

62-F-284 m

ROAD BRIDGE

LOT 15 CON 111 & IV

N. OF THAMES R.

N. DORCHESTER

TWP

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### INTRODUCTION

In accordance with verbal authorization from Mr. A.M. Spriet a soil investigation has been carried out at a site in the Township of North Dorchester where it is proposed to replace an existing township road bridge with a new structure. The bridge carries a gravel road across a tributary stream of the River Thames.

It is understood that the new bridge will be of approximately the same span and in the same position as the existing one.

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

## I PHYSIOGRAPHY

The site lies approximately 2 miles east of the Town of Dorchester and 2 miles north of the River Thames. It is located in one of a complex of spillway valleys which intersect the Oxford Till Plain to the north and discharged into the major Thames Spillway to the south. These valleys are now occupied by lesser streams such as the one on which the present site is located. The upper deposits on the floor of the valley are glacial-fluvial sediments which cover the deeper tills.

## II FIELD WORK

Field work was carried out during the period 6th to 11th of December 1962 and consisted of 2 boreholes at the locations shown on enclosure 2. The holes were advanced by washboring and lined with Bx (3-inch) casing. In borehole 1 a boulder was encountered at a depth of 25 feet. This was penetrated using a Bxt core barrel.

Standard Penetration tests were performed at frequent intervals of depth and dynamic cone penetration tests were made adjacent to each borehole. The former test gave a measure of the relative density or consistency of the soil and provided disturbed samples while the latter test gave a continuous record of soil density.

The results of the field tests are recorded on geotechnical data sheets comprising enclosures 3 and 4. Elevations have been referred to the level of the deck of the existing bridge which is taken as El. 100.0 feet.

## III SUBSURFACE CONDITIONS

Details of the stratification at each borehole are shown on the data sheets and a general picture of the subsurface conditions is given by the profile on enclosure 2.

Deposits of fine sand, silty sand and silt were encountered in the upper 20 to 25 feet in both boreholes. The density of these deposits varies widely, especially in the upper layers where it is quite loose.

Near El. 70 in both boreholes, there is a grey cohesive till. At borehole 1, this material is hard from its surface throughout the depth explored, while at borehole 2 a more gradual

stiffening takes place with depth. The content of granular material in the till is generally less than 5% and the particle size generally less than 1 inch. An exception to this is the case of a boulder encountered in borehole 1 at a depth of 25 feet, from which 12 inches of continuous core was recovered.

#### IV FOUNDATIONS

The bearing capacity of the soil is insufficient to support footings above El. 80, which is 14 feet below the water table. Construction at this level would be difficult and costly, and it is recommended that timber piles should be used to support the structure.

It is estimated that piles driven to El. 65.0 feet will allow a safe working load of 20 tons. The piles will derive their support partly from skin friction and partly from end bearing. It is estimated that skin friction alone will provide an ultimate resistance of 20 tons.

The piles should be driven until a satisfactory set is obtained in accordance with the Hiley formula, irrespective of the depth at which this may occur.

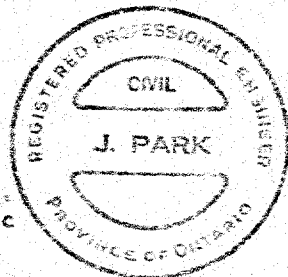
#### V SUMMARY

1. The strata consist of 20 to 25 feet of compact to dense sand and silt. Below this is a stiff to hard cohesive till.
2. The bearing capacity of the strata is insufficient to support footings at a practicable level.
3. It is recommended that the structure should be carried on timber piles using a working load of 20 tons.
4. It is expected that the piles will reach a satisfactory set at about El. 65.0 feet.

#### VI REFERENCES

1. The Physiography of Southern Ontario by L.J. Chapman and D.F. Putman of the Ontario Research Foundation, University of Toronto Press, 1951.

2. Procedures for Testing Soils, ASTM, April 1958, pp. 186 to 198 (Unified Soil Classification System, by A.A. Wagner) London.
3. Proceedings of the 4th International Conference on Soil Mechanics and Foundation Engineering (Research on Determining the Density of Sands by Spoon Penetration Testing, by H.J. Gibbs and W.G. Holtz of the United States Bureau of Reclamation).
4. Terzaghi and Peck: Soil Mechanics in Engineering Practice, John Wiley and Sons, New York, 1948.
5. Standard Penetration Tests and Bearing Capacity of Cohesionless Soils, by G.G. Meyerhof, ASCE Paper 866, January 1956.
6. M.J. Tomlinson, The Adhesion of Piles Driven in Clay Soils, Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, 1957.



Encl:  
JP/mc

DOMINION SOIL INVESTIGATION LIMITED

A handwritten signature in cursive script, appearing to read "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"	3/4"	4.75mm	2.0	0.42	0.074	0.002	>			
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

Tiv 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

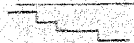
**DYNAMIC PENETRATION RESISTANCE** : to drive a 2" ø, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot

**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

 $\gamma$ 

Natural bulk density (unit weight)

e

Void ratio

RD

Relative density

Cv

Coeff. of consolidation

mv

Coeff. of volume compressibility

k

Coeff. of permeability

C

Shear strength in terms of

 $\phi$ 

Angle of int. friction total stress

C'

Cohesion in terms of

 $\phi'$ 

Angle of int. friction effective stress

## UNDRAINED SHEAR STRENGTH.

-- DERIVED FROM --

TRIAXIAL

UNCONFINED

LABORATORY

FIELD

COMPRESSION TEST

VANE 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

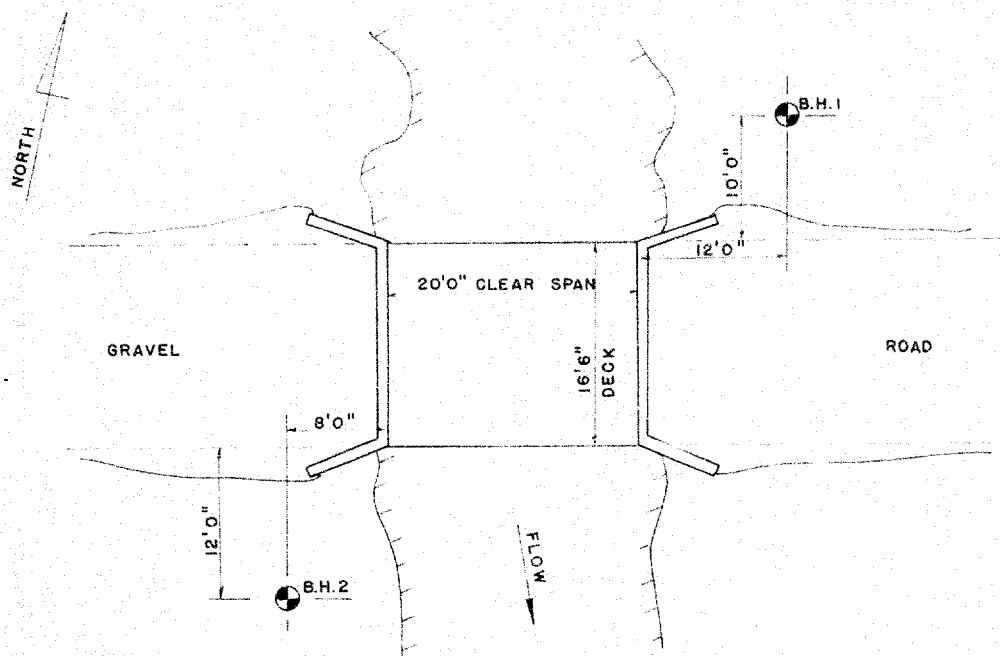
1000 - 2000

Very stiff

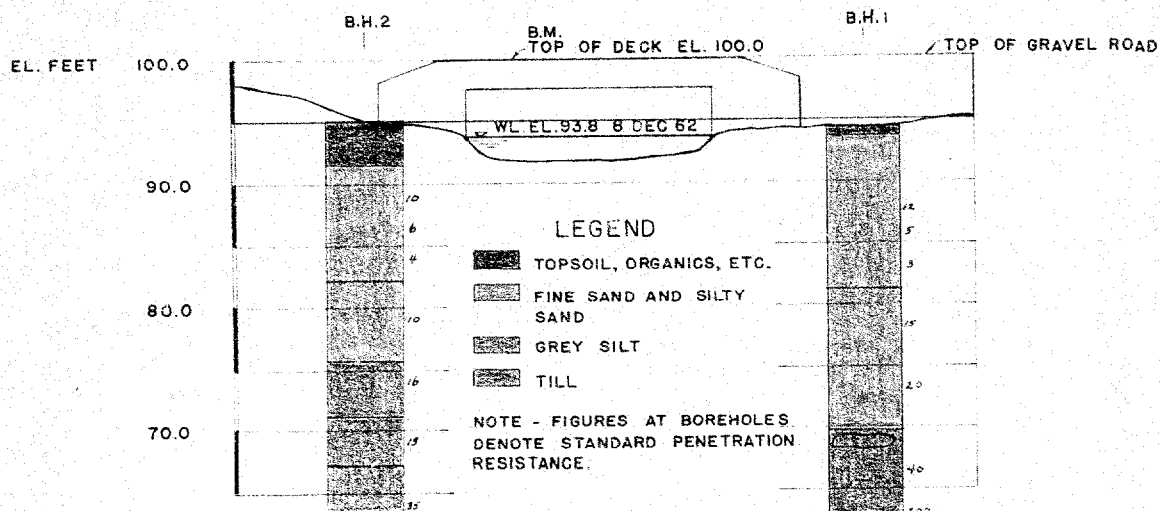
2000 - 4000

Hard

over 4000



LOCATION OF BOREHOLES  
SCALE - 1 INCH TO 10 FEET



SUBSURFACE PROFILE  
SCALE - 1 INCH TO 10 FEET



OUR REFERENCE NO. 2-12-14 GEOTECHNICAL DATA SHEET FOR BOREHOLE 1

CLIENT: Messrs. A.M. Snieland and Company

METHOD OF BORING Washboring

ENCLOSURE NO. 3

PROJECT: Road Bridge, Township of North

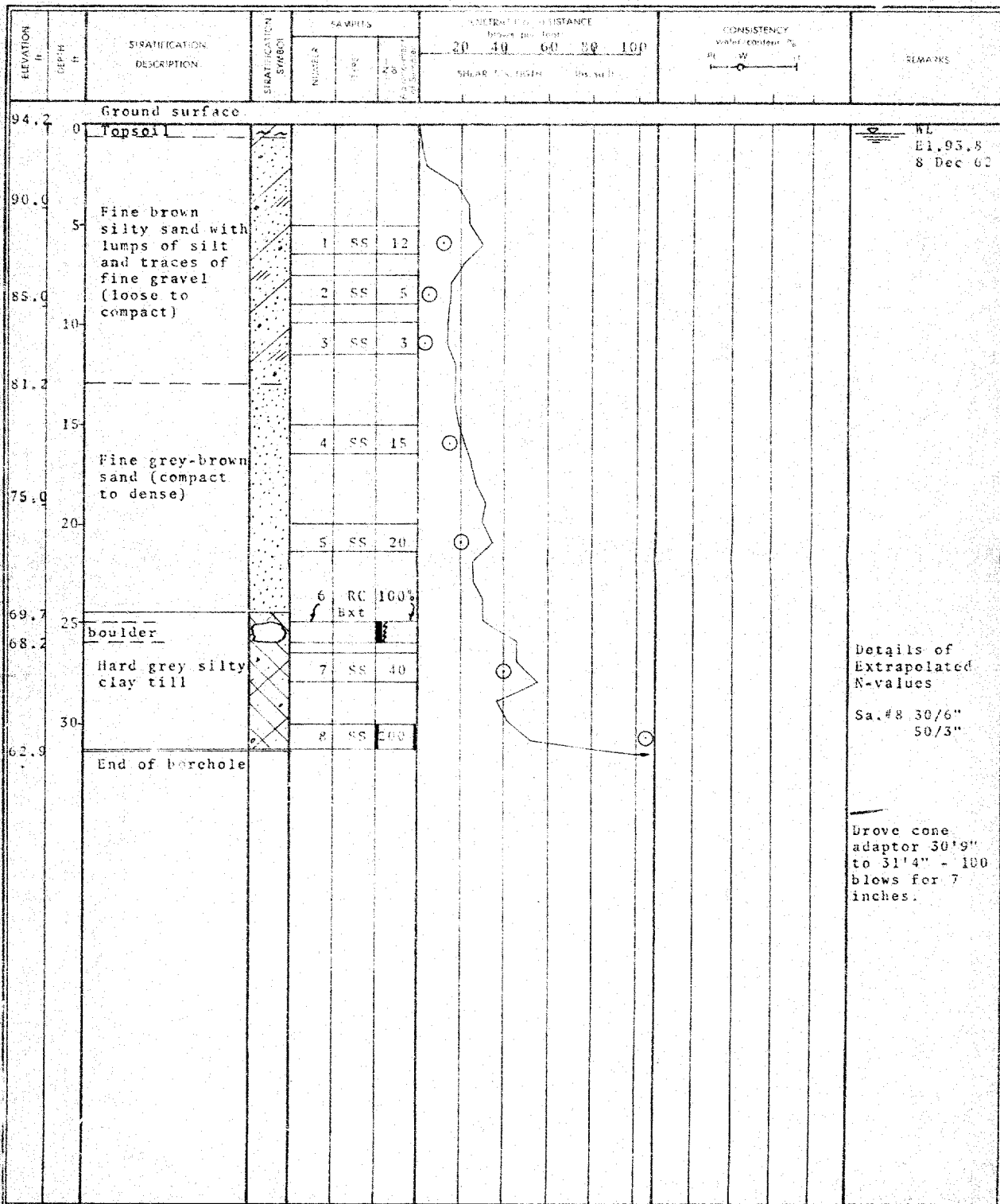
DIAMETER OF BOREHOLE Bx (3-inch)

LOCATION: See enclosure 2

Perchester

DATE 6 and 7 Dec 62

DATUM ELEVATION: Existing bridge deck El. 100.0 feet



# GEOTECHNICAL DATA SHEET FOR BOREHOLE . . .

OUR REFERENCE NO. 2-12-14

CLIENT: Messrs. A. H. Smet and Company

METHOD OF BORING Washboring

PROJECT: Road Bridge, Township of North

DIAMETER OF BOREHOLE 8x (3-inch)

ENCLOSURE NO. 4

LOCATION: See enclosure 2

Dorchester

DATE: 8 Dec 62

DATUM ELEVATION: Existing bridge deck El. 100.0 feet

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY Water Content %		REMARKS
				NUMBER	TYPE	N <sub>60</sub> Advancement in Sample	20	40	60	80	100	91	92	

95.1	0	Ground surface													
		Topsoil													
		Black organic sandy silt (unconsolidated)													
91.6	5	Fine grey-brown silty sand, trace of fine gravel (loose to compact)		1	SS	10									
				2	SS	6									
85.0	10			3	SS	4									
82.1	15	Fine grey sand (compact)		4	SS	14									
75.6	20			5	SS	16									
71.1	25	Grey silt - slight cohesion (compact to dense)													
67.1	30	Stiff grey clayey silt till		6	SS	13									
63.6		Hard grey silty clay till		7	SS	35									
		End of borehole													

WL  
E1.93.8  
8 Dec 62

NE  
El. 93.8  
8 Dec 62