67-F-236M

SOUTH BRANCH OF THE

SOUTH NATION RIVER

LOT 1, CON. 5

EDWARDSBURG

REPORT ON SUBSURFACE INVESTIGATION

PROPOSED NEW BRIDGE OVER THE SOUTH BRANCH OF THE SOUTH NATION RIVER NORTH OF PITTSTON, ONTARIO

LOT 1 - CONCESSION V

TOWNSHIP OF EDWARDSBURG

TO 67-F-236 M

C. C. PARKER & ASSOCIATES LIMITED

CONSULTING ENGINEERS

FOR

THE UNITED COUNTIES OF LEEDS & GRENVILLE

Report No. SF-1072
February 27, 1967

McROSTIE SETO GENEST
& ASSOCIATES LTD. - CONSULTING ENGINEERS
& ASSOCIÉS LTÉE - INGÉNIEURS CONSEILS
OTTAWA, CANADA

B.H. 2551
SITE 16-187

McROSTIE SETO GENEST

& ASSOCIATES LTD. - CONSULTING ENGINEERS - 393 BELL ST., OTTAWA, ONTARIO
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1. TERMS OF REFERENCE

We were requested by C. C. Parker and Associates Limited, Consulting Engineers, on behalf of the United Counties of Leeds & Grenville, to carry out a subsurface investigation for a proposed new bridge, crossing the South Branch of the South Nation River, in Lot 1 - Concession V, Township of Edwardsburg. The new bridge would consist of a single 50' or 60' span.

The investigation would consist of two boreholes in the locations shown on Drawing No. B.H.-1 submitted.

2. CONCLUSIONS AND RECOMMENDATIONS

2.1 Foundation Type

A pile type foundation bearing on the dense till is recommended to support all the loads of the proposed structure. Driven cast in place expanded base concrete piles could be made to bear on or near the surface of the underlying dense soil layer which varies from elevation 71 at borehole No. 1 to elevation 72 at borehole No. 2; thus, with such a pile type the length of pile would likely be of the order of ten feet.

A footing type foundation was considered and rejected for the following reasons; the cost of a pile foundation for the proposed structure at this site would be similar

to a footing type foundation since footings would need to bear at a depth of about 15 feet below the existing ground surface in view of the loose density of the silty till layer above this depth and also the elevation of the groundwater table, a pile foundation does not require the precautions necessary as with footing foundation to guard against disturbance of in-situ soil conditions by construction traffic, a pile foundation is free of groundwater conditions, quick to construct and convenient at any time of year.

2.2 Pile Types

The most likely economical and feasible type of end bearing pile for the proposed structure at this site is the driven cast in place expanded base concrete pile with encased shafts. This type of pile is so considered since it can be made to bear adequately, on or near the surface of the underlying dense till layer 10' or so below the required underside of abutments. With this type of pile a bulb is formed at the base of the pile thus reducing the length of pile that would be required with other types of end bearing piles. Local piling Contractors could likely supply such type of pile economically.

Of course, any alternate type of end bearing piles such as steel H-piles, concrete filled tube piles and driven precast concrete piles should be considered if they prove economical. However, the difficulties in driving end bearing piles into such dense glacial till containing boulders, should be recognized in the selection of pile type.

These end bearing piles can be expected to penetrate a considerable distance into the dense till layer, possibly 10' to 20'.

2.3 Soil Strengths

Since soils are not recommended for support of a footing type foundation for the proposed structure, detailed bearing values are not given here. It can be stated however that the underlying dense till below the site will provide adequate support for driven cast in place expanded base concrete piles or other types of end bearing piles.

2.4 Embankment Foundation

The clay deposit below the 12 foot high embankment adjacent to the south abutment has sufficient shear strength to remain stable under the proposed loads. Also consolidation settlement of the clay foundation at this location is not expected to be significant in view of the small load addition and the small thickness of the compressible deposit.

2.5 Construction Precautions

Pile driving inspection should be considered. Furthermore, the provision of an allowance to cover the cost of a pile load test is a helpful addition to construction control of any piling operation.

Variations in depth to boulder till could be encountered at this site and contract payment procedures should make clear which party is to bear the cost of these variations. Finally, if variations in subsurface conditions between boreholes are encountered at the time of construction they should be reported to the Supervising Authority for suitable action.

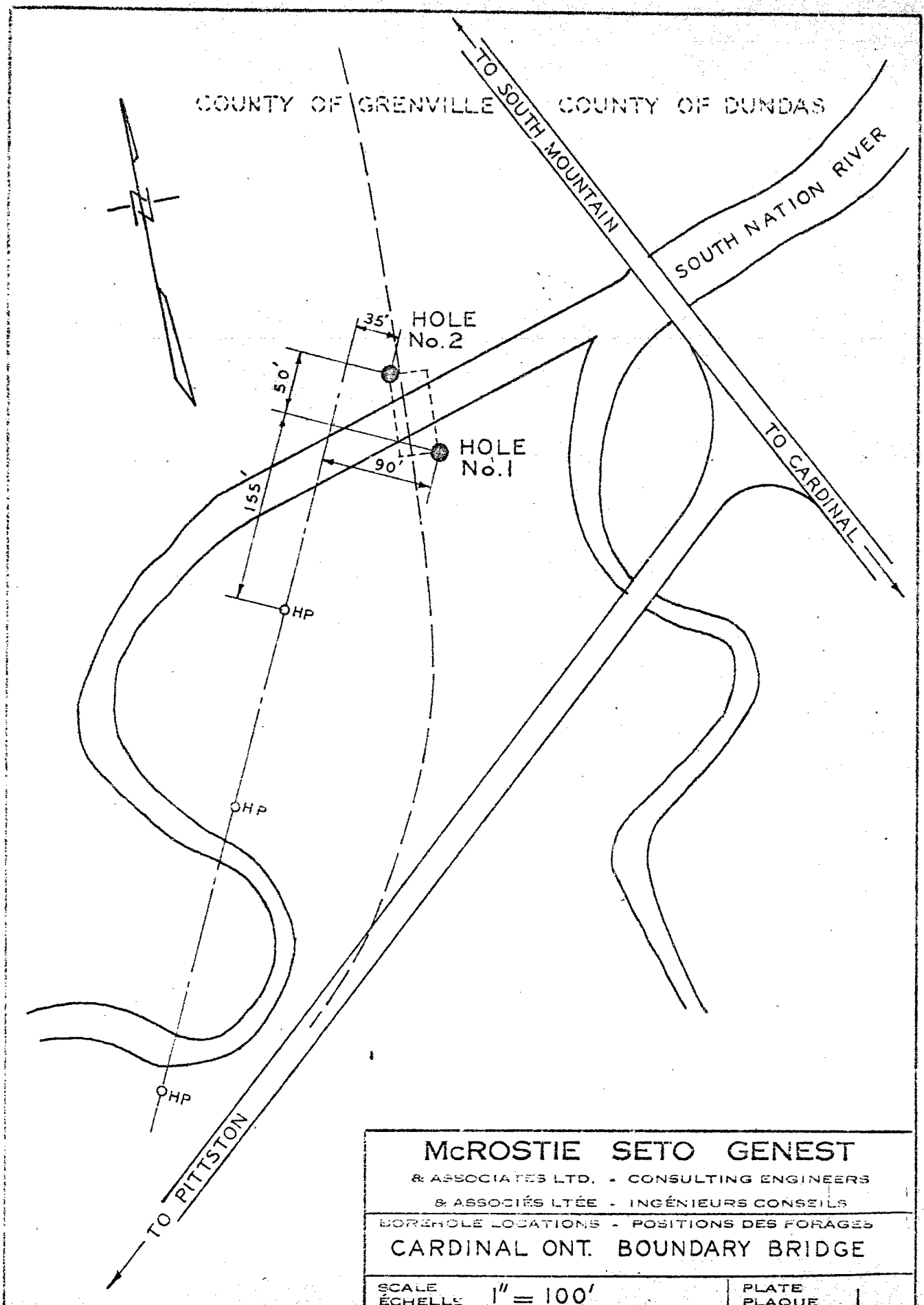
3. SITE INVESTIGATION

Two boreholes were made at the site with our test drilling equipment in the locations shown on Plate No. 1. Split barrel samples were retrieved from the basically granular subsoil at 2½ foot intervals, and Standard Penetration Resistance Tests were carried out with the split barrel sampling. Groundwater levels were observed during the investigation. All samples were brought to our laboratory for further examination.

All samples were visually classified and moisture content determinations were made on all samples.

The soils encountered at borehole locations are shown in detail on the accompanying Plates No. 2 and No. 3. The subsoil can be generalized as consisting of a layer of clay 4 feet to 8.5 feet thick (8.5' at borehole No. 1 possible River deposit) underlain by a layer of glacial till (mixture of clay, silt, sand, gravel & boulders) at least 30 feet thick and varying in density from medium dense to dense with depth.

Groundwater levels in the boreholes were observed to be at elevation 87.6.



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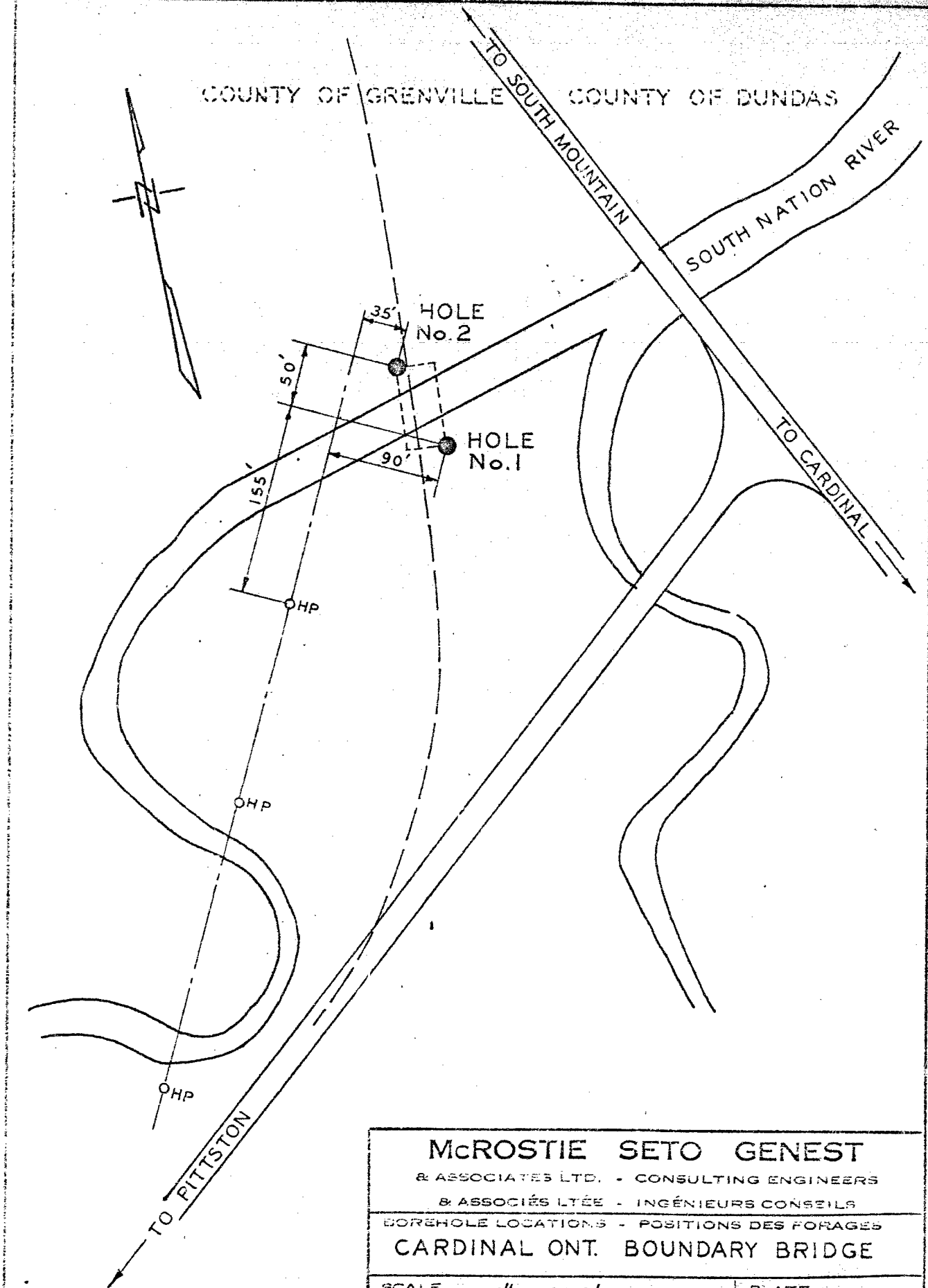
BOREHOLE LOCATIONS - POSITIONS DES FORAGES

CARDINAL ONT. BOUNDARY BRIDGE

SCALE ÉCHELLE 1" = 100'

PLATE PLAQUE 1



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BOREHOLE LOCATIONS - POSITIONS DES FORAGES

CARDINAL ONT. BOUNDARY BRIDGE

SCALE ÉCHELLE	1" = 100'	PLATE PLAQUE	1

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OTTAWA CANADA

SOIL PROFILE & TEST SUMMARIES
PROFIL SOUTERRAIN ET RÉSUMÉ DES ESSAIS

CARDINAL, ONT.
BOUNDARY BRIDGE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 88.7' DATE FEB. 7, 1967 HOLE FORAGE No. 1
NIVEAU DU SOL (PROFONDEUR ZÉRO)
NOTES B.M. (EL. 100.0') ASSUMED - RAILWAY SPIKE IN ROOT OF 4 FT. MAPLE AT STATION 0+25 28' LEFT, TAKEN FROM C.C. PARKER & ASSOC. LTD. PLAN No. BH-1

Compressive Strength K.S.F. Résistance à la Compression K/Pd.²	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.²	Essai-Standard Penetration Blows/ft.-Coups/pd	Sample No. Échantillon	DESCRIPTION OF SOIL DU SOL (Ground Surface / Niveau du Sol)	Depth in Feet Profondeur--Pied	Elevation Niveau
	5·0, 5·0, 4·4	9	1-1	SILTY GRAY CLAY WITH SOME FINE SAND & A TRACE OF ORGANIC MATERIAL (RIVER DEPOSIT)	0'	88·7'
	1·5, 1·0, 1·2 2·4, 2·2, 2·0 1·2, 1·2, 1·0 0·6, 1·0, 0·6 R-0·0		1-2			
	0·2, 0·2, 0·2	3	1-3A 1-3B	VERY SOFT SILTY GRAY CLAY	8·5'	
		8	1-4	LOOSE SILTY TI	10'	78·7'
		26	1-5	MEDIUM DENSE TO DENSE SILTY TILL WITH A FEW BOULDERS	12·5'	
		112, 15 for 6"	1-6			
		37	1-7		17·5'	71·2'
		62	1-8	DENSE SILTY TILL WITH A FEW BOULDERS		
		133	1-9			
		37	1-10			
		24, 19 for 6"	1-11		27·5'	61·2'
		54, 15 for 6"	1-12			
		19, 16, 22	1-13	MEDIUM DENSE TO DENSE SILTY TILL		
		15	1-14			
		48	1-15	DENSE SILTY TILL	37·5'	
		79	1-16			
				BOTTOM OF HOLE	41·5'	47·2'

PROFILE OR VANE TEST — SONDAGE OU ESSAI AU MOULINET
MARTEAU---HAMMER, CHUTE LIBRE---DROP
NO CASING SANS TUBAGE, BARRE----DIA. ROD
~~BLOWS/FOOT OR~~ ~~COUPS/PIED OU~~ SHEAR STRENGTH K.S.F. RÉSISTANCE AU CISAILLEMENT K/PD.²

0 1·5 3·0 4·5 6·0 7·5

OVER-NIGHT WATER LEVEL 87·6'
WATER CONTENT
VANE TEST
UNDISTURBED
REMOULDED

0 2,0 4,0 6,0 8,0 10,0
% WATER CONTENT
% TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ □
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

Plate Plaque No. 2

⊕ = Remoulded-Remanié
⊕ = Core Recovery, Carotte Récupérée

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CARDINAL, ONT.
BOUNDARY BRIDGE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 87.6′ DATE FEB. 9, 1967
NIVEAU DU SOL (PROFONDEUR ZERO)
NOTES SEE PLATE No.2

HOLE / FORAGE No. 2

Compressive Strength K.S.F. Résistance à la Compression K/Pd.2	Small Scale Penetrometer K.S.F. Petit Pénétromètre K/Pd.2	Essai - Standard Penetration Blows/Ft. - Coups/pd.	Sample Echantillon No.	DESCRIPTION OF SOIL DU SOL	Depth in Feet Profondeur - Pied	Elevation Niveau
				Ground Surface – Niveau du Sol		
				TOPSOIL	0′	87.6′
	3·0, 2·2, 3·0	8	2.1	STIFF SILTY BROWNISH GRAY CLAY	1′	
	0·8, 1·0, 1·0	11	2.2	SOFT SILTY BROWNISH GRAY CLAY	2.5′	
		8 before 8"	2.3	LOOSE TO MEDIUM DENSE CLAYEY SILT	5′	82.6′
		10 before 6" 47	2.4	MEDIUM DENSE SILTY TILL WITH A 1′0" DENSE LAYER	7.5′	80.1′
		16	2.5			
		15	2.6			
		44	2.7	DENSE SILTY TILL	15′	72.6′
		62	2.8			
		64	2.9			
				BOTTOM OF HOLE	21.5′	66.1′

WATER LEVEL AFTER 1½ HRS. 87.6′

WATER CONTENT

0 20 40 60 80 100

WATER CONTENT
%TENEUR EN EAU
NATURAL NATURELLE ⊙
LIQUID LIMIT LIMITE DE LIQUIDITÉ □
PLASTIC LIMIT LIMITE DE PLASTICITÉ △

PLATE / PLAQUE No. 3

R = REMOULDED-REMANIÉ
CR = CORE RECOVERY CAROTTE RECUPEREE