

GEOCRES No. 30M15-39DIST. 6 REGION W.P. No. 44-71-20CONT. No. W. O. No. STR. SITE No. HWY. No. 401LOCATION THICKSON RD(N.W. QUADRANT) & HWY 401No of PAGES - 1

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FOUNDATION
INVESTIGATION & DESIGN
REPORT

SOIL MECHANICS SECTION

ENGINEERING SERVICES BRANCH
GEOTECHNICAL OFFICE



Ontario

Ministry of
Transportation and
Communications



FOUNDATION INVESTIGATION & DESIGN REPORT

W.P. 44 - 71 - 20

DIST. 6

HWY. 401

STR. SITE

Whitby North Service Road relocation
at Hwy 401 and Thickson Road inter-
change & Corbett Creek culvert

DISTRIBUTION

G.C.E. Burkhardt (3)
R.S. Pillar
C.S. Grebski
B.J. Giroux
G.A. Wrong
M.R. Ernesaks
R.D. Gunter
H. Greenland

R. Hore
J. Anderson)
R. Fitzgibbon) cover only
G. Sloan)
Files ✓

SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	Jan 31 / 77	M.D.
TUBES	April 10 / 77	M.D.
ROCK CORES	—	—

INTRODUCTION

It is proposed to relocate the North Service Road between Thickson Rd. and Hopkins Street as part of the reconstruction program for Hwy. 401 east of Whitby. The Regional Municipality of Durham will be carrying out design, tendering and property acquisition on behalf of the Ministry, under a legal agreement. Since the municipality does not have the capability of carrying out foundation investigation for the Corbett Creek Crossing, they have requested that the Ministry do the required work for them.

In a memorandum dated August 12th, 1976 Mr. W. Kulmatickas of the Regional Structural Planning office requested the Soil Mechanics Section to carry out a foundation investigation at the site of the proposed crossing.

Following this request this section carried out a foundation investigation to determine the subsoil and groundwater conditions existing at the site.

After completion of the field work a detailed memorandum dated November 25, 1976 was issued by this office describing the results of the subsurface investigation and giving recommendations pertaining to the design and construction of the foundations of the proposed culvert and approach fills. However a detailed report was still required. This report contains the results of that investigation and recommendations pertaining to the design and construction of the foundations of the proposed culvert and approach fills.

SITE DESCRIPTION AND GEOLOGY

The site of the proposed crossing is approximately 900 feet west of Thickson Road and about 1300 feet north of Hwy. 401 between Whitby and Oshawa.

Corbett Creek drains the surrounding fields and empties into Lake Ontario about a mile and half from the site. At the proposed crossing the creek is about 15 feet wide and approximately 1.5 feet deep as observed during the field investigation. The existing service road crosses the creek about 900 feet downstream from the site and the existing 10' X 6' concrete box culvert shows no signs of cracking or differential settlement.

Topographically, the general area is flat to gently rolling, sloping down to the creek from the east and from the west. While the site is located in a field presently used for pasture, land use in the surrounding area along Thickson Rd. is residential.

Physiographically, the site is located in the region referred to as the "Iroquois Plain". This is the lowland bordering Lake Ontario which was inundated in the Pleistocene time by Lake Iroquois. Subsoil in this area generally consists of lacustrine deposits overlying glacial till.

FIELD AND LABORATORY INVESTIGATION PROCEDURES

An initial field investigation was carried out from August 24 to August 27, 1976. A total of three sampled boreholes, two of which were accompanied by dynamic cone penetration tests, were put down at the site of the proposed crossing. These boreholes (B. H. 1, 1A & 2) were advanced using a track mounted auger machine equipped with hollow stem augers.

Two additional investigations were subsequently carried out on October 1, 1976 and from October 25 to October 29, 1976 to supplement the information obtained in the initial investigation. These subsequent investigations consist of three boreholes (B.H. 3, 4 & 5) in which continuous field vane tests were carried out and one sampled borehole (B.H. 7) in which continuous Shelby tube samples were recovered.

The locations and elevations of the boreholes were surveyed by personnel from the Regional Municipality of Durham and are shown on drawing No. 447120-A.

Disturbed samples were recovered by means of a 2 inch. O.D. split spoon sampler driven in accordance to the specifications of the Standard Penetration Test. Relatively undisturbed samples were recovered using 2 inch and 3 inch I.D. Shelby tubes which were pushed manually or hydraulically into the soil. Field vane tests were carried out to obtain the in-situ undrained shear strength of the cohesive stratum.

Samples were visually examined and identified in the field and again in the laboratory. Laboratory testings were carried out on representative samples

to determine:

- Atterberg Limits
- Natural moisture content
- Organic content
- Bulk density
- Grain-size distribution
- Undrained shear strength
- Consolidation characteristics

The results of the Field and Laboratory testing are summarized on the Record of Borehole Log Sheets; on the Grain-size envelope, Figures 1 and 2; on the Plasticity Charts, Figures 3 and 4; on the Consolidation Curves, Figure 5; and on the Undrained Shear Strength vs Depth profile, Figure 6.

SUBSURFACE CONDITIONS

General

The overburden at the site as revealed by our borings is comprised of two lacustrine deposits, overlying a glacial till. From ground surface downward, the lacustrine deposits consists of an 8 foot thick layer of very soft to soft organic material, followed by a 26 foot to 31 foot thick very soft to soft clayey silt to silty clay. The underlying glacial till is a heterogenous mixture of clayey silt, sand and gravel. A detailed description of the subsoil types is given below:

Organic Material

This deposit extends to a depth of approximately 8 feet below the ground surface. It consists of organic silt with inclusions of roots, shell fragments, decayed and undecayed vegetation. The organic content of this material is as high as 87% by weight and generally decreases with depth. Its colour varies from black to light brown.

The undrained shear strength as measured by field vane tests range from 200 to 930 p.s.f. and generally decreases with depth. The high range of shear strength values is attributed to the presence of roots and undecayed

vegetation.

Standard Penetration Test 'N' values were observed to be 1 blow for 18 inches. Based on the 'N' values together with the undrained shear strengths the consistency of the organic material is estimated to be generally very soft to soft.

Clayey Silt to Silty Clay

Underlying the organic deposit is a stratum of clayey silt to silty clay, the thickness of which is estimated to be 26 feet to 31 feet thick. This material contains occasional seams of silt and sand. Pockets of organics were also encountered in the upper portion of the stratum. In the lower 8 foot portion of the stratum alternate layers of dark grey and light grey clayey silt to silty clay were encountered.

In the upper 6 feet of this deposit undrained shear strengths as measured by field vane tests were as low as 80 p.s.f. Below this very soft layer shear strength increases with depth from about 200 p.s.f. to about 450 p.s.f. at a depth of 35 feet below ground surface.

The following physical properties of this cohesive strata were obtained from laboratory and field testing:

	<u>Range</u>	<u>Average</u>
Natural Moisture Content (W)%	47 - 62	53
Liquid Limit (W_L)%	20 - 47	36
Plastic Limit (W_p)%	11 - 21	16
Liquidity Index (I_L)%	1.3 - 6.1	2.1
Bulk Density (γ) p.s.f.	96 - 107	104
<u>Undrained Shear Strength (C_u) psf</u>	<u>Range</u>	<u>Sensitivity</u>
Field Tests	80 - 500	2 - 9
Laboratory Tests	80 - 440	2 - 9
<u>Consolidation Tests (Four tests)</u>		
Initial void ratio (e_o)	1.3 - 2.2	
Compression index (C_c)	0.85 - 1.98	

Based on the above undrained shear strength measurements the consistency of the cohesive stratum varies with depth from very soft to soft.

Glacial Till

Underlying the clayey silt to silty clay stratum is a glacial deposit of a heterogeneous mixture of clayey silt, sand and gravel, a glacial till. The upper boundary of this deposit was encountered at depths from 34 to 39 feet below ground surface. On the basis of Standard Penetration 'N' values ranging from 54 blows per foot to 100 blows for 2 inches the consistency of this material in general is classified as hard, with the exception of the upper 5 feet where the glacial till has been reworked and exhibits a firm to stiff consistency.

Groundwater Conditions

The groundwater level at the site was close to the ground surface. Local information indicates that the area surrounding the creek is inundated during the spring season.

EXISTING CULVERT

It was decided to carry out an additional borehole at the location of the existing crossing of the North Service Road over Corbett Creek. The purpose was to compare the subsurface conditions at this location to those at the location of the proposed Corbett Creek crossing. The investigation revealed the subsurface conditions are generally favourable at the existing service road culvert. This indicates that the conditions are somewhat improving towards Hwy. 401. The results of this additional borehole is not included in this report but are retained in our files for any future reference.

DISCUSSION AND RECOMMENDATIONS

It is proposed to realign the north service road of Hwy. 401 between Thickson Rd. and Hopkin's St. The new alignment would cross Corbett Creek about 900 feet north of the existing structure. A 16'x10' concrete box culvert is proposed to facilitate the crossing. Fill heights up to 10 feet would be required in this area.

The subsoil at the site consists of an 8 foot layer of very soft to soft organic material overlying 26 - 31 feet of very soft to soft clayey silt to silty clay. This cohesive deposit is underlain by glacial till.

The groundwater level is at ground elevation.

The presence of the very soft to soft organic material as well as the very soft to soft clayey silt to silty clay stratum is the governing factor from a foundation point of view, since it will be necessary to ensure that it is not overstressed by the embankment loading. The relevance of this will be discussed in the sub-sections to follow.

Stability of Embankments

Analysis in terms of total stresses have been carried out in the transverse direction to determine the stability of fills immediately after construction. In this method of analysis, stability is governed by undrained shear strength properties of the foundation and fill materials. Two types of fill materials were considered 1) regular granular fill and 2) an air cooled granulated lightweight expanded blast furnace slag. The following data and values were used in carrying out the stability analysis.

	<u>Fill Material</u>		
	<u>(PCF)</u>	<u>ϕ^0</u>	<u>Cu(PSF)</u>
1) Regular granular material	130	30	0
2) Lightweight slag	85	35	0

<u>Subsoil Foundation Materials</u>				
<u>Elevation (ft)</u>	<u>(PCF)</u>	<u>(PCF)</u>	<u>ϕ^0</u>	<u>Cu(PSF)</u>
264 - 272	85	23	0	350
256 - 264	105	43	0	85
252 - 256	105	43	0	250
244 - 252	105	43	0	350

The following are our recommendations based on the above analysis:

Regular granular fill: Fills of regular granular material up to 5 feet would be stable if built directly on the organics with side slopes of 2:1. To facilitate construction on the organic layer and to prevent the fill material from puncturing the organics, a synthetic mat should be used to separate the fill material and organic layer. This mat would allow water in the granular fill to drain.

Lightweight slag: Fills up to 10 feet built directly on the organics should be constructed of lightweight expanded blast furnace slag and should have side slopes of 2:1 together with 25 foot long counter balancing berms at mid-height on both sides of the embankment. As discussed above, a synthetic mat would also be required between the slag fill and organic material.

In the appendix are included graphical representations of the assumed stratigraphy, density and undrained shear strength profile together with the critical failure circle and associated factor of safety. Figure 7 pertains to the recommendations for regular granular fill. Figure 8 pertains to the recommendations for the lightweight slag fill.

Settlement of Embankment

The underlying compressible clay stratum will settle as a result of consolidation under the weight of the embankment. For our settlement computations the stresses induced within the subsoil by the embankment were computed by the Osterberg method. The soil parameters used in the settlement analysis were determined by laboratory consolidation tests.

For both the 5 foot regular granular fill and the 10 foot lightweight fill it is estimated that the magnitude of the settlements will be in the order of 18 inches.

Because of the very low permeability of the clay strata we expect that fifty percent of the settlement would occur within the first 6 - 12 months and that ninety percent of the settlement may not be reached until 2 - 3 years after construction.

To reduce the anticipated post construction settlements (total as well as differential settlements) we recommend that the embankments be constructed and left in place for a period of approximately one year before the paving operation. In addition if conditions permit surcharging the embankment with additional fill will be desirable. The details of the surcharge loading and the duration of the surcharge loading including the length of the temporary berms will be provided by this office at a later date if it is decided to proceed with the proposed alignment.

Culvert

Due to the highly compressible nature of the subsurface soils differential settlements can be anticipated within the length of the concrete box culvert. In order to articulate the performance of the box culvert below the embankment, provision should be made for construction joints to accommodate for any differential settlements. These joints should be preferably located underneath the outside shoulders and the center-line. Alternatively one or more corrugated steel or structural plate pipe or pipe arch could be used.

The culvert should be placed on granular 'A' bedding material to the full base width of the embankment and to a depth as specified according to current M.T.C. standards. A synthetic mat, as mentioned elsewhere, should also be used to prevent the bedding material from puncturing the organics and also to facilitate construction over the organic deposit. The culvert should be backfilled symmetrically. Compaction of the granular backfill material should be undertaken so as to avoid any damage to the culvert.

The culvert invert can be placed at the level of the existing stream bed. As a precaution against washout a three foot clay seal should be installed in the side slopes at the upstream end of the culvert.

MISCELLANEOUS

The initial field work for the investigation was carried out from August 24 to August 27, 1976 under the supervision of L. Crocker, Student Technician. The equipment used for subsoil sampling at that time was owned and operated by Site Investigation Services Ltd., Peterborough.

The field work on October 1, 1976 was carried out by Mr. E.C. Lane and Mr. H. Shah, Project Engineers using hand operated equipment.

The supplementary field work from October 25 to October 29, 1976 was carried out under the supervision of Mr. E.C. Lane, Project Engineer. Site Investigation Services, Peterborough, owned and supplied the equipment used for this subsoil investigation.

This report was written by Mr. E.C. Lane and Mr. M. MacLean, Project Engineers and reviewed by Mr. M. Devata, Supervising Engineer.

M Maclean



M. MacLean, P. Eng.
Project Engineer

M. Devata

M. Devata, P. Eng.
Supervising Engineer

MD/MM/bp
January, 1977

APPENDIX

RECORD OF BOREHOLE NO 1

WP 44-71-20

LOCATION Sta. 23 + 25 50' LT Q N Service Rd.

ORIGINATED BY L.C.

DIST 6 HWY 401

BORING DATE 24th & 25th August 1976

COMPILED BY T.L.

DATUM Geodetic

BOREHOLE TYPE CME 55, Hollow Stem Auger

CHECKED BY J.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
272.5	Ground Level						100	200	300	400	500	20	30	40		GR SA SI CL
0.0	Organic silt Brown with occ shell fragments and undecayed veg. V.soft		1	SS	1/18"	270										ORG 31.4%
264.7			2	SS	1/18"											ORG 15.2%
7.8	Clayey silt to silty clay--sensitive		3	SS	1/18"											
	Grey		4	SS	1/18"											
	Occasional silt seams		5	SS	1/18"	260										
	Very soft to soft		6	SS	1/18"											
	Alternate layers of light grey & dark grey silty clay		7	TW	PM										107	0 5 59 36
238.5			8	SS	3	250										
34.0	Mix. of clayey silt firm to stiff some sand (re-worked glacial till) Grey		9	TW	PM											
233.5			10	TW	PM	240										
39.0	Mix. of sand & grav. with silt--to clay		11	SS	54	230										
230.2	Hard Grey (Glac. till)															
42.3	End of Borehole															

RECORD OF BOREHOLE NO 1A

WP 44-71-20

LOCATION Sta. 23 + 25 53' LT C. N. Service Rd.

ORIGINATED BY L.C.

DIST 6 HWY 401

BORING DATE 25th and 26th August 1976

COMPILED BY T.L.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Augers

 CHECKED BY *el*

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
272.5	Ground Level					ELEV	100	200	300	400	500	20	40	60		GR SA SI CL
0.0	OrganicsiltBrown with occ. shell fragments and undecayed vegetation	2 2 2 2				270										
264.7	Very soft		1	TW	PM											ORG 1.29%
7.8	Clayey Silt to silty clay sensitive grey occasional silt seams		2	TW	PM											ORG 0.9 %
			3	TW	PM	260	6	+ S8.5							100	
								x S8.8								
								+ S4.3								
	Very soft to soft		4	TW	PM	250									107	0 0 54 46
	Alternate layers of light grey and dark grey silty clay															
239.5																
33.0	Mix. of clayey silt some sand Grey Soft					240										
235.0	Reworked Glacial Till firm to stiff															
37.5	End of Borehole															

RECORD OF BOREHOLE NO 2

WP 44-71-20

LOCATION STA. 22 + 92 76' RT C N. Service Rd.

ORIGINATED BY L.C.

DIST 6 HWY 401

BORING DATE 26th and 27th August 1976

COMPILED BY T.L.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Augers

CHECKED BY U.J.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
273.8	Ground Level															
0.0	OrganicsiltBlack to lt. brown		1	TW	PH	270										ORG 87.4%
	with occ fragments and undec. vegetation. Soft		2	TW	PM						+S3					ORG 62.9%
265.3	Pockets of Organics		3	TW	PM						+S2.2					0 0 48 52
8.5	Clayey silt to silty clay		4	TW	PM	260										
	sensitive		5	TW	PM										104	
	grey		6	TW	PM	250										
	occasional silt and sand seams		7	TW	PM											
	Very soft to soft		8	TW	PM	240										
	Alternate layers of light grey and dark grey silty clay		9	TW	PH											0 0 34 66
234.8	Mixture of clayey silt some sand Grey firm to stiff		10	SS	14	230									125	12 24 34 30
229.8	reworked glacial till		11	RC	--											7 42 43 8
44.0	Mixture of sandy silt, some clay Trace of gravel (Glacial Till)		12	SS	100											7 31 40 22
219.6	Stiff to Hard Brown															8 36 38 18
54.2	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 44-71-20 LOCATION Sta. 23 + 20 53' LT 1 N. Service Rd. ORIGINATED BY T.L.
DIST 6 HWY 401 BORING DATE October 1, 1976 COMPILED BY T.L.
DATUM Geodetic BOREHOLE TYPE Hand Auger Continuous Vane CHECKED BY *af*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100									
							SHEAR STRENGTH									
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
272.5	Ground Level					100	200	300	400	500						
0.0	OrganicsiltBrown with occ. shell fragments and undecayed vegetation Very soft					270										
265.0			1	PS												
7.5	Clayey Silt to silty clay Sensitive Grey Occasional silt seams					260										
249.0	Very soft to soft					250										
23.5	End of Borehole															
	(DESCRIPTION ASSUMED)															

RECORD OF BOREHOLE NO 4

WP 44-71-20 LOCATION Sta. 22 + 87 80' RT. G N. Service Rd. ORIGINATED BY T.L.
 DIST 6 HWY 401 BORING DATE October 1, 1976 COMPILED BY T.L.
 DATUM Geodetic BOREHOLE TYPE Hand Auger Continuous Vane CHECKED BY d.l.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
273.8	Ground Level													
0.0	Organicsilt Black to lt. brown with occ. shell fragments and undec. vegetation Soft	1 2 3 4 5				270								
264.3														
8.5	Clayey silt to silty clay Sensitive Grey Occasional silt and sand seams	6 7 8 9 10				260								
252.8	Very soft to soft													
21.0	End of Borehole					250								
	(DESCRIPTION ASSUMED)													

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

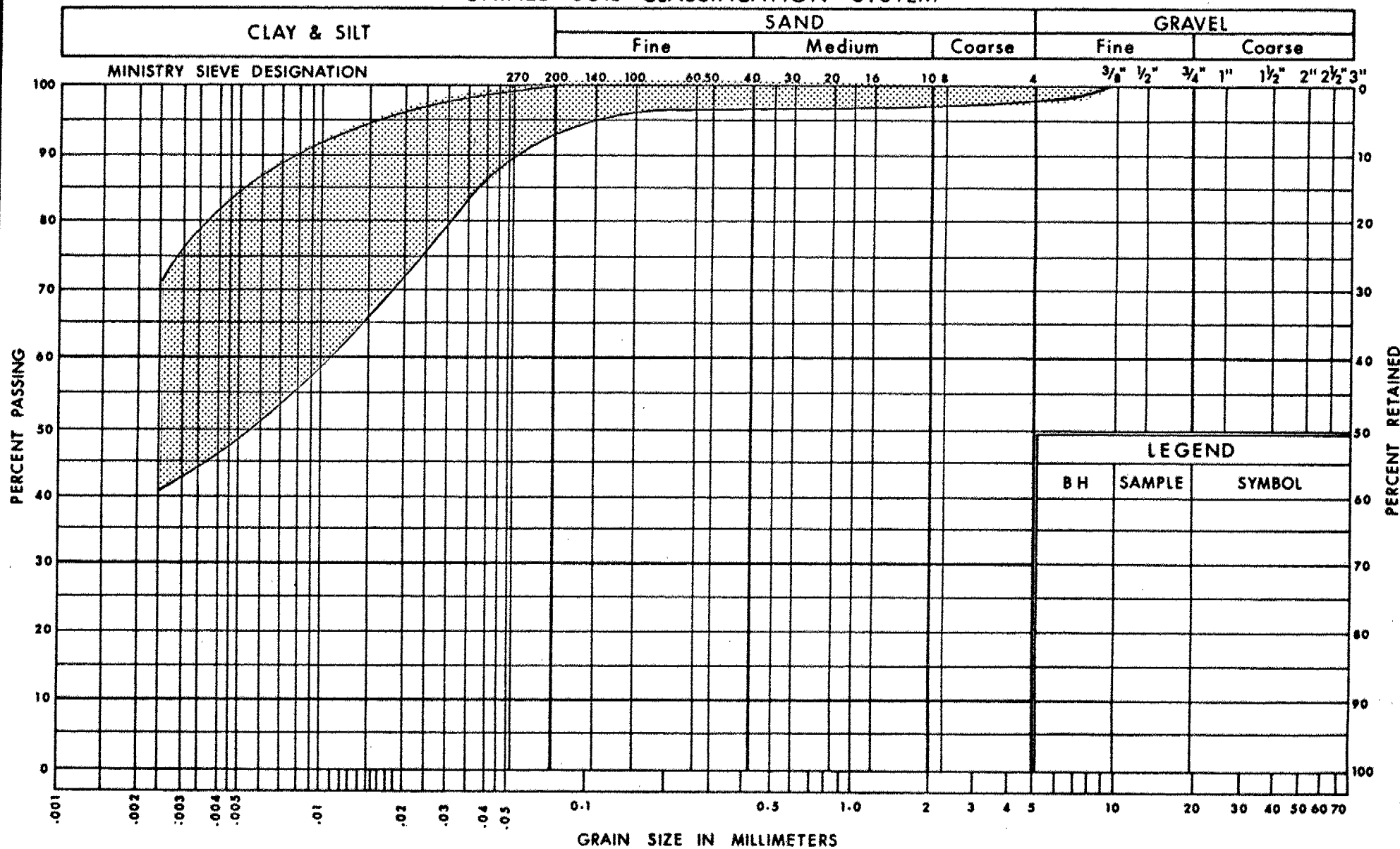
WP 44-71-20 LOCATION Sta. 22 + 89 72' RT. G. N. Service Rd. ORIGINATED BY T.L.
DIST 6 HWY 401 BORING DATE October 25, 1976 COMPILED BY M.M.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger Continuous Vane CHECKED BY J.F.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT —WL PLASTIC LIMIT —WP WATER CONTENT —W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	Wp	W	WL		
273.8	Ground Level															
0.0	Organic silt Black to lt. brown with occ. shell fragments and undecayed vegetation	2 2 2 2 2				270										
264.3	Soft to firm															
9.5	Clayey Silt to silty clay					260										
	Sensitive															
	Grey					250										
	Occasional silt and sand seams															
	Very soft to soft					240										
237.3																
36.5	End of Borehole					230										
	(DESCRIPTION ASSUMED)															

RECORD OF BOREHOLE NO 7

WP 44-71-20 LOCATION Sta. 22 + 89 65' RT. C. N. Service Rd. ORIGINATED BY T.L.
 DIST 6 HWY 401 BORING DATE October 28, 1976 COMPILED BY M.M.
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger Continuous 3" Shelby Sampling CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	W_p	W	W_L		
273.8	Ground Level															
0.0	Organic silt Black to lt. brown with occ. shell fragments and undec. vegetation		1	TW	PH	270										Peat
264.8	Soft		2	TW	PH											W=1.39%
9.0	Clayey Silt to silty clay		3	TW	PH											0 48 46 11
	Sensitive		4	TW	PH											
	Grey		5	TW	PM											
	Very soft to soft		6	TW	PM											
	Occasional silt and sand seams		7	TW	PM	260										0 0 44 56
			8	TW	PM											
			9	TW	PM											
			10	TW	PM											103
			11	TW	PM											96.5
			12	TW	PM											
			13	TW	PM	250										104
			14	TW	PM											106
			15	TW	PM											
			16	TW	PM											
			17	TW	PM											104.5
			18	TW	PH											
			19	TW	PH	240										102
			20	TW	PH											
236.8	Alternate layers of light grey & dark grey silty clay		21	TW	PH											
			22	TW	PH											115
37.0	End of Borehole					230										



**Ministry of
Transportation and
Communications**

Ontario

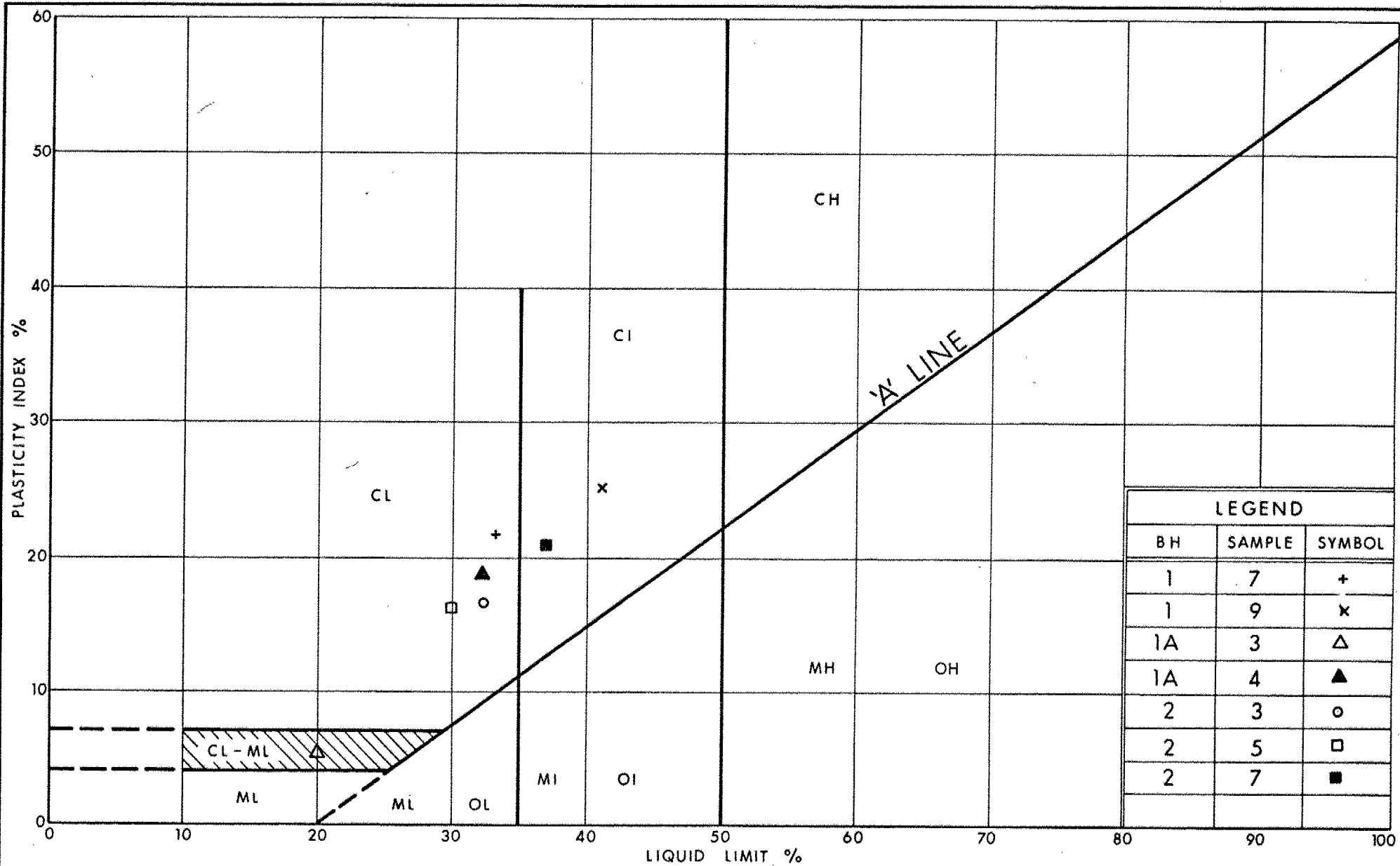
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION CLAYEY SILT TO SILTY CLAY

FIG No 1

WP 44-71-20





Ministry of
Transportation and
Communications

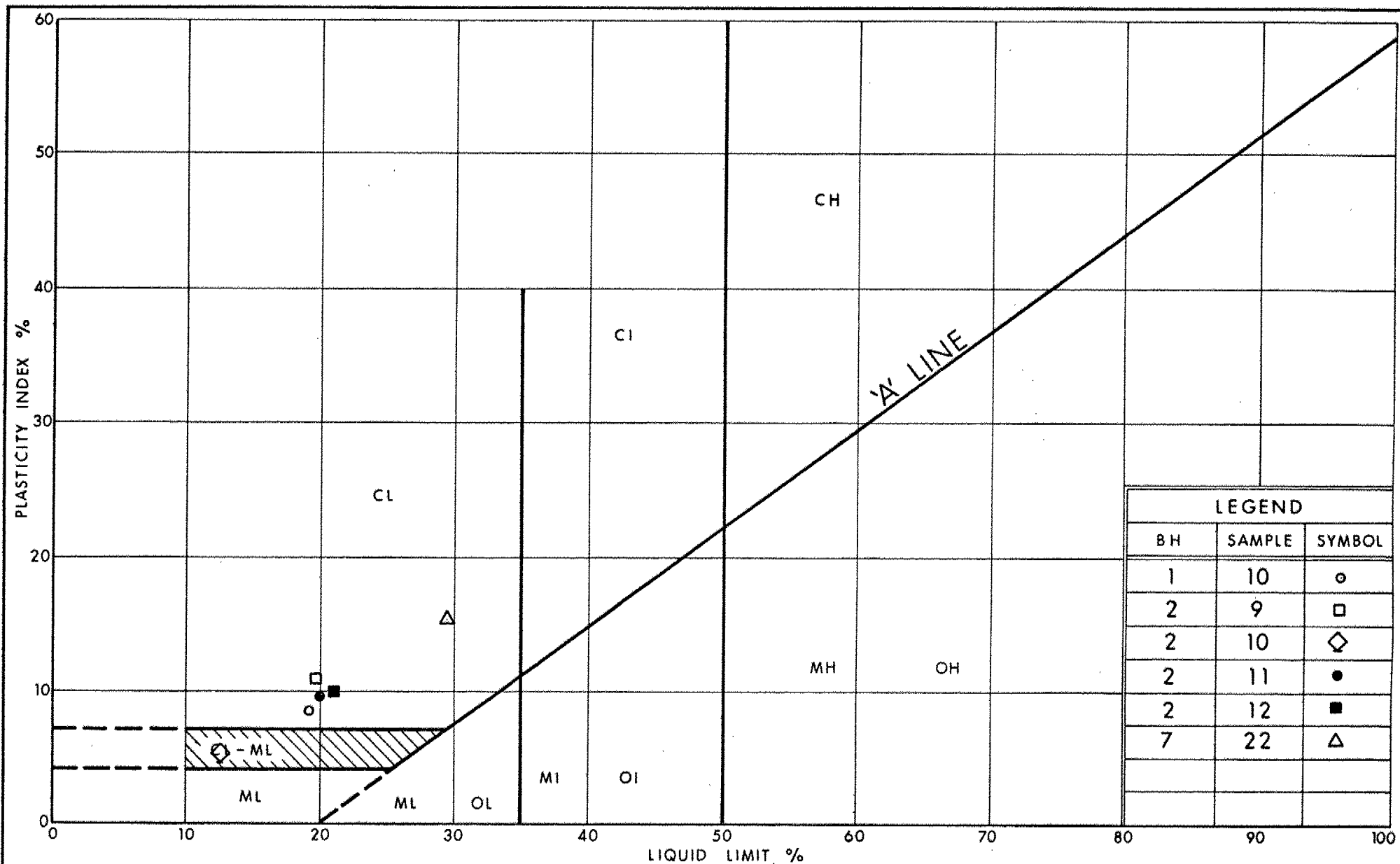
Ontario

ENGINEERING SERVICES BRANCH

PLASTICITY CHART CLAYEY SILT TO SILTY CLAY

FIG No 3

W P 44-71-20



Ministry of
Transportation and
Communications

Ontario

ENGINEERING SERVICES BRANCH

PLASTICITY CHART
GLACIAL TILL
MIX OF CLAYEY SILT SAND & GRAVEL

FIG No 4

W P 44-71-20

VOID RATIO-PRESSURE CURVES

W. P. 44-71-20

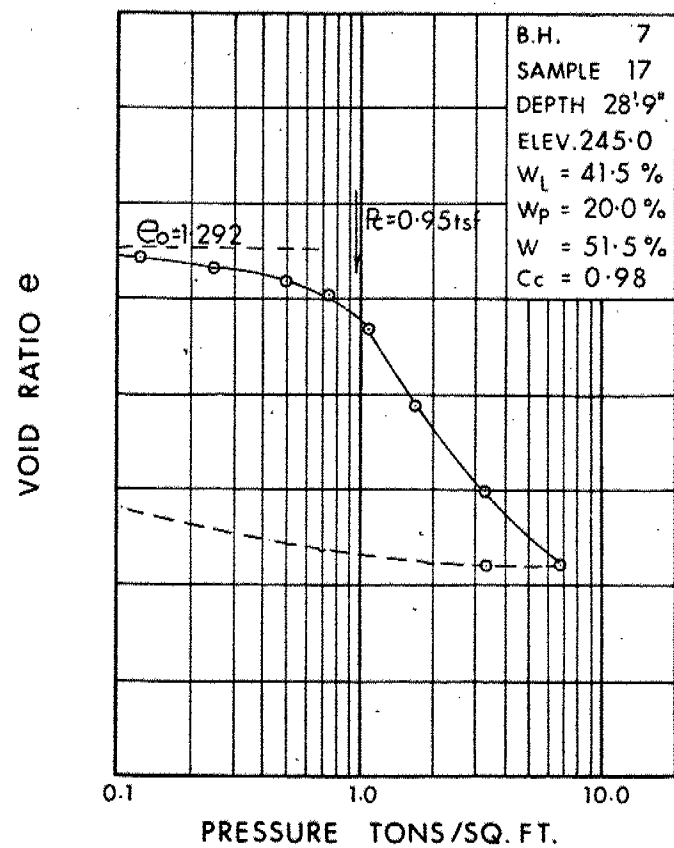
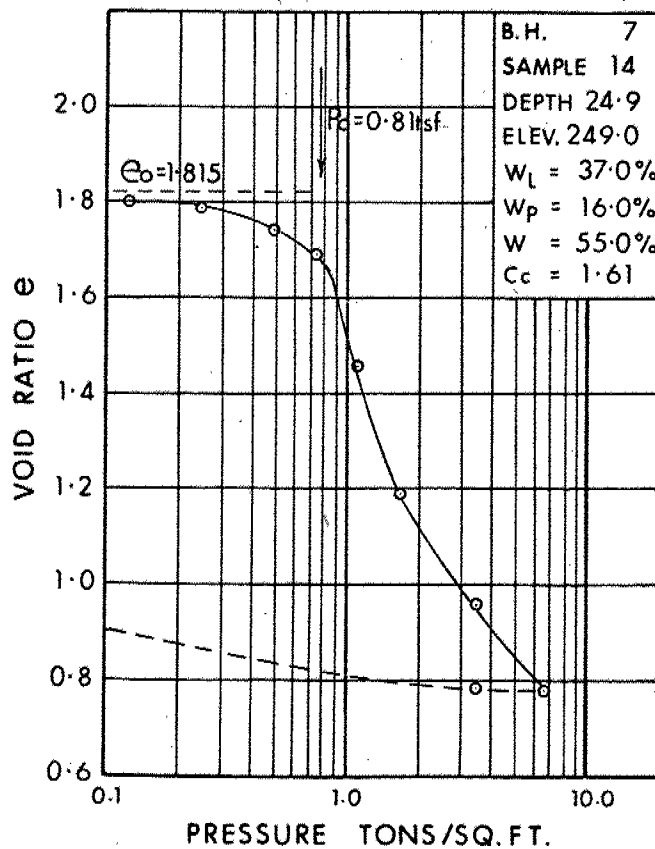
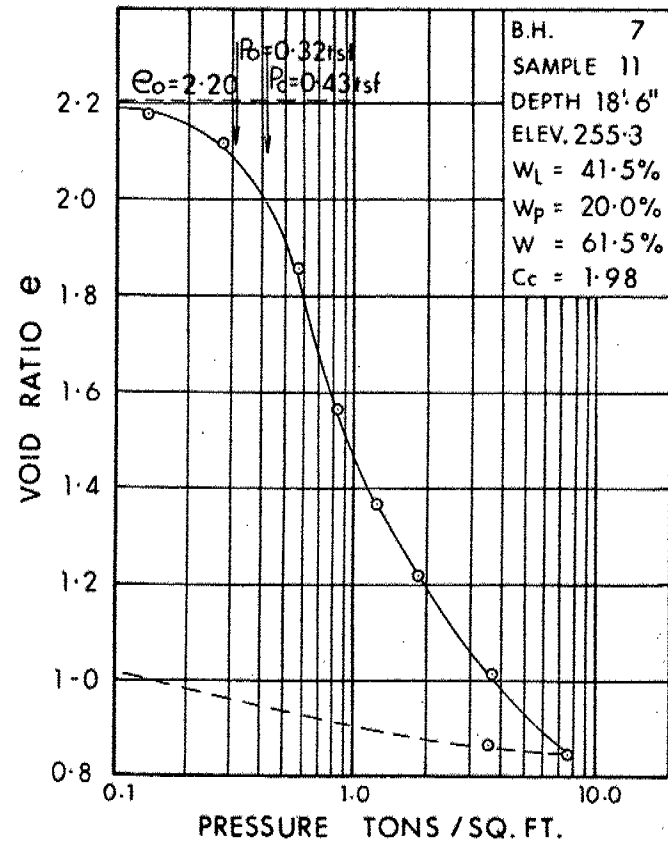
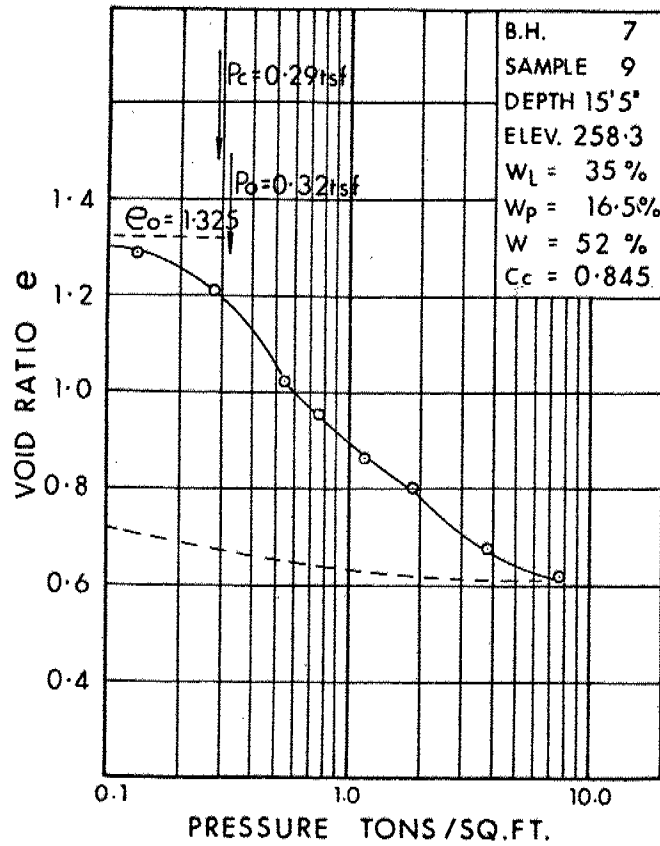


FIG. 5

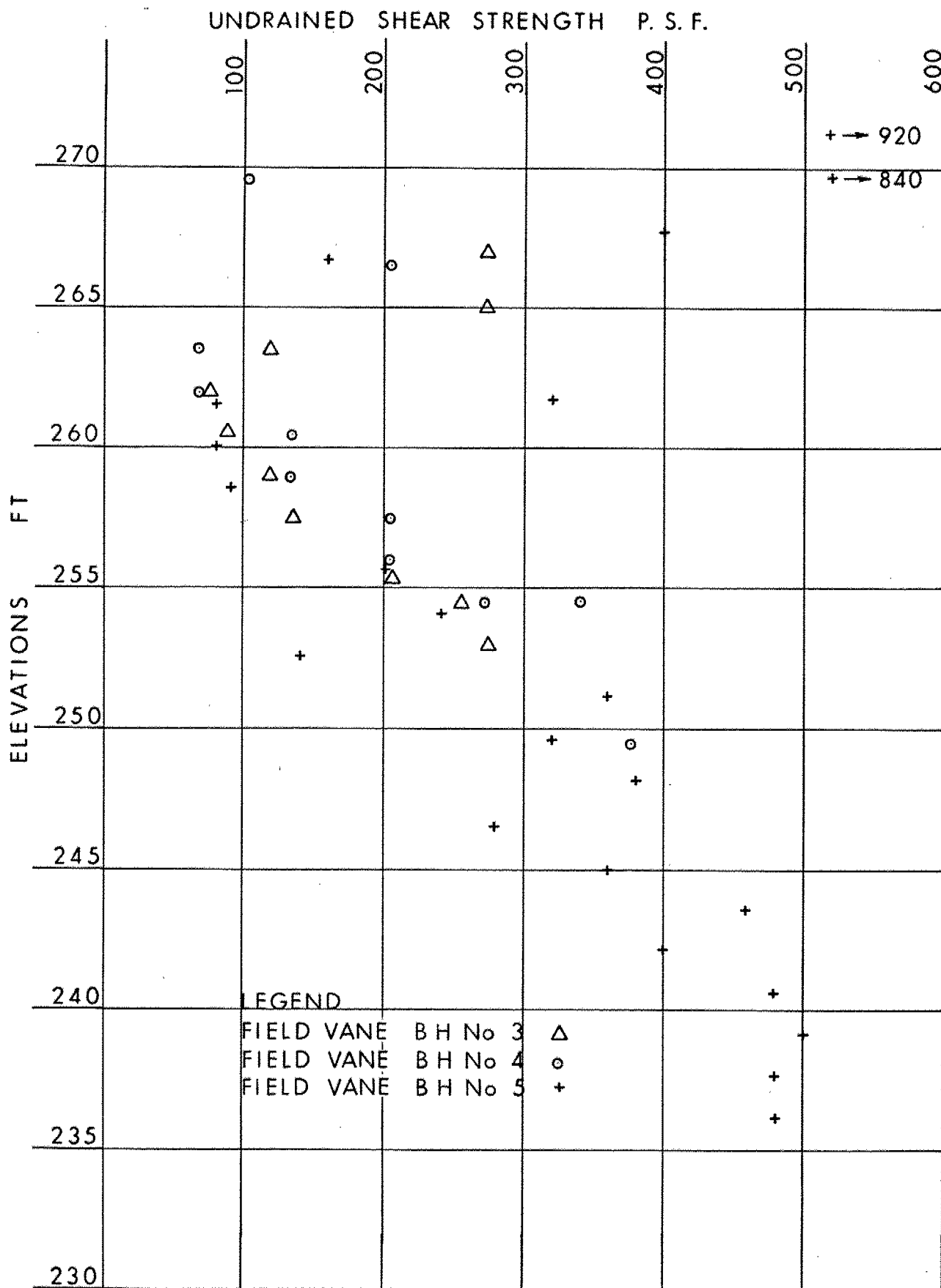
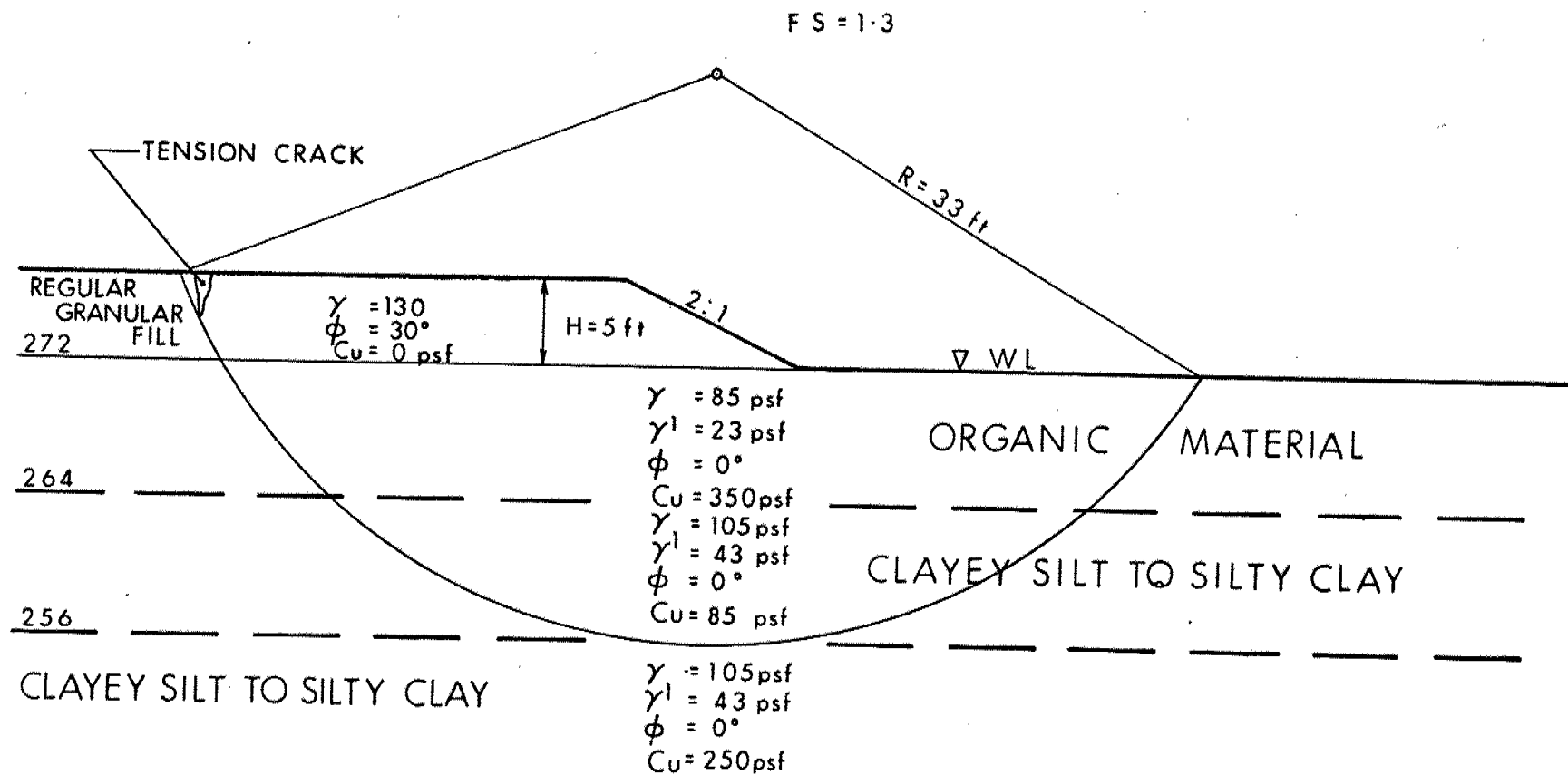


FIG 6

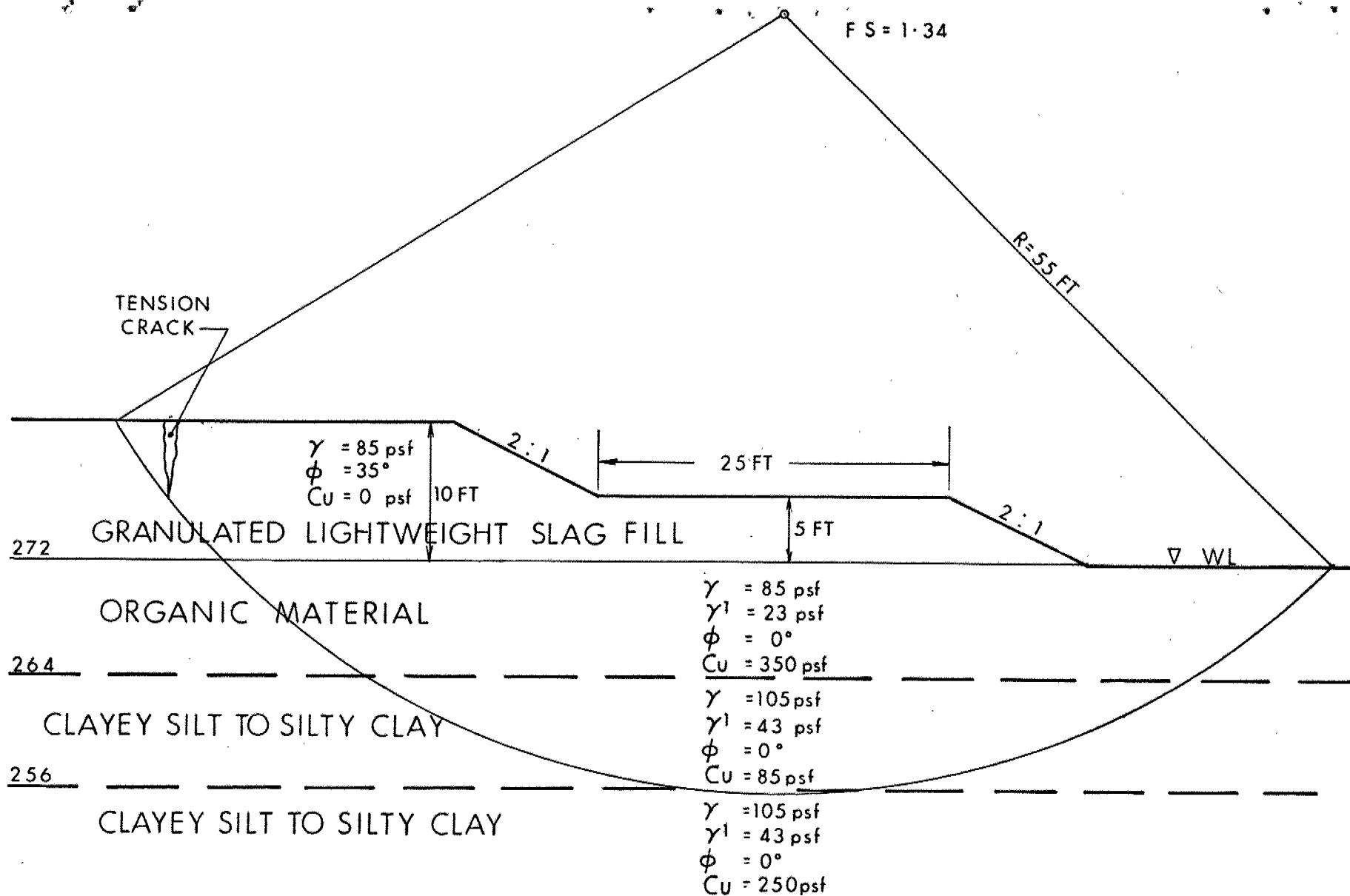
WP 44-71-20



ASSUMED PROFILE & STRATIGRAPHY
TOGETHER WITH CRITICAL CIRCLE
FOR STABILITY CALCULATIONS

FIG 7

WP 44-71-20



ASSUMED PROFILE & STRATIGRAPHY
TOGETHER WITH CRITICAL CIRCLE
FOR STABILITY CALCULATIONS

FIG 8

WP 44-70-20

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' = STANDARD PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>c LB./SQ FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 500	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W.	THINWALL OPEN
W.S	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T	SLOTTED TUBE SAMPLE	O.S	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S	CHUNK SAMPLE	R.C	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

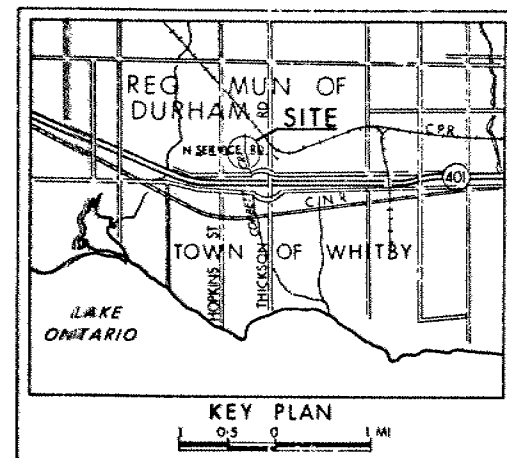
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

CONT No
WP No 44-71-20

N SERVICE RD RELOCATION

BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone, 350ft lbs energy)
- W.L. at time of investigation AUG 1976
- HANDAUGER
- CONTINUOUS VANE

No	ELEVATION	STATION	OFFSET
1	272.5	23+25	50' LT
1A	272.5	23+25	53' LT
2	273.8	22+92	76' RT
3	272.5	23+20	53' LT
4	273.8	22+87	78' RT
5	273.8	22+89	72' RT
7	273.8	22+89	65' RT

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

REVISIONS	DATE	BY	DESCRIPTION

HWY No 401

SUBMITTED BY M. D. MacLEOD

DRAWN BY M. D. MacLEOD

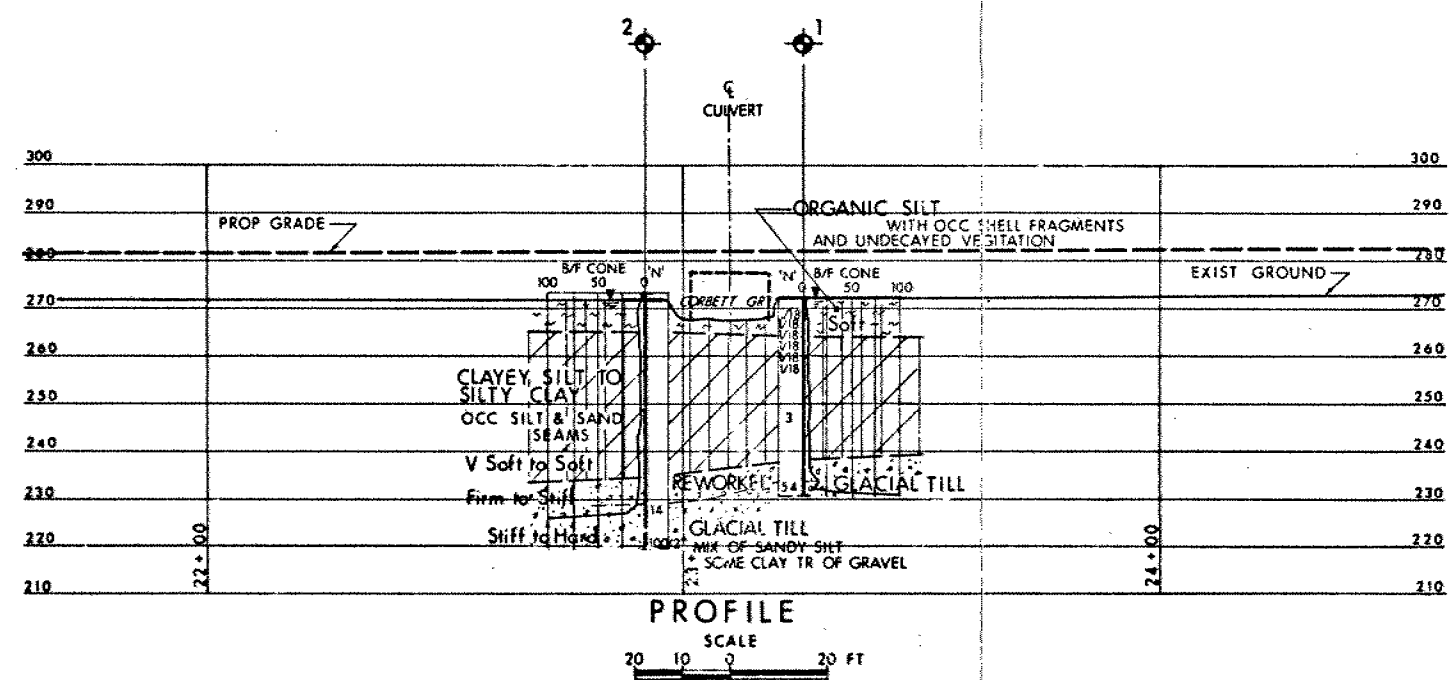
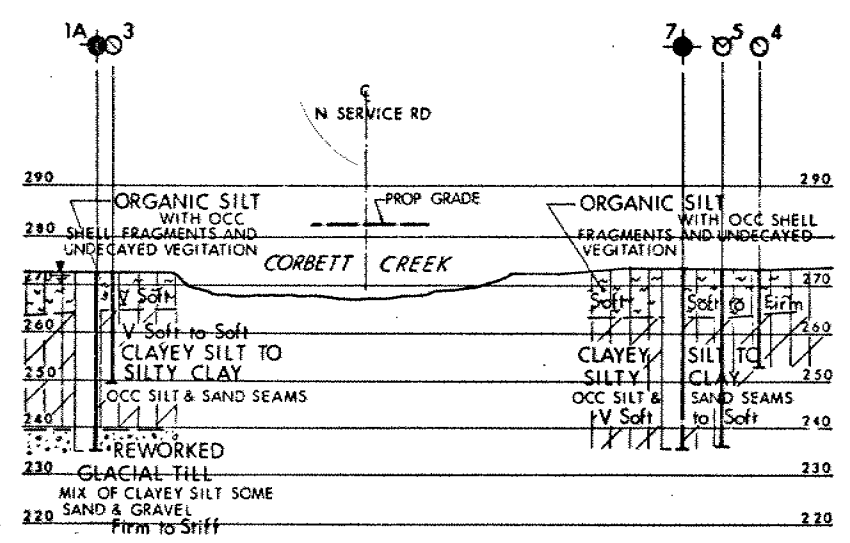
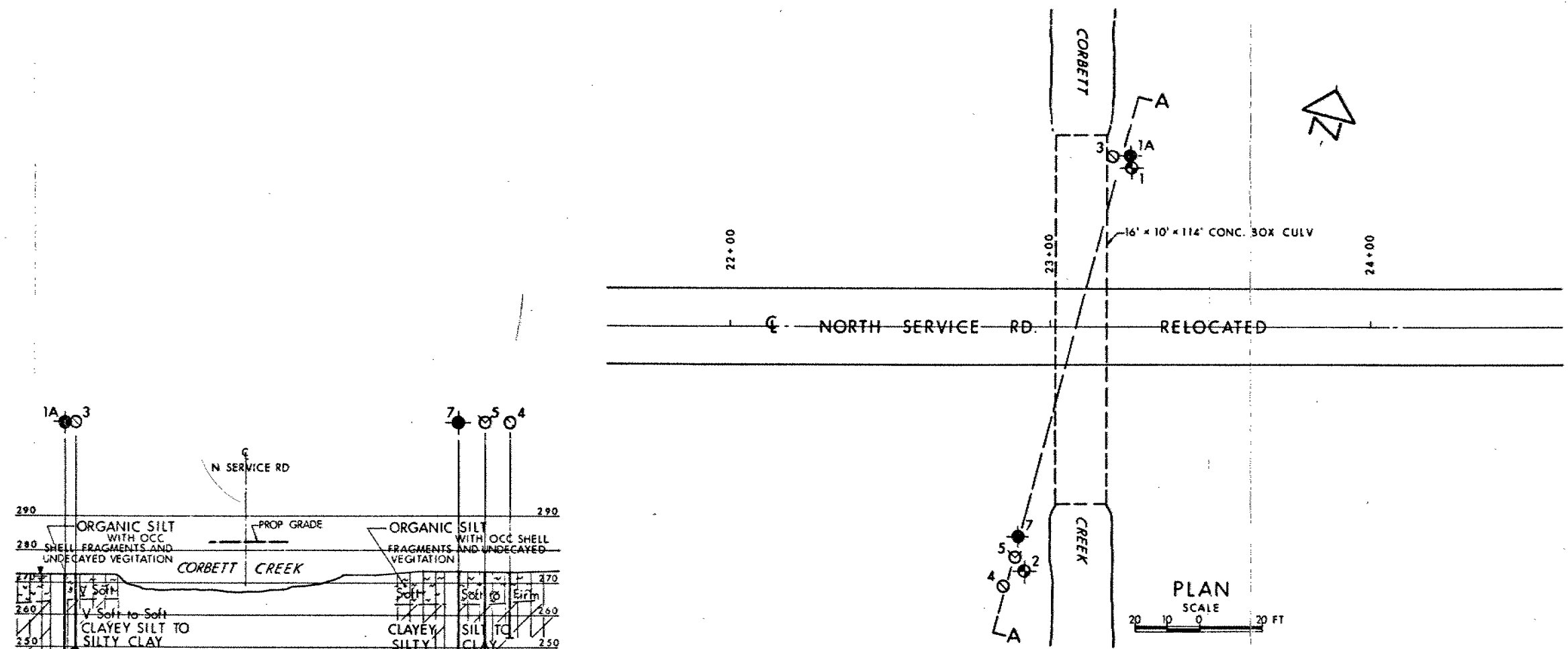
CHECKED

DATE 24 12 76

APPROVED

SITE

DWG 447120-A





Memorandum

C. Mirza

To: Mr. M.R. Ernesaks,
Planning and Design Office,
Central Region.

From: Regional Geotechnical Section,
Central Region.

Attention: Mr. C.R. Lumley

Date: 78 06 20

Our File Ref.

In Reply to

Subject:

W.P. 44-71-20, Highway 401
North Service Road Relocation at
Highway 401 and Thickson Road
Interchange and Corbett Creek Culvert
District 6, Toronto

Further to my memorandum of 78-06-14 regarding the above project, we wish to make additional comments regarding the use of the filter fabric (TERRAFIX 200N) under the proposed earth fill embankment.

Following the issue of the memorandum, we were informed of a similar product known as TERRA-TRACK, also produced by KENROSS NAUE CANADA LIMITED of Rexdale, Ontario. This product, whose physical properties are similar to or better than the TERRAFIX 200N, is approximately one half the price. Its burst and puncture strength and permeability are slightly less than the TERRAFIX 200N, however, its tensile strength is 57% greater. In addition, its percent elongation is approximately three times that of the TERRAFIX 200N (69% versus 24%). The only major drawback to using this product is that its thickness only measures 0.4 mm as compared to 3 mm of the TERRAFIX 200N. With this in mind, we would recommend that a 6-inch layer of a well graded free draining granular material be placed over the filter fabric to facilitate lateral drainage.

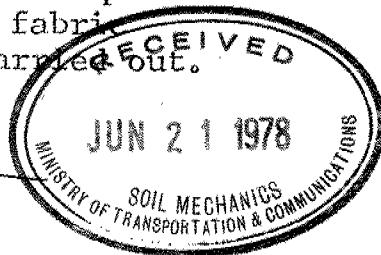
In view of its reduced cost while still providing the requirements of a strong filter fabric we would recommend that the alternate product TERRA-TRACK could be used in place of the TERRAFIX 200N. The selection of the filter fabric should be decided after a cost analysis has been carried out.

RVV/RDG:saw

c.c. C. Mirza
G.A. Wrong
A.K. Barsvary

R. Van Veen

For: R.D. Gunter
Head, Geotechnical Section





Memorandum

C. Mirza
Tom: Look into this
78 06 15

To: Mr. M. R. Ernesaks
Planning and Design Office
Central Region

From: Regional Geotechnical Section
Central Region

Attention: C. R. Lumley

Date: 78 06 14

Our File Ref.

In Reply to

Subject: W.P. 44-71-20, Highway 401
North Service Road Relocation at
Highway 401 and Thickson Road Interchange
and Corbett Creek Culvert
District 6, Toronto

We have reviewed the "General Review and Discussion of Alternatives" and other related information provided by your office regarding the relocation of the above section of roadway. Contained within this memorandum are our comments and recommendations.

Based upon the information provided and additional information obtained from both within our Office and the Soil Mechanics Section it is proposed to construct a roadway fill about 40 to 50 feet wide and measuring approximately 7.5 to 10.0 feet in height. In conjunction to this, it is proposed to place twin 8 foot diameter C.S.P. culverts at the Corbett Creek crossing.

The subsoil generally consists of a surficial layer about 7 feet thick of a mixture of soft organic silt, marl and undecayed vegetation. This is followed by a layer of very soft to soft silty clay to clayey silt overlying a till deposit consisting of a heterogenous mixture of sand, silt, clay and gravel of glacial origin.

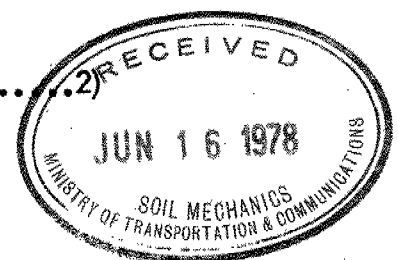
The groundwater level was found to be at or only slightly below the ground surface.

Moisture tests carried out on the clayey silt to silty clay deposit indicates that the natural moisture content of this material averages at about 53%. This is well above the Liquid Limit of the material ($W_L = 36\%$). In addition to this, an average liquidity index of 2.1 tends to support the theory that this deposit is highly sensitive to failure under a load. Any slight vibration would increase the susceptibility to failure.

This Office concurs with the recommendation by Site Investigation Services Limited to adopt alternative no. 8 which calls for pre-loading of the subsoil for a period from 6 months to 1 year and the construction of counterbalancing berms.

The following are our comments and recommendations:

(cont'd2)



- 1) The section from Station 20+30 to Station 27+50 should be constructed in stages. The first stage should include the earth grading and granular subbase material. The second stage should include placing the Granular 'A' and binder course paving. The surface course and curb and gutter work should follow at a later date after the embankment reaches equilibrium.

An interval of at least 6 months should be allowed between the first and second stages.

- 2) For the first stage of construction the subgrade elevation should be set at 6" below final profile grade and the embankment construction accordingly.

Eighteen inches of Granular 'C' should be placed over the earth grade. Therefore the top of the Granular 'C' should be set at 12" above the final profile grade.

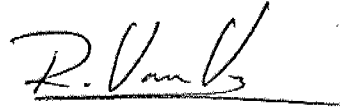
During the second stage, most of the predicted 18" of settlement has taken place, add Granular 'C' as required for reshaping purposes and place 6" of Granular 'A' and pave with 2" of H.L. 4.

Routine maintenance consisting of patching and/or resurfacing may be required for a period following the initial construction.

- 3) As indicated by the soils consultant, an attempt should be made to equalize the embankment loads between the embankment fill itself and the culvert.
- 4) To reduce the possibility of the soft subsoil punching into the fill material, thereby creating local failures, a filter fabric (TERRAFIX 200N or equivalent) should be placed over the soft subsoil prior to placing the fill. This should be carried out throughout the area where these sensitive soils occur. (Station 20+30 to Station 27+50). The filter fabric should be staked and any overlapping at the joints should be about 1 yard. This will ensure a more uniform settlement and also act as a toe drain to eliminate or prevent piping.
- 5) Due to the relatively severe erodibility of the subsoil, a layer of random or hand laid rip-rap should be placed both upstream and downstream of the culverts. In addition, a layer of filter fabric should be placed below the rip-rap to ensure the containment of the fine grained particles within the native soil.
- 6) The bedding for the twin 8' diameter C.S.P.'s is to be constructed as per Standard DD-808-A, Type 5. The pipe bedding material should

consist of Granular 'A' and be 24" in depth placed over filter fabric as in (4) above.

If any further assistance is required in this regard, feel free to contact this Office.



R. Van Veen

RVV/RDG:gap
c.c. C. Mirza
G. A. Wrong
A. K. Barsvary

For: R. D. Gunter
Head, Geotechnical Section

Mr. G.C.E. Burkhardt
Regional Structural Planning Office
Central Region
3501 Dufferin Street, Downsview

Mr. W. Kulmatickas

Soil Mechanics Section
Geotechnical Office
West Building, Downsview

November 25, 1976

North Service Road Relocation
Thickson Road/Hwy. 401 Interchange
Oshawa, W.P. 44-71-20

As per your memorandum of August 12, 1976, we have completed our subsoil investigation at the above mentioned site.

The site of the proposed crossing is approximately 900 feet west of Thickson Road and about 1300 feet north of Hwy. 401 between Whitby and Oshawa.

Corbett Creek drains the surrounding fields and empties into Lake Ontario about a mile and a half from the site. Topographically, the general area is flat to gently rolling, sloping down to the creek from the east and from the west. Land in the immediate area is presently being used for pasture. The sub

The subsoil at the site consists of approximately 8 feet of very soft, compressible organic material underlain by a 25 to 31 foot cohesive stratum of very soft to soft clayey silt to silty clay, which in turn is underlain by a mixture of clayey silt, sand and gravel, a glacial till. The organic and clayey silt strata are separated by a 1 foot layer of pure silty clay. Very low shear strengths, in the order of 80 PSF, were encountered in the upper 8 feet of the clayey silt stratum. The undrained shear strength in the remaining portion of this stratum increases with depth from about 250 to 400 PSF.

Groundwater at the site was encountered at the surface. Local information indicates that the area surrounding the creek is inundated with water during the spring season.

During our meeting of November 8, 1976 with Mr. Kulmatickas of the Regional Structural Planning Office, and Mr. Dutchak of the Planning and Design Office, we discussed some of the problems and preliminary recommendation for construction of the proposed culvert on this subsoil. This memorandum will provide you with recommendations for the proposed structure and approach fills before the final Foundation Report is completed.

It has been proposed to construct a concrete box culvert with approach fills of about 10 feet to facilitate the crossing of the North Service Road over Corbett Creek.

cont'd.... ..

Analysis in terms of total stresses were carried out to determine the stability of the proposed fills. Two fill materials were considered; regular granular fill with a bulk density of 130 PCF, and a granulated lightweight expanded blast furnace slag with a bulk density of 85 PCF.

The following are our recommendations based on the above analyses.

1. Fills of up to 5 feet would be stable if constructed of granular type material with 2:1 side slopes built directly on the organic material. To facilitate construction on the organic layer and to prevent the fill material from puncturing the organics, a synthetic mat should be used to separate the fill material and organic layer. This mat would allow the granular fill to drain through the mat and may reduce differential settlement problems.
2. Fills up to 10 feet would be stable if constructed of lightweight expanded slag built directly on the organics. Side slopes of 2:1 with counter balancing berms of 15 feet in length on both sides of the highway embankment would be required. As discussed above, a synthetic mat would be required between the slag fill and the organic material.

At our meeting we suggested it might be possible to construct a 10 foot fill of granular type material by excavating the organic and the soft clayey silt to silty clay to a total depth of approximately 16 feet below the ground surface and subsequent backfilling with granular type of material. It is understood that this type of construction may not be economical.

Settlements will be significant for each of the fills on the above recommendations. This aspect will be discussed in detail in our final Foundation Investigation Report.

Because of the anticipated differential settlement, a concrete box culvert should not be considered for this site. We suggest that one or a combination of corrugated structural pile or pipe arch should be considered for this crossing.

Malcolm MacLean

M. MacLean
Project Engineer

For: M. Devata
Supervising Engineer
MD/MM/gs

cc: L. Dutchak
Files
Record Services

Soil Mechanics Section
Geotechnical Office
West Building
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

Tel: (416) 248-3282

October 26, 1976

Site Investigation Services Limited
677 Crown Drive
Peterborough, Ontario

Dear Sirs:

This letter confirms our request by telephone of October 19, 1976 for the supply of a Muskeg vehicle mounted Type II 3½" hollow stem auger machine, together with all necessary equipment as per your Tender for Supply Contract S-76-1002 at Whitby, Ontario, on October 25, 1976.

Mobilization will be from Oshawa.

Our Project Number is 44-71-20.

Yours truly,

A. K. Barsvary
A.K. Barsvary
Head
Geotechnical PPI

AKB/gs

cc: W.W. Fry
(Attn: V. Di Marco)
Files ✓
Record Services

✓

BORING CONTRACTORS - COMPARATIVE COSTS

SUPPLY CONTRACT No. 5 - 76 - 1002

PERIOD FROM MAY 1st, 1976 TO OCT. 31st, 1976DRILL ITEM NO. 5.2START DATE OCT 21 1976ESTIMATED DRILLING FOOTAGE 120UNIT REQUIRED 5.2 (E)SITE RELOCATED NORTH SERVICE ROAD GESTIMATED FEET PER HOUR 6W. P. 44-71-20RAFT REQUIRED YES ☐ NO ☒CORBETT CREEK, WHITBYESTIMATED TOTAL HOURS 20

W. O. _____

CONTRACTOR	EQUIPMENT DESCRIPTION AND RATES									MOBILIZATION RATES			MOBILIZATION POINTS	MILES ONE WAY	MOB. COST	DRILLING COST	OTHER COST	TOTAL COST
	5.2(A) S.A. TRAIL	5.2(B) S.A. TRUCK	5.2(C) S.A. M.V.	5.2(D) H.S. 2 1/4" TRAIL	5.2(E) H.S. 2 1/4" TRUCK	5.2(F) H.S. 2 1/4" M.V.	5.2(G) H.S. 3 1/4" TRAIL	5.2(H) H.S. 3 1/4" TRUCK	5.2(I) H.S. 3 1/4" M.V.	6.2(A) TRAIL	6.2(B) TRUCK	6.2(C) M.V.						
AWTHORNE	36.00	36.00	40.00	38.00	38.00	40.00	38.00	38.00	40.00	1.40	1.40	1.50	CONCORD, BELLEVILLE, LONDON, NORTH BAY	40	120	900	(3)	920
CANADIAN LONGYEAR	37.00	37.00	40.50	39.50	39.50	43.00	39.50	39.50	43.00	1.35	1.35	1.65	CONCORD (WITHIN 50 MILES)	40	132	860	(6)	992
	40.00	40.00	43.50	42.50	42.50	46.00	42.50	42.50	46.00	1.35	1.35	1.65	CONCORD, NORTH BAY, LONDON, SUDBURY *					
	* RATES APPLY TO ALL JOBS MORE THAN 50 MILES FROM CONCORD WAREHOUSE																	
GEOCON	-	31.00	35.00	-	33.00	37.00	-	33.00	37.00	-	1.00	1.50	TORONTO, SUDBURY, HAMILTON	40	120	740	(2)	860
R.B. DODDS OR MORTON DODDS	45.00	45.00	50.00	45.00	45.00	50.00	45.00	45.00	50.00	1.50	1.50	1.50	TORONTO, SUDBURY, THUNDER BAY	40	120	1000	(7)	1120
DOMINION SOIL	PLUS 1.20/MILE MOTEL TO JOB SITE OR 22.00/HOUR TRAVELLING TIME IN CLIENT'S VEHICLE																	
	50.00	50.00	50.00	-	-	-	50.00	50.00	50.00	1.50	1.50	1.50	TORONTO, KITCHENER, LONDON, THUNDER BAY, WINDSOR, OTTAWA, NORTH BAY	40	120	1000	(7)	1120
AWTHORNE	PLUS \$1.50/MILE, MOTEL TO JOB SITE AND RETURN DAILY, THUNDER BAY, NORTH BAY, OTTAWA																	
	-	-	-	-	-	-	-	38.00	42.00	-	2.00	2.00	OTTAWA	220	880	840	(8)	1720
JOHNSTON	32.00	32.00	37.00	35.00	35.00	40.00	35.00	40.00	40.00	1.25	1.25	1.50	OTTAWA, TORONTO (WITHIN 30 MILES)					
	35.00	35.00	40.00	38.00	38.00	43.00	38.00	43.00	43.00	1.25	1.25	1.50	OTTAWA, TORONTO (OUTSIDE 30 MILES)	40	120	860	(5)	980
MASTER	34.00	34.00	39.50	36.50	36.50	42.00	36.50	36.50	42.00	1.35	1.35	1.65	TORONTO, LONDON, NORTH BAY, OTTAWA	40	132	840	(4)	972
P. V. K.	-	-	-	-	-	40.00	-	-	-	-	-	2.00	TORONTO, BURFORD, LONDON					
SITE INVESTIGATION SERVICES	-	37.50	40.00	-	37.50	40.00	-	37.50	40.00	-	1.15	1.90	PETERSBOROUGH, FORT HOPE, BELLEVILLE, SHAWA, BRAMPTON, LINDSAY	1	3 ⁸⁰	800	(1)	803 ⁸⁰

ASSIGNED TO SITE INVESTIGATION LTD.

GIVE REASON IF OTHER THAN LOWEST COST CONTRACTOR ABLE TO SUPPLY EQUIPMENT ON REQUIRED DATE

DATE 14 OCT 76

SIGNATURE OF SUPERVISING ENGINEER

G. L. Denny

REMARKS

Soil Mechanics Section
Geotechnical Office
West Building
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

Tel: (416) 248-3282

August 23, 1976

Site Investigation Services Limited
677 Crown Drive
Peterborough, Ontario

Dear Sirs:

This letter confirms our request by telephone of August 18, 1976 for the supply of a Type II Auger machine (M.V. mounted) - 5.2.i, together with all necessary equipment, as per your Tender for Supply Contract S-76-1002 at Corbett Creek Culvert and Hwy. 401 (3 miles southwest of Oshawa) on August 24, 1976.

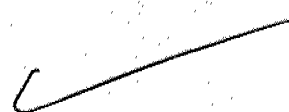
Mobilization will be from Oshawa, Ontario.

Our Project Number is W.P. 44-71-20.

Yours truly,

M. Devata
Supervising Engineer

cc: W.W. Fry
(Attn: V. Di Marco)
Files
Record Services



BORING CONTRACTORS - COMPARATIVE COSTS

SUPPLY CONTRACT No. 5 - 76 - 1002

PERIOD FROM MAY 1st, 1976 TO OCT. 31st, 1976

DRILL ITEM NO. 5.2

START DATE 24-08-76

ESTIMATED DRILLING FOOTAGE 60

UNIT REQUIRED 5.2

SITE CORBETT CREEK CULVERT, NORTH OF HWY 401 CN

ESTIMATED FEET PER HOUR 4

W. P. 44-71-20

RAFT REQUIRED: YES ☐ NO ☒
RELOCATED NORTH SERVICE ROAD

ESTIMATED TOTAL HOURS 15

W. O.

CONTRACTOR	EQUIPMENT DESCRIPTION AND RATES									MOBILIZATION RATES			MOBILIZATION POINTS	MILES ONE WAY	MOB. COST	DRILLING COST	OTHER COST	TOTAL COST
	5.2(A) S. A. TRAIL	5.2(B) S. A. TRUCK	5.2(C) S. A. M.V.	5.2(D) H.S. 2 1/4" TRAIL	5.2(E) H.S. 2 1/4" TRUCK	5.2(F) H.S. 2 1/4" M.V.	5.2(G) H.S. 3 1/4" TRAIL	5.2(H) H.S. 3 1/4" TRUCK	5.2(I) H.S. 3 1/4" M.V.	6.2(A) TRAIL	6.2(B) TRUCK	6.2(C) M.V.						
COST	36.00	36.00	40.00	38.00	38.00	40.00	38.00	38.00	40.00	1.40	1.40	1.50	CONCORD, BELLEVILLE, LONDON, NORTH BAY	32	96.00	600.		696.00
CANADIAN LONGYEAR	37.00	37.00	40.50	39.50	39.50	43.00	39.50	39.50	43.00	1.35	1.35	1.65	CONCORD (WITHIN 50 MILES)	32	105.00	645.		750.00
	40.00	40.00	43.50	42.50	42.50	46.00	42.50	42.50	46.00	1.35	1.35	1.65	CONCORD, NORTH BAY, LONDON, SUDBURY *					
	* RATES APPLY TO ALL JOBS MORE THAN 50 MILES FROM CONCORD WAREHOUSE																	
GEOCON	-	31.00	35.00	-	33.00	37.00	-	33.00	37.00	-	1.00	1.50	TORONTO, SUDBURY, HAMILTON	32	96.00	555.	②	651.00
R.B. DODDS OR MORTON DODDS	45.00	45.00	50.00	45.00	45.00	50.00	45.00	45.00	50.00	1.50	1.50	1.50	TORONTO, SUDBURY, THUNDER BAY	32	96.00	750.		846.00
DOMINION SOIL	PLUS 1.20/MILE MOTEL TO JOB SITE OR 22.00/HOUR TRAVELLING TIME IN CLIENT'S VEHICLE																	
	50.00	50.00	50.00	-	-	-	50.00	50.00	50.00	1.50	1.50	1.50	TORONTO, KITCHENER, LONDON, THUNDER BAY, WINDSOR, OTTAWA, NORTH BAY	32	96.00	750.		846.00
JAWTHORNE	PLUS \$1.50/MILE, MOTEL TO JOB SITE AND RETURN DAILY, THUNDER BAY, NORTH BAY, OTTAWA																	
	-	-	-	-	-	-	-	38.00	42.00	-	2.00	2.00	OTTAWA					
JOHNSTON	32.00	32.00	37.00	35.00	35.00	40.00	35.00	40.00	40.00	1.25	1.25	1.50	OTTAWA, TORONTO (WITHIN 30 MILES)					
	35.00	35.00	40.00	38.00	38.00	43.00	38.00	43.00	43.00	1.25	1.25	1.50	OTTAWA, TORONTO (OUTSIDE 30 MILES)	32	96.00	645.		741.00
MASTER	34.00	34.00	39.50	36.50	36.50	42.00	36.50	36.50	42.00	1.35	1.35	1.65	TORONTO, LONDON, NORTH BAY, OTTAWA	32	105.00	630.		735.00
P. V. K.	-	-	-	-	-	40.00	-	-	-	-	-	2.00	TORONTO, BURFORD, LONDON					
SITE INVESTIGATION SERVICES	-	37.50	40.00	-	37.50	40.00	-	37.50	40.00	-	1.15	1.90	PETERSBOROUGH, NORTH HOPE, BELLEVILLE, OTTAWA, BRANFORD, LINDSAY	3	11.40	600.	①	611.40

ASSIGNED TO SITE INVESTIGATION SERVICES

REMARKS

DATE 18th Aug 76 SIGNATURE OF SUPERVISING ENGINEER J. N. A. A. A.

DATE 18th Aug 76 SIGNATURE OF SUPERVISING ENGINEER J. N. A. A. A.



Memorandum

To: Mr. D. Gunter,
Head, Geotechnical Section,
Central Region.

From: L. Dutchak,
Planning & Design Office.

Attention:

Date: December 3, 1976.

Our File Ref.

In Reply to

Subject:

RE: Soils Investigations,
Proposed Relocation of N. Service Road,
N/W Quadrant of Thickson Rd/Hwy 401,
W.P. 44-71-20

The Region of Durham has been requested to undertake, on behalf of the Ministry, the design and construction of the North Service Road relocation as indicated on the attached plan and profile.

Preliminary foundation investigations taken by our Soils Mechanics Office for a proposed culvert at Corbett Creek disclosed an extremely poor soils condition in the area.

In order to continue our design study we require the following soils information:

- soil conditions along the proposed route between the points noted on the plan (identification of swamp limits required)
- depth of swamp along centreline (100' intervals) on d.
- depth of swamp 100 - 150' either side of centreline (at intervals of 100')
- depth of swamp in area adjacent to existing Service Road (see plan)
- your comments relative to a possible route immediately adjacent to the rear (west limit of homes) and parallel to Thickson Rd.

The route of the North Service relocation has been delineated in the field by the Region of Durham staff.

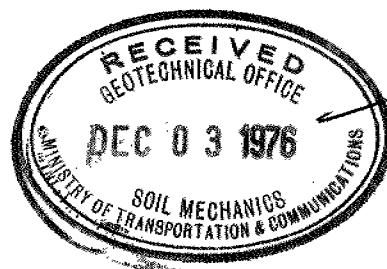
I would suggest that prior to undertaking any field work that you contact Mr. Ron Dupuis from the Region of Durham. (phone 825-668-7711) so that permission to enter onto the lands can be obtained.

If there are any questions regarding this request please contact me.

Your early attention to this matter would be appreciated.

L. Dutchak
L. Dutchak,
Sr. Project Manager.

LD/lr W. Kulmatics
c.c. R. Dupuis
Mr. Devata ✓



m D
m m
Diln



Memorandum

To: Mr. C. Mirza,
Head, Soils Mechanics Section,
West Building.

From: G. C. E. Burkhardt,
Structural Planning Office,
3501 Dufferin Street.

Attention:

Date: August 12, 1976.

Our File Ref.

In Reply to

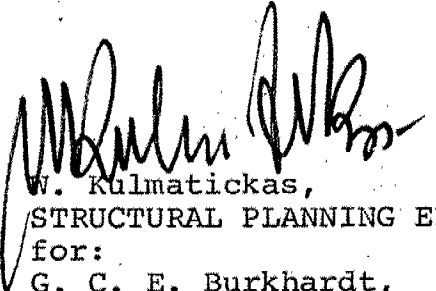
Subject:

North Service Road Relocation,
Thickson Road / Hwy. No. 401 Interchange,
Oshawa W. P. 44-71-20.

Attached
findings

Attached, please find two copies of drawings showing the location of a new 16 foot wide by 10 foot high culvert, (indicated in red), which will carry the North Service Road over Corbett Creek.

Kindly initiate a foundation investigation of sufficient scope to cover the soil condition at the above indicated site. As this project is very urgent, we would like to receive the finished soil report by September 30, 1976.


W. Kulmattickas,
STRUCTURAL PLANNING ENGINEER,
for:
G. C. E. Burkhardt,
REGIONAL STRUCTURAL PLANNING ENG.

WK:jo
Attach.

cc: L. Dutchak
R. Fitzgibbon
J. Anderson





Memorandum

To: Mr. G. Burkhardt,
Bridge Planning Engineer,
Regional Structural Planning Office.

From: L. Dutchak,
Planning & Design,
Central Region.

Attention:

Date: July 30th, 1976.

Our File Ref.

In Reply to

Subject: North Service Road Relocation,
Thickson Road/Hwy. 401 interchange
Oshawa Work Project 44-71-20

Attached, please find 1 print of a plan depicting the proposed alignment for the North Service Road.

The Regional Municipality of Durham will be carrying out design, tendering and property acquisition on behalf of the Ministry, under a legal agreement.

Since the municipality does not have the capability of carrying out foundation investigation for the Corbett Creek Crossing, they have requested that the Ministry do the required work for them.

My earlier discussions with you on this matter indicated that you would do the required investigations. To assist you in this endeavour, I have requested Mr. R. (Ron) Dupuis of the municipality to:

- 1) establish a line in the field and
- 2) obtain permission to enter from the property owners.

Upon receipt of confirmation of the above, I will advise you immediately.

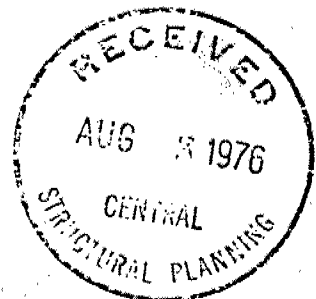
Thank you for your co-operation on this matter.

L. Dutchak,
Senior Project Manager.

LD:mk

cc's
Mr. R. Dupuis
Regional Municipality of Durham,
105 Consumers Drive,
Whitby, Ontario.

Note:
2 additional prints of plan
provided who are relevant
building area had in mind.
J. Richards
August 11/76





THE REGIONAL MUNICIPALITY OF DURHAM

WORKS DEPARTMENT R.F. RICHARDSON, P.Eng./Commissioner of Works
105 CONSUMERS DRIVE, P.O. BOX 623, WHITBY, ONTARIO L1N 1C4 TELEPHONE: (416) 668-7721

August 9, 1976

Mr. G. Burkhardt
Bridge Planning Engineer
Regional Structural Planning Office
Ministry of Transportation
and Communications
3501 Dufferin Street
DOWNSVIEW, Ontario

Dear Sir:

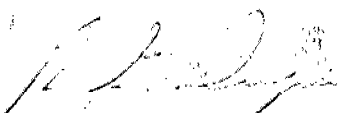
Re: North Service Road Relocation
Thickson Road/Hwy. 401 Interchange
Your W.P. 44-71-20, Foundation Investigation Report

Further to Mr. L. Dutchak's memo of July 30, 1976 to you, I am forwarding information which should enable you to perform the required investigation.

Attached is a copy of a letter granting the Region permission to enter the subject lands for purposes of conducting soils analysis, a copy of a reference plan, indicating the proposed right-of-way, and a print of our preliminary design plan for the project. Further to this, I have been advised by our survey people that centreline for the above has been staked in the field.

Should you require further information or assistance on this matter, I would be pleased to discuss it with you.

Yours very truly,


R. G. Dupuis, P. Eng.
Road Design Engineer

RGD/vl
Attach.



292441 Ontario Ltd.,
C/O 120 Overbrook Road,
Downsview, Ontario.

July 28, 1976

The Regional Municipality
of Durham,
Works Department,
P.O. BOX 623,
Whitby, Ontario.
L1N 1C4

Attention: Mr. R. Mayr, Land Purchase Division

Dear Sirs:

Re: 292441 Ontario Ltd.

With regard to your letter of July 12, 1976, we hereby give you permission to enter the lands in the vicinity of Thickson Road and Champlain Avenue, in the Town of Whitby owned by 292441 Ontario Ltd., for the purpose of conducting soils analysis.

Trusting this is satisfactory.

Yours very truly

292441 Ontario Limited

F. Happe
FH/jb



REGION	DURHAM	
REGION		
RECEIVED		
COPIES TO	AUG 3-1976	
	WORKS	
	DEPT.	FILE

