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DIST. 6 REGION

W.P. No. 144-87-00(B)

CONT. No. 94-37

W. O. No.

STR. SITE No.

HWY. No. 407

LOCATION HML - Hwy 400 E to
CPR. MacMillan Rd.

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

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Transportation

FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

CONT 9A-37

WP 144-87-00(B) DIST 6

HWY 407 STR SITE -

High Mast Lighting
Hwy 407 From Weston Road to Jane Street

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FOUNDATION INVESTIGATION REPORT
For
High mast Lighting
Hwy 407 From Weston Road to Jane Street
W.P. 144-87-00(B)
Hwy. 407, District 6, Toronto

INTRODUCTION

This report presents the soil information for the proposed high mast lights at the above mentioned site. Soil information was collected from previous subsurface investigations in the area and supplemented by drilling seven new boreholes (P48, P49, P54, P58, P59, P61, P68). The previous investigations were carried out under work project number, W.P. 164-79-06, W.P. 137-87-01 and W.P. 140-87-01. In areas where soil information was not available (on the east side of Hwy 400) new boreholes were drilled. The investigation was carried out at the request of Central Region Structural Section.

SITE DESCRIPTION

The high mast lighting poles will be located along the proposed Highway 407 alignment from Weston Road to just east of Jane Street. The area is situated in Vaughan Township.

The topography across the site consists of relatively flat land.

The site lies within the physiographic region known as the South Slope (after Chapman and Putnam, 1984) and it consists largely of glacial deposits. Land use in the area is agricultural or undeveloped.

INVESTIGATION PROCEDURES

The field work for the new boreholes (P48, P49, P54, P58, P59, P61 and P68) was conducted between 93 03 29 and 93 03 31. The boreholes were advanced using a CME55 track-mounted auger machine equipped with solid 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).

SUBSURFACE CONDITIONS

General

All new and old boreholes encountered glacial till as a native soil. In general, at most of the locations the strata consists of clayey silt to silt with layers of silty sand to gravelly sand. The deposits occasionally contain cobbles and boulders. The site for the proposed high mast light poles covers several kilometres. Hence, the composition of the till is variable. At some locations the till consists of cohesive material and at other locations it consist of non-cohesive material. However, the composition of till within short distances are consistent. For detailed soil condition at any high mast light location reference is made to attached log sheets.

The locations of new seven boreholes are shown on the attached drawing Dwg. No. 1448700B-A.

Groundwater Conditions

Groundwater was encountered in all new boreholes. Groundwater stabilized in about 24 hours. The water level ranged from 187.2m (BH P48) to 197.5m (BH P59) which corresponds to depth 1.6m (BH P59) to 4.2m (BH P68) below ground surface. The groundwater table is expected to lie within the wet to saturated non-cohesive layers of soil (refer to borehole logs). The composition of the non-cohesive silty sand to gravelly sand seams in the glacial till make the material susceptible to disturbance under conditions of unbalanced hydrostatic head.

DISCUSSION AND RECOMMENDATIONS

It is proposed to install 28 high mast lighting poles (P35 through P61 and P68) along Hwy 407 between Weston Road and just east of Jane Street. The details of high mast lighting poles locations and elevations are attached to this report in Appendix A.

The High Mast Lighting poles will be founded on single reinforced concrete caissons. The foundations for HML should be designed in accordance with the methods described by B.B. Broms in the following two papers:

Broms, B.B.; Lateral Resistance of Piles in Cohesive Soils, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol.90, No.SM2, Paper 3825, March 1964.

Broms, B.B.; Lateral Resistance of Piles in Cohesionless Soils, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol.90, No.SM3, Paper 3909, May 1964.

There will be no grade changes at most of the pole locations with exception of following light poles where grades will be changed:

<u>HML Pole</u>	<u>Change in Grade</u>
P35	Cut 0.7m
P44	Fill 10.4m
P53	Cut 1.4m
P54	Cut 3.0m
P55	Cut 3.1m
P56	Cut 2.0m
P57	Cut 3.8m

If the grade is to be changed at the pole locations then, the most critical lowest surface elevations should be assumed for design purposes. It should be assumed that soil in the zone of frost penetration does not provide any lateral resistance. The depth of frost penetration at this site is 1.2m.

The design values at each of the HML locations are as follows:

SOIL PARAMETERS AT EACH HIGH MAST LIGHT POLES

Structure Locations	W.L. Elev (m)	Elev (m) From - To	Soil Type	ϕ (Deg)	Q_u kPa	γ kN/m ³
P35	190.0	190.8-186.0	Cohesive	0	120	19.6
		186.0-180.0	Cohesive	0	500	21.2
		180.0-176.6	Cohesive	0	250	20.2
P36	190.0	190.8-186.0	Cohesive	0	120	19.6
		186.0-180.0	Cohesive	0	500	21.2
		180.0-176.6	Cohesive	0	250	20.2
P37	192.0	192.9-188.0	Cohesive	0	300	20.4
		188.0-184.0	Cohesive	0	450	21.0
		184.0-180.3	Cohesive	0	500	21.2
P38	190.0	190.8-186.0	Cohesive	0	120	19.6
		186.0-180.0	Cohesive	0	500	21.2
		180.0-176.6	Cohesive	0	250	20.2
P39	191.0	191.5-189.0	Cohesive	0	350	20.6
		189.0-185.0	Non-Cohesive	30	0	21.2
		185.0-176.3	Cohesive	0	500	21.2
P40	192.0	192.9-188.0	Cohesive	0	300	20.4
		188.0-184.0	Cohesive	0	450	21.0
		184.0-180.3	Cohesive	0	500	21.2
P41	192.0	192.9-188.0	Cohesive	0	300	20.4
		188.0-184.0	Cohesive	0	450	21.0
		184.0-180.3	Cohesive	0	500	21.2
P42	191.0	191.8-189.5	Cohesive	0	200	20.0
		189.5-187.5	Non-Cohesive	30	0	21.2
		187.5-185.4	Cohesive	0	500	21.2
P43	191.0	191.5-189.0	Cohesive	0	350	20.6
		189.0-185.0	Non-Cohesive	30	0	21.2
		185.0-176.3	Cohesive	0	500	21.2
P44	190.8	192.0-188.5	Cohesive	0	250	20.2
		188.5-185.0	Non-Cohesive	30	0	20.6
		185.0-176.6	Cohesive	0	500	21.2

Structure Locations	W.L. Elev (m)	Elev (m) From - To	Soil Type	ϕ (Deg)	Q_u kPa	γ kN/m ³
P45	191.8	192.3-185.0	Cohesive	0	250	20.2
		185.0-180.0	Cohesive	0	350	21.2
		180.0-176.9	Cohesive	0	500	21.2
P46	190.0	192.3-189.0	Cohesive	0	200	20.0
		189.0-184.0	Cohesive	0	500	21.2
		184.0-176.0	Cohesive	0	250	20.2
		176.0-173.6	Cohesive	0	500	21.2
P47	190.0	192.3-189.0	Cohesive	0	200	20.0
		189.0-184.0	Cohesive	0	500	21.2
		184.0-176.0	Cohesive	0	250	20.2
		176.0-173.6	Cohesive	0	500	21.2
P48	187.2	188.9-187.0	Cohesive	0	200	20.0
		187.0-183.0	Cohesive	0	500	20.2
		183.0-179.3	Cohesive	0	300	20.4
P49	190.0	192.5-189.0	Cohesive	0	200	20.0
		189.0-182.9	Cohesive	0	400	20.8
P50	184.5	191.5-189.0	Cohesive	0	200	20.0
		189.0-183.4	Cohesive	0	500	21.2
P51	184.5	191.5-189.0	Cohesive	0	200	20.0
		189.0-183.4	Cohesive	0	500	21.2
P52	192.0	193.4-189.5	Cohesive	0	100	19.6
		189.5-180.8	Cohesive	0	350	20.6
P53	193.0	193.8-190.0	Cohesive	0	150	19.8
		190.0-185.4	Cohesive	0	400	20.8
P54	192.8	195.6-191.0	Cohesive	0	150	19.8
		191.0-186.0	Cohesive	0	500	21.2
P55	194.0	197.4-193.0	Cohesive	0	150	19.8
		193.0-188.8	Non-Cohesive	30	0	20.0
		188.8-187.8	Cohesive	0	350	20.5
P56	194.0	197.4-193.0	Cohesive	0	150	19.8
		193.0-188.8	Non-Cohesive	30	0	20.0
		188.8-187.8	Cohesive	0	350	20.5

Structure Locations	W.L. Elev (m)	Elev (m) From - To	Soil Type	ϕ (Deg)	Q_u kPa	γ kN/m ³
P57	197.5	199.1-197.0	Cohesive	0	120	19.5
		197.0-194.5	Cohesive	0	250	20.2
		194.5-192.0	Cohesive	0	350	20.6
		192.0-189.5	Cohesive	0	500	21.2
P58	194.0	197.4-193.0	Cohesive	0	150	19.8
		193.0-188.8	Non-Cohesive	30	0	20.0
		188.8-187.8	Cohesive	0	350	20.5
P59	197.5	199.1-197.0	Cohesive	0	120	19.5
		197.0-194.5	Cohesive	0	250	20.2
		194.5-192.0	Cohesive	0	350	20.6
		192.0-189.5	Cohesive	0	500	21.2
P60	192.5	195.9-193.5	Cohesive	0	150	19.8
		193.5-191.0	Cohesive	0	300	20.4
		191.0-186.3	Cohesive	0	500	21.2
P61	192.5	195.9-193.5	Cohesive	0	150	19.8
		193.5-191.0	Cohesive	0	300	20.4
		191.0-186.3	Cohesive	0	500	21.2
P68	191.5	195.4-191.5	Cohesive	0	150	19.8
		191.5-188.2	Cohesive	0	500	21.2
		188.2-185.8	Non-Cohesive	30	0	21.2

Where:

HML = High Mast Lighting
 ϕ = Apparent angle of internal friction for non-cohesive Soils
 Q_u = Unconfined Compressive Strength (kPa)
 γ = Unit Weight (kN/m³)

Construction Consideration:

It is recommended that a non-standard special provision for the construction of HML foundations, should be incorporated in the contract. A copy of the latest NSSP from other project is appended in this report for reference. The contractor should be advised that variable types of subsurface material may be encountered at the high mast light pole locations; and that the soil descriptions in this report are generalized and not site specific. For construction planning purposes it may be assumed that;

- Groundwater is at or near the surface.
- Cohesionless material may be encountered and it would be susceptible to disturbance under conditions of unbalanced hydrostatic head.
- Glacial deposits are anticipated and there is a probability that occasional cobbles and boulders may be encountered within the deposit.

The Contractor is responsible for constructing the high mast pole foundations without disturbing the material at the sides or bases of the foundations. His proposal should be capable of dealing with the above-noted site condition. The Contractor shall submit eight copies of his proposed construction method to the Engineer for review a minimum of 15 working days prior to the commencement of construction of these foundation elements.

Miscellaneous

The supplementary fieldwork for this project was carried out under the supervision of K. Ahmad, using equipment owned and operated by Malone Soil Samples. The report was prepared by K. Ahmad, Foundation Engineer, reviewed by D. Dundas, Senior Foundation Engineer and approved by M. Devata, Chief Foundation Engineer.



K. S. Q. Ahmad

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

M. Devata

M. Devata, P. Eng.
Chief Foundation Engineer

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

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
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'_{vo}	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_f	kPa	REMOULDED SHEAR STRENGTH
S_f	1	SENSITIVITY = $\frac{c_u}{\tau_f}$

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						

FORMER

RECORD OF BOREHOLE No 13

METRIC

W P 164-79-06 LOCATION Co-ords. N 4 848 755.0; E 301 194.5 ORIGINATED BY KZ
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers & Cone Test COMPILED BY KZ
 DATUM Geodetic DATE 88 05 24 CHECKED BY

OFFICE REPORT ON SOIL EXPLORATION

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								WATER CONTENT (%) 20 40 60
								SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
190.8	Ground Level															
0.0	Clayey Silt, Some Sand Occ. Gravel, Random Layers or Pockets of Sand, Boulders & Cobbles, Stiff (Glacial Till)	Brown	1	SS	12											
188.4																
2.4	Silty Clay Occ. Silt and Clay Layers	Grey	2	SS	14									0 10 50 40		
186.8	Stiff (Lacustrine)															
4.0			3	SS	49									2 19 65 14		
	Clayey Silt Some Sand Occasional Gravel Random Layers or Pockets of Sand Boulders & Cobbles Hard (Glacial Till)		4	SS	54											
			5	SS	73											
			6	SS	86											
			7	SS	68											
179.2																
11.6	Silty Clay Occasional Silt and Clay Layers Very Stiff (Lacustrine)		8	SS	25									0 0 28 72		
176.6			9	SS	24											
14.2	End of Borehole															

FORMER

RECORD OF BOREHOLE No 13

METRIC

W P 164-79-06 LOCATION Co-ords. N 4 848 755.0; E 301 194.5 ORIGINATED BY KZ
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers & Cone Test COMPILED BY KZ
DATUM Geodetic DATE 88 05 24 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					
190.8	Ground Level													
0.0	Clayey Silt, Some Sand Occ. Gravel, Random Layers or Pockets of Sand, Boulders & Cobbles, Stiff (Glacial Till)	Brown	1	SS	12									
188.4	Silty Clay	Grey	2	SS	14									
2.4	Occ. Silt and Clay Layers													
186.8	Stiff (Lacustrine)		3	SS	49									
4.0	Clayey Silt Some Sand Occasional Gravel Random Layers or Pockets of Sand Boulders & Cobbles Hard (Glacial Till)		4	SS	54									
			5	SS	73									
			6	SS	86									
			7	SS	68									
179.2	Silty Clay Occasional Silt and Clay Layers Very Stiff (Lacustrine)		8	SS	25									
11.6			9	SS	24									
176.6	End of Borehole													
14.2														

OFFICE REPORT ON SOIL EXPLORATION

POLE NO P37

W.P. 144-87-00(B)

FORMER			RECORD OF BOREHOLE No 11-11				METRIC					
W P 137-87-03		LOCATION Co-ords. N 4 849 033.0; E 301 623.5		ORIGINATED BY TS								
DIST 6 HWY 400/407		BOREHOLE TYPE Cone Test, Solid Stem Auger		COMPILED BY TS								
DATUM Geodetic		DATE 87 11 18		CHECKED BY HS								
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					
192.9	Ground Surface											
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff (Glacial Till)		1	SS	29							
			2	SS	29							
180.6	Silt, Dense (Lacustrine)		3	SS	31							
2.3			4	SS	50							
			5	SS	25							
			6	SS	54							
			7	SS	42							
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Compact to Very Dense Very Stiff to Hard (Glacial Till)		8	SS	43							
			9	SS	48							
			10	SS	52							
			11	SS	80							
180.3			12	SS	100							
12.6	End of Borehole											

FORMER

RECORD OF BOREHOLE No 13

METRIC

W P 164-79-06 LOCATION Co-ords. N 4 848 755.0; E 301 194.5 ORIGINATED BY KZ
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers & Cone Test COMPILED BY KZ
 DATUM Geodetic DATE 88.05.24 CHECKED BY

OFFICE REPORT ON SOIL EXPLORATION

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			VALUES	20 40 60 80 100					
190.8	Ground Level												
0.0	Clayey Silt; Some Sand Occ. Gravel, Random Layers or Pockets of Sand, Boulders & Cobbles, Stiff (Glacial Till)	Brown	1	SS	12								
188.4	Silty Clay	Grey	2	SS	14								0 10 50 40
2.4	Occ. Silt and Clay Layers												
186.8	Stiff (Lacustrine)		3	SS	49								2 19 65 14
4.0	Clayey Silt Some Sand Occasional Gravel Random Layers or Pockets of Sand Boulders & Cobbles Hard (Glacial Till)		4	SS	54								
			5	SS	73								
			6	SS	86								
			7	SS	68								
179.2	Silty Clay Occasional Silt and Clay Layers Very Stiff (Lacustrine)		8	SS	25								0 0 28 72
11.6			9	SS	24								
176.6	End of Borehole												
14.2													



POLE NO P39

W.P. 144-87-00(B)

FORMER

RECORD OF BOREHOLE No 9-11

METRIC

W P 137-87-06 LOCATION Co-ords. N 4 848 825.0; E 301 771.0 ORIGINATED BY MS
DIST 6 HWY 400/407 BOREHOLE TYPE Cone Test, H-S Auger, Tricone COMPILED BY MS
DATUM Geodetic DATE 87 10 30 & 87 11 18 CHECKED BY DD

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
191.5	Ground Surface											
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff to Hard (Glacial Till)		1	SS	26							
189.4			2	SS	37							
2.1			3	SS	57							
	Silt to Silty Sand Compact to Very Dense (Lacustrine)		4	SS	24							0 38 60 2
			5	SS	100	25 cm						0 67 32 1
			6	SS	100	23 cm						0 10 86 4
			7	SS	100	28 cm						
			8	SS	105	25 cm						
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Very Dense/Hard (Glacial Till)		9	SS	100							1 15 57 27
			10	SS	95	25 cm						
			11	SS	117	28 cm						2 19 61 18
178.7			12	SS	108	25 cm						
12.8	Silty Clay to Clay With Thin Silt Seams Hard (Lacustrine)		13	SS	100							
176.3	Gravel		14	SS	126	25 cm						
15.2	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

FORMER			RECORD OF BOREHOLE No 11-11				METRIC					
W.P. 137-87-03		LOCATION		Co-ords. N 4 849 033.0; E 301 623.5		ORIGINATED BY TS						
DIST 6 HWY 400/407		BOREHOLE TYPE		Cone Test, Solid Stem Auger		COMPILED BY TS						
DATUM Geodetic		DATE		87 11 18		CHECKED BY HS						
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					
192.9	Ground Surface											
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff (Glacial Till)		1	SS	29							
			2	SS	29							
190.6	Silt, Dense (Lacustrine)		3	SS	31							
2.3			4	SS	50							
			5	SS	25							
			6	SS	54							
			7	SS	42							
			8	SS	43							
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Compact to Very Dense Very Stiff to Hard (Glacial Till)		9	SS	48							
			10	SS	52							
			11	SS	80							
180.3			12	SS	100							
12.6	End of Borehole											

POLE NO P41

W.P. 144-87-00(B)

FORMER			RECORD OF BOREHOLE No 11-11				METRIC				
W P 137-87-03		LOCATION Co-ords. N 4 849 033.0; E 301 623.5		ORIGINATED BY TS							
DIST 6 HWY 400/407		BOREHOLE TYPE Cone Test, Solid Stem Auger		COMPILED BY TS							
DATUM Geodetic		DATE 87 11 18		CHECKED BY MS							
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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER								
192.9	Ground Surface										
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff (Glacial Till)		1	SS	29						
			2	SS	29						
190.6			3	SS	31						
2.3	Silt, Dense (Lacustrine)		4	SS	50						
			5	SS	25						
			6	SS	54						
			7	SS	42						
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Compact to Very Dense Very Stiff to Hard (Glacial Till)		8	SS	43						
			9	SS	48						
			10	SS	52						
			11	SS	80						
180.2			12	SS	100						
12.6	End of Borehole										

FORMER **RECORD OF BOREHOLE No 10-11** **METRIC**

W P 137-87-05 LOCATION Co-ords. N 4 849 155.0; E 301 780.5 ORIGINATED BY MS

DIST 6 HWY 400/407 BOREHOLE TYPE Cone Test, H-S Auger COMPILED BY DD

DATUM Geodetic DATE 87 10 19 CHECKED BY MS

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			20 40 60 80 100						
191.8	Ground Surface												
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff (Glacial Till)		1	SS	19								
189.5			2	SS	21								
2.3	Silt Dense to Very Dense (Lacustrine)		3	SS	31								
			4	SS	88								
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Dense to Very Dense/Hard (Glacial Till)		5	SS	108								
			6	SS	71								
			7	SS	82	10 cm							
185.2			8	SS	90	13 cm							
6.4	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION



Ministry of
Transportation and
Communications
Ontario

POLE NO P43

W.P. 144-87-00(B)

FORMER

RECORD OF BOREHOLE No 9-11

METRIC

W P 137-87-06

LOCATION Co-ords. N 4 848 825.0; E 301 771.0

ORIGINATED BY MS

DIST 6 HWY 400/407

BOREHOLE TYPE Cone Test, H-S Auger, Tricone

COMPILED BY MS

DATUM Geodetic

DATE 87 10 30 & 87 11 18

CHECKED BY DD

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					
191.5	Ground Surface																
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff to Hard (Glacial Till)		1	SS	26												
189.4			2	SS	37												
2.1			3	SS	57												
	Silt to Silty Sand Compact to Very Dense (Lacustrine)		4	SS	24												0 38 60 2
			5	SS	100	25 cm											0 67 32 1
			6	SS	100	23 cm											
			7	SS	100	28 cm											0 10 86 4
			8	SS	105	25 cm											
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Very Dense/Hard (Glacial Till)		9	SS	100												1 13 57 27
			10	SS	95	25 cm											
			11	SS	117	28 cm											2 19 61 18
178.7			12	SS	108	25 cm											
12.8	Silty Clay to Clay With Thin Silt Seams Hard (Lacustrine)		13	SS	100												
176.3	Gravel		14	SS	126	25 cm											
15.2	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION



MINISTRY OF
TRANSPORTATION AND
COMMUNICATIONS
ONTARIO

POLE NO P44

W.P. 144-87-00(B)

FORMER			RECORD OF BOREHOLE No 11-10				METRIC							
W.P. 137-87-03			LOCATION Co-ords. N 4 848 913.0; E 301 853.0				ORIGINATED BY MS							
DIST 6 HWY 400/407			BOREHOLE TYPE H-S Auger, Tricone				COMPILED BY MS							
DATUM Geodetic			DATE 87 10 27				CHECKED BY MS							
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	WATER CONTENT (%)					
192.0	Ground Surface													
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff to Hard (Glacial Till)		1	SS	33									
			2	SS	37									
189.3			3	SS	22									
2.7			4	SS	31									
	Silt Very Dense (Lacustrine)		5	SS	53									
			6	SS	40									
			7	SS	42									
			8	SS	38									2 22 62 14
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Dense to Very Dense/ Hard (Glacial Till)		9	SS	110/25 cm									3 35 52 10
			10	SS	127/28 cm									
			11	SS	68									
180.1			12	SS	110/30 cm									3 79 17 1
11.9	Sand		13	SS	110/15 cm									
	Silty Clay to Clay With Thin Silt Seams Hard (Lacustrine)		14	SS	110/18 cm									
176.6														
15.4	End of Borehole													

POLE NO P45

W.P. 144-87-00(B)

FORMER

RECORD OF BOREHOLE No 12-9

METRIC

W P 137-87-04 LOCATION Co-ords: N 4 848 968.5; E 301 856.0 ORIGINATED BY MS
DIST 6 HWY 400/407 BOREHOLE TYPE Cone Test, H-S Auger COMPILED BY MS
DATUM Geodetic DATE 87 10 23 CHECKED BY MS

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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
192.3	Ground Surface												
0.0	Clayey Silt Some Sand Trace Gravel Very Stiff to Hard (Glacial Till)		1	SS	29		192						
			2	SS	19								
189.6			3	SS	30		190						
2.7			4	SS	20								
	Silty Sand to Silt Compact to Dense (Lacustrine)		5	SS	37								
			6	SS	28		188						
			7	SS	43								
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders Compact to Very Dense Very Stiff to Hard (Glacial Till)		8	SS	20		186						
			9	SS	100	23 cm	184						
			10	SS	52		182						
			11	SS	34								
180.1			12	SS	32		180						
12.2	Silt Silty Clay to Clay With Thin Silt Seams Hard (Lacustrine)		13	SS	100	20 cm	178						
176.9			14	SS	120	17 cm							
15.4	End of Borehole												

FORMER

RECORD OF BOREHOLE No 7-5

METRIC

W P 137-87-01 LOCATION Co-ords. N 4 849 076.0: E 301 875.5 ORIGINATED BY DD
 DIST 6 HWY 400/407 BOREHOLE TYPE Cone Test, H-S Auger COMPILED BY DD
 DATUM Geodetic DATE 87 10 20 CHECKED BY DD

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			20	40	60	80	100				
192.3	Ground Surface														
0.0	Clayey Silt Some Sand Trace Gravel Firm to Very Stiff (Glacial Till)		1	SS	18										
189.9			2	SS	31										
2.4	Silt, Very Dense (Lacustrine)		3	SS	54										
			4	SS	24										
	Silt/Clayey Silt Some Sand Trace Gravel Random Silt and Sand Pockets Occ. Boulders		5	SS	59										
			6	SS	63										
			7	SS	62										
			8	SS	57										
			9	SS	23										
	Compact to Very Dense/ Very Stiff to Hard (Glacial Till)		10	SS	30										
			11	SS	24										
			12	SS	25										
178.9			13	SS	37										
13.4	Silt Compact (Lacustrine)		14	SS	22										
	Silty Clay to Clay with Thin Silt Seams Hard (Lacustrine)		15	SS	62/	15 cm									
173.6			16	SS	91/	25 cm									
18.7	End of Borehole														

3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

FORMER			RECORD OF BOREHOLE No 7-5				METRIC						
W P 137-87-01		LOCATION Co-ords. N 4 849 076.0; E 301 875.5		ORIGINATED BY DD									
DIST 6 HWY 400/407		BOREHOLE TYPE Cone Test, H-S Auger		COMPILED BY DD									
DATUM Geodetic		DATE 87 10 20		CHECKED BY DD									
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					
192.3	Ground Surface												
0.0	Clayey Silt Some Sand Trace Gravel Firm to Very Stiff (Glacial Till)		1	SS	18								
189.9			2	SS	31								
2.4	Silt, Very Dense (Lacustrine)		3	SS	54								
			4	SS	24								
	Silt/Clayey Silt Some Sand Trace Gravel		5	SS	59								
			6	SS	63								
	Random Silt and Sand Pockets		7	SS	62								
			8	SS	57								
	Occ. Boulders		9	SS	23								
	Compact to Very Dense/ Very Stiff to Hard (Glacial Till)		10	SS	30								
			11	SS	24								
			12	SS	25								
178.9			13	SS	37								
13.4	Silt Compact (Lacustrine)		14	SS	22								
	Silty Clay to Clay with Thin Silt Seams Hard (Lacustrine)		15	SS	62/	15 cm							
173.6			16	SS	91/	25 cm							
18.7	End of Borehole												

+3, x5: Numbers refer to
Sensitivity

20
15 \div 3 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No P48

1 OF 1

METRIC

W.P.	144-87-00(B)	LOCATION	Co-ords: N 4 849 061.5; E 302 180.0	ORIGINATED BY	KA
DIST	5	HWY	407	BOREHOLE TYPE	Solid Stem Auger
DATUM	Geodetic	DATE	1993 03 31	COMPILED BY	KA
				CHECKED BY	DD

[illegible]

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No P49

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 243.0; E 302 227.0 ORIGINATED BY KA
DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 31 CHECKED BY DD

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60	80	100	W _p	W			W _L
192.5	Ground Surface																
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Silty Sand Layers Occ. Cobbles & Boulders Brown to Grey Stiff to Hard (Glacial Till)		1	SS	12												
			2	SS	16												
			3	SS	26												
			4	SS	31												
			5	SS	41												
			6	SS	64												
			7	SS	40												
			8	SS	39												
			9	SS	100												
182.9	End of Borehole		10	SS	41												
9.6	Water Level on 1993 04 01																

FORMER

RECORD OF BOREHOLE No 45

1 OF 1 METRIC 21

W.P. 140-87-01 LOCATION Co-ord: N 4849120 ; E 302380 ORIGINATED BY B.C.
DIST 6 HWY 407 BOREHOLE TYPE Continuous Flight Auger (S.S.) COMPILED BY P.M.
DATUM Geodetic DATE 90-02-07 CHECKED BY P.M.

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 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					
191.5	Ground Surface													
0.0	Topsoil													
	CLAYEY SILT, With Sand, Trace of Gravel (Glacial Till)		1	SS	16									
			2	SS	28									
			3	SS	38									
	brown		4	SS	133									
	grey		5	SS	145									
	Occasional sandy silt layers		6	SS	120	/18cm								
185.5	Very Stiff to Hard		7	SS	120	/18cm								
5.9	CLAYEY SILT to SILTY CLAY, Trace of Sand (Lacustrine)		8	SS	114									
183.4	Hard		9	SS	75									
8.1	End of Borehole													
	• Water Level Not Stabilized													

FORMER

RECORD OF BOREHOLE No 45

1 OF 1 METRIC 21

W.P. 140-87-01 LOCATION Co-ord: N 4849120 ; E 302380 ORIGINATED BY B.C.
DIST 6 HWY 407 BOREHOLE TYPE Continuous Flight Auger (S.S.) COMPILED BY P.M.
DATUM Geodetic DATE 90-02-07 CHECKED BY P.M.

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 (%)					
181.5	Ground Surface													
0.0	Topsoil													
	CLAYEY SILT With Sand, Trace of Gravel (Glacial Till)		1	SS	16									
			2	SS	28									
			3	SS	38									
	brown		4	SS	133									
	grey		5	SS	145									
	Occasional sandy silt layers		6	SS	120	/18cm								
185.6	Very Stiff to Hard		7	SS	120	/18cm								
5.9	CLAYEY SILT to SILTY CLAY, Trace of Sand (Lacustrine)		8	SS	114									
183.4	Hard		9	SS	75									
8.1	End of Borehole													
	• Water Level Not Stabilized													

FORMER			RECORD OF BOREHOLE No 43			1 OF 1			METRIC			19												
W.P. 140-87-01			LOCATION Co-ord: N 4849136 ; E 302505			ORIGINATED BY P.M.																		
DIST 5 HWY 407			BOREHOLE TYPE Continuous Flight Auger (H.S.)			COMPILED BY P.M.																		
DATUM Geodetic			DATE 90-02-01 to 90-02-02			CHECKED BY P.M.																		
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS			ELEVATION SCALE			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES																			
193.4	Ground Level																							
0.0	Topsoil																							
	CLAYEY SILT, With Sand, Trace of Gravel (fill)		1	SS	12																		2	31 (67)
			2	SS	14																			
	brown		3	SS	11																			
	grey		4	SS	8																			
	Occasional sandy silt layers		5	SS	46																			
			6	SS	98																			
	Stiff to Hard		7	SS	33																			
186.7			8	SS	34																			
6.7																								
	CLAYEY SILT to SILTY CLAY		9	SS	21																			
	Some Sand		10	SS	33																			
	Occasional thin silt layers (Lacustrine)		11	SS	44																			
	Hard																							
180.8			12	SS	49																			
12.6	End of Borehole																							

FORMER

RECORD OF BOREHOLE No 44

1 OF 1 METRIC 20

W.P. 140-87-01 LOCATION Co-ord: N 4849137 : E 302534 ORIGINATED BY P.M.
DIST 6 HWY 407 BOREHOLE TYPE Continuous Flight Auger (H.S.) COMPILED BY P.M.
DATUM Geodetic DATE 90-01-31 to 90-02-01 CHECKED BY P.M.

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		
193.8	Ground Level												
0.0	Topsoil												
	CLAYEY SILT, With Sand, Trace of Gravel (Till)		1	SS	18								
			2	SS	16								
			3	SS	21								
	brown		4	SS	14								
	grey		5	SS	32								
	Occasional sandy silt layers		6	SS	33								
	Very Stiff to Hard		7	SS	39								
188.8			8	SS	42								
5.8	CLAYEY SILT to SILTY CLAY Trace of Sand		9	SS	43								
	Occasional thin silt layers (Lacustrine)												
185.4	Hard												
8.4	End of Borehole												

RECORD OF BOREHOLE No P54

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 159.0; E 302 628.5 ORIGINATED BY KA
DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 30 CHECKED BY DD




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	10 20 30	10 20 30	10 20 30					
185.6	Ground Surface																
0.0			1	SS	12												
			2	SS	13												
			3	SS	16												
			4	SS	10												
			5	SS	28												
			6	SS	52												
			7	SS	83												
			8	SS	84												
			9	SS	41												
186.0			10	SS	52												
9.6	End of Borehole																
	Water Level on 1993 03 31																

RECORD OF BOREHOLE No P58

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 220.0; E 302 880.0 ORIGINATED BY KA
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 30 CHECKED BY DD

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			20	40	60	80	100	W _p	W	W _L		
197.4	Ground Surface															
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Cobbles & Boulders Stiff to V. Stiff (Glacial Till)		1	SS	14											
			2	SS	12											
			3	SS	20											
			4	SS	9											
193.0			5	SS	24											
4.4	Silty Sand to Fine Sand Grey, Wet Compact (Glacial Till)		6	SS	3	**										
			7	SS	22											
			8	SS	26											
			9	SS	24											
188.8																
8.6	Clayey Silt, Hard															
187.8	(Glacial Till)		10	SS	33											
9.6	End of Borehole															
	* Water Level on 1993 03 31															
	** Not Representative, Disturbed															

RECORD OF BOREHOLE No P58

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 220.0; E 302 880.0 ORIGINATED BY KA
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 30 CHECKED BY DD

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 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					
197.4	Ground Surface																
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Cobbles & Boulders Stiff to V. Stiff (Glacial Till) Brown Grey		1	SS	14		196										
			2	SS	12												
			3	SS	20												
			4	SS	9		194										
193.0			5	SS	24												
4.4	Silty Sand to Fine Sand Grey, Wet Compact (Glacial Till)		6	SS	3	**	192										
			7	SS	22												
			8	SS	26												
			9	SS	24		190										
188.8																	
8.6 187.8	Clayey Silt, Hard (Glacial Till)		10	SS	33		188										
9.6	End of Borehole																
	* Water Level on 1993 03 31 ** Not Representative, Disturbed																

RECORD OF BOREHOLE No P59

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 428.0; E 302 983.0 ORIGINATED BY KA
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 29 CHECKED BY DD

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	SHEAR STRENGTH kPa						
199.1	Ground Surface													
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Silty Clay Layers Occ. Cobbles & Boulders Brown to Gray Stiff to Hard (Glacial Till)		1	SS	10									
			2	SS	12									
			3	SS	20									
			4	SS	26									
			5	SS	26									
			6	SS	34									
			7	SS	39									
			8	SS	32									
			9	SS	69									
189.5					10	SS	51							
9.6	End of Borehole													
	* Water Level on 1993 03 30													

RECORD OF BOREHOLE No P58

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 220.0; E 302 880.0 ORIGINATED BY KA
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 30 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			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	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	W _p	W	W _L		
197.4	Ground Surface																
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Cobbles & Boulders Stiff to V. Stiff (Glacial Till)		1	SS	14		196										
			2	SS	12												
			3	SS	20												
			4	SS	9		194										
193.0			5	SS	24												
4.4	Silty Sand to Fine Sand Grey, Wet Compact (Glacial Till)		6	SS	3		192										
			7	SS	22												
			8	SS	26												
			9	SS	24		190										
188.8																	
8.6	Clayey Silt, Hard (Glacial Till)		10	SS	33		188										
187.8																	
9.6	End of Borehole																
	* Water Level on 1993 03 31 ** Not Representative, Disturbed																

RECORD OF BOREHOLE No P59

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 428.0; E 302 983.0 ORIGINATED BY KA
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 29 CHECKED BY DD

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					
199.1	Ground Surface																
0.0	Clayey Silt to Silt with Sand, Trace Gravel Occ. Silty Clay Layers Occ. Cobbles & Boulders Brown to Grey Stiff to Hard (Glacial Till)		1	SS	10		198										
			2	SS	12												
			3	SS	20												
			4	SS	26		196										
			5	SS	26												
			6	SS	34												
			7	SS	39		194										
			8	SS	32												
			9	SS	69		192										
			10	SS	51		190										
189.5	End of Borehole																
9.6	Water Level on 1993 03 30																

RECORD OF BOREHOLE No P61										1 OF 1		METRIC		
W.P. 144-87-00(B)		LOCATION Co-ords: N 4 849 114.5; E 303 038.0		ORIGINATED BY KA										
DIST 6 HWY 407		BOREHOLE TYPE Solid Stem Auger		COMPILED BY KA										
DATUM Geodetic		DATE 1993 03 29		CHECKED BY DD										
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					
185.9	Ground Surface													
0.0			1	SS	13									
			2	SS	19									
			3	SS	31									
			4	SS	52									
			5	SS	39									
			6	SS	33									
			7	SS	50									
			8	SS	48									
			9	SS	71									
186.3			10	SS	110									
9.6	End of Borehole													
	Water Level on 1993 03 30													

RECORD OF BOREHOLE No P61

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 849 114.5; E 303 038.0 ORIGINATED BY KA
DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 29 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			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	W _P	W	W _L		
195.9	Ground Surface																
0.0			1	SS	13												
			2	SS	18												
			3	SS	31												
			4	SS	52												
			5	SS	38												
			6	SS	33												
			7	SS	50												
			8	SS	48												
			9	SS	71												
186.3			10	SS	110	/28cm											
9.6	End of Borehole																
	Water Level on 1993 03 30																

RECORD OF BOREHOLE No P68

1 OF 1

METRIC

W.P. 144-87-00(B) LOCATION Co-ords: N 4 848 552.0; E 301 926.0 ORIGINATED BY KA
DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA
DATUM Geodetic DATE 1993 03 30 CHECKED BY DD

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 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					
195.4	Ground Surface																
0.0	Silty Clay to Clayey Silt some Sand, Trace Gravel Occ. Silt Layers Occ. Cobbles & Boulders Brown to Grey Stiff to Hard (Glacial Till) Silty Sand to Coarse Sand		1	SS	11		194										
			2	SS	17												
			3	SS	16												
			4	SS	14		192										
			5	SS	57												
			6	SS	33												
			7	SS	79		190										
			8	SS	94												
			9	SS	48		188										
185.8			10	SS	42		186										
9.6	End of Borehole																
	Water Level on 1993 03 31																

APPENDIX A

CO-ORDINATES OF HIGH MAST POLES

HWY. 407 - HIGH MAST LIGHTING
W.P. 144-87-00
New High Mast Poles

Table 1 (Cont'd)

POLE NO.	HEIGHT [m]	LUMINAIRE		OFFSET* FROM ¢ HWY. 407 [m]	STATION*	COORDINATES	REMARKS
		NO.	DISTRIBUTION TYPE				
P27	35	8	V-M-C	104 N	18+144	N 4 848 835 E 300 773	
P28	35	5	III-M-SC	162.5 S	18+250	N 4 848 609 E 300 948	Orientation 22°
P29	35	8	V-M-C	0	18+271	N 4 848 770.5 E 300 924	
P30	35	6	III-M-SC	177 N	18+293	N 4 848 947 E 300 896	Orientation 136°
P31	35	5	III-M-SC	194 S	18+376	N 4 848 613 E 301 078	Orientation 7°
P32	35	6	V-M-C	0	18+410	N 4 848 810 E 301 059	
P33	35	6	III-M-SC	250 N	18+435	N 4 849 055.5 E 301 011.5	Orientation 115°
P34	35	8	V-M-C	0	18+523	N 4 848 859.5 E 300 165.5	
P35	35	8	V-M-C	94 N	18+654	N 4 848 966.6 E 301 266.5	
P36	35	6	V-M-C	52.5 S	18+637	N 4 848 822 E 301 290	
P37	35	8	V-M-C	57.5 N	18+800	N 4 848 972.5 E 301 416	
P38	35	8	V-M-C	80 S	18+780	N 4 848 835 E 301 435	
P39	35	8	V-M-C	193.5 S	18+903	N 4 848 761 E 301 585	

HWY. 407 - HIGH MAST LIGHTING

W.P. 144-87-00

New High Mast Poles

Table 1 (Cont)

POLE NO.	HEIGHT [m]	LUMINAIRE		OFFSET* FROM ¢ HWY. 407 [m]	STATION*	COORDINATES	REMARKS
		NO.	DISTRIBUTION TYPE				
P40	35	8	V-M-C	53 N	18+922.5	N 4 848 900 E 301 564	
P41	35	8	V-M-C	145 N	18+942	N 4 849 096 E 301 528.5	
P42	40	10	V-M-C	288 N	19+055	N 4 849 265 E 301 596	
P43	45	12	V-M-C	318 S	19+183	N 4 848 717 E 301 890	
P44	45	12	V-M-C	208.5 S	19+314	N 4 848 860 E 301 984	
P45	45	12	V-M-C	81.5 S	19+429	N 4 849 014 E 302 058.5	
P46	45	12	V-M-C	123 N	19+381	N 4 849 197 E 301 956	
P47	35	8	V-M-C	131 N	19+520	N 4 849 243 E 302 087	
P48	45	12	V-M-C	69.5 S	19+558.5	N 4 849 061.5 E 302 180	
P49	35	8	V-M-C	92 N	19+654	N 4 849 243 E 302 227	
P50	45	12	V-M-C	41 S	19+729.5	N 4 849 136.5 E 302 336	
P51	35	8	V-M-C	83 N	19+798	N 4 849 274.5 E 302 368	
P52	35	6	V-M-C	57.5 S	19+884	N 4 849 164 E 302 488	

HWY. 407 - HIGH MAST LIGHTING
W.P. 144-87-00
New High Mast Poles

Table 1 (Cont'd)

POLE NO.	HEIGHT [m]	LUMINAIRE		OFFSET* FROM HWY. 407 [m]	STATION*	COORDINATES	REMARKS
		NO.	DISTRIBUTION TYPE				
P53	40	10	V-M-C	73 N	19+972	N 4 849 314 E 302 539	
P54	40	8	V-M-C	101 S	20+016	N 4 849 159 E 302 628.5	
P55	45	12	V-M-C	85 N	20+134	N 4 849 344 E 302 688	
P56	35	8	V-M-C	94 S	20+154.5	N 4 849 204 E 302 759.5	
P57	35	8	V-M-C	57 N	20+275.5	N 4 849 385 E 302 831	
P58	35	8	V-M-C	114.5 S	20+273	N 4 849 220 E 302 880	
P59	35	6	V-M-C	52.5 N	20+434	N 4 849 428 E 302 983	
P60	35	8	V-M-C	109 S	20+420.5	N 4 849 271 E 303 020	
P61	35	5	III-M-SC	262.5 S	20+388.5	N 4 849 114.5 E 303 038	Orientation 260°
P62	35	8	V-M-C	0	20+573	N 4 849 421.5 E 303 131.5	
P63	35	8	V-M-C	0	20+724	N 4 849 471 E 303 274	
P64	35	6	V-M-C	0	20+878	N 4 849 521 E 303 426	
P65	35	8	V-M-C	0	21+045	N 4 849 572 E 303 578	

HWY. 407 - HIGH MAST LIGHTING
W.P. 144-87-00
New High Mast Poles

Table 1 (Cont'd)

POLE NO.	HEIGHT [m]	LUMINAIRE		OFFSET* FROM ¢ HWY. 407 [m]	STATION*	COORDINATES	REMARKS
		NO.	DISTRIBUTION TYPE				
P66	35	8	V-M-C	0	21+220	N 4 849 629 E 303 744	
P67	35	8	V-M-C	0	21+395	N 4 849 685 E 303 910	
P68	40	10	V-M-C	15 W	1+223	N 4 848 552 E 301 926	Station and offset in reference to Ramp 400S-407W (sheet 38).

Note:

* Stations and offsets - in reference to Hwy. 407 centre line unless otherwise indicated.

Type III luminaire orientation - in reference to North.

APPENDIX B

NSSP FOR HIGH MAST POLE CONSTRUCTION

(AN EXAMPLE FROM ANOTHER REPORT)

METRIC

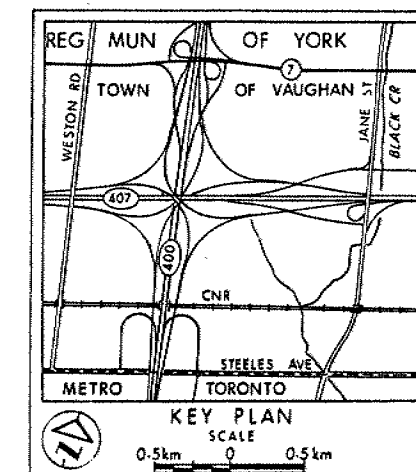
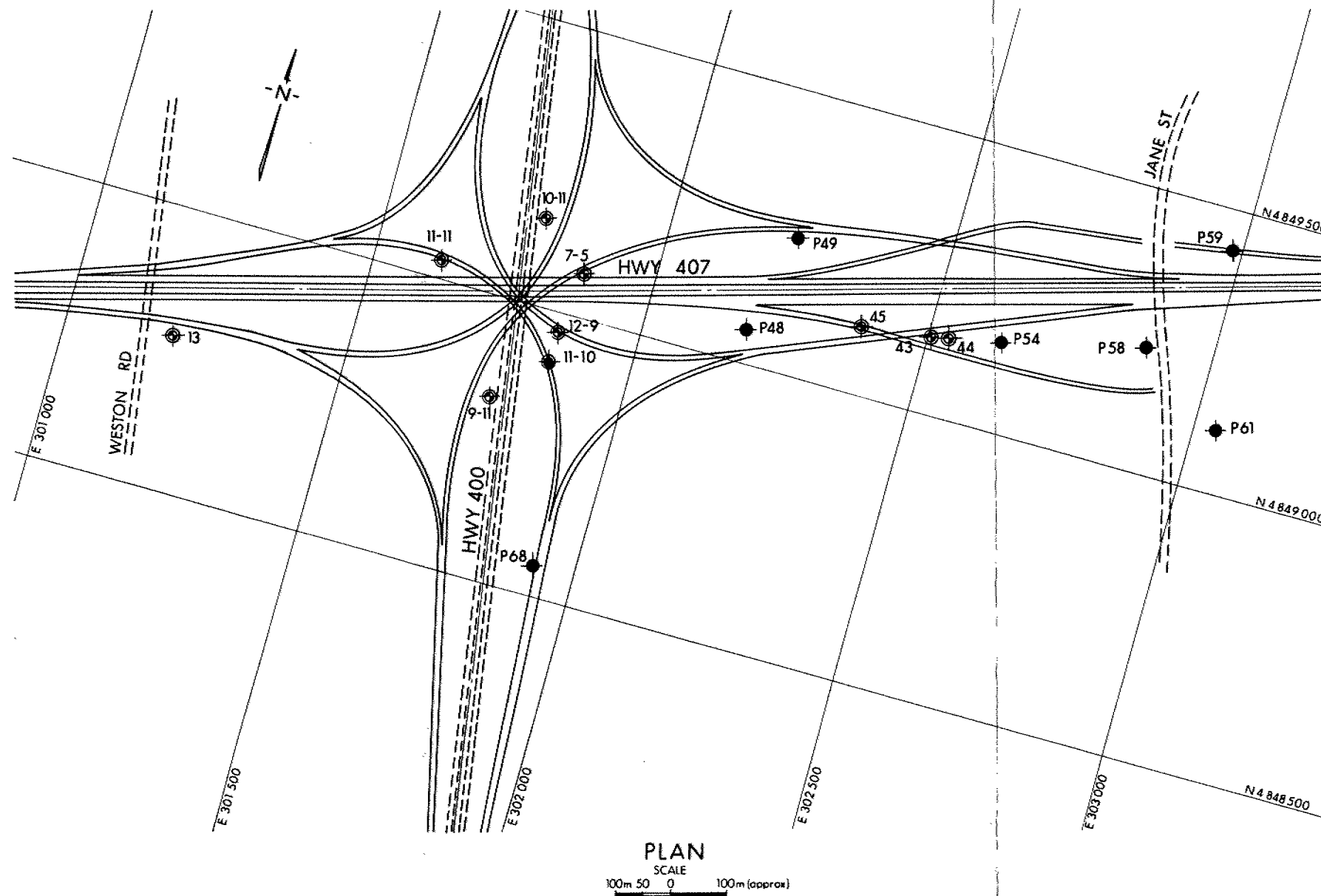
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES + METRES.

CONT No
WP No 144-87-00(B)



HIGH MAST LIGHTING
FROM WESTON RD TO JANE ST
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND	
	Bore Hole
	Dynamic Cone Penetration Test (Cone)
	Bore Hole & Cone
N	Blows/0.3m (Std Pen Test, 475 J/blow)
CONE	Blows/0.3m (60° Cone, 475 J/blow)
	W L at time of investigation
	Bore Holes from previous investigations

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
P48	188.9	4849 061.5	302 180.0
P49	192.5	4849 243.0	302 227.0
P54	195.6	4849 159.0	302 628.5
P58	197.4	4849 220.0	302 880.0
P59	199.1	4849 428.0	302 983.0
P61	195.9	4849 114.5	303 038.0
P68	195.4	4848 552.0	301 926.0
7-5	192.3	4849 076.0	301 875.5
9-11	191.5	4848 825.0	301 771.0
10-11	191.8	4849 155.0	301 780.5
11-10	192.0	4848 913.0	301 853.0
11-11	192.9	4849 033.0	301 623.5
12-9	192.3	4848 968.5	301 856.0
13	190.8	4848 755.0	301 194.5
43	193.4	4849 136.0	302 505.0
44	193.8	4849 137.0	302 534.0
45	191.5	4849 120.0	302 380.0

Bore Holes From
Previous Investigations

NOTE: FOR SUBSOIL INFORMATION
REFER TO RECORD OF BORE HOLE

NOTE
The boundaries between soil strata have been established
only at Bore Hole locations. Between Bore Holes the
boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for
this project and other related documents may be examined at the
Engineering Materials Office, Downsview. Information contained in
this report and related documents is specifically excluded in
accordance with the conditions of Section GC 2.01 of OPS Gen. Cond.

REV.	DATE	BY	DESCRIPTION
1			

Geocres No 30M13-131

HWY No 400/407	DIST 6
SUBM'D KA	CHECKED DATE 1993 04 16
DRAWN SO	CHECKED APPROVED
	SITE DWG 1448700(B)-A