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aurecon

Rosemerryn Subdivision, Lincoln

Stages 10 to 18 Geotechnical Investigation Report

Fulton Hogan Land Development Limited

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Contents

EX	Culiv	e Summary	· · · · · · · · · · · · · · · · · · ·
1	Intro	oduction	4
2	Site	Conditions	5
	2.1	Site Description	5
	2.2	Regional Geology	5
	2.3	Seismicity	5
	2.4	Recorded Earthquake Damage	6
	2.5	MBIE Land Classification	6
3	Geo	technical Review and Site Investigations	7
	3.1	General	7
	3.2	Environment Canterbury GIS Data	8
	3.3	Canterbury Geotechnical Database	8
	3.4	Cone Penetration Testing	9
	3.5	Test Pit Excavations	9
	3.6	Boreholes	10
	3.7	MASW Soundings	10
	3.8	Ground Water	11
4	Eng	ineering Considerations	12
	4.1	General	12
	4.2	Geotechnical Ground Model	12
	4.3	Site Flexibility	13
	4.4	Liquefaction Assessment	13
	4.5	Liquefaction Mitigation	23
	4.6	Soft to Firm Clayey Silty Soils	25
	4.7	Council Vested Infrastructure	26
5	Ass	essment Against the RMA	28
6	Refe	erences	29
7	Limi	itations	31

Appendices

Appendix A

Figures

Appendix B

Provided Davis Lovell Smith Drawings

Appendix C

ECan Borehole Logs

Appendix D

CGD Borehole Log

Appendix E

CPT Logs

Appendix F

Test Pits Logs

Appendix G

Borehole Logs

Appendix H

MASW Soundings

Appendix I

Summary of Liquefaction Results

Tables

Table 1: Summary of ECan borehole logs	3
Table 2: Summary of CGD borehole logs	3
Table 3: Inferred ground profile – northern section of site	12
Table 4: Inferred ground profile – southern section of site	12
Table 5: Liquefaction deformation limits and house foundation implications	13
Table 6: Earthquake events for liquefaction analysis	15
Table 7: Summary of SPT based liquefaction analysis for sand lenses	16
Table 8: LSN descriptions	18
Table 9: Summary of liquefaction analysis for the 4 September 2010 Darfield Earthquake	19
Table 10: Summary of liquefaction analysis for the design level events	20

Executive Summary

Introduction

Fulton Hogan Land Development Limited is proposing to subdivide a 26.7ha area of rural land in Lincoln. It will be known as Rosemerryn Stages 10 to 18. The site is located in the central portion of the wider Rosemerryn Subdivision being undertaken by Fulton Hogan Land Development Limited, which when completed Rosemerryn Stages 10 to 18 will comprise 400 residential lots, reserves and associated roading.

Fulton Hogan Land Development Limited has engaged Aurecon to undertake a geotechnical investigation and assessment for the entire Rosemerryn subdivision, including these nine stages. The purpose of the investigation was to assess the suitability of the land for residential development, and in particular to characterise the risk of liquefaction and lateral spreading to the development.

Geotechnical Investigations

Based on the results of our geotechnical investigations the site is underlain by variable geology.

The northern section of the site is typically underlain by:

- 0.1 to 0.7m of topsoil.
- 0.1 to 6.2m of loose to medium dense Sands and Silty Sands interbedded with layers of soft to stiff Sandy Silts and Silts.
- Over 10m of medium dense to very dense Sandy Gravels and Gravels

The southern section of the site is typically underlain by:

- 0.2 to 0.5m of topsoil.
- 2.5 to 7.8m of loose to medium dense Sands and Silty Sands interbedded with layers of soft to stiff Sandy Silts and Silts.
- Over 10m of medium dense to very dense Sandy Gravels and Gravels

Based on groundwater measurements during testing which occurred between 2011 and 2015 and the ECan groundwater model we infer the groundwater level to be approximately between 1m and 3m depth in the northern section and 1m depth in the southern section. Groundwater levels will however vary seasonally or following prolonged rainfall.

Liquefaction Assessment

A liquefaction assessment has been carried out at the site. The assessment indicated the following:

- Based on the O'Rourke et. al. (2012) PGA model the site has been "sufficiently tested" (MBIE Guidelines (2012)) as the median value for the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. 1.7 x 0.13g = 0.22g). Therefore, we have considered ground damage observations at the site after the 4 September 2010 earthquake event to help refine our liquefaction assessment.
- GNS Science report on liquefaction in eastern Canterbury (GNS, 2012), review of aerial
 photography and site observations made by Aurecon and Fulton Hogan staff confirms there
 was no evidence of liquefaction observed at the site after the 4 September 2010 Darfield
 earthquake or any subsequent earthquakes part of the 2010 to 2012 Canterbury Earthquake
 Sequence.

- In all cases the liquefaction assessment calculated that lower levels of vertical settlement and ground damage will occur in a SLS earthquake event than those observed following the 4 September 2010 Darfield Earthquake.
- Due to current topography liquefaction induced lateral spreading is considered to be low.
- Based on our liquefaction assessment and observed damage we infer that minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site.

Further information of the liquefaction assessment are outlined in Section 4.4 of this report.

Technical Category Classification

Based on our liquefaction assessment the site in its current form is considered consistent with a mixture of zones of **Technical Category 1 and 2 Classification**. Across Rosemerryn Stages 10 to 18 future land damage from liquefaction is unlikely in the Technical Category 1 area and possible in the Technical Category 2 area in future large earthquakes.

The locations of the various Technical Category zones are shown on Figure 8 in Appendix A.

Due to the potential liquefaction risk at the site, recommendations for the protection of Council vested infrastructure have been made in Section 4.6 of this report.

Soft to Firm Clayey Silty Soils

Soft to firm clayey silty soils may be encountered at relatively shallow depths in most of the southern side of the site and in isolated pockets of the northern side of the site. Based on investigation logs we have split the site into two Zones as follows:

- Zone A there is potential for soft silt layers being present at 2m depth with thicknesses between 0.3m and 1.0m. There is also another soft layer from 3m with thicknesses up to 2m.
- Zone B there is potential that soft silt layers will be present in isolated pockets across this
 part of the site.

The approximate areas of these zones are shown on Figure 9 in Appendix A.

Based on the available investigation logs it is unlikely that shallow bearing for a typical house foundation of 300kPa could be achieved in these areas. Therefore if these soils are encountered 'Good Ground' as per NZS3604 will not be met and specifically designed foundations will be required based on the building consent investigations.

However, based on our analysis typical TC2 type waffle or beam grid type systems should be suitable as foundation elements. The calculated long term consolidation settlement induced by foundation loading is likely to be within acceptable limits of the NZ Building Code (i.e settlement less than 25mm over 6m). However as this is a subdivision area wide geotechnical report and in line with MBIE guidelines bearing capacities must be confirmed during the detailed house design.

RMA Section 106 Assessment

The site is potentially susceptible to "subsidence" and "inundation" from seismically induced liquefaction. However, using appropriate liquefaction mitigation and remediation measures, as detailed in this report, we believe that the risk imposed by liquefaction will be reduced to an acceptable level. As such, the site will essentially be geotechnically stable land. Thus in our opinion, the proposed development will generally be free of "erosion," "falling debris," "subsidence," "slippage," and "inundation" and the proposed development satisfies the intent of RMA Section 106 1(a).

Provided that appropriate investigation and design inputs are made, as recommended in this report, subsequent use of the land following development is unlikely to accelerate, worsen, or result in

material damage to the land, other land, or structures. In our opinion therefore, the development will comply with the requirements of Clause 106 1(b) RMA.

The geotechnical investigation was aimed at assessing the site for geotechnical suitability for subdivision into residential lots with associated access roads and rights-of-way. Detailed design of house foundations has not been addressed in the report.

This Revision 3 report updates figures and incorporates Client and Council peer reviewer comment, finalise the site specific Technical Category classification and supersedes all previous revisions.

Our Limitations are attached as Section 7 of this report. This report shall be read as a whole.

1 Introduction

Fulton Hogan Land Development Limited is proposing to subdivide a 26.7ha area of rural land in Lincoln. It will be known as Rosemerryn Stages 10 to 18. The final layout has now been confirmed and will comprise 400 residential lots, reserves and associated roading. The site is located in the central portion of the wider Rosemerryn Subdivision being undertaken by Fulton Hogan Land Development Limited. See Figures 1 and 2 in Appendix A and the Davie Lovell Smith drawing in Appendix B.

Fulton Hogan Land Development Limited has engaged Aurecon to undertake a geotechnical investigation and assessment for the entire Rosemerryn subdivision, including Stages 10 to 18. The purpose of the investigation was to assess the suitability of the land for residential development, and in particular to better characterise the risk of liquefaction and lateral spreading to the development. The scope of the works undertaken was as follows:

- A detailed desk study of readily available geological and geotechnical information available for this site.
- A preliminary site walkover and reconnaissance.
- Review the existing geotechnical work carried out in the area by Aurecon.
- Undertake further geotechnical investigations comprising of three machine drilled boreholes, five cone penetration tests and MASW soundings.
- Undertake an updated and revisited liquefaction hazard assessment based upon the results of the geotechnical data.
- Provide recommendations on potential liquefaction remediation options for the site.
- Provide recommendations for further testing (if required).
- Assess the site against Sections 106 1a) and 1b) of the RMA.
- Prepare this factual and interpretive geotechnical for Rosemerryn Subdivision stages 10 to 18.

This Revision 3 report updates figures and incorporates Client and Council peer reviewer comment, finalise the site specific Technical Category classification and supersedes all previous revisions.

Our limitations are attached as Section 7 of this report. This report shall be read as a whole.

2 Site Conditions

2.1 Site Description

The site is located in the central portion of the wider Rosemerryn subdivision (See Figures 1 and 2 in Appendix A and the Davie Lovell Smith drawing in Appendix B). The main site features are:

- The site has an approximate area of 26.7ha.
- The site is made from two irregularly shaped rectangles, a northern rectangle and a southern rectangle which we have denoted the northern and southern section respectively.
- The site is bound to the north by rural land, to the west by rural land and previous stages of the Rosemerryn subdivision, to the south by previous stages of the Rosemerryn subdivision and Edward Street and to the east by future stages in the Rosemerryn subdivision which is currently used for farming activities.
- There is a small stream which runs through the Rosemerryn subdivision and divides the northern section from the southern section. The stream is approximately 0.5m deep and 2m to 3m wide with no significant bank.
- It is understood that there will be not stormwater basins or stormwater channels built as part of the subdivision.
- The site is currently being used for pastoral and cropping farming activities and is covered in barley and grass.
- Current drainage is inferred to be via direct soakage to the ground or via runoff to the small stream.

2.2 Regional Geology

The regional geology of the site is described in the Institute of Geological and Nuclear Sciences (GNS) QMaps (as shown on the Canterbury Geotechnical Database (CGD, 2015) as "Modern river floodplain / low-level degradation terrace. Unweathered, variably sorted gravel / sand / silt / clay. Surfaces <2 degree slope (Q1a)".

2.3 Seismicity

The GNS Science Active Fault System database (GNS, 2011a) indicates that the site is located approximately 12km south-east of the eastern extension of the Greendale Fault. Movement on the Greendale Fault was responsible for the Magnitude M_w7.1 Darfield (Canterbury) Earthquake on 4 September 2010.

The site is also located:

- 16km south-west of the epicentre of the Magnitude M_w6.2 Christchurch Earthquake on 22 February 2011 (GNS, 2011b);
- 21km south-west of the epicentre of the Magnitude M_w6.0 major aftershock on 13 June 2011 (GNS, 2011b); and
- 23km south-west of the epicentre of the Magnitude M_w5.9 major aftershock on 23 December 2011 (GNS, 2011b).

Based on the O'Rourke et. al. (2012) (as shown on the CGD, 2015) peak ground accelerations of approximately 0.34g were experienced at the site during the 4 September 2010 Darfield Earthquake.

2.4 Recorded Earthquake Damage

Based on the GNS Science report "Review of liquefaction hazard information in eastern Canterbury, including Christchurch City and parts of Selwyn, Waimakariri and Hurunui" (GNS, 2012), as shown on Canterbury Maps (2015), there was no observed liquefaction induced damage after the 4 September 2010 or 22 February 2011 earthquakes. But there were minor observed areas within 500m of the site. The locations of observed damage are shown in Figures 3 and 4 in Appendix A.

Following reviews of aerial photography, discussions with Fulton Hogan staff that are familiar with the site, and Aurecon site walk overs in 2011, 2012, 2013 and 2015, no surface expression or manifestation of liquefaction induced ground damage was observed. This confirms the lack of observations noted in the GNS Science report.

2.5 MBIE Land Classification

The current land classification for the site, according to the Ministry of Business Innovation and Employment (MBIE) Technical Categories map (as shown on the CGD, 2015), is "N/A – Rural & Unmapped". But to the east of the site on the eastern side of Elsmere Road it is classified as "Technical Category 2" and to the west of the site it is classified as "Technical Category 1". "N/A – Rural & Unmapped" means that normal consenting procedures apply in these areas. "Technical Category 1" means that future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances. Standard foundations (NZS 3604) are acceptable subject to shallow geotechnical investigation. "Technical Category 2" means that minor to moderate land damage from liquefaction is possible in future large earthquakes. Lightweight construction or enhanced foundations are likely to be required such as enhanced concrete raft foundations (i.e. stiffer floor slabs that tie the structure together).

3 Geotechnical Review and Site Investigations

3.1 General

The objective of the geotechnical review and site investigation was to investigation the ground and groundwater conditions across the site in order to assess the suitability of the site for subdividing into residential sections.

An initial geotechnical assessment investigation was carried out across the wider site between August and September 2011. Additional testing on these stages was undertaken between April 2012 and January 2015 to provide information for detailed liquefaction risk assessment as part of the subdivision consenting and design process.

The geotechnical review and investigation comprised the following:

- A review of publically available geotechnical information from Environment Canterbury and the Geotechnical Database.
- Cone Penetrometer Testing supervised by Engineering Geologists and Geotechnical Engineers from Aurecon.
- Excavation and logging of test pits by Engineering Geologists from Aurecon.
- Borehole drilling and logging by Engineering Geologists and Geotechnical Engineers from Aurecon.
- Undertaking of Multi-channel Analysis of Surface Waves (MASW) profiling to generate shear wave velocity profiles.

This section of the report describes the geotechnical testing undertaken on the site.

3.2 Environment Canterbury GIS Data

A review of the Environment Canterbury GIS Database (ECan, 2015) indicates five Environment Canterbury boreholes with logs on the site. The borehole logs, locations, and depths are summarised in Table 1 below.

Table 1: Summary of ECan borehole logs

Borehole	Location	Depth	Summary of Stratigraphy
M36/8672	In eastern side of southern section	6.0m	 0 to 0.2m – Topsoil 0.2 to 6.0m – Silty Sand, Silt Sandy, Clayey Silt and Silty Clay
M36/8673	To the west of the southern section	6.0m	 0 to 0.2m – Topsoil 0.2 to 6.0m – Clayey Silt and Silty Clay
M36/8677	In the south- eastern side of the northern section	5.2m	 0 to 0.2m – Topsoil 0.2 to 2.8m – Silt and Silty Clay 2.8 to 5.2m – Gravel
M36/8678	In the western side of the northern section	5.2m	 0 to 0.2m – Topsoil 0.2 to 1.0m – Silty Clay 1.0 to 1.8m – Sandy Gravel and Silty Gravel 1.8 to 2.8m – Silty Clay with no to some Gravel. 2.8 to 5.2m – Silty Gravel
M36/8681	In the northern side of the northern section	4.5m	 0 to 0.2m – Topsoil 0.2 to 1.8m – Silt and Silty Sand mixed with Gravel 1.8 to 4.5m – Gravel

The locations of the ECan borehole logs are presented in Figure 5 in Appendix A and the borehole logs are presented in Appendix C.

3.3 Canterbury Geotechnical Database

A review of the Canterbury Geotechnical Database (CGD, 2015) indicates one borehole log near to the site. As the site is in Lincoln there is no other applicable information is available on the Canterbury Geotechnical Database. The borehole log, location, and depth are summarised in Table 2 below.

Table 2: Summary of CGD borehole logs

Borehole	Location	Depth	Summary of Stratigraphy
BH_33771 (Borehole 3)	To the west of the northern section	10.5m	 0 to 0.5m – Topsoil 0.5 to 3.1m – Silty Sand 3.1 to 3.7m – Sand 3.7 to 10.5m – Sandy Gravel with a sand lens between 5.0 and 5.15m.

The location of CGD log is presented in Figure 5 in Appendix A and the borehole log is presented in Appendix D.

3.4 Cone Penetration Testing

69 Cone Penetration Tests (CPT) were undertaken in the vicinity of Stages 10 to 18 of the Rosemerryn Subdivision to effective refusal (a sustained tip bearing over 30MPa) at depths between 0.7m and 10.2m depth. The locations of the CPTs are shown in Figure 6 in Appendix A and the logs are presented in Appendix E.

The CPT logs indicate:

Northern section of the site

- Surface to 0.4-6.5m Interbedded layers Sands to Silty Clays
- 0.4-6.5m onwards Sandy Gravels

Southern section of the site

- Surface to 3.0-8.0m Interbedded layers Sands to Silty Clays
- 3.0-8.0m onwards Sandy Gravels

3.5 Test Pit Excavations

45 test pit excavations were undertaken in the vicinity of Stages 10 to 18 of the Rosemerryn Subdivision to a maximum achievable depth of 2.0m and 4.2m due to the test pits collapsing or encountering very dense gravels. The test pits were logged in accordance with the New Zealand Geotechnical Society's field description of soil and rock (NZGS, 2005). The locations of the test pits are shown in Figure 6 in Appendix A and the logs are presented in Appendix F together with an explanatory sheet outlining the terms and symbols on the logs.

The test pits logs indicate:

Northern section of the site

- Surface to 0.2-0.5m Topsoil
- 0.2-0.5m to 0.4-3.7m Sand, Silty Sand, Sandy Silt, Silt
- 0.4-3.7m onwards Gravel and Sandy Gravel

Southern section of the site

- Surface to 0.3-0.4m Topsoil
- 0.3-0.4m onwards Sand, Silty Sand, Sandy Silt, Silt

3.6 Boreholes

Five machine boreholes with Standard Penetrometer Testing (SPT) were drilled in the vicinity of Stages 10 to 18 of the Rosemerryn Subdivision. The boreholes were drilled to the target depth between 10.5m and 15.2m and were logged in accordance with the New Zealand Geotechnical Society's field description of soil and rock (NZGS, 2005). The locations of the boreholes are shown in Figure 6 in Appendix A and the Aurecon and McMillan logs are presented in Appendix G.

The test pits logs indicate:

Northern section of the site

- Surface to 0.1-0.7m Topsoil
- 0.1-0.7m to 0.1-3.8m Interbedded Sand, Silty Sand, Sandy Silt and Silt
- 0.1-3.8m onwards Predominately Sandy Gravel and Gravel with minor sand lenses up to 1.5m thick.

Southern section of the site

- Surface to 0.4m Topsoil
- 0.4 to 6.8m Silt and Silty Sand
- 6.8m onwards Sandy Gravel

3.7 MASW Soundings

A series of 12 Multi-channel Analysis of Surface Waves (MASW) profile lines were undertaken by Southern Geophysical Limited. These profile lines total 3.1km in length and comprise individual MASW soundings at approximately 10m centres. From the MASW soundings, shear wave velocity profile sections have been produced for the upper 25m of the soil profile. The MASW soundings were undertaken to obtain information between the physical control points (CPT, borehole and test pits) and in particular it provided information on the start of the gravel layer in both sections and sand lens in the gravel layer though the upper profile in the northern section. The locations of the profile lines are shown in Figure 7 in Appendix A and the velocity profiles are presented in Appendix H.

The shear wave velocity (V_s) profiles when calibrated to the CPT, test pit and borehole logs indicate:

Northern section of the site

- Upper Sands and Silts V_s < 180m/s
- Gravels (Upper 10m) 180m/s < V_s < 350 m/s
- Sand Lenses 200m/s < V_s < 250 m/s
- Gravels (Deeper) 350m/s < Vs

Southern section of the site

- Upper Sands and Silts V_s < 180m/s
- Gravels (Upper 10m) 180m/s < V_s < 250 m/s
- Gravels (Deeper) 250m/s < V_s

3.8 Ground Water

Groundwater levels have been recorded from the four sources as follows:

- After the CPTs water measurements have been taken, where possible, when the rods have been removed these show water at approximately 1.9m depth in the northern section.
- From the test pit logs groundwater was encountered at depths between 2.0m and 3.6m on the northern section and between 2.0m and 3.8m on the southern section.
- During the drilling of the machine boreholes static ground water was observed between 1.8m and 3.8m on the northern section and 1.2m in the southern section.
- Groundwater level has been recorded in the CGD borehole by the northern section at 2.1m depth.

Groundwater levels are expected to vary seasonally or with periods of high or low precipitation.

4 Engineering Considerations

4.1 General

Fulton Hogan Land Development Limited is proposing to subdivide 26.7ha area of rural land in Lincoln. It will be known as Rosemerryn Stages 10 to 18 and comprises 400 residential lots and reserve areas. To fulfil the Ministry of Business, Innovation and Employment (MBIE, 2012) guidelines on residential development, the liquefaction risk at the site needs to be quantified. Once this liquefaction risk is quantified then appropriate mitigation measures (if required) can be developed as part of the physical site development.

This section of the reports outlines details of our liquefaction assessment, and presents our recommendations for liquefaction mitigation options as part of the site development.

4.2 Geotechnical Ground Model

Based on the results of our geotechnical site investigation we infer a ground profile as presented in Table 3 and 4.

Unit	Depth to Start of Layer	Depth to End of Layer	Material
1	Surface	0.1 to 0.7m	Topsoil
2	0.1 to 0.7m	0.4 to 6.5m	Loose to medium dense Sands and Silty Sands interbedded with layers of soft to stiff Sandy Silts and Silts
3	0.4 to 6.5m	15m onwards	Predominately medium dense to very dense Sandy Gravels and Gravel with occasional sand lenses up to 1.5m thick

Table 3: Inferred ground profile - northern section of site

Table 4: Inferred ground profile - southern section of site

Unit	Depth to Start of Layer	Depth to End of Layer	Material
1	Surface	0.2 to 0.5m	Topsoil
2	0.2 to 0.5m	3.0 to 8.0m	Loose to medium dense Sands and Silty Sands interbedded with layers of soft to stiff Sandy Silts and Silts. With a 0.5m to 2m soft to firm Clayey Silt starting approximately 2m depth.
3	3.0 to 8.0m	15m onwards	Medium dense to very dense Sandy Gravels and Gravels

Based on our ground investigations and the ECan groundwater model we infer groundwater levels to be approximately between 1m and 3m below ground level on the northern section of the site and to be approximately 1m below ground level on the southern section of the site.

Groundwater levels are expected to vary seasonally or with period of high or low precipitation.

4.3 Site Flexibility

We have assessed the site flexibility based on the following:

- Site stratigraphy comprises approximately sands and silts underlain by gravels to at least 15m depth (maximum depth investigated at the site).
- Clause 3.1.3 and Table 3.2 of NZS 1170.5:2004.

We consider that the site subsoil category in terms of NZS 1170.5:2004 Clause 3.1.3 is Class D (Deep soil site).

4.4 Liquefaction Assessment

4.4.1 General

Under cyclic loading (i.e. during an earthquake) loose, non-cohesive materials such as gravels, sands, silty-sands, tend to decrease in volume. This tendency to decrease in volume is much greater in loose than in dense soils. When loose non-cohesive soils are saturated and rapid loading occurs under undrained conditions, the soils densification causes pore water pressure to increase. The increase in pore water pressure results in a loss of soil strength due to a decrease in effective stress and eventually liquefaction occurs when the effective stress drops to zero. Liquefaction can lead to large displacements of foundations, flow failures of slopes and ground surface settlement, sand boils, and post-earthquake stability failures.

This assessment quantifies the risk of future liquefaction in terms of the technical category classification system outlined in the MBIE (2012) guidelines. This classification system is divided into three technical categories that reflect both the liquefaction experience to date and future performance expectations. The categories and corresponding criteria are summarised as follows:

- **Technical Category 1 (TC1)** Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.
- **Technical Category 2 (TC2)** Minor to moderate land damage form liquefaction is possible in future large earthquakes.
- **Technical Category 3 (TC3)** Moderate to significant land damage from liquefaction is possible in future large earthquakes.

MBIE (2012) has indicated the following liquefaction and lateral spreading deformation limits for house foundations as summarised in Table 5 below:

Table 5: Liquefaction deformation limits and house foundation implications

Technical	Index Liqu	efaction Def	ormation I	_imits	Likely Implication for House Foundations (subject to individual assessment)	
Category	Vertical		Lateral S	pread		
	SLS	ULS	SLS	ULS	, in the second second	
TC1	15mm	25mm	Nil	Nil	Standard NZS3604 type foundations with tied slabs	
TC2	50mm	100mm	50mm	100mm	MBIE enhanced foundation solutions	
TC3	>50mm	>100mm	>50mm	>100mm	Site specific foundation solution	

In determining the liquefaction potential at the site, the main factors to be considered are:

- How has the site performed during the major seismic events of the Canterbury earthquake sequence?
- Which layers have liquefied?
- What is the likelihood of further liquefaction in the future?
- How the potential liquefaction affects the development?

Each of these is considered below.

Observations after Previous Major Earthquake Events

As outlined in Section 2.4 there is no evidence of liquefaction observed at the site after the 4 September 2010 Darfield earthquake or any subsequent earthquakes part of the 2010 to 2012 Canterbury Earthquake Sequence. This suggests that limited potential for soil liquefaction at the site.

Potential for Liquefaction

Three primary factors contribute to liquefaction potential:

- · Soil grading and density.
- · Groundwater.
- Earthquake intensity and level of ground shaking.

Each of these is discussed below.

Soil Grading and Density

The CPT logs show layers of loose to medium dense sands, silty sands and sandy silts. These layers are considered to be potentially susceptible to liquefaction from a soil grading and density perspective.

Groundwater

We have adopted a groundwater table between 1m and 3m below ground level for the northern section and a groundwater table at 1m below ground level for the southern section. Therefore, soils are potentially liquefiable from a depth of 1m to 3m from a saturation criterion. It should be noted that groundwater levels are subject to seasonal changes.

Earthquake Intensity and Level of Shaking

The level of ground shaking is one of the key factors in determining whether liquefaction will or will not occur. For this study, we have assessed the three design levels of shaking outlined in the MBIE Guidelines plus two peak ground acceleration cases of the 4 September 2010 earthquake event. We have considered the 4 September 2010 Darfield earthquake as there is PGA data available for the site which shows the levels of shaking was larger than an SLS event. Therefore the 4 September 2010 earthquake provides an upper bound indicator of ground damage and settlements likely to occur in an SLS event. The levels of shaking used are as follows:

Table 6: Earthquake events for liquefaction analysis

Earthquake Event	Magnitude	Peak Ground Acceleration
4 September 2010-a	M _w 7.1 ⁽¹⁾	0.34g ⁽¹⁾
4 September 2010-b	$M_w 7.1^{(1)}$	0.20g ⁽²⁾
ULS	M _w 7.5	0.35g
SLS-a	M _w 7.5	0.13g
SLS-b	M _w 6.0	0.19g

- (1) Magnitude and peak ground acceleration from O'Rourke et. al. (2012) (as shown on the CGD 2014)
- (2) Approximately 65% (1/170%) of the peak ground acceleration of the O'Rourke et. al. (2012) to account for uncertainty of PGA model

For an Ultimate Limit State (ULS) earthquake buildings are expected to retain their structural integrity and form during a ULS earthquake event and not endanger life. Some plastic deformation of structural elements within the structure is expected to occur but ideally the damage can be repaired and the structure can be returned to service after the event, although repair may be uneconomical.

For a Serviceability Limit State (SLS) earthquake buildings are expected to perform well for the SLS event and be returned to service after limited repair.

4.4.2 Liquefaction Potential Assessment

The ground investigations show that the site is directly underlain by sandy and silty soils which in turn is underlain by predominately gravels with some sand lenses. Based on the geotechnical ground investigations the gravels have been assessed to be non-liquefiable in design level events due to the recorded relative densities and partial size. Therefore to define the liquefaction hazard at the site we need to assess the liquefaction potential of the upper soils as well as the sand lenses within the gravel layers. To assess the liquefaction potential of the upper soils we have used a cone penetration test (CPT) assessment and to assess the liquefaction potential of the sand lenses we have considered the relative density of the sandy layers from the SPT and shear wave velocity data.

As the Bradley and Hughes (2012a, b) ground shaking model does not extend into Lincoln area we have considered the O'Rourke et al (2012) PGA model. Based on this PGA model and the MBIE Guidelines (2012) the site has been 'sufficiently tested' as the median value for the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. $1.7 \times 0.13g = 0.22g$). Therefore, we have also considered ground damage observations at the site after the 4 September 2010 earthquake event to help refine our liquefaction assessment.

Liquefaction in the Deeper Soils

A sand lens was encountered in a borehole BH102 as well as other sand lenses being inferred in the MASW soundings. For this reason in our liquefaction assessment we have considered the liquefaction hazard of these layers.

To assess liquefaction of these sand lenses we have considered an SPT undertaken in this layer and shear wave velocity profile obtained from the MASW sounding and well as the mechanism of liquefaction occurring, the likely damage from it occurring and the previous observed damage or lack thereof.

Using the single SPT (BH102 at 4.56m depth) we have in a sand lens we have assessed the liquefaction potential of this layer based on the Boulanger and Idriss (2014) SPT based liquefaction

assessment method assuming a clean sand. The calculated factors of safety are shown in the Table below:

Table 7: Summary of SPT based liquefaction analysis for sand lenses

Earthquake Event	Calculated Factor of Safety Against Liquefaction
4 September 2010-a	0.4
4 September 2010-b	0.7
SLS-a	1.0
SLS-b	0.8
ULS	0.4

From this SPT based liquefaction assessment, sand lens are assessed as being is highly liquefiable even at relatively low levels of shaking with the factor of safety against liquefaction for 4 September 2010 event calculated to have a factor of safety between a SLS and ULS design event.

To supplement this SPT we have also considered the shear wave velocity obtained from the MASW soundings. Based on the method outlined in Idriss and Boulanger (2008) the maximum shear wave velocity for liquefiable soils is 215m/s. Therefore in the initial liquefaction analysis for the site we have considered that all soils with shear wave velocities less than 200m/s are potentially liquefiable in a design level event. This shows that there is limited potential for liquefaction to occur within in these sand lenses.

These two assessments show differing results. For this reason we have considered the mechanism of the liquefaction process. When loose non-cohesive soils are saturated and rapid loading occurs under undrained conditions, the soils densification causes pore water pressure to increase. The increase in pore water pressure results in a loss of soil strength due to a decrease in effective stress and eventually liquefaction occurs when the effective stress drops to zero. However, as these sand lenses as surrounded by gravel drainage effects may occur, limiting and reducing the build-up of excess pore water pressure, thus limiting liquefaction occurring. Therefore the liquefaction hazard of these sand lenses will be reduced.

The effects of these sand lenses liquefying also required to be considered. Borehole BH102 shows 4.5m of medium to very dense gravels overlying the potentially liquefiable sand lens. The MASW profiles suggest that this layer of medium dense to very dense gravels is as thin as 3m in some areas. Therefore based on observations in Christchurch if these sand layers were to liquefy the damage to shallow founded structures will likely be suppressed due to this medium dense to very dense gravel layer.

Lastly no significant differential damage, including settlement, was observed across areas with sand lens and areas without. Which suggests that either theses layers did not liquefy or the upper gravel layer has supressed the liquefaction induced damage in these areas.

For these reasons we consider the liquefaction or liquefaction effects occurring in these deeper sand lenses to be limited concerns to shallow founded domestic structures and therefore we have not considered it further in our assessment. Instead we have only considered liquefaction in the upper soils as the main driving mechanism of the site liquefaction hazard.

Liquefaction in the Upper Soils Methodology

The ability for the subsoils to resist the effect of ground shaking associated with the design level earthquakes has been assessed from the upper subsoil information obtained from the CPTs.

The liquefaction assessment was carried out using the methods outlined in Boulanger and Idriss (2014) in line with the recent amendments to the MBIE Guidelines (2014). The fines content fitting parameter has been set as 0 as no laboratory testing has been undertaken on the soils at the site.

Some of the upper soils were inferred to be clayey silts to organic silts (I_c greater than 2.6). As limited laboratory testing has been carried out to aid in determining a liquefaction cut off on the soils underlying the site, soils have been assumed to be non-liquefiable where the CPT Soil Character Index, I_c , is greater than 2.6.

Upper Liquefaction Effects

Liquefaction can have a number of effects on buildings and land. In this assessment we have considered the following effects:

- Liquefiable layers.
- Liquefaction induced reconsolidation settlement.
- Liquefaction induced ground damage.

These are discussed in the following sections:

Liquefiable Layers

The layers which may liquefy in a design level event are critical in regards to the foundation performance. The Boulanger and Idriss (2014) method has been used in this assessment and it has been assumed that soils are liquefiable when the factor of safety is below one.

Liquefaction Induced Settlement

The method of Zhang et. al. (2004) was used for calculating the potential liquefaction induced reconsolidation settlements in the CPT analysis. Settlements have been calculated over the entire CPT profiles (up to 15m depth), as well as over the upper 10m of the profile ("index settlement" in terms of the MBIE Guidelines).

Liquefaction Induced Ground Damage

We have used two methods to assess the potential for liquefaction induced ground damage as outlined below:

a) Published information (after Ishihara, 1985) can be used to assess the potential for surface expression of liquefaction and hence the likelihood of inducing damage. Ishihara's method is for a single non-liquefiable layer overlying a single liquefiable layer only. The liquefaction analysis indicates multiple liquefiable layers within the CPT profiles and to account for this we have taken the thickness of the non-liquefied crust as the thickness from the ground surface to the top of the uppermost critical liquefiable layer, and the thickness of the critical liquefied layer as the sum of the thicknesses of all critical liquefiable layers.

Ishihara's plots do not explicitly indicate ground damage curves for specific PGAs such as 0.13g which is the SLS level PGA. To simplify the analysis we have used following curves to assess the ground damage:

- The 0.20g curve when assessing damage under SLS design levels of ground shaking and the lower bound 4 September 2010 Darfield Earthquake.
- The 0.40g curve when assessing damage under ULS design level of ground shaking and the 4 September 2010 Darfield Earthquake.

b) Tonkin & Taylor (T&T) developed the Liquefaction Severity Number (LSN) (Tonkin & Taylor 2013) based on investigation data and observations made following major earthquake events in Christchurch. The LSN uses the settlements calculated from the Idriss and Boulanger (2008) method with the Robertson and Wride (1998) fines content method and the Zhang et. al. (2004) settlement method to assess the expected ground damage that could be caused by liquefaction in future earthquakes. The level of ground damage associated with LSN numbers is summarised in Table 8 below.

Table 8: LSN descriptions

LSN Range	Predominate 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 structures
>50	Severe damage, extensive evidence of liquefaction at surface, severe total and differential settlement affecting structures, damage to services

Upper Liquefaction Results

The result of the liquefaction assessment for the 4 September 2010 event are summarised in Table 9 and the results of the design level events are summarised in Table 10. The liquefaction outputs are presented in Appendix I.

Table 9: Summary of liquefaction analysis for the 4 September 2010 Darfield Earthquake

Earthquake Event	Earthquake Effects	Northern Section	Southern Section
4 September 2010 Darfield Earthquake (M _w 7.1, 0.34g)	Liquefiable Layers ⁽¹⁾	Unit 2 below the water level	Unit 2 below the water level
	Settlement ⁽²⁾	0 to 50mm	35 to 145mm
	Ground Damage ⁽³⁾	Yes over half of the site	Yes
	LSN	0 to 16	21 to 56
	Comments	The analysis indicates minor to moderate damage	The analysis indicates moderate to major damage
4 September 2010 Darfield Earthquake (M _w 7.1, 0.20g)	Liquefiable Layers ⁽¹⁾	Some of the sandy layers of Unit 2 below the water table	Unit 2 below the water level
	Settlement ⁽²⁾	0 to 35mm	15 to 130mm
	Ground Damage ⁽³⁾	No	Yes over half of the site
	LSN	0 to 14	8 to 50
	Comments	Not assessed	The analysis indicates minor to major damage

⁽¹⁾ Due to the inherent uncertainty in calculating liquefiable layers, the calculated layers are indicative only. Actual positions and thickness of liquefiable layers could vary from those above.

⁽²⁾ Settlements are calculated over the full CPT profile. Settlements are presented to the nearest 5mm. Due to the inherent uncertainty in calculating liquefaction induced settlements, the calculated settlements are indicative only and actual settlements will vary from those above.

⁽³⁾ Ground damage based upon published information after Ishihara (1985).

Table 10: Summary of liquefaction analysis for the design level events

Earthquake Event	Earthquake Effects	Northern Section	Southern Section
ULS (1 in 500 year event) (M _w 7.5, 0.35g)	Liquefiable Layers ⁽¹⁾	Unit 2 below the water level	Unit 2 below the water level
	Settlement ⁽²⁾	0 to 50mm	35 to 150mm
	Ground Damage ⁽³⁾	Yes over half of the site	Yes
	LSN	0 to 16	21 to 56
	Comments	The analysis indicates minor to moderate damage. This is similar to or greater than what is calculated in the 4 September 2010 earthquake.	The analysis indicates moderate to major damage. This is similar to or greater than what is calculated in the 4 September 2010 earthquake.
SLS-a (1 in 25 year event) (M _w 7.5, 0.13g)	Liquefiable Layers ⁽¹⁾	Limited layers	Some of the sandy layers of Unit 2 below the water table
	Settlement ⁽²⁾	0 to 15mm	0 to 105mm
	Ground Damage ⁽³⁾	No	No
	LSN	0 to 6	2 to 41
	Comments	The analysis indicates minor damage. This is less than that calculated for the 4 September 2010 Earthquake.	The analysis indicates minor to major damage. This is less than that calculated for the 4 September 2010 Earthquake.
SLS-b (1 in 25 year event) (M _w 6.0, 0.19g)	Liquefiable Layers ⁽¹⁾	Some of the sandy layers of Unit 2 below the water table	Unit 2 below the water level
	Settlement ⁽²⁾	0 to 30mm	10 to 125mm
	Ground Damage ⁽³⁾	Predominately No	Yes over 1/6 of the site
	LSN	0 to 5	2 to 40
	Comments	The analysis indicates minor damage. This is less than that calculated for the 4 September 2010 Earthquake.	The analysis indicates minor to major damage. This is less than that calculated for the 4 September 2010 Earthquake.

⁽¹⁾ Due to the inherent uncertainty in calculating liquefiable layers, the calculated layers are indicative only. Actual positions and thickness of liquefiable layers could vary from those above.

⁽²⁾ Settlements are calculated over the full CPT profile. Settlements are presented to the nearest 5mm. Due to the inherent uncertainty in calculating liquefaction induced settlements, the calculated settlements are indicative only and actual settlements will vary from those above.

⁽³⁾ Ground damage based upon published information after Ishihara (1985).

Discussion

The MBIE guidelines divide flat land into three technical categories that reflect both the liquefaction experience to date and future performance expectations. The categories and corresponding criteria are summarised as follows:

- **Technical Category 1 (TC1)** Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.
- **Technical Category 2 (TC2)** Minor to moderate land damage form liquefaction is possible in future large earthquakes.
- **Technical Category 3 (TC3)** Moderate to significant land damage from liquefaction is possible in future large earthquakes.

As the Bradley and Hughes (2012a, b) does not extend into Lincoln we have considered the O'Rourke et. al. (2012) PGA model. Based on the MBIE Guidelines (2012) the site has been 'sufficiently tested' as the median value for the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. $1.7 \times 0.13g = 0.22g$). No damage was observed on the site due to liquefaction after the 4 September 2010 earthquake event. Based upon this actual site response we infer that the liquefaction assessment method over estimates likely settlement under future large earthquakes. Therefore, we have calibrated the liquefaction assessment based on observations from the previous 4 September 2010 Darfield earthquake event.

It is not possible to compare the calculated and actual settlements for the 4 September 2010 Darfield earthquake event at the site because there is no quality information on actual ground settlements. We can however make the following comments based on observations, calculated settlements and ground damage for the three design earthquakes:

- For the northern part of the site the calculated ULS settlements are between 0mm and 50mm and the calculated SLS settlements are between 0mm 30mm which is consistent with MBIE TC1 and TC2 classifications. The analysis indicates that in a ULS event minor to moderate damage and in a SLS event minor damage.
- For the southern part of the site the calculated ULS settlements are between 35mm and 150mm and the calculated SLS settlements are between 0mm 125mm which is consistent with MBIE TC2 and TC3 classifications. The analysis indicates that in a ULS event moderate to major damage which is similar to or greater than what is calculated in the 4 September 2010 event, and in a SLS event minor to major damage which is less than that calculated for the 4 September 2010 Earthquake.
- Based on the GNS Science (2012) report on liquefaction in eastern Canterbury, discussions
 with a Fulton Hogan staff that are familiar with the site, review of aerial photography and
 Aurecon site walkovers in 2011, 2012, 2013 and 2015 no liquefaction induced damage was
 noted on the site.
- The MBIE prescribe liquefaction assessment methodology indicates that in the southern section of the site moderate to major ground damage should have occurred in the 4 September 2010 Darfield earthquake, which is not supported by field observations.
- In the southern section of the site the liquefaction assessment calculated that lower levels of vertical settlement and ground damage will occur in a SLS earthquake event than the 4 September 2010 Darfield Earthquake.

For the southern section of the site the liquefaction assessment overstates the liquefaction risk when compared to actual site performance as only limited to minor damage was observed at and around the site after the 4 September 2010 earthquake event.

Hence, based on our liquefaction assessment and observed damage we infer that minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site. Therefore we conclude based on our liquefaction assessment:

- The northern section of Stage 10 to 18 is consistent with the classifications of Technical Category 1 (TC1) and Technical Category 2 (TC2).
- The southern section is consistent with the classification of Technical Category 2 (TC2).

The areas of TC1 and TC2 are shown in Figure 8 in Appendix A.

4.4.3 Liquefaction Induced Lateral Spreading

Lateral spreading occurs in the surface soils move downslope or towards a free edge, such as a river or basin. Lateral spreading can occur during an earthquake under seismic loading and following the earthquake until the excess pore water pressure caused by ground shaking dissipate and the soil regains strength.

When assessing liquefaction induced lateral spreading we considered the following:

- There is a small stream which runs through the site which is approximately 0.5m deep and 2m to 3m wide with no significant bank.
- No other significant rivers or significant changes in height are in close proximity to the site.
- The site is relatively level and we understand that there will be no significant change in this once the development is undertaken.
- We understand that no stormwater basins or open channels will be built as part of this development.

Based on the site topography we consider that the global lateral and lateral stretch potentials across the site is considered to be low and will not govern the MBIE Technical Category assessment. As such no further assessment of lateral spreading has been undertaken.

4.4.4 Summary of MBIE Technical Category Liquefaction Assessment

The liquefaction analysis indicates the following:

- Based on the O'Rourke et. al. (2012) PGA model the site has been "sufficiently tested" (MBIE Guidelines (2012)) as the median value for the PGA for the 4 September 2010 event exceeded 170% of the SLS PGA (i.e. 1.7 x 0.13g = 0.22g). Therefore, we have also considered the lack of ground damage observations at the site after the 4 September 2010 earthquake event to help refine our liquefaction assessment.
- GNS Science report on liquefaction (GNS, 2012), review of aerial photography and site
 observations made by Aurecon and Fulton Hogan staff confirms there was no evidence of
 liquefaction observed at the site after the 4 September 2010 Darfield earthquake or any
 subsequent earthquakes part of the 2010 to 2012 Canterbury Earthquake Sequence.
- In all cases the liquefaction assessment calculated that lower levels of vertical settlement and ground damage will occur in a SLS earthquake event than the 4 September 2010 Darfield Earthquake.
- Liquefaction induced lateral spreading is considered to be low.
- Based on our liquefaction assessment and observed damage we infer that minor to moderate land damage from liquefaction is possible in future large earthquakes at parts of the site.

Therefore we conclude based on our liquefaction assessment and accounting for groundwater levels and depth to underlying gravels, the northern section of Stage 10 to 18 is consistent with the classifications of Technical Category 1 (TC1) and Technical Category 2 (TC2) and the southern section is consistent with the classification of Technical Category 2 (TC2). See Figure 9 in Appendix 9 for further details.

4.5 Liquefaction Mitigation

4.5.1 General

It is considered that the site in its current assessment state is susceptible to varying degrees of seismically induced liquefaction in a future major seismic event.

In terms of liquefaction hazard mitigation there are four basic approaches as follows:

1. Accept Liquefaction Risk

Design a structure with no regards to the liquefaction risk. This approach would only be used where there is effectively no to very little risk from seismically induced liquefaction (i.e. in Technical Category 1 areas).

2. Building Strengthening

Structurally design the building to accommodate the effects of liquefaction. Examples of this include using raft or piled foundations. These methods do not remove the liquefaction hazard but reinforce the structure in such a way that it maintains stability during a liquefaction event.

3. Ground Improvement

Improve the soil at the site so that it is less susceptible to seismically induced liquefaction. This general approach can be divided into three categories:

- **1.** Densify the soil so that soil grain skeleton will not collapse under earthquake loading. Examples of this include compaction and replacement (refilling with material which will not liquefy).
- **2.** Soil reinforcement. Examples include stone columns, driven piles to densify and stiffen the soil, deep soil mixing, soil cement columns etc.
- **3.** Allow dissipation of excess pore water pressure so that liquefaction is reduced. Examples of this include installation of drains, drainage blankets, and or stone columns.

4. Alternative Land Use

Use the site for non-residential housing activities, such as reserve areas, playing fields etc.

The recommended approach for liquefaction mitigation in each Technical Category classification zone is discussed below.

4.5.2 Technical Category 1

As per the MBIE (2012) Guidelines with TC1 sites "Future land damage from liquefaction is unlikely, and ground settlements from liquefaction effects are expected to be within normal accepted tolerances". Therefore, only shallow geotechnical testing is required at the building consent stage of residential development. If 'Good Ground' test is met, NZS3604 'Timber Framed Buildings' type foundations can be used.

For the TC1 area we are effectively using an 'Acceptance of Liquefaction' solution as the risk is sufficient low to warrant this approach.

4.5.3 Technical Category 2

The sites are consistent with the deformation characteristics of TC2 and do not meet the intent of the definition of 'Good Ground' as per the New Zealand Standards (NZS3604 'Timber Framed Buildings' and NZS4229 'Concrete Masonry Buildings not requiring Specific Engineering Design'). These standards are typically used to design the structural components of residential dwellings. Due to a TC2 equivalent classification the generic foundation options presented in these standards cannot generally be used.

The principal objectives of the foundation design at the site should be to provide sufficient stiffness for the house to remain in a near flat plane in a future earthquake, and to be capable of being re-levelled if differential settlement does occur. To achieve these objectives the foundation system will need to go beyond the lightly reinforced slab-on grade floor system permitted by NZS3604 which is too flexible and lacks the strength to resist ground movement without significant damage. The chosen foundation system should be designed to be able to accommodate settlement of ground beneath the house and to be capable of resisting imposed loads and stresses from differential settlement.

The above comments are in line with the guidance advice made by the MBIE (2012). The foundation options in the MBIE guidelines are house specific and will need to be selected and design during two categories: shallow foundations, and deep foundations. Each of these is discussed below. For the TC2 area we are effectively using a 'Building Strengthening' type approach to liquefaction mitigation where the foundations are strengthened to withstand the effects of liquefaction.

It should be noted that this report provides guidance only on residential foundation design and should not be taken as detailed design. Other foundation solutions are available (i.e ground improvement to achieve TC1 site characteristics etc.). However these options are unlikely to be economic relative to the options below and are not recommended at this stage.

Shallow Foundations

A shallow foundation, such as a raft, is intended to tie the superstructure together and to minimise structural damage if there is any ground movement during or following a future major seismic event. A properly detailed raft foundation is unlikely to prevent settlement of the dwelling but will reduce differential settlement and will also allow the house to be re-levelled if required. Raft foundations are generally suitable for dwellings with concrete floor slab only.

Raft foundations can take several forms, including:

- A gravel raft (either with or without geogrid reinforcement) with a reinforced concrete slab formed on top of the gravel raft.
- A double reinforced concrete raft case onto the in situ ground.
- A reinforced ground beam grid with slab foundation case onto the in situ ground (rib raft).

An alternative shallow foundation option is to use a suspended wooden floor with short piles and ring foundations as given in NZS3604. However, with this option, the site foundation soils must have 300kPa rupture bearing capacity and the building must have lightweight cladding and roofing systems.

Deep Foundations

Deep foundations such as piles will transfer structural loads from the structure to deeper and stronger non-liquefiable soil layers which will minimise any structural damage associated with ground liquefaction and settlement during and after a major seismic event. Piled foundations will minimise both total and differential settlements.

Piled foundations for a residential house typically comprise driven piles and can be either concrete (typically used if a concrete floor system is to be used), or timber (typically used if a timber floor and sub-floor system is to be used). A piled foundation system does not require any special soil preparation, but will require site specific investigation and design. Based upon the results of the ground testing, pile foundations would likely be founded well into the sandy gravel material at typically 4m to 5.5m below the finished ground level.

Discussion and Recommendations

The recommendations above are based on Section 5 of the MBIE (2012) guidelines. Schematics and typical cross sections of these foundation systems are presented in the guideline.

The raft foundation options are likely to be cheaper than the piled foundation options but piled foundations are often recommended for residential housing as piled foundations minimise settlement and damage during a large seismic event.

If piled foundations are adopted, then the floor slab should be well reinforced to provide continuity across the building floor and foundation elements. The objective is to provide additional capacity in the floor slab and enhance its ability to redistribute loads, if necessary, during large seismic events. All pile heads need to be adequately tied into the floor slab. An alternative approach could be to utilise the NZS3604 suspended wooden floor system founded directly onto the deep driven timber piles.

During detailed foundation design particular attention should be given to detailing the connections of buried services (water and sewer pipes, power conduits, etc.) between the house foundation and the in situ ground. The design should allow sufficient movement and ductility to account for seismic shaking and liquefaction induced movement, and to allow for easy reinstatement in the event of future damage.

Due to the depth of gravel layer on the southern section, we do not currently recommend using deep piles in this area.

To provide site specific geotechnical information for use in foundation design in TC2 areas it is recommended that a site specific geotechnical assessment be carried out by suitability qualified chartered engineer with experienced in residential house development in accordance with the MBIE guidelines.

4.6 Soft to Firm Clayey Silty Soils

Soft to firm clayey silty soils may be encountered at relatively shallow depths in most of the southern side of the site and in isolated pockets of the northern side of the site. Based on investigation logs we have split the site into two Zones as follows:

- Zone A there is potential for soft silt layers being present at 2m depth with thicknesses between 0.3m and 1.0m. There is also another soft layer from 3m with thicknesses up to 2m.
- Zone B there is potential that soft silt layers will be present in isolated pockets across this part of the site.

The approximate areas of these zones are shown on Figure 9 in Appendix A.

Based on the available investigation logs it is unlikely that shallow bearing for a typical house foundation of 300kPa could be achieved in these areas. Therefore if these soils are encountered 'Good Ground' as per NZS3604 will not be met and specifically designed foundations will be required based on the building consent investigations.

However, based on our analysis typical TC2 type waffle or beam grid type systems should be suitable as foundation elements. The calculated long term consolidation settlement induced by foundation loading is likely to be within acceptable limits of the NZ Building Code (i.e settlement less than 25mm

over 6m). However as this is a subdivision area wide geotechnical report and in line with MBIE guidelines bearing capacities must be confirmed during the detailed house design.

4.7 Council Vested Infrastructure

For the area identified as TC1 no specific liquefaction mitigation measures are required for Council vested infrastructure. The potential effects of liquefaction will need to be considered when designing the Council vested infrastructure in TC2 areas.

This section describes the proposed liquefaction mitigation measures for the infrastructure at Rosemerryn Stages 10 to 18 in the areas classified as TC2 only (see Figure 8). The proposed liquefaction mitigation measures are in line with the Christchurch City Council Capital Programme Group Technical Memorandum 'Earthquake Learnings – Amendments to the IDS and the CSS for Pipes Infrastructure in Christchurch City, to Mitigate Against Future Earthquake Damage'.

4.7.1 Buried Structures

In order to minimise lifting / floatation all buried services founded below design groundwater level as manhole risers, pump station chamber, etc. should be designed to have neutral buoyancy and to resist the uplift forces associated with liquefied soil, not just groundwater buoyancy forces. Spaces around buried structures should be backfilled with free draining, granular, non-liquefying fill in order to alleviate pore water pressure build up during a large seismic event thereby reducing the potential for liquefaction in the soils immediately surrounding the buried structure.

Manhole inverts and pipe entry and exit levels should be designed to accommodate liquefaction induced differential settlements. The hydraulic design of the pipes entering and exiting the manhole risers should be designed to accommodate up to 50mm on the northern section and 115mm on the southern section of vertical movement both up and down. Manhole risers should have strap rings to hold the manhole riser sections together in order to reduce lateral displacement of the manhole risers. Additionally, manhole connectors with greater than 90mm sealing lengths should be used to minimise the potential for joint pull-out.

It is recommended that the finalised design of each buried service (manhole riser, pump station, etc.) is confirmed on a case by case basis during construction once the site specific ground conditions are identified, in particular if the infrastructure element is being founded directly into gravel.

4.7.2 Pipe and Service Conduits

In line with the Christchurch City Council Capital Programme Group Technical Memorandum, all pipes and service conduits should be made from flexible material (e.g. plastic) where practicable. For gravity reticulated sewer lines, all pipe joints and intersections with manhole risers should be installed with short slip collars to allow greater capacity of joint movement and increase joint resilience. Pressurised sewer lines should be constructed from PE pipe and should have end restraints at pump stations. Well-designed end restraints combined with the PE pipe material itself will improve the resilience of the pressure line and help prevent damage.

As noted above, for hydraulic pipes (sewer, stormwater, and possibly reticulated water), the pipe sizes and gradients should be designed in such a way that they can accommodate post liquefaction differential settlement, both positive and negative. Differential settlements of 50 in the northern section and 115mm in the southern section should be used for design.

All pipes and conduits should be founded into the non-liquefiable crust material where possible. If the founding depth of the pipes and conduits extends down to liquefiable silty sandy material the service trenches should be backfilled with non-liquefiable geotechnically competent fill.

All service trenches located below the water table should be lined with a geosynthetic filter fabric material (i.e. Bidim A19 or similar) to separate potentially liquefiable soils from non-liquefiable granular bedding and backfill material. For shallow service trenches founded above the water table, a filter fabric is not required but is generally recommended.

By providing a filter fabric and filling the service trenches with non-liquefiable geotechnically competent fill the trench backfill is non-liquefiable and will therefore limit liquefaction induced settlement or flotation. Additionally, if a pipe was to rupture, by having a filter fabric encasing the bedding material there is less likelihood of sand material infiltrating into and blocking the pipeline.

4.7.3 Pavements

At this stage it is inferred that the pavement is unlikely to be significantly affected by seismically induced liquefaction. However, to ensure robustness of the pavement following a liquefaction inducing major earthquake it is recommended that the pavement be designed to accommodate the potentially adverse effect of seismically induced liquefaction. The pavement should be designed in such a way that it can bridge any localised voids / settlements that may be caused by seismically induced liquefaction, and prevent liquefiable soil from penetrating into the pavement structure.

If subsoil drains are to be installed as part of the subdivision development for stormwater control, then it is recommended extending the subsoil drainage under the foot print of the roading network. Drainage will increase the thickness of non-liquefied crust below the pavement areas as well as the residential sections, thereby minimising the likelihood of liquefaction induced damage.

A geosynthetic filter fabric (i.e. Bidim A29 or similar) should be placed directly onto the in situ subgrade material prior to the placement of the granular sub-base fill to limit fines migration from the subgrade to the sub-base during a liquefaction inducing seismic event and the potential loss of pavement strength.

5 Assessment Against the RMA

Section 106 of the Resource Management Act (RMA) states inter alia

... "a consent authority may refuse to grant a subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that:

- a) the land in respect of which a consent is sought, or any structure on the land, is or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source; or
- b) any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to the land, other land, or structure by erosion, falling debris, subsidence, slippage, or inundation from any source; or
- c) sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision."

No erosion was observed on the site. However the silty soils that directly underlie the site are inferred to be potentially susceptible to erosion when left unvegetated. We infer that the site is not susceptible to falling debris or slippage due to the topographical location.

It is noted that issues surround stormwater discharge are being dealt with in the detailed civil engineering design by Davie Lovell-Smith and any potential "inundation" susceptibility due to stormwater is being addressed as part of the detailed subdivision civil engineering design.

Due to the potential for seismically induced liquefaction, we infer that parts of the site are potentially susceptible to varying degrees to subsidence and inundation from liquefaction. However, if the appropriate liquefaction mitigation measures, as outlined in this report, are undertaken, then the risk of subsidence and inundation from liquefaction is significantly reduced to an acceptable (TC1 or TC2) level as defined by the MBIE. Therefore, if appropriate liquefaction mitigation measures are implemented in or opinion the site will be free of "subsidence", or "inundation". The proposed subdivision development therefore generally complies with the intent of Section 106 (a).

The site is underlain by fine grained soils and there is potential for erosion and rilling from run-off or wind if vegetation cover is removed for prolonged periods of time from both stormwater runoff if it is not discharged in a controlled manner, and from the wind. The susceptibility to erosion of the silty soils can be minimised by using appropriate industry standard design measures during construction.

The site has been identified as being susceptible to seismically induced liquefaction and hence has the potential for "subsidence", "and "inundation." Provided that appropriate liquefaction mitigation measures are implemented, as recommended in this report, subsequent use of the land following development is unlikely to accelerate, worsen, or result in material damage to the land, other land, or structures. In our opinion therefore, the development will comply with the intent of section 106 (b).

Section 106 (c) is not directly relevant to a geotechnical appraisal and therefore has not been considered in detail in this report.

6 References

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7 Limitations

We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

The recommendations in this report are based on data collected at specific locations and by using appropriate investigation methods with limited site coverage. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgment and it must be appreciated that actual conditions could vary from the assumed model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

This report is not to be reproduced either wholly or in part without our prior written permission.

Appendix A Figures

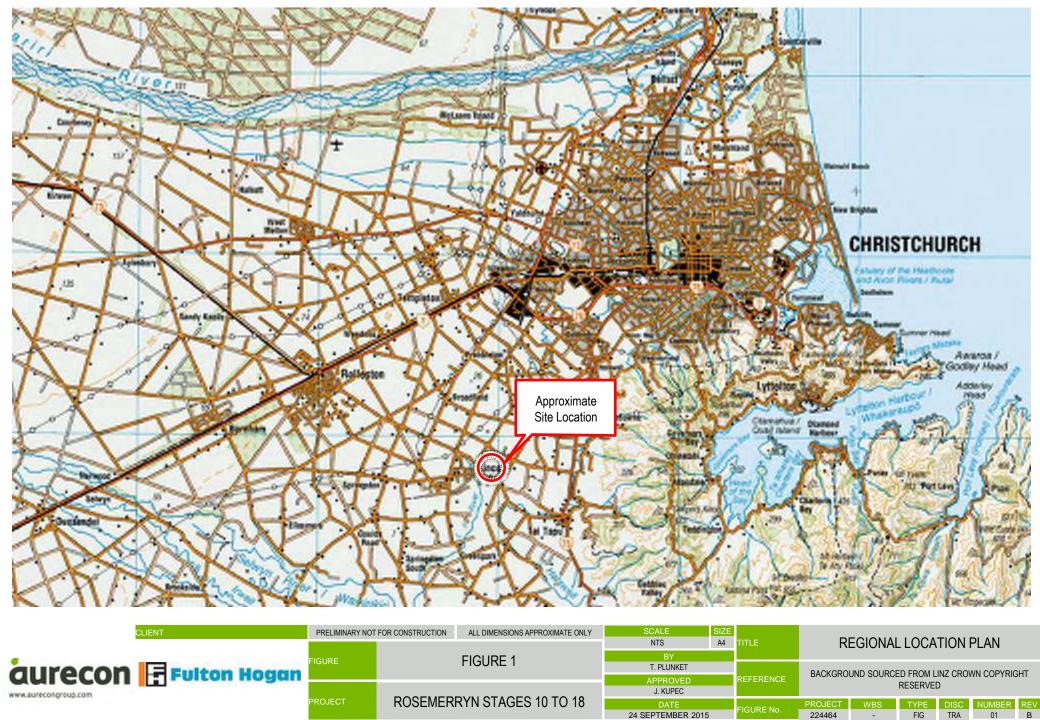






FIGURE FIGURE 2

PROJECT ROSEMERRYN STAGES 10 TO 18

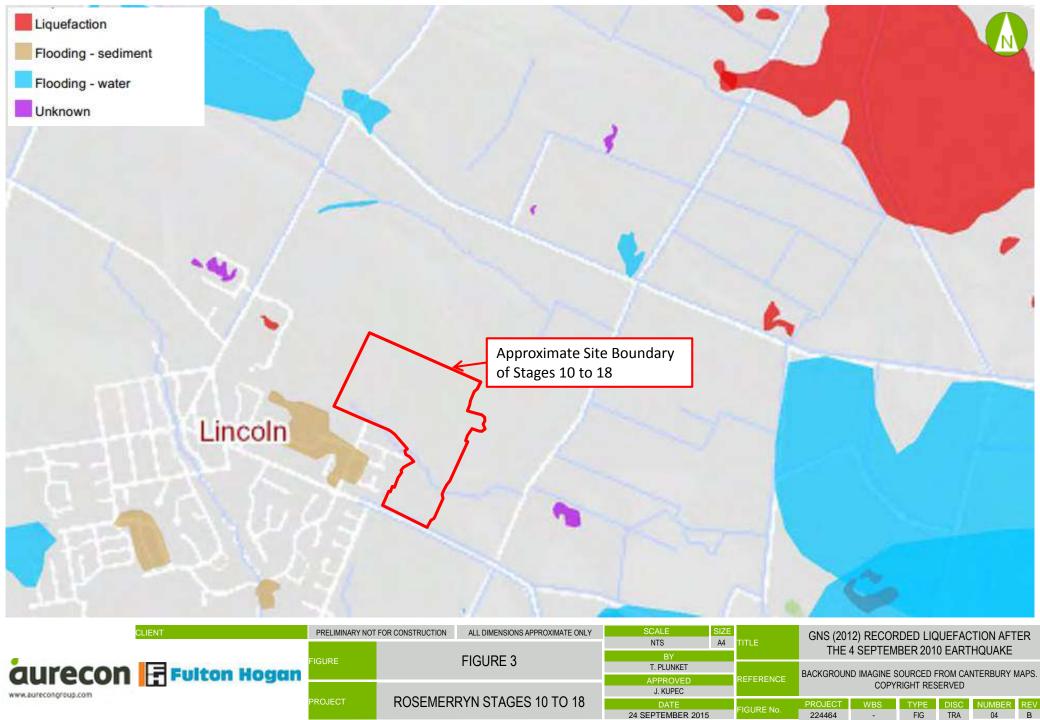
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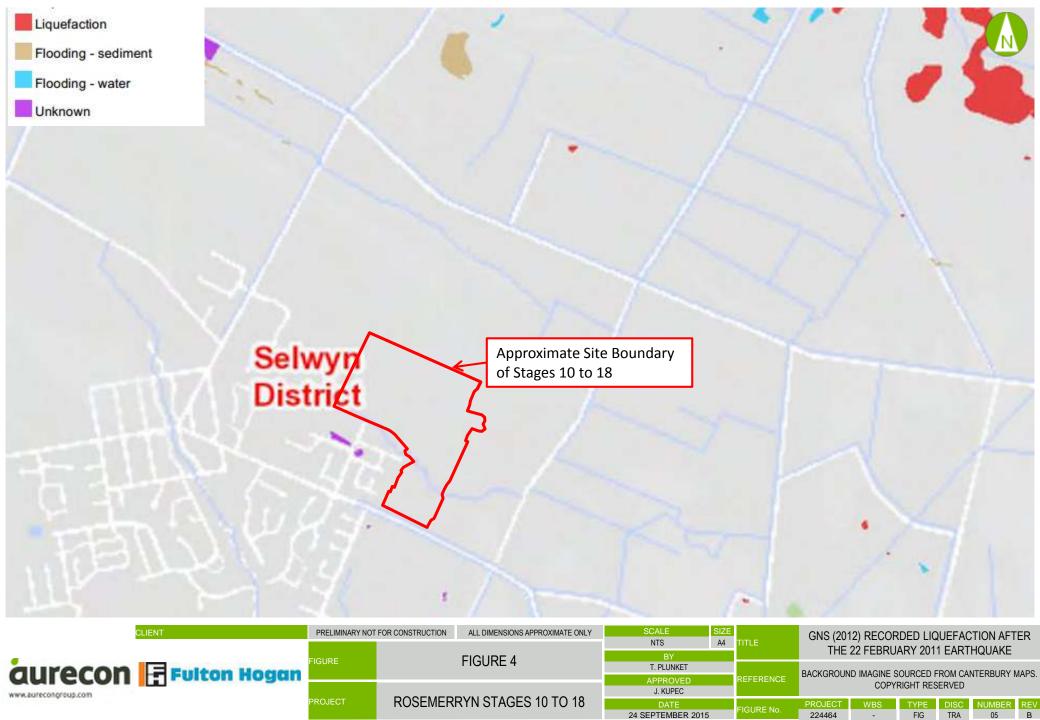
BY
T. PLUNKET

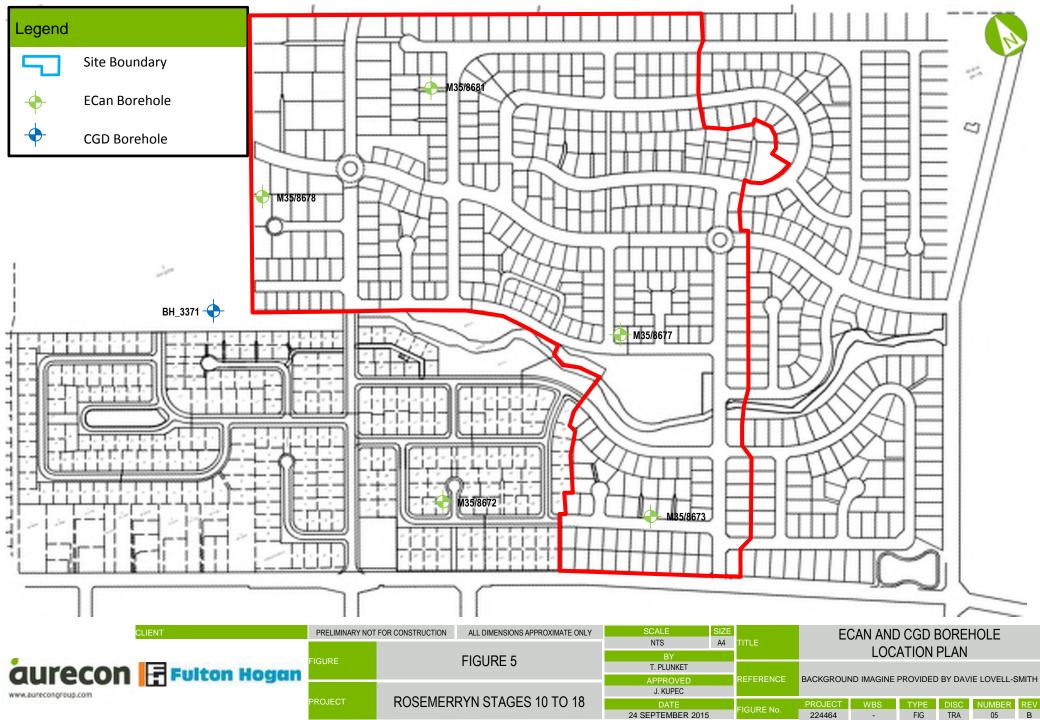
APPROVED
J. KUPEC

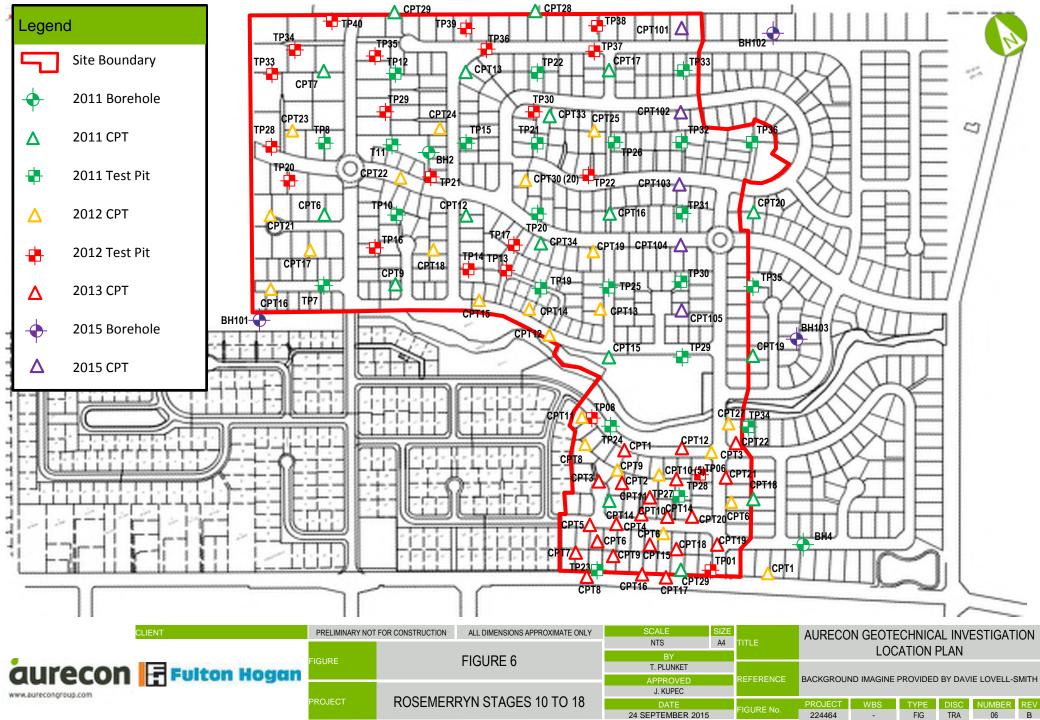
DATE
24 SEPTEMBER 2015

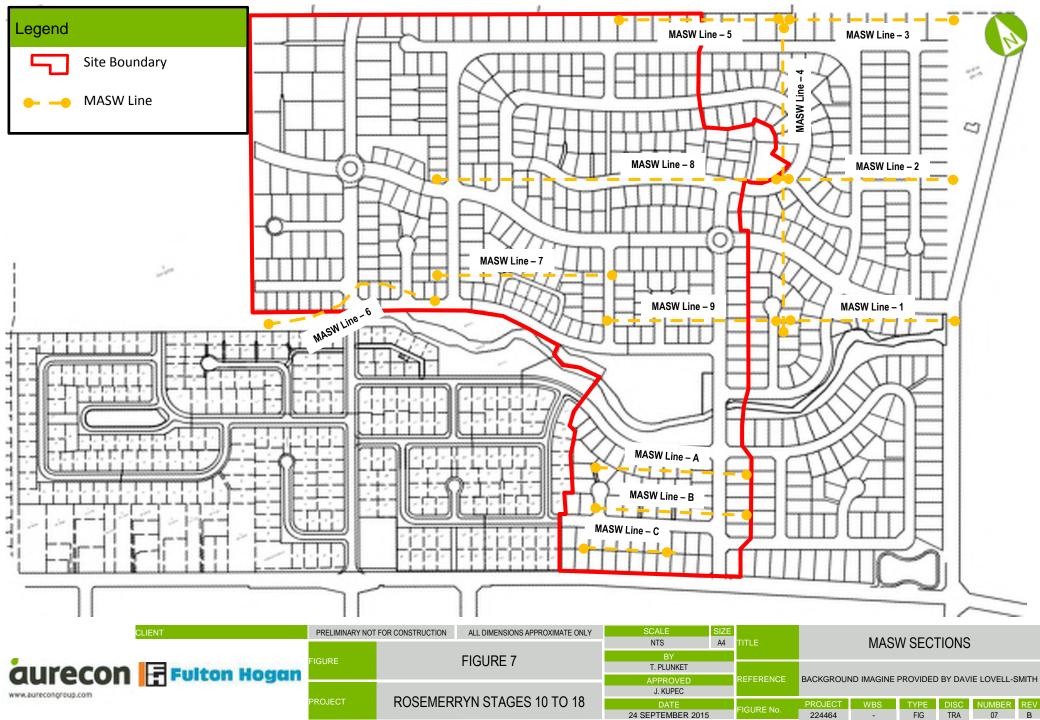
BACKGROUND IMAGINE SOURCED FROM CANTERBURY MAPS.
COPYRIGHT RESERVED. IMAGE TAKEN ON 23 FEBRUARY 2011.

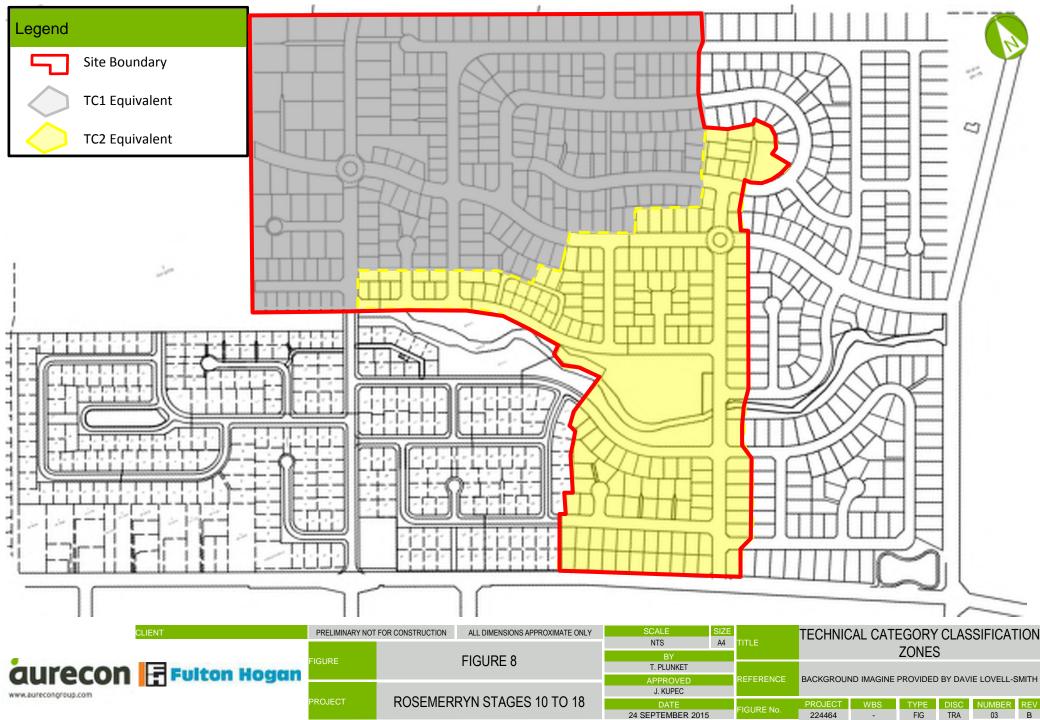


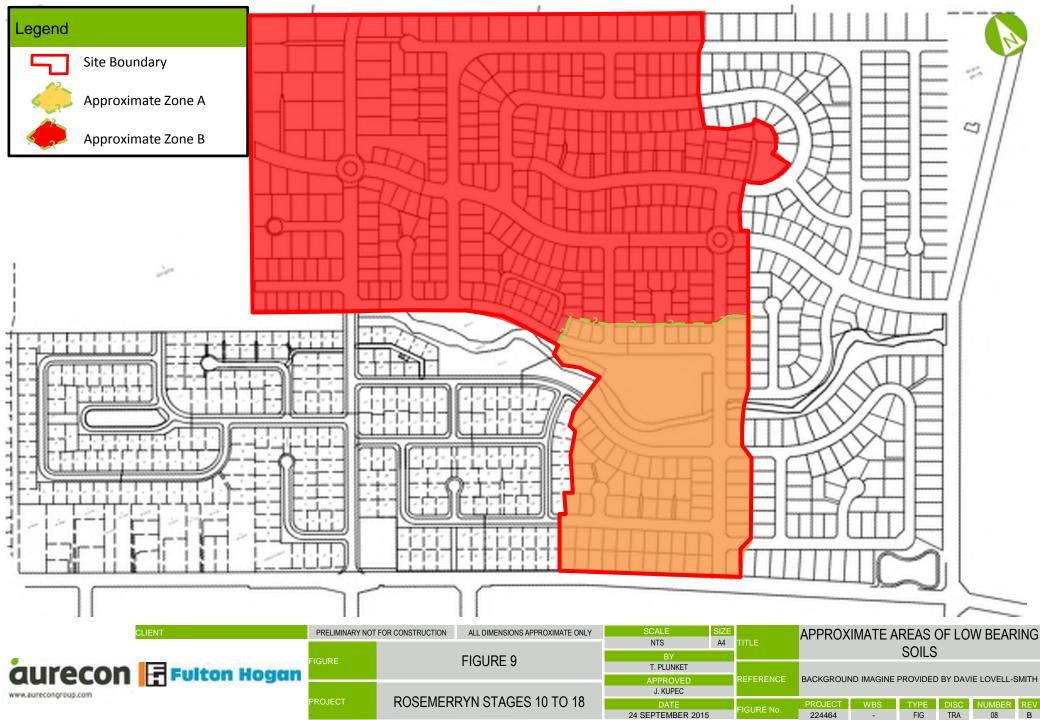




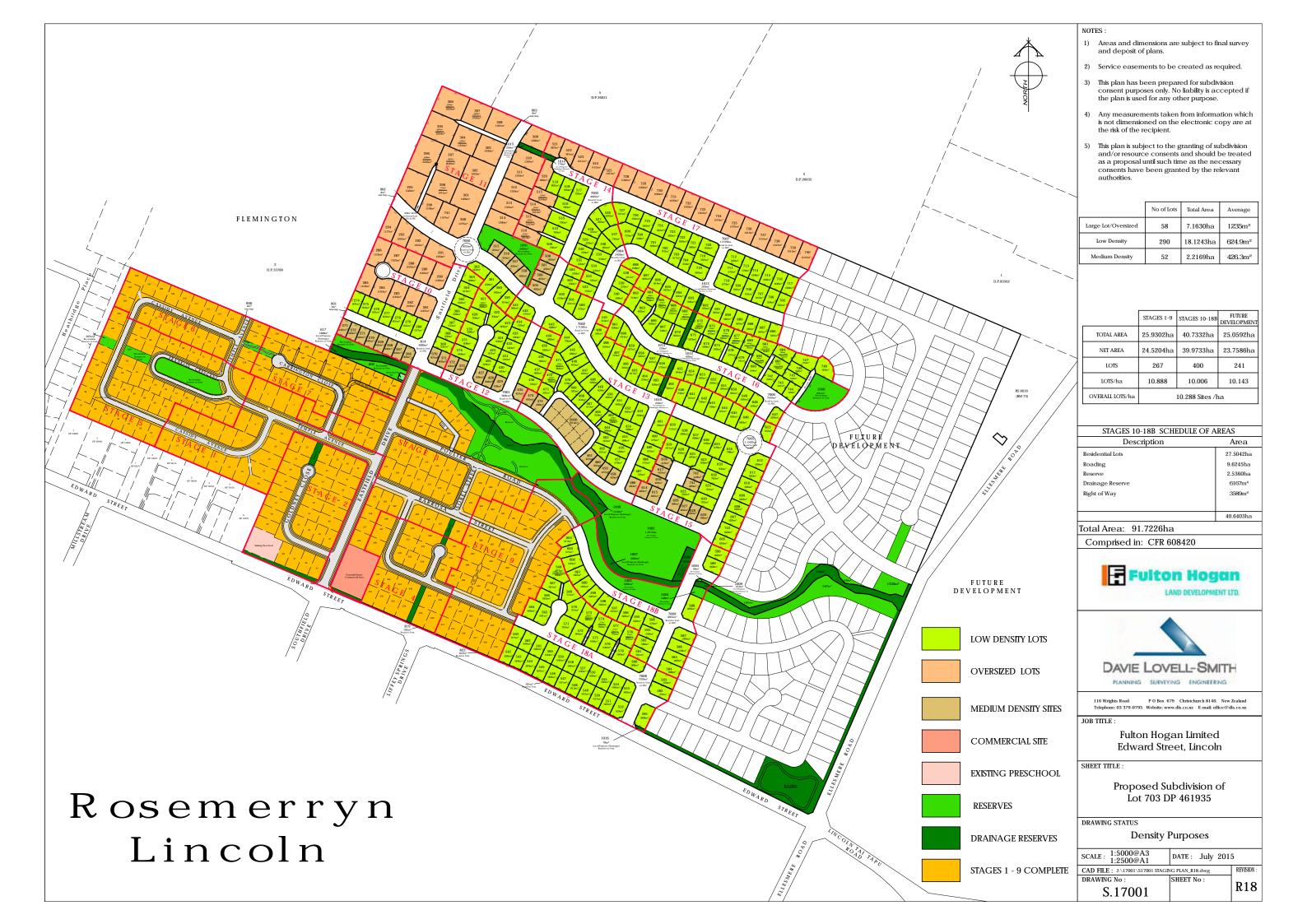








Appendix B Provided Davis Lovell Smith Drawings



Appendix C ECan Borehole Logs

Borelog for well M36/8672
Gridref: M36:69507-29314 Accuracy: 2 (1=high, 5=low)
Ground Level Altitude: 9.45 +MSD

Driller : not known
Drill Method : Rotary/Percussion
Drill Depth : -6m Drill Date : 9/10/2008



Scale(m)	Water Level Depth(m	1)	Full Drillers Description	Forma Co
	2.22		Dark Grey loamy topsoil	
0.2	-0.20m	10000 C	Grey mottled with yellow silty clay mixed with grey silty	
0.4			sand	
-0.4				
0.6				
-0.8		■■=: :===		
11	-1.00m			
' -			Grey puggy silt mottled with orange/yellow rust	
		=======	discoluration	
-1.4				
1.6				
<u> </u> -1.8		22223		
_ _				
22				
2.2	-2.20m	<i></i>		
-2.2			Grey sandy silt mixed with grey clayey silt. Clay faction	
2.4			increasing	
2.6				
		-: ====================================		
2.8		==::==		
33				
3.2		===• . ••===		
		=;• <u>:</u> ==		
-3.4		<u> </u>		
3.6		===: <u>*</u>		
<u> </u>				
-3.8		====:		
44				
4.2		=====		
-4.2		=;•===================================		
4.4		====:==		
4.6		======================================		
4.0	-4.80m			
4.8			Grey mottled with orange brown clayey silt with pieces of	
55			timber <100mm diameter	
-5.2				
-5.4				
-5.8				
	-6.00m			
\sqcup	-0.00111	<u> ========1</u>		

Borelog for well M36/8673Gridref: M36:69764-29180 Accuracy: 2 (1=high, 5=low)
Ground Level Altitude: 8.67 +MSD

Driller : not known
Drill Method : Rotary/Percussion
Drill Depth : -6m Drill Date : 9/10/2008



Scale(m)	Water Level Depth(m)	Full Drillers Description	Formatior Code
0.2	-0.20m		Dark grey loamy topsoil	
			Soft light grey, mottled with orange, silty clay	
0.4				
0.6				
0.8				
-11	-1.00m		Soft light grey silty clay mixed with soft orange silty	
-1.2			clay. Clay content more distict, very soft	
1.4				
1.6				
-1.8				
-22				
2.2	-2.20m	===···=	Very soft grey, speckled with orange, silty clay. Mixed	
2.4			with minor patches of orange/brown coarse sand.	
2.6				
2.8				
-33				
-3.2				
-3.4				
-3.6				
-3.8				
-44				
4.2				
4.4				
4.6				
-55				
-5.2		====*•==== ===========================		
-5.4				
5.6				
T-0.0	-6.00m			
4.8 5 5.2 5.4	-6.00m			

Borelog for well M36/8677
Gridref: M36:69828-29433 Accuracy: 2 (1=high, 5=low)
Ground Level Altitude: 8.67 +MSD

Drill Pepth : -5.2m Drill Date : 9/10/2008



Scale(m)	Water Level Depth(m)	Full Drillers Description	Formati Cod
	-0.20m	Dark grey loamy topsoil	
0.2	-0.20111 _	Grey & yellow silt speckled with orange	
0.4			
0.6	-0.60m		
-0.8		Soft grey silty clay speckled with orange	
_	1.00		
-11	-1.00m _	Soft blue grey silty clay with pieces of timber	
-1.2			
1.4			
1.6			
-1.8			
-22			
-2.2			
_			
2.4			
2.6	-2.60m _	Soft brown yellow silty clay	
2.8	-2.80m		
-33		Grey gravel	
-33			
-3.2			
-3.4			
3.6			
-3.8			
-44			
4.2			
_			
4.4			
4.6			
4.8			
-55			
	-5.20m		
Ц	-5.2011		

Borelog for well M36/8678Gridref: M36:69444-29810 Accuracy: 2 (1=high, 5=low)
Ground Level Altitude: 10.14 +MSD

Driller : not known
Drill Method : Rotary/Percussion
Drill Depth : -5.2m Drill Date : 9/10/2008



Scale(m)	Water Level Depth(m)	Full Drillers Description	Forma Co
	-0.20m		Dark grey loamy topsoil	
0.2	-0.2011	,0000	Light grey & yellow silty clay	
0.4				
-0.6				
-0.8				
	-1.00m			
-1	-1.00111	0::0::0:	Sandy gravel <70mm diameter	
		::o::o::o		
	-1.40m	2:0::0::		
-1.4	-1.40111	0==0==0=	Silty gravel	
1.6		=0=0=d		
	-1.80m	0==0==0=		
-1.8	-1.00111	0=0=0	Yellow & grey silty clay with some gravel	
22		==O==O==d		
		0==0==0=		
2.2		— <u>_</u> — — — —		
2.4		==0==0		
	-2.60m	<u> </u>		
2.6	2.00111		Soft brown yellow silty clay	
2.8	-2.80m		Grey silty gravel	
.33		== 0 == 0 == d	Gley Silty graver	
3 -3		0=0=0=		
-3.2		==0==0==4		
3.4		0==0==0=		
-5.4		<u> </u>		
-3.6		== 0 == 0 == 0		
-3.8		0==0==0=		
		0=0=0=0		
44				
4.2		0=0=0=0		
		=0=0=0		
-4.4		0==0==0==		
4.6		#2#2#d		
		0==0==0==		
4.8		0==0==0		
-55		==0==0==q		
	-5.20m	0==0==0=		
Ц	-5.∠UM	<u></u>		

Borelog for well M36/8681 Gridref: M36:69726-29855 Accuracy : 2 (1=high, 5=low) Ground Level Altitude : 10.14 +MSD

Driller : not known
Drill Method : Rotary/Percussion
Drill Depth : -4.5m Drill Date : 9/10/2008



Scale(m)	Water Level Depth(m)		Full Drillers Description	Formation Code
0.2	-0.20m		Dark grey loamy topsoil	
0.4		0=0=0	Grey & brown silt mixed with gravel. Dry. No sand or small gravel particles. Max. Gravel size 80mm	
- 1		0=0=0		
0.6		0=0=0=0		
0.8		0==0==0=		
-11		0=-0=-0=-		
-1.2	-1.20m	0:.0::0.	Grey silty sand mixed with gravel. Dry	
-1.4		000		
-1.6		000d		
-1.8	-1.80m	0:0:0	Grey sandy gravel becoming wet	
-22		0:0:0	City sainty graver becoming wet	
2.2		0.0.0		
2.4		9:0:0:0:		
2.6): 0: 0: 0		
- 1		0.0.0		
2.8		0.0.0		
-33		0.0.0		
-3.2		3.0.0.		
-3.4): 0: :0: (
-3.6)::0::0::0		
-3.8		0.0.0.0		
-44		0.0.0		
4.2		0.0.0		
4.4		0:0:0		
	-4.50m _	1.0.0		

Appendix D
CGD Borehole Log

Elio	t Sinc	lair
surveyors	engineers p	olanners

Unit 4, 502 Wairakei Road, Christchurch PO Box 4597, Christchurch N.Z. Ph. (03) 379-4014 Fax. (03) 365-2449

2

Lot

SITE INVESTIGATION RECORD

Client NZ Plant & Food Research

		Site:	581 Birches Road, Lincoln		Bore	hole 3
DEPTH		<u> </u>		<u> </u>		
[m]		Boreh	nole log			SPT Data
GL						(uncorrected)
0.0 -	$\times \times $	Grevish	Brown SILT, highly plastic, soft, moist			
-	****	Orcylan	Brown Ster, mgmy plastic, sort, moist			_
0.4 —	* <u>x</u> ^x					_
0.8	XXX					_
-	* * * * \ *	Brownis	sh Grey Mottled Orange Silty SAND.			_
1.2 -	γ× ² ×					_
-	* * *					N=4 (C) 1.5m
1.6 -	γ^ ×					1, 1/ 1, 1, 1, 1 75mm
	\hat{\chi}\chi \hat{\chi}	$\overline{}$				-
2.0	$\times \times$	<u>√</u> Wat	ter table at 2.1m depth .			_
2.4 -	\\ \x \x \	•				_
2.4	<i>Y</i> ^					-
2.8 -	* * *					_
2.0	γ [×] ×					N=3 (C) 3.0m
3.2 -						0, 1/ 0, 1, 0, 2
_		Grey fine	e-medium SAND, moist-wet.			75mm –
3.6 -						_
_	Day					-
4.0 -	000					_
_	0 80	Brownish	h Orange coarse Sandy GRAVEL up to 70mn	n, some Silt, moist-wet.		_
4.4 -	0000					_
_	0000					N=30(C) 4.5m
4.8 -	000	Greyish E	Brown medium-coarse Sandy Gravel, moist-	wet		5, 10/8, 7, 8, 7
]	0000.		Brown fine-medium-SAND, moist-wet.			75mm -
5.2 -	000					_
_	0000	Brownish	n Grey medium-coarse Sandy GRAVEL up to	70mm		_
5.6 —	0000	BIOWIIISII	Torey medium-coarse sandy disavel up to	7011111.		_
=	000					_
6.0 -	00000			T_		
Site Pl	lan	See atta	ached test location plan	Comments		
				Civil Engineer	Date:	
1	L			1- 3		<u> </u>

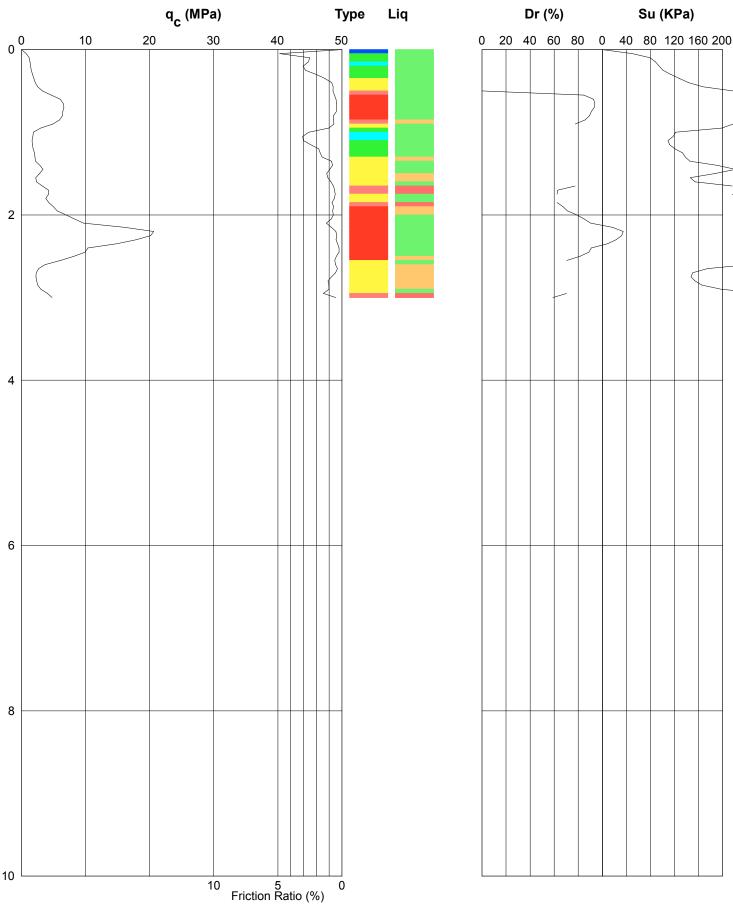
No. of Concession, Name of Street, or other Persons, Name of Street, or ot			Job Number	
	io	Unit 4, 502 Wairakei Road, Christchurch PO Box 4597, Christchurch N.Z.		9181
	IU	PO Box 4597, Christchurch N.Z.	Date Tested	
surveyors engineers planners				v-2012
			Page	2 of 2
	SI	TE INVESTIGATION RECORD	D.P 33700	
	<u> </u>		Lot 2	
		Client NZ Plant & Food Research	Project No.	hala O
DEDTU	1	Site: 581 Birches Road, Lincoln	Bore	hole 3
DEPTH		Develope		LODE Date
[m] GL		Borehole log		SPT Data
6.0 -	500			(uncorrected)
0.0	0000			
6.4 -	0000			N=42 (C) 6.0m
	0000			4, 8/8, 7, 8, 7
6.8 -	2000			75mm
_	2000			•
7.2 -	2000			•
_	2000	Brownish Grey medium Sandy GRAVEL up to 80mm.		N=24 (C) 7.5m
7.6 -	2000			4, 6/ 7, 6, 4, 7
_	000			75mm
8.0 -	2000			
_	2000			•
8.4 -	2000			
_	2000			
8.8	0000			
_	0000			
9.2 -	0000			N=36(C) 9.0m
_	0000			2, 5/ 9, 8, 10, 9
9.6 -	0000			75mm
40.0	9000			
10.0 —	9000			
10.4	99889			
10.4 -	9988			
10.8 -				N=49(C) 10.5m 7, 9/ 11, 12, 14, 12
10.6		End of Log at 10.5m depth		7, 9/ 11, 12, 14, 12 75mm
11.2 -				
				•
11.6 -				
_	1			
12.0 -	1			
Site P	lan	Comments		

Civil Engineer

Date:

See attached test location plan

Appendix E CPT Logs



Job No:

9402

CPT No:

CPTu006

Project:

Location:

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Date:

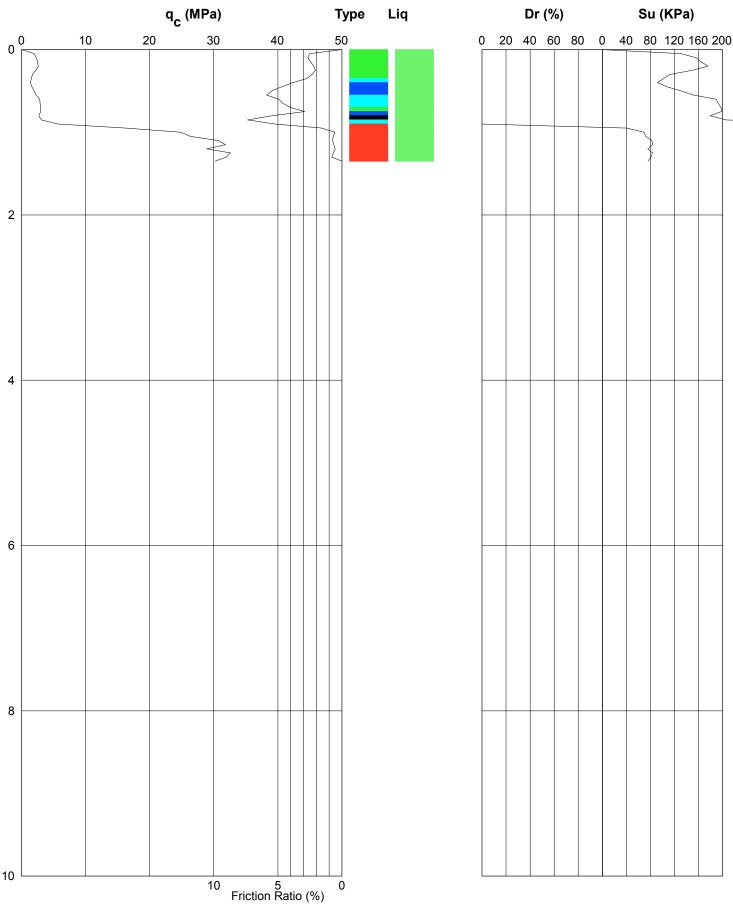
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu007

Project:

Location:

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Date:

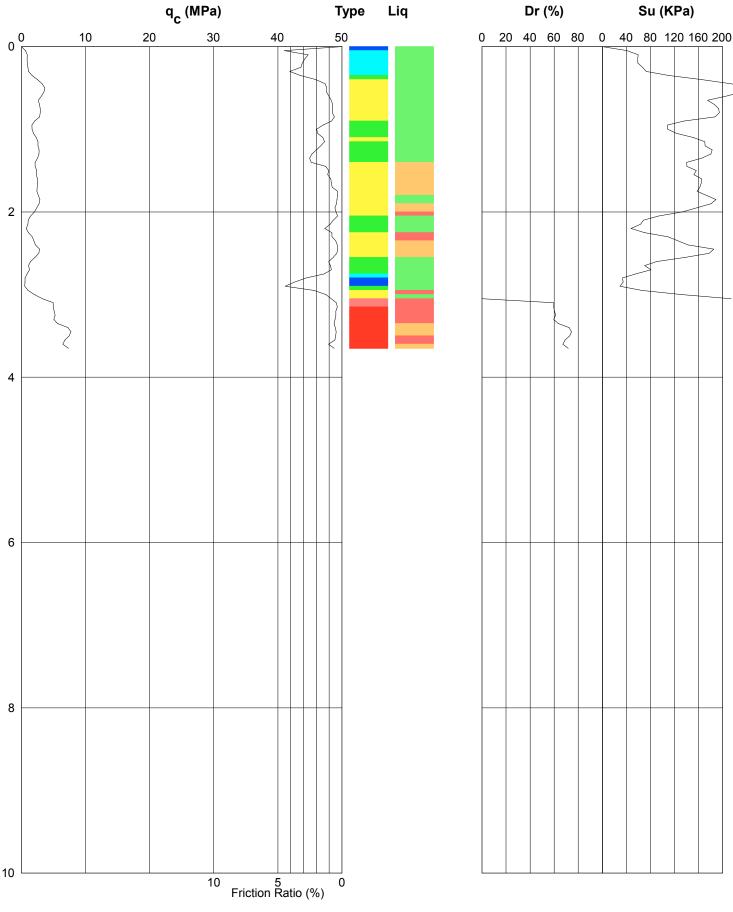
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu009

Project:

CPTu009

Job No 9402 - Site Investigations

Location:

Rosemerryn, Edward St, Lincoln

Date:

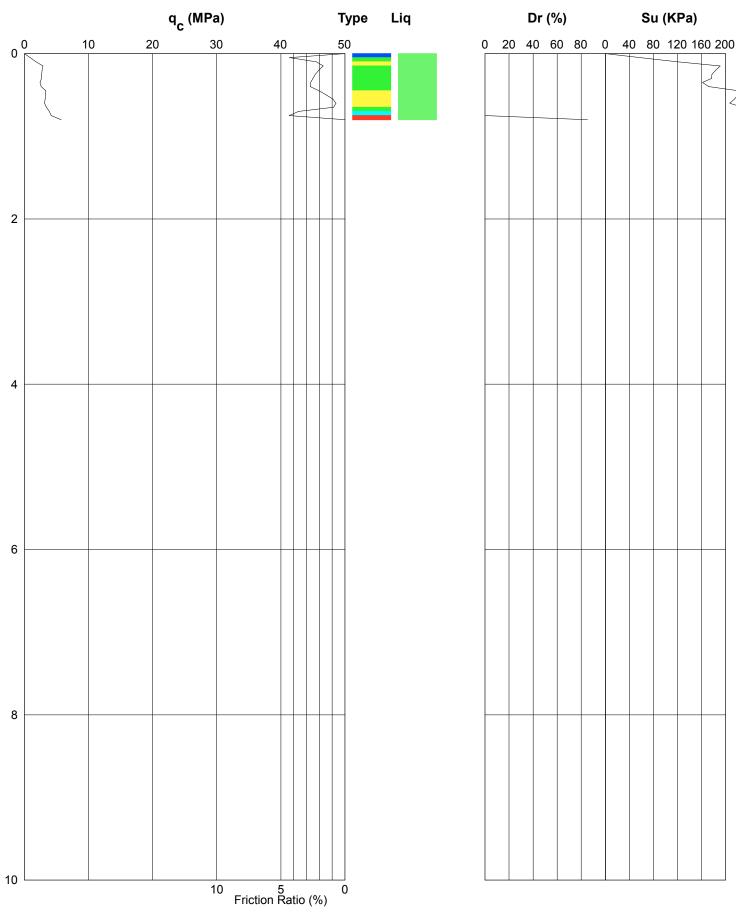
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu009a

Project:

FH C/o Aurecon

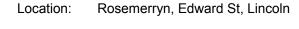
Date:

27/08/11

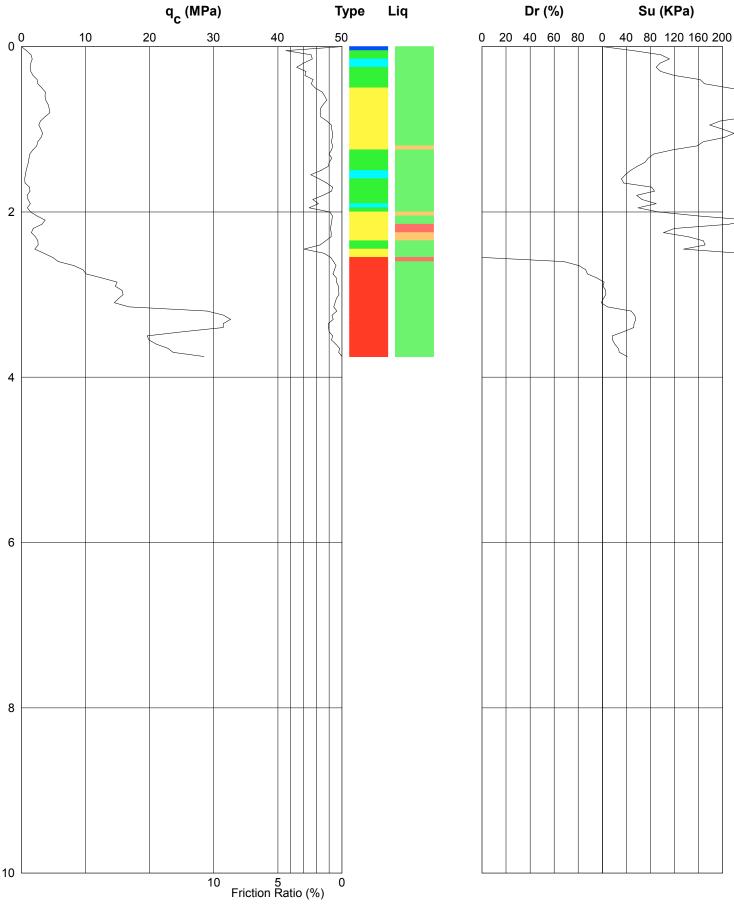
Operator:

J. Kendrick

Remark:







Job No:

9402

CPT No:

Project:

CPTu012

FH C/o Aurecon

Location:

Rosemerryn, Edward St, Lincoln

Date:

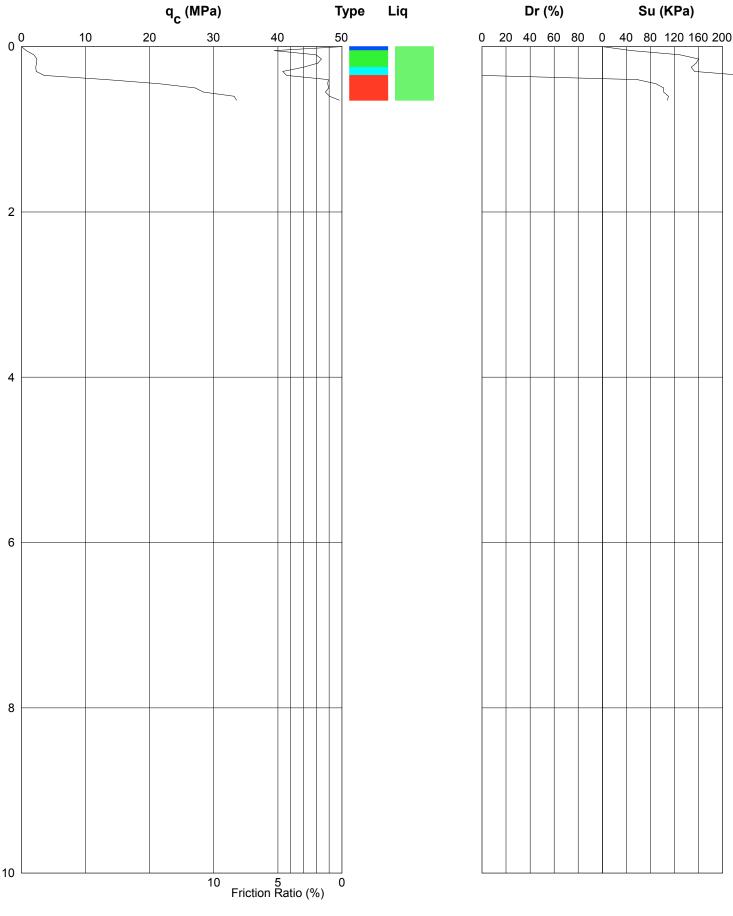
27/08/11

Operator:

J. Kendrick

Remark:





Job No: CPT No: 9402

CPTu013

Project:

Location:

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Date:

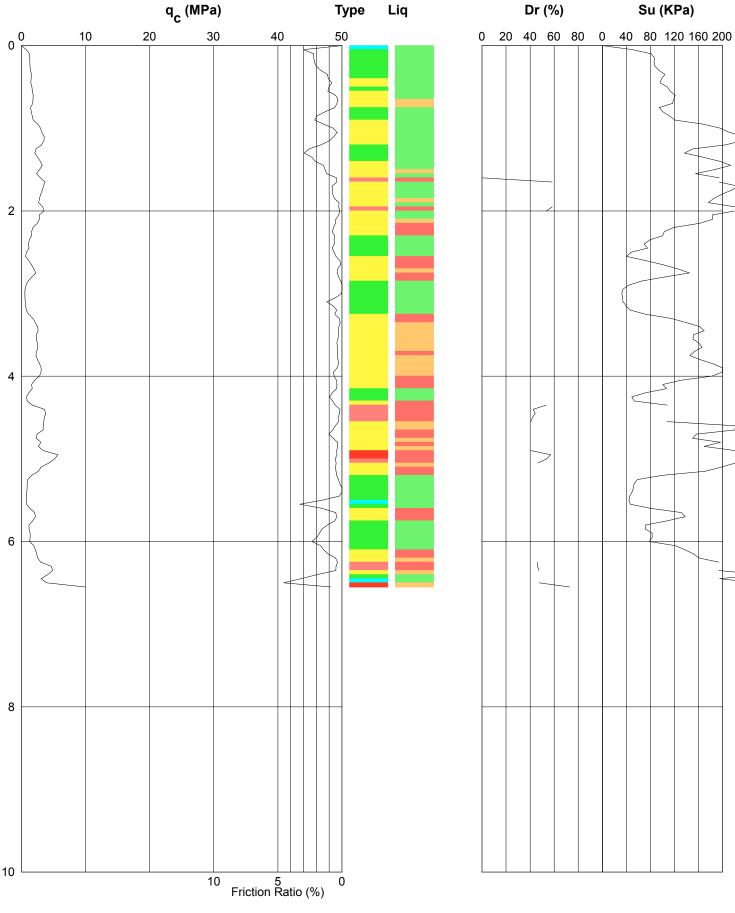
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu014

Project:

FH C/o Aurecon

Location: Rosemerryn, Edward St, Lincoln Date:

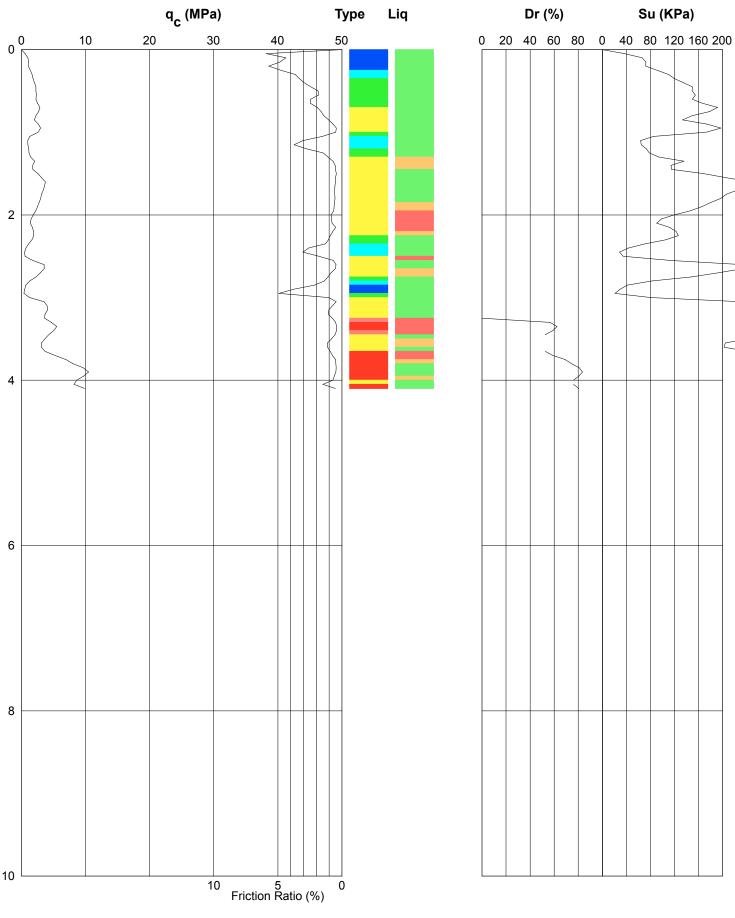
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu015

Project:

FH C/o Aurecon

Date:

27/08/11

Operator:

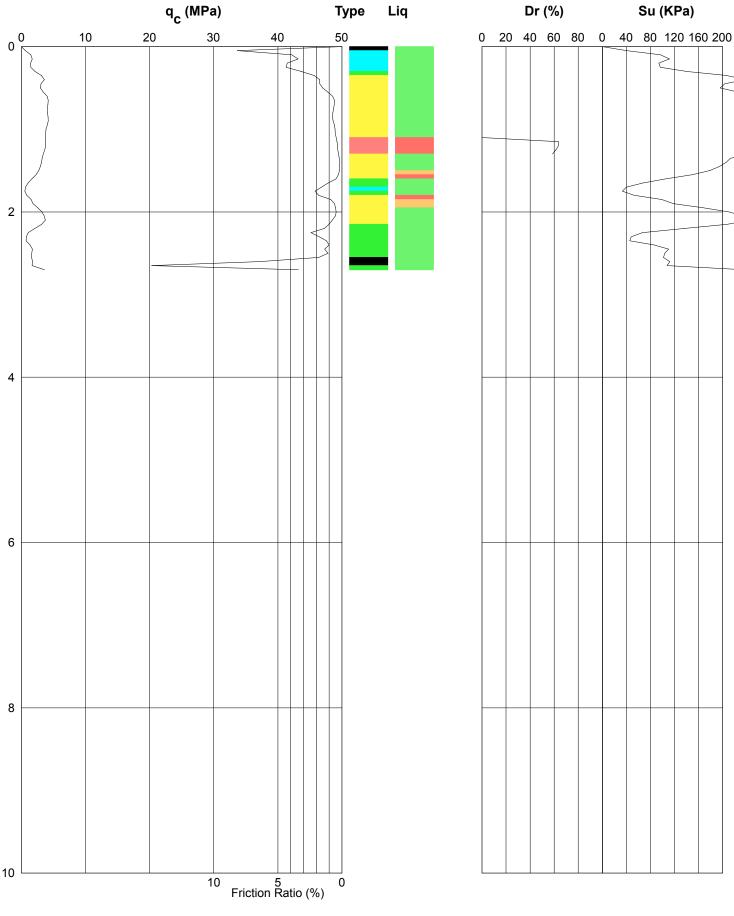
J. Kendrick

Remark:

Effective Refusal

Location: Rosemerryn, Edward St, Lincoln





Job No:

9402

CPT No:

CPTu016

Project:

Location:

Date:

27/08/11

Operator:

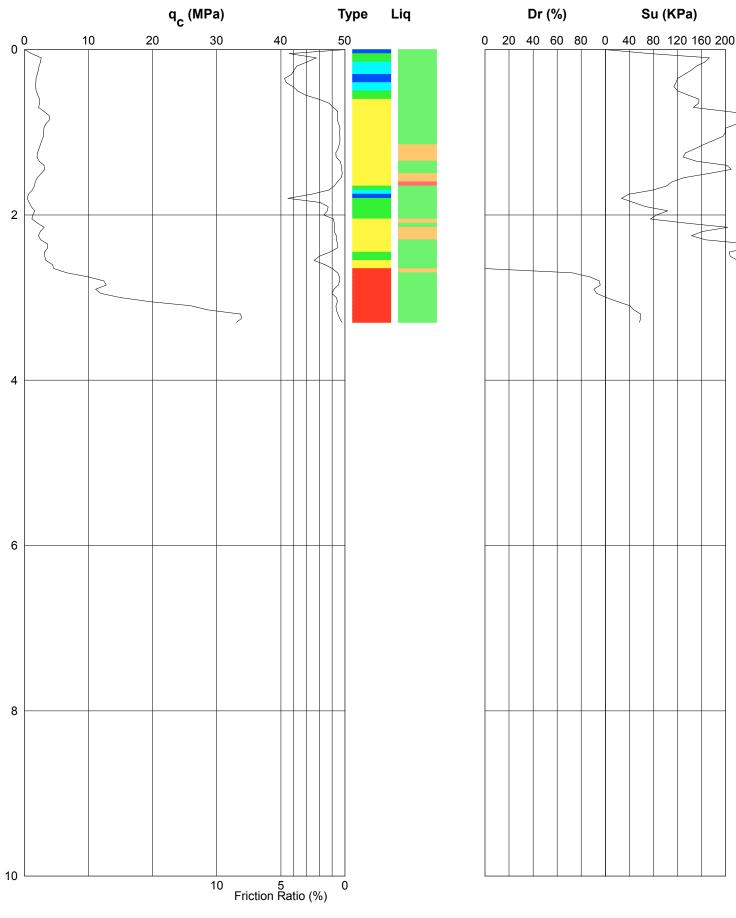
J. Kendrick

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Remark:





Job No:

9402

CPT No:

CPTu017

Project:

Location:

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Date:

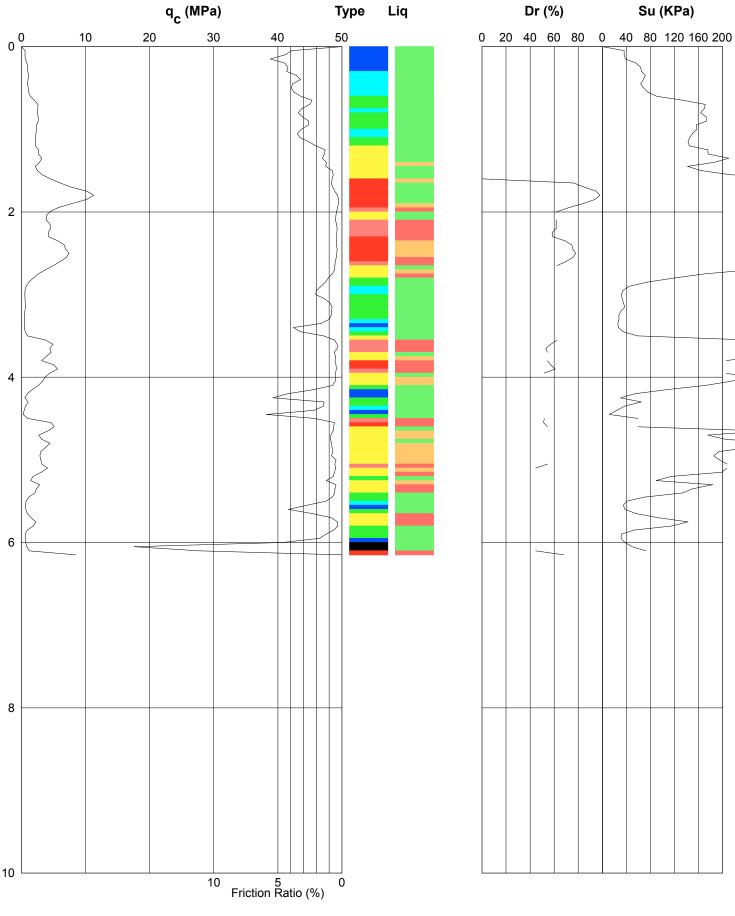
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu018

Project:

Location:

FH C/o Aurecon

Rosemerryn, Edward St, Lincoln

Date:

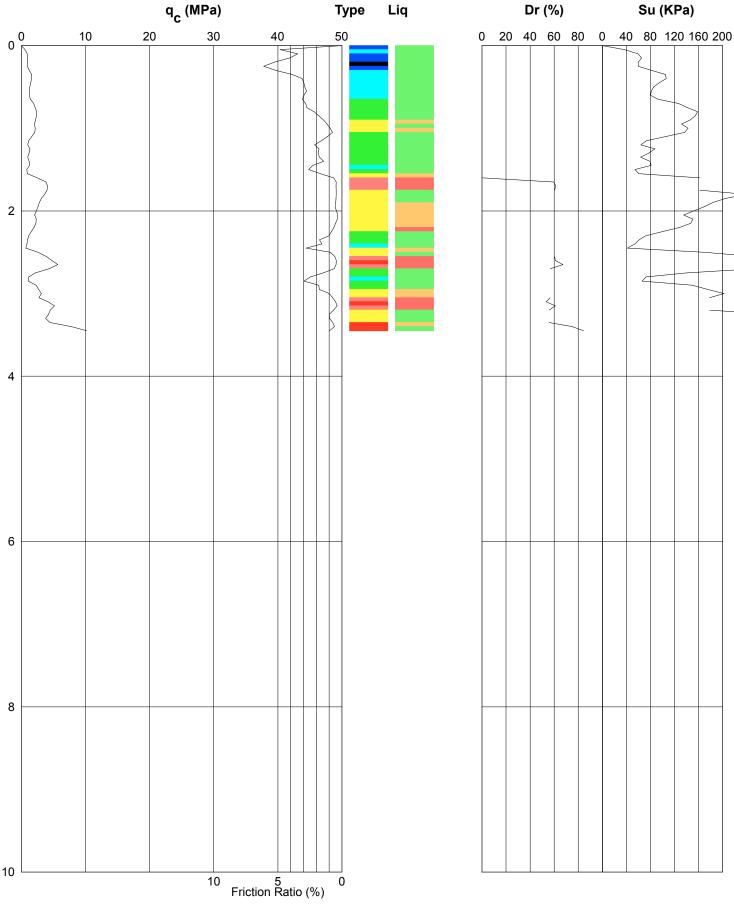
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu019

Project:

FH C/o Aurecon

Date:

27/08/11

Operator:

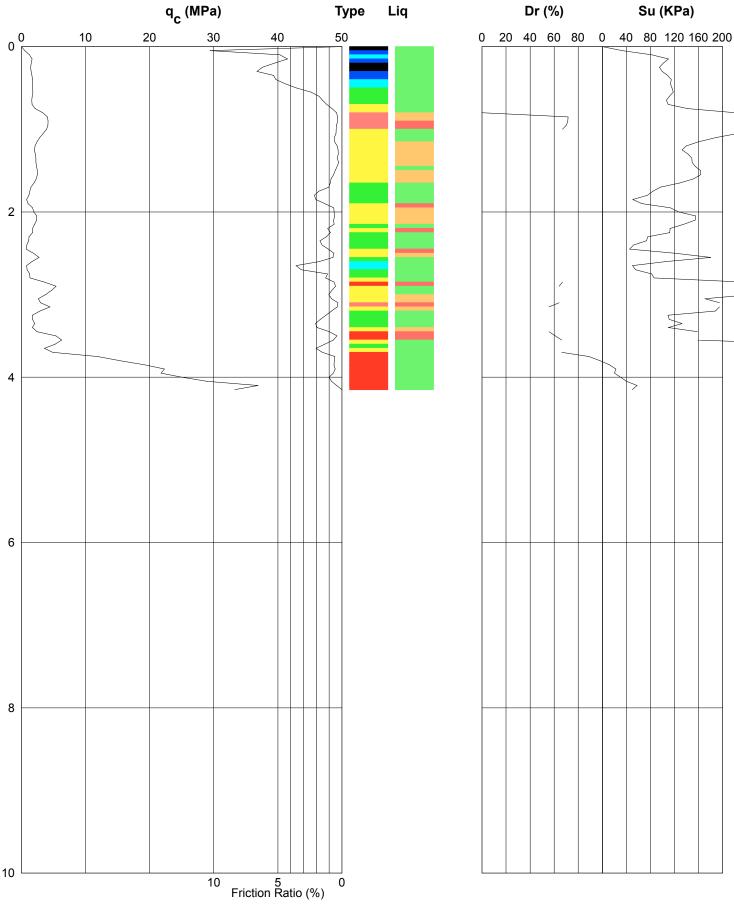
J. Kendrick

Remark:

Effective Refusal

Location: Rosemerryn, Edward St, Lincoln





Job No:

9402

CPT No:

CPTu020

Project:

FH C/o Aurecon

Date:

27/08/11

Operator:

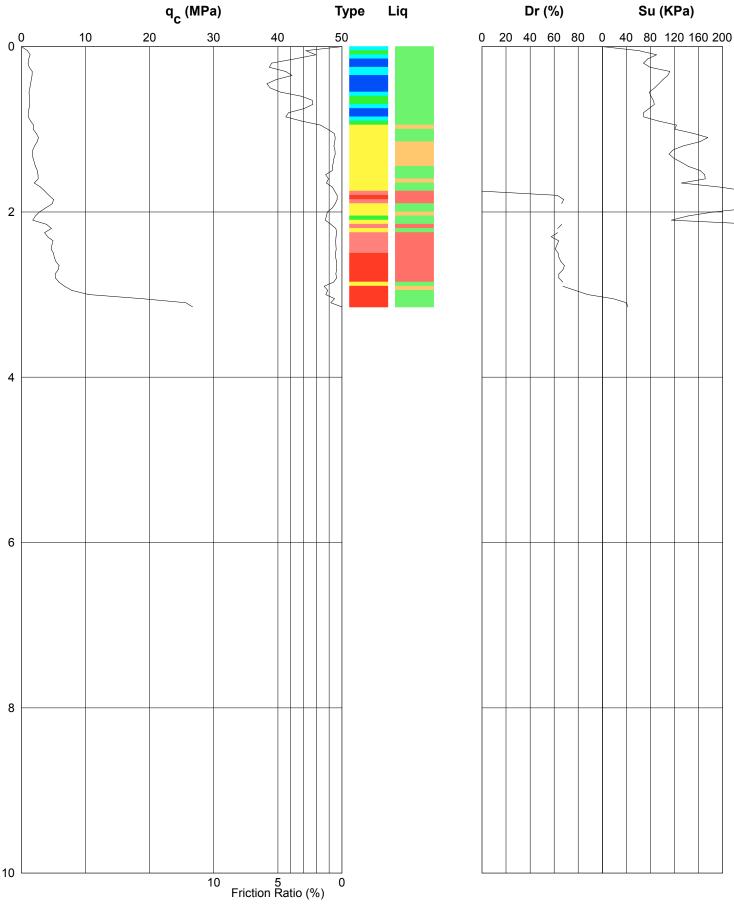
J. Kendrick

Remark:

Effective Refusal

Location: Rosemerryn, Edward St, Lincoln





Job No:

9402

CPT No:

CPTu021

Project:

FH C/o Aurecon

Location: Rosemerryn, Edward St, Lincoln

Date:

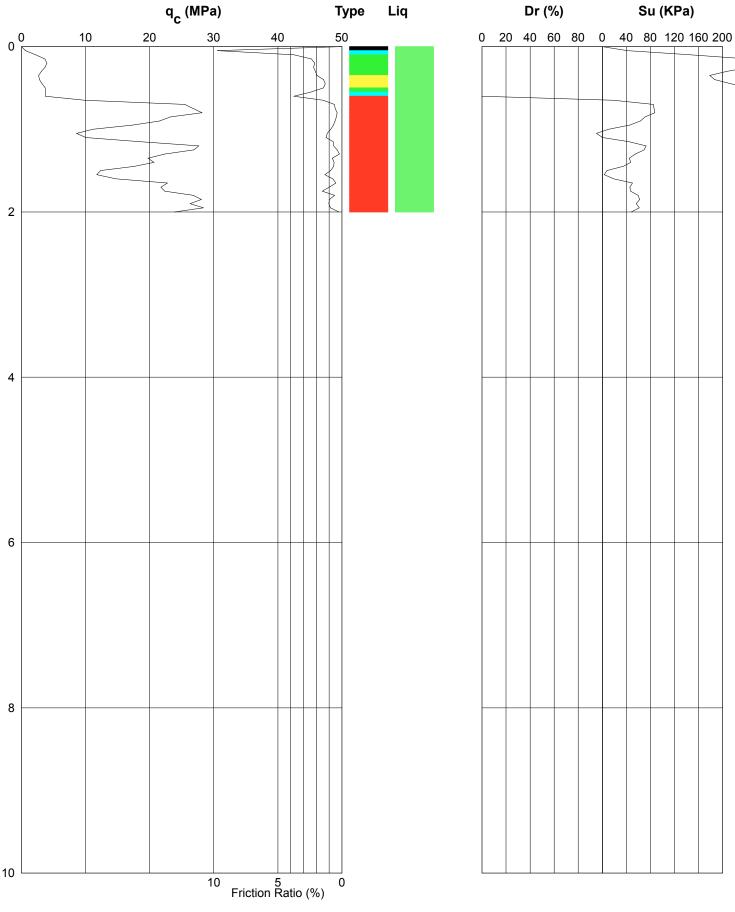
27/08/11

Operator:

J. Kendrick

Remark:





Job No:

9402

CPT No:

CPTu028

Project:

FH C/o Aurecon

Location:

Rosemerryn, Edward St, Lincoln

Date:

27/08/11

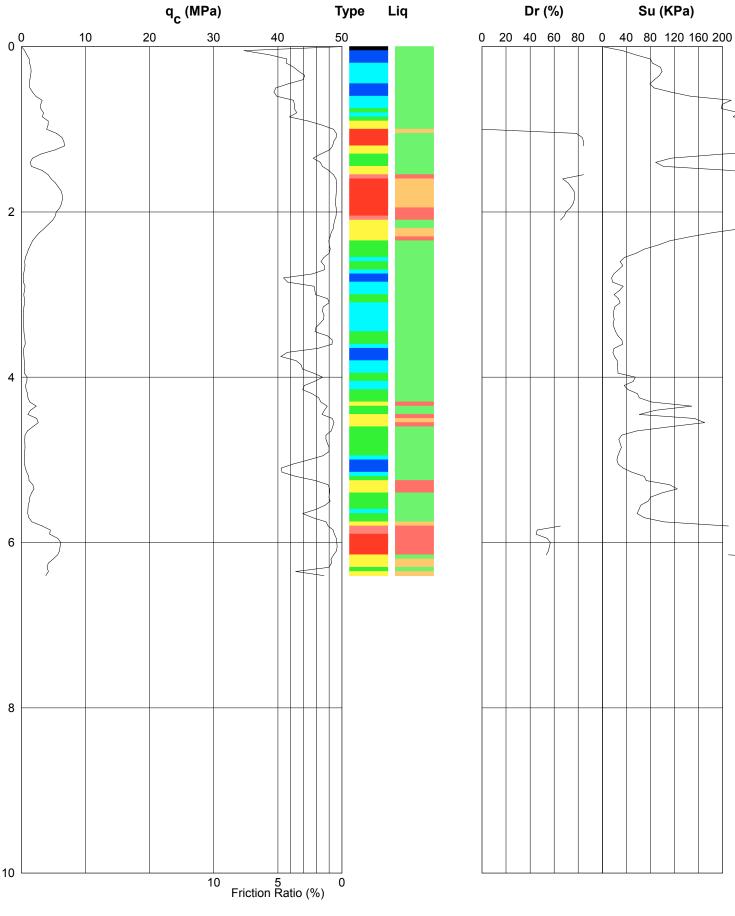
Operator:

J. Kendrick

Remark:

Effective Refusal





Job No:

9402

CPT No:

CPTu029

Project:

FH C/o Aurecon

Date:

27/08/11

Operator:

J. Kendrick

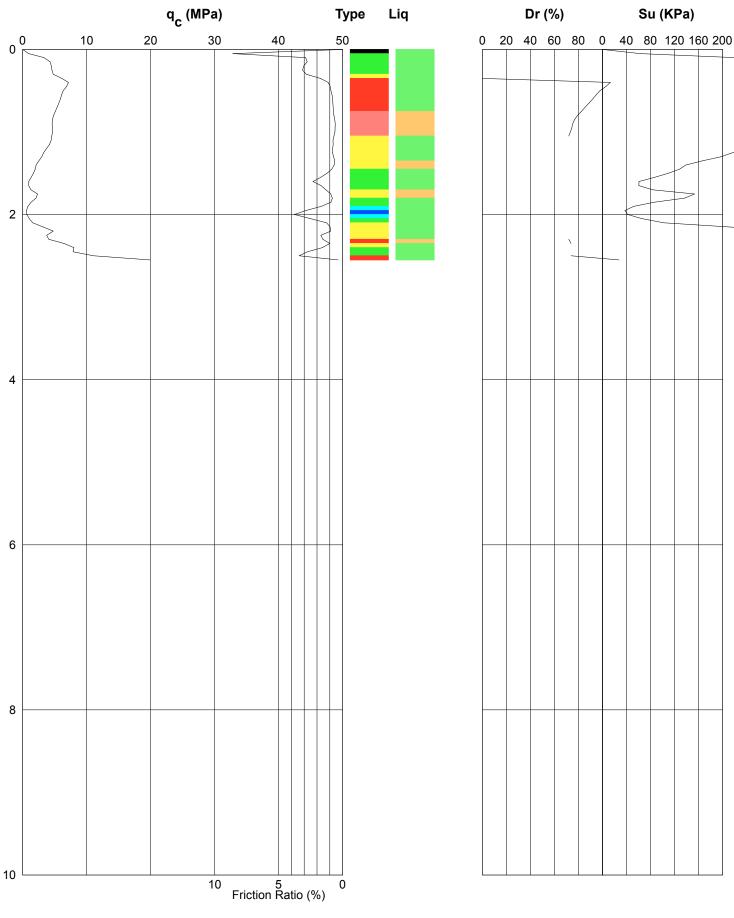
Remark:

Effective Refusal

Location:

Rosemerryn, Edward St, Lincoln





Job No:

9402

Date:

20/09/11

CPT No:

CPTu033

Operator:

B. Powell

Project:

FH C/o Aurecon

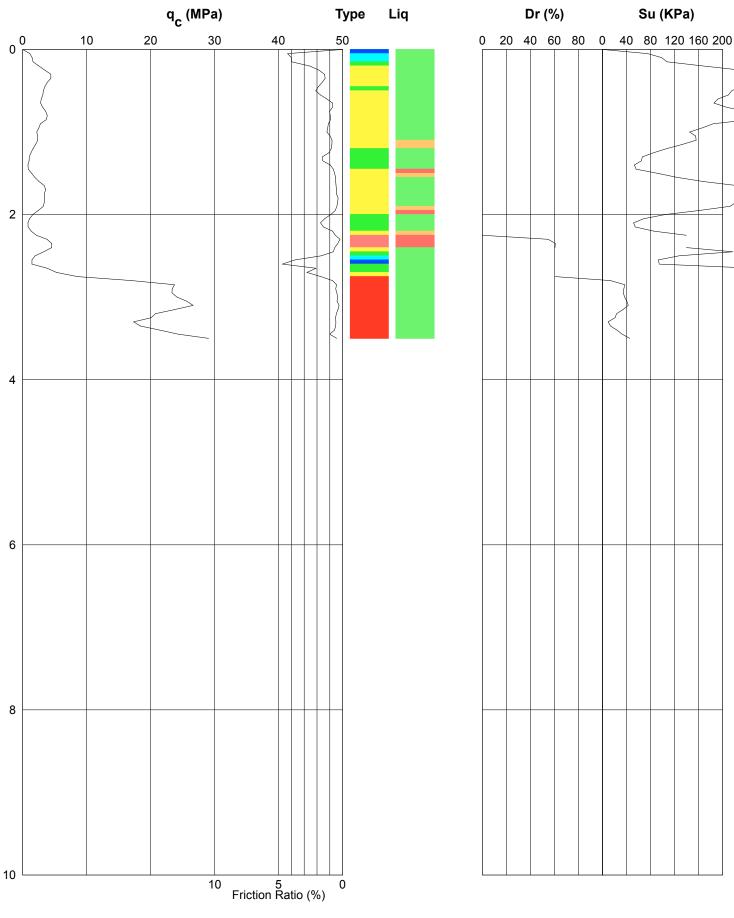
Remark:

Effective Refusal

Location:

Rosemerryn, Edward St, Lincoln





Job No:

9402

Date: 20/09/11

CPT No: CPTu034

Operator: B. Powell

Project: FH C/o Aurecon

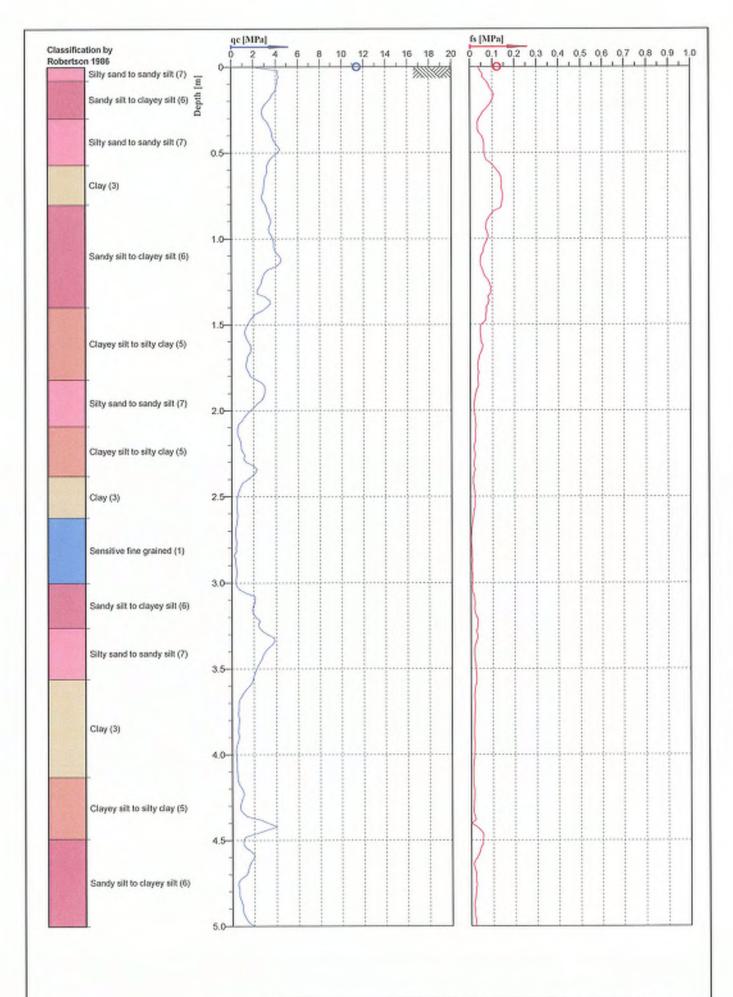
Remark:

Effective Refusal

Location:

Rosemerryn, Edward St, Lincoln



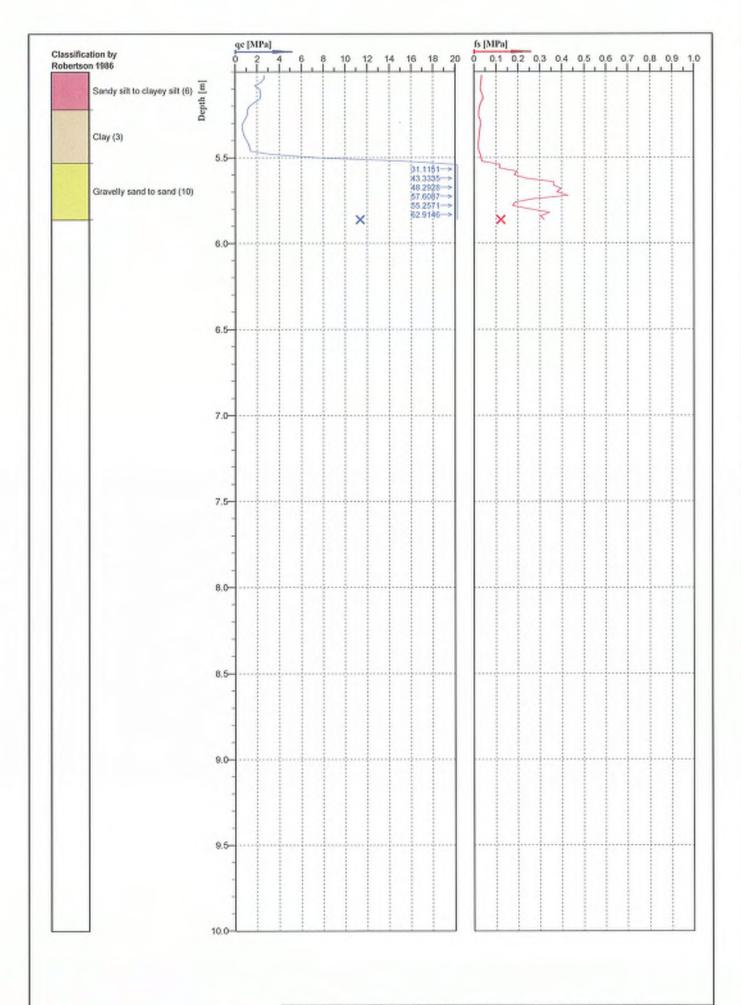






Cone No: 4485
Tip area (cm2): 10
Steeve area (cm2): 15/

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cpt

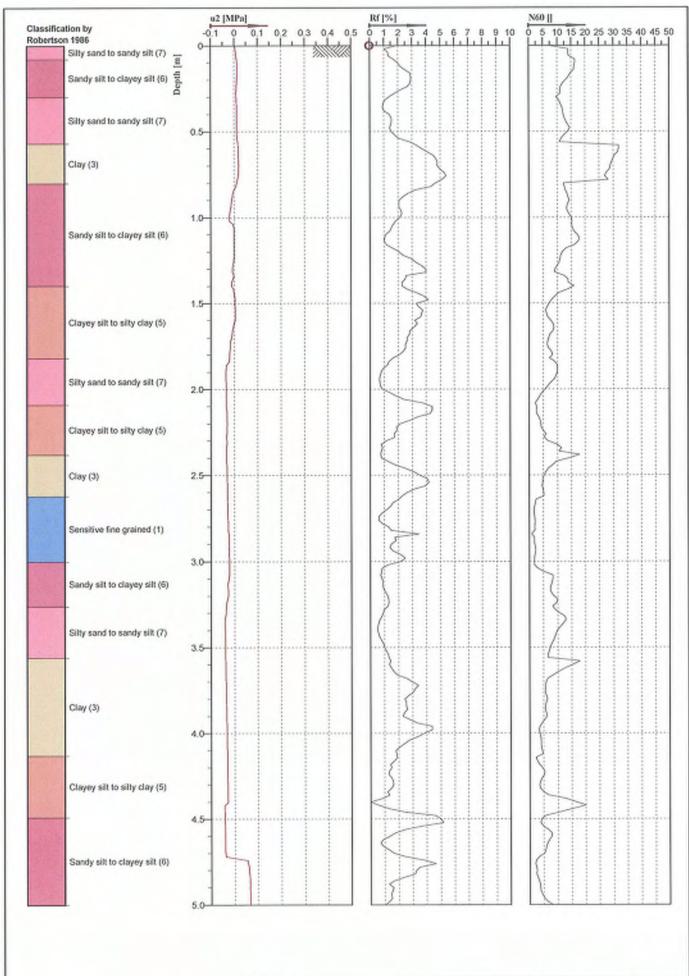






Cone No: 4495 Tip area (cm2): 10 Sieeve area (cm2): 150

Location:	Position:	Ground level;	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cpt

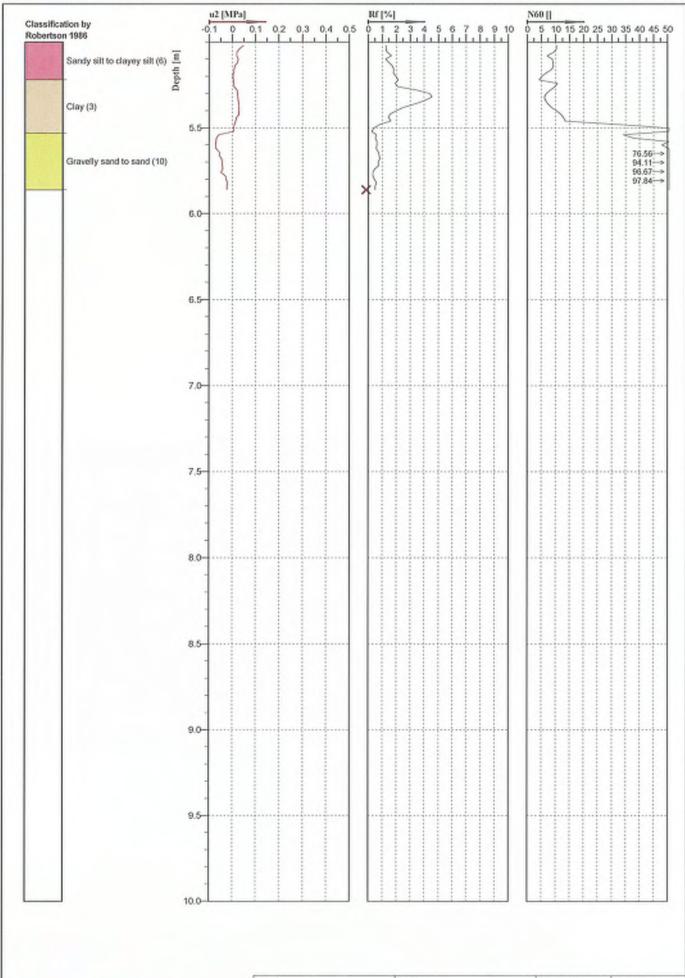






Cone No: 4485
Tip area [cm2]: 10
Sleeve area (cm2): 150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no:
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cpt

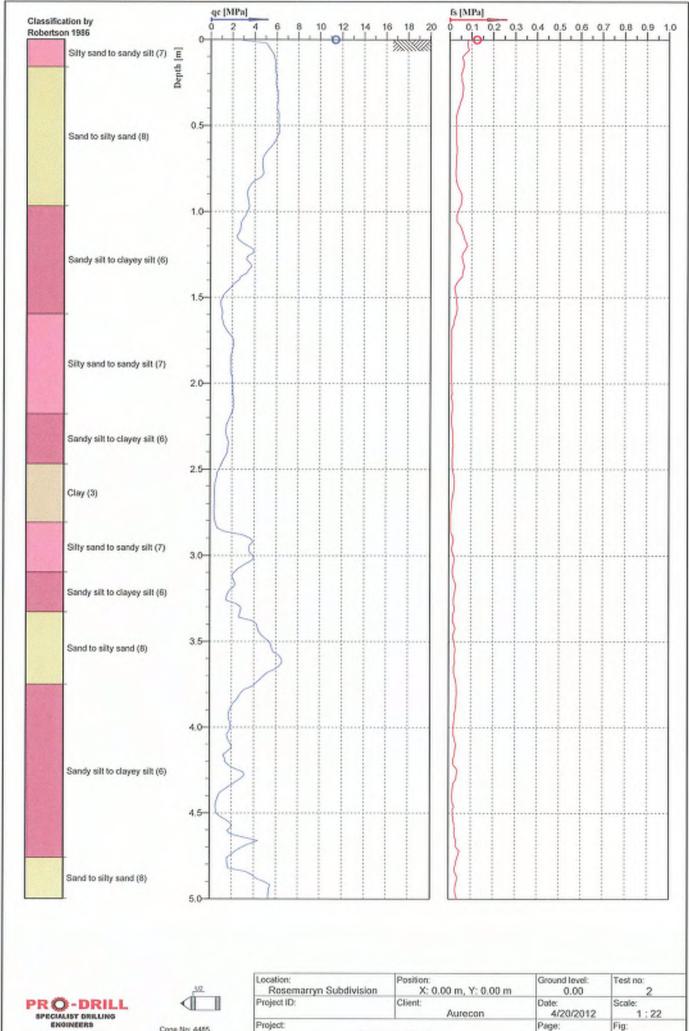






Cone No: 4485	
Tip area (cm2): 10)
Sieeve area [cm2]	150

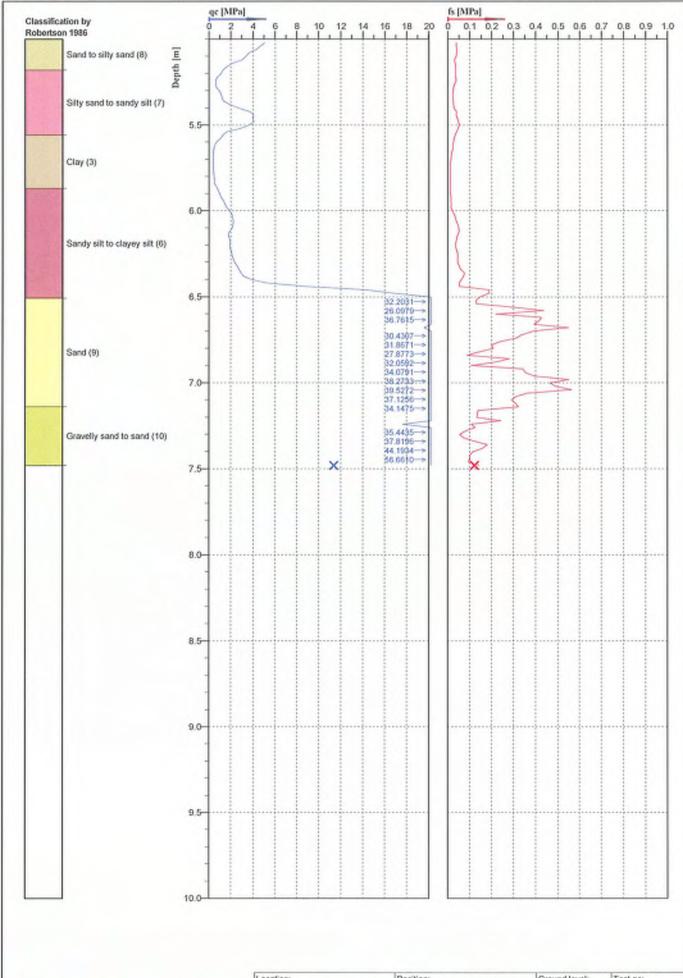
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cp



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Cone No: 4485
Tip area (cm2): 10
Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSE	Page: 1/2	Fig:	
		File: RosemarrynSu	bdivisionCPT2.cpt

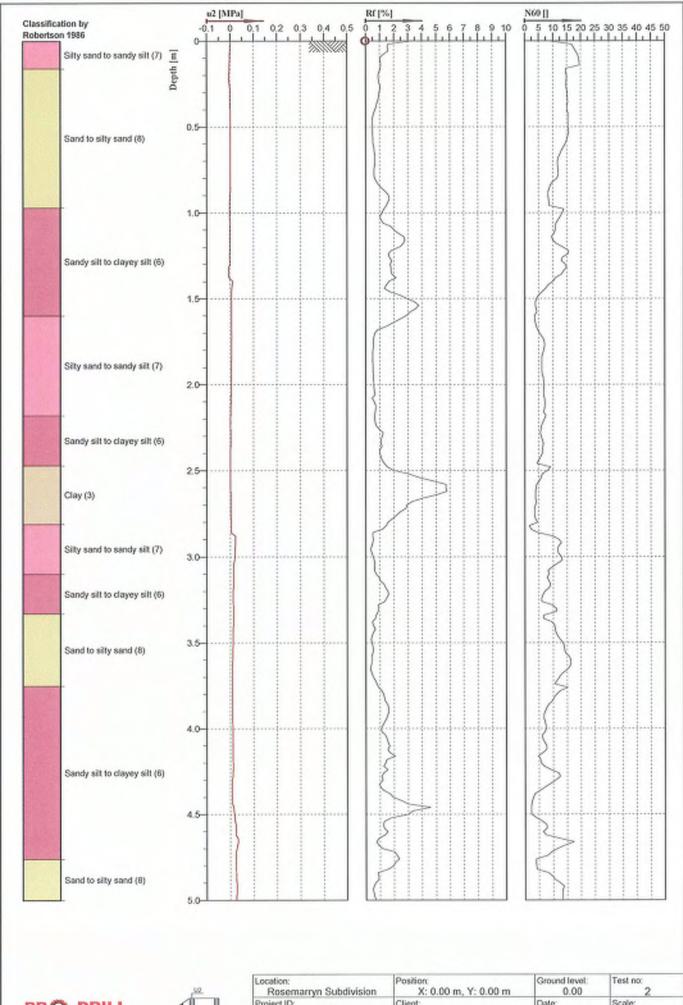






Cone No: 4485 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	hdivisionCPT2 cr

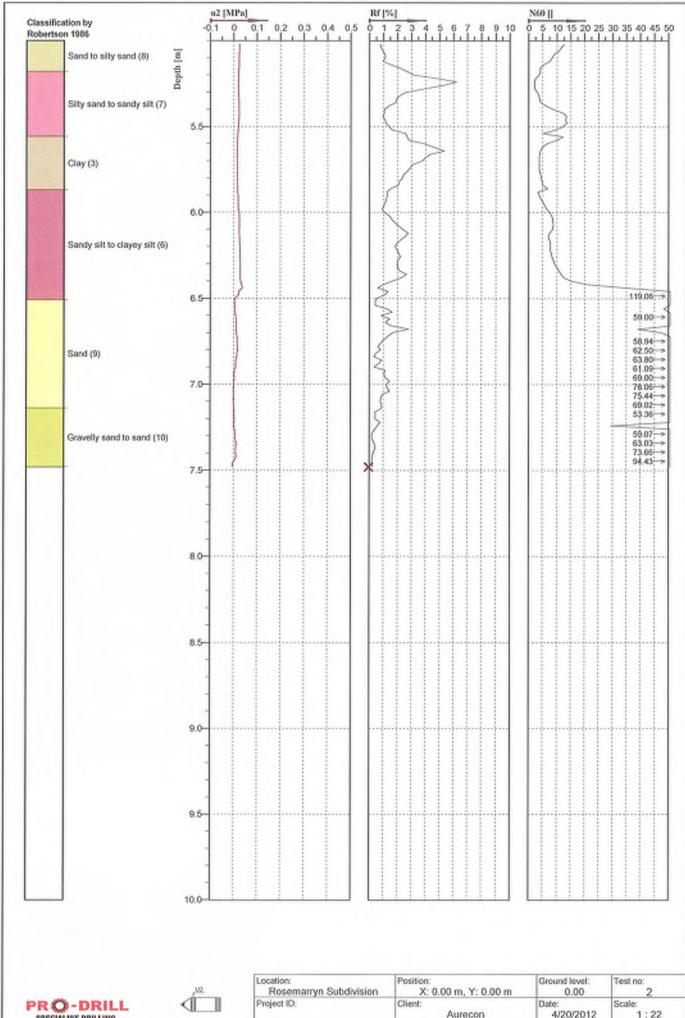






Cone No: 4485 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT2.cpt



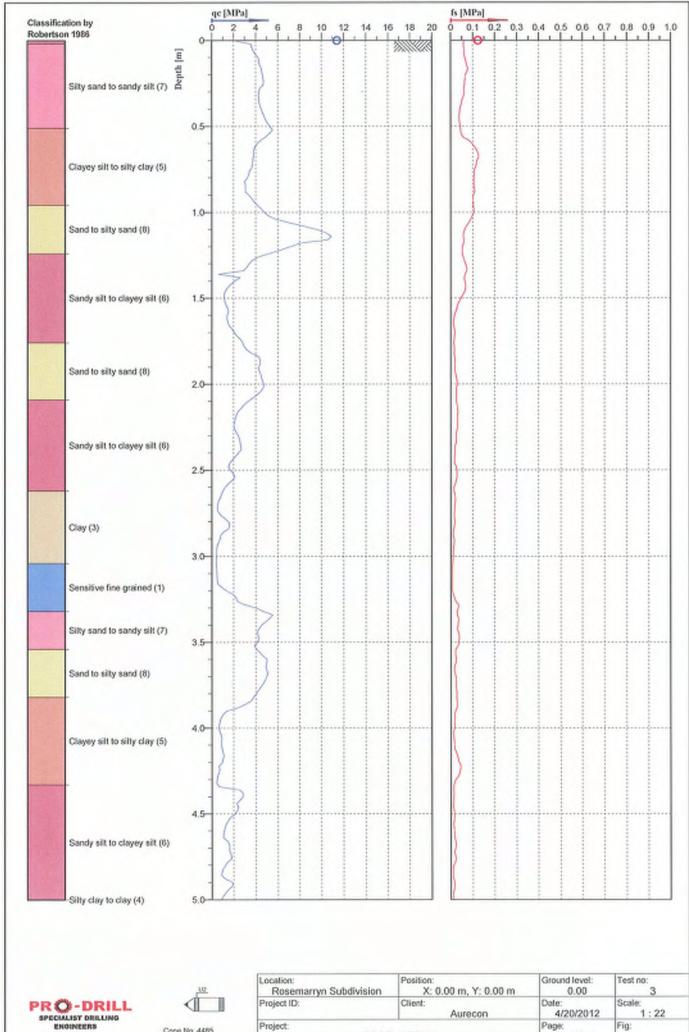
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ENGINEERS 0800 477 637



Cone No: 4465 Tip area [cm2]: 10 Sleeve area (cm2): 150

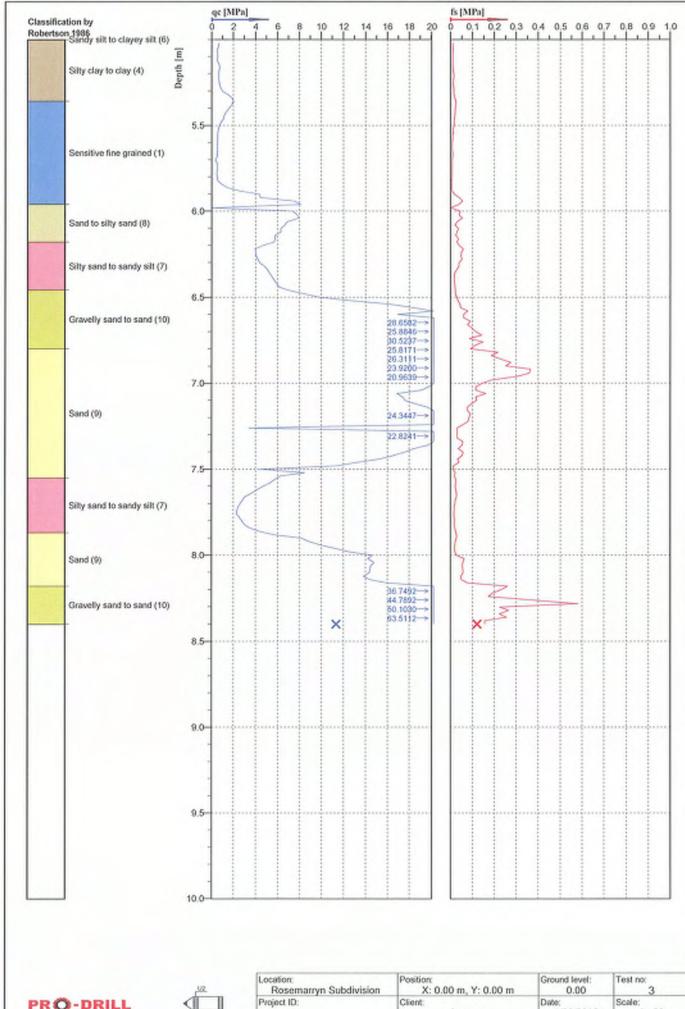
Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no:
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT2.cpt



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Cone No: 4465 Tip area [cm2]: 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt

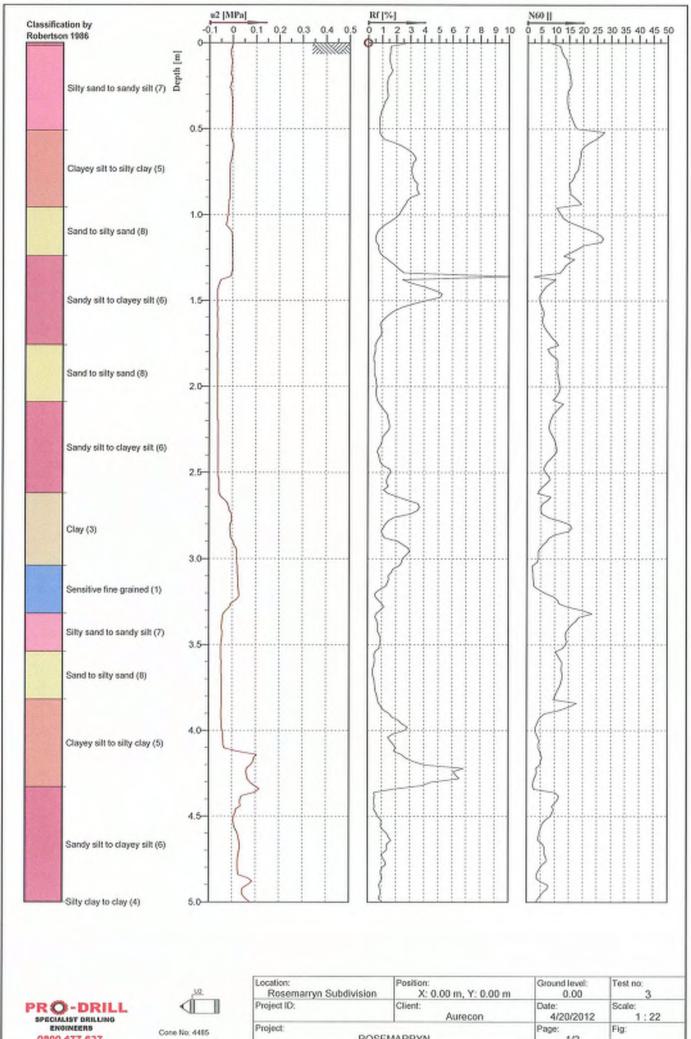






Cone No: 4485	
Tip area (cm2): 10	
Steave area [cm2]	150

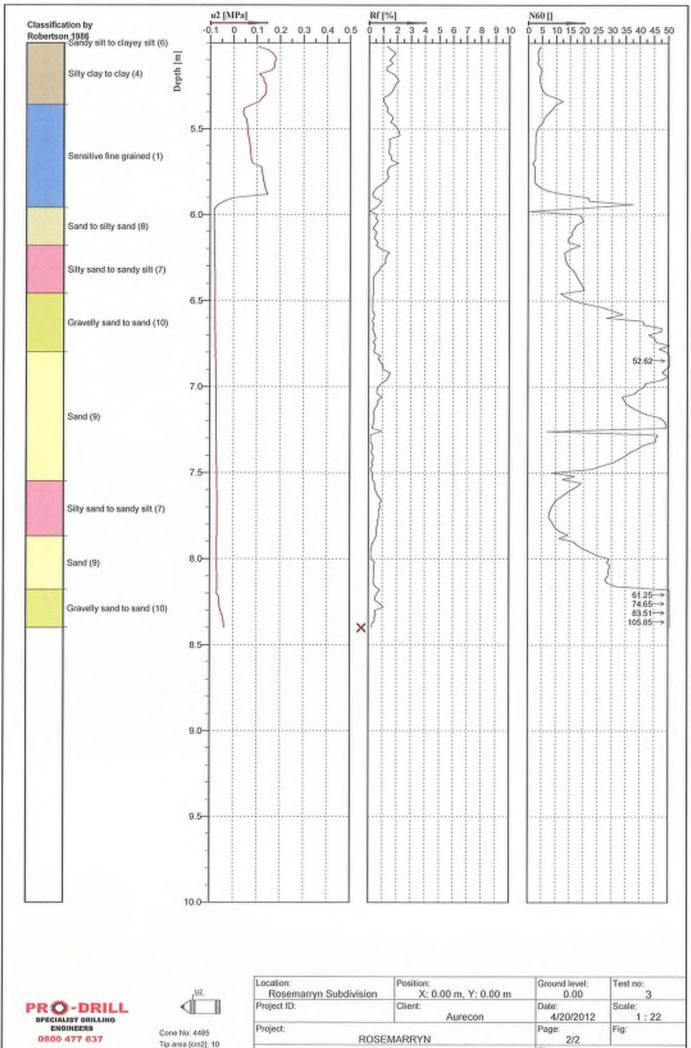
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt



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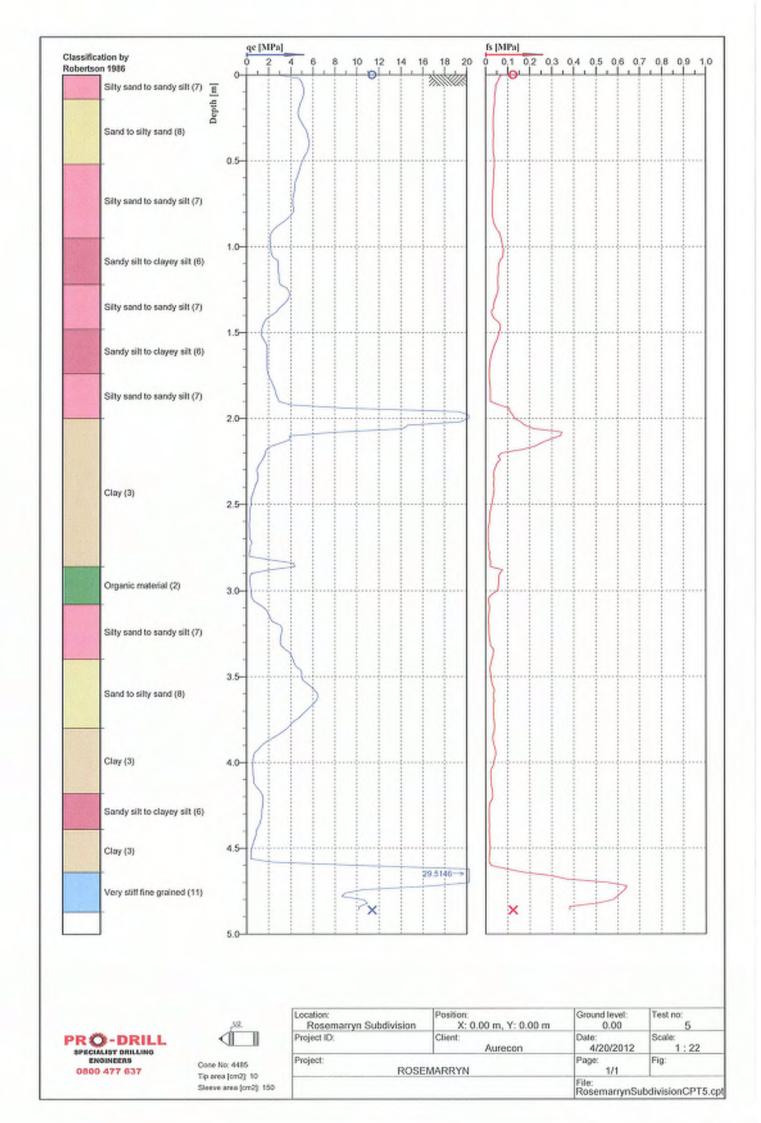
Tip area [cm2] 10 Steeve area (cm2): 150

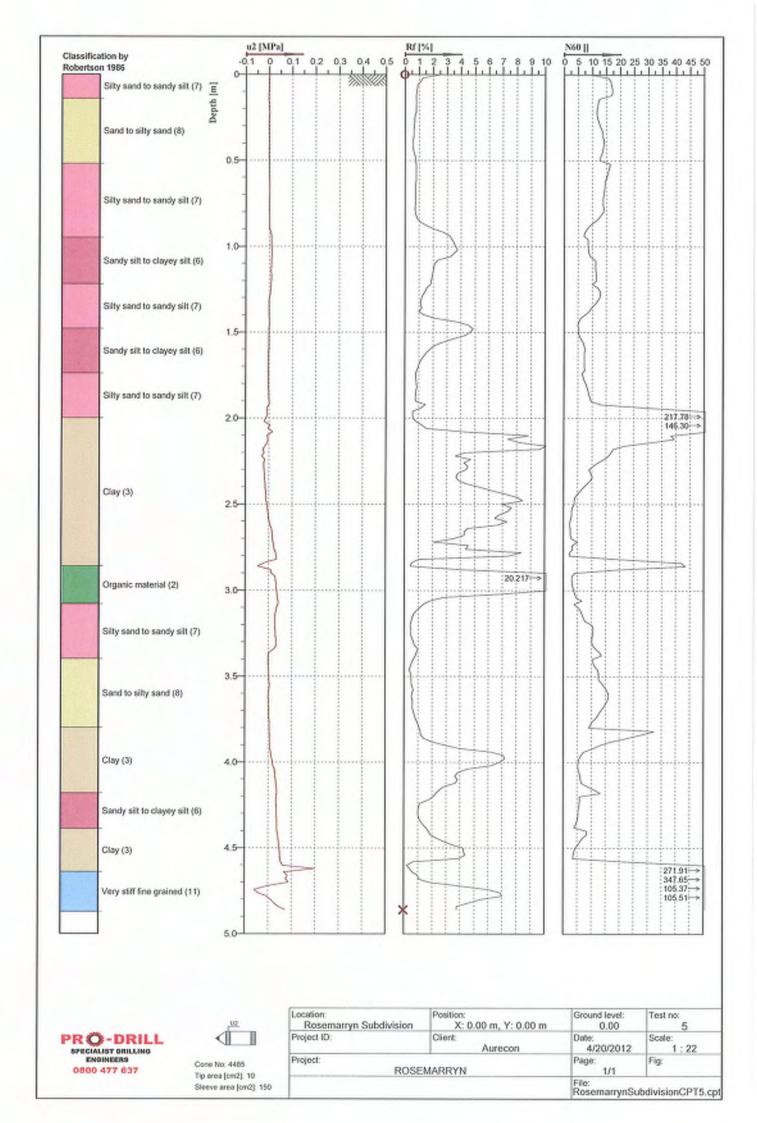
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt

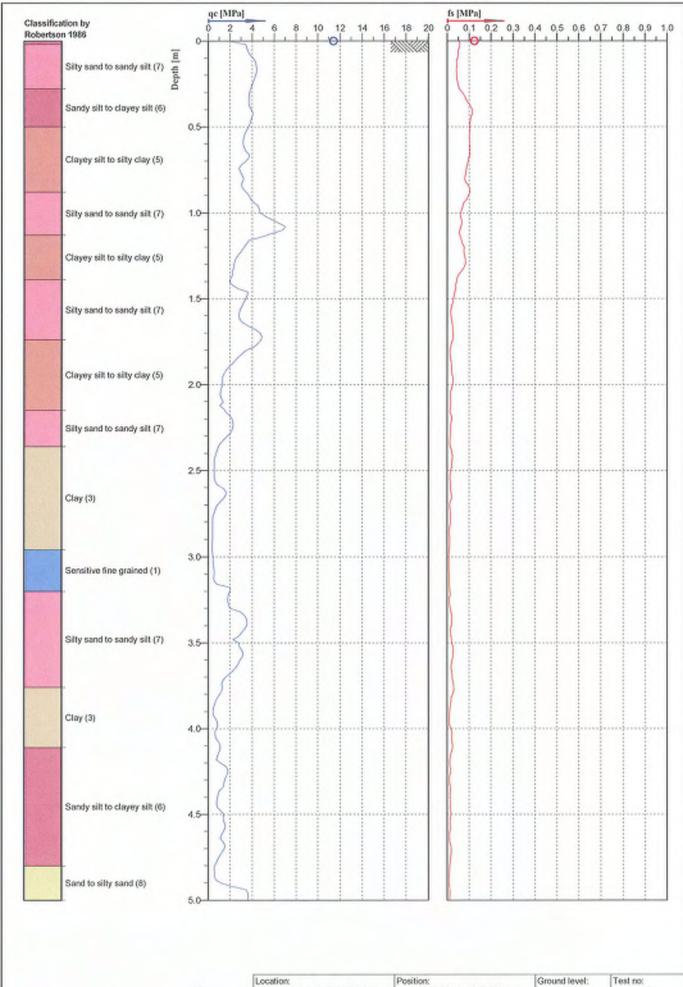


Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position;	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt





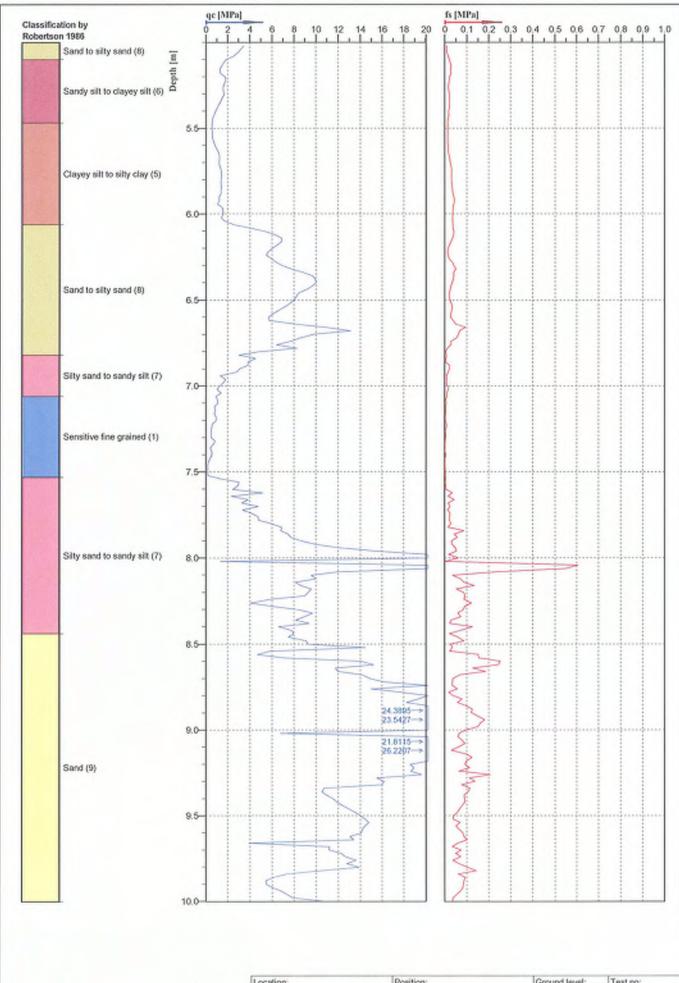






Cone No: 4485	
Tip area [cm2]: 10	
Sieeve area (cm2):	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/3	Fig.
		File: RosemarrynSu	bdivisionCPT6.cpt

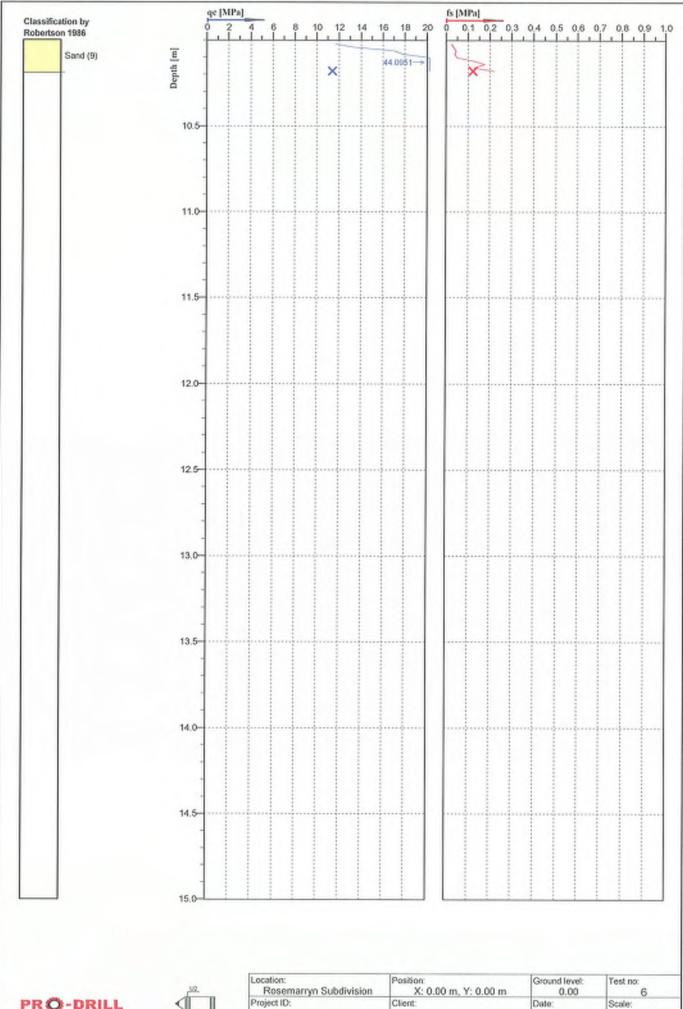






Cone No: 4485
Tip area [cm2]: 10
Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cpt

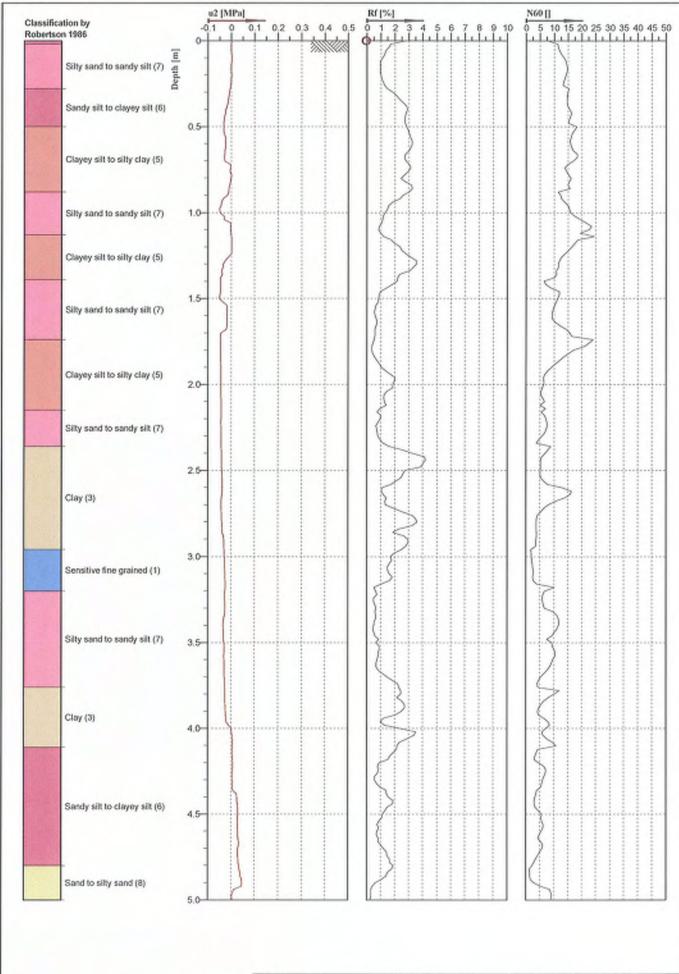


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Cone No: 4495 Tip area (cm2): 10 Sloove area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 3/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cot

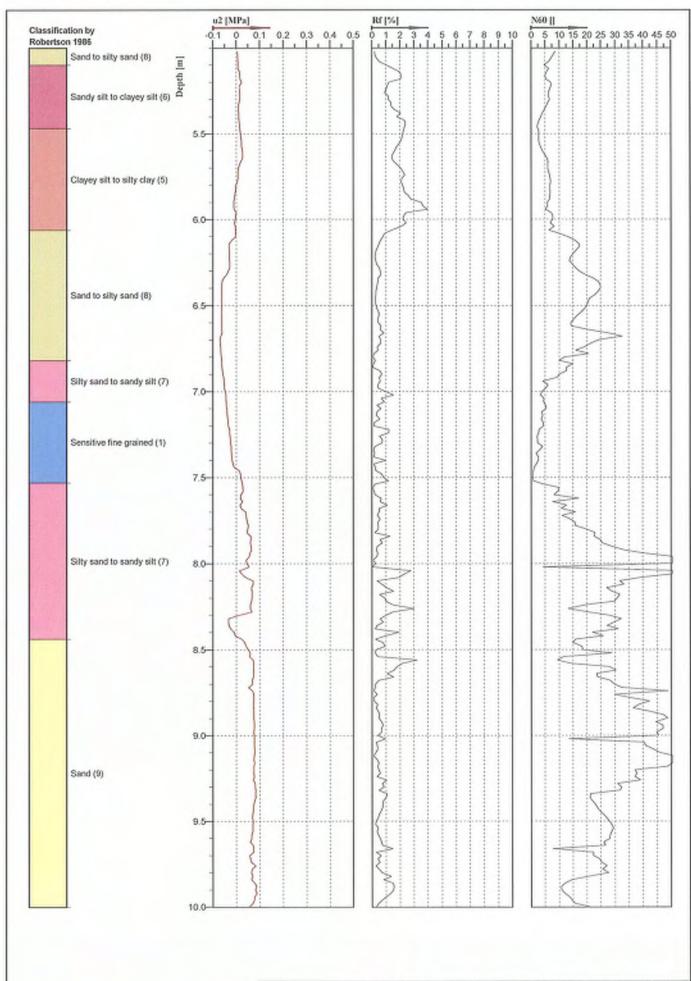






Cone No: 4465	
Tip area (on2) 10	
Steeve area (cm2):	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cpt

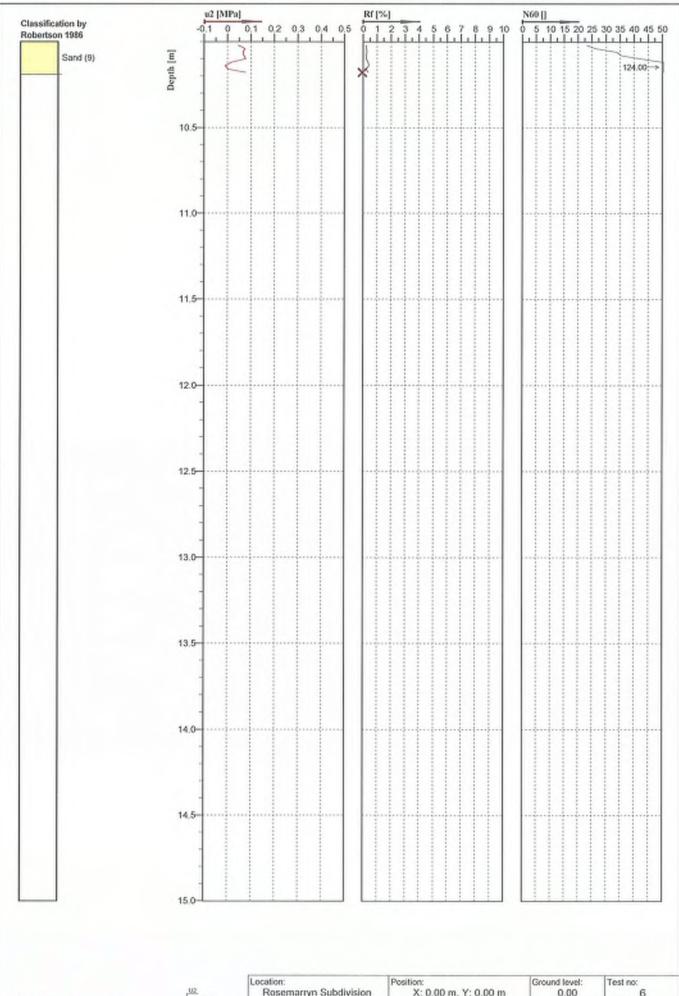






Cone No: 4485	
Tip area (cm2): 10	
Sleeve area (cm2): 150	

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cpt

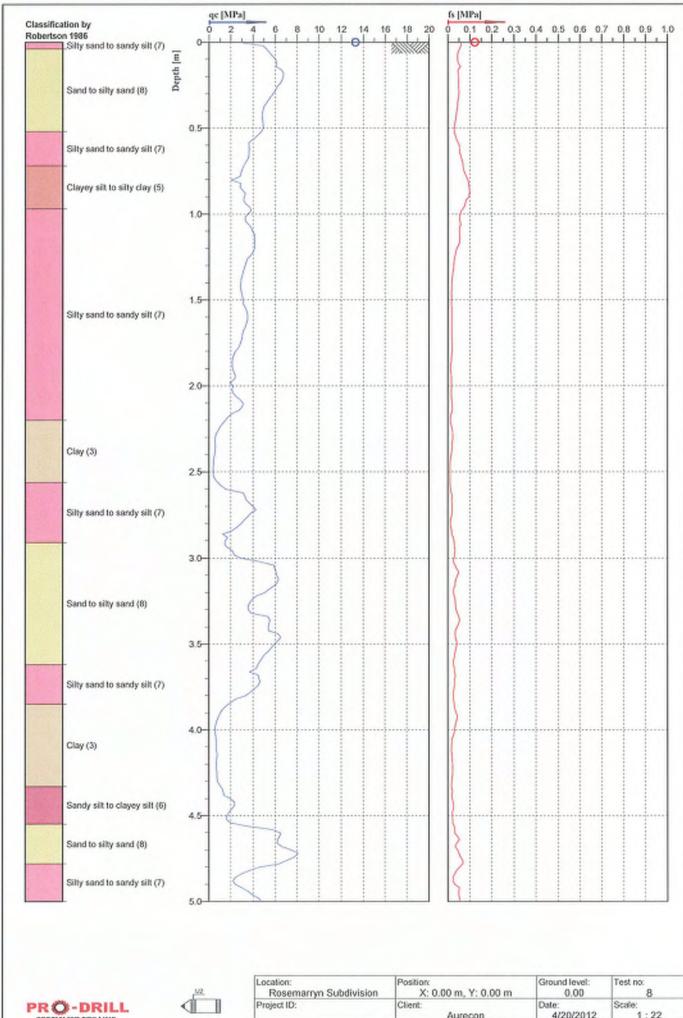


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ENGINEERS
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Cone No: 4405 Tip area [cm2]: 10 Siecve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
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Project: ROSE	MARRYN	Page: 3/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.co

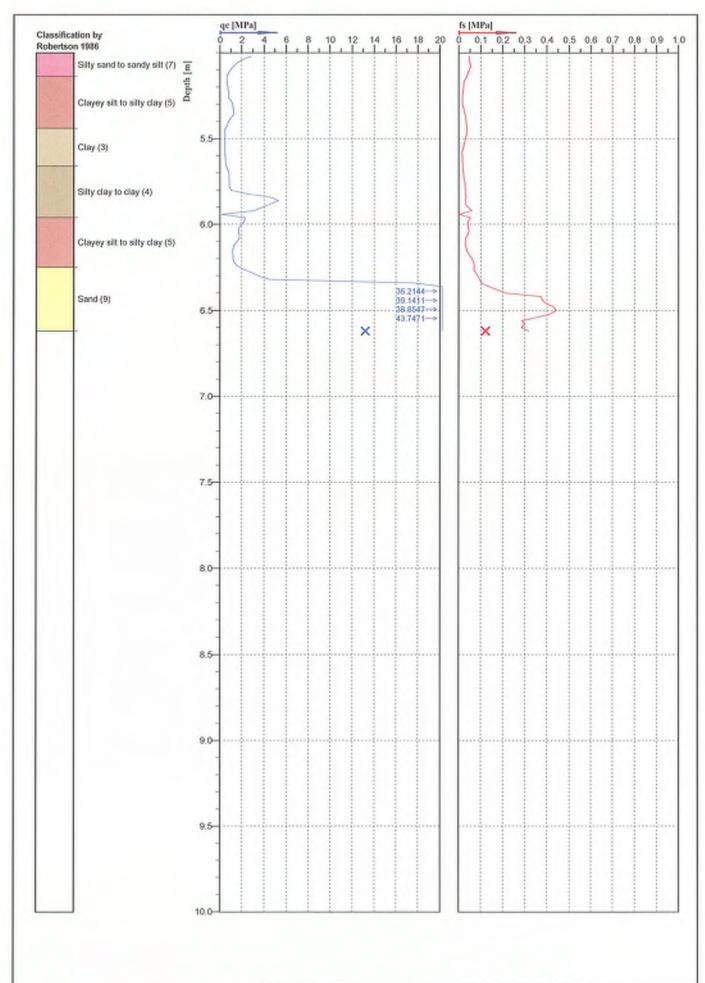






Cone No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSE	MARRYN	Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

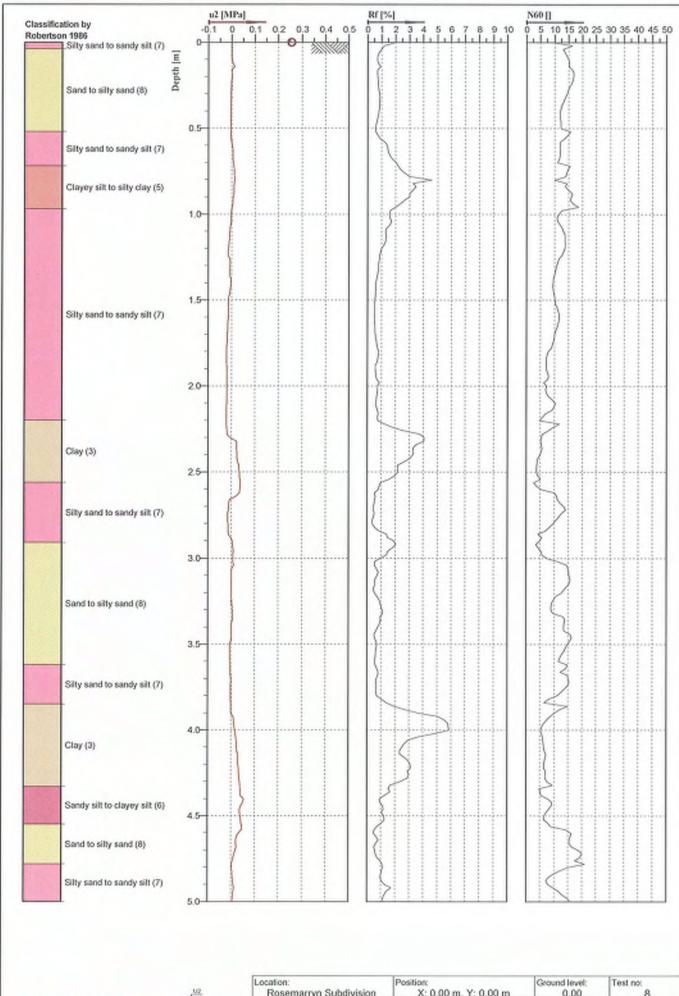






Cone No: 4439 Tip axes [cm2]: 10 Sleeve ares [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSE	MARRYN	Page: 2/2	Fig:
		File: RosemarounSu	entinisionCPT8 co

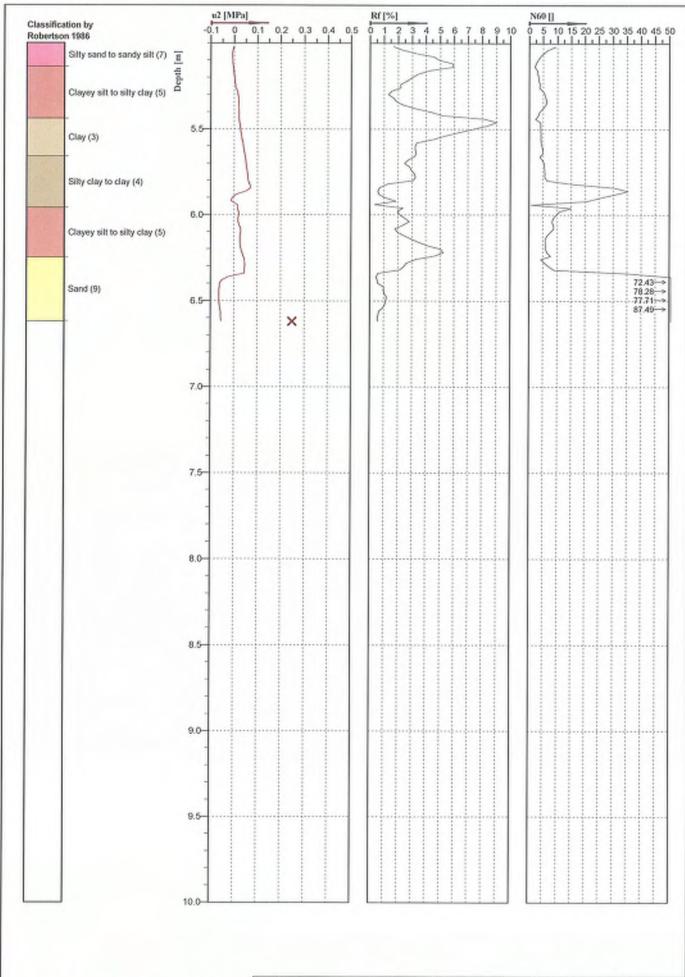






Cone No: 4439	
Tip area (cm2): 10	
Sleeve area [cm2]:	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

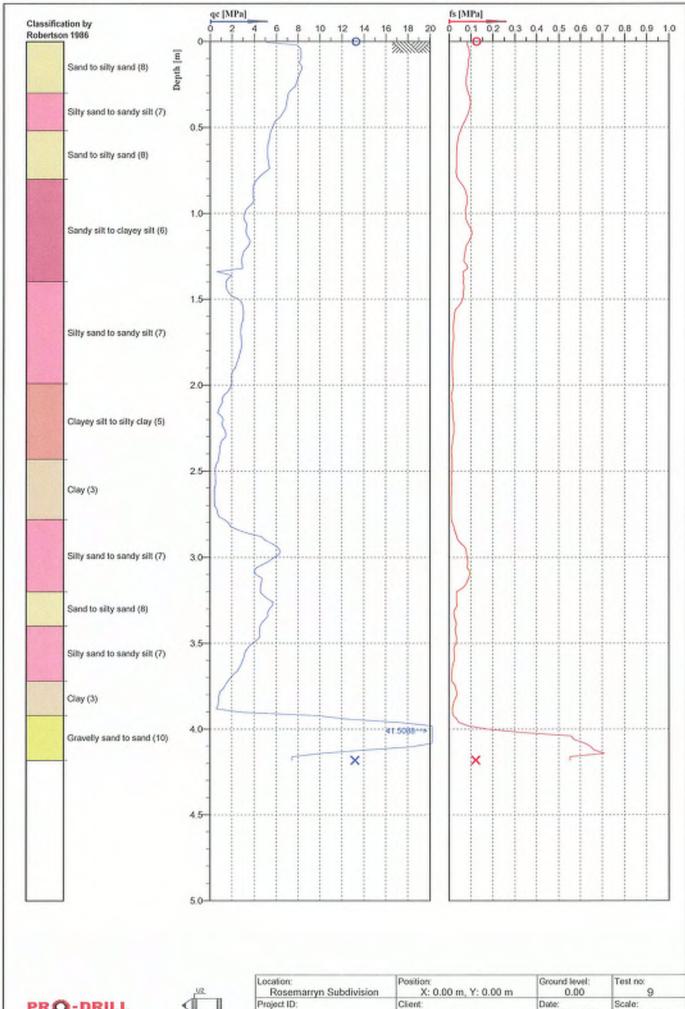






Cone No: 4439	
Tip area (cm2): 10	
Sleeve area [cm2]	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

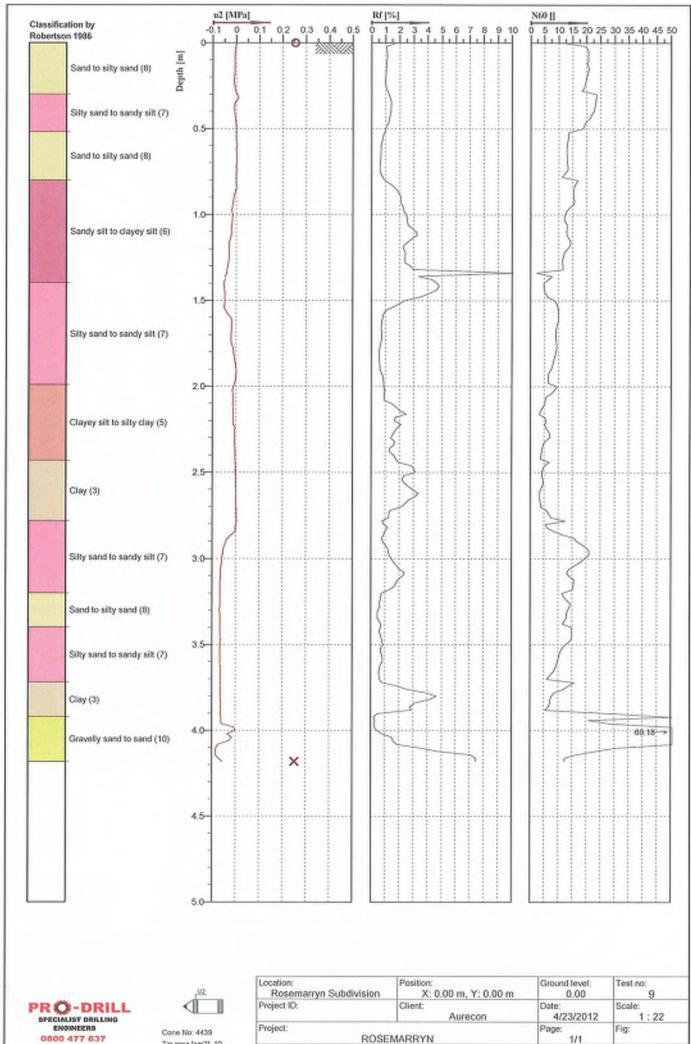


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Cone No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

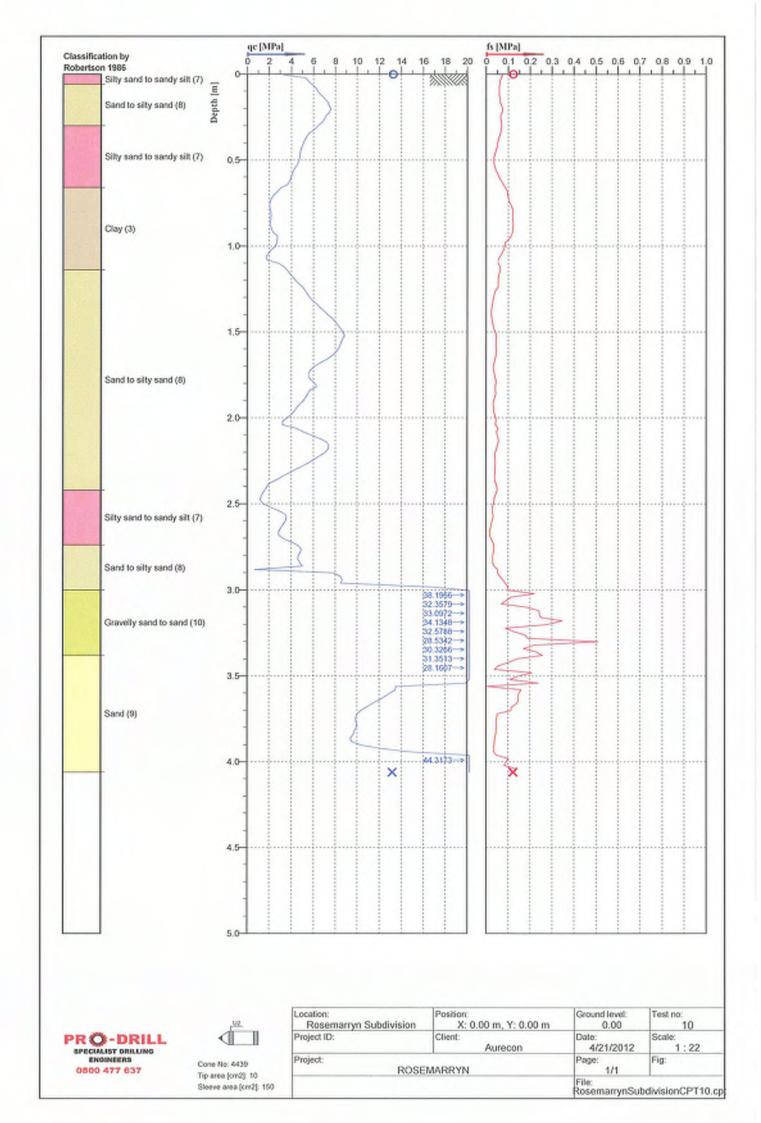
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSu	bdivisionCPT9.cpt

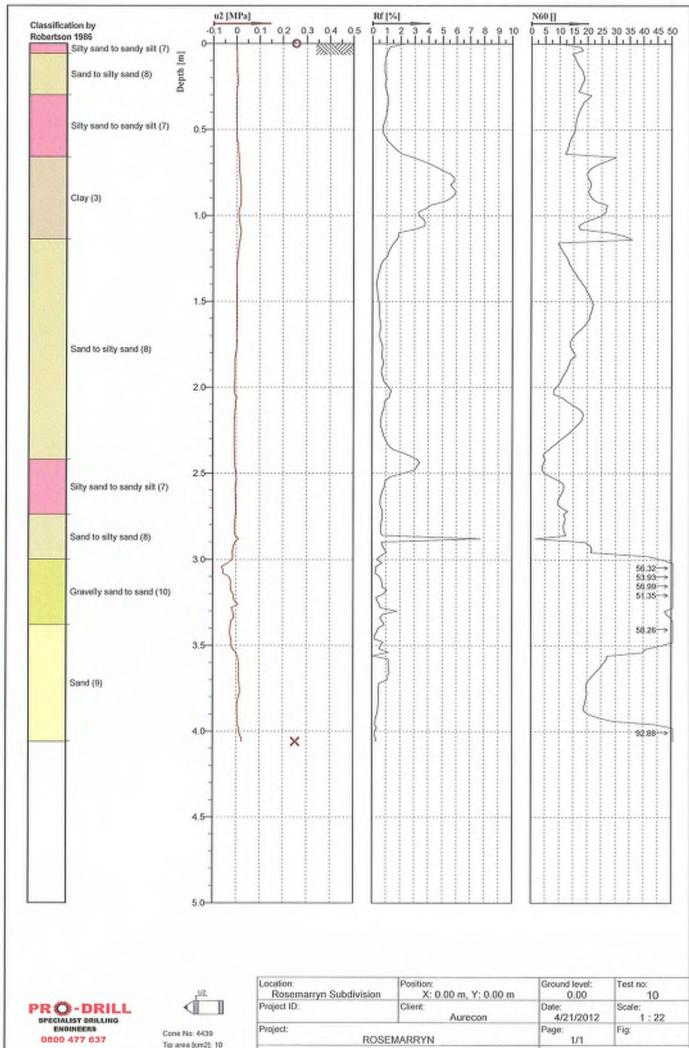


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Tip area [cm2]: 10 Sleeve area (cm2) 150

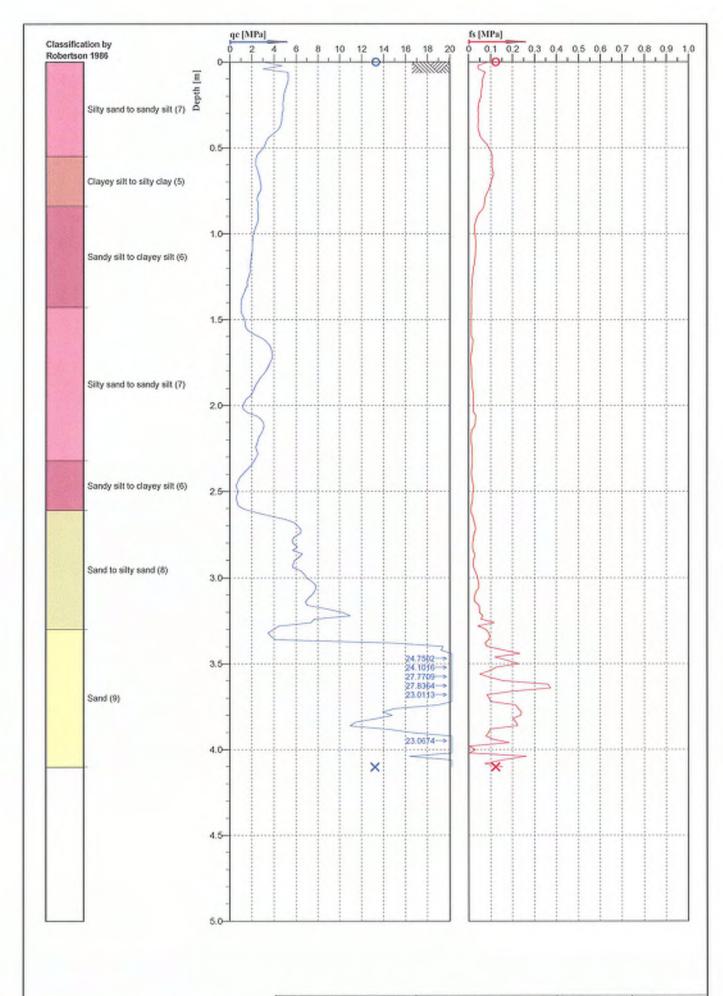
Rosemarryn Subdivision	Position:	Ground level:	Test no:
	X: 0.00 m, Y: 0.00 m	0.00	9
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSu	bdivisionCPT9.cpt





Tip area (cm2): 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	10
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig.
		File: RosemarrynSul	odivisionCPT10.cp

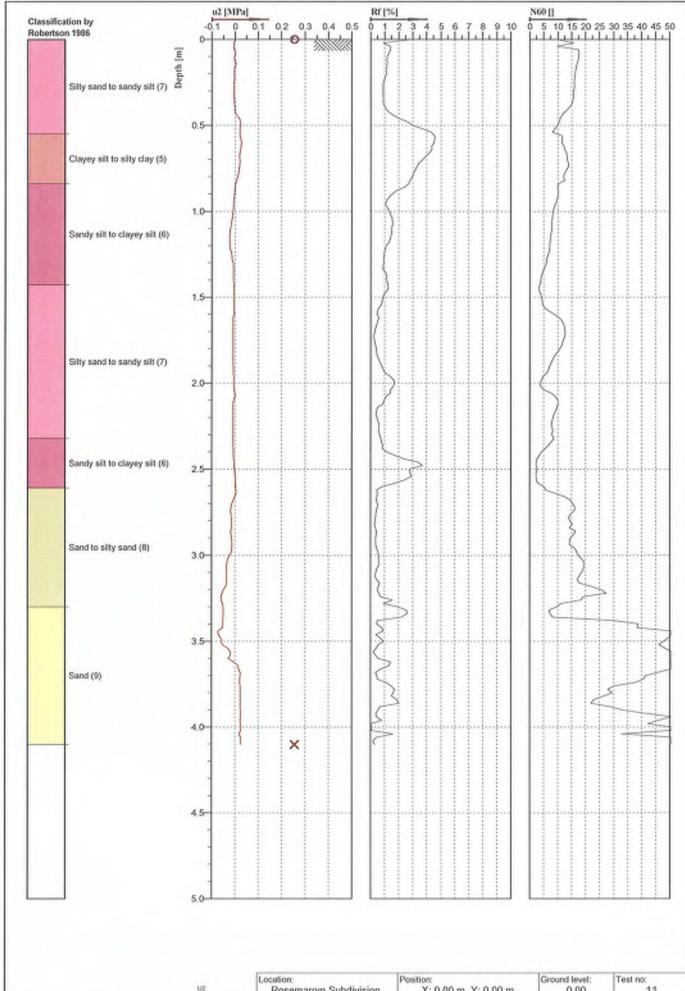






Cone No: 4439 Tip area [cm2]: 10 Sieeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSubdivisionCPT11.cp	

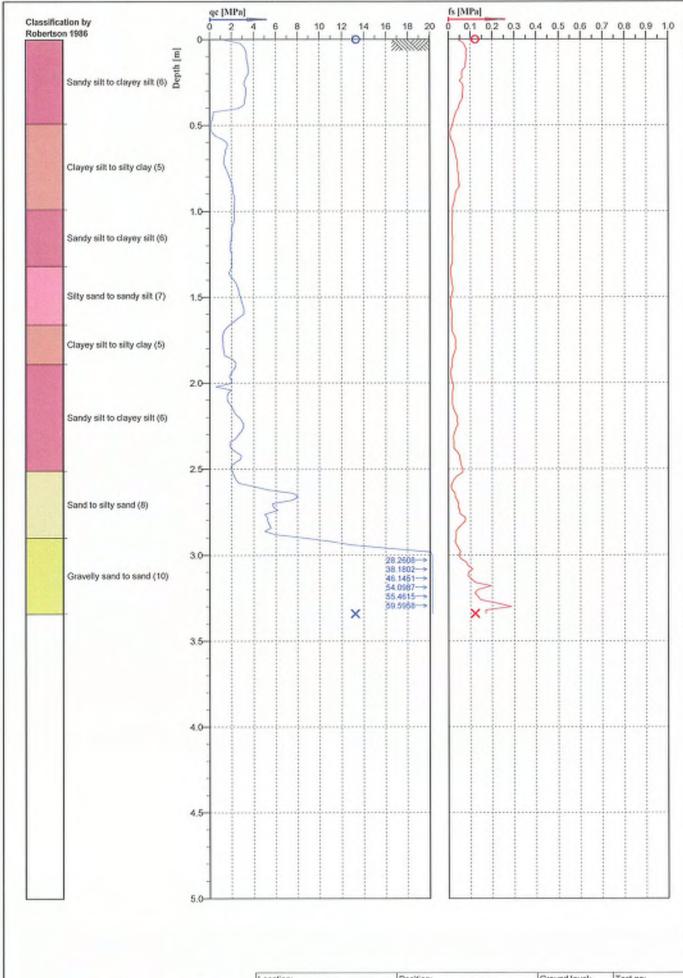






Cor	e No: 4439
Tip	area (cm2): 10
Ste	we area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSubdivisionCPT11.cp	

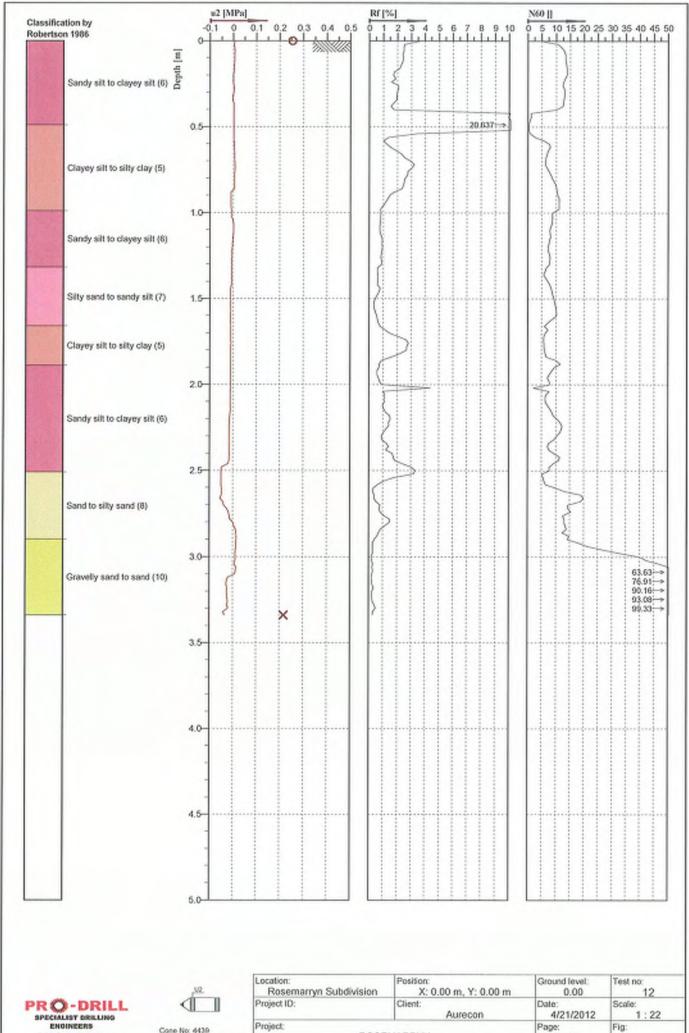






Cone No. 4439 Tip area [cm2]: 10 Steeve area [cm2]: 150

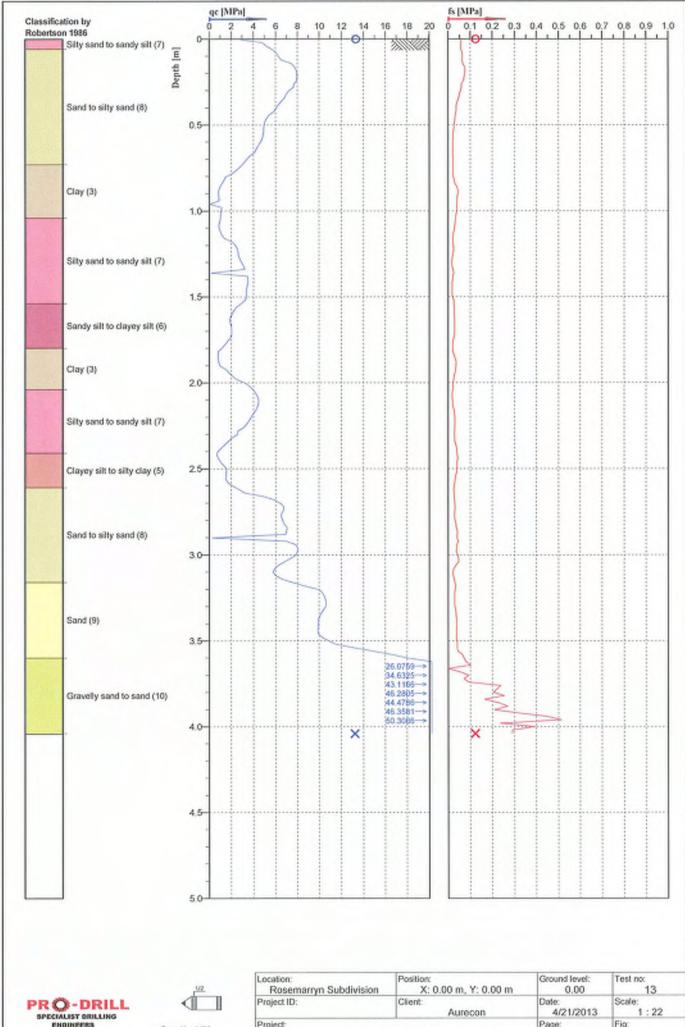
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	12
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSub	odivisionCPT12.cr



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Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

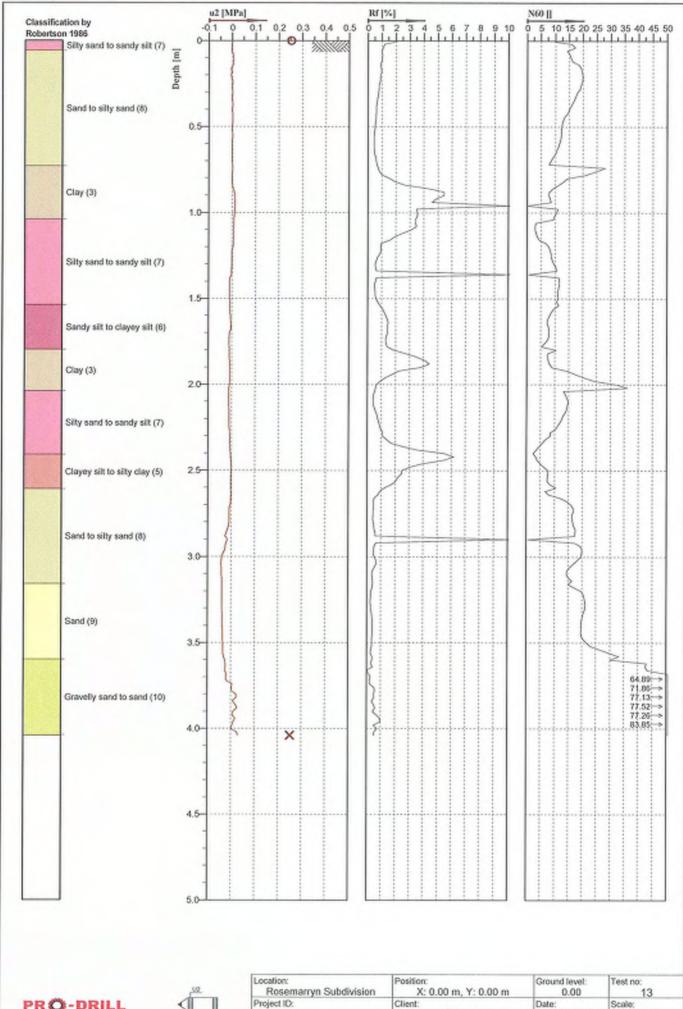
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	12
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSubdivisionCPT12.cp	



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Cone No: 4439	
Tip area (cm2): 10)
Sleeve area (cm2	1: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	13
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT13.cp

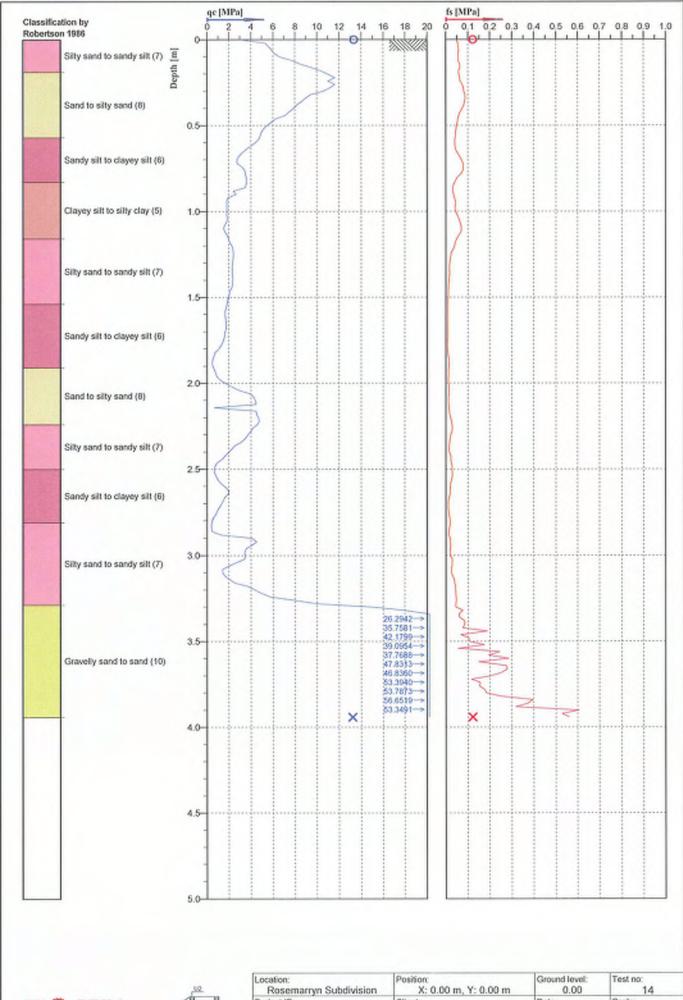


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Cone No: 4439 Tip area (cm2): 10 Steeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	13
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: Fig	Fig:
		File: RosemarrynSul	bdivisionCPT13.cp

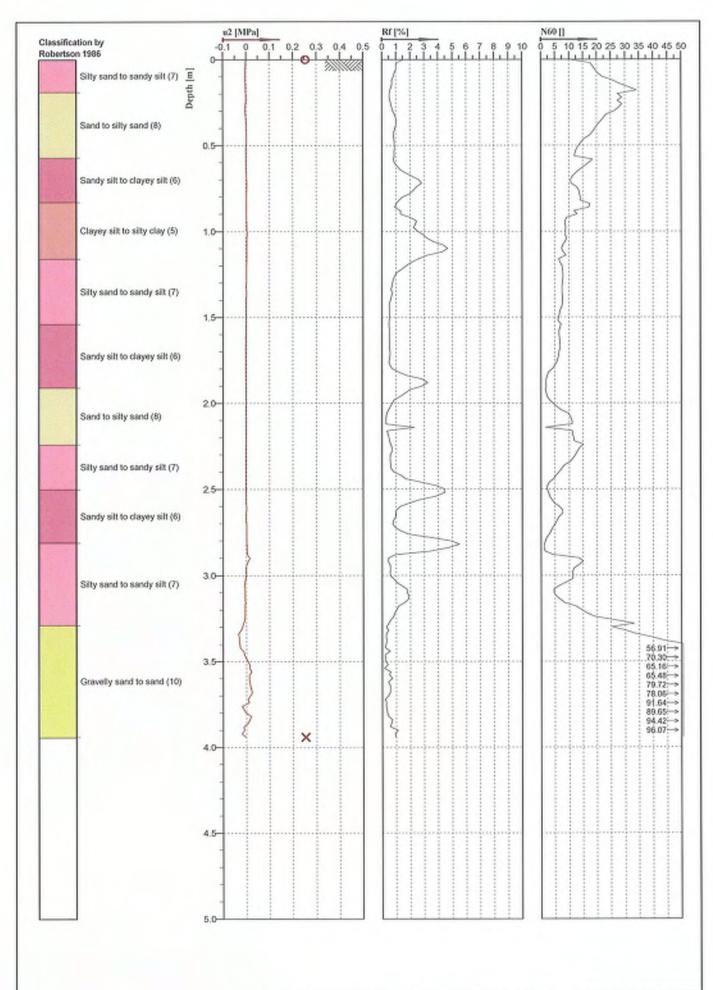






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	14
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT14.cp

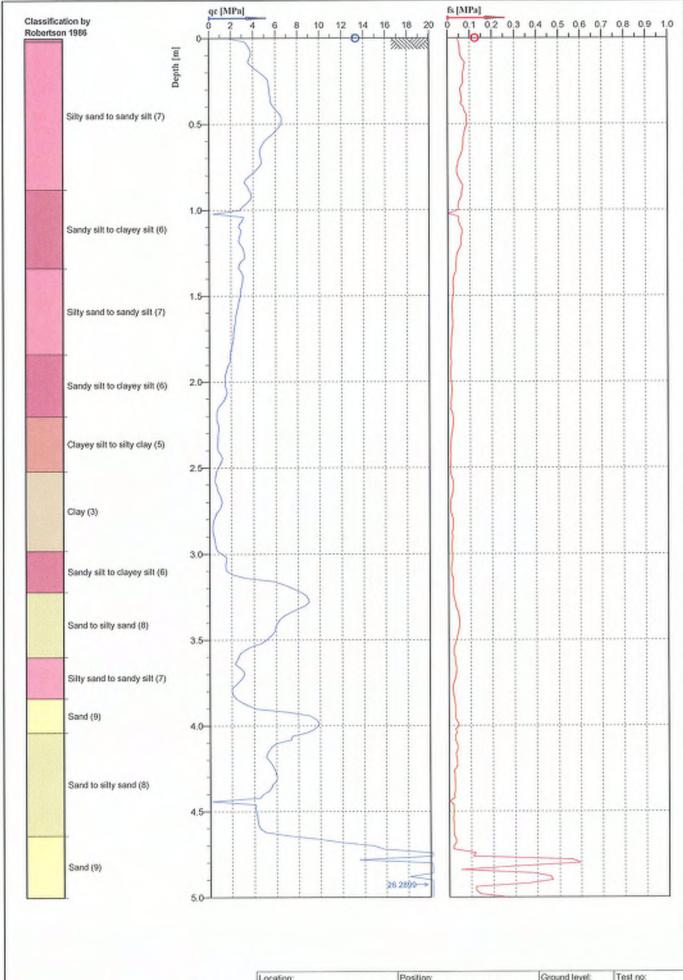






Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	14
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT14.c

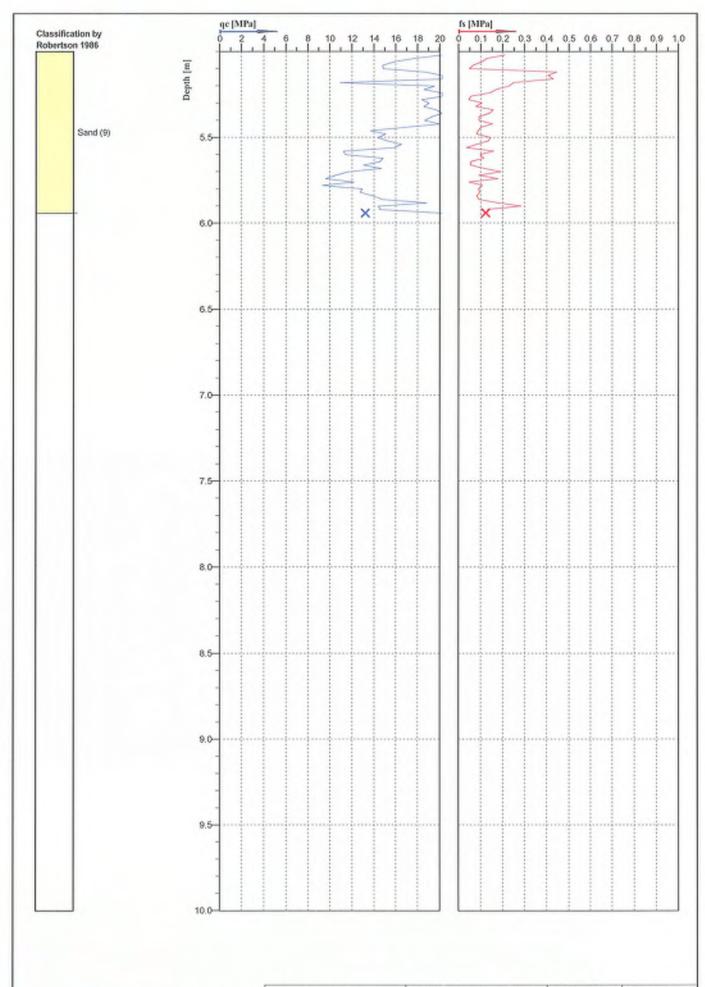






Cone No: 6439	
Tip area (cm2): 10	
Steeve area (cm2):	150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 15
Project ID:	Client: Aurecon	Date: 4/21/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSul	odivisionCPT15.cp

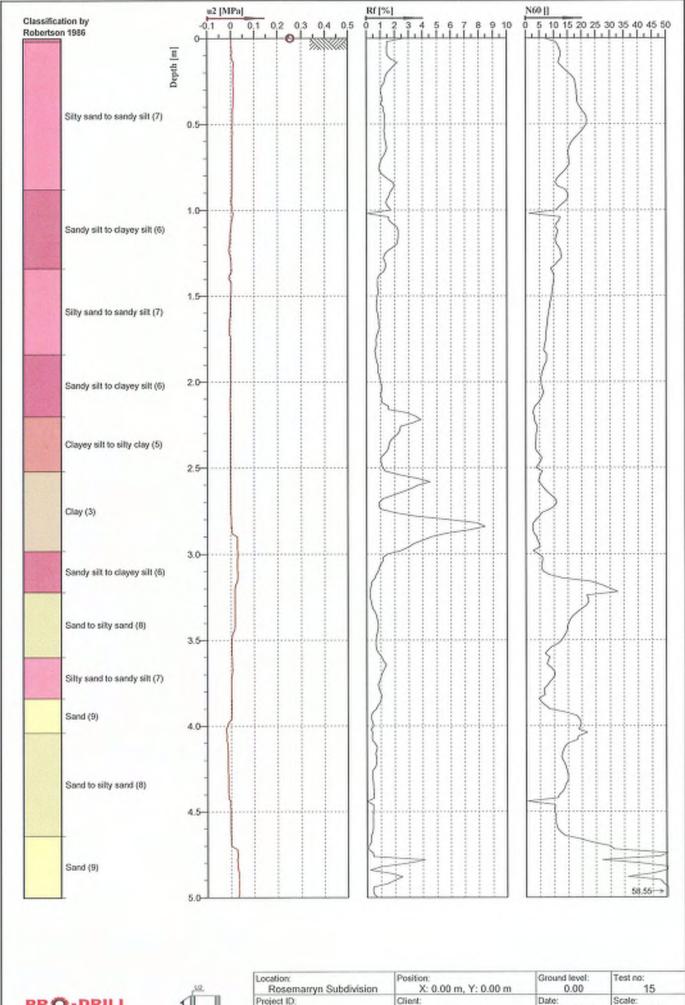






Cone No. 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 15
Project ID:	Client: Aurecon	Date: 4/21/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSul	odivisionCPT15.cp

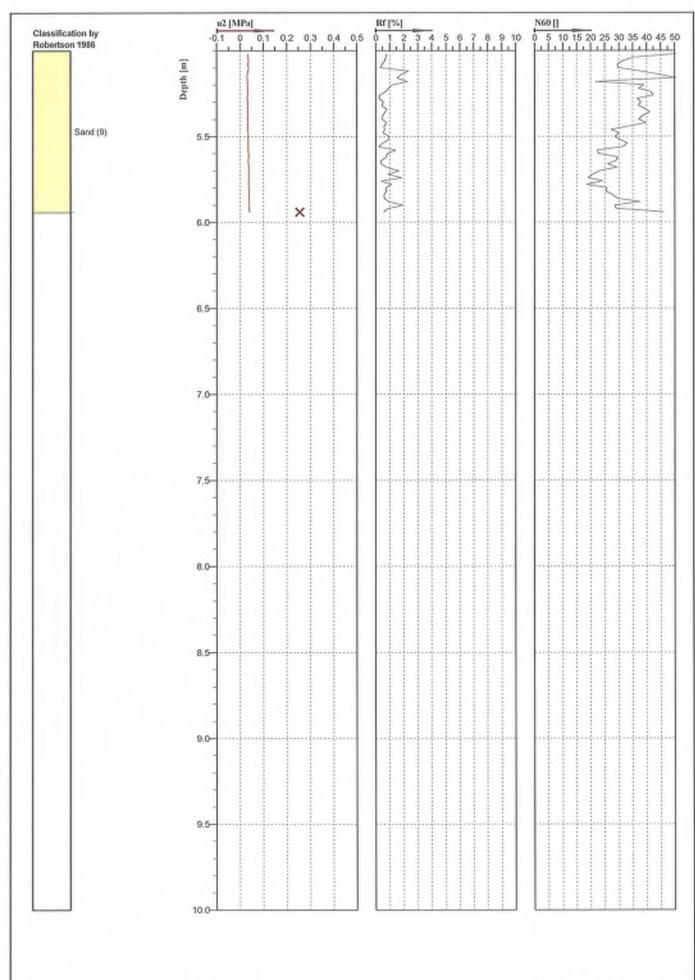


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Cone No: 4439 Tip area [cm2] 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSut	odivisionCPT15.c

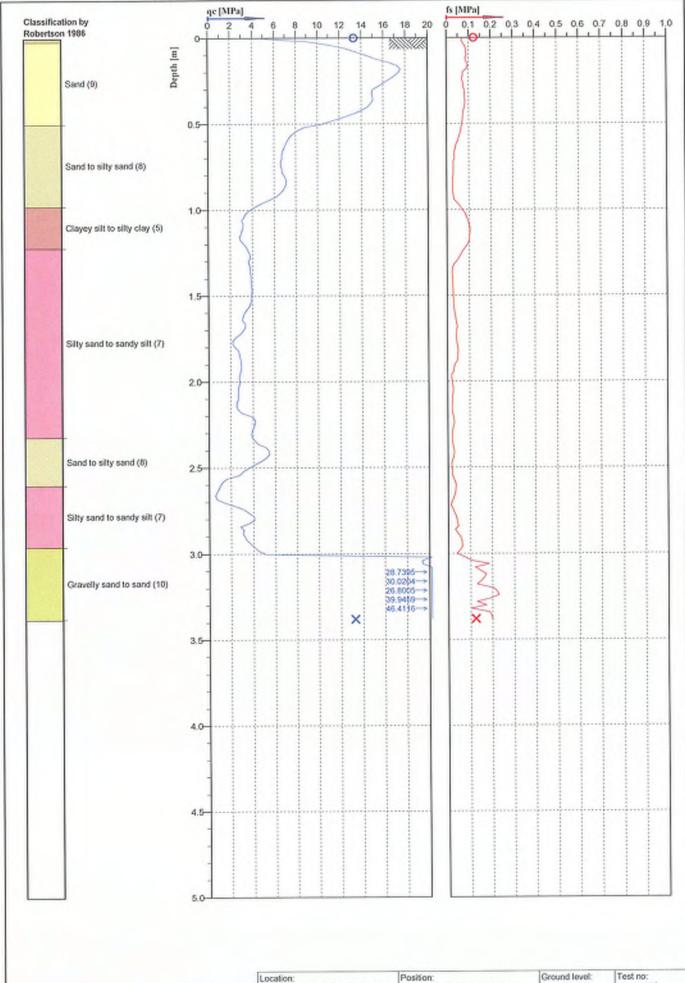






Cone No: 4439	
Tip area (cm2): 10	
Sleeve area [cm2]:	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSut	odivisionCPT15.cp

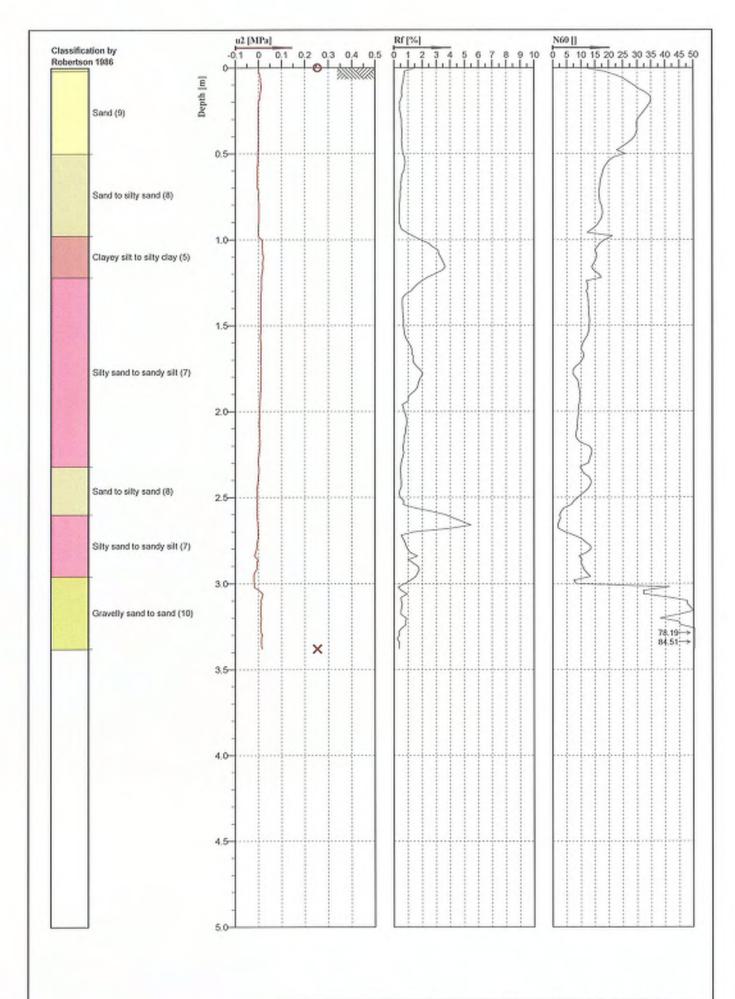






Cone No. 4439 Tip area [cm2] 10 Steeve area [cm2] 150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 16
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT16.cp

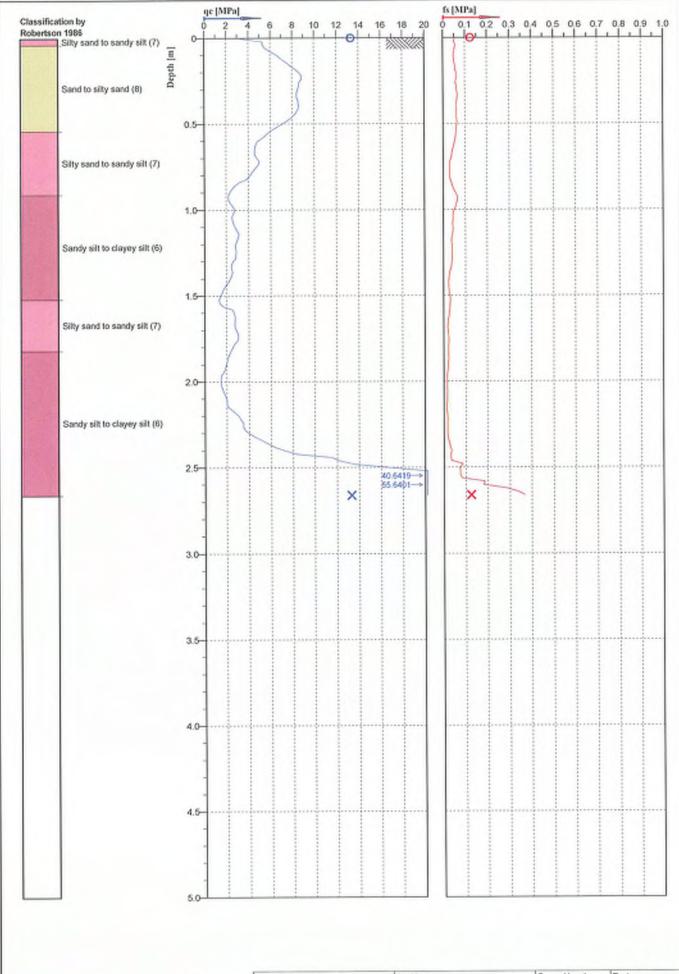






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	16
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSut	divisionCPT16.cr

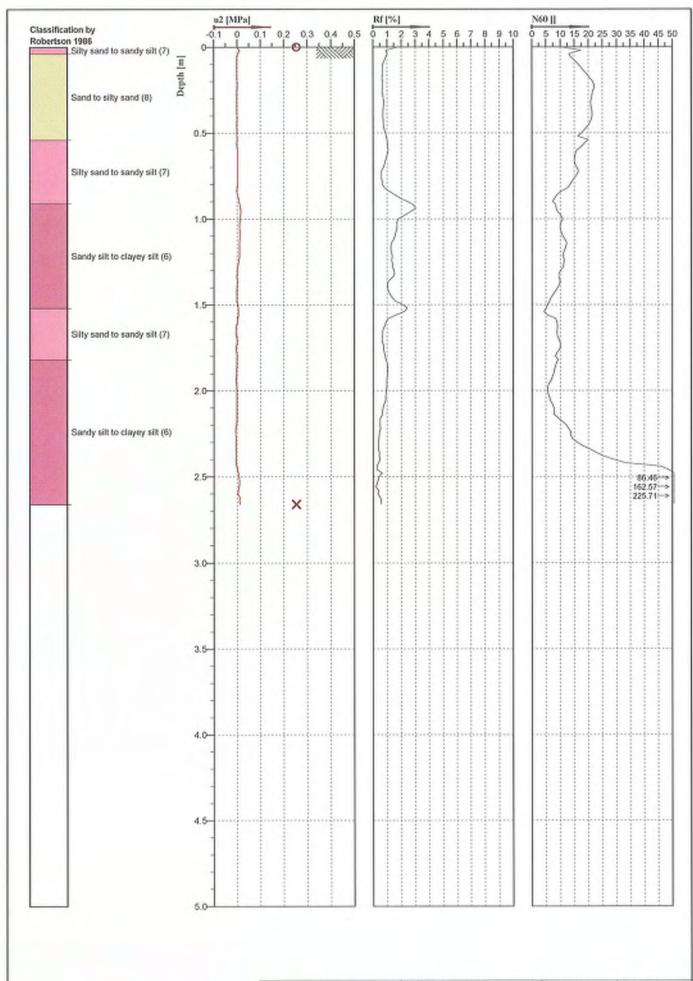






Cone No. 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	17
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSut	odivisionCPT17.cp

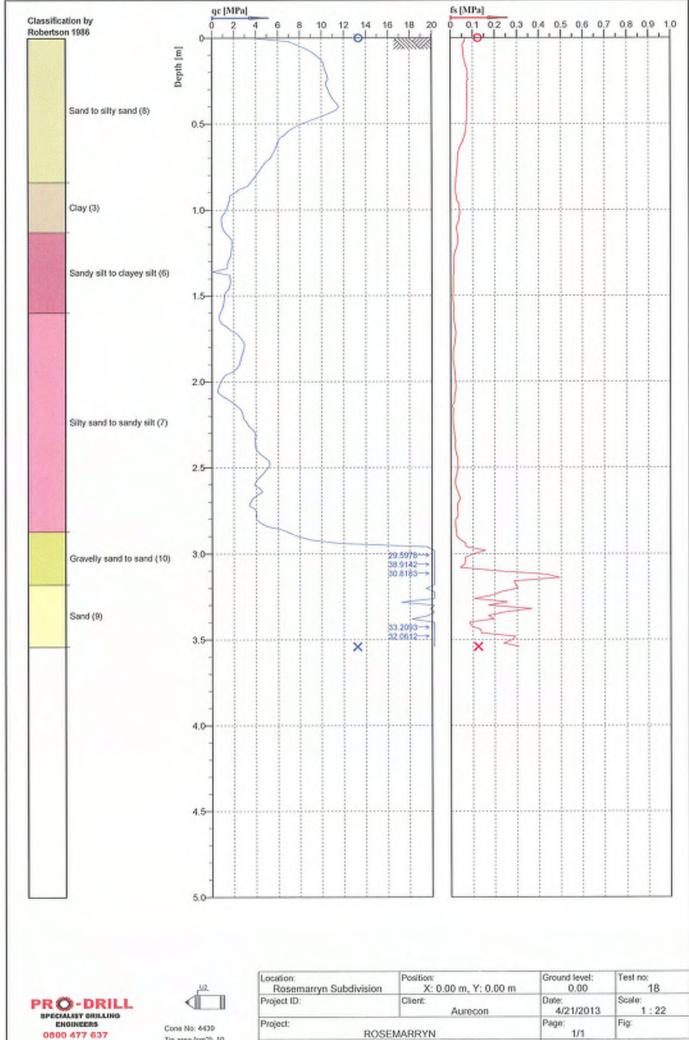


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Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

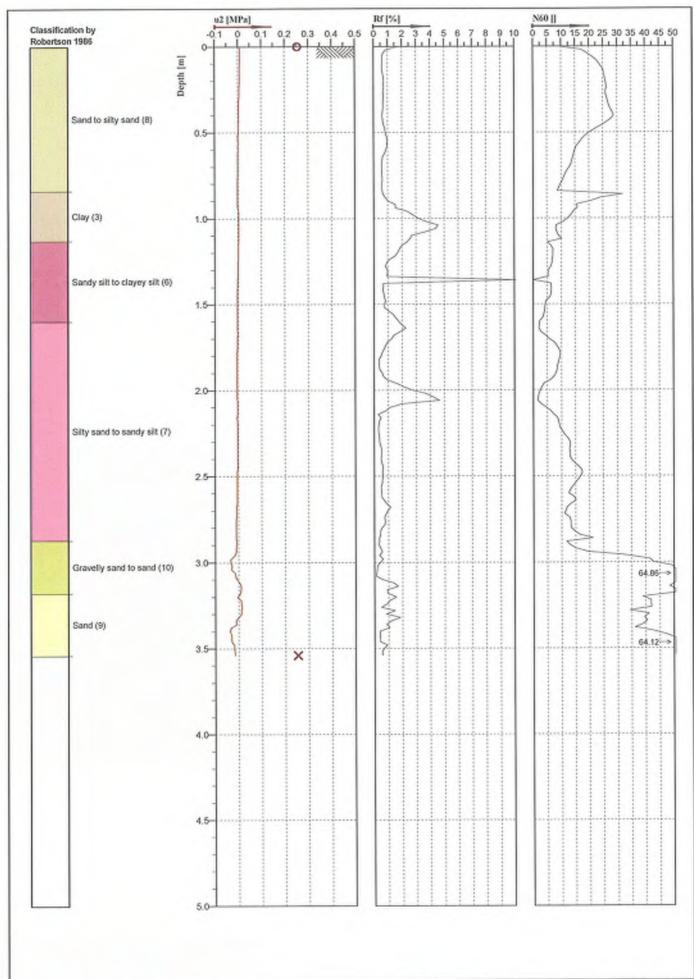
Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 17
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	ndivisionCPT17.cp



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Tip area (cm2): 10 Sleeve area (cm2): 150

		File: RosemarrynSult	odivisionCPT18.cp
Project: ROSEMARRYN		Page: 1/1	Fig:
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	18

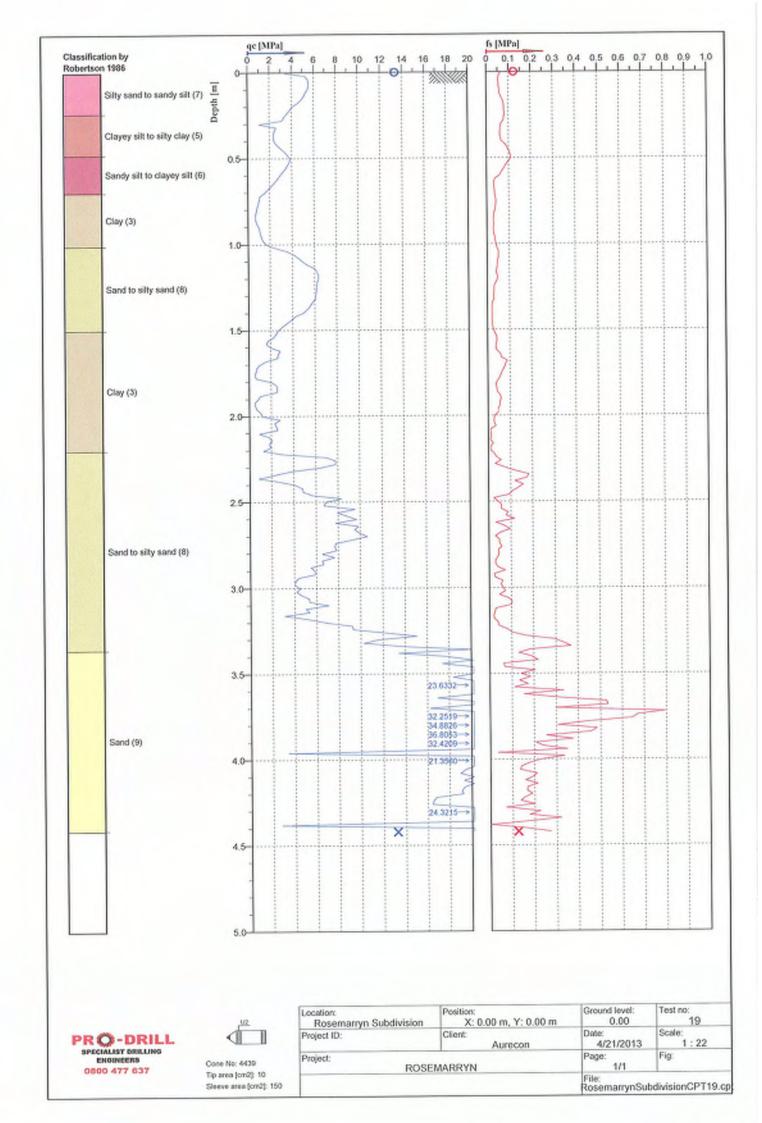


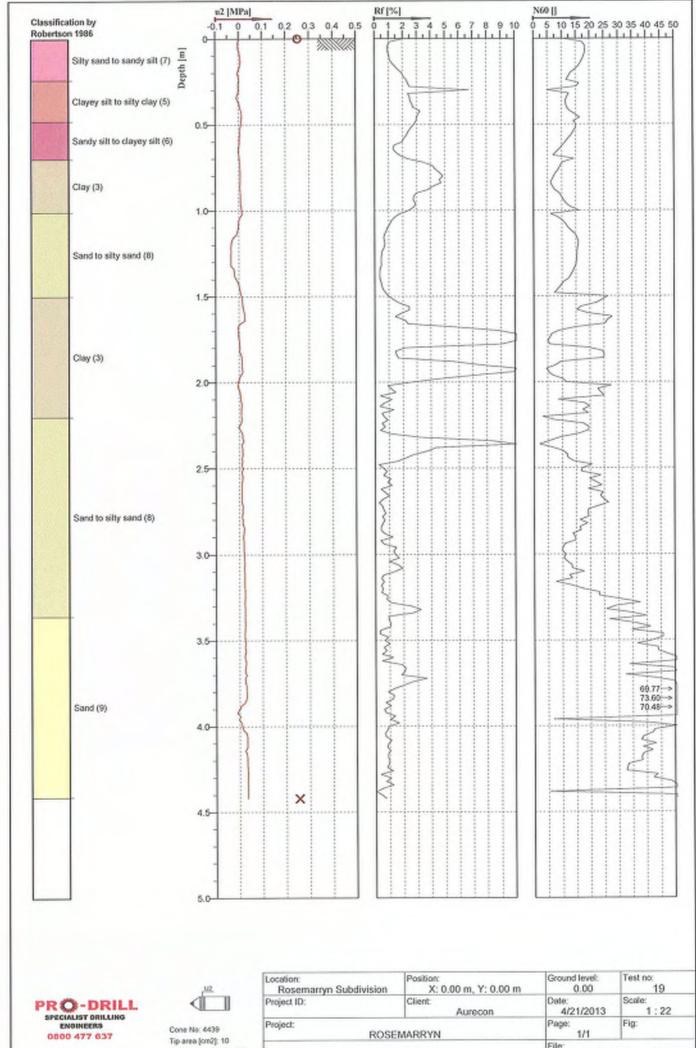




Cone No: 4439	
Tip area (cm2) 10	
Sleave area (cm2):	150

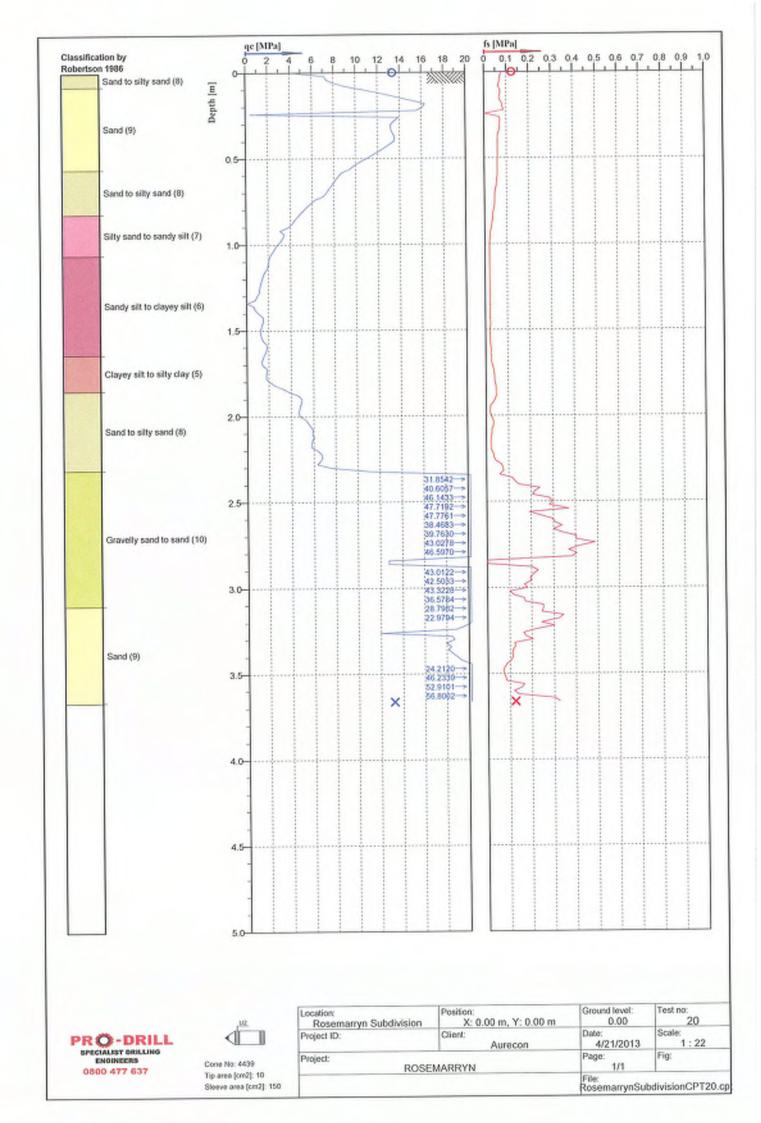
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	18
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT18.cg

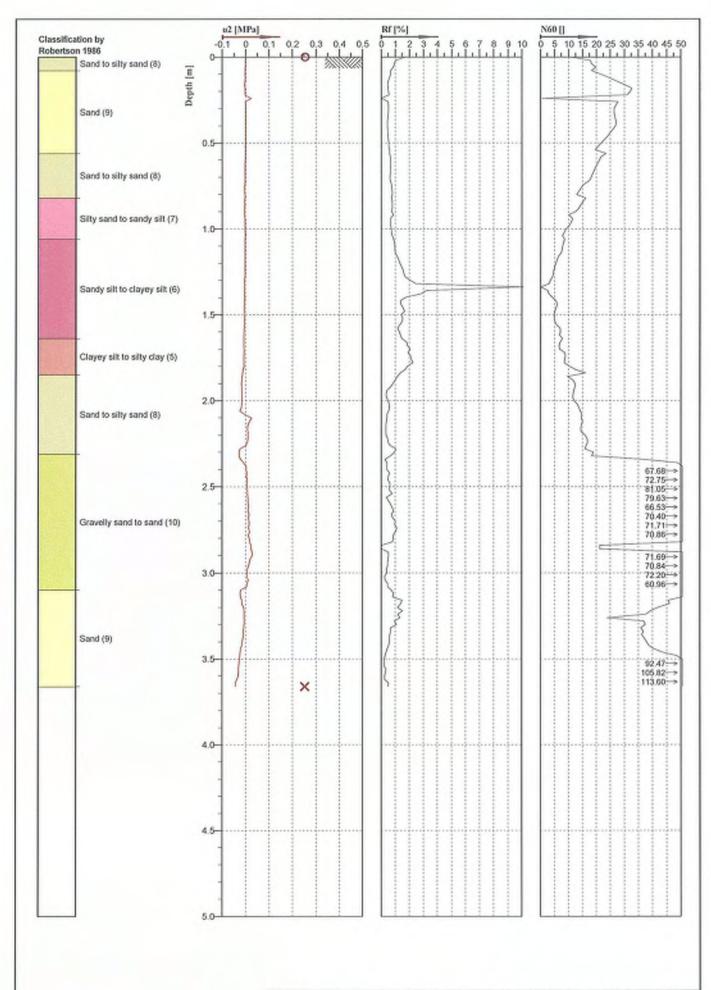




Sleeve area (cm2): 150

		File: RosemarrynSul	divisionCPT19.cp
Project: ROSEMARRYN		Page: Fig:	Fig:
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	19



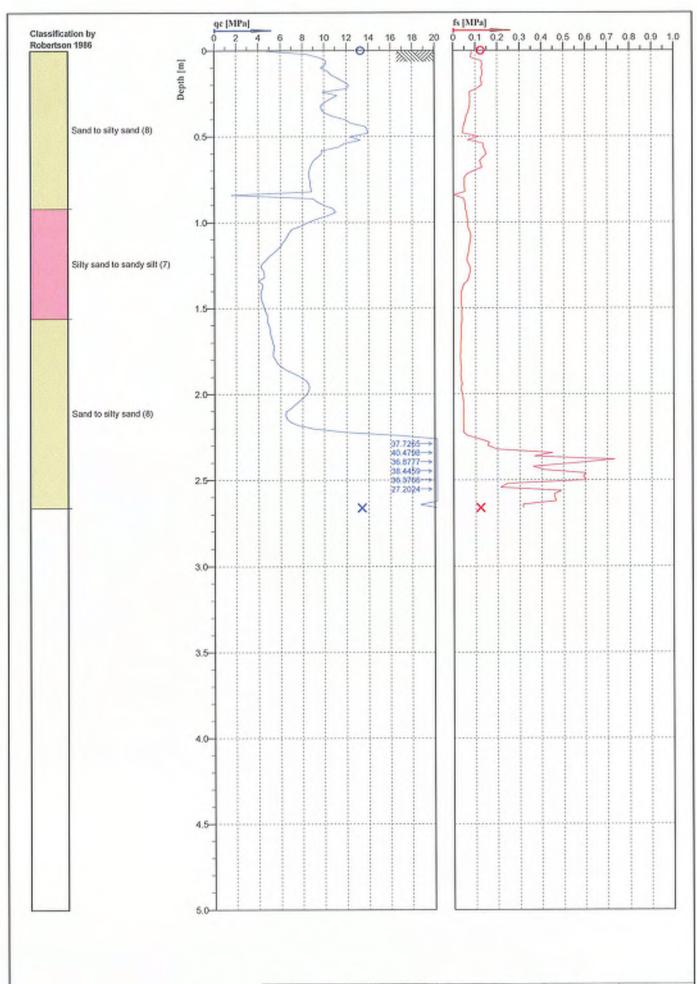






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	20
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSut	divisionCPT20.cp







Cone No: 4439
Tip area (cm2): 10
Sleeve area (cm2): 150

Location Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 21
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT21.cp

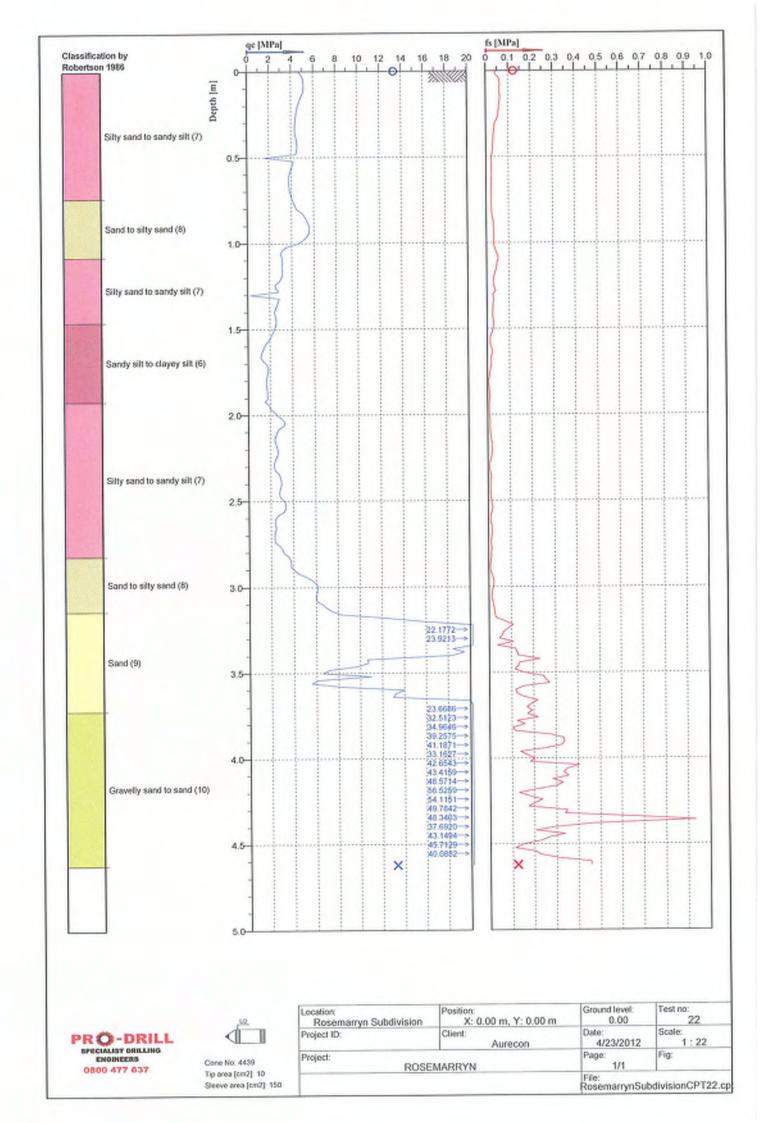


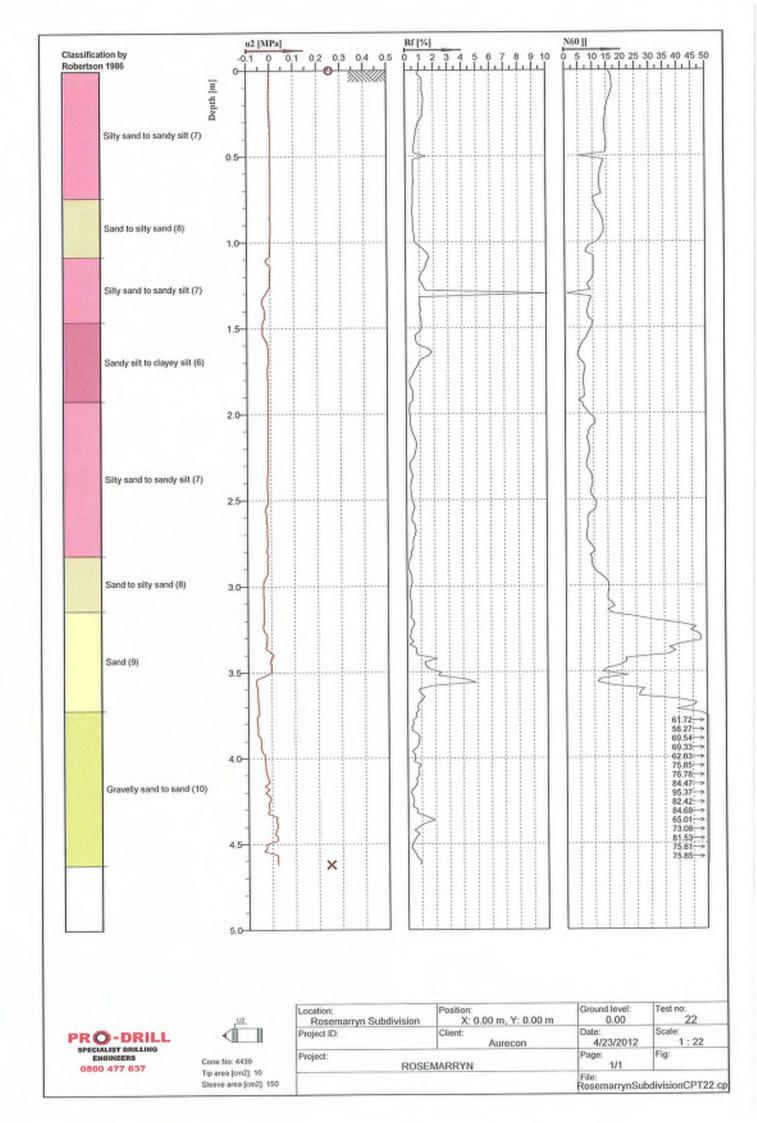


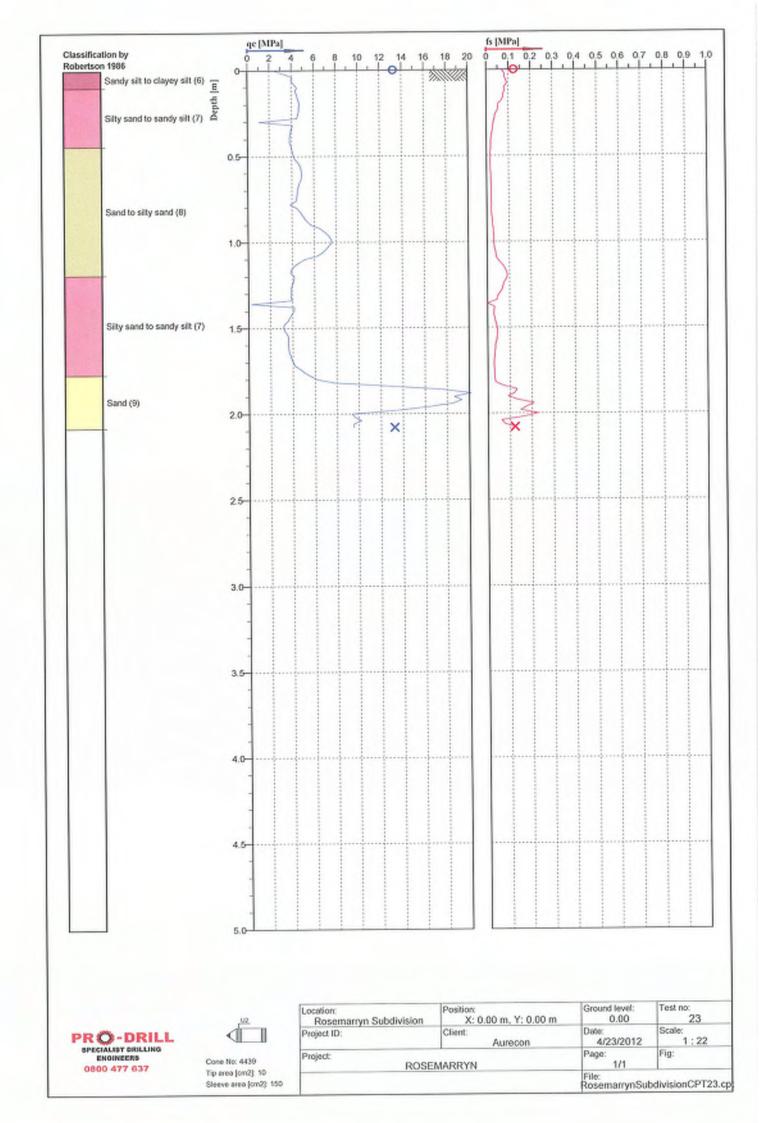


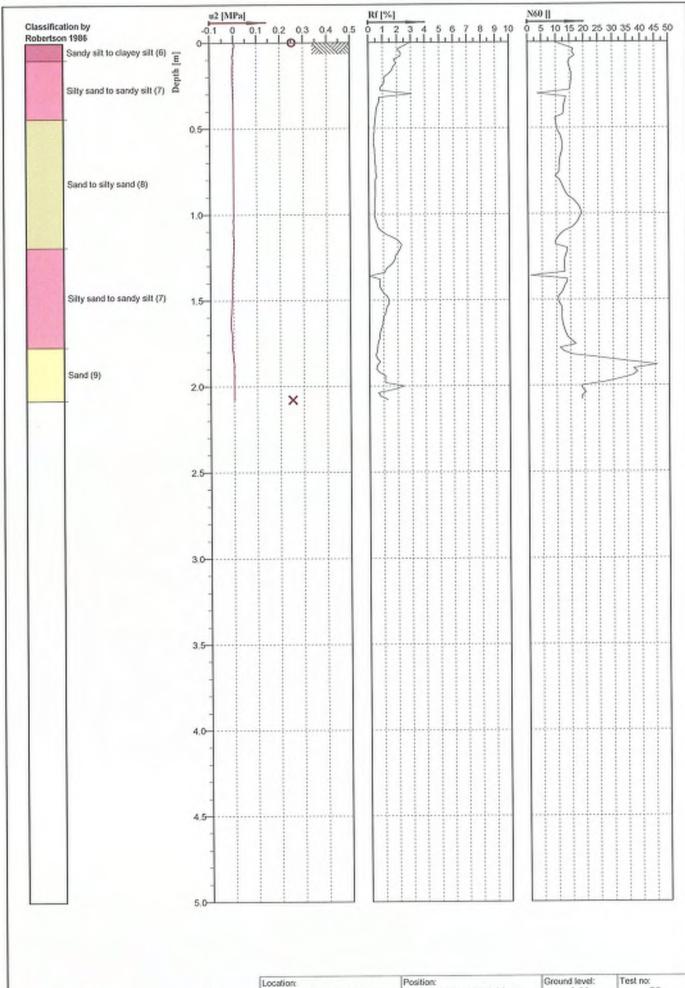
Cona No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

Location:	Position	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	21
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: Fig:	Fig:
		File: RosemarrynSul	bdivisionCPT21.cp







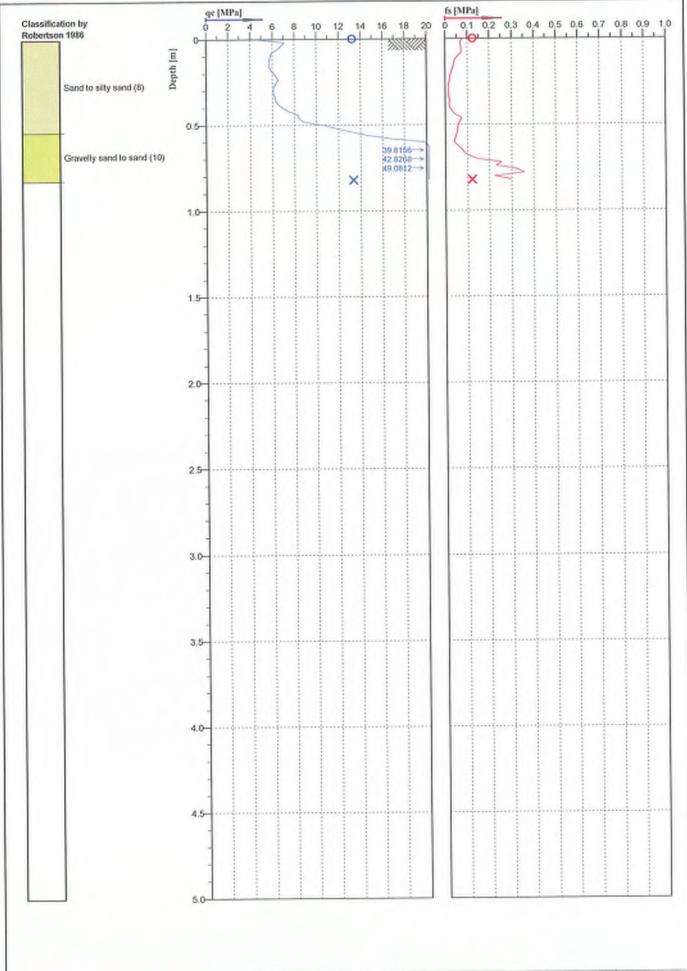






Cone No: 4439 Tip area (on/2): 10 Stoeve area (on/2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	23
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	bdivisionCPT23.cp

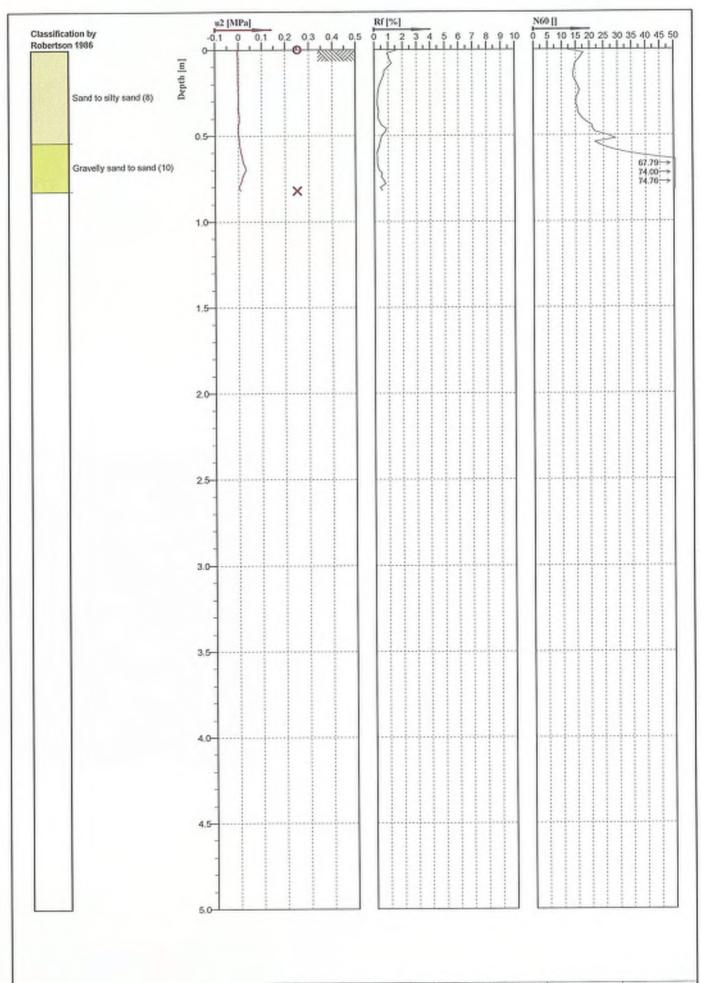






Cone No: 4439	
Tip area [cm2]: 10	
Sieeve area [cm2]	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	CPT24
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	bdivisionCPT24.cp

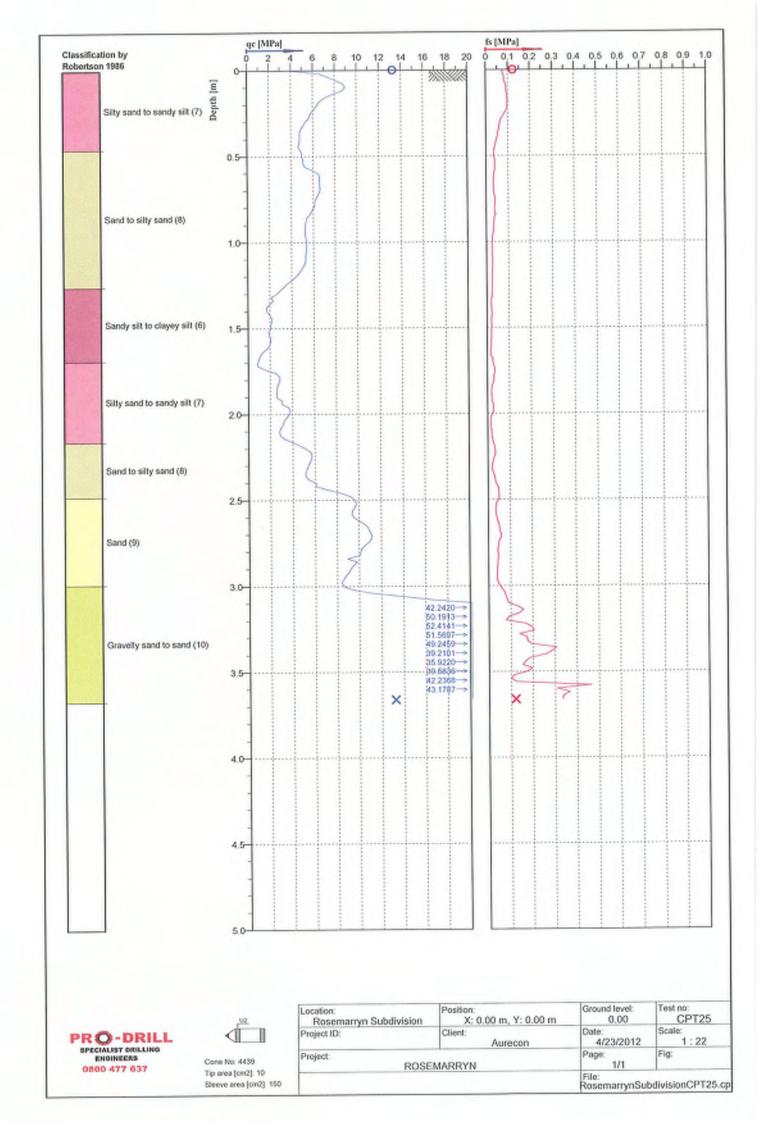


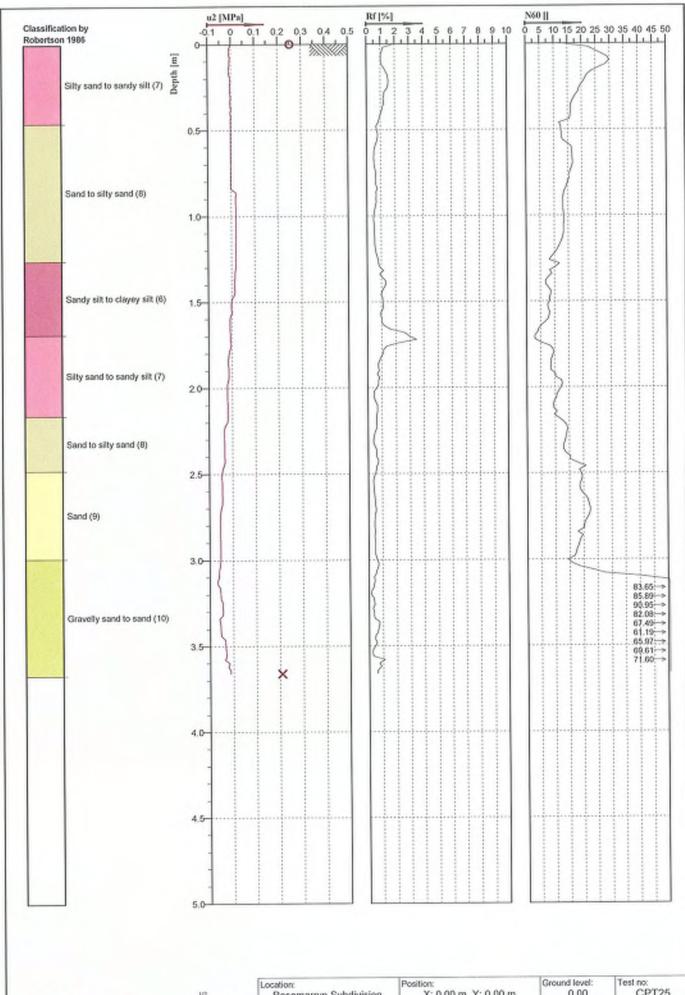




Cone No. 4439
Tip area [om2]: 10
Steeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	CPT24
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT24.cp



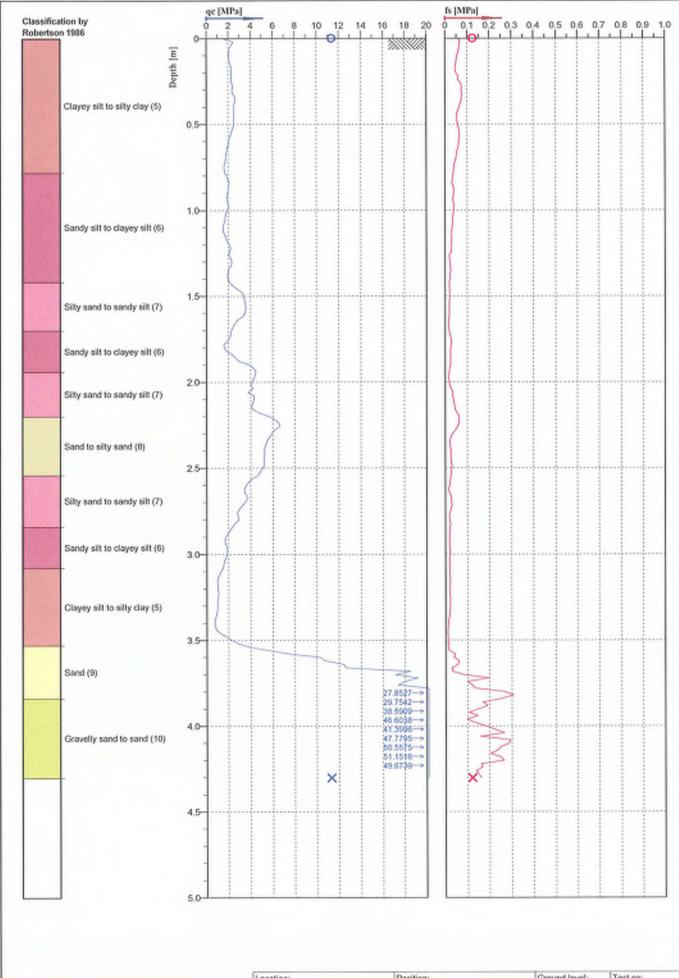






Cone No: 4439	
Tip area (cm2): 10	
Steeve area (cm2):	150

		File: RosemarrynSubdivisionCPT25.cp	
Project: ROSEMARRYN		Page: 1/1	Fig:
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	CPT25

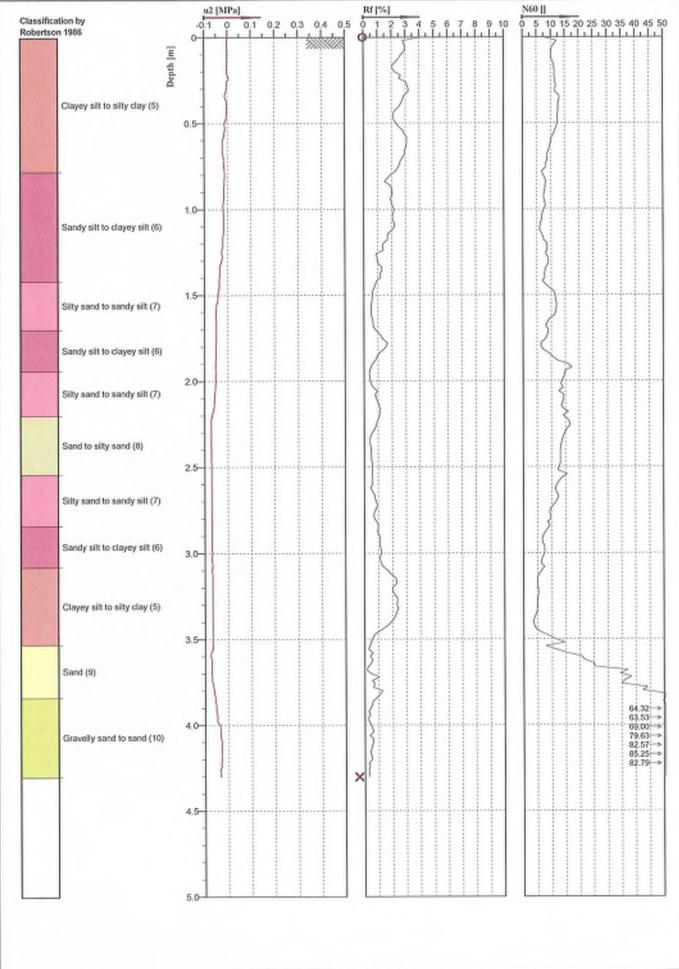






Cone No: 4485	
Tip area (cm2): 10	
Steeve area [cm2]:	150

Location: Rosemarryn Subdivision	Position: X: 0,00 m, Y: 0.00 m	Ground level: 0.00	Test no: 27
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSult	odivisionCPT27.cp

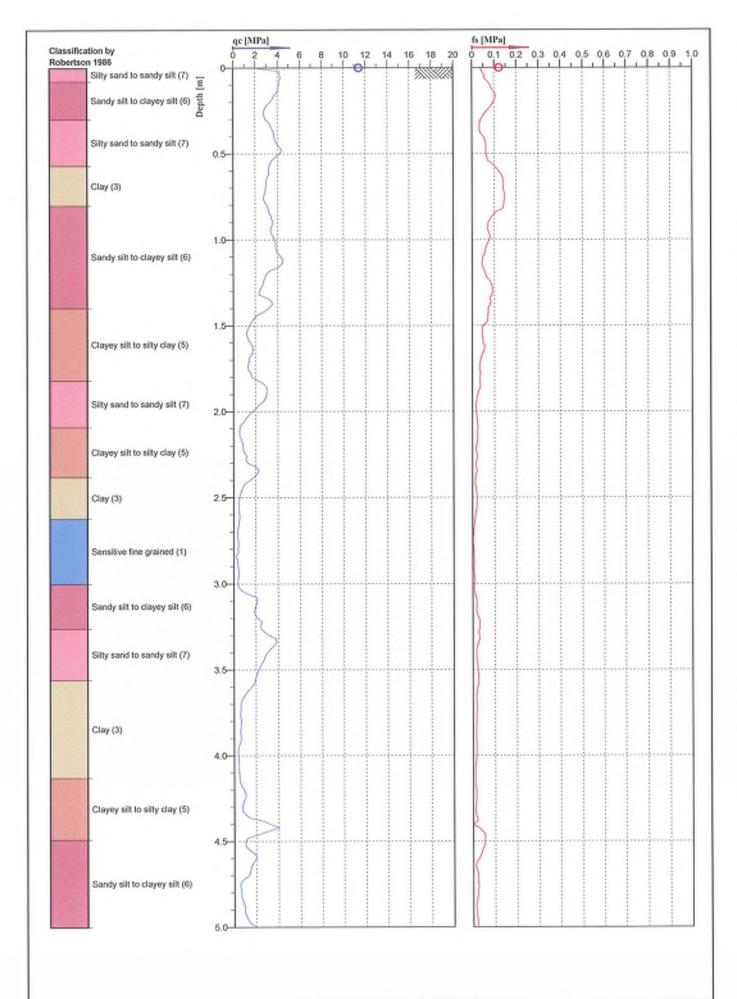






Cone No: 4485	
Tip area [cm2]: 10	
Sleeve area [cm2]:	150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 27
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT27.cp

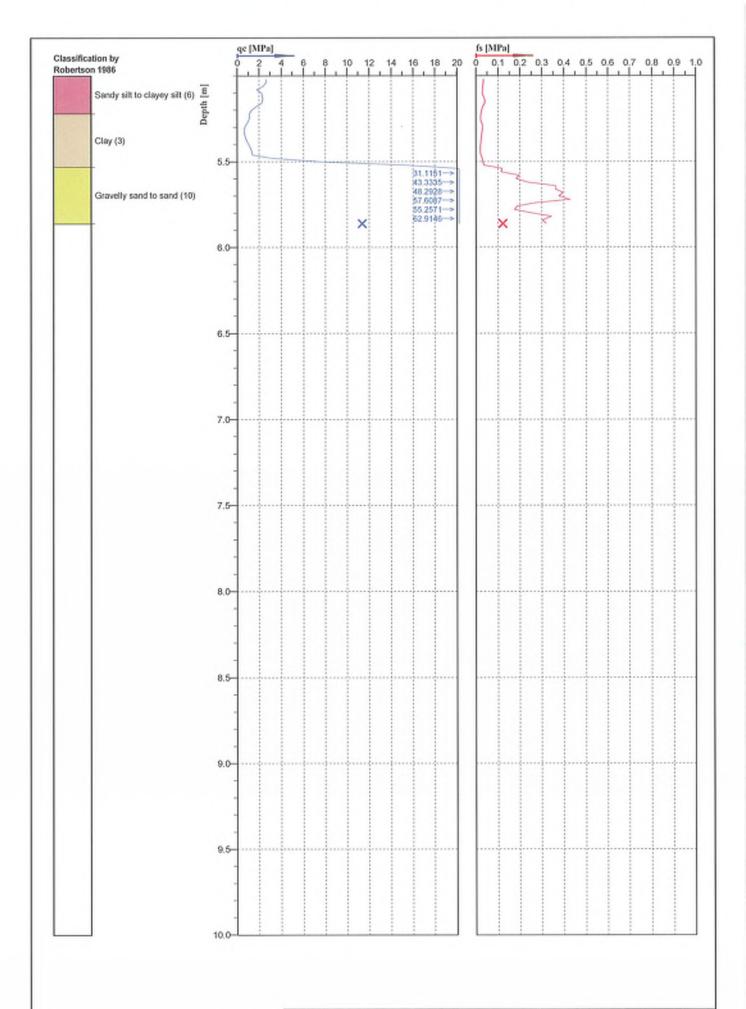






Cone No: 4485 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cpt

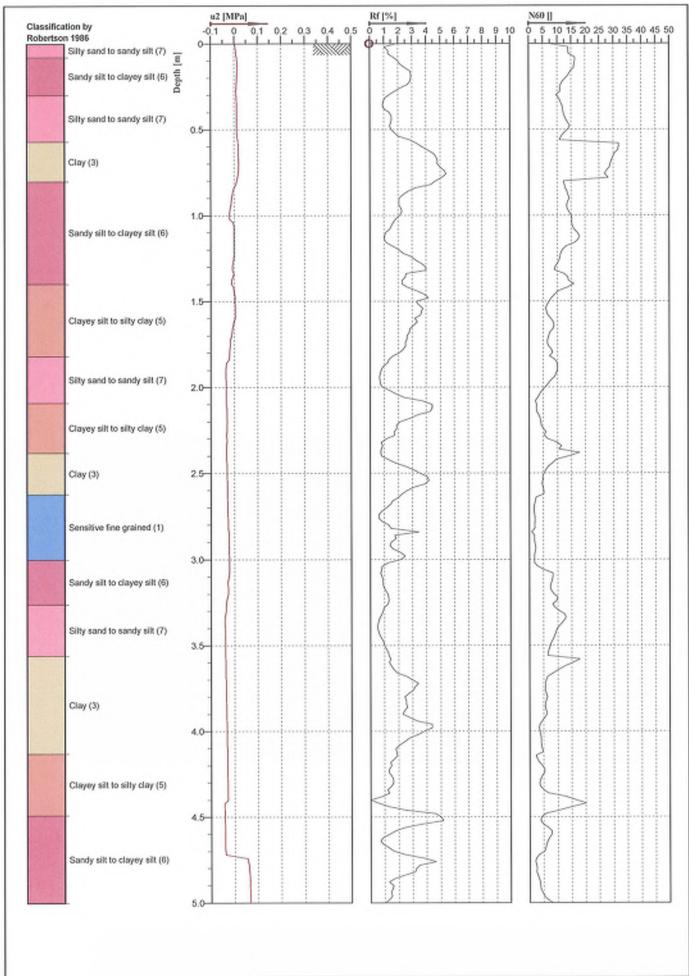






Cone No: 4495 Tip area (cm2): 10 Sieeve area (cm2): 150

Location:	Position:	Ground level;	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT1.cpt

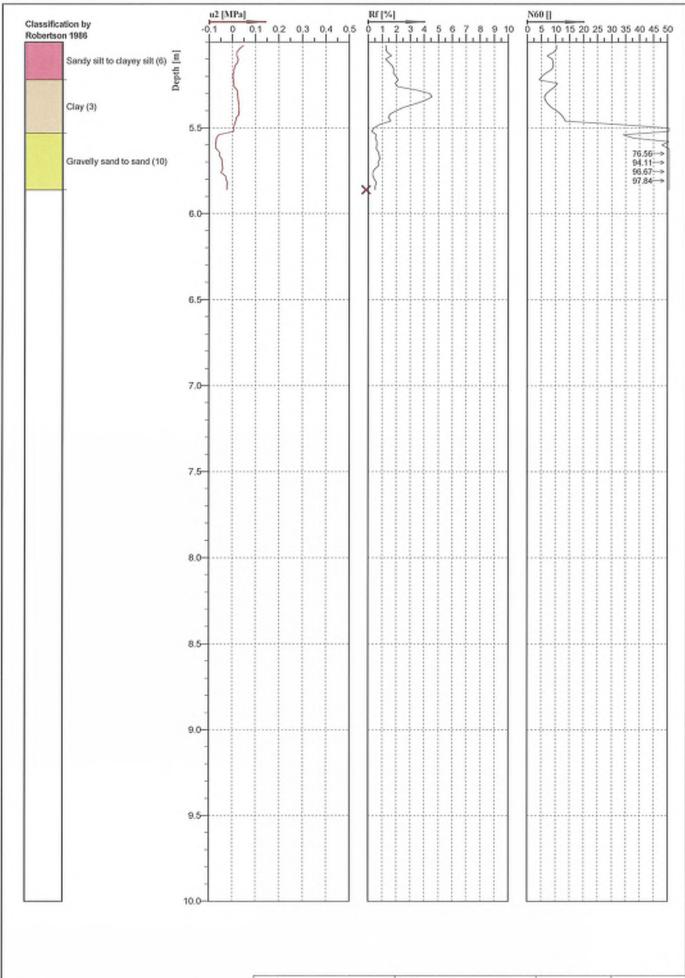






Cone No: 4485 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSubdivisionCPT1.cpt	

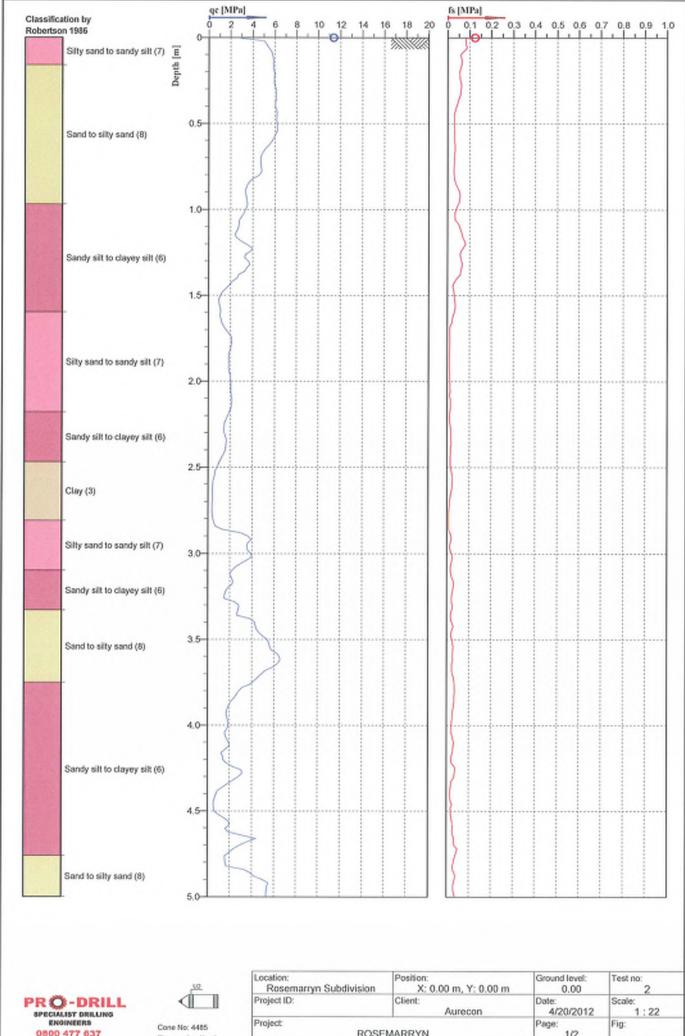






Cone No: 4485 Tip area [cm2]: 10 Sileeve area [cm2]: 150

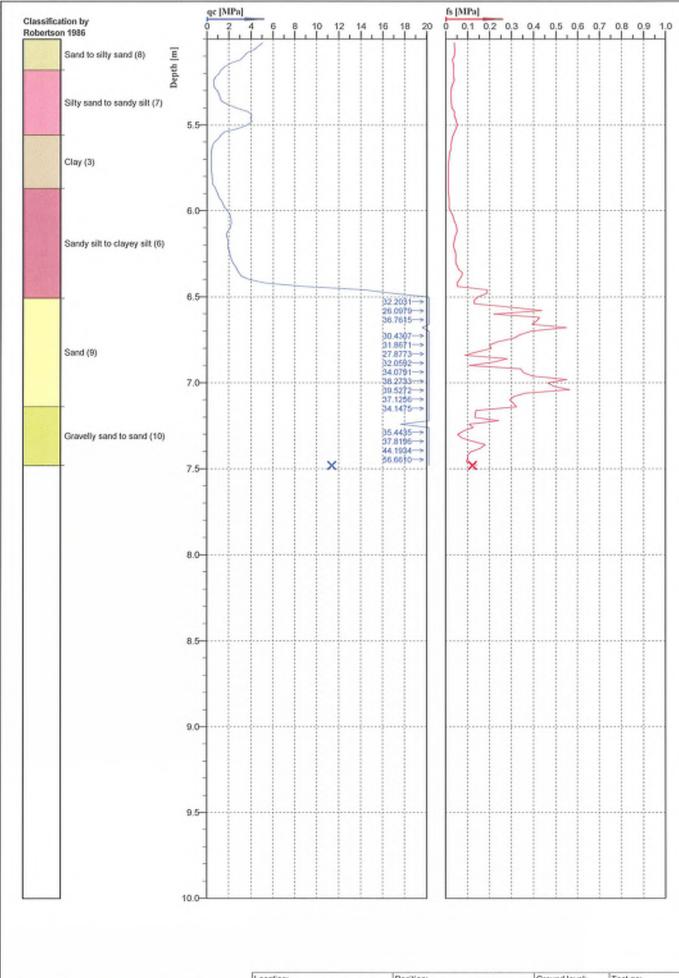
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSubdivisionCPT1.cpt	



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Tip area (cm2) 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSubdivisionCPT2.cpt	

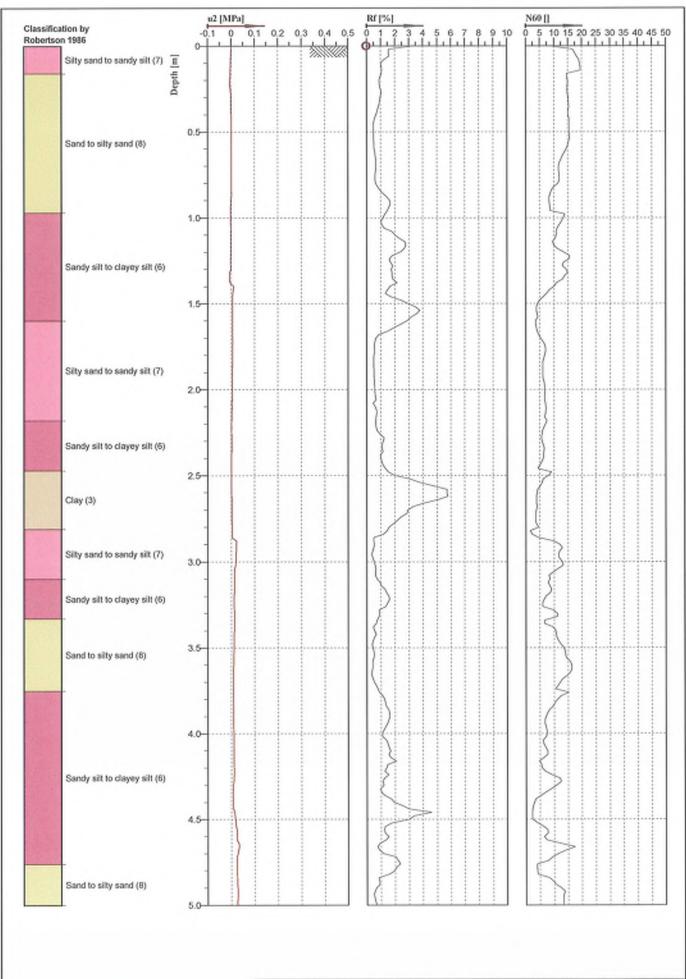






Cone No: 4485 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
			hdivisionCPT2 o

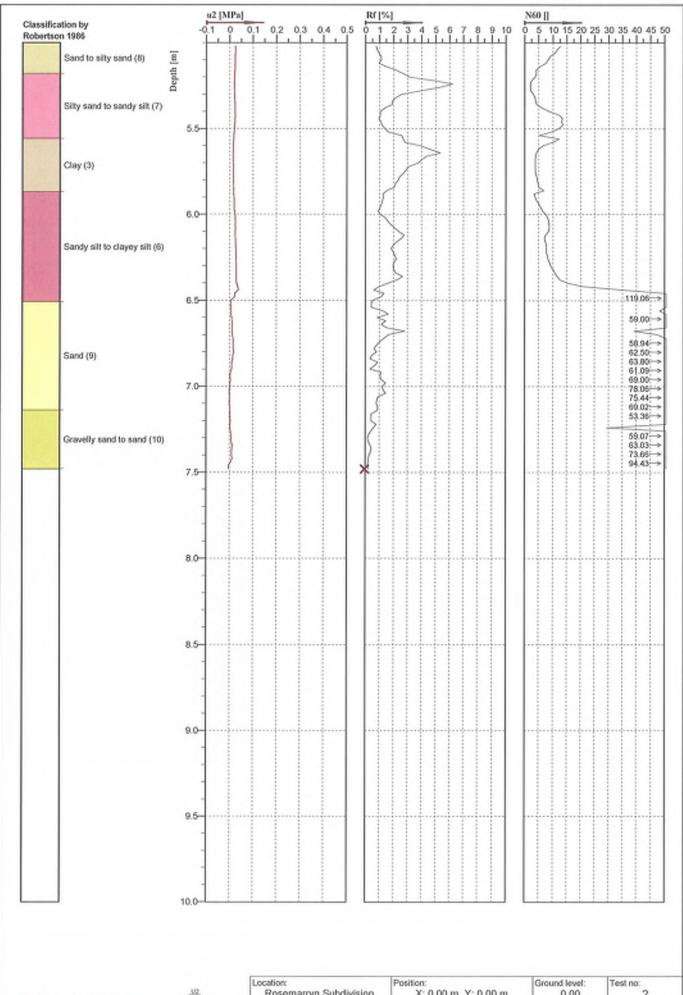






Cone No: 4485 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	2
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT2.cpt

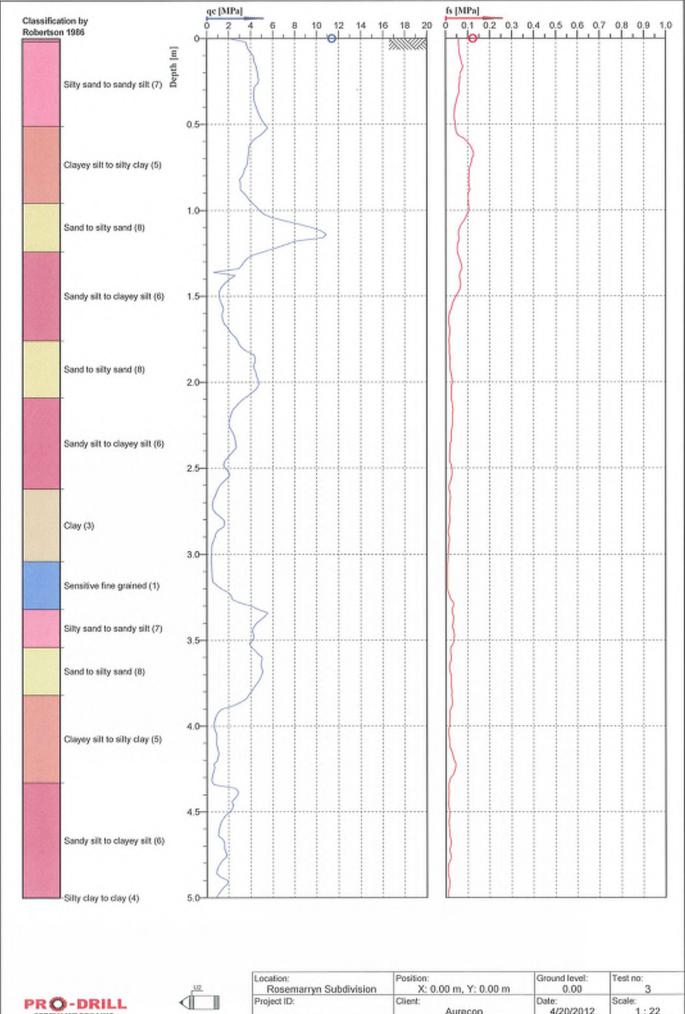


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Cone No: 4465 Tip area [cm2]: 10 Steeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	2
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT2.cpt

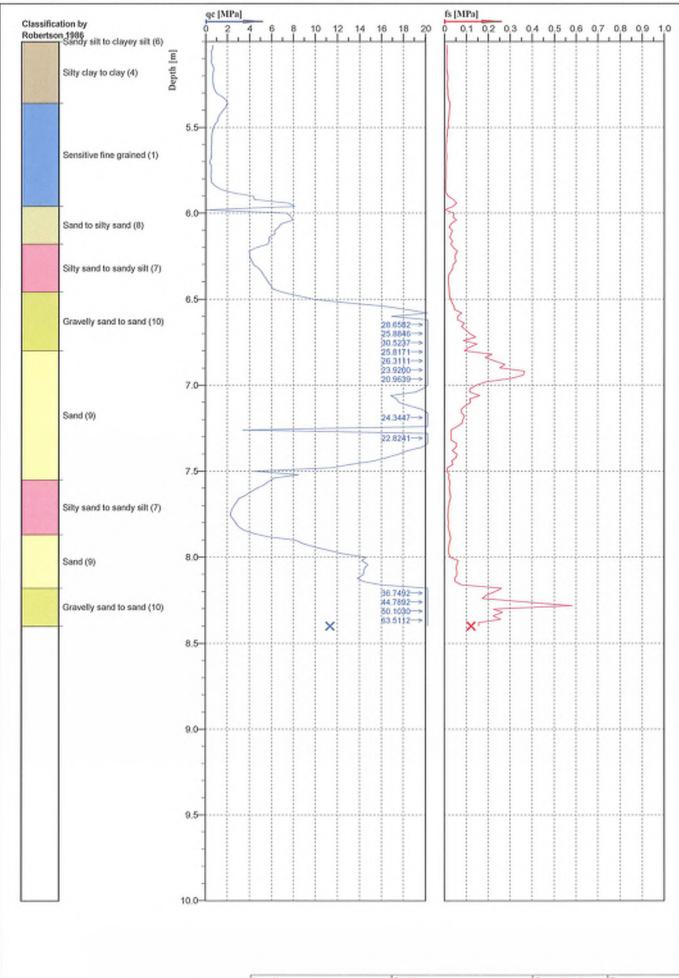






Cor	ne No: 4485	
	area [cm2]: 10	
	eve area form23	

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt

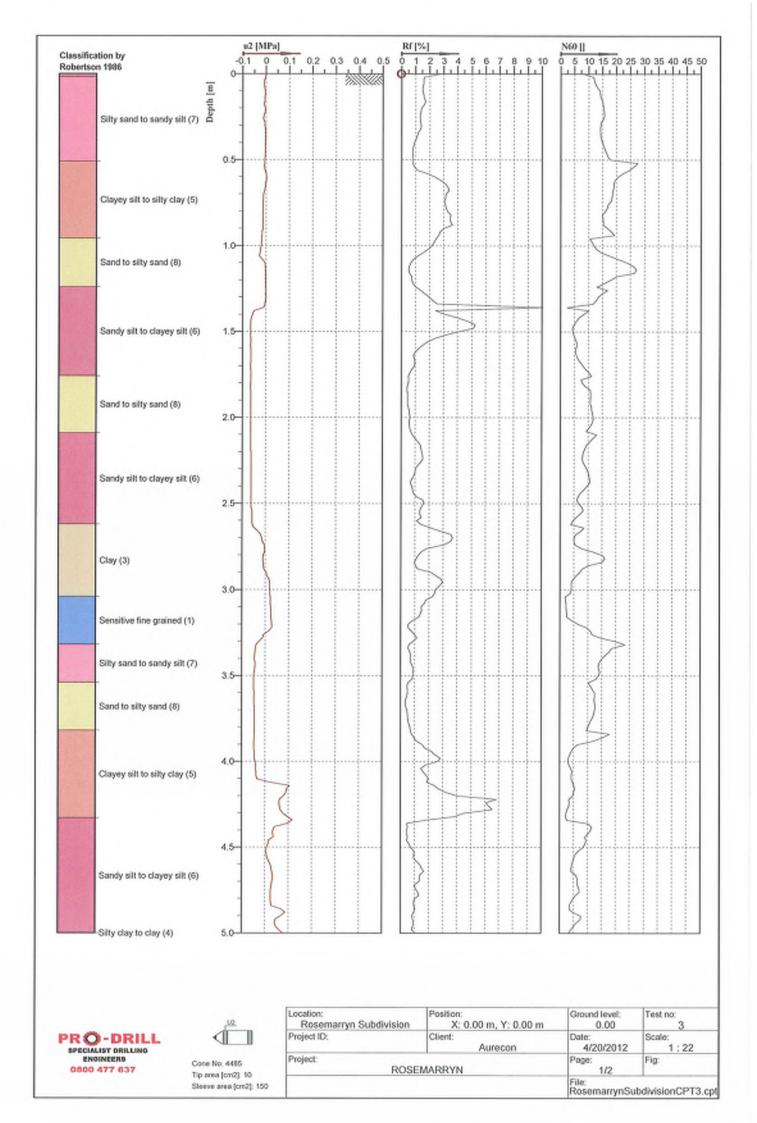


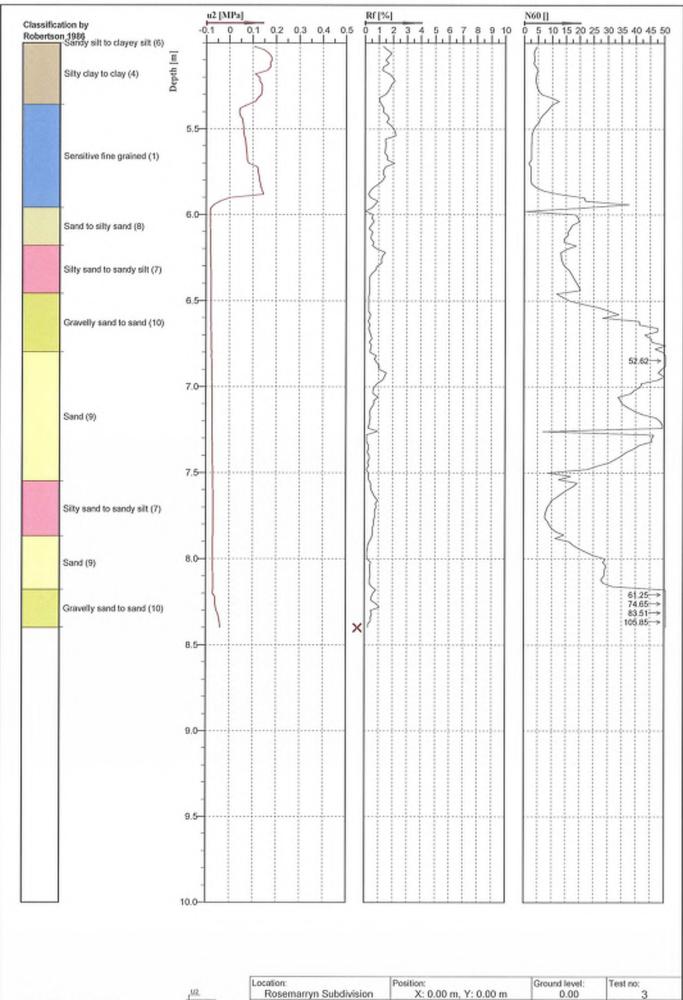




Cone No: 4485 Tip area (cm2): 10 Steeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt



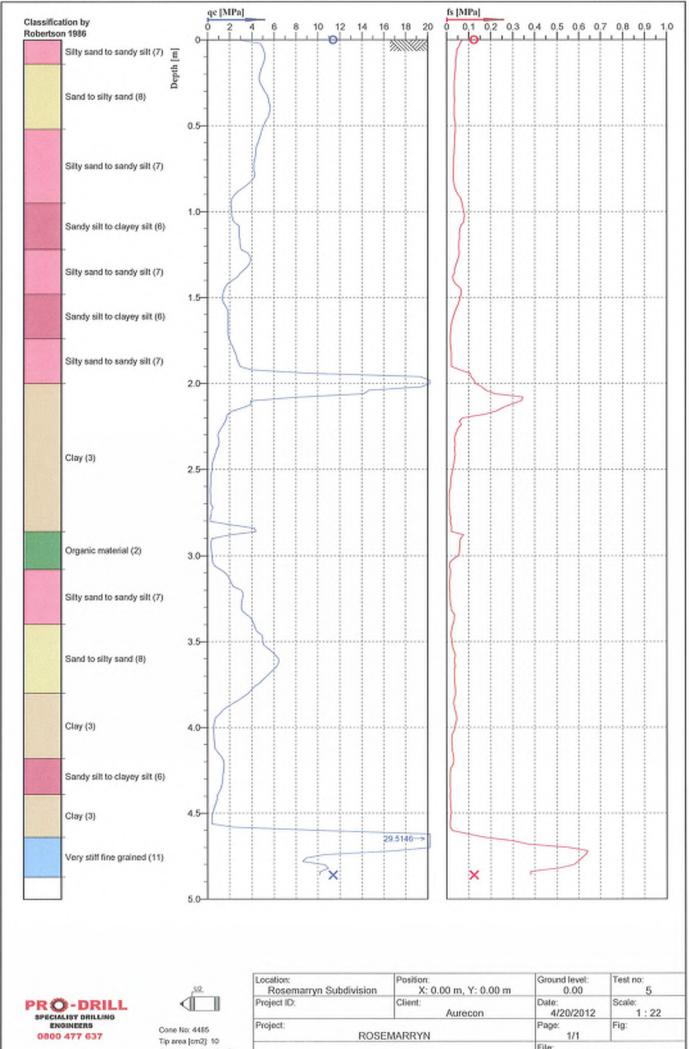


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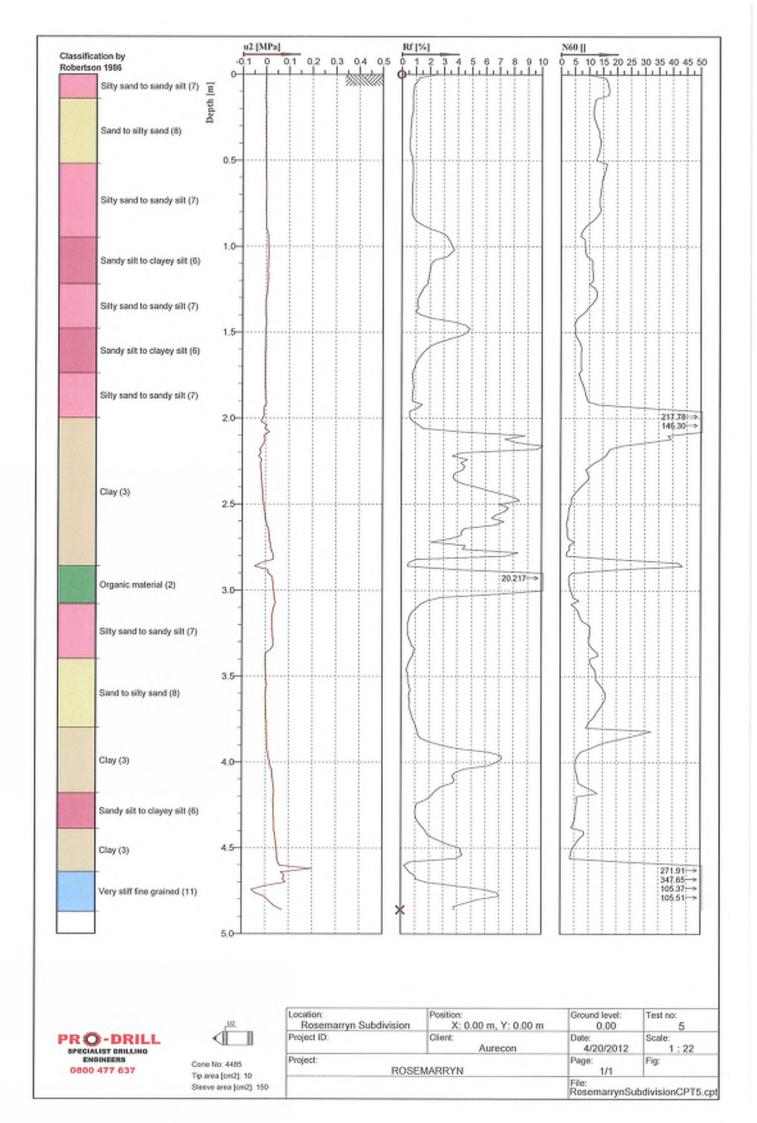
Cone No: 4485 Tip area [cm2]: 10 Sieeve area [cm2]: 150

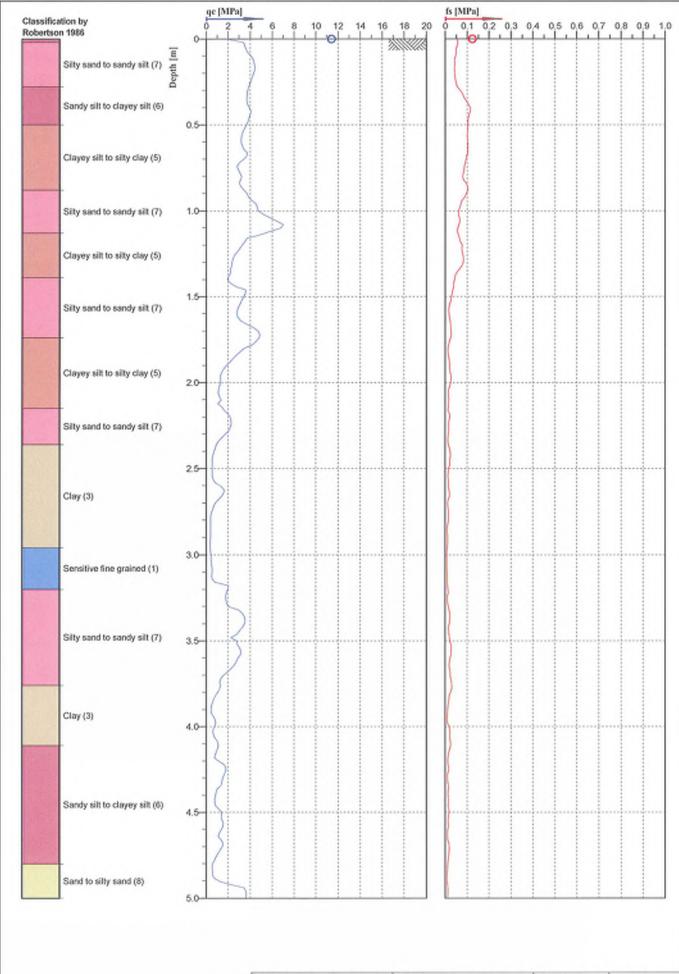
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT3.cpt



Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	5
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSu	bdivisionCPT5.cpt



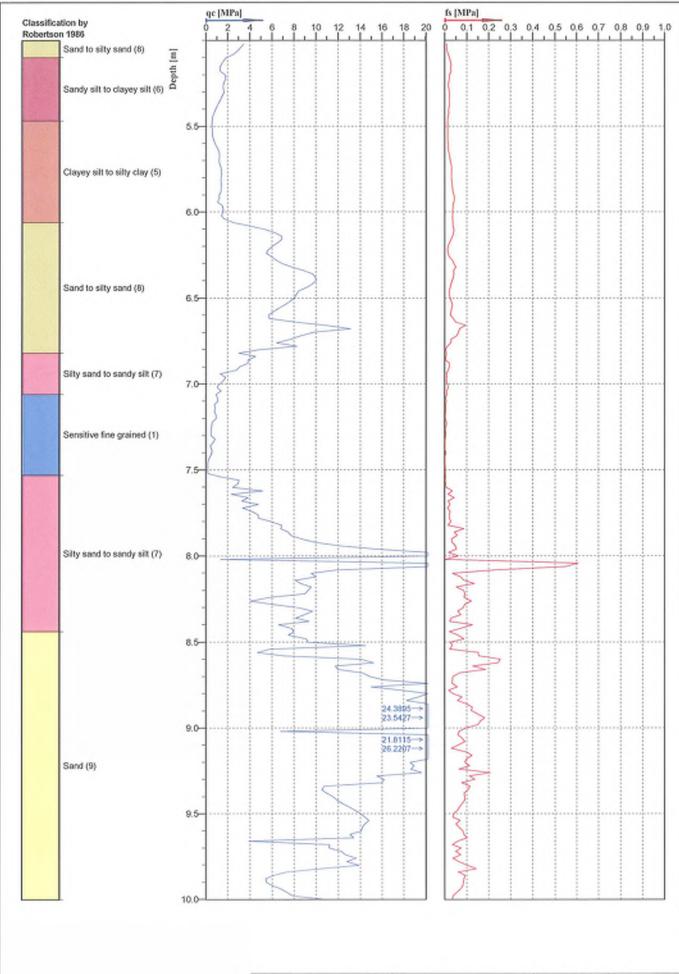






Cor	o N	lo: 44	105		
Tip	are	a [cm	21:	10	
Ste	ovo	area	[cn	n2):	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/3	Fig:
	File: RosemarrynSubo		bdivisionCPT6.cpt

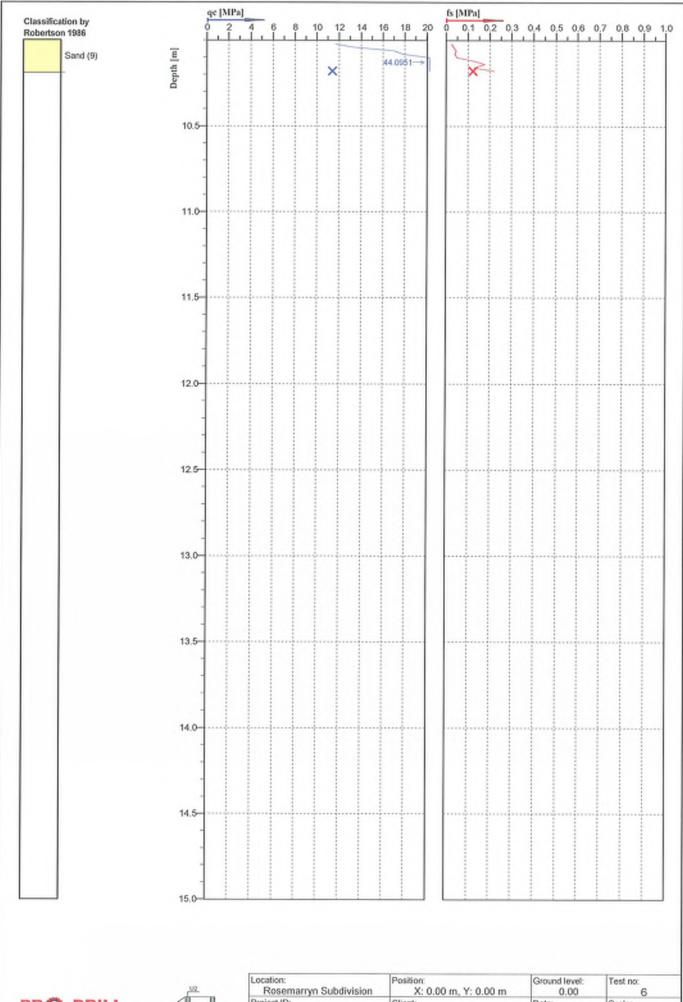






Cone No: 4485	
Tip area [cm2]: 10	
Sleeve area (cm2): 150	

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no:
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSEMARRYN		Page: 2/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cp

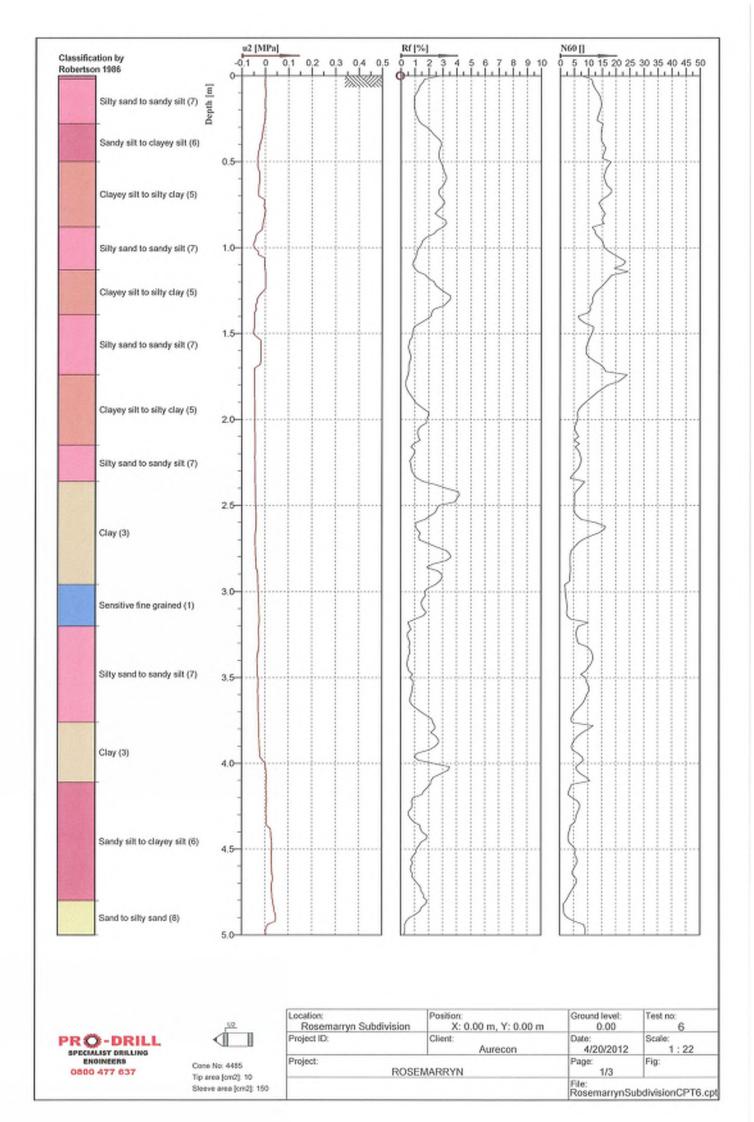


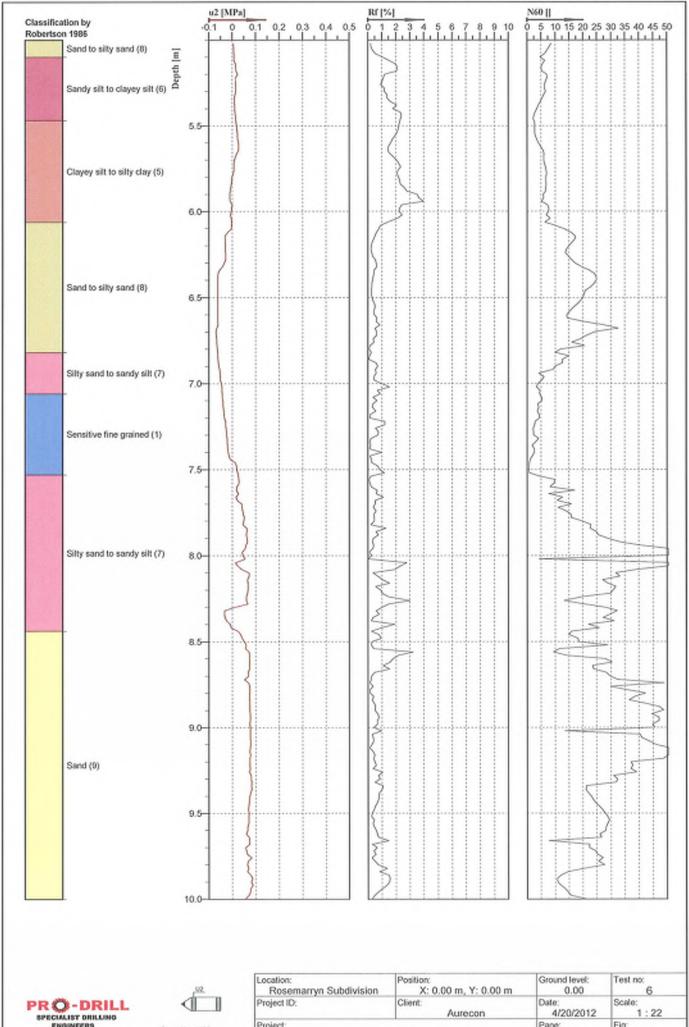
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Cone No: 4495 Tip area (cm2): 10 Sloove area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project ROSEMARRYN		Page: 3/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.cpt

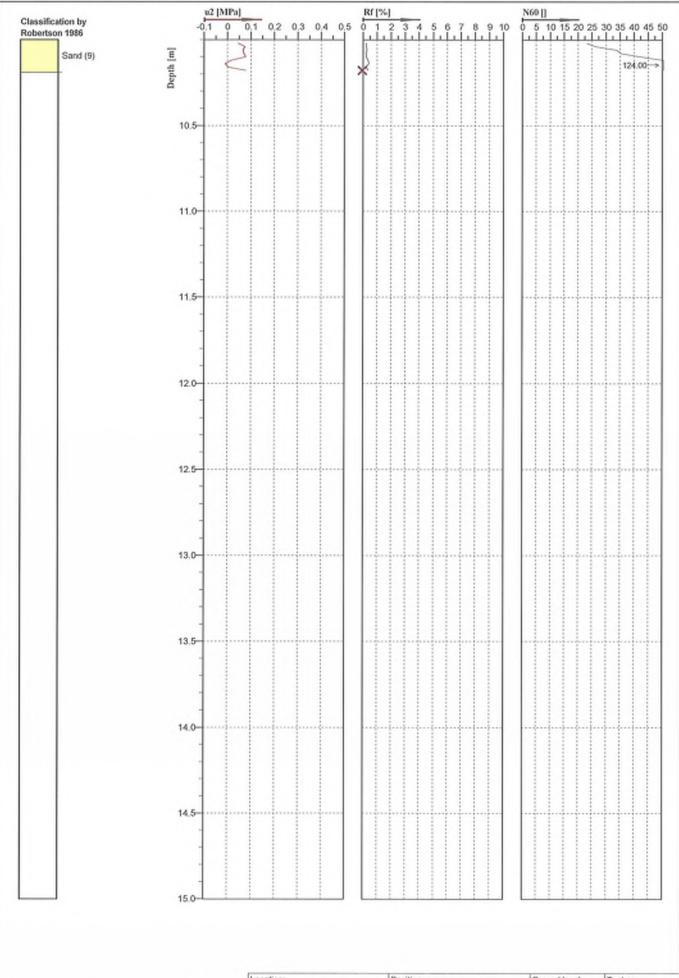






Cone No: 4485	
Tip area (cm2): 10	
Sleeve area (cm2): 150	

Project: ROSEMARRYN		File: RosemarrynSu	bdivisionCPT6.cpt
		Page: 2/3	Fig:
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	6

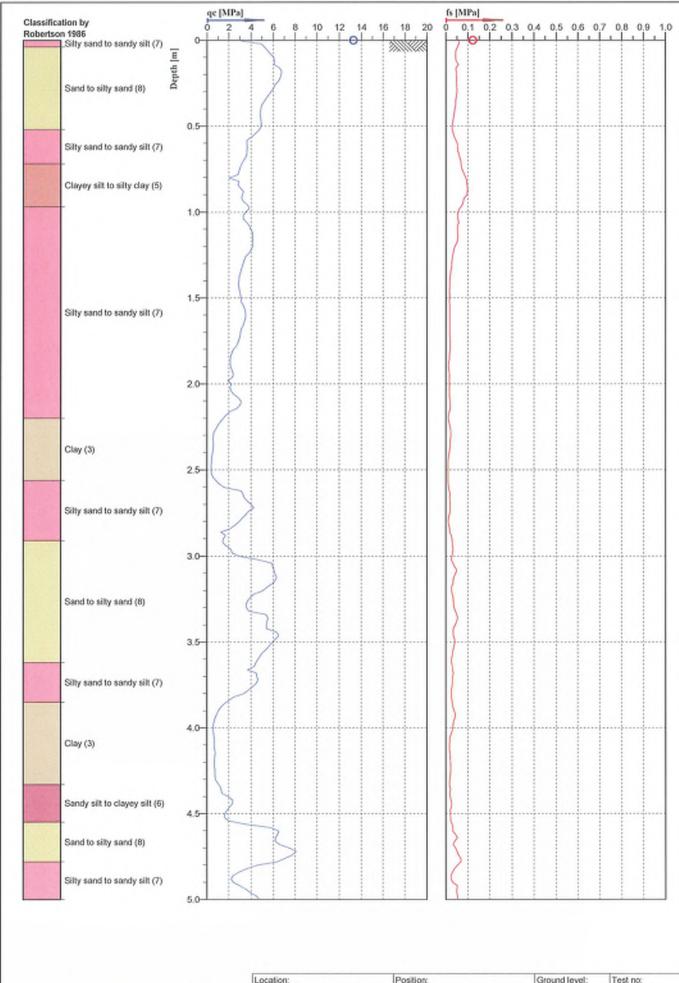






Cone No: 4485	
Tip area (cm2): 10	
Sleeve area (cm2)	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 3/3	Fig:
		File: RosemarrynSu	bdivisionCPT6.c

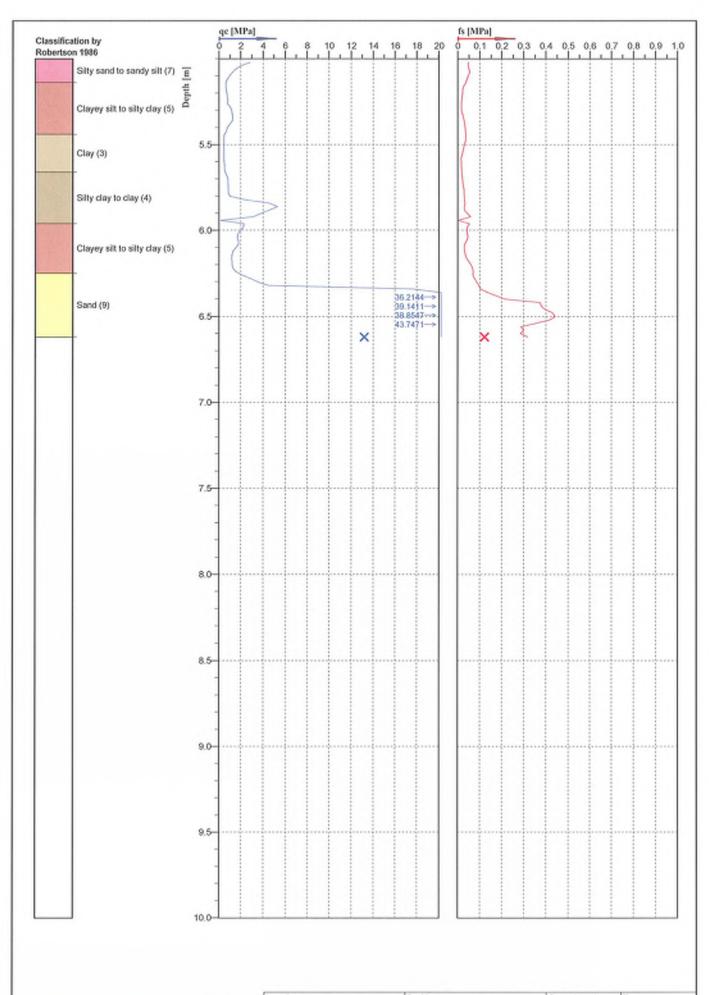






Cone No: 4439	
Tip area (cm2): 10	
Sleeve area [cm2]:	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

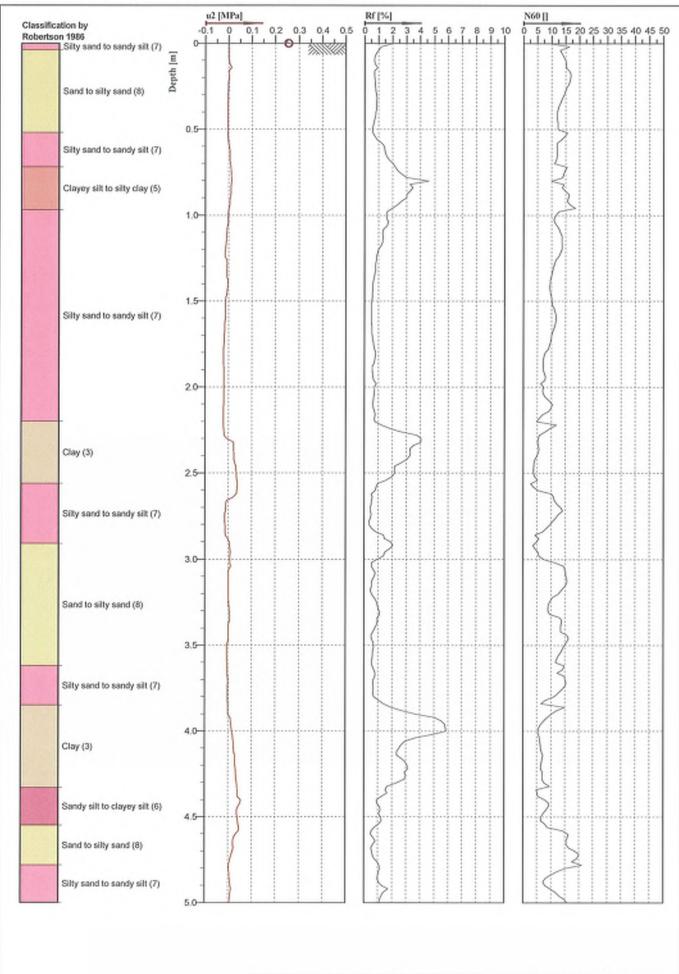






Cone No: 4439 Tip area [cm2]: 10 Siesve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

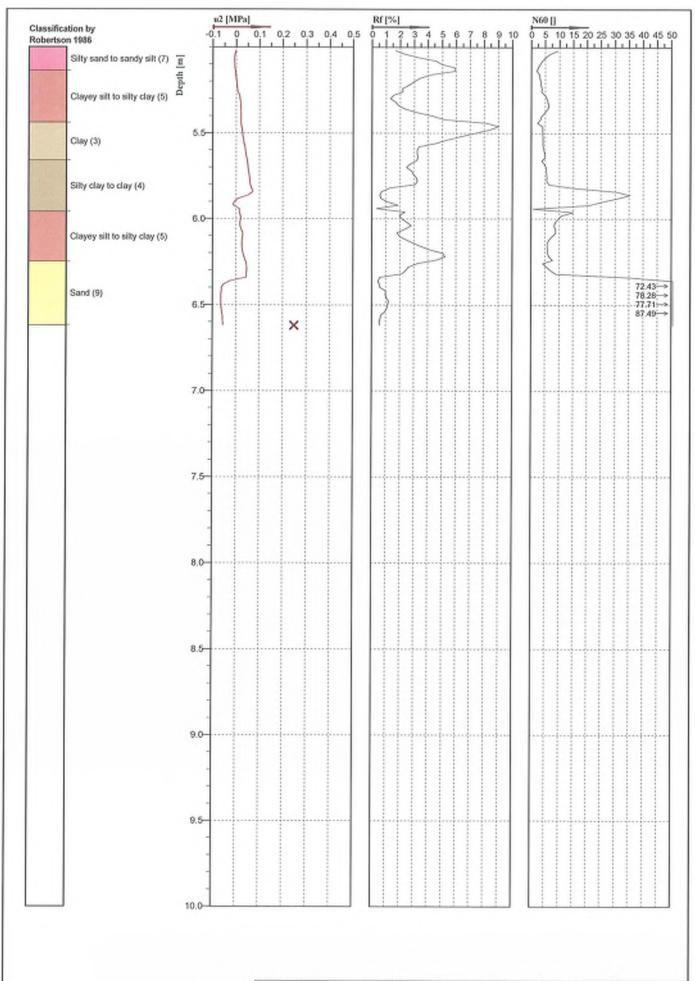






Cone No: 4439	
Tip area (cm2): 10	
Sleeve area [cm2]:	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

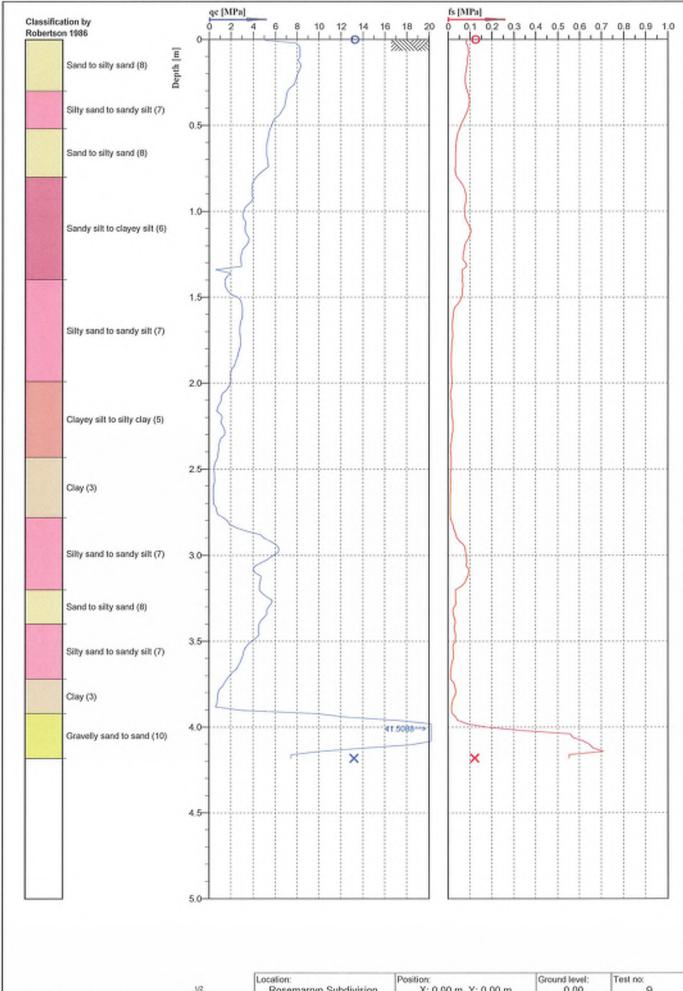






Cone No: 4439	
Tip area (cm2): 10	
Cleana man free?!	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	8
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSu	bdivisionCPT8.cpt

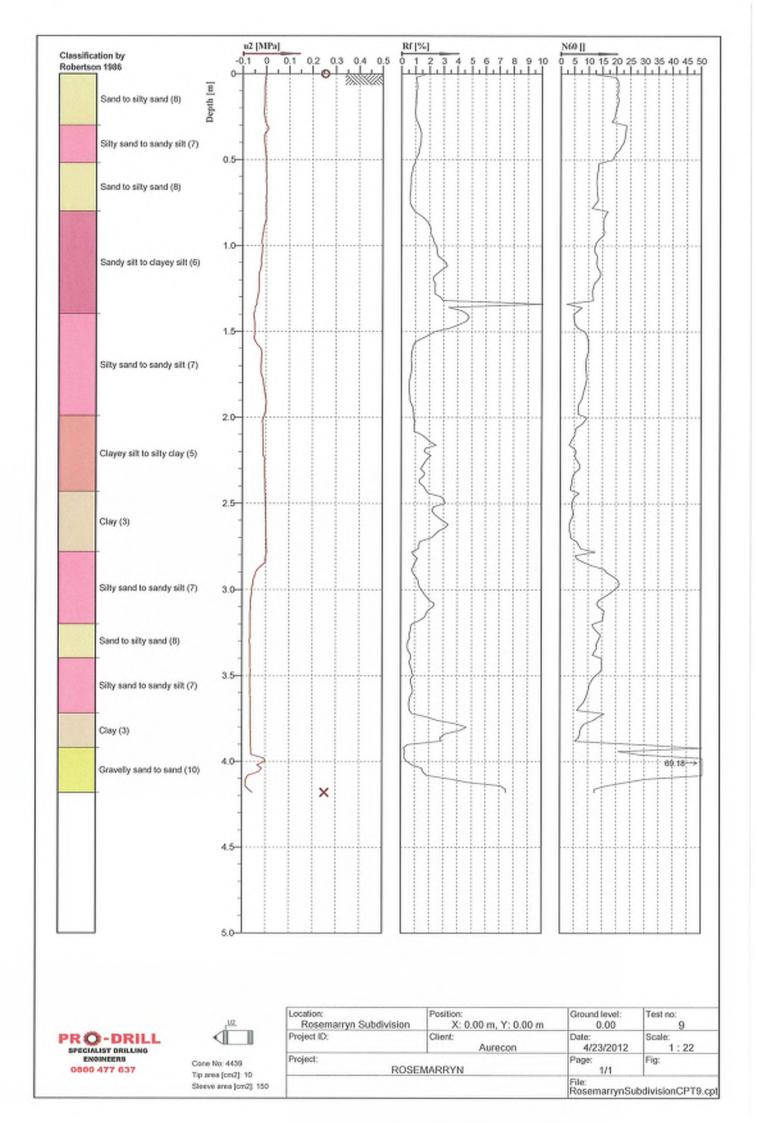


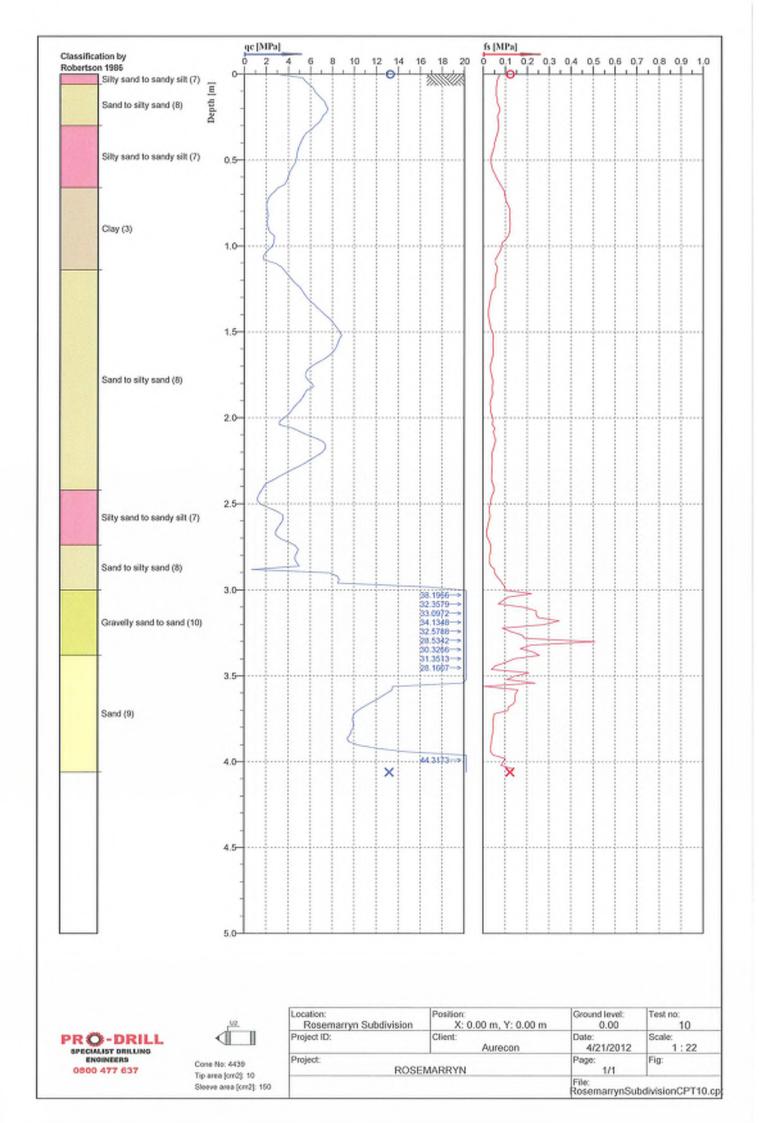
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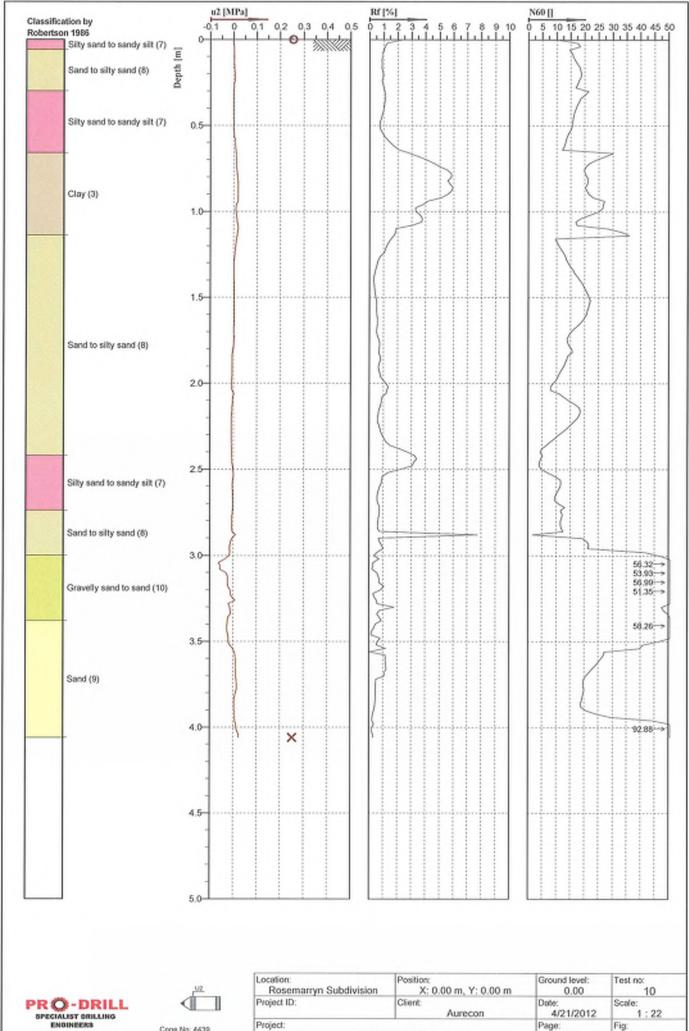


Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	9
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSu	bdivisionCPT9.cpt



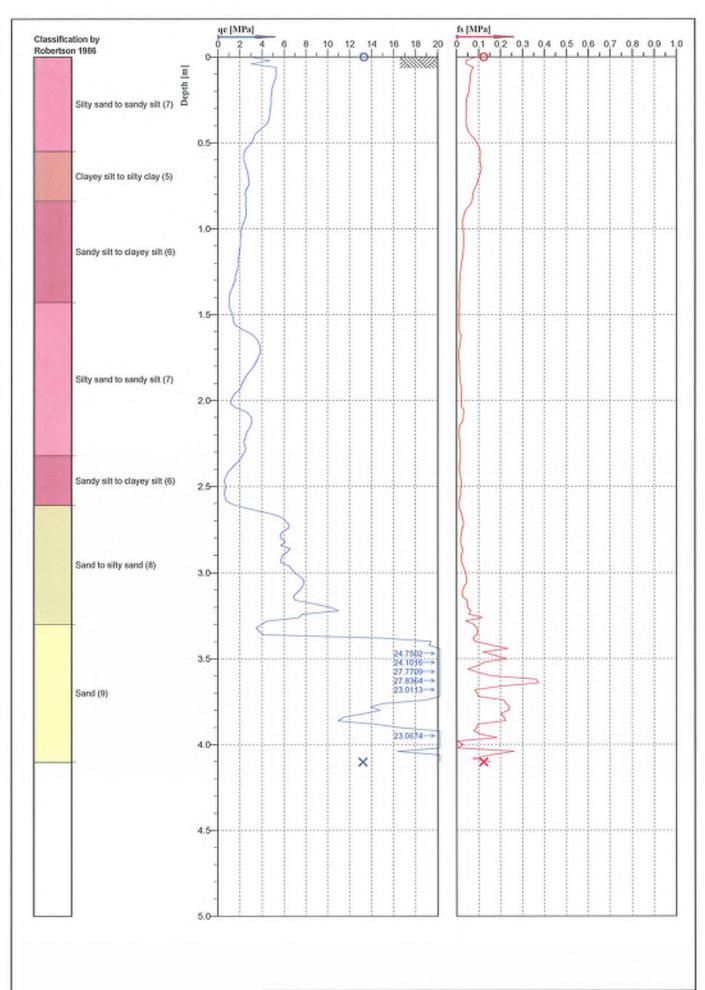




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Cone No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	10
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT10.cp

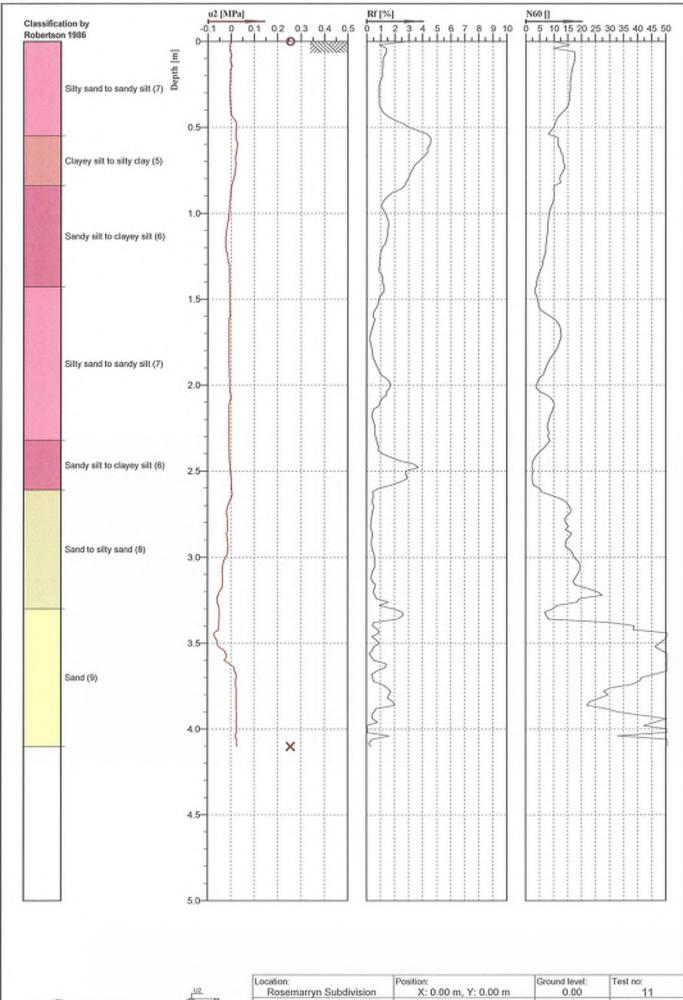






Cone No: 4439 Tip area [cm2]: 10 Sieeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT11.cp

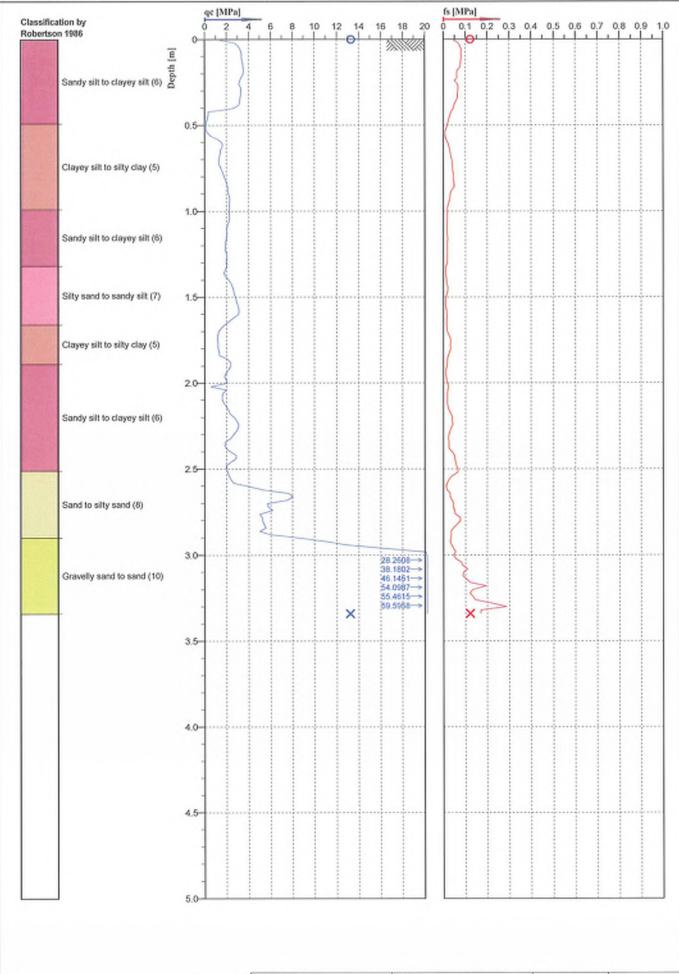






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT11.cp

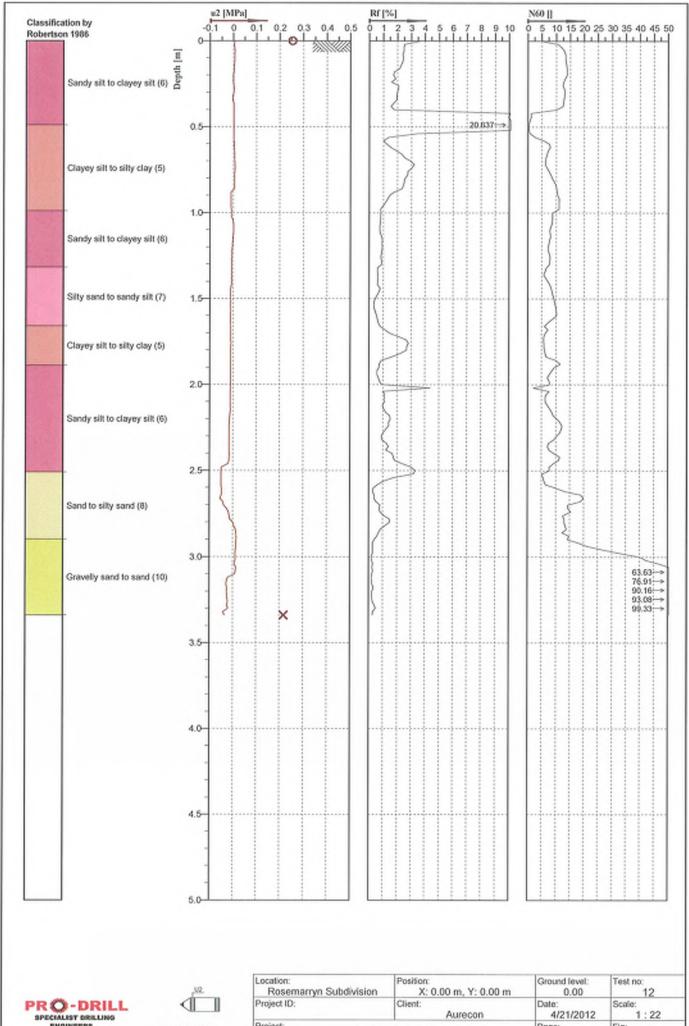






Cone No. 4439 Tip area (cm2): 10 Steeve area (cm2): 150

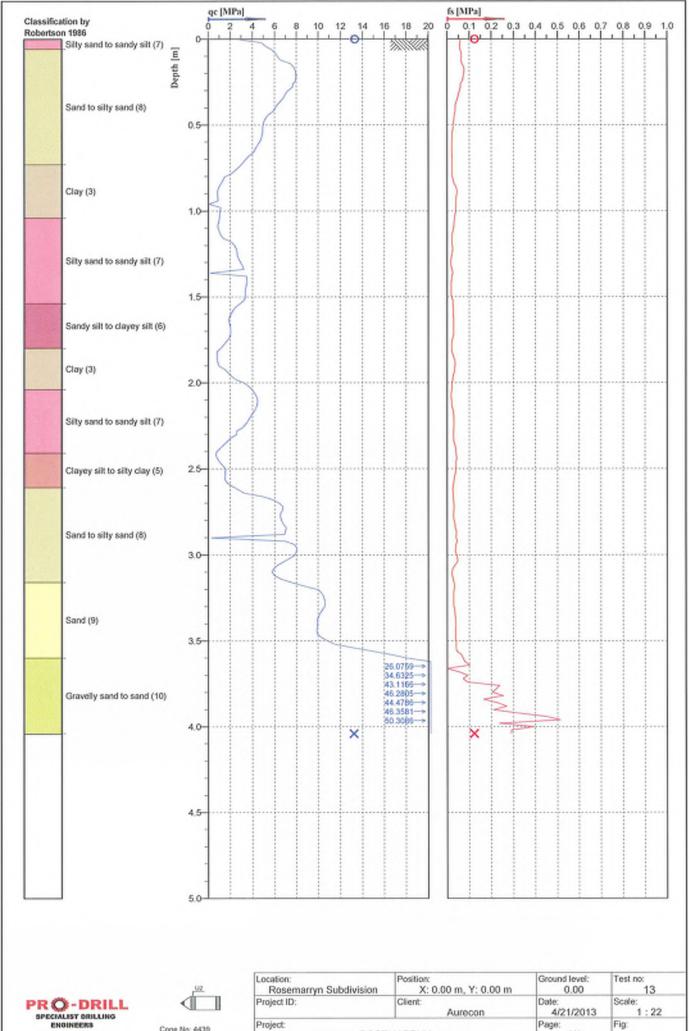
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	12
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT12.cp



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Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

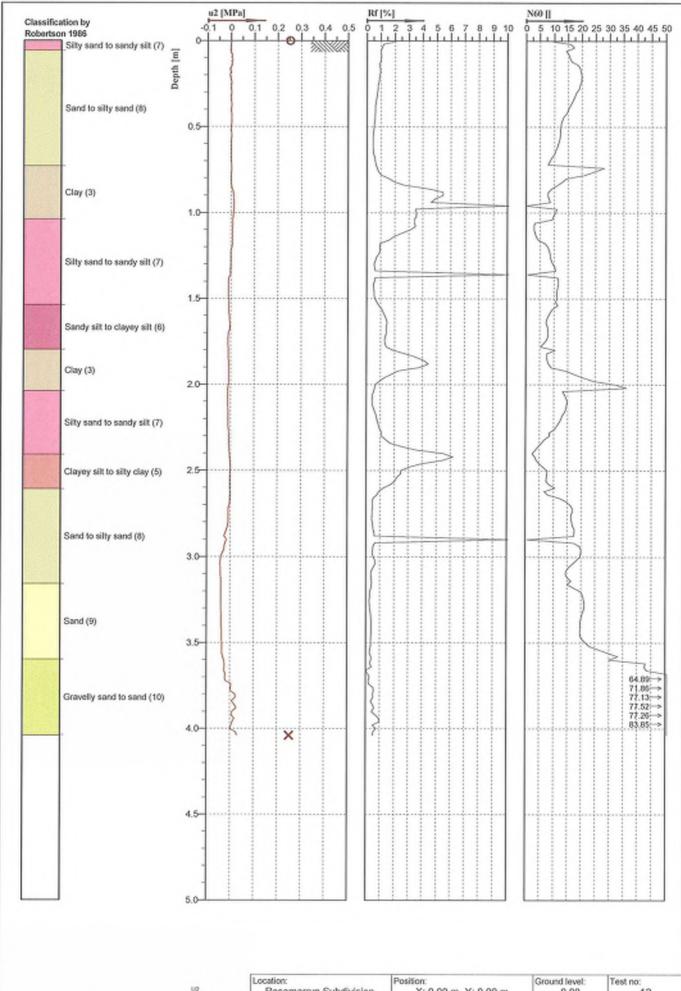
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	12
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSut	divisionCPT12.cp



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Cone No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

		File: RosemarrynSul	odivisionCPT13.cp
Project: ROSE	MARRYN	Page: 1/1	Fig:
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	13

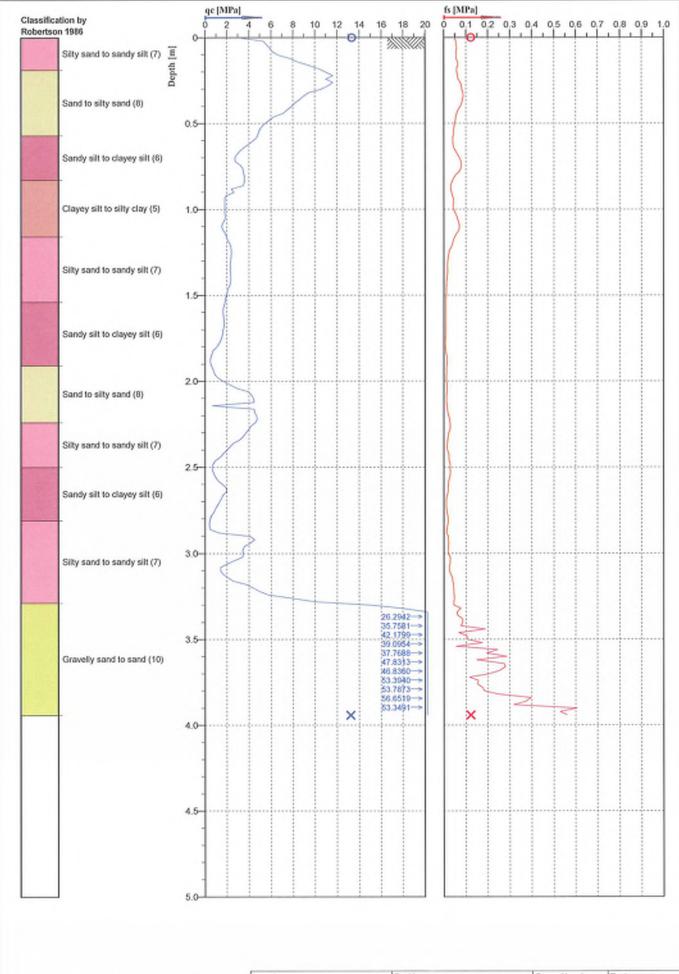






Cone No: 4439	
Tip area (cm2): 10	
Steave area (cm2):	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	13
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT13.cp;

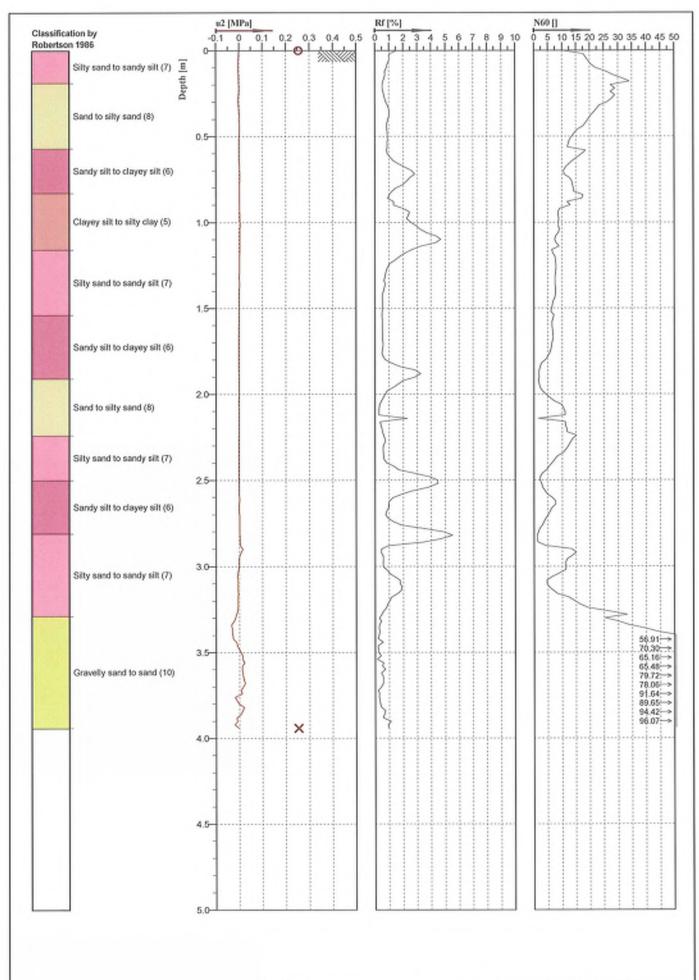






Cone No: 4439 Tip area (cm2): 10 Steeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	14
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT14.cp

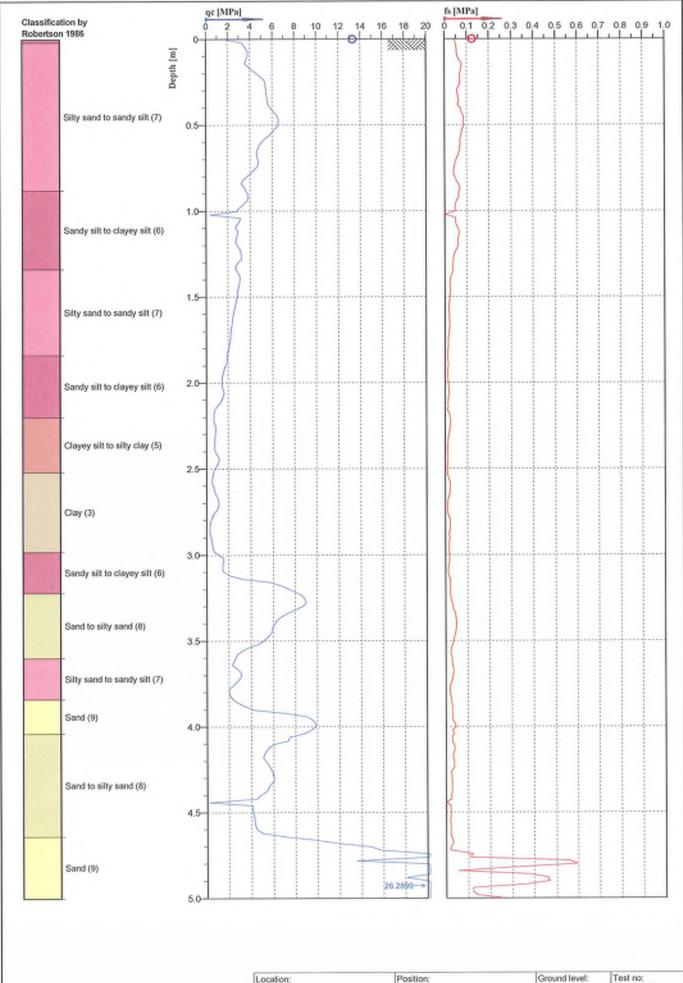






Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	14
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT14.cg

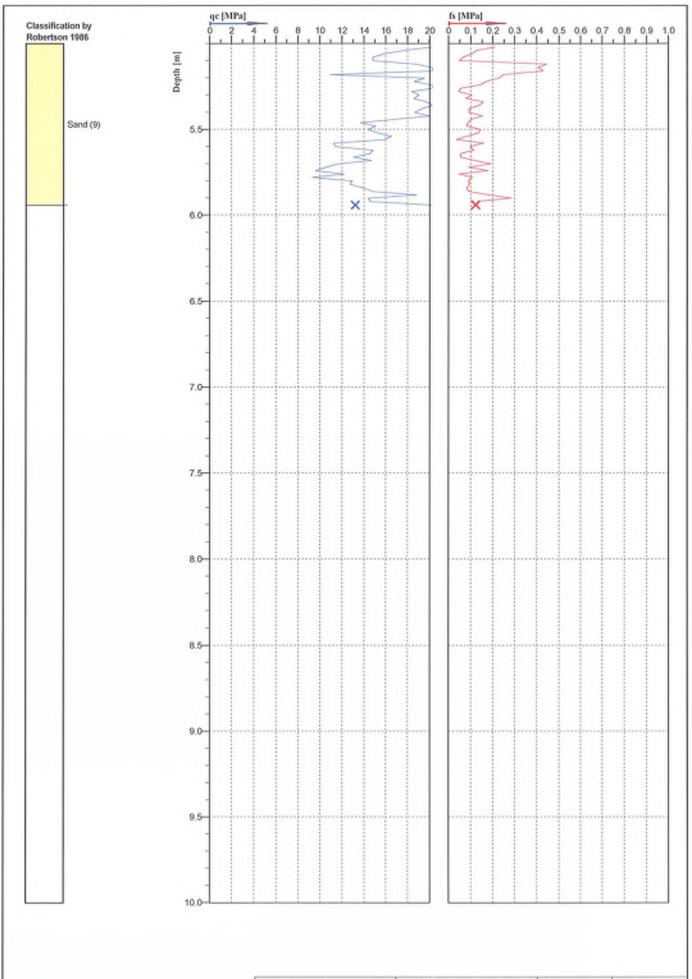






Cone No: 6439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSul	odivisionCPT15.cp

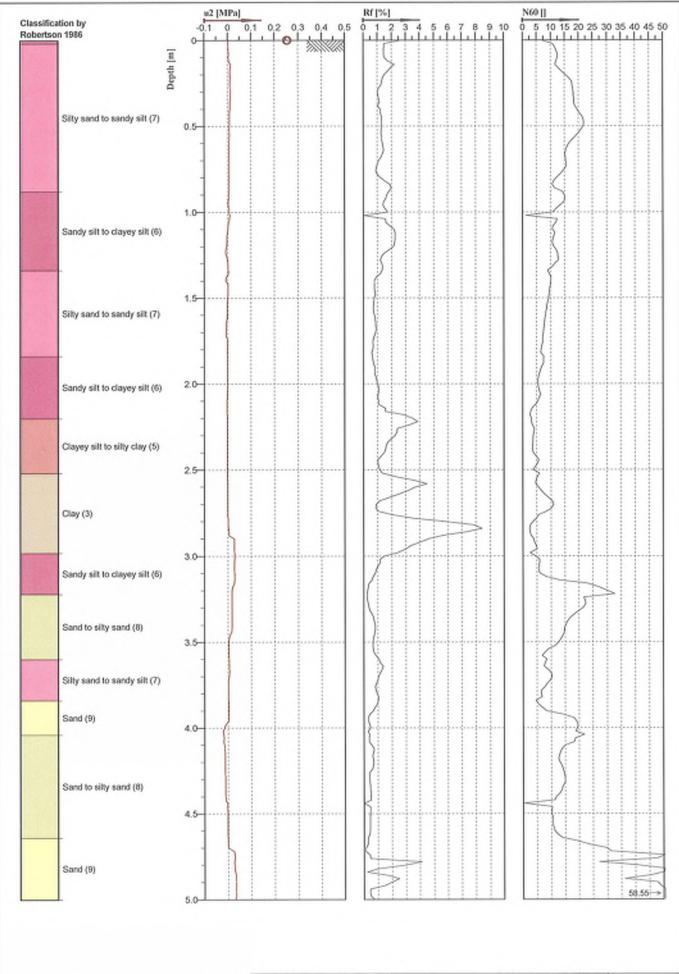


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Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
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Project: ROSE	ROSEMARRYN		Fig:
		File: RosemarrynSub	odivisionCPT15.cp

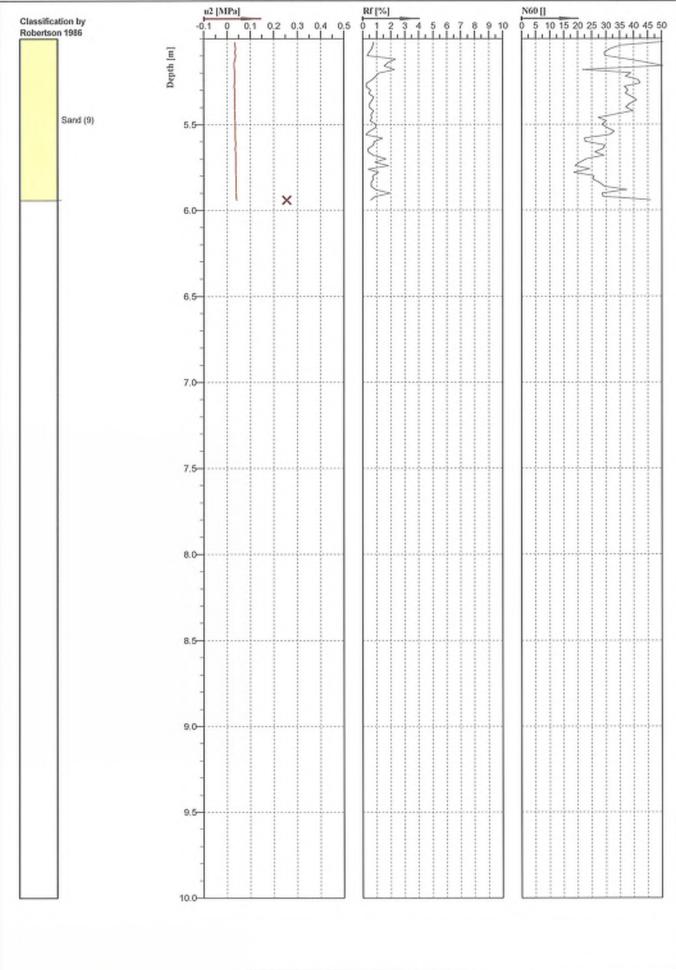






Cone No. 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2012	1:22
Project: ROSEMARRYN		Page: 1/2	Fig:
		File: RosemarrynSut	odivisionCPT15.cr

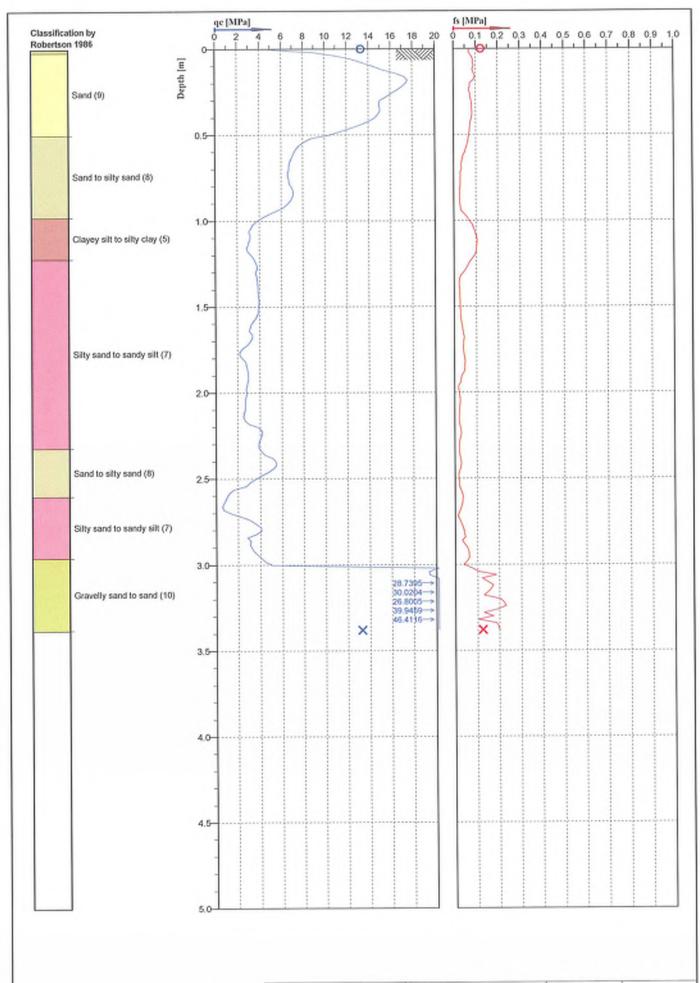






Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	15
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 2/2	Fig:
		File: RosemarrynSut	odivisionCPT15.cc

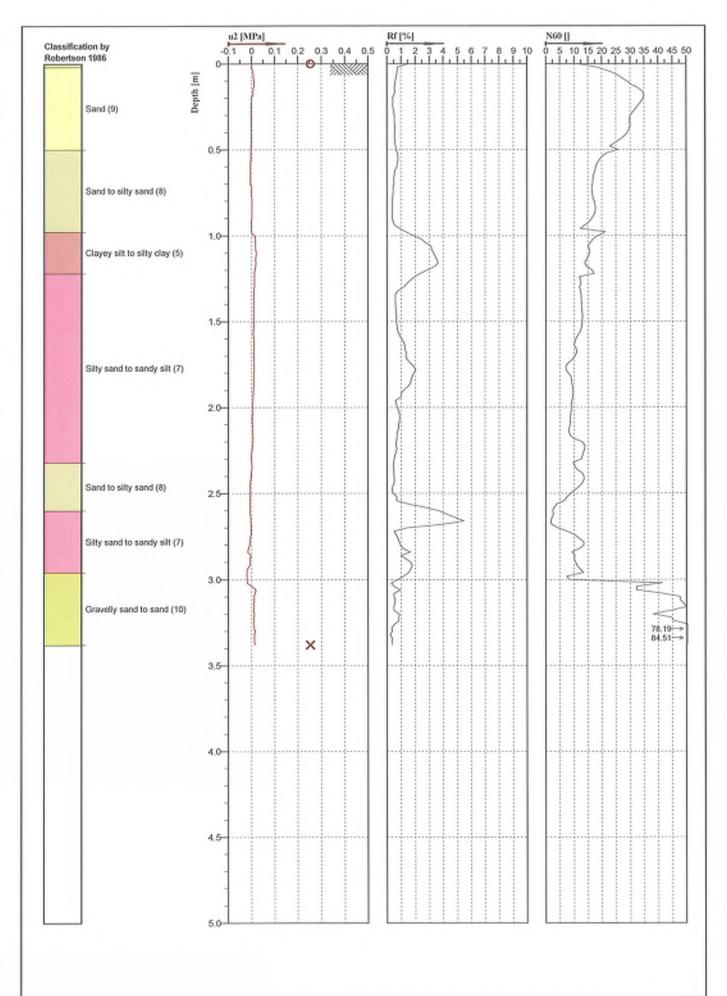






Cone No: 4439 Tip area [cm2]: 10 Steeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	16
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT16.cp

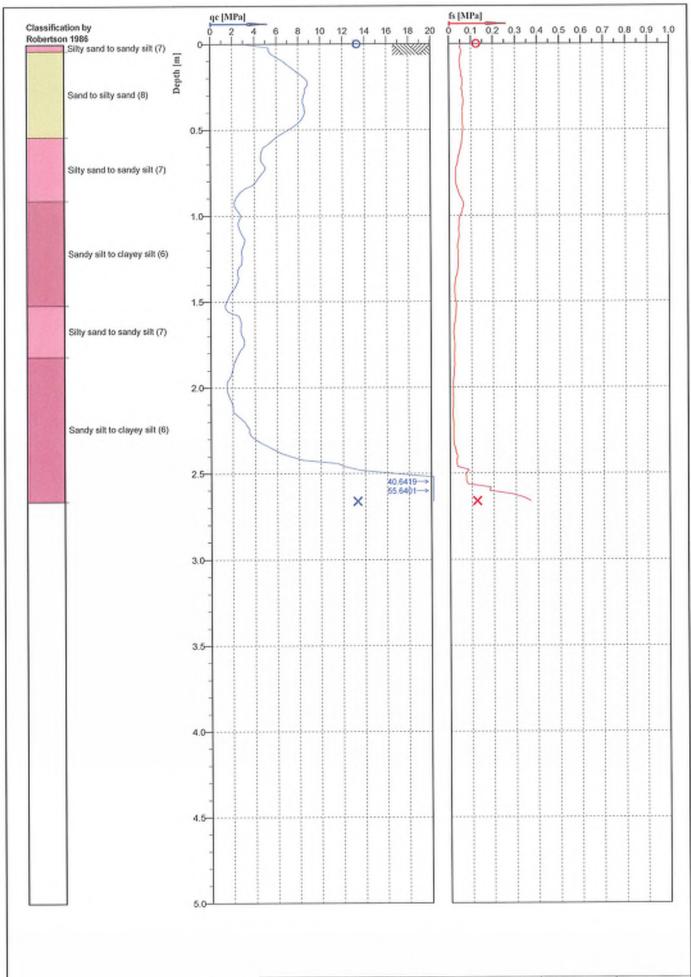






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	16
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSut	odivisionCPT16.c

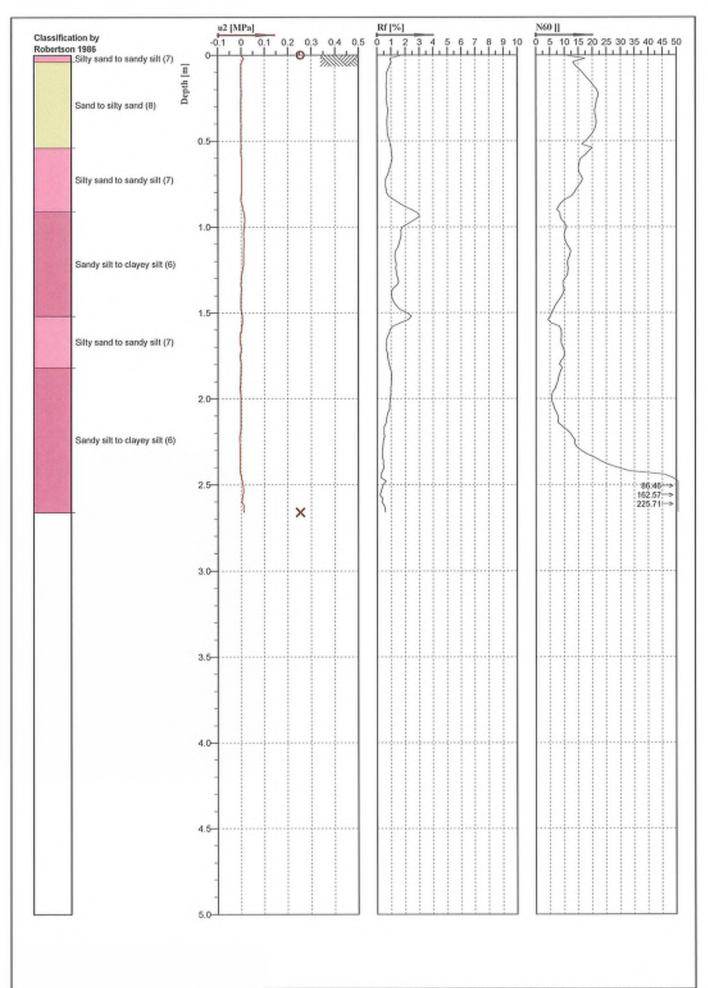






Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	17
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT17.cp

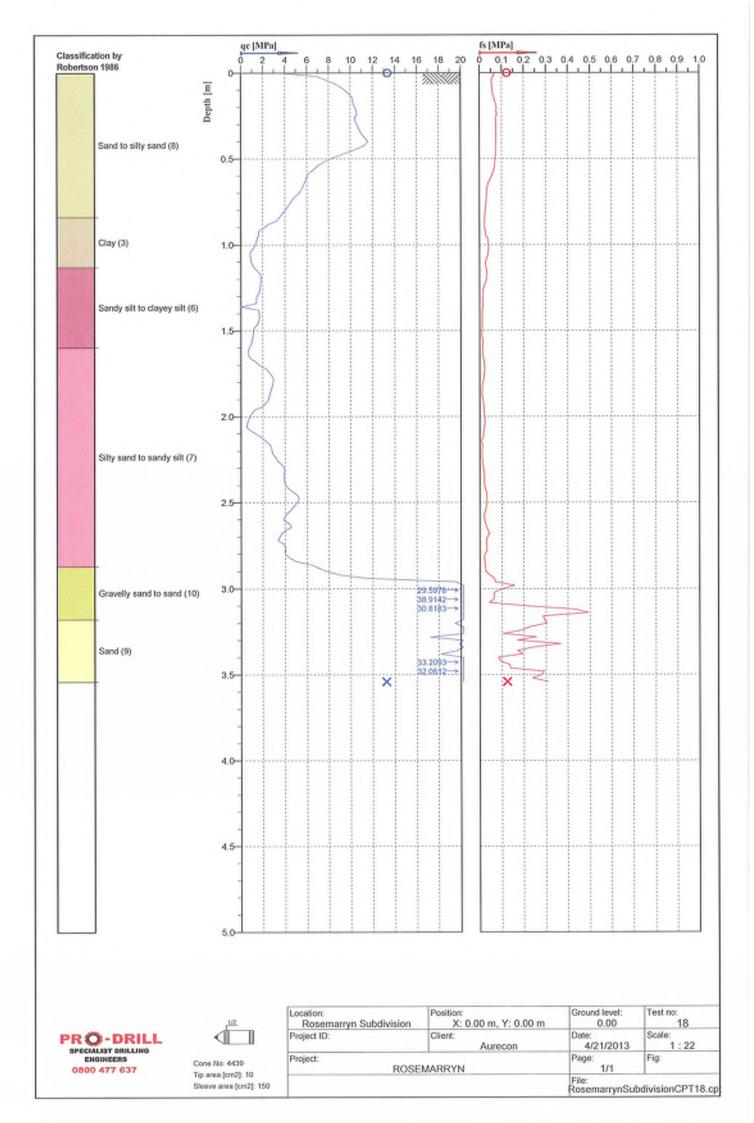


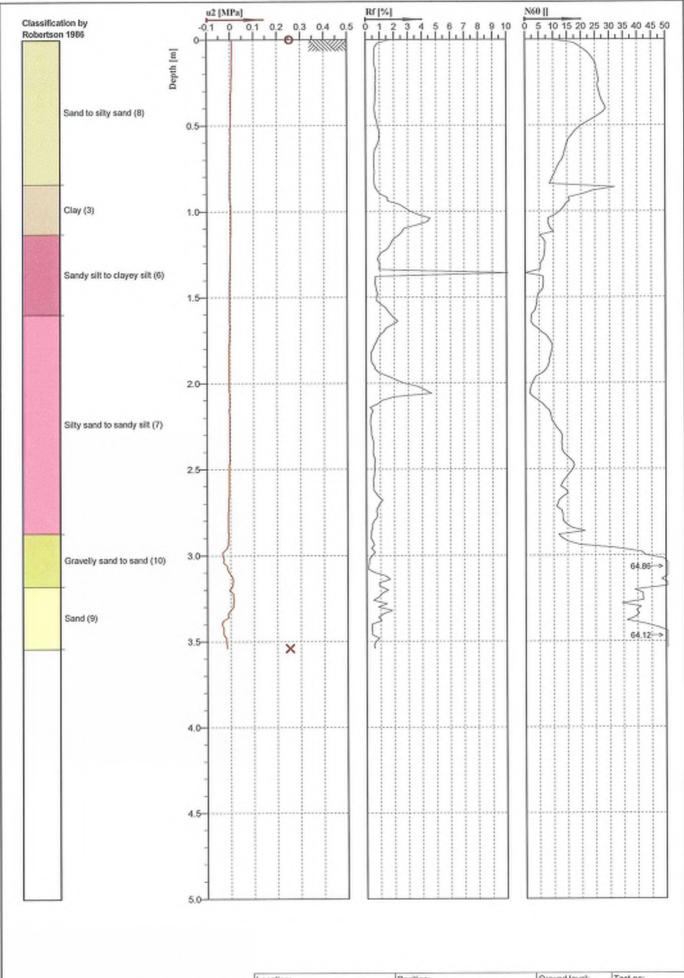




Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 17
Project ID:	Client: Aurecon	Date: 4/21/2013	Scale: 1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT17.cp



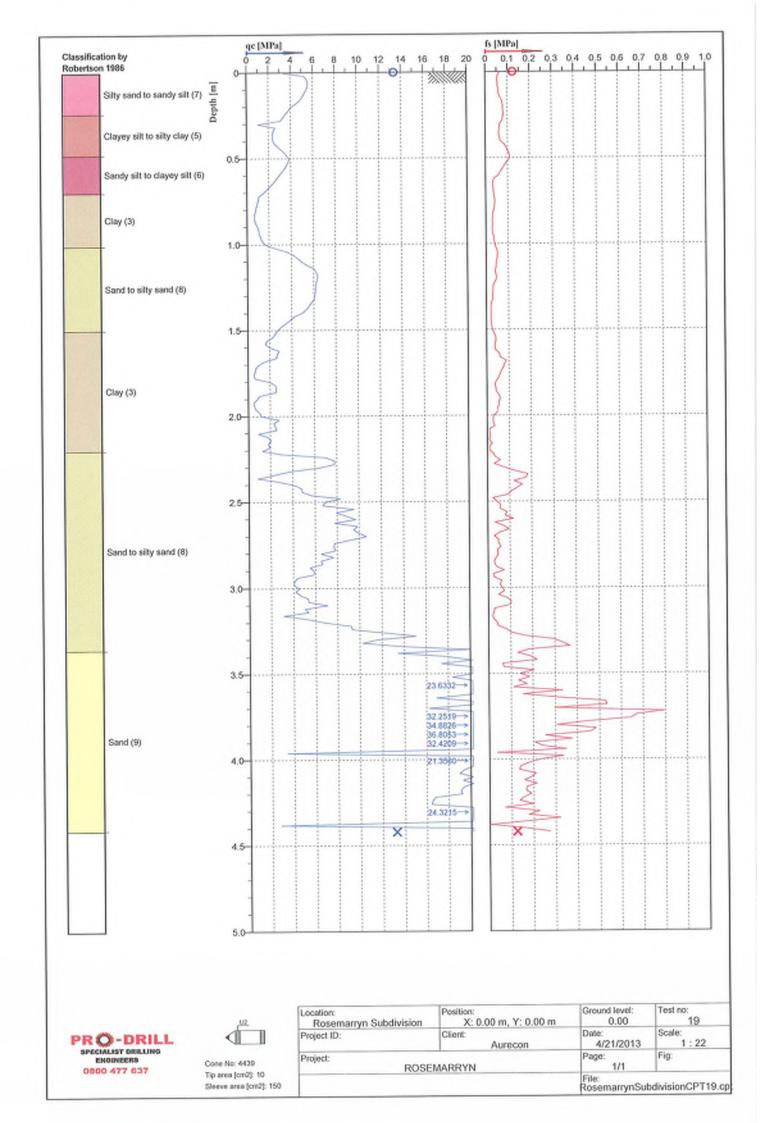


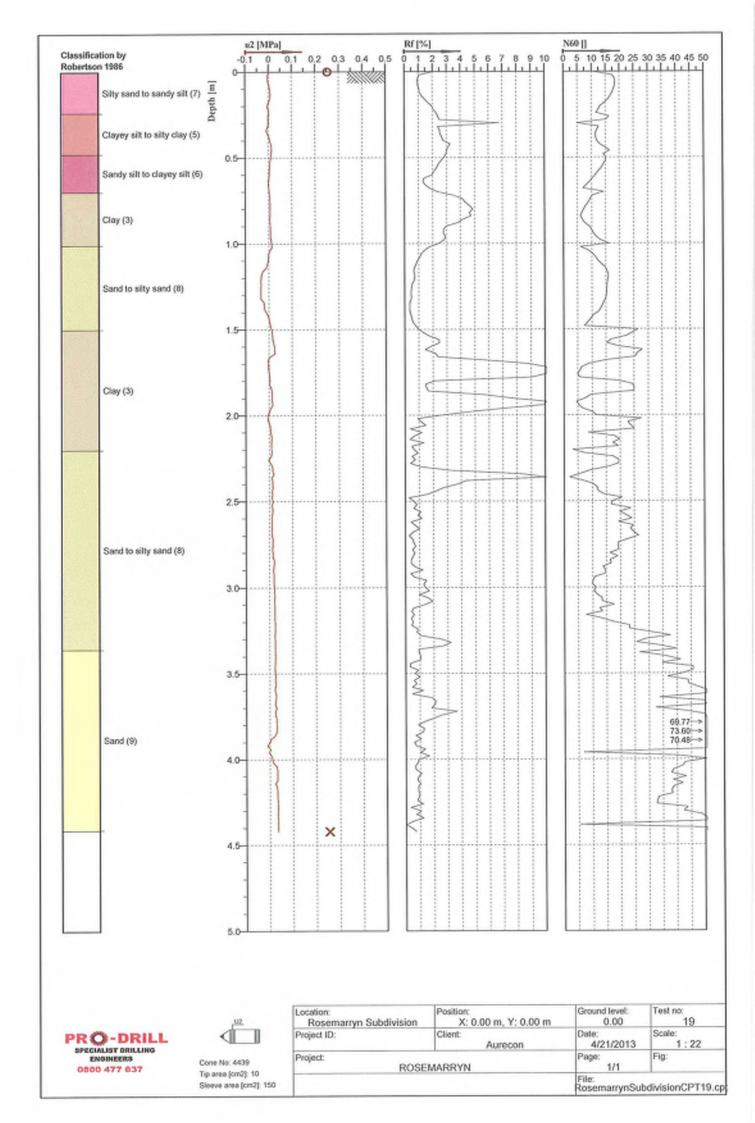


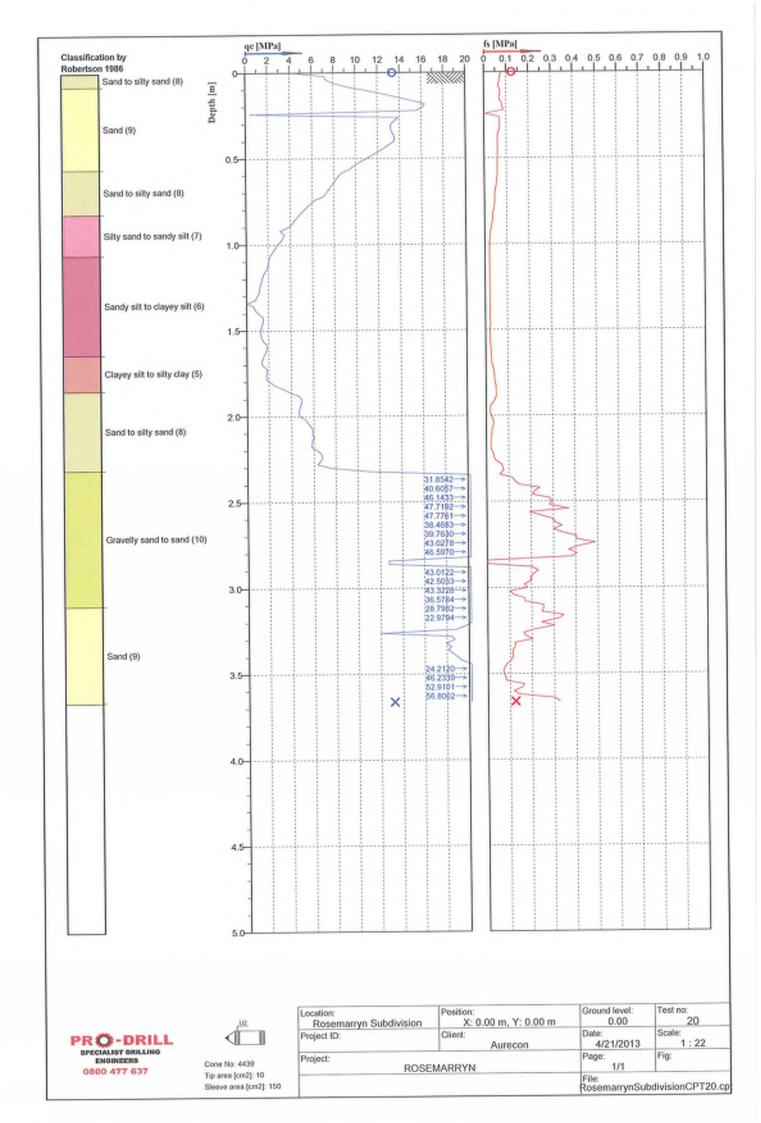


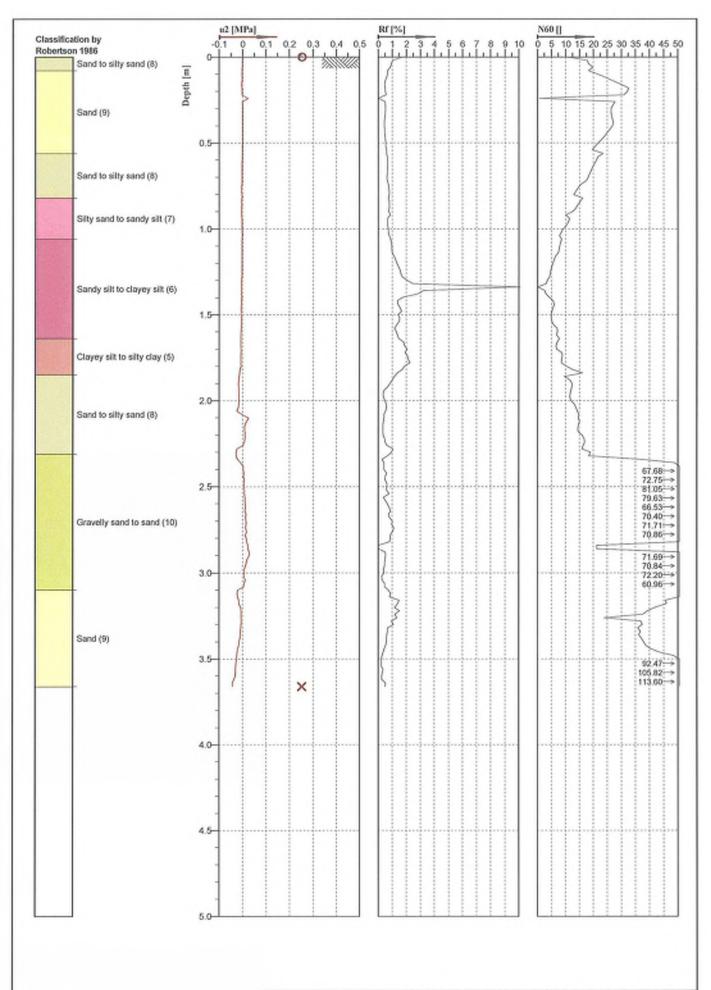
Cone No: 4439	
Tip area (cm2): 10	
Steeve area (cm2):	150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	18
Project ID:	Client:	Date:	Scale:
	Aurecon	4/21/2013	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT18.cp







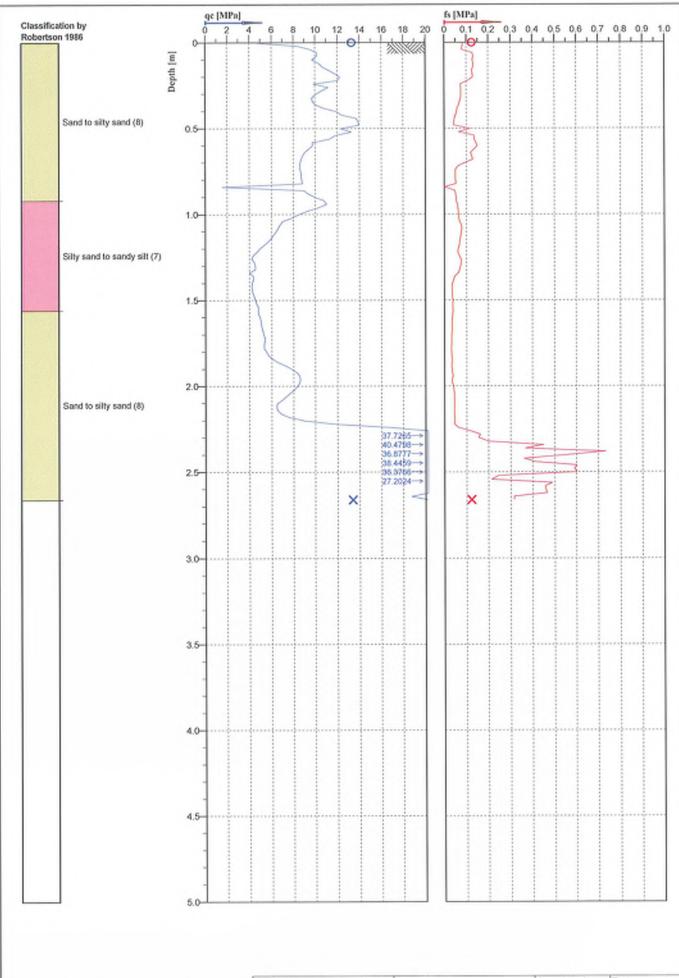






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	20
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSut	divisionCPT20.cp

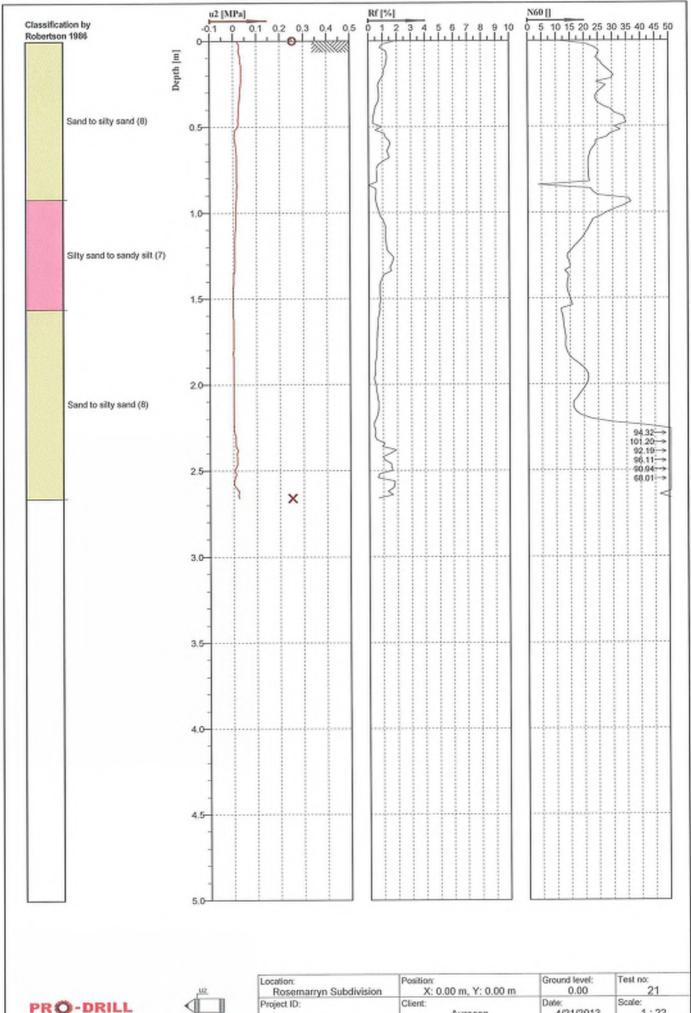






Cone No: 4439 Tip area (cm2): 10 Sleeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	21
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
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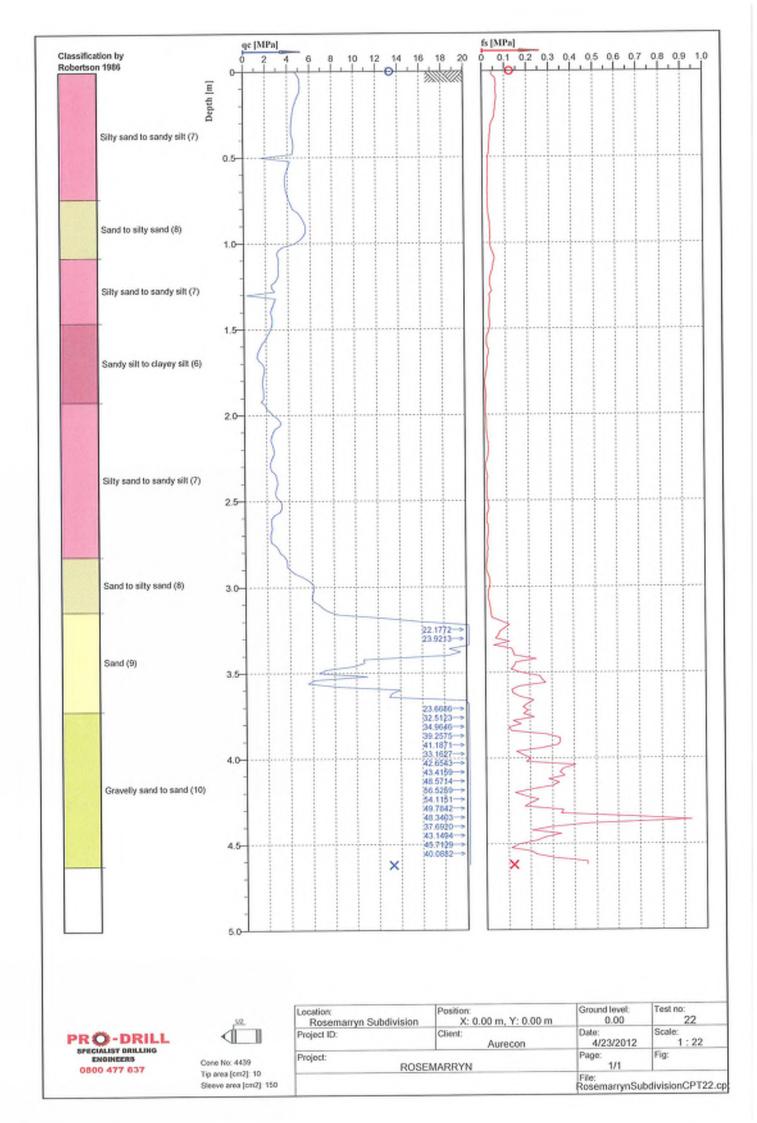


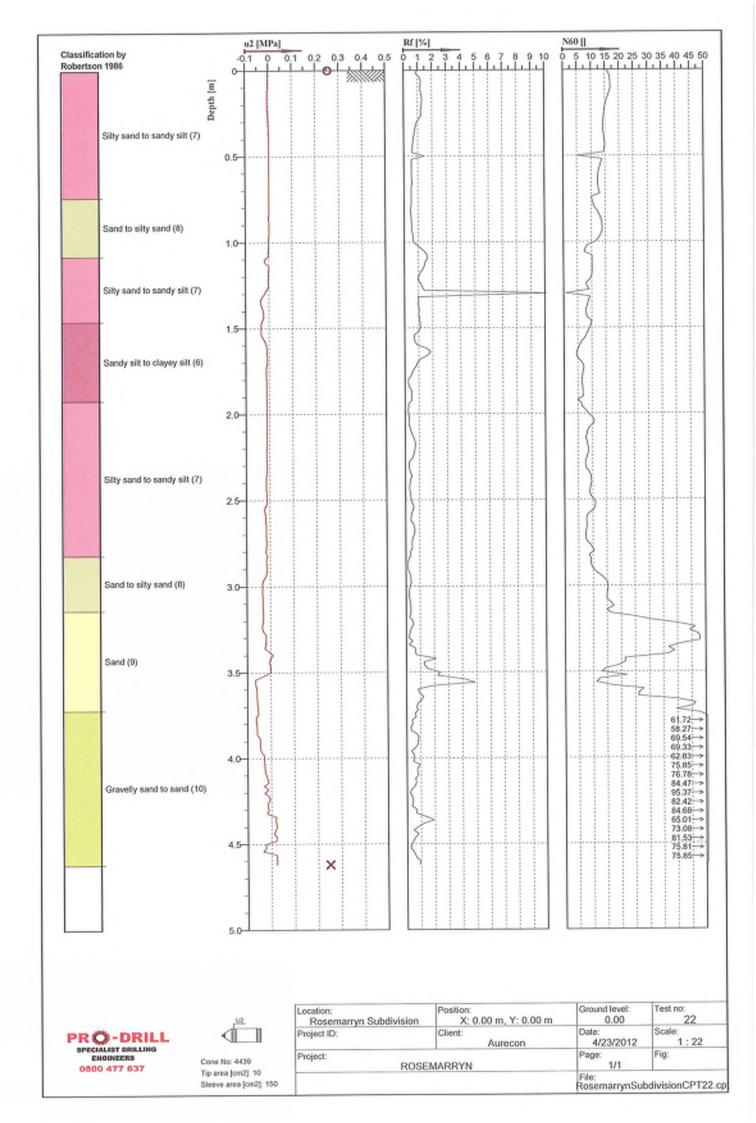


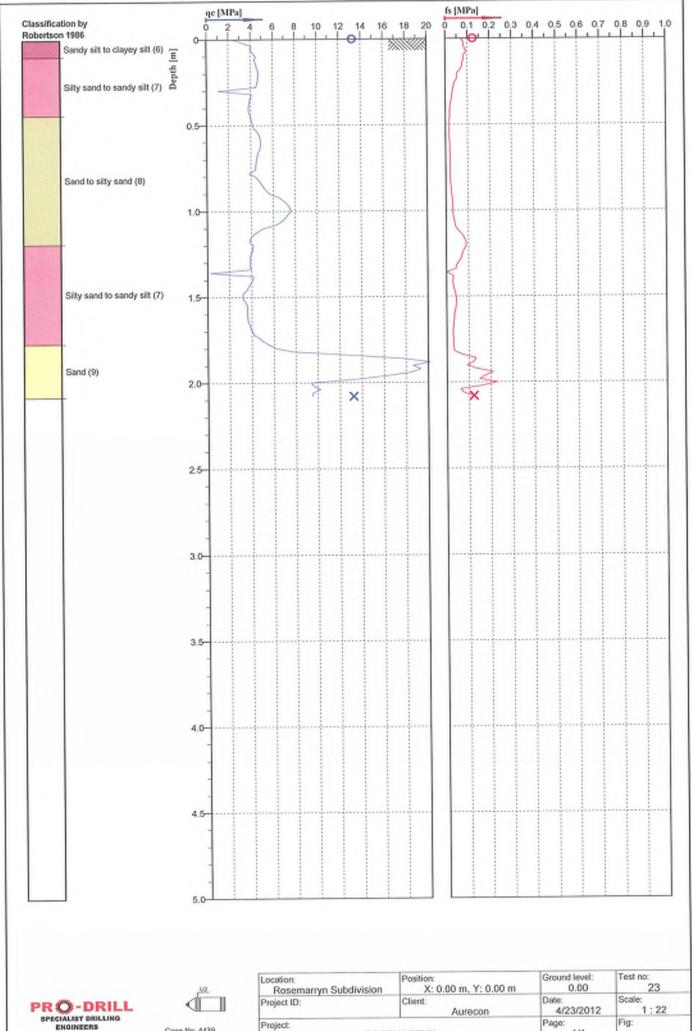


Cone No: 4439 Tip area (cm2): 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	21
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
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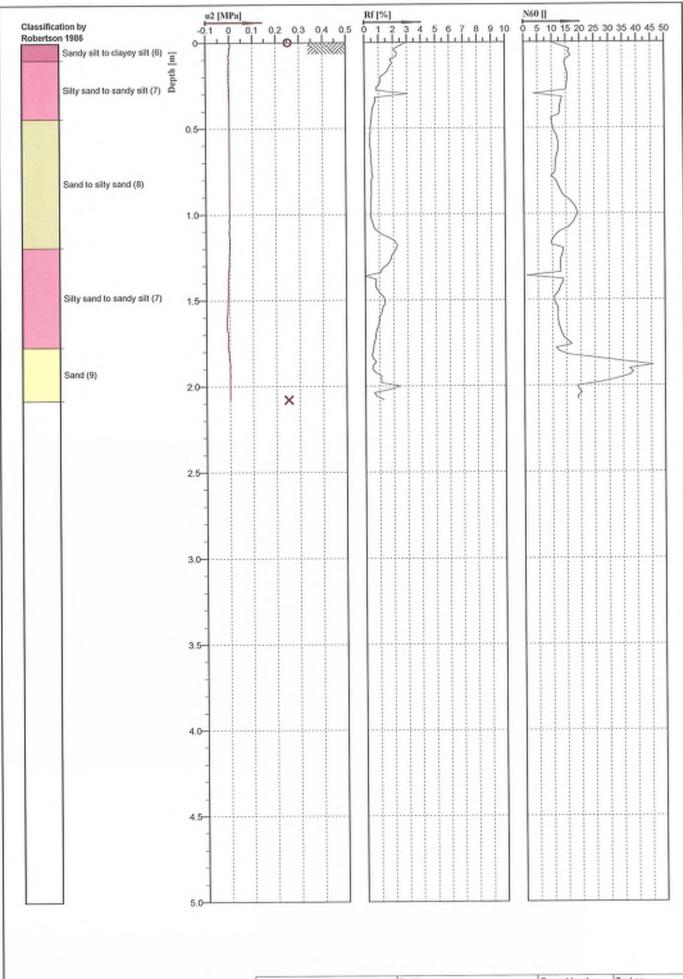






Cone No: 4439 Tip area [om2]: 10 Steeve area (cm2): 150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	0.00	23
Project ID:	Client: Aurecon	Date: 4/23/2012	Scale: 1 ; 22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT23.cp

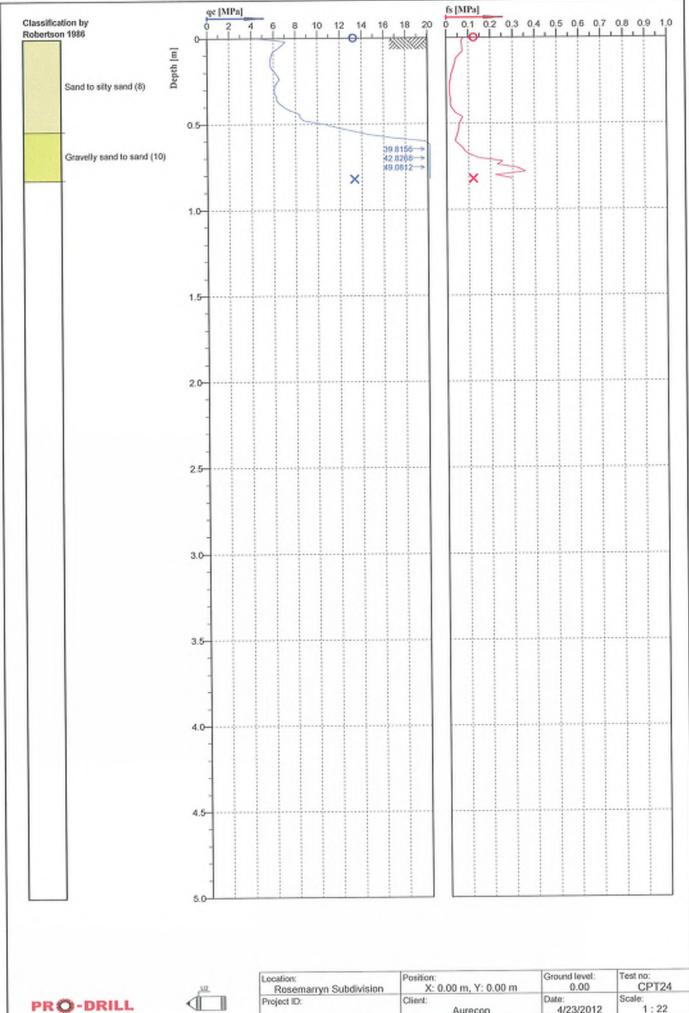






Cone No: 4439 Tip area (cm2): 10 Steeve area (cm2): 150

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	23
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
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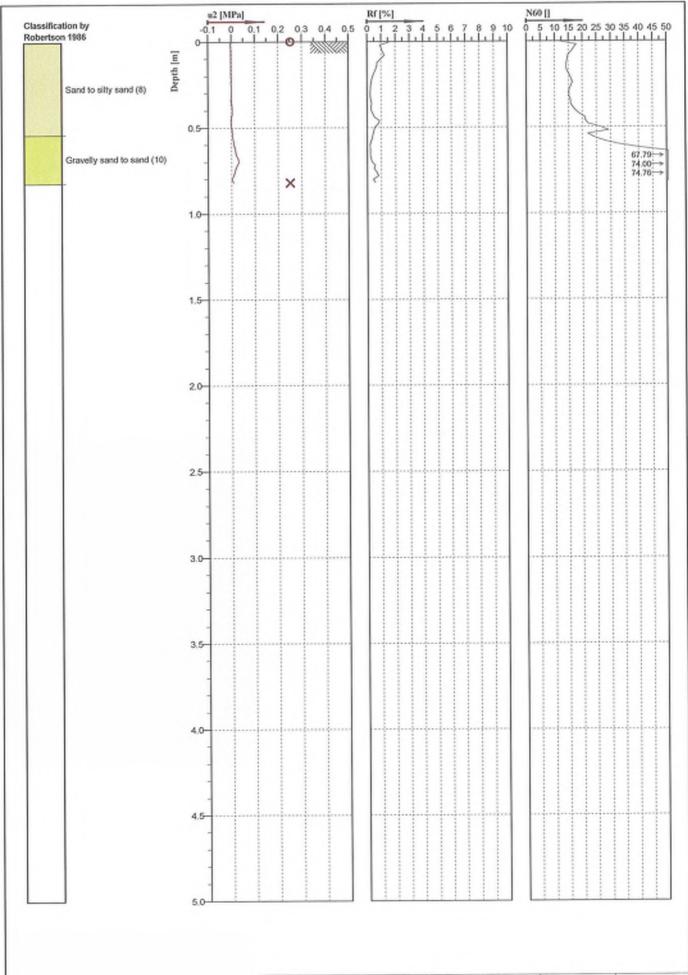






Cone No: 4439 Tip area [cm2]: 10 Sleeve area [cm2]: 150

Location:	Position:	Ground level:	CPT24
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	
Project ID:	Client:	Date:	Scale:
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Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT24.cp

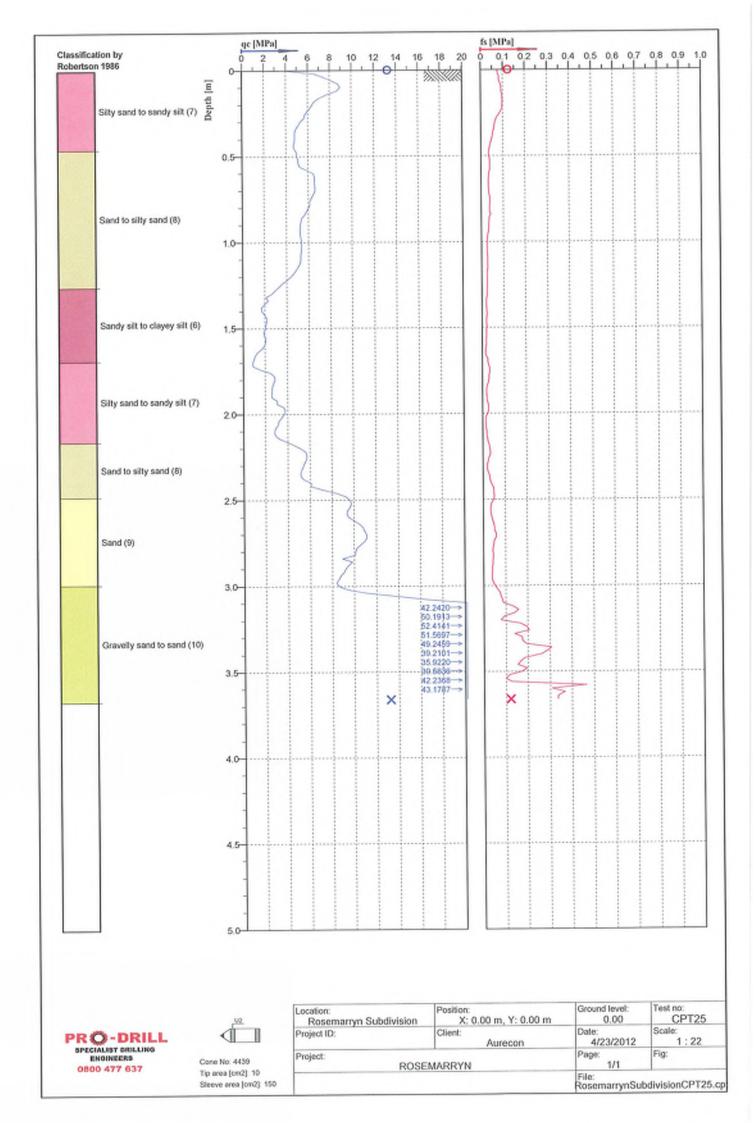


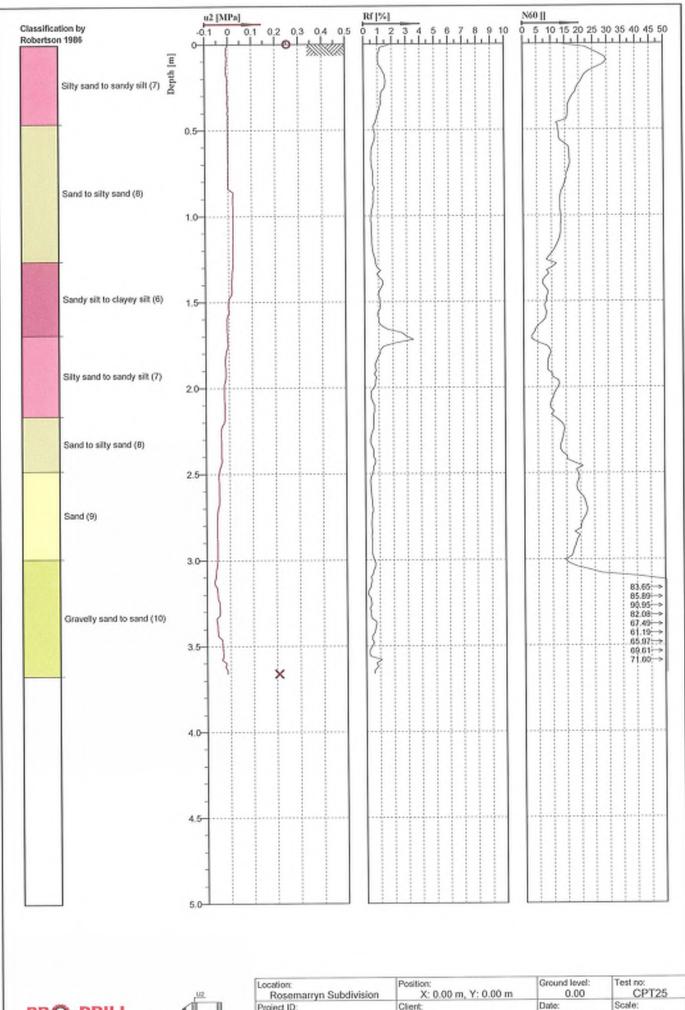




Cone No: 4439
Tip area [om2]: 10
Steeve area fcm27: 550

Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	CPT24
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT24.cp



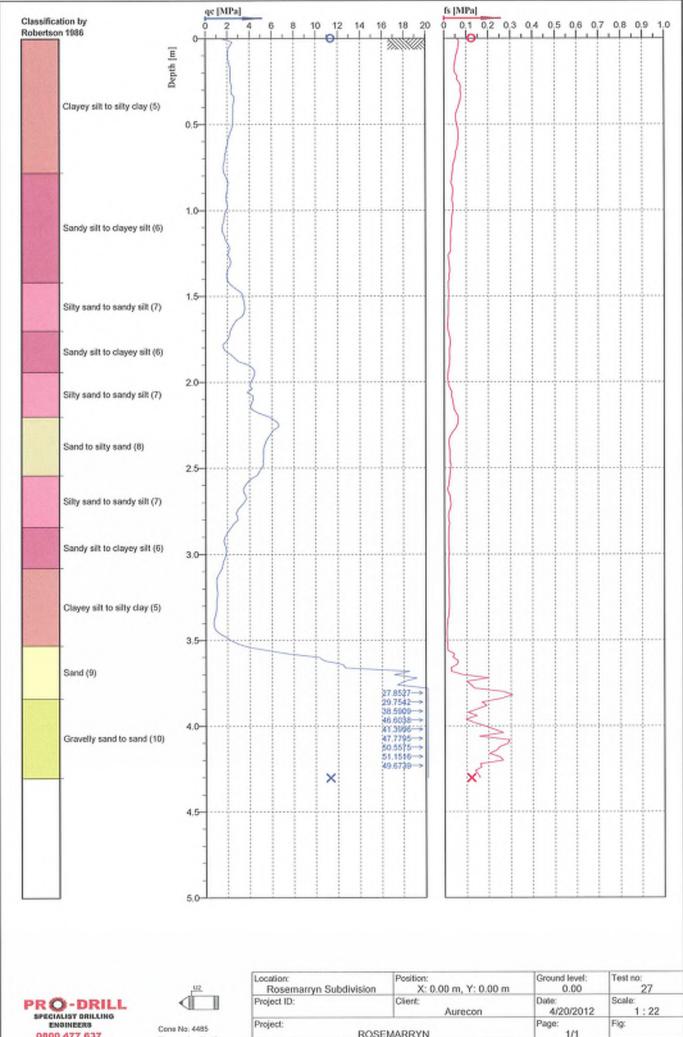






Cone No: 4439
Tip area (cm2): 10
Steeve area (cm2): 150

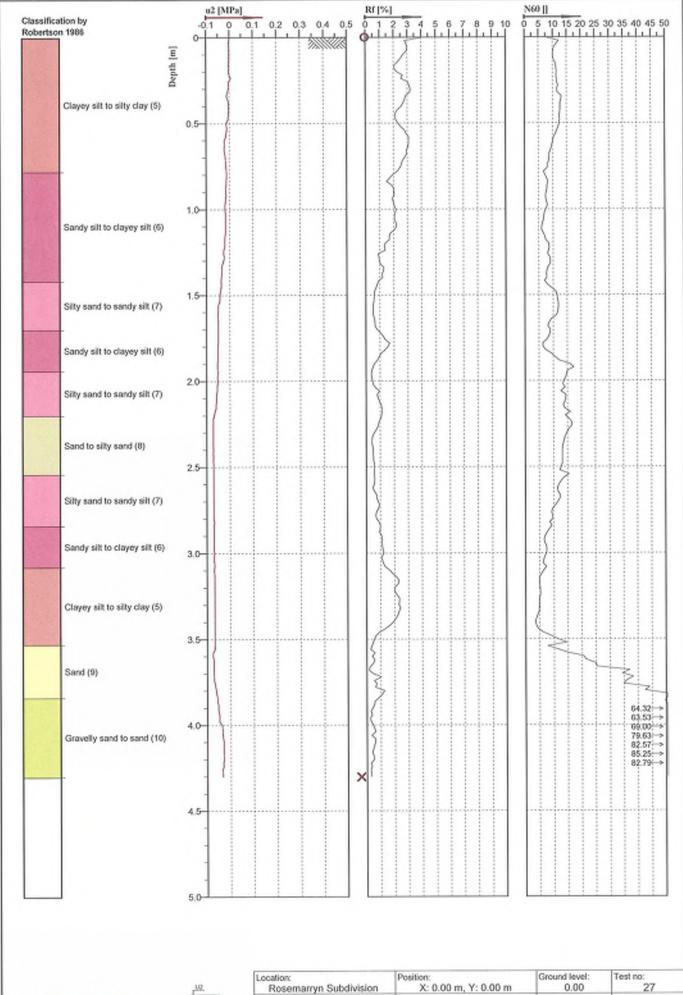
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	CPT25
Project ID:	Client:	Date:	Scale:
	Aurecon	4/23/2012	1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSubdivisionCPT25.cpt	



0800 477 637

Cone No: 4485	
Tip area (cm2): 10	
Siceve area [cm2]:	150

Location: Rosemarryn Subdivision	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: 27
Project ID:	Client: Aurecon	Date: 4/20/2012	Scale: 1:22
Project: ROSE	MARRYN	Page: 1/1	Fig:
		File: RosemarrynSult	odivisionCPT27.cp

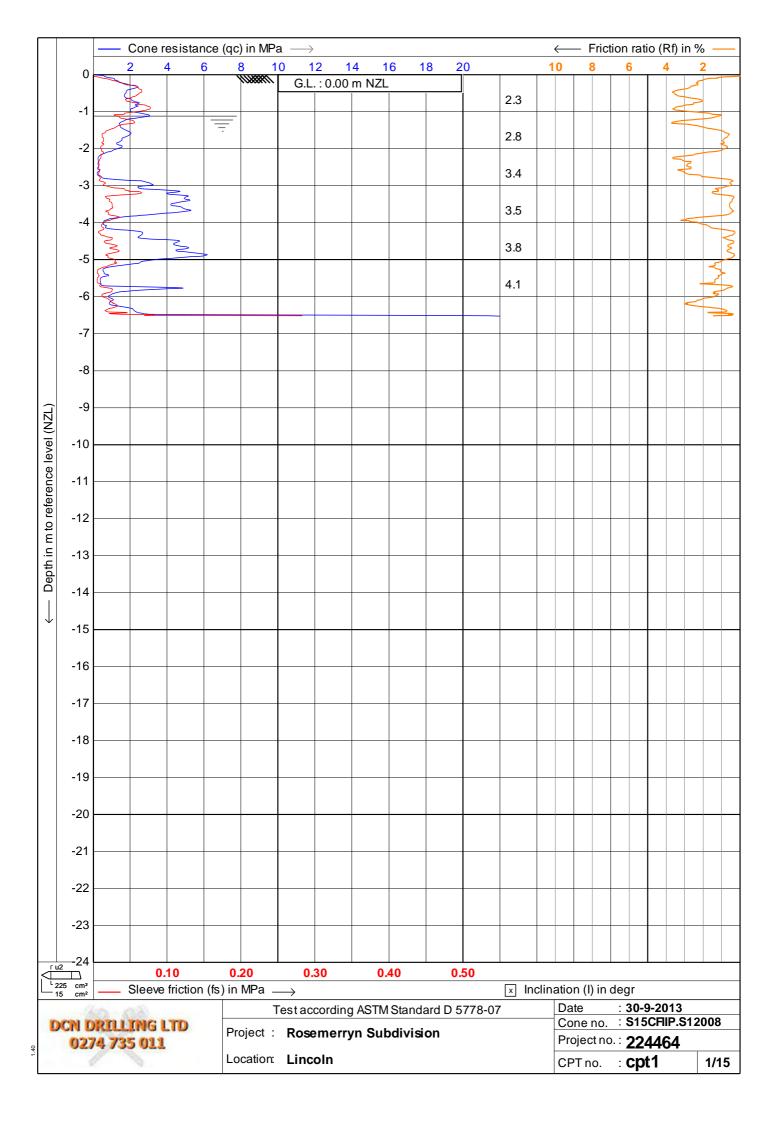


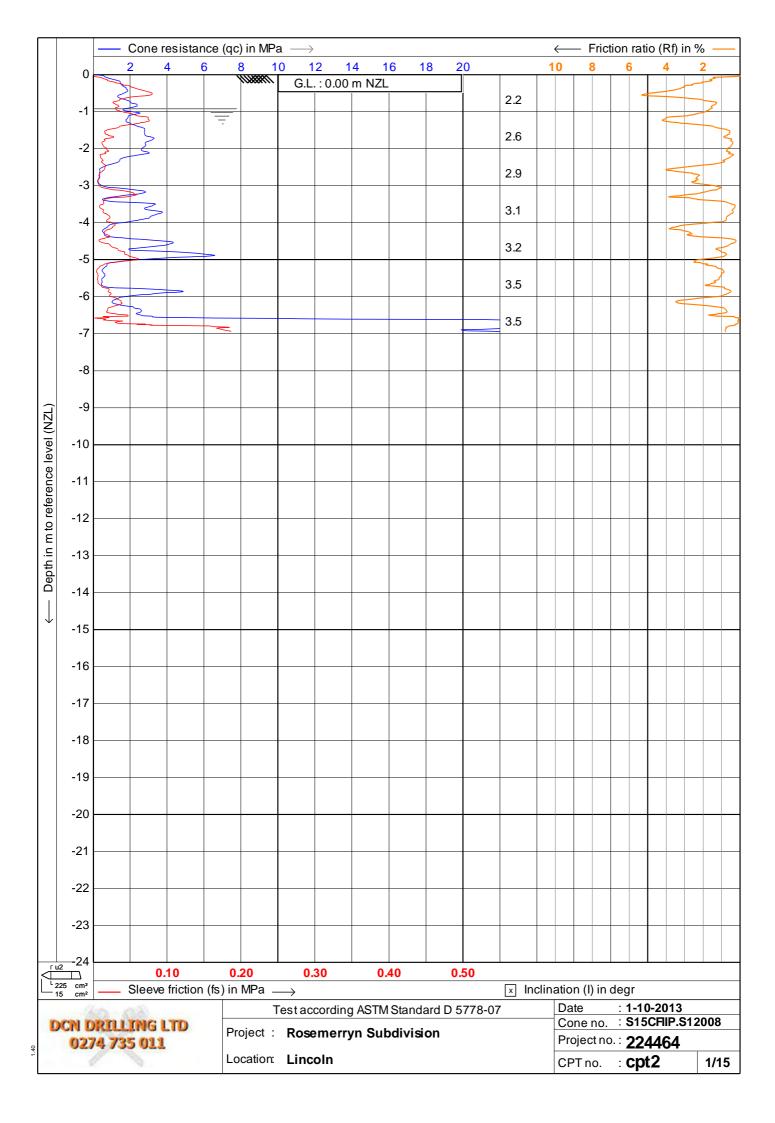


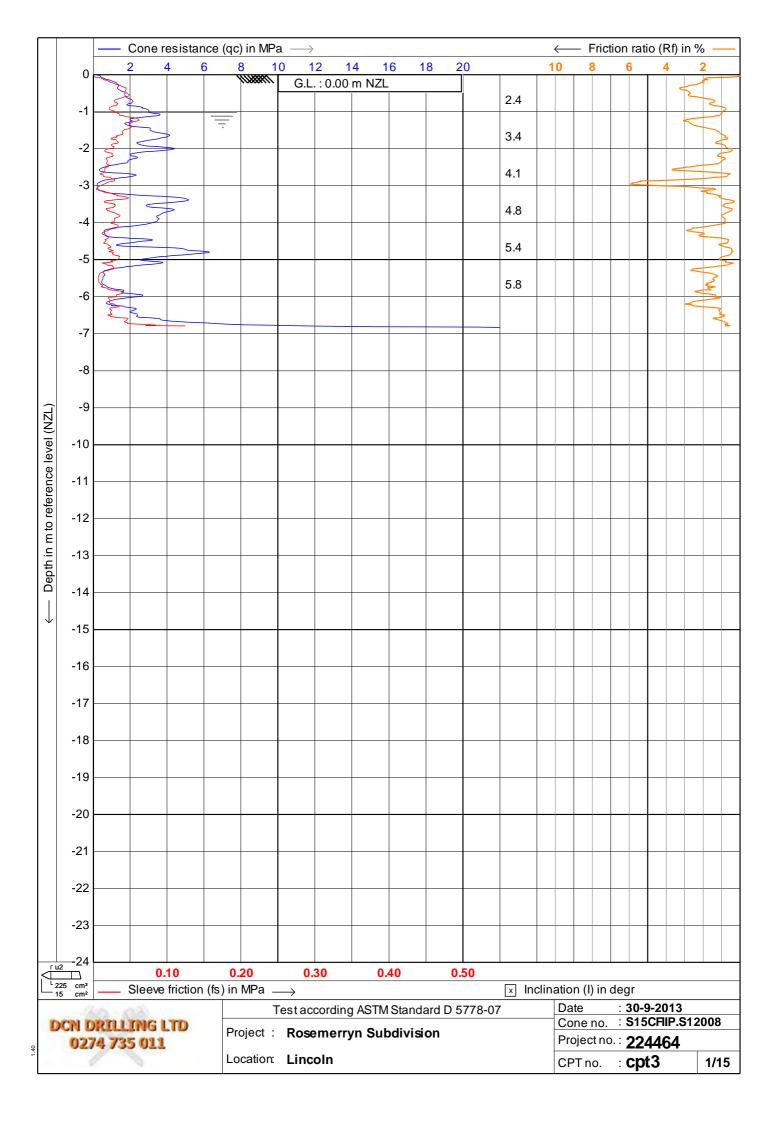


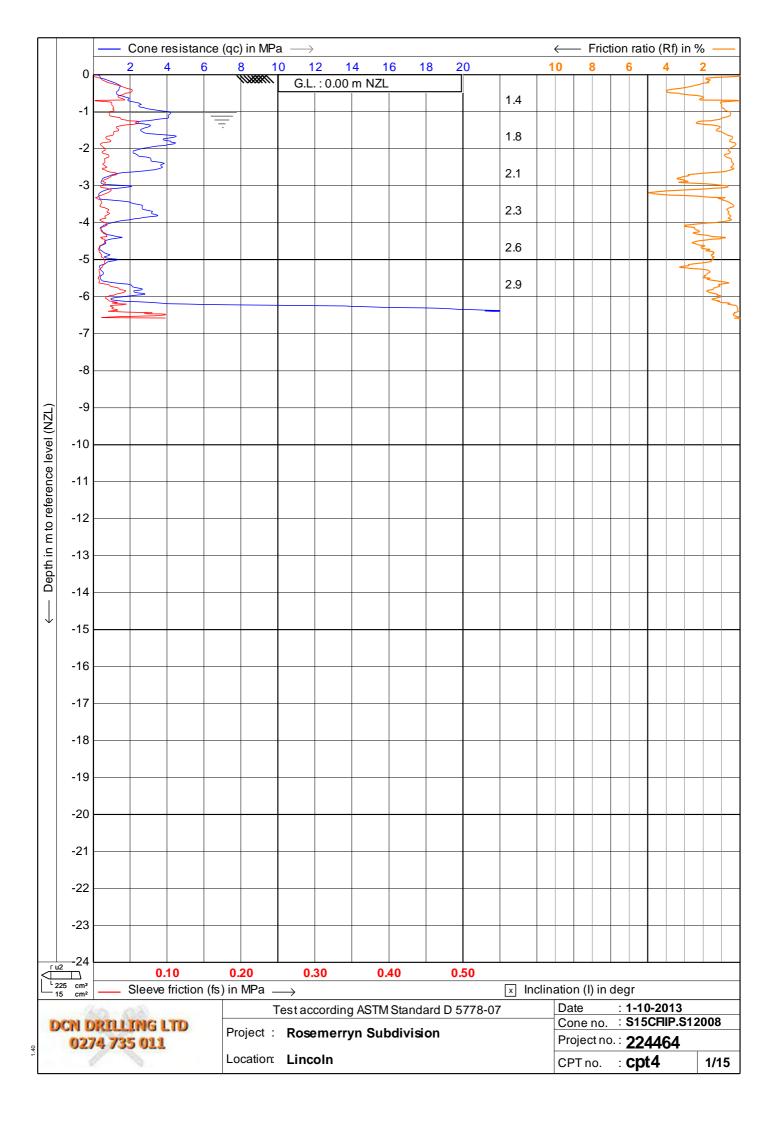
Cone No: 4485 Tip area [cm2]: 10 Sieeve area [cm2]: 150

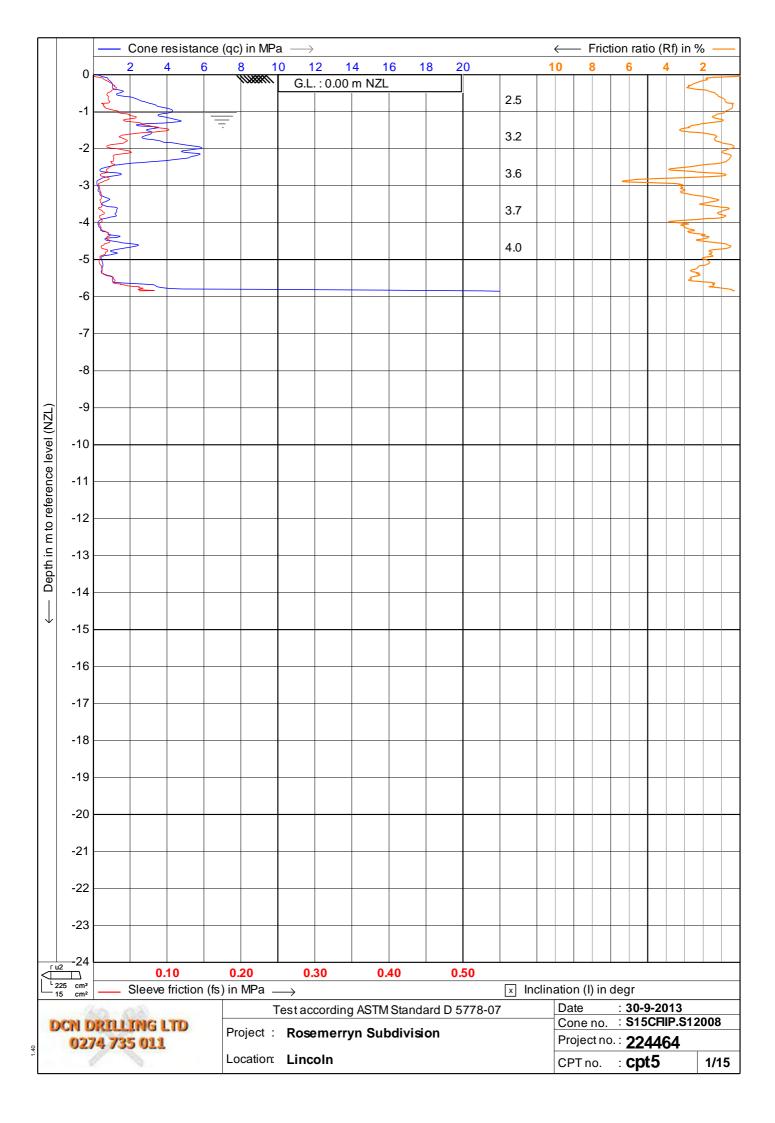
Location:	Position:	Ground level:	Test no:
Rosemarryn Subdivision	X: 0.00 m, Y: 0.00 m	0.00	27
Project ID:	Client:	Date:	Scale:
	Aurecon	4/20/2012	1:22
Project: ROSEMARRYN		Page: 1/1	Fig:
		File: RosemarrynSul	odivisionCPT27.cg

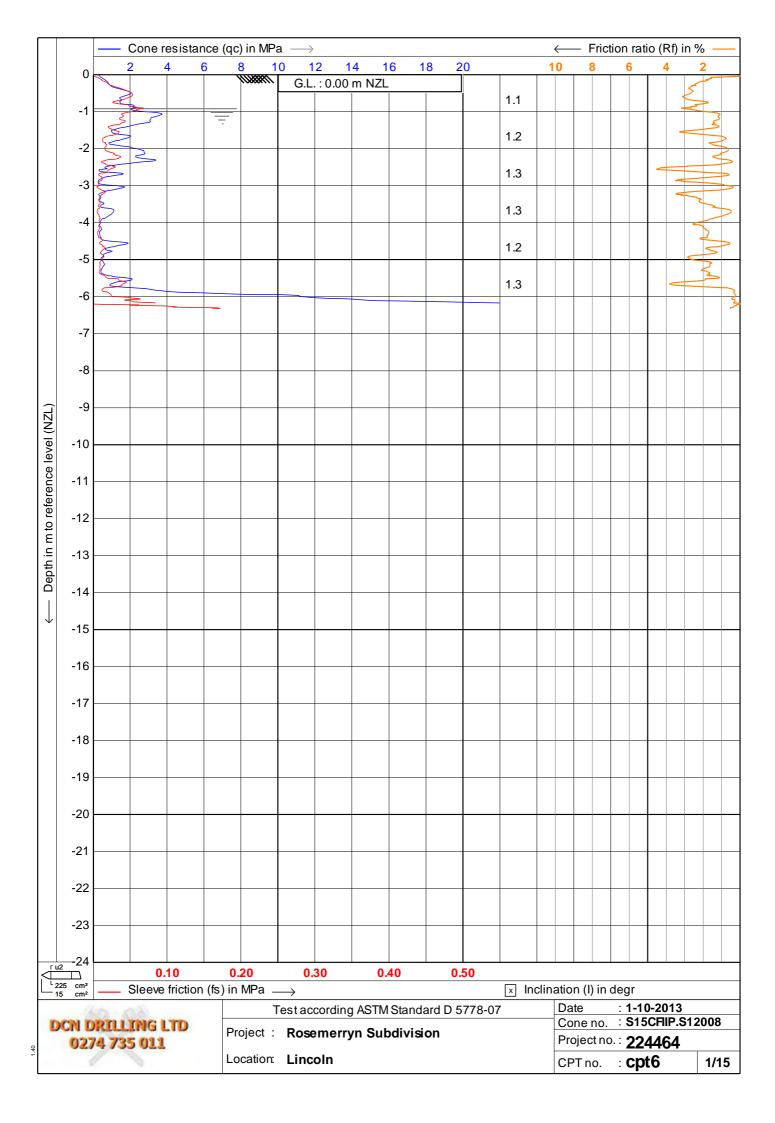


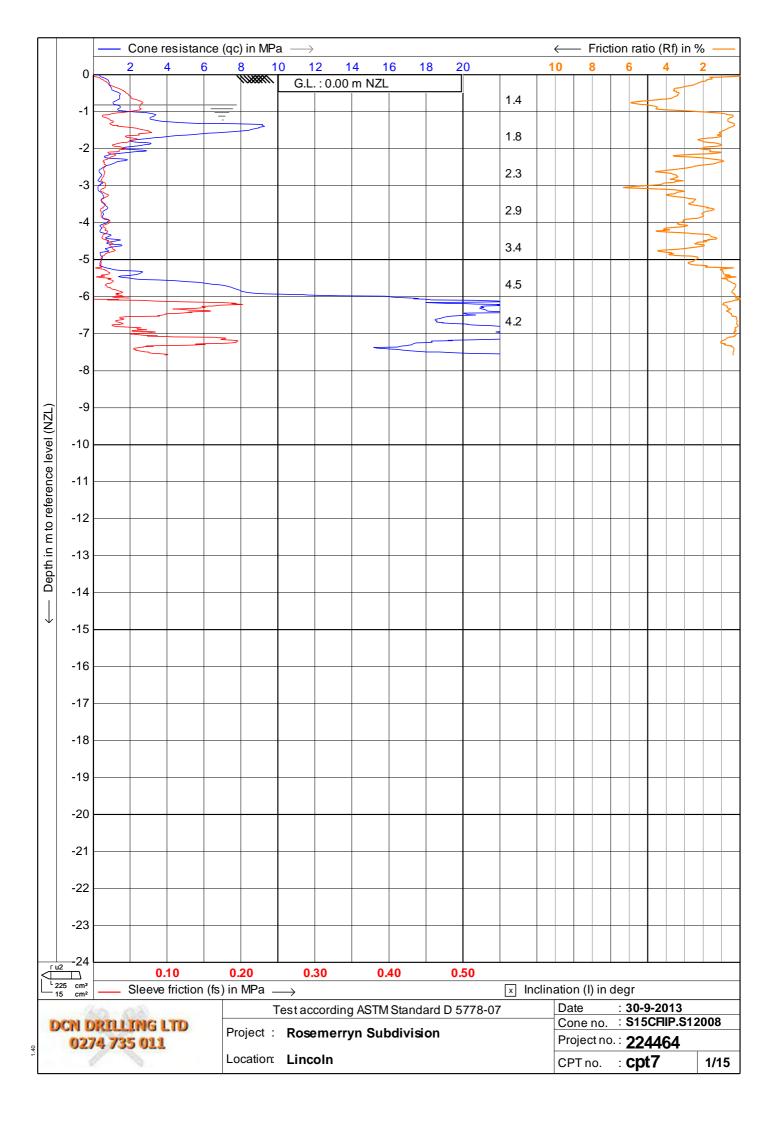


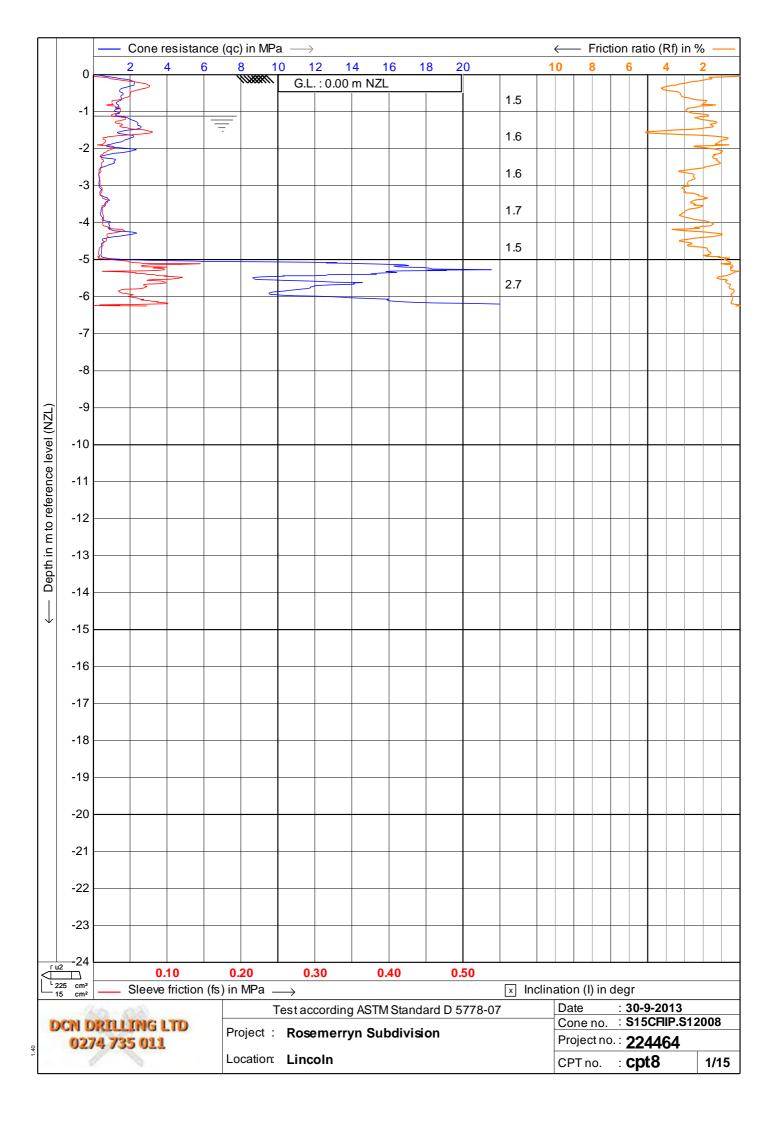


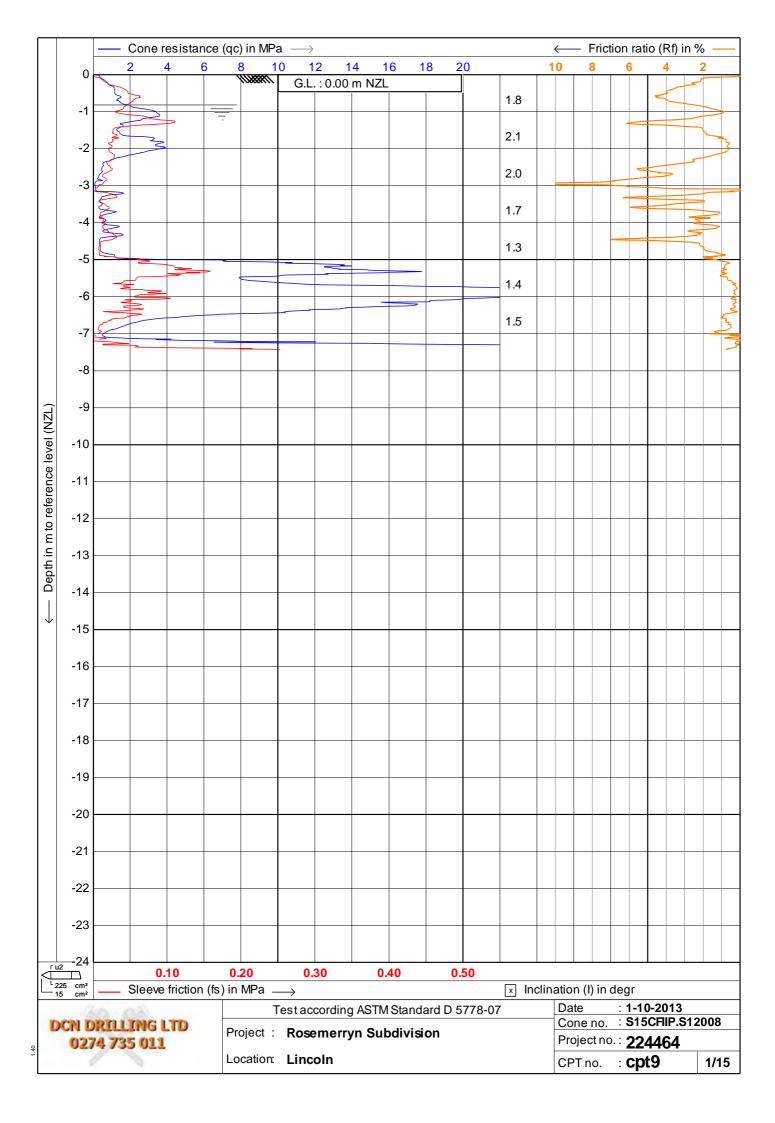


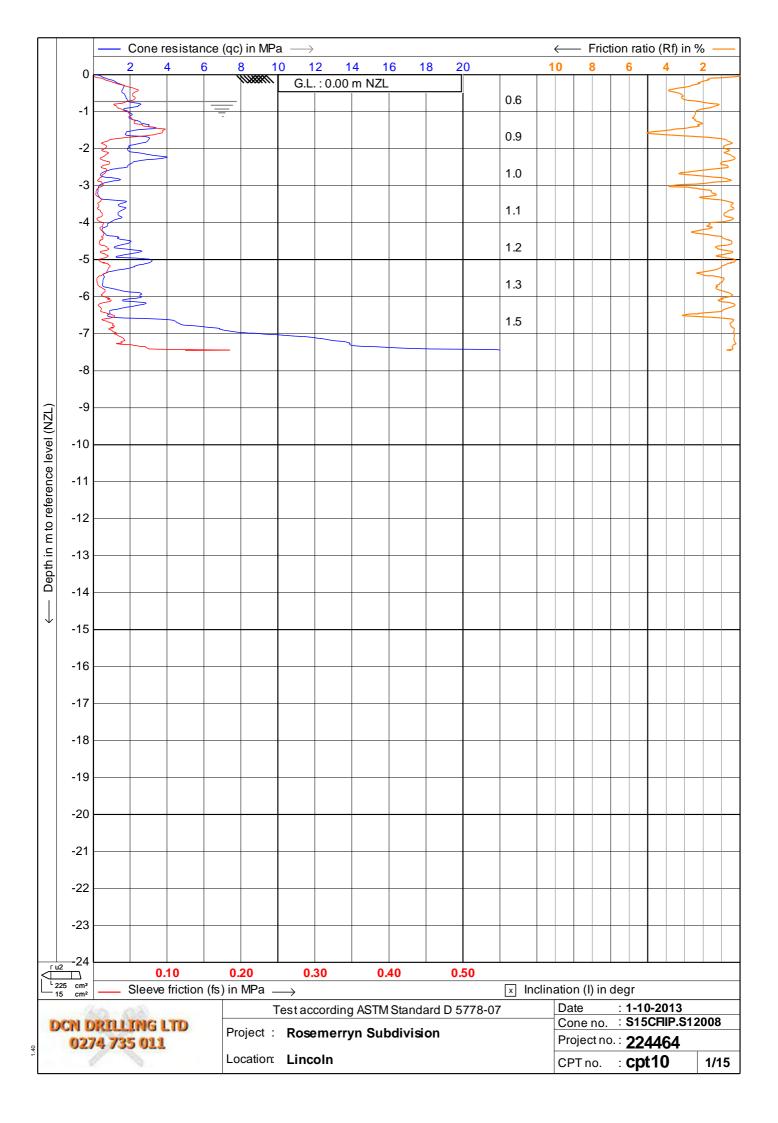


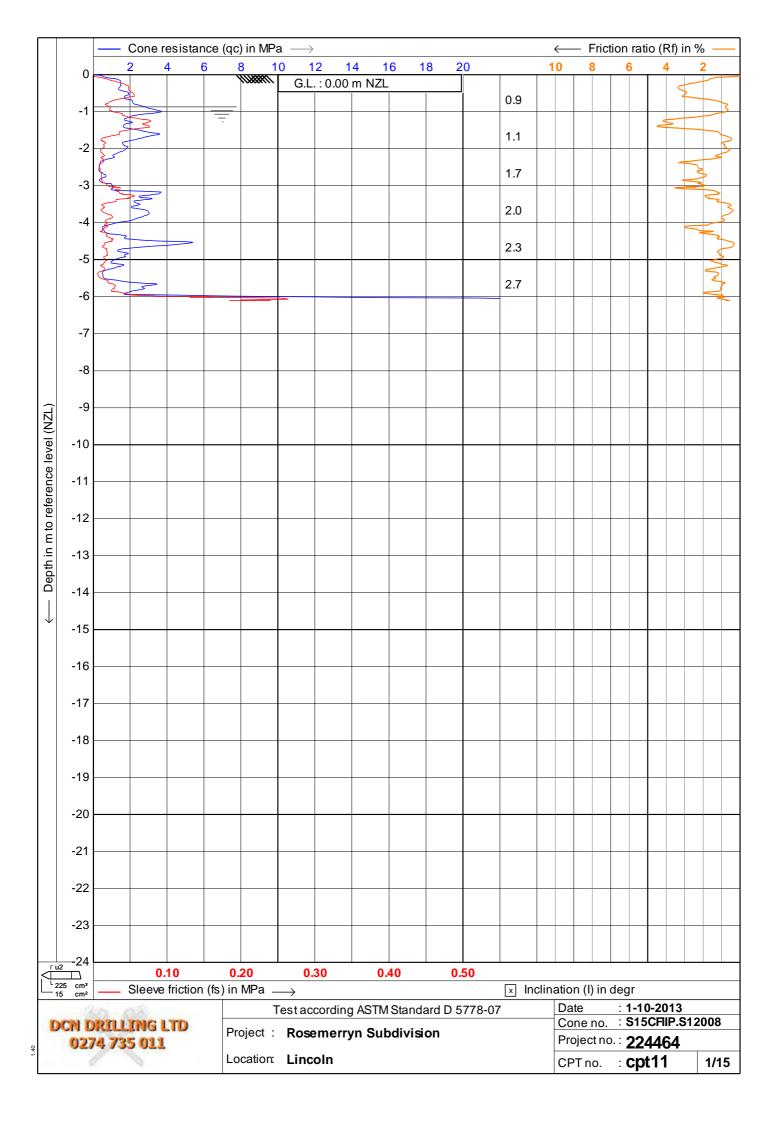


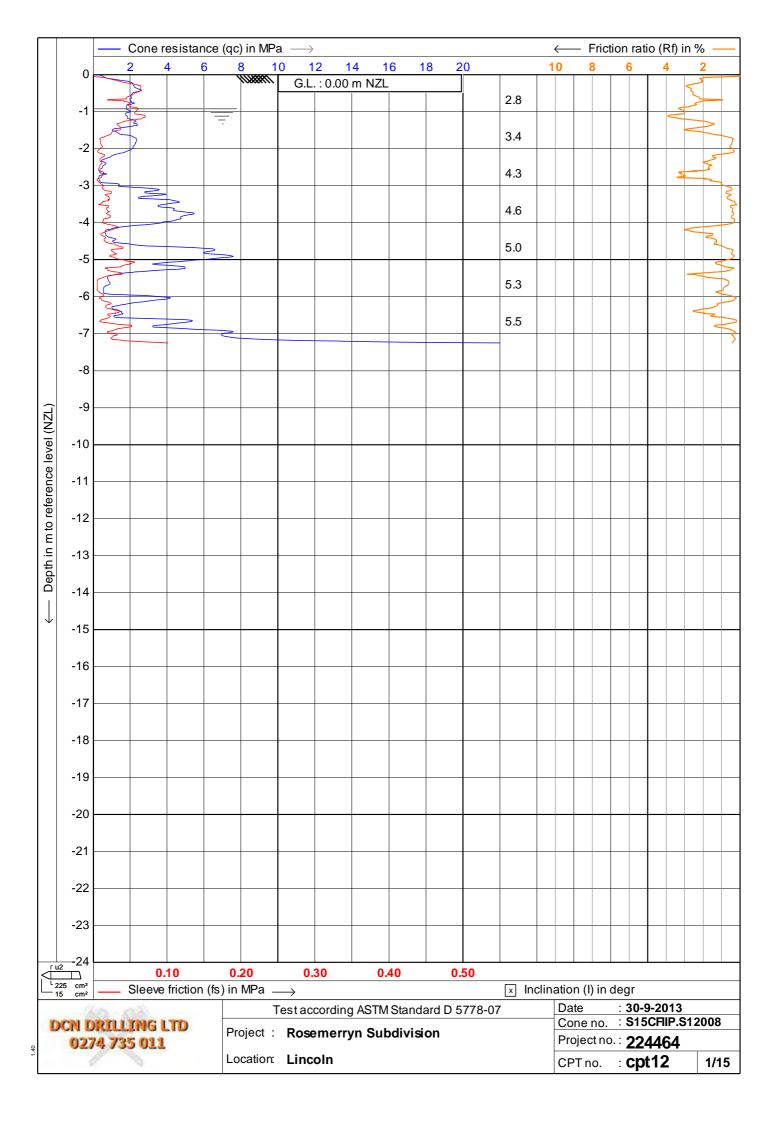


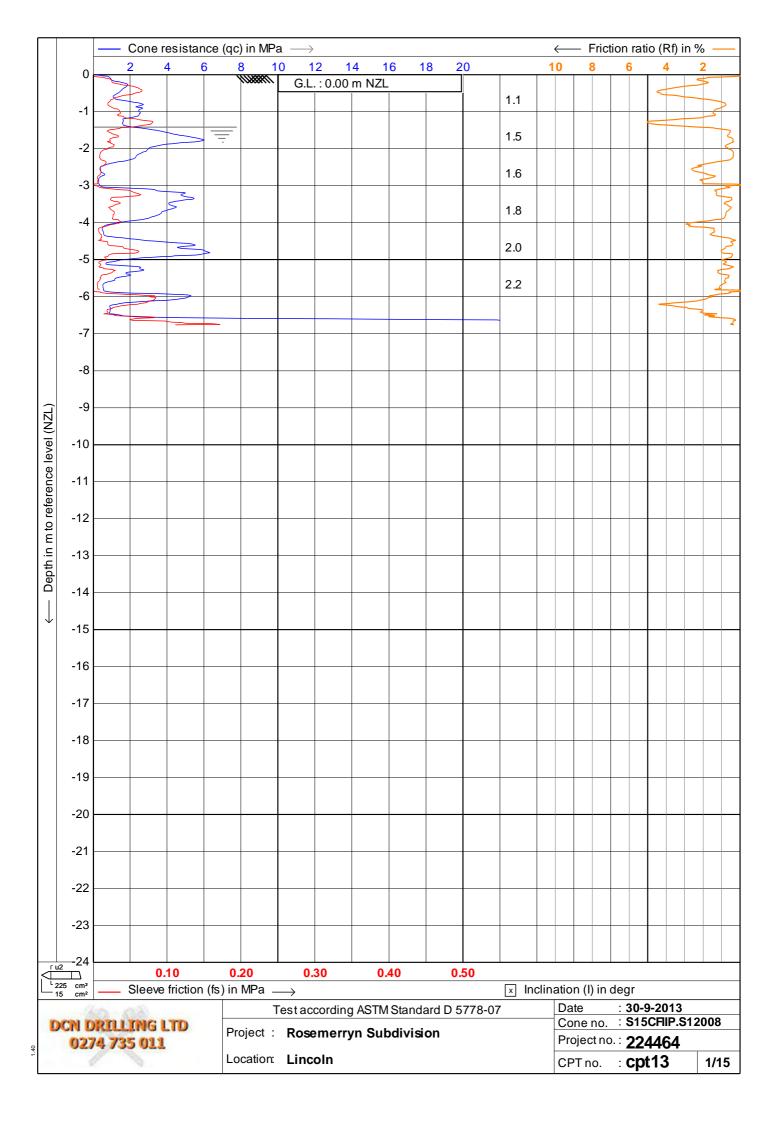


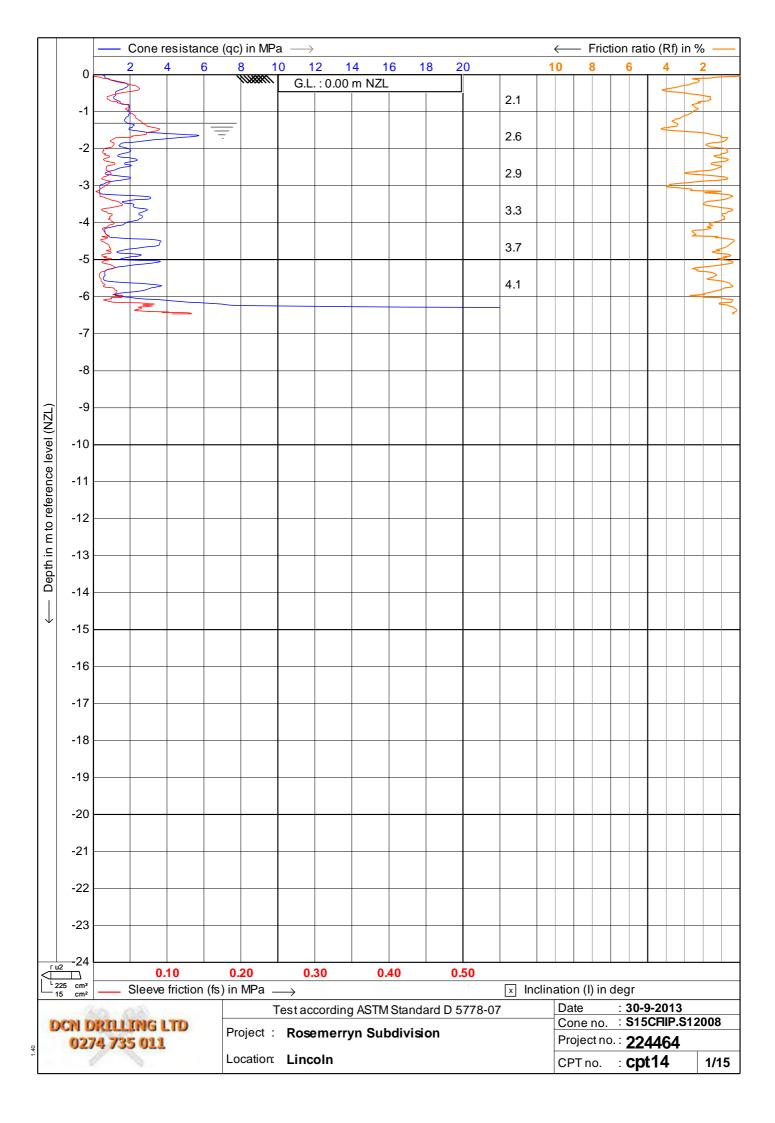


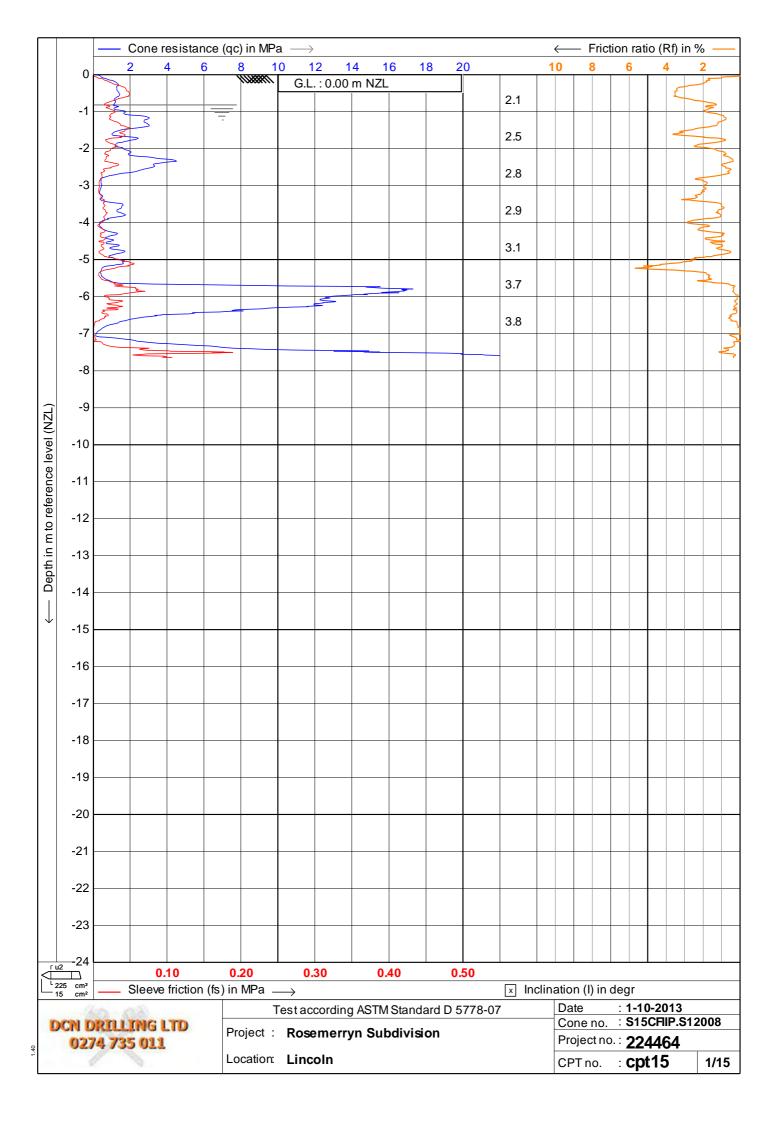


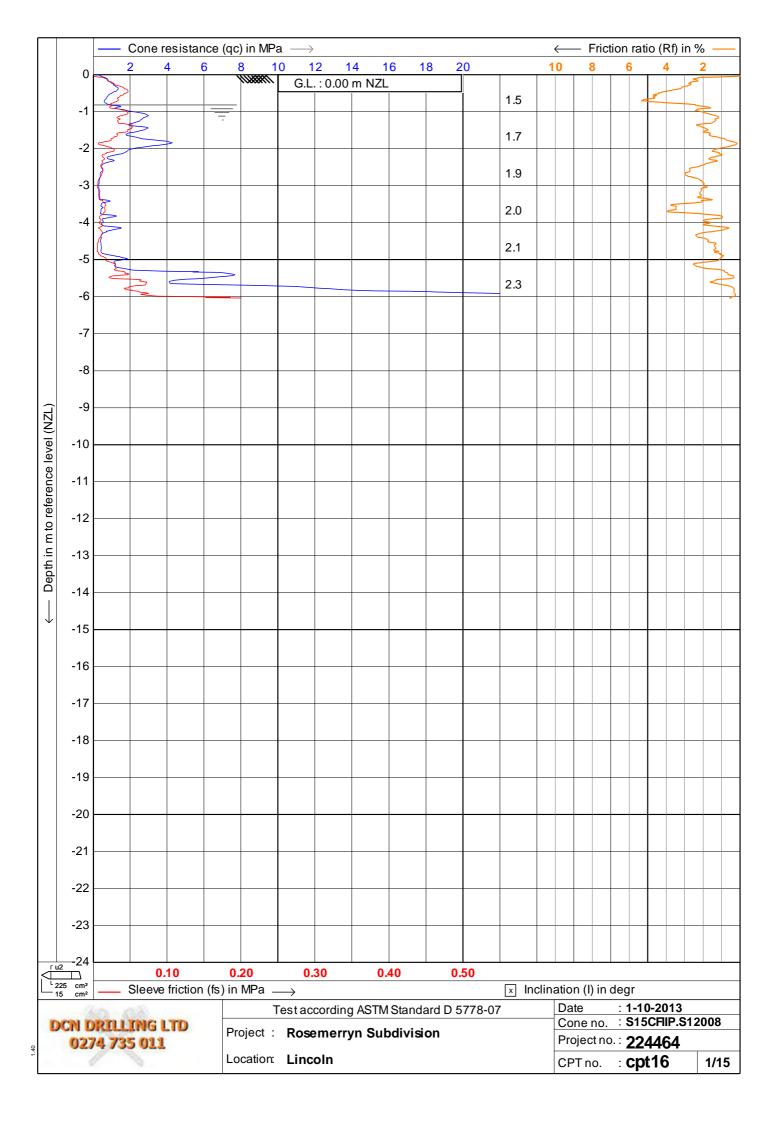


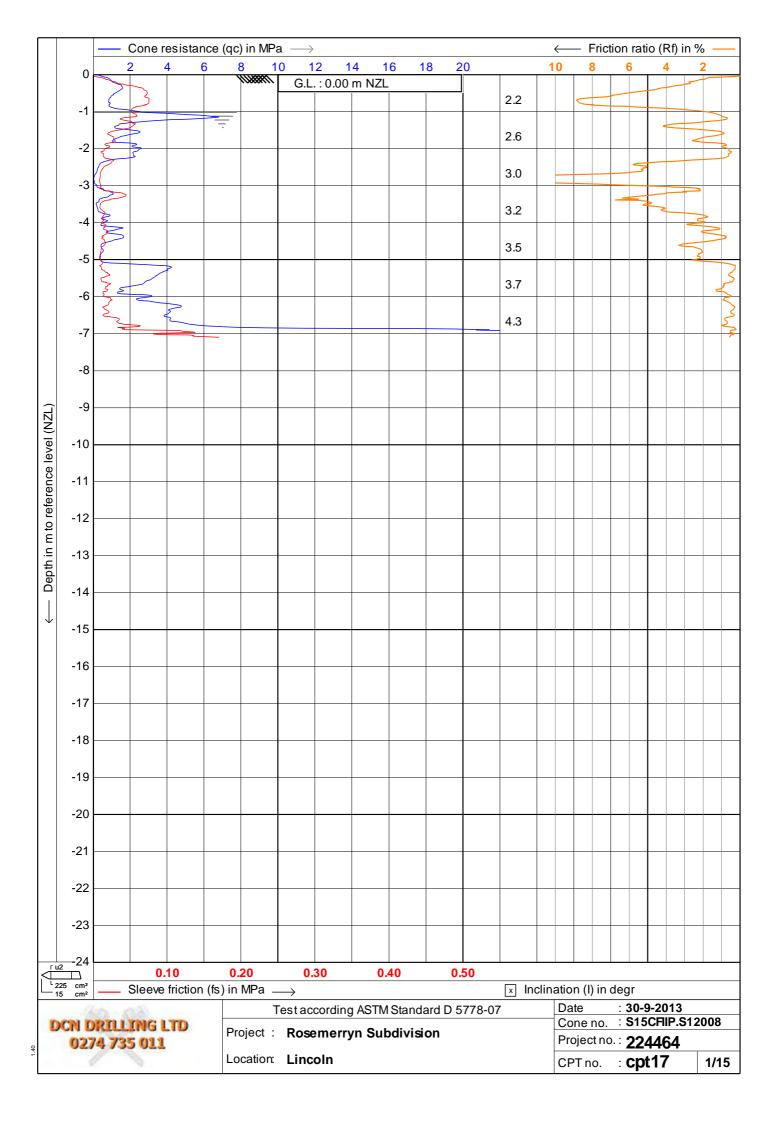


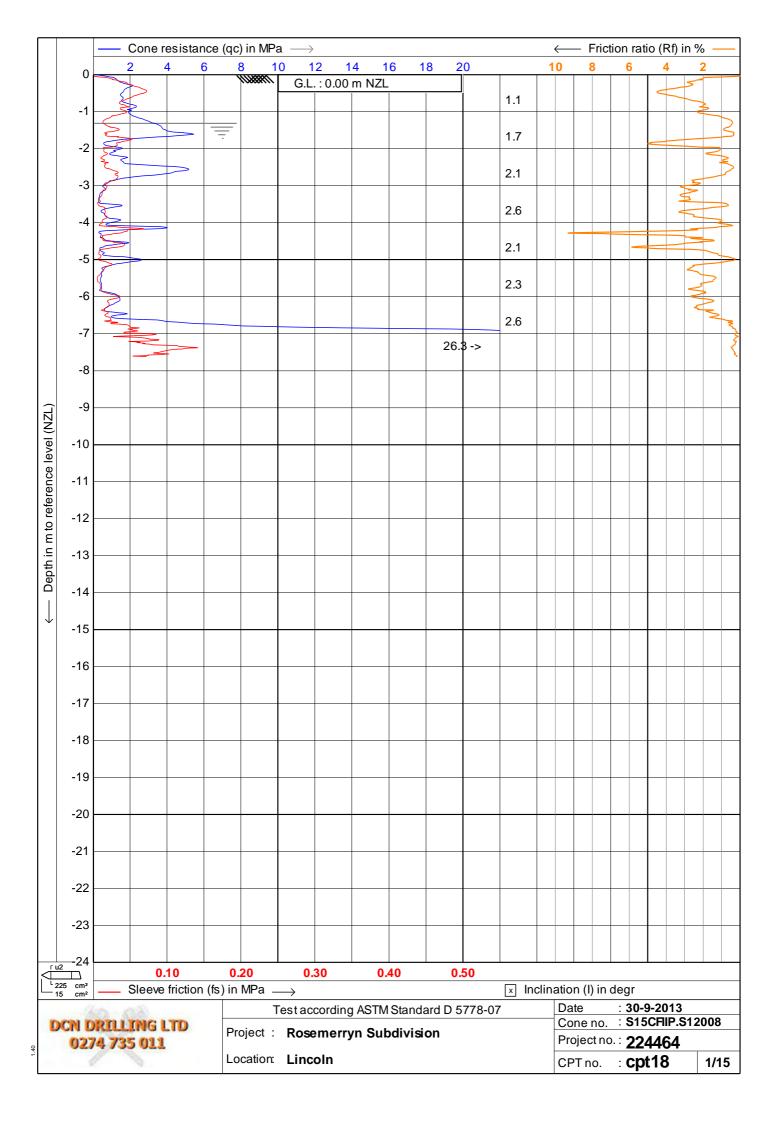


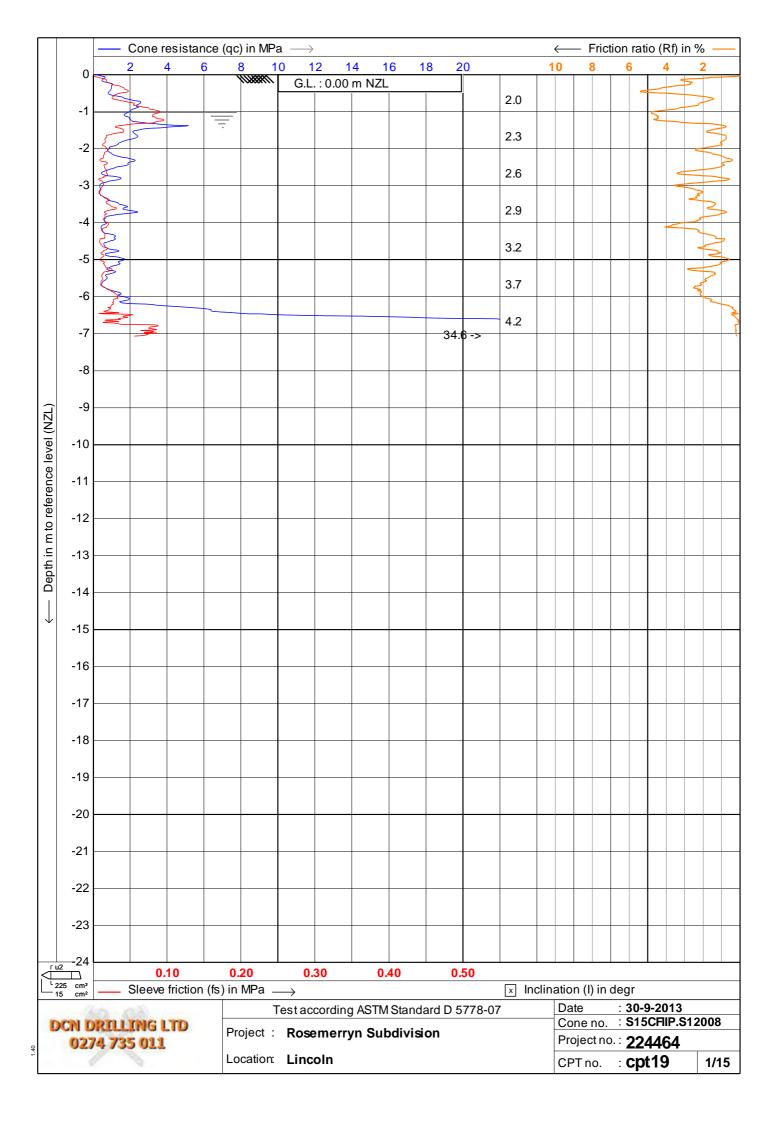


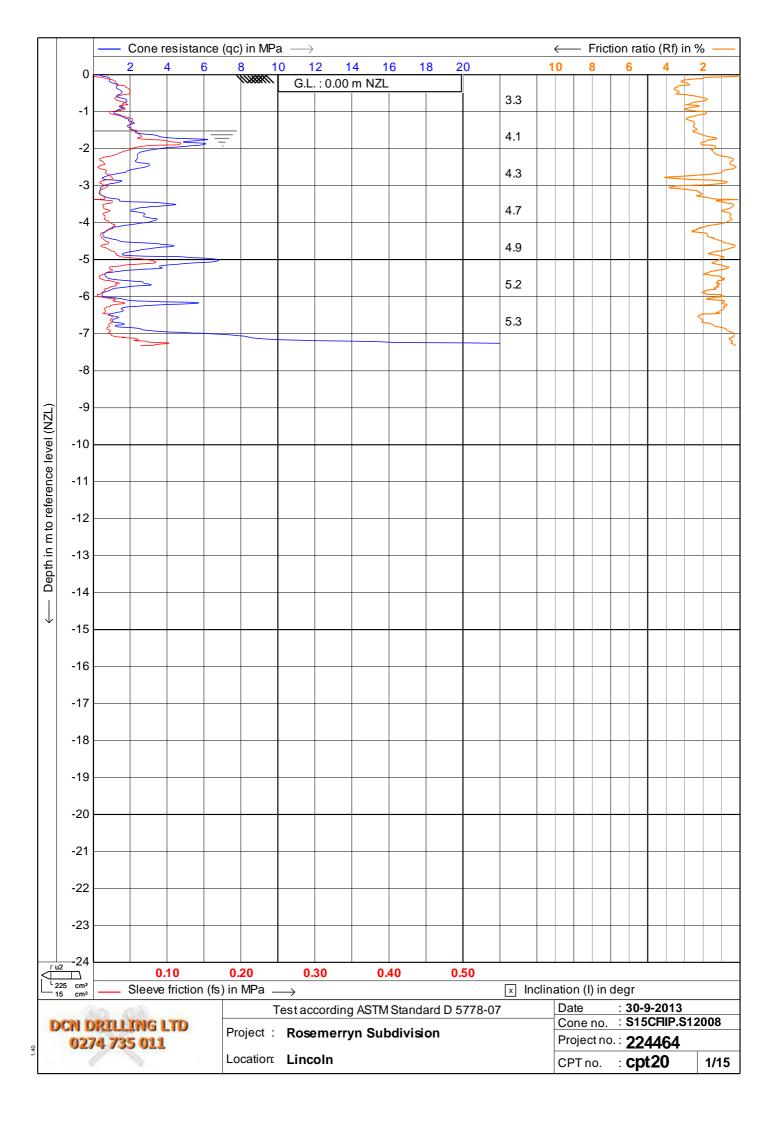


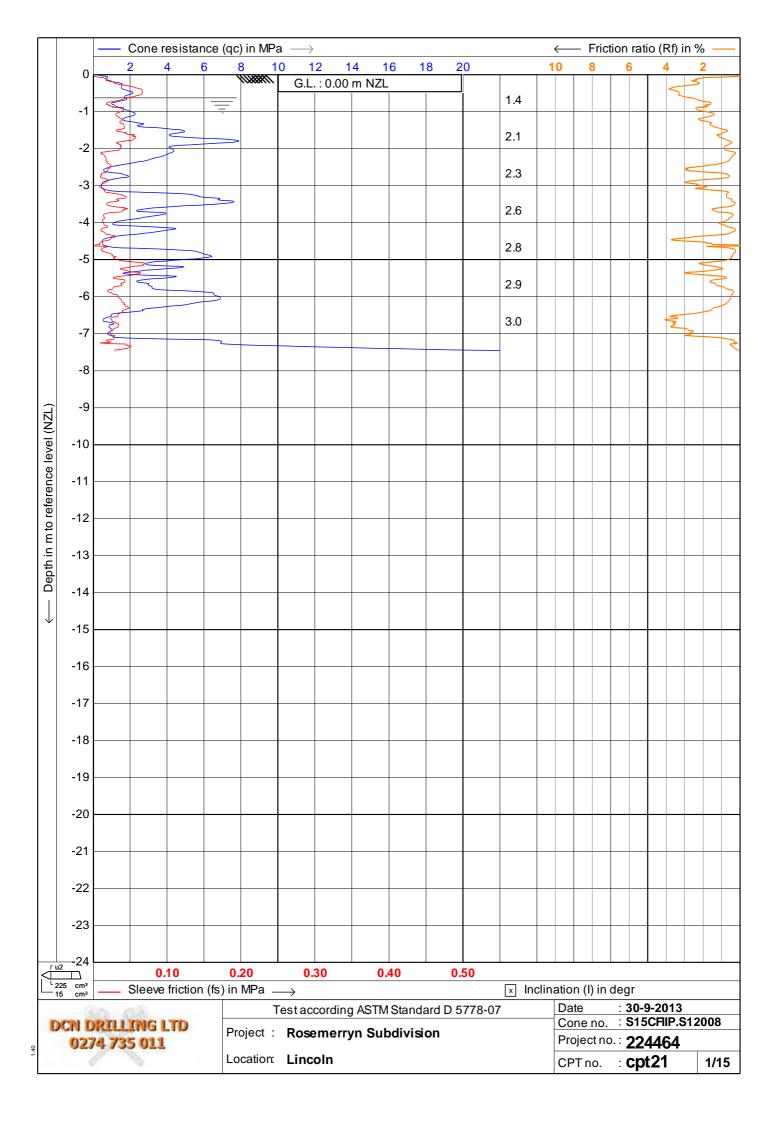


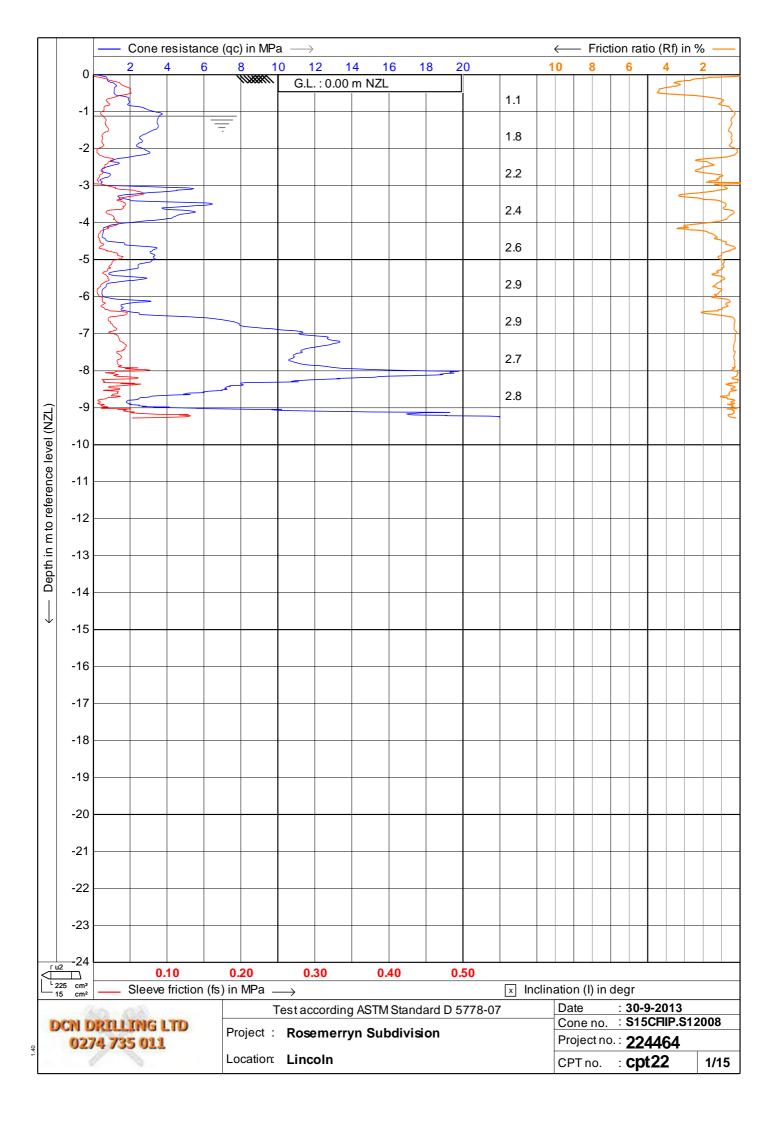












Appendix F Test Pits Logs

Aureon (New Zealand) Limited Unit 1, 150 Cavendish Rd Po BOX 1061 Christchurch 8140 New Zealand Unit 4, 160 Cavendish Rd Po BOX 1061 Christchurch 8140 New Zealand Telephone: +64 3 366 0821 New Zealand Possibile: +64 3 379 6955 Email: christchurch@ap.aurecongroup.com

Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN

TP07

	TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan	CO-ORDINATES NZTM Easting: 1559471 m Northing: 5168052 m Ground Level: N/A	Date Started: 6/09/2011 Date Completed: 6/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK
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Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
0.5			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SAND; Brown. Loose. Moist. Sand fine grained.	
1.0			× × × × × × × × × × × × × × × ×	Shear vane at 1m: 59/30kPa		SILT; Grey with orange brown mottling. Very stiff. Moist. Non plastic.	
1.5 -			X	Shear vane at 1.5m: 41/30kPa			
2.5 –			××			SAND with minor silt; Light blue grey. Medium dense. Saturated. Sand fine grained.	
3.0			× × × × × × × × × × × × ×			SILT with minor peat inclusions. Light blue grey. Wet. Low plasticity. 3.30 SILT; Light blue grey. Stiff. Wet. Low plasticity.	
3.5 -		T	×××			End of Test Pit at 3.5m (GW Reached)	
4.0							
4.5 –							
Remarks Groundw		ched @	3.5m			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
						Sheet	1 of 1

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Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN Location: SEE PLAN

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pit Dimensions:
Contractor: Fulton Hogan Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Dale Started: 6/09/2011 Dale Completed: 6/09/2011 CO-ORDINATES N/A Easting: 1559 Northing: 5160 Ground Level: N/A 1559549 m 5168236 m

Depth (m)	Water Level (m)	Graphic Log	Shear Vane Tests	Pockat Penetrometer Fests	Soil Description	Elevation (m)
		77.77.7 77.77.7			TOPSOIL silt with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained.	
).5 -	- Managara de la compania del compania del compania de la compania del la compania de la compania dela compania del la compani	° 0°			Gravelly SAND; Brown, Loose, Molst, Gravel fine to medium grained, sub rounded, Sand medium grained.	
.0 -		, O ,				
.5 -		0 0				
.0 —	-				234 Sandy GRAVEL; Brown, Loose, Moist, Gravel fine to medium grained, sub rounded, Sand medium grained.	<u> </u> - -
.5						****
.0 —						
.5	Ţ.				End of Test Pit at 3.6m (GW Reached)	
.0			A PARTIE AND A PAR			
.5 -			ления в при			
Remarks:	iched @ :	2 Cm			Logged by: LFS Input by: LFS Checked by: JSM	

Last Generaled: 29/09/2011 (0x01:35 a.m.

Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN

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TP10

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30f Excavator
Test Pit Dimensions:
Contractor: Fulton Hogan

CO-ORDINATES WA
Easting: 1559602 m
Northing: 5188105 m
Ground Level: N/A

Date Started: 6/09/2011 Date Completed: 6/09/2011

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (π)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Paremometer Tests	Sail Description	Elevation (m)
			7. 27. 27. 2 7. 27. 2 7. 20. 20. 27. 27. 2			TOPSOIL SILT with trace sand and occalsional rootlets; Dark brown, Firm, Moist, Low plasticity, Sand fine grained.	
).5 -			× × × × × × × × × ×	Cimer i ene at C.Fett. 104 12kPa		SILT; Grey with orangle brown mottling, Very stiff, Molst, Non plastic.	
.0 -			x			SAND; Brown. Loose to medium dense. Molst. Medium grained. SILT; Light grey. Soft. Moist. Low plasticity.	
2.			x	Shear vone 14 1.5m: 50% 6kPq			
.0 —			*	Shear tene at 2m: C0/15hPa	***************************************	SAND with minor silt; Blue grey, Medium dense, Saturated, Fine grained, Low plasticity.	
.5			X X X X X X X X X X X X X X X X X X X			PEAT silty with some roots. Light blue grey. Wet. Low plasticity.	
.0						SINGRAVEL sandy with trace silts; Grey, Loose, Wet, Fine to medium grained. Non plastic, Well graded. GRAVEL sandy with trace silts; Light brown orange, Loose, Wet, Fine to	
.5	i na ja ni na					End of Test Pit at 3.3m (GW Reached)	
.0 -	APPLIPERATE ASSESSMENT AS A SECOND						
5			***************************************				
emarks;	twater er	acounte	red			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

Client: FULTON HOGAN
Project Name: ROSEMER
Location: SEE PLAN
Telephonia -451 370 5022
Location: SEE PLAN
Project Reference: 224464

FULTON HOGAN LAND DEVELOPMENT

Project Name: ROSEMERRYN Location: SEE PLAN

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pit Dimensions:
Contractor: Fullon Hogan CO-ORDINATES N/A Easting: 15596-Northing: 51681 Ground Level: N/A Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Date Started: 7/09/2011 Dale Completed: 7/09/2011 1559641 m 5168197 m

1.5 - Sithy SAND; Dark grey Loose, Moist, Sand fine grained. 2.6 - Sithy SAND; Dark grey Loose, Moist, Sand fine grained. 2.7 - Sithy SAND; Dark grey Loose, Moist, Sand fine grained. 2.8 - Sithy SAND; Dark grey Loose, Moist, Sand fine grained. 2.9 - Sithy SAND; Dark grey Loose, Moist, Sand fine grained. 2.10 - Sithy SAND; Dark grey blue, Soft, Well, Low plasticity. 2.10 - S	Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
Silty SAND; Dark grey. Loose. Moist. Sand fine grained. Silt; Dark grey blue. Soft. Well. Low plasticity. End of Test Pit at 2.9m (GW Reached)	5			77 77 77 74 77 77			Moist. Low plasticity. Sand fine grained.	
Silty SAND; Dark grey. Loose. Moist. Sand fine grained. Silty SAND; Dark grey blue. Soft. Wel. Low plasticity. SILT: Dark grey blue. Soft. Wel. Low plasticity. End of Test Pit at 2.9m (GW Reached)	0	1						
5.5 - SILT; Dark grey blue. Soft. Wei. Low plasticity. Silt; Dark grey blue. Soft. Wei. Low plasticity. Silt; Dark grey blue. Soft. Silt; Dark grey blue. Soft. Silt; Dark grey blue. Soft. Silt; Dark				× ×			Silty SAND; Dark grey. Loose. Moist. Sand fine grained.	
Sill, Dak gley dide. Soft. Well. Low plasticity. Sill, Dak gley dide. Soft. Well. Low plasticity. End of Test Pit at 2.9m (GW Reached) End of Test Pit at 2.9m (GW Reached)				*			255 C. L. T. Dark area bloo Sept. Mol. Levy observed.	
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emarks: Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK		ter reach	ed @	2.9m			Logged by: LFS input by: LFS Checked by: JSM Verified by: JK	

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Figuration: 194 2 596 888

Project Name: ROSEMER

Location: SEE PLAN

Project Reference: 224464

FULTON HOGAN LAND DEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

TP12

Sheet 1 of 1

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK 6/09/2011 6/09/2011 TEST PIT INFORMATION CO-ORDINATES N/A Date Started: Excavator Type: 30I Excavator Test Pit Dimensions: Contractor: Fulton Hogan Easting: 1559
Northing: 5168
Ground Level: N/A 1559680 m 5168289 m Date Completed:

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penatrometer:Tests	Soil Description	Elevation (m)
).5 -			77 77 3 77 77 3			TOPSOIL SILT with trace sand and occasional rootlets; Dark brown, Firm. Moist, Low plasticity. Sand fine grained. SAND with some silt; Brown, Loose to medium dense, Moist, Sand fine grained.	
o —			3			Sandy GRAVEL; Light grey. Loose to medium dense. Moist. Gravel fine to medium grained, sub rounded. Sand medium grained. Sandy SILT; Light brown. Firm. Wet. Low plasticity. Sand fine grained. Sandy GRAVEL; Light grey. Loose to medium dense. Moist. Gravel fine to	
5						medium grained, sub rounded. Sand medium grained.	
0 — 5 —							
o —		Ţ				End of Test Pit at 2.9m (GW Reached)	<u> </u>
5 -							
.0			THE PROPERTY OF THE PROPERTY O				
.5 - -	1		Transperson and the state of th				
Remark: Bround	s: water reac	ched 2.5	Jm			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

29/09/2011 10:01:44 a.m.

Last Generated:

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Email: chinischilichi@p.pu.resorgirouz.com

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FULTON HOGAN LAND DEVELOPMENT

Project Name: ROSEMERRYN Location: SEE PLAN

TP15

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pit Dimensions:
Contractor: Fulton Hogan Logged by: LFS Inpul by: LFS Checked by: JSM Verified by: JK Dale Started: 7/09/2011 Dale Completed: 7/09/2011 CO-ORDINATES N/A Easting: 1559733 m Northing: 5168158 m Ground Level: N/A

Depth (m)	Sample	Wafer Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
).5			<u>V. V.</u> I <u>r 80</u> ; <u>84</u>			TOPSOIL SILT with trace sand and occalsional rootlets; Dark brown, Firm. Moist, Low plasticity, Sand fine grained. SAND; Grey with orange brown mottling, Loose, Moist, Sand fine grained.	
.0 -			*			SILT; Dark grey. Soft. Moist. Low plasticity.	
.5		- 111 PORT	× × × × × × × × × × × × × × × × × × ×				
.0			× × × × × × • × × ×			230 GRAVEL with some sand; Grey and dark orange brown. Dense. Wet to saturated. Gravel fine grained, rounded to sub-rounded. Sand fine grained. End of Test Pit at 2.3m (GW Reached)	
.5 -		-AL000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-ALD000-A					
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Aureon (New Zealand Umited Umited Umited Umited 1,150 Capteriol Red Po BOX 1081 (Facsimile: +64 3 366 0921 www.aureorogroup.com Facsimile: +64 3 376 6955 Famile: historichurch 8140 Project Reference: 224464 Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN

TP19

Sheet 1 of 1

Email: dividication gap.darocong.cap.com			
TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan	CO-ORDINATES NZTM Easting: 1559747 m Northing: 5167935 m Ground Level: N/A	Date Started: 6/09/2011 Date Completed: 6/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK
		_	

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
- - - - 0.5 –			\(\frac{\frac}\firi}{\firint{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fracc}			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SILT; Light brown. Soft. Moist. Low plasticity.	
.0 —			× × × × × × × × × × ×			SAND with minor silt; Light brown. Loose to medium dense. Moist. Sand fine grained. SILT with minor sand; Grey with brown mottling. Stiff. Moist. Low plasticity. Sand fine to medium grained.	
.5 - .5 .			× × × × × × × × × × × × × × × × × × ×			1.70 1.80 SILT with some peat inclusions; Light blue grey. Wet. Low plasticity.	-
2.0 — -						SAND; Blue. Loose to medium dense. Wet. Fine grained. SAND; Brown. Loose to medium dense. Wet. Fine grained.	
- 2.5 - - -		T				2.80	
3.0 — - -						End of Test Pit at 2.8m (GW Reached)	
-							
5.5 - - - -							
- - -							
1.0 —							
Ground	s: water see ot @ 2.5m	page @	1.7m			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

FULTON HOGAN LAND DEVELOPMENT

Project Name: ROSEMERRYN Location: SEE PLAN

Sheet 1 of 1

Client: FULTON HOGAN
Project Name: ROSEMER
Location: SEE PLAN
Talpiona 464.1 266.0821
New Jealand
New TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pit Dimensions:
Contractor: Fullon Hogan CO-DRDINATES N/A
Easting: 1559786 m
Northing: 5168027 m
Ground Level: N/A Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Dale Started: 6/09/2011 Dale Completed: 6/09/2011

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket	Soil Description	Elevation (m)
			20 30 30 22 37 3			TOPSOIL SILT with trace sand and occalsional rootlets; Dark brown, Firm, Moist, Low plasticity. Sand fine grained.	
1			7, 2, 1			SAND with minor silt, Brown. Loose to medium dense. Moist. Sand fine grained.	
1.5			X X X X X X X X X X X X X X X X X X X			Silty SAND; Grey with orange brown moltling. Loose to medium dense. Moist. Sand fine grained.	
0.0			× × × × × × × × × × × × × × × × × × ×				
.5 -			*				
.0			× × × × × × × × × × ×			SILT with tree roots; Grey with brown mottling. Soft. Wet. Low plasticity.	
.5			x x x x x x x x x x x x x x x x x x x	***************************************		> ha	
i.0 —		<u>*</u>	9			Gravelly SAND; Grey. Loose. Wet. Sand fine to medium grained. Gravel medium to coarse grained and sub rounded. End of Test Pit al 3m (GW Reached)	
.5							
.0 —							
.5 -			-	- Type de la constante de la c			
	Links			AND			
temarks: Sroundwat	er table	reache	ed at 3.0m			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
						Sheet 1	of 1

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Unit 1.180 Covendeb Rd
Project Name: ROSEMER
Location: SEE PLAN
Project Reference: 224464

FULTON HOGAN LAND DEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

TP21

Sheet 1 of 1

Empt: christensch@ap no econgroup com			
TEST PIT INFORMATION Excavator Type: 30t Excavator Tast Pt Dimensions: Contractor: Fulton Hogan	CO-ORDINATES N/A Easting: 1659825 m Northing: 5168119 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
).5 -			54 54 5 6 54 54			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown, Firm. Moist, Low plasticity. Sand fine grained. SAND; Grey with orange brown mottling. Loose, Moist, Sand fine grained.	
.0 —		:	× × × × × × × × × × × × × × ×			SILT; Dark grey. Soft. Moist. Low plasticity.	
.5			x x x x x x x x x x x x x x x x x x x			Silty SAND; Dark blue grey. Loose to medium dense. Moist. Sand fine grained.	-
2.0		**************************************	* * * * * * * * * * * * * * *			Gravelly SAND; Grey and dark orange brown. Dense. Wet to saturated.	
2.5 −		A de la companya de l				Gravelly SAND; Grey and dark orange brown. Dense. Wet to saturated. Gravel fine grained, rounded to sub-rounded. Sand fine grained. End of Test Pit at 2.5m (GW Reached)	
i.0 —							<u> </u>
3.5					AAAAA AAAAA AAAAA AAAAA AAAAA AAAAA AAAA		
.0 —							
i.5 –							
		1	i e			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

Client:

FULTON HOGAN LAND DEVELOPMENT

	Project Name: ROSEMERRYN Location: SEE PLAN		IPZZ
	Project Reference: 224464		Sheet 1 of 1
TEST PIT INFORMATION Excavator Type: 30i Excavator Test Pit Dirmensions: Contractor: Fullon Hogan	CO-ORDINATES N/A Easting: 1559864 m Northing: 5168211 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LF\$ Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
			F 20 20			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist, Low plasticity. Sand fine grained.	1
9.5						SAND; Grey with orange brown mottling. Loose, Moist. Sand fine grained.	
0.1							
1.5					the same and the s		
.0					To the continue of the continu		
.5 -		:				GRAVEL with some sand; Grey with brown sand. Dense. Wet to saturated. Gravel fine to medium grained, rounded to sub-rounded. Sand fine grained.	
3.0		Ţ				End of Test Pit at 2.9m (GW Reached)	
3.5			A CONTROL OF THE CONT				
1.0 —		A LA			The state of the s		OPPORT THE RESIDENCE OF THE PROPERTY OF THE PR
4.5							
Remark No grou	s: ndwater e	encount	ered			Logged by: LFS input by: LFS Checked by: JSM	
-						Verified by: JK	

Last Generated: 29/09/2011 19:02:02 a.m.

Aurecon (New Zealand) Limited
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Email: christchurch@ap.aurecongroup.com

Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN

TEST PIT INFORMATION	CO-ORDINATES NZTM	Date Started: 9/09/2011	Logged by: LFS
Excavator Type: 30t Excavator	Easting: 1559684 m	Date Completed: 9/09/2011	Input by: LFS
Test Pit Dimensions:	Northing: 5167528 m	·	Checked by: JSM
Contractor: Fulton Hogan	Ground Level: N/A		Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
- - -			71/2 1/1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/			TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained.	
0.5 -			<i>j.</i> , , , , , , , , , , , , , , , , , , ,			SAND; Dark grey. Loose to medium dense. Moist. Sand fine grained.	
.0 —						Silt with some peat inclusions. Light blue grey. Soft. Wet. Low plasticity.	
I.5 –			1, 11, 11,			SAND; Brown. Loose to medium dense. Moist. Sand medium grained. SAND; Grey. Loose to medium dense. Wet. Sand medium grained.	
2.0			× × × × × × × × × × × × × × × ×			Silty SAND; Grey. Loose to medium dense. Wet. Sand medium grained.	
2.5 -			* * * * * * * * * * * * * * * * * * *			Silty SAND with tree roots; Light blue grey. Medium dense. Wet. Sand fine grained.	
3.0			× × × × × × × × × × × × × × × × × × ×				
3.5			× × × × × × × × × × × × × × × × × × ×				
1.0			* *			End of Test Pit at 4m (Pit Collapse)	
1.5							
Remarks:	s @ 1.0r	m				Logged by: LFS Input by: LFS Checked by: JSM	
Tree root	s @ 3 ∩ r	m				Verified by: JK	

Aureon (New Zealand) Limited Unit 1, 150 Cavendish Rd Po BOX 1061 Christchurch 8140 New Zealand Unit 4, 160 Cavendish Rd Po BOX 1061 Christchurch 8140 New Zealand Telephone: +64 3 366 0821 New Zealand Possibile: +64 3 379 6955 Email: christchurch@ap.aurecongroup.com Client: FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN

TP24

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan CO-ORDINATES NZTM Easting: 1559762 m Northing: 5167712 m Ground Level: N/A	Date Started: 9/09/2011 Date Completed: 9/09/2011	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK
--	--	---

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
0.5 -			\(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}\)	Shear vane at		TOPSOIL SILT with trace sand and rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. Sandy SILT; Grey with orange brown mottling. Stiff. Moist. Low plasticity. Sand fine grained.	
1.0			× × × × × × × × × × × × × × × × × × ×	0.5m: 104/18kPa Shear vane at 1m: 44/27kPa			
.5 -			x x x x x x x x x x x x x x x x x x x	Shear vane at 1.5m: 30/27kPa			
2.0			X X X X X X X X X X X X X X X X X X X			Sandy SILT with tree roots; Dark blue grey. Stiff. Saturated. Low plasticity. Sand fine grained.	
2.5			× × × × × × × × × × × × × × × × × × ×				
3.0			× × ×			SAND; Brown. Loose to medium dense. Saturated. Sand medium grained.	
3.5		Ā				End of Test Pit at 3.8m (GW Reached)	
1.0 —							
r.o							
Remarks		ountere	d @ 3.8m			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
						Sheet 1	

Client: **FULTON HOGAN LAND DEVELOPMENT**

Aurecon (New Zealand) Limited
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Email: christchurch@ap.aurecongroup.com Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN

Sheet 1 of 1

TP25

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan CO-ORDINATES NZTM
Easting: 1559840
Northing: 5167896
Ground Level: N/A 1559840 m 5167896 m

Date Started: 6/09/2011 Date Completed: 6/09/2011

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
-			× × × × × × × × × × × × × × × × × ×			TOPSOIL with some rootlets and minor silt; Dark brown. Moist. Low plasticity. 0.30 SILT; Light brown. Firm. Moist. Low plasticity.	
0.5			× × × × × × × ×			SILT, LIGHT DIOWIT. FIITH, INDIST. LOW PLASTICITY.	
1.0 —			x x			SAND with minor silt; Light brown. Loose to medium dense. Moist. Fine grained.	
1.5 -						SAND with some silt; Grey with orange brown mottling. Loose to medium dense. Wet. Fine grained.	_
2.0 —			× × × × × × × × × × × × × × × × × ×			SILT; Light blue grey. Soft. Wet. Low plasticity.	
2.5 -		_	^ × ^ × × ×			SAND; Reddish brown. Loose. Wet. Sand medium grained. 280 End of Test Pit at 2.8m (GW Reached)	-
3.0 —						Lift of Test Fit at 2.011 (GW Reached)	
3.5 -							
4.0 —							
4.5 -							
Remark Ground	s: water see	page @	2.2			Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	1 of 1

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PD 80X 105 CH
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Fedehalte: +66 2 779 695

Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN Location: SEE PLAN Project Reference: 224464

TP26

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30I Excavator
Test Pit Dimensions:
Contractor: Fulton Hogan

CO-ORDÍNATES N/A
Easting: 1559917 m
Northing: 5168080 m
Ground Level: N/A

Date Started: 9/09/2011 Date Completed: 9/09/2011

Logged by: LFS input by: LFS Checked by: JSM Verified by: JK

			1	1	vernously. di	
Depth (m)	Sample Water Lavel (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
		15 71 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18			TOPSOIL SILT with trace sand and occalsional rootlets; Dark brown, Firm. Noist, Low plasticity, Sand fine grained.	
0.5	, in the second	X X X X X X X X X X X X X X X X X X X	Sheer cane at 3.5m; 59734Pa		Sandy SILT; Brown. Firm. Moist. Low plasticity. Sand fine grained.	
1.0	STATE OF THE STATE				SAND; Brown with orange mottling. Loose to medium dense. Moist. Sand fine grained.	
1.5 -		××			SAND with some silt; Dark blue grey. Loose to medium dense. Wet. Sand fine	
2.0		* * * * * * * * * * * * * * * * * * *			grained. SILT with some tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
2.5	Ţ	x × x × a			Gravelly SAND; Grey and dark orange brown. Dense. Wet to saturated. Gravel fine grained, rounded to sub-rounded. Sand fine grained. 282 End of Test Pit al 2.8m (GW Reached)	
3.0						
3.5	The Table and th	Thinks to a second				
1.0	NATIONAL PROPERTY IN	1.				
4.5				LONGOLOGIA		
Remarks: No groundwa	ater encou	ntered		a a a a a a a a a a a a a a a a a a a	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
					Sheet 1	of 1

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Aurecon (New Zealand; Unitides Units), 15% Colembia Rd Project Name: ROSEMER Por BCX 15% Colembia Rd Project Name: ROSEMER Location: SEE PLAN
New Zealand Telephone: 16% 3 35% 0885 Email, definition regions com Project Reference: 224464

Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN Location: SEE PLAN

TP27

Sheet 1 of 1

TEST PIT INFORMATION
EXCHANGE TYPE: 301 EXCHANGE
Test Pit Dimensions:
Contractor: Fullon Hogan CO-ORDINATES N/A Easung: 1699919 m Northing: 5167581 m Ground Level: N/A Logged by: LFS input by: LFS Checked by: JSM Verified by: JK Date Started: 9/09/2011 Date Completed: 9/09/2011

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
			* 70 00 00 50 7			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained.	
1.5			X X X X X X X X X X X X X X X X X X X			Sandy SILT; Grey with orange brown mottling, Stiff, Moist, Low plasticity. Sand fine grained.	
0 -			x x x x x x x x x x x x x x x x x x x				
.5 -			x x x x x x x x x x x x x x x x x x x				
o —			X X X X X X X X X X X X X X X X X X X				
5			X X X X X X X X X X X X X X X X X X X		CO. L. C. L. C.	SILT with tree roots; Dark blue grey. Soft. Saturated. Low plasticity.	
.0 —			x x x x x			SAND; Dark blue grey. Loose to medium dense. Saturated. Sand fine grained.	
.5 -							
.0 —			<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>			End of Test Pit at 4m (Pit Collapse)	
.5							
			<u> </u>			Logged by: LFS	
Remarks Broundw	:: vater seep	oage @	3.0m			Input by: LFS Checked by: JSM Verified by: JK	
						Sheet 1	of 1

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FULTON HOGAN LANO OEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

Project Reference: 224464

Sheet 1 of 1

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK TEST PIT INFORMATION
Excavalor Type: 30 Excavalor
Test Pit Dimensions:
Contractor: Fulton Hogan CO-ORDINATES N/A
Easting: 1559854 m
Northing: 5167673 m
Ground Level: N/A Date Slarted. 9/09/2011 Date Completed: 9/89/2011

Depth (m)	Wafer Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Sóil Descriptión	Elevation (m)
0.5 -					TOPSOIL SILT with trace sand and occalisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. 331 SILT; Grey with orange brown mottling. Stiff. Moist. Low plasticity.	
1.0		X X X X X X X X X X X X X X X X X X X			SILT; Grey. Soft. Wet. Low plasticity.	
2.0		× × × × × × × × × × × × × × × × × × ×			SAND; Light grey. Loose. Wet. Sand fine grained. SAND with tree roots; Light grey. Medium dense. Moist. Sand medium	
2.5		× × × × × × × × × × ×			grained. 256 Silty SAND; Brown, Medium dense, Moist, Sand fine grained.	
3.0	Ţ	* *			End of Test Pit at 3m (GW Reached)	
1.5 -						
1.5		A A A A A A A A A A A A A A A A A A A				41.44
Remarks:]	Logged by: LFS input by: LFS Checked by: JSM]
Groundwater (1 Crecked by: JSM	

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Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN

Location: SEE PLAN Project Reference: 224464 **TP29**

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pil Dimensions: Contractor: Fulton Hogan

CO-ORDINATES N/A 1559893 m 5167765 m Easting: 1559 Northing: 516' Ground Level: N/A

Dale Started: 9/09/2011 Date Completed: 9/09/2011

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

2.0 -	electron and the second and the seco	() () () () () () () () () ()	Shear vane at 0.5m. X	TOPSOIL SILT with trace sand and occaisional roottets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. Sandy SILT; Grey with orange brown mottling. Stiff. Moist. Low plasticity. Sand fine grained.	
2.5		× × × × × × ×	17.132 di 1990	0.80	
2.5 -	-		x	Silty SAND; Grey with brange brown mottling, Loose, Moist, Sand fine grained.	
.5 -	į	× × × × × × × × × × × × × × × × × × ×	Shoat vane et 1 5ee: X 30/15 kPe	SILT with tree roots, Dark blue grey. Soft. Wet. Low plasticity.	
.5 -		×	×	SAND; Light grey. Loose. Moist. Sand medium grained. SILT with tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
.5		×	*	SAND; Light grey. Loose. Moist. Sand medium grained.	
		T		3:00 Sandy GRAVEL; Brown. Dense. Saturated. Gravel fine to coarse grained, sub-rounded. Sand medium grained. End of Test Pit at 3m (GW Reached)	
.o.			Tr. American A. Roscocco (Medical)	A de la constantina del constantina del constantina de la constantina del constantina	
.5					
Remarks: Tree roots @ 1.9r Groundwater @ 3	1	•		 Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

Authoror (New Zeschrick Umitted
Unit 1, 1950 Cerevisch Rie
PO Geo. 1 (51)
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Cerevisch Rie
Project Name: ROSEMER
Location: SEE PLAN
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Project Reference: 224464
Project Reference: 224464

FULTON HOGAN LAND DEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

TP30

Sheet 1 of 1

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK CO-ORDINATES N/A
Easting: 155990
Northing: 51678
Ground Level: N/A TEST PIT INFORMATION
Excevator Type: 30l Excavator
Test Pil Dimensions:
Contractor: Fulton Hogan Date Started: 9/09/2011 Date Completed: 9/09/2011 1559932 m 5167857 m

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	So∦ Description	Elevation (m)
0.5 -			21 21 2 7 27 77 27 75 2			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. 533 SAND with trace silts; Grey with orange mottling. Loose. Moist. Sand fine to medium grained.	
1.0 —						SAND; Dark grey. Loose to medium dense. Wet. Sand fine to medium grained.	
1.5 — 2.0 —			× × × × ×			SILT with some tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
2.5 -			x x x x x x x x x x x x x x x x x x x			SAND; Dark brown. Loose. Moist, Sand fine to medium grained.	
3.0		Ā				End of Test Pit at 3m (GW Reached)	
3.5 	A contractive of the contractive		***************************************				
1.0							}
4.5 -	anthus orference.	A PELANTAPAN PRANCISCO			**************************************		
Remark Tree roo Ground	ss: ots @ 1.5 water @ 3	m 3.0 m	I		I .,,,,,,,,	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	

åurecon

FULTON HOGAN LAND DEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

TP31

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30 Excavator
Test Pit Dimensions:
Contractor: Fulton Hogan CO-ORDINATES N/A Easling: 15599 Northing: 51679 Ground Level: N/A Logged by: LFS input by: LFS Checked by: JSM Verified by: JK Date Started: 9/09/2011 Date Completed: 9/09/2011 1559971 m 5167949 m

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
0.5			77 77 3 F 57 77 F 57 57			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown, Firm. Moist, Low plasticity. Sand fine grained. 5.30 SAND with trace silts; Grey with orange mottling. Loose, Moist, Sand fine to medium grained.	
.0.					ANNONANAN MARINE (A CALADA CA	SAND; Dark brown, Loose, Moist. Sand fine to medium grained.	
.5			× × × ×			SILT with some tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
0			× × × × × ×			SAND; Dark grey. Loose to medium dense. Wet. Sand fine to medium grained. SILT with some tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
.0						End of Test Pit at 2m (GW Reached)	
.5				•			
.0.							
.5							
o.							
.5 -							
Remarks.	: ater @ 2	2.0m				Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
						Sheet	

Forecon (New Zeelandy Linking
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Telephona +64 3 566 0875
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Feddimile: +64 3 779 8955
Key Fastand

Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN

Location: SEE PLAN Project Reference: 224464 **TP32**

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan CO-ORDINATES N/A Easting: 1560010 m Northing: 5168041 m Ground Level: N/A

Date Started: 9/09/2011 Date Completed: 9/09/2011 9/09/2011 Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pockel Penelromster Tests	Soil Description	Elevation (m)
0.5				Stees vans at 0.5m; 133730kPa		TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SILT; Grey with brown mottling. Firm. Wet. Low plasticity.	
0.0			* * * * * * * * *			SAND; Dark brown. Loose. Moist. Sand fine to medium grained.	
.5 -			× × × × × × × × × × × ×			SILT with some tree roots; Dark blue grey. Soft. Wet. Low plasticity.	
.0 —			× × × × × × ×		To your purpose and a second s	SAND with some tree roots; Dark grey. Loose. Wet. Sand fine to medium grained.	
2.5		Y			a november of	SAND; Dark brown. Loose. Moist. Sand fine to medium grained.	
.0 -						End of Test Pit at 2.8m (GW Reached)	
.5			THE PROPERTY OF THE PROPERTY O				
.0.					to have been designed and the second		
.5							
temarks:	(Ø) 1.5n	n .8m				Logged by: LFS input by: LFS Checked by: JSM Verified by: JK	

Client: FULTON HOGAN
Autooc (New Zooland) Luritide
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Disk 1, 150 Color (New Zooland)
Chitekhalush 6140
Nex Zooland
Nex Zool

FULTON HOGAN LAND DEVELOPMENT

Project Name: ROSEMERRYN Location: SEE PLAN

Sheet 1 of 1

CO-ORDINATES N/A
Easting: 1560049 m
Notthing: 5168133 m
Ground Level: N/A Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK Date Started: 9/09/2011 Date Completed: 9/09/2011 TEST PIT INFORMATION Excavator Type: 30t Excavator Test Pit Dimensions: Contractor: Fulton Hogan

Depth (m)	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Soil Description	Elevation (m)
-		77 77 7			TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown, Firm. Moist, Low plasticity, Sand fine grained.	
					SAND; Grey with orange brown mottling. Loose. Moist, Sand fine grained.	
).5 -						
.0 -						
.5 -						
.0					Sandy GRAVEL; Grey with brown sand, Dense, Wet to saturated. Gravel fine to medium grained, rounded to sub-rounded. Sand fine grained.	
.5	_				285	
.0	—				End of Test Pit at 2.8m (GW Reached)	
6.5 -		***************************************				
.0 —		HIRA ALIA ALIA ALIA ALIA ALIA ALIA ALIA A				
i.5 –						
					Logged by: LFS Input by: LFS	

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Client: **FULTON HOGAN LAND DEVELOPMENT**

Project Name: ROSEMERRYN Location: SEE PLAN

TP34

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pil Dimensions:
Contractor: Fulton Hogen CO-ORDINATES N/A Easting: 155994 Northing: 51676 Ground Level; N/A 1559946 m 5167634 m

Daie Started: 9/09/2011 Dăie Compleied: 9/09/2011

Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

•		Ţ	1	1		p zamody. on	i
Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penetrometer Tests	Solf Description	Elevation (m)
-			7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7			TOPSOIL SILT with trace sand and occasional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained.	
).5			× × × × × × × × × × × × × ×	Shee: vane at 0.5m; 44/24xPa		SILT; Grey with orange brown moltling. Stiff. Moist. Low plasticity.	
-	•		× × × × × × × ×			Sandy SILT; Grey with orange brown mottling. Stiff. Moist. Low plasticity. Sand fine grained.	
1.0			x x x x x x x x x x x x x x x x x x x	Shoer vane a: tin. 107/18kPe			
.5 -			× × × × × × × ×	Shear yane of 1,5m; 27% 2%Pa		Sandy SILT; Blue grey. Soft. Saturated. Low plasticity. Sand fine grained.	
2.0			x x x x x x x x x x x x x x x x x x x				
:.5			*				
i.0 —			X X X X X X X X X X X X X X X X X X X	·····		3.29	
.5				:		End of Test Pit at 3.2m (Pit Collapse)	
.0 —	PERFECUENCE		7770.00000				
.5	ļ	The second second			- Annual Control of the Control of t		
1				,			ţ
Remarks: Groundwa	ater seeps @ 1.8m	age @	1. 6 m		· ·	Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK	
						Sheet 1 o	of 1

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Telephone: 184 2 386 066 5
Prival christohurch@App eurecongroup.com
Facsenier 164 2 379 9655
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FULTON HOGAN LAND DEVELOPMENT Client:

Project Name: ROSEMERRYN Location: SEE PLAN

Project Reference: 224464

TP35

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavator
Test Pit Dimensions:
Contractor: Futton Hogan CO-ORDINATES N/A Easting: 156002 Northing: 51678 Ground Level: N/A Date Started: 9/09/2011 Date Completed: 9/09/2011 Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK 1560024 m 5187818 m

Depth (m)	Sample	Water Level (m)	Graphic Log	Shear Vane Tests	Pocket Penefrometer Tests	Soil Description	Elevation (m)
-			00 00 d	a na na na na na ana ana ana ana ana an		TOPSOIL SILT with trace sand and occaisional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained.	
-			X X X X X X			SILT with minor sand. Grey with orange brown mottling. Firm. Molst. Low plasticity. Sand fine grained. Friable.	
.5 -			×			SAND with minor silt. Grey with orange brown mottling, Loose, Moist, Sand fine grained.	
0 —		ļ 1	x x x x x x			SILT with minor sand and tree roots. Grey with orange brown mottling. Firm. Wet. Low plasticity. Sand fine grained.	
5 -			NW x			SAND, Grey, Loose to medium dense. Wet. Sand fine grained.	
						220	
; - - -			x x x x			SILT with minor sand and tree roots. Grey with orange brown mottling. Firm. Wet. Low plasticity. Sand fine grained. SAND; Brown. Loose to medium dense. Moist. Sand fine grained.	-
0						316 330 Sandy GRAVEL; Brown. Dense. Wet. Gravel medium to coarse grained,	
.5 -		Ā				rounded. Sand medium grained. End of Test Pit at 3.3m (GW Reached)	-
0 —							
.5							
3 4 1							
temark:	s: vater s e e	l. page @	! 1.0m			Logged by: LFS input by: LFS Checked by: JSM Verified by: JK	<u> </u>
						Sheet 1	of 1

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Talespinne: +64 3 368 d821

New Zasland

Talespinne: +64 3 379 8055

Email: thatWhiteh@ab.eurecongroup.com

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision Location: Stage 7 to 15 Project Reference: 224464

TP01

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavalor
Tesl Pit Dimensions: 1.5m x 3m
Contractor: Sketlys Limited

CO-ORDINATES N/A
Easting: 1557263 m
Northing: 5166808 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

2.0 — 2.0m Becomes dark grey mottled orange brown. 2.2m Becomes with some sitt. 2.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.0 — 2.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.5 — 2.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.6 — 2.6 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.7 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.6 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.7 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.6 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.7 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.8 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained.	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description		Clouding (m)
1.0 —			:		<u>,,</u>	× ×	grained (TOPSOIL)			- - - - - -
2.0 — 2.0m Becomes dark grey mottled grey. Loosely packed, moist; sand is fine grained and poorly graded. 2.0m Becomes dark grey mottled orange brown. 2.2m Becomes with some silt. 3.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.0 — 3.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.6 — 4.0 — 5.5 SILT with some sand; dark grey. Moist, moderate plasticity; sand is fine grained.	0.5	1			, x , x , x		poonly graded (ALLOVs	ne depositoj.		<u> </u>
2.0 m Becomes dark grey mottled orange brown. 2.2 m Becomes with some silt. X			:		×		1 40		acked, moist; sand is	-17 - -
2.5 - 2.5 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.0 - 2.5 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 3.5 - 2.5 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 4.6 - 2.5 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 4.7 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 4.6 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained. 4.7 Sil.T with some sand; dark grey. Moist, moderate plasticity; sand is fine grained.	1.5				:					- - - -
3.0 — Site with some sand, dark grey. Moist, moderate plasticity; sand is tine grained. -15 3.5 — Site with some sand, dark grey. Moist, moderate plasticity; sand is tine grained. -15 -15 -16 -17 -17 -18 -19 -19 -19 -19 -19 -19 -19	2.0									- 16
3.5 -	2.5 -		M		×××××××××××××××××××××××××××××××××××××××	* * * *	SILT with some sand; d grained.	ark grey. Moist, moderate pla	sticity; sand is fine	1 1 1 1
3.5 -	3.0				× × ×	* * * * * * * * * * * * * * * * * * *				- 15
4.5	3.5 -				× × × ×	* * * * * * * * * * * * * * * * * * *				-
	4.0					× ×	End of Test Pit at 3.9m	(Maximum Extention of Excar	vator.)	- 14
				TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT			. *			

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Emeil: driftsthurch@se aurocoogroup.com

Client:

Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP03

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor. Skellys Limited

CO-ORDINATES N/A
Easting: 1559600 m
Northing: 5167558 m
Ground Level: N/A

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
	-					* * * *	1 monage	
	0.5					x x x x x x x x x x x x x x x x x x x	moderate plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS).	
	1.0 —					X X X X X X X X X X X X X X X X X X X	1.0m Becomes sandy. 1.3m Becomes with trace sand; grey mottled light brown.	
	1.5 -		▼				SAND with some silt; dark grey. Loosely packed moist; sand is fine to medium grained.	
	2.0 —		<u> </u>				2.3m Becomes with fibrous organic inclusions (branches and roots up to 30mm in diameter).	
	2.5					× × × × × ×	SILT with minor sand; dark grey. Stiff, moist, moderate plasticity.	
3	3.0					x x x x x x x x x x x x x x x x x x x		
	-			****		* * * * * * * * *	3.4m Becomes with fibrous organic inclusions (up to 80mm in diameter).	
	3.5 ~ -				·	*		
2	4.0 —					× ×	End of Test Pit at 4m (Target Depth Achieved.)	
2	4.5 -				**			
	Remark: Groundv	s: vater at 2.	0m					

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP06**

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavalor
Tesl Pit Dimensions: 1.5m x 3m
Contractor: Skeltys Limited

CO-ORDINATES N/A
Easting: 1559835 m
Northing: 5167650 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Flevation (m)
	0.5					\(\frac{1}{1}\) \(\frac{1}\) \(\frac{1}{1}\) \(\frac{1}\) \(\frac{1}{1}\) \(\frac{1}\) \(\	grained (TOPSOIL).	
	1.0			TO COOK THE COOK OF THE COOK O		* * * * * * *	SAND with some silt; light brown grey. Loosely packed, moist; sand is fine grained.	· 17
	1.5						1.5m Becomes mottled reddish brown.	
	2.0						1.9m Becomes dark grey.	-16
	2.5			The state of the s		*	SILT with some sand; light brown. Stiff, moist, moderate plasticity. Sand is fine grained and poorly graded.	
	3.0 -	and the second s		TO THE PARTY OF TH		x * x *	SAND with some silt; dark grey. Loosely packed, moist; sand is fine grained. 3.0m Becomes with fibrous organic inclusions (roots) 20mm in diameter.	15
	3.5						383	
	4.0			The second section			End of Test Pit at 3.8m (Target Depth Achieved.)	· 14
20:24 a.m.	4.5							
8	Remarks Groundw	ater not e	ncount	ered.				

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision Location: Stage 7 to 15 Project Reference: 224464

TP08

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Tesl Pit Dimensions: 1.5m x 3m
Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559761 m
Northing: 5167731 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
						70 70 70 7 70 70 70 77 7	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	-
	0.5					x x x x x x x x x x x x x x x x x x x	SiLT with some sand; light brown. Stiff, moist, low plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS).	- - -
	1.0					x x x x x x x x x x x x x x x x x x x	1.1m Becomes brownish grey mottled orange.	- 15
	1.5					× × × × × × × × × × × × × × × × × × ×	1,70	
	2.0 —		Ä				SAND with minor silt; greyish brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained. 2.0m Becomes dark grey. 2.1m Becomes with fibrous organic inclusions (up to 20mm in diameter).	- - 14 -
	2.5							- -
	3.0							-13
	3.5						3.70	- -
							End of Test Plt at 3.7m (Target Depth Achieved.)	-
-	4.0							- 12
	4.5 -			THE TRANSPORTED AND A PARTY.				- - - -
[]	Remarks Groundw	s: /ater at 2.1	1m	Na Para				-

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP13

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavelor
Test Pit Dimensions: 1.5m x 3m
Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559745 m
Northing: 5167953 m
Ground Level: 16 m

Dale Started: 27/04/2012 Dale Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
hermooso						77 77 77 7 77 77 7	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	-
-	•]:	<u> </u>	0.35	-
	0.5				×	(SILT with some sand; light brown mottled orange brown. Very stiff, dry to wet, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	<u>.</u>
	0.5						SAND with minor silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained.	-
							motor, zane iz moto z motorin granica.	-
	1.0 —							- 15
ŀ	1.0							- "
	-						1.2m Becomes dark grey with some silt.	-
	1.5							
	1.0							-
	2.0 —							-14
	2.0							14
ŀ	-						O On December 1th a section of the s	-
	2.5 –						2.3m Becomes with occasional fibrous organic Inclusions (rootlets).	
	2.5							
	•							-
	3.0 —						3.40	- 13
	3.0		<u>v</u>	1	0	٠٠٠ م م	GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine	- 13
	-		- V		٥		to coarse grained.	-
	3.5		:			Vo	End of Test Pit at 3.4m (Target Depth Achieved.)	
	0.0							-
	-			. **				-
	4.0							- 12
	-7,U					٠.		'-
	-			·				-
	4.5		,					
	J T							-
11:26:26 a.m.						ŀ		-
707								
772012	Remarks			· · · · · · · · · · · · · · · · · · ·				
300	PIONUM	vater 3.2m	!. 		***			
ast Generated: 3/07/2012								٠

Aurocon (New Zesland) Linibed Unit 1, 500 Covendah Rd PD DDX 1081 Chuladhurth 8140 New Zesland New Zesland Telephron: +54 3 3 do 0821 New Zesland New Zesland PF Facilitätis: +64 3 376 4955 Eradi: Childchurdifficas principricipi com

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP14**

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30t Excavalor
Test Pil Dimensions:
Contractor: Fullon Hogan

CO-ORDINATES NZTM
Easting: 1559655 m
Northing: 5167974 m
Ground Level; N/A

Date Started: 6/09/2011 Date Completed: 6/09/2011 Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Contracto	r: Fulton	Hogan			Grou	nd Level; N/A		Verified by: JK	******
Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soll Description		Elevation (m)
0.5				{ l.	5 5 5 7 7 7 2 6 6 6 7 <td>plasticity. Sand fine gra</td> <td>ce sand and rootlets; Dark brown Ined. dense. Moist. Fine grained.</td> <td>n. Fírm. Moist. Low</td> <td></td>	plasticity. Sand fine gra	ce sand and rootlets; Dark brown Ined. dense. Moist. Fine grained.	n. Fírm. Moist. Low	
1.0	:			Shear vene at 177. 179. 101/24kPa	*	SILT; Light brown. Soft			
2.0						SAND; Brown orange. 2.00 SAND; Grey. Loose. W	Loose. Wet. Sand fine grained.		
2.5 -					*	2.50 Sandy SILT; Blue grey.	Firm. Wet. Low plasticity. Sand	is fine grained.	
3.0 —					X X X X X X X X X X X X X X X X X X X				
3.5		▼.		2	*	270 End of Test Pit at 3.7m	(GW Reached)		· · · · · · · · · · · · · · · · · · ·
1.0 —									
4.5									
Remarks Tree root Groundw	es @ 2.4n rater reac	1 hed 3.7		· · · · · · · · · · · · · · · · · · ·					

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Project Name: Rosemerry
Location: Stage 7 to 15

New Zeolard Location: Facolities + 104 3 375 0855

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Facolities + 104 3 375 0855

Emai: dristatureti@neurorgoup.com
Facolities + 104 3 375 0855

Emai: dristatureti@neurorgoup.com
Co-ordinates N/A

TP16

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pil Dimensions: 1.5m x 3m Contractor: Skellys Limited CO-ORDINATES N/A
Easting: 1559549 m
Northing: 5168050 m
Ground Level: 16 m

Dale Started: 27/04/2012 Date Completed: 27/04/2012

Soll Description Soll Description Soll Description Silt, minor aand, dark brown. Silf, molal, low plasticity, sand is fine grained (TOPSOIL). Silty, minor aand, dark brown. Silf, molal, low plasticity, sand is fine grained (TALLUVIAL DEPOSITS). SanD with some silf, light brown motified orange brown. Loosely packed, most; sand is fine to medium grained. SanD with some silf, light brown motified orange brown. Loosely packed, most; sand is fine to medium grained. 2.0 — 2.0 — 2.0 — 2.0 — 2.1 m Log encountered (250mm in diameter). 1.5 — 1.6 — 1.7 — 1.7 — 1.7 — 1.7 — 1.8 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.0 — 1.1 — 1.1 — 1.2 — 1.3 — 1.4 — 1.5 — 1.5 — 1.6 — 1.7 — 1.7 — 1.7 — 1.8 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.9 — 1.0				40	·	. · · · · · · · · · · · · · · · · · · ·				
grained (TOPSOIL). Stity SAND; light brown mottled orange. Loosely packed, moist; sand is fine to medium grained (ALLUVIAL DEPOSITS). SAND with some silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, most; sand is fine to medium grained. SAND with some silt; light brown mottled orange. Loosely packed, moist; sand is fine to medium grained.	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests			Soil Description		Elevation (m)
SAND with some silt; light brown mottled orange. Loosely packed, moist; sand is fine to medium grained (ALLUVIAL DEPOSITS). SAND with some silt; light brown mottled orange brown. Loosely packed, mosit; sand is fine to medium grained. SAND with some silt; light brown mottled orange brown. Loosely packed, mosit; sand is fine to medium grained. 2.0 — 2.0m Becomes dark grey. 2.1m Log encountered (250mm in diameter). 2.5 — 2.5 — 3.6 —						v ~ ~ ~ ~	grained (TOPSOIL).	brown. Stiff, moist, low plasticity, sar	nd is fine	
SAND with some silt; light brown mottled orange brown. Loosely packed, mosil; sand is fine to medium grained. 2.0m Becomes dark grey. 2.1m Log encountered (250mm in diameter). 14 2.0 End of Test Pit at 3m (Target Depth Achieved.) 13 55	1.5 -					*	Silty SAND; light brown to medium grained (AL	mottled orange. Loosely packed, m LUVIAL DEPOSITS).	oist; sand is fine	
2.0m Becomes dark grey. 2.1m Log encountered (250mm in diameter). 55 - 60 - End of Test Pit at 3m (Target Depth Ach(eved.)) 13	.0					x x x x x x x x x x x x x x x x x x x	1.20			- 15
2.0 2.1m Log encountered (250mm in diameter). End of Test Pit at 3m (Target Depth Achieved.) 13 15 10 112	1.5				TOTAL DESCRIPTION OF THE PROPERTY OF THE PROPE		SAND with some silt; lig mosit; sand is fine to m	pht brown mottled orange brown. Loc edium grained.	sely packed,	-
End of Test Pit at 3m (Target Depth Achieved.) 13 14 15 16 17 18 19 19 19 19 19 19 19 19 19	2.0						2.0m Becomes dark gr 2.1m Log encountered	ey. (250mm in diameter).		- 14
.0 — 12	2,5									- - - - -
.0 —	.0 —						End of Test Pit at 3m (1	arget Depth Achieved.)		-13 -
	3.5									
1.5	1.0									- -12 - -
	1.5	-								- -

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP17**

Sheet 1 of 1

TEST PIT INFORMATION Excavalor Type: 8 Tonne Excavator Tesl Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited CO-ORDINATES N/A
Easting: 1559708 m
Northing: 5168009 m
Ground Level: 13 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description		Elevation (m)
			-		7 77 77 7 77 77 77 77 7	SILT, minor sand, dark brown. Stiff, moist, low plastic grained (TOPSOIL).	ity, sand is fine	
.5 -					× × × × ×	sity SAND; light brown mottled orange. Loosely pac to medium grained (ALLUVIAL DEPOSITS).	ked, moist; sand is fine	- - -
					× × × × × × × × ×			 - -
o —					× × × × × × × × × ×			12
•	:				× × × × × ×			} -
5 -					× × × × × × × × × × × × × × ×	1.4m Becomes with some silt, grey mottled orange b 1.5m Becomes with occasional fibrous organic incluse.		-
) -					× × × × × × × × × × × × × ×	2.0m Becomes dark grey.		<u>-</u> 11
5 -					× × × × × × × × × × × × × × × × × × ×			harraharraharrahan makaasahan
)		▼ .			× × × • Č V č	» GRAVEL with some sand; brownish grey. Loosely pa graded; subrounded to rounded; gravel is fine to coa	cked; saturated; well	10 .
						to coarse grained. End of Test Pit at 3m (Too dense to excavate.)	oo gramoo, dana ta mio	
5 -								
)								- 9
			· · · · · · · · · · · · · · · · · · ·					
5			·					
emarks	:							

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Unit 1, 150 Caronistsh Rd
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Drinisthiauch 8140
New Zealand
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www.surecongroup.com
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+04 3 379 6655
Embil **elektrinistiglico pulebongraup.com

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15
Project Reference: 224464

TP20

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavator
Tesl Pil Dimensions: 1.5m x 3m
Contractor: Skeliys Limited

CO-ORDINATES N/A
Easting: 1559485 m
Northing: 5168200 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soll Description	Elevation (m)
- -						grained (TOPSOIL).	brown. Stiff, moisf, low plasticity, sand is fine	
.5 -					x x x x x x x x x x x x x x x x x x x	SILT, some sand, light plasticity, Sand is fine g	brown mottled orange brown. Very stiff, dry, low grained (ALLUVIAL DEPOSITS).	- - -
.o —					× × ×	SAND with some silt; lig medium grained.	sht brown mottled orange brown; sand is fine to	17
.5 – .0 –								16
2.5						Sandy GRAVEL browns subrounded to rounded grained.	sh grey. Loosely packed; moist to wet; well graded; ; gravel is fine to coarse grained; sand is fine to coars	1
3.0						3.10	/To and Donth Assistance	-15
3.5						End of Test Pit at 3. mil	(Target Depth Achieved.)	
.0 —			TO CONTRACT	vernous and the second				14
.5								

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

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Co-Ordinaryes N/A

TP21

Sheet 1 of 1

TEST PIT INFORMATION Excavalor Type: 8 Tonne Excavator Tesl Pit Dimensions: 1.5m x 3m CO-ORDINATES N/A Easting: 1559683 m Northing: 5168142 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soll Description	Elevation (m)
-					77 77 77 7 77 77 77 77 77 77 77 77 77 77	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	 - -
.5					x x x x x x x x	SILT, some sand; light brown mottled orange brown. Very stiff, dry to moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	-
-					* *	SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.	
0							16 - - -
5 -						1.5m Becomes dark grey.	- -
o —							- 15 -
5 -		.			°0°°	GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine	- -
0 —						to coarse grained.	- - -14
}					h <u> </u>	End of Test Pit at 3.1m (Test Pit Sides Collapsing)	
5 -			***************************************				
-			POPULATION OF THE POPULATION O				F . F . F .
0 —							13
5			те т				- - - -
marks	<u>_</u>						- - · .

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Fulton Hogan Land Development Limited Client: Project Name: Rosemerryn Farm Subdivision

Anterea (New Zelande) Limited
Unit 1, 150 Covendash Rd
PD GDX 1001
Unit 1, 150 Covendash Rd
PD GDX 1001
Unit 1, 150 Covendash Rd
Project Name: Rosemerry
Location: Stage 7 to 15

New Zeland
Www. uniscompap.com
Email: childshurch/@cop estatecomplosis coin

Telephane: 484 3 308 0821
Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION

Excavalor Type: 8 Tonne Excavalor
Test Pit Dimensions: 1.5m x 3m
Contractor: Stallar Limited

CO-ORDINATES N/A
Easting: 1559859 m
Northing: 5168076 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevetion (m)
0.5	-				× ×	SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). SiLT with some sand; light brown mottled orange brown. Dry to moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	
1.0 -					* *	SAND with some silt; light brown mottled orange brown. Loosely packed, mosit; sand is fine to medium grained.	16
1.5						1.2m Becomes grey.	
2.0 -	***************************************					2.0m Becomes dark grey. 2.1m Becomes with fibrous organic inclusions (Branches and roots up to 60mm in diameter).	15
2.5	-	Ā				290	
3.0						to coarse grained.	14
3.5						End of Test Pit at 3.2m (Test Pit Sides Collapsing)	
4.0	-						13
4.5							
Remar	rks: dwater at 2	.8m					<u></u> · . ·

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Emist: christchurch@wp.eurocongroup.com

Client:

Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP28**

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Fil Dimensions: 1.5m x 3m CO-ORDINATES N/A Easting: 1559471 m Northing: 5168269 m

Dale Started: 27/04/2012 Dale Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	(cor) tropped [2
0.5	-				1 3 1 × 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). 5.35 Sandy SILT, light brown mottled orange brown. Very stiff, dry, low plasticity, sand is fine grained (ALLUVIAL DEPOSITS). Sandy GRAVEL; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	
2.0 -							12
3.0 -	-					End of Test Pit at 3m (Target Depth Achieved.)	— 1 1
3.5							
4.0 -							- 10
Remark	ks: Iwater not e	encount	ered.				-

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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: N/A
Northing: N/A
Ground Level: N/A

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description
0).5					× × × × × × × × × × × × × × ×	grained (TOPSOIL).
1	- 0.1					× ×	SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.
1	- - 1.5						1.2m Becomes dark grey.
	- -						1.6m Becomes fibrous organic inclusions (branches up to 100mm diameter).
2	2.0				1		2.0m Tree stump 0.5m diameter.
2	2.5 -				G		GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.
3	3,0		Y .		c	,00,	End of Test Pit at 3m (Target Depth Achieved.)
3	1.5						
4	.0						
4	.5						
. 11:26:33 a.m.	-						
전	Remarks	s: valer et 3,	0m				

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP30**

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m
Confractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559847 m
Northing: 5168197 m
Ground Level: 13 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
0.5				1	× × × × × × × × × × × × × × × × × × ×	grained (TOPSOIL).	
1.0					× ×	SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.	- 12
1.5						1.2m Becomes dark grey.	
,						1.6m Becomes with fibrous organic inclusions (branches up to 100mm diameter).	
2.0						2.0m Tree stump 0.5m diameter.	⊢11
2.5							- -
3.0						GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3.2m (Target Depth Achieved.)	10
3.5	·. ·						
4.0 -							9
4.5 -			The state of the s				
Remarks. Groundwa		Om					

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Auceon (New Zealand) Limited
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www.puracongroup.com
Enral* christchurch@sp.eurecongroup.com

Client: Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP33**

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559526 m
Northing: 5168388 m
Ground Level: 16 m

27/04/2012 Date Started: Dale Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
0.5 –					\(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). SILT with some sand; brown. Stiff, wet, low to moderate plasticity. Sand is fine to medium grained (ALLUVIAL DEPOSITS).	
.0 —		TO THE PROPERTY OF THE PROPERT		The state of the s	×ÎxÎ	SAND with minor silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained.	15
.0						Becomes light grey mottled orange brown. 2.3m Becomes dark grey.	- -14 -
.0.						End of Test Pit at 3.1m (Target Depth Achieved.)	- - -13 -
.5 -							-12
.5							- · · · · · · · · · · · · · · · · · · ·

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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

TP34

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559565 m
Northing: 5168402 m
Ground Level: 11 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
	0.5 -				<u>.</u>	(grained (TOPSOIL).	
	1.0 —	,			×	*	1,26	10
	1.5 -				122		SAND with minor silt; brown and grey. Loosely packed; moist; poorly graded; sand is fine to medium grained.	1
	2.0						2.0m Becomes with some silt.	9
	2.5						Becomes dark grey. 2.5m Becomes with organic inclusions (branches and large roots).	<u>.</u>
	3.0 3.5		<u>*</u>					8
	4.0			7	D	200	GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3.7m (Target Depth Achieved.)	- 7 ·
	4.5 -			Contained to the contai				- - - - -
¥	Remarks Groundw	s: vater at 3.	5m					

Groundwater not encountered.

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

CO-ORDINATES N/A
Easting: 1559649 m
Northing: 5168358 m
Ground Level: 14 m Logged by: TEST PIT INFORMATION Logged by: RS Input by: MJF Checked by: RS Date Started: 27/04/2012 Excavator Type: 8 Tonne Excavator Tesl Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited Date Completed: 27/04/2012 Verified by: Penetrometer Tests Shear Vane Tests Water Level (m) Graphic Log Elevation (m) Depth (m) Sample Soil Description 717. 77. SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). 7 12 12 11 34 **SILT**, minor sand; brown. Stiff, moist, low plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS). × 0.5 × х 1.0 . ~ 13 **GRAVEL** with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. 1.3m Becomes with some sand. Dalabase File: STAGE 7 TO 15 UPDATED TEST PIT LOGS, GPJ, Library: AURECON CHRISTCHURCH, GLB. Data template. CHCH DATA TEMPLATE NOV 2010. GDT 1.5 2.0 12 2.5 3.0 End of Test Pit at 3m (Target Depth Achieved.) 3,5 4.0 10 4.5 Last Generated: 3/07/2012 11:26:37 a.m

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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

TP36

Sheel 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavalor
Tesl Pit Dimensions: 1.5m x 3m
Contractor: Skellys Limited CO-ORDINATES N/A
Easting: 1559878 m
Northing: 5168255 m
Ground Level: 16 m Date Started: 27/04/2012 Date Completed: 27/04/2012 Logged by: RS Input by: MJF Checked by: RS Verified by:

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
					6 58 58 55 58 5	grained (TOPSOIL).	-
	}				× × × ×	SILT, some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	<u> </u>
0.5	- - - - -					GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	- - -
	1						<u>-</u>
1.0	-						- 15
-							-
1.5 -						1.5m Весоmes sandy and moist.	_
-						1.011 Beesines sainly and moise.	-
-							-
2.0 —							14
				'			-
2.5 -							-
							-
3.0 —		.]	1			300	- 13
						End of Test Pil al 3m (Targel Depth Achieved.)	- 13
-							_
3.5							_
							- -
4.0							- 12
-							- - ·
4.5							· ·
4.5							
							- -
Remarks			<u> </u>				
Groundw	vater not e	ncounte	ered.		· · · · · · · · ·		*. ··

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

TP37

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavalor
Test Pit Dimensions: 1.5m x 3m

CO-ORDINATES N/A
Easting: 1559935 m
Northing: 5168238 m

Dale Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
					6 57 57 55 55 5	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	-
	:				× ×	grained (TOPSOIL). 329 SILT, some sand; light brown mottled orange brown. Stiff, moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	-
5 -						SAND with minor silt; light brown motttled orange brown. Loosely packed, moist; sand is fine to medium grained.	-
}						0.8m Becomes grey mottled orange brown.	
0							14
-						1.3m Becomes dark grey.	-
5 -							-
_							
) —							– 13 -
1							-
5							-
1							-
		ā					~
					وںیہ	3.00 GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded;	12
						subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	_
1						End of Test Pit at 3.1m (Target Depth Achieved.)	_
5 -							-
				Handi Talah Salah Talah			-
) —							- 11
-							-
1							
5 -			·				~ .
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Unit 1, 150 Cownrish Rd
Project Name: Rosemerry
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New Zealent
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Federine: 4913 379 0855
Email: Control of the Control o

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

TP38

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m CO-ORDINATES N/A
Easting: 1559993 m
Northing: 5168257 m
Ground Level: 16 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests Shear Vane Tests	Graphic Log	Soil Description	
				× × × × × × × × × × × × × × × × × × ×	SILT, minor sand, dark brown. Stiff, dry, low plasticity, sand is fine grained (TOPSOIL). SILT with some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; Sand is fine grained (ALLUVIAL DEPOSITS).	<u> </u>
0.5	enter extra esta esta esta esta esta esta esta est			- X	SAND with minor to some silt; light brown mottled orange brown. Loosely packed; sand is fine to medium grained.	- - -
1.0 —					GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	-1 -1
1.5					1.4m Becomes moist.	- - -
2.0 -			and the second s		2m Becomes sandy.	-1
2.5		<u>~</u>			280	- - -
3.0					End of Test Pit at 2.8m (Target Depth Achieved.)	- 1
3.5	-					
4.0						- 1.
4,5 4,5						-

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Unit 1, 160 Zealand Limited
Unit 1, 160 Zealand Limited
Unit 1, 160 Zealand
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Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m
Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559837 m
Northing: 5168324 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
).5 -			**************************************		\(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\frac{1}{1}\), \(\frac{1}\), \(\	SILT, minor sand, dark brown. Stiff, dry, low plasticity, sand is fine grained (TOPSOIL). SILT with some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	-
0.			on to the top to the top to the top			GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	15 15
.5	-			, , , , , , , , , , , , , , , , , , ,		1.4m Becomes sandy.	- - -
.0						1.9m Becomes moist.	- 14 - -
.5 -						End of Test Pit at 2,5m (Target Depth Achieved.)	<u> </u>
i.0			THE PROPERTY OF THE PROPERTY O				13
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.5 							- · · · · · · · · · · · · · · · · · · ·
temark Frounds	s: vater not e	encounte	ered.				

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Wew Landschaptup Loss
Email: cantalchuich@ea aurecongroup con

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15
Project Reference: 224464

TP40

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Torine Excavator
Test Pil Dimensions: 1.5m x 3m
Contrador: Skellys Limited

CO-ORDINATES N/A
Easting: 1559627 m
Northing: 5168409 m
Ground Level: 17 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
0.5 -					**************************************	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). SILT, some sand; brown. Stiff, moist, low to moderate plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS).	-16
1.5					* * * * * * * * * * * * * * * * * * *	GRAVEL with some sand; brown and grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to medium grained. SAND with minor slit; brown mottled grey. Loosely packed; moist; poorly graded; sand is fine to medium grained.	- 10
2.0 —							- 15 -
3.0 —					X	2.5m Becomes dark grey. 2.7m Becomes silty.	-14
4.0 4.5						GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 4.2m (Target Depth Achieved.)	13
Remarks	vater not e	encount	ered.				

More Ward E New York SE 39
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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision Location: Stage 7 to 15 Project Reference: 224464

TP01

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m
Contractor: Sketlys Limited

CO-ORDINATES N/A
Easting: 1557263 m
Northing: 5166808 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description		
				<u>//</u>	× × × × × × × × × × × × × × × × × × ×	grained (TOPSOIL)	brown. Stiff, moist, low plastic i. Stiff, moist, low plasticity. Si AL DEPOSITS).		- - - - - -
0.5				×	x x x x x x x x x x x x x x x x x x x	poorly graded (ALLUVI)	AL DEPOSITS).	•	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1.0 -				×	× × × ×	0.95m Becomes brown SAND with minor silt; br fine grained and poorly	own mottled grev. Loosely pa	cked, moist; sand is	
1.5									-
2.0 —	-		:			2.0m Becomes dark gre	ey mottled orange brown.		- - 16
2.5 -		Ā		××××	× × × × × × ×	2.50	ark grey. Moist, moderate pla	sticity; sand is fine	
3.0	7			× × × ×	* * * * * * * * * * * * * * * * * * *				15
3.5 -				×××××××××××××××××××××××××××××××××××××××	× × × × × × × × × × × ×				
4.0 —					× ×	=== End of Test Pit at 3.9m (Maximum Extention of Excar	ator.)	14
4.5			T THE PROPERTY OF THE PROPERTY						<u> </u>
Remark	ss: water at 2.1	'm .							

GUIFECON
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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP03

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559600 m
Northing: 5167558 m
Ground Level: N/A

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
	-					× × × × × × × × × × × ×	1	
	0.5					x x x x x x x x x x x x x x x x x x x	moderate plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS).	
	1.0					X X X X X X X X X X X X X X X X X X X	1.0m Becomes sandy. 1.3m Becomes with trace sand; grey mottled light brown.	
	1.5		▼				SAND with some silt; dark grey. Loosely packed moist; sand is fine to medium grained.	
	2.5		+				2.3m Becomes with fibrous organic inclusions (branches and roots up to 30mm in diameter).	
•				. •		× × × × × × × × × × × × × × × × × × ×	SILT with minor sand; dark grey. Stiff, moist, moderate plasticity.	
2	3.0					*		
3	3.5				·	*	3.4m Becomes with fibrous organic inclusions (up to 80mm in diameter).	
2	1.0 —					x	And of Toot Dit at Am (Torret Dooth Appined	
2	1.5				. · · ·		End of Test Pit at 4m (Target Depth Achieved.)	
	Remarks	rater at 2.0	0m	· . ·				

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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

TP06

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited CO-ORDINATES N/A
Easting: 1559835 m
Northing: 5167650 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description	Elevation (m)
).5				4	* * * * * * * * * * * * * * * * * * *	grained (TOPSOIL). SILT with some sand; li	brown. Stiff, moist, low plasticity, sand is fine ght brown. Stiff, moist, low plasticity. Sand is fine led (ALLUVIAL DEPOSITS).	-
.0 —	:			×	× ×	SAND with some silt; lig grained.	ht brown grey. Loosely packed, moist; sand is fine	17
.5						1.5m Becomes mottled 1.9m Becomes dark great the second of the		- - -
				× × ×	× × × × × × × × × × × × ×	2.20	ght brown. Stiff, moist, moderate plasticity. Sand is	- 16
.0 -				x		grained.	rk grey. Loosely packed, moist; sand is fine ous organic inclusions (roots) 20mm in diameter.	- 15
5			- The state of the			End of Test Pit at 3.8m	(Target Depth Achieved.)	- 14
emarks roundw	: rater not e	encounte	ered.		· · · · · · · · · · · · · · · · · · ·			<u>†</u>

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision Location: Stage 7 to 15 Project Reference: 224464

TP08

Sheet 1 of 1

TEST PIT INFORMATION
Excavalor Type: 8 Tonne Excavalor
Test Pit Dimensions: 1.5m x 3m
Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559761 m
Northing: 5167731 m
Ground Level: 16 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description	Elevation (m)
0.5				***************************************	\(\frac{\frac}\f{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fracc}	grained (TOPSOIL).	brown. Stiff, moist, low plasticity, sand is fine ght brown. Stiff, moist, low plasticity; sand is fine to VIAL DEPOSITS).	-
1.0					x x x x x x x x x x x x x x x x x x x	1.1m Becomes brownis	sh grey mottled orange.	- 15
2.0		<u>*</u>			× × × × × × × × × × × × × × × × × × ×	moist; sand is fine to m 2.0m Becomes dark gr		14
.5								13
.0						End of Test Pit at 3.7m	(Target Depth Achieved.)	12

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Ernell: christianus hypothesis

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP13

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m
Confractor: Skelivs Limited

CO-ORDINATES N/A
Easting: 1559745 m
Northing: 5167953 m
Ground Level: 16 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

		Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
						7 77 77 77 77 7	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	_
	1					22 32 3	0.36	-
						× × ×	SILT with some sand; light brown mottled orange brown. Very stiff, dry to wet, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	-
١	1.5				[SAND with minor silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained.	F
							moist, sand is line to medium grained.	-
								- . .
1	.0 —			İ				15 -
							1.2m Becomes dark grey with some silt.	-
	1							-
1	.5							-
	1							
2	:.o –							-14
	1						2.3m Becomes with occasional fibrous organic inclusions (rootlets).	-
2	.5							
]							
								_
3	.0 —				i i	200	GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine	13
	1		<u> </u>				graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	
					į		2 40	-
3	.5 -						End of Test Pit at 3.4m (Target Depth Achieved.)	
								-
]							-
4	.0 —							- 12
		٠.						-
	-			*+				-
4	.5 –							
	-	ļ				į		
11:Zb:Zb a.m								-
								<u> </u>
₫	Remarks Smundu	s: vater 3.2π						
est delicialeu. 3/1	ww> IWT	-am val	*. **					

Auracon (New Zealand) Linibed Unit 1, 590 Covendah Rd PD DDX 1081 Chuladhurth 8140 New Zealand New Zealand Telephron: +54 3 360 082: **
Sewa auracongroup.com
Eradi: **Add 3 376 4955
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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP14**

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 30l Excavator
Test Pit Dimensions:

CO-ORDINATES NZTM
Easting: 1559655 m
Northing: 5167974 m
Ground Level; N/A

Date Started: 6/09/2011 Date Completed: 6/09/2011 Logged by: LFS Input by: LFS Checked by: JSM Verified by: JK

Contracto	r: Fullon	Hogan			Grau	nd Level; N/A		Verified by: JK	
Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soll Description		Elevation (m)
0.5				{ l.	7 77 77 24 76 7	plasticity. Sand fine gra	ce sand and rootlets; Dark brown ined. dense. Moist. Fine grained.	. Firm. Moist. Low	
1.0				Shear vane at the tot/24kPa	*	SILT; Light brown. Soft			
2.0 —						SAND; Brown orange. z. SAND; Grey. Loose. W	Loose. Wet. Sand fine grained.		
2.5 -							et. Sand fine grained.		
3.0 —				1. D	*	Sandy SILT; Blue grey.	Firm. Wet. Low plasticity. Sand i	s fine grained.	
3.5		y .		3	× × × × × × × × × ×	376	CW Food of	· · · · · · · · · · · · · · · · · · ·	
4.0 —						End of Test Pit at 3.7m	(Gw Reauleu)		
4.5									
Remarks Tree root Groundw	es @ 2.4n rater reac	n hed 3.7	m						

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

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Facalitatis 1903 3379 0835
Final: dylatchurch@ep.surecongroup.com
Focalitatis
Focali Location: Stage 7 to 15

TP16

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559549 m
Northing: 5168050 m
Ground Level: 16 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description		Elevation (m)
0.5 -				<u>.</u>	\(\frac{\frac}\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\frac{\fra	grained (TOPSOIL).	brown. Stiff, moist, low plasticity mottled orange. Loosely packer LUVIAL DEPOSITS).		
1.0				×	× × × × × × × ×	SAND with some silt; lig mosit; sand is fine to m	ht brown mottled orange brown. edium grained.	Loosely packed,	- 15 -
2.0						2.0m Becomes dark gro 2.1m Log encountered			14
2.5	·								
.5						End of Test Pit at 3m (1	arget Depth Achieved.)		13
.0.									12
.5 ~								. ***	-
emarks	s: rater Not I	Encount	ered						

Email christchurch@for

Client:

Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

Logged by: RS input by: Checked by: RS WD CO-ORDINATES N/A Easting: 1559708 m Date Started: 27/04/2012 Date Completed: 27/04/2012 TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skeliys Limited Easting: Northing 5168009 m Ground Level: 13 m Pocket Penetrometer Tests Shear Vane Tests Nater Level (m) Elevation (m) Graphic Log $\widehat{\mathbf{E}}$ Sample Depth (Soil Description (17) SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). Silty SAND; light brown mottled orange. Loosely packed, moist; sand is fine to medium grained (ALLUVIAL DEPOSITS). × 0.5 ×. × 1.0 -12 × Dalabase File: STAGE 7 TO 15 UPDATED TEST PIT LOGS.GPJ, LBrary: AURECON CHRISTCHURCH.GLB, Data template: CHCH DATA TEMPLATE NOV 2010.GDT 1.4m Becomes with some silt, grey mottled orange brown. 1.5 1.5m Becomes with occasional fibrous organic inclusions (rootlets). 2.0 -11 2.0m Becomes dark grey. 2.5 × W GRAVEL with some sand; brownish grey. Loosely packed; saturated; well 3.0 10 graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3m (Too dense to excavate.) 3.5 4.0 4.5 Remarks: Groundwater at 2.9m

Anticacu, (New Joanne) Evilled
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Embil **Inhibitation** 1680 politicon-puspican

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP20**

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skeliys Limited CO-ORDINATES N/A
Easting: 1559485 m
Northing: 5168200 m
Ground Level: 18 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log		Soil Description	Elevation (m)
.5 -				<u>.</u>	× × × × × × × × × × × × × × × × × × ×	grained (TOPSOIL).	brown. Stiff, moist, low plasticity, sand is fine brown mottled orange brown. Very stiff, dry, low grained (ALLUVIAL DEPOSITS).	
0 -					× * × × × × × × × × × ×	SAND with some slit; lig medium grained.	sht brown mottled orange brown; sand is fine to	17
0 —				T T T T T T T T T T T T T T T T T T T		Sandy GRAVEL browni subrounded to rounded grained.	sh grey. Loosely packed; moist to wet; well graded; l; gravel is fine to coarse grained; sand is fine to coars	- 16
5 -		, , , , , , , , , , , , , , , , , , ,		C		3.16		15
5			The state of the s			End of Test Pit at 3.3m	(Target Depth Achieved.)	
5 -								14
marks								-

Client:

Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Aurocon (free Zestands Lumbool table 1, 160 Carecoda Ros Project Name: Rosemerry Location: Stage 7 to 15

New Zestands Telephone: +64 3 198 1982 Project Reference: 224464

Email: chila Sharupto Care Project Reference: 224464

CO-ORDINATES N/A

TP21

Sheet 1 of 1

TEST PIT INFORMATION Excavalor Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m CO-ORDINATES N/A Easting: 1559683 m Northing: 5168142 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
-					77 77 77 7 77 77 77 77 7	SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	
.5 -					X X X X X X X X X X X X X X X X X X X	SILT, some sand; light brown mottled orange brown. Very stiff, dry to moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	
0						SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.	- 16
5 -							- - -
						1.5m Becomes dark grey.	- -
o —							15
5						GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	- 14
						End of Test Pit at 3.1m (Test Pit Sides Collapsing)	- 1-
5 -							
) —							13
5 -			THE				- - - -
emarks	<u></u>						-

Fulton Hogan Land Development Limited

Client: Fulton Hogan Lan
Austral (New Zaskard) Limited
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New Zeddard
Telephone: 4943 308 6821
New Zeddard
Telephone: 4943 308 6821
Project Reference: 224464

Project Reference: 224464

CO-ORDINATES N/A Project Name: Rosemerryn Farm Subdivision

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m CO-ORDINATES N/A Easting: 1559859 m Northing: 5168076 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
				1	7 77 77 77 77 7	SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	_
0.5 -					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	SILT with some sand; light brown mottled orange brown. Dry to moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	- -
i.o —					× ×	SAND with some silt; light brown mottled orange brown. Loosely packed, mosit; sand is fine to medium grained.	16
				incontrol in the control in the cont		1.2m Becomes grey.	- - -
1.5 -							- - -
2.0 —						2.0m Becomes dark grey. 2.1m Becomes with fibrous organic inclusions (Branches and roots up to 60mm in diameter).	15
2.5 -		A	·				- - - - - -
3.0 —	· .			Notice to the contract of the		GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	- -14
	-					End of Test Pit at 3.2m (Test Pit Sides Collapsing)	
3.5 -							· .
	-		٠.				40
1.0							- 13
	1						
1.5	1		***				-
•							-
 Remari					·····		
Ground	iwater at 2	.8m		·. ·.			

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Emist: christchurch@wp.eurocongroup.com

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP28**

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A Easting: 1559471 m Northing: 5168269 m Ground Level: 14 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

SLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSCIL). Sandy SLT, light brown motited orange brown. Very stiff, dry, low plasticity, sand is fine grained (ALLUVIAL DEPOSITS). Sandy GRAYEL, brownish grey. Loosely pecked; moist to wet; well graded; submounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. 1.0		Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
2.5 - 3.0 -		1.0					は、	grained (TOPSOIL). 5.35 Sandy SILT, light brown mottled orange brown. Very stiff, dry, low plasticity, sand is fine grained (ALLUVIAL DEPOSITS). Sandy GRAVEL; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	
3.0	14	2.0							- - - - - - -
4.0 —		1						 End of Test Pit at 3m (Target Depth Achieved.)	11
4.5	55	3.5							
	4								10

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Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: N/A
Northing: N/A
Ground Level: N/A

Date Started: 27/04/2012 Date Completed: 27/04/2012

SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TORSOLL). SILT, some sand, light brown motiled orange brown. Very stiff, dry, low plasticity, Sand is fine grained (ALLUVIAL DEPOSITS). SAND with some slift; light brown motiled orange brown; sand is fine to medium grained. 1.0 — 1.5 — 1.6 m Becomes fibrous organic inclusions (branches up to 100mm diameter). 2.0 — 2.0 m Tree stump 0.5m diameter. 3.0 — 3.0 — 3.6 — 3.7 Servet. with some sand; brownish grey. Loosely packed; moist to wel; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. 3.0 Servet.	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description
SAND with some silt; light brown mottled orange brown; sand is fine to medium grained. 1.2m Becomes dark grey. 1.5 - 1.6m Becomes fibrous organic inclusions (branches up to 100mm diameter). 2.0 - 2.0m Tree stump 0.5m diameter. 2.5 - 3.0	0.5					(grained (TOPSOIL).
2.0 — 2.0m Tree stump 0.5m diameter. 2.5 — 2.5 — 2.6 — 2.0	1.0	-					SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.
2.0 — 2.0m Tree stump 0.5m diameter. 2.5 — 3.0 — 3.5 — 3.6	1.5	-					1.2m Becomes dark grey.
2.5 - 3.0 GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3m (Target Depth Achieved.)		† 					1.6m Becomes fibrous organic inclusions (branches up to 100mm diameter).
3.0 SRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained to coarse grained. End of Test Pit at 3m (Target Depth Achieved.)	2.0 -	- my manufactured			,		2.0m Tree stump 0.5m diameter.
3.0 End of Test Pit at 3m (Target Depth Achieved.) 4.0 —	2.5				0	,0,0°	GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.
4.0 —	3.0 -		X		o		3.60
	3.5						
	4.5						
4.5	4.0 -						
	4.5		-				

New Code 19 Can Carlo 19 IS Auscont 1940 2004a001 United Unit 1, 150 Cavendich Rid PO 80X 1001 Christhurch 8140 New Zedand Www.authcomptus.com Fecchille: +04 3 318 6815 Email: printisthurch@sp.eurocongroup.com

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP30**

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m

CO-ORDINATES N/A Easting: 1559847 m Northing: 5168197 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
-			DOUBLES WEDGE		7	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL).	-
0.5			попония		* * * * * * * * *.	SiLT, with some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; Sand is fine grained (ALLUVIAL DEPOSITS).	- - -
					× × ×	SAND with some silt; light brown mottled orange brown; sand is fine to medium grained.	
1.0 —							- 12 -
1.5 -						1.2m Becomes dark grey.	
	,		TOUT POPPOUT POPPOUT PARAMAN			1.6m Becomes with fibrous organic inclusions (branches up to 100mm diameter).	-
2.0		1				2.0m Tree stump 0.5m diameter.	- 11 -
2.5							-
3.0		Ā					- - - 10
						GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3.2m (Target Depth Achieved.)	-
3.5 -							- -
40							
4.0							- 9
4.5 -							
							- -
Remarks Groundw)m					

S CUIPECON
Aureon (New Zealand) Limited
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New Zeatend Telephone +64 3 359 0821
www.purscongroup.com Faccintile +64 3 379 0055
Enrall chiricitaturch@sp.purscongroup.com

Fulton Hogan Land Development Limited Client: Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP33

Sheet 1 of 1

TEST PIT INFORMATION

Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited

CO-ORDINATES N/A
Easting: 1559526 m
Northing: 5168388 m
Ground Level: 16 m

27/04/2012 Date Started: Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
).5 –				1,	× × × × × × × × × × × × × × × × × × ×		
1.0 —				×	× × ×	SAND with minor silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained.	15
2.0 —						1.8m Becomes light grey mottled orange brown. 2.3m Becomes dark grey.	- - - - 14
.5 -						210	13
.5						End of Test Pit at 3.1m (Target Depth Achieved.)	
.5 -							12
Remarks Groundy	s: vater not c	encounte	ared.		, , , , , , , , , , , , , , , , , , , ,		-

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Aurocia (New Zaalers) Umiled Just 1, 150 Coversich Rd 20 BOX 1061 Christensch 8140 Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15
Project Reference: 224464

TP34

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m

CO-ORDINATES N/A
Easting: 1559565 m
Northing: 5168402 m
Ground Level: 11 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

	Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
	0.5 -					\(\lambda \lambda \lambd	SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). SILT, minor to some sand, brown. Stiff, moist, low to moderate plasticity, sand is fine to medium grained (ALLUVIAL DEPOSITS).	
	1,0 —				Noorboaroussissis is a second	× × × × × × × × × × × × × ×	1.26	10
	1.5 -						SAND with minor silt; brown and grey. Loosely packed; moist; poorly graded; sand is fine to medium grained.	1
	2.0						2.0m Becomes with some silt.	9
	2.5 —	· · · · · · · · · · · · · · · · · · ·					Becomes dark grey. 2.5m Becomes with organic inclusions (branches and large roots).	8
	4.0			T TO ANALYSIS AND			GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3.7m (Target Depth Achieved.)	7
202	Remarks Groundw	:: vater at 3.	5m					-

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

12

10

Location: Stage 7 to 15 Project Reference: 224464 Sheet 1 of 1 CO-ORDINATES N/A
Easting: 1559649 m
Northing: 5168358 m
Ground Level: 14 m Logged by: TEST PIT INFORMATION Logged by: RS Input by: MJF Checked by: RS Date Started: 27/04/2012 Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited Date Completed: 27/04/2012 Verified by: Penetrometer Tests Shear Vane Tests Water Level (m) Graphic Log Elevation (m) Depth (m) Sample Soil Description <u> 77.77.</u> SiLT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). 11/ 11/ 11/ 11/ **SILT**, minor sand; brown. Stiff, moist, low plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS). × 0.5 × х 1.0 -~ 13 **GRAVEL** with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. 1.3m Becomes with some sand. Database File: STAGE 7 TO 15 UPDATED TEST PIT LOGS,GPJ, Library: AURECON CHRISTCHURCH,GLB, Data template: CHCH DATA TEMPLATE NOV 2010.GDT 1.5

2.5 3.0 3,5

End of Test Pit at 3m (Target Depth Achieved.)

Last Generated: 3/07/2012 11:26:37 a.m

4.0

4.5

2.0

Groundwater not encountered.

durecon

turecon (New Zeoland) Umsted trist 1, 150 Cavensish Rid NO 800x 1001 Dinstiturch 9140

cos | cot 8140 | Telephone, +84 3 380 8921 congroup.com | Facatrille: +84 3 376 6055 Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 TP36

Sheet 1 of 1

CO-ORDINATES N/A
Easting: 1559878 m
Northing: 5168255 m
Ground Level: 16 m TEST PIT INFORMATION Date Started: 27/04/2012 Logged by: Excavator Type; 8 Tonne Excavator Test Pit Dimensions; 1.5m x 3m Contractor: Skellys Limited Date Completed: 27/04/2012 input by: MJI Checked by: RS Verified by: Pocket Penetrometer Tests Shear Vane Tests Water Level (m) Graphic Log Elevation (m) Depth (m) Sample Soil Description **SILT**, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). $\overline{M}_{1},\overline{M}_{2}$ 4 34 34 SILT, some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS). 0.5 10 GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse 1.0 15 Database Files, STAGE 7 TO 16 UPDATED TEST PIT LOGS, GPJ, LIbrary: AURECON CHRISTCHURCH, GLB, Data templater, CHCH DATA TEMPLATE NOV 2010. GDT 1.5 1.5m Becomes sandy and moist. 2.0 2.5 3.0 13 End of Test Pit at 3m (Target Depth Achieved.) 3.5 4.0 12 4.5 Last Generated: 3/07/2012 11:26:38 a.m. Groundwater not encountered.

CUPECOPI Aurezon (New Zeoland) Livrillod Luft 1, 150 Cassordish Rd PO BDX 10et Chestaturch 8140 New Zeoland New Zeoland New Seoland New Se

Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

TP37

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 8 Tonne Excavator
Test Pit Dimensions: 1.5m x 3m

CO-ORDINATES N/A
Easting: 1559935 m
Northing: 5168238 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
5 -			Щ		\(\frac{\fir}{\fir}}}}}}{\frac	SILT, minor sand, dark brown. Stiff, moist, low plasticity, sand is fine grained (TOPSOIL). SILT, some sand; light brown mottled orange brown. Stiff, moist, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS). SAND with minor silt; light brown mottled orange brown. Loosely packed, moist; sand is fine to medium grained. 0.8m Becomes grey mottled orange brown.	14
5		<u>*</u>				GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded;	-13
5		The state of the s				subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained. End of Test Pit at 3.1m (Target Depth Achieved.)	
emarks	s: vater at 2.	9m	· · · · · · · · · · · · · · · · · · ·				

Client: **Fulton Hogan Land Development Limited** Project Name: Rosemerryn Farm Subdivision

Autreant/Nov Scaland Unitial
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Project Name: Rosemerry
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New Zealent
New Zealent
New Zealent
Securities - 491 3:379 8855
Email: Control of the Company of the Control of the C

TP38

Sheet 1 of 1

TEST PIT INFORMATION Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Stratus Limited CO-ORDINATES N/A
Easting: 1559993 m
Northing: 5168257 m
Ground Level: 16 m

Date Started: 27/04/2012 Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests Shear Vane Tests	Graphic Log	Soil Description	
				× × × × × × × × × × × × × × × × × × ×	SILT, minor sand, dark brown. Stiff, dry, low plasticity, sand is fine grained (TOPSOIL). SILT with some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; Sand is fine grained (ALLUVIAL DEPOSITS).	
0.5	بة المسادمة سأسمدن مسال سما			× • •	plasticity; Sand is fine grained (ALLUVIAL DEPOSITS). SAND with minor to some silt; light brown mottled orange brown. Loosely packed; sand is fine to medium grained.	
1.0 -					GRAVEL with some sand; brownish grey. Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	- 1 - 1
1.5					1.4m Becomes moist.	- - -
2.0 -					2m Becomes sandy.	-1
2.5		Ā			zao End of Test Plt at 2.8m (Target Depth Achieved.)	
3.0					Lina or restra at 2,011 (raiget popul Adilleveu.)	-1
3.5						
4.0						- 1 - 1
4.56 40 a.m.						-

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464

Sheet 1 of 1

CO-ORDINATES N/A
Easting: 1559837 m
Northing: 5168324 m
Ground Level: 16 m Logged by: RS Input by: MJF Checked by: RS Verified by: WD TEST PIT INFORMATION Date Started: 27/04/2012 Excavator Type: 8 Tonne Excavator Test Pit Dimensions: 1.5m x 3m Contractor: Skellys Limited Date Completed: 27/04/2012

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
0.5						SiLT, minor sand, dark brown. Stiff, dry, low plasticity, sand is fine grained (TOPSOIL). SILT with some sand; light brown mottled orange brown. Very stiff, dry, low plasticity; sand is fine grained (ALLUVIAL DEPOSITS).	- - - -
1.0						GRAVEL with some sand; brownish grey, Loosely packed; dry; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	15
1.5	- - - - - -					1.4m Becomes sandy.	-
2.0	-					1.9m Becomes moist.	14
2.5		·				End of Test Pit at 2,5m (Target Depth Achieved.)	•
3.0							13
3.5			AND TO THE PARTY OF THE PARTY O				
4.0							-12
Rem	arks:	encount	ered.				

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Client: Fulton Hogan Land Development Limited Project Name: Rosemerryn Farm Subdivision

Location: Stage 7 to 15 Project Reference: 224464 **TP40**

Sheet 1 of 1

TEST PIT INFORMATION
Excavator Type: 6 Torine Excavator
Test Pit Dimensions: 1.5m x 3m

CO-ORDINATES N/A
Easting: 1559627 m
Northing: 5168409 m
Ground Level: 17 m

Date Started: 27/04/2012 Date Completed: 27/04/2012 Logged by: RS Input by: MJF Checked by: RS Verified by: WD

Depth (m)	Sample	Water Level (m)	Pocket Penetrometer Tests	Shear Vane Tests	Graphic Log	Soil Description	Elevation (m)
.0 —				. •	\(\frac{1}{1}\), \(\frac{1}\), \(SILT, some sand; brown. Stiff, moist, low to moderate plasticity; sand is fine to medium grained (ALLUVIAL DEPOSITS). 1.20 GRAVEL with some sand; brown and grey, Loosely packed; moist to wet;	- 16
.5						well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to medium grained. SAND with minor slit; brown mottled grey. Loosely packed; moist; poorly graded; sand is fine to medium grained.	-
2.0 —							15
2.5					× × × × × × × × × × × × ×	2.5m Becomes dark grey. 2.7m Becomes silfy,	-14 ·
1.5					x x x x x x x x x x x x x x x x x x x	350	
1.0						GRAVEL with some sand; brownish grey. Loosely packed; moist to wet; well graded; subrounded to rounded; gravel is fine to coarse grained; sand is fine to coarse grained.	- 13
4.5 -						End of Test Pit at 4.2m (Target Depth Achieved.)	
Remarks Groundw	s: vater not e	encount	ered.				1

SOL

field guide sheet

IELD DESCRIPTION OF SOIL

SEQUENCE OF TERMS - fraction - colour - structure - strength - moisture - bedding - plasticity - sensitivity - additional

GRAIN SIZE CRITERIA

			0	DARSE					FI	NE	ORGANIC
TYPE				Gravel			Sand				
	Boulders	Cobbles	coarse	medium	fine	coarse	medium	fine	Silt	Clay	Organic Soil
Size Range (mm)	2	00 6	0 2	0 6		2 0	6 0	2 0.	06 0.0	002	
Graphic Symbol		00	90	38	388				XXX XXX XXX		***

PROPORTIONAL TERMS DEFINITION (COARSE SOILS)

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

SOIL CLASSIFICATI	ON
<35%	Particle size composition Composition
Fraction finer	SAND
>35%	ig a -
	Plastic behaviour

DENSITY INDEX (RELATIVE DENSITY) TERMS

Descriptive Term	Density Index (R _D)	SPT "N" value (blows / 300 mm)	Dynamic Cone (blows / 100 mm)
Very dense	> 85	> 50	> 17
Dense	65 – 85	30 - 50	7 – 17
Medium dense	35 - 65	10 - 30	3-7
Loose	15 – 35	4-10	1-3
Very loose	< 15	<4	0-2
Note: • No correlation i	s implied between Standay	Panatration Test (SPT) and Du	comic Cone Test volues

lote:

No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Test values.

SPT "N" values are uncorrected.

Dynamic Cone Penetrometer (Scala)

ORGANIC SOILS/ DESCRIPTORS

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

PLASTICITY (CLAYS & SILTS)

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

CONSISTENCY TERMS FOR COHESIVE SOILS

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

MOISTURE CONDITION

Condition	Description	Granular Soils	Cohesive Soils						
Dry	Looks and feels dry	Run freely through hands	Hard, powdery or friable						
Moist	Feels cool, darkened in colour	Tend to cohere	Weakened by moisture, but no free water on hands when remoulding						
Wet			Weakened by moisture, free water forms on hands when handling						
Saturated	Feels cool, darkened in colour and free water is present on the sample								

GRADING (GRAVELS & SANDS)

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

NZ GEOTECHNICAL SOCIETY INC

This field sheet has been taken from and should be used and read with reference to the document FIELD DESCRIPTION OF SOIL AND ROCK, Guideline For the Field Classification and Description of Soil and Rock for Engineering Purposes. NZ Geotechnical Society Inc., December 2005, www.nzgeotechsoc.org.nz

Appendix G Borehole Logs

CULTECON

Associated Linds Control Linds of Linds

Last Generated: 19/10/2011 12:50:52 p.m.

Client: FULTON HOGAN LAND DEVELOPMENT
Project Name: ROSEMERRYN FARM SUBDIVISION

BH02

Location: SEE PLAN
Project Reference: 224464

BÇi Dril Die	REH Book	chindou OLE III Viethod ir Care tor:	IFOR	MATI	ON 2 Tra	ack F	CO-ORD Easting: Northing: Ground Lo	NATES N/A N/A N/A N/A evel: N/A	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Date Date Inclini Orien	Com ation:	pleted :					Logged by: input by: Checked by: Verified by:	JSM JSM JSM JK	V1 &
Method/Casing	Care Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.l. (m)	Depth (m)	Graphic Log	. N	Aaterial Descriptio	n		USC Description	Consistency/Density	Moisture	Sample	kn-Situ Testing	Laboratory Testing	Notes	Backfill	Geologicaf Unit
WASH					3 4 5 6 7		Sand fine grained SAND: Grey brow Loose. Moist. Sai SILT: Dark blue gi Sandy GRAVEL: I mottling. Dense, V coarse grained an grained.	wn. Firm. Moist. L. n with orange bro nd fine grained. rey. Low plasticity. Dark grey with ora Vet to saturated.	ow plasticity. wn mottles. Stiff. Moist.	71	OL SP ML	THE PROPERTY OF THE PROPERTY O	The state of the s		SPT #1 3m H = 35 € 490, 9, 8, 8 450mm (BC)	NO LABORATORY TESTING			
Matth CC OB SSA HSA NASH HG3 HG3 HG3 HG3 HG3 HG3 HG3 HG3 HG3 HG	con ope soli holi holi PQ HQ NO NO NO	ncrete : en ban- id stemi id water id temi id water shall Triple I Triple I Triple ILC Triple ILC Triple at Tube sing	el n auge Tube Tube Tube ple Tu	rbe	USC COLORGIC WILL TO FEE	Inorgania Sality Pour Sality	selfication antic CLAYS high presidenty antic CLAYS produint phesicity who CLAYS from plesticity who CLAYS from plesticity who CLAYS from plesticity and CLAYS from plesticity and state of the plesti	Consistency V\$ very soft S soft F firm S stiff V\$ very stiff H hard Density VI. very loose L loose MD medium dense D dense VD very dense	Water Z at end of excavation	SPT ski SS spi SC so HB ha	n pen ne sh l, pen it spo ld commen iks un	etram ear lest on pour der or	cing vn we		Connect Seet: 1 PP 3	lough Se ge group lothed Py nough 1	ockett: 1		

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FULTON HOGAN LAND DEVELOPMENT Client: Project Name: ROSEMERRYN FARM SUBDIVISION Location: SEE PLAN Project Reference: 224464

BH02

Sheet 2 of 2

Drill Dia	ling I	OLE Methor Fr Cor tor.	d: 0 e: 1	CAT 3	3127 Yi	Freck	Northing: N/A	Date	Star Com netion ntetio	iplete K					Logged by: Input by: Checked by Verified by:	JSM MSL JSM JK	
Method/Casing	Core Recovery (%)	Weter Loss (%)	Groundwater Lavel (m)	R.L. (m)	Table Honey	(iii) indep	Material Description		USC Description	Consistency/Density	Moisture	Semple	in-Situ Testing	Laboratory Tasting	Notes	Backfill	Geological Unit
WASH					1 1		grained. (Layer Continued from previous page)	C ATT	GW				SPT at 16m N = 50 5, 7/12, 14, 13, 11 460mm (SC)	NO LABORATORY TESTING			TOTOMORE ALABAMAN TOTAL
Aetho CC DB BSA BSA BSA BSA BSA BSA BSA BSA BSA BS	d concepts of the context was self-context was properly context of the context of	crete in bent distention of the control of the cont	core ei i su su Tube Tube p pla	er ger i	18		salification snite CLAYS ligh plassicity artic CLAYS medium plasticity Artic CLAY medium for high plasticity Artic CLAY medium for high plasticity artic fact i low plasticity by artic fact i low plasticity artic fact i low plasticity by artic fact i low plasticity artic fact i low plasticity by artic f	SPT sig SS spi SC soi	n pen ne shi 1. pen lit spo lid cor mmer iks un	etromi ear . test on le	ting m wei		Bendy GRAVES.	viologis ibe	ovidi: 1 1 jeps w: 1 ptos	The state of the s	And the state of t

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Last Generaled: 19/10/2011 12:50:53 p.m.

Aureous (New Zeeland) Limited
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New Zeeland
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How Zeeland
Tylischanic +64 3,790 r065
Email: ef-1 370 r065
Email: ef-1 370 r065

Client: **FULTON HOGAN LAND DEVELOPMENT** Project Name: ROSEMERRYN FARM SUBDIVISION

Location: SEE PLAN Project Reference: 224464 **BH04**

Sheet 1 of 2

BOREHOLE INFORMATION
Drilling Method: CAT 312 Track Rig
Diarneter Core: 100mm
Contractor: McMilleri Drilling

CO-ORDINATES N/A
Easting: N/A
Northing: N/A
Ground Level: N/A

Date Started: Date Completed: Inclination: Orientation:

15/09/2011 15/09/2011 90

Logged by: JSM Input by: JSM Checked by: JSM Verified by: JK

F	·		·) Colonia Lobe. 14%	en read	Ott.		• • • • • • • • • • • • • • • • • • • •		1 7	eiffied by:	JK		1
Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.t. (m)	Depth (m)		Material Description	USC Description	Consistency/Density	Moisture	Sampie	M-Situ Testing	Laboratory Testing	Notes	Backfii	Geological Unit	
WASH	od.				8 9 4 6 9 9 6 9 9	00000000000000000000000000000000000000	TOPSOIL SILT with trace sand and occasional rootlets; Dark brown. Firm. Moist. Low plasticity. Sand fine grained. SILT with minor sand; Yellow brown. Low plasticity. Firm. Moist. Sand fine to medium grained. Silty SAND; Dark blue grey. Loose to medium dense. Moist to wet. Sand fine to medium grained. SILT: Dark blue grey. Low plasticity. Firm to stiff, Moist. SiltT: Dark blue grey. Low plasticity. Firm to stiff, Moist. Sandy GRAVEL: Dark grey with orange brown morting. Dense. Wet to saturated. Gravel fine to coarse grained and rounded. Sand fine to medium grained.	OW OW				3PT at 3m N = 12 2, 2/3, 3, 3, 3 450mm (SC)	NO LABORATORY TESTING		nkokonkokonkokonkokonkokonkonkonkonkonko		Detabase File: TEST PITS.GPJ, Library: CDPY OF CHCH LIBRARY MARCH 2011, Cal.B, Data lemplate: CHCH DATA TEMPLATE NOV 2010, GDT, Last Generaled; 19/10/2011.
CC OB SSA HSA WASH PG3 HG3 NG3 NG3 NG3 DP DT	conc oper solid holid wash PC] HO NML Direc Duai	1000	Tube Tube Tube Tube Tube (70m	r 81	COLGGOM PY WAR COLDEN	norgani norgani tayay liky Gr toosiy (Yuli Gr tongasi norgas norgas norgas norgasi norgas	C CLAYS high plasticity C CLAYS medium plasticity C CLAYS medium plasticity S SOT U undisturbed SPT E STRING GRAVEL Should GRAVEL YS very soft B husk PP p C CLAYS how pasticity Firm D disturbed SPT is STRING GRAVEL YS very stiff Water High SC SC STRING GRAVEL H hard Water High SC SC STRING GRAVEL	en pe ane si d. pe bit sp bid co amme nks u	netrom hear n, test con me er bourn nder ov	chig vin we		St. 7 Bity SAND Sardy GRAVEL	Dig Glouph Bacidi: plps graup, † ph Catotack Piper graup, † ph				Database File: TEST PITS.G

GUIFECON
Autoun (New Zerland) (Imitted
Linh 1, 1952 Centralish Rosel
PG BIOL 1001
Christolycoth 61:40
Ress Zisslahnd
www.autoungrapus.com
Erisel: christolycoth (Ege autoungraps)

BOREHOLE INFORMATION

Last Gerverated: 19/10/2011 12:50:53 p.m.

FULTON HOGAN LAND DEVELOPMENT Project Name: ROSEMERRYN FARM SUBDIVISION

Location: SEE PLAN

Tolkehore. 1964 2 500 0021 Project Reference: 224464 CO-ORDINATES N/A

BH04

Sheet 2 of 2

Driit Diar	REHC ing M neter aracto	lethor	d: C/ e: 10	MAT AT 31 Omm Milla	2 Tra	ack R illing	lig	CO-ORDINA Easting: Northing: Ground Leve	N/A N/A		Date Incli	Start Com nation	pleted :	15 1: 15 90	/09/2 /09/2	2015 2011		Logged by: input by: Checked by: Verified by:	JSM JSM JSM JK	
Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.L. (m)	Depth (m)	Graphic Log		*******	terial Descriptio	on		USC Description	Consistency/Density	Moistune	Semple	in-Silu Testing	Laboratory Testing	Notes	Backfill	Geological Unit
WASH	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				- 12 - 13 - 14		motiling. coarse grained.	Dense, Wa ained and (Layer Con	irk grey with ora at to saturated. rounded. Sand tinued from previous of at 15m (Targa	Gravel fine to fine to mediu ious pagé)	: Th	GW	127700000	- ALLEMAN - ALLE		SPT of 19th N = 49 3, 6/10, 16, 9, 16 46Dmm (SC)	NO LABORATORY TESTING			
		The state of the s			16							The state of the s		The state of the s	THE PROPERTY OF THE PROPERTY O	Tanahia I a	NO LABOR.			
CC COB SSA HSA WASH PG3 HG3 HG3 HG3 HG3 FG3 HG3 FG3 HG3 FG3 HG3 FG3 HG3 HG3 HG3 HG3 HG3 HG3 HG3 HG3 HG3 H	con	ow sty in drill Triple Triple Triple I.C Tr ixt Pu		ger	STOCK COMP	Inorga Inorga Claya Silty (Poort	salification salification spic CLAYS high pix spic CLAYS madium spic CLAYS low pixes y GRAVEL GRAVEL GRAVEL GRAVEL GRAVEL SPIC SET Spic pixel spic SET pix pixel spic SET pix pixel spic SET pix pixel spic SET pix pixel spic SET pixe	slicity plassicity telty ity to righ plasticity ity coils	Constatency VS very soft \$ 50ft F firm \$ 50ff VS very stiff H hard Density VL very locse LD medium dense D dense VD very dense	excavation	VS V SPT S SS S SC S HB h	en per ens sh id. pen pilt spo pild co emmer nks un	etrometar l. test loon ne r bounder ov	cing vn wei		Cement Spei; 1	Sough Bar pipe group Godad Pip group, 1 pi	csidSi: 1 1 papes K: 1 papes pe pe p		

Project:

Aurecon NZ Ltd

Edward Street, Lincoln

Bore No.:

BH001

Bore Log

Job No.:

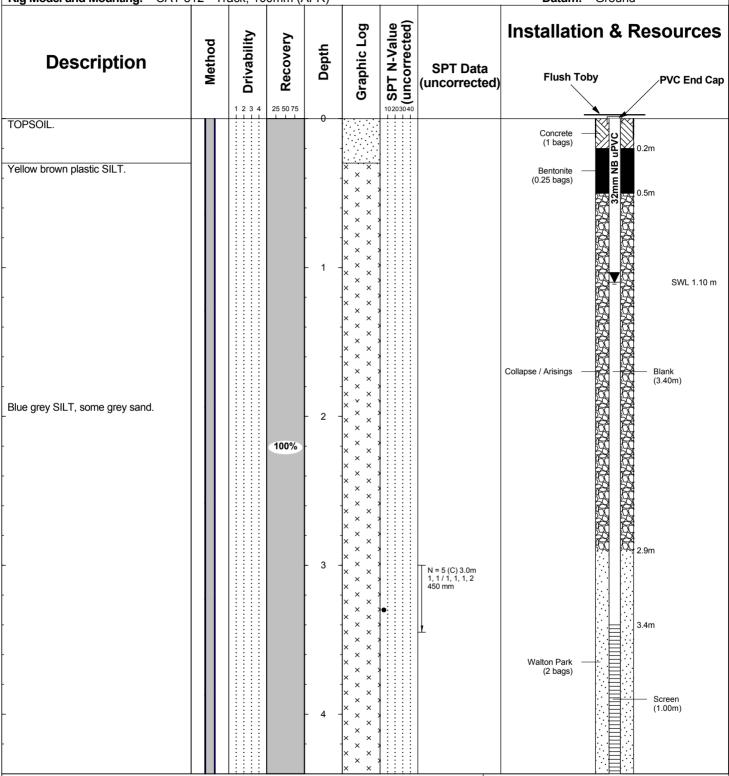
Between TP9 and TP13 Site Location: Refer to Aurecon NZ site plan **Grid Reference:**

Date Commenced: Date Completed: 9402

Rig Operator: P. Smith Consent:

19/09/2011 19/09/2011

Rig Model and Mounting: CAT 312 - Track, 100mm (AFR) Datum: Ground



E.O.H. 4.4m Remarks: Installation of Ground water monitoring well BH001.
SPT @ 3.0m
SPT: "Doughnut" trip SPT Hammer #001 used (energy ratio 52.0%)

Drivability

1 Easy Push - No Hammer \ Fast Penetration

2 Relatively Easy Push - Light Hammer \ Nedatively Fast

3 Medium Push - Consistent Hammer \ Medium

4 Hard Push - Full Hammer \ Somewhat Slow

5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Α	dditional Resources:	
P	lastic Liner	m
FI	ush Mounted Toby Box	
	- Standard	ea 🗶
	- Environmental	ea
Δ	hove Ground Protective Surround	ea

Handclear Location Decontaminate Equipment 120 High Street, Southbridge 7602, Canterbury, New Zealand | ph: (03) 324 2571 fax: +64 3 324 2431 web: www.drilling.co.nz

Geotextile Sock

m

Project:

Aurecon NZ Ltd

Edward Street, Lincoln

Bore No.:

BH002

Bore Log

Job No.:

9402

Between TP11 and TP15 Site Location: **Grid Reference:** Refer to Aurecon NZ site plan

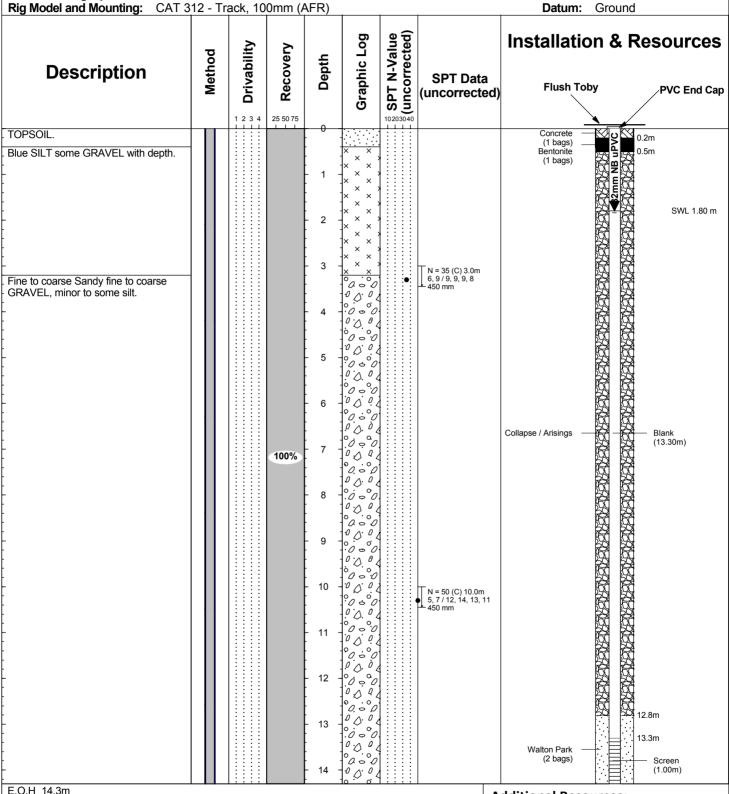
Rig Operator: P. Smith

Date Completed:

Date Commenced: 16/09/2011 19/09/2011

Consent:

Datum: Ground



	10			
E.O.H 14.3m Remarks: Installation of Ground water monitoring well BHC	002.	Additional Resources: Plastic Liner	m	_ _
SPT @ 3.0m and 10.0m		Flush Mounted Toby Box		
SPT: "Doughnut" trip SPT Hammer #001 used (en	orgunatio 52.0%)	- Standard - Environmental	ea X	4
3F1. Dougillut trip 3F1 Hammer #001 used (en	ergy ratio 32.0%)	Above Ground Protective Surround	ea 🗌	╡
	Drivability 1 Fasy Push - No Hammer \ Fast Penetration	Geotextile Sock	m 🗀	Ī
	1 Easy Push - No Hammer \ Fast Penetration 2 Relatively Easy Push - Light Hammer \ Relatively Fast 3 Medium Push - Consistent Hammer \ Medium	Handclear Location	ea	╛
	4 Hard Push - Full Hammer \ Somewhat Slow 5 Very Hard Push - Very Slow, Full Hammer \ Very Slow	Decontaminate Equipment	ea	۷
120 High Street, Southbridge 7602, Ca	nterbury, New Zealand ph: (03) 324 2571 fax: +	64 3 324 2431 web: www.drilling.co.nz		
		Report Created: 28/09/2011 4:16:02	p.m.	

Project:

Aurecon NZ Ltd

Edward Street, Lincoln

Bore No.:

BH003

Bore Log

Job No.:

9402

Between CPT20 and TP41 Site Location: Refer to Aurecon NZ site plan **Grid Reference:** Rig Operator:

P. Smith

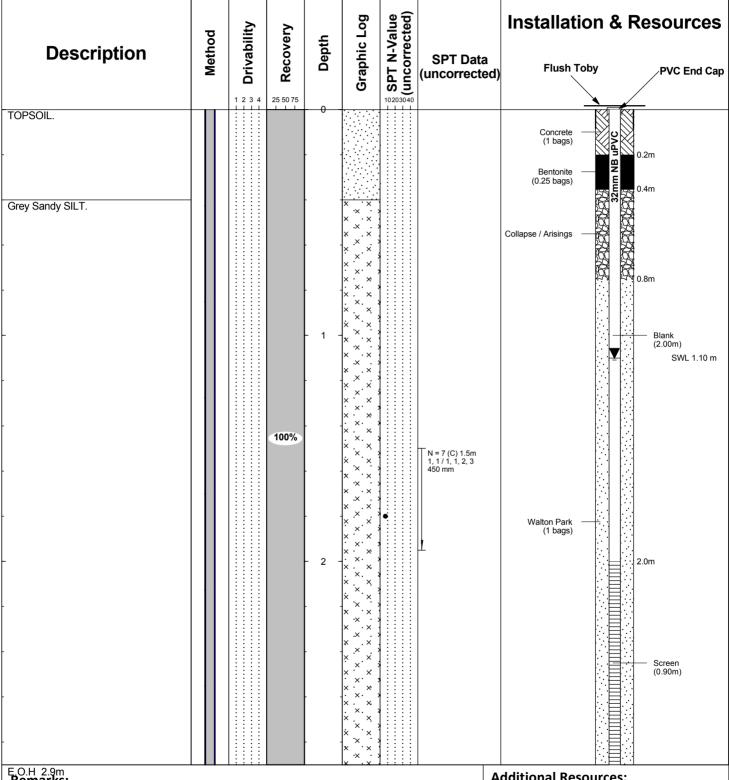
Date Commenced:

16/09/2011 16/09/2011

Consent:

Date Completed:

Rig Model and Mounting: CAT 312 - Track, 100mm (AFR) Datum: Ground



E.O.H 2.9m **Remarks:** Installation of Ground water monitoring well BH003. SPT Testing @ 1.5m SPT: "Doughnut" trip SPT Hammer #001 used (energy ratio 52.0%)

Drivability

1 Easy Push - No Hammer \ Fast Penetration

2 Relatively Easy Push - Light Hammer \ Relatively Fast

3 Medium Push - Consistent Hammer \ Medium

4 Hard Push - Full Hammer \ Somewhat Slow

5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Additional Resources: **Plastic Liner** m **Flush Mounted Toby Box** - Standard ea X - Environmental

Above Ground Protective Surround ea **Geotextile Sock** m **Handclear Location Decontaminate Equipment** ea

120 High Street, Southbridge 7602, Canterbury, New Zealand | ph: (03) 324 2571 fax: +64 3 324 2431 web: www.drilling.co.nz

Aurecon NZ Ltd

Project:

Edward Street, Lincoln

Bore Log Bore No.:

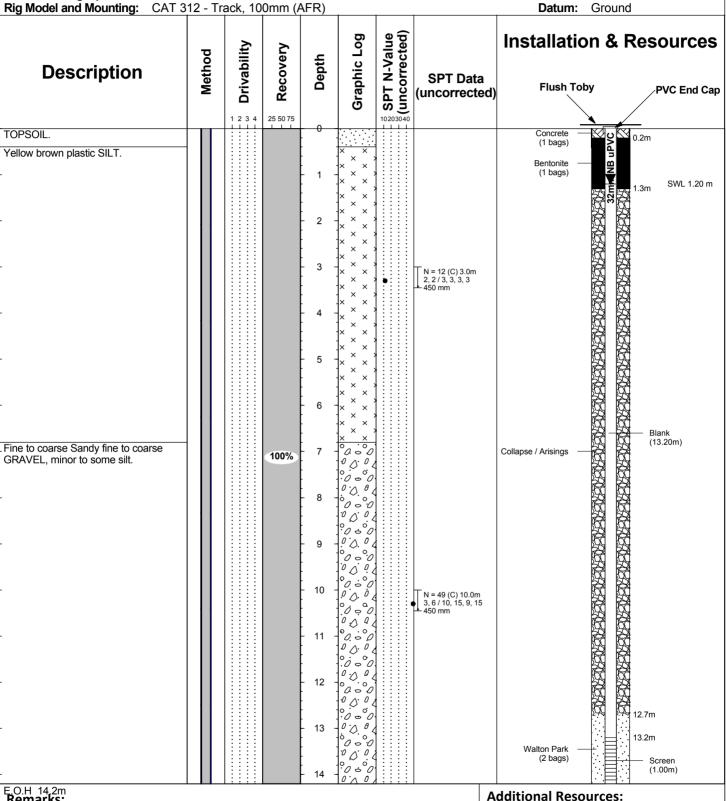
BH004

Job No.:

9402

Site Location: Between CPT22 and TP37 **Date Commenced:** 15/09/2011 Refer to Aurecon NZ site plan 15/09/2011 **Grid Reference: Date Completed:** P. Smith **Rig Operator:**

Consent:



E.O.H 14.2m Remarks: Installation of Ground water monitoring well BH004. SPT @ 3.0m and 10.0m SPT: "Doughnut" trip SPT Hammer #001 used (energy ratio 52.0%)

Drivability

1 Easy Push - No Hammer \ Fast Penetration

2 Relatively Easy Push - Light Hammer \ Relatively Fast

3 Medium Push - Consistent Hammer \ Medium

4 Hard Push - Full Hammer \ Somewhat Slow

5 Very Hard Push - Very Slow, Full Hammer \ Very Slow

Plastic Liner Flush Mounted Toby Box - Standard - Environmental **Above Ground Protective Surround Geotextile Sock Handclear Location**

120 High Street, Southbridge 7602, Canterbury, New Zealand | ph: (03) 324 2571 fax: +64 3 324 2431 web: www.drilling.co.nz

Decontaminate Equipment

m

ea X

ea

ea

m

ea



Water

FLUSHING MEDIUM

BOREHOLE RECORD

HOLE NO. BH101

PROJECT NO. **224464**

GROUND-LEVEL

+10.00 m RL

 Rosemerryn Subdivision Lincoln

 METHOD
 DP
 CO-ORDINATES (NZTM)
 SHEET
 1
 of
 2

 MACHINE & NO. VTR 9700-D Truck
 N 5168089
 DATE from 21/01/2015
 to 22/01/2015

ORIENTATION VERTICAL

Drilling	Progress	Casing depth/size	Water level (m) shift start/ end	Water	Recovery % Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests		mples	Reduced	Depth (m)	Legend	STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
_21/01/3			0.10		90					Type	Ref Depth 0.00	+9.50	0.00	1/ · 1/ · 1/	SILT with minor sand and trace rootlets; dark brown. Dry, low plasticity; sand, fine. (TOPSOIL)
Ē										DT		+9.20	0.80	× × × ×	SILT with minor sand; light brown mottled orange. Dry, low plasticity; sand, fine.
-												+8.90 +8.80	1:18	×××	Fine SAND with some silt; light brown. Dry. 1.00m becomes fine to medium SAND with some silt.
-					70				(2, 1, 2, 1, 2, 2)	+	- 1.52	+8.40 +8.35	1.60	^ × ^	1.10m becomes silty fine SAND. 1.20m becomes sandy SILT; light brown mottled orange.
-									2, 2) N = 7			+8.00	2.00	× ×	Moist, low plasticity. Medium to coarse SAND with minor silt; reddish brown.
Ē										DT 		+7.80 +7.75 +7.60	2.20 2.25 2.40	X X	Silty fine to coarse SAND; brownish grey. Moist. SILT with some sand and trace organics; dark grey. Moist, low plasticity; sand, fine to coarse.
													-		Medium to coarse SAND; grey. Moist. SILT with minor sand; grey. Moist, low plasticity.
-					85				(1, 3, 2, 1, 1, 5)	*	3.04	+6.96	- 3.04 - - -	× × × ×	Fine to coarse SAND with minor silt; grey. Moist. Sandy SILT; grey. Dry, low plasticity; sand, fine.
-									N = 9			+6.45 +6.30	3.55	×	3.55m becoming silty fine to medium SAND. Moist.
<u> </u>			7							DT			-	0000	plasticity, rounded to subangular; sand, fine to coarse.
Ė									(12, 16, , 18, 20, 19,	<u> </u>	- 4.56	+5.44	- 4.56	000	
									3) N = 60/240	Ī		+5.25 +5.05	- 4.75 - 4.95	0000	Medium to coarse GRAVEL; grey. Dry, subrounded. Coarse SAND; dark greyish brown. Moist. Fine to coarse GRAVEL with some sand and minor silt;
									mm	DT				000	brownish grey. Dry, subrounded to subangular; sand, fine to coarse.
Ή-													-	000	
<u>-</u> - -									(5, 8, 7, 8, 9, 9)	+	- 6.08		-	000	6.08m - 6.30m coarse GRAVEL with no sand or silt. Grey.
E									N = 33	DT				0000	
													-	000	
Ė					35				1/3 / / 3	+	7.60	+2.40	7.60	0000	7.60m becomes Sandy fine to coarse GRAVEL with minor
									(3, 4, 4, 3, 3, 5) N = 15			+2.00	8.00	0000	silt.
- - - -										DT 			_	000	and some silt.
												10.00	-	000	
• → 🛛					40				(6, 7, 10, 9, 11, 10) N = 40	1	9.12	+0.88	9.12 - - 9.35	0000	Gravelly medium to coarse SAND; dark greyish brown. Dry; gravel, fine to coarse.
Ė									ţ==0	DT 			- - -	0000	Fine to coarse GRAVEL with minor sand; grey. Dry; sand, fine to coarse.
•			bed Samp		Ţ	•	ater I		acker Test		LOGGE	D T.	PLUNKI		REMARKS
	SPT	Liner Sa	•		mple I	Si	tanda		netration Test		DATE		/01/2015		Coorindates and ground level based on hand held GPS, likely accurate to +/- 5m. Groundwater level recorded at 3.8m.
	U10	0 Undistu	urbed San trometer 1	nple	• 🛓	_ ∱ Pi		eter /	Standpipe Tip		CHEC	(ED_ B.	SUCKL	ING	SPT hammer energy ratio 79%.
۱_		on Samp		. 001	. ~				Shear Test		DATE	05/	/02/2015	<u> </u>	



HOLE NO. BH101

PROJECT NO. **224464**

PROJECT Rosemerryn Subdivision

METHOD DP CO-ORDINATES (NZTM) SHEET 2 of 2

MACHINE & NO. VTR 9700-D Truck

E 1559383

N 5168089

DATE from 21/01/2015 to 22/01/2015

FLUSHING MEDIUM Water ORIENTATION VERTICAL GROUND-LEVEL +10.00 m RL

Drilling Progress	Casing depth/size	Water level (m) shift start/ end	Water	Total core	- 1	Recovery %	R.Q.D.	Fracture Index	Tests	Samples	Reduced		00.01 (m)	Legend	STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
				4	5				(0, 1, 0, 1, 0, 0, 0) N = 1	DT 10.	54				10.64m becomes medium to coarse GRAVEL. Rounded to subrounded.
-)				(3, 4, 4, 6, 9, 13) N = 32	12.	-3.16		- 13.16		
)				(10, 16, 19, 12, 13, 13) N = 57	13.0 DT	68		-		13.68m - 14.00m sandy fine to medium GRAVEL; dark brownish grey.
- Sm Lar									(14, 25, 20, 21, 24) N = 65/225 mm	. ₩ 15.:	-5.20		15.20	· 0 0 0	End of Dynamic probe sampling at 15.20m, on 22/01/2015 Termination Reason: Target depth reached.
• Sm Lar SP	ge Distur T Liner Sa	•	ole		<u>↓</u> <u>▼</u>	lm _l Sta	ores: inda	rd Pe	Packer Test netration Test	LOG	GED <u>T</u>		LUNKE		REMARKS Coorindates and ground level based on hand held GPS, likely accurate to +/- 5m.
Poor	00 Undistocket Pene ton Samp		nple Test	e i	~	Pie Pac In-s	zom cker situ	eter / Test Vane	Test Standpipe Tip Shear Test	CHE	CKED <u>B</u>	5. S 5/0	SUCKLI 02/2015	NG	Groundwater level recorded at 3.8m. SPT hammer energy ratio 79%. 55 christchurch@aurecongroup.com



HOLE NO. BH102

224464 PROJECT NO. **Rosemerryn Subdivision PROJECT** METHOD DP CO-ORDINATES (NZTM) SHEET of 2 E 1560211 MACHINE & NO. VTR 9700-D Truck DATE from **22/01/2015** to 22/01/2015 N 5168161 FLUSHING MEDIUM ORIENTATION VERTICAL Water **GROUND-LEVEL** +9.00 m RL

Drilling Progress Casing	Water level (m) start/ end	Recovery % Total core Recovery %	R.Q.D. Fracture	Tests	Samples	Reduced	Depth (m)	Legend	STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR, STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDINIG, PLASTICITY, ETC. (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
		20		17	Pe Ref Depth 0.00		0.00		Sandy fine to coarse GRAVEL with some silt and trace rootlets; greyish brown. Dry to moist, subrounded to angular; sand, fine to coarse. (Logged from sample bag)
		20		(26, 25, 24, 23, 15, -7) N = 69/262 mm	1.52 DT	+7.48	- 1.52 		(Logged from sample hag)
-		40		(3, 5, 5, 5, 6, 6) N = 22	3.04 DT	+5.96 +5.76 +5.25	3.04 3.24 		Gravelly fine to coarse SAND; greyish brown. Moist; gravel, fine to medium, rounded to subangular. 3.24m becomes sandy fine to medium GRAVEL. 3.75m becomes fine to coarse GRAVEL with minor sand.
		115		(1, 1, 1, 1, 1, 2, 2) N = 6	4.56	+4.44	- 4.56	0000	SAND; brown. Wet. (Logged from sample bag)
		90		(2, 4, 5, 4, 4, 7) N = 20	6.08 DT	+2.92			Sandy fine to coarse GRAVEL; grey. Dry, rounded to subangular; sand, fine to coarse. 6.20m becomes fine to coarse GRAVEL with some silt and minor sand; reddish brown. Dry.
		40		(4, 7, 7, 5, 5, 4) N = 21	7.60 DT	+1.40	7.60 - 7.90		brown. Dry, subrounded to angular, sand, fine to coarse.
-		3000		(5, 8, 8, 7, 12, 12) N = 39	9.12 DT	-0.12	9.12		Fine to coarse GRAVEL with minor sand; grey and reddish grey. Dry, rounded to angular; sand, medium to coarse.
Large D SPT Lin Thin W	Disturbed Sample Disturbed Sample ner Sample all Undisturbed S	sample	Impression F Standard Per Permeability	netration Test Test	LOGGE		PLUNKE 01/2015	ET	REMARKS Coorindates and ground level based on hand held GPS, likely accurate to +/- 5m. Groundwater level not recorded.
_	ndisturbed Samp Penetrometer Te Sample		Piezometer / Packer Test In-situ Vane	Standpipe Tip Shear Test	CHEC		SUCKLI 02/2015		SPT hammer energy ratio 79%.



BH102 HOLE NO.

224464 PROJECT NO. **Rosemerryn Subdivision PROJECT** METHOD DP CO-ORDINATES (NZTM) SHEET 2 of 2 E 1560211 MACHINE & NO. VTR 9700-D Truck DATE from **22/01/2015** 22/01/2015 to N 5168161 FLUSHING MEDIUM ORIENTATION VERTICAL Water **GROUND-LEVEL** +9.00 m RL

Drilling Progress	Casing depth/size	Water level (m) shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Tests		nples	Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUR STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (INZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
				100					DT I			-	0000	
• Sm.								(3, 3, 6, 5, 4, 4) N = 19	•	10.64	-1.64			End of Dynamic probe sampling at 10.64m, on 22/01/2015 Termination Reason: Target depth reached.
												<u> </u>		
Sm	nall Disturl rge Disturl			7			_evel sion F	Packer Test		LOGGE	ED <u>T.</u>	PLUNK	ET	REMARKS Coorindates and ground level based on hand held GPS,
	T Liner Sa in Wall Un		l Sam	ple	<u>.</u>		rd Per ability	netration Test Test		DATE	29	/01/2015	<u> </u>	likely accurate to +/- 5m. Groundwater level not recorded.
U10	00 Undist	urbed Sar	nple	_	_ 合 Pi	ezom	eter /	Standpipe Tip		CHEC	(ED <u>B.</u>	SUCKL	ING	SPT hammer energy ratio 79%.
	cket Pene		ıest	_		acker -situ		Shear Test		DATE	05	/02/2015	5	



HOLE NO. BH103

www.aurecongroup.com 224464 PROJECT NO. **Rosemerryn Subdivision PROJECT METHOD** DP CO-ORDINATES (NZTM) SHEET of 2 E 1560056 MACHINE & NO. VTR 9700-D Truck DATE from **28/01/2015** to 28/01/2015 N 5167722 FLUSHING MEDIUM ORIENTATION VERTICAL GROUND-LEVEL Water +9.00 m RL

STRATA DESCRIPTION STRATA DESCRIPTION STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACT STRUCTURE, STRENGTH, MOISTURE CONDITIO GRADING, BEDDING, PLASTICITY, ETC SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACT STRUCTURE, STRENGTH, MOISTURE CONDITIO GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL Type Ref Depth Type Ref Dep	ION, COLOUR, N
Type Ref Depth 0.00 3 Wix of SILT with minor sand and trace rootlets brown. Dry, low plasticity; sand, fine to medium (TOPSOIL) and; SILT with some sand; light brown mottled orange.	ION, COLOUR, N
Company Comp	IN
2801/2015 15 15 16 17 18 18 18 18 18 18 18 18 18	AND ROCK)
X X brown. Dry, low plasticity; sand, fine to medium (TOPSOIL) and; X X SILT with some sand; light brown mottled oran (SILT with some sand; light brown mottled oran (SILT with some sand). SILT with some sand; light brown mottled oran (SILT with some sand). SILT with some sand; light brown mottled oran (SILT with some sand). SILT with some sand; light brown mottled oran (SILT with some sand). SILT with some sand; light brown mottled oran (SILT with some sand).	
X X SILT with some sand; light brown mottled oran	n.
DT	ige. Dry,
	J - ,,
-	
1.52 +7.48 1.52 X X	C-10
(1,1,2,2, 1,2) Sandy SILT; greyish brown. Stiff, wet, low plast fine to medium.	ticity; san
- \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	ev. Wet.
DT FEAT; dark brown. Fibrous, saturated.	-,
	w plasticity
SILT with some sand and trace organics; grey stiff, wet, low plasticity; organics are fibrous.	. Firm to
3.04 +5.96 -3.04 Stiff, wet, low plasticity; organics are fibrous. (4, 8, 7, 7, 1, 4, 5, 7, 7, 1, 5, 7, 7, 1, 7, 7, 1, 7, 7, 7, 1, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7,	
$\begin{vmatrix} 6, 6 \\ N = 26 \end{vmatrix}$ $\begin{vmatrix} 6, 6 \\ 0 \\ 0 \end{vmatrix}$ Gravelly fine to coarse SAND; greyish brown.	Wet; grav
	L.
Fine to coarse SAND with minor gravel; brown	
N = 40 Sandy fine to meating. GRAVEL: grayish prown	
	,
DT $0.00 0$	
(8, 13, 10, 6.08 +2.75 6.25 Fine to coarse SAND; brown. Wet.	
7, 6, 5) N = 28 +2.60	n. Wet,
+2.45 + 6.55 Subrounded to angular; sand, fine to coarse. Fine to coarse GRAVEL; grey. Wet, rounded to	
DT	U
Sandy fine to coarse GRAVEL: grevish brown	Wet,
subrounded to angular; sand, fine to coarse.	
1 1 1 1 1 1 1 1 1 1	
(8, 12, 13, 12, 14) (8, 12, 13, 12, 14) Fine to coarse SAND; brown. Wet.	
1 N=51 7.90m becomes gravelly fine to coarse SAND.	Gravel,
+0.70 + 8.30 O O O O O O O O O O O O O O O O O O O	Wet
Twist and fine to coars	e.
l l l l l l l l l l l l l l l l l l l	
Sality file to coalse GRAVEL, greyish blown.	Wet,
9.12 subrounded to angular; sand, fine to coarse.	
$\left \begin{array}{c c} & & & & \\ & & & \\ & & & \\ & & & \\ \end{array}\right $ $\left \begin{array}{c c} & & & \\ & & \\ & & \\ \end{array}\right $ $\left \begin{array}{c c} & & \\ & & \\ & & \\ \end{array}\right $ 9.55m white.	
• Small Disturbed Sample	
Large Disturbed Sample Impression Packer Test SPT Liner Sample Standard Penetration Test STE SOLUTION 5	I GPS,
Thin Wall Undisturbed Sample Permeability Test DATE 29/01/2015 Groundwater level recorded at 2.0m.	
U100 Undisturbed Sample	
Pocket Penetrometer Test Packer Test	
Piston Sample VIn-situ Vane Shear Test DATE 05/02/2015	



BH103 HOLE NO.

www.aurecongroup.com 224464 PROJECT NO. **Rosemerryn Subdivision PROJECT** METHOD DP CO-ORDINATES (NZTM) SHEET 2 of 2 E 1560056 MACHINE & NO. VTR 9700-D Truck DATE from **28/01/2015** to 28/01/2015 N 5167722 FLUSHING MEDIUM ORIENTATION VERTICAL Water **GROUND-LEVEL** +9.00 m RL

Drilling Progress	Casing depth/size	Water level (m) shift start/ end	Water Recover		Solid core Recovery %	R.Q.D.	Fracture Index	Tests	Samp		Reduced Level	Depth (m)	Legend	STRATA DESCRIPTION SUBORDINATE FRACTION, MAJOR FRACTION, MINOR FRACTION, COLOUF STRUCTURE, STRENGTH, MOISTURE CONDITION GRADING, BEDDING, PLASTICITY, ETC (NZ GEOTECHNICAL SOCIETY - FIELD DESCRIPTION OF SOIL AND ROCK)
8/01/2015				45					DT		-1.64	- - - - - 10.64	0000	
								(9, 12, 13, 11, 10, 6) N = 40		10.64	-1.04	- 10.04		End of Dynamic probe sampling at 10.64m, on 28/01/2015 Termination Reason: Target depth reached.
• Sm	nall Disturi	ned Samr	ole		Z w	ater I	evel							REMARKS
Lar	rge Disturl T Liner Sa	bed Samp			lm	pres	sion F	Packer Test	Lo	OGGE	D <u>T. F</u>	PLUNK	ET	Coorindates and ground level based on hand held GPS, likely accurate to +/- 5m.
Thi	in Wall Un	disturbed		•	Pe	ermea	bility	Test		ATE		01/2015		Groundwater level recorded at 2.0m.
- Poc	00 Undistu cket Penet	trometer ·		_	Pa	acker	Test	Standpipe Tip				SUCKL		SPT hammer energy ratio 79%.
Pisi	ton Samp	le		`	∕ In-	-situ	Vane	Shear Test	D	ATE	_05/	02/2015	<u> </u>	

Bore Log Client: Bore No.: Aurecon NZ Ltd **BH101** McMILLAN Drilling Project: Job No.: Rosemerryn Farm development 14216 Site Location: Ellesmere Road, Lincoln (Rosemerryn Farm development) Date Commenced: 21/01/2015 Grid Reference: 1559383.26mE, 5168089.14mN (NZTM) Date Completed: 22/01/2015 Rig Operator: C. Nee Consent: -Rig Model & Mounting: VTR 9700-D Truck Datum: Ground SPT N-value (Uncorrected) Recovery Drivability Installation **Graphic Log** Samples Depth Description Resources 22 22 22 22 22 28838 ΔD %06 Fine SAND: light brown. 1.0 Silty fine SAND; light brown 1.52 - 1.84m, 1, N = 7 (S) 1.52m2, 1 / 2, 1, 2, 2 450mm 2.0 SPTLS %02 2.5 Medium SAND; grey. 3.0 3.00 - 3.32m, 2, SPTLS N = 9 (S) 3.04m 1, 3 / 2, 1, 1, 5 3.5 Trace of gravel. 450mm 85% 4.0 Sandy fine to coarse GRAVEL; light brown. N = 60+ (C) 4.56m 12, 16 / 18, 20, 19, 3 0.6 ô 390mm Effective 20% 5.5 6.0 0 N = 33 (C) 6.08m 5, 8 / 7, 8, 9, 9 0.6 .%59 7.0 Dual tube ന്റ് N = 15 (C) 7.60m 3, 4 / 4, 3, 3, 5 450mm 0 Ö 35% 8.5 0.6 9.0 N = 40 (C) 9.12m 6, 7 / 10, 9, 11, 10 .00 450mm 10.0 10.5 N = 1 (C) 10.64m 0, 1 / 0, 1, 0, 0 450mm 。 C $\circ \circ$. O. ō. 11.5 0 12.0 Ö N = 32 (C) 12.16m 3, 4 / 4, 6, 9, 13 450mm 0.6 12.5 ,o 80% 13.0 0.6 N = 57 (C) 13.68m 10, 16 / 19, 12, 13, 13 450mm 25% Fine to coarse GRAVEL with minor silt and sand: N = 60+ (C) 15.20m 14, 25 / 20, 21, 24 375mm Effective EOH: 15.2m Remarks **Additional Resources:** Seotechnical Investigation Borehole BH101 with SPT Testing **Plastic Liner** 10 m Static Water Levels: Flush Mounted Toby Box -3.8m @ Casing depth of 13.5m; 22/1/2015 - Standard ea 500 Liters Water Added - Environmental ea Drivability **Above Ground Protective Surround** Safety Auto Trip Hammer #398 used (energy ratio 79%) ea 1 Easy Push - No Hammer \ Fast Penetration Geotextile Sock m 2 Relatively Easy Push - Light Hammer \ Relatively Fast 3 Medium Push - Consistent Hammer \ Medium 4 Hard Push - Full Hammer \ Somewhat Slow **Hand Clear Location** ea 5 Very Hard Push - Full Hammer \ Very Slow **Decontaminate Equipment** Hole Depth: 15.2m 120 High Street, Southbridge 7602, Canterbury, New Zealand ph: (03) 324 2571 fax: (03) 324 2431 web: www.drilling.co.nz Page 1 of 1

Core

Generated by

Bore Log Client: Bore No.: Aurecon NZ Ltd **BH102** McMILLAN Drilling Project: Job No.: Rosemerryn Farm development 14216 Site Location: Ellesmere Road, Lincoln (Rosemerryn Farm development) **Date Commenced: 22/01/2015** Grid Reference: 1560211.07mE, 5168161.33mN (NZTM) Date Completed: 22/01/2015 Rig Operator: C. Nee Consent: -Rig Model & Mounting: VTR 9700-D Truck Datum: Ground SPT N-value (Uncorrected) Drivability Recovery Installation **Graphic Log** Samples Depth Description Resources 9,89,99 25 50 75 TOPSOIL Sandy coarse GRAVEL; brown. Hard; dry 00 00 N = 60+ (C) 1.52m 26, 25 / 24, 23, 15, 7 412mm Effective 2.0 °°C 2.2m Refusal 00 3.0 0 N = 22 (C) 3.04m 3, 5 / 5, 5, 6, 6 3.5 O O 450mm . O.6 ° C 0°°° Fine to medium gravelly SAND; brown. N = 6 (C) 4.56m 1, 1 / 1, 1, 2, 2 tube 450mm Ö. 5.5 Dual 6.0 Fine to medium (rarely coarse) GRAVEL with N = 20 (C) 6.08m 2, 4 / 5, 4, 4, 7 450mm minor silt and sand; brown. -%09 0 00 .0ŏ N = 21 (C) 7.60m 4, 7 / 7, 5, 5, 4 ° 450mm 40% 8.5 0 ,0ō ° C N = 39 (C) 9.12m 5, 8 / 8, 7, 12, 12 `°°° 450mm 35% 10.0 0 0 N = 19 (C) 10.64m 3, 3 / 6, 5, 4, 4 450mm EOH: 10.64m

Remarks

Generated by GEROC Core-GS

Geotechnical Investigation Borehole BH102 with SPT Testing

No Static Water Levels recorded

200 Liters Water Added

afety Auto Trip Hammer #398 used (energy ratio 79%)

Drivability

1 Easy Push - No Hammer \ Fast Penetration 2 Relatively Easy Push - Light Hammer\ Relatively Fast
3 Medium Push - Consistent Hammer\ Medium
4 Hard Push - Full Hammer\ Somewhat Slow
5 Very Hard Push - Full Hammer\ Very Slow

Additional Resources:

Plastic Liner Flush Mounted Toby Box - Standard

m ea

6

- Environmental **Above Ground Protective Surround**

ea ea m

ea

Hand Clear Location Decontaminate Equipment

Geotextile Sock

Hole Depth: 10.64m Page 1 of 1

Bore Log Client: Bore No.: Aurecon NZ Ltd **BH103** McMILLAN Drilling Project: Job No.: Rosemerryn Farm development 14216 Site Location: Ellesmere Road, Lincoln (Rosemerryn Farm development) **Date Commenced: 28/01/2015** Grid Reference: 1560056.48mE, 5167721.87mN (NZTM) Date Completed: 28/01/2015 Rig Operator: C. Nee Consent: -Rig Model & Mounting: VTR 9700-D Truck Datum: Ground SPT N-value (Uncorrected) Drivability Recovery Installation **Graphic Log** Samples Depth Description Resources 25 50 75 28838 Silty fine SAND; grey mottled orange. 0.5 1.0 1.52 - 1.93m, 1, SPTLS - 1.93m) 1, 1.5 N = 7 (S) 1.52mFine to medium SAND with trace of wood: bluish 1, 1 / 2, 2, 1, 2 450mm 2.0 3.0 Fine to medium SAND, yellowish brown. 3.1m N = 26 (S) 3.04m 4, 8 / 7, 7, 6, 6 3.04 - 3.45m, 2, SPTLS Sandy GRAVEL with some silt. 3.5 Peat and wood. $\circ \circ$ 450mm 80% 4.0 ,0.6 ° C N = 40 (C) 4.56m 4, 7 / 12, 11, 9, 8 0.6 ° (450mm %:06 5.5 Presence of reddish sand. 6.0 °° (N = 28 (C) 6.08m 8, 13 / 10, 7, 6, 5 .%09 .0.ŏ 7.0 N = 51 (C) 7.60m 8, 12 / 13, 12, 12, 14 450mm .0.6 20% 8.5 0.6 9.0 N = 48 (C) 9.12m 3, 11 / 13, 13, 12, 10 450mm .%09 10.0 0 10.5 N = 40 (C) 10.64m 9, 12 / 13, 11, 10, 6 450mm EOH: 10.64m Remarks **Additional Resources:** Seotechnical Investigation Borehole BH103 with SPT Testing **Plastic Liner** 7 m Static Water Levels: -2.03m @ Casing depth of 7.5m; 28/1/2015, 11:00 am Flush Mounted Toby Box - Standard ea 300 Liters Water Added Safety Auto Trip Hamme - Environmental ea Drivability Safety Auto Trip Hammer #398 used (energy ratio 79%) **Above Ground Protective Surround** ea 1 Easy Push - No Hammer \ Fast Penetration Generated by GEROC 2 Relatively Easy Push - Light Hammer\ Relatively Fast
3 Medium Push - Consistent Hammer\ Medium
4 Hard Push - Full Hammer\ Somewhat Slow
5 Very Hard Push - Full Hammer\ Very Slow Geotextile Sock m **Hand Clear Location** ea

120 High Street, Southbridge 7602, Canterbury, New Zealand ph: (03) 324 2571 fax: (03) 324 2431

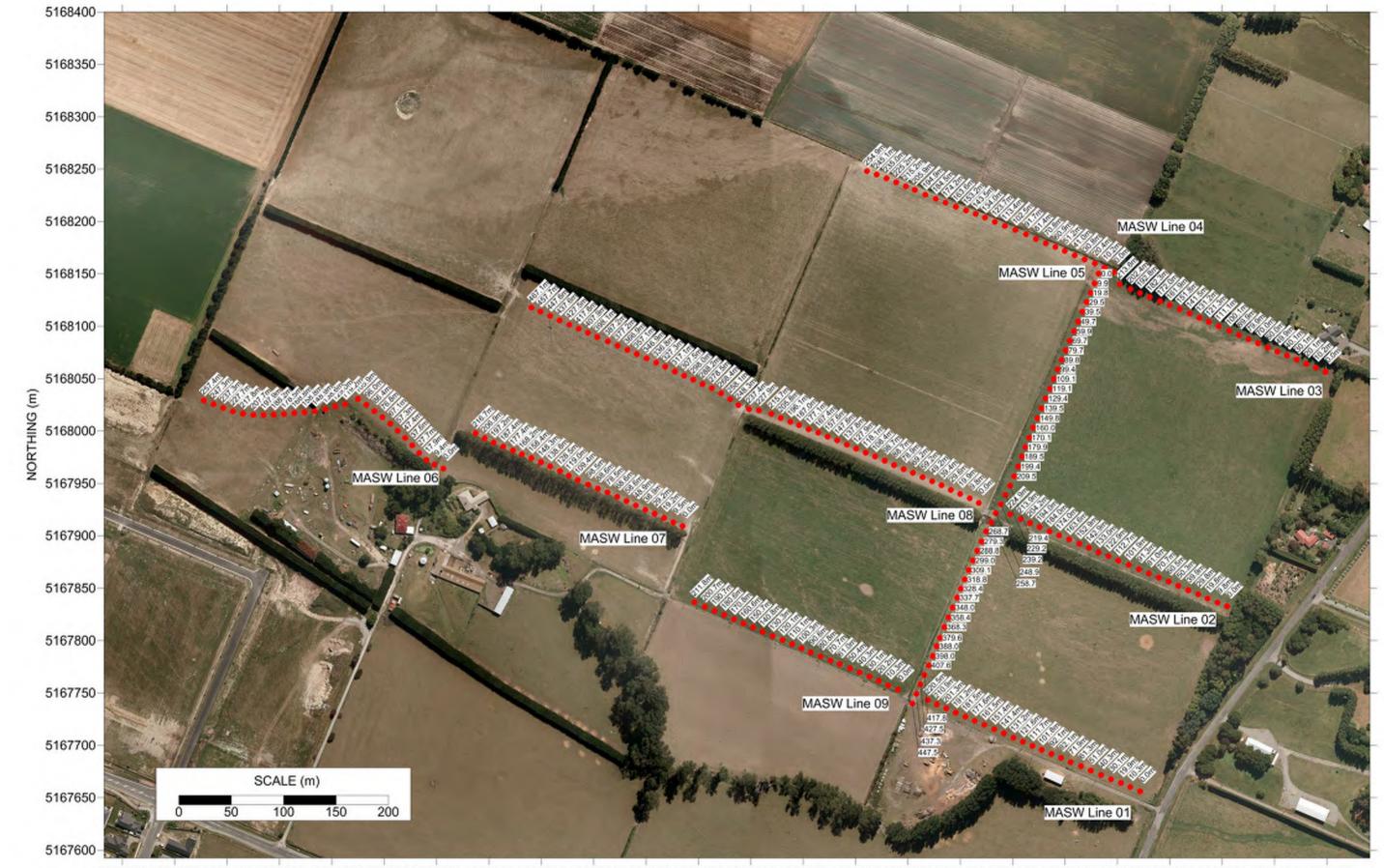
Hole Depth: 10.64m

Page 1 of 1

Decontaminate Equipment

web: www.drilling.co.nz

Appendix H MASW Soundings



1559300 1559350 1559400 1559500 1559500 1559500 1559600 1559650 1559700 1559750 1559800 1559850 1559900 1559950 1560000 1560050 1560100 1560150 1560200 1560250 1560300 1560350 1560400 1560450 EASTING (m)

TITLE- Figure 1: MASW Location Plan

Rosemerryn Farm, Lincoln

NOTES-

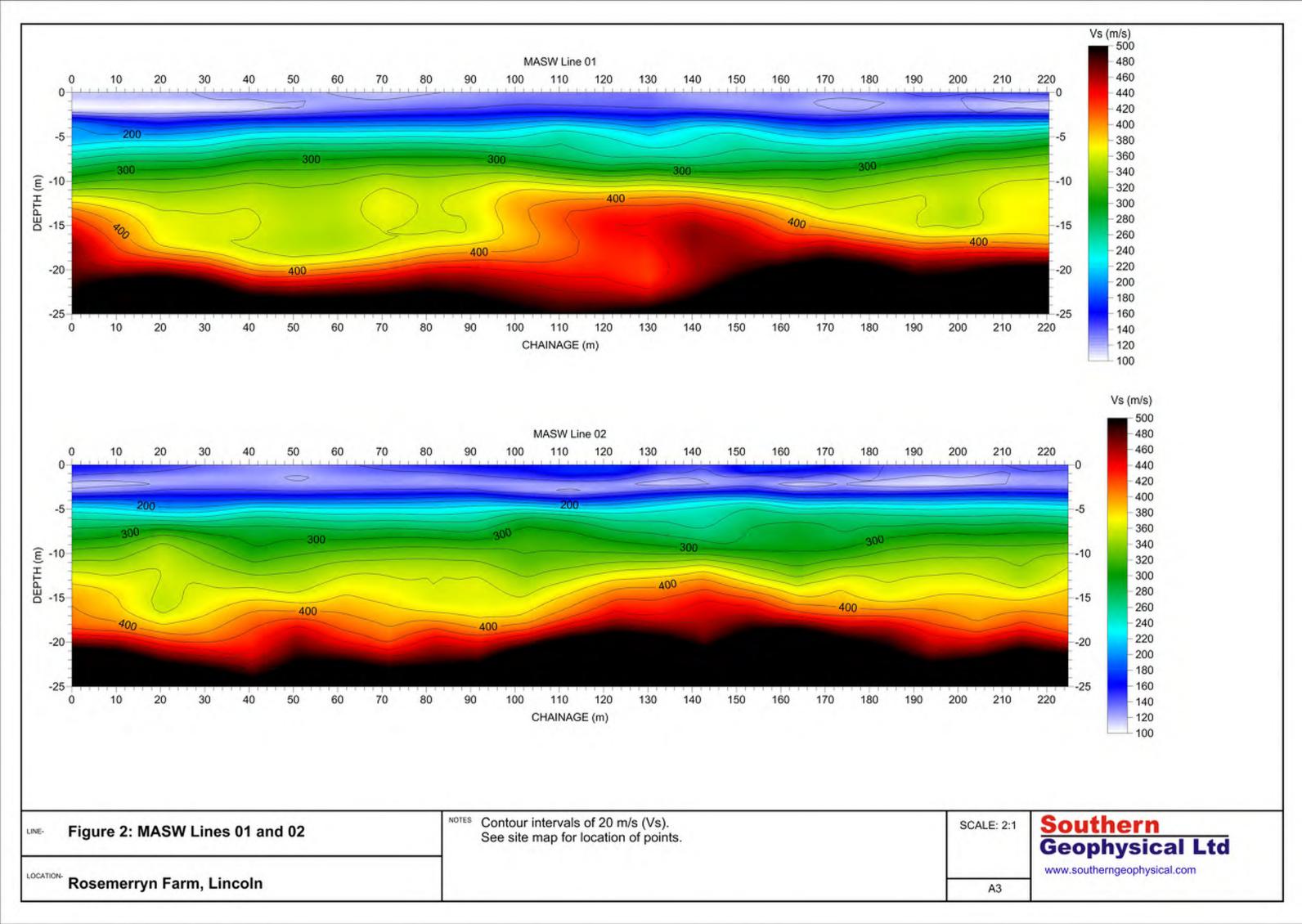
Coordinates NZ2000 TM Grid. Aerial photograph post February 2011, sourced from LINZ. MASW

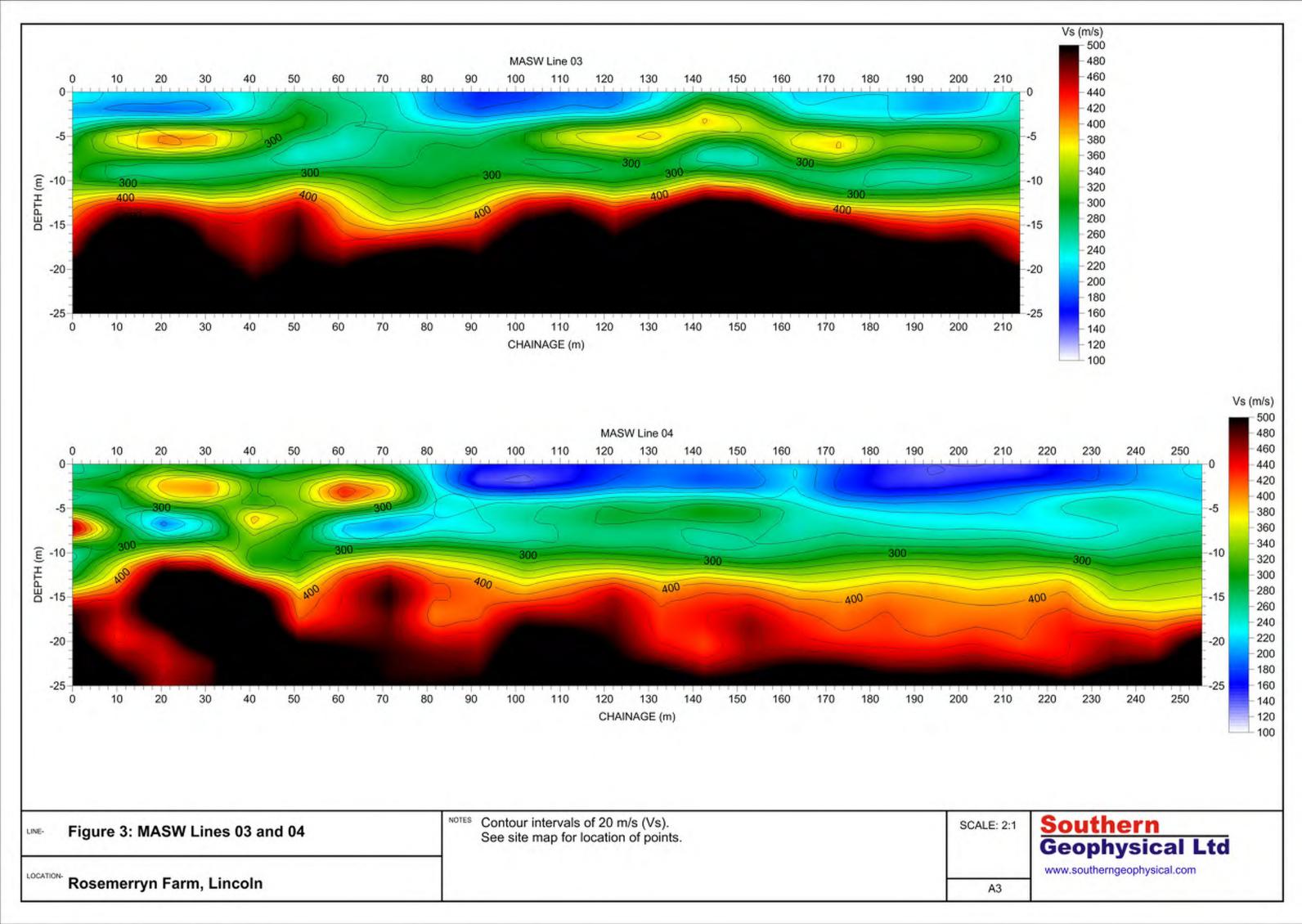
Line labels show the chainage along the line. Points are the midpoint of a 23 m 24 channel MASW array with 1 m receiver spacing and 10 m shot offset.

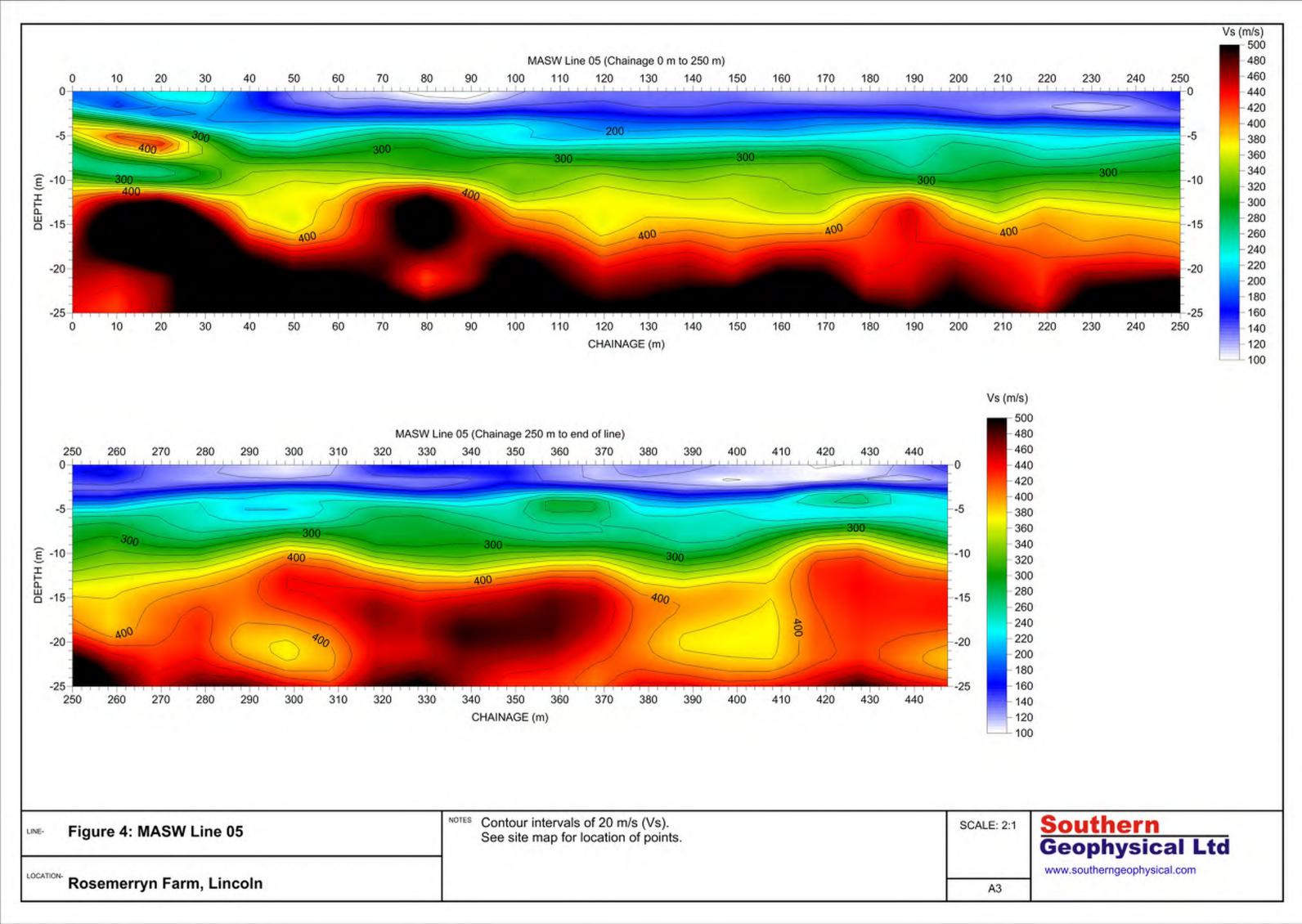


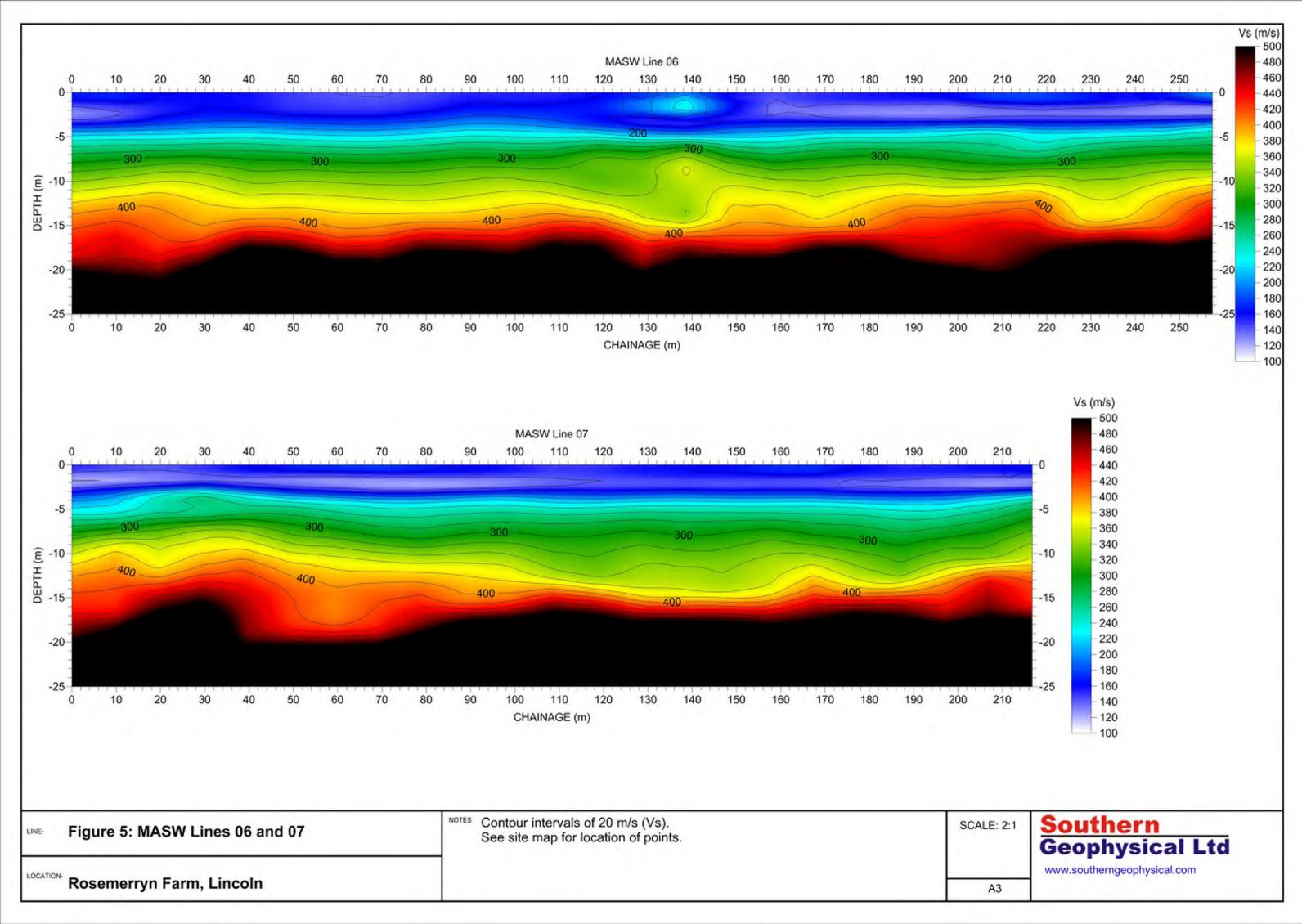


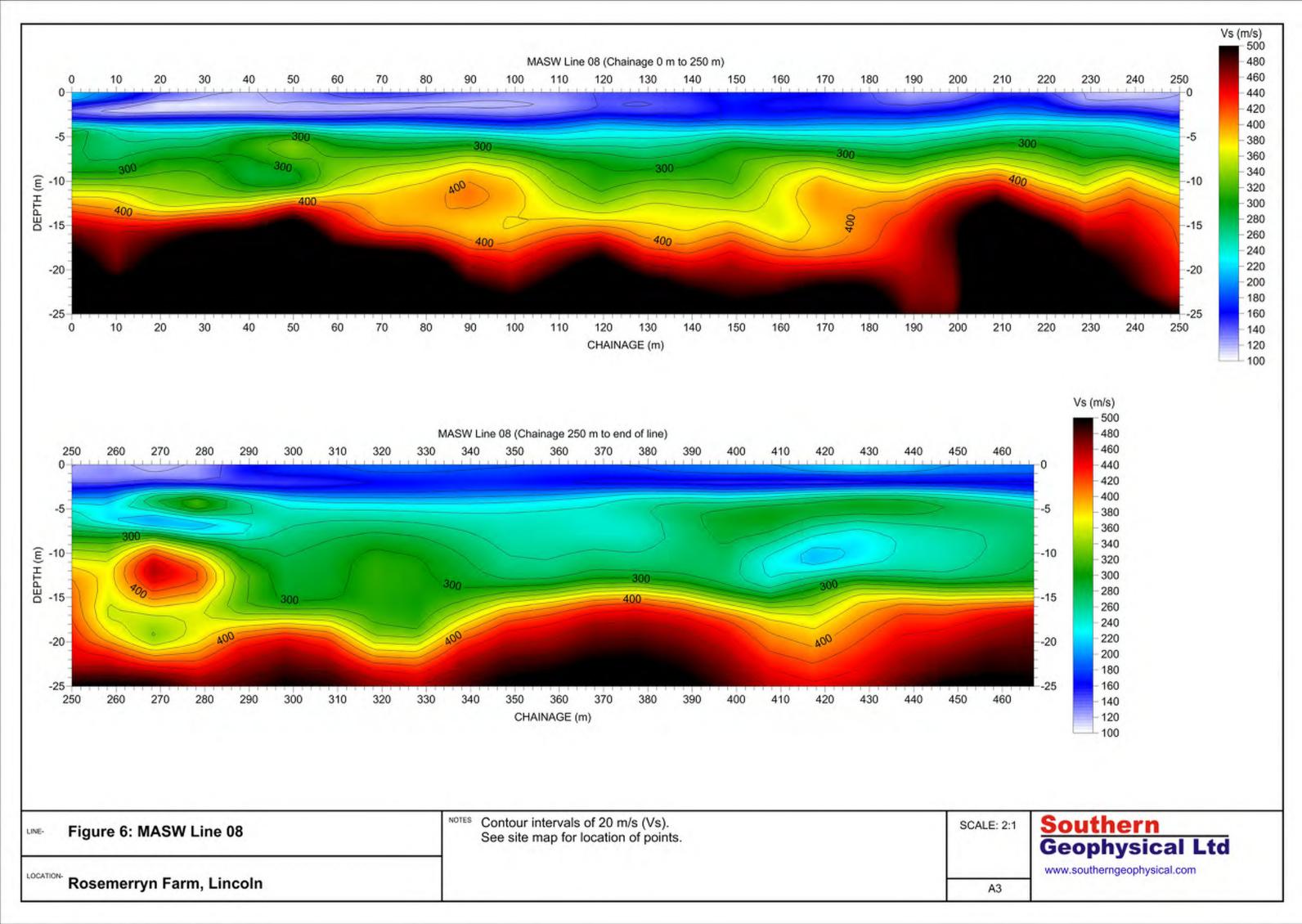
www.southerngeophy

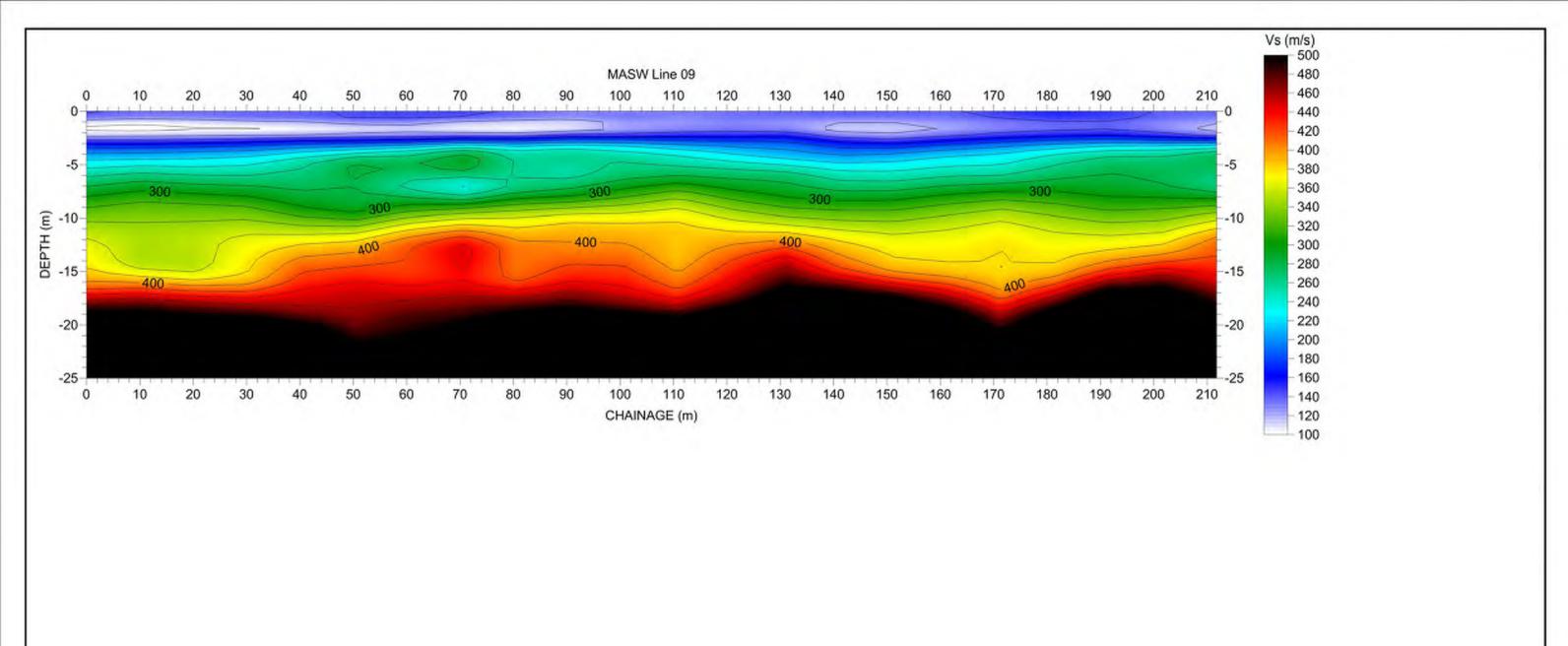


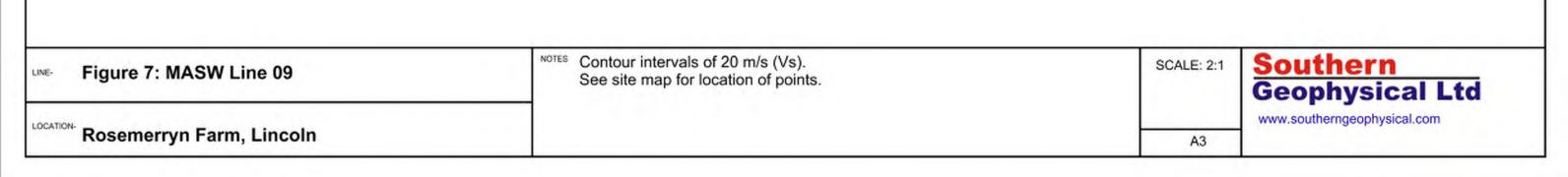














PROJECT- MASW Investigation

LOCATION- Rosemerryn Farm Subdivision
Lincoln, Canterbury

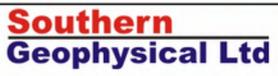
NOTES-

Coordinates NZ2000 TM Grid.

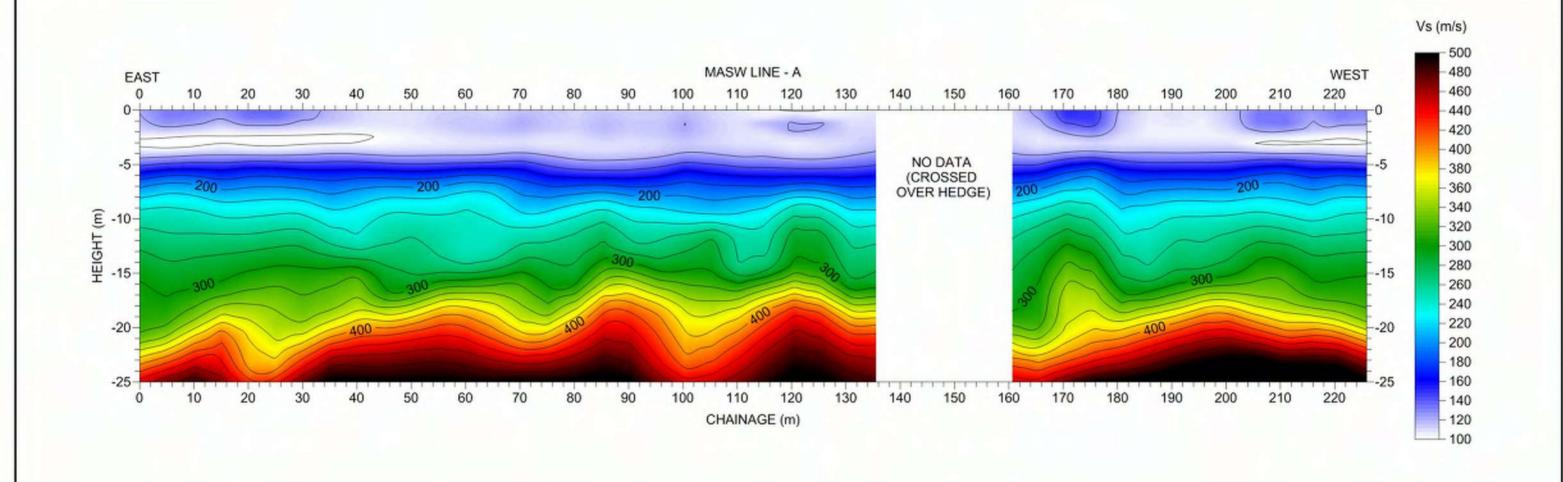
Aerial photograph post February 2011.

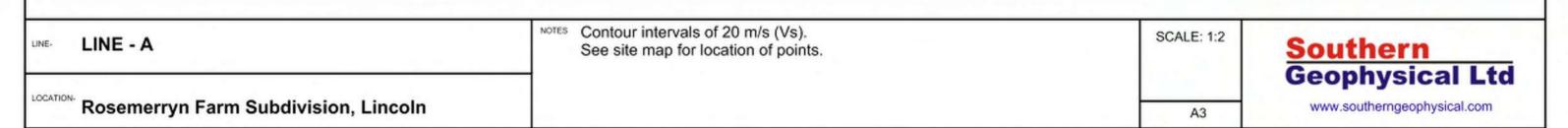
Markers are the midpoint of the 24 channel MASW array at each chainage point. Survey conducted with 1 m receiver spacing and 10 m shot offset, optimized for maximum depth penetration.

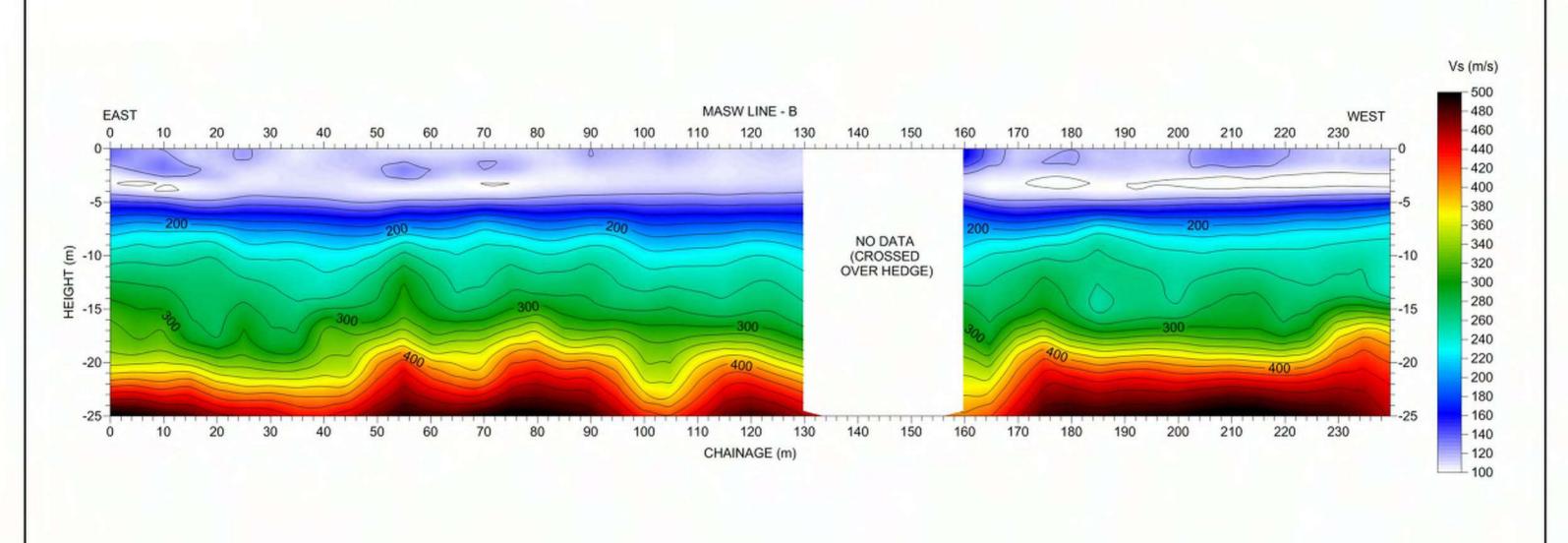


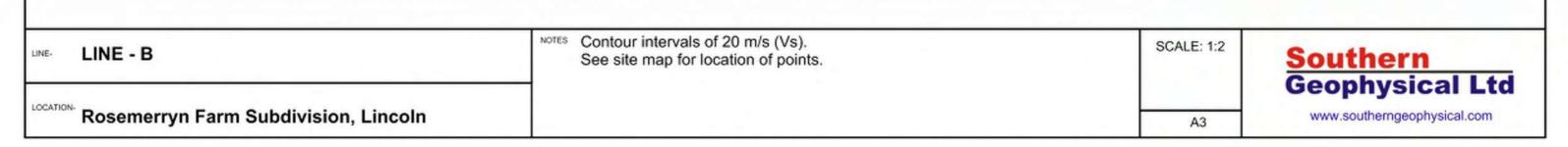


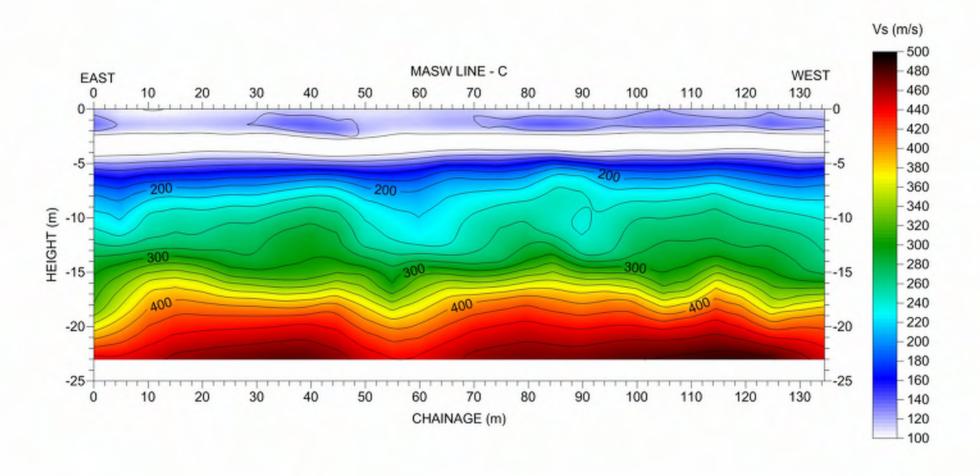
www.southerngeophysical.com

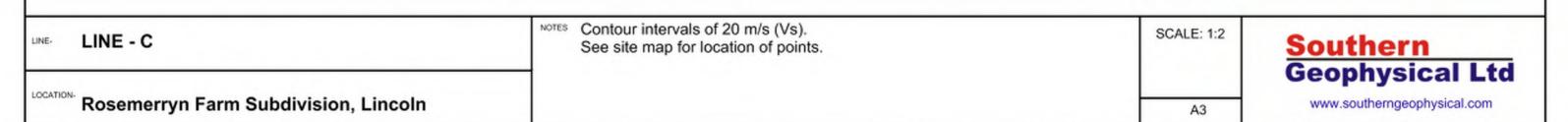












Appendix I Summary of Liquefaction Results

Client: Fulton Hogan Land Development Project: Rosemerryn Subdivsion Subject: Boulanger and Idriss (2014) assessment Date: Feb 2014 Job Number: 224464 By: T. Plunket

Southern Section

Year CPT Depth (m) GWL SLS-a (0.13g, Mw7.5) SLS-b (0.19g, Mw6.0) ULS (0.35g, Mw7.5) Sept 2010 (0.34g, Mw7.1) Sept 2010 (0.20g, Mw7.1)																																	
Year	CPT	Depth (m)	GWL			SLS-a (0.1	3g, Mw7.5)	1				SLS-b (0.19	g, Mw6.0)				•	ULS (0.35g, Mw7.5)						pt 2010 (0.3	4g, Mw7.1)					ot 2010 (0.2	20g, Mw7.1)		
			(m bgl)	Total Settlement	Index Settlement					Total Settlement	Index Settlement					Total Settlement	Index Settlement					Total Settlement	Index Settlement					otal lement	Index Settlement				
				(mm)	(mm)	LSN	Liquefi	able Layers	Ishihara	(mm)	(mm)	LSN	Liquefia	ble Layers	Ishihara	(mm)	(mm)	LSN	Liquefiab	le Layers	Ishihara	(mm)	(mm)	LSN	Liquefiable La	ayers Ishi		mm)	(mm)	LSN	Liquefiable	e Layers	Ishihara
2011	14	6.6	1	105	N/A	41	1.9	6.5	Yes	125	N/A	40	1.6	6.5	Yes	145	N/A	56	1	6.5	Yes	145	N/A	56		6.5 Y		130	N/A	50	1.1	6.5	Yes
2011	18	6.2	1	40	N/A	15	2.1 3.5	2.3 5.4	No	65	N/A	13	1.9 3.5	2.8 5.4	Yes	85	N/A	35	3.5	2.8 5.4	Yes	85	N/A	34		2.8 Y 5.4	es	70	N/A	25	1.9 3.5	2.8 5.4	Yes
2011	29	6.5	1	30	N/A	10	4.3	4.6	No	40	N/A	9	1.9	2.4	No	60	N/A	26	1	2.4	Yes	60	N/A	25			es	50	N/A	16	1.4	2.4	No
							5.3	6.4					4.3 5.3	4.6 6.4					4.3 5.3	4.6 6.4						4.6 6.4					4.3 5.3	4.6 6.4	ł
2012	1	5.9	1	20	N/A	11	3.1	3.6	No	35	N/A	11	3.1	3.6	No	45	N/A	22	1	1.4	No	45	N/A	22	1		0	40	N/A	16	3.1	3.6	No
							4.4 5	4.7					4.4 5	4.7					1.8	2						2					4.4	4.7	ł
							5	5.2					5	5.2					3.1 4.4	3.6 4.7						3.6 4.7					5	5.2	ł
0010		7.5		45	A1/A	00	0.0			0.5	N1/A	0.7	4.0			105	N1/A	10	5	5.2		405	A1/A	40	-	5.2		0.5	N1/A		1.0		
2012	2	7.5	1	45	N/A	29	2.8 5.9	5.5 6.4	No	85	N/A	27	1.6 5.9	5.5 6.4	Yes	105	N/A	43	1	6.5	Yes	105	N/A	43	1	6.5 Y	es	95	N/A	36	1.6 5.9	5.5 6.4	Yes
2012	3	8.4	1	55	N/A	22	3.2	3.9		85	N/A	20	1.5	5	Yes	105	N/A	37	1.2	6.5	Yes	105	N/A	36			es	95	N/A	33	1.5	5	Yes
							4.4 5.9	5 6.5					5.9 7.5	6.5 8					7.5	8.2					7.5	8.2					5.9 7.5	6.5 8	ł
							7.5	7.9																									
2012	5	4.9	1	15	N/A	8	3.1	3.9	No	30	N/A	7	1.6 3.1	1.9 3.9	No	45	N/A	23	1.1 3.1	1.9 3.9	Yes	45	N/A	23		1.9 Y 3.9	es	35	N/A	17	1.6 3.1	1.9 3.9	No
2012	6	10.2	1	70	70	25	3.2	3.7	No	95	95	23	1.6	2.4	Yes	135	135	43	1	2.4	Yes	130	130	42			es '	115	115	35	1.3	2.4	No
							4.2 6.1	5.4 7.8					3.2 4.2	3.7 5.4					3.2 4.2	3.7 5.4						3.7 5.4					3.2 4.2	3.7 5.4	ł
							0.1	7.0					6.1	8.5					6.1	10						10					6	8.5	ł
2012	8	6.6	1	25	N/A	17	3.5	3.9 5	No	55	N/A	15	1.5	2.2	No	85	N/A	40	1	3.9	Yes	85	N/A	39			es	70	N/A	33	1.3	3.9	Yes
							4.4	5					2.6 4.4	3.8 5.1					4.4 5.8	5.1 6					4.4 5.8	5.1 6					4.4 5.8	5.1 6	ł
2012	9	4.2	1	10	N/A	9	L	imited	No	25	N/A	7	1.7	2.1	No	45	N/A	26	1	2.1	Yes	45	N/A	25			es	30	N/A	18	1.5	2.1	No
2012	10	4.1	1	0	N/A	2	L	imited	No	10	N/A	2	3.2 2.5	3.7 2.9	No	40	N/A	21	2.8	3.7	Yes	40	N/A	21		3.7 3 Y	es	15	N/A	8	2.8 1.7	3.7 2.9	No
																			3.7	3.9						3.9							
2012	11 27	4.1	1	10 10	N/A N/A	15 12	2.9	imited 3.1	No No	30 30	N/A N/A	14 10	1.5 1.5	3 2	No No	50 55	N/A N/A	33 35	1	3.4	Yes Yes	50 55	N/A N/A	33 35		3.4 Y 3.1 Y		40 45	N/A N/A	29 31	1.1	3.4 3.1	Yes Yes
													2.3	3.1																			
2013	1	6.5	1	45	N/A	23	2.8	5.2	No	75	N/A	22	1.5 2.8	2.1 5.2	No	85	N/A	36	2.8	2.1 5.2	Yes	85	N/A	36		2.1 Y 5.2	es	80	N/A	32	1.4 2.8	2.1 5.2	Yes
2013	2	6.9	1	45	N/A	22	3.4	4	No	70	N/A	20	1.7	2.4	No	85	N/A	35	1	2.4	Yes	85	N/A	35	1	2.4 Y	es	75	N/A	33	1.3	2.4	No
							4.4 5.8	5 6.6					3.1 4.4	4 5					3.1 5.8	5 6.6					3.1 5.8	5 6.6					3.1 5.8	5 6.6	ł
							0.0	0.0					5.8	6.6					0.0	0.0					0.0	0.0					0.0	0.0	
2013	3	6.8	1	45	N/A	21	3.4 4.4	4.1 5.2	No	75	N/A	18	1.8 3.2	2.4 5.2	No	100	N/A	40	1 5.8	5.2 6.8	Yes	100	N/A	40		5.2 Y 6.8	es	85	N/A	34	1.2 3.2	2.4 5.2	Yes
							5.8	6.8					5.8	6.8					5.6	0.0					5.0	0.0					5.8	6.8	ı
2013	4	6.6	1	35	N/A	20	3.4 5.6	4 6.2	No	60	N/A	19	1.6 3.4	2.7 4	No	80	N/A	38	1 3.4	2.7	Yes	80	N/A	38		2.7 Y	es	70	N/A	31	1.4 3.4	2.7	No
							3.0	0.2					5.6	6.2					5.6	6.3						6.3					5.6	6.2	i
2013	5	5.8	1	20	N/A	9	4.4	4.8	No	30	N/A	8	1.9 4.4	2.4 4.8	No	55	N/A	30	1 4.4	2.4 4.8	Yes	55	N/A	29		2.4 Y 4.8	es	40	N/A	17	1.6 4.4	2.4 4.8	No
2013	6	6.3	1	25	N/A	16	L	imited	No	40	N/A	15	1.6	2.5	No	55	N/A	29	1	2.5	Yes	55	N/A	29			es	45	N/A	23	1.3	2.5	No
2013	7	7.6	1	15	N/A	8	5.3	5.8	No	25	N/A	7	5.3	5.9	No	45	N/A	23	5.5	6.1 2.4	Voc	45	N/A	22		6.1 2.4 Y	20	35	N/A	16	5.5 1.7	6 2.4	No
2013	,	7.0	'	15	IN/A	0	5.5	5.6	140	25	IN/A	,	5.5	5.9	140	45	IN/A	23	5.3	6	Yes	45	IN/A	22	5.3	2.4 Y	35	33	IN/A	10	5.3	5.9	140
2013	8	6.3	1	10	N/A	10	L	imited	No	20	N/A	9	1.6	2.4	No	35	N/A	21	1.1 5.4	2.4 6.1	Yes	35	N/A	21		2.4 Y 6.1	es	25	N/A	18	1.1	2.4	Yes
2013	9	7.4	1	25	N/A	10	6.5	6.9	No	35	N/A	9	1.8	2.2	No	55	N/A	24	1	2.2	Yes	55	N/A	23			es	45	N/A	18	1.6	2.2	No
													6.4	6.9					4.9 6.3	5.7 7.3						5.7 7.3					6.4	7.2	ł
2013	10	7.5	1	75	N/A	29	3.4	4	No	90	N/A	27	1.7	2.6	No	110	N/A	43	1	2.9	Yes	110	N/A	43			es '	100	N/A	37	1.7	2.6	No
							4.4	5.3 7					3.4 4.4	4					3.4 4.4	4 5.3					3.4	4					3.4	4	ł
							5.8	1					5.8	5.3 7					5.8	7.3						5.3 7.3					5.8	5.3 7.1	ł
2013	11	6.1	1	45	N/A	23	3.4	4	No	65	N/A	22	1.7	2.3	No	80	N/A	33	1	2.3	Yes	80	N/A	33			es	70	N/A	29	1.5	2.3	Yes
							4.3 5.6	5.2 5.9					3.1 5.6	5.2 5.9					3.1 5.6	5.2 6					3.1 5.6	5.2 6					3.1 5.6	5.2 6	ł
2013	12	7.3	1	65	N/A	27	2.9	7.2	No	95	N/A	26	1.6 2.9	2.2 7.2	No	105	N/A	37	1.2	2.2	Yes	105	N/A	37			es '	100	N/A	35	1.6 2.9	2.2	Yes
2013	13	6.8	1	40	N/A	18	3.1	4	No	65	N/A	17	1.8	2.4	No	90	N/A	35	2.9	7.2 2.4	Yes	90	N/A	35		7.2 2.4 Y	es	80	N/A	29	1.4	7.2 2.4	No
							4.4	5.6					3.3	4 6.2					3.1	6.2					3.1	6.2					3.1	6.2	1
2013	14	6.5	1	50	N/A	27	3.2	4.1	No	75	N/A	26	4.4 1.8	2.9	No	90	N/A	37	1	6.3	Yes	90	N/A	37	1	6.3 Y	es	80	N/A	33	1.7	6.1	Yes
							4.2						4.2	4.1																		ļ	ł
							5.6	6.2					4.4 5.6	5.2 6.2																		ļ	1
2013	15	7.7	1	50	N/A	21	3.5		No	65	N/A	19	1.7	2.7	No	85	N/A	36	1	2.7	Yes	85	N/A	36			es	75	N/A	31	1.7	2.7	No
							4.2 6.3						3.5 4.2	3.9 4.9					3.5 4.2	3.9 4.9						3.9 4.9					3.5 4.2	3.9 4.9	1
									ļ.,.				6.3	7.4					6	7.5	ļ.,.				6	7.5					6.3	7.4	
2013	16	6	1	20	N/A	11	5.2	5.6	No	30	N/A	10	1.8 5.2	2.2 5.7	No	50	N/A	28	1.8 4.9	2.3 5.8	No	50	N/A	28		2.3 N 5.8	0	40	N/A	22	1.3 4.9	2.2 5.7	No
2013	17	7.1	1	55	N/A	17	5.1	6.8	No	65	N/A	17	1.8	2.3	No	80	N/A	28	1	2.3	Yes	80	N/A	28	1		es	70	N/A	23	1.5	2.3	No
2013	18	7.6	1	30	N/A	16	6.4	6.8	No	45	N/A	15	5.1	6.9 2.8	No	65	N/A	32	5.1	6.9 2.8	Yes	65	N/A	32		6.9 2.8 Y	es	55	N/A	28	5.1 1.2	6.9 2.8	Yes
													6.4	6.8					6.4	6.8					6.4	6.8					6.4	6.8	
2013	19	7.1	1	40	N/A	20	2.2 3.5	2.9 3.8	No	55	N/A	19	1.9 3.5	2.9 3.8	No	65	N/A	28	1.3 3.5	2.9 3.8	Yes	65	N/A	28		2.9 Y 3.8	es	60	N/A	25	1.4 3.5	2.9 3.8	Yes
					<u> </u>	1	6	6.5		1	1		6	6.5	<u> </u>	1	1	ļ	6	6.5					6	6.5					6	6.5	— —
2013 2013	20 21	7.3 7.5	1	60 55	N/A N/A	25 22	3.4		No No	85 85	N/A N/A	24 19	2.1	7.2 2.8	Yes No	105 115	N/A N/A	40 44	1.2	7.2 6.4	Yes Yes	105 115	N/A N/A	40 44				95 100	N/A N/A	35 34	1.2 1.9	7.2 6.4	Yes Yes
													3.2	6.4																			
2013	22	9.3	1	75	N/A	29	3.3 4.5	4 5.6	No	105	N/A	26	1.5 3	2.3 4	No	150	N/A	50	1	9.1	Yes	145	N/A	49	1	9.1 Y	es '	130	N/A	45	1 8.2	6.9 9.1	Yes
							6	6.9					4.5	5.6																	1		í
							8.3	9.1					6 8.3	6.9 9.1																			í

Client: Fulton Hogan Land Development Project: Rosemerryn Subdivsion Subject: Boulanger and Idriss (2014) assessment Date: Feb 2014 Job Number: 224464 By: T. Plunket

Northern Section

V	CPT	Donath (m)	CVA/I			010 - (0.40) - M. 7.5\				SLS-b (0.19	- M. C O				1110/005-	M. 7 5			0-	-+ 0040 (0.0	4- M74)	Sept 2010 (0.20g, Mw7.1)					
Year	CPT	Depth (m)	GWL	Total		SLS-a (0.13g, Mw7.5)			Total		I (0.19	9g, MW6.0)		Total	•	ULS (0.35g, Mw7.5)			Total	Sept 2010 (0.34g, Mw7.1)				Total			20g, MW7.1)	/
			(m bgl)	Total	Index				Total	Index				Total	Index					Index					Index			
				Settlement	Settlement	LON	Lieu-Gable Lauren	Intelligence	Settlement	Settlement	LON	Linux Calabia Laurana	Intelligence	Settlement	Settlement	LON	Limited Lance	Intelligence	Settlement	Settlement	LON	Linux Calaba Laurana	Intelleren	Settlement	Settlement	LON	1:	labiliana.
0044		0.4		(mm)	(mm)	LSN	Liquefiable Layers	Ishihara	(mm)	(mm)	LSN	Liquefiable Layers	Ishihara	(mm)	(mm)	LSN	Liquefiable Layers	Ishihara	(mm)	(mm)	LSN	Liquefiable Layers	Ishihara	(mm)	(mm)	LSN	Liquefiable Layers	Ishihara
2011	6	3.1	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	15	N/A	6	2.4 3.1	Yes	15	N/A	6	2.4 3.1	Yes	10	N/A	4	2.6 3	No
2011	7	1.4	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2011	9	3.7	2	5	N/A	5	Limited	No	15	N/A	4	2.4 2.7 2.9 3.4	No	35	N/A	16	2 3.7	Yes	35	N/A	16	2 3.7	Yes	30	N/A	13	2 3.7	No
2011	12	3.8	2	0	N/A	1	Limited	No	0	N/A	1	Limited	No	15	N/A	8	2 2.7	No	15	N/A	8	2 2.7	No	5	N/A	5	2.1 2.5	No
2011	13	0.7	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2011	15	4.2	2	5	N/A	3	Limited	No	15	N/A	3	3 3.7	No	45	N/A	16	2 4.1	Yes	40	N/A	16	2 4.1	Yes	30	N/A	14	2 3.8	No
2011	16	2.7	2	0	N/A	2	Limited	No	4	N/A	1	Limited	No	15	N/A	7	2 2.7	No	15	N/A	7	2 2.7	No	10	N/A	6	2.4 2.7	No
2011	17	3.4	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	15	N/A	8	2.1 2.7	No	15	N/A	8	2.1 2.7	No	6	N/A	5	2.1 2.5	No
2011	19	3.5	2	0	N/A	3	Limited	No	10	N/A	2	Limited	No	30	N/A	14	2 3.4	Yes	30	N/A	14	2 3.4	Yes	20	N/A	11	2 3.4	No
2011	20	4.2	2	5	N/A	5	Limited	No	15	N/A	4	3.1 3.6	No	35	N/A	15	2 3.7	Yes	35	N/A	15	2 3.7	Yes	30	N/A	14	2 3.7	No
2011	21	3.2	2	0	N/A	0	Limited	No	5	N/A	0	Limited	No	25	N/A	10	2 3	Yes	25	N/A	10	2 3	Yes	15	N/A	4	2.3 2.9	No
2011	28	2.1	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2011	29	6.5	2	15	N/A	6	4.3 4.6	No	30	N/A	5	4.3 4.6	No	40	N/A	12	2 2.4	No	40	N/A	12	2 2.4	No	35	N/A	9	4.3 4.6	No
							5.7 6.4					5.3 6.4					4.3 4.6					4.3 4.6					5.3 6.4	
																	5.3 6.4					5.3 6.4						
2011	33	2.6	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	10	N/A	4	2 2.5	No	10	N/A	4	2 2.5	No	0	N/A	2	Limited	No
2011	34	3.6	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	15	N/A	7	2.2 2.7	No	15	N/A	7	2.2 2.7	No	10	N/A	6	2.2 2.6	No
2012	12	3.3	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	20	N/A	10	2 2.9	Yes	20	N/A	9	2 2.9	Yes	5	N/A	5	Limited	No
2012	13	4	2	0	N/A	1	Limited	No	5	N/A	0	Limited	No	25	N/A	11	2 3.5	Yes	25	N/A	10	2 3.5	Yes	10	N/A	4	Limited	No
2012	14	3.9	2	0	N/A	3	Limited	No	10	N/A	3	2.9 3.2	No	25	N/A	12	2 3.3	Yes	25	N/A	12	2 3.3	Yes	20	N/A	9	2 3.2	No
2012	15	5.9	2	5	N/A	6	Limited	No	25	N/A	5	3.5 4.7	No	50	N/A	16	3 4.7	Yes	50	N/A	16	3 4.7	Yes	35	N/A	13	3 4.7	No
2012	16	3.4	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	25	N/A	10	2 3	Yes	25	N/A	10	2 3	Yes	10	N/A	5	2.3 2.9	No
2012	17	2.7	2	0	N/A	1	Limited	No	0	N/A	1	Limited	No	10	N/A	6	2 2.4	No	10	N/A	6	2 2.4	No	5	N/A	5	2 2.3	No
2012	18	3.5	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	20	N/A	10	2.1 2.9	No	20	N/A	10	2.1 2.9	No	15	N/A	7	2.1 2.9	No
2012	19	4.4	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	20	N/A	10	2 3.2	Yes	20	N/A	9	2 3.2	Yes	7	N/A	4	Limited	No
2012	20	3.7	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	5	N/A	3	2 2.3	No	5	N/A	3	2 2.3	No	1	N/A	0	Limited	No
2012	21	2.7	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	5	N/A	2	Limited	No	5	N/A	1	Limited	No	0	N/A	0	Limited	No
2012	22	4.6	2	5	N/A	3	Limited	No	15	N/A	5	2.3 3	No	35	N/A	15	2 3.2	No	35	N/A	15	2 3.2	No	25	N/A	13	2 3.1	No
2012	23	2.1	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2012	24	0.8	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2012	25	3.7	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	15	N/A	7	2 3	Yes	15	N/A	7	2 3	Yes	5	N/A	2	Limited	No
2015	101	2.1	2	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No	0	N/A	0	Limited	No
2015	102	4.4	2	0	N/A	1	Limited	No	5	N/A	1	Limited	No	25	N/A	10	2 3	Yes	25	N/A	10	2 3	Yes	10	N/A	5	2.2 2.7	No
2015	103	4	2	5	N/A	5	Limited	No	15	N/A	5	2.4 3.1	No	20	N/A	10	2 3.1	Yes	20	N/A	10	2 3.1	Yes	20	N/A	9	2.1 3.1	No
2015	104	6.3	2	0	N/A	3	Limited	No	10	N/A	2	Limited	No	35	N/A	14	2 4 4.4 4.9	Yes	35	N/A	13	2 4 4.4 4.9	Yes	15	N/A	7	2.4 3	No
2015	105	3	2	0	N/A	1	Limited	No	3	N/A	0	Limited	No	20	N/A	q	2 2.9	Yes	20	N/A	Ω	2 2.9	Yes	10	N/A	5	2 2.7	No
2010	105	3		U	IN/A	1	Littilled	INO	3	IN/A	U	Littilled	INO	20	IN/A	9	2 2.9	res	20	IN/A	0	2 2.9	162	10	IN/A	Э	2 2.1	INO



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