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LETTER REPORT

Geotechnical Investigation
Proposed Battery Point Cofferdam
Muggah Creek
Sydney, Nova Scotia

CBCL LIMITED

PROJECT NO. 1003810

**Jacques
Whitford**

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Project No. 1003810

December 15, 2005

Mr. Dan MacDonald, P.Eng.
CBCL Limited
50 Dorchester Street
Sydney, Nova Scotia B1P 6H4

Dear Mr. MacDonald:

**Re: Geotechnical Investigation, Proposed Battery Point Cofferdam
Muggah Creek, Sydney, Nova Scotia**

Jacques Whitford Limited, acting at the request of CBCL Limited, and in accordance with our proposal dated 8 July 2005, has completed a subsurface investigation for the proposed cofferdam to be constructed across the mouth of Muggah Creek, from Battery Point on the south side to SYSCO lands on the north side. The purpose of the work was to establish the stratigraphy and physical properties of the overburden and bedrock.

This letter report has been prepared specifically and solely for the project which is described above: it contains all our findings from the field program and related laboratory testing.

The site at the mouth of Muggah Creek is in generally shallow water, less than 1m deep at the Battery Point shore at low tide, and deepening to about 3 m near the SYSCO shore. Previous boreholes indicate surficial loose sand and silt sediments contaminated by hydrocarbons, underlain by a thin till stratum and sedimentary bedrock of the Morien Group.

FIELD PROCEDURES

The field work was carried out during the period 30 August 2005 to 2 September 2005. Nine boreholes and 5 dynamic cone penetration tests were completed using a CME55 drill mounted on a 10m by 10m wood and steel barge, operated by Boart Longyear. The locations of the boreholes and cone tests are shown on Drawing No 1003810-1, at the back of this report.

The boreholes were advanced using N casing. Samples in overburden were obtained with a 50mm OD split spoon sampler using the Standard Penetration Test procedure. Samples of the surficial very loose deposits were attempted with a 76mm ID thin wall Shelby tube push sampler. Bedrock was proven by core drilling to a penetration of at least 1.5 m using NQ series diamond drilling equipment. Detailed logs of the soil and bedrock encountered, and the sampling and testing carried out, are given on the Borehole records in the Appendix. Dynamic cone penetration tests were completed as an aid to interpreting the stratigraphy between boreholes. The tests were conducted using a solid cone, having a base diameter of 50 mm and an apex angle of 60 degrees, attached to the end of standard A drill rods, and driven with the same energy as the Standard

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Penetration Test. The tests were terminated at practical refusal, defined as 50 blows for 100 mm penetration.

All soil and bedrock samples were taken to our Sydney laboratory for testing and further classification. Samples remaining after testing will be stored until 30 April 2006, at which time they will be disposed of unless instruction to the contrary are received.

Coordinates of borehole and cone penetration test locations were provided by CBCL Limited. Locations were established in the field by JW personnel using a Trimble Geoplotter GPS unit, which has a nominal accuracy of +/- 1m. All locations are referenced to the ATS77 MTM coordinate system. Elevations are based on Chart Datum (LNT), and were established by using tide tables to correct actual water depths at the times of measurement.

SOIL AND BEDROCK CONDITIONS

The strata encountered in the boreholes are described in detail on the appended Boreholes Records and in this section. Findings from the Dynamic Cone Penetration Tests are provided in the following table.

Table 1 Summary of Dynamic Cone Penetration Tests

Test	DPT1	DPT 2	DPT 3	DPT 4	DPT 5
Harbour Bottom el. (m)	-0.55	-1.05	-1.36	-2.20	-3.46
Depth Interval (m)	Blows/0.3m				
0-0.3	3	4	0	0	0
0.3-0.6	36	22	22	0	0
0.6-0.9	40/0.15m*	50/0.1m*	50/0*	24	0
0.9-1.2				50/0.25**	6
1.2-1.35					50/0.25**
Inferred material at end of test	Till	Till	Bedrock	Till	Bedrock

* Practical refusal. ** Test stopped because of deteriorating weather conditions.

MARINE SEDIMENT

All boreholes encountered a surficial layer of very loose black silt and sand-sized particles containing organic materials. This material provided essentially no resistance to advancing the split spoon sampler or the dynamic cone, and was difficult to retain in Shelby tube samples.

The particles are a mixture of conventional mineral soils, coal and coke. The samples were characterized by vegetative material, hydrocarbon and sewage odours, some shells, and an oily sheen.

The grain size analysis of a representative sample from mid-channel (BH6,SA1) is shown in Figure 1, Appendix A. The sample contained about 15 percent fine gravel, 26 percent sand, and 59 percent silt and clay sizes. Analysis of a representative sample from the south side of the creek mouth (BH2 SA1) is also

shown in Figure 1. The sample contained about 30 percent gravel, 45 percent sand, 20 percent silt, and about 5 percent clay sizes.

Grain size analysis by the hydrometer method was not applicable to most samples because of the organic content and the lightweight coal and coke particles. For two samples, simple jar tests were performed to observe the rate at which particles would settle out of suspension. 100 gram subsamples of BH8 SA1 and BH9 SA1 were each mixed with 500 grams of Sydney harbour water in a jar, agitated, and left to stand and settle, and the following were noted:

- Within an hour, some particles settled but water still very murky
- Gradual clearing over the next 3-4 hours
- After 24 hours, a marked improvement but the supernatant was still cloudy, and there were floating particles.

After 24 hours the supernatant was decanted and the total suspended solids (TSS) determined, as follows:

- BH8SA1 TSS = 19,000 mg/L
- BH9SA1 TSS = 3,100 mg/L .

For purposes of design, the following parameters, based on the literature and local experience, are recommended:

Total unit weight	15 kN/m ³
Effective friction angle	20 degrees
Effective cohesion	0 kPa

TILL

All boreholes encountered a stratum of brown to grey silty sand and gravel, which is classified as glacial till. In BH1, BH3, cobbles and boulders were inferred from drill progress. In BH7 and BH9, siltstone fragments, which may be surficial bedrock incorporated into the till, were identified. The thickness varied randomly from less than 0.1m at BH6 to about 2m at BH4. Standard penetration test N values ranged from 11 to 62 blows/0.3m, with an average of 33 blows/0.3m. Thus the compactness (relative density) is inferred to be dense. As noted in Table 1, most of the Dynamic Penetration Tests are inferred to have met refusal in the till.

Water contents varied from 9.1 percent to 15.8 percent, averaging 12.4 percent. Grain size analyses on three representative samples of the minus 38mm fraction of the till showed approximately equal proportions of gravel, sand, and fines (silt and clay). Particle size analyses are shown in Figure 2, Appendix A.

For purposes of design, the following parameters, based on the literature and local experience, are recommended:

Total unit weight	21 kN/m ³
Effective friction angle	35 degrees
Effective cohesion	0 kPa

BEDROCK

All boreholes terminated in bedrock, which at this location is predominantly grey to reddish brown siltstone, with minor sandstone in BH6. The rock is fractured, with joint surfaces commonly slightly weathered with iron staining. Occasional mud seams are reported only in BH8. Rock Quality Designation values (RQDs) vary from 0 to 100 percent, indicating a wide range from very poor to excellent rock quality. However, most RQDs lie between 20 and 55 percent, with an average of 35 percent: on this basis, the rock is classified as severely fractured.

DISCUSSION

This report was originally written as a factual description of the conditions encountered in the field program. The following comments address questions raised by CBCL limited related to design of a proposed SSP wall intended to define the channel opening.

Design of a tied back SSP wall would require significant pile toe resistance. Since bedrock is shallow penetration into the bedrock would be necessary. This is very difficult to predict due to the highly variable bedrock strength and quality. We estimate that penetration would be less than 0.5 metres in relatively weak fractured rock with the maximum practical driving energy. In this case the passive toe resistance would be calculated as if in a granular soil with an internal friction angle of 40 degrees. Due to the variable nature of the rock pile penetration may not be possible in some cases.

If toe pins or steel sheet piles with alternate king piles (H sections) are considered we assume that the toe pins or the H sections would be drilled into place. In this case design of passive resistance can also be carried out using soil mechanics methods. The present investigation did not include rock strength testing. However, as an approximation for the strength of the local bedrock we referred to test results from the nearby Battery Point sewer outfall project. For preliminary design the equivalent internal friction angle and effective shear strength values to calculate passive resistance of the bedrock would be 20 degrees and 150 kPa respectively.

An alternate design method to tied back sheet pile walls would be circular sheet pile cells which could be self stabilizing and would not rely on toe pressure.

Mr. Dan MacDonald, P.Eng.

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December 15, 2005

CLOSING COMMENTS

This report has been written for the sole benefit of CBCL Limited. The report may not be used by any other person or entity without the express written consent of Jacques Whitford Limited and CBCL Limited.

Any use which a third party makes of this report, or any reliance on decisions made based on it, are the responsibility of such third parties. Jacques Whitford Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff, in accordance with generally accepted engineering practices current at the time the work was performed.

The conclusions presented in this report represent the best technical judgement of JW based on the data obtained from the work. Due to the nature of the study, Jacques Whitford Limited cannot warrant against undiscovered environmental liabilities.

A soils investigation is a random sampling of a site. The subsurface conditions at borehole locations can rarely be determined beyond question, nor can the continuity of conditions inferred between boreholes be guaranteed. We trust that any design and specifications relying on the information presented will recognize this.

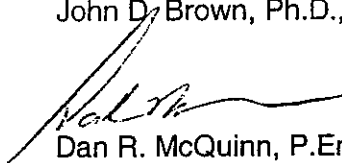
If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions and recommendations provided herein.

This report was written by John D. Brown and reviewed by S. Greg MacNeill, P.Eng., with additional discussion by Dan R. McQuinn, P.Eng. We are available at your convenience to discuss the contents of the report or any other geotechnical aspects of the project.

Respectfully submitted,

JACQUES WHITFORD LIMITED

John D. Brown, Ph.D., P.Eng.



Dan R. McQuinn, P.Eng.

Attachments

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APPENDIX A

Symbols and Terms Used on Borehole and Test Pit Records
Grain Size Analysis

Borehole Records, BH1 and BH9

Drawing No. 1003810-1, Borehole and DPT Plan and Stratigraphic Section



SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

- Topsoil* - mixture of soil and humus capable of supporting good vegetative growth
- Peat* - fibrous aggregate of visible and invisible fragments of decayed organic matter
- Till* - unstratified glacial deposit which may range from clay to boulders
- Fill* - any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

- Desiccated* - having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
- Fissured* - having cracks, and hence a blocky structure
- Varved* - composed of regular alternating layers of silt and clay
- Stratified* - composed of alternating successions of different soil types, e.g. silt and sand
- Layer* - >75 mm
- Seam* - 2 mm to 75 mm
- Parting* - < 2 mm
- Well Graded* - having wide range in grain sizes and substantial amounts of all intermediate particle sizes
- Uniformly Graded* - predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

- Trace, or occasional* Less than 10%
- Some* 10-20%

The standard terminology to describe cohesionless soils includes the compactness (formerly "relative density"), as determined by laboratory test or by the Standard Penetration Test 'N' - value.

Relative Density	'N' Value	Compactness %
<i>Very Loose</i>	< 4	< 15
<i>Loose</i>	4-10	15-35
<i>Compact</i>	10-30	35-65
<i>Dense</i>	30-50	65-85
<i>Very Dense</i>	> 50	> 85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.



Consistency	Undrained Shear Strength		'N' Value
	kips/sq. ft.	kPa	
<i>Very Soft</i>	<0.25	< 12.5	<2
<i>Soft</i>	0.25-0.5	12.5-25	2-4
<i>Firm</i>	0.5-1.0	25-50	4-8
<i>Stiff</i>	1.0-2.0	50-100	8-15
<i>Very Stiff</i>	2.0-4.0	100-200	15-30
<i>Hard</i>	> 4.0	> 200	> 30

ROCK DESCRIPTION

Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on NW core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from *in situ* fractures.

RQD	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000-6000	<i>Very Thick</i>	<i>Very Wide</i>
600-2000	<i>Thick</i>	<i>Wide</i>
200-600	<i>Medium</i>	<i>Moderate</i>
60-200	<i>Thin</i>	<i>Close</i>
20-60	<i>Very Thin</i>	<i>Very Close</i>
<20	<i>Laminated</i>	<i>Extremely Close</i>
<6	<i>Thinly Laminated</i>	

Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Low</i>	1-25
<i>Low</i>	25-50
<i>Medium</i>	50-100
<i>High</i>	100-200
<i>Very High</i>	> 200

Terminology describing weathering:

<i>Slight</i>	-	Weathering limited to the surface of major discontinuities. Typically iron stained.
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Moderate

-

Weathering extends throughout rock mass. Rock is not friable.

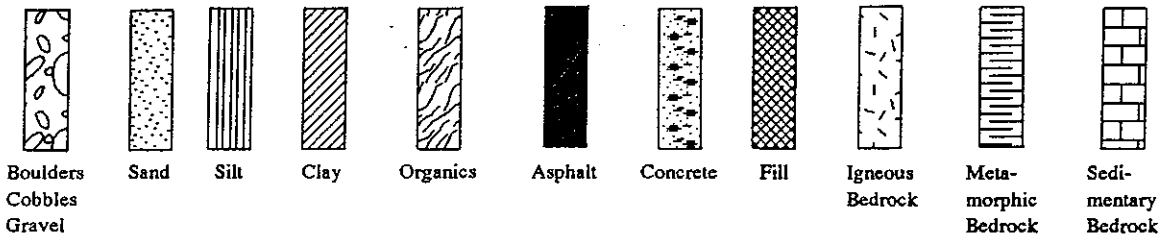
High

-

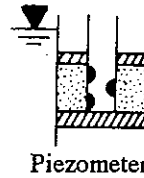
Weathering extends throughout rock mass. Rock is friable.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT



SAMPLE TYPE

SS Split spoon sample (obtained by performing the Standard Penetration Test)
 ST Shelby tube or thin wall tube
 PS Piston sample

BS Bulk sample
 WS Wash sample
 HQ, NQ, BQ, etc. Rock core samples obtained with the use of standard size diamond drilling bits.

N - VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75).

OTHER TESTS

S Sieve analysis
 G_s Specific gravity of soil particles
 k Permeability (cm/sec)
 Single packer permeability test; test interval from depth shown to bottom of borehole
 Double packer permeability test; test interval as indicated
 Falling head permeability test using casing
 Falling head permeability test using well point or piezometer

H Hydrometer analysis
 γ Unit weight
 C Consolidation
 CD Consolidated drained triaxial
 CU Consolidated undrained triaxial with pore pressure measurements
 UU Unconsolidated undrained triaxial
 DS Direct shear
 Q_u Unconfined compression
 I_p Point Load Index (I_p on Borehole Record equals I_p(50); the index corrected to a reference diameter of 50 mm)



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BOREHOLE RECORD

NORTHING: 5113116.5

EASTING: 4600176.4

BH1

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/08/30 WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa																																
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS		DYNAMIC PENETRATION TEST, BLOWS/r		STANDARD PENETRATION TEST, BLOWS/r																								
																w_p	w	w_L	*																							
0	0.03	Harbour Bottom					mm																																			
	-0.12	Black marine organic sediments			SS	1		20																																		
	-0.42	Compact brown silty sand:																																								
	-0.73	TILL																																								
1		- some gravel																																								
		Sandstone cobbles and boulders																																								
		Very severely fractured slightly weathered grey to reddish brown siltstone: BEDROCK																																								
2																																										
3																																										
	-3.67																																									
4		End of Borehole																																								
5																																										
6																																										
7																																										
8																																										
9																																										
10																																										



BOREHOLE RECORD

NORTHING: 5113135.3
EASTING: 4600169.7

BH2

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/08/30 WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa														
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/r							
0	-0.14	Harbour Bottom						mm																
	-0.34	Organic sediments				ST	1	150	Push	SH														
	-0.45	Grey black sand and gravel				SS	2	325	50/0mm															
		Compact brown silty sand:																						
		TILL																						
		- trace gravel																						
		- boulder																						
1	-1.75					SS	3	325	-	S														
2		Very severely fractured to severely fractured slightly weathered grey to reddish brown siltstone: BEDROCK				NQ	4	100%	RQD	100%														
3						NQ	5	66%	0															
4																								
5						NQ	6	88%	42%															
5	-5.40																							
		End of Borehole																						
6																								
7																								
8																								
9																								
10																								

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BOREHOLE RECORD

NORTHING: 5113144.4
EASTING: 4600159.2

BH3

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/08/30 WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa																																									
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/r				STANDARD PENETRATION TEST, BLOWS/r																														
0	0.00	Harbour Bottom																																																	
	-0.15	Black marine sediment			SS	1	400	11																																											
	-0.69	Compact brown silty sand: TILL				SS	-																																												
1		- some gravel Sandstone cobbles and boulders																																																	
2	-1.64	Very severely fractured to severely fractured slightly weathered grey to reddish brown siltstone: BEDROCK			SS	3	250	50/120mm																																											
				NQ	4	100%	RQD 0%																																												
3				NQ	5	39%	0%																																												
4				NQ	6	82%	34%																																												
5	-5.26	End of Borehole																																																	
6																																																			
7																																																			
8																																																			
9																																																			
10																																																			

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BOREHOLE RECORD

NORTHING: 5113168.3
EASTING: 4600157.9

BH4

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/08/31

WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa												
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/R					
0	-0.60	Harbour Bottom					mm			STANDARD PENETRATION TEST, BLOWS/R 10 20 30 40 50 60 70 80 90												
1	-0.75	Black marine sediments Compact to dense brown to grey silty sand with gravel: TILL			SS	1	600	24	S													
1					SS	2	375	62														
2					SS	3	600	38														
2	-2.88				SS	4	400	34														
3	-3.03	Hard clayey sand and gravel Severely fractured to fractured slightly weathered grey to reddish brown siltstone: BEDROCK			NQ	5	100%	RQD 100%														
4					NQ	6	65%	22%														
6					NQ	7	93%	41%														
7	-7.02	End of Borehole																				

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BOREHOLE RECORD

NORTHING: 5113200.2
EASTING: 4600156.2

BH5

CLIENT CBCL LIMITED
LOCATION BATTERY POINT COFFERDAM
DATES: BORING 2005/08/31 WATER LEVEL -

PROJECT No. 1003810
BH SIZE NQ
DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa											
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			STANDARD PENETRATION TEST, BLOWS/ft				
0	-1.21	Harbour Bottom																			
		Compact brown silty sand: TILL - some gravel			ST	1	50	Push													
					SS	2	475	36													
1	-2.37				SS	3	500	50/125mm													
		Very fractured slightly weathered siltstone: BEDROCK			NQ	4	40%	RQD 33%													
2					NQ	5	71%	28%													
3																					
4					NQ	6	60%	50%													
	-5.65	End of Borehole																			

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BOREHOLE RECORD

NORTHING: 5113212.4
EASTING: 4600142

BH6

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/08/31 WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa															
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			STANDARD PENETRATION TEST, BLOWS/R								
									Wp w WL																
0	-1.53	Harbour Bottom					mm																		
	-1.78	Black marine sediment			ST	1	75	Push	S																
	-1.85	Dense brown silty sand and gravel: TILL			SS	2	250	50/50mm																	
		Severely fractured to fractured slightly weathered grey siltstone: BEDROCK			NQ	3	75%	RQD 33%																	
1					NQ	4	76%	43%																	
2																									
	-3.94	Very severely fractured slightly weathered grey SANDSTONE			NQ	5	83%	22%																	
3																									
	-4.90	Very severely fractured black siltstone: BEDROCK																							
4		End of Borehole																							
5																									
6																									
7																									
8																									
9																									
10																									



BOREHOLE RECORD

NORTHING: 5113246.2
EASTING: 4600129.8

BH7

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

DATES: BORING 2005/09/01 WATER LEVEL -

DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa													
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200		400		600		800							
0	-2.15	Harbour Bottom																					
	-2.28	Black organic marine sediments			SS	1	0	mm	Push														
		Dense brown to grey silty sand and gravel: TILL			SS	2	450		41	S													
1	-3.37	- interbedded siltstone fragments			SS	3	350	50/50mm															
		Very severely fractured to severely fractured slightly weathered grey siltstone:			NQ	4	100%		RQD 50%														
2		BEDROCK			NQ	5	77%		28%														
3		- 60 mm thick layer of severely weathered siltstone at 2.9 m depth			NQ	6	70%		19%														
4	-6.82	End of Borehole																					
5																							
6																							
7																							
8																							
9																							
10																							



BOREHOLE RECORD

NORTHING: 5113279.8
 EASTING: 4600117.7
BH8

CLIENT CBCL LIMITED
 LOCATION BATTERY POINT COFFERDAM
 DATES: BORING 2005/09/01 WATER LEVEL -

PROJECT No. 1003810
 BH SIZE NQ
 DATUM CHART

DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa										
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			DYNAMIC PENETRATION TEST, BLOWS/ft			
									w_p w w_L			STANDARD PENETRATION TEST, BLOWS/ft								
												10	20	30	40	50	60	70	80	90
0	-2.63	Harbour Bottom					mm													
		Very soft black marine sediment			ST	1	500	Push												
	-3.49				ST	2	200	Push												
-1	-3.95	Dense brown to grey silty sand: TILL			SS	3	600	33												
		Severely fractured grey siltstone: BEDROCK - occasional mud seams - very weak siltstone layer from 3.3 to 4.1 m depth			NQ	4	90%	RQD 55%												
					NQ	5	83%	40%												
					NQ	6	75%	40%												
	-7.22	End of Borehole																		

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BOREHOLE RECORD

NORTHING: 5113313.4
EASTING: 4600105.6

BH9

CLIENT CBCL LIMITED

PROJECT No. 1003810

LOCATION BATTERY POINT COFFERDAM

BH SIZE NQ

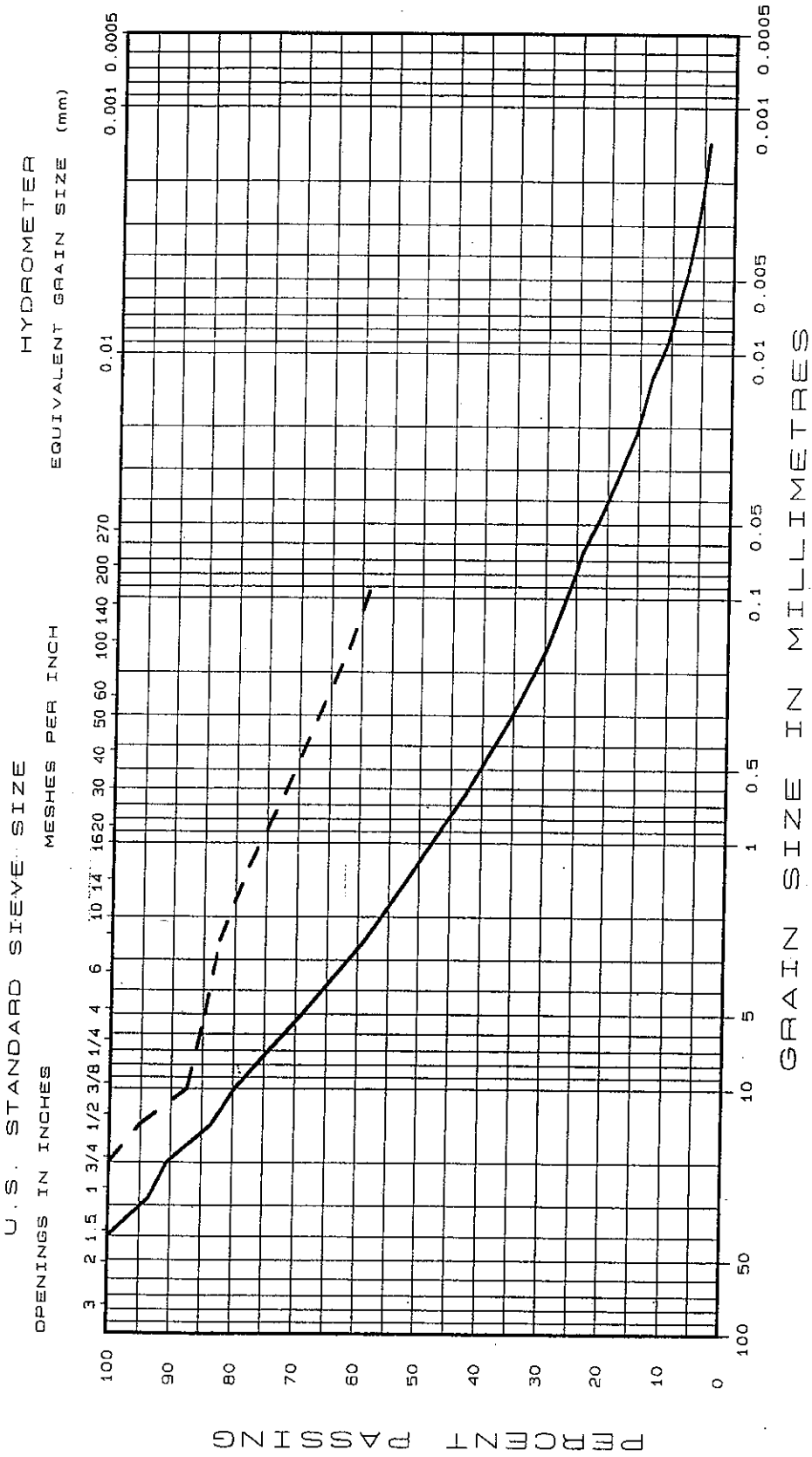
DATES: BORING 2005/09/02

WATER LEVEL -

DATUM CHART

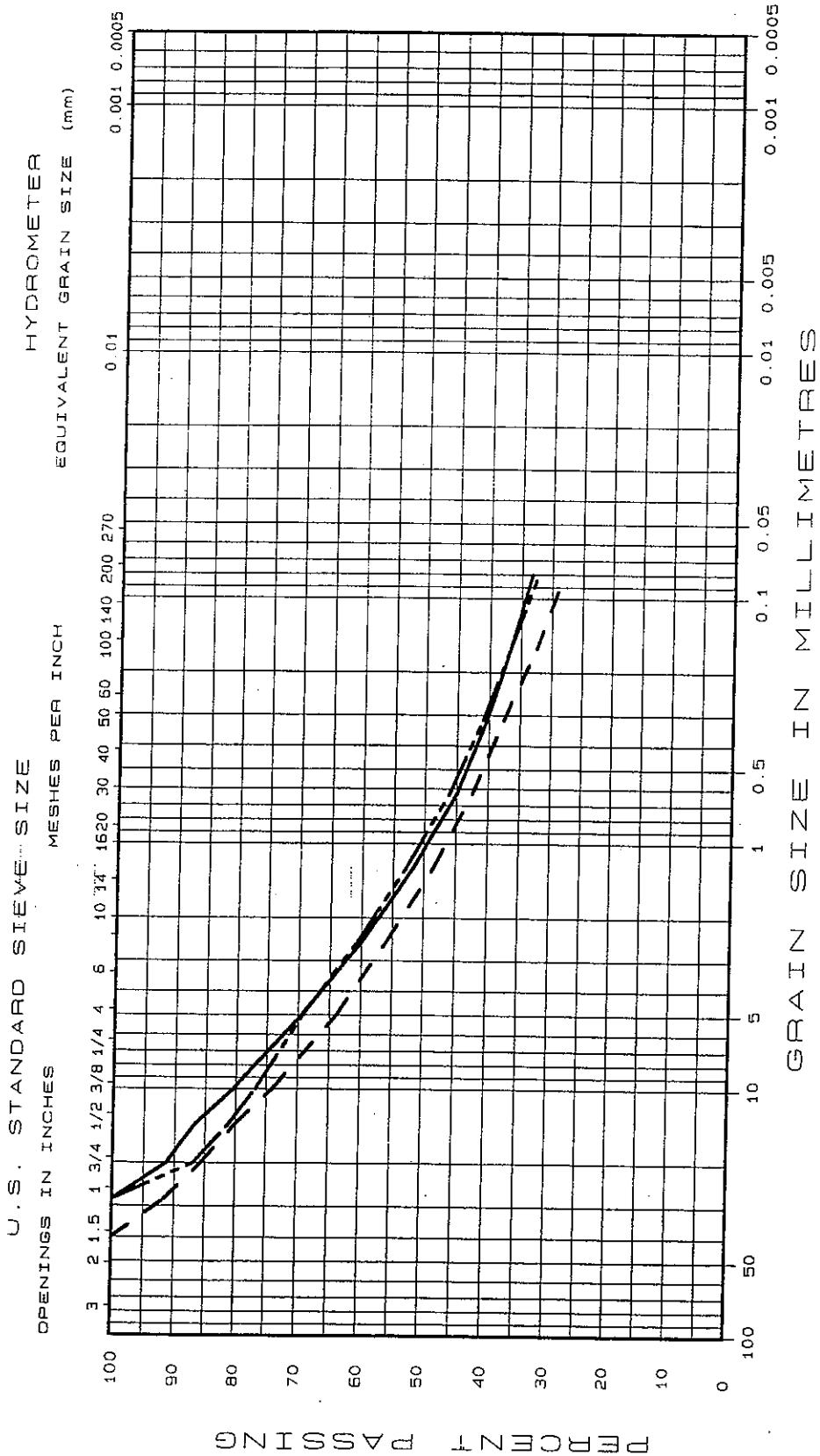
DEPTH(m)	ELEVATION(m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa															
					TYPE	NUMBER	RECOVERY	N-VALUE OR-RQD %		200	400	600	800	WATER CONTENT & ATTERBERG LIMITS			STANDARD PENETRATION TEST, BLOWS/ft								
0	-3.25	Harbour Bottom						mm																	
		Soft black marine sediment				ST	1	250	Push																
1	-3.96	Dense brown to grey silty sand with siltstone fragments Very severely fractured to severely fractured grey siltstone: BEDROCK				SS	2	300	50/0mm																
	-4.25			NQ	3	91%	RQD 30%																		
2				NQ	4	53%	0%																		
3																									
4							NQ	5	79%	48%															
5	-7.95	End of Borehole																							

App'd Dec 15 2005 14:15:4



LOCATION: BH2, BH6
SAMPLE: SA1, SA1
DEPTH: 0.0-0.15m, 0.2m
SAMPLE DESCRIPTION: MARINE SEDIMENT, MARINE SEDIMENT

Unified Soil Classification



GRAVEL		SAND			SILT & CLAY	
Coarse	Fine	Coarse	Medium	Fine		

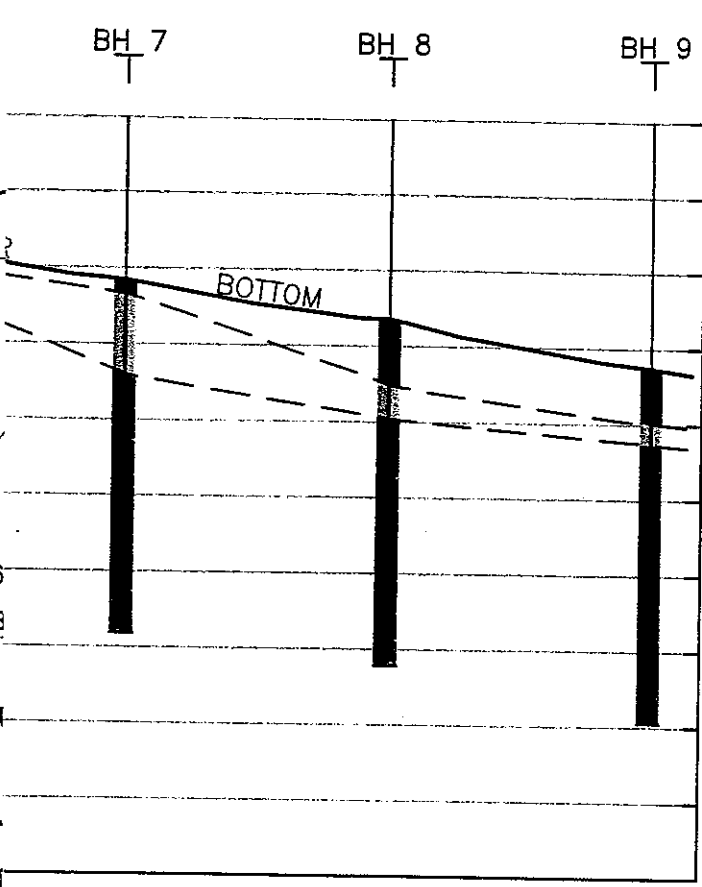
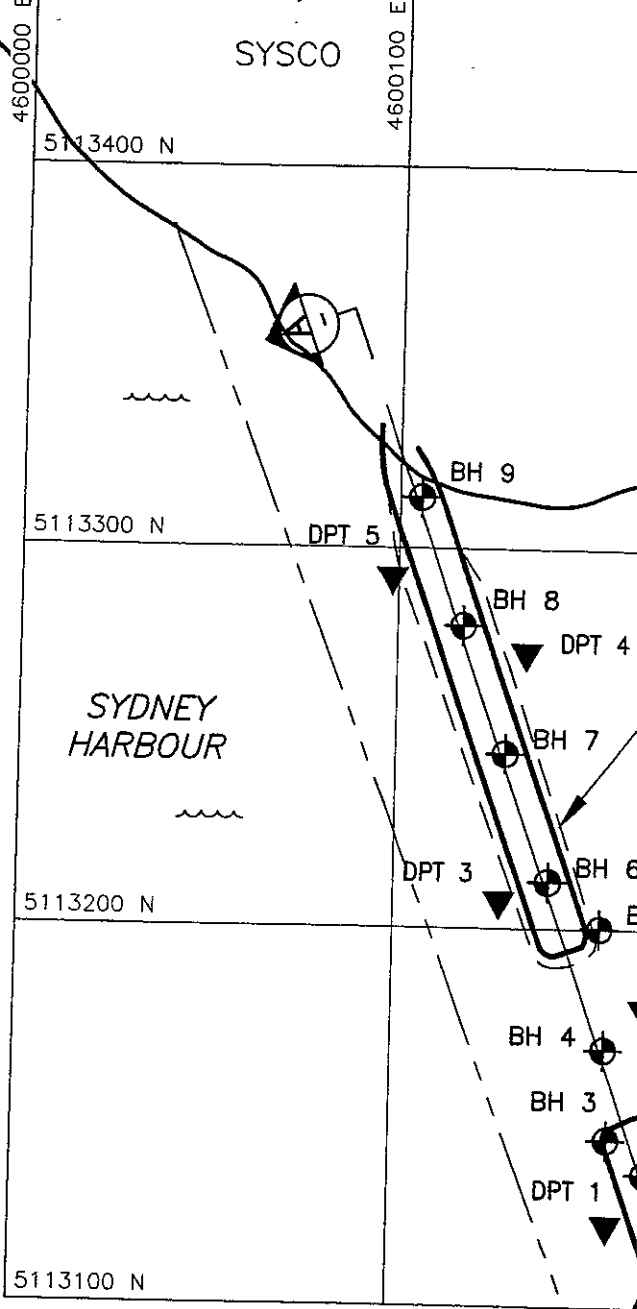
Unified Soil Classification

LOCATION	SAMPLE	DEPTH	SAMPLE DESCRIPTION
BH2	SA3	1.5m	TILL
BH4	SA2	0.9m	TILL
BH7	SA2	0.4m	TILL

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SYSCO

NORTH



BOREHOLE	NORTHING	EASTING
BH 1	5113116.5	4600176.3
BH 2	5113135.3	4600169.7
BH 3	5113144.4	4600159.1
BH 4	5113168.2	4600157.9
BH 5	5113200.2	4600156.2
BH 6	5113212.4	4600141.9
BH 7	5113246.2	4600129.8
BH 8	5113279.7	4600117.7
BH 9	5113313.4	4600105.6
DPT 1	5113121.7	4600159.7
DPT 2	5113179.0	4600168.9
DPT 3	5113207.2	4600129.0
DPT 4	5113272.8	4600135.1
DPT 5	5113292.3	4600098.3

NOTES:

- COORDINATES TO ATS77 MTM SYSTEM.
- DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATION ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.



REFERENCE:
CBCL LIMITED,
SEPTEMBER 30,

**BOREHOLE AND DPT PLAN
AND STRATIGRAPHIC SECTION**

1003810-1