

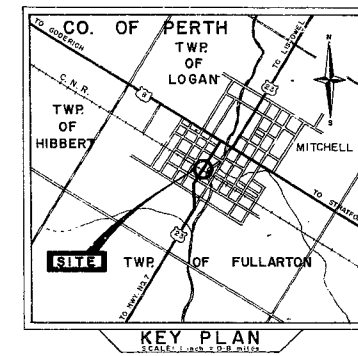
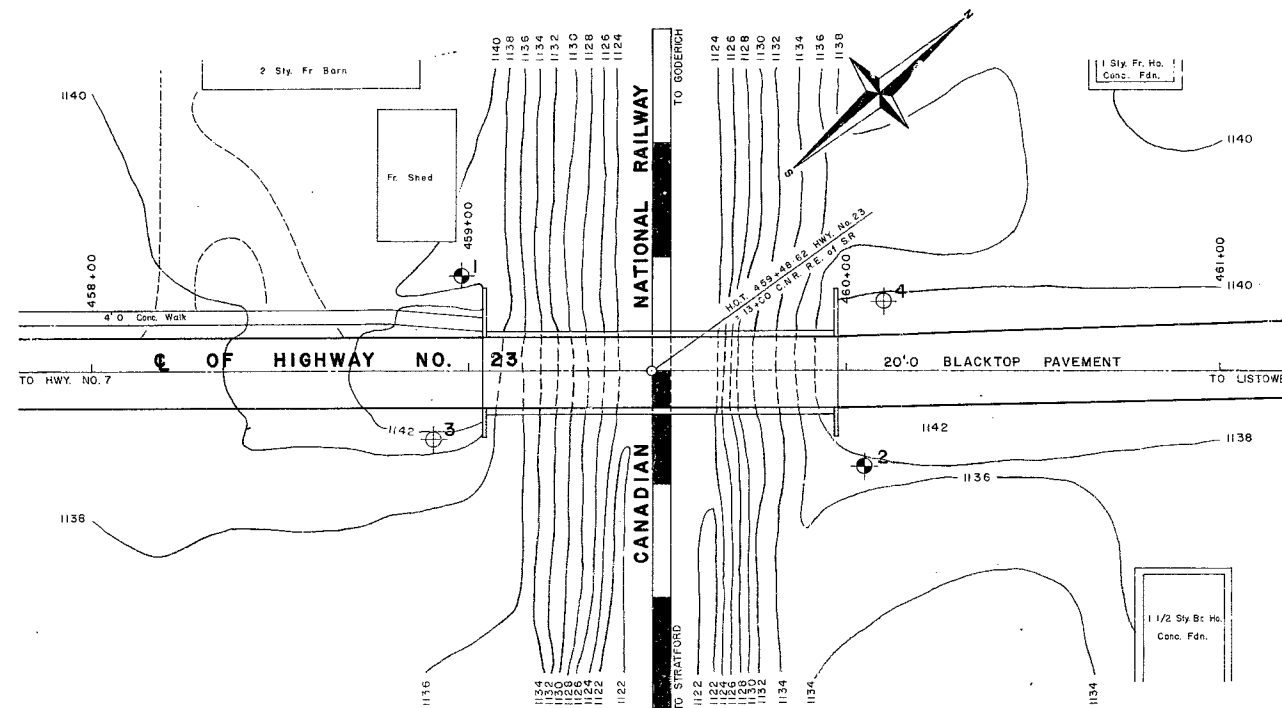
61-F-42

W.P. # 292-60

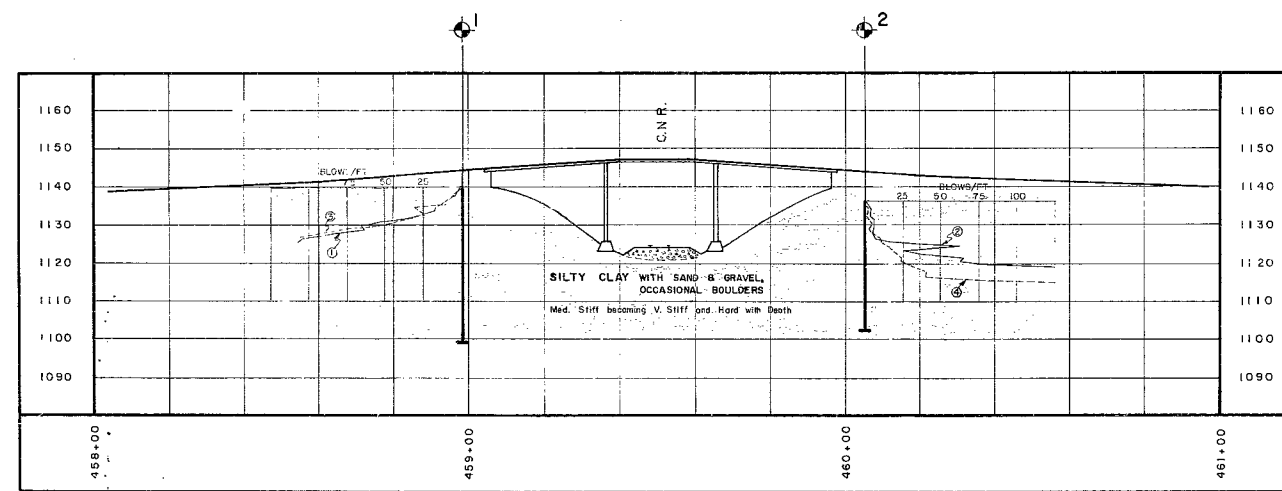
Hwy. # 23

C.N.R. OVERHEAD

MITCHELL

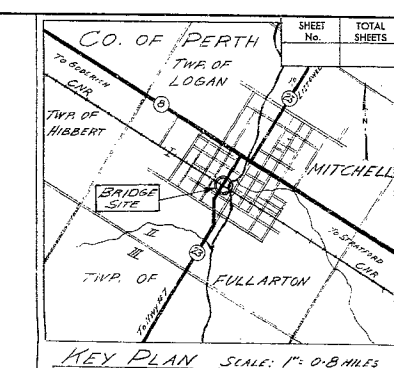
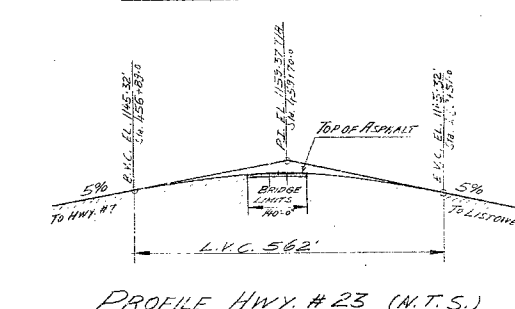
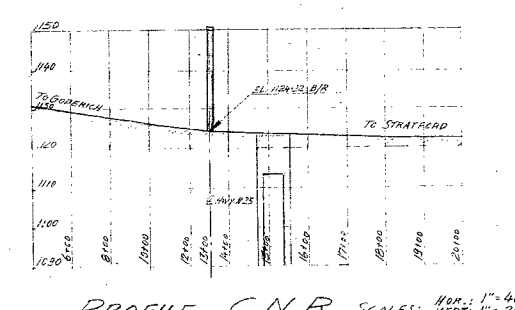
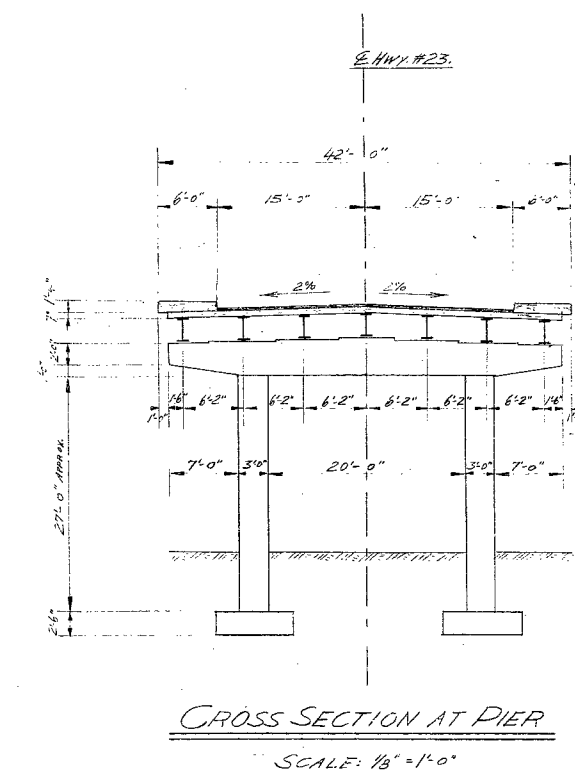
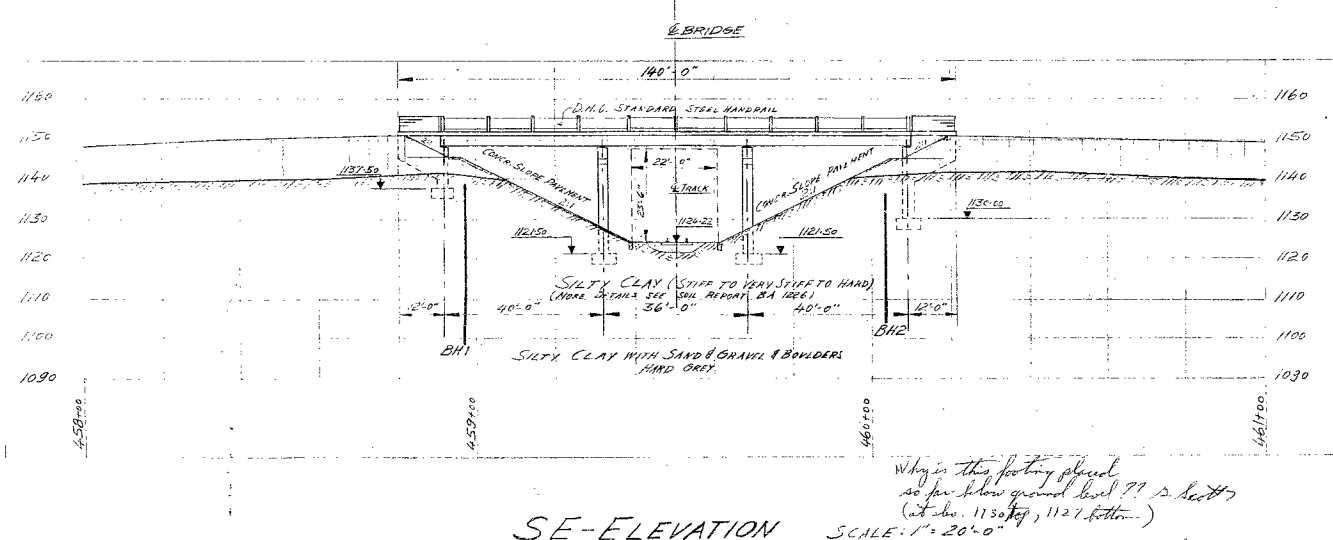
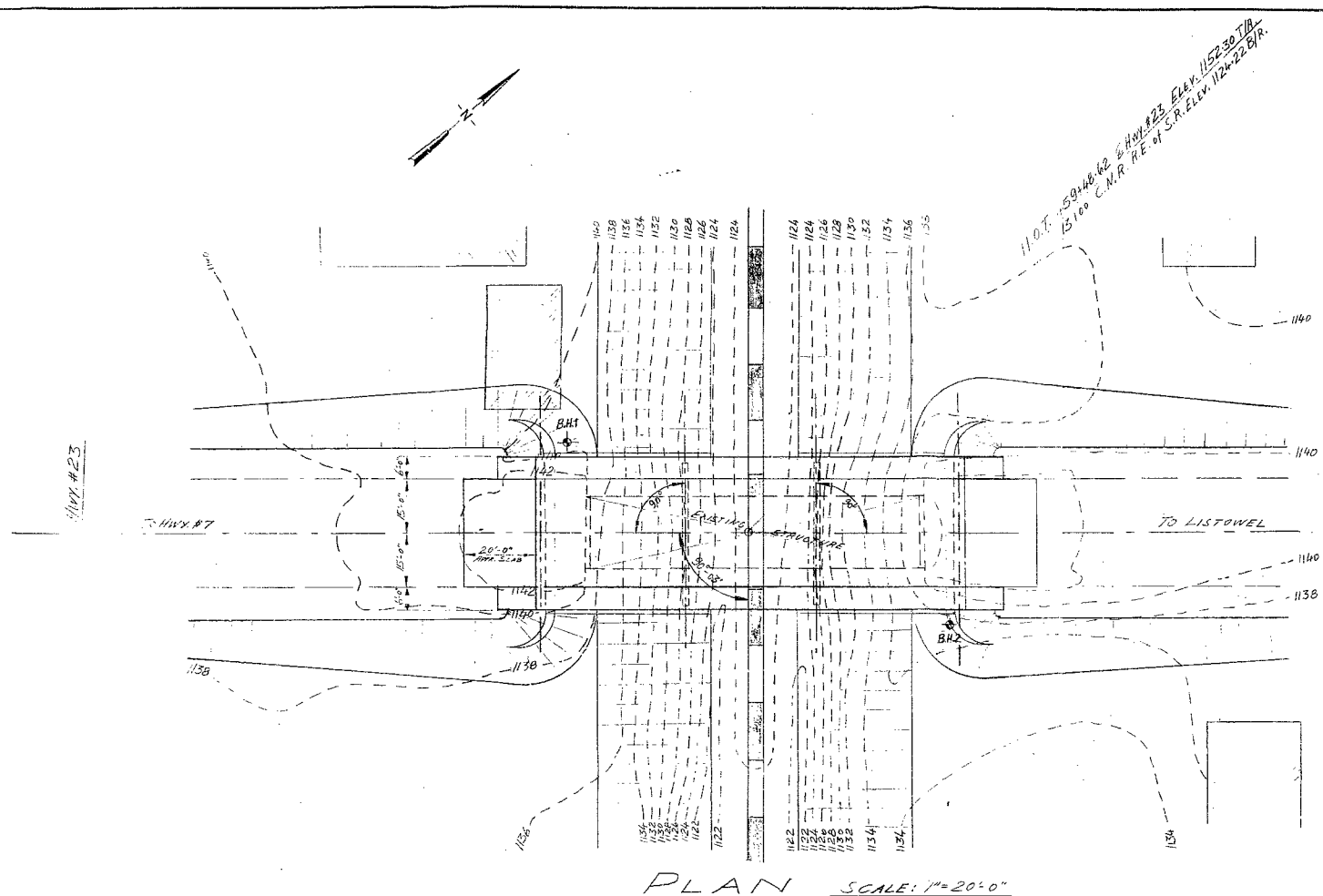


LEGEND			
BORE & PENETRATION HOLE			
PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM C.
1	1139.9	458+98	25' LT.
2	1136.3	460+05	25' RT.
3	1139.0	458+90	18' RT.
4	1141.5	460+10	18' LT.



DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
CANADIAN NATIONAL RAILWAY AND HIGHWAY NO. 23		
ORIGINATED B. SHADALI	DISTRICT NO. 3	DATE 7 JUNE 1961
DRAWN D. MUMFORD	W.P. NO. 252-60	JOB NO. 61-F-42
CHECKED J.P.P.	SCALE	DRAWING NO.
APPROVED <i>[Signature]</i>	1 INCH = 20 FEET	61-F-42A

REF. PLAN NO. E-3918-1

[illegible]

REVISIONS			
DATE	BY	DESCRIPTION	

DEPARTMENT OF HIGHWAYS ONTARIO			
BRIDGE DIVISION			
<u>C.N.R. OVERHEAD HWY. #23</u>			
<u>IN THE TOWN OF MITCHELL</u>			
KING'S HIGHWAY No.	<u>23</u>	DIST. No.	<u>3</u>
CO.	<u>PERTH</u>		
TWP.	<u>FALCONTON</u>	LOT	CON. <u>I</u>
<u>PRELIMINARY PLAN</u>			
APPROVED		SITE No.	W.P. No. <u>292-60</u>
BRIDGE ENGINEER			
DESIGN	<u>W.L.L.</u>	CHECK	
DRAWING	<u>A.B.J.</u>	CHECK	
DATE	<u>JAN. 1961</u>	LOADING	<u>1120 516</u>
		DRAWING No.	<u>D-5006-P</u>

Mr. A. M. Tove,
Bridge Engineer.
Materials & Research Section,
(Foundations Office).
Attention: Mr. P. McKeachie.

June 22, 1961.

D.H.C. FOUNDATION INVESTIGATION

M.J. 61-P-42 -- (M.P. 292-60.

Re: C.H.R. Overhead on Hwy. 23, in Mitchell,
Township of Fullerton, County of Perth,
District No. 3.

Accompanying this memo, is our detailed foundation
report on the subsol conditions existing at the above site.

The conclusions and recommendations summarized in
the report are, we believe, self-explanatory and should prove
adequate for your future design work. However, should any
queries arise in connection with this project, please do not
hesitate to contact our Office.

LOG/MEP
Attach.

cc: Messrs. A. Tove (2)
H. D. Regan
H. D. McMillan
A. Gater
L. D. Barrett
J. Roy
T. J. Kovich
J. E. Crusier
R. F. Saint
F. Norman
A. Watt
Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.

Per:

A. Stermac

(A. G. Stermac,
SUPERVISING FOUNDATION ENGR.

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 3. DESCRIPTION OF FIELD AND LABORATORY WORK.
 4. SUBSOIL CONDITIONS:-
 - 4.1) General.
 - 4.2) Till.
 - 4.3) Ground Water Conditions.
 5. DISCUSSION AND RECOMMENDATIONS.
 6. SUMMARY.
 7. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION

For

C.N.R. Overhead on Hwy. 23, in Mitchell,
Twp. of Fullerton, County of Perth, Dist. 3.
W.J. 61-F-42 -- W.P. 292-60.

1. INTRODUCTION:

It is planned to replace the existing overhead structure which carries Hwy. 23 over the single C.N.R. track at Mitchell in the County of Perth, (Hwy. 23, St'n. 459+48.62 at Centre Line, Plan E 3918-1).

A subsoil investigation was carried out at the site of the proposed structure and the results of the field and laboratory investigations, together with the discussion of the findings and the foundation recommendations, are contained in this report.

2. DESCRIPTION OF SITE AND GEOLOGY:

A 3-span steel structure carries Hwy. 23 over a single track of the C.N.R. The area on either side of Hwy. 23 is generally undulating and overgrown with grass and trees in some places. There are buildings on both sides of the highway.

On either side of the track and 10 feet from its Centre Line, two ditches about 18 inches deep and carrying drainage water, run parallel to the track. Water used for drilling was taken from these ditches.

Geologically, the site under consideration, is located in the boundary area of the Stratford Till Plain and on the eastern shore of the Horseshoe Moraines. The Stratford Till Plain is a broad

cont'd. /2 ...

2. DESCRIPTION OF SITE AND GEOLOGY: (cont'd.) ...

clay plain of approximately 1,370 sq. miles. It is fairly uniform and consists of brown calcareous silty clay. One common characteristic of this plain is the presence of imperfectly drained clay loam. This requires artificial drainage and so municipal ditches are an integral part of the landscape. Another characteristic is the washing away of surface soil from the sloping hillsides, leaving sticky brown clay or even greyish subsoil exposed. This is particularly apparent on the vertical slopes on either side of the C.N.R. crossing. The site under investigation is also influenced by being near the Horseshoe Moraines, and so sand and gravel is often present.

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

Field work consisted of two sampled boreholes and dynamic cone penetration test adjacent to each borehole. In addition, two more dynamic cone penetration tests were performed. The locations of the boreholes were chosen from the given Plan of the site - (E 3918-1), where the dimensions of the new structure are shown. Conventional wash boring procedure was followed. Samples were recovered at depths required by means of a 2" O.D. split spoon sampler. The dimension of the spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. Use of BXT core barrel had to be made for drilling through the bouldery subsoil. As it was not conveniently possible to set up the core drilling machine near the piers, confirmation of the anticipated subsoil conditions at these locations was made by the use of a hand auger.

cont'd. /3 ...

3. DESCRIPTION OF FIELD AND LABORATORY WORK: (cont'd.) ...

Samples were visually examined and identified in the field before being transported to the laboratory. Upon receipt in the laboratory, grain-size distribution and Atterberg limits of a few typical samples were determined. Laboratory and field test results for the borings, have been summarized and are included in this report.

4. SUBSOIL CONDITIONS:

4.1) The investigation has shown the general stratification of the subsoil to be regular. Below a thin surface layer of topsoil, a layer of till material consisting of silty clay with sand and gravel was observed to a depth of 40 feet (Approx. elev. 1099). The total depth of this layer is undetermined.

A detailed description of this layer is given below:-

4.2) Till:-

This layer, composed basically of silty clay and gravel, was encountered in both deep borings. The upper portion of this silty clay stratum has been subjected to oxidation, resulting in its present brown colour. Below the oxidized zone, the colour is predominantly grey.

In this layer, sporadic seams of sand and gravel were encountered throughout its entire depth. Boulders were encountered in this layer below elevation 1112.4 in Boring 1, and below elevation 1111.2 in Boring 2.

The consistency of this layer is generally very stiff, becoming hard and very dense with increasing depths, values of 'N'

cont'd. /4 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.2) Till: (cont'd.) ...

being upwards of 24. However, in Boring 2, a layer of medium stiff consistency with a minimum 'N' value of 7, was encountered up to a depth of approximately 4 feet from the ground surface (elev. 1127.5').

The average values of Atterberg limits and moisture content are 23.3, 12.9%, and 14.5%, respectively.

4.3) Ground Water Conditions:

The exact ground water level could not have been established during the investigation, because of relatively low permeability of the subsoil. It is believed that the ground water table does not lie above elevation 1125'.

5. DISCUSSION AND RECOMMENDATIONS:

From the description of the subsoil layer given in the preceding paragraph, it can be seen that strength and consistency characteristics are favourable for spread footing supports of the proposed new structure.

First, considering the South abutment footing and taking an average 'N' value of 30 (Boring 1), a safe load of 2.5 T.S.F. can be applied to footings of an average width of 6 feet to 8 feet. The footing may be founded at elev. 1135' or below - i.e., at least 5 feet below the existing ground surface, to provide for frost protection.

Considering the North abutment footing and referring to boring 2 and cone penetration hole 4, it can be seen that the top 9 feet of material are only of medium stiffness. Below this level,

cont'd. /5 ...

5. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

the soil is in a very stiff or even hard state, with 'N' values upwards of 30 and as such, the soil is competent of supporting spread footings. Adequate bearing support can be found at any depth below elev. 1127.5'. It is recommended that a safe permissible load of 2.5 T.S.F. be taken for the footing, of an average width of 6 feet to 8 feet.

Similarly, for the pier footings, a safe bearing load of 2.5 T.S.F. can be allowed for footings of average width of 6 feet to 8 feet, and founded at elev. 1119' or below - i.e., at least 5 feet below the ground surface to provide for frost protection.

The natural water content of the described layer being close to the plastic limit, indicates that no appreciable settlements could be expected.

The load of the existing structure will act as preloading for the new structure, thus also minimizing the resulting settlements.

6. SUMMARY:

1. The subsoil at the investigated site, underlying the thin top soil layer, is a silty clay material with erratic sand and gravel seams. A 40-foot thickness of this layer was determined by borings while its total depth remains undetermined.
2. The density and consistency characteristics are such that spread footings can be recommended. A safe load of 2.5 T.S.F. at or below the following elevations, is suggested:-

South Abutment.....	1135.0'
North Abutment.....	1127.5'
Piers	1119.0'

cont'd. /6 ...

6. SUMMARY: (cont'd.) ...

3. The resulting settlements are expected to be well within the allowable limits.

4. No excavation dewatering problems are foreseen.

7. MISCELLANEOUS:

The field work was commenced on May 15, 1961 and completed by May 23, 1961, under the supervision of Mr. B. Ghadiali of our Section. Equipment was owned by D.H.O. and operated by a two-man crew.

June 1961. REPORT PREPARED BY:

... *B. M. Ghadiali*
B. Ghadiali,
PROJECT FOUNDATION ENGR.

REPORT APPROVED BY:

... *A. G. Sternmac*
A. G. STERNMAC,
SUPERVISING FOUNDATION ENGR.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-42

W.P. 292-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S1	3'-4.5'	Silty clay with sand & gravel. Some organic material. Stiff. Dark brown.	22	-	-	-	-	-	
	S2	6'-7.5'	Silty clay, trace of fine gravel & organic material. V. stiff. D. brown.	30	13.5	13.5	22.9	-	-	
	S3	10'-11'	Silty clay & gravel. V. stiff. Brown.	32	-	-	-	-	-	
	S4	15'-16.5'	Silty clay & fine gravel. V. stiff. Grey.	31	16.5	13.8	30.1	-	-	
	S5	20'-21.5'	Silty clay & trace of fine gravel Sand seam at 21'-4". V. stiff. Grey.	24	11.2	9.9	14.1	-	-	
	S6	25'-26.3'	Silty clay with sand & gravel. Hard. Grey.	60	-	-	-	-	-	
	S7	32'-32.8'	" " " "	109-9"	-	-	-	-	-	
	S8	40'-41'	" " " "	100	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-42

W.P. 292-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
2	S1	3'-4.5'	Silty clay & gravel. Med. stiff. brown.	7	-	-	-	-	-	
	S2	6'-7.5'	Silty clay with sand & gravel Med. stiff. brown.	8	14.5	12.1	19.5	-	-	
	S3	10'-11.5'	Silty sand & gravel. Clayey silt as binder. Dense. Brown.	34	-	-	-	-	-	
	S4	15'-16.5'	Silty clay & trace of fine sand & gravel. Hard. Grey.	41	16.1	14.9	29.5	-	148.4	
	S5	20'-21.5'	" " " "	45	-	-	-	-	-	
	S6	27.7'-28'	No Recovery.	100-4"	-	-	-	-	-	
	S7	33'-33.9'	Silty clay with sand & gravel in excess. Hard. Grey.	170-11"	-	-	-	-	-	
3 & 4	(cone penetration only)									
			S denotes split spoon sample.							

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 292-60 BORE HOLE NO. 1

JOB 61-F-42 STATION 458+98 (25' Lt.)

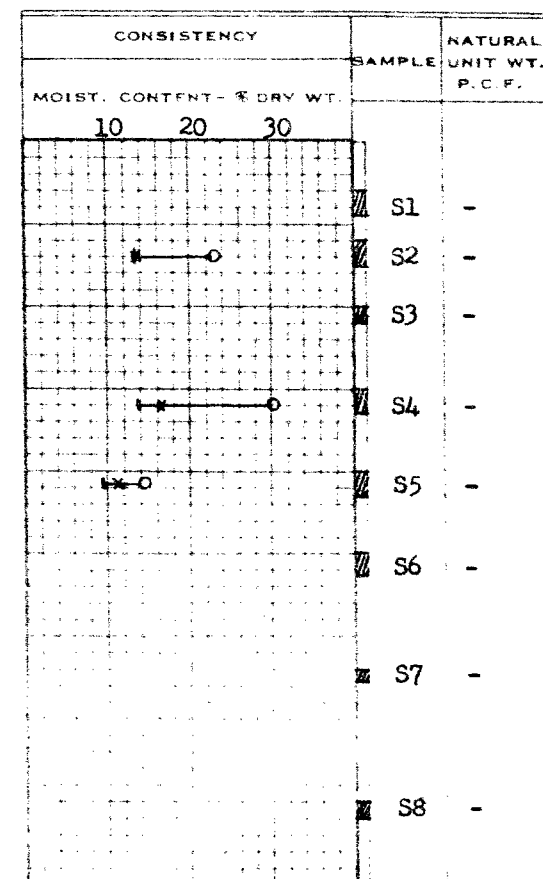
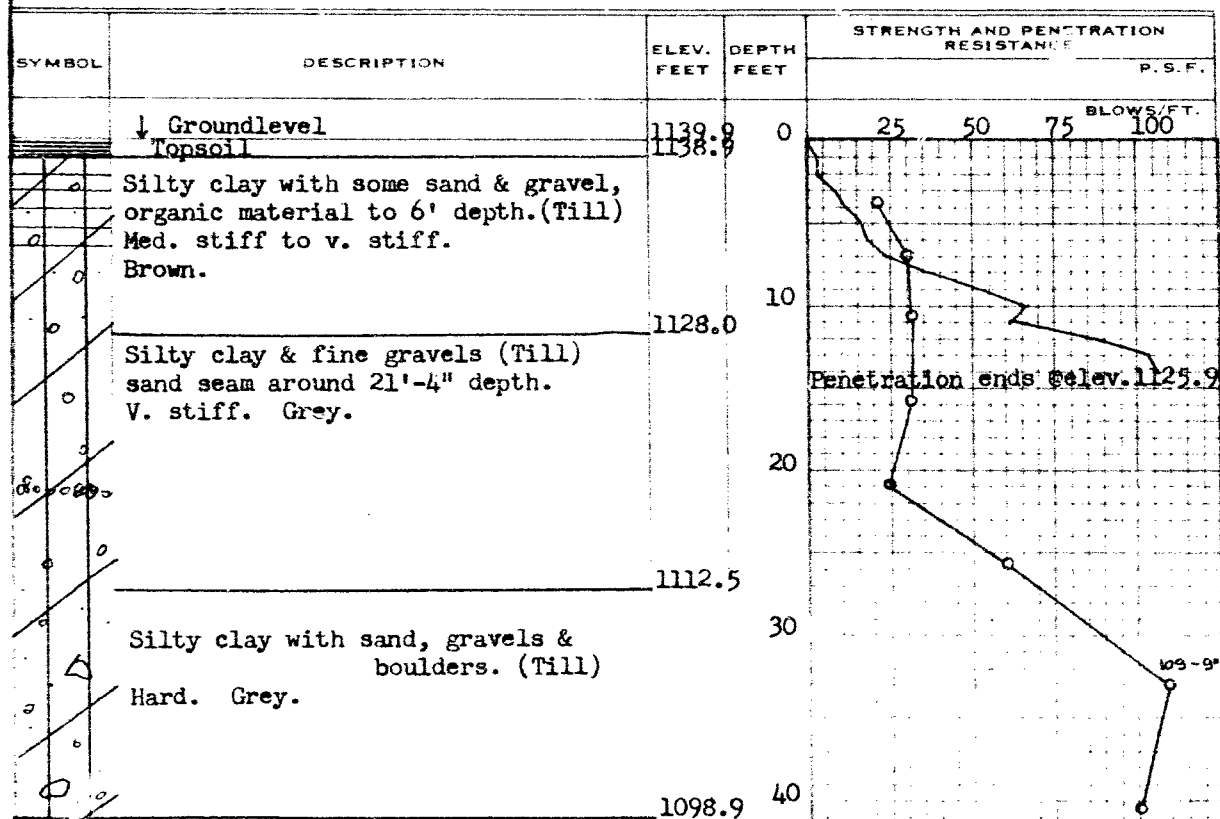
DATUM 1139.9' COMPILED BY B.K.

BORING DATE May 16/61. CHECKED BY B.H.G.

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



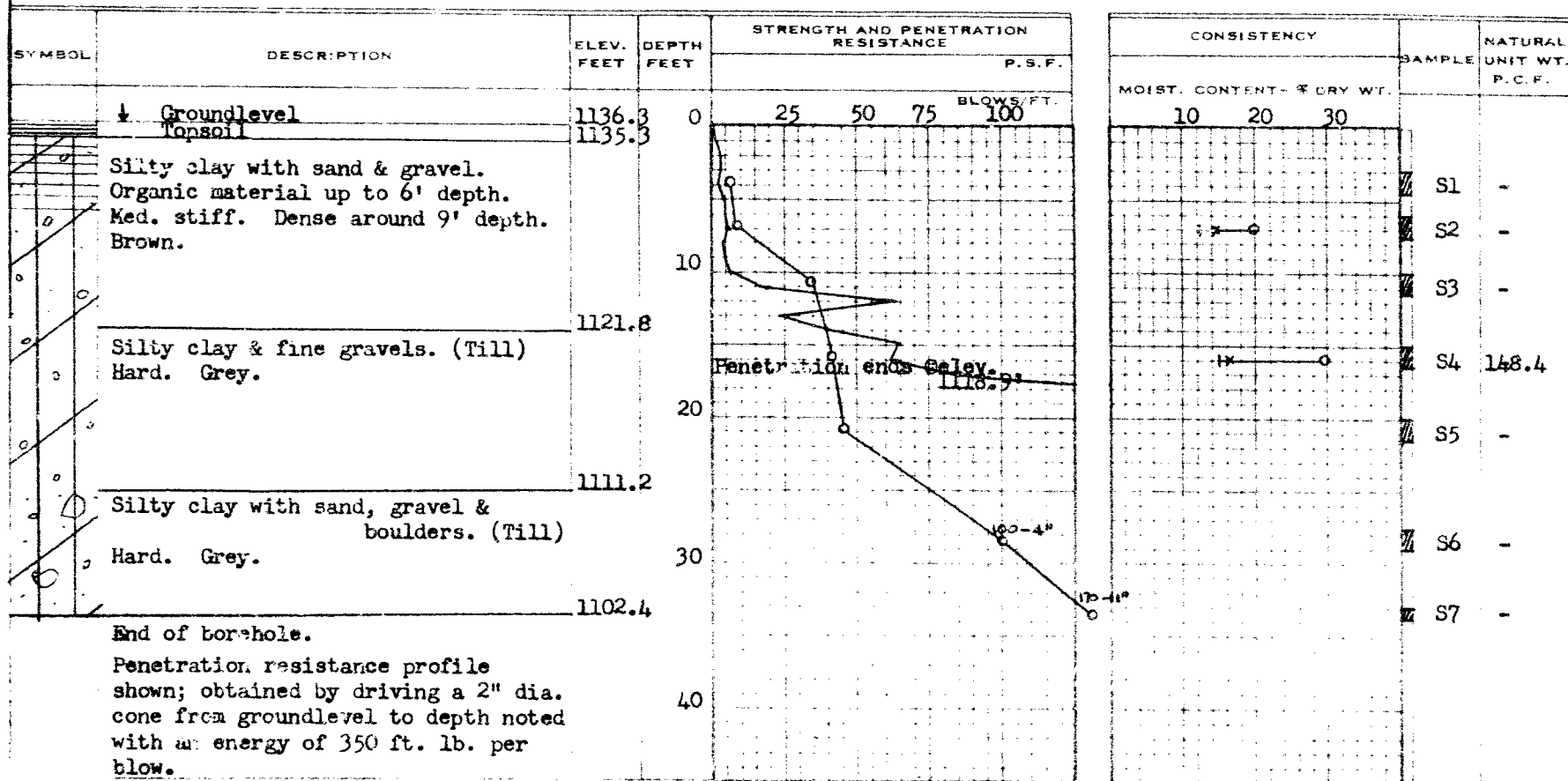
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 292-60 BORE HOLE NO. 2
JOB 61-F-42 STATION 460+05 (25' Rt.)
DATUM 1136.3' COMPILED BY B.K.
BORING DATE May 18/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE _____
2" SHELBY TUBE _____
2" SPLIT TUBE _____
2" DIA. CONE _____
2" SHELBY _____
CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (QU)	---	O
VANE TEST (C) AND SENSITIVITY (S)	---	+ ^s
NATURAL MOISTURE AND		
LIQUIDITY INDEX	---	LI
LIQUID LIMIT	---	X
PLASTIC LIMIT	---	



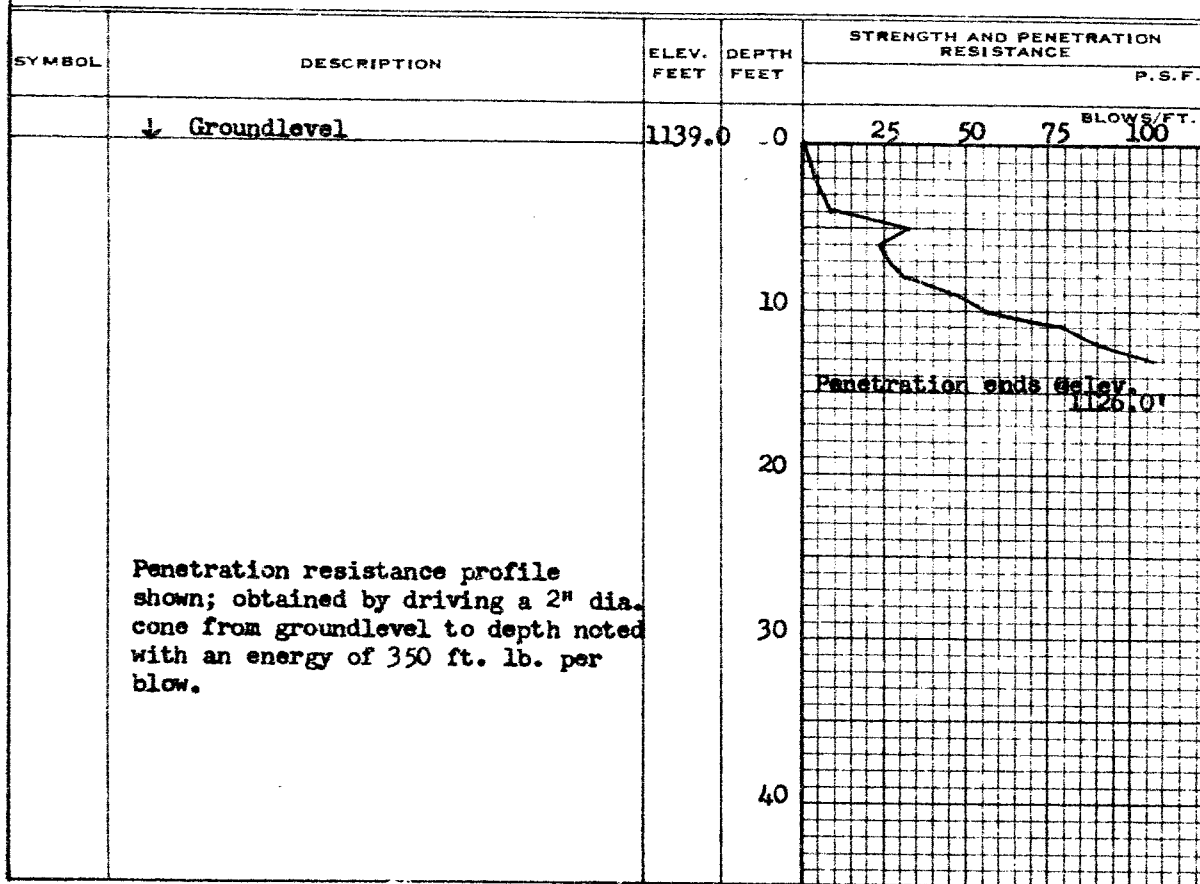
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 292-60 _____ BORE HOLE NO. 3 _____
 JOB 61-F-42 _____ STATION 458+90 (18' Lt.) _____
 DATUM 1139.0' _____ COMPILED BY B.K. _____
 BORING DATE May 18/61. _____ CHECKED BY B.M.G. _____

2" DIA. SPLIT TUBE -----
2" SHELBY TUBE -----
2" SPLIT TUBE -----
2" DIA. CONE -----
2" SHELBY -----
CASING -----

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) --- 0
VANE TEST (C) AND SENSITIVITY (S) --- +
NATURAL MOISTURE AND LIQUIDITY INDEX --- LI
LIQUID LIMIT --- X
PLASTIC LIMIT ---

[illegible]

W.P. 292-60 _____ BORE HOLE NO. 4 _____
JOB 61-F-42 _____ STATION 460+10 (18' Lt.) _____
DATUM 1141.5' _____ COMPILED BY B.K. _____
BORING DATE May 23/61. _____ CHECKED BY B.H.G. _____

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

1/2 UNCONFINED COMPRESSION (Qu) _____	O
VANE TEST (C) AND SENSITIVITY (S) _____	+S
NATURAL MOISTURE AND	
LIQUIDITY INDEX _____	L
LIQUID LIMIT _____	X
PLASTIC LIMIT _____	

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				P. S. F.			
	↓ Groundlevel	1141.5	0	25	50	75	100
				BLOWS/FT.			
				Penetration ends at 119.5'			

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.

[illegible]

OFFICE LOCATION—

DOWNSVIEW AVE.,
KEELE ST. — HIGHWAY 401
TORONTO, ONTARIO.



ONTARIO

DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS—

DEPARTMENT OF HIGHWAYS,
PARLIAMENT BUILDINGS,
TORONTO 5, ONTARIO.

Bridge Division,
May 9, 1961.

MEMORANDUM TO:

Mr. N. D. Smith,
Soils & Materials Planning Eng.,
Materials & Research Branch,
Department of Highways,
Downsview, Ontario.

RE: W.P. 292-60
C.N.R. O'Head at Mitchell
Hwy. 23 District #3

Further to my letter of April 5th and our subsequent telephone conversation to hold the soils investigation in abeyance, it has now been established that the present line for highway 23 should be retained in the vicinity of the above structure, and we request that you now proceed with soil investigation.

The attached sketch shows the relative location of the proposed piers and abutments.

A handwritten signature in cursive script, appearing to read "Gavin Scott".

GS/et

Gavin Scott,
Bridge Location Engineer.

cc. S. McCombie
cc. C. R. Hopkins
cc. R. Fitzgibbon