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February 26, 2007

06-1111-020

URS Canada Inc.
75 Commerce Valley Drive East
Markham, Ontario
L3T 7N9

Attention: Mr. Roy Pritchard, P.Eng.

**RE: RESULTS OF BEDROCK CORING
HWY 69 NBL BRIDGE NORTH PIER CAISSONS
HIGHWAY 69 FOUR-LANING
CONTRACT NO. 2005-5009, W.P. 300-99-01**

Dear Sirs:

This letter presents the results of the borehole drilling carried out in the area of north pier caissons of the new Northbound lane (NBL) structure at the Hwy 69 crossing of Seguin River near Parry Sound, Ontario. The work was carried out in accordance with our proposal dated February 5, 2007. This work was carried out following a site meeting held on January 17, 2007 with URS Canada Inc. (URS), Golder Associates Ltd. (Golder), Ministry of Transportation Ontario (MTO), the General Contractor - BOT Construction and their piling sub-contractor - James Donn Piling. URS is the Contract Administrator on behalf of the MTO as well as the designers of the bridge; Golder is acting as the foundation sub-consultant to URS.

We understand that after the attempted installation of the caissons at the north pier of the NBL bridge, the contractor has expressed concern regarding the quality of the bedrock in the area of the north pier. Although the results of the diver inspection (and video) do not show significant disturbance of the bedrock within the rock socket or at the bedrock surface, it was considered that obtaining bedrock core samples would provide direct information regarding the potential extent of fracturing over the length of the rock socket. This letter presents the results of the bedrock coring.



INVESTIGATION PROCEDURES

The field work for this investigation was carried out between February 6 and February 12, 2007. At this time, seven boreholes (numbered BH-071 to BH-077) and three probeholes (P-1 to P-3) were put down at the site using a track-mounted CME 55 drill rig supplied and operated by Marathon Drilling Ltd of Ottawa, Ontario. The subsurface soil and bedrock conditions encountered in the boreholes are described on the Record of Borehole and Drillhole sheets that follow the text of this report; the rock core samples obtained are shown on the attached photographs. The locations of the boreholes and probeholes are shown on the attached Drawing 1.

The boreholes were advanced to depth ranging from 16.8 m to 18.1 m relative to the top of the inner 1.5 m diameter steel casing which was installed as part of the caisson construction procedure. The boreholes were advanced using 'NW' casing and wash boring methods. All of the boreholes were advanced to refusal on bedrock and six boreholes were extended into the bedrock by coring. It should be noted that bedrock coring was not carried out in Borehole BH-075 since there was grinding of the drill casing noted while seating the casing and the hole could not be continued.

Where overburden was encountered, soil samples were obtained using 50 mm outside diameter (O.D.) split-spoon samplers in accordance with Standard Penetrating Test (SPT) procedures with a pneumatic hammer. Bedrock core samples were obtained using an 'NQ' size rock core barrel. All boreholes were backfilled with bentonite mixed with water; typically, a half bag of bentonite to about 15L water.

The probeholes were done within the centre caisson only in order to confirm the depth to the bedrock surface. No sampling was carried out in these holes.

Members of our staff located the boreholes and probeholes, observed the drilling and sampling operations, logged the boreholes and examined and cared for the soil and rock samples. The samples were identified in the field and brought back to our Sudbury geotechnical laboratory for further visual examination.

The boreholes were laid out in the field by both Golder and URS. The location system agreed upon by site personnel was to take construction north as being parallel to the highway. The surveyed elevations of the tops of inner steel casings were provided to us by URS; it is understood that the elevations are referenced to geodetic datum. The borehole locations as shown on the attached Drawing 1 should be considered approximate.

SUBSURFACE CONDITIONS

The subsoils encountered in the boreholes put down in the area of the north pier caissons consisted of variable depths of river bed deposits underlain by gneiss bedrock.

River Bed Deposits

Boreholes BH-072 and BH-074 were located outside the centre and west caisson, respectively. At these locations, the river bed was encountered at 11.6 m and 9.6 m depth, respectively, below the top of the inner steel casing (i.e. river bed at Elevation 182.1 m and 184.3 m, respectively) and the river bed deposits were found to be 2 m (BH-072) and 4.4 m (BH-074) in thickness overlying the bedrock.

The overburden consisted of very soft to soft silty clay containing trace sand at the location of BH-072 at the centre caisson. In BH-074, located outside the west caisson, the overburden consisted of very soft to soft silty clay overlying very loose sandy silt. Standard Penetration 'N' values measured within the silty clay deposits ranged from 0 blows (weight of hammer or rods) to 4 blows per 0.3 m of penetration. SPT 'N' values measured within the non-cohesive deposits ranged from 0 to 10 blows per 0.3 m of penetration, typically higher near the bedrock surface.

In Borehole BH-073, Sample 1 was terminated after 0.15 m penetration through silty sand deposits when refusal to further spoon advancement was encountered at Elevation 179.8 m. After further advancement of the drill casing, the spoon/rods sank 1.2 m through silty sand deposits before hitting refusal again at Elevation 178.2 m; this second refusal is considered to be indicative of the bedrock within the rock socket.

Bedrock

The following table gives the depth and elevation of the surface of the bedrock as encountered at each of the borehole/probe locations. All borehole depths were measured relative to the top of the inner 1.5 m diameter steel casing of the nearest caisson (i.e. west, centre or east). Note that where two references are given for "Depth to Bedrock Surface" and "Bedrock Surface Elevation", the first reflects the initial casing/spoon refusal which is indicative of the rock surface at the base of the caisson and the second is indicative of where the rock was encountered within the rock socket. It is probable that the NW casing was not absolutely vertical and the casing broke through/slipped off the edge of the rock socket.

<i>Caisson</i>	<i>Borehole</i>	<i>Location/Position</i>	<i>Depth to Bedrock Surface (m)</i>	<i>Bedrock Surface Elevation (m)</i>
<i>West (Top Elevation 193.89 m)</i>	BH-073	Inside Casing/ 1:00	14.1/15.7	179.8/178.2
	BH-074	Outside Casing/ 2:00	14.0	179.9
	BH-075	Inside Casing/ 2:45	14.0/16.3	179.9/177.6
	BH-076	Inside Casing/ 11:00	14.1	179.8
<i>Centre (Top Elevation 193.65 m)</i>	BH-071	Inside Casing/ 3:00	14.3	179.4
	BH-072	Outside Casing/ 10:30	14.0	179.7
	P-1	Inside Casing/ 2:00	14.4	179.3
	P-2	Inside Casing/ 2:45	14.3	179.4
	P-3	Inside Rock Socket	16.1	177.6
<i>East (Top Elevation 193.53 m)</i>	BH-077	Inside Casing/ 11:45	16.6	176.9*

*NW drill casing probably extended inside the rock socket.

It should be noted that in Borehole BH-075, the casing was advanced to 16.3 m depth (Elev. 177.6 m), but the borehole was terminated after seating the casing 0.18 m into the rock due to the sound of grinding metal.

The bedrock is described as fresh, foliated, medium grained, medium to thinly bedded, strong, black, amphibolite gneiss with quartz, feldspar and garnet banding and a trace of sulphides. The Rock Quality Designation (RQD) measured on the rock core samples ranged from 72% to 100% indicating a rock mass of fair to excellent quality as indicated in the Canadian Foundation Engineering Manual, 3rd Edition, 1992 (CFEM 1992). The Total Core Recovery (TCR) of the samples ranged from 50% to 100%, generally greater than 88%. Where fractures (joints) were observed within the rock core samples, they were generally undulating to planar, smooth to rough and were infilled with clay, carbonate or chlorite where the joints had infilling. A summary of the rock core samples as encountered at each caisson is given below and further details are given on the attached Record of Drillhole sheets.

West Caisson

The RQD measured on the core samples obtained from the three boreholes at the west caisson ranged from 72% to 100% indicating that the rock is of fair to excellent quality (CFEM 1992).

The TCR typically ranged between 88% and 100%; however, a value of 50% was measured in the first run (1 m) in BH-073. A sub-vertical to vertical carbonate, chlorite infilled joint approximately 1 mm to 1 cm thick with some healed portions was noted within the rock core obtained in the two boreholes located within the inner steel casing (Boreholes BH-073 and BH-076). This jointing was noted in the upper 1.5 m of the core sample from BH-073 and was most prevalent in the second core run in BH-076 between 2.3 m and 2.5 m depth below the bedrock surface.

In general, the number of fractures in the core ranged between 0 and 3 fractures per 0.3 m of core. There were no fractures within the upper 1.5 m of core in BH-074 located outside the caisson (i.e. RQD, SCR and TCR all 100%).

Centre Caisson

The RQD and TCR measured in the two boreholes at the centre caisson ranged from 93% to 100%, indicating that the rock is of excellent quality (CFEM 1992). In BH-071, located inside the casing, 2 fractures are evident in the upper 0.15 m of the core sample, but there were only 3 fractures measured for the full 1.5 m core run. No fractures were observed in the full 3 m of core sample obtained in Borehole BH-072.

East Caisson

It is probable that at the location of BH-077 at the east caisson, the NW drill casing is within the rock socket and therefore, this rock core sample is reflecting the bedrock below the rock socket. As is evident in the core sample photograph, attached, there was a cobble and a few pieces of rock fragments retrieved in the core barrel at the top of the first core run. The RQD and TCR measured on the core samples from Borehole BH-077 was 89% and 90%, respectively, indicating that the rock is of good quality (CFEM 1992). The number of fractures per 0.3 m of core run ranged between 0 and 3.

URS Canada Inc.
Mr. Roy Pritchard, P.Eng.

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We trust that this letter is sufficient for your immediate requirements. Please do not hesitate to call if you have any questions or require further clarification.

Yours truly,

GOLDER ASSOCIATES LTD.



Sarah E. M. Poot, P.Eng.
Geotechnical Engineer



Anne S. Poschmann, P.Eng.
Principal

Attachments: Drawing 1
 List of Abbreviations and Symbols
 Lithological and Geotechnical Rock Description Terminology
 Record of Borehole and Drillhole Sheets
 Photographs of Rock Core Samples

KAH/SEP/ASP/lb/al

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METRIC

CONT No. 2005-5009
WP No.

**HIGHWAY 69 NBL BRIDGE
NORTH PIER
BOREHOLE AND PROBEHOLE
LOCATIONS**

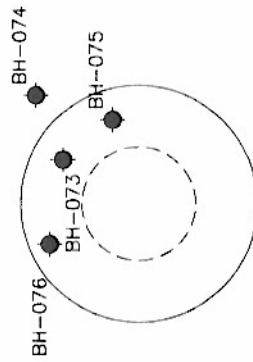
SHEET



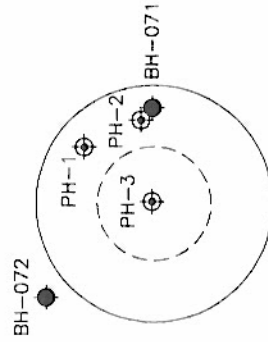
**Golder
Associates**

Goldier Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA

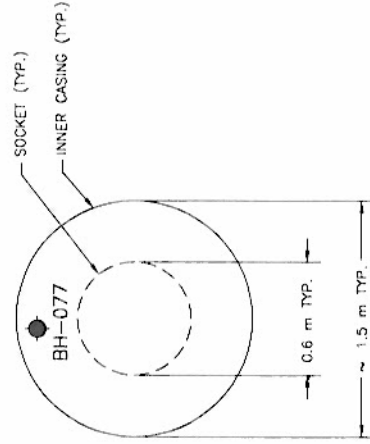
WEST CAISSON



CENTRE CAISSON



EAST CAISSON



PLAN
N.T.S.

LEGEND

- | Approximate Borehole Location | Approximate Probehole Location |
|-------------------------------|--------------------------------|
| | |

[illegible]

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE		III. SOIL DESCRIPTION	
AS	Auger sample	(a) Cohesionless Soils	
BS	Block sample	Density Index (Relative Density)	N
CS	Chunk sample		Blows/300 mm or Blows/ft.
SS	Split-spoon	Very loose	0 to 4
DS	Denison type sample	Loose	4 to 10
FS	Foil sample	Compact	10 to 30
RC	Rock core	Dense	30 to 50
SC	Soil core	Very dense	over 50
ST	Slotted tube		
TO	Thin-walled, open		
TP	Thin-walled, piston		
WS	Wash sample		
II. PENETRATION RESISTANCE		(b) Cohesive Soils	
Standard Penetration Resistance (SPT), N:		Consistency	c_u, s_u
The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 300 mm (12 in.)			
	Very soft	kPa	psf
	Soft	0 to 12	0 to 250
	Firm	12 to 25	250 to 500
	Stiff	25 to 50	500 to 1,000
	Very stiff	50 to 100	1,000 to 2,000
	Hard	100 to 200	2,000 to 4,000
		over 200	over 4,000
Dynamic Cone Penetration Resistance; N_d :		IV. SOIL TESTS	
The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.)		w	water content
PH: Sampler advanced by hydraulic pressure		w_p	plastic limit
PM: Sampler advanced by manual pressure		w_l	liquid limit
WH: Sampler advanced by static weight of hammer		C	consolidation (oedometer) test
WR: Sampler advanced by weight of sampler and rod		CHEM	chemical analysis (refer to text)
Piezo-Cone Penetration Test (CPT)		CID	consolidated isotropically drained triaxial test ¹
A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm ² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.		CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
		D_R	relative density (specific gravity, G_s)
		DS	direct shear test
		M	sieve analysis for particle size
		MH	combined sieve and hydrometer (H) analysis
		MPC	Modified Proctor compaction test
		SPC	Standard Proctor compaction test
		OC	organic content test
		SO ₄	concentration of water-soluble sulphates
		UC	unconfined compression test
		UU	unconsolidated undrained triaxial test
		V	field vane (LV-laboratory vane test)
		γ	unit weight
		Note: 1 Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.	

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LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. General		(a) Index Properties (continued)	
π	3.1416	w	water content
ln x.	natural logarithm of x	w_L	liquid limit
\log_{10}	x or log x. logarithm of x to base 10	w_p	plastic limit
g	acceleration due to gravity	I_p	plasticity index = $(w_L - w_p)$
t	time	w_s	shrinkage limit
F	factor of safety	I_L	liquidity index = $(w - w_p)/I_p$
V	volume	I_C	consistency index = $(w_L - w)/I_p$
W	weight	e_{max}	void ratio in loosest state
II. STRESS AND STRAIN		e_{min}	void ratio in densest state
γ	shear strain	I_D	density index = $(e_{max} - e)/(e_{max} - e_{min})$ (formerly relative density)
Δ	change in, e.g. in stress: $\Delta \sigma$	(b) Hydraulic Properties	
ϵ	linear strain	h	hydraulic head or potential
ϵ_v	volumetric strain	q	rate of flow
η	coefficient of viscosity	v	velocity of flow
ν	Poisson's ratio	i	hydraulic gradient
σ	total stress	k	hydraulic conductivity (coefficient of permeability)
σ'	effective stress ($\sigma' = \sigma - u$)	j	seepage force per unit volume
σ'_{vo}	initial effective overburden stress	(c) Consolidation (one-dimensional)	
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)	C_c	compression index (normally consolidated range)
σ_{oct}	mean stress or octahedral stress = $(\sigma_1 + \sigma_2 + \sigma_3)/3$	C_r	recompression index (over-consolidated range)
τ	shear stress	C_s	swelling index
u	porewater pressure	C_a	coefficient of secondary consolidation
E	modulus of deformation	m_v	coefficient of volume change
G	shear modulus of deformation	c_v	coefficient of consolidation
K	bulk modulus of compressibility	T_v	time factor (vertical direction)
III. SOIL PROPERTIES		U	degree of consolidation
(a) Index Properties		σ'_p	pre-consolidation pressure
$\rho(\gamma)$	bulk density (bulk unit weight*)	OCR	over-consolidation ratio = σ'_p/σ'_{vo}
$\rho_d(\gamma_d)$	dry density (dry unit weight)	(d) Shear Strength	
$\rho_w(\gamma_w)$	density (unit weight) of water	τ_p, τ_r	peak and residual shear strength
$\rho_s(\gamma_s)$	density (unit weight) of solid particles	ϕ'	effective angle of internal friction
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)	δ	angle of interface friction
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s/\rho_w$) (formerly G_s)	μ	coefficient of friction = $\tan \delta$
e	void ratio	c'	effective cohesion
n	porosity	c_{u, s_u}	undrained shear strength ($\phi = 0$ analysis)
S	degree of saturation	p	mean total stress $(\sigma_1 + \sigma_3)/2$
*	Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density \times acceleration due to gravity)	p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
		q	$(\sigma_1 + \sigma_3)/2$ or $(\sigma'_1 + \sigma'_3)/2$
		q_u	compressive strength $(\sigma_1 + \sigma_3)$
		S_t	sensitivity

- Notes: 1 $\tau = c' + \sigma' \tan \phi'$
 2 Shear strength = (Compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING STATE

Fresh: no visible sign of weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock texture and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	> 2 m
Thickly bedded	0.6 m to 2m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	< 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	> 3 m
Wide	1 - 3 m
Moderately close	0.3 - 1 m
Close	50 - 300 mm
Very close	< 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	> 60 mm
Coarse Grained	2 - 60 mm
Medium Grained	60 microns - 2 mm
Fine Grained	2 - 60 microns
Very Fine Grained	< 2 microns

Note: * Grains > 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to (W.R.T.) Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviated description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

B - Bedding	P - Polished
FO - Foliation/Schistosity	S - Slickensided
CL - Cleavage	SM - Smooth
SH - Shear Plane/Zone	R - Ridged/Rough
VN - Vein	ST - Stepped
F - Fault	PL - Planar
CO - Contact	FL - Flexured
J - Joint	UE - Uneven
FR - Fracture	W - Wavy
MF - Mechanical Fracture	C - Curved
- Parallel To	
⊥ - Perpendicular To	

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE



PROJECT 06-1111-020		RECORD OF BOREHOLE No BH-071				2 OF 2 METRIC								
W.P. 2005-5009		LOCATION See Drawing 1				ORIGINATED BY KAH								
DIST HWY 69		BOREHOLE TYPE NW Wash Boring				COMPILED BY KAH								
DATUM Geodetic		DATE February 7, 2007				CHECKED BY SEP								
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						
	--- CONTINUED FROM PREVIOUS PAGE ---													
177.9	GNEISS BEDROCK													
	For Details Refer to Record of Drillhole BH-071													
15.8	END OF BOREHOLE													

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-071

SHEET 2 OF 2

LOCATION: See Drawing 1

DRILLING DATE: February 7, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH	COLOUR & RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.										NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
									RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	B Angle	DIP SW 1 CORE AXIS	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY			Diameter Point Load Index (MPa)	RMC Q AVG																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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DEPTH SCALE

1 : 50



LOGGED: KAH

CHECKED: SEP

MIS-RCK-010 06-1111-020.GPJ CAL-MISS GDT 2/21/07 MSM



PROJECT 06-1111-020		RECORD OF BOREHOLE No BH-072				1 OF 2 METRIC						
W.P. 2005-5009		LOCATION See Drawing 1		ORIGINATED BY KAH								
DIST HWY 69		BOREHOLE TYPE NW Wash Boring		COMPILED BY KAH								
DATUM Geodetic		DATE February 8, 2007		CHECKED BY SEP								
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
193.7 0.0	TOP OF CASING											
193												
192												
191												
190												
189												
188												
187												
186												
185												
184												
183												
182.1 11.6	SILTY CLAY, trace sand Very soft to soft Grey Wet		1	SS	2							
			2	SS	WR							
			3	SS	WR							
179.7 14.0	GNEISS BEDROCK For Details Refer to Record of Drillhole BH-072											
179												

MIS-MTO 001 06-1111-020.GPJ GAL-MISS GDT 2/21/07 MSM

Continued Next Page

+ 3, × 3; Numbers refer to Sensitivity O 3% STRAIN AT FAILURE



+3, X3: Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-072

SHEET 2 OF 2

LOCATION: See Drawing 1

DRILLING DATE: February 8, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH	COLOUR & RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Congregate BD - Bedding FD - Foliation CO - Contact OR - Orthogonal CL - Cleavage PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.										NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
									RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY K, cm/sec			Diameter Point Load Index (MPa)	RMC AVG.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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DEPTH SCALE

1 : 50



LOGGED: KAH

CHECKED: SEP

MIS-RCK 010 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM



+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE



PROJECT 06-1111-020		RECORD OF BOREHOLE No BH-073				2 OF 2		METRIC						
W.P. 2005-5009		LOCATION See Drawing 1				ORIGINATED BY KAH								
DIST HWY 69		BOREHOLE TYPE NW Wash Boring				COMPILED BY KAH								
DATUM Geodetic		DATE February 8, 2007				CHECKED BY SEP								
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						
178.2			3	SS	10									
15.7	GNEISS BEDROCK													
	For Details Refer to Record of Drillhole BH-073													
175.8														
18.1	END OF BOREHOLE													
	Notes: 1. Sample 1 encountered refusal after 0.15 m. Casing extended through refusal. 2. Sample 2 rods dropped 1.2 m.													

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-073

SHEET 2 OF 2

LOCATION: See Drawing 1


DRILLING DATE: February 8, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH % RETURN	COLOUR X RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conglomerate	BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.	NOTES WATER LEVELS INSTRUMENTATION								
														RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY K, cm/sec	Diameter Point Load Index (MPa)	RMC Q AVG
														TOTAL CORE %	SOLID CORE %			TYPE AND SURFACE DESCRIPTION	DIP w.r.t CORE AXIS			
														10 ⁴	10 ³							
		Continued from previous page		178.2																		
16	NQ-Coring	Fresh, foliated, medium grained, medium to thinly bedded, black/grey, amphibolite GNEISS with quartz and feldspar banding, carbonate veins and trace of sulphides		15.7	1																	
17																						
18				175.8																		
		END OF DRILLHOLE		18.1																		
19		Notes: CHL: Chlorite infilling CB: Carbonate infilling Clay: Clay coating																				
20																						
21																						
22																						
23																						
24																						
25																						

DEPTH SCALE

1: 50



LOGGED: KAH

CHECKED: SEP

MIS-ROCK 010 06-1111-020.GPJ GAL-MISS GDT 2/21/07 MSM



+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT 06-1111-020		RECORD OF BOREHOLE No BH-074				2 OF 2 METRIC								
W.P. 2005-5009		LOCATION See Drawing 1				ORIGINATED BY KAH								
DIST HWY 69		BOREHOLE TYPE NW Wash Boring				COMPILED BY KAH								
DATUM Geodetic		DATE February 9, 2007				CHECKED BY SEP								
SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						
	— CONTINUED FROM PREVIOUS PAGE —						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED			10 20 30 WATER CONTENT (%)			GR SA SI CL	
177.0	GNEISS BEDROCK					178								
16.9	END OF BOREHOLE					177								
	Notes: 1. Sample 1 rods sank 1.2m. 2. Sample 4 rods dropped 0.9m.													

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-074

SHEET 2 OF 2

LOCATION: See Drawing 1

DRILLING DATE: February 9, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH	COLOUR & RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Congregate										BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage										PL - Planar CU - Curved UN - Unkinking ST - Stepped IR - Irregular										PO - Polished K - Slickensided SM - Smooth Rg - Rough MB - Mechanical Break										BR - Broken Rock	NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
									RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY		Diameter Port Loss Index (MPa)	RUC 47 AVG																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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DEPTH SCALE

1 : 50



LOGGED: KAH

CHECKED: SEP

MIS-RCK 010 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM



+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE

PROJECT <u>06-1111-020</u>			RECORD OF BOREHOLE No BH-075			2 OF 2 METRIC		
W.P. <u>2005-5009</u>			LOCATION <u>See Drawing 1</u>			ORIGINATED BY <u>KAH</u>		
DIST <u>HWY 69</u>			BOREHOLE TYPE <u>NW Wash Boring</u>			COMPILED BY <u>KAH</u>		
DATUM <u>Geodetic</u>			DATE <u>February 10, 2007</u>			CHECKED BY <u>SEP</u>		

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w_p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w_L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
177.6	— CONTINUED FROM PREVIOUS PAGE —																
16.5	GNEISS BEDROCK END OF BOREHOLE REFUSAL ON BEDROCK Note: 1. Borehole terminated after seating the casing 0.18 m into bedrock due to the sound of grinding metal.	X															

[illegible]



PROJECT		RECORD OF BOREHOLE				No BH-076		2 OF 2		METRIC			
W.P. 2005-5009		LOCATION See Drawing 1				ORIGINATED BY KAH							
DIST HWY 69		BOREHOLE TYPE NW Wash Boring				COMPILED BY KAH							
DATUM Geodetic		DATE February 11, 2007				CHECKED BY SEP							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
	— CONTINUED FROM PREVIOUS PAGE —												
	GNEISS BEDROCK												
	For Details Refer to Record of Drillhole BH-076												
176.9													
17.0	END OF BOREHOLE												

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-076

SHEET 2 OF 2

LOCATION: See Drawing 1

DRILLING DATE: February 11, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH	COLLOID % RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conglate	BD - Bedding FO - Foliation CD - Contact OR - Orthogonal CL - Cleavage	PL - Planar CU - Curved UN - Unclimbing ST - Stepped IR - Irregular	PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break	BR - Broken Rock NOTE: For additional abbreviations refer to list of abbreviations & symbols.	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, cm/sec	Diameter Pore Size Index (MPa)	PUC QZ AVG	NOTES WATER LEVELS INSTRUMENTATION
		Continued from previous page		179.8 14.1														
		Fresh, foliated, medium grained, medium to thinly bedded, black/grey, amphibolite GNEISS with garnet, quartz and feldspar banding																
15					1													
16																		
17					2													
17		END OF DRILLHOLE		178.9 17.0														
		Notes: CHL: Chlorite infilling CB: Carbonate infilling Clay: Clay coating																
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE

1:50



LOGGED: KAH

CHECKED: SEP

MIS-PCX 010 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

Continued Next Page

+³, ×³: Numbers refer to Sensitivity ○^{3%} STRAIN AT FAILURE



PROJECT		RECORD OF BOREHOLE				No BH-077		2 OF 2		METRIC			
W.P.		LOCATION		ORIGINATED BY		COMPILED BY		CHECKED BY					
DIST		BOREHOLE TYPE											
DATUM		DATE											
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
177.1													
16.6	SAND and GRAVEL, trace silt Loose Brown Wet		1	SS	9								
	GNEISS BEDROCK												
	For Details Refer to Record of Drillhole BH-077												
175.4													
18.1	END OF BOREHOLE												

MIS-MTO 001 06-1111-020.GPJ GAL-MISS.GDT 2/21/07 MSM

PROJECT: 06-1111-020

RECORD OF DRILLHOLE: BH-077

SHEET 2 OF 2

LOCATION: See Drawing 1

DRILLING DATE: February 11, 2007

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-55

DRILLING CONTRACTOR: MARATHON DRILLING

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	COLLOUR FLUSH % RETURN	JN - Joint FLT - Fault SHR - Shear VN - Vein CJ - Conjugate										BD - Bedding FO - Foliation CO - Contact OR - Orthogonal CL - Cleavage										PL - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular										PO - Polished K - Slickensided SM - Smooth Ro - Rough MB - Mechanical Break										BR - Broken Rock										NOTES WATER LEVELS INSTRUMENTATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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								TOTAL CORE %	SOLID CORE %			DIP w.r.t. CORE AXIS	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION	K ₁	K ₂	D ₁	D ₂																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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DEPTH SCALE

1:50



LOGGED: KAH

CHECKED: SEP

MIS-RCK 010 06-1111-020.GPJ GAL-MISS.GDT 2/26/07 MSM

Client : URS

Project Number : 06-1111-020

Site Name : Parry Sound North Pier

Site Location : Hwy 69 NBL bridge north pier caissons

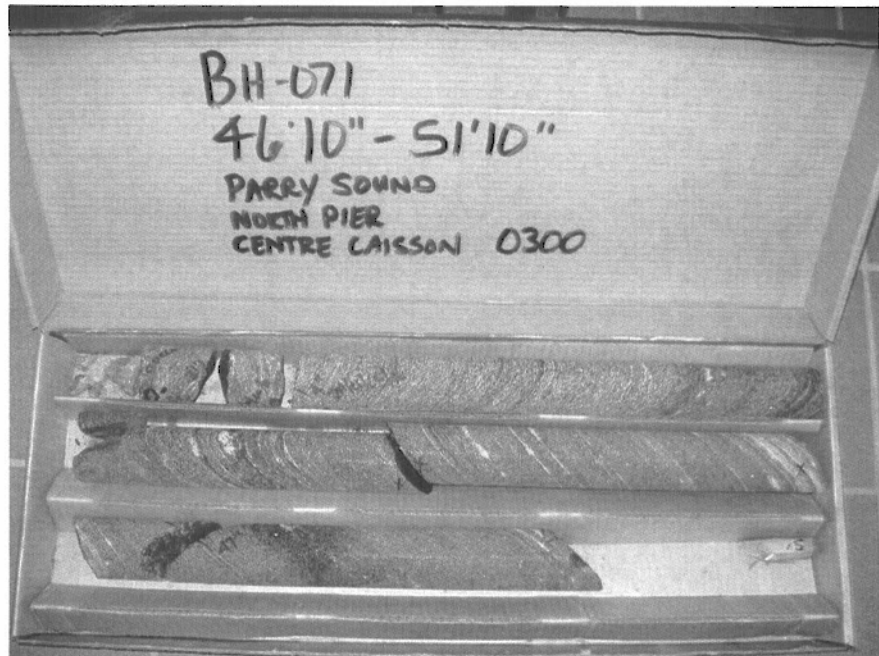
Photographer : KAH

Date : February 2007

Drawn By : KAH

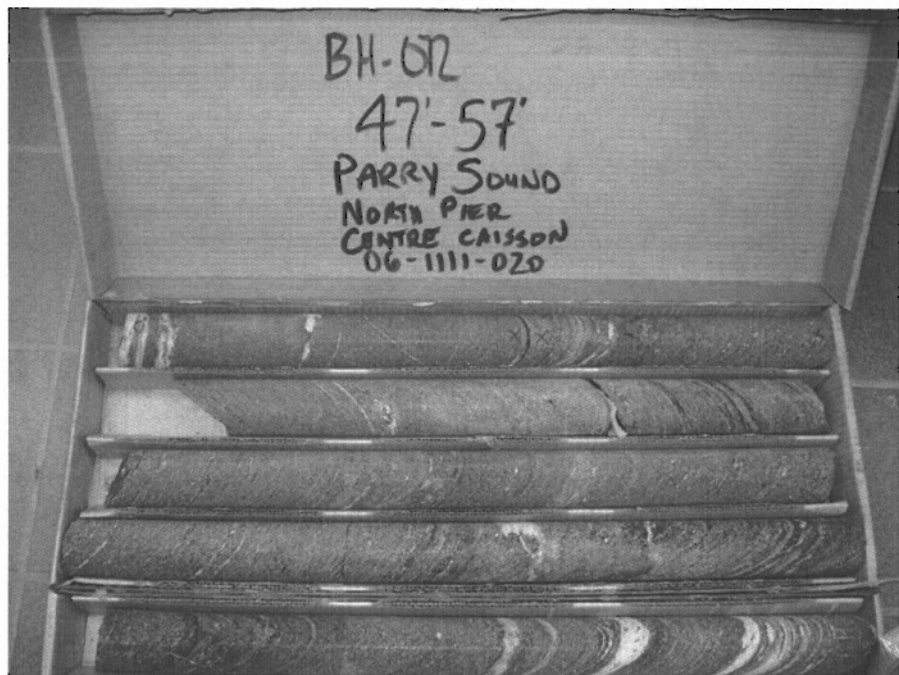
Photograph 1

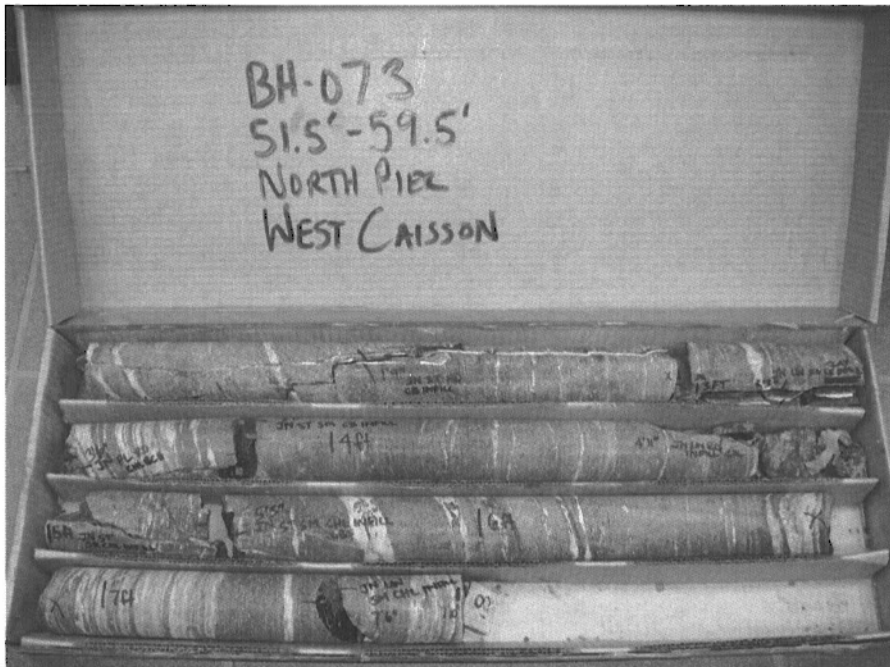
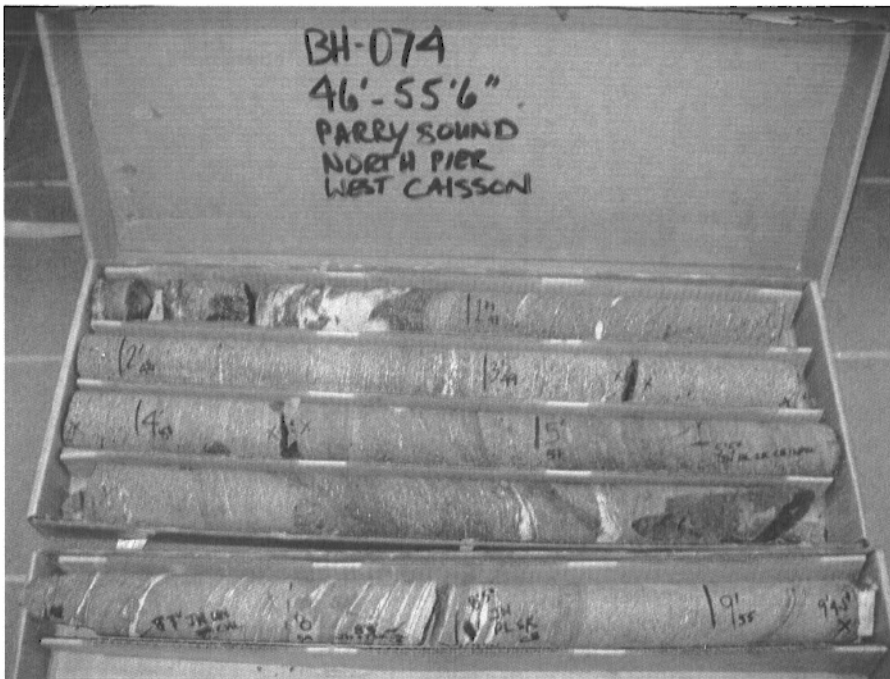
BH-071



Photograph 2

BH-072



Client : URS		Project Number : 06-1111-020	
Site Name : Parry Sound North Pier		Site Location : Hwy 69 NBL bridge north pier caissons	
Photographer : KAH		Date : February 2007	Drawn By : KAH
Photograph 3 BH-073			
Photograph 4 BH-074			

Client : URS		Project Number : 06-1111-020
Site Name : Parry Sound North Pier		Site Location : Hwy 69 NBL bridge north pier caissons
Photographer : KAH	Date : February 2007	Drawn By : KAH
Photograph 5 BH-076		
Photograph 6 BH-077		