

59-F-227C

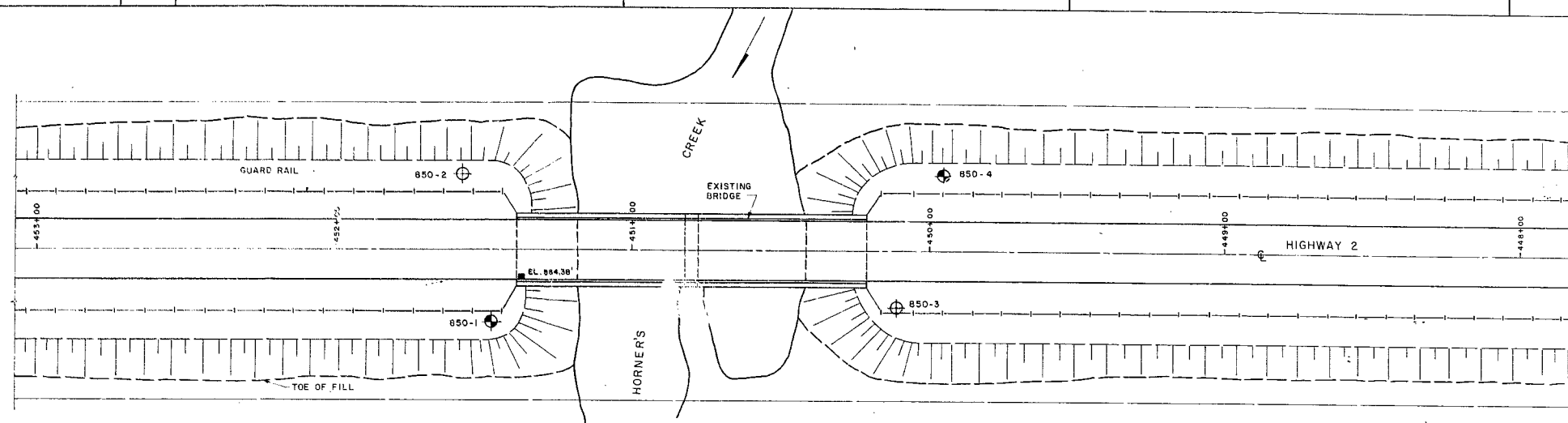
W.P. # 185-59

HORNER'S

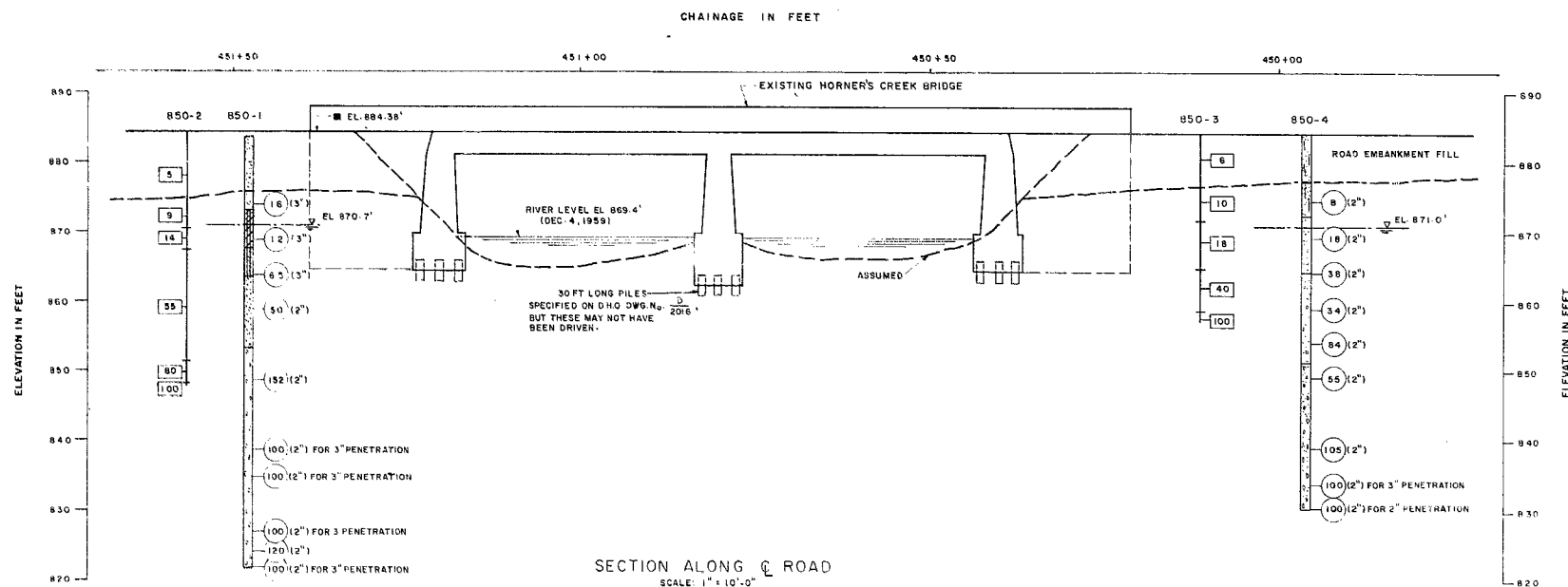
CREEK

Hwy # 2

CROSSING



PLAN
SCALE: 1" = 20'-0"



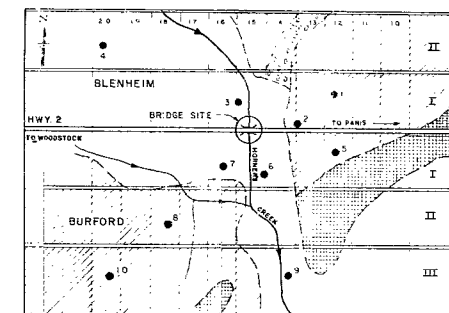
SECTION ALONG ROAD
SCALE: 1" = 10'-0"

LEGEND:

- ▽ WATER TABLE
- ⊙ EXPLORATORY DRILL HOLE
- ⊙ 2 IN. DIA. PENETRATION CONE TEST
- ⊙ PERMANENT TURN POINT - ONTARIO DEPARTMENT OF HIGHWAYS
- ⊙ BLOWS PER FOOT FOR STANDARD PENETRATION TEST
- ⊙ AVERAGE NUMBER OF BLOWS PER FOOT PENETRATION
- ⊙ OUTSIDE DIAMETER OF SPLIT-SPONGE SAMPLER
- CLAYEY SILT
- SANDY SILT
- SILTY SAND
- FINE SAND
- COARSE SAND
- GRAVEL

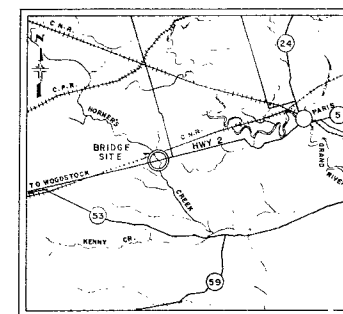
NOTES:

1. STANDARD PENETRATION TESTS AND CONE PENETRATION TESTS WERE PERFORMED USING A 140 LB. WEIGHT DROPPING 30 INCHES.
2. INFORMATION CONCERNING THE GENERAL GEOLOGY OF THE PRINCETON AREA AND THE WATER WELL RECORDS WAS OBTAINED FROM THE FOLLOWING REFERENCES:
(A) CHAPMAN, L.S., AND PUTNAM, D.F., 1951.
THE PHYSIOGRAPHY OF SOUTHERN ONTARIO.
UNIVERSITY OF TORONTO PRESS.
(B) GROUND WATER IN ONTARIO, 1946, 1949 AND 1950.
ONTARIO DEPARTMENT OF MINES, BULLETIN 145.



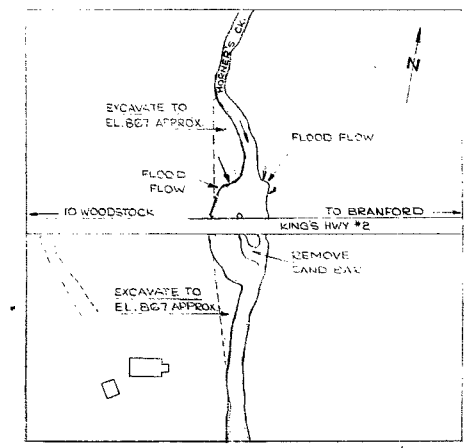
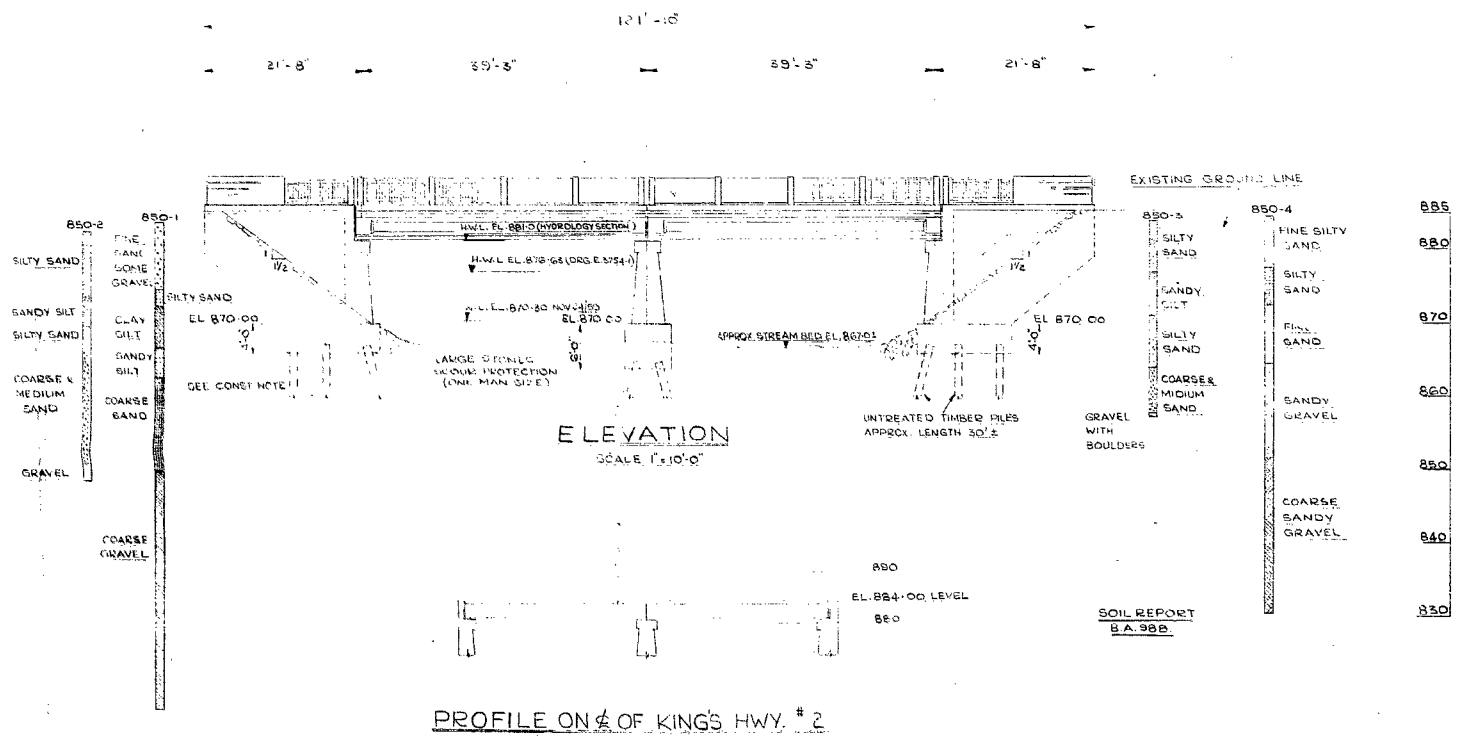
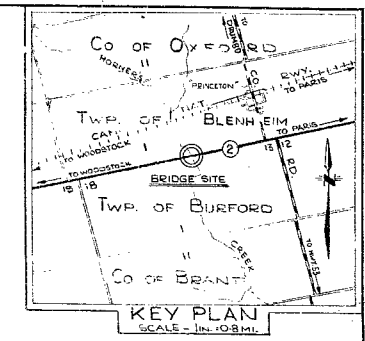
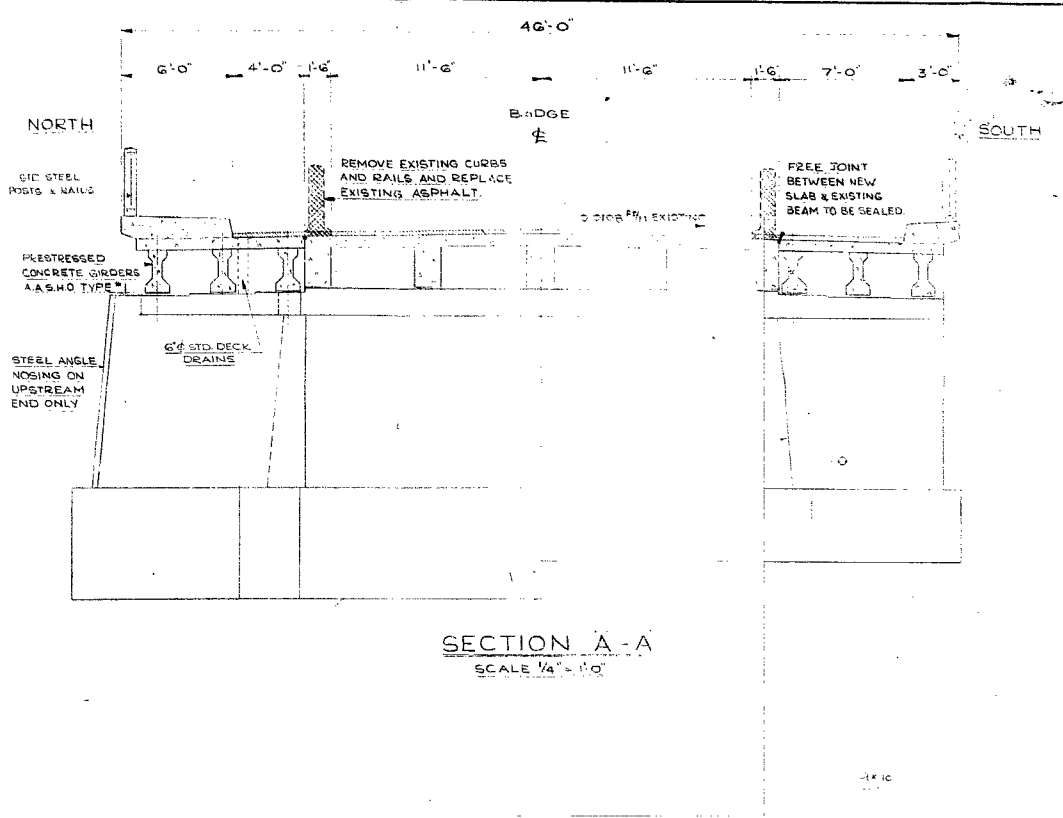
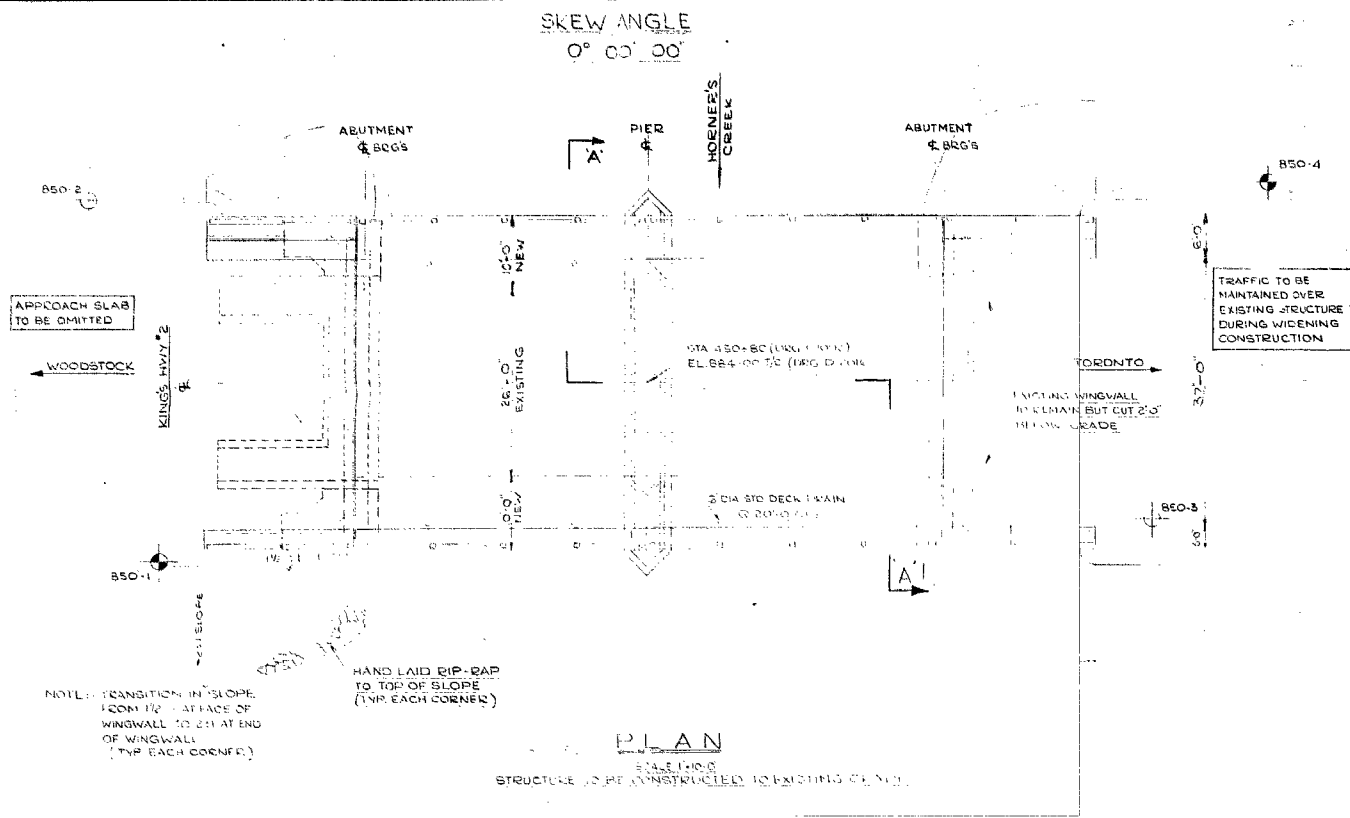
- LEGEND:
- SAND PLAINS
 - SPILLWAYS
 - TILL MORAINES
 - TILL PLAINS
 - WATER WELL

HOLE No.	GROUND WATER LEVEL	WATER WELL RECORDS
1	25 FT.	CLAY 55', GRAVEL 77' ±
2	20 FT.	CLAY 20', FINE SAND 30', CLAY 55', GRAVEL 60' ±
3	19 FT.	SAND 58', GRAVEL 60' ±
4	50 FT.	SANDY CLAY 60', FINE SAND 70' ±
5	29 FT.	SAND 10', CLAY 55', GRAVEL 60' ±
6	40 FT.	SANDY CLAY 30', SAND 55', FINE SAND 60' ±
7	25 FT.	SAND 10', CLAY 70', GRAVEL 70' ±
8	17 FT.	CLAY 30', SANDY CLAY 50', CLAY 80', GRAVEL 100' ±
9	24 FT.	SAND 10', CLAY 60', GRAVEL 55', CLAY 120', BEDROCK
10	17 FT.	CLAY 55', TILL 65', CLAY 70', BEDROCK (SHALE)



KEY PLAN
SCALE: 1" = 4 MI.

H. G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS NIAGARA FALLS CANADA	
DEPARTMENT OF HIGHWAYS OF ONTARIO	
HORNER'S CREEK, HIGHWAY 2 CROSSING (WP-185-59)	
EXPLORATORY HOLES PLANS AND SECTION	
APPROVED	DATE: DEC. 17, 1959
<i>D. H. Macdonald</i> H.G. ACRES & COMPANY LIMITED	SCALE AS NOTED
	850
PLATE - I	



- CONSTRUCTION NOTES**
- 1. ALL EXISTING CONCRETE IN EXISTING BEAMS, PIER & BRIDGE PAVES TO BE REMOVED AND BEAMS, PIER & BRIDGE SEALS REPAIRED BY THE DIRECTION OF THE BRIDGE MAINTENANCE ENGINEER.
 - 2. EXCAVATION OF FOOTINGS SHOULD BE CARRIED BELOW THE ELEVATION OF THE BOTTOM OF THE EXISTING FOOTINGS EXCEPT AS REQUIRED TO OBTAIN FOOTING DEPTH AS SHOWN ON THE PLANS. HOWEVER, EXCAVATION SHOULD BE CARRIED TO THE BOTTOM OF THE EXISTING FOOTING AND THE EXISTENCE IN FOOTING DEPTH MAINTAINED WITH MASS CONCRETE.
 - 3. EXCAVATION BELOW THE BOTTOM OF THE REINFORCED CONCRETE FOOTING MAY BE REQUIRED, HOWEVER, THIS WILL BE DETERMINED BY THE DIST. ENG. AT THE TIME OF CONSTRUCTION.

W.P. 185-59

DEPARTMENT OF HIGHWAYS-ONTARIO
BRIDGE OFFICE-TORONTO

WIDENING OF HORN LICK CREEK BRIDGE

THE KING'S HIGHWAY No. 2 DIST. No. 2
CO. OXFORD & BRANT
TWP. BLENHEIM & BURFORD LOT 15 CON. 1

PRELIMINARY PLAN

APPROVED

BRIDGE ENGINEER DESIGN ENGINEER

DATE	BY	DESCRIPTION

REVISIONS	DATE	BY	DESCRIPTION

REFERENCE PLANS	CONTRACT NUMBER	LOADING NUMBER
D. 2016	E. 3754-1	H. 20
E. 3754-1	E. 3754-1	S. 16
C. 1092		

DATE MARCH 1961

PROFILE ON 1/2 OF KING'S HWY. #2

RECOMMENDED CHANNEL IMPROVEMENT
TO BE ARRANGED BY ROAD DESIGN

PILES FOR STRUCTURE ABUTMENTS & PIER

SUBSOIL DATA :-

WEST ABUTMENT

EAST ABUTMENT

SOIL TYPE	EL.	BLOW / FT	
Sand & Gravel (Firm)	884.0	4	9
	876.0		
Silty Sand	873.5	8	15
Clay Silt	868.0		6
Sandy Silt	864.0	18	29
			—
Coarse Sand	854.0	17	26
			18 27
Coarse Sand & Gravel	822.0	25	50
			—

Top of pile to be at el. 865.0

$$Q_f = 4 N_{Ap} + \bar{N} A_s / 50 \quad (\text{Meyerhof 1956})$$

$$= 4 \times 18 \times \frac{\pi}{4} + 18 \times \pi \times 10 \times \frac{1}{50}$$

$$= 56.5 + 11.3 = 67.8 \text{ T}$$

USE 15 TONS / PILE OR 20 T / PILE

DRIVE BELOW EL. 855.0

length of Piles = approx 12'

Mr. S. McCombie,
Bridge Planning Engr.
Materials & Research Section,
(Foundations Office).
Attention: Mr. Gavin Scott.

April 27, 1961.

REVIEW OF PRELIMINARY PLAN
by: Foundations Office.

Re: Widening of Horner's Creek Bridge
Required Pile Lengths -
W.P. 185-59 - District #2.

We have reviewed the Preliminary Plan for the
above structure and are herewith submitting our comment for your
consideration:-

The piles should be driven to or below elevation 865.0'
and a safe bearing capacity of 15 - 20 tons per pile can be taken
for design purposes. It is our opinion that 12-ft. piles would
be adequate.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.
Per:

AGS/MdeF
cc: Foundations Office
Gen. Files.

A. G. Stermac
(A. G. Stermac,
SUPERVISING FOUNDATION ENGR.

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section.

January 19, 1960.

FOUNDATION REPORT - by
H.G. Acres & Company, Ltd.

Attention: Mr. S. McCombie.

Re: Horner's Creek Crossing
Highway #2 - W.P. 185-59
District #2.

Enclosed herewith, please find a detailed soils report prepared by H.G. Acres & Co., Ltd. The factual data presented in this report have been reviewed by the Foundation Section.

The Consultants conclude that the footings for the proposed extension to the structure can be:-

- (1) Supported directly on spread footings founded at Elevation 865.0' using bearing pressures of 2 Tons/sq. ft.
- or -
- (2) Supported on short, large displacement type piles with cut-off elevation below low water level. Either rip-rap or sheet pile protection would have to be used if pile-supported footings are used.

It is our opinion that a short pile-type footing support be used. This would make the design similar to that of the existing structure. The need for erosion or scour protection should be based upon the hydrologic report which we do not have available.

Should any queries arise in connection with the contents of the Consultants' report, or our above-mentioned comments, please do not hesitate to contact the Foundation Office.

LOG/AdEF

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
D. G. Ramsay
A. Coter
W.L. Fraser

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATIONS ENGINEER
J. Roy A. Watt Fdn. Office - Gen. Files.

DEPARTMENT OF HIGHWAYS OF ONTARIO
Toronto, Ontario

REPORT

on

SITE INVESTIGATION AT HORNER'S CREEK
HIGHWAY 2 CROSSING
(WP-185-59)

DISTRICT 2

59 F 227 C

H.G. ACRES & COMPANY LIMITED
Consulting Engineers
Niagara Falls, Canada

December 17, 1959

DEPARTMENT OF HIGHWAYS OF ONTARIO
Toronto, Ontario

REPORT

on

SITE INVESTIGATION AT HORNER'S CREEK
HIGHWAY 2 CROSSING
(WP-185-59)

Table of Contents

Introduction

General Geology

Exploratory Work

Site Conditions and Soil Properties

Conclusions

Recommendations

List of Plates

DEPARTMENT OF HIGHWAYS OF ONTARIO
Toronto, Ontario

REPORT

on

SITE INVESTIGATION AT HORNER'S CREEK
HIGHWAY 2 CROSSING
(WP-185-59)

Introduction

It has been planned to widen the existing bridge which carries Highway 2 across Horner's Creek, west of Princeton, Ontario, (see Plate I), and to obtain information concerning the foundation conditions, a soils investigation was carried out by H.G. Acres & Company Limited at the request of the Department of Highways of Ontario. The drilling and sampling were performed by the F.E. Johnston Drilling Company Limited, and the drilling operations were supervised by Mr. G. Wilson of H.G. Acres & Company Limited. Field work commenced on November 24, 1959, and was completed on December 5, 1959. No laboratory testing was done, except visual classification of the soil samples. The results of the field work, together with our conclusions and recommendations, are contained in this report.

General Geology

The site of the bridge which carries Highway 2 across Horner's Creek is located within the physiographic region known as the Norfolk Sand Plain (see Plate I). This plain slopes gently towards Lake Erie and is underlain by sands and silts deposited in the glacial lakes Whittlesey and Warren. The Norfolk sands are of deltaic origin and occur at the mouths of glacial spillways which cut across the Paris till moraine. These deltaic formations also contain silt and gravel deposits, and boulders.

Records of water wells drilled in the area indicate that the soil stratigraphy consists primarily of silt and sand deposits overlying water-bearing gravels. These gravels generally extend to bedrock which is at an approximate depth of 150 feet below the ground surface. However, as noted on Plate I, deposits of clay or clay till have also been found to exist at various levels above the bedrock.

Exploratory Work

The site investigation consisted of putting down two exploratory holes and driving two penetration cones, the locations of which are shown on Plate I. The holes were advanced where possible by wash-boring methods, but in hole No. 850-1 where boulders were encountered at a depth of 46 feet, it was found necessary to drill the casing. This

drilling proved to be a difficult operation because the gravels were so pervious that there was no return of the drilling water.

Standard penetration tests were performed at 5-foot intervals and the soil samples thus obtained were retained for visual inspection.

Site Conditions and Soil Properties

A description of the materials which were encountered in the exploratory holes, and the results of the standard penetration tests and the cone penetration tests, are recorded in the attached drilling logs, Plates II to V, inclusive.

In general, the soil becomes progressively more coarse-grained and more dense with depth. Below the road embankment fill, the soils from approximately elevation 875 feet to elevation 865 feet consist of alluvial deposits of loose silt and sand mixtures, and generally less than 20 blows per foot were required to advance the penetration cones and the split-spoon sampler. Below elevation 865 feet, there are deposits of coarse sand, gravel, and boulders, which vary considerably from point to point. In hole No. 850-1 the casing had to be drilled below elevation 840 feet in order to penetrate boulders, whereas in hole No. 850-4, the 4-inch casing was driven to elevation 830 feet

without encountering any large boulders. In the two cone penetration tests, refusal was met at elevations which differed by 10 feet. In spite of the erratic nature of these granular deposits, which is to be expected in deltaic formations, it may be concluded from the penetration tests that these deposits are relatively dense as penetration resistances considerably greater than 40 blows per foot, were measured.

The ground water levels measured in holes No. 850-1 and No. 850-4 were 1.3 feet and 1.6 feet, respectively, above the water level in Horner's Creek at the time of drilling and, during the drilling, the water levels in these holes did not fluctuate.

Conclusions

(a) - The general soil profile consists of about 10 feet of a loose sandy and silty alluvial mixture overlying deposits of coarse sand, gravel, and boulders, which become progressively more coarse-grained with depth and which extend at least to elevation 820 feet. The ground water level was found to correspond approximately with the water level in Horner's Creek; that is, elevation 870 feet.

(b) - The results of cone and standard penetration tests indicate that below the loose sand and silt mixtures, that is, below approximately elevation 865 feet, the soils are relatively dense and seem to become progressively more

dense with depth. The average penetration resistance is greater than 40 blows per foot.

(c) - The abutments and central pier of the present bridge are assumed to be supported by piles as required by Department of Highways of Ontario drawing No. D-2016, revised as of October 8, 1924. In all probability, these are bearing piles with a minor frictional component driven to refusal into the sands and gravels below elevation 865 feet.

Recommendations

The foundations of the bridge extensions can be supported either by spread footings or by piles.

The relatively dense sands and gravels below elevation 865 feet are capable of safely supporting footing pressures of two tons per square foot without allowing excessively large settlements. However, as these footings would be founded upon erodible soil, it would be essential to found them at such a depth that undermining of the footings by stream erosion would not occur. The determination of this elevation could be made only on the basis of the flow records of Horner's Creek. In the absence of these records, no calculations have been made, but it seems likely that a safe elevation would be approximately 5 feet below the bottom of the existing creek; that is at about elevation 860 feet.

This is approximately 10 feet below the water level in Horner's Creek and construction of these footings would, therefore, require cofferdamming and dewatering.

In order to establish the bottom of the bridge piers at a higher elevation and, therefore, to eliminate some of the difficulties encountered with a spread footing type of foundation, the bridge piers could be supported by bearing piles driven into the relatively dense sands and gravels below elevation 865 feet. In view of the denseness of the soils, wooden bearing piles could probably be safely driven no more than 20 feet, and could be expected to support loads of 15 to 20 tons per pile. Having thus eliminated the effect of erosion on the stability of the piers, the elevation of the bottom of the piers could be established somewhat above the elevation required by spread footings only, but safely below the minimum low water level for reasons of pile preservation. Erosion of the soil beneath the pile caps could be prevented by driving a shallow sheet pile wall around the pile caps.

PLATES

LIST OF PLATES

Plate I - Exploratory Holes, Plans and Section.

Plate II - Drilling Report, Hole No. 850-1.

Plate III - Drilling Report, Hole No. 850-2.

Plate IV - Drilling Report, Hole No. 850-3.

Plate V - Drilling Report, Hole No. 850-4.

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario JOB No. 850
 PROJECT Horners Creek, Highway 2 Crossing (WP-185-59) HOLE No. 850-1
 SITE Horners Creek Bridge SHEET No. 1 OF 3

CONTRACTOR: F.E. Johnston Drilling Co. Ltd. STARTED 1:00 P.M. Nov. 24 1959
 FINISHED 11:15 A.M. Dec. 3 1959
 METHOD SOIL Wash boring and diamond drilling CASING DIAM. 4" flush joint,
 OF reducing to AX:
 DRILLING: ROCK CORE DIAM. -

LOCATION: Latitude CH 451° 47' ELEVATIONS: DATUM G.S.C.
DEPARTURE Offset 24' Left DRILL PLATFORM
 BEARING - GROUND SURFACE 883.7 = 884
 INITIAL DIP 90 degrees ROCK SURFACE
 OTHER DIPS - BOTTOM OF HOLE 821.7
 WATER TABLE 870.7

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST ★
			NO.	TYPE *	SIZE	DEPTH	RET'D	
0			1.	AR	3"	10'-0"		Blows
	Road embankment fill	Fine sand and some gravel		"	"	10'-6"		10
8'-0"				"	"	11'-0"	70%	8
	Silty sand	Dark brown, containing organic matter (roots etc.)		"	"	11'-6"		10 1/2
10'-6"			2.	AR	3"	15'-0"		
	Clay silt	Brown and greyish, saturated, stratified, firm with soft bands.		"	"	15'-6"		20
				"	"	16'-0"	85%	6
				"	"	16'-6"		6
16'-0"			3.	AZ	3"	20'-0"		
	Sandy silt	Grey, stratified, loosely compacted		"	"	20'-6"		23
				"	"	21'-0"	NIL	31
20'-0"				"	"	21'-6"		34
	Coarse sand	Brown and grey, stratified, well compacted, saturated (no apparent water loss or gain)	4.	AR	2"	25'-0"		
				"	"	25'-6"		19
				"	"	26'-0"	80%	26
				"	"	26'-6"		33
30'-3"			5.	AR	2"	35'-0"		
				"	"	35'-6"		15
				"	"	36'-0"	75%	44
				"	"	36'-6"		108
			6.	AZ	2"	45'-0"		
				"	"	45'-3"	NIL	100 for 3"

SAMPLING METHOD

* A — SPLIT TUBE
 B — THIN WALL TUBE
 C — PISTON SAMPLER
 — CORE BARREL

E — AUGER
 F — WASH

SHIPPING CONTAINER

N — INSERT
 O — TUBE
 P — WATER CONTENT TIN
 Q — GLASS JAR

R — CLOTH BAG
 S — PLOFILM BAG
 Z — DISCARDED

INSPECTOR G. Wilson

LOGGED BY G. Wilson

APPROVED

D. H. McDonald

DATE

December 16, 1959

Plate 11 A

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario

JOB No. 850

PROJECT Horners Creek, Highway 2 Crossing (WP-185-59)

HOLE No. 850-1

SITE Horners Creek Bridge

SHEET No. 2 OF 3

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST ★
			NO	TYPE	SIZE	DEPTH	RET D	
30'-3"			7.	Core	AX	45'-3"	50%	Blows
		Brown and grey, stratified, with lenses of silty sand, coarse sand and boulders up to 6" diam. Generally well compacted but contains lenses of loose material.			Shoe	46'-0"		
			8.	AZ	2"	48'-6"		
					"	49'-0"	10%	48
	Coarse gravel				"	49'-3"		72 for 3"
			9.	AZ	2"	57'-0"		
					"	57'-6"	10%	90
52'-0"	End of hole					57'-9"		58 for 3"
			10.	AR	2"	57'-9"		
						58'-3"		24
						58'-9"	50%	50
						59'-3"		75
		★ Penetration Test:						
		Number of blows of a 140-pound weight falling 30-inches required to advance a split-spoon sampler one foot.						

DRILLING REPORT

CLIENT Department of Highways of Ontario

JOB No. 850

PROJECT Horner's Creek, Highway 2 Crossing (WP-185-59)

HOLE No. 850-1

SITE Horner's Creek Bridge

SHEET No. 3 OF 3

0 to 46 feet

4-inch diameter flush joint casing advanced by driving. Penetration resistance measured as the number of blows of a 350-pound weight falling 20 inches required to advance the casing one foot.

Depth	Blows/ft	Depth	Blows/ft
0' (G/L)		24'	100
1'	12	25'	90
2'	12	26'	60
3'	10	27'	90
4'	9	28'	70
5'	7	29'	80
6'	6	30'	180
7'	11	31'	200
8'	18	32'	200
9'	22	33'	200
10'	29	34'	210
11'	20	35'	205
12'	28	36'	215
13'	30	37'	260
14'	30	38'	240
15'	30	39'	155
16'	28	40'	155
17'	30	41'	155
18'	36	42'	150
19'	48	43'	200
20'	90	44'	200
21'	31	45'	200
22'	62	46'	200
23'	85		

46 to 56 feet

BX casing was advanced by drilling.

56 to 62 feet

AX casing was advanced by drilling.

60 to 62 feet

D.H.O. Cone penetration test, — number of blows of a 140-pound weight falling 30 inches required to advance the cone one foot.

Depth	Blows/ft
60'	
61'	30
62'	100
62'-2"	100 for 2"

H. G. ACRES & COMPANY LIMITED - CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario JOB No. 850
 PROJECT Horners Creek, Highway 2 Crossing (WP-185-59) HOLE No. 850-2
 SITE Horners Creek Bridge SHEET No. 1 OF 2
 CONTRACTOR: F.E. Johnston Drilling Co. Ltd. STARTED 1:45 P.M. Dec. 3 1959
 FINISHED 2:45 P.M. Dec. 3 1959
 METHOD SOIL D.H.Q. Cone Penetration Test CASING DIAM. -
 OF DRILLING: ROCK - CORE DIAM. -
 LOCATION: LATITUDE CH. 451+57 ELEVATIONS: DATUM G.S.C.
 DEPARTURE Offset 26'-0" right DRILL PLATFORM -
 BEARING - GROUND SURFACE 882.5
 INITIAL DIP 90 degrees ROCK SURFACE -
 OTHER DIPS - BOTTOM OF HOLE 848.0
 WATER TABLE -

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE				PENETRATION TEST ★	
			NO.	TYPE *	SIZE	DEPTH	RET'D	Blows/ft
<i>West about</i>		<u>INTERPRETATION</u>			882.5	0'		
						1'		3
		0 to 9' - Embankment fill (silty sand)				2'		7
						3'		5
						4'		3
						5'		3
						6'		5
						7'		5
						8'		9
		9' to 13' - Sandy silt				9'		12
						10'		7
						11'		7
					870.5	12'		11
		13' to 16' - Silty sand				13'		12
						14'		12
					867.5	15'		16
		16' to 32' - Coarse and medium sand				16'		41
						17'		48
						18'		38
						19'		34
						20'		37
						21'		51
						22'		57
						23'		55
						24'		58
						25'		74
						26'		59
					855.5	27'	53	
<u>SAMPLING METHOD</u>			<u>SHIPPING CONTAINER</u>					
* A - SPLIT TUBE			N - INSERT					
B - THIN WALL TUBE			O - TUBE					
C - PISTON SAMPLER			P - WATER CONTENT TIN					
D - CORE BARREL			Q - GLASS JAR					
E - AUGER			R - CLOTH BAG					
F - WASH			S - PLIOFILM BAG					
			Z - DISCARDED					

SAMPLING METHOD

* A - SPLIT TUBE
 B - THIN WALL TUBE
 C - PISTON SAMPLER
 D - CORE BARREL

E - AUGER
 F - WASH

SHIPPING CONTAINER

N - INSERT
 O - TUBE
 P - WATER CONTENT TIN
 Q - GLASS JAR

R - CLOTH BAG
 S - PLIOFILM BAG
 Z - DISCARDED

INSPECTOR G. Wilson

LOGGED BY G. Wilson

APPROVED

D. H. MacDonald

DATE

December 16, 1959

Plate III A

DRILLING REPORT

JOB No. 850

HOLE No. 850-2

SHEET No. 2 OF 2

Plate III

H. G. ACRES & COMPANY LIMITED - CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario JOB No. 850
 PROJECT Horner's Creek, Highway 2 Crossing (WP-185-59) HOLE No. 850-3
 SITE Horner's Creek Bridge SHEET No. 1 OF 1

CONTRACTOR: F.E. Johnston Drilling Co. Ltd. STARTED 4:00 P.M. Dec. 3 1959
 FINISHED 5:00 P.M. Dec. 3 1959

METHOD SOIL D.H.O. Cone Penetration Test CASING DIAM. -
 OF
 DRILLING: ROCK - CORE DIAM. -

LOCATION: LATITUDE CH. 450+11 ELEVATIONS: DATUM G.S.C.
 DEPARTURE Offset 19'-0" left
 BEARING -
 INITIAL DIP 90 degrees
 OTHER DIPS -
 DRILL PLATFORM -
 GROUND SURFACE 884.0
 ROCK SURFACE -
 BOTTOM OF HOLE 857.5
 WATER TABLE -

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTION, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST ★ Blows/ft
			NO.	TYPE *	SIZE	DEPTH	RET'D	
		<u>INTERPRETATION</u>			44.0	0'		
						1'		10
		0' to 7' - Embankment fill				2'		28
		(silty sand)				3'		9
						4'		6
						5'		6
						6'		5
		7' to 13' - Sandy silt				7'		2
						8'		12
						9'		7
						10'		9
						11'		8
						12'		10
		13' to 20' - Silty sand				13'		19
						14'		21
						15'		15
						16'		10
						17'		12
						18'		17
						19'		23
		20' to 26' - Coarse and				20'		44
		medium sand				21'		38
						22'		48
						23'		34
						24'		41
						25'		58
		26' to 26'-6" - Gravel with				26'		112
		boulders			57.5	26'-6"		100

SAMPLING METHOD

* A - SPLIT TUBE
 B - THIN WALL TUBE
 C - PISTON SAMPLER
 D - CORE BARREL

E - AUGER
 F - WASH

SHIPPING CONTAINER

N - INSERT
 O - TUBE
 P - WATER CONTENT TIN
 Q - GLASS JAR

R - CLOTH BAG
 S - PLIOFILM BAG
 Z - DISCARDED

Refusal

INSPECTOR G. Wilson

LOGGED BY G. Wilson

APPROVED

D. H. MacDonald

DATE

December 16, 1959

Plate IV

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario JOB No. 850
 PROJECT Horners Creek, Highway 2 Crossing (WF-185-59) HOLE No. 850-4
 SITE Horners Creek Bridge SHEET No. 1 OF 3
 CONTRACTOR: F.E. Johnston Drilling Co. Ltd. STARTED 10:00 A.M. Dec. 4 1959
 FINISHED 4:00 P.M. Dec. 5 1959
 METHOD OF DRILLING: SOIL Wash boring CASING DIAM. 4" flush joint.
 ROCK - CORE DIAM. -
 LOCATION: LATITUDE CH. 449495 ELEVATIONS: DATUM G.S.C.
 DEPARTURE Offset 26'-0" right DRILL PLATFORM -
 BEARING - GROUND SURFACE 884.5
 INITIAL DIP 90 degrees ROCK SURFACE -
 OTHER DIPS - BOTTOM OF HOLE 830.5
 WATER TABLE 871.0

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTION, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST ★
			NO.	TYPE *	SIZE	DEPTH	RET'D	
0								Blows
	Road embankment fill	Fine silty sand; loosely compacted.	11.	AZ	2"	10'-0"		
					"	10'-6"	15%	4
7'-0"					"	11'-0"		4
		Brown fine sand with layers of silt and silty clay;				11'-6"		4
	Silty sand	loosely compacted, saturated and containing organic matter (roots, etc.)	12.	AR	2"	15'-0"		
					"	15'-6"		9
					"	16'-0"	50%	5
12'-0"					"	16'-6"		9
	Fine sand	Brown and grey fine sand with layers of silt; saturated and only moderately compacted (no drilling water loss).	13.	AR	2"	20'-0"		
					"	20'-6"		16
					"	21'-0"	50%	19
20'-0"					"	21'-6"		19
		Brown and grey, stratified, containing lenses and seams of silty sand, coarse sand,	14.	AZ	2"	25'-0"		
	Sandy gravel	and well graded layers with some clay; only moderately compacted (no drilling water loss).			"	25'-6"		13
					"	26'-0"	1%	17
					"	26'-6"		17
			15.	AR	2"	30'-0"		
33'-0"					"	30'-6"	15%	17
					"	31'-0"		25
					"	31'-6"		42

SAMPLING METHOD

* A — SPLIT TUBE
 B — THIN WALL TUBE
 C — PISTON SAMPLER
 D — CORE BARREL

E — AUGER
 F — WASH

SHIPPING CONTAINER

N — INSERT
 O — TUBE
 P — WATER CONTENT TIN
 Q — GLASS JAR

R — CLOTH BAG
 S — PLIOFILM BAG
 Z — DISCARDED

INSPECTOR G. Wilson

LOGGED BY G. Wilson

APPROVED

D. H. MacDonald.

DATE

December 16, 1959

Plate V A

FORM NO. 51-A

H. G. ACRES & COMPANY LIMITED - CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Department of Highways of Ontario

JOB No. 850

PROJECT Horner's Creek, Highway 2 Crossing (WP-185-59)

HOLE No. 850-4

SITE Horner's Creek Bridge

SHEET No. 2 OF 3

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST
			NO.	TYPE	SIZE	DEPTH	RET'D	
33'-0"			16	AR	2"	35'-0"		Blows
		Brown and grey, stratified,			"	35'-6"		46
		containing lenses and seams of			"	36'-0"	50%	36
		silty sand, coarse sand and			"	36'-6"		19
	Coarse	boulders. Generally well com-	17	AR	2"	45'-0"		
	sandy	pacted but containing pockets			"	45'-6"		65
	gravel	and seams of looser material.			"	46'-0"	50%	55
					"	46'-6"		50
54'-0"	End of hole		18	AL	2"	50'-0"		
					"	50'-3"	NIL	100
<p>★ Penetration Test: Number of blows of a 140-pound weight falling 30 inches required to advance a split-spoon samples one foot.</p>								

DRILLING REPORT

CLIENT Department of Highways of Ontario

JOB No. 850

PROJECT Horner's Creek, Highway 2 Crossing (WP-185-59)

HOLE No. 850-4

SITE Horner's Creek Bridge

SHEET No. 3 OF 3

0 to 53'-6"

4-inch diameter flush joint casing
 advanced by driving. Penetration
 resistance measured as the number of
 blows of a 350-pound weight falling
 20-inches required to advance the
 casing one foot.

Depth	Blows/ft	Depth	Blows/ft
0'			
1'	10	28'	65
2'	9	29'	65
3'	10	30'	75
4'	15	31'	33
5'	13	32'	86
6'	14	33'	110
7'	15	34'	175
8'	15	35'	200
9'	15	36'	80
10'	16	37'	63
11'	20	38'	70
12'	34	39'	75
13'	40	40'	115
14'	47	41'	50
15'	46	42'	80
16'	30	43'	90
17'	34	44'	90
18'	33	45'	120
19'	38	46'	92
20'	45	47'	100
21'	49	48'	93
22'	54	49'	140
23'	49	50'	165
24'	51	51'	160
25'	69	52'	300
26'	31	53'	300
27'	47	53'-6"	300

52' to 54'-2"

D.H.O. Cone Penetration Test:

Number of blows of a 140-pound weight
 falling 30 inches required to advance
 the cone one foot.

Depth	Blows/ft
52'	
53'	14
54'	44
54'-2"	100