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FOUNDATION ENGINEERS

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London, 18 April 1963.

3-3-L8 Report

Messrs. A.M. Spriet and Associates.
Consulting Engineers,
234 Queens Avenue,
London, Ontario.

63-10-223 M

Soil Investigation for Culvert on Road
Allowance between Concessions 7 and 8,
Lot 24, Caradoc Township, County of
Middlesex

Gentlemen:

We have completed the above project in accordance with your verbal authorization. This report is a record of our findings and recommendations.

Subsurface Conditions

A single borehole and adjacent dynamic cone penetration test were made from the existing road surface at the location shown on enclosure 2. Details of the stratification encountered are shown on enclosure 3. The bed of the creek was located by sounding at El. 92 feet.

Foundations

The low penetration resistance above a depth of 20 feet illustrates the poor bearing qualities of the soil in that zone. The highest elevation at which the soil is sufficiently dense to give a practicable bearing value is at El. 77 feet where the allowable net soil pressure is about 4000 p.s.f. To brace the sides of the excavation and to prevent the bottom from "boiling" when water is pumped out, it will be necessary to drive sheet piles into the cohesive strata between Els. 60 and 70, say to El. 65, or 35 feet below the present road surface.

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As an alternative solution, the use of untreated timber piles is suggested. Twelve-inch diameter piles driven to El. 70 will have a theoretical safe working load of 10 tons per pile. If driven to El. 60 the theoretical safe working load would be in excess of 20 tons per pile. Irrespective of these theoretical values, the piles should be driven to a satisfactory set in accordance with the Hiley formula.

In forming a pile cap it will be necessary to lower the water table to El. 87 approximately. After diverting the surface water, this can be done either with well-points or by excavating and pumping from within a sheet pile enclosure. In the latter case the sheet piles should be driven to such a level that the depth of their tips below the excavation is equal to or greater than the intended drop in head. Timber sheeting will probably be satisfactory.

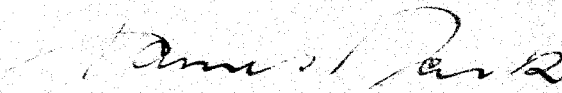
Of the two foregoing solutions, viz. the use of conventional spread footings or timber piles, we recommend the latter because it involves fewer construction problems and uncertainties. It may also prove a cheaper solution in that it avoids the use of long steel sheet piling, and will probably demand a lesser degree of supervision.

We thank you for this opportunity to be of service. If any questions arise in connection with this report or during excavation for the structure, please do not hesitate to get in touch with us.

Soil samples are normally stored for a period of 3 months from the date of issue of the report, and thereafter destroyed. Kindly advise us if you have any other instruction.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED



James Park, M.Sc., P.Eng.
London Branch Manager

Encl.
JP/mc

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
		COARSE	FINE	COARSE	MEDIUM	FINE						
$\phi > 8"$	$3"$	$3/4"$	4.76mm	2.0	0.42	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	RC Rock core	TP Piston, thin walled tube sample
CS Sample from casing	% Recovery	TW Open, thin walled tube sample
ChS Chunk sample	SS Split spoon 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	γ Natural bulk density (unit weight)	k Coeff. of permeability
LL % Liquid limit	e Void ratio	C Shear strength in terms of total stress
PL % Plastic limit	RD Relative density	ϕ Angle of int. friction in terms of effective stress
PI % Plasticity index	C_v Coeff. of consolidation	C' Cohesion
LI Liquidity index	m_v Coeff. of volume compressibility	ϕ' Angle of int. friction

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

TRIAXIAL UNCONFINED

LABORATORY FIELD

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 :

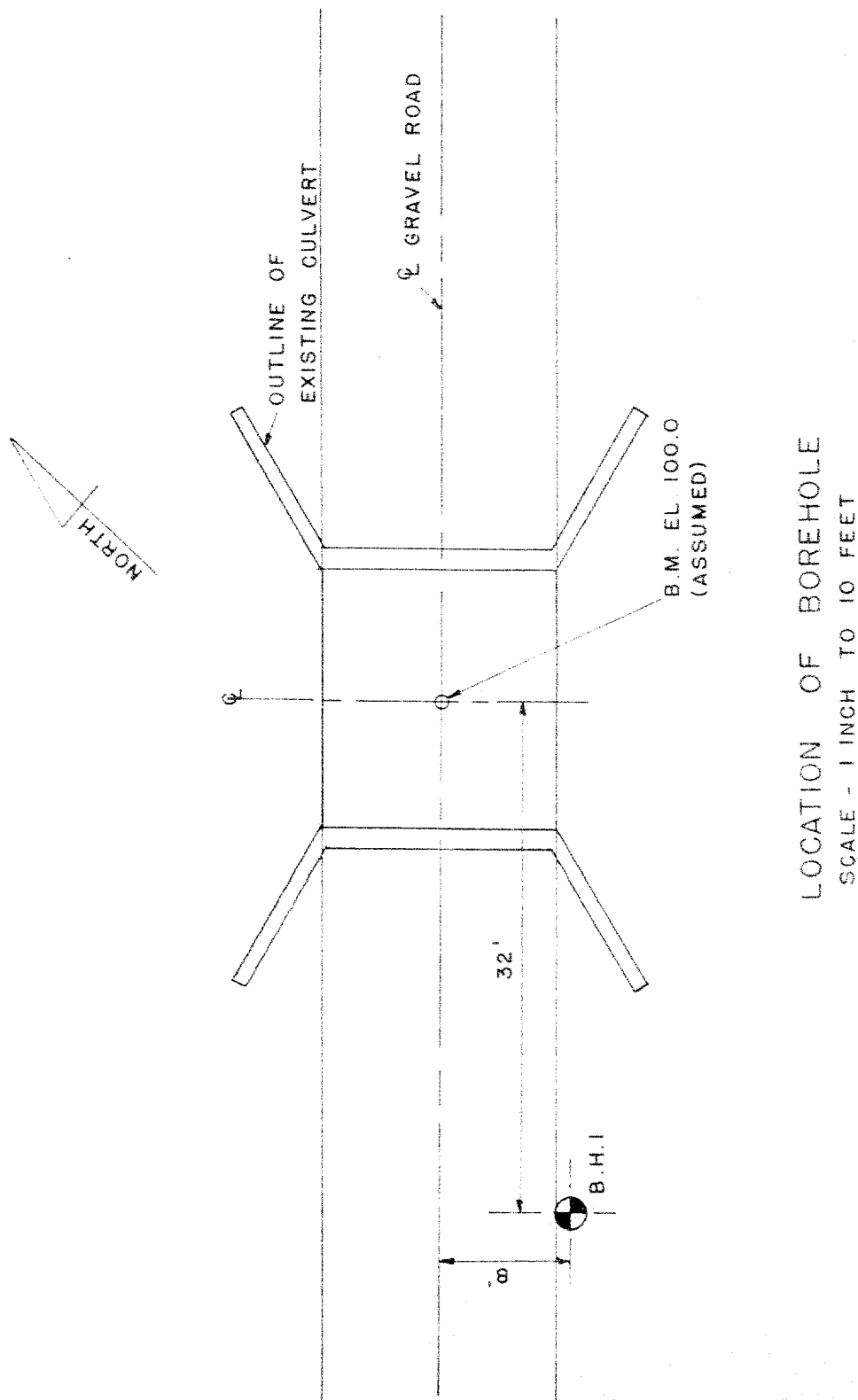
COHESIVE SOILS :

c lbs/sq.ft.

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

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

Prep. By M. C.



GEOTECHNICAL DATA SHEET FOR BOREHOLE . . .

OUR REFERENCE NO. 3-3-L8

CLIENT: Mr. A.M. Spriet

PROJECT: Culvert

LOCATION: Caradoc Township, Lot 24, Conc. 7 and 8

DATUM ELEVATION: See enclosure 2

METHOD OF BORING: Washboring

DIAMETER OF BOREHOLE: 3x (3-inch)

DATE: 28/29 Mar 63

ENCLOSURE NO. 3

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %	REMARKS
				NUMBER	TYPE	DEPTH ft.	20	40	60	80	100		
							SPEAR STAINING ft. Blows/ft.						
							1000	2000	3000	4000	5000		
99.5	0	Ground surface											
		Read fill											
		Brown weathered sandy clayey silt fill											
94.8	5			1	SS	3							
		Dark soft organic clayey sandy silt, wood fragments, etc.											
	10			2	SS	3							
85.8	15			3	SS	< 1							
		very loose compact											
80.8	20	Grey sandy silt		4	SS	16							
		slight cohesion cohesionless											
76.0	25	sand-silt mixture		5	SS	26							
69.8	30			6	SS	17							
		Seams of clayey silt, silty clay, and sandy silt (very stiff)											
	35			7	SS	19							
				8	TW	p							
					vane								
59.3	40			9	SS	30							
	45	Dense grey sandy silt		10	SS	33							
	50			11	SS	37							
47.8		End of borehole											

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: MC

CHD: JP

#63-F-250 M

CULVERT

LOT 24 , CON 7/8

CARADOC TWP.

