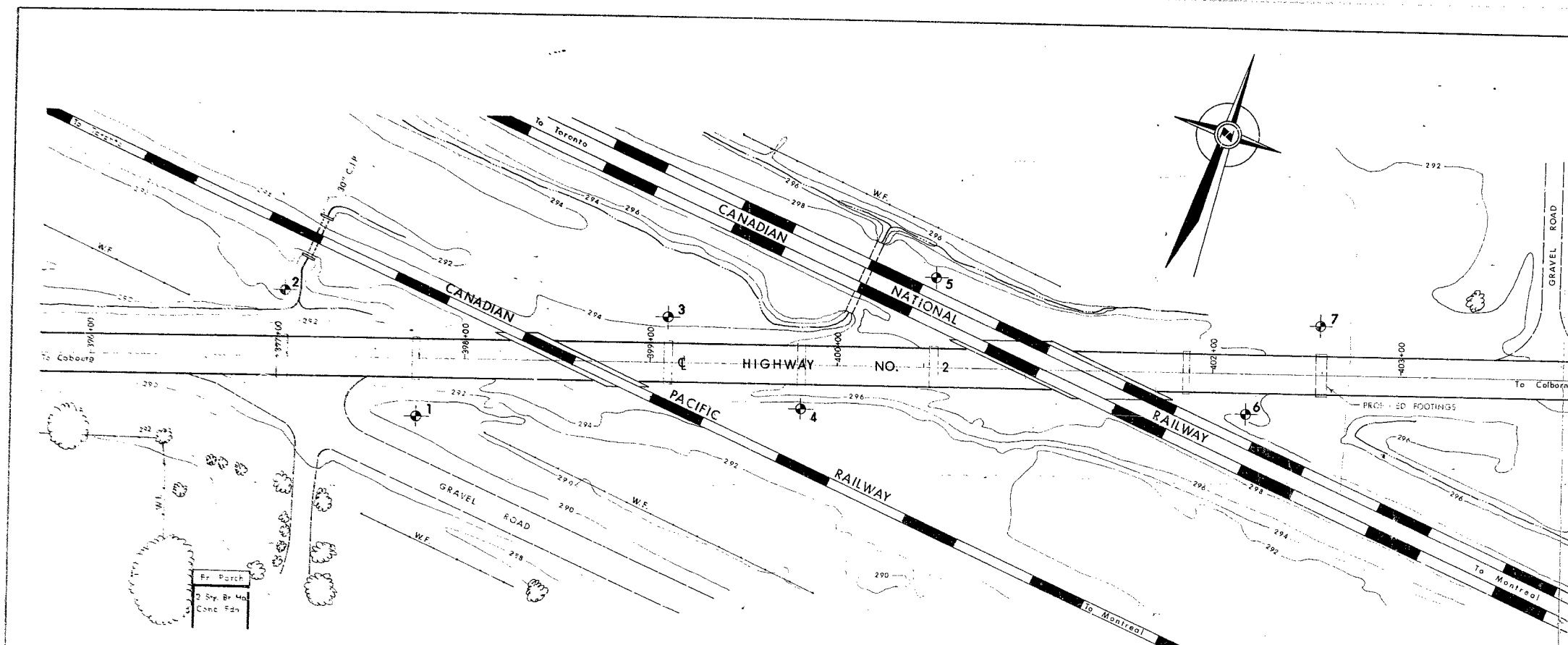


#64-F-77

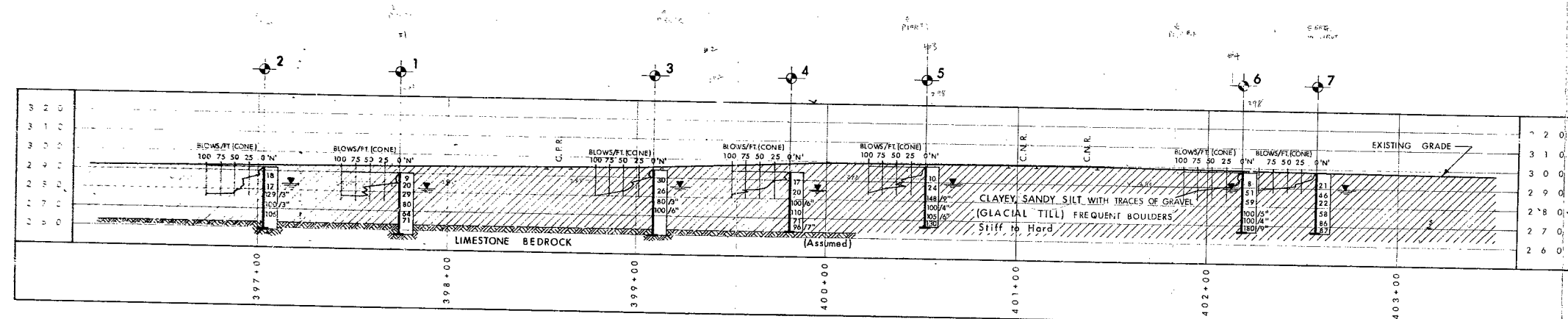
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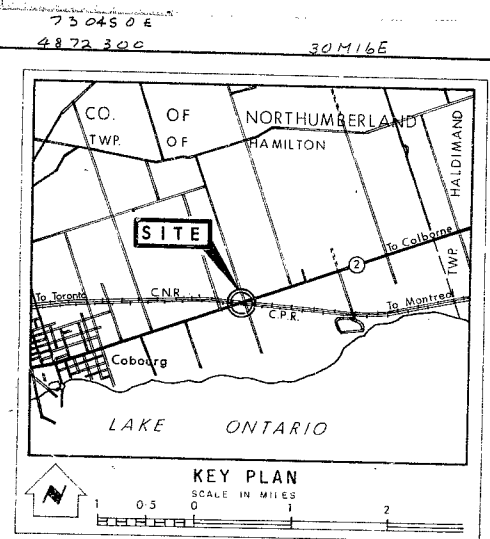
C.P.R. & C.N.R.



PLAN
SCALE
0 10 20 30 40 50 60 FT.



PROFILE
SCALE
0 10 20 30 40 50 60 FT.



LEGEND			
●	Bore Hole		
⊕	Cone Penetration Hole		
⊗	Bore & Cone Penetration Hole		
—	Water Levels established at time of field investigation (Aug. 1964)		

NO.	ELEVATION	STATION	OFFSET
1	290.0	397+75	30.5' RT.
2	292.0	397+03	35' LT.
3	294.0	399+09	24' LT.
4	294.0	399+81	23' RT.
5	298.0	400+52	48' LT.
6	298.0	402+18	21' RT.
7	298.0	402+57	26' 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

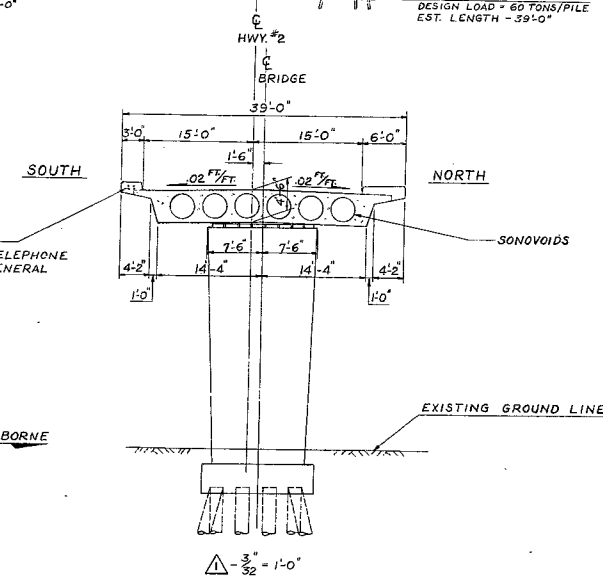
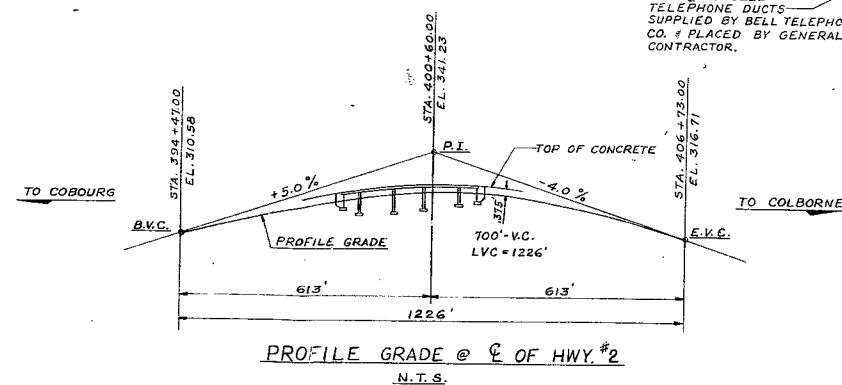
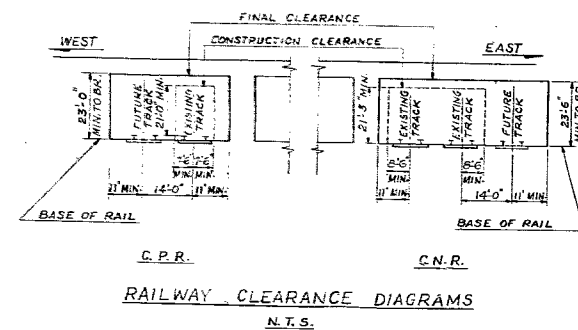
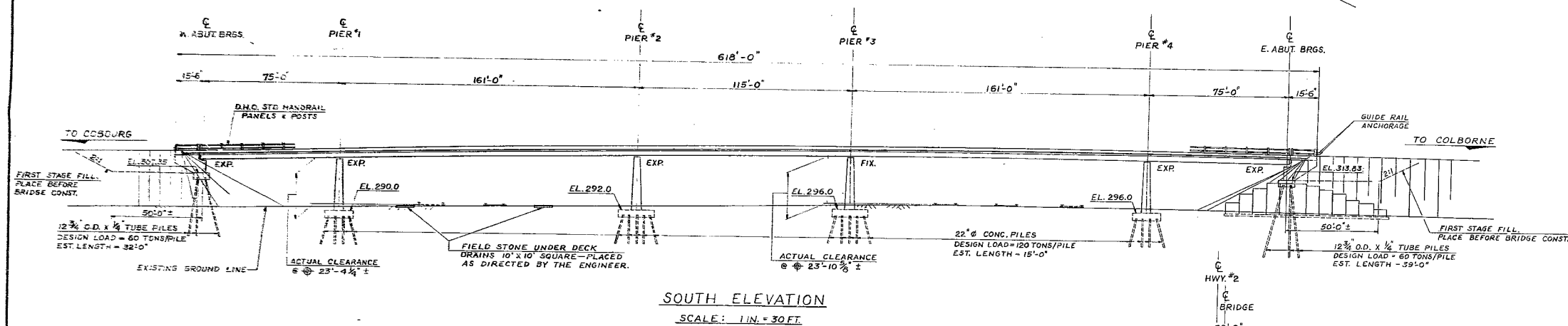
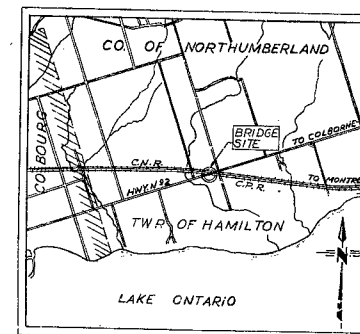
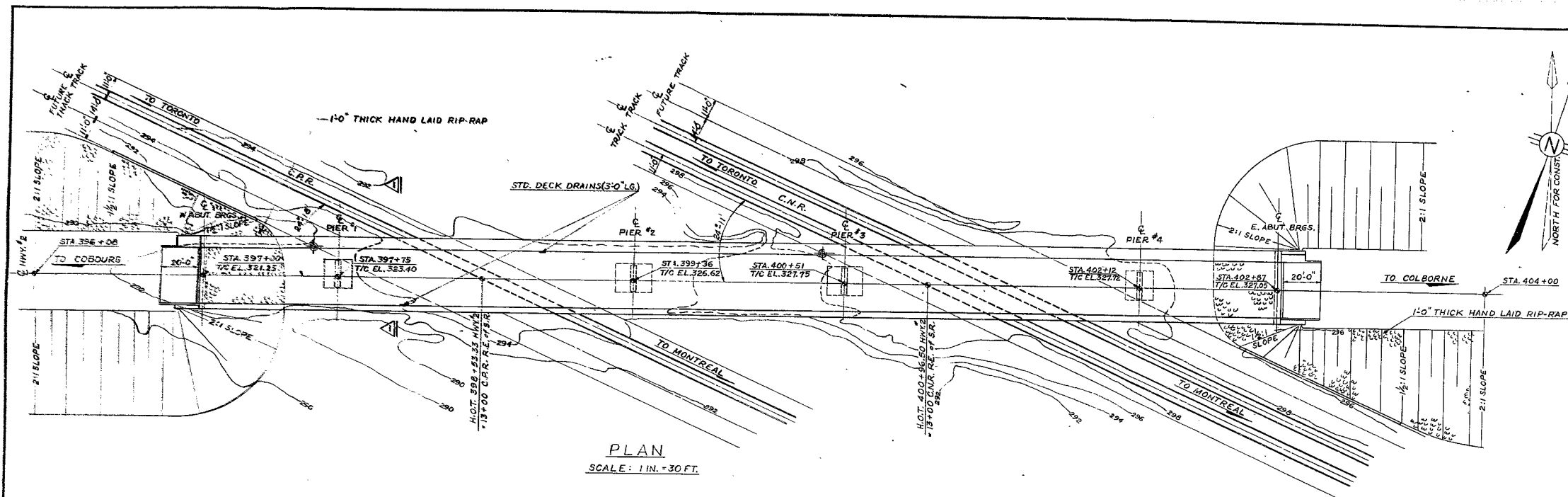
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION - FOUNDATION SECTION

CANADIAN NATIONAL RAILWAY AND CANADIAN PACIFIC RAILWAY
KING'S HIGHWAY NO. 2 DIST. NO. 7
CO. NORTHUMBERLAND
TWP. HAMILTON LOT 9 CON. B

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. W.K. CHECKED /	W.P. NO. 247 - 62	M.B.R. DRAWING NO.
DRAWN D.M. CHECKED /	JOB NO. 64 - F - 77	64-F-77A
DATE 13 OCT. 1964	SITE NO.	BRIDGE DRAWING NO.
APPROVED /	CONT. NO.	

REF. NO. E-4246-1

[illegible]

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION									
<u>C.N.R. & C.P.R. OVERHEAD</u> <u>EAST OF JOUBOURT</u>									
KING'S HIGHWAY No. 2					DIST. No. 7				
CO. NORTHUMBERLAND									
TWP. HAMILTON					LOT 9		CON. A & B		
- PRELIMINARY PLAN -									
APPROVED BRIDGE ENGINEER					SITE No. 21-333		W.P. No. 247-61		
DESIGN	P.O.L.		CHECK		CONTRACT No.				
DRAWING	R.T.		CHECK		P.O.L.				
DATE	SEPT 1962		LOADING		H20-S16		DRAWING No.		D5796-P1

MEMORANDUM

To: Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

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

Attention: Mr. S. McCombie

DATE: October 15, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

C.P.R. and C.N.R. and Hwy. #2
County of Northumberland, Twp.
of Hamilton,
Lot 9 Con "A" Dis. 7, Lot 9 Con "B"
W.J. 64-F-77 W.P. 247-62

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

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

AGS/PB
Attach.

cc: Messrs.

A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
G. K. Hunter
F. B. Whiteley
T. Kovich
A. Watt

L A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office
General Files. ✓

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 2. DESCRIPTION OF SITE.
 3. FIELD AND LABORATORY WORK.
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frequent boulders - stiff to hard.
 - 4.3) Limestone bedrock.
 5. GROUND WATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS.
 7. SUMMARY.
 8. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT

For

C.P.R. and C.N.R. and Hwy #2
County of Northumberland, Twp. of Hamilton
Lot 9 Con "A" Lot 9 Con "B"
District #7
W.J. 64-F-77 W.P. 247-62

1. INTRODUCTION:

A request to carry out a Foundation Investigation at the crossing of Hwy #2 and C.N.R. and C.P.R. at Cobourg, Ontario was received, from Bridge Location Engineer Mr. A. Watt, dated August 3, 1964.

It is proposed to erect a new bridge to carry Hwy #2 over the C.P.R. and C.N.R. lines. The site of the proposed bridge is located approximately 1.5 miles east of the city of Cobourg, county of Northumberland, Twp. Hamilton.

In order to determine the soil properties and decide on the type of foundation, an investigation was carried out by this section. Results and the discussion of the field and Laboratory Investigations, as well as conclusions and recommendations for the future design work, are contained in the following paragraphs of this report.

2. DESCRIPTION OF SITE:

The site of the proposed bridge is located approximately 1.5 miles east of the city of Cobourg. The surrounding area is generally flat terrain. Physiographically, the site is located in the so called Iroquois Plain.

cont'd /2...

3. FIELD AND LABORATORY WORK:

In order to obtain sufficient information on the type and properties of the sub-soil, seven sampled boreholes and seven dynamic cone penetration tests were carried out at this site. Five feet of bedrock core was taken in boreholes #1, #2 and #3.

Split-spoon samples were taken at various depth intervals. Samples were used to determine the following physical properties.

1. Natural Moisture Content.
2. Atterberg Limits.
3. Grain size distributions.

Results of these laboratory tests are summarized in the

4. SUBSOIL CONDITIONS:

Appendix.

4.1) General:

The stratigraphy of the soil at the site was found to be generally uniform. A detailed description of various soil types encountered during the investigation, is shown in Appendix I of this report and is also given in subsequent paragraphs. The estimated stratigraphical profile, shown on Dwg. No. 64-F-77A, is based upon this information.

4.2) Clayey sandy silt with traces of gravel

Frequent Boulders - stiff to hard:

This layer, which extends down to bedrock, was found immediately below the topsoil.

The percentage of silt in this layer is 45%, sand 32%, clay forms 18% and the rest of 5% is gravel. Moisture content determinations for this layer averaged about 12.7% ranging from

cont'd /3...

4.2) Clayey sandy silt with traces of gravel: (cont'd)

34.9% to 5.4%. The range of the liquid limits is from 14.2% to 49.4% and that of the plastic limits from 10.1% to 34.2%.

The overall stratum was found in a stiff to hard state, with an average "N" value of over 100 blows/foot. The "N" values varied from 9 blows/foot, to over 150 blows/foot.

4.3) Limestone Bedrock:

Following the stratum of clayey sandy silt with traces of gravel and frequent boulders, is limestone bedrock. 5 feet of rock core taken in BH #1, 2 and 3, showed that the bedrock is in a sound condition.

5. GROUND WATER CONDITIONS:

The ground water level, at the time of the investigation, was found at the following elevations:

In BH #1 at Elev. 281.9

BH #2 at Elev. 284.0

BH #3 at Elev. 285.8

BH #4 at Elev. 285.0

BH #5 at Elev. 289.2

BH #6 at Elev. 289.4

BH #7 at Elev. 289.5

It may be assumed that the water level will vary with the seasons of the year. No artesian water conditions were encountered.

6. DISCUSSION AND RECOMMENDATIONS:

As can be seen from the previously described soil stratigraphy, The soil consists of stiff to hard clayey sandy silt with traces of gravel and frequent boulders. The investigation has revealed

6. DISCUSSION AND RECOMMENDATIONS: (cont'd)

that within the upper 20 feet of the deposit the properties are such that adequate support for spread footings could be obtained. In the case of the proposed piers it is recommended to place the footings approximately 8'-0" ft. below existing original ground levels. at the following approximate elevations:-

(Piers numbered 1-5 East to West)

Pier	1	Elev.	290.0
Pier	2	Elev.	292.0
Pier	3	Elev.	290.0
Pier	4	Elev.	288.0
Pier	5	Elev.	285.0

A net allowable pressure of 2.5 tons t.s.f. may be assumed for design purposes.

The proposed abutments should be founded within the approach fills on 12 3/4" X 1/4" steel tube piles driven to approximate elevation 275.0. A design load of 60 tons per pile may be used in this event.

Since the subsoil consists of relatively dense and impermeable material, and the ground water level is low, dewatering of the Excavations should not present problems. No stability problems are anticipated with the approach fills.

7. SUMMARY:

1. The stratification of the soil which consists of glacial till is quite uniform. The consistency of the materials encountered varies from stiff to hard.

2. Because of the stiffness of the upper layers spread footings may be used for the proposed piers.

7. SUMMARY: (cont'd)

12 3/4" X 1/4" steel tube piles driven through the fill are recommended for the abutments.

3. The bottom of the pier footings should be approximately 8 ft below existing ground levels. Piles for the abutments should be driven to approximately Elev. 275.0."

4. Dewatering of the excavations should not present major problems.

5. No stability problems are anticipated for the approach fills.

8. MISCELLANEOUS:

The field work, performed during the period from August 17 to August 31, 1964, together with the preparation of this report, was undertaken by Mr. W. W. Kulmattickas, Proj. Foundation Engineer. The investigation was carried out under the general supervision of Mr. K. G. Selby, Senior Engineer, who also reviewed this report.

October 15, 1964.

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 64-F-77LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 397+74 30.5 Rt.ORIGINATED BY W.W.K.W P 247-62BORING DATE Aug. 17-19, 1964.COMPILED BY W.W.K.DATUM 290.0BOREHOLE TYPE BX Casing RunCHECKED BY K.G.S.

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL			BULK DENSITY P C F.	REMARKS		
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT					PLASTIC LIMIT — WP				
							20	40	60	80	100	WATER CONTENT — W				
							SHEAR STRENGTH P.S.F.					W P — W — W L				
												WATER CONTENT % 15 30 45				
290.0	Groundlevel															
289.0	Black org. topsoil															
1.0	Clayey, sandy silt with traces of gravel. (Glacial Till)		1	SS	9	280								W.L. Elev. 281.9 Observed in casing.		
	Frequent boulders.		2	SS	20											
	Stiff to hard.		3	SS	29											
			4	SS	80	270										
			5	SS	64											
			6	SS	71											
262.8	Limestone					260										
257.8	Bedrock.															
32.2	End of borehole.						250									

W.L. Elev.

281.9

Observed in
casing.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 64-F-77

LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 397+03 - 35.0 Lt.

ORIGINATED BY W.W.K.

W P. 247-62

BORING DATE Aug. 19-21, 1964.

COMPILED BY W.W.K.

DATUM 292.0

BOREHOLE TYPE BX Casing Run

CHECKED BY _____ K.G.S.



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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 64-F-77 LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 399+09 - 24.0 Lt. ORIGINATED BY W.W.K.
 W.P. 247-62 BORING DATE Aug. 21-24, 1964. COMPILED BY W.W.K.
 BATHY 294.0 BOREHOLE TYPE BX Casing Run CHECKED BY K.G.S.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W			BULK DENSITY Y P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	20	40	60	80	100			W _P
294.0	Groundlevel													
293.0	Black org. topsoil													
1.0	Clayey, sandy silt with traces of gravel. (Glacial Till) Frequent Boulders. Stiff to hard.					290								
			1	SS	30									
			2	SS	26									
			3	SS	80	280								
					for 3"									
			4	SS	100									
					for 6"	270								
262.7														
31.3	Limestone					260								
259.9	Bedrock.													
34.1	End of borehole.					250								

W.L. Elev.
 285.8
 Observed in
 casing.

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 64-F-77LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 399/80- 23.C Rt.ORIGINATED BY W.W.K.W. P. 247-62BORING DATE Aug. 25, 1964.COMPILED BY W.W.K.DATUM 294.0BOREHOLE TYPE BX Casing RunCHECKED BY K.G.S.

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV.	DEPTH	NUMBER	TYPE		BLOWS / FOOT	20	40	60	80	100	PLASTIC LIMIT — WP		
DESCRIPTION					SHEAR STRENGTH P.S.F.					WATER CONTENT %			
										WP	WL		
										15	30	45	
294.0	Groundlevel												
292.8	Black org. topsoil.												
1.2	Clayey, sandy silt with traces of gravel.	1	SS	17									
	(Glacial Till).	2	SS	20									
	Frequent Boulders.	3	SS	100	for 6"								
	Stiff to hard.	4	SS	110									
		5	SS	71									
262.9		6		96									
31.1	Assumed Bedrock				for 7"								
	End of borehole.												

W.L. Elev. 285.0

Observed in

Casing.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 64-F-77LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 400/51 - 48.0 Lt.ORIGINATED BY W.W.K.W. P. 247-62BORING DATE Aug. 26-1964COMPILED BY W.W.K.DATUM 298.0BOREHOLE TYPE BX Casing RunCHECKED BY K.G.S.

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	NUMBER	TYPE		20	40	60	80	100	W _L	W _P	W		
298.0	Groundlevel													
297.0	Black org. topsoil													
1.0	Clayey, sandy silt with traces of gravel (Glacial Till) Frequent Boulders. Stiff to hard.	1	SS	10										
				290										
		2	SS	24										
		3	SS	148 for 9"										
				280										
		4	SS	100 for 4"										
		5	SS	105 for 6"										
				270										
		6	SS	130										
266.5														
31.5	End of borehole.			260										

W.L. El.

289.2

Observed in
Casing.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 64-F-77LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 402/18-21.0 Rt.ORIGINATED BY W.W.K.W.P. 247-62BORING DATE Aug. 27, 1964.COMPILED BY W.W.K.DATUM 298.0BOREHOLE TYPE BX Casing RunCHECKED BY K.G.S.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W		
					20 40 60 80 100				
298.0	Groundlevel								
296.0	Black org. topsoil								
2.0	Clayey, sandy silt with traces of gravel. (Glacial Till) Frequent Boulders. Stiff to hard.	1	SS 8						
		2	SS 51						
		3	SS 59						
		4	SS 100 for 5"						
		5	SS 100 for 4"						
266.5		6	SS 180 for 9"						
31.5	End of borehole.								

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 64-F-77 LOCATION Hwy. #2 & C.N.R. & C.P.R. Ch. 402/57-26.0 Lt. ORIGINATED BY W.W.K.
 W P 247-62 BORING DATE Aug. 31, 1964. COMPILED BY W.W.K.
 DATUM 298.0 BOREHOLE TYPE BX Casing Run CHECKED BY K.G.S.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W WP — W — WL	BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT					
298.0	Groundlevel								
296.0	Black org. topsoil								
2.0	Clayey, sandy silt with traces of gravel. (Glacial Till) Frequent Boulders. Stiff to hard.	1	SS	21	290				W.L. Elev. 289.5
		2	SS	46					Observed in Casing.
		3	SS	22	280				
		4	SS	58					
		5	SS	86	270				
266.5		6	SS	87					
31.5	End of borehole.				260				

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

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 JENSEST 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
π_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_i	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. G. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: Bridge Division,
Downsview, Ontario.

DATE: January 18, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: C.N.R. and C.P.R. Overhead
East of Cobourg,
Hwy. 2 - Dist. 7
Bridge Site 21-333
W.P. 247-62

24-F-77

Herewith for your information one print of the preliminary plan D-5587-Pl. Design appears to conform to the recommendations of foundation report.



JBC/sp

J. B. Curtis,
Regional Bridge Location Engineer.

*No comment.
Jan 19. 1965 agtmanag*

MEMORANDUM

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

From: Bridge Division,
Downsview, Ontario.

Date: October 4, 1965.

Our File Ref.

In Reply To

Subject: W.P. 247-62 - Site 21-333
C.N.R. and C.P.R. Overhead
East of Cobourg
Hwy. 2 - District 7

Herewith one print of preliminary plan D 5796-P1 for your information. This supersedes drawing D 5587-P1 sent to you on January 18, 1965. The redesign has been necessitated by the addition of one track to the north of the present C.N.R. tracks.

The design appears to conform to the recommendations of the foundation report.

JFW/im

Joseph F. Walshe
J. F. Walshe,
for J. B. Curtis,
Regional Bridge Location Engineer.

Department of Highways Ontario

Copy for the information of
Mr. A. Stermac,
Principal Foundation Eng.
Room 107, Lab. Bldg.

Mr. R. B. Fraser,
District Construction Engineer,
Port Hope, Ontario.

Bridge Division,
Downsview, Ontario.

December 12, 1966.

C.N.R. and C.P.R. Overhead
East of Cobourg
Hwy. 2, District 7, W.P. 247-62
Contract 66-151

This letter will confirm our telephone conversation regarding the pile driving at pier #3 of the above structure.

Since the present method of installation of the caissons by driving appears likely to appreciably displace the railway tracks, this office suggests that in this pier the piles be installed by augering the first 10 feet and resuming driving from there on. The soils department concurs with this suggestion.

This will apply to pier #3 only.

JWR/dn

J. W. Reid
J. W. Reid,
Regional Construction Liaison Engineer.

c.c. A. Stermac

*File with report,
please*

Dony

64-8-77

MEMORANDUM

TO: Mr. C. S. Grebski,
Bridge Design Engineer,
Administration Bldg.

FROM: Bridge Division,
Downsview, Ontario.

DATE: August 17, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 247-62 - Site 21-333,
C.N.R. and C.P.R. Overhead at Cobourg,
Hwy. #2 - Dist. #7.

The Bridge Engineer has directed that the above structure be redesigned to provide the extra track requested by the C.N.R. in their letter of July 14th. 1965. This track is to be located 14'-0" to the north of the centre line of the existing westbound track.

The horizontal alignment will be the same as on the existing design. The vertical alignment will be set to satisfy the requirements of the Bridge Division. The selected grades should again satisfy the temporary as well as the permanent clearance requirements. The design section is to supply information regarding the clearances, depth of structure and bridge cross-section and we will have Functional Planning set the grades to suit. The existing design shows asphalt on the deck, the new design will not have asphalt in conformity with current practice.

The provisions and recommendations of the Foundation, Bridge Planning and other reports are still operative except in so far as they are affected by the foregoing.

Please arrange for the redesign of this structure. The preliminary drawing should be ready as soon as possible and the tracings completed by Jan. 31, 1966.

All design costs for this redesign should be kept separately as there may be a claim against the C.N.R. for recovery of same.

The drawing number assigned is D 5796.

JFW/ds
c.c. R. Fitzgibbon

Joseph F. Walshe.
J. F. Walshe,
for J. B. Curtis,
Regional Bridge Location Engineer, D.H.O.

TORONTO
RECEIVED
AUG 17 1965
BRIDGE
OFFICE