Appendix 2 Geotechnical Report

GEOTECHNICAL INVESTIGATION

For: Carmel Frontino

Project Address: Lot 751 Donnybrook – Boyup Brook Road, Beelerup

Project Number: D88327

Job Number: J148320

Revision Number: 0

Author: Daniel Smith

Date: 3 October 2014

STRUCterre consulting engineers

Residential Geotechnical Commercial & Infrastructure

Inspect & Investigate Energy Assessment Environmental

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1. INTRODUCTION

On behalf of Carmel Frontino (The Client), Structerre Consulting Engineers (Structerre) have conducted a Geotechnical Site Assessment at Lot 751 Donnybrook – Boyup Brook Road, Beelerup. The purpose of the investigation was to provide:

- An assessment of subsurface soil profile and groundwater conditions across the site;
- An assessment of materials for suitability for use of structural fill; and
- An estimate of available volumes for quarrying (to the extent of the field assessment).

Structerre were provided with plan prepared by MBS Environmental showing surface contours derived from the Perth Groundwater Atlas (Waters & Rivers Commission Website) and dimensions of the lot.

Terms of reference for this investigation were presented in a Structerre Consulting Engineers proposal reference Q48983Rev1 (dated 27 August 2014), which was submitted to and accepted by Carmel Frontino.

2. SITE DESCRIPTION

The site is located at Lot 751 Donnybrook – Boyup Brook Road, Beelerup, Shire of Donnybrook, Balingup. Donnybrook – Boyup Brook Road lies to the north of the site and native bushland properties to the east and south with a sand quarry to the west.

The site is generally sloping upwards from east to west. At the time of the field investigation the site was covered in light to dense vegetation.

3. FIELD INVESTIGATION – SCOPE OF WORKS

The field investigation was carried out on 17 September 2014 under the supervision of a Geotechnical Engineer and consisted of:

- 5 x Sample Retrieval Probe Boreholes to a depth of 4.5m over the site for material assessment and soil profiling;
- 1 x Hand Auger Boreholes to a depth of 1.3m over the site for material assessment and soil profiling; and
- 3 x Electric Friction Cone Penetrometer Tests (CPT) to a depth of 20.0m over the site for material assessment and soil profiling.

The Borehole, CPT locations are shown on a site plan included in Appendix A.

Structerre commissioned Thompson Survey Consultants, (Bunbury), to conduct a contour survey of the site for use in volume calculations.

4. DESK STUDY

The *Collie 1: 250,000 Environmental Geology Series Sheet* (2034 II and Part of 2034 III and 2134 III, 1986) prepared by the Geological Survey of Western Australia indicates that the following geological layer underlies the site:

- SAND; overlying laterite, yellow, white or grey.

The Perth Groundwater Atlas (Waters & Rivers Commission) indicates the ground surface level at this site was approximately between 95.0m and 115.0m Australian Height Datum (AHD).

5. RESULTS OF THE INVESTIGATION

The subsurface soil profile was determined from the ground conditions encountered within the boreholes and through the interpretation of the CPT results. Based on the site investigation findings, the subsurface soil profile is presented below:

Table 1 – Subsurface Soil Profile

Depth to Base of Strata (m)	Material Description
1.6 – 4.5 (Ave. 2.2)	NATURAL: SAND (fine to coarse grained), non-plastic, trace clay, trace organic material, very loose to loose.
Not Penetrated (>2.5m)	NATURAL: Clayey SAND (fine to medium grained, trace silt, very loose to medium dense.

The soils encountered are consistent with the expected site conditions as predicted from the Environmental Geology Map. It is important to note that there may be pockets of material on site that are deeper or shallower than that encountered by the investigation boreholes. The subsurface soil conditions encountered are presented in the bore logs, included in Appendix B.

Groundwater was encountered during or immediately after drilling at each test location, as summarised in Table 2 below;

Table 2 – Depth to Water

Test Hole	Depth (m)	Approximate AHD (m)
SRP1	Not Intersected	-
SRP2	Not Intersected	-
SRP3	2.5	103
SRP4	Not Intersected	-
SRP5	0.9	100
SRP6	1.0	99
CPT1	12.0	97
CPT2	5.0	100
CPT3	1.5	100

It should be noted that groundwater levels can vary significantly due to seasonal variation and the data from the recorded maximum levels should be used only as a guide.

Results of the laboratory tests are summarised below:

Table 3 – Laboratory Test Results

Sample	Test Hole	Depth (m)	Soil Description	Passing 2.36mm Sieve Size (%)	Passing 75 micron Sieve Size (%)
1	SRP3	0.5-1.3	SAND trace clay and gravel	98	5
2	SRP4	0.5-1.0	SAND trace clay and gravel	98	5
3	SRP4	1.2-2.0	Gravelly SAND trace clay	86	4
4	SRP4	2.5-3.0	Clayey SAND trace gravel	96	28
5	SRP5	0.5-1.0	SAND with clay trace gravel	97	6

6. POTENTIAL VOLUMES

Based on the extent of the geotechnical assessment undertaken, the estimated total volume of quarry materials are in the order of:

- 500,000 m^3 within the potential extractive area, as outlined by MBS environmental.

It should be noted that the volumes quoted are indicative only as there may be localised pockets where depth of sand vary from those encountered during the investigation.

Localised shallow water levels encountered onsite may also restrict some potential extraction areas.

7. CONCLUSION

Typical specifications for the use of sand for structural fill require the following:

- Nominal size (sieve size where 90% of material will pass) 2.36mm;
- Material finer than 0.075mm to be less than 5%; and
- Free of organic and deleterious materials.

Based on the assessment conducted by Structerre, it can be concluded that the upper profile can be selectively extracted for the use as structural fill.

It should be noted that test results do indicate the insitu sand fines content was assessed in the upper range (between 4 and 5%), which may restrict the end use of the fill material for use as free draining sand.

The investigation carried out at the site has deemed it the upper profile suitable for use as structural FILL. The potential volume of sand onsite is in the order of 500,000m^3, however the total usable volume may vary based on conditions encountered during extraction.

8. LIMITATION OF FIELD INVESTIGATIONS

This report has been prepared in accordance with generally accepted consulting practice for Carmel Frontino using information supplied at the time and for the project specific requirements as understood by Structerre. To the best of our knowledge the information contained in this report is accurate at the date of issue.

The conclusions and recommendations in this report are based on the site conditions revealed through selective point sampling, representing the conditions of the site in total, although the area investigated represents only a small portion of the site. The actual characteristics may vary significantly between successive test locations and sample intervals other than where observations, explorations and investigations have been made.

The materials and their geotechnical properties presented in this report may not represent the full range of materials and strengths that actually exist on site and the recommendations should be regarded as preliminary in nature. Allowances should be made for variability in ground conditions and any consequent impact on the development. Structerre accepts no responsibility and shall not be liable for any consequence of variations in ground conditions.

For and behalf of
STRUCTERRE CONSULTING ENGINEERS

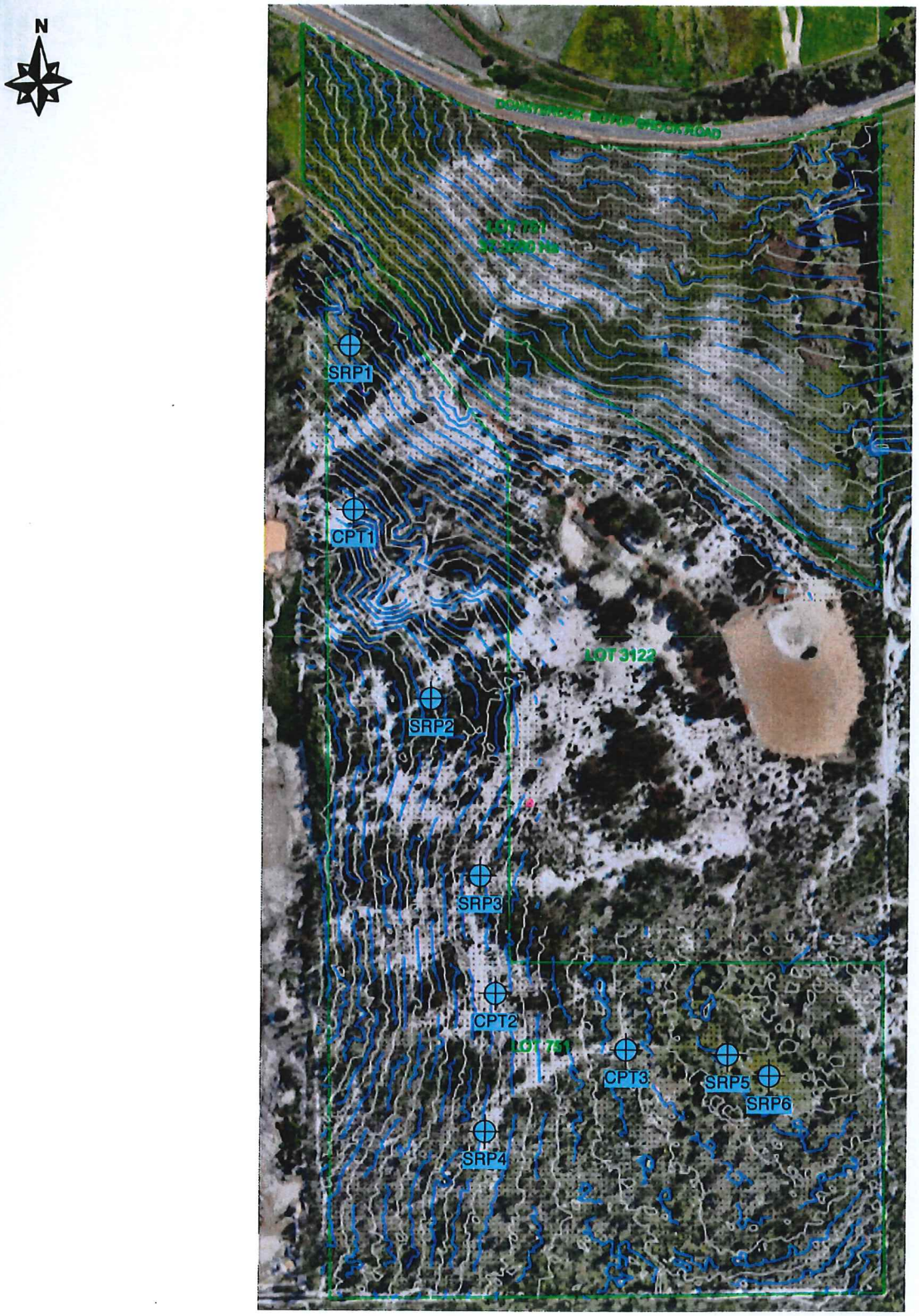
pp DANIEL SMITH
Graduate Geotechnical Engineer
BEng (Civil)

MEL CASTLE
Division Manager – Geotechnical

9. REFERENCES

- WRC (2004) Perth Ground Water Atlas Perth – Western Australia
- AS 1726-1993 Geotechnical Site Investigations
- AS 2870-2011 Residential Slabs and Footings
- AS 3798-2007 Earthworks for Residential and Commercial Developments
- AS 1170-4-2007 Earthquake Actions in Australia
- AS 1289.6.3.3-1997 Soil Strength and Consolidation Tests
- AS 4055-2012 Wind Loads for Housing
- Geological Survey of Western Australia 1:50,000 Environmental Geology Series

APPENDIX A – SITE PLAN



LEGEND

SRP: Sample Retrieval Probe
CPT: Electric Friction Cone Penetrometer Test

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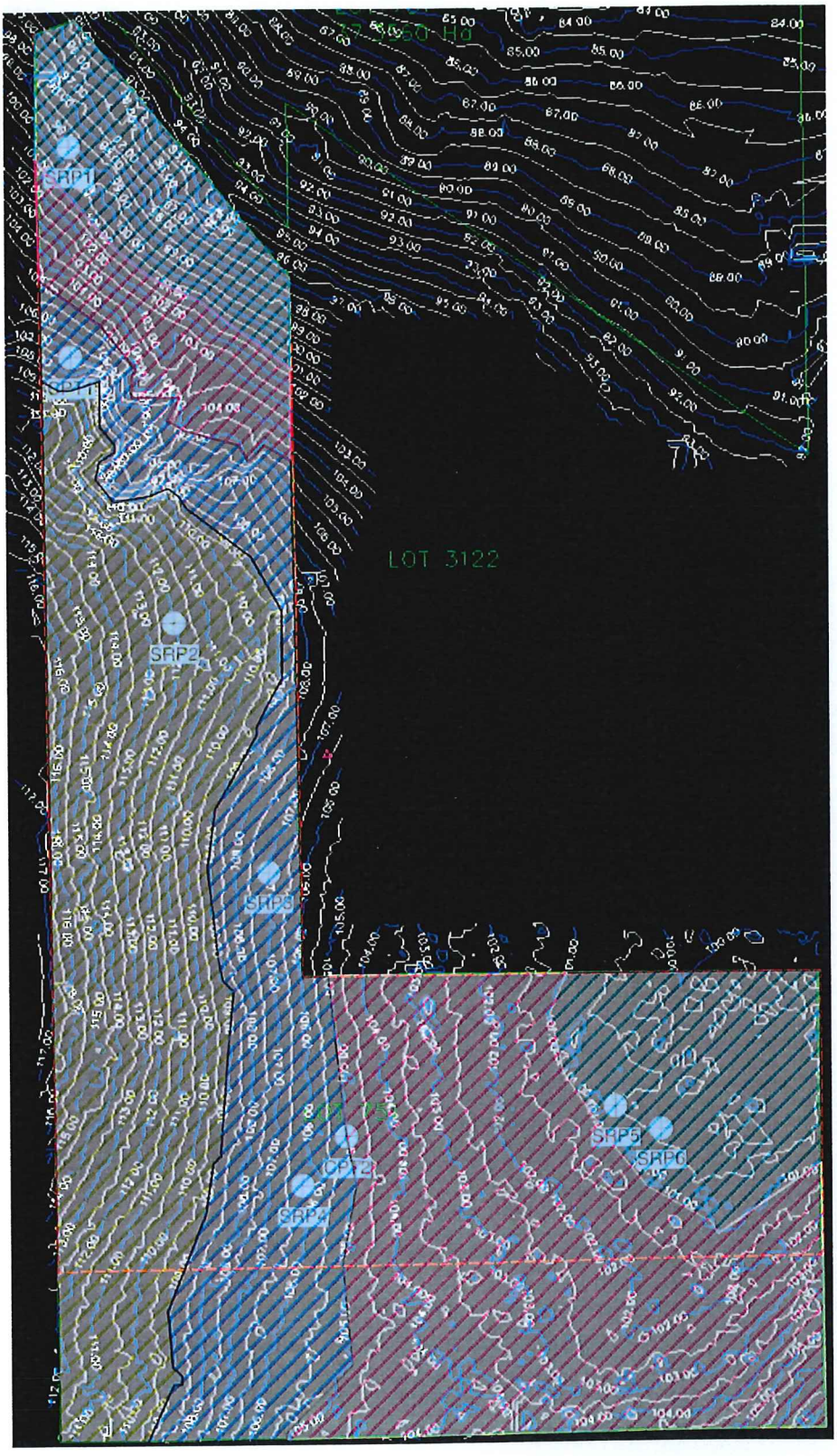
PROJECT:	Lot 751 Donnybrook - Boyup Brook Road BEELERUP
PROJECT #:	D88327
JOB #:	J148320
CLIENT:	**CARMEL FRONTINO**
SCALE:	NTS
TITLE:	Geotechnical Investigation
DATE:	30/09/14
DRAWN:	DS
APPROVED:	RG

APPENDIX B – ESTIMATED SAND DEPTHS



LEGEND

- Area of Investigation

Estimated Depth of Sands

- 0-1.0m
- 1.0-2.0m
- 2.0-3.0m
- 3.0-4.5m

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JOB #:	J148320
SCALE:	NTS
TITLE:	Estimated Sand Depths
DATE:	30/09/14
DRAWN:	DS
APPROVED:	RG

APPENDIX C – BORELOGS

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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0394621 N: 6285382	TEST HOLE No. **SRP1**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
			TOPSOIL				
		SP	SAND; (fine to medium grained), pale grey, trace silt, trace organic material (fine roots), dry		D	DRY 17/9/14	
			-dry to moist				
			-gravelly, yellow / brown		D-M		
2.0			End of Borehole @ 1.6m (Borehole Resusal on Hard Ground)				
4.0							
6.0							

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
BW	DS	RG	17 September 2014	Sample Retrieval Probe

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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0394701 N: 6285051	TEST HOLE No. **SRP2**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
			SAND; (fine to medium grained), pale grey, trace silt, trace organic material (fine roots), dry				
			-pale cream, no organic material				
2.0		SP	-(medium to coarse grained), pale grey		D	DRY 17/9/14	
4.0			-(fine to coarse grained), pale grey				
6.0			End of Borehole @ 4.5m (Borehole Resusal on Hard Ground)				

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0394763 N: 6284856	TEST HOLE No. **SRP3**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
			SAND; (fine to medium grained), pale grey, trace clay, trace organic material (fine roots), dry		D		
			-pale cream, no organic material				
2.0		SP	-(medium to coarse grained), pale grey, dry to moist		D-M	W.T @ 2.5m 17/9/14 ▽	
			Clayey SAND; (fine to medium grained), pale brown, dry to moist				
4.0			End of Borehole @ 3.0m (Borehole Resusal on Hard Ground)				
6.0							

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
BW	DS	RG	17 September 2014	Sample Retrieval Probe

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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0394775 N: 6284654	TEST HOLE No. **SRP4**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
		SP	SAND; (fine to medium grained), pale grey, trace clay and gravel, trace organic material (fine roots), dry		D	DRY 17/9/14	
			-pale brown, no organic material				
			-gravelly				
2.0			-(medium to coarse grained), dry to moist				
		SM	Clayey SAND; (fine to medium grained), pale brown, dry to moist		D-M		
4.0			End of Borehole @ 3.8m (Borehole Resusal on Hard Ground)				
6.0							

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
BW	DS	RG	17 September 2014	Sample Retrieval Probe

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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0395040 N: 6284713	TEST HOLE No. **SRP5**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
			TOPSOIL				
		SP	SAND; (fine to medium grained), brown, trace silt, trace organic material (fine roots), dry		D	W.T @ 0.9m 17/9/14 ▽	
			-trace gravel, no organic material				
			-gravelly				
2.0		SM	Clayey SAND; (fine to medium grained), pale brown, trace gravel, dry to moist		D-M		
4.0			End of Borehole @ 3.5m (Borehole Resusal on Hard Ground)				
6.0							

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
BW	DS	RG	17 September 2014	Sample Retrieval Probe

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PROJECT SITE: Lot 751 Donnybrook - Boyup Brook Road, Beelerup	Job No: **J148320** Project No: **D88327**	GPS: E: 0395049 N: 6284707	TEST HOLE No. **SRP6**

SOIL BORELOG

DEPTH (M)	GEO. INTER.	USCS	DESCRIPTION OF SOIL	GRAPHIC LOG	MOISTURE	WATER LEVEL	PERTH SAND PENETROMETER (BLOWS/300mm)
			TOPSOIL				
		SP	SAND; (fine to medium grained), grey, trace clay, trace organic material (fine roots), dry to moist		D-M	W.T @ 1.0m 17/9/14 ▽	
			-no organic material				
			-(medium to coarse grained), brown, wet		W		
			End of Borehole @ 1.3m (Borehole Resusal on Hard Ground)				
2.0							
4.0							
6.0							

Comments:

DRILLED BY:	LOGGED BY:	APPROVED BY:	DATE DRILLED:	DRILL METHOD:
BW	DS	RG	17 September 2014	Sample Retrieval Probe

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APPENDIX D – CPT TRACES

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Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	
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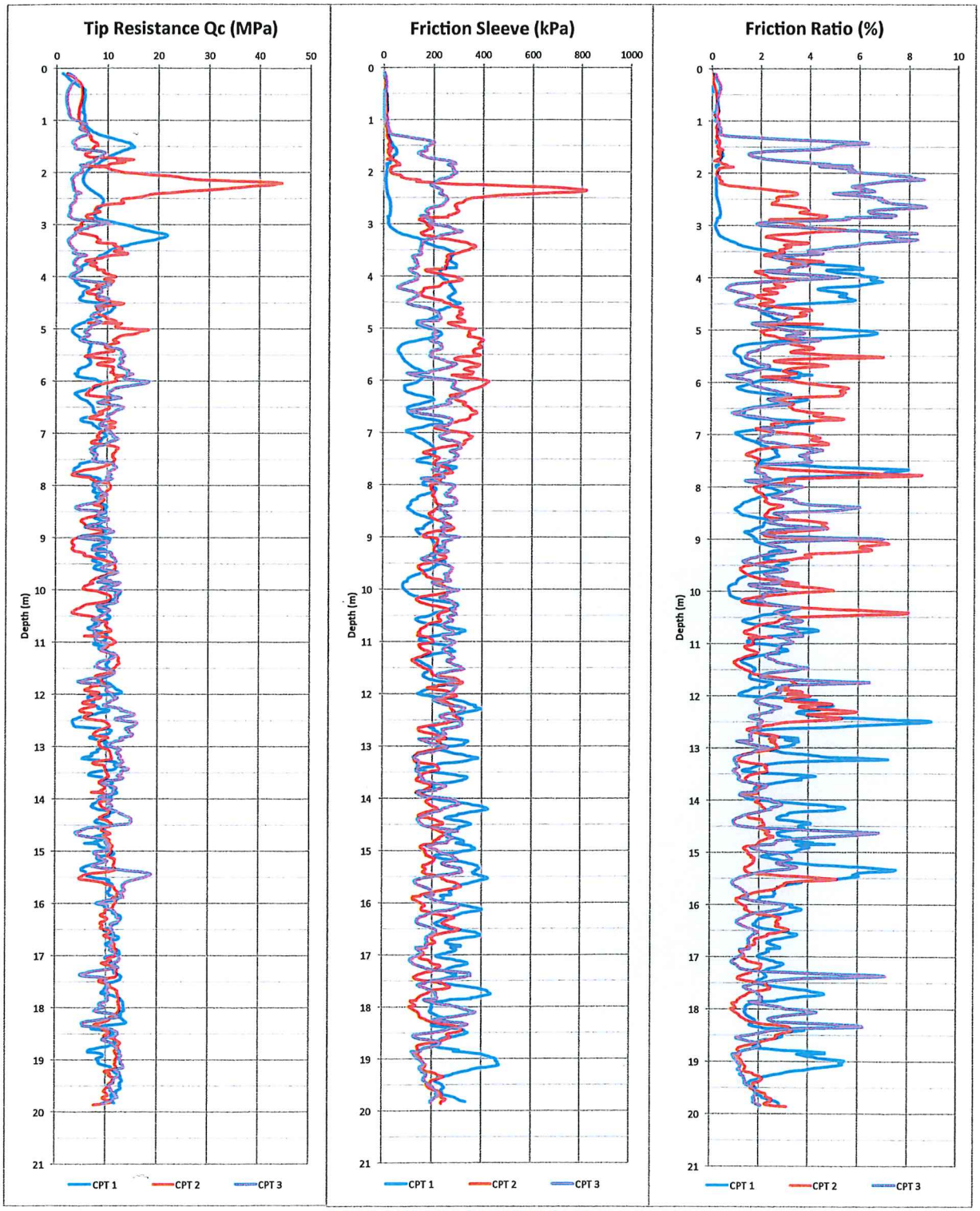

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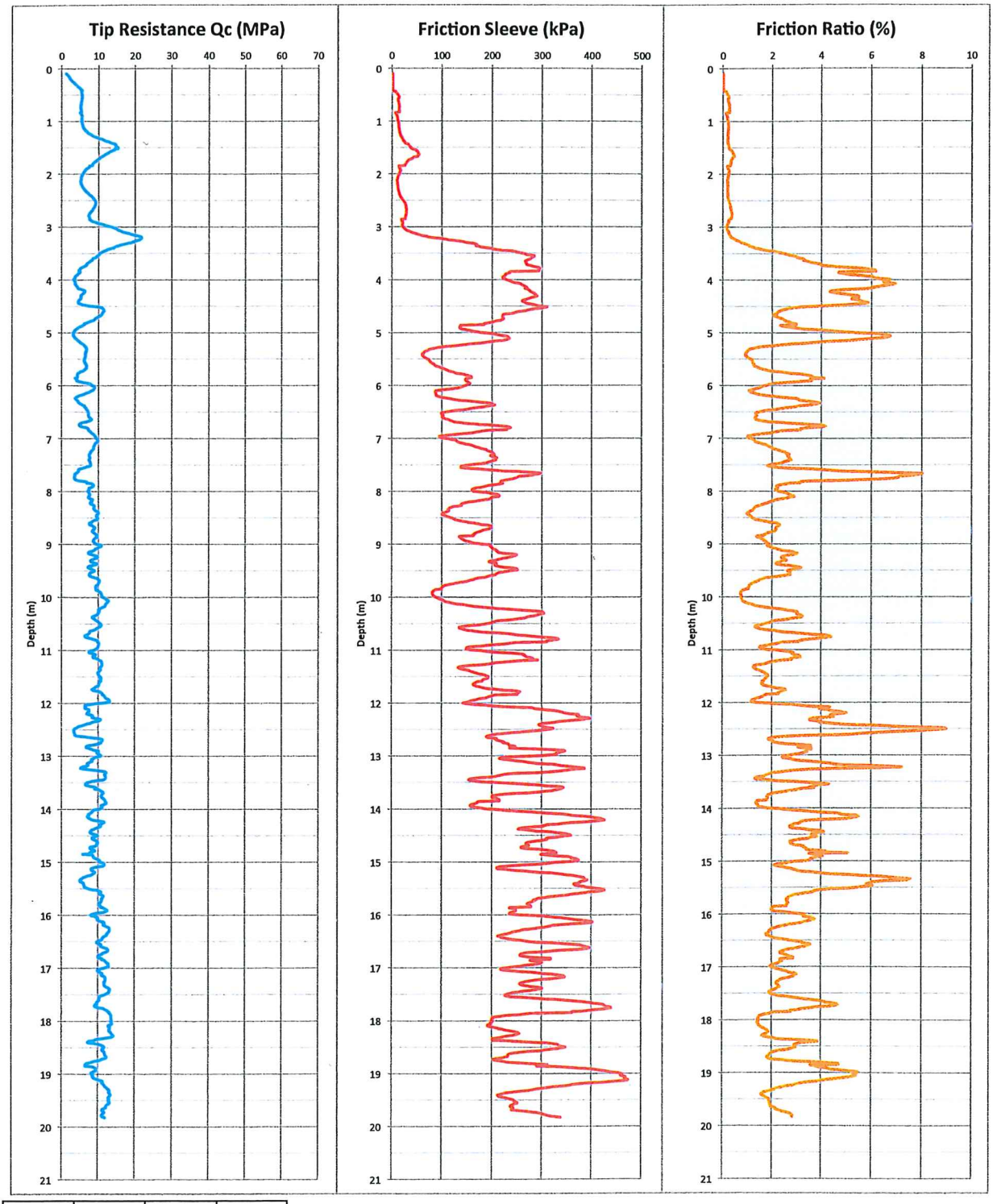
Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.0641S 11551.8853E
Probe No:	CPT1	Test Date:	17/09/14	Tested By:	D.SMITH



Water (m)		Refusal	

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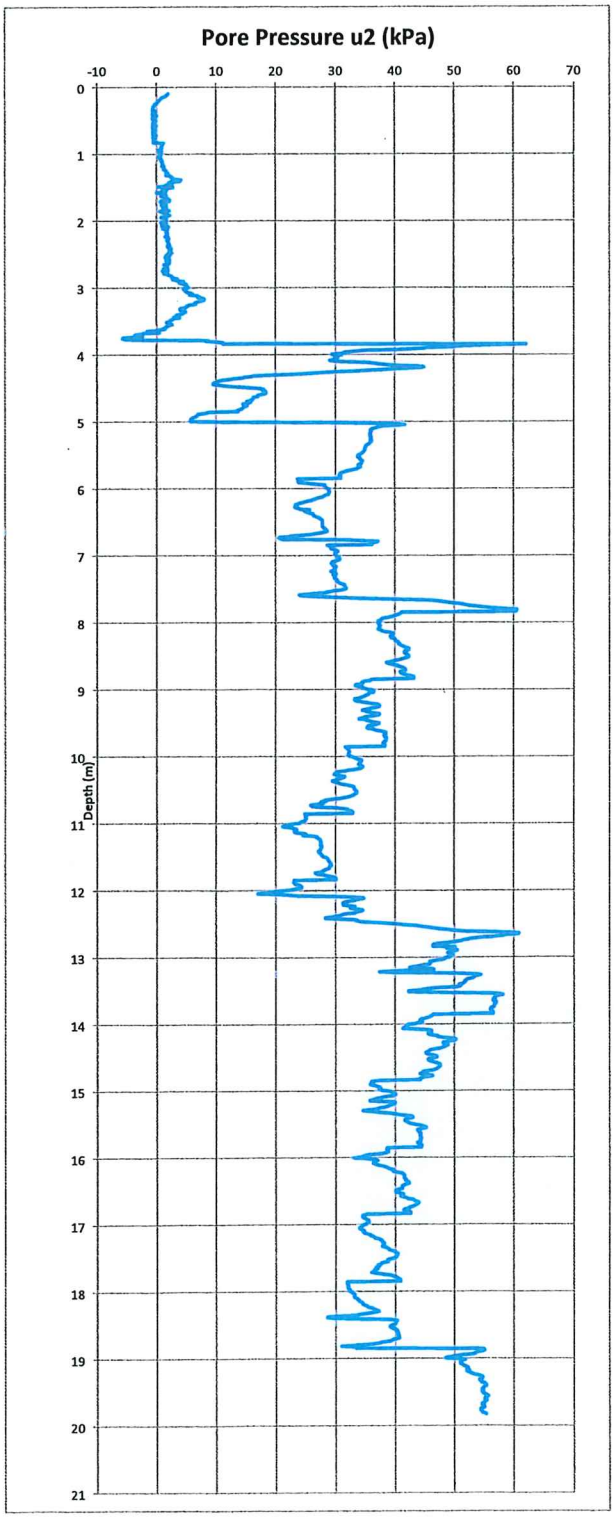
Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.0641S 11551.8853E
Probe No:	CPT1	Test Date:	17/09/14	Tested By:	D.SMITH



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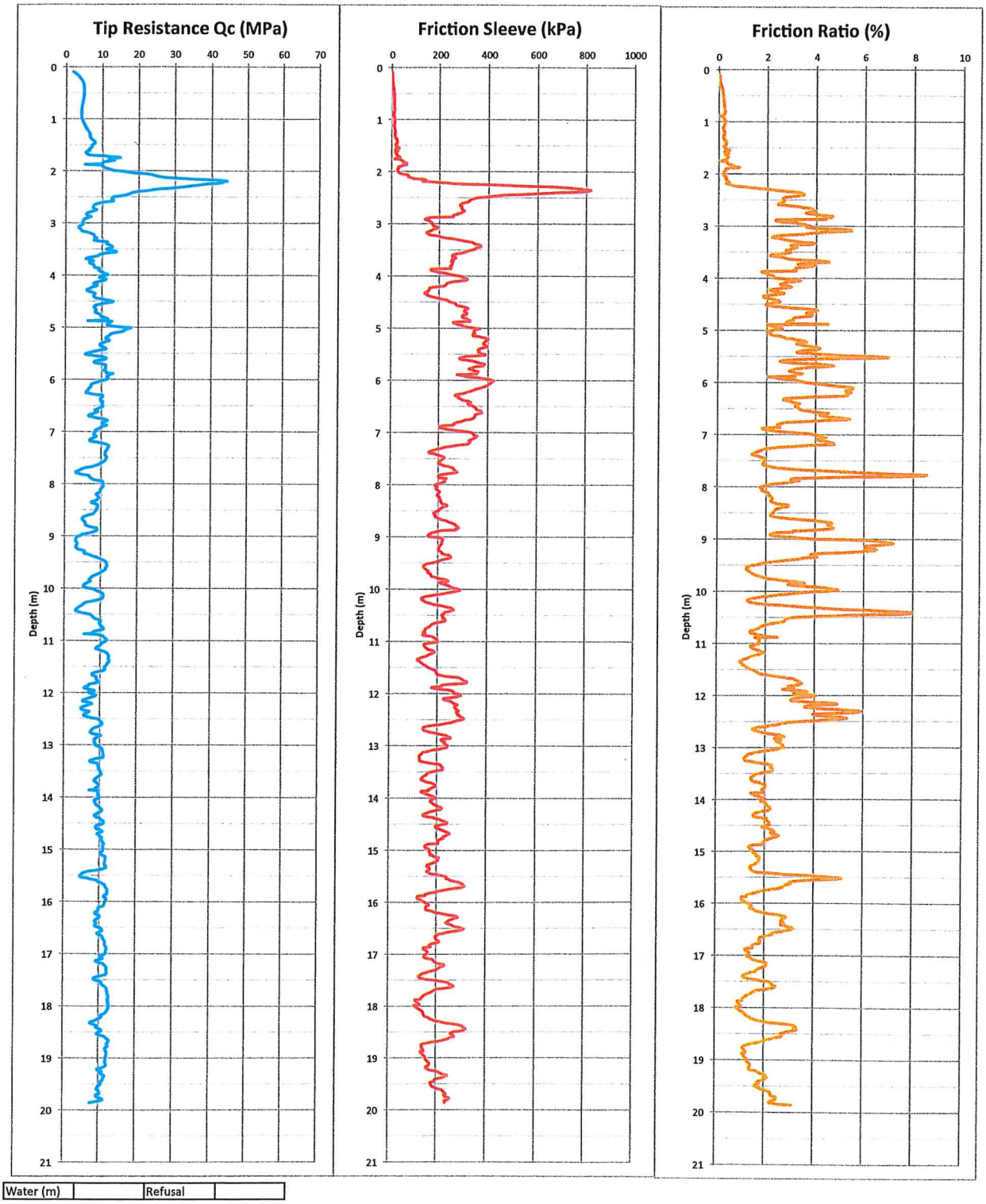
Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.3182S 11552.0012E
Probe No:	CPT2	Test Date:	17/09/14	Tested By:	D.SMITH



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Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.3182S 11552.0012E
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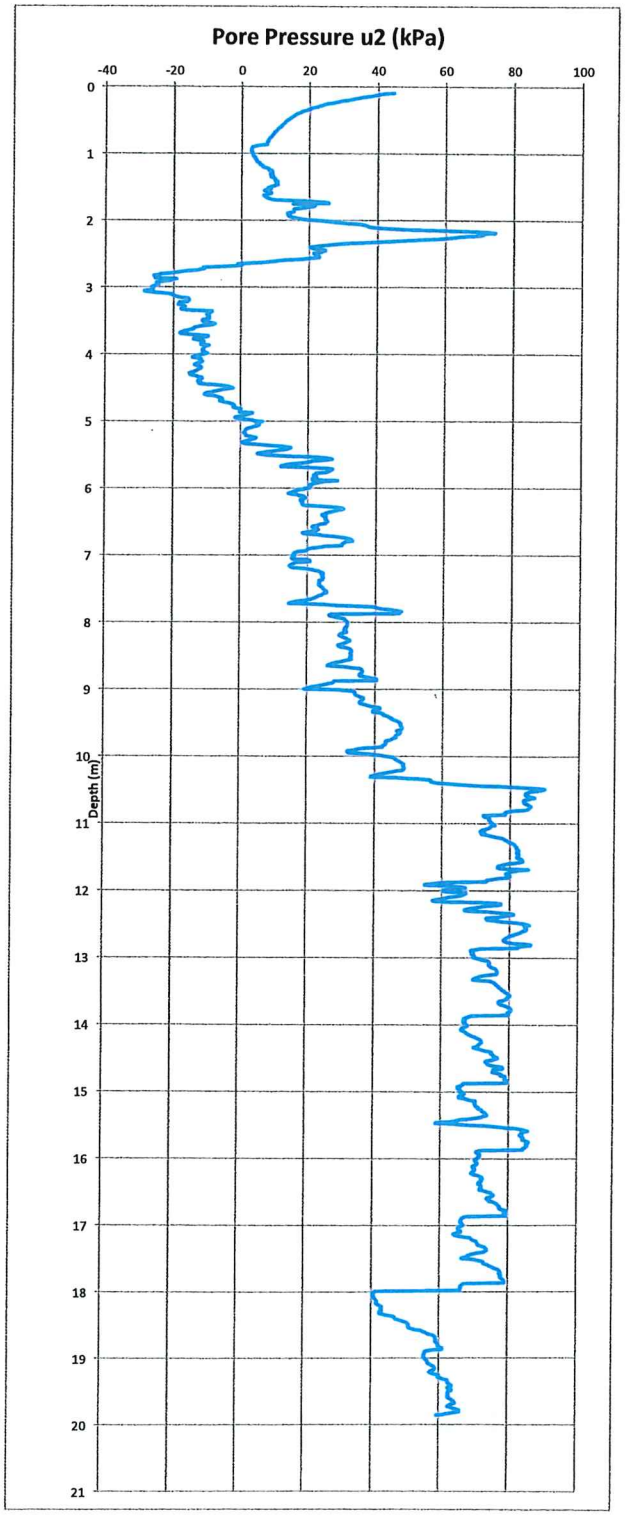

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Client:	Carmel Fontino			Project:	J148320/D88327
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.3108S 11552.1050E
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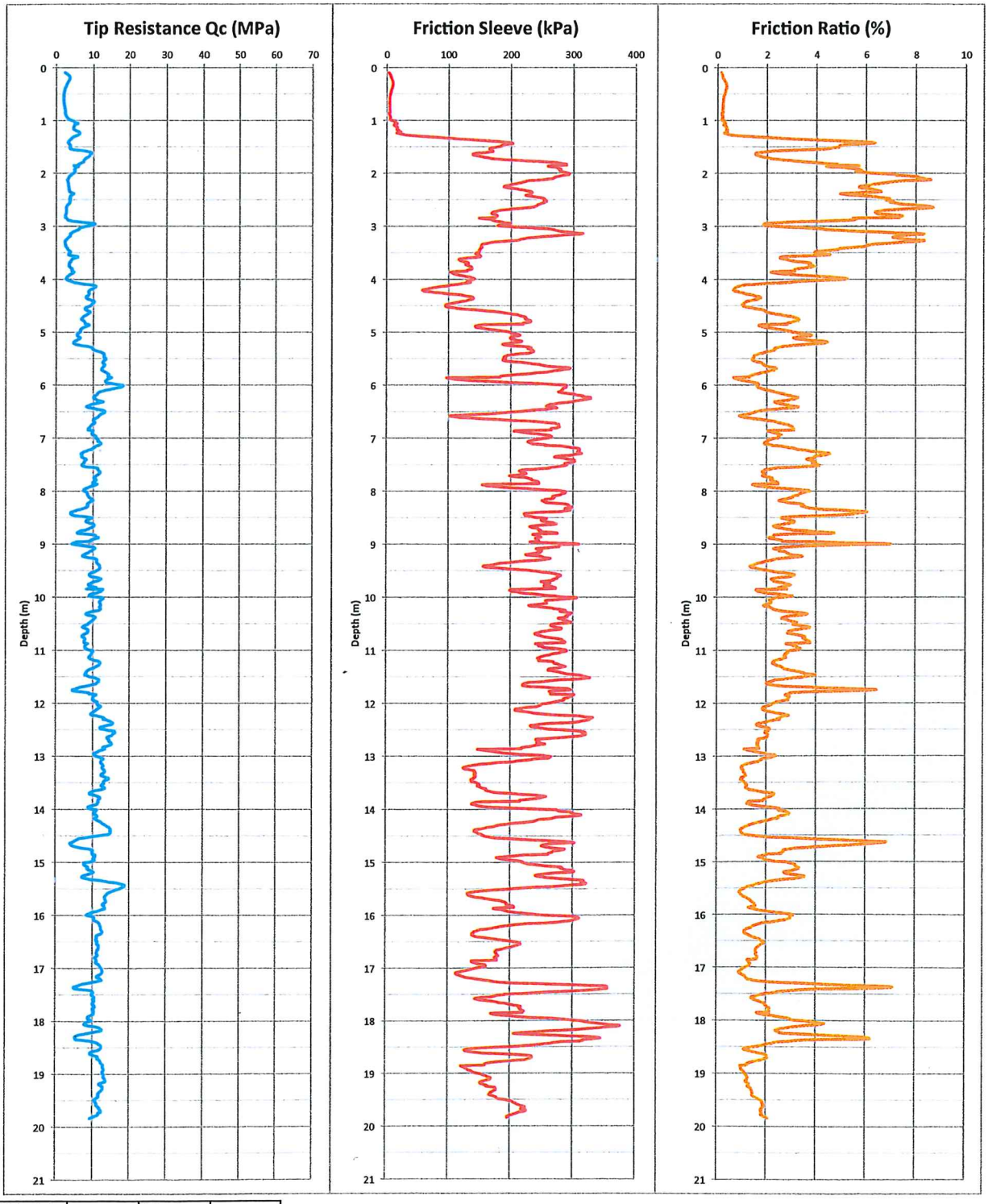

Water (m)		Refusal	

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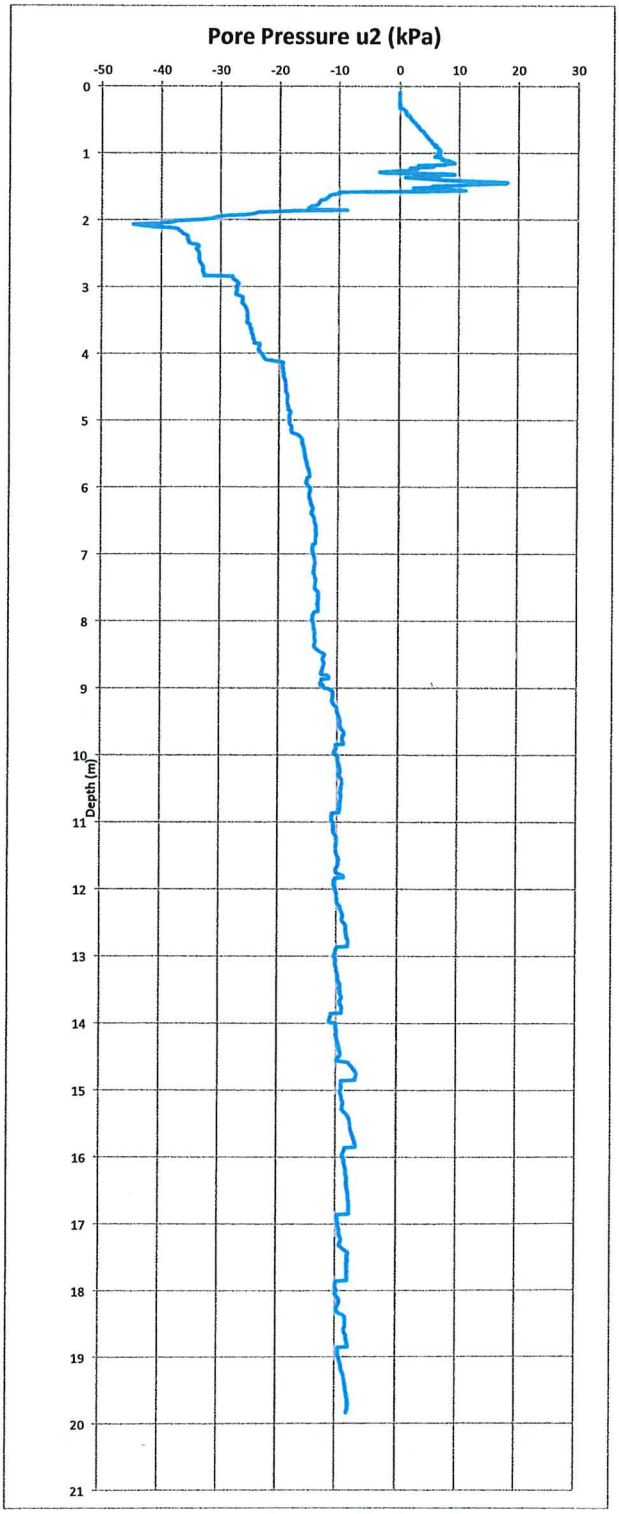
Project:	Lot 751 Donnybrook-Boyup Brook Road, Beelerup			GPS:	3334.3108S 11552.1050E
Probe No:	CPT3	Test Date:	17/09/14	Tested By:	D.SMITH



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ABN 71 349 772 837 Zemla Pty Ltd ACN 008 966 283 as trustee for the Young Punch and Higham Unit Trust trading as Structerre Consulting Engineers

APPENDIX E – LABORATORY TEST RESULTS

MATERIALS TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION AND ATTERBERG LIMITS

Report No: D88327 **Client:** GEOTECH

Job No: J148320 **Project:** Lot 751 Donnybrook-Boyupbrook road, Beelerup

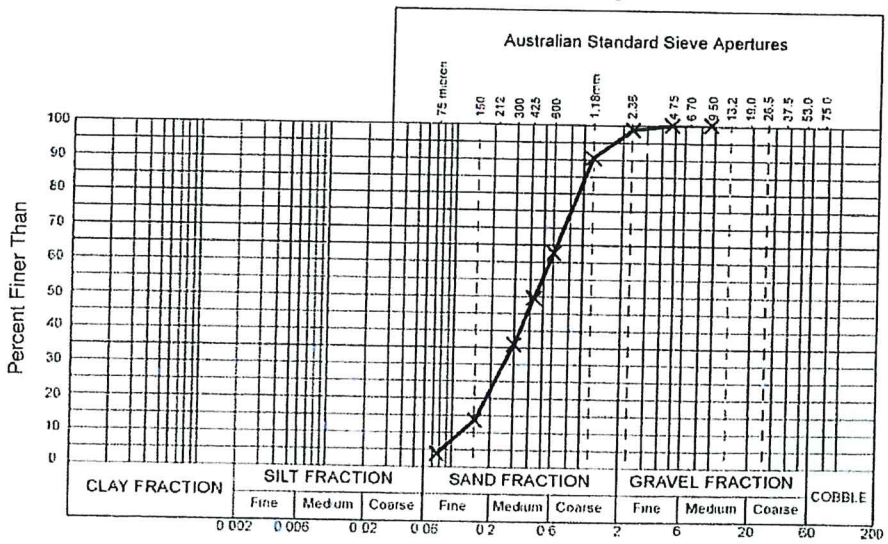
Sample Details

Laboratory Number:	23790	Lot Number	
Sample ID:	SRP3 0.5-1.3m	Sample Method	Selected by Client
Date Tested:	23 September 2014		
Material Description:	SAND trace clay and gravel - pale grey		

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS 1289.3.6.1)				**Atterberg Limits (AS 1289.3.1.2/3.2.1/3.4.1) Moisture Content (AS 1289.2.1.1)**	
Sieve Size	% Passing	Sieve Size	% Passing	Liquid Limit (%)	N/A
150.0mm		1.18 mm	90	Plastic Limit (%)	N/A
75.0mm		600 micron	63	Plasticity Index (%)	N/A
37.5 mm		425 micron	50	Linear Shrinkage (%)	N/A
19.0 mm		300 micron	37	Nature Of Shrinkage	N/A
9.50 mm	100	150 micron	15	Sample History	
4.75 mm	100	75 micron	5	Moisture Content (%)	-
2.36mm	98				

Particle Size Distribution Graph



Remarks:

NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025

Authorised Signatory

Date: 25/9/14

MATERIALS TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION AND ATTERBERG LIMITS

Report No: D88327 **Client:** GEOTECH

Job No: J148320 **Project:** Lot 751 Donnybrook - Boyup brook road, Beelerup

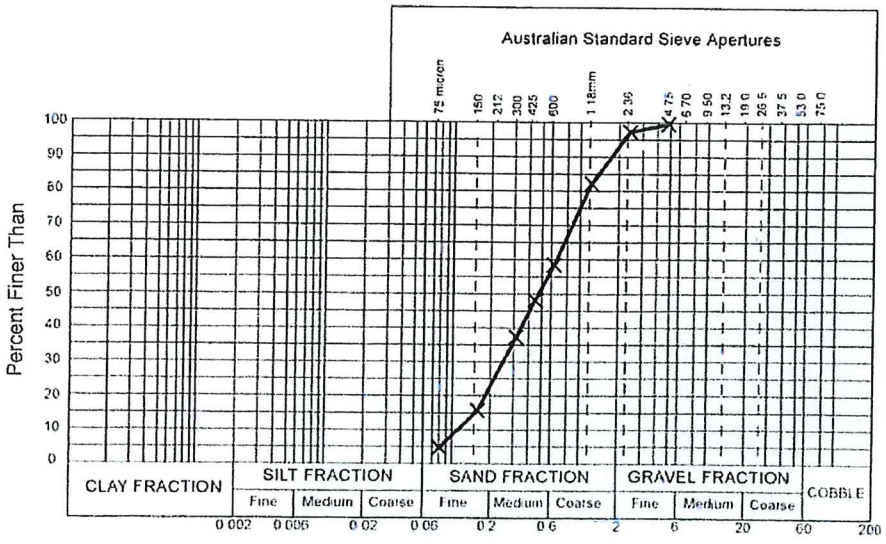
Sample Details

Laboratory Number:	23791	Lot Number	
Sample ID:	SPR 4 0.5 - 1.0 m	Sample Method	Selected by Client
Date Tested:	23 September 2014		
Material Description:	SAND trace clay and gravel		

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS 1289.3.6.1)				**Atterberg Limits (AS 1289.3.1.2/3.2.1/3.4.1) Moisture Content (AS 1289.2.1.1)**	
Sieve Size	% Passing	Sieve Size	% Passing	Liquid Limit (%)	N/A
150.0mm		1.18 mm	83	Plastic Limit (%)	N/A
75.0mm		600 micron	59	Plasticity Index (%)	N/A
37.5 mm		425 micron	49	Linear Shrinkage (%)	N/A
19.0 mm		300 micron	38	Nature Of Shrinkage	N/A
9.50 mm		150 micron	16	Sample History	
4.75 mm	100	75 micron	5	Moisture Content (%)	-
2.36mm	98				

Particle Size Distribution Graph



Remarks:

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Date: 25/9/14

AS 1289.3.6.1 R Rev. 2 Jul-14

MATERIALS TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION AND ATTERBERG LIMITS

Report No: D88327 **Client:** GEOTECH

Job No: J148320 **Project:** Lot 751 Donnybrook-Boyupbrook road , Beelerup

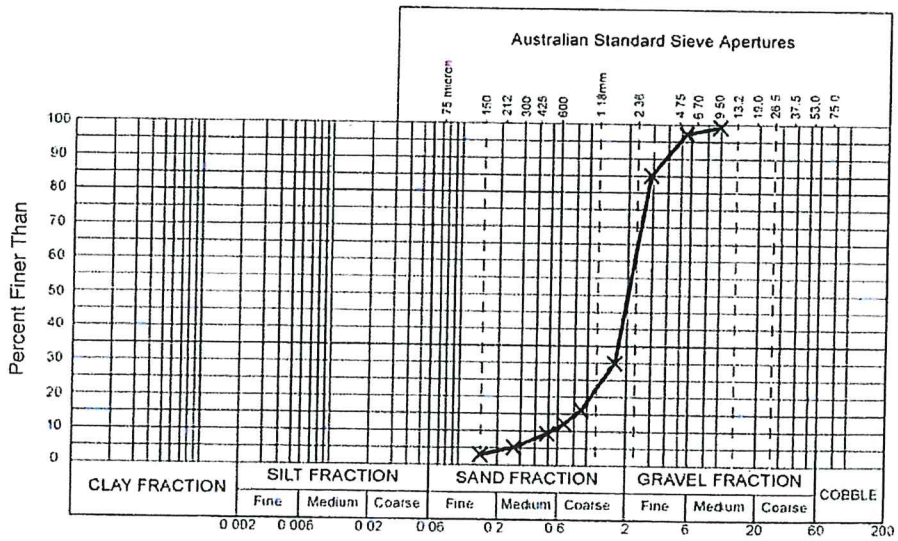
Sample Details

Laboratory Number:	23792	Lot Number	
Sample ID:	SRP 4.1.2 - 2.0 m	Sample Method	Selected by Client
Date Tested:	23 September 2014		
Material Description:	gravelly SAND trace clay		

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS 1289.3.6.1)				**Atterberg Limits (AS 1289.3.1.2/3.2.1/3.4.1) Moisture Content (AS 1289.2.1.1)**	
Sieve Size	% Passing	Sieve Size	% Passing	Liquid Limit (%)	N/A
150.0mm		1.18 mm	31	Plastic Limit (%)	N/A
75.0mm		600 micron	17	Plasticity Index (%)	N/A
37.5 mm		425 micron	13	Linear Shrinkage (%)	N/A
19.0 mm		300 micron	10	Nature Of Shrinkage	N/A
9.50 mm	100	150 micron	6	Sample History	
4.75 mm	98	75 micron	4	Moisture Content (%)	-
2.36mm	86				

Particle Size Distribution Graph



Remarks:

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Date: 27/9/14

AS 1289.3.6.1 R Rev. 2 Jul-14

MATERIALS TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION AND ATTERBERG LIMITS

Report No: D88327 **Client:** GEOTECH

Job No: J148320 **Project:** Lot 751 Donnybrook-Boyupbrook road , Bellerup

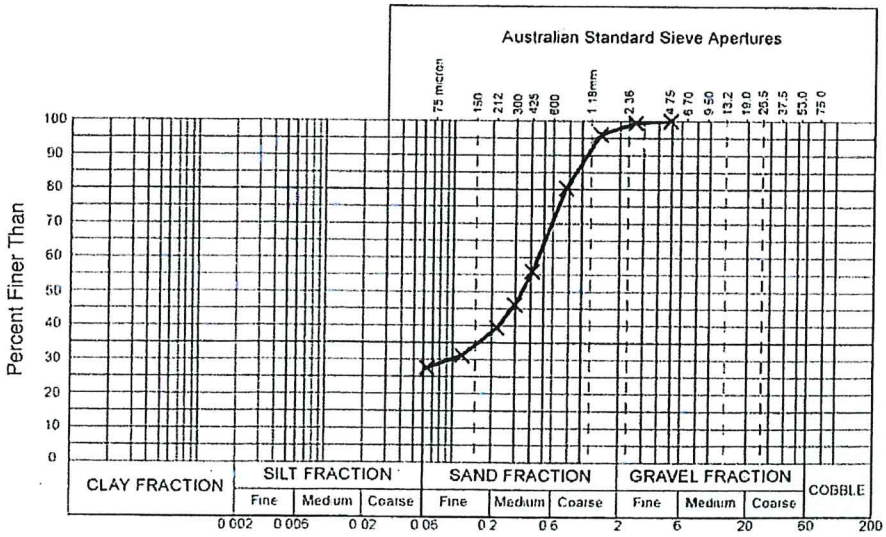
Sample Details

Laboratory Number:	23793	Lot Number	
Sample ID:	SPR 4 2.5 - 3.0 m	Sample Method	Selected by Client
Date Tested:	23 September 2014		
Material Description:	clayey SAND trace gravel		

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS 1289.3.6.1)				**Atterberg Limits (AS 1289.3.1.2/3.2.1/3.4.1) Moisture Content (AS 1289.2.1.1)**	
Sieve Size	% Passing	Sieve Size	% Passing	Liquid Limit (%)	N/A
150.0mm		1.18 mm	80	Plastic Limit (%)	N/A
75.0mm		600 micron	56	Plasticity Index (%)	N/A
37.5 mm		425 micron	46	Linear Shrinkage (%)	N/A
19.0 mm		300 micron	40	Nature Of Shrinkage	N/A
9.50 mm	100	150 micron	32	Sample History	
4.75 mm	99	75 micron	28	Moisture Content (%)	-
2.36mm	96				

Particle Size Distribution Graph



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Date: 25/9/14

AS 1289.3.6.1 R Rev. 2 Jul-14

MATERIALS TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION AND ATTERBERG LIMITS

Report No: D88327 **Client:** GEOTECH

Job No: J148320 **Project:** Lot 751 Donnybrook-Boyupbrook road , Beelerup

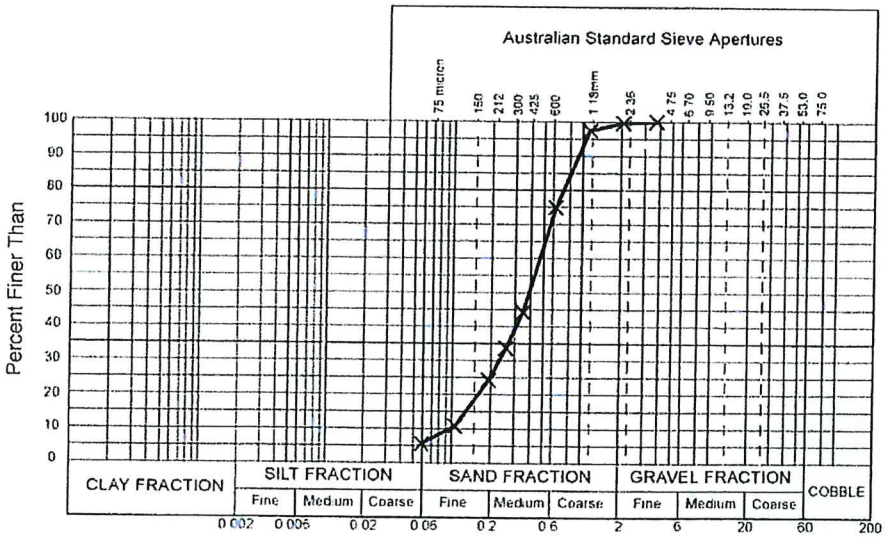
Sample Details

Laboratory Number:	23794	Lot Number	
Sample ID:	SRP 5 0.5 - 1.0 m	Sample Method	Selected by Client
Date Tested:	23 September 2014		
Material Description:	SAND with clay trace gravel		

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS 1289.3.6.1)				**Atterberg Limits (AS 1289.3.1.2/3.2.1/3.4.1) Moisture Content (AS 1289.2.1.1)**	
Sieve Size	% Passing	Sieve Size	% Passing	Liquid Limit (%)	N/A
150.0mm		1.18 mm	75	Plastic Limit (%)	N/A
75.0mm		600 micron	44	Plasticity Index (%)	N/A
37.5 mm		425 micron	34	Linear Shrinkage (%)	N/A
19.0 mm		300 micron	25	Nature Of Shrinkage	N/A
9.50 mm	100	150 micron	11	Sample History	
4.75 mm	100	75 micron	6	Moisture Content (%)	-
2.36mm	97				

Particle Size Distribution Graph



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Date: 25/9/14

AS 1289.3.6.1 R Rev. 2 Jul-14

APPENDIX F – BORELOG TERMINOLOGY

STRUCterre consulting engineers

Residential | Geotechnical | Commercial & Infrastructure

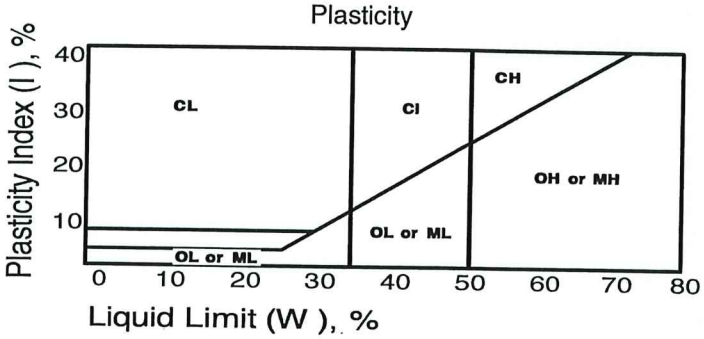
Inspect & Investigate | Energy Assessment | Environmental

BORELOG TERMINOLOGY

Particle Size Distribution

Major Division	Subdivision	Size
Boulders		>200mm
Cobbles		200 - 63mm
Gravel	Coarse	63 - 20mm
	Medium	20- 6mm
	Fine	6 - 2.36mm
Sand	Coarse	2.36 - 0.6mm
	Medium	0.6 - 0.2mm
	Fine	0.2 - 0.075mm

Plasticity



Consistency of Cohesive Soils

Term	Undrained Strength Su (kPa)	Field Guide
Very Soft	< 12	Exudes between the fingers when squeezed in hand
Soft	12 - 25	Can be moulded by light finger pressure
Firm	25 - 50	Can be moulded by strong finger pressure
Stiff	50 - 100	Cannot be moulded by Fingers. Can be indented by thumb.
Very Stiff	100 - 200	Can be indented by thumb nail
Hard	> 200	Can be indented with difficulty by thumb nail.
Friable	-	Crumbles or powders when scraped by thumbnail

Consistency/Density of Non-Cohesive Soils

Term	Density Index (%)	SPT "N" Value Comparison
Very Loose	< 15	0 - 4
Loose	15 - 35	4 - 10
Medium Dense	35 - 65	10 - 30
Dense	65 - 85	30 - 50
Very Dense	> 85	> 50

Moisture Content

D	Dry
M	Moist
W	Wet
S	Saturated

Minor Components

Term	Assessment Guide	Proportion of Minor Component In:
Trace	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component	Coarse grained soils: < 5 % Fine grained soils: <15%
With	Presence easily detected by feel or eye, soil properties little different to general properties of primary component	Coarse grained soils: 5 - 12 % Fine grained soils: 15 - 30%

Soil Legend

FILL	CLAY	GRAVEL	CONCRETE
TOPSOIL	SILT	LIMESTONE	COMBINATIONS
PEAT	SAND	BEDROCK	eg: Clay, Silty, Sandy

USCS

GW	Well graded gravel	SC	Clayey sand	OL	Organic low plasticity silt
GP	Poorly graded gravel	SM	Silty sand	ML	Low plasticity silt
SW	Well graded sand			MH	High plasticity silt
SP	Poorly graded sand			OH	Organic high plasticity silt

CL	Low plasticity clay
CI	Intermediate plasticity clay
CH	High plasticity clay
PT	Peat

Doc: GE 2.2.3

Perth | Brisbane | Sydney | Bunbury | Geraldton | Gold Coast | Albany | Karratha

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