

GEOCRES No. 30M12-224DIST. 6 REGION W.P. No. 615-89-00CONT. No. W. O. No. STR. SITE No. HWY. No. 427LOCATION High Mast light from
Campus Rd/Farber Dr. to SteelesNo of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:



Ministry
of
Transportation

FILE

FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 615-89-00 DIST 6
HWY 427 STR SITE -

High Mast Lighting
Hwy. 427 from Campus Rd./Fasken Dr. to Steeles Ave.

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GEOCRES 30M12-224

DATE JAN 25 1995

GEORES No
30M12-224

FOUNDATION INVESTIGATION REPORT
For
High Mast Lighting
Hwy. 427 from Campus Rd/Fasken Dr. to Steeles Ave.
W.P. 615-89-00
Hwy. 427, District 6, Toronto

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 and supplemented by drilling 20 new boreholes (BH1 through BH 20). The details of the previous investigations are provided in Table 2 (Reference Borehole Number). 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 427 alignment from Campus Road/Fasken Drive to Steeles Ave. The area is situated in the City of Etobicoke in the Region of Metro Toronto.

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

INVESTIGATION PROCEDURES

The fieldwork for the supplementary investigation was carried out between 94 08 09 and 94 08 19 and consisted of 20 sampled boreholes (BH 1 through BH 20) advanced to depths ranging from 9.2 to 12.6m below ground surface. All boreholes except one, were drilled in the median of Hwy 427. Only Borehole 3 was drilled near 409E - 427S ramp.

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

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

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

SUBSURFACE CONDITIONS

General

The soil generally consists of glacial till deposits as the native soil. At some locations glacial till is overlain by fill material. The native soil generally consists of clayey silt with layers of silt, sandy silt and silty sand. The glacial deposits occasionally contain cobbles and boulders. The site for the proposed high mast light poles covers a stretch of six kilometres. Hence, the composition of the till is variable. However, the composition of till within short distances are consistent. For soil condition detail at any high mast light location, reference is made to the attached log sheets and Table 1 (Reference Borehole Numbers).

The locations of the boreholes are shown on the attached drawings DWG 6158900 A - C.

Groundwater Conditions

In the previous and recent studies, groundwater was encountered in almost all boreholes. Groundwater table elevation ranged from 153.8m (HML Pole 16, BH 7, W.P. 280-65) to 171.8m (HML Pole 54, BH 9, W.P. 615-89-00). However, in some boreholes groundwater didn't establish shortly after their completion. For groundwater information at each HML locations reference is made to the attached borehole logs.

DISCUSSION AND RECOMMENDATIONS

It is proposed to install 59 high mast lighting poles (P1 through P59) along Highway 427 from north of Campus Road/Fasken Drive to south of Steeles Avenue. 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 five HML pole locations. At all other locations grade will be changed. Generally, grade will be raised. Fill height will range from 0.1m to 2.7m. On average, fill will be about 1.5m high. Grade will be lowered at six locations. Cut depth will range from 0.1m to 0.4m. 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 1.3	P31	Cut 0.3
P2	Fill 1.9	P32	Fill 0.4
P3	Fill 1.9	P33	Fill 1.8
P4	Fill 1.6	P35	Fill 1.7
P5	Fill 1.8	P36	Fill 1.6
P8	Cut 0.1	P37	Fill 1.6
P9	Fill 0.1	P38	Fill 1.8
P10	Fill 0.4	P39	Fill 1.7
P11	Fill 0.3	P40	Fill 1.9
P12	Fill 0.1	P41	Fill 2.2
P13	Cut 0.2	P42	Fill 2.3
P14	Fill 1.6	P43	Fill 1.8
P15	Cut 0.4	P45	Cut 0.1

<u>HML Pole</u>	<u>Change in Grade</u>	<u>HML Pole</u>	<u>Change in Grade</u>
P16	Fill 1.1	P46	Fill 0.4
P17	Fill 1.4	P47	Fill 0.3
P18	Fill 1.3	P48	Fill 1.8
P19	Fill 1.7	P49	Cut 0.3
P20	Fill 1.5	P50	Fill 2.7
P21	Fill 2.1	P51	Fill 1.7
P22	Fill 1.8	P52	Fill 1.7
P23	Fill 1.6	P53	Fill 1.6
P24	Fill 1.6	P54	Fill 1.8
P25	Fill 1.5	P55	Fill 2.1
P26	Fill 1.6	P56	Fill 2.0
P27	Fill 1.4	P57	Fill 0.6
P28	Fill 1.7	P58	Fill 0.7
P30	Fill 1.7	P59	Fill 0.6

Cut Considerations

If the grade is to be lowered 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 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:

$$\phi = 30^\circ$$

$$\gamma = 20 \text{ kN/m}^3$$

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	ϕ (Deg)	Q_u kPa	γ kN/m ³
P1	165.4	167.4 - 165.1	Fill	-	-	-
		165.1 - 161.3	Cohesive	0	350	20.6
		161.3 - 152.0	Cohesive	0	500	21.2
P2	163.4	165.9 - 161.5	Fill	-	-	-
		161.5 - 156.0	Cohesive	0	250	20.2
		156.0 - Below	Cohesive	0	500	21.2
P3	163.4	165.9 - 161.5	Fill	-	-	-
		161.5 - 156.0	Cohesive	0	250	20.2
		156.0 - Below	Cohesive	0	500	21.2
P4	NE	164.5 - 161.6	Fill	-	-	-
		161.6 - 156.0	Cohesive	0	250	20.2
		156.0 - Below	Cohesive	0	500	21.2

P5	NE	164.5 - 161.6	Fill	-	-	-
		161.6 - 156.0	Cohesive	0	250	20.2
		156.0 - Below	Cohesive	0	500	21.2
P6	155.8	160.3 - 153.9	Cohesive	0	300	20.4
		153.9 - 139.0	Non Cohesive	30	0	21.2
P7	158.7	159.7 - 157.0	Cohesive	0	100	19.6
		157.0 - 146.1	Cohesive	0	500	21.2
P8	160.5	161.3 - 154.0	Cohesive	0	250	20.2
		154.0 - 141.5	Cohesive	0	500	21.2
		141.5 - Below	Bedrock	0	750	22.5
P9	155.8	160.3 - 154.0	Cohesive	0	350	20.6
		154.0 - 146.6	Non Cohesive	30	0	21.2
		146.6 - 139.0	Cohesive	0	500	21.2
P10	154.2	163.0 - 153.4	Cohesive	0	200	20.2
P11	157.5	163.4 - 155.0	Cohesive	0	350	20.6
		155.0 - 143.7	Cohesive	0	500	21.2
P12	161.6	163.6 - 159.9	Fill	-	-	-
		159.9 - 152.9	Cohesive	0	250	20.2
		152.9 - 141.2	Cohesive	0	500	21.2
		141.2 - Below	Bedrock	0	750	22.5
P13	158.8	161.1 - 154.9	Cohesive	0	300	20.4
		154.9 - 145.1	Cohesive	0	500	21.2
		145.1 - Below	Bedrock	0	750	22.5
P14	158.8	161.1 - 154.9	Cohesive	0	300	20.4
		154.9 - 145.1	Cohesive	0	500	21.2
		145.1 - Below	Bedrock	0	750	22.5
P15	158.7	166.7 - 160.8	Fill	-	-	-
		160.8 - 154.1	Cohesive	0	300	20.4
P16	153.8	155.7 - 150.7	Cohesive	0	100	19.6
		150.7 - 143.0	Cohesive	0	500	21.2

P17	154.0	155.6 - 149.4	Cohesive	0	200	20.2
		149.4 - 140.4	Cohesive	0	500	21.2
		140.4 - Below	Bedrock	0	750	22.5
P18	167.8	171.8 - 161.7	Fill	0	200	20.2
		161.7 - 159.2	Cohesive	0	500	21.2
P19	163.3	173.0 - 163.9	Fill	0	200	20.0
		163.9 - 160.4	Cohesive	0	400	20.8
P20	164.8	165.9 - 149.4	Cohesive	0	250	20.2
		149.4 - 144.5	Cohesive	0	500	21.2
P21	162.9	165.3 - 154.0	Cohesive	0	200	20.0
		154.0 - 146.7	Cohesive	0	400	20.8
P22	165.0	171.1 - 165.0	Fill	-	-	-
		165.0 - 161.5	Cohesive	0	250	20.2
P23	165.7	168.7 - 166.9	Fill	-	-	-
		166.9 - 158.3	Cohesive	0	150	20.0
P24	165.7	168.7 - 166.9	Fill	-	-	-
		166.9 - 158.3	Cohesive	0	150	20.0
P25	165.5	166.3 - 164.2	Fill	-	-	-
		164.2 - 159.0	Cohesive	0	150	20.0
		159.0 - 156.7	Cohesive	0	350	20.6
P26	165.5	166.3 - 164.2	Fill	-	-	-
		164.2 - 159.0	Cohesive	0	150	20.0
		159.0 - 156.7	Cohesive	0	350	20.6
P27	163.7	165.5 - 164.1	Fill	-	-	-
		164.1 - 157.7	Cohesive	0	150	20.0
		157.7 - 155.9	Non Cohesive	30	0	20.2
P28	161.5	164.6 - 161.0	Cohesive	0	100	19.6
		161.0 - 157.5	Cohesive	0	250	20.2
		157.5 - 155.0	Non Cohesive	30	0	20.0

P29	161.5	164.6 - 161.0	Cohesive	0	100	19.6
		161.0 - 157.5	Cohesive	0	250	20.2
		157.5 - 155.0	Non Cohesive	30	0	20.0
P30	168.2	168.4 - 160.0	Cohesive	0	200	20.0
		160.0 - 157.8	Non Cohesive	30	0	20.0
		157.8 - 153.2	Cohesive	0	450	20.4
		153.2 - 147.2	Non Cohesive	30	0	20.4
		147.2 - 142.1	Cohesive	0	500	21.2
P31	162.5	168.1 - 154.1	Cohesive	0	250	20.2
		154.1 - 151.0	Non Cohesive	30	0	20.0
		151.0 - 147.7	Cohesive	0	500	21.2
P32	167.2	168.0 - 155.0	Cohesive	0	300	20.4
		155.0 - 150.9	Non Cohesive	30	0	19.6
		150.9 - 145.9	Non Cohesive	30	0	21.2
		145.9 - 142.5	Cohesive	0	500	21.2
P33	168.2	168.2 - 152.5	Cohesive	0	350	20.6
		152.5 - 146.2	Non Cohesive	30	0	20.4
		146.2 - 142.9	Cohesive	0	500	21.2
P34	NE	163.1 - 162.0	Cohesive	0	100	19.6
		162.0 - 159.4	Non Cohesive	30	0	19.6
		159.4 - 153.5	Cohesive	0	200	20.0
P35	NE	163.1 - 162.0	Cohesive	0	100	19.6
		162.0 - 159.4	Non Cohesive	30	0	19.6
		159.4 - 153.5	Cohesive	0	200	20.0
P36	159.7	162.1 - 160.7	Cohesive	0	200	20.0
		160.7 - 159.6	Non Cohesive	30	0	20.8
		169.6 - 157.7	Cohesive	0	400	20.8
		157.7 - 153.5	Cohesive	0	300	20.4
		153.5 - Below	Non Cohesive	30	0	21.0
P37	159.7	162.1 - 160.7	Cohesive	0	200	20.0
		160.7 - 159.6	Non Cohesive	30	0	20.8
		169.6 - 157.7	Cohesive	0	400	20.8
		157.7 - 153.5	Cohesive	0	300	20.4
		153.5 - Below	Non Cohesive	30	0	21.0

P38	159.7	161.4 - 160.4	Non Cohesive	30	0	20.0
		160.4 - 157.7	Cohesive	0	200	20.0
		157.7 - 156.1	Cohesive	0	500	21.2
		156.1 - 152.1	Non Cohesive	30	0	21.2
P39	161.5	162.9 - 161.7	Cohesive	0	200	20.0
		161.7 - 158.3	Non Cohesive	30	0	20.2
		158.3 - 150.6	Cohesive	0	500	21.2
P40	160.5	162.5 - 155.4	Cohesive	0	500	21.2
		155.4 - 152.9	Bedrock	0	750	22.5
P41	160.5	162.5 - 155.4	Cohesive	0	500	21.2
		155.4 - 152.9	Bedrock	0	750	22.5
P42	162.3	163.7 - 158.5	Cohesive	0	500	21.2
		158.5 - 154.5	Bedrock	0	750	22.5
P43	162.3	163.7 - 158.5	Cohesive	0	500	21.2
		158.5 - 154.5	Bedrock	0	750	22.5
P44	162.8	164.4 - 163.4	Cohesive	0	250	20.2
		163.4 - 162.3	Non Cohesive	30	0	20.2
		162.3 - 155.1	Bedrock	0	750	22.5
P45	162.8	164.4 - 163.4	Cohesive	0	250	20.2
		163.4 - 162.3	Non Cohesive	30	0	20.2
		162.3 - 155.1	Bedrock	0	750	22.5
P46	167.7	169.7 - 164.0	Cohesive	0	200	20.0
		164.0 - 154.6	Cohesive	0	500	21.2
P47	165.4	168.8 - 166.4	Cohesive	0	200	20.0
		166.4 - 154.8	Cohesive	0	500	21.2
P48	167.4	169.6 - 164.1	Cohesive	0	250	20.2
		164.1 - 154.5	Cohesive	0	500	21.2
P49	157.5	165.3 - 160.9	Fill	-	-	-
		160.9 - 160.1	Cohesive	0	150	19.8
		160.1 - 155.8	Cohesive	0	500	21.2

P50	158.3	160.9 - 157.1	Non Cohesive	30	0	20.4
		157.1 - 153.4	Non Cohesive	30	0	21.2
		153.4 - 151.6	Cohesive	0	500	21.2
		151.6 - 148.4	Bedrock	0	750	22.5
P51	162.6	168.1 - 163.7	Fill	-	-	-
		163.7 - 161.0	Non Cohesive	30	0	19.8
		161.0 - 158.5	Non Cohesive	30	0	21.2
P52	167.5	171.7 - 169.6	Fill	-	-	-
		169.6 - 165.0	Cohesive	0	250	20.2
		165.0 - 163.1	Cohesive	0	500	21.2
		163.1 - Below	Non Cohesive	30	0	21.2
P53	167.5	171.7 - 169.6	Fill	-	-	-
		169.6 - 165.0	Cohesive	0	250	20.2
		165.0 - 163.1	Cohesive	0	500	21.2
		163.1 - Below	Non Cohesive	30	0	21.2
P54	171.8	176.1 - 170.9	Fill	-	-	-
		170.9 - 166.5	Cohesive	0	250	20.2
P55	171.8	176.1 - 170.9	Fill	-	-	-
		170.9 - 166.5	Cohesive	0	250	20.2
P56	171.4	171.9 - 163.0	Cohesive	0	150	19.8
		163.0 - 160.0	Cohesive	0	400	20.8
		160.0 - 158.0	Non Cohesive	30	0	21.2
P57	165.7	171.5 - 162.4	Cohesive	0	200	20.0
		162.4 - 149.8	Non Cohesive	30	0	21.2
P58	171.1	172.1 - 168.0	Cohesive	0	200	20.0
		168.0 - 162.5	Cohesive	0	500	21.2
P59	Dry	179.4 - 173.7	Fill	0	100	19.6
		173.7 - 172.0	Cohesive	0	250	20.2
		172.0 - 169.8	Cohesive	0	500	21.2

Where:

HML	= High Mast Lighting
ϕ	= Apparent angle of internal friction for non-cohesive Soils
Q_u	= Unconfined Compressive Strength (kPa)
γ	= Unit Weight (kN/m^3)
NE	= Water level not established

Construction Consideration:

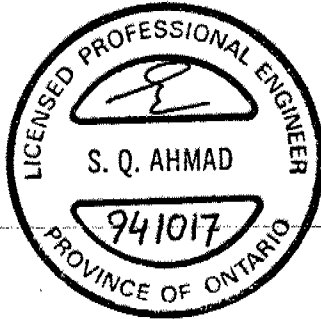
It is recommended that a non-standard special provision for the construction of HML foundations, should be incorporated in the contract. A copy of the latest NSSP from other project is appended in this report (Appendix 'B') for reference. The contractor should be advised that variable types of subsurface 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.

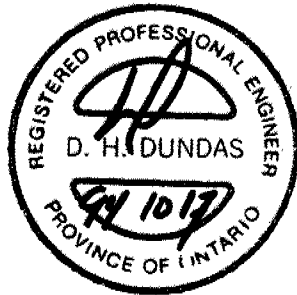
Miscellaneous

The soil information for this project was obtained from previous Foundation Investigation in this area and supplemented by drilling 20 new boreholes (BH1 through BH 20). The fieldwork for the supplementary investigation was carried out under the supervision of Lori O'Malley engineering student, using equipment owned and operated by Canadian Soil Drilling. This report was prepared by K.S.Q. Ahmad, Foundation Engineer, reviewed and approved by D. Dundas, Senior Foundation Engineer.



A handwritten signature of K.S.Q. Ahmad in black ink.

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



A handwritten signature of D. Dundas in black ink.

D. Dundas, P. Eng.
Senior Foundation Engineer

W.P. 615-89-00

TABLE 1

REFERENCE BOREHOLE NUMBERS

HML Pole Numbers	Reference B.H. No	Project Numbers on B.H. Logs	Ground Elev. at Boreholes	Existing Grade at HML	Final Grade
P1	4	W.P. 273-66	167.4	168.6	169.9
P2	1	W.P. 615-89-00	165.9	166.6	168.5
P3	1	W.P. 615-89-00	165.9	165.3	167.2
P4	2	W.P. 615-89-00	164.5	164.5	166.3
P5	2	W.P. 615-89-00	164.5	164.5	166.3
P6	10	W.P. 404-65	160.3	164.8	164.8
P7	17	W.P. 403-65	159.7	160.5	160.5
P8	19	W.P. 403-65	161.3	159.6	159.5
P9	10	W.P. 404-65	160.3	159.7	159.8
P10	3	W.P. 615-89-00	163.0	161.4	161.8
P11	12	W.P. 404-65	163.4	161.9	162.2
P12	13	W.P. 404-65	163.6	165.3	165.4
P13	14	W.P. 404-65	161.1	171.2	171.0
P14	14	W.P. 404-65	161.1	167.7	169.3
P15	4	W.P. 615-89-00	166.7	168.6	168.2
P16	7	W.P. 280-65	155.7	170.0	171.1
P17	12	W.P. 280-65	155.6	170.5	171.9
P18	5	W.P. 615-89-00	171.8	171.8	173.1
P19	4	W.P. 48-71-22	173.0	172.4	174.1
P20	10	W.P. 213-65	165.9	173.1	174.6

P21	7	W.P. 48-71-22	165.3	172.0	174.1
P22	6	W.P. 48-71-22	171.1	170.9	172.7
P23	6	W.P. 615-89-00	168.7	169.5	171.1
P24	6	W.P. 615-89-00	168.7	168.0	169.6
P25	7	W.P. 615-89-00	166.3	166.7	168.2
P26	7	W.P. 615-89-00	166.3	165.9	167.5
P27	8	W.P. 615-89-00	165.5	165.5	166.9
P28	9	W.P. 615-89-00	164.6	164.8	166.5
P29	9	W.P. 615-89-00	164.6	165.5	165.5
P30	1	W.P. 126-60	168.4	164.3	166.0
P31	8	W.P. 126-60	168.1	168.8	168.5
P32	7	W.P. 126-60	168.0	168.6	169.0
P33	5	W.P. 126-60	168.2	163.4	165.2
P34	10	W.P. 615-89-00	163.1	165.8	165.8
P35	10	W.P. 615-89-00	163.1	162.9	164.6
P36	11	W.P. 615-89-00	162.1	162.4	164.0
P37	11	W.P. 615-89-00	162.1	161.9	163.5
P38	12	W.P. 615-89-00	161.4	161.4	163.2
P39	2	W.P. 604-89-00	162.9	161.8	163.5
P40	13	W.P. 615-89-00	162.5	162.3	164.2
P41	13	W.P. 615-89-00	162.5	162.8	165.0
P42	14	W.P. 615-89-00	163.7	163.3	165.6
P43	14	W.P. 615-89-00	163.7	164.1	165.9
P44	15	W.P. 615-89-00	164.4	166.7	166.7
P45	15	W.P. 615-89-00	164.4	164.5	166.4
P46	6	W.P. 49-71-04	169.7	169.8	170.2
P47	1	W.P. 49-71-04	168.8	169.7	170.0
P48	5	W.P. 49-71-04	169.6	165.3	167.1

丁表②

P49	16	W.P. 615-89-00	165.3	166.3	166.0
P50	1	W.P. 49-71-07	160.9	165.3	168.0
P51	17	W.P. 615-89-00	168.1	168.1	169.8
P52	18	W.P. 615-89-00	171.7	170.5	172.2
P53	18	W.P. 615-89-00	171.7	172.9	174.5
P54	19	W.P. 615-89-00	176.1	175.1	176.9
P55	19	W.P. 615-89-00	176.1	177.1	179.2
P56	1	W.P. 153-80-02	171.9	179.4	181.4
P57	5	W.P. 153-80-02	171.5	180.5	181.1
P58	2	W.P. 88-78-02	172.1	179.6	180.3
P59	20	W.P. 615-89-00	179.4	179.4	180.0

APPENDIX

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 838 995, E 296 386 ORIGINATED BY LO
 DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LO
 DATUM Geodetic DATE 1994 08 09 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
165.9	Ground Surface																
0.0	CLAYEY SILT Trace to some Gravel Some Sand Stiff		1	SS	12												
			2	SS	13												
163.0	(FILL MATERIAL)		3	SS	10												
2.9	SANDY SILT Trace of Gravel Trace to some Clay Compact to Dense		4	SS	35												
161.5	(FILL MATERIAL)		5	SS	23												
4.4	Trace Organics		6	SS	19												
			7	SS	20												
	CLAYEY SILT Trace to Some Gravel Some Sand Very Stiff to Hard (GLACIAL TILL)		8	SS	55												
			9	SS	39												
	Brown Grey		10	SS	34												
154.8			11	SS	127	/25cm											
11.1	End of Borehole																

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 839 198, E 296 285 ORIGINATED BY LQ
 DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LQ
 DATUM Geodetic DATE 1994 08 09 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
164.5	Ground Surface																
0.0	CLAYEY SILT Trace of Gravel Some Sand Stiff to Very Stiff		1	SS	23	*	164										
	Sand		2	SS	15												
161.8	(FILL MATERIAL)		3	SS	18		162										
2.9	Trace Organics		4	SS	17												
			5	SS	14												
			6	SS	28		160										
	CLAYEY SILT Trace to Some Gravel Some Sand Stiff to Hard		7	SS	50												
	(GLACIAL TILL)		8	SS	63		158										
	Brown		9	SS	21												
	Grey						156										
155.1			10	SS	75	/15cm											
9.4	End of Borehole																
	* WATER LEVEL NOT ESTABLISHED DUE TO THE WALLS CAVING AT 8 FEET.																

JOH 77-11016

LOCATION 15,877,155 N. 971,477 E.

ORIGINATED BY Y.S.

W.P. 404-65

BORING DATE Feb. 17, 18 & 24, 1972

COMPILED BY T.S.T.

DATUM Geodetic

BOREHOLE TYPE Penn Drill Washboring

CHECKED BY _____

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS & TESTING OFFICE

JOB 72-11006

LOCATION

RECORD OF BOREHOLE No. 4

CO-ORDINATE 4 830 605.0, E 296 492.3

FOUNDATION SECTION

W.P. 273-66

BORING DATE Jan. 6, 1972

ORIGINATED BY VE

DATUM Geodetic

BOREHOLE TYPE Pan Drill & Cone

COMPILED BY TL

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION: RESISTANCE					LIQUID LIMIT — %			BULK DENSITY
ELEV. DEPTH (m)	ELEV. DEPTH	DESCRIPTION	STRAT. NOT	NUMBER	TYPE	BLOWS/FOOT	20	40	60	80	100	PLASTIC LIMIT — %	WATER CONTENT — %	
167.4	167.4	Ground Level												
0.0	0.0	Fill												
165.1	165.1	Stiff to Very Stiff		1	SS	11								
2.3	7.5	Glacial Till		2	SS	17								
		Brown		3	SS	35								
		Gray		4	SS	18								
		Glacial Till		5	SS	93								
		Not mix. of clayey silt, sand & gravel.		6	SS	32								
		Hard		7	SS	120/9"								
				8	SS	100/3"								
				9	SS	43								
				10	SS	77								
				11	SS	95								
				12	SS	95								
152.0	152.0	End of Borehole												
15.4	50.1													

20
15 → 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 19

CO-ORDS: N4839425, E 296133

JOB 72-11017

LOCATION 15,877,178N. 971,565 E.

ORIGINATED BY H.S.

W.P. 403-65

BORING DATE Jan. 28 & 31, 1972 Feb. 4, 7 & 9, 1972

COMPILED BY T.S.T.

DATUM Geodetic

BOREHOLE TYPE Penn Drill

CHECKED BY Lo

SOIL PROFILE				SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_L — w — w_p	BULK DENSITY γ T.C.F.	REMARKS	
ELEV. DEPTH	ELEV. DEPTH	DESCRIPTION	STRAT. PLCT	NUMBER	TYPE						BLOWS/FOOT
161.3	529.3	Ground elevation.									
METRIC UNITS		Het. Mix. of clayey silt, sand & gravel.		1	SS	25					EI. 526.3 In open B.H.
				2	SS	26					2-17 5, 31
				3	SS	41					Feb. 28/72
		Brown		4	CS	20					
		Grey		5	SS	24					
		Glacial Till.		6	SS	45					
				7	SS	49					
		Very stiff to hard.		8	SS	123					
				9	SS	88					
				10	SS	1027					
				11	SS	1007					
				12	SS	1007					
				13	SS	1007					
				14	SS	1507					
				15	RC BXL	957					
146.1	479.3										
15.2	50.0	With shale fragments.									
141.5	464.3										
19.8	65.0	Shale bedrock.									
140.0	459.3	Sound - grey.									
21.3	70.0	End of borehole.									

20
15 \diamond 5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 839 483, E 296 019 ORIGINATED BY L.O.
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 19 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
163.0																	
0.0	CLAYEY SILT Trace to some Gravel Some Sand		1	SS	28		162										
180.9	(FILL MATERIAL)		2	SS	21												
2.1			3	SS	14												
	Trace Organics		4	SS	22		160										
			5	SS	26												
	CLAYEY SILT Trace to some Gravel Some sand Stiff to Hard		6	SS	31		158										
	(GLACIAL TILL) Sandy Silt Seams		7	SS	36												
			8	SS	22												
	Brown Grey		9	SS	19		156										
153.4			10	SS	28		154										
9.6	End of Borehole																

RECORD OF BOREHOLE NO 12 CO-ORDS: N 4 839 511, E 296 165

JOB 72-11016

LOCATION 15,877,562 N. 971,669 E.

ORIGINATED BY V.K.

WP 404-65

BORING DATE Feb. 22, 1972

COMPILED BY F.B.I.

DATUM Geodetic

BOREHOLE TYPE Penn Drill.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH (m)	ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS/FOOT	BLOWS / FOOT					PLASTIC LIMIT — w_p				WATER CONTENT — w	
								20	40	60	80	100	WATER CONTENT %					
													w_p	w				w_L
SHEAR STRENGTH P.S.F.							+ FIELD VANE					x LAB VANE						

RECORD OF BOREHOLE NO 14

Co-ords: N 4839 586, E 296 061

JOB 72-11016

LOCATION 15,577,908 N. 971,330 E.

ORIGINATED BY V.K.

W.P. 404-65

BORING DATE Feb. 11, 1972

COMPILED BY T.S.P.

DATUM: geodetic

BOREHOLE TYPE Penn Dr.

CHECKED BY

SOIL PROFILE				SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT w_L			BULK DENSITY γ	REMARKS	
ELEV. DEPTH (m)	ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT w_p					WATER CONTENT w
								20	40	60	80	100	WATER CONTENT %					
													w_p	w	w_L			
SHEAR STRENGTH P.S.F.							UNCONFINED + FIELD VANE					QUICK TRIAXIAL x LAB VANE						

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords: N 4 839 786 E 295 997 ORIGINATED BY LO
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 08 10 CHECKED BY BB

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100		
166.7	Ground Surface												
0.0	CLAYEY SILT Trace to some Gravel Some Sand Stiff		1	SS	13	166							
			2	SS	13								
			3	SS	12	164							
			4	SS	17								
			5	SS	14								
			6	SS	18	162							
160.5	(FILL MATERIAL)		7	SS	19								
5.9			8	SS	28	160							
	Traces Organics												
	CLAYEY SILT Trace to some Gravel Some Sand Very Stiff to Hard (GLACIAL TILL)		9	SS	30	158							
	Brown												
	Grey												
			10	SS	30								
			11	SS	43	156							
154.1			12	SS	19								
12.6	End of Borehole												

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 72-11004

LOCATION

Co-ords: N 4 839 936, E 295 936
Co-ords, 15,879,051 N; 970,920 E.

ORIGINATED BY VK

W.P. 280 - 65

BORING DATE

Feb. 3, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Answer

CHECKED BY *GR*

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

JOB 72-11004

W.P. 280 - 65

DATUM Geodetic

LOCATION

BORING DATE

BOREHOLE TYPE

Co-ORDS N 4839 961, E 275 924
Elev. 15,879.130 N: 110,880 E

Feb. 1, 1972

Aug. 1971 Core

No. 12

FOUNDATION SECTION

ORIGINATED BY VK

COMPILED BY TST

CHECKED BY

METRIC UNITS	SOIL PROFILE		STRAT. NOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY Y P.C.F.	REMARKS			
	ELEV. DEPTH (m)	DESCRIPTION		NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %		
								40	60	80	100			UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE	w_p — w_L 10 20 30
155.6	510.5	Ground Level											GR. SA. SI. CL.			
0.0	0.0	Het. mix. of clayey silt sand and gravel		1	SS	0							0 29 57 11			
				2	SS	37							505.0			
				3	SS	14			156				(M) 154.0			
		Glacial Till		4	SS	10										
		Stiff to Hard		5	SS	11										
				6	SS	16										
		Sand and Gravel		7	SS	52							21 33 32 11			
				8	SS	130										
				9	SS	100										
				10	SS	100										
				11	SS	100										
				12	SS	100										
140.4	160.5			13	SS	100										
15.2	50.0	Weathered shale bedrock		14	EX	NR										
137.3	450.5	sound		15	RC	100%										
18.3	60.0	End of Borehole														

20
12.5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 840 151. E 295 829 ORIGINATED BY LO
 DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LO
 DATUM Geodetic DATE 1994 08 10 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W _p	W	W _L		
171.8	Ground Surface																
0.0																	
	Layer of Sand		1	SS	19												
			2	SS	18												
			3	SS	7												
			4	SS	13												
	CLAYEY SILT Traces of Gravel Some Sand Stiff to Hard		5	SS	15												
			6	SS	37												
			7	SS	11												
6.1			8	SS	14												
			9	SS	18												
			10	SS	24												
181.7	(FILL MATERIAL)																
10.1	CLAYEY SILT Trace to some Gravel Some Sand Hard to Very Stiff (GLACIAL TILL) Brown		11	SS	80												
	Grey																
159.2			12	SS	23												
12.8	End of Borehole																

RECORD OF BOREHOLE No 4 Co-ords: N 4 840 310, E 295 755

METRIC

W P 48-71-22 LOCATION Sta. 406 + 50; o/s 26.0' Lt. (Imperial Chainage)
DIST 6 HWY 427/409 BOREHOLE TYPE Cone Test, Solid Stem Auger
DATUM Geodetic DATE 88 03 29
ORIGINATED BY TS
COMPILED BY TS
CHECKED BY

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(feet)	ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
									SHEAR STRENGTH						

567.6	173.0	Ground Surface													
0.0	0.0	Irregular Mixture of Clayey Silt, Some Sand, Trace Gravel (Fill)		1	SS	40									
		Some Organics		2	SS	12								20.2	14 14 40 32
				3	SS	10									
				4	SS	22									
		Brown/Grey Stiff to Very Stiff		5	SS	20									
537.6	163.9			6	SS	37									
30.0	9.1	Het. Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		7	SS	71									
		Brown Grey		8	SS	31								22.6	
526.1	160.4														
41.5	12.6	End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15
10
5
0
5
10
15
20
(%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 10 Co-ords: N4 840 425, E 295 701

JOB 77-1022

LOCATION Co-ord's 880, 661 N. 270, 150 E.

ORIGINATED BY V.K.

W.P. 213-65

BORING DATE March 3, 1972

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.F. Machine.

CHECKED BY

METRIC UNITS

SOIL PROFILE				SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH (m)	ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT — w_p				
165.9	544.3	Ground level.															
0.0	0.0	Het. mix. of clayey silt, sand and grav.															

W.L. 540.8 ft.
= 164.8m
1 28 54 17

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 7

Co-ords: N4840593, E295629

JOB 72-11023

LOCATION

Co-ords. 881,210 N; 969,913 E.

W.P. 20-60-00 48-71-22

BORING DATE Nov. 8, 1972

ORIGINATED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger & sample with CME Machine

COMPILED BY VK

CHECKED BY *AK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	20 40 60 80 100	PLASTIC LIMIT	WATER CONTENT		
165.3	542.3	Ground Level										
0.0	0.0											
		Brown Grey		1	SS	13						
				2	SS	17						
				3	SS	35						
				4	SS	33						
		Heterogeneous mixture of clayey silt, sand and gravel.		5	SS	20						
		(Glacial Till)		6	SS	22						
		Stiff to Hard		7	SS	25						
				8	SS	13						
				9	SS	12						
151.0	505.3											
11.3	37.0	Silty sand with few gravel.		10	SS	180						
152.2	499.3	Very Dense										
13.1	43.0											
				11	SS	36						
146.7	481.3											
18.6	61.0	Bedrock		12	SS	185						
		Weathered Shale										
141.0	472.3											
143.2	469.8	Sound Shale		13	EXL	90%						
22.1	72.5	End of Borehole										

METRIC UNITS

534.3
162.9m



RECORD OF BOREHOLE No 6

METRIC

W.P. 48-71-22

LOCATION Sta. 422 + 90; n/s 26.0' Rt. (Imperial Chainage)

ORIGINATED BY TS

DIST 6 HWY 427/409

BOREHOLE TYPE Cone Test, Solid Stem Auger

COMPILED BY TS

DATUM Geodetic

DATE 88 03 30

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. (feet)	DEPTH (m)	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			20	40	60	80	100				
561.4	0.0	Ground Surface														
		Irregular Mixture of Clayey Silt Sand and Gravel (Fill)		1	SS	16										
		Brown/Grey		2	SS	16										
		Stiff to Very Stiff		3	SS	18										
		Organic Inclusions		4	SS	23										
				5	SS	30										
541.4	165.0	Het. Mix. of Clayey Silt, Sand and Gravel		6	SS	20										
20.0	6.8	Brown Grey (Glacial Till)		7	SS	41										
529.9	161.5	V. Stiff to Hard		8	SS	20										
31.5	9.6	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

*3, x5: Numbers refer to Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 17

FOUNDATIONS OFFICE

Co-ords: N 4839 441, E 296 191

JOB 72-11017

LOCATION 15,877,430 N. 971,755 E.

ORIGINATED BY H.S.

WP 403-65

BORING DATE Jan. 1 & Feb. 1, 1972

COMPILED BY T.S.T.

DATUM Geodetic

BOREHOLE TYPE Penn Drill & Cone Penetration

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L FLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV DEPTH (m)	ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	20	40	60	80	100	w_p	w	w_L		
159.7	524.0	Ground elevation.														
		Het. mix. of clayey silt, with sand and gravel.		1	SS	10										
		Glacial Till.		2	SS	11										
				3	SS	58										
		Brown		4	SS	52										
		Grey		5	SS	52										
				6	SS	45										
				7	SS	59										
				8	SS	82										
				9	SS	100										
149.0	489.0			10	SS	100										
10.7	35.0	Silt to sandy silt. Very dense. Grey														
147.1	482.5			11	SS	67										
12.6	41.5															
146.1	479.3															
13.6	44.7	End of borehole. Probable bedrock														

METRIC UNITS

El. 520.6 = 158.7 m
 in open
 0 26 50 24
 Feb. 18/72

0 25 65 10

20
 15 \div 5 % STRAIN AT FAILURE
 10

ORIGINATED BY V.K.

COMPILED BY T.S.T.

CHECKED BY _____

15 $\frac{20}{10}$ 5 % STRAIN AT FAILURE

RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 840 964 E 295 487 ORIGINATED BY LQ
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY LQ
 DATUM Geodetic DATE 1994 08 11 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
168.7	Ground Surface																
0.0	CLAYEY SILT Trace Gravel Some Sand Stiff		1	SS	15		168										
168.9	(FILL MATERIAL)		2	SS	11												
1.8			3	SS	14												
			4	SS	21		166										
			5	SS	29												
	Brown		6	SS	15		164										
	Grey		7	SS	11												
	CLAYEY SILT TO SILT Trace to some Gravel Trace to some Sand Firm to Hard (GLACIAL TILL)		8	SS	11		162										
			9	SS	8												
			10	SS	25		160										
158.3			11	SS	40												
10.4	End of Borehole																

RECORD OF BOREHOLE No 7

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 841 287, E 295 339 ORIGINATED BY LO
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
 DATUM Geodetic DATE 1994.08.11 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
166.3	Ground Surface																
0.0	CLAYEY SILT Trace Gravel Some Sand Firm to Stiff		1	SS	4		166										
164.2	(FILL MATERIAL)		2	SS	9												
2.1			3	SS	29		164										
	Brown		4	SS	30												
	Grey		5	SS	16		162										
	CLAYEY SILT TO SILT Trace Gravel Trace to some Sand Stiff to Hard (GLACIAL TILL)		6	SS	14												
	Silty Sand Seams		7	SS	13												
			8	SS	16		160										
			9	SS	34												
							158										
156.7			10	SS	34												
9.6	End of Borehole																

RECORD OF BOREHOLE No 8

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 841 472, E 295 251 ORIGINATED BY LO
DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 06 11/12 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20	40	60	80	100						10	20	30
165.5	Ground Surface																			
0.0	CLAYEY SILT Trace Gravel Some Sand Trace Organics																			
164.1	(FILL MATERIAL)		1	SS	23															
1.4			2	SS	21															
	Grey																			
	Brown		3	SS	15															
	CLAYEY SILT Trace Gravel Trace to some Sand Stiff to Hard (GLACIAL TILL)		4	SS	11															
			5	SS	8															
			6	SS	12															
	Silty Sand		7	SS	16															
			8	SS	27															
157.7			9	SS	40															
7.6	SILTY SAND TO SAND Traces to Clay Compact																			
155.9			10	SS	26															
9.6	End of Borehole																			

RECORD OF BOREHOLE No 9

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 841 689, E 295 189 ORIGINATED BY LO
 DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY LO
 DATUM Geodetic DATE 1994.08.12 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W _p	W	W _L		
164.6	Ground Surface																
0.0	CLAYEY SILT Trace to some Gravel Trace to some Sand Stiff to Hard (GLACIAL TILL)		1	SS	10												
			2	SS	7												
			3	SS	11												
			4	SS	11												
			5	SS	23												
			6	SS	24												
			7	SS	24												
			8	SS	60	/1cm											
157.5																	
7.1	SANDY SILT Traces of Clay Dense to Compact			9	SS	29											
155.0			10	SS	12												
9.6	End of Borehole																

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

Co-ords: N 4841 82 B, E 295 134

JOB 72-1102h

LOCATION: 5,885,263 N; 968,288 E.

W.P. 126-60

BORING DATE March 8, 1972

DATUM Geodetic

BOREHOLE TYPE Auger & sample with C.H.E.

ORIGINATED BY VK

COMPILED BY VK

CHECKED BY

METRIC UNITS

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p - w_L$ WATER CONTENT % 15 30 45	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER TYPE BLOWS/FOOT					
168.1 0.0	552.6 0.0	Ground Level						
			1 SS 11	550				551.6 =168.1m
			2 SS 76					2 19 69 10
			3 SS 78					
			4 SS 21	540				
			5 SS 22					0 10 33 57
			6 SS 21					
			7 SS 43	530				
160.0 8.4	525.0 27.6	Silty sand with some gravel.	8 SS 20					0 18 51 31
			9 SS 18					
157.8 10.7	517.6 35.0	Compact	10 SS 95	520				13 83 (4)
			11 SS 13					
			12 SS 55	510				
153.2 15.2	502.6 50.0	Silty sand to sandy silt, with trace of clay and gravel.	13 SS 28	500				0 42 48 10
			14 SS 43	490				
147.2 21.2	483.1 69.5	Compact to Dense						
			15 SS 110	480				
			16 SS 100	470				
142.1 26.4	466.1 86.5	End of Borehole Probable Bedrock						

20
15 5 % STRAIN AT FAILURE
10

20
13 \diamond 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 5

Co-ords: N 4841 866, E 295 119

JOB 72-11024

LOCATION

Co-ords. 5,885,387 N; 968,237 E.

W.P. 126-60

BORING DATE March 7, 1972

ORIGINATED BY VK

DATUM Gendetic

BOREHOLE TYPE Auger & sample with C.M.E.

COMPILED BY VK

CHECKED BY

METRIC UNITS

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT			BULK DENSITY	REMARKS
ELEV. DEPTH (m)	ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	BLOWS / FOOT	20	40	60	80	100	PLASTIC LIMIT	WATER CONTENT		
168.2	551.8	Ground Level														
0.0	0.0	Het. mix. of clayey silt with sand and gravel.		1	SS	36										
				2	SS	37										
				3	SS	38										
164.2	538.8	Brown Grey		4	SS	21										
4.0	13.0	Glacial Till		5	SS	29										
		Stiff to Hard		6	SS	12										
				7	SS	81										
				8	SS	51										
				9	SS	120										
				10	SS	94										
				11	SS	36										
				12	SS	17										
152.5	500.3			13	TV	PM										
13.7	51.5	Silty sand to sandy silt, with some clay and occ. gravel		14	SS	30										
		Dense to Very Dense		15	SS	61										
				16	SS	170										
146.2	479.8	Het. mix. of clayey silt, sand and gravel. (Glacial Till)														
21.9	72.0	shale fragments below el. 474.4 = 144.5 m		17	SS	100/3"										
142.9	468.8	Hard		18	BXL	80%										
25.3	83.0	Shale Bedrock		19	BXL	80%										
141.4	463.8	Sound														
26.8	88.0	End of Borehole														

METRIC

[illegible]

RECORD OF BOREHOLE No 11

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 842 341, E 294 896 ORIGINATED BY J.C.
DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 15 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
162.1	Ground Surface																
0.0	CLAYEY SILT TO SILT Traces of Sand Very Stiff		1	SS	23												
160.7																	
1.4	SILTY SAND TO SAND Traces of fines Dense to Very Dense		2	SS	37												
159.6																	
2.5	CLAYEY SILT TO SILT Traces of Sand Hard		3	SS	52												
158.1			4	SS	43												
4.0	SAND - Poorly Graded, Traces of Fines, Very Dense		5	SS	81												
157.7																	
4.4	CLAYEY SILT Trace of Gravel Some Sand Hard to Very Stiff (GLACIAL TILL)		6	SS	30												
			7	SS	89												
			8	SS	67												
			9	SS	29												
153.5																	
8.6	SANDY SILT Trace Gravel Trace Sand Occasional Seams of Sand Dense		10	SS	45												
152.5																	
9.6	End of Borehole																

RECORD OF BOREHOLE No 12

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 842 571, E 294 803 ORIGINATED BY L.O.
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 19 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
161.4	Ground Surface																
0.0	SANDY SILT Some Clay Very Stiff																
180.4			1	SS	24												
1.0	CLAYEY SILT TO SILT Some Sand Very Stiff to Hard (GLACIAL TILL)		2	SS	25												
			3	SS	19												
			4	SS	22												
	Some Gravel		5	SS	100	/30cm											
			6	SS	102	/25cm											
158.1			7	SS	100	/28cm											
5.3	SANDY SILT Trace to some Gravel Very Dense		8	SS	88												
154.3																	
7.1	SAND TO GRAVELLY SAND Traces of fines Very Dense		9	SS	77												
152.1			10	SS	86	/11cm											
9.3	End of Borehole																

RECORD OF BOREHOLE No 2

1 OF 1 METRIC

W.P. 804-89-00 FORMERLY 49-71-02 LOCATION Coords: N 4 842 634.4, E 294 775.1

ORIGINATED BY BRL

DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger

COMPILED BY BRL

DATUM Geodetic DATE 79/07/09

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa									
								20 40 60 80 100									
162.9	Ground Surface																
0.0	Glacial Till, Grey Very Stiff																
161.7																	
1.2	Silt, Grey, Compact to Dense With Occasional Thin Clay Layers		1	SS	20											0 49 49 2	
	Cloyey Silt		2	SS	35												
158.3			3	SS	60	/13cm										6 35 49 10	
4.6	Glacial Till Heterogeneous Mixture of Silt, Sand, Clay and Gravel Very Dense		4	SS	60	/10cm											
			5	SS	70												
			6	SS	60	/10cm										23 48 29 0	
	Shale Fragments		7	SS	111	/23cm											
151.0																	
150.6	Weathered Shale		8	SS	80	/15cm											
12.3	End of Borehole																
	Note: Borehole Caved in at 1.2 m Shortly After Completion of Boring																

RECORD OF BOREHOLE No 13

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 842 931. E 294 859 ORIGINATED BY T.C.
 DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 15 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
162.5	Ground Surface																
0.0	CLAYEY SILT TO SILT Trace Gravel Trace to some Sand Very Stiff to Hard		1	SS	58		162										
			2	SS	17												
			3	SS	122		160										
			4	SS	125												
			5	SS	149	/23cm	158										
157.3			6	SS	150	/28cm											
5.2	SILTY SAND Some Gravel Some Fines Dense		7	SS	32												
156.8			8	SS	150		156										
5.9	CLAYEY SILT Traces of Gravel Some Sand Hard		9	SS	112	/8cm	154										
155.4			10	SS	100	/8cm											
7.1	BEDROCK Weathered Grey Shale Hard																
152.9																	
0.6	End of Borehole																

RECORD OF BOREHOLE No 14

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 843 234, E 294 581 ORIGINATED BY T.C.
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 17 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					NATURAL MOISTURE CONTENT W	PLASTIC LIMIT W _p	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
163.7	Ground Surface																
0.0	CLAYEY SILT TO SILT Traces of Gravel Some Sand Hard (GLACIAL TILL)		1	SS	50												
			2	SS	129		162										
			3	SS	130												
			4	SS	119		160										
			5	SS	55												
158.5			6	SS	120	/8cm											
5.2	BEDROCK Gray Weathered Shale Hard		7	SS	55		158										
			8	SS	108	/23cm											
			9	SS	116	/15cm	156										
154.5			10	SS	126	/10cm											
9.2	End of Borehole																

RECORD OF BOREHOLE No 15

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 843 449, E 294 548 ORIGINATED BY T.C.
 DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 17 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20	40	60	80	100						20	40	60
164.4	Ground Surface																			
0.0	CLAYEY SILT Trace Gravel Some Sand						164													
163.4	(GLACIAL TILL)		1	SS	26															
1.0	SILTY SAND TO SAND Traces of Fines Compact		2	SS	27															
162.3																				
2.1	BEDROCK Weathered Grey Shale Hard		3	SS	65		162													
			4	SS	103															
			5	SS	117	/28cm														
			6	SS	117	/25cm	160													
			7	SS	140	/28cm														
			8	SS	120	/13cm	158													
			9	SS	120	/10cm														
155.1			10	SS	128	/13cm	156													
9.3	End of Borehole																			

RECORD OF BOREHOLE No. 6

CO-ORDS: N 4843 519, E 294 564

Geographic: N 15,851,000, E 96,400

49-21-04

ORIGINATED BY: PR

DST 6 HWY 427

BOREHOLE TYPE: Hollow Stem Auger

COMPILED BY: BR

DATUM: Geodetic

DATE: July 11, 1979

CHECKED BY:

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH (m)	ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	20	40	60	80	100		
169.7	556.7	Ground Surface											
0.0	0.0	Clay: intermediate plasticity, brown, very stiff.		1	SS	20							
166.9	547.7			2	SS	31							6 39 41 14
2.7	9.0	Glacial Till: Heterogeneous mixture of clay, silt, sand & gravel. Brown Grey, very stiff to hard		3	SS	35							
				4	SS	100/25"							14 44 31 11
				5	SS	58							
				6	SS	37							5 2 47 46
				7	SS	46							
				8	SS	63							
				9	SS	107							
154.6	507.2	Becoming more cohesive. Containing frequent shale fragments.		10	SS	116							
15.1	49.5	End of Borehole											
		Note: Hole open to 44 feet on completion.											

METRIC UNITS

RECORD OF BOREHOLE No 1

Co-ords: N 4 843 591, E 294 493

49-71-04

LOCATION Co-ords. N 15,891,045; E 966,184

ORIGINATED BY

6 HWY 427

BOREHOLE TYPE Hollow Stem Auger

COMPILED BY BPL

DATUM Geodetic

DATE July 16, 1979

CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	WATER CONTENT (%)	GR SA SI CL
168.8	553.8	Ground Surface											
0.0	0.0	Clay: low plasticity, very stiff, brown.											
166.4	545.8			1	SS	23							
2.4	8.0	Glacial Till: Heterogeneous mixture of clay, silt, sand & gravel. Hard		2	SS	65							
		Brown		3	SS	100							9 34 42 15
		Grey		4	SS	116							
		occ. shale fragments.		5	SS	43							17 39 34 10
		becoming more cohesive, containing frequent shale fragments.		6	SS	86							
				7	SS	100							
				8	SS	100							
154.8	507.8			9	SS	60							
14.0	46.0	End of Borehole											

METRIC UNITS

RECORD OF BOREHOLE NO. 5

Co-ORDS: N 4 843 605, E 294 562

49-71-04

U.S. ATLAS Co-ORDS: N 11,981,000; E 449,417

BOREHOLE TYPE Hollow Stem Auger

COMPLETED BY BRI

LOCATION

DATE July 11, 1979

CHECKED BY

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH (m)	ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60						80	100
SHEAR STRENGTH									WATER CONTENT (%)									
○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE																		
169.6	556.4	Ground Surface																
0.0	0.0	Clay: low to intermediate plasticity, very stiff, brown.		1	SS	21		550										
166.2	545.4			2	SS	25												
3.4	11.0	Glacial Till: Heterogeneous mixture of clay, silt, sand & gravel. Hard.		3	SS	44		540								3 12 70 15		
				4	SS	100/4"												
		silt, very dense		5	SS	165		530								0 10 85 5		
				6	SS	53												
				7	SS	36		520										
		containing numerous shale fragments		8	SS	62												
154.5	506.9			9	SS	134		510										
15.1	49.5	End of Borehole		10	SS	80												
<p>Note:</p> <p>1) Hole caved in at 21 feet after completion.</p> <p>2) Refusal to augering at 46 feet.</p>																		

METRIC UNITS

RECORD OF BOREHOLE No 16

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 843 738 E 294 508 ORIGINATED BY I.C.
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1984 08 17 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
165.3	Ground Surface																
0.0	CLAYEY SILT Trace to some Gravel Some Sand Stiff		1	SS	12												
			2	SS	11												
			3	SS	8												
			4	SS	12												
	(FILL MATERIAL)		5	SS	13												
160.9																	
4.4	CLAYEY SILT - (GLACIAL TILL) Trace Gravel Some Sand Very Stiff		6	SS	18												
160.1																	
5.2	SILTY SAND Trace to some Gravel Traces of Clay Very Dense (GLACIAL TILL)		7	SS	130	/23cm											
			8	SS	158	/25cm											
			9	SS	129	/28cm											
156.1																	
158.8	CL SI-Trace SA, Some GR - (TILL)		10	SS	121	/20cm											
9.5	End of Borehole																

RECORD OF BOREHOLE No. 1

Co-ords: N 4843 851, E 294 447

49-71-07

LOCATION Co-ords: N15,891,900; E966,035

ORIGINATED BY BRL

DIST 6 HWY 427

BOREHOLE TYPE 3 1/2" Diam. RSA and Cone Test

COMPILED BY BL

DATUM Geodetic

DATE August 10, 1979

CHECKED BY RS

SOIL PROFILE

SAMPLES

DYNAMIC CONE PENETRATION RESISTANCE PLOT

20 40 60 80 100

PLASTIC LIMIT

NATURAL MOISTURE CONTENT

LIQUID LIMIT

UNIT WEIGHT

REMARKS & GRAIN SIZE DISTRIBUTION (%)

DESCRIPTION

STRAT PLOT

NUMBER

TYPE

'N' VALUES

GROUND WATER CONDITIONS

ELEVATION SCALE

SHEAR STRENGTH

○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB VANE

W_p W W_L

WATER CONTENT (%)

γ

GR SA SI CL

Ground Level

Sandy silt, dark grey to grey, compact and slightly cemented.

Glacial Till

Silty sand, some gravel, very dense

Sand with gr., v. dense

Silty clay, some sand, reddish, hard.

Shale bedrock, fine texture and fissile, weathered.

End of Borehole

520

510

500

490

20 38 (42)
53 34 (13)
18 46 (36)

METRIC UNITS

ELEV
DEPTH
(m)

ELEV
DEPTH
(m)

160.9

0.0

158.8

2.1

154.2

6.7

151.6

9.3

148.4

12.5

141.0

137.0

133.0

129.0

125.0

121.0

117.0

113.0

109.0

105.0

101.0

97.0

93.0

89.0

85.0

81.0

77.0

73.0

69.0

65.0

61.0

57.0

53.0

49.0

45.0

41.0

37.0

33.0

29.0

25.0

21.0

17.0

13.0

9.0

5.0

1.0

0.0

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RECORD OF BOREHOLE No 17

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coors.: N 4 843 984, E 294 468 ORIGINATED BY T.C.
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 18 CHECKED BY B.B.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					NATURAL MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60	80	100	W _p	W		
168.1	Ground Surface															
0.0	CLAYEY SILT Trace to some Gravel Some Sand Stiff to Hard		1	SS	26											
			2	SS	26											
			3	SS	12											
			4	SS	11											
163.7	(FILL MATERIAL)		5	SS	11											
4.4	SILTY SAND INTERBEDDED WITH CLAYEY SILT Traces of Gravel Compact		6	SS	12											
			7	SS	24											
			8	SS	22											
161.0	(GLACIAL TILL)															
7.1	GRAVELLY SAND Traces of Fines Very Dense		9	SS	54											
158.8																
9.2	SANDY SILT, Trace Gravel Trace Clay, Very Dense		10	SS	105											
158.3																
9.6	End of Borehole															

RECORD OF BOREHOLE No 18

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 844 232, E 294 431 ORIGINATED BY T.G.
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 18 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa									
								20	40	60	80	100					
171.7	Ground Surface																
0.0	CLAYEY SILT Trace Gravel Some Sand Very Stiff (FILL MATERIAL)		1	SS	28												
169.8			2	SS	20												
2.1	CLAYEY SILT Trace to some Gravel Some Sand Very Stiff to Hard (GLACIAL TILL)		3	SS	23												
			4	SS	26												
			5	SS	32												
	Brown ----- Grey		6	SS	31												
			7	SS	27												
			8	SS	39												
			9	SS	138	/25cm											
163.1																	
8.6	SILTY SAND TO SAND Traces of Gravel Traces of Fines																
162.1			10	SS	61												
9.6	End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 19

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 844 556, E 294 384 ORIGINATED BY I.C.
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 18 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT			NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)						
								20	40	60	80	100	W _p	W	W _L				
178.1	Ground Surface																		
0.0	SANDY SILT Trace to some Gravel Some Sand Compact		1	SS	12														
174.3	(FILL MATERIAL)		2	SS	20														
1.8	CLAYEY SILT Trace to some Gravel Some Sand Stiff to Hard		3	SS	31														
			4	SS	14														
			5	SS	11														
170.9	(FILL MATERIAL)		6	SS	18														
5.2			7	SS	20														
	Brown		8	SS	31														
	Grey																		
	SILT TO CLAYEY SILT Trace Gravel Trace to some Sand Very Stiff to Hard (GLACIAL TILL)		9	SS	20														
166.5		10	SS	40															
9.6	End of Borehole																		

RECORD OF BOREHOLE No 1

METRIC

W P 153-80-02 LOCATION Co-ords. N 4 844 821.2; E 294 328.3 ORIGINATED BY V.P.
 DIST 6 HWY 427 BOREHOLE TYPE Rollow Stem Augers and Cone Test COMPILED BY V.P.
 DATUM Geodetic DATE 81-12-10 to 81-12-11 CHECKED BY GP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100						
171.9	Ground Surface												
0.0													
	Mottled		1	SS	9								2-20-45-33
			2	SS	13								
			3	SS	29								
	Brown Grey		4	SS	27								
	(Glacial Till)		5	SS	21								3-20-57-20
	Silty Clay with Sand trace of Gravel		6	SS	35								
			7	SS	14								
	Stiff to Hard		8	SS	16								
			9	SS	53								
			10	SS	37								0-28-42-30
160.0													
11.9	Silty Sand Dense		11	SS	37								
158.0	Boulder		12	BC	-								
13.9	Break corebarrel in borehole Abandon hole End of Borehole												
	* Borehole caved at shallow depth. Perched water level at 0.5 metres.												

RECORD OF BOREHOLE No 5

METRIC

W P 153-80-02 LOCATION Co-ords. N 4 844 920.5 E 294 356.5 ORIGINATED BY V.P.
 DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger/BW Casing and Cone Test COMPILED BY V.P.
 DATUM Geodetic DATE 81-12-16 to 81-12-17 CHECKED BY SP.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40						60	80	100	WATER CONTENT (%)	10	20	30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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RECORD OF BOREHOLE No 2

METRIC

W P 88-78-22 LOCATION Co-ords. N 4 845 140.9; E 294 264.6 ORIGINATED BY R.Z.
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY R.Z.
DATUM Geodetic DATE 82 05 14 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
172.1	Ground Level																
0.0	(Glacial Till)																
	Mottled		1	SS	7												
	Firm		2	SS	20												
	Silty Clay with Sand		3	SS	45												
	Trace of Gravel		4	SS	58												
	Brown		5	SS	47												
	Gray		6	SS	52												
	occ. Sand Seams																
	Very Stiff to Hard																
165.7			7	SS	100/	28 cm											
6.4	(Glacial Till)																
	Silt to Silty Clay		8	SS	100												
	and Sand																
	Varying amounts of																
	Gravel																
	occ. Cobbles and																
	Boulders Hard		9	SS	100/	23 cm											
162.5																	
9.6	End of Borehole																

+3, x⁵: Numbers refer to
Sensitivity

20
15
10
5 (% STRAIN AT FAILURE)

RECORD OF BOREHOLE No 20

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 845 292 E 294 270 ORIGINATED BY L.O.
DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 19 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
179.4	Ground Surface																
0.0	CLAYEY SILT Trace Gravel Trace to some Sand Firm to Stiff		1	SS	6	DRY											
			2	SS	18		178										
			3	SS	14												
			4	SS	6		176										
			5	SS	13												
			6	SS	12												
173.7	(FILL MATERIAL)		7	SS	15		174										
5.7	CLAYEY SILT Trace Gravel Trace to some Sand Stiff to Hard (GLACIAL TILL)		8	SS	24												
			9	SS	83		172										
169.8			10	SS	50		170										
9.6	End of Borehole																

APPENDIX 'A'

DETAILS OF HIGH MAST LIGHTING POLES

W.P. 615-89-00
HWY 427 ILLUMINATION
FROM NORTH OF FASKEN DR.
TO SOUTH OF STEELES

HML POLE NO.	HWY 427 STATION	OFFSET FROM CL (m)	SIDE	EXISTING ELEVATION	PROP. FINAL ELEV. AT TOP OF FOOTING	POLE HEIGHT (m)
P1	10+405.0	CL		168.64	169.94	30
P2	10+579.5	CL		166.57	168.53	30
P3	10+749.0	CL		165.28	167.17	30
P4	10+912.5	CL		164.51	166.09	30
P5	11+071.0	CL		164.51	166.27	35
P6	11+149.0	129	EAST	164.78	164.75	35
P7	11+228.0	59	EAST	160.46	160.50	40
P8	11+244.5	80	WEST	159.60	159.50	35
P9	11+265.0	160.3	EAST	159.74	159.84	35
P10	11+311.8	176	WEST	161.40	161.75	35
P11	11+341.0	65.5	EAST	161.90	162.19	40
P12	11+383.0	61.5	WEST	165.26	165.39	40
P13	11+506.0	92	WEST	171.16	171.00	30
P14	11+501.0	CL		167.68	169.33	35
P15	11+637.5	36.5	WEST	168.55	168.20	35
P16	11+761.0	CL		169.96	171.13	35
P17	11+895.5	CL		170.54	171.89	35
P18	12+042.0	CL		171.81	173.08	35
P19	12+191.0	CL		172.44	174.10	30
P20	12+352.0	CL		173.09	174.55	30
P21	12+519.0	CL		172.05	174.11	30
P22	12+684.0	CL		170.91	172.72	30
P23	12+849.0	CL		169.49	171.13	30
P24	13+013.5	CL		167.96	169.55	30
P25	13+178.0	CL		166.66	168.23	30
P26	13+339.5	CL		165.91	167.46	30

Note:

Pole elevation at centre median is top of median barrier wall.

W.P. 615-89-00
HWY 427 ILLUMINATION
FROM NORTH OF FASKEN DR.
TO SOUTH OF STEELES

HML POLE NO.	HWY 427 STATION	OFFSET FROM CL (m)	SIDE	EXISTING ELEVATION	PROP. FINAL ELEV. AT TOP OF FOOTING	POLE HEIGHT (m)
P27	13+484.0	CL		165.51	166.93	30
P28	13+626.5	CL		164.76	166.48	35
P29	13+713.5	69	EAST	165.52	165.52	30
P30	13+778.0	CL		164.32	165.97	35
P31	13+845.0	85	EAST	168.83	168.50	40
P32	13+914.0	78.5	WEST	168.64	169.00	40
P33	14+003.5	CL		163.39	165.19	35
P34	14+054.0	65.0	WEST	165.81	165.81	30
P35	14+178.0	CL		162.87	164.58	35
P36	14+337.5	CL		162.40	164.02	30
P37	14+504.0	CL		161.88	163.46	30
P38	14+670.0	CL		161.38	163.16	30
P39	14+803.0	CL		161.84	163.53	30
P40	14+972.0	CL		162.27	164.23	30
P41	15+139.0	CL		162.79	165.03	30
P42	15+290.0	CL		163.27	165.56	30
P43	15+453.0	CL		164.09	165.92	35
P44	15+582.0	66.4	EAST	166.72	166.72	30
P45	15+613.0	CL		164.51	166.35	35
P46	15+702.0	79.5	EAST	169.82	170.25	40
P47	15+751.5	68.3	WEST	169.68	170.00	40
P48	15+818.0	CL		165.26	167.09	35
P49	15+879.0	84.5	WEST	166.30	166.00	30
P50	15+971.0	CL		165.34	167.99	35
P51	16+130.0	CL		168.07	169.83	35
P52	16+299.0	CL		170.50	172.24	30
P53	16+639.0	CL		172.94	174.52	30
P54	16+803.0	CL		175.07	176.86	30
P55	16+967.0	CL		177.09	179.18	30
P56	17+131.0	CL		179.40	181.38	30
P57	17+275.0	2.5	WEST	180.47	181.07	35
P58	17+455.0	2.5	WEST	179.61	180.33	40
P59	17+630.0	2.5	WEST	179.44	179.93	40

Note:

Pole elevation at centre median is top of median barrier wall.

APPENDIX 'B'

NSSP FOR HIGH MAST LIGHTING POLES 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.

3. Structural Section D. Wong

Initiated by

Detailed by

Approved by

EXPLANATION OF TERMS USED IN REPORT

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

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

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

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

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

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

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

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

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

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

JOINTING AND BEDDING:

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

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

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

STRESS AND STRAIN

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

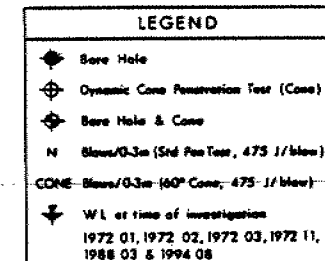
MECHANICAL PROPERTIES OF SOIL

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

PHYSICAL PROPERTIES OF SOIL

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

SHEET

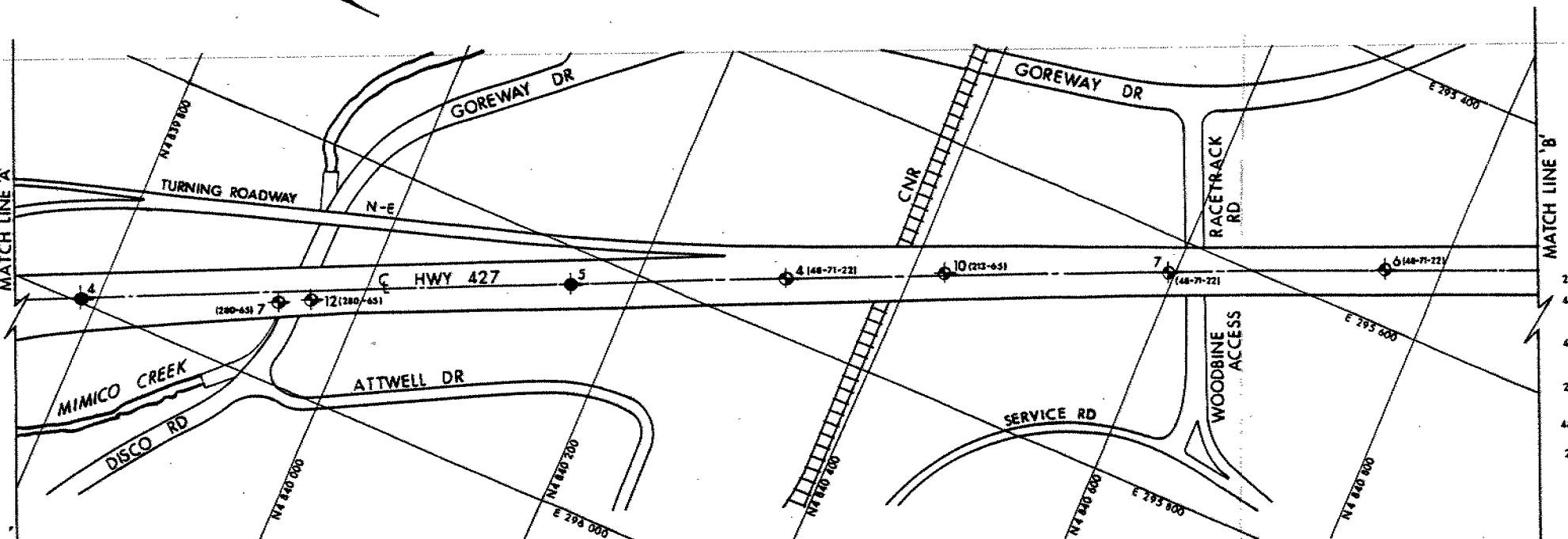


No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	165.9	4 838 995	296 386
2	164.5	4 839 198	296 285
3	163.0	4 839 483	296 919
4	166.7	4 839 786	295 937
5	171.8	4 840 131	295 829
6	167.4	4 838 605	296 492
17	159.7	4 839 441	296 191
19	161.3	4 839 425	296 133
10	160.3	4 839 462	296 279
12	163.4	4 839 511	296 165
13	163.6	4 839 549	296 106
14	161.1	4 839 586	296 061
7	155.7	4 839 936	295 936
12	155.6	4 839 961	295 924
4	173.0	4 840 310	295 753
6	171.1	4 840 735	295 558
7	165.3	4 840 593	295 629
10	165.9	4 840 425	295 701

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, Department, information contained in this report and related documents is specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen Cont.

REV				
DATE	BY	DESCRIPTION		
Geocore No 30M12-224				
HWTY No 427			DIST 6	
SUBNO KA	CHECKED KA	DATE 1994 11 17	SITE	
DRAWN DT	CHECKED DT	DATE 1994 11 17	DWG 6158900-A	



40m 0 40m

NOTE
For Soil details refer to
Record of Borehole Sheets

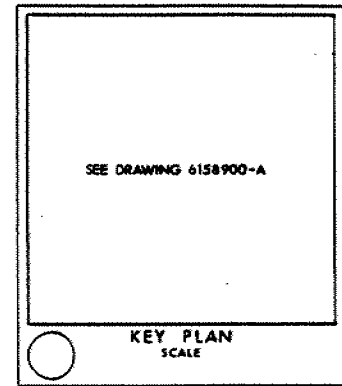
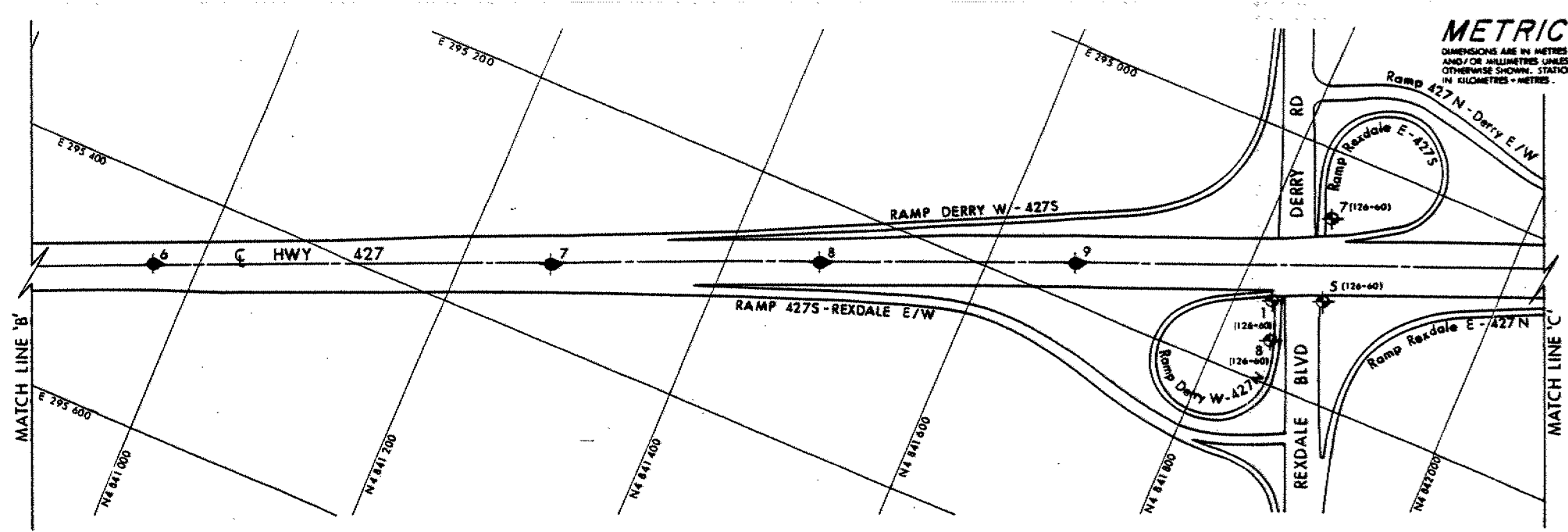
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES - METRES.

CONT No
WP No 615-89-00



HIGH MAST LIGHTING
HWY 427 FROM CAMPUS RD
FASKEN DR TO STEELES AVE
BORE HOLE LOCATIONS & SOIL STRATA

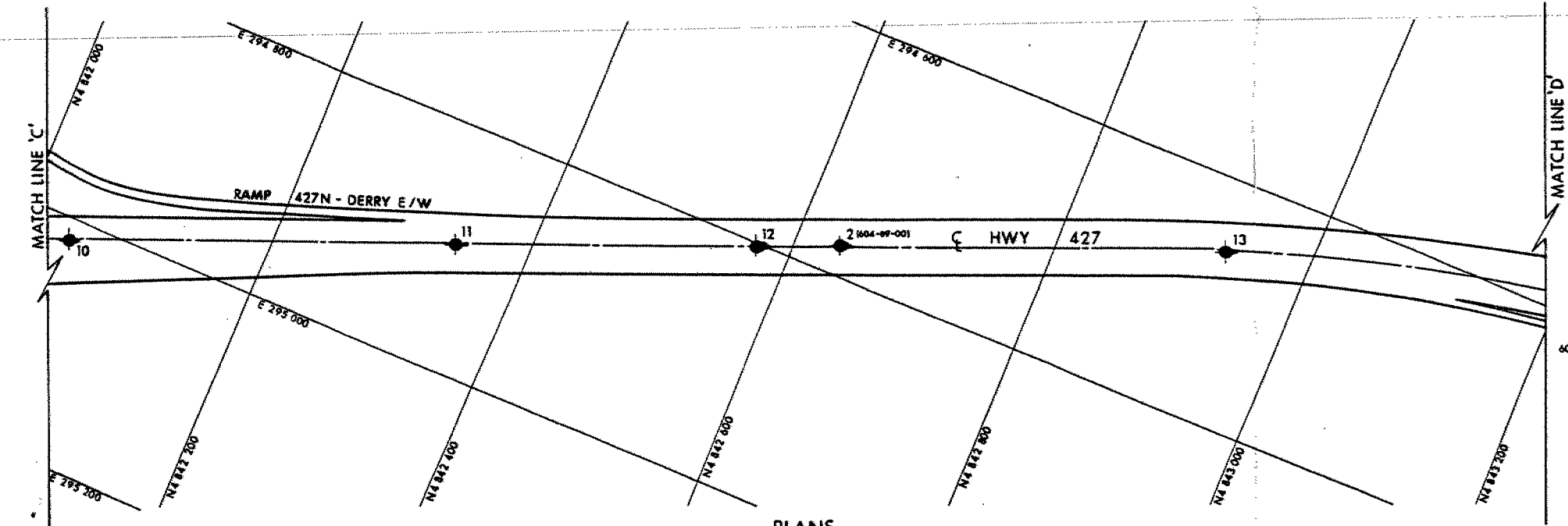
SHEET



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 1/blow)
- CONE Blows/0.3m (60° Cone, 475 1/blow)
- ✚ Wt at time of investigation
1972 03, 1973 02, 1979 07 &
1994 08

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
6	168.7	4 840 964	295 467
7	166.3	4 841 267	295 339
8	165.5	4 841 472	295 251
9	164.6	4 841 669	295 169
10	163.1	4 842 042	295 018
11	162.1	4 842 341	294 896
12	161.4	4 842 571	294 803
13	162.5	4 842 931	294 659
1	168.4	4 841 828	295 134
5	168.2	4 841 866	295 119
7	168.0	4 841 846	295 053
8	168.1	4 841 840	295 165
2	162.9	4 842 634	294 775



PLANS
SCALE
40m
0
40m

NOTE
For Soil details refer to
Record of Borehole Sheets

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 included in
accordance with the conditions of Section GC 2.01 of OPS Gen Con

DATE	BY	DESCRIPTION
1994 11 17	SA	Site
1994 11 17	SA	Site
1994 11 17	SA	Site

Geocore No 30M12-224

HWY No 427

SUMMIT K.A. (CHECKED) DATE 1994 11 17 SITE

DRAWN BY (CHECKED) DATE 1994 11 17 SITE

DWG 6158900-8

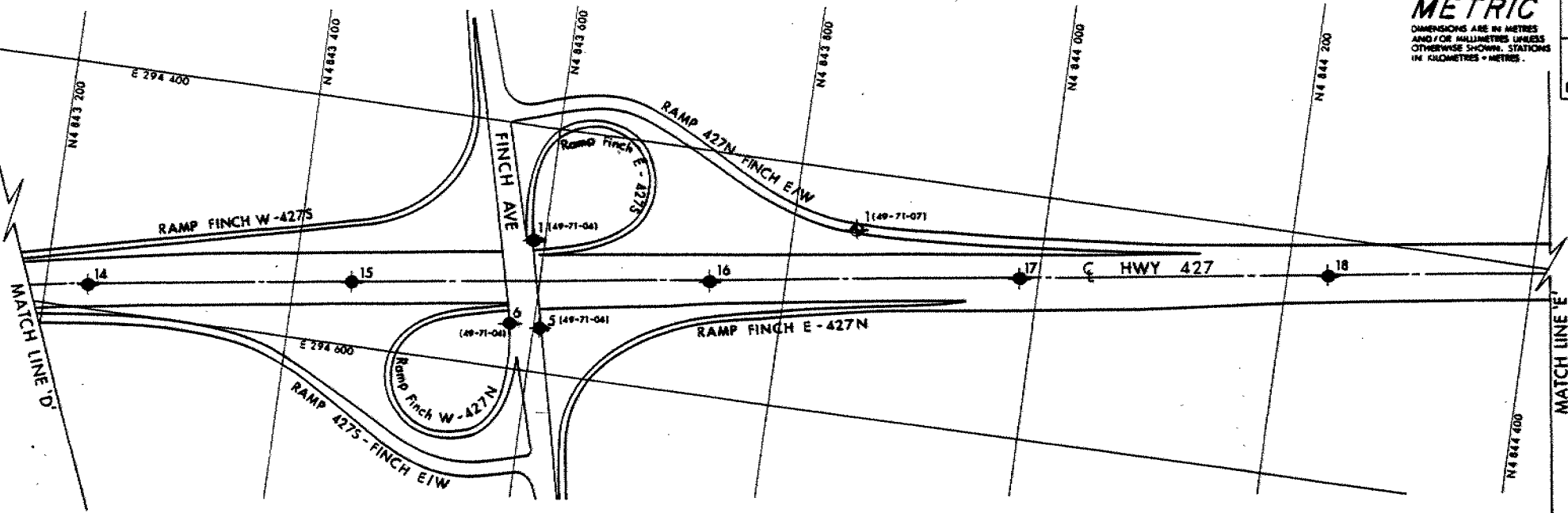
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES - METRES.

CONT No
WP No 615-89-00



HIGH MAST LIGHTING
HWY 427 FROM CAMPUS RD7
FASKEW DR TO STEELES AVE
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



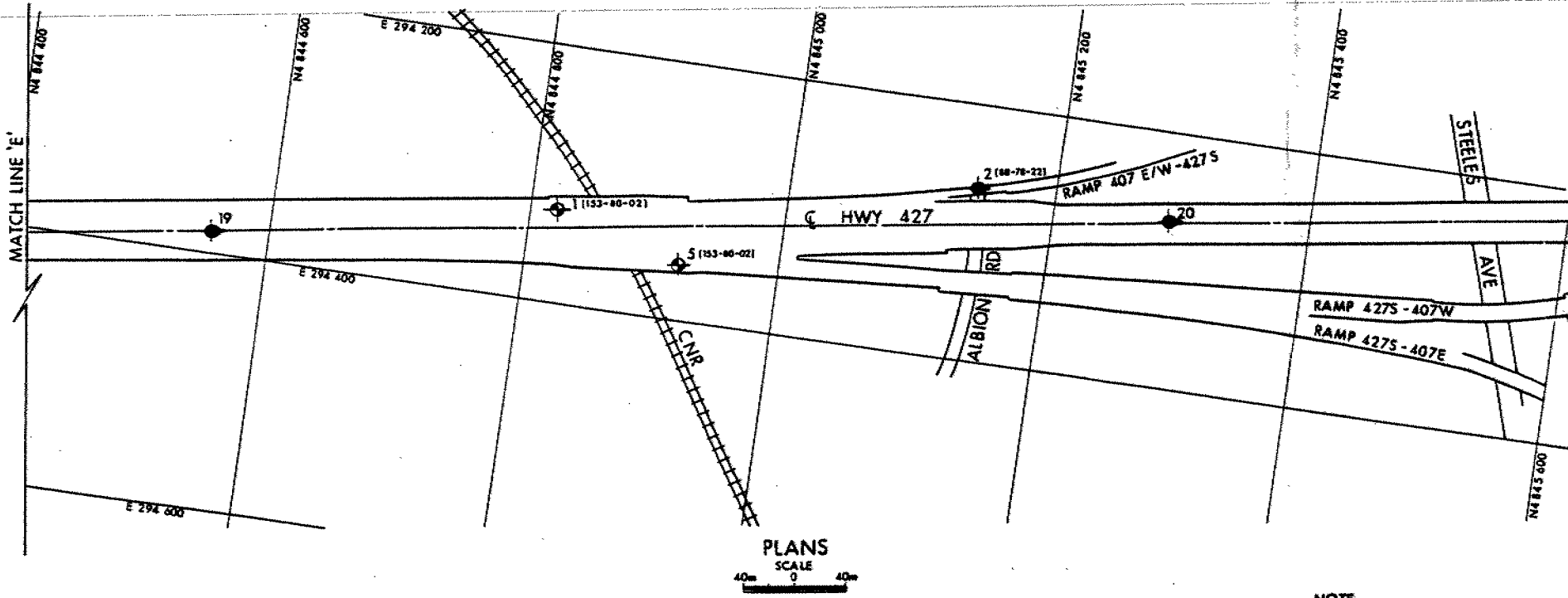
SEE DRAWING 6158900-A

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
1979 07, 1979 08, 1981 12,
1982 05 & 1994 08

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
14	163.7	4 843 234	294 581
15	164.4	4 843 449	294 548
16	165.3	4 843 738	294 506
17	168.1	4 843 984	294 468
18	171.7	4 844 232	294 431
19	176.1	4 844 556	294 384
20	179.4	4 845 292	294 270
49-71-04	1	168.8	4 843 591
49-71-07	5	169.6	4 843 603
153-80-02	1	169.7	4 843 579
88-78-22	1	160.9	4 843 851
	5	171.9	4 844 821
	1	171.5	4 844 921
	2	172.1	4 845 141



PLANS
SCALE
0 40m

NOTE
For Soil details refer to
Record of Borehole Sheets

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. Information contained in
this report and related documents is specifically excluded in
accordance with the conditions of Section GC 2.01 of OPS Gen Card

REV.	DATE	BY	DESCRIPTION
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GEOCRES No. 30M12-224DIST. 6 REGION W.P. No. 615-89-00CONT. No. W. O. No. STR. SITE No. HWY. No. 427LOCATION Hwy 427 Widening
 Campus Rd / Farker Dr. to Steeles Ave.No of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

memorandum



To: H. Shah
Highway Engineering
Central Region

December 5, 1996

From: Pavements and Foundations Section
Room 315 Central Building

Phone: 235-3731

Re: Subsurface Information for Jacking and Boring Operation
WP 202-95-00 Hwy 427 Widening from Hwy 409 n'ly to Steeles Ave.
Central Region

At the final engineering review meeting held on November 14, it was observed that this contract will include a number of jack and boring operations along the length of the project. Under normal circumstances, a foundation request would have been issued to investigate the subsurface conditions at each of the proposed jack and bore locations. Given the time constraints, an investigation is not possible. It was requested instead that existing subsurface information be provided, if available.

From fieldwork carried out for the high mast lighting poles and existing structures along this stretch of Highway 427, borehole information within 100m +/- of each of the jacking and boring locations was identified. It is intended that the borehole data be used for information purposes only to enable the contractor to bid the job more accurately and to provide some sense of the general subsurface conditions. In some instances the site conditions may have changed due to construction following the foundation investigation. If the contractor feels that the information is not adequate, the contractor is free to carry out an investigation to verify the subsurface conditions to his satisfaction. An NSSP prepared for this item should perhaps make this point clear.

The following subsurface information for the jack and boring operations was obtained from the Foundation Investigation and Design Report for HML (WP 615-95-00). The stations mentioned are approximate only.

1. Jack and Bore at Hwy 427, Sta 11+100
Borehole 2 (~Sta 11+000)
2. Jack and Bore at Hwy 427, Sta 11+400
Borehole 13 (~Sta 11+400)
3. Jack and Bore, Ramp 409W - 427 N
Borehole 10

4. Jack and Bore at Hwy 427, Sta 12+820
5. Jack and Bore at Hwy 427, Sta 13+025
Borehole 6 (~Sta 12+930)
6. Jack and Bore at Hwy 427, Sta 14+540
Borehole 11 (~Sta 14+425)
7. Jack and Bore at Hwy 427, Sta 15+450
Borehole 14 (~Sta 15+370)
8. Jack and Bore at Hwy 427, Sta 16+250
Borehole 17 (~Sta 16+130)

Please find attached the borehole log sheets for each of the jack and boring operations and plans showing the jack and bore locations to apply them to. The borehole locations are not plotted because the northing and easting grid could not be deciphered on the plans provided.

Also appended is the latest version of the new End Result Specification for Jacking and Boring, as well as a draft NSSP advising the Contractor to be aware of and be prepared for the conditions that might be encountered at the sites.

If there are any questions or comments, please advise.



Betty Bennett, P.Eng.
Foundation Engineer
Ph: -4333

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 839 198 E 296 285 ORIGINATED BY LO
DIST 8 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY LO
DATUM Geodetic DATE 1994 08 09 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
164.5	Ground Surface																
0.0	CLAYEY SILT Traces of Gravel Some Sand Stiff to Very Stiff		1	SS	23												
	Sand		2	SS	15												
161.8	(FILL MATERIAL)		3	SS	18												
2.9	Trace Organics		4	SS	17												
			5	SS	14												
	CLAYEY SILT Traces to Some Gravel Some Sand Stiff to Hard (GLACIAL TILL)		6	SS	28												
			7	SS	50												
	Brown		8	SS	63												
	Grey		9	SS	21												
155.1			10	SS	75	/15cm											
9.4	End of Borehole																
	* WATER LEVEL NOT ESTABLISHED DUE TO THE WALLS CAVING AT 8 FEET.																

RECORD OF BOREHOLE NO 13

Co-ords N 4839 549, E 296 106

JOB 22-11015

LOCATION 15, 372, 740 N. 971, 372 E.

ORIGINATED BY J. L.

W.P. 404-55

BOREHOLE DATE Feb. 17, 1962

COMPILED BY J. L.

DATUM Geodetic

BOREHOLE TYPE Penn Drill Washburn,

CHECKED BY

SOIL PROFILE				SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS				
ELEV. DEPTH	ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	SHEAR STRENGTH P.S.F.							
													○ UNCONFINED + FIELD VANE				● QUICK TRIAXIAL x LAB VANE			
													WATER CONTENT %							
163.6	536.7	Ground elevation																		
0.0	0.0	Fill material. Clayey silt, with some sand & trace of gravel. Very stiff to hard.		1	SS	27										161.6 m = 21.530 y. 2				
				2	SS	15	530									10 29 40 15				
				3	SS	38														
159.9	524.7			4	SS	48														
3.7	12.0	Het. mixture of clayey silt, sand & gravel. (Brown) (Grey) Glacial Till.		5	SS	59	520													
				6	SS	78														
				7	SS	37														
				8	SS	24	510													
				9	SS	28														
52.9	501.7			10	SS	007"	500													
10.7	35.0	Silt to sandy silt, with trace of gravel. Very dense - Grey.		11	SS	007"														
				12	SS	087"	490													
49.0	490.7			13	SS	110														
14.0	46.0																			
				14	SS	100"	480													
46.2	479.7																			
17.4	57.0	Silty sand.		15	SS	100"	470													
11.2	463.2	With fragments of shale.																		
				16	RC BXL	Rec. 100"	460													
22.4	73.5	Shale bedrock Sound - Grey																		
19.8	458.8																			
13.7	77.9	End of borehole.																		
							450													

RECORD OF BOREHOLE NO 10

FOUNDATIONS OFFICE

COORDINATES: N 4839 462, E 296 279

JOB 72-11016

LOCATION: 11,377,500 N. 923,044 E.

WP 414-05

BORING DATE Feb. 10, 1972

DATUM Geodetic

BOREHOLE TYPE Penn Drill

ORIGINATED BY V.K.

COMPILED BY J.S.P.

CHECKED BY

SOIL PROFILE				SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT w_L			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS/FOOT	BLOWS / FOOT					PLASTIC LIMIT w_p				
								20 40 60 80 100					WATER CONTENT w				
								SHEAR STRENGTH P.S.F.					WATER CONTENT %				
								O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE					w_p w w_L				
50.3	526.0	Ground surface.												P.C.F.	GR.SA.SI.CL		
		Het. mixture of clayey silt, sand & gravel. (Brown) (Grey)		1	SS	58											
		Glacial Till. Very stiff to hard.		2	SS	69											
				3	SS	40											
				4	SS	26											
				5	SS	24											
53.3	505.0			6	SS	34											
0.4	21.0	Sandy silt with some gravel.		7	SS	72											
2.1	499.0	Very dense - Grey.		8	SS	56											
0.2	27.0			9	SS	67											
4.1	491.0			10	SS	100/5"											
0.7	35.0	Sandy silt to silt with some gravel. Very dense - Grey.		11	SS	100/5"											
	481.0			12	SS	100/5"											
0.7	45.0			13	SS	100/5"											
0.1	476.0			14	SS	151/10"											
2	50.0	With fragments of shale.															
2.0	456.0	Probable bedrock.															
0.3	70.0	End of borehole.															

RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 840 984, E 295 487 ORIGINATED BY LQ
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY LQ
DATUM Geodetic DATE 1994 08 11 CHECKED BY BB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
168.7	Ground Surface																
0.0	CLAYEY SILT Trace Gravel Some Sand SUIT		1	SS	13		168										
168.9	(FILL MATERIAL)		2	SS	11												
1.8			3	SS	14		166										
			4	SS	21												
	Brown		5	SS	29												
	Grey		6	SS	13		164										
	CLAYEY SILT TO SILT Trace to some Gravel Trace to some Sand Firm to Hard (GLACIAL TILL)		7	SS	11												
			8	SS	11		162										
			9	SS	6												
			10	SS	23		160										
158.3			11	SS	40												
10.4	End of Borehole																

RECORD OF BOREHOLE No 11

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 842 341, E 294 898 ORIGINATED BY T.C.
DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
DATUM Geodetic DATE 1994 08 15 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20 40 60 80 100										10 20 30		
162.1	Ground Surface																			
0.0	CLAYEY SILT TO SILT Traces of Sand Very Stiff		1	SS	23															
160.7																				
1.4	SILTY SAND TO SAND Traces of fines Dense to Very Dense		2	SS	37															
159.6			3	SS	52															
2.3	CLAYEY SILT TO SILT Traces of Sand Hard		4	SS	43															
158.1			5	SS	81															
4.0 157.7	SAND — Poorly Graded, Traces of Fines, Very Dense		6	SS	30															
4.4	CLAYEY SILT Trace of Gravel Some Sand Hard to Very Stiff (GLACIAL TILL)		7	SS	88															
			8	SS	67															
			9	SS	29															
153.5																				
8.6 152.5	SANDY SILT Trace Gravel Trace Sand Occasional Seams of Sand Dense		10	SS	45															
9.6	End of Borehole																			

RECORD OF BOREHOLE No 14

1 OF 1

METRIC

W.P. 815-89-00 LOCATION Coords.: N 4 843 234 E 294 581 ORIGINATED BY T.G.
 DIST 8 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.O.
 DATUM Geodetic DATE 1994 08 17 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
163.7	Ground Surface													
0.0	CLAYEY SILT TO SILT Traces of Gravel Some Sand Hard (GLACIAL TILL)		1	SS	50									
			2	SS	129		162							
			3	SS	130									
			4	SS	119									
			5	SS	55		160							
158.5			6	SS	120	/8cm								
5.2	BEDROCK Grey Weathered Shale Hard		7	SS	55		158							
			8	SS	106	/23cm								
			9	SS	118	/15cm	156							
154.5			10	SS	126	/10cm								
9.2	End of Borehole													

RECORD OF BOREHOLE No 17

1 OF 1

METRIC

W.P. 615-89-00 LOCATION Coords.: N 4 843 984, E 294 488 ORIGINATED BY T.G.
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY L.Q.
DATUM Geodetic DATE 1994 08 18 CHECKED BY B.B.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
168.1	Ground Surface																
0.0	CLAYEY SILT Trace to some Gravel Some Sand Stiff to Hard		1	SS	28												
			2	SS	28												
			3	SS	12		166										
			4	SS	11												
163.7	(FILL MATERIAL)		5	SS	11		164										
4.4	SILTY SAND INTERBEDDED WITH CLAYEY SILT Traces of Gravel Compact		6	SS	12												
			7	SS	24												
			8	SS	22		162										
161.0	(GLACIAL TILL)																
7.1	GRAVELLY SAND Traces of Fines Very Dense		9	SS	54		160										
158.8																	
158.3	SANDY SILT, Trace Gravel Trace Clay, Very Dense		10	SS	105	/25cm											
9.6	End of Borehole																