

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 31G-24

DIST. 9 REGION

W.P. No. ~~5~~

CONT. No.

W. O. No. 74-11002

STR. SITE No.

HWY. No. 401 / 417

LOCATION ONTARIO - QUEBEC

BORDER CROSSING SIGNS

No. of PAGES -

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

316-24

GEOCREs No.

TO: Mr. T.C. Kingsland, (2) FROM: Soil Mechanics Section,
Regional Structural Planning Geotechnical Office,
Engineer, West Building, Downsview.
Eastern Region, Kingston.

ATTENTION: DATE: May 10th, 1974.

OUR FILE REF. IN REPLY TO MAY 16 1974

SUBJECT:

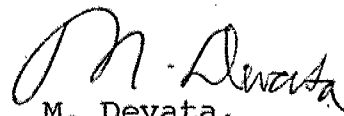
FOUNDATION INVESTIGATION REPORT
For
Border Crossing Signs,
Hwy. #417 and Hwy. #401, Quebec Border,
District #9, Ottawa, Ontario.

W.O. 74-11002.

W.P.-NIL.

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the abovementioned site.

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.


M. Devata,
Supervising Engineer.

MD/mj
Attach*

c.c. E.J. Orr
B.R. Davis
A.J. Percy
J.M. Childs
B.J. Giroux
E.R. Saint
G.A. Wrong
B.A. Singh
G.W. Raycroft
Files, ✓
Documents

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 - 3.3) Recommendations.
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FOUNDATION INVESTIGATION REPORT
For
Border Crossing Signs,
Hwy. #417 and Hwy. #401, Quebec Border,
District #9, Ottawa, Ontario.
W.O. 74-11002, W.P. NIL.

1. INTRODUCTION:

A request for foundation investigation for the proposed border crossing signs at the crossing of Quebec Border and Hwy. #401 and #417, was received from Mr. T.C. Kingsland, Regional Structural Planning Engineer, in a memorandum dated March 18th, 1974.

Following this request, the Soil Mechanics Section carried out foundation investigation at both locations to determine the existing subsoil conditions.

This Report contains the results of both investigations and our recommendations pertaining to the foundation design of the proposed border crossing signs.

Since these sites are located approximately 70 miles (112 Km.) apart, subsoil description and recommendations are discussed separately, for each location.

2. SITE #1: Hwy. #417 and Quebec Border Crossing:

2.1) General.

This site is situated at the crossing of Hwy. #417 (Sta. 494+70) W.B.L. and Quebec Border. The inside edge of the 14 ft. (4.3 m) by 20 ft. (6.1 m) sign will be located some 42 ft. (12.8 m) from the centreline of W.B.L., or 30 ft. (9.1 m) from the edge of pavement.

2.2) Subsoil Conditions.

The subsoil at this location was found to consist of a compact to very dense silty sand to sand with some gravel. The thickness of the deposit was not determined, since the boring was terminated within this deposit at a depth of 36 ft. (11 m).

Standard Penetration Test carried out within this deposit gave 'N' values ranging from 11 to 132 blows/ft. The low 'N' value of 11 blows/ft. was encountered approx. 8 - 9 ft. (2.4 - 2.8 m) below groundlevel.

The groundwater level was observed to be approx. 5 ft. (1.5 m) below groundlevel at the time of field investigation.

2.3) Recommendations.

The subsoil conditions are generally favourable for spread footing type foundation at the proposed border crossing sign. It is recommended that the footings for this sign may be designed for an allowable load up to 4.0 T.S.F. (383 kPa) provided the footing is located at or below elev. 131, (40 m). Since excavations will be carried out below the observed water table in the granular subsoil, a dewatering scheme may be required during construction. It is believed that the groundwater level may be lower during the dry season and if construction is carried out during that period, dewatering may not be a problem.

3. SITE #2: Hwy. #401 and Quebec Border Crossing:

3.1) General.

This site is located at the crossing of Hwy. #401 (Sta. 471+80) W.B.L. and Quebec Border. The inside edge of the 14 ft. (4.3 m) by 20 ft. (6.1 m) will be located some 42 ft. (12.8 m) from the centreline of W.B.L. or 30 ft. (9.1 m) from the edge of pavement.

3.2) Subsoil Conditions.

The subsoil was found to consist of a cohesive deposit of clayey silt to clay with some sand. Based on the undrained shear strength obtained from in-situ vane tests, the consistency of this cohesive material is estimated to be ranging from soft to very stiff.

The groundwater level was observed to be approx. 4 ft. (1.2 m) below groundlevel at the time of field investigation.

3.3) Recommendations.

Spread footing type foundation is recommended at this location with an allowable load up to 1,000 p.s.f. (48 kPa). Consolidation settlement of the subsoil under the abovementioned pressure is estimated to be in the order of 2 to 3 inches. No major dewatering problems are anticipated due to the relatively impervious nature of the subsoil. The cohesive subsoil is very sensitive and therefore, care should be exercised to ensure the foundation subsoil is not softened by uncontrolled surface runoff and/or construction traffic. In this regard, it may be advantageous to pour a lean concrete working slab immediately after the completion of the footing excavation.

4. MISCELLANEOUS:

The field work was carried out between March 28th and April 1st, 1974, under the supervision of Mr. J.T. Bangs, Project Engineer.

Drilling equipment used was owned and operated by F.E. Johnston Ltd. of Ottawa.

This Report was written by Mr. P. Payer, Senior Engineer, and was reviewed by Mr. M. Devata, Supervising Engineer.

P. Payer
P. Payer, P. Eng.

M. Devata
M. Devata, P. Eng.

PP/mj
May, 1974.



DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 1- SITE 1

FOUNDATIONS OFFICE

(HWY. NO. 417)

JOB 74-11002

LOCATION Sta. 494 + 70 52' Lt.

ORIGINATED BY JB

W.P. Nil

BORING DATE Mar. 28 & 29, 1974

COMPILED BY CP

DATUM Geodetic

BOREHOLE TYPE Washbore; BX Casing

CHECKED BY *N.P.*

SOIL PROFILE			SAMPLES			ELEV. SCALES ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				w_p w w_L WATER CONTENT %				
42.7	140.1	Ground Level				42.7									
0.0	0.0	Silty sand to sand, some gravel.													
		Compact to Very Dense													
			1	SS	38										
			2	SS	21										
			3	SS	11	130									
			4	SS	76	39.6									
			5	SS	87										
36.5	119.6		6	SS	134	120									
6.2	20.5	End of Borehole				36.6									
						110									
						33.5									

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 2 - SITE 2

 FOUNDATIONS OFFICE
(HWY. NO. 401)

JOB 74-11002

LOCATION Sta. 471 + 80 82' Lt.

ORIGINATED BY JB

W.P. Nil

BORING DATE April 1, 1974

COMPILED BY CP

DATUM Geodetic

BOREHOLE TYPE Washbore - NX Casing

CHECKED BY M.P.

SOIL PROFILE			SAMPLES			ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.			WATER CONTENT %			P.C.F.	GR.SA.SI.CL
50.3	165.0	Ground Level												
0.0	0.0	Clayey silt (Brown)	1	SS	5	160								
			2	SS	6	48.8								
			3	SS	4									
		Silty clay to clay, some sand.	4	TW	PM	150								
			5	TW	PM	45.7			+ 12.0					
		Soft to Very Stiff	6	SS	2	140			+ 12.0					
			7	SS	-	42.7			+ 6.0					
						130			+ 6.0					
39.2	128.5		8	TW	PM	39.6								
11.1	36.5	End of Borehole												
						120								
						36.6								
									25 kPa					
									50					

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION 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 "		

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

IN TERMS OF
EFFECTIVE STRESS
 $\tau_f = c' + \sigma' \tan \phi'$

IN TERMS OF
TOTAL STRESS
 $\tau_f = c_u + \sigma \tan \phi$

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

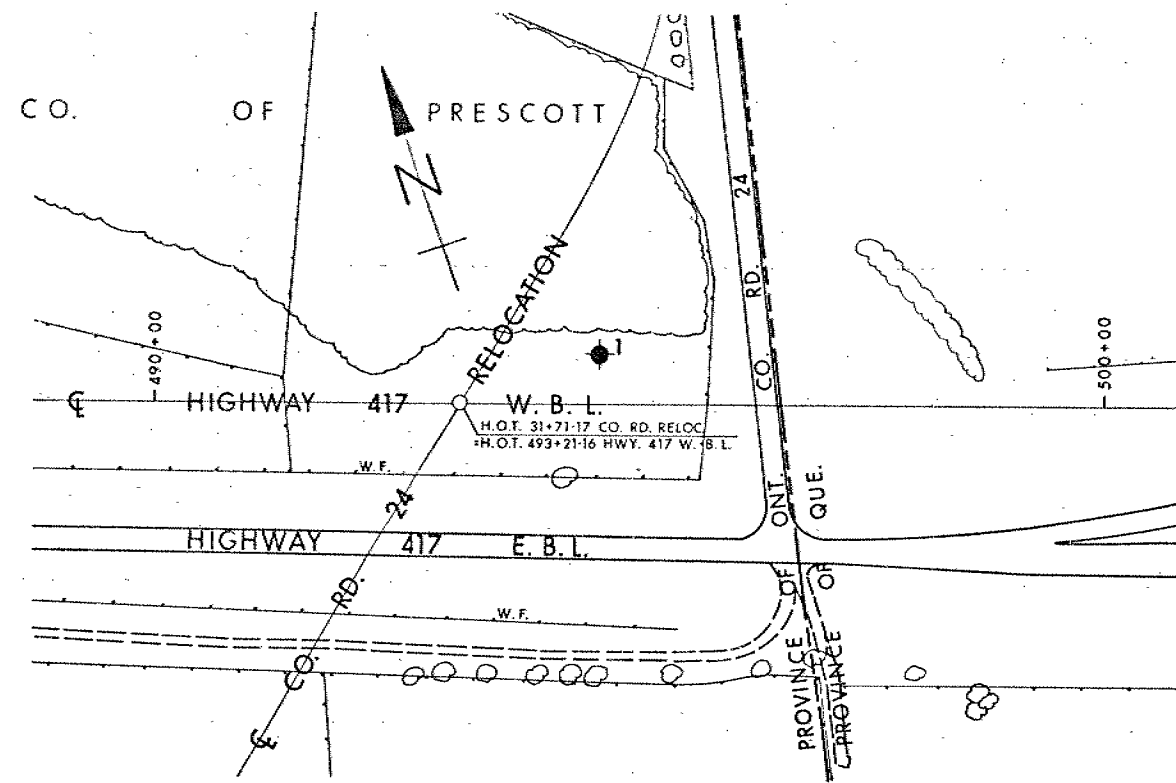
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

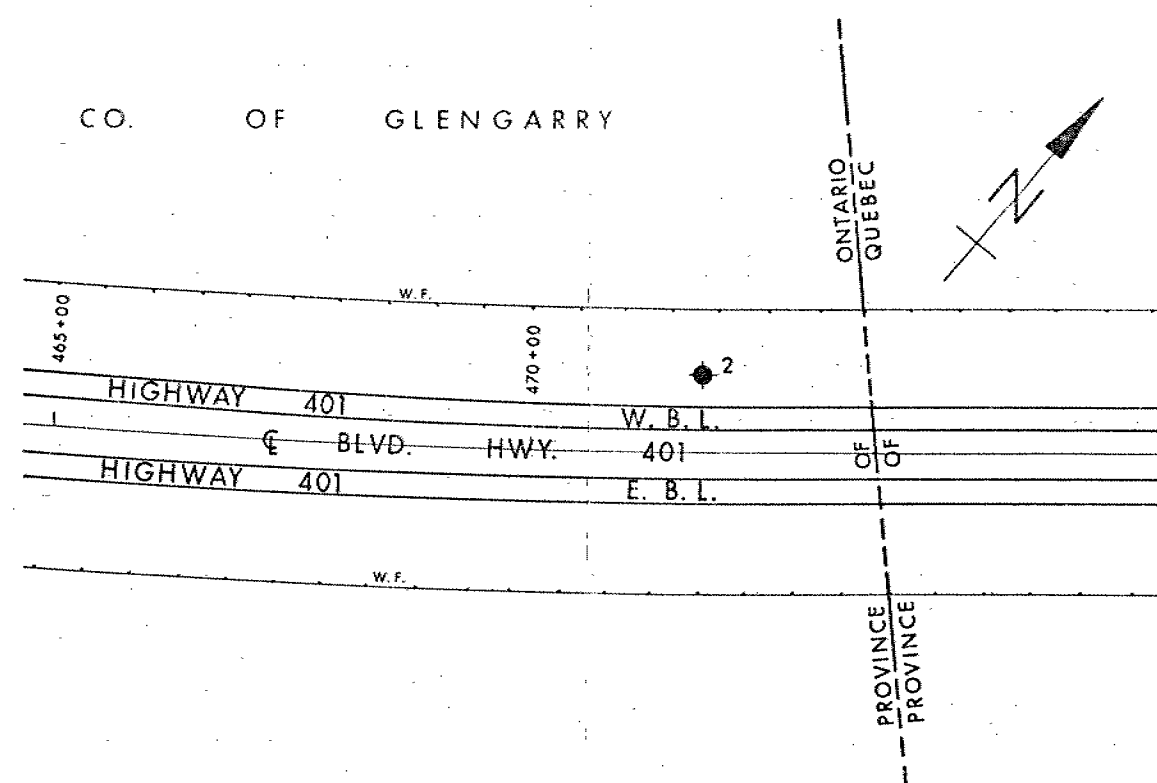
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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

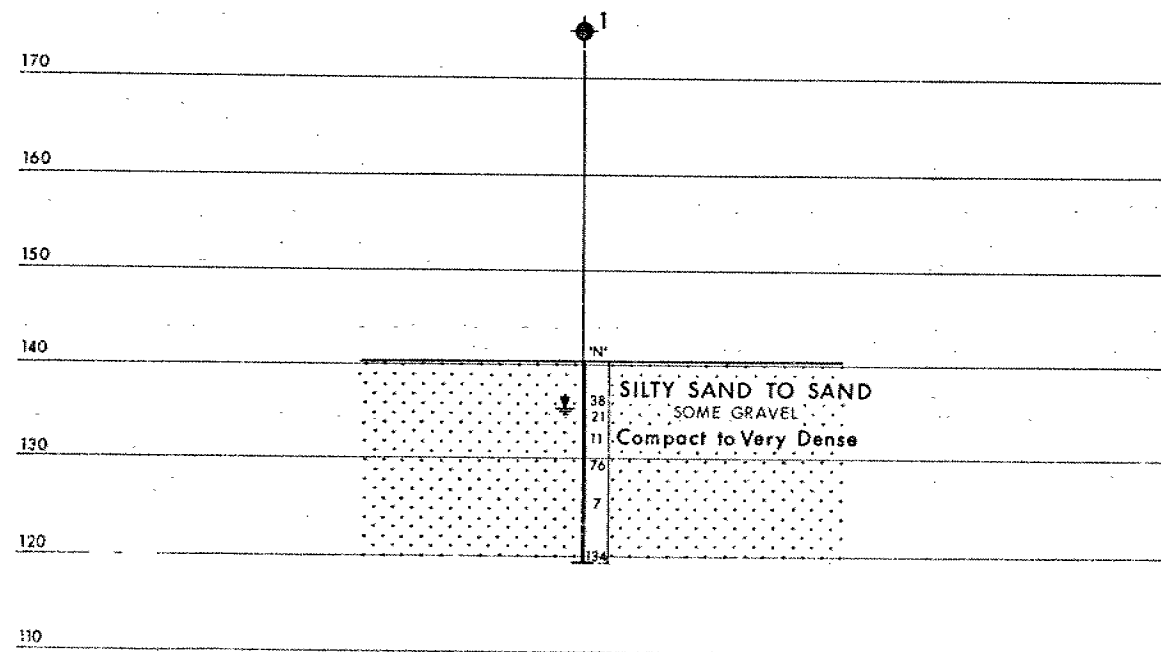
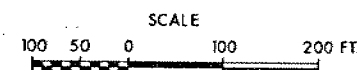


SITE 1 - B.H. 1

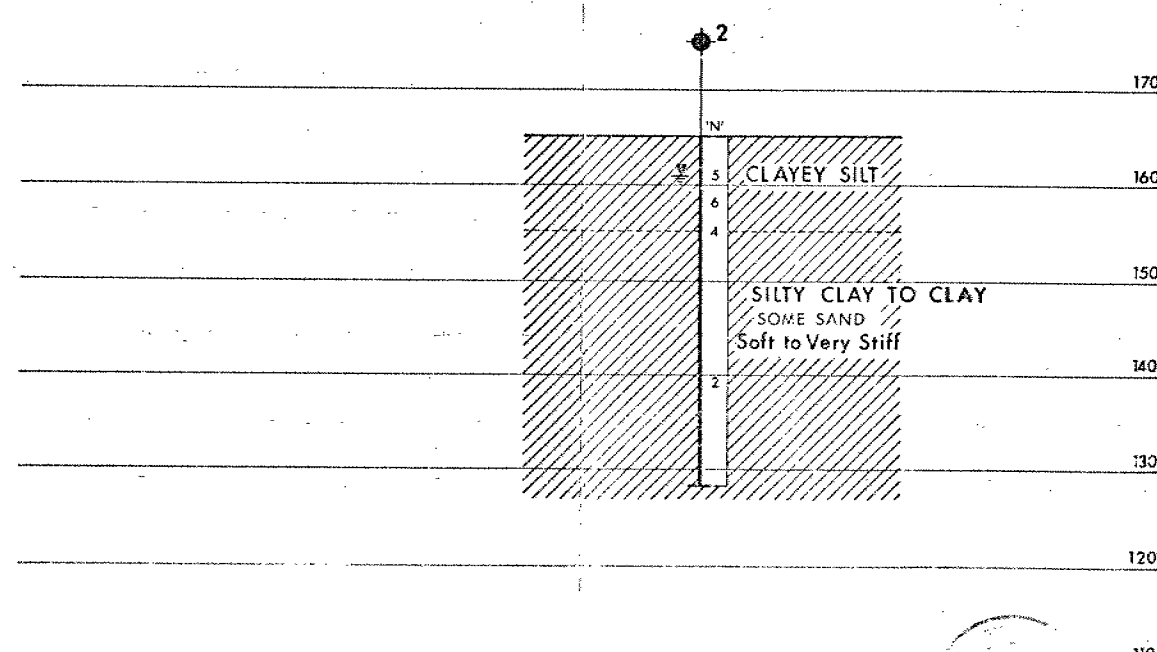


SITE 2 - B.H. 2

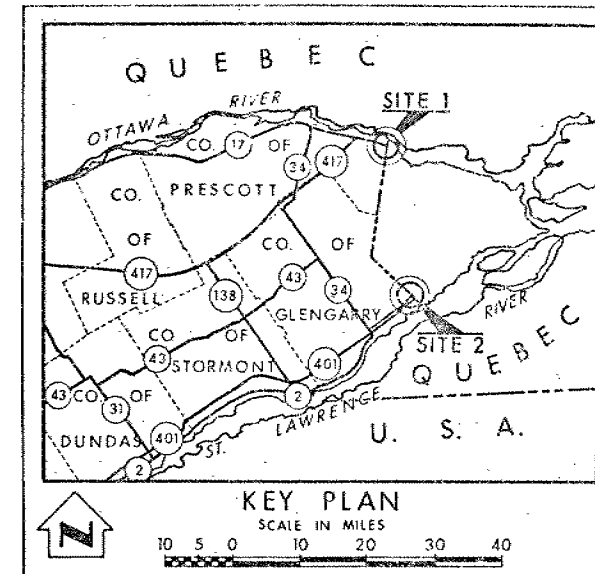
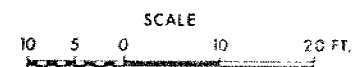
PLANS



BORE HOLE 1



BORE HOLE 2



LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, MAR. & APR. 74

NO.	ELEVATION	STATION	OFFSET
1	140.1	494 + 70	52' LT.
2	165.0	471 + 80	82' LT.

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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE

BORDER CROSSING SIGNS

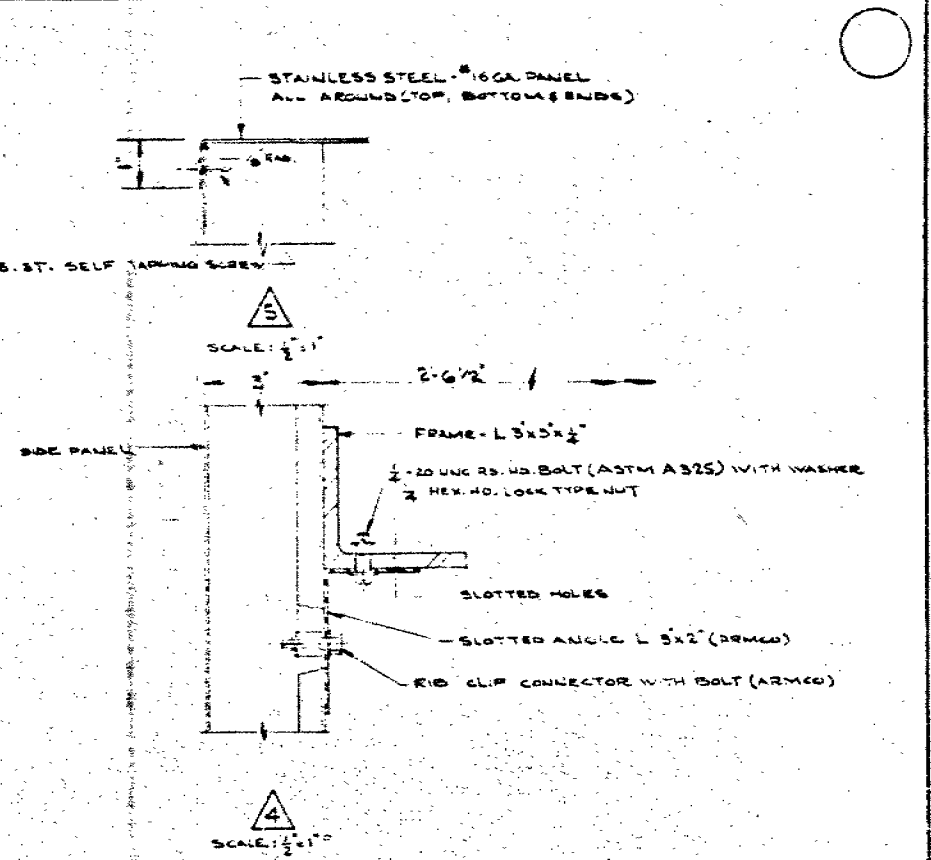
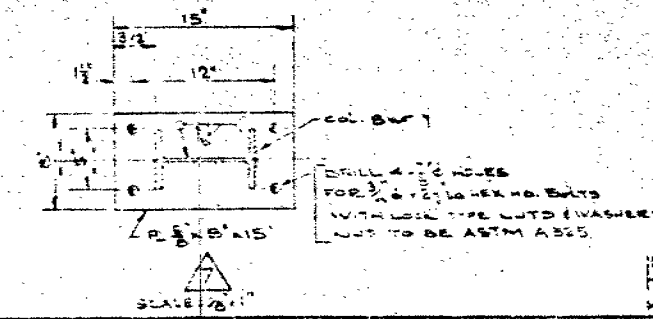
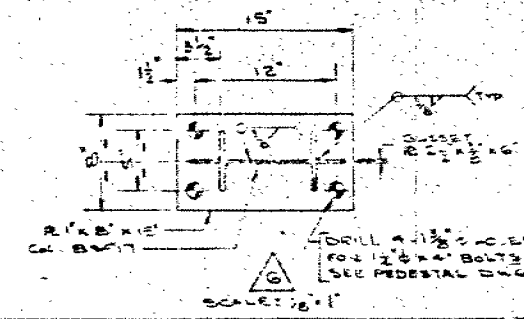
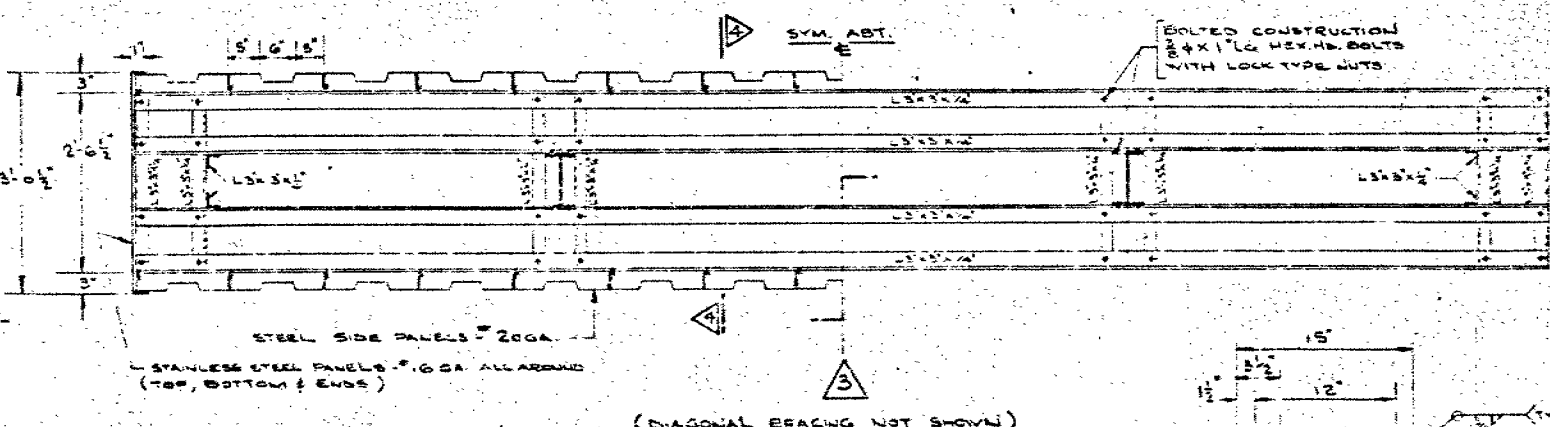
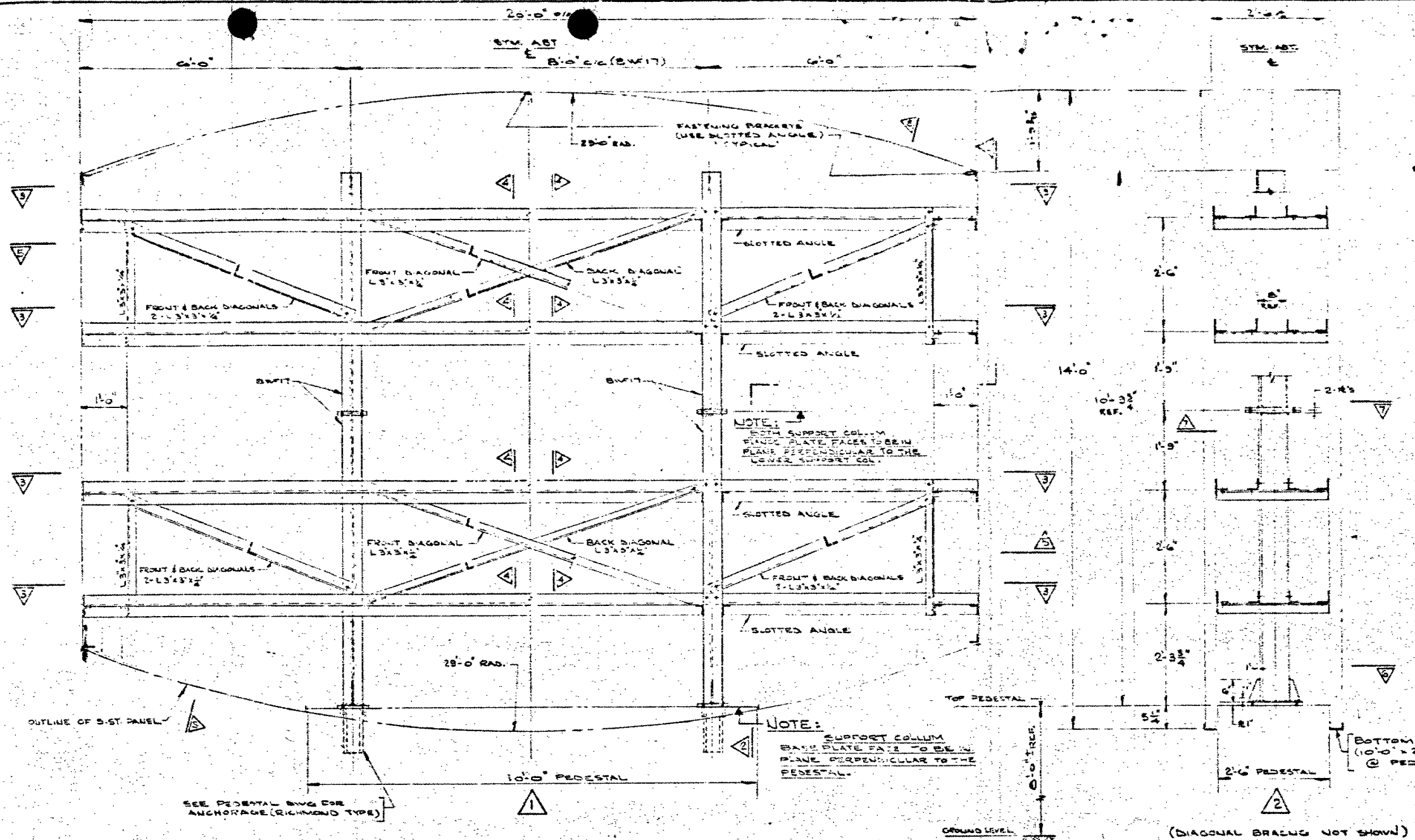
HIGHWAY NOS. 401 and 417 DIST. NO. 9
CO. PRESCOTT and GLENGARRY
TWP. LOT. CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD J.B.	CHECKED	WP NO.	DRAWING NO.
DRAWN N.T.	CHECKED	WO NO 74-11002	74-11002A
DATE 9 MAY 1974	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	ONT. NO.		

NOTE FOR CONTRACT DOCUMENT

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundation Office, Downsview, and at the Office, District Office.



- NOTES:**
- STRUCTURAL STEEL TO BE C.S.A. G40-12.
 - SIGN PANELS TO BE ARMCO (OR EQUAL) #20 GA. ZINC COATED STEEL ACRYLIC ENAMEL (COLOUR 0501).
 - WELDING SHALL CONFORM TO C.S.A. SPEC. W58.
 - ALL STRUCTURAL STEEL & HARDWARE (BOLTS, NUTS, SLOTTED ANGLE, ETC.) TO BE GALVANIZED IN ACCORDANCE WITH C.S.A. SPECIFICATION G164 AFTER ASSEMBLY.
 - BOLTED CONSTRUCTION.
 - ALL NUTS TO BE LOCK TYPE.
 - ALL STAINLESS STEEL PANELS & S.S.T. SELF TAPPING SCREWS TO BE ALLOY 304 / OR 302.

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS		
ONTARIO		
ONTARIO BOUNDARY SIGN		
HIGHWAY No. _____		DIST. No. _____
TO _____	LOT _____	
TWP. _____	CON. _____	
STRUCTURAL DETAILS		
APPROVED _____	DATE _____	BY _____
DESIGN _____	CHECK _____	DRAWING _____
DATE _____	DEPT. OF _____	NO. _____

FOR REDUCED PLAN
USE SCALE BELOW
1" = 10'-0"
3" = 30'-0"

"WELCOME TO ONTARIO" SIGN STRUCTURES

HWY. 417 N.B.L

AT STA. 494+70

APP. 250' EAST FROM CTY. RD. 24

Site 27-1A9

FR. FOUNDATION REPORT

TYP. SUB SOIL CONDITIONS AT STRUCTURE SITE BOREHOLE #5

2' TOP SOIL

12'-6" SILTY SAND WITH TRACE OF CLAY & OCC. BOULDER

21.6' SAND WITH TRACE OF CLAY VERY DENSE.

32' CLAYEY SILT TO SILTY CLAY VERY STIFF-HARD

ALLOWABLE BEARING PRESSURE FOR SPREAD PIER FOUNDATION

(PAGE 7)

5.0 T.S.F.

FROM SOILS DATA

STA. 494+00

0"-8" OK. BR. SA. TPS.

8"-24" BR. SI. SA. TILL

24" N.F.P. BLORS

STA. 495+50

0"-7" OK. BR. SA. TPS.

7"-30" BR. SI. SA. TILL

24" N.F.P. BLORS

HWY. 401 N.B. L

AT STA. 471+80

APP.

380

EAST OF FORGED ROAD V'DASS SITE 21-245

FR. FOUNDATION REPORT.

TYP. SUBSOIL CONDITIONS AT STRUCTURE SITE BOREHOLE #892-5

9.5' SILTY CLAY NOTTED, GREY BROWN, STIFF

27.5' CLAY, BLUE GREY, HOMOGENEOUS, SOFT TO MEDIUM

12.8' SAND AND GRAVEL, GREY, HET. WITH SOME SILT & CLAY

MEDIUM DENSITY CONT. SCATT. BLDRS.

ALLOWABLE BEARING PRESSURE (PGE 1A) = 960 PSF = 0.48 T.S.F.

FOR SPREAD PIER FOUNDATION

FROM SOILS DATA.

AT STA. 471+00

0"-8" NOTTED BROWN TOPSOIL

8"-20" GRAY BR. SA-CLAY LO.

20"-36" V.F. SA-CL.

AT STA. 473+00

0"-12" H. BR. TOPSOIL

12"-48" GRAY BR. V.F. SA-CL.

LAYERS V.F. SA. @ 28' + WET @ 48"

ALLOWABLE BEARING PRESSURE AT SIGN SITE ASSUMED NOT TO
BE LESS THAN AT STRUCTURE SITE = 0.48 T.S.F.

A.V. FEB 15/74

D.B.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. E. Argue
Director, Maintenance Branch
Central Building

FROM: J. E. Gleason
Traffic Control Office
Central Building

ATTENTION:

DATE: December 13, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: Border Crossing Signs Highways 401 and 417, Québec Border

Attached are the cross section drawings for the proposed border crossing signs to be erected on Highways 401 and 417, promised in my earlier memo to you of September 10, 1973.

You will note that the recommended position for these signs is to place them 30 feet from the edge of pavement to the left edge of the sign. This has been done since I understand that it is planned to use a concrete type mounting base similar to the one supporting the Welcome sign at the Manitoba border.

If you are in agreement with these sites it would be appreciated if the necessary arrangements be made for the manufacture and erection of the signs.

JEG/RB/mp


J. E. Gleason
Traffic Control Engineer

cc: Mr. J. B. Wilkes
Mr. J. Faretis

