

#63 - F - 259 M

CTY. RD. #11

CULVERT

LOGAN TWP.

BA. 1796

25-281

MR. T. COLLINGS
RTH COUNTY ENGINEER
COURT HOUSE
TFORD ONTARIO

63 F 259M

Report on
SOIL INVESTIGATION
for
CULVERT
COUNTY ROAD #11, TOWNSHIP OF LOGAN
COUNTY OF PERTH

by
DOMINION SOIL INVESTIGATION LIMITED
363 Queens Avenue
LONDON ONTARIO
Reference No. 3-12-L9
December 1963

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I INTRODUCTION

Verbal authorization was received from Mr. T. Collings to carry out a soil investigation at site on County Road #11, where it is proposed to replace an existing concrete culvert or small bridge with a new structure. The new bridge will probably be a 30-foot span rigid frame whose centre line will be located a few feet to the east of the existing culvert.

The purpose of this investigation has been to reveal the subsurface conditions and to determine the necessary soil properties for the design and construction of foundations.

II FIELD WORK

Field work was carried out on the 19th and 20th of December 1963 and consisted of 1 borehole at the location shown on enclosure 2. In view of the dense soil conditions and the client's instruction in this respect, no additional borings were made. The hole was advanced by wash-boring and lined with Bx (3-inch) casing. Standard Penetration test were performed at frequent intervals of depth to determine the relative density or consistency of the soil and to recover disturbed samples. A dynamic cone penetration test was performed adjacent to the borehole. This test provides a continuous record of penetration resistance and reveals abrupt changes in stratification.

The results of the field tests are recorded on enclosure 3. Elevations have been referred to the centre of the existing bridge deck (assumed El. 100.0 feet).

III SUBSURFACE CONDITIONS

Details of the stratification are shown on enclosure 3, and a simplified subsurface profile appears on enclosure 2.

Topsoil and compact sandy silt fill comprising the road embankment were encountered to a depth of 7 feet. Between 7'-0" and 10'-6" there is a dense clayey gravel and sand mixture. This stratum corresponds with the level of the bed of the creek and is probably a fluvial deposit. The gravel is underlain by a very dense sandy clayey silt till of glacial origin. By visual inspection the material contains about 10% clay, 60% silt, 15% sand and 15% of subangular gravel particles generally less than 1/2 inch in diameter. The permeability of the till is quite low and it is partially cemented.

IV FOUNDATIONS

The dense till stratum offers ample support for spread footing foundations. The bed of the creek was located at

El.89 feet (\pm) so that allowing for scour, the footings should bear at or below El.85 feet. Below this elevation, 'N'-values of 145 and more were recorded, corresponding to a very high relative density and correspondingly high value of ultimate bearing capacity.

Considering the size of the structure, a maximum soil pressure of 10,000 p.s.f. is proposed for the design of footings located at or below El.85. The corresponding settlement is unlikely to exceed 0.5 inch.

In considering the resistance of the footing to horizontal sliding, it may be assumed that the coefficient of friction between the soil and the concrete is equal to 0.35. If this does not provide sufficient resistance against sliding, the footings could be lowered and the passive earth resistance of the till below the assumed level of maximum scour can also be considered. The following design values are recommended for this case:

Unit weight of the
undisturbed till $\gamma = 140$ p.c.f.

Coefficient of passive
earth pressure $K_p = 3.0$

No unusual construction problems are anticipated in view of the dense impervious nature of the till. Excavations into the till will stand vertically without support. Cuts through the upper fill and gravel layers should be sloped at 1 to 1 or braced.



DOMINION SOIL INVESTIGATION LIMITED

James Park

James Park, M.Sc., P.Eng.

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
Ø > 8"	3"	COARSE	FINE	COARSE	MEDIUM	FINE	0.074	0.002	>	NO SIZE LIMIT		

U.S. Standard Sieve Size: No.4 No.10 No.40 No.200

SAMPLE TYPES.

AS Auger sample
CS Sample from casing
ChS Chunk sample

RC Rock core
% Recovery
SS Split spoon sample

TP Piston, thin walled tube sample
TW Open, thin walled tube sample
WS Wash sample

SAMPLER ADVANCED BY static weight : w
" pressure : p
" tapping : t

OBSERVATIONS
MADE WHILE
CORING

Steady pressure
No pressure
Intermittent pressure

Washwater returns
Washwater lost

PENETRATION RESISTANCES.

DYNAMIC PENETRATION RESISTANCE : to drive a 2" ϕ , 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

STANDARD PENETRATION RESISTANCE, -N- : to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL :



322

SOIL PROPERTIES.

W % Water content
LL % Liquid limit
PL % Plastic limit
PI % Plasticity index
LI Liquidity index

γ^* Natural bulk density (unit weight)
e Void ratio
RD Relative density
C_v Coeff. of consolidation
m_v Coeff. of volume compressibility

k Coeff. of permeability
c Shear strength in terms of total stress
 ϕ Angle of int. friction
c' Cohesion in terms of effective stress
 ϕ' Angle of int. friction

UNDRAINED SHEAR STRENGTH.

- DERIVED FROM -

TRIAXIAL COMPRESSION TEST
UNCONFINED TEST

LABORATORY VANE TEST
FIELD TEST

POCKET PENETROMETER TEST

Strain at failure is represented by direction of stem

20%
15% + 5%
10%

St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS :

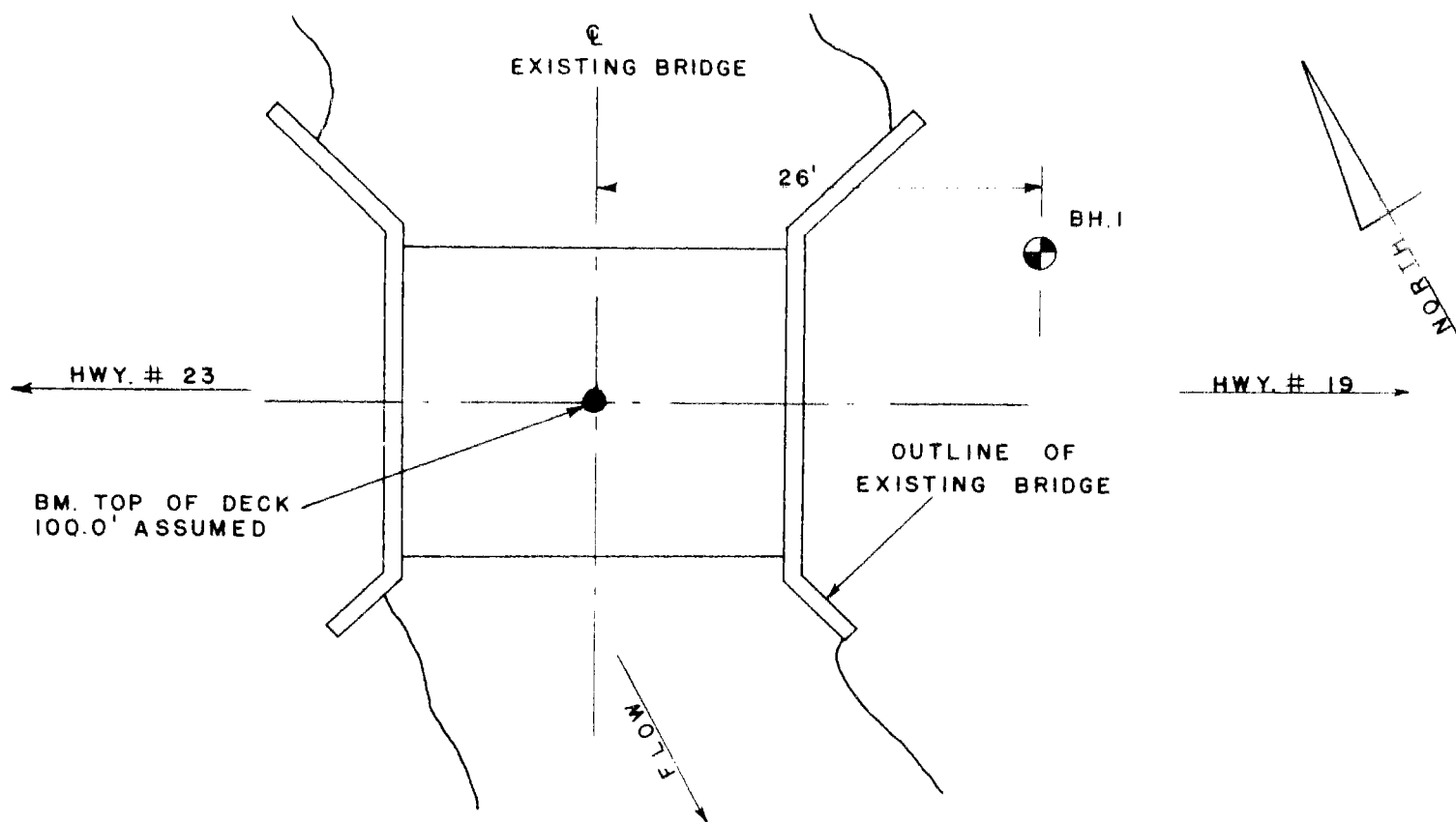
RD :

Very loose 0 - 15 %
Loose 15 - 35 %
Compact 35 - 65 %
Dense 65 - 85 %
Very dense 85 - 100 %

COHESIVE SOILS :

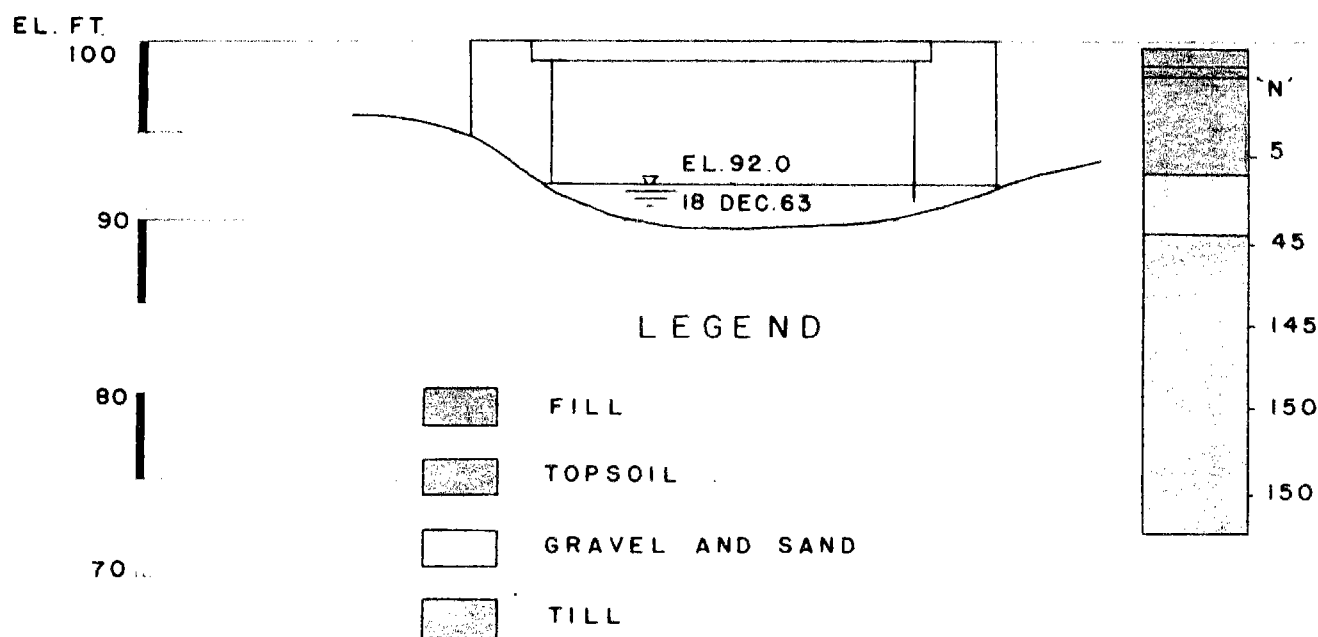
c lbs/sq.ft.

Very soft less than 250
Soft 250 - 500
Firm 500 - 1000
Stiff 1000 - 2000
Very stiff 2000 - 4000
Hard over 4000



LOCATION OF BOREHOLE

SCALE: 1 INCH TO 10 FEET



NOTE - FIGURES AT BOREHOLE DENOTE
STANDARD PENETRATION RESISTANCE

SUBSURFACE PROFILE

SCALE: 1 INCH TO 10 FEET

GEOTECHNICAL DATA SHEET FOR BOREHOLE 1.

OUR REFERENCE NO. 3-12-19

CLIENT County of Perth

PROJECT Road bridge

LOCATION Perth County Road #11

DATUM ELEVATION 100.0' (centre of deck of existing bridge)

METHOD OF BORING Washboring

DIAMETER OF BOREHOLE 6x (3-inch)

DATE December, 1965.

ENCLOSURE

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N or Advance of Sampler	20	40 60 80 100		
99.7	0	Ground Surface								
		Granular fill.								
		Topsoil.								
95	5	Brown, clayey sandy silt fill, trace of organic firm, damp.		1	SS	5				
		Dense clayey gravel and sand.								
90	10			2	SS	45				
		Hard sandy clayey brown silt grey till.								
85	15			3	SS	145				
		gravelly								
80	20			4	SS	150				
75	25			5	SS	150				
		End of borehole								
30										

2" Ø cone.

WL in creek
E1.92.0'
18 Dec. 1965.