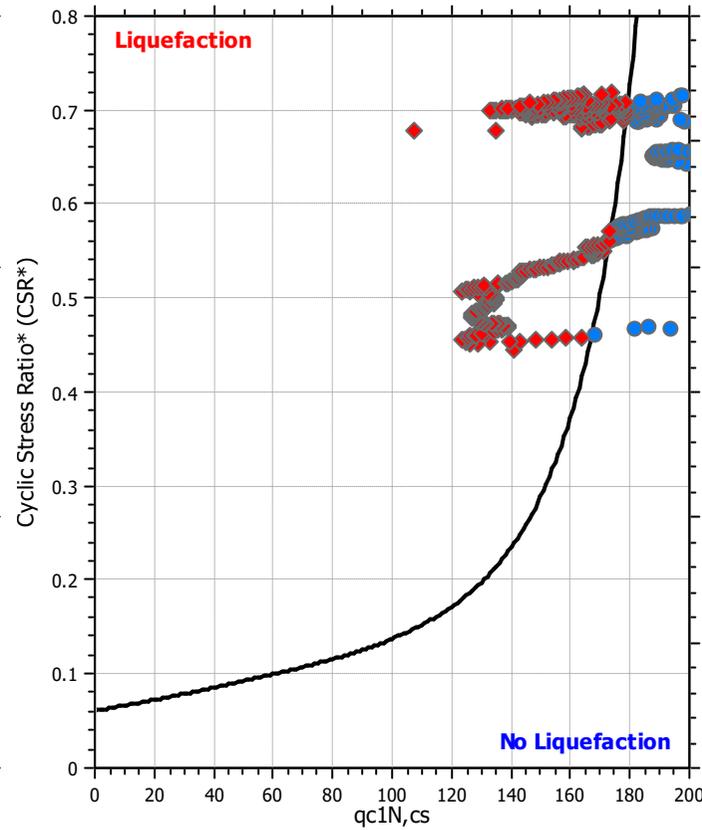
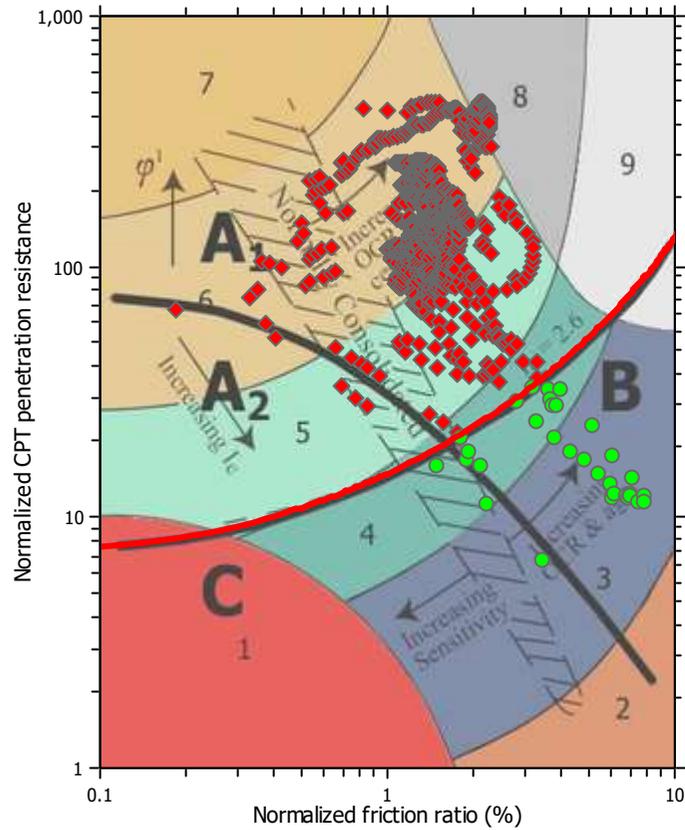
Location : 65 & 73 Ratanui Road, Paraparamu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



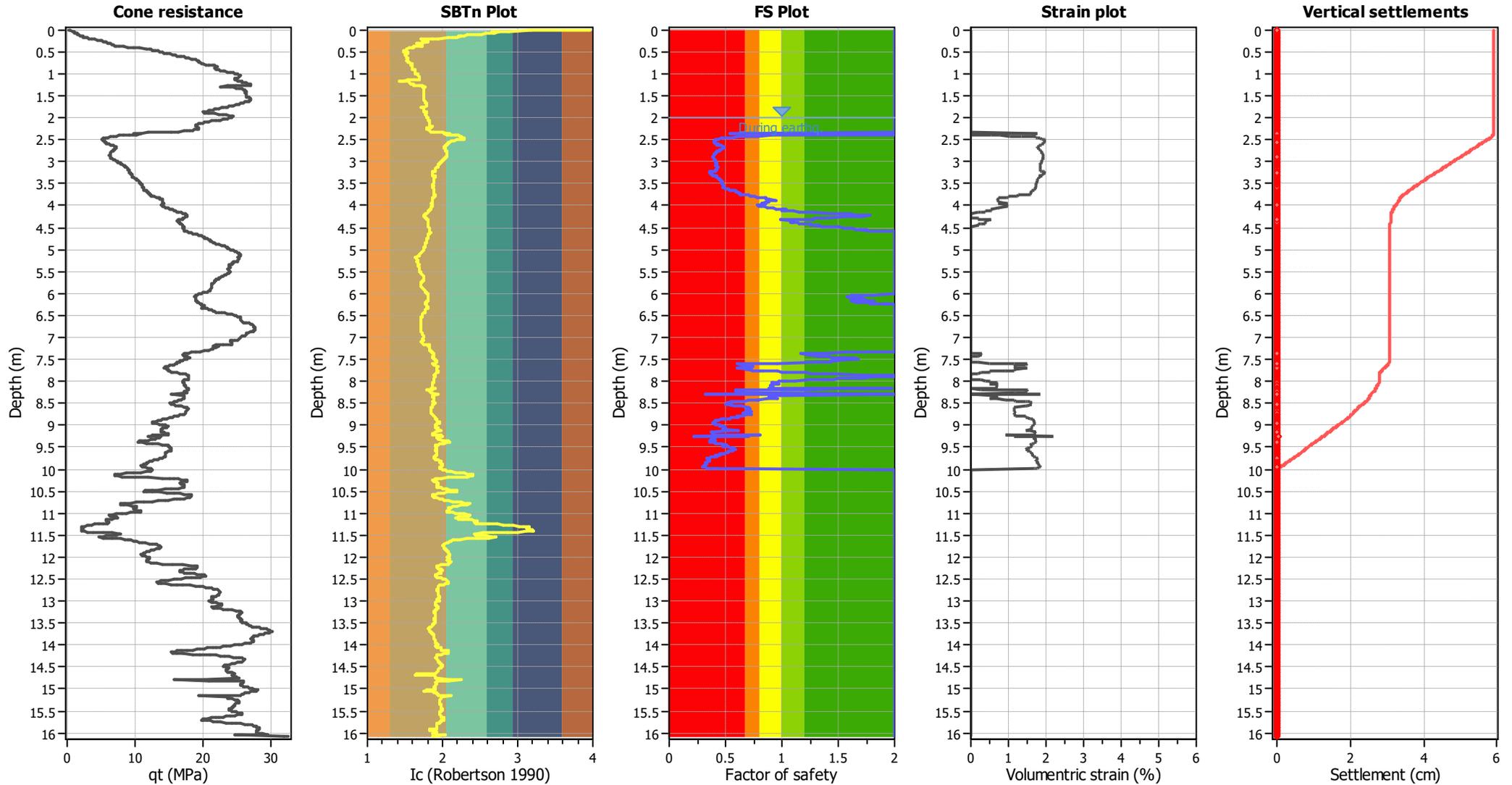
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

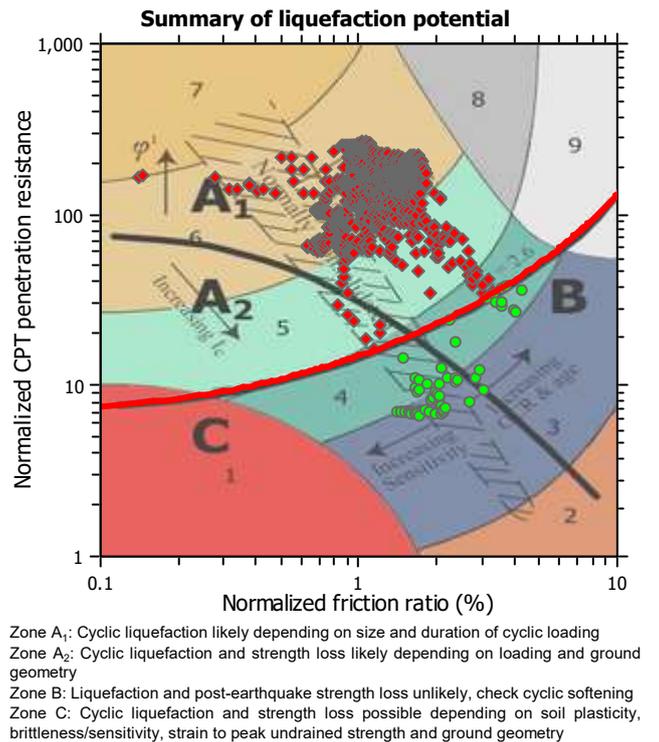
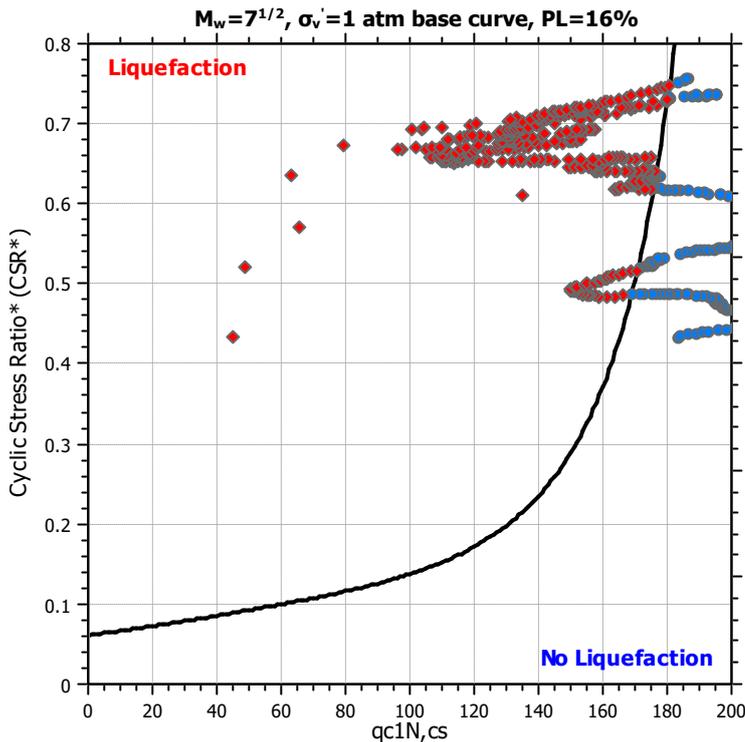
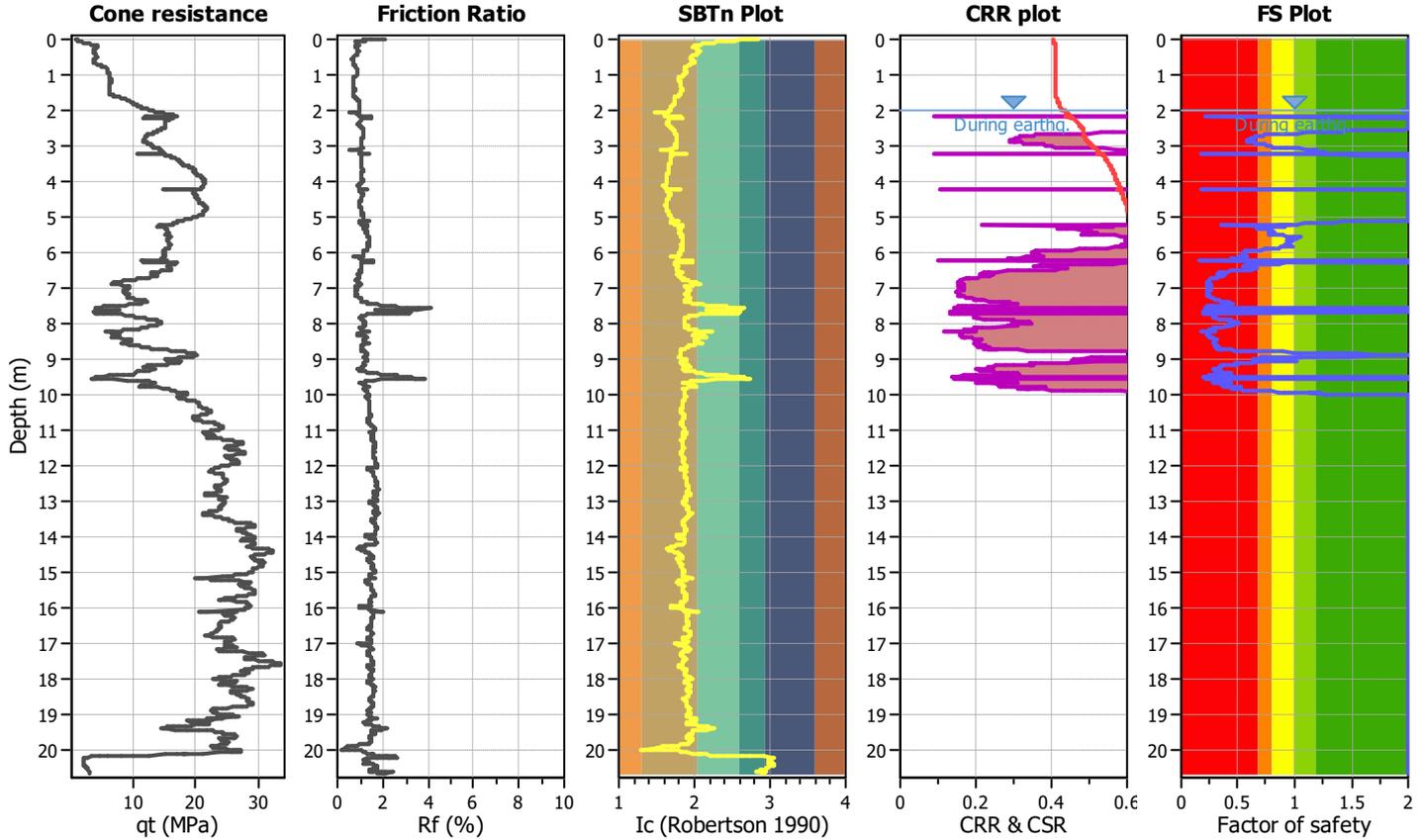
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65 Ratanui Rd CPT02

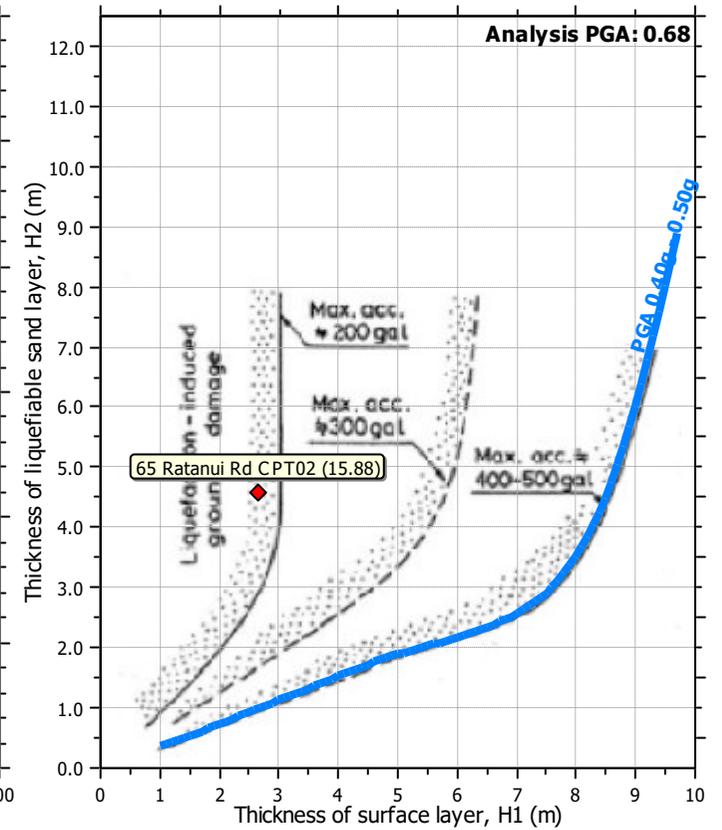
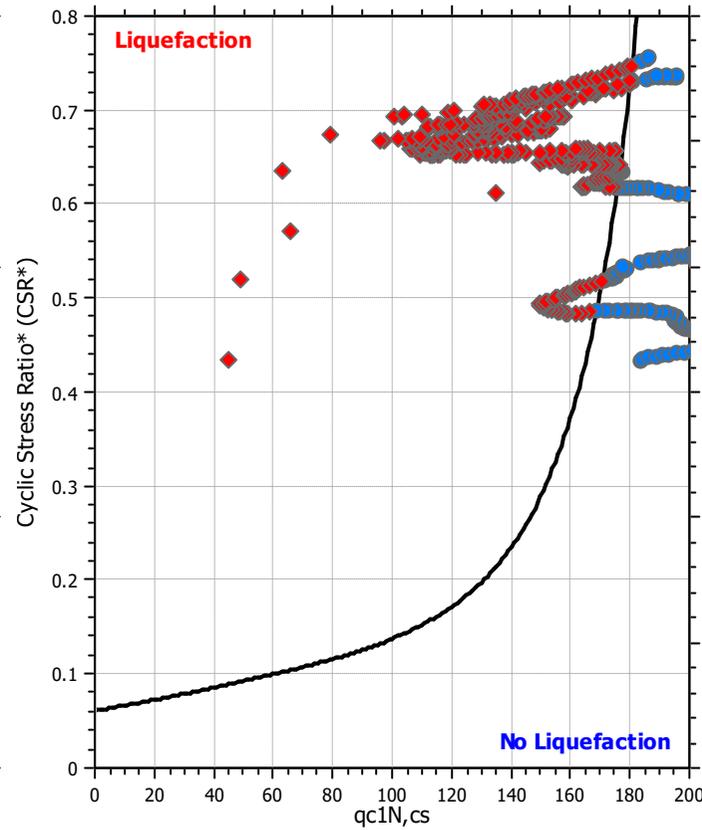
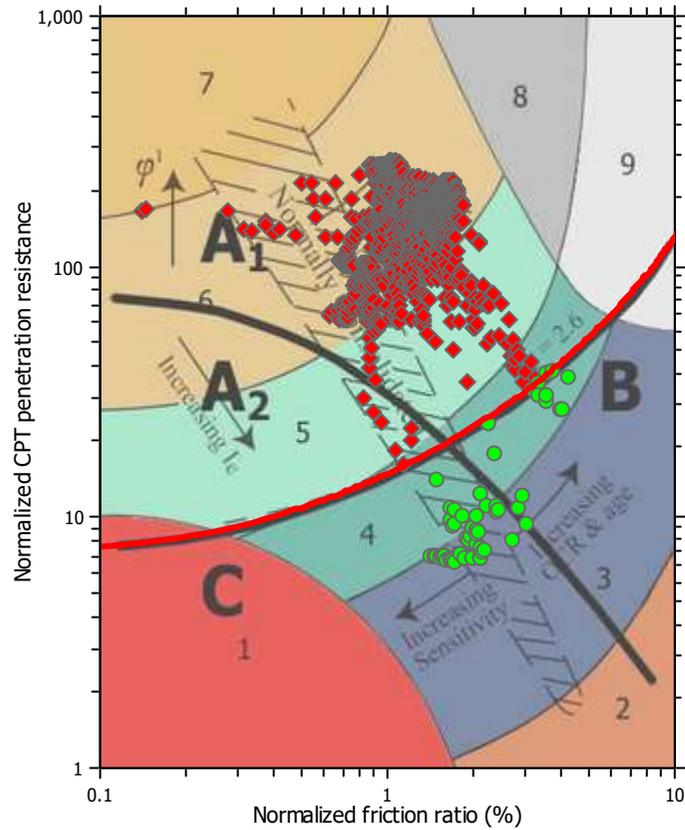
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



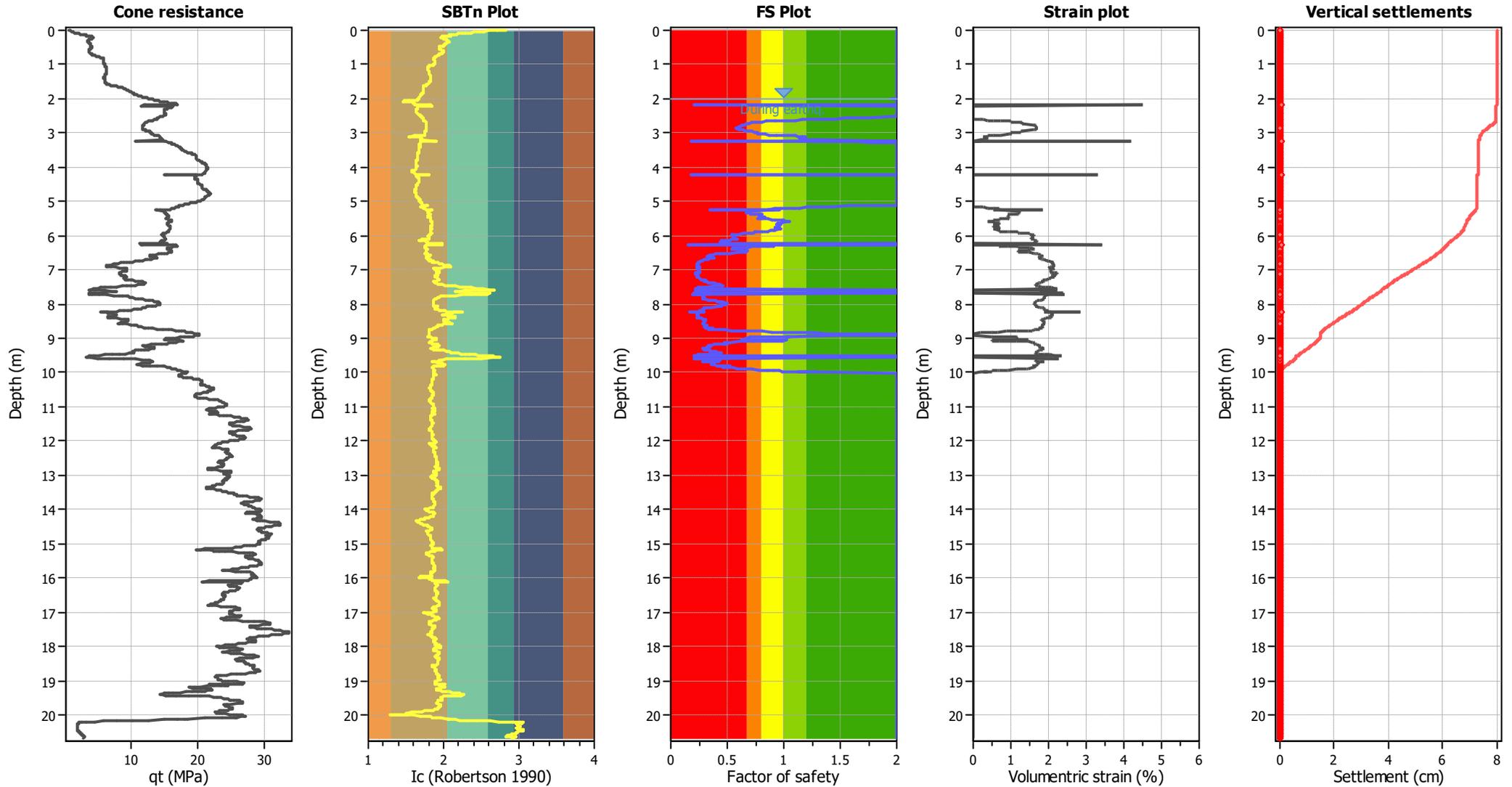
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

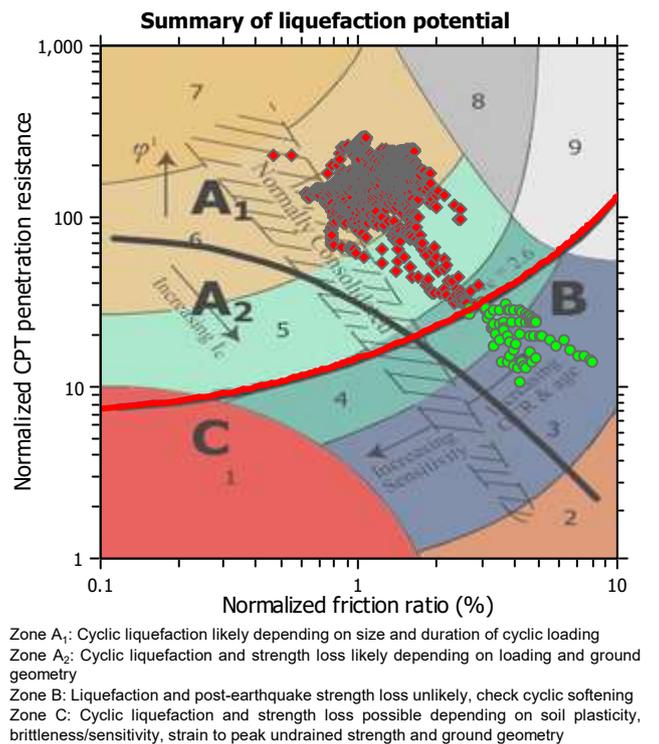
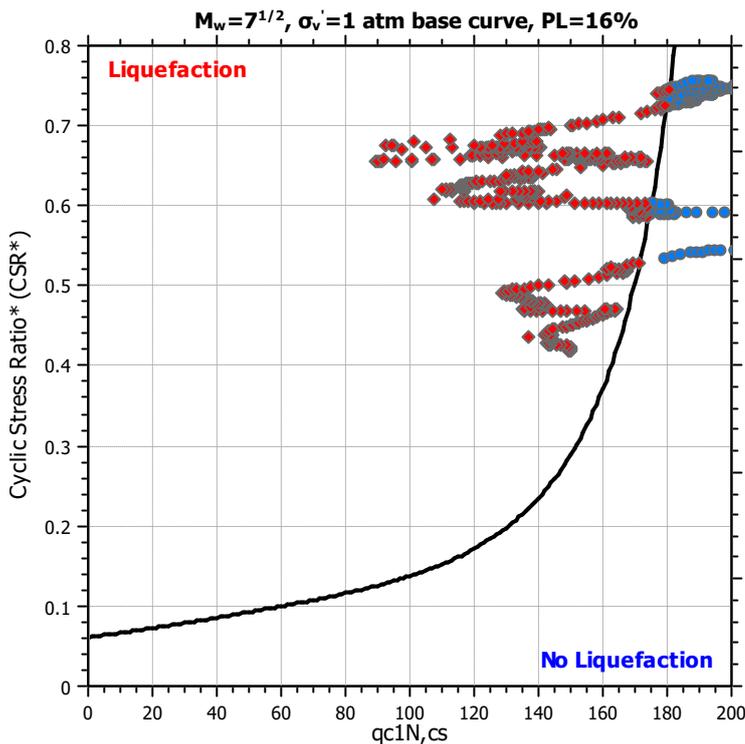
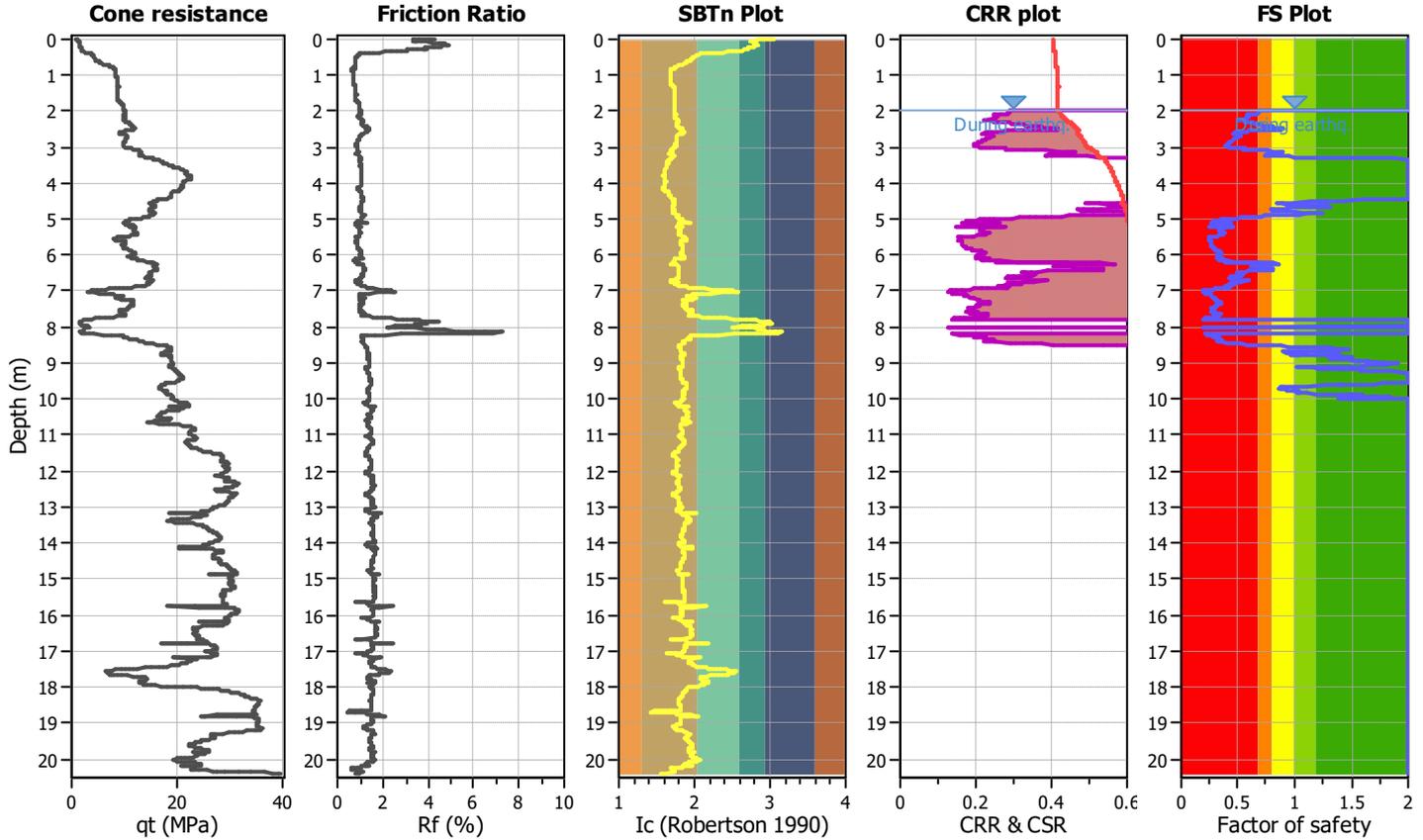
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparamu - 500yr
CPT file : 65 Ratanui Rd CPT03

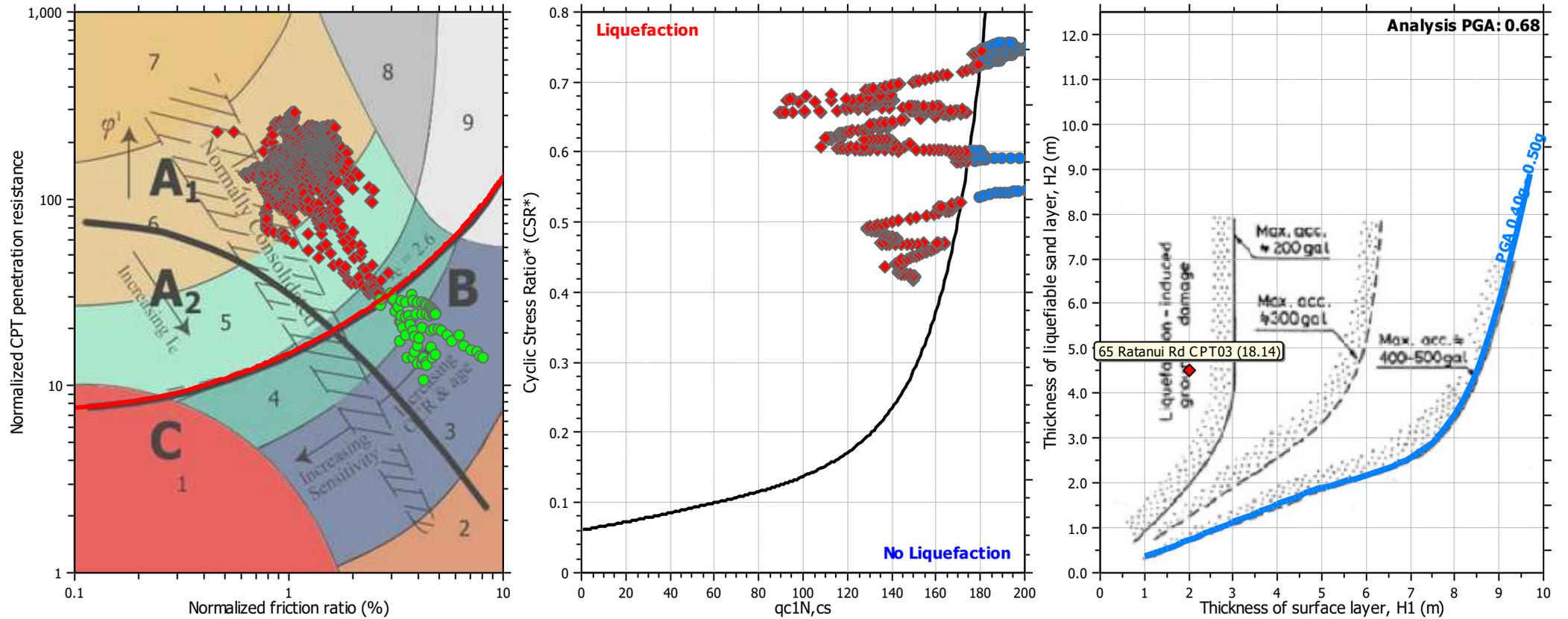
Location : 65 & 73 Ratanui Road, Paraparamu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



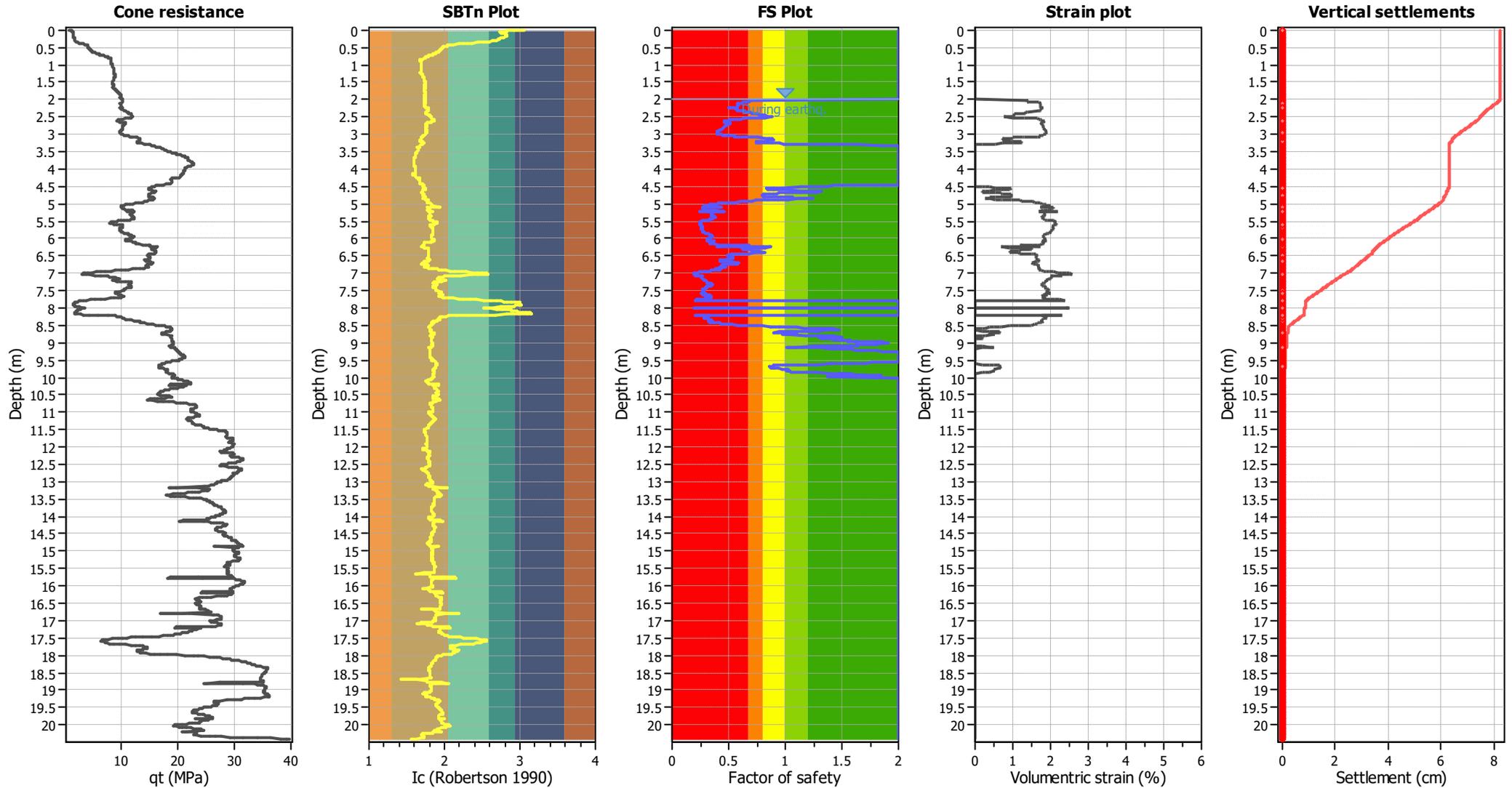
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

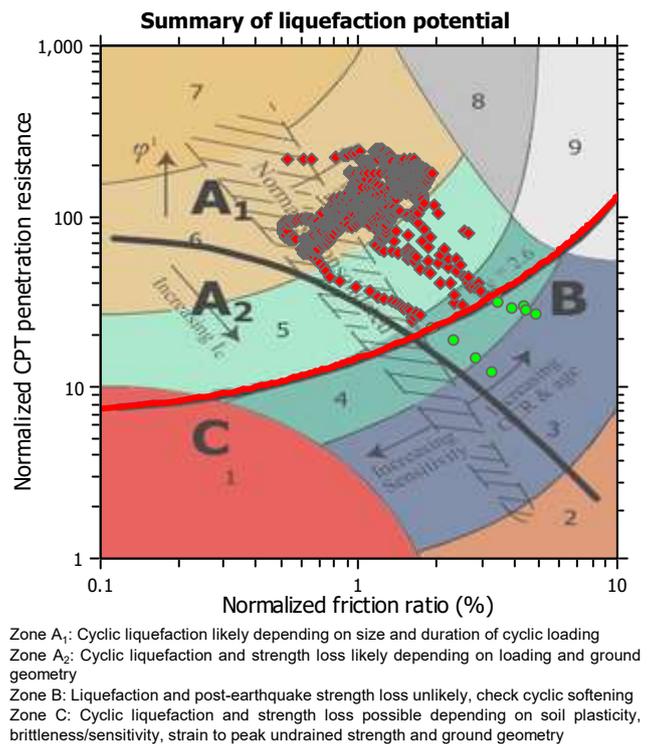
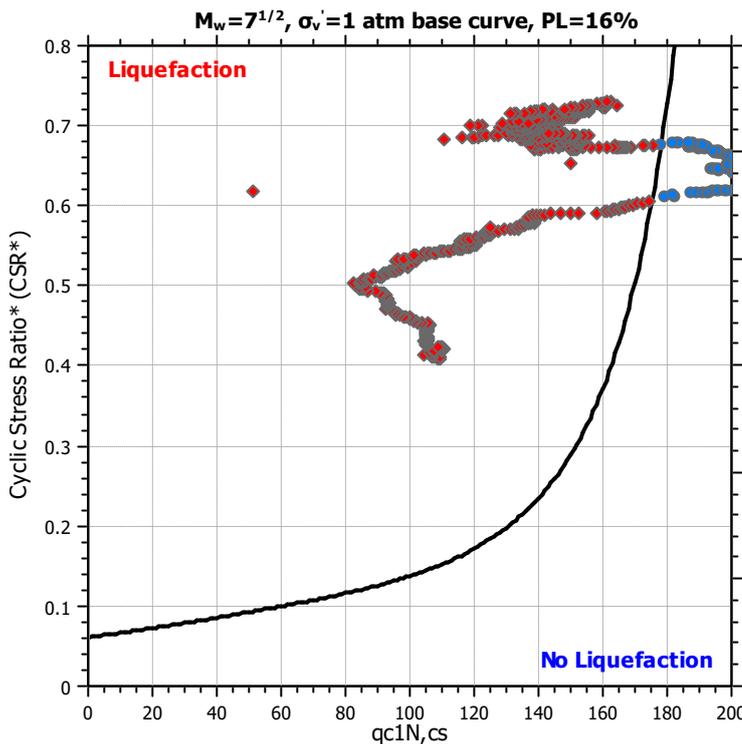
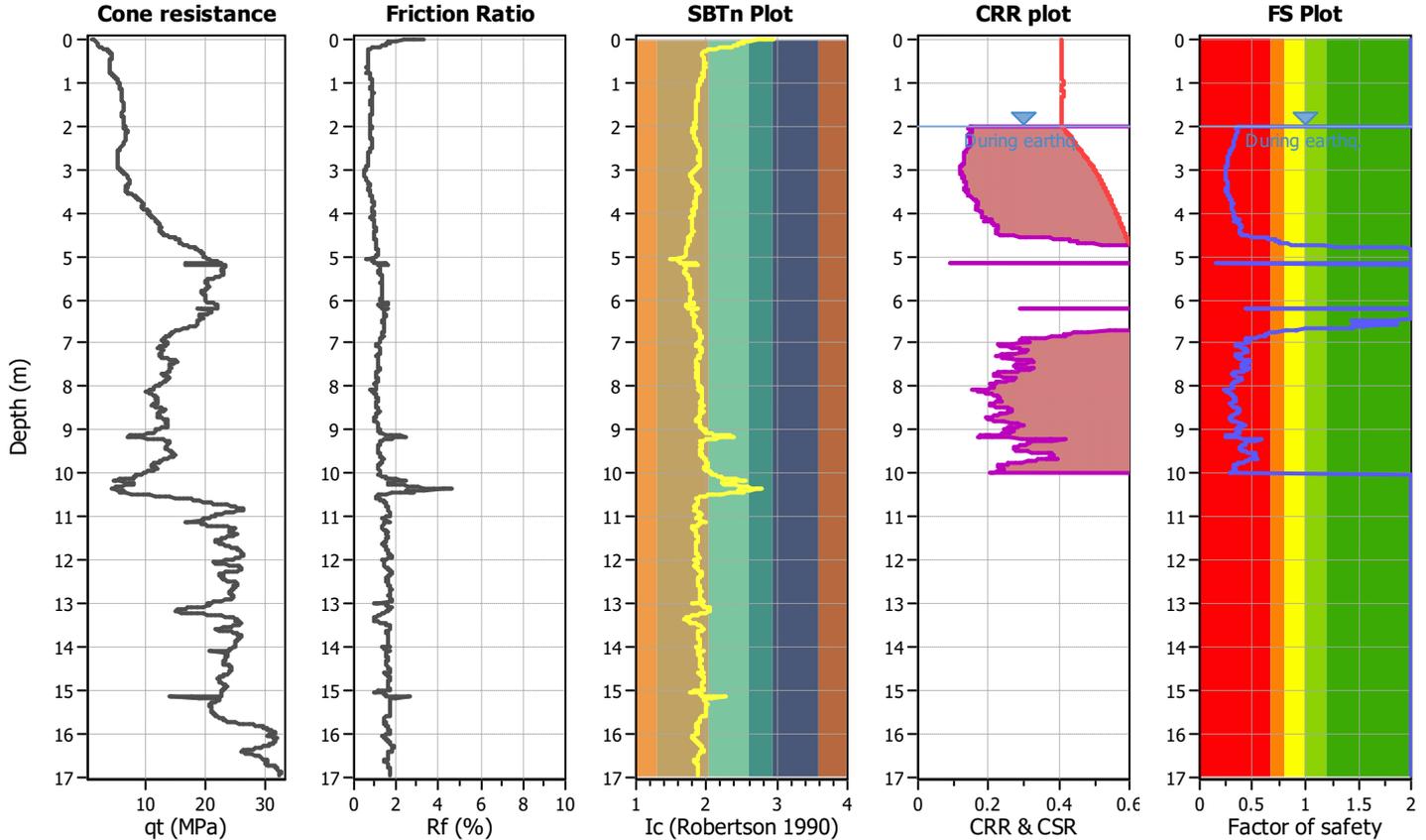
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65 Ratanui Rd CPT04

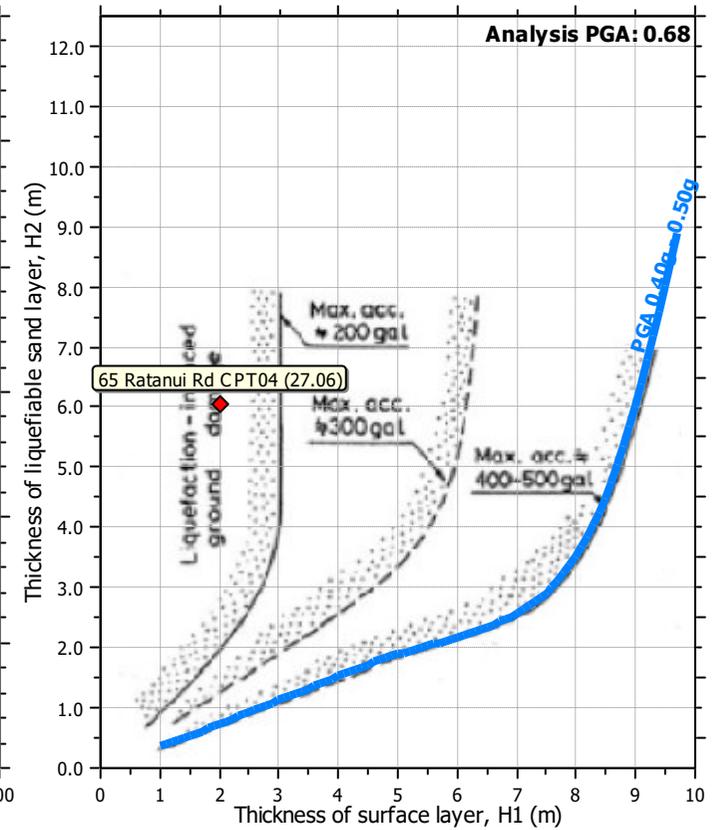
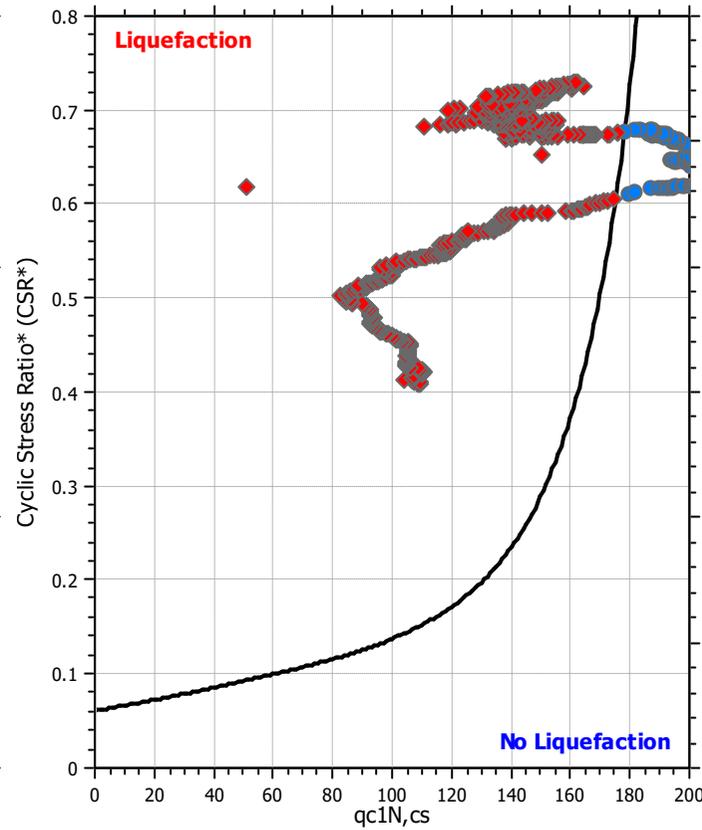
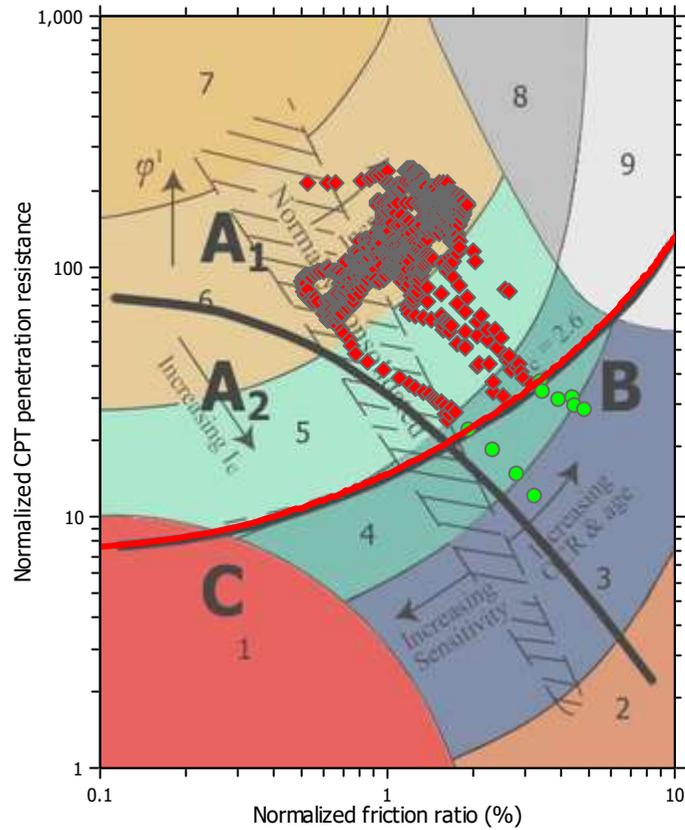
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



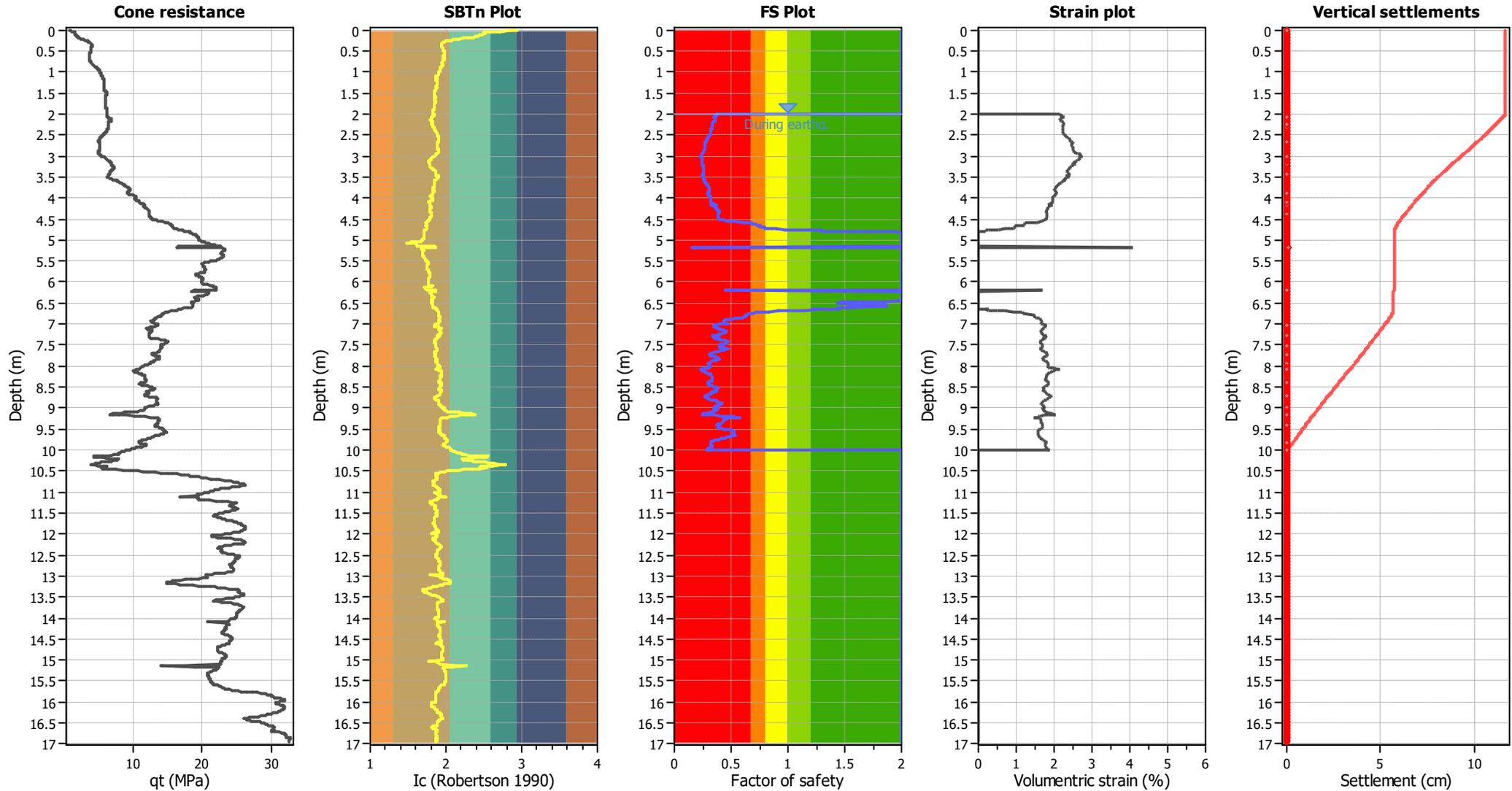
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

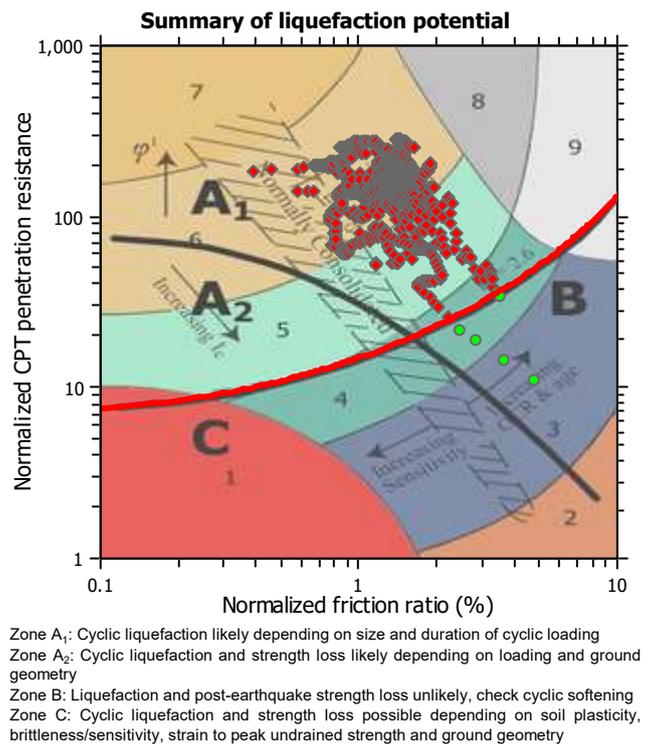
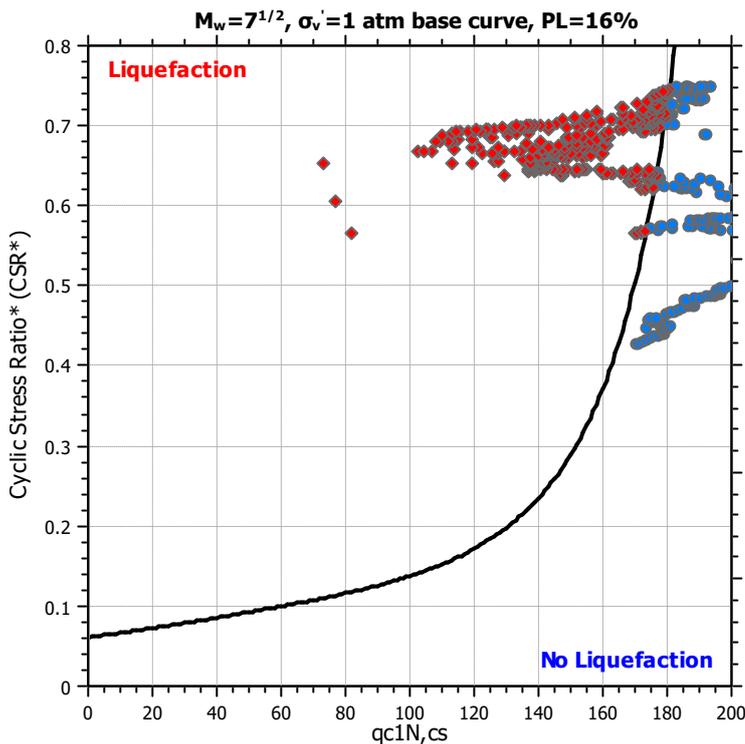
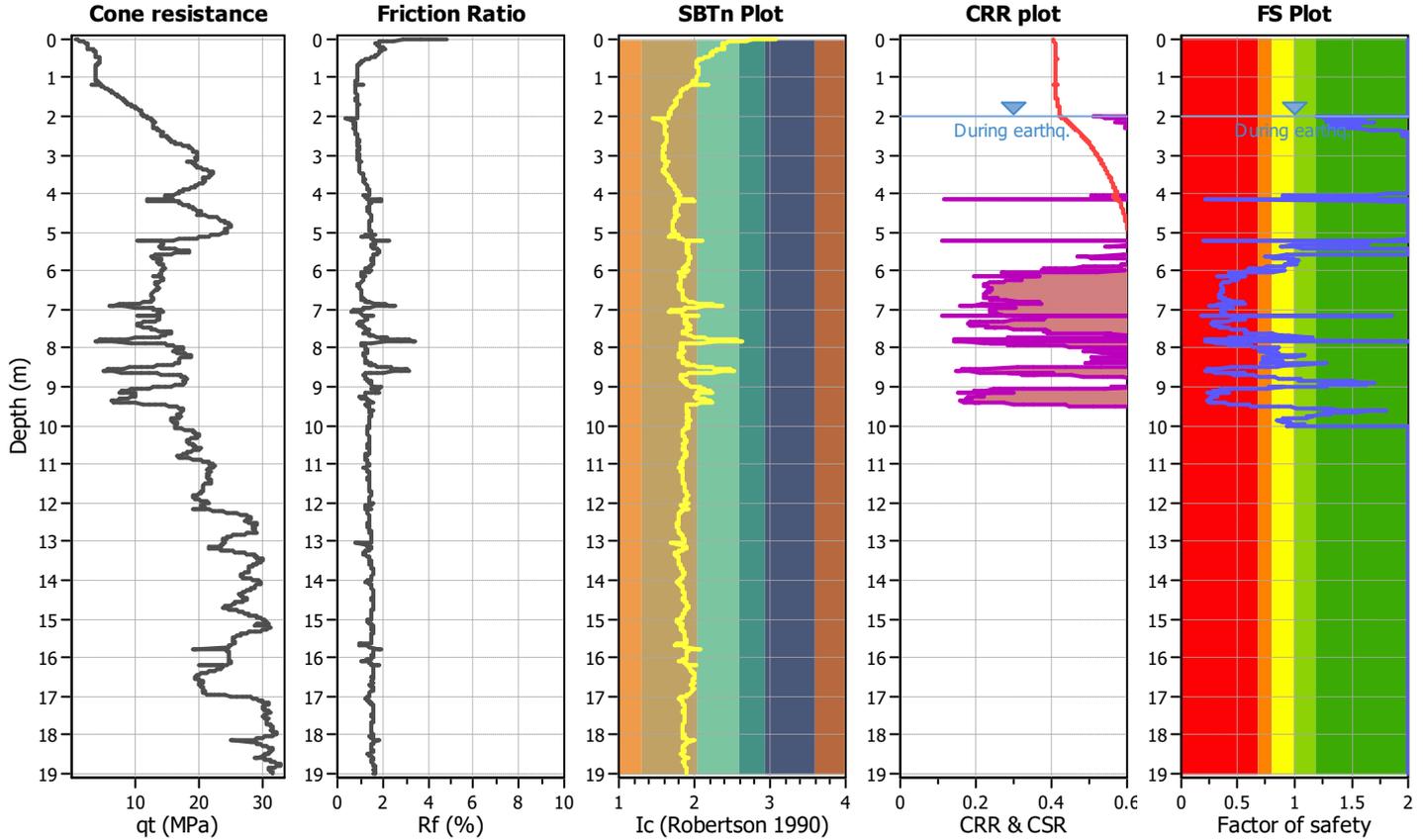
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65 Ratanui Rd CPT05

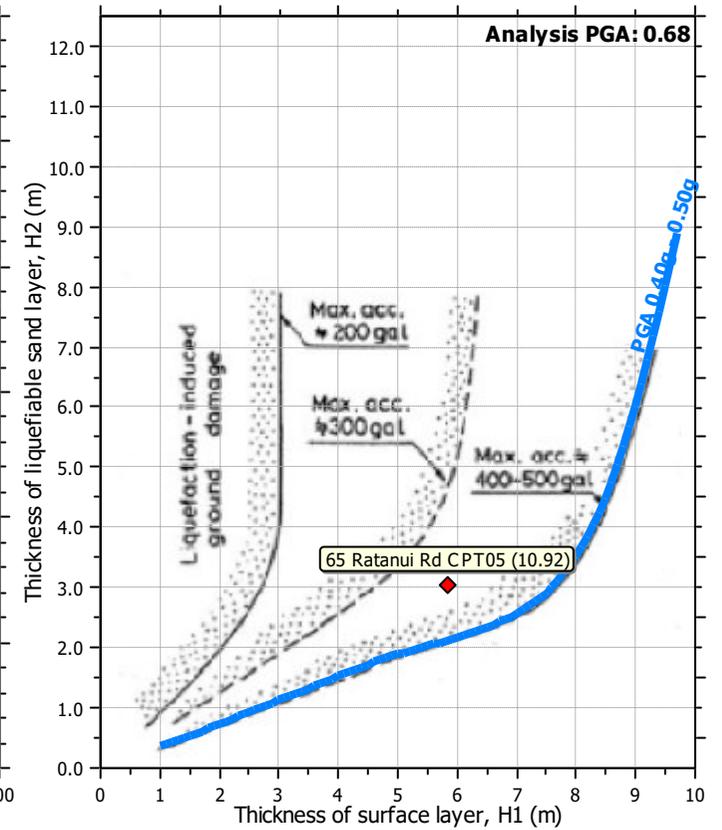
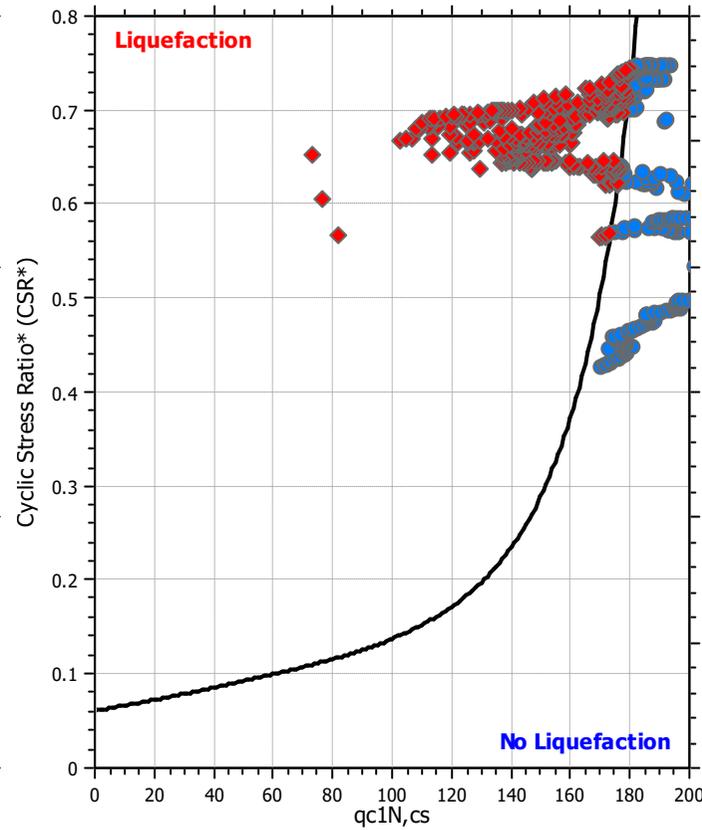
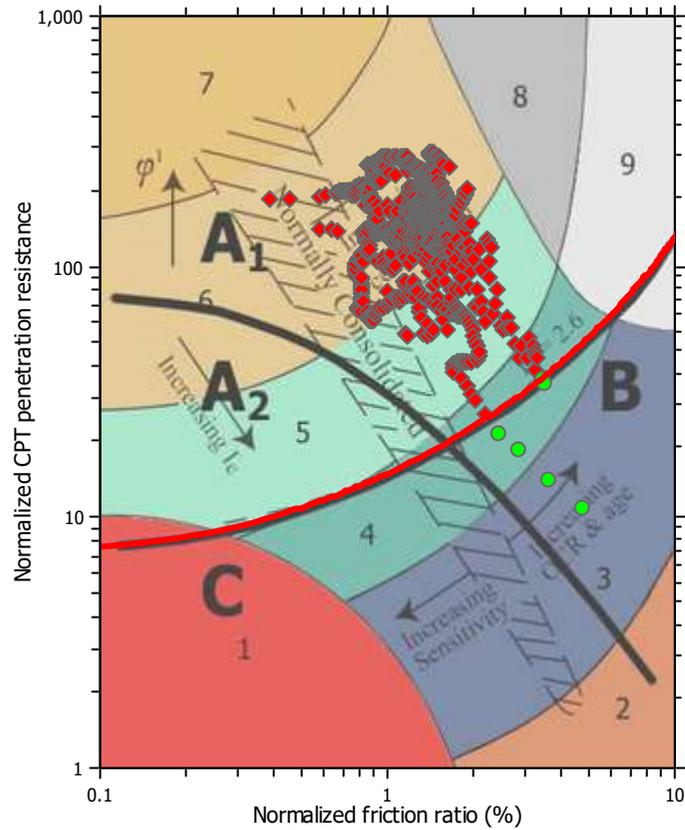
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.20 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



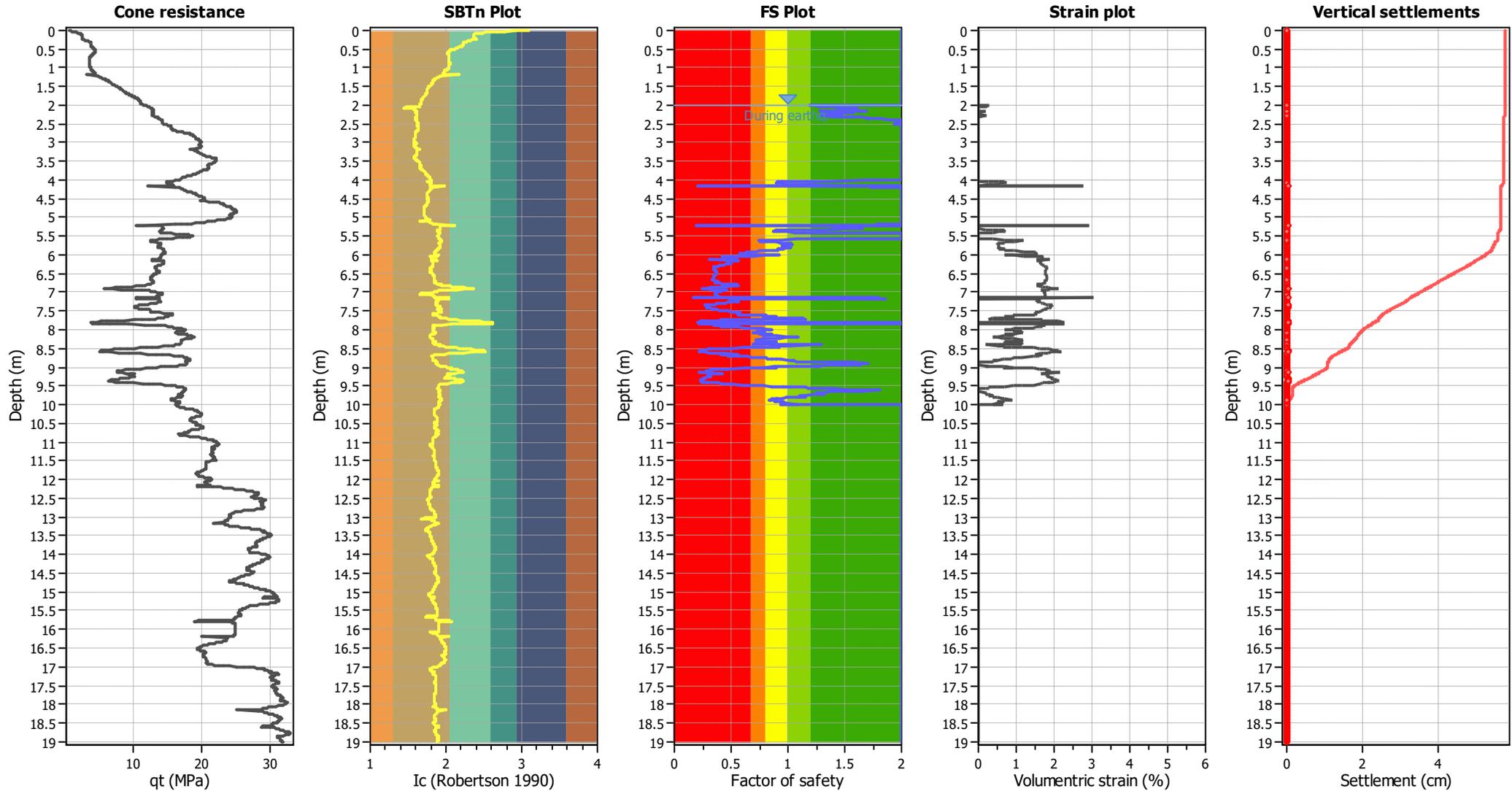
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.20 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

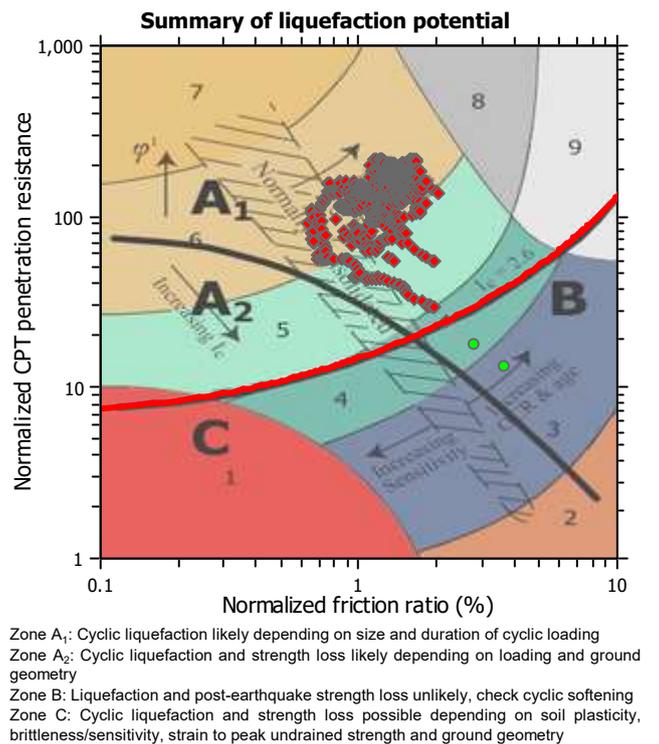
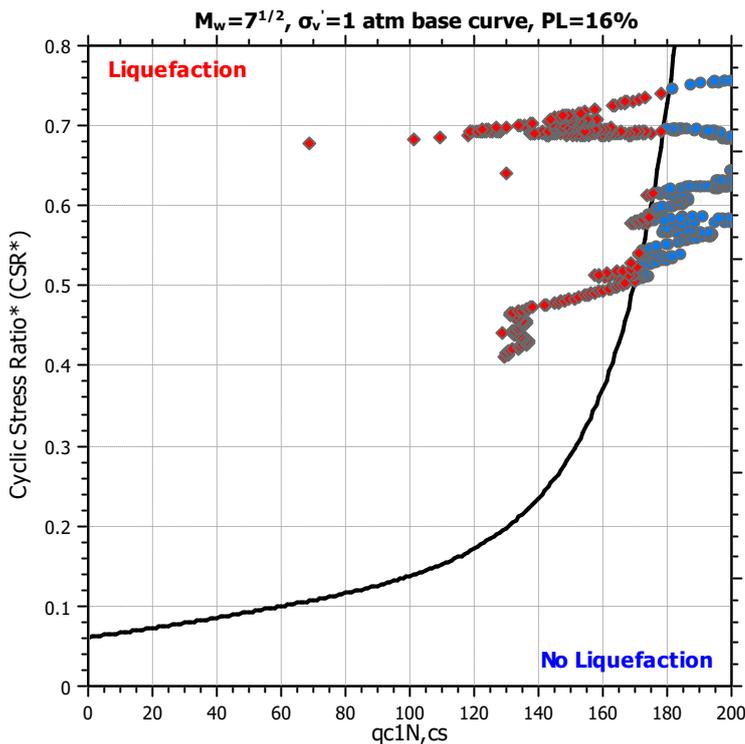
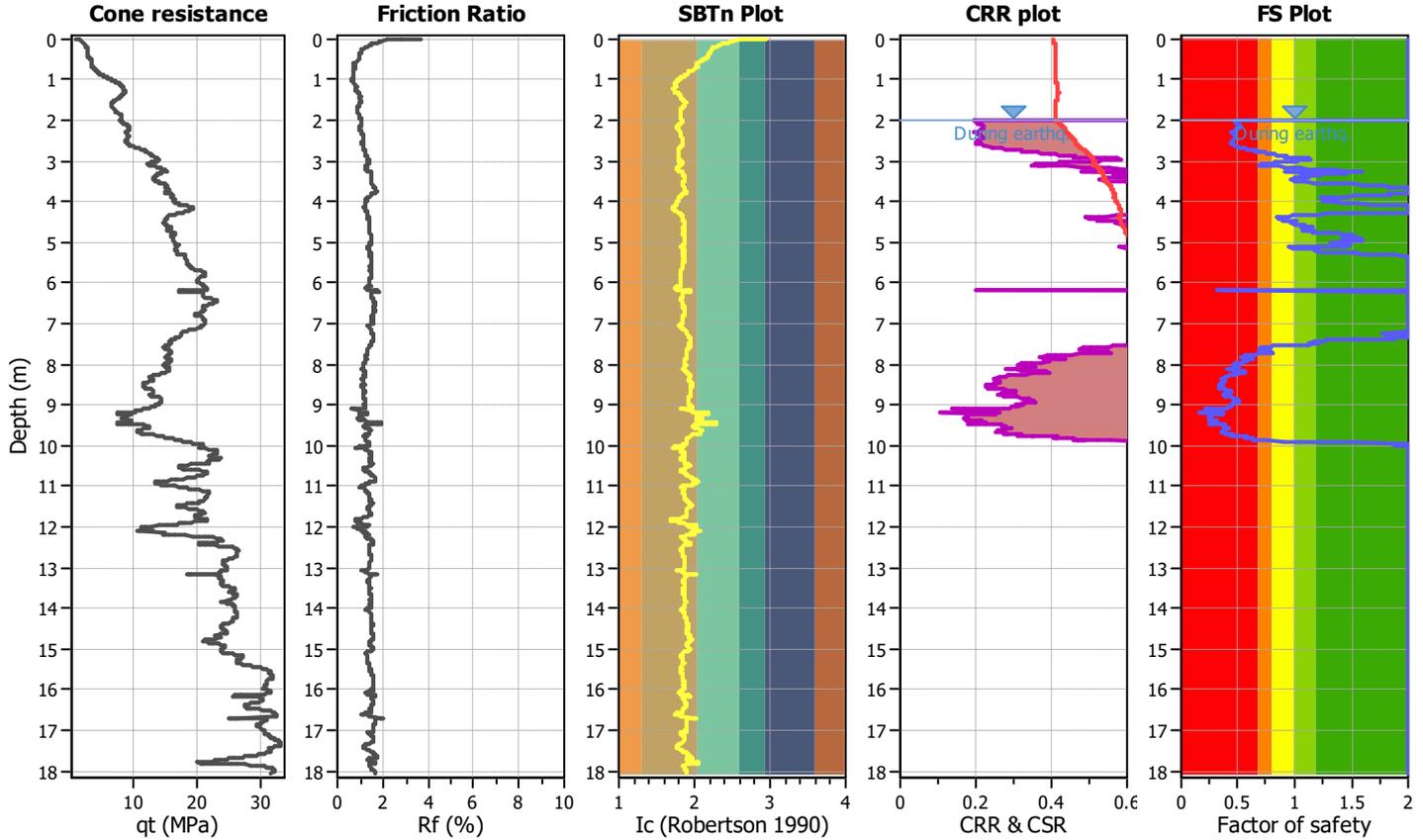
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65 Ratanui Rd CPT06

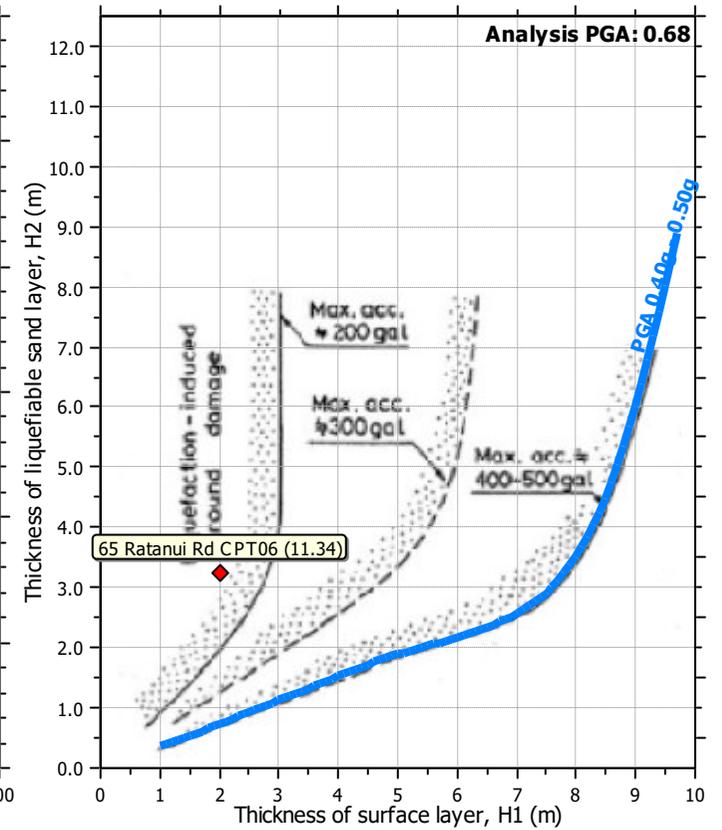
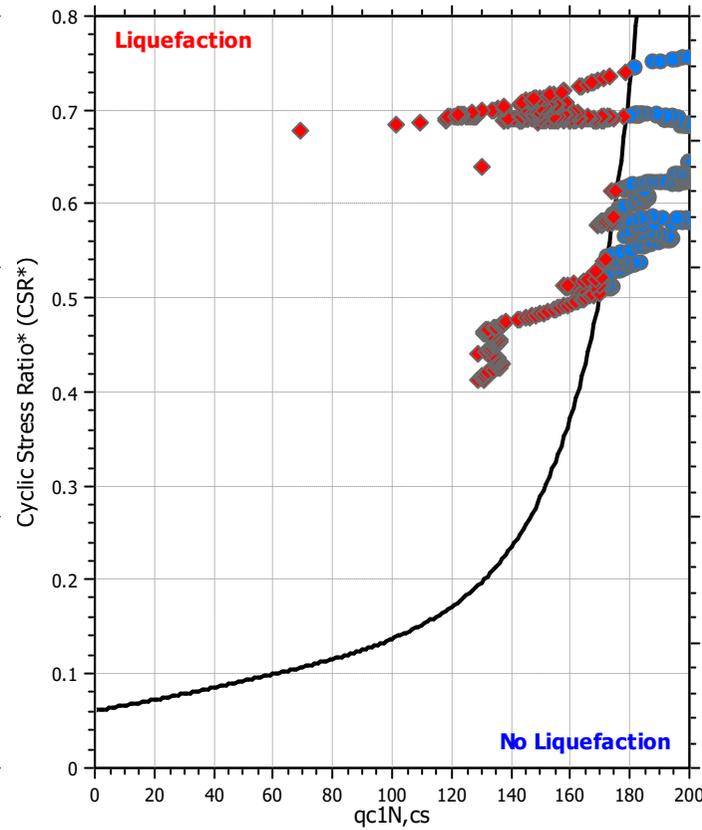
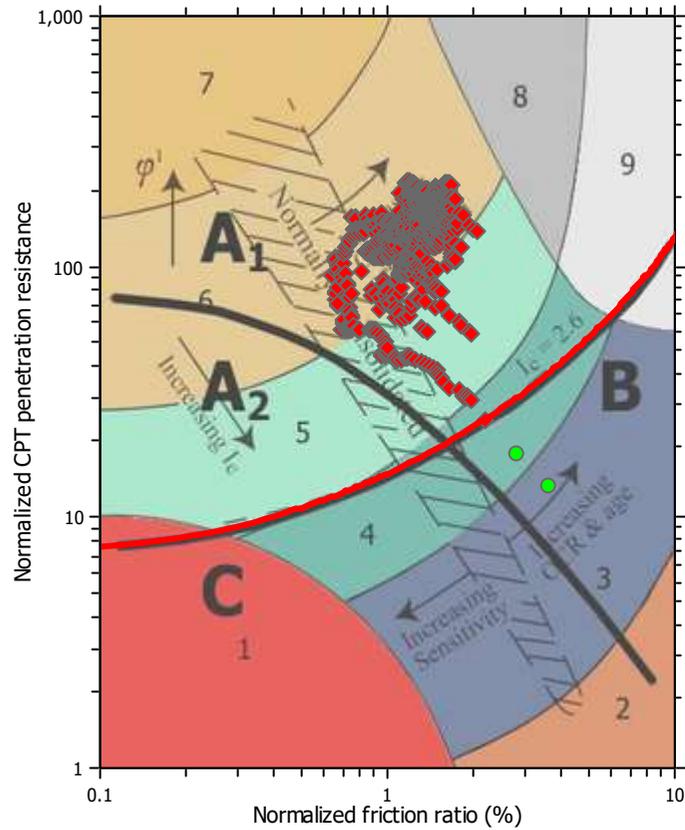
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



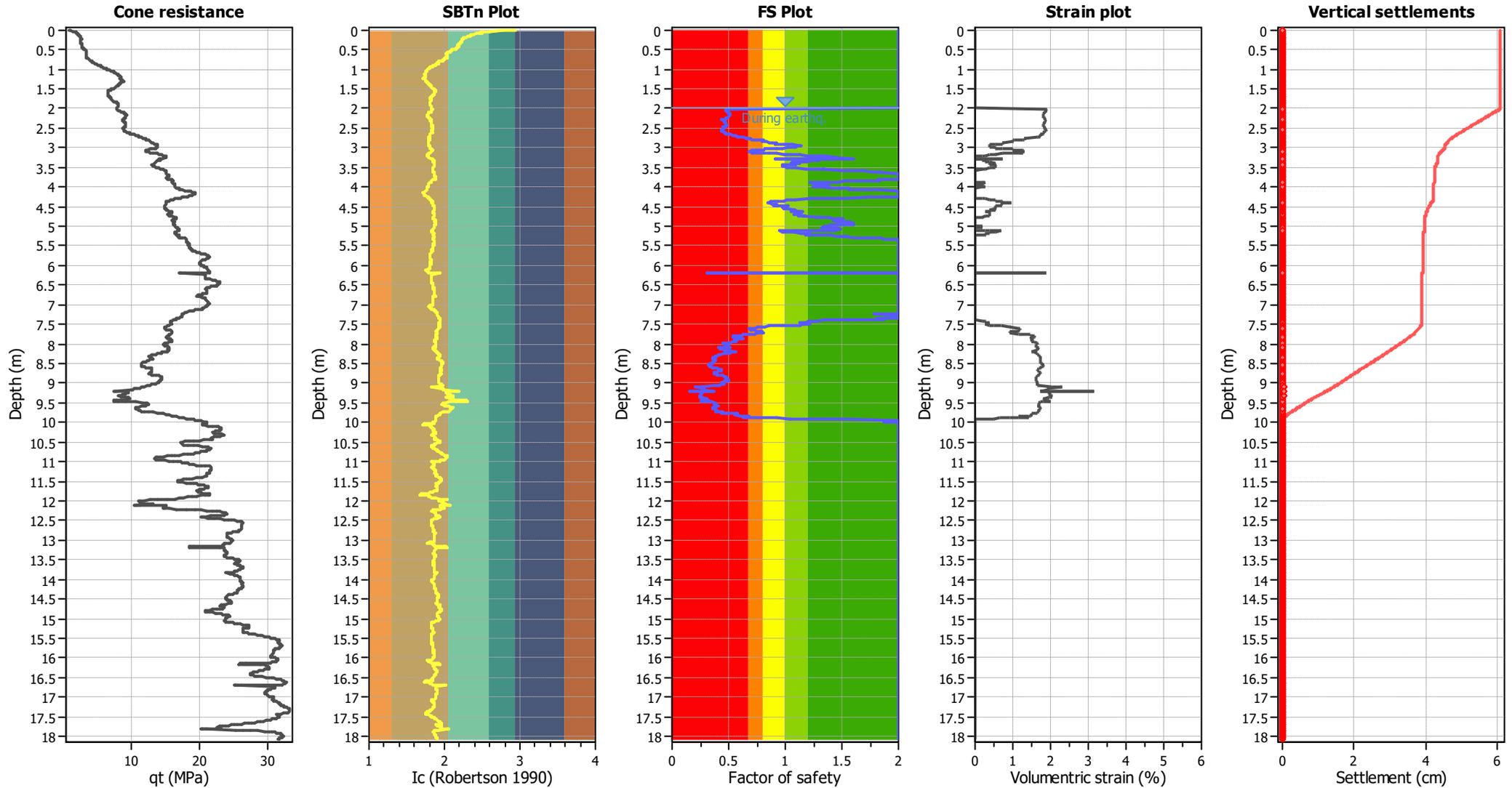
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	5.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

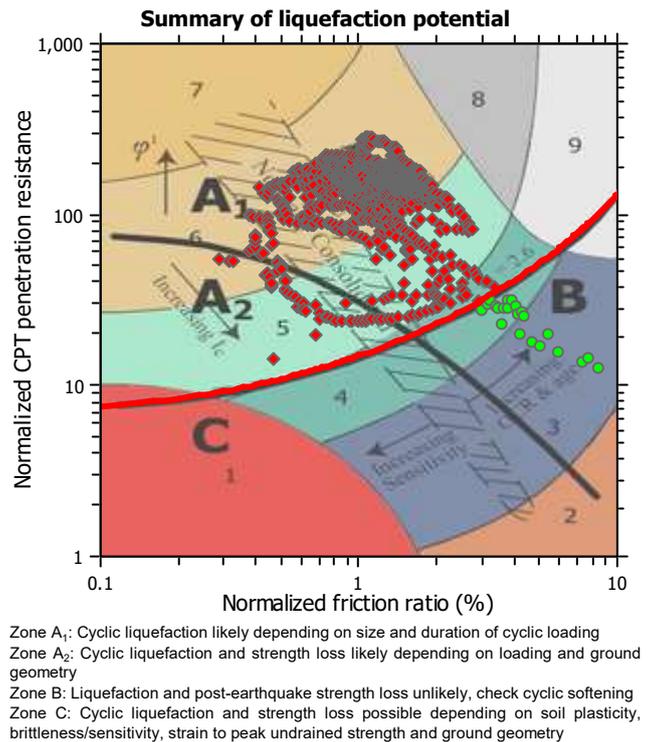
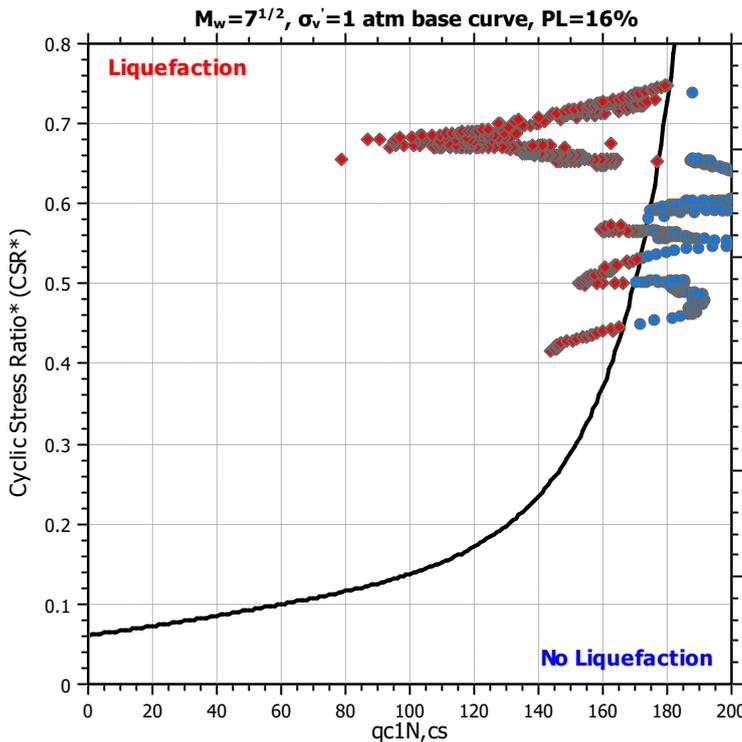
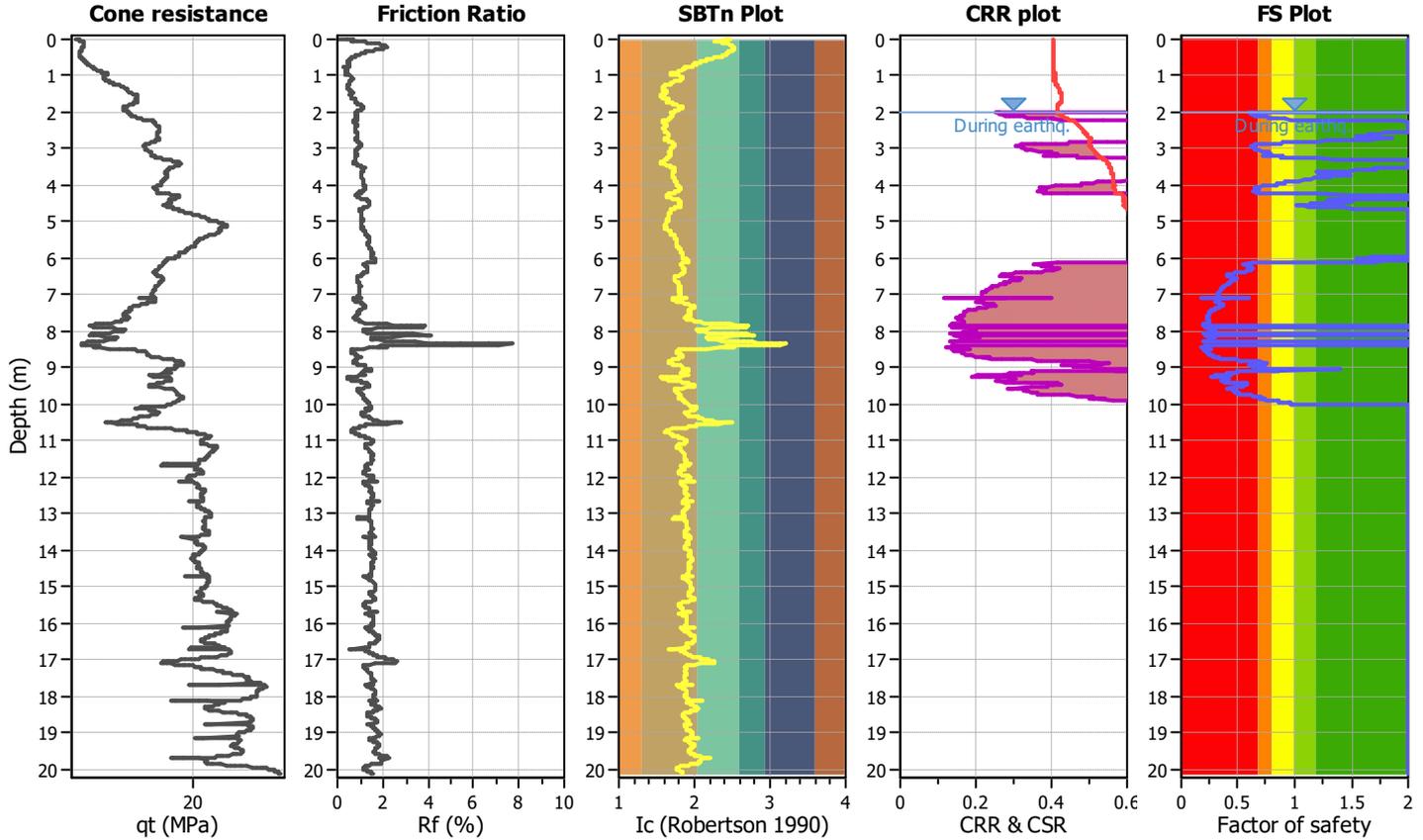
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65 Ratanui Rd CPT07

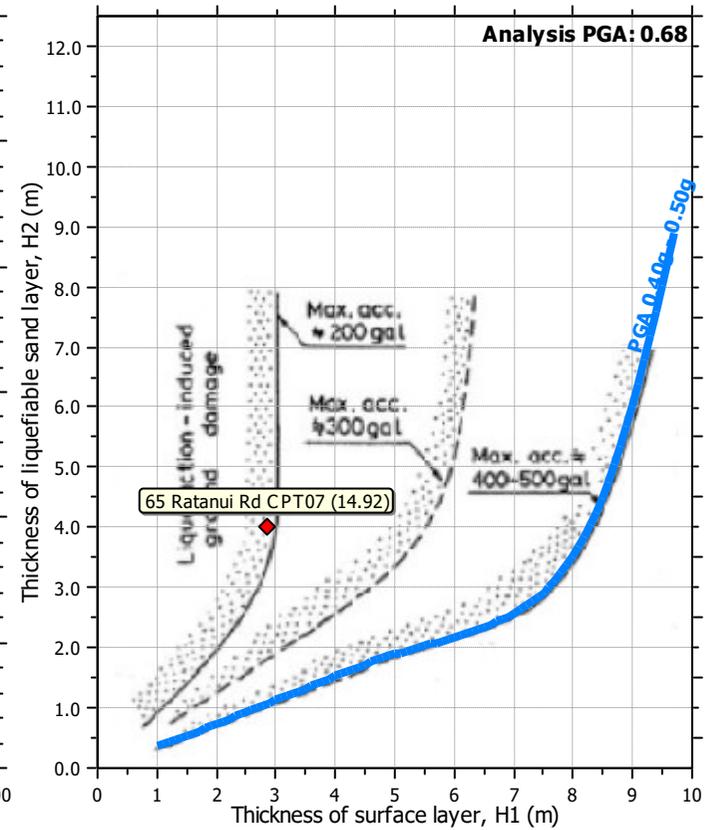
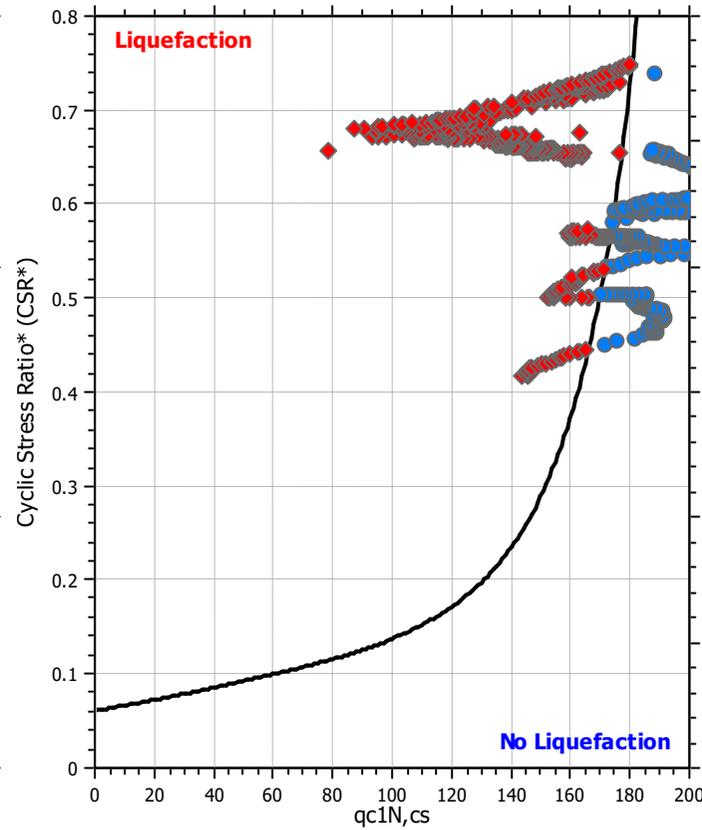
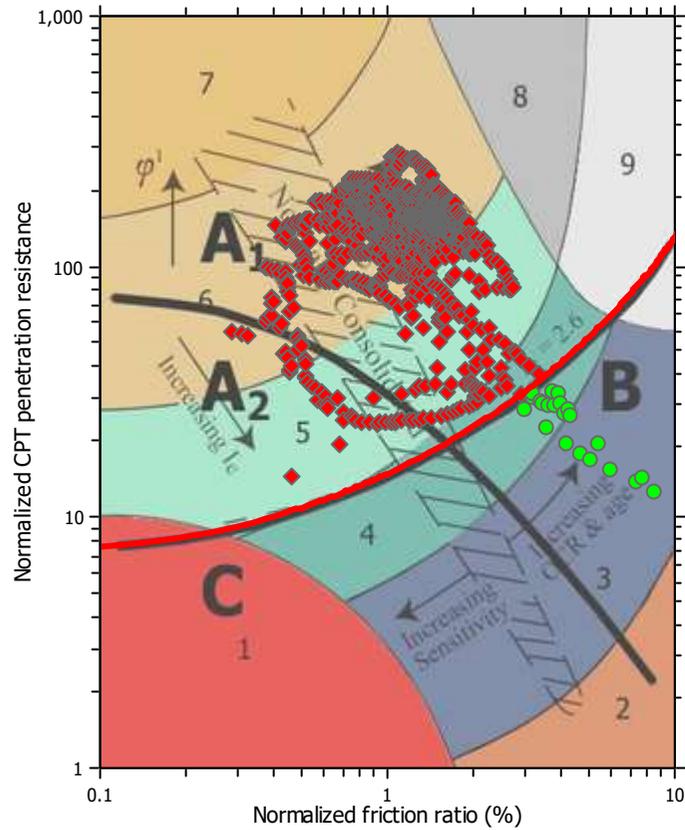
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



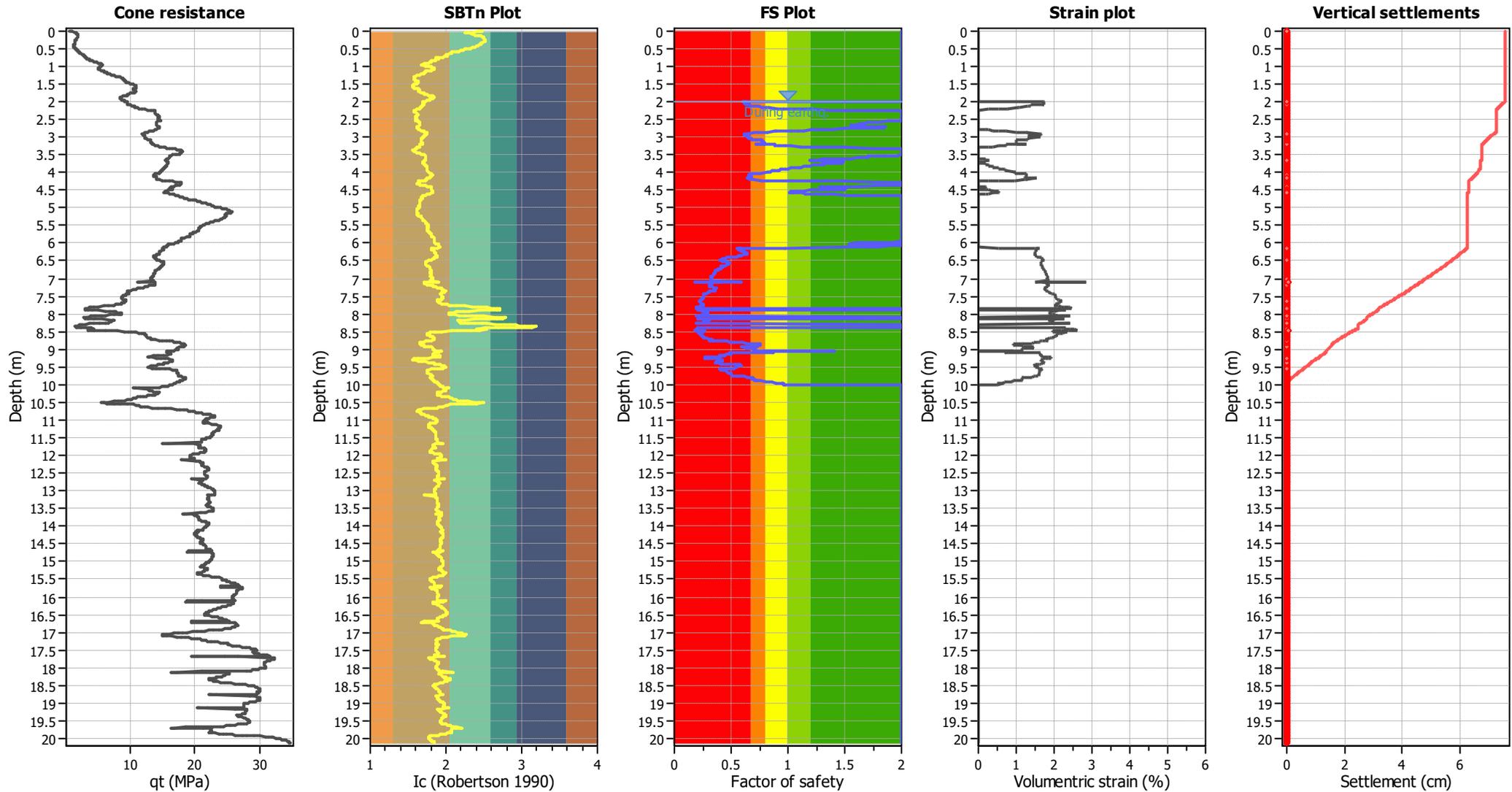
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

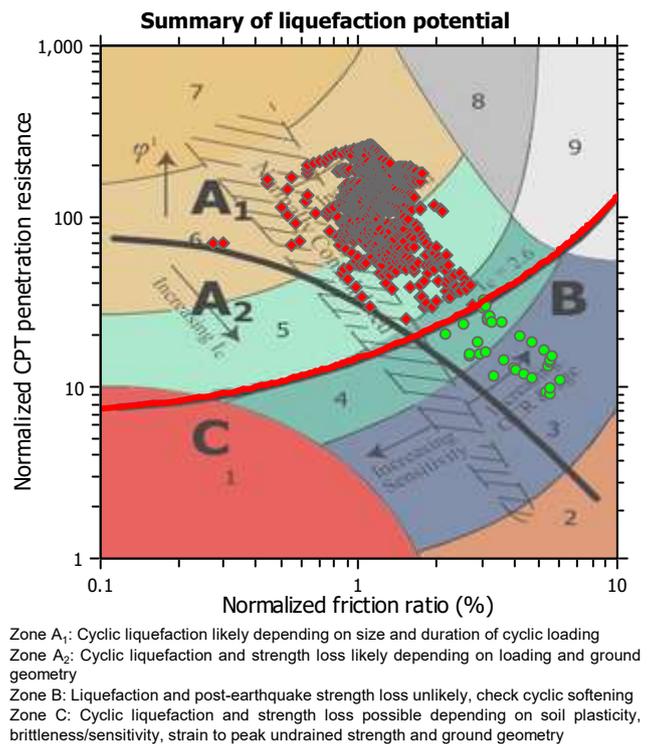
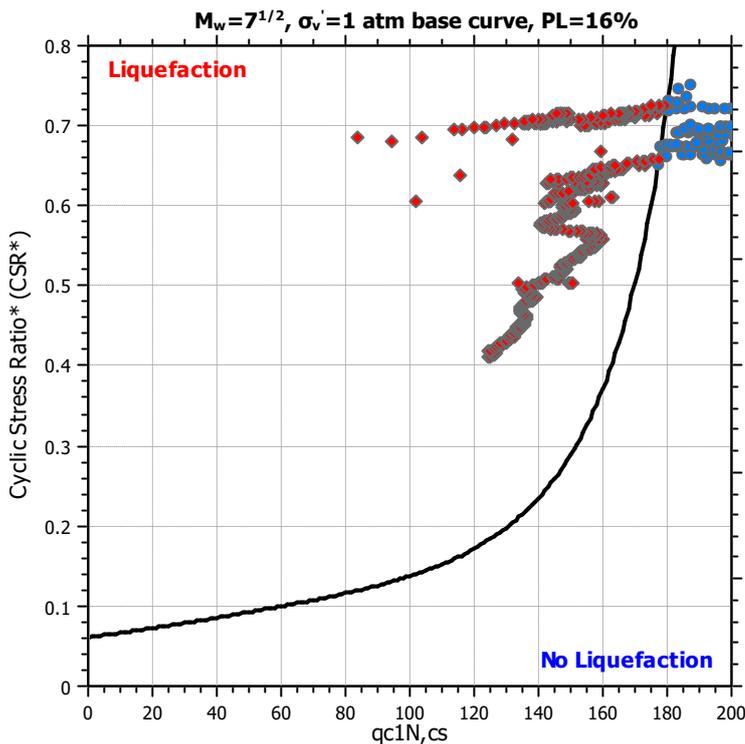
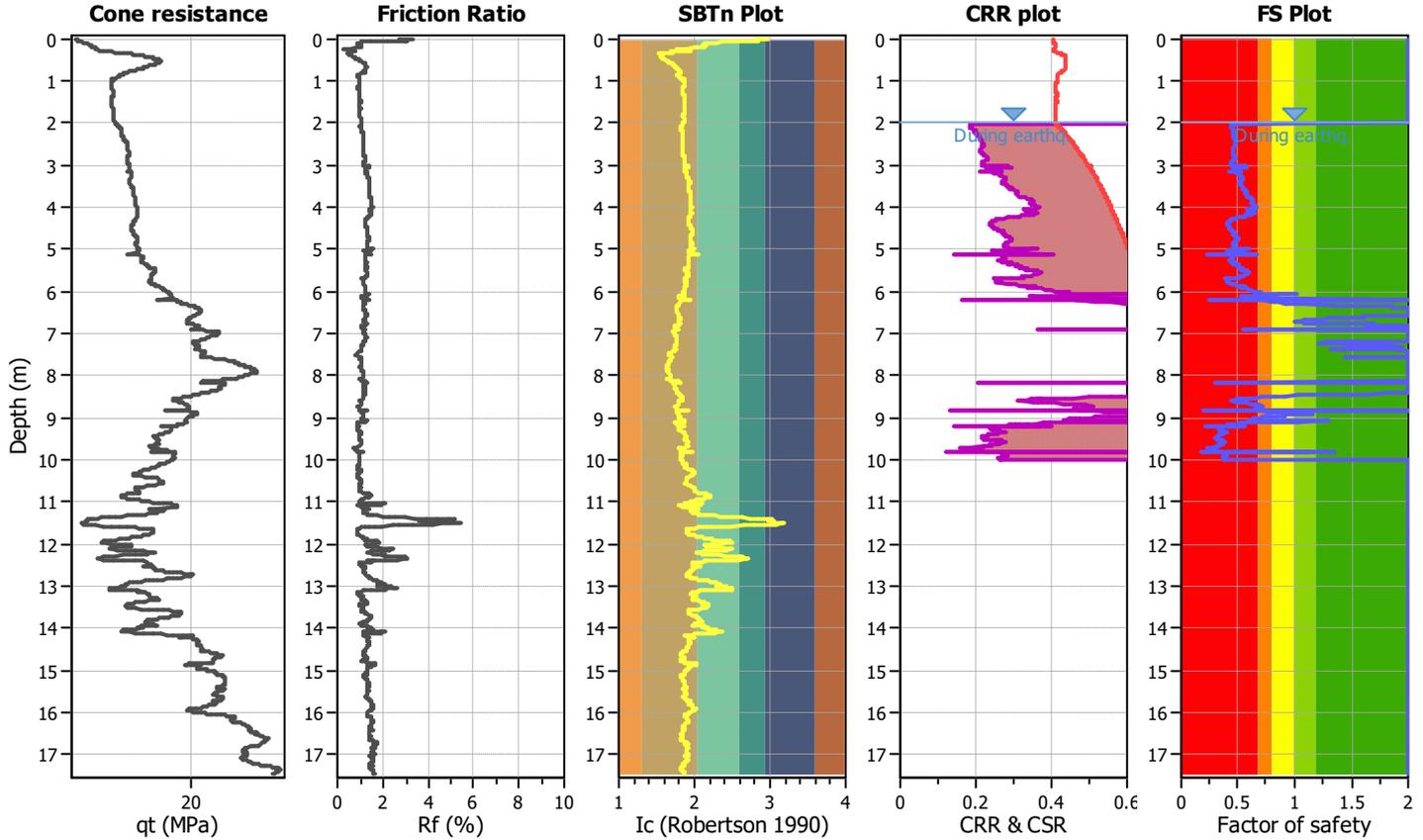
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparamu - 500yr
CPT file : 65-73 Ratanui Rd CPT08

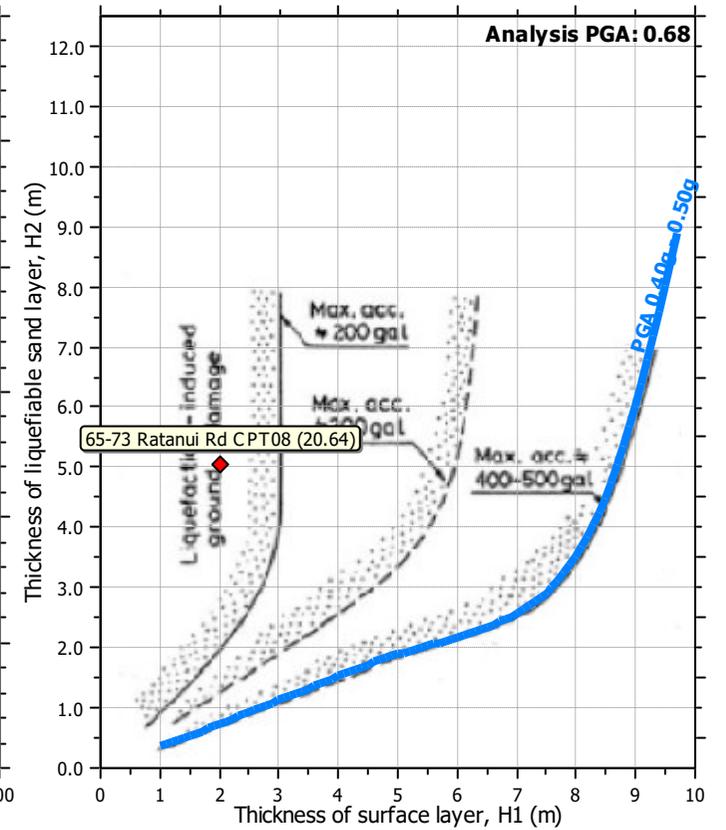
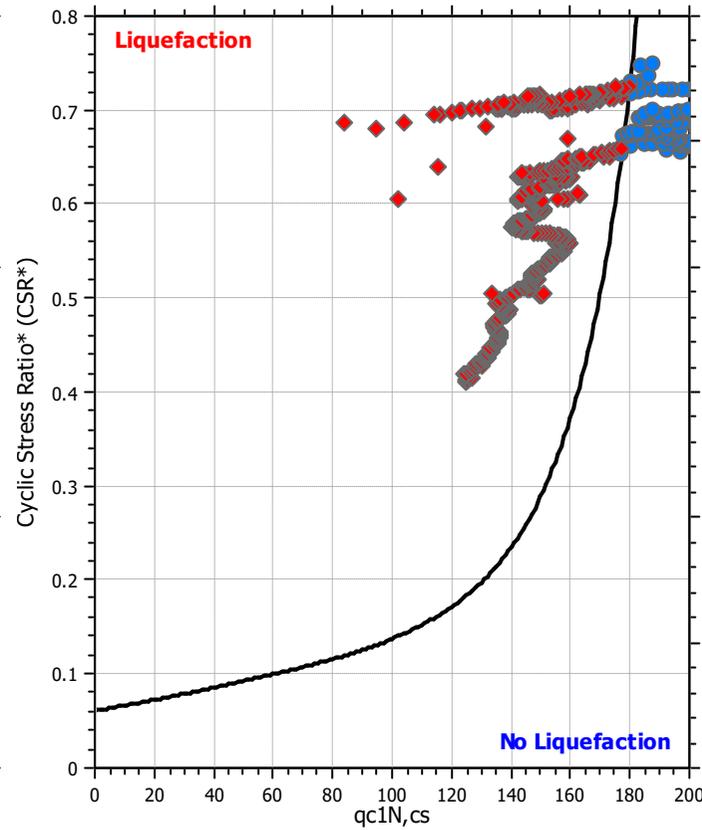
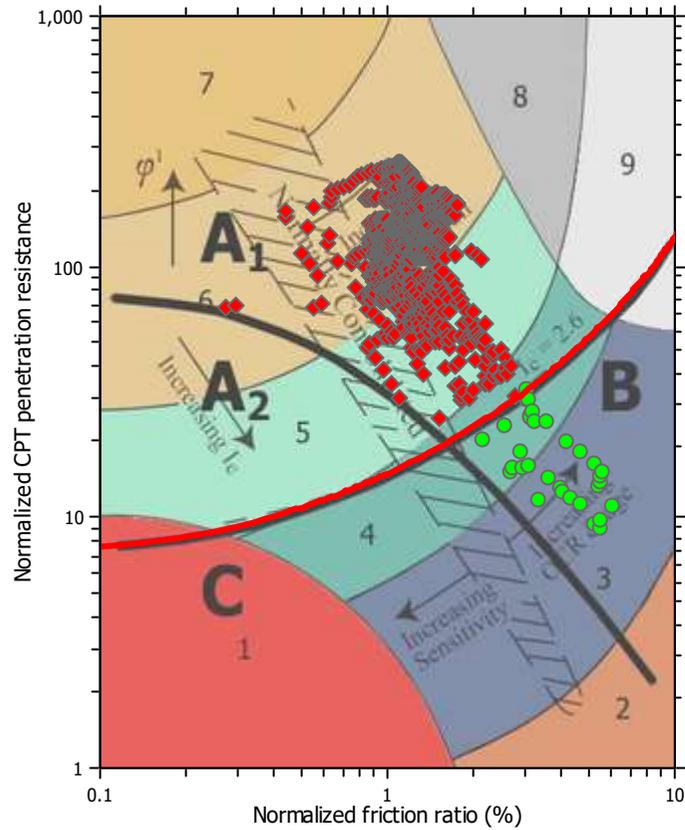
Location : 65 & 73 Ratanui Road, Paraparamu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



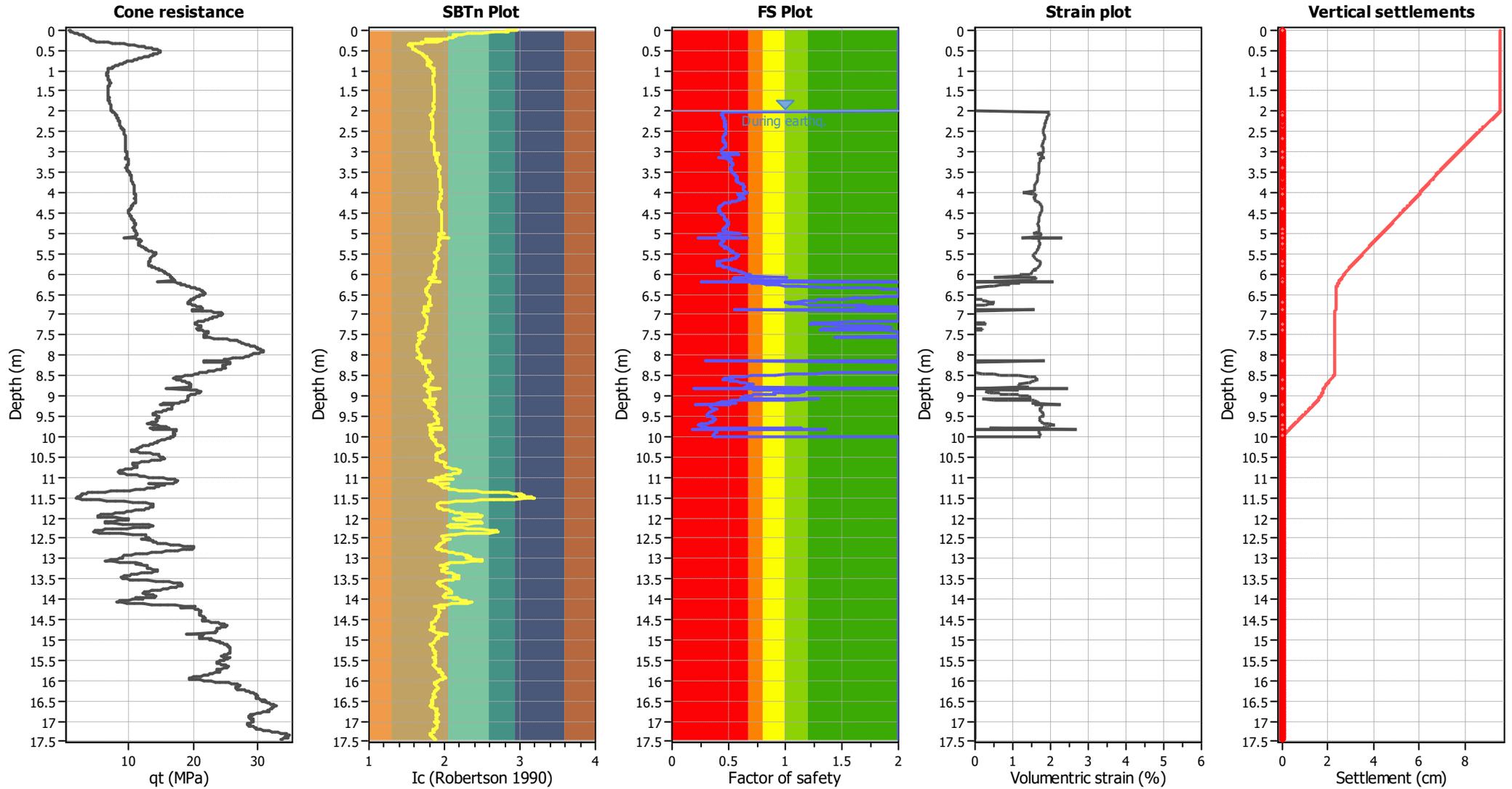
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

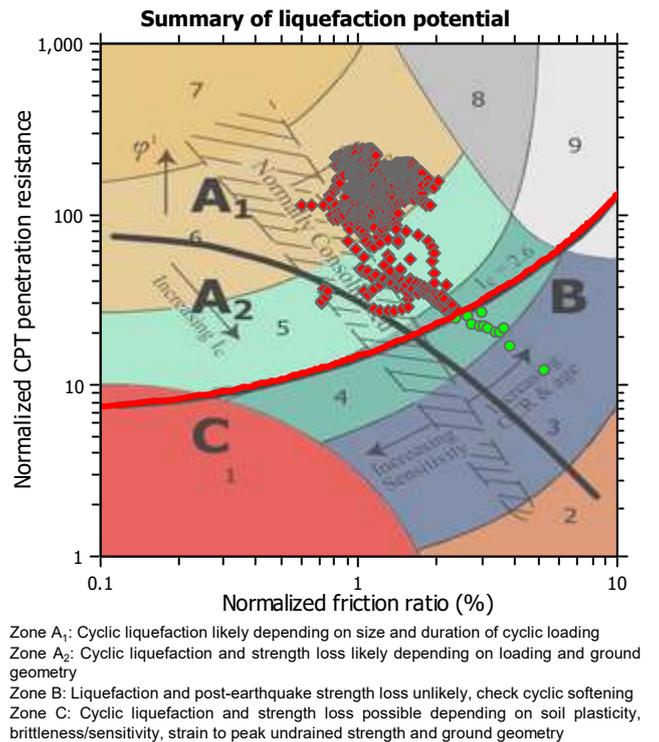
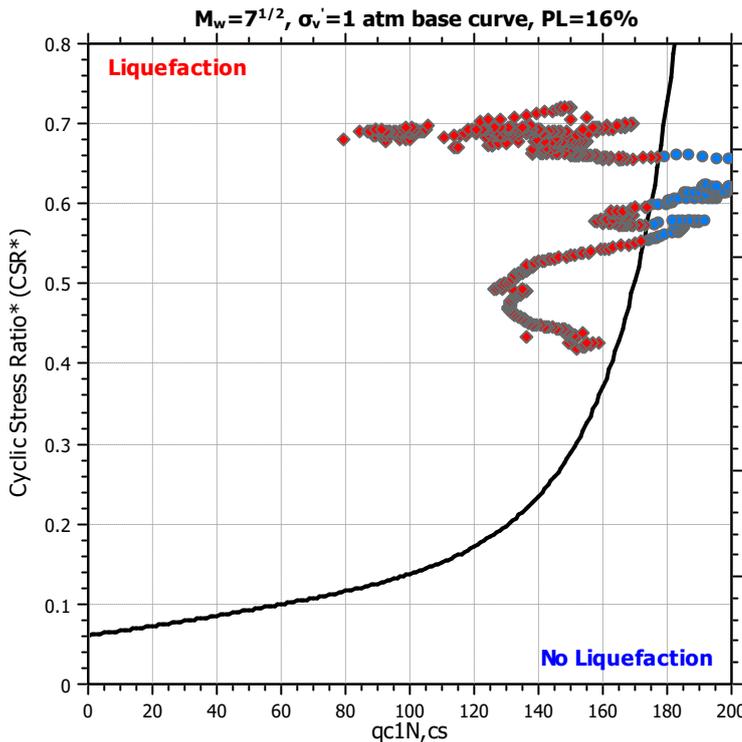
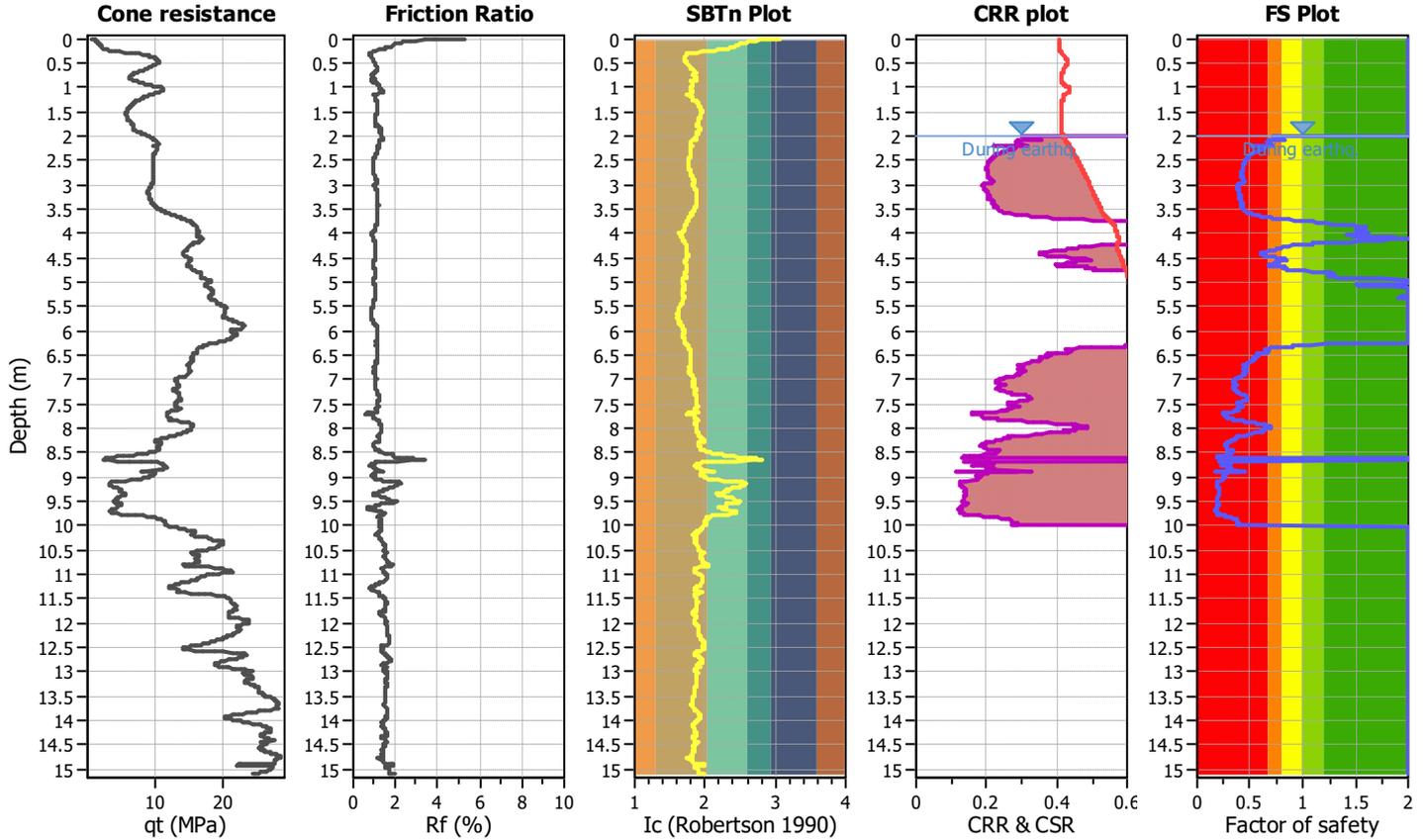
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT09

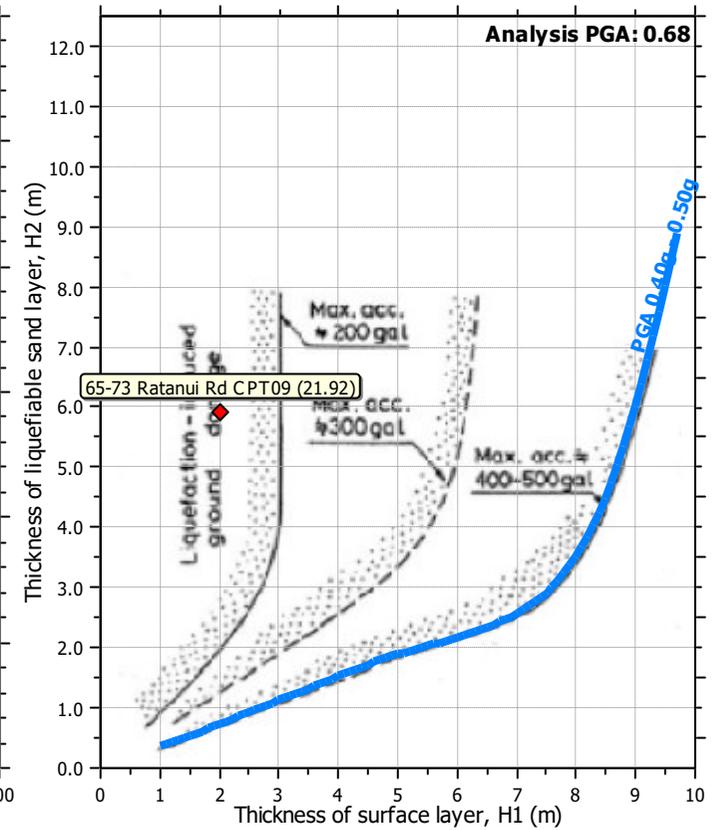
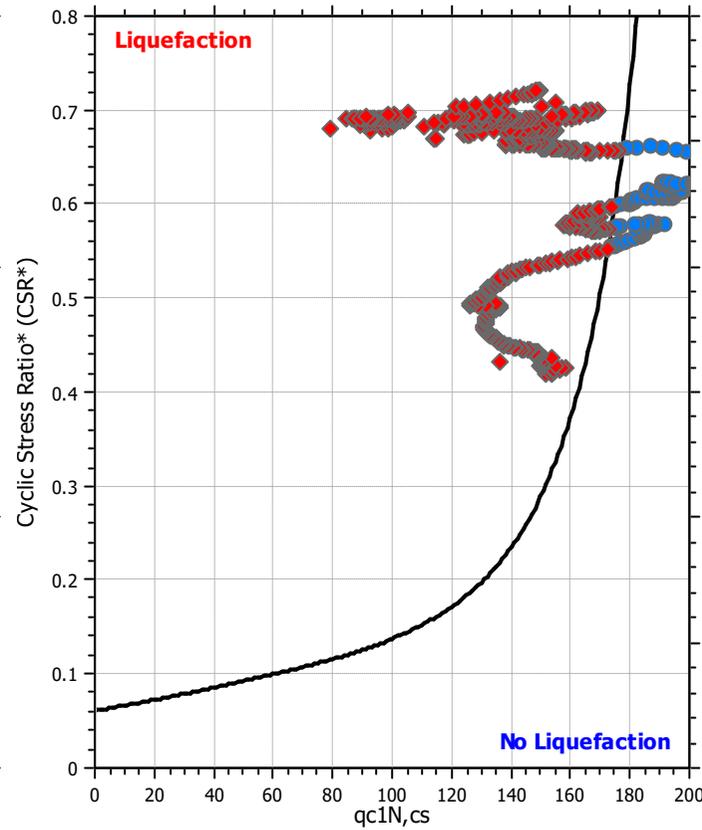
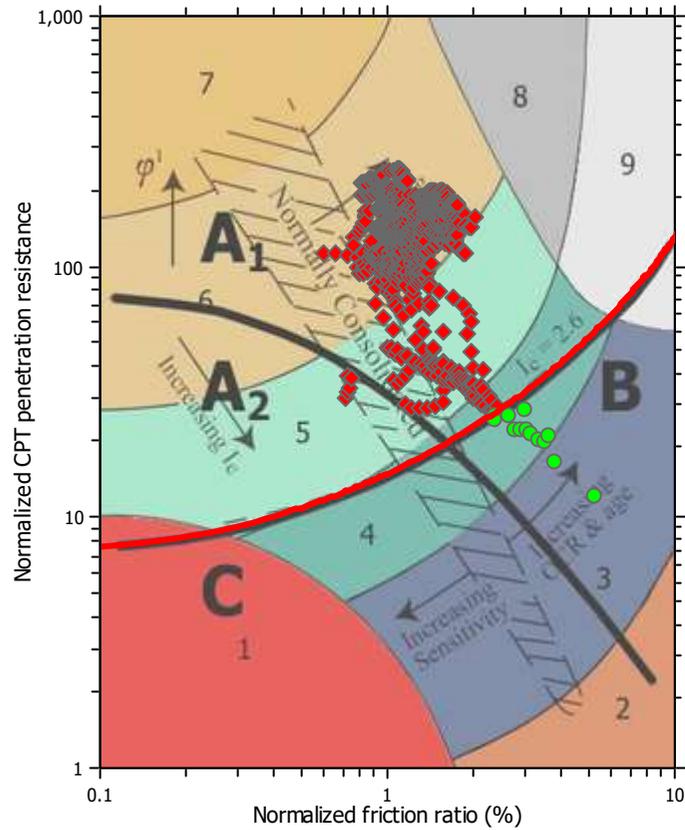
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



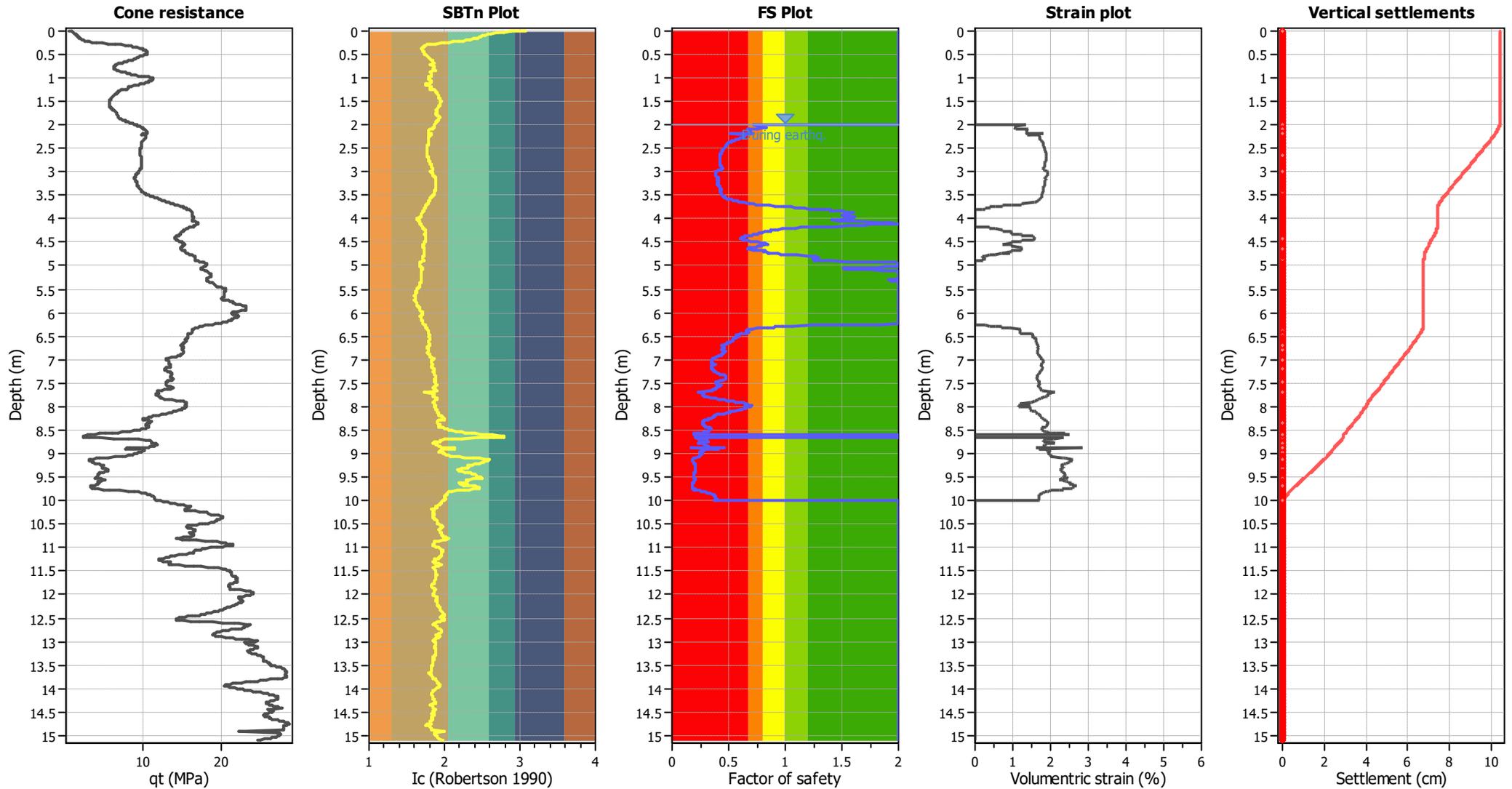
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

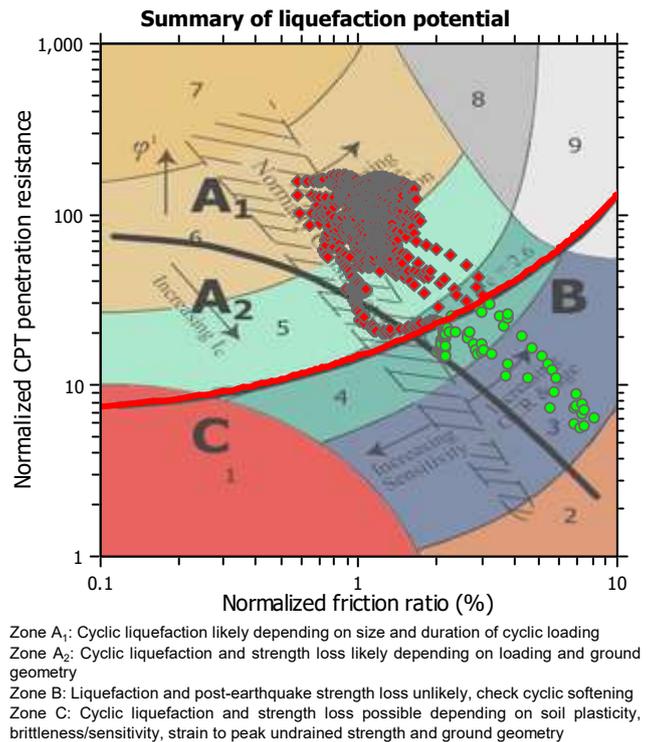
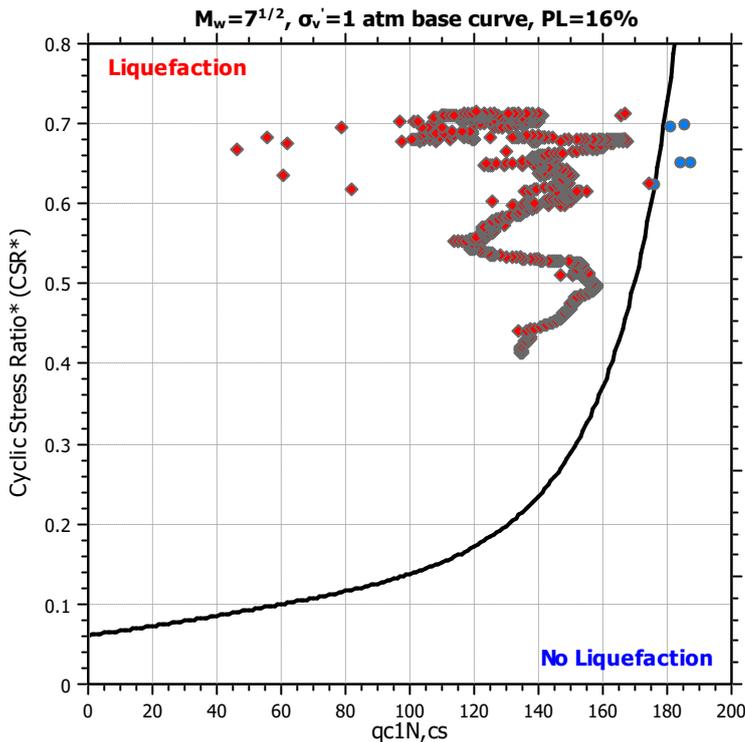
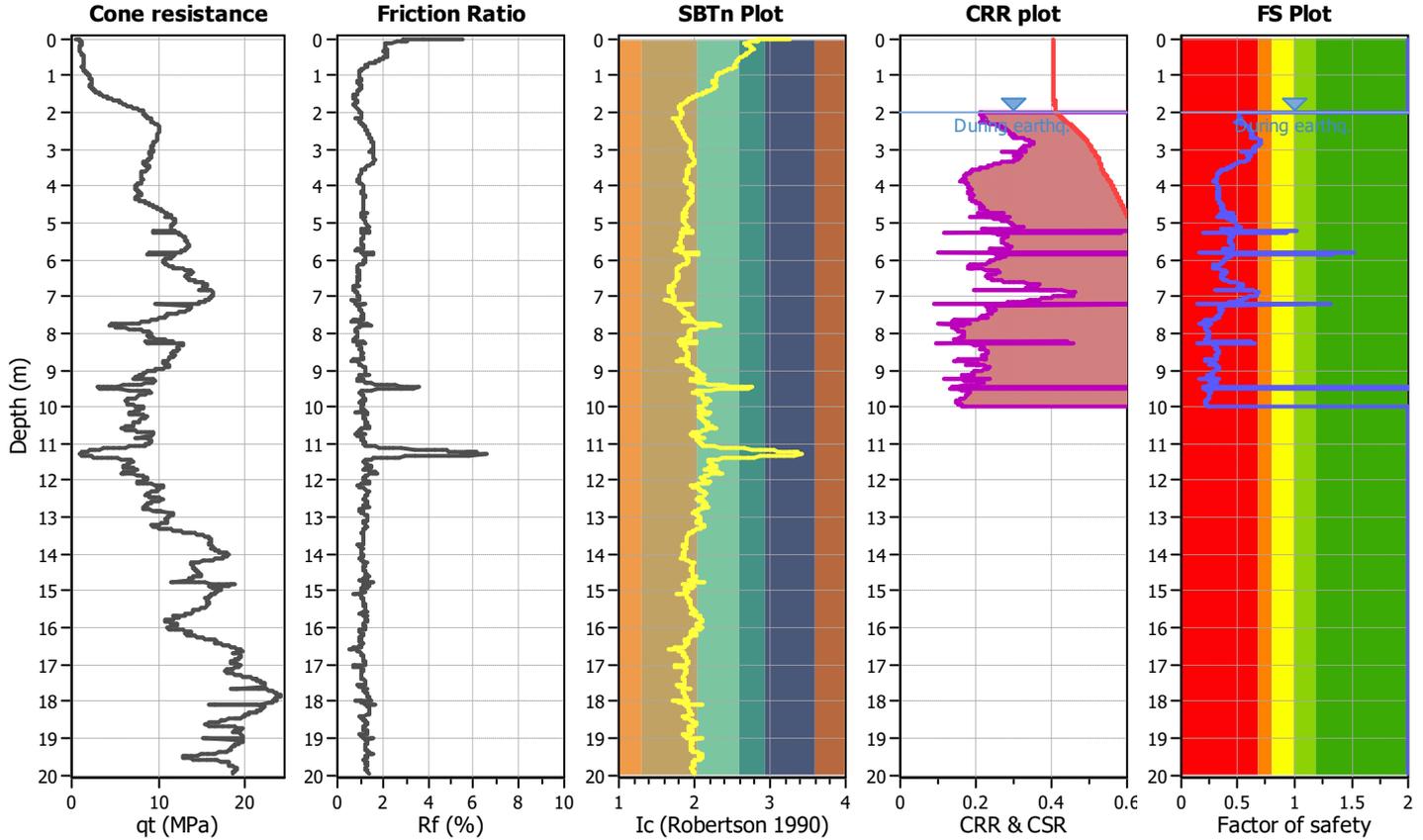
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparamu - 500yr
CPT file : 65-73 Ratanui Rd CPT10

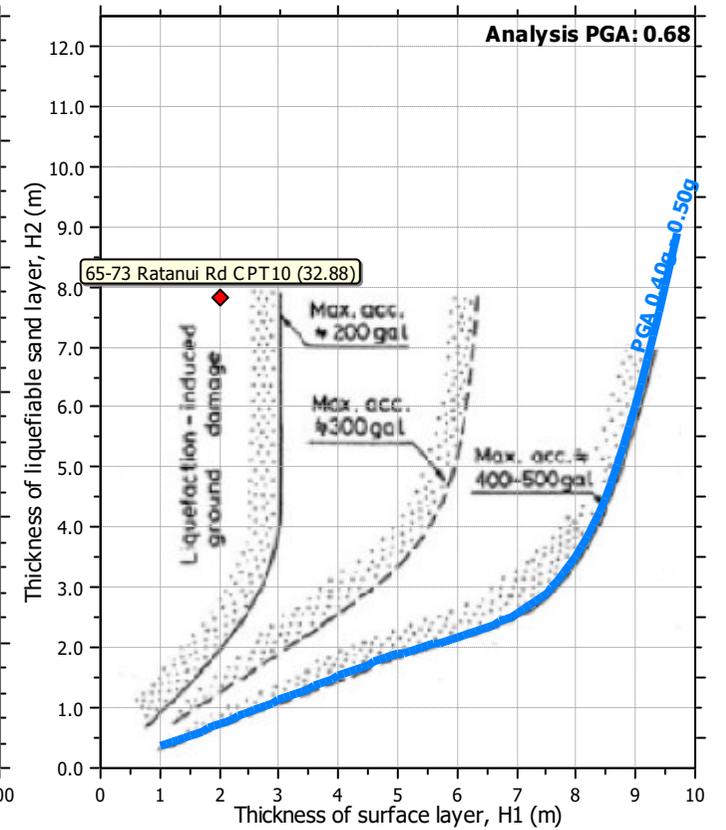
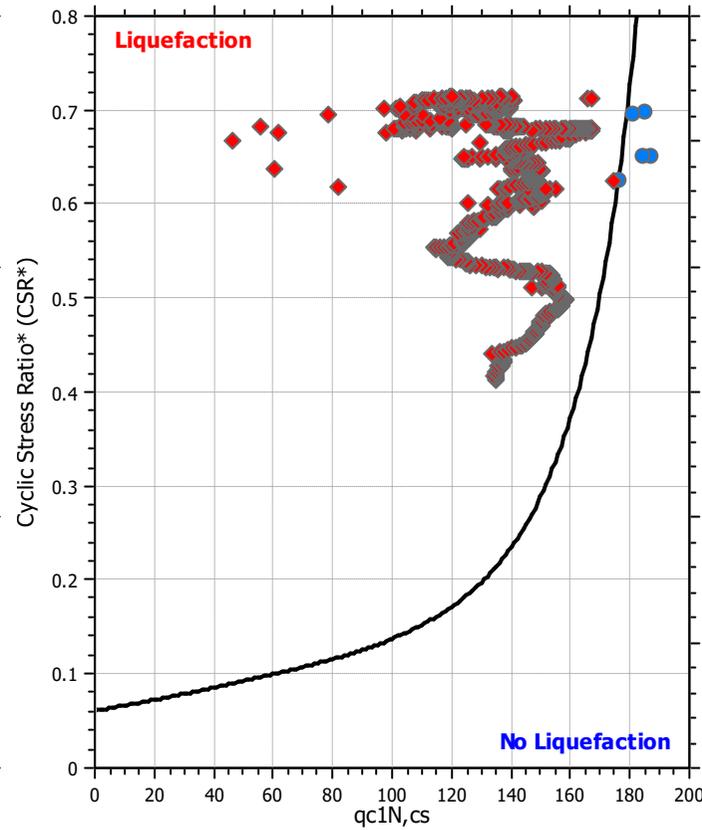
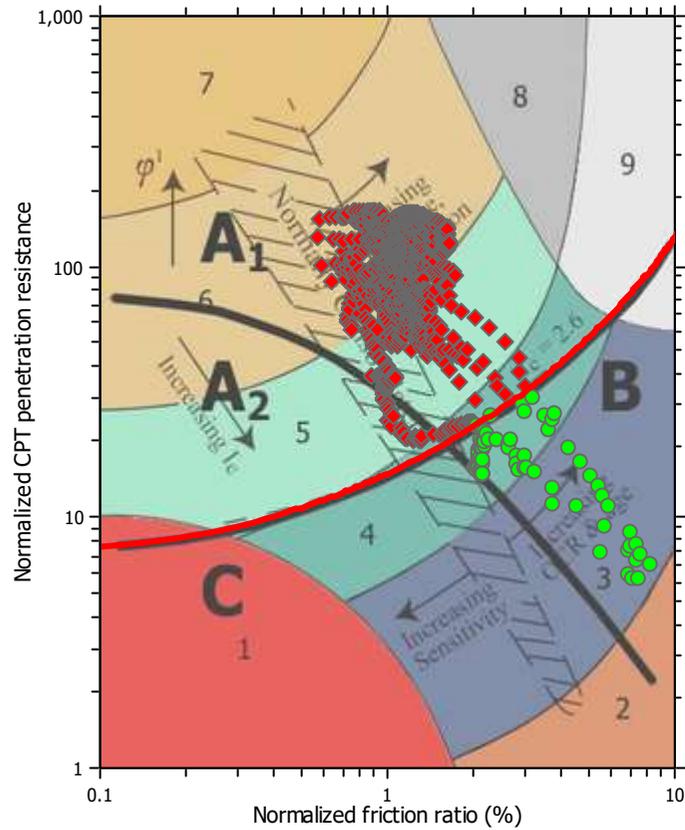
Location : 65 & 73 Ratanui Road, Paraparamu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



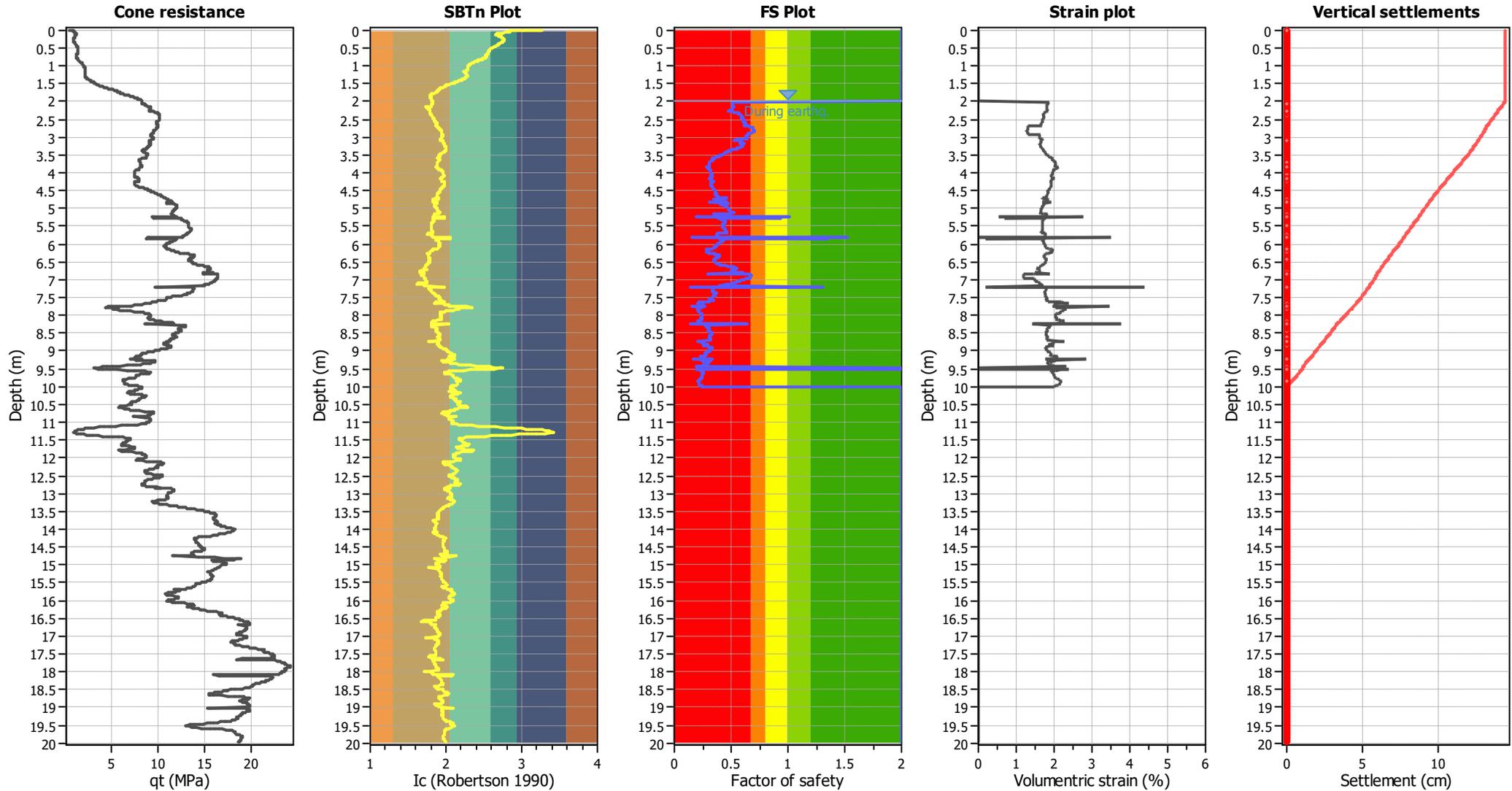
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

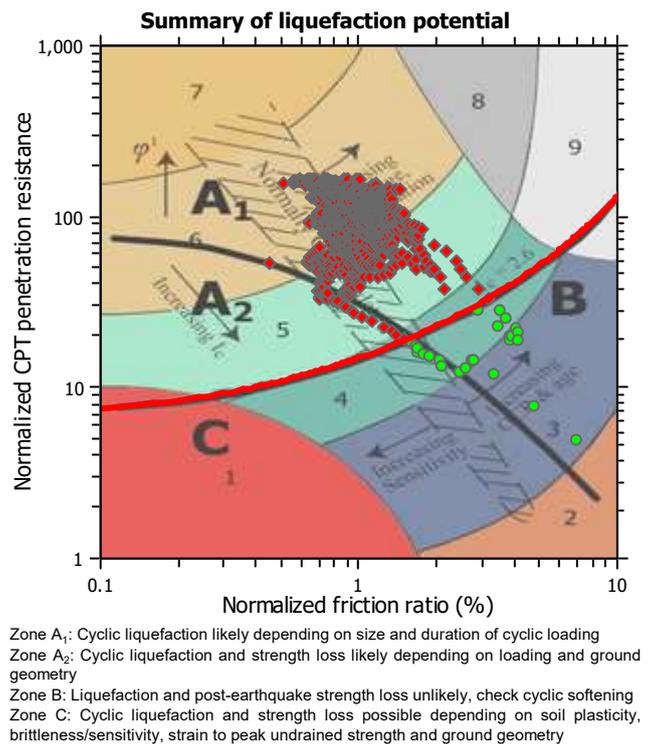
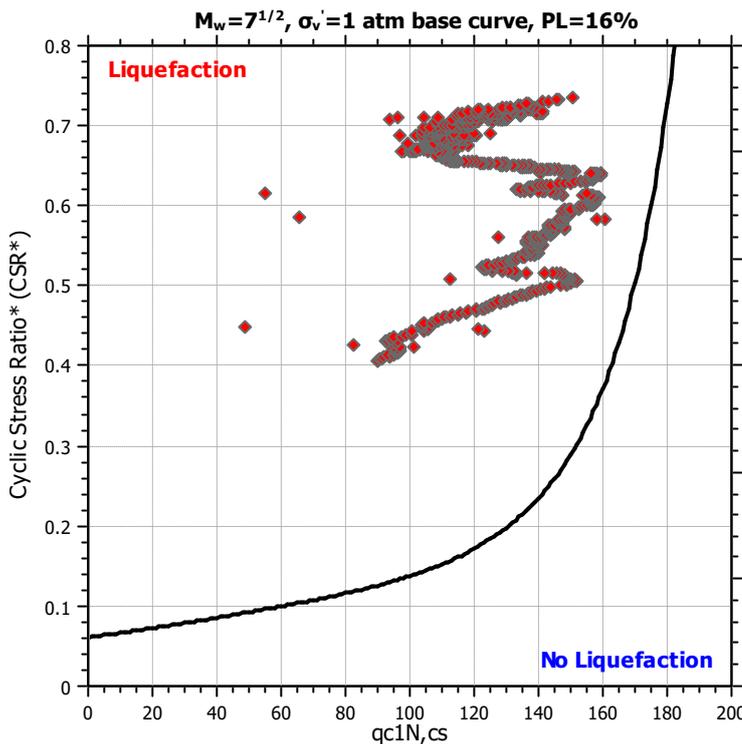
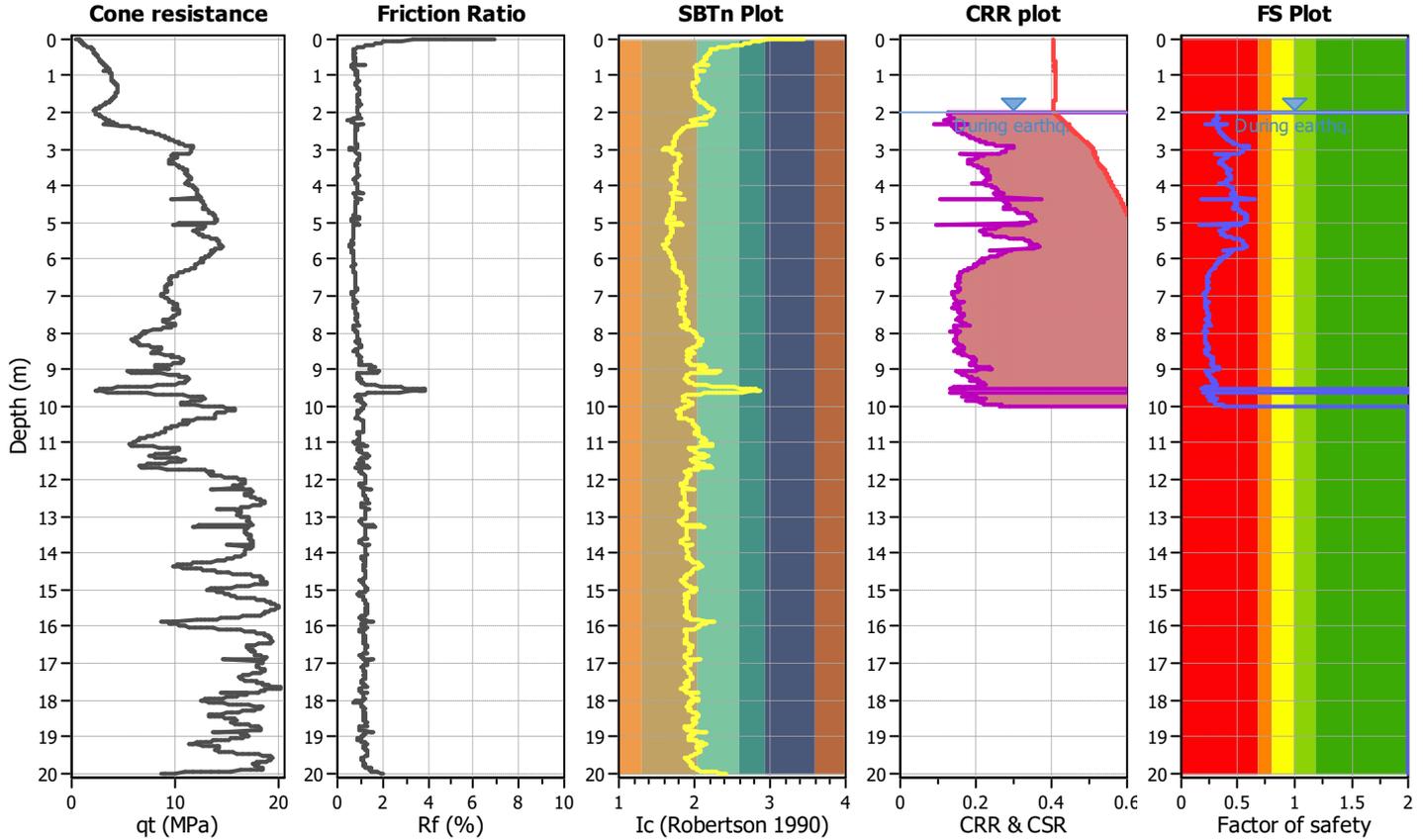
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT11

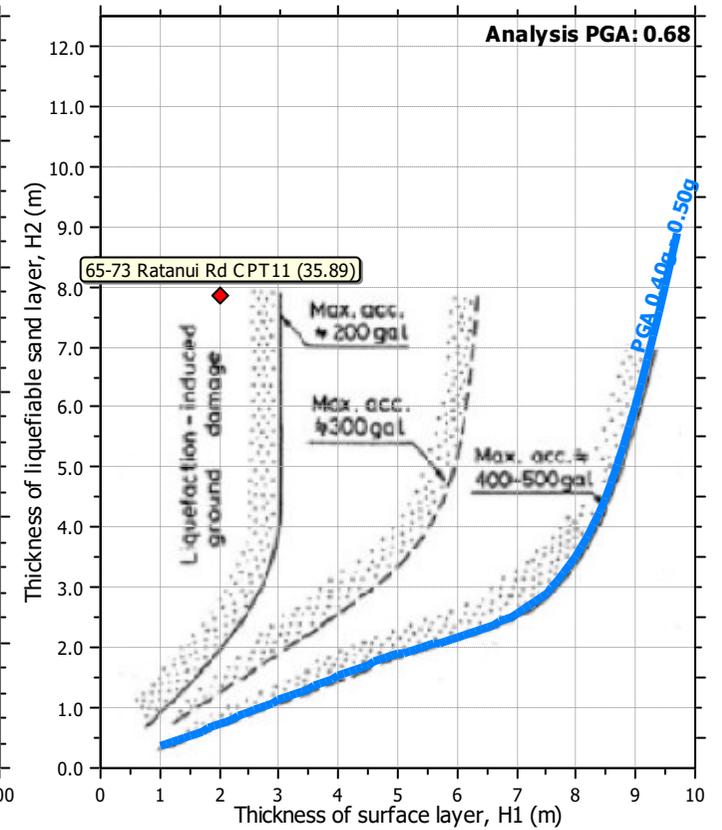
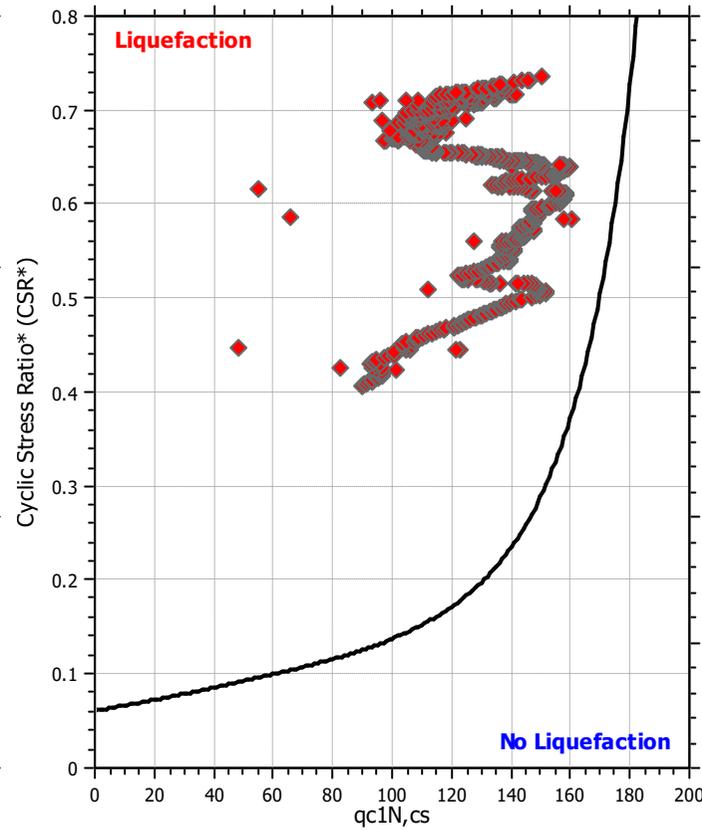
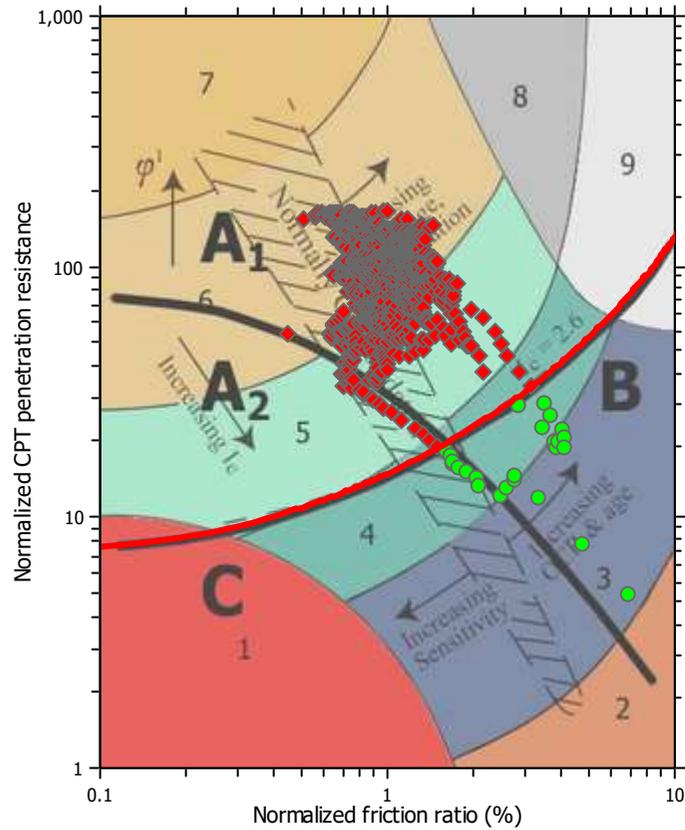
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



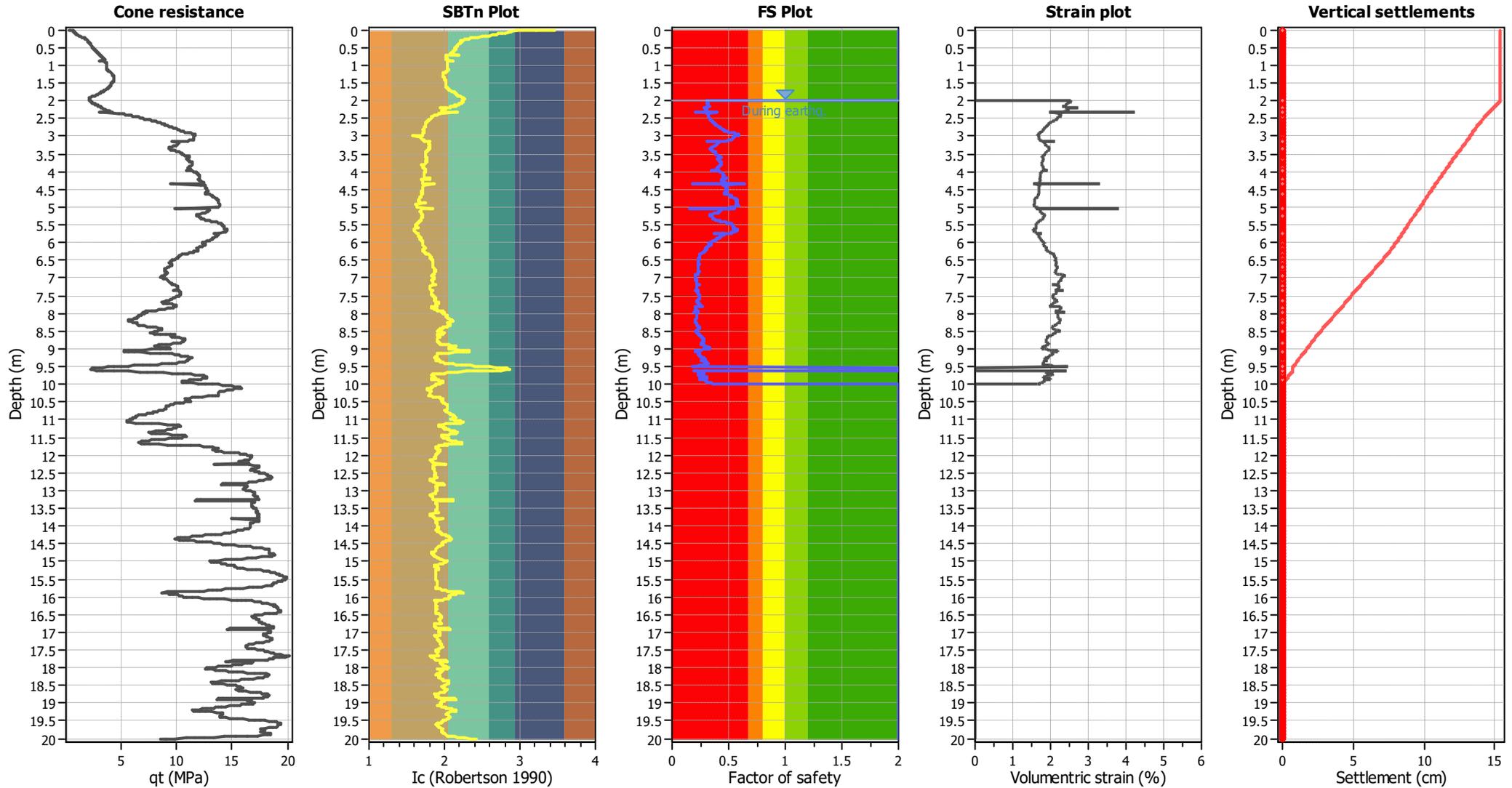
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

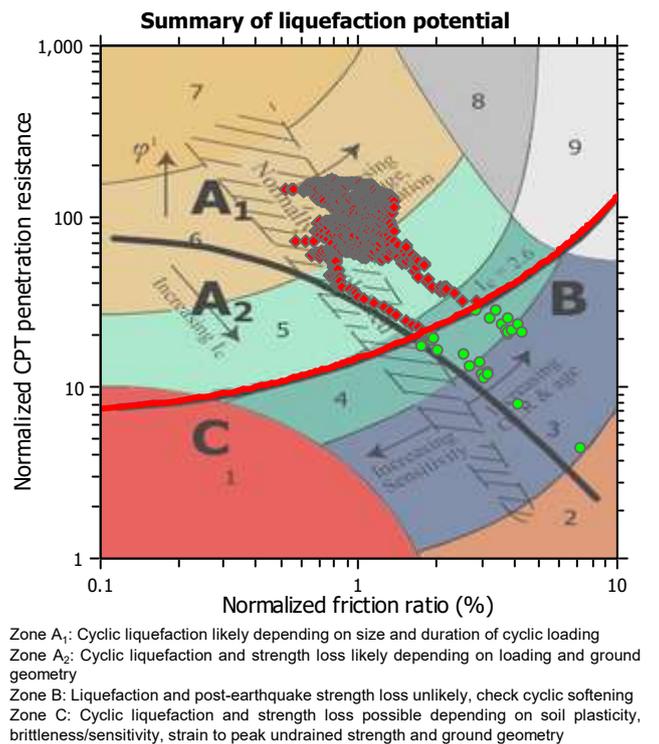
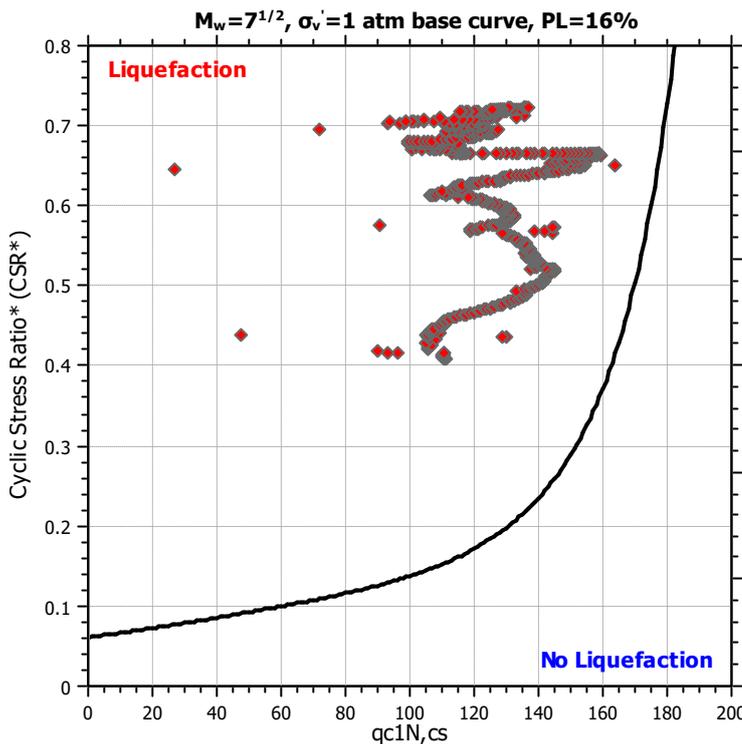
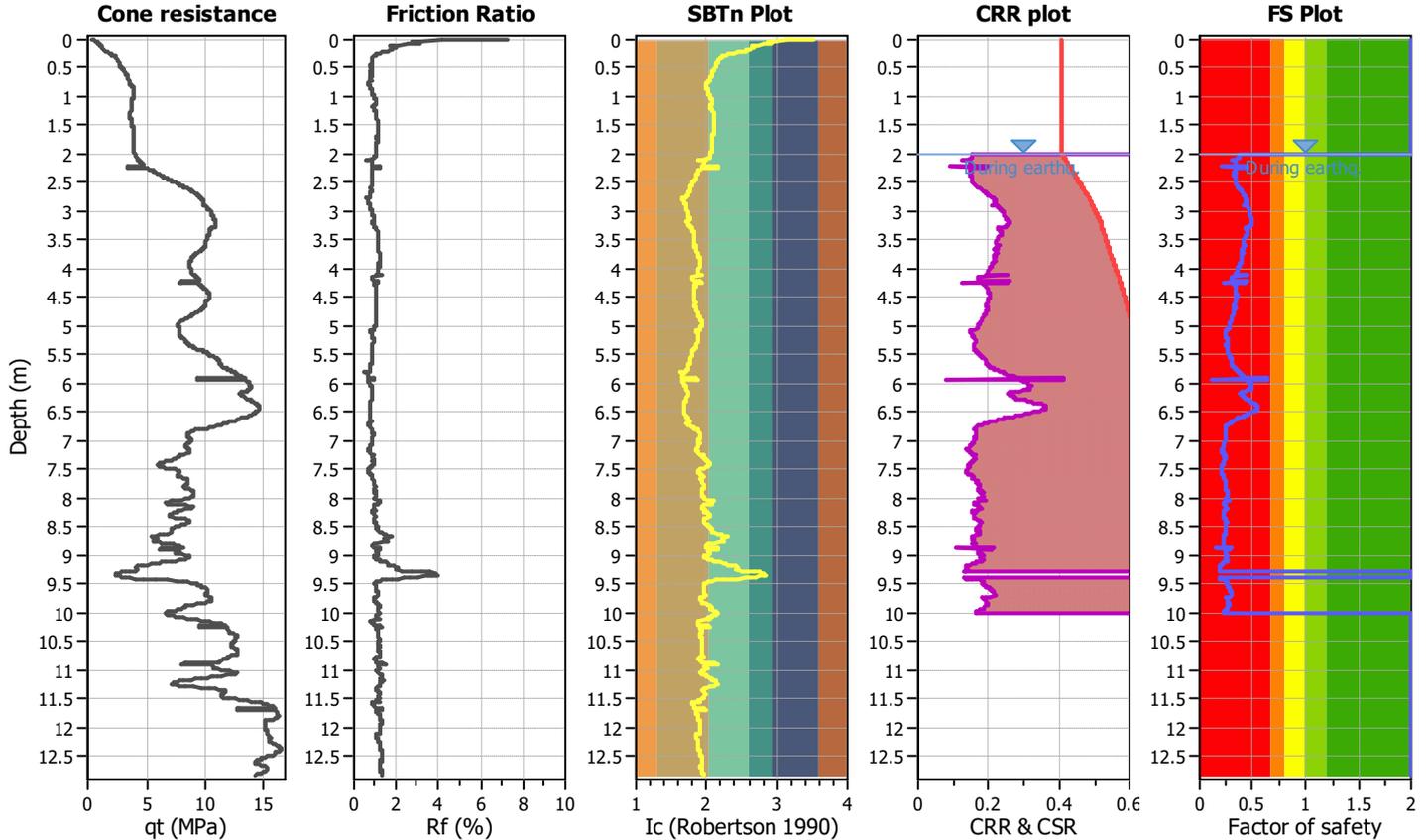
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT12

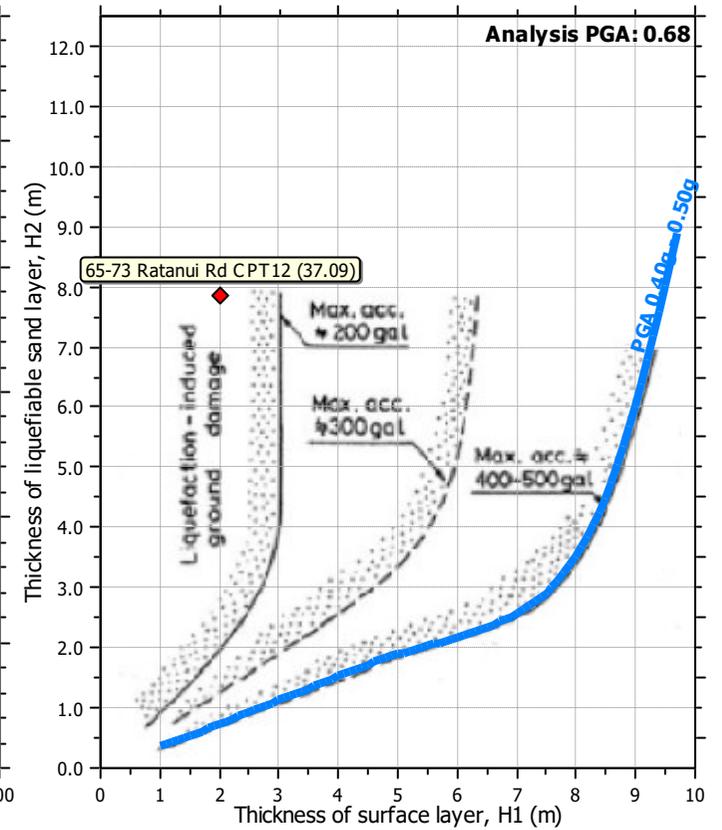
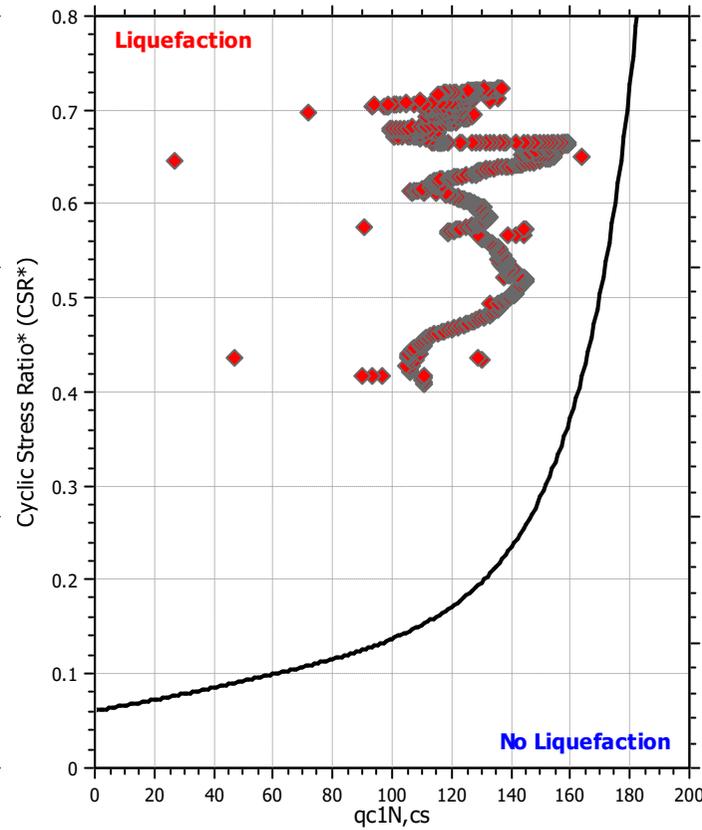
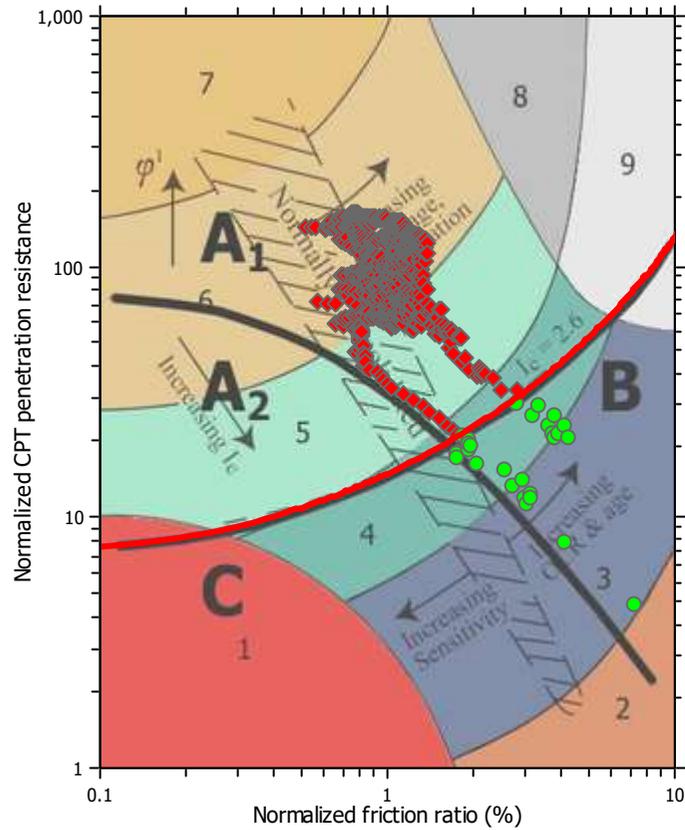
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



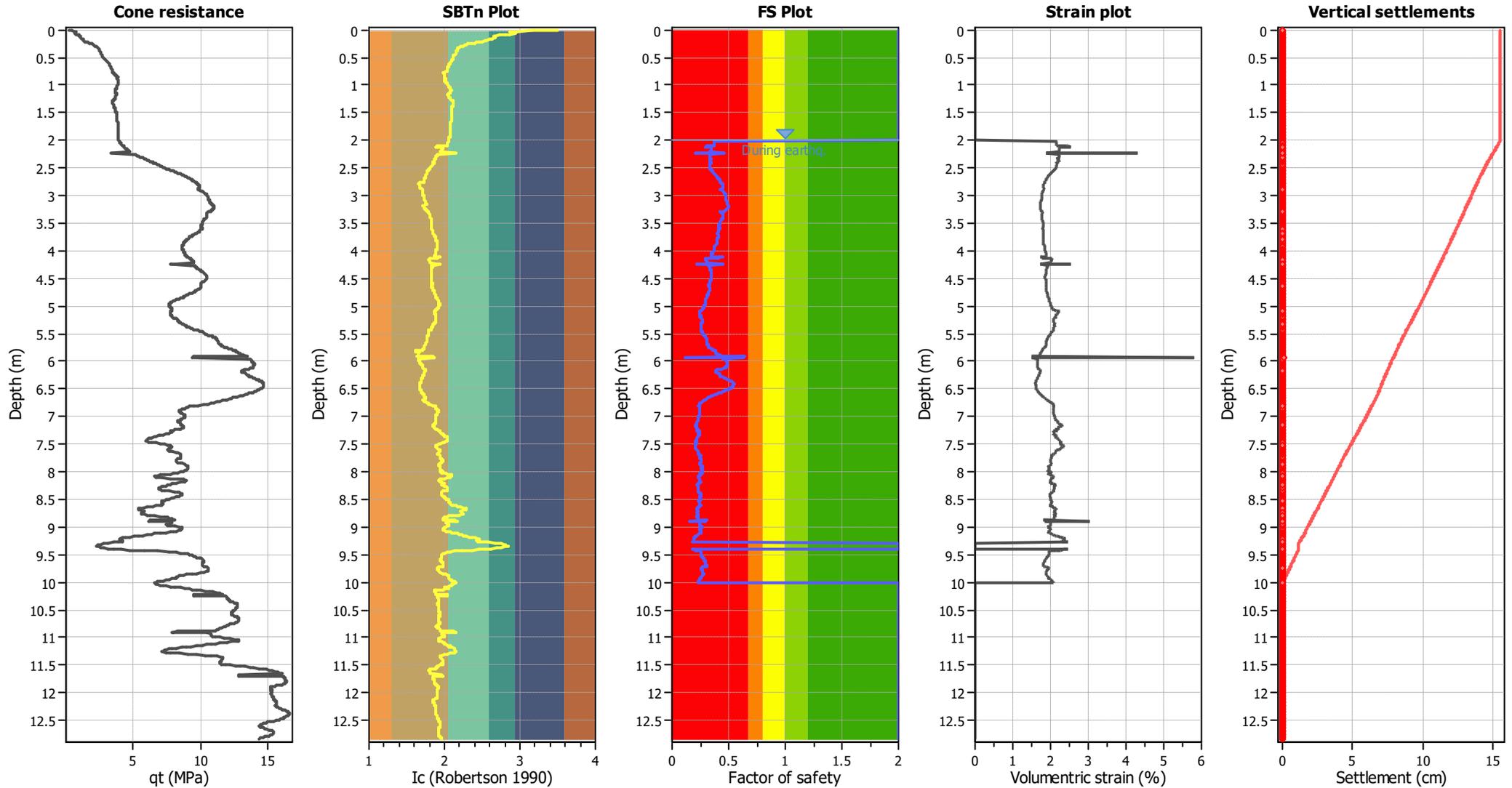
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

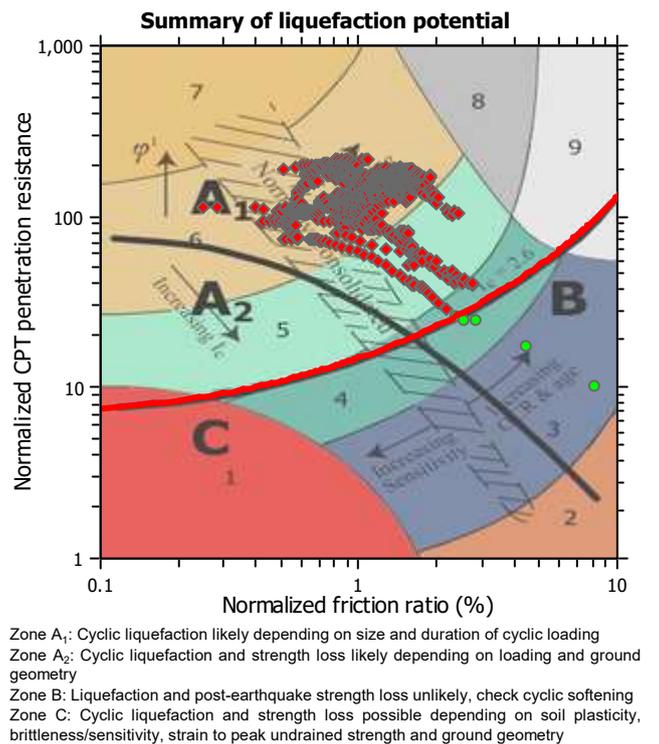
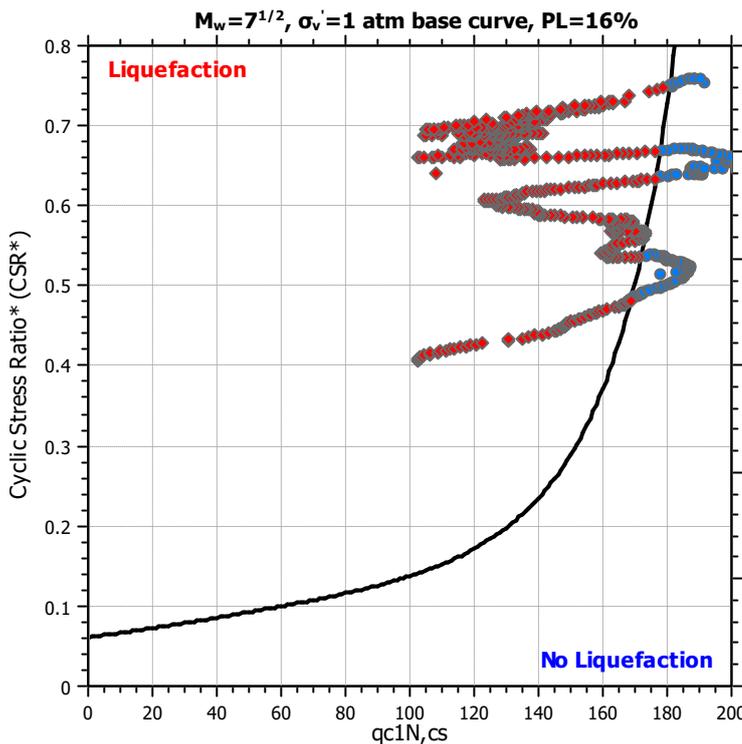
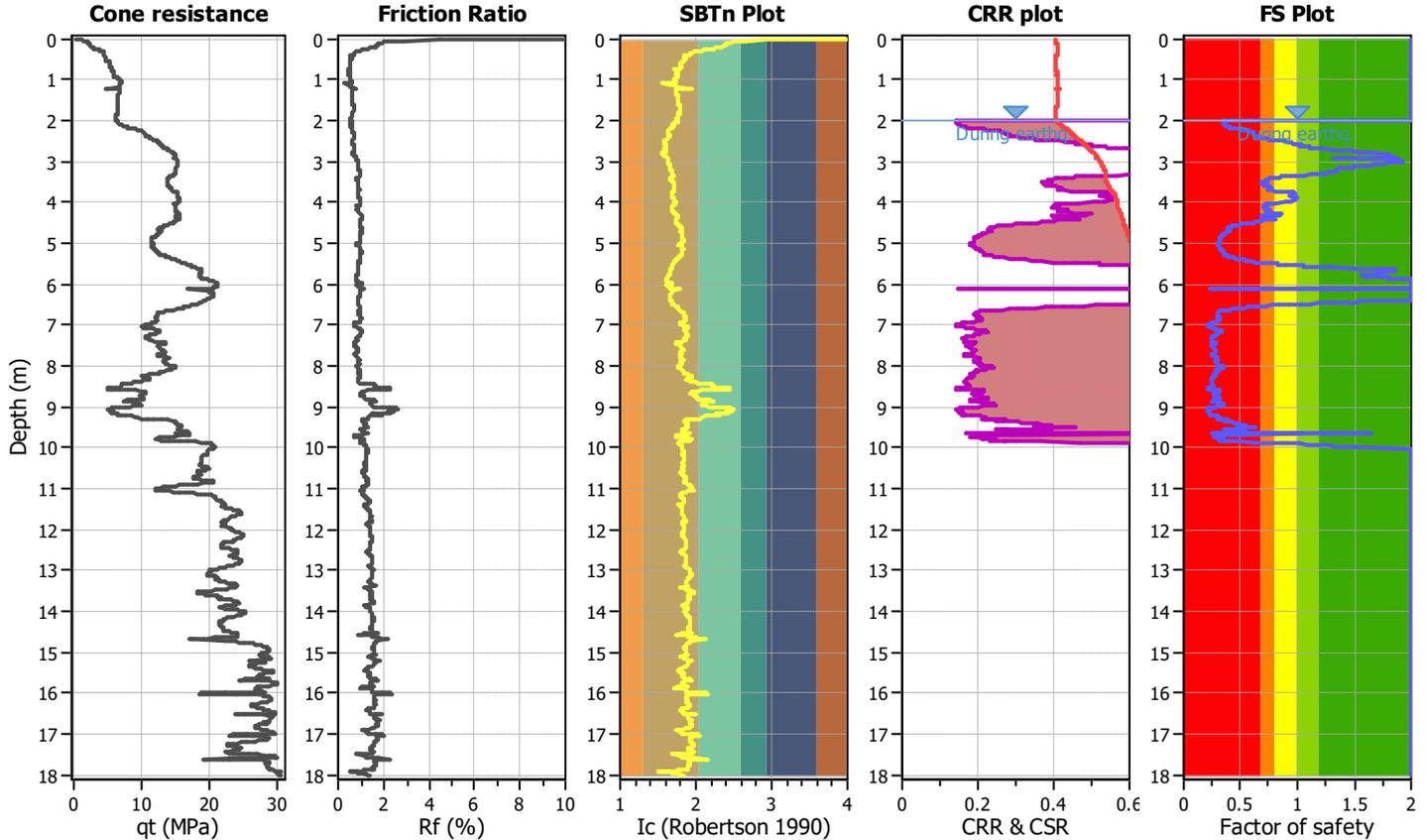
Project title : Summerset Paraparaumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparaumu

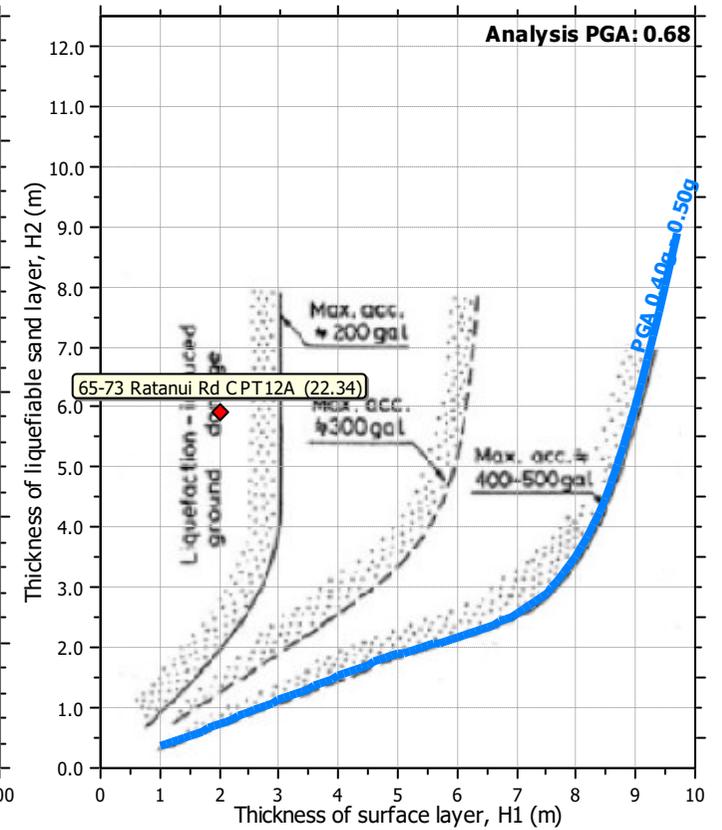
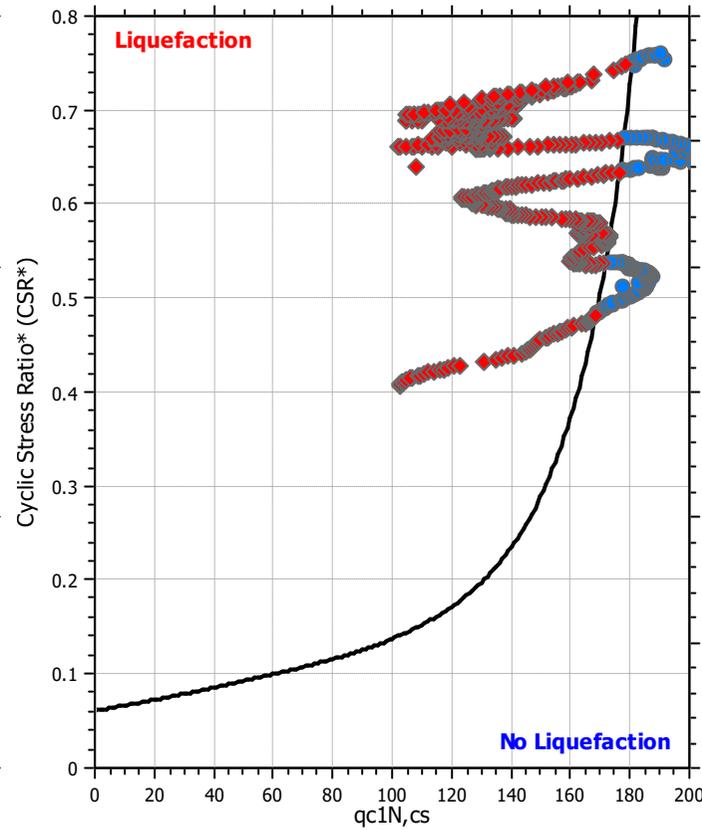
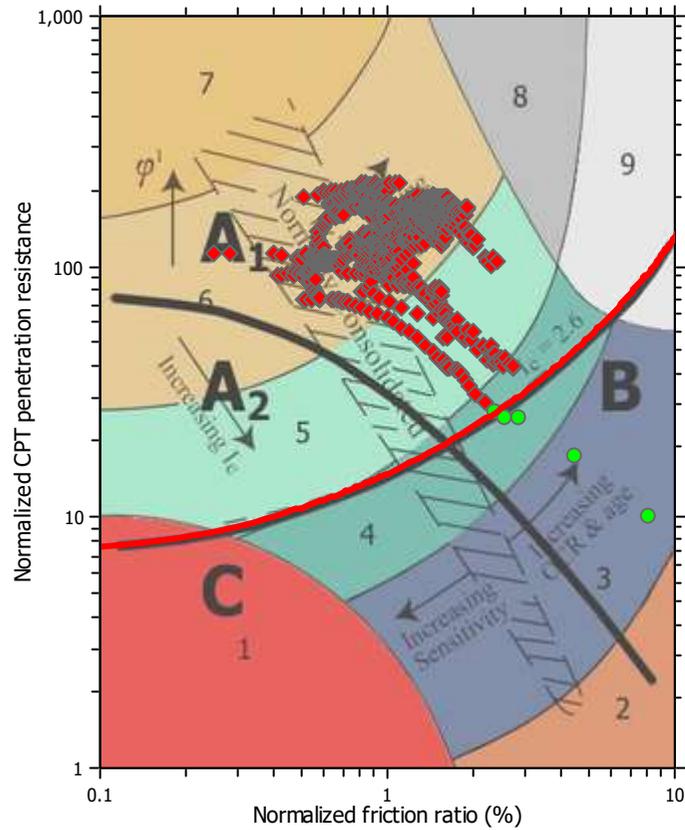
CPT file : 65-73 Ratanui Rd CPT12A

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



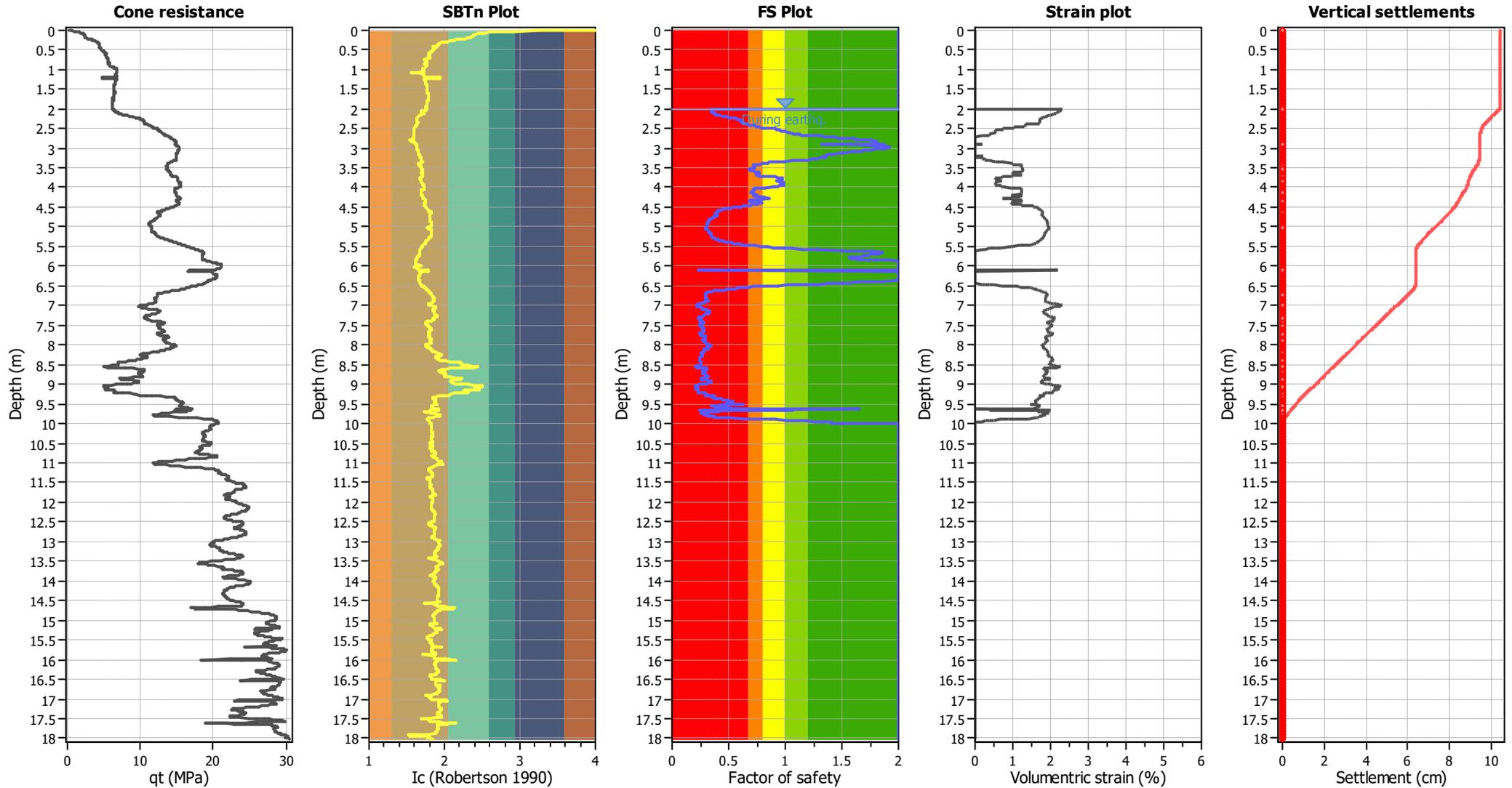
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _q applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	4.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

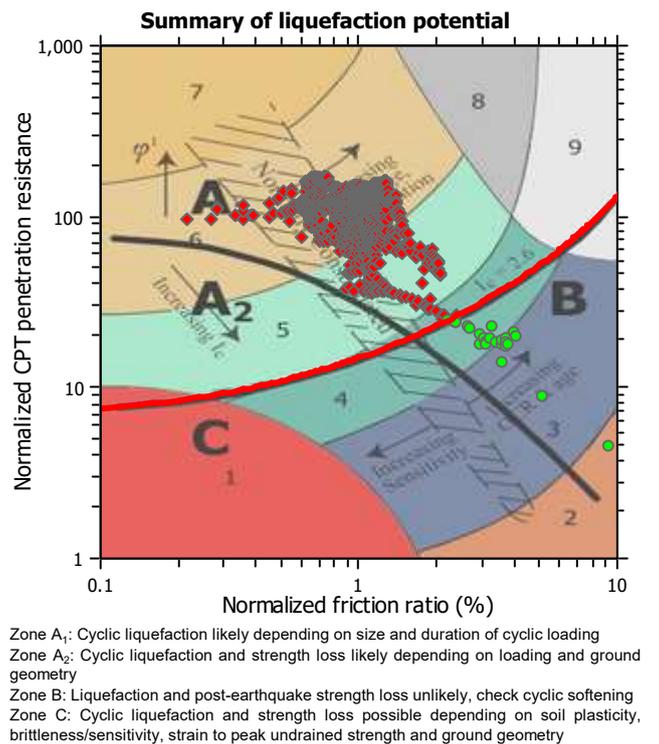
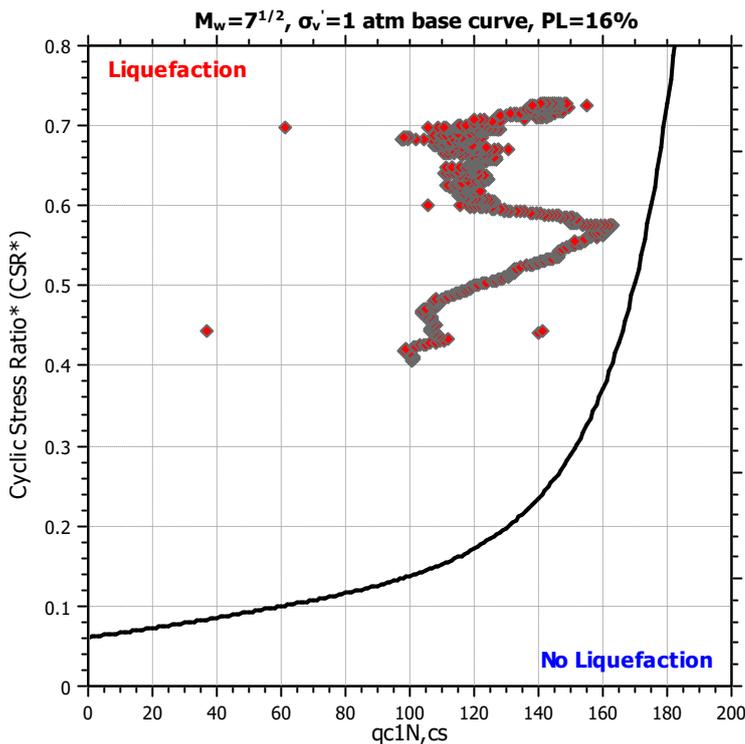
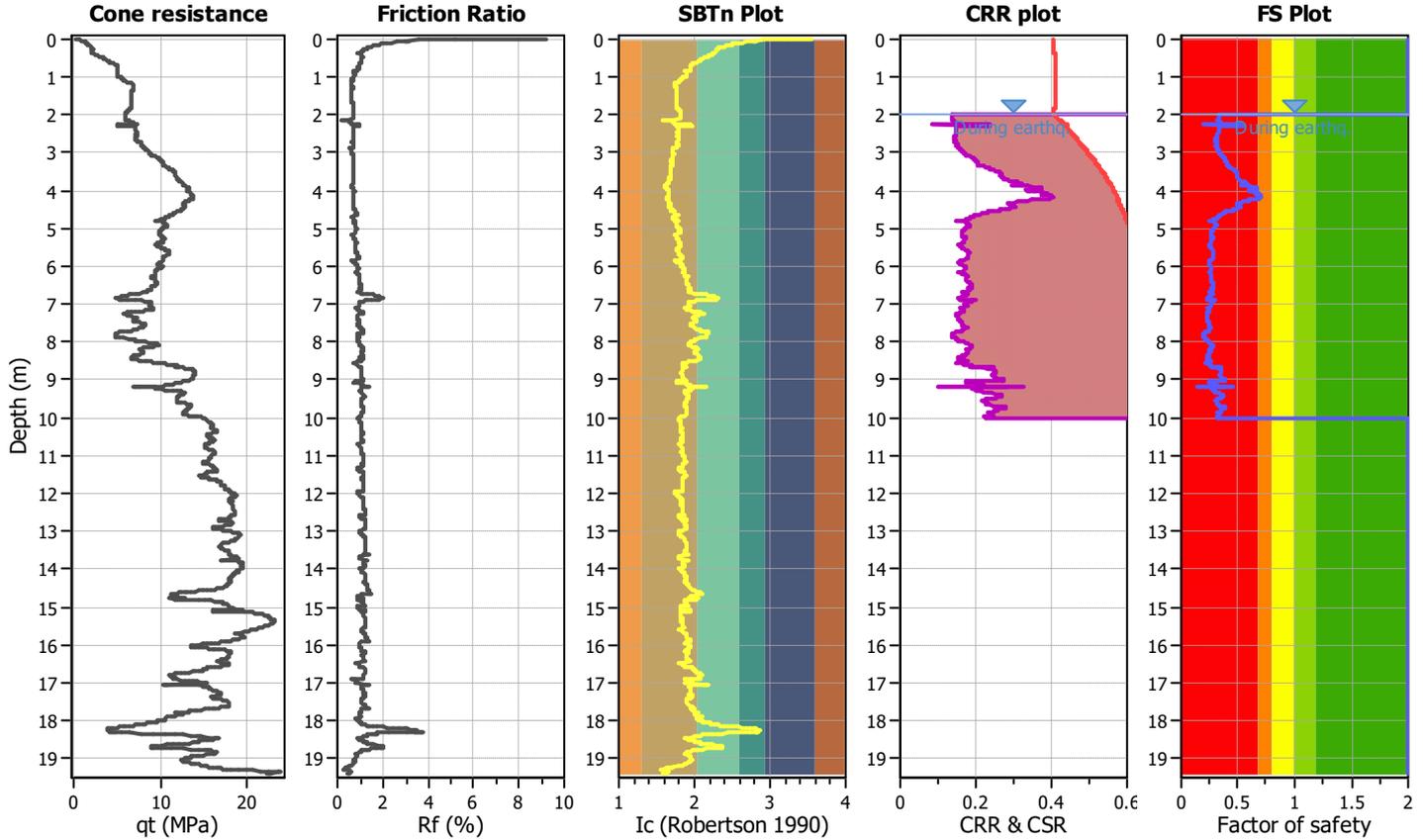
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT13

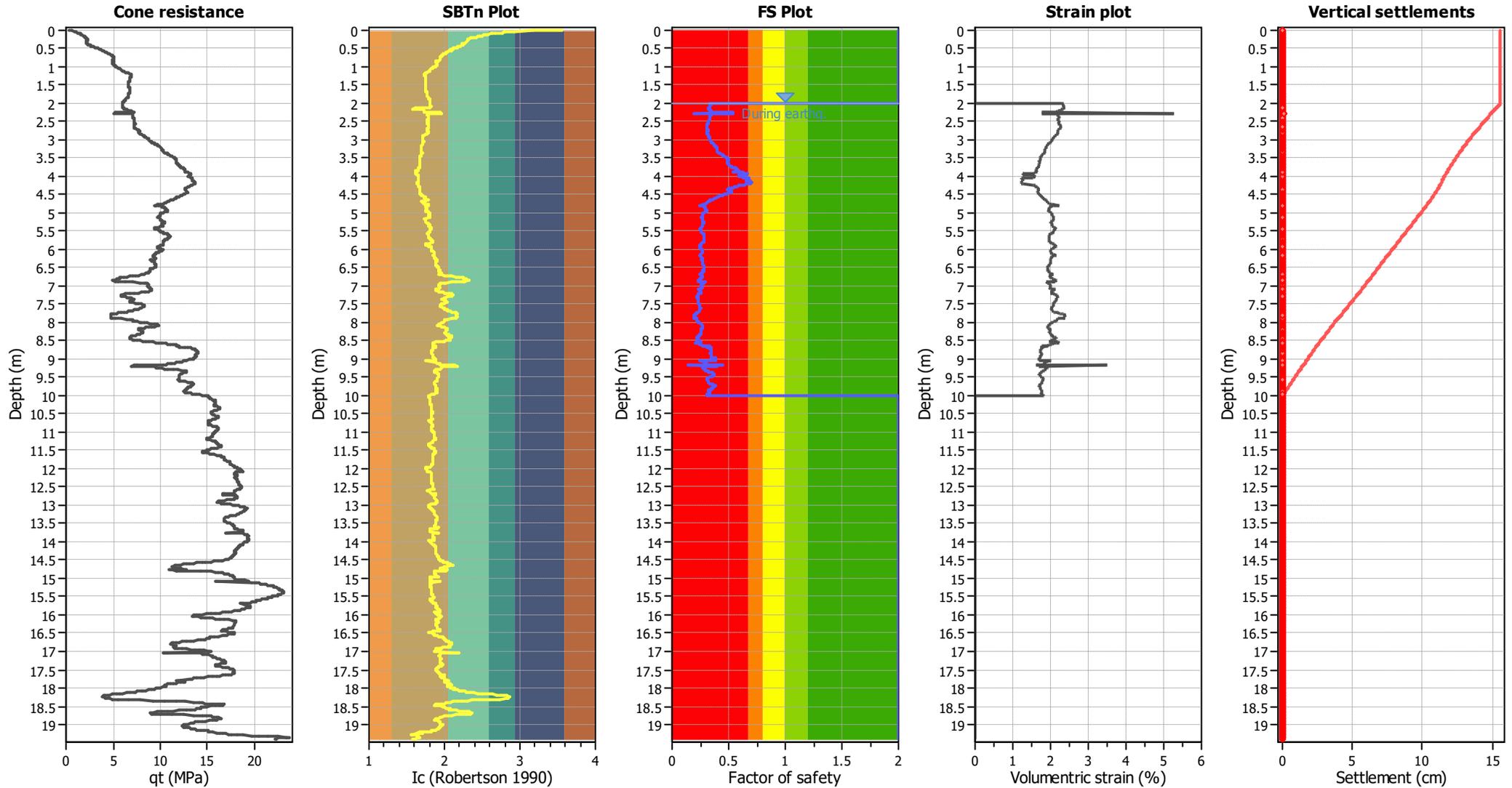
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.80 m	Use fill:	No	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

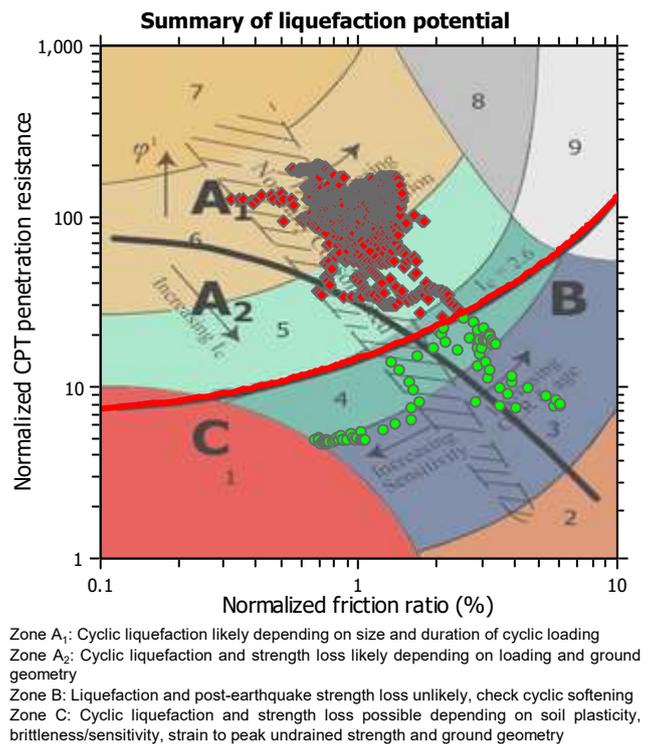
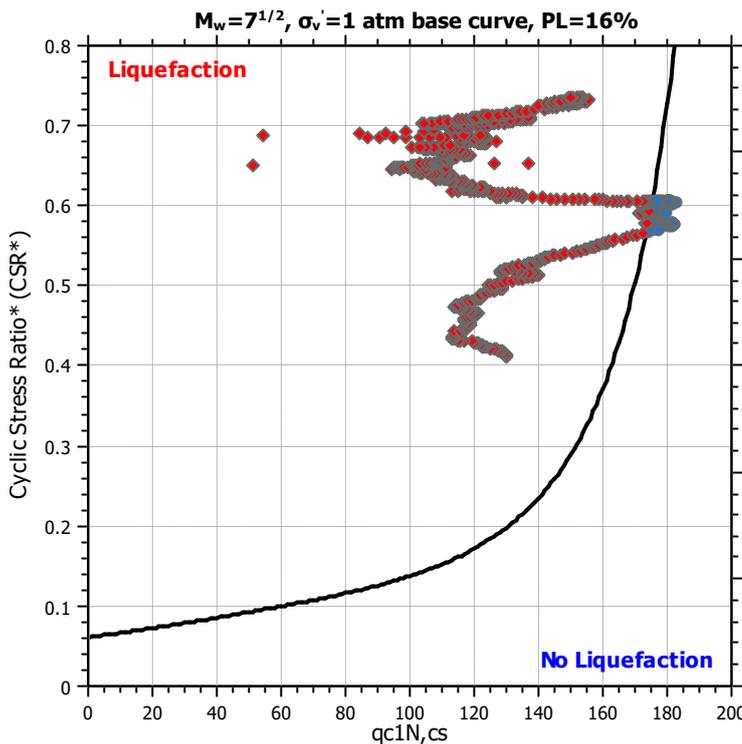
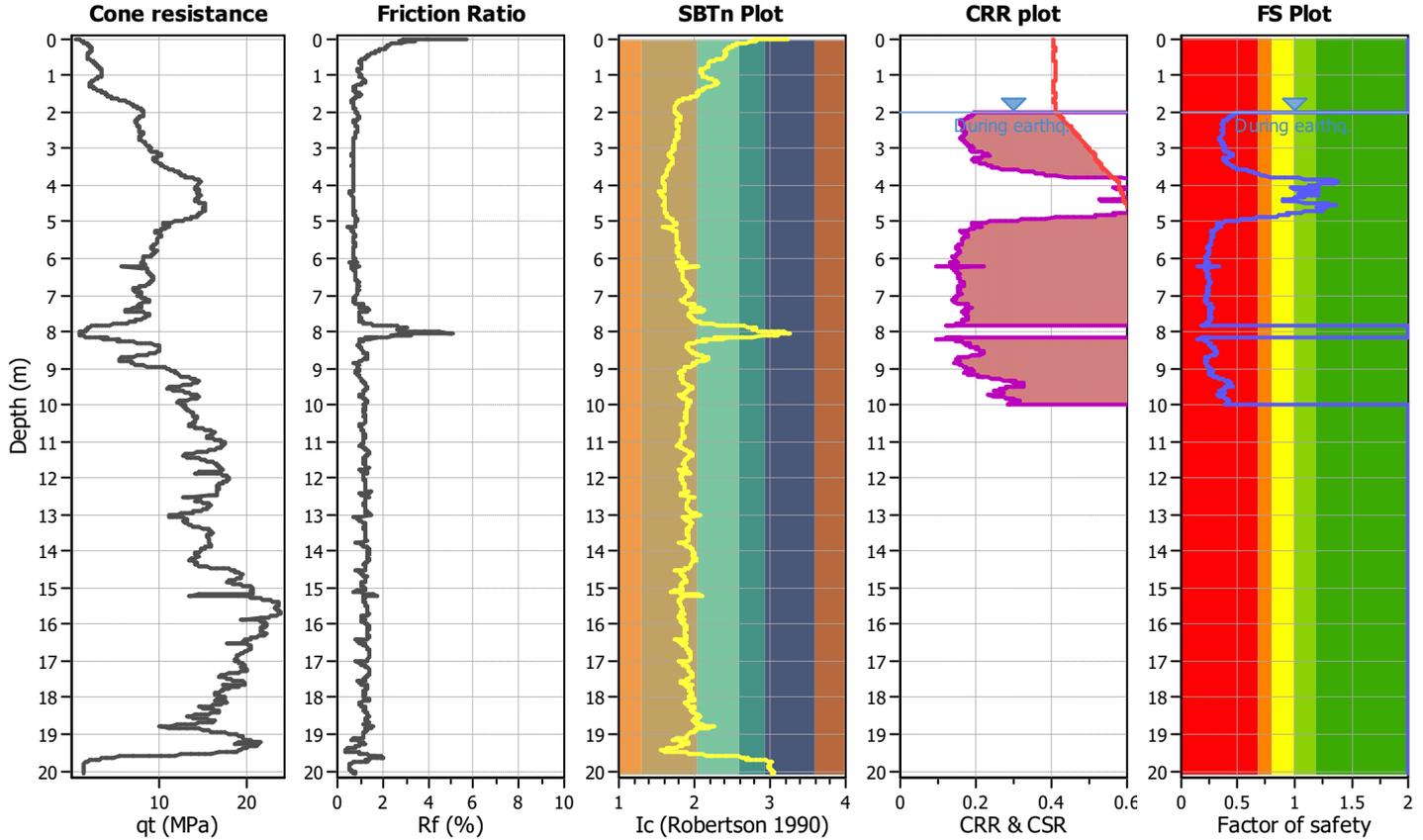
Project title : Summerset Paraparaumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparaumu

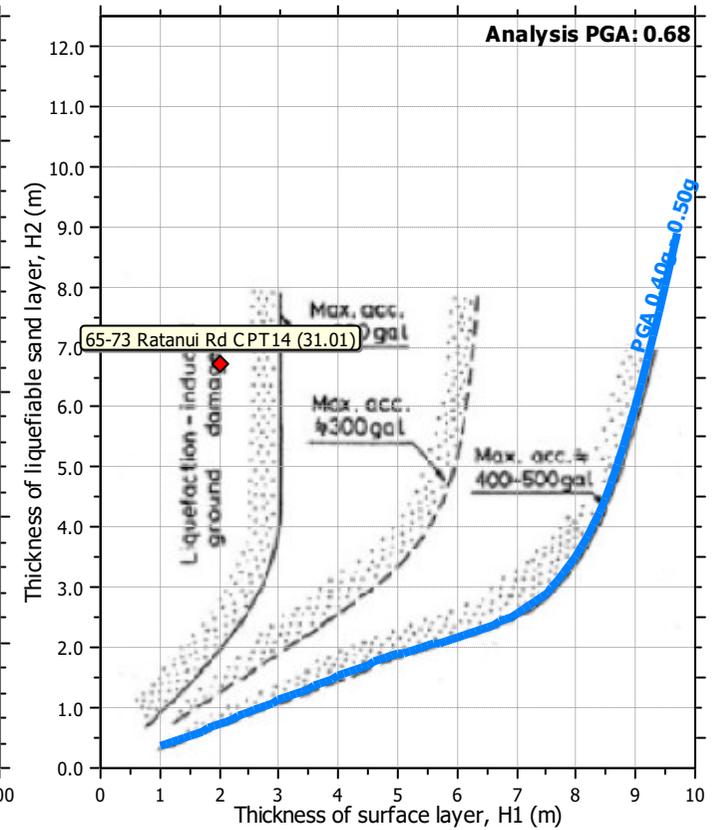
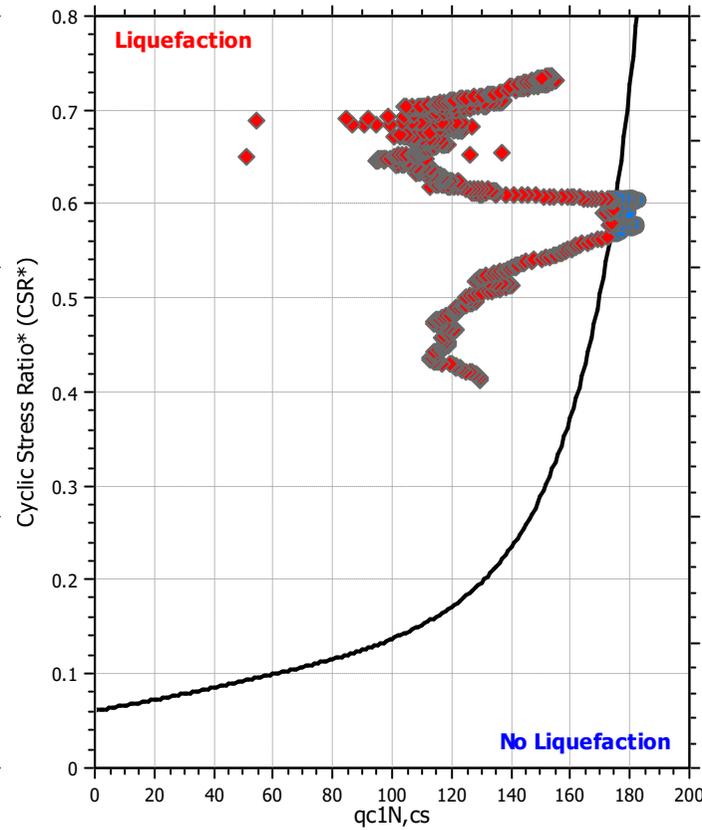
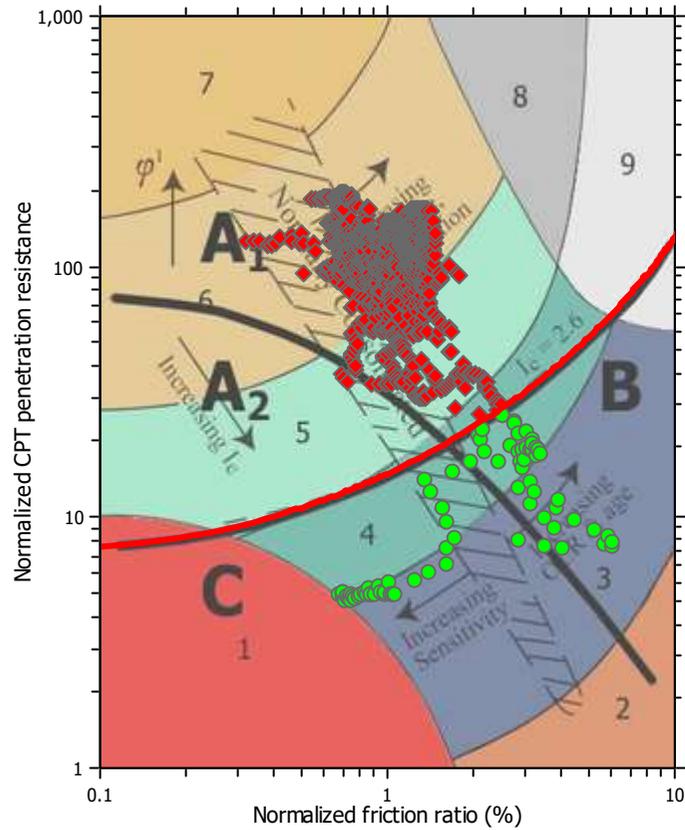
CPT file : 65-73 Ratanui Rd CPT14

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



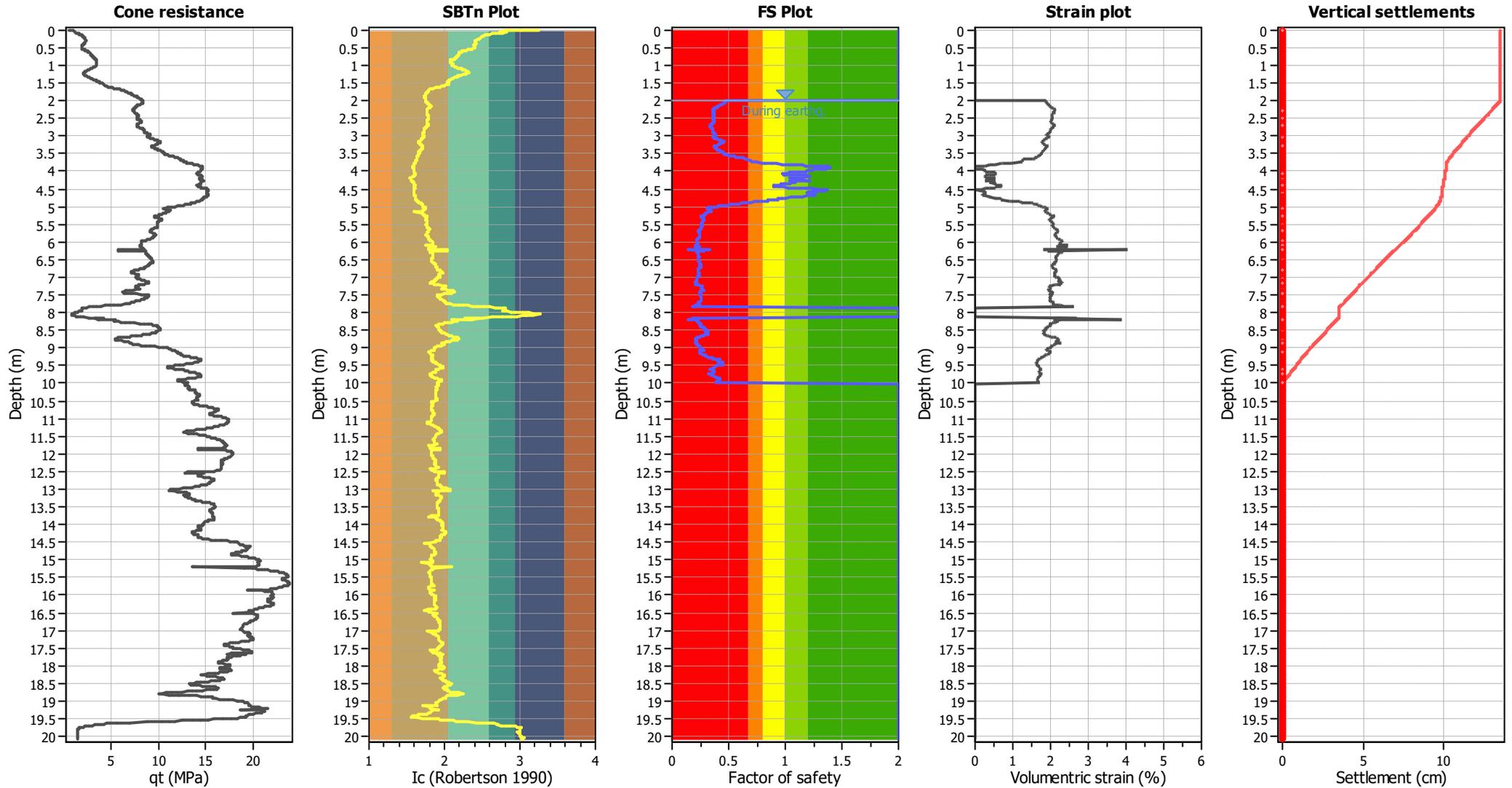
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

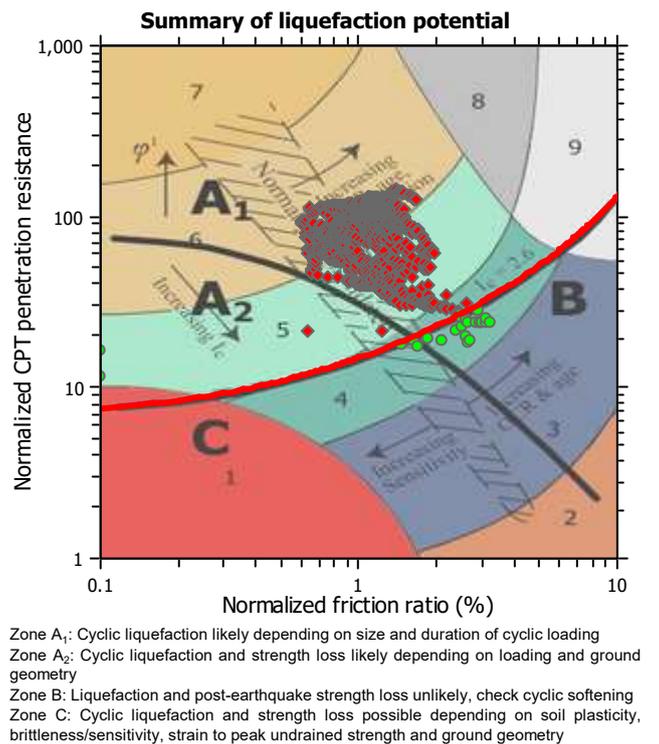
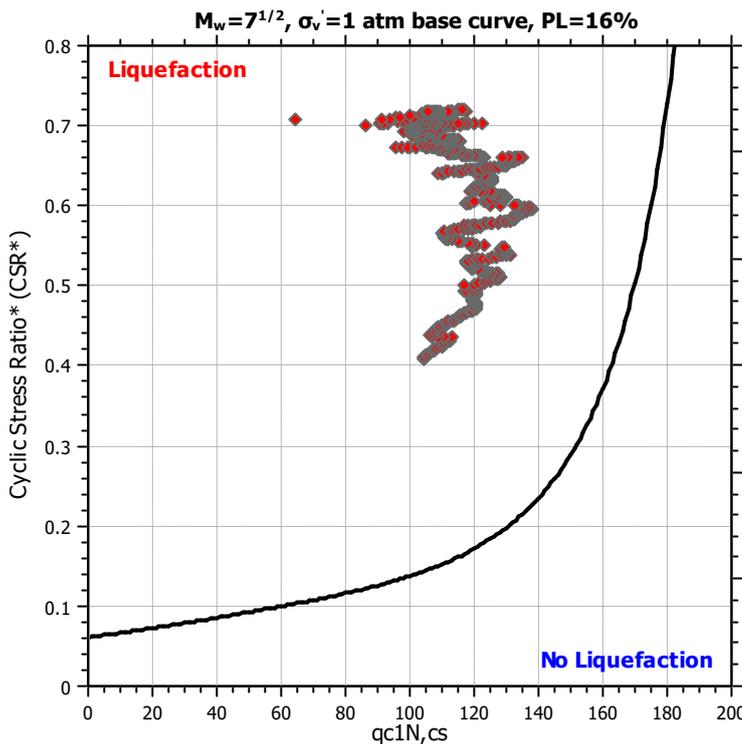
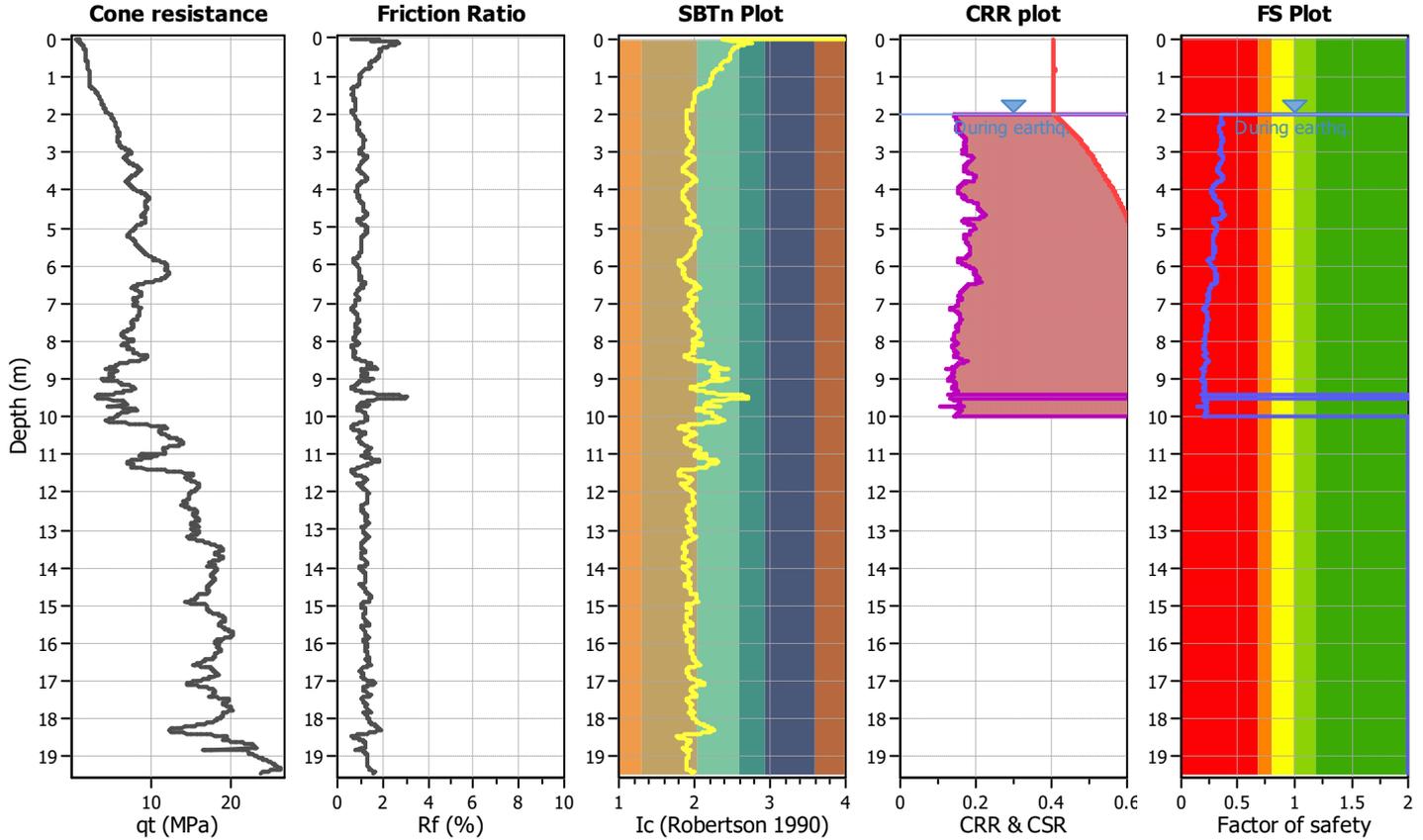
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT15

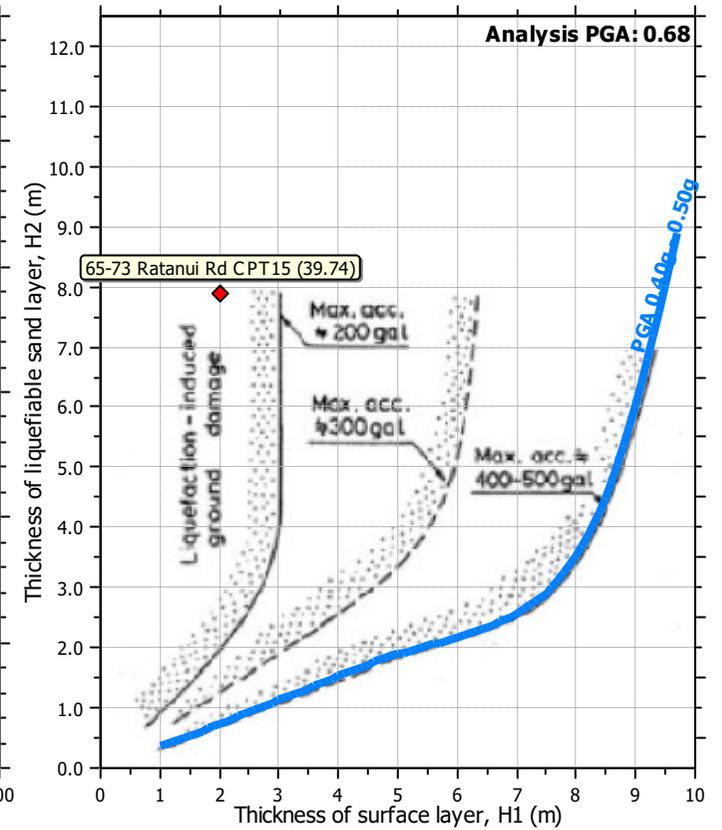
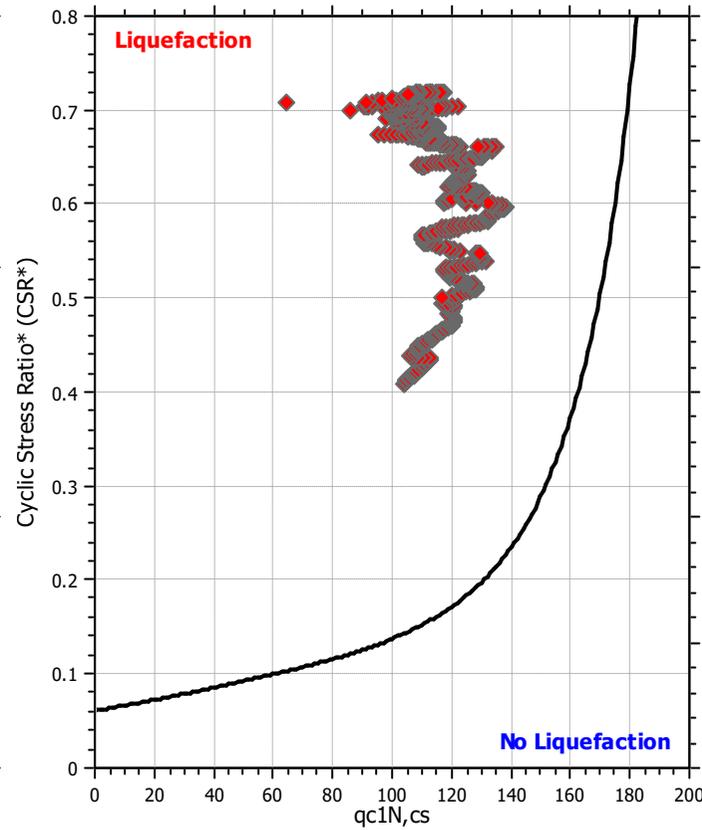
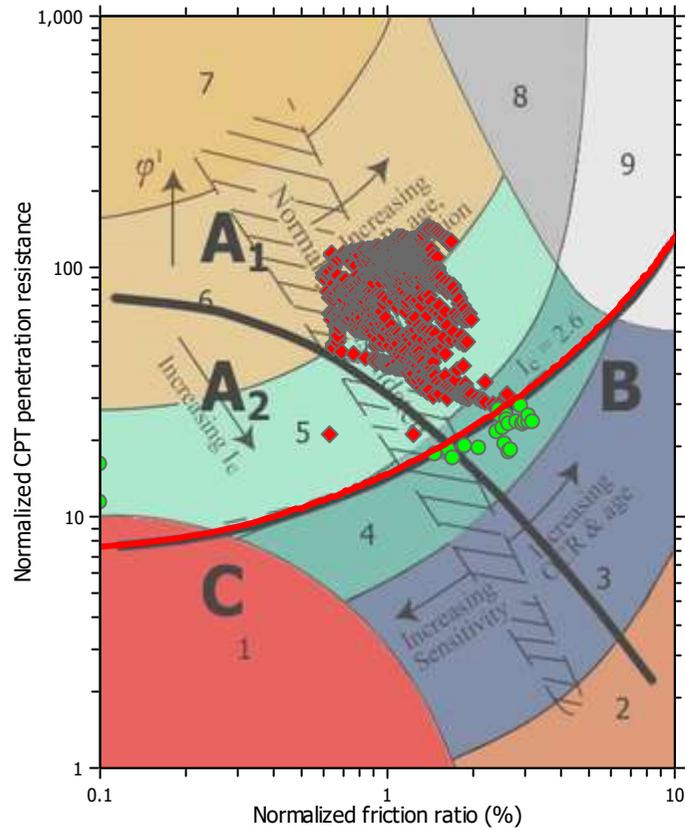
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



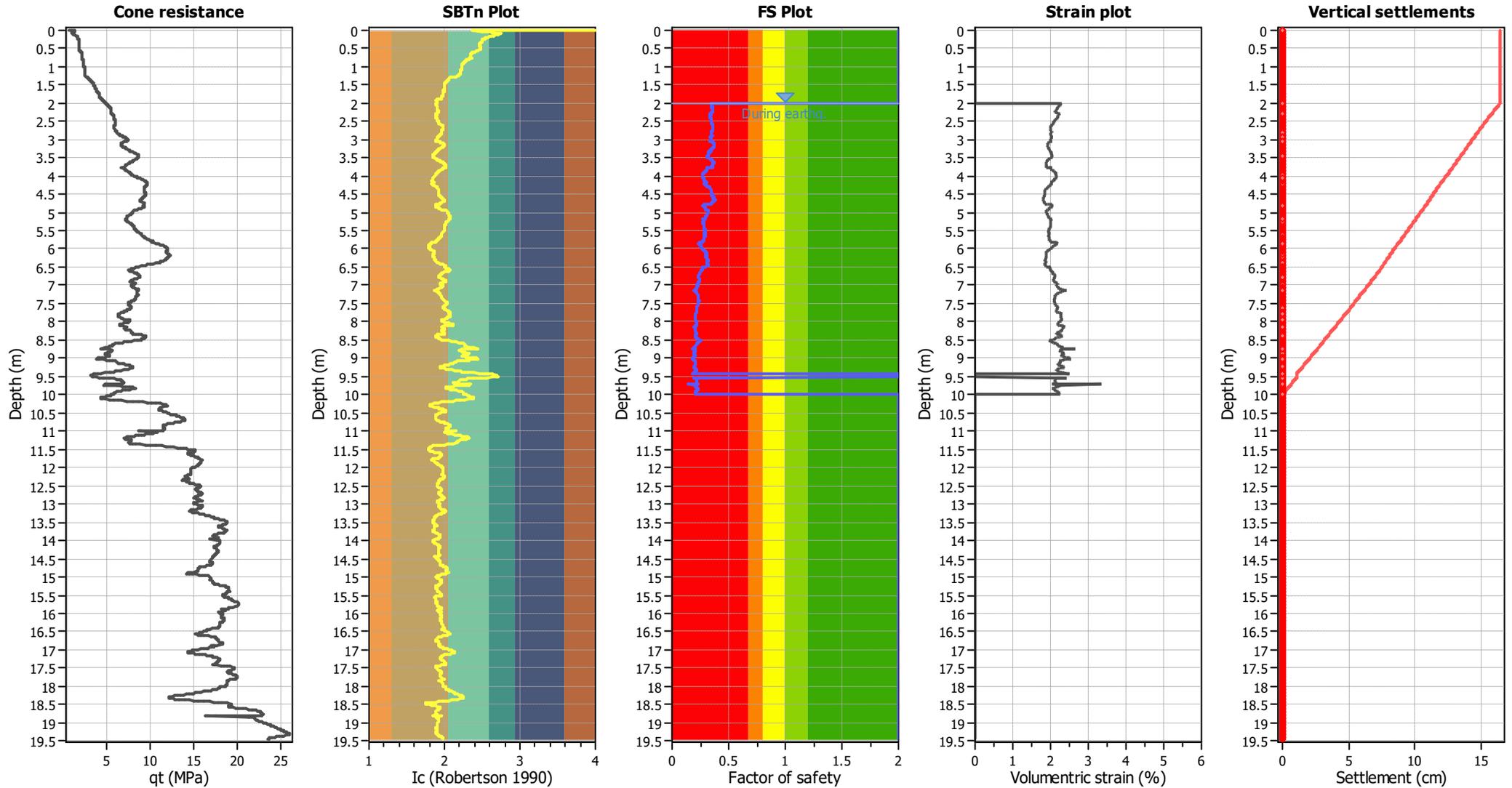
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

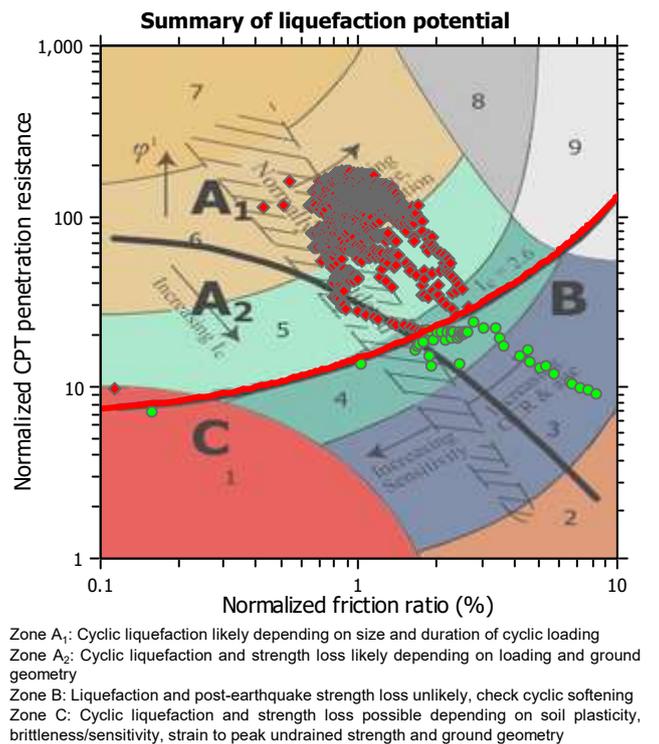
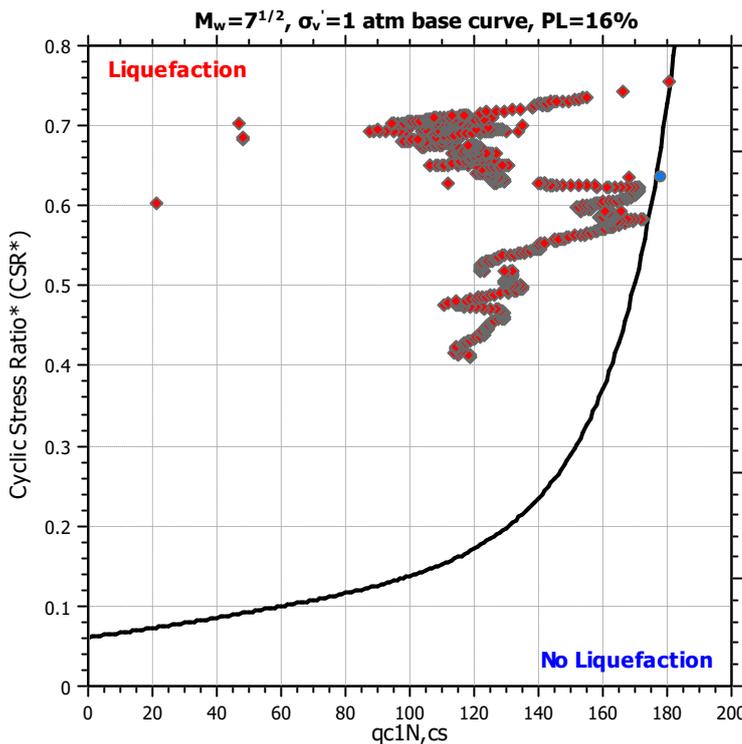
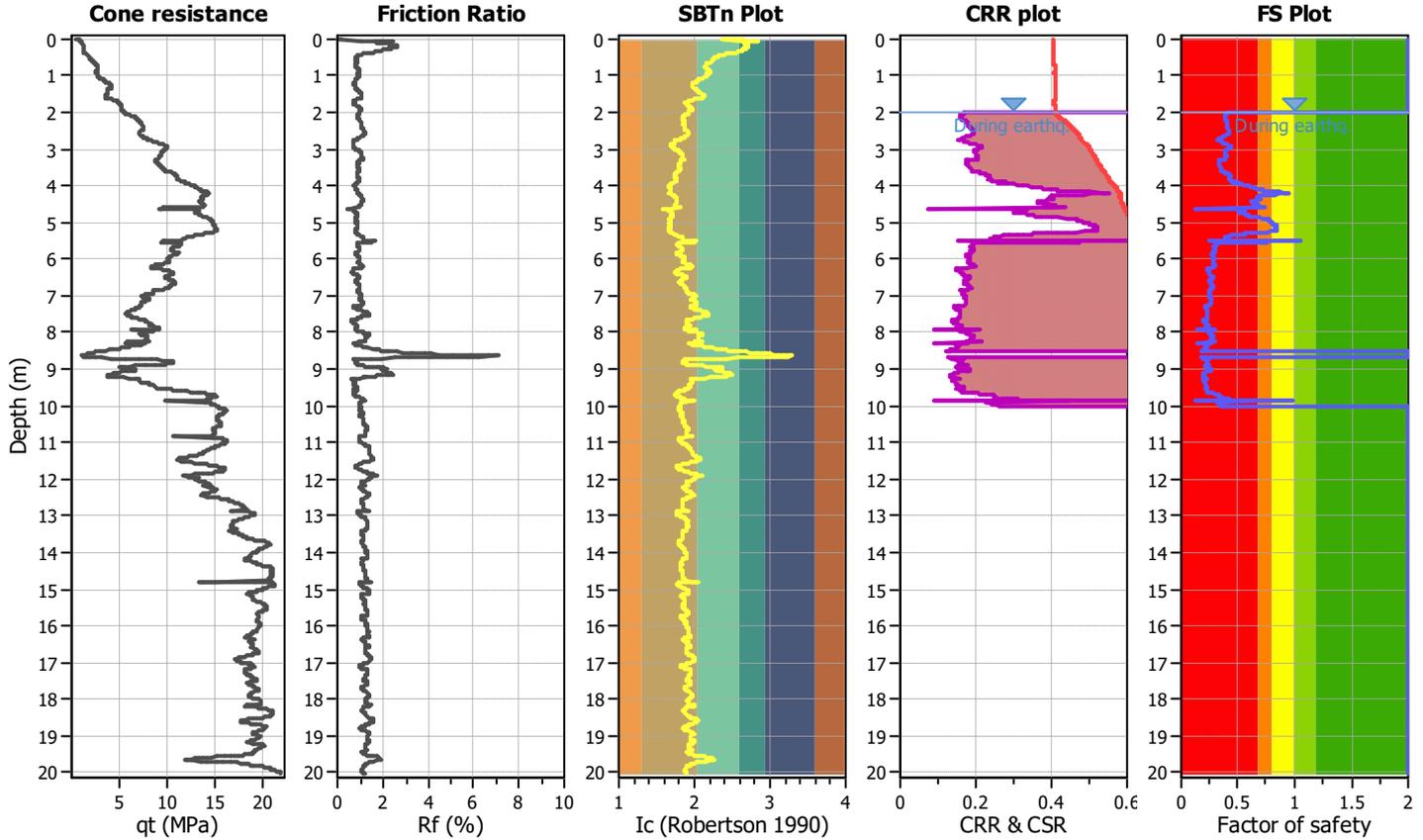
Project title : Summerset Paraparumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparumu

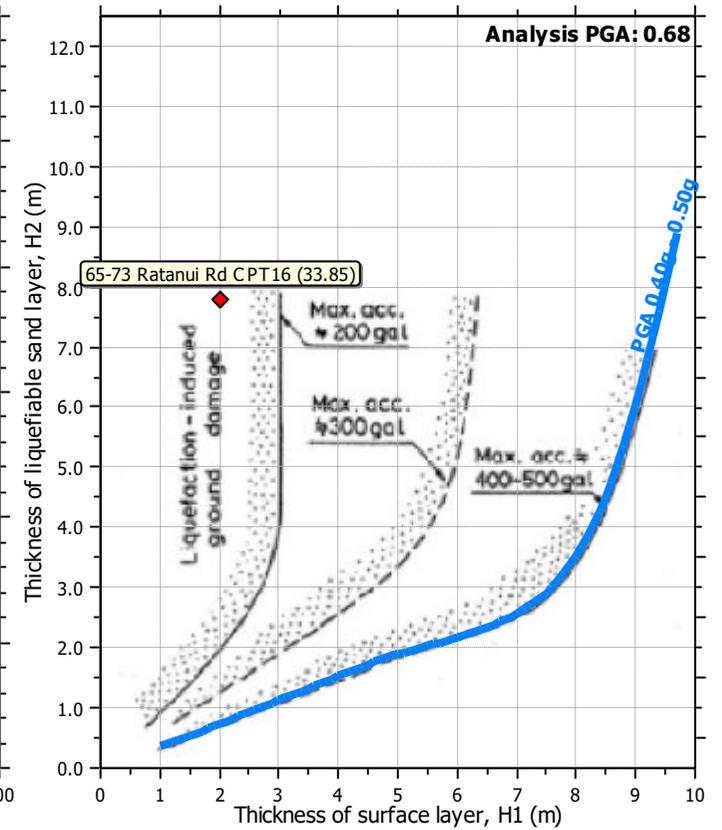
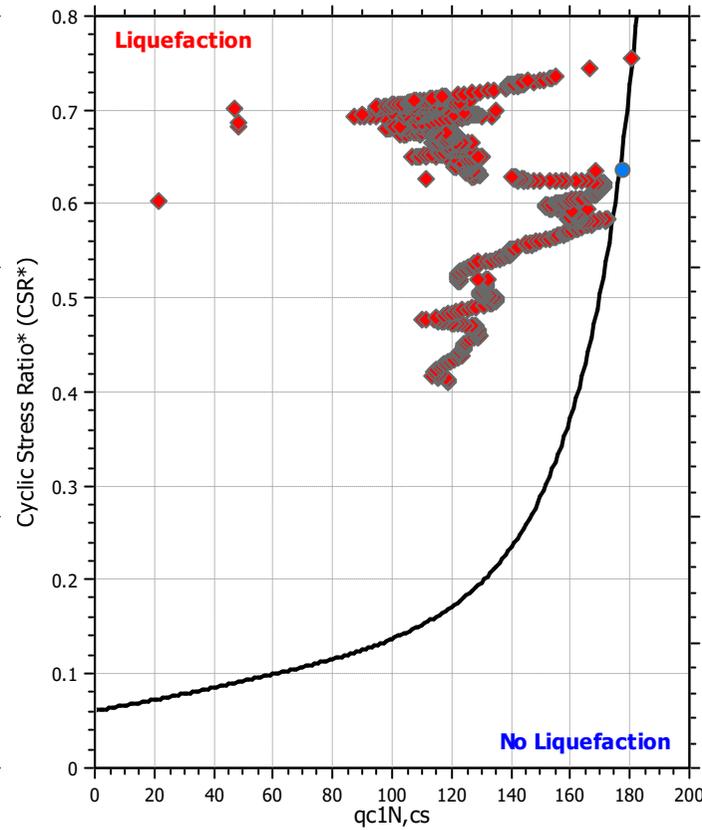
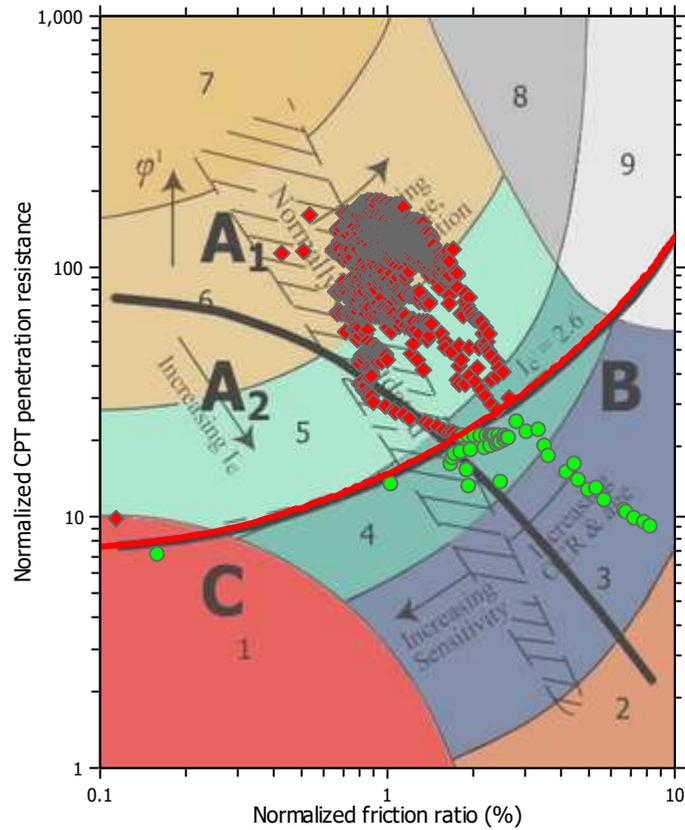
CPT file : 65-73 Ratanui Rd CPT16

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



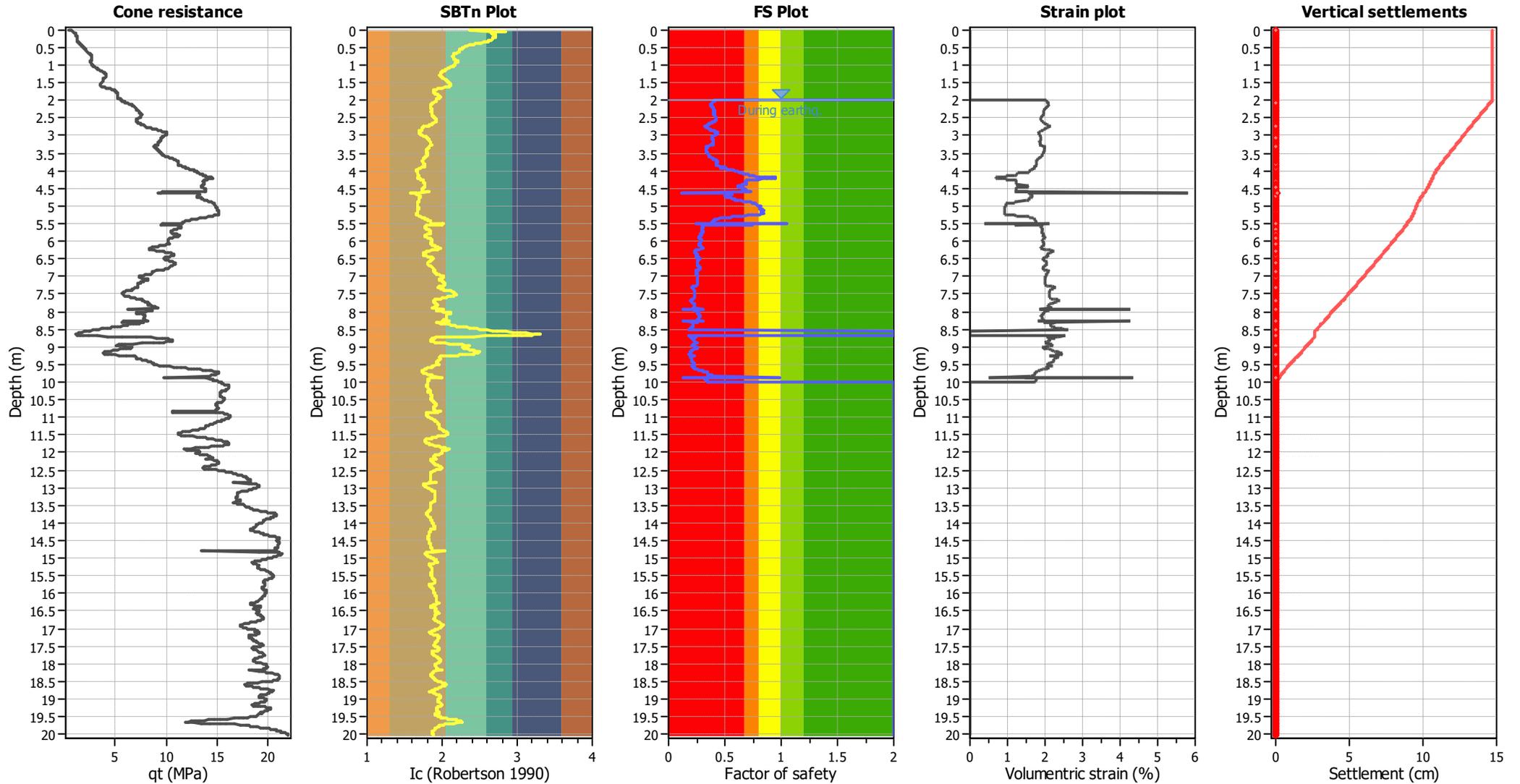
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

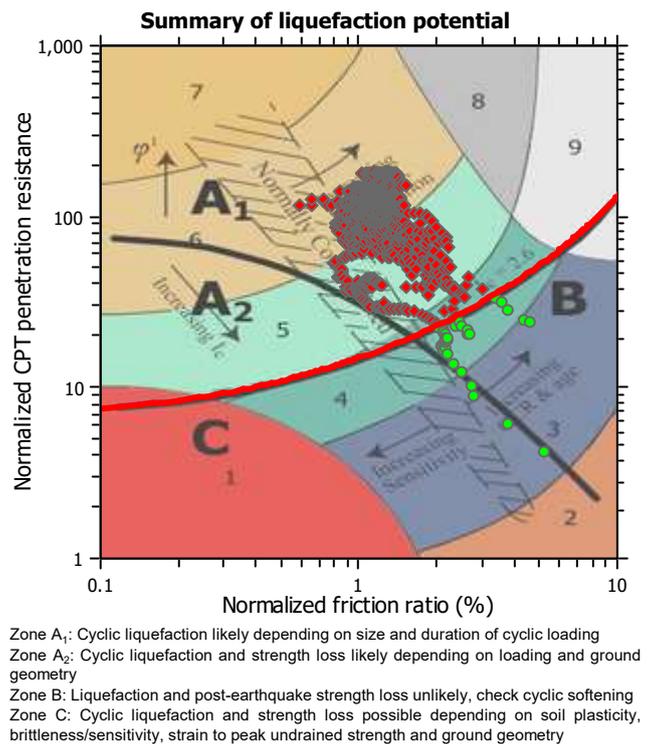
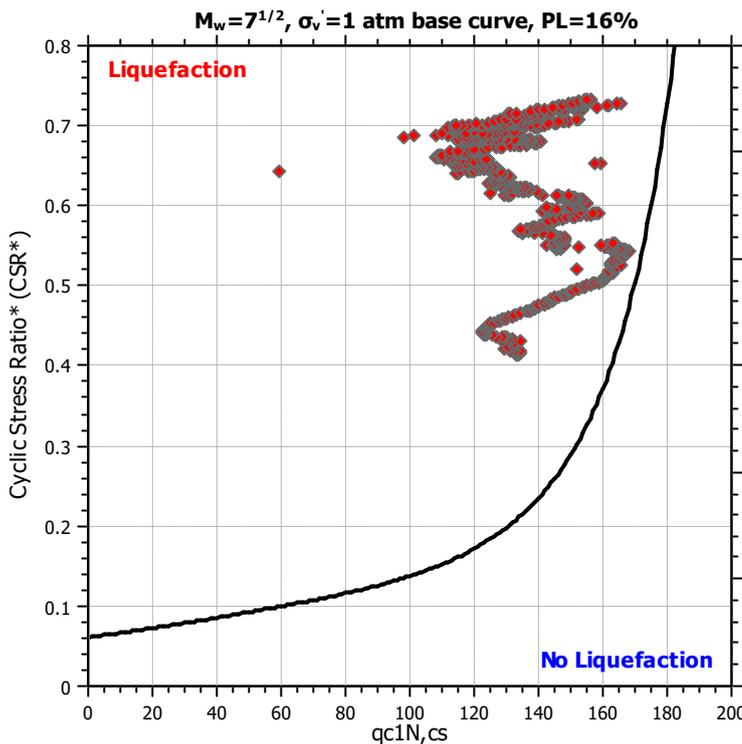
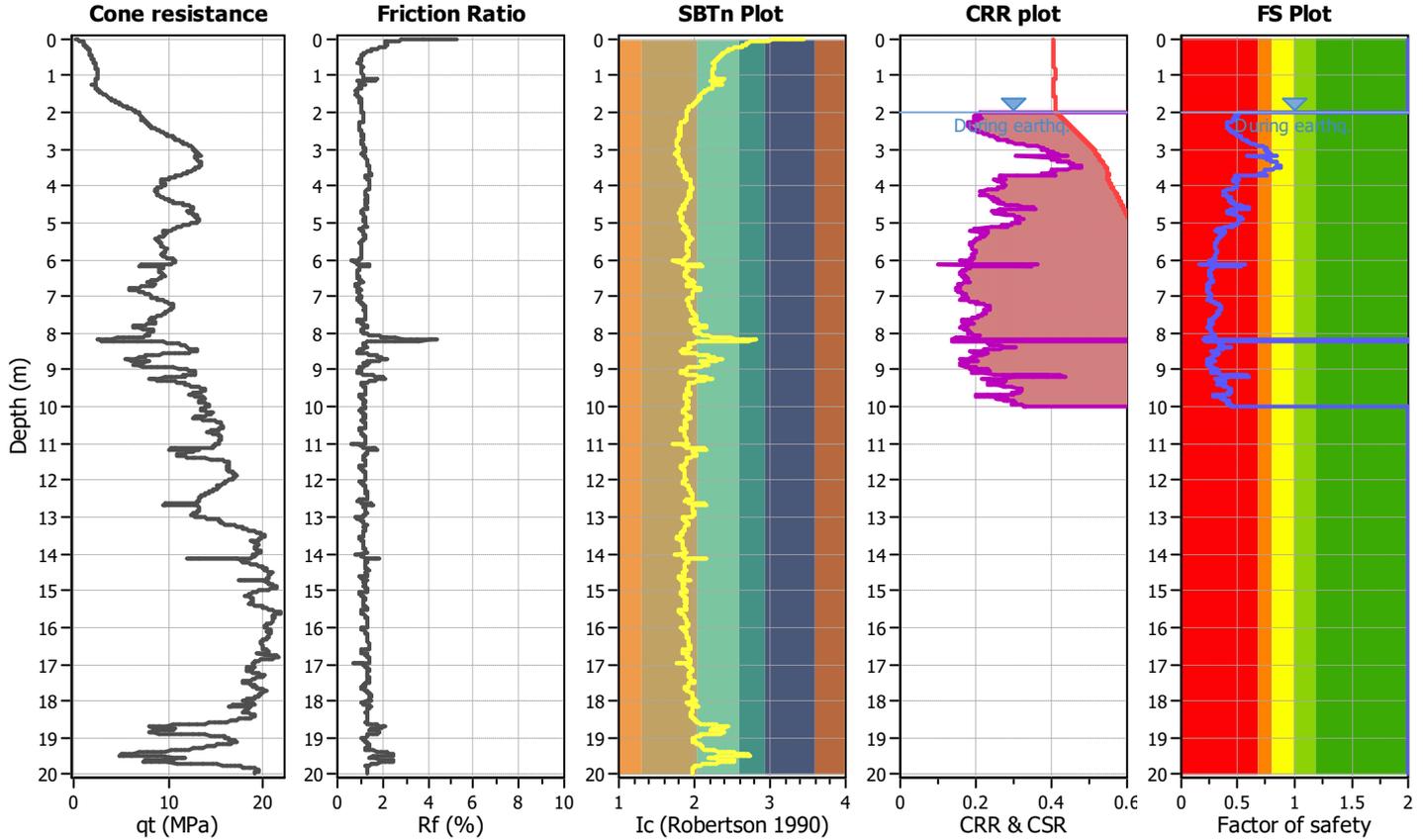
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT17

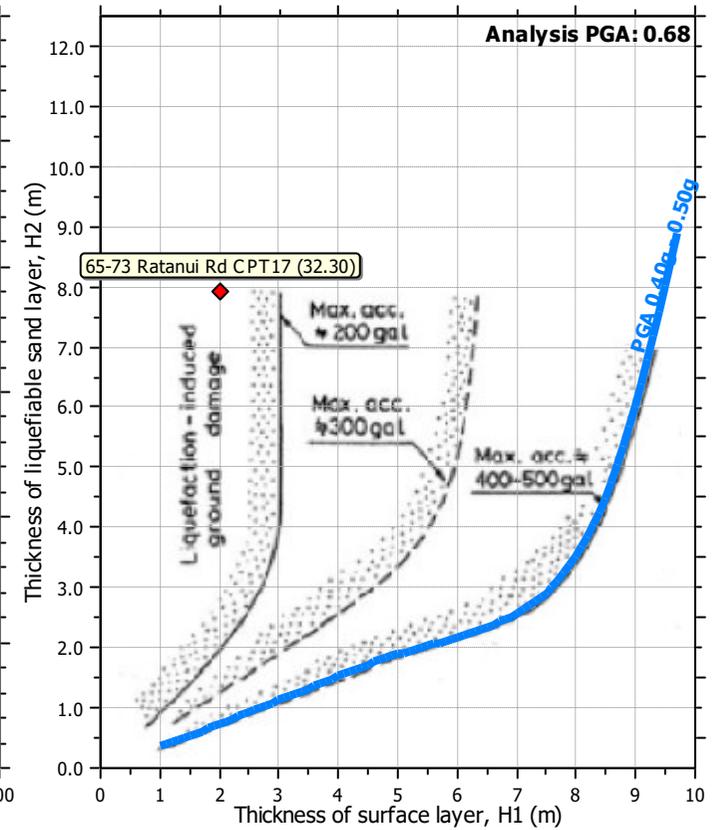
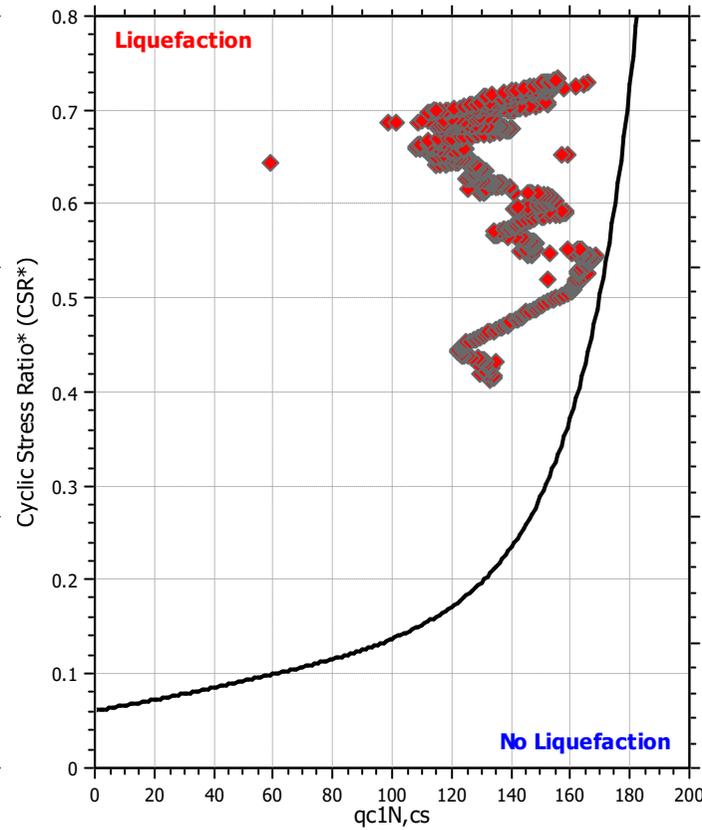
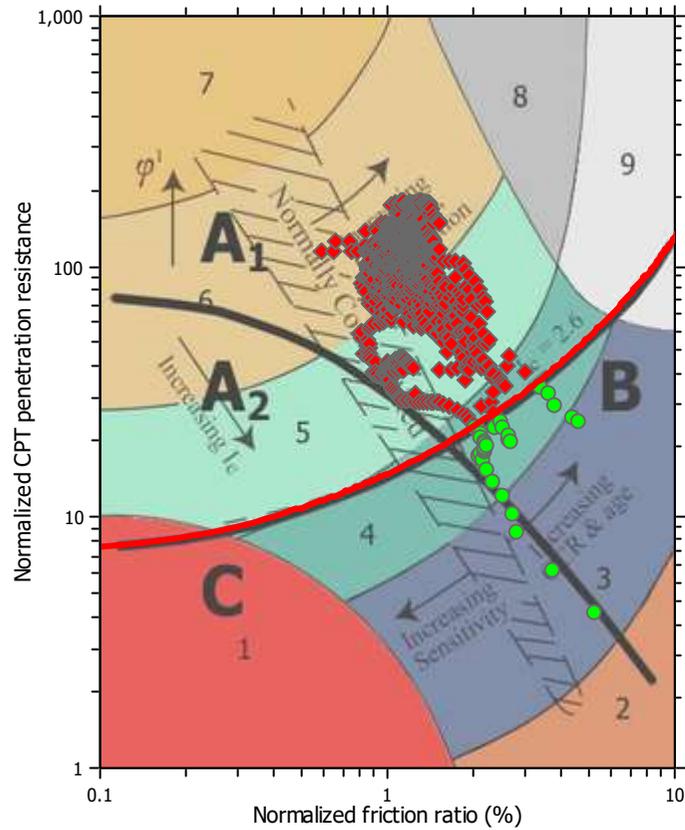
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_g applied:	Yes		



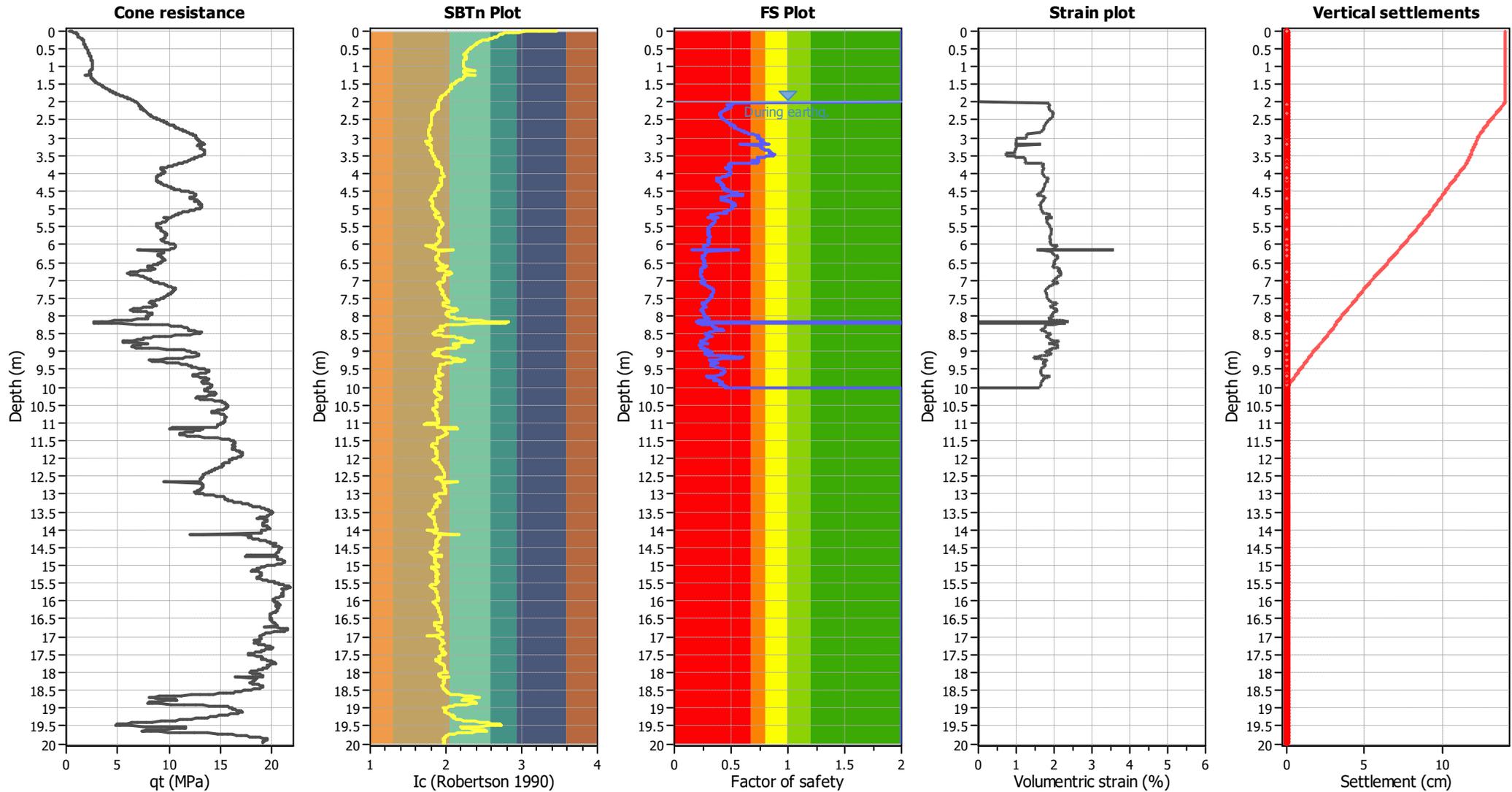
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

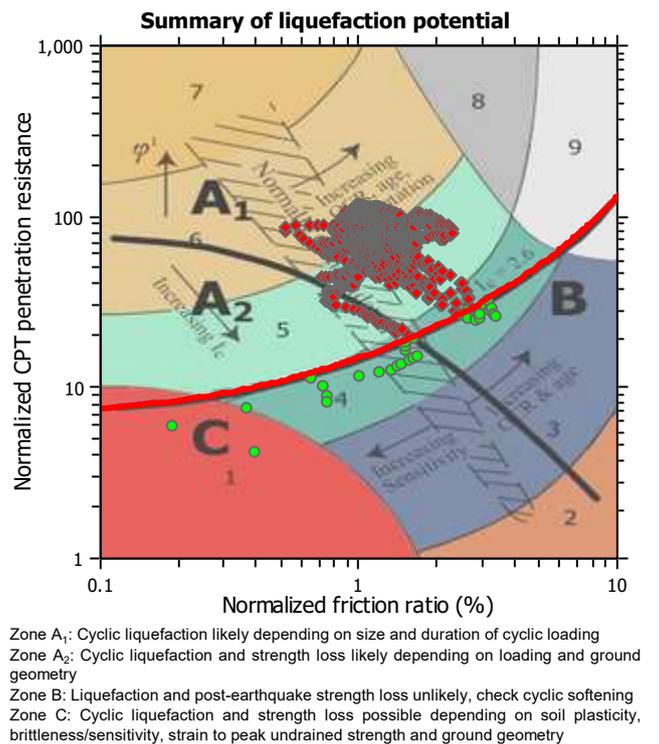
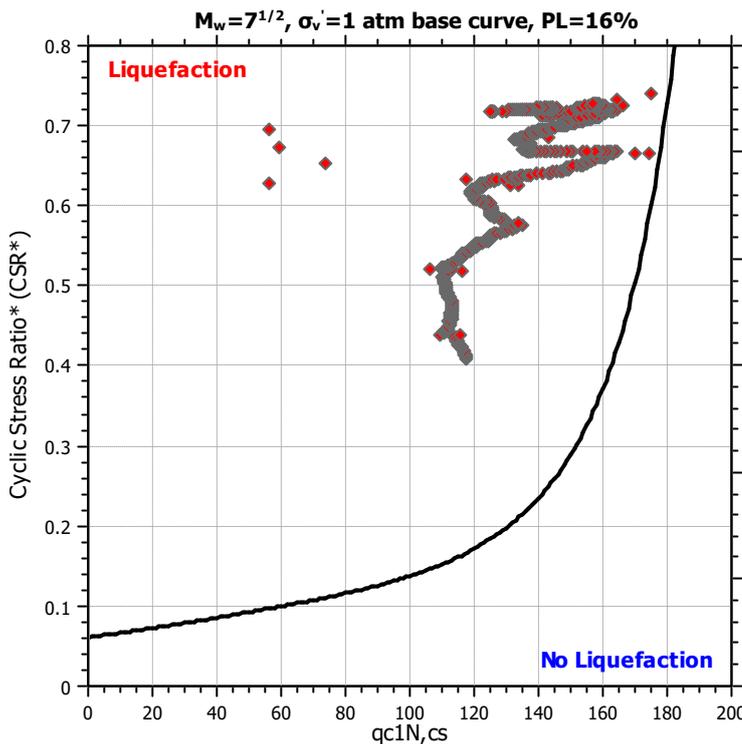
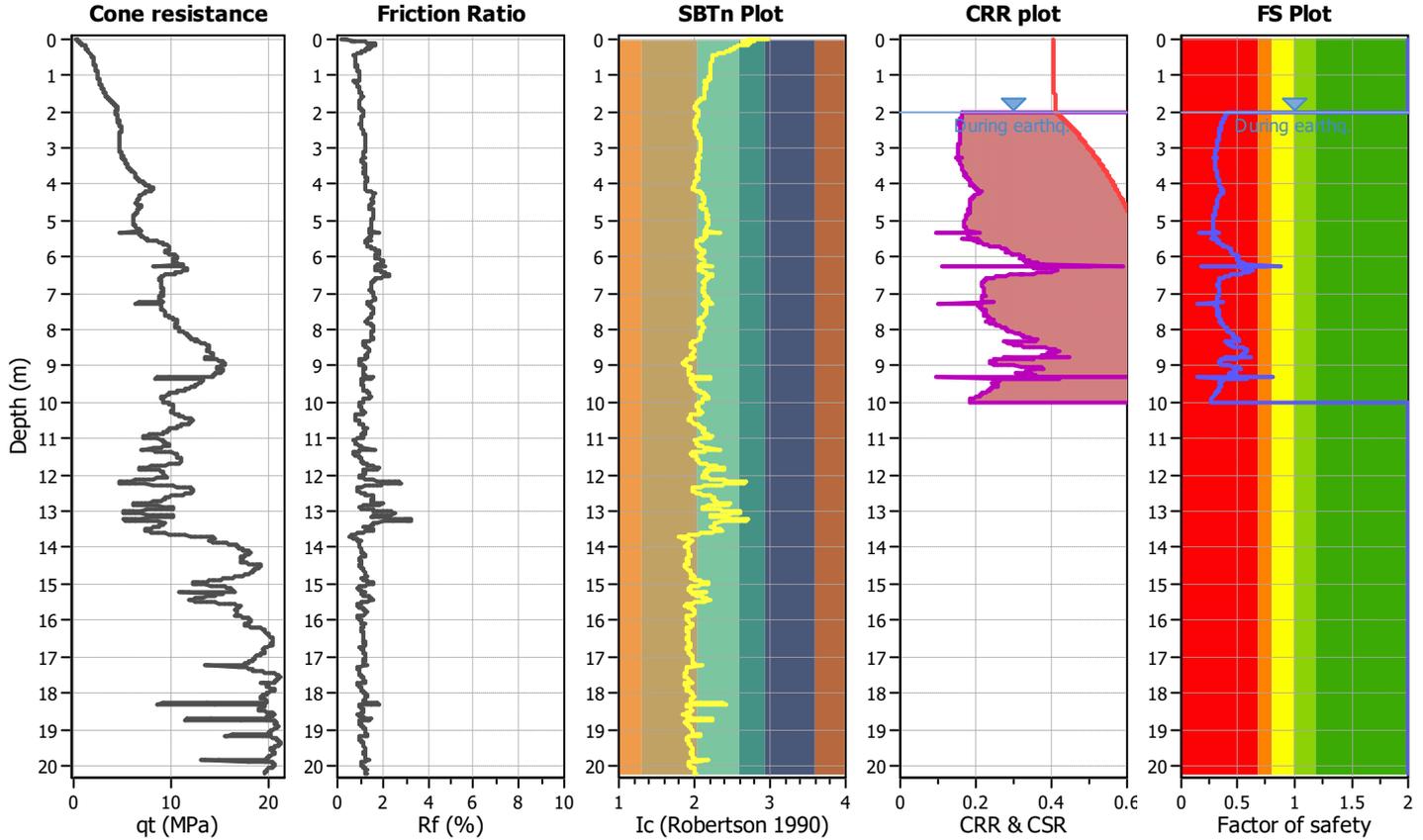
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT18

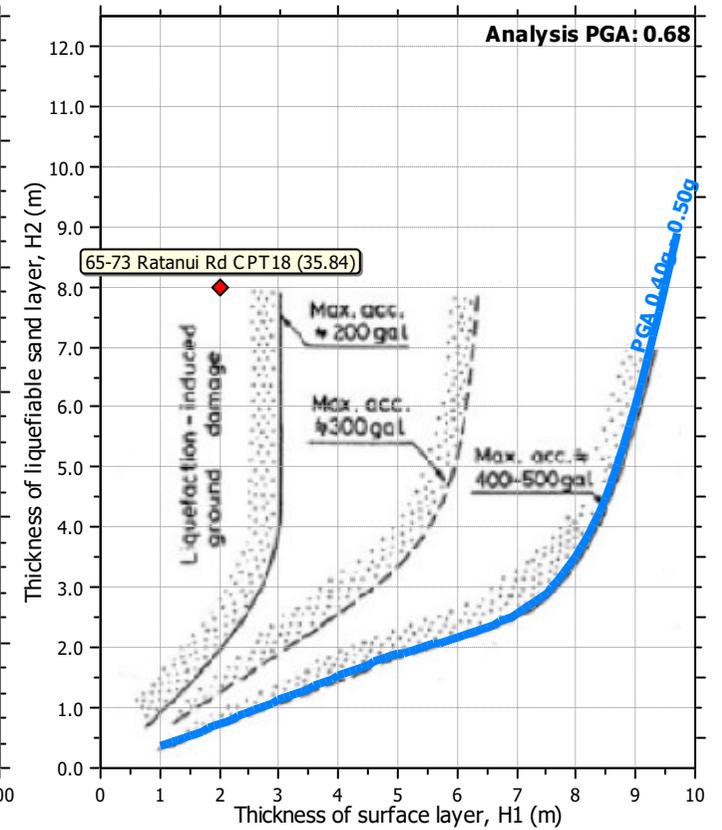
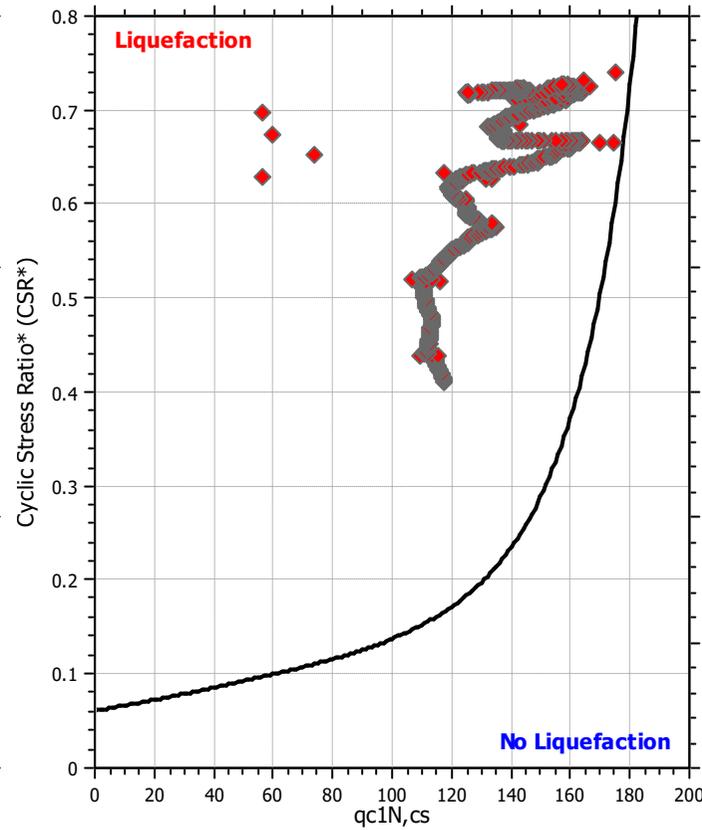
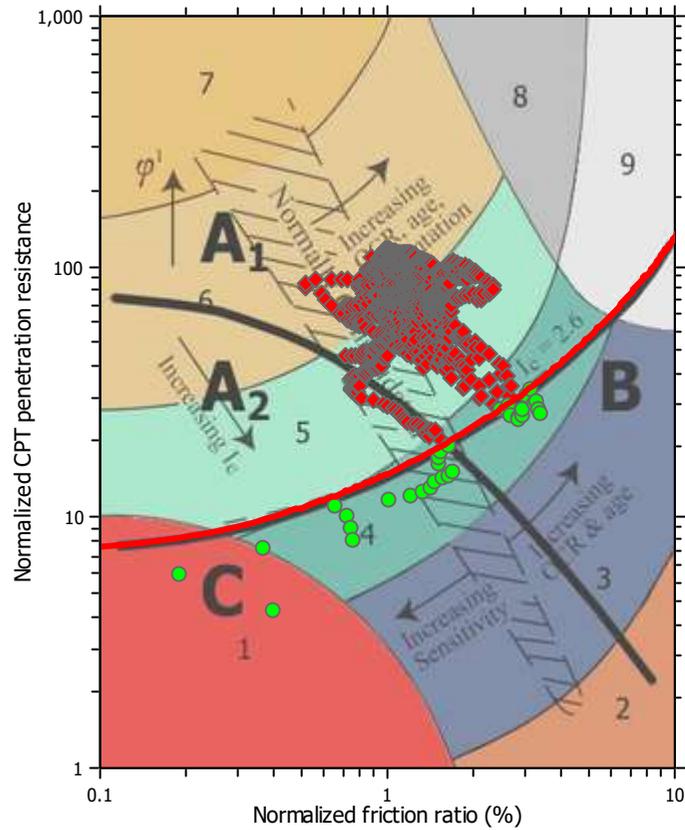
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



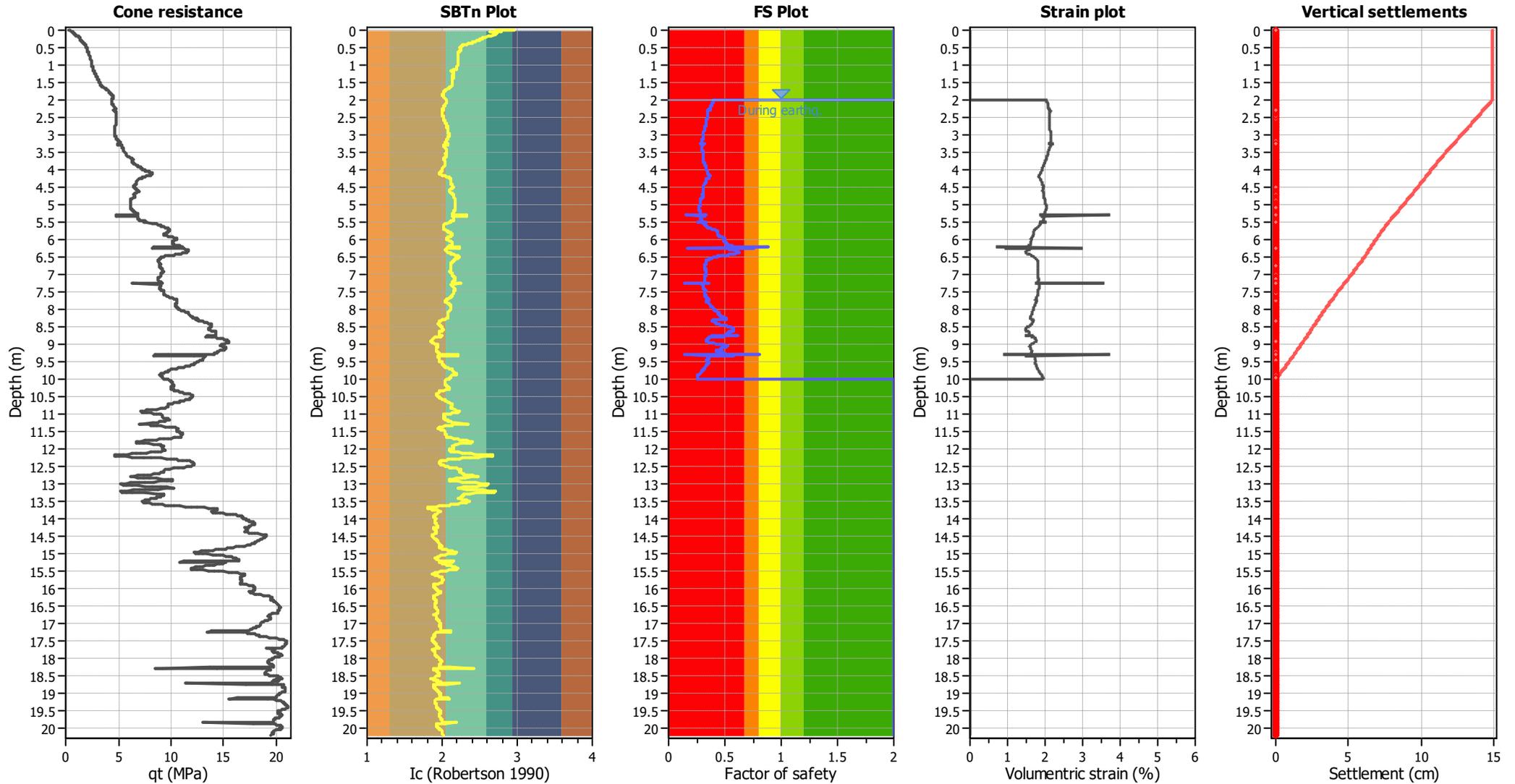
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

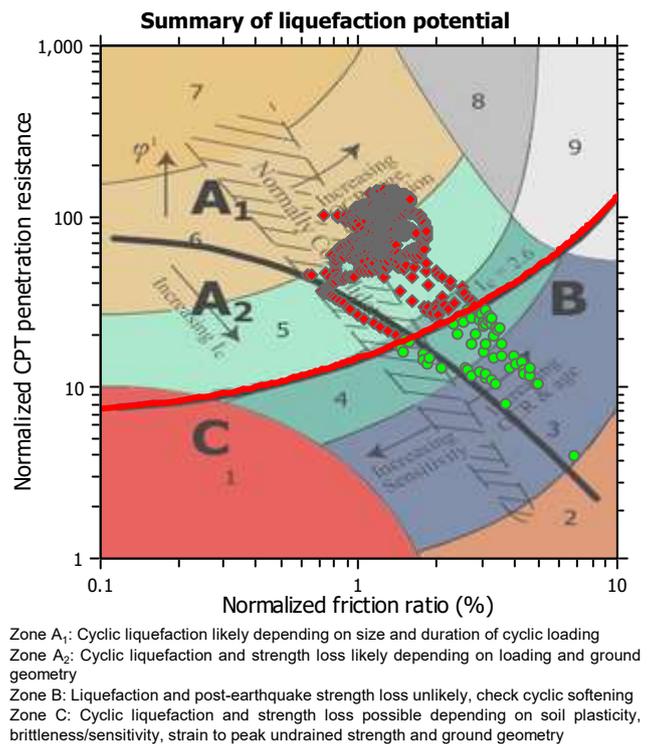
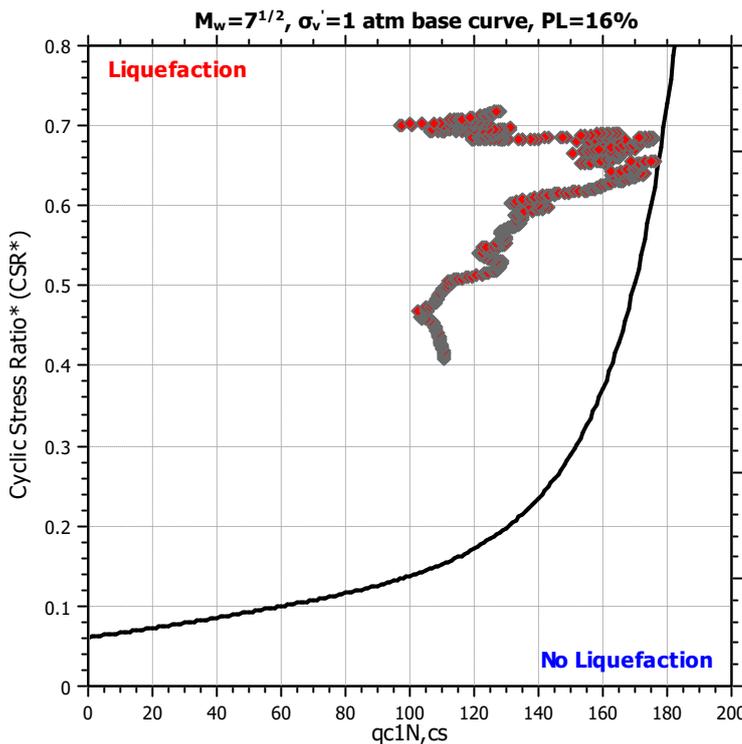
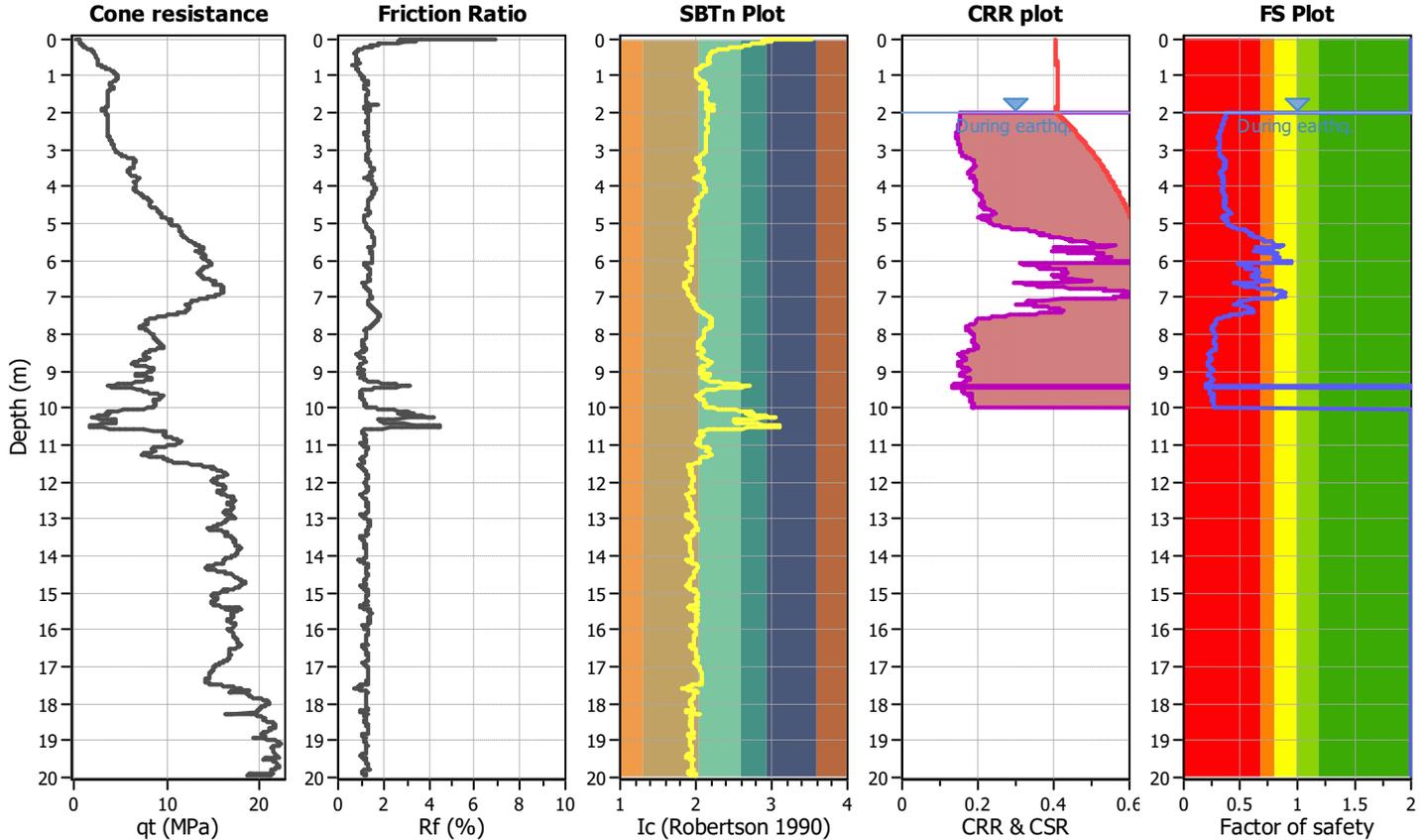
LIQUEFACTION ANALYSIS REPORT

Project title : Summerset Paraparaumu - 500yr
CPT file : 65-73 Ratanui Rd CPT19

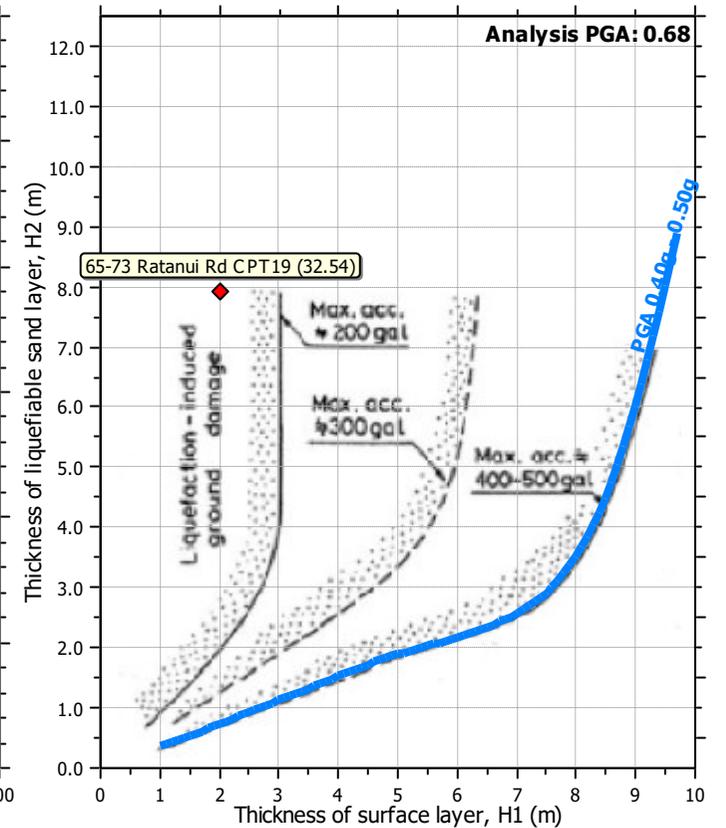
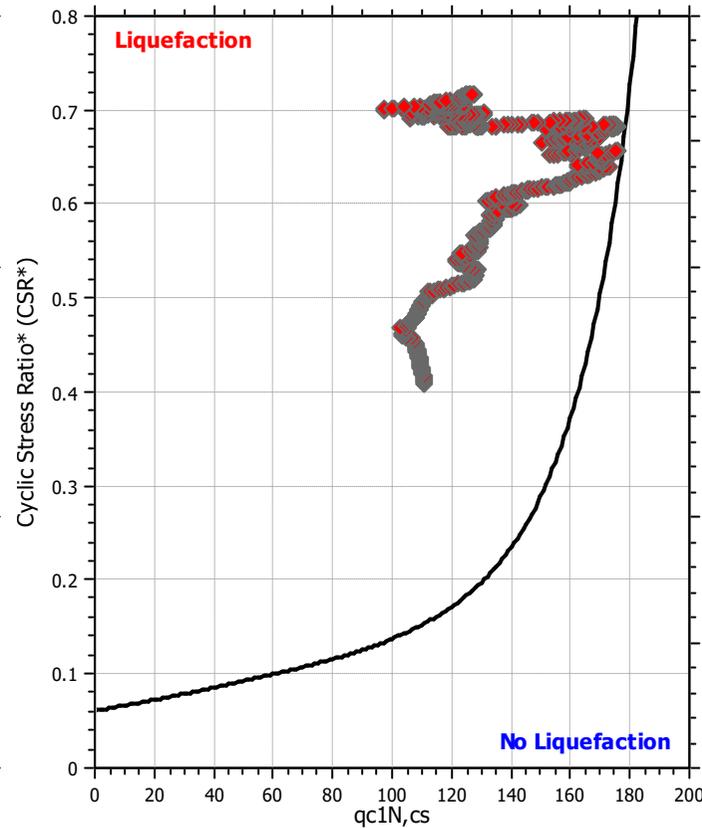
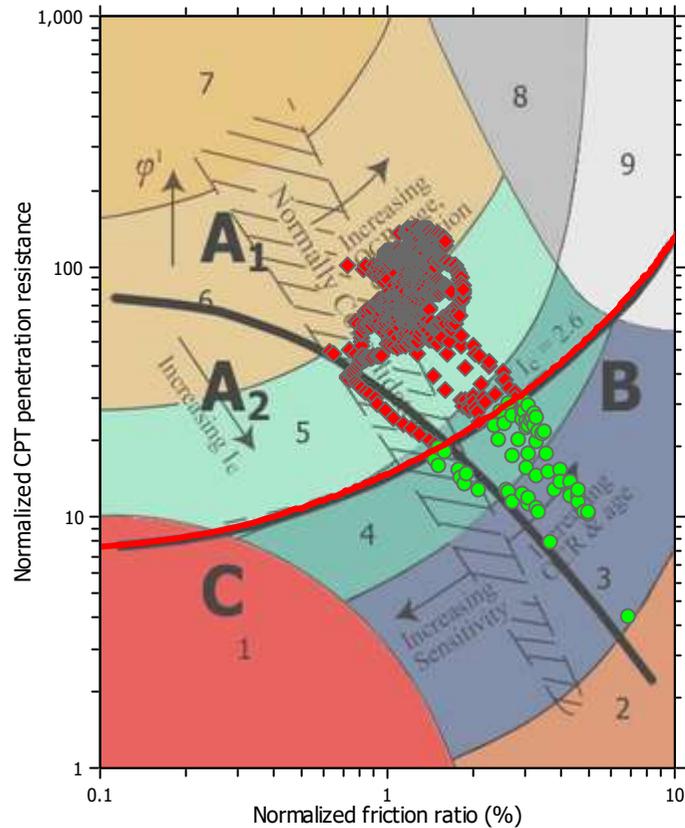
Location : 65 & 73 Ratanui Road, Paraparaumu

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



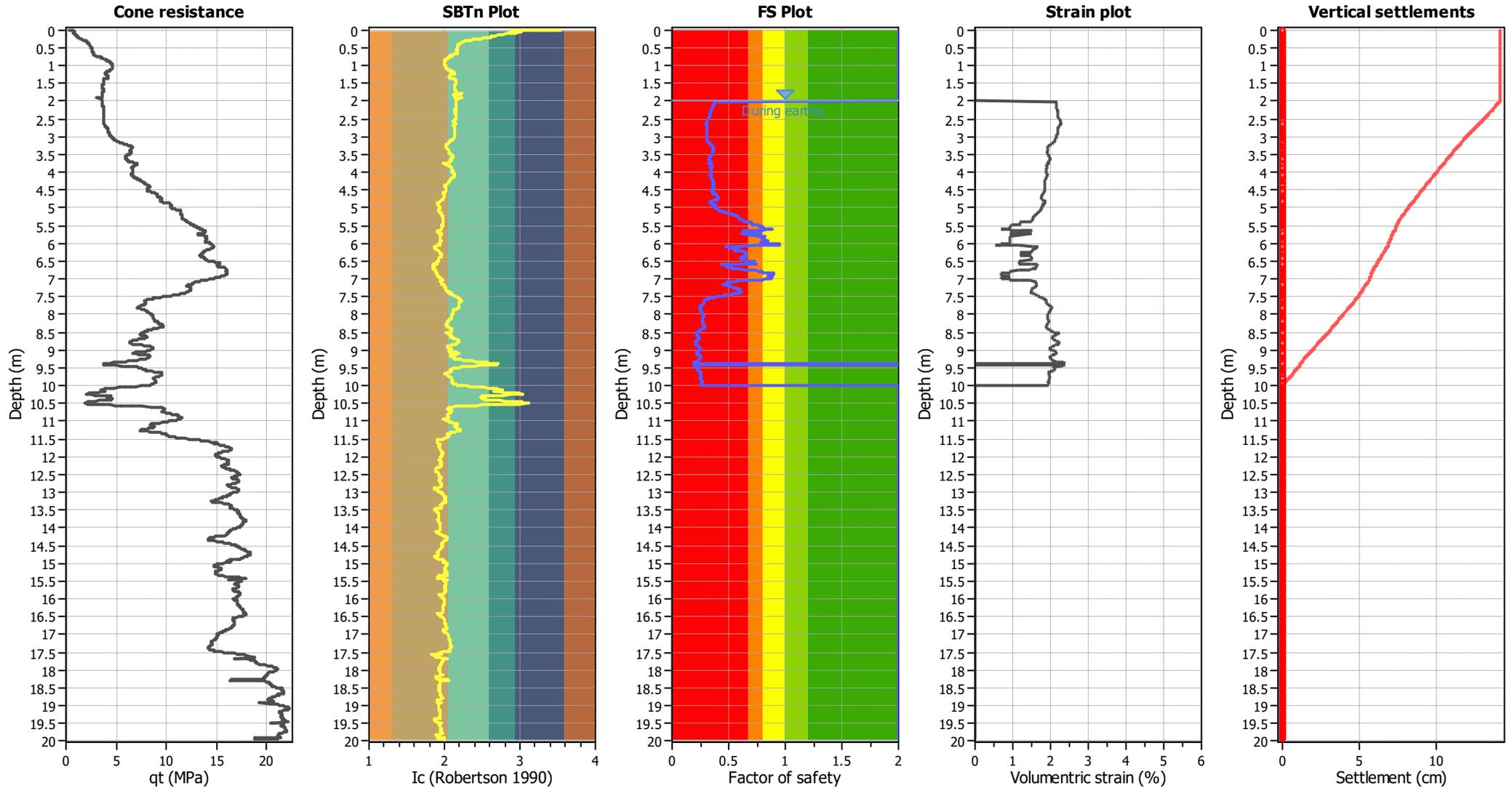
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

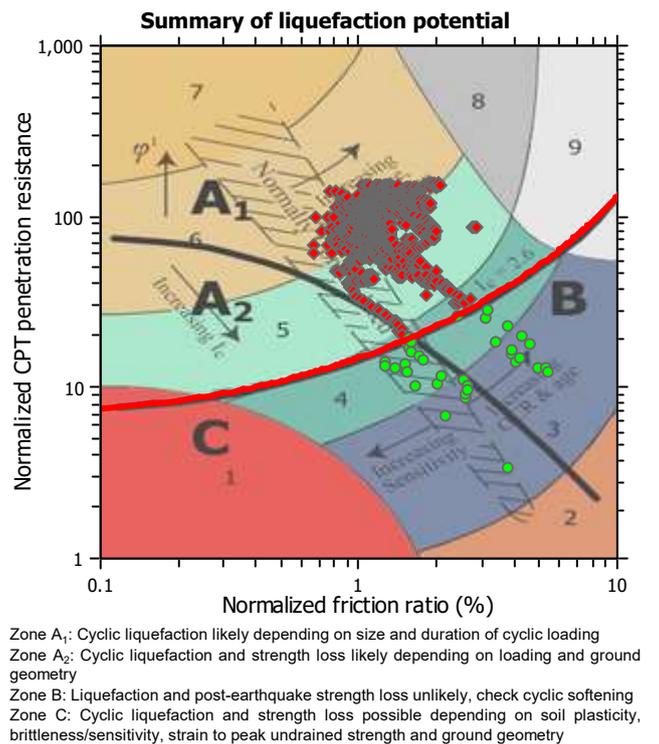
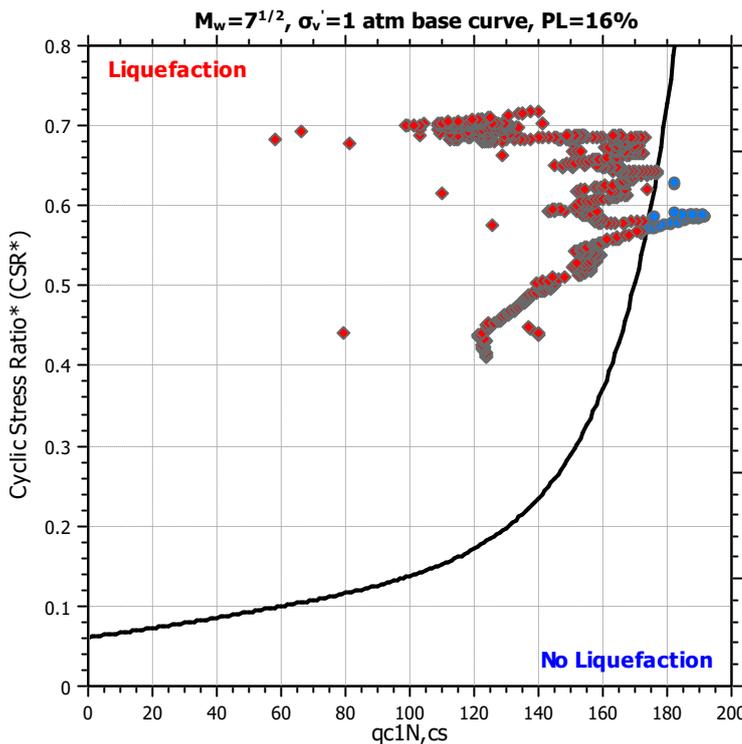
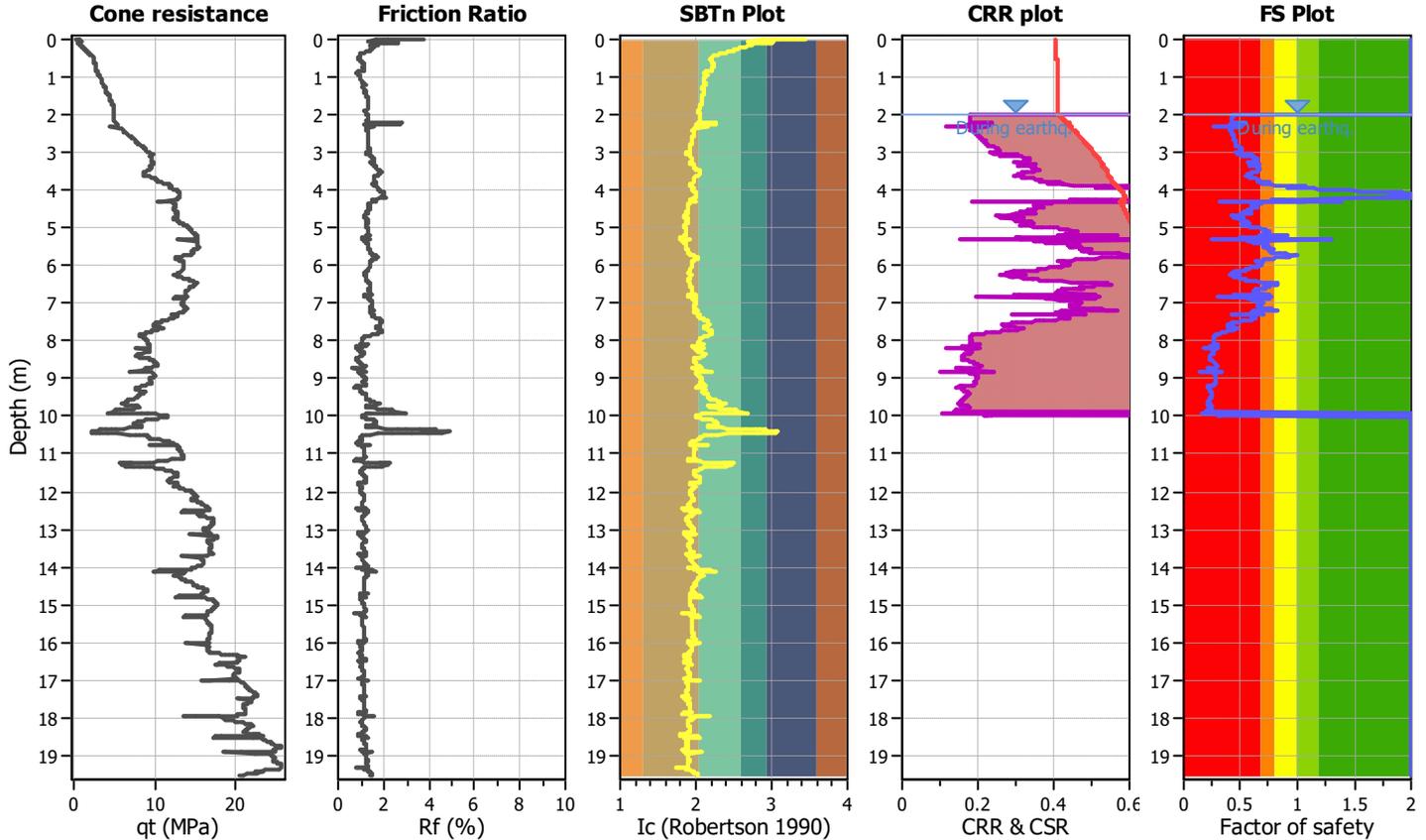
Project title : Summerset Paraparaumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparaumu

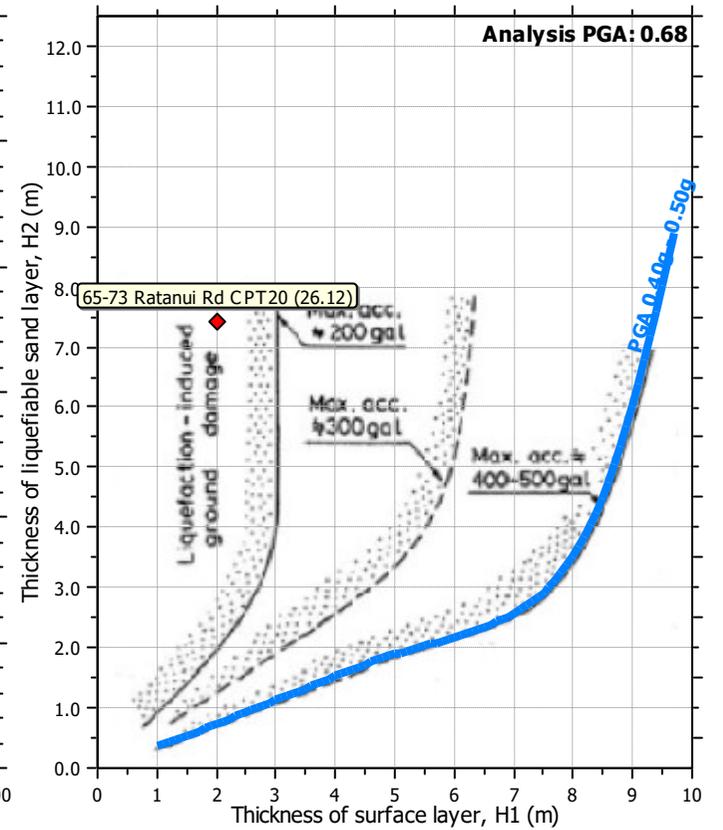
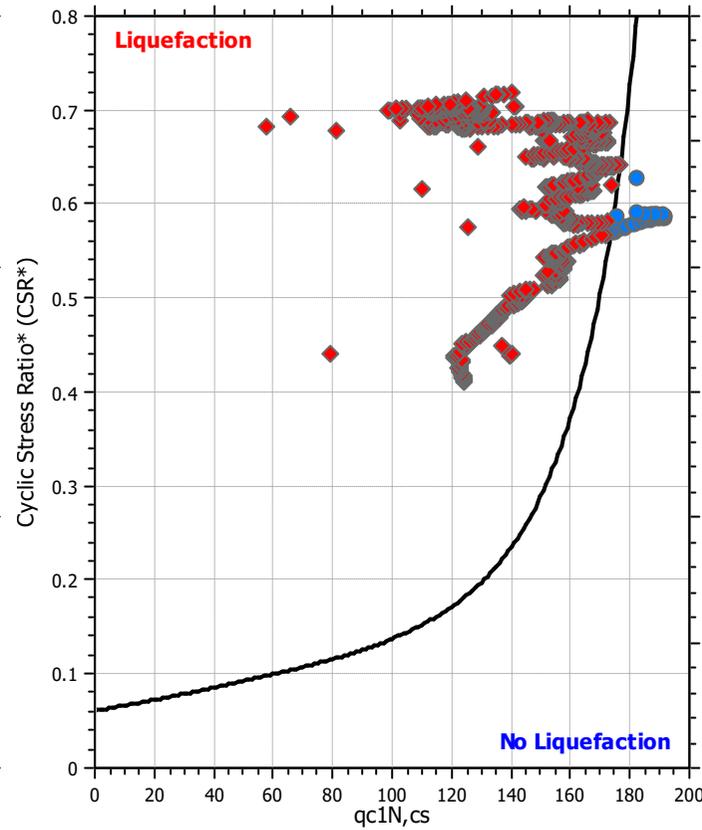
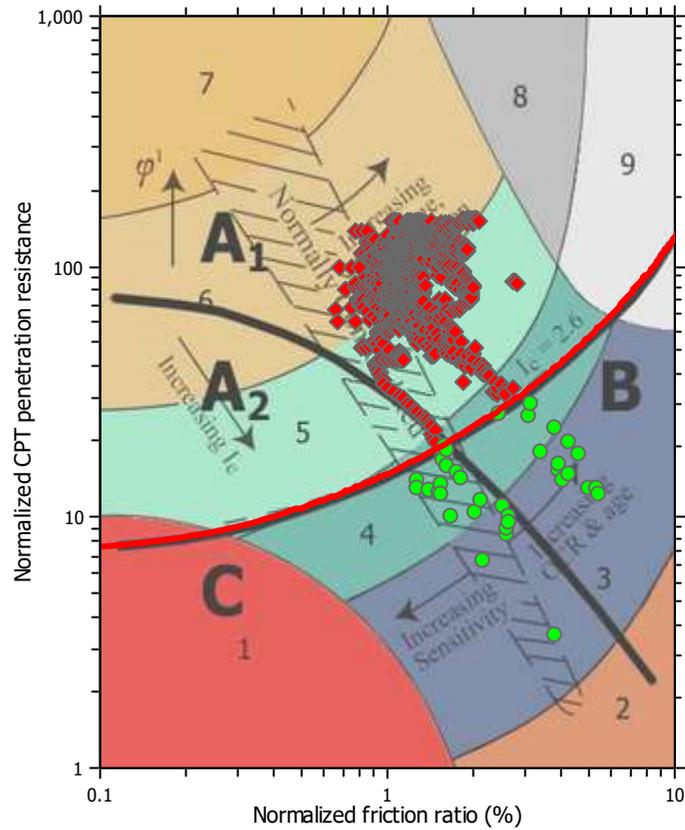
CPT file : 65-73 Ratanui Rd CPT20

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



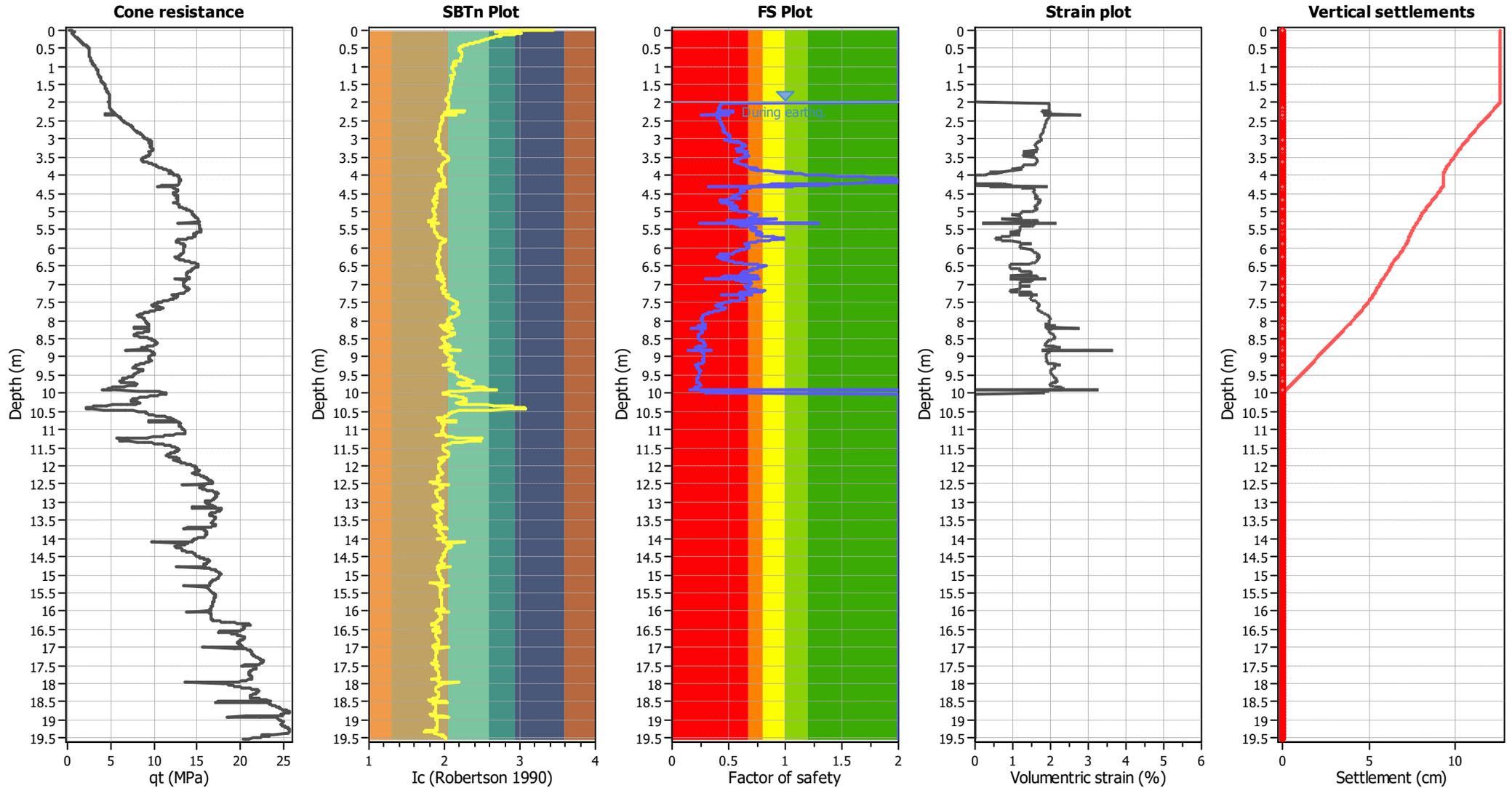
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.50 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

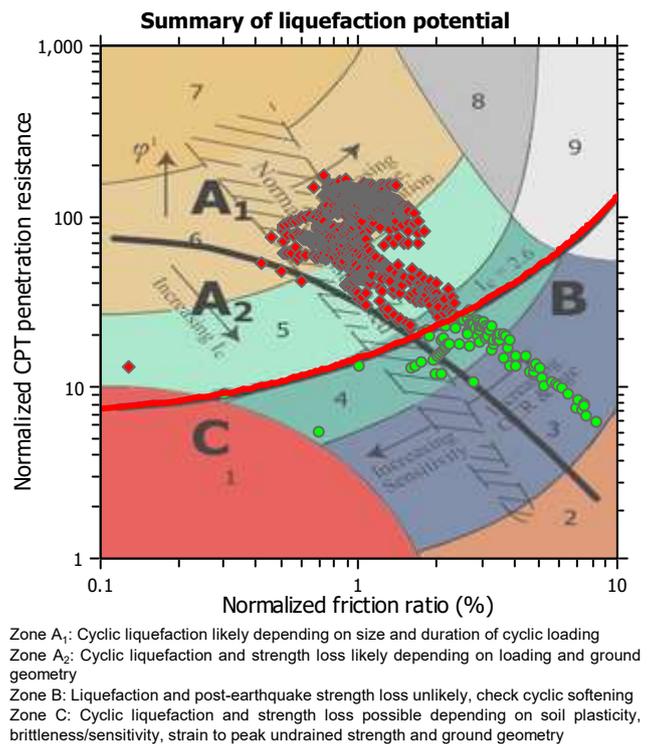
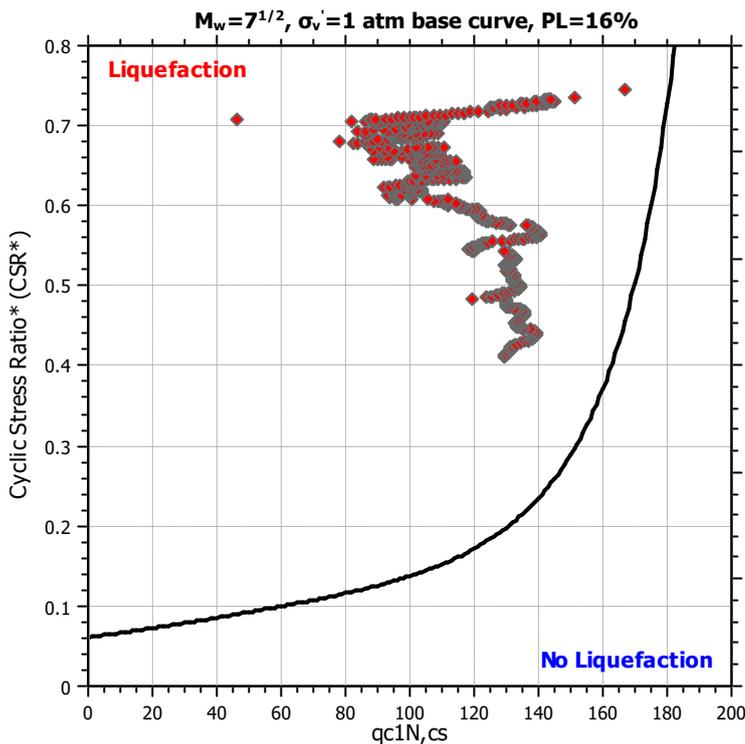
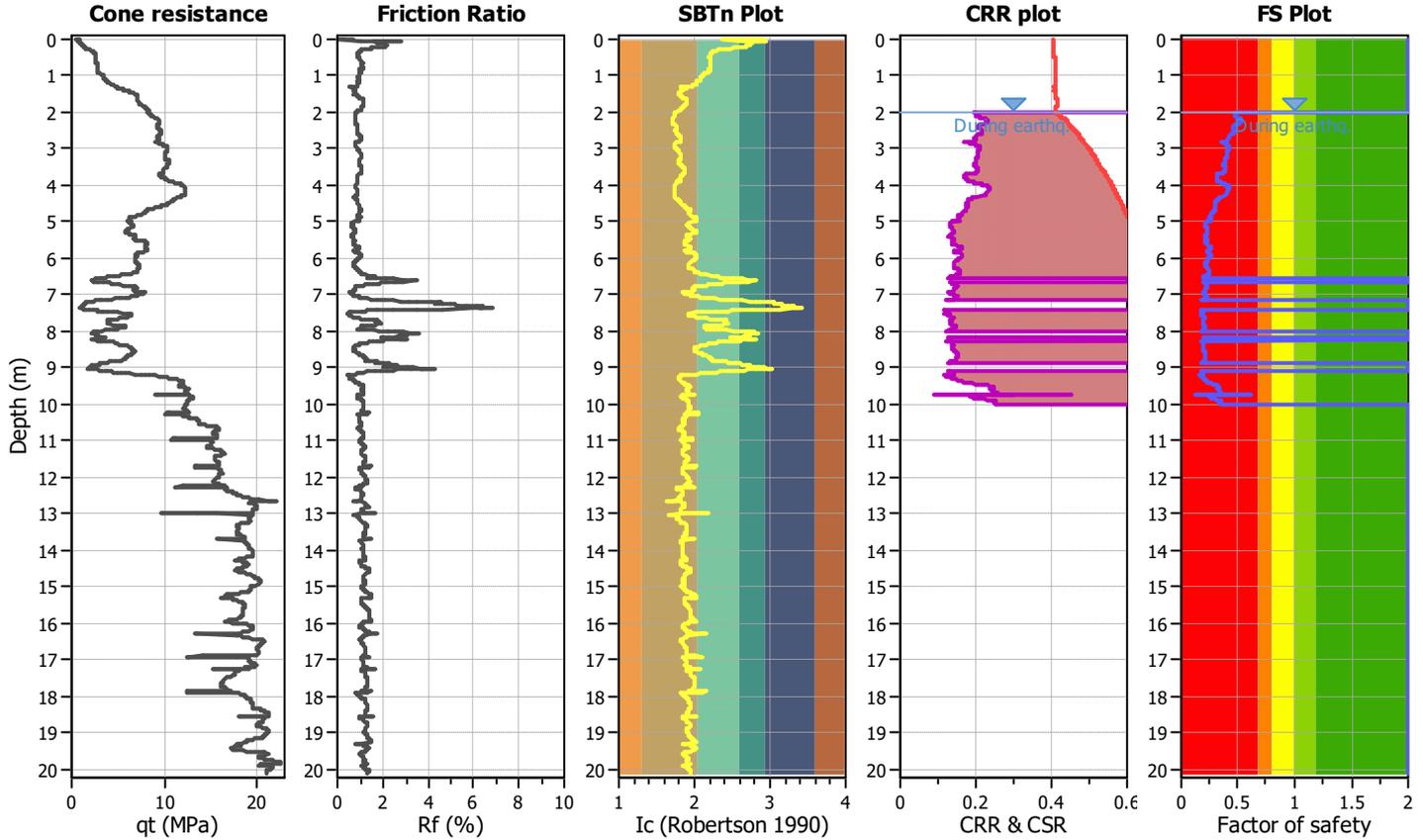
Project title : Summerset Paraparamu - 500yr

Location : 65 & 73 Ratanui Road, Paraparamu

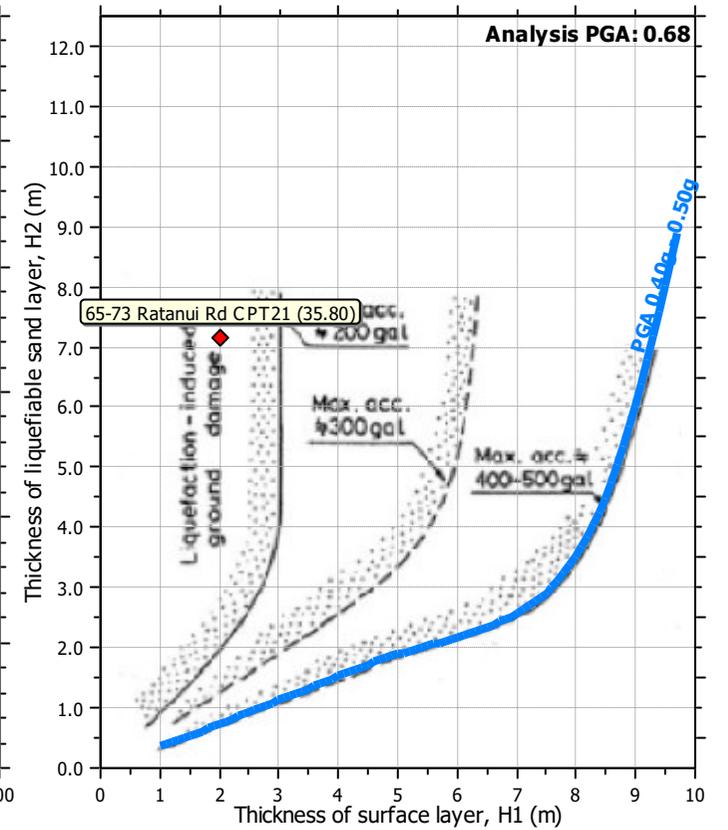
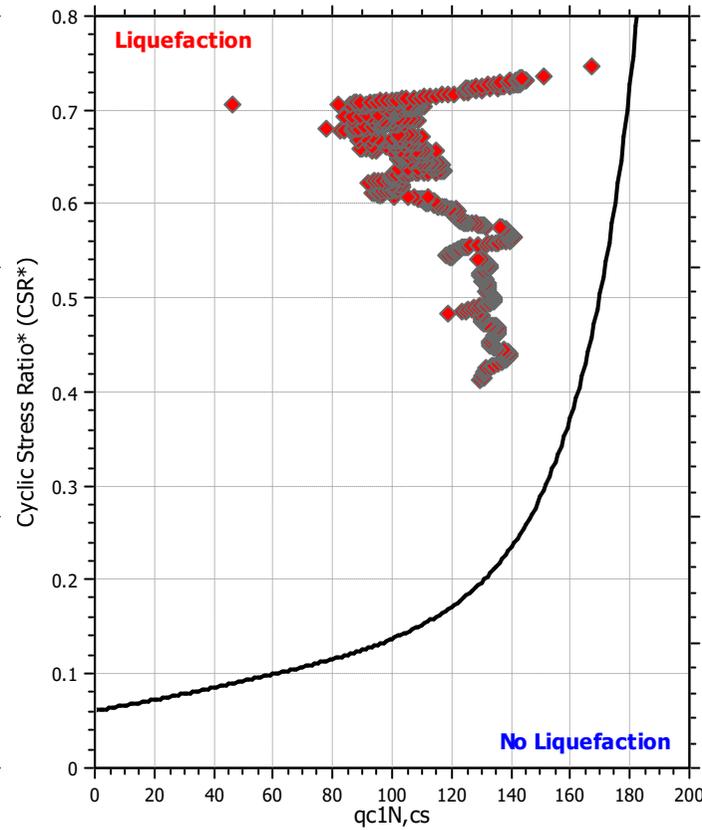
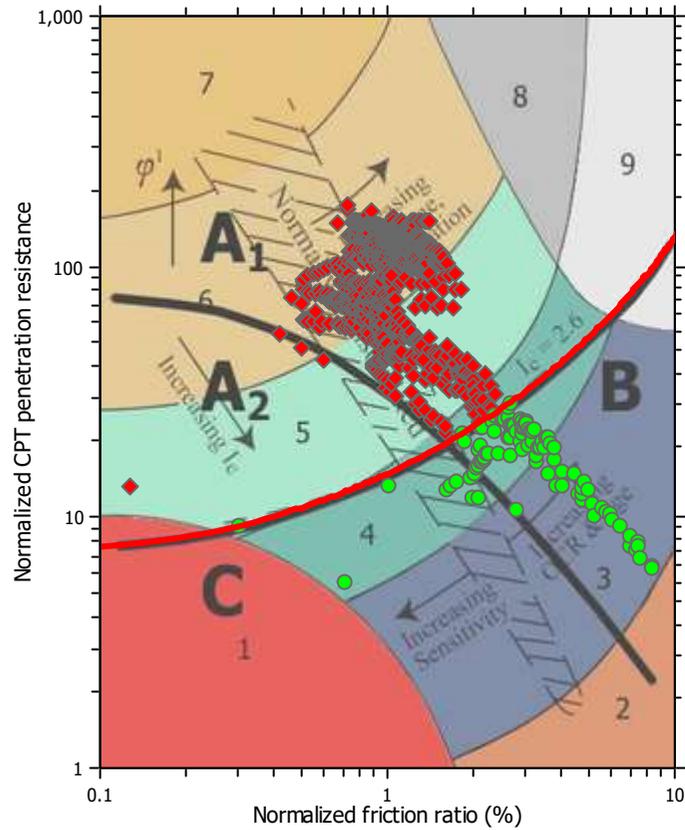
CPT file : 65-73 Ratanui Rd CPT21

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.80 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



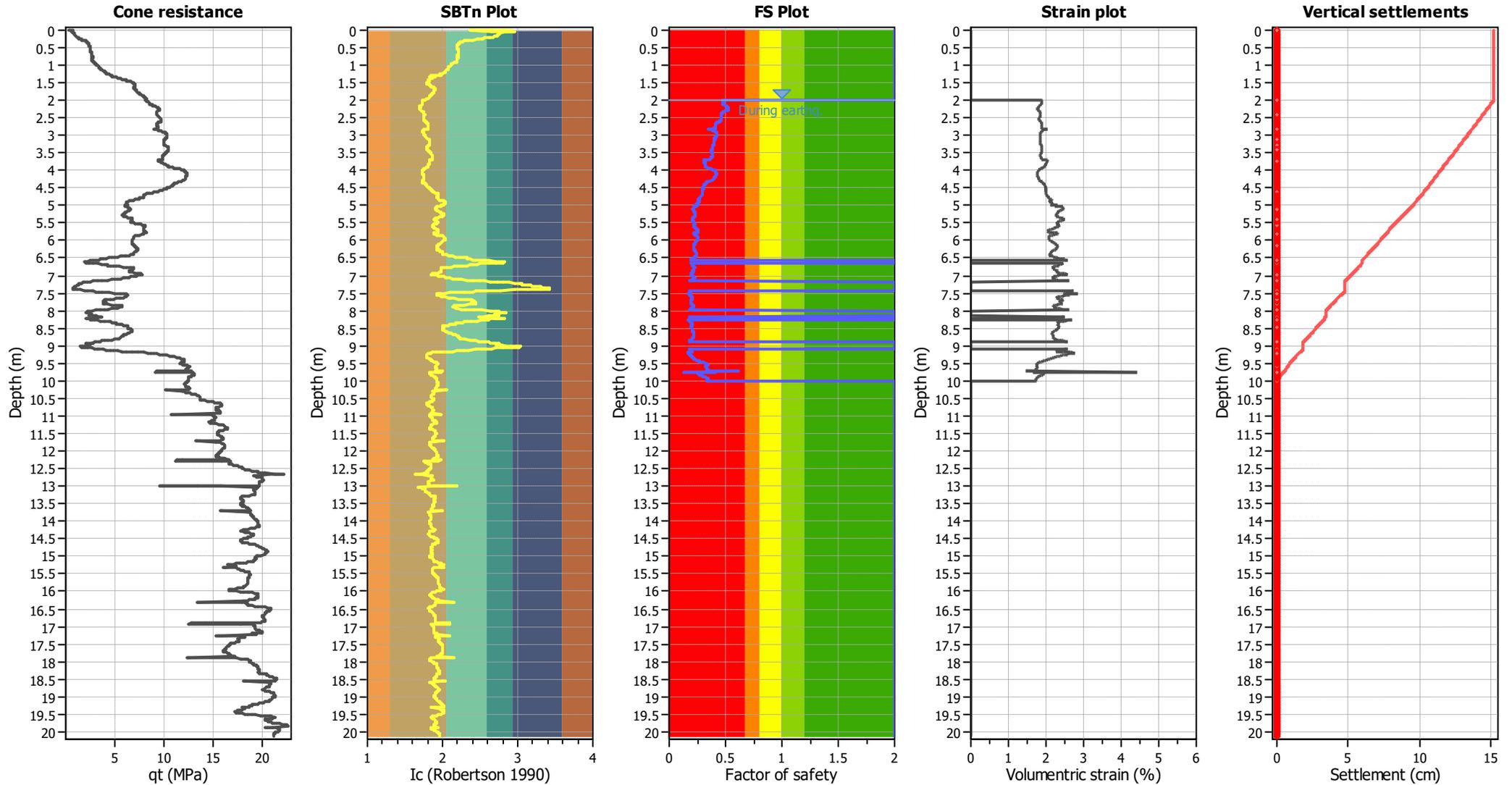
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.80 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

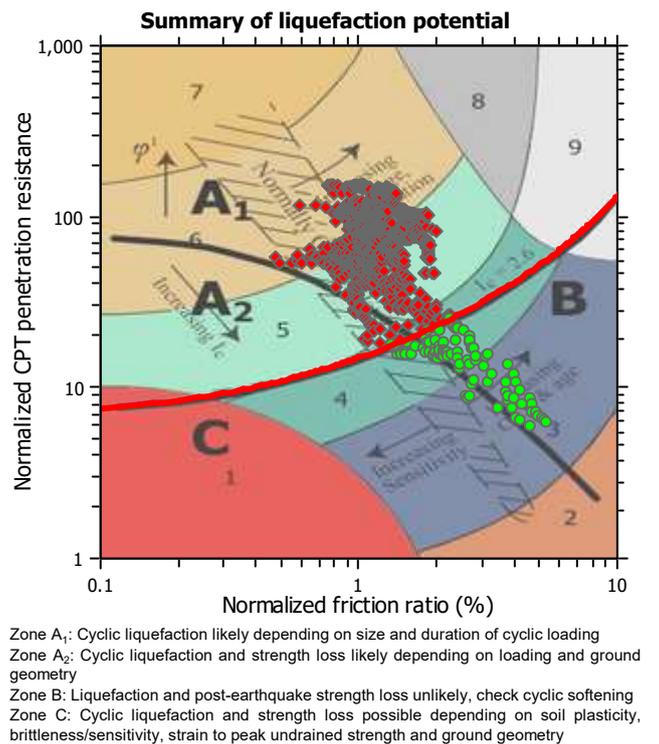
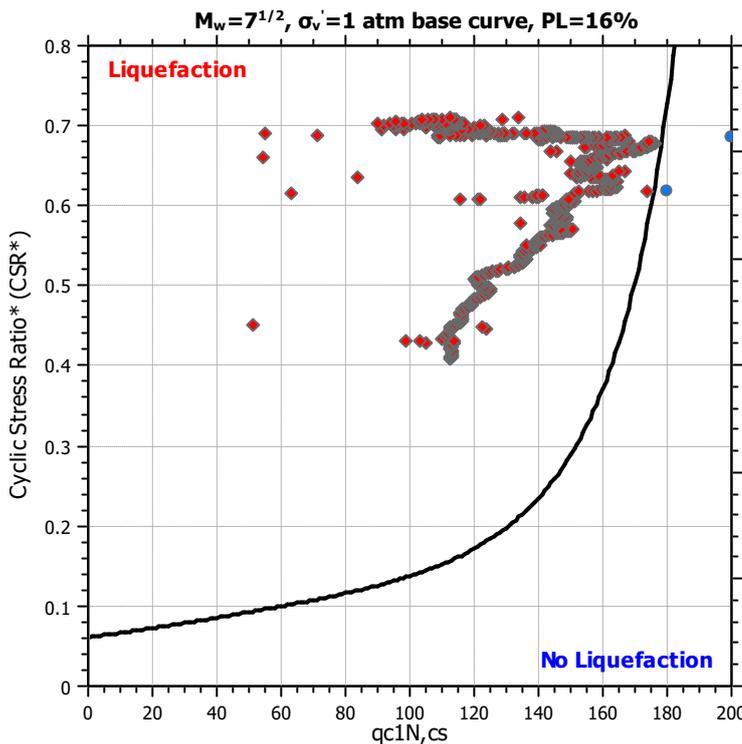
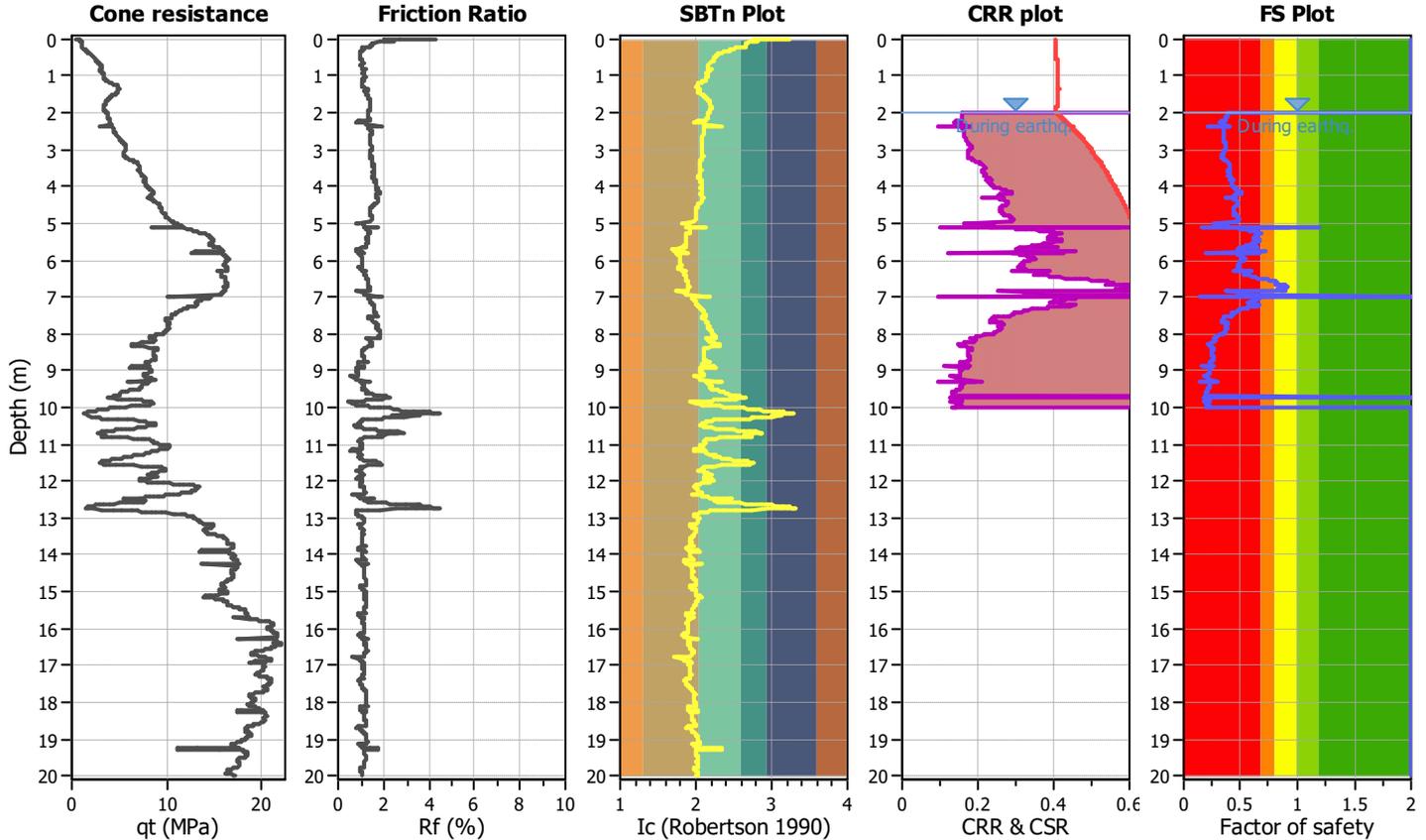
Project title : Summerset Paraparaumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparaumu

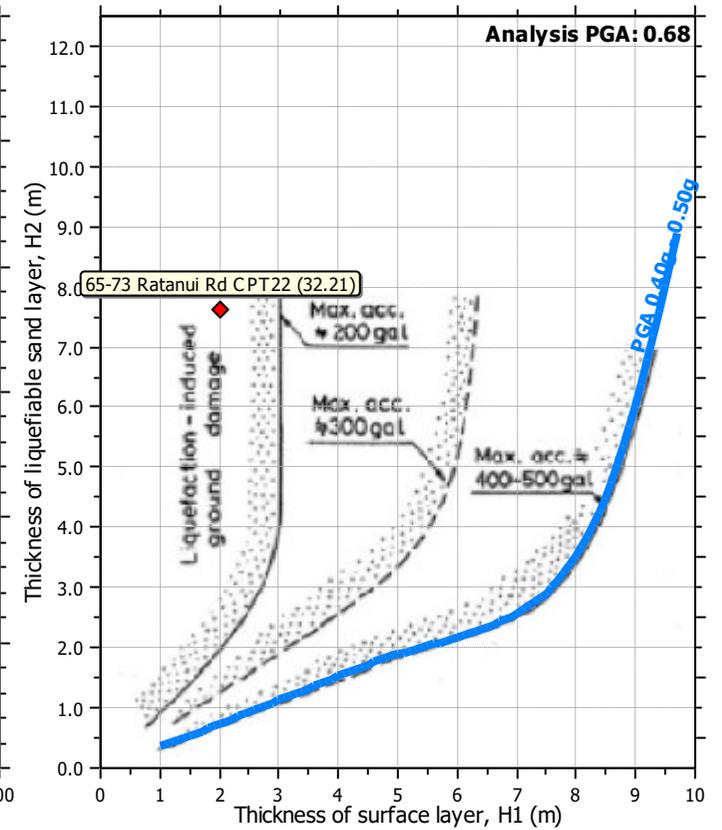
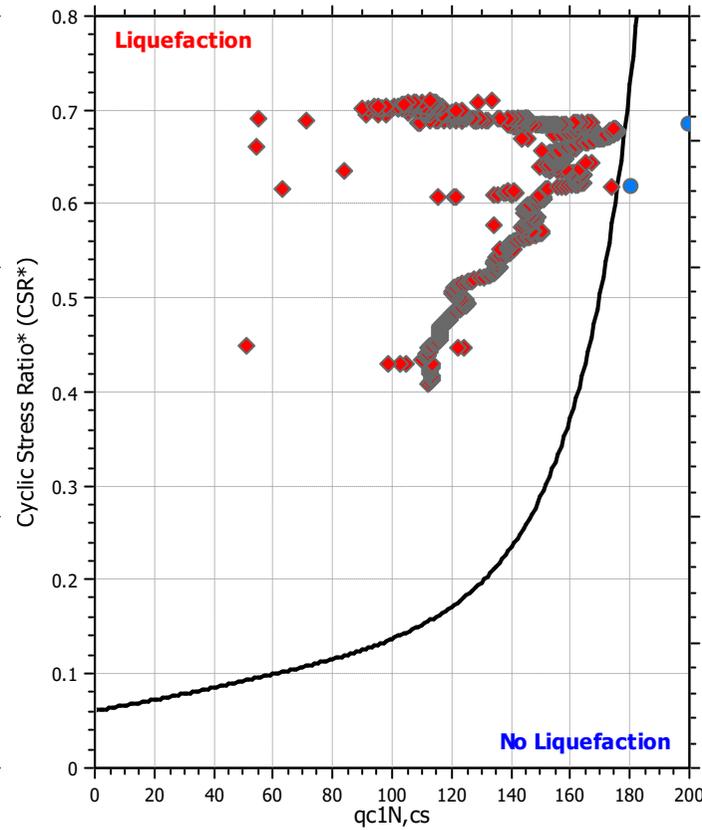
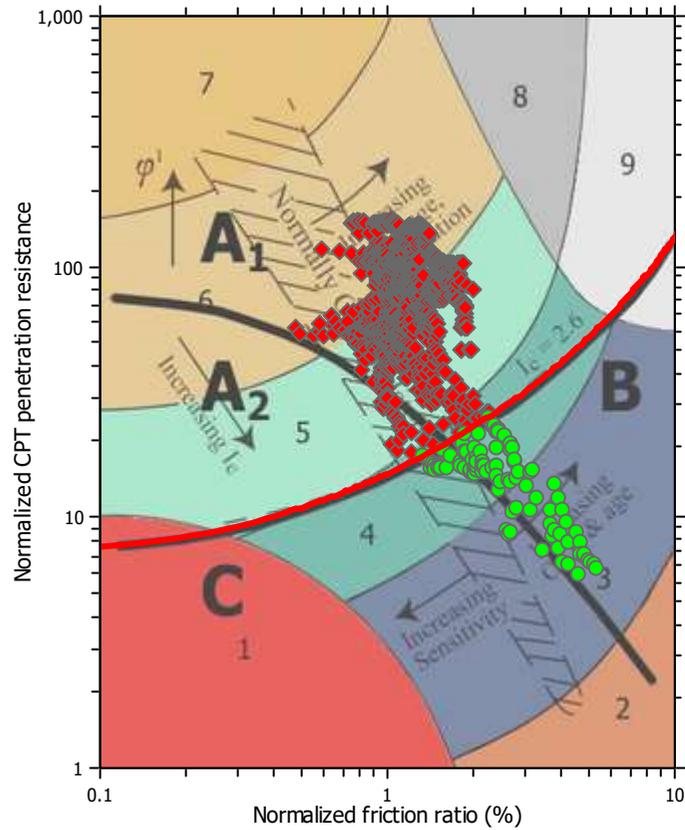
CPT file : 65-73 Ratanui Rd CPT22

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 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 :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



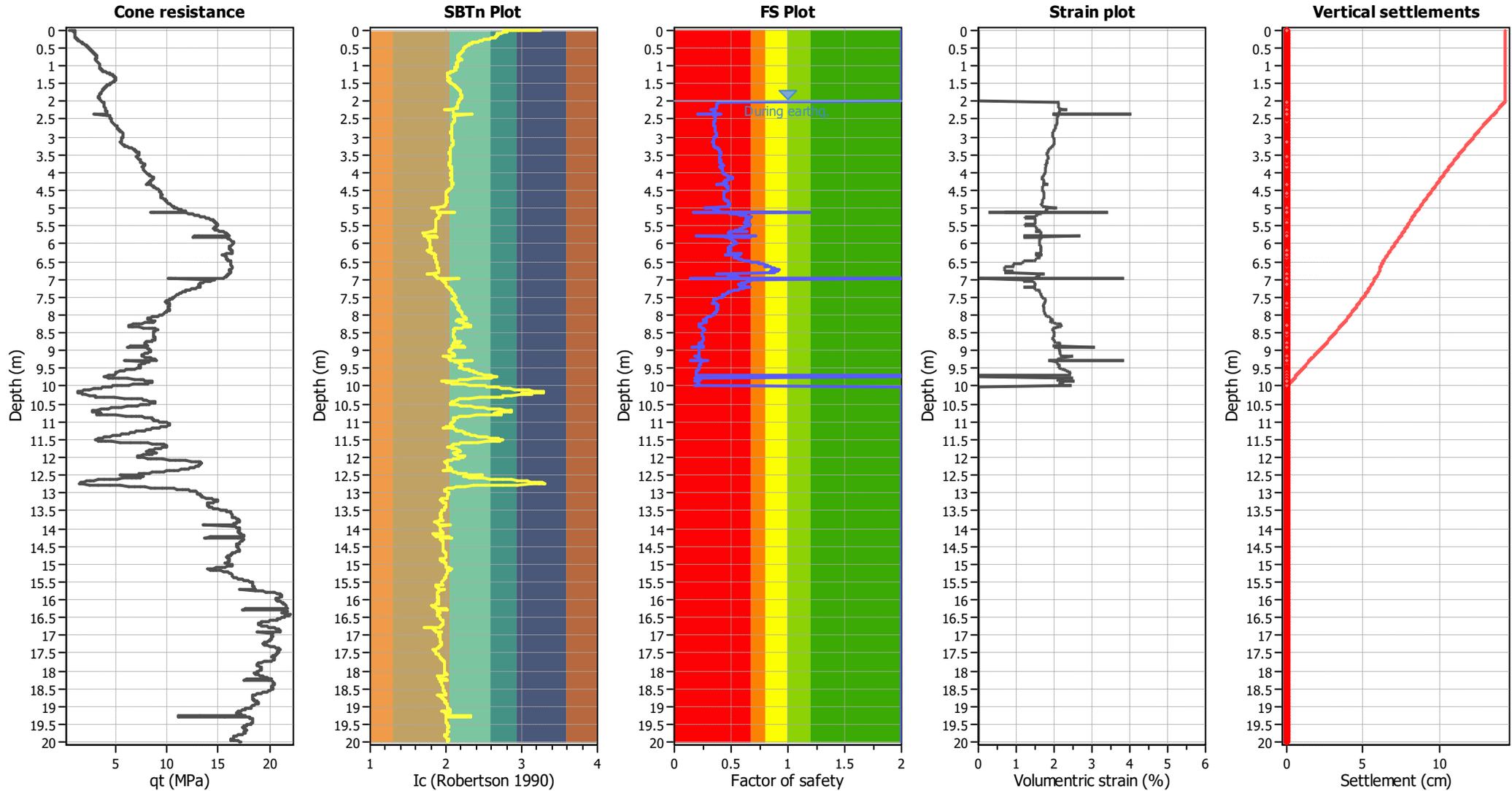
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_q applied:	Yes
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.68	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	10.00 m

Estimation of post-earthquake settlements



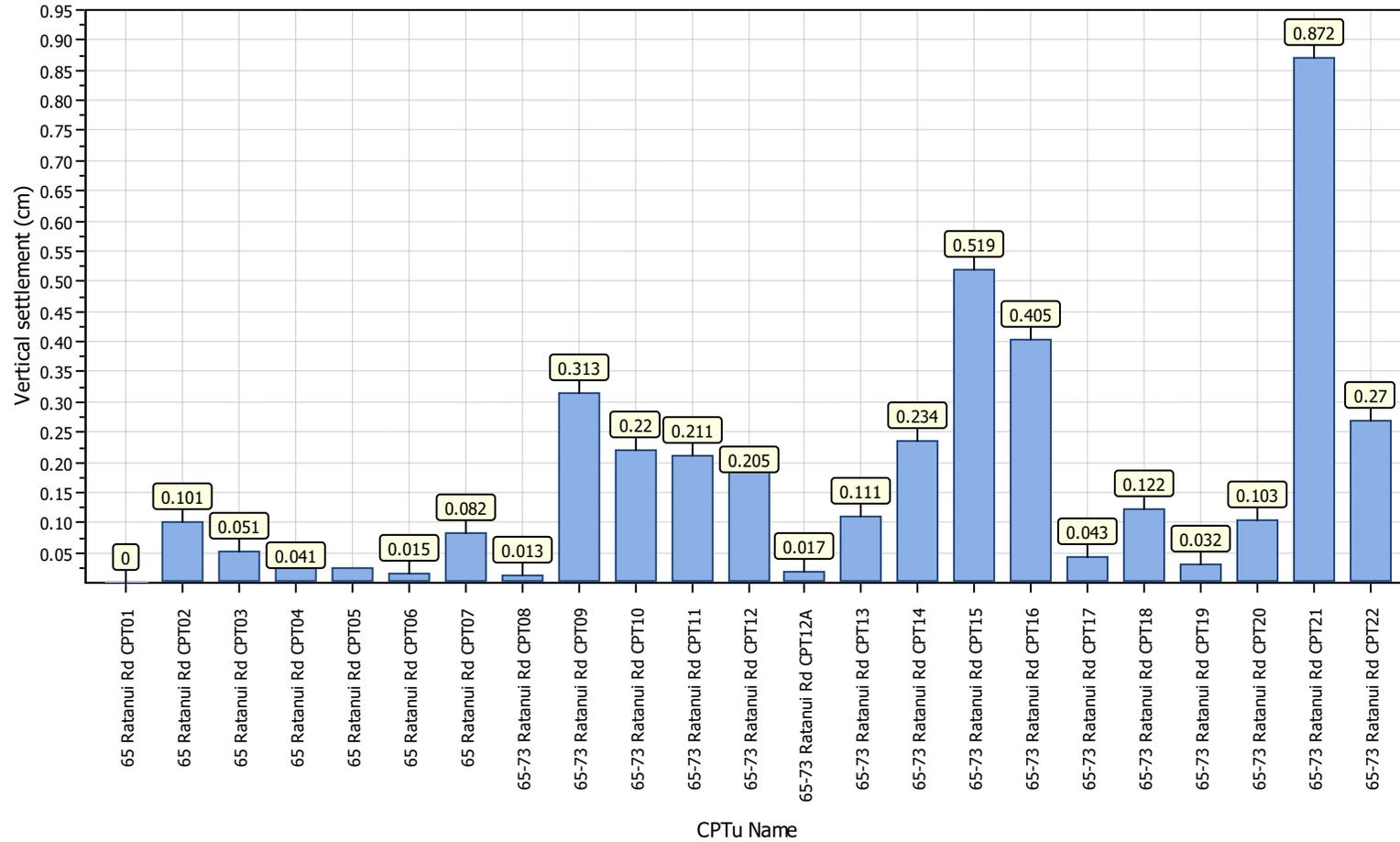
Abbreviations

- qt: Total cone resistance (cone resistance q_c corrected for pore water effects)
- I_c: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

Project title : Summerset Paraparaumu - 25yr

Location : 65 & 73 Ratanui Road, Paraparaumu

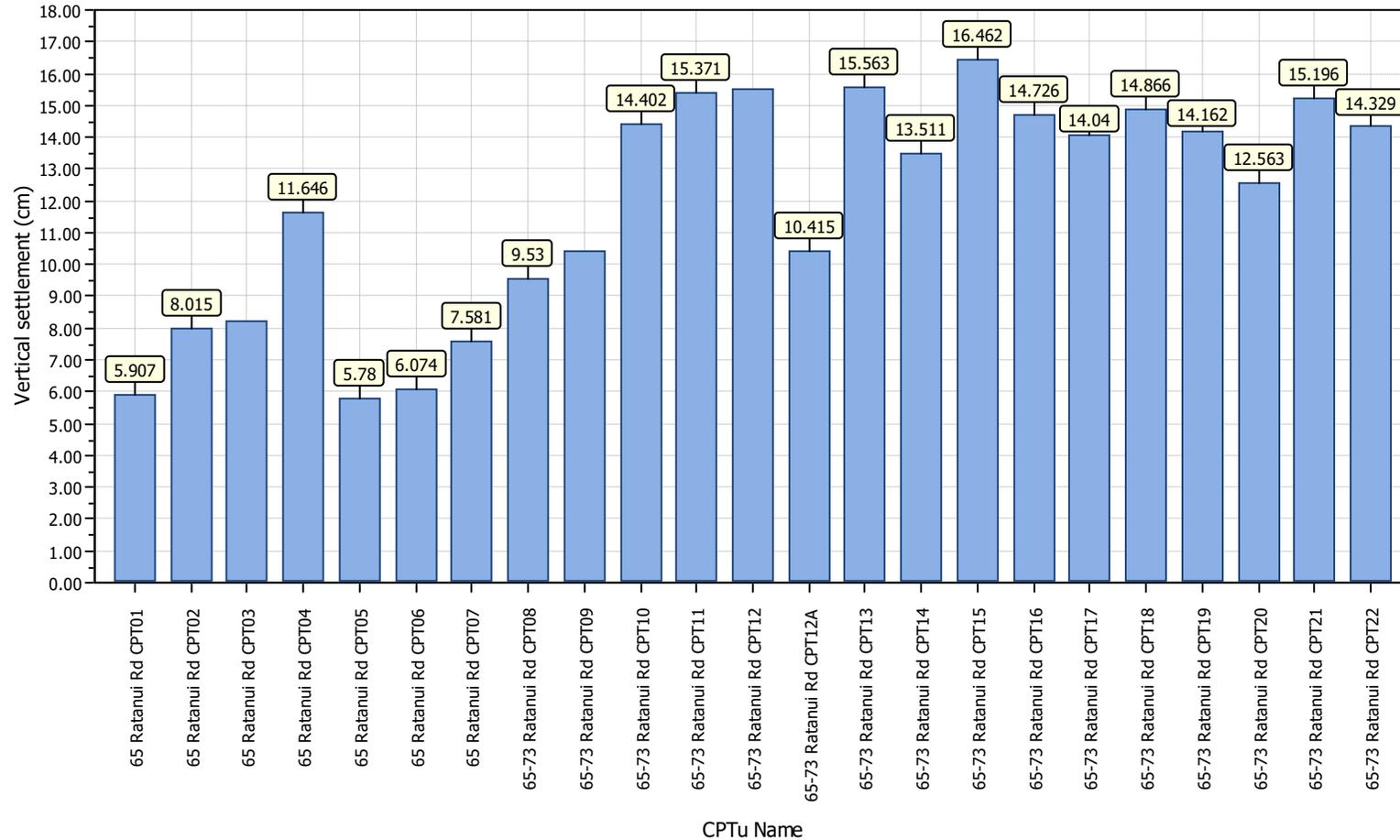
Overall vertical settlements report



Project title : Somerset Paraparaumu - 500yr

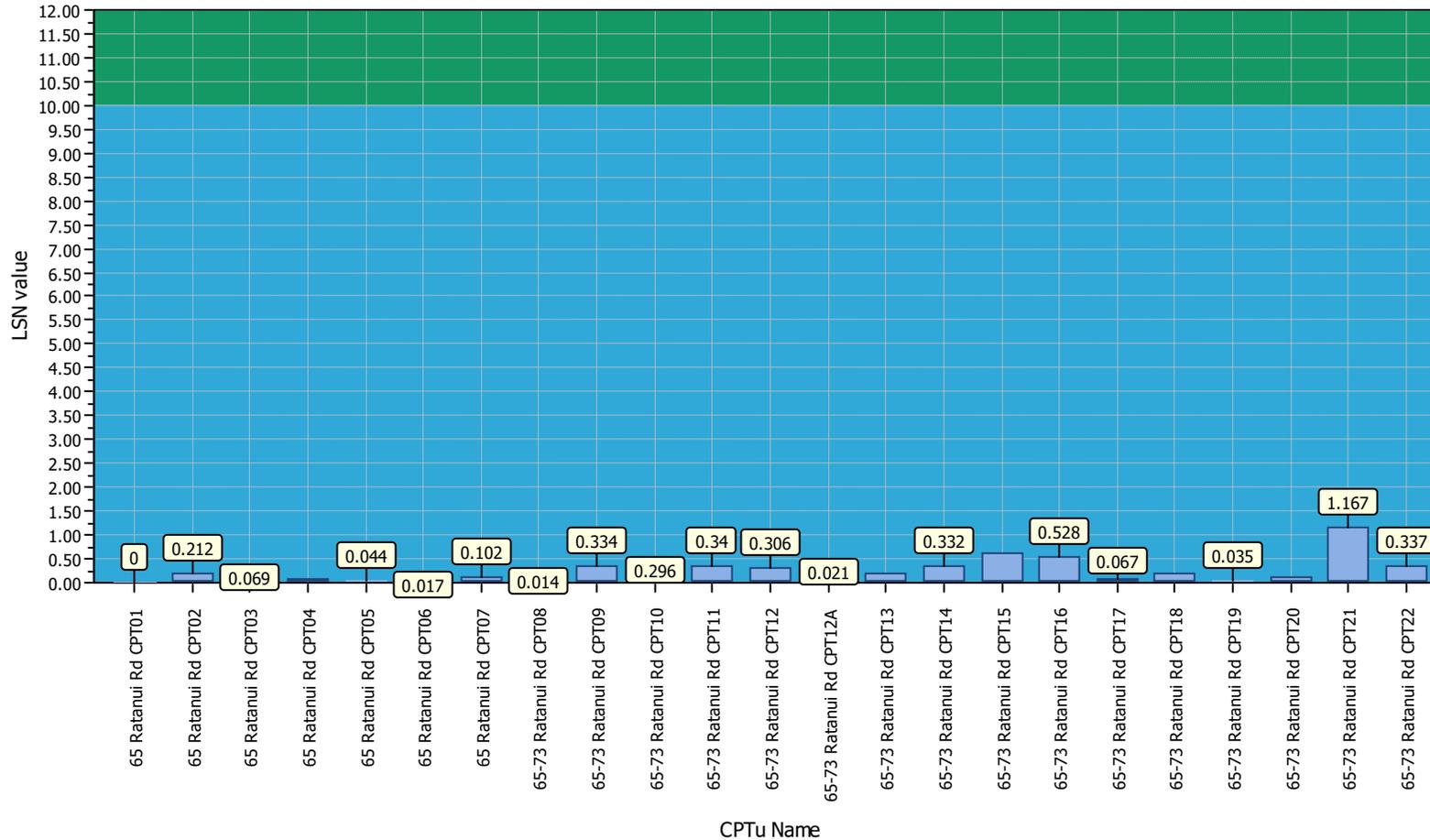
Location : 65 & 73 Ratanui Road, Paraparaumu

Overall vertical settlements report



Project title : Summerset Paraparaumu - 25yr
Location : 65 & 73 Ratanui Road, Paraparaumu

Overall Liquefaction Severity Number report



LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

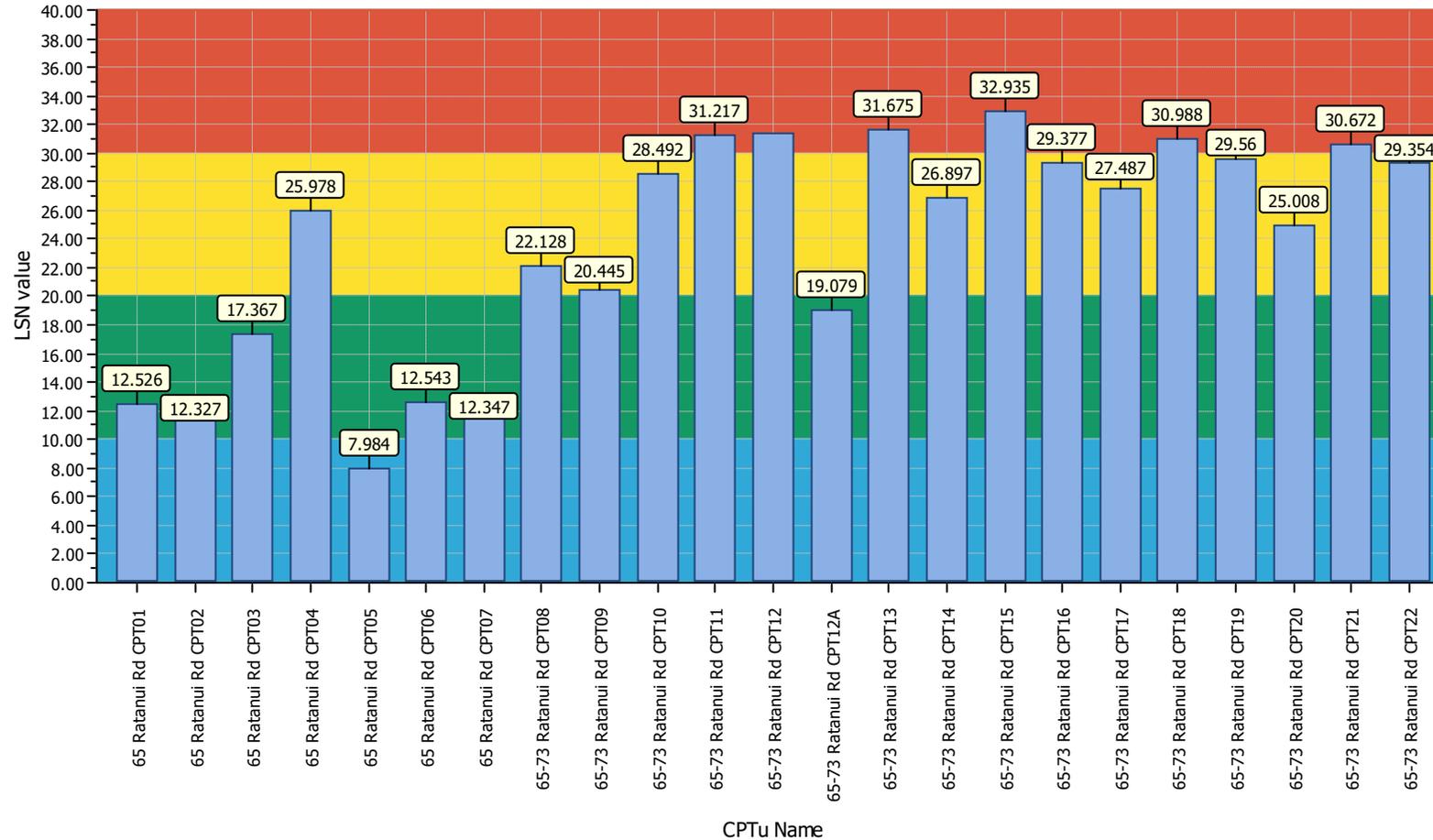
Basic statistics

- Total CPT number: 23
- 100% little liquefaction
- 0% minor liquefaction
- 0% moderate liquefaction
- 0% moderate to major liquefaction
- 0% major liquefaction
- 0% severe liquefaction

Project title : Summerset Paraparaumu - 500yr

Location : 65 & 73 Ratanui Road, Paraparaumu

Overall Liquefaction Severity Number report



LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

Basic statistics

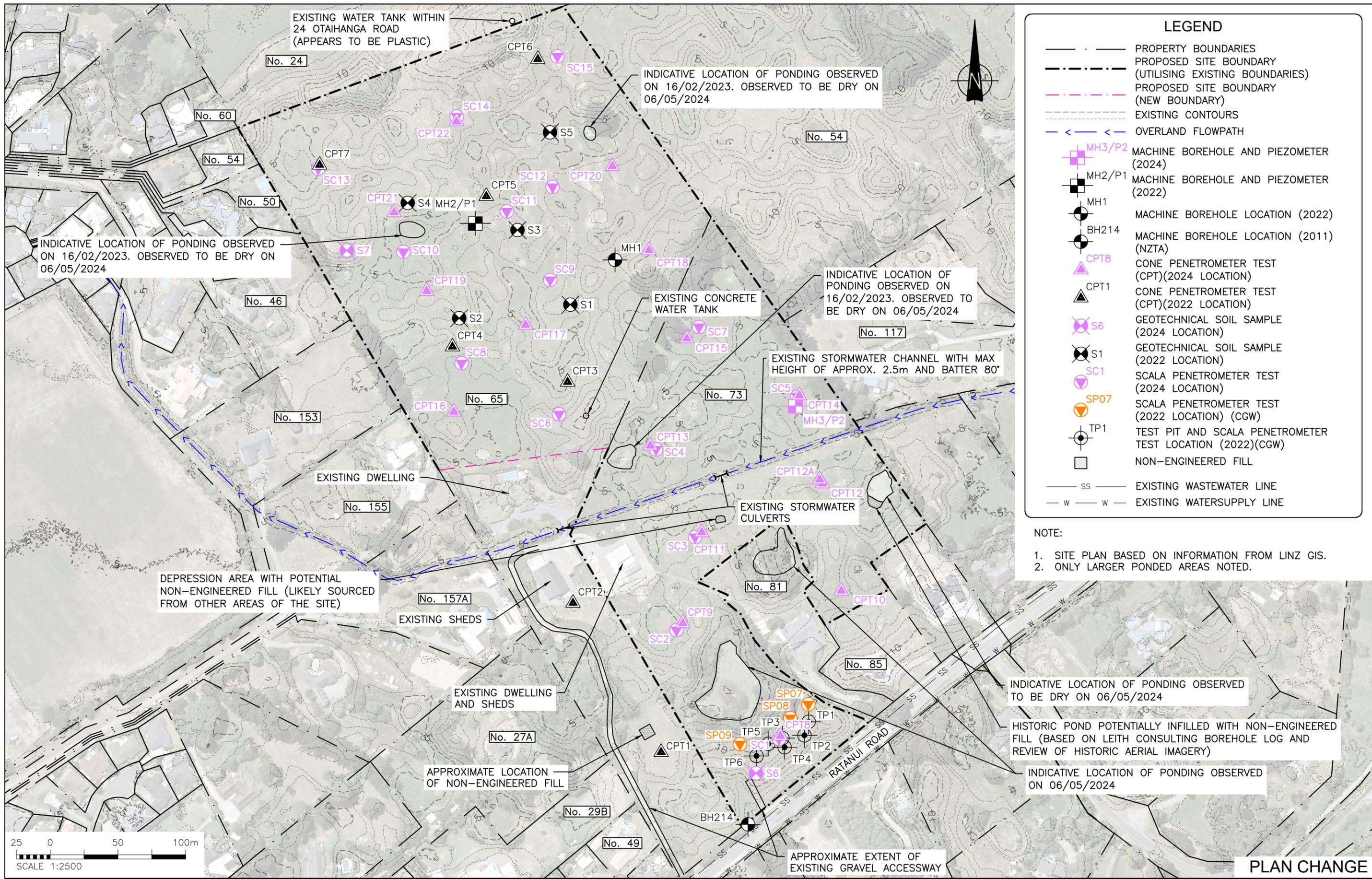
- Total CPT number: 23
- 4% little liquefaction
- 26% minor liquefaction
- 43% moderate liquefaction
- 26% moderate to major liquefaction
- 0% major liquefaction
- 0% severe liquefaction



Appendix H

Riley Drawing: 220306-10





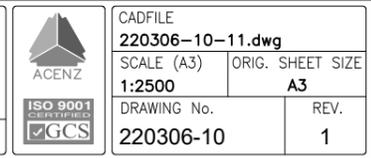
DESIGN	DES CHECK	APPROVED FOR ISSUE
KC	CDG	B. BLACK
DRAWN	CAD CHECK	
ZL	ZL	
DATE DRAWN	ISSUE DATE	
OCT 2024	27/11/24	
REV	DATE	ISSUE
1	27.11.24	PLAN CHANGE
ZL	BY	

SCALE	1:2500
-------	--------



CLIENT	WELHOM DEVELOPMENTS LTD.
ADDRESS	65 & 73 RATANUI ROAD, PARAPARAMU
PROJECT	PLAN CHANGE
SHEET TITLE	GEOTECHNICAL INVESTIGATION SITE PLAN

CADFILE	220306-10-11.dwg
SCALE (A3)	1:2500
ORIG. SHEET SIZE	A3
DRAWING No.	220306-10
REV.	1



AUCKLAND

4 Fred Thomas Drive, Takapuna
riley@riley.co.nz

CHRISTCHURCH

22 Moorhouse Avenue, Addington
rileychch@riley.co.nz

riley.co.nz

