



*Marlborough District Council*

# **Blenheim Urban Growth Study Stage 2**

**Site Investigations**

**Factual Report**



*Marlborough District Council*

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# Blenheim Urban Growth Study

## Stage 2

### Site Investigations

### Factual Report

Prepared By



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Status: Final

Project No: 5C2128.01

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# 1 Introduction

Marlborough District Council is developing a strategy for the urban growth and development. The Council has identified a number of potential urban growth areas for Blenheim, that lie on the periphery of the city. Opus International Consultants Ltd (Opus) has been commissioned by the Council to carry out a geotechnical evaluation of the proposed growth areas.

Geotechnical investigations and assessment of proposed growth areas to the north, east and southeast of the city were previously carried out in early 2012 (Opus, 2011; 2012a). The investigations showed the areas to the east and southeast are underlain by significant thicknesses (> 15 m) of loose materials which are susceptible to liquefaction. Consequently, these areas would require considerable cost and resources to develop.

The geotechnical appraisal of the ground conditions and suitability of the land for development recommended that land which is more stable to earthquake hazards be developed (Opus, 2012b). The Council therefore identified 5 new areas to the northwest, west and southwest of the city for possible urban growth, and engaged Opus to carry out investigations in the new areas to assess the geotechnical issues there, particularly relating to the hazard posed by liquefaction.

Site investigations have subsequently been carried out in September to December 2012. This report has been prepared as part of the investigation, and provides the factual results of the investigations and testing.

The investigations were scoped and carried out in accordance with the guidelines provided by the former Department of Building and Housing (now the Ministry of Business, Innovation and Employment) for geotechnical investigations of land in Canterbury (MBIE, 2012).

## 2 The Site

### 2.1 Geomorphology

The proposed urban growth areas are located on the outskirts of Blenheim's urban area, to the north (areas Na:Nb), northwest (areas 1, 3 to 6) and southwest (area 8). The sites are situated on predominantly flat to gently undulating alluvial plains, with several streams and drains. The land is predominantly under agricultural use with few existing dwellings.

### 2.2 Geology

The geology of the Marlborough Area has been mapped at 1:25,000 scale by the New Zealand Geological Survey (NZGS, 1981) and at 1:250,000 scale by the Institute of Geological and Nuclear Sciences (IGNS, 2000).

The mapping shows the Blenheim area is underlain by Holocene age marine/estuarine silts and sands of the Dillons Point Formation and alluvial gravels and sands of the Rapaura Formation. These strata are underlain by older, clay-bound alluvial gravels of the Speargrass Formation (NZGS, 1981; Landcare Research, 1995; MCRWB, 1987; Davidson and Wilson, 2011).

### 2.3 Groundwater

A study by Marlborough District Council (Davidson and Wilson, 2011) provides a thorough description of the groundwater regime of the lower Wairau Valley. As part of this study, a series of boreholes in the Blenheim area show the static groundwater levels in this area. This analysis shows that shallow groundwater generally lies between 2 m and 5 m below ground level in the vicinity of the study areas, and flows from west to east.

Groundwater in the south Marist-Clifford area suggests a deeper aquifer where groundwater was encountered below 6.0 m in the most southern boreholes.

## 3 Site Investigations

### 3.1 Boreholes

Twenty seven boreholes were drilled in two phases, between October and December 2012. The boreholes were drilled by CW Drilling and Investigation Ltd, and all were 125 mm diameter, drilled by rotary percussive (concentrix) drilling. The locations and depths of the boreholes are given in Table 1; their locations are shown on Figure 1.

The boreholes were carried out to provide information to characterise the geology and hydrogeology of the development areas. Undisturbed push tubes and bulk samples were collected from the boreholes to provide information on the physical properties of the soils.

The boreholes were drilled to depths between 10 m and 25 m. Standard Penetration Tests (SPTs) were carried out in the boreholes at 1 m intervals.

Engineering geologists from Opus logged the samples recovered from the boreholes. All samples were logged in accordance with the New Zealand Geotechnical Society (2005) Guidelines.

The borehole logs are presented in Appendix A and the driller's logs are provided in Appendix B. Standpipe piezometers were installed in boreholes BH 101, 105, 109, 110 and 210, to allow measurement of the groundwater levels.

**Table 1** Borehole summary table

No.	Location	Easting <sup>1</sup>	Northing <sup>1</sup>	Depth (m)	Groundwater (m) <sup>2</sup>
BH 101	Battys Road	1677842	5403363	15.27	1.5
BH 102	59 Davids Road	1677291	5403528	15.375	1.2
BH 103	Severne Street	1677296	5403996	15.395	1.5
BH 104	3 Rose Street	1677387	5404341	10.28	1.5
BH 105	Middle Renwick Road	1676723	5404249	15.32	1.3
BH 106	Cherryland, off Rene Road	1676821	5404883	15.36	2.0
BH 108	Old Renwick Road	1677174	5405365	15.31	2.0
BH 109	244 Old Renwick Road	1676648	5405338	15.41	2.0
BH 110	Blicks Lane	1676862	5405990	15.415	3.0
BH 111	190 Old Renwick Road	1677291	5405804	15.35	2.0
BH 112	Thomsons Ford Road	1677729	5405953	15.335	2.0
BH 113	78 Old Renwick Road	1678431	5405608	15.24	1.8
BH 114	38 Old Renwick Road	1679067	5406028	20.295	1.2
BH 115	26 Old Renwick Road	1679178	5405490	21.335	1.0
BH 201	David Street	1677565	5403629	15.325	2.0
BH 202	25 Battys Road	1677930	5403920	15.41	2.0
BH 203	Rose Street	1677410	5404619	15.45	3.0
BH 204	Between Rene St & Middle Renwick Rd	1676829	5404561	10.355	3.0
BH 205	Off Westward Avenue	1677233	5404709	15.34	3.0
BH 206	Rene Street	1676940	5405024	10.45	3.0
BH 207	Blicks Lane	1676905	5405386	15.3	3.0
BH 208	Off Old Renwick Road	1677526	5405521	10.365	2.5
BH 209	125 New Renwick Road	1677382	5402149	14.0	7.1
BH 210	Battys Road	1677919	5402149	15.45	6.0
BH 211	125 New Renwick Road	1677632	5402413	15.37	5.0
BH212	125 New Renwick Road	1677342	5402708	15.42	3.0
BH213	Battys Road	1677896	5402736	15.355	2.0

<sup>1</sup> Coordinates are in metres to NZ Transverse Mercator

<sup>2</sup> Depth groundwater encountered following completion of drilling (metres below ground level)

### 3.2 Cone Penetration Tests

Eighteen Static Cone Penetration Tests (CPTs) were carried out across the project area between the 11<sup>th</sup> and 13<sup>th</sup> of December 2012. The CPTs were carried out to provide geotechnical data on the strength and thickness of the strata, for use in assessing the liquefaction susceptibility of the soils. Water levels were not recorded in the tests.

The locations and depths of the CPTs are summarised in Table 2. The test results are provided in Appendix C.

**Table 2** Cone penetration test summary table

No.	Location	Easting <sup>1</sup>	Northing <sup>1</sup>	Depth (m)
CPT 201	89 Battys Road	1677964	5403628	1.43
CPT 202	David Street	1677752	5403653	2.57
CPT 203	Battys Road	1677675	5403427	2.26
CPT 204	102 Battys Road	1677500	5403851	2.85
CPT 205	3 Rose Street	1677263	5404429	3.52
CPT 206	Between Rene St & Middle Renwick Rd	1676711	5404646	3.8
CPT 207	Cherryland of Rene Street	1676940	5404807	0.99
CPT 208	Roseneath Lane	1677496	5404945	3.39
CPT 209	183 Old Renwick Road	1677241	5405081	1.19
CPT 210	Rene Street	1676672	5405052	2.52
CPT 211	Rene Street	1676930	5405232	1.54
CPT 212	190 Old Renwick Road	1677181	5405634	2.65
CPT 213	190 Old Renwick Road	1677071	5406317	3.7
CPT 214	45 Thomsons Ford Road	1677521	5405944	1.01
CPT 215	19 Thomsons Ford Road	1677703	5405665	2.24
CPT 216	56 Thomsons Ford Road	1678191	5405976	4.16
CPT 217	44 Old Renwick Road	1678536	5405990	3.25
CPT 218	Lansdowne Park	1679980	5405464	5.27
CPT 219	Old Renwick Road	1678881	5405915	4.37
CPT 220	Old Renwick Road	1678871	5406010	2.59
CPT 221	Old Renwick Road	1679098	5405617	4.48
CPT 222	125 New Renwick Road	1677360	5402400	7.44
CPT 223	125 New Renwick Road	1677347	5402563	6.85
CPT 224	Battys Road	1677902	5402406	2.47
CPT 225	125 New Renwick Road	1677594	5402719	6.52

<sup>1</sup> Coordinates are in metres to NZ Transverse Mercator

### 3.3 Shear Wave Velocity Testing

Down-hole shear wave velocity testing was carried out in two 15 m deep boreholes (BH 201 and BH 207), on 27 December 2012. The testing was carried out by AJ Sutherland Consulting Ltd, to measure shear wave and compression wave velocities for the stratigraphic layers within the boreholes. The results of the testing are presented in Appendix D.

### 3.4 Laboratory Testing

Laboratory soil classification tests were performed on samples collected from the boreholes, in accordance with NZS 4402 : 1986, to determine the following properties:

- Particle size distribution (NZS 4402, tests 2.8.1 and 2.8.4);
- Atterberg limits (NZS4402, tests 2.1, 2.2, 2.3, and 2.4).

The tests were carried out to provide data to characterise the soils and provide information for use in the liquefaction assessment. The tests were completed by Opus Central Laboratories in Lower Hutt. The tests are summarised in Table 3 and the analytical results are included in Appendix E.

**Table 3** Soil classification test results summary

BH No.	Sample Depth (m)	Plasticity Index	Particle Size Distribution (%)			
			Clay	Silt	Sand	Gravel
BH 101	5.0 – 5.45	13 ± 2	25	63	12	0
BH 102	12.45 – 13.0		0	2	77	21
BH108	2.0 - 2.45	non plastic				
BH 112	2.5 – 2.8		5	28	66	1
BH 115	0.5 – 1.0		18	66	16	0
BH 116	2.45 – 3.0		17	78	5	0
BH 117	12.0 – 12.45		17	65	17	1
BH 203	8.0 – 8.45		19	52	29	0
BH 205	8.0 – 8.45	14 ± 2	29	69	2	0
BH 208	2.0 – 2.45	non plastic				
BH 209	7.0 – 7.45	4 ± 2				
BH 211	3.0 – 3.45	6 ± 2				
BH 212	7.0 – 7.45	11 ± 2	18	36	30	16
BH 213	3.0 – 3.45	7 ± 1				

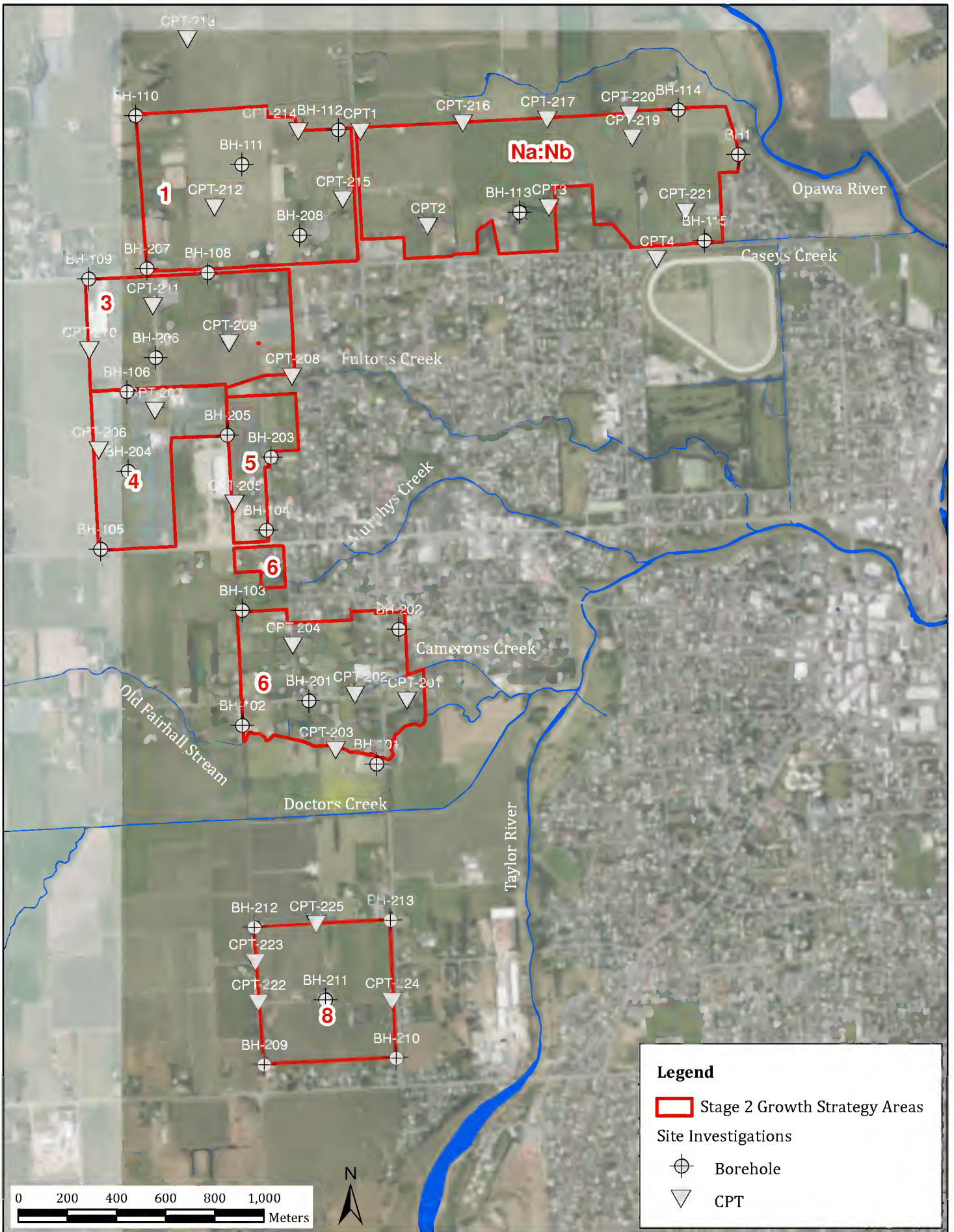


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- Opus International Consultants (2012b). Blenheim Urban Growth Study - Geotechnical Evaluation - Interpretive Report. Opus report reference GER 2012/09.

# Figures





Prepared For:	Prepared By:	Title: Site investigations location map			
		Project: Blenheim Urban Growth Study Stage 2			
		Scale: 1:20,000	Date: Feb 2013	Project No: 5C2128.01	Figure: <b>1</b>

# **Appendix A**

## **Borehole Logs**





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# BOREHOLE LOG

HOLE No.  
**BH101**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 15.27 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**Battys Road**

CO-ORD.  
**1677842 E 5403363 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**8 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE							RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
Rapaura Formation	Gravelly SILT; brown, soft, moist.	1	1								0	Rootlets present. Gravel is subrounded to subangular, well graded to 40 mm.			BS	Hand Dug					
	Clayey SILT with trace gravel; brown, very soft to soft, moist, high plasticity.	2	2		4	2/1/1/1/1						Gravel is subrounded, well graded to 10 mm. Gravel is very fine.			BS						
	Becomes mottled blue-grey and brown, soft.	3	3		5	3/1/1/1/2						Deep brown organic matter.			DHH						
	Silty CLAY; blue-grey, soft, moist, high plasticity.	4	4		6	1/1/1/2/2									<del>DHH</del> PT						
	Becomes very soft.	5	5		1	1/0/0/1/0									SPT						
	Becomes firm.	6	6		11	4/1/3/3/4									DHH						
	Becomes mottled blue-grey and brown.	7	7		10	7/3/3/2/2									SPT						
	Clayey SILT with some sand and gravel; grey, firm, moist, medium to high plasticity.	8	8		41	10/7/10/11/13						7.20 m: 50 mm thick gravel band. Gravel is subangular, <5 mm. 7.25 m: Gravel is subangular to subrounded, <5 mm. Sand is medium to coarse. 7.50 m: Gravel is subrounded, well graded to 10 mm.			DHH						
	Silty GRAVEL with some sand; brown, dense, wet.	9	9		48	11/10/12/10/16									SPT						
	Becomes saturated.	10	10		50+	16/26/24 = 70 mm						Gravel is subrounded to subangular, <40 mm.			DHH						
		11	11		50+	25/17/19/14 = 65 mm									SPT						
		12	12		50+	19/19/19/12 = 35 mm									DHH						
		13	13		50+	22/24/26 = 70mm									SPT						
		14	14		50+	18/12/35/3 = 5mm									DHH						
		15	15		50+	25/27/23 = 45mm									SPT						

### NOTES

Groundwater level at end of drilling 1.5 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	3/10/2012	FINISHED	3/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH101**



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 www.opus.co.nz

# BOREHOLE LOG

HOLE No.  
**BH102**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 15.375 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**59 Davids Road**

CO-ORD.  
**1677291 E 5403528 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**9 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
Rapaura Formation	SILT; brown, soft, dry.		0							0	Rootlets present.			BS	Hand Dug					
	Clayey SILT; dark brown, soft, dry to moist, low to medium plasticity. 1.30 m becomes mottled blue-grey and brown, higher clay content.		1								Rootlets present.			PT						
	Silty GRAVEL with some clay; brown, dense, wet, clay zones have high plasticity.		2			43	7/8/11/12 /12				Gravels are rounded, poorly graded, <30 mm.			SPT						
	Sandy gravelly SILT; grey-brown, hard, wet. Becomes saturated.		3			50+	22/22/13 /11/4 = 30mm				Gravel is well rounded, well graded to 10 mm. Sand is medium.			BS						
	Sandy silty GRAVEL, dense. Possible interbedded sand layers.		4			41	13/9/8/6/8				Gravel is subangular.			SPT						
	Gravelly SAND with some silt; grey-brown, very dense, saturated.		5			50+	21/21/23/6 = 30mm				Gravel is subangular, well graded to 10 mm.			DHH						
	Becomes dense.		6			46	10/11/11/12 /12							SPT						
	Clayey SILT with minor sand; grey, firm, saturated, medium to high plasticity.		7			10	4/2/2/3/3							BS						
	Sandy gravelly SILT with some clay; brown, hard, saturated, medium to high plasticity.		8			50+	21/15/12 /14/9 = 50mm				Gravel is subangular, <10 mm. Sand is medium to fine. Gradational basal contact.			SPT						
	Silty sandy GRAVEL; brown, very dense, saturated.		9			50+	28/24/22/4 = 10mm				Gravel is subangular, well graded to 10 mm. Sand is medium to coarse.			BS						
	Possible interbedded coarse sand layers.		10			50+	27/20/26 /4 = 15mm				Quartz grains; white, subangular, <10 mm.			SPT						
	SAND with some gravel; brown, medium dense, saturated.		11			50+	8/12/21 /17 = 55mm							BS						
	Silty sandy GRAVEL; brown, very dense, saturated.		12			14	3/2/1/4/7				Gravel is well rounded, well graded to 10 mm. Sand is coarse.			SPT						
		13			50+	11/20/13 /25/ 2 = 10mm				Gravel is subangular, well graded to 10 mm. Quartz grains. Sand is medium to coarse.			BS							
		14			50	12/12/11/13 /14							SPT							
		15			50+	7/11/14 /25							DHH							

**NOTES**

Groundwater level at end of drilling 1.2 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	1/10/2012	FINISHED	2/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH102**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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 www.opus.co.nz

# BOREHOLE LOG

HOLE No.

**BH103**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677296 E 5403996 N**

R.L.

**9 m**

SHEET

**1 of 1**

LOCATION

**Severne Street**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.395 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS		ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION		
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE						RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL				
Rapaura Formation	Sandy SILT; mottled orange and grey-brown, soft, dry.		0							0	Rootlets present. Sand is fine.			BS	Hand Dug							
	Sandy silty GRAVEL; brown, loose, moist to wet.		1							90	Gravel is well rounded, poorly sorted, <70 mm. Sand is coarse.			BS								
	Becomes sandy GRAVEL with some silt, very dense.		2			50+	27//16/25/9 = 25mm					Gravel is well rounded, well graded to 20 mm.				HD						
	Becomes saturated.		3	6			50+	18//9/14/12 /15 = 70mm							DHH	Rotary Percussive (Concentrix) Drilling						
	Becomes dense.		4				49	20//10/11/13 /15							SPT							
	Becomes very dense.		5	4			43	18//10/9/10 /14							DHH							
			6				50+	8//12/12/19 /7 = 10mm							SPT							
			7	2			50+	20//13/30 /7 = 25mm							DHH							
			8				50+	19//15/16 /17/2 = 10mm							SPT							
			9	0			50+	8//13/23 /14 = 40mm							DHH							
			10				50+	17//13/21 /17 = 35mm							SPT							
			11	-2			47	18//12/10/11 /14							DHH							
			12				50+	20//9/17/17 /7 = 20mm							SPT							
			13	-4			50+	27//20/21 /9 = 25mm							DHH							
			14				50+	14//14/19 /17 = 40mm					Some green gravel with quartz bands.				SPT					
	Possible interbedded sand layers.	15	-6			50+	4//7/6/19 /18 = 20mm							DHH								
		16												SPT								
		17	-8																			
		18																				
		19	-10																			
		20																				
		21	-12																			
		22																				
		23	-14																			
		24																				
		16																				

**NOTES**

Groundwater level at end of drilling 1.5 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	3/10/2012	FINISHED	4/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH103**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13







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# BOREHOLE LOG

HOLE No.

**BH105**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676723 E 5404249 N**

R.L.

**10 m**

SHEET

**1 of 1**

LOCATION

**Middle Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.32 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Rapaura Formation	SILT with some clay; brown, soft, dry to moist, low plasticity. Some zones of dark grey SILT.		1																
	Sandy silty GRAVEL; brown, medium dense, wet.		2		24	7/6/6/6					Gravel is well rounded, well graded to 30 mm. Sand is medium to coarse.			BS					
	Becomes dense, saturated.		3		40	16/11/10/10 /9								HD					
	Becomes sandy GRAVEL with some silt; brown-grey.		4		37	14/10/9/18 /10								DHH					
			5		43	14/9/11/11 /12								SPT					
	Becomes very dense.		6		32	6/6/7/10/9						Gravel is well rounded to subangular, well graded to 40 mm.			DHH				
			7		50+	15/14/17 /19 = 70mm								SPT					
			8		50+	9/7/15/14 /14 = 55mm								DHH					
			9		50+	10/12/12/15 /11 = 50mm								SPT					
			10		50+	22/15/18 /17 = 65mm								DHH					
			11		50+	12/14/15/19 /12 = 10mm								SPT					
			12		50+	16/13/20 /17 = 40mm								DHH					
			13		50+	12/13/20 /17 = 40mm								SPT					
			14		50+	21/17/17 /14 = 55mm								DHH					
			15		50+	14/22/21/7 = 20mm								SPT					
		-6	16																
			17																
		-8	18																
			19																
		-10	20																
			21																
		-12	22																
			23																
		-14	24																

**NOTES**

Groundwater level at end of drilling 1.3 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	8/10/2012	FINISHED	8/10/2012
DRILLER	Troy Norriss	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH105**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13





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# BOREHOLE LOG

HOLE No.

**BH108**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677174 E 5405365 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**Old Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.31 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING			BASE OF HOLE & WATER LEVEL
Rapaura Formation	SILT; dark brown, soft, moist.		0							0	Rootlets present.			BS	Hand Dug					
	Zones of clayey SILT; blue grey, soft, moist to wet, low plasticity.		1											BS						
			2			5	2/2/1/1/1									HD				
	Sandy SILT with some clay zones; blue grey, firm, wet, clay zones have high plasticity.		3			11	2/1/2/4/4					Basal contact position inferred. Sand is very fine.			DHH	Rotary Percussive (Concentrix) Drilling				
	Sandy silty GRAVEL; brown, dense, saturated.		4			32	14/8/8/8/8					Gravel is rounded to subangular, well graded to 40 mm. Sand is medium to coarse.			SPT					
			5			37	10/7/8/10/12								DHH					
	Becomes very dense.		6			50+	21/11/11/16/12 = 70mm								SPT					
			7			50+	27/10/18/17/5 = 35mm					Large gravel up to 50 mm.			SPT					
	Becomes sandy GRAVEL with minor silt.		8			50+	13/12/14/15/9 = 55mm								DHH					
			9			50+	12/14/14/22 = 55mm								SPT					
	Becomes dense.		10			37	8/8/8/10/11					Sample recovered with very little sand matrix.			DHH					
	Becomes very dense.		11			50+	50 = 145mm					No SPT recovery.			SPT					
			12			50+	8/4/11/22/13 = 55mm								DHH					
	Becomes sandy silty GRAVEL.		13			50+	15/18/16/16/15 = 30mm								SPT					
	Becomes sandy GRAVEL with some silt.		14			50+	11/14/12/17/17 = 20mm								DHH					
Becomes sandy silty GRAVEL.		15			50+	14/16/30/4 = 10mm								SPT						
		16																		
		17																		
		18																		
		19																		
		20																		
		21																		
		22																		
		23																		
		24																		
		14																		

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	10/10/2012	FINISHED	10/10/2012
DRILLER	Troy Norriss	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH108**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS



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# BOREHOLE LOG

HOLE No.

**BH109**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676648 E 5405338 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**244 Old Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.41 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Rapaura Formation	SILT; dark brown, soft, dry.		0							0									
	Zones of SILT with some clay; blue-grey, soft, moist, low plasticity.		1							90									
	Sandy GRAVEL with some silt; grey-brown, dense, wet.		2		44	14/8/11/15 /10					Gravel is well rounded to sub angular, well graded to 30 mm. Sand is medium.								
	Becomes very dense.		3		50+	10/10/11 /29 = 70 mm													
	Becomes saturated.		4		40	21/13/9/8 /10													
	Becomes dense.		5		50+	20/11/12 /27 = 70mm													
	Becomes very dense.		6		41	14/11/10/10 /10													
	Becomes dense.		7		43	14/7/9/14 /13													
	Becomes medium dense.		8		46	7/10/9/13 /14													
	Becomes very dense.		9		27	4/6/9/5/7					Very little sand/silt matrix in SPT sample.								
	Becomes very dense.		10		50+	4/7/14/16 /9 = 35mm													
	Becomes very dense.		11		50+	4/11/14/16 /9 = 35mm													
	Becomes dense.		12		50+	5/9/11/15 /15 = 55mm													
	Becomes dense.		13		32	7/2/7/11 /12													
	Becomes very dense.		14		50+	16/30/19 /1 = 10mm													
		15		50+	6/7/7/22 /14 = 35mm														
		16																	
		17																	
		18																	
		19																	
		20																	
		21																	
		22																	
		23																	
		24																	
		14																	

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	9/10/2012	FINISHED	9/10/2012
DRILLER	Troy Norriss	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH109**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH110**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676862 E 5405990 N**

R.L.

**12.1 m**

SHEET

**1 of 1**

LOCATION

**Blicks Lane**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.415 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS		ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE						RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL			
Rapaura Formation	SILT; dark brown, soft, dry.		1	[Graphic Log]						0	Rootlets present.			BS	Hand Dug						
	Becomes moist.		2	[Graphic Log]	8	2/1/0/2/5								BS							
	Sandy gravelly SILT with minor clay zones; grey-brown, soft to stiff, moist, clay zones have high plasticity.		3	[Graphic Log]	37	16/10/10/8/9						Gravel is well rounded, well graded to 30 mm.			DHH						
	Sandy GRAVEL with some silt; brown, very dense, wet.		4	[Graphic Log]	50+	27/17 = 55mm (bouncing)						Gravel is subrounded, well graded to 30 mm. Sand is medium to coarse.			SPT						
			5	[Graphic Log]	50+	19/13/16/13 /8 = 30mm									DHH						
			6	[Graphic Log]	50+	19/19/26 /15 = 55mm									SPT						
			7	[Graphic Log]	50+	27/19/18 /13 = 40mm									DHH						
			8	[Graphic Log]	50+	21/18/19 /13 = 55mm									SPT						
	Becomes dense.		9	[Graphic Log]	47	13/7/12/19 /9									DHH						
			10	[Graphic Log]	49	15/10/13/12 /14									SPT						
	Becomes very dense.		11	[Graphic Log]	50+	20/16/20 /14									DHH						
	Becomes dense.		12	[Graphic Log]	48	9/9/12/12/15									SPT						
	Becomes very dense.		13	[Graphic Log]	50+	7/9/15/16 /10 = 55mm									DHH						
			14	[Graphic Log]	50+	20/12/11/14 /12 = 50mm									SPT						
			15	[Graphic Log]	50+	10/9/14/16 /11 = 40mm									DHH						
		16	[Graphic Log]											SPT							
		17	[Graphic Log]																		
		18	[Graphic Log]																		
		19	[Graphic Log]																		
		20	[Graphic Log]																		
		21	[Graphic Log]																		
		22	[Graphic Log]																		
		23	[Graphic Log]																		
		24	[Graphic Log]																		

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	5/10/2012	FINISHED	8/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MST800
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH110**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH111**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677291 E 5405804 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**190 Old Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.35 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION			
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL					
Rapaura Formation	SILT; dark brown, soft, dry.		10																				
	Zones of SILT with some clay; blue-grey, soft, moist, low plasticity.		1										BS	Hand Dug									
	Sandy gravelly SILT; brown, stiff, saturated.		2			21	11/6/4/6/5				Gravel is rounded, well graded to 40 mm. Sand is coarse.												
	Becomes sandy silty GRAVEL; brown, dense, saturated.		3			39	12/11/10/9/9																
	Becomes sandy GRAVEL with some silt.		4			46	16/12/12/11/11				Gravel is well rounded to subangular.												
	Becomes very dense.		5			50+	20/11/12/27 = 70mm																
	Becomes sandy GRAVEL with minor silt; dense.		6			50	11/11/13/15/11																
	Becomes sandy silty GRAVEL.		7			49	11/15/9/11/14																
	Becomes very dense.		8			50+	24/22/24/4 = 10mm																
	Becomes sandy GRAVEL with minor silt; dense.		9			50+	19/11/12/5/12 = 30mm																
	Possible sand layers.		10			41	13/8/7/12/14																
	Becomes very dense.		11			50	7/7/9/15/19																
			12			50+	11/29/21																
			13			50+	9/10/16/28																
			14			50+	21/18/20/11 = 25mm																
		15			50+	27/18/17/15 = 50mm																	
		16																					
		17																					
		18																					
		19																					
		20																					
		21																					
		22																					
		23																					
		24																					
		14																					

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	9/10/2012	FINISHED	9/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MST800
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH111**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH112**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677729 E 5405953 N**

R.L.

**10 m**

SHEET

**1 of 1**

LOCATION

**Thomsons Ford Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.335 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL			
Rapaura Formation	SILT; brown, soft, dry.		1																		
	Zones of SILT with some clay; blue-grey, soft, moist, low plasticity.		2																		
	Becomes soft to firm, moist, highly plastic.		3																		
	Silty SAND; dark grey, medium dense, moist.		4																		
	Becomes saturated.		5																		
	Gravelly SAND with some silt; dark grey, dense, saturated.		6																		
	Becomes sandy GRAVEL with some silt.		7																		
			8																		
	Becomes sandy silty GRAVEL.		9																		
	Becomes sandy GRAVEL with some silt.		10																		
	Becomes sandy silty GRAVEL.		11																		
	Becomes silty GRAVEL with some sand; dense.		12																		
	Becomes very dense.		13																		
	Becomes dense.		14																		
	Becomes sandy silty GRAVEL.		15																		
		16																			
		17																			
		18																			
		19																			
		20																			
		21																			
		22																			
		23																			
		24																			

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	10/10/2012	FINISHED	10/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MST800
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH112**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH113**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1678431 E 5405608 N**

R.L.

**9 m**

SHEET

**1 of 1**

LOCATION

**78 Old Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.24 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL			
Rapaura Formation	SILT with some clay; dark brown, soft, dry to moist, zones of low plasticity.	8	1	[Symbol]						0	Rootlets present.			BS	Hand Dug						
	Sandy SILT with some clay, soft, wet, zones of low plasticity.			[Symbol]										BS							
				[Symbol]												HD					
	Silty SAND with minor gravel; dark grey-brown, loose, wet.		2		[Symbol]	7	2/1/11/4					Gravel is subangular, 10 mm.			DHH	Rotary Percussive (Concentrix) Drilling					
	Becomes medium dense with some gravel.	6	3		[Symbol]	28	4/4/7/8/9					Gravel is subrounded, <30 mm.			SPT						
	Sandy silty GRAVEL; dark grey-brown, very dense, saturated.		4		[Symbol]	56	15/17/15/13/11					Gravel is well rounded to subangular, well graded to 30 mm. Sand is medium to coarse.			DHH						
			4		[Symbol]	50+	26/15/15/20								SPT						
	Becomes SAND with some gravel; dense.		6		[Symbol]	47	11/11/13/11/12								DHH						
	Becomes very dense.	2	7		[Symbol]	50+	17/16/19/15 = 55mm								SPT						
	Becomes gravelly SAND.		8		[Symbol]	50+	30/20/20/10 = 25mm								DHH						
	Becomes sandy GRAVEL.	0	9		[Symbol]	50+	14/17/21/12 = 30mm								SPT						
			10		[Symbol]	50+	23/28 (bouncing)								DHH						
			-2		[Symbol]	50+	34/25/12 = 10mm								SPT						
	Becomes sandy GRAVEL with some silt.		12		[Symbol]	50+	17/16/19/16 = 40mm					Sand is medium.			DHH						
			-4		[Symbol]	50+	18/24/26 = 55mm								SPT						
Silty GRAVEL with minor sand and clay; blue-grey, very dense, wet, clay zones have high plasticity.		14		[Symbol]	50+	24/42/8 = 5mm								DHH							
Sandy silty GRAVEL; dark grey-brown, very dense, saturated.		-6		[Symbol]	50+	23/33/17 = 15mm					Gravel is well rounded to subangular, well graded to 30 mm. Sand is medium to coarse.			SPT							

**NOTES**

Groundwater level at end of drilling 1.8 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	11/10/2012	FINISHED	11/10/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/AZIMUTH	-90°	DRILLING RIG	MST800
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH113**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13





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# BOREHOLE LOG

HOLE No.  
**BH114**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 20.295 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**38 Old Renwick Road**

CO-ORD.  
**1679067 E 5406028 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**7 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION		
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING			BASE OF HOLE & WATER LEVEL	
Rapaura Formation	SILT; dark grey-brown, very soft to soft, dry.		0																		
	Becomes SILT with some clay; moist, clay zones have high plasticity.		1									BS	Hand Dug								
			2			4	1/1/1/1/1					HD									
	Becomes saturated.		3			5	2/1/1/1/2					DHH									
	Becomes soft, mottled brown and blue-grey.		4			5	2/1/1/1/2					SPT									
			5			30	11/7/7/8/8					DHH									
	Sandy GRAVEL with some silt; grey, medium dense to dense, saturated.		6			24	5/4/5/5/10					SPT									
	Gravelly SAND; dark grey, medium dense, saturated.		7			50+	17/50 = 55mm					DHH									
	Becomes very dense.		8			50+	50 = 130mm					SPT									
			9			11	3/2/3/2/4					DHH									
			10			50+	7/10/13/20 /7 = 45mm					SPT									
			11			50+	14/14/17/13 /6 = 35mm					DHH									
			12			50+	20/18/18 /14 = 65mm					SPT									
	Possible interbedded soft layer.		13			50+	2/3/13/19 /15 = 70mm					DHH									
			14			38	10/10/9/8 /11					SPT									
			15			50+	25/21/22 /17 = 45mm					DHH									
	SILT with minor clay; dark grey, stiff, moist, low plasticity.		16			21	6/5/4/6/6					SPT									
	Sandy silty GRAVEL; brown, very dense, saturated.		17			50+	16/9/15/25 /1 = 5mm					DHH									
			18			50+	7/8/10/17 /15 = 60mm					SPT									
	Becomes dense.		19			40	2/4/9/10/17					DHH									
		20			50+	18/16/30 /4 = 10mm					SPT										
		21			50+	18/22/28 = 70mm					DHH										
		22									SPT										
		23																			
		24																			
		18																			

<b>NOTES</b> Groundwater level at end of drilling 1.2 m HD: Hand Dug BS: Bulk Sample PT: Push Tube Sample DHH: Down Hole Hammer SPT: Standard Penetration Test	STARTED	10/10/2012	FINISHED	11/10/2012
	DRILLER	Troy Norriss	DRILLING CO.	CW Drilling & Exploration Ltd
	INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
	LOGGED	Ella Williamson	CHECKED	Doug Mason
	CLIENT	Marlborough District Council	JOB No.	5C2128.01
LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES	SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS		<b>BH114</b>	

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH115**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1679178 E 5405490 N**

R.L.

**6 m**

SHEET

**1 of 1**

LOCATION

**26 Old Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**21.335 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION		
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE							RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL				
Rapaura Formation	SILT; brown, soft, dry. Zones of SILT with some clay; mottled brown and blue-grey, soft, moist, clay zones have medium to high plasticity.		1												BS	Hand Dug							
			2											BS									
			3												HD								
	Sandy silty GRAVEL; brown, dense, moist. Becomes saturated.		4	2		39	5/18/9/13/9						Gravel is well rounded, well graded to 30 mm. Sand is medium to coarse.			DHH							
			5	3		30	13/9/8/7/6						Gravel is well rounded to subangular.			SPT							
			6	4		32	16/10/7/7/8									DHH							
			7	5		42	12/10/10/11/11						Gravel is well rounded to subangular, well graded to 50 mm. Sand is medium to coarse. Heaving sand.			SPT							
	Sandy GRAVEL with some silt; dark grey, dense, saturated. Becomes very dense.		8	6		50+	14/9/14/14/13 = 35mm									DHH							
			9	7		38	7/8/10/10/10									SPT							
			10	8		50+	5/10/11/14/15 = 65mm									DHH							
	Becomes very dense. Possible interbedded sand layers. Becomes dense.		11	9		49	4/6/13/13/17									SPT							
			12	10		47	5/6/11/17/14						Quartz bands on gravel.			DHH							
			13	11		50+	18/13/14/13/10 = 45mm									SPT							
	Becomes sandy silty GRAVEL; very dense. Becomes medium dense.		14	12		28	7/4/4/7/13						Increased sand is SPT sample.			DHH							
			15	13		50+	16/26/26/1 = 5mm									SPT							
			16	14		31	10/7/8/9/7						Sand is fine.			DHH							
	SILT; grey, very stiff, saturated. SAND with some silt; dark grey, dense, saturated.		17	15		21	8/5/6/5/5									SPT							
			18	16		50+	16/16/23/11 = 35mm									DHH							
			19	17		50+	6/15/15/20 = 65mm									SPT							
	Possible interbedded sand layers.		20	18		50+	5/7/15/21/7 = 15mm									DHH							
			21	19		50+	11/23/27 = 55mm									SPT							
		22	20		50+	29/20/25/15 = 25mm									DHH								
		23	21		50+	21/17/23/10 = 35mm									SPT								
		24	22																				

**NOTES**

Groundwater level at end of drilling 1.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	18/10/2012	FINISHED	18/10/2012
DRILLER	Troy Norriss	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH115**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS



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# BOREHOLE LOG

HOLE No.

**BH201**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677560 E 5403630 N**

R.L.

**8 m**

SHEET

**1 of 1**

LOCATION

**David Street**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.325 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS		ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE						RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL			
Rapaura Formation	SILT with some gravel; brown, soft, moist.		1							0	Gravel is uniformly graded up to 1cm, subrounded to subangular.				Hand Dug						
	Sandy silty GRAVEL; dark brown, dense to very dense, wet to saturated.		2		43	6/5/7/8/ 15/13					Gravel is well graded up to 2cm, subrounded to subangular. Sand is medium to coarse grained.		SPT		Rotary Percussive (Concentrix) Drilling						
	Medium dense layer.		3		31	5/6/10/8/ 7/6							DHH								
			4		22	4/5/6/6/ 4/6							SPT								
	Medium dense layer.		5		43	5/6/10/10/ 11/12							DHH								
			6		45	5/8/10/ 10/13/12							SPT								
			7		43	3/5/8/ 10/12/13							DHH								
			8		50+	6/9/13/ 14/14/10 = 55mm							SPT								
			9		23	4/3/5/4/ 5/9						Heaving sand, small SPT sample recovered.		DHH							
			10		50+	5/8/10/ 12/14/14 = 55mm							SPT								
			11		50+	4/6/15/ 20/15 = 55mm							DHH								
			12		45	3/4/10/ 14/10/11							SPT								
			13		50+	10/25/ 18/32							DHH								
			14		50+	11/21/ 21/29 = 55mm							SPT								
			15		50+	5/7/10/16/ 18/6 = 25mm							DHH								
			16																		
			17																		
			18																		
			19																		
			20																		
			21																		
			22																		
			23																		
			24																		

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	18/12/2012	FINISHED	18/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH201**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.  
**BH202**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 15.41 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**25 Battys Road**

CO-ORD.  
**1677930 E 5403920 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**7 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING			BASE OF HOLE & WATER LEVEL
Rapaura Formation	Silty GRAVEL; grey, dense, dry. SILT; grey, stiff to very stiff, dry. Silty SAND with some clay; brown, loose, moist to wet, low plasticity.	6	1							0	Gravel is rounded, 10-40 mm. Sand is medium.				Hand Dug					
	Silty sandy GRAVEL; brown, very dense, wet.	2	2		50+	4/5//12/12/ 14/12 = 45mm					Gravel is rounded, well graded to 20 mm. Sand is medium to coarse.			DHH	Rotary Percussive (Concentrix) Drilling					
		4	3		50+	7/13//12/ 15/21/12 = 40mm								SPT						
		4	4		50+	9/12//14/ 11/11/14 = 70mm								DHH						
		2	5		37	5/10//7/6/ 9/15					Gravel is rounded, well graded to 30mm. Sand is medium to coarse.			SPT						
	Becomes sandy GRAVEL; brown, dense, wet.	6	6		39	3/9//9/12/ 7/11								DHH						
	Becomes very dense.	0	7		50+	5/6//9/14/ 18/9 = 50mm					Gravel up to 40 mm.			SPT						
	Becomes medium dense.	8	8		29	5/10//9/6/ 4/10								DHH						
		-2	9		18	2/2//3/3/ 5/7					Large fibrous wood inclusion. Heaving sand in SPT. Rootlets, quartz gravel.			SPT						
	Becomes dense.	10	10		49	6/6//8/11/ 15/15								DHH						
	Becomes very dense.	-4	11		50+	4/6//10/15/ 20/15 = 45mm								SPT						
		12	12		50+	4/14//18/ 20/12 = 35mm								DHH						
		-6	13		50+	10/17//19/ 31								SPT						
	Becomes sandy GRAVEL with some silt; brown, very dense, wet.	14	14		50+	3/10//14/ 20/16 = 30mm								DHH						
		-8	15		50+	7/12//15/6/ 19/10 = 35mm								SPT						
	16	16																		
	-10	17																		
	18	18																		
	-12	19																		
	20	20																		
	-14	21																		
	22	22																		
	-16	23																		
	24	24																		
	-18	25																		

## NOTES

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	11/12/2012	FINISHED	11/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH202**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ\_OPUS\_WLG\_REV090525.GDT\_19/02/13



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# BOREHOLE LOG

HOLE No.  
**BH203**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 15.45 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**Off Rose Street**

CO-ORD.  
**1677410 E 5404619 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**9 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT N VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Rapaura Formation	SILT; dark brown, soft, dry.		8		4	1/1/1/1/1/1			0		Rootlets.			BS	Hand Dug				
	Silty CLAY; mottled grey and brown, soft, moist, moderate to high plasticity. Becomes firm.		2		8	1/1/2/2/2/2								SPT					
	Clayey SAND with some gravel; dark grey, very dense, wet, high plasticity. Sandy GRAVEL with some clay; dark grey, very dense, wet, sand and clay matrix has high plasticity.		3		50+	6/26/28/12/10/6 = 45mm					Gravel is rounded, well graded to 40 mm. Sand is fine.			SPT					
			4		50+	5/24/19/18/23								SPT					
	Becomes sandy GRAVEL.		5		48	3/33/16/10/12/11								DHH					
			6		50+	2/2/7/21/20/9 = 35mm								SPT					
			7		50+	4/12/14/30/6 = 15mm								SPT					
	Clayey SILT with some minor sand; brown, firm, wet, moderate plasticity. SILT with some clay; blue-grey, firm, moist, low plasticity.		8		12	2/2/2/3/3/4					Sand is fine.			BS					
	Silty GRAVEL with some clay; grey, very dense, wet. GRAVEL with some sand and silt; brown, very dense, wet.		9		50+	4/8/11/15/24 = 55mm					Gravel is subrounded, well graded to 30 mm. Gravel is subrounded, well graded to 30 mm. Sand is fine.			SPT					
			10		48	4/18/9/8/10/13								SPT					
		11		46	7/7/10/13/10/13								DHH						
		12		50+	5/6/24/26 = 25mm								SPT						
		13		50+	1/16/25/25 = 70mm								SPT						
		14		50+	3/8/20/26/4 = 5mm								SPT						
		15		50	2/1/4/8/14/24								SPT						
		16																	
		17																	
		18																	
		19																	
		20																	
		21																	
		22																	
		23																	
		24																	
		16																	

### NOTES

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	6/12/2012	FINISHED	6/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH203**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS



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# BOREHOLE LOG

HOLE No.

**BH204**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676850 E 5404519 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**Off Middle Renwick Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**10.355 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
Rapaura Formation	SILT with some clay; brown, soft, dry.	10	1	[Symbol]						0	Rootlets.				Hand Dug					
	Silty SAND with minor clay; dark brown, medium dense, moist.	8	2	[Symbol]	16	1/1/1/5/5/5				90	Sand is fine to medium grained.				SPT					
	Sandy silty GRAVEL; brown, very dense, wet.	8	3	[Symbol]	39	5/10/9/10/10/10						Gravel is well graded up to 4cm, subrounded. Sand is fine to medium grained.				SPT				
		4	4	[Symbol]	50+	5/9/10/14/16/10 = 40mm											DHH			
	GRAVEL with minor sand; greyish brown, dense, wet.	6	5	[Symbol]	50+	8/22/23/27						Gravel is well graded to 3cm, subrounded.				SPT				
		4	6	[Symbol]	50+	7/12/16/26/8 = 45mm											DHH			
Sandy silty GRAVEL; brown, dense to very dense, wet.	8	7	[Symbol]	32	4/3/5/6/7/14						Gravel is well graded to 2cm, subrounded. Sand is coarse grained.				SPT					
	2	8	[Symbol]	50+	3/7/10/10/11/19 = 35mm											DHH				
		10	9	[Symbol]	39	2/6/9/14/7/9										SPT				
		10	10	[Symbol]	50+	12/26/16/13/11/10 = 55mm										SPT				

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	17/12/2012	FINISHED	17/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH204**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS



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# BOREHOLE LOG

HOLE No.

**BH205**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677233 E 5404709 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**Westwood Avenue**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.34 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION		
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE							RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL				
Rapaura Formation	SILT; brown, soft, dry.		10								0	Rootlets.			BS	Hand Dug							
	Silty CLAY; mottled brown and grey, soft, moist, moderate to high plasticity.		2		7	1/2/1/2/2/2									DHH								
	Sandy CLAY with some gravel; dark grey, very stiff, moist, moderate to high plasticity.		8		49	3/8/9/8/12/20							Gravel is rounded, uniformly graded up to 5-10 mm. Sand is medium. Gravel is subrounded, well graded to 30 mm. Sand is medium.			BS							
	Sandy GRAVEL; dark brown, dense to very dense, saturated.		4		48	9/9/11/12/12/13										SPT							
			6		50+	5/6/9/12/15/15											DHH						
			6		38	5/7/10/10/9/9											SPT						
			4		10	4/2/2/2/2/4								Heaving sand in SPT.			DHH						
	Sandy CLAY; dark brown, firm, wet, high plasticity.		8		13	2/1/3/2/3/5								Sand is fine.			SPT						
	Silty CLAY with minor sand; blue-grey, firm, wet, high plasticity.		2		50+	3/16/19/24/7 = 25mm								Gravel is subrounded, well graded to 20 mm.			DHH						
	Clayey GRAVEL with some silt; blue-grey, very dense, wet, matrix has high plasticity.		10		50+	5/13/19/14/17								Gravel is subrounded, well graded to 30 mm. Sand is medium.			SPT						
	Sandy GRAVEL with some silt; brown, dense to very dense, saturated.		0		50+	2/4/4/24/12 = 45mm											DHH						
	Interbedded loose layer.		12		50+	7/25/27/23											SPT						
			-2		35	9/7/8/7/9/11											DHH						
			14		50+	5/8/15/25/10 = 50mm											SPT						
			-4		50+	3/8/18/27/6 = 40mm											DHH						
		16														SPT							
		-6																					
		18																					
		-8																					
		20																					
		-10																					
		22																					
		-12																					
		24																					
		-14																					

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	7/12/2012	FINISHED	7/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH205**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS



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# BOREHOLE LOG

HOLE No.

**BH206**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676940 E 5405020 N**

R.L.

**11 m**

SHEET

**1 of 1**

LOCATION

**Rene Street**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**10.45 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
Rapaura Formation	Gravelly SILT; brown, soft, dry.	10	1						0	Gravel is uniformly graded up to 1cm, subrounded.				Hand Dug						
	Gravelly SILT with some clay; yellowish brown, very dense, moist.	8	2		50+	8/15//15/ 18/19 = 40mm				Gravel is uniformly graded up to 2cm, subrounded.			SPT							
	Sandy silty GRAVEL; dark brown, dense, wet to saturated.	6	3		35	6/9//7/11/ 8/9				Gravel is well graded to 3cm, subrounded to subangular. Sand is coarse grained.			SPT							
	Becomes medium dense.	4	4		26	3/4//5/8/ 7/6							SPT							
	Becomes loose.	6	5		7	5/3//1/1/1/4							DHH							
	Becomes dense.	4	6		41	6/8//9/10/ 11/11							SPT							
	SAND; dark brown, very dense, moist.	4	7		50+	20/20 = 35mm				SPT bouncing. Sand is coarse grained.			SPT							
Sandy GRAVEL; dark brown, dense wet.	8	8		36	5/7//7/7/ 10/12				Gravel is well graded to 3cm, subrounded to subangular. Sand is coarse grained.			SPT								
		2	9		31	3/4//4/6/ 9/12						SPT								
		10	10		46	2/6//8/7/ 11/20						SPT								
		0	11																	
			12																	
		-2	13																	
			14																	
		-4	15																	
			16																	
		-6	17																	
			18																	
		-8	19																	
			20																	
		-10	21																	
			22																	
		-12	23																	
			24																	
		-14																		

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	19/12/2012	FINISHED	19/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH206**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS





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# BOREHOLE LOG

HOLE No.

**BH207**

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1676910 E 5405390 N**

R.L.

**12 m**

SHEET

**1 of 1**

LOCATION

**Blicks Lane**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.3 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL		
Rapaura Formation	SILT with some gravel; brown, soft, dry.		1							0	Gravel is uniformly graded up to 1cm, subrounded to subangular.				Hand Dug					
	Gravelly SILT; brown, hard, dry.		2		50+	8/14//15/ 18/14/13 = 65mm					Gravel is well graded to 3cm, subrounded.			SPT						
	Becomes wet with some sand.		3		50+	5/6//8/ 13/16/13 = 65mm								DHH						
	Silty sandy GRAVEL; brown, medium dense to very dense, wet.		4		26	3/7//8/7/5/6					Gravel is well graded up to 3cm, subrounded to subangular. Sand is medium grained.			SPT						
			5		50+	6/8//7/16/ 14/13 = 50mm								DHH						
			6		41	4/12//12/ 10/5/14								SPT						
	Gravelly SAND; brown, dense to very dense, wet.		7		41	6/7//8/9/ 11/13					Gravel is uniformly graded up to 1cm, subrounded. Sand is coarse grained.			SPT						
			8		50+	6/21//32 = 50mm								DHH						
			9		28	4/6//6/8/7/7					Gravel is well graded to 2cm, subrounded. Sand is medium grained.			SPT						
	Silty sandy GRAVEL; brown, medium dense to very dense, wet to saturated.		10		36	3/6//6/8/ 10/12								DHH						
			11		50+	2/14//12/17/ 18/3 = 5mm								SPT						
			12		50+	1/3//16/18/ 16 = 25mm								DHH						
	Some clay present.		13		50+	12/25//39/ 11 = 30mm								SPT						
	Some silt and minor clay.		14		46	3/2//5/10/ 14/17								DHH						
			15		50+	3/15//25/25								SPT						
		16																		
		17																		
		18																		
		19																		
		20																		
		21																		
		22																		
		23																		
		24																		

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	19/12/2012	FINISHED	19/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH207**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.

**BH208**

PROJECT  
**Blenheim Urban Growth Study - Stage 2**

CO-ORD.  
**1677526 E 5405521 N**

R.L.  
**10 m**

SHEET  
**1 of 1**

LOCATION  
**156 Old Renwick Road**

REF. GRID  
**NZ Transverse Mercator**

DATUM  
**MSL**

HOLE LENGTH  
**10.365 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION	
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING			BASE OF HOLE & WATER LEVEL
Rapaura Formation	SILT; dark brown, soft, dry.		0-1	[Symbol]						0										
	Sandy CLAY; dark grey, very soft to soft, moist, moderate plasticity. Becomes clayey SAND; dark grey, loose, wet.		1-2	[Symbol]	4	1/1/1/1/1/1				90	Sand is medium. Clay has low plasticity.			BS	Hand Dug					
			2-3	[Symbol]	7	1/1/1/1/1/4														
	Sandy GRAVEL; brown, very dense, wet.		3-4	[Symbol]	50+	5/10/15/17/14/4 = 30mm						Gravel is subangular to subrounded, well graded to 20 mm. Sand is medium								
			4-5	[Symbol]	50+	8/11/14/16/19						Gravel is subrounded, well graded to 30 mm.								
			5-6	[Symbol]	50+	6/7/14/15/19/2 = 5mm														
	Sandy GRAVEL/Gravelly SAND.		6-7	[Symbol]	50+	9/4/32/18 = 35mm						Heaving sand.								
			7-8	[Symbol]	50+	7/12/25/25 = 55mm						Gravel is well rounded.								
			8-9	[Symbol]	50+	3/8/20/20/10 = 35mm														
			9-10	[Symbol]	50+	7/16/18/19/13 = 65mm														
			10-11	[Symbol]																
			11-12	[Symbol]																
			12-13	[Symbol]																
			13-14	[Symbol]																
			14-15	[Symbol]																
			15-16	[Symbol]																
			16-17	[Symbol]																
			17-18	[Symbol]																
			18-19	[Symbol]																
			19-20	[Symbol]																
			20-21	[Symbol]																
			21-22	[Symbol]																
			22-23	[Symbol]																
			23-24	[Symbol]																

**NOTES**

Groundwater level at end of drilling 2.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	10/12/2012	FINISHED	10/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH208**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ\_OPUS\_WLG\_REV090525.GDT\_19/02/13



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# BOREHOLE LOG

HOLE No.  
**BH209**

PROJECT  
**Blenheim Urban Growth Study - Stage 2**

CO-ORD.  
**1677382 E 5402149 N**

R.L.  
**16 m**

SHEET  
**1 of 1**

LOCATION  
**New Renwick Road**

REF. GRID  
**NZ Transverse Mercator**

DATUM  
**MSL**

HOLE LENGTH  
**14 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION			
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING			BASE OF HOLE & WATER LEVEL		
Speargrass Formation	SILT; brown, soft, dry. Becomes light brown, hard.	14	1	[Symbol]						0	Rootlets.				Hand Dug							
	Gravelly SILT; brown, hard, dry.	14	2	[Symbol]	50+	6/10/9/11/11/9					Gravel is subangular to subrounded, well graded to 40 mm.				DHH							
			3	[Symbol]	23	2/4/5/7/6/5						Gravel is subangular, <5 mm. Iron staining.				SPT						
	CLAY with some silt and minor gravel; mottled dark brown and grey, firm, moist, moderate plasticity.	12	4	[Symbol]	9	1/2/1/3/2/3									DHH	Rotary Percussive (Concentrix) Drilling						
			5	[Symbol]	10	1/1/2/1/2/5									SPT							
	Clayey GRAVEL; brown, dense to very dense, moist. Becomes saturated.	8	6	[Symbol]	9	1/1/1/2/3/3									DHH							
			7	[Symbol]	12	1/1/2/2/3/5									SPT							
				8	[Symbol]	45	7/10/9/11/12/13					Gravel is subangular, well graded to 20 mm. Clay has high plasticity.					DHH					
				9	[Symbol]	30	5/6/6/7/9/8										SPT					
				10	[Symbol]	50	10/14/13/12/11/14										DHH					
				11	[Symbol]	50+	8/12/12/14/15/9 = 35mm										SPT					
				12	[Symbol]	50+	4/11/12/20/18 = 15mm					Gravel is subrounded to 30 mm.					DHH					
				13	[Symbol]	45	3/5/9/11/12/13										SPT					
				14	[Symbol]										DHH							
			15	[Symbol]																		
			16	[Symbol]																		
			17	[Symbol]																		
			18	[Symbol]																		
			19	[Symbol]																		
			20	[Symbol]																		
			21	[Symbol]																		
			22	[Symbol]																		
			23	[Symbol]																		
			24	[Symbol]																		

**NOTES**

Groundwater level at end of drilling 7.1 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	11/12/2012	FINISHED	12/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Ella Williamson	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH209**



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# BOREHOLE LOG

HOLE No.

## BH210

PROJECT

**Blenheim Urban Growth Study - Stage 2**

CO-ORD.

**1677920 E 5402175 N**

R.L.

**13.9 m**

SHEET

**1 of 1**

LOCATION

**Off Battys Road**

REF. GRID

**NZ Transverse Mercator**

DATUM

**MSL**

HOLE LENGTH

**15.45 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK STRENGTH	ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING				PIEZOMETER DETAILS	OTHER INSTRUMENTATION		
					SPT N° VALUE	SPT BLOW COUNTS OR SHEAR VALUE							RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING	BASE OF HOLE & WATER LEVEL				
Speargrass Formation	SILT with some gravel; brown, soft, dry.		1									Gravel is uniformly graded up to 1cm, subrounded to subangular.				Hand Dug							
	Becomes stiff.		2		25	4/5/6/6/7/6								DHH									
	Silty SAND with some gravel and minor clay; brown, medium dense, dry. Becomes more silty.		3		19	3/7/5/6/3/5							Gravel is uniformly graded up to 1cm, subrounded to subangular. Sand is medium to coarse grained.										
	Gravelly SILT with some clay; brown, very stiff, dry.		4		38	3/8/8/8/9/13							Gravel is well graded up to 3cm, subrounded to subangular.										
	Becomes wet.		5		50+	6/18/14/11/14/7 = 70mm							Gravel up to 5cm.										
	Clayey GRAVEL with some sand; brown, dense, wet.		6		42	3/7/8/7/14/13																	
	Becomes medium dense.		7		39	4/6/9/9/13/8																	
	Becomes dense.		8		26	4/5/6/6/8/6																	
			9		37	6/7/7/9/9/12																	
			10		34	6/7/7/6/10/11																	
			11		37	13/10/9/7/7/14																	
	Becomes very dense.		12		50+	8/12/14/22/16 = 55mm								Gravel up to 2cm, subrounded.									
	Becomes saturated.		13		50+	10/14/24/21/4 = 10mm																	
	Becomes dense.		14		47	8/25/13/10/10/14																	
	10cm bed of gravelly CLAY; mottled orange and brown, stiff, wet.		15		25	5/10/12/4/4/5																	
		16																					
		17																					
		18																					
		19																					
		20																					
		21																					
		22																					
		23																					
		24																					

### NOTES

Groundwater level at end of drilling 6.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	13/12/2012	FINISHED	13/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/ AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH210**

LOGGED IN ACCORDANCE WITH NZ GEOTECHNICAL SOCIETY (2005) GUIDELINES

SEE ATTACHED KEY SHEET FOR EXPLANATION OF SYMBOLS

BOREHOLE\_LOG\_A3\_5C2128.01\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_STAGE\_2.GPJ OPUS WLG REV090525.GDT 19/02/13



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# BOREHOLE LOG

HOLE No.  
**BH211**

PROJECT  
**Blenheim Urban Growth Study - Stage 2**

CO-ORD.  
**1677629 E 5402411 N**

R.L. SHEET  
**12 m 1 of 1**

LOCATION  
**Off New Renwick Road**

REF. GRID  
**NZ Transverse Mercator**

DATUM HOLE LENGTH  
**MSL 15.37 m**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Speargrass Formation	SILT with some gravel; brown, soft, dry.		1							0	Gravel is well graded up to 3cm, subrounded to subangular.				Hand Dug				
	Gravelly SILT; brown, firm, dry.		2		13	6/10/12/2/5/4				90	Gravel is well graded up to 2cm, subrounded to subangular.			DHH					
	Gravelly CLAY with some silt; mottled orange and brown, firm, moist, moderate plasticity.		3		11	1/2/1/3/2/3/3					Iron staining. Gravel is well graded up to 2cm, subrounded.			DHH					
	Gravelly SILT with some sand; brown, firm, moist.		4		14	3/3/1/3/3/3/5					Gravel is well graded up to 2cm, mostly less than 1cm, subrounded. Sand is fine.			SPT					
	Sandy GRAVEL; brown, medium dense, wet.		5		29	6/8/10/5/6/8					Gravel is uniformly graded up to 1cm, subrounded to subangular. Sand is coarse.			DHH					
	0.5m layer of very dense GRAVEL with some sand.		6		50+	5/13/15/16/19								SPT					
			7		50+	5/7/11/19/16/12/3 = 25mm								DHH					
	Gravelly CLAY with some silt; brown, hard, wet.		8		50+	6/4/8/10/12/20 = 65mm						Gravel is well graded up to 2cm, subrounded to subangular, highly weathered.			SPT				
	Sandy GRAVEL; brown, dense, wet.		9		46	6/12/11/14/12/13/7						Gravel is well graded up to 4cm, subrounded. Sand is coarse.			DHH				
			10		34	6/8/8/7/7/12								SPT					
	Becomes saturated.		11		50	4/6/7/9/13/21								DHH					
	Becomes very dense.		12		50+	12/20/12/21/20/3 = 10mm						Gravels up to 2cm.			SPT				
			13		50+	13/21/28/22								DHH					
			14		50+	6/16/16/24/26								SPT					
			15		50+	8/16/17/8/15 = 70mm								DHH					
		16											SPT						
		17																	
		18																	
		19																	
		20																	
		21																	
		22																	
		23																	
		24																	

**NOTES**

Groundwater level at end of drilling 5.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	13/12/2012	FINISHED	13/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH211**



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# BOREHOLE LOG

HOLE No.  
**BH212**  
 SHEET  
 1 of 1  
 HOLE LENGTH  
 15.42 m

PROJECT  
**Blenheim Urban Growth Study - Stage 2**  
 LOCATION  
**Off New Renwick Road**

CO-ORD.  
**1677387 E 5402709 N**  
 REF. GRID  
**NZ Transverse Mercator**

R.L.  
**11 m**  
 DATUM  
**MSL**

GEOLOGY/UNIT	MAIN DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS			ROCK WEATHERING	DEFECT SPACING	DIP degrees	DETAILED DESCRIPTION	CORE			DRILLING			PIEZOMETER DETAILS	OTHER INSTRUMENTATION
					SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH					RQD (%)	TOTAL CORE RECOVERY (%)	SAMPLE TYPE	DRILLING METHOD	DRILLING FLUID LOSS	CASING		
Speargrass Formation	SILT with some gravel; brown, soft, dry.		10							0	Gravel is uniformly graded up to 1cm, subangular.				Hand Dug				
	Sandy GRAVEL; brown, loose to medium dense, dry.		1							90	Gravel is uniformly graded up to 1cm, subrounded to subangular.			DHH					
	Gravelly SAND with some silt; brown, loose, dry.		2			5	2/1/1/1/1/2							SPT					
	CLAY with some silt and minor gravel; mottled orange and brown, firm, moist, moderate plasticity.		3			9	1/1/1/1/3/4					Gravel is uniformly graded up to 1cm, subrounded.			DHH				
	Gravelly SILT; brown, very stiff, moist to dry.		4			41	6/11/10/12/11/8					Gravel is well graded up to 4cm, subrounded to subangular.			SPT				
	Becomes wet.		5			34	9/10/12/2/11/9								DHH				
	Becomes saturated. Some sand present.		6			17	3/3/3/4/4/6								SPT				
	CLAY with some silt and minor gravel; brown, soft, wet, high plasticity.		7			10	1/0/2/2/2/4					Gravel is uniformly graded up to 1cm, subrounded to subangular.			DHH				
	Gravelly SILT with some sand; brown, very stiff, wet.		8			38	5/7/10/10/10/8					Gravel is well graded up to 4cm, subrounded to subangular.			SPT				
	CLAY with some silt and minor gravel; brown, soft, wet, high plasticity.		9			18	4/5/4/5/4/5					Gravel is uniformly graded up to 1cm, subrounded to subangular.			DHH				
	Gravelly SAND with some silt; brown, dense, wet.		10			50	2/6/14/15/14/7					Gravel is well graded up to 2cm, well rounded.			SPT				
	Sandy GRAVEL; brown, very dense, wet.		11			50+	8/15/21/26/23 = 10mm								DHH				
	Becomes saturated.		12			50+	5/22/38					SPT bouncing.			SPT				
			13			50+	1/5/13/13/10/14 = 65mm								DHH				
			14			50+	3/8/17/28/5 = 15mm					Gravels up to 5cm.			SPT				
		15			50+	3/7/8/16/17/9 = 45mm								DHH					
		16												SPT					
		17																	
		18																	
		19																	
		20																	
		21																	
		22																	
		23																	
		24																	
		14																	

**NOTES**

Groundwater level at end of drilling 3.0 m  
 HD: Hand Dug  
 BS: Bulk Sample  
 PT: Push Tube Sample  
 DHH: Down Hole Hammer  
 SPT: Standard Penetration Test

STARTED	12/12/2012	FINISHED	12/12/2012
DRILLER	Barclay Moir	DRILLING CO.	CW Drilling & Exploration Ltd
INCLINATION/AZIMUTH	-90°	DRILLING RIG	MP100
LOGGED	Allannah Morpeth	CHECKED	Doug Mason
CLIENT	Marlborough District Council	JOB No.	5C2128.01

**BH212**



# **Appendix B**

## Driller's logs







CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#101 PROJECT LOCATION Adjacent to Battys Road

DATE STARTED 3/10/12 COMPLETED 3/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 1.50 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
2		Hand dug two starter holes, located cables in first. Bore backfilled upon completion		Dark Brown silty Gravels
		SPT@2m,2,1,1,1,1 Push tube sample		Light brown silty clay
4		SPT@3m,3,1,1,1,2 Push tube sample		
		SPT@4m,1,1,1,2,2 Push tube sample		Blue/grey Silt
6		SPT@5m,1,1,0,0		
		SPT@6m,4,1,3,3,4		
		SPT@7m,7,3,3,2,2		
8		SPT@8m,10,7,10,11,13		Brown silty Gravels
		SPT@9m,11,10,12,10,16		Light brown silty Gravels
10		SPT@10m,16,26,24-70mm travel		
		SPT@11m,25,17,19,14-65mm travel		
12		SPT@12m,19,19,19,12-35mm travel		
		SPT@13m,22,24,26-35mm travel		
14		SPT@14m,18,12,35,3-5mm travel		
		SPT@15m,25,27,23-45mm travel		
				Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS 101 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#102 PROJECT LOCATION David Street, Blenheim


DATE STARTED 1/10/12 COMPLETED 2/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman  $\nabla$  AT END OF DRILLING 1.20 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		Dark brown silt
			1.10	
			1.30	Light brown silty clay
				Light brown silty clay, saturated
2	SPT @2 7,8,11,12,12		2.10	Light brown silty Gravels
		SPT @ 3m,22,22,13,11,4	3.00	Light brown, sandy Gravels
4	SPT @ 4m, 13,9,8,6,8			
		SPT @ 5m, 21,21,25,6-20mm travel		
6	SPT @ 6m,10,11,11,12,12			
		SPT @ 7m,4,2,2,3,3	6.80	Brown silty clay
			7.40	Light brown sandy Gravels
8	SPT@ 8m,21,15,12,14,9-50mm travel			
		SPT@9m,28,24,22,4-10mm travel		
10	SPT @10m,27,22,26,4-15mm travel			
		SPT @11m,8,12,21,17-55mm travel		
12	SPT@12m,3,2,1,4,7(heaved sand)-invalid result		11.70	Grey Sand
		SPT@13m,11,20,13,25,2-10mm travel	12.70	Light brown/grey silty Gravels
14	SPT@14m,12,12,11,13,14			
		SPT@15m,7,11,14,25	15.00	Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS 102 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#103 PROJECT LOCATION Adjacent to Saverne Street

DATE STARTED 4/10/12 COMPLETED 4/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman  $\nabla$  AT END OF DRILLING 1.50 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		Dark Brown sandy Gravels
2		SPT@2m,27,16,25,9-25mm travel		$\nabla$
		SPT@3m,18,9,14,12,15-70mm travel		
4		SPT@4m,20,10,11,13,12 travel		
		SPT@5m,18,10,9,10,11 travel		
6		SPT@6m,8,12,12,19,17-10mm travel		
		SPT@7m,20,13,30,7-25mm travel		
8		SPT@8m,19,15,16,17,2-10mm travel		8.00
		SPT@9m,8,13,23,10-40mm travel		Light brown silty Gravels
10		SPT@10m,17,13,21,17-35mm travel		
		SPT@11m,12,8,10,11,12 travel		
12		SPT@12m,20,9,17,17,7-20mm travel		
		SPT@13m,27,20,21,9-25mm travel		
14		SPT@14m,14,14,19,17-40mm travel		
		SPT@15m,4,7,6,19,18-70mm travel		15.00
				Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL / OPUS BLENHEIM UGS 103 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#104 PROJECT LOCATION 3 Rose Street, Blenheim

DATE STARTED 4/10/12 COMPLETED 4/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 1.50 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Hole backfilled upon completion		Dark brown topsoil
2		SPT@2m,8,8,8,6,9	1.90	Dark brown silty Gravels
		SPT@3m,17,12,10,11,15	3.00	Light brown sandy Gravels
4		SPT@4m,21,11,21,13,5-3 mm travel		
		SPT@5m,20,20,21,9-20 mm travel		
6		SPT@6m,13,14,10,14,12	6.00	Poorly sorted Gravels, some sands
		SPT@7m,11,9,12,9,9		
8		SPT@8m,14,9,12,14,11		
		SPT@9m,13,10,23,17-80 mm travel		
10		SPT@10m,25,34,16-35 mm travel	10.00	Bottom of hole at 10.00 m.

GENERAL\_BH/TP /WELL /OPUS\_BLENHEIM\_UGS104\_GPJ\_CW\_DRILLING\_GDT\_23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#105 PROJECT LOCATION Adjacent to Middle Renwick Road

DATE STARTED 8/10/12 COMPLETED 9/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Troy Norris CHECKED BY James Chapman ▼ AT END OF DRILLING 1.30 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0		Alloy flush toby installed at surface		Light brown silts/sandy clay	Cemented to surface
1.90					
2		SPT@2m,7,6,6,6,6		Light brown/grey sandy Gravels	Bentonite seal 50mm Blank upvc pipe  Blinding sand  Walton park washed Gravels 50mm machine slotted upbv wellscreen
3		SPT@3m,16,11,10,10,8			
4		SPT@4m,14,10,9,8,10			
5		SPT@5m,14,9,11,11,12			
6		SPT@6m,6,6,7,10,9			
7		SPT@7m,15,14,17,19-70mm travel			
8		SPT@8m,9,7,15,14,14-55mm travel			
9		SPT@9m,10,12,12,15,17-65mm travel			
10		SPT@10m,22,15,18,17-65mm travel			
11		SPT@11m,12,14,15,19,2-10mm travel			
12		SPT@12m,16,17,18,15-55mm travel			
13		SPT@13m,12,13,20,17-40mm travel			
14		SPT@14m,21,17,17,14-55mm travel			
15		SPT@15m,14,22,21,7-20mm travel		Bottom of hole at 15.00 m.	

GENERAL BH / TP / WELL OF US BLENHEIM UGS 105 GPJ CW DRILLING.GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#106 PROJECT LOCATION \_\_\_\_\_  
 DATE STARTED 5/10/12 COMPLETED 8/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING ---  
 LOGGED BY Troy Norris CHECKED BY James Chapman ▼ AT END OF DRILLING 2.00 m  
 NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		0.30 Dark brown silt/topsoil Brown sandy Gravels
2	SPT@2m,2,9,7,9,9			1.70 ▼ Light brown sandy silty Gravels
4	SPT@3m,18,10,16,15,9			
	SPT@4m,16,9,6,8,7			
	SPT@5m,7,8,6,7,9			
6	SPT@6m,3,1,1,1,4			5.50 Reddish, sandy silty Gravels
8	SPT@7m,21,13,12,11,4			
	SPT@8m,4,4,5,5,8			7.50 Brown sandy Gravels, some silts
10	SPT@9m,8,11,11,10,11			
	SPT@10m,50-90mm travel			
	SPT@11m,6,7,18,17,8-45mm travel			
12	SPT@12m,2,3,8,10,10			
	SPT@13m,19,20,24,6-15mm travel			
14	SPT@14m,5,11,11,14,13			
	SPT@15m,14,16,16,18-60mm travel			15.00 Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS106 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#108 PROJECT LOCATION Adjacent to Old Renwick Road

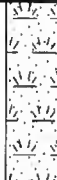














DATE STARTED 10/10/12 COMPLETED 10/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Troy Norris CHECKED BY James Chapman ▽ AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		Dark brown silt/topsoil
2	SPT@2m,14,8,11,15,15			2.00 ▽ Brown silty clay
	SPT@3m,10,10,11,29-70	travel		3.00 Brown sand
4	SPT@4m,21,13,9,8,10			3.80 Light brown/grey, sandy Gravels
	SPT@5m,14,11,11,13,10			
6	SPT@6m,14,11,10,10,10			
	SPT@7m,14,7,9,14,13			
8	SPT@8m,7,10,9,13,14			
	SPT@9m,4,6,9,5,7			
10	SPT@10m,4,3,16,31-70	travel		
	SPT@11m,4,11,14,16,9-39	travel		
12	SPT@12m,5,9,11,15,15-56	travel		
	SPT@13m,7,2,7,11,12			
14	SPT@14m,16,30,19,1-10	travel		
	SPT@15m,6,7,7,22,14-35	travel		
				Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OF US BLENHEIM UGS108 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#109 PROJECT LOCATION Adjacent to Old Renwick Road

DATE STARTED 9/10/12 COMPLETED 9/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Troy Norris CHECKED BY James Chapman AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0		Alloy Flush toby installed at surface		Dark brown silt/topsoil	
2		SPT@2m,14,8,11,15,14		2.00 ▽ Brown/grey silty sandy Gravels	
3		SPT@3m,10,10,11,29-70mm travel			
4		SPT@4m,21,13,9,8,10			
5		SPT@5m,14,11,11,13,7			
6		SPT@6m,14,11,10,10,10			
7		SPT@7m,14,7,9,14,13			
8		SPT@8m,7,10,9,3,14			
9		SPT@9m,4,6,9,5,7			
10		SPT@10m,4,3,16,31-70mm travel			
11		SPT@11m,4,11,14,16,9-35mm travel			
12		SPT@12m,5,9,11,15,15-50mm travel			
13		SPT@13m,7,2,7,11,12			
14		SPT@14m,16,30,19,1-10mm travel			
15		SPT@15m,6,7,7,22,14-35mm travel		15.00 Bottom of hole at 15.00 m.	

GENERAL BH / TP / WELL / OPUS BLENHEIM UGS 109 GPJ CW DRILLING GDT 23/10/12





CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#110 PROJECT LOCATION Blicks Lane

DATE STARTED 5/10/12 COMPLETED 5/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 3.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
2		Bore backfilled upon completion Two hand clearances, first located cables.  SPT@2m,2,1,1,2,5		Dark brown silt/topsoil
4		SPT@3m,16,10,10,8,9  SPT@4m,27,17-50mm travel, bouncing	 	Brown silty Gravels  Light brown sandy Gravels
6		SPT@5m,19,13,16,13,8-30mm travel  SPT@6m,19,19,26,15-55mm travel		Light brown sandy Gravels
8		SPT@7m,27,19,18,13-40mm travel  SPT@8m,21,18,19,13-55mm travel		Light brown sandy Gravels
10		SPT@9m,13,7,12,19,9  SPT@10m,15,10,13,12,14		Light brown sandy Gravels
12		SPT@11m,20,16,20,14  SPT@12m,9,9,12,12,18		Light brown silty Gravels
14		SPT@13m,9,7,15,16,18  SPT@14m,20,12,11,14,12-50mm travel		Light brown sandy Gravels
15		SPT@15m,10,9,14,16,11-40mm travel		Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL: OPUS BLENHEIM UGS 110 GPJ CW DRILLING GDT 23/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#111 PROJECT LOCATION In a vinyard North of Old Renwick Road

DATE STARTED 9/10/12 COMPLETED 9/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		Dark brown silt with some fine gravels
2		SPT@2m,11,6,4,6,5		Brown silt
				Light brown/grey sandy Gravels
4		SPT@3m,12,11,10,9,9		
		SPT@4m,16,12,12,11,11		
		SPT@5m,20,11,12,27-70m travel		
6		SPT@6m,11,11,13,15,11		
		SPT@7m,11,15,9,11,11		
8		SPT@8m,24,22,24,4-10m travel		
		SPT@9m,19,11,12,15,12-30m travel		
10		SPT@10m,13,8,7,12,11		
		SPT@11m,7,7,9,15,19		
12		SPT@12m,11,29,21		
		SPT@13m,9,10,16,24		
14		SPT@14m,21,18,20,1		
		SPT@15m,29,18,17,15-50m travel		Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL - OPIUS BLENHEIM UGS111.GPJ CW/DRILLING.GDT 24/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#112 PROJECT LOCATION Vinyard North of Lod Renwick Road

DATE STARTED 10/10/12 COMPLETED 10/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman ▽ AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled at completion		Dark brown silt/topsoil
2	SPT@2m, 1,1,2,2,3			Sand
			2.00 ▽	
	SPT@3m, 8,11,9,14,9			Light brown sandy Gravels
			3.00	
4	SPT@4m, 30-refusal, bouncing			Well graded gravels, brown silt
			3.90	
			4.20	Grey/brown sandy Gravels
	SPT@5m, 13, 10, 14, 13, 10			
6	SPT@6m, 32, 14, 11, 10, 9			
	SPT@7m, 24, 16, 17, 17			
8	SPT@8m, 4, 5, 5, 5, 7			
	SPT@9m, 20, 14, 14, 19, 3-12 m travel			
10	SPT@10m, 20, 16, 13, 13, 8-45 m travel			
	SPT@11m, 20, 16, 21, 13-45 m travel			
12	SPT@12m, 9, 9, 10, 13, 13			
	SPT@13m, 18, 13, 19, 18-70 m travel			
14	SPT@14m, 13, 8, 9, 10, 13			
	SPT@15m, 8, 12, 19, 21-40 m travel			
			15.00	Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS112 GPJ CW DRILLING GDT 24/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#113 PROJECT LOCATION Paddock North of Old Renwick Road

DATE STARTED 11/10/12 COMPLETED 11/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 1.80 m






















NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore backfilled upon completion		Dark Brown silt/topsoil
2		SPT@2m,2,1,1,1,4		1.50  Brown sandy silt
4		SPT@3m,4,4,7,8,9		3.00 Light brown/grey sandy Gravels
6		SPT@4m,13,17,15,13,11		
		SPT@5m,26,15,15,20		
8		SPT@6m,11,11,13,11,11		
		SPT@7m,17,16,19,15-55mm travel		
		SPT@8m,30,20,20,10-35mm travel		
		SPT@9m,14,17,21,12-80mm travel		
10		SPT@10m,23,28-bouncing		
		SPT@11m,34,25,12-100 bouncing		
12		SPT@12m,17,16,19,16-40mm travel		
		SPT@13m,18,24,26-55mm travel		
14		SPT@14m,34,42,8-5mm travel		13.50 Dark grey Silt
		SPT@15m,23,33,17-15mm travel		14.50 Brown/grey sandy Gravels
				15.00 Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS113 GPJ CW DRILLING GDT 24/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#114 PROJECT LOCATION Northern end of vinyard, adjacent to Old Renwick Road  
 DATE STARTED 10/10/12 COMPLETED 11/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING ---  
 LOGGED BY Troy Norris CHECKED BY James Chapman ▼ AT END OF DRILLING 1.20 m  
 NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
2		Bore backfilled upon completion		Dark brown silt/topsoil
		SPT@2m,1,1,1,1,1		
		SPT@3m,2,1,1,1,2		3.00
4		Push Tube sample		Grey Silt
		SPT@4m,11,7,7,8,8		4.00
		SPT@5m,5,4,5,5,10		Brown sandy Gravels
6		SPT@6m,17,50-55mm travel		
		SPT@7m,50-130mm travel		
8		SPT@8m,3,2,3,2,4		
		SPT@9m,7,10,13,20,7-45mm travel		
10		SPT@10m,14,14,17,13,6-30mm travel		
		SPT@11m,20,18,18,14-65mm travel		
12		SPT@12m,2,3,13,19,15-70mm travel		
		SPT@13m,10,10,9,8,11		
14		SPT@14m,25,21,22,7-45mm travel		
		SPT@15m,6,5,4,6,6		14.70
				15.40
16		SPT@16m,16,9,15,25,1-5mm travel		Grey Silt
		SPT@17m,7,8,10,17,15-60mm travel		Grey sandy Gravels
18		SPT@18m,2,4,9,10,17		
		SPT@19m,18,16,30,4-10mm travel		
20		SPT@20m,18,22,28-70mm travel		20.00
				Bottom of hole at 20.00 m.

GENERAL BH / TP / WELL / OPUS BLENHEIM UGS 114.GPJ CW-DRILLING GDT\_24/10/12



CLIENT Opus International PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#115 PROJECT LOCATION Adjacent to Old Renwick Road, in vinyard



DATE STARTED 18/10/12 COMPLETED 19/10/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Troy Norris CHECKED BY James Chapman  AT END OF DRILLING 1.00 m

NOTES Geotech bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
2		Bore backfilled upon completion		Dark brown silt/topsoil
		SPT@2m,5,8,9,13,9		2.50
4		SPT@3m,13,9,8,7,6		Grey silty Gravels
		SPT@4m,16,10,7,7,8		
6		SPT@5m,12,10,10,11,11		
		SPT@6m,14,9,14,14,13-55mm travel		
8		SPT@7m,7,8,10,10,10		
		SPT@8m,5,10,11,14,15-65mm travel		
10		SPT@9m,4,6,13,13,17		
		SPT@10m,5,6,11,17,12		
12		SPT@11m,18,13,14,13,10-45mm travel		
		SPT@12m,7,4,4,7,13		
14		SPT@13m,16,26,23,1-5mm travel		13.70
		SPT@14m,10,7,8,9,11		Grey Silt
16		SPT@15m,8,5,6,5,5		
		SPT@16m,16,16,23,11-35mm travel		15.70
18		SPT@17m,6,15,15,20-35mm travel		Brown/grey sandy Gravels
		SPT@18m,5,7,15,21,7-15mm travel		
20		SPT@19m,11,23,27-55mm travel		
		SPT@20m,29,20,25,5-25mm travel		
		SPT@21m,21,17,23,10-35mm travel		21.00
				Bottom of hole at 21.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM UGS 115 GPJ CW-DRILLING GDT 24/10/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#201 PROJECT LOCATION Road verge, David Street  
 DATE STARTED 18/12/12 COMPLETED 18/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concatrix AT TIME OF DRILLING \_\_\_\_\_  
 LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 2.00 m  
 NOTES Geotech Bore AFTER DRILLING \_\_\_\_\_

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0.00		Alloy Flush toby installed at surface		Brown silt/topsoil	<p>40mm PN15 UPVC blank pipe cemented to surface</p>
1.50				Brown silty clay	
2.00	SPT@2.0m, 6, 5, 7, 8, 15			Well sorted Gravels, silty sandy matrix	
3.00	SPT@3.0m, 5, 6, 10, 8, 7, 6				
4.00	SPT@4.0m, 4, 5, 6, 6, 4, 6				
5.00	SPT@5.0m, 9, 6, 10, 10, 11, 12				
6.00	SPT@6.0m, 5, 8, 10, 10, 13, 12				
7.00	SPT@7.0m, 3, 5, 8, 10, 12, 13				
8.00	SPT@8.0m, 6, 9, 13, 13, 14, 10 for 55mm			Well sorted Gravels clay bound	
9.00	SPT@9.0m, 4, 3, 2, 4, 5, 9				
10.00	SPT@10m, 5, 8, 10, 12, 14, 14 for 55mm				
11.00	SPT@11m, 4, 6, 15, 20, 15 for 50mm				
12.00	SPT@12m, 3, 4, 10, 14, 10, 11				
13.00	SPT@13m, 10, 25, 18, 32				
14.00	SPT@14m, 11, 21, 21, 29 for 50mm				
15.00	SPT@15m, 5, 7, 10, 16, 18, 6 for 25mm			Bottom of hole at 15.00 m.	

GENERAL BH/TP/WELL OPUS BLENHIM UG# 201 GFJ CW DRILLING 001 2V-2012



CLIENT Opus International Consultants PROJECT NAME Bienheim Urban Growth Study  
 PROJECT NUMBER BH#202 PROJECT LOCATION Adjacent to Battys Road  
 DATE STARTED 11/12/12 COMPLETED 11/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING ---  
 LOGGED BY Barclay Moir CHECKED BY James Chapman ▽ AT END OF DRILLING 2.00 m  
 NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned hole backfilled upon completion		0.20 Brown silty Gravels 0.40 Brown Silt Brown silty Sand
2		SPT@2.0m, 4,9,12,12,14,12 for 45mm		1.80 ▽ Brown well sorted sandy silty Gravels
		SPT@3.0m, 7,13,12,15,21,12 for 40mm		
4		SPT@4.0m, 9,12,14,11,11,14 for 70mm		3.70 Grey, well sorted sandy Gravels
		SPT@5.0m, 5,10,7,6,9,15		
6		SPT@6.0m, 3,9,9,12,11,11		
		SPT@7.0m, 5,6,9,14,18,9 for 50mm		
8		SPT@8.0m, 5,10,9,6,4,10		8.50 Grey sandy Gravels, organic material
		SPT@9.0m, 2,2,3,3,5,7		
10		SPT@10m, 6,6,8,11,15,16		9.70 Light brown, well sorted Gravels, some silts sands
		SPT@11m, 4,6,10,13,20,15 for 45mm		
12		SPT@12m, 4,4,18,20,12 for 35mm		
		SPT@13m, 10,17,19,31		
14		SPT@14m, 3,10,14,20,16 for 40mm		
		SPT@15m, 7,12,15,6,19,10 for 35mm		
				15.00 Bottom of hole at 15.00 m

GENERAL BH / TP / WELL OPUS BIENHEIM UG5 202.GPJ CW DRILLING GDT 18/12/12





CLIENT Opus International Consultants Ltd PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#203 PROJECT LOCATION Rose Street, Blenheim

DATE STARTED 5/12/12 COMPLETED 5/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING ---

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned, backfilled upon completion		
		SPT@ 1.0m, 1.1,1.1,1.1,1		Brown Silt
2		SPT@ 2.0m, 1,1,2,2,2		
		SPT@3.0m, 6,26,28,12,10,6 for 45mm		Brown Sand
		SPT@4.0m, 5,24,19,18,23		Well sorted Gravels, silty matrix
4		SPT@5.0m, 13,33,16,10,12,11		Well sorted sandy Gravels
		SPT@6.0m, 2,2,7,21,20 for 35mm		Well sorted Gravels, silty sandy matrix
6		SPT@7.0m, 4,12,14,30,6 for 15mm		
		SPT@8.0m, 2,2,3,3,4		Brown silty clay
8		SPT@9.0m, 4,8,11,15,16 for 55mm		Grey Silt, dry
		SPT@10m, 4,18,9,8,10,13		
10		SPT@11.0m, 7,7,10,13,10,13		Grey well sorted silty Gravels
		SPT@12m, 5,6,24,26, for 25mm		
12		SPT@13m, 1,18,25,25 for 70mm		
		SPT@14m, 3,8,20,26,4 for 5mm		
14		SPT@15m, 2,1,4,8,14,24		
				Bottom of hole at 15.00 m

GENERAL DRAFTER / WELL OF US BLenheim UC03 200 CBJ CVI DRILLING EDT 19/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#204 PROJECT LOCATION In vinyard, adjacent to Middle Renwick Road  
 DATE STARTED 17/12/12 COMPLETED 17/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING \_\_\_\_\_  
 LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 3.00 m  
 NOTES Geotech Bore AFTER DRILLING \_\_\_\_\_

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned, hole backfilled upon completion		Brown silt/topsoil
2		SPT@2.0m, 1.1, 1.5, 5.5		Brown silty clay
4		SPT@3.0m, 5, 10, 9, 10, 10, 10 SPT@4.0m, 5, 9, 10, 14, 16, 10 for 40mm		Well sorted sandy Gravels
6		SPT@5.0m, 8, 22, 23, 27 SPT@6.0m, 7, 12, 16, 26, 8 for 25mm		
8		SPT@7.0m, 4, 3, 5, 6, 7, 14 SPT@8.0m, 3, 7, 10, 10, 11, 19 for 45mm		Poorly sorted Gravels, some sands silts
10		SPT@9.0m, 2, 6, 9, 14, 7, 9 SPT@10m, 12, 26, 16, 13, 11, 10 for 55mm		
				Bottom of hole at 10.00 m

GENERAL B11/TP/1 WELL OPUS BL ENKEM UDS 204 GPJ CA DRILLING G01 2.V1/2/12



CLIENT Opus International Consultants Ltd PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#205 PROJECT LOCATION Adjacent to Bunnings Warehouse

DATE STARTED 5/12/12 COMPLETED 6/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 3.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned hole backfilled upon completion		Brown Silt/topsoil
2		SPT@2.0m, 1.2,1,2,2,2		
		SPT@3.0m, 3,8,9,18,12,20	2.80	▼ Brown well sorted silty Gravels
4		SPT@4.0m, 9,9,11,12,12,13	3.70	Well sorted sandy Gravels
		SPT@5.0m, 5,6,9,12,14,15		
6		SPT@6.0m, 5,7,10,10,9,9		
		SPT@7.0m, 4,2,2,2,2,4	7.40	Grey/brown silty clay(saturated)
8		SPT@8.0m, 2,1,3,2,3,5	8.00	Grey Silt
		SPT@9.0m, 3,15,19,24,7 for 25mm	9.20	Grey Silts, some fine gravels
10		SPT@10m, 5,13,19,14,17	9.60	Well sorted Gravels little or no fines
		SPT@11.0m, 2,4,14,24,12 for 45mm		
12		SPT@12.0m, 7,25,27,23		
		SPT@13m, 4,7,8,7,9,11		
14		SPT@14m, 5,8,15,25,10 for 50mm		
		SPT@15m, 3,8,18,27,6 for 40mm	15.00	Bottom of hole at 15.00 m.

GENERAL BHTIP/WELL, OPUS BLENHEIM UG5 205 (PJ) CNDRILLING 05/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#206 PROJECT LOCATION \_\_\_\_\_  
 DATE STARTED 19/12/12 COMPLETED 19/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING \_\_\_\_\_  
 LOGGED BY Barday Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 3.00 m  
 NOTES Geotech Bore AFTER DRILLING \_\_\_\_\_

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned hole backfilled upon completion		Brown silt/topsoil
2		SPT@2.0m, 8,15,15,18,17 for 40mm		1.50 Brown silty clay
				1.70 Poorly Sorted Gravels
		SPT@3.0m, 6,9,7,11,8,9		3.00 ▼ Well sorted Gravels, silty sandy
4		SPT@4.0m, 3,4,5,8,7,6		4.90 Well sorted silty Gravels
		SPT@5.0m, 5,3,1,1,1,4		6.70 Well sorted sandy Gravels
6		SPT@6.0m, 6,8,9,10,11,11		
		SPT@7.0m, 20,20-for 35mm bouncing		
8		SPT@8.0m, 5,7,7,7,10,12		
		SPT@9.0m, 3,4,4,6,9,12		
10		SPT@10m, 2,6,8,7,11,20		
				Bottom of hole at 10.00 m.

GENERAL BH / TP / WELL OPUS BLENH#206 UGS 206 GPJ CW DRILLING LTD 21/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#207 PROJECT LOCATION Road verge, Bicks Road

DATE STARTED 19/12/12 COMPLETED 19/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING \_\_\_\_\_

LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 3.00 m

NOTES Geotech Bore AFTER DRILLING \_\_\_\_\_

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
		Alloy flush box installed at surface		Brown silt/topsoil	
2	SPT@2.0m, 8, 14, 15, 18 for 65mm			Poorly sorted Gravels	
3	SPT@3.0m, 5, 6, 8, 13, 16 for 65mm			Well sorted sandy Gravels	
4	SPT@4.0m, 3, 7, 8, 7, 5, 6				
5	SPT@5.0m, 6, 8, 7, 16, 14, 13 for 50mm				
6	SPT@6.0m, 4, 12, 12, 10, 9, 4				
7	SPT@7.0m, 6, 7, 8, 9, 11, 13				
8	SPT@8.0m, 6, 21, 32 for 50mm, bouncing				
9	SPT@9.0m, 4, 6, 6, 8, 7, 7				
10	SPT@10m, 3, 6, 6, 8, 10, 12				
11	SPT@11m, 2, 14, 12, 17, 18, 3 for 5mm				
12	SPT@12m, 1, 3, 16, 18, 16 for 25mm				
13	SPT@13m, 12, 25, 39, 11 for 30mm				
14	SPT@14m, 3, 2, 5, 10, 14, 17				
15	SPT@15m, 3, 15, 25, 25			Bottom of hole at 15.00 m	

40mm PN15 UPVC pipe Cemented to surface

GENERAL BH#12 / 12 / WELL\_OPUS\_BLENHEIM\_URBAN\_GROWTH\_STUDY\_CW\_DRILLING\_GDT\_21/12/12



CLIENT Opus International Consultants Ltd  
PROJECT NUMBER BH#208

PROJECT NAME Blenheim Urban Growth Study  
PROJECT LOCATION Adjacent to Old Renwick Road

DATE STARTED 10/12/12 COMPLETED 10/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned, hole backfilled upon completion		Silt/topsoil
2		SPT@2.0m, 1.1, 1.1, 1.1, 1.1	1.90	Dark brown sandy Silt
		SPT@3.0m, 1.1, 1.1, 1.1, 1.4	3.40	Grey sandy silt, some medium gravels
4		SPT@4.0m, 5, 10, 15, 17, 14, 4 for 40mm	4.00	Well sorted Gravels, little or no fines
		SPT@5.0m, 8, 11, 14, 17, 19		
6		SPT@6.0m, 6, 7, 14, 15, 19, 2 for 5mm	5.70	Well sorted sandy Gravels
		SPT@7.0m, 9, 24, 32, 18 for 25mm		
8		SPT@8.0m, 7, 12, 25, 25 for 25mm		
		SPT@9.0m, 3, 8, 20, 20, 10 for 35mm		
10		SPT@10.0m, 7, 16, 18, 19, 13 for 65mm	10.00	Bottom of hole at 10.00 m

GENERAL BH # 1 / WELL OPUS BL ENHEIM URG STUDY / CW DRILLING LTD 10/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#209 PROJECT LOCATION Adjacent to New Remwick Road

DATE STARTED 11/12/12 COMPLETED 12/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 7.10 m

NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned, hole backfilled upon completion		Brown silt/topsoil
			1.00	Well sorted silty Gravels
2		SPT@2.0m, 6,10,9,11,11,9 for 70mm	2.50	Well sorted Gravels, silty sandy Matrix
		SPT@3.0m, 2,4,5,7,6,5	3.70	Brown silty clay, few gravels
4		SPT@4.0m, 1,2,1,3,2,3		
		SPT@5.0m, 1,1,2,1,2,5		
6		SPT@6.0m, 1,1,1,2,2,3,2		
		SPT@7.0m, 1,1,2,2,3,5		
8		SPT@8.0m, 7,10,9,11,12,13		
		SPT@9.0m, 5,6,6,7,9,8	9.00	Brown well sorted silty gravels
10		SPT@10m, 10,14,13,12,11,14		
		SPT@11m, 8,12,12,14,15,9 for 35mm		
12		SPT@12m, 4,11,12,20,18 for 15mm		
		SPT@13m, 3,5,9,11,12,13	13.00	Bottom of hole at 13.00 m

GENERAL BH / TP / WELL OPUS BLLENHEIM UGS 209 GPJ CW DRILLING GDT 19/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#210 PROJECT LOCATION Adjacent to Battys Road  
 DATE STARTED 13/12/12 COMPLETED 14/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING ---  
 LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 6.00 m  
 NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
		Alloy flush trolley installed at surface		Brown silt/topsoil	
2		SPT@ 2.0m, 4.5,6,6,7,6			
			2.50	Brown sandy Clay	
		SPT@3.0m, 3.7,5,6,3,5			
4		SPT@4.0m, 3.8,8,8,9,11		Brown well sorted Gravels with silt	
			4.50	Brown well sorted silty Gravels	
6		SPT@6.0m, 3.7,8,7,14,13			
		SPT@7.0m, 4.6,9,9,13,8			
8		SPT@8.0m, 4.5,6,6,8,6			
		SPT@9.0m, 6.7,7,9,9,12			
10		SPT@10m, 6.7,7,6,10,11			
		SPT@11m, 13,10,9,7,7,14			
12		SPT@12m, 8,12,14,22,16 for 55mm			
		SPT@13m, 10,14,24,21,4			
14		SPT@14m, 8,25,13,10,10,14			
		SPT@15m, 5,10,12,4,4,5			
			15.00	Bottom of hole at 15.00 m.	

GENERAL B-17/P / WELL OPUS BLLENHEIM UG5 210 GPJ, CW DRILLING, DOT, 14/12/2012









CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH#211 PROJECT LOCATION In Vinyard adjacent to New Renwick Road  
 DATE STARTED 13/12/12 COMPLETED 13/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING \_\_\_\_\_  
 LOGGED BY Barclay Moir CHECKED BY James Chapman ▽ AT END OF DRILLING 5.00 m  
 NOTES Geotech Bore AFTER DRILLING \_\_\_\_\_

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned hole backfilled upon completion		Greyish silt
			1.00	
			1.50	Brown silty clay some gravels
2		SPT@2.0m. 8,10,2,2,5,4		Brown well sorted Gravels little or no fines
			2.80	
		SPT@3.0m. 1,2,3,2,3,3,		Brown silty clay
			3.50	
4		SPT@4.0m. 3,3,3,3,3,5		Brown well sorted silty Gravels
		SPT@5.0m. 6,8,10,9,8,6		
6		SPT@6.0m. 5,13,15,16,19 for 75mm		
		SPT@7.0m. 5,7,19,16,12,3 for 25mm		
8		SPT@8.0m. 6,4,8,10,12,20 for 65mm		Brown Gravelly Clay
			9.70	
		SPT@9.0m. 6,12,14,12,13,11		Brown well sorted silty clay bound Gravels
10		SPT@10m. 6,8,8,7,7,12		
		SPT@11m. 4,6,7,9,13,21		
12		SPT@12m. 12,20,27,20,8 for 10mm		
		SPT@13m. 13,21,28,22		
14		SPT@14m. 6,16,24,26		
		SPT@15m. 8,16,17,15,15 for 70mm		
			15.00	Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BLENHEIM LOGS 211.GPJ CIV DRILLING GOT 13/12/12



CLIENT Opus International Consultants Ltd PROJECT NAME Blenheim Urban Growth Study  
 PROJECT NUMBER BH212 PROJECT LOCATION Adjacent to New Renwick Road  
 DATE STARTED 12/12/12 COMPLETED 12/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125  
 DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Concentrix AT TIME OF DRILLING ---  
 LOGGED BY Barclay Moir CHECKED BY James Chapman ▼ AT END OF DRILLING 3.00 m  
 NOTES Geotech Bore AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Hole abandoned hole backfilled upon completion		Silty sandy Gravels
			1.00	
				Well sorted Gravels, little or no fines
2		SPT@2.0m, 2,1,1,1,1,2	1.80	Brown Clayey Gravels
		SPT@3.0m, 1,1,1,1,3,4	3.00 ▼	Brown Clay
4		SPT@4.0m, 6,11,10,12,11,8	3.70	Brown well sorted sandy Gravels
		SPT@5.0m, 9,10,12,12,11,9		
6		SPT@6.0m, 3,3,3,4,4,6	6.50	Brown well sorted clayey gravels
		SPT@7.0m, 1,1,2,2,2,4	7.00	Brown Gravelly Clay
8		SPT@8.0m, 5,7,10,10,10,8	8.00	Well graded silty gravels
		SPT@9.0m, 4,5,4,5,4,5	9.10	Silty Clay
10		SPT@10m, 2,6,14,15,14,7 for 40mm	9.80	Brown Silty clay bound well sorted Gravels
		SPT@11m, 8,15,21,26,3 for 10mm		
12		SPT@12m, 5,22,38 bouncing		
		SPT@13m, 1,5,13,13,10,14 for 65mm		
14		SPT@14m, 3,8,17,28,5 for 15mm		
		SPT@15m, 3,17,8,16,19,9 for 45mm	15.00	Bottom of hole at 15.00 m.

GENERAL BH (TP) WELL OPUS BLFNHEM UGS 212 GPJ CW DRILLING GDT 12/12/12



CLIENT Opus International Consultants PROJECT NAME Blenheim Urban Growth Study

PROJECT NUMBER BH#213 PROJECT LOCATION In vinyard adjacent to Baitys Road

DATE STARTED 14/12/12 COMPLETED 17/12/12 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 125

DRILLING CONTRACTOR CW Drilling GROUND WATER LEVELS:

DRILLING METHOD Concentrix AT TIME OF DRILLING ---

LOGGED BY Barclay Moir CHECKED BY James Chapman AT END OF DRILLING 2.00 m

NOTES Geotech Bore AFTER DRILLING ---

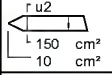
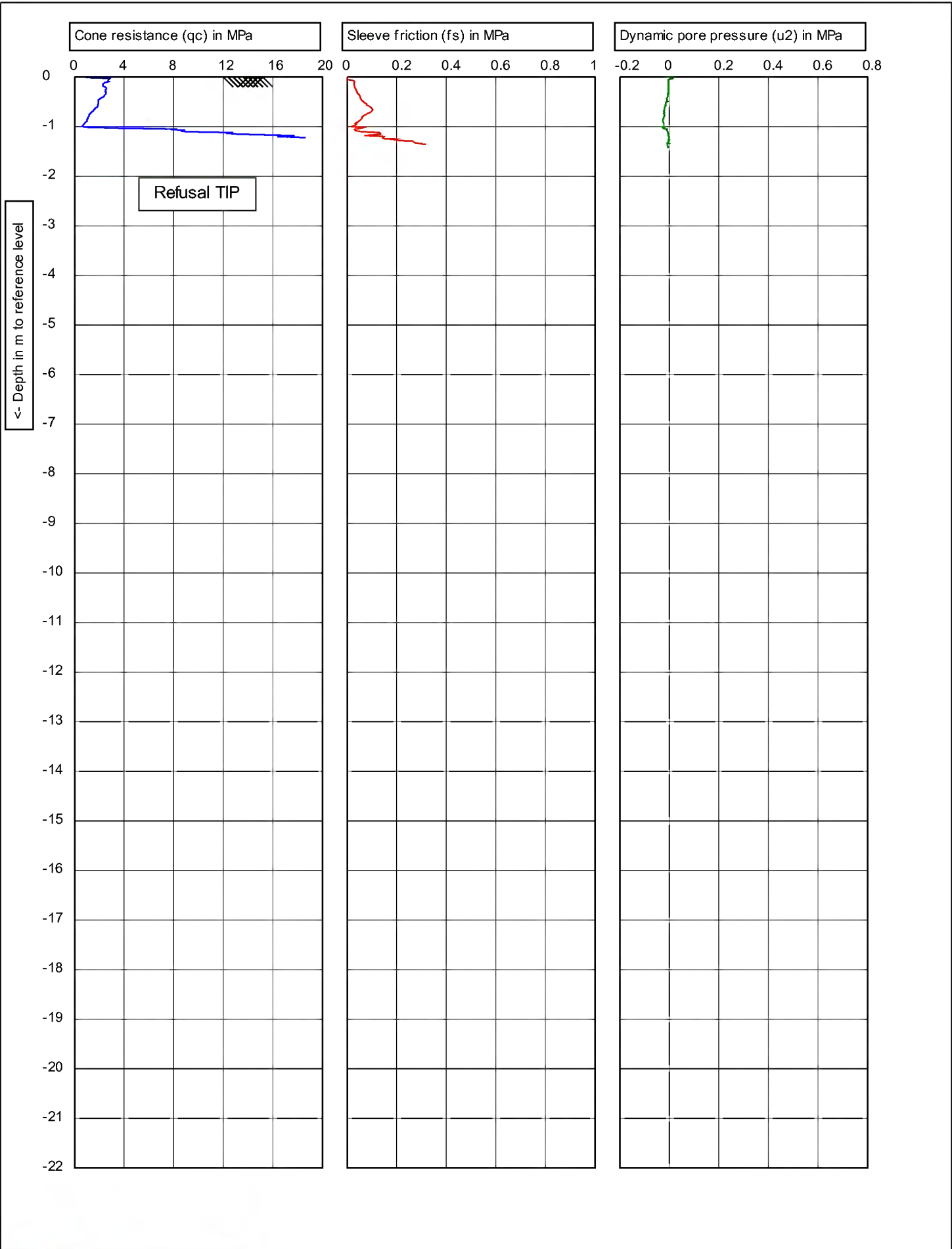
DEPTH (m)	SAMPLE TYPE NUMBER	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION
		Bore abandoned, hole backfilled upon completion		Brown silt/topsoil
2	SPT@2.0m, 1,2,3,3,4,4		1.50	Brown Clay wet
	SPT@3.0m, 1,1,1,1,2		2.50	Well sorted silty Gravels
4	SPT@4.0m, 5,5,6,5,5,9		3.00	Brown Clay
	SPT@5.0m, 2,7,8,7,7,9		3.70	Brown silty clay bound Gravels
6	SPT@6.0m, 3,7,9,10,9,11			
	SPT@7.0m, 4,2,10,11,12,12			
8	SPT@8.0m, 5,6,8,12,9,13			
	SPT@9.0m, 27 for 60mm, bouncing			
10	SPT@10m, 6,11,17,15,14,14 for 70mm			
	SPT@11m, 7,20,17,17,13,3 for 15mm			
12	SPT@12m, 4,10,15,13,16,4 for 25mm			
	SPT@13m, 2,10,16,20,14 for 45mm			
14	SPT@14m, 5,13,13,15,17,5 for 20mm			
	SPT@15m, 4,12,15,17,18 for 55mm		15.00	Bottom of hole at 15.00 m.

GENERAL BH / TP / WELL OPUS BL EMBLEM LOGS 213 GPJ CW DRILL INC GDT 2/12/12

# **Appendix C**

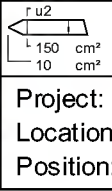
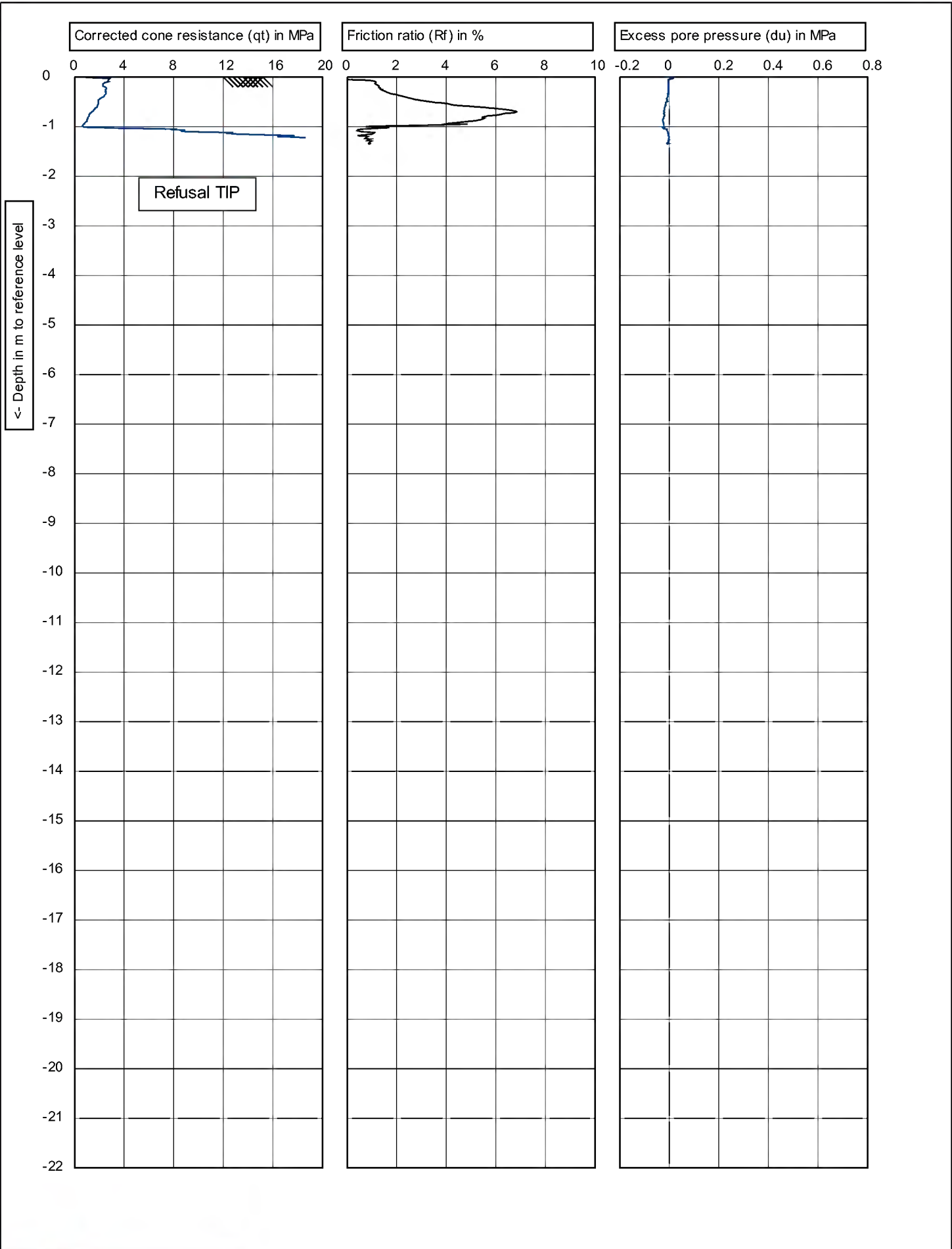
## **Cone penetration test results**





Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677971 N5403634</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT201	1/6

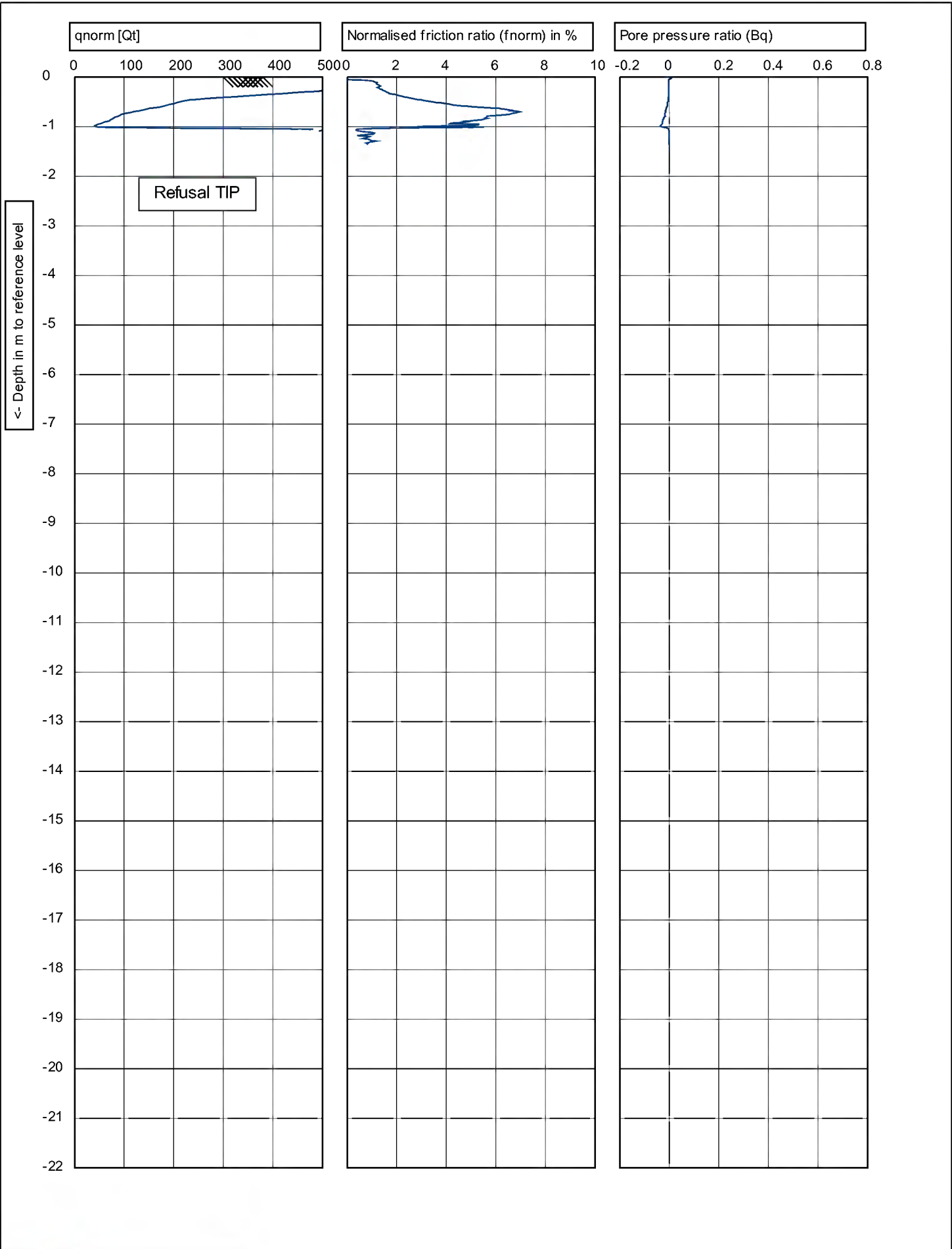
CPTask V1.20



Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1677971 N5403634**  
 Position:

Predrill :	0
Date:	12/12/2012
Cone no.:	C10CFIIP.C10021
Project no.:	5-C2128.00
CPT no.:	CPT201
	2/6

CPTask V1.20



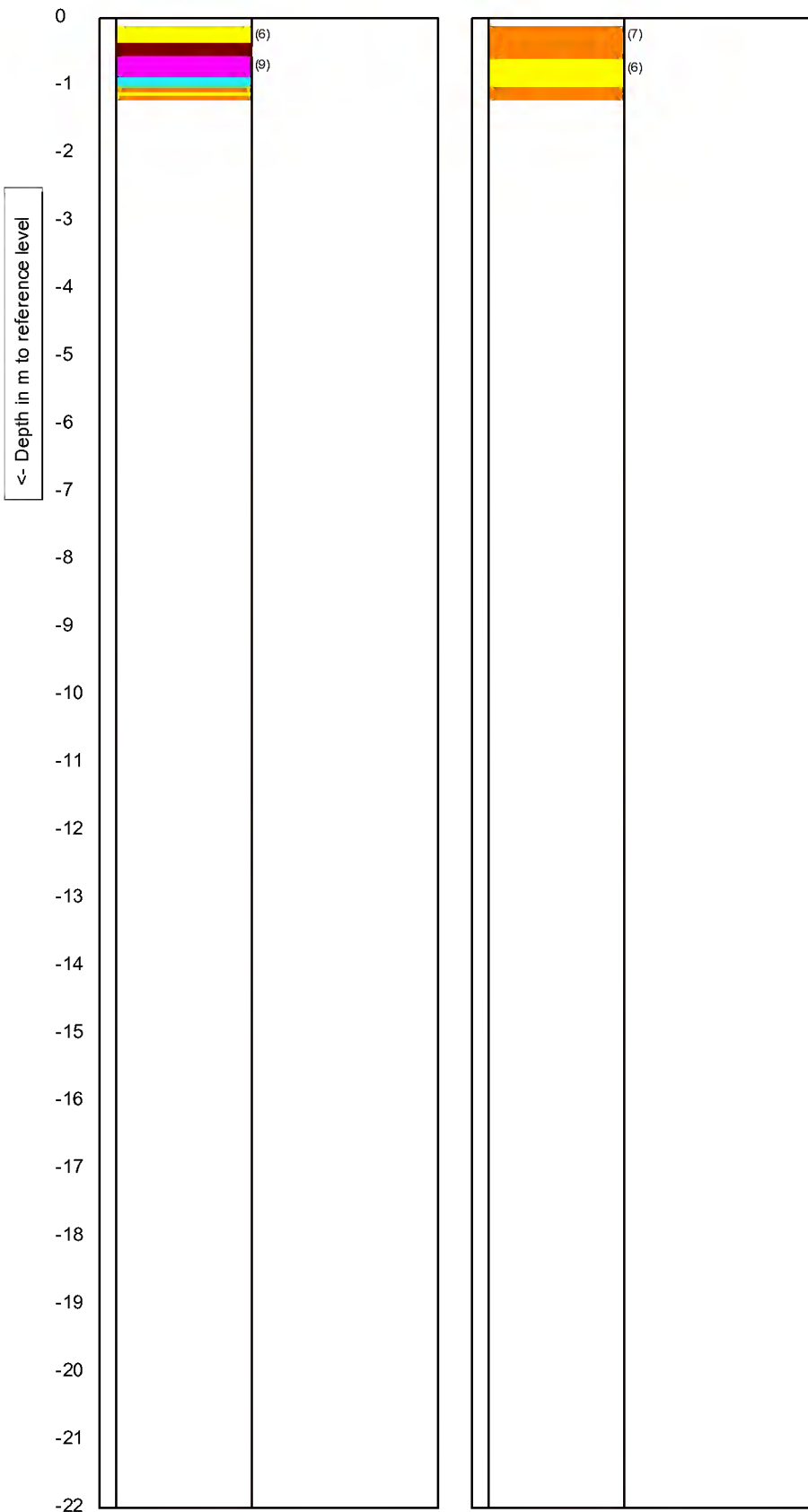
$r_{u2}$   
 150 cm<sup>2</sup>  
 10 cm<sup>2</sup>

Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1677971 N5403634**  
 Position:

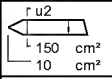
Predrill : 0  
 Date: 12/12/2012  
 Cone no.: C10CFIIP.C10021  
 Project no.: 5-C2128.00  
 CPT no.: CPT201      3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



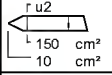
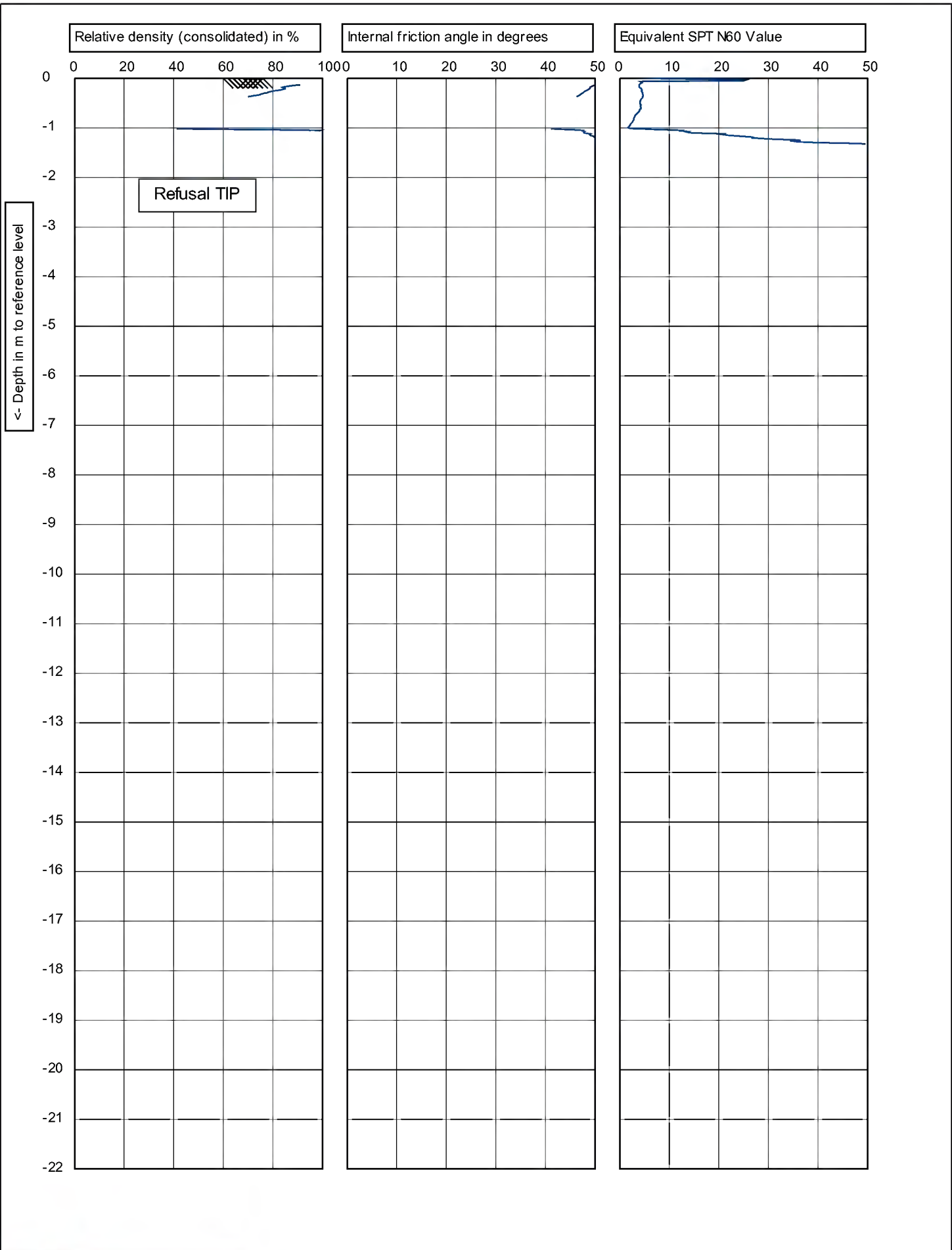
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677971 N5403634</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT201
			4/6

CPTask V1.20

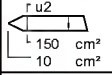
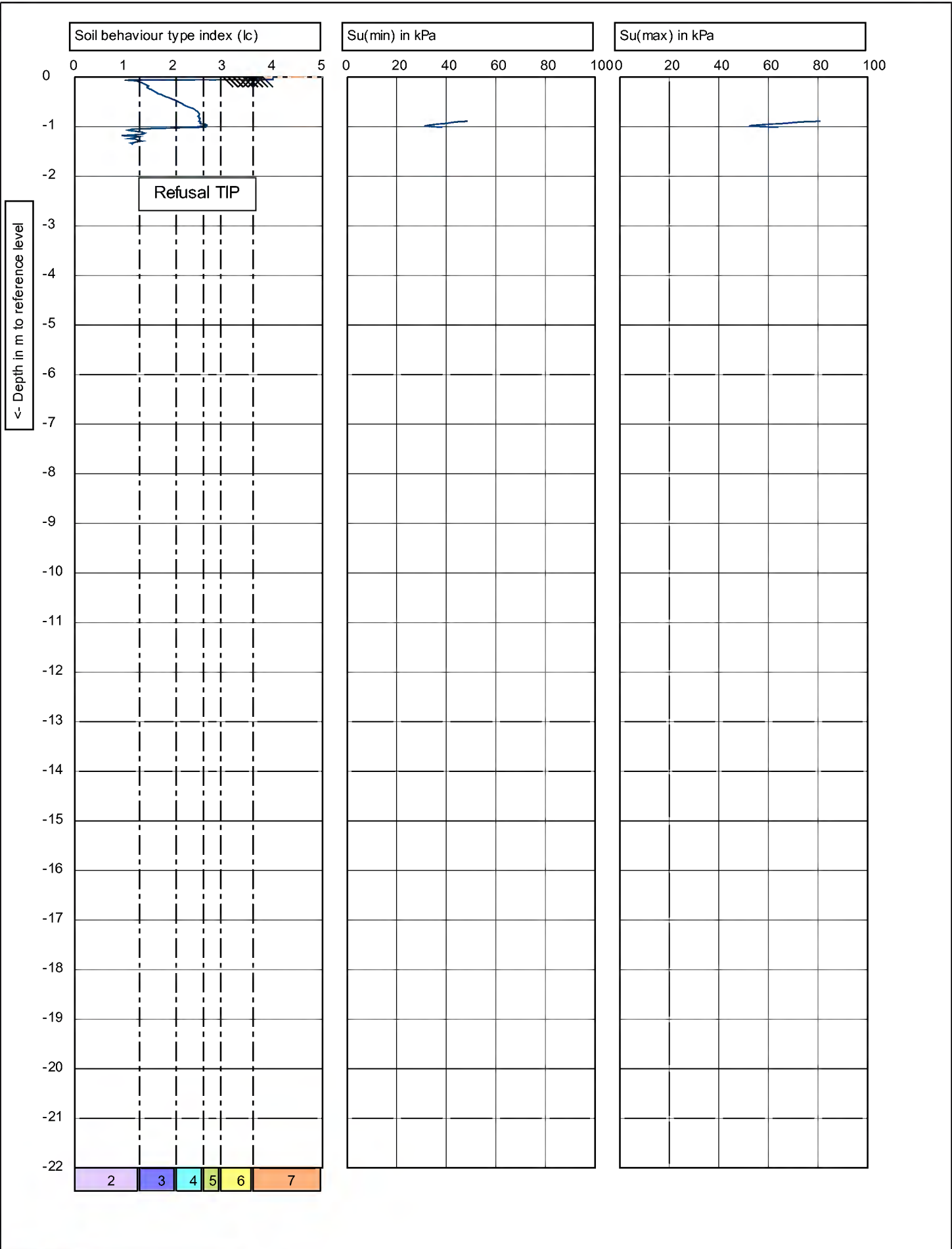




Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100

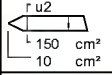
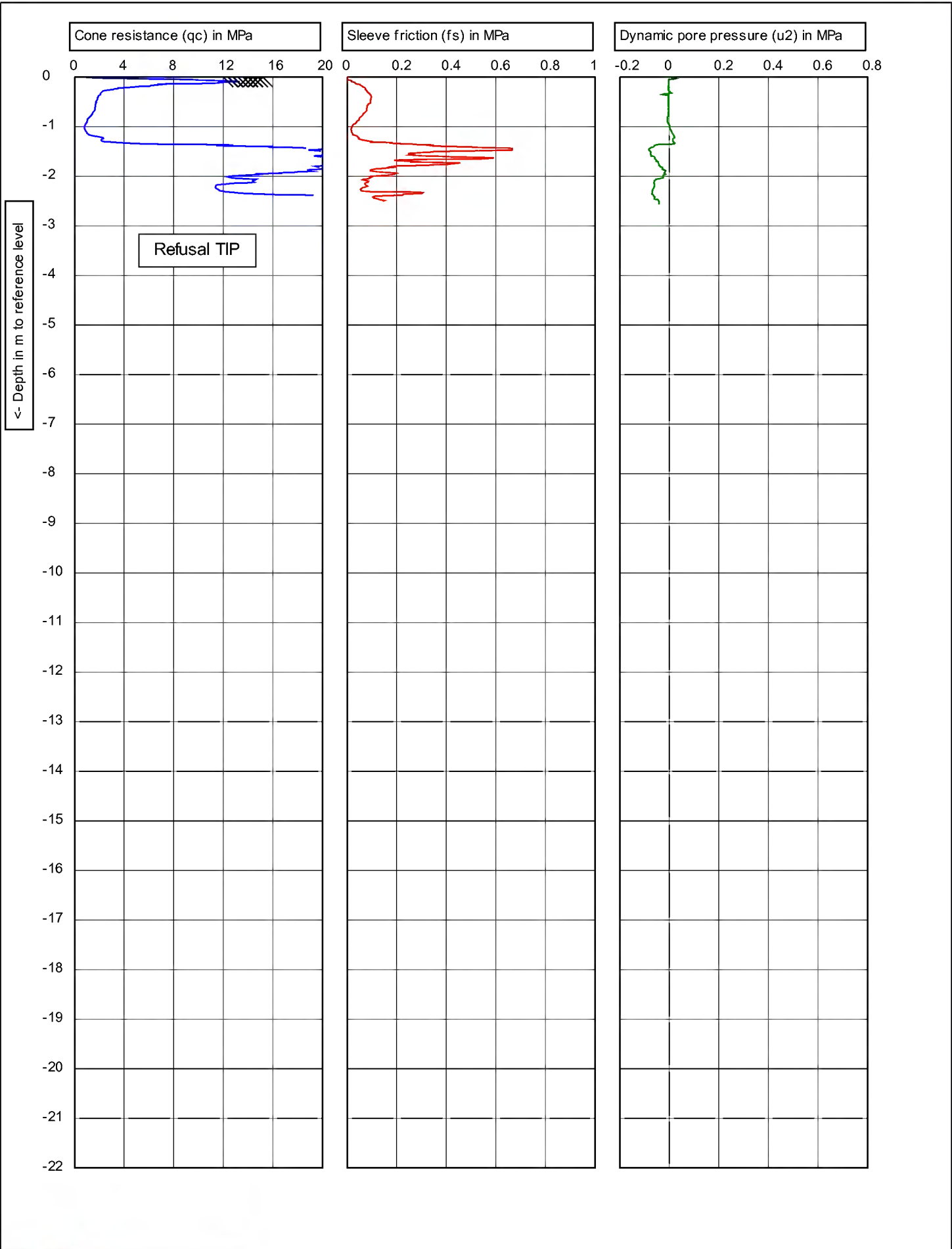
Predrill :	0
Date:	12/12/2012
Cone no.:	C10CFIIP.C10021
Project no.:	5-C2128.00
CPT no.:	CPT201

Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1677971 N5403634**  
 Position:



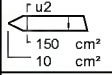
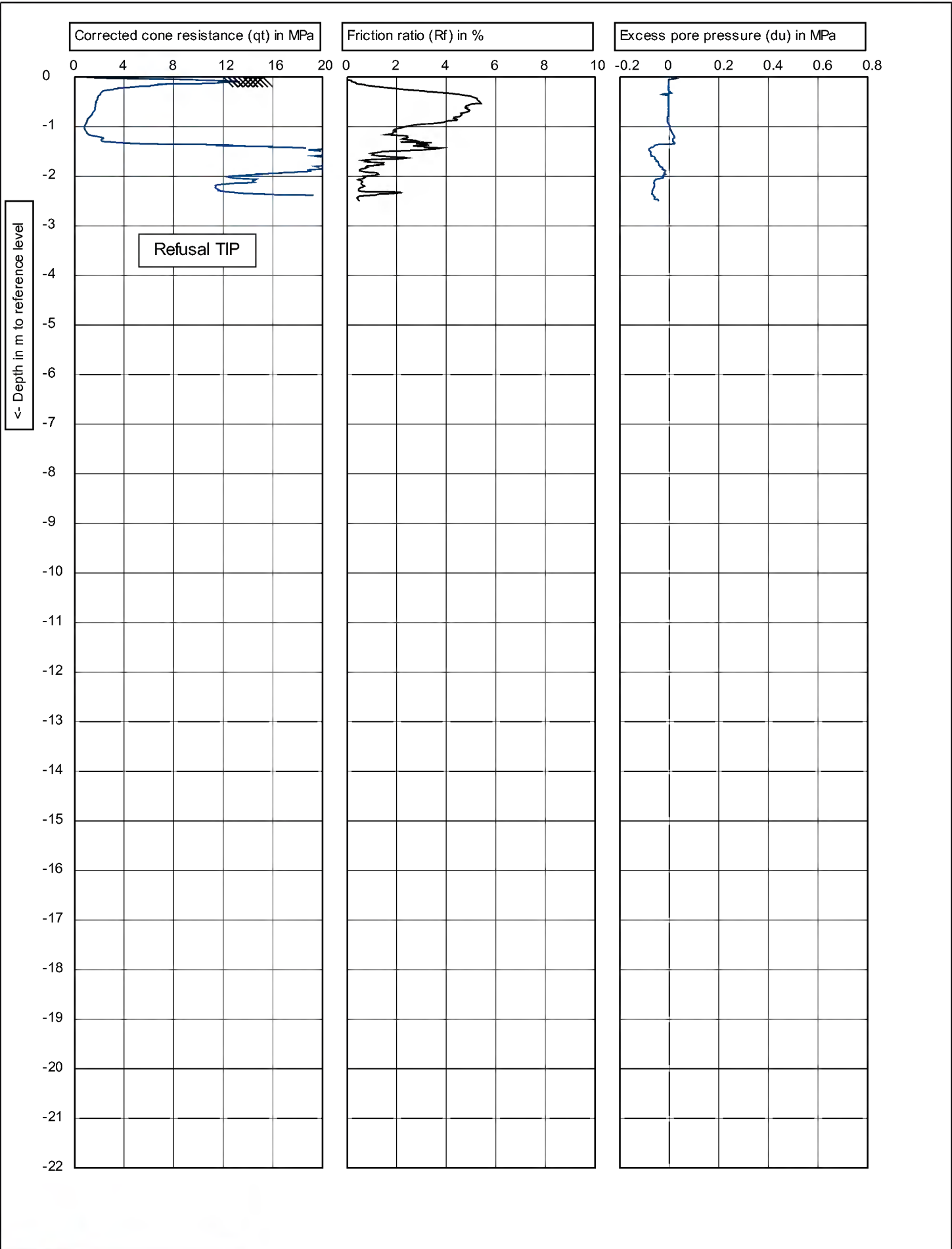
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677971 N5403634</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT201	6/6

CPTask V1.20



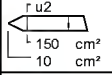
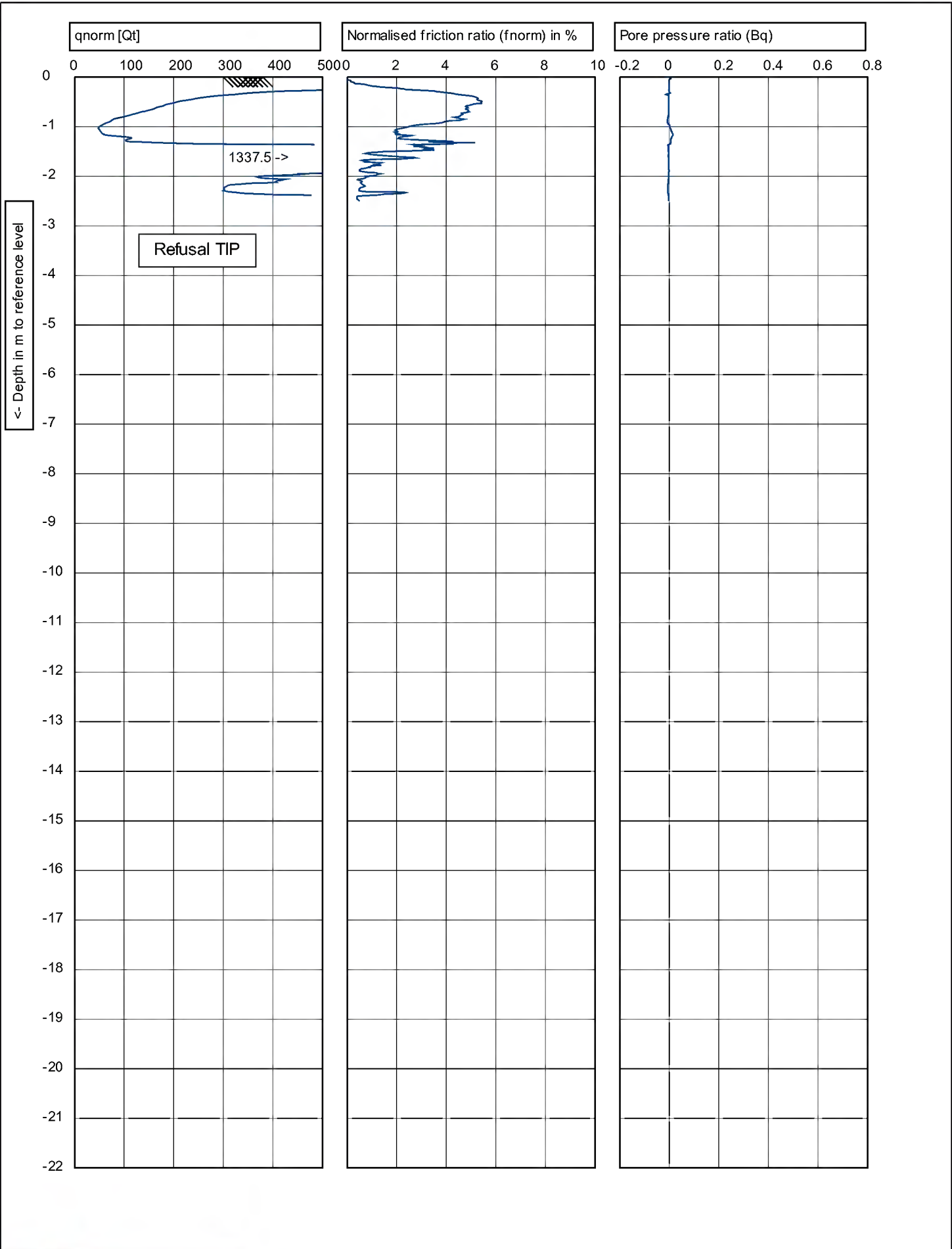
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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677743 N5403652</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT202	1/6

CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677743 N5403652</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT202	2/6

CPTask V1.20

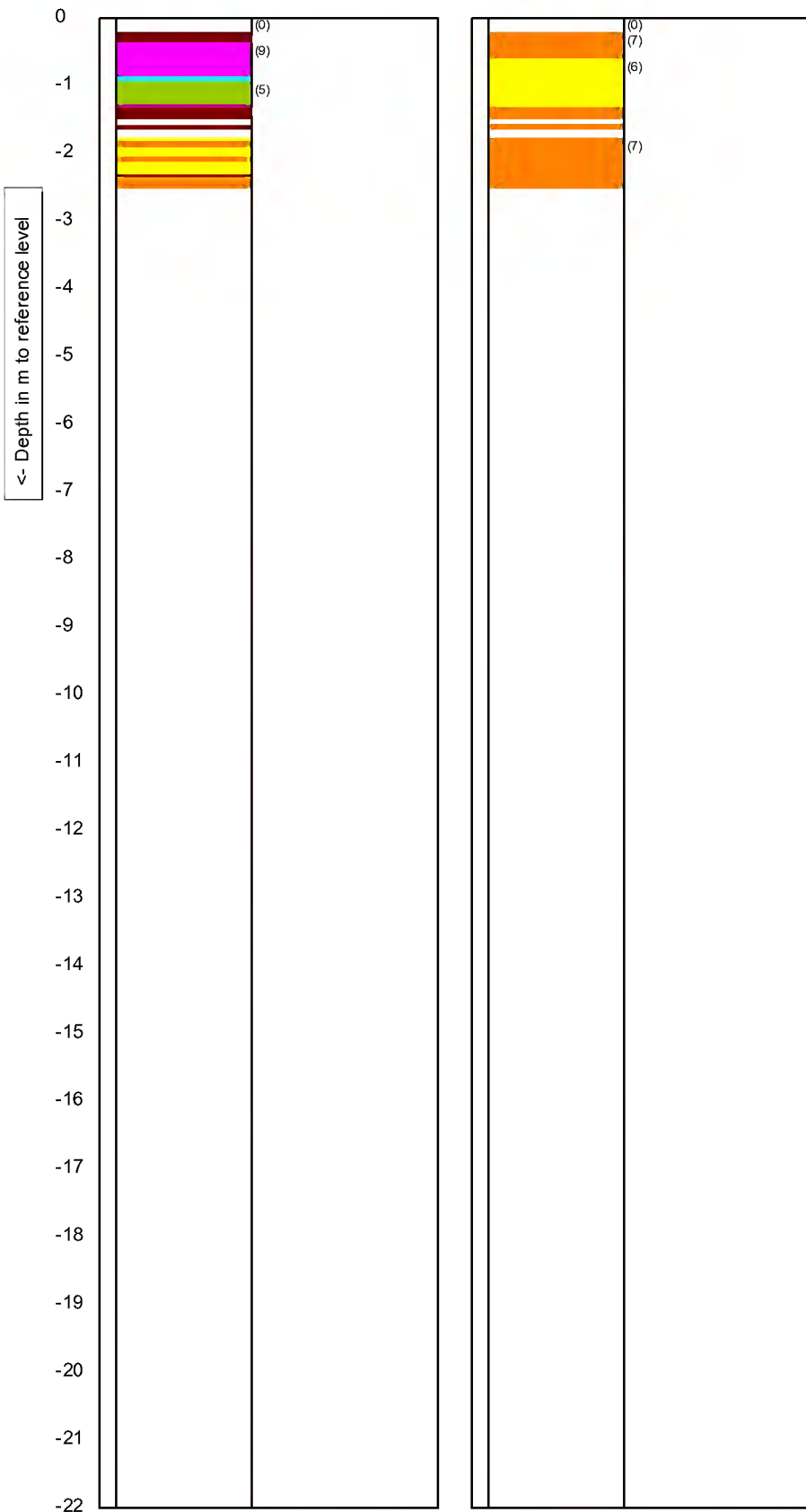


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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677743 N5403652</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT202	3/6

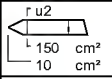
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

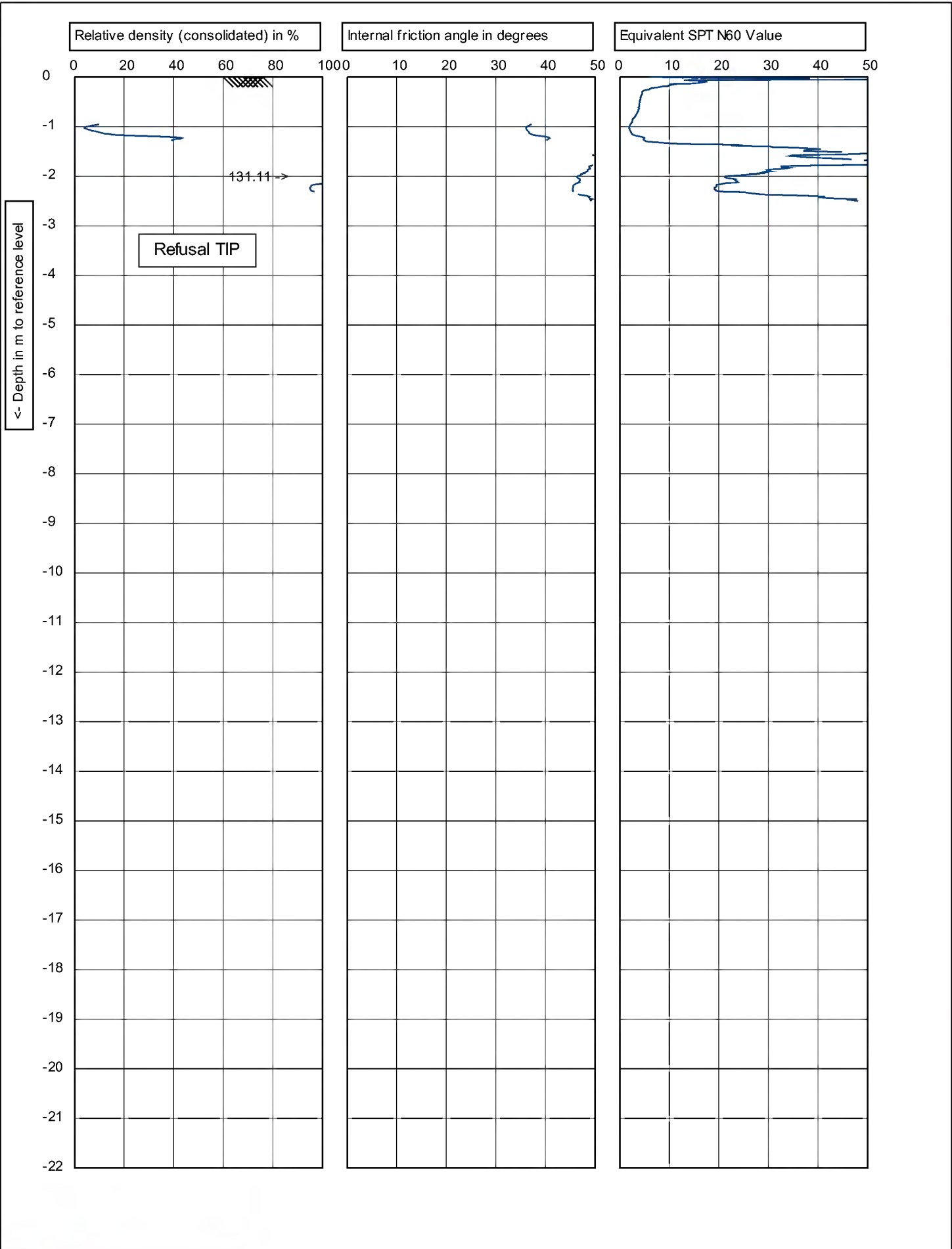


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

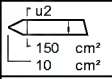


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1677743 N5403652		Project no.: 5-C2128.00	
Position:		CPT no.: CPT202	4/6

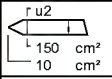
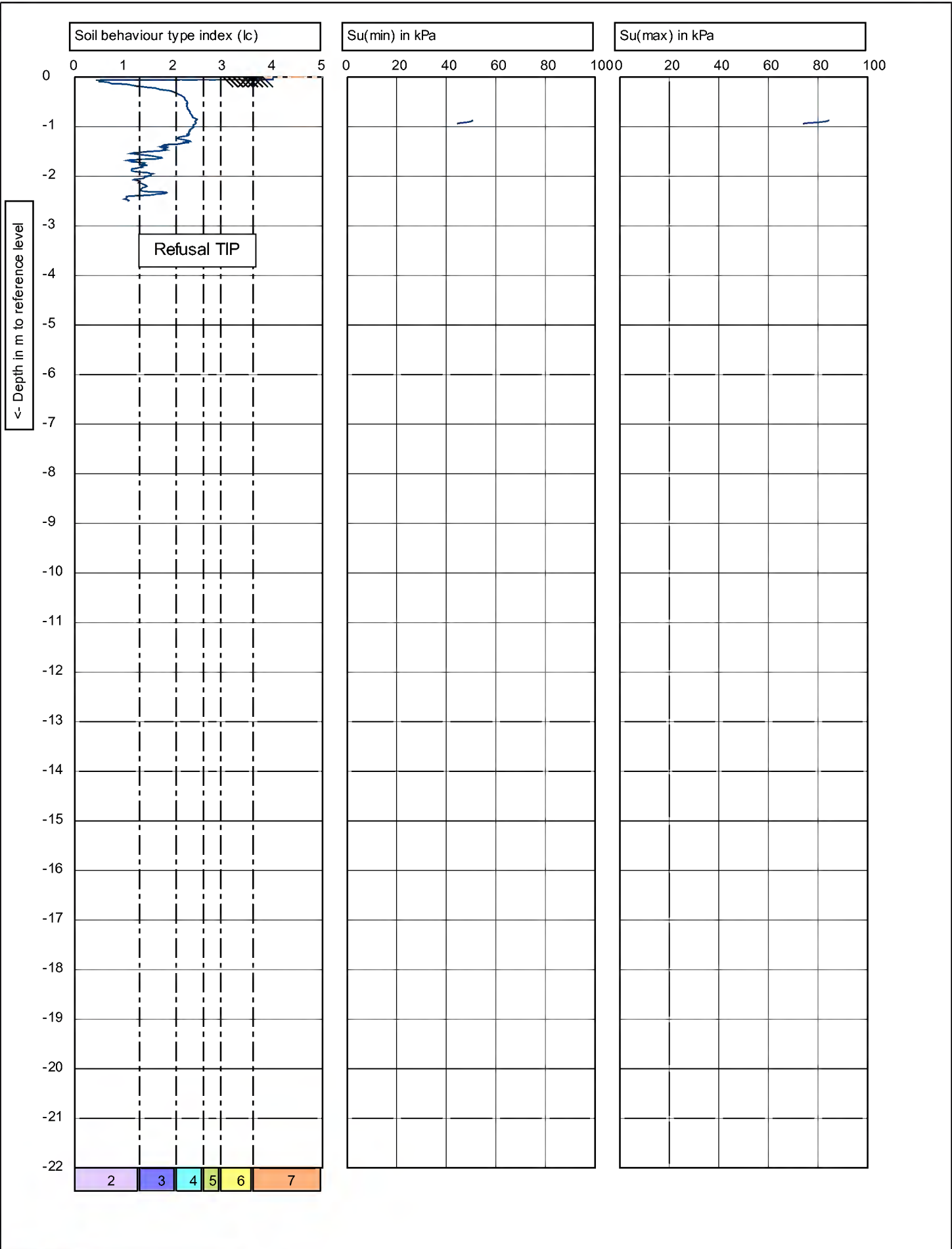
CPTask V1.20



CPTask V1.20



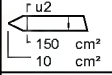
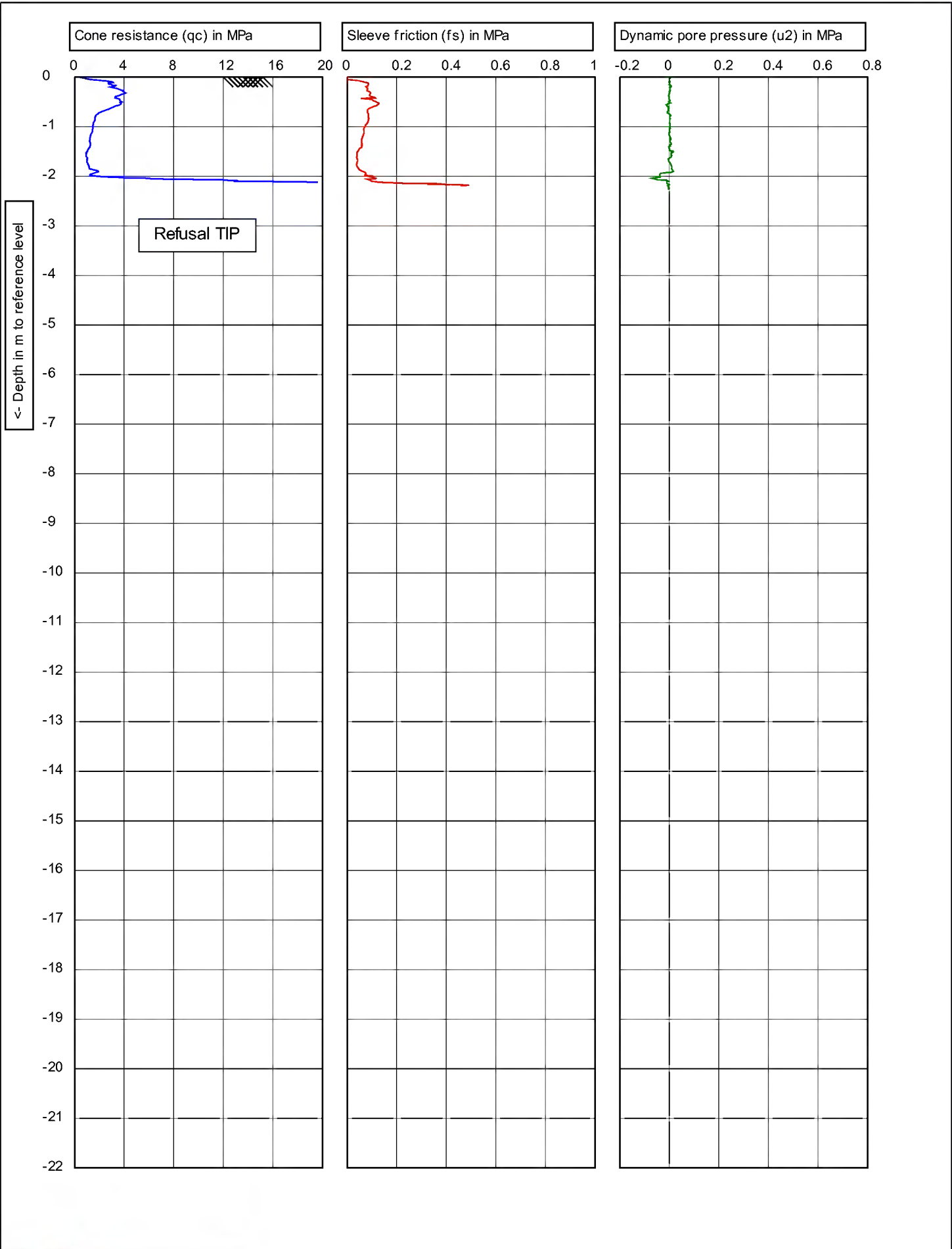
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G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677743 N5403652</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT202	5/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677743 N5403652</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT202
			6/6

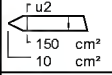
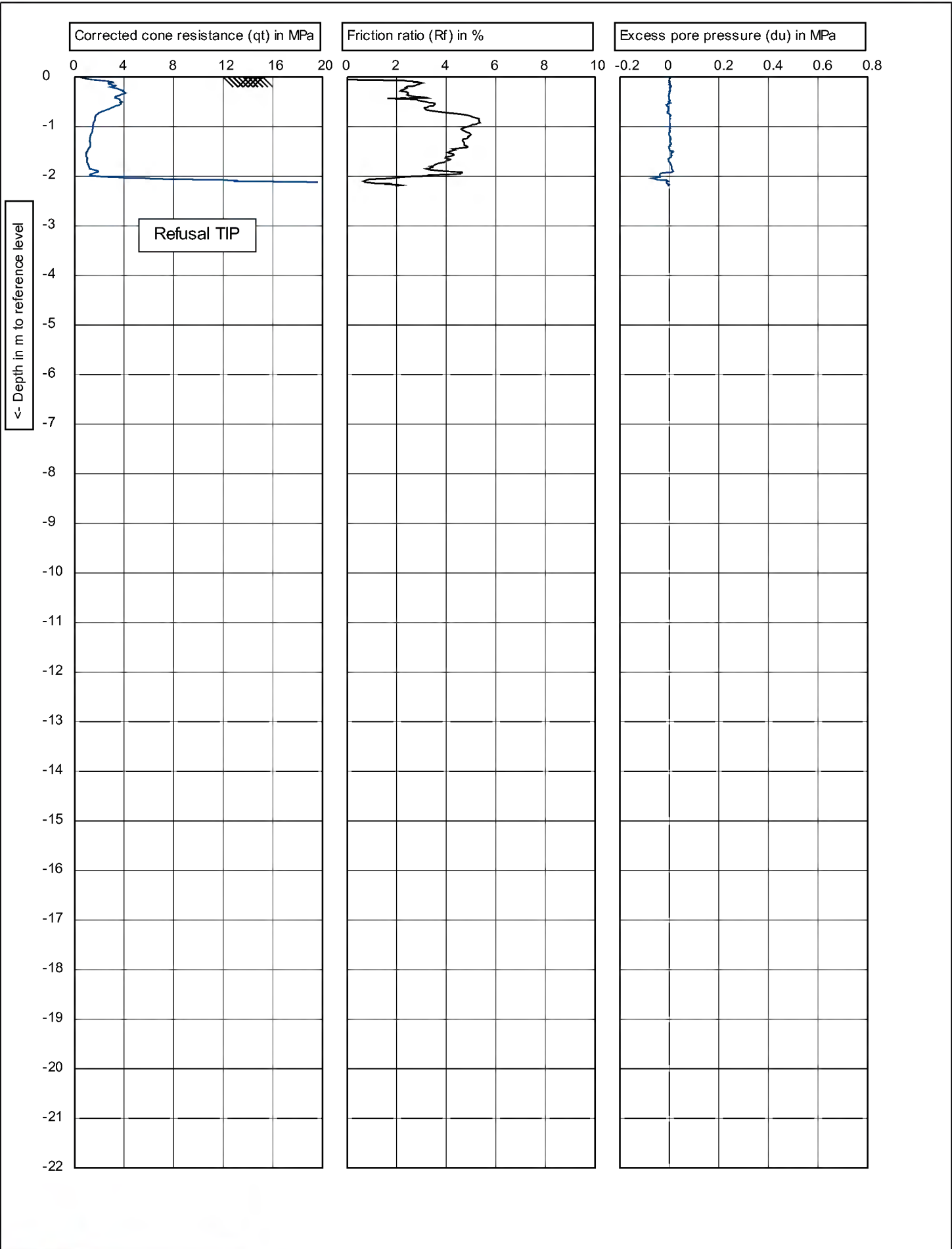
CPTask V1.20





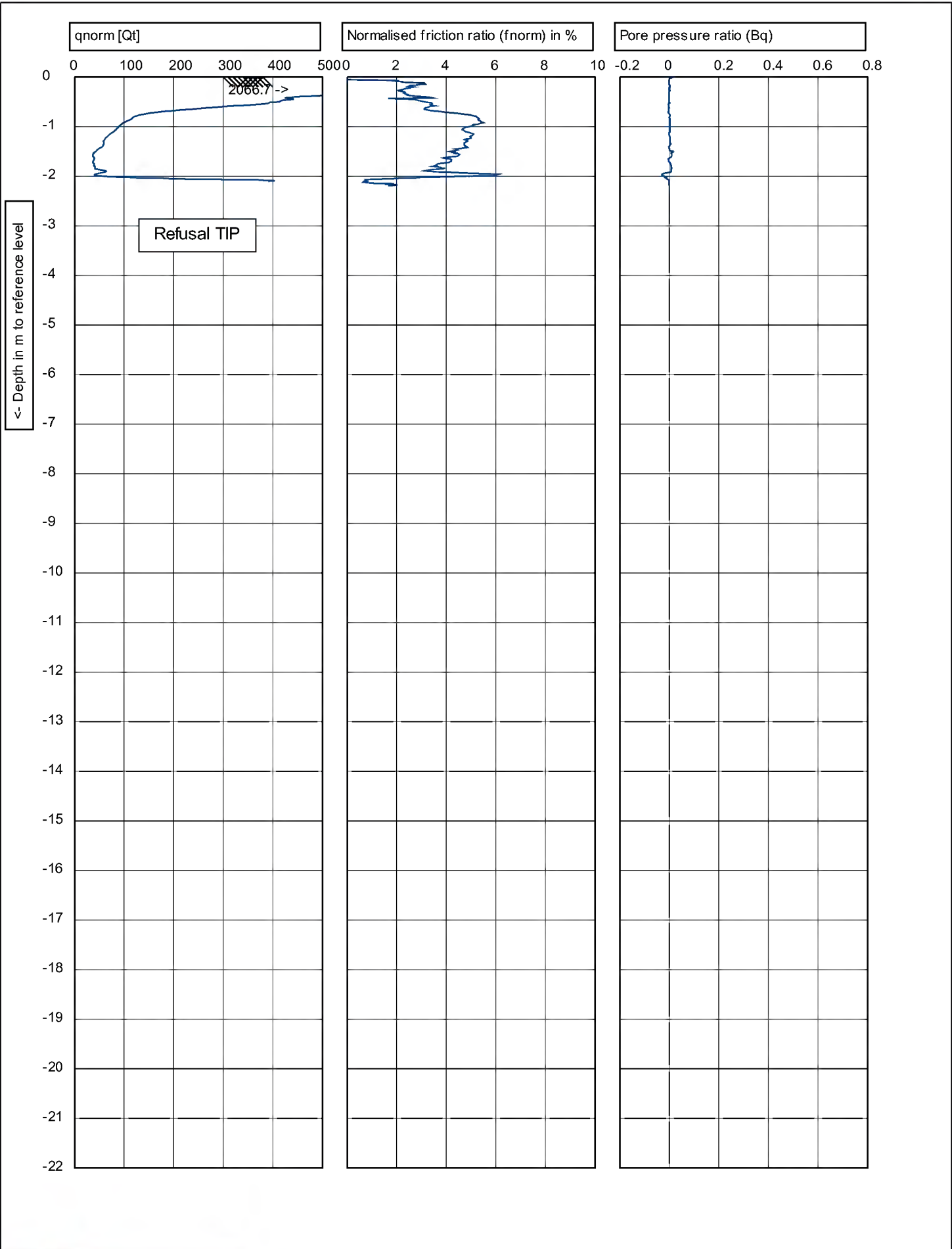
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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677664 N5403424</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT203	1/6

CPTask V1.20

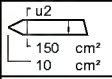


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIIP.C10021</b>	
Location: <b>GPS: E1677664 N5403424</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT203	2/6

CPTask V1.20



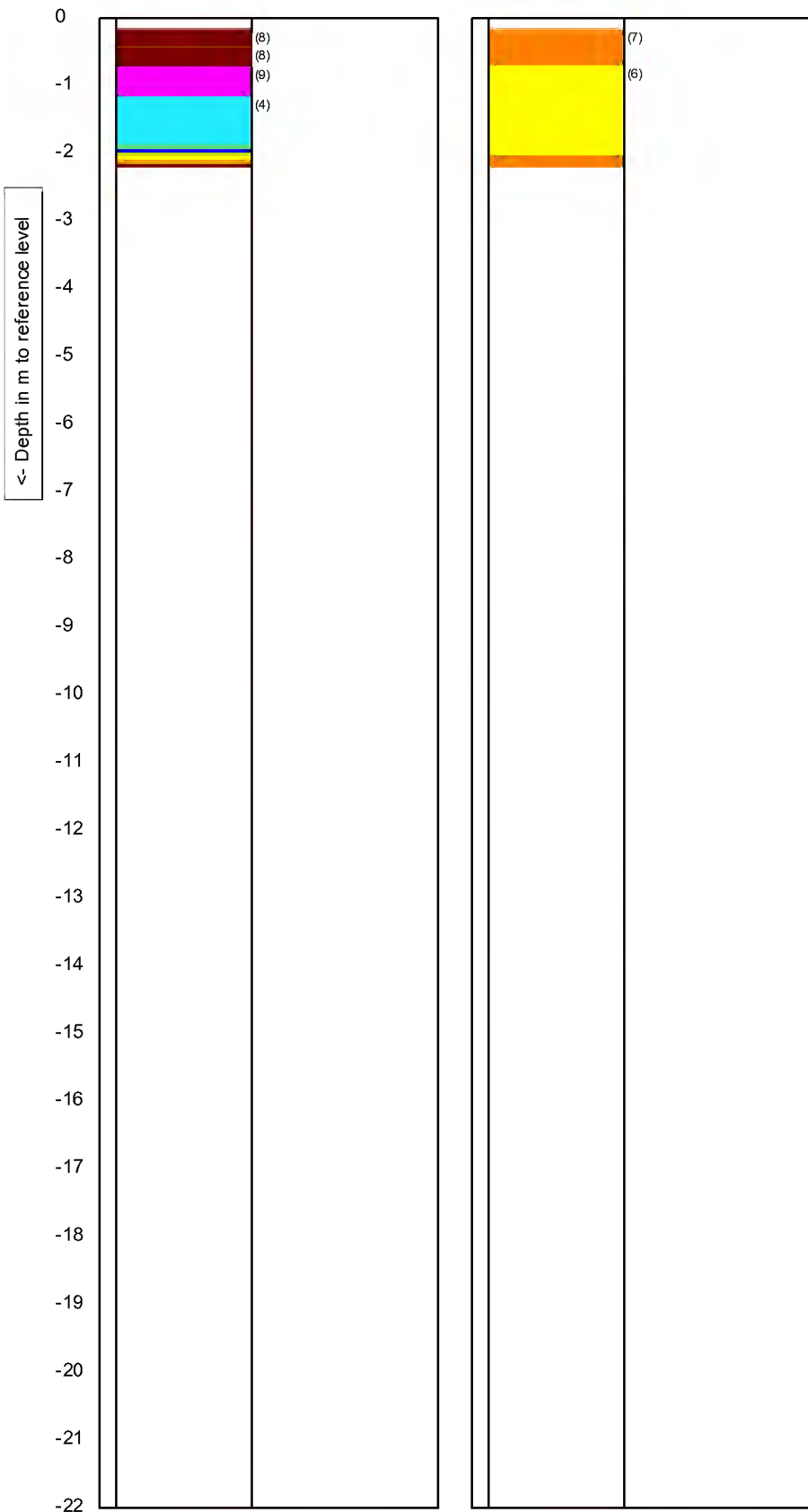
CPTask V1.20



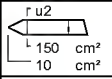
Test according to A.S.T.M standard D-5778-12		Predrill :	0
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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677664 N5403424</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT203	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

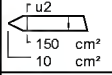
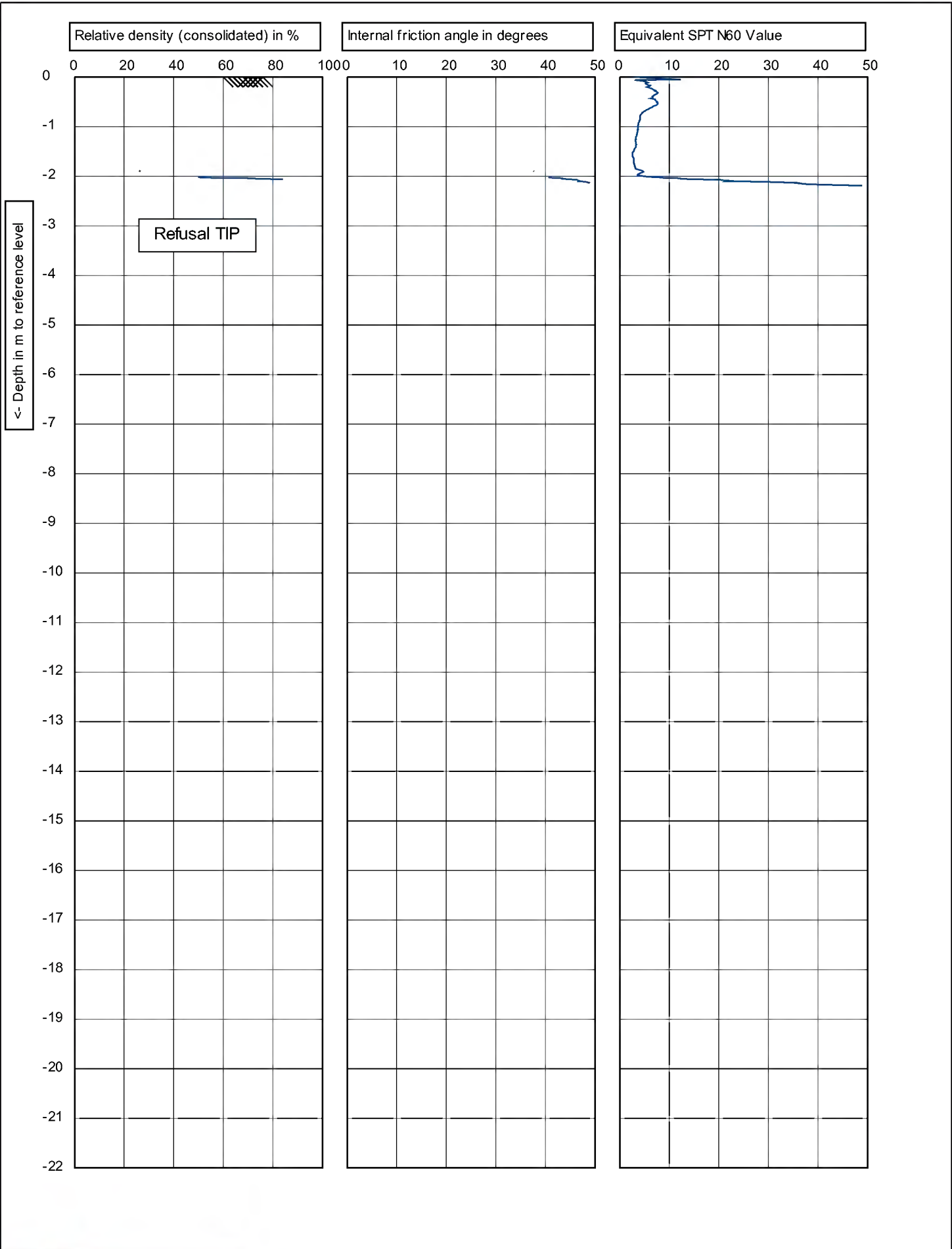


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

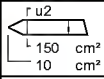
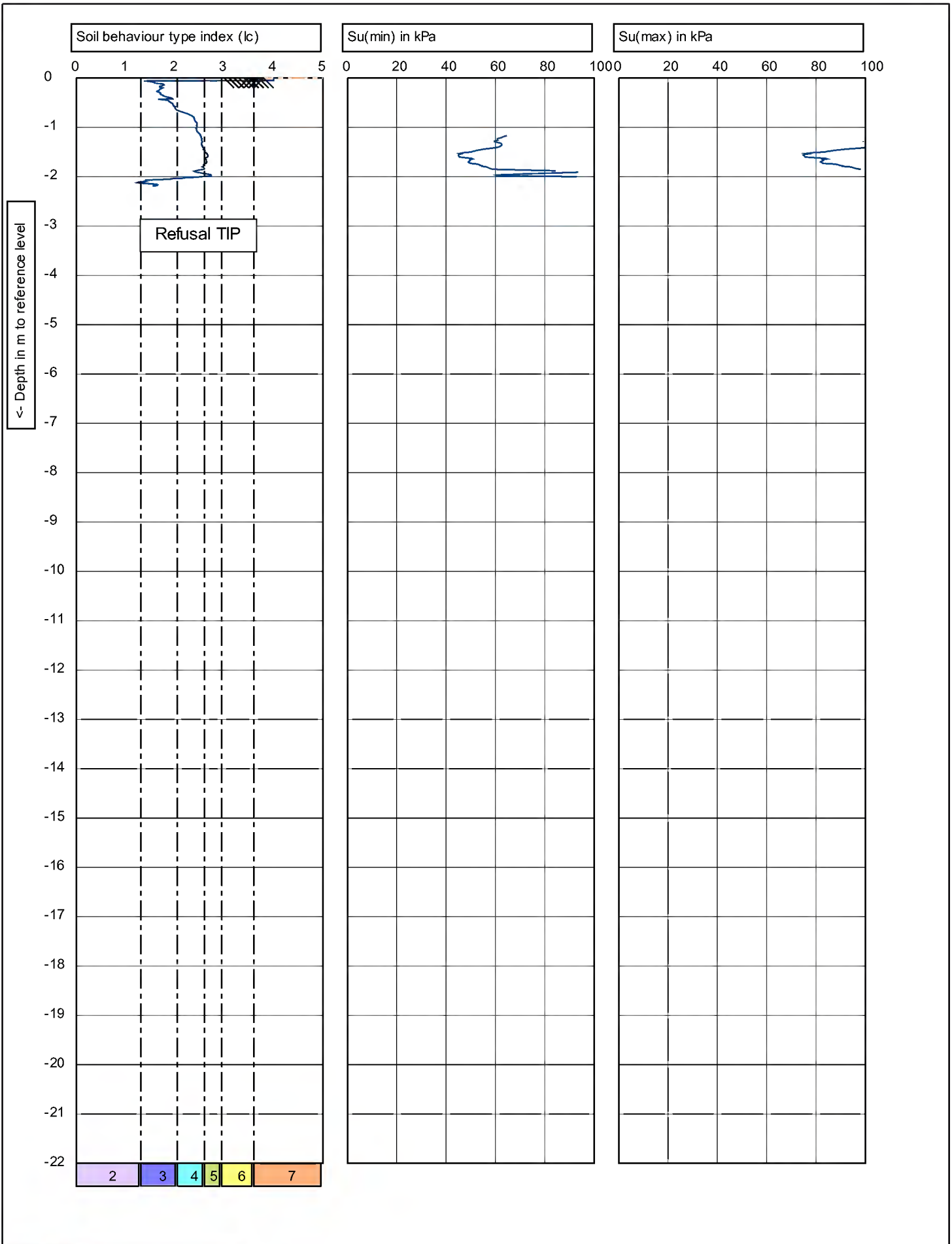


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1677664 N5403424</b>		Project no.: <b>5-C2128.00</b>	
Position:	CPT no.: CPT203	4/6	

CPTask V1.20

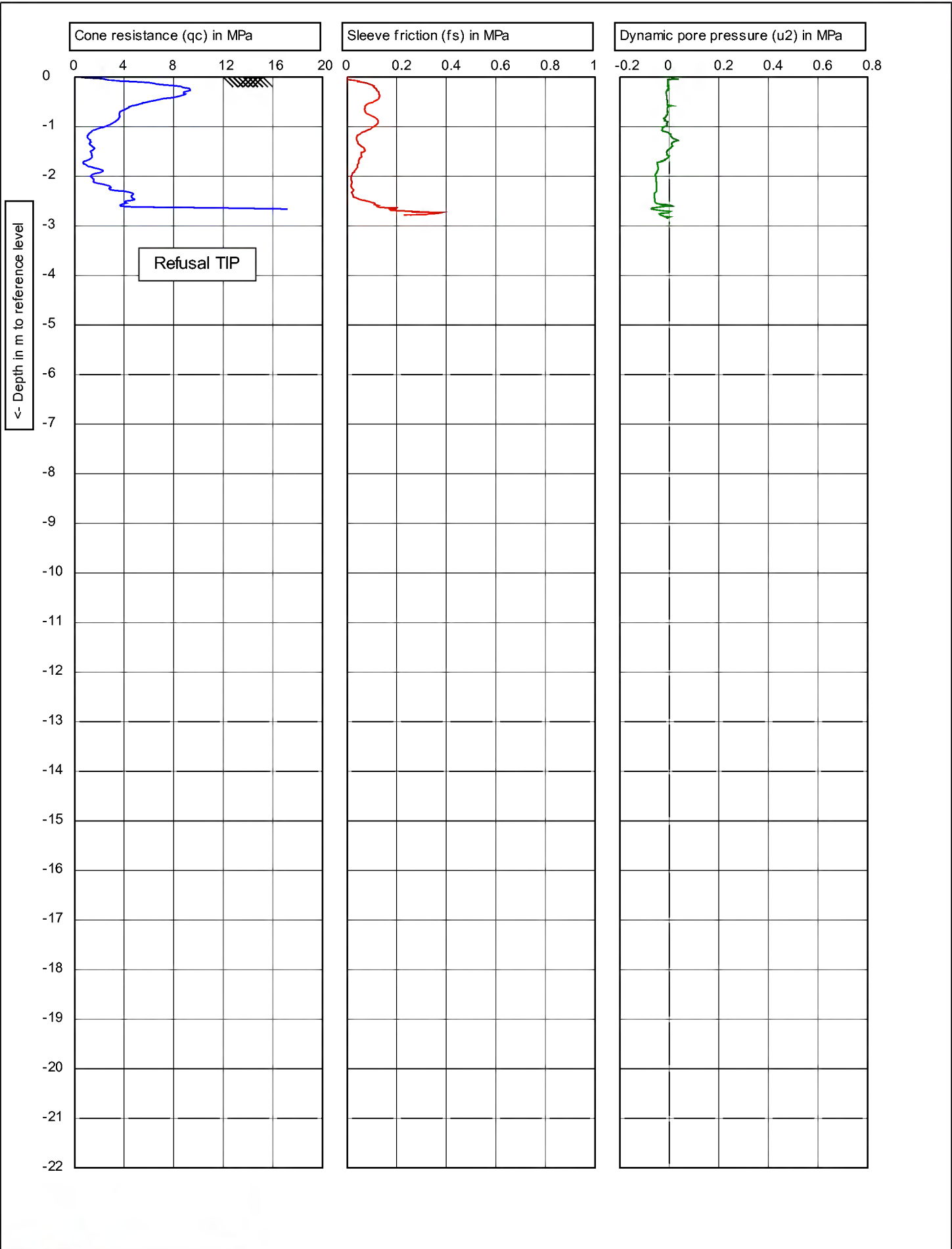


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677664 N5403424</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT203	5/6

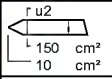


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677664 N5403424</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT203
			6/6

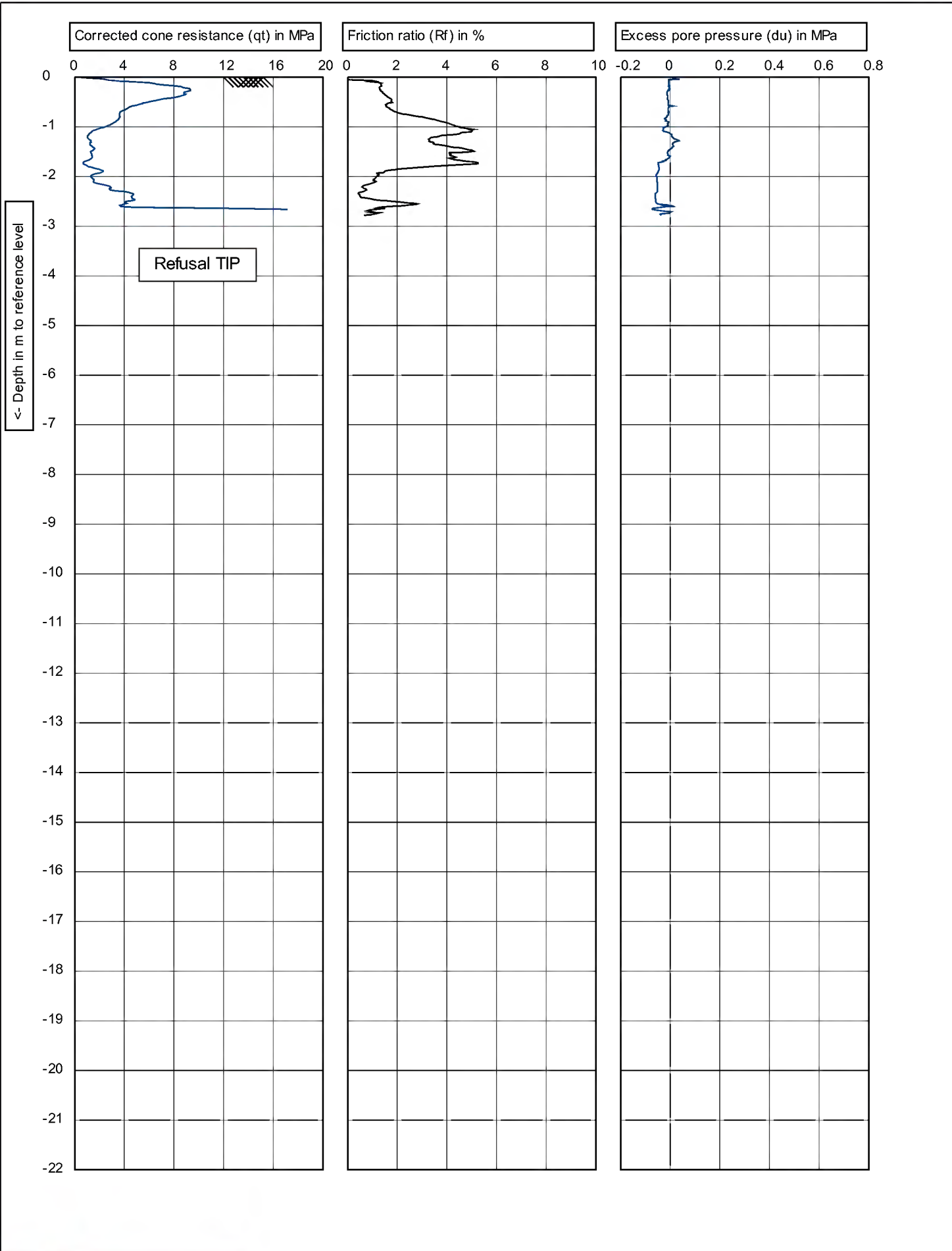
CPTask V1.20



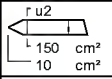
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677498 N5403855</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT204	1/6

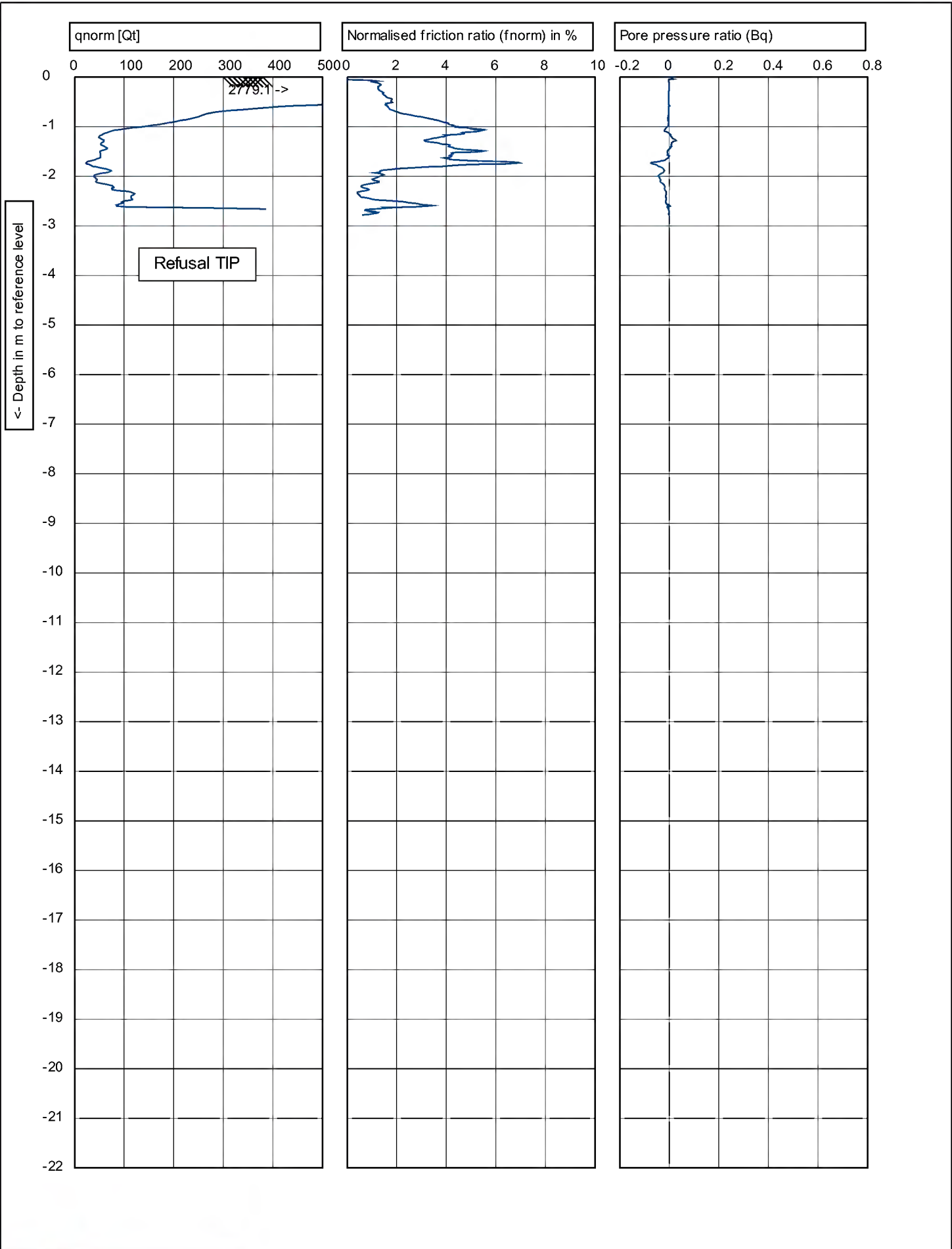


CPTask V1.20

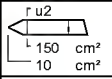


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677498 N5403855</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT204	2/6





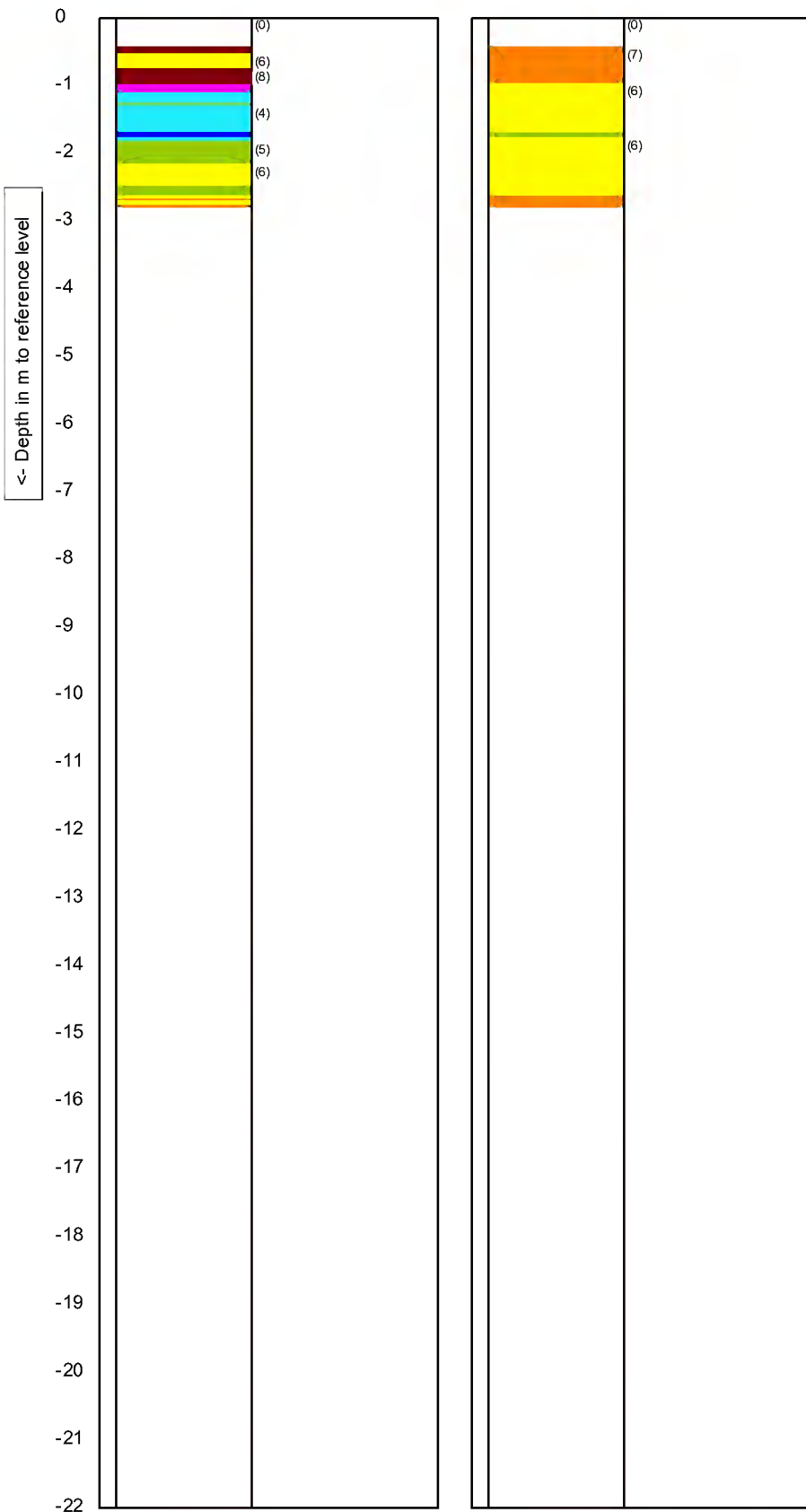
CPTask V1.20



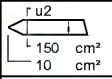
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677498 N5403855</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT204	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

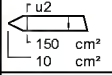
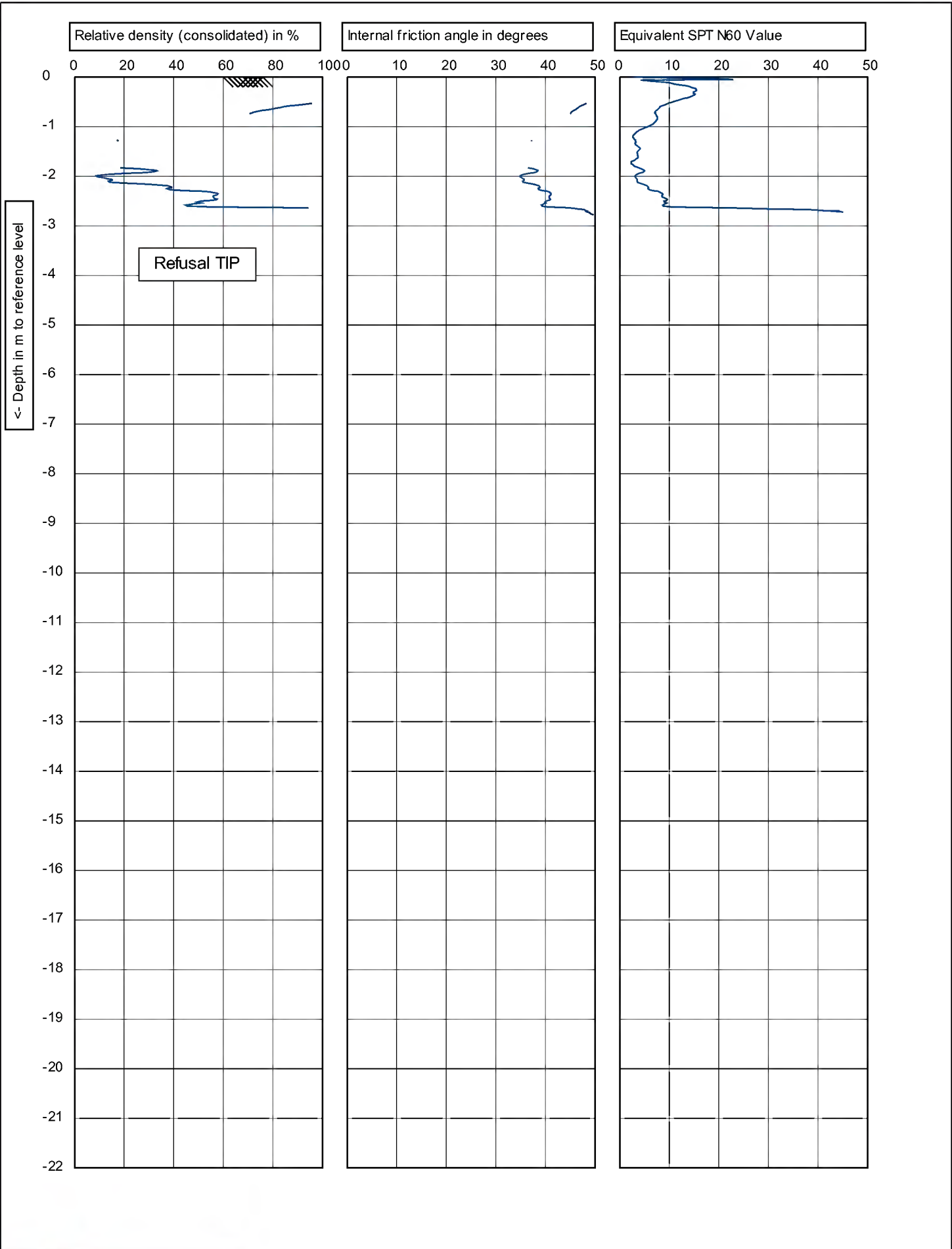


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

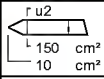
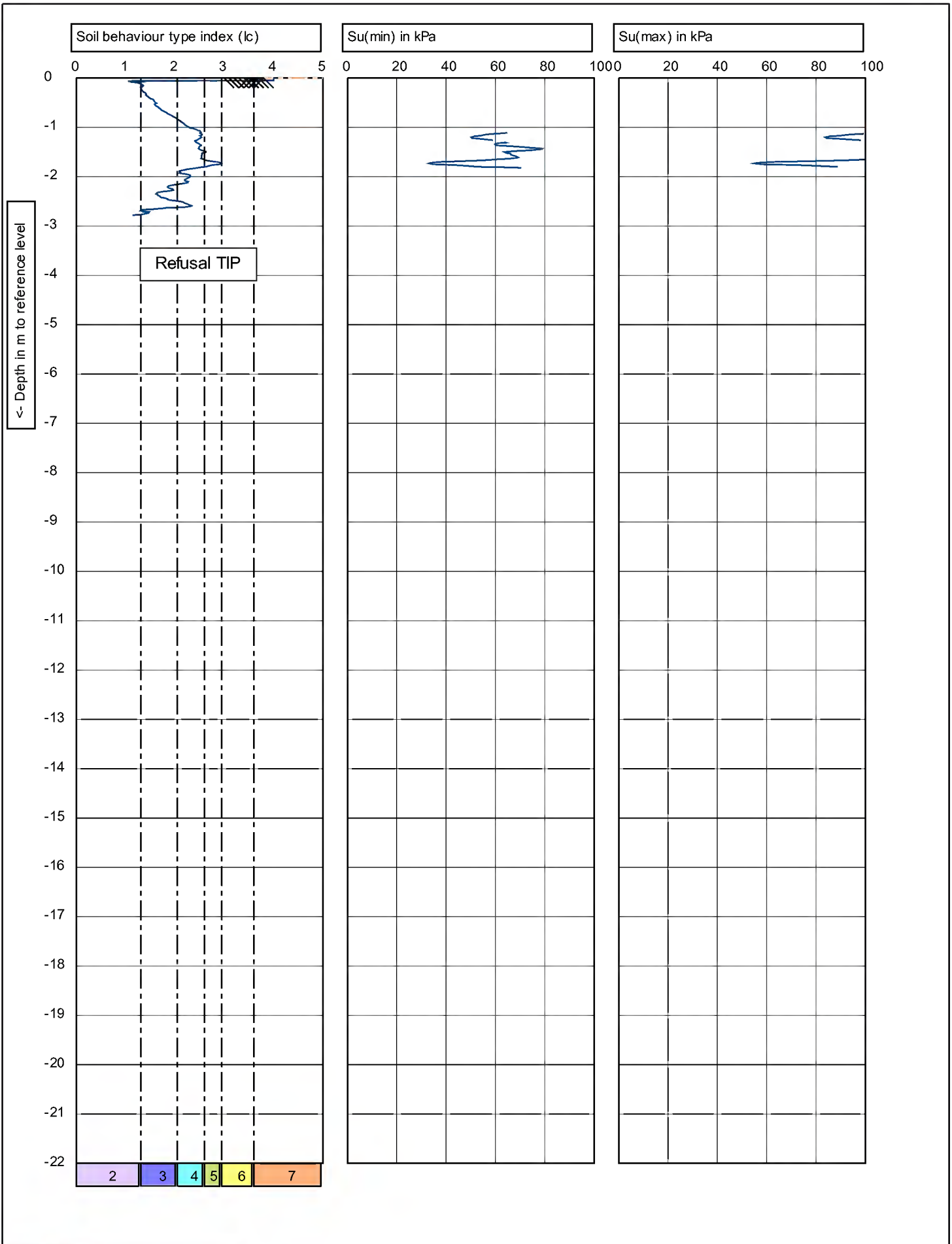


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1677498 N5403855</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT204	4/6

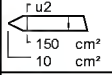
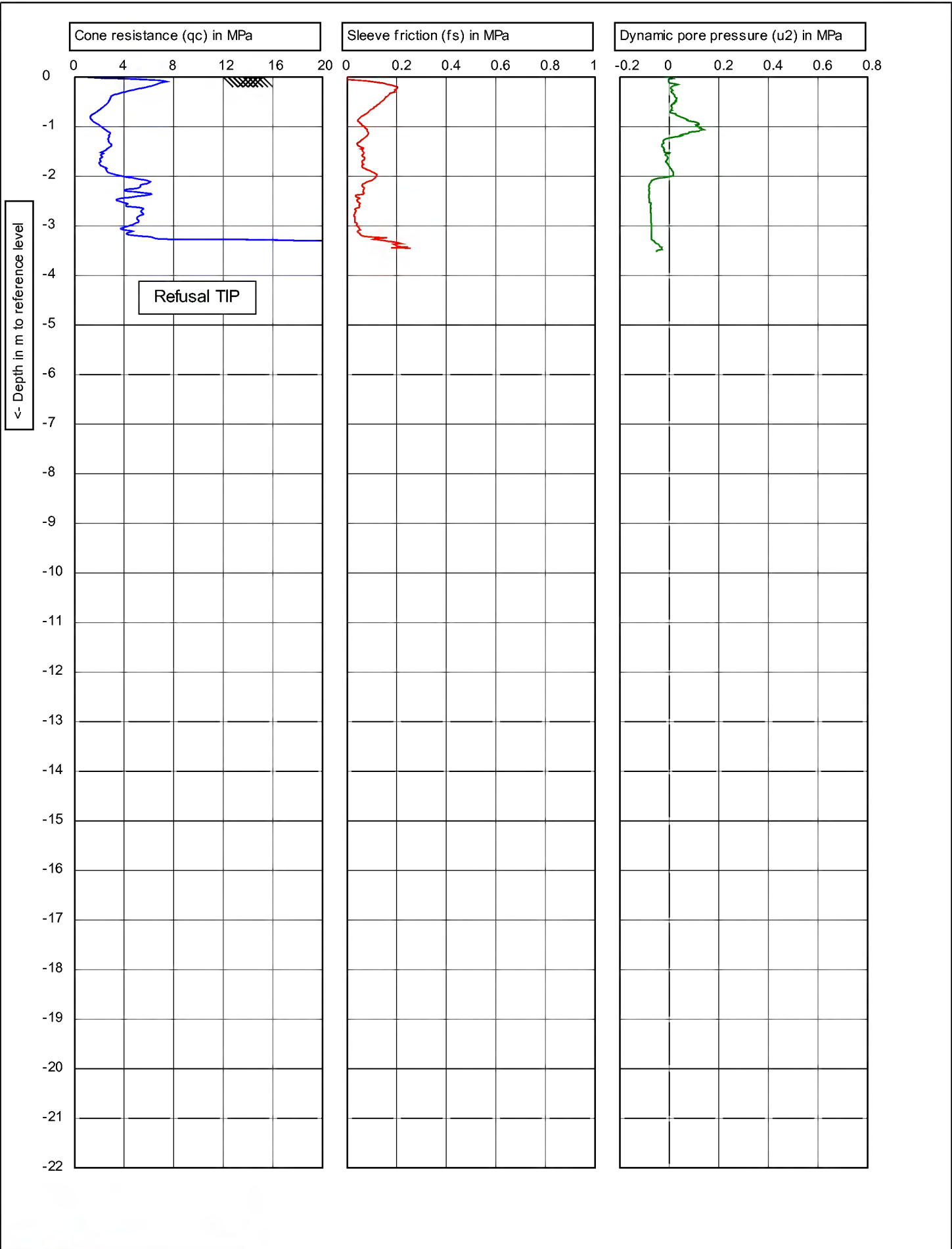
CPTask V1.20



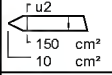
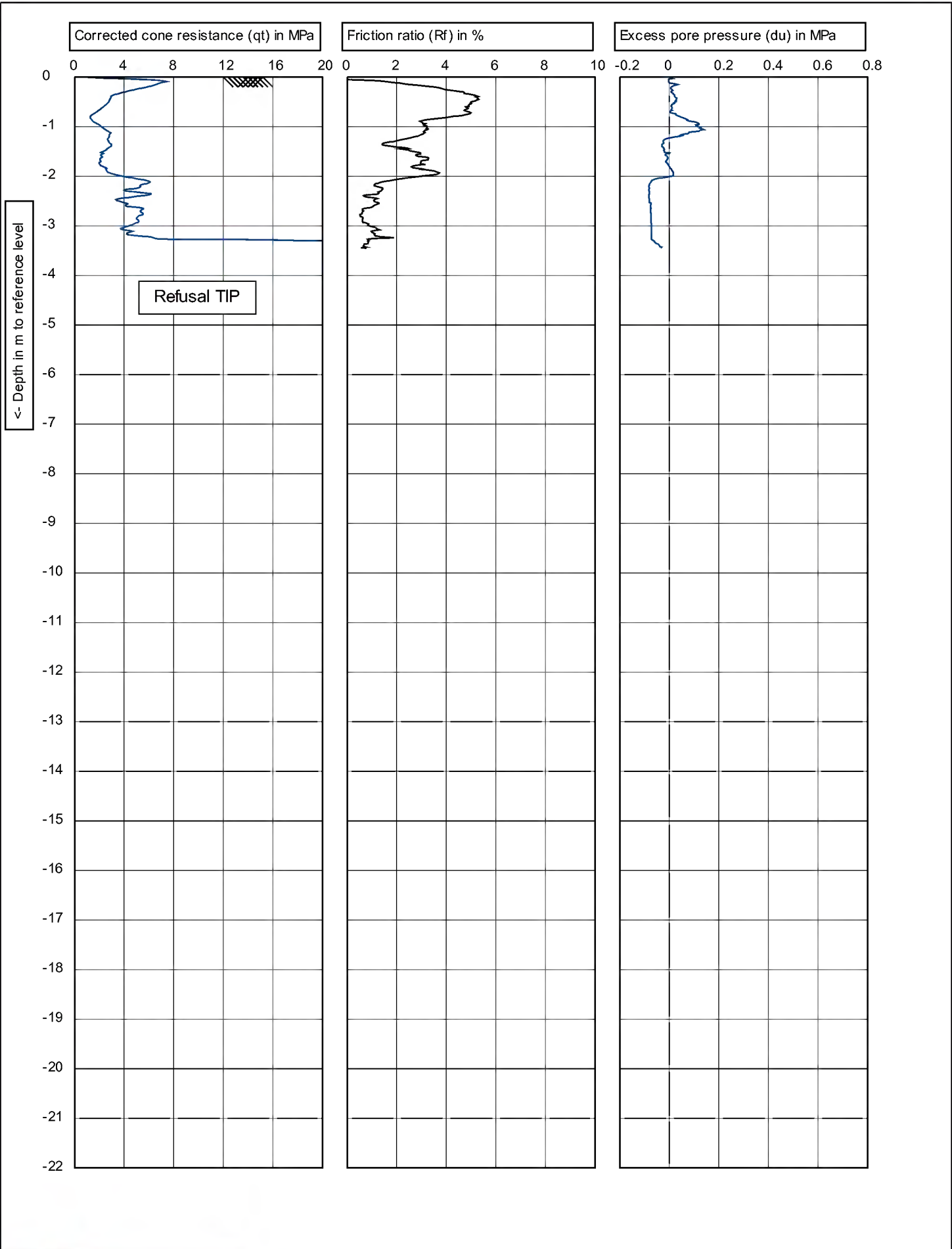
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677498 N5403855</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT204	5/6



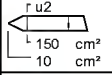
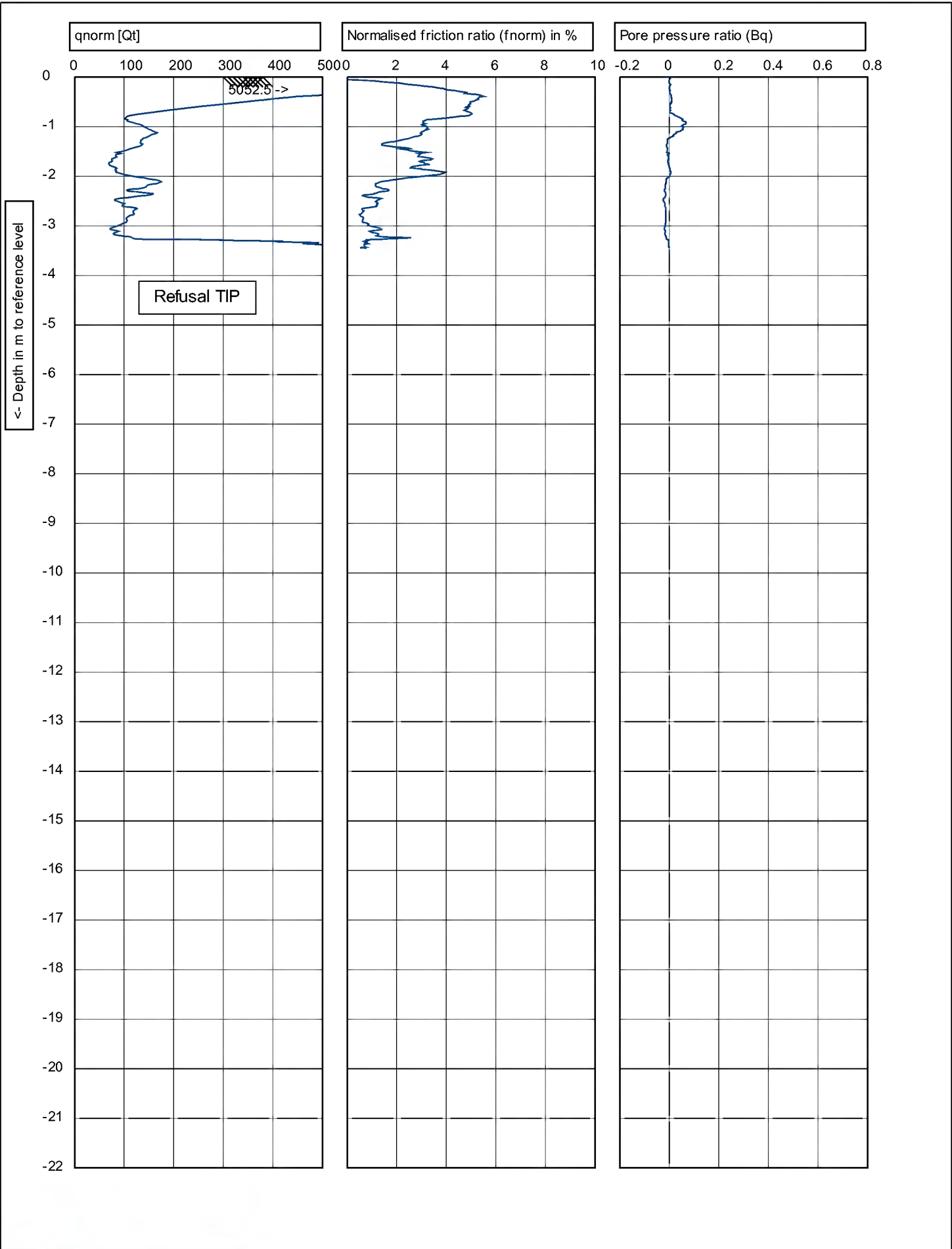
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677498 N5403855</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT204
			6/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677272 N5404426</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT205	1/6



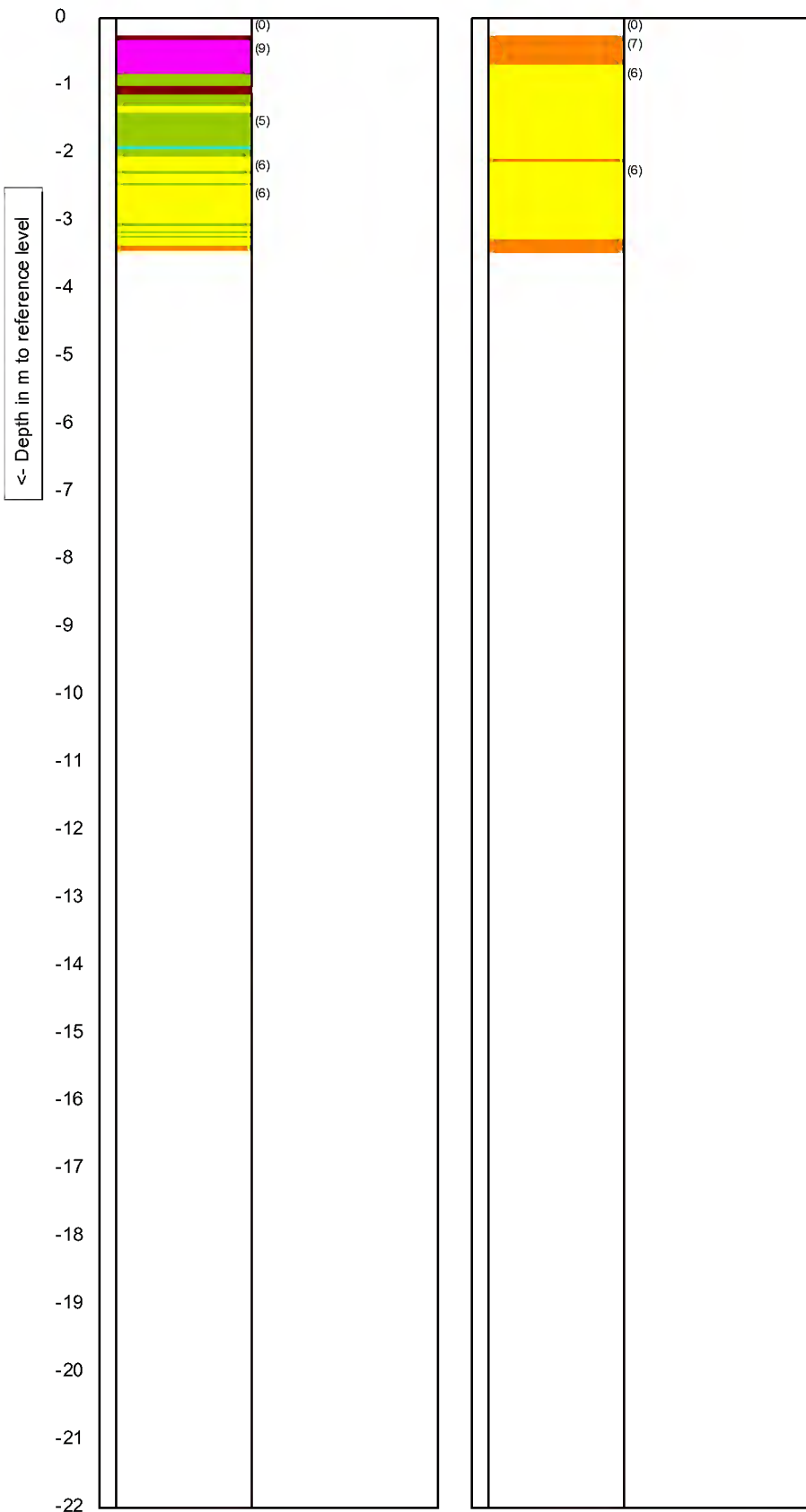
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677272 N5404426</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT205	2/6



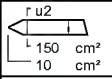
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677272 N5404426</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT205	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



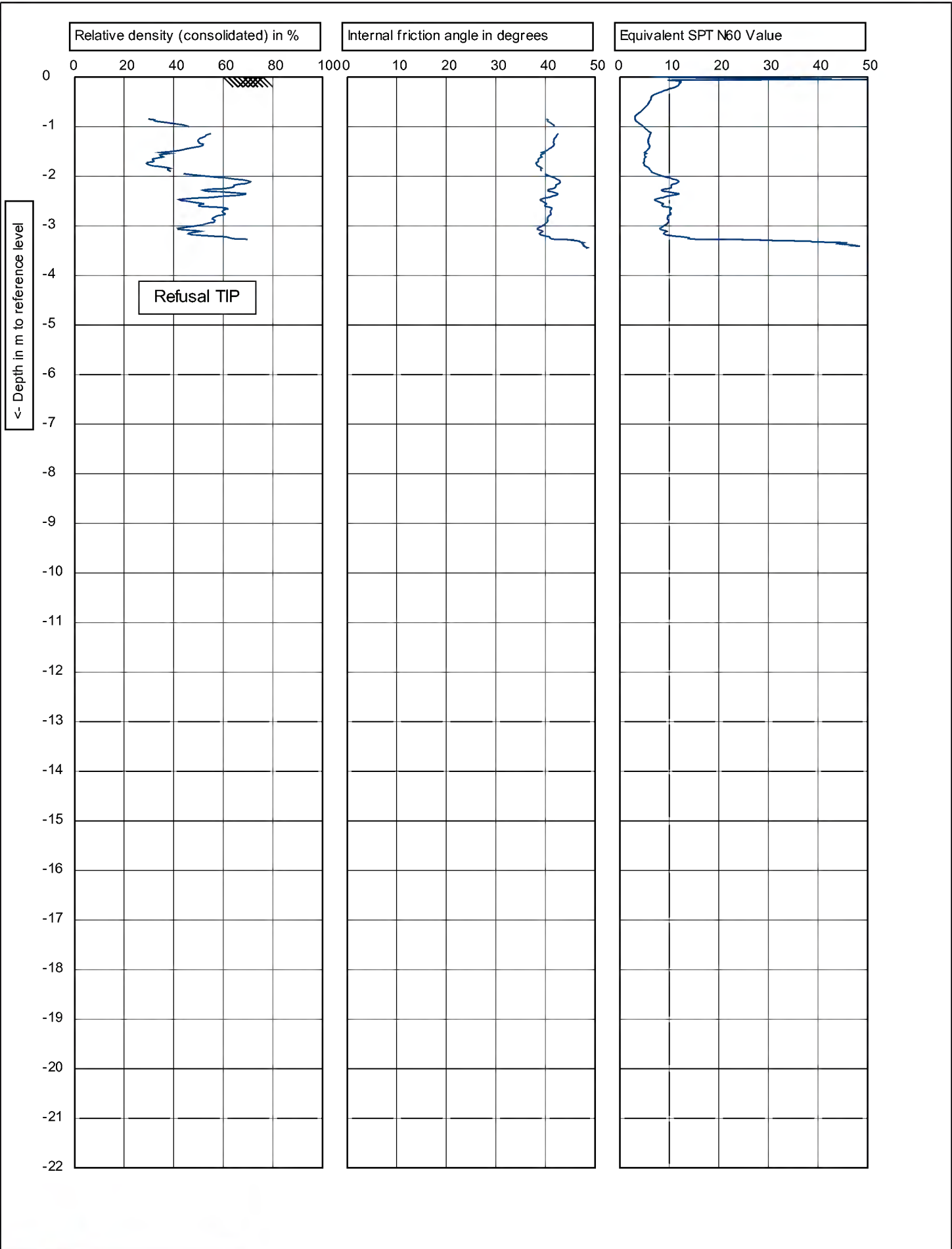
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



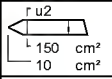
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1677272 N5404426		Project no.: 5-C2128.00	
Position:		CPT no.: CPT205	4/6

CPTask V1.20

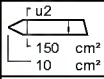
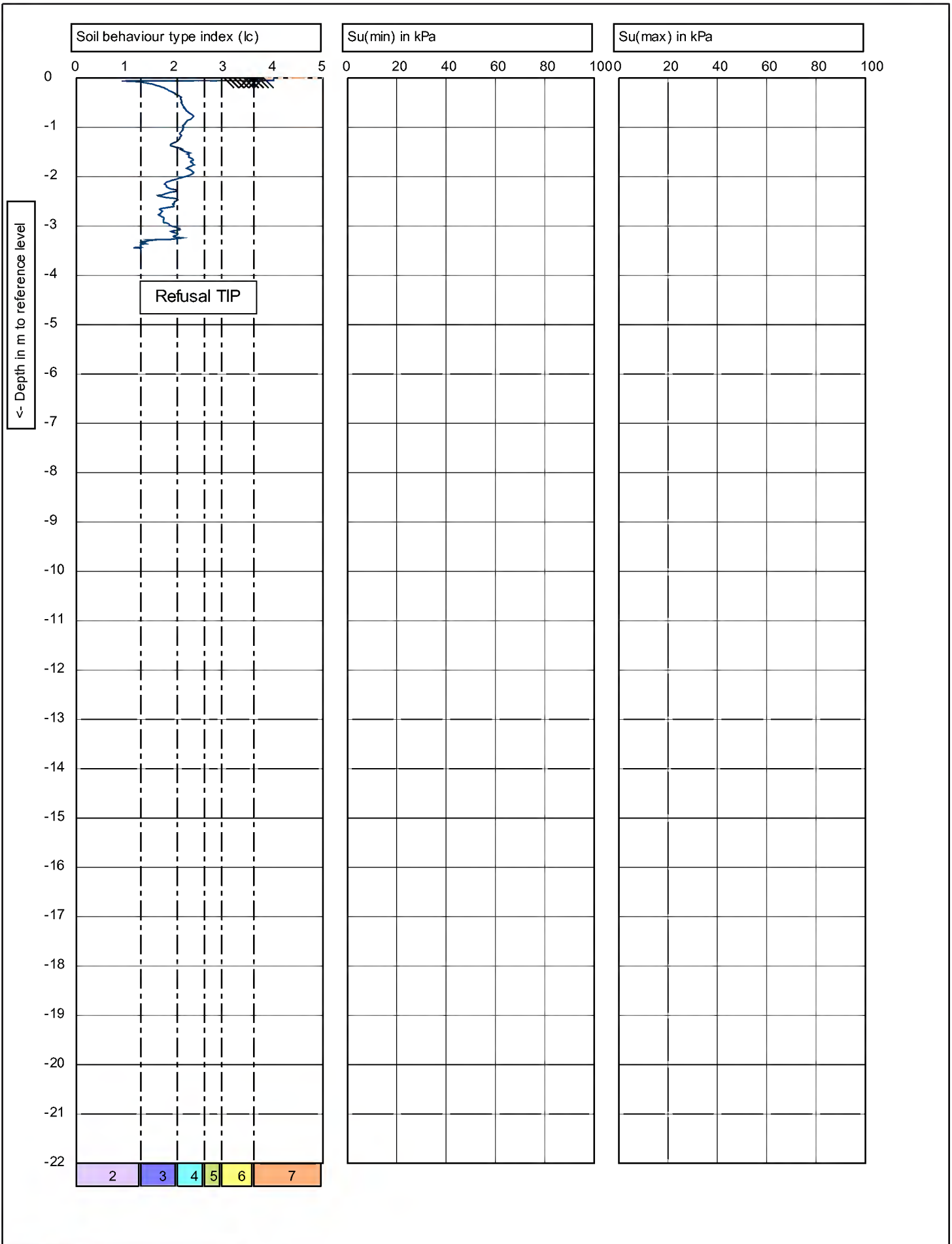




CPTask V1.20

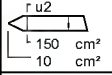
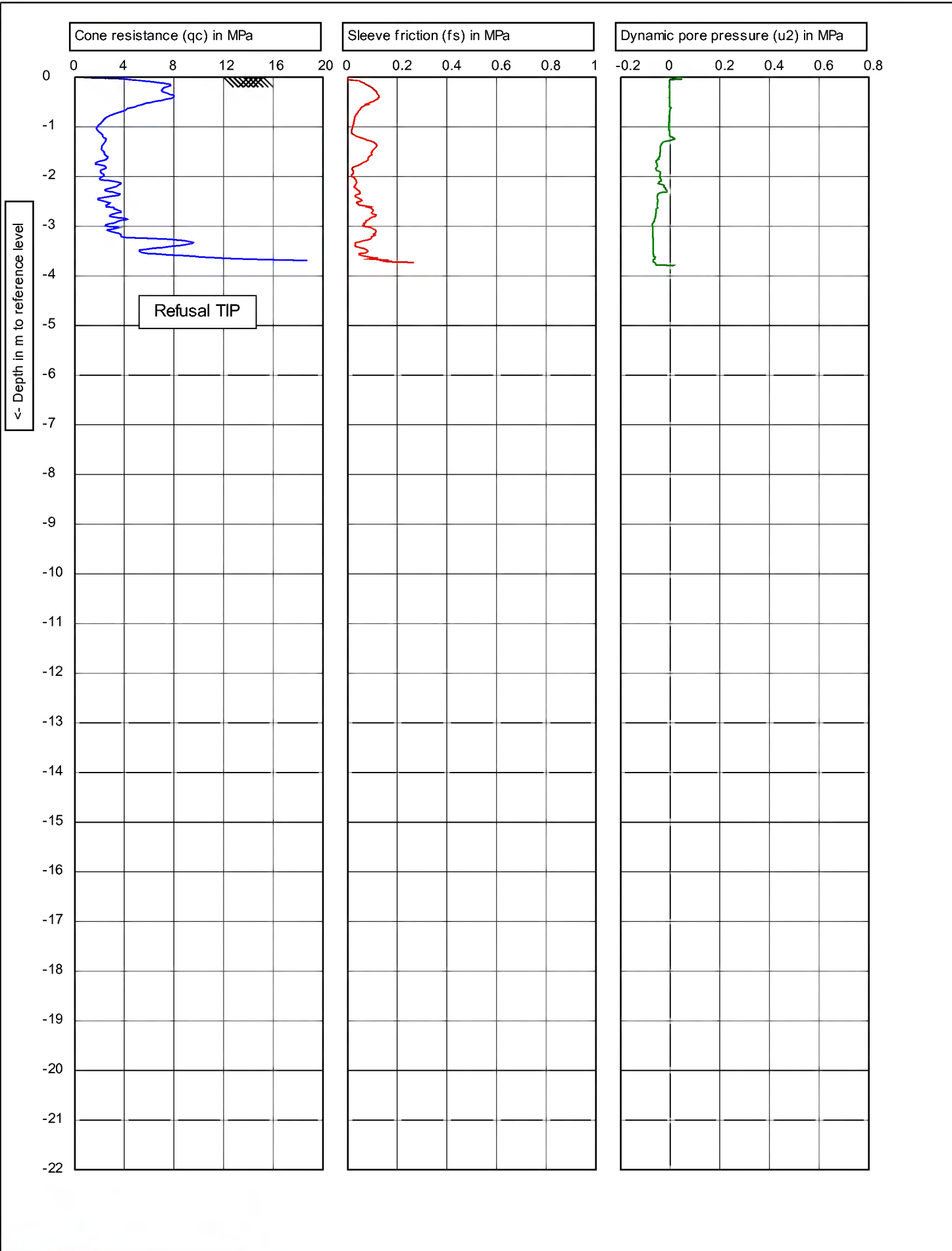


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677272 N5404426</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT205	5/6

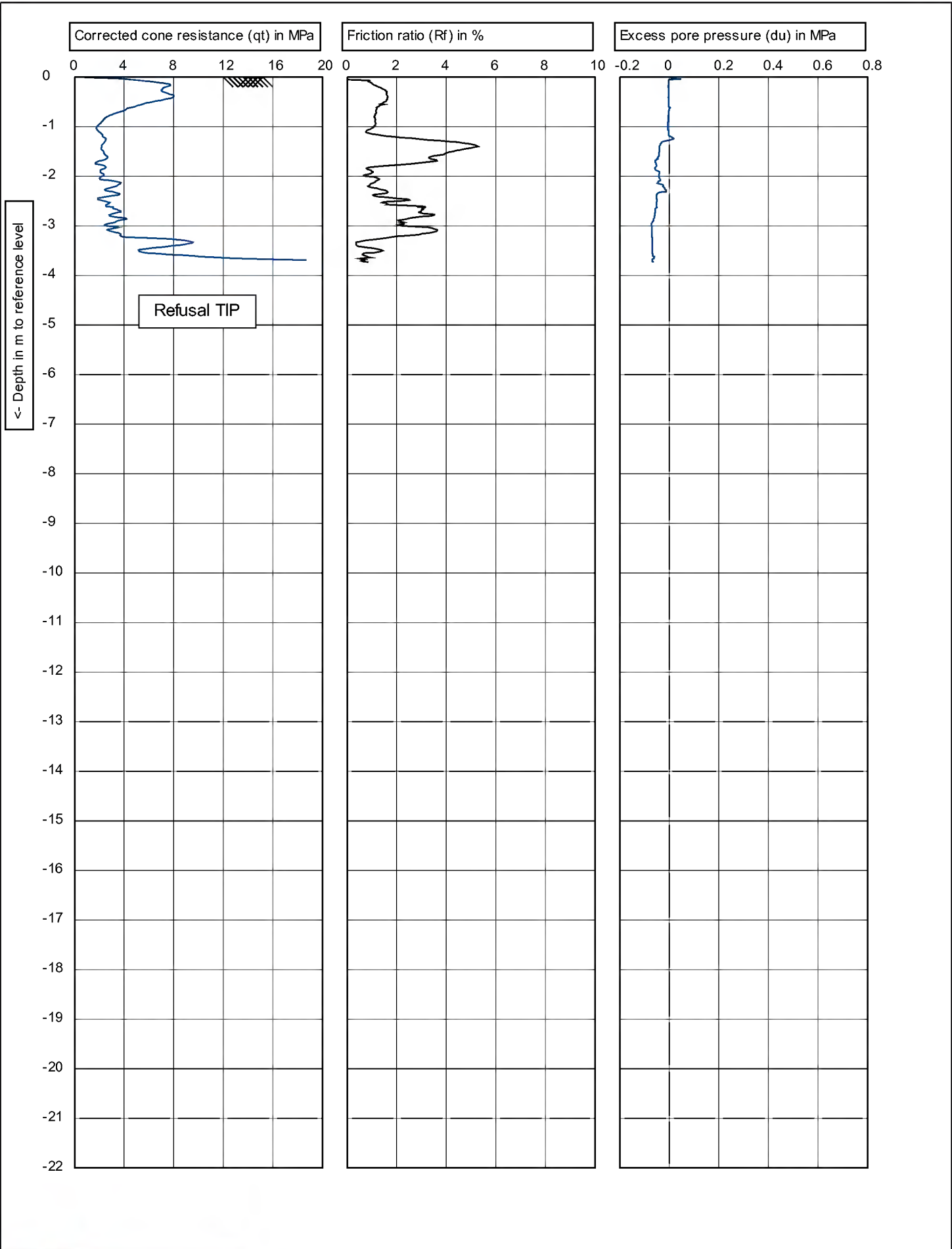


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677272 N5404426</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT205
			6/6

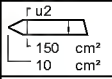
CPTask V1.20



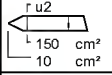
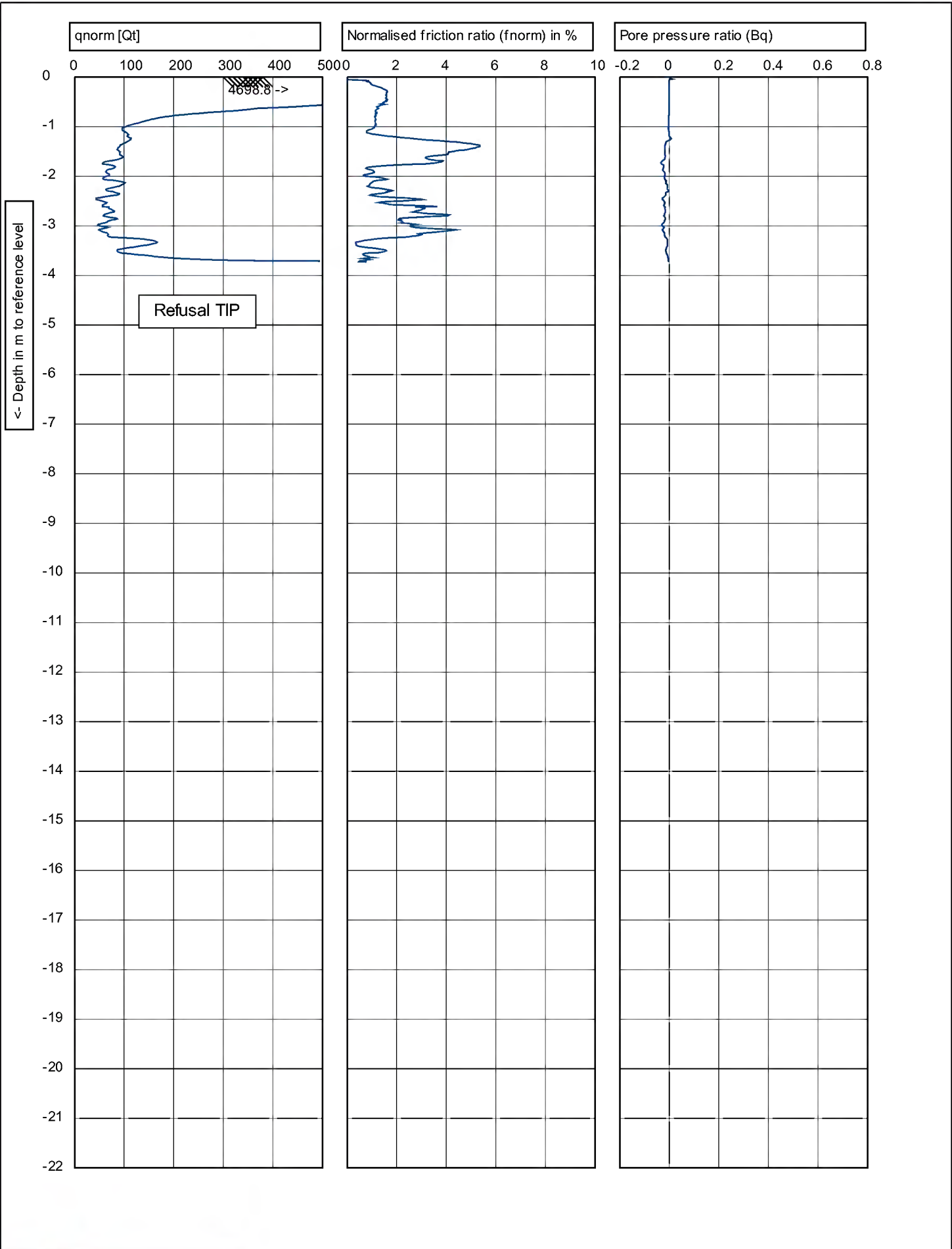
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676711 N5404645</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT206	1/6



CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676711 N5404645</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT206	2/6

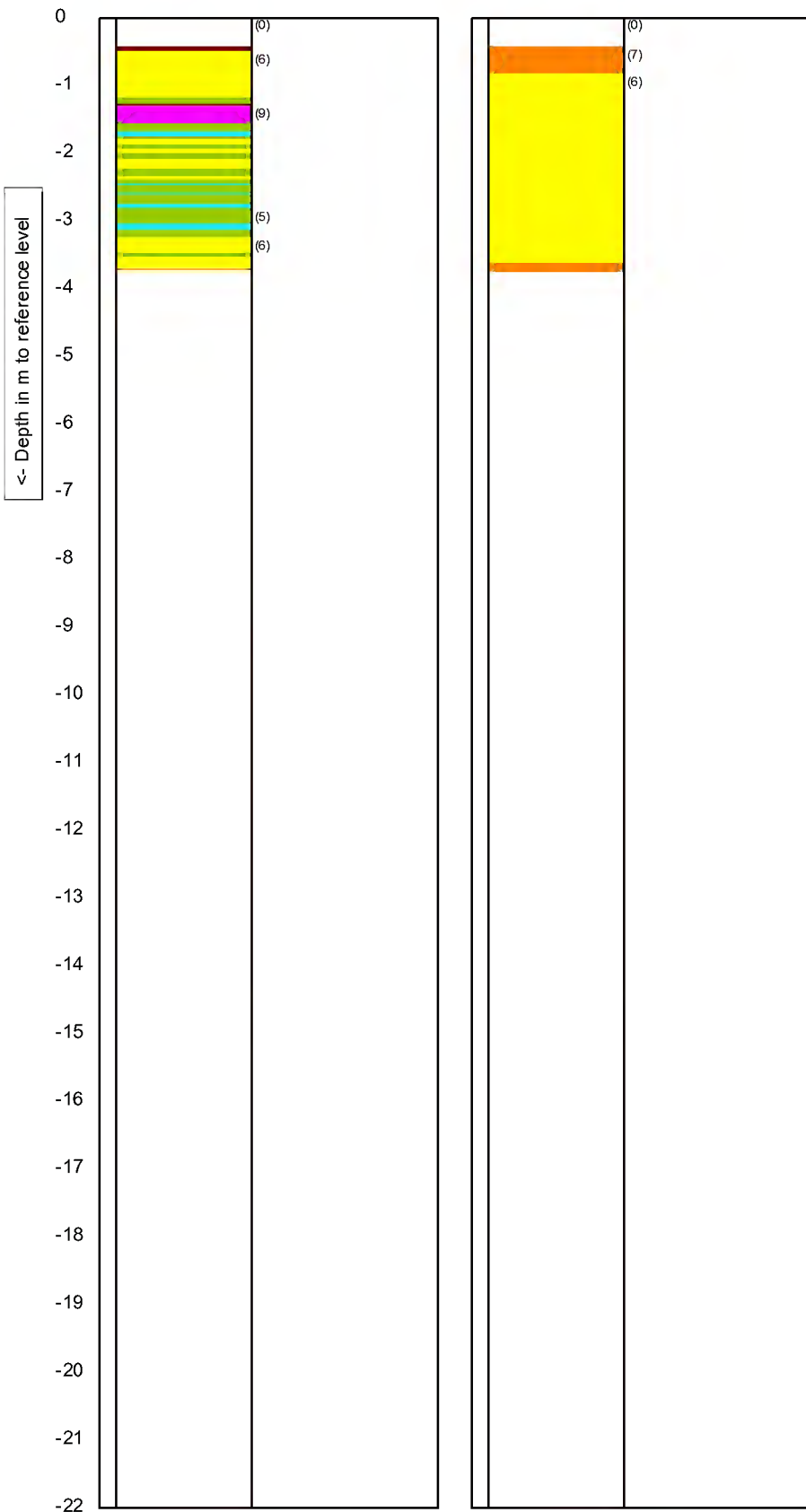


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676711 N5404645</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT206
			3/6

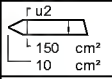
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

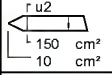
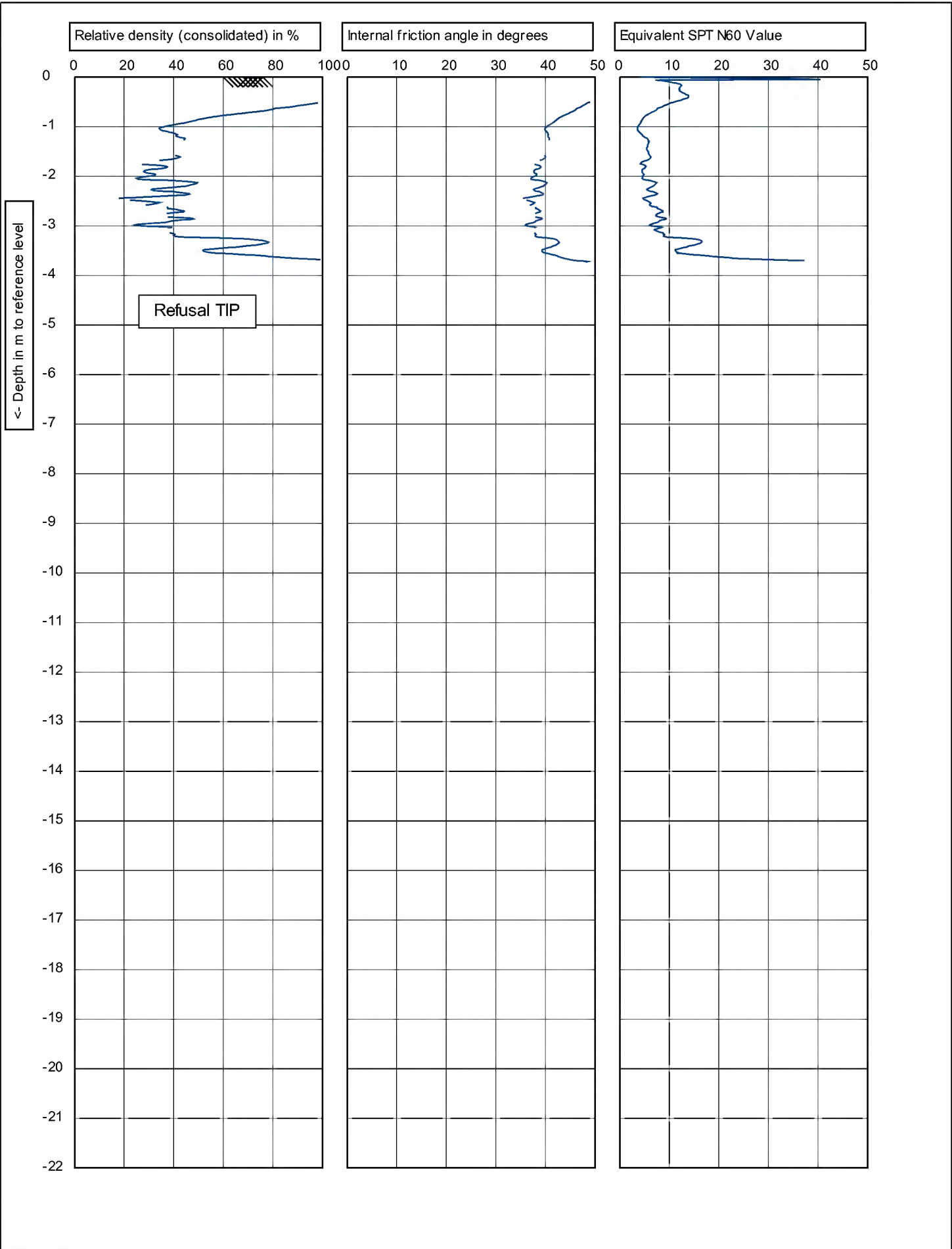


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

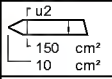
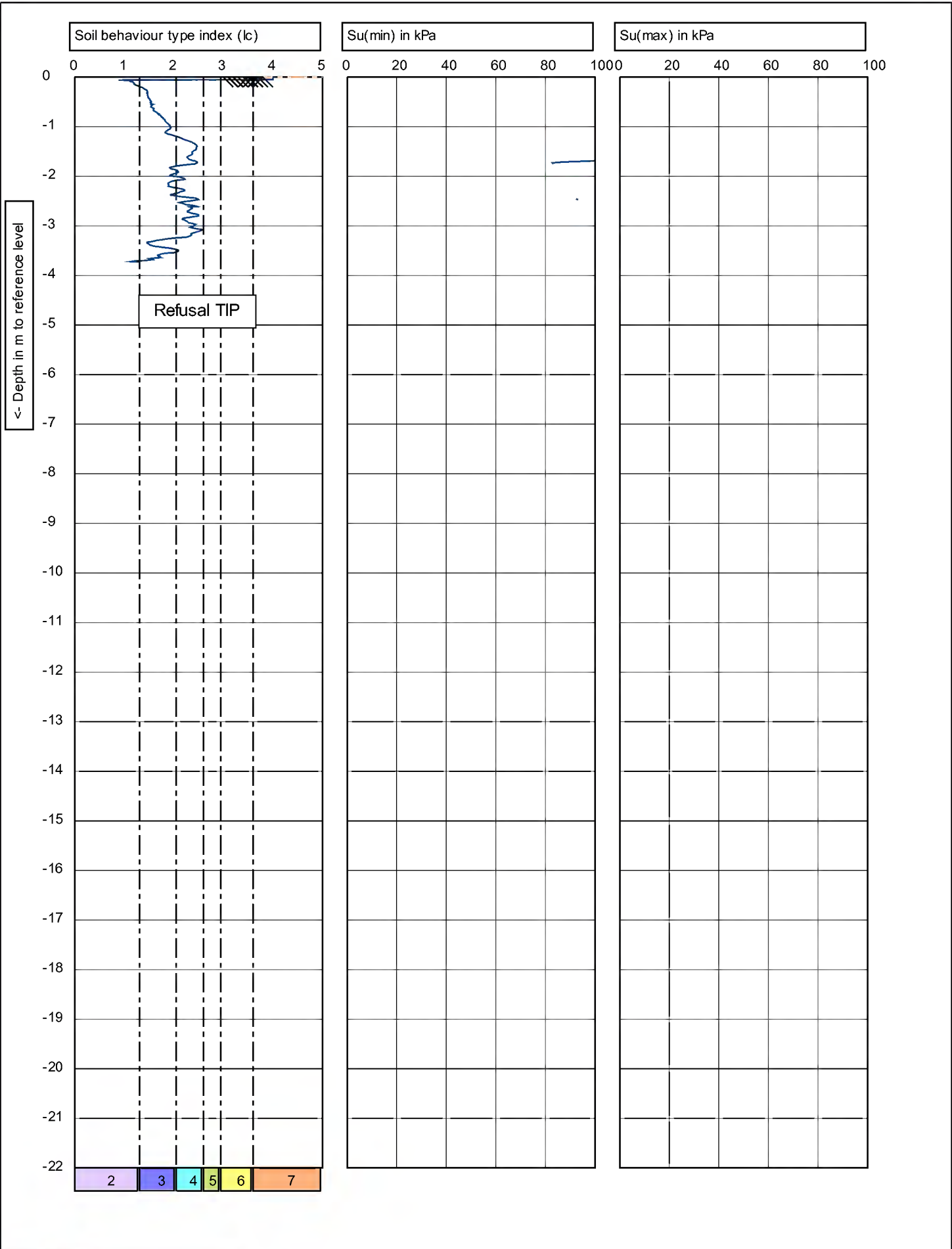


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1676711 N5404645		Project no.: 5-C2128.00	
Position:		CPT no.: CPT206	4/6

CPTask V1.20



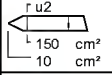
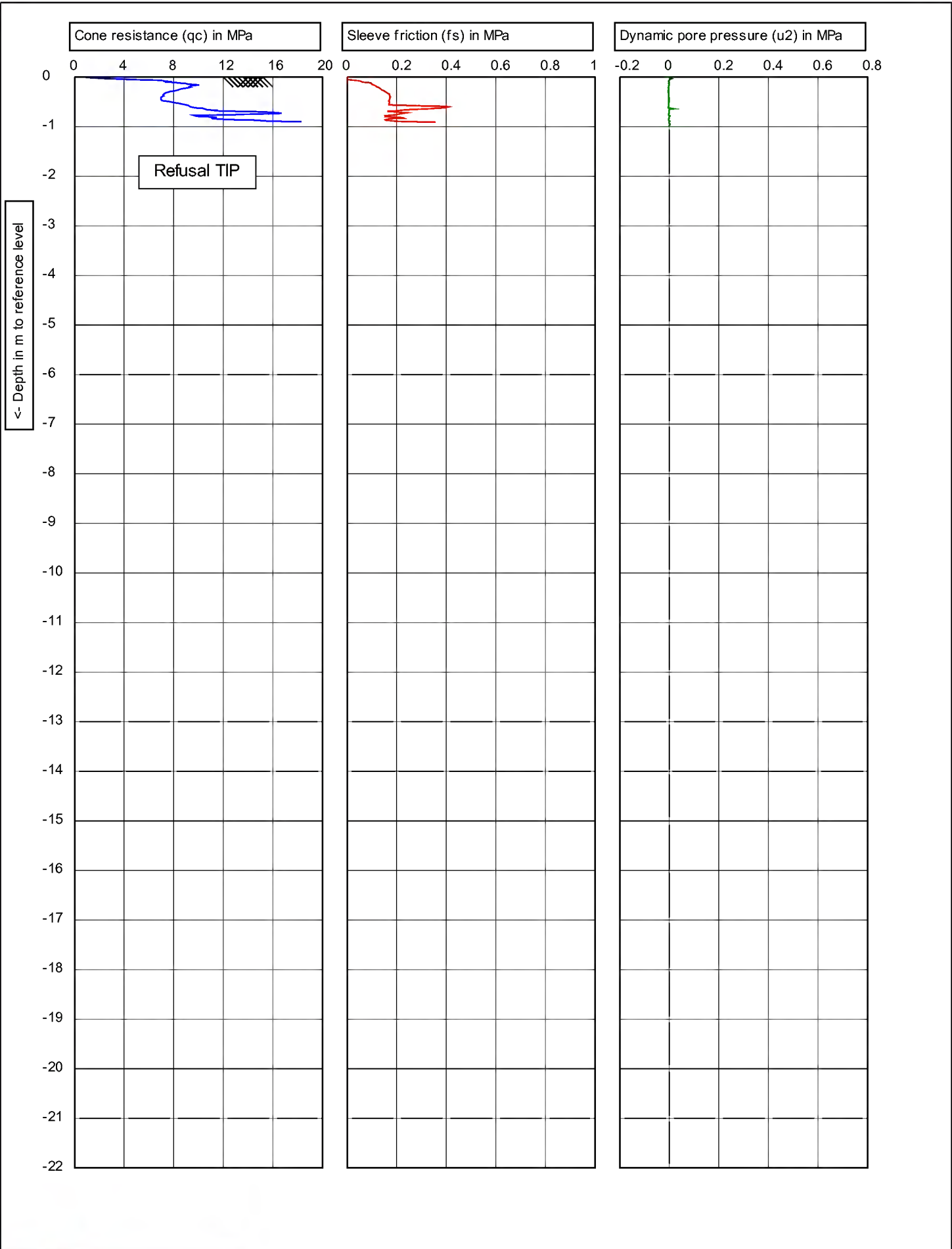
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676711 N5404645</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT206	5/6



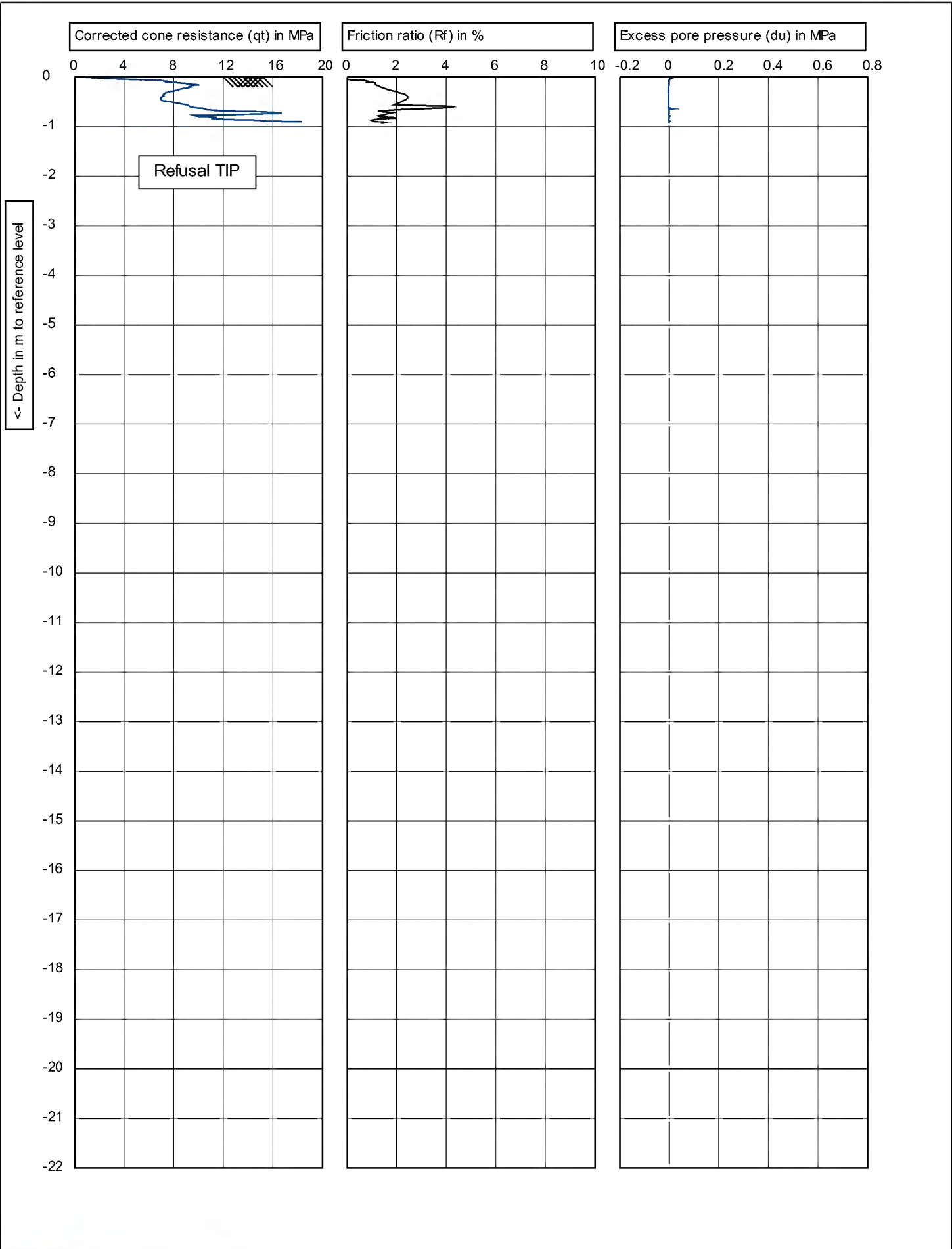
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676711 N5404645</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT206
			6/6

CPTask V1.20

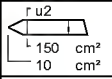




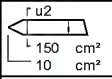
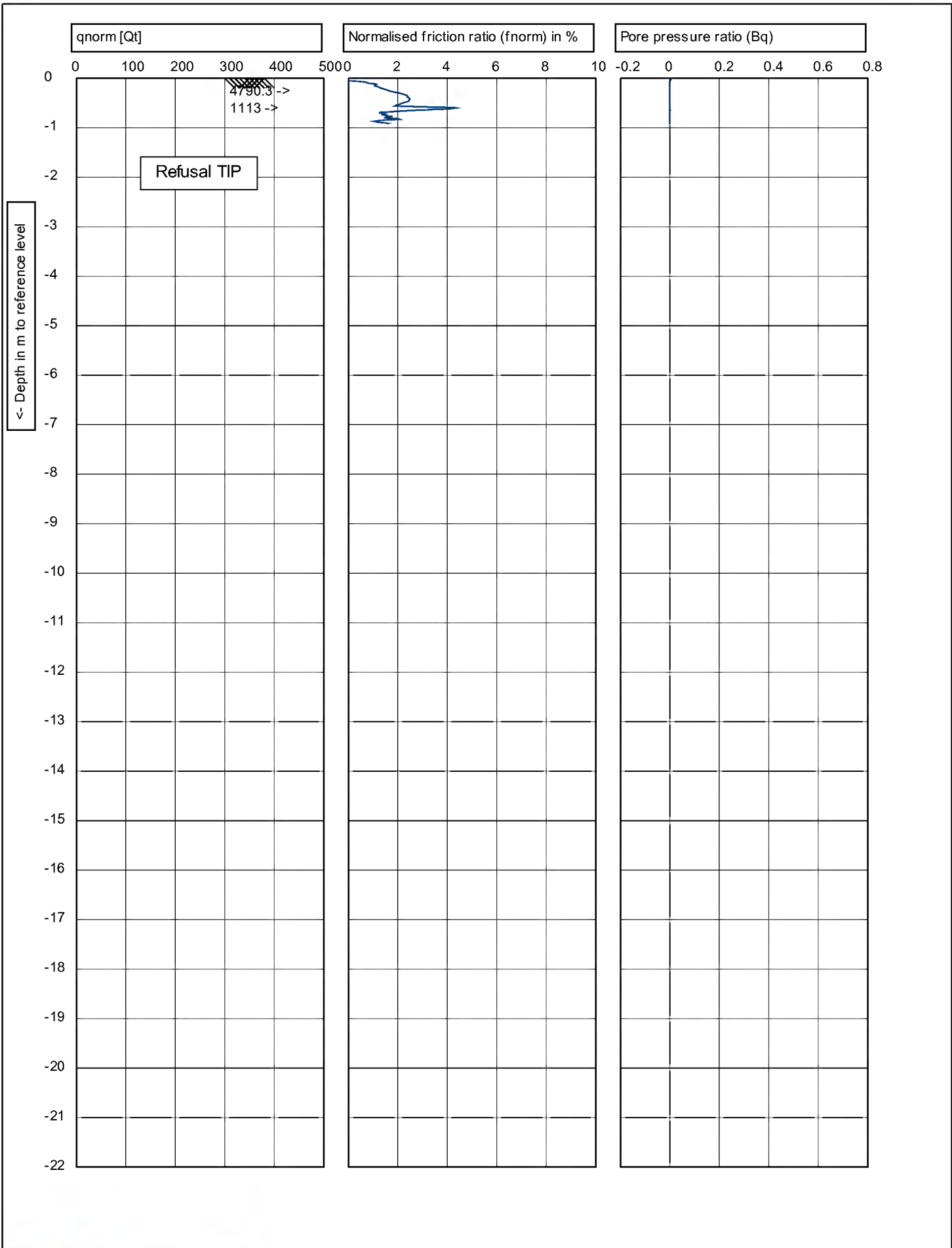
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676934 N5404800</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT207	1/6



CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676934 N5404800</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT207	2/6

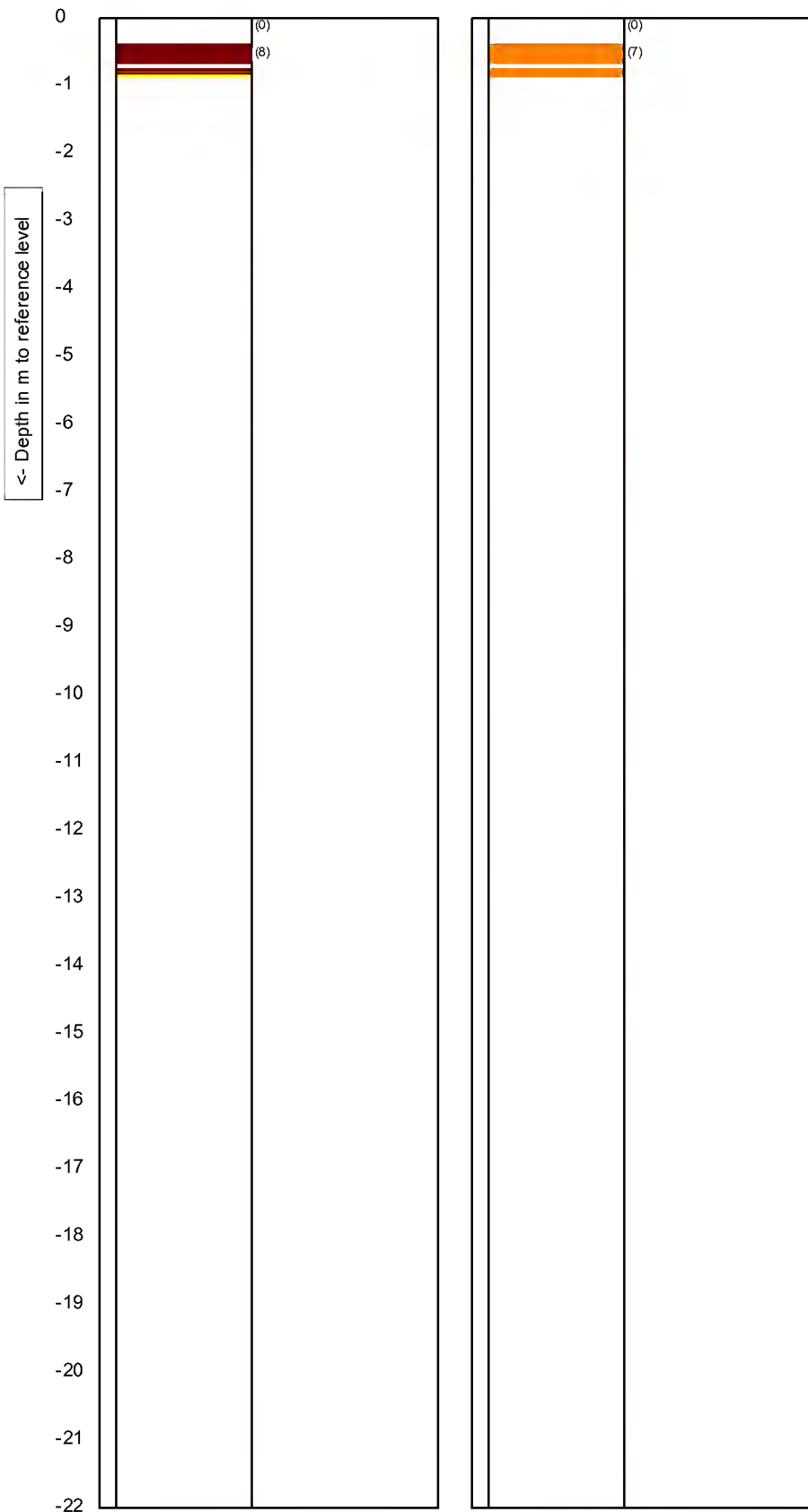


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676934 N5404800</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT207	3/6

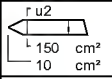
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

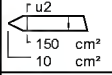
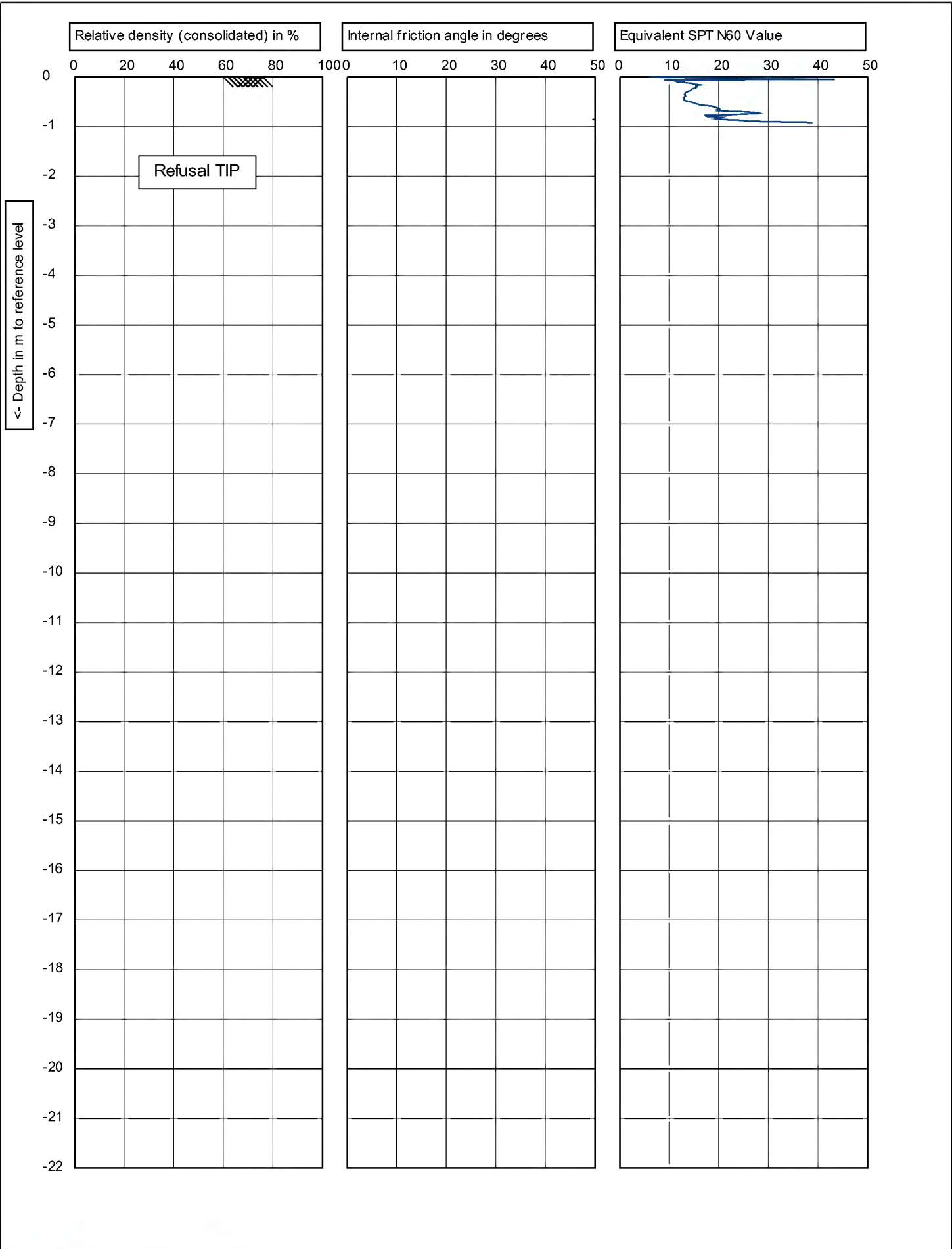


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

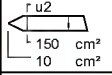
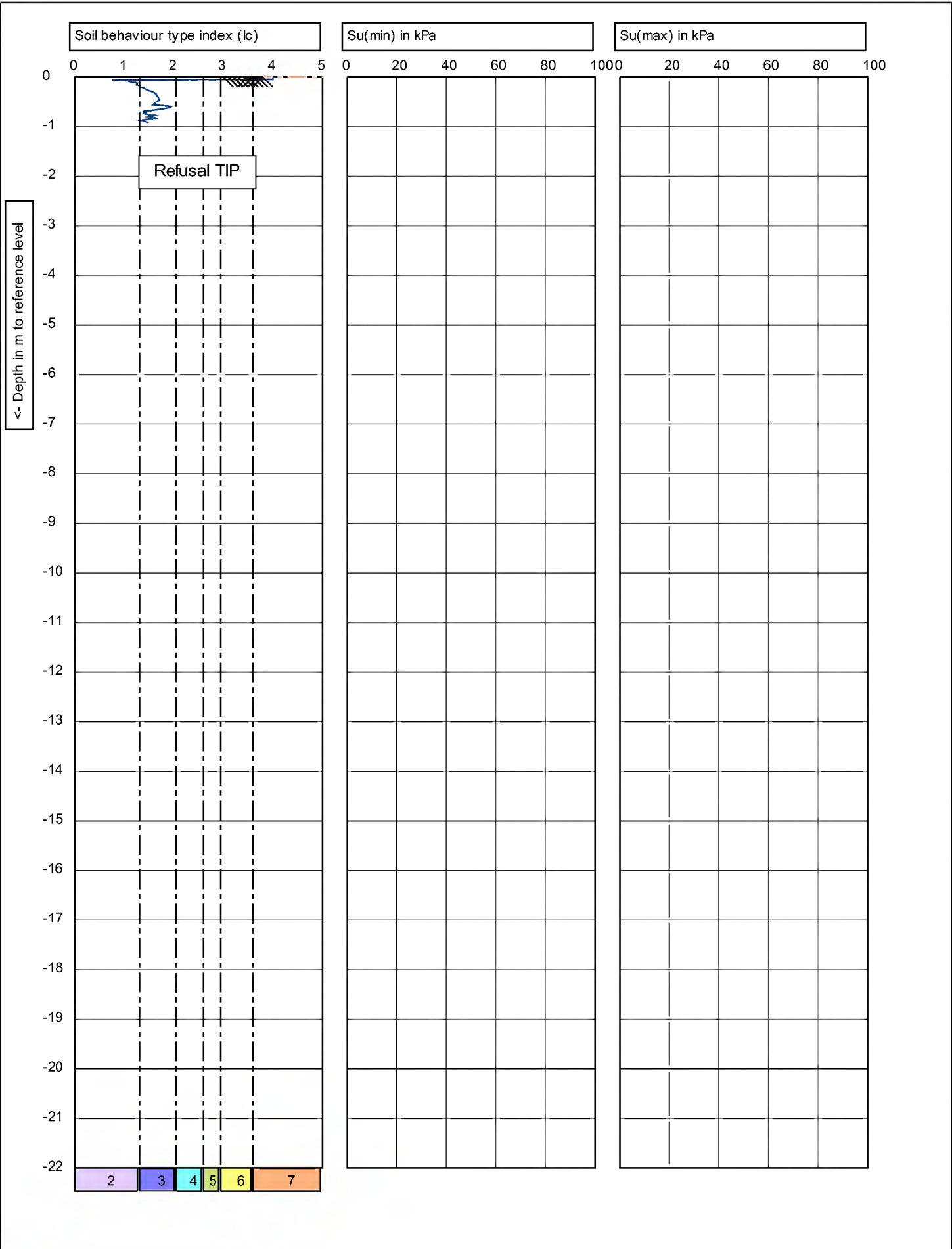


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1676934 N5404800</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT207	4/6

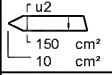
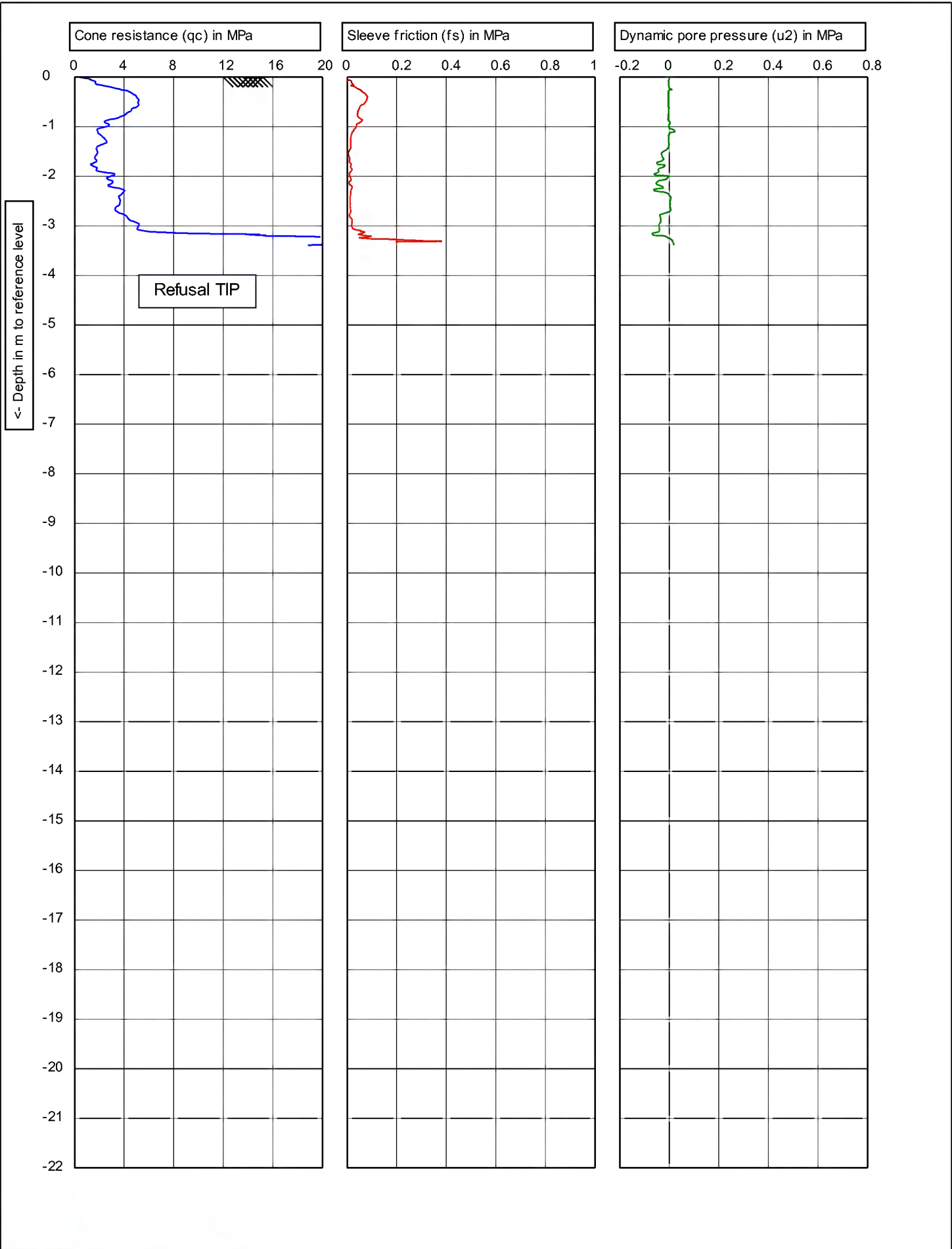
CPTask V1.20



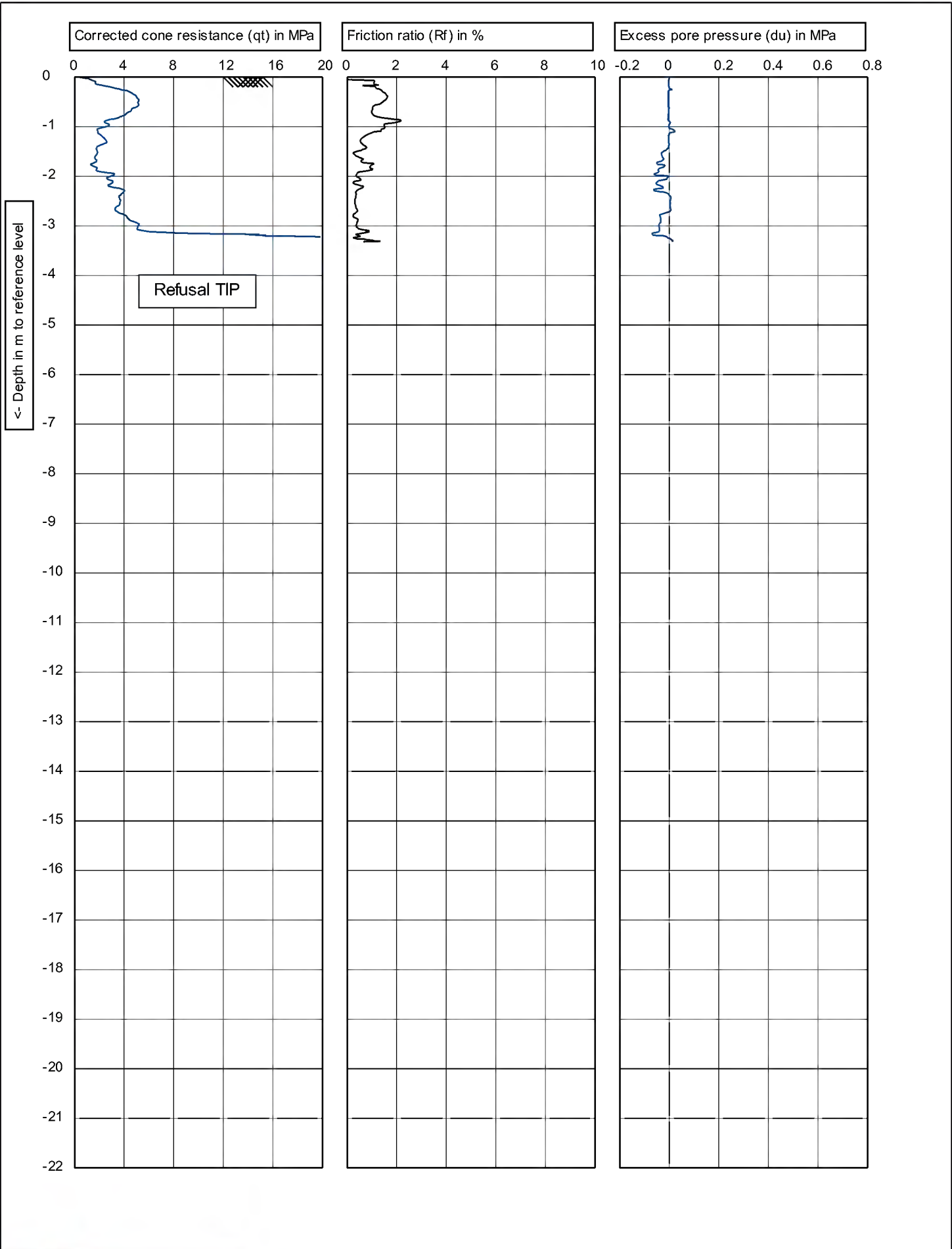
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676934 N5404800</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT207	5/6



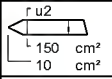
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676934 N5404800</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT207
			6/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C11284</b>
Location: <b>GPS: E1677488 N5404949</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	<b>CPT208</b>	1/6

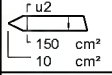
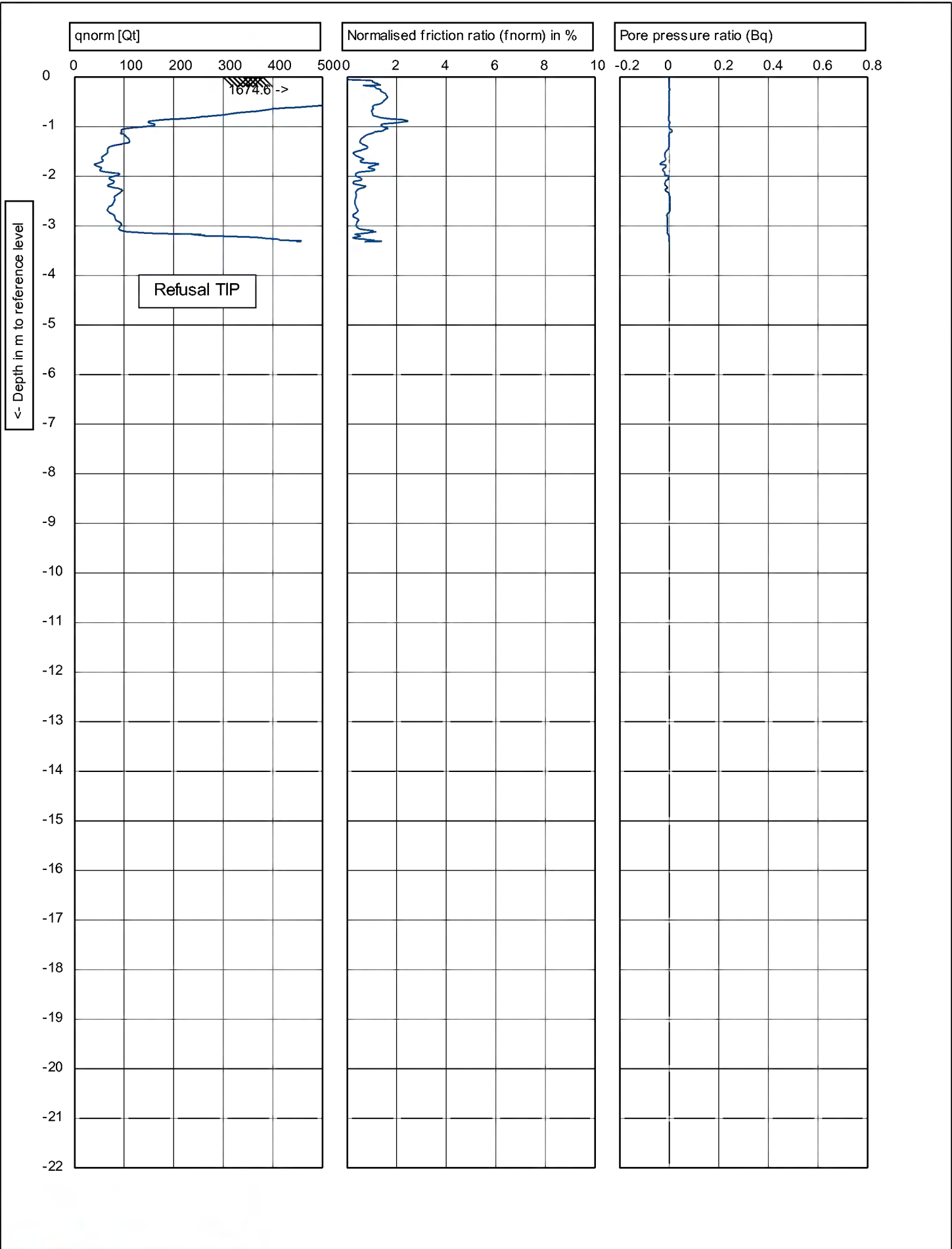


CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIIP.C11284</b>	
Location: <b>GPS: E1677488 N5404949</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: <b>CPT208</b>	2/6





Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIIP.C11284</b>	
Location: <b>GPS: E1677488 N5404949</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: <b>CPT208</b>	3/6

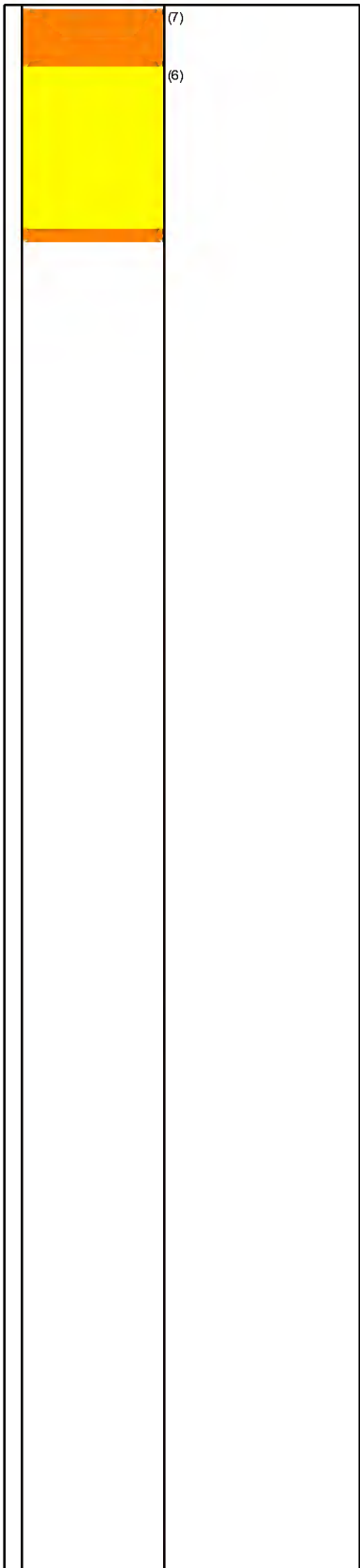
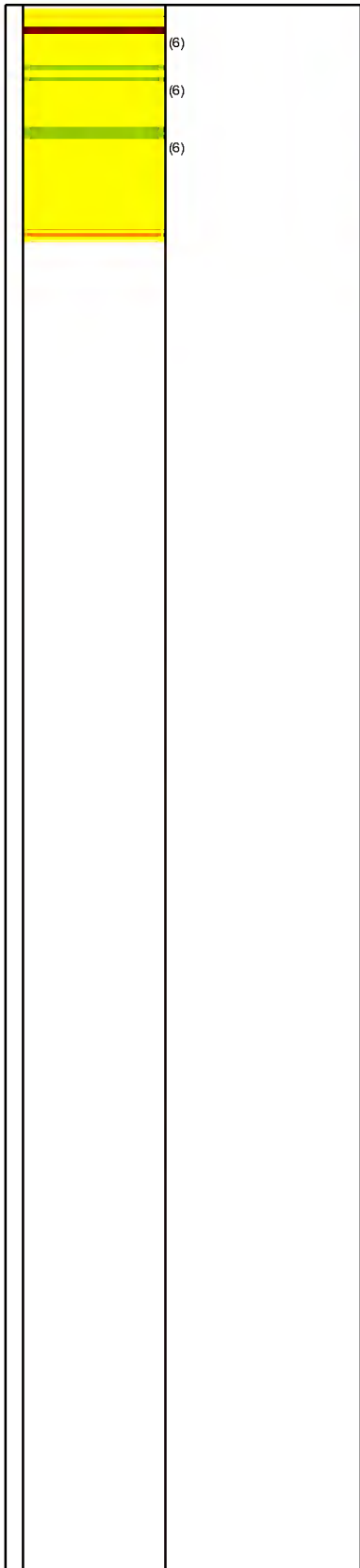
CPTask V1.20

Soil Classification (using Fr)

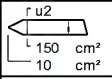
Soil Classification (using Bq)

Depth in m to reference level

0  
-1  
-2  
-3  
-4  
-5  
-6  
-7  
-8  
-9  
-10  
-11  
-12  
-13  
-14  
-15  
-16  
-17  
-18  
-19  
-20  
-21  
-22

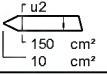
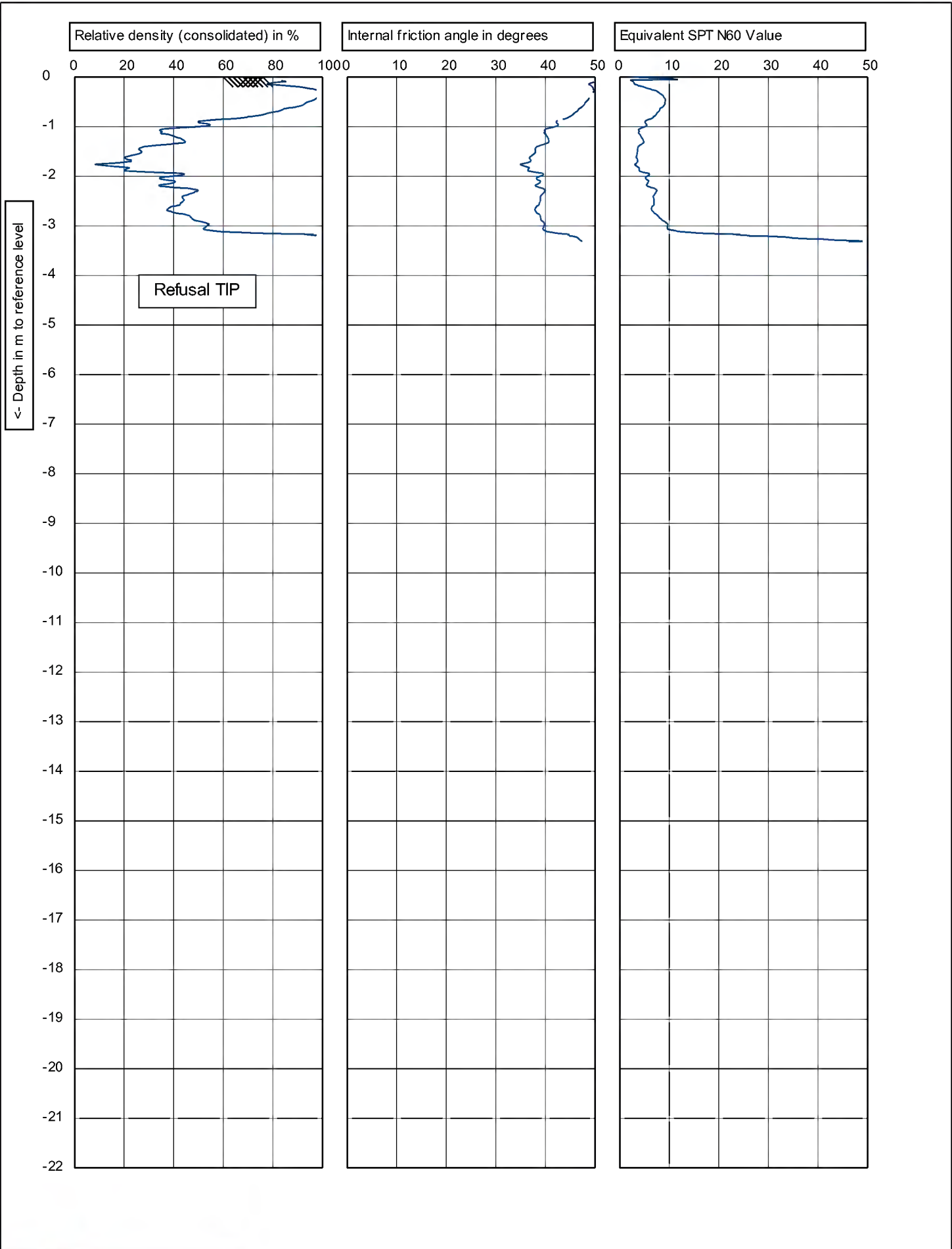


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C11284</b>	
Location: <b>GPS: E1677488 N5404949</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: <b>CPT208</b>	4/6

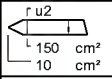
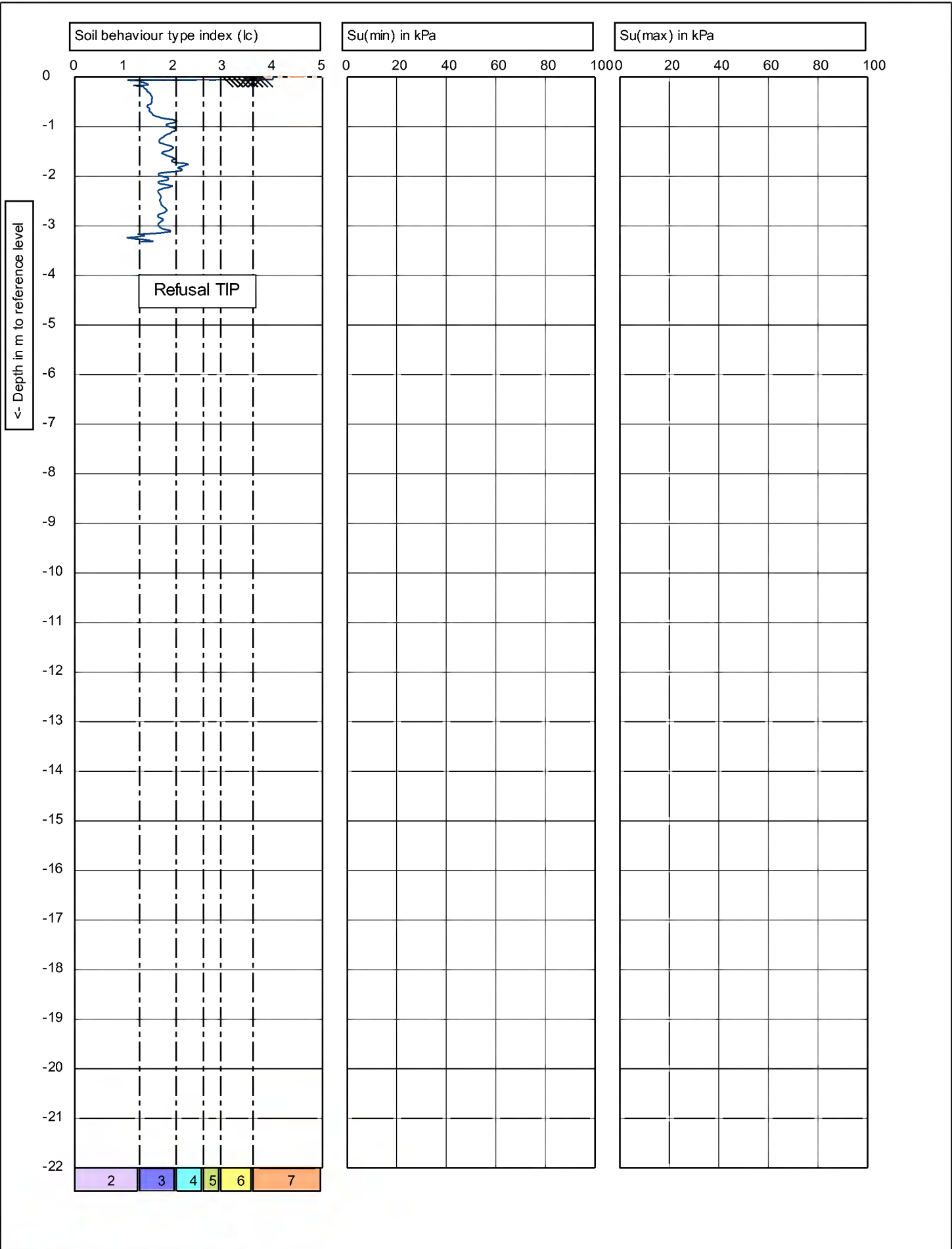
CPTask V1.20



Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100

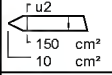
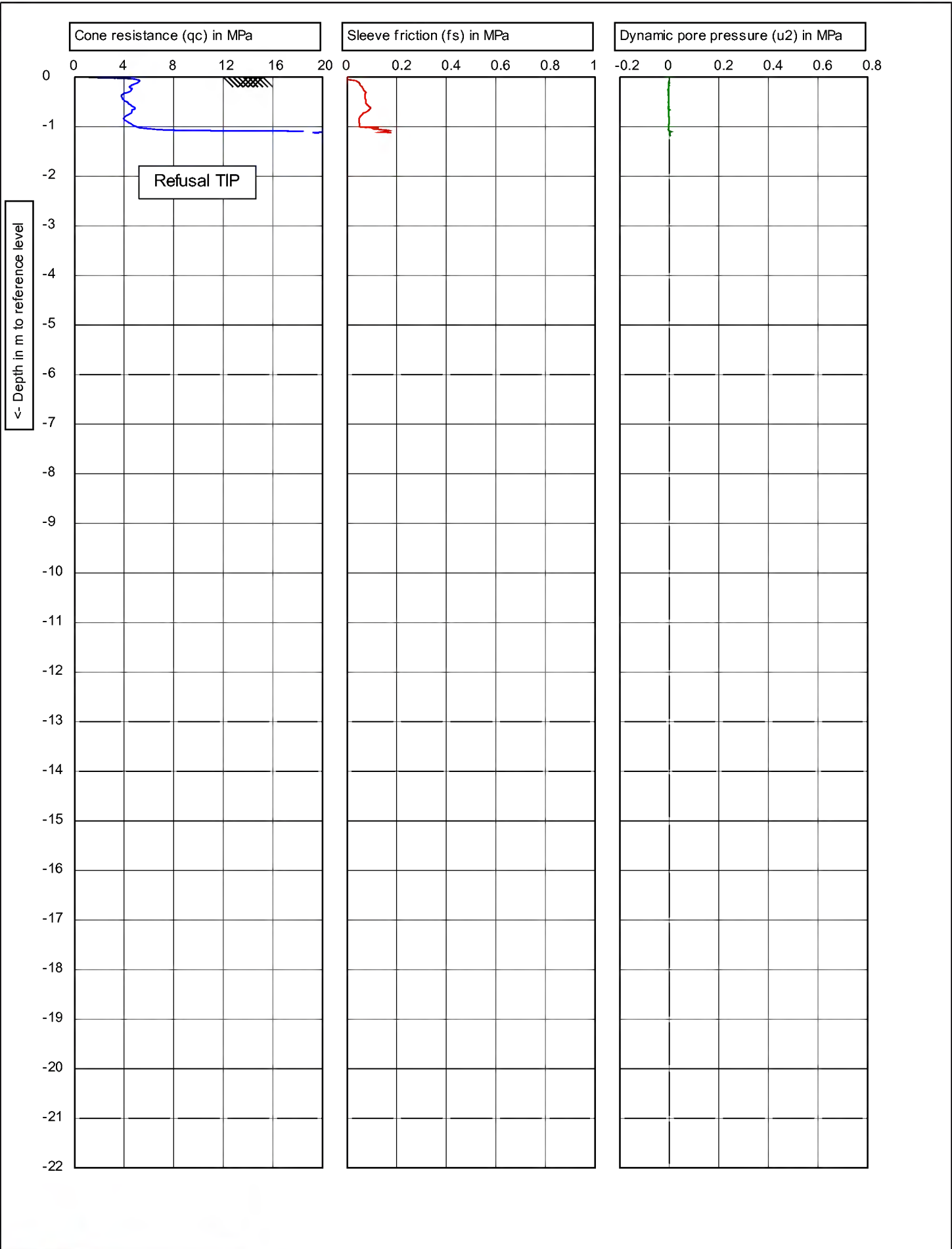
Predrill :	0
Date:	11/12/2012
Cone no.:	C10CFIIP.C11284
Project no.:	5-C2128.00
CPT no.:	CPT208

Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1677488 N5404949**  
 Position:



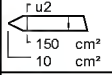
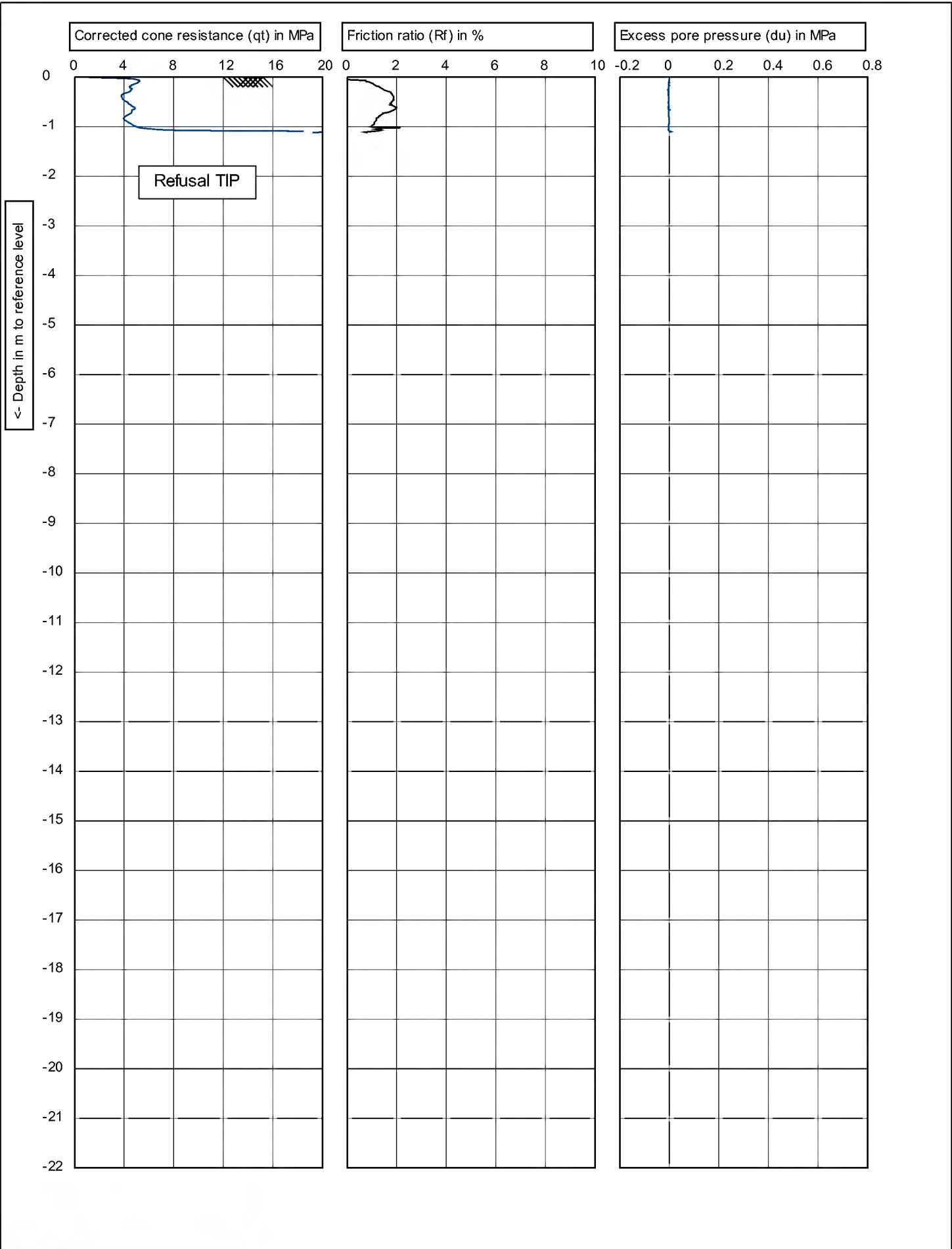
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C11284</b>
Location: <b>GPS: E1677488 N5404949</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	<b>CPT208</b>
			6/6

CPTask V1.20



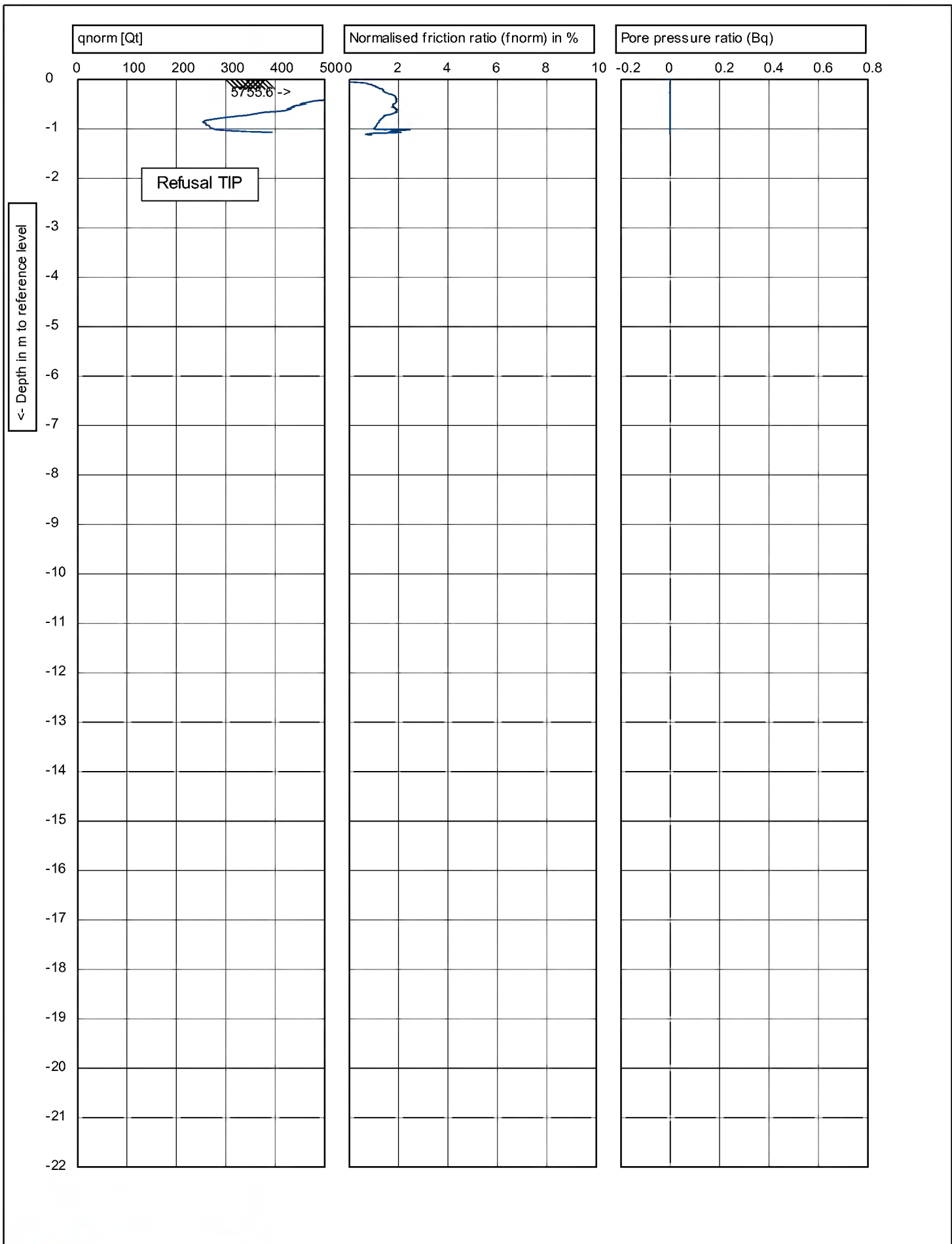
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677249 N5405080</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT209	1/6

CPTask V1.20

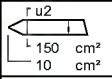


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677249 N5405080</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT209	2/6

CPTask V1.20



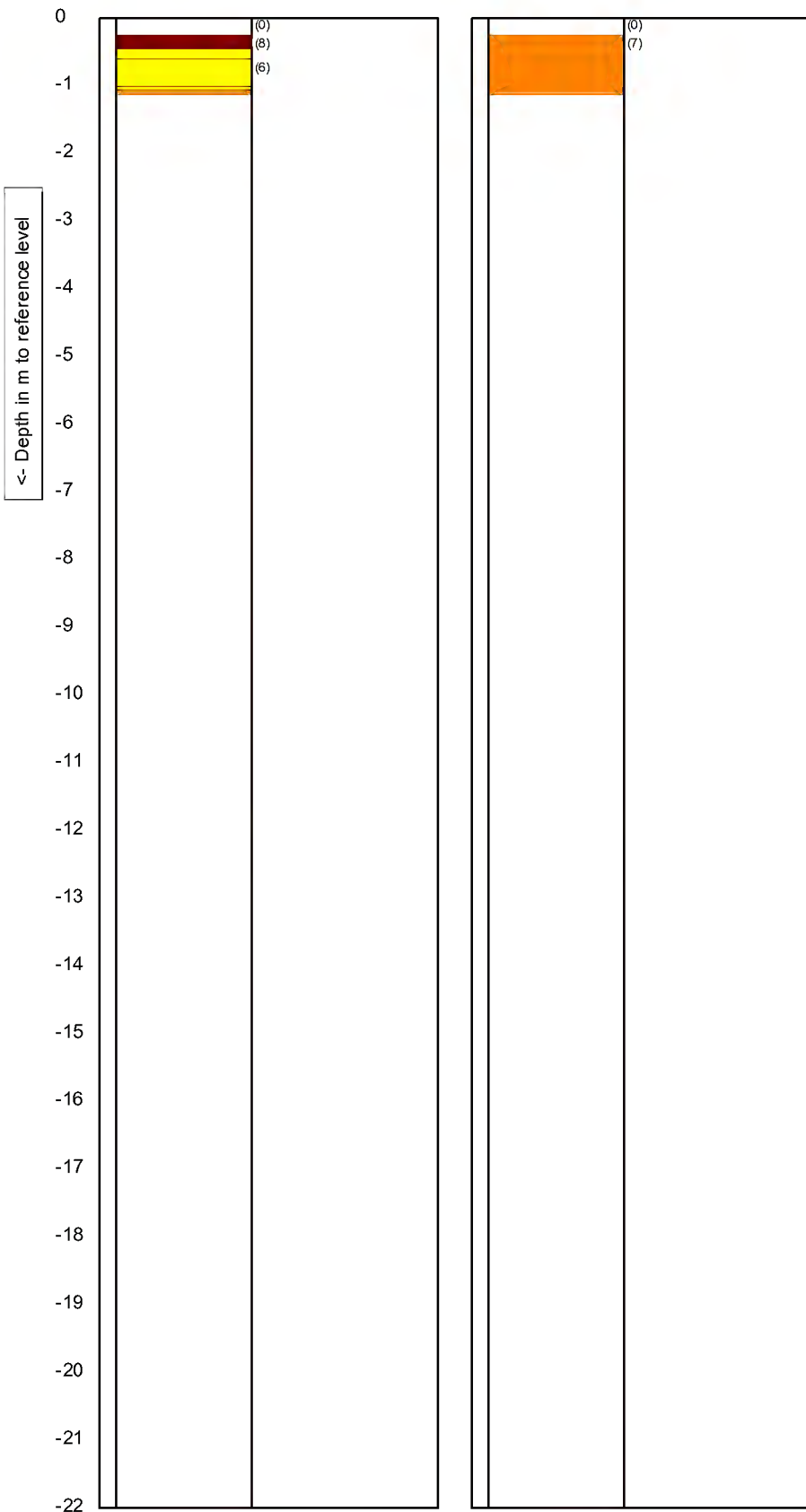
CPTask V1.20



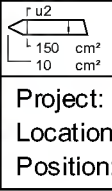
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677249 N5405080</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT209
			3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



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



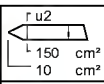
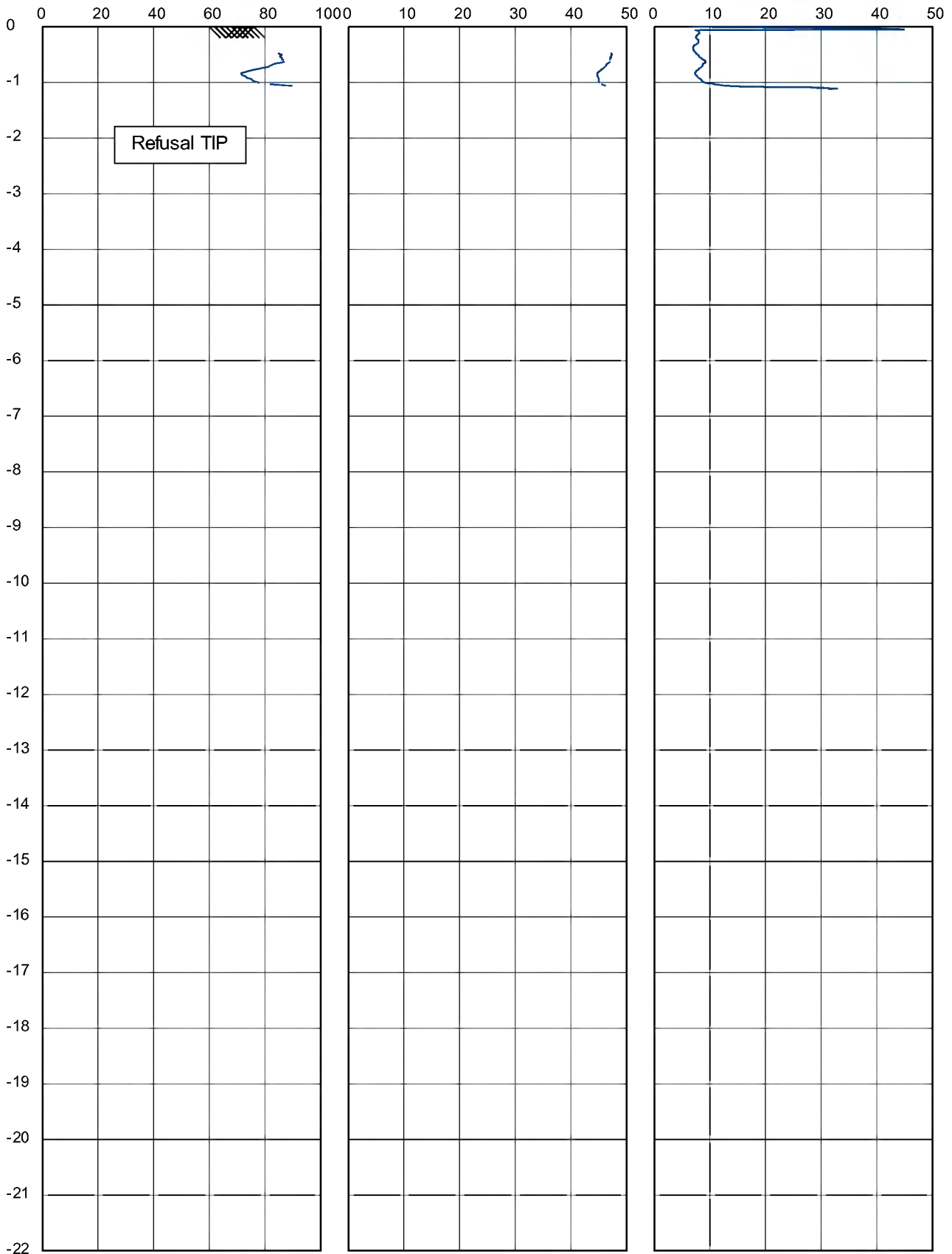
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1677249 N5405080</b>		Project no.: <b>5-C2128.00</b>	
Position:	CPT no.: CPT209	4/6	



Relative density (consolidated) in %

Internal friction angle in degrees

Equivalent SPT N60 Value



Test according to A.S.T.M standard D-5778-12

Predrill : 0

G.L. 0

W.L.: -100

Date: 11/12/2012

Project: **Blenheim Geotechnical Investigation**

Cone no.: **C10CFIP.C10021**

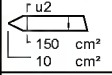
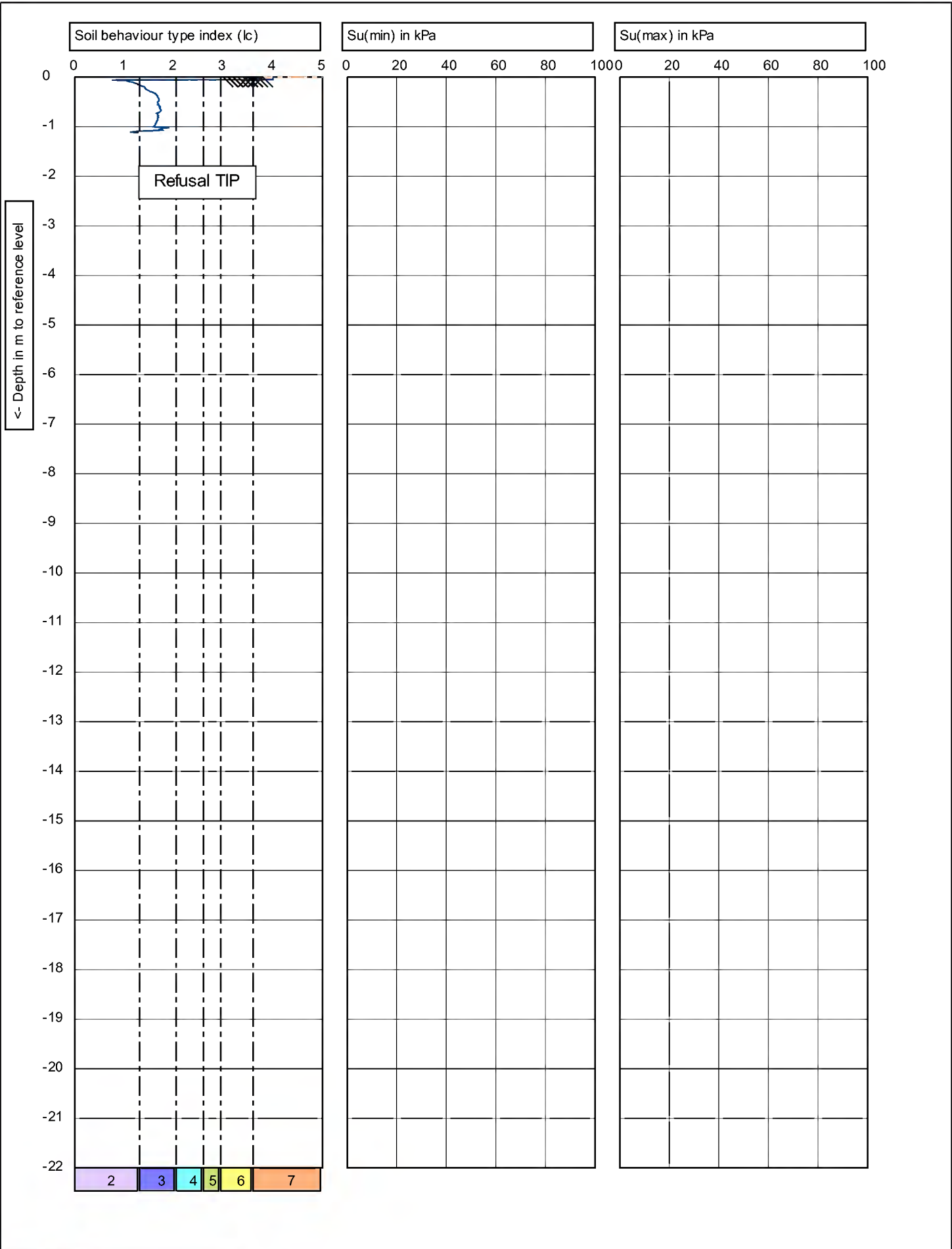
Location: **GPS: E1677249 N5405080**

Project no.: **5-C2128.00**

Position:

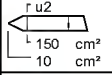
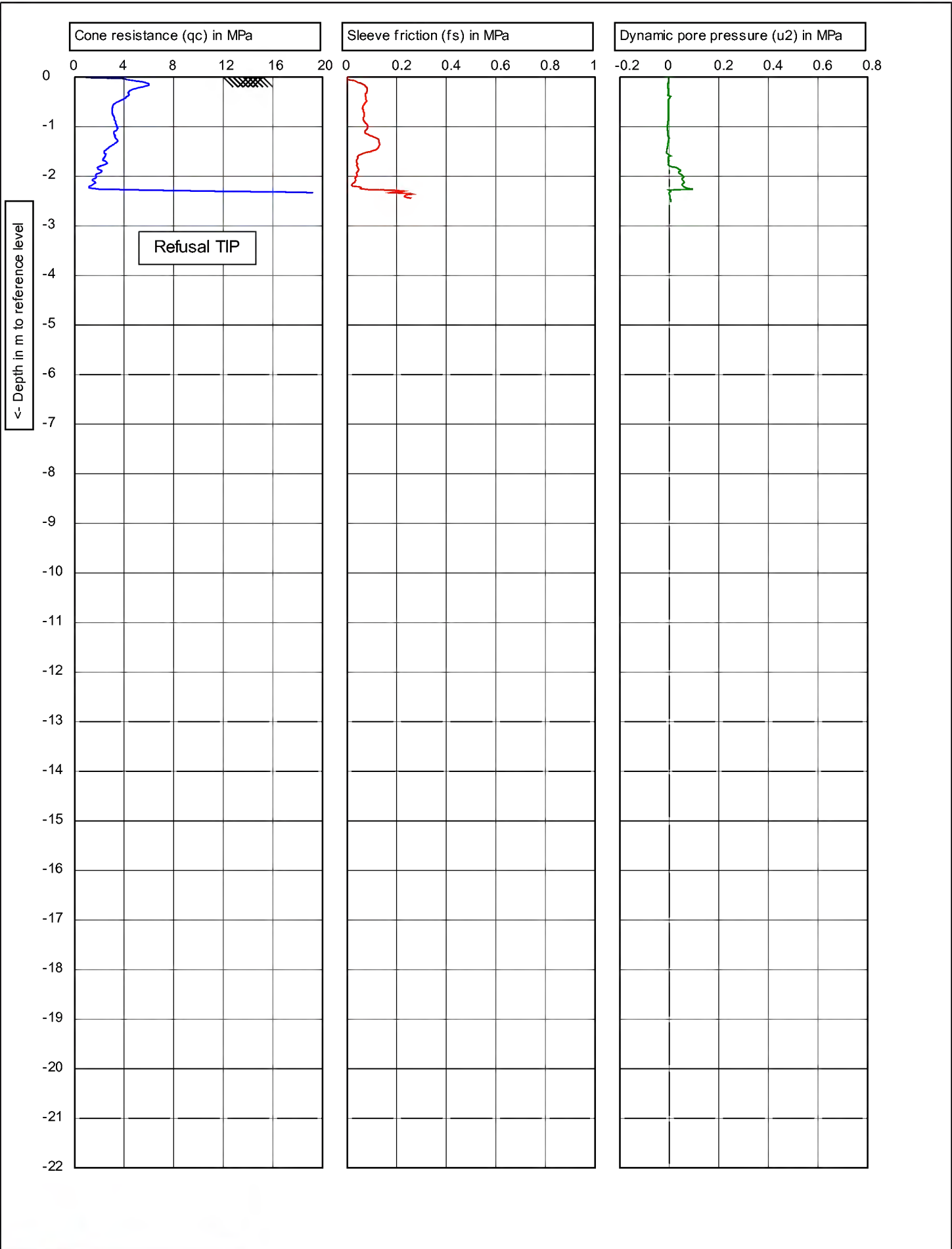
CPT no.: CPT209

5/6



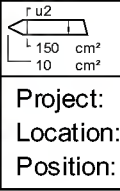
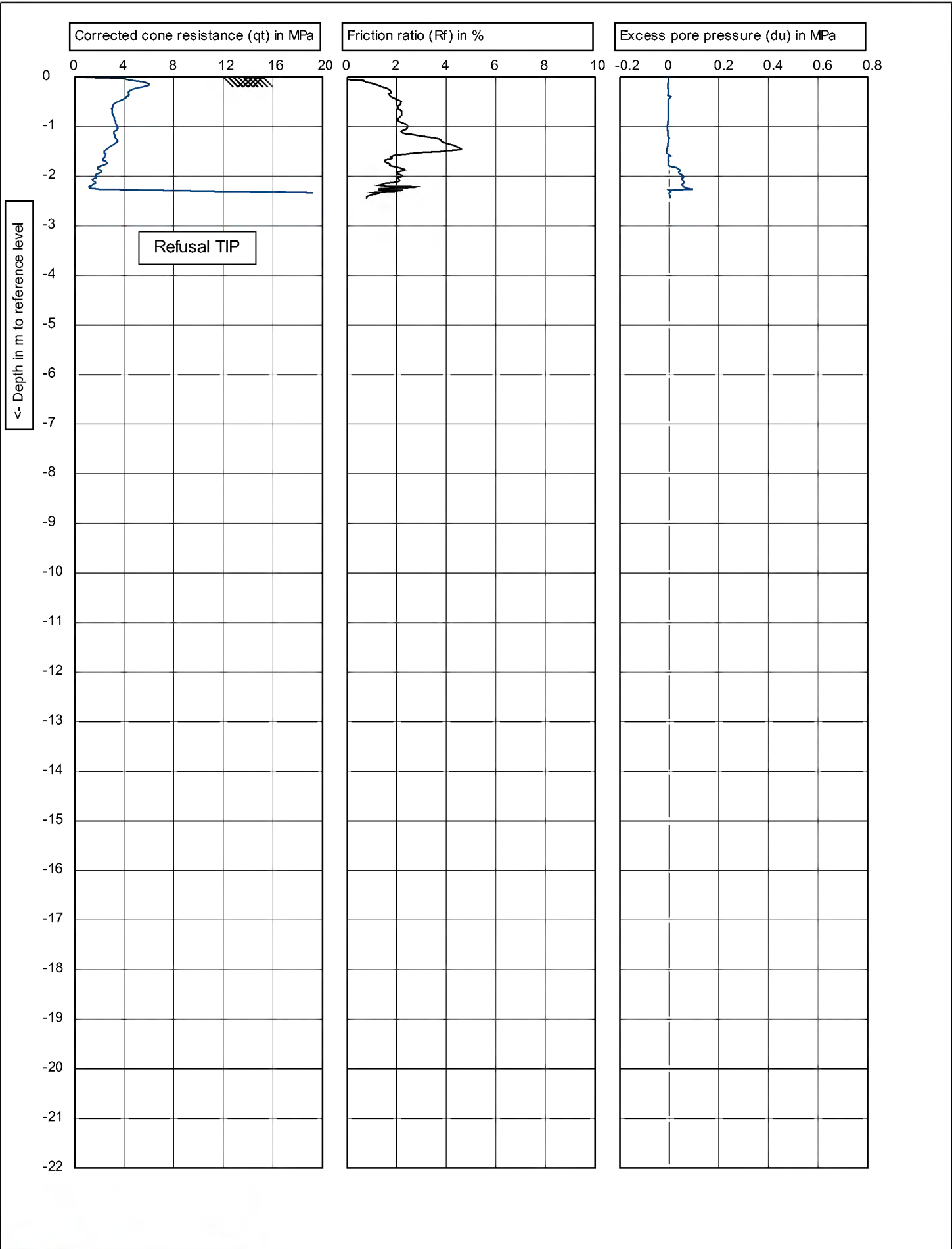
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677249 N5405080</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT209
			6/6

CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676672 N5405052</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT210	1/6

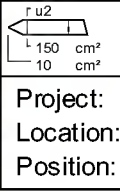
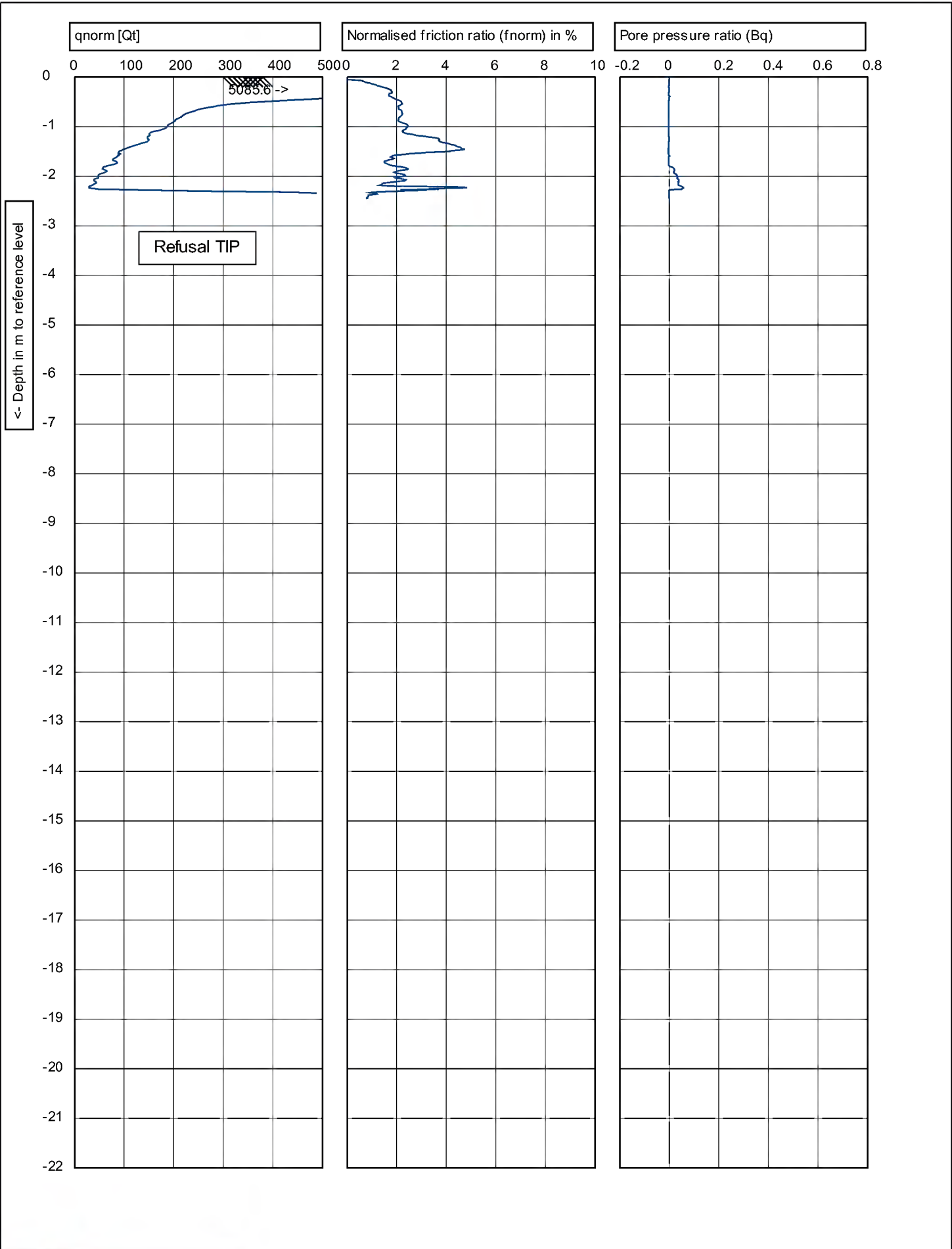
CPTask V1.20



Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1676672 N5405052**  
 Position:

Predrill :	0
Date:	11/12/2012
Cone no.:	C10CFIIP.C10021
Project no.:	5-C2128.00
CPT no.:	CPT210
	2/6

CPTask V1.20



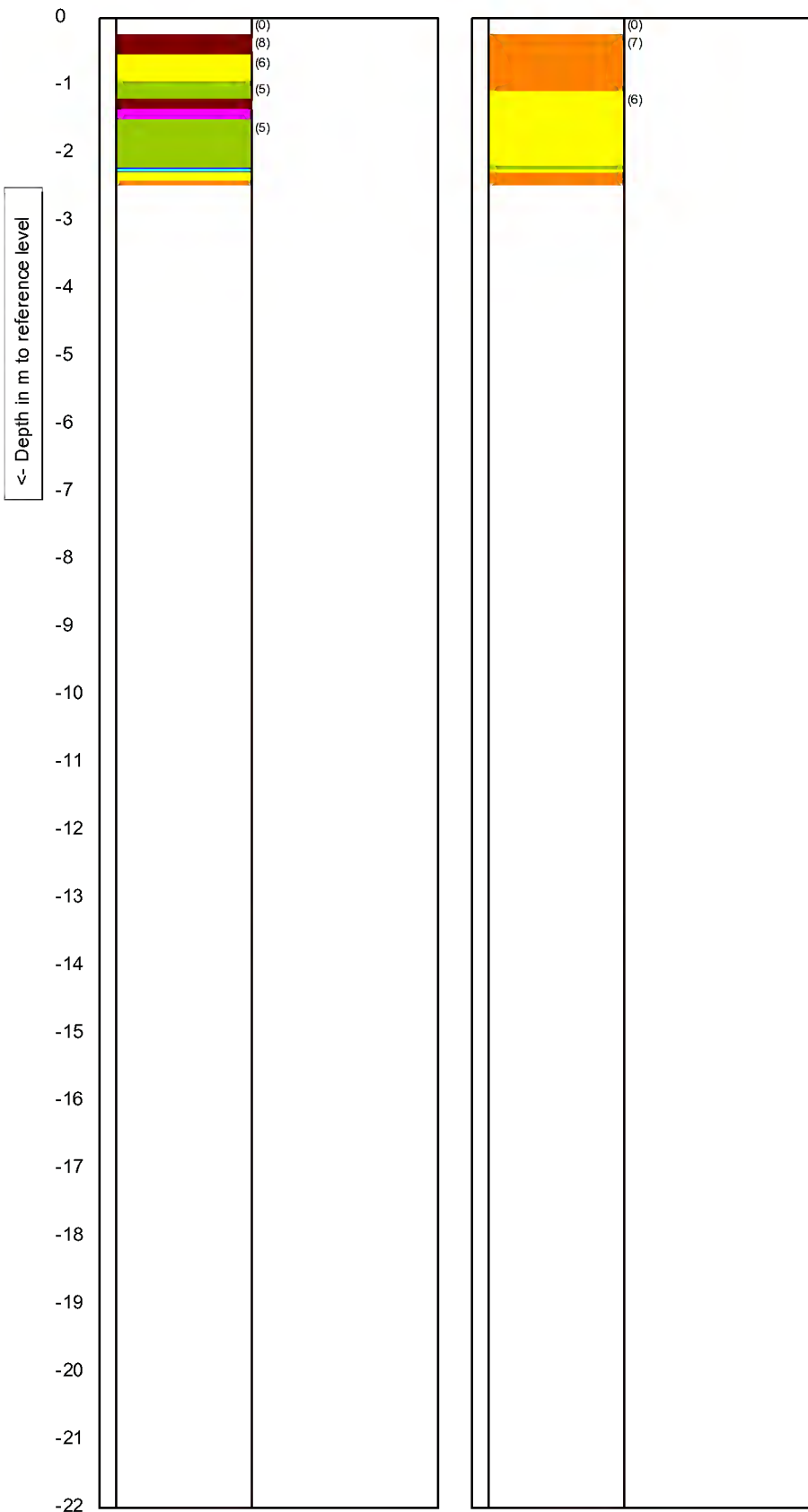
Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1676672 N5405052**  
 Position:

Predrill :	0
Date:	11/12/2012
Cone no.:	C10CFIIP.C10021
Project no.:	5-C2128.00
CPT no.:	CPT210
	3/6

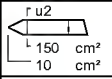
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

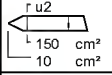
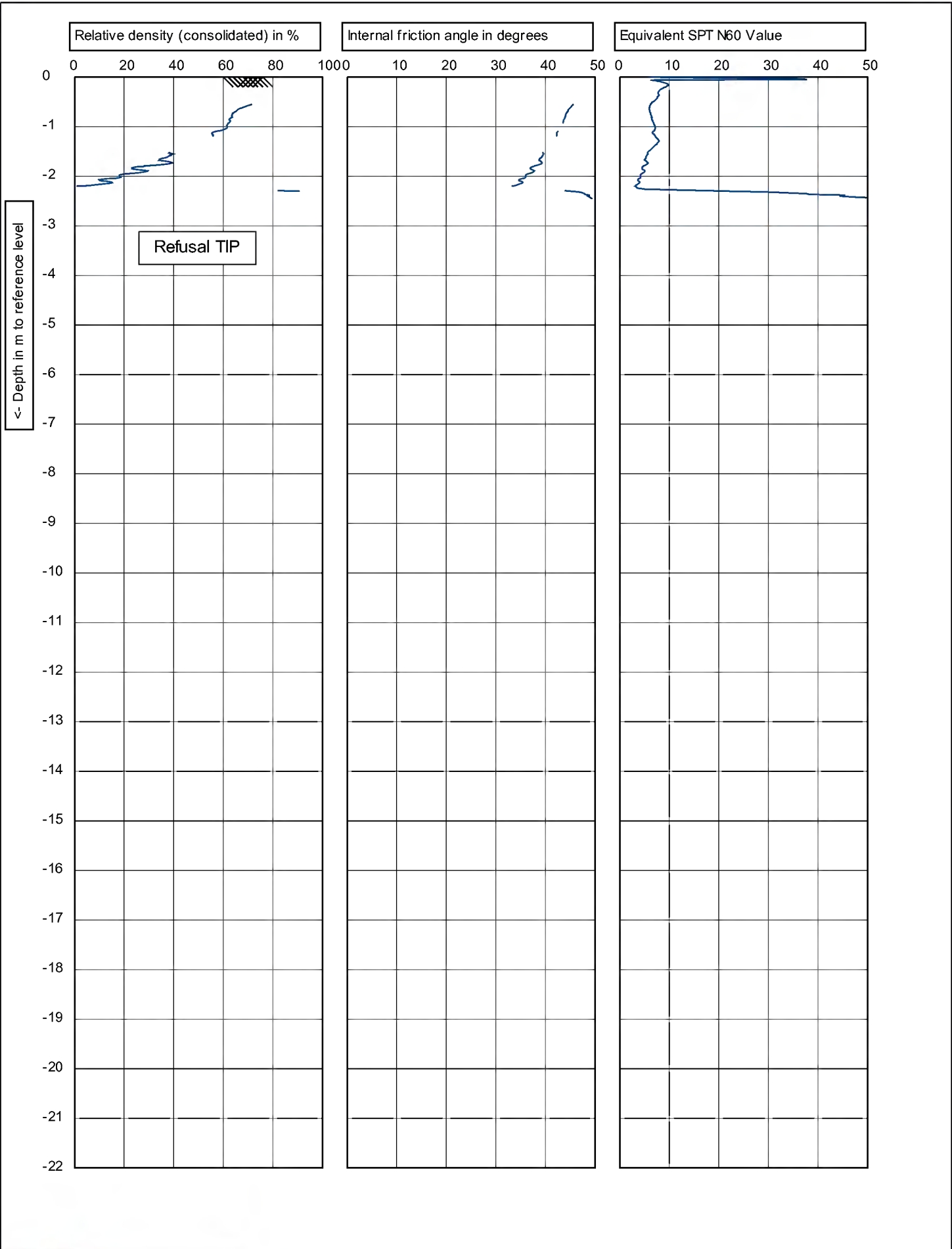


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



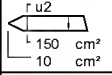
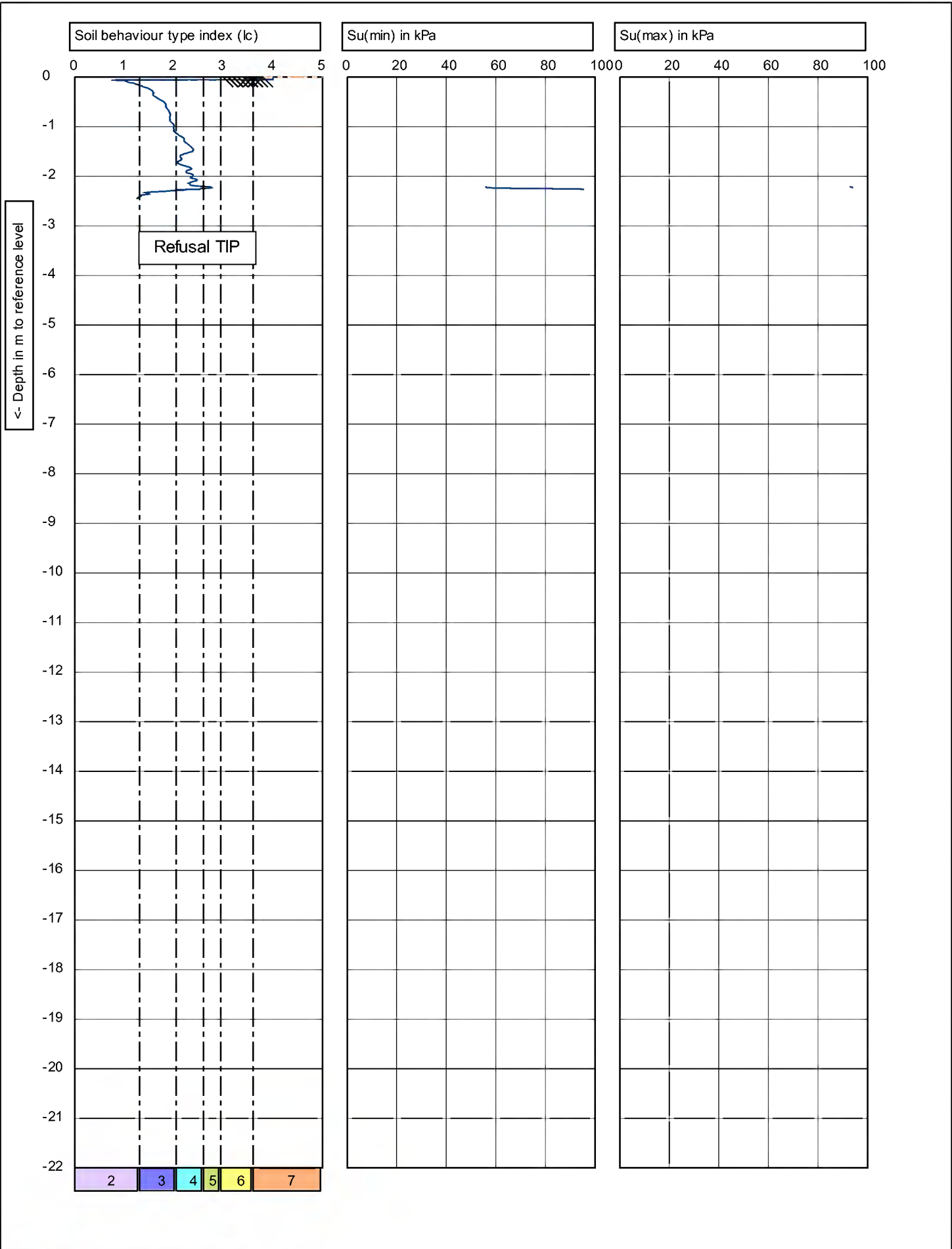
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1676672 N5405052</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT210	4/6

CPTask V1.20



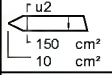
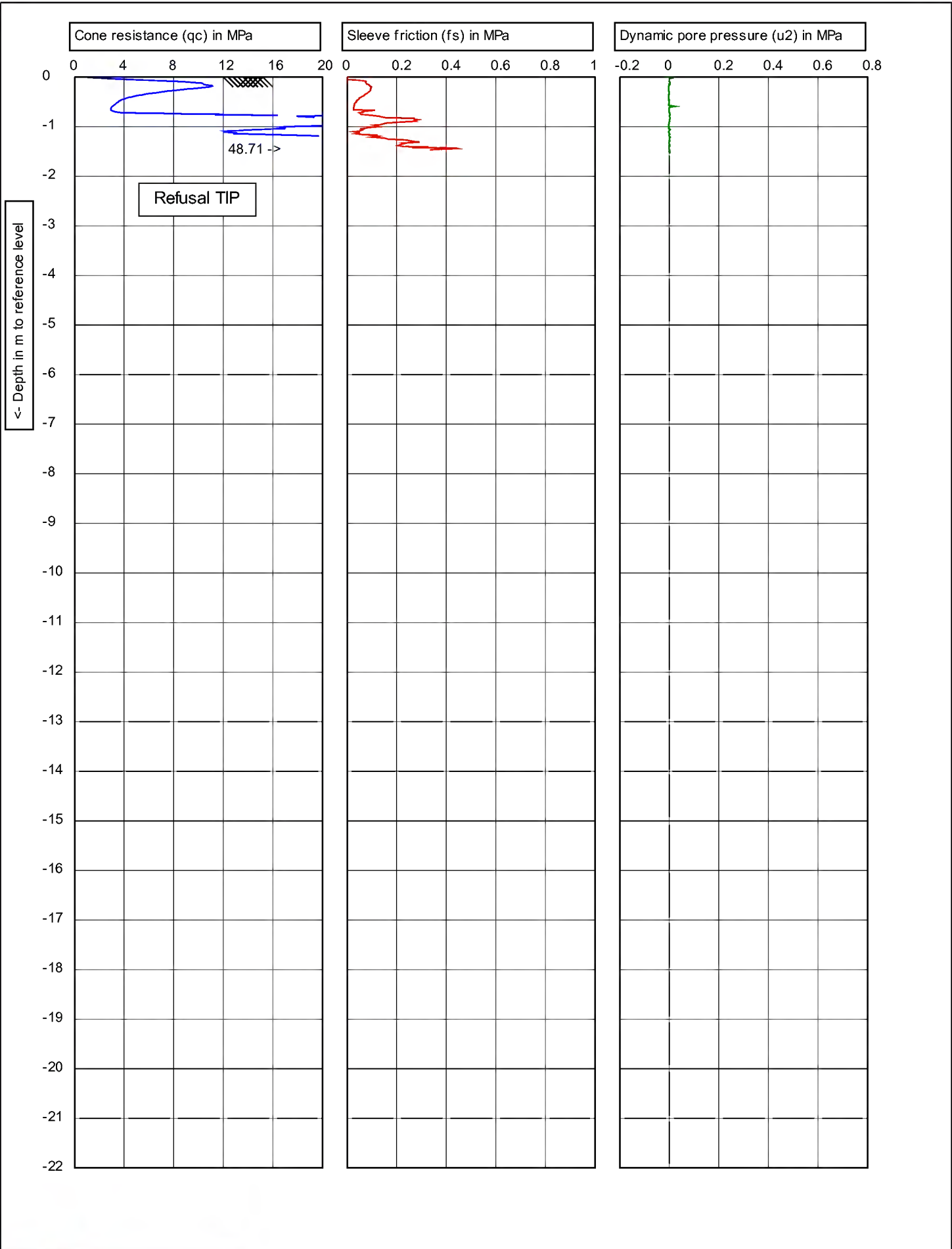
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676672 N5405052</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT210
			5/6

CPTask V1.20



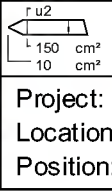
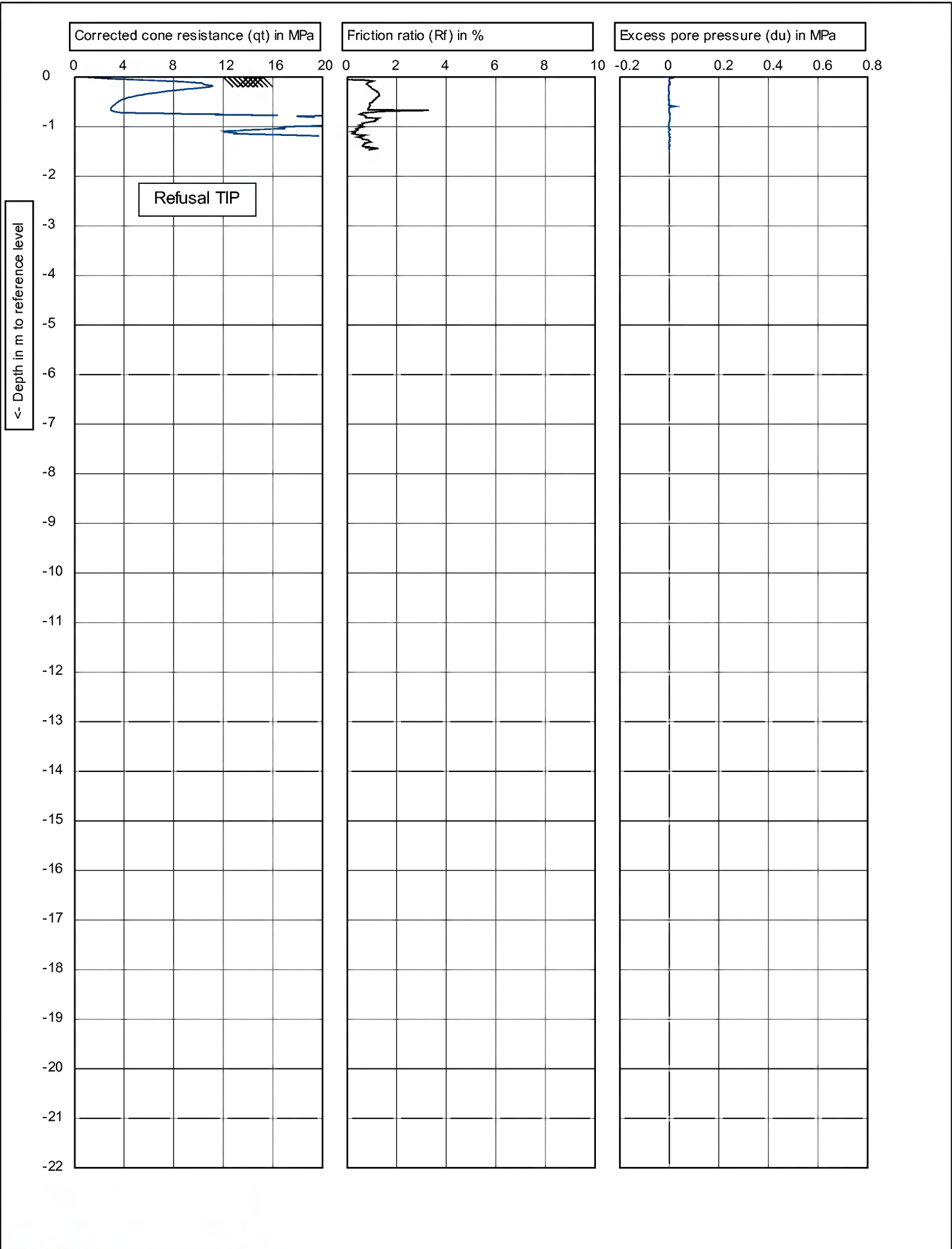
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676672 N5405052</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT210
			6/6





Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1676930 N5405230</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT211	1/6

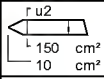
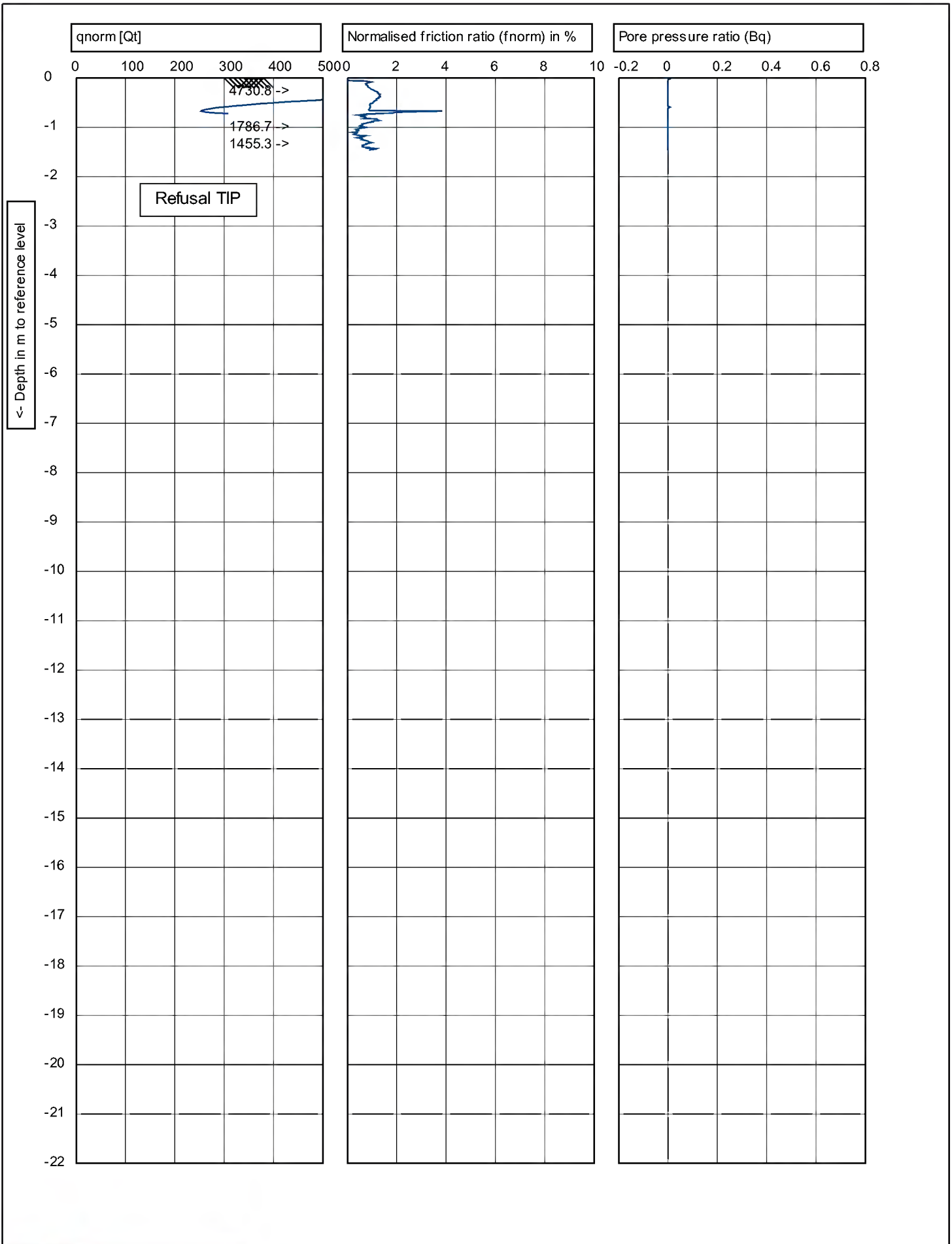
CPTask V1.20



Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1676930 N5405230**  
 Position:

Predrill :	0
Date:	11/12/2012
Cone no.:	C10CFIIP.C10021
Project no.:	5-C2128.00
CPT no.:	CPT211
	2/6

CPTask V1.20

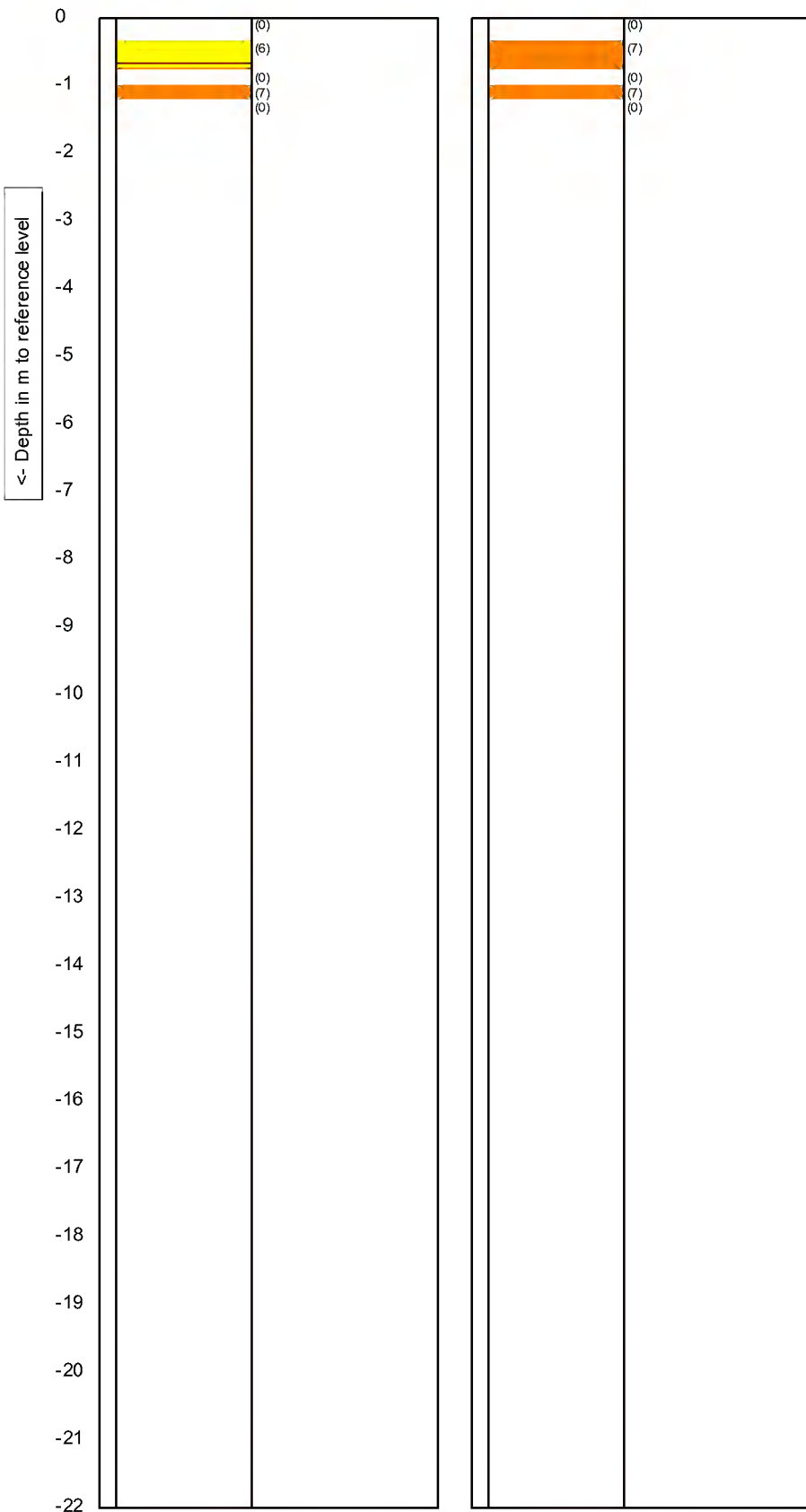


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676930 N5405230</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT211	3/6

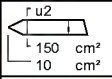
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)



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



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1676930 N5405230</b>		Project no.: <b>5-C2128.00</b>	
Position:	CPT no.: CPT211	4/6	

CPTask V1.20

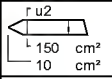
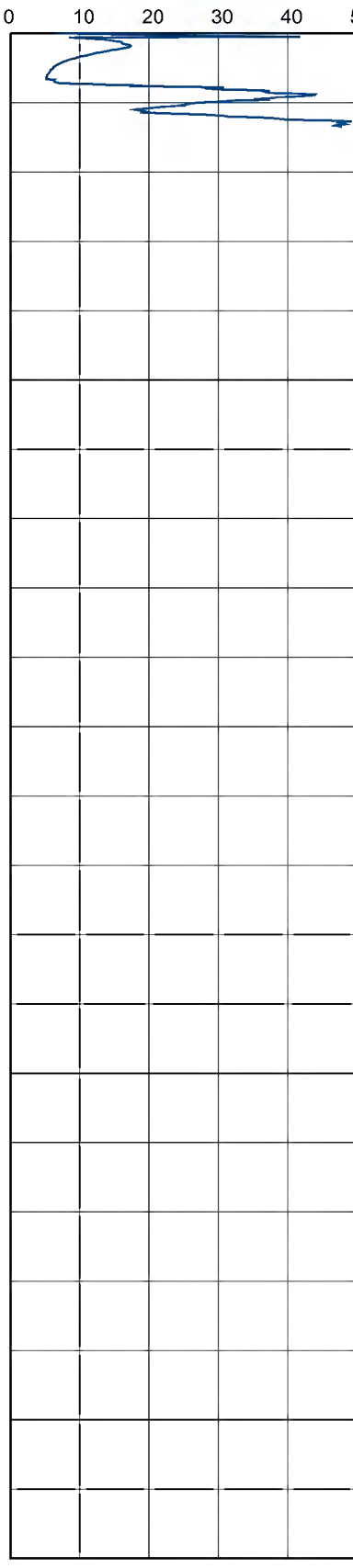
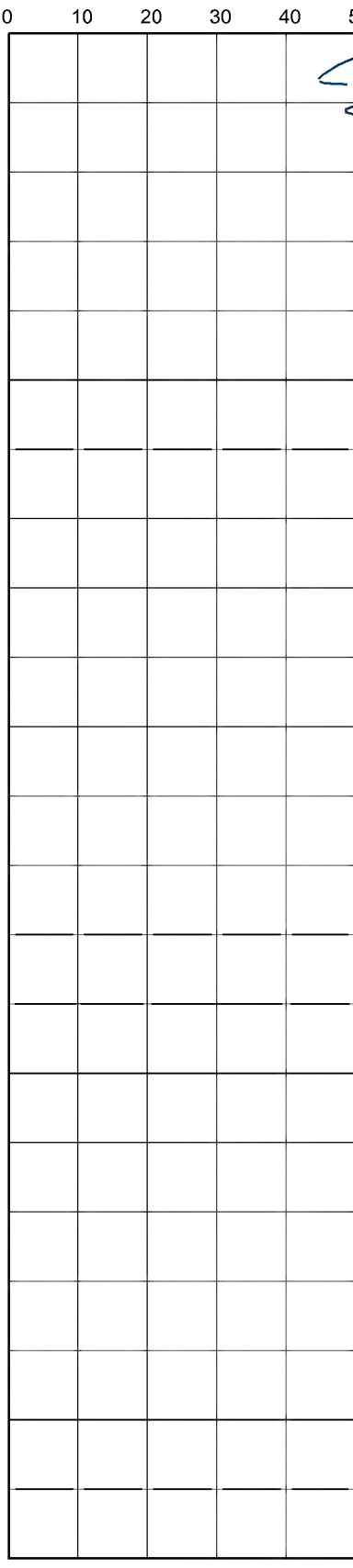
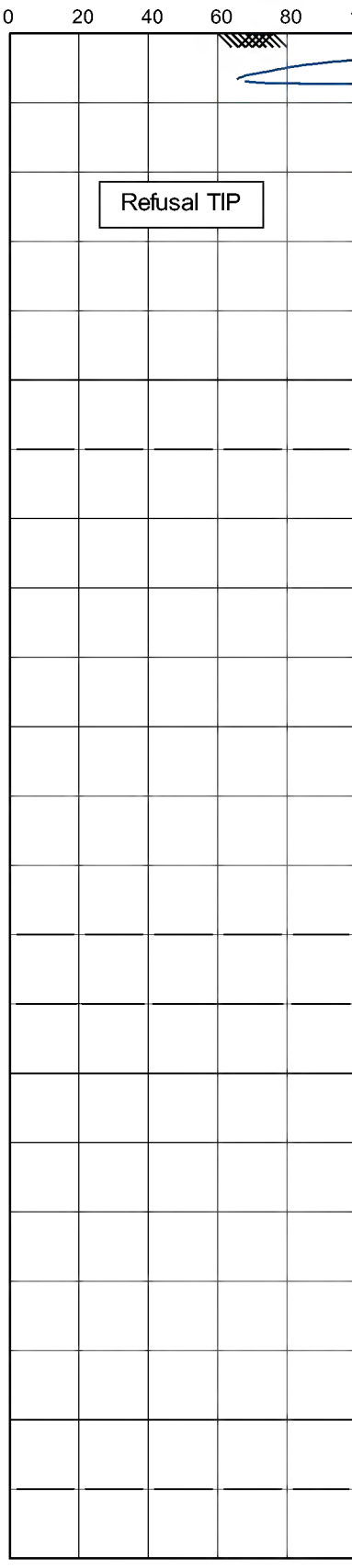
Relative density (consolidated) in %

Internal friction angle in degrees

Equivalent SPT N60 Value

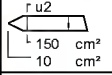
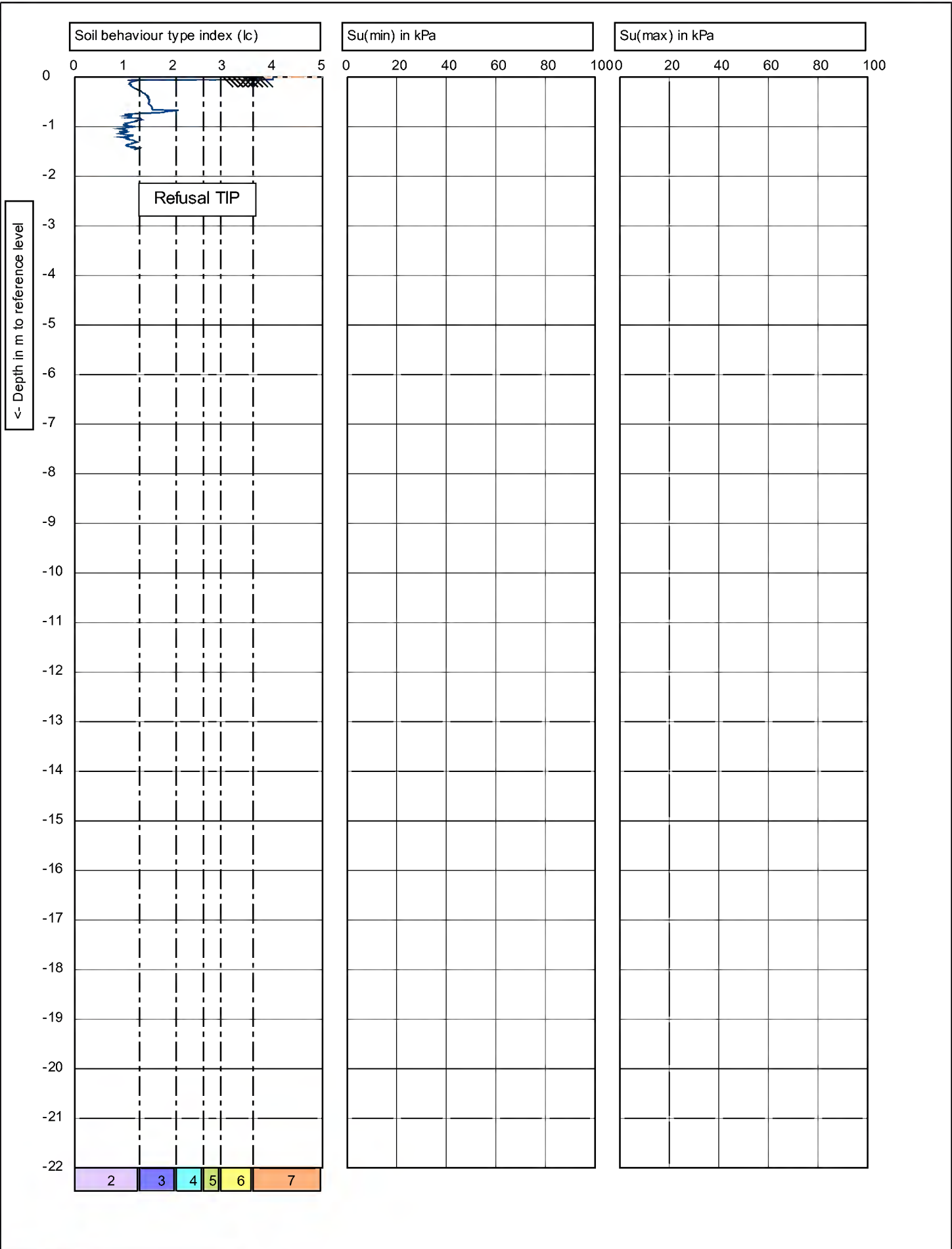
Depth in m to reference level

0  
-1  
-2  
-3  
-4  
-5  
-6  
-7  
-8  
-9  
-10  
-11  
-12  
-13  
-14  
-15  
-16  
-17  
-18  
-19  
-20  
-21  
-22



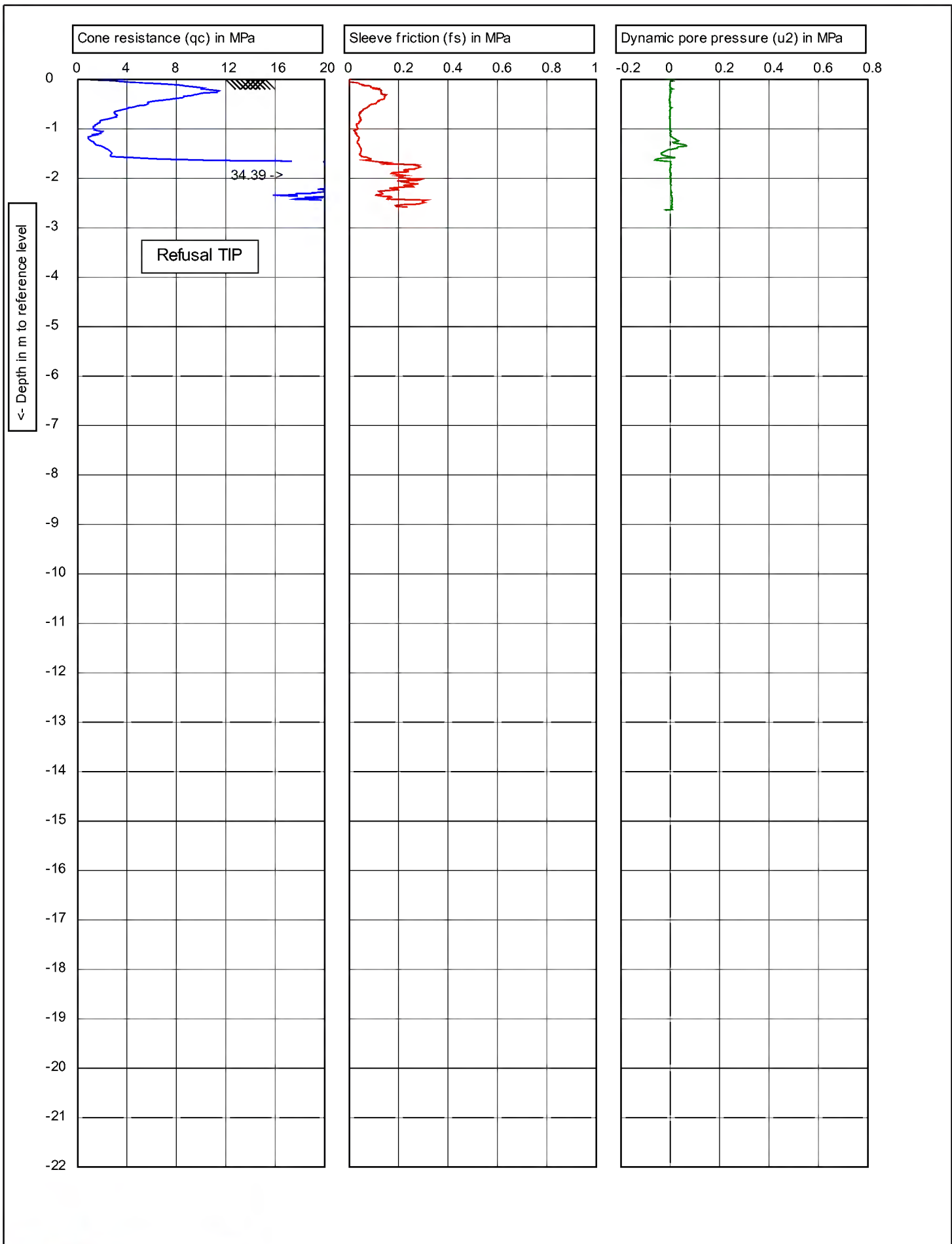
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 11/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1676930 N5405230</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT211	5/6


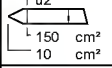
CPTask V1.20



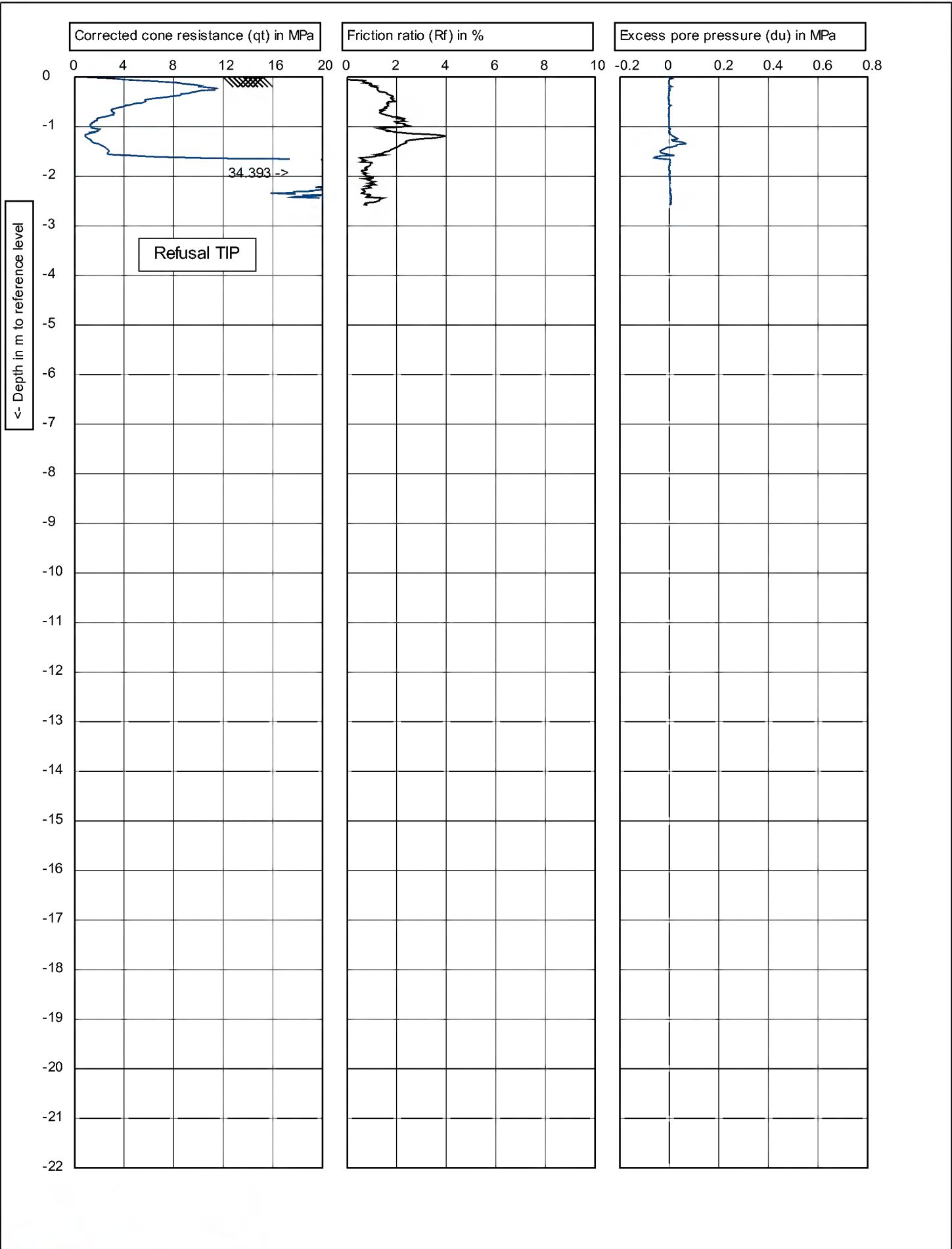
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	11/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1676930 N5405230</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT211
			6/6

CPTask V1.20



		Test according to A.S.T.M standard D-5778-12		Predrill :	0
		G.L. 0	W.L.: -100	Date:	12/12/2012
		Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
		Location: <b>GPS: E1677181 N5405634</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT212	1/6	

CPTask V1.20

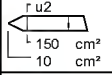
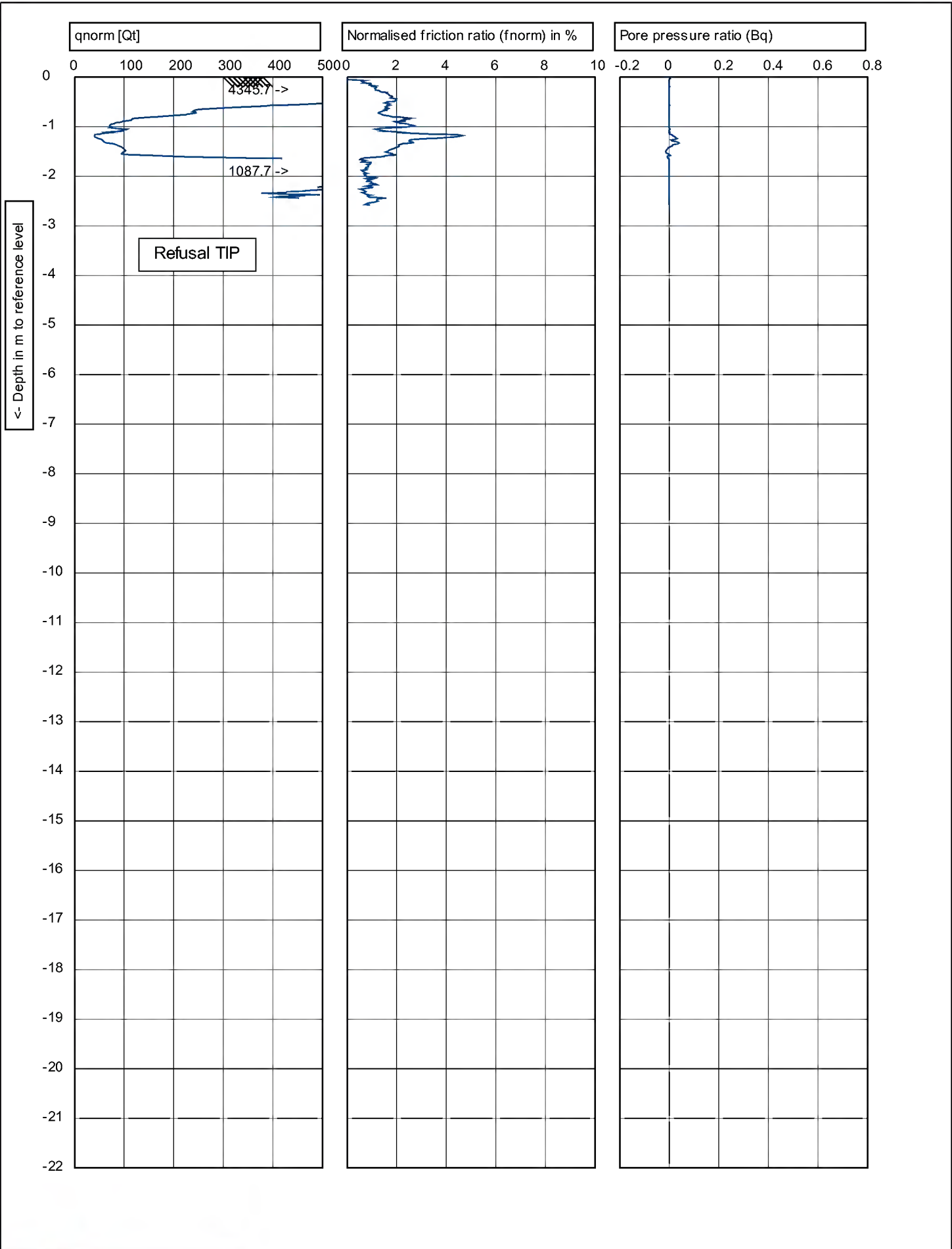


$r u_2$   
 150  $cm^2$   
 10  $cm^2$

Test according to A.S.T.M standard D-5778-12  
 G.L. 0      W.L.: -100  
 Project: **Blenheim Geotechnical Investigation**  
 Location: **GPS: E1677181 N5405634**  
 Position:

Predrill : 0  
 Date: 12/12/2012  
 Cone no.: C10CFIIP.C10021  
 Project no.: 5-C2128.00  
 CPT no.: CPT212      2/6



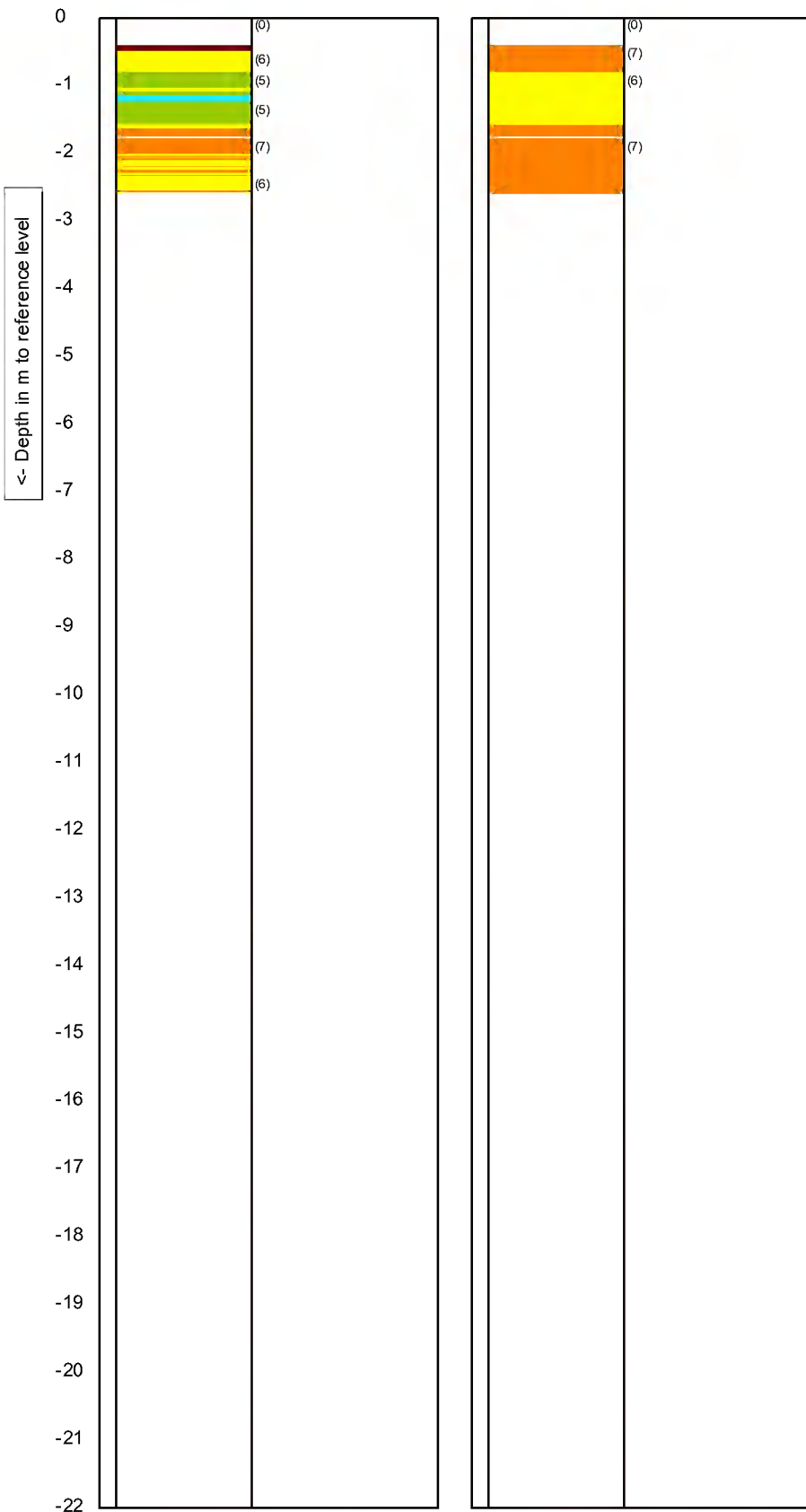


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677181 N5405634</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT212	3/6

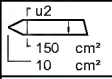
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

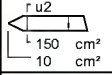
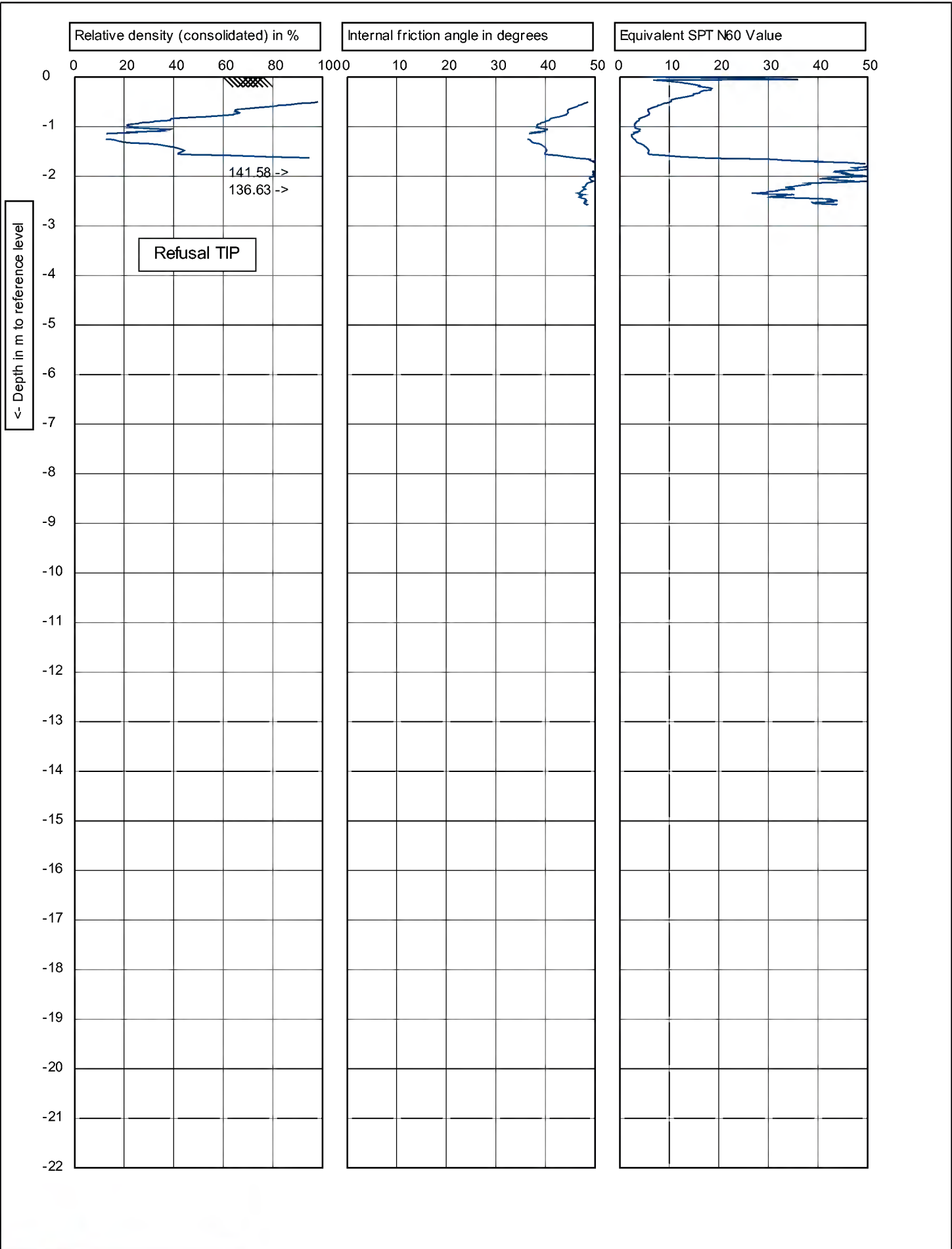


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

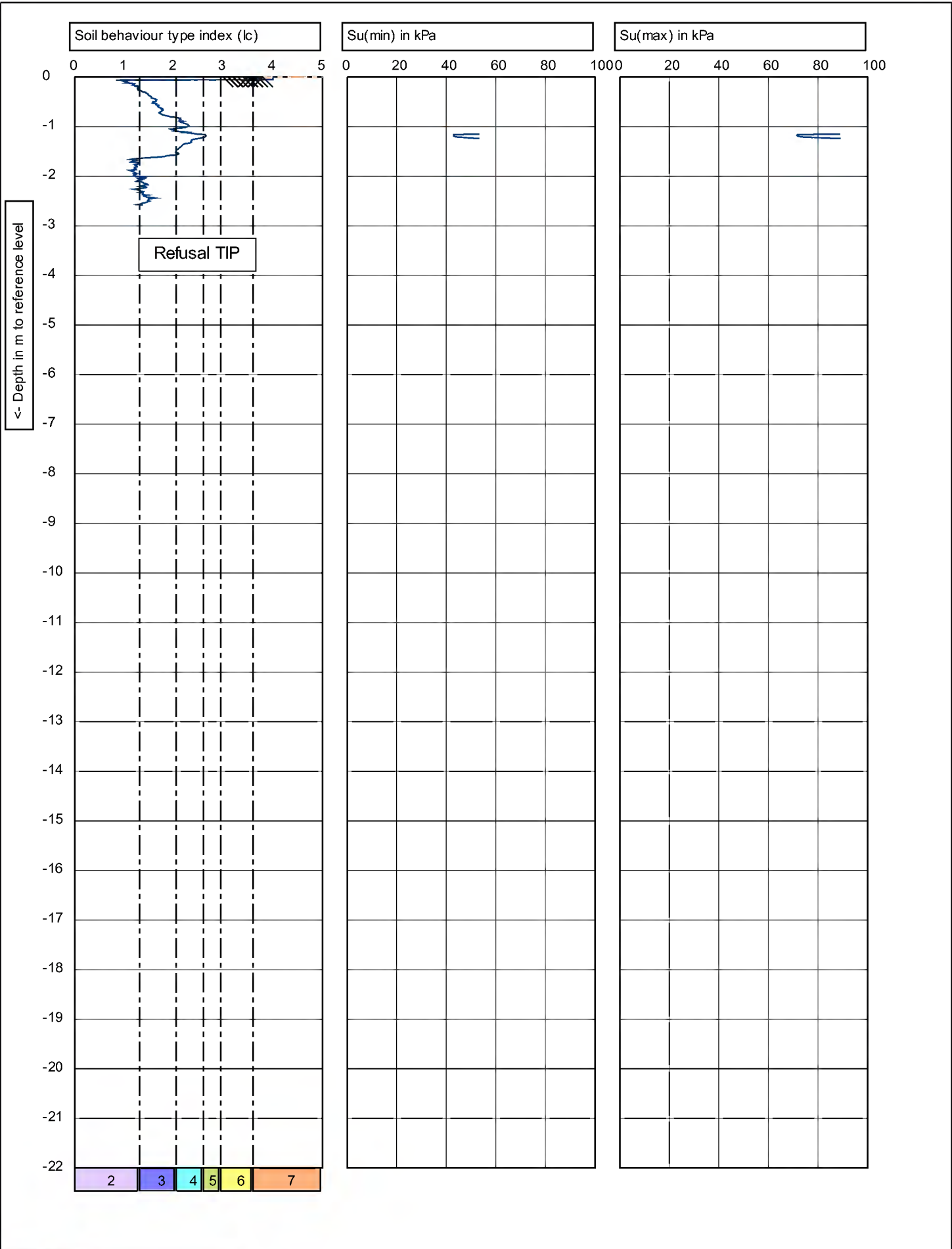


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677181 N5405634</b>		Project no.:	<b>5-C2128.00</b>
Position:	CPT no.:	CPT212	4/6

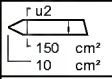
CPTask V1.20



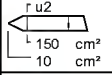
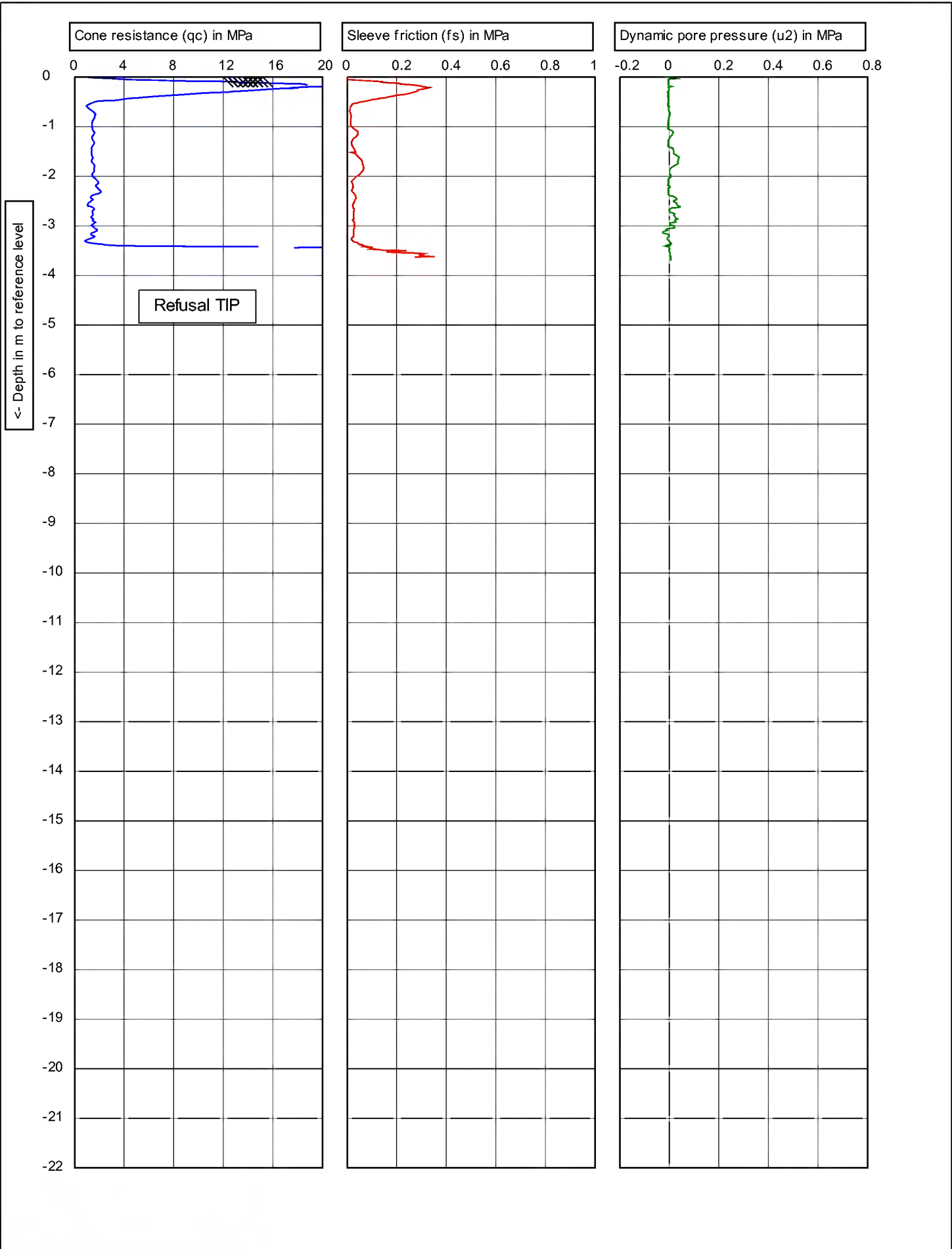
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677181 N5405634</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT212	5/6



CPTask V1.20

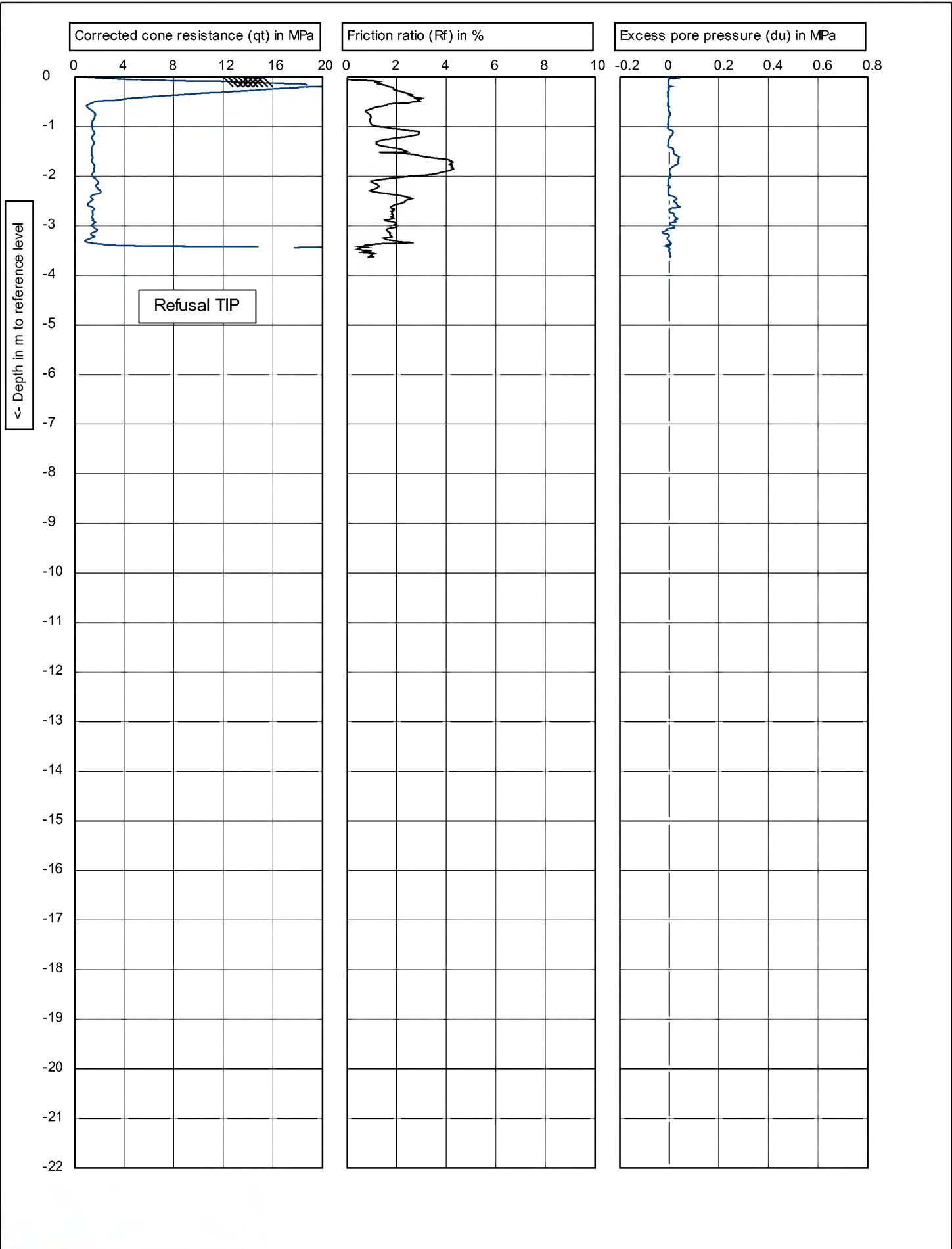


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677181 N5405634</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT212
			6/6

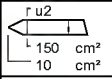


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677071 N5406317</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT213	1/6

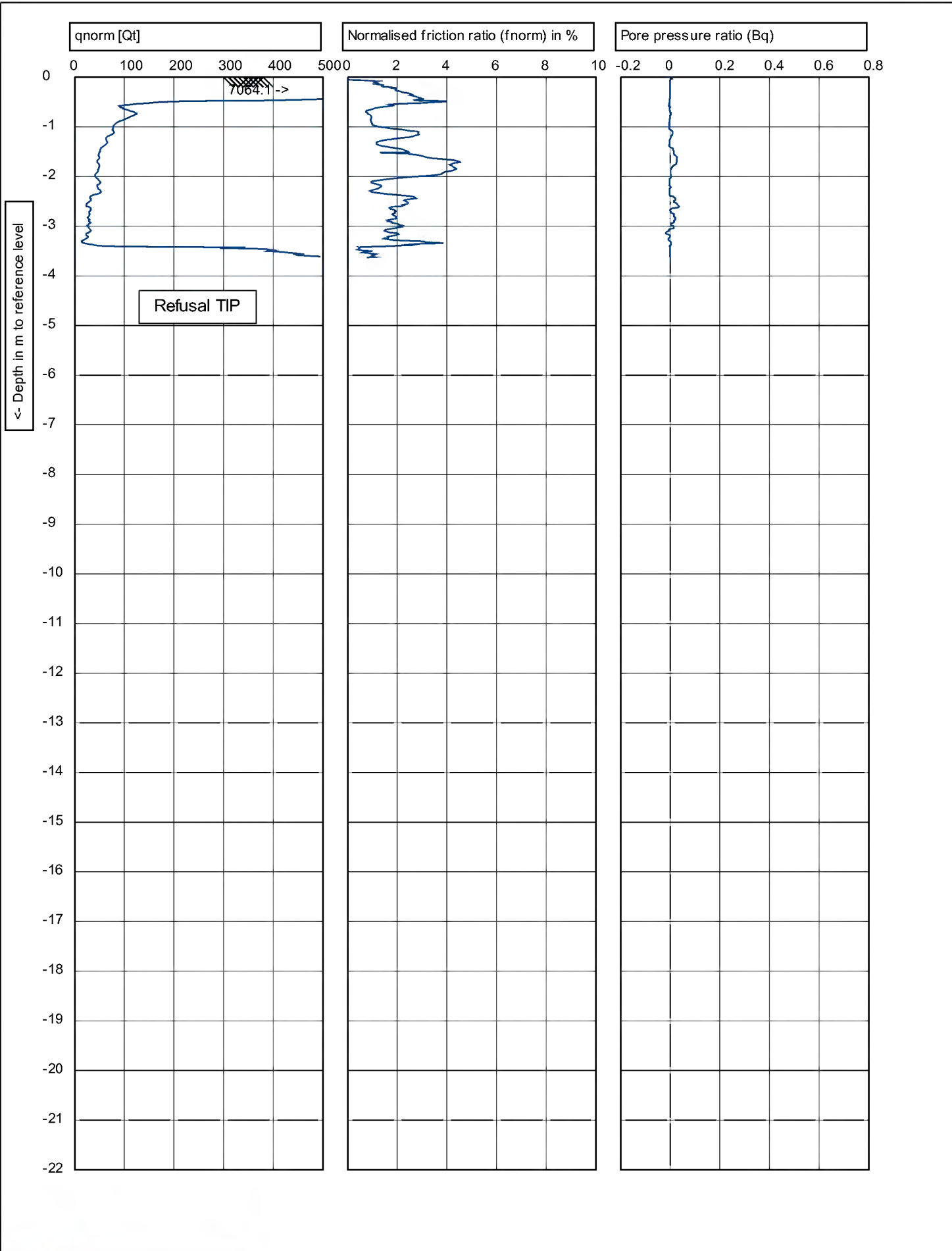
CPTask V1.20



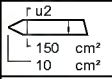
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 12/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1677071 N5406317</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT213	2/6



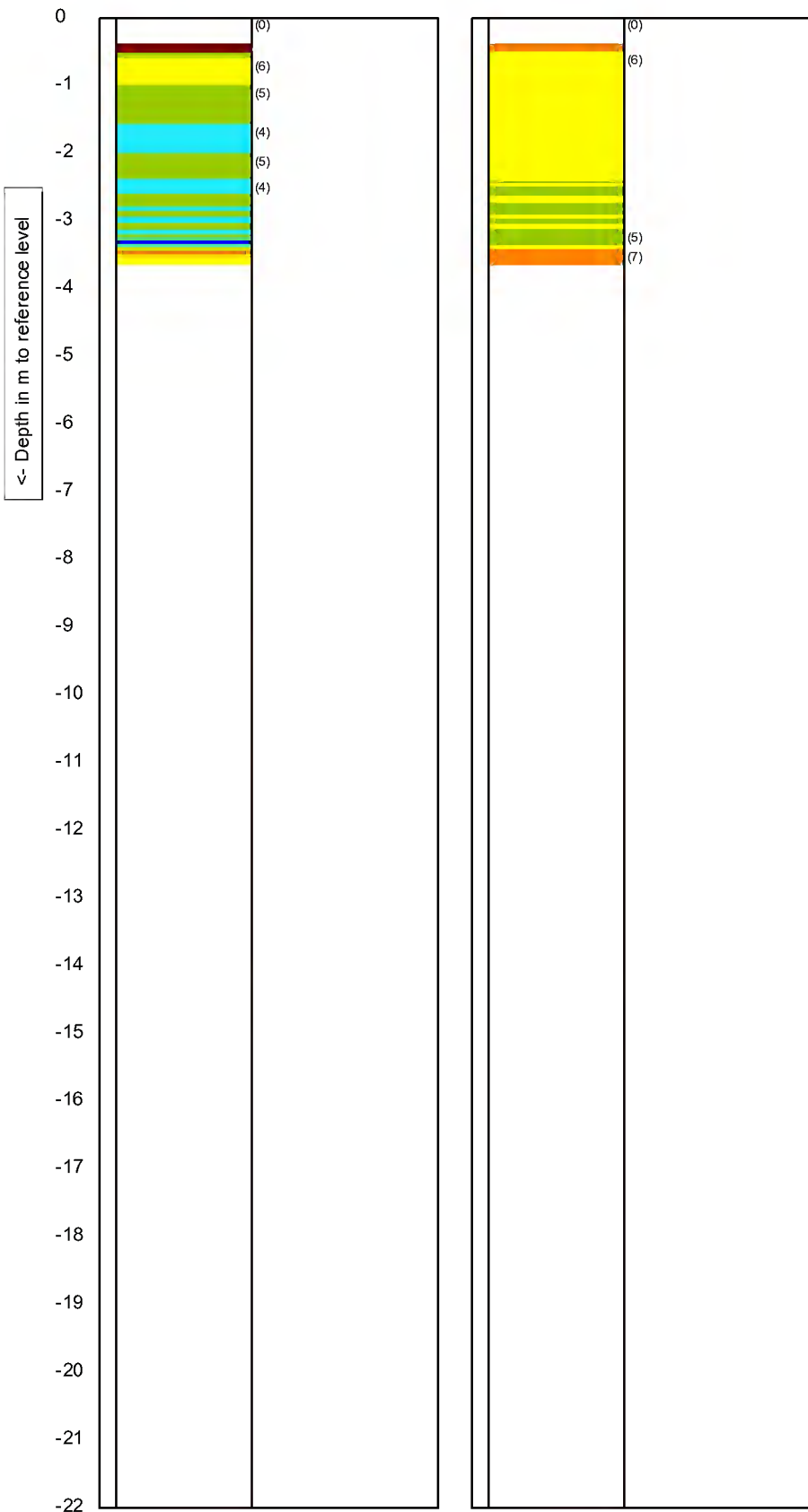
CPTask V1.20



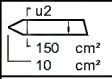
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677071 N5406317</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT213	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



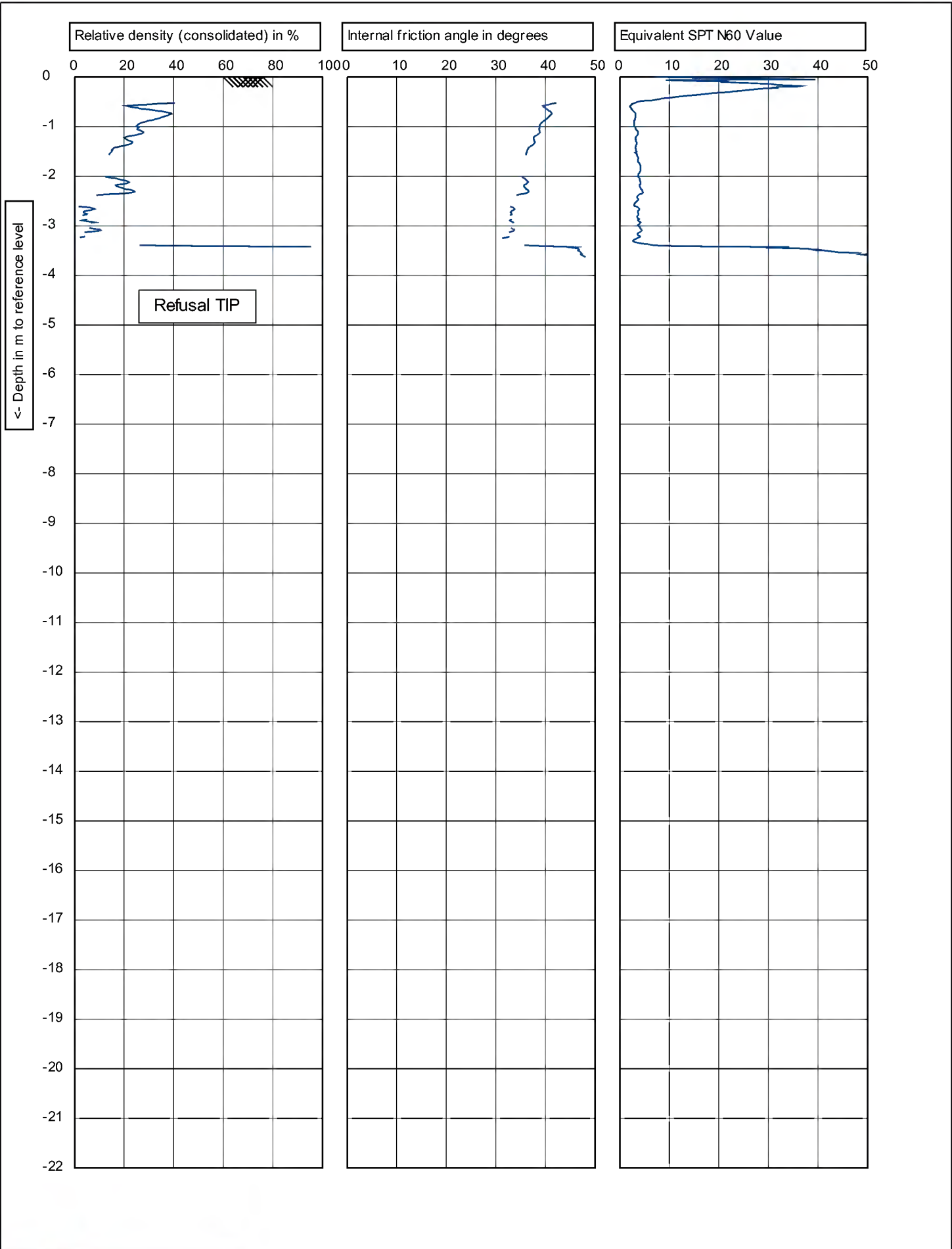
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



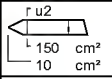
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677071 N5406317</b>		Project no.:	<b>5-C2128.00</b>
Position:	CPT no.:	CPT213	4/6

CPTask V1.20

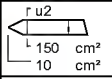
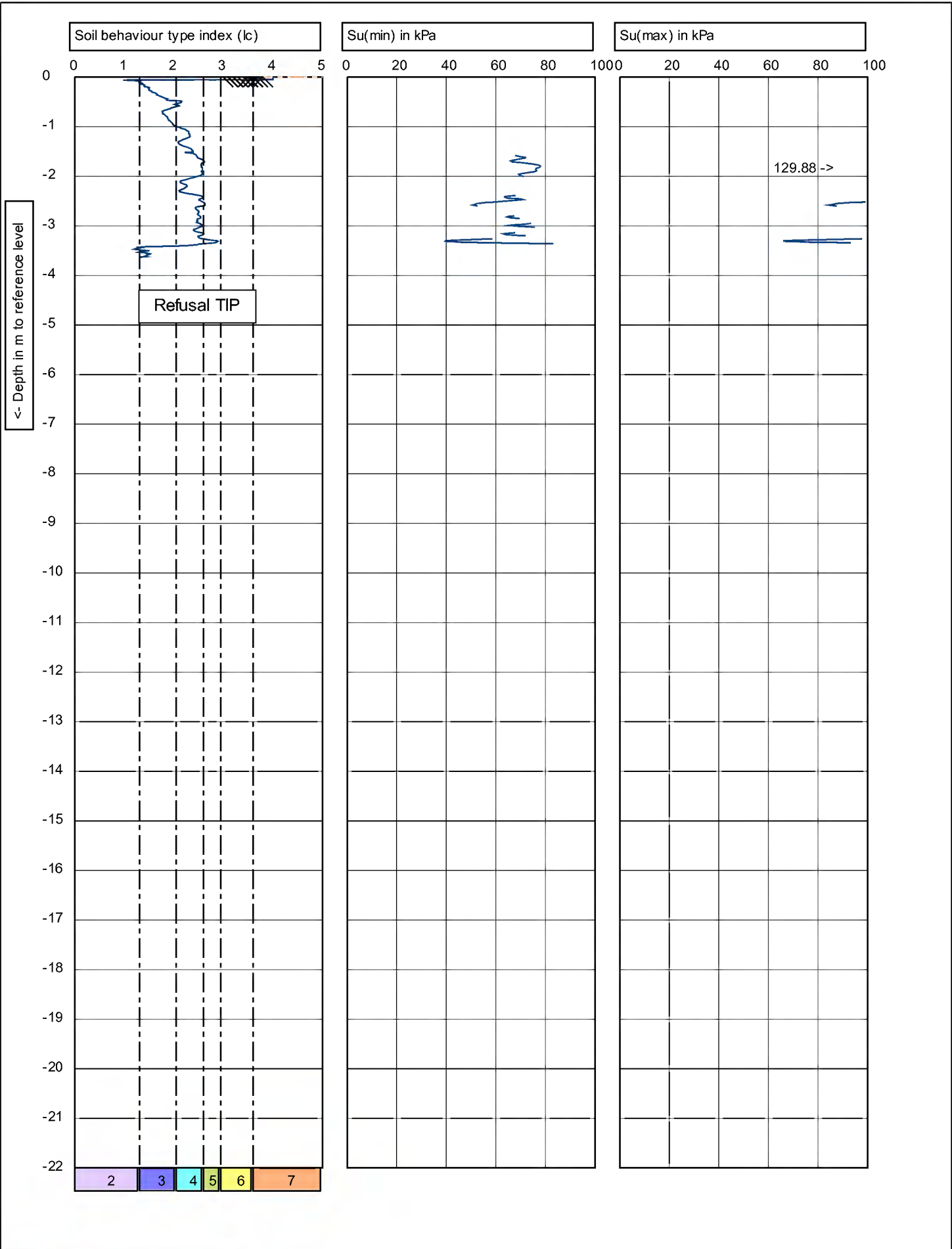




CPTask V1.20

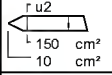
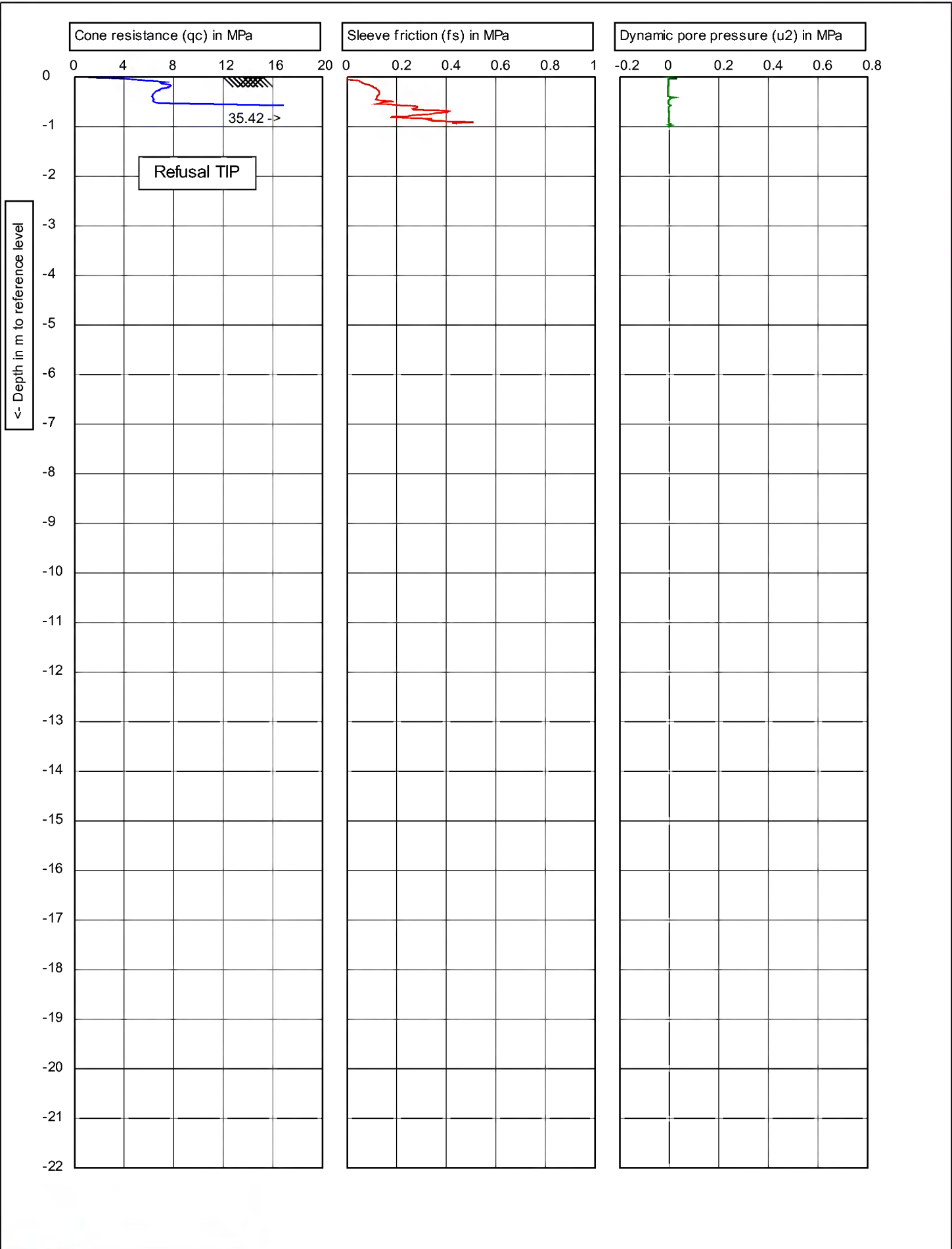


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677071 N5406317</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT213	5/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677071 N5406317</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT213
			6/6

CPTask V1.20

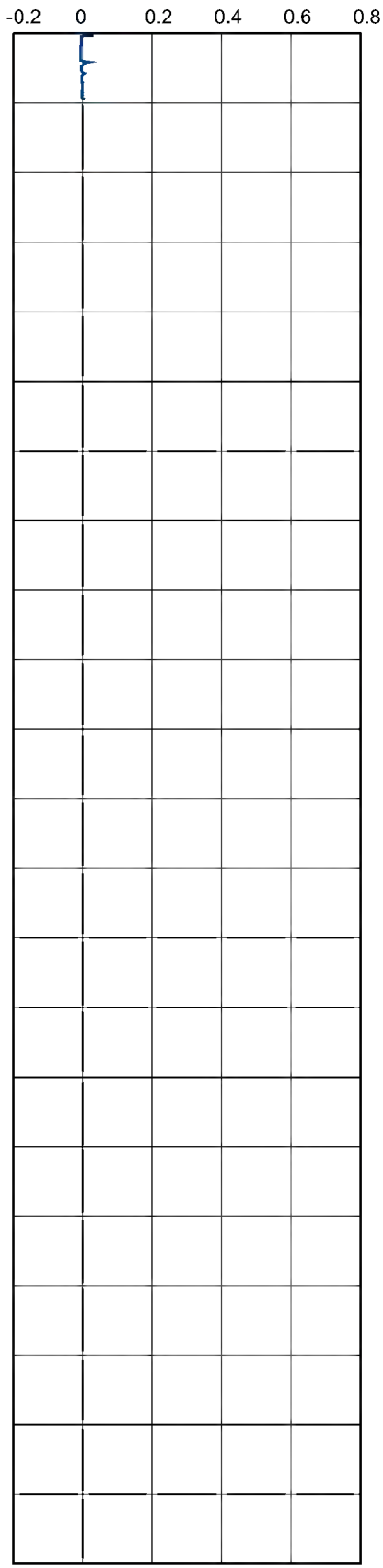
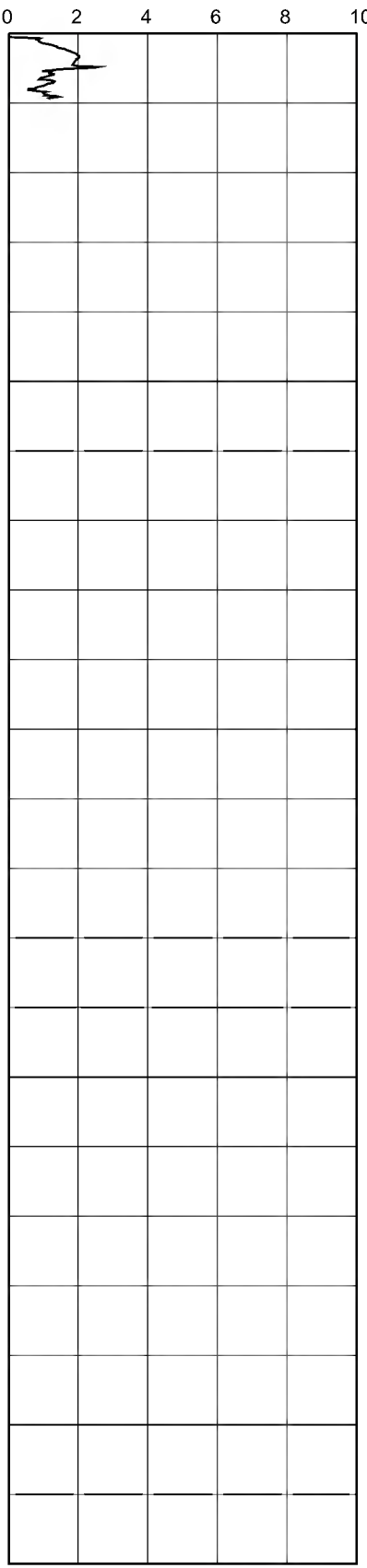
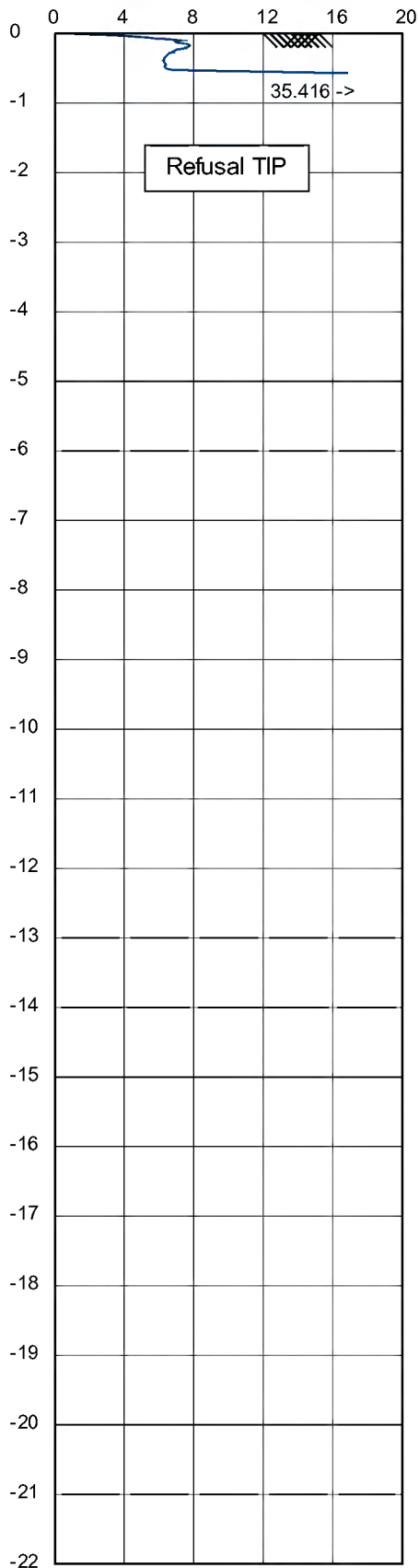


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT214	1/6

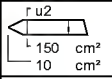
Corrected cone resistance (qt) in MPa

Friction ratio (Rf) in %

Excess pore pressure (du) in MPa

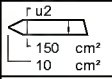
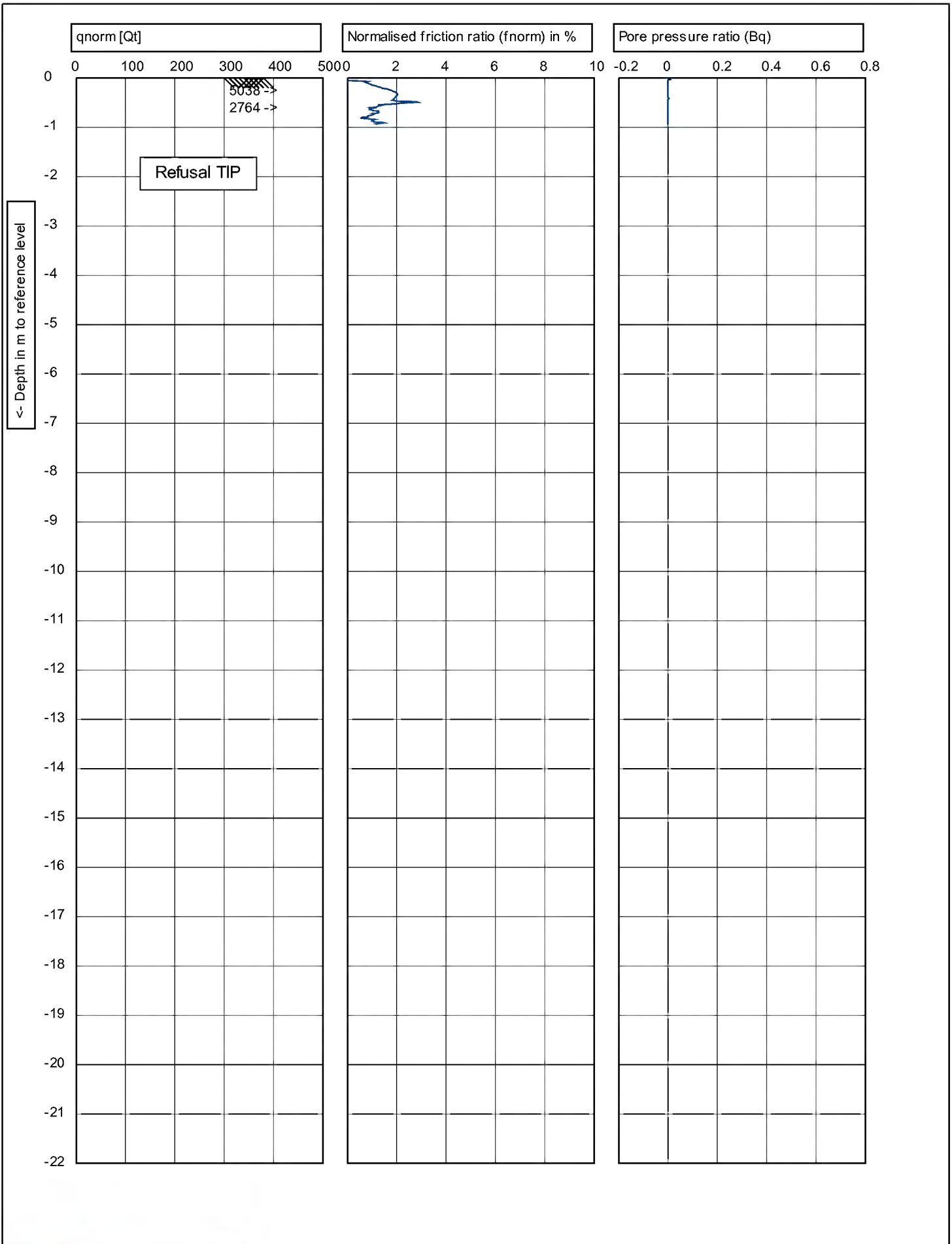


-< Depth in m to reference level



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT214	2/6

CPTask V1.20

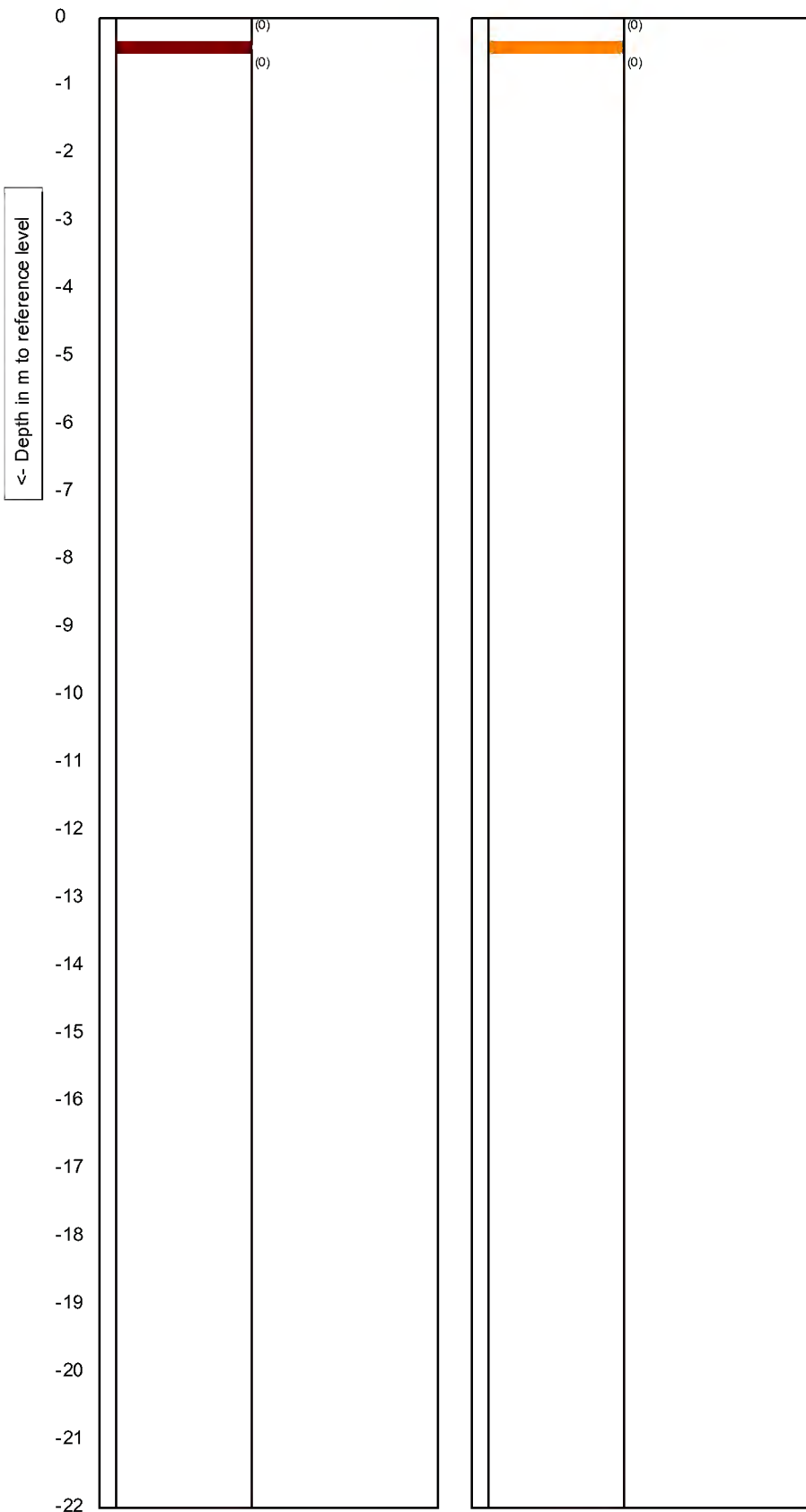


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT214
			3/6

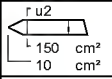
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)

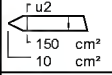
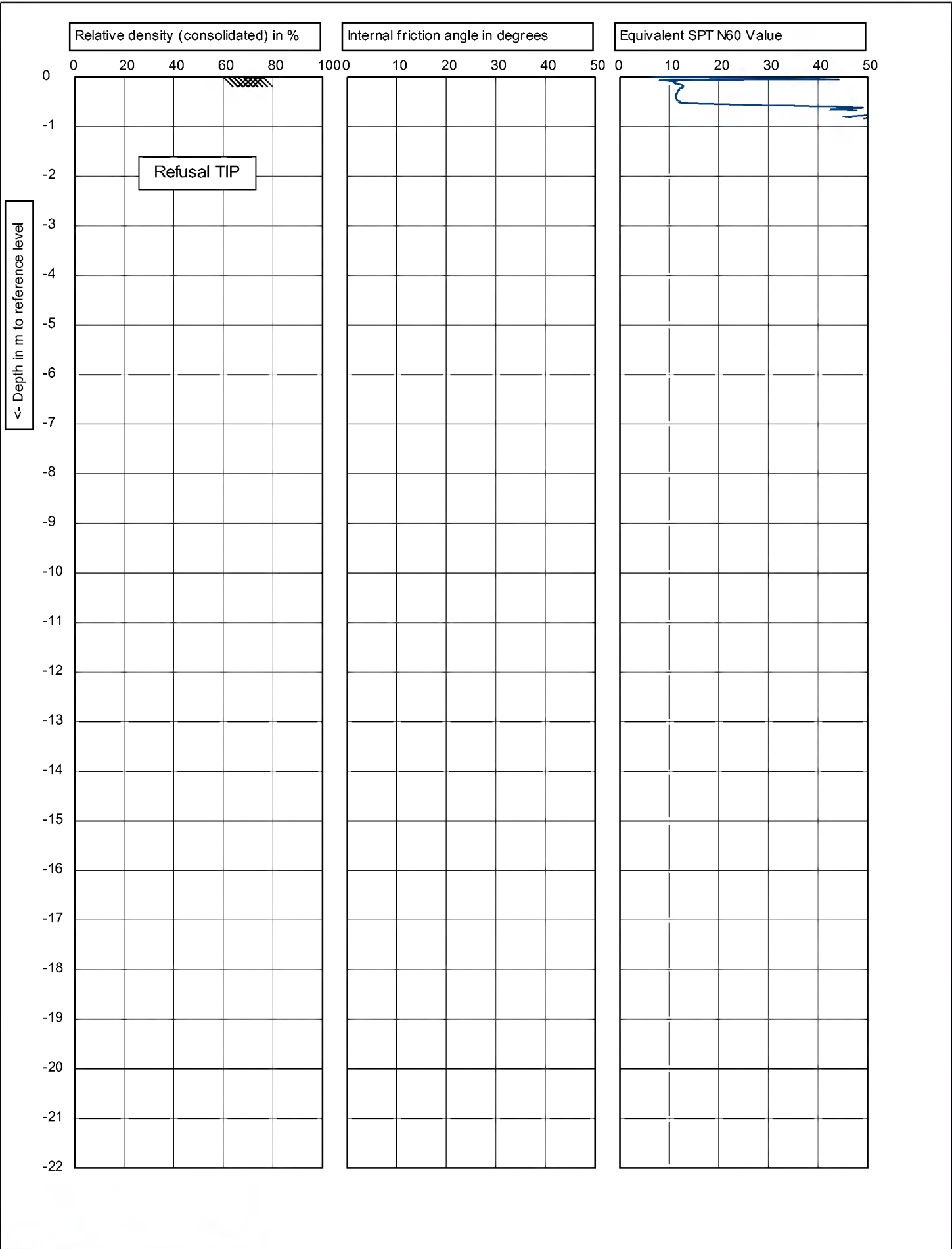


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

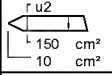
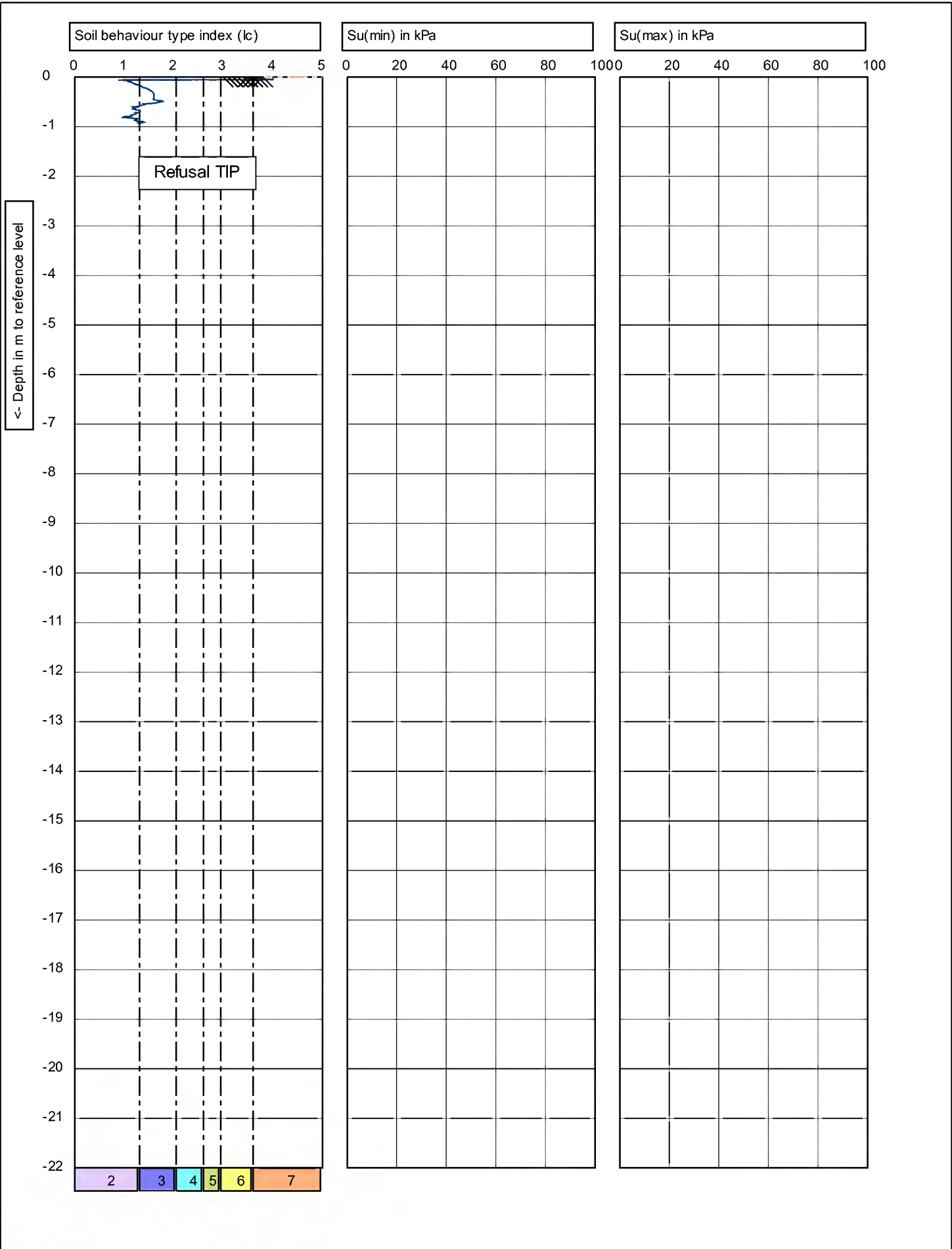


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT214	4/6

CPTask V1.20



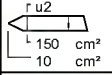
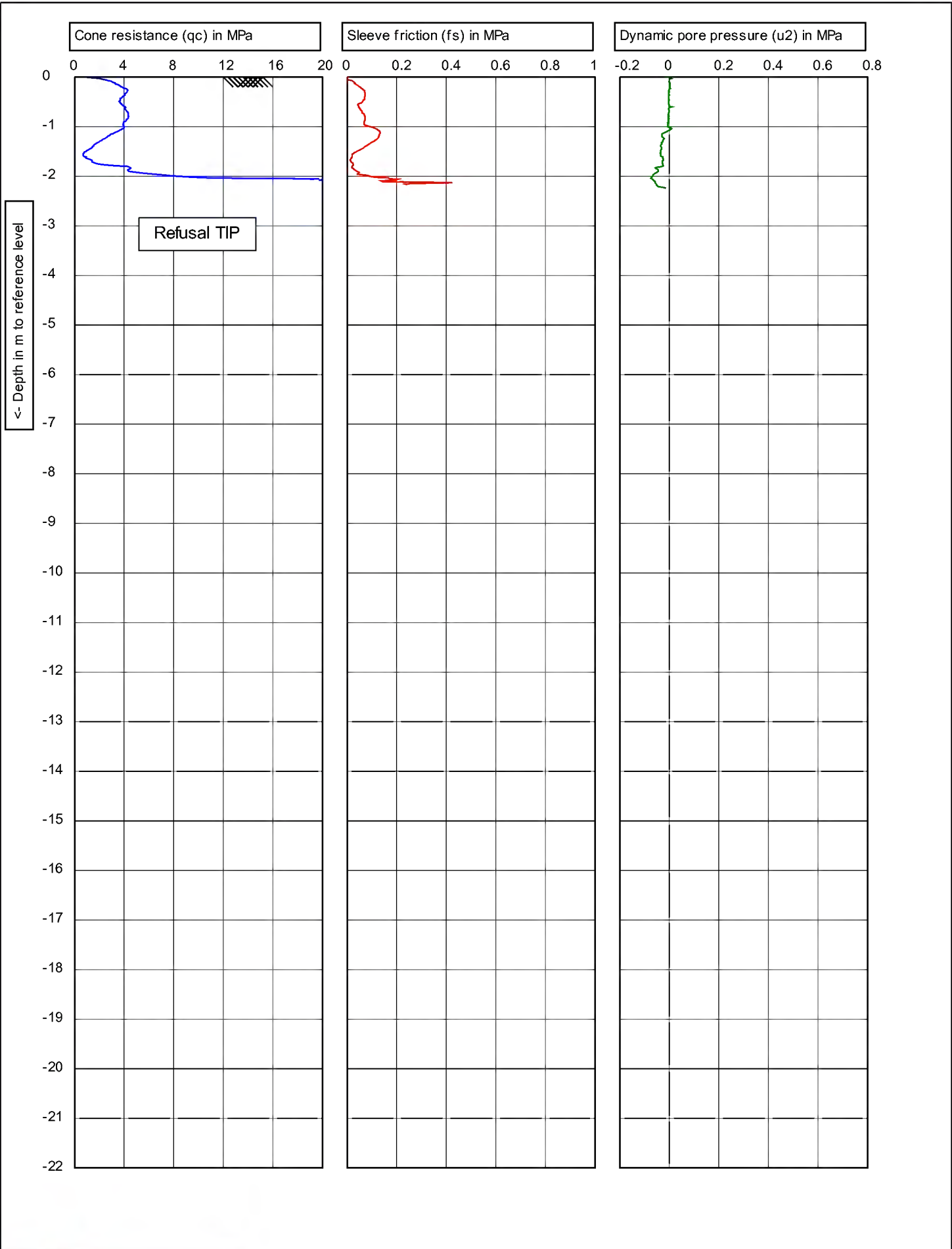
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT214	5/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677523 N5405944</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT214
			6/6

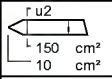
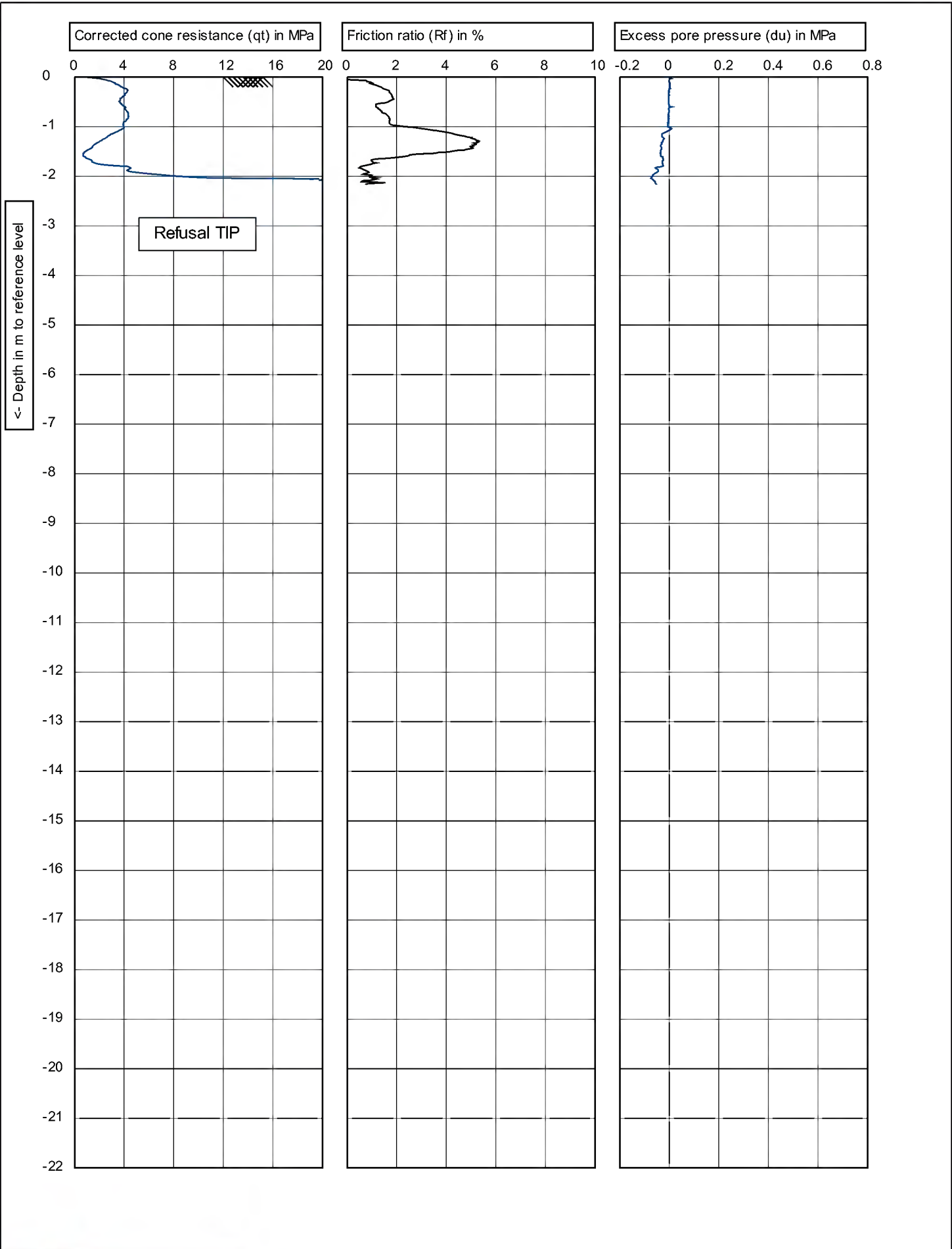
CPTask V1.20





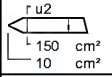
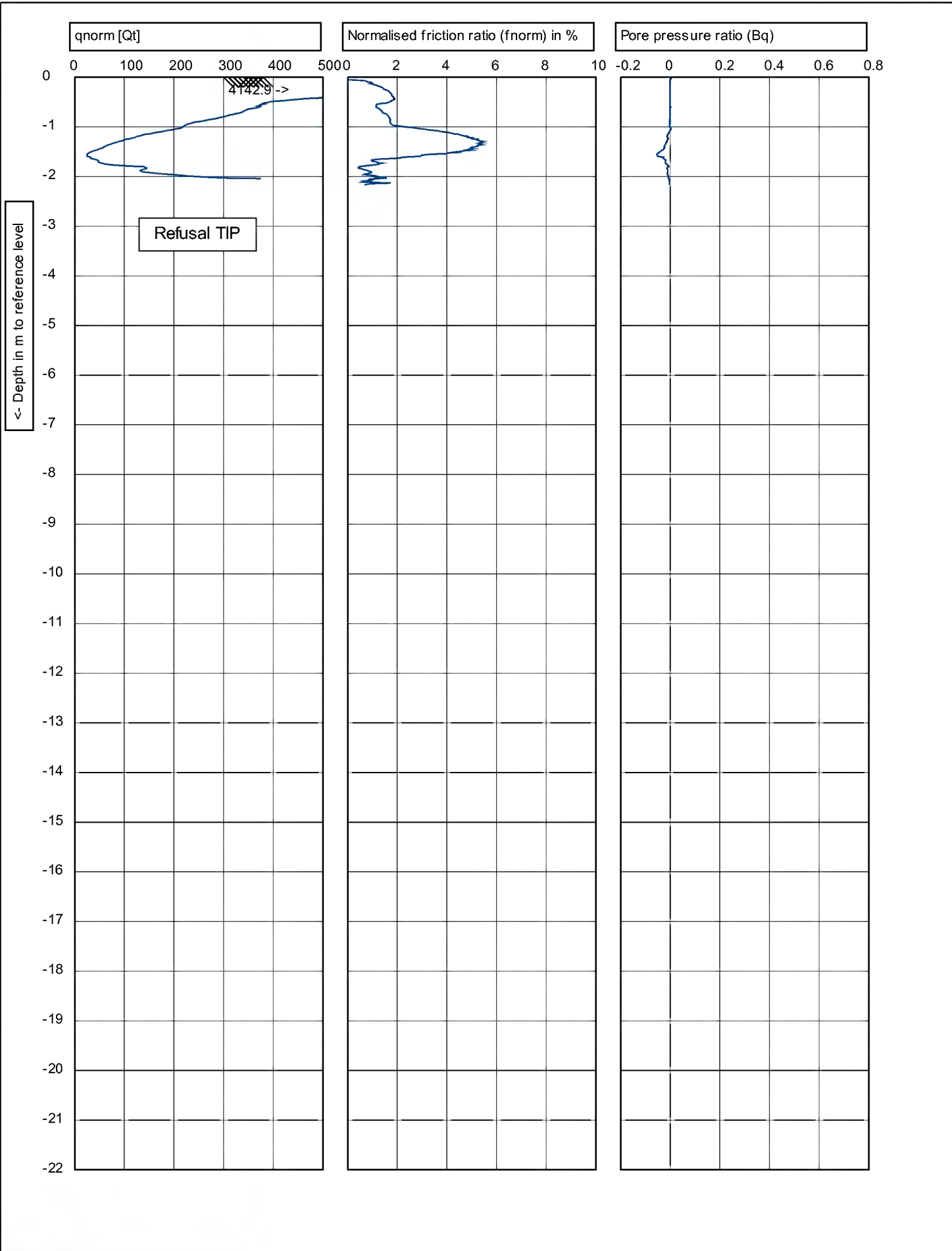
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677710 N5405663</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT215	1/6

CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677710 N5405663</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT215	2/6

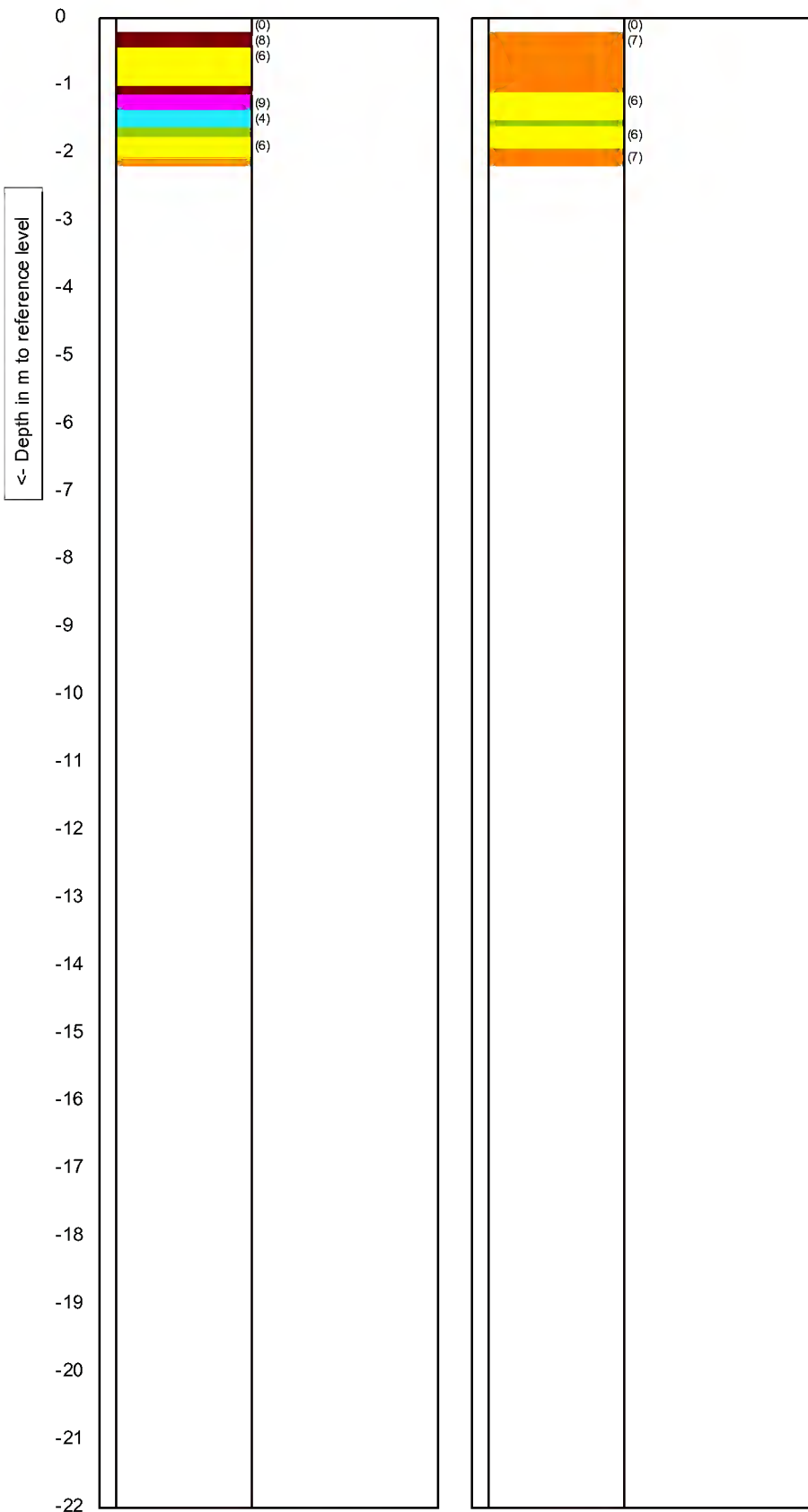
CPTask V1.20



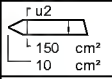
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677710 N5405663</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT215	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

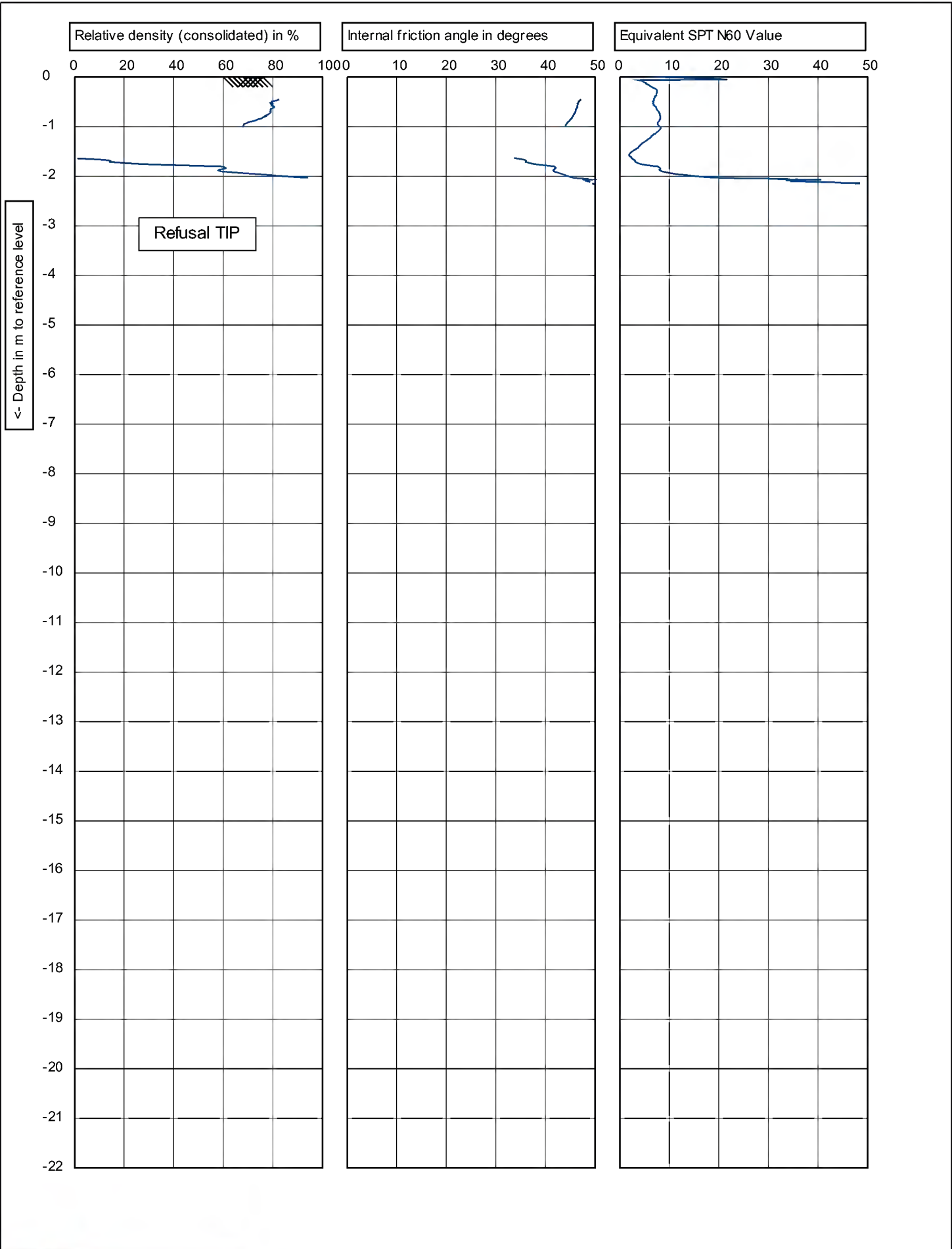


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

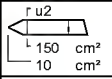


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 12/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1677710 N5405663		Project no.: 5-C2128.00	
Position:		CPT no.: CPT215	4/6

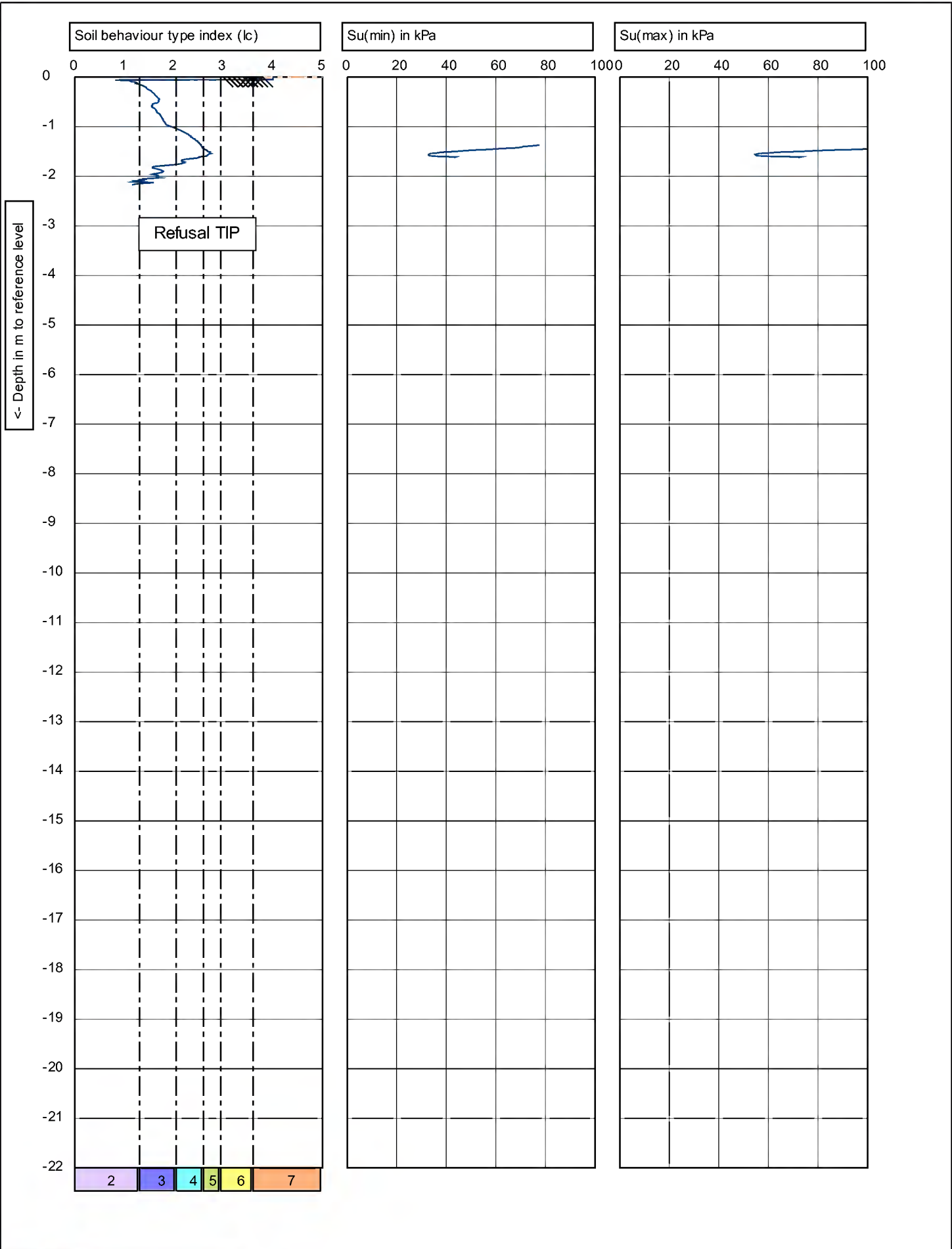
CPTask V1.20



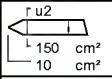
CPTask V1.20



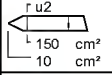
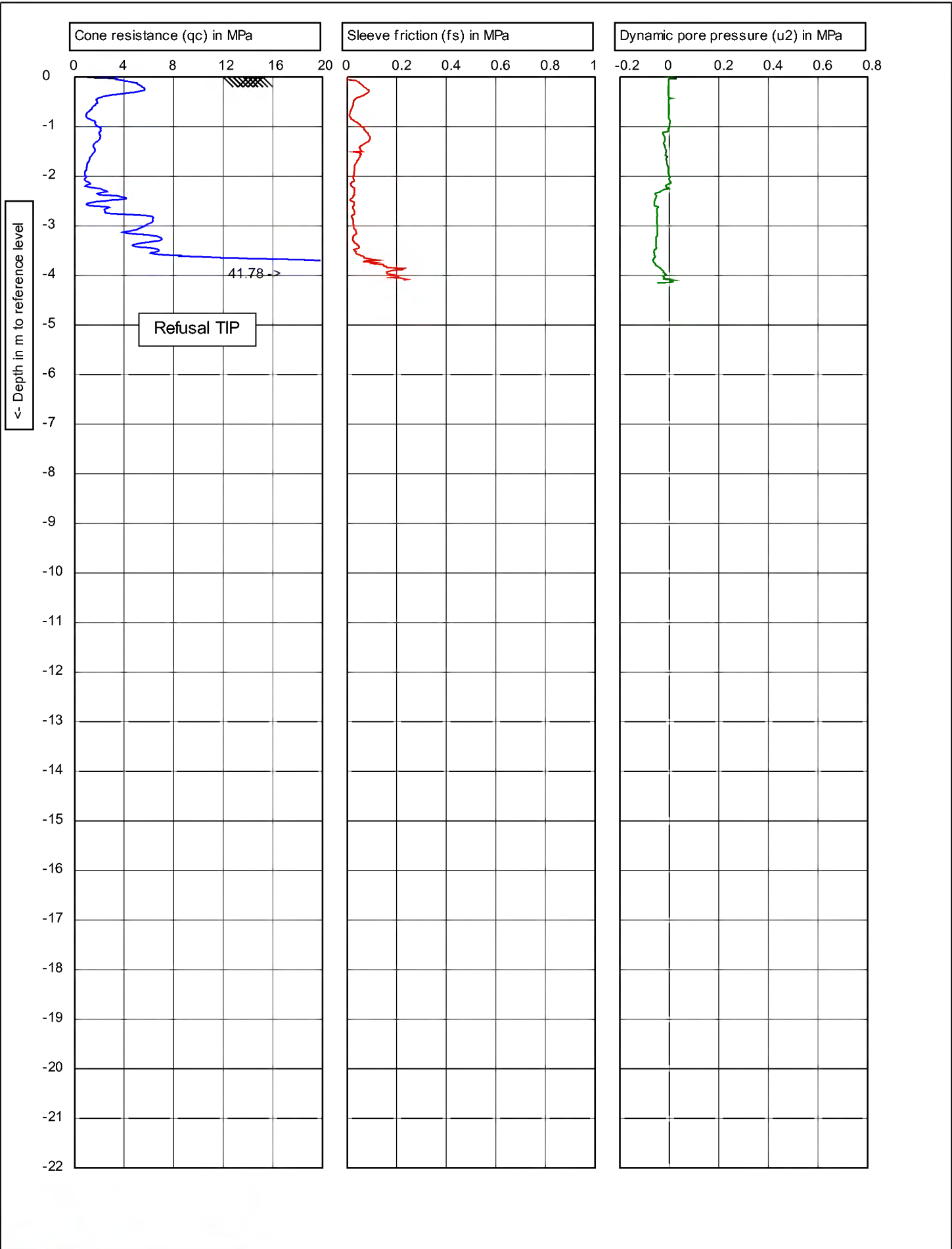
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677710 N5405663</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT215	5/6



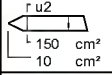
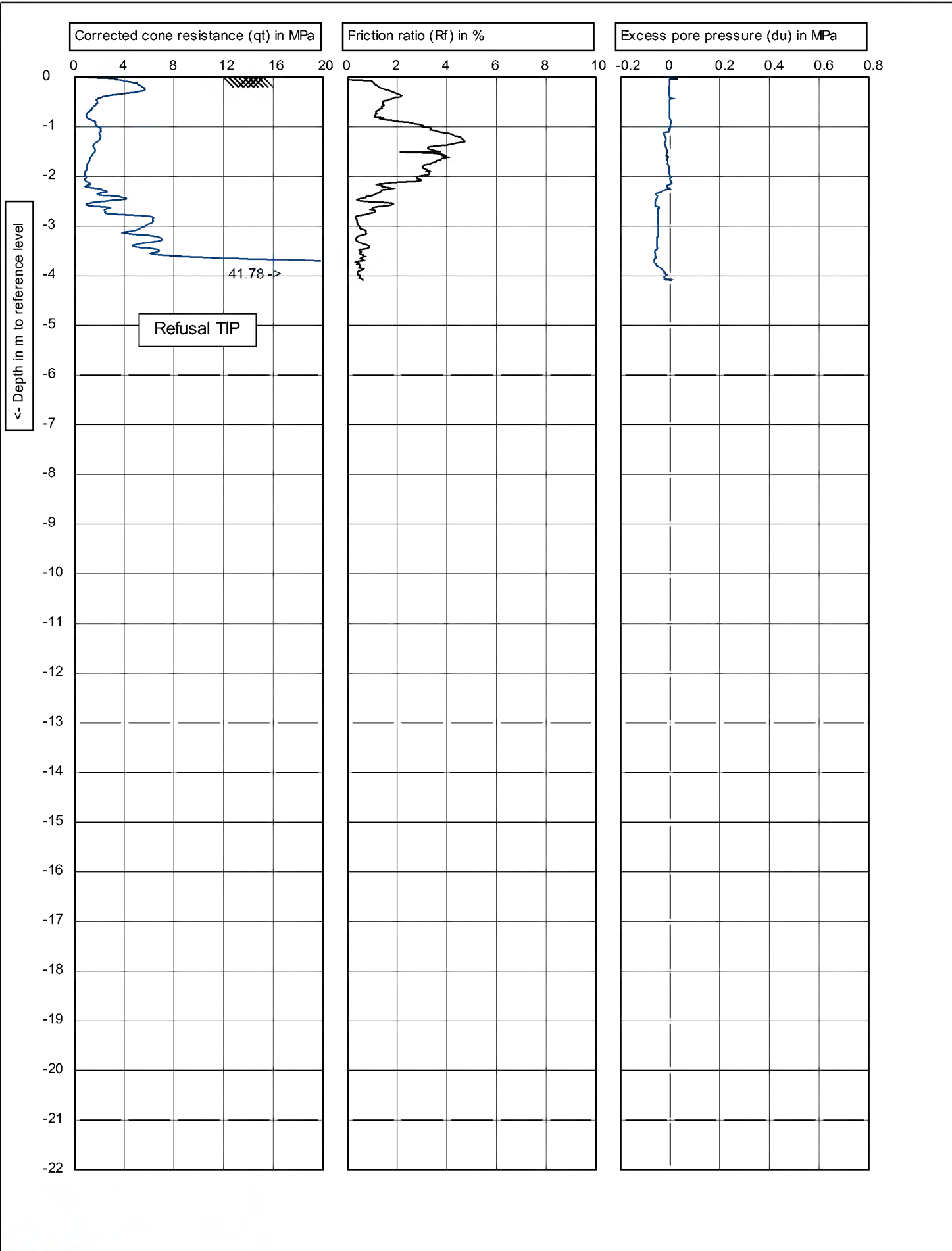
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677710 N5405663</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT215
			6/6

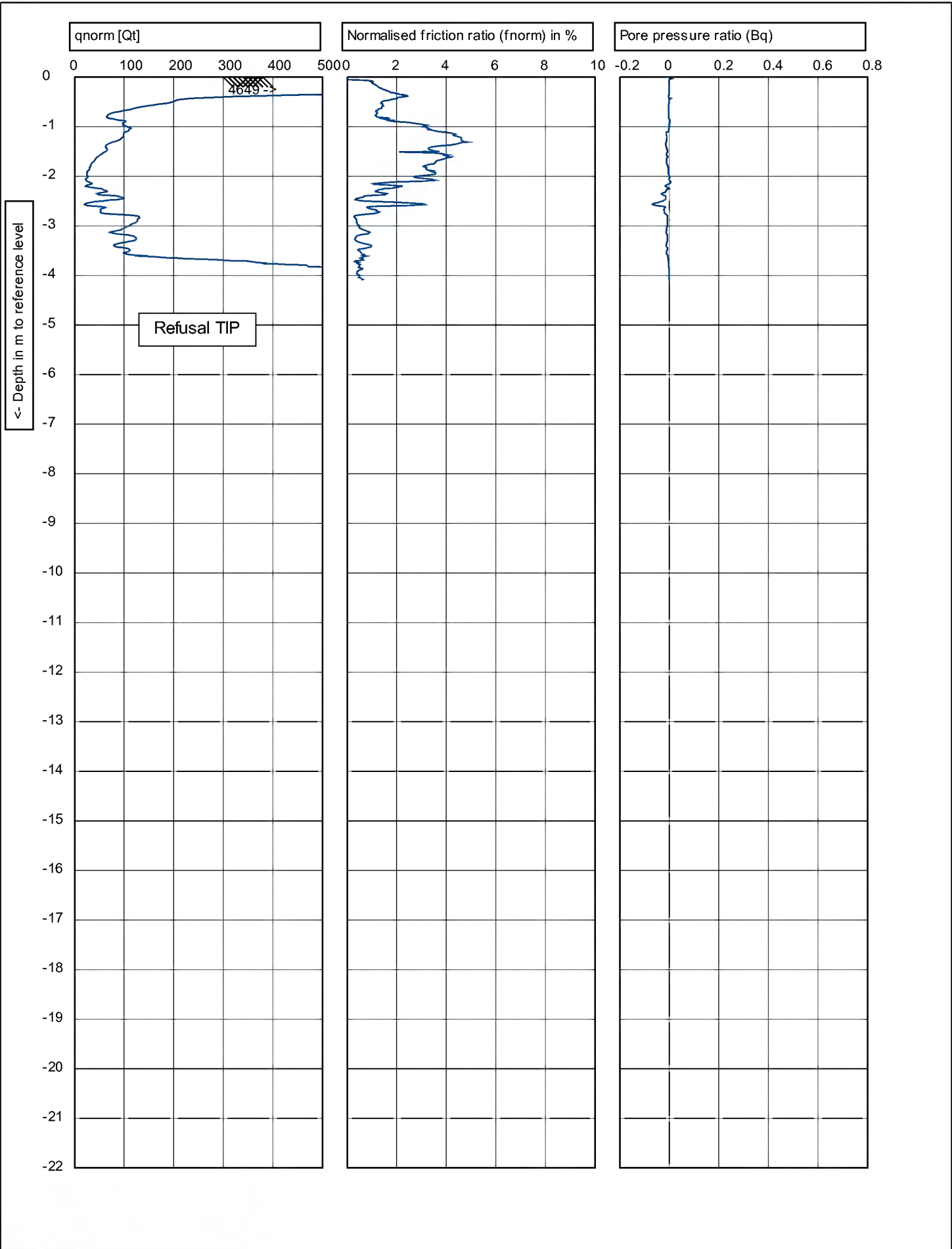


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1678177 N5405974</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT216	1/6

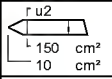


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678177 N5405974</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT216	2/6





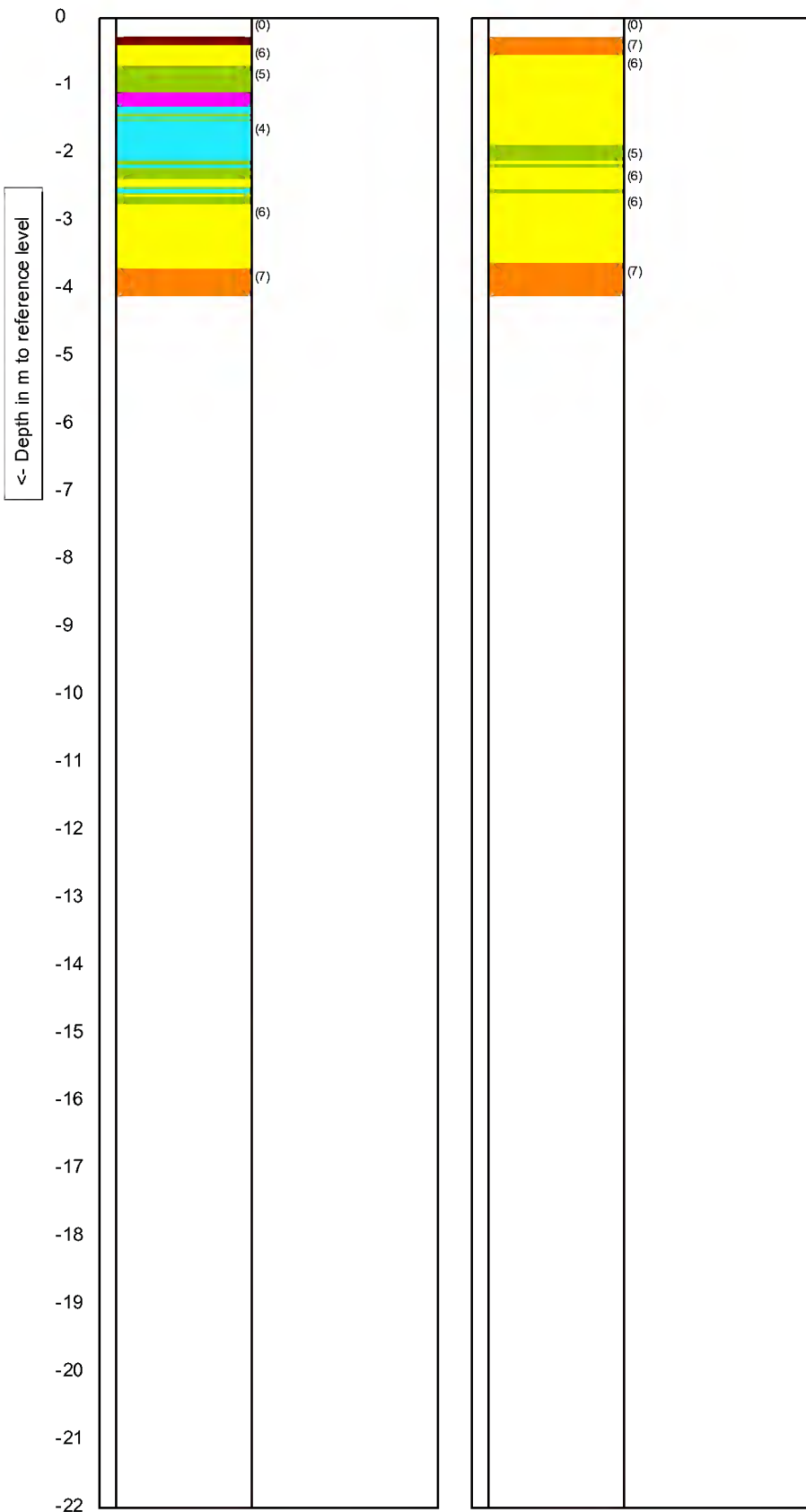
CPTask V1.20



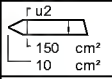
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678177 N5405974</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT216
			3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

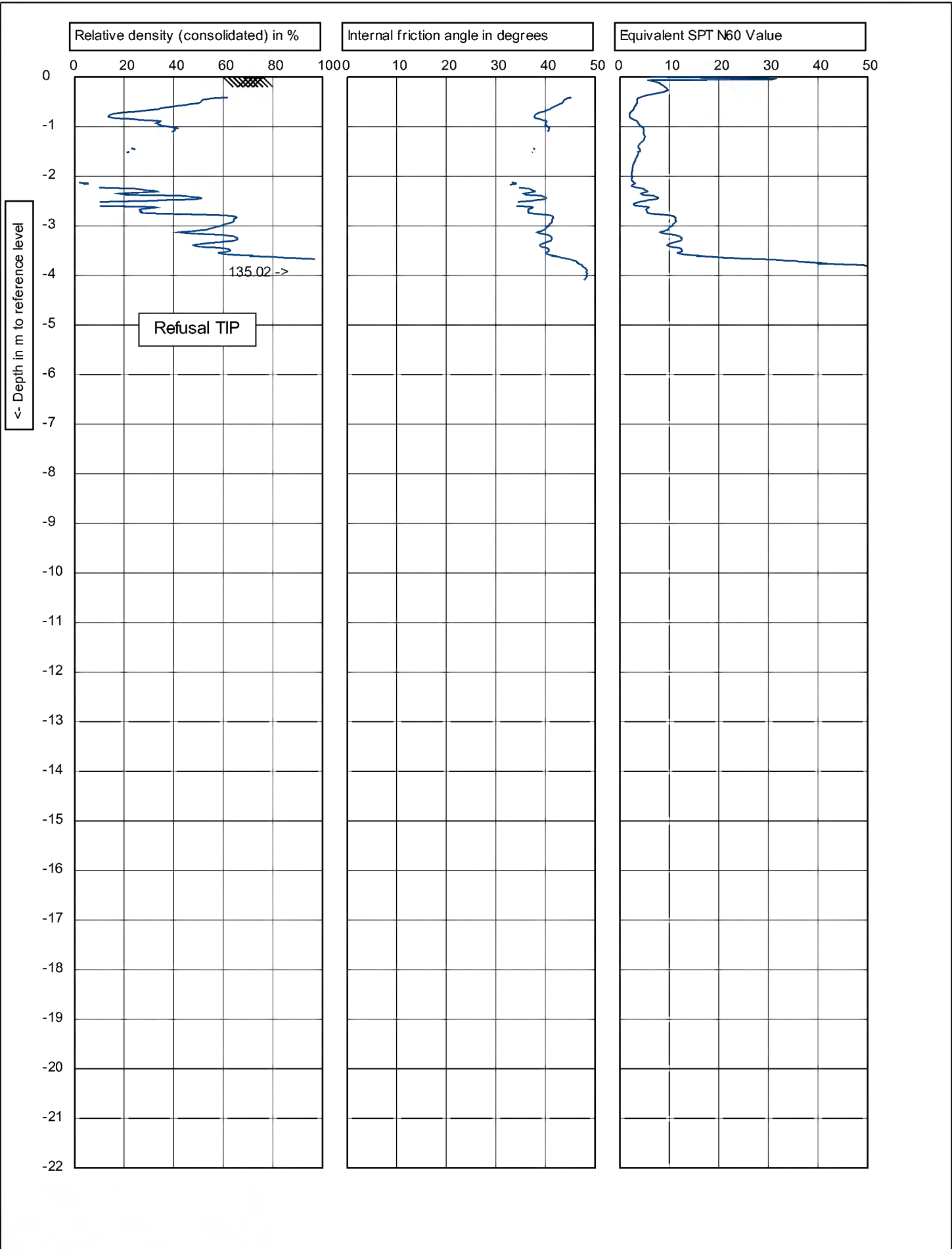


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

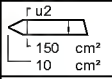


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 12/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1678177 N5405974		Project no.: 5-C2128.00	
Position:		CPT no.: CPT216	4/6

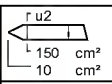
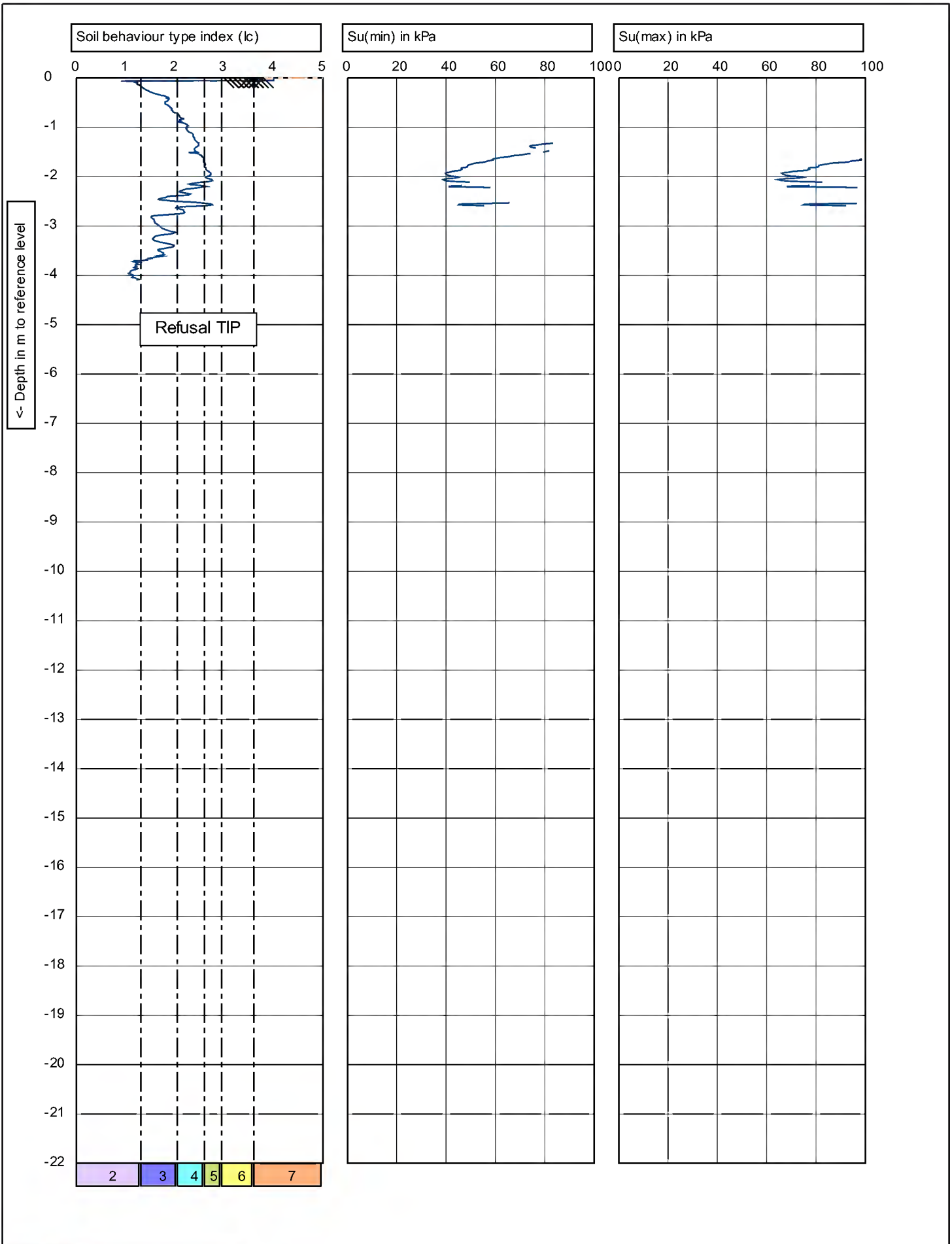
CPTask V1.20



CPTask V1.20

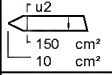
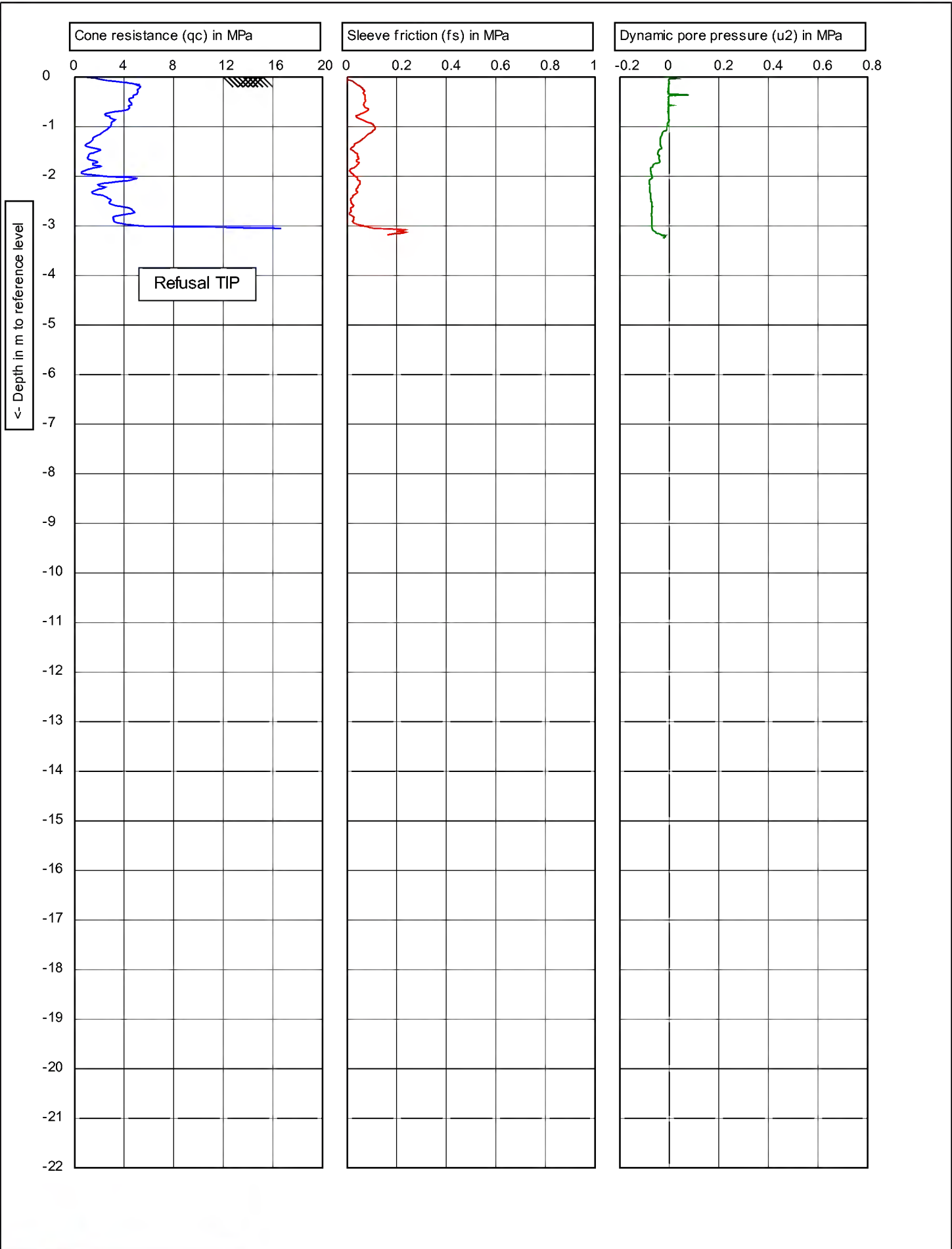


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678177 N5405974</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT216
			5/6

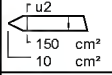
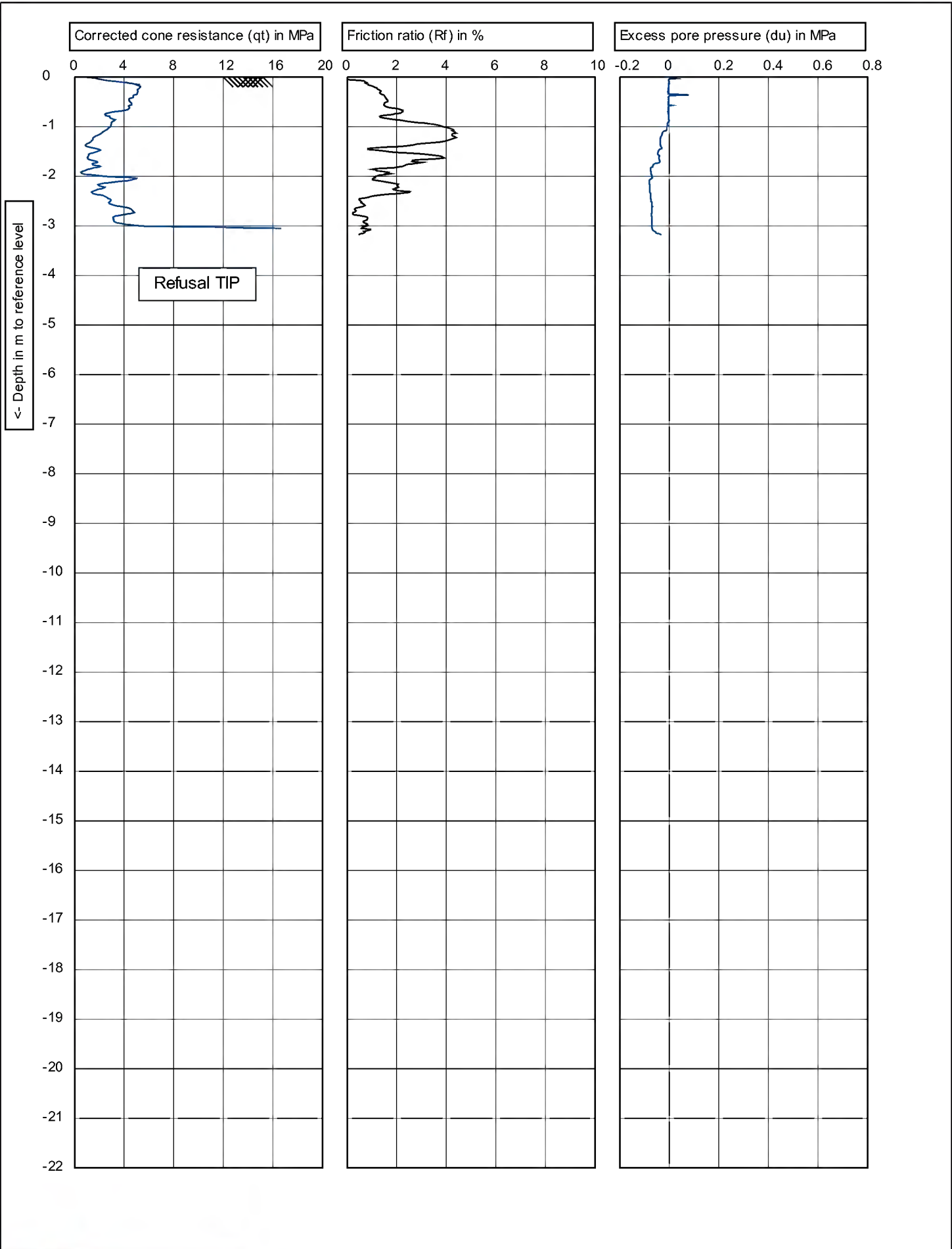


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678177 N5405974</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT216
			6/6

CPTask V1.20

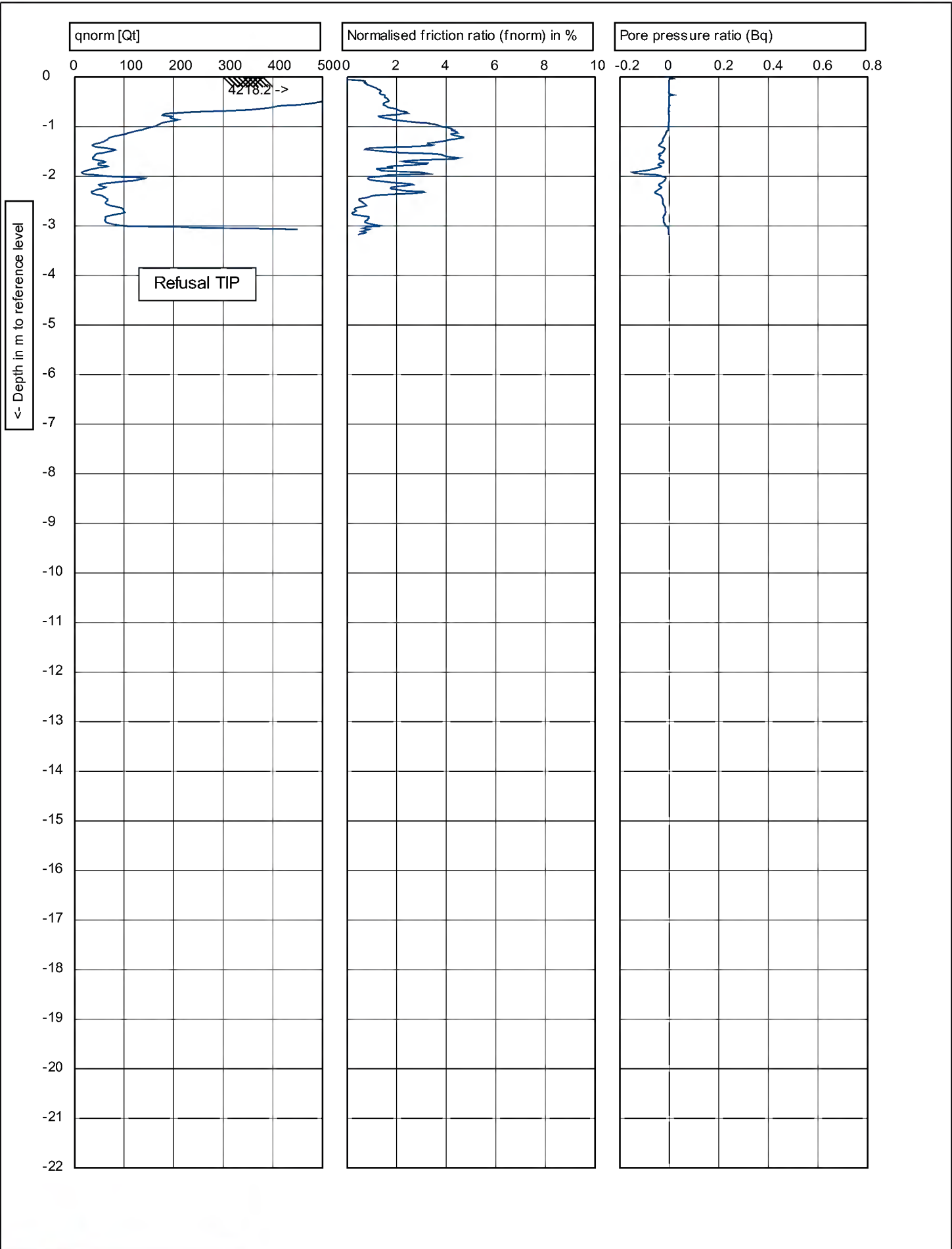


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1678536 N5405990</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT217
			1/6

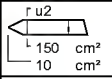


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1678536 N5405990</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT217	2/6

CPTask V1.20



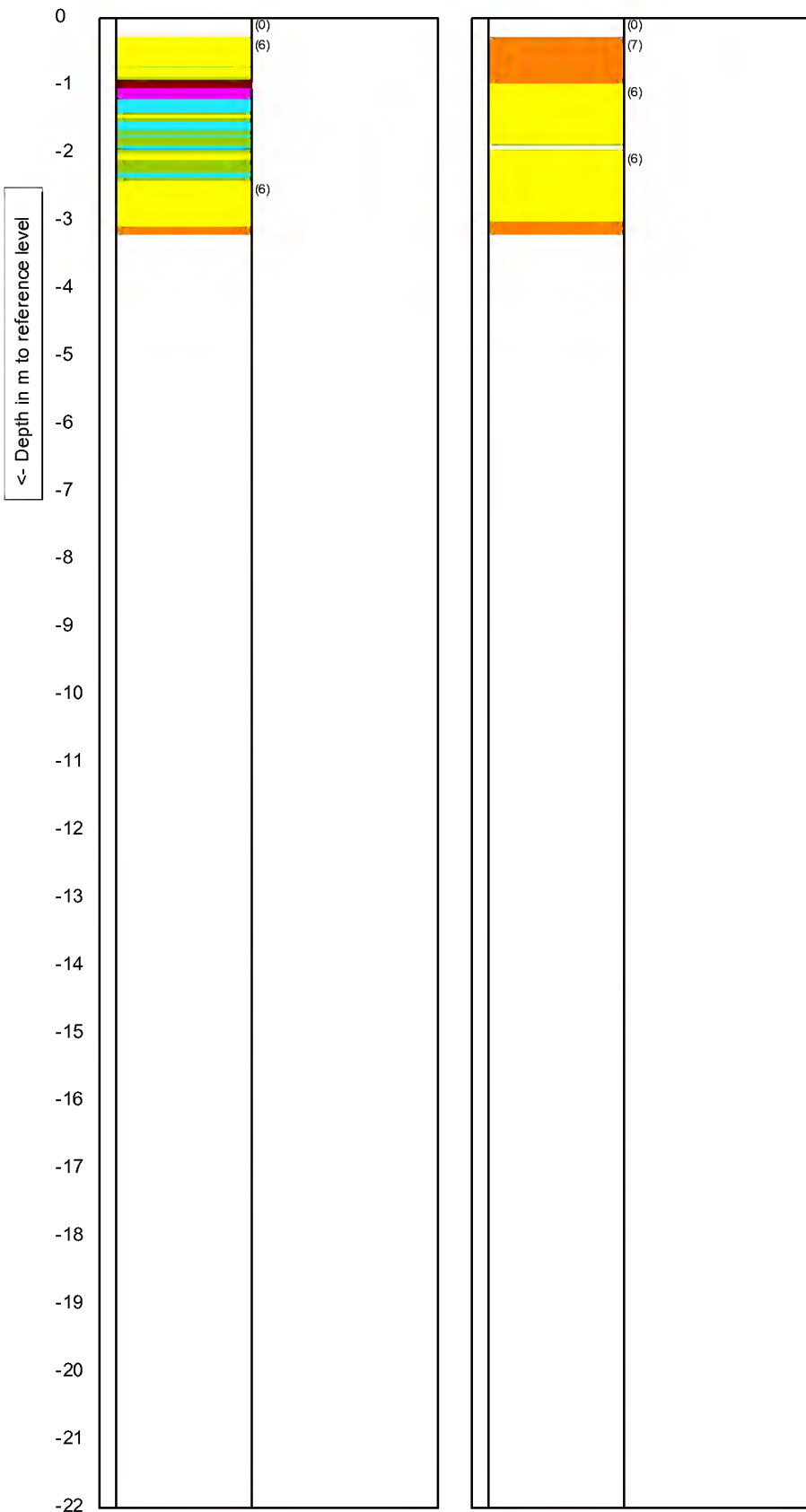
CPTask V1.20



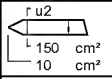
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678536 N5405990</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT217	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



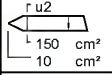
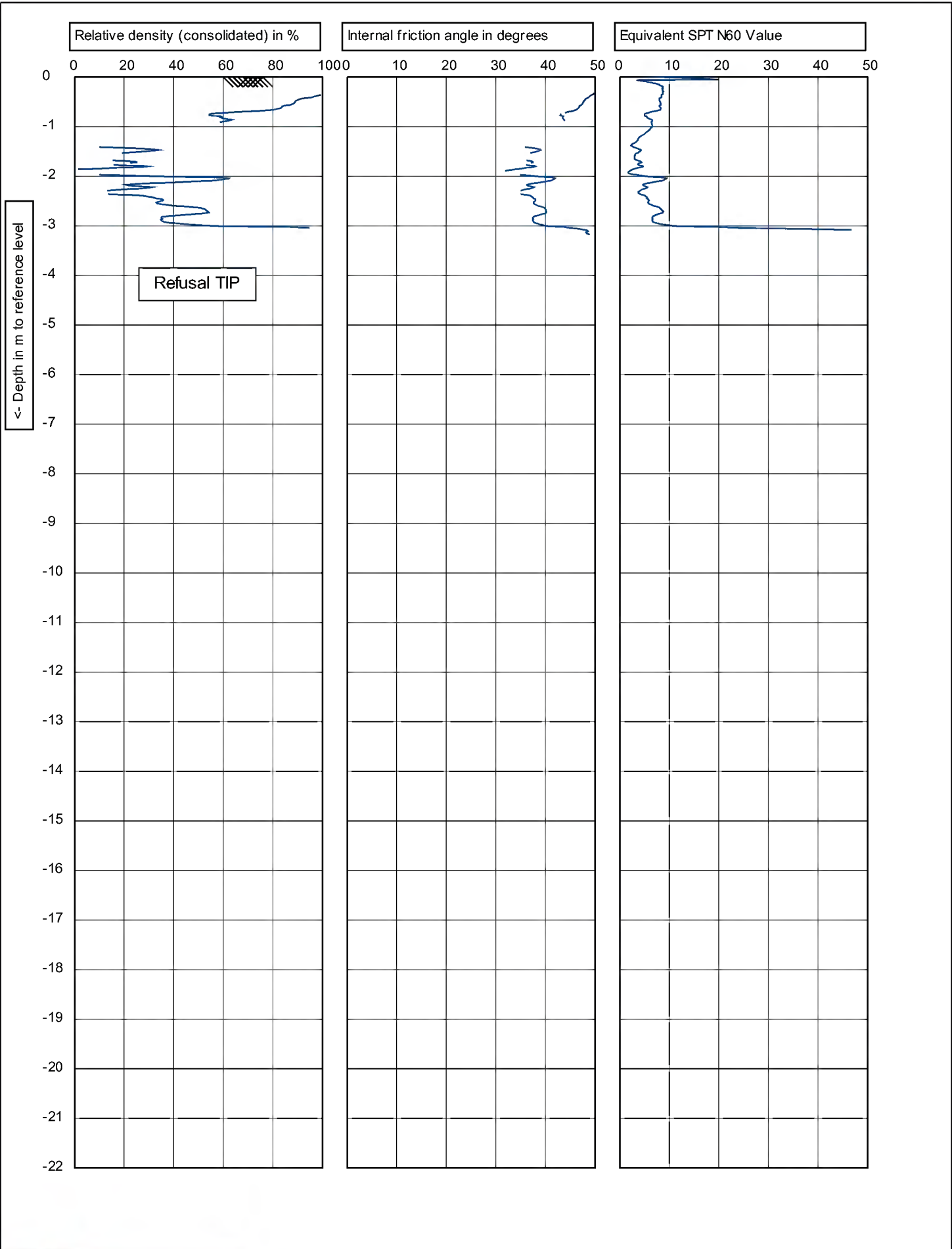
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1678536 N5405990</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT217	4/6

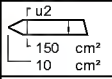
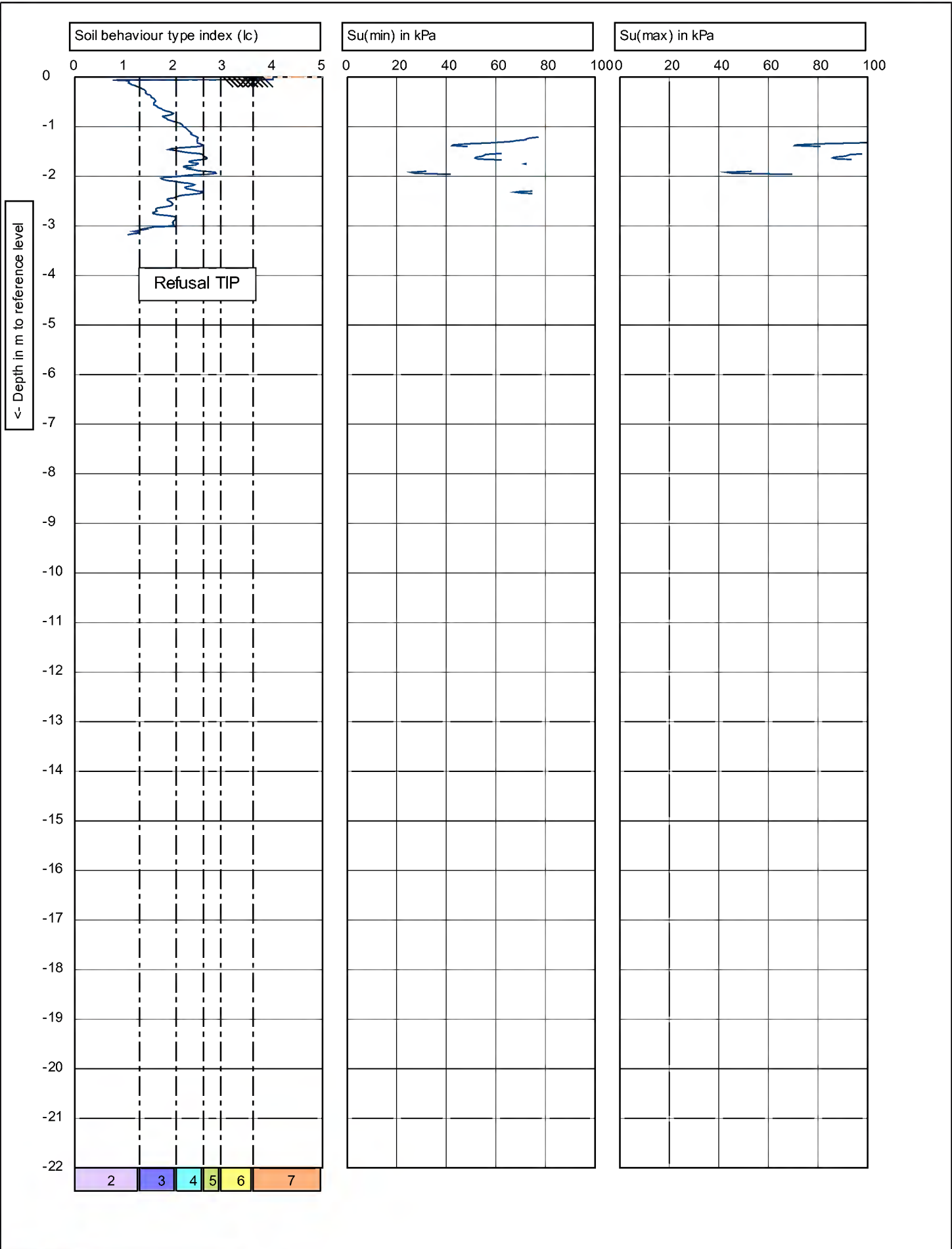
CPTask V1.20





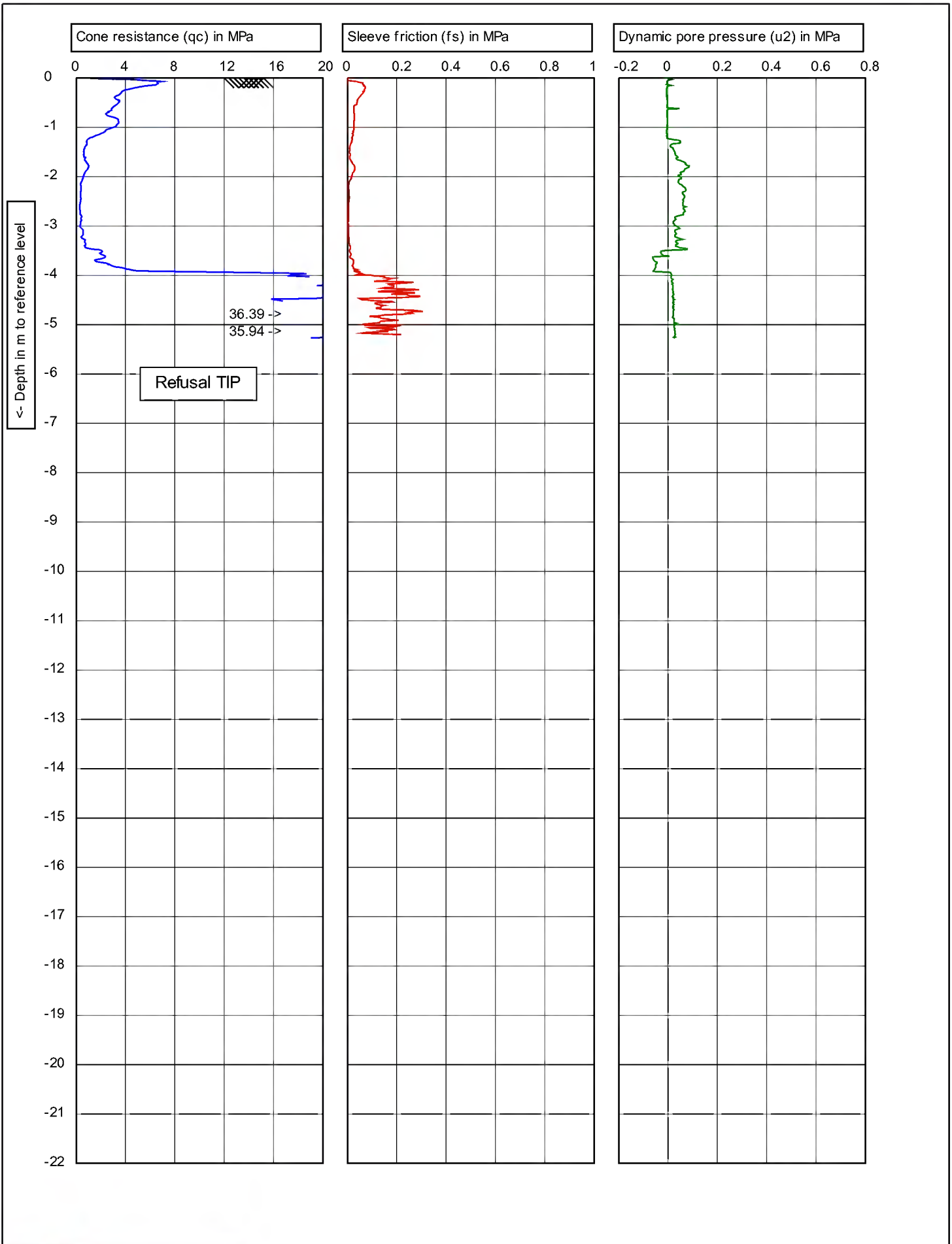
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678536 N5405990</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT217	5/6

CPTask V1.20



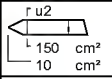
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678536 N5405990</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT217
			6/6

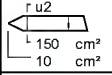
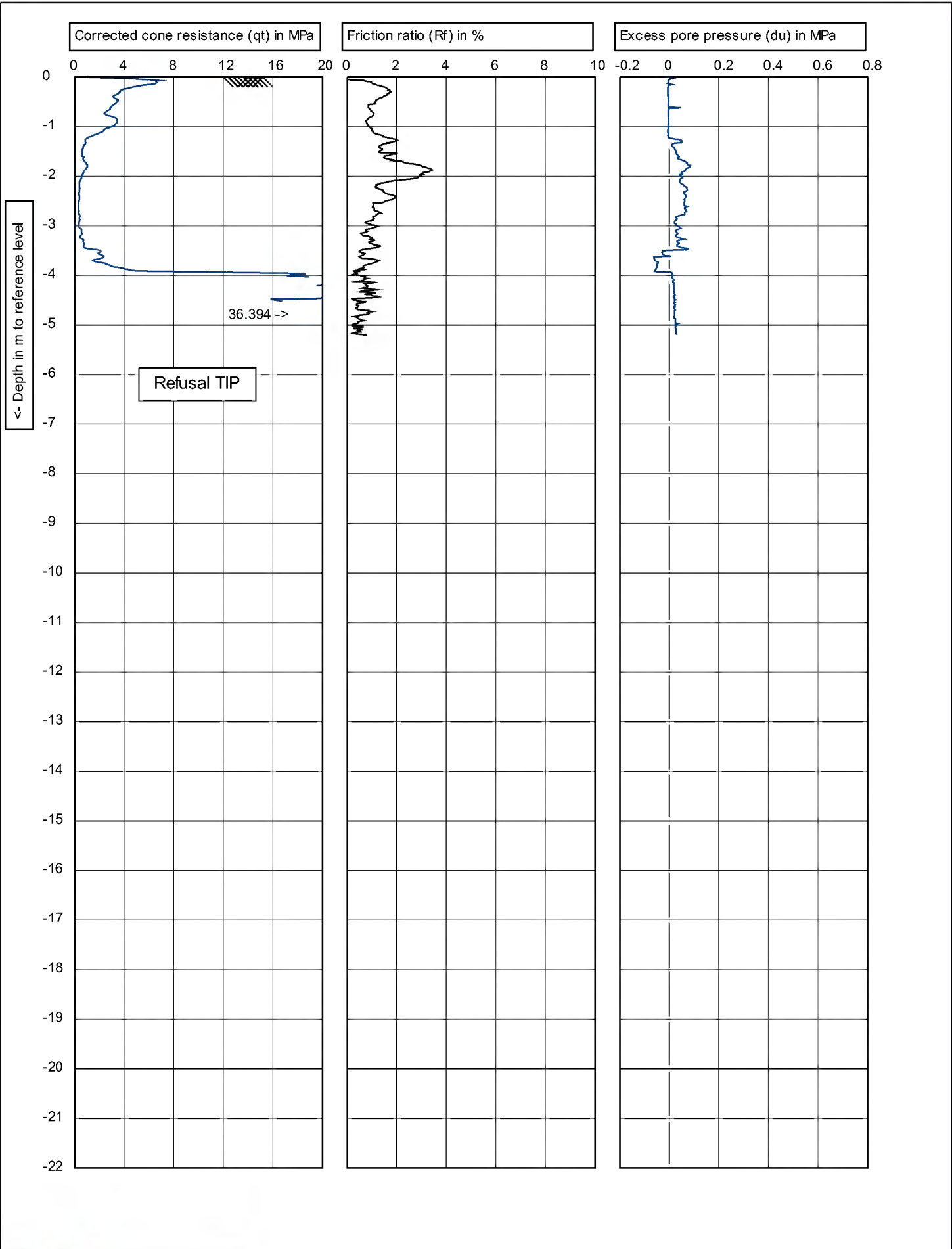
CPTask V1.20



CPTask V1.20

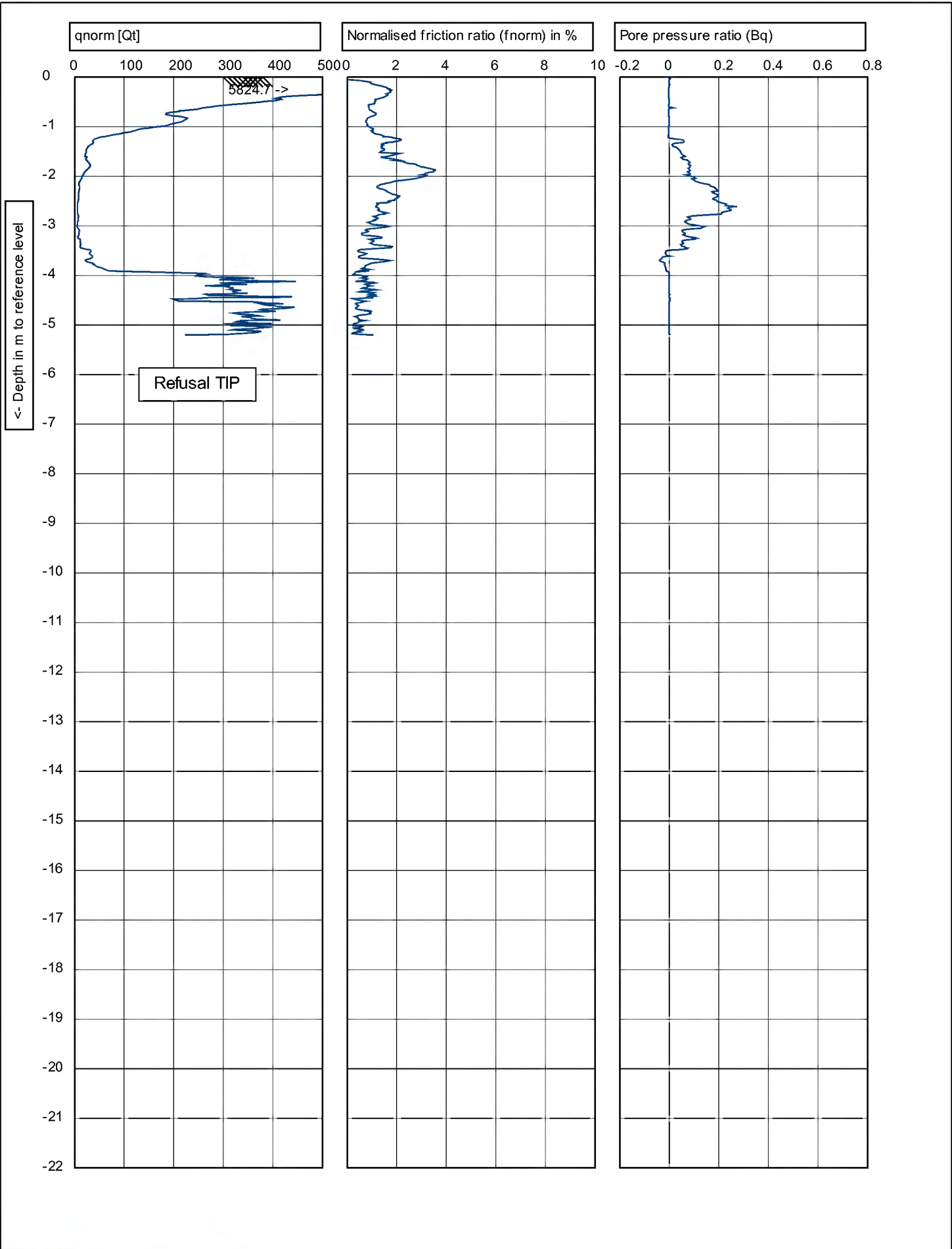


	Test according to A.S.T.M standard D-5778-12		Predrill : 0	
	G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.: <b>C10CFIIP.C10021</b>		Project no.: <b>5-C2128.00</b>	
Location: <b>GPS: E1679980 N5405464</b>	CPT no.: CPT218		1/6	
Position:				

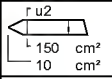


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1679980 N5405464</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT218
			2/6

CPTask V1.20



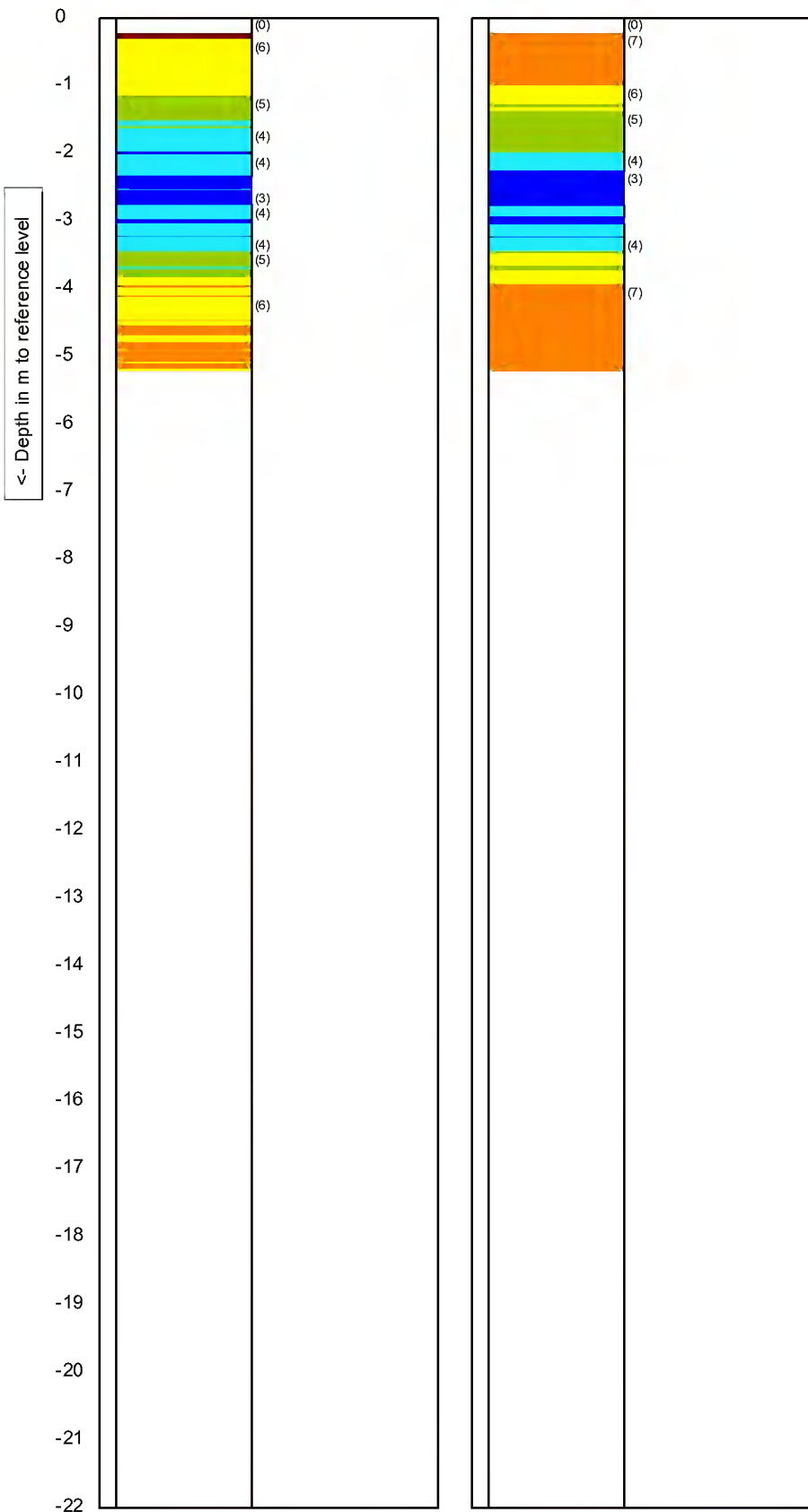
CPTask V1.20



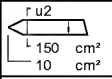
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679980 N5405464</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT218
			3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

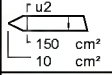
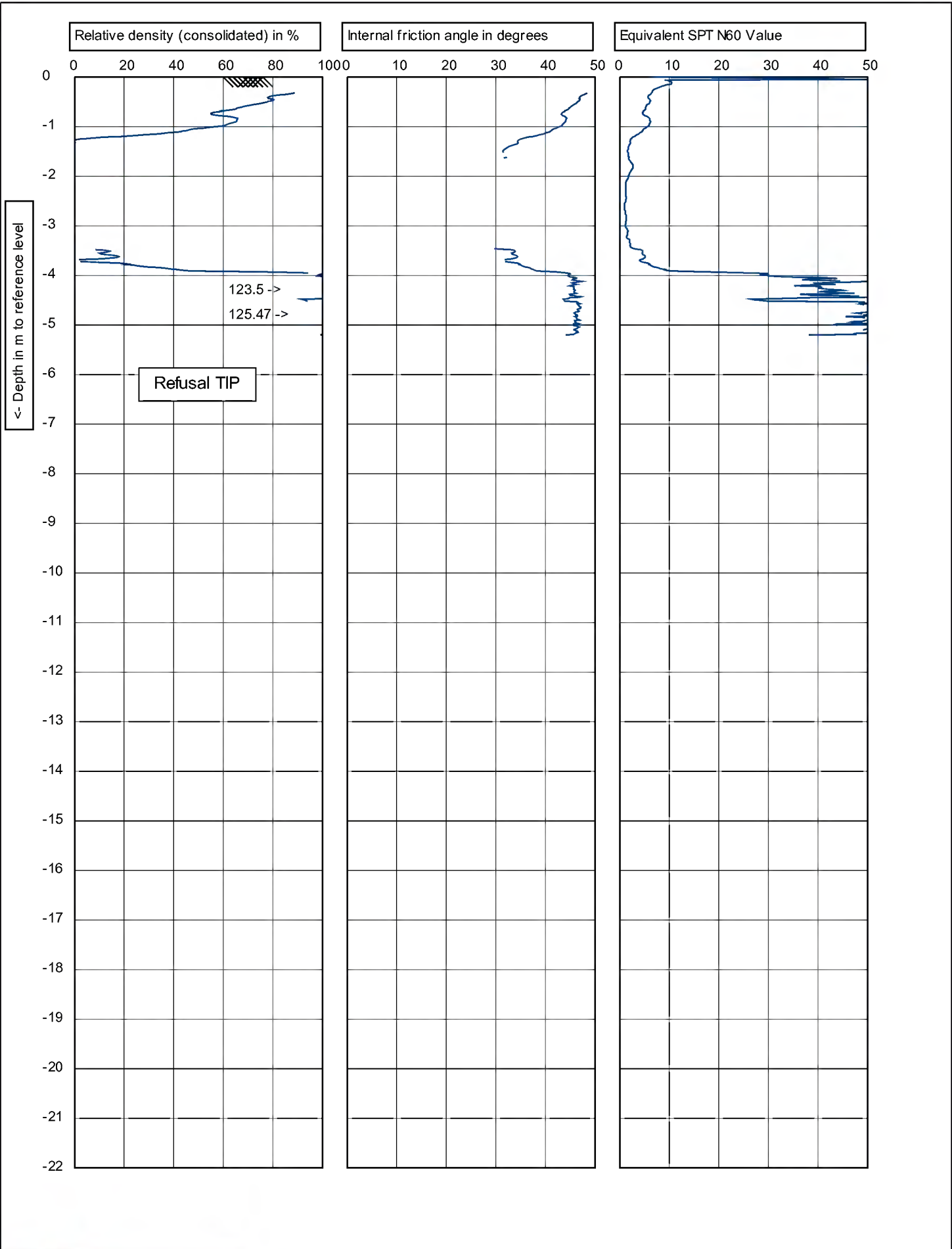


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



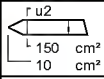
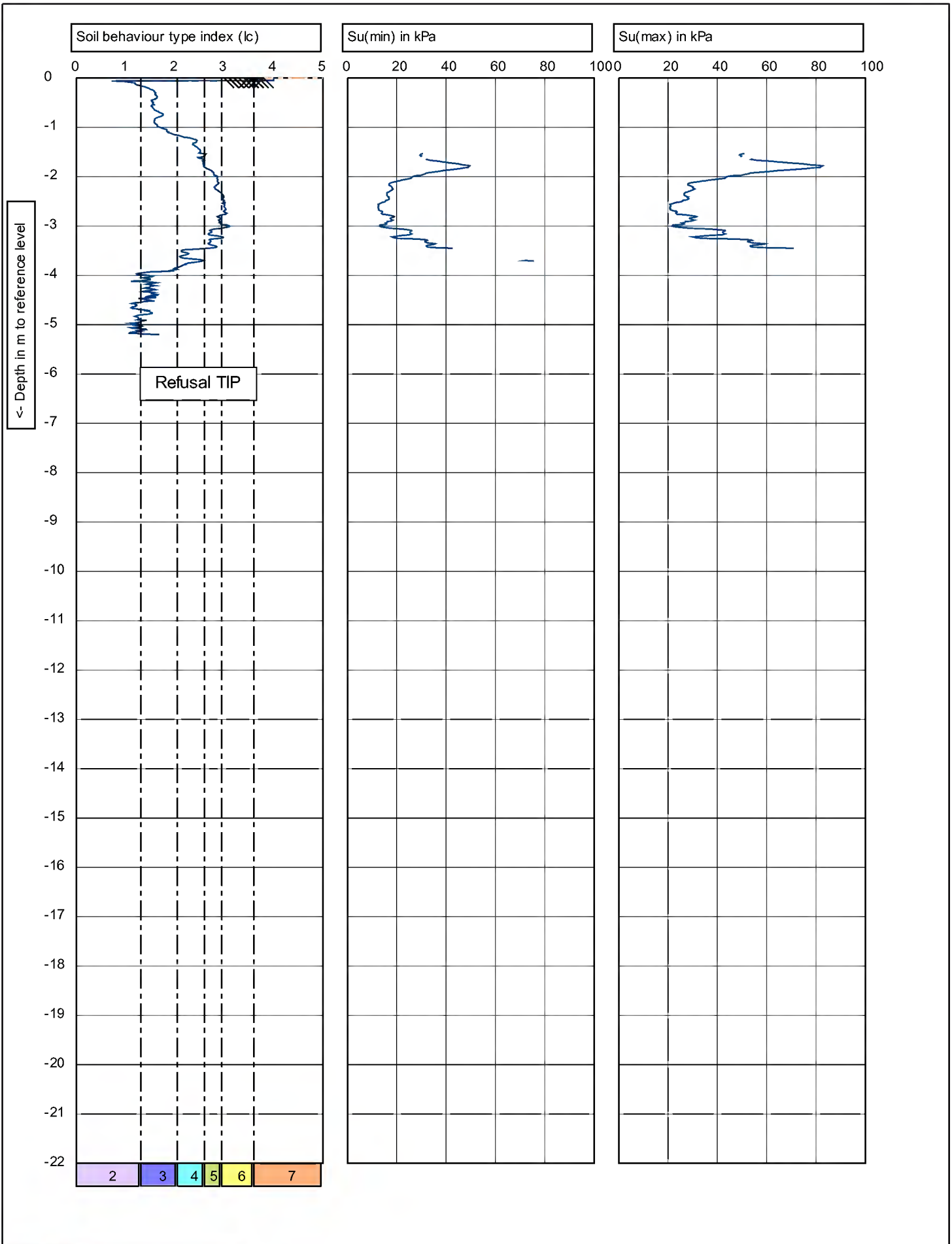
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 12/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1679980 N5405464</b>		Project no.: <b>5-C2128.00</b>	
Position:	CPT no.: CPT218	4/6	

CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679980 N5405464</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT218	5/6

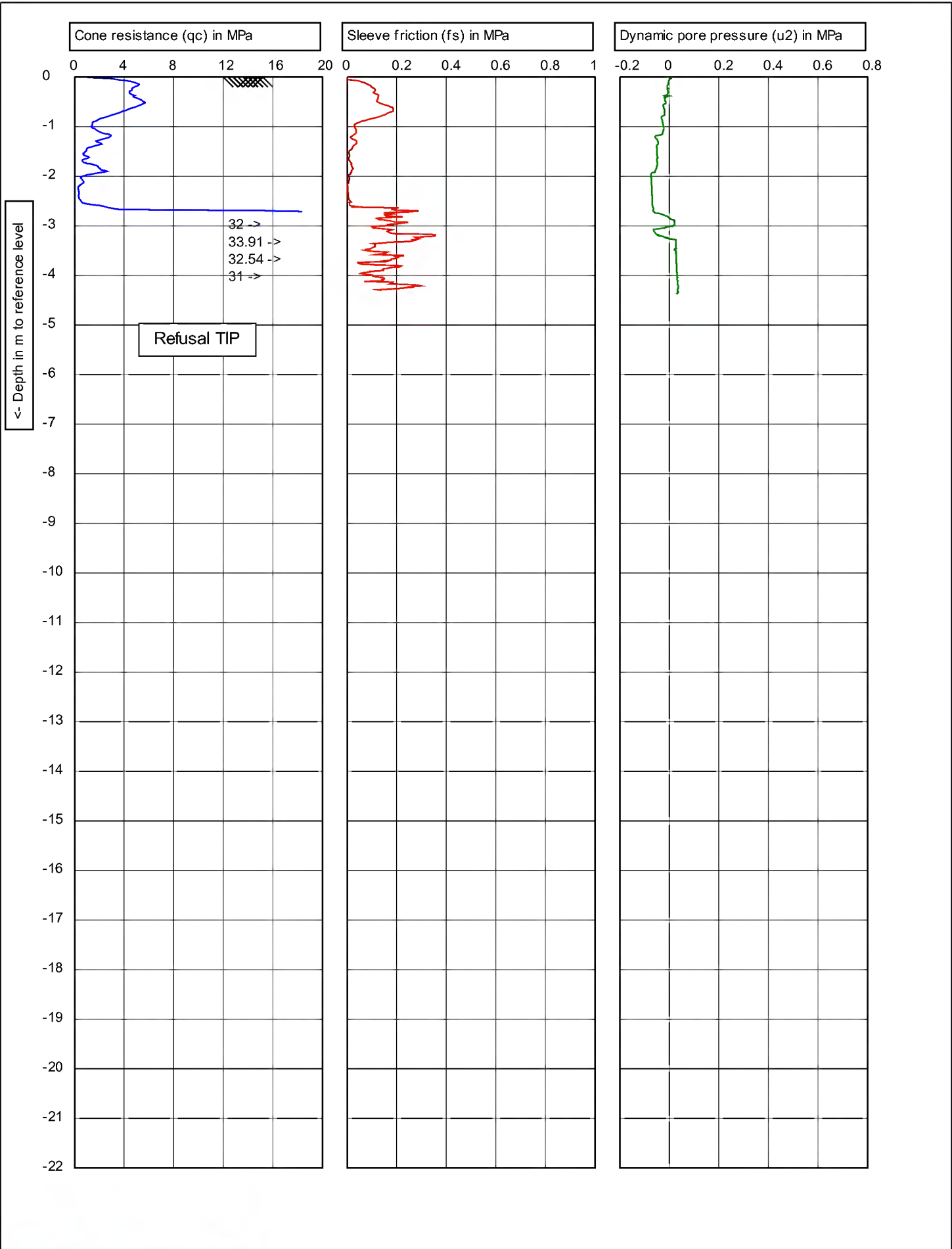
CPTask V1.20



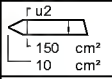
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	12/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679980 N5405464</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT218
			6/6

CPTask V1.20

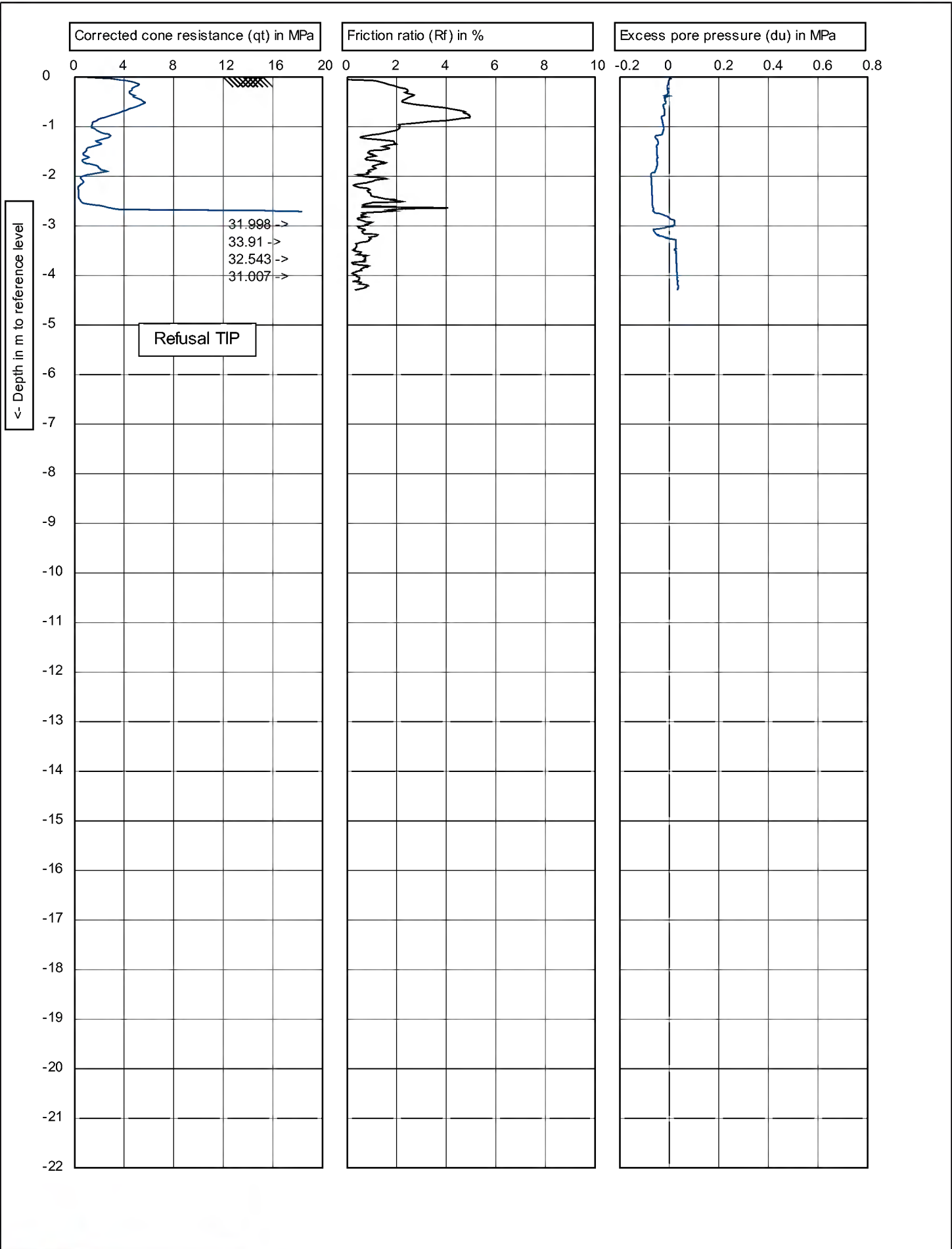




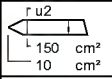
CPTask V1.20



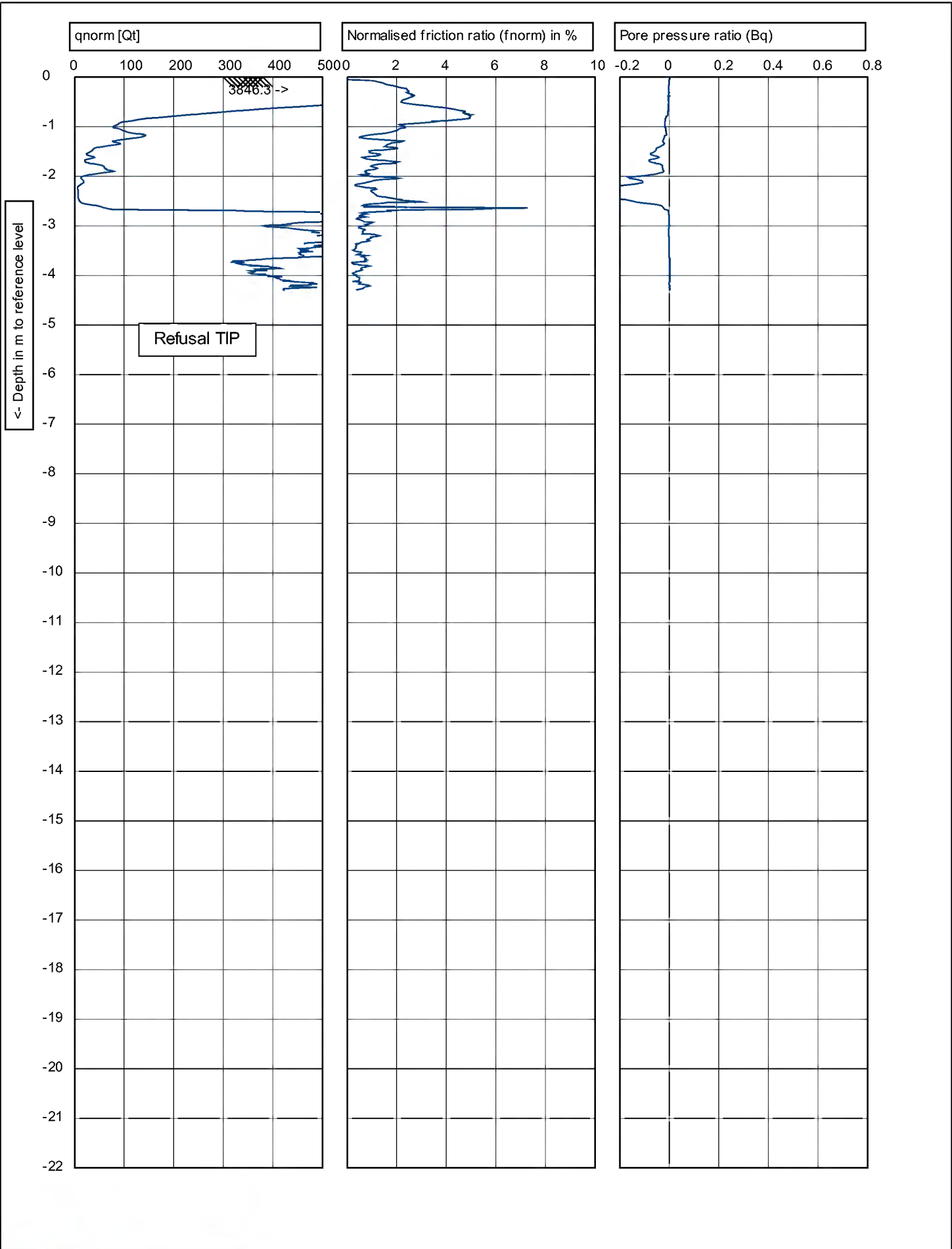
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1678874 N5405919</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT219	1/6



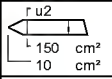
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1678874 N5405919</b>		Project no.: <b>5-C2128.00</b>	
Position:	CPT no.: CPT219	2/6	



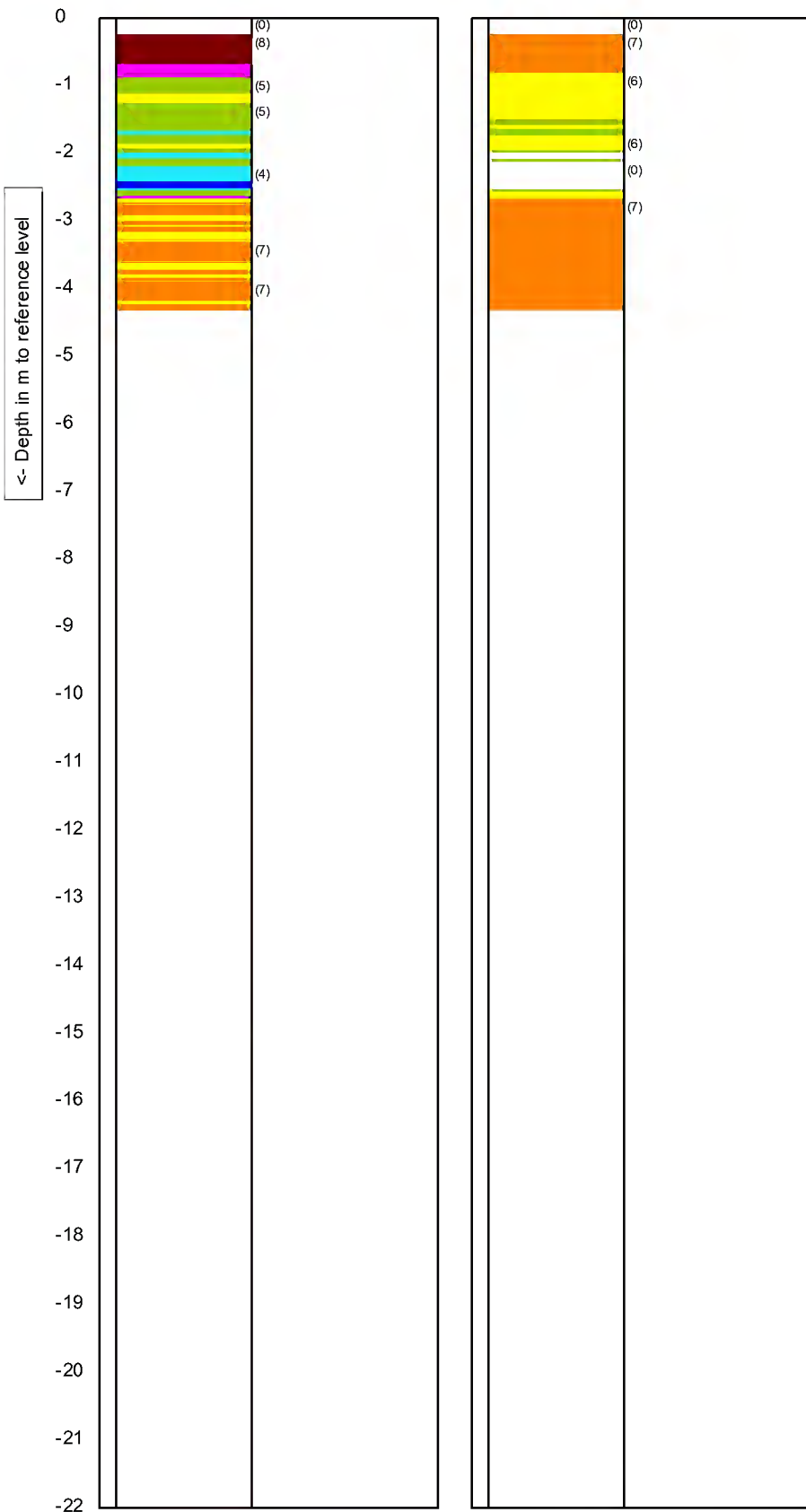
CPTask V1.20



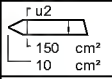
Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 13/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1678874 N5405919</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT219	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

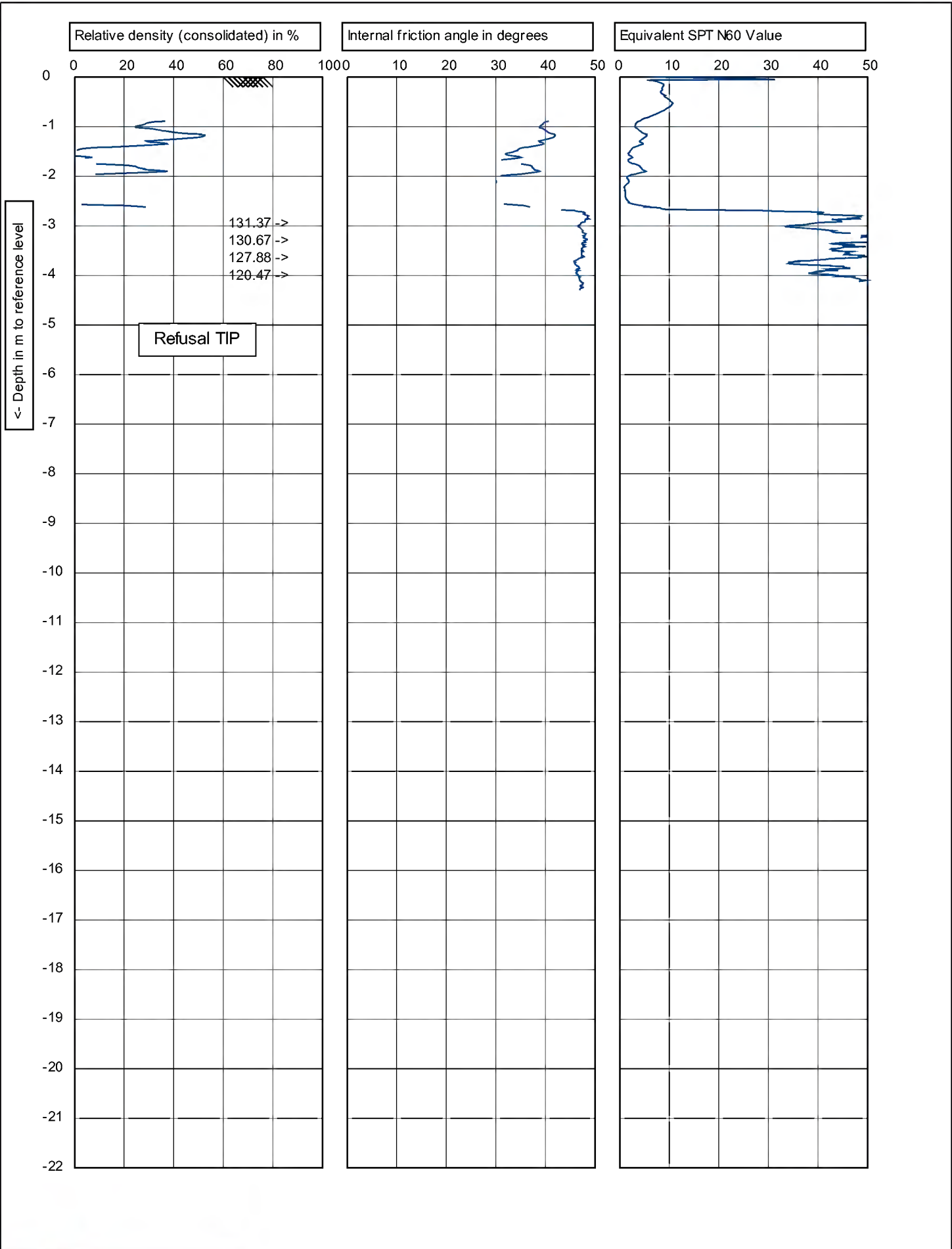


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

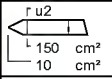


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 13/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1678874 N5405919		Project no.: 5-C2128.00	
Position:		CPT no.: CPT219	4/6

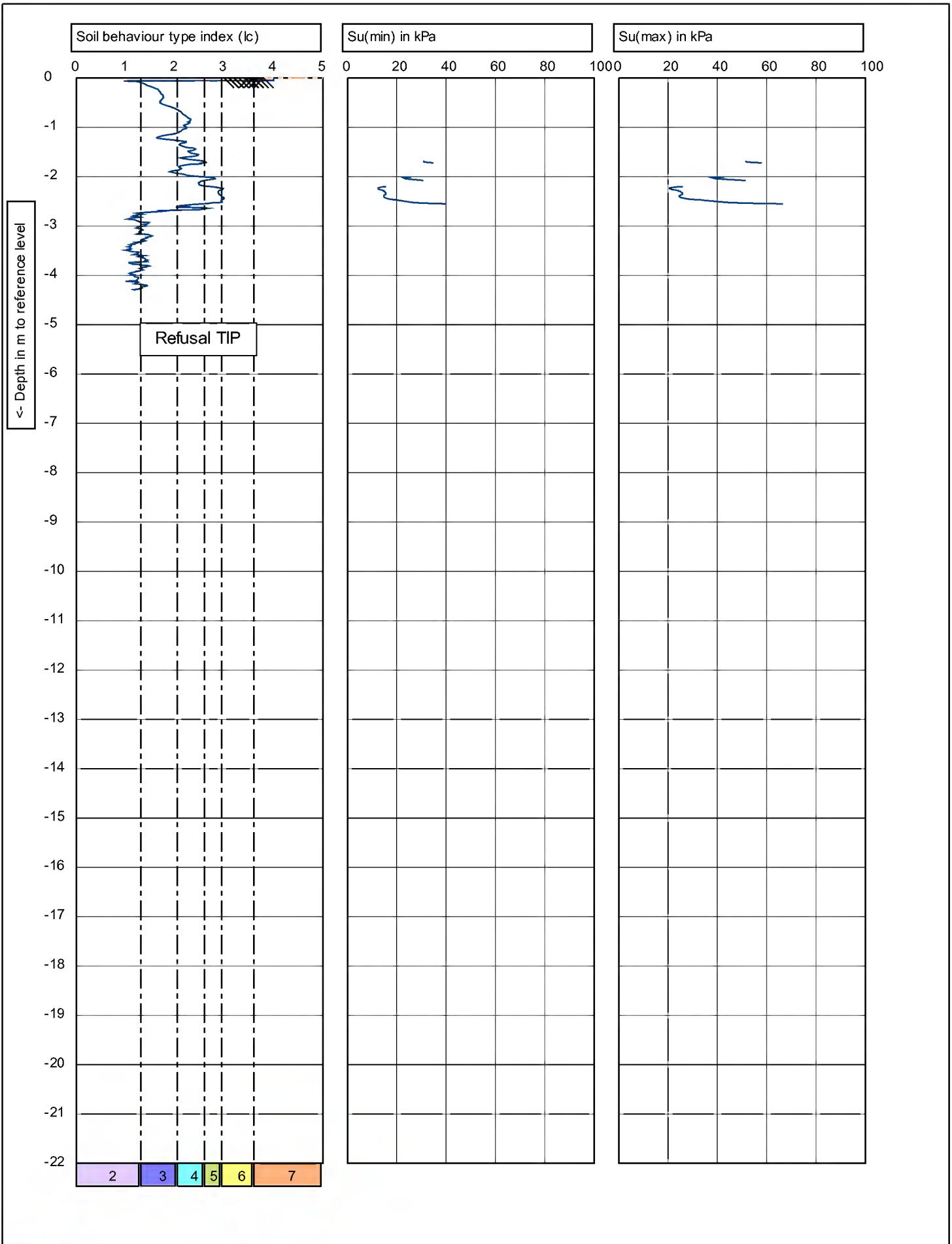
CPTask V1.20



CPTask V1.20

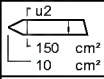


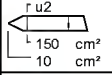
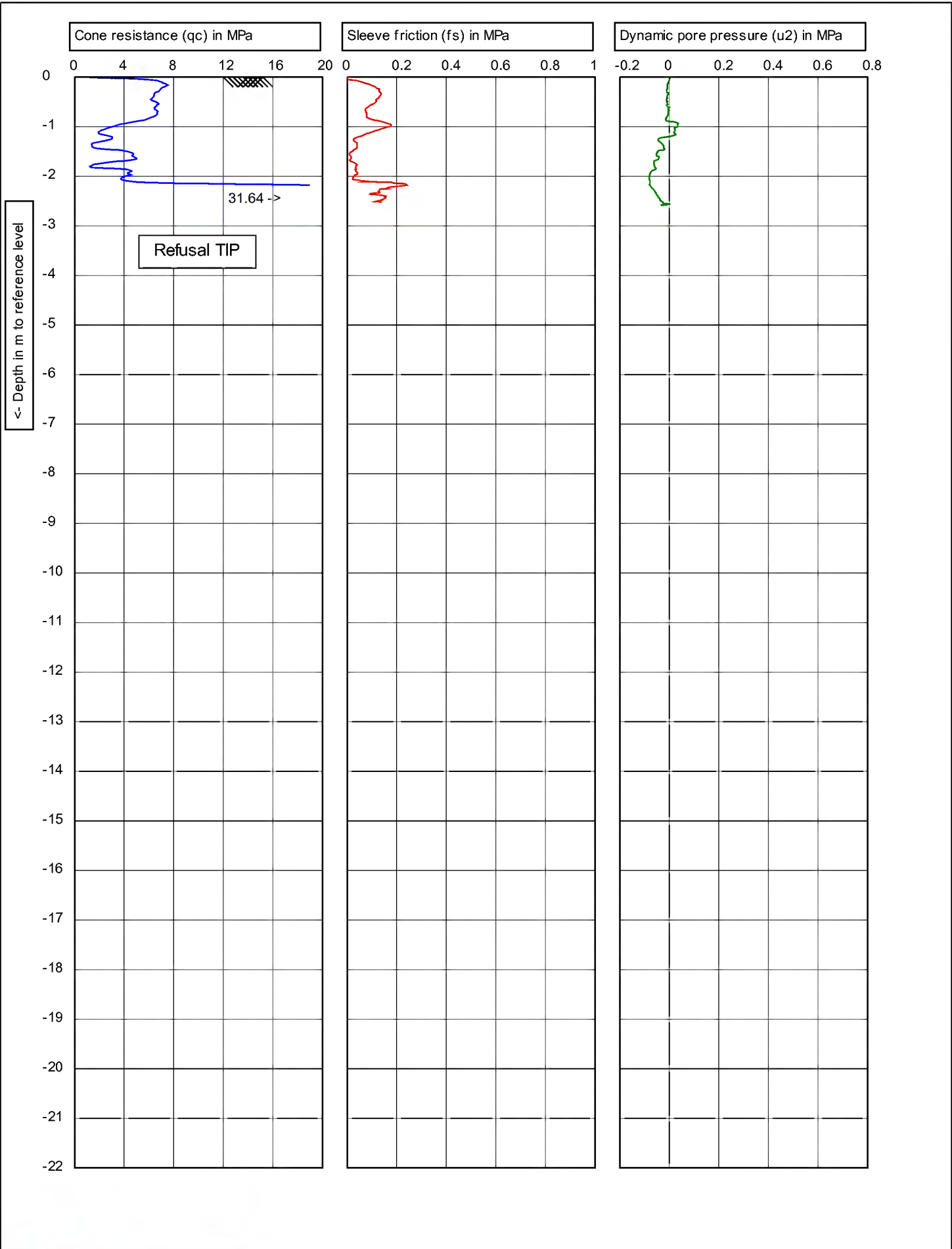
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678874 N5405919</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT219	5/6



CPTask V1.20

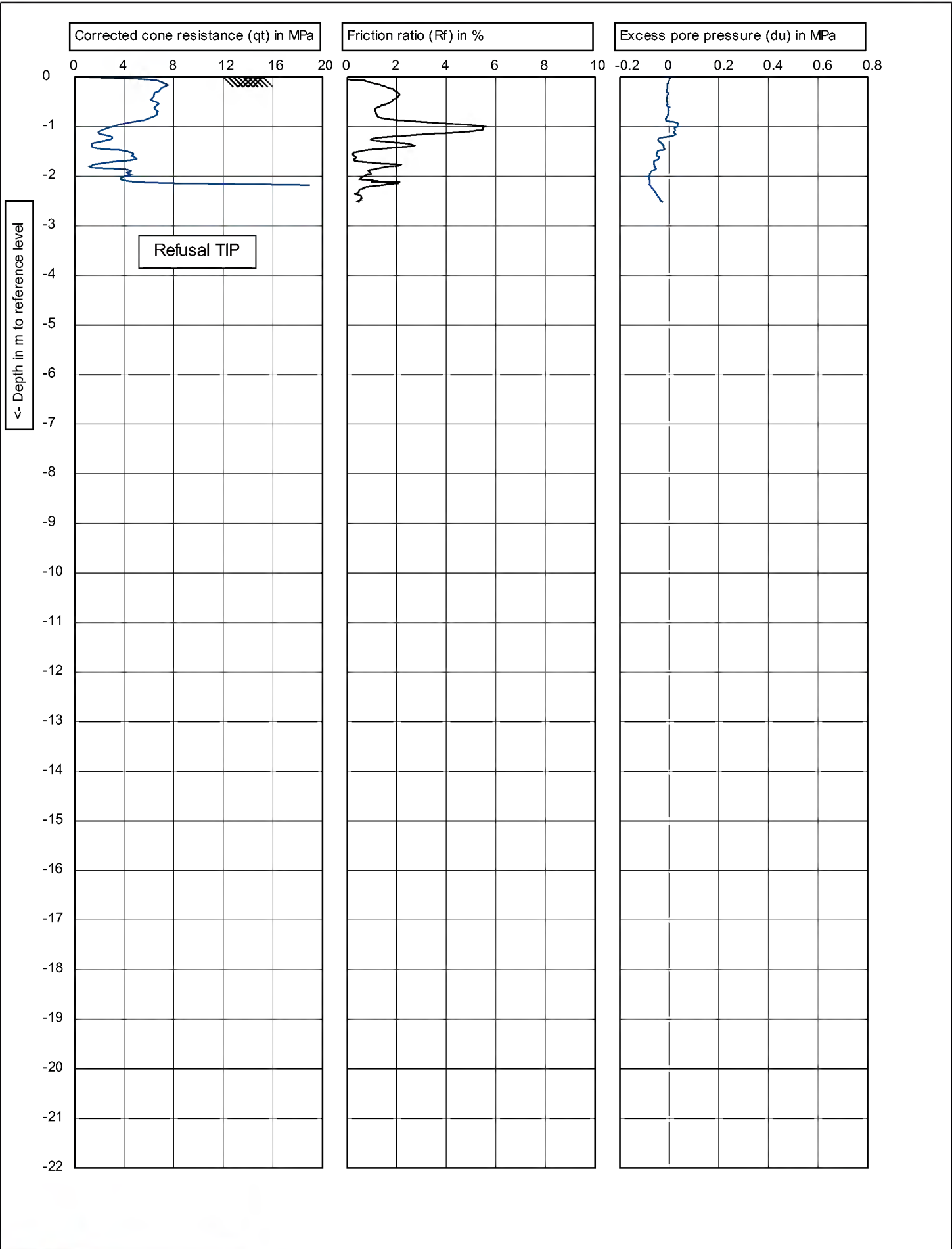


	Test according to A.S.T.M standard D-5778-12		Predrill : 0	
	G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.: <b>C10CFIP.C10021</b>		Project no.: <b>5-C2128.00</b>	
Location: <b>GPS: E1678874 N5405919</b>	CPT no.: CPT219		6/6	
Position:				

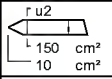


Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1678878 N5406011</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT220	1/6

CPTask V1.20

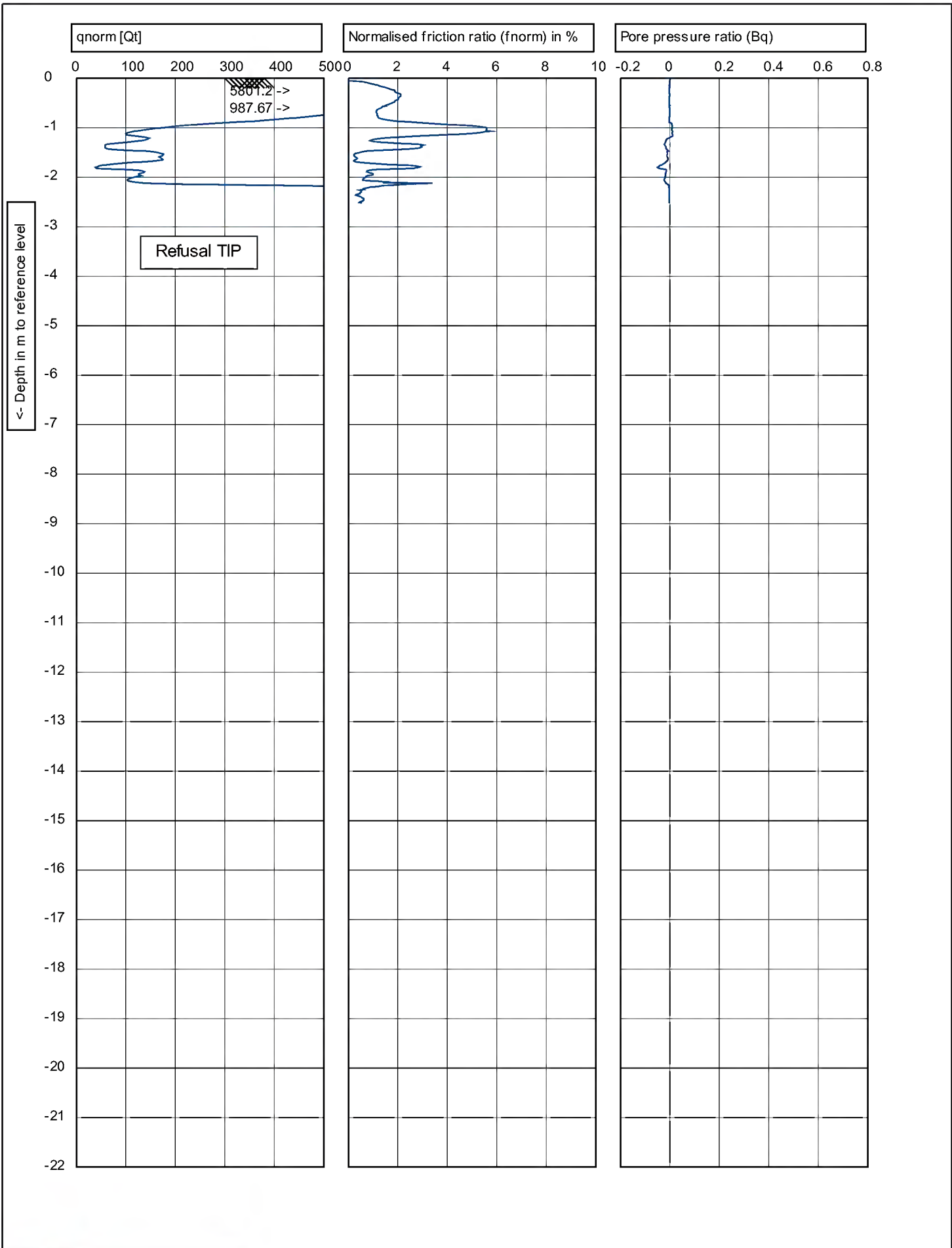


CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678878 N5406011</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT220	2/6





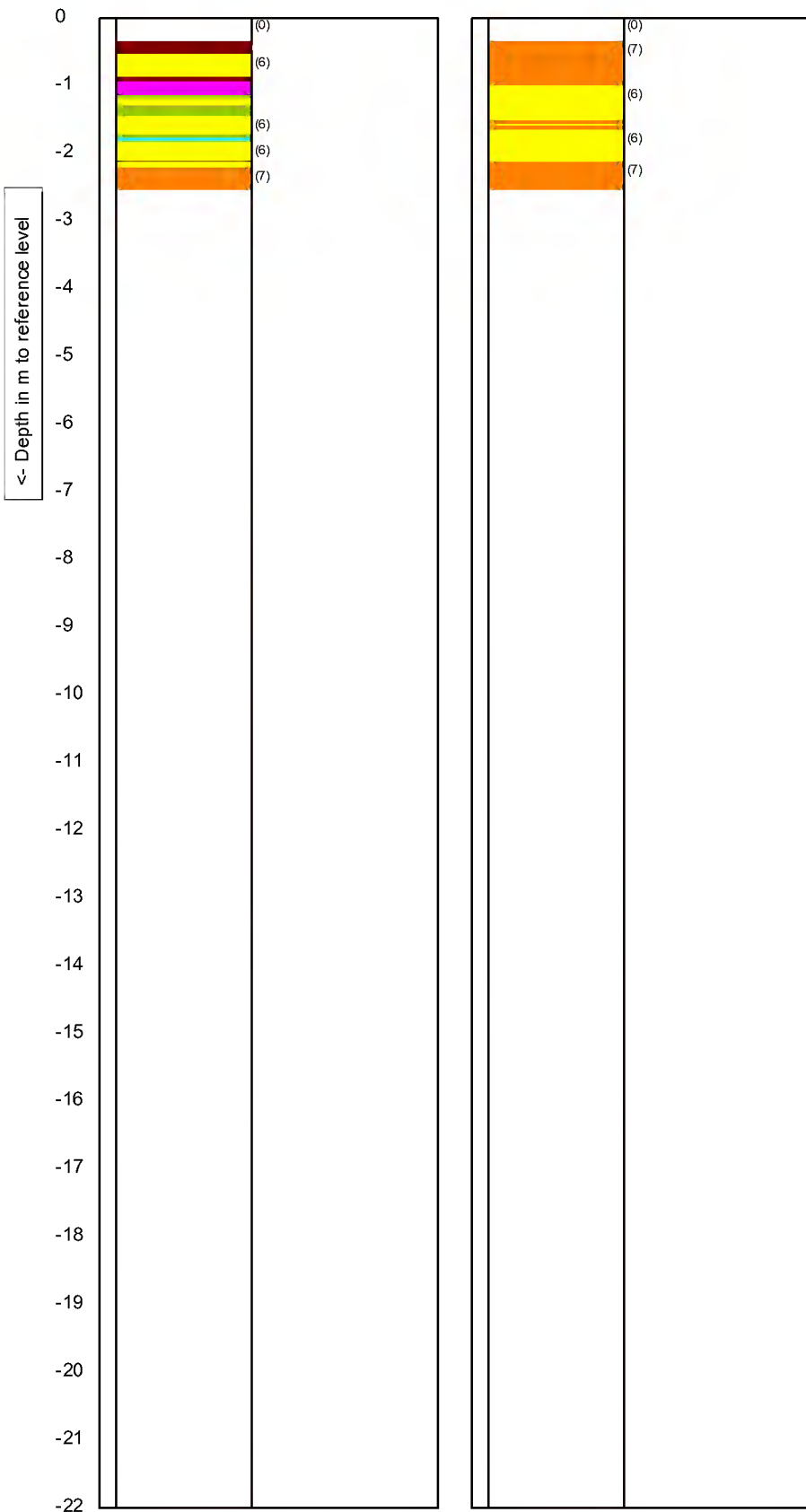
CPTask V1.20



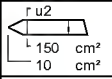
	Test according to A.S.T.M standard D-5778-12		Predrill : 0	
	G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.: <b>C10CFIP.C10021</b>		Project no.: <b>5-C2128.00</b>	
Location: <b>GPS: E1678878 N5406011</b>	CPT no.: CPT220		3/6	
Position:				

Soil Classification (using Fr)

Soil Classification (using Bq)

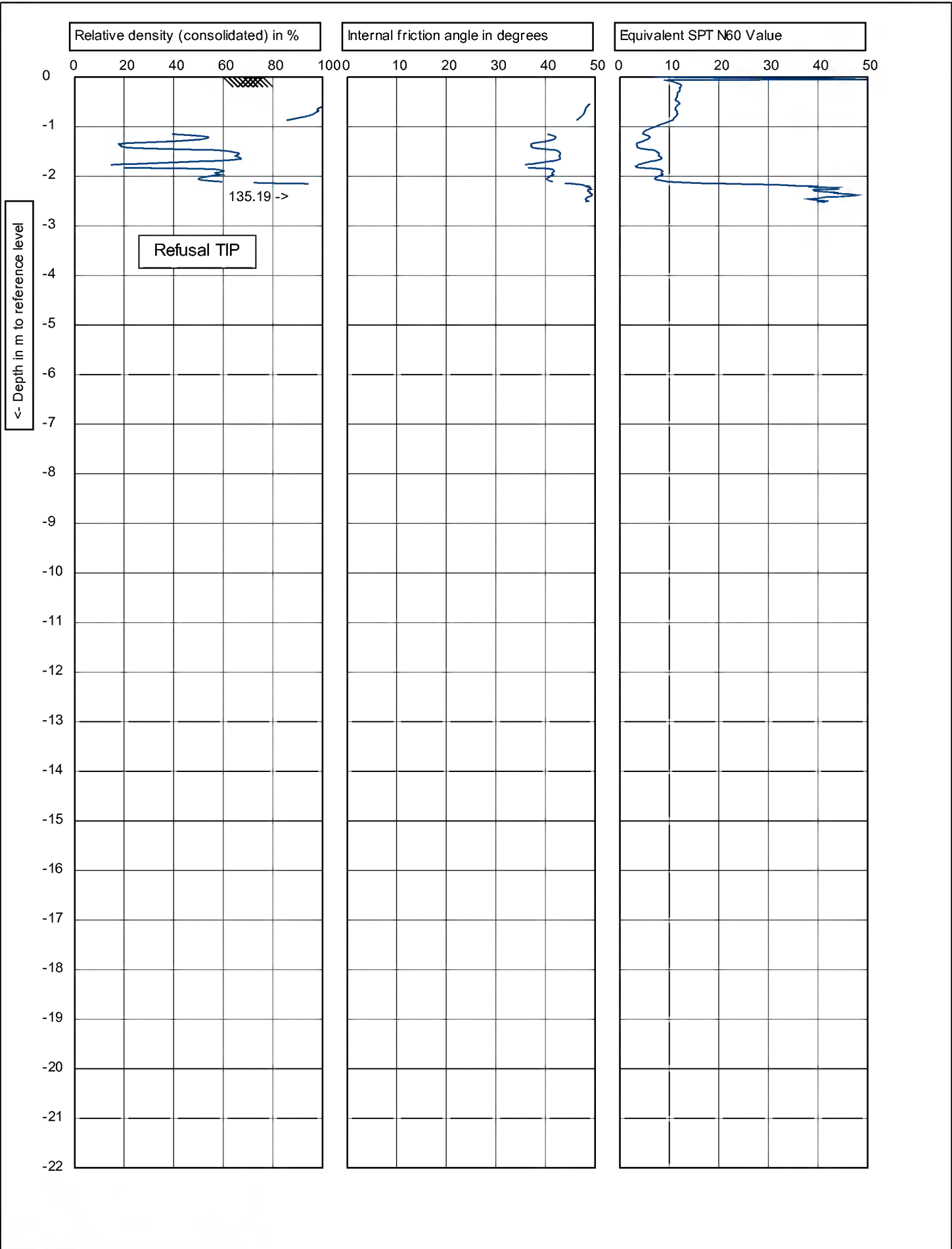


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

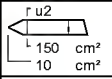


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 13/12/2012	
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.: <b>C10CFIP.C10021</b>	
Location: <b>GPS: E1678878 N5406011</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT220	4/6

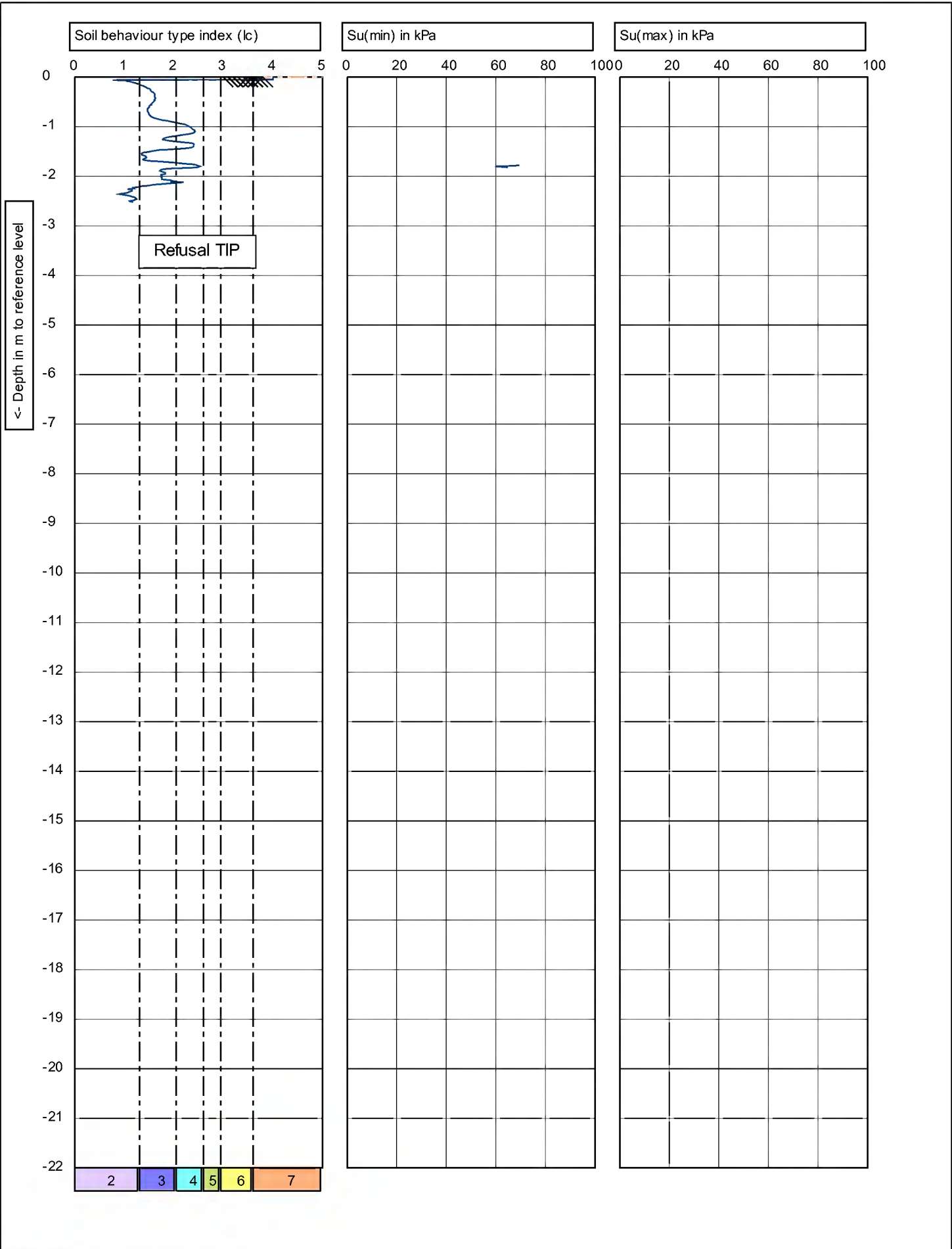
CPTask V1.20



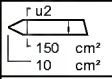
CPTask V1.20



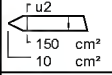
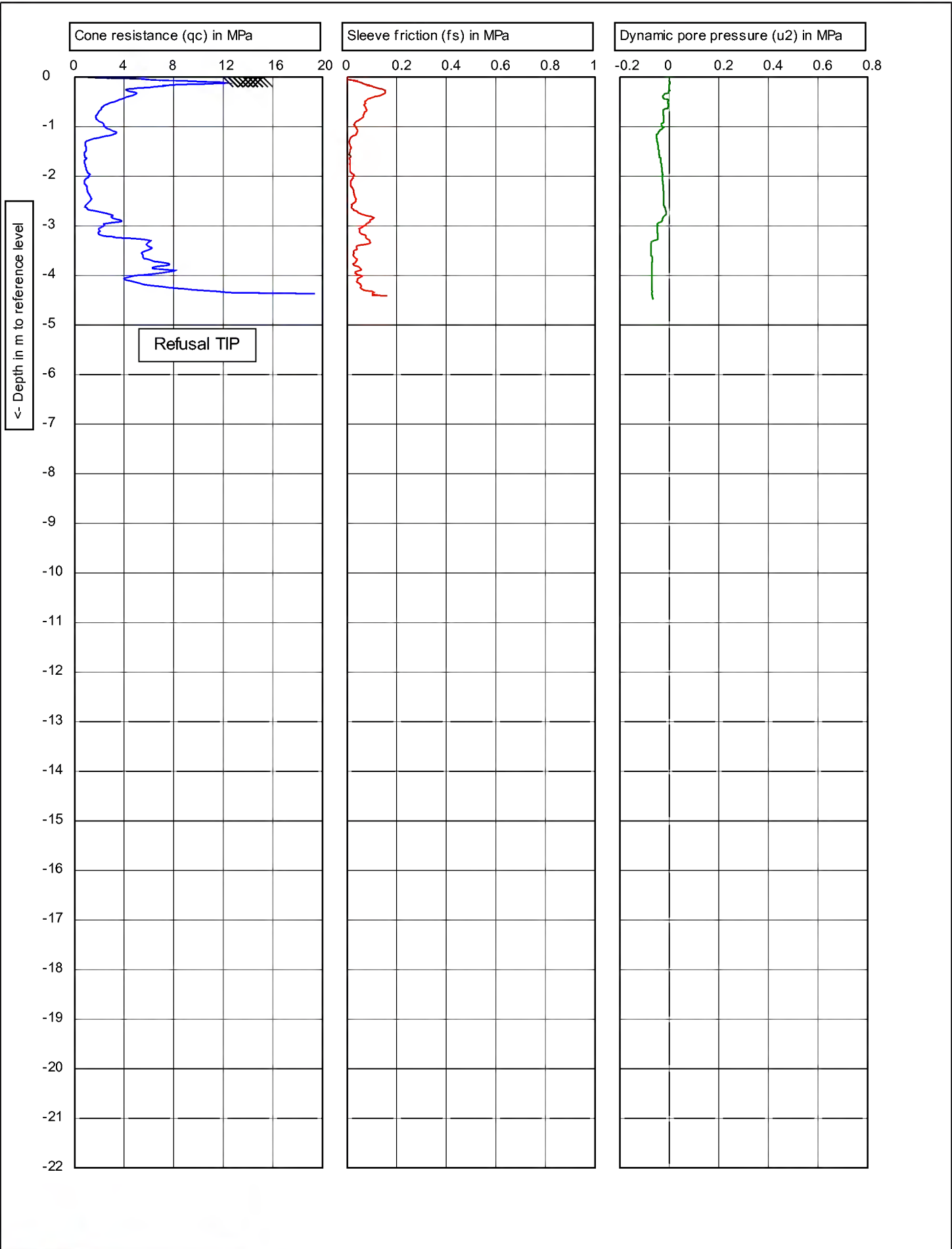
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678878 N5406011</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT220	5/6



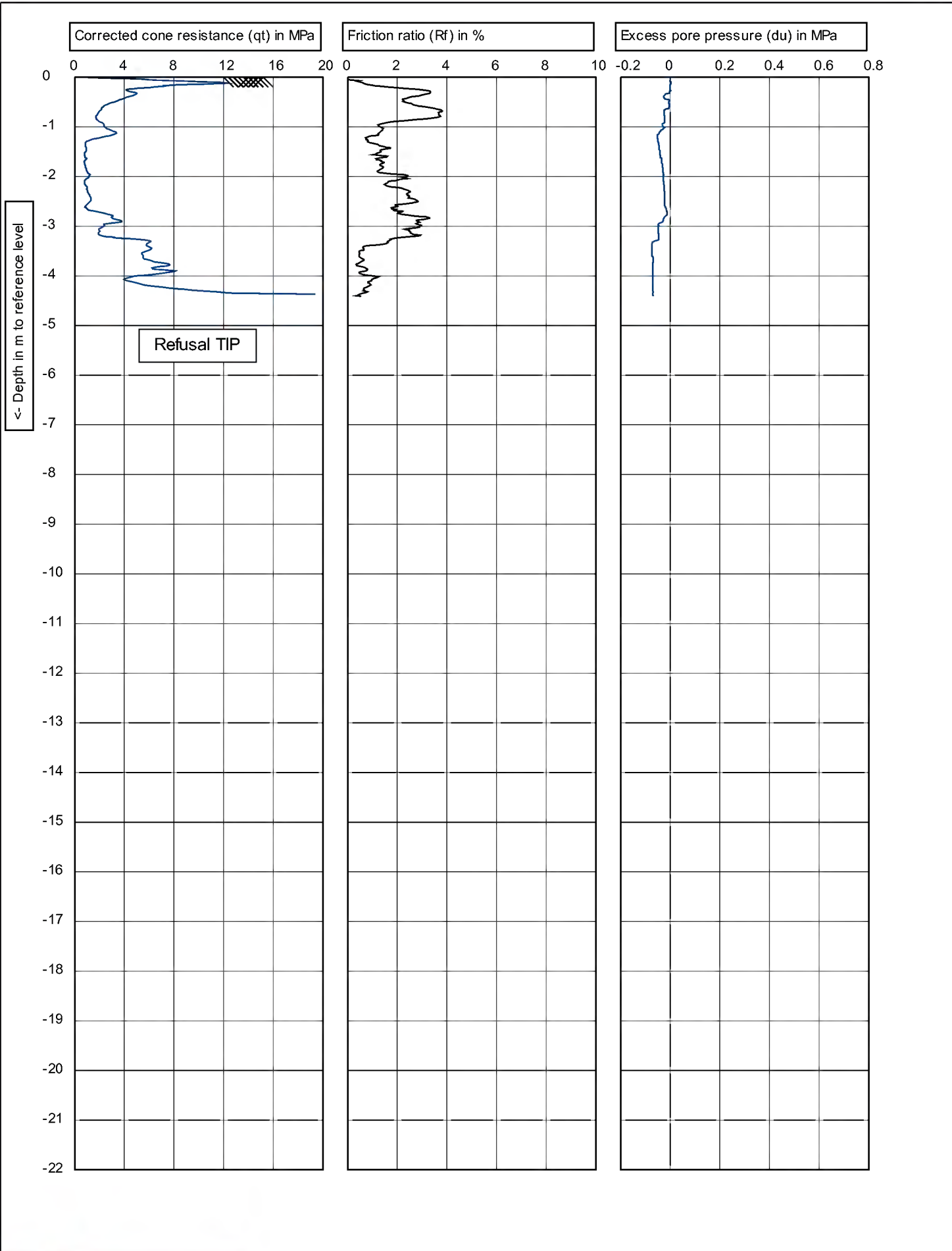
CPTask V1.20



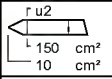
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1678878 N5406011</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT220
			6/6



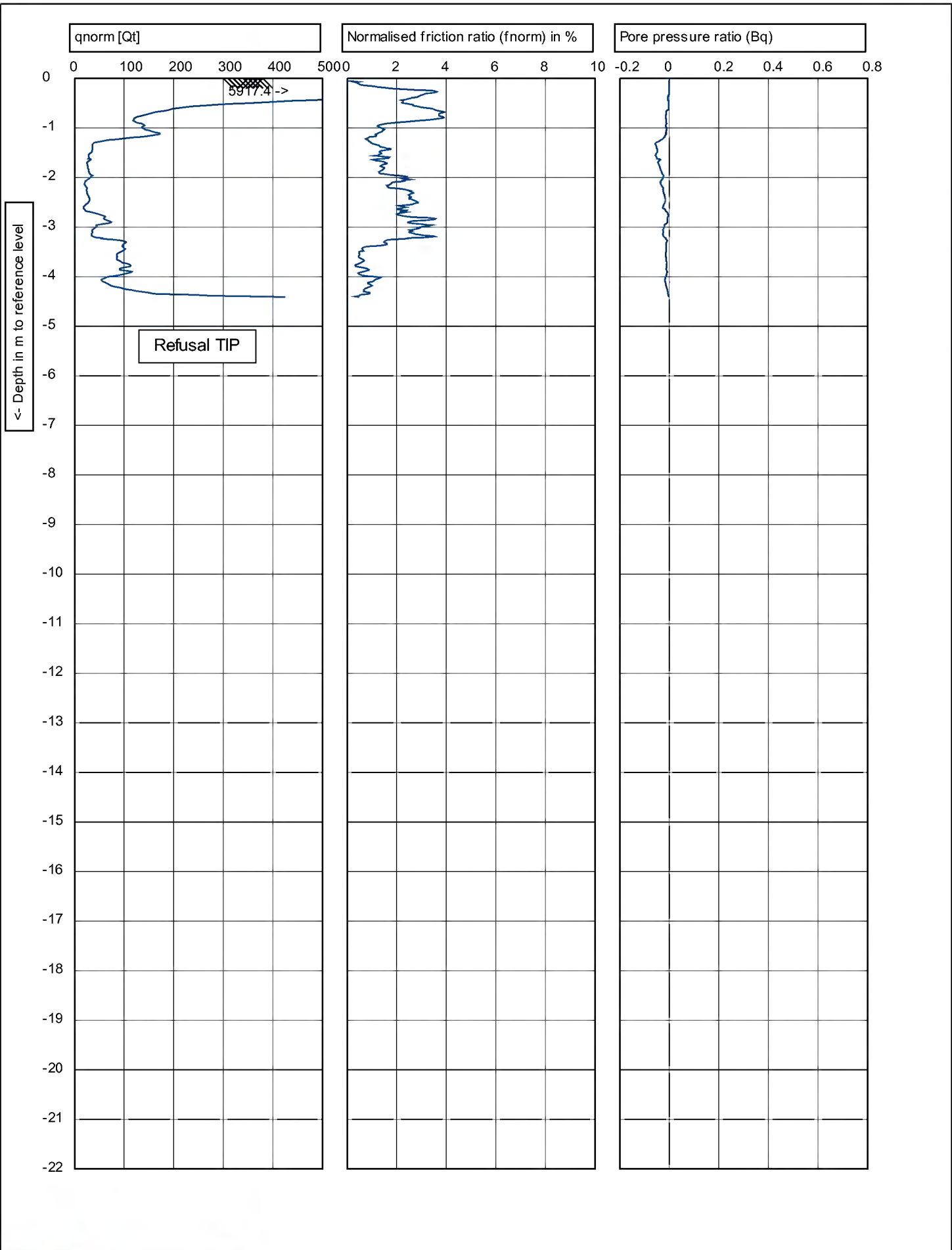
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT221	1/6



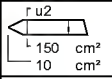
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT221	2/6



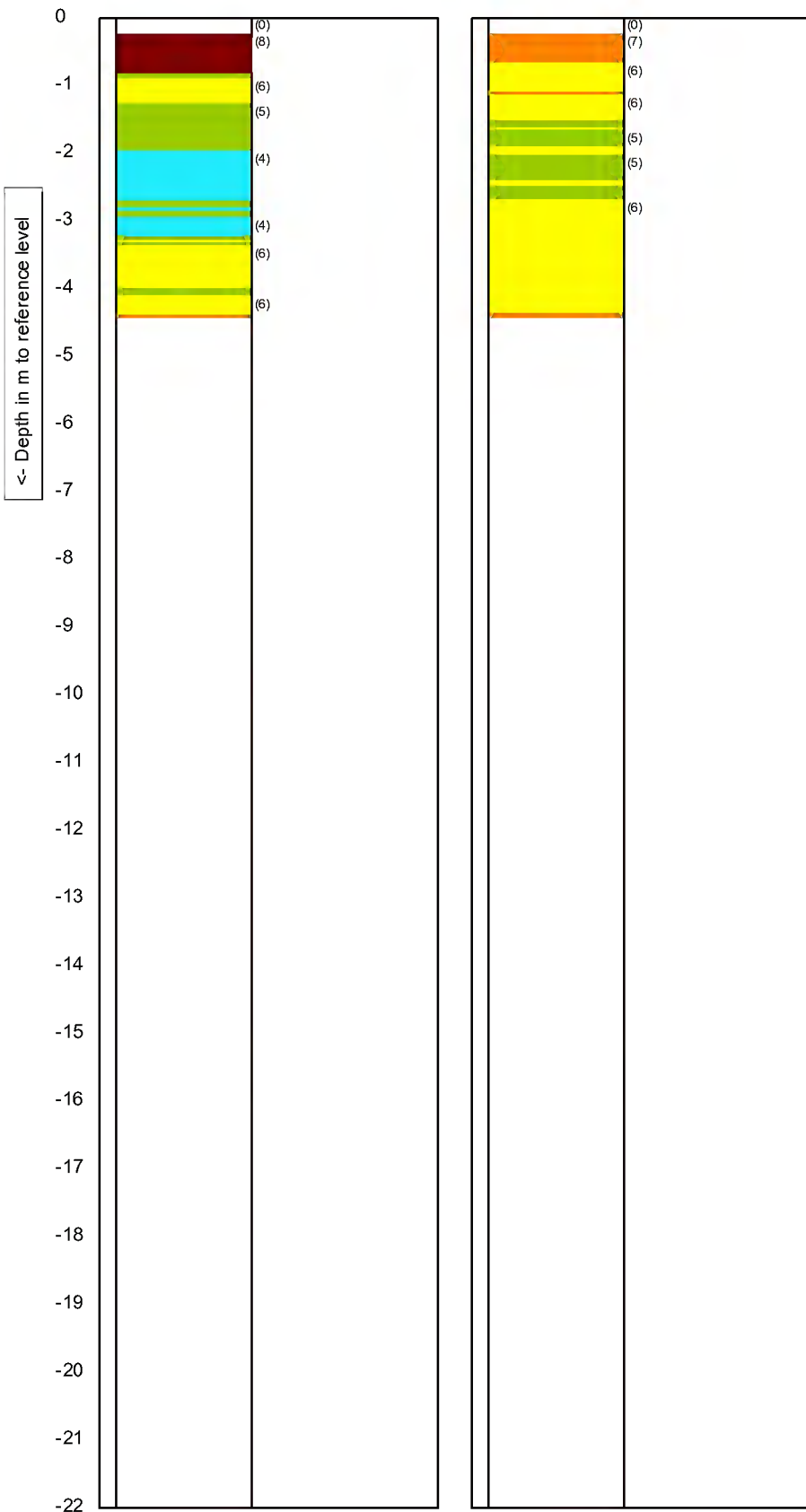
CPTask V1.20



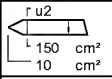
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT221	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)



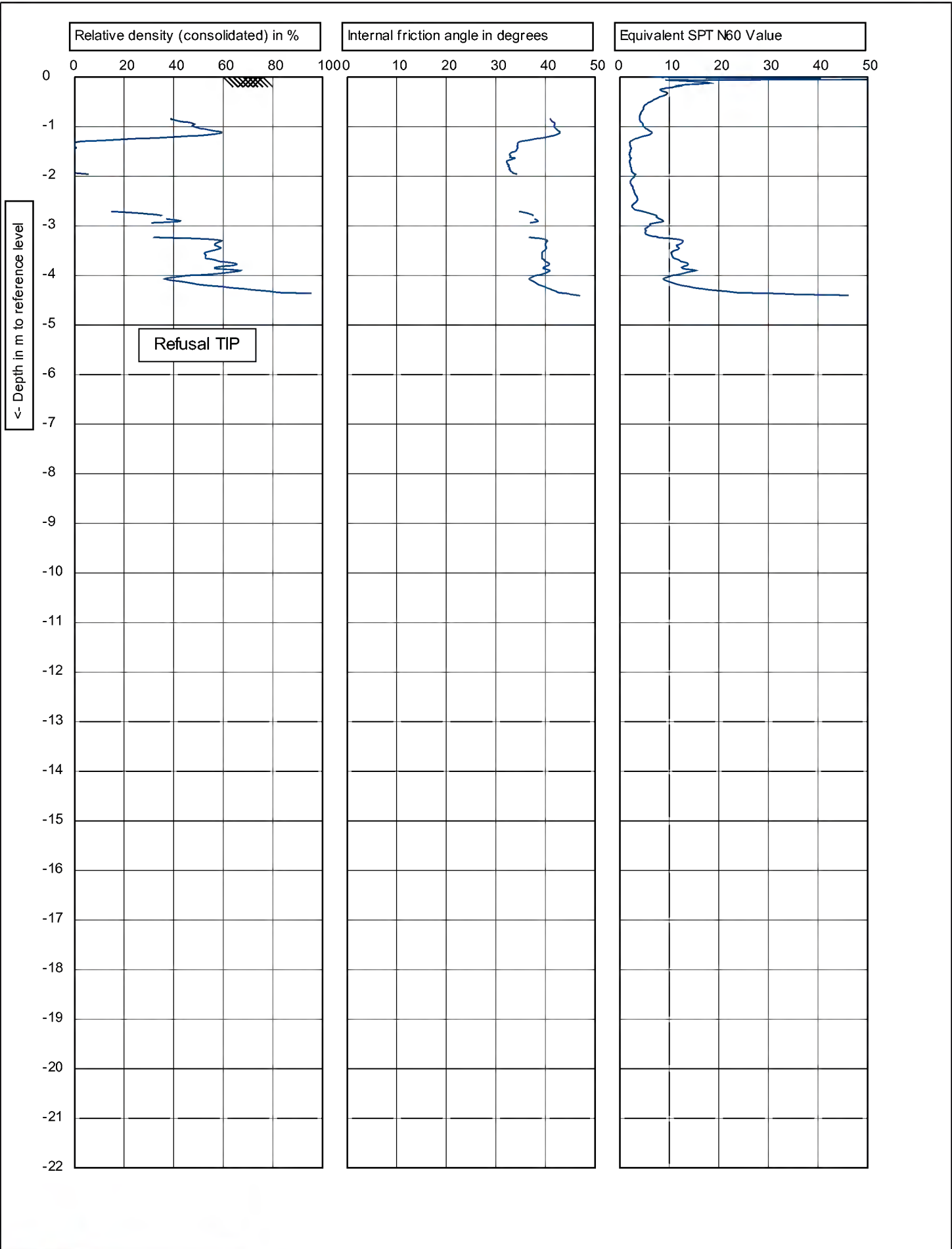
- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



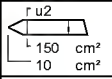
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT221
			4/6

CPTask V1.20

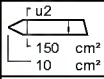
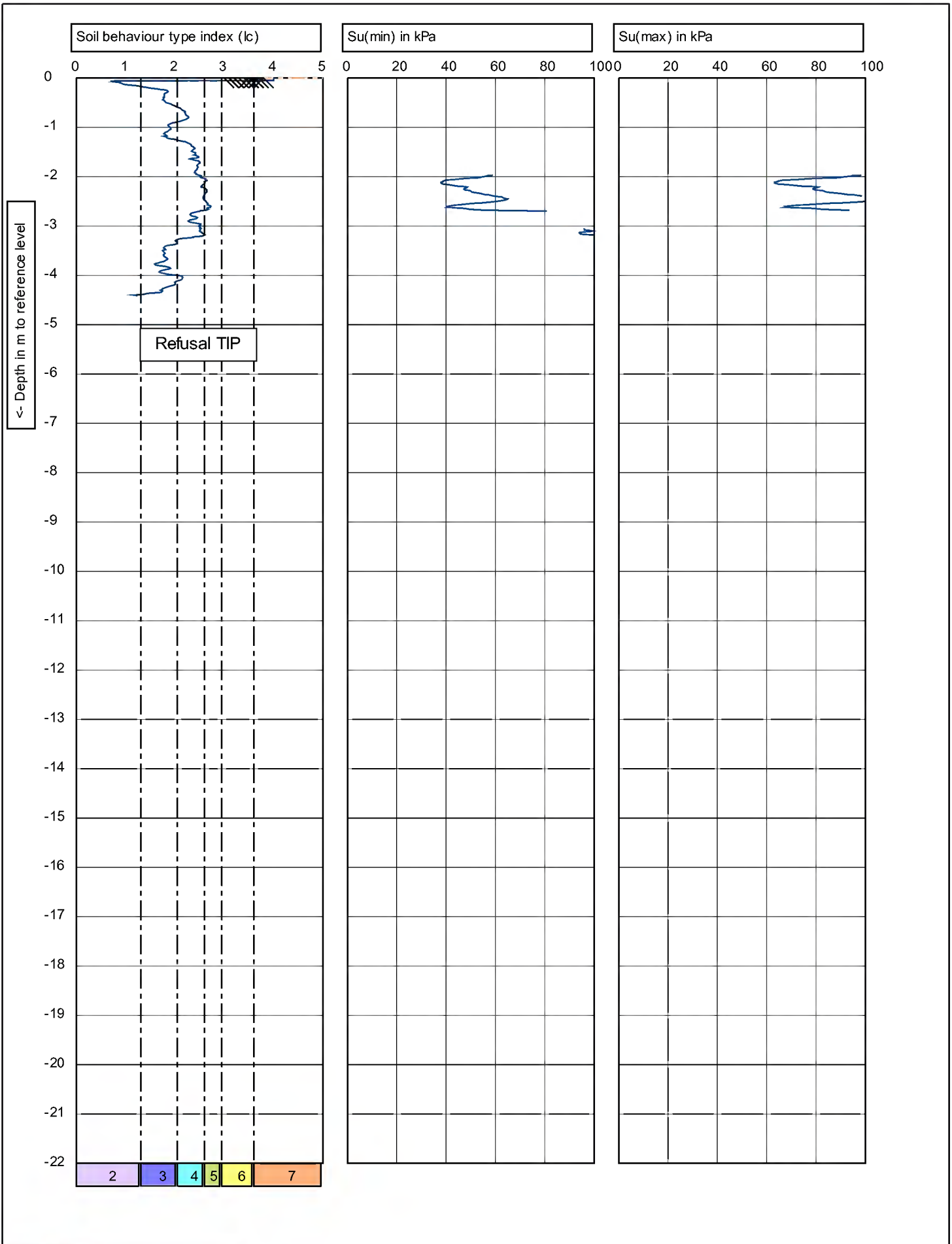




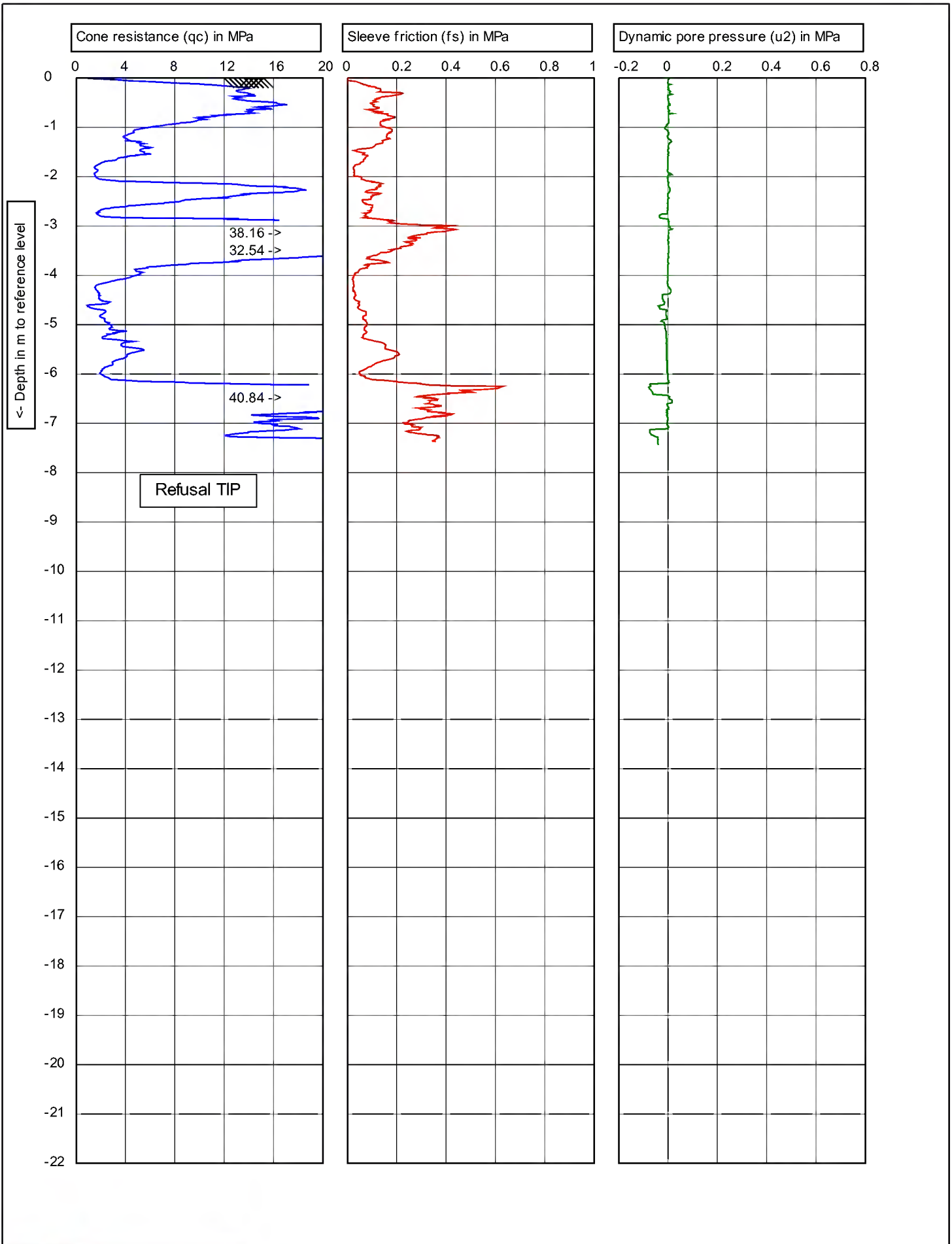
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT221	5/6

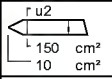


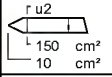
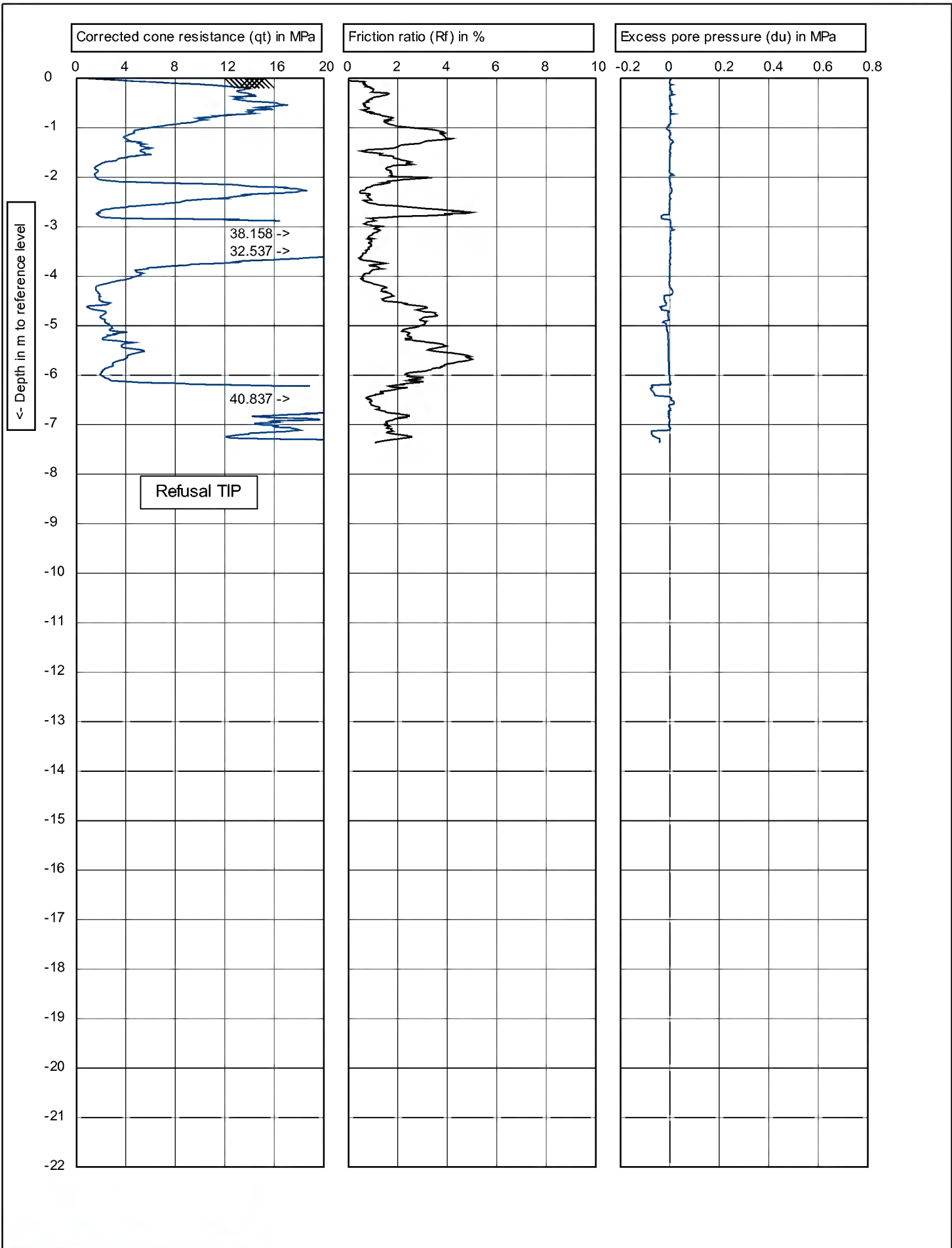
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1679106 N5405619</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT221
			6/6



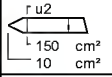
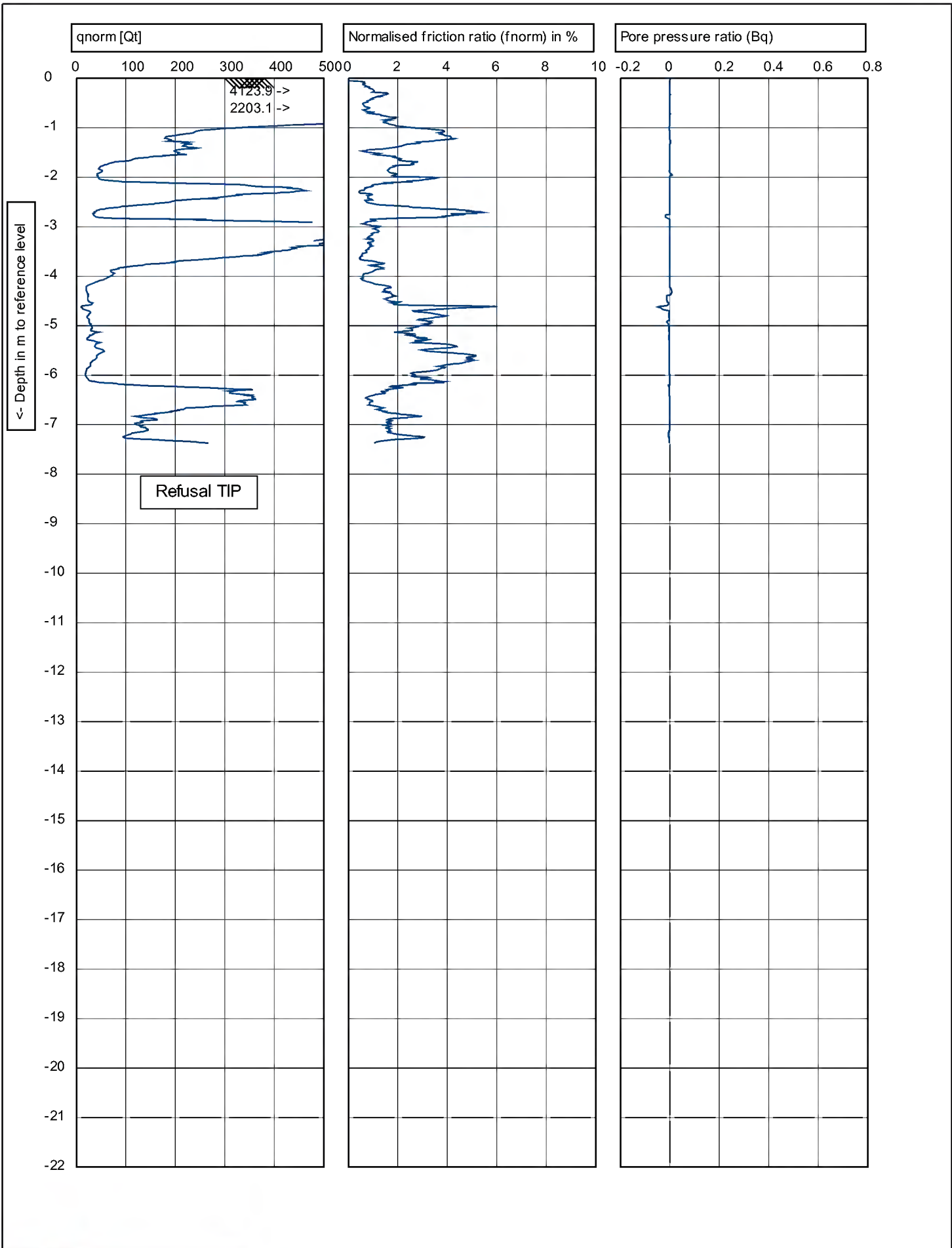
CPTask V1.20



	Test according to A.S.T.M standard D-5778-12		Predrill : 0	
	G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.: <b>C10CFIIP.C10021</b>		Project no.: <b>5-C2128.00</b>	
Location: <b>GPS: E1677365 N5402404</b>	CPT no.: CPT222		1/6	
Position:				



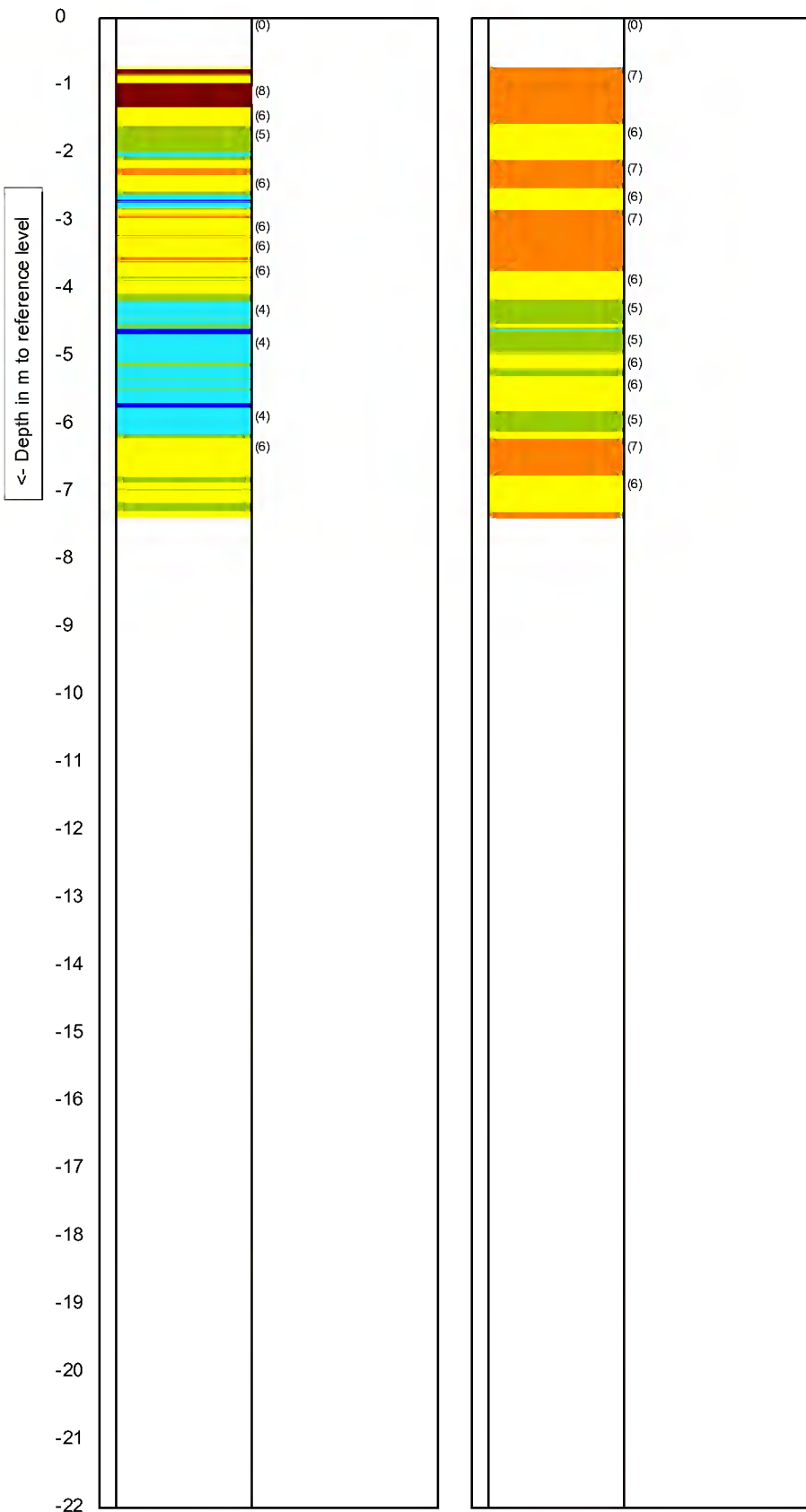
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677365 N5402404</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT222	2/6



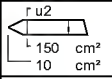
Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677365 N5402404</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT222	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

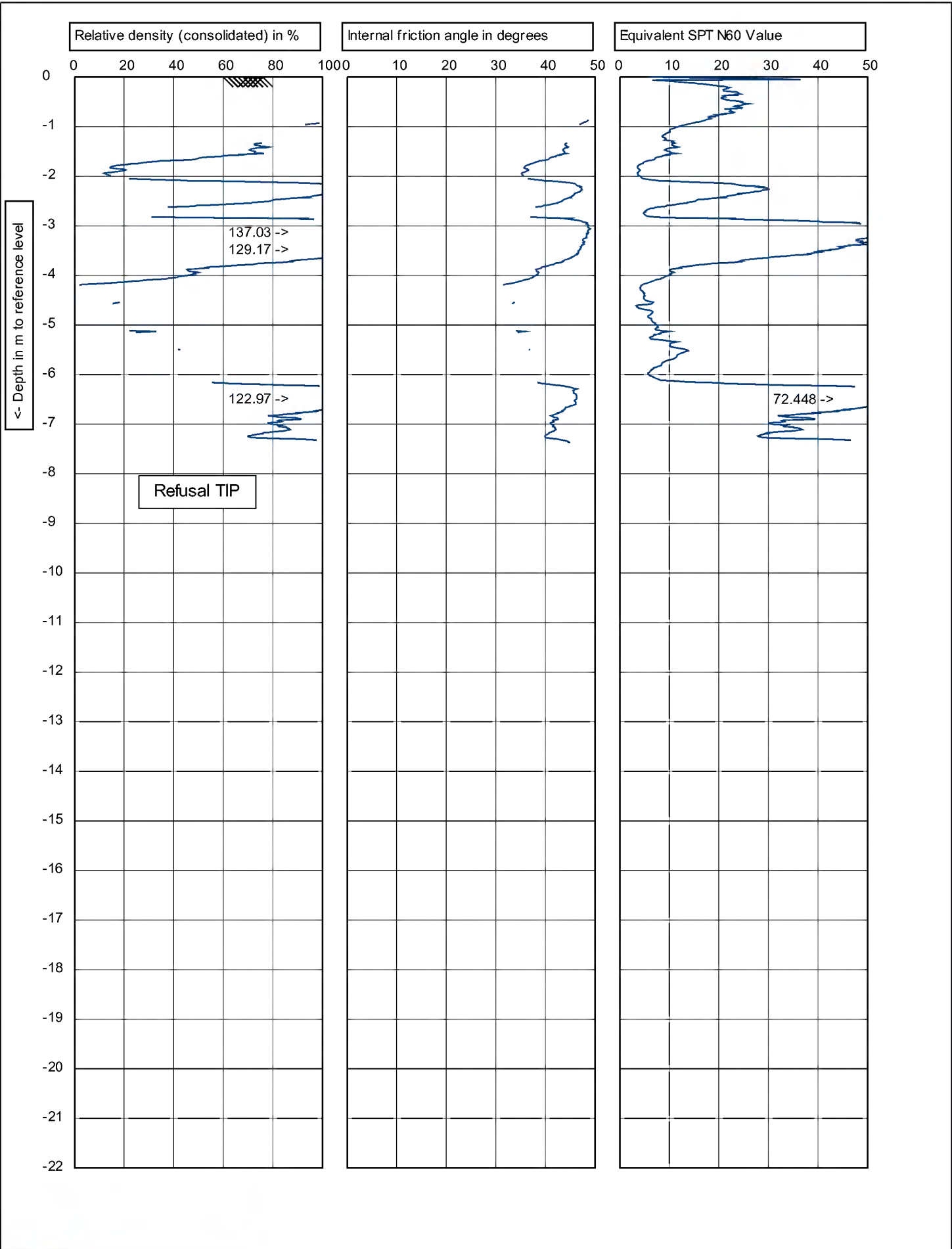


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained

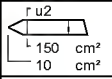


Test according to A.S.T.M standard D-5778-12		Predrill : 0	
G.L. 0	W.L.: -100	Date: 13/12/2012	
Project: Blenheim Geotechnical Investigation		Cone no.: C10CFIP.C10021	
Location: GPS: E1677365 N5402404		Project no.: 5-C2128.00	
Position:		CPT no.: CPT222	4/6

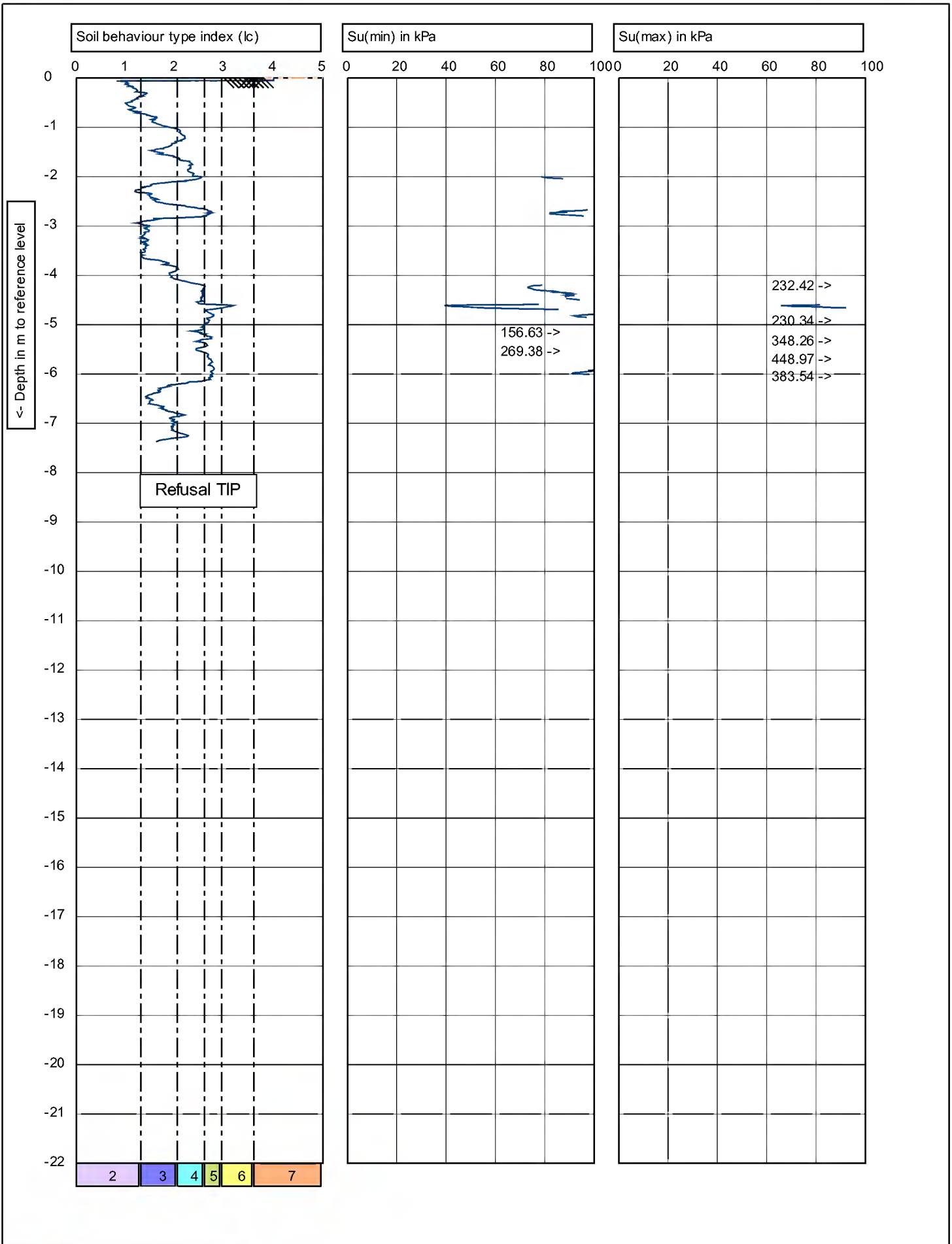
CPTask V1.20



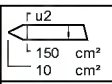
CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677365 N5402404</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT222	5/6

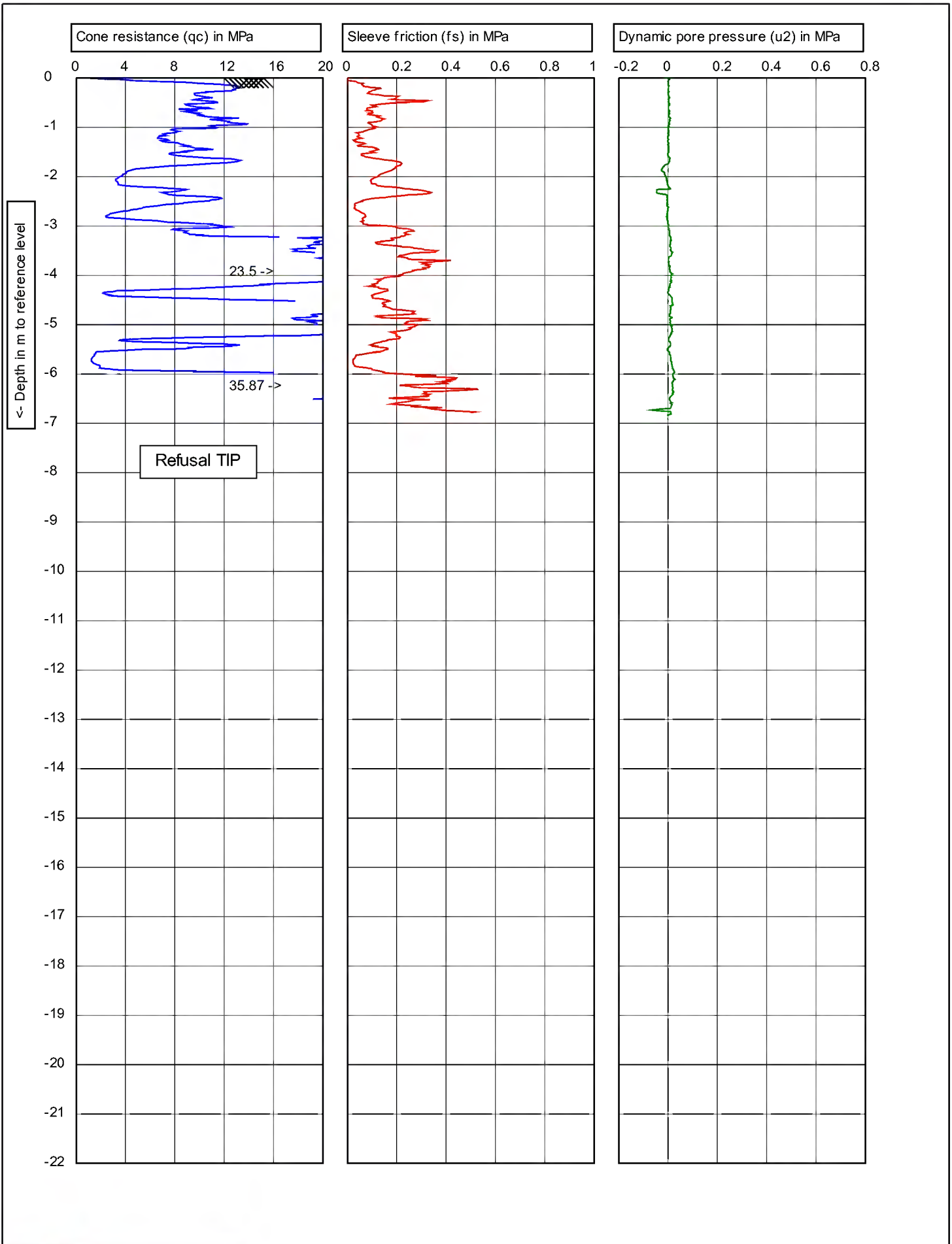


CPTask V1.20



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677365 N5402404</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT222
			6/6

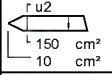
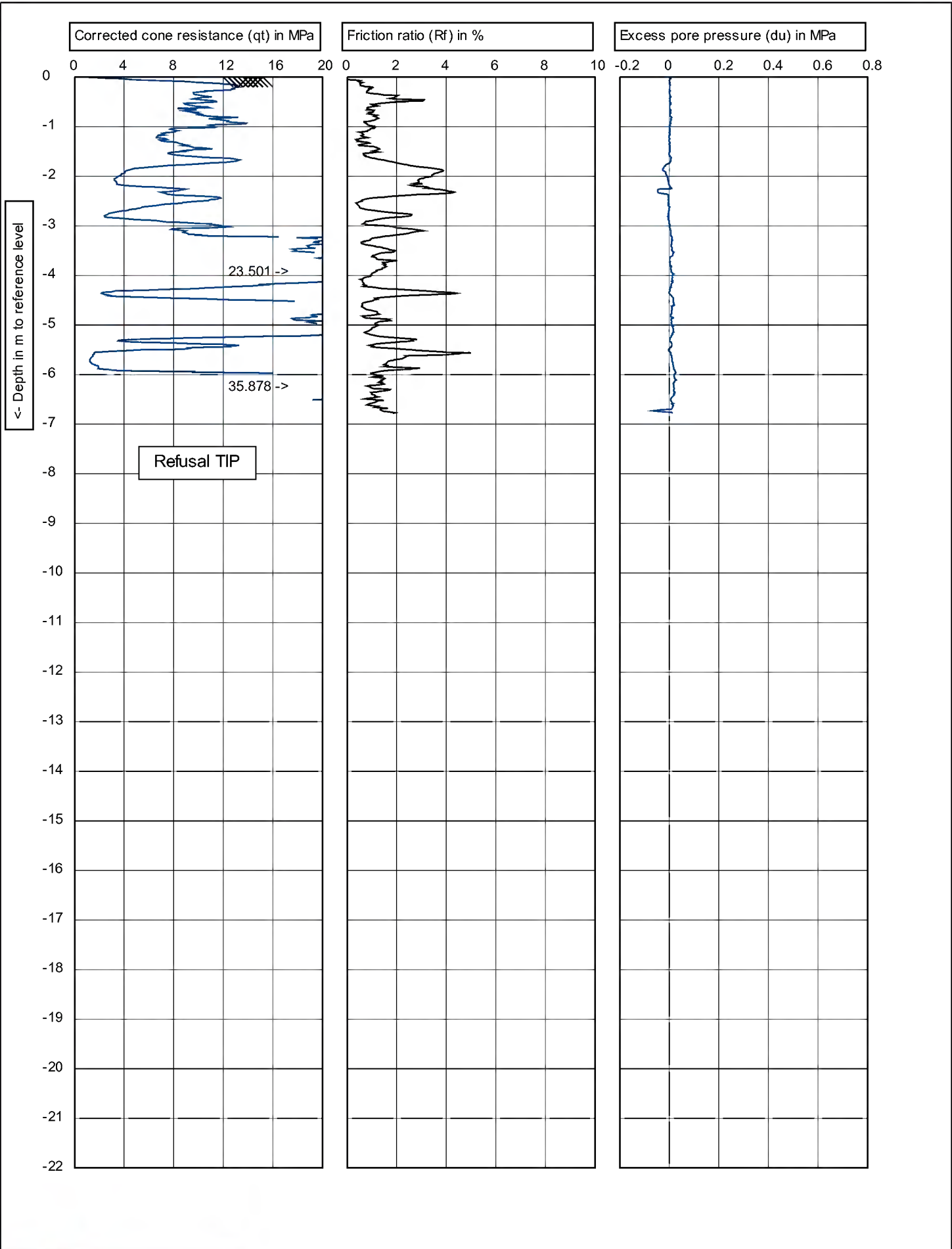




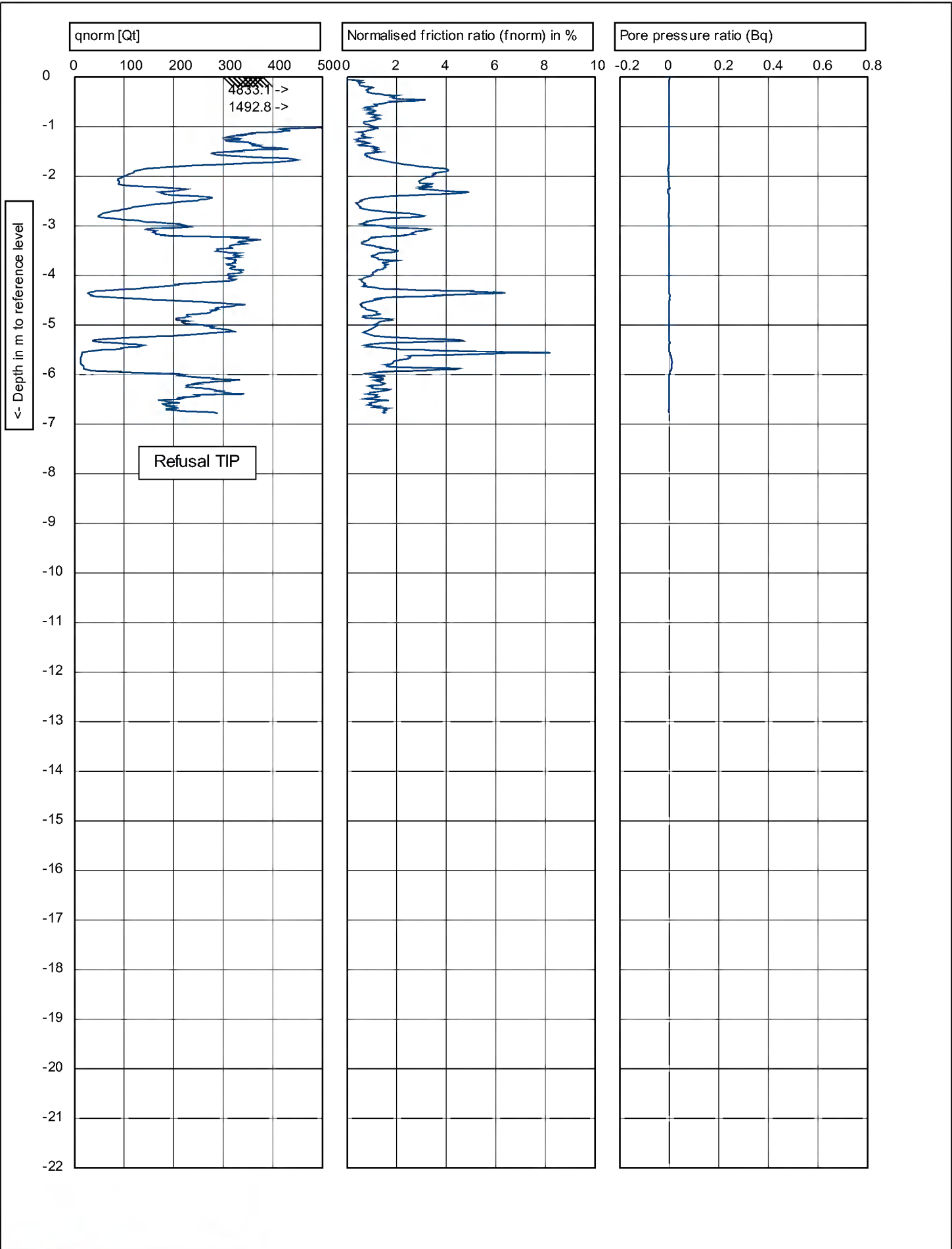
CPTask V1.20



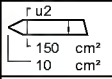
	Test according to A.S.T.M standard D-5778-12		Predrill :	0
	G.L. 0	W.L.: -100	Date:	13/12/2012
Project:	Blenheim Geotechnical Investigation		Cone no.:	C10CFIIP.C10021
Location:	GPS: E1677347 N5402565		Project no.:	5-C2128.00
Position:			CPT no.:	CPT223
				1/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677347 N5402565</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT223	2/6



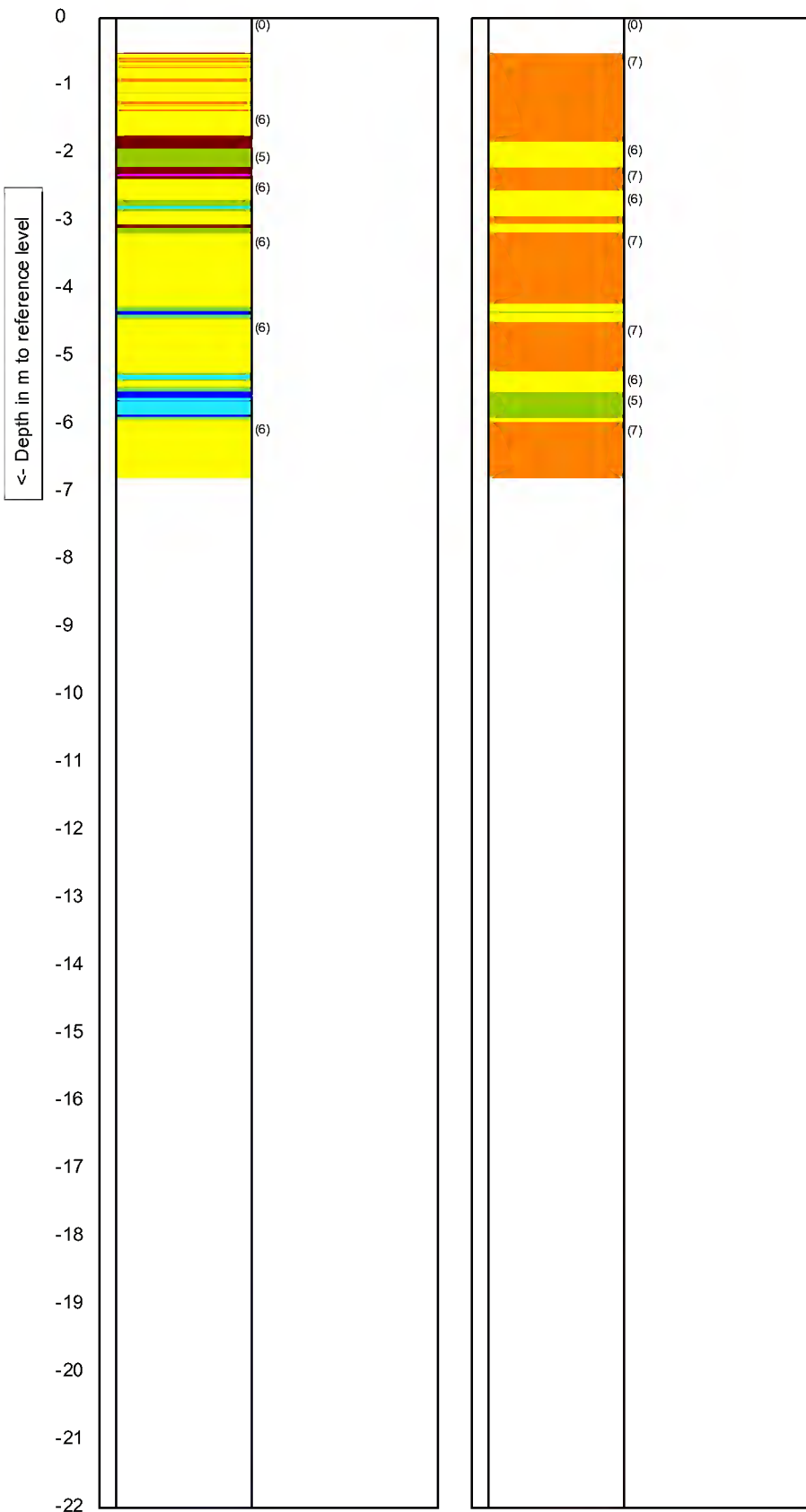
CPTask V1.20



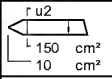
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Location: <b>GPS: E1677347 N5402565</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT223	3/6

Soil Classification (using Fr)

Soil Classification (using Bq)

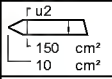
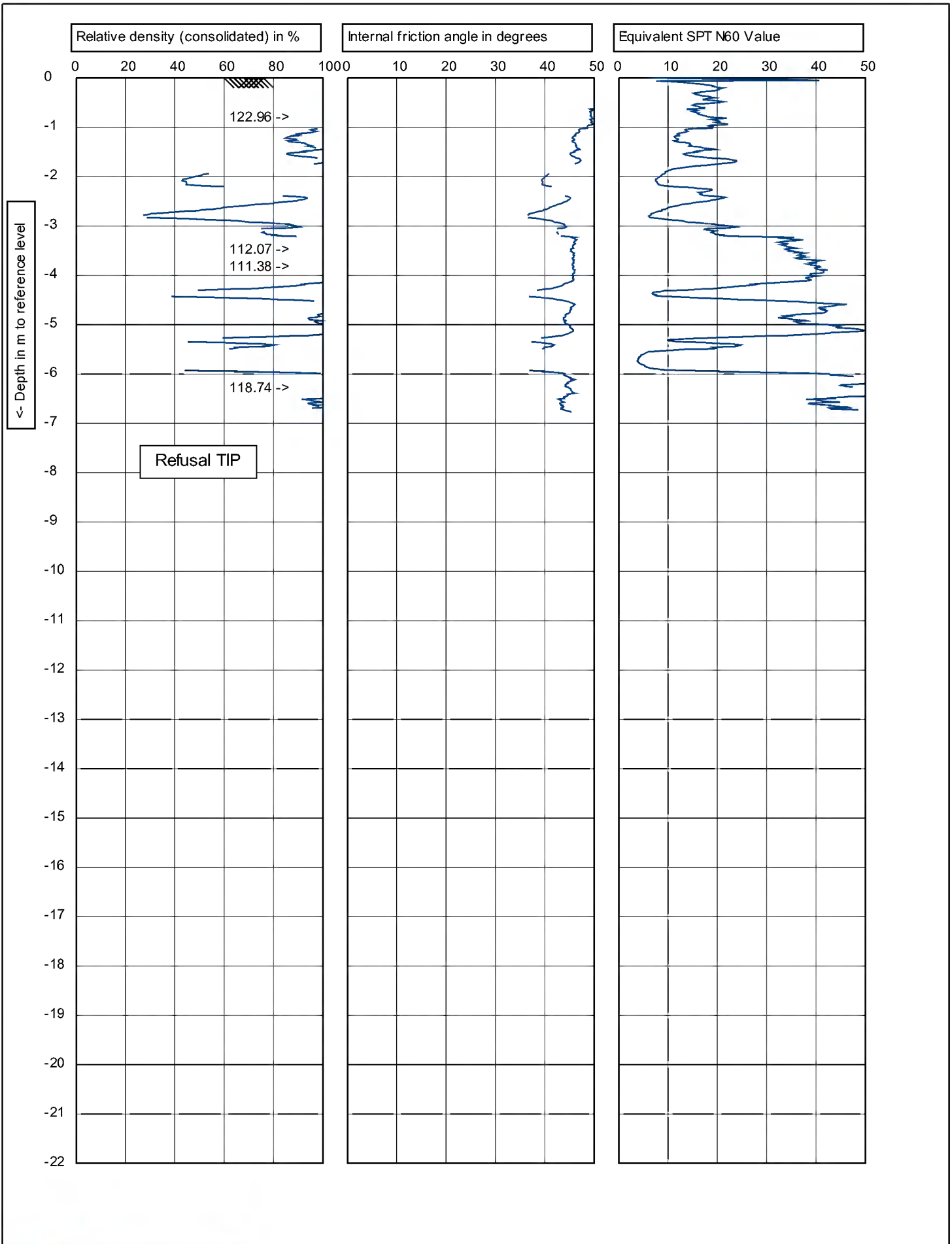


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



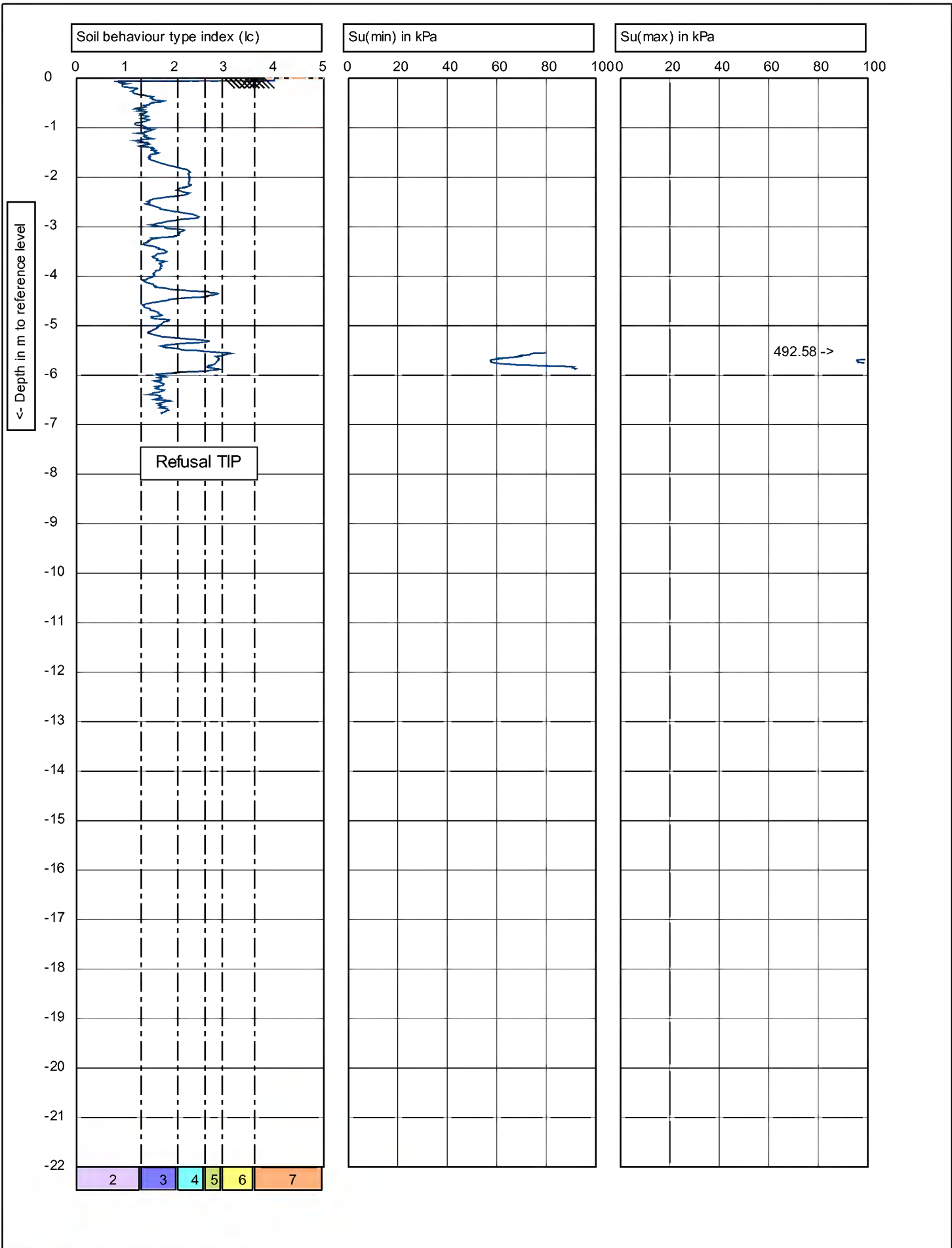
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Location: GPS: E1677347 N5402565		Project no.: 5-C2128.00	
Position:		CPT no.: CPT223	4/6

CPTask V1.20

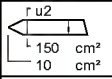


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Position:	CPT no.:	CPT223	5/6

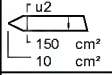
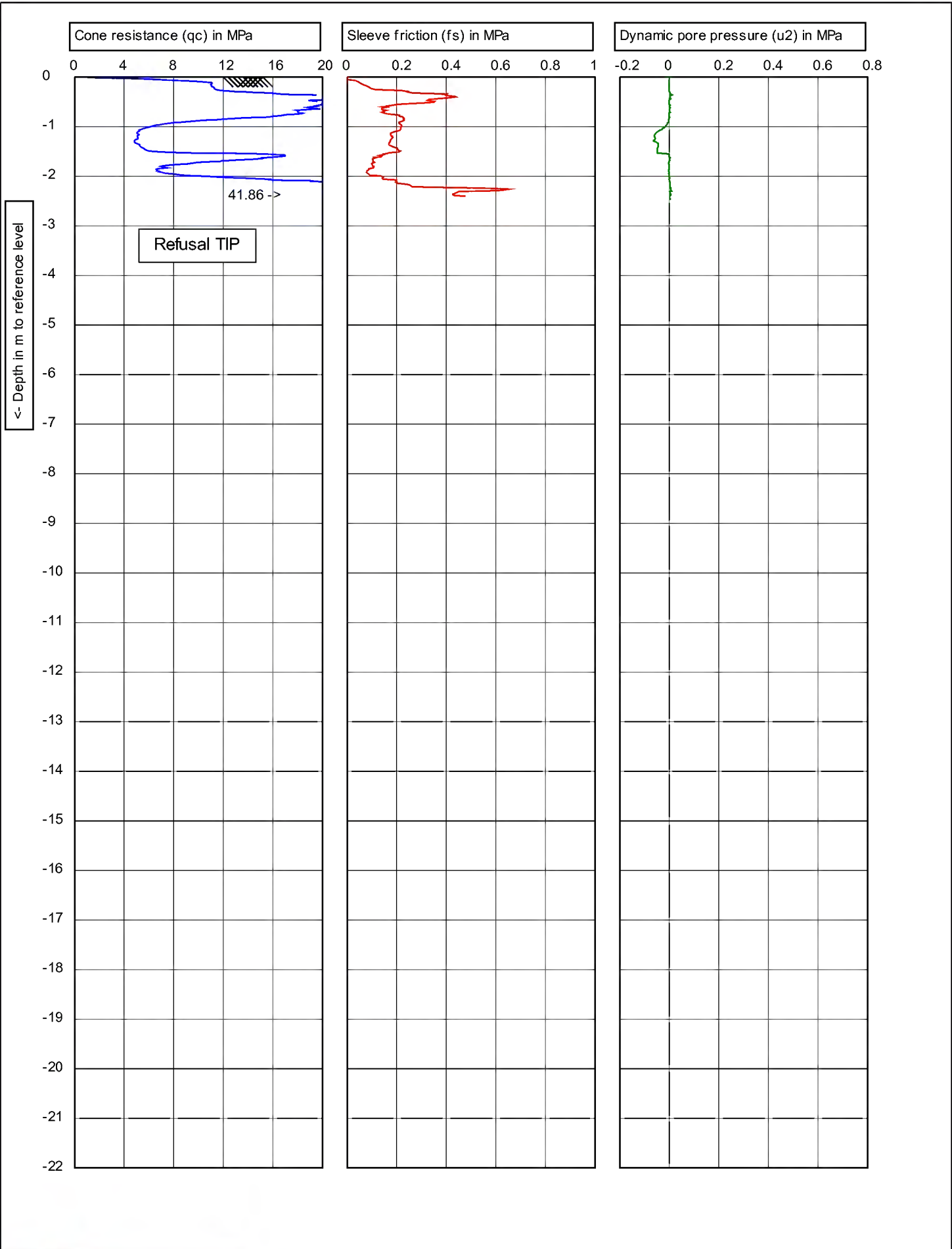
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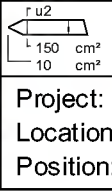
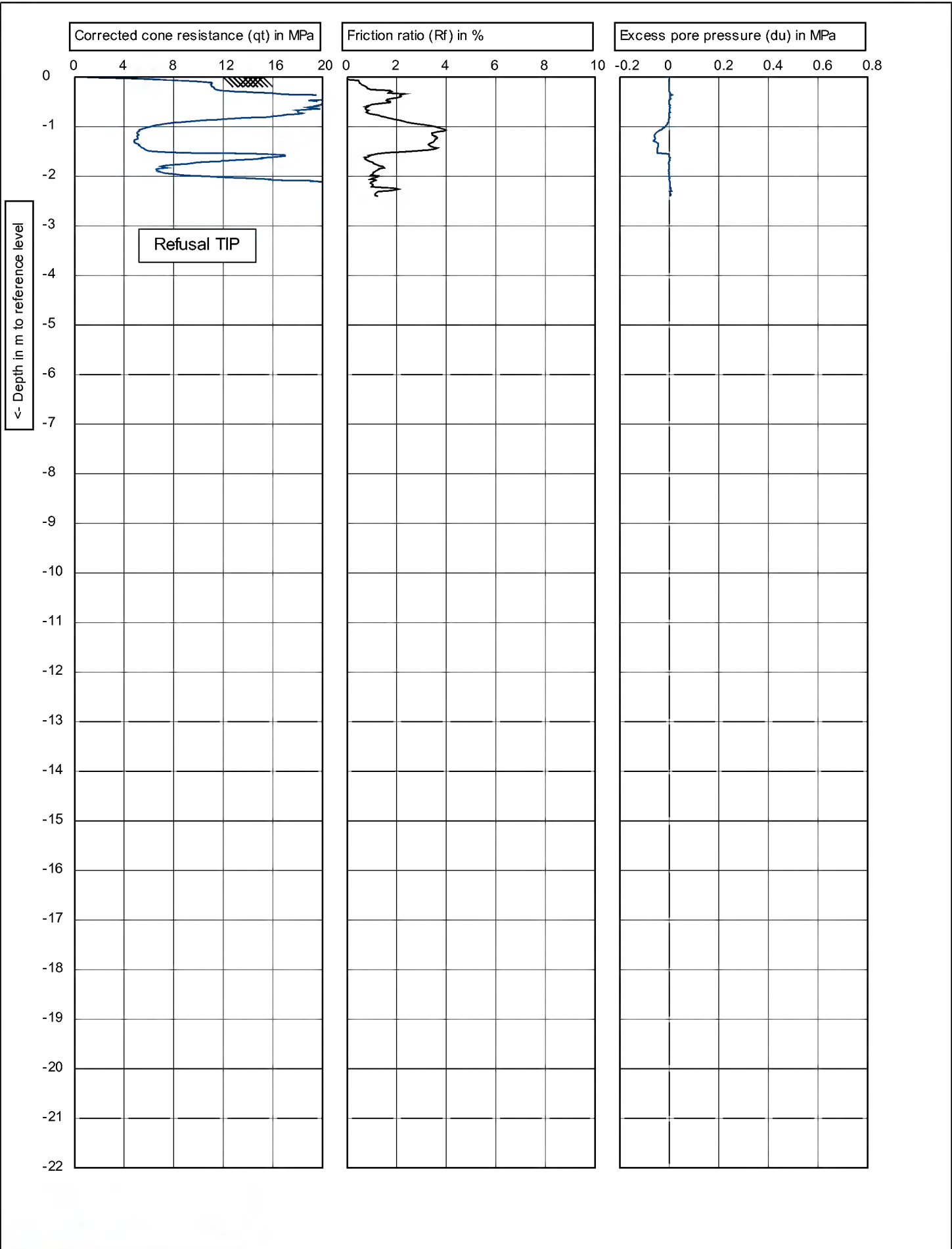
CPTask V1.20



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Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677347 N5402565</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT223
			6/6



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677896 N5402403</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT224	1/6

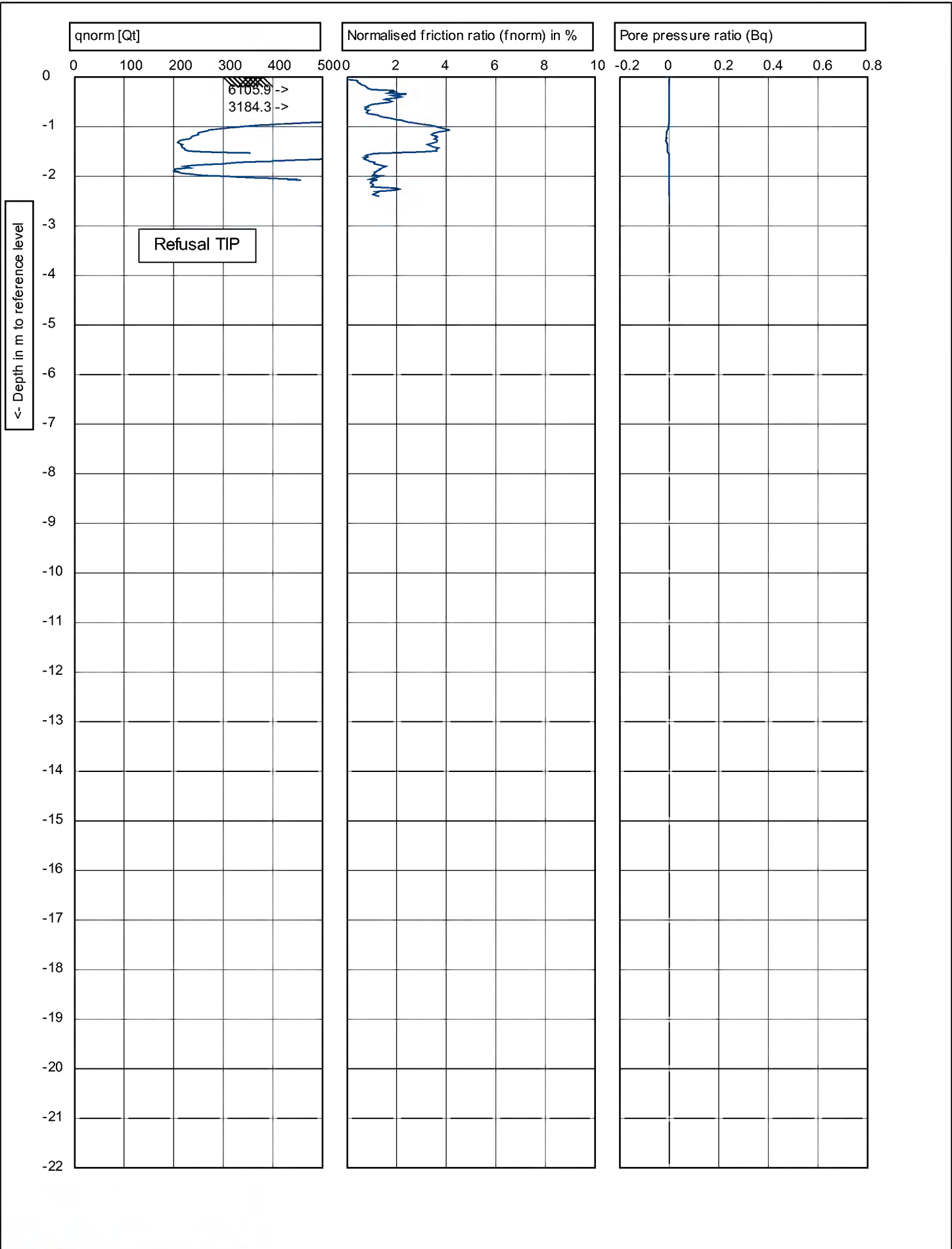


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 Location: **GPS: E1677896 N5402403**  
 Position:

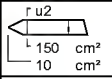
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Project no.:	5-C2128.00
CPT no.:	CPT224
	2/6

CPTask V1.20





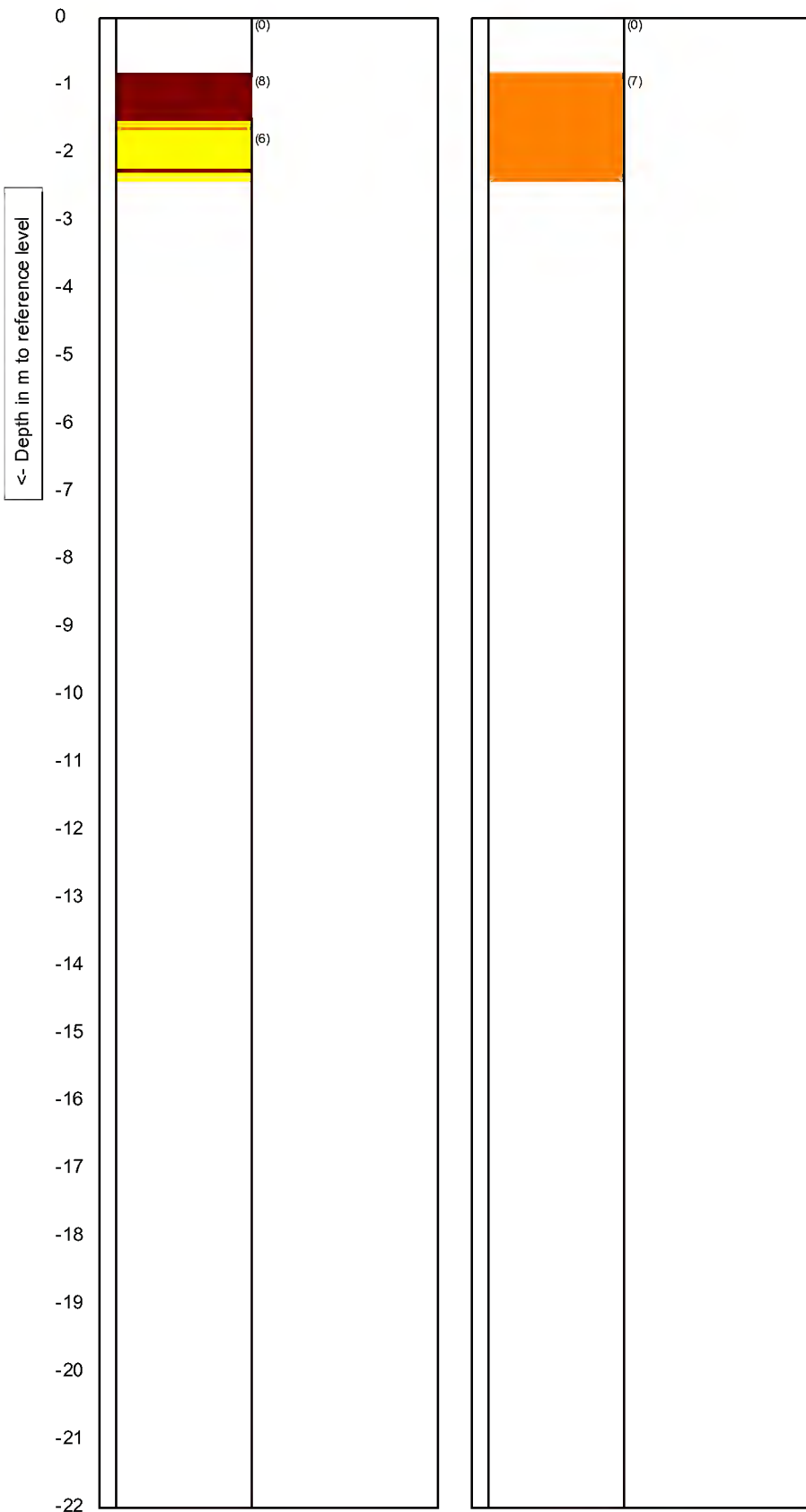
CPTask V1.20



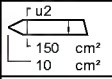
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Location: <b>GPS: E1677896 N5402403</b>		Project no.: <b>5-C2128.00</b>	
Position:		CPT no.: CPT224	3/6

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Soil Classification (using Bq)

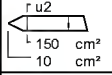
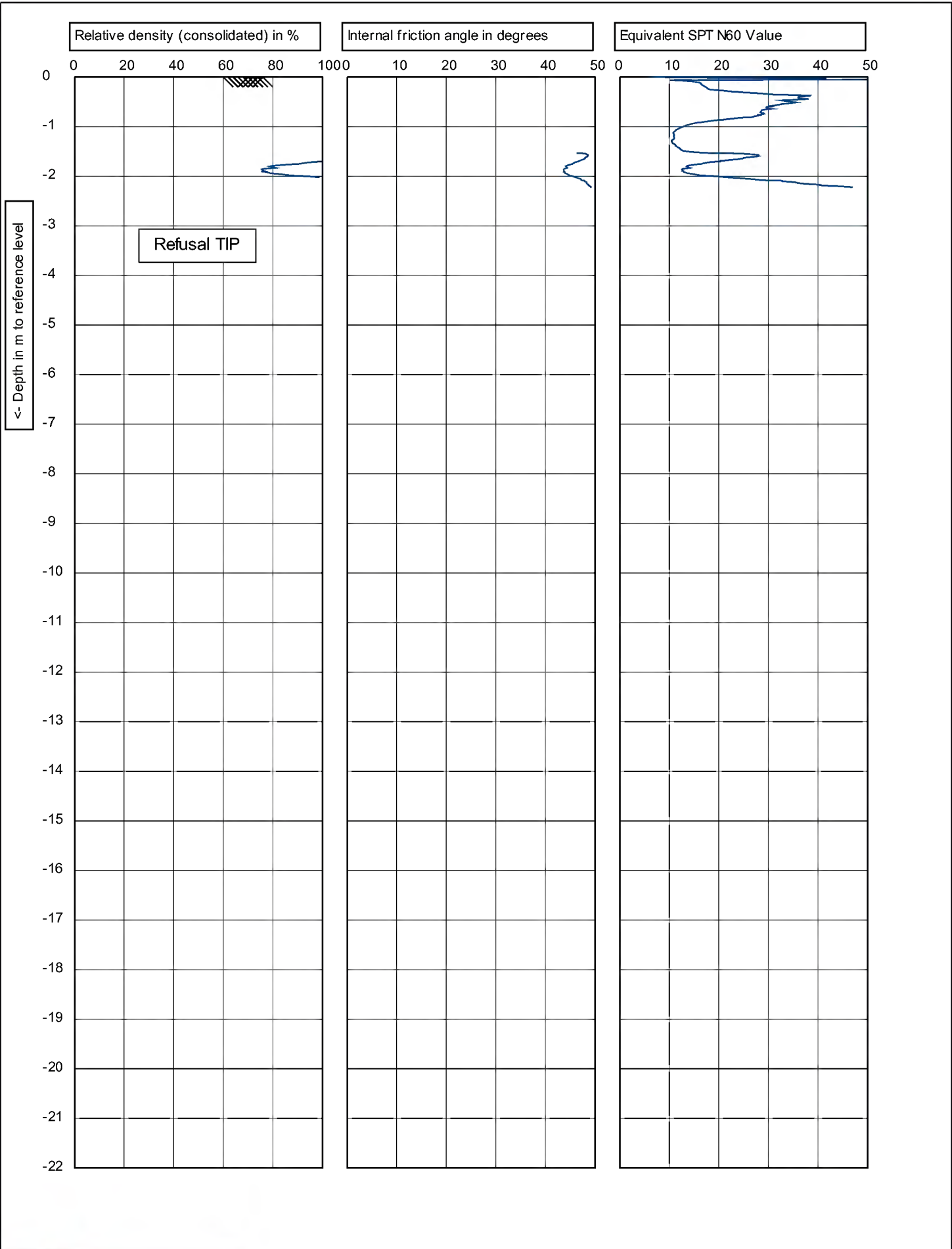


- (0) Not defined
- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



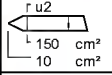
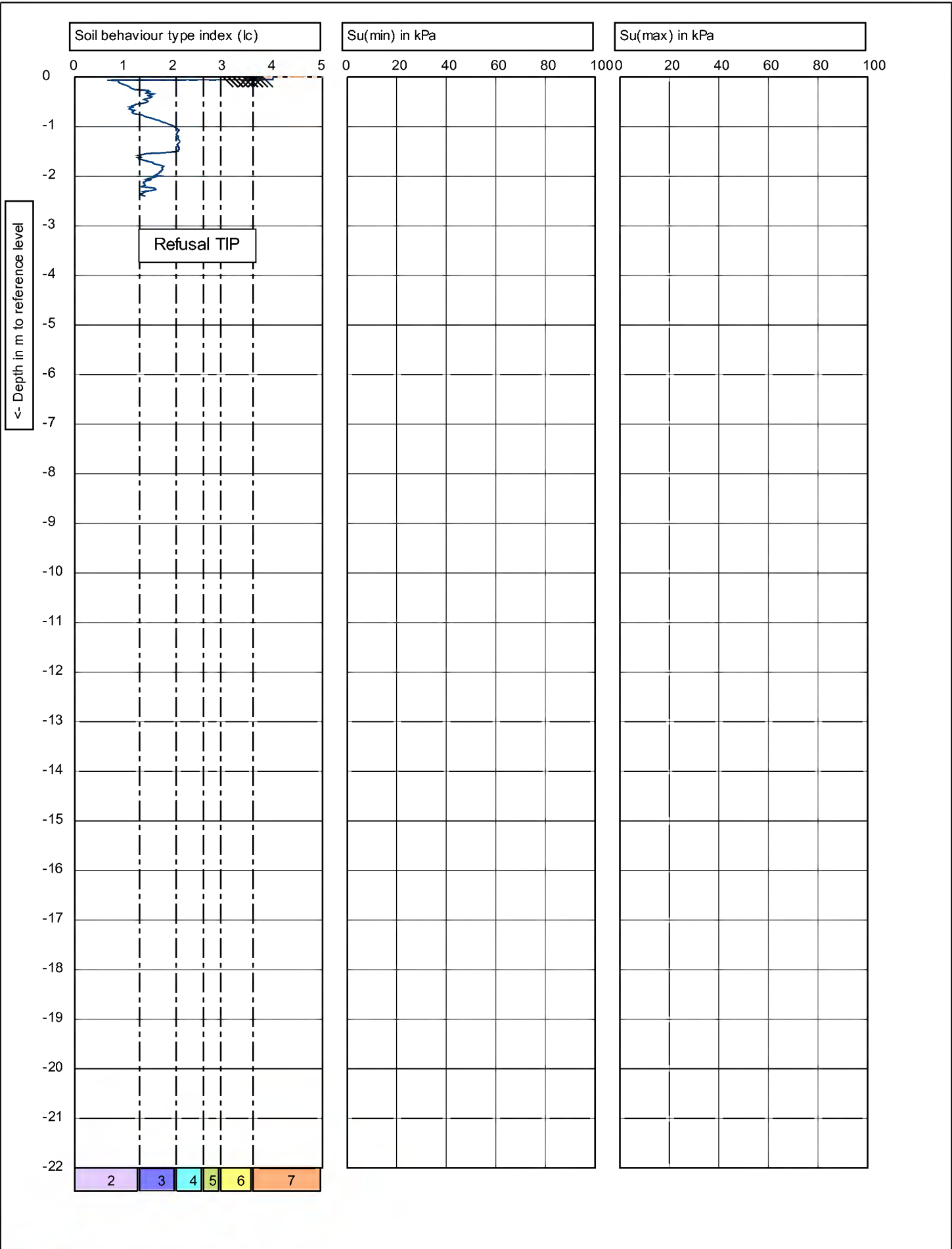
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Location: <b>GPS: E1677896 N5402403</b>	Project no.:		<b>5-C2128.00</b>
Position:	CPT no.:	CPT224	4/6

CPTask V1.20

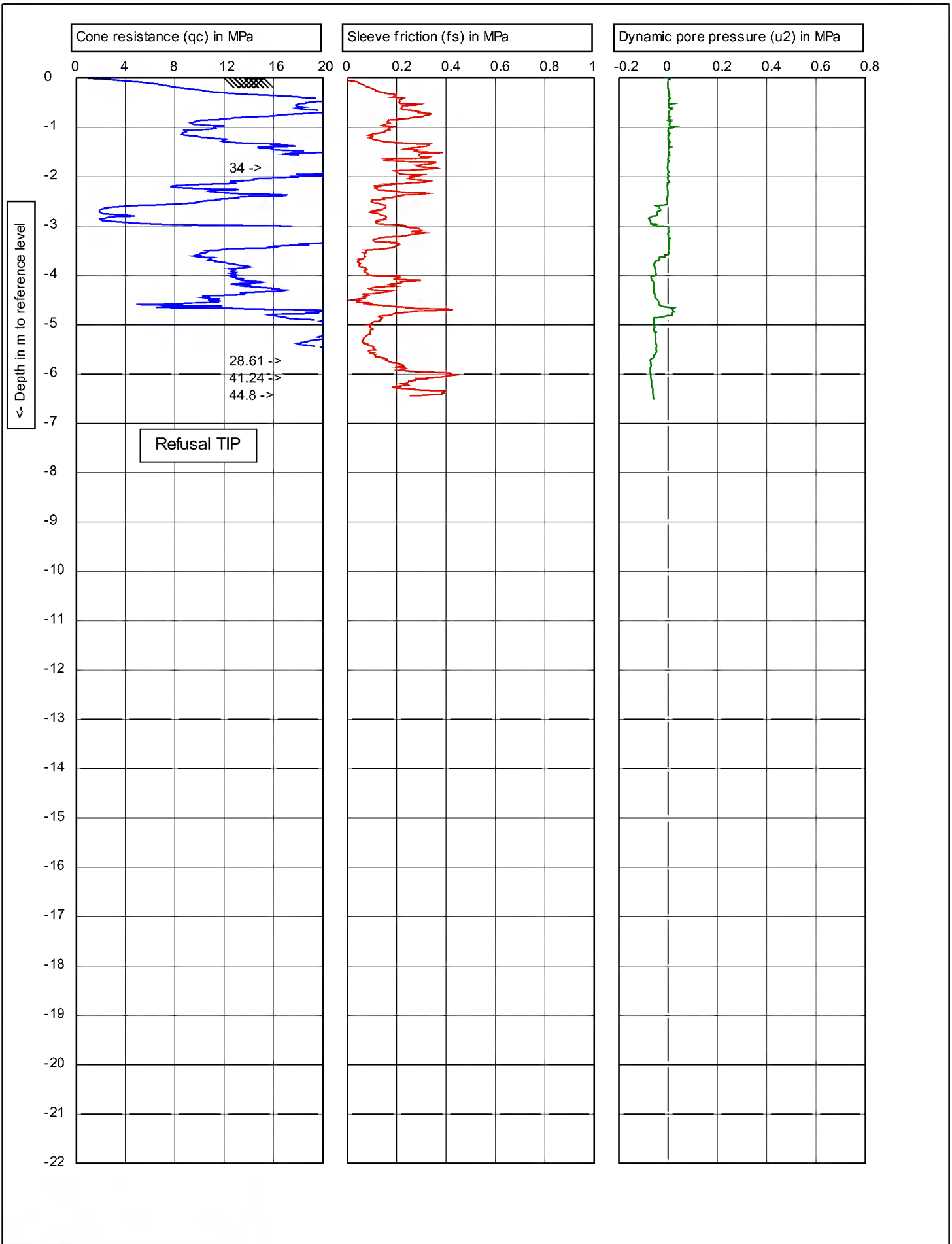


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Position:	CPT no.:	CPT224	5/6

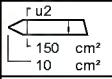
CPTask V1.20



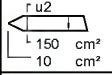
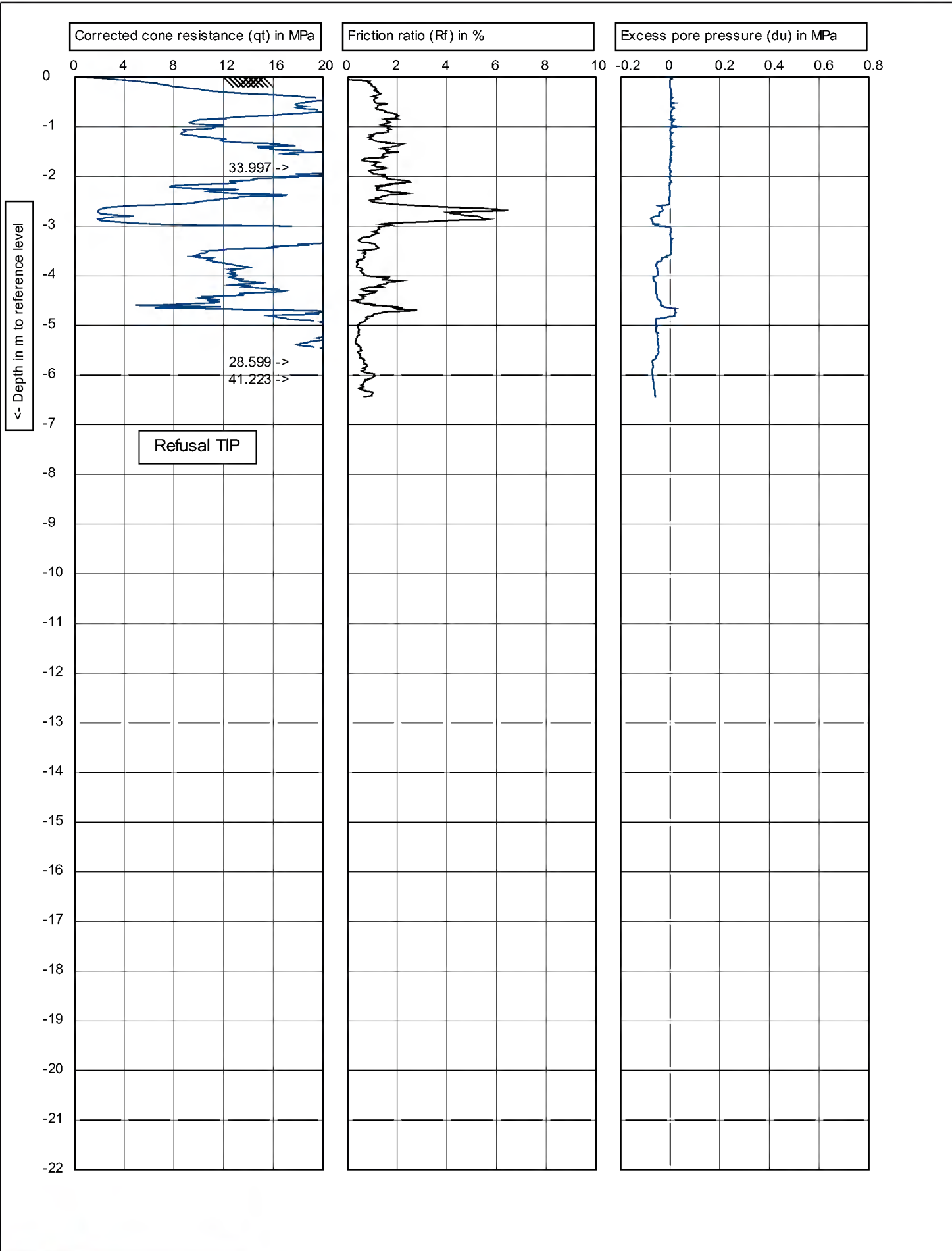
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Location: <b>GPS: E1677896 N5402403</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT224
			6/6



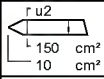
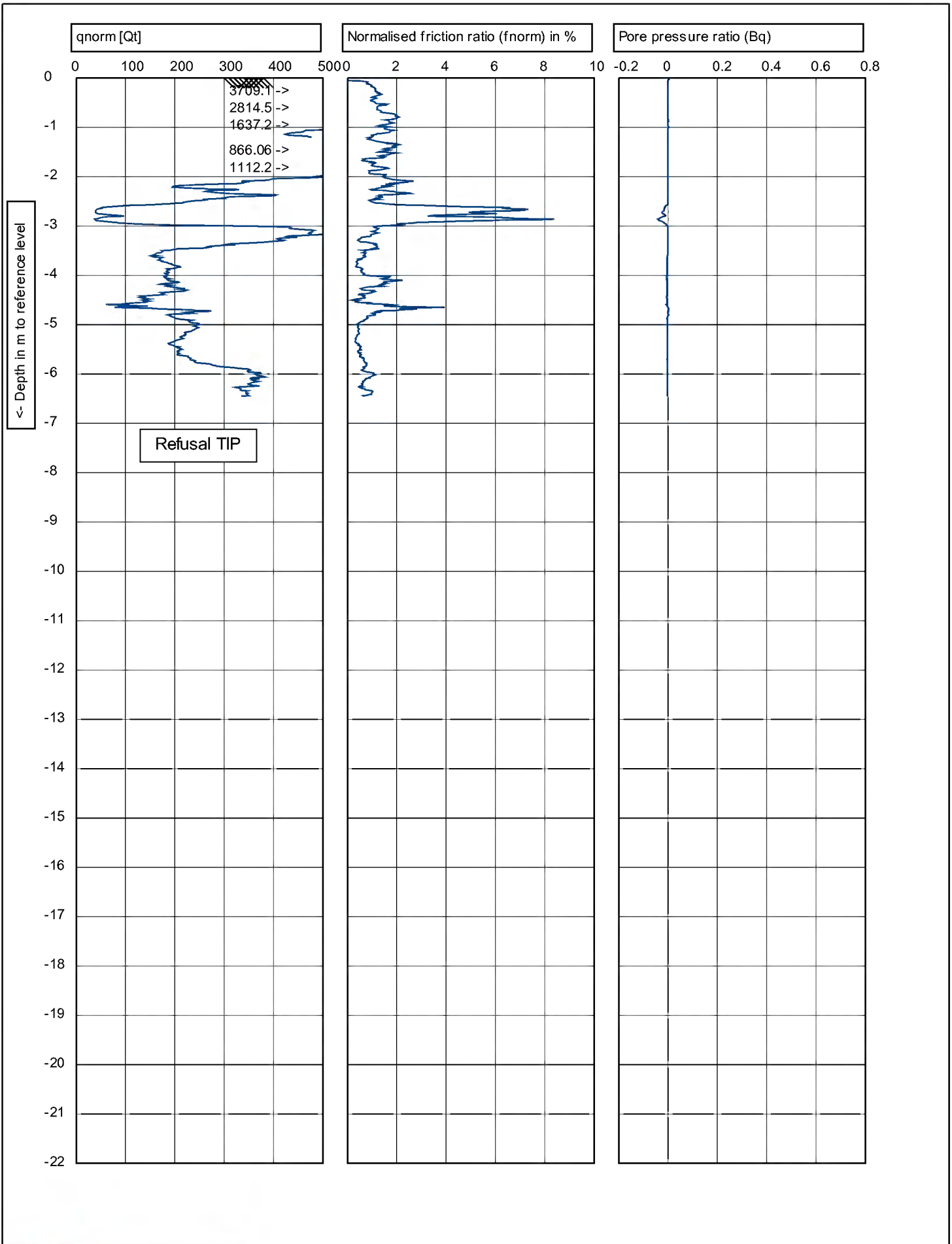
CPTask V1.20



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Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIIP.C10021</b>
Location: <b>GPS: E1677589 N5402722</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT225
			1/6



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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.:		<b>C10CFIP.C10021</b>
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Position:	CPT no.:	CPT225	2/6

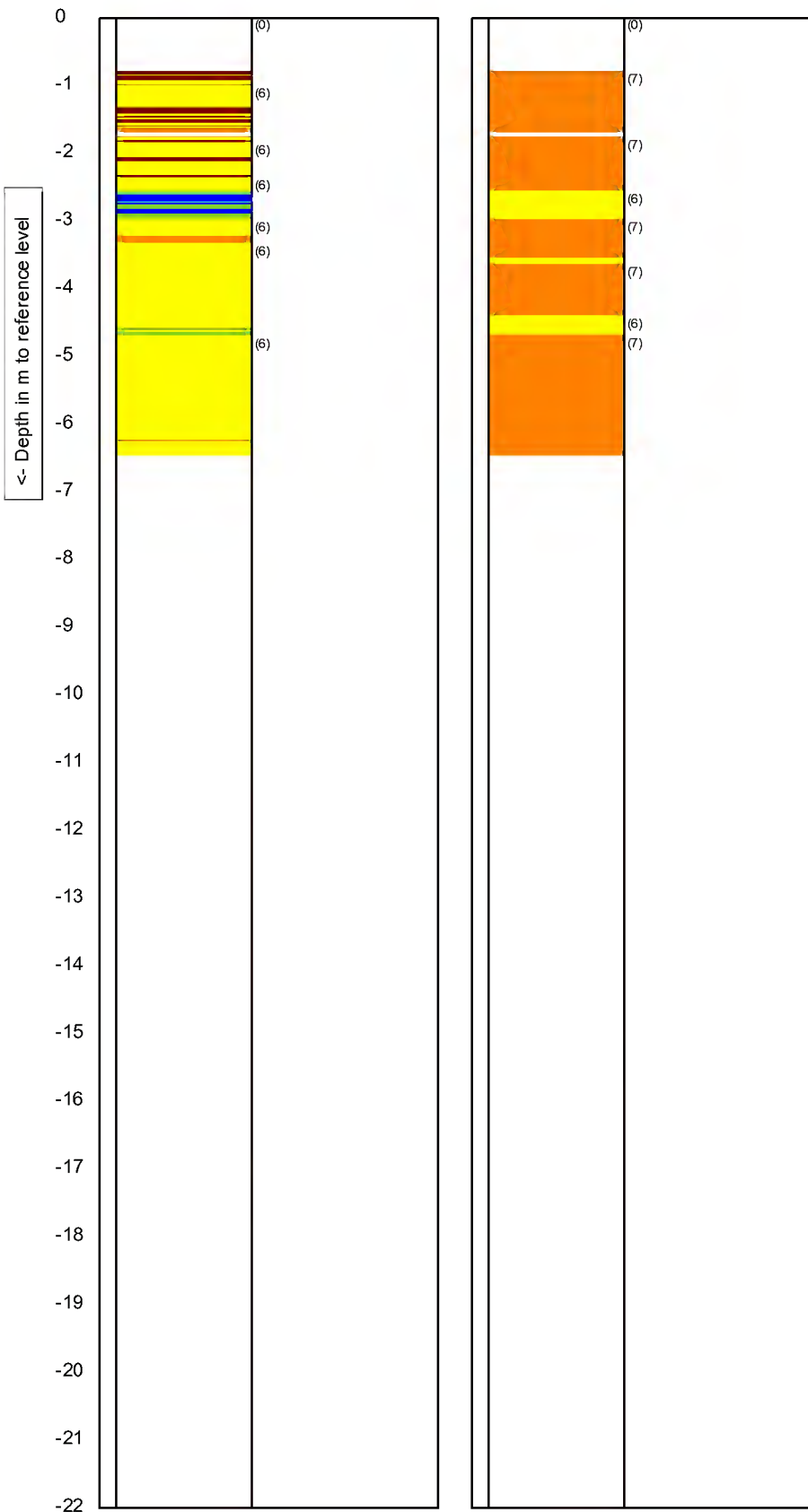


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Position:	CPT no.:	CPT225	3/6

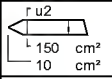
CPTask V1.20

Soil Classification (using Fr)

Soil Classification (using Bq)



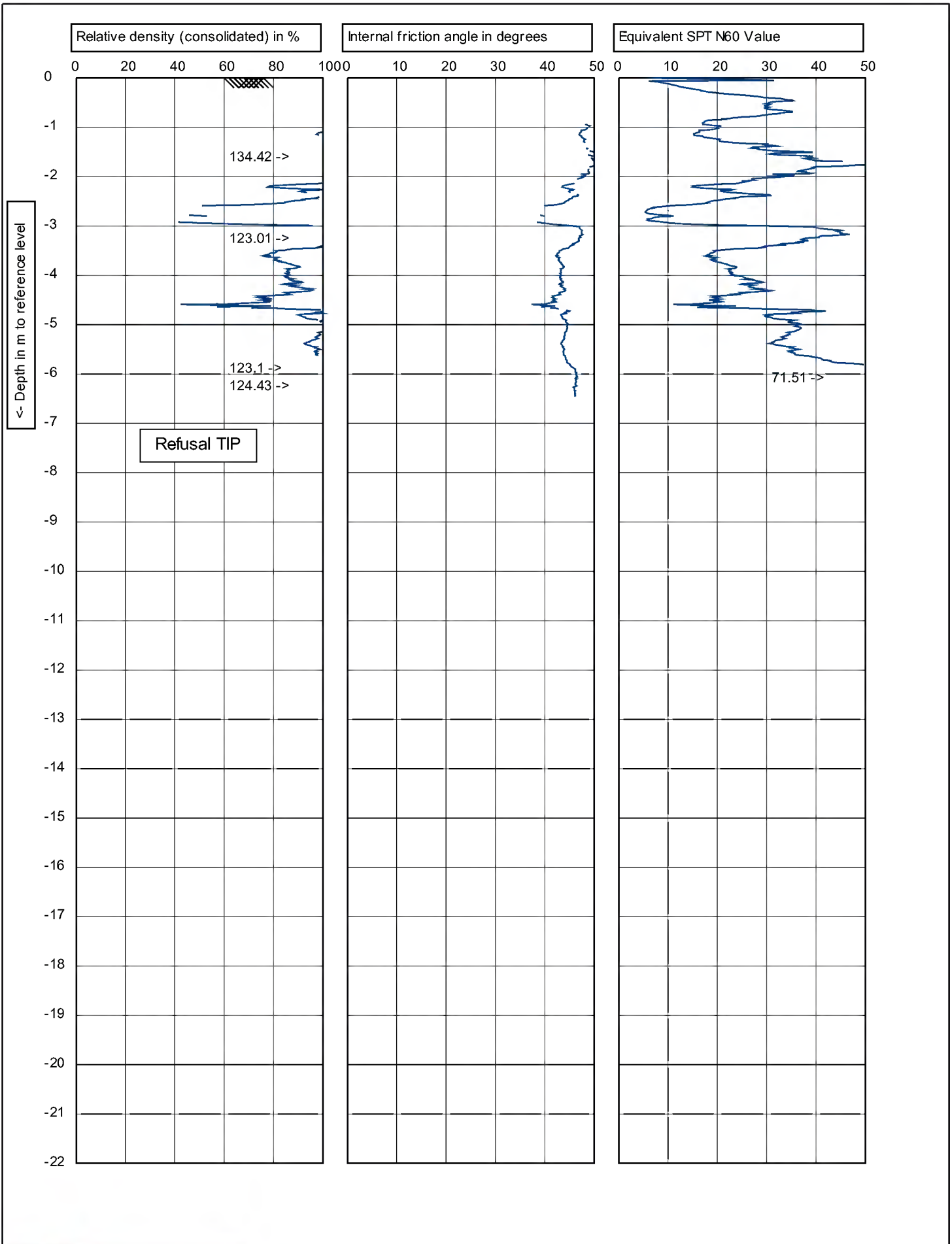
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- (1) Sensitive, fine grained
- (2) Organic soils-peats
- (3) Clays-clay to silty clay
- (4) Clayey silt to silty clay
- (5) Sand mixtures
- (6) Sands
- (7) Gravelly sand to sand
- (8) Very stiff sand to clayey sand
- (9) Very stiff fine grained



Test according to A.S.T.M standard D-5778-12		Predrill :	0
G.L. 0	W.L.: -100	Date:	13/12/2012
Project: <b>Blenheim Geotechnical Investigation</b>		Cone no.:	<b>C10CFIP.C10021</b>
Location: <b>GPS: E1677589 N5402722</b>		Project no.:	<b>5-C2128.00</b>
Position:	CPT no.:	CPT225	4/6

CPTask V1.20

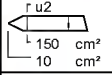
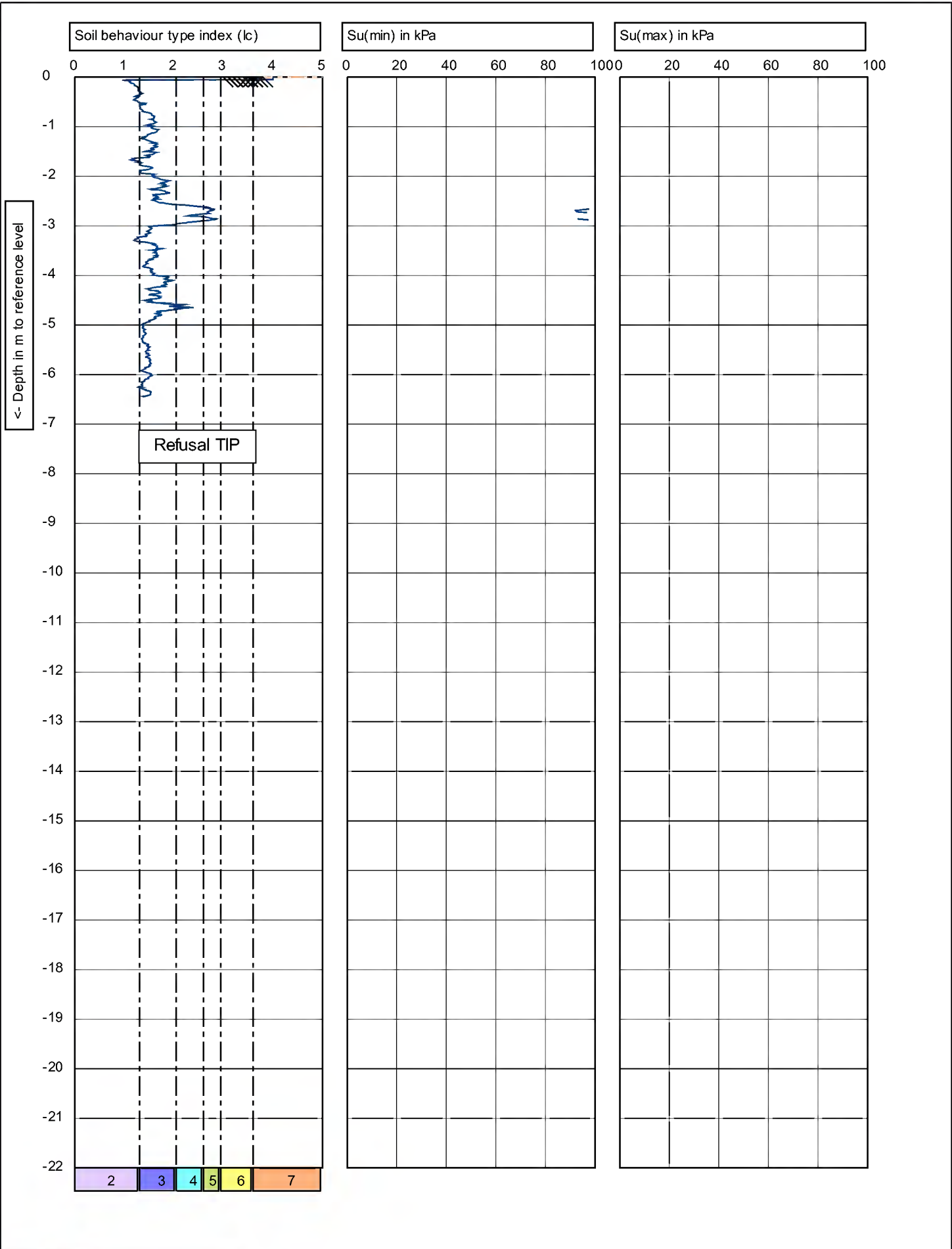




CPTask V1.20



	Test according to A.S.T.M standard D-5778-12		Predrill : 0	
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Project: <b>Blenheim Geotechnical Investigation</b>	Cone no.: <b>C10CFIP.C10021</b>		Project no.: <b>5-C2128.00</b>	
Location: <b>GPS: E1677589 N5402722</b>	CPT no.: CPT225		5/6	
Position:				



Test according to A.S.T.M standard D-5778-12		Predrill :	0
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Location: <b>GPS: E1677589 N5402722</b>		Project no.:	<b>5-C2128.00</b>
Position:		CPT no.:	CPT225
			6/6

CPTask V1.20

# **Appendix D**

## **Shear wave velocity test results**



# **Blenheim Downhole Shearwave Survey**

January 2013

A J Sutherland Consulting Ltd

Prepared for Opus International Consultants Ltd

Prepared by Alan Sutherland

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**2 Shear Wave Testing Methodology..... 2**

**3 Processed Data..... 3**

**4 Conclusions ..... 5**

**Appendix A: Velocity Profiles ..... 6**

**Appendix B: Time Histories ..... 10**

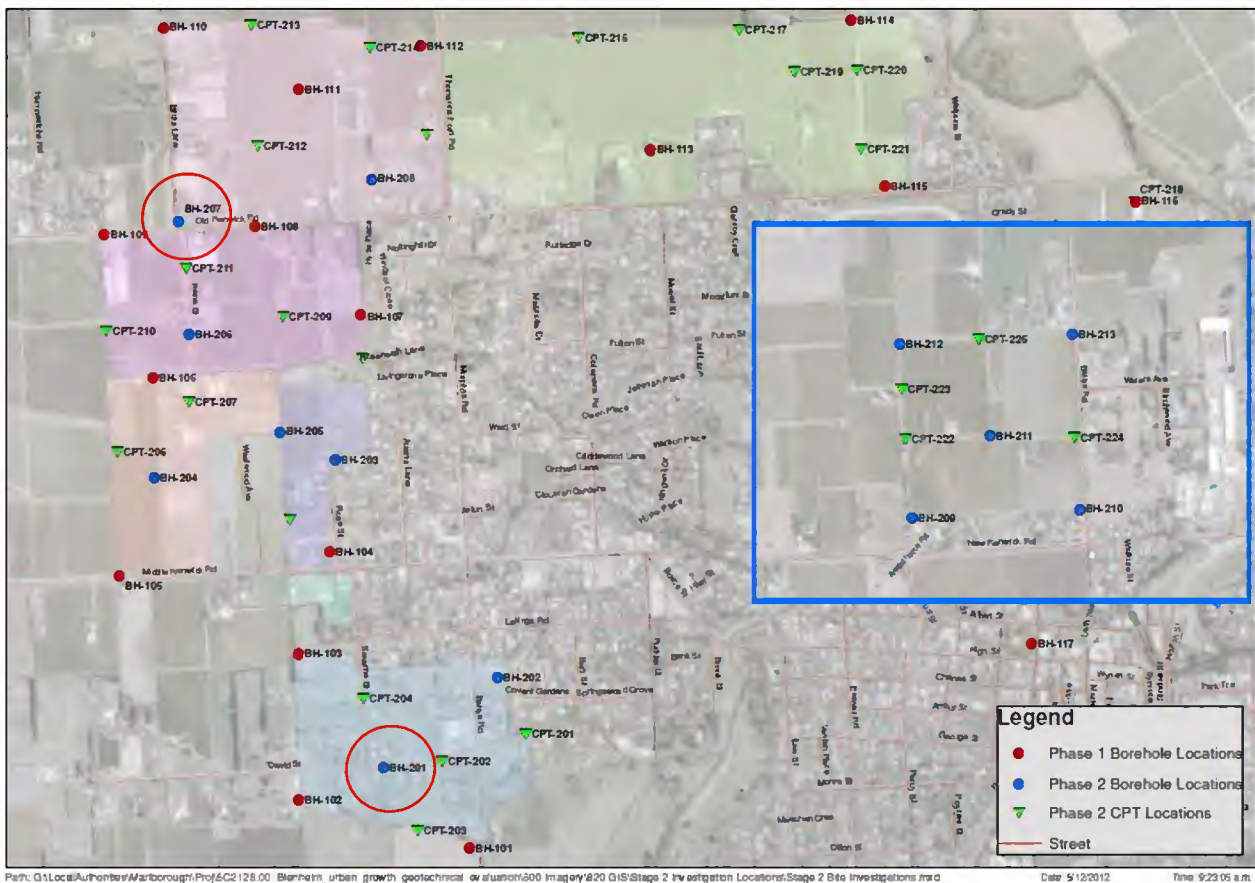
# 1 Introduction

Shear wave velocities were measured in two 15m deep boreholes near Blenheim, on 27 December 2012. The boreholes, were designated BH-201 and BH-207. The locations of the boreholes is shown (circled) on Figure 1. below.

The boreholes were lined with 32mm PVC pressure pipe (PN15) prior to the shear wave measurements which allowed measurements to be made to a depth of 14.5m in each hole.

This report describes the shear wave testing methodology adopted along with the resulting shear wave and compression wave velocities estimated for various layers within the borehole. The velocity profiles and time history plots are given in Appendices A and B, respectively.

**Figure 1: Site Plan**



Path: G:\Local\Aurion\Blenheim\Prof\62128.00 Blenheim\_urban\_growth\_geotechnical\_situation\200 imagery\20 GIS\Stage 2 Investigation Locations\Stage 2 Bore Investigations.mxd Date: 5/12/2012 Time: 9:23:05 a.m.

## 2 Shear Wave Testing Methodology

Shear waves were generated by using a sledge hammer to strike the ends of a plank, which was held in contact with the ground by parking a loaded vehicle on it. Compression waves were also created by striking a metal plate on the ground, vertically.

The resulting shear waves were recorded using an assembly of five pairs of horizontally and vertically orientated geophones, these pairs of geophones were spaced at 0.5m intervals. The geophone pairs were individually spring loaded to ensure good contact with the PVC liner, which had been grouted into the borehole. The pairs of geophones were isolated from each other by flexible spacers.

Data from the geophones was recorded using an ABEM digital seismograph. The seismograph was triggered by the closing of an electrical circuit between the hammer and the steel plates on the ends of the plank.

The acquired data was processed to determine the phase velocities of the shear waves over one metre intervals, between geophone elements, using LabVIEW™ software. Once the profile had been determined, a first arrival time was calculated for each depth and this was superimposed on the time history plot. This first arrival line should match the first break of the shear wave seen on the time history plot.

Compression wave velocities were calculated from linear fits through the first arrival times from the vertical hits. The time history plot also includes a line representing the first arrivals of the wave travelling down the borehole.

### 3 Processed Data

The shear wave and compression wave profiles are presented in Appendix A. The time history for each geophone element, plotted at the depth of the reading, for both shear wave and compression wave readings are presented in Appendix B.

The calculated shear wave velocities for each metre of the hole are summarised in Tables 1 and 2 below.

The estimated first arrival of the shear wave and compression wave, determined from the calculated velocities, are shown on the time history plots as a blue line.

**Table 1: Calculated shear wave and compression wave velocities BH-201**

<b>Depth Range (m)</b>	<b>Shear wave velocities (m/s)</b>	<b>Compression wave velocities (m/s)</b>
0.0 – 1.0	-	-
1.0 – 2.0	183	330
2.0 – 3.0	216	330
3.0 – 4.0	234	330
4.0 – 5.0	196	780
5.0 – 6.0	331	780
6.0 – 7.0	296	780
7.0 – 8.0	385	2730
8.0 – 9.0	255	2730
9.0 – 10.0	339	2730
10.0 – 11.0	550	2730
11.0 – 12.0	464	2730
12.0 – 13.0	510	2730
13.0 – 14.0	567	2730
14.0 – 15.0	567	2730



**Table 2: Calculated shear wave and compression wave velocities BH-207**

<b>Depth Range (m)</b>	<b>Shear wave velocities (m/s)</b>	<b>Compression wave velocities (m/s)</b>
0.0 – 1.0	-	-
1.0 – 2.0	181	560
2.0 – 3.0	120	560
3.0 – 4.0	259	340
4.0 – 5.0	370	340
5.0 – 6.0	252	340
6.0 – 7.0	316	2680
7.0 – 8.0	290	2680
8.0 – 9.0	339	2680
9.0 – 10.0	364	2680
10.0 – 11.0	392	2680
11.0 – 12.0	537	2680
12.0 – 13.0	464	2680
13.0 – 14.0	393	2680
14.0 – 15.0	638	2680

## 4 Conclusions

The shear wave data were of good quality with low background noise. The compression wave data had high background noise.

The shear wave velocities calculated from phase differences matched well with the velocity estimates determined from first arrivals.



Alan Sutherland  
Geophysical Consultant

Appendix A: Velocity Profiles

Figure A1: Shear Wave Velocity Profile, BH201

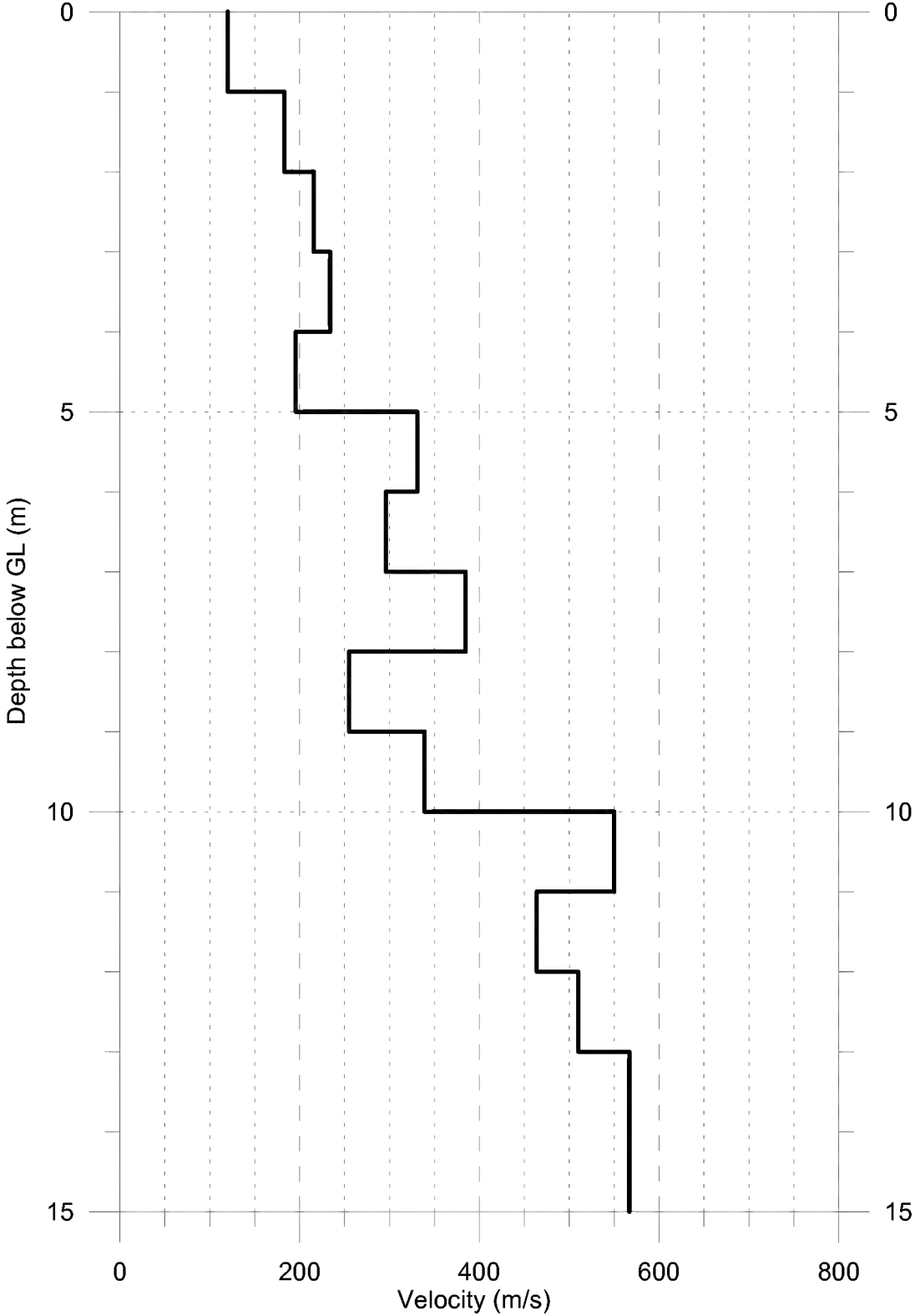


Figure A2: Shear Wave Velocity Profile, BH207

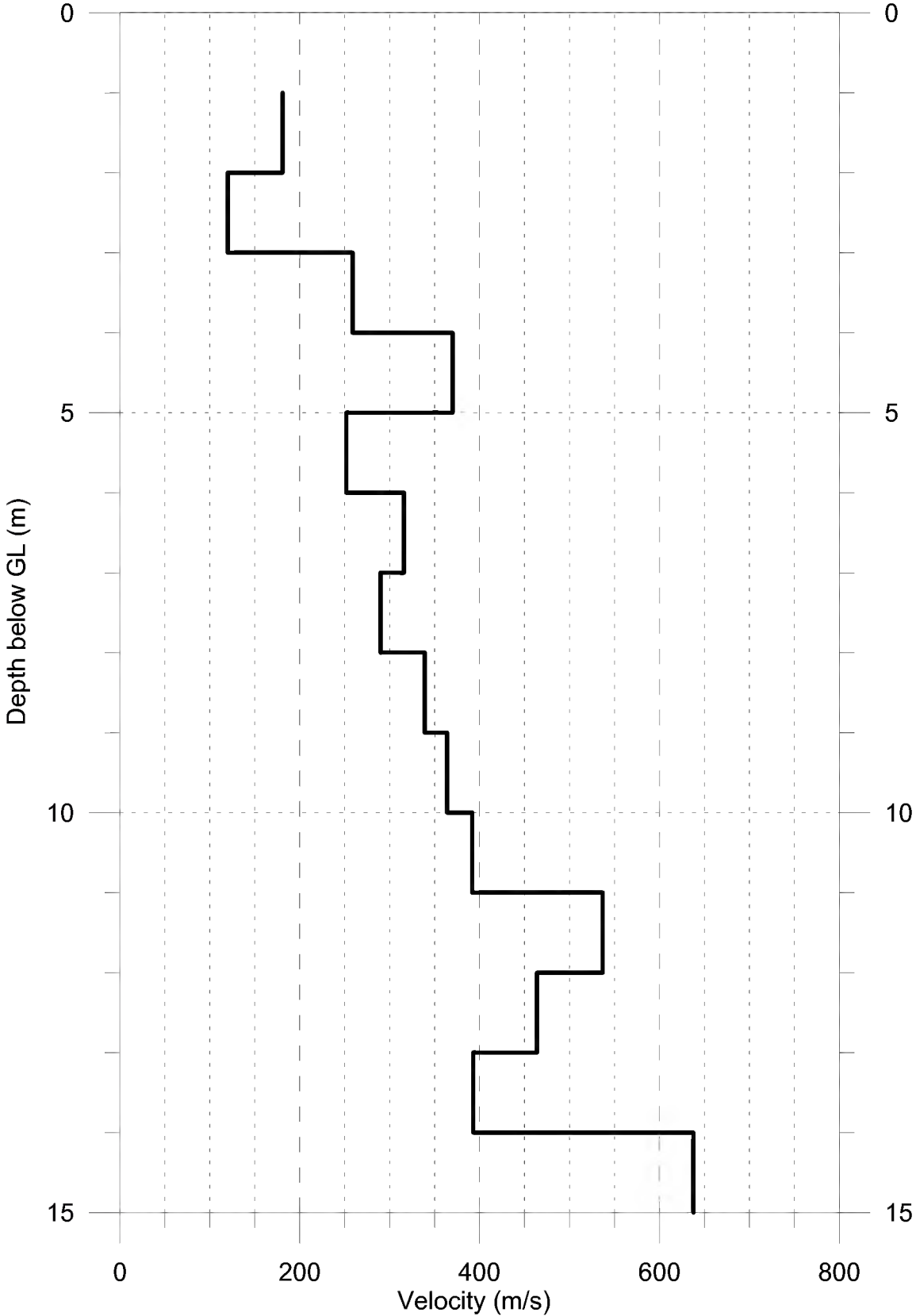
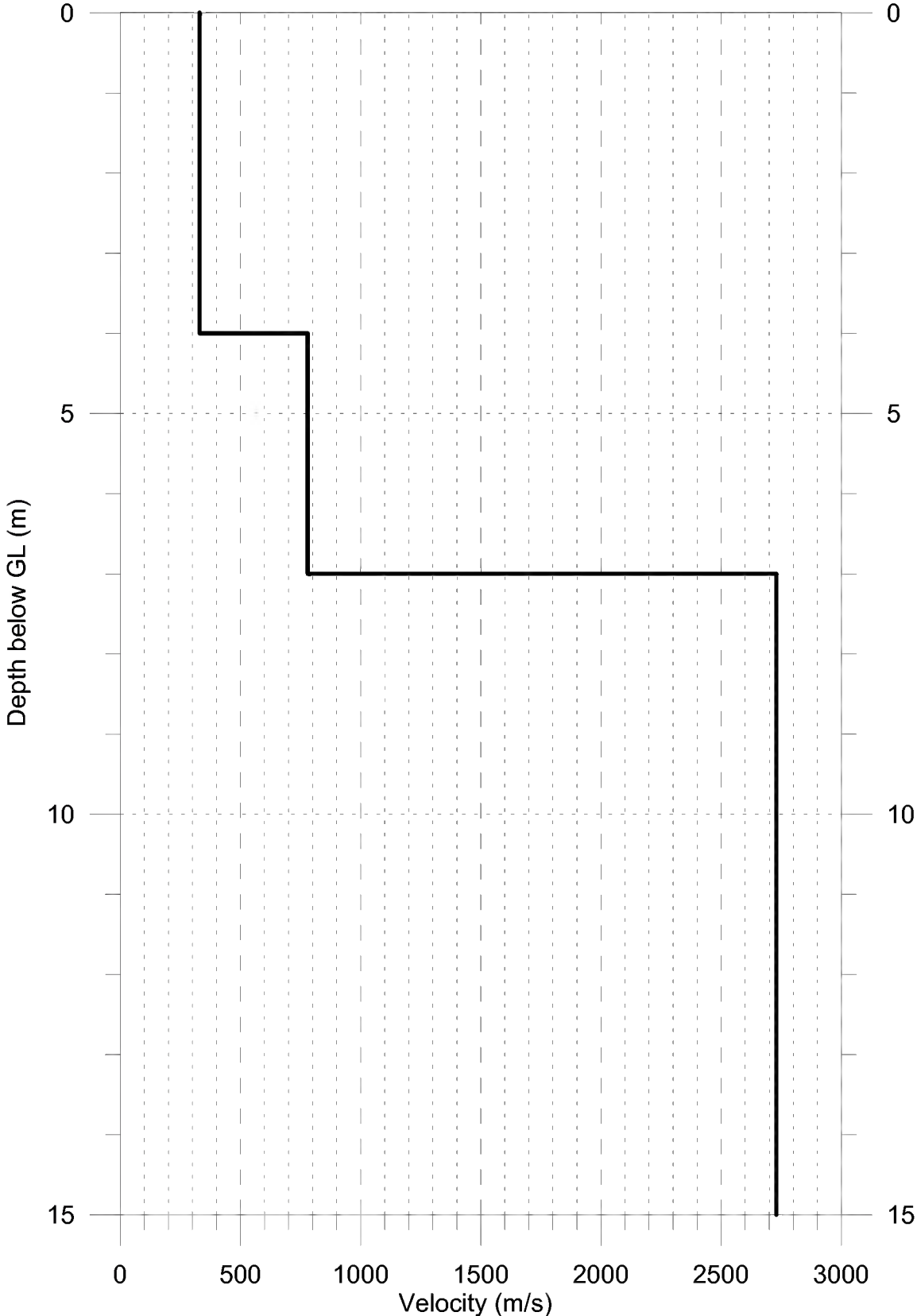
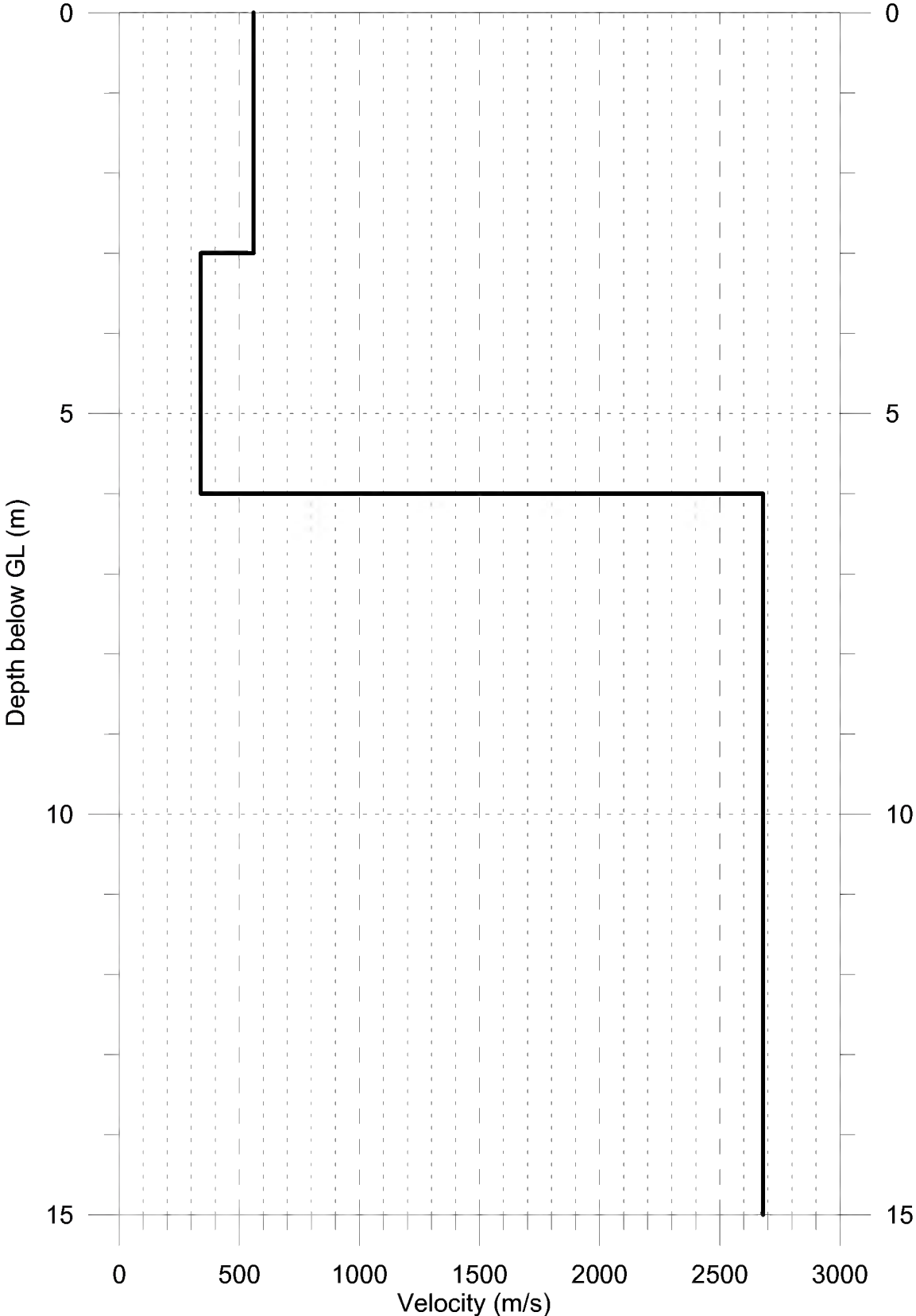


Figure A3: Compression Wave Velocity Profile, BH201



4.1

Figure A4: Compression Wave Velocity Profile, BH207



## Appendix B: Time Histories

Figure B1: Shear Wave Time Histories, BH201

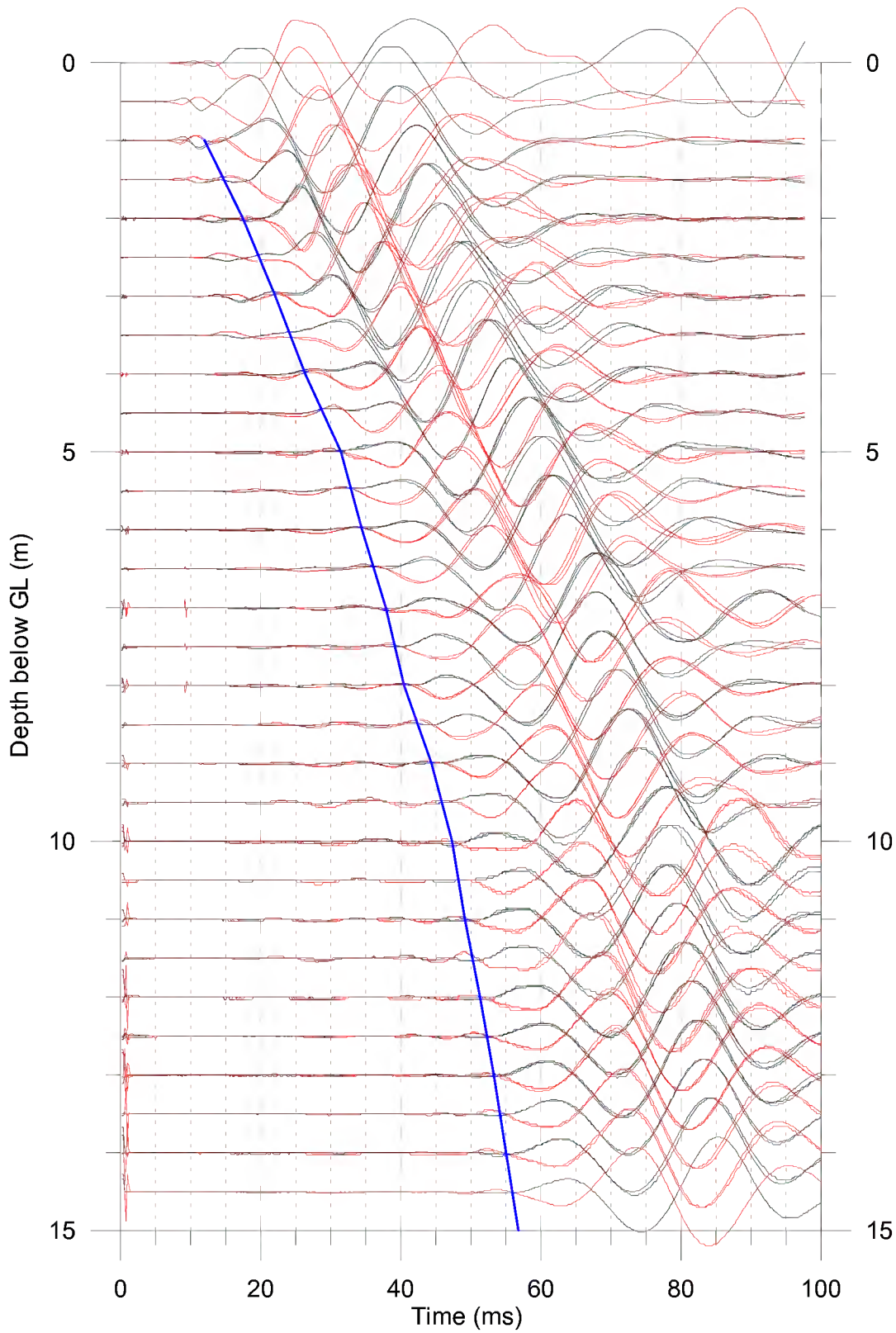


Figure B2: Shear Wave Time Histories, BH207

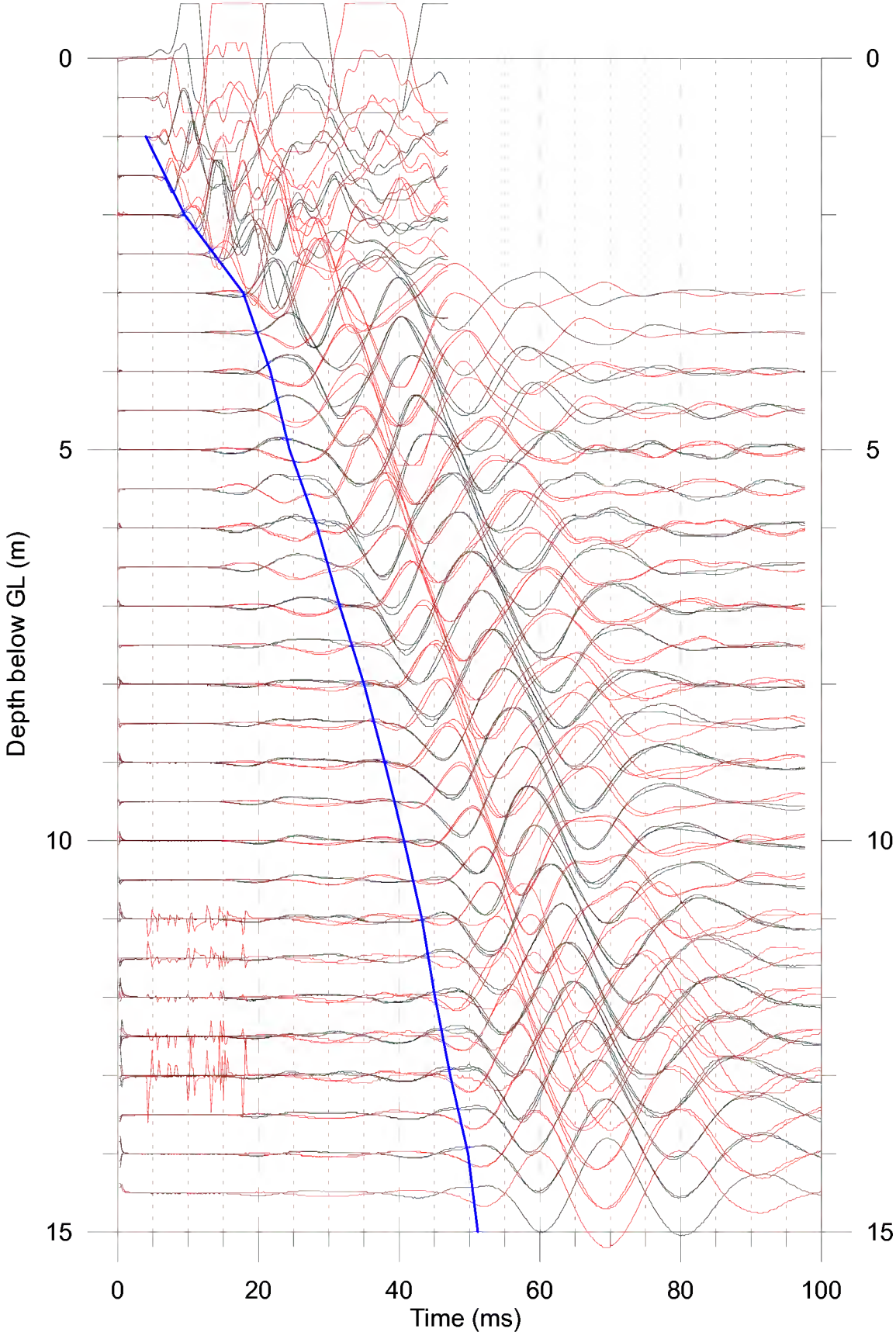




Figure B3: Compression Wave Time Histories, BH201

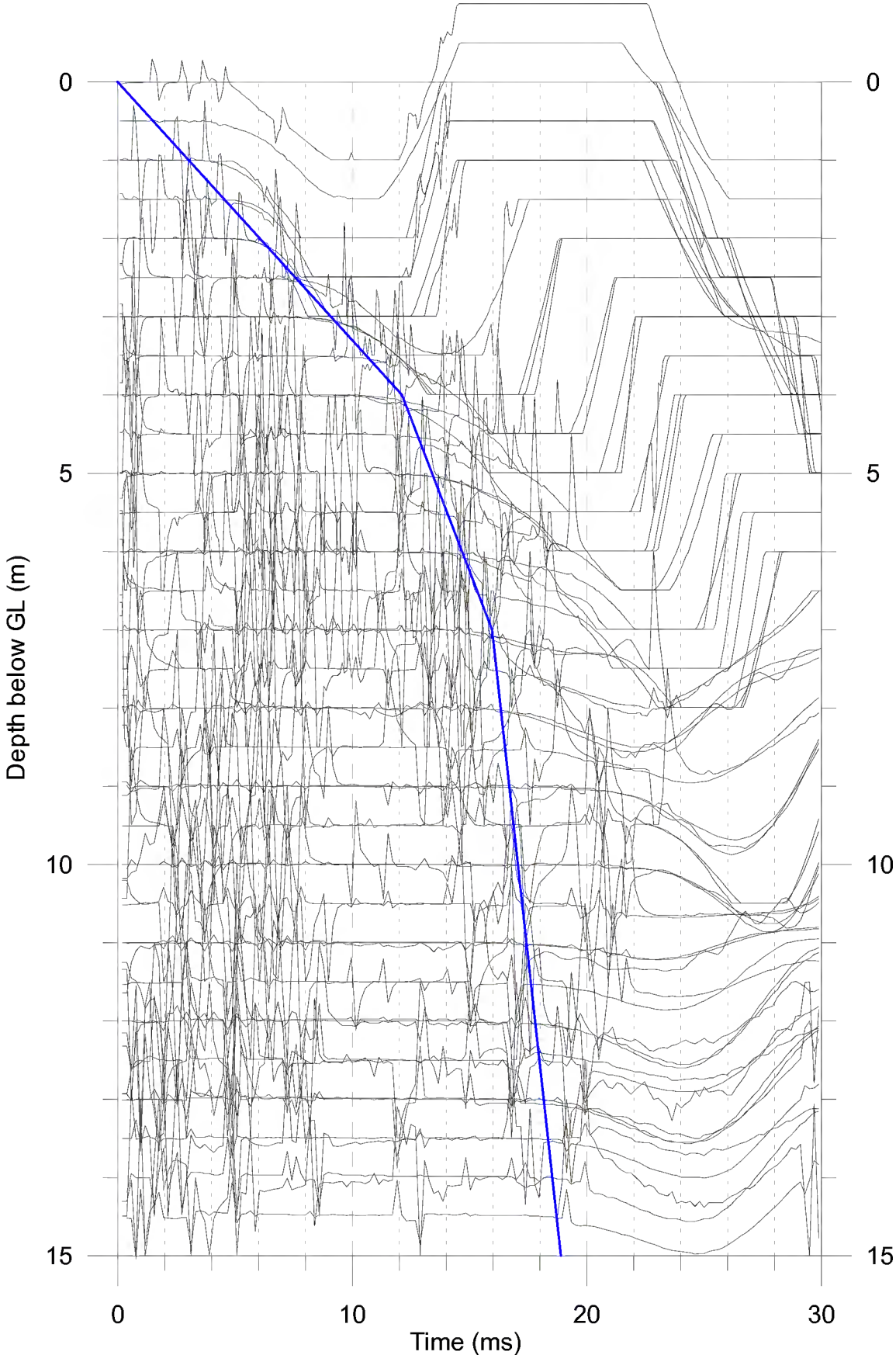
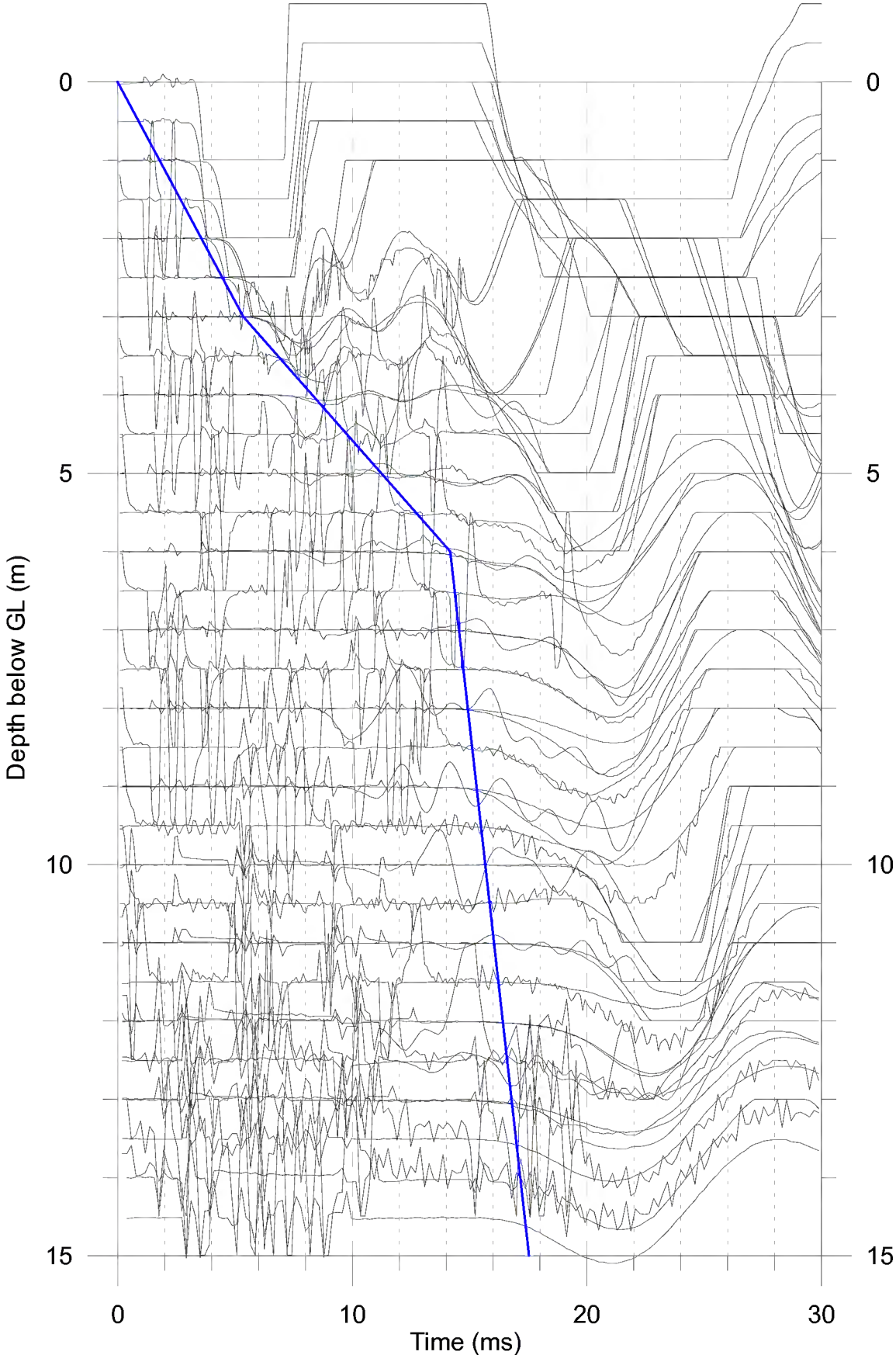


Figure B4: Compression Wave Time Histories, BH207

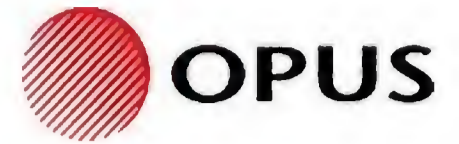


# **Appendix E**

## Laboratory test results



**PLASTICITY INDEX FOR SOILS  
TEST REPORT**



Project : **Blenheim Urban Growth Study**  
 Location : **Blenheim**  
 Client : **Opus Wellington**  
 Contractor : **N/A**  
 Sampled by : **CW Drilling & Investigation Ltd**  
 Date sampled : **See table**  
 Sampling method : **See table**  
 Sample source: **See table**  
 Sample condition : **As received**

Report No:	<b>522900/1052</b>
Sample No:	<b>See table</b>
Project no.	<b>5C2128.01</b>

Test Results						
Sample no:	<b>2-12/701</b>	<b>2-12/703</b>	-	-	-	-
Sample source:	<b>BH 101 5m SPT</b>	<b>BH 108 1m SPT</b>	-	-	-	-
Dates sampled :	<b>3.10.2012</b>	<b>10.10.2012</b>	-	-	-	-
Sample description	<b>Clayey SILT: with f-m sands, Blue/Grey</b>	<b>Sandy SILT: light grey</b>	-	-	-	-
Liquid Limit (LL):	<b>29 ± 1</b>	-	-	-	-	-
Cone Pen. Limit (CPL):	-	<b>26 ± 1</b>	-	-	-	-
Plastic Limit (PL):	<b>16 ± 1</b>	<b>non plastic</b>	-	-	-	-
Plasticity Index (PI):	<b>13 ± 2</b>	<b>N/A</b>	-	-	-	-
Natural Water Content (%) :	<b>24.1</b>	<b>22.2</b>	-	-	-	-
Fraction tested	<b>-0.425mm</b>	<b>-0.425mm</b>	-	-	-	-
Number of LL or CPL points	<b>4</b>	<b>4</b>	-	-	-	-

Test Methods	Notes
Liquid Limit	Alternative 0.01g accuracy balance used. NZS 4402:1986 requires the reporting of a range of values. History: Natural*
Plastic Limit	
Plasticity Index	
Cone Penetration Limit	

Date tested : **7-20.11.12**  
 Date reported : **21.11.12**

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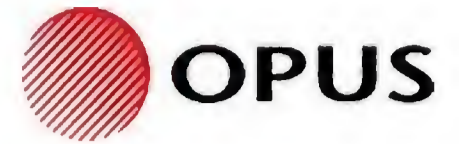
**IANZ Approved Signatory**

Designation : **Engineering Technician (DW Pollard)**  
 Date : **21.11.12**



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**PLASTICITY INDEX FOR SOILS  
TEST REPORT**



Project : **Blenheim Urban Growth Study Stage 2**  
 Location : **Blenheim**  
 Client : **Opus Wellington**  
 Contractor : **N/A**  
 Sampled by : **CW Drilling & Investigation Ltd**  
 Date sampled : **See table**  
 Sampling method : **See table**  
 Sample source: **See table**  
 Sample condition : **As received**

Report No:	522900/1056
Sample No:	See table
Project no.	5C2128.01

Test Results						
Sample no:	2-13/026^	2-13/028*	2-13/029*	2-13/030^	2-13/031*	2-13/032*
Sample source:	BH 205 8.0-8.45m	BH 208 2.0-2.45m	BH 209 7.0-7.45m	BH 211 3.0-3.45m	BH 212 7.0-7.45m	BH 213 3.0-3.45
Sample method:	SPT	SPT	SPT	SPT	SPT	SPT
Dates sampled :	7.12.2012	10.12.2012	11.12.2012	13.12.2012	12.12.2012	14.12.2012
Sample description	CLAY-SILT: with minor sand blue-grey, firm, wet	Clayey-SAND: dark grey, very soft to soft, moist	Silty CLAY: minor gravel, mottled dark brown and grey, firm, moist	Gravelly CLAY: with some silt, mottled orange and brown, firm, moist	Clayey SILT-SAND: with some gravel brown, soft, wet	Gravelly CLAY with some silt, mottled orange and brown, firm, wet
Liquid Limit (LL):	33 ± 1	-	24 ± 1	22 ± 1	26 ± 1	24 ± 1
Cone Pen. Limit (CPL):	-	24 ± 1	-	-	-	-
Plastic Limit (PL):	19 ± 1	non plastic	20 ± 1	16 ± 1	15 ± 1	17 ± 1
Plasticity Index (PI):	14 ± 2	N/A	4 ± 2	6 ± 2	11 ± 2	7 ± 1
Natural Water Content (%) :	24.8	24.4	20.6	12.9	19.2	26.0
Fraction tested	-0.425mm	Whole	-0.425mm	-0.425mm	-0.425mm	-0.425mm
Number of LL or CPL points	6	6	5	6	5	6

Test Methods	Notes
Liquid Limit	NZS 4402 : 1986, Test 2.2
Plastic Limit	NZS 4402 : 1986, Test 2.3
Plasticity Index	NZS 4402 : 1986, Test 2.4
Cone Penetration Limit	NZS 4402 : 1986, Test 2.5
	Alternative 0.01g accuracy balance used. NZS 4402:1986 requires the reporting of a range of values. History: Air dried* or Natural^

Date tested : **14.01-04.02.13**  
 Date reported : **4.02.13**

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**IANZ Approved Signatory**  
 Designation : **Engineering Technician (DW Pollard)**  
 Date : **4.02.13**



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CSF 2101 ( 13/09/2006 )

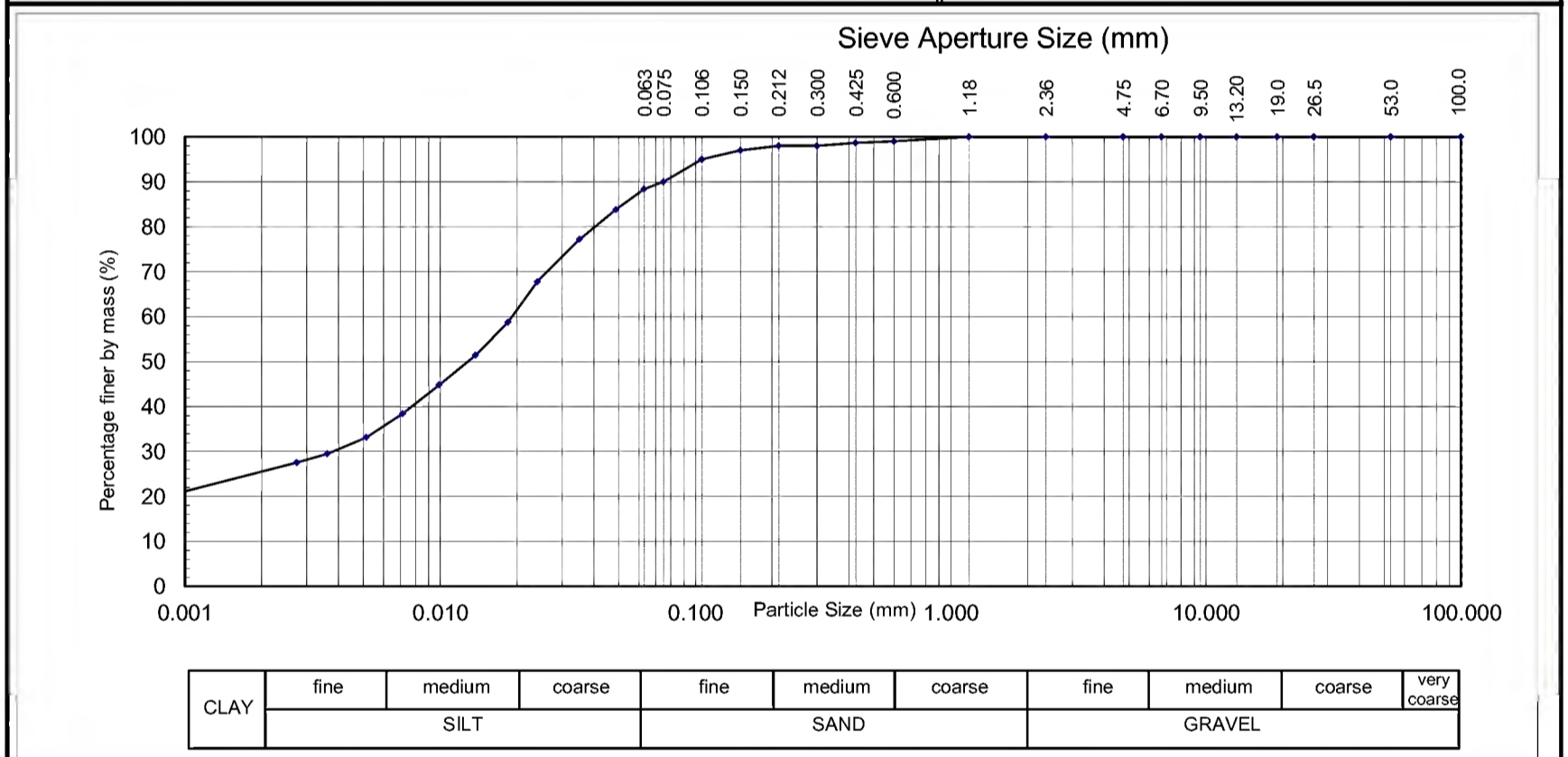
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **3.10.2012**  
 Sampling method: **SPT**  
 Sample source: **BH 101, 5m**  
 Sample description: **Clayey SILT: with f-m sands . Blue/Grey**  
 Sample condition: **As received**  
 Solid density: **2.70** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **24.1** % **whole**

Report No: **522900/1052**  
 Sample No: **2-12/701**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	98	0.049	84	0.0071	38
53.0	100	4.75	100	0.212	98	0.035	77	0.0051	33
26.5	100	2.36	100	0.150	97	0.024	68	0.0036	29
19.0	100	1.18	100	0.106	95	0.018	59	0.0027	28
13.20	100	0.600	99	0.075	90	0.014	51	0.0009	20
9.50	100	0.425	99	0.063	88	0.010	45		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Natural Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 8 - 13.11.12  
 Date Reported: 20.11.12

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Designation: Engineering Technician (DWPollard)  
 Date: 20.11.12



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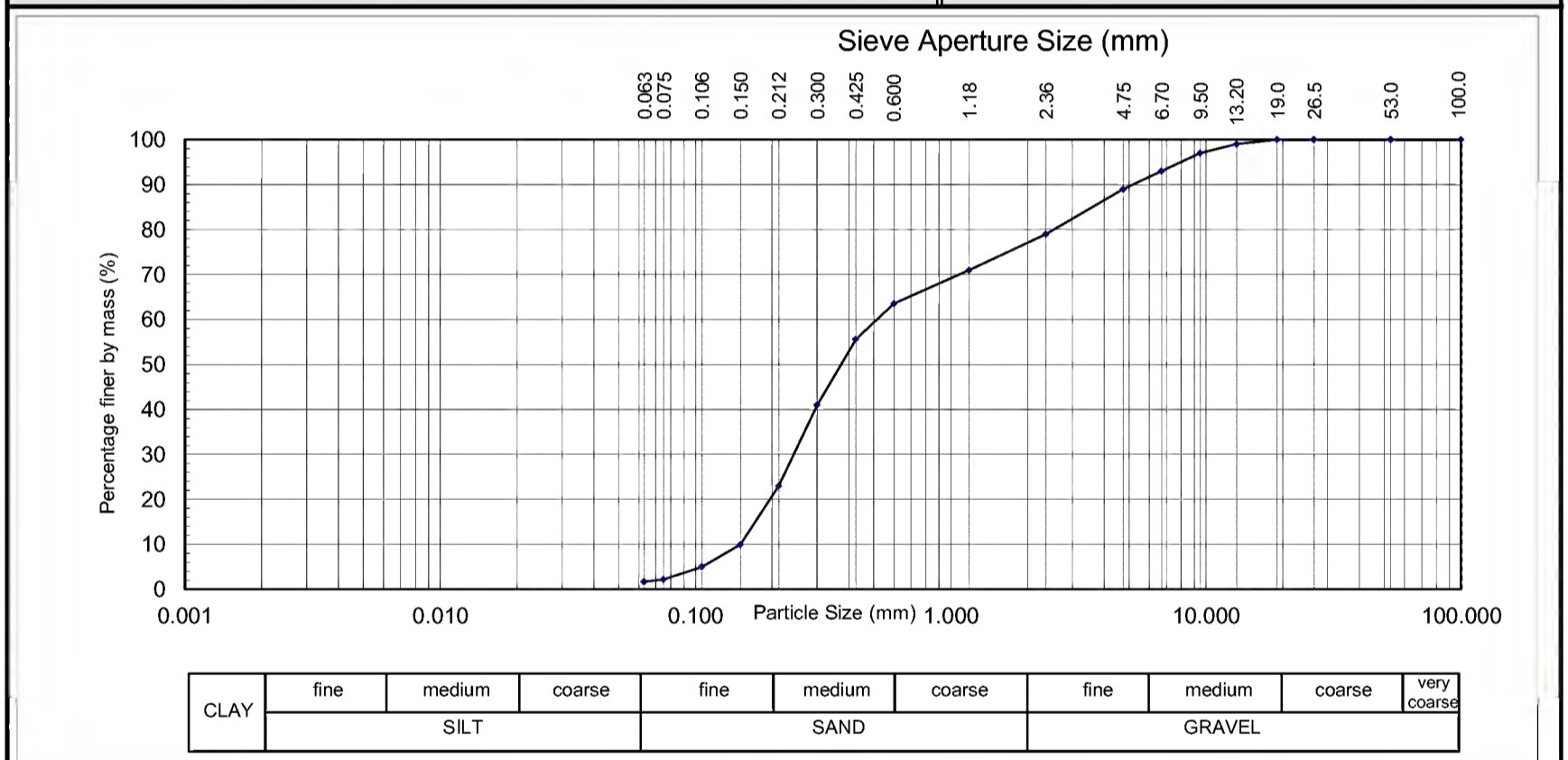
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **2.10.2012**  
 Sampling method: **Bulk Sample**  
 Sample source: **BH 102, 12.0-13.0m**  
 Sample description: **Gravelly SAND: f-c, with f-m gravels. Grey and brown**  
 Sample condition: **As received**  
 Solid density: **2.65 t/m<sup>3</sup> Assumed**  
 Water content as rec'd: **18.5 % whole**

Report No: **522900/1052**  
 Sample No: **2-12/702**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis (not performed)			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	93	0.300	41				
53.0	100	4.75	89	0.212	23				
26.5	100	2.36	79	0.150	10				
19.0	100	1.18	71	0.106	5				
13.20	99	0.600	64	0.075	2				
9.50	97	0.425	56	0.063	2				



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve)	History: Air dried Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 8 - 12.11.12  
 Date Reported: 20.11.12

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 Date: 20.11.12



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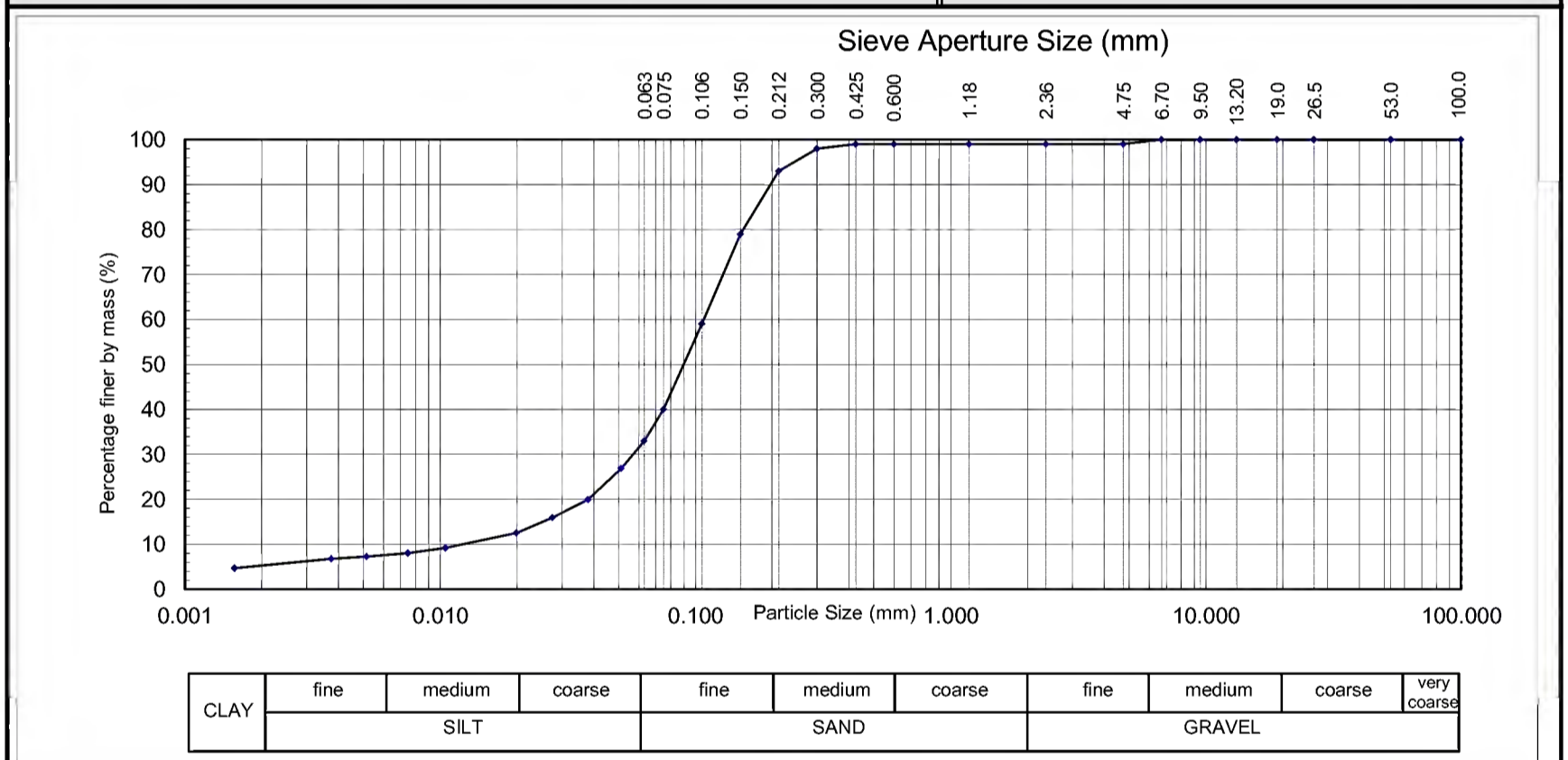
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **10.10.2012**  
 Sampling method: **Push Tube**  
 Sample source: **BH 112, 2.5m**  
 Sample description: **Silty SAND: f-m, with silt. Grey**  
 Sample condition: **As received**  
 Solid density: **2.65** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **25.9** % **whole**

Report No: **522900/1052**  
 Sample No: **2-12/704**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	98	0.051	27	0.0052	7
53.0	100	4.75	99	0.212	93	0.038	20	0.0037	7
26.5	100	2.36	99	0.150	79	0.028	16	0.0016	5
19.0	100	1.18	99	0.106	59	0.020	13		
13.20	100	0.600	99	0.075	40	0.010	9		
9.50	100	0.425	99	0.063	33	0.007	8		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Air dried Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 13-19.11.2012  
 Date Reported: 20.11.2012

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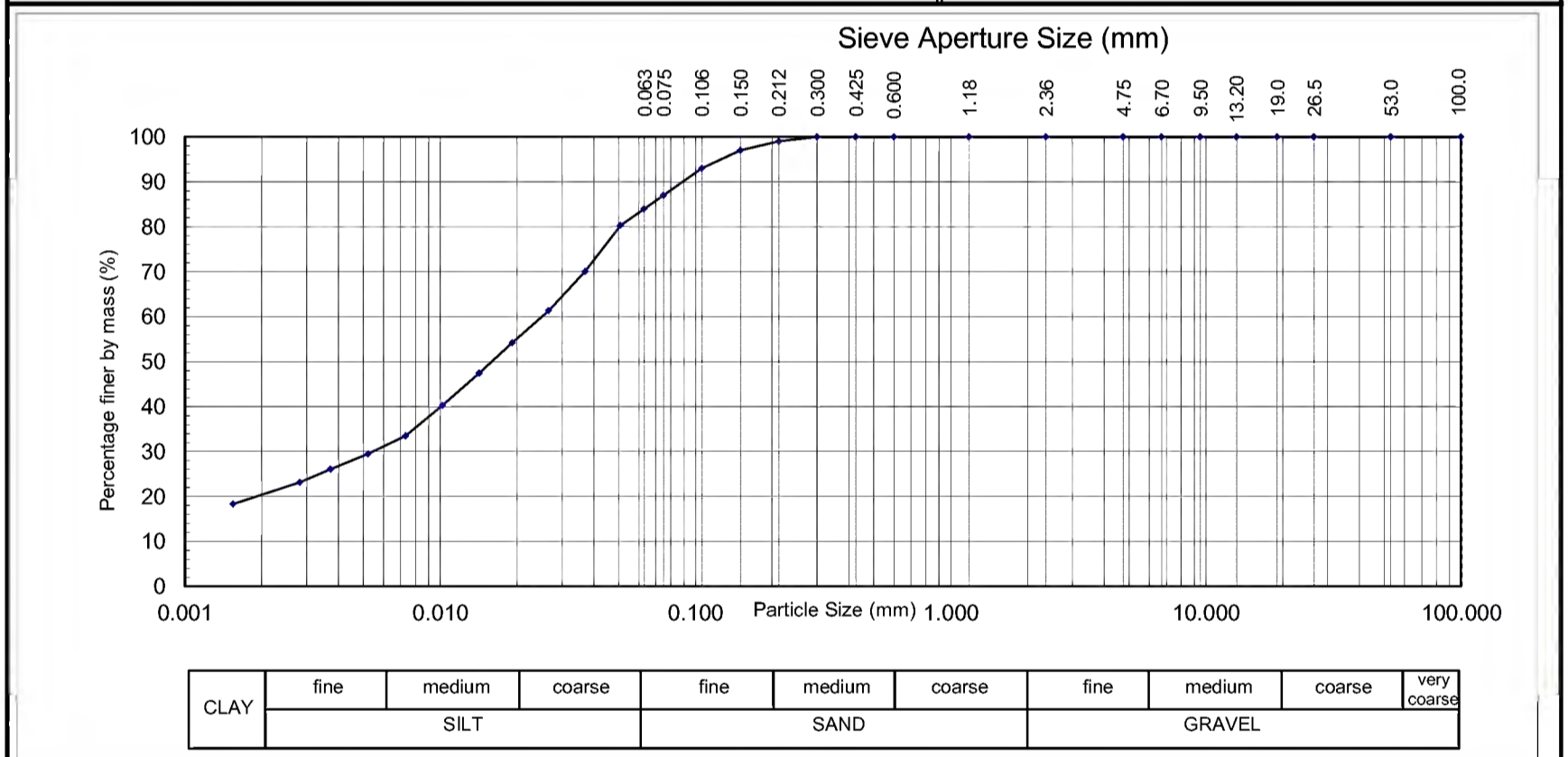
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **18.10.2012**  
 Sampling method: **Bulk Sample**  
 Sample source: **BH 115, 1.0m**  
 Sample description: **SILT: f-c, with sand and clay. Orange brown / blue grey**  
 Sample condition: **As received**  
 Solid density: **2.65 t/m<sup>3</sup> Assumed**  
 Water content as rec'd: **21.4 % whole**

Report No: **522900/1052**  
 Sample No: **2-12/705**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	100	0.051	80	0.0073	34
53.0	100	4.75	100	0.212	99	0.037	70	0.0052	30
26.5	100	2.36	100	0.150	97	0.027	61	0.0037	26
19.0	100	1.18	100	0.106	93	0.019	54	0.0028	23
13.20	100	0.600	100	0.075	87	0.014	47	0.0015	18
9.50	100	0.425	100	0.063	84	0.010	40		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Natural Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 8-16.11.2012  
 Date Reported: 20.11.2012

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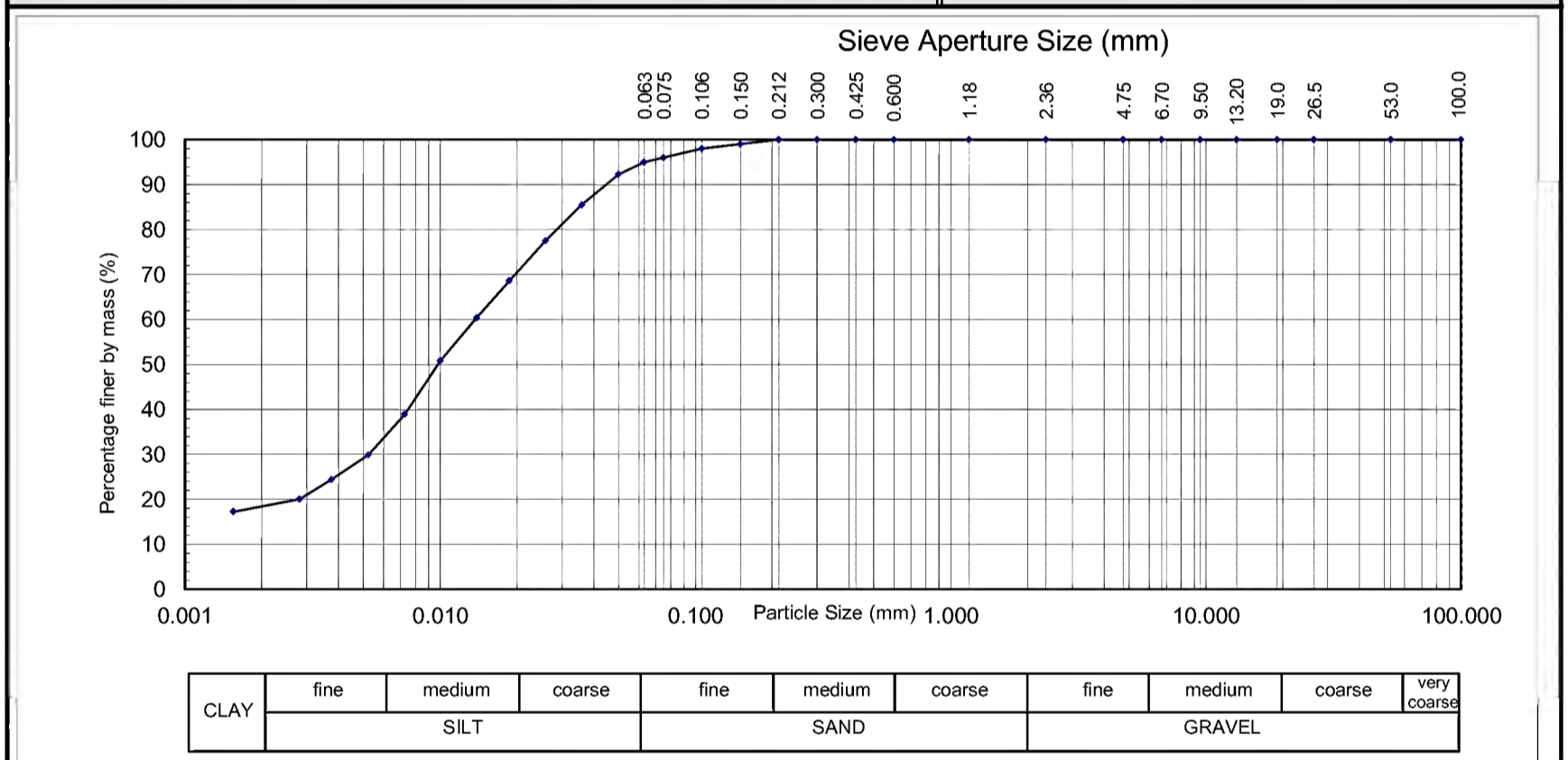
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **12.10.2012**  
 Sampling method: **Bulk Sample**  
 Sample source: **BH 116, 2-3m**  
 Sample description: **clayey SILT: f-C, grey**  
 Sample condition: **As received**  
 Solid density: **2.65** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **36.0** % **whole**

Report No: **522900/1052**  
 Sample No: **2-12/706**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	100	0.050	92	0.0073	39
53.0	100	4.75	100	0.212	100	0.036	85	0.0052	30
26.5	100	2.36	100	0.150	99	0.026	78	0.0037	24
19.0	100	1.18	100	0.106	98	0.019	69	0.0028	20
13.20	100	0.600	100	0.075	96	0.014	60	0.0015	17
9.50	100	0.425	100	0.063	95				



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Natural Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 8-16.11.2012  
 Date Reported: 20.11.2012

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 Date: 20.11.2012



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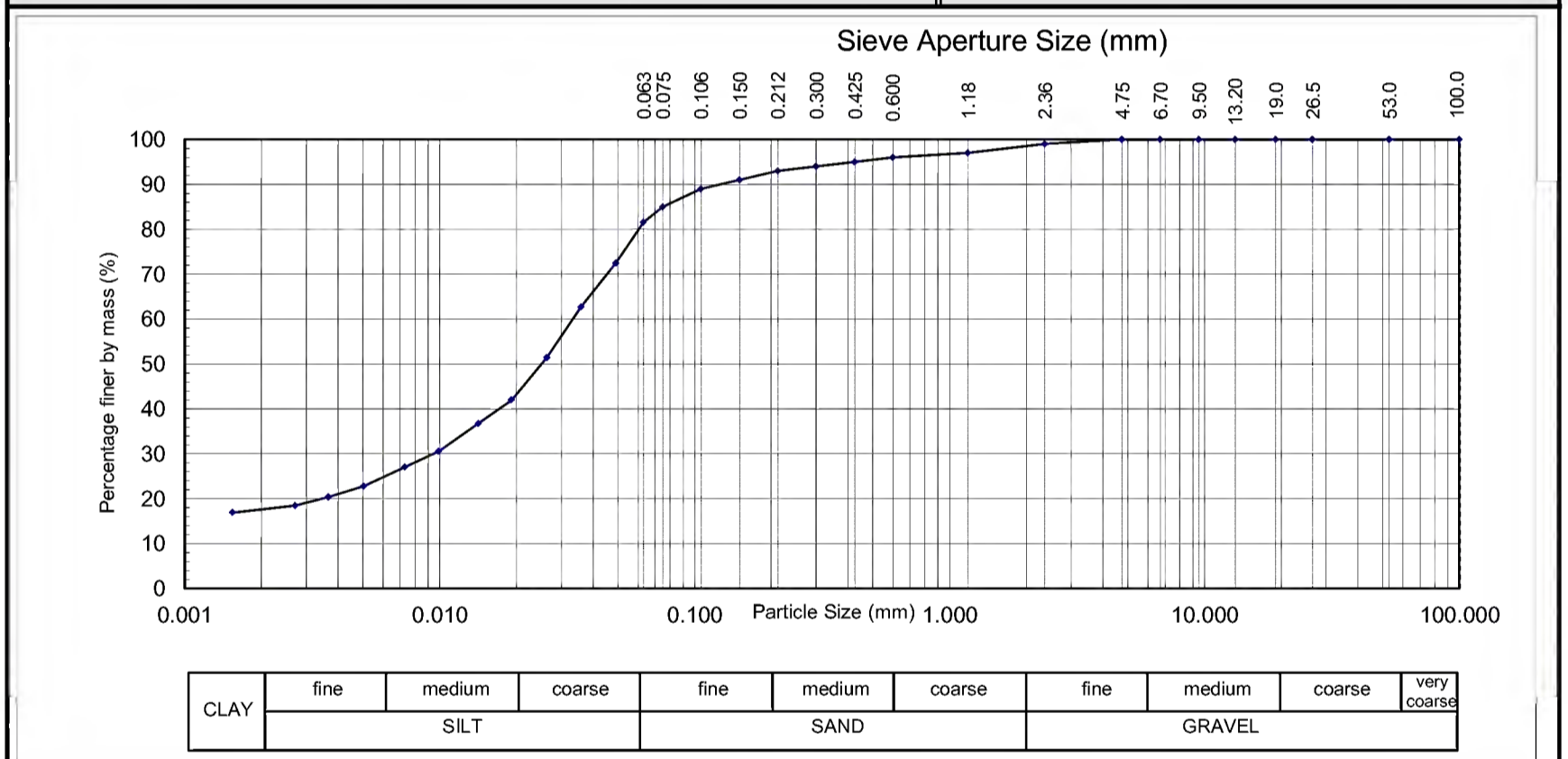
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **17.10.2012**  
 Sampling method: **SPT**  
 Sample source: **BH 117, 12m**  
 Sample description: **Clayey SILT: f-c, some sand, grey with blue green**  
 Sample condition: **As received**  
 Solid density: **2.65 t/m<sup>3</sup> Assumed**  
 Water content as rec'd: **23.9 % whole**

Report No: **522900/1052**  
 Sample No: **2-12/707**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	94	0.049	72	0.0073	27
53.0	100	4.75	100	0.212	93	0.036	63	0.0050	23
26.5	100	2.36	99	0.150	91	0.026	51	0.0037	20
19.0	100	1.18	97	0.106	89	0.019	42	0.0027	18
13.20	100	0.600	96	0.075	85	0.014	37	0.0015	17
9.50	100	0.425	95	0.063	82	0.010	31		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Air dried Uncalibrated Sieve sizes: 0.212 & 0.106mm

Date Tested: 8-16.11.2012  
 Date Reported: 20.11.12

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 Date: 20.11.12



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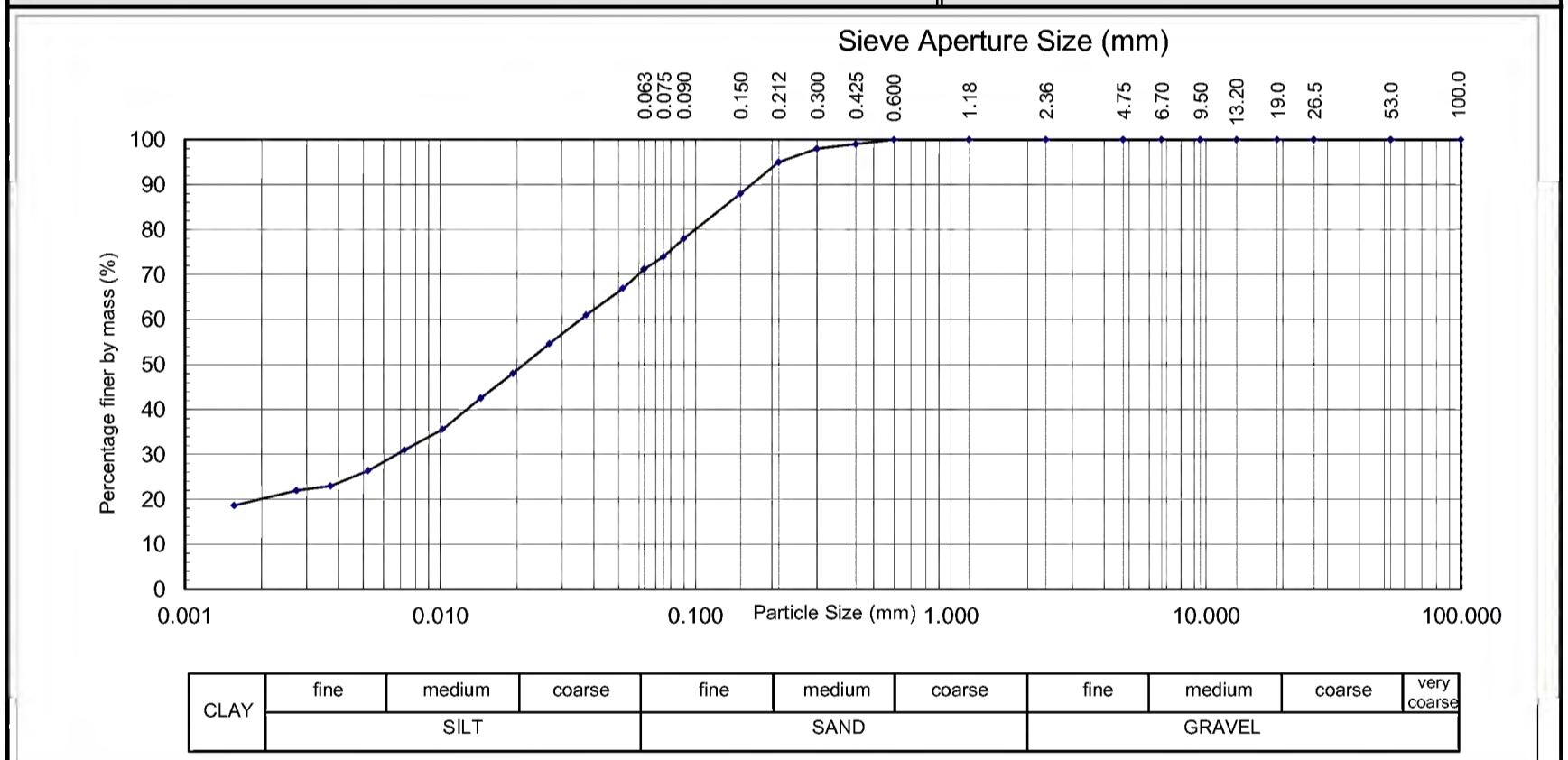
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **6.12.2012**  
 Sampling method: **SPT**  
 Sample source: **BH 203, 8.0-8.45m**  
 Sample description: **Clayey SILT-SAND: blue-grey, firm, wet**  
 Sample condition: **As received**  
 Solid density: **2.60** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **20.0** % **whole**

Report No: **522900/1056**  
 Sample No: **2-13/025**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	98	0.052	67	0.0073	31
53.0	100	4.75	100	0.212	95	0.037	61	0.0052	26
26.5	100	2.36	100	0.150	88	0.027	55	0.0037	23
19.0	100	1.18	100	0.090	78	0.019	48	0.0027	22
13.20	100	0.600	100	0.075	74	0.014	43	0.0016	19
9.50	100	0.425	99	0.063	71	0.010	36		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve)	History: Natural
Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	Uncalibrated Sieve sizes: 0.212 & 0.090mm

Date Tested: 14-22.01.2013  
 Date Reported: 5.02.2012

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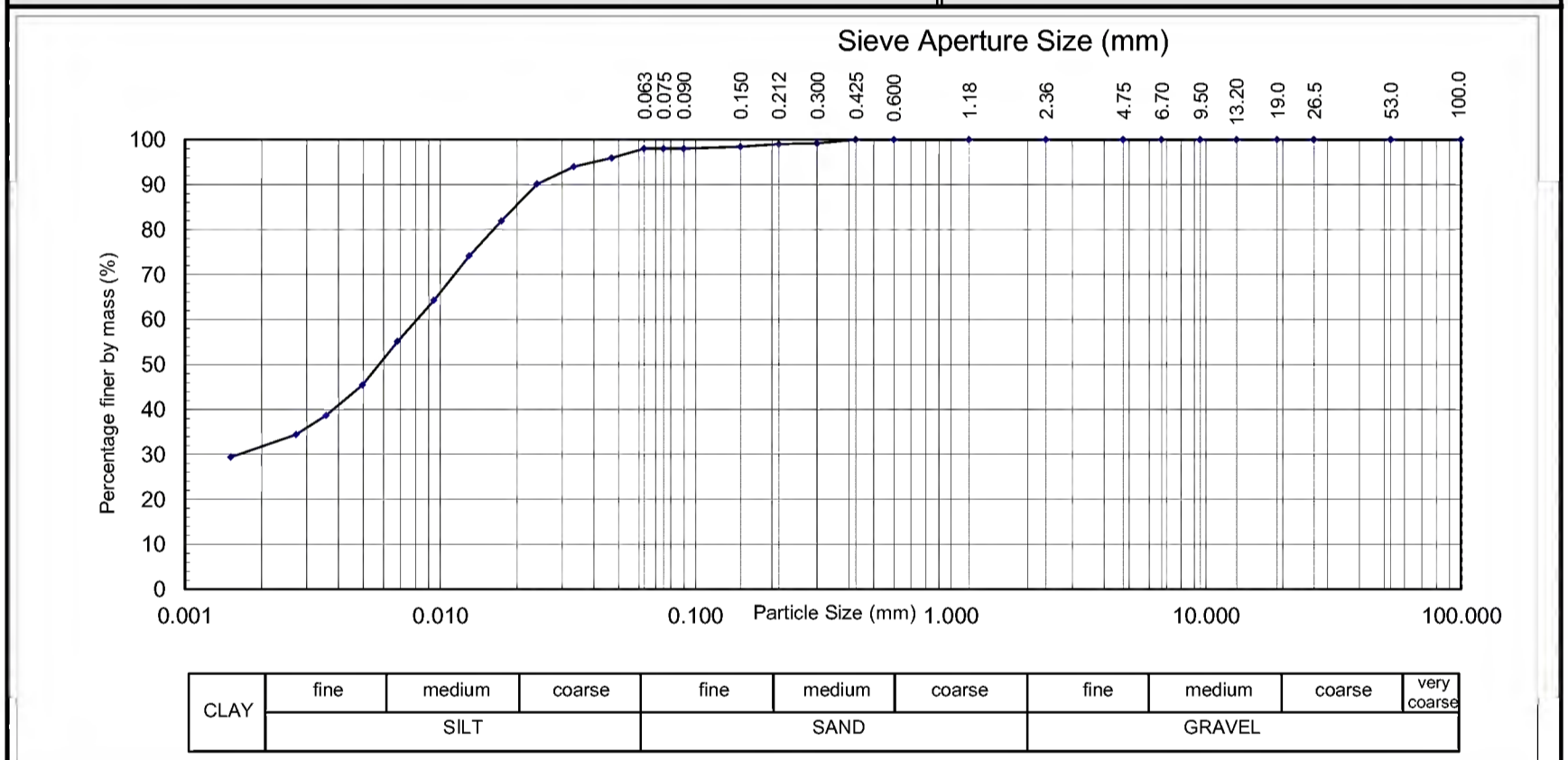
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **7.12.2012**  
 Sampling method: **SPT**  
 Sample source: **BH 205, 8.0-8.45m**  
 Sample description: **CLAY-SILT: with minor sand blue-grey, firm, wet**  
 Sample condition: **As received**  
 Solid density: **2.60** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **24.8** % **whole**

Report No: **522900/1056**  
 Sample No: **2-13/026**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	100	0.300	99	0.047	96	0.0068	55
53.0	100	4.75	100	0.212	99	0.033	94	0.0050	45
26.5	100	2.36	100	0.150	98	0.024	90	0.0036	39
19.0	100	1.18	100	0.090	98	0.017	82	0.0027	34
13.20	100	0.600	100	0.075	98	0.013	74	0.0015	29
9.50	100	0.425	100	0.063	98	0.009	64		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Natural Uncalibrated Sieve sizes: 0.212 & 0.090mm

Date Tested: 14-22.01.2013  
 Date Reported: 5.02.2013

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 Date: 5.02.2013



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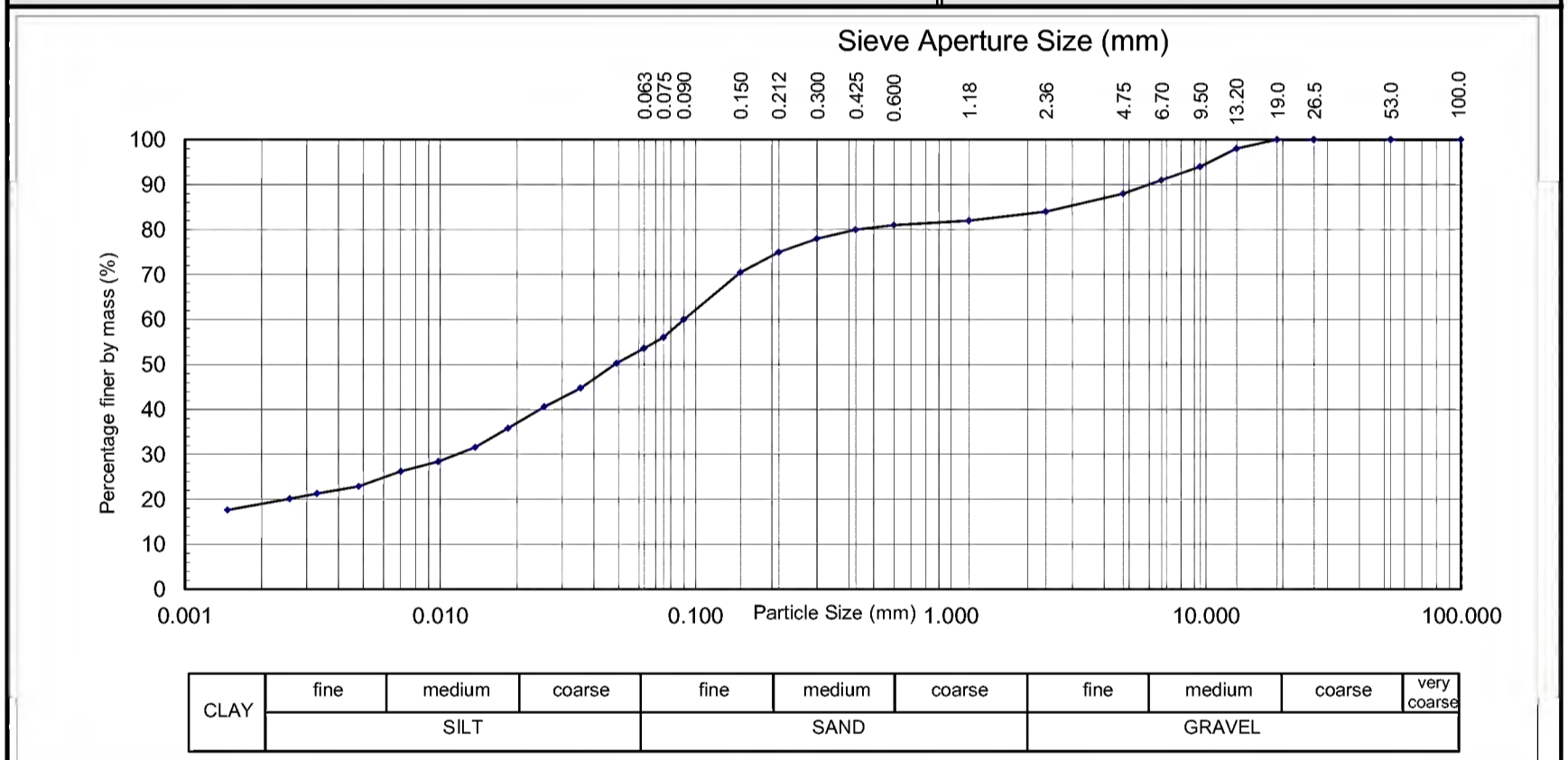
**PARTICLE SIZE ANALYSIS  
TEST REPORT**



Project: **Blenheim Urban Growth Study**  
 Location: **Blenheim**  
 Client: **Opus Wellington**  
 Contractor: **N/A**  
 Sampled by: **CW Drilling & Investigation Ltd**  
 Date sampled: **12.12.2012**  
 Sampling method: **SPT**  
 Sample source: **BH 212, 7.0-7.45m**  
 Sample description: **Clayey SILT-SAND: with some gravel, brown**  
 Sample condition: **As received**  
 Solid density: **2.70** t/m<sup>3</sup> **Assumed**  
 Water content as rec'd: **19.2** % **whole**

Report No: **522900/1056**  
 Sample No: **2-13/031**  
 Project no: **5C2128.01**

Sieve Analysis						Hydrometer Analysis			
Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Sieve Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)	Particle Size (mm)	Passing (%)
100.0	100	6.70	91	0.300	78	0.049	50	0.0070	26
53.0	100	4.75	88	0.212	75	0.036	45	0.0048	23
26.5	100	2.36	84	0.150	71	0.026	41	0.0033	21
19.0	100	1.18	82	0.090	60	0.018	36	0.0026	20
13.20	98	0.600	81	0.075	56	0.014	32	0.0015	18
9.50	94	0.425	80	0.063	54	0.010	28		



Test Methods	Notes
Particle Size Analysis: NZS 4402 1986 Test 2.8.1 (Wet Sieve) Particle Size Analysis: NZS 4402 1986 Test 2.8.4 (Hydrometer)	History: Air dried Uncalibrated Sieve sizes: 0.212 & 0.090mm

Date Tested: 14-22.01.2013  
 Date Reported: 5.02.2013

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 Date: 5.02.2013



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