

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M13-133

DIST. 6 REGION

W.P. No. 144-87-01

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 407

LOCATION BLACK CREEK WEST

TRIBUTARY CROSSING

No. of PAGES -

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

U.I.P.30 SEP. 1970



Ontario

**Action
Memo**

Time

3:15

Date

Mar

Month

Day

14051

To

Ken

From (Name and City)

Bob Jeffries

I.C.N. No

Area Code

Telephone No

Ext

Message Taken By

☐ Phoned
☐ On
☐ Hold

☐ Please Call
☐ Returned
☐ Your Call

☐ Will Call Back
☐ Wishes Appointment

☐ Waiting
☐ in Person
☐ Was Here

☐ Will
☐ Return
☐ File
☐ Draft Reply For
My Signature

☐ Provide
More Details

☐ For Your
information
☐ Type Draft
☐ For Your Approval
and Signature

☐ Keep Me
Informed

☐ Per Discussion
☐ Type Final
☐ Circulate, Initial
and Return

☐ Take
Appropriate Action

☐ Per Your Request

☐ Make
Copies

☐ Return
With Comments

☐ Note and
See Me

☐ Returned
With Thanks

☐ Please Answer

☐ Investigate
and Report

☐ Note and
Return

☐

Comments

→ Confirming
 - no utilities in
 - area of the
subverts.

Lept 50-93-01

Integral Attachment



Ministry
of
Transportation

File

FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 144-87-01 DIST 6
HWY 407 STR SITE

Black Creek West Tributary Culvert

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GEOCRES 30M13-133

DATE JUN 22 1994

FOUNDATION INVESTIGATION REPORT

For

Black Creek West Tributary Culvert

W.P. 144-87-01, Geocres No. 30M13-133

Hwy. 407, District 6, Toronto

INTRODUCTION

This report summarizes the results of a foundation investigation at the above mentioned site. It is proposed to construct a reinforced box concrete culvert to transmit the waters of the Black Creek West tributary creek beneath the Hwy 407 and associated ramps. The investigation was carried out at the request of Central Region Structural Section.

SITE DESCRIPTION

The site is located within the proposed Highway 407 alignment (Station 19+631) about 800m south of Hwy 7 and 450m east of Hwy 400. The area is situated in the Township of Vaughan. Land use in the area is undeveloped. An existing channel runs southerly at 23m offset towards the west from the proposed culvert location. The existing channel is about 18m wide at the top and 5m wide at the bottom. The flow of water in the channel was very slow at the time of investigation.

The topography across the site consists of relatively flat land gently sloping towards the south 40H:1V. The ground surface was covered with grass.

The site lies within the physiographic region known as the South Slope (after Chapman and Putnam, 1984) and it consists largely of glacial deposits.

INVESTIGATION PROCEDURES

The fieldwork for the investigation was carried out on 94 05 17 and 94 05 18 and consisted of 6 sampled boreholes (BH 1 through BH 6) advanced to depths ranging from 9.6 to 14.2m below ground surface.

The boreholes were advanced using a CME 55 track-mounted auger machine equipped with solid and hollow stem augers.

Sampling was carried out at each borehole location by means of a 50mm O.D. split spoon sampler driven into the soil according to the specifications of the Standard Penetration Test (ASTM D 1586).

In boreholes (BH1, BH2 and BH3) samples were obtained at 1.5m interval. In BH4, BH5 and BH6 samples were retrieved at 0.7m intervals within the first 6.1m and then at 1.5m thereafter. Dynamic cone test was carried out in Borehole 3. A piezometer was also installed in Borehole 3.

Groundwater levels were obtained by monitoring the levels in the open boreholes throughout the duration of the field investigation. All boreholes were backfilled at the completion of the fieldwork.

SUBSURFACE CONDITIONS

General

All boreholes encountered glacial till as a native soil. In general, at most of the locations the strata consists of clayey silt to silty clay glacial till underlain by silty clay to clay deposit. The glacial deposit contained layers of silty sand and some gravel. The deposits occasionally contain cobbles and boulders. For detailed soil condition reference is made to attached borehole log sheets.

The locations of boreholes (BH1 through BH6) are shown on the attached drawing Dwg. No. 1448701-A.

Groundwater Conditions

Groundwater was encountered in four boreholes (BH1,4,5 and 6). The water level ranged from 185.0m (BH 1) to 189.7m (BH 4). However, it is assumed that in Borehole 1 water level was not stabilized. The stabilized water level elevation was therefore, 187.1 (BH 6) to 189.7 (BH 4). The depth of water level below ground level was 0.4m (BH 4) to 1.5m (BH 6)

DISCUSSION AND RECOMMENDATIONS

General

It is proposed to construct a reinforced concrete box culvert at station 19+631 of Hwy 407, to transmit the waters of the Black Creek West tributary creek beneath the Hwy 407 and associated ramps. The culvert will be 303m long, 5m wide and 3m high.

The culvert invert elevations at inlet and outlet will be 187.1m and 186.6m respectively. The culvert will be sloping at 0.163 per cent.

As previously designed (Drawing No 42-0762-01), the inlet of the culvert will be connected to a channel which will be constructed at 2H:1V side slopes. The channel, within 30m (probably due to curve) of the inlet will be treated with Gabion mat (could be rock protection). At the inlet there will be two wing walls 9m and 12m long. The wing walls will be 2.5m high (Top elevation of the wing walls will be 190.1m). The wing walls will be oriented at 135° and 165° with respect to the culvert walls. There will be cutoff walls about 0.5m deep at the inlet and the outlet of the culvert. At the outlet the flow will discharge into a detention pond at a distance of 25m from the outlet.

The proposed profile grade of Hwy 407 and associated ramps varies from elevation 193.6 m to 199.0 m. The culvert obvert elevation would range from elevation 189.6 m to 190.1 m. Consequently, approach fills in the order of magnitude of 3.5 m to 9.2 m will be required. Following are the details of the proposed highway and associated ramps passing over the culvert:

<u>Proposed Embankment</u>	<u>Proposed Grade (m)</u>	<u>Existing Ground (m)</u>	<u>Fill Above Culvert Obvert (m)</u>
Ramp 407E-400N	194.5	192.5	4.5
Ramp 407E-400S	193.9	192.0	3.8
Ramp Jane N/S-407W	193.6	191.1	3.7
Hwy 407 WB	193.9	190.8	4.0
Hwy 407 EB	193.9	190.4	4.0
Ramp 407W-Jane N/S	193.3	189.9	3.5
Ramp 400N-407E	199.0	188.7	9.2
Ramp 400S-407E	198.8	188.6	9.0

Structural Foundations

The soil at the proposed culvert invert elevation (186.6m to 187.1m) is a competent native soil. The culvert can be founded on spread footing on granular bedding (see 'Bedding' section for details) constructed on very stiff to hard glacial till deposit or hard silty clay to clay deposit.

The depth of cutoff walls and retaining walls should be determined based on frost depth and scour depth whichever is greater. Frost depth at the site is 1.2m.

The following values can be utilized for the design of proposed culvert extension and the cutoff walls foundations for the purposes of the O.H.B.D.C.

Factored Bearing Capacity at U.L.S. =	300 kPa
Bearing Capacity at S.L.S. Type II =	200 kPa

Backfilling/Lateral Pressure

Backfilling to the culvert and retaining walls should consist of suitable material compacted in accordance with MTO Standards and conform to OPSD 800 series. The backfill operations should be carried out simultaneously on both sides of the culvert as per MTO specifications. The following properties are recommended for the calculation of lateral pressure:

Granular 'A'	$\gamma = 22.8 \text{ kN/m}^3$, $\phi = 35^\circ$, $K_o = 0.43$, $K_a = 0.27$
Granular 'B'	$\gamma = 21.2 \text{ kN/m}^3$, $\phi = 30^\circ$, $K_o = 0.50$, $K_a = 0.33$
Native Soil	$\gamma = 20.0 \text{ kN/m}^3$, $\phi = 26^\circ$, $K_o = 0.56$, $K_a = 0.39$

If the structure is to be designed as a rigid frame then the coefficient of earth pressure at rest (K_o) should be used. For structural elements rigidly connected to concrete box culvert, at rest condition (K_o) should be used to calculate lateral pressure.

Sliding Resistance

Sliding resistance calculations will not be required for culvert foundation. Sliding resistance for wing walls footings should be calculated in accordance with the O.H.B.D.C. assuming unfactored angle of friction, $\phi = 26^\circ$

Stability and Settlement

No deep seated stability problems are anticipated for the proposed height of permanent embankment. Total and differential settlement will be negligible if the foundation is constructed in accordance with the recommendations.

CONSTRUCTION CONSIDERATIONS

Dewatering

The excavation for culvert construction would extend below prevailing groundwater table, particularly near the outlet. It would be required to lower the groundwater table prior to the excavation.

A special provision should be in the contract requiring the contractor to lower the groundwater table. The contractor should be advised that cohesionless material may be encountered at the proposed culvert foundation elevations and it would be susceptible to disturbance under conditions of unbalanced hydrostatic head. The contractor should also be advised to construct without disturbance to the underlying foundations. Although, the dewatering method is the responsibility of the contractor, it is anticipated that if a granular layer is encountered at the proposed culvert foundation elevations then the groundwater can be lowered by a system of oversize perimeter ditches and sumps. If granular layer is not encountered at the founding elevations, then the seepage could be controlled by sump pump technique. In any case the contractor should submit his dewatering proposal for review a minimum of 15 working days prior to construction.

Excavation

It is expected that the depth of excavation will be about 7.5m on the north side and 2m on the south side. Temporary excavation up to 4m deep would be stable at 1H:1V above water table and 2H:1V below water table. For excavation deeper than 4m a 2m a mid height berm should be incorporated.

Bedding

Although bedding for concrete box culvert at this site is not necessary, but could be helpful over localized weak areas and for levelling the grade. Bedding under the culvert foundation shall consist of Granular 'A' of the following thickness:

<u>Limit of stations (m)</u>	<u>Bedding Thickness (m)</u>
0+845 - 1+050	0.3
1+050 - 1+145	0.5

Cambering

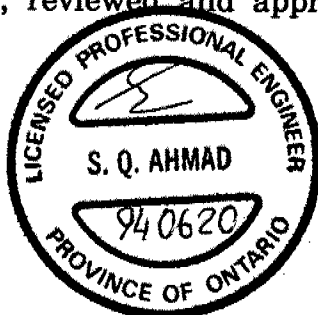
Due to competent soil condition, no significant settlements are anticipated. Therefore, cambering is not required.


Erosion Protection

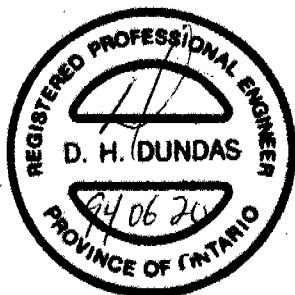
It is understood that cutoff walls will be constructed at the inlet and the outlet. Clay seal will not be required in the presence of cutoff walls. Rock protection will be required at both ends (minimum blanket thickness = 0.6m) should be placed to protect the embankment. It should extend from the high water level to the toe of the slope and at least 2m along the creek bed. In transverse direction, the erosion protection should extend a minimum of 5m on each side of the culvert. At the outlet the rock blanket should be placed over a 0.5m thick Granular 'A' material.


Miscellaneous

The fieldwork for this project was carried out under the supervision of Todd Barlow, Lori O'Malley and Tanya Cross Engineering students, using equipment owned and operated by Master Soil Investigation. The report was prepared by K. Ahmad, Foundation Engineer, reviewed and approved by D. Dundas, Chief Foundation Engineer (Acting).




 K.S.Q. Ahmad, P. Eng.
 Foundation Engineer




 D. Dundas, P. Eng.
 Chief Foundation Engineer (Acting)

APPENDIX

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{v0}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kn/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kn/m ³	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kn/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ³ /s	RATE OF DISCHARGE
γ_d	kn/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kn/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kn/m ³	SEEPAGE FORCE
γ'	kn/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

METRIC

DATUM Geodetic DATE 1994 05 18 CHECKED BY KA

+3, x⁵: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 144-87-01 LOCATION Coords.: N 4 849 222; E 302 198 ORIGINATED BY TB
DIST 6 HWY HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 05 18 CHECKED BY KA

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
192.0	Ground Surface															
0.0						*										
	Clayey Silt to Silty Clay Trace Sand, Trace Gravel Brown to Grey Hard (Glacial Till)		1	SS	56											
			2	SS	75											
			3	SS	92											
186.7																
5.3																
	Silty Clay to Clay Occasional Silt Seams Grey Hard		4	SS	68											
			5	SS	54											
			6	SS'	49											
			7	SS	54											
			8	SS	34											
			9	SS	45											
177.8																
14.2	End of Borehole															
	* Groundwater not established															

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 144-87-01 LOCATION Coords.: N 4 849 167; E 302 222 ORIGINATED BY KA
DIST 6 HWY HWY 407 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 05 17 CHECKED BY KA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT 7 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	20 40 60 80 100	W _p W W _L	10 20 30							
190.9	Ground Surface																	
0.0	Clayey Silt to Silty Clay Trace Sand, Trace Gravel Brown to Grey Very Stiff to Hard (Glacial Till)		1	SS	25													
			2	SS	45													
			3	SS	95													
185.6	Silty Clay to Clay Occasional Silt Seams Grey Hard		4	SS	118													
5.3			5	SS	60													
			6	SS	60													
			7	SS	58													
			8	SS	78													
178.3	End of Borehole																	
12.6	<p>May 17, 1994</p> <p>* GROUND WATER CONDITIONS *</p> <table border="1"> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> <tr> <td>1</td> <td>Piezometer Destroyed</td> </tr> </table>		PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	Piezometer Destroyed												
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																	
1	Piezometer Destroyed																	

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 144-87-01 LOCATION Coords.: N 4 849 125; E 302 240 ORIGINATED BY TC
DIST 6 HWY HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 05 17 CHECKED BY KA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT 7 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	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
190.1	Ground Surface													
0.0	Clayey Silt to Silty Clay Trace Sand, Trace Gravel Brown to Grey Firm to Hard (Glacial Till)		1	SS	5		189							
			2	SS	32		188							
			3	SS	17		187							
	Silty Sand Wet, Compact		4	SS	25		186							
185.9			5	SS	130		185							
4.2			6	SS	144		184							
			7	SS	65		183							
			8	SS	81		182							
			9	SS	151		181							
	Silty Clay to Clay Occasional Silt Seams Grey Hard		10	SS	141		180							
179.0			11	SS	177		179							
11.1	End of Borehole													

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

W.P. 144-87-01 LOCATION Coords.: N 4 849 080; E 302 260 ORIGINATED BY LO
DIST 6 HWY HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 05 18 CHECKED BY KA

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					
188.0	Ground Surface																
0.0																	
			1	SS	17		187										
			2	SS	11		186										
			3	SS	25		185										
			4	SS	11		184										
			5	SS	62		183										
			6	SS	85		182										
182.3			7	SS	90		181										
5.7			8	SS	85		180										
			9	SS	67		179										
			10	SS	180		178										
178.1																	
9.9																	
			11	SS	153		177										
178.9																	
11.1	End of Borehole																

RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 144-87-01 LOCATION Coords.: N 4 849 043; E 302 276 ORIGINATED BY TB
DIST 6 HWY HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 05 18 CHECKED BY KA

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					
188.6	Ground Surface																
0.0																	
	Heterogeneous Mixture of Silty Clay and Sand Brown, Stiff to V. Stiff (Fill)		1	SS	13		188										
			2	SS	18		187										
185.9			3	SS	13		186										
2.7	Stiff to V. Stiff		4	SS	17		185										
			5	SS	9		184										
	Hard		6	SS	150		183										
			7	SS	147		182										
	Clayey Silt to Silty Clay Trace sand, Trace Gravel Brown to Grey (Glacial Till)		8	SS	114		181										
			9	SS	71		180										
179.0			10	SS	73		179										
9.6	End of Borehole																

