

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M13-107  
30M13-113

DIST. 6 REGION \_\_\_\_\_

W.P. No. 88-78-01(A)

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. \_\_\_\_\_

HWY. No. 407 / 427

LOCATION HML -

Hwy 407 FROM Hwy 427 TO HUMBER RIVER

Hwy 427 FROM South of Albion RD To

Hwy 7 =====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**ENGINEERING MATERIALS OFFICE**  
**FOUNDATION DESIGN SECTION**

WP 88-78-01(A) DIST 6  
HWY 407 & 427 STR SITE -

Highmast Lighting  
Hwy 407 from Hwy 427 to Humber River  
Hwy 427 from South of Albion Rd. to Hwy 7

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GEOCRES 30M13-107  
30M13-113

DATE AUG 11 1994

FOUNDATION INVESTIGATION REPORT  
For  
High mast Lighting  
Hwy. 407 from Hwy. 427 to Humber River  
Hwy. 427 from South of Albion Rd. to Hwy. 7  
W.P. 88-78-01(A)  
Hwy. 407 and Hwy 427, District 6, Toronto

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## INTRODUCTION

This report presents soil information for the proposed high mast lights at the above mentioned sites. Soil information was obtained from previous subsurface investigations in the area. The previous investigations were carried out under work project number, W.P. 88-78-01, and W.P. 88-78-02. This report is produced 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 Hwy 427 to Humber River and along Hwy 427 from South of Albion Rod to Hwy 7. The area is situated in Vaughan Township.

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.

## SUBSURFACE CONDITIONS

### General

The soil generally consists of glacial till deposits as the native soil. The strata is mainly clayey silt to silt with layers of silty clay, silty sand and 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 detail soil condition at any high mast light location, reference is made to the attached log sheets and Table 2 (Reference Borehole numbers).

The locations of the boreholes are shown on the attached drawings from previous studies. Dwg. Nos. 887801A, 887801B, 887801C and 887802C-A.

### Groundwater Conditions

From the boreholes of the previous studies, it appears that groundwater was encountered at most of the location. However, some of the boreholes remained dry and at some locations groundwater didn't established shortly after completion. Artesian condition was encountered in one borehole near proposed HML P52, The artesian was encountered at elevation 130.3m and the water rose to elevation 135.6m. For groundwater information at each HML locations reference is made to the attached borehole logs.

## DISCUSSION AND RECOMMENDATIONS

It is proposed to install 52 high mast lighting poles (P1, P2 and P4 through P53) along Highway 407 from Hwy 427 to Humber River and along Hwy 427 from South of Albion Road to Hwy 7. 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 26 HML pole locations. At four pole locations (P18 to P21) information on final grade is not available. However, at 22 pole locations grade would be changed. The fill height would range from 0.5m to 8.1m, while cut depths would range from 1.1m to 10.7m. The details of grade changes are as follows:

<u>HML Pole</u>	<u>Change in Grade</u>	<u>HML Pole</u>	<u>Change in Grade</u>
P1	Fill 8.1	P43	Cut 7.8
P2	Fill 6.9	P44	Cut 5.3
P4	Fill 2.3	P45	Cut 6.2
P7	Fill 0.5	P46	Cut 4.8
P9	Cut 4.5	P47	Fill 2.4
P14	Fill 6.9	P48	Cut 10.7
P16	Fill 6.1	P49	Fill 4.5
P17	Cut 1.1	P50	Fill 1.5
P40	Cut 5.0	P51	Cut 4.2
P41	Cut 5.8	P52	Fill 4.2
P52	Cut 7.1	P53	Fill 6.2

### Cut Considerations

If the grade is to be changed at the pole locations then, the most critical lowest surface elevations should be assumed for design purposes.

### Fill Considerations

It should be assumed that the existing or proposed fill will not provide any lateral resistance unless it is carefully engineered.

Any organic and soft material should be removed within the plan limits of the fill before placing the fill material. The fill material should consist of acceptable soil free of organics. The fill should be placed and compacted as per MTO standard.

For design purposes following parameters should be used taking into consideration that only half of the fill height would provide lateral support:

$$\begin{aligned}\phi &= 30^\circ \\ \gamma &= 20 \text{ kN/m}^3\end{aligned}$$

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.

### Slope Considerations

For HML poles near slopes, the caisson should be a minimum 3m from the crest of the 2H:1V downslope. The upper 50% of the embedment length within the embankment (taken from frost penetration depth) should be disregarded for lateral resistance. If the caisson for HML foundations are constructed at a distance of 3m from the crest of a 3H:1V and 4H:1V slopes the reduction in embedment length would be 25% and 0% respectively.

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

**SOIL PARAMETERS AT EACH HIGH MAST LIGHT POLES**

HML Poles	W.L. Elev (m)	Elev (m) From - To	Soil Type	$\phi$ (Deg)	$Q_u$ kPa	$\gamma$ kN/m <sup>3</sup>
P1	NE	171.7 - 161.6	Cohesive	0	300	20.4
		161.6 - 151.5	Non Cohesive	35	0	21.2
P2	170.8	172.6 - 164.0	Cohesive	0	300	20.4
		164.0 - 158.7	Cohesive	0	500	21.2
P4	169.4	174.6 - 173.0	Cohesive	0	100	19.6
		173.0 - 168.8	Cohesive	0	400	20.8
		168.8 - 165.0	Non Cohesive	35	0	21.2
P5	NE	175.9 - 173.0	Cohesive	0	300	20.4
		173.0 - 169.0	Non Cohesive	35	0	21.2
		169.0 - 163.1	Non Cohesive	35	0	20.8
		163.1 - Below	Cohesive	0	500	21.2
P6	170.5	175.3 - 171.7	Cohesive	0	350	20.6
		171.7 - 166.5	Non Cohesive	35	0	21.2
		166.5 - Below	Non Cohesive	35	0	21.0
P7	170.5	178.0 - 175.1	Cohesive	0	300	20.4
		175.1 - 169.0	Non Cohesive	35	0	21.2
		169.0 - 166.0	Non Cohesive	35	0	20.8
		166.0 - 164.0	Non Cohesive	35	0	21.2
		164.0 - Below	Cohesive	0	500	21.2
P8	170.2	175.9 - 172.8	Cohesive	0	300	20.4
		172.8 - 168.5	Non Cohesive	35	0	21.2
		168.5 - Below	Non Cohesive	35	0	21.2

P9	170.9	179.4 - 177.3	Cohesive	0	150	19.8
		177.3 - 174.0	Non Cohesive	35	0	20.8
		174.0 - 169.0	Non Cohesive	35	0	21.2
		169.0 - Below	Cohesive	0	500	21.2
P10	NE	176.8 - 173.1	Cohesive	0	400	20.8
		173.1 - 158.4	Non Cohesive	35	0	21.2
P11	173.1	177.7 - 173.2	Cohesive	0	400	20.8
		173.2 - 159.2	Non Cohesive	35	0	21.2
P12	Dry	178.3 - 174.5	Cohesive	0	200	20.2
		174.5 - 169.0	Non Cohesive	35	0	21.2
P13	173.1	177.7 - 173.2	Cohesive	0	400	20.8
		173.2 - 159.2	Non Cohesive	35	0	21.2
P14	Dry	176.1 - 170.9	Cohesive	0	250	20.2
		170.9 - 167.9	Cohesive	0	500	21.2
P15	Dry	177.0 - 174.5	Cohesive	0	350	20.6
		174.5 - 171.8	Cohesive	0	500	21.2
		171.8 - 168.6	Non Cohesive	35	0	21.2
		168.6 - Below	Cohesive	0	500	21.2
P16	Dry	177.0 - 174.5	Cohesive	0	350	20.6
		174.5 - 171.8	Cohesive	0	500	21.2
		171.8 - 168.6	Non Cohesive	35	0	21.2
		168.6 - Below	Cohesive	0	500	21.2
P17	175.2	177.3 - 167.7	Cohesive	0	500	21.2
		167.7 - Below	Cohesive	0	500	21.2
P18	175.8	177.8 - 170.0	Cohesive	0	500	21.2
		170.0 - Below	Cohesive	0	500	21.2
P19	175.3	177.7 - 175.6	Cohesive	0	200	20.0
		175.6 - Below	Cohesive	0	500	21.2
P20	175.3	177.7 - 175.6	Cohesive	0	200	20.0
		175.6 - Below	Non Cohesive	0	500	21.2



P21	174.6	179.8 - 168.8	Cohesive	0	500	21.2
P22	171.0	174.0 - 166.8	Cohesive	0	300	20.4
		166.8 - 162.0	Non Cohesive	35	0	20.6
		162.0 - Below	Non Cohesive	35	0	21.2
P23	Dry	175.0 - 169.0	Cohesive	0	400	20.8
		169.0 - Below	Non Cohesive	35	0	21.2
P24	Dry	174.8 - 172.5	Cohesive	0	500	21.2
		172.5 - 167.8	Non Cohesive	35	0	20.2
		167.8 - Below	Non Cohesive	35	0	21.2
P25	NE	174.8 - 169.5	Cohesive	0	300	20.4
		169.5 - Below	Cohesive	0	500	21.2
P26	167.6	175.9 - 174.0	Cohesive (Fill)	0	200	20.0
		174.0 - 166.9	Cohesive	0	400	20.8
		166.9 - Below	Non Cohesive	35	0	21.2
P27	166.6	172.7 - 165.1	Cohesive	0	350	20.6
		165.1 - Below	Non Cohesive	35	0	21.2
P28	167.8	172.2 - 168.0	Cohesive	0	500	21.2
		168.0 - 165.0	Cohesive	0	350	20.6
		165.0 - Below	Cohesive	0	500	21.2
P29	169.2	173.3 - 166.9	Cohesive	0	500	21.2
		166.9 - 165.5	Non Cohesive	35	0	20.2
		165.5 - Below	Cohesive	0	500	21.2
P30	169.2	173.3 - 166.9	Cohesive	0	500	21.2
		166.9 - 165.5	Non Cohesive	35	0	20.2
		165.5 - Below	Cohesive	0	500	21.2
P31	166.1	174.1 - 168.0	Cohesive	0	500	21.2
		168.0 - 162.8	Cohesive	0	200	20.0
		162.8 - 158.6	Non Cohesive	35	0	21.2

P32	170.0	174.0 - 171.5	Cohesive	0	80	19.5
		171.5 - 160.0	Cohesive	0	400	20.8
		160.0 - Below	Non Cohesive	35	0	21.2
P33	167.5	172.4 - 165.8	Cohesive	0	500	21.2
		165.8 - 163.9	Non Cohesive	35	0	21.2
		163.9 - Below	Cohesive	0	500	21.2
P34	164.5	170.9 - 165.7	Cohesive	0	500	21.2
		165.7 - 161.6	Non Cohesive	35	0	21.2
P35	165.9	172.5 - 163.4	Cohesive	0	500	21.2
P36	Dry	171.9 - 166.0	Cohesive	0	350	20.6
		166.0 - 159.4	Cohesive	0	500	21.2
P37	161.2	172.1 - 169.5	Cohesive	0	300	20.4
		169.5 - 159.9	Cohesive	0	500	21.2
		159.9 - Below	Non Cohesive	35	0	21.2
P38	Dry	171.2 - 162.1	Cohesive	0	500	21.2
		162.1 - Below	Non Cohesive	35	0	21.2
P39	Dry	170.5 - 162.4	Cohesive	0	250	20.2
P40	Dry	170.6 - 160.1	Cohesive	0	500	21.2
		160.1 - 158.4	Non Cohesive	35	0	21.2
		158.4 - Below	Cohesive	0	500	21.2
P41	166.1	171.7 - 162.4	Cohesive	0	350	20.6
		162.4 - 161.0	Non Cohesive	35	0	21.2
		161.1 - 157.5	Cohesive	0	400	20.8
P42	159.5	167.1 - 164.0	Cohesive	0	250	20.2
		164.0 - 160.0	Cohesive	0	400	20.8
		160.0 - 154.9	Cohesive	0	500	21.2
		154.9 - 151.8	Non Cohesive	35	0	21.2
P43	NE	170.0 - 162.0	Cohesive	0	300	21.2
		162.0 - 153.0	Cohesive	0	500	21.2
		153.0 - 152.6	Non Cohesive	32	0	21.2

P44	NE	167.4 - 160.0	Cohesive	0	300	20.0
		160.0 - 153.5	Cohesive	0	500	20.0
		153.5 - 151.9	Non Cohesive	32	0	21.2
P45	NE	165.4 - 164.0	Cohesive	0	200	21.2
		164.0 - 156.5	Cohesive	0	500	21.2
		156.5 - 152.9	Non Cohesive	35	0	21.2
		152.9 - 151.2	Cohesive	0	500	21.2
P46	NE	162.6 - 160.0	Cohesive	0	120	19.6
		160.0 - 152.4	Non Cohesive	32	0	21.2
		152.4 - 150.0	Cohesive	0	500	21.2
P47	NE	161.2 - 153.3	Non Cohesive	35	0	21.0
		153.3 - 142.8	Cohesive	0	500	21.0
P48	NE	160.8 - 158.0	Cohesive	0	200	21.0
		158.0 - 149.7	Cohesive	0	500	21.0
		149.7 - Below	Cohesive	0	500	21.0
P49	NE	139.4 - 125.4	Non Cohesive	28	0	19.6
P50	NE	138.7 - 134.7	Cohesive (Peat)	0	0	15.0
		134.7 - 126.1	Non Cohesive	28	0	19.6
P51	NE	140.9 - 134.0	Cohesive	0	150	19.9
		134.0 - 128.3	Cohesive	0	500	21.2
P52	Artesian 135.6m	135.9 - 134.8	Cohesive (Peat)	0	0	15.0
		134.8 - 133.3	Cohesive	0	50	19.0
		133.3 - 131.8	Non Cohesive	28	0	19.6
		131.8 - 129.3	Cohesive	0	75	19.6
		129.3 - Below	Cohesive	0	100	19.6
P53	134.5	135.2 - 134.1	Cohesive	0	10	19.0
		134.1 - 129.5	Non Cohesive	28	0	19.6
		129.5 - 126.0	Cohesive	0	100	19.6
		126.0 - 124.1	Cohesive	0	300	20.0
		124.1 - Below	Cohesive	0	500	21.2

Where:

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HML	= High Mast Lighting
$\phi$	= Apparent angle of internal friction for non-cohesive Soils
$Q_u$	= Unconfined Compressive Strength (kPa)
$\gamma$	= Unit Weight ( $\text{kN/m}^3$ )
NE	= Water level not established

### Construction Consideration:

Near proposed HML pole P52 (Previous Borehole Location P13) artesian condition was encountered at elevation 130.3m, approximately 6.6m below ground surface. It is possible that the caisson foundation will intersect this artesian zone. Special provisions will be required to control the loss of fines from the surrounding soil thereby minimizing loss of lateral capacity. It is anticipated that when the caisson penetrates the aquifer, water will seep up along the shaft of the pile to the surface. A drainage medium should be provided in the vicinity of such poles. The details of the drainage requirements are sketched in Figure 1 in Appendix 'C'. The scheme should include a means of drainage into a near by creek or drainage facility taking into account frost protection requirements.

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 (Appendix 'B') 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 soil information for this project was obtained from previous Foundation Investigation in this area (WP 88-78-01 and WP 88-78-02). This report was prepared by K.S.Q. Ahmad, Foundation Engineer, reviewed and approved by D. Dundas, Chief Foundation Engineer (Acting).



A handwritten signature in cursive script, reading "K.S.Q. Ahmad".

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



A handwritten signature in cursive script, reading "D. Dundas".

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

## **APPENDIX**

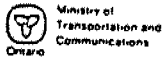
Table 2

## REFERENCE BOREHOLE NUMBERS

HML Pole #	Ref. BH No.	Previous Project No	Orig. Grade	Exist. Grade	Final Grade
P01	153-80-02-7	88-78-01	171.92		180.02
P02	88-78-21-1	88-78-01	172.29		179.24
P04	P5	88-78-01		174.56	176.9
P05	88-78-24-3	88-78-01		175.2	175.2
P06	153-80-04-6	88-78-01		175.2	175.2
P07	363-87-01-3	88-78-01		177.7	178.15
P08	153-80-04-4	88-78-01		175.5	175.5
P09	88-78-25-4	88-78-01		178.9	174.4
P10	153-80-05-2	88-78-01		176.2	176.2
P11	150-87-01-16	88-78-01		177.3	177.3
P12	P15	88-78-01		178.3	178.03
P13	150-87-01-16	88-78-01		176.5	176.5
P14	P17	88-78-01	175.58		182.52
P15	P16	88-78-01		177.01	177.01
P16	P16	88-78-01	171.22		177.35
P17	P43	88-78-01	177.33		176.27
P18	P44	88-78-01			
P19	P45	88-78-01			
P20	P45	88-78-01			
P21	P47	88-78-01			
P22	88-78-23-1	88-78-01	174.2		174.2
P23	P19	88-78-01		175	175
P24	P20	88-78-01		174.8	174.8

P25	368-87-04-12	88-78-01		174.75	174.75
P26	P21	88-78-01		174.4	174.4
P27	88-78-01-2	88-78-01		174.3	174.3
P28	88-78-01-4	88-78-01		172.7	172.7
P29	P26	88-78-01		173.26	173.26
P30	P26	88-78-01		173.23	173.23
P31	368-87-05-5	88-78-01	173.94		173.94
P32	368-87-05-3	88-78-01		173.3	173.3
P33	P30	88-78-01		172.4	172.4
P34	P31	88-78-01		170.87	170.87
P35	P29	88-78-01		172.5	172.5
P36	88-78-01-7	88-78-01		172	172
P37	88-78-08-1	88-78-01		171.6	171.6
P38	P33	88-78-01		172	170.3
P39	88-78-01-D1	88-78-01		170	170
P40	P36	88-78-01		170.76	165.75
P41	88-78-01-15	88-78-01		170.17	164.38
P42	P39	88-78-01	170.5	163.36	163.42
P43	P1	88-78-02(C)	170.55	169.19	162.74
P44	P2	88-78-02(C)	167	161.6	161.74
P45	P3	88-78-02(C)	166.24	164.87	160.03
P46	P4	88-78-02(C)		162.74	157.89
P47	P5	88-78-02(C)		152.43	154.82
P48	P6	88-78-02(C)		161.03	150.3
P49	P8	88-78-02(C)		140.78	145.24
P50	P10	88-78-02(C)		140.21	141.68
P51	P12	88-78-02(C)		144.45	140.21
P52	P13	88-78-02(C)		136.49	140.73
P53	P14	88-78-02(C)		135.38	141.6





## RECORD OF BOREHOLE No 153-80-02-7

METRIC

W P BB-7B-01 LOCATION Co-ords. N 4 844 880.0; E 294 310.4 ORIGINATED BY V.P.  
 DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers and Cone Test COMPILED BY V.P.  
 DATUM Geodetic DATE 81-12-22 CHECKED BY 2P.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
171.7	Ground Surface																
0.0	(Glacial Till)		1	SS	27	*	170										
	Brown Grey		2	SS	44		168										
	Silty Clay with Sand trace of Gravel occ. cobbles		3	SS	30		166										
	Very Stiff to Hard		4	SS	75		164										
			5	SS	122/	22 cm	162										
161.6			6	SS	40		160										
10.1	Grey Silty Sand to Sand		7	SS	107		158										
	Varying Amounts of Gravel		8	SS	79		156										
	occasional Cobbles and Boulders throughout		9	SS	103		154										
	Very Dense		10	SS	102		152										
151.5			11	SS	157/	20 cm											
20.2	End of Borehole																
	* Note: W.L. not established at time of investigation.																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 88-78-21-1

METRIC

W P 88-78-01 LOCATION Co-ords. N 4 845 127.0; E 294 349.1 ORIGINATED BY R.2.  
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers & Cone Test COMPILED BY R.2.  
DATUM Geodetic DATE 82 05 12 CHECKED BY *CP*

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
172.6	Ground Surface									
0.0	(Glacial Till)									
	Silty Clay of Low Plasticity with Sand Trace of Gravel		1	SS	20					4 17 34 43
			2	SS	17					3 22 43 32
			3	SS	40					
			4	SS	42					
	Brown Gray		5	SS	31					
			6	SS	28					
	Very Stiff to Hard									
166.8	Alternating Layers of Silty Sand		7	SS	46					31 42 23 4
5.8	(Glacial Till)									
	Silt to Silty Clay and Sand Varying amounts of Gravel Occasional Cobbles and Boulders throughout		8	SS	41					
			9	SS	83					
			10	SS	66					
	Hard		11	SS	100	25 cm				
158.7			12	SS	100	20 cm				
13.9	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P5

METRIC

W P 88-78-01 LOCATION Stn 17+644, O/S 32.5 Rt GL Hwy 427 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.16 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa	FLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>		
174.6	Ground Surface													
0.0	FILL silty clay, tr.						174							
173.5	gravel, roots, brown		1R	SS	12									
1.1	200 mm topsoil		2	SS	45									
	CLAYEY SILT (TILL)		3	SS	33		172							
	brown, hard		4	SS	43									
170.9			5	SS	54									
3.7	SILT (TILL)		6	SS	63		170							
	some sand, clay		7	SS	70									
	cemented brown		8	SS	107/150		169.4							
168.8	brown/grey grey						90.07.17							
	hard													
5.8	SILTY SAND (TILL)		9	SS	33		168							
	some gravel													
167.0	moist, grey													
	very dense													
7.6	SAND						166							
	some gravel													
	trace silt, wet													
	grey boulder													
165.0	dense to v.dense		10	SS	79/2	75 mm								
9.6	END OF BOREHOLE													
	Borehole caved in													
	to 6.2 m after													
	drilling													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 88-78-24-3

METRIC

W P 88-78-01 LOCATION Co-ords N.4845 481.0; E.294 111.6 ORIGINATED BY D.W.  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY D.W.  
DATUM Geodetic DATE 82 07 01 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
175.9	Ground Surface																
0.0	Brown Silty Clay with Sand Trace of Gravel Very Stiff to Hard		1	SS	28	*	174										4 18 30 48
			2	SS	27												
173.0			3	SS	107												22 38 33 7
2.9	Silty Clay Layers		4	SS	60	13cm	172										6 50 42 2
			5	SS	85	20cm											
	Silty Sand with Silt Layers		6	SS	111	20cm	170										
	Brown Grey		7	SS	84	23cm											1 7 89 3
	to		8	SS	44		168										
	Gravelly Sand with Cobbles occ. Boulders		9	SS	16		166										0 85 (15)
	Compact to Very Dense		10	SS	41												
163.1			11	SS	120	15cm	164										
12.8	Grey (Glacial Till) Silty Clay with Excess of Sand and gravel		12	SS	50	3cm	162										
160.6	Hard		13	SS	75	5cm											
15.3	End of Borehole * Water Table not established																

OFFICE REPORT ON SOIL EXPLORATION

\*3, \*5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

RECORD OF BOREHOLE No 153-80-04-6

W P 88-78-01 LOCATION Co-ords. 4, 845, 510 N; 294, 350 E. ORIGINATED BY ME  
 DIST 6 HWY 427 BOREHOLE TYPE Hollow-stem auger COMPILED BY ER  
 DATUM Geodetic DATE February 13, 1982 CHECKED BY JME

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Metres ELEV DEPTH	DESCRIPTION	STRAT	NUMBER	TYPE			20	40	60	80	100					
175.33	Ground Level															
0.00	Topsoil, 150 mm thick		1	SS	32	Seal										
	Till, silty clay, with some sand and gravel		2	SS	30	172										
	Very Stiff to Hard		3	SS	43	Seal										
171.67	Brown		4	SS	35	172										
3.60	Interbedded Silty Sand and Sandy Silt		5	SS	73	Water Level										
	Very Dense Brown		6	SS	53	Mar. 3/82										
			7	SS	89	170										
3.62			8	SS	82											
6.71	Fine Sand, Silty		9	SS	76	150										
67.10	Very Dense Brown		10	SS	69											
8.23	Sand, with some Gravel		11	SS	69											
	Very Dense Grey		12	SS	34	166										
			13	SS	74	Piezometer										
44.20			14	SS	39											
11.13	End of Borehole					160										
						162										

RECORD OF BOREHOLE No 363-87-01-3

METRIC

W P BB-78-01 LOCATION Co-ords. N 4 845 627.0: E 294 102.0 ORIGINATED BY D.W.  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY T.J.K.  
DATUM Geodetic DATE 82 07 13 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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					
178.0	Ground Surface																
0.0	Brown mottled Silty Clay with Sand Trace Gravel		1	SS	27												
	Very Stiff to Hard		2	SS	47												4 31 41 24
175.1			3	SS	86												
2.9			4	SS	107												0 68 30 2
	Silt		5	SS	75												
	Silty Sand		6	SS	100/	25 cm											
	Trace Clay & Gravel		7	SS	100/	18 cm											
			8	SS	85												
	Brown Grey		9	SS	65												
	Cobbles		10	SS	39												
	with Gravel		11	SS	100												
	Occ. Cobbles and Boulders		12	SS	100/	20 cm											
163.7	Dense to Very Dense		13	SS	100/	14 cm											
14.3	Grey (Glacial Till) Silty Clay, Sand & Gravel Hard																
162.5	End of Borehole																
15.5	Note: Borehole caved at 9.2 m																

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No 153-80-04-4

W P 88-78-01 LOCATION Co-ords. 4,845,572 N; 294,247 E. ORIGINATED BY HR  
 DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY HR  
 DATUM Geodetic DATE February 16, 1982 CHECKED BY HR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARK & GRAIN SI DISTRIBUTION (%)
Surface ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
175.93	Ground Level																
0.00	Topsoil, 150 mm thick						Seal										
	Till, silty clay, with some sand and gravel		1	SS	29												
	Very Stiff to Hard		2	SS	39		174										
172.73	Brown		3	SS	12												
	Interbedded Silty Sand and Sandy Silt		4	SS	357		Seal										
	Very Dense Brown		5	SS	120		172										
170.30	Fine Sand, Silty		6	SS	31												
	Very Dense Brown		7	SS	56		Water Level										
			8	SS	68		Mar. 170										
			9	SS	61												
168.06	Sand, silt, some gravel		10	SS	35												
166.99	Very Dense Brown		11	SS	113		Piezometer										
165.18			12	SS	50												
9.60	End of Borehole						166										
							164										

RECORD OF BOREHOLE No 88-78-25-4

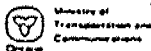
METRIC

W P 88-78-01 LOCATION Co-ords. N 4 845 771.3; E 294 089.7 ORIGINATED BY DW  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY TJK  
DATUM Geodetic DATE 82 07 13 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
179.4	Ground Surface												
0.0	Brown Silty Clay Some Sand Trace Gravel Stiff to V. Stiff		1	SS	18		178						1 16 54 29
177.3			2	SS	11								0 39 59 2
2.1	Brown		3	SS	31								
			4	SS	49		176						2 2 92 4
			5	SS	37								
			6	SS	71		174						
		Silt Layer											
			7	SS	50/	8 cm							
	Silty Sand Trace Clay & Gravel Occ. Cobbles		8	SS	95/	15 cm	172						6 51 38 5
			9	SS	100/	23 cm	170						
169.0	Dense to V. Dense												
10.4	Gray (Glacial Till) Silty Clay, Sand, Gravel		10	SS	125/	19 cm	168						
166.9	Hard		11	SS	112								
12.5	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION





# RECORD OF BOREHOLE No 153-80-05-2

METRIC

W P 88-78-01 LOCATION Co-ords. 4 845 713 N; 394 232 E. ORIGINATED BY \_\_\_\_\_  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY \_\_\_\_\_  
 DATUM Ganarone DATE 92-01-29 CHECKED BY \_\_\_\_\_

SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	SHEAR STRENGTH ○ UNCONFINED    • FIELD VANE ■ QUICK TRIAXIAL    * LAB VANE	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER									
176.3	Ground Level											
0.2	Silty clay, sandy, trace of gravel (Till) Hard, brown		1	SS	13						21.4	
			2	SS	45						21.4	
			3	SS	57						22.3	27 52 21
			4	AS	-							3 24 45 28
173.2												
3.7	Sand, fine, silty, some gravel, (possibly Till lenses in part) Very dense, brown		5	SS	170/150mm							4 53 38 5
171.7												
5.5	Silt, some sand, trace of clay, occasional rock fragments and gravel Very dense, grey		6	SS	172/150mm						23.7	
			7	SS	173/150mm						23.6	
			8	SS	174/150mm						20.7	
	Hard grey varved silty clay layer at ± elev. 166		9	SS	174						22.6	
			10	SS	170/130mm						23.6	
			11	SS	172/150mm						23.6	
			12	SS	177/150mm						23.6	
			13	SS	162/150mm						23.7	
			14	SS	162/150mm						23.4	
158.4												
18.4	End of Borehole											
	<p>* Note: sampler refusal at elev. 173.9. Augered through and took auger sample</p>											

20  
15 → 3 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No. 150-87-01-16 METRIC

W P 88-78-01 LOCATION N 4 845 905.2; E 294 202.0 ORIGINATED BY LSR  
 DIST 6 HWY 407/427 BOREHOLE TYPE 100mm dia. Solid Stem Augering COMPILED BY LSR  
 DATUM Geodetic DATE 1987-10-30 & 31 and 11-02 CHECKED BY LSR

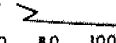
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
177.7	Ground Level																GR SA SI CL
0.0	0.4m Topsoil Silty Clay, some Sand trace Gravel		1	SS	36		177										
	Glacial Till		2	SS	41												
			3	SS	85												
	Hard Brown Damp		4	SS	83/0	15m	175										
173.7							Seal										
4.0	Silt with Fine Sand lenses moist saturated		5	SS	86/0	15m	173										0 18 72 10
			6	SS	58/0	10m											
			7	SS	80/0	15m											
	Very Dense Brown		8	SS	100/0	22m	171										
			9	SS	100/0	19m											2 11 78 9
168.4			10	SS	100/0	17m	169										
9.3	Sandy, Silt, trace Gravel with Gravelly and Sandy lenses		11	SS	100/0	23m	167										
	Glacial Till		12	SS	100/0	13m	Piezometer 165										
	Grey		13	SS	100/0	10m											
	Very Dense Moist Traces of Shale Fragments		14	SS	100/0	14m	163										
			15	SS	100/0	14m	161										
159.2			16	SS	100/0	09m											
18.5	End of Borehole						159										

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P15

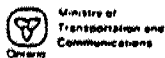
METRIC

W P 88-78-01 LOCATION Stn 18+389, O/S 52.0 Lt CL Hwy 427 ORIGINATED BY SG  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.17 CHECKED BY IPL

SOIL PROFILE		STRAT PLOT	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
178.3	Ground Surface																
0.0	220 mm topsoil CLAYEY SILT (TILL) trace roots brown fissured		1	SS	16		178										
176.0	very stiff to hard		2	SS	39		176										
2.3	SILT (TILL) some sand, clay tr. gravel boulder		3	SS	51												
174.5	very dense		4	SS	25/0 mm												
3.8	SANDY SILT very dense		5	SS	56/150 mm		174										
	moist		6	SS	52/150 mm												
	brown		7	SS	57/150 mm												
	grey		8	SS	49/150 mm		172										
171.7			9	SS	30/0 mm												
7.6	SANDY SILT (TILL) tr. gravel boulder grey boulder		10	SS	50/125 mm		170										
169.0	very dense																
9.3	END OF BOREHOLE * Borehole dry on completion																

OFFICE REPORT ON SOIL EXPLORATION

Hit boulder  
at 3 m;  
moved hole  
1 m west


 Ministry of  
Transportation and  
Communications  
Ontario

## RECORD OF BOREHOLE No 150-87-01-16 METRIC

W P 88-78-01 LOCATION N 4 845 905.2; E 294 202.0 ORIGINATED BY LSR  
 DIST 6 HWY 407/427 BOREHOLE TYPE 100mm dia. Solid Stem Augering COMPILED BY LSR  
 DATUM Geodetic DATE 1987 - 10 - 30 & 31 and 11 - 02 CHECKED BY CR

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
177.7	Ground Level															GR SA SI CL
0.0	0.4m Topsoil Silty Clay, some Sand trace Gravel		1	SS	36	177										
	Glacial Till		2	SS	41											
			3	SS	85											
	Hard Brown Damp		4	SS	83/0	175										
173.7						Seal										
4.0	Silt with Fine Sand lenses moist saturated		5	SS	86/0	173										0 18 72 10
			6	SS	58/0	10m										
			7	SS	80/0	15m										
	Very Dense Brown		8	SS	100/0	171										
			9	SS	100/0	19m										2 11 78 9
168.4			10	SS	100/0	17m										
9.3	Sandy, Silt, trace Gravel with Gravelly and Sandy lenses		11	SS	100/0	167										
	Glacial Till		12	SS	100/0	13m										
			13	SS	100/0	10m										
	Gray					Piezometer 165										
	Very Dense Moist Traces of Shale Fragments		14	SS	100/0	163										
			15	SS	100/0	161										
159.2			16	SS	100/0	09m										
18.5	End of Borehole					159										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No P17

METRIC

W P 88-78-01 LOCATION Stn 11+363, O/S 20.0 Lt CL 407E - 427N ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.17 CHECKED BY LPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
176.1	Ground Surface																
0.0	150 mm topsoil CLAYEY SILT (TILL) some sand seams trace gravel very stiff brown to hard grey		1	SS	31	*	176										
			2	SS	33		174										
			3	SS	23												
			4	SS	17												
			5	SS	26		172										
170.9			6	SS	24												
5.2	SILT (TILL) some clay, tr. gravel cemented grey hard sandy silt		7	SS	60/75 mm		170										
			8	SS	30/60 mm												
167.9			9	SS	62/150 mm		168										
8.2	END OF BOREHOLE * Borehole dry on completion																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No P16										METRIC				
W P 88-78-01		LOCATION Stn 18+536, O/S 34.5 Rt. CL Hwy 427						ORIGINATED BY SC						
DIST 6 HWY 427		BOREHOLE TYPE Solid Stem Auger						COMPILED BY JN						
DATUM Geodetic		DATE 1990.07.17						CHECKED BY IPI.						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
177.0	Ground Surface													
0.0	200 mm topsoil CLAYEY SILT (TILL) some sand tr. roots tr. gravel sand seam desiccated brown hard		1	SS	36		176							4 22 60 34
			2	SS	34									
			3	SS	52		174							
			4	SS	54									
			5	SS	70/	250 mm								
	boulder		6	SS	60/	125 mm	172							8 18 67 7
171.8	SILT		7	SS	53/	150 mm								
171.0	some sand, v. dense		8	SS	60/	125 mm	170							12 75 (13)
6.0	SILTY SAND tr. gravel damp to moist brown very dense		9	SS	90/	150 mm								
168.6	CLAY with silt (varved)													
167.7	grey hard		10	SS	63/	150 mm	168							
9.3	END OF BOREHOLE * Borehole dry on completion													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No P16

METRIC

W P 88-78-01

LOCATION Stn 18+536, O/S 34.5 Rt. Cl. Hwy 427

ORIGINATED BY SC

DIST 6 HWY 427

BOREHOLE TYPE Solid Stem Auger

COMPILED BY JN

DATUM Geodetic

DATE 1990.07.17

CHECKED BY IPI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
(m)	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100						WATER CONTENT (%)
ELEV DEPTH								SHEAR STRENGTH kPa										
								○ UNCONFINED + FIELD VANE										
								● QUICK TRIAXIAL x LAB VANE										
177.0	Ground Surface					*											GR SA SI CL	
0.0	200 mm topsoil CLAYEY SILT (TILL) some sand tr. roots tr. gravel sand seam desiccated brown hard boulder		1	SS	36		176										4 22 40 14	
			2	SS	34													
			3	SS	52		174											
			4	SS	54													
			5	SS	70/	250 mm												
			6	SS	60/	125 mm												
171.8							172										8 18 67 7	
5.2	SILT		7	SS	53/	150 mm												
171.0	some sand, v. dense		8	SS	60/	125 mm												
6.0	SILTY SAND						170										12 75 (13)	
	tr. gravel damp to moist brown very dense		9	SS	90/	150 mm												
168.6																		
8.4	CLAY with silt (varved)						168											
167.7	grey hard		10	SS	63/	150 mm												
9.3	END OF BOREHOLE * Borehole dry on completion																	

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P43

METRIC

W P 88-78-01 LOCATION Stn 18+868, O/S 38.0 Rt. CL Hwy 427 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.18 CHECKED BY IDL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					FLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100										WATER CONTENT (%)		
								SHEAR STRENGTH kPa										10 20 30		
177.3	Ground Surface																			
0.0	220 mm topsoil CLAYEY SILT (TILL) some sand, trace gravel desiccated hard		1	SS	74		176									3 30 41 26				
			2	SS	70															
			3	SS	437															
			4	SS	537															
173.6			5	SS	607											0 1 68 31				
3.7 172.9	SANDY SILT (TILL) very dense		6	SS	867															
4.4	CLAY with silt seams (varved) low plasticity grey, hard		7	SS	477															
			8	SS	52															
170.3							170													
7.0	CLAYEY SILT (TILL) some sand tr: gravel well graded grey hard		9	SS	67															
167.7			10	SS	73		168													
9.6	END OF BOREHOLE  Borehole caved in to 5.2 m after drilling																			


OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No P44

METRIC

W P 88-78-01 LOCATION Stn 19+060, O/S 41.2 Lt CL Hwy 427 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.18 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION {%} GR SA SI CL			
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE												
177.8	Ground Surface																			
0.0	600 mm topsoil CLAYEY SILT (TILL) some sand, trace gravel desiccated brown hard		1	SS	40		176													
			2	SS	41		175.8													
			3	SS	67		90.07.19													
174.1	more sand		4	SS	45		150 mm													
			5	SS	70		225 mm													
3.7	CLAY with silt seams (varved) grey hard		6	SS	75															
			7	SS	67		172													
			8	SS	56															
170.5																				
170.1	SAND		9	SS	70		225 mm									2 Bl (17)				
7.7	CLAYEY SILT (TILL) with sand and gravel well graded grey hard		10	SS	74		225 mm													
							168													
167.4																				
10.4	SILT (TILL)		11	SS	51		150 mm													
10.8	END OF BOREHOLE Borehole caved in to 6.1 m after drilling																			

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No P 45

METRIC

W P 88-78-01 LOCATION Stn 19+240, 0/5 38.0 Rt. CL Hwy 427 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.19 CHECKED BY IPI

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					NATURAL MOISTURE CONTENT			UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION [%] GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
177.7	Ground Surface															
0.0	CLAYEY SILT (TILL) some sand pocket brown very stiff to hard		1	SS	16											
175.6			2	SS	54											
2.1	SILT (TILL) some sand trace gravel brown hard		3	SS	45/	176										
173.3			4	SS	60/	174										
4.4	SILT tr. clay moist		5	SS	59/	174										
172.5	grey, very dense		6	SS	30/	174										
5.2	CLAY some silt seams (varved) low plasticity grey hard		7	SS	47/	172										
			8	SS	81											
			9	SS	79											
168.6			10	SS	50/	170										
9.1	CLAYEY SILT (TILL)															
9.4	END OF BOREHOLE Borehole caved in to 4.3 m after drilling															

OFFICE REPORT ON SOIL EXPLORATION

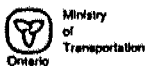
# RECORD OF BOREHOLE No P 45

METRIC

W P 88-78-01 LOCATION Stn 19+240, O/S 38.0 Rt. CL Hwy 427 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.19 CHECKED BY JPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
177.7	Ground Surface																
0.0	CLAYEY SILT (TILL) some sand pocket brown very stiff to hard		1	SS	16		176										
175.6			2	SS	54												
2.1	SILT (TILL) some sand trace gravel brown hard		3	SS	65		W.L. 175.3										4 38 41 17
			4	SS	68	150 mm	174	90.0	19								
173.3			5	SS	39	150 mm											
4.4	SILT tr. clay moist grey, very dense		6	SS	30	75 mm											0 2 92 6
172.5			7	SS	47	150 mm	172										
5.2	CLAY some silt seams (varved) low plasticity grey hard		8	SS	81												0 1 58 41
			9	SS	79		170										
168.6																	
9.1	CLAYEY SILT (TILL)		10	SS	50	150 mm											
9.4	END OF BOREHOLE Borehole caved in to 4.3 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION



## RECORD OF BOREHOLE No P 47

METRIC

W P 88-78-01 LOCATION Stn 19+607, O/S 52.0 Lt CL Hwy 427 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.18 CHECKED BY IP1

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION {%} GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa									
								20	40	60	80	100					
								O UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB VANE									
179.8	Ground Surface																
0.0	200 mm topsoil CLAYEY SILT (TILL) some sand, tr.gravel brown, hard		1	SS	68												
177.7			2	SS	477	150 mm	178										
2.1	SILT (TILL) some sand, clay tr. gravel brown hard grey		3	SS	627	150 mm											
			4	SS	71												
			5	SS	487	150 mm	176										
			6	SS	507	150 mm											
			7	SS	487	150 mm	174										
			8	SS	75												
			9	SS	587	150 mm	172										
170.8																	
170.4	SAND, tr.silt, moist		10	SS	66		170										
9.4	CLAYEY SILT (TILL) with sand and gravel well graded, hard																
168.8			11	SS	587	125 mm											
11.0	END OF BOREHOLE Borehole caved in to 7.3 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 88-78-23-1

METRIC

W P 88-78-01 LOCATION Co-ords. N 4 845 390.0; E 294 364.8 ORIGINATED BY D.W.  
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY D.W.  
DATUM Geodetic DATE 82 06 28 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
174.0	Ground Surface																
0.0	Silty Clay with Sand		1	SS	30												3 15 47 35
	Trace of Gravel		2	SS	31												
			3	SS	43												
			4	SS	85												
	Brown Grey		5	SS	28												5 32 43 20
	Occasional Cobbles and Boulders		6	SS	33												
	Very Stiff to Hard		7	SS	44												
166.8																	
7.2	Gray		8	SS	34												25 37 33 5
	Silty Sand with Gravel to Gravelly Sand		9	SS	36												
	Some Cobbles																
	Dense to Very Dense																
			10	SS	90												59 36 (5)
160.3																	
13.7	End of Borehole																
	*NOTE: Borehole caved at 6.1 m depth																

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P19

METRIC

W P 88-78-01 LOCATION Stn 11+203, O/S 43.0 L.R. CL 427N - 407E ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.19 CHECKED BY IPJ

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
175.0	Ground Surface													
0.0	175 mm topsoil CLAYEY SILT (TILL) roots roots some sand trace gravel hard brown grey		1	SS	35	*	174							
			2	SS	43									
			3	SS	47		172							
			4	SS	46	150 mm								
			5	SS	69	250 mm								
			6	SS	34		170							
			7	SS	43									
169.0	SANDY SILT trace clay dilatant, wet grey, v. dense		8	SS	50	150 mm	168							
167.4	SILT (TILL) some sand, clay grey		9	SS	60	150 mm								
165.7	hard		10	SS	65	125 mm	166							
9.3	END OF BOREHOLE * Borehole dry on completion													

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P20

METRIC

W P 88-78-01 LOCATION SLn 11+253, O/S 46.0 Rt. GL Hwy 407 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.19 CHECKED BY JPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100										SHEAR STRENGTH kPa			WATER CONTENT (%)		
																		○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			10 20 30		
174.8	Ground Surface																						
0.0	CLAYEY SILT (TILL) some sand very stiff to hard sand seam silt seam brown grey		1	SS	54	*	174																
			2	SS	50																		
			3	SS	27																		
			4	SS	28																		
			5	SS	44																		
			6	SS	31																		
			7	SS	27																		
			8	SS	40																		
167.8							168																
7.0	SAND trace silt, gravel brown very dense		9	SS	56/	150 mm																	
							166																
165.6	CLAYEY SILT TILL grey, hard		10	SS	50/	150 mm																	
9.4																							
	* Borehole dry on completion, but caved in to 7.9 m																						

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 368-87-04-12

METRIC

W.P. 88-78-01 LOCATION G-2-V-1, N. 4. 845, 942.5, L. 294, 638.0  
DIST 8 HWY 407 BOREHOLE TYPE Continuous Flight Auger (H.S.)  
DATUM Geodetic DATE 89-12-21

ORIGINATED BY U.C.  
COMPILED BY P.M.  
CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH kPa					
174.8	Ground Level												
0.0	CLAYEY SILT, With Sand, Trace of Gravel (fill)  (Locustrine)  (fill)  Very Stiff to Hard		1	SS	27								1 15 (84)
			2	SS	48								
			3	SS	32								
			4	SS	33								
			5	SS	35								
			6	SS	28								
			7	SS	68								
			8	SS	103								
			9	SS	52								
			10	SS	50								
168.4	Heterogeneous Mixture of Gravel, Sand, Silt and Clay (fill) Hard												
8.4													
165.2													
9.6	End of Borehole • Water Level Not Established												



# RECORD OF BOREHOLE No P21

METRIC

W P 88-78-01 LOCATION Stn 11+181. 0/S 28.0 Lt CL 407E - 427S ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.19 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
175.9	Ground Surface																GR SA SI CL
0.0	FILL silty clay some organic dark brown		1	SS	18												
174.1			2	SS	18		174										
1.8	CLAYEY SILT (TILL) some sand		3	SS	39												
			4	SS	40		172										
			5	SS	53												
170.7			6	SS	39												2 25 49 24
5.2	SILT (TILL)		7	SS	77		170										
169.7	brown/grey hard		8	SS	71												
6.2	CLAY with silt seam (varved grey hard		9	SS	49		168										0 0 58 42
166.5							W.L. 167.6										
166.5	SILTY FINE SAND		10	SS	517		90.07.20										
9.4	END OF BOREHOLE					150 mm											
	Borehole caved in to 8.5 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No 88-78-01-2 METRIC

W P 88-78-01 LOCATION Co-ords: N 4 846 080, E 294 670.5 ORIGINATED BY BB  
 DIST 6 HWY 407 BOREHOLE TYPE Cont. Flight Auger (S.S.) and Cone Test COMPILED BY BB  
 DATUM Geodetic DATE 88 09 19 CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT Y kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES								
172.7	Ground Level												
0.0													
	Trace Organics		1	SS	33								
	Clayey Silt		2	SS	86								
	Some/With Sand		3	SS	60	15cm							
	Trace Gravel		4	SS	60	13cm							
	Brown Grey												
	Hard		5	SS	31								
	(Glacial Till)		6	SS	59								
165.1													
7.6	Sand												
164.7	Grey Very Dense		7	SS	98								0 81 (19)
8.0	End of Borehole												

# RECORD OF BOREHOLE No 88-78-01-4 METRIC

W P 88-78-01 LOCATION Co-ords: 'N 4 846 002.5, E 294 811.5 ORIGINATED BY BB  
 DIST 6 HWY 407 BOREHOLE TYPE Cont. Flight Auger (S.S.) and Cone Test COMPILED BY BB  
 DATUM Geodetic DATE 88 09 20 CHECKED BY \_\_\_\_\_

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	Wp	W	Wp	W	Wp		
172.2	Ground Level						172								GR SA SI CL
0.0															
	Trace Organics		1	SS	56										10 30 (60)
	Brown Grey		2	SS	67										
	Clayey Silt		3	SS	64										
	Trace/With Sand														
	Trace Gravel		4	SS	36										0 1 (99)
	Sand and Gravel		5	SS	39										
	Hard														
164.1	(Glacial Till)		6	SS	50										
8.1	End of Borehole														



RECORD OF BOREHOLE No P26

METRIC

W P 88-78-01 LOCATION Stn 11+725, O/S 61.0 Rt CL Hwy 407 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.19 CHECKED BY 1P1

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR 5A SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPo					WATER CONTENT (%)				
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	x LAB VANE	10	20	30			
173.3	Ground Surface																
0.0	600 mm topsoil																
171.8	SILTY CLAY tr. roots brown, v. stiff		1	SS	25		172										
1.5	CLAYEY SILT (TILL)		2	SS	70	225 mm											
	some sand		3	SS	50	175 mm											
	hard brown grey		4	SS	86	275 mm	170										
168.9	silty clay		5	SS	78	W.L. 169.2											
4.4	CLAY		6	SS	88	250 mm	90.02.20										
	with silt seam (varved)		7	SS	55	275 mm	168										
166.9			8	SS	26											13 68(19)	
6.4	SAND						166										
165.5	trace gravel, wet compact																
7.8	CLAYEY SILT (TILL)		9	SS	52												
	with sand and gravel grey hard						164										
163.7			10	SS	42												
9.6	END OF BOREHOLE																
	Borehole caved in to 6.7 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No P26

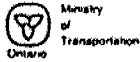
METRIC

W P 88-78-01 LOCATION Stn 11+725, O/S 61.0 Rt CL Hwy 407 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.19 CHECKED BY IPI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
173.3	Ground Surface																
0.0	600 mm topsoil																
171.8	SILTY CLAY tr. roots brown, v. stiff		1	SS	25		172										
1.5	CLAYEY SILT (TILL)		2	SS	70/225 mm												
	some sand brown		3	SS	50/75 mm												
	hard grey		4	SS	86/275 mm		170										
168.9	silty clay		5	SS	78/250 mm		169.2										
4.4	CLAY with silt seam grey, hard (varved)		6	SS	88/275 mm		168										
166.9			7	SS	55												
6.4	SAND trace gravel, wet compact		8	SS	26		166										
165.5			9	SS	52												
7.8	CLAYEY SILT (TILL) with sand and gravel grey hard		10	SS	42		164										
163.7																	
9.6	END OF BOREHOLE Borehole caved in to 6.7 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

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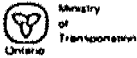


# RECORD OF BOREHOLE No 368-87-05-5 METRIC

W P BB-7B-01 LOCATION Co-ords: N 4 846 152.0, E 294 879.5 ORIGINATED BY PM  
 DIST 6 HWY 407 BOREHOLE TYPE Continuous Flight Auger (H.S.) COMPILED BY PM  
 DATUM Geodetic DATE 89 12 13 CHECKED BY \_\_\_\_\_

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED   * FIELD VANE ● QUICK TRIAXIAL   × LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
174.1	Ground Level									
0.0	Topsoil									
	Clayey Silt With to Trace of Sand		1	SS	81					18 31 (51)
	Trace of Gravel		2	SS	55					
	Occasional Silty Sand Layers		3	SS	44					
			4	SS	48					
			5	SS	47					
			6	SS	77					
			7	SS	48					
	Occasional Cobbles		8	SS	18					2 23 (75)
	(Till) (Lacustrine)		9	SS	27					
			10	SS	23					
162.8	Hard/Very Stiff		11	SS	33					6 23 (71)
11.3	Heterogeneous Mixture of Gravel, Sand, Silt and Clay (Till) Hard		12	SS	50	9cm				8 36 43 17
160.9										
13.2	Heterogeneous Mixture of Gravel, Sand, Silt and Clay (Till) Very Dense		13	SS	75	15cm				51 38 8 3
15.5	End of Borehole									
	* Presumed Heterogeneous Mixture of Gravel, Sand, Silt and Clay Hard									

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 368-87-05-3 METRIC														
W P <u>88-78-01</u>		LOCATION Co-ords; N 4 846 193.7 E 294 978.0				ORIGINATED BY <u>PM</u>								
DIST <u>6</u> HWY <u>407</u>		BOREHOLE TYPE <u>Continuous Flight Auger (H.S.)</u>				COMPILED BY <u>PM</u>								
DATUM <u>Geodetic</u>		DATE <u>89 12 07</u> to <u>89 12 08</u>				CHECKED BY								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT			UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W <sub>p</sub>	W	W <sub>L</sub>	10 20 30		
174.0 0.0	Ground Level Topsoil													GR SA SI CL
	Clayey Silt, With to Trace of Sand Trace of Gravel		1	SS	8									9 30 (61)
			2	SS	7									10 59 27 4
			3	SS	33									1 37 (62)
			4	SS	45									
	Firm to Very Stiff	(Till) (Lacustrine)	5	SS	44									
		Occasional Layers of Silty Sand and Silt	6	SS	55									
			7	SS	66									
			8	SS	65									
		(Till)	9	SS	21									2 17 (81)
164.7 9.3	Heterogeneous Mixture of Gravel Sand, Silt & Clay		10	SS	29									
		(Till)	11	SS	44									
			12	SS	65									8 31 (61)
160.0 14.0	Hard Heterogeneous Mixture of Gravel Sand, Silt & Clay		13	SS	105	10cm								46 44 7 3
157.3 16.7	Very Dense		14	SS	100	5cm								
	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No P 30

METRIC

W P 88-78-01 LOCATION Stn 12+028, O/S 79.0 Rt. CL Hwy 407 ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.20 CHECKED BY LPL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					NATURAL MOISTURE CONTENT			UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRAT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
172.4	Ground Surface															GR SA SI CL
0.0	450 mm topsoil CLAYEY SILT (TILL) some sand trace organics, gravel, brown, hard		1	SS	73											2 27 43 28
170.0			2	SS	64											
2.4	SILT (TILL) some sand, clay trace brown grey gravel hard boulder		3	SS	52	150 mm										2 29 49 20
			4	SS	61	150 mm										
			5	SS	53	150 mm										
			6	SS	60	150 mm										
			7	SS	60	150 mm										
			8	SS	60	150 mm										
165.8						125 mm										
6.6	FINE SAND trace silt wet, dilatant grey, v. dense		9	SS	63	150 mm										1 85 (14)
163.9																
8.5	CLAYEY SILT TILL some sand, gravel, hard		10	SS	68	150 mm										
163.1																
9.3	END OF BOREHOLE Borehole caved in to 7.3 m after drilling															

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No P31

METRIC

W P 88-78-01 LOCATION Stn 10+225, O/S 33.0 Lt CL 27N - 407E ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.23 CHECKED BY IPL


SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
170.9	Ground Surface																
0.0	50 mm topsoil CLAYEY SILT (TILL) some sand, brown hard		1	SS	46		170										
168.8			2	SS	81												
2.1	SILT (TILL) some sand, clay trace gravel, hard		3	SS	59		168										
167.1			4	SS	64												
3.8	CLAYEY SILT (TILL) some sand hard		5	SS	54		166										
165.7			6	SS	74	225 mm											
5.2	SANDY SILT (TILL) some clay cemented grey very dense boulder		7	SS	52	150 mm											
			8	SS	46	150 mm	W.L. 164.5										
			9	SS	30	50 mm	90.07.23										
161.6			10	SS	61	150 mm	162										
9.3	END OF BOREHOLE Borehole caved in to 7.9 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No P29

METRIC

W P BB-78-01 LOCATION Stn 10+800, O/S 18.0 Rf. Cl. 407W - 275 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.23 CHECKED BY IP1

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT (%)				
172.5	Ground Surface																
0.0	350 mm topsoil						172										
171.3	CLAYEY SILT (TILL) brown, hard		1	SS	707	25 mm											
1.2	SILT (TILL) some sand, gravel cemented boulder brown hard		2	SS	77												
			3	SS	807	25 mm	170										
			4	SS	907	50 mm											
			5	SS	807	50 mm											
			6	SS	707	50 mm	168										
167.5	SILTY CLAY grey hard		7	SS	68												
5.0			8	SS	527	150 mm W.L. 165.9 90.07.23	166										
			9	SS	607	150 mm											
163.4			10	SS	307	mm	164										
9.1	CLAYEY SILT (TILL)																
9.4	END OF BOREHOLE  Borehole caved in to 7.0 m after drilling																

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No 88-78-01-7 METRIC

W P 88-78-01 LOCATION Co-ordinate N 4 846 305.01 E 295 321.0 ORIGINATED BY BB  
 DIST 6 HWY 407 BOREHOLE TYPE Cont. Flight Auger (S.S.) and Cone Test COMPILED BY BB  
 DATUM Geodetic DATE 88 09 20-21 CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
171.9	Ground Level													GR SA SI CL
0.0														
	Trace Organics		1	SS	23									
			2	SS	31									
			3	SS	41									
			4	SS	59									
	Brown Grey													
	Clayey Silt Some Sand Trace Gravel Very Stiff to Hard		5	SS	43									3 21 (76)
			6	SS	65									
	Sandy Silt Brown		7	SS	60/	14cm								7 48 (45)
			8	SS	60									
	(Glacial Till)													
			9	SS	100/	25cm								
159.4			10	SS	81									
12.5	End of Borehole													
	*Borehole Dry													

# RECORD OF BOREHOLE No 88-78-08-1 METRIC

W P 88-78-01 LOCATION Co-ords 4,846,237.60 N; 295,475.70E ORIGINATED BY JZ  
 DIST 6 HWY 407 & 27 BOREHOLE TYPE Hollow Stem Augers & Cone Test COMPILED BY PAD  
 DATUM Geodetic DATE 1982 03 17-18 CHECKED BY WJB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
172.09	Ground Level																
0.00	Fill		1	CS			172						0				
170.87			2	SS	32		170						0	4			1 25 48 26
1.22	Silty clay of low plasticity, some sand, trace gravel. (Till)		3	SS	40								0				
	Hard		4	SS	59								0				
	Brown Grey		5	SS	46		168						0				
			6	SS	51		166										
			7	SS	49		164						0				
			8	SS	61		162						0				
			9	SS	88		160						0				
159.96			10	SS	91		158						0				4 17 75 4
12.19	Sandy silt, trace clay, trace gravel. (Till)		11	SS	92								0				
	Dense to Very Dense		12	SS	45												
156.35	Green-Grey																
15.70	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION



## METRIC

W P 88-78-n1 LOCATION Stn 11+265, O/S 22.5 Lt CL 275 - 407W ORIGINATED BY SC  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
DATUM Geodetic DATE 1990.07.23 CHECKED BY JPL

[illegible]

# RECORD OF BOREHOLE No 88-78-01-DI METRIC

W P 88-78-01 LOCATION Co-ords: N 4 846 381.5; E 295 691.0 ORIGINATED BY BB  
 DIST 6 HWY 407 BOREHOLE TYPE Cont. Flight Auger (S.S.) COMPILED BY BB  
 DATUM Geodetic DATE 88 09 26 CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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					
170.5	Ground Level																
0.0	Trace Organics		1	SS	31	*	170										
			2	SS	49												
	Brown Grey		3	SS	25		168										
	Silty Clay to Clayey Silt		4	SS	35		166										
	Trace/Some Sand		5	SS	26		164										
	Trace Gravel																
	Very Stiff to Hard																
162.4	(Glacial Till)		6	SS	27												
8.1	End of Borehole																
	*Borehole Dry																

OFFICE REPORT ON SOIL EXPLORATION


 Ministry  
of  
Transportation  
Ontario

## RECORD OF BOREHOLE No P 36

METRIC

W P 88-78-01 LOCATION Stn 12+616, O/S 50.0 Rt. CL Hwy 407 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990-07-24 CHECKED BY LPL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100					
170.6	Ground Surface															GR SA SI CL
0.0	220 mm topsoil CLAYEY SILT (TILL)  some sand trace gravel hard.  brown grey		1	SS	53	*							0			2 22 45 31
			2	SS	53								0			
			3	SS	477	150 mm							0			13 20 46 21
			4	SS	86								0			
			5	SS	71								0			9 41 40 10
			6	SS	78/	250 mm							0			
			7	SS	35								0			
			8	SS	48								0			
	more clay		9	SS	36								0			
			10	SS	53/	150 mm							0			
160.1																
10.5	SANDY SILT some gravel, clay brown, v. dense		11	SS	65/	150 mm							0			
158.4																
12.2	CLAYEY SILT (TILL)		12	SS	78											
12.6	END OF BOREHOLE  * Borehole dry on completion															

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No 88-78-01-15 METRIC

W P 88-78-01 LOCATION Co-ords N 4 846 504.0; E 295 990.0 ORIGINATED BY BB  
 DIST 6 HWY 407 BOREHOLE TYPE Cont. Flight Auger (S.S.) and Cone Test COMPILED BY BB  
 DATUM Geodetic DATE 88 09 27 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100		W <sub>p</sub>	W			W <sub>L</sub>
								SHEAR STRENGTH kPa						
171.7	Ground Surface													
0.0														
	Trace Organics		1	SS	46									
			2	SS	36									
	Clayey Silt													
			3	SS	40									
	Brown Grey		4	SS	23									
	Some Sand		5	SS	33									
	Trace Gravel													
	Very Stiff to Hard		6	SS	80									
162.4	(Glacial Till)													
9.3	Sandy Silt to Silt		7	SS	71									
	Trace Gravel													
161.0	Very Dense													
10.7	Clayey Silt		8	SS	67									
	With Sand													
	Trace Gravel													
	Occasional Sandy Silt		9	SS	45									
	Zones													
	Hard													
157.5	(Glacial Till)		10	SS	39									
14.2	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No P 39

METRIC

W P 88-78-01 LOCATION Stn 13+025, O/S 44.0 Rt CL Hwy 407 ORIGINATED BY SC  
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY JN  
 DATUM Geodetic DATE 1990.07.04 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
167.1	Ground Surface															
0.0	CLAYEY SILT (TILL) some sand brown tr. gravel grey very stiff to hard silt seam		1	SS	49		166						o			0 28 45 27
			2	SS	22								o			
			3	SS	24								o			
			4	SS	40		164						o			
			5	SS	49								o			
			6	SS	35		162						o			
			7	SS	48								o			
			8	SS	50	150 mm	160						o			
			9	SS	85		W.L. 159.5 90.07.24						o			6 35 40 19
158.0			10	SS	81		158						o			
9.1	SILT (TILL) with sand and gravel well graded grey hard		11	SS	46	150 mm	156						o			
154.9			12	SS	37	150 mm							o			15 35 36 14
12.1	SILTY SAND some gravel grey very dense		13	SS	60	125 mm	154						o			
			14	SS	60	100 mm	152						o			
151.8	sandy silt															8 65 (27)
15.3	END OF BOREHOLE Borehole caved in to 7.6 m after drilling															

OFFICE REPORT ON SOIL EXPLORATION



1 OF 1

METRIC

**LOCATION**

N 4 846 605.0, E 296 505.0

ORIGINATED BY CC

DIST 6 HWY 407

BOREHOLE TYPE Solid Stem Auger

COMPILED BY KA

DATUM Geodetic

DATE 90 04 19

\_\_\_\_ CHECKED BY \_\_\_\_ DD

+3, x5: Numbers refer to Sensitivity

# RECORD OF BOREHOLE No P3

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 777.0, E 296 632.0 ORIGINATED BY CC  
 DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 18-19 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
165.2	Ground Level																
0.0			1	SS	54												
			2	SS	100	/28cm											
			3	SS	87	/31cm											
			4	SS	103	/31cm											
			5	SS	73												
156.3			6	SS	104	/26cm											
8.7			7	SS	94	/23cm											
152.9			8	SS	87	/28cm											
12.3																	
151.2																	
14.0																	

\* GWL Not Established

# RECORD OF BOREHOLE No P4

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 765.0, E 296 840.0 ORIGINATED BY CC  
 DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA  
 DATUM Geodetic DATE 90 04 18 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	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										10 20 30		
162.6	Ground Level																			
0.0						*	162													
160.0	Clayey Silt to Silt Trace Sand, Trace Gravel Brown, Moist, Stiff		1	SS	14		160													
2.6			2	SS	66															
			3	SS	89		158													
	Silty Sand to Sandy Silt Brown to Grey, Dry to Moist Dense to Very Dense		4	SS	89		156													
			5	SS	37															
	Sand and Gravel Brown, Wet Dense		6	SS	31		154													
152.4							152													
10.2	Clayey Silt to Silt Trace Sand, Trace Gravel Grey, Dry Hard		7	SS	77															
150.0			8	SS	106		150													
12.6	End of Borehole																			
	• GWL Not Established																			

## METRIC

+3, x3: Numbers refer to Sensitivity

# RECORD OF BOREHOLE No P6

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 901.0, E 297 138.0 ORIGINATED BY CC  
 DIST 5 HWY 407 BOREHOLE TYPE Solid Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 20 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
160.8	Ground Level															
0.0																
			1	SS	23											
	V. Stiff Hard Brown Gray		2	SS	102	/23cm										
	Clayey Silt to Silt Trace Sand, Trace Gravel Occ. Silty Sand & Gravel Layers Dry to Moist		3	SS	104											
			4	SS	87	/26cm										
			5	SS	50	/8cm										
	Sand, Some Gravel		6	SS	96	/31cm										
149.7			7	SS	86											
11.1	End of Borehole															
	* CWL Not Established															

## RECORD OF BOREHOLE No P8

1 OF 1

METRIC

W.P. 88-78-02 (C)

LOCATION N 4 847 065.0, E 297 233.0

ORIGINATED BY KA

DIST 5 HWY 407

BOREHOLE TYPE Hollow Stem Auger, Cone Test

COMPILED BY KA

DATUM Geodetic

DATE 90 04 24

CHECKED BY DD

[illegible]



# RECORD OF BOREHOLE No P10

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 005.0, E 297 403.0 ORIGINATED BY KA  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 25 CHECKED BY DD

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT 7 KN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH kPa					
138.7	Ground Level						20 40 60 80 100	10 20 30					
0.0	Peat/Organic Clayey Silt with Sand Dark Brown/Black Moist, Firm		1	SS	9								
134.7			2	SS	16								
4.0			3	SS	8								
	Silty Sand to Sandy Silt Trace Gravel Gray, Wet to Saturated Loose to Dense		4	SS	20								
			5	SS	28								
			6	SS	20								
128.1			7	SS	43								
12.6	End of Borehole												
	• GWL Not Established												

## METRIC

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>P</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT 7 KN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20					
							SHEAR STRENGTH kPa						
							○ UNCONFINED + FIELD VANE • QUICK TRIAXIAL = LAB VANE						
							20 40 60 80 100						
									WATER CONTENT (%)				
									10 20 30				

[illegible]

# RECORD OF BOREHOLE No P13

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 265.0, E 297 695.0 ORIGINATED BY CG/KA  
 DIST 5 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 27 & 90 05 03 CHECKED BY DD

SOIL PROFILE		SAMPLES			GROUND WATER * CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20					
135.9	Ground Level												
0.0	Peat/Organic Clayey Silt		1	SS	5								
134.8	Dark Brown, Moist, Firm												
1.1	Clayey Silt		2	SS	5								
133.3	Brown, Moist, Firm												
2.6	Sand & Gravel		3	SS	11								
131.8	Gray, Saturated, Compact												
4.1	Silty Clay to Clayey Silt with Sand Layers Gray, Moist to Wet Firm to Very Stiff		4	SS	7								
129.3			5	SS	16								
6.6	End of Borehole												
128.3													
7.8	End of Cone Test												
<p>* NOTE:                      Artesian condition encountered                      at El. 130.3m.                      Artesian Head at El. 135.6m.                      Entire borehole was sealed with                      bentonite (Hole Plug)</p>													

# RECORD OF BOREHOLE No P14

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 275.0, E 297 880.0 ORIGINATED BY KA  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 05 01 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 <sup>3</sup>	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 <sub>P</sub> W W <sub>L</sub>	WATER CONTENT (%) 10 20 30			
135.2	Ground Level													
0.0	Clayey Silt with Sand		1	SS	1									
134.1	Tr. Organic, Moist, V. Soft													
1.1			2	SS	15									
	Silty Sand to Sand & Gravel Brown to Grey Moist to Saturated Compact		3	SS	14									
			4	SS	11									
129.6														
5.6			5	SS	6									
	Clayey Silt with Layers of Silty Clay and Sandy Silt Grey, Moist to Wet Firm to Hard		6	SS	4									
			7	SS	26									
124.1	Glacial Till		8	SS	52									
11.1	End of Borehole													

## **APPENDIX 'A'**

### **DETAILS OF HIGH MAST POLES**

W.P. 88-78-01  
HWY 407 FROM HWY 427 TO EAST OF KIPLING AVE.  
HWY 427 FROM CNR TO SOUTH OF HWY 7  
TABLE 1 - DETAILS OF H.M. POLES

EO 93M05  
4/21/94  
Page 1 of 1

Pole No.	Location	Station	Offset -E/P to C/L of Pole	O/S-C/L of Pole to Profile Control Line	Pole Height	Original Ground Elevation	Exist Elevation	Final Elevation	Pavement Elevation Adj. to Pole	Grading As Per	Access From:	Luminaires	Remarks
*P01	427	17+275	Median		35M	171.92		180.02		Figure 4	Hwy 427	Type V 8 - 400W	
*P02	427	17+455	Median		40M	172.29		179.24		Figure 4	Hwy 427	Type V 10 - 400W	
*P03	NOT USED												
*P04	427	17+630	Median		40M		174.56	176.9		Figure 2A	427	Type V 10 - 400W	
P05	407E-427S	12+082	27.25	31.00LT	40M		175.2	175.2		Figure 1	Steeles Avenue	8-400W - Changed from Vector to Type III	Gate in Fence provided in 89-62
*P06	427	17+792	19.45	35.00RT	40M		175.2	175.2		"	Steeles Avenue/427	Type V 10 - 400W	Footings to be installed in Cont. 93-100
P07	427N-407E	10+846	N/A	15.50RT	40M		177.7	178.15		"	Ramp 427N-407E	Type V 10 - 400W	
P08	427	17+944	15.75	31.3.00RT	40M		175.5	175.5		"	Steeles Ave	Type V 8 - 400W	Footings to be installed in Cont. 93-100
P09	407	10+821	16.75	56.00RT	45M		178.9	174.4		Figure 3	407	Type V 10 - 400W	
P10	427	18+095	48.45	64.00RT	45M		176.2	176.2		Figure 1	Ramp 427N-407E	Type V 8 - 400W	
P11	407	10+949	20.25	46.00LT	45M		177.3	177.3		"	Hwy 427-407	Type V 10 - 400W	
P12	427	18+389	32.7	52.00LT	30M		178.3	178.03		Figure 1	427	Type V 8 - 400W	
P13	407	11+106	33.25	59.00LT	40M		176.5	176.5		Figure 1	407	Type V 10 - 400W	
P14	407E-427N	11+363	15.25	20.00LT	35M	175.58		182.52		"	407E-427N	8-400W - changed from Vector to Type III	
P15	427	18+536	15.2	34.50RT	30M		177.01	177.01		"	407E-427N	Type V 8 - 400W	
*P16	427N	18+685	11	27.00LT	35M	171.22		177.35		Figure 4	Hwy 427	Type II 8 - 400W	
*P17	427N	18+868	11	30.00RT	35M	177.33		176.27		"	"	Type II 8 - 400W	
*P18	427N	19+056	11	30.00LT	35M					"	"	Type II 8 - 400W	
*P19	427	19+244	11	30.50RT	35M					"	"	Type II 8 - 400W	
*P20	427N	19+432	11	34.5L 39.50RT	35M					"	"	Type II 8 - 400W	
*P21	427N	19+610	11	43.00RT	35M					"	"	Type II 8 - 400W	
P22	427S-407E	11+022	20.25	24.00LT	40M	174.2		174.2		Figure 1	STEELES AVE	8-400W - changed from Vector to Type III	Gate in Fence provided in 89-62
P23	427N-407E	11+203	43	43.00LT	40M		175	175		"	Ramp 427N-407E	Type V 8 - 400W	
P24	407	11+253	23.75	46.00RT	35M		174.8	174.8		"	Ramp 427N.S-407E	Type V 8 - 400W	
P25	427NS-407E	11+489	15.75	19.50RT	35M		174.75	174.75		"	Ramp 427N.S - 407E	Type V 8 - 400W	
P26	407E-427S	11+181	24.25	28.00RT	40M		174.4	174.4		"	407	Type V 10 - 400W	
P27	407E-427S	11+002	16.25	20.00LT	40M		174.3	174.3		"	Ramp 407E - 427S	Type V 10 - 400W	
P28	427NS-407E	11+650	18.25	22.00RT	35M		172.7	172.7		"	Ramp 427N.S - 407E	Type V 8 - 400W	
P29	407	11+725	28.25	61.00RT	30M		173.26	173.26		Figure 1	407	Type V 8 - 400W	
P30	407	11+875	28.75	58.50RT	30M		173.23	173.23		"	407	Type V 8 - 400W	
P31	407	11+645	12.75	35.00LT	30M	173.94		173.94		"	Ramp 407E - 427N.S	Type V 8-400W	
P32	407	11+797	18.75	41.00LT	35M		173.3	173.3		"	Ramp 407E - 427N.S	Type V 8 - 400W	
P33	407	12+028	49.25	79.00RT	40M		172.4	172.4		"	407	Type V 10 - 400W	
P34	27N - 407E	10+225	33	33.00LT	40M		170.87	170.87		"	Ramp 27N - 407E	Type V 10 - 400W	
P35	27S - 407W	10+800	13.25	18.00RT	35M		172.5	172.5		"	Ramp 407E - 427 N.S	Type V 8 - 400W	
P36	407	12+133	17.5	69.00LT	40M		172	172		"	Ramp 27S - 407W	Type V 10 - 400W	
P37	27S-407E	10+469	23	27.75RT	40M		171.6	171.6		"	Ramp 27S - 407 W	Type V 10 - 400W	
P38	SW27/407W	11+265	22.5	22.50LT	40M		172	170.3		"	Ramp 27S - 407W	Type V 10 - 400W	
P39	407	12+463	20.5	46.5LT	40M		170	170		"	407	Type V 10 - 400W	
*P40	407	12+620	Median		40M		170.76	165.75		Figure 4	Hwy 407	Type V 10 - 400W	
P41	407	12+810	Median		35M		170.17	164.38		"	"	Type V 8 - 400W	
P42	407	12+982	Median		35M	170.5	163.36	163.42		"	"	Type V 8 - 400W	
P43	407	13+153	Median		35M	170.55	169.19	162.74		"	"	Type V 8 - 400W	
P44	407	13+324	Median		35M	167	161.6	161.74		"	"	Type V 8 - 400W	
P45	407	13+495	Median		35M	166.24	164.87	160.03		"	"	Type V 8 - 400W	
P46	407	13+666	Median		35M		162.74	157.89		"	"	Type V 8 - 400W	
P47	407	13+838	Median		35M		152.43	154.82		"	"	Type V 8 - 400W	
P48	407	14+009	Median		35M		161.03	150.3		"	"	Type V 8 - 400W	
P49	407	14+180	Median		35M		140.78	145.24		"	"	Type V 8 - 400W	
P50	407	14+351	Median		35M		140.21	141.68		"	"	Type V 8 - 400W	
P51	407	14+522	Median		35M		144.45	140.21		"	"	Type V 8 - 400W	
P52	407	14+693	Median		35M		136.49	140.73		"	"	Type V 8 - 400W	
P53	407	14+864	Median		35M		135.38	141.61		"	"	Type V 8 - 400W	

BOLD indicates poles which are moved and/or revised from original (1991) design

\* indicates poles revised on April 21, 1994

## **APPENDIX 'B'**

### **NSSP FOR HIGH MAST POLE CONSTRUCTION**

**(AN EXAMPLE FROM ANOTHER REPORT)**

WP NO 368-87-00 CONTRACT NO \_\_\_\_\_ DISTRICT NO 6 HWY NO 407

LOCATION 407/427 Interchange TYPE OF WORK \_\_\_\_\_

1. This S P is new (✓) ☐

This S P replaces No N/A

Remarks:

Explanation of Intent:

To define High Mast Pole foundation construction

2.	Item No	Spec No	Title or Item Description
	45	631	CONCRETE FOOTING FOR HIGH MAST POLES

### CONSTRUCTION

The Contractor is advised that variable types of subsurface material may be encountered at the high mast light pole locations; for additional information regarding soil conditions the Contractor is referred to the Foundation Investigation Report.

For bidding purposes it may be assumed that:

- Ground water is at or near the surface.
- If cohesionless material is encountered, it would be susceptible to disturbance under conditions of unbalanced hydrostatic head.
- If glacial deposits are encountered, 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. The Contractor shall submit eight copies of the proposed construction method to the Engineer for review a minimum of 15 working days prior to the commencement of construction of these foundation elements.

### BASIS OF PAYMENT

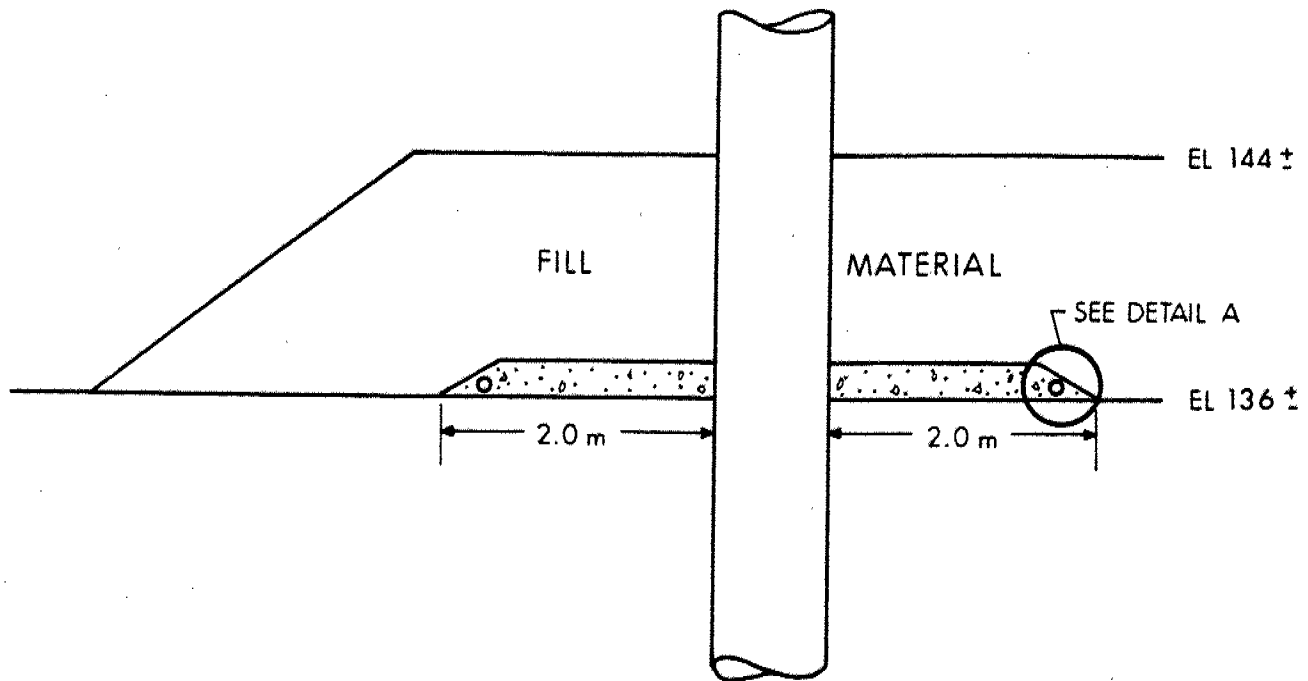
Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials required to do the work.



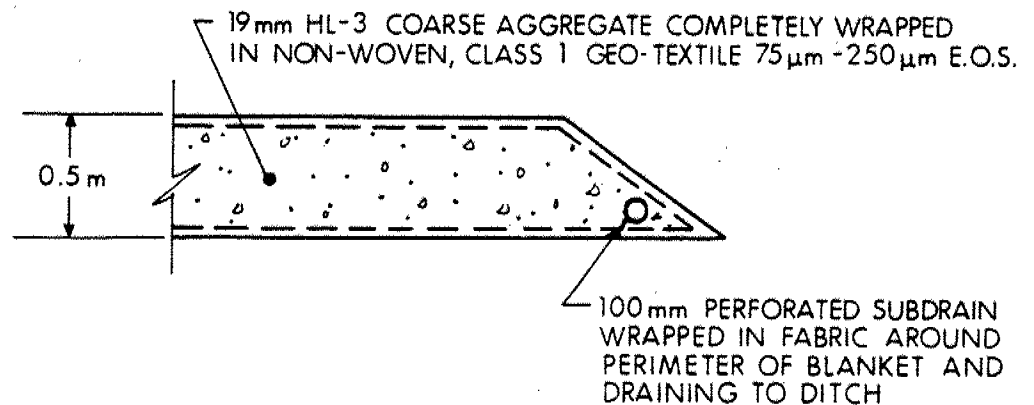
## **APPENDIX 'C'**

### **DRAINAGE BLANKET DETAILS FOR HML POLES**

NOTE: THE DRAINAGE BLANKET SHOULD  
BE IN PLACE PRIOR TO FILL PLACEMENT  
& CAISSON INSTALLATION



### HIGH MAST LIGHTING POLE FOUNDATION



### DETAIL A

FIG 1 - DRAINAGE BLANKET DETAILS FOR HML

## 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

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	m <sup>2</sup> /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_r$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	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
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	kg/m <sup>3</sup>	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	kg/m <sup>3</sup>	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	kN/m <sup>3</sup>	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	kg/m <sup>3</sup>	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	kg/m <sup>3</sup>	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	m <sup>3</sup> /s	RATE OF DISCHARGE
$\gamma_d$	kN/m <sup>3</sup>	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	kg/m <sup>3</sup>	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{sat}$	kN/m <sup>3</sup>	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	kg/m <sup>3</sup>	DENSITY OF SUBMERGED SOIL	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE	j	kn/m <sup>3</sup>	SEEPAGE FORCE
$\gamma'$	kN/m <sup>3</sup>	UNIT WEIGHT OF SUBMERGED SOIL						

**METRIC**

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

CONT No  
WP No 88-78-01

HIGH MAST LIGHTING HWY 407  
HWY 427 to Martin Grove Road  
BORE HOLE LOCATIONS & SOIL STRATA



SHEET

GEO-CANADA LTD.



**LEGEND**

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (5rd Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation

PLAN  
SCALE



HML	BORE HOLES						
	No	No	ELEV.	STATION	OFFSET	REF. LINE	CO-ORDINATES
							NORTH EAST
P-1	153-80-02-7		171.7				4 844 880.0 294 310.4
P-2	88-78-22-3		172.2				4 845 120.1 294 263.4
P-3	88-78-21-1		172.6				4 845 127.0 294 349.1
P-4	P-4	178.9	12+291	10.0	Rt	407E - 427S	4 845 253.0 294 212.0
P-5	P-5	174.6	17+644	32.5	Rt	427	4 845 311.0 294 300.0
P-41	P-41	179.3	17+090	29.5	Rt	427	4 844 764.0 294 385.0
P-43	P-43	177.3	18+868	38.0	Rt	427	4 846 521.0 294 130.0
P-44	P-44	177.8	19+060	41.2	Lt	427	4 846 705.0 294 032.0
P-45	P-45	177.7	19+240	38.0	Rt	427	4 846 886.0 294 103.0
P-47	P-47	179.8	19+607	52.0	Lt	427	4 847 248.0 293 995.0

**NOTE**

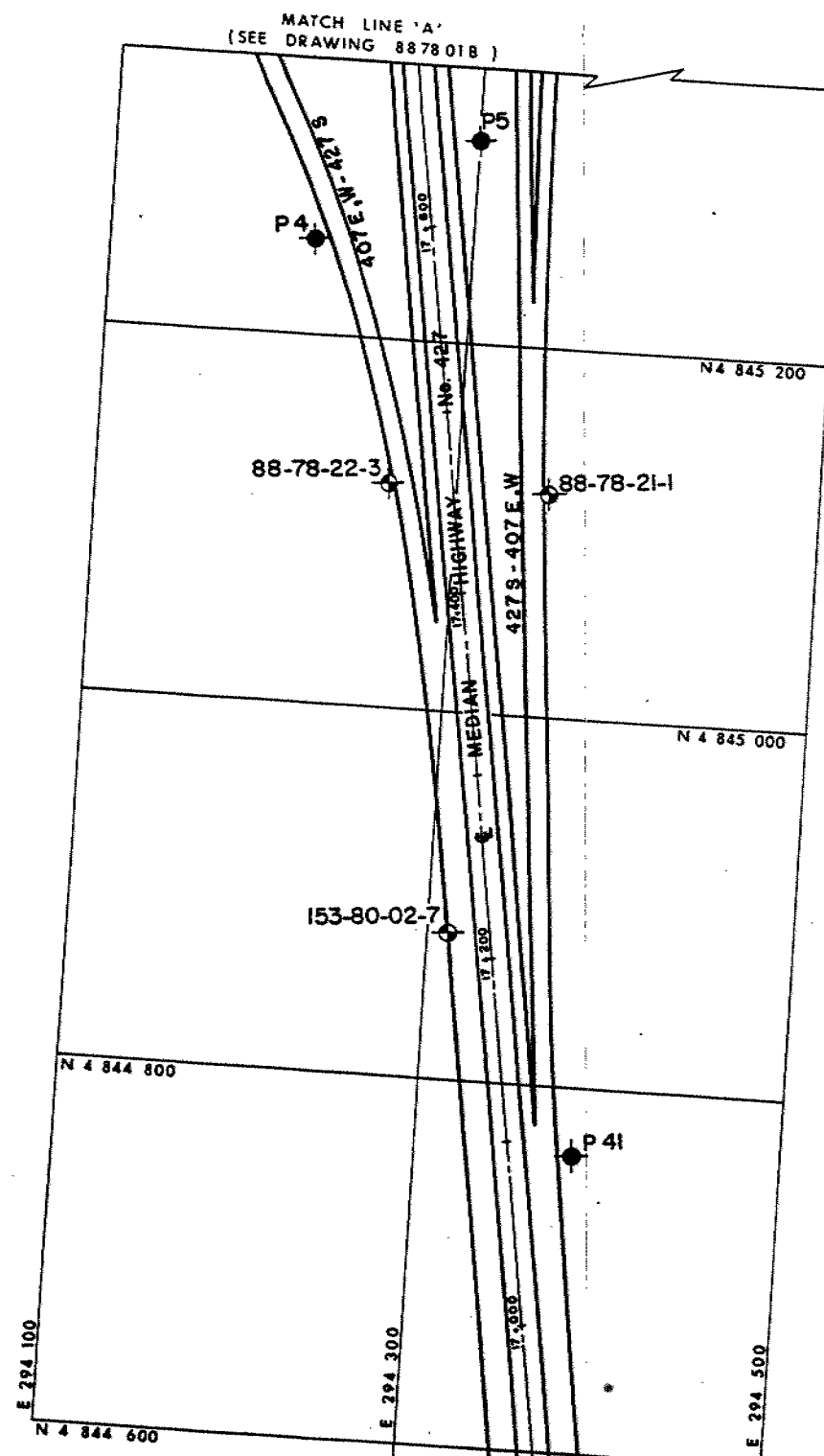
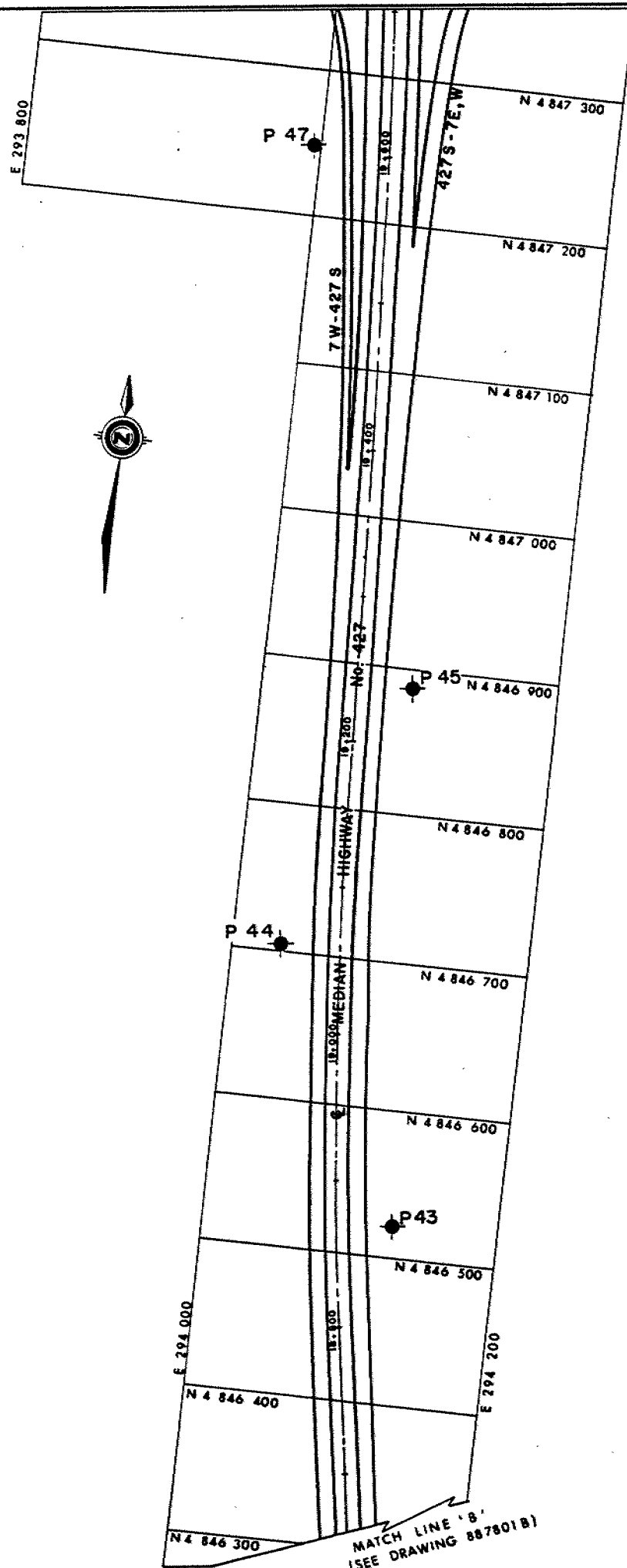
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

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
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Geocres No 30M13-113

HWY No 407	CHECKED/PL	DATE Sept. 1990	SITE
SUBMD	CHECKED	APPROVED	OWG 887801A



MATCH LINE 'B'  
(SEE DRAWING 887801 A)**METRIC**DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES UNLESS  
OTHERWISE SHOWN. STATIONS  
IN KILOMETRES + METRES.CONT No  
WP No 88-78-01HIGH MAST LIGHTING HWY 407  
HWY 427 to Martin Grove Road  
BORE HOLE LOCATIONS & SOIL STRATA

SHEET

GEO-CANADA LTD.

SEE DWG. 887801 A

KEY PLAN  
SCALE

## LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (3rd Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation

HML No	No	ELEV.	STATION	OFFSET	REF. LINE	CO-ORDINATES	
						NORTH	EAST
P-6	88-78-24-3	175.9				4 845 481.0	294 111.6
P-7	153-80-04-6	175.33				4 845 514.0	294 256.0
P-8	363-87-01-3	178.0				4 845 623.0	294 102.0
P-9	153-80-04-4	175.98				4 845 572.0	294 247.0
P-10	88-78-23-1	174.0				4 845 590.0	294 364.8
P-11	88-78-25-4	179.4				4 845 771.3	294 089.7
P-12	153-80-05-2	176.8				4 845 713.0	294 232.0
P-13	150-87-01-16	177.7				4 845 905.2	294 202.0
P-15	P-15	178.3	18+389	52.0 Lt	427	4 846 036.0	294 109.0
P-16	P-16	177.0	18+536	34.5 Rt	427	4 846 195.0	294 163.0
P-17	P-17	176.1	11+363	20.0 Lt	407E-427N	4 846 078.0	294 337.0
P-19	P-19	175.0	11+203	43.0 Lt	427N-407E	4 845 837.0	294 406.0
P-20	P-20	174.8	11+253	46.0 Rt	407	4 845 924.0	294 528.0
P-21	P-21	175.9	11+181	28.0 Lt	407E-427S	4 846 043.0	294 534.0
P-22	88-78-01-2	172.7				4 846 080.0	294 670.5
P-23	368-87-04-12	174.8				4 845 942.5	294 638.5
P-24	88-78-01-4	172.2				4 846 002.5	294 811.5
P-25	368-87-05-5	174.1				4 846 152.0	294 879.5
P-26	P-26	173.3	11+725	61.0 Rt	407	4 846 059.0	294 984.0
P-27	368-87-05-3	174.0				4 846 193.7	294 978.0

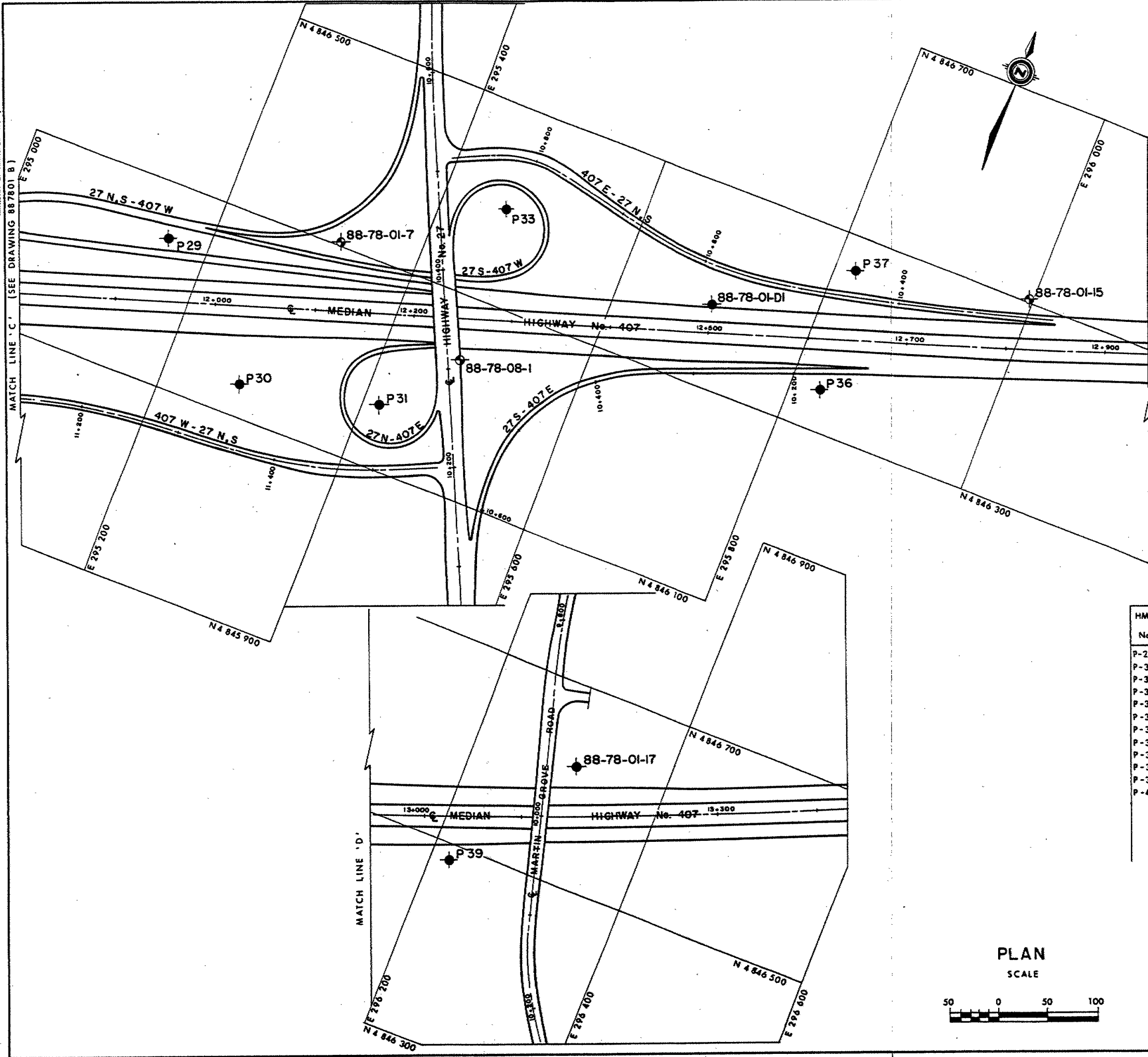
## NOTE

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.

DATE	BY	DESCRIPTION
Geocres No 30M13-113		
HWY No 407		DIST 6
SUBAREA	CHECKED/PL DATE Sept. 1990	SITE
DRAWN DZ	CHECKED	APPROVED
		DWG 887801B

PLAN  
SCALEMATCH LINE 'A'  
(SEE DRAWING 887801 A)



**METRIC**

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

CONT No  
WP No 88-78-01

HIGH MAST LIGHTING HWY 407  
HWY 427 to Martin Grove Road  
BORE HOLE LOCATIONS & SOIL STRATA



SHEET

GEO-CANADA LTD.

SEE DWG. 887801A

KEY PLAN  
SCALE

**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

HML	BORE HOLES						
	No	ELEV.	STATION	OFFSET	REF. LINE	CO-ORDINATES	
						NORTH	EAST
P-29	P-29	172.5	10+800	18.0 R	407W-27S	4 846 244.0	295 158.0
P-30	P-30	172.4	12+028	79.0 R	407	4 846 133.0	295 278.0
P-31	P-31	170.9	10+225	33.0 L	27N-407E	4 846 165.0	295 416.0
P-32	88-78-01-7	171.9				4 846 305.0	295 321.0
P-33	P-33	171.2	11+265	22.5 L	27S-407W	4 846 397.0	295 465.0
P-34	88-78-08-1	172.09				4 846 237.6	295 475.7
P-35	88-78-01-D1	170.5				4 846 383.5	295 693.0
P-36	P-36	170.6	12+616	50.0 R	407	4 846 345.0	295 828.0
P-37	P-37	171.6	10+450	26.8 R	407E-27N,S	4 846 470.0	295 818.0
P-38	88-78-01-15	171.7				4 846 504.0	295 990.0
P-39	P-39	167.1	13+025	44.0 R	407	4 846 485.0	296 215.0
P-40	88-78-01-17	170.4				4 846 614.0	296 306.0

**NOTE**

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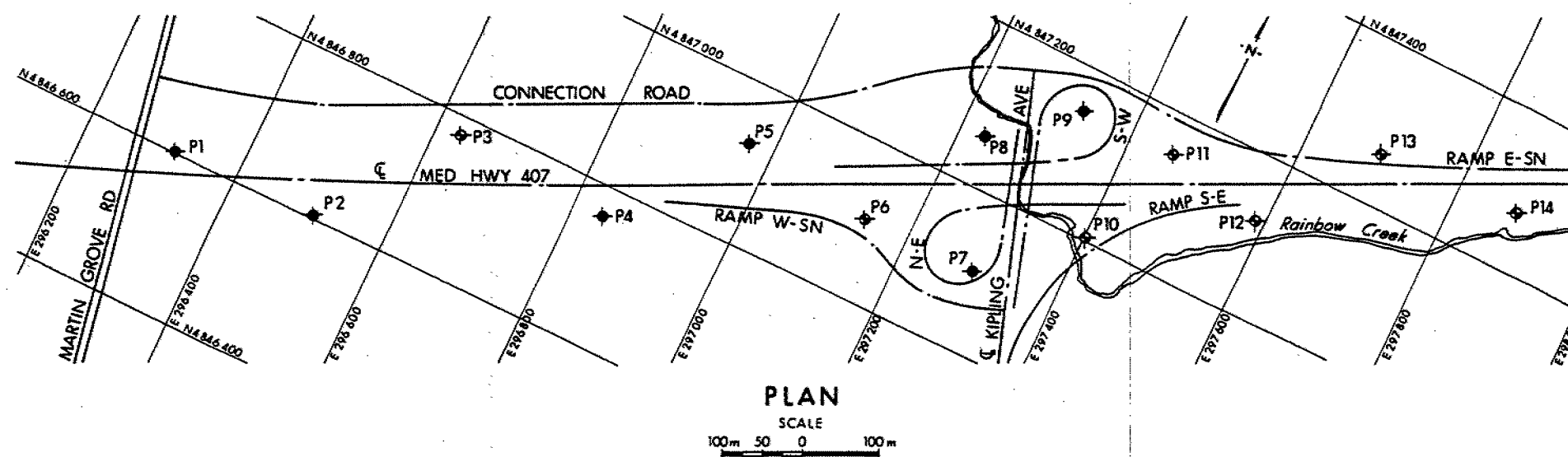
REV.	DATE	BY	DESCRIPTION
1			
Geocres No 30M13-113			
HWY No 407			DIST 6
SUBMD	CHECKED	DATE	Sept. 1990
DRAWN	DZ	CHECKED	APPROVED
			DWG 887801C

PLAN  
SCALE

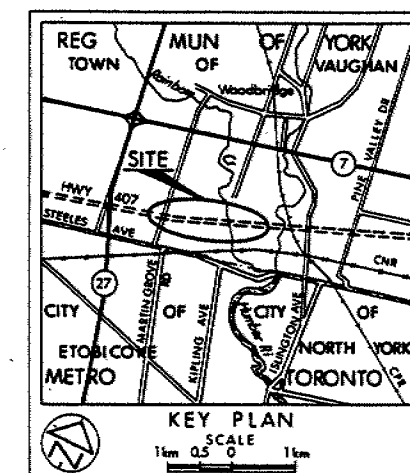








**HIGH MAST LIGHTING**  
**MARTIN GROVE RD TO KIPLING AVE**  
**BORE HOLE LOCATIONS & SOIL STRATA**



NOTE - REFER TO RECORD OF BORE HOLE  
FOR SUBSOIL INFORMATION



### 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)     |
|  | WL at time of investigation           |

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
P1	170.7	4 846 603.0	296 315.0
P2	167.4	4 846 605.0	296 505.0
P3	165.2	4 846 777.0	296 632.0
P4	162.6	4 846 765.0	296 840.0
P5	161.2	4 846 925.0	296 968.0
P6	160.8	4 846 903.0	297 138.0
P7	157.7	4 846 905.0	297 290.0
P8	139.6	4 847 065.0	297 233.0
P9	152.2	4 847 145.0	297 330.0
P10	138.7	4 847 005.0	297 403.0
P11	146.9	4 847 150.0	297 460.0
P12	140.9	4 847 120.0	297 588.0
P13	135.9	4 847 265.0	297 695.0
P14	135.2	4 847 275.0	297 880.0

**==NOTE==**

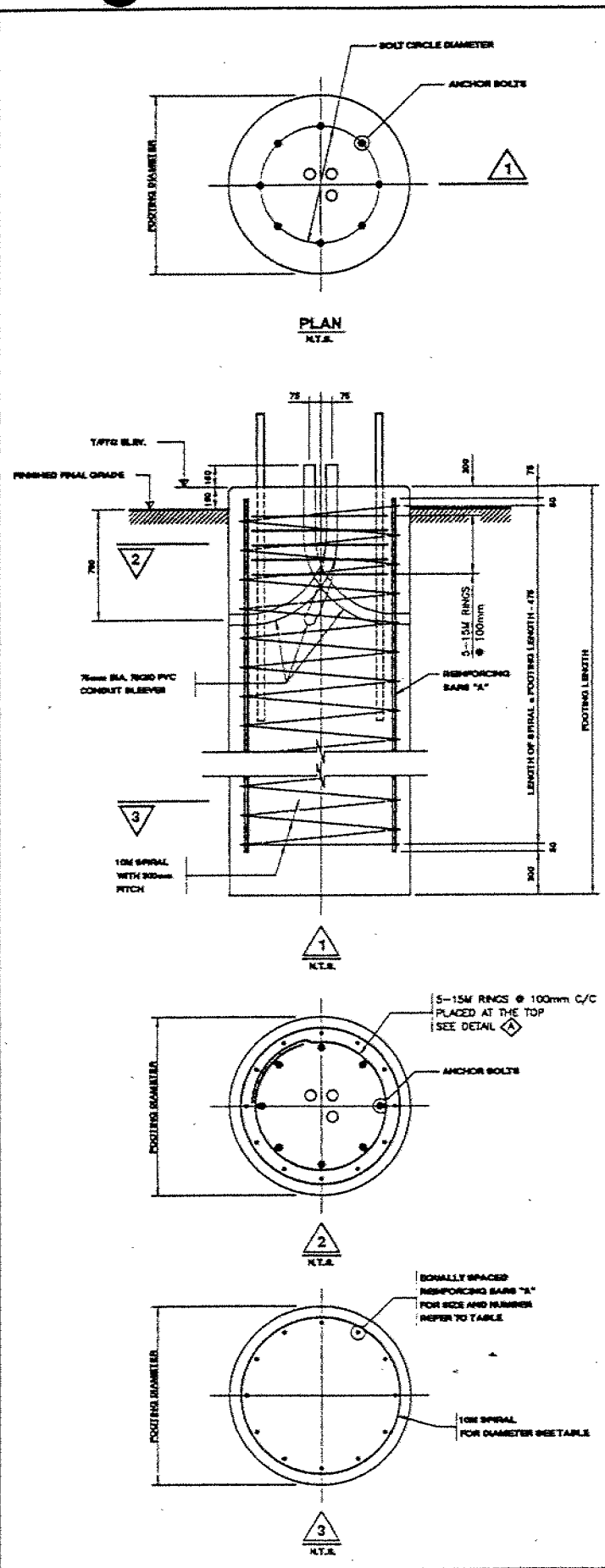
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

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 GC2.01 of OPS Gen. Cond.

REV	DATE	BY	DESCRIPTION

Geocres No 30M13-107

HWY No 407			DIST 6
SUBWD KA	CHECKED	DATE 1990 06 26	SITE
DRAWN SO	CHECKED	APPROVED	DWG 887802C




QUANTITIES	
TOTAL No. OF POLES THIS SHEET =	12
TOTAL MASS OF REINFORCING STEEL =	13.6 tonnes
TOTAL VOLUME OF CONCRETE =	190.6 m³

POLE No.	POLE HEIGHT (m)	TFTG ELEVATION (m)	FOOTING DIAMETER (m)	FOOTING LENGTH (m)	REINFORCING BARS "A"			SPIRAL		TOTAL MASS OF STEEL (tonne)	VOLUME OF CONCRETE (m³)
					SIZE	No. REQ'D	LENGTH (m)	LENGTH (m)	DIA. (m) *		
P42	35	164.820	1.372	7.000	30 M	18	6.625	6.525	1.172	0.7	10.3
P43	35	164.140	1.372	7.000	30 M	18	6.625	6.525	1.172	0.7	10.3
P44	35	163.150	1.372	8.000	30 M	18	7.625	7.525	1.172	0.9	11.8
P45	35	161.450	1.372	7.000	30 M	18	6.625	6.525	1.172	0.7	10.3
P46	35	159.150	1.372	10.000	30 M	18	9.625	9.525	1.172	1.1	14.8
P47	35	156.250	1.372	12.000	30 M	18	11.625	11.525	1.172	1.3	17.7
P48	35	151.650	1.372	7.000	30 M	18	6.625	6.525	1.172	0.7	10.3
P49	35	146.650	1.372	16.000	30 M	18	15.625	15.525	1.172	1.7	23.7
P50	35	143.050	1.372	16.000	30 M	18	15.625	15.525	1.172	1.7	23.7
P51	35	141.650	1.372	7.000	30 M	18	6.625	6.525	1.172	0.7	10.3
P52	35	142.130	1.372	16.000	30 M	18	15.625	15.525	1.172	1.7	23.7
P53	35	143.010	1.372	16.000	30 M	18	15.625	15.525	1.172	1.7	23.7

NOTE (\*): INDICATED VALUE IS OUTSIDE DIAMETER

NOTE:  
POLES P47, P49, P50, P52, AND P53  
SHALL NOT BE INSTALLED UNTIL 3 MONTHS  
AFTER COMPLETION OF HIGHWAY 407  
EMBANKMENT FILL.

METRIC  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

CONT No WP No 88-78-01	
ELECTRICAL DETAILS HIGH MAST LIGHTING POLE FOOTING, FROST DEPTH: 1.8m	SHEET

- NOTES:
- CLASS OF CONCRETE SHALL BE 30 MPa.
  - CLEAR COVER TO REINFORCING STEEL SHALL BE 100±25mm.
  - REINFORCING STEEL SHALL BE GRADE 400. BAR MARKS WITH SUFFIX "C" DENOTE COATED BARS.
  - ANCHOR BOLTS ARE ROUND BARS, QUENCHED AND TEMPERED MEDIUM CARBON STEEL WITH MINIMUM YIELD OF 517 MPa (WHL TENSILE STRENGTH OF 725 MPa) AND SHALL SATISFY CHARTER V-NOTCH REQUIREMENTS OF 20 JOULES AT MINUS 30° C.
  - EACH ANCHORAGE ASSEMBLY SHALL BE PROVIDED WITH A WOODEN TEMPLATE.
  - ANCHORAGE ASSEMBLY SHALL BE INSTALLED VERTICALLY. NO ADJUSTMENTS SHALL BE ALLOWED AFTER CONCRETE IS PLACED IN FOOTING.
  - FOR FINISHED GRADE ELEVATION, REFER TO GRADING DRAWINGS.

APPLICABLE OPSD DRAWINGS  
OPSD 2458.01



STANDARD DRAWING JUNE 1988	SS116-50
HIGH MAST LIGHTING POLE FOOTING FROST DEPTH: 1.8 m	

DRAWING NOT TO BE SCALED  
100 mm ON ORIGINAL DRAWING

REVISIONS		DESCRIPTION		DATE	OCT 84
DESIGN WY	CHK	CODE CHS0071	LOAD		
DRAWN RFL	CHK WY	SITE	STRUCT	SCHEME	DWG 1



DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M13-107

DIST. 6 REGION \_\_\_\_\_

W.P. No. 88-78-02(c)

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. \_\_\_\_\_

HWY. No. 407

LOCATION HIGH Mast LIGHTING  
KIPLING AVE INTERCHANGE

No. of PAGES - \_\_\_\_\_

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

ENGINEERING MATERIALS OFFICE  
FOUNDATION DESIGN SECTION

WP 88-78-02 (c) DIST 6

HWY 407 STR SITE N/A

High Mast Lighting  
Martingrove Road to  
Hwy. 407/Kipling Ave. I.C.

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FOUNDATION INVESTIGATION REPORT  
For  
High Mast Lighting  
Hwy. 407/Kipling Avenue Interchange  
W.P. 88-78-02 (C)  
Hwy. 407, District 6, Toronto

INTRODUCTION

This report summarizes the foundation investigation required for the above-noted high mast lighting.

The fieldwork was conducted between 90 04 18 and 90 05 03 utilizing a continuous flight auger machine equipped with solid and hollow stem augers.

This work consisted of advancing sampled boreholes near all proposed high mast light locations (P1 through P14).

SITE DESCRIPTION

The high mast lighting poles will be located along the proposed Highway 407 alignment from Martingrove Road to just east of the proposed Kipling Avenue extension. This area is situated in Vaughan Township.

The topography across the site consists of relatively flat land that is intersected by two valleys carved out by Rainbow Creek and Rainbow Creek Tributary.

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 was conducted between 90 04 18 and 90 05 03, utilizing a continuous flight auger machine equipped with solid and hollow stem augers. A total of 14 boreholes were advanced, one for each proposed high mast light. The investigation was supplemented by cone tests in eight

boreholes. The boreholes were slightly moved from the proposed locations of light poles to minimize any possible disturbance to the foundation soil.

Artesian condition was encountered in BH P13 at El. 130.3 m. The borehole drilling was terminated and the borehole was plugged by putting bentonite seal in the entire length of the borehole.

The elevations and co-ordinates of the boreholes were provided by MTO's Central Region Survey and Plans Office.

### SUBSURFACE CONDITIONS

#### General

The existing ground elevation at each borehole location is quite variable and ranges from 135.2 m to 170.7 m. The subsurface condition at each borehole location is quite different. Therefore, the log sheets should be referred to for soil conditions at each borehole location.

The Record of Borehole sheets (Appendix) illustrate the conditions at the borehole locations (BH P1 to P14). The locations of the high mast lights are illustrated on Dwg. No. 887802C-A.

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 are glacial in origin and may contain cobbles and boulders.

#### Groundwater Conditions

Most of the boreholes remained dry after completion. All boreholes were backfilled after completion. The groundwater table is expected to lie within the wet to saturated layer 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.

Artesian conditions were encountered only in Borehole P13 at El. 130.3 m. The artesian head rose to El. 135.6 m.

## DISCUSSION AND RECOMMENDATIONS

It is proposed to install 14 high mast lights at the Hwy. 407 and Kipling Avenue Interchange.

The high mast light pole will be supported on a single concrete caisson designed in accordance with the method 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

and

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, March 1964

### Fill Considerations

It should be assumed that existing or proposed fill will not provide any lateral resistance unless it is carefully engineered.

To achieve the proposed grade, fill material is required at pole locations P10, P13 and P14. Any organic and soft organic material should be removed within the plan limits of the fill to a maximum 4.0 m radius about the pole location. The subexcavation should be backfilled with appropriate compacted granular material.

<u>Pole Location</u>	<u>Approximate Depth of Subexcavation</u>
P10	4.0 m
P13	2.5 m
P14	1.0 m

The engineered fill should be constructed by placing layers of Granular 'A' compacted to 100 percent Standard Proctor Dry Density (SPDD).

If an engineered fill is constructed of compacted Granular 'A' it should extend horizontally for a 4 m radius from the high mast light footing, then

continue at a 2H:1V slope. The following design parameters may be applied:

$$\begin{aligned}\phi &= 30^\circ \\ \gamma &= 22 \text{ kN/m}^3\end{aligned}$$

It should be assumed that material (fill or native soil) in the zone of frost penetration does not provide any lateral resistance. The depth of frost penetration for earth cover at this site is 1.2 m.

#### Dewatering

At HML pole location P13, artesian conditions were encountered at El. 130.3 m, approximately 6.6 m below ground surface. It is probable that the caisson foundation will intersect this artesian zone. Special provisions will be required to control the loss of fines from the surrounding soil thereby minimizing loss of lateral capacity. It is anticipated that when the caisson penetrates the aquifer, water will seep up along the shaft of the pile to the surface. A drainage medium should be provided in the vicinity of P13 and placed prior to placement of the fill material. The details of the drainage requirements are sketched in Figure 1. The scheme should include a means of drainage into the nearby creek or drainage facility taking into account frost protection requirements.

Some of the caissons will, in part, be located within layers of non-cohesive subsoil, below the groundwater level. In view of this, the following Special Provision should be included in the contract documents:

"The Contractor shall install concrete footings in earth for high mast poles. At the various pole locations, soil deposits consist of mixtures of silts, sand and gravels with occasional cobbles. Groundwater is likely to be encountered above the base level.

The soil is highly susceptible to conditions of unbalanced hydrostatic head and seepage forces and it is likely to 'boil' and become unstable under such conditions. The Contractor shall maintain the stability of the soil in the sides and bases of the

holes of the concrete footings at all times from commencement of their construction to the placing of concrete".

### Design

If there are to be any elevation changes at the high mast light locations, then for design purposes, the most critical (i.e. lowest) surface elevations should be assumed. The following soil parameters are provided for the design of the high mast lighting caissons:

- $\phi$  = apparent angle of internal friction for non-cohesive soils  
 $q_u$  = unconfined compressive strength in kPa  
 $\gamma$  = unit weight in kN/m<sup>3</sup>

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

<u>Light Pole</u>	<u>Elev. (m)</u> <u>From - To</u>	<u>Soil Type</u>	<u><math>\phi</math></u> <u>Degrees</u>	<u><math>q_u</math></u> <u>(kPa)</u>	<u><math>\gamma</math></u> <u>(kN/m<sup>3</sup>)</u>
P1	170.0-162.0	Cohesive	0	300	21.2
	162.0-153.0	Cohesive	0	500	21.2
	153.0-152.6	Non-Cohesive	32	0	21.2
P2	167.4-160.0	Cohesive	0	300	20.0
	160.0-153.5	Cohesive	0	500	20.0
	153.5-151.9	Non-Cohesive	32	0	21.2
P3	165.4-164.0	Cohesive	0	200	21.2
	164.0-156.5	Cohesive	0	500	21.2
	156.5-152.9	Non-Cohesive	35	0	21.2
	152.9-151.2	Cohesive	0	500	21.2
P4	162.6-160.0	Cohesive	0	120	19.6
	160.0-152.4	Non-Cohesive	32	0	21.0
	152.4-150.0	Cohesive	0	500	21.2

<u>Light Pole</u>	<u>Elev. (m)</u> <u>From - To</u>	<u>Soil Type</u>	<u>0</u> <u>Degrees</u>	<u>qu</u> <u>(kPa)</u>	<u>(kN/m<sup>3</sup>)</u>
P5	161.2-153.3	Non-Cohesive	35	0	21.0
	153.3-142.8	Cohesive	0	500	21.0
P6	160.8-158.0	Cohesive	0	200	21.0
	158.0-149.7	Cohesive	0	500	21.0
P7	157.7-139.1	Cohesive	0	500	21.0
	139.1-128.3	Non-Cohesive	32	0	21.0
P8	139.4-125.4	Non-Cohesive	28	0	19.6
P9	152.2-146.7	Cohesive	0	150	19.6
	146.7-139.1	Non-Cohesive	35	0	21.2
	139.1-133.8	Cohesive	0	500	21.2
P10	138.7-134.7	Cohesive (Peat)	0	0	15.0
	134.7-126.1	Non-Cohesive	28	0	19.6
P11	146.9-144.5	Cohesive	0	500	21.2
	144.5-140.0	Non-Cohesive	32	0	20.1
	140.0-133.1	Cohesive	0	500	21.2
P12	140.9-134.0	Cohesive	0	150	19.9
	134.0-128.3	Cohesive	0	500	21.2
P13	135.9-134.8	Cohesive (Peat)	0	0	15.0
	134.8-133.3	Cohesive	0	50	19.0
	133.3-131.8	Non-Cohesive	28	0	19.6
	131.8-129.3	Cohesive	0	75	19.6
	129.3 & below	Cohesive	0	100	19.6



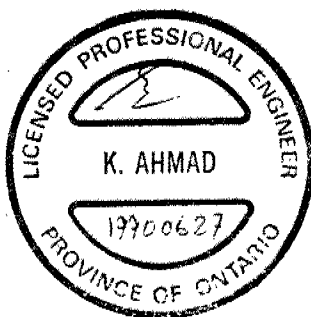
<u>Light Pole</u>	<u>Elev. (m)</u> <u>From - To</u>	<u>Soil Type</u>	<u>0</u> <u>Degrees</u>	<u>qu</u> <u>(kPa)</u>	<u>(kN/m<sup>3</sup>)</u>
P14	135.2-134.1	Cohesive	0	10	19.0
	134.1-129.5	Non-Cohesive	28	0	19.6
	129.5-126.0	Cohesive	0	100	19.6
	126.0-124.1	Cohesive	0	300	20.0
	124.1-below	Cohesive	0	500	21.2

Most of the HML poles will be placed within a cut section. To minimize the caisson depth the poles should be placed as shown in Figure 2.

#### MISCELLANEOUS

The fieldwork for this project was carried out under the supervision of Calvin Curtis, Trainee Engineer, and Ken Ahmad, Foundation Engineer, using equipment owned and operated by Master Soil Investigation Ltd.

The report was written by Ken Ahmad, Foundation Engineer, reviewed by D. Dundas, Senior Foundation Engineer, and approved by M. Devata, Chief Foundation Engineer.



Ken Ahmad, P.Eng.  
Foundation Engineer

M.S. 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 (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

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$u$	l	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	l	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	l	COMPRESSION INDEX
$C_s$	l	SWELLING INDEX
$C_\alpha$	l	RATE OF SECONDARY CONSOLIDATION
$c_v$	m <sup>2</sup> /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	l	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	l	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	kg/m <sup>3</sup>	DENSITY OF SOLID PARTICLES	e	l, %	VOID RATIO	$e_{min}$	l, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	kn/m <sup>3</sup>	UNIT WEIGHT OF SOLID PARTICLES	n	l, %	POROSITY	$I_D$	l	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	kg/m <sup>3</sup>	DENSITY OF WATER	w	l, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	kn/m <sup>3</sup>	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	kg/m <sup>3</sup>	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	l	UNIFORMITY COEFFICIENT
$\gamma$	kn/m <sup>3</sup>	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	kg/m <sup>3</sup>	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	m <sup>3</sup> /s	RATE OF DISCHARGE
$\gamma_d$	kn/m <sup>3</sup>	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	kg/m <sup>3</sup>	DENSITY OF SATURATED SOIL	$I_L$	l	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	l	HYDRAULIC GRADIENT
$\gamma_{sat}$	kn/m <sup>3</sup>	UNIT WEIGHT OF SATURATED SOIL	$I_C$	l	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	kg/m <sup>3</sup>	DENSITY OF SUBMERGED SOIL	$e_{max}$	l, %	VOID RATIO IN LOOSEST STATE	j	kn/m <sup>3</sup>	SEEPAGE FORCE
$\gamma'$	kn/m <sup>3</sup>	UNIT WEIGHT OF SUBMERGED SOIL						

## METRIC

+3, x5: Numbers refer to Sensitivity

1 OF 1

METRIC

ORIGINATED BY CC

COMPILED BY KA

CHECKED BY DD

+3, x<sup>5</sup>: Numbers refer to Sensitivity



# RECORD OF BOREHOLE No P4

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 765.0, E 296 840.0 ORIGINATED BY CC  
 DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA  
 DATUM Geodetic DATE 90 04 18 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N* VALUES			20	40	60	80	100					
162.6	Ground Level																
0.0						*	162										
160.0	Clayey Silt to Silt Trace Sand, Trace Gravel Brown, Moist, Stiff		1	SS	14		160										
2.8			2	SS	66		158										
			3	SS	89		156										
	Silty Sand to Sandy Silt Brown to Grey, Dry to Moist Dense to Very Dense		4	SS	89		154										
			5	SS	37		152										
	Sand and Gravel Brown, Wet Dense		6	SS	31		150										
152.4																	
10.2	Clayey Silt to Silt Trace Sand, Trace Gravel Grey, Dry Hard		7	SS	77												
150.0			8	SS	106												
12.6	End of Borehole																
	* GWL Not Established																

# RECORD OF BOREHOLE No P5

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 925.0, E 296 968.0 ORIGINATED BY CC  
 DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA  
 DATUM Ceodetic DATE 90 04 19 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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'u' VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								20 40 60 80 100					w <sub>p</sub> w w <sub>L</sub>				
161.2	Ground Level																
0.0						*											
	Sand with Gravel						160										
							158										
							156										
			1	SS	35	/10cm											
	Sand to Gravelly Sand Some Silt Brown, Wet, V. Dense						154										
153.3			2	SS	99	/26cm											
7.9			3	SS	77	/26cm											
	Sand with Gravel Reddish Brown, wet, V. Dense		4	SS	60	/15cm											
			5	SS	92												
			6	SS	94	/31cm											
	Clayey Silt to Silt Trace Sand, Trace Gravel Occ. Silty Sand Seams Grey, Dry Hard		7	SS	100	/23cm											
			8	SS	85	/15cm											
142.8			9	SS	60	/8cm											
18.4	End of Borehole																
	* GWL Not Established																

+3, x5: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10



## METRIC

[illegible]

# RECORD OF BOREHOLE No P7

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 846 905.0, E 297 290.0 ORIGINATED BY CC/KA  
 DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Auger COMPILED BY KA  
 DATUM Geodetic DATE 90 04 20 & 23 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 <sup>3</sup>	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 <sub>p</sub> W W <sub>L</sub>	10 20 30						
157.7	Ground Level					*											
0.0							156										
							154										
							152										
							150										
							148										
							146										
							144										
							142										
							140										
139.1	Clayey Silt, Brown, Dry With Sand, Trace Gravel Greyish Brown, Dry, Hard (Glacial Till)		1	SS	159	/27cm	138										
18.6			2	SS	118		136										
			3	SS	34		134										
			4	SS	44		132										
							130										
128.3																	
29.4	End of Borehole * GWL Not Established																



# RECORD OF BOREHOLE No P9

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 145.0, E 297 330.0 ORIGINATED BY KA  
 DIST 5 HWY 407 BOREHOLE TYPE Hollow Stem Auger COMPILED BY KA  
 DATUM Geodetic DATE 90 05 01-03 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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
152.2	Ground Level															
0.0			1	SS	9	*										
			2	SS	16											
	Clayey Silt Trace Sand, Trace Gravel Occ. Gravelly Sand Layers Brown to Grey, moist Stiff to Hard (Glacial Till)		3	SS	32											
			4	SS	51											
146.7			5	SS	100	/21cm										
5.5			6	SS	110	/15cm										
	Silty Sand Occ. Gravelly Sand Layers Brown, Dry Very Dense (Glacial Till)		7	SS	102											
			8	SS	137	/15cm										
			9	SS	168	/31cm										
139.1			10	SS	120	/13cm										
13.1			11	SS	105	/15cm										
	Clayey Silt Trace Sand, Trace Gravel Light Grey, Dry, Hard (Glacial Till)		12	SS	120	/13cm										
133.8			13	SS	110	/15cm										
18.4	End of Borehole															
	* GWL Not Established															

# RECORD OF BOREHOLE No P10

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 005.0, E 297 403.0 ORIGINATED BY KA  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 25 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
135.7	Ground Level													
0.0						*	138							
	Peat/Organic Clayey Silt with Sand Dark Brown/Black Moist, Firm		1	SS	9		136							
134.7														
4.0			2	SS	16		134							
	Silty Sand to Sandy Silt Trace Gravel Gray, Wet to Saturated Loose to Dense		3	SS	8		132							
			4	SS	20		130							
			5	SS	28		128							
			6	SS	20									
128.1			7	SS	43									
12.6	End of Borehole													
	* GWL Not Established													

# RECORD OF BOREHOLE No P11

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 150.0, E 297 460.0 ORIGINATED BY KA/CC  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 25-26 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	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					
146.9	Ground Level													
0.0	Clayey Silt with Sand Seams Brown, Moist, Hard (Glacial Till)		1	SS	46	*	146							
144.5			2	SS	24		144							
2.4	Silty Sand to Sandy Silt Trace Gravel, Trace Clay Brown to Grey, Moist to Wet Compact to Very Dense (Glacial Till)		3	SS	85		142							
140.0			4	SS	60	/13cm	140							
6.9			5	SS	60	/15cm	138							
			6	SS	68	/15cm	136							
	Clayey Silt to Silt Trace Sand, Trace Gravel Occ. Silty Sand layers Grey, Dry Hard		7	SS	64	/15cm	134							
			8	SS	65	/15cm								
133.1			9	SS	60	/10cm								
13.8	End of Borehole													
	* GWL Not Established													

# RECORD OF BOREHOLE No P12

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 120.0, E 297 588.0 ORIGINATED BY CC  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 04 27 CHECKED BY DD

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT 7 kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE									'N' VALUES
140.8	Ground Level												
0.0	Clayey Silt to Silt Occ. Silty Sand Seams Grey Stiff to Hard  Moist Wet		1	SS	58								
			2	SS	14								
			3	SS	9								
			4	SS	29								
			5	SS	71								
			6	SS	68	/15cm							
			7	SS	105	/26cm							
128.3			8	SS	100	/23cm							
12.6	End of Borehole												
	* GWL Not Established												

# RECORD OF BOREHOLE No P13

1 OF 1

METRIC

W.P. 88-78-02 (C) LOCATION N 4 847 265.0, E 297 695.0 ORIGINATED BY CC/KA  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Ceodetic DATE 90 04 27 & 90 05 03 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
135.9	Ground Level																
0.0	Peat/Organic Clayey Silt		1	SS	5												
134.8	Dark Brown, Moist, Firm																
1.1	Clayey Silt		2	SS	5												
133.3	Brown, Moist, Firm																
2.6	Sand & Gravel		3	SS	11												
131.8	Grey, Saturated, Compact																
4.1	Silty Clay to Clayey Silt with Sand Layers Grey, Moist to Wet Firm to Very Stiff		4	SS	7												
129.3			5	SS	16												
6.6	End of Borehole																
128.3																	
7.6	End of Cone Test																
<p>* NOTE:</p> <p>Artesian condition encountered at El. 130.3m. Artesian Head at El. 135.6m.</p> <p>Entire borehole was sealed with bentonite (Hole Plug)</p>																	



# RECORD OF BOREHOLE No P14

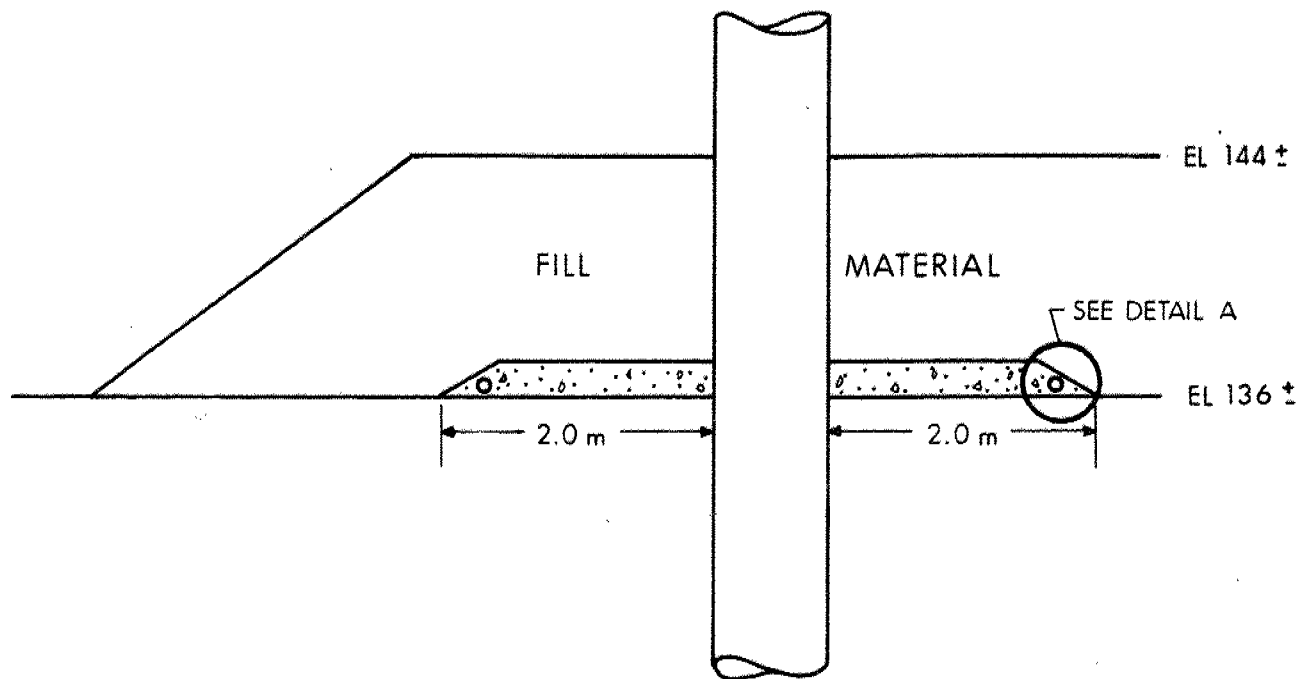
1 OF 1

METRIC

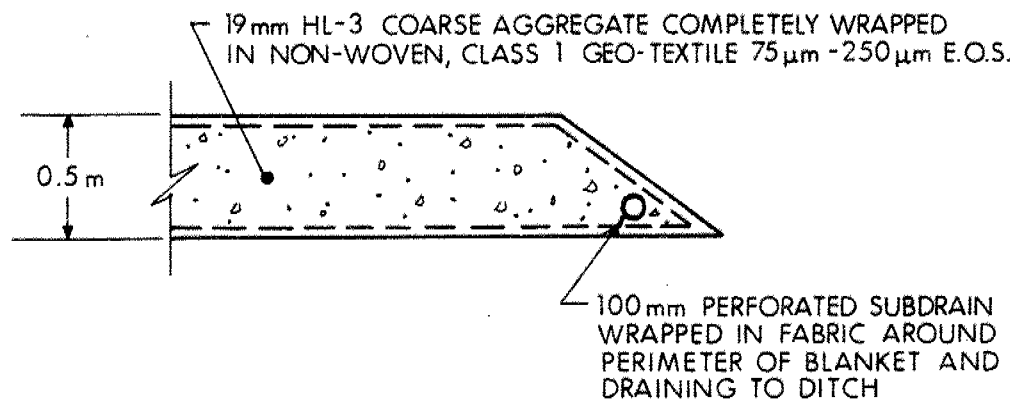
W.P. BB-78-02 (C) LOCATION N 4 847 275.0, E 297 880.0 ORIGINATED BY KA  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY KA  
 DATUM Geodetic DATE 90 05 01 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT 7 kN/m <sup>3</sup>	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 <sub>p</sub>	W	W <sub>L</sub>		
135.2	Ground Level													
0.0 134.1	Clayey Silt with Sand Tr. Organic, Moist, V. Soft		1	SS	1									
1.1	Silty Sand to Sand & Gravel Brown to Grey Moist to Saturated Compact		2	SS	15									
			3	SS	14									
			4	SS	11									
129.6			5	SS	6									
5.6	Clayey Silt with Layers of Silty Clay and Sandy Silt Grey, Moist to Wet Firm to Hard		6	SS	4									
			7	SS	26									
			8	SS	52									
124.1	Glacial Till													
11.1	End of Borehole													

NOTE: THE DRAINAGE BLANKET SHOULD  
BE IN PLACE PRIOR TO FILL PLACEMENT  
& CAISSON INSTALLATION



HIGH MAST LIGHTING POLE FOUNDATION



DETAIL A

FIG 1 - DRAINAGE BLANKET DETAILS FOR HML P13

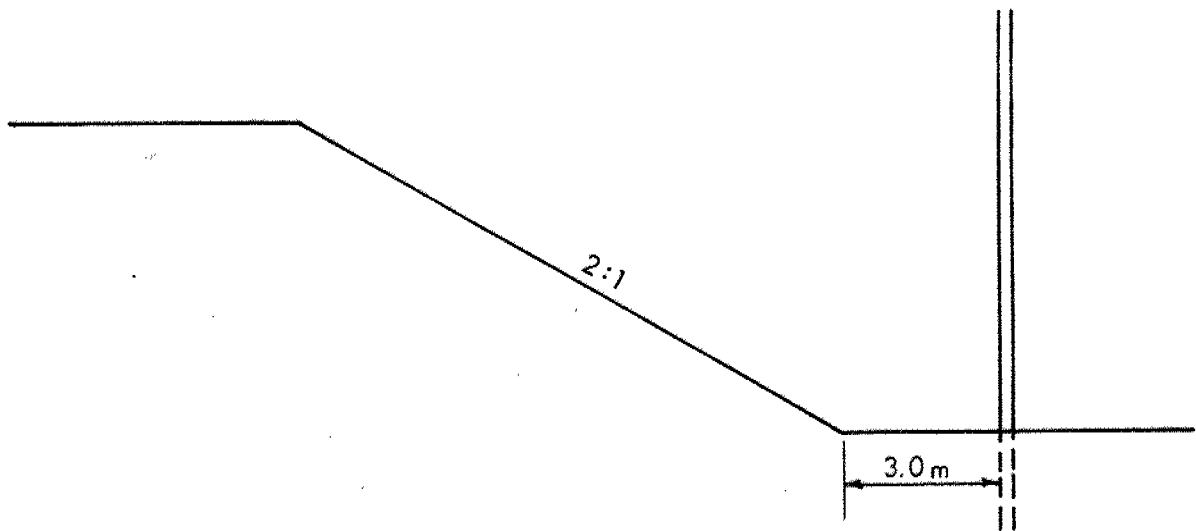


FIG 2 - HIGH MAST LIGHTING POLE IN CUT SECTION

**METRIC**

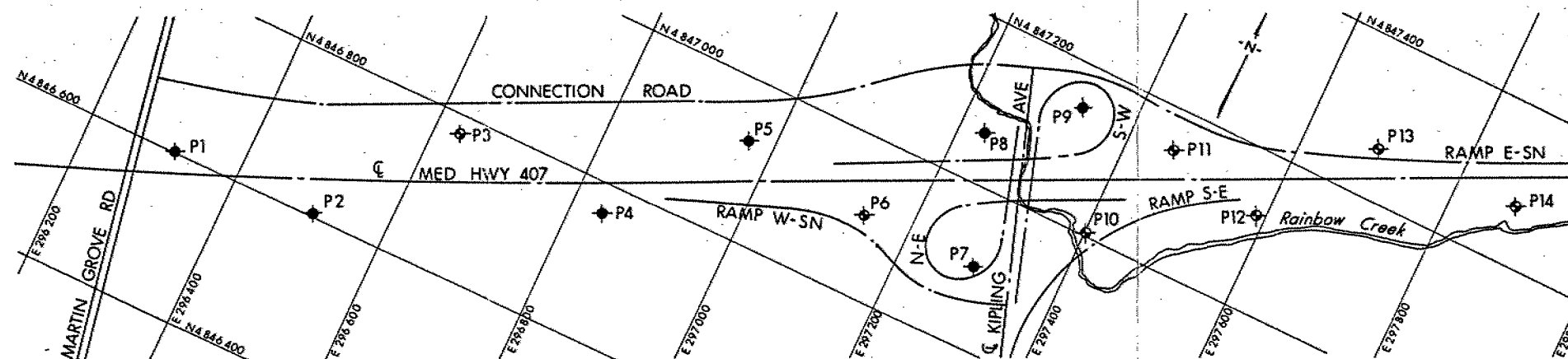
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES UNLESS  
OTHERWISE SHOWN. STATIONS  
IN KILOMETRES + METRES.

CONT No  
WP No 88-78-02 C



HIGH MAST LIGHTING  
MARTIN GROVE RD TO KIPLING AVE  
BORE HOLE LOCATIONS & SOIL STRATA

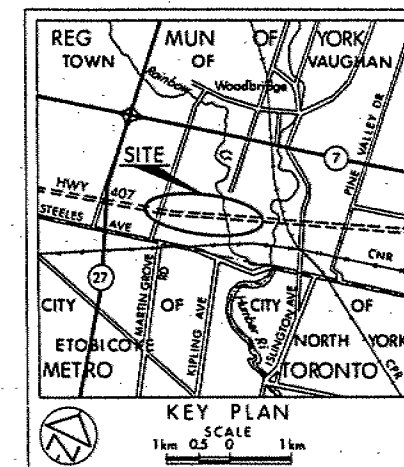
SHEET



PLAN

SCALE  
100m 50 0 100 m

NOTE - REFER TO RECORD OF BORE HOLE  
FOR SUBSOIL INFORMATION



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

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
P1	170.7	4846 603.0	296 315.0
P2	167.4	4846 605.0	296 505.0
P3	165.2	4846 777.0	296 632.0
P4	162.6	4846 765.0	296 840.0
P5	161.2	4846 925.0	296 968.0
P6	160.8	4846 903.0	297 138.0
P7	157.7	4846 905.0	297 290.0
P8	139.6	4847 065.0	297 233.0
P9	152.2	4847 145.0	297 330.0
P10	138.7	4847 005.0	297 403.0
P11	146.9	4847 150.0	297 460.0
P12	140.9	4847 120.0	297 588.0
P13	135.9	4847 265.0	297 695.0
P14	135.2	4847 275.0	297 880.0

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 102-2 of Form 100.

REV	DATE	BY	DESCRIPTION

Geocres No 30M13-107

HWY No 407	CHECKED	DATE 1990 06 26	DIST 6
SUBM'D KA	CHECKED	DATE 1990 06 26	SITE
DRAWN SO	CHECKED	DATE 1990 06 26	DWG 887802C-A

**MINISTRY OF TRANSPORTATION**  
**M E M O R A N D U M**

**To:** M. Devata  
Chief Foundation Engineer  
Foundation Design Section  
Room 315, Central Building

**Date:** April 10, 1990

**From:** Structural Section  
Central Region

---

**Re:** Foundation Request for High Mast Lighting - Update #2  
W.P. 88-78-02 Highway 407/Kipling Avenue

Please note that the location of HML pole P-10-8 has been changed as a result of re-alignment of the S-E ramp at the above interchange.

Enclosed please find a revised set of documents, prepared by Marshall Macklin Monaghan Consultants, consisting of the following:

- Table 1 - Revision #2 - Pole stations, offsets and elevations
- Table of quantities and pole assemblies
- Plan view of pole layout

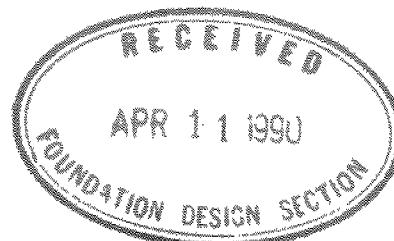
The cross-section plots at the HML pole locations will be forwarded as soon as they are received by our section. Please note that the above values supersede those forwarded to you on 90/04/03, 90/003/20 and 90/03/13.

For any questions or concerns please contact our section.

*S. Markovic*  
S. Markovic  
Senior Structural Engineer  
for:  
V. F. Boehnke  
Head, Structural Section

SM/vn

cc: D. Riseboro



**TABLE 1**  
**W.P. 88-78-01,04**  
**HIGHWAY 407/KIPLING AVENUE**  
**HIGH MAST POLE LOCATIONS**

POLE NO.	STATION	OFFSET FROM C/L of Hwy 407	APPROXIMATE ELEVATION	
			EXISTING	FINAL
P - 1 - 8	13+163.0	43.5 m. North	170.70	162.75
P - 2 - 10	13+342.0	41.0 m. South	167.40	162.60
P - 3 - 10	13+527.0	64.0 m. North	165.20	165.20
P - 4 - 10	13+706.5	40.0 m. South	162.60	161.10
P - 5 - 10	13+891.0	56.5 m. North	161.17	154.50
P - 6 - 8	14+037.0	43.0 m. South	160.85	159.50
P - 7 - 8	14+174.0	111.0 m. South	157.70	141.00
P - 8 - 8	14+190.0	60.0 m. North	139.61	139.61
P - 9 - 8	14+313.5	93.5 m. North	152.25	142.00
P - 10 - 8	14+315.0	67.0 m. South	138.70	141.50
P - 11 - 8	14+430.0	38.0 m. North	146.90	145.00
P - 12 - 8	14+532.0	45.0 m. South	140.90	140.90
P - 13 - 7	14+690.0	39.0 m. North	135.90	143.60
P - 14 - 7	14+860.0	35.5 m. South	135.20	142.70

**File No. 18-89105-D31**  
**MA:da:14**

QUANTITIES - POLE ASSEMBLIES

Location	Pole No. or Foundation No.	Station	Offset - E to C of Pole or C of Foundation	OFFSET - C OF POLE TO HWY 407 HORIZONTAL CONTROL LINE	EXISTING ELEV. AT POLE LOCATION	PROPOSED ELEV. AT POLE LOCATION	ELEV. DIFFERENCE AT POLE LOCATION	ELEV. OF ADJACENT ROADWAY	ELEV. DIFFERENCE BETWEEN POLE & ROAD	POLE IN CUT OR FILL OR EXIST.	GUIDE RAILS (YES/NO)	ACCESS FROM	LOCAL GRADING REQUIRED (YES/NO)	NO. OF LUMINAIRES	ACTUAL POLE HEIGHT (METERS)	MOUNTING HEIGHT (METERS)
Sub-Totals Brought Forward																
HWY 407 WBL	P-1-8	13+163.0	14.0	43.5	170.70	162.75	7.95	164.14	-1.39	CUT	NO	HWY 407	NO	8	30.0	28.6
HWY 407 EBL	P-2-10	13+342.0	15.5	41.0	167.40	162.60	4.8	162.80	-0.2	CUT	NO	HWY 407	YES	10	35.0	34.6
HWY 407 WBL	P-3-10	13+527.0	38.0	64.0	165.20	165.20	0	160.90	+4.3	EXIST.	NO	M.G. CONN. RD.	NO	10	40.0	44.3
HWY 407 EBL	P-4-10	13+706.5	13.5	40.0	162.60	161.10	1.5	158.65	+2.45	CUT	NO	HWY 407		10	35.0	37.4
HWY 407 WBL	P-5-10	13+891.0	30.5	56.5	161.17	154.50	6.67	155.90	-1.4	CUT	NO	M.G. CONN. RD.	NO	10	35.0	33.6
HWY 407 EBL	P-6-8	14+037.0	20.5	43.0	160.85	159.50	1.35	153.20	+6.3	CUT	NO	HWY 407	NO	8	30.0	36.3
HWY 407 RAMP N-E	P-7-8	14+174.0	14.0	111.0	157.70	141.00	16.7	150.50	-9.5	CUT	YES	RAMP N-E	YES	8	40.0	30.5
HWY 407 WBL	P-8-8	14+190.0	34.0	60.0	139.61	139.61	0	150.50	-10.9	FILL	YES	KIPLING AVE.	NO	8	40.0	29.1
HWY 407 RAMP S-W	P-9-8	14+313.5	33.5	93.5	152.25	142.00	10.25	148.40	-6.4	CUT	NO	RAMP S-W	NO	8	35.0	28.6
HWY 407 RAMP S-E	P-10-8	14+315.0	18.0	67.0	138.70	141.50	2.8	145.70	-4.2	FILL	YES	RAMP S-E	YES	8	40.0	35.8
HWY 407 WBL	P-11-8	14+430.0	15.5	38.0	146.90	145.00	1.9	147.20	-2.2	CUT	NO	HWY 407	NO	8	35.0	32.8
HWY 407 EBL	P-12-8	14+532.0	11.0	45.0	140.90	140.90	0	145.10	-4.2	FILL	YES	HWY 407	YES	8	40.0	35.8
HWY 407 WBL	P-13-7	14+690.0	6.5	39.0	135.90	143.60	7.7	144.10	-0.5	FILL	YES	HWY 407	YES	7	35.0	34.5
HWY 407 EBL	P-14-7	14+860.0	5.5	35.5	135.20	142.70	7.5	142.90	-0.2	FILL	YES	HWY 407	YES	7	35.0	34.8
Sub-Totals Carried Forward																

TOTALS  
UNIT  
ITEM No.

Remarks :  
\* Carried forward to "QUANTITIES-POWER SUPPLY EQUIPMENT,..."

RECEIVED

APR 9 1990

CENTRAL REGION  
STRUCTURAL SECTION

CHKD. \_\_\_\_\_  
APPR. \_\_\_\_\_  
DATE \_\_\_\_\_



Ministry  
of  
Transportation

Ministère  
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Transports

Telephone: (416) 235-5529

Planning & Design Section  
Central Region  
4th Floor, Atrium Tower  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

April 3, 1990

R. Vander Hoop  
Manager, Western District  
Parks and Property Department  
Municipality of Metropolitan Toronto  
8th Floor, 365 Bay Street  
Toronto, Ontario  
M5H 2V1

Dear Sir:

RE: Construction Permit 69N  
Kipling Ave. Extension (Hwy. 407)  
(Our File: W.P. 88-28-02)

In response to your letter dated March 16, 1990, I attach a renewed permit 69N for foundation, survey, geotechnical, environmental, geological and site visits (occasional) at the MTRCA lands north of old Steeles up to Hydro corridor, as per attached map, for the period April 1, 1990 to April 1, 1991 (1 year).

The gate key is in my possession and will be returned to you at the end of this period. We will make every effort to lock the gate during and after our forces have left the site.

Please contact me at 235-5529 if you have any questions.

Yours truly,

DS:jo

Dan Solomon  
Senior Project Manager

attach.

cc: T. Durey  
J. Klowak  
D. Riseboro  
G. Cautillo  
D. Ivanuskas  
C. Southey  
R. Kivi - M.M.M.  
S. Nisbett - M.M.M.  
D. Dundas





MINISTRY OF TRANSPORTATION

M E M O R A N D U M

To: Mr. M. Devata  
Chief Foundation Engineer  
Foundation Design Section  
Room 315, Central Region

Date: April 02, 1990

From: Structural Section  
Central Region

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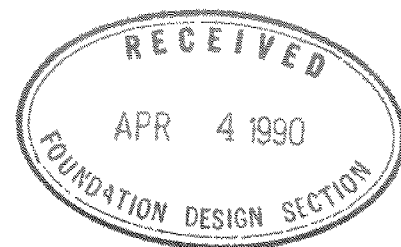
Re: Foundation Request for High Mast Lighting - Update  
W.P. 88-78-02 Highway 407/Kipling Avenue

Please note that two high mast lights have been transferred to our project from W.P. 141-87-00. Therefore, please add the poles described in the attached memo to the Foundation request for W.P. 88-78-02.

The consultant has been instructed to update the documents to reflect this addition, and the existing and future elevations as well as the cross-sections at the pole locations will be made available as soon as they are received by our section.

*S. Markovic*  
S. Markovic  
Senior Structural Engineer  
for:  
V. F. Boehnke  
Head, Structural Section

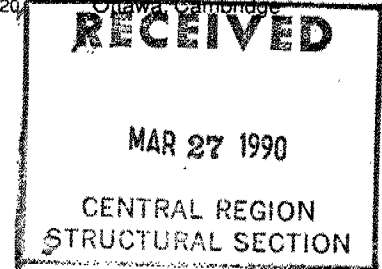
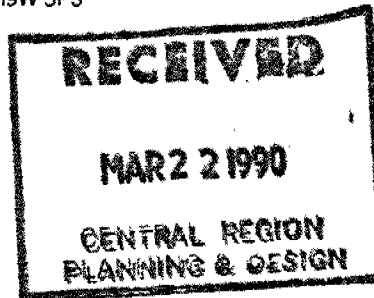
SM/vn



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Toronto (Rexdale), Ontario  
Canada M9W 5P3

Tel (416) 675-5950  
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Offices: Toronto  
Ottawa, Cambridge



March 16, 1990

Marshall Macklin Monaghan Ltd.  
275 Duncan Mill Road  
Don Mills, Ontario  
M3B 2Y1

Highway 407 Advanced Structures  
Humber River to Pine Valley Drive  
W.P. 141-87-00  
Giffels Project No. W90057

Attention: Mr. S. Waife-Annoh  
Senior Project Manager

Dear Sir:

As per your request, we have located the two high mast lighting poles east of pole P-12-8 and west of the Humber River structure. Please initiate a soil investigation for the poles as outlined below:

<u>Pole</u>	<u>Station</u>	<u>Offset from C/L of Hwy 407</u>	<u>Height</u>
P1-7	14+690 L	39 m	35 m
P2-7	14+860 R	35.5 m	35 m

Attached is sketch indicating the pole locations. Should you have any questions please contact the undersigned.

Yours truly

*Sharon Cross*

S. Cross, P. Eng.  
Manager - Illumination & Signals

SC:lm/9(54)

cc: D. Solomon - MTO, P & D  
B. Bendall - MTO, Electrical Design  
M. O'Sullivan - MTO, Electrical Design  
J. Cover  
W. Lachmaniuk  
Project File

