

#

68-F-89

#

W.P. 35-66-36-66

Hwy. # 417 (LINE D)

CASSELMAN

EASTERLY TO

#

Hwy 34

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. J. L. Forster,  
Functional Planning Engr.,  
Eastern Region,  
KINGSTON, Ontario.

FROM: Foundation Section,  
Materials & Testing Office,  
Room 107, Lab. Bldg.

ATTENTION:

DATE: March 7, 1969

OUR FILE REF:

IN REPLY TO

MAR 13 1969

SUBJECT:

PRELIMINARY FOUNDATION REPORT  
For

Proposed Hwy. 417 - (Line 'D')  
Casselman Easterly to Hwy. 34  
Structure Sites No. 81, 82, 83, 83A,  
85, 86, 87 & 87A, Counties of Russell,  
Prescott, Stormont and Glengarry --  
District No. 9 (Ottawa)  
W.J. 68-F-89 --- W.P. 35-66 & 36-66

Attached, we are forwarding to you, our Preliminary Foundation Investigation Report pertaining to the above sites. Presented in this report are the results of the investigation, together with our general comments pertaining to the stability of the approaches and recommendations regarding structure foundations at various crossings.

We believe that the information contained therein will prove adequate for your immediate use. Should you require further data, or clarification of the report, please feel free to contact this Office.

AGS/MdeF  
Attach:

cc: Messrs. J. L. Forster (2)  
B. R. Davis (2)  
H. A. Tregaskes  
D. W. Farren  
S. J. Markiewicz  
C. R. Robertson  
I. C. Campbell  
G. Scott  
J. E. Gruspier  
B. A. Singh

Foundations Files  
Gen. Files

*Althman*  
A. G. Sternac  
PRINCIPAL FOUNDATION ENGINEER

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

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PRELIMINARY FOUNDATION REPORT  
For  
Proposed Hwy. 417 - (Line 'D')  
Casselman Easterly to Hwy. 34  
Structure Sites No. 81, 82, 83, 83A,  
85, 86, 87 & 87A, Counties of Russell,  
Prescott, Stormont and Glengarry --  
District No. 9 (Ottawa)  
W.J. 68-P-89 -- W.P. 35-66 & 36-66

1. INTRODUCTION:

The Foundation Section was requested to provide preliminary subsoil information at the proposed structure and creek crossings along Hwy. 417 (Line 'D'), namely, between Vars and the Quebec Border. This portion of the proposed highway is approximately 52 miles in length. The request was contained in a memo from the Eastern Region Functional Planning Section (Mr. J. L. Forster, Regional Functional Planning Engineer), dated December 10, 1968. An investigation was subsequently carried out by this Section to determine the subsoil conditions at the crossings.

This report presents preliminary information on the subsoil and groundwater conditions encountered at the proposed structure crossings of Hwy. 417, located between Casselman and Hwy. 34. Also included are recommendations pertaining to foundation design and stability and settlement of approach embankments.

A Preliminary Foundation Report has already been submitted on that portion of the alignment which follows existing Hwy. 17 (Quebec Border westerly). Foundation Reports for the remaining sections will be submitted, in due course.

2. DESCRIPTION OF THE SITES AND GEOLOGY:

The proposed alignment for Hwy. 417, from Casselman easterly to Hwy. 34 is located within the Counties of Russell, Prescott, Stormont and Glengarry. The terrain is gently undulating

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

in relief, between about elevation 215 and 255; in general, the surface elevation increases gradually moving in an easterly direction. The land is basically being utilized for farming purposes; there are, however, localized timbered areas. The surficial drainage in the area is quite poor, being provided mainly by the South Nation River located to the west of this section. Because of this condition, swamps, of variable extent, are located in low-lying areas throughout this area. Site #83 lies on the northern perimeter of such a swamp.

Geographically the alignment, in this section, is situated in two physiographic regions. The majority of the western portion, encompassing Sites No. 81, 82 and 83, is situated in the "Winchester Clay Plains", an area in which the predominant stratum is composed of a sensitive marine clay deposited in the geologic past by the Champlain Sea. The clay, which is encountered at a relatively shallow depth below ground surface, varies anywhere from 10 to 40 feet in thickness. It, in turn, is underlain by competent glacial till deposits.

The eastern section is, however, located in the "Glengarry Till Plains". This area is characterized by drumlinized ridges with the intervening flats floored with clays, and in some cases, swamp deposits. The glacial till is stoney in texture and generally less than 25 feet in thickness.

The overburden is underlain by crystalline limestone bedrock of the Trenton Group, Ordovician Period.

3. FIELD AND LABORATORY WORK:

A detailed sampled borehole was put down at Structure Sites No. 82, 83, 83A, 85, 86, 87 and 87A, while two were put down at Site No. 81, during the course of the investigation.

The locations of the structure sites and borings are shown on Drawing No. 68-F-89A, located in the Appendix of this

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

report. The location of the sites, and respective borings, were provided by the Engineering Surveys Section (Eastern Region). The elevations given in the report are referenced to the ground surface contours given on the County Militia maps (scale 1:50,000, contour interval 25 feet).

Samples of the overburden were taken using standard sampling equipment and techniques. Bedrock was proven at some of the boring locations by obtaining either AXT or BXL rock core samples. Laboratory testing was carried out on selected samples to determine the engineering properties of the overburden.

The subsoil conditions encountered at the boring locations, are shown on the Record of Borelog sheets; a stratigraphical profile along the alignment has been inferred from this data, and is shown on Drawing 68-F-89A. The results of the laboratory testing carried out are shown on the borelog sheets as well as on Figures No. 1 and 2, all of which are located in the Appendix of this report.

4. SUBSOIL CONDITIONS:

A brief resumé of the subsoil conditions encountered at each site is presented below:

SITE #81

B.H. #1

Ground Elev. - 212 ±  
Groundwater Elev. - 208 (approx.)

<u>Depth</u>	
0' - 4.5'	Silty Sand & Gravel ( <u>Roadway Fill</u> ) - Compact to Dense.
4.5' - 14.5'	<u>Clay</u> to <u>Silty Clay</u> - Stiff to Firm.
14.5' - 26.0'	Clayey Silt to Silt with Sand & Gravel - ( <u>Glacial Fill</u> ) - Very Stiff to Hard or Dense.
26.0' - 31.5'	<u>Silty Sand</u> and <u>Gravel</u> - Very Dense.
31.5' - 41.5'	<u>Limestone Bedrock</u> - Sound.

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

SITE #81 (cont'd.) ...

B.H. #2 (30' North of B.H. #1)

Depth

0' - 2.5'	Silty Sand & Gravel ( <u>Roadway Fill</u> ) - Compact.
2.5' - 15.0'	<u>Silty Clay</u> to <u>Clay</u> - Stiff to Firm.
15.0' - 16.5'	Clayey Silt with Sand & Gravel ( <u>Glacial Till</u> ) - Very Stiff.

SITE #82

Ground Elev.	- 216 ±
Groundwater Elev.	- 215 (approx.)

0' - 4.5'	Silty Sand & Gravel ( <u>Roadway Fill</u> ) - Compact
4.5' - 10.0'	<u>Clay</u> to <u>Silty Clay</u> - Firm.
10.0' - 14.0'	<u>Silt</u> - Dense.
14.0' - 22.5'	<u>Silty Sand</u> & <u>Gravel</u> - Very Dense. (Boulders up to 2' in size below a depth of 18').

SITE #83

Ground Elev.	- 216 ±
Groundwater Elev.	- 212 (approx.)

0' - 1.5'	Sand & Gravel ( <u>Roadway Fill</u> ) - Compact.
1.5' - 4.5'	<u>Peat</u> - Soft.
4.5' - 39.0'	<u>Clay</u> - Soft to Firm.
39.0 - 68.0'	Clayey Silt to Silt with Sand & Gravel - ( <u>Glacial Till</u> ) - Stiff to Hard or Compact to Very Dense. (Boulders up to 12" in size below a 61' depth).

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

SITE #83A

Ground Elev. - 218 <sup>±</sup>  
Groundwater Elev. - 215 (approx.)

Depth

0' - 1.5' Silty Sand & Gravel (Roadway Fill).  
1.5' - 3.5' Peat - Soft.  
3.5' - 22.3' Clay - Soft to Firm.  
22.3' - 57.0' Clayey Silt to Silt with Sand & Gravel -  
(Glacial Till) - Very Stiff to Hard or Dense.  
(- Sand and Gravel layer from 30' to 35')  
(- Boulders up to 18" in size below a depth  
of 52')

SITE #85

Ground Elev. - 220 <sup>±</sup>  
Groundwater Elev. - 218 (approx.)

0' - 1.5' Sand & Gravel (Roadway Fill).  
1.5' - 12.0' Clayey Silt to Silt with Sand & Gravel -  
(Glacial Till) - Hard or Very Dense.  
(Boulders up to 6" in size below a depth of 6').  
12.0' - 18.0' Limestone Bedrock - Sound.

SITE #86

Ground Elev. - 235 <sup>±</sup>  
Groundwater Elev. - 233 (approx.)

0' - 2.0' Silty Sand & Gravel (Roadway Fill) - Compact.  
2.0' - 7.7' Clayey Silt to Silt with Sand & Gravel -  
(Glacial Till) - Stiff to Very Stiff or Very Dense.  
(Boulders up to 6" in size below a depth of 3').  
7.7' - 15.5' Limestone Bedrock - Sound.



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

SITE #87

Ground Elev. - 225  $\pm$   
Groundwater Elev. - 223 (approx.)

Depth

0' - 2.0' Sand & Gravel (Roadway Fill) - Compact.  
2.0' - 6.5' Clayey Silt with some Sand & Gravel -  
(Glacial Till) - Very Stiff. (Boulders up to  
6" in size below a depth of 4').  
6.5' - 14.0' Limestone Bedrock - Sound.

SITE #87A

Ground Elev. - 253  $\pm$   
Groundwater Elev. - 250 (approx.)

0' - 1.5' Clayey Silt (Topsoil).  
1.5' - 9.0' Clayey Silt to Silt with Sand & Gravel -  
(Glacial Till) - Hard or Very Dense.  
9.0' - 14.0' Limestone Bedrock - Sound.

5. DISCUSSION AND RECOMMENDATIONS:

Proposed Hwy. #417 (Line 'D'), will be a 4-lane highway incorporating a wide median. The discussion presented herein is applicable for that portion of the alignment of the proposed highway from Casselman easterly to Hwy. 34.

It is understood that underpass structures will be constructed at the major crossings proposed within the above section, namely, at Sites No. 81, 82, 83A, 85, 86 and 87A. At this stage the profile grades have not been finalized; it is understood, however, that the associated approach fills will be of the order of 22 to 23 feet.

Preliminary recommendations pertaining to structure foundations as well as stability and settlement of approach fills, are summarized in tabular form as follows:

# FOUNDATION RECOMMENDATIONS

Site No.	Approx. Exist. Ground Elev. (ft.)	R E C O M M E N D A T I O N S		Remarks	
		<u>STRUCTURES</u>	<u>EMBANKMENTS</u> Height of Approach Fill (Assumed)  Comments		
81	212 ±	<u>Piers &amp; Abutments</u> End-bearing piles driven to bedrock - approx. tip elev. 180.- designed for max. capacity of the pile section chosen.	21' (Slopes 2:1)	<u>Stability</u> Fill heights should not be increased above 21'; higher fills will require berms in order to provide a F.S. of 1.3. <u>Probable Consolidation Settlement</u> 5" in 3 months 8" in 1 year (max.)	Settlements will take place in a relatively short period of time. Consideration should there- fore be given to constructing the approach fills prior to construction of the structure foundations.
82	216 ±	<u>Piers &amp; Abutments</u> End-bearing piles driven to practical refusal within glacial till, or alternatively, to bedrock - estimated tip elev. 180. - designed for max. capacity of the pile section chosen.	22' (Slopes 2:1)	No stability problem for Standard 2:1 slopes. <u>Probable Consolidation Settlement</u> 3" in 1 month 5" in 6 months (max.)	Settlements will take place in a relatively short period of time. Consideration should there- fore be given to constructing the approach fills prior to construction of the structure foundations.

FOUNDATION RECOMMENDATIONS - (cont'd.) ...

Site No.	Approx. Exist. Ground Elev. (ft.)	R E C O M M E N D A T I O N S			Remarks
		<u>STRUCTURES</u>	<u>EMBANKMENTS</u>		
			Height of Approach Fill (Assumed)	Comments	
83A	218 ±	<u>Piers &amp; Abutments</u>  End-bearing piles driven to practical refusal within glacial till - estimated tip elev. 160. - designed for max. capacity of the pile section chosen.	22'  (Slopes 2:1)	<u>Stability</u>  1) Fills up to 13' (with 2:1 slopes) will be stable.  2) Fills in excess of 13' will require berms in all directions.  - A mid-height berm of 35' will be required for a fill height of 22'.  (F.S. $\geq$ 1.3).  <u>Probable Consolidation Settlements</u>  1) 13' fill (2:1 slopes) 5" in 6 months 9" in 2 years (max.)  2) 22' fill with a berm length of 35' at mid-height 12" in 6 months 24" in 2 years (max.)	Require sub- excavation of up to 4' of surficial peat. Backfill with suitable gran- ular material.  Settlements will take place in a relatively short period of time. Consideration should, there- fore, be given to constructing the approach fills prior to construction of the structure foundations.

cont'd. /9

# FOUNDATION RECOMMENDATIONS

Site No.	Approx. Exist. Ground Elev. (ft.)	R E C O M M E N D A T I O N S			Remarks
		<u>STRUCTURES</u>	Height of Approach Fill (Assumed)	<u>EMBANKMENTS</u>  Comments	
85	220 ±	<u>Piers</u>  Spread footings within glacial till or to sound bedrock, allow- able bearing pressure up to 5 t.s.f. and 20 t.s.f., respectively.		No stability problems for Standard 2:1 slopes.	-
86	235 ±				
87A	253 ±	<u>Abutments</u>  Spread footings founded on a granular pad with- in approach fills, allowable bearing pressure 2 t.s.f. - or, alternatively, end-bearing piles driven to bedrock (for tip elevation, see Borelog sheets attached - designed for max. capacity of the pile section chosen.	22'  (Slopes 2:1)		

cont'd. /10

## 6. SUMMARY:

The results of a preliminary foundation investigation for the structure crossings, of that portion of Hwy. 417 between Casselman and Hwy. 34, are presented in this report. The Sites are Nos. 81, 82, 83, 83A, 85, 86, 87 and 87A.

The subsoil at the sites located immediately west of Hwy. 34 (Sites 85, 86, 87 and 87A), is composed of shallow deposits of glacial till which directly overlie limestone bedrock. At the locations of the most westerly Sites (nos. 81, 82, 83 and 83A), a stratum of sensitive clay, between 6 and 20 feet in thickness, overlies competent glacial till and granular deposits.

Preliminary comments regarding

- i) the type of foundation acceptable,
- ii) stability and settlement of approach embankments, and
- iii) additional recommendations, such as sub-excavation of surficial organic material,

are presented in this report.

It should be stressed that this report is of a preliminary nature. A complete foundation investigation will be required at all the structure sites, when design details become available.

## 7. MISCELLANEOUS:

The field work for this project was carried out during the period of January 8 and February 6, 1969, under the supervision of Mr. V. Korlu, Project Foundation Engineer.

The equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd.

This report was written by Mr. B. T. Darch, Senior Foundation Engineer, and reviewed by Mr. M. Devata, Supervising Foundation Engineer.

March, 1969

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 1 SITE 81

FOUNDATION SECTION

JOB 68-F-89

LOCATION Hwy. 417 (Line D) - Refer to Drawing 68-F-89A

ORIGINATED BY VK

W.P. 35-66-05

BORING DATE Jan. 8, 1969

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Washboring, NX, BX Casing - BXL Rock Core

CHECKED BY

*[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. + Field Vane o Unconfined Comp.					WATER CONTENT % WP — W — WL				
							400	800	1200	1600	2000	20	40	60		
212.5	Ground Level															
0.0	Silty sand & gravel (Roadway Fill)	X				210									V 208 W.L. in open BH.  93	
207.5	Compact to Dense															
4.5	Silty clay to clay with a trace of sand sensitive (Grey with random red- dish brown laminations)	/	1	SS	7											
			2	TW	PM	200										
297.5	Stiff to firm															
14.5	Clayey silt to silt with sand & gravel (Glacial Till) (Grey) Very stiff to hard or	T	3	SS	10											
		T	4	SS	31	190										
286.0	Compact to very dense	T	5	SS	>100											
28.0	Silty sand & gravel trace of clay (Grey) Very dense.	b.o. b.o. b.o.	6	SS	100/4"	180										
31.5	Crystalline limestone bedrock with irregular shaly seams. (Grey) Sound	X	7	BXL	100% Rec											
170.5			8	BXL	100% Rec											
41.5	End of Borehole					170										

208  
W.L. in  
open BH.

96.1  
84.9

93

FOUNDATION SECTION

CHECKED BY                     

[illegible]



DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

JOE 68-F-89

LOCATION Hwy. 417 (Line D) - Refer to Drawing 68-F-89A

ORIGINATED BY                      VK

W. P. 35-66-05

BORING DATE Jan. 13, 1969

COMPILED BY                      VK

DATUM \_\_\_\_\_ Geodetic

BOREHOLE TYPE Washboring NX BX Casing - BXL Rock Core

CHECKED BY                     

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

JOB 68-F-89

LOCATION Hwy. 417 (Line D)

## RECORD OF BOREHOLE FOR SITE 83

FOUNDATION SECTION

W P 35-66-05

BORING DATE Jan. 13, 1969

ORIGINATED BY                      VK

DATUM Geodetic

BOREHOLE TYPE Washboring - NX, BX Casing, BXL, AET Rock Core

COMPILED BY \_\_\_\_\_ VK

DATUM Geodetic

CHECKED BY

[illegible]

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## RECORD OF BOREHOLE FOR SITE 83A

FOUNDATION SECTION

68-F-89

LOCATION Hwy. 417 (Line D)

ORIGINATED BY BTD

W P 38-66-05

BORING DATE Jan. 30, 1969

COMPILED BY                     JFK                    

**DATUM** Geodetic

BOREHOLE TYPE Washboring, NX, BX Casing - BXL Rock Core

CHECKED BY AK

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— W <sub>L</sub> PLASTIC LIMIT ——— W <sub>P</sub> WATER CONTENT ——— W			BULK DENSITY P C F	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F. + Field Vane o Unconfined 400 800 1200 1600 2000					WATER CONTENT % 20 40 60				
18 ±	Ground Level														
16.5	Silty sand and gravel. (Roadway fill) Frozen	X	1	SS	149										215
17.5	Peat. (Grey-brown) soft	X													
18.5	Clay with a trace of sand, occ. organic inclusions.	/	2	TP	PM										116
	sensitive (grey with occ. reddish brown laminations)	/	3	TP	PM										
	Soft to firm	/	4	TW	PM										94
95.7		/	5	TW	PM										
22.3		T	6	SS	15										49 28 18 5
88.0		T													
30.0	Layer of silty sand and gravel.	.	7	SS	12										
83.0	Compact	.	8	WS	-										
35.0	Clayey silt to silt with sand & gravel (Glacial Till)	T	9	SS	42										
	(occasional seams of sand up to 6" thick) (grey)	T													
	Very stiff to hard or dense (boulders up to 18" in size below el. 166)	T	10	SS	46										
61.0		O	11	BXL	Rec. 20%										
57.0	End of Borehole	Q	12	BXL	15%										
						0	15	5 % strain	10						

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DEPARTMENT OF HIGHWAYS - ONTARIO


MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE FOR SITE 85

FOUNDATION SECTION

JOB 68-F-89LOCATION Hwy. 417 (Line D)ORIGINATED BY VKW.P. 36-66-01BORING DATE Jan. 14, 1969COMPILED BY VXDATUM GeodeticBOREHOLE TYPE Washboring BX Casing, BXL Rock CoreCHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT % 20 40 60				
220.2	Ground Level														
218.5	Clayey silt (compact)	X													
1.5	Clayey silt to silt with sand and gravel (glacial till) (boulders up to 6" in size below about el. 221.7)	T	1	SS	48	210									V 218 WL in open BH
	(red-brown to grey) very hard or very dense	T	2	SS	73										
208.0			3	SS	71										
12.0	Crystalline limestone Bedrock with irregularly shaly seams (grey) sound		4	BXL	100 Rec.										
202.0															
18.0	End of Borehole					200									

 218  
 WL in open BH

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE FOR SITE 86

FOUNDATION SECTION

JOB 68-T-89LOCATION Hwy. 417 (Line D)ORIGINATED BY VKW.P. 36-66-01BORING DATE Jan. 16, 1969COMPILED BY VKDATUM GeodeticBOREHOLE TYPE Washboring - BX Casing - BXL Rock CoreCHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT <u>WL</u>		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT <u>WP</u>	WATER CONTENT <u>W</u>		
235.1	Ground Level											
233.0	2.0' Sand & gravel (Roadway fill) Compact	X	1	CS	-	230						
227.3	Clayey silt to silt with sand & gravel (Glacial Till)	T										
7.7	Crystalline Limestone Bedrock, with irreg. shaly seams (grey)	HE	2	BXL	100% Rec							
219.5	Sound		3	BXL	100% Rec	220						
15.5	End of Borehole					210						

(boulders up to 6" in size below elev. 232)  
Grey  
Stiff to very stiff or very dense.

233 ±  
WL in open BH

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE FOR SITE 87

FOUNDATION SECTION

JOB 68-T-89LOCATION Hwy. 417 (Line D)ORIGINATED BY VKW. P. 36-66-05BORING DATE Jan. 17, 1969COMPILED BY VKDATUM GeodeticBOREHOLE TYPE Washboring, BX Casing, BXL Rock CoreCHECKED BY OK

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		
225.1	Ground Level											
218.0	Highway (fill) Compact	XX										
2.0			1	SS	19	220	<div>Clayey silt with some sand &amp; gravel (glacial till) (boulders up to 6" in size below about elev. 221) Grey Very stiff</div>					
218.5												
6.5	Crystalline Limestone Bedrock, irregular shaly seams (grey sound		2	BXL	100% Rec							
211.0			3	BXL	100% Rec							
14.0	End of Borehole					210						

223  
 WL in open  
 BH

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING DIVISION

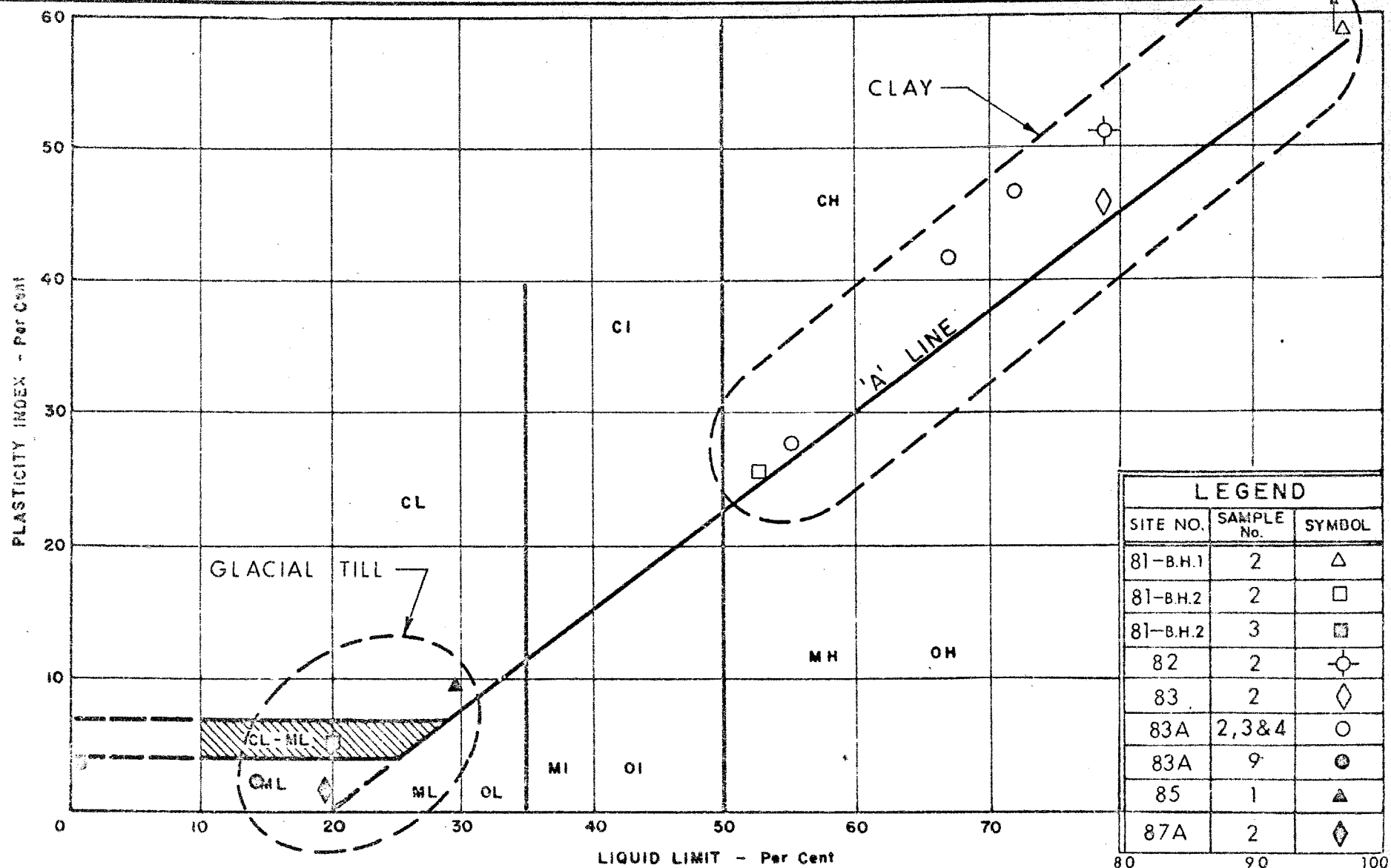
## RECORD OF BOREHOLE FOR SITE 87A

FOUNDATION SECTION

JOB 68-F-89LOCATION Hwy. 417 (Line D)ORIGINATED BY WHW.P. 36-66-05BORING DATE Feb. 5, 1969COMPILED BY VKDATUM GeodeticBOREHOLE TYPE Washboring - BX Casing, AXT Rock CoreCHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W WATER CONTENT % 20 40 60	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
253.5	Ground Level									
251.5	Clayey silt. (Topsoil)	T	1	SS	71	250				250 WE in open 54 27 17 2
244.0		T	2	SS	63					
239.0	Crystalline Limestone bedrock, irreg. shaly seams. (Gray) Sound.	///	3	AXT	80% Rec	240				
224.0	End of Borehole					230				

Clayey silt to silt with sand & gravel (Glacial Till) (occ. layers of sand & gravel up to 6" thick throughout) (brown to grey) Hard or very dense.



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## PLASTICITY CHART

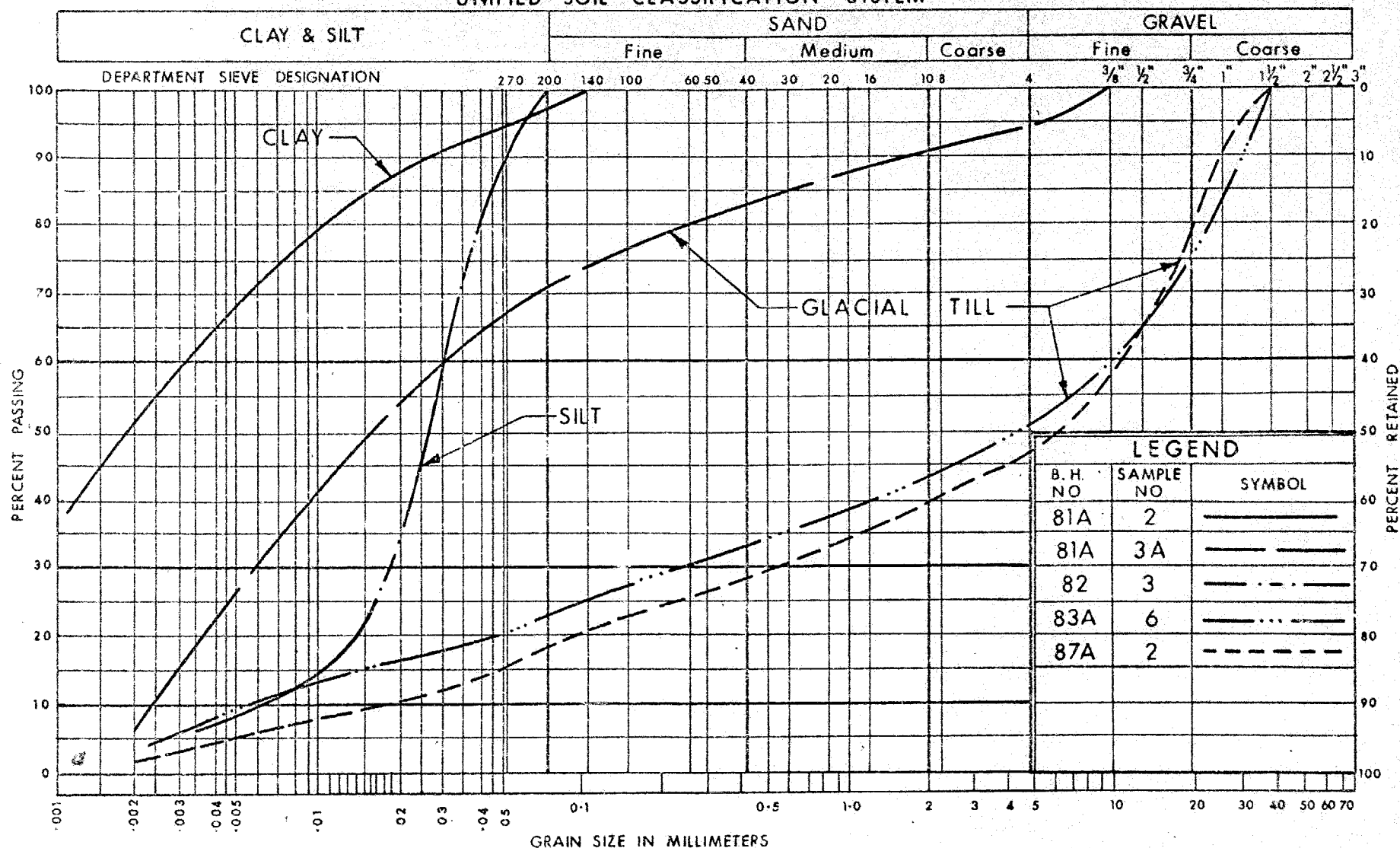
W.P. No. 35 & 36-66

JOB No. 68-F-89

FIG. NO. 1



## UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## GRAIN SIZE DISTRIBUTION

W.P. No. 35 &amp; 36-66

JOB No. 68-F-89

FIG NO. 2

## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

### DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT</u>	<u>c LB. / SQ FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

### TYPE OF SAMPLE

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	PH SAMPLE ADVANCED HYDRAULICALLY		
	PM SAMPLE ADVANCED MANUALLY		

### SOIL TESTS

Qu	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
$S_r$	DEGREE OF SATURATION
$w_L$	LIQUID LIMIT
$w_p$	PLASTIC LIMIT
$I_p$	PLASTICITY INDEX
s	SHRINKAGE LIMIT
$I_L$	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
$I_C$	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
$e_{max}$	VOID RATIO IN LOOSEST STATE
$e_{min}$	VOID RATIO IN DENSEST STATE
$I_D$	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY $D_r$ IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
Q	RATE OF DISCHARGE
V	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
$m_v$	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
$c_v$	COEFFICIENT OF CONSOLIDATION
$C_c$	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
$T_v$	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
$\tau$	SHEAR STRENGTH
c	EFFECTIVE COHESION INTERCEPT
$\phi$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_v$	SENSITIVITY

### GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

### S TRESS AND STRAIN

u	PORE PRESSURE
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

### EARTH PRESSURE

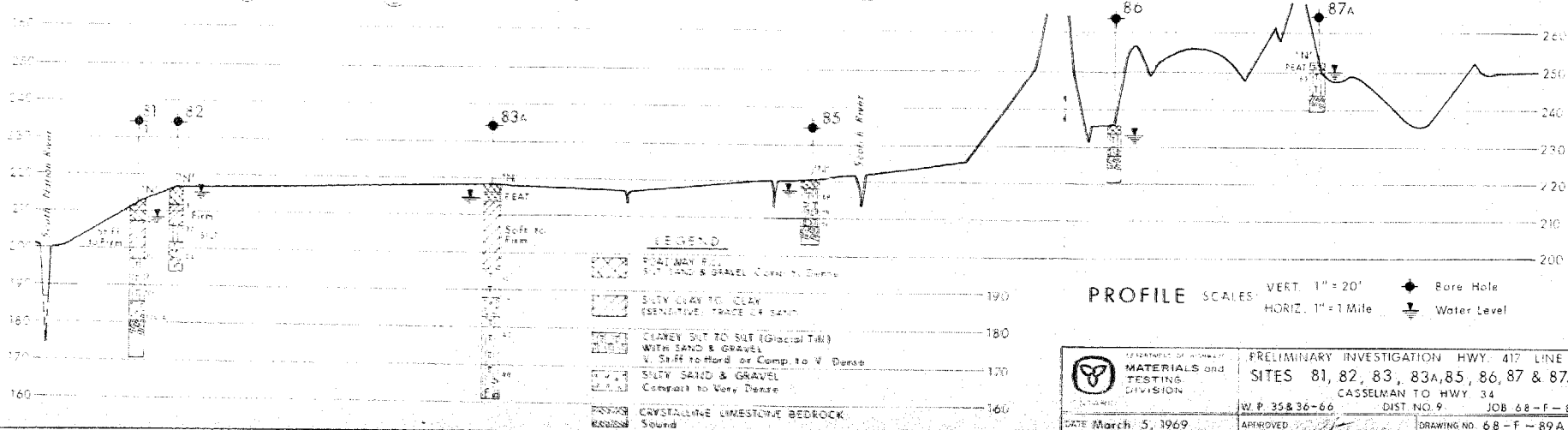
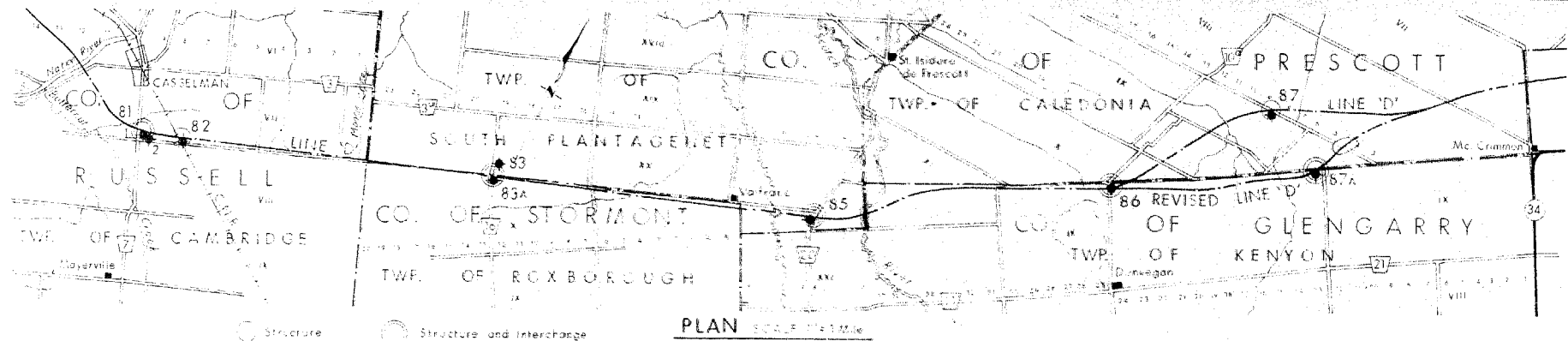
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

### FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

### SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



MEMORANDUM

68-F-29

TO: Mr. R. J. Forrest,  
Regional Schedule Co-Ordinator,  
KINGSTON, Ontario.

FROM: Materials and Testing Office,  
KINGSTON, Ontario.

ATTENTION:

DATE: January 10th, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: W. P. 37-66-02, G.B., and H.M.P. & Structures, Hwy. 417, From 0.68  
Mi. E. of Hwy. # 34 Easterly 4.35 Miles AND  
W. P. 37-66-04, G.B., H.M.P. & Structures, Hwy. 417, From E. of  
Glengarry County Road # 24 E'ly. to Hwy. # 17, 6.51 Miles

As a result of delay in contract 72-22 and Contract 72-24, the award of the above mentioned projects will have to be re-scheduled.

It is understood that it is intended to award one contract for paving over both grading contracts including five structures.

It is recommended that the paving of these projects be awarded as two separate contracts in consideration of the following factors:

1. Contract 72-22, base construction is expected to be completed by October, 1973. Contract award could be made for paving and structures in the fall of 1973 with work on structures to be carried out during the winter 1973-74. Paving is not to be started until four months after C.T.B. is completed, thus paving could begin around May 1st to 15th, 1974.
2. Approach fills to the C.N.R. tracks on Contract 72-22 were to have been completed within 4 months after the award of the contract. It now appears that they won't be completed before July, 1973. Foundations' recommendations suggest that the structure construction should not proceed until nine months after the approach fills have been placed in view of anticipated subsoil consolidation. If the nine month interval is not practical, as much time as possible should be allowed. Maximum settlements of 8"± are anticipated at the E.B.L. structure. A special provision concerning construction scheduling at these structure sites would be required if the contract is awarded in the fall of 1973.
3. Contract 72-24 is not expected to be completed before July 1974. Interim schedule dates could provide required time for shrinkage crack development on the C.T.B. This could be done by special provision. However any delays due to wet weather, could complicate one large contract in that the paving over Contract 72-22 would be completed and paving over Contract 72-24 could not be started. This could result in claims because of delay.

Cont'd.....

4. W. P. 37-66-02, asphalt tender quantities total approximately 50,000 tons. Approximately 60,000 tons Granular A is estimated.

W. P. 37-66-04 asphalt tender quantities are estimated at approximately 85,000 tons. Granular 'A' quantity is approximately 95,000 tons.

Each of these projects are quite large on their own and each of them have internal scheduling problems. Grouping into one large contract would result in a very large contract with complex internal scheduling. Breakdown of the schedule dates would probably result in complex administration and contract supervision problems.

5. The Glengarry County Road # 13 approach fills on Contract 72-24 have not yet been placed. Large settlements, due to consolidation of the foundation soils are anticipated at this site. Maximum settlement is estimated at 24 inches with 50 percent of this expected in the first 18 months after the fill is completed. It will be necessary to schedule the paving of these approach fills as a last operation under W. P. 37-66-04. Consideration could be given to retention of a level crossing of Hwy. 417 on the detour to allow construction of this structure and paving of the approach fills approximately 2 to 3 years after the approach fills are completed.



*A. M. Batten*

A. M. Batten,  
Senior Soils Supervisor

AMB/sgp

c. c. = P. D. Billings  
J. E. Callaghan  
G. A. Wrong  
A. G. Stermac, Att: M. Devata ✓  
A. J. Percy

## MEMORANDUM

2818  
ajf

To: Mr. W.G. Wigle,  
Program Engineer,  
Downsview, Ontario.

From: Functional Planning Section,  
Kingston, Ontario.

ATTENTION: Mr. R. Forrest

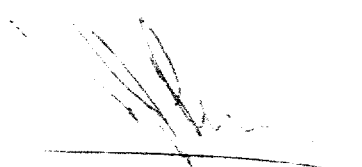
DATE: November 2, 1969.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 35-66-05, Hwy. 417, Casselman Ely. 6.4 miles,  
District 9 - Ottawa

With reference to the field meeting for the above project, we would recommend that W.P. 35-66-19, Sideroad to Ste. Rose de Prescott Underpass, be cancelled as we feel an underpass is not necessary at this location. We will approach the Ontario Municipal Board with the view to closing this crossing.



A. J. Percy,

for: M. R. Ernesaks,

Regional Functional Planning Engineer.

AJP/mjh

c.c. H. A. Aron

A. G. Boucher

J. E. Gruspier

T. C. Kingsland

S. J. Markiewicz

L. Timson

J. S. Trew

C. R. Robertson

A. G. Stermac ✓

Mr. H.A. Aron  
Mr. A.G. Boucher  
Mr. J.E. Gruspier  
Mr. T.C. Kingsland  
Mr. S.J. Markiewicz

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

281

To: Mr. L. Timson  
Mr. J.S. Trew  
Mr. C.R. Robertson  
Mr. R. Forrest  
Mr. A.G. Stermac ✓

FROM: Functional Planning Section,  
Kingston, Ontario.

DATE: October 24, 1969.

B-F 89

ATTENTION:

OUR FILE REF.

IN REPLY TO

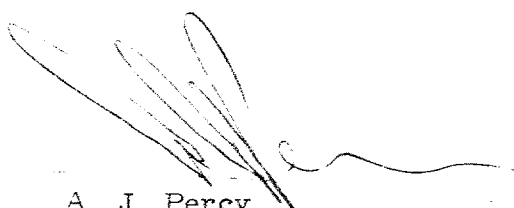
SUBJECT: W.P. 35-66-05, Hwy. 417, District 9 - Ottawa

With reference to the minutes of the field meeting for the above project dated September 25th, 1969, the following is submitted for your information.

Attached is a copy of a memorandum dated October 21st, 1969 from Mr. A.G. Stermac, Principal Foundation Engineer, which is self-explanatory. Also attached is a copy of memos dated October 7th and 14th, 1969 from the Regional Materials and Testing Section.

In view of Mr. Stermac's recommendations, we do not feel that a relocation of the Highway #138 structure is warranted and we will therefore proceed on the basis of the alignment of the free-way and proposed Highway 138 as presented at the field meeting.

It would be appreciated if comments regarding the above, and the field meeting could be forwarded as soon as possible so that we may proceed with the preparation of the report.



A. J. Percy,  
Project Planning Engineer.

AJP/mjh  
Atts.



## MEMORANDUM

☒ RFP ENG  
☐ PROJ ENG (A)  
☐ PROJ ENG (B)  
☒ PROJ ENG (C)  
☐ ROW TECH  
☐ CLERK  
☐ FILE

To: Mr. A.J. Percy,  
Functional Planning,  
Kingston.

FROM: Materials and Testing Office,  
Kingston.

ATTENTION:

DATE: October 14, 1969.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Re: Hwy. 417, W.P. 35-66-18  
Interchange with Hwy. 138

Attached are the logs of additional borings carried out in the south west quadrant of the proposed interchange and along a portion of the proposed Hwy. 138 alignment on revision south of the ditch.

The borings are referenced to the ditch and existing county road.

For your information.

*H.A. Meyer*  
H.A. Meyer

for: J.A. Cruickshank,  
Sr. Project Soils Engineer.

HAM/pdc

cc: T. Kingsland  
A.G. Stermac  
G. Wrong

400' South of Ditch - 200' West

0" - 38" Blk. Amorph. Gran. Org.  
38" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

400' South of Ditch - 400' West

0" - 38" Blk. Amorph. Gran. Org.  
38" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

400' South of Ditch - 600' West

0" - 38" Blk. Amorph. Gran. Org.  
38" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

400' South of Ditch - 800' West

0" - 36" Blk. Amorph. Gran. Org.  
36" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

400' South of Ditch - 1000' West

0" - 42" Blk. Amorph. Gran. Org.  
42" - 6½' Gr. Si. Cl. Firm  
6½' - 10'+ Gr. Si. Cl. Soft

600' South of Ditch - 1000' West

0" - 36" Blk. Amorph. Gran. Org.  
36" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

800' South of Ditch - 1000' West

0" - 48" Blk. Amorph. Gran. Org.  
48" - 7' Gr. Si. Cl. Firm  
7' - 10'+ Gr. Si. Cl. Soft

1000' South of Ditch - 1000' West

0" - 60" Blk. Amorph. Gran. Org.  
60" - 8' Gr. Si. Cl. Firm  
8' - 12' Gr. Si. Cl. Soft

600' South of Ditch - 400' West

0" - 38" Blk. Amorph. Gran. Org.  
38" - 72" Gr. Si. Cl. Firm  
72" - 10'+ Gr. Si. Cl. Soft

800' South of Ditch - 200' West

0" - 52" Blk. Amorph. Gran. Org.  
52" - 10' Gr. Si. Cl. Firm  
10' - 12'+ Gr. Si. Cl. Soft

1000' South of Ditch - 200' West

0" - 57" Blk. Amorph. Gran. Org.  
57" - 8' Gr. Si. Cl. Firm  
8' - 10'+ Gr. Si. Cl. Soft

250' South of Ditch - 160' East

0" - 36" Blk. Amorph. Gran. Org.  
36" - 6' Gr. Si. Cl. Firm  
6' - 10'+ Gr. Si. Cl. Soft

500' South of Ditch - 120' East

0" - 42" Blk. Amorph. Gran. Org.  
42" - 6' Gr. Si. Cl. Firm  
6' - 10'+ Gr. Si. Cl. Soft

750' South of Ditch - 100' East

0" - 42" Blk. Amorph. Gran. Org.  
42" - 7' Gr. Si. Cl. Firm  
7' - 10'+ Gr. Si. Cl. Soft

1000' South of Ditch - 800' West

0" - 60" Blk. Amorph. Gran. Org.  
60" - 7½' Gr. Si. Cl. Firm  
7½' - 12'+ Gr. Si. Cl. Soft

800' South of Ditch - 800' West

0" - 48" Blk. Amorph. Gran. Org.  
48" - 6½' Gr. Si. Cl. Firm  
6½' - 10'+ Gr. Si. Cl. Soft

600' South of Ditch - 800' West

0" - 54" Blk. Amorph. Gran. Org.  
54" - 7' Gr. Si. Cl. Firm  
7' - 10'+ Gr. Si. Cl. Soft

600' South of Ditch - 600' West

0" - 42" Blk. Amorph. Gran.  
42" - 6' Gr. Si. Cl. Firm  
6' - 10'+ Gr. Si. Cl. Soft

800' South of Ditch - 600' West

0" - 46" Blk. Amorph. Gran. Org. Bld. @ 4'  
46" - 8½' Gr. Si. Cl. Firm  
8½' - 12'+ Gr. Si. Cl. Soft

1000' South of Ditch - 600' West

0" - 48" Blk. Amorph. Gran. Org.  
48" - 6½' Gr. Si. Cl. Firm  
6½' - 10'+ Gr. Si. Cl. Soft

1000' South of Ditch - 400' West

0" - 48" Blk. Amorph. Gran. Org.  
48" - 10½' Gr. Si. Cl. Firm  
10½' - 12'+ Gr. Si. Cl. Soft

800' South of Ditch - 400' West

0" - 48" Blk. Amorph. Gran. Org.  
48" - 6½' Gr. Si. Cl. Firm  
6½' - 10'+ Gr. Si. Cl. Soft

Mr. H.C. Stermac,  
Principal Foundation Engineer.

Materials and Testing Office,  
Kingston.

Mr. B.L. Darch

October 7, 1969.

Re: Hwy. 417, W.P. 35-66-18  
Interchange with Hwy. 138  
Site 83, District 9, Ottawa

Attached are the logs of borings carried out at this site by power auger and hand equipment, in an attempt to determine the depth to till. The maximum depth of boring with the power auger is 26'. Where possible the additional depth to till below 26' was determined by sounding pipe.

The borings were all taken along the existing county road and are referenced to the drainage ditch along the county boundary.

For your information.

*H.A. Meyer*  
H.A. Meyer,

for: J.E. Gruspier,  
Regional Materials Engineer.

HAM/pdc

cc: Mr. A.J. Percy  
Mr. T. Kingsland  
Mr. G. Wong

600' North of Ditch

0 - 4" Br. Si. "Cr" Grav.  
4" - 10" Grey Si. Cl. Stiff (Traces of Org.)  
10" - 14" Br. Sa. Si.  
14" - 30' Grey Si. Cl. (Firm to 4')  
(Soft 4'+)  
30' + Till

400' North of Ditch

0 - 4" Br. Si. "Cr" Grav.  
4" - 12" Grey Si. Cl. Stiff  
12" - 16" Br. Sa. Si.  
16" - 19" Blk. Org. Tops.  
19" - 24' Grey Si. Cl. (Firm to 5½')  
(Soft 5½'+)  
24' - 26'+ Grey Till

200' North of Ditch

0 - 16" Br. Si. Cr. Grav.  
16" - 26" Blk. Org.  
26" - 23' Grey Si. Cl. (Firm to 7')  
(Soft 7'+)  
23' - 26'+ Grey Cl. Sa. Till

300' North of Ditch

0 - 10" Br. Si. "Cr" Grav.  
10" - 32" Blk. Org.  
32" - 23½' Grey Si. Cl. (Firm to 7')  
(Soft 7'+)  
23½'-26'+ Grey Cl. Sa. Till

550' North of Ditch

0 - 10" Br. Si.  
10" - 17" Br. Sa. Si.  
17" - 20" Blk. Org.  
20" - 29½' Grey Si. Cl. (Firm to 6')  
(Soft 6'+)  
29½'+ Till

500' South of Ditch

0 - 2" Asph.  
2" - 18" Br. Si. "Cr" Grav.  
18" - 60" Blk. Amorphous Gran. Org.  
60" - 26'+ Grey Si. Cl. (Firm to 7')  
(Soft 7'+)

1000' South of Ditch

0 - 1" Asph.  
1" - 26" Br. Si. "Cr" Grav.  
26" - 60" Blk. Amorphous Gran. Org.  
60" - 26'+ Grey Si. Cl. (Firm to 9½')  
(Soft 9½'+)

1500' South of Ditch

0 - 1" Asph.  
1" - 16" Br. Si. Cr. Grav.  
16" - 60" Blk. Amorphous Gran. Org.  
60" - 84" Blk. Fi. Fibrous Org.  
84" - 26'+ Grey Si. Cl. (Firm to 9½')  
(Soft 9½'+)

2000' South of Ditch

0 - 1" Asph.  
1" - 30" Br. Si. Cr. Grav.  
30" - 96" Blk. Amorphous Gran. Org.  
96" - 31' Grey Si. Cl. (Firm to 11')  
(Soft 11'+)  
Strks. of Grey Si. F. Sa. @ 10'  
31'+ Till

3000' South of Ditch

0 - 1" Asph.  
1" - 18" Br. Si. Cr. Grav.  
18" - 72" Amorphous Gran. Org.  
72" - 24' Grey Si. Cl. (Firm to 14')  
(Soft 14'+)  
24' - 26'+ Grey Cl. Sa. Till

4000' South of Ditch

0 - 1" Asph.  
1" - 32" Br. Si. Cr. Grav.  
32" - 66" Blk. Amorphous Gran. Org.  
66" - 17' Grey Si. Cl. (Firm to 17')  
17' - 20' Grey Cl. Sa. Till  
20'+ Blds.

200' South of Ditch

0	-	1"	Asph.
1"	-	20"	Br. Si. Cr. Grav.
20"	-	42"	Blk. Amorphous Gran.
42"	-	21'	Grey Si. Cl. (Firm to 9') (Soft 9'-)
21'	-	26'+	Grey Cl. Sa. Till



DEPARTMENT OF HIGHWAYS ONTARIO

## MEMORANDUM

To: Mr. M. E. Ernesaks,  
Regional Functional Planning Engr.,  
Eastern Region,  
KINGSTON, Ontario.

FROM: Foundation Section,  
Materials & Testing Office,  
Room 107, Lab. Bldg.

ATTENTION: Mr. A. J. Percy

DATE: October 21, 1969

OUR FILE REF.

IN REPLY TO

## SUBJECT:

Interchange at the Crossing of Hwy. #417  
And Highway #138 (Sites 83 and 83A) --  
Townships of Cambridge and South Plantagenet  
District #9 (Ottawa) --  
A.P. 35-66-18 -- W.J. 68-P-89

During the course of the preliminary foundation investigation, carried out in January and February of 1969 by the Foundation Section, one boring was put down at each location of the two alternate crossings of Hwys. #417 and #138, namely, at Sites 83 and 83A (refer to Report #68-P-89, dated March 7, 1969). At Site #83, located about 1,100 feet north of the creek situated on the township boundary, 34.5 feet of soft compressible clay directly underlies 3 feet of peat. At Site #83A, located approximately 100 feet north of the creek, the thickness of the clay was found to be only 19 feet. From a foundation point of view, it would be advantageous to construct the proposed structure at the location where the thickness of the compressible stratum is least. For preliminary planning purposes, therefore, a location in close proximity to Site #83A was adopted.

At the Hwy. #417 Coordinating Committee Meeting, held in Kingston on September 25, 1969 (minutes dated October 3, 1969), it was concluded that the thickness of the compressible stratum be further delineated by putting down additional borings, particularly south of the creek. The purpose of these borings is to determine if a relocation of the proposed interchange is warranted.

A total of 12 borings was put down in September, 1969, using a power auger under the supervision of personnel from the Regional Materials Section (Eastern Region).

The results of these borings indicate the following:

1) that the thickness of the compressible clay stratum, from a point 500 feet north of the creek to a point 2,500 feet south, varies randomly from 18 to 23 feet. Further, the thickness of the overlying organic matter ranges from 2 feet, near the creek, to 6 feet south of the creek - i.e., increases in a southerly direction.

Mr. M. R. Ernesaks,  
Regional Functional Planning Engr.,  
Eastern Region, Kingston, Ont.  
Attn: Mr. A. J. Percy

2

October 21, 1969

Re: Interchange - Crossing of Hwys. #417 and #138 (Sites 83 & 83A)  
W.P. 35-66-18 -- W.J. 68-F-89

ii) North of these limits the thickness of the compressible stratum gradually increases to a maximum of 34.5 feet at Site #83. South of these limits the thickness decreases until, at a point 4,000 feet south of the creek, it is 11.5 feet in depth.

Recommendations:

As discussed previously, the thickness of the compressible clay does not decrease appreciably until a point is reached some 2,500 feet south of the creek. Site #83A is, in fact, located at a local minimum as far as the depth of clay is concerned. In addition, a realignment to the south of the present proposal would place the interchange well within the main body of the peat bog. This would require additional swamp excavation, not only within the plan limits of the structure proper, but also along the expressway. In view of this, it is our recommendation that a relocation of the interchange is not warranted.

We trust that the information contained in this memo is adequate for your immediate needs. Should you require clarification of anything herein, or if we can be of any further assistance, please contact this Office.

BTD/WdeF

cc: Messrs. S. J. Markiewicz  
J. E. Gruspier

*M. Devata*  
M. Devata,  
SUPERVISING FOUNDATION ENGR.  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGR.

Foundations Files  
Gen. Files

Mr. H. A. Aron  
Mr. A. G. Boucher  
Mr. J. E. Graspier  
Mr. T. C. Kingsland  
Mr. S. J. Markiewicz  
Mr. L. Timson  
Mr. J. S. Trew  
Mr. C. E. Robertson  
Mr. R. Forrester  
Mr. A. G. Stiermas

DEPARTMENT OF HIGHWAYS, ONTARIO

MEMORANDUM

FROM: Functional Planning Section  
Kingston, Ontario.

DATE: October 3, 1969.

ATTENTION:

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 35-66-01 & 36-66-01, Hwy. 417, District 9 - Ottawa

Attached for your information is one copy of the minutes of the Planning Committee Meeting held on September 23rd, 1969. If you find any errors or omissions please advise.

In order to proceed with these projects, the following information will be required:

(a) W.P. 35-66-01


1. In order to determine the best location for the Highway 138 structure, the Foundation Section will have to provide additional information to the Bridge Section and advise on the limiting fill heights.
2. The Bridge Section will have to provide comparative cost estimates for the alternative Highway 138 bridge sites.
3. The Materials and Testing Section will have to provide additional soils information in the southwest quadrant of the Highway 138 interchange.
4. When the above information is available, the Regional Functional Planning Section will reassess the alignment in the vicinity of the Highway 138 interchange.

(b) W.P. 36-66-01

1. The Bridge Section will have to provide cost estimates for the structures at the two alternative County Road #8 sites. A plan and profile has been forwarded to Mr. T. C. Kingsland for this purpose.
2. The Property Section will have to provide comparative windshield cost estimates for the property required for the two alternative alignments. A plan has been forwarded to Mr. Aron for this purpose.

3. Upon receipt of the above information, the Regional Functional Planning Section will select the alignment based primarily on economic considerations.

The information requested should be available by October 17th, 1969 if at all possible. It would be appreciated if the Sections affected would confirm this date.



A. J. Percy,  
Project Planning Engineer.

ASP/mjn  
Ajr.



# M I N U T E S

## HIGHWAY 417 - CO-ORDINATING COMMITTEE

### MEETING AND FIELD MEETING

W. P. 35-66-05 and W. P. 36-66-01

The above meeting was held on Thursday, September 25th, 1969 at 2 p.m. in Boardroom #3, Kingston Regional Office.

Those present:

Mr. B. Darch	Foundation Section (Head Office)
Mr. T.C. Kingsland	Bridge Section
Mr. M.J. MacMaster	Road Design Section
Mr. S.J. Markiewicz	Road Design Section
Mr. B. Todd	Traffic Section
Mr. L. Timson	Photogrammetry
Mr. A.G. Boucher	Engineering Surveys
Mr. M. Baker	Engineering Surveys
Mr. J. Cruickshank	Materials & Testing
Mr. R. Forrest	Program Office (Head Office)
Mr. K. Westerby	Construction Engineer (District 6)
Mr. J.E. Graspier	Materials & Testing
Mr. A.J. Percy	Functional Planning Section
Mr. I. Williams	Functional Planning Section

The Agenda, as presented by Mr. Percy, was as follows:

- 1) Status of W. P. 35-66-01 Vars to Limoges  
and W.P. 35-66-03 Limoges to Casselman
- 2) Status of W. P. 37-66-05
- 3) Field Meeting for W. P. 35-66-05 and W. P. 36-66-01

#### 1) Status of W. P. 35-66-01 and W. P. 35-66-03

Mr. Percy informed the group that Functional Planning have met with the relevant municipalities for the above projects. He said that generally full approval was given, although formal resolutions have not yet been received. The only serious objection to our scheme came from the Township of Russell - re our proposed closing of the township roads between Vars and Limoges. However, Mr. Percy said that a structure is not feasible here as the traffic figures are low and the foundation conditions poor. We will approach the Board with a view to closing this road.

On W. P. 35-66-03, Mr. Percy informed the group that there were no objections from the municipalities to any closings. Mr. Percy said that the actual treatment of the township roads, which parallel the South Nation River, is still dependent on field information.

It was found out at a municipal meeting with the Village of Casselman that the interchange at County Road #7 will fall partially within the village limits. Mr. Percy asked about the progress of the field work, and particularly bridge site plans. Mr. Boucher answered that the first two sites were nearly ready and the South Nation River site should be completed within two weeks. He said that Engineering Surveys will meet their completion dates for these projects.

### 2) Status of W. P. 37-66-03

Mr. Percy informed the meeting that the Province of Quebec have sent Functional Planning a scheme for an interchange at County Road #34 at the Quebec-Ontario border. Functional Planning is at present considering alternative schemes for such an interchange while trying to maintain the original structure size.

Mr. Kingeland said that if an interchange is recommended at this location, then the Bridge Section would appreciate early notification so that the bridge drawings can be revised accordingly.

Mr. MacMaster asked if the Road Design Section should cut the grading contract for W. P. 37-66-05 short, in view of these considerations. Mr. Percy said that Functional Planning would make a decision on this point as soon as possible.

In answer to a question from Mr. Westerby, Mr. Percy said that part of any proposed interchange would fall in the Province of Quebec, and a construction cost sharing agreement would have to be negotiated. Mr. Markiewicz suggested that such an interchange should be constructed either completely by Quebec or completely by Ontario (with a cost sharing arrangement), so that one set of standards would be used. He said that from past experience, the Province of Quebec have been co-operative in such negotiations.

Mr. MacMaster asked that Functional Planning send a memo showing our revised limits for W. P. 37-66-05 as soon as we have decided upon this matter.

### 3) Field Meeting for W. P. 35-66-05 and W. P. 36-66-01

Before discussing the projects in detail, Mr. Percy explained that we have obtained full Head Office approval for W. P. 35-66-05, but not for W. P. 36-66-01 yet.

W. P. 35-66-03

Mr. Percy started by listing the controls for this project:

- 1) The east limit of W. P. 35-66-03
- 2) As direct route as possible along approved corridor
- 3) Keep the speed change lane for the future interchange design at County Road 7 clear of the C. N. R. overhead structure.
- 4) Parallel the township road east of Casselman, yet leave room for possible widening of the township road right-of-way to 88'.

At this point, Mr. MacMaster noted that the median width was ~~22.11~~ 40' an appreciable amount of this project. Mr. Percy agreed, and said that as the area contained possibly some of the best farms yet encountered on 417, we were not warranted in using a wider right-of-way. Mr. MacMaster asked how many farms are actually severed. Mr. Percy said it is difficult to state an exact figure, as some farmers are thought to work both sides of the township road, but we feel that severance is quite low.

- 5) The curve at the C. N. R. overhead was purposely set so that the whole structure was on curve. It was thought that this would be aesthetically more pleasing for the motorist.

Mr. MacMaster asked if it was unavoidable to sever the farms to the east of the township boundary. Mr. Percy said that we could not move the line south to avoid severance, as we would be moving into the Moose Creek bog. We feel that our proposal is the most economical on a property cost versus muskeg excavation cost basis. It is difficult to be sure of the amount of severance in this area, as we are no longer authorized to request Land Use Surveys. This type of information would have been particularly useful in the area from County Road 3 to County Road 9. Mr. Percy stated that the Moose Creek bog may develop as a market garden area, when the freeway is constructed.

The group then entered into discussion about the interchange site at proposed Highway 138. The two bore holes (83 and 88A) taken at Highway 138 were shown on the plan used for the field meeting. Mr. Percy said that settlement figures for bore hole #83 were only rough estimates made by the Foundation Section and were not included in the Foundation Report for this area.

Mr. MacMaster asked if there is any variations in the thickness of the clay beds at the Highway 138 crossing sites. Mr. Darch answered there is an appreciable variation, and the thicker beds are softer than the thinner beds. Mr. MacMaster said, although the line would appear to be south of the thicker clay he thought the interchange fills may be over the poor clay areas. Mr. Percy said that he thought the fills could be reduced quickly enough so this would not be a big problem. Mr. MacMaster suggested that more foundation information should be obtained at this site before a final crossing location was decided upon. Mr. Percy agreed that the more information we have the better, but



obtaining further on site foundation information would seriously delay W. P. 35-86-65.

There was a lengthy discussion about the various alternative locations for the structure, and their relative merits. Mr. Darch said that to be really sure that the best location was found; it would be necessary to take a series of bore holes and plot a clay profile. He agreed with Mr. Gruspier's suggestion that cone penetration tests could be used to supplement the bore hole information.

Mr. Percy said that if the structure and alignment were moved south (to the apparently thinner clay beds) then the muskeg excavation in the bog would be very expensive. He explained that if more curvatures was introduced to the west of proposed Highway 138 so that the structure site was moved south, but the alignment still skirted the Moose Creek bog to the north, then there would be a property severance problem to the east of proposed Highway 138. The freeway would also be pushed farther into the bog east of the proposed Highway 138. The discussion on these points continued at some length. Structure costs, muskeg subexcavation costs, and property costs were compared. Moving the Highway 138 structure east was also considered, but rejected on the grounds that the existing County Road 16 road bed would then be abandoned, and Highway 138 would require new construction within the bog.

A summary of the decisions made with regard to the Highway 138 interchange follows:

- (i) Functional Planning will issue a Survey Request for the line as presented, with the understanding that this may be changed in the area of the structure.
- (ii) Head Office Foundation Section will do further investigations in the area and make a recommendation to the Regional Bridge Section as to the best structure site and permissible fill heights.
- (iii) The Regional Bridge Section will provide Functional Planning with comparative structure costs.
- (iv) The Regional Materials and Testing Section will have to provide additional soils information in the southwest quadrant of the interchange.
- (v) Based on (iii) and (iv) above, Functional Planning will prepare a cost comparison for the possible schemes in this area and make a final recommendation for the interchange site. If necessary, the survey request will be adjusted accordingly.



Mr. Darch said he thought the recommendations to the Bridge Section could be made within two weeks, but he would have to check on the availability of field crews before being sure. Mr. Percy asked to be informed of the actual expected date for this information as soon as possible.

W. P. 36-66-01

Mr. Percy explained that immediately to the east of Highway 138, the alignment swung south in order to do a minimum amount of severance to farms in the area. Although the recommended line is slightly longer than the alternatives shown (one to the north and two to the south of the Town of ...), it is felt that the reduction in severance would make this line the most acceptable. A cost comparison had been made which showed that the recommended alignment was the most acceptable.

Mr. Percy then presented the two alternative schemes in the area of the interchange at County Road #9. He explained that Regional Functional Planning has not yet received Head Office approval for a scheme in this area, but it was almost certain that approval would be received for one of the schemes presented at the meeting. Mr. Percy said that it was his intention to discuss both alternatives so that if one was approved it would not be necessary to hold another field meeting for W. P. 36-66-01.

Mr. Percy explained that our original line (the northerly one) was intended to run from the southerly dip, east of Highway 138 referred to above, northerly to run along the county boundary, while ensuring that the County Road #9 interchange was on tangent. However, this introduced a bad skew angle at the County Road #9 structure which induced our Head Office to recommend investigations into the more southerly line. This southerly line would appear to cost about \$35,000 less than the northerly line, this figure could be higher in view of the latest Bridge Office Standards. One disadvantage of the south scheme is that the interchange is on a curve. This curve, however, is quite flat and therefore this may not be too serious.

At this point the group looked at a rock cut on the profile, at about Station 510I. Mr. Gruspier suggested the rock cut could be made deeper, as the material would be needed. Mr. Markiewicz recommended that the rock cut section be widened to 30' from edge of pavement in view of the new bridge office standards. This improves the appearance of the cut, and also provides more material. There was general discussion on this point. Mr. Percy asked the Road Design Section to mention this in their written comments for the meeting.

Referring back to the County Road #9 interchange, Mr. Markiewicz asked if we could move the P.I. on the south alternative further east and so keep the interchange on tangent. Mr. Percy said this would involve an inferior crossing of the east branch of the Scotch River east of County Road #9, and also

cause more farm severance. The curve would be sharper (about  $1^{\circ} 30'$ ) and one exit bull nose for the interchange would still be on the curve. Mr. Percy said we were investigating compounding the following curves in the south scheme at about Station 420.

Westbound Lane	11'-15" curve to 45' curve
Eastbound Lane	30' curve to 15' curve

He asked if this would introduce any problems. Mr. Boucher answered that there should be no problems with this, and no spirals would be needed between the curves.

Mr. Percy said that Functional Planning will be asking for cost estimates for both schemes at County Road #9 from the Regional Bridge Section and the Property Section. Any other comments about these schemes were also requested.

Mr. Craickshank advised that County Road #9 was recently designated as a Development Road. Mr. Percy advised he would look into the matter to determine what affect, if any, it would have on the proposals for the free-way.

Mr. Percy explained that it was originally intended to recommend an interchange at County Road #21 (the east end of W.P. 36-66-01). However, a review of the County Road system, low population densities, and the low traffic volumes in this area suggested that an interchange is not necessary. An underpass only is recommended.

Mr. Percy asked if there were any serious objections to either scheme at County Road #9. As no objections were raised, it was decided that no extra field meeting would have to be held for W.P. 36-66-01. Mr. Percy said Functional Planning would issue a Survey Request up as far as the west end of the alternative scheme for County Road #9. The east portion of the Survey Request will be issued as soon as possible.

Mr. Kingsland asked how soon Functional Planning required the structure cost estimates for the schemes at County Road 9. Mr. Percy said as soon as possible; in two weeks if at all possible.

Mr. Percy said that Functional Planning will issue Survey Requests for W.P. 36-66-05 and 36-66-01, under the conditions as mentioned elsewhere in the minutes. He asked for written comments in one week.

Mr. Westerby said the District has no comments.

Referring back to the comparative costs required at County Road #8. Mr. Percy said Functional Planning will issue the Bridge Section and Property Section with a print showing the alternative schemes at this location.

The meeting then adjourned.

A handwritten signature in dark ink, appearing to read "I. Williams", with a horizontal line drawn underneath it.

I. Williams  
Secretary.

IW/mjh

## MEMORANDUM

TO: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
Downsview, Ontario.

FROM: Functional Planning Office,  
Kingston, Ontario.

ATTENTION:

DATE: December 10, 1968.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 35-66 to 37-66, Hwy. 417, Vars to Quebec Border,  
District 9 - Ottawa

At a meeting on December 3rd, 1968, at this office with Mr. M. Devata and the Regional staff concerning the above projects, it was agreed that preliminary foundation information is required for the structure sites on the recommended corridor. This will assist this section in establishing the final alignment in detail.

Please accept this memo as our request to have the preliminary investigations carried out.

Mr. Devata advised that he would prefer to start the investigation at Vars immediately and proceed eastward to Casselman to complete as much as possible prior to the New Year. We are in agreement with this procedure and would suggest a schedule as follows, which is based on the present construction program.

1st Priority - Structure Sites 1 to 8 inclusive - 8 SITES  
Structure Sites 79, 80 and 81 - 3

2nd Priority - Structure Sites 29, 30, 31 & 88 - 4

3rd Priority - Structure Sites 82 to 83 inclusive - 2  
85 to 87 inclusive - 3  
22 to 28 inclusive - 7  
+ 84 - 1

The site numbers referred to are shown on the mosaic which was forwarded to you on November 14th, 1968 with the exception of Site #88 which is at the intersection of Highway 17 and the County Road at the Quebec Border.

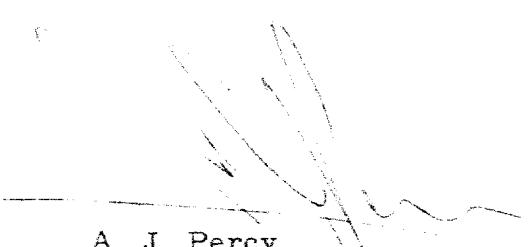
We have arranged to have Engineering Surveys stake out and tie in the structure sites with existing landmarks and establish assumed bench mark elevations for future reference.

W.J. 68-F-88  
68-F-89  
68-F-8890  
68-F-8991

...../2

Mr. W. Hutton of your office was in this office on December 9th, 1968, at which time he was given a mosaic for his reference and introduced to Engineering Surveys staff working on the project.

We trust the above meets with your approval.



A. J. Percy,  
For: J. L. Forster,  
Regional Functional Planning Engineer.

AJP/mjh  
c. c.  
S. J. Markiewicz  
G. Scott  
J. E. Gruspier  
A. G. Boucher  
L. Timson  
H. A. Aron  
K. M. Williams

DEPARTMENT OF HIGHWAYS ONTARIO  
DESIGN BRANCH - ENGINEERING SURVEYS DIVISION  
SURVEY REQUEST

Joc Name VARS T. CASSELMAN CUMBERLAND RUSSELL  
Hwy. No. 417 District # 1 - OTTAWA Region KINGSTON  
W.P. No. 32-66-4103 Work Schedule \_\_\_\_\_ Priority (If Not a W.P.) \_\_\_\_\_  
Date DEC 2/68 Date of Previous Request (If Any) \_\_\_\_\_  
Req'd. By [Signature] Title PAUL PANNIN Section FUNCT. PLANNING  
Signature \_\_\_\_\_

Future Design Standards

Hwy. Class No. \_\_\_\_\_ Design Speed \_\_\_\_\_ Median Width \_\_\_\_\_ R/W Width \_\_\_\_\_

Survey Information

Limits of Survey VICINITY VARS & CASSELMAN

Bridge Site Plans Req'd. At \_\_\_\_\_

Railway Crossing Plans Req'd. At \_\_\_\_\_

Pipe Line Crossing Plans Req'd. At \_\_\_\_\_

Instructions (Note Any Special Requirements or Drafting Instructions)

- ① STAKE OUT FUTURE STRUCTURE SITES # 1, 2, 3, 4, 5, 6, 7, 8, 9 & 10 FOR PRELIMINARY FOUNDATION INVESTIGATION IN CO-OPERATION WITH FOUNDATION SECTION.
- ② TIE IN STRUCTURE SITES TO EXISTING LANDMARKS
- ③ SET UP ASSUMED BENCHMARKS TO TIE IN SITE ELEVATIONS FOR FUTURE CORRELATION WITH GEODETIC B.M.'S ESTABLISHED.
- ④ ~~ENTER THE FOLLOWING INFORMATION FOR BRIDGE OFFICE~~
  - (a) ~~ROUGH PROFILE REPRESENTATIVE OF RIVER CROSSINGS AT SITES # 5, 7, 8 & 10~~
  - (b) ~~REFERENCE DATA ASSUMED AT SITE # 4 WITH SITE # 5~~
  - ~~AND AT SITE # 6 WITH SITE # 7 & 8~~
- ⑤ ~~SHOULD SHOW ACCOMPANYING AERIAL PHOTOS & MOSAIC~~  
PLEASE RETURN AERIAL PHOTOS AS SOON AS POSSIBLE

(4.1 Copy)

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

December 12/68.

MEMO: TO FILES 68-F-86.  
68-F-87.  
68-F-88.  
68-F-89.

RE PRELIMINARY FOUNDATION INVESTIGATIONS  
HWY. # 417 - 28 STRUCTURE SITES.

BECAUSE OF PHYSIOGRAPHIC AND GEOLOGIC  
SIMILARITIES IT IS RECOMMENDED THAT THE  
SITES BE SUB-DIVIDED INTO THE FOLLOWING  
WORK PROJECT NOS.

- 1/ W.J. 68-F-86      W.P. 35-66      SITES 1 to 8, inclusive  
(VARS TO SOUTH NATION RIVER)      79 and 80
- 2/ W.J. 68-F-87      W.P. 35-66      SITE 81  
   W.P. 37-66      SITES 82, 83, 84, 85, 86, 87  
(SOUTH NATION RIVER EAST TO MC CRIMMON)
- 3/ W.J. 68-F-88      W.P. 37-66      SITES 22 to 28, inclusive.  
(MC CRIMMON EAST TO NEW HWY #17.)
- 4/ W.J. 68-F-89      W.P. 36-66      SITES 29, 30, 31 and 88.  
(ALONG NEW HWY #17 to QUEBEC BORDER)

B.T.D.