

W.O. 70-F-206M

PROP. CULVERT

ALBERT ST.,

LUCAN

40P3-43

DOMINION SOIL INVESTIGATION LIMITED
CONSULTING SOIL & FOUNDATION ENGINEERS
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40 PS.
GEOTECH No.

74 51003

London
April 30, 1970

Report 70-4-L5

J. P. McIntyre, P. Eng.,
Consulting Engineer,
277 Cathcart Street,
London, Ontario.

70-4-L5-206M

Dear Sir:

Report on
Soil Investigation for
Proposed Culvert,
Albert Street,
Lucan, Ontario.

We have completed this project in accordance with your letter of authorization dated April 16, 1970. This report contains a record of our findings and presents our recommendations for the design and construction of foundations:

FIELD WORK

The field work, consisting of one borehole and two dynamic cone penetration tests, was carried out on April 23rd, 1970, at the locations shown on Enclosure 1.

The borehole was advanced to the sampling depths by wash-boring methods and was lined with 8x size casing.

Standard penetration tests were performed at frequent intervals of depth, as detailed in Appendix 'A', and the results are recorded on the borehole logs as N values.

The dynamic cone penetration tests were performed to obtain an indication of soil density and strata changes with depth, and to compare the relative soil properties at the two locations.

The field work was supervised by a soils engineer, who also determined the ground surface elevations. These were referred to a nail in the north root of a five foot diameter tree, 150 feet right of Sta 8+80, which was taken as a Geodetic El. 987.96 feet.

SUBSURFACE CONDITIONS

Detailed descriptions of the strata, which were encountered in the borehole, are given on the borehole log comprising Enclosure 2. The following notes are intended only to amplify this data.

The borehole penetrated an upper layer of generally soft silty clay, which extends to a depth of 5 feet. At El. 983.6, the borehole encountered a glacial silty clay stratum in which it was terminated at El. 968.6.

The gravel content of the silty clay till stratum was found to increase significantly at El. 973.8.

Due to the clay content the till should be regarded as being a plastic and cohesive material, and on the basis of the standard penetration test results the consistency is described as 'very stiff' to 'hard'. The moisture content within the silty clay till stratum ranges from 9% to 16%, which is generally less than the Plastic Limit of the soil.

The groundwater level in the borehole reached equilibrium at El. 985.6, which was about 14 inches above water level in the adjacent stream.

DISCUSSION AND RECOMMENDATIONS

Underlying the soft upper layer of silty clay the borehole penetrated a very stiff to hard glacial silty clay till stratum, which is suitable for the support of normal spread footing foundations. Footings for standard D.H.O. concrete culverts are usually constructed at a depth of about 5 feet below the stream bed level to provide sufficient protection against frost action and also against undermining due to scour, therefore it is

assumed that the footing level will be at about Elevation 979.

The proposed footing level lies within the layers of hard silty clay till, and on the basis of the borehole results a maximum allowable soil pressure of 4 tons per square foot is appropriate for the design of footings. Furthermore the footings will have a factor of safety of 3 against shear failure of the underlying soil.

It is anticipated that the total load applied by the footings will not exceed 2 tons per square foot for the proposed structure, and using this loading it is estimated that the total settlement will not exceed 0.25 inch.

Adhesion between the footings and the silty clay till may be taken as 2,000 p.s.f., and the factor of safety against horizontal sliding of the footings should be at least 1.5. Additional lateral resistance may be generated by lowering the footing grade, and utilizing the passive earth pressure.

The impervious silty clay till should cause no unusual

construction problems. Seepage should be accumulated in sumps dug below the footing grade and removed by pumping.



Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED

Q.J.W. Atkinson
 Q.J.W. Atkinson, B. Sc., P. Eng.,
 Branch Manager

CJWA/jj

APPENDIX 'A'.

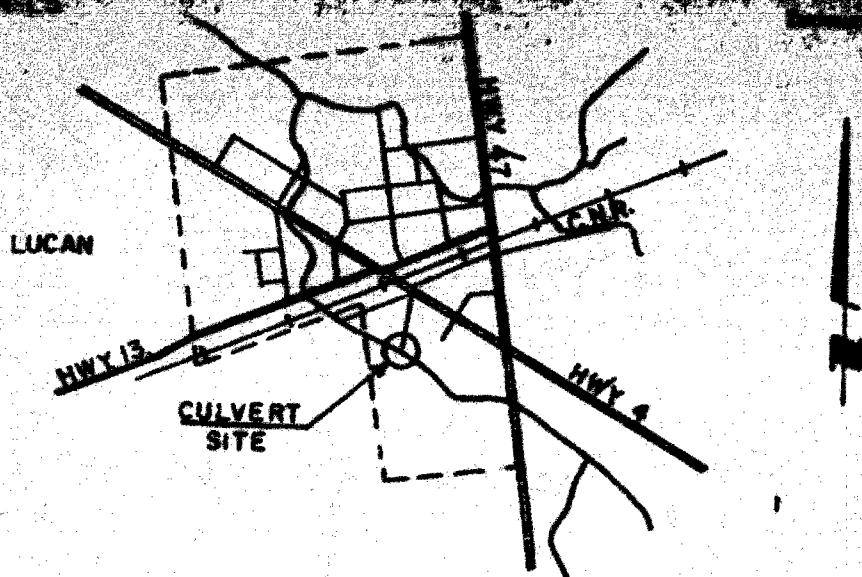
THE STANDARD PENETRATION TEST.

In order to determine the relative density of non-cohesive soils, such as sands and gravels, the standard penetration test has been adopted. The test also gives an indication of the consistency of cohesive soils.

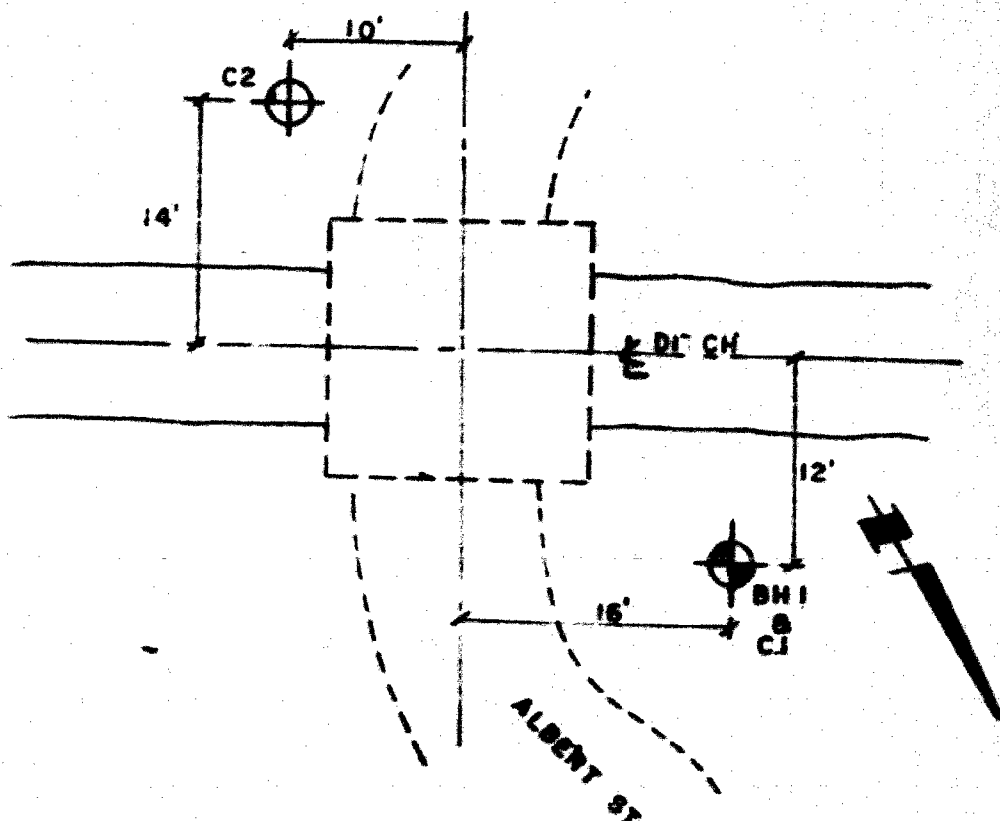
A two inch external diameter thick-walled sample tube is driven into the ground at the bottom of the borehole by means of a 140 lb. hammer falling freely through 30-ins. The tube is first driven an initial 6-inches to allow for the presence of disturbed material at the bottom of the borehole. The number of standard blows (N) required to drive the sampler a further 12-in. is recorded. The sample tube is one originally developed by Raymond Concrete Pile Company in the United States, where a sufficient number of tests have been made in conjunction with field investigations to show that the results, although essentially empirical, may be applied to foundation design.

For Sands:-

Values of 'N'.	Density.
Less than 10	Loose
Between 10 and 30	Compact
Between 30 and 50	Dense
Greater than 50	Very dense.



KEYPLAN



LOCATION OF BOREHOLES
Scale 1" = 10'

LOG OF BOREHOLE 1 and CONES C1 & C2

Our Reference No 70-4-15

Enclosure No 2

CLIENT: J.P. McIntyre P.Eng., Consulting Engineer.
PROJECT: Albert Street Culvert,
LOCATION: Lucan, Ontario.
DATUM ELEVATION: nail in tree root, 150' R of Sta. 8+80, El. 987.96 feet

DRILLING DATA

Method: Washboring
Diameter: 3-inch
Date: April 23, 1970.
El. 987.96 feet

SUBSURFACE PROFILE				SAMPLES			PENETRATION RESISTANCE Blows / Foot					WATER CONTENT %			REMARKS						
ELEVATION Ft.	DEPTH Ft.	DESCRIPTION	SYMBOL	GROUND WATER	NUMBER	TYPE	'N' Blows / Foot	20	40	60	80	100	PLASTIC LIMIT	NATURAL		LIQUID LIMIT					
								UNDRAINED SHEAR STRENGTH					lb/sq. ft.					W _p	W	W _L	
								+ FIELD VANE TEST					- COMPRESSION TEST								
10 20 30 40 50																					
Borehole 1																					
9885.0	0.0	Ground Surface																			
	1.0	Topsoil																			
		Brown weathered silty clay																			
985.35		Soft brown sandy silty clay																			
	5.0																				
		Very stiff brown to hard grey silty clay, trace of gravel			1	SS	24														
980					2	SS	37														
					3	SS	57														
975		(Glacial Till)			4	SS	138														
	14.8				5	SS	53														
970		Hard grey gravelly silty clay.																			
	20.0				6	SS	127														
		End of Borehole																			
Borehole 2																					
9896.0	0.0	Ground Surface																			