

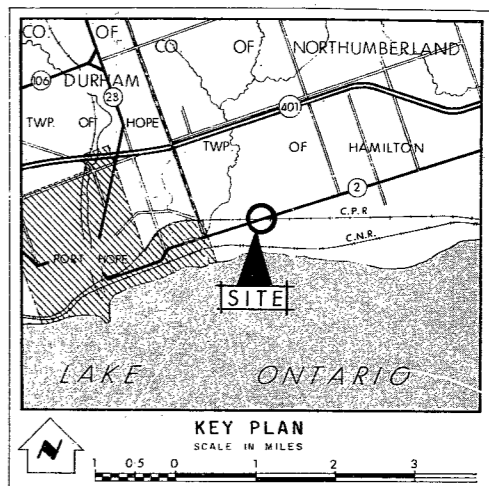
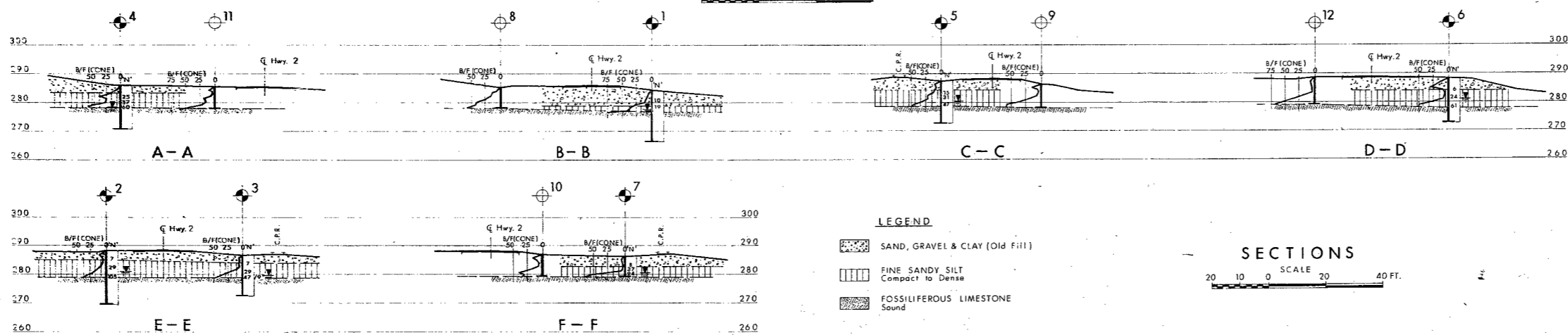
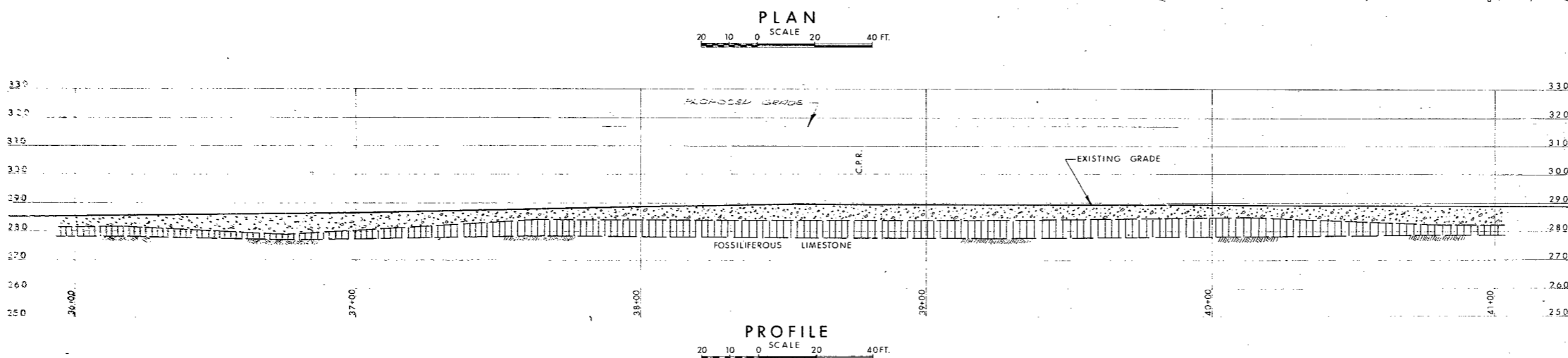
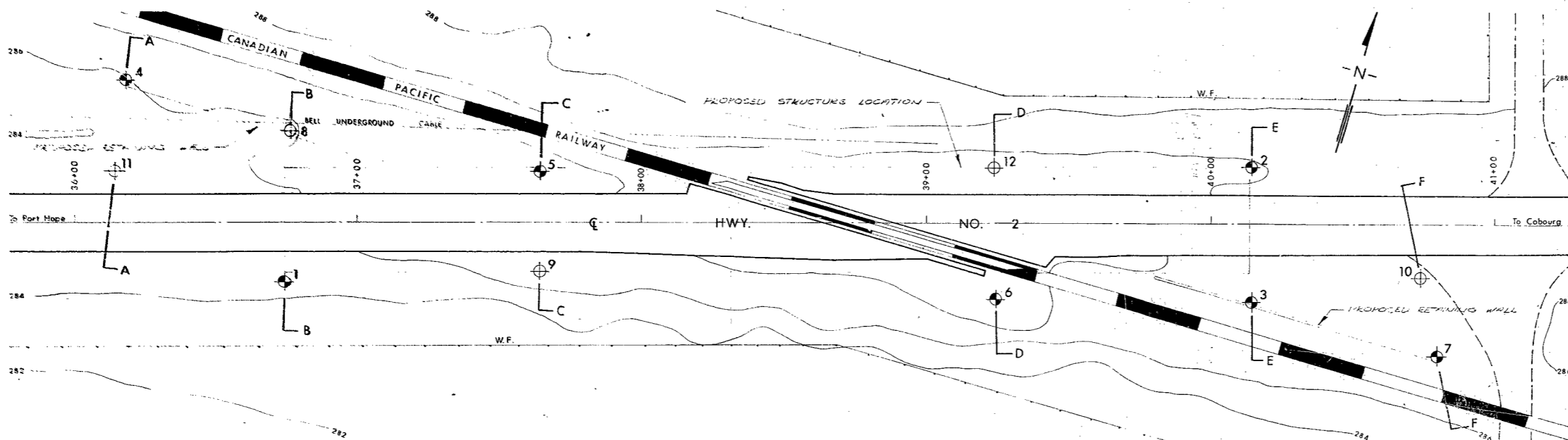
#66-F-90

W.P. #1-63

Hwy. #2 E.

C.P.R.

OVERHEAD



LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊕ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, OCT. 1966

NO.	ELEVATION	STATION	OFFSET
1	284.7	36+74	21' RT.
2	288.2	40+14	20' LT.
3	286.5	40+14	28' RT.
4	286.2	36+17.5	50' LT.
5	287.3	37+64	18' LT.
6	288.3	39+24	27' RT.
7	286.2	40+80	46' RT.
8	285.5	36+76	32' LT.
9	286.4	37+64	17' RT.
10	286.9	40+74	18' RT.
11	285.5	36+14	18' LT.
12	288	39+24	20' 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.

NO.	DATE	BY	DESCRIPTION

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

CANADIAN PACIFIC RAILWAY

KING'S HIGHWAY NO. 2 DIST. NO. 7
CO. NORTHUMBERLAND
TWP. HAMILTON LOT 1 CON. 'A'

BORE HOLE LOCATIONS & SOIL STRATA

SUB'D. D.K.	CHECKED	W.P. NO.	1-63	M.B.T. DRAWING NO.
DRAWN S.O.	CHECKED	JOB NO.	66-F-90	66-F-90A
DATE	1 NOV. 1966	SITE NO.		BRIDGE DRAWING NO.
APPROVED	<i>[Signature]</i>	CONT. NO.		

NO.	FOR	DATE

MEMORANDUM

83 68-137

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

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

DATE: October 21, 1966

OUR FILE REF.

IN REPLY TO: NOV - 7 1966

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Hwy. #2 & C.P.R. Overhead
Bridge, approx. 0.5 Miles East of
Port Hope on Hwy. #2
District No. 7 (Port Hope)
W.J. 66-F-90 -- W.P. 1-63

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
G. K. Hunter (2)
D. P. Collins
W. S. Melinyshyn
T. J. Kovich
A. Watt

Foundations Office
Gen. Files ✓

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

TABLE OF CONTENTS

1. INTRODUCTION.
 2. SUBSOIL CONDITIONS.
 3. DISCUSSION AND RECOMMENDATIONS.
 4. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Proposed Hwy. #2 & C.P.R. Overhead
Bridge, approx. 0.5 Miles East of
Port Hope on Hwy. #2
District No. 7 (Port Hope)
W.J. 66-F-90 -- W.P. 1-63

1. INTRODUCTION:

A request to carry out a foundation investigation at the crossing of Hwy. #2 and C.P.R., 0.5 miles east of Port Hope, was received from the Regional Bridge Location Engineer, Mr. W. S. Melnyshyn, in a memo dated October 4, 1966.

An investigation, consisting of seven sampled boreholes supplemented by 12 dynamic cone penetration tests, was carried out by the Foundation Section.

Presented in this report are the results of this investigation, together with our recommendations for the foundation design of the proposed structure and approaches.

2. SUBSOIL CONDITIONS:

The natural ground surface at the site is level to very gently undulating. According to available geological information, the site has a shallow covering of drift over the bedrock.

The stratigraphical profile at the site consists of a 1.0 to 4.0 ft. deposit of old road fill overlying a stratum of fine, brown, sandy silt which is highly oxidized. The average thickness of this deposit is 5 ft.

Standard penetration values for the sandy silt deposit ranged from 7 blows/ft. to 105 blows/ft., generally increasing with depth. From these values it is estimated that the relative density of the deposit is loose to very dense.

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

Grain size distribution curves obtained from typical samples of sandy silt, are included in the appendix of the report.

Bedrock was proven for a depth of 10 ft. in Boreholes 1 and 2, and for 5 ft. in Boreholes 3, 4, 5, and 6. The rock encountered was sound fossiliferous limestone. The depth to bedrock was found to be 7.5 ft. to 10.5 ft. below ground surface.

During the investigation, groundwater observations were carried out in the boreholes. These indicate that the groundwater level varies between elev. 278 and elev. 281 in the boreholes. The exact water levels are shown on the borelog sheets attached to this report.

3. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct an overhead bridge at the intersection of Hwy. #2 and C.P.R. At present, a 3-span (90'-160'-90') structure having a total width of 37 ft. is contemplated. The new structure will replace the existing level crossing at this site.

The subsoil consists of old road fill and loose to very dense sandy silt overlying limestone bedrock. It is, therefore, considered that the most satisfactory method of supporting the entire structure would be on spread footing foundations.

Footings can be founded within the sandy silt stratum with a safe design load of 2.5 t.s.f. Specific recommendations pertaining to the footing elevations within the sandy silt stratum, are as follows:

East Retaining Structure	--	282.0	or	below
East Abutment	--	282.0	or	below
East Pier	--	282.0	or	below
West Pier	--	282.0	or	below
West Abutment	--	280.0	or	below
West Retaining Structure	--	280.0	or	below

cont'd. /3 ...

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

If higher loads are required, the entire structure including retaining walls, can be founded on sound limestone bedrock with a safe bearing pressure of 10 t.s.f.

No major dewatering problems are anticipated; however, any minor seepage from the side slopes can be controlled by the use of low-capacity pumps.

No stability problems are anticipated for the proposed approach fills with standard 2:1 slopes.

4. MISCELLANEOUS:

The field work, performed during the period October 6 to 12, 1966, together with the preparation of this report, was undertaken by Mr. D. Katauskas, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who reviewed this report.

October 1966

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 66 - F - 90 LOCATION Hwy #2 & C.P.R. Port Hope 36-74 o/s 21' RT. ORIGINATED BY D.K.
W.P. 1 -63 BORING DATE 6-10-66 COMPILED BY D.K.
DATUM Geodetic BOREHOLE TYPE Wash-boring Diamond Drill CHECKED BY HL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w _L PLASTIC LIMIT — w _p WATER CONTENT — w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w _p — w — w _L WATER CONTENT %				
284.7	Groundlevel															
279.2	Old fill - gravel sand and occasional boulders.		1	SS	10	280										
277.2	Fine sandy silt Brown - Compact.		2	SS	19											
7.5	Sound Fossiliferous limestone with some shale bands.		3	R.C.	100% AXT Rec.	270										
266.5			4	R.C.	100% AXT Rec.											
18.2	End of borehole.					260										

277.7 WL
7.0

15/6"

277.7 WL
7.0

DEPARTMENT OF HIGHWAYS - ONTARIO								RECORD OF BOREHOLE NO. 2							FOUNDATION SECTION			
MATERIALS & TESTING DIVISION																		
JOB	66 - F - 90			LOCATION			<u>Hwy #2 & C.P.R. Port Hope 40' ± 14 o/s 20' Left</u>					ORIGINATED BY			<u>D.K.</u>			
W.P.	1 - 63			BORING DATE			<u>7 - 10 - 66</u>					COMPILED BY			<u>D.K.</u>			
DATUM	<u>Geodetic</u>			BOREHOLE TYPE			<u>Washboring Diamond Drill</u>					CHECKED BY			<u>[Signature]</u>			
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	SHEAR STRENGTH P.S.F.	WP	WL			W	
288.2	Groundlevel																	
284.7	Dark grey fill (sand, gravel and clay)		1	SS	7													
3.5	Brown fine sandy silt. Compact to v.dense.		2	SS	29													
278.2			3	SS	105	280												
9.6	Sound fossiliferous limestone with some shale bands.		4	R.C.	AXT 100% Rec.													
269.6			5	R.C.	AXT 100% Rec.	270												
18.6	End of borehole.																	

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 66-E-90 LOCATION Hwy # 2 & C.P.R. Port Hope 40' / 14' 0/s 28' RT. ORIGINATED BY D.K.
W.P. 1-63 BORING DATE 7 - 10 - 66 COMPILED BY D.K.
DATUM Geodetic BOREHOLE TYPE Washboring Diamond drill. CHECKED BY HR

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. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WP	W	WL		
286.5	Groundlevel.														
283.7	Old fill (Gravel sand clay and silt).		1	SS	7										
282.8	Brown fine sandy silt		2	SS	29										
278.7	Compact to dense.		3	SS	46/9"	280									
7.8	Sound fossiliferous limestone.		4	R.C. AXT											
272.5			5	R.C. 95% REC.											
14.0	End of borehole.					270									

49/9"

279.5W
7.0

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 66 - F - 90 LOCATION Hwy # 2 & C.P.R. Port Hope 36 1/2 17.5' O/s 50' LT. ORIGINATED BY D.K.
 W.P. 1 - 63 BORING DATE 11 - 10 - 66 COMPILED BY D.K.
 DATUM Geodetic BOREHOLE TYPE Washboring Diamond drill CHECKED BY AK

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					WATER CONTENT %				
							20	40	60	80	100	wp ——— w ——— WL				
SHEAR STRENGTH P.S.F.																
286.2	Groundlevel															
283.7	Old fill (dark grey sand gravel and clay)															
2.5	Brown fine sandy silt Compact.		1	SS	25	280										
278.6			2	SS	37											
7.6			3	SS	60											
	Sound fossiliferous limestone.		4	R.C.	95% act Rec.	270										
			5	R.C.	85% act Rec.											
270.7			6	R.C.	100% act Rec.											
15.5	End of borehole.															

55'7"

▼278.7.WL
7.5

DEPARTMENT OF HIGHWAYS - ONTARIO

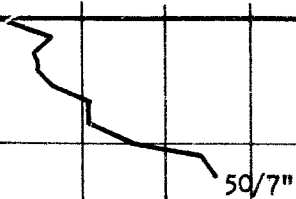
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 66-F-90 LOCATION Hwy # 2 & C.P.R. Port Hope 37 + 64' 0/s 18' Lt. ORIGINATED BY D.K.
W.P. 1 - 63 BORING DATE 11 - 10 - 66 COMPILED BY D.K.
DATUM Geodetic BOREHOLE TYPE Washboring Diamond Drill CHECKED BY HR

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		20	40	60	80	100	WP	WL		
287.3	Groundlevel														
284.3	Old fill (sand gravel and clay)														
3.0	Brown fine sandy silt		1	SS	15										
278.7	Compact to dense.		2	SS	31										
			3	ss	47										
8.6	Sound fossiliferous limestone.		4	RC	70% Rec.										
			5	rc	ext. 90%										
272.6			6	RC	ext. 98% Rec.										
14.7	End of borehole.														



▼ 280.3 WL
7.0

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _P 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.	WATER CONTENT % w _P ——— w ——— w _L			
288.3	Groundlevel											
284.0	Old fill (sand gravel and clay)		1	SS	6							
4.3	Brown fine sand silt. Compact to dense.		2	SS	24	280						
277.8			3	SS	61							
10.5	Sound fossiliferous limestone.		4	RC	21	95%						
272.7			5	RC	50							
15.6	End of borehole.		6	R.C.	95	Rec.						

FOUNDATION SECTION

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— w _P	WATER CONTENT ——— w		
286.2	Groundlevel											
282.7	Old fill(sand gravel and clay)		1	SS	8	280					280.2 w _L 6.0	
3.5	Brown sandy silt		2	SS	37							
278.9	Compact to dense.		3	SS	94							
7.3	End of borehole Probable Bedrock.					270						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 66 - F - 90

W.P. 1 - 63

DATUM Geodetic

RECORD OF BOREHOLE NO. 8

LOCATION Hwy # 2 & C.P.R. Port Hope 36 1/2 76 O/s 32' Lt.

BORING DATE 12 - 10 - 66

BOREHOLE TYPE Dynamic Cone Penetration Test # 8

FOUNDATION SECTION

ORIGINATED BY D.K.

COMPILED BY D.K.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w	WATER CONTENT %		
285.5	Groundlevel											
278.4						280						
7.1	End of Dynamic Cone penetration test (Probable bedrock)					270						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 66 - F - 90LOCATION Hwy # 2 & C.P.R. Port Hope 37 1/2 64' o/s 17' RTORIGINATED BY D.K.W.P. 1 - 63BORING DATE 12 - 10 - 66COMPILED BY D.K.DATUM GeodeticBOREHOLE TYPE Dynamic Cone Penetration Test # 9CHECKED BY HR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W WP — W — WL WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
286.4	Groundlevel									
278.1										
8.3	End of Dynamic cone penetration test. (Probable bedrock)	///					38 3/4"			

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 66 - F - 90

LOCATION Hwy # 2 & C.P.R. Port Hope 40' 74' o/s 18' RT.

ORIGINATED BY D.K.

W.P. 1 - 63

BORING DATE 12 - 10 - 66

COMPILED BY _____ D.K.

DATUM Geodetic

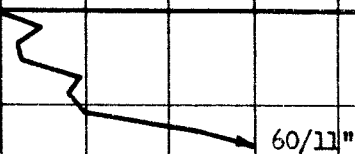
BOREHOLE TYPE Dynamic Cone Penetration Test. # 10

CHECKED BY AK

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	SHEAR STRENGTH P.S.F.					
286.9	Groundlevel												
279.2						280							
7.7	End of Cone Penetration Test (Probable Bedrock)					270							

DEPARTMENT OF HIGHWAYS - ONTARIO		RECORD OF BOREHOLE NO. 11		FOUNDATION SECTION	
MATERIALS & TESTING DIVISION					
JOB <u>66 - F - 90</u>		LOCATION <u>Hwy # 2 & C.P.R. Port Hope 36 + 14' o/s 18' Lt.</u>		ORIGINATED BY <u>D.K.</u>	
W.P. <u>1 - 63</u>		BORING DATE <u>12 - 10 - 66</u>		COMPILED BY <u>D.K.</u>	
DATUM <u>Geodetic</u>		BOREHOLE TYPE <u>Dynamic Cone Penetration Test. # 11</u>		CHECKED BY <u>JK</u>	

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w _L PLASTIC LIMIT — w _p WATER CONTENT — w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % w _p — w — w _L				
285.5	Groundlevel.															
277.6						280										
7.9	End of cone penetration test. (Probable Bedrock)					270										



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 66 - F - 90

W.P. 1 - 63

DATUM Geodetic

LOCATION Hwy # 2 & C.P.R. Port Hope 39 + 24 o/s 20' Lt.

BORING DATE 12 - 10 - 66

BOREHOLE TYPE Dynamic Cone Penetration Test # 12

FOUNDATION SECTION

ORIGINATED BY D.K.

COMPILED BY D.K.

CHECKED BY AK

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		SHEAR STRENGTH P.S.F.					
288.5	Groundlevel											
278.9						280						
9.6	End of Dynamic Cone Penetration Test. Probable Bedrock.					270						

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 COMESIONLESS 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

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

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	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
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

MEMORANDUM

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

FROM: Bridge Division,
Downsview, Ontario.

DATE: October 4, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-63 - Site 21-332,
C.P.R. Overhead at Port Hope,
Hwy. #2 - Dist. #7.

66-F-90

We are sending to you herewith a copy of Bridge Site Plan E 4755-1 on which we have marked in red the proposed location of the above structure and some additional bore-hole requirement.

The bridge site is readily accessible. It is 0.5 miles east of Port Hope.

Please make the necessary arrangement for foundation soils investigation.

Your early attention would be very much appreciated.

N. Zoltay

NZ/sp
cc. R. Forrest

N. Zoltay,
for W. Melnyshyn,
Regional Bridge Location Eng.

RECEIVED OCT 4 1966

DUE DATE OCT 15/66 !!
DEC 17 1966 REVISED (OCT 4 1966)

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. M. Davata,
Senior Foundation Engineer,
Foundation Section.

FROM: B. K. Glassford

DATE: February 8th, 1967

OUR FILE REF.

IN REPLY TO:

SUBJECT: Foundation Investigation C.P.R. Overhead Highway #2
District 7, (W.P. 1-63) (66-F-90)

Examination of the cores for this project show the following characteristics:

1. Cores on this project show limestone bedrock of the Trenton formation.
2. This limestone is a medium to fine grained texture rock, partly fossiliferous, hard and is a medium grey colour.
3. The bedding characteristics show thin to medium strata separated by thin partings of calcareous shale. Some sections appear slightly rubbly in structure.
4. This rock appears to be a typical limestone of the Trenton formation, possibly from the uppermost section of the strata.
5. It gives the appearance of being a strong, sound rock type with good physical characteristics, that should meet load bearing capacities for the structure being considered for erection at this site.

B.K. Glassford
B. K. Glassford,
Geologist.

BK7/jm

cc: W.R. Bennett
Z. Katona
T. Kovich

ago

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

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

February 7, 1967

C.F.R. Overhead Structure at Port Hope
Hwy. #2, District #7 (Port Hope)
W.P. 1-63 -- W.J. 66-P-90

We have reviewed the Preliminary Plan D-6097-P1
for the above mentioned structure.

There are no comments pertaining to the proposed
structure foundations shown on the preliminary drawing.
Further to your recent request, we are investigating the
possibility of adopting large diameter caisson foundations
penetrating into the rock. According to available information
on the mechanical properties of rocks in relation to the design,
it can be assumed that if a caisson foundation is carried more
than two feet into sound rock, the assumed maximum safe bearing
capacity may be increased by 20% for each additional foot of
depth, but should not exceed twice the allowable bearing capacity
on the surface of the sound rock. In order to evaluate accurate
maximum safe bearing capacity of limestone bedrock, tests have
been carried out by our Geologist in the laboratory, and the
results will be submitted to you as soon as they become available.

AD/adeP

cc: Messrs. S. McCombie
W. S. Melnyshyn

Foundations Files
Gen. Files

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

Department of Highways Ontario

Copy for the information of
Mr. A. Stermac, Principal Foundation Engineer,
Room 107, Lab. Building

Mr. W.S. Melingshyn,
Regional Bridge Location Engineer,
Bridge Division,
Administration Building

Bridge Division,
Downsview, Ontario

January 31, 1967

66-F-90

G.P.R. Overhead Bridge at Port Hope
2.3 Miles East of Hwy. #28
W.P. 1-63, Site 21-332
Highway 2, District No. 7

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-6097-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$297,000.
This cost includes tender, materials, engineering and sundry
construction.

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

CSQ:rd

C.S. Grebaki,
Bridge Design Engineer

Attach.

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

66-F-90

Mr. W. S. Melinyshyn,
Regional Bridge Location Engr.,
Bridge Division,
Admin. Bldg.

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

November 22, 1966

Your Memo -- Nov. 17/66

C.P.R. Overhead at Port Hope,
Site 21-332 -- W.P. 1-63,
Hwy. #2 -- District #7.

Further to your memo of November 17, 1966,
we have reviewed the subsoil conditions contained in our
Foundation Report W.J. 66-F-90, for your new proposal,
and submit the following comments:

At this location the bedrock surface is
fairly level and varies from elev. 279.2 to elev. 277.2.
In our opinion, an additional foundation investigation
will not be necessary, and our Foundation Report W.J. 66-F-90
will be adequate for your design purposes. However, at the
time of review of the preliminary structure drawings, if
necessary, this section will carry out additional boreholes
at the appropriate footing locations.

MD/MdeF

cc: Foundations Office ✓
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: Bridge Division,
Downsview, Ontario.

DATE: November 17, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-63, Site 21-332,
C.P.R. Overhead at Port Hope,
Hwy. #2 - Dist. #7.

We have received the Foundation Investigation Report, dated October 21st. 1966 (W.J. 66-F-90) for the above project. The Report is based on our proposed location of the future structure which was in accordance with the C.P.R. request for additional track, south of the existing track.

The C.P.R. now requests that the additional track be on the north side of the existing line. Consequently we have to shift the proposed bridge towards the west.

On the attached plan we show our revised proposals in blue colour.

Would you please advise us if additional foundation investigation would be necessary or if the present Foundation Report will be adequate for the design of the structure.

N. Zoltay

NZ/sp
cc. R. Forrest

N. Zoltay,
for W. S. Melinyshyn,
Regional Bridge Location Engineer.

MEMORANDUM

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

FROM: Bridge Division,
Downsview, Ontario.

DATE: October 4, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-63 - Site 21-332,
C.P.R. Overhead at Port Hope,
Hwy. #2 - Dist. #7.

We are sending to you herewith a copy of Bridge Site Plan E 4755-1 on which we have marked in red the proposed location of the above structure and some additional bore-hole requirement.

The bridge site is readily accessible. It is 0.5 miles east of Port Hope.

Please make the necessary arrangement for foundation soils investigation.

Your early attention would be very much appreciated.

N. Zoltay

NZ/sp
cc. R. Forrest

N. Zoltay,
for W. Melinyshyn,
Regional Bridge Location Eng.

RECEIVED OCT 4 1966

DUE DATE OCT 15/66 12
DEC 17, 1966 REVISED (OCT 4, 1966)

Mr. M. Duvata,
Senior Foundation Engineer,
Foundation Section.

B. K. Glassford

February 8th, 1967

CONT. 68-137

Foundation Investigation C.P.R. Overhead Highway #2
District 7. (W.P. 1-63) (66-F-90)

Examination of the cores for this project show the following characteristics:

1. Cores on this project show limestone bedrock of the Trenton formation.
2. This limestone is a medium to fine grained texture rock, partly fossiliferous, hard and is a medium grey colour.
3. The bedding characteristics show thin to medium strata separated by thin partings of calcareous shale. Some sections appear slightly rubbly in structure.
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5. It gives the appearance of being a strong, sound rock type with good physical characteristics, that should meet load bearing capacities for the structure being considered for erection at this site.

B.K. Glassford

B. K. Glassford,
Geologist.

BKG/jm

cc: W.R. Bennett
Z. Katona
T. Kovich

Re: C.P.R. Overhead Str.
at Port Hope, Hwy #

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

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

February 7, 1967

C.P.R. Overhead Structure at Port Hope
Hwy. #2, District #7 (Port Hope)
W.P. 1-63 -- W.J. 66-P-90

We have reviewed the Preliminary Plan D-6097-P1
for the above mentioned structure.

There are no comments pertaining to the proposed structure foundations shown on the preliminary drawing. Further to your recent request, we are investigating the possibility of adopting large diameter caisson foundations penetrating into the rock. According to available information on the mechanical properties of rocks in relation to the design, it can be assumed that if a caisson foundation is carried more than two feet into sound rock, the assumed maximum safe bearing capacity may be increased by 20% for each additional foot of depth, but should not exceed twice the allowable bearing capacity on the surface of the sound rock. In order to evaluate accurate maximum safe bearing capacity of limestone bedrock, tests have been carried out by our Geologist in the laboratory, and the results will be submitted to you as soon as they become available.

MD/adeF

cc: Messrs. S. McCombie
W. S. Belinyshyn

Foundations Files
Gen. Files ✓

M. Devata

M. Devata,
SUPERVISING FOUNDATION ENGR.

For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.