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57-F-229C

Hwy # 401

OAKVILLE CREEK

TRAFALGAR TWP.

BA 689

UNIVERSAL
GEOTECHNIQUE

LIMITED



REPORT

on

SUBSURFACE EXPLORATION

for

PROPOSED TRAFALGAR TOWNSHIP BRIDGE N° 7

HIGHWAY 401

COUNTY OF HALTON

ONTARIO

2924 Bloor Street West,
Toronto 18, Ontario.

REPORT

on

SUBSURFACE EXPLORATION

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PROPOSED TRAFALGAR TOWNSHIP BRIDGE N° 7HIGHWAY 401COUNTY OF HALTONONTARIOINTRODUCTION

The Highways Department of the Province of Ontario are planning a bridge to carry the traffic of the proposed Highway 401 over Oakville Creek in Trafalgar Township just South of Hornby Common.

In order to determine the subsurface conditions for purposes of engineering design, the D.H.O. authorized GEOTECHNIQUE to proceed with subsurface exploration of the proposed site. Exploratory boreholes were accordingly carried out in conformity with the requirements of the Department as shown on drawing N° D-4013A.

THE SITE

The site comprises farm land which is at the moment laid down to grass on both banks of the Oakville Creek. It exhibits a level topography of a flood plain bordered by rather steep banks in the Northeast and the Southwest which separate the lowlying area from the rest of the countryside.

SUBSURFACE EXPLORATION

Subsurface exploration was carried out during the period 28th of November to 8th of December, 1957, and comprised a total of six exploratory boreholes located in positions as shown on the plan accompanying this Report. The proposed location of the boreholes were staked and the ground surface elevations obtained by a D.H.O. Survey Crew but subsequently the positions of boreholes BH. 1, 4, 5, and 6 were slightly revised to avoid obstructions such as trees and to obviate the necessity for drilling one of the boreholes over water, the position of this latter borehole having to be moved only a few feet to avoid extra expenditures.

Soil samples were obtained generally at intervals of about 5 feet but where noticeable changes of strata occurred the depths of such changes were registered and additional samples were obtained.

The state of compaction of essentially cohesionless soil and the consistency of cohesive soil were determined by the standard penetration test taken during the operation of soil sampling. (The standard penetration test, as referred to in this Report, involves the recording of the number of blows (N) of a 140 lb. hammer falling 30 inches that are required to drive a 2 inch diameter split barrel sampler 1 foot into the soil at the bottom of the borehole, after an initial penetration of 6 inches).

Visual examination and classification of all samples was carried out in the laboratory and certain samples were subjected to testing.

The descriptions of the soil obtained from the foregoing examination together with results of the standard penetration tests are given on the borehole logs and these, together with borehole sections A-A' and B-B' and a location plan, form part of this Report.

Subsurface conditions given in this Report are those indicated by material encountered in the boreholes. The accuracy of extrapolation to obtain the soil profile should be associated directly with the geological conditions and inversely with the spacing of the boreholes.

GEOLOGICAL FEATURES

The site is situated within the flood plain of one of the small tributaries of the Oakville Creek which is encompassed by a bevelled till plain known as the Peel Plain.

The flood plain is of a limited nature and the meandering creek wanders between its boundaries leaving a number of old abandoned channels. Occasionally an island of till can be observed projecting out of the comparatively flat plain. A till mound and a rather well defined abandoned channel can be observed a few yards downstream from the southern limit of the site.

From the information derived from the boreholes it may be concluded that the strata down to the explored depth can be divided into the following categories:

(a) ALLUVIAL DEPOSITS

Under the term "alluvial deposits" has been included the cover of topsoil and the generally sandy and somewhat organic loam as well as the underlying organic clays, gravelly clays, sands and gravels which exist in lens-like deposits tending to grade into one another. All these materials were deposited by the waters of the creek and are of recent origin.

(b) REDDISH BROWN TO GREYISH BROWN TILL

This till is generally reddish brown in colour with occasional streaks of greyish brown material scattered within the formation. The till is composed of sandy clay with variable amounts of fine to medium gravel.

(c) BROWN SILTY TILL

Brown silty clay was encountered in boreholes BH.4 and BH.6. This material underlies the reddish brown till.

Water was encountered in all the boreholes at an approximate elevation of 623.0 feet and in BH.3 a sand pocket contained water under slight pressure which, on being penetrated, rose to an approximate elevation of 629.0. The artesian pressure was minor and was dissipated in a relatively short time and the water level in this borehole was found to be 626.5 on the 15th of December, 1957.

LABORATORY TESTS

In addition to visual examination of the soil samples in the laboratory certain samples were tested in unconfined compression and the results are as follows:

Borehole N°	Sample N°	Depth Below Ground Surface	Unconfined Compression Strength lbs./sq.ft.
BH.3	3	9'-0"	11,000
		9'-10"	
	5	19'-6"	15,000 at 20% strain
		20'-3"	
BH.4	5	9'-6"	3,500
		10'-6"	
	6	14'-0" 15'-0"	12,000
	7	24'-0"	9,000
		24'-6"	

DISCUSSION

The results of the subsurface exploration disclosed alluvial deposits overlying hard glacial till, with the upper surface of the till at a fairly uniform elevation varying from about 618 to 621.

From drawing N° D.4013A the underside of the footings as shown for the tentative design of the bridge are located at elevation 614.4 and for normal spread footings located at this elevation, we would suggest an allowable bearing capacity of 4 tons/sq.ft.

If reference is made to the borehole log of BH.4 it will be observed that somewhat softer conditions exist to a slightly lower level than in the other boreholes and accordingly it may be necessary to excavate to a slightly lower elevation than 614.4 in the vicinity of borehole BH.4 and to replace the material removed below this level with weak concrete in order to ensure uniformity of conditions.

CONCLUSIONS

The tentative design of this bridge indicates spread footings located at elevation 614.4 and the results of the subsurface exploration indicate that an allowable bearing capacity of 4 tons/sq.ft. can be used for design purposes.

No particularly difficult conditions are anticipated in the construction of the foundations for this bridge.

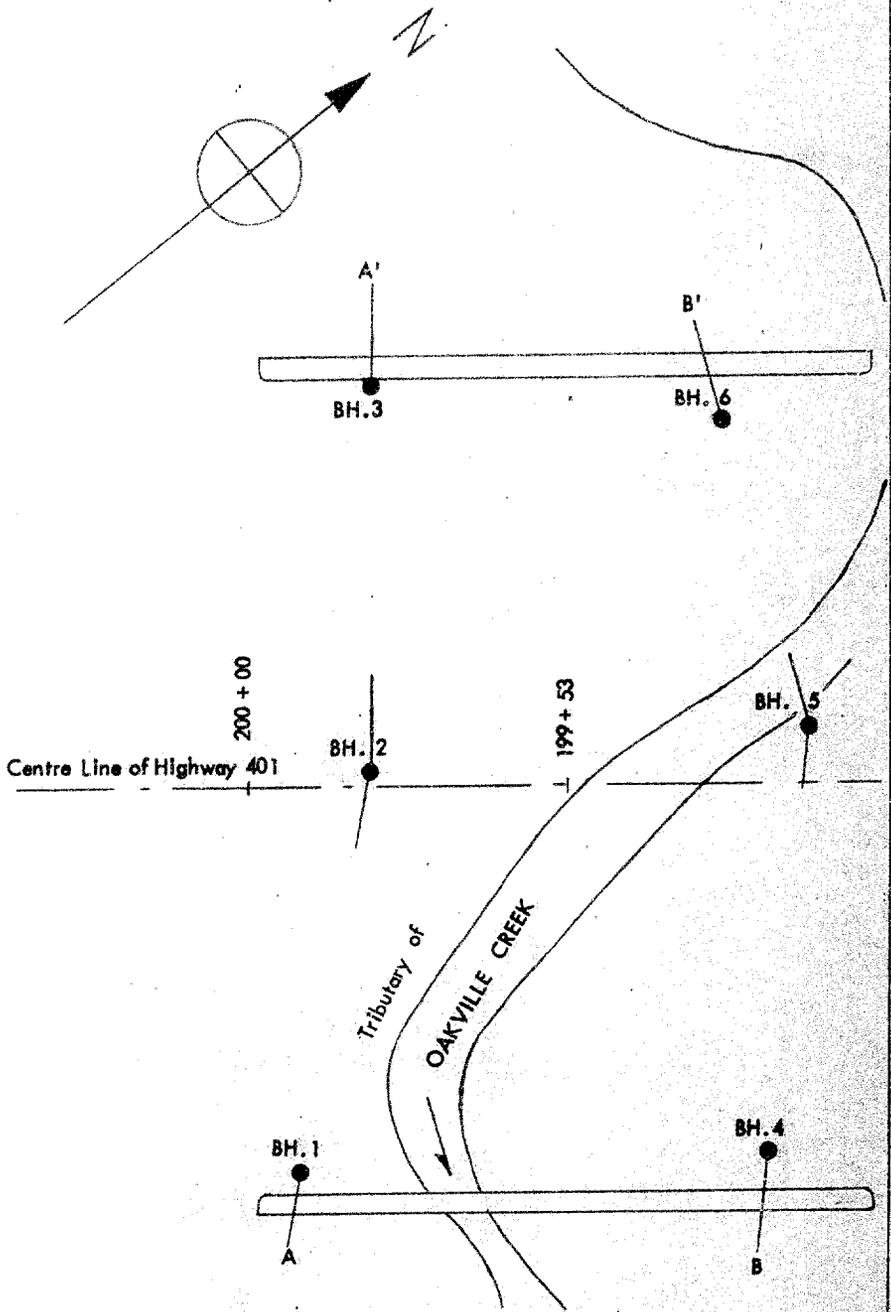
Universal GEOTECHNIQUE Limited,



L. Beskin, P.Eng.
Engineering Geologist.

Report N° T.271/57

December, 1957.



SCALE
1" = 20'-0"

This sketch is a copy of the deck plan included in drawing N° D 4013A supplied by the D.H.O.

PROJECT Trafalgar Township Bridge N° 7
TITLE Borehole Location Plan
DRG. NO. 1 ORDER NO. T.271/57



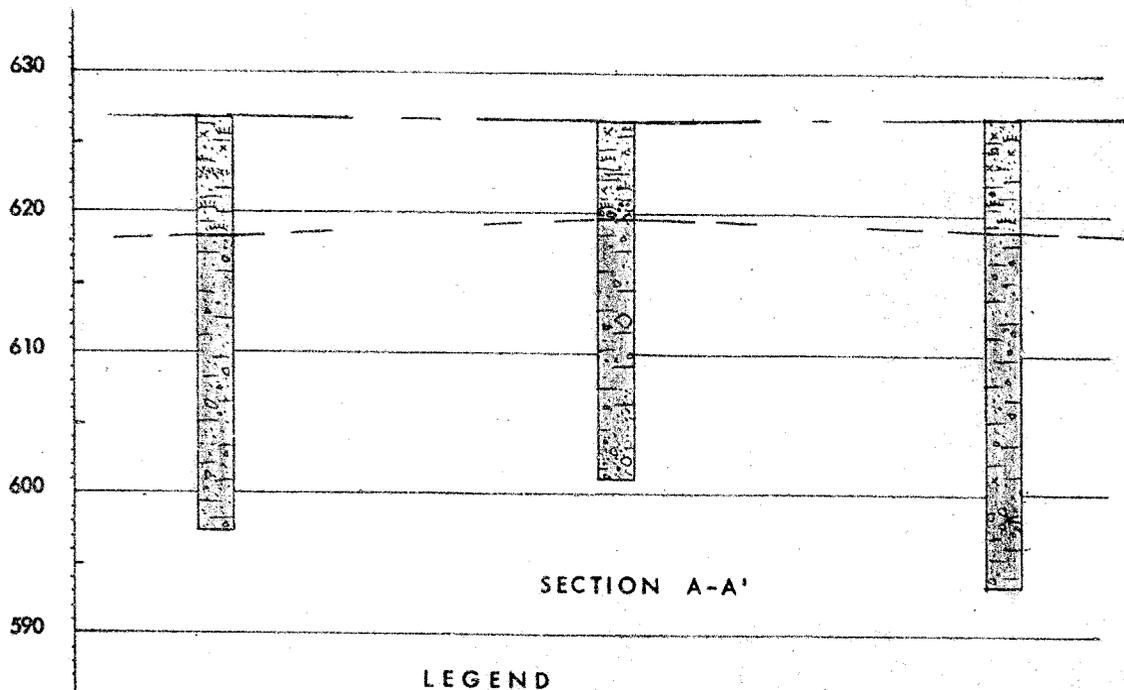
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PROJECT Trafalgar Township Bridge No. 7.
TITLE Borehole Section
DRG. NO. 2 ORDER NO. T.271/57

BH. 1

BH. 2

BH. 3



LEGEND



ALLUVIAL DEPOSITS



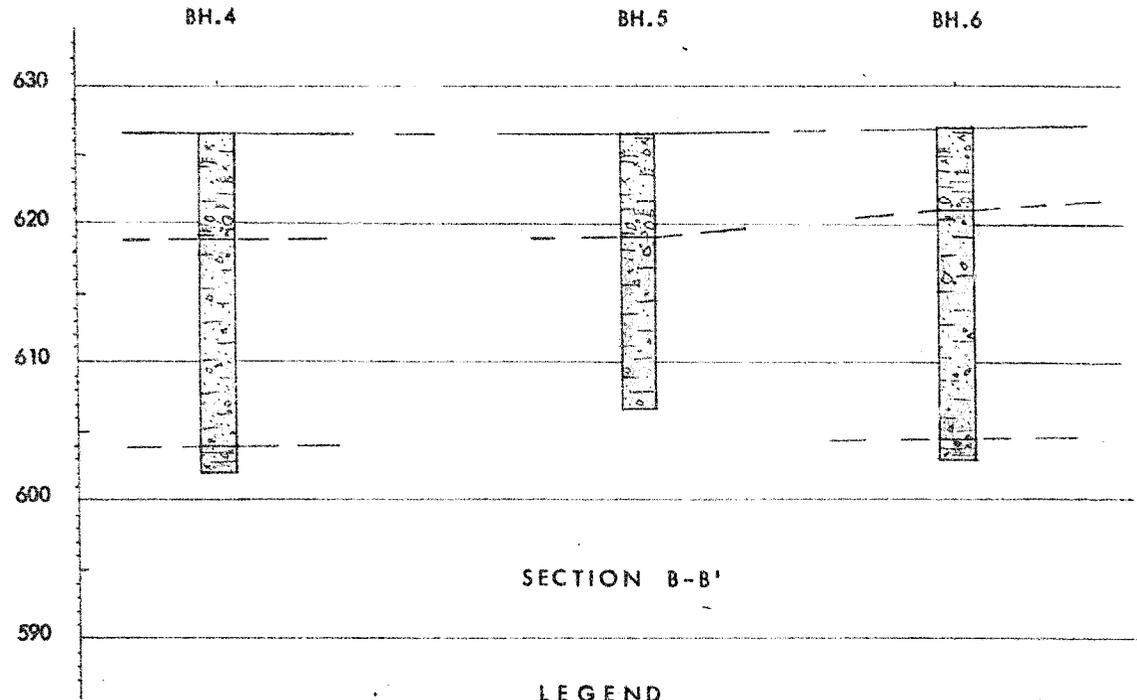
REDDISH BROWN TO GREYISH BROWN TILL

SCALE

Horizontal 1" = 20'-0"
Vertical 1" = 10'-0"



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SECTION B-B'

LEGEND



ALLUVIAL DEPOSITS



BROWN SILTY TILL



REDDISH BROWN TO GREENISH BROWN TILL

SCALE

Horizontal 1" = 20'-0"
Vertical 1" = 10'-0"

PROJECT Trafalgar Township Bridge No 7
TITLE Borehole Section
DRG. NO. 3 ORDER NO. T.271/57



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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trefalgar Township Bridge N° 7 ORDER NO. T.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. BH.1 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING _____

FORM G-1A 500
UNITED STATES OF AMERICA

DESCRIPTION OF STRATA	ELEVATION	LOG	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Loose dark brown sandy loam with organic matter.	626.7		● 1	Zero		4	Damp
Soft grey to brown somewhat organic sandy CLAY. Upper part contains sand lenses.			● 2	4'-6"	Free Water	6	Moist. Medium to high dry strength.
				8'-6"			
Hard reddish brown sandy CLAY with fine to medium subangular gravel.			● 3			54	Damp High dry strength.
Dense medium to coarse SAND. Fine gravel and sandy clay lenses. Hard reddish brown sandy CLAY with fine subangular gravel.			● 4	13'-0"		35 (6")	Damp
			● 5	14'-0"			Damp High dry strength.
Hard greyish brown sandy CLAY with some gravel. Hard reddish brown sandy CLAY with fine subangular gravel.			● 6	18'-0"		48	do
			● 7	19'-3"		50 (6")	do
Very dense reddish brown clayey SAND with generally fine subangular gravel.			● 8			72	Medium to high dry strength.
Hard reddish brown very sandy CLAY with fine to large subrounded gravel.			● 9	28'-9"		60 (3")	High N due to large gravel.
				29'-3"			

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trafalgar Township Bridge N° 7 ORDER NO. I.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. BH.2 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A 500
UNIVERSAL ENGINEERING CO.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS		
Loose brown sandy loam with some organic matter.	626.5		● 1	Zero		6	Damp		
Firm brown sandy CLAY. Iron stained, some organic matter. Very loose fine to coarse SAND with some fine gravel. Soft dark organic sandy gravelly CLAY.			● 2	3'-6"	Free Water	7	Moist		
			● 3	4'-9"		3	Wet. Low dry strength.		
			● 4	6'-0"		2	Wet. High dry strength.		
				7'-0"					
Hard reddish brown sandy CLAY with pockets of fine to medium subangular gravel and brown generally medium sand.			● 5			50	Damp. High dry strength.		
Hard reddish brown CLAY with fine to medium subangular gravel.			● 6			70	(6") do		
Hard greyish brown sandy CLAY with generally fine subangular gravel, exhibits tendency to lamination.			● 7			30	(6") Damp High dry strength.		
Dense reddish brown fine to coarse slightly clayey SAND and fine to medium GRAVEL.			● 8	21'-3"		25	(6") Moist Low to medium dry strength.		
Very dense reddish brown clayey SAND with fine to medium subangular gravel.			● 9	25'-6"		90	Moist. Medium to high dry strength.		
				End of Borehole					

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trafalgar Township Bridge N° 7 ORDER NO. T.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. BH 3 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A, 800
UNION STATIONERY CO.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Soft brown clayey loam with some organic matter.	626.9		● 1	Zero		4	
Soft brown very sandy CLAY. Iron stained with lenses of black organic matter.			● 2	3'-6"	Free Water	6	Moist Medium dry strength.
Hard brown sandy CLAY with fine to medium subangular gravel.			● 3	8'-0"		50 (10")	Damp High dry strength.
Reddish brown do			● 4			50 (9")	do
do			● 5			50 (9")	do
do Becoming sandier			● 6			50 (7")	do
Very dense brown fine to coarse somewhat silty SAND.			● 7	27'-0"	Water at rose above ground sur- face	28'-9" 55 (6")	Damp. Low dry strength.
Very dense medium to coarse SAND and fine to medium GRAVEL.			● 8	28'-9"		65 (6")	Damp. No dry strength.
Hard reddish brown sandy CLAY with fine to medium subangular gravel.			● 9	30'-6"		65 (6")	Damp High dry strength.
				33'-6"			End of Borehole

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trafalgar Township Bridge N° 7 ORDER NO. T.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. BH.4 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A 800 UNITED STATIONERS CO.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
	626.5			Zero			
Firm brown clayey loam with organic matter.			● 1			5	Damp
							Free Water
Firm brown very sandy CLAY with little organic matter.			● 2	3'-9"		5	Moist High dry strength.
Soft do			● 3	6'-0"		3	Wet. High dry strength.
Firm grey to brown sandy gravelly CLAY. Traces of organic matter.			● 4	7'-6"		12	do
Very stiff reddish brown sandy CLAY with fine to medium subangular gravel.			● 5			27	Moist High dry strength.
Hard do			● 6			75	Damp. High dry strength.
do			● 7	20'-6"		75	do
do			● 8	22'-6"			do
Becoming very sandy.			● 9	24'-6"		42 (6")	do
Hard brown sandy silty CLAY with fine subangular gravel.							End of Borehole

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trafalgar Township Bridge N° 7 ORDER No. T.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. BH.5 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A 800
UNITED STATES G.P.O.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Loose brown sandy loam with organic matter. Soft brown to grey sandy CLAY and organic matter. Stiff brown sandy gravelly CLAY, weathered, iron stained. Hard reddish brown sandy CLAY with fine subangular gravel. do do	626.7		● 1	Zero		5	Damp
			● 2	3'-9"	Free Water	4	Moist
			● 3	5'-6"	15	Moist High dry strength.	
			● 4	7'-6"	75	Damp High dry strength.	
			● 5		40 (6")	do	
			● 6	20'-0"	40 (6")	do	
				End of Borehole			

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Trafalgar Township Bridge N^o 7 ORDER NO. T.271/57

CLIENT Department of Highways, Ontario.

BOREHOLE NO. 8H.6 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A B00
UNITED STATIONARY CO.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
	627.0			Zero			
Loose brown sandy loam with organic matter.			• 1			3	Damp
					Free Water		
Firm brown sandy CLAY.			• 2	5'-0"		6	Moist
Very loose brown fine to coarse SAND and fine GRAVEL.			• 3	6'-0"		3	Wet. No dry strength.
Very stiff brown sandy CLAY with fine to medium subangular gravel.			• 4			15	Damp. High dry strength.
Hard reddish brown do			• 5			38	do
do			• 6			70	do
do			• 7			68 (β")	do
Hard brown sandy silty CLAY with fine subangular gravel.			• 8	22'-6"			
				24'-0"			35 (β") do
				End of Borehole			