GEN. FILES 33-F-22

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 5, 1968

Our File Ref.

In reply to JAN 22 1968

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed C.N.R. Overhead on Hwy. #69
Township of Medora, Lot 15, Con. C
District of Muskoka
District No. 11 (Huntsville)
W.J. 67-F-107R -- W.P. 177-63

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
J. B. Curtis
W. S. Aitken
T. J. Kovich
B. A. Singh

Foundations Files
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed C.N.R. Overhead on Hwy. #69
Township of Medora, Lot 15, Con. C
District of Muskoka
District No. 11 (Huntsville)
W.J. 67-F-107R -- W.P. 177-63

1. INTRODUCTION:

A request to carry out a foundation investigation for the proposed overhead to carry Highway #69 over the C.N.R. tracks, was received from Mr. J. B. Curtis, Regional Bridge Location Engineer, in a memo dated October 31, 1967.

An investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site of the proposed overhead.

This report contains the results of our field and laboratory investigations, together with our recommendations for the foundations of the new structure.

2. DESCRIPTION OF SITE AND GEOLOGY:

The new structure is proposed to be located just west of the existing one, about 0.1 miles south of the north limits of Bala. The existing structure is a simple timber beam bridge, about 123.9 ft. clear span, founded directly on bedrock.

The bedrock outcrops at the site and all around it. The general topography is undulating.

3. FIELD AND LABORATORY WORK:

The field work at the site consisted of five sampled boreholes and five dynamic cone penetration tests. All holes were advanced using conventional diamond drilling equipment adapted for soil sampling purposes. A driving energy of 350 ft. lbs. per blow was used for the dynamic cone penetration tests.

cont'd. /2 ...

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

Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. Bedrock samples were obtained in all boreholes using AXT coring equipment, except borehole 4, where BXT coring equipment was used.

Samples were visually examined in the field and subsequently in the laboratory. The tests were carried out on selected samples to determine the following properties of the soil:

1) Grain-Size Distribution

2) Natural Moisture Content

3) Atterberg Limits

The results of field and laboratory tests are summarized in the Record of Borehole sheets, which are contained in the appendix to the report.

The locations and elevations of boreholes are given on Drawing No. 67-F-107A, which is also contained in the appendix to this report.

The borehole locations and elevations were provided by the Huntsville District Office, D.H.O.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil on the north side of the tracks consists of a sand layer overlying gneiss bedrock. In borehole 7 the thickness of the sand layer was 12.0 ft., and in borehole 4, 3.5 ft. of sand - which is a part of the railway embankment - was followed by 0.5 ft. of organic soil and 3.5 ft. of silty clay underlain by 4.4 ft. of sand overlying the bedrock. The denseness of the sand is loose to compact.

On the south side of the tracks, bedrock outcrops everywhere.

cont'd. /3 ...

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

4.2) Bedrock:

The bedrock was proven to various depths in all boreholes. It is exposed on the south side of the railway tracks and just north of the bridge site. The bedrock core samples were examined by Mr. K. Ingham, Geologist, Materials and Testing Division, Department of Highways, whose report is as follows:

"Exploratory drill holes 1, 2 and 3, reportedly drilled in bedrock exposed at the surface, intersect a banded biotite gneiss of medium grain size - the banding being due to variations in the biotite content. Minor zones of medium grained granite gneiss from 0.1 to 0.5 ft. in thickness occur in all three holes and in addition the upper 2.5 ft. in hole No. 3 is granite gneiss.

"Throughout this area, rocks of this type generally have two widely spaced vertical joint systems and also a more closely spaced inclined system and planes of roakness parallel to the lineation. In this case the lineation in the rock is reported to be approximately parallel to the surface.

"Blasting this rock should not constitute a problem providing the usual precautions are taken. However, as the holes will of necessity be shallow it is recommended that light charges be used.

"Holes 4 and 7 which have up to 12 ft. of overburden are predominantly granite gneiss with irregular sections of meta-granite. Minor inclined pegmatite (coarse granite) veins from 0.1 ft. to 0.5 ft occur in both holes."

5. GROUNDWATER:

The groundwater level on the north side of the railway tracks at the time of investigation, was at elevation 773.3.

cont'd. /4 ...

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to replace the existing timber beam bridge with a new structure located slightly to the west of the existing one. The new bridge is skewed at an angle of 29°. A maximum approach height of about 30.0 ft. is required.

Because the bedrock is either exposed or is shallow, it is recommended that spread footing type foundations, placed on sound bedrock, be provided. A safe bearing pressure of 20.0 tons/sq.ft. may be used for design purposes.

All organic soil should be removed and replaced with suitable fill.

No stability problems are anticipated for standard 2:1 forward and side slopes of the embankment.

Since the spread footings on the north side of the railway tracks have to be founded under water, it will be necessary to provide a dewatering scheme.

7. SUMMARY:

A foundation investigation at the site of the proposed overhead crossing of Hwy. #69 over C.N. railway tracks is reported.

Subsoil to the north of the tracks consists of a sand layer and at places, a thin silty clay layer overlying gneiss bedrock. The bedrock is exposed on the south side of the tracks and just north of the site.

It is recommended that the structure be supported on spread footings placed on sound bedrock.

All organic material should be removed.

No stability problems are anticipated for forward and side slopes of 2:1.

No major dewatering problems are anticipated.

cont'd. /5 ...

8. MISCELLANEOUS:

The field work for this project was carried out during the period November 16 to 23, 1967, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

The equipment used was owned and operated by Dominion Soil Investigation Ltd.

This report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

January 1968

APPENDIX I

FORM OB-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-107(R) LOCATION Hwy. 69 Rev. 90 + 43 3' Lt. ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 17 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Rock Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / 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	ELEV. SCALE				
787.9										
0.0	Bedrock - Gneiss				AXT					
	Sound		1	RC	100%					
783.9										
4.0	End of Borehole					780				

FORM DB-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-107(R) LOCATION Hwy. 69 Rev. 90 + 66 2' Lt. ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 17, 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Rock Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / 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					
783.7	Ground Level									
0.0	Bedrock - Gneiss Sound		1	RC	AXT 100%	780				
773.5										
10.2	End of Borehole					770				

FORM OB-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-107(R) LOCATION Hwy. 69 Rev. 91 + 03 ℄ ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 17, 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Rock Core Crilling CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 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					
777.1	Ground Level									
0.0	Top Soil									
774.1	Mixture of sand & silt with some clay & org. matter.									
3.0	Bedrock - Gneiss		1	RC	AXT 100%	770				
767.1	Sound									
10.0	End of Borehole					760				

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OFFICE REPORT ON SOIL EXPLORATION

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 67-F-107(R) LOCATION Hwy. 69 Rev. 91 + 52 ℄ ORIGINATED BY AP
W.P. 177-63 BORING DATE Nov. 20 - 22, 1967 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE NX Casing, Washboring CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / 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					
774.9										Gr.Sa.Si.Cl
0.0	Sand, some silt & clay. Loose		1	SS	10	770				5 65 (30)
771.4	Organic Soil		2	CS						
770.9			3	CS						
4.0	Silty clay. Stiff		4	TW	PM					
766.9			5	TW	PM					
8.0	Sand, some silt & clay. Loose		6	SS	9					4 72 (24)
762.5			7	SS	100/6"					
12.4	Bedrock - Gneiss Sound		8	RC	BXT 100%	760				
757.5										
17.4	End of Borehole									

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

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DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 67-F-107(R) LOCATION Hwy. 69 Rev. 91 + 37 19' Rt. ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 22, 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (10 20 30 40 50) 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 γ P.C.F.	REMARKS
776.9										
0.0						770	Bouncing			
762.4										
14.5	End of Cone Test Probable Bedrock					760				

FORM 08-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 67-F-107(R) LOCATION Hwy. 69 Rev. 91 + 37 22' Lt. ORIGINATED BY AP
W.P. 177-63 BORING DATE Nov. 22, 1967 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY AK

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (10 20 30 40 50) 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 γ P.C.F.	REMARKS
EL. EV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
776.6	Ground Level									
0.0						770	Bouncing			
767.9										
8.7	End of Cone Test					760				
	Probable Bedrock									

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OFFICE REPORT ON SOIL EXPLORATION

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 67-F-107(R)
W.P. 177-63
DATUM Geodetic

LOCATION Hwy. 69 Rev. 91 + 82 ℄
BORING DATE Nov. 23, 1967
BOREHOLE TYPE NX Casing, Washboring, Cone

ORIGINATED BY AP
COMPILED BY AP
CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 10 20 30 40 50 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH 773.7	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
0.0	Fine sand, some silt & clay.					770				Sa. Si.& Cl
	Loose to compact.		1	SS	8			○		38 62
			2	SS	10					
761.7			3	SS	15		Bouncing	○		70 30
12.0	Bedrock - Gneiss Sound		4	RC	AXT 100%	760				
756.0										
17.7	End of Borehole									

FORM OB-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-107(R) LOCATION Hwy. 69 Rev. 91 + 64 20' Rt. ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 23, 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 10 20 30 40 50 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 γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
774.3										
0.0						770				
763.4								Bouncing		
10.9	End of Cone Test Probable Bedrock					760				

FORM 08-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-107(R) LOCATION Hwy. 69 Rev. 91 + 82 25' Lt. ORIGINATED BY AP

W.P. 177-63 BORING DATE Nov. 23, 1967 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 10 20 30 40 50 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 γ P.C.F.	REMARKS
ELEV. DEPTH 773.2	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
0.0						770				
764.5							Bouncing			
8.7	End of Cone Test Probable Bedrock					760				

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
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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

Dominion Soil Investigation
77 Crockford Blvd.
Scarborough, Ontario

Dear Sirs:

This is to confirm our request of November 15, 1967 for the supply of a Diamond Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Bala, Ontario, November 16, 1 p.m.

These projects bear Job Numbers 67-F-107 and 67-F-108.

Yours truly,

K. G. Selby

KGS:mt

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

Department of Highways Ontario
Copy for the information of

Mr. A. Stermac

Mr. J.E. Curtis,
Reg. Bridge Location Engineer,
North Bay Regional Office,
North Bay, Ontario

Bridge Division,
Downsview, Ontario

June 10, 1968

C.N.R. Overhead
At the N. Limits of the Town of Sala
W.P. 177-63, Site No. 42-51
Highway 69, District No. 11

Attached herewith are prints of the Preliminary Bridge Plan Drawing B-6432-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is $105,000. This cost includes tender, materials, engineering and sundry construction, but does not include the cost of removal of the existing structure.

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

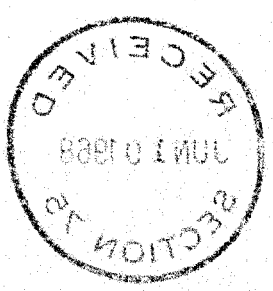
C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. S. McCambie
A. Stermac (2)
J. Anderson

No Comments
M.L. Sully
June 17 1968



DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

From: Bridge Office,
Downsview, Ontario

Attention:

Date: January 24, 1969

Our File Ref.

In reply to

Subject: C.N.R. Overhead
At the North Limits of
the Town of Bala
W.P. 177-63, Site 42-51
Highway 69, District 11

67-F-107(R)

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.

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Section

no. and lengths of piles
for N- abutment not given.

~~AF~~
29/1/69

no comments
4/2/69

W.P. 177-63.
Re: Bridge Foundations

Mr. A. Prakash,
Foundation Field Engineer,
Foundations Section.

K. W. Ingham

December 5th, 1967

Re: Bridge Foundations, W.P.177-63.
Job No. 67F 107

Exploratory drill holes 1, 2 and 3, reportedly drilled in bedrock exposed at the surface, intersect a banded biotite gneiss of medium grain size - the banding being due to variations in the biotite content. Minor zones of medium grained granite gneiss from 0.1 to 0.5 ft. in thickness occur in all three holes and in addition the upper 2.5 ft. in hole No. 3 is granite gneiss.

Throughout this area, rocks of this type generally have two widely spaced vertical joint systems and also a more closely spaced inclined system and planes of weakness parallel to the lineation. In this case the lineation in the rock is reported to be approximately parallel to the surface.

Blasting this rock should not constitute a problem providing the usual precautions are taken. However, as the holes will of necessity be shallow it is recommended that light charges be used.

Holes 4 and 7 which have up to 12 ft. of overburden are predominantly granite gneiss with irregular sections of meta-granite. Minor inclined pegmatite (coarse granite) veins from 0.1 ft. to 0.5 occur in both holes.

K. W. Ingham,
Geologist.

KWI/jm

#67-F(R)-107

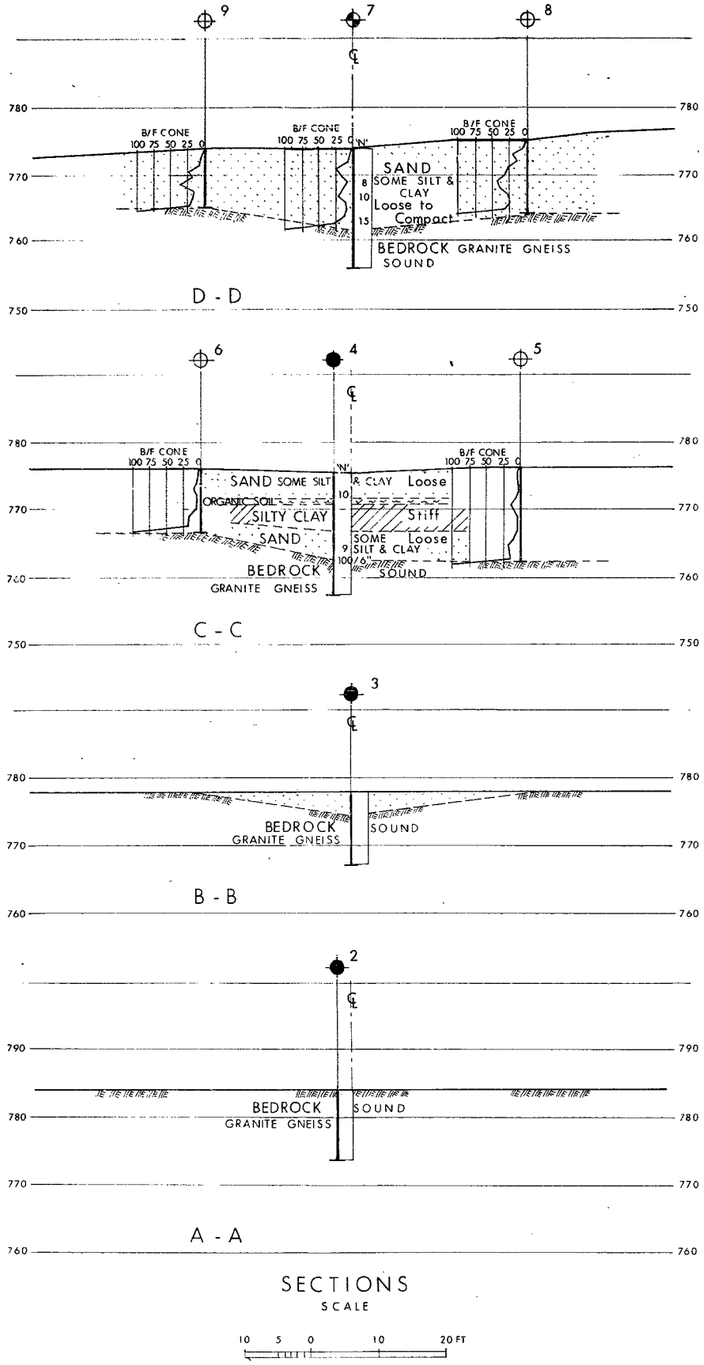
W.P. #177-63

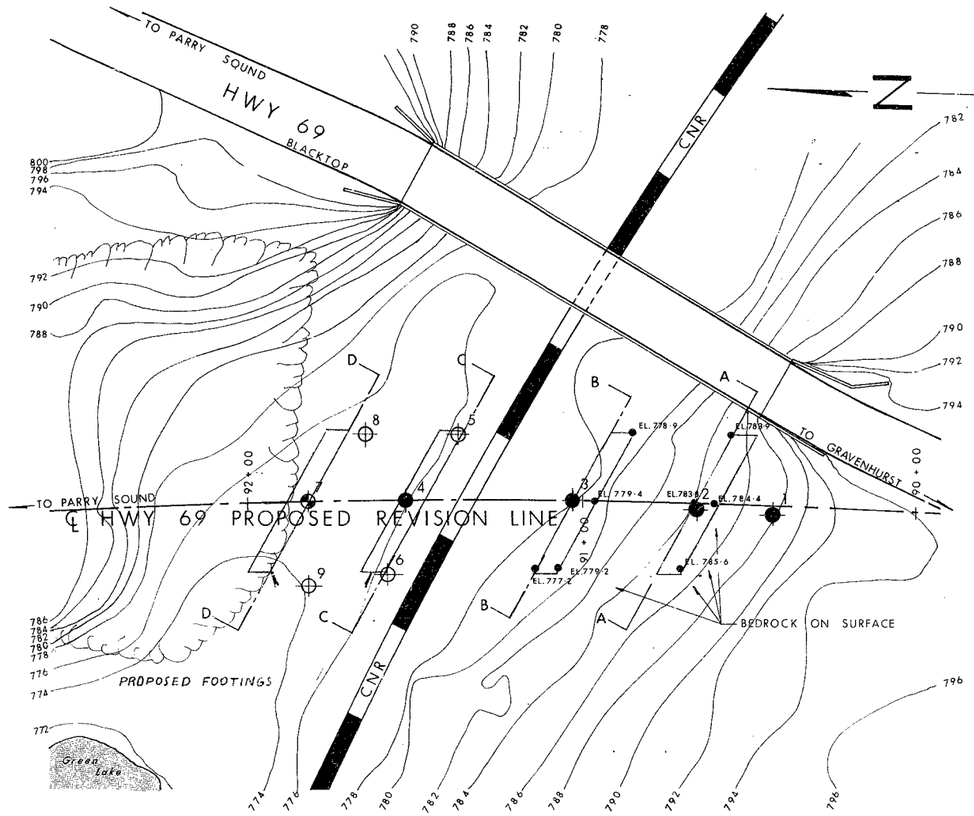
HWY. #69

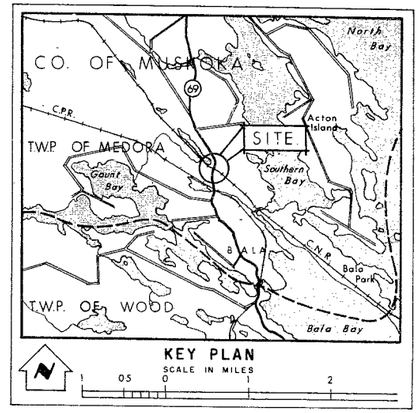
C.N.R.

OVERHEAD

(BALA)







LEGEND

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

NO.	ELEVATION	STATION	OFFSET
1	787·9	90+43	3' LT
2	783·7	90+66	2' LT
3	777·1	91+03	℄
4	774·9	91+52	℄
5	776·9	91+37	19' RT
6	776·6	91+58	22' LT
7	773·7	91+82	℄
8	774·3	91+64	20' RT
9	773·2	91+82	25' 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.

PRINT RECORD		
NO.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

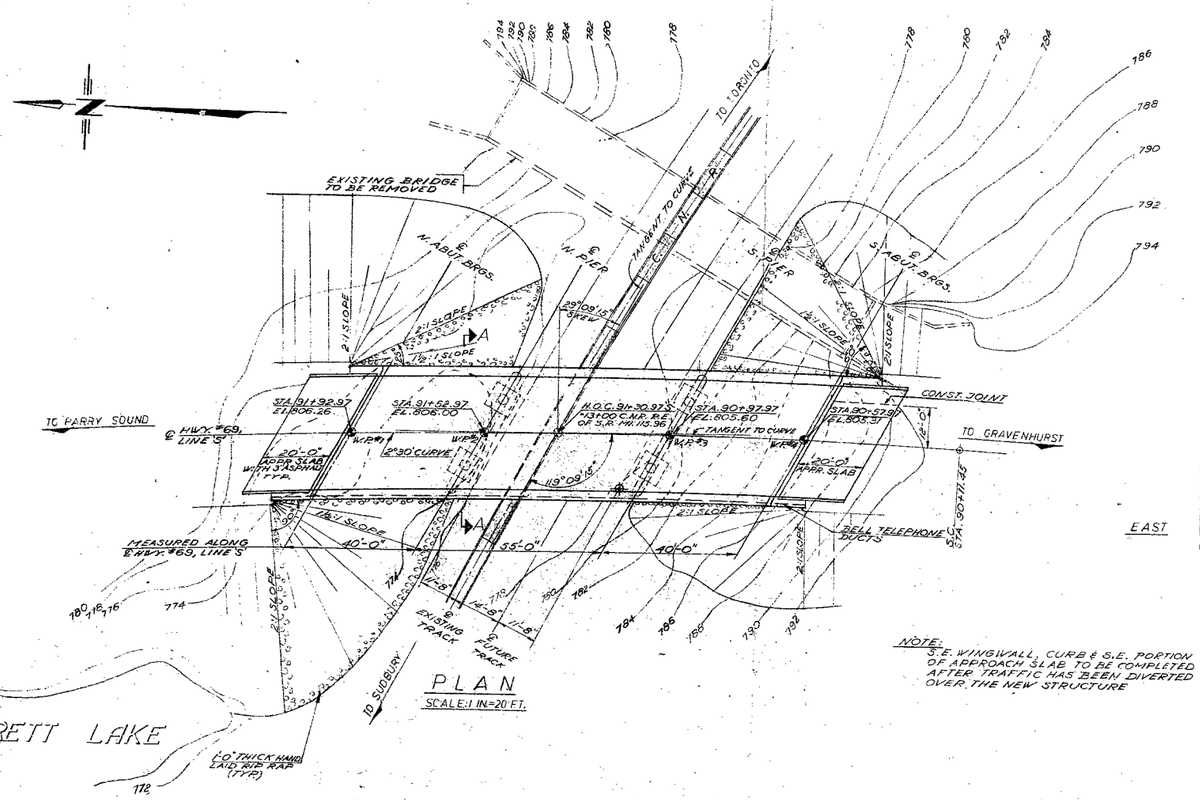
DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & TESTING DIVISION – FOUNDATION SECTION

CANADIAN NATIONAL RAILWAYS
TOWN OF BALA

KING'S HIGHWAY NO. 69 DIST. NO. 11
CO. MUSKOKA
TWP. MEDORA LOT 15 CON. C

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. A.P.	CHECKED J.P.	W.P. NO. 177-63	M.B.T. DRAWING NO. 67-F-107 A
DRAWN A.B.	CHECKED J.P.	JOB NO. 67-F-107	
DATE JAN. 10, 1968.		SITE NO.	BRIDGE DRAWING NO.
APPROVED A.G. Thomas PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

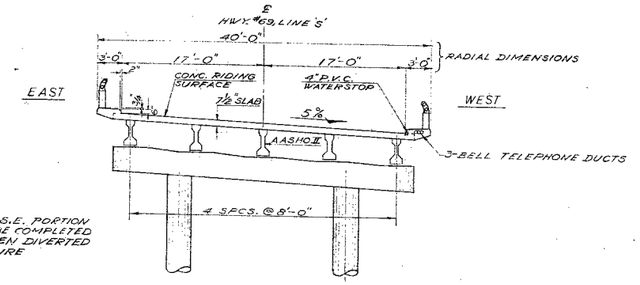


PLAN
SCALE: 1 IN=20 FT.

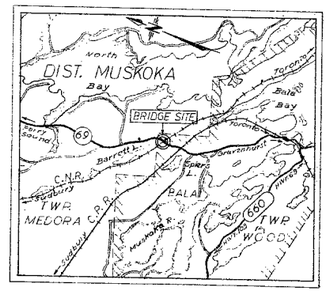
SKEW 29°09'15"
SIN = .487 1612
COS = .873 3121
TAN = .557 6318

CURVE DATA
Δ = 36°09'
Δc = 31°46' 30"
D = 2°30' L.T.
R = 2291.83'
Lc = 1271.00'
Es = 119.57'

NOTE:
S.E. WINGWALL, CURB & S.E. PORTION OF APPROACH SLAB TO BE COMPLETED AFTER TRAFFIC HAS BEEN DIVERTED OVER THE NEW STRUCTURE



SECTION A-A
SCALE: ⅛ IN. 1 FT.



KEY PLAN
SCALE: 1 IN.=0.8 MI.

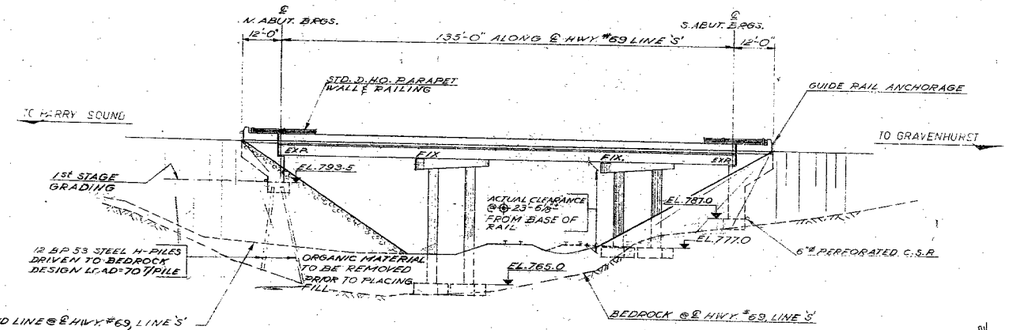
CLASS OF CONCRETE
PIER CAPS, COLUMNS, DECK, CURBS & PARAPET WALLS 4000 P.S.I.
REMAINDER ..... 3000 P.S.I.
FOR PRESTRESSED GIRDERS SEE D-6432-6

CLEAR COVER ON REINFORCING STEEL
FOOTINGS & ABUTMENTS ..... 3"
COLUMNS & CAPS ..... 2½"
DECK ..... 1½"
DIAPHRAGMS & CURBS ..... 2"
AND/OR AS NOTED ON DRAWINGS

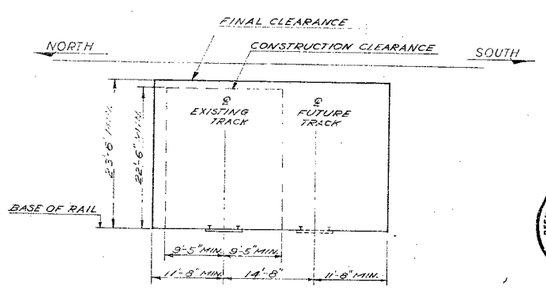
CONSTRUCTION NOTES
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/16". NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

LIST OF DRAWINGS
D-6432-1 GENERAL LAYOUT
-2 BOREHOLE LOCATIONS & SOIL STRATA
-3 FOOTING LAYOUT & PIERS
-4 NORTH ABUTMENT
-5 SOUTH ABUTMENT
-6 PRESTRESSED GIRDERS & BEARINGS
-7 DECK, DIAPHRAGMS & SCREED ELEVATIONS
-8 APPROACH SLABS
-9 PARAPET WALL DETAILS
-10 STANDARD STEEL PARAPET RAIL
-11 STANDARD DETAILS

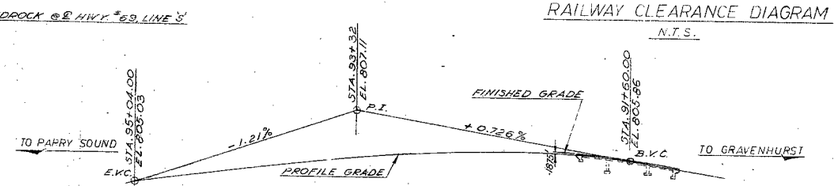
177-F-107



WEST ELEVATION
SCALE: 1 IN.=20 FT.



RAILWAY CLEARANCE DIAGRAM
N.T.S.



PROFILE GRADE ℄ HWY. #69, LINE 'S'
N.T.S.

B.M. ELEV. 799.94
GEODETIC DATUM
CUT X ON ROCK
107' RT. 92+31

REGISTERED PROFESSIONAL ENGINEER
C. F. FARRELL
PROVINCE OF ONTARIO

REVISIONS			
	DATE	BY	DESCRIPTION

PRINT RECORD		
No.	FOR	DATE

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

177-F-107

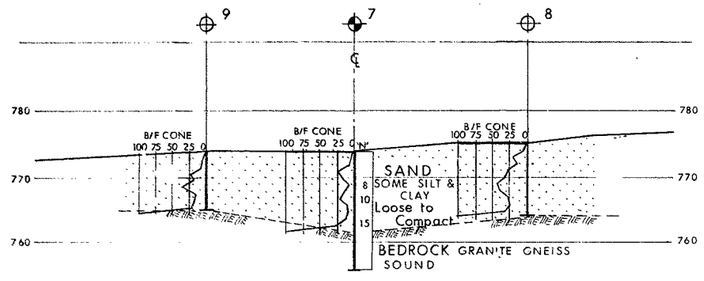
C.N.R. OVERHEAD
AT THE NORTH LIMITS OF THE TOWN OF BALA

KING'S HIGHWAY No. 69 — DIST. No. 11
DIST. OF MUSKOKA
TWP. MEDORA — LOT 14 — CON. C

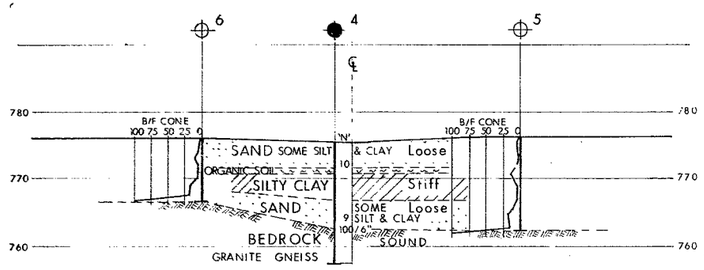
GENERAL LAYOUT

APPROVED _____ BRIDGE ENGINEER

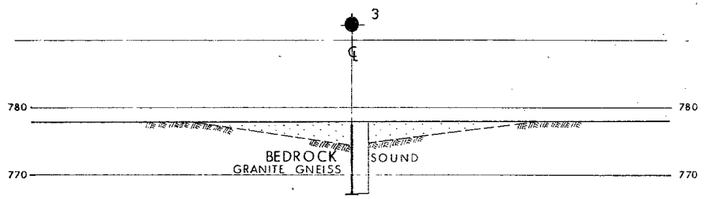
DESIGN	C.F.F.	CHECK	P.O.L.	SITE No. 42-51	W.P. No. 177-63
DRAWING	P. SCH.	CHECK	C.F.F.	CONTRACT Nos.	
DATE	DEC/68	LOADING	HS20-44	DRAWING No.	D-6432-1



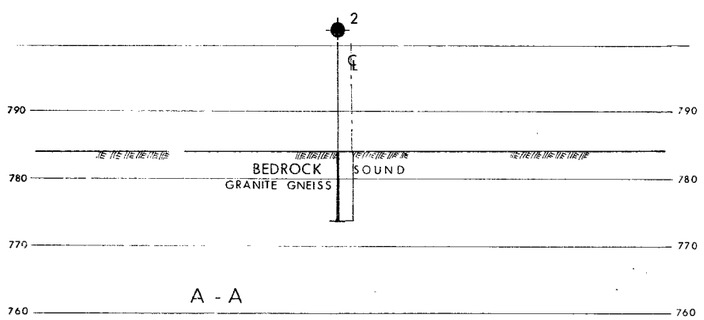
D - D



C - C

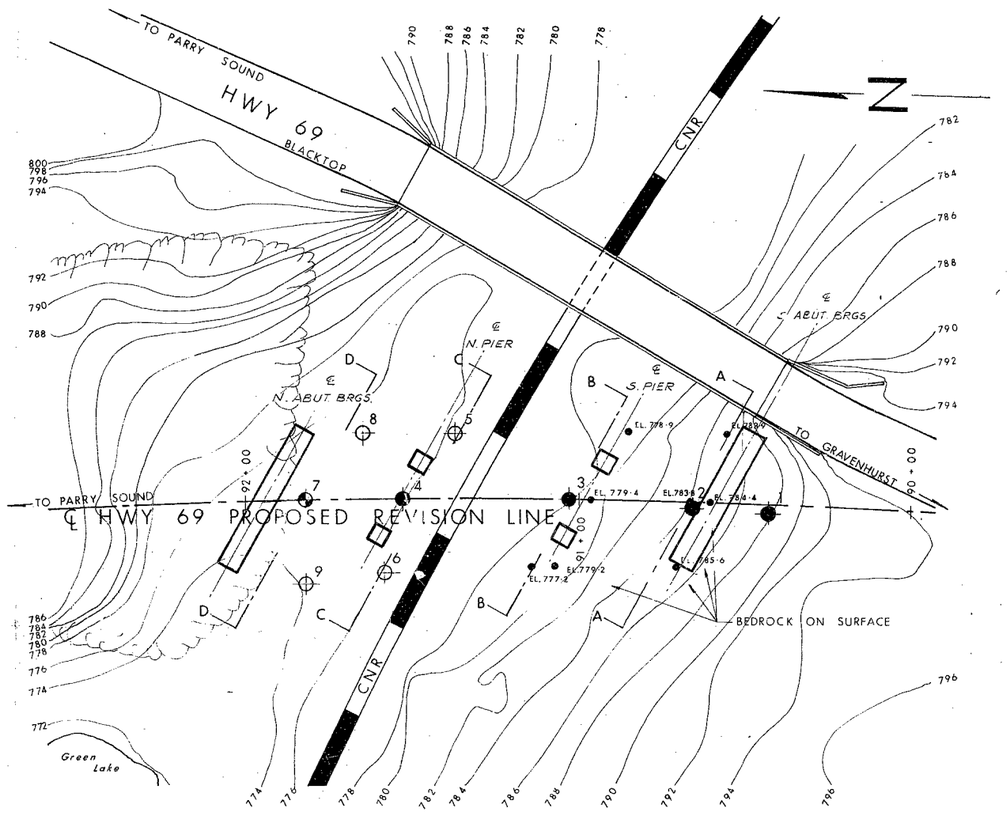


B - B

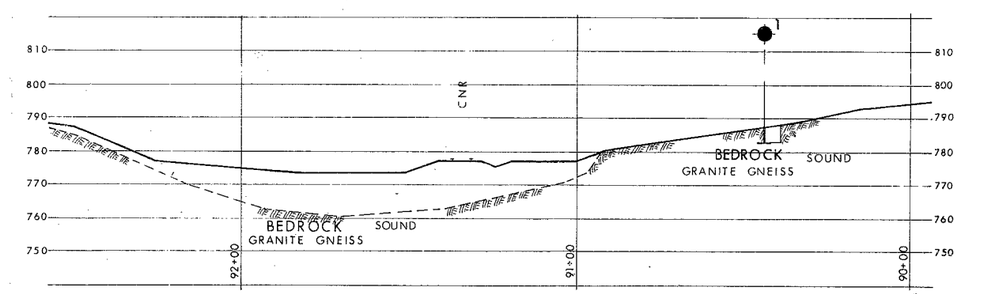


A - A

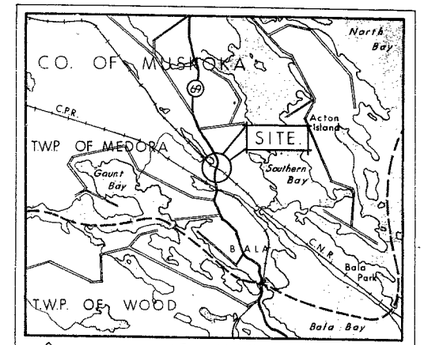
SECTIONS
SCALE
10 5 0 10 20 FT



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.

NO.	ELEVATION	STATION	OFFSET
1	787·9	90 + 43	5' LT
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5	776·9	91 + 37	19' RT
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9	773·2	91 + 82	25' 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.

—NOTE—

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

PRINT RECORD		
NO	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

67-F-107

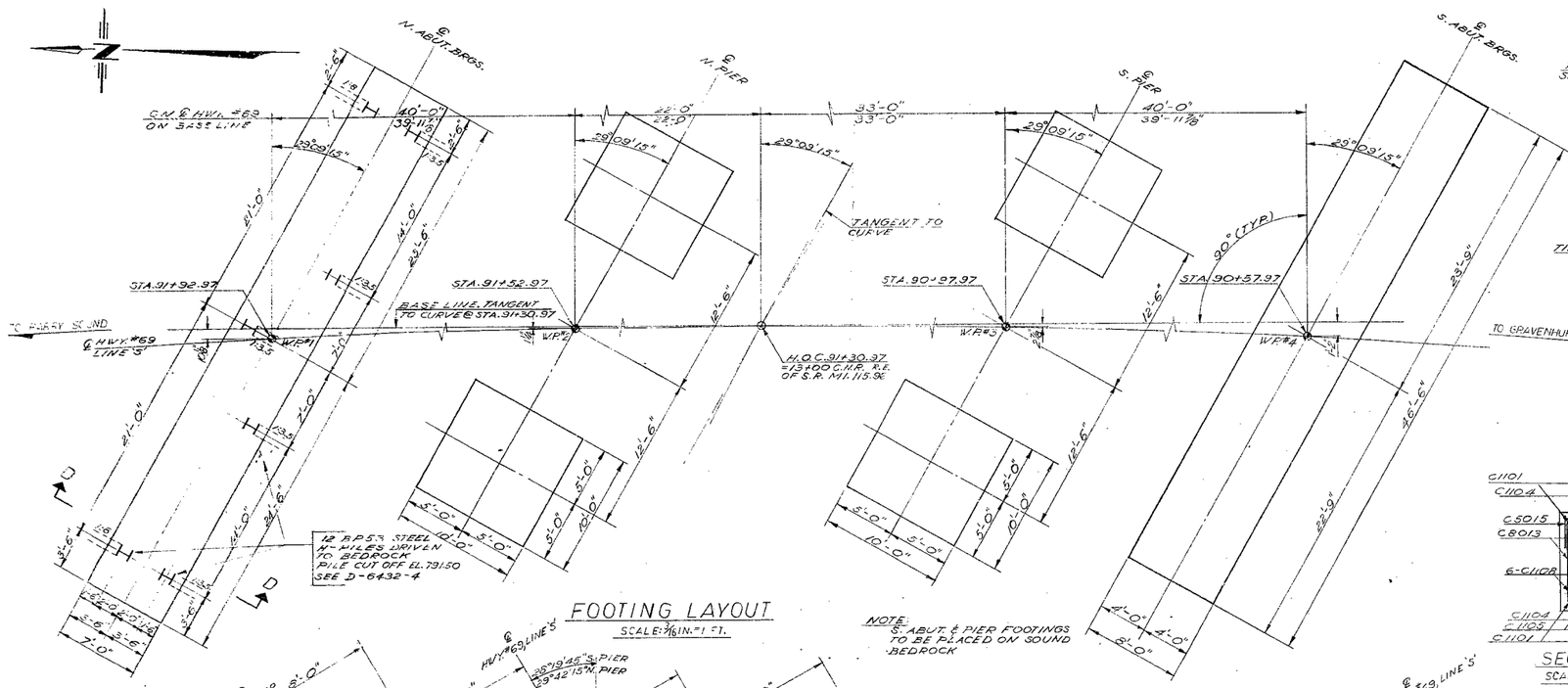
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CANADIAN NATIONAL RAILWAYS
TOWN OF BALA

KING'S HIGHWAY NO. 69 DIST. NO. 11
CO. MUSKOKA
TWP. MEDORA LOT 15 CON. C

BORE HOLE LOCATIONS & SOIL STRATA

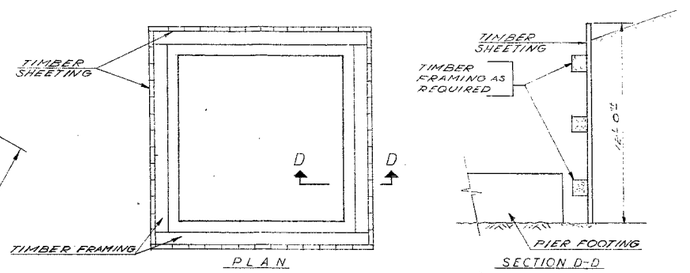
SUBM'D. A. P.	CHECKED P P	W.P. NO. 177 - 63	M.B.T. DRAWING NO. 67-F-107 A
DRAWN A. B.	CHECKED	JOB NO. 67 -F-107	
DATE JAN. 10, 1968.		SITE NO 42-51	BRIDGE DRAWING NO. D6432-2
APPROVED A. G. Thomas PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	



FOOTING LAYOUT

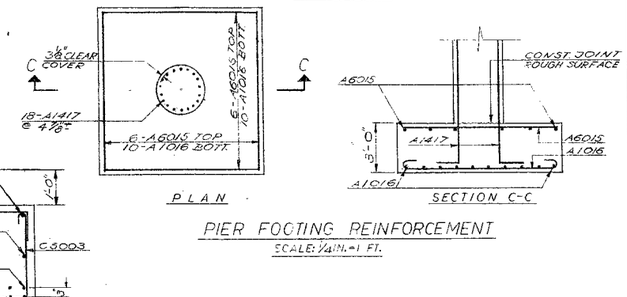
SCALE: 1/16 IN. = 1 FT.

NOTE:
℄ ABUT. & PIER FOOTINGS TO BE PLACED ON SOUND BEDROCK



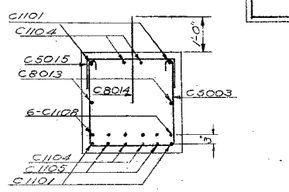
SUGGESTED RAILWAY PROTECTION DURING CONSTRUCTION OF NORTH PIER

SCALE: 1/4 IN. = 1 FT.



PIER FOOTING REINFORCEMENT

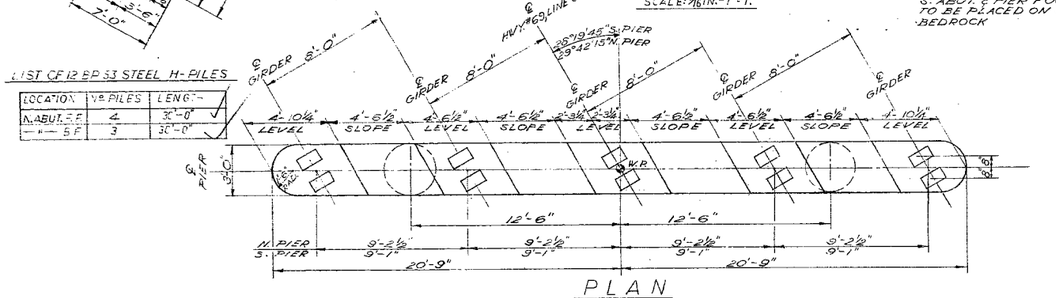
SCALE: 1/4 IN. = 1 FT.



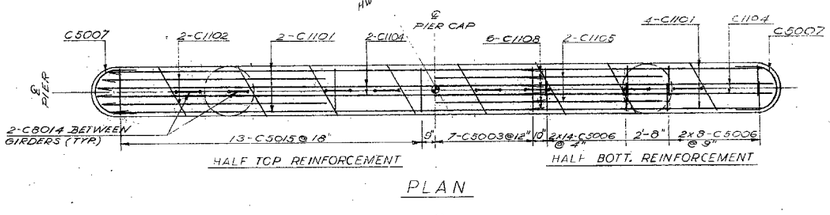
SCALE: 1/2 IN. = 1 FT.

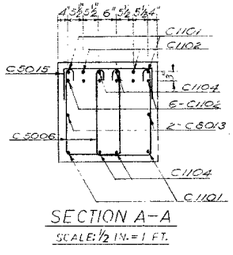
LIST OF 12 BP 53 STEEL H-PILES

LOCATION	NO. PILES	LENGTH
N. ABUT. - E.F.	4	30'-0"
" - S.F.	3	30'-0"



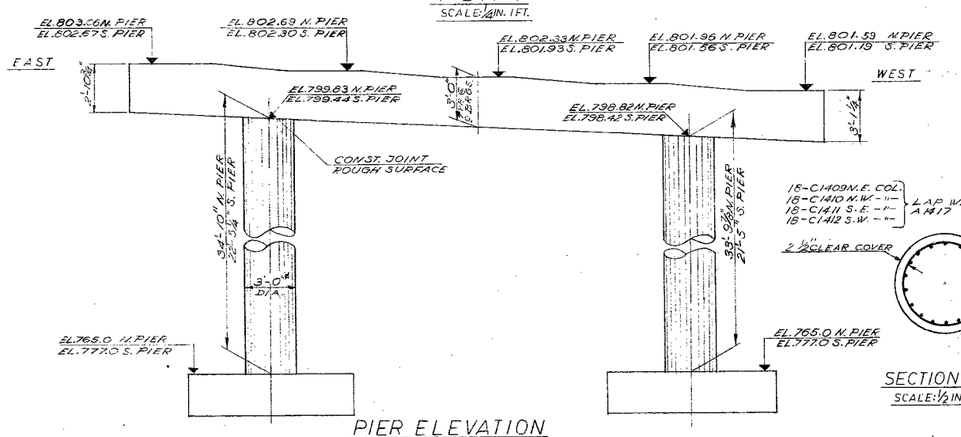
SCALE: 1/4 IN. = 1 FT.





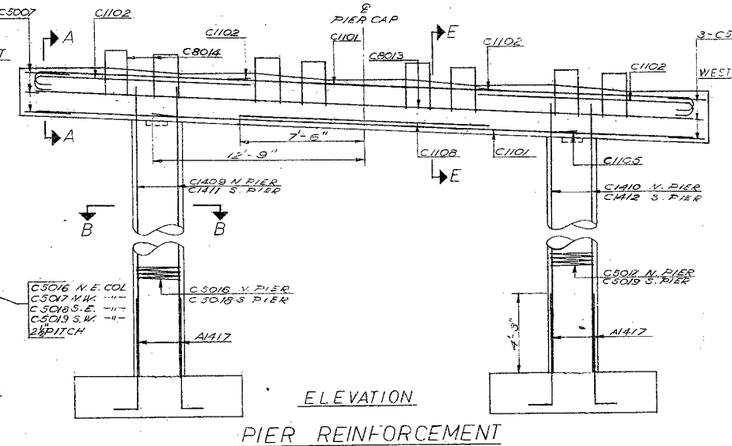
SCALE: 1/2 IN. = 1 FT.

REGISTERED PROFESSIONAL ENGINEER C. F. FARRELL PROVINCE OF ONTARIO



SCALE: 1/4 IN. = 1 FT.

SCALE: 1/2 IN. = 1 FT.



PIER REINFORCEMENT

SCALE: 1/4 IN. = 1 FT.

REVISIONS		
DATE	BY	DESCRIPTION

PRINT RECORD		
No.	FOR	DATE

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

C.N.R. OVERHEAD
AT THE NORTH LIMITS OF THE TOWN OF BALA

KING'S HIGHWAY No. 69 — DIST. No. 11
DIST. OF MUSKOKA
TWP. MEDORA — LOT 14 — CON. C

FOOTING LAYOUT & PIERS

APPROVED BRIDGE ENGINEER				SITE No. 42-51	W.P. No. 177-63
DESIGN	C.F.F.	CHECK	P.O.L.	CONTRACT Nos.	
DRAWING	P.SCH.	CHECK	C.F.F.	DRAWING No.	D-6432-3
DATE	DEC. 1968	LOADING	HS 20-44		