D

APPENDIX D

Site Geotechnical Suitability Memorandum

Job No P19511

10th September 2019

BUILTsmart Homes
496 Thermal Explorer Highway
HUNTLY

Attention: Cameron Beverland

RE: PROPOSED NEW BUILDINGS AT SITES ADJACENT TO EXISTING HUNTLY YARD - LETTER OF RECOMMENDATION FOR SITE DEVELOPMENT SUITABILITY

INTRODUCTION

Probase Engineering has been engaged by BUILTsmart Homes to undertake a preliminary geotechnical site assessment to determine the suitability of the subject site for the proposed new buildings/yard extension at the BUILTsmart Homes assembly yard in Huntly. This letter has been prepared for preliminary planning purposes only.

PROPOSED DEVELOPMENT

It is proposed to construct two new trade/industrial buildings and extend the existing yard for BUILTsmart Huntly. The western-most building consists of 11 construction bays and has a 110m x 20m footprint (2,200m^2), and the eastern-most building consists of 22 constructions bays and has a 100m x 30m footprint (3,300m^2), for a combined total footprint of 5,500m^2. The proposed yard extension area is a total of 9,000m^2, and is to be finished in concrete surfacing. Preliminary site development plans are attached in Appendix A.

SITE INVESTIGATIONS

Probase Engineering Ltd carried out two augers with in-situ strength testing, one auger with falling head permeability, and one Piezocone Penetration Test (CPTu) on the 9th September 2019. The locations were set out in relation to the site layout and conceptual plans provided to Probase Engineering and are indicated on the attached Figure 2 (Site Plan). Auger test logs are presented in Appendix B, along with CPT test logs in Appendix C.

PRELIMINARY FINDINGS

The ground conditions encountered during the investigation have been interpreted from CPTu data gathered on-site. Based on the DCP/CPTu test results, the natural subgrade underlying topsoil material achieved an ultimate bearing capacity of 60kPa at an approximate depth of 0.7m bgl, and the ultimate bearing capacity of 150kPa is achieved at an approximate depth of 2.3m bgl. Summary of the liquefaction induced ground deformations included in Table 1 below (refer to Appendix D for liquefaction analysis plots). CPT data suggests soil is variable in strength with depth over the extent of the test logs.

TABLE 1 Summary of liquefaction vulnerability for a SLS & ULS EQ event

Earthquake Scenario	Vertical Settlement to Tested Depth (mm)	Lateral Spread/Stretch Potential (mm)
SLS	<5	<5
ULS	270-400	900-1600

PRELIMINARY RECOMMENDATIONS

Following preliminary geotechnical investigation, we have determined that site is suitable for the proposed Industrial development. Additional testing in relation to the proposed development will be required prior to detailed design of the proposed developments. All proposed building foundations will require specific engineering design.

ADDITIONAL TESTING PROPOSED DURING THE DETAILED DESIGN STAGE

Given the proposed development shown on preliminary plans at the time of reporting, we recommend the following testing be conducted prior to detailed design (estimate for planning purposes only, final number of tests and test locations up to the discretion of the project designer/geotechnical engineer):

- 20x 4m auger with in-situ strength testing to guide shallow building recommendations/design
- 20x 1m auger with in-situ strength testing to guide pavement recommendations/design
- 4x 20m CPT to guide liquefaction analysis/deep soil investigations
- 2x 20m core auger to guide liquefaction analysis/deep soil investigations

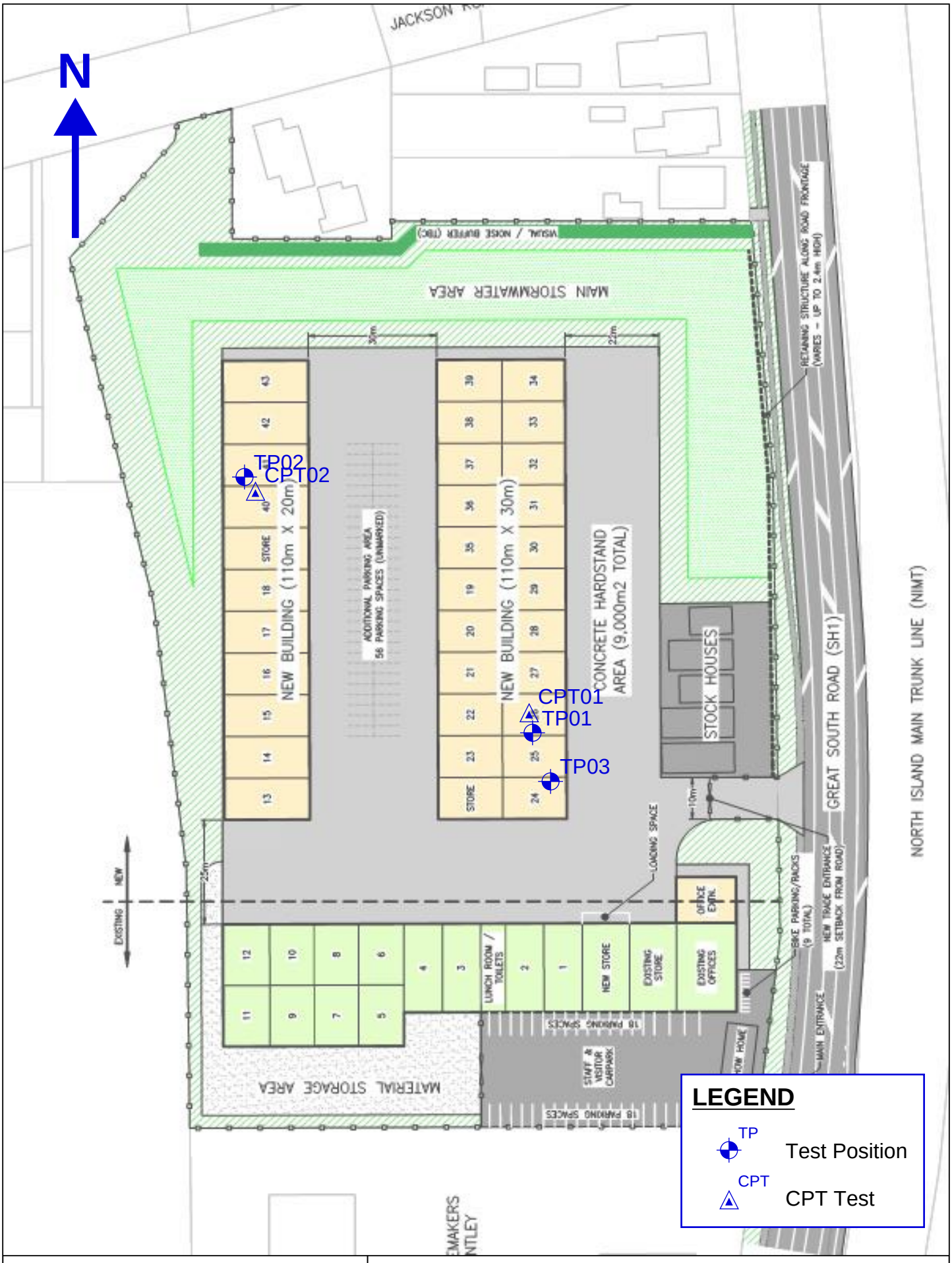
PREPARED BY

BEN MCKAY
GEOTECHNICAL ENGINEER

REVIEWED BY

RAGULAN KANAPATHIPPILLAI
PRINCIPAL GEOTECHNICAL ENGINEER
CPEng No. 1025615

PROBASE ENGINEERING	Project Title: BUILTsmart Huntly		
	Figure Title: Location Plan		
Author: BJM	Date: 10/09/19	Job No: P19511	Figure: 1



PROBASE ENGINEERING	Project Title: BUILTsmart Huntly		
	Figure Title: Site Plan		
Author: BJM	Date: 10/09/19	Job No: P19511	Figure: 2

APPENDIX A

Site Development Plans

READ DRAWINGS CAREFULLY // MEASURETWICECUTONCE

WAIKATO RIVER

N

DRAWING SCALE BAR (IN MILLIMETRES) 0 2 4 6 8 10 20 30 40 50 60 70 80 90 100

EXISTING | NEW

25m

MATERIAL STORAGE AREA

11 12 9 10 7 8 5 6 4 3 2 1

LUNCH ROOM / TOILETS

NEW STORE

EXISTING STORE

EXISTING OFFICES

OFFICE EXTN.

18 PARKING SPACES

18 PARKING SPACES

STAFF & VISITOR CARPARK

SHOW HOME

LOADING SPACE

13 14 15 16 17 18 STORE 40 41 42 43

NEW BUILDING (110m X 20m)

ADDITIONAL PARKING AREA
56 PARKING SPACES (UNMARKED)

30m

STORE 23 22 21 20 19 35 36 37 38 39

24 25 26 27 28 29 30 31 32 33 34

NEW BUILDING (110m X 30m)

CONCRETE HARDSTAND AREA (9,000m2 TOTAL)

22m

10m

STOCK HOUSES

MAIN STORMWATER AREA

VISUAL / NOISE BUFFER (TBC)

PLACEMAKERS HUNTLEY

JACKSON ROAD

GEORGE DRIVE

BIKE PARKING/RACKS (9 TOTAL)

MAIN ENTRANCE

NEW TRADE ENTRANCE (22m SETBACK FROM ROAD)

GREAT SOUTH ROAD (SH1)

RETAINING STRUCTURE ALONG ROAD FRONTAGE (VARIES – UP TO 2.4m HIGH)

NORTH ISLAND MAIN TRUNK LINE (NIMT)

LEGEND

- EXISTING CADASTRAL BOUNDARIES
- BUILDING (EXISTING)
- BUILDING (NEW)
- PAVEMENT AREA (ASPHALT)
- PAVEMENT AREA (CONCRETE)
- PAVEMENT AREA (UNSEALED)
- VEGETATION (PLANTING/GRASS)
- ENVIRONMENTAL BUFFER
- STORMWATER AREA
- RETAINING STRUCTURE
- SITE FENCING

NOTES:

1. CONCEPT LAYOUT, FOR DISCUSSION PURPOSES ONLY
2. STORMWATER AREAS SHOWN ARE INDICATIVE ONLY AND SUBJECT TO CONFIRMATION
3. BASED ON INITIAL SITE CONCEPT PROVIDED BY BUILTSMART (APRIL 2019)

REV	DESCRIPTION	BY	DATE
D	FOR INFORMATION	LPM	20.06.19.
C	FOR INFORMATION	LPM	30.05.19
B	FOR INFORMATION	LPM	09.05.19
A	FOR INFORMATION	LPM	24.04.19

APPROVAL STATUS: FOR INFORMATION

DESIGNED BY: —	DATE: —
DRAWN BY: L. MCCAFFREY	DATE: 24.04.19
APPROVED BY: —	DATE: —

CLIENT NAME: BUILTsmart Advanced Transportable Homes™

PROJECT NAME: BUILDSMART PRIVATE PLAN CHANGE

DRAWING TITLE: SITE MASTER PLAN GENERAL ARRANGEMENT

PRODUCED BY: TE MIRO WATER

DATE PRINTED: 20 June 2019

DRAWING SCALE: 1:1000	REVISION No.: D
DISCIPLINE: CIVIL ENGINEERING	
DRAWING No.: 19013-C-0010	

FILE NAME: 19013-C-0010.dwg

APPENDIX B

Hand Auger Logs

CLIENT:	Buildsmart	**Job No:**	P19511
Job Name:	Soils test	**Date:**	2019-9-9
Address	492 SH1 Huntly	**Tested By:**	AM
Note		**Test Location 1**	

Depth (m)	No of Blows	Scale Penetrometer (Blows / 100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Depth (m)	Undrained Shear (kPa)
0.10	1	0	Topsoil - near garden of existing house	0.10	
0.20	2	1		0.20	
0.30	2	2		0.30	
0.40	1	3		0.40	
0.50	2	4		0.50	
0.60	1	5		0.60	
0.70	1	6		0.70	
0.80	2	7	SAND - brown; fine grained, loose, moist	0.80	
0.90	2	8		0.90	
1.00	1	9		1.00	
1.10	1	10		1.10	
1.20	2	11		1.20	
1.30	1	12		1.30	
1.40	2	13		1.40	
1.50	1	14		1.50	
1.60	2	15		1.60	
1.70	2	16	@1700mm becomes wet	1.70	
1.80	1	17	@1800mm becomes fine to medium grained & speckled light brown	1.80	
1.90	2	18		1.90	
2.00	3	19		2.00	
2.10	3	20		2.10	
2.20	2	21		2.20	
2.30	2	22	@2300 trace pumiceous gravel	2.30	
2.40	3	23	@2400mm becomes fine grained & grey	2.40	
2.50	3	24		2.50	
2.60	3	25		2.60	
2.70	4	26		2.70	
2.80	5	27		2.80	
2.90	6	28	Cont on next page	2.90	

CLIENT:	Buildsmart	**Job No:**	P19511
Job Name:	Soils test	**Date:**	2019-9-9
Address	492 SH1 Huntly	**Tested By:**	AM
Note		**Test Location**	**1 cont**

Depth (m)	No of Blows	Scale Penetrometer (Blows / 100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Depth (m)	Undrained Shear (kPa)
2.60	-	0	Continued from previous page	2.60	
2.70	-	1	SAND - brown; fine grained, loose to medium dense, moist to wet	2.70	
2.80	-	2		2.80	
2.90	-	3		2.90	
3.00	-	4	SAND, trace gravel - brownish grey; medium dense, saturated	3.00	
3.10	-	5		3.10	
3.20	-	6		3.20	
3.30	-	7		3.30	
3.40	-	8		3.40	
3.50	-	9		3.50	
3.60	-	10		3.60	
3.70	-	11		3.70	
3.80	-	12		3.80	
3.90	-	13		3.90	
4.00	-	14		4.00	
4.10	-	15		4.10	
4.20	-	16	sandy, silty. CLAY - light bluish grey; firm to stiff, wet, high plasticity	4.20	
4.30	-	17		4.30	
4.40	-	18		4.40	
4.50	-	19		4.50	
4.60	-	20	silty SAND, trace gravel & clay - bluish grey; fine to coarse grained, medium dense, saturated	4.60	
4.70	-	21		4.70	
4.80	-	22		4.80	
4.90	-	23		4.90	
5.00	-	24		5.00	
5.10	-	25	@5200mm to 5400mm trace cobbles	5.10	
5.20	-	26		5.20	
5.30	-	27		5.30	
5.40	-	28	EOB 5.5m	5.40	

PROBASE SELECTTRADEPROFESSIONALS

CLIENT:	Buildsmart	**Job No:**	P19511
Job Name:	Soils test	**Date:**	2019-9-9
Address	492 SH1 Huntly	**Tested By:**	AM
Note		**Test Location**	**2**

Depth (m)	No of Blows	Scale Penetrometer (Blows / 100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Depth (m)	Undrained Shear (kPa)
0.10	-		Topsoil	0.10	
0.20	1			0.20	
0.30	2			0.30	
0.40	1			0.40	
0.50	1		SAND - brown; fine grained, loose, moist	0.50	
0.60	1			0.60	
0.70	1			0.70	
0.80	2			0.80	
0.90	1			0.90	
1.00	2			1.00	
1.10	2			1.10	
1.20	3			1.20	
1.30	3		@1300mm becomes fine to med grained & mixed with dark grains	1.30	
1.40	3			1.40	
1.50	3		SAND, trace gravel - brownish grey & dark grey; fine to coarse grained, medium dense, moist	1.50	
1.60	3			1.60	
1.70	3			1.70	
1.80	3			1.80	
1.90	4			1.90	
2.00	-			2.00	
2.10	-			2.10	
2.20	-			2.20	
2.30	-			2.30	
2.40	-			2.40	
2.50	-			2.50	
2.60	-			2.60	
2.70	-			2.70	
2.80	-		Cont on next page	2.80	
2.90	-			2.90	

CLIENT:	Buildsmart	**Job No:**	P19511
Job Name:	Soils test	**Date:**	2019-9-9
Address	492 SH1 Huntly	**Tested By:**	AM
Note		**Test Location 2 cont**	

Depth (m)	No of Blows	Scale Penetrometer (Blows / 100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Depth (m)	Undrained Shear (kPa)
3.10	-	0	Cont from previous page	3.10	
3.20	-	1	SAND, trace gravel - brownish grey & dark grey; fine to coarse grained, medium dense, moist	3.20	
3.30	-	2		3.30	
3.40	-	3	@3200mm becomes wet	3.40	
3.50	-	4		3.50	
3.60	-	5		3.60	
3.70	-	6		3.70	
3.80	-	7		3.80	
3.90	-	8		3.90	
4.00	-	9		4.00	
4.10	-	10		4.10	
4.20	-	11		4.20	
4.30	-	12		4.30	
4.40	-	13		4.40	
4.50	-	14		4.50	
4.60	-	15		4.60	
4.70	-	16		4.70	
4.80	-	17	@4800mm becomes coarse grained and gravelly	4.80	
4.90	-	18		4.90	
5.00	-	19		5.00	
5.10	-	20		5.10	
5.20	-	21		5.20	
5.30	-	22		5.30	
5.40	-	23		5.40	
5.50	-	24		5.50	
5.60	-	25		5.60	
5.70	-	26		5.70	
5.80	-	27		5.80	
	-	28	EOB 5.8m		

CLIENT:	Buildsmart	**Job No:**	P19511
Job Name:	Soils test	**Date:**	2019-9-9
Address	492 SH1 Huntly	**Tested By:**	AM
Note	Perc test location	**Test Location**	**3**

Depth (m)	No of Blows	Scale Penetrometer (Blows / 100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Depth (m)	Undrained Shear (kPa)
0.10	-		Topsoil	0.10	
0.20	-			0.20	
0.30	-			0.30	
0.40	-		SAND - brown; fine grained, loose, moist	0.40	
0.50	-			0.50	
0.60	-			0.60	
0.70	-			0.70	
0.80	-			0.80	
0.90	-			0.90	
1.00	-			1.00	
1.10	-			1.10	
1.20	-			1.20	
1.30	-			1.30	
1.40	-		@1400mm becomes moist to wet	1.40	
1.50	-			1.50	
1.60	-		EOB 1.5m (perc test)	1.60	
1.70	-			1.70	
1.80	-			1.80	
1.90	-			1.90	
2.00	-			2.00	

FOUNDING EXCELLENCE
PROBASE
ENGINEERING

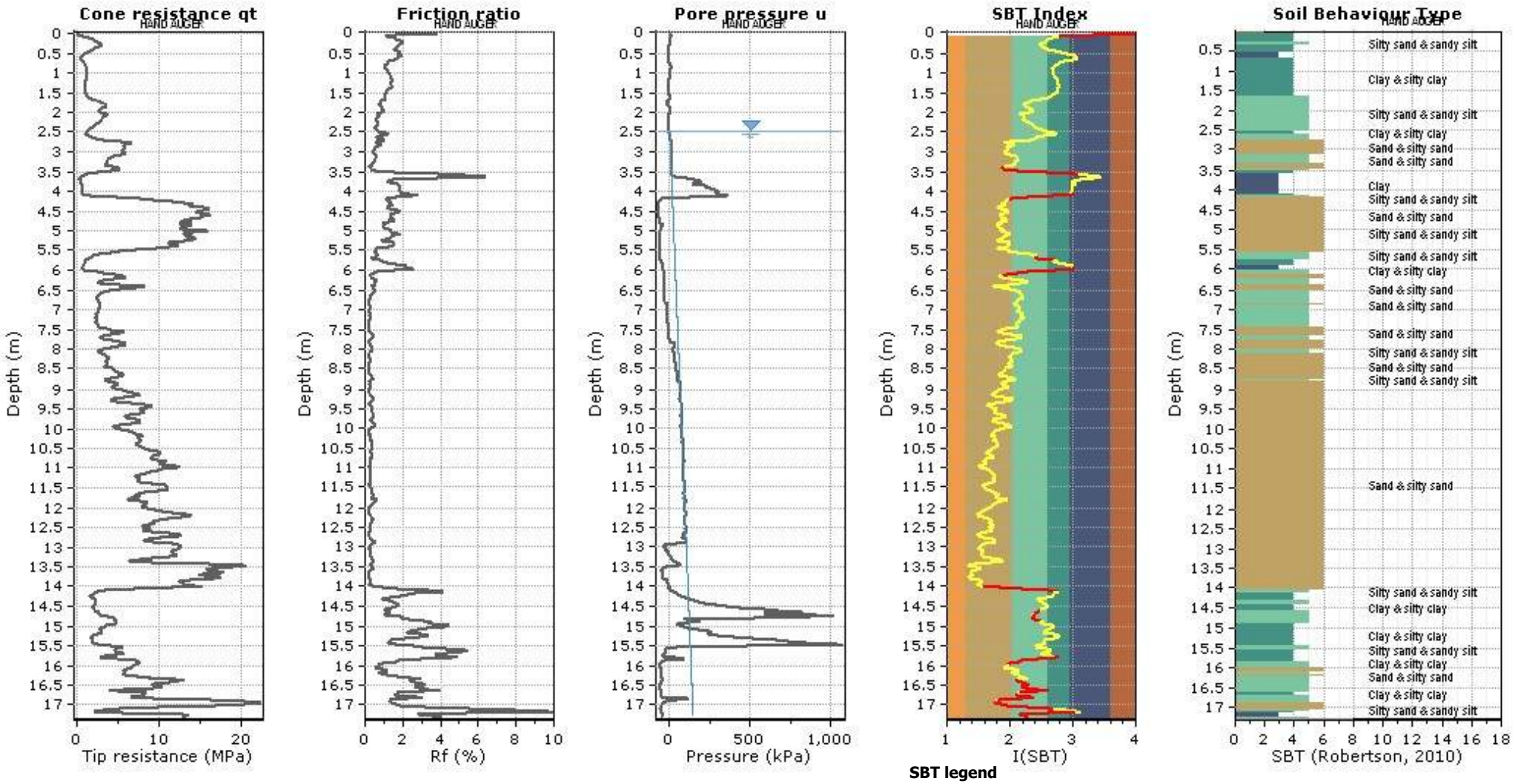
APPENDIX C

CPT Logs

Probase Engineering Ltd
Geotechnical, Civil & Structural Engineers
96 Vickery St, Te Rapa
www.probase.co.nz

Project: **492 SH1, Huntly**
Location: **492 SH1, Huntly**

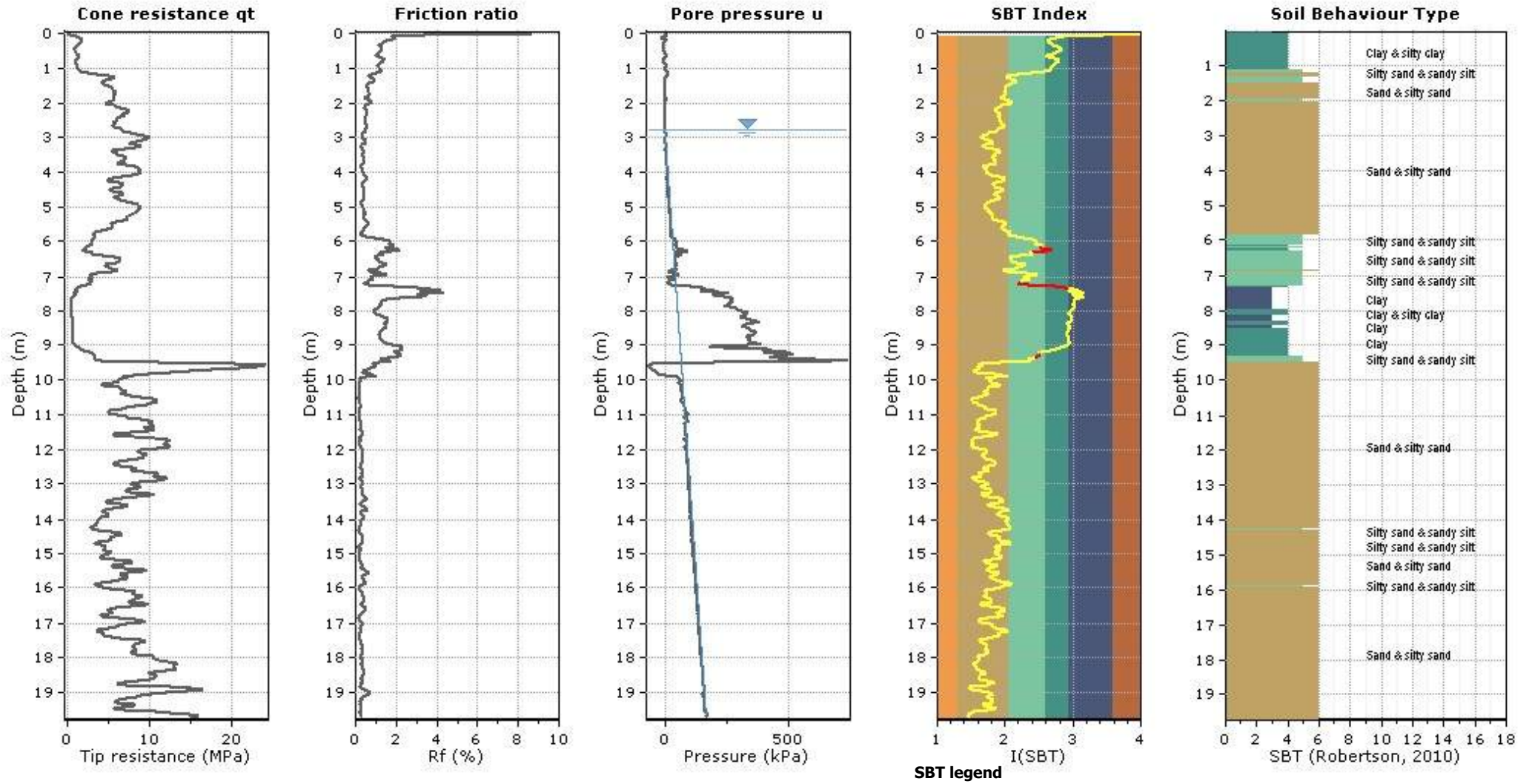
CPT: CPT01
Total depth: 17.29 m, Date: 10/09/2019
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



Probase Engineering Ltd
Geotechnical, Civil & Structural Engineers
96 Vickery St, Te Rapa
www.probase.co.nz

Project: **492 SH1, Huntly**
Location: **492 SH1, Huntly**

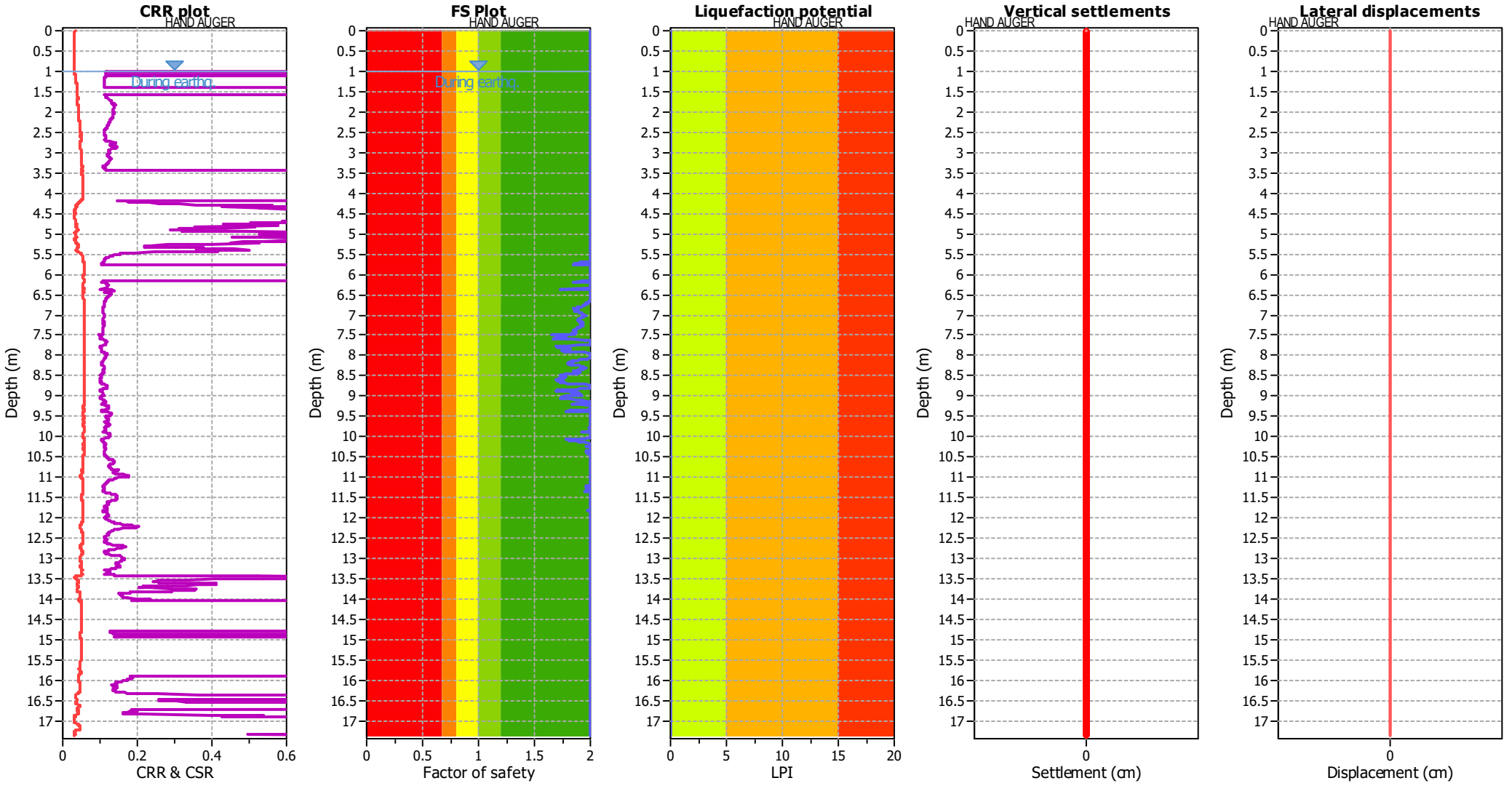
CPT: CPT02
Total depth: 19.70 m, Date: 10/09/2019
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown



APPENDIX D

Liquefaction Analysis Plots

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.06	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	N/A

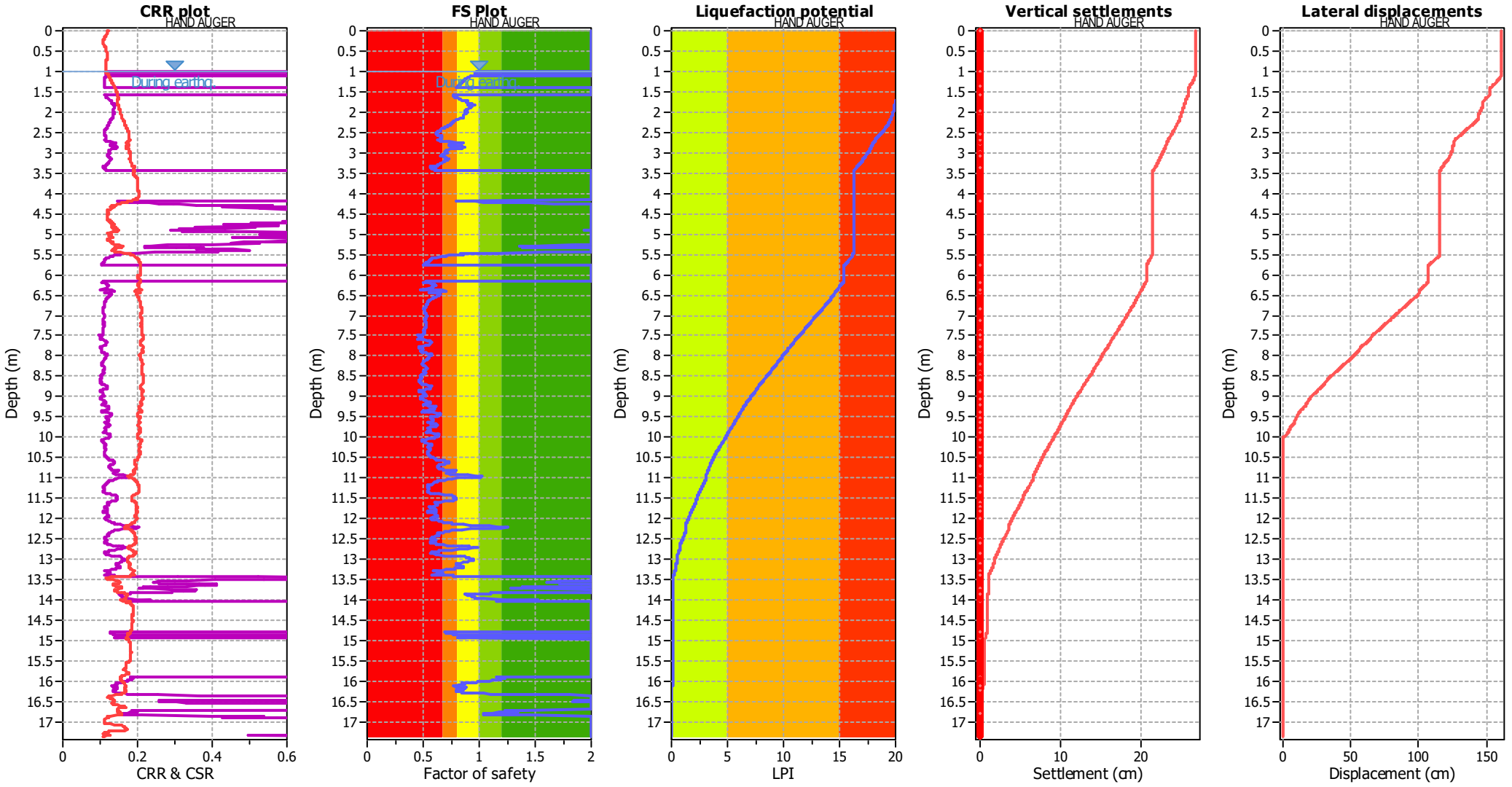
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.22	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
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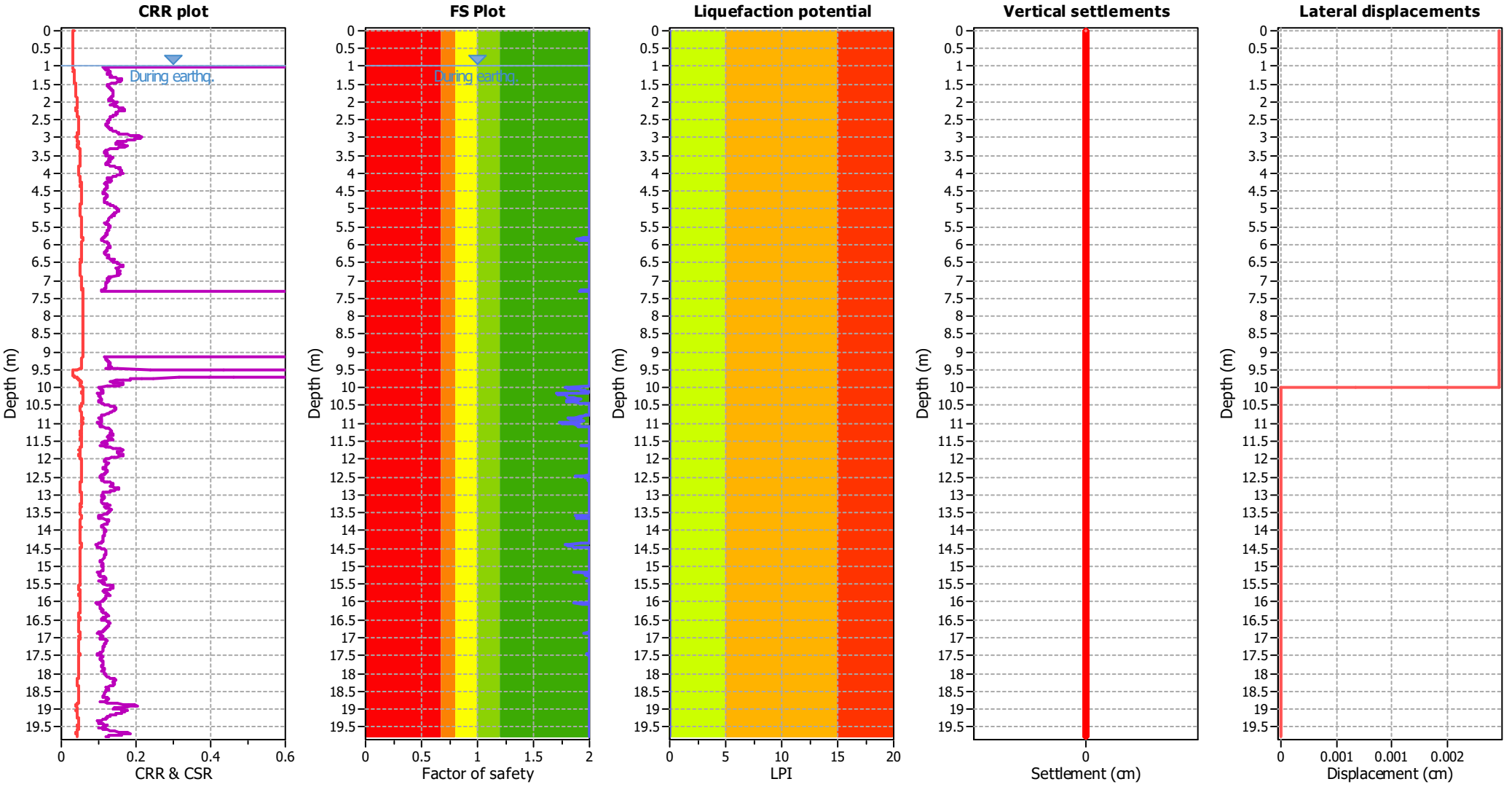
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 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:	5.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.06	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

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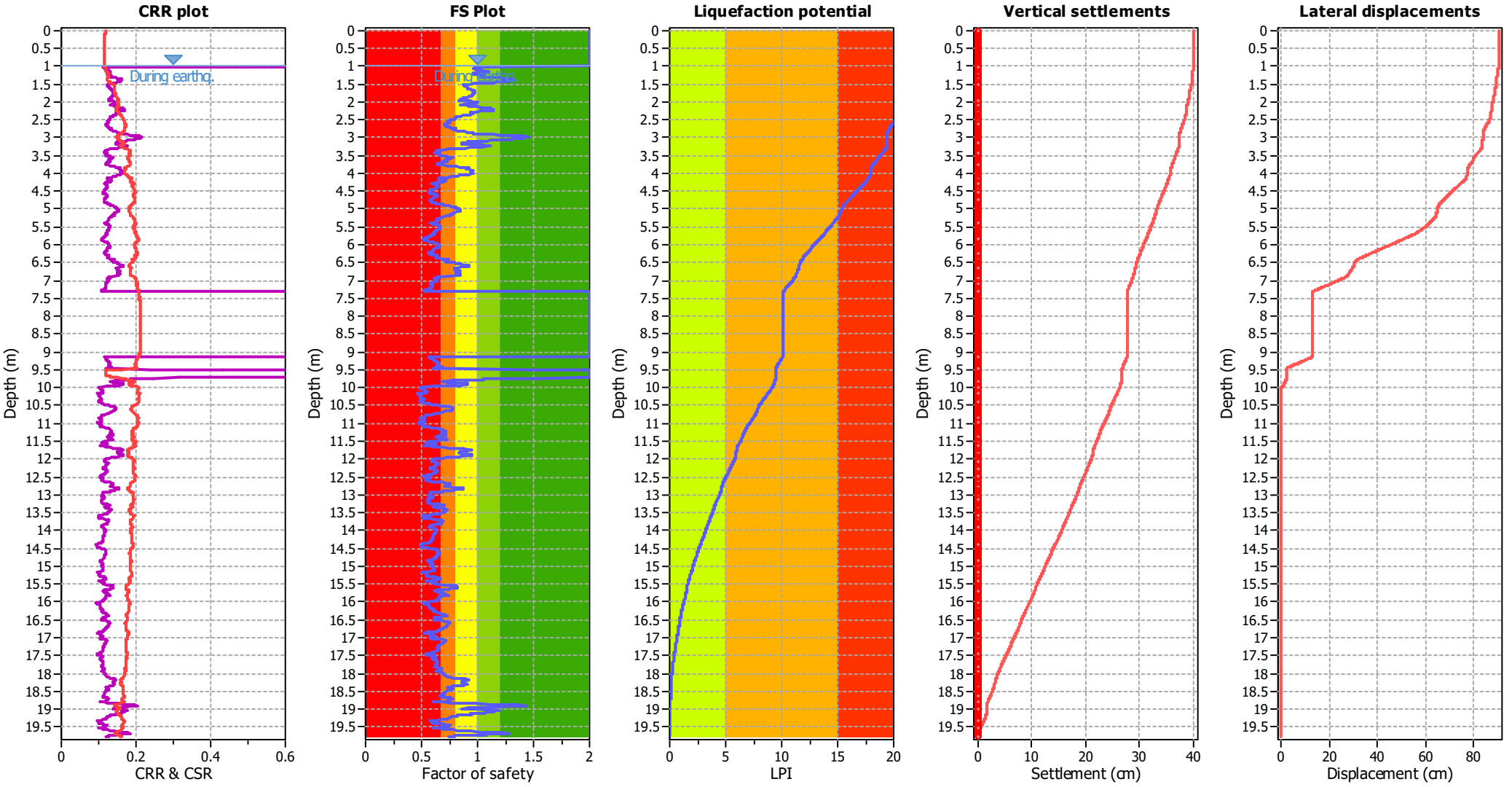
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 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:	5.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.22	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

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LPI color scheme

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LIQUEFACTION VULNERABILITY INDICATORS

Non liquefiable crust thickness

Ishihara (1985) published a paper containing observations on the protective effect that an upper layer of non liquefied material had against the manifestation of liquefaction at the ground surface. The paper contained graphs that plotted thickness of the upper non liquefied layer (H1), and the thickness of underlying liquefied material (H2). The data points were divided into two main categories; sites that did not have surface expression of liquefaction at the ground surface and sites that did have surface liquefaction expression at the ground surface. The paper was based on observations for two earthquakes. Dividing lines were then drawn to separate those sites which had expression of liquefaction at the ground surface from those sites where there was no observed expression of liquefaction at the ground surface.

Youd and Garris (1995) extended this concept by considering additional data and presented data and dividing curves for ranges of peak ground acceleration. Both papers showed that, for sites with any substantial thickness of liquefied material, the upper non liquefied material typically had a critical thickness, beyond which the likelihood of ground surface manifestation of liquefaction did not increase. The paper did not directly measure damage to structures, but instead considered only whether evidence of ejected material was observed at the ground surface. The conclusion drawn from these papers is that an upper layer of non liquefying material has a beneficial effect in mitigating the occurrence of sand ejection and therefore the damaging effects of liquefaction at the ground surface.

Liquefaction Potential Index (LPI)

The vulnerability of sites to liquefaction was also considered by Iwasaki (1978, 1982) and subsequently by Juang (2005). Iwasaki's Liquefaction Potential Index (LPI) is presented as a measure of the vulnerability of sites to liquefaction effects. The LPI presents the risk of liquefaction damage as a single value. The papers note that LPI values can range from 0 to 100, with the following indicators of liquefaction induced damage:

LPI Range	Damage
0	Liquefaction risk is very low
0 - 5	Liquefaction risk is low
5 - 15	Liquefaction risk is high
>15	Liquefaction risk is very high

Liquefaction Severity Number (LSN)

The Liquefaction Severity Number LSN is a new calculated parameter developed by Tonkin & Taylor to reflect the more damaging effects of shallow liquefaction on residential land and foundations. The equation used to calculate LSN is presented below. LSN considers depth weighted calculated volumetric densification strain within soil layers as a proxy for the severity of liquefaction land damage likely at the ground surface. The published strain calculation techniques consider strains that occur where materials have a calculated triggering FoS that reduces below 2.0. This means that the LSN begins to increase smoothly as factors of safety drop, rather than when the FoS reaches 1.0. One other aspect of LSN to note is that strains self-limit based on the initial relative density as the factor of safety drops, so a given soil profile has a maximum LSN that it tends towards as the PGA increases.

The LSN number is likely to be a better index of surface damage than reconsolidation settlement, because the LSN number is affected more by shallow liquefaction and less by liquefaction at depth. Liquefaction at depth is less likely to affect the ground surface or shallow founded buildings. Using reconsolidation settlement, the same weighting on deep liquefaction is applicable to shallow liquefaction, even though settlement will have less impact at the ground surface with increasing depth. LSN numbers have been correlated to observed liquefaction effects during recent earthquakes in Christchurch as shown below:

LSN Range	Predominant Performance
0-10	Little to no expression of liquefaction, minor effects
10-20	Minor expression of liquefaction, some sand boils
20-30	Moderate expression of liquefaction, with sand boils and some structural damage
30-40	Moderate to severe expression of liquefaction, settlement can cause structural damage
40-50	Major expression of liquefaction, undulations and damage to ground surface, severe total and differential settlement of structure
>50	Severe damage, extensive evidence of liquefaction at surface, severe total and differential settlements affecting structures, damage to services

LIQUEFACTION VULNERABILITY INDICATORS (Cont.)

Volumetric One Dimensional Free Field Settlement (s)
The c settlement indicator is based on published methods to estimate volumetric shear strains. These strains are integrated to calculate ground settlement. The MBIE/NZGS documents recommend using the B&I triggering method with the Zhang et al. (2002) volumetric densification calculation, which uses a normalised tip resistance and factor of safety to estimate settlements. The Zhang et al. (2002) method predicts strain in layers where the liquefaction factor of safety is less than 2.0. The calculated settlement indicator increases as the factor of safety drops and the material approaches a liquefied state. Therefore, some settlement is calculated when FoS is more than 1 even though liquefaction triggering has not occurred. In Canterbury, land for proposed residential subdivision development is being delineated into technical categories depending on its expected performance in the event of liquefaction. Calculated free field settlement is being applied as a parameter to be considered in this delineation. While this guideline is not applicable outside of Canterbury, but it can be referred to for indicative purposes. The guidance report states that the technical categories are intended to guide foundation solution developments at each site. The nominal criteria used to define the technical categories are presented below.

TC1: Future land damage from liquefaction is unlikely, and ground settlements from liquefaction effects are expected to be within normally accepted tolerances. Once the technical category is confirmed, shallow geotechnical investigations may be required (depending on the degree of damage, and in particular for a rebuild). If the 'good ground' test is met, NZS 3604 foundations (as modified by B1/AS1) can be used.

TC2: Liquefaction damage is possible in future large earthquakes. Shallow geotechnical investigations may be required (depending on the degree of damage, and in particular for a rebuild) and, subject to establishing minimum bearing capacities, suspended timber floor or enhanced slab foundation options can be used.

TC3: Liquefaction damage is possible in future large earthquakes. Deep geotechnical investigation (or assessment of existing information) may be required (depending on the degree of damage, and in particular for a rebuild) and depending on the geotechnical assessment, might require specific engineering input for foundations.

CPT-Based Liquefaction Index Settlement
Extensive studies have been undertaken on assessing the vulnerability of land to liquefaction damage. Tonkin & Taylor (2013) and van Ballegooy et al. (2014b) show that liquefaction triggering of soil layers more than 10m below the ground surface provides a negligible contribution to liquefaction damage at the ground surface. Hence, the MBIE Canterbury guidelines recommend that the thresholds provided in the table below should be applied to the settlement calculated from the liquefying soil layers in the top 10m of the soil profile only. The following criteria are indicated for the Technical Categorization in Canterbury Region.

Technical Criteria		SLS Settlement Index (mm)	ULS Settlement Index (mm)
TC1 criteria		<15	<25
TC2 criteria		<50	<100
TC3 criteria	TC3 hybrid criteria	<50	>100
	TC3 SLS <100mm criteria	<100	N/A
	TC3 SLS >100 mm criteria	>100	N/A

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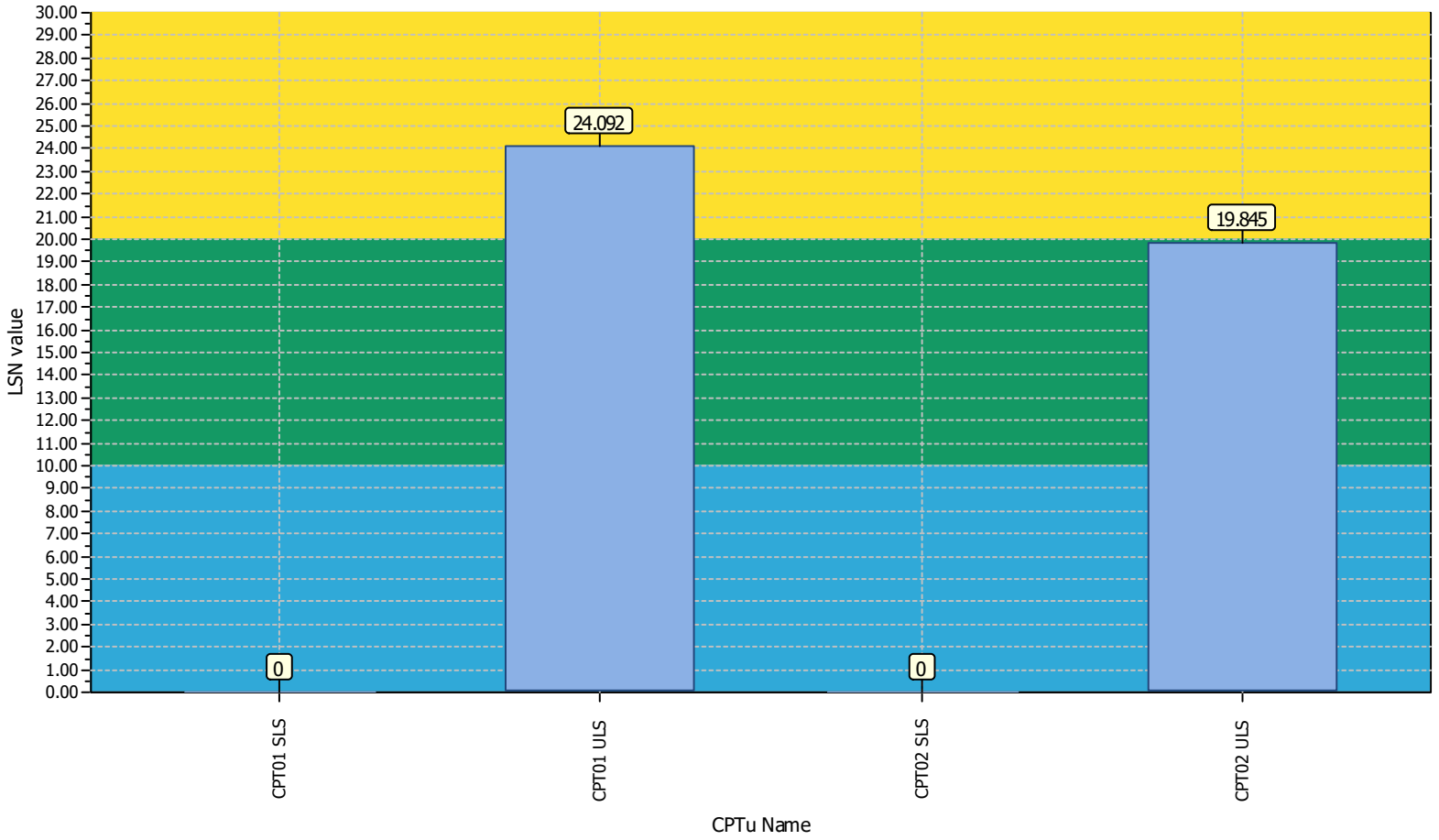
Location : 496 SH1, Huntly

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: 4

50% little liquefaction

25% minor liquefaction

25% moderate liquefaction

0% moderate to major liquefaction

0% major liquefaction

0% severe liquefaction

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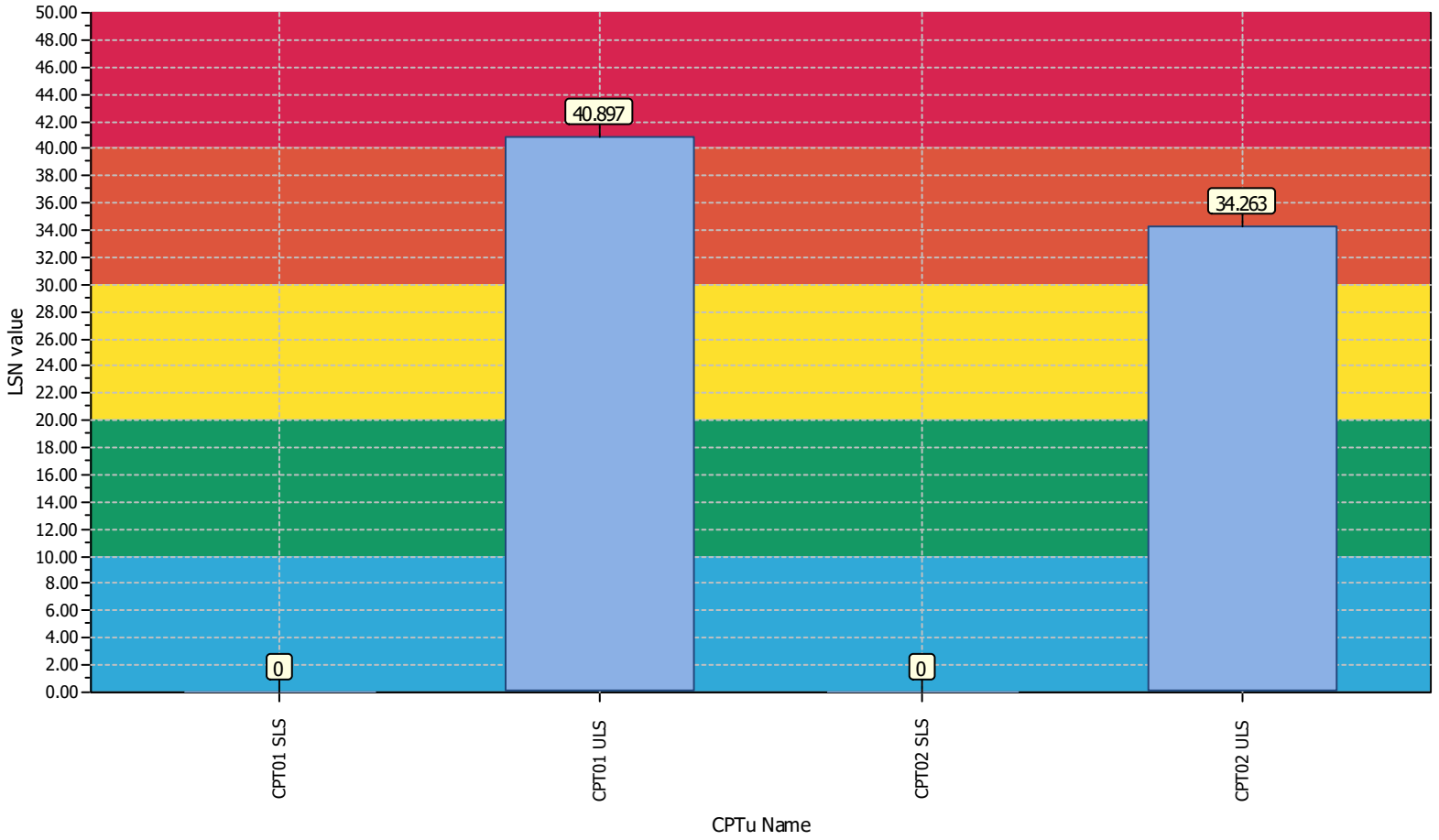

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