

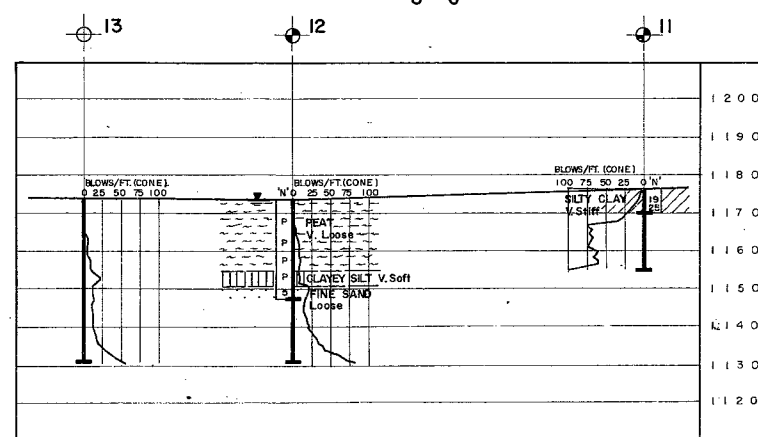
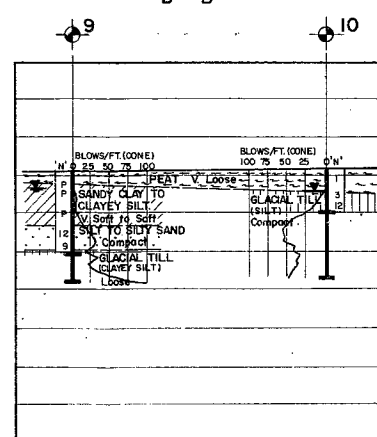
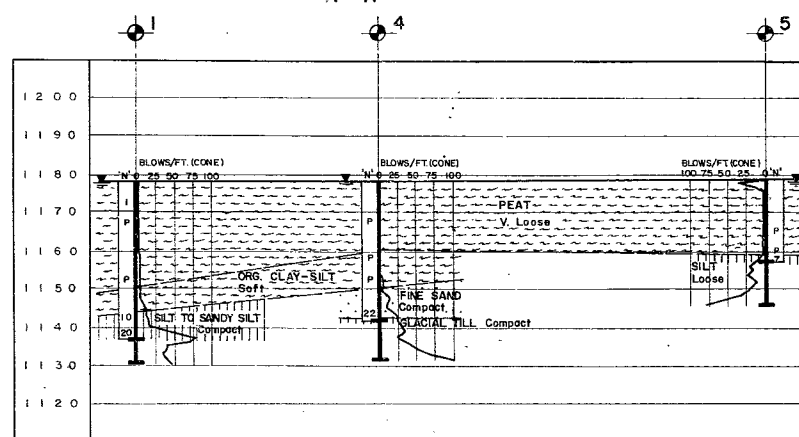
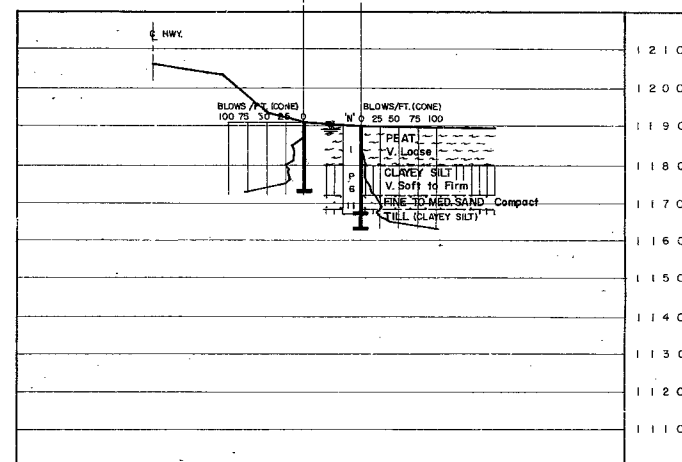
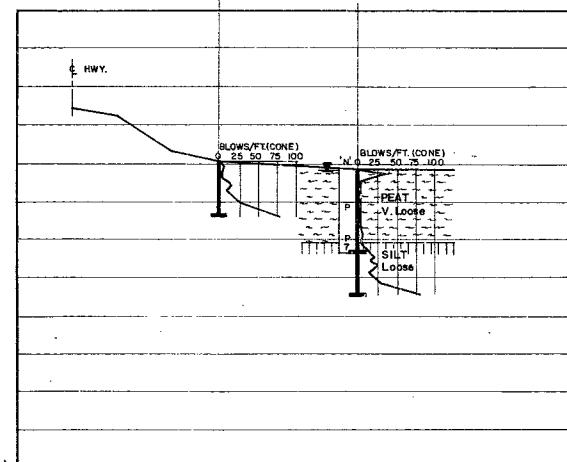
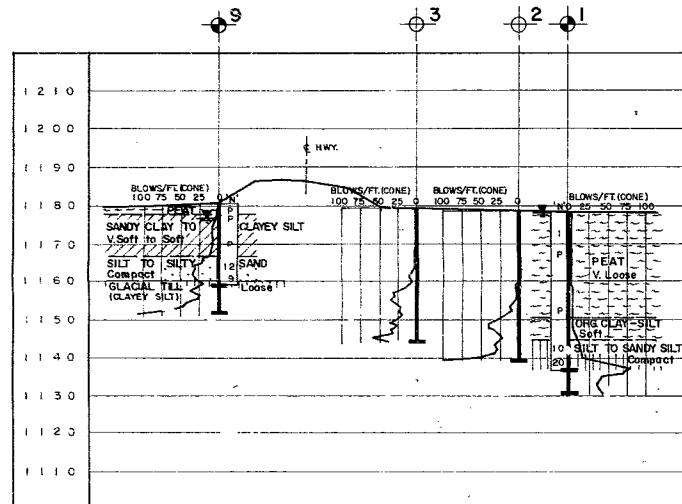
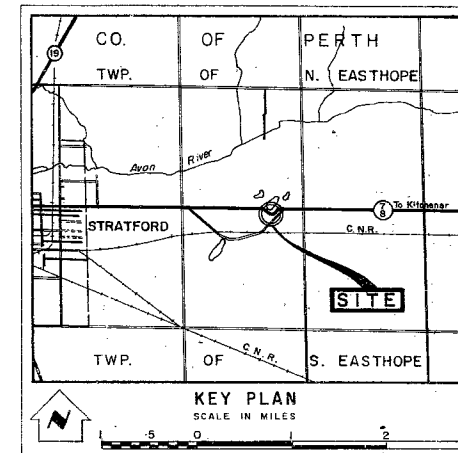
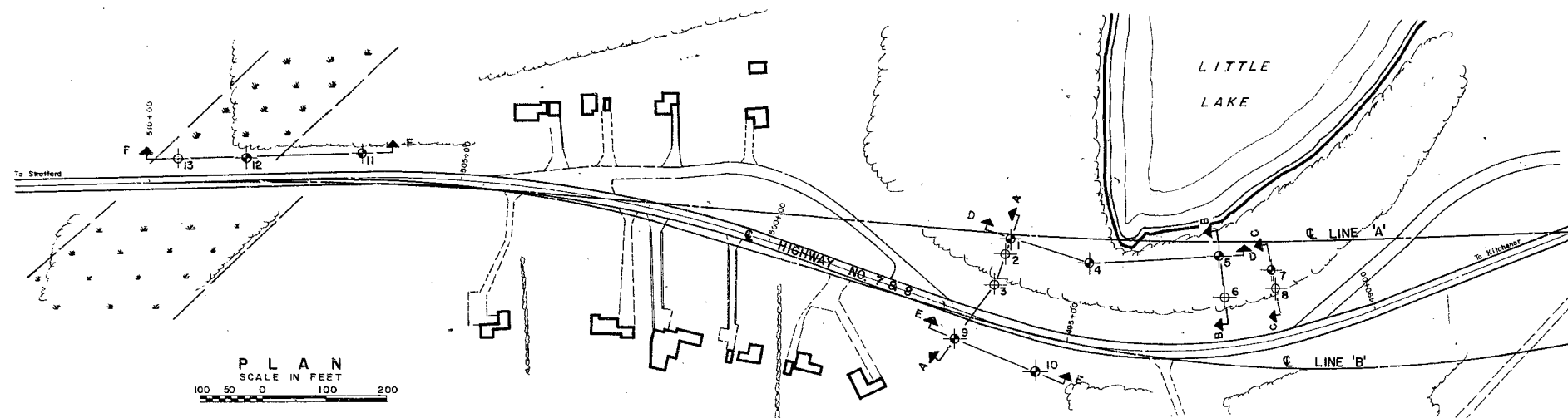
#63-F-67

W.P.#125-62

HWYS.#7 & 8

PROP. RELOCATION

AT LITTLE LAKE



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. (June 1963)		
NO.	ELEVATION	STATION	OFFSET
1	1178.5	496+35	135' RT.
2	1178.6	496+35	110' RT.
3	1179.3	496+35	58' RT.
4	1178.5	494+86	129' RT.
5	1178.8	492+39	144' RT.
6	1180.5	492+39	78' RT.
7	1180.0	491+50	109' RT.
8	1181.0	491+50	79' RT.
9	1181.0	496+65	43' LT.
10	1181.3	495+37	55' LT.
11	1176.5	506+56	39' RT.
12	1173.9	508+33	34' RT.
13	1174.0	509+54	36' RT.

**NOTE**  
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH DIVISION - FOUNDATION SECTION			
FOUNDATION INVESTIGATION FOR			
<b>RELOCATION OF HIGHWAYS NO. 7 &amp; 8</b>			
KING'S HIGHWAY NO. 7 & 8		DIST. NO. 3	
CO. PERTH			
TWP. NEASTHOPE & SEASTHOPE LOT 37		CON. I	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBM'D. G. C.	CHECKED	W.P. NO. 125-62	M.B.R. DRAWING NO.
DRAWN D.M.	CHECKED	JOB NO. 63-F-67	<b>63-F-67 A</b>
DATE 2 AUG. 1963	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		

23-67-82

Mr. A. M. Teye,  
Bridge Engineer,  
Bridge Division.

Attention: Mr. S. McCombie

Mr. A. G. Stermac,  
Principal Foundation Engr.,  
Foundation Section,  
Materials & Research Division.

August 9, 1963

D.H.O. FOUNDATION INVESTIGATION REPORT --  
Proposed Relocation of Hwy. 7 & 8 at Little Lake  
(Approx. 3 Mi. E. of Stratford) Co. of Perth.  
W.J. 63-F-67 -- District #3 -- W.P. 125-62

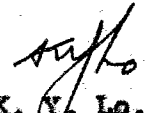
Attached, we are forwarding to you, our detailed foundation investigation report outlining the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your future design work. Should additional information be required, please do not hesitate to contact our Office.

KYL/MdeF  
Attach.

cc: Messrs. A. M. Teye (2)  
H. A. Tregaskes  
H. D. McMillan  
A. Gater  
L. D. Barrett  
J. Roy  
A. Watt

Foundations Office  
Gen. Files ✓

  
K. Y. Lo,  
SUPERVISING FOUNDATION ENGR.  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGR.

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-

# FOUNDATION INVESTIGATION

For

Proposed Relocation of Hwy. 7 & 8 at Little Lake  
(Approx. 3 Mi. E. of Stratford) Co. of Perth.  
W.J. 63-F-67 -- District #3 -- W.P. 125-62.

## 1. INTRODUCTION:

A request dated May 10, 1963, was received from Mr. J. Roy, Materials Engineer, S.W. Region, for a foundation investigation for the relocation of Hwy. 7 & 8 in the vicinity of Little Lake.

The investigation was to determine the relative suitability of two alternate locations for Hwy. 7 & 8.

This report contains the findings of the investigation, the laboratory results, their interpretation and discussion, as well as recommendations for a new location for the existing road.

## 2. DESCRIPTION OF SITE:

In this area, Hwy. 7 & 8 generally runs in an E.W. direction but is forced to make a sharp detour around the southern limit of a depression containing a small lake. The lake (Little Lake) is approximately 450' wide by 800' long and has no visible inlet or outlet.

The southern terminus of the lake is bordered by a swampy area which stretches from the water's edge to the existing roadway.

An old dried-up drainage channel approx. 300' wide, runs in a southerly direction across Hwy. 7 & 8 from the southern edge of the lake.

cont'd. /2 ...

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

Approximately 1200' west of Little Lake, Hwy. 7 & 8 dips through another swampy depression about 300' wide. This depression is also an old dried-up drainage channel for another small lake to the N.W. of Little Lake.

3. GEOLOGY OF SITE:

The countryside on both sides of the site consists of gently rolling ground moraine known as the Stratford Till Plain.

Examination of aerial photographs of this area, indicates that Little Lake is one of three adjacent kettle lakes located on the till plain. Typically, a kettle lake is a small circular trapped lake with steep sides. Such lakes were formed when blocks of ice broke free of the glacier and were then embedded in the material washed down from the melting glacier. With time, the blocks of ice melted and left small circular steep-sided lakes with no inlet or outlet. Since, in general, these lakes have no inlet or outlet, they are gradually filled in by vegetation forming swamps or bogs. Little Lake typifies this condition, with approximately 1/4 to 1/3 of its original surface area now being covered by swamp.

4. FIELD AND LABORATORY WORK:

Eight sampled boreholes supplemented by 13 dynamic cone penetration tests, were performed at the site utilizing a diamond drill rig adapted for soil sampling purposes.

cont'd. /3 ...

4. FIELD AND LABORATORY WORK: (cont'd.) ...

Samples were recovered at various depths using a 2" I.D. thin-wall sampler in cohesive soils, while in non-cohesive soils, a 2" O.D. split-spoon sampler was employed. The dimensions of the split-spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test.

In-situ field vane tests were performed in cohesive materials, where possible.

Soil samples were visually examined and classified in the field before transportation to the laboratory where a further visual classification was performed.

In addition, Atterberg limits, moisture content determinations, grain size analyses, unconfined compression tests and laboratory vane shear strength tests were conducted, where applicable, on representative samples in the laboratory.

The locations and elevations of all boreholes are shown on Dwg. 63-F-67A which accompanies this report.

5. GROUND WATER CONDITIONS:

At the time of the field investigation, the water level in B.H.'s 1, 4, 5, 7, 9 & 10 varied between el.1117  $\pm$  and el.1179  $\pm$ . In B.H. 12, the free water elevation was at el. 1173  $\pm$  while in B.H. 11, no free water was encountered to the depth sampled (el.1170).

6. SUBSOIL CONDITIONS:

LINE 'A'

6.1) General:

The subsoil stratigraphy in the vicinity of Line 'A'

cont'd. /4 ...

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

LINE 'A'

6.1) General: (cont'd.) ...

(B.H.'s 1 - 8) consists of between 10 and 30' of very loose peat overlying granular material which ranged from a silt to a fine to medium sand.

In B.H.'s 4 & 7, a deposit of glacial till was found under the granular material.

In B.H.'s 1 & 4, a layer of very soft, highly organic clay of between 6 and 10' in thickness was found between the peat and the underlying granular material.

For both the peat and organic clay, the borings indicated these deposits to be deepest in the centre of the swamp at the South edge of the lake. Both peat and clay decrease in thickness to the South and to the East and West.

6.2) Peat - (Very Loose):

This material varied between 10 and 30' in thickness and had a very loose consistency with 'N' values of the order of 1 blow per foot. Moisture contents ranged from 300 - 1200% with field vane shear strengths ranging between 100 and 350 p.s.f.

6.3) Organic Clay - (Soft to very Soft):

The clay was found in B.H.'s 1 & 4 with a thickness between 6 and 10'. Two field shear strength tests gave values of 180 and 360 p.s.f. Two Atterberg limits tests gave Liquid limit of 280 and 350%, Plastic limit of 48 and 150%, and moisture contents of 235 and 305%.

cont'd. /5 ...



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

LINE 'A'

6.4) Silt to Fine-Medium Sand:

This material underlies the clay and peat and, according to the location, varied from a silt to a fine-medium sand.

'N' values ranged from 7 to 20 blows/ft. indicating a loose to compact material.

6.5) Glacial Till - (Clayey Silt):

One set of Atterberg Limits gave a Liquid limit = 18%, Plastic limit = 12%, and a Moisture content of 11%. These values indicate the material is a clayey silt.

Average value of 22 blows/ft. shows the material to be in a compact state.

LINE 'B'

c.1) General:

B.H.'s 9 & 10 which were placed on Line 'B' indicated a surface cover of between 3 and 6' of very loose peat. In B.H. #10 glacial till was found to underlie the peat, while in B.H. 9, a 11' thick layer of very soft to stiff clayey silt followed by 6½ feet of stratified granular material was encountered before the glacial till was encountered.

6.2) Peat:

Only 1 split-spoon sample was taken in the peat with a 'N' value of 1 blow per foot, indicating it to be in a very loose state.

cont'd. /6 ...

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

LINE 'B' (cont'd.) ...

6.3) Clayey Silt:

Shear strength values in this material ranged from 220 to 440 p.s.f., indicating the material to be in a very soft to soft consistency.

Two sets of Atterberg limits gave values for Liquid limit of 21 & 24%, Plastic limit of 15.3 & 14.7%, and moisture contents of 19% & 18%. These values show the material to be a clayey silt.

6.4) Stratified Granular Material:

This deposit was approx.  $6\frac{1}{2}$ ' thick and consisted of 1 foot of coarse sand and fine gravel over 3' of silt over  $2\frac{1}{2}$  feet of fine to medium sand.

An 'N' value of 12 blows per foot indicated the material to be in a compact state.

6.5) Glacial Till:

'N' values in the till ranged between 9 & 12 blows/ft. indicating the material is in a loose to compact state.

One set of Atterberg limits gave values of Liquid limit = 28%, Plastic limits = 14%, and Moisture content of 14%. These values show the material to be a clayey silt.

cont'd. /7 ...

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

STATIONS 506+50 to 510+00 (B.H.'s 11 - 13)

6.1) General:

Two sampled boreholes and three dynamic cone tests were performed in this area to determine the reason for continual settling of the road bed.

In B.H. 11 which was placed at the edge of the swamp, a deposit of very stiff silty clay was found.

In B.H. 12 which was placed near the approximate centre of the swampy area, 19' of very loose peat was found to overlie 3' of very soft clayey silt. A loose fine sand of undetermined thickness was found under the clayey silt.

6.2) Peat:

Shear strength values in the peat varied from 170 to 440 p.s.f., indicating the material to be in a very loose condition.

6.3) Clayey Silt:

Only one split-spoon was taken in this material and it was pushed in by hand, indicating the material to be in a very loose state.

6.4) Fine Sand:

A split-spoon value of 5 blows per foot was recorded and showed the material to be in a loose state.

7. SUMMARY:

Two possible lines (A & B) for relocating Hwy. 7 & 8 in the vicinity of Little Lake were investigated (See Dwg. 63-F-67A).

cont'd. /8 ...

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

The results of the field exploration indicate that Line 'A' is unsuitable due to a 20 - 30' deep deposit of very loose peat in the area of the line. The thickness of the peat was found to decrease to the south, indicating that Line 'B' is much better since the thickness of soft peat at this location (3 - 6') is substantially less than along Line 'A'.

While no change of road location was proposed in the area of Sta. 506+50 to 510+00, 3 dynamic cone tests and 2 sampled boreholes were placed in this area to determine the reason for continual settlement of this section of the road.

The borings showed that a trough-shaped depression containing up to 19' of peat existed under the roadway.

It would appear that the peat was not removed when the road was originally built and, consequently, has been the cause of long-term settlement. Such settlements can continue for years, and the positive method of stopping such movements is by complete sub-excavation of the peat.

8. MISCELLANEOUS:

The field work, performed during the period from June 18 to 25, 1963, together with the preparation of this report, was undertaken by Mr. G. G. Cherrington, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. M. Devata, Sr. Foundation Engineer, who reviewed this report.

Equipment was owned and operated by Dominion Soil Investigation, Ltd.

August 1963.

APPENDIX 1.

ORIGINATED BY G.C.

COMPILED BY G.C.

CHECKED BY \_\_\_\_\_ M.D.

[illegible]

FOUNDATION SECTION

[illegible]

FOUNDATION SECTION

JOB <u>63-F-67</u>	LOCATION <u>Hwy. 7 &amp; 8 Sta. 492<del>f</del>39 (144' Rt.)</u>	ORIGINATED BY <u>G.C.</u>
W.P. <u>125-62</u>	SORING DATE <u>June 19, 1963.</u>	COMPILED BY <u>G.C.</u>
DATUM <u>Geo. 1178.8</u>	BOREHOLE TYPE <u>Washboring (NX Casing)</u>	CHECKED BY <u>M.D.</u>

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — WP	WATER CONTENT — W		
							100 200 300 400 500		20 40 60			
1178.8	Groundlevel					1180						
0.0	Peat, very loose, Black to Brown.	~~~~~				1170	5.0					
		~~~~~	1	SS	P		6.0				916	
		~~~~~						4.5			720	
1159.3		~~~~~	2	SS	P	1160						
19.5	Silt, loose, Brown		3	SS	7							
21.5	End of borehole.					1150						
						1140						
						1130						



CHECKED BY M.D.

W.L.  
 $\nabla$  1179.0  
 1.0

JOB 63-F-67

LOCATION Hwy. 7 & 8 Sta. 496.65 (43' Lt.)

ORIGINATED BY G.C.

W.P. 125-62

BORING DATE June 21, 1963.

COMPILED BY G.C.

DATUM Good. 1181.0

BOREHOLE TYPE Washboring (NX Casing)

CHECKED BY M.D.

[illegible]

FOUNDATION SECTION

ORIGINATED BY G.C.

COMPILED BY G.C.

CHECKED BY M.D.

[illegible]

CHECKED BY                      M.D.

[illegible]