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GEOCRES No. 52B-8

DIST. 19 REGION

W.P. No. 174-79-01

CONT. No.

W. O. No.

STR. SITE No. N/A

HWY. No. 622

LOCATION HWY 622 FROM ATIKOKAN
NORTHERLY 10.9 KM (VARIOUS SITES)

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

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Communications

foundation investigation and design report

ENGINEERING MATERIALS OFFICE
PAVEMENT & FOUNDATION DESIGN SECTION

WP 174-79-01

DIST 19

HWY 622

STR SITE Various Sites

Various Sites Highway 622
From Atikokan Northerly 10.9 km

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Foundation Investigation Report

for

Various Sites Highway 622

From Atikokan Northerly 10.9 km

W.P. 174-79-01

Highway 622, District 19

Introduction

This report summarizes the factual information obtained from field investigations conducted at the above noted project during the period of March, April and August, 1983. A total of 25 deep borings were conducted by means of hollow stem augers, washboring techniques or hand augering.

In addition this report provides recommendations with regard to the stability and settlement of various earthworks within the limits of the above noted project.

Project Site Description and Geology

The project is located on Highway 622 extending northerly from Atikokan 10.9 km. Highway 622 in this area is a two lane secondary highway with an asphalt concrete surface course.

The surface terrain in this predominately undeveloped area, is generally very rugged.

Physographically the site lies in the region known as the Canadian Shield. Extending northerly from Atikokan the highway crosses glacial lacustrine clay plains for approximately 1 km; organic terrain for an additional 1.5 km; and alternating kame terraces and organic terrain for a further 4 km. The remaining portion of the highway extends through a bedrock knob terrain characterised by high local relief with peat organic terrain in the low lying areas. In this last section the highway borders numerous small lakes.

Subsurface Conditions

The boundaries between the various subsurface types are given on the Record of Borehole Sheets attached. This information is based on field and laboratory work carried out by the Northwest Region Geotechnical Section.

Additional subsurface information incorporated for this study was obtained from the Soils Profile No. 622TB19-1 dated June, 1983.

Discussion and Recommendations

Present proposals call for upgrading the existing Highway 622. Grade and alignment revisions are proposed for most of the highway length under consideration.

Our input was requested with regard to stability and settlement for 10 portions of the Highway 622 where adverse subsurface conditions indicate potential problems.

Our recommendations with regard to the above are contained in the attached Foundation Data Sheets which also describe the present proposals for the reconstruction. These recommendations are based on extensive stability analysis carried out in terms of total stress as well as detailed settlement computations based on consolidation theory.

Miscellaneous

This report was written by M. MacLean, Foundation Engineer and reviewed by M. Devata, Senior Foundation Engineer.



M. MacLean

M. MacLean
Foundation Engineer

M. Devata

M. Devata
Sr. Foundation Engineer

APPENDIX

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 10+952 to 11+100

AVG. EXISTING GND. ELEV. 386.6 PROPOSED HWY. GRADE 389-390

SITE DESCRIPTION: New construction across low lying area. Strawhat Creek meanders across site. (Elev. creek bed 385.4 m).

SUBSURFACE CONDITIONS: (Reference BH 1)

Elev. 386.3 to 379.1 Soft to firm, sensitive, silty clay of intermediate plasticity

Elev. 379.1 to 368.9 Very soft to firm, sensitive, clay of high plasticity (CH)

Elev. 368.9 to 361.3 Firm, sensitive, silty clay of low plasticity (CL)

RECOMMENDATIONS:

Fill heights up to 4.6 m above the creek bed will be stable with 2:1 side slopes. Long term settlements of the embankment due to consolidation of the underlying clay deposits will be in the order of 250 mm. In order to minimize the settlements occurring after paving it is advisable to place 1.0 m of surcharge for a period of 6 months prior to paving.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 11+690 to 12+160

AVG. EXISTING GND. ELEV. 392.8 - 394.5 PROPOSED HWY. GRADE 394.9

SITE DESCRIPTION: Existing 0.5 to 0.9 m high fill. Proposed alignment to be shifted 1 m to right. Proposed grade raise up to 1.0 m.

SUBSURFACE CONDITIONS: Sta. 11+690 to 11+900 and Sta. 11+980 to 12+160
(Reference Soils Profile)

Elev. 393± to 389± Organic soil, very soft.

Elev. 389± below Stiff clay

Sta. 11+900 to 11+980
(Reference BH 3)

Elev. 393.8 to 389.5 Black organic soil, soft.

Elev. 389.5 to 386.8 Soft, sensitive, silty clay of intermediate plasticity.

Elev. 386.8 to 379.2 Very soft to firm, sensitive, clay (CH).

Elev. 379.2 to 371.2 Stiff silt of slight plasticity.

Elev. 371.2 to 360.0 Stiff silty clay of slight plasticity.

RECOMMENDATIONS:

Sta. 11+690 to 11+880 and Sta. 12+000 to 12+160

Fills up to elevation 394.5 will be stable provided the organic material is completely excavated beneath the widening to limits defined by a 1:1 projection down to the firm bottom from the top of the slope. The adverse affects of the anticipated differential settlement of 50 mm between the existing embankment and the widening can be minimized by preloading for a period of 1 year and also by realigning the roadway so that a 1:1 projection from the future edge of pavement falls within the limits of the existing embankment.

(Cont'd)

RECOMMENDATIONS: (Continued)

Sta. 11+880 to 12+000

The presence of the very soft to soft clay deposits underlying the surficial organic deposits is the governing factor with regard to embankment stability. Excavation of the surficial organic deposits and backfilling with granular material in this area will result in overstressing the very soft cohesive material. Extensive berms and subexcavation will be necessary to ensure the stability of the fill required for the nominal grade considered. In addition, it is felt that completed excavation or excavation and displacement of the soft underlying material will not be effective because of the deep deposit and adverse geometry of the firm bottom. In view of the foregoing discussion, it is recommended that the widening and the grade raise be accomplished by using saw dust fill. It will be necessary to carry out excavation of the existing fill to such an extent that the total unit weight of the saw dust plus the fill material covering the saw dust will not exceed the total unit weight of the existing fill. The saw dust should be completely enclosed in a layer of 6 mil thick plastic sheet to prevent the rapid decay of saw dust.

NOTE: This office has contacted Deep Foundations Ltd. requesting proposals from their Mr. B. Lardner regarding the use of pre-fabricated "Ali-Drains" in this area. The "Ali-Drains" are expected to accelerate the consolidation of the peat and underlying soft clay so that direct construction on the organic soil could be carried with minimal post construction settlements. We will keep you advised of the developments in this area.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 11+470 to 12+640

AVG. EXISTING GND. ELEV. 390.5 ± PROPOSED HWY. GRADE 393 to 394

SITE DESCRIPTION: Existing 2.0 m high fill. Proposed alignment to be shifted 2.0 m ± to right. Proposed grade raise up to 1.8 m.

SUBSURFACE CONDITIONS: (Reference BH 5)

Elev. 390.5 to 389.9 Organic soil.

Elev. 389.9 to 384.7 Soft to firm, sensitive, clay of medium to high plasticity (CI to CH).

Elev. 384.7 to 369.2 Silt of low plasticity, very soft to firm.

RECOMMENDATIONS:

Fills up to 3.0 m above average ground surface will be stable with 2:1 side slopes provided that in the area of widenings the organic material is completely subexcavated and backfilled with granular material. Backfilling operations should follow excavations by no more than 15 m to preserve the integrity of the existing embankment. To minimize the expected differential settlement of up to 100 mm between the widening and the existing fill, the final paving should be delayed for a period of one year after completion of the widening. Alternatively, a surcharge up to 0.5 m could be applied for a period of six months. Surcharges in excess of 0.5 m will require berms for stability purposes.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 12+988 to 13+080

AVG. EXISTING GND. ELEV. 391.6 PROPOSED HWY. GRADE 394.4

SITE DESCRIPTION: Existing 0.5 m fill. Proposed alignment to be shifted 1.0 m \pm to right.

SUBSURFACE CONDITIONS: (Reference BH 6)

Elev. 392.1 to 389.1 Organic soil, very soft.

Elev. 389.1 to 386.3 Very soft, very sensitive, clay of high plasticity (CH).

Elev. 386.1 to 381.7 Soft, sensitive, silt of slight plasticity (ML).

Elev. 381.7 \pm Bedrock (probable).

RECOMMENDATIONS:

In order to ensure satisfactory long term performance of the highway embankment, it will be necessary to remove the organic soil in the area of the embankment widening. The presence of the underlying very soft to soft clay and silt deposits necessitate extensive berms to ensure the stability of the embankment. In addition, these very soft to soft compressible deposits will result in long term detrimental settlements of the highway embankments. In view of the foregoing and considering the limited lateral extent of underlying soft deposits it is recommended that the organic soil and the very soft to soft underlying clay and silt deposits be entirely removed beneath the proposed embankment to a limit defined by a 1:1 projection from the top of the slope to sound bottom.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 13+570 to 13+674

AVG. EXISTING GND. ELEV. 409.0± PROPOSED HWY. GRADE 412 to 414°

SITE DESCRIPTION: Up to 2.0 m of existing fill. Proposed alignment shifted 1 m ± right. Proposed grade raise up to 2.0 m.

SUBSURFACE CONDITIONS: (Reference BH 8)

Elev. 409.8 to 407.7 Organic soil.

Elev. 407.7 to 404.9 Silt of slight plasticity, stiff.

Elev. 404.9 to 400.2 Sandy silt to silty sand, very loose to loose.

RECOMMENDATIONS:

Fill heights up to 4.5 m will be stable with 2:1 side slopes provided the organic material is completely subexcavated within the limits of the widening as defined by a 2:1 projections from the top of the slope to the silt deposit. Backfill must be a free draining granular material.

Settlements between the existing fill and widened portion are expected to be very small and will occur during or shortly after construction.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 14+500 to 14+720

AVG. EXISTING GND. ELEV. 396 to 385 PROPOSED HWY. GRADE 396 to 385

SITE DESCRIPTION: Proposed alignment shifted to left by 8 m \pm .
Proposed grade reduced by 0 to 1.0 m. Existing
slopes 3 or 4:1.

SUBSURFACE CONDITIONS: (Reference BH 11, 12 and 13)

Elev. 383 \pm to 382 \pm Organic soil.

Elev. 382 \pm to 371 \pm Silty clay of intermediate plasticity, very soft to soft, sensitive.

Elev. 371 \pm to 364 \pm Clay of intermediate plasticity to high plasticity, soft, sensitive.

RECOMMENDATIONS:

Because of the marginal factor of safety of the existing embankments and the extremely soft conditions immediately left of the existing roadway it is recommended that no additional fill be added in this area. If it is desired to straighten the alignment it should be done by lowering the grade so that no additional fill is required.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 14+805 to 15+070

AVG. EXISTING GND. ELEV. 383 to 385 PROPOSED HWY. GRADE 385 to 386.5

SITE DESCRIPTION: Alignment shifted 20 to 30 m to east and follows remains of a failed embankment previously located in this area.

SUBSURFACE CONDITIONS: BH 15: Sta. 14+923 o/s 4.0 m Lt.

Elev. 385.1 to 384.8 Organic soil.

Elev. 384.8 to 379.0 Very loose to loose sand (Probable fill).

Elev. 379.0 to 367.1 Silty clay of intermediate plasticity, very soft.

Elev. 367.1 to 362.8 Clay of high plasticity, firm.

Elev. 362.8 ± Probable Bedrock.

RECOMMENDATIONS:

If the revised alignment follows the line as proposed it will be located in the area of a previous failure. For stability purposes the fill should be limited to a height of not more than 1.0 m with 2:1 side slopes. The surficial organic material should be subexcavated and backfilled with free draining granular material. It is emphasized that the road performance for this alignment will not be very good. Differential settlements are expected to be substantial because of the variable condition and geometry of fill in the failed area and because of the very soft underlying soil. In view of the depth of these very soft underlying deposits removal by either excavation or displacement is considered impractical. In view of the anticipated poor road performance for this alignment, it is recommended that the alignment be located elsewhere.

For widening of the existing embankment or for new construction in this area, the shallow surficial organic material should be completely subexcavated beneath plan limits of the widening and backfilled with free draining granular material. Fill heights up to 2.0 m will be stable with 2:1 side slopes. Long term settlements of the embankment will be in the order of 250 mm. Differential settlements between the widened portion and the existing embankment are expected to be up to 50 mm. The adverse effects of these differential settlements can be minimized by preloading for a period of 6 months (Note: berms are required for additional surcharge loads and hence surcharging is not considered economically justifiable) and by adjusting the alignment to that a 1:1 line project down from the pavement surface is within the limits of the existing embankment.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 15+130 to 15+230

AVG. EXISTING GND. ELEV. 385.5 + PROPOSED HWY. GRADE 386.5

SITE DESCRIPTION: Existing fill 1.0 m high. Proposals require alignment revision 2 m (\pm) right. No grade revision proposed.

SUBSURFACE CONDITIONS: (Reference BH 18)

Elev. 385.4 to 384.8 Organic soil.

Elev. 384.8 to 382.7 Loose sand.

Elev. 382.7 to 361.3 Soft, sensitive, silty clay and clay.

RECOMMENDATIONS:

Excavate the organic soil in the area of the widening to a limit defined by a 2:1 slope projecting from the top of the slope to the sand deposit and backfill with granular material. Settlements between the widening and the existing embankment are expected to be in the order of 50 mm. The adverse effects of these settlements can be minimized by preloading for a period of six months.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 15+650 to 15+850

AVG. EXISTING GND. ELEV. 396 to 400 PROPOSED HWY. GRADE 396.5 to 401.4

SITE DESCRIPTION: Existing fill 4.0 m high. Proposals required increasing grade by up to 1.5 m and shifting alignment to the west.

SUBSURFACE CONDITIONS: (Reference BH 19)

Elev. 414.5 to 413.9 Organic soil.

Elev. 413.9 to 412.4 Firm, silty clay with organics, very sensitive.

Elev. 412.4 to 405.7 Very stiff, silty clay of low to intermediate plasticity.

Elev. 405.7 Probable Bedrock.

RECOMMENDATIONS:

Fills up to 5.5 m above the average original ground surface will be stable with 2:1 side slopes provided the organic material and the underlying firm silty clay in the area of the widening is completely excavated and backfilled with granular material. Differential settlements between the widening and existing embankment are expected to be in the order of 100 mm. Preloading for a period of 1 year is recommended in order to reduce differential settlements after paving. Surcharge techniques are not recommended because of the need for berms for stability of the higher embankments.

FOUNDATION DATA SHEET

LOCATION: Hwy. 622 Sta. 16+267 to 16+330

AVG. EXISTING GND. ELEV. 414.0 PROPOSED HWY. GRADE 414 to 416

SITE DESCRIPTION: Existing 0.9 m fill. Proposed 2.5 m right alignment shift. No changes proposed for vertical alignment.

SUBSURFACE CONDITIONS: (Reference BH 20)

Elev. 414.3 to 413.4 Organic soil.

Elev. 413.4 to 412.2 Compact sandy silt.

Elev. 412.2 to 409.9 Silty clay of slight plasticity. Stiff.

Elev. 409 ± Probable Bedrock.

RECOMMENDATIONS:

Excavate in the widened portion in accordance with DD-408. Settlements between the widened portion and existing fill are expected to be very small and will occur during or shortly after construction.

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/0.3 m)	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 (R Q D), 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

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 = $\frac{c_u}{\tau_r}$

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

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^2	SEEPAGE FORCE
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL						



METRIC

ORIGINATED BY AM

COMPILED BY RM

CHECKED BY

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



Ministry of
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Communications
Ontario

RECORD OF BOREHOLE No 1 Continued METRIC

W P 174-79-01 LOCATION Sta. 10 + 960; C Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger Washboring & Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 19 and 1983 04 25 CHECKED BY GP

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
350.3	Continued												
36.0													
347.7													
38.6	End of Cone Test												

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

METRIC

W P 174-79-01 LOCATION Sta. 11 + 860; o/s 10.5 m RT of Hwy. 622
DIST 19 HWY 622 BOREHOLE TYPE Cone Penetration Test
DATUM Geodetic DATE 198303 25

ORIGINATED BY AM
COMPILED BY RM
CHECKED BY SP

[illegible]

+3, x5 : Numbers refer to Sensitivity

RECORD OF BOREHOLE No 3

METRIC

W P 174-79-01 LOCATION Sta. 11 + 920; o/s 9.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Washboring & Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 21 to 23 and 1983 04 22 CHECKED BY

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			20 40 60 80 100	25 50 75					
393.8	Ground Surface													
0.0	Organic Soil Soft Black					*		Frozen Ground +6						
389.5								+73						
4.3	Silty Clay of intermediate plasticity (sensitive) Soft Grey		2	SS	1			+13						
386.8								+10						
7.0	Clay (sensitive) of high plasticity Very Soft Light Red Grey Firm		3	TW	1			+4.5					14.5 E _s =2.868 P _c =64kPa Cc=1.81	0 0 62 38
			4	SS	1			+1.6						0 0 15 85
														0 0 14 86
			5	TW	1			+2.1					15.7 E _s =1.594 P _c =123kPa Cc=1.04	0 0 39 61
379.2														
14.6	Silt of slight plasticity trace of clay Stiff Grey		6	SS	1			+4.8						0 0 90 10
			48	SS	3									1 1 87 11
			49	SS	14									0 3 67 30
371.2														
22.6	Silty Clay of slight plasticity Stiff Grey		50	SS	3									4 5 62 29
			51	SS	3									2 2 57 39
			52	SS	10			122/30 cm						0 1 72 27
			53	SS	20									1 4 86 9
359.7	Silt Red Very Stiff		54	SS										0 2 86 12
34.1	End of Borehole													
	*Note Water Level Not Established													

+3, x5: Numbers refer to 20
Sensitivity 15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



METRIC

W P 174-79-01 LOCATION Sta. 11 + 980; o/s 10.0 m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Washboring and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 21 to 22 CHECKED BY [Signature]

[illegible]

+3, x5: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION

**METRIC**

W P 174-79-01 LOCATION Sta. 12 + 540; o/s 8-0m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 26 and 1983 05 03 CHECKED BY (Signature)

[illegible]

+3, x5: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 6

METRIC

W P 174-79-01 LOCATION Sta. 13 + 038; o/s 12.0 m LT. & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 26 and 1983 04 08 CHECKED BY

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			20 40 60 80 100						
392.1	Ground Surface													
0.0	Organic Soil Very Soft Black		12	SS	2	*	392	Frozen Ground						
389.1							390	+2					W=471%	
3.0	Clay (very sensitive) of high plasticity		13	SS	1		388	+8					W=138%	0 0 10 90
386.3	Red Grey Very Soft		14	SS	1			+7.5					W=106%	0 0 15 85
5.8	Silt (sensitive) of slight plasticity Soft Grey		15	SS	2		386	+14						0 3 79 18
			16	SS	1		384							0 1 84 15
381.7	End of Borehole Probable Bedrock						382							
10.4	*Note Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 7

METRIC

W P 174-79-01 LOCATION Sta. 13 + 047; o/s 8.0 m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Washboring and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 26 and 1983 04 10 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		W _p	W	W _L		
								SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
391.4	Ground Surface													GR SA SI CL
0.0	Organic Soil Firm Black					*		Frozen Ground						
389.6							390	3.6						
1.8			18	SS	16		388							0 1 65 34
			19	SS	2		386							0 0 44 56
			20	SS	4		384							0 1 60 39
			21	SS	5									0 1 79 20
382.6	Sand Brown													
8.8	End of Borehole Probable Bedrock													
	* Note: Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION



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Ontario

RECORD OF BOREHOLE No 8

METRIC

W P 174-79-01 LOCATION Sta. 13 + 622; o/s 7.5 m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 26 and 1983 04 09 CHECKED BY *EF*

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
409.2	Ground Surface													
0.0	Organic Soil Black					*			Frozen Ground					
407.7	Silt of slight plasticity trace of clay, sand and gravel								+ 58					
1.5	Stiff Grey		8	SS	10									2 1 84 13
404.9	Sandy Silt to Silty Sand Trace of Clay Very Loose to Loose Brown		9	SS	6									1 27 68 4
4.3			10	SS	2									0 18 79 3
			11	SS	5									0 66 30 4
400.2	End of Borehole													
9.0														
394.3														
14.9	End of Cone Test								120/28 cm					
	<u>*Note</u> Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE



METRIC

W P 174-79-01 LOCATION Sta. 14 + 467; o/s 80 m LT Q Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Cone Penetration Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 12 CHECKED BY JP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100							W _p	W	W _L
								SHEAR STRENGTH									
								○ UNCONFINED	+ FIELD VANE								
								● QUICK TRIAXIAL	x LAB VANE	WATER CONTENT (%)							
386.3 0.0	Ground Surface						386	Frozen Ground									
							384										
							382										
							380										
							378										
377.2 9.1	End of Cone Test Probable Bedrock							29/28 cm									

+3, x5: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION



METRIC

W P 174-79-01 LOCATION Sra. 14 + 560; o/s 90 m IT C Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Cone Penetration Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 19 CHECKED BY GP

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	20 40 60 80 100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			WATER CONTENT (%)					
386.5	Ground Surface														GR SA SI CL
0.0									386	Frozen Ground					
									384						
									382						
									380						
									378						
									376						
									374						
									372						
									370						
									368						
									366						
									364						
									362						
									360						
									358						
									356						
									354						
									352						

36.0 End of Cone Test

+3, x5 ; Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 11

METRIC

W P 174-79-01 LOCATION Sta. 14 + 605; o/s 30.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Washboring and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 06 and 20 CHECKED BY

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
384.9	Ground Surface													
0.0 384.0 0.9	Organic Soil Black					*	384	Frozen	Ground					
				SS	1									
	Silty Clay (sensitive) of intermediate plasticity		34	SS	1		382						0	2 68 30
			35	SS	1		380						0	0 54 46
	Very Soft to Soft Grey		36	SS	1		378						0	0 58 42
			37	SS	2		376						0	0 66 34
375.3 9.6	Clay (sensitive) of high plasticity		38	SS	2		374						0	0 42 58
	Soft Red		39	SS	2		372						0	0 23 77
370.6 14.3	Silty Sand						370							
369.2	Trace of gravel													
15.7	Very Dense Grey			SS	137				120/5 cm					
	End of Borehole													
	<u>*Note</u> Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 12

METRIC

W P 174-79-01 LOCATION Sta. 14 + 650; o/s 27.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 06 and 21 CHECKED BY *EP*

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 (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE						
383.9	Ground Surface						20 40 60 80 100		25 50 75						
383.6	Organic Soil Black														
0.3	Some Sand		40	SS	2	*	382	Frozen Ground						0 21 71 8	
			41	SS	1		380	+ 9						0 0 65 35	
	Silty Clay (sensitive) of intermediate plasticity Very Soft to Soft Grey		42	SS	1		378	+ 44						0 0 51 49	
			43	SS	2		376							1 2 63 34	
			44	SS	2		374							0 0 55 45	
			45	SS	2		372							0 1 61 38	
372.6			46	SS	1		370							0 0 17 83	
11.3	Clay (sensitive) of high plasticity Soft Red		47	SS	2		368							0 0 24 76	
366.1	End of Borehole Probable Bedrock							Cone Test Terminated at Probable Bedrock							
17.8	*Note Water Level Not Established														

+3, x5: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 13

METRIC

W P 174-79-01 LOCATION Sta. 14 + 750; o/s 25.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 06 and 29 CHECKED BY

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 (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									
								SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
										WATER CONTENT (%) 25 50 75							
382.8	Ground Surface																
382.5	Organic Soil Black																
0.3																	

+3, x5 : Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 15

METRIC

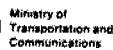
W P 174-79-01 LOCATION Sta. 14 + 923; o/s 4.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger, Cone Test & Continuous Vane Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 07 and 29 (Vane Test 83 08) CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
385.1	Ground Surface													
384.8	Organic Soil Black													
384.5														
	Sand trace of silt Very Loose to Loose Grey		75	SS	1	*	384							1 92 7 0
							382							
							380							
379.0			76	SS	1		378							0 34 38 28
6.1	With Sand		77	SS	1		376							0 6 72 22
			78	SS	1		374							0 1 67 32
	Silty Clay of intermediate plasticity Very Soft Grey		79	SS	1		372							0 0 55 45
			80	SS	0		370							0 0 68 32
367.1							368							
18.0	Clay of high plasticity Firm Red		81	SS	0		366							0 0 16 84
							364							0 0 23 77
362.8			82	SS	0									
22.3	End of Borehole Probable Bedrock													
	*Note Water Level Not Established													

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



METRIC

ORIGINATED BY AM

COMPILED BY RM

CHECKED BY ST

+3, x5: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION

[illegible]

+3, x⁵: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 18

METRIC

W P 174-79-01 LOCATION Sta. 15 + 175; o/s 11.0 m RT Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 08 CHECKED BY

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			20 40 60 80 100	SHEAR STRENGTH kPa					
385.4	Ground Surface								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					GR SA SI CL
384.8	Organic Soil Black								25 50	25 50 75				
0.6	Sand trace of silt Loose Grey		65	SS	4	*	384							1 89 10 0
382.7	traces of sand and organic		66	SS	2		382							0 27 54 19
2.7			67	SS	1		380							0 6 74 20
	Silty Clay (sensitive)		68	SS	1		378							0 1 62 37
	Soft		69	SS	1		376							0 0 59 41
			70	SS	2		374							0 0 61 39
372.8			71	SS	1		372							0 0 57 43
12.6	Clay (sensitive)						370							0 0 22 78
	Soft Red		72	SS	0		368							0 1 34 65
368.6							366							0 0 85 15
16.8	Silty Clay (sensitive) Soft to Firm Grey		73	SS	0		364							
			74	SS	1		362							
361.3	End of Borehole Probable Bedrock													
24.1	*Note Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 19

METRIC

W P 174-79-01 LOCATION Sta. 15 + 703; o/s 13.0 m RT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 27 and 1983 04 08 CHECKED BY *ep*

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			20	40	60	80	100					
414.5	Ground Surface																
413.9	Organic Soil Black																
0.6	Silty Clay with Organics (very sensitive)					*											
412.4	Firm Grey																
2.1																	
	Silty Clay of low to intermediate plasticity Very Stiff Grey		7	SS	7												0 3 75 22
405.7																	
8.8	End of Borehole Probable Bedrock																
	*Note Water Level Not Established																

+3, x5: Numbers refer to Sensitivity 20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 20

METRIC

W P 174-79-01 LOCATION Sta. 16 + 293; o/s 5.0 m RT of Hwy. 622**
 DIST 19 HWY 622 BOREHOLE TYPE Washboring and Cone Test
 DATUM Geodetic DATE 1983 03 28 and 1983 04 10
 ORIGINATED BY AM
 COMPILED BY RM
 CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p	W	W _L		
								SHEAR STRENGTH		WATER CONTENT (%)			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
414.3	Ground Surface								25	50	75		GR SA SI CL
0.0	Organic Soil Black					*	414	Frozen Ground					
413.4	Organic												
0.9	Sandy Silt												
412.2	Compact Brown		22	SS	27		412						
2.1	Silty Clay of slight plasticity Stiff		23	SS	12								0 0 76 24
409.9	Grey						410						
4.4	End of Borehole Probable Bedrock												
408.3													
6.0	End of Cone Test Probable Bedrock							120/25 cm					
	<u>*Note</u> Water Level Not Established												
	<u>**Note</u> Cone Test located at Sta. 16 + 293 o/s 7.0 m RT & Hwy. 622												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 21

METRIC

W P 174-79-01 LOCATION Sta. 18 + 253; o/s 16.0 m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 29 and 1983 04 11 CHECKED BY SP

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH					
410.8	Ground Surface													
0.0	Organic Soil Black					*	410	Frozen Ground						
408.5							408							0 10 75 15
2.3	Silt of slight plasticity traces of clay and sand		26	SS	29									
406.5	Very Stiff Grey													
4.3	Sand, with Silt trace clay, some gravel		27	SS	31		406							26 37 27 10
405.4	Compact Grey													
5.4	End of Borehole Probable Bedrock							55/25 cm						
	* Note Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 22

METRIC

W P 174-79-01 LOCATION Sta. 18 + 090; o/s 10.0 m RT of Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 03 29 and 1983 04 10 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
410.9	Ground Surface							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE						
								● QUICK TRIAXIAL x LAB VANE						
								25 50						
								WATER CONTENT (%)						
								Wp W WL						
								25 50 75						
0.0	Organic Soil Black					*	410	Frozen Ground						
409.4														
1.5	Silt of slight plasticity traces of sand Very Stiff Grey		24	SS	39		408							0 4 70 26
			25	SS	26		406							1 2 87 10
405.1	End of Borehole Probable Bedrock													
5.8	<u>Note</u> Water Level Not Established													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 23

METRIC

W P 174-79-01 LOCATION Sta. 18 + 500; o/s 22.0 m LT & Hwy. 622 ORIGINATED BY AM
DIST 19 HWY 622 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RM
DATUM Geodetic DATE 1983 04 06 and 11 CHECKED BY *GP*

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								20 40 60 80 100						
								○ UNCONFINED + FIELD VANE						
								● QUICK TRIAXIAL x LAB VANE						
								25 50				25 50 75		
411.1	Ground Surface													
0.0	Fill													
410.2	Gravel Rock													
0.9														
	Organic Soil Very Soft Black		27	SS	3	*	410	Gravel Rock Fill and Frost						
								+10						
			28	SS	2		408							
			28	SS	2		406							
405.3			29	SS	1		404							
5.8			30	SS	1		402	+14						0 18 59 23
	Silty Clay (sensitive) trace to some sand		31	SS	1		400							0 17 70 13
	Firm Grey		32	SS	1		398							0 2 71 27
			33	SS	5		396							0 1 84 15
395.0							394							0 10 74 16
16.1	End of Borehole						392							
391.7														
19.4	End of Cone Test													

+3, x5: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 24

METRIC

W P 174-79-01 LOCATION Sta. 15 + 960; o/s 12.0 m RT of Hwy. 622 ORIGINATED BY AM
 DIST 19 HWY 622 BOREHOLE TYPE Vane Test COMPILED BY HI
 DATUM Geodetic DATE 1983 08 CHECKED BY CP

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH kPa					
409 [±]	Ground Surface						20 40 60 80 100						
0.0							25 50						
						408							
							+18						
						406	+22						
							+13						
						404	+8						
							+8						
						402	+7						
							+4						
						400	+5						
							+4						
						398	+4						
397 [±]							+4						
12.0	End of Vane Test												

OFFICE REPORT ON SOIL EXPLORATION

+3, x5 : Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 25

METRIC

W P 174-79-01 LOCATION Sta. 15 + 980; o/s 5.0 m RT of Hwy. 622 ORIGINATED BY AM
 DIST 19 HWY 622 BOREHOLE TYPE Vane Test COMPILED BY HI
 DATUM Geodetic DATE 1983 08 CHECKED BY GP

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	20 40 60 80 100			W _p	W	W _L	WATER CONTENT (%)			
411±	Ground Surface														
0.0															

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE