

#67-F-7

W.P. #129-65

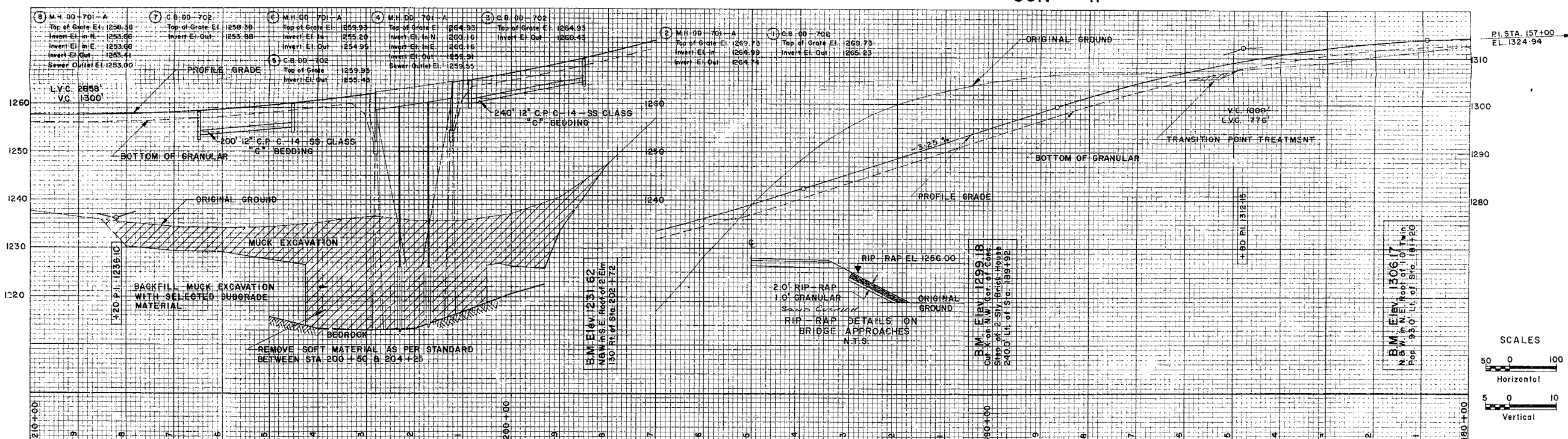
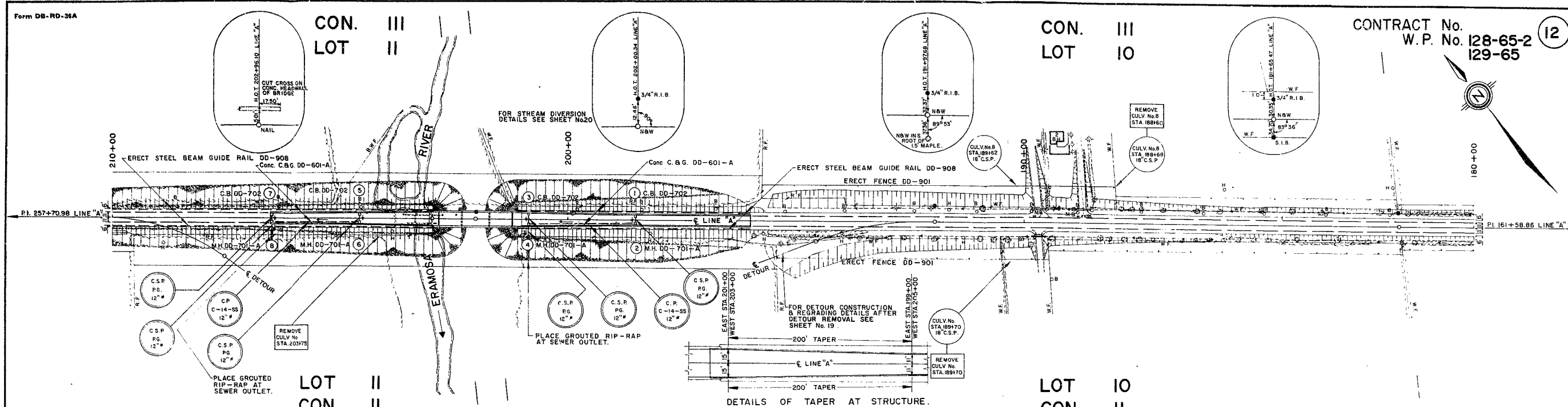
W.P. #128-65-03

Hwy. #25

ERAMOSA

RIVER

(SPEED RIVER)



				Totals	
Earth Cut		23300 CU.YDS.	8400 CU.YDS.	31700	Earth Cut
Stripping		2100 CU.YDS.	1400 CU.YDS.	3500	Stripping
Ditching		50 CU.YDS.	160 CU.YDS.	210	Ditching
Muskeg Excavation	44600 CU.YDS.	4950 CU.YDS.		49550	Muskeg Excav.
Earth Fill	90400 CU.YDS.	44200 CU.YDS.	1100 CU.YDS.	135700	Earth Fill
Rock Cut					Rock Cut
Shatter					Shatter
Rock Fill					Rock Fill
Muskeg Backfill					Muskeg Backfill

SAND CUSHION

GRANULAR "A"

MEMORANDUM

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division,
Admin. Bldg.
Attention: Mr. S. McCombie
OUR FILE REF.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.
DATE: April 5, 1967
IN REPLY TO: **APR 12 1967**

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Bridge Over
Eramosa (Speed) River, Hwy. #25
District #3 (Stratford)
W.J. 67-F-7 -- W.P. 129-65

Attached, we are forwarding to you, our detailed foundation investigation report on 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 design requirements. Should additional information be required, please feel free to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
A. Gater
J. G. Tillcock
A. P. Watt
J. Roy
B. A. Singh

Foundations Files
Gen. Files ✓

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

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FOUNDATION INVESTIGATION REPORT
For
Proposed Bridge Over
Eramosa (Speed) River, Hwy. #25
District #3 (Stratford)
W.J. 67-F-7 -- W.P. 129-65

1. INTRODUCTION:

A request, dated February 2, 1967, to conduct a foundation investigation at the proposed bridge site, was received from the Bridge Planning Section (Mr. A. P. Watt, Regional Bridge Location Engineer).

The existing bridge carrying Highway #25 over the Eramosa (Speed) River, is to be replaced either by a single-span structure with a grade increase of about 16 feet, or by a three-span structure with a grade increase of 29 feet. The latter proposal provides for the construction of a dam and reservoir downstream of the existing structure.

Subsequently, a foundation investigation was conducted at the proposed site to determine the subsoil conditions. Field and laboratory test results, together with discussion and recommendations for the structure foundations and the embankment designs, are reported herein.

2. TOPOGRAPHY AND GEOLOGY:

The site is located one mile south of Ospringle, 4.5 miles north of Acton on Highway #25 and is situated in Lot 11, Concession II & III in the Township of Erin, County of Wellington.

The surrounding area has a moderately hilly relief and the particular area of the site is in a flat valley some 1500 feet wide. Physiographically, the site lies in the area known as the Horseshoe Moraine. The deposits in the area are predominantly of glacial origin with valleys containing post-glacial and recent sediments. These deposits are underlain by bedrock of the Paleozoic era.

cont'd. /2 ...

3. FIELD AND LABORATORY WORK:

Using conventional diamond drilling equipment adapted for soil sampling purposes, 16 sampled boreholes and adjacent dynamic cone penetration tests were carried out at the site. A driving energy of 350 ft.-lb. per blow was used for the dynamic cone penetration tests.

In cohesive material, 2-inch I.D. Shelby tube samples were obtained by manually pushing the tubes into the soil, if possible. Otherwise, samples of cohesive and non-cohesive materials were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test. In-situ shear strength was established, where possible, with a field vane test.

AXT-size rock core samples were obtained from all boreholes to prove bedrock.

Samples were visually examined and identified in the field and subsequently in the laboratory. Laboratory tests were conducted on selected representative samples to determine, where applicable, Atterberg limits, bulk density, grain-size distribution, natural moisture content, organic content, and shear strength. The shear strength was determined by means of laboratory vane, quick triaxial, and unconfined compression tests.

Results of the laboratory and field tests, together with the locations and elevations of the boreholes, are presented in the appendix of this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at the site consists generally of a deposit of organic material, underlain by a variable deposit of silt to clayey silt with some sandy silt, which extends to bedrock except at the outer extremes of the investigation where a thin till-like deposit overlies the bedrock.

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

4.2) Organic Material:

This material was encountered in all boreholes to a depth of 5.0 to 9.0 feet. Organic analyses indicated organic contents as high as 63% by weight with corresponding high natural moisture contents up to 358%. Some clayey silt, silt and sand were contained in variable quantities throughout the deposit.

4.3) Silt to Clayey Silt:

Underlying the organic material and extending generally to bedrock at a depth of 11.5 to 20.0 feet, was a deposit of silt to clayey silt with some sandy silt. Except in the vicinity of the west abutment of the existing structure, the deposit is layered and is predominantly silt or clayey silt of very low plasticity (CL - ML designation). In the vicinity of the west abutment, the material is predominantly clayey silt. The upper 1.5 to 2 feet of the deposit contains traces of organics.

The deposit could be described as having a soft to stiff consistency with shear strength generally between 300 p.s.f. and 1000 p.s.f. (i.e., generally firm). The silt and sandy silt layers are generally loose. Because of the predominantly silty nature of the soil, the low shear strengths are considered to represent at least a partially disturbed value.

Liquid limits vary between 19% and 32%, plastic limits from 13.5% to 20.9%, and moisture contents from 16% to 48% (in general, about 25%). A typical gradation of the more silty materials is: 5% sand, 90% silt, and 5% clay sizes.

4.4) Clayey Silt to Sand & Gravel (Till):

This deposit was encountered in the outer boreholes only (i.e., boreholes 12, 13, and 14) and could be described as hard or very dense with 'N' values of 28 to in excess of 100 blows per foot. The deposit is 9 feet thick at the westerly extreme of the investigation, but rapidly peters out. About 2.5 feet of till was encountered on the easterly extreme.

cont'd. /4 ...

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

4.5) Bedrock:

Bedrock was proven in all boreholes by drilling with AXT-sized core. The profile of the bedrock is somewhat dish-shaped with contact elevations varying from west to east as elevations 1222.7 to 1211.8 to 1215.5, respectively (i.e., at a depth of 12 to 20 feet).

The rock is buff granular dolomite, generally sound, but containing some vuggy zones. The formation of rock is a part of the Guelph formation of the Silurian period (Paleozoic era).

4.6) Water Table:

The water table was observed in the boreholes and was generally 1 to 2 feet below the existing ground surface during the time of the investigation.

5. DISCUSSION AND RECOMMENDATIONS:

5.1) General:

It is proposed to reconstruct the existing bridge on Highway #25 over the Eramosa (Speed) River. Two alternative proposals were considered and will be discussed as a low-level bridge and a high-level bridge. The latter proposal is required as a consequence of a proposed dam to be constructed downstream of the existing structure.

The subsoil consists generally, of about 5.0 to 9.0 feet of organic material underlain by a variable deposit of silt to clayey silt with some sandy silt which extends to bedrock at a depth of 12 to 20 feet.

cont'd. /5 ...

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

5.2) Low-Level Bridge:

The proposed bridge is a single-span, 2-lane structure some 36 feet wide and 50 feet long to be constructed at the present bridge site. The proposed grade would require a maximum embankment of 16 feet above the existing grade (i.e., about 22 feet above the general ground surface).

The subsoil at the site is unsuitable for the use of spread footing type foundations. Piled foundations are recommended, therefore, and should be end-bearing type piles driven to bedrock. Allowable loads will depend upon the pile section chosen (e.g., 12 BP 74 steel H-piles may be designed for 90 tons per pile).

All organic material should be subexcavated beneath the embankment area according to D.H.O. Standard DD 406, and should be replaced with suitable granular material below the water table (other acceptable material may be used above the water table). The extent of the organic material is indicated in the soils report submitted by the Regional Materials Section. The abutment then may be constructed without danger of base failure, provided that 2:1 slopes are constructed.

5.3) High-Level Bridge:

The proposed bridge is to be located some 114 feet east of the existing structure along the alignment of Highway #25, and will be a 3-span, 2-lane structure, 34 feet wide and 145 feet long. Proposed grades will be about 29 feet above the existing grade (i.e., about 35 feet above the general ground surface).

The subsoil is not adequate to support the proposed embankments. Accordingly, two alternative proposals, either a multispan, trestle-type bridge, or subexcavation, are discussed as follows:

cont'd. /6 ...

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

5.3) High-Level Bridge: (cont'd.) ...

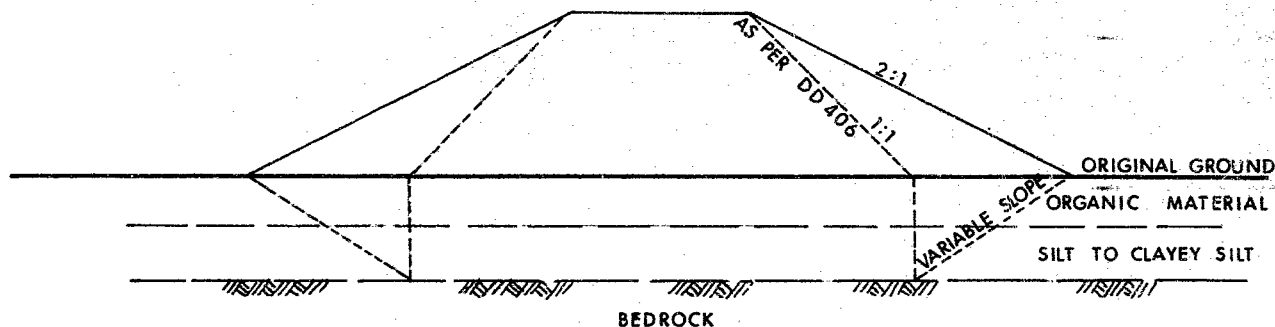
1) Multispan, Trestle-type Bridge:

A multispan bridge is recommended to span from station 199+50 to 205+00. The structure could be supported on end-bearing type piles driven to bedrock, in which case, the pile section chosen will govern the design capacity, or on caissons founded on bedrock where an allowable load of 10 t.s.f. could be used for design purposes.

All organic material beneath the embankments should be subexcavated and replaced according to D.H.O. Standard DD 406.

11) Subexcavation:

All material should be subexcavated to bedrock between stations 200+50 and 204+25 for the full width of the required excavation of organic material with side-slopes taken to the toe of the proposed embankment (See typical sketch below), and replaced with suitable granular material.



Sketch of Typical Subexcavation Details

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

5.3) High-Level Bridge: (cont'd.) ...

The structure abutments should be founded on end-bearing type piles driven to bedrock as detailed for the low-level bridge. The bridge piers could be founded directly on spread footings on sound bedrock where a load of 10 t.s.f. could be used for design purposes.

Care should be taken that no bouldery fill is used in the area where piles are to be driven.

The detour road should be constructed at least 100 feet from the toe of the proposed embankment.

5.4) Drawdown Conditions:

The high-level bridge embankments will, in effect, partially dam the proposed reservoir and, if sudden drawdown of the reservoir occurred, could be subjected to more severe conditions than have been considered for the present embankment design.

Analysis for a drawdown condition requires complete details of the nature of the embankment material, the nature of the back-fill material, the rate of drawdown, etc., When all data are determined, this condition will be fully analyzed by the Foundation Section.

6. SUMMARY:

The results of a foundation investigation for the proposed bridge over the Eramosa (Speed) River on Highway #25 are presented.

The subsoil at the site consists, in general, of a deposit of organic material some 5.0 to 9.0 feet thick, underlain by a variable deposit of silt to clayey silt with some sandy silt which extends to bedrock at a depth of 12 to 20 feet.

For the low-level bridge, the structure should be founded on end-bearing piles driven to bedrock (H-piles are recommended in this case). The organic material should all be subexcavated

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

according to D.H.O. Standard DD 406 and replaced with suitable granular fill below the water table. No stability problems are anticipated for the proposed embankments with standard 2:1 side-slopes.

For the high-level bridge, the subsoil is inadequate to safely support the proposed embankments. A multispan, trestle-type bridge is proposed which could be founded on end-bearing type piles driven to bedrock, or on caissons founded on bedrock. The bridge should span from station 199+50 to station 205+00.

All organic material beneath the embankments should be subexcavated and replaced as for the low-level bridge.

As an alternative, all material beneath the embankments between stations 200+50 and 204+25 could be subexcavated and replaced with granular material. No stability problems would then be anticipated for 2:1 slopes. Under such conditions, the central bridge piers could be founded directly on bedrock, and the abutments could be founded on end-bearing piles driven to bedrock.

Care should be taken that no bouldery fill is placed in areas where piles are to be driven.

The detour road should be built at least 100 feet from the toe of the proposed embankments.

There is insufficient data as yet to determine the draw-down conditions. These conditions will be discussed by the Foundation Section when sufficient data are available.

7. MISCELLANEOUS:

The field work was carried out in the period from February 14 to March 2, 1967, using equipment owned and operated by Dominion Soil Investigation Ltd., under the supervision of Mr. V. Korlu, Project Foundation Engineer.

cont'd. /9 ...

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

The report was prepared by Mr. Korlu and Mr. L. Palmer, Project Foundation Engineer, and was reviewed by Mr. M. Devata, Supervising Foundation Engineer, under whose general supervision the entire project was carried out.

April 1967

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy. 25 & Speed River, Sta. 203 1/4 16' Rt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE Feb. 14. 1967

COMPILED BY V.K.

DATUM _____ Geodetic

BOREHOLE TYPE Drive casing and wash

CHECKED BY AK

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

[illegible]

FOUNDATION SECTION

JOB 67-F-7 LOCATION Hwy. 25 @ Speed River, Sta. 203 + 41 22' Lt. ORIGINATED BY V.K.
W. P. 129-65 BORING DATE Feb. 16, 1967 COMPILED BY V.K.
DATUM Geodetic BOREHOLE TYPE Drive casing and wash CHECKED BY MR.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100					wp — w — WL				
							SHEAR STRENGTH P.S.F.					WATER CONTENT %				
							● Quick Triaxial + Field Vane ○ Unconfined					15 30 45				
						400 800 1200 1600 2000										
1230.2	GROUND LEVEL					1230										
0.0	Organics, some clayey silt to sand		1	SS	3		+ S-2								WL 1229.7	
1224.2							+ S-2							122	W 144.6%	
6.0	Clayey silt to silt		2	TW	P		+ S-5							122	0 2 (98)	
	Soft to loose		3	TW	P	1220	- S-3.5									
			4	TW	P		+ S-4.5								0 2 (98)	
			5	TW	P											
1210.2						1210										
20.0	Dolomite Bedrock		6	AXT	100%											
1205.2	Sound															
25.0	End of Borehole					1200										

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

W.P. 129-65

DATUM Geodetic

LOCATION Hwy. 25 @ Speed River. Sta. 202 + 82 22' Rt.

BORING DATE Feb. 20, 1967

BOREHOLE TYPE Drive NX Casing and wash

ORIGINATED BY V.K.

COMPILED BY V.K.

CHECKED BY _____

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy. 25 @ Speed River, Sta. 202 + 73 28' Lt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE Feb. 22, 1967

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive NX Casing and Wash

CHECKED BY

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO.5

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy. 25 @ Speed River, Sta. 202 + 34 22' Rt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE Feb. 22, 1967

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive NX Casing & Wash

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY Y P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %						
							● Quick Triaxial + Field Vane × Lab Vane					WP — W — WL						
						20	40	60	80	100								
						400	800	1200	1600	2000								
1230.9	GROUND LEVEL					1230												
0.0	Organics, some clayey silt to silt.		1	TW	P													
1225.4																		
5.5	(with traces of orgs.)		2	TW	P													
1222.9																		
8.0	Silt with layers of clayey silt. Loose or firm		3	TW	P	1220												
			4	TW	P													
1214.4			5	TW	P													
16.5	Dolomite Bedrock some vugs, sound		6	AXT	70%													
1208.9			7	AXT	100%	1210												
22.0	End of Borehole																	
						1200												

FOUNDATION SECTION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7 LOCATION Hwy. 25 @ Speed River, Sta. 202 + 27 30+ Lt. ORIGINATED BY V.K.
W.P. 129-65 BORING DATE Feb. 23, 1967 COMPILED BY V.K.
DATUM Geodetic BOREHOLE TYPE Drive BX Casing and wash CHECKED BY SR

SOIL PROFILE		SAMPLES	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT				
		NUMBER	TYPE	BLOWS / FOOT		
1230.8	GROUND LEVEL					
0.0	Organics, some clayey silt to sand	1	TW	P	1230	
1225.3	(with traces of orgs.)	2	TW	P		
1223.8	Silt to clayey silt with sand seams.	3	TW	P	1220	
7.0	Loose or firm to stiff.	4	TW	P		
		5	TW	P		
1211.8	Dolomite Bedrock Sound	6	AXT	100%	1210	
1207.8		7	AXT	100%		
23.0	End of Borehole					

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy 25 @ Speed River, Sta. 201 / 70 38' Lt.

ORIGINATED BY V.K.

W. P. 129-65

BORING DATE Feb. 24, 1967

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive casing and wash

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — WL PLASTIC LIMIT — wp WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	$w_p \quad w \quad w_L$				
							SHEAR STRENGTH P.S.F. ● Quick Triaxial + Field Vane ○ Unconfined	WATER CONTENT % 15 30 45				
1230.2	GROUND LEVEL											
0.0	Organics, some clayey silt to silt, some marl.		1	TW	P	1230						
1224.7	(with traces of orgs.)		2	TW	P		+ S3.5					
1222.7			3	TW	P		+ S3				127	1.
7.5	Silt to clayey silt, loose or firm, layered some sandy silt		4	TW	P	1220					125	
			5	TW	P						128	
1212.7			6	AXT	100%							0 29 67 4
17.5	Dolomite Bedrock Sound		7	AXT	100%	1210						
1208.7												
21.5	End of Borehole					1200						

FOUNDATION SECTION

CHECKED BY

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	PLASTIC LIMIT ——— wp								
							20	40	60	80			100	WATER CONTENT ——— w		
							SHEAR STRENGTH P.S.F.						wp ——— w ——— WL			
						● Quick Triaxial + Field Vane										
						○ Unconfined x Lab Vane										
						400 800 1200 1600 2000						WATER CONTENT %				
												15 — 30 45				
1231.4	GROUND LEVEL															
0.0	Organics, some clayey silt to silt, some marl.					1230										
1225.9			1	TW	P											
1223.9	(with traces of orgs.)		2	TW	P											
7.5	Silt to clayey silt, Loose or Firm, layered pockets of sand.		3	TW	P	1220										
1216.4			4	TW	P											
15.0	Dolomite Bedrock Sound		5	AXT	100%											
1211.4																
20.0	End of Borehole					1210										

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

W.P. 129-65

DATUM _____ Geodetic

LOCATION Hwy. 25 @ Speed River Sta. 201 + 18 34' Lt.

BORING DATE Feb. 27, 1967

BOREHOLE TYPE Drive NX casing & wash

ORIGINATED BY V.K.

COMPILED BY V.K.

CHECKED BY _____

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

[illegible]

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy. 25 @ Speed River, Sta. 200 + 25 19' Rt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE Feb. 27, 1967

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Drive NX casing and wash

CHECKED BY.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LQUID LIMIT ——— WL	BULK DENSITY	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— wp			
							20 40 60 80 100	WATER CONTENT ——— w			
							SHEAR STRENGTH P.S.F.	wp ——— w ——— WL			
							• Quick Triaxial + Field Vane				
							x La Vane				
							400 800 1200 1600 2000	WATER CONTENT %	15 30 45		
1232.1	GROUND LEVEL								Y		
0.0	Organics, some clayey silt to sand.	~~~~~				1230				P.C.F. 1231.1	
1226.6	Trace of marl.	~~~~~	1	TW	P					1.85%	
5.5	Silt to clayey silt		2	TW	P		S2.5			0 15 76 9	
	Trace of organics		3	TW	P		S6 x S2	o		2 22 69 7 1	
	Loose or firm					1220		o		0 5 88 7	
1219.6								100			
12.5	Dolomite Bedrock		4	AXT	100%						
1216.1	Sound										
16.0	End of Borehole					1210					

FOUNDATION SECTION

CHECKED BY

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		20	40	60	80	100	WP	W	WL		
							SHEAR STRENGTH P.C.F. + Field Vane									
1034.2	GROUND LEVEL					400	800	1200	1600	2000						
0.0	Organics, some clayey silt to sand, some marl.		1	TW	P	1230									W.L. 1233.7 Org. 59.5% W. 257.0% Org. 2.7%	
1225.2			2	TW	P											
9.0	Silt, sand & gravel		3	SS	28											
1222.7	Compact to very dense		4	SS	100/5"											
11.5	Dolomite Bedrock sound		5	AXT	100%	1220										
1217.7																
16.5	End of Borehole					1210										

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-E-7

LOCATION Hwy. 25 @ Speed River Sta. 204 / 51 40' Lt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE March 1, 1967

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive NX casing & wash

CHECKED BY AK

RECORD OF BOREHOLE NO.13

FOUNDATION SECTION

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

W.P. 129-65

DATUM Geodetic

RECORD OF BOREHOLE NO. 14

LOCATION Hwy. 25@ Speed River Sta. 205 / 64 12' Rt.

BORING DATE Feb. 28, 1967

BOREHOLE TYPE Drive NX casing & wash

FOUNDATION SECTION

ORIGINATED BY V.K.

COMPILED BY V.K.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F. + Field Vane					WATER CONTENT %		
							20	40	60	80	100	400	800	1200			1600	2000	WP
1233.5	GROUND LEVEL																		
0.0	Organics, some clayey silt to sand.		1	TW	P	1230										Gr Ss Si Cl Or			
1227.5			2	SS	23											WL = 1233.0 W. 300% 62			
6.0	Layers of silty sand		3	SS	27														
1224.5	& clayey silt.		4	SS	117	1220										42 42 (16)			
9.0	Clayey silt with sand & gravel. Stiff to Hard		5	SS	105														
1215.5			6	AXT	50%														
18.0	Dolomite Bedrock		7	AXT	100%														
1211.5	some vuggy zones, sound																		
22.0	End of Borehole					1210													

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

JOB 67-F-7

LOCATION Hwy. 25 @ Speed River Sta. 202 + 86 92' Rt.

ORIGINATED BY V.K.

W. P. 129-65

BORING DATE March 2, 1967

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive NX casing & wash

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LQUID LIMIT ——— WL	BULK DENSITY	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— WP			WATER CONTENT ——— W
							20 40 60 80 100	WP ——— W ——— WL			WATER CONTENT %
							SHEAR STRENGTH P.S.F.				
							• Quick Triaxial + Field Vane				
							400 800 1200 1600 2000				
1231.1	GROUND LEVEL										
0.0	Organics, some clayey silt to sand.					1230					
1228.1											
3.0	Layers of organic silt and clayey silt. Soft or Loose.		1	TW	P		+ 3.5				
			2	TW	P		+ S2.5				
1221.1			3	TW	P						
10.0	Layers of clayey silt silt and silty sand. Soft or Loose		4	TW	P	1220	+ S1.5				
			5	TW	P		+ S2.5				
1212.6							+ S3				
18.5	Dolomite Bedrock sound		6	AXT	100%	1210					
1207.6											
23.5	End of Borehole					1200					

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-7

LOCATION Hwy. 25 @ Speed River. Sta. 201 + 03 101' Lt.

ORIGINATED BY V.K.

W.P. 129-65

BORING DATE March 2, 1967

COMPILED BY V.K.

DATUM Geodetic

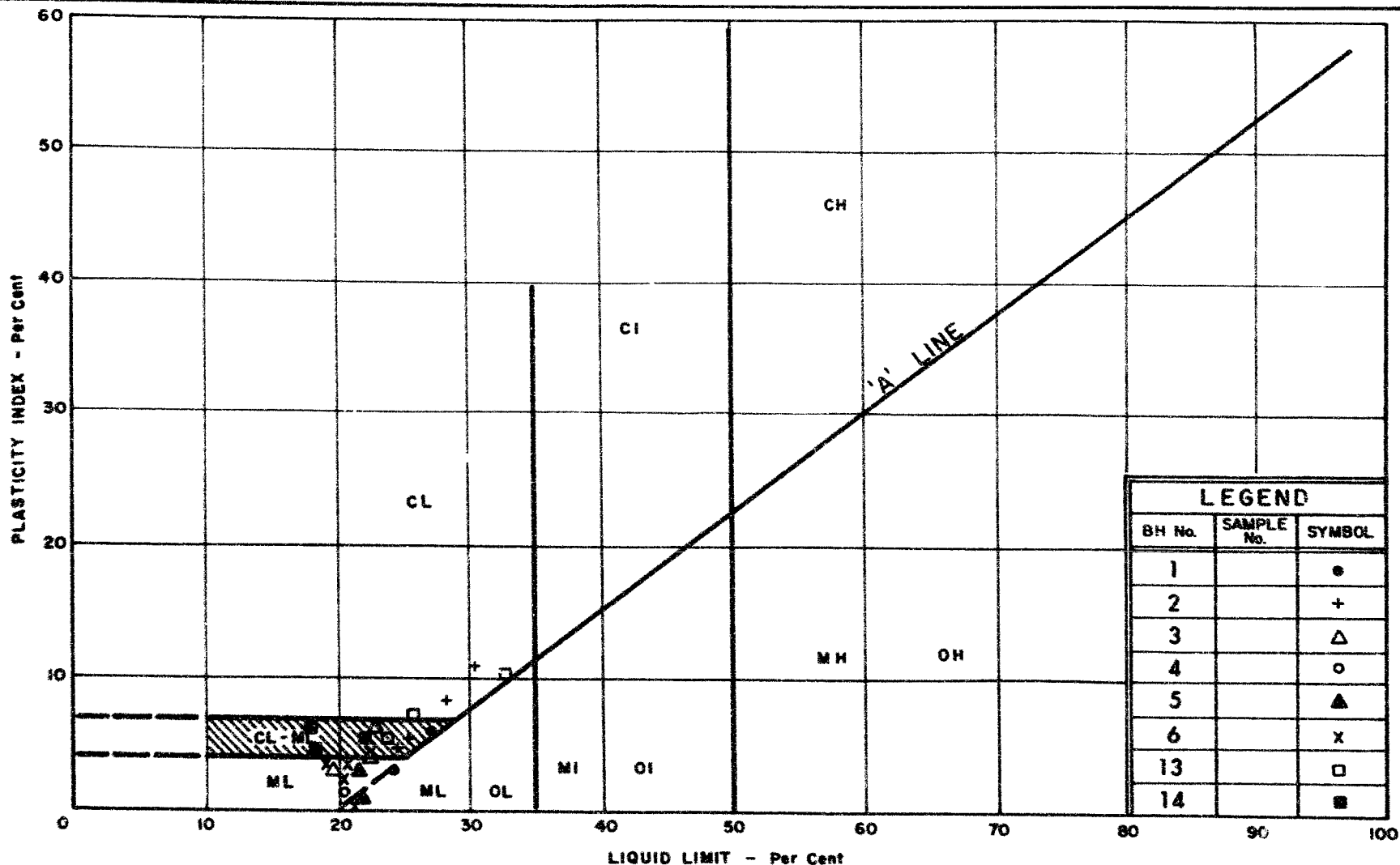
BOREHOLE TYPE Drive NX casing & wash

CHECKED BY

RECORD OF BOREHOLE NO. 16

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit — WL	Plastic Limit — WP	BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	WATER CONTENT — W				
							SHEAR STRENGTH P.S.F. ● Quick Triaxial + Field Vane ○ Unconfined	WP — W — WL				
1230.0	GROUND LEVEL					1230	400 800 1200 1600 2000	WATER CONTENT % 15 30 45			Gr S _a S _i C _i	
0.0	Organics, some clayey silt to sand.		1	TW	P	1220			111	V 1229.0		
1226.0			2	TW	P						1228	177 (22)
4.0	Silt with organics. Loose		3	TW	P							
1221.0			4	TW	P							
9.0	Layers of clayey silt, silt and sand. Loose or firm to stiff		5	TW	P							
1213.0		6	AXT	100%	1210							
17.0	Dolomite Bedrock Sound											
1208.0												
22.0	End of Borehole					1200						

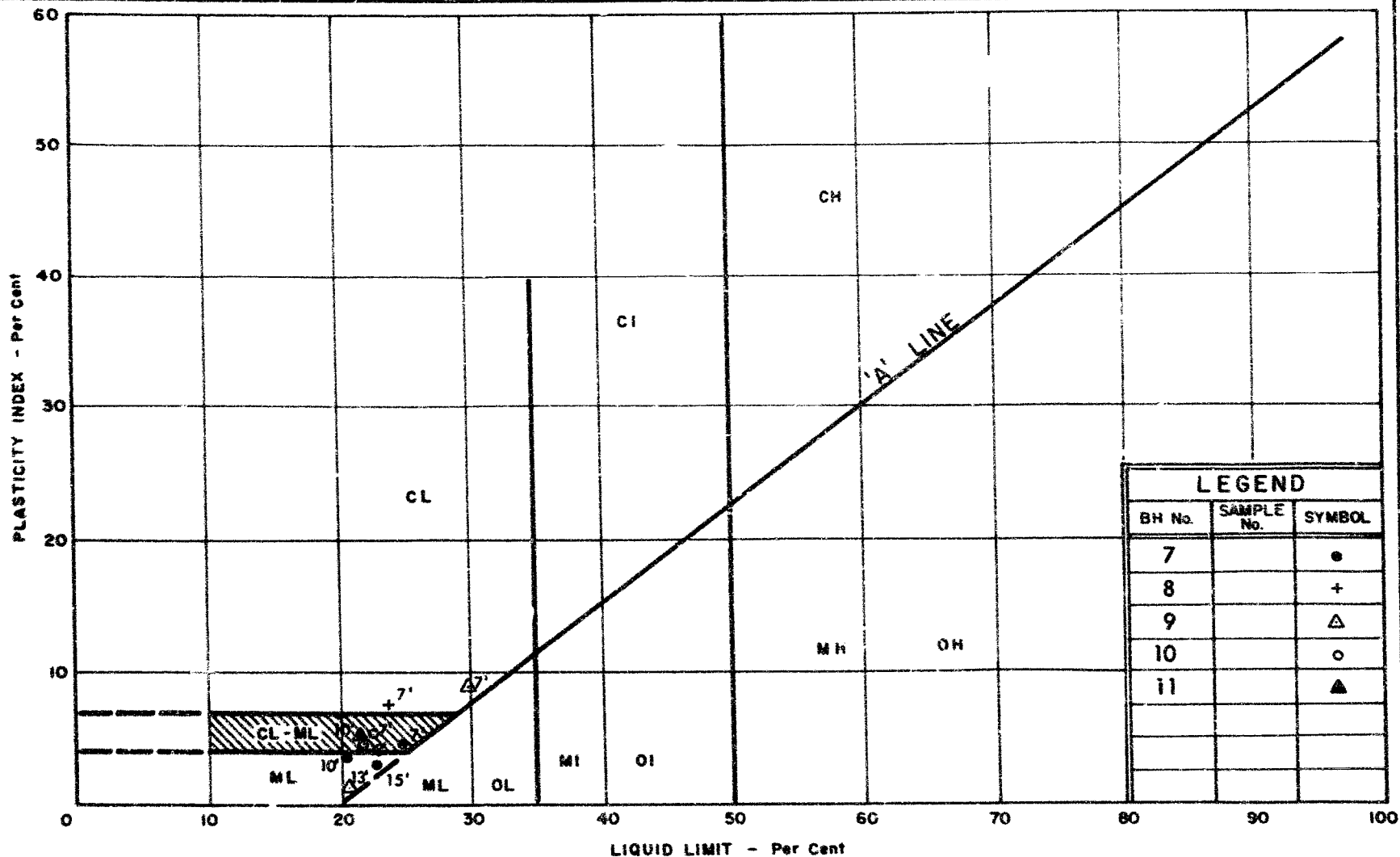


DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART SILT - CLAYEY SILT

W.P. No. 129-65

JOB No. 67-F-7



LEGEND		
BH No.	SAMPLE No.	SYMBOL
7		•
8		+
9		Δ
10		○
11		▲



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART SILT - CLAYEY SILT

WP. No. 129-65
JOB No. 67-F-7

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	CS	DESTERBERG 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

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	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
T_1	SHEAR STRENGTH
c	EFFECTIVE COHESION
ϕ	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	≈ 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

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	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
β	ANGLE OF SLOPE TO HORIZONTAL

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

Mr. B. B. Davis,
Bridge Engineer,
Bridge Division,
Admin. Bldg.

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

DATE: March 29, 1967

Attention: Mr. S. McCombie

OUR FILE REF.

IN REPLY TO:

SUBJECT:

PRELIMINARY
FOUNDATION INVESTIGATION REPORT
For
Proposed Bridge over Eramosa-
(Speed River) Hwy. #25
District #3 (Stratford)
W.J. 67-P-7 -- W.P. 129-65

1. Introduction:

A request for a foundation investigation at the above mentioned site, was contained in a memo, dated February 2, 1967, from Mr. A. P. Watt, Regional Bridge Location Engineer. The site is located 1.0 mile south of Ospringe (about 4.5 miles north of Acton) on Highway 25.

Due to the unusual conditions imposed upon the embankment by the proposed construction of a dam and reservoir downstream of the bridge, computations are not yet available. However, to facilitate the planning for this structure, a brief review of the soil conditions, together with our recommendations for the structure foundations and approach fills, is contained herein. The final report will be submitted when detailed calculations are completed.

2. Subsoil:

Subsoil over the investigated area consists, in general, of about 5.5 to 10 feet of organic material underlain by a variable deposit of layers of clayey silt, silt and silty sand which extends to bedrock at a depth of 11.5 to 20.0 feet.

The upper material has organic contents as high as 63% by weight and is entirely unsuitable for any foundation purposes. The underlying deposit is predominantly silt with numerous layers of clayey silt or silty sand. Shear strength values are quite variable and may be considered somewhat low because of the high silt content of the deposit. Values obtained varied from about 400 p.s.f. to in excess of 2000 p.s.f.

cont'd. /2 ...

March 29, 1967

2. Subsoil: (cont'd.) ...

The bedrock encountered was limestone of the Guelph formation. It was proven in all holes with generally good recovery from AKT coring.

3. Recommendations:

It is proposed to construct either a single-span, low-level bridge or a three-span, high-level bridge. The latter bridge would be required if a dam and reservoir are constructed downstream of the bridge site.

For both proposals, subsoil conditions are not favourable for spread-footing type of foundations. For this reason, it is recommended that the proposed structures be supported on end-bearing piles driven to bedrock. Allowable loads will depend upon the pile section chosen (e.g., 12 BP 74 steel H-piles may be designed for 90 tons per pile).

For the low-level bridge, proposed embankments are to be approximately 16 feet above the existing grade. All organic material should be subexcavated beneath the embankment area and replaced with suitable granular fill beneath the water-table (any other acceptable fill above the water-table) according to D.H.O. Standard DD 406. The slopes may then be constructed without danger of base failure provided that 2:1 slopes are constructed.

For the high-level bridge, proposed embankments are to be approximately 29 feet above the existing grade. All organic material should be subexcavated and replaced as detailed for the low-level bridge. The embankments may then be constructed with 2:1 side slopes. Berms may be required in the longitudinal direction, and will be discussed in detail in the final report.

The detour road should be constructed at least 100 feet from the toe of the proposed embankment.

As an alternative, all the material beneath the embankment down to bedrock, could be subexcavated and replaced with suitable fill as detailed above. Under such conditions, the embankment could be constructed with standard 2:1 slopes or less, depending upon the fill material. As well, it would then be feasible to support the bridge structure on piers founded on sound bedrock where an allowable load of 10 t.s.f. could be used.

cont'd. /3 ...

Mr. B. R. Davis,
Bridge Division,
Attn: Mr. S. McCombie

- 3 -

March 29, 1967

3. Recommendations: (cont'd.) ...

Draw-down conditions in the reservoir could adversely affect the high-level embankments. This will be discussed in detail, in our final foundation report.

The complete foundation report for this project will be forwarded to you as soon as possible. If you have any further queries, or if any of the foregoing requires clarification, please do not hesitate to call us.

LP/MdeF

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

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
A. Gater
J. G. Tillcock
A. P. Watt
J. Roy
B. A. Singh
Foundations Files ✓
Gen. Files

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

Job Name Ennisco Bridge (Steel Deck) TWP. _____
Hwy. No. 225 District (District 100) Region South Western
W.P. No. 129-65 Work Schedule _____ Priority (If Not a W.P.) _____
Date 28 Feb 1967 Date of Previous Request (If Any) _____
Req'd. By M. A. A. A. A. Title Supervisor Section Foundation Section
Signature Foundation Engineer

Future Design Standards

Hwy. Class No. _____ Design Speed _____ Median Width _____ R/W Width _____

Survey Information

Limits of Survey _____

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)

Require Portable location of Stationing for the above mentioned project. One bridge engineer Mr. [unclear] will be on site during the field work. The field work will be completed by the end of the week.

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

cc: Mr. H. Szymanski

Hwy. 401 & Keele St.
Downsview, Ontario.

Materials and Testing Division

February 13, 1967

Dominion Soil Investigation Ltd.,
77 Crookford Blvd.,
Scarborough, Ontario.

Attention: Mr. A. Bonca

Dear Sir:

This is to confirm our request of February 10, 1967,
for the supply of one Diamond Drill, together with all nec-
essary equipment, as specified under the terms of our Contract
Agreement, at Speed River and Hwy. No. 25, near Acton, on
February 14, 1967, at 10:00 a.m.

This project bears Job Number 67-F-7.

Yours truly,

MD/MdeF

cc: Messrs. H. Konings
H. Szymanski
Foundations Files
Gen. Files

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

MEMORANDUM

67-F-7

To: Mr. A. G. Stermac
Principal Foundation Engineer
Lab Building
D O W N S V I E W

From: A. P. Watt

Date: February 2, 1967

Rev'd. Feb. 3, 1967

Our File Ref.

IN REPLY TO

SUBJECT: W.P. 129-65, Bridge Site 35-303,
Eramosa (Speed) River Bridge,
1.0 miles south of Ospringe,
Highway 25,
District 3, Stratford.

Please be advised that the Grand Valley Conservation Authority is planning to build a dam called the Everton Dam on the Eramosa (Speed) River which will effect this site. Attached please find a copy of the General Plan - Everton Dam and Reservoir contained in a report prepared by R. K. Kilborn and Associates, Consulting Engineers for the Grand Valley Conservation Authority. Also please find a copy of the preliminary hydrology report and a copy of a letter from Mr. W. A. Scott, P. Eng. of Kilborn Engineering Limited for your use.

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed two copies of the site plan number E-4394-1 with the probable footing locations marked in red and blue along with two copies of the profile C-347-5 showing the high grade with reservoir and the low grade without reservoir.

Since in the planning of this structure we are making allowance for the Dam and Reservoir, would you kindly consider the structure with footings marked in red and higher grade with reservoir as the major portion of the investigation. Comments on the foundation requirements for the structure marked in blue and the lower grade are required so that the designer may estimate the cost of a structure without reservoir more accurately. The difference in the cost of the two schemes is required to obtain a contribution from the Grand Valley Conservation Authority.

continued...

no

February 2, 1967

Please comment on slope protection of the approach fills under sudden draw-down of the reservoir.

I have also enclosed the preliminary structure site report for your use.

Accommodations may be found at Acton or Guelph, Ontario.



A. P. WATT
REGIONAL BRIDGE LOCATION ENGINEER

AL:igf
ATT:O

c.c. Mr. A. Crowley
Mr. E. Forrest
Mr. E. McCombie

MEMORANDUM

TO: Mr. A.P. Watt,
Regional Bridge Location Engineer,
London Regional Office,
LONDON, Ontario.

FROM: Bridge Division,
Downsview, Ontario.

DATE: October 21, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: Eramosa River, 1 mile South of Ospringe,
Site No. 35-303, W.P. No. 129-65, BW No. 1517,
Highway 25, District No. 3, Stratford.

Preliminary Hydrology Report

The above site has been inspected and the tentative hydrology recommendations are as follows:

Note: This report assumes that the reservoir will be built and recommends that the structure and grade be designed for this condition. The data given for no reservoir is to enable cost comparisons to be made.

Waterway:

- (a) without reservoir; - provide an effective width of 40 to 50 feet, measured at elevation 1232.5.
- (b) with reservoir; - provide an effective width of 60 to 70 feet, measured at elevation 1240.0.

Soffit:

- (a) without reservoir; - elev. 1239.0 to give 3' clearance above the est. HWL of 1236.0.
- (b) with reservoir; - elev. 1258.0 to give 7' clearance for navigation above the controlled W.L. of 1251.0.

Location and Skew:

- (a) without reservoir; - locate at sta. ~~231~~+50 ± at 10° left skew.
- (b) with reservoir; - locate at sta. 202 + 50 ± at 10° left skew; preferably, the structure should be located as close to the existing structure as possible.

203 + 50 ← { proposed
confirmed
as existing.
changed }
202 + 00 ACCEPTABLE June

Foundation:

To be determined when foundation report received.

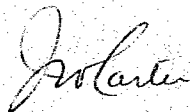
Channelization:

- (a) without reservoir; - some minor diversion work would be required to direct the flow to the structure.
- (b) with reservoir; - pending completion of the Everton reservoir, a new channel both upstream and downstream for a total distance of 1200 + feet will be necessary to suit a structure located at sta. 202 + 50 +.

Rip-rap:

- (a) without reservoir: - place rip-rap to elevation 1237, adjacent to the structure only.
- (b) with reservoir: - refer to letter from Mr. W.A. Scott, P. Eng., Kilborn Engineering, October 7, 1966, which notes rip-rap is required on the embankment slopes.

JWC/aw



J. W. Carter,
for J. D. Harris,
Bridge Hydrology Engineer.

RECEIVED

OCT 27 1966

REGIONAL OFFICE



KILBORN ENGINEERING LTD.

CONSULTING ENGINEERS

October 7th, 1966.

K. M. DEWAR, B.Sc., P.ENG.
PRESIDENT

B. S. CROCKER, M.A.Sc., P.ENG.
VICE-PRESIDENT

J. T. DEW, B.A.Sc., P.ENG.
GENERAL MANAGER

N. FARRAR, B.Sc., P.ENG.
CHIEF MECHANICAL ENG.

36 PARK LAWN ROAD
TORONTO 18, ONTARIO, CANADA
TELEPHONE: AREA CODE 416, 259-9607
TELEX: 02-2765

FILE NO. 734-100

Department of Highways,
335 Saskatoon Street,
P. O. Box 4544,
Postal Station "C",
London, Ontario.

Attention: Mr. R. G. Gascoyne

Re: Speed River Basin Report for the
Grand Valley Conservation Authority

Gentlemen:

We wish to acknowledge receipt of your letter of October 4th, regarding proposed improvements on Highway No. 25 in the Township of Erin. We have reviewed the plans accompanying your letter and we comment as follows:

- a. We agree that the top of the roadway should be 6' above the high water level of 1251 and that the clearance under the structure should be 7' to permit access for boats, etc.
- b. The slopes for any earth embankment should be designed for sudden draw-down conditions in the reservoir and no doubt at the time of reservoir construction, will have to be rip-rap.
- c. Based on our preliminary flow studies, the estimated flows at the dam site are as follows:
Maximum Observed - 2600 cfs
Regional Flood Flow - 6400 cfs
- d. The design flood for the spillway will be 17,000 cfs.

Yours very truly,

KILBORN ENGINEERING LTD.

W. A. Scott
W. A. Scott, P. Eng.



OCT 14 1966

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

RECORDED & INDEXED

WAS:rm

cc: Conservation Authorities
Branch

ACTION SLIP

DATE

April 3, 1967

Marty Devata

A. G. STERMAC

FROM

☐

NOTE AND
FILE

☐

NOTE AND
RETURN TO ME

☐

RETURN WITH MORE
DETAILS

☐

NOTE
AND SEE ME

☐

PLEASE
ANSWER

☐

FOR YOUR
APPROVAL

☐

RETURN WITH YOUR
COMMENTS

☐

PREPARE REPLY FOR
MY SIGNATURE

☐

TAKE APPROPRIATE
ACTION

☐

PER YOUR
REQUEST

☐

FOR YOUR
SIGNATURE

☐

FOR YOUR
INFORMATION

☐

INVESTIGATE AND
REPORT

☐

COMMENTS

I would suggest that
you have the boundaries
of the backfill material
drawn so you could
see better what kind
of material that really

is.

Tom

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
DOWNSVIEW, Ontario.

FROM: J. R. Roy,
Regional Materials Engineer,
London.

DATE: March 30, 1967.

OUR FILE REF.

IN REPLY TO

SUBJECT: - W. P. 128-65, Highway 25, Acton to Osprings,
W. P. 129-65, Eramosa River Structure.

With respect to draw down conditions and low water level at the proposed reservoir at the Eramosa River on Highway 25 the information can be obtained from Mr. W. A. Scott, P. Engr., Kilborn Engineering Limited, 36 Park Lawn Road, Toronto. His telephone number is 259-9607.

The cuts on either side of the proposed causeway are composed of a fine sandy loam till which grades as follows. Borrow would be similar.

F. Gravel	- 5.
Co. & M. Sand	- 13.
F. & V. F. Sand	- 45.
Silt	- 24.
Clay	- 13.

Proctor density tests show:-

Maximum Wet Density - 145.5 lbs. / cu. ft.

Maximum Dry Density - 136.7 lbs. / cu. ft.

Optimum Moisture - 6.4.

Complete gradation is attached.

Backfill to swamp excavation or excavation of other undesirable material would be specified as follows and is available within a mile of the structure.

<u>Sieve</u>	<u>% Passing.</u>
6 inch	100.
4 inch	87 - 100.
1 inch	50 - 100.
No. 4.	20 - 100.
No. 16	10 - 100.
No. 50	5 - 95.
No. 100	3 - 65.
No. 200	3 - 25.
No. 270	0 - 15.

This latter material could be specified for the embankments, however it would be more desirable economically that the embankment be constructed of the sandy loam available in the adjacent areas.

If we can be of any further assistance please advise.



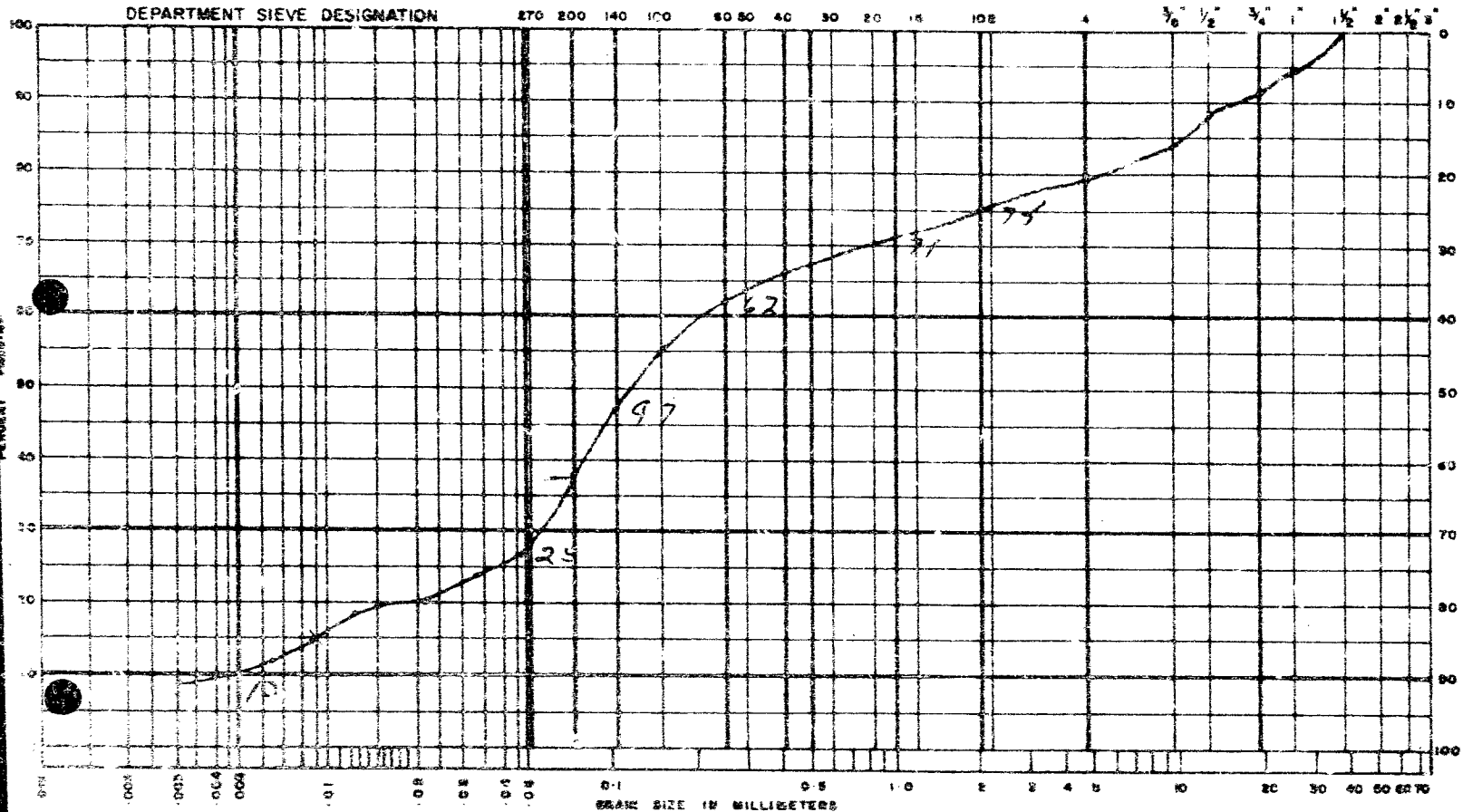
J. R. ROY,
REGIONAL MATERIALS ENGINEER.

JRR:hp.

C.C. - A. E. Irving,
File.

U.S. BUREAU OF SOILS CLASSIFICATION

Clay	Silt	Very Fine Sand	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Gravel
------	------	----------------	-----------	-------------	-------------	-------------	--------



Clay & Silt	25	Sand			47	Gravel		25
		Fine	Medium	Coarse		Fine	Coarse	
UNIFIED SOIL CLASSIFICATION SYSTEM								

UNIFIED SOIL CLASSIFICATION SYSTEM

REMARKS: *See 1/6 c*

DATE: *Dec 1/6 c*

U.S. BUREAU OF SOILS CLASSIFICATION

% FINE GRAVEL 5
 % COARSE AND MEDIUM SAND 13
 % FINE AND VERY FINE SAND 45
 % SILT 24
 % CLAY 13
 % VERY FINE SAND AND SILT 47

LAB. TEXTURAL CLASS. FI-UF SA LG

FIELD TEXTURAL CLASS. BO FI SA LG Till WEI

DENSITY

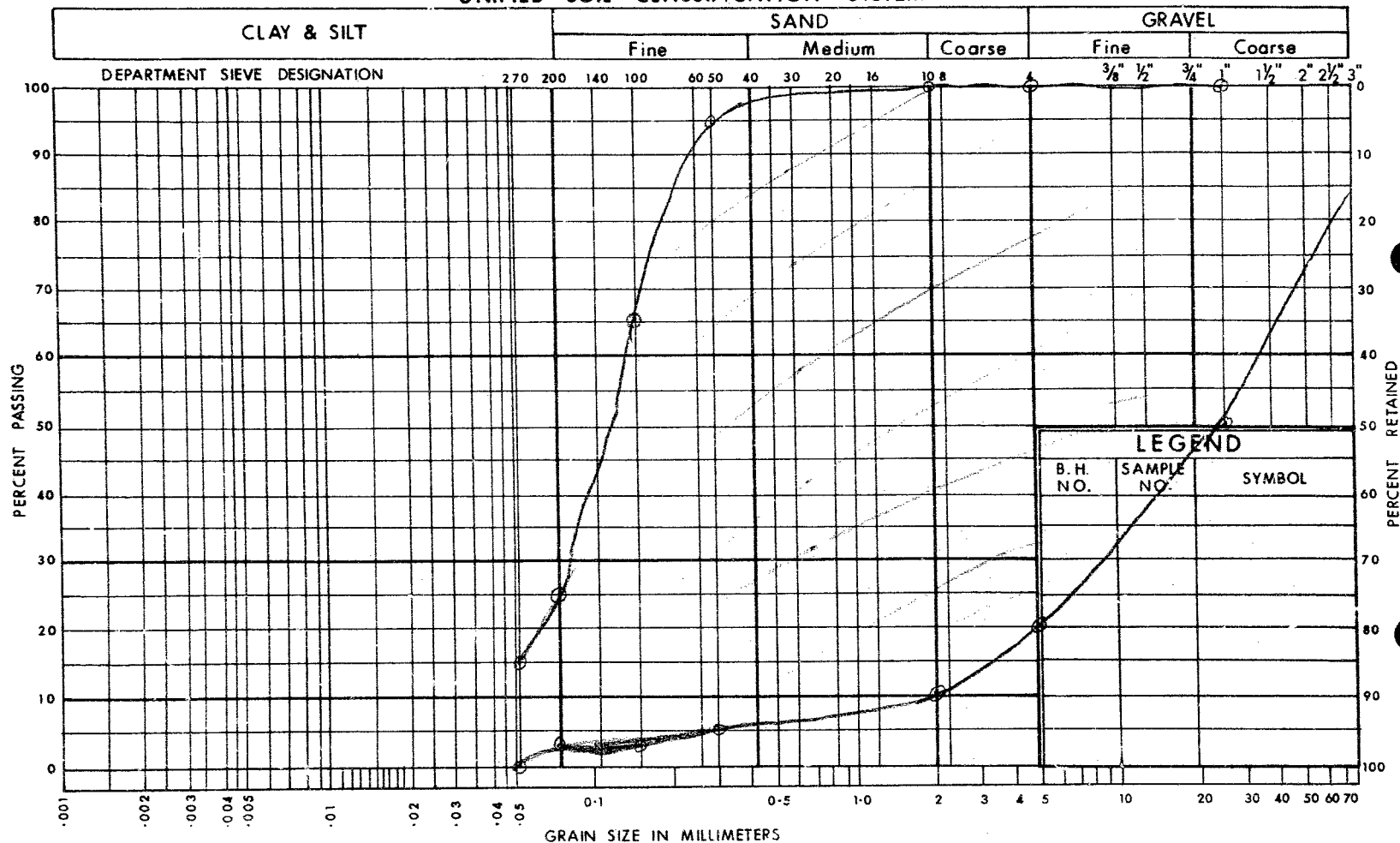
SPECIFIC GRAVITY 2.65
 MAXIMUM WET 141.2 175.5 P.C.F.
 MAXIMUM DRY 131.6 136.7 P.C.F.
 OPTIMUM MOISTURE CONTENT 7.3 6.4 %
 FIELD WET _____ P.C.F.
 FIELD DRY _____ P.C.F.
 FIELD MOISTURE CONTENT 10.5 %
 % COMPACTION _____

UNIFIED SOIL CLASSIFICATION

% PASSING #4 _____
 % PASSING #200 _____
 $C_u = \frac{D_{60}}{D_{10}} =$ _____
 $C_c = \frac{(D_{40})^2}{D_{10} \cdot D_{60}} =$ _____
 LIQUID LIMIT _____ %
 PLASTIC LIMIT _____ %
 PLASTICITY INDEX _____ %
 GROUP SYMBOL _____
 FIELD CLASSIFICATION _____

See 1/6 c

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

ONTARIO

GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No.

MEMORANDUM

To: Mr. T. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
Downsview.

FROM: Materials and Testing,
London.

DATE: December 5, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: - Highway No. 25, W. P. 129-65,
Eramosa River Bridge, 1.0 Miles
South of Highway No. 24.

67-F-7

ATTENTION: Mr. K. Selby.

Attached is the profile for the above site showing the proposed grade and soil boring data along the alignment of the proposed causeway.

As discussed with you the subsoils south of the existing structure are soft and saturated. Investigation of the approach here with regard to stability will likely be required. North of the structure it appears that a dense till will be encountered about 7 feet below ground level.

Structure and causeway details should be obtained from Mr. A. P. Watt, Bridge Location Engineer, London Region.

Although your report for this project is not due until March 22, 1967, an earlier report for our benefit would be appreciated.


J. FORSTER,

JF:hp.

FOR: J. R. ROY,
REGIONAL MATERIALS ENGINEER.

C.C. - W. P. 128-65.

agp

Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

September 5, 1967

Eramosa River Bridge (Speed River)
W.P. 129-65 -- Site No. 35-303
Highway No. 25, Dist. #3 (Stratford)

The Preliminary Bridge Plan Drawing D-6252-F1
for the above mentioned structure has been reviewed.

We have no comments pertaining to structure
foundations.

MD/MdeF

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

cc: Messrs. S. McCombie
A. P. Watt

Foundations Files
Gen. Files

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac,
Principal Foundation Engineer

Mr. A.P. Watt,
Reg. Bridge Location Engineer,
London Regional Office,
London, Ontario

RECEIVED
BRIDGE DIVISION
DOWNSVIEW, ONTARIO
AUG 29 1967

August 29, 1967

Eramosa River Bridge (Speed River)
W.P. 129-65, Site No. 35-303
Highway 25, District No. 3

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-6252-F1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$130,000.
This cost includes tender, materials, engineering and sundry
construction.

Any comments or revisions you may have should be submitted
within three weeks.

CSG:rd

C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. S. McCombie
A. Stermac
R. Forrest
E. Cross



W.1.3.1

KILBORN ENGINEERING LTD.
CONSULTING ENGINEERS

K. M. DEWAR, B.Sc., P.ENG.
PRESIDENT

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VICE-PRESIDENT

J. T. DEW, B.A.Sc., P.ENG.
GENERAL MANAGER

N. FARRAR, B.Sc., P.ENG.
CHIEF MECHANICAL ENG.

36 PARK LAWN ROAD
TORONTO 18, ONTARIO, CANADA
TELEPHONE: AREA CODE 416, 252-1101
TELEX: 02-2765

FILE NO. 813-010

November 7, 1967.

Grand River Conservation Authority,
P. O. Box 134,
Galt, Ontario.

Attention: Mr. I. Kao,
Director of Operations.

Re: Proposed Everton Dam

Dear Sirs:

In reply to your request for comments on the preliminary DHO bridge plan (D-6252 Pl.) in your letter of November 2nd, the details as shown conform to the data supplied by us to the Department in our Hydrology Report dated June, 1967. The information was based on a maximum water surface elevation in the reservoir of 1251.0.

To protect the slopes from scour due to wave run-up by rock rip-rap was proposed for the embankment with the equivalent diameter of 50% of the stones being equal to or greater than 16 in. This protection has been shown on the drawing only in the vicinity of the bridge opening, but should be placed to protect all the embankment fill. Also, the granular material under all of the rip-rap should be a well graded material to act as a filter but this would normally be covered in the specifications.

In the previously mentioned report, a minimum soffit elevation for one span of 1258.0 was requested providing 7 ft of clearance so that small craft operating on the reservoir would have clear passage. This agrees with soffit elevations of 1258.47, 1259.15, 1260.07 and 1260.86 shown on the drawing in red.

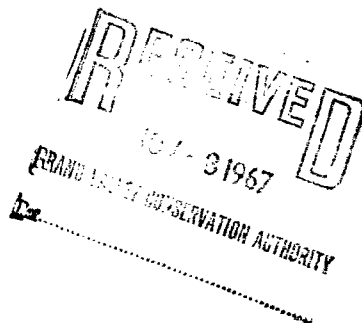
If any further information or comment is required, do not hesitate in contacting us.

Yours very truly,

KILBORN ENGINEERING LTD.

J. D. Jones
J. D. Jones, P. Eng.

JDJ/kf



MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
DOWNSVIEW, Ontario.

From: Mr. J. T. Kernaghan,
Office Project Design Engineer,
Road Design Division,
LONDON REGIONAL OFFICE.

Date: November 24th, 1967.

Our File Ref.

IN REPLY TO

SUBJECT:

Re: W.P. 128-65 Hwy. #23 Dist. #3 Acton to Osprige
Drawdown Conditions on High Level Approach
----- Embankments to Eramosa River Structure -----

This is further to your Foundation Investigation Report for the Eramosa River Bridge W.P. 129-65 in which section 5.4 states that the drawdown conditions for the approach embankments would be fully analysed when all pertinent information became available.

In order that the above analysis may be started we are forwarding the following information:

- (a) One copy of a hydrology report for the Eramosa River Bridge prepared by Kilborne Engineering Ltd. This report recommends 24" of rip rap overlying a 6" pad of crushed stone as embankment protection.
- (b) One copy of the Soils Design Report prepared by the Regional Materials and Testing Office. This report states that earth borrow available for the northern half of the project is a brown fine sandy loam till.
- (c) One print prepared by our road design consultants showing the proposed Eramosa River Bridge embankment details. 24" of rip-rap over 12" of Granular Sand Cushion as protection against drawdown is proposed.

Since our consultants road design completion date is December 6th, 1967 your comments concerning the embankment protection are urgently required.



J. T. Kernaghan,
Office Project Design Engineer.

c. c. A. P. Watt
A. Morrison.

JTK/sl.

Mr. W. Zonnenberg,
Regional Road Design Engineer,
Regional Office,
LONDON.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attn: Mr. J. T. Kernaghan,
Office Project Design Engr.

December 1, 1967

Proposed Structure over Eramosa (Speed) River
Hwy. #25 -- District No. 3 (Stratford)
W.P. 129-65 -- W.J. 67-P-7

Further to your memo dated November 24, 1967, we have reviewed the stability analyses, taking into account the sudden drawdown conditions for the high level approach embankments to the Eramosa River structure with the following assumptions:

i) The embankment fill mainly consists of granular type material as discussed in the Soils Design Report.

ii) The H.W.L. is at elev. 1251 with a maximum 20-ft. drawdown at 5 ft. per day as outlined in the Hydrology Report.

iii) To protect the side slopes from scour, a 24" rock rip-rap over 12" well graded granular filter material is required as per Road Design consultants.

Based on the above information, we conclude that there are no stability problems for the proposed approach embankments with sudden drawdown conditions.

MD/WdeP

cc: Messrs. A. P. Watt
J. Roy

Foundations Files ✓
Gen. Files

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

P.S. -- Soils report and Hydrology report returned herewith.

Department of Highways Ontario

Copy for the information of

M. Devata

Mr. J. H. Roy
Reg. Mat. & Testing Engineer
Materials & Testing
London Regional Office

Mr. J. T. Kernaghan
Office Project Design Engineer
London Regional Office

March 18, 1968.

Re: P.P. 128-65-2, Hwy. 25, Dist. #3,
Acton to Ospringe
Grassed Structure Approaches,
Stability Analysis -----

This is further to our discussions during the
Regional Review of P.P. 128-65-2 concerning Mr.
Devata's conclusions in his letter of December
1, 1967.

Mr. Devata has confirmed that his conclusion of
"no stability problems" is still valid provided
the approach fill consists of a sandy clay loam.
He also explained that in his letter of December
1, 1967 the reference to a "granular type of
material" was used as opposed to a cohesive type
of material.

Since the material available for the approach fills
does fall within the context of Mr. Devata's use
of "Granular" our proposed treatment of the approaches
will remain "as is".



J. T. Kernaghan
Office Project Design Engineer

JTE/ba

cc: A. E. Morrison
W. Westlake
M. Devata

MEMORANDUM

To: Mr. W. Zonnenberg,
Regional Road Design Engineer,
Regional Office,
LONDON.

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

Attn: Mr. J. T. Kernaghan,
Office Project Design Engr.

DATE: December 1, 1967

OUR FILE REF.

IN REPLY TO

SUBJECT: Proposed Structure over Eramosa (Speed) River
Hwy. #25 -- District No. 3 (Stratford)
W.P. 129-65 -- W.J. 67-F-7

Further to your memo dated November 24, 1967, we have reviewed the stability analyses, taking into account the sudden drawdown conditions for the high level approach embankments to the Eramosa River structure with the following assumptions:

i) The embankment fill mainly consists of granular type material as discussed in the Soils Design Report.

ii) The H.W.L. is at elev. 1251 with a maximum 20-ft. drawdown at 5 ft. per day as outlined in the Hydrology Report.

iii) To protect the side slopes from scour, a 24" rock rip-rap over 12" well graded granular filter material is required as per Road Design consultants.

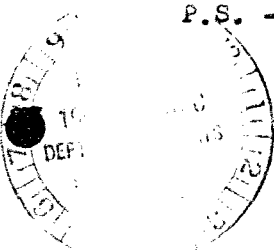
Based on the above information, we conclude that there are no stability problems for the proposed approach embankments with sudden drawdown conditions.

MD/MdeP

cc: Messrs. A. P. Watt
J. Roy
Foundations Files
Gen. Files

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

P.S. -- Soils report and Hydrology report returned herewith.



Mr. W. Zonnenberg,
Regional Design Engineer,
London.

Materials and Testing,
London.

March 26, 1968.

- S.P. 128-65-2, Highway #25,
District #3, Acton to Osprings.

In order to control the type of material placed in the fill approaches to the Eramosa structure to assure that the gradation is similar or better than that assumed for the stability analysis this S.P. is suggested. It should be applied to the Earth Excavation and Earth Borrow items.

"Earth fill placed in the embankment from Station 195 to Station 215, Erin Township shall conform to the following gradation requirements

Pass 6" Sieve - 100%.

Pass #150 Sieve - 3 - 50%.

Pass #270 Sieve - 3 - 35%.

Clay fraction (pass 0.005 Millimeter Sieve)-Maximum 15%".

Material of this nature is found in the adjacent cut
Station 187 to Station 195".

J.R. Roy
J. R. ROY,
REGIONAL MATERIALS ENGINEER.

JRR:hp.
C.C. - H. Devata,
J. McKeown,
File.

004
Department of Highways Ontario

Copy for the information of

Z. Devata

335 Saskatoon Street,
London, Ontario,
March 22, 1968.

Mr. A. R. Morrison, P. Eng.,
Totten, Sims, Hubicki & Associates,
519 Dundas Street, East,
WHITBY, Ontario.

Re: W.P. 128-65-2, Hwy. 25, Dist. #3
Action to Osprings -----

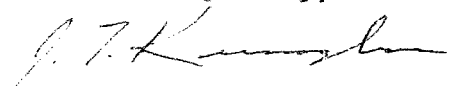
67-1-7²

Dear Sir:

As per our telephone conversation of March 22, 1968 I am returning your field inspection report with our comments marginally noted in red. Please make the necessary changes and return one copy along with the Original Title Sheet for Mr. Sonnenberg's signature; the title sheet will then be returned for printing of the required number of copies.

Also, please be advised that your date for submission of documents to scrutiny is now April 10, 1968. However since we are awaiting information from our Soils Office concerning the need of a sp. prov. to control the type of earth fill used in the "Eramosa" approaches would you please retain your documents until further notice. When available, the soils information will be forwarded for preparation of a special provision.

Yours very truly,



J. T. Kernaghan
Office Project Design Engineer

JEK/ba

cc: J. R. Roy
Z. Devata

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac, Principal Foundation Engineer,

Room 107, Lab. Bldg.

Mr. A.P. Watt,

Reg. Bridge Planning Engineer,

London Regional Office,

London, Ontario

Bridge Office,
Downsview

September 2, 1970

Eramosa (Speed) River Structures

1.0 Miles South of Ospringe

W.P. 128-65-03, Site 35-303

Highway 25, District No. 3

67-F-7

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6860-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$27,000. This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

CSG:rd

C.S. Grabski,
Bridge Design Engineer

Attach.

c.c. S. McCombie

A. Stermac (2)

J. Anderson

MEMORANDUM

CC: FOUNDATIONS FILES

(RM. 110)

To: Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Office,
Admin. Bldg.

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

ATTENTION:

DATE: September 25, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT:

Eramosa (Speed) River Structures
1.0 Miles South of Ospringe
Highway #25 -- District No. 3 -
W.O. 67-11007 -- W.P. 128-65-03

We have reviewed the Preliminary Bridge Plan D-6860-P1 for the above mentioned structures and submit the following comments.

Based on our borehole information, it appears that the excavation for the 2-foot granular cushion beneath the pipe arch will not remove all of the organic material located beneath the structures. This organic material should be excavated to its full extent beneath the proposed structures and the widened portion of the roadway.

MD/MdeF

cc: Messrs. S. McCombie
A. P. Watt

Foundations Files ✓
Gen. Files

M. Devata

M. Devata
SUPERVISING FOUNDATION ENGR.

For:

A. G. Stermac
PRINCIPAL FOUNDATION ENGR.

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: October 6, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT: Eramosa (Speed) River Structure
1.0 Mile South of Ospringe
W.P. 128-65-03, Site 35-303
Highway 25, District No. 3

67-F-7

Attached herewith we are submitting the final
bridge drawings which show the foundation design for
this structure.

Kindly give us your comments at your earliest
convenience.

Walton Li
f C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

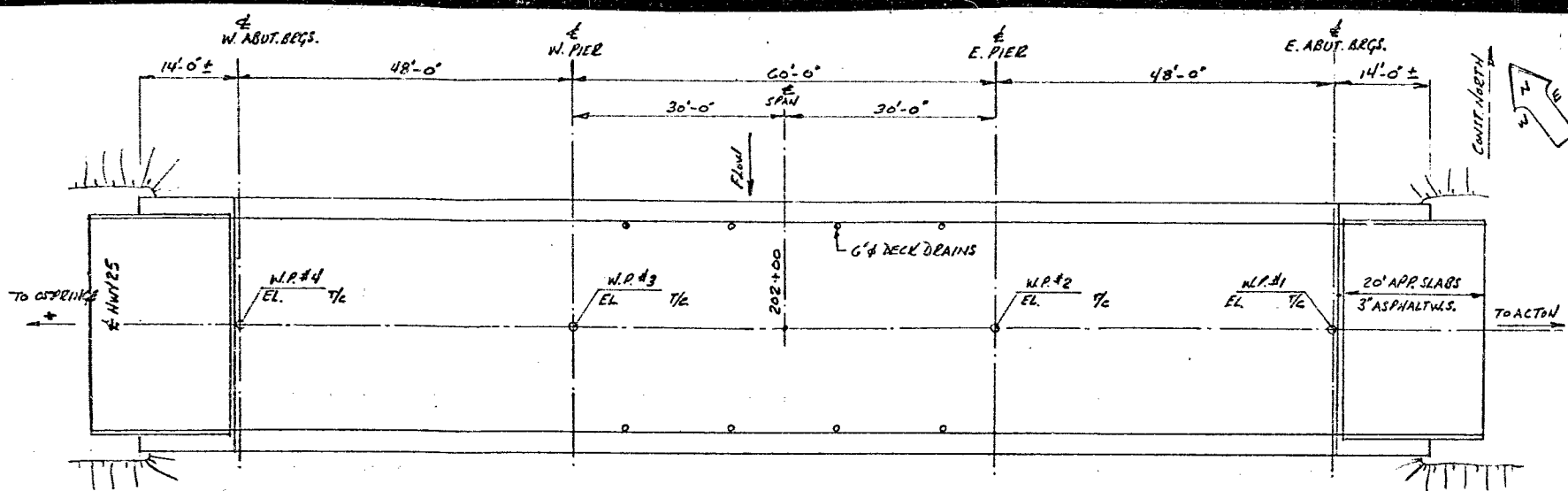
c.c. Foundation Office

Please refer our comments of Sept 25/1970 memo to Mr C.S. Grebski

M. Anonta
Oct 9th 1970

AR

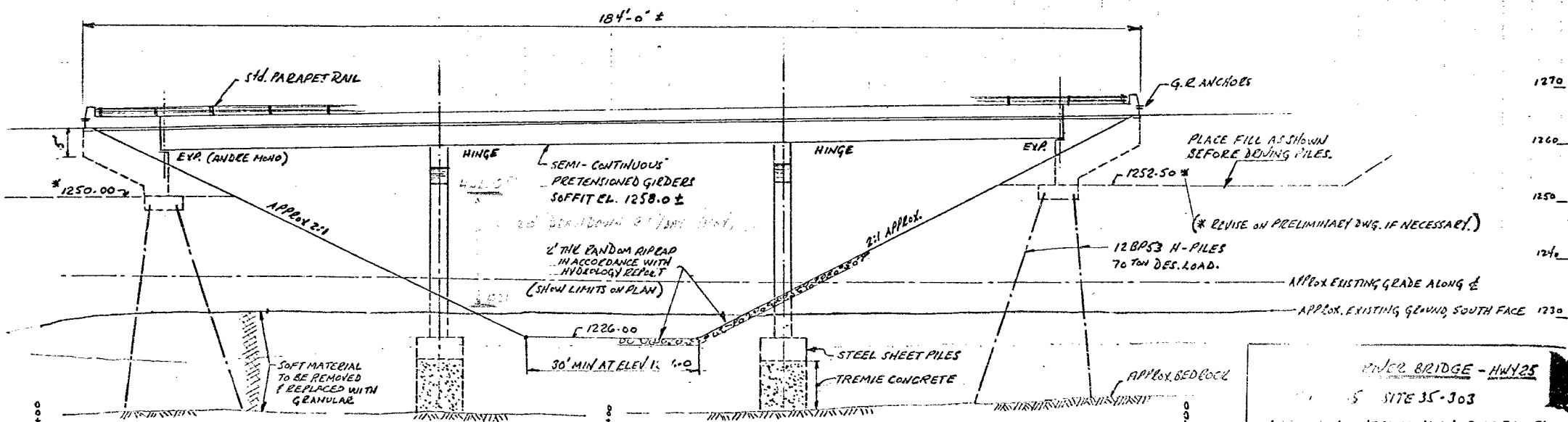
67-F-7



SHOW TO OF SLOPE & LIMITS OF R/P-RAP

PLAN
1" = 20'

W.P. DENOTES WORKING POINT
T/C " TOP OF CONCRETE RIDING SURFACE ON STRUCTURE.



ELEVATION 1" = 20'

BRIDGE - HWY 25
SITE 35-303
PRELIMINARY, DG252-PI
JUL 12/1/67