66-F-271 M

CULVERT

CADY BOTT DRAIN

LOT 13, CONS. 1/2

NORTH DORCHESTER TWP.

DOMINION SOIL INVESTIGATION LIMITED
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FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 68989

London
October 13, 1966

Report
6-9-L9

A. M. Spriet & Associates Ltd.,
264 Wellington Street,
LONDON, Ontario.

Gentlemen:

Soil Investigation for Proposed
Culvert at Cady Bott Drain,
Lot 13, Concessions 1 & 2,
Township of North Dorchester.

REPORT

We have completed this project in accordance with your verbal authorization of September 21, 1966. This report contains a record of our findings and presents our recommendations for the foundation design of the proposed structure.

FIELD WORK

The field work, consisting of one borehole was carried out on September 23, 1966 at the location shown on Enclosure 2.

Standard Penetration Tests using a 2 inch outside diameter split-spoon sampler were performed at frequent intervals of depth, using a driving force of a 140 lb. hammer falling freely through 30 inches. 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 required to drive the sampler a further 12 inches was recorded as the standard penetration resistance (or 'N' value). This test determines the relative density of granular strata and gives an indication of the consistency of cohesive strata. It also enables samples to be obtained for classification purposes.

The results of the field tests are presented on the Geotechnical Data Sheet, Enclosure 3. Elevations were referred to a spike in a hydro pole at Sta. 1+90W, which was given the arbitrary value, El. 100 feet.

SUBSURFACE CONDITIONS

The borehole revealed the following ground succession:-

Cont'd over....

		Thickness
(a)	Clay Fill	2'- 0"
(b)	Brown clayey silt containing a trace of organics. This material is probably fill material associated with the construction of the approaches to the existing culvert.	5'- 6"
(c)	Grey silty clay containing seams of silt. The consistency of the clay is described as 'stiff' to 'very stiff' as indicated by 'N' values ranging from 14 to 18 blows per foot. Atterberg Limit tests performed on a sample of the silty clay gave a Liquid Limit value of 33%, Plastic Limit of 15% and Plasticity Index of 18 indicating that the clay has a low plasticity and compressibility. The Liquidity Index which relates the natural moisture content to the Atterberg Limits was 0.4, confirming the stiff consistency obtained from visual and tactile examination.	11'- 0"
(d)	Hard grey sandy silty clay (Glacial Till). The borehole was terminated in this stratum at El. 79±.	Penetrated 3'- 0"

The water level observed in the borehole was at El. 94.7 feet, while the water level in the adjacent creek was at El. 94.2 feet.

DISCUSSION

The bed of the creek extends to El. 93.9 therefore allowing 4 feet of cover for frost protection it is recommended that footings should bear at or below El. 89.9. The footing depth should be decided after a hydrological study has been made to determine the maximum depth of scour. This level lies within the stratum of very stiff silty clay and on the basis of the borehole results a maximum net soil pressure of 4000 pounds 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 estimated that total settlement of footings mobilizing the above soil pressure will not exceed 1 inch.

Cont'd over....

The stiff cohesive soil will present no unusual construction problems. The volume of seepage into excavations will probably be very small and should be collected in sumps dug below the footing grade and removed by pumping.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED

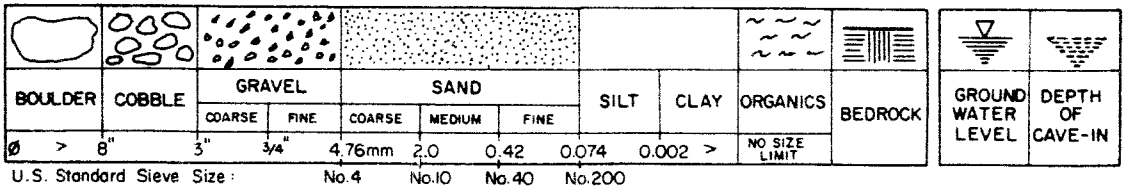
C.J.W. Atkinson, M.Sc., P.Eng.,
Branch Manager

CJWA:jms

Enclosures

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.



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

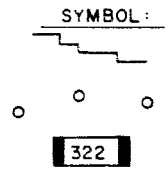
OBSERVATIONS MADE WHILE CORING: Steady pressure; No pressure; Intermittent pressure; Washwater returns; Washwater lost

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.

SYMBOL :



EXTRAPOLATED -N- VALUE

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

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 total stress
PI %	Plasticity index	C_v	Coeff of consolidation	C'	Cohesion — in terms of effective stress
LI	Liquidity index	m_v	Coeff of volume compressibility	ϕ'	Angle of int friction — in terms of effective stress

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

TRIAXIAL COMPRESSION / UNCONFINED TEST S_t

LABORATORY VANE TEST S_t

FIELD VANE TEST S_t

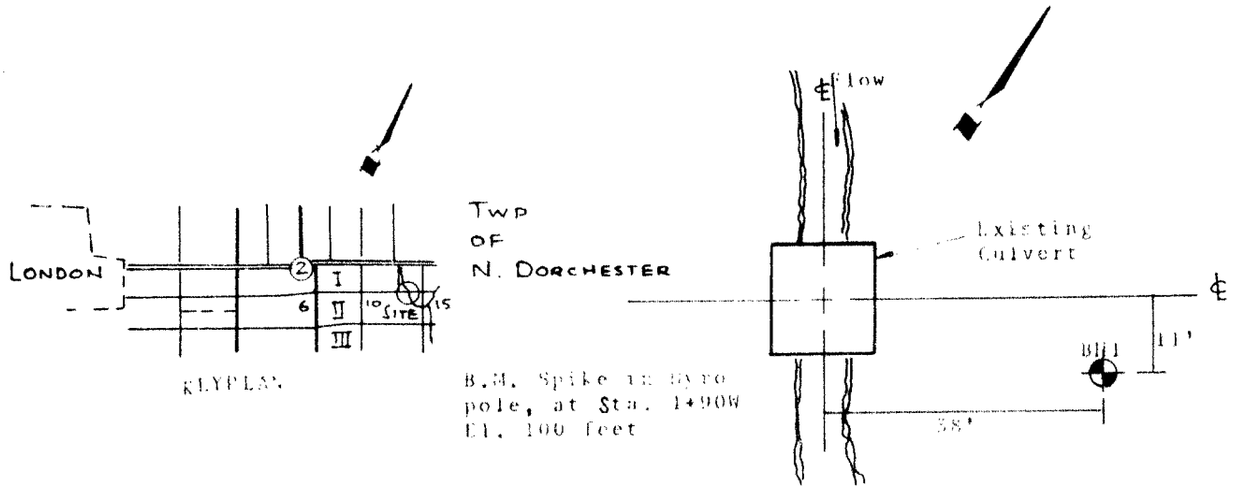
POCKET PENETROMETER TEST S_t

Strain at failure is represented by direction of stem: 20%, 15%, 5%, 10%

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

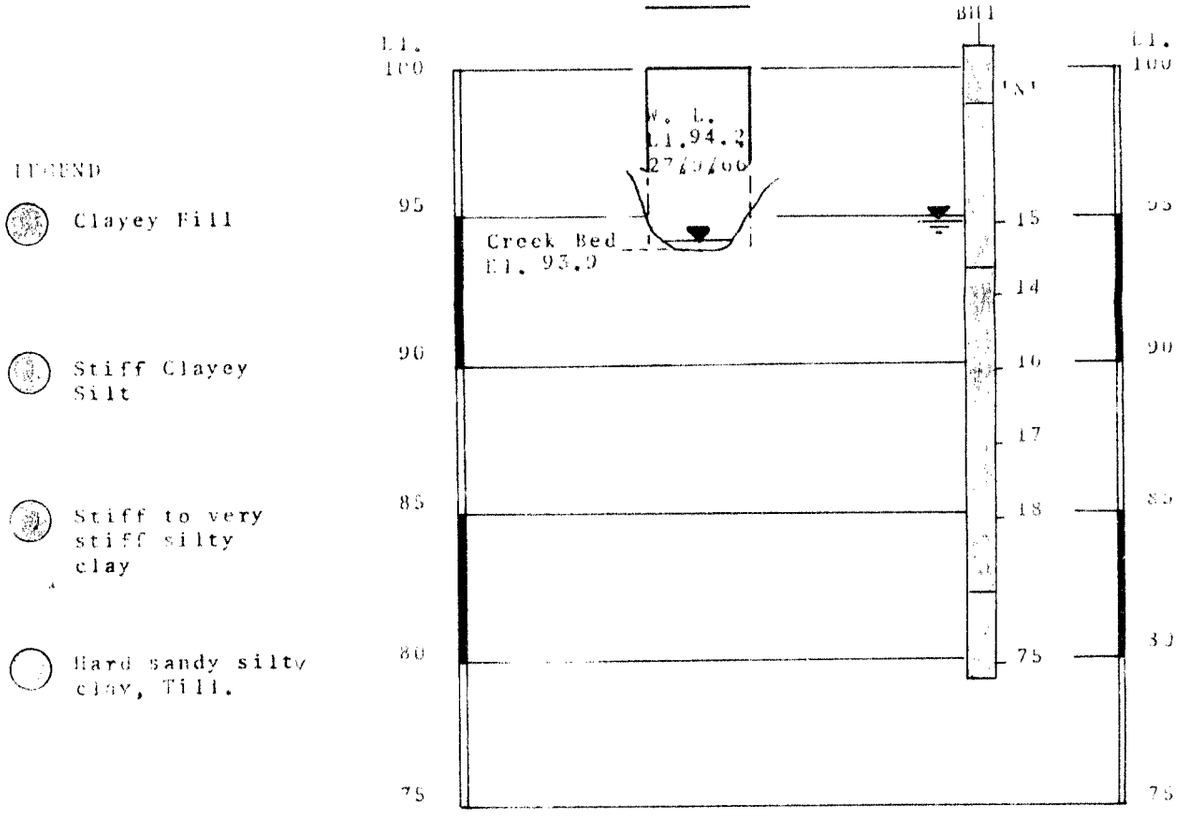
SOIL DESCRIPTION.

COHESIONLESS SOILS :	RD :	COHESIVE SOILS :	C lbs/sq ft
Very loose	0 – 15 %	Very soft	less than 250
Loose	15 – 35 %	Soft	250 – 500
Compact	35 – 65 %	Firm	500 – 1000
Dense	65 – 85 %	Stiff	1000 – 2000
Very dense	85 – 100 %	Very stiff	2000 – 4000
		Hard	over 4000



LOCATION OF BOREHOLE

Scale 1 inch to 20 feet



SUBSOIL PROFILE

Vert. Scale 1 inch to 5 feet

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 1 . . . .

OUR REFERENCE NO 6-9-L9

CLIENT A. M. Sprict & Associates
PROJECT Proposed Bridge
LOCATION Lot 13, Conc. 1 & 2, Twp. of N. Dorchester
DATUM ELEVATION 100 feet (see Enclosure 2)

METHOD OF BORING Wash boring
DIAMETER OF BOREHOLE Bx (3-inch)
DATE September 27, 1966

ENCLOSURE NO 3

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES N or Advancement of Sampler	PENETRATION RESISTANCE Blows per foot 20 40 60 80 100 / SHEAR STRENGTH lbs. sq. ft.	CONSISTENCY water content % PL W LL 40 30 20 10	REMARKS
100.7	0.0	Ground Surface							
	2.0	Clayey Till							
		Stiff brown clayey silt, traces of organic.		1	SS	15	○		
95	7.5			2	SS	14	○		
		Stiff to very stiff grey silty clay and silt seams.		3	SS	16	○	⊢○⊣	
90				4	SS	17	○		
				5	SS	18	○		
85	18.5								
		Hard grey sandy silty clay, traces of gravel (Glacial Till)		6	SS	75	○		
80	21.5	End of Borehole							
75									

▼ W. L. El. 94.7
September 27, 1966.

VERTICAL SCALE: 1 IN. TO FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE CH'D.