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52-F-210C

W.P.# 745-56

#

Hwy 401

WOOLER ROAD

N.W. OF TRENTON

e. m. peto associates ltd.

YOUR REFERENCE:-

OUR REFERENCE:- 5762

850 roselawn avenue,
TORONTO, ONTARIO.
RUssell 1 - 4955.

REPORT ON
SOIL SITE INVESTIGATION
HWY. #401 - WOOLER ROAD BRIDGE
NORTH-WEST OF TRENTON
MURRAY TWP. #3 W.P. 745 - 56
for
DEPARTMENT OF HIGHWAYS OF ONTARIO
PLANNING AND DESIGN BRANCH

TERMS OF REFERENCE:

We were retained, by a letter from Mr. J. C. McAllister dated April 29th, 1957, to perform a complete soil site investigation at the above mentioned road crossing.

We were required to drive 6 test holes at locations shown on the D.H.O. drawing E-3240 of the proposed bridge site. Test holes were to be driven initially using BX casing and sampling in the standard manner to a depth of approximately 25 ft., depending upon the soil conditions. Standard penetration tests were to prove a minimum of 15 feet of good bearing soil, with standard penetration test results of 30 blows or more.

If bedrock was encountered at shallow depths on the site, this was to be proved by coring with a diamond drill core barrel and bit.

Water table levels were to be carefully noted, both during the performance of the work and after the casing had been pulled.

METHOD OF OPERATIONS:

The work was performed using a Longyear Straightline Junior drill rig with A-frame, which was trucked to the site from our office in Toronto on May 30th, 1957. Work commenced on this date, and was completed on June 5th, 1957. The equipment was then trucked to the site of another Highway 401 bridge, at the Ganaraska River.

METHOD OF OPERATIONS:

The 6 boreholes were located as shown on the site plan attached at the rear of this report. All elevations shown on the site plan and mentioned in the report are referred to Geodetic datum, and were obtained from a D.H.O. bench mark which was a nail and washer in the East root of a 9" maple tree, 152 feet right of the centre line at Sta 177 + 85. The elevation of this bench mark was taken to be 370.32.

All samples obtained on the site were carefully examined in our laboratory and complete boreholes logs were drawn up. These are included at the rear of this report. All samples will be retained for a period of 30 days, after which they will be discarded unless we are otherwise notified.

SITE AND GEOLOGY:

The topography at the site is generally undulating. The site lies in a drumlinized area of the old glacial Lake Iroquois plain. This physiographic region contains modified deposits of glacial till. The till is dominated by limestone content and contains stones and boulders of limestone. The matrix generally consists of silt, clay and very fine sand. The occurrence of occasional Precambrian type rocks such as granite is occasionally noted.

At the time of this investigation, a good portion of the new Highway 401 fill had been placed, except right at the proposed new Woelker Road crossing itself. The fill seemed to be a good granular sandy or silty till.

SOIL CONDITIONS:

Soil conditions on the site are not uniform, and this is liable to cause some problems with the foundations for the proposed bridge.

New Fill: Sandy and Silty Till

The area containing boreholes 4, 5, 6, and 3 has had up to 3-1/2 feet of fill for the new Highway 401 placed upon it. This fill, from visual examination seems to be excellent material if properly compacted. The fill has been placed directly upon the organic topsoil, which is only up to 1 foot thick.

Silty and Clayey Till

Underlying the entire site is a stratum of light brownish grey to light grey, silty and clayey fine sand, with many grits and rock fragments. The density of this material ranges generally from compact to extremely dense, and increases with depth. The material is wet to saturated. Standard penetration test results in this stratum ranged from a low of only 10 blows to a high of well over 100 blows per foot. Due to the nature of the till there are minor variations, with various of the constituents predominating at different locations. In general this material has excellent load bearing capacities, and should not consolidate or settle.

SOIL CONDITIONS:

Silty and Clayey Till. (Cont'd)

The important feature about this till is that its upper surface is not flat or level. There is a considerable slope to the South, and a lesser slope from the West down to the East. This is shown rather clearly on the profile at the rear of this report.

There are indications on the site that at one time there was a slough, a pond or other such body of water in the area bounded by boreholes 1, 2 and 4. In this area there are some loose and soft deposits between the topsoil and the dense till below.

The two types of intervening materials found between the topsoil and the till are:

Loose to Compact Sand

Except at borehole 6, there was from 2-1/2 feet to 16-1/2 ft. of brown and greyish-brown loose to compact, saturated sand with minor silt content. At borehole number 1 this material showed a tendency to become "quick", as the sand backed up the hole a distance of 3 ft. in only one hour. Because of its loose and saturated condition this material would cause settlements if loaded, and is a poor foundation material.

Soft Very Clayey Silt.

In the vicinity of boreholes 1, 4 and 5 only, a stratum from 3 to 6-1/2 feet thick of soft, saturated, very clayey silt was encountered. This material at one point was even wetter than the liquid limit, which means that it would flow if unconfined. Standard penetration blows in this stratum were only in the order of 4 to 6 blows per foot. This also is extremely poor foundation material.

WATER CONDITIONS:

A number of reliable readings of ground water level were taken in all 6 of the test holes, and these are shown on the borehole logs. The water table is nearly at the surface in the vicinity of boreholes 1 and 2 and is only some 5 to 7 ft. below surface at other points.

RECOMMENDATIONS AND CONCLUSIONS:

The profile at the rear of this report illustrates rather clearly the foundation difficulties that will be involved in the construction of a bridge on this site, due to the different types of materials underlying different parts of the proposed bridge site.

Although it is probably not possible, the best measure to take by far would be to move the highway alignment a distance of some 60 feet North, where there is every indication that the till is very close to surface. If this step is ruled out because it is undesirable to introduce horizontal curves into the new Highway No. 401, or because of the difficulty in acquiring more right-of-way, there are then two normal alternatives which can be taken, using the present site:

1. To place two long, narrow footings parallel to the new Wooler Road, the Northernmost portions of which would be founded directly on dense till, and the other portions of which would be founded on short piles driven to refusal into the till. These would of course be level, and should be at elevation 349, which would mean that the piles at the Southernmost ends of these footings would be some 20 feet long.
2. To construct a series of isolated footings (3 or 4 on each side of Wooler Road, which are stepped down from North to South. On the East side of Wooler Road the Northern ones could be at elevation 349.0, the centre ones at elevation 335.0, and the Southern ones at elevation 330.0. On the West side of Wooler Road these footings could be placed at elevations 353.0, 345.0 and 330.0 respectively). There would undoubtedly be considerable difficulty in making the excavations for the footings at the lower elevations and sheeting would be required. Regardless of the footing elevations, they should all have a safe allowable bearing capacity of 2.7 tons per sq. ft., if the least dimension is no smaller than 5 feet.

E. M. PETO ASSOCIATES LTD.,



E. M. Peto, P. Eng.

EMP:sb

June 17th, 1957.

BOREHOLE LOG

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
SILTY LOAM	BLACK		0' 0" 350.5					W.T.
CLAYEY SILT	GREY	SOFT	4' 0" 346.5					
FINE SAND	BROWN	LOOSE			1	S.S.	10	SATURATED.
FINE TO COARSE SAND	BROWN	LOOSE	10' 0" 340.5		2	S.S.	11	SATURATED.
FINE TO MEDIUM SAND SOME GRITS	"	"	15' 0" 335.5		3	S.S.	8	"
SILTY FINE TO MEDIUM SAND, GRITS AND GRAVEL TILL	LIGHT GREYISH-BROWN	DENSE	20' 0" 330.5		4	S.S.	42	NOTE: WHEN HOLE WAS 15 FT DEEP, SAND BACKED UP THE CASING A DISTANCE OF 3 FT. IN ONE HOUR. WET.
CLAYEY FINE TO COARSE SAND, GRITS AND PEBBLES SOME SILT CONTENT	GREY	DENSE	25' 0" 325.5		5	S.S.	80/e"	
			30' 0" 320.5		6	W.S.		
			HOLE TERMINATED.					

Checked ByE.M.P.

W. T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
ORGANIC SANDY TOPSOIL.		V	0' 0" 351.7	S.S.S			2 W.T.	
FINE TO MEDIUM SAND GRITS.	GREYISH-BROWN	LOOSE	5' 0" 346.7	1 X	S.S.	10		SATURATED.
FINE SAND	GREYISH-BROWN	COMPACT	10' 0" 341.7	2 X	S.S.	12		SATURATED.
" " SOME GRITS.	"	"	15' 0" 336.7 17' 0" 334.7	3 X	S.S.	18		"
SILTY MEDIUM TO COARSE SAND AND PEBBLE GRAVEL.	DARK GREY	COMPACT.	20' 0" 331.7 23' 0" 328.7	4 X	S.S.	17		"
TILL: SILTY FINE TO MED. SAND MANY GRITS AND PEBBLES.	LIGHT GREY	VERY DENSE		5 X	S.S.	77		QUITE MOIST.
AS ABOVE. MINOR CLAY CONTENT	"	EXTREMELY DENSE	30' 0" 321.7 32' 4" 319.4	6 X 7 X 8 X	S.S. W.S. S.S.	90 1/6"		" "
			HOLE TERMINATED					

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Hwy. 401 - Wooler Rd. Bridge Job No. 5762

Borehole No. 3





Client Dept. of Highways of Ontario Casing BX (2 1/2" diam.)

Boring Date June 5, 1957

Datum Geodetic Compiled By M. Mindess

Checked By E.M.P.

SAMPLE CONDITION

















-  UNDISTURBED
-  FAIR
-  DISTURBED
-  LOST

SAMPLE TYPE

- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- Q/6 UNCONFINED COMPRESSIVE STRENGTH
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft	WATER LEVELS, SOIL MOISTURE & REMARKS
SANDY AND CLAYEY SILT FILL. GRITS.	LIGHT BROWN		0' 0" 356.2					
ORGANIC SANDY TOPSOIL			3' 0" 4' 0" 352.2					
SILTY VERY FINE SAND MIXED WITH COARSE SAND	LT. GREY LT. BROWN	COMPACT	6' 8" 349.5		1	 S.S.	26	W.T. WET
TILL: CLAYEY AND SILTY FINE SAND, GRITS AND GRAVEL	LIGHT GREY	COMPACT TO DENSE	10' 0" 346.2		2	 S.S.	36	WET. ANGULAR LIMESTONE FRAGMENTS UP TO 2" SIZE
AS ABOVE	"	VERY DENSE	15' 0" 341.2		3	 S.S.	94	WET
AS ABOVE	"	"	20' 0" 336.2		4	 S.S.	80/6"	"
"	"	"	"		5	W.S.		
"	"	EXTREMELY DENSE	25' 0" 331.2		6	 S.S.	100/4"	"
SILTY FINE TO MEDIUM SAND, GRITS AND ROCK FRAGMENTS.	LIGHT BROWNISH- GREY	"	27' 0" 329.2					
		"	30' 0" 326.2		7		130	ON STRAIGHT A-ROD.

HOLE TERMINATED

Job No. 5762

Borehole No. 5

Casing.....BK (2-1/2" diam.)


Boring Date May 31st, 1957.

Compiled By M. Mindess

Checked By E. M. P.

SAMPLE TYPE

ABBREVIATIONS

 FAIR

☒ DISTURBED

LOST

S.S. 2" STANDARD SPLIT TUBE SAMPLE

5. L. SPLIT BARREL WITH LINERS

B. T. THIN-WALLED SHELBY TUBE SAMPLE

H. S. WASH SAMPLE

R. C. ROCK CORE

V. T. IN SITU VANE SHEAR TEST

Q/u UNCONFINED COMPRESSIVE STRENGTH

W. L. WATER LEVEL IN CASING

W. T. GROUND WATER TABLE IN SOIL

[illegible]

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Hwy. 401-Wooler Rd. Bridge

Job No. 5762

Borehole No. 6

Client Dept. of Highways of Ontario

Casing.....BX (2-1/2" diam.)

Boring Date May 30th and 31st, 1957

Datum 2003-01-10

Compiled By.....M. J. Sanders

Checked By E.A.P.

SAMPLE CONDITION



UNDISTURBED

FAIR

DISTURBED

LOST

SAMPLE TYPE

S. S. 2" STANDARD SPLIT TUBE SAMPLE

S.L. SPLIT BARREL WITH LINERS

S. T. THIN-WALLED SHELBY TUBE SAMPLE

W.S. WASH SAMPLE

R. C. ROCK CORE

ABBREVIATIONS

V. T. IN SITU VANE SHEAR TEST

Q/u UNCONFINED COMPRESSIVE STRENGTH

W.L. WATER LEVEL IN CASING

W. T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS	
			0' 0" 355.1						
SANDY AND CLAYEY SILT FILL GRITS.	LT BROWN		3' 2" 355.5					MOIST	
SILTY LOAM TOPSOIL.									
SILTY FINE SAND; GRITS AND ROCK FRAGMENTS TILL	LT BROWN	COMPACT γ			1 X	S.S.	24	QUITE MOIST	
								W.T.	
			10' 0" 349.1		2 X	S.S.	45	WET	
SILTY TILL AS ABOVE.	LIGHT BROWNISH-GREY	DENSE			3	W.S.			
	"								
	"	VERY DENSE.	15' 0" 347.1		4	S.S.	72		
" " " "	GREY	EXTREMELY DENSE	20' 0" 339.1		5 X	S.S.	30/9"	WET	
					6	W.S.			
CLAYEY AND SILTY TILL.	"	"	24' 5" 334.6	7	S.S.	60/6"	"		
				HOLE TERMINATED					

[illegible]