13-70-03

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division,
Admin. Bldg.

Attention: Mr. S. McCombie

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

Date: January 11, 1968

Our File Ref.

In reply to

JAN 19 1968

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Credit River Structure
Hwy. #10 & #24; Orangeville By-Pass
District No. 3 (Stratford)
W.J. 67-F-109 -- W.P. 274-66-01

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

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

A. C. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
W. Zonnenberg
J. G. Tillcock
A. P. Watt
J. Roy
B. A. Singh

Foundations Files
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed Credit River Structure
Hwy. #10 & #24; Orangeville By-Pass
District No. 3 (Stratford)
W.J. 67-F-109 -- W.P. 274-66-01

1. INTRODUCTION:

A request for a foundation investigation at the crossing of the proposed Orangeville By-Pass (Hwy. #10 & #24) and the proposed Credit River Diversion, was received from Mr. A. P. Watt, Regional Bridge Location Engineer, in a memorandum, dated November 21, 1967.

A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations.

2. DESCRIPTION OF THE SITE:

The proposed structure site is located on the proposed Orangeville By-Pass (Hwy. #10 & #24) at Credit River, in the Town of Orangeville. The surrounding area is flat and swampy at the immediate vicinity, and bush-covered.

Physiographically, the site is located in the region referred to as the Hillsburg Sand Hills. Rough topography, sandy material and flat-bottom swampy valley are the outstanding characteristics.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of four boreholes and ten dynamic cone penetration tests was carried out during the course of the field investigation. Boring was achieved by means of conventional diamond drilling

cont'd. /2 ...

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES: (cont'd.) ...

equipment adapted for sampling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler and the energy used in driving it, conformed to the requirements of the Standard Penetration Test. Dynamic cone penetration tests were carried out adjacent to each borehole and at six other locations. Driving energy to advance the cone was 350 ft.-lbs. per blow. In-situ vane tests were carried out on a few occasions, at elevations 12 inches below the various sample depths.

The locations and elevations of all boreholes are shown on Drawing No. 67-F-109A, which accompanies this report.

Samples were visually examined and classified at the site as well as in the laboratory. Certain tests were carried out in the laboratory for classification purposes. These tests consisted of Atterberg limits, natural moisture content, grain-size distribution and organic content determinations. The test results are shown on the Record of Borehole sheets in the Appendix of this report.

4. SOIL TYPES AND SOIL CONDITIONS:

4.1) General:

The subsoil at the site consists of about five different deposits. The boundaries of the different deposits are shown on the accompanying Record of Borehole sheets. The estimated stratigraphical profile shown on Dwg. No. 67-F-109A, is based upon this information. From ground level downwards, the various soil types are as follows:

4.2) Muck:

This deposit was observed in all boreholes, and extends from ground level to about El. 1332. The thickness varies from 3 ft. to 7 ft. The material consists mainly of black-coloured decayed and undecayed organic substances. The consistency may be described as very soft. The organic content was found to range from 17% to 64%.

cont'd. /3 ...

4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.3) Silty Sand to Sandy Silt (Grey):

This stratum was found to underlie the muck deposit in all boreholes, and varies in depth from about 2 ft. to 8 ft. The maximum thickness occurs in Borehole #7, being about 8 ft.

The material consists of silt and sand in varying proportions and traces of clay. The colour of the deposit is grey. The obtained 'N' values ranged from 5 to 14 blows per foot. In Borehole #7, occasional clayey silt layers were encountered within this deposit.

4.4) Clayey Silt to Silt:

This deposit was encountered in B.H.'s #1 and #3 and underlies the silty sand to sandy silt zone. The lower boundary was found to be at approx. El. 1327.

The material consists mainly of silt and clay, with traces of fine sand. Based on field vane test measurements, the consistency may be described as soft to firm.

4.5) Gravelly Sand:

This deposit was encountered at all borehole locations between approx. El. 1325 and El. 1328. The chief components were found to be sand and gravel with some fines. The relative density may be described as compact to dense.

4.6) Sandy Silt to Silty Sand (Brown):

This stratum underlies the gravelly sand material in all boreholes. The lower boundaries were not determined since the borings were terminated in this layer which extends below El. 1268.

The material is predominantly non-cohesive and consists mainly of silt and sand with traces of clay. Typical grain-size distribution curves are included in the Appendix of this report. The natural moisture content was found to vary between 18% and 27%. The relative density of the deposit may be described as compact to very dense, the 'N' values being in the order of 12 to 71 blows per foot.

cont'd. /4 ...

5. GROUNDWATER CONDITIONS:

The groundwater levels were found to be at or a few inches below the existing ground level during the field investigation.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a single-span structure at the crossing of the proposed Credit River Diversion and the proposed Orangeville By-Pass.

The proposed finished grade elevation will be at El. 1349, and the diverted stream bed at El. 1336.5.

The subsoil at the site consists of muck, followed by silty sand to sandy silt and clayey silt to silt, followed by gravelly sand, followed by an extensive compact to very dense sandy silt to silty sand. For detailed information, see section headed: "Soil Types and Soil Conditions". To achieve a safe bearing capacity of about 2.0 t.s.f., assuming a safety factor of 3.0, the excavation for a spread footing type foundation would have to be carried down to approx. El. 1326, which is considered to be uneconomical. The observed high groundwater level would complicate matters during construction.

In view of the foregoing, it is recommended that the proposed structure be supported on 25-ft. long No. 14 timber piles driven into the denser sandy silt to silty sand stratum where a safe design load of 25 tons per pile could be achieved. The pile driving should be controlled by means of the Hiley Formula according to D.H.O. Standards DD 1218 and 1219.

Prior to construction of any type of bridge or culvert, it is recommended that the organic soil which forms the surface deposit, be completely removed and replaced with suitable granular fill over the entire area of the structure and approaches. Since the present field investigation covers only the section of highway between Sta. 634+63 and Sta. 636+64, it is recommended that further field work be carried out by the Regional Materials Engineer to determine the full extent of the required subexcavation.

cont'd. /5 ...

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

As an alternative, the proposed structure may consist of a concrete box type culvert or a flexible pipe arch culvert. Both of these structures should be supported on a granular pad of minimum thickness 2.0 ft., and should be constructed according to the pertinent D.H.O. Standards. If either of these types of structure is decided upon, it is recommended that the above mentioned subexcavation and backfilling be completed to ground level, then re-excavated to the elevation of the base of the culvert bed. This will result in consolidation and hence strengthening of the underlying loose to compact sand and silt layers. The material in the 2-ft. thick bed of the pipe should consist of granular backfill compacted in 6-inch layers.

In order to properly compact the culvert bed, it is necessary to carry out this work in the dry. To accomplish this, a dewatering scheme will be required. Two methods are suggested:

A.) Vacuum Wellpoints:

Since the gravelly sand and the sandy silt to silty sand materials are sufficiently free-draining, wellpoints may be installed around the periphery of the structure excavation. The tips should penetrate into the pervious gravelly sand material, and should be also at least 4 ft. below the base of the culvert bed. The system must be kept in operation until the backfilling, compaction and placing of concrete is completed.

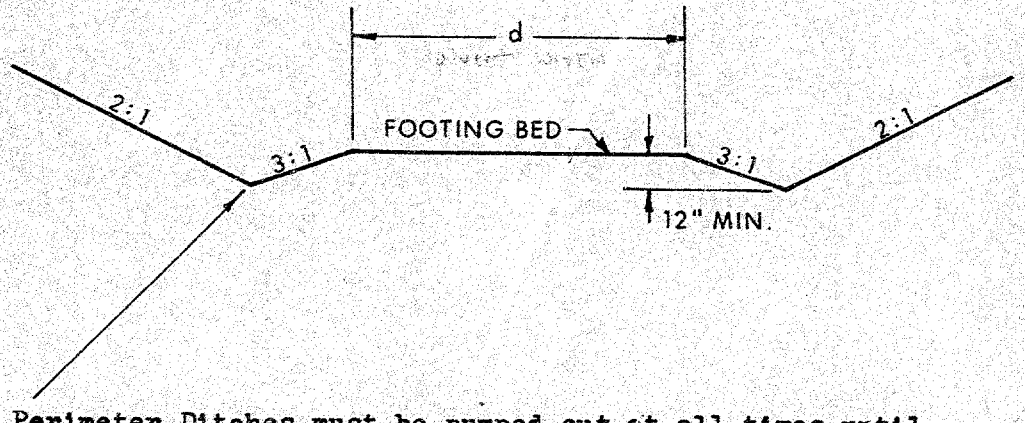
B.) Oversize Excavation:

An undisturbed and dry excavation base can be exposed with an oversize excavation as illustrated on the sketch on the following page. This method would involve an initial gradual pumping, with final pumping confined to the shallow ditches around the bottom of excavation. The rate of pumping should be such that the sides of the excavation do not slough in.

cont'd. /6 ...

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

No stability problems are anticipated for the proposed 10-ft. high approach embankments, provided all the soft organic material is removed completely and replaced with suitable fill. Standard 2:1 slopes are recommended.



Perimeter Ditches must be pumped out at all times until footing placed.

d = culvert width

cont'd. /7 ...

7. SUMMARY:

A foundation investigation at the crossing of the proposed Orangeville By-Pass (Hwy. #10 & #24) and the proposed Credit River Diversion is reported.

Subsoil at the site investigated was found to consist of muck, followed by silty sand to sandy silt and clayey silt to silt, followed by gravelly sand, followed by sandy silt to silty sand.

The groundwater level was found to be at ground level.

Three types of structure have been considered:

1.) Single-span bridge; supported on 25-ft. long #14 timber piles. A safe load of 25 tons per pile may be used for design purposes.

2.) Concrete Box type culvert.

3.) Flexible pipe arch culvert.

The culverts should be supported on a minimum 2.0 ft. thick well compacted granular pad.

All the soft organic soil should be removed within the entire construction area, and replaced with suitable fill.

A proper dewatering scheme will be required.

No stability problems are anticipated for the side slopes of the 10-ft. high approach fill if the recommendations are followed.

Details are given in the foregoing section: "Discussion and Recommendations".

cont'd. /8 ...

8. MISCELLANEOUS:

The field work was carried out during the period November 26 to December 5, 1967. Equipment used was owned and operated by Canadian Longyear Limited.

The supervision of the field work, together with the preparation of this report, was carried out by Mr. P. Payer, Project Foundation Engineer. The report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

January, 1968.

APPENDIX I.

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 636 + 15; o/s 60' Rt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE November 27 & 28, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Washbore - NX & BX Casing CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	REMARKS
1339.4	Ground Level					
0.0	Muck-Black, decayed & undecayed. Organic substances.		1	SS	1½	Gr.Sa.Si.Cl
1332.3	Very soft.		2	SS	2½	
7.1	Silty sand.					0 87 (13)
1330.0	Very loose.		3	SS	4	
9.4	Clayey silt to silt.					0 2 79 19
1327.3	Soft		4A	SS	21	
12.1	Gravelly sand.		5	SS	31	
1324.7	Compact.		6	SS	21	
14.7	Sandy silt to silty sand with traces of clay. Compact to very dense.		7	SS	17	0 54 39 7
			8	SS	19	
			9	SS	12	
			10	SS	31	
			11	SS	17	
			12	SS	29	
			13	SS	26	
			14	SS	71	0 0 96 4
			15	SS	32	
			16	SS	19	
1279.4						
60.0	End of Borehole					

ELEV. SCALE: 1330, 1320, 1310, 1300, 1290, 1280

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 25, 50, 75, 100, 125
SHEAR STRENGTH P.S.F. + Field Vane: 1000, 2000
+S=2.5
End of Cone Test

LIQUID LIMIT ——— w_L
PLASTIC LIMIT ——— w_P
WATER CONTENT ——— w
WATER CONTENT %: 10, 20, 30

BULK DENSITY P.C.F.

▽ W.L.

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 84; o/s 78' Rt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Nov. 29, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1339.0	Ground Level									
0.0						1330				
						1320				
						1310				
1302.0							End of cone test.			
37.0	End of Borehole					1300				

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 60; o/s 24' Rt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Nov. 29 & 30, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Washbore - NX & BX Casing CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
1339.0	Ground Level				
0.0	Muck - Black				
1334.5	Very soft		1	SS	1
4.5	Silty sand.		2	SS	5
1331.7	Loose.		3	SS	5
7.3	Clayey silt to silt, with traces of sand.		4	TW	PM
1326.8	Soft to firm.				
12.2	Gravelly sand.		4A	SS	23
1324.0	Compact.				
15.0	Sandy silt to silty sand with traces of clay. Compact to dense.		5	SS	41
			6	SS	31
			7	SS	23
			8	SS	22
			9	SS	39
			10	SS	50
			11	SS	25
1267.5			12	SS	18
71.5	End of Borehole				

ELEV. SCALE: 1330, 1320, 1310, 1300, 1290, 1280, 1270

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 25 50 75 100 125
SHEAR STRENGTH P.S.F. — + Field Vane — 1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
w_P w w_L
WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.

REMARKS

Gr.0,Sa.51 Si.45,Cl.3
Gr.26,Sa.63 Si.&Cl.11
Sa.11,Si.81 Cl.8
Gr.0,Sa.0. Si. 93,Cl.7

FORM OB-MT-126
66-4846

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 91; o/s 16' Rt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Nov. 30, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
1339.0	Ground Level									
0.0						1330				
						1320				
						1310				
1302.1										
36.9	End of Cone Test					1300				

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 65; o/s 30' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE December 1, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Washbore - NX & BX Casing CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
1339.0	Ground Level				
0.0 / 1336.2	Muck - Black Soft		1	SS	6
2.8	Sand to silty sand. Loose to compact with layers of clayey		2	SS	12
			3	SS	5
1328.1	silt. Grey & Brown.		4	SS	6
10.6 / 1325.7	Gravelly sand Compact to dense		5	SS	44
			6	SS	26
13.3	Sandy silt to silty sand with traces of clay. Compact to dense.		7	SS	10
			8	SS	22
			9	SS	17
			10	SS	24
			11	SS	26
			12	SS	24
			13	SS	45
			14	SS	19
1286.5			15	SS	43
52.5	End of Borehole				

ELEV. SCALE: 1330, 1320, 1310, 1300, 1290, 1280

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 25 50 75 100 125
SHEAR STRENGTH P.S.F.

LIQUID LIMIT ——— w_L
PLASTIC LIMIT ——— w_P
WATER CONTENT ——— w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY P.C.F.

REMARKS
Gr.27,Sa.2
Si.43,Cl.6
Gr.0,Sa.37
Si.57,Cl.6

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 43; o/s 70' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Dec. 4, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 70 100 125 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
1339.4	Ground Level									
0.0						1330				
						1320				
						1310				
						1300				
1289.4						1290				
50.0	End of Cone Test									

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 13; o/s 57' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Dec. 4, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE WASHBORE - BX & NX Casing CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
1339.2	Ground Level					
0.0 / 1336.2	Muck V. Soft		1	SS	1½	
3.0	Sandy silt, occ. layers of clayey silt Loose to compact.		2	SS	14	
			3	SS	14	
			4	SS	8	1330
1328.2			5	SS	22	
11.0 / 1325.7	Gravelly sand Compact		6	SS	17	
13.5	Sandy silt to silty sand with traces of clay. Compact to dense.		7	SS	22	
			8	SS	25	1320
			9	SS	18	
			10	SS	31	
			11	SS	19	1310
			12	SS	49	
1298.2						1300
41.0	End of Borehole					1290

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
25 50 75 100 125
SHEAR STRENGTH P.S.F.

LIQUID LIMIT ——— w_L
PLASTIC LIMIT ——— w_P
WATER CONTENT ——— w
w_P w w_L
WATER CONTENT %
10 20 30

BULK DENSITY
P.C.F.

REMARKS

Gr.0,Sa.32
Si.61,Cl.7

Gr.11,Sa.11
Si.71,Cl. 7

Gr.0,Sa. 1
Si.90,Cl.9

Gr.0,Sa.27
Si.71,Cl.2

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 635 + 34; o/s 18' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Dec. 5, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test only CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT
1339.0	Ground Level				
0.0					
1306.0					
33.0	End of Cone Test				

ELEV. SCALE: 1330, 1320, 1310, 1300

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
25 50 75 100 125
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY P.C.F.

REMARKS

SUPER IMPOSED DOCUMENTS MAY APPEAR AS MULTI-FILED ON FILM

FORM OS-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 634 + 63; o/s 61' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Dec. 5, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
1339.0	Ground Level									
0.0						1330				
1319.0						1320				
20.0	End of Cone Test					1310				

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 10

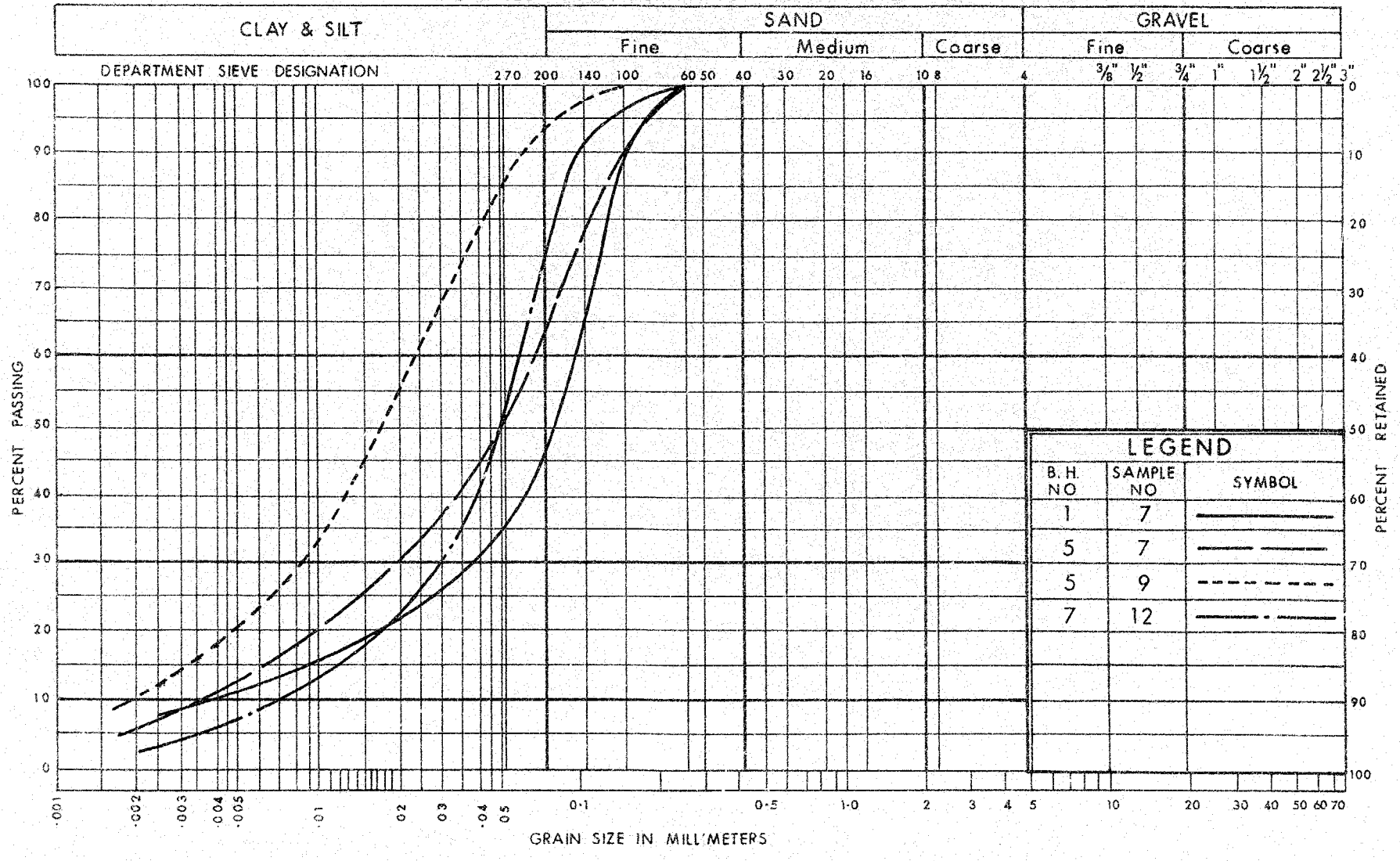
FOUNDATION SECTION

JOB 67-F-109 LOCATION Sta. 636 + 64; o/s 3' Lt. ORIGINATED BY PP
W.P. 274-66-01 BORING DATE Dec. 5, 1967 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test only CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
1339.0	Ground Level									
0.0						1330				
1319.0						1320				
20.0	End of Borehole					1310				

FORM OB MT-17
REV. APR. 1965

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

SILTY SAND TO SANDY SILT

W.P. No. 274-66-01

JOB No. 67-F-109

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
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

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	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
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
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 (YOUNGS 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_o	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

401 & Keele Street
Downsview, Ontario

November 24, 1967

Canadian Longyear Limited
35 Brydon Drive
Rexdale, Ontario

Dear Sirs:

This is to confirm our request of November 24, 1967 for the supply of a Diamond Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at 10.a.m. November 27, 1967 at Orangeville, Ontario.

This project bears Job Number 67-F-109.

Yours truly,

K. G. Selby

KGS:mt

K. G. Selby
Supervising Foundation Engineer
for: A. G. Sterman
Principal Foundation Engineer

Aug 1/68

Credit River Br. W.J 67-F-109

Hwy 10 & 24 12'10" - 8'4"

W.P. 274-66-01

Corrugated Pipe

4-7' much sand to silty sand
sandy silt to silty sand } gravel

Excavate much & backfill

Q: What period should be accepted for the proposed staging?

A.: As long as possible
Six months would be fine

Note: The material being granular it could be even less than 6 months

Department of Highways Ontario
Copy for the information of
Foundation Section

Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Building

Bridge Division,
Downsview, Ontario

November 19, 1968

Credit River Structure
Orangeville By-pass
W.P. 274-66-01, Site 4-143
Hwys. 10 & 24, District 3

67-F-109

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.

CSG:rd

C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. Foundation Section

No comments.
PP.
Dec. 2/68.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
Attention: Downsview.

From: Mr. D. A. Sutherland,
Advance Program Engineer,
Downsview.

Date: August 6, 1968.

Our File Ref:

In reply to

Subject: W. P. 274-66-1 - Credit River Bridge - Highway 10
Orangeville Diversion - District 3 - Stratford.

67-F-109

It has been brought to our attention that a twin multi-plate arch culvert has been recommended for the above location which will require excavating, backfilling and surcharging in advance of placing the culverts.

Would you at your, earliest convenience, supply me with a sketch and a cost estimate of the work involved, so that we may consider programming it as a separate project, in advance of placing the culverts under W. P. 5-66-00.

DAS/ld

D. A. Sutherland,
Advance Program Engineer.

Some necessary information by phone call

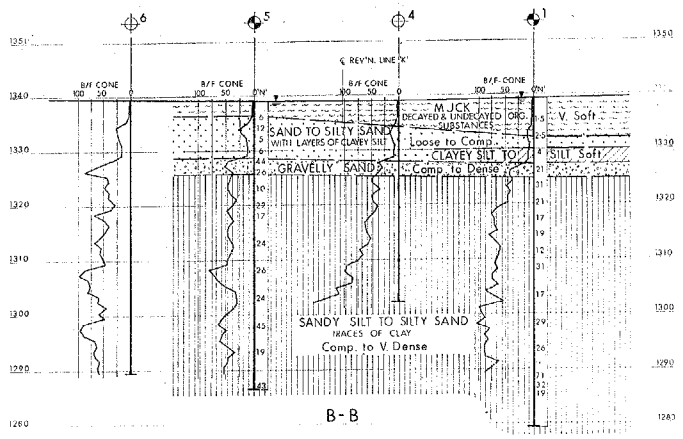
#67-F-109

W.P.#274-66-01

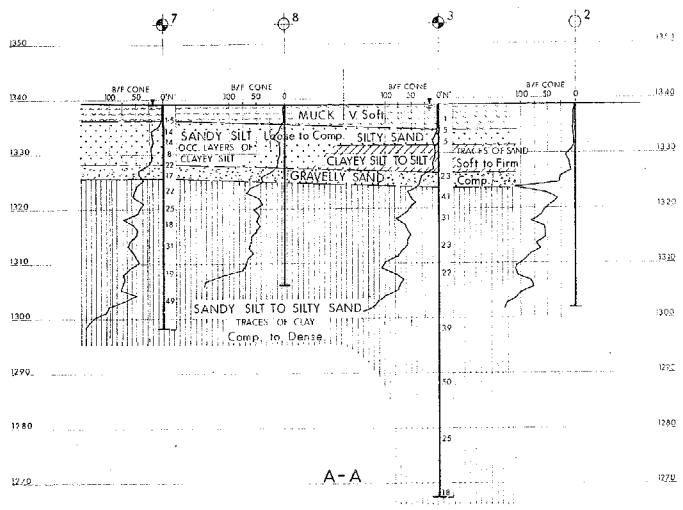
HWY. #10 & 24

CREDIT RIVER

STRUCTURE



B-B



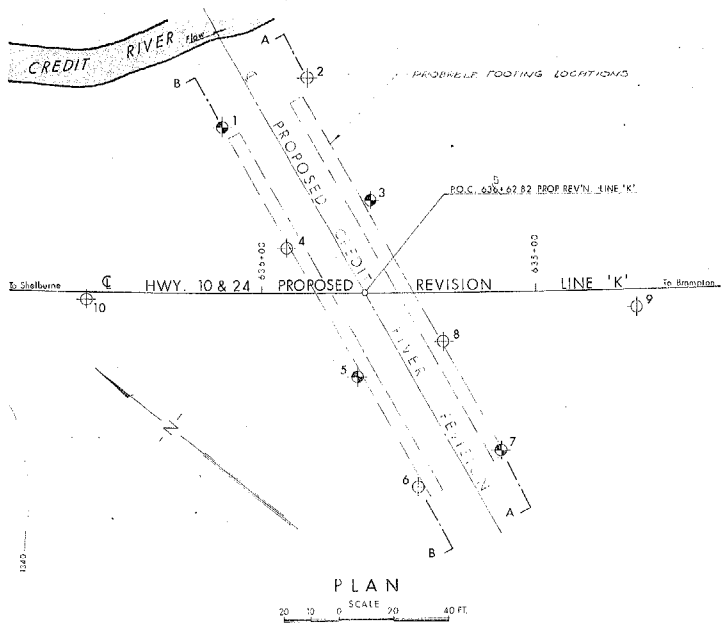
A-A

SECTIONS

SCALE

VERT. 10 5 0 10 20 FT.

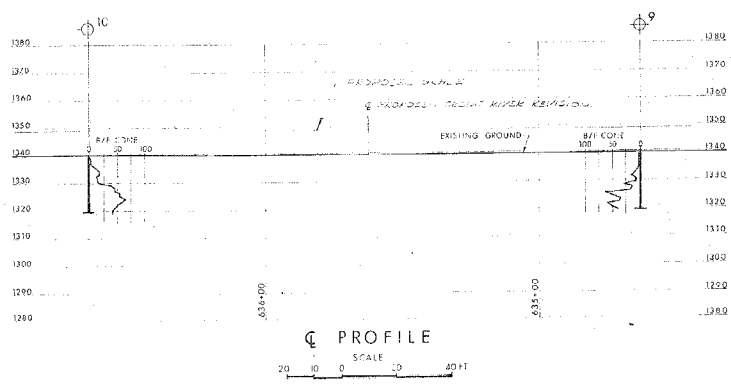
HORIZ. 20 10 0 20 40



PLAN

SCALE

20 10 0 20 40 FT.

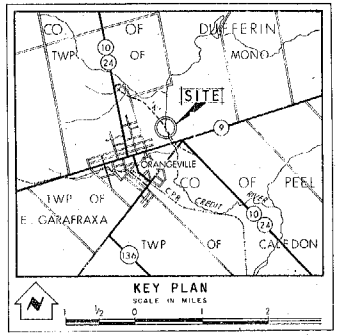


℄ PROFILE

SCALE

20 10 0 20 40 FT.

REF. NO. E 4814-1



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. NOV. 1967

NO.	ELEVATION	STATION	OFFSET
1	1339.4	636+15	60' RT.
2	1339.0	635+94	78' RT.
3	1339.0	635+60	24' RT.
4	1339.0	635+91	16' RT.
5	1339.0	635+65	30' LT.
6	1339.4	635+43	20' LT.
7	1339.2	635+13	57' LT.
8	1339.0	635+34	18' LT.
9	1339.0	634+63	6' LT.
10	1339.0	636+64	3' LT.

- NOTE -

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

REVISIONS			
	DATE	BY	DESCRIPTION

PRINT RECORD

NO.	FOR	DATE

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CREDIT RIVER

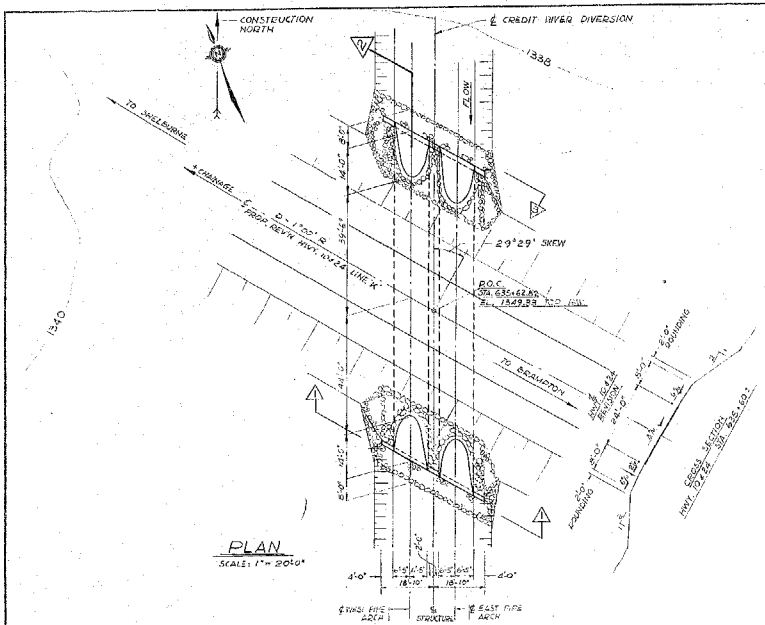
KING'S HIGHWAY NO. 10 & 24 LINE 'K' DIST. NO. 3

CO. DUFFERIN

TWP. MONO LOT 1 CON. 1WHS

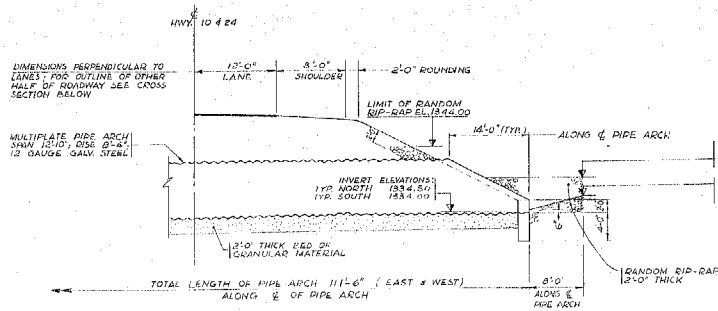
BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. P.P.	CHECKED	W.P. NO. 274-66-01	M.B.T. DRAWING NO. 67-F-109A
DRAWN S.O.	CHECKED	JOB NO. 67-F-109	
DATE 17 JAN. 1968		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT. NO.	



PLAN

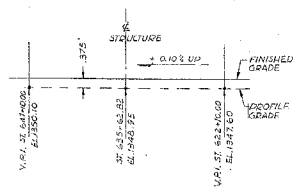
SCALE: 1" = 20'-0"



SECTION 2

TO ℄ HWY. 10 & 24

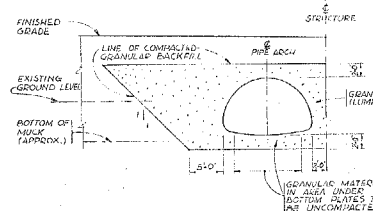
N.T.S.



PROFILE

AT ℄ HWY. 10 & 24 REVISION

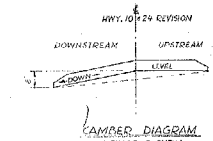
N.T.S.



MINIMUM GRANULAR BACKFILL

HALF SECTION PERPENDICULAR TO ℄ OF STRUCTURE.

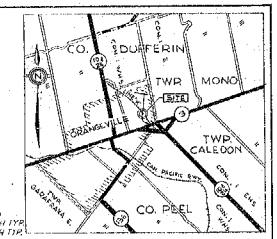
SCALE: 1/8" = 1'-0"



CAMBER DIAGRAM

BEFORE BACKFILL

N.T.S.



KEY PLAN

SCALE: 1" = 1 MILE

G.B.M. № 1714 EL. 1406.113

FUNDAMENTAL BENCH MARK IN MEMORIAL PARK 115.0' SOUTH OF SOUTHERLY LIMIT OF FIRST AVE. & 168.0' EAST OF EASTERLY LIMIT OF SECOND ST. TABLET ON TOP OF PIER 'ORANGEVILLE'

NOTES

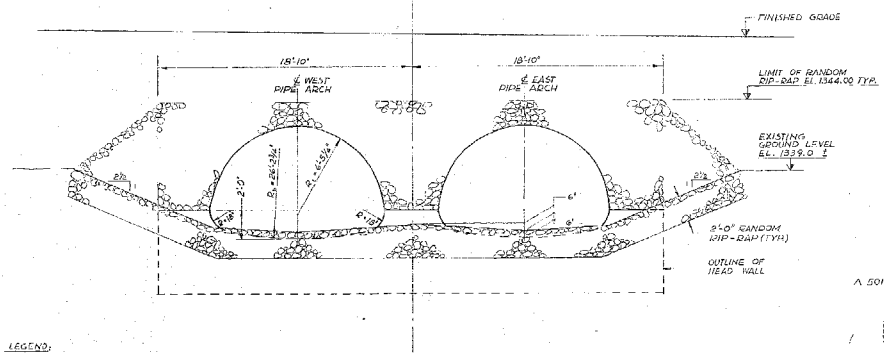
CLASS OF CONCRETE : 3000 P.S.I.

COVER FOR REINFORCING STEEL: 3"

PIPE ARCHES TO BE INSTALLED ACCORDING TO CAMBER DIAGRAM SHOWN ABOVE

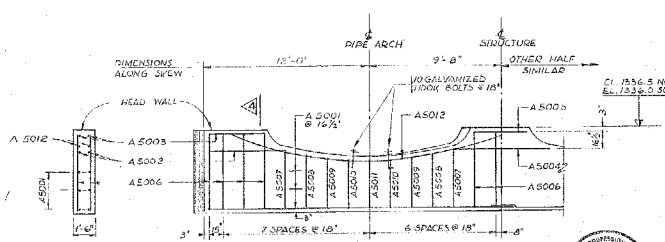
LIST OF DRAWINGS

D-6437-1	GENERAL ARRANGEMENT
D-6437-2	BORE HOLE LOCATIONS AND SOIL STRATA



SECTION 1

SCALE: 1/2" = 1'-0"



STEEL SHOWN, TYPICAL EACH FACE

SECTION 3

TYPICAL N. & S.

SCALE: 1/2" = 1'-0"

SECTION 4

LEGEND:

R_B - RADIUS AT BOTTOM

R_T - RADIUS AT TOP

R - RADIUS AT CORNERS

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DEPARTMENT OF HIGHWAYS ONTARIO

BRIDGE DIVISION

67 F 109

CREDIT RIVER STRUCTURE

ORANGEVILLE BY-PASS

KING'S HIGHWAY No. 10 & 24 DIST. No. 5

CO. DUFFERIN

TWP. MONO LOT 1 CON. 1 W.H.S.

GENERAL ARRANGEMENT

APPROVED _____ BRIDGE ENGINEER

DESIGN	R.S.R.	CHECK	J.L.K.
DRAWING	H.M.	CHECK	D.C.
DATE	NOV. 1988	LOADING	MS 20-44

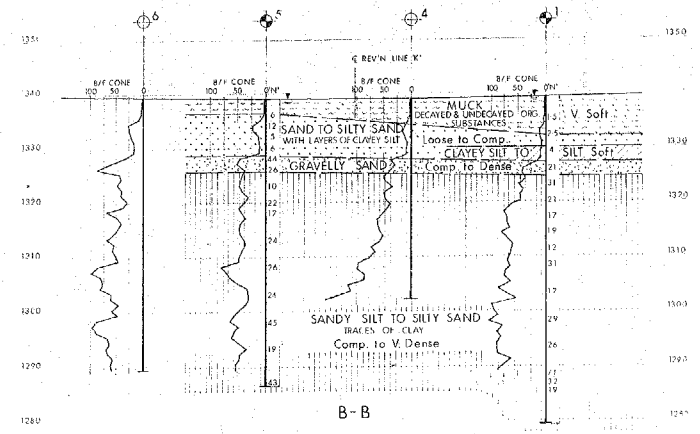
SITE No. 4-143 W.P. No. 74-60-01

CONTRACT Nos.

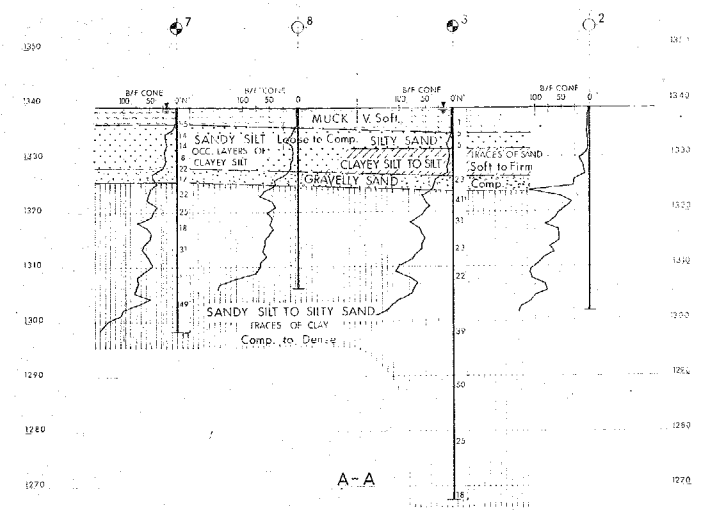
DRAWING No. D-6437-1

R. S. PEEL

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO



B-B



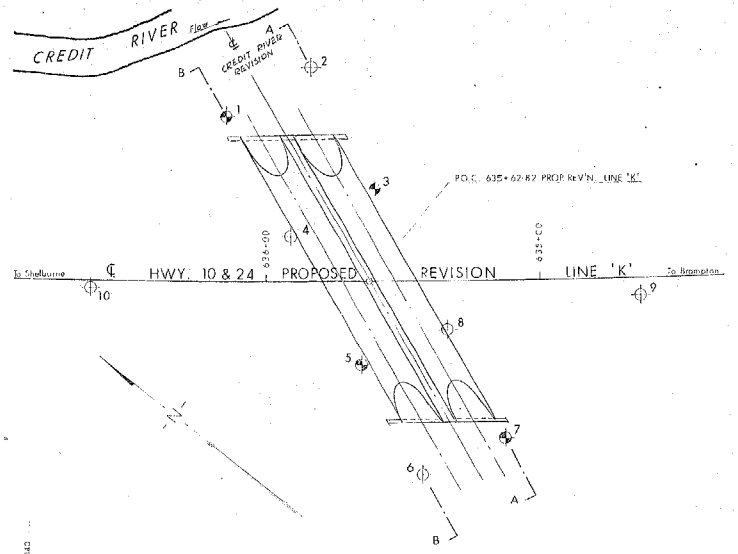
A-A

SECTIONS

SCALE

VERT. 10 5 0 10 20 FT.

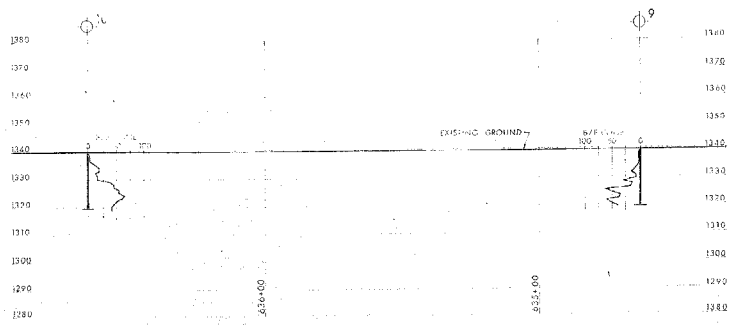
HORIZ. 20 10 0 20 40



PLAN

SCALE

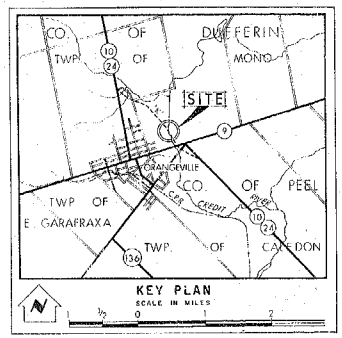
20 10 0 20 40 FT.



℄ PROFILE

SCALE

20 10 0 20 40 FT.



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, NOV. 1967

NO.	ELEVATION	STATION	OFFSET
1	1339.4	636+15	60' RT.
2	1439.5	635+84	78' RT.
3	1339.0	635+60	24' RT.
4	1339.0	635+91	16' RT.
5	1339.0	635+65	30' LT.
6	1339.4	635+43	70' LT.
7	1339.2	635+13	57' LT.
8	1339.0	635+34	18' LT.
9	1339.0	634+6[illegible]	6' LT.
10	1339.0	636+6[illegible]	3' LT.

NOTE

The complete soil [illegible] may be examined at the Bridge Office and Foundation Office, Downsview, and at the Stratford [illegible]

NOTE

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

PRINT RECORD		
NO	FOR	DATE

REVISIONS			
	DATE	BY	DESCRIPTION

67 F 109

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CREDIT RIVER

KING'S HIGHWAY NO. 10 & 24 LINE 'K' DIST. NO. 3

CO. DUFFERIN

TWP. MONO LOT 1 CON. 1 WHS

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. P.P.	CHECKED	W.P. NO. 274-66-01	M.B.T. DRAWING NO. 67-F-109A
DRAWN S.O.	CHECKED	JOB NO. 67-F-109	
DATE 17 JAN. 1968		SITE NO. 4-143	BRIDGE DRAWING NO. D6437-2
APPROVED [illegible] MATERIAL & TESTING ENGINEER		CONT. NO.	

REF. NO. E-4814.1

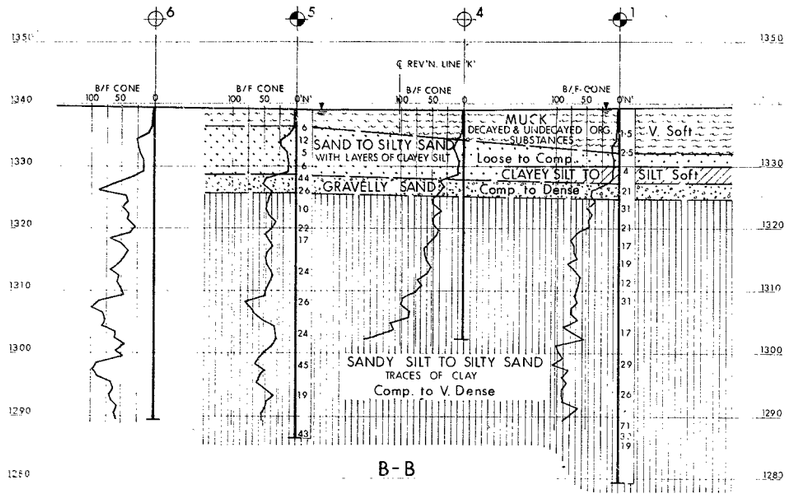
#67-F-109

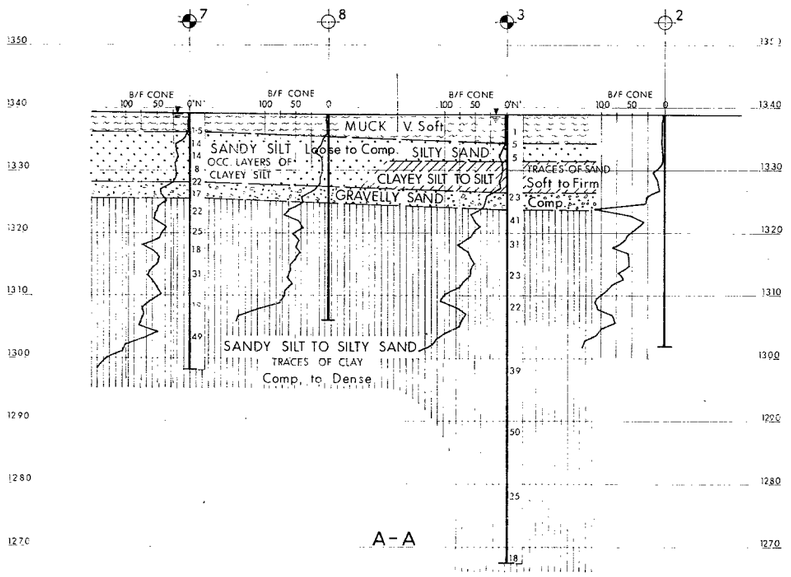
W.P. #274-66-01

HWY. #10 + 24

CREDIT RIVER

STRUCTURE



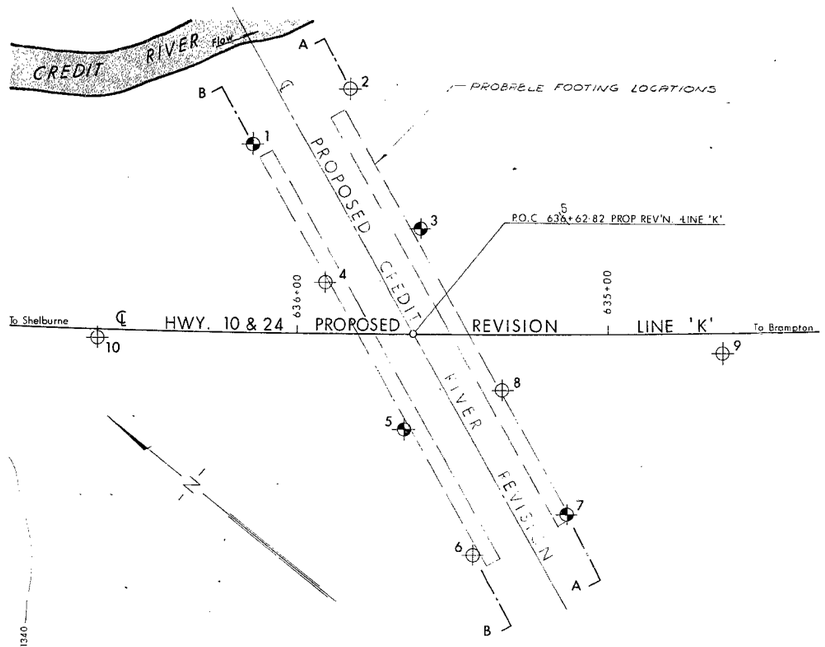


SECTIONS

SCALE

VERT 10 5 0 10 20 FT.

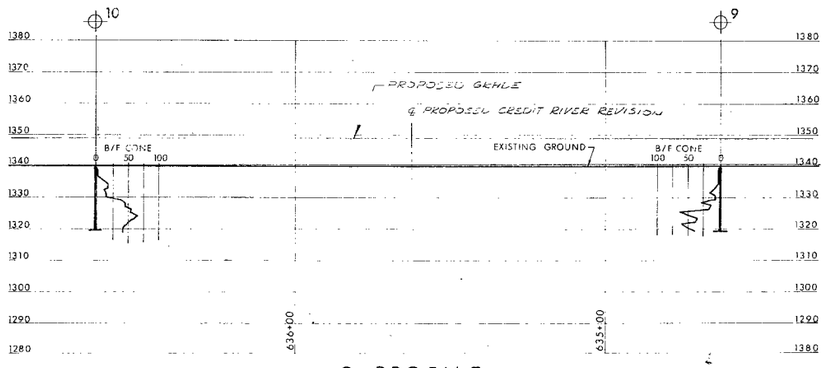
HORIZ 20 10 0 20 40



PLAN

SCALE

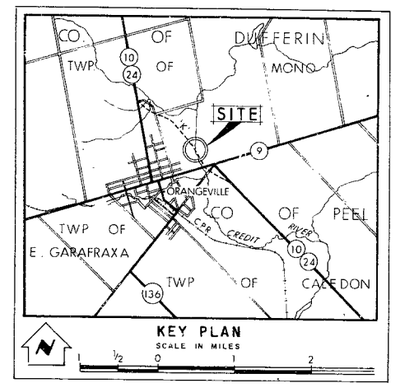
20 10 0 20 40 FT.



℄ PROFILE

SCALE

20 10 0 20 40 FT



KEY PLAN

SCALE IN MILES

½ 0 1 2

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. NOV 1967

NO.	ELEVATION	STATION	OFFSET
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5	1339·0	635+65	30' LT.
6	1339·4	635+43	70' LT.
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9	1339·0	634+63	6' LT.
10	1339·0	636+64	3' LT.

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PRINT RECORD		
NO.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS – ONTARIO

MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CREDIT RIVER

KING'S HIGHWAY NO. 10 & 24 LINE 'K' DIST. NO. 3

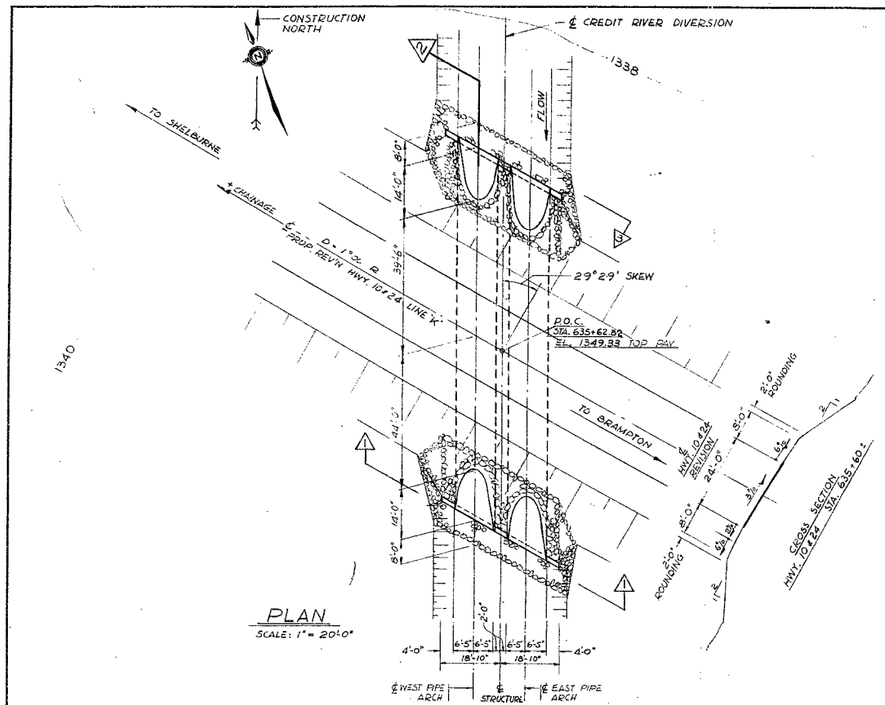
CO. DUFFERIN

TWP. MONO LOT 1 CON. 1 WHS

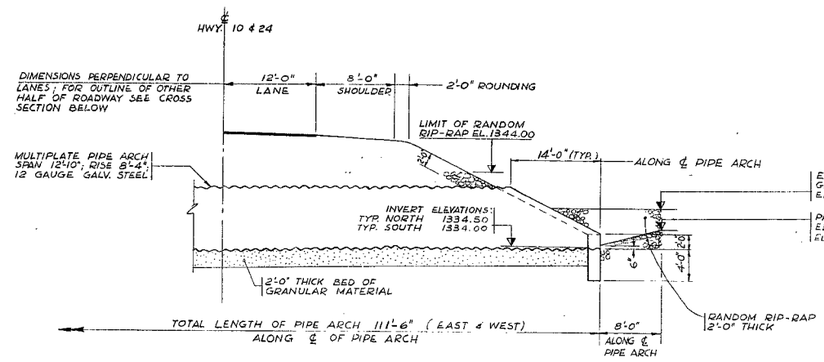
BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. P.P.	CHECKED	W.P. NO. 274-66-01	M.B.T. DRAWING NO. 67-F-109A
DRAWN S.O.	CHECKED	JOB NO. 67-F-109	
DATE 17 JAN 1968		SITE NO	BRIDGE DRAWING NO.
APPROVED		CONT. NO	

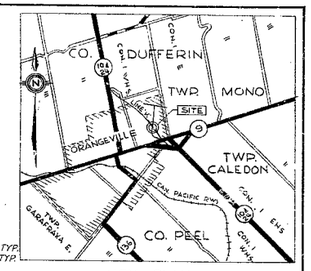
REF. NO. E-4814-1



PLAN
SCALE: 1" = 20'-0"

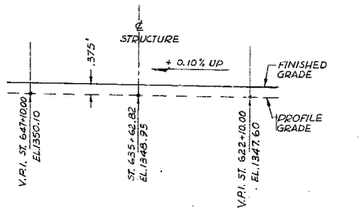


SECTION 2
TO ℄ HWY. 10 & 24
N.T.S.

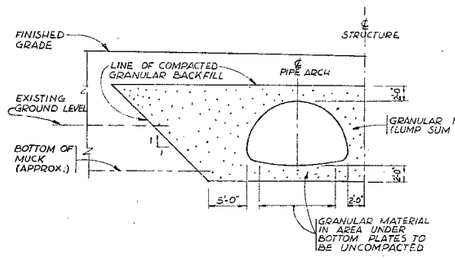


KEY PLAN
SCALE: 1" = 1 MILE

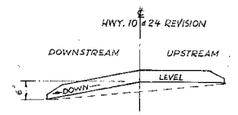
G.B.M. Nº 1714 EL. 1406.113
FUNDAMENTAL BENCH MARK IN MEMORIAL PARK 115.0' SOUTH OF SOUTHERLY LIMIT OF FIRST AVE. & 165.0' EAST OF EASTERLY LIMIT OF SECOND ST. TABLET ON TOP OF PIER 'ORANGEVILLE'



PROFILE
AT ℄ HWY. 10 & 24 REVISION
N.T.S.



MINIMUM GRANULAR BACKFILL
HALF SECTION PERPENDICULAR TO ℄ OF STRUCTURE
SCALE: 1/8" = 1'-0"

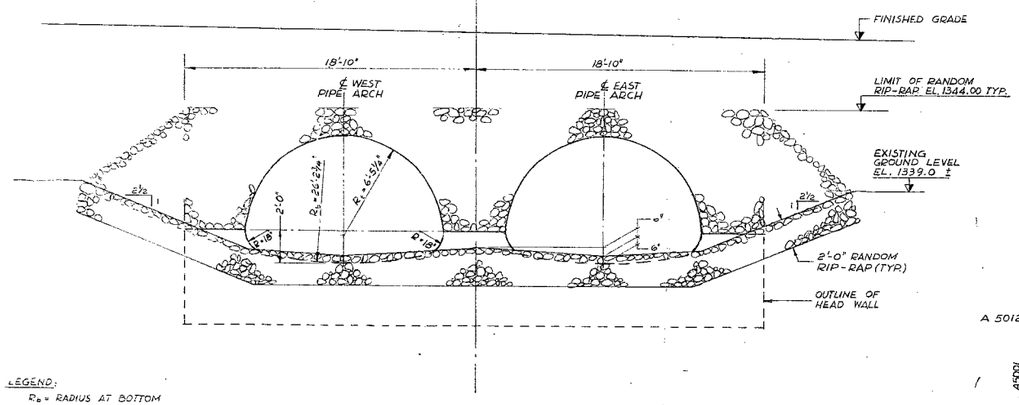


CAMBER DIAGRAM
BEFORE BACKFILL
N.T.S.

NOTES
CLASS OF CONCRETE: 3000 P.S.I.
COVER FOR REINFORCING STEEL: 3"
PIPE ARCHES TO BE INSTALLED ACCORDING TO CAMBER DIAGRAM SHOWN ABOVE

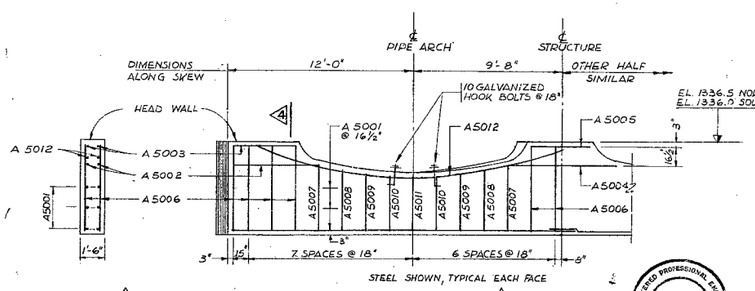
LIST OF DRAWINGS

D-6437-1	GENERAL ARRANGEMENT
D-6437-2	BORE HOLE LOCATIONS AND SOIL STRATA



LEGEND:
Rb = RADIUS AT BOTTOM
Rt = RADIUS AT TOP
R = RADIUS AT CORNERS

SECTION 1
SCALE: 1/2" = 1'-0"



STEEL SHOWN, TYPICAL EACH FACE

SECTION 4

SECTION 3
TYPICAL N & S
SCALE: 1/2" = 1'-0"

R. S. REEL
REGISTERED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

PRINT RECORD		
No.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

67 F 109

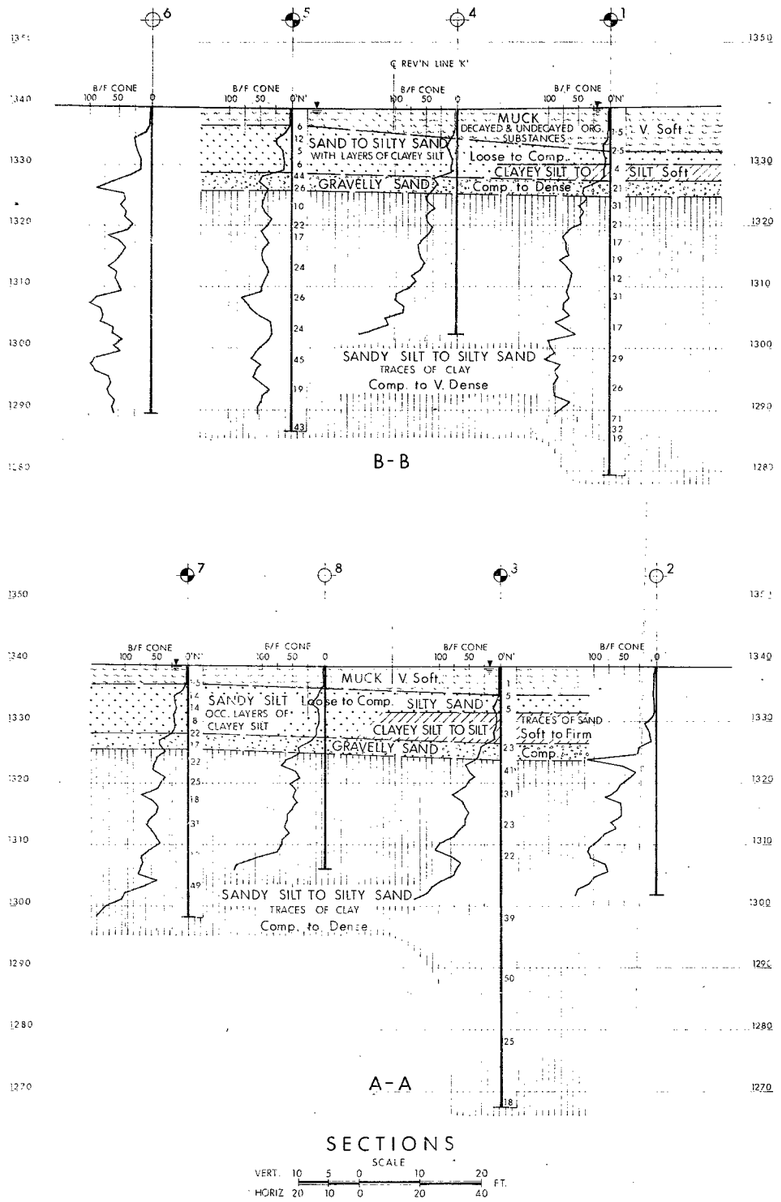
CREDIT RIVER STRUCTURE
ORANGEVILLE BY-PASS

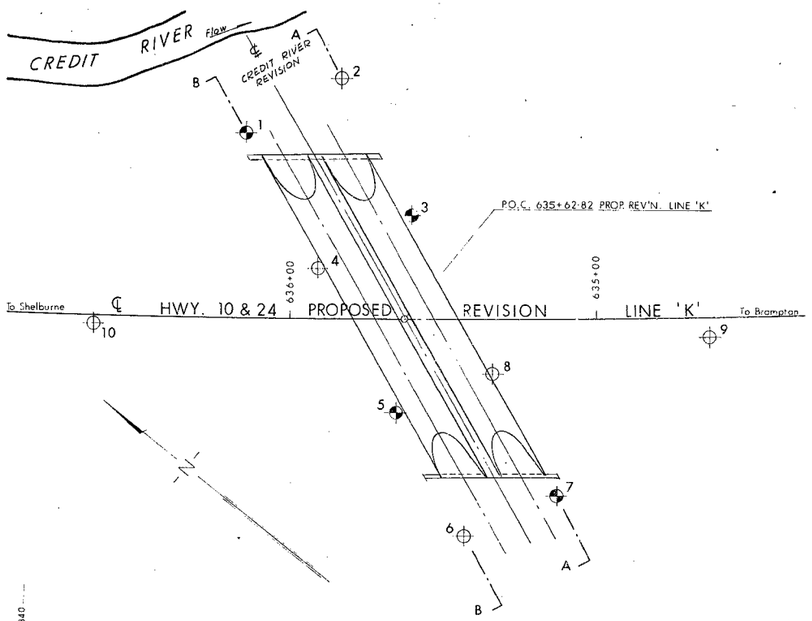
KING'S HIGHWAY No. 10 & 24 — DIST. No. 3
CO. DUFFERIN
TWP. MONO — LOT 1 — CON. 1 W.H.S.

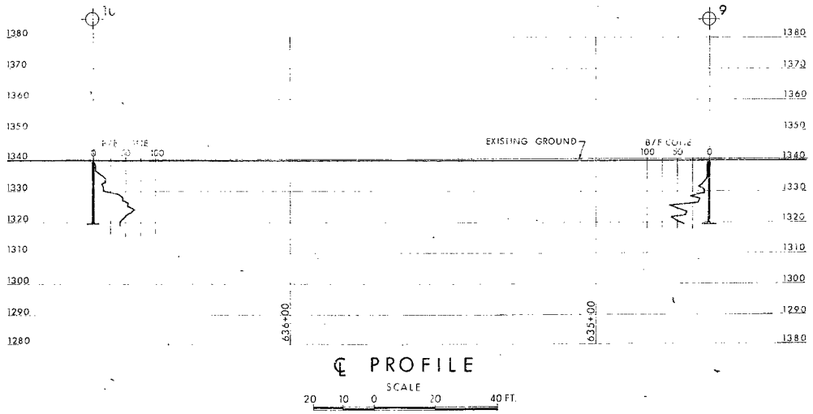
GENERAL ARRANGEMENT

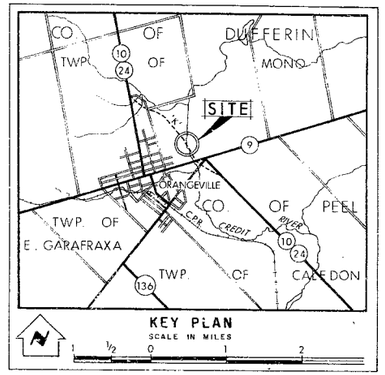
APPROVED _____ BRIDGE ENGINEER

DESIGN	R.S.R.	CHECK	J.L.K.	SITE No. 4-143	W.P. No. 74-62-01
DRAWING	H.H.	CHECK	D.C.	CONTRACT Nos.	
DATE	NOV. 1968	LOADING	HS 20-44	DRAWING No.	D-6437-1









LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, NOV. 1967

NO.	ELEVATION	STATION	OFFSET
1	1339.4	636+15	60' RT.
2	1339.0	635+84	78' RT.
3	1339.0	635+60	24' RT.
4	1339.0	635+91	16' RT.
5	1339.0	635+65	30' LT.
6	1339.4	635+43	70' LT.
7	1339.2	635+13	57' LT.
8	1339.0	635+34	18' LT.
9	1339.0	634+63	6' LT.
10	1339.0	636+64	3' LT.

NOTE

The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the Stratford District Office.

- NOTE -

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

PRINT RECORD		
NO	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

67 F-109

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CREDIT RIVER

KING'S HIGHWAY NO. 10 & 24 LINE 'K' DIST. NO. 3
CO. DUFFERIN
TWP. MONO LOT 1 CON. 1 WHS

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. P.P.	CHECKED	W.P. NO. 274-66-01	M.B.T. DRAWING NO. 67-F-109A
DRAWN S.O.	CHECKED	JOB NO. 67 F-109	
DATE 17 JAN. 1968		SITE NO. 4-143	BRIDGE DRAWING NO. D6437-2
APPROVED [signature] PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

REF. NO E-4814-1

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

HWY 9 DIST. 3

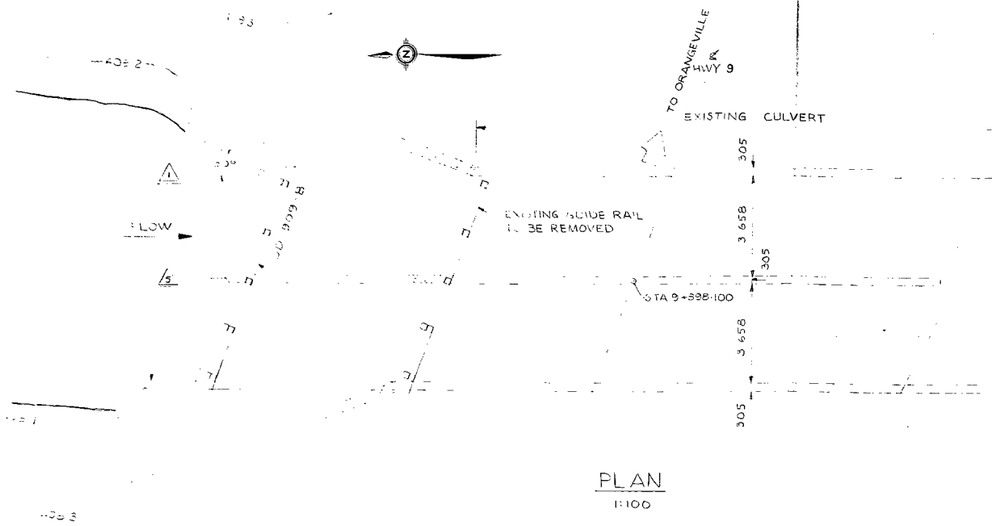
CONT No

WP No 53-82-02

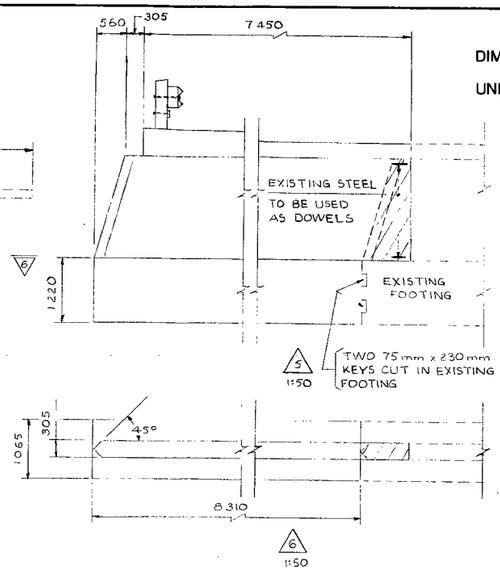
CREDIT RIVER CULVERT EXT'N AT ORANGEVILLE

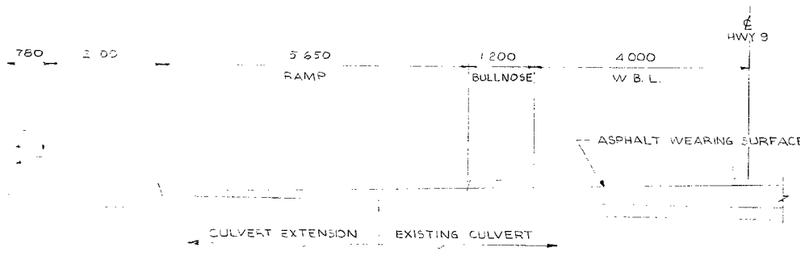
GENERAL ARRANGEMENT

SHEET

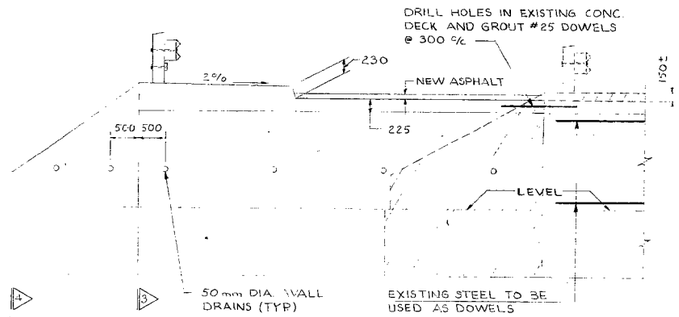


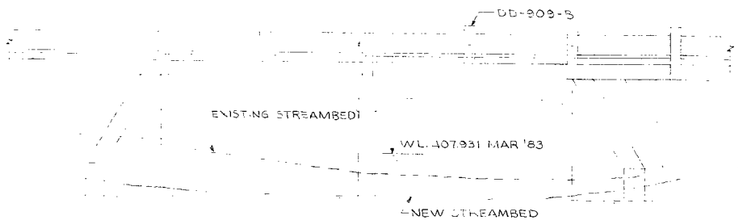
PLAN
1:100



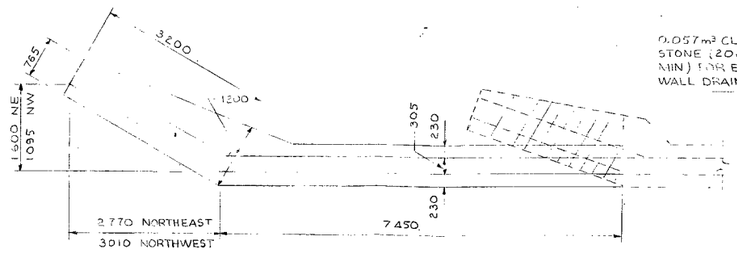


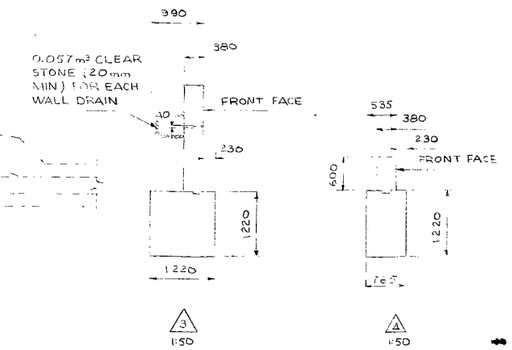
CROSS SECTION OF DECK
N.T.S





NORTH ELEVATION OF WIDENING
1:50





GENERAL NOTES

- CLASS OF CONCRETE: FOOTINGS - 20 MPa
  REMAINDER - 30 MPa
- CLEAR COVER TO REINFORCING STEEL:

FOOTINGS	100 ± 25 mm
ABUTMENTS, PIER & WINGWALLS	100 ± 25 mm
DECK (TOP)	70 ± 20 mm
DECK (BOTTOM)	50 ± 10 mm

- ALL EXPOSED CORNERS TO BE CHAMFERED 20 mm.
- NO CONCRETE SHALL BE PLACED FOR ANY FOOTING, UNTIL THE DEPTH OF THE EXCAVATION AND CHARACTER OF THE FOUNDATION MATERIAL HAVE BEEN APPROVED BY THE ENGINEER.
- FILL SHALL BE PLACED AT BOTH SIDES OF CULVERT SIMULTANEOUSLY.
- CULVERTS AND RETAINING WALLS (WHERE APPLICABLE) SHALL BE BUILT IN ACCORDANCE WITH MTC FORM 904.
- REINFORCING STEEL SHALL BE HARD GRADE. BARS MARKED SUFFIX C SHALL BE EPOXY COATED.
- WALL DRAIN OPENINGS TO BE FORMED USING NON-METALLIC MATERIAL. VERTICAL LOCATION OF WALL DRAINS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
- IF DENOTES INSIDE FACE, OF DENOTES OUTSIDE FACE, EF DENOTES EACH FACE.

CONSTRUCTION SEQUENCE.

1. DIVERT FLOW TO ONE CELL OF EXISTING CULVERT.
2. REMOVE HATCHED [///] PARTS OF THE OTHER CELL OF EXISTING CULVERT, EXISTING ASPHALT SURFACE AND STEEL BEAM GUIDE RAIL.
3. CONSTRUCT WIDENING OF ONE CELL.
4. RE-DIVERT FLOW TO THE COMPLETED WIDENING.
5. REMOVE REMAINDER OF HATCHED PARTS OF EXISTING CULVERT.
6. COMPLETE WIDENING OF EXISTING CULVERT
7. FINISH ASPHALT WEARING SURFACE TO ELEVATIONS SHOWN.
8. INSTALL M.T.C. STD. STEEL BEAM GUIDE RAIL.

LIST OF DRAWINGS

24-1333-247 - 1 GENERAL ARRANGEMENT
- 2 REINFORCING DETAILS
- 3 STANDARD DETAILS

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN ADOPTED	CHECK	LOADING HS-20-44	DATE 83-06
DRAWING NH	CHECK ASM	SITE No 24-1333-247	DWG 1