

G.I.-20 SEPT. 1976

GEOCRES No. 40P10-28DIST. 3 REGION South western

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. _____

LOCATION LOT 20 CON. 11,CREEKBANK, PEEL TWP.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: DOCUMENTS TO BE UNFOLDED BEFOREMICROFILMED

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B.A. 1942

MR. V. R. ASTROP
CONSULTING ENGINEER
HAMILTON - ONTARIO

REPORT ON
SOIL INVESTIGATION
FOR
CREEKBANK BRIDGE
LOT NO. 20, CONCESSION XI
TOWNSHIP OF PEEL

Submitted by
DOMINION SOIL INVESTIGATION LIMITED
77 Crockford Boulevard
SCARBOROUGH - ONTARIO

OUR REFERENCE: 4-1-4

JANUARY 1964

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S U M M A R Y

The site is underlain by dense glacial deposits mostly of granular nature.

The high density and the low compressibility of the soil make the use of normal shallow foundations possible and suitable for rigid frame construction. The allowable bearing value of the soil is given as 5 tons per square foot and the total settlement is estimated to be less than 0.5 inches.

Possible dewatering problems during construction are discussed in the text.

I. INTRODUCTION

This work was authorized on behalf of the County of Wellington by Mr. V. R. Astrop, Consulting Engineer, in a letter dated January 17th, 1964.

The number of boreholes, their locations and a temporary bench mark to be used in the survey was specified by the Client on an accompanying drawing. It is understood that the new bridge will be of similar span and in approximately the same position as the existing 40 foot reinforced concrete bridge.

The purpose of this investigation has been to reveal the subsurface conditions and to furnish the consulting engineers with the necessary information for the design and construction of foundations.

II. SITE AND GEOLOGY

The site is located on Wellington County Road No. 59 between Peel and Pilkington Townships. It lies on the border of Lot No. 20, Concession XI of Peel Township and Concession IV of Pilkington Township.

It is an interesting area from the geological point of view. During the last stage of the Pleistocene period, a continuous ice sheet covered all of Ontario extending as far as Ohio to the south. With the warming up of the climate, the recession of the Wisconsin ice sheet began and it was only then that a part of Southern Ontario was uncovered. The first land to be revealed by the receding glacier was a narrow long strip of land between London and Orangeville. The first split in the continuous ice sheet occurred along this line, dividing the glacier into two gradually regressing ice lobes and leaving behind a series of sandy moraines.

III. FIELD WORK

The work in the field was carried out on the 13th and 14th of February, 1964 by a diamond drill rig. The work consisted of two boreholes at the locations shown on the attached site plan (enclosure No. 2). The holes were advanced by washboring and lined with 3 in. diameter casings. In both boreholes, it was also necessary to employ diamond drilling techniques to advance the holes through very dense strata.

Standard penetration tests were performed at frequent intervals of depth to determine the relative density of the soil and to recover disturbed samples.

The results of the borings, penetration tests and ground water conditions are shown on the geotechnical data sheets.

The elevations are referred to a temporary bench mark located on the south side of the road and approximately 70 feet west of the centre line of the existing bridge. The bench mark was a spike driven into a hydro pole with a given elevation of 100.00 feet.

IV. SUBSURFACE CONDITIONS

Two boreholes were put down to reveal the subsurface conditions and the detailed results of the borings are shown on enclosures Nos. 3 and 4.

Under about 8 to 10 feet of artificial fill consisting of sandy-gravelly road fill and a thicker stratum of backfilled excavation material from the previous construction, basically one stratum was encountered.

The natural soil underlying the site is a dense glacial deposit consisting of sand, gravel, silt and clay in variable proportions. Occasionally the silt and clay particles are abundant or on the other hand, only coarse sand and gravel are present with a trace of the other constituents. This erratic variation can be explained by the origin and mode of deposition

outlined in the section dealing with the geology of the area. The bulk of the stratum, however, consists of sand and silt, mostly of a high relative density. The "N" values as obtained from the standard penetration tests ranged from 26 to over 100 blows per foot.

Ground water was encountered in borehole No. 1 at elevation 93.3 and in borehole No. 2 at elevation 95.0. At the same time, the water level in the river was at elevation 92.0.

V. DISCUSSION OF THE RESULTS

(a) Foundations

In view of the fact that the river bed is at elevation 91.0, the footings will have to be founded at or below elevation 86.0. At this level, both boreholes indicated a very dense sandy silty glacial deposit with a recommended safe bearing value of 5 tons per square foot.

The total and differential settlements under a continuous footing of the size likely to be required is estimated not to exceed 0.5 and 0.25 inches respectively. These values are considered to be within the tolerable limits for a rigid frame reinforced concrete structure.

The sliding resistance of the footings against horizontal movement should be calculated on the assumption that the coefficient of friction between the footings and the foundation is 0.35.

(b) Construction

The presence of coarse sand and gravel seams within the silty sandy till was indicated in both boreholes. Should they form a continuous seam, the dewatering of the excavation will require special consideration. The rate of flow through this pervious layer will likely be high making the use of high

rate pumps necessary. To avoid loss of material and possible decrease in the density of the stratum, it is recommended that sumps should be installed outside the footing area and below the proposed foundation level.

However, in view of the generally erratic nature of glacial deposits, it is also possible that the sand and gravel occurs only in isolated pockets in which case the dewatering will not present major problems.

IPL/oed



DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowszky
I. P. Lieszkowszky, P.Eng.

E n c l o s u r e s

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						
Ø > 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.

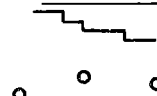
DYNAMIC PENETRATION RESISTANCE : to drive a 2"Ø, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

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 :



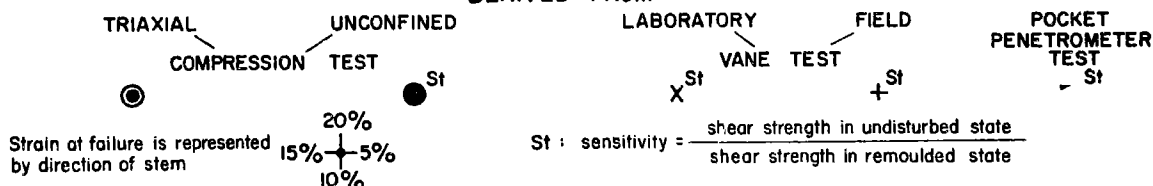
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SOIL PROPERTIES.

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	Cv 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

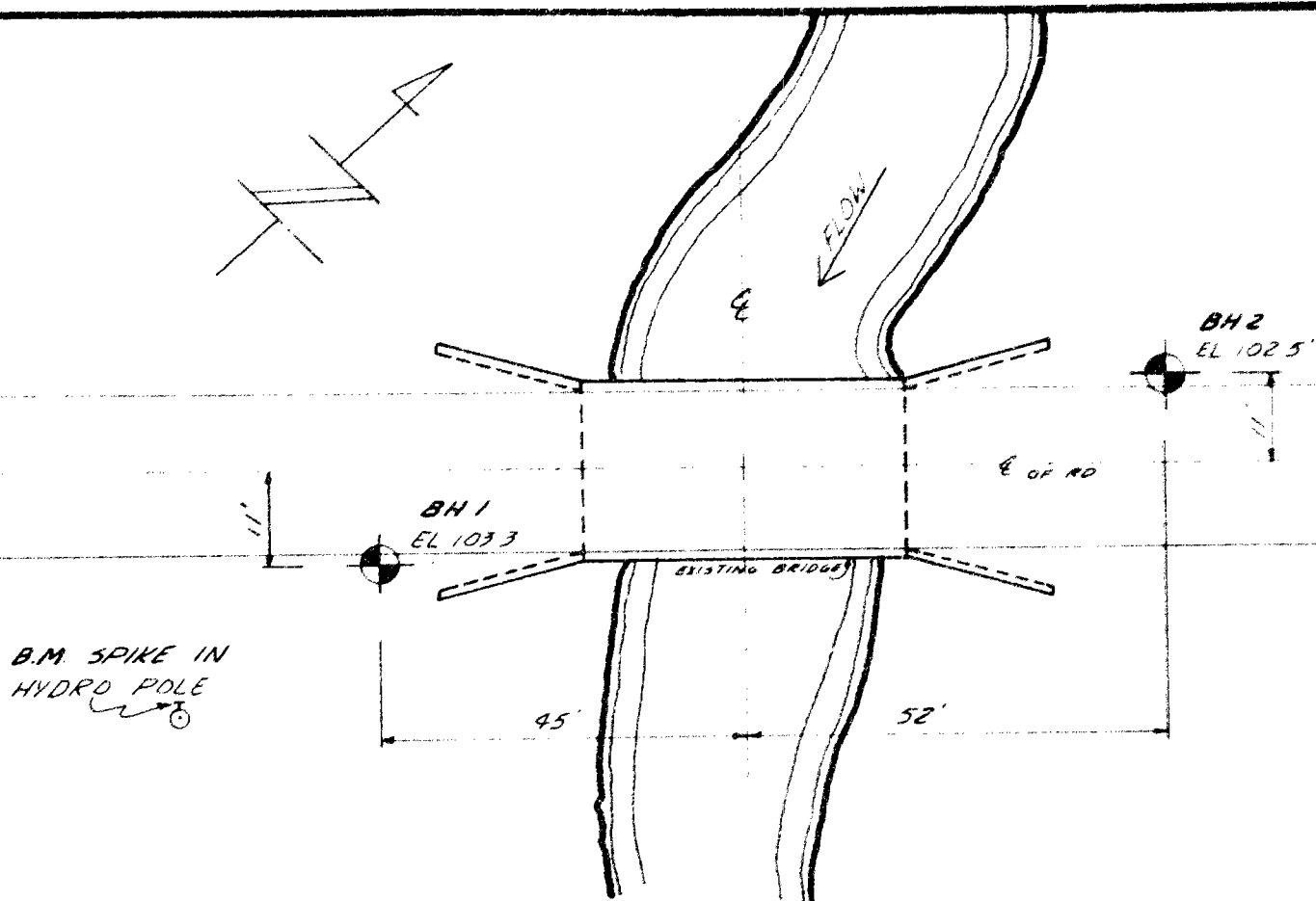
UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

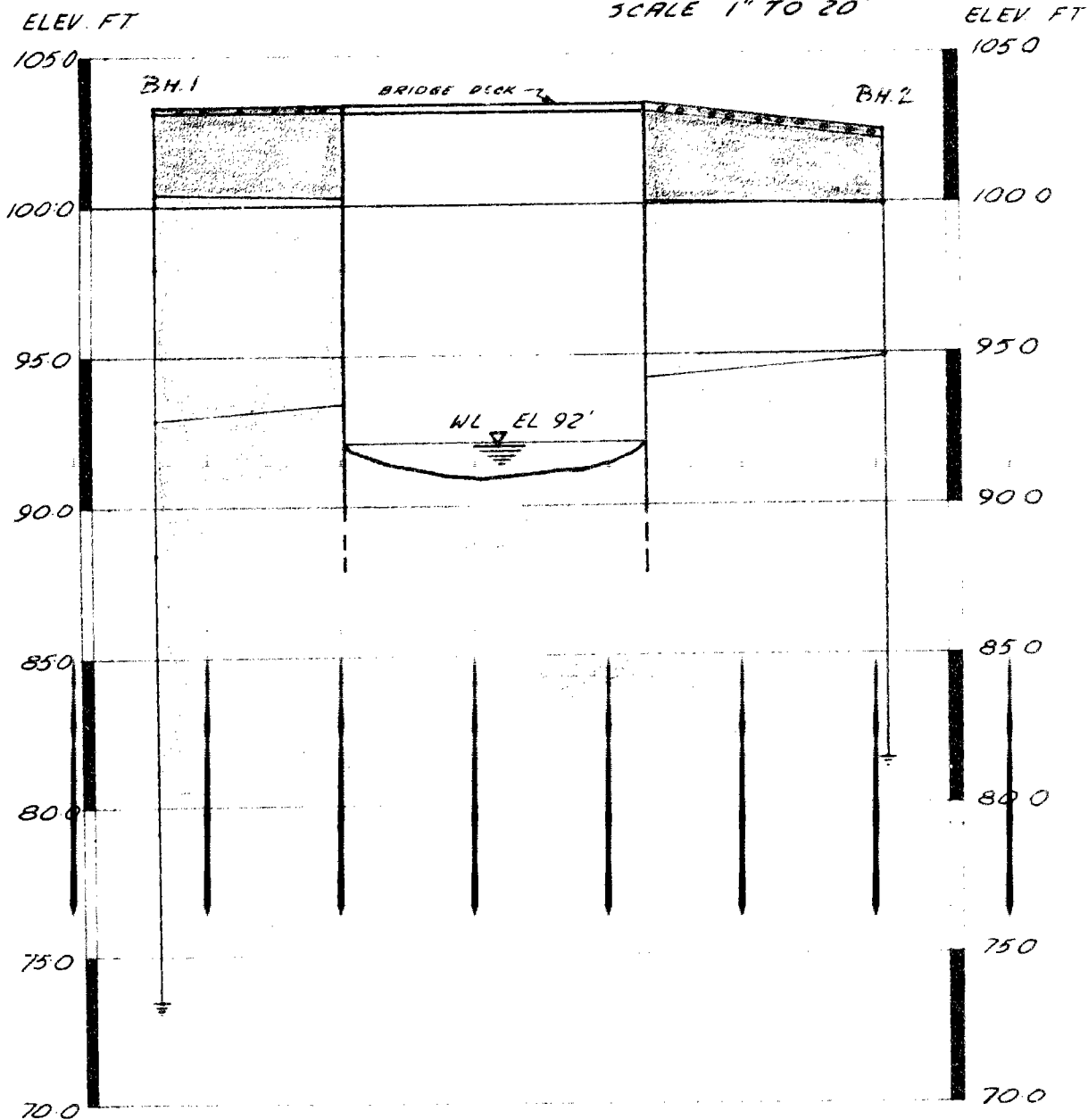


SOIL DESCRIPTION.

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 BOREHOLES
SCALE 1" TO 20'



SUBSURFACE PROFILE
SCALE VERT 1" TO 5'
HOR 1" TO 20'

LEGEND	
	PAVEMENT
	SANDY GRAVELLY FILL
	SILTY CLAYEY FILL
	SANDY SILTY TILL

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . / . . .

CLIENT: **U.R. ASTROP**
 PROJECT: **CREEKBANK BRIDGE**
 LOCATION: **WELLINGTON COUNTY RD. 59**
 DATA LOCATION: **SPIKE IN HYDRO POLE EL. 1000'**

APPROVED BY: **WASHBORO**
 DIAMETER OF BOREHOLE: **2 7/8"**
 DATE: **FEB 13, 1969**

ENCLOSURE NO. **3**

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content %	REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs sq ft		
103.3	0	PAVEMENT								
100.0		SANDY FILL								
95.0	5	FIRM SILTY CLAYEY FILL with some gravel and organic matter		1	SS	7				
	10			2	SS	7				
90.0	15	VERY DENSE SANDY SILTY TILL with some gravel and clay		3 ^A	CS	-				
				4 ^B	SS	95				
85.0				5 ^A	SS	61				
	20			6	SS	130				
80.0		brown grey		7	WS					
	25			8	SS	240				
75.0										
70.0	30	END OF BOREHOLE		9	SS	144				

FEB 13, 1969

EL 93.3'

DETAILS OF
EXTRAPOLATED
N - VALUES

Sa*	Blows
6	60/5 1/2"
8	60/3"
9	60/5"

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 2 . . .

OUR REFERENCE NO. 57-1-4

CLIENT: KR. RETROP
 PROJECT: CREEKBANK BRIDGE
 LOCATION: WELLINGTON COUNTY RD 59
 DATUM ELEVATION: SPIKE IN HYDRO POLE EL. 100.0'

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 7/8"
 DATE: FEB. 19, 1969

ENCLOSURE NO. 4

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs/sq ft	water content % PL W LI		
102.5	0	PAVEMENT									
100.0		SANDY GRAVELLY FILL									
95.0	5	FIRM SILTY CLAYEY FILL with some gravel and organic matter		1	SS	8					
	10	COMPACT TO VERY DENSE brown SANDY SILTY TILL		2	SS	-					
				3	SS	26					
	15	with some gravel and clay		4	SS	34					
				5 ^A 8	SS	53					
	20			6	RC						
				7 ^A 8	SS	110					
80.0		END OF BOREHOLE									
	25										

FEB 11, 1969

EL. 95'