

61/20 SEPT. 1976

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. LOP9-14

W.P. No. 109-68-09

CONT. No. BUILT BY C.N.R.

W. O. No. 70-11076

STR. SITE No. 35-407

HWY. No. H-E DIST. 3

LOCATION GUELPH - C.N.R.

Subway, 0.2 mi N. of Waterloo  
Ave.

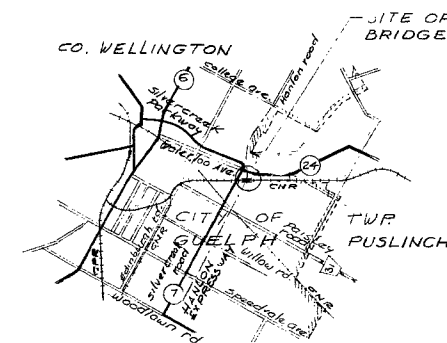
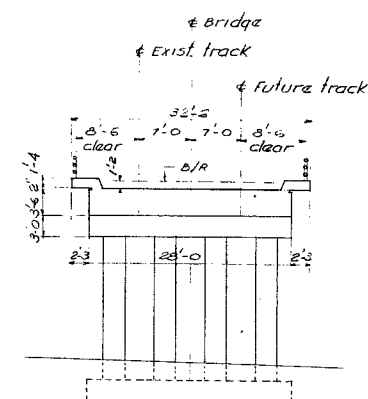
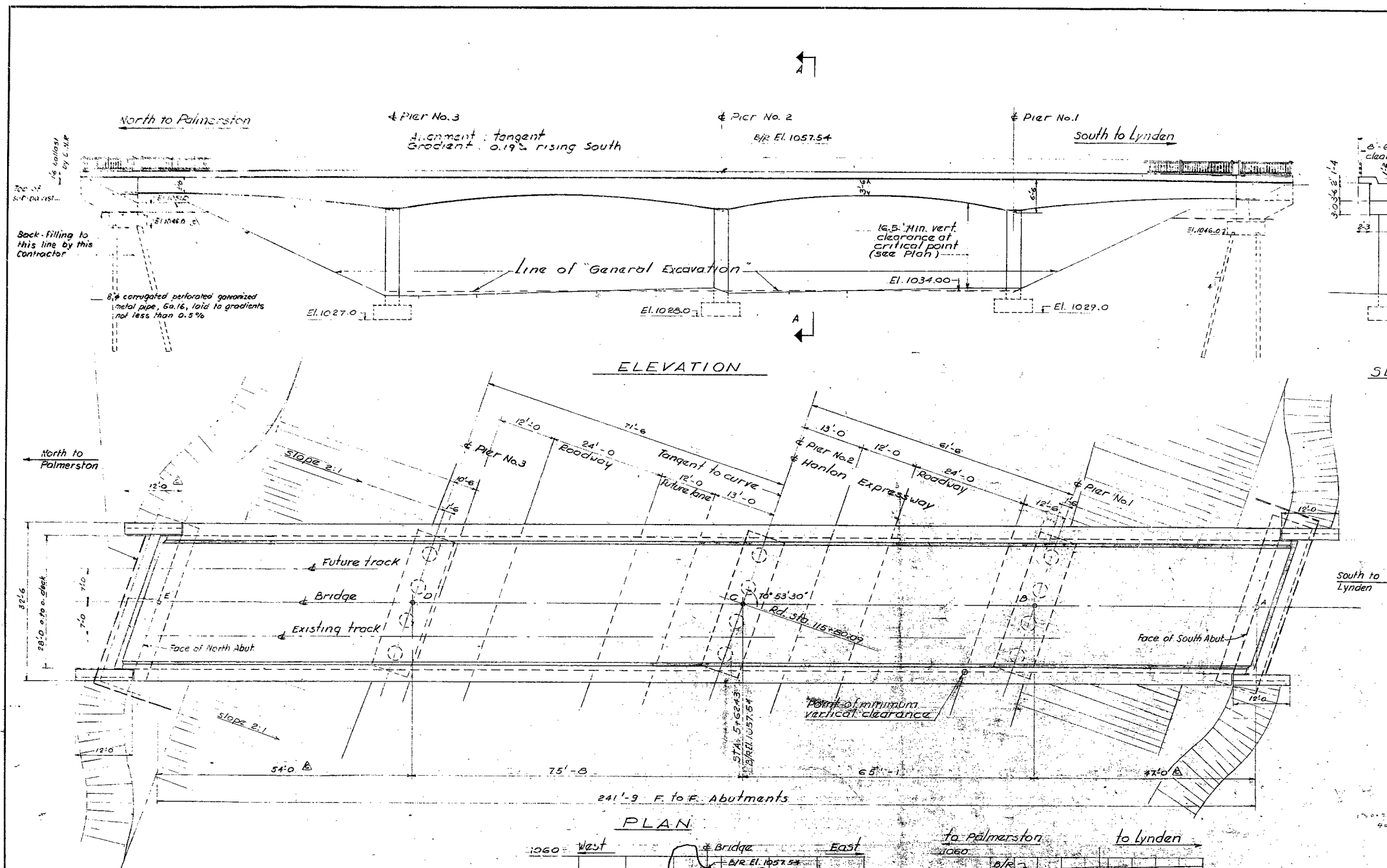
=====  
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



#### GENERAL NOTES

- A new reinforced concrete bridge, consisting of 4 continuous spans supported on 3 piers and 2 abutments, is to be constructed to carry 2 C.N.R. tracks, of which one future, over Hanlon Expressway.
- Alignment and b/r elevation remain unchanged.
- Live load: Cooper loading E70 + Diesel Impact.
- Material specifications:
  - Concrete: C.N.R. Std. Spec. S.O.M. = 6.1 and S.O.W. = 7.1
  - Reinforcing: C.S.A. G 30 Series

- Datum: D.H.O. B.M. No. 29.69, 1074.689 ft.  
 one-story frame house, owned by O. Bohn, N.E. corner of Paisley Rd. and Glengarry St., tablet set in south face of concrete foundation 12 ft. west of S.E. corner, 0.9 ft. below trackwork.  
 Authorization: R.T.C. Order No. R-15130 dated 12 October 1972.

Nearest station: Guelph Jct., M.R. 39.0

#### REFERENCE DRAWINGS


Department of Highways of Ontario  
 Drg. No. G-4015, dated May 1969

#### LIST OF DRAWINGS

General layout: AA 956-29.36-1.1

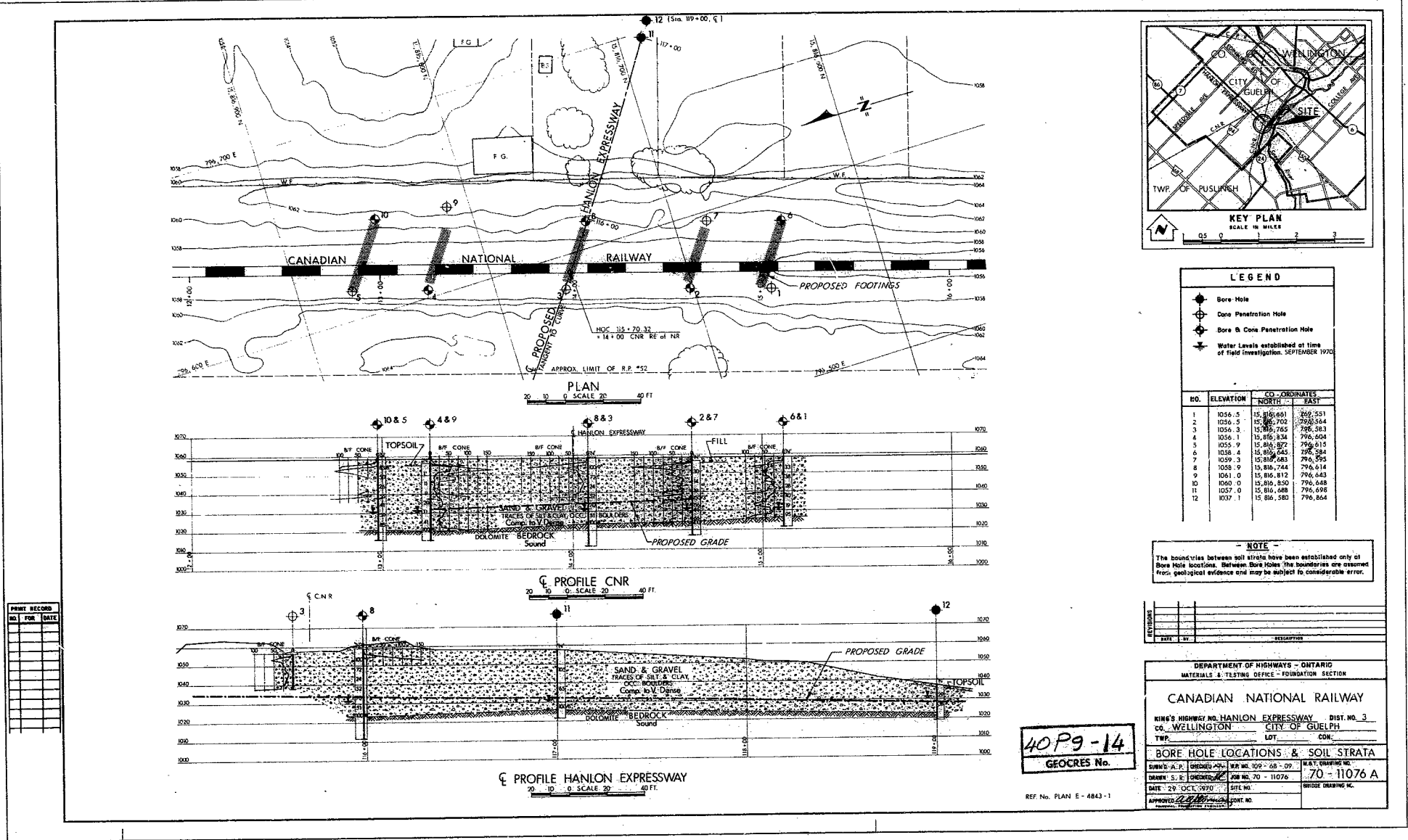
#### ESTIMATED QUANTITIES

Concrete, 4000 p.s.i. : cu. yds.  
 Concrete, 4500 p.s.i. : cu. yds.  
 Reinforcing steel : lbs.

E	28 MAY 1973	ABUTMENTS ON PILES					
D	9 APR 1973	PIERS 3'-6" DIAMETER					
C	13 FEB. 1973	EXTERIOR SPANS LENGTHENED TO ELIMINATE NEGATIVE REACTION					
B	19 SEPT. 1972	PARABOLIC SOFFIT					
A	3 DEC. 1970	ROAD PROFILE; LENGTH. OF SPAN C-D					
No	Date	Revision					
Region Region	GREAT LAKES	Area Sector	SOUTHWESTERN ONTARIO	Sub- division	FERGUS	File File	29.36
HANLON EXPRESSWAY SUBWAY							
GUELPH, ONTARIO							
GENERAL LAYOUT							
Drawn Details	Z.D.	Checked Verification	J.W.4.	Approved Approval	215	Scale Echelle	1" = 10'-0" OR DATE AS NOTED 30 JUNE, 1970
Office of Chief Engineer							
Bureau de l'Ingénieur en chef							
File Reference	29.36 FERGUS SD		Drawing Number	AA956-29.36-1.1		IE	

40 P 9-14

GEOCR N° 40P9 - 14



## MEMORANDUM

To: Mr. A. Stermac,  
Principal Foundation Eng.,  
Downview.

FROM: Bridge Planning,  
Southwestern Region.

ATTENTION:

DATE: July 30, 1970.

40 P9-14  
GEOCRES No.

OUR FILE REF.

IN REPLY TO

## SUBJECT:

RE: W.P. 109-68-09. Bridge Site 35-407,  
C.N.R. Subway,  
0.2 miles north of Waterloo Ave.,  
City of Guelph,  
Hanlon Expressway,  
District 3, Stratford.

10-110-76

Would you kindly arrange to have a Foundation Investigation conducted at the above location. I have enclosed two copies of bridge site plan E-4843-1 with the probable footing locations marked in red. Also enclosed is a copy of C.N. general layout drawing AA 956-29.36-1.1, along with a copy of the C.N.R. instruction for foundation consultants.

Please contact the C.N. Area engineer, Mr. M.B. Hansen, in London, telephone 433-4511, local 235, for his assistance in locating the boreholes and the provision of flagmen, if required. One week advance notice would be appreciated.

In addition to the foundation investigation for the C.N.R. Subway, the Materials and Testing Section, London, would like their auger holes and seismic investigation supplemented with boreholes as indicated in red on the attached Railway Plan, G-4015, e.g. station 117 + 00 and 119 + 00, to outline the bedrock line. Should bedrock be found above the proposed grade line in these holes, would you also place a borehole west of the C.N.R. track where the cut is also substantial. For your information I have enclosed the Materials and Testing's Soil Profile ME 3L-1 (portion print) in the area of the C.N.R., showing their auger holes and seismic investigation.

S. Janes

SJ/14  
Encl.

S. JANES,  
Bridge Planning Technician,  
Southwestern Region.

FOR: A.P. WATT,  
Regional Bridge Planning Eng.

cc: S. McCombie.  
A. Crowley.  
J. Anderson.  
J. Roy.

1 copy to London

FIELD RECONNAISSANCE REPORT  
REQUIRED BY FOUNDATION SECTION  
FOR

FF-69  
SEPT. 1968

70-110-76

W.P. NO. 100-110-76 HIGHWAY NO. 110 DISTRICT 1 SITE PLAN NO. 1 PROFILE NO. 1  
RIVER CROSSING ☐ GRADE SEPERATION ☐ R.R.X. ☐ OTHER (SPECIFY) 110-110-76  
ALTERNATE SCHEME (IF ANY) 110-110-76

EXISTING SITE CONDITIONS

DESCRIPTION:

TOPOGRAPHY: HILLY ☐ ROLLING ☒ VALLEY ☐ GULLIED ☐ FLAT ☐  
VEGETATION: TREES ☐ BRUSH ☐ GRASS ☐ SWAMP ☐ FARM CROPS ☐ CLEARED ☐  
SNOW COVER: 0"-6" ☐ 6"-12" ☐ >12" ☐  
SNOW OUTCROP (SPECIFY LOCATIONS) 110-110-76

UNDERGROUND UTILITIES:

UTILITY COMPANY

TELEPHONE NO. FOR DEFINITE LOCATION

- 1 110-110-76 NORTH OF TRACKS
- 2 110-110-76 SOUTH OF TRACKS
- 3 110-110-76
- 4 110-110-76
- 5 110-110-76

EXISTING STRUCTURE(S):

FOUNDATIONS: SPREAD FOUNDATIONS ☐ SIZE 110-110-76 ELEVATION(S) 110-110-76  
PILES ☐ TYPE 110-110-76 LENGTH(S) 110-110-76  
DESIGN LOAD 110-110-76 T.S.F. 110-110-76 TONS/PILE 110-110-76  
CONDITION OF STRUCTURE 110-110-76

APPROACHES: CUT ☐ FILL ☐ SIDE SLOPES 110-110-76  
BERMS YES ☐ NO ☐

OTHER OBSERVATIONS (USE BACK OF SHEET TO DESCRIBE ANY FAILURES IN AREA, PAST PERFORMANCE OF EXISTING APPROACHES & STRUCTURE, ETC.)

ACCESSIBILITY

IS STRUCTURE LOCATED ON D.H.O. RIGHT OF WAY? YES ☐ NO ☐ IF NO,  
HAS PERMISSION BEEN OBTAINED TO ENTER PROPERTY? YES ☐ NO ☐ IF NO,  
PROPERTY OWNER(S):

NAME

ADDRESS

TELEPHONE NO.

- 1 110-110-76
- 2 110-110-76
- 3 110-110-76
- 4 110-110-76

WHO WILL OBTAIN NECESSARY PERMISSION? 110-110-76

HAS SITE BEEN SURVEYED & STAKED? YES ☐ NO ☐ IF YES, DATE OF MOST RECENT SURVEY 110-110-76

WILL CLEARING BE NECESSARY TO ENTER SITE AREA? YES ☐ NO ☐

IS SITE ACCESSIBLE TO WHEELED VEHICLES? YES ☐ NO ☐

IF RIVER CROSSING:

WILL A RAFT BE NECESSARY? YES ☐ NO ☐ IF YES, GIVE MAX. DEPTH OF WATER 110-110-76 FT.

CURRENT: SWIFT ☐ MODERATE ☐ SLOW ☐

DRILLING OPERATIONS

NEAREST SOURCE OF WATER (GIVE HAULING DISTANCE, IF KNOWN) 110-110-76

ADDITIONAL INVESTIGATION REQUIRED FOR THE FOLLOWING PURPOSES:

ALTERNATE SCHEME: YES ☐ NO ☐ IF YES, SPECIFY 110-110-76

HYDROLOGIC REASONS: YES ☐ NO ☐ IF YES, SPECIFY (SCOUR, ETC.) 110-110-76

REMARKS

NEAREST AVAILABLE ACCOMMODATION: 110-110-76

OTHER COMMENTS: 110-110-76

DATE 110-110-76

REGIONAL BRIDGE LOCATION ENGINEER 110-110-76

Mr. F. E. Loscombe,  
Regional Supt. of Eng. Surveys,  
London Regional Office.

W. R. Agnew,  
Field Supervisor.

P. J. Rule, O. Schur

September 21, 1970

W. P. 109-68-01, Job 56-70  
Hanton Expressway and C. N. R.  
City of Guelph, County of Wellington  
District No. 3 - Strafford

This is to inform you that a request from A. Prakash, Project Foundations Engineer, Head Office, on 31st of August, 1970 has been completed on the 15th of September, 1970 by G. Telford, C. A. McDermid and parties.

Profile: The reduced ground elevation notes were left with the site Engineer as per verbal request from him. I am not, therefore, submitting any field information at this time.



W. R. Agnew,  
Field Supervisor.

WRC:ww

c.c. K. Selby  
Foundations H.O.  
Attention A. Prakash  
File No. W.P. 109-68-01

Rec - I gave the information  
sent with you please send  
the necessary log sheets  
Dmity

RECEIVED  
OCT 9 10 10:07  
TELETYPE

DOWN LOND 3 OCTOBER 9/70 10 00 AM

PRIORITY

T STERMAC PRIN FOUNDATION ENGINEER

ATTENTION M DEVATA K.G. Sekky

RE WP 109-68-09 HANLON EXPRESSWAY CNR SUBWAY 9.2 MILES NORTH OF  
WATERLOO AVENUE

EARLIER THIS WEEK I OBTAINED SOME BEDROCK ELEVATION ON THE ABOVE SITE  
FROM YOUR OFFICE

COULD YOU SEND US A COPY OF THE LOG OF HOLES FOR THESE BORINGS

THE STATIONS INVOLVED ARE 116 PLUS OR MINUS, 117 AND 119

(HANLON EXPRESSWAY DRAINAGE)

JOHN ROY REGIONAL MATERIALS ENGINEER

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## MEMORANDUM

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

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

Attention: Mr. S. McCombie

Date: November 12, 1970

Our File Ref.

In Reply To

NOV 17 1970

Subject:

FOUNDATION INVESTIGATION REPORT  
For  
C.N.R. Subway at Hanlon Expressway  
City of Guelph  
District No. 3 (Stratford)

W.O. 70-11076 - W.P. 109-68-09

40P9-14
GEOCREs No.

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.

AGS/MdeF  
Attach.

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

cc: Messrs. B. R. Davis  
H. A. Tregaskes  
D. W. Farren  
W. Zonnenberg  
H. C. Dernier  
A. P. Watt (2)  
J. Roy  
B. J. Giroux  
B. A. Singh  
Foundations Files  
Gen. Files



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  6. DISCUSSION AND RECOMMENDATIONS.
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-

FOUNDATION INVESTIGATION REPORT  
For  
C.N.R. Subway at Hanlon Expressway  
City of Guelph  
District No. 3 (Stratford)  
W.O. 70-11076    -    W.P. 109-68-09

1. INTRODUCTION:

A request for a foundation investigation for a subway at the crossing of C.N.R. tracks and Hanlon Expressway, was received from Mr. A. P. Watt, Regional Bridge Planning Engineer, in a memo dated July 30, 1970.

A field investigation was subsequently carried out by the Foundation 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 SITE:

The site of the proposed crossing is located in the northeast part of the City of Guelph, about 800 ft. east of the junction of Hwy. #7 and #24. The proposed subway will be located about 650 ft. south (along C.N.R. tracks) of the existing level crossing of C.N.R. tracks and Silvercreek Road (Hwy. #7).

At this place, the C.N.R. tracks are located in a shallow cut (3 - 5 ft.). The area to the east of the tracks is inhabited and relatively level or gently rolling. About 60 ft. to the west of the tracks there is a 17-ft. drop in ground level. The natural slopes on the west side are approx. 1-1/2:1.

3. FIELD AND LABORATORY WORK:

The field work at the proposed site consisted of a total of 5 sampled boreholes (one at each footing location), and 10 dynamic cone penetration tests. Cone tests were carried out

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

adjacent to each borehole, and also at the opposite ends of the footings. In addition, 2 boreholes (#11 & 12) were put down at Sta. 117+00 and 119+00 to supplement the auger holes and seismic investigation done by the Soils Section.

Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. Driving energy to advance the cone was 350 ft.-lbs. per blow.

The bedrock was proven in all boreholes using BXT rock coring equipment. In Borehole #7 the bedrock was assumed to be at elevation where refusal to cone was achieved.

Samples were visually examined in the field and subsequently in the laboratory. Tests were carried out on selected samples to determine the grain-size distribution and natural moisture content.

The results of the field and laboratory tests are summarized in the Record of Borehole sheets and in Fig. 1, which are contained in the Appendix to the report.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at the site consists of a sand and gravel deposit overlying dolomite bedrock.

The boundaries between various soil types are shown on the Record of Borehole sheets. The estimated stratigraphical profile shown on Drawing 70-11076A, is based upon this information.

A detailed description of the soil types and soil properties are given, as follows:

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

4.2) Sand and Gravel:

This was the only soil type encountered at the site, and extends down to bedrock. The thickness of the overburden at the location of the proposed crossing varies from 32.0 ft. (B.H. #6) to 39.0 ft. (B.H. #10). In Boreholes #11 and 12 the overburden was 31.0 and 14.5 ft. thick, respectively. The material consists of sand, and fine and coarse gravel, with traces of silt and clay. Occasional boulders were encountered. Out of 10 cones, only 3 could be driven down to bedrock. Seven cones met refusal in the overburden itself, presumably stopped by boulders. The grain-size analyses indicate the following distributions and are plotted on Fig. 1.

		<u>Min.</u>	<u>Max.</u>	<u>Average</u>
Gravel	(%)	14	80	58
Sand	(%)	18	83	37
Silt and Clay	(%)	1	27	5

The N-values range from 9 blows/ft. to 150 blows/3 in., indicating a compact to very dense relative density.

4.3) Bedrock:

The bedrock was proven in all boreholes by drilling 4.0 ft. to 11.0 ft. into the bedrock using BXT rock coring equipment. In Borehole #7 the bedrock was assumed to be an elevation where refusal to cone was met. The rock cores were examined by Mr. G. Woda, Geologist, Materials & Testing Office, D.H.O., and described as sound, fossilized dolomite. The bedrock is relatively flat and the surface elevations in various boreholes are as follows:

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

4.3) Bedrock: (cont'd.) ...

B.H. # 2	.....	Elev. 1024.2
# 4	.....	1020.5
# 6	.....	1026.4
# 7	.....	1023.8
# 8	.....	1023.6
#10	.....	1021.0
#11	.....	1026.0
#12	.....	1022.0

5. GROUNDWATER CONDITIONS:

Water levels recorded in the boreholes at the time of investigation, indicate the groundwater to be between Elev. 1031.0 and 1031.5.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a subway to carry the Hanlon Expressway under the C.N.R. tracks. This will require a cut. The maximum depth of the cut is about 27 ft. at a point about 40 ft. east of the tracks, while under the tracks the cut will be about 22 ft.

Subsoil at the site consists of compact to very dense sand and gravel with traces of silt and clay and occasional boulders, overlying dolomite bedrock.

The C.N.R. tracks will be carried over a 4-span (38'-73'-65'-38') structure. The grade of the Hanlon Expressway at this point is Elev. 1034.0  $\pm$  2.0, approximately. The investigation has revealed that the subsoil is capable of providing adequate bearing capacity. Therefore, it is recommended that the proposed piers be founded on spread footings constructed at least 4.0 ft. below the finished grade. A safe bearing capacity of 3 tons/sq.ft. may be assumed for design purposes. Alternatively, the pier footings may be founded on bedrock and a safe pressure of up to 20 tons/sq.ft. used for design.

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

It is recommended that the proposed abutments be constructed within the approach embankments and supported on spread footing type foundations. A safe bearing capacity of 3 tons/sq.ft. may be assumed for design purposes. As an alternative, the abutments may be supported on steel H-piles driven to bedrock. For design purposes, the maximum allowable design load may be used for the particular section chosen.

All footings and pile caps should have a minimum cover of 4 ft. for frost protection.

It is believed that the water levels recorded in the boreholes represent the true groundwater levels at the time of the field investigation. However, due to the permeable nature of the subsoil, water levels are subject to fluctuations, depending upon seasonal and weather conditions. A suitable dewatering scheme will be required to pour concrete - for the pier footings - in the dry.

No stability problems are anticipated for 2:1 side slopes of the cut.

7. MISCELLANEOUS:

The field investigation was carried out during the period September 1 - 17, 1970, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

Equipment was owned and operated by F. E. Johnston Drilling Co. Ltd.

Borehole locations and elevations were surveyed in the field by personnel from Regional Surveys Office, Southwestern Region, London.

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

November, 1970

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 1


FOUNDATION SECTION

JOB 70-11076 LOCATION Co-ords. 15,816.661 N; 796,551 E ORIGINATED BY AP  
 W.P. 102-68-09 BORING DATE Sept. 1, 1970 COMPILED BY AP  
 DATUM Geodetic BOREHOLE TYPE Cone Penetration Test CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SOILS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %			
1056.5 0.0	Ground Level										
1038.8 17.7	Probable Sand & Gravel Trace of silt & clay occ. boulders Compact to Dense End of Cone Test										



FOUNDATION SECTION

JOB	70-11076	LOCATION	Co-ords. 15,816,702 N; 796,564 E.	ORIGINATED BY	AP
W.P.	109-68-09	BORING DATE	Sept. 2 - 3, 1970	COMPILED BY	AP
DATUM	Geodetic	BOREHOLE TYPE	Washboring, BX & XN Casing, BXT Core & Cone	CHECKED BY	

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— w <sub>L</sub> PLASTIC LIMIT ——— w <sub>P</sub> WATER CONTENT ——— w		BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %		
1056.5	Ground Level									
1055.5	Railway Fill	XXXX								
1.0			1	AS						65 29 ( 6 )
		Δ Δ	2	SS	30	1050				
	Sand & Gravel	O O								
	Traces of silt & clay	Δ Δ	3	SS	14					
	occ. boulders	Δ Δ								
		Δ Δ	4	SS	19	1040				63 33 ( 4 )
	Compact Dense to Very Dense	Δ Δ	5	SS	150 3"					
		Δ Δ	6	SS	116					
		O O	7	SS	46	1030				Sept. 9/70 ▼ 1031.3 17 83 ( 3 )
		Δ Δ	8	SS	66					
1024.2	some silt	Δ Δ	9	SS	100 3"					40 33 (27)
32.3		XXXX	10	BXT	15%					
	Dolomite Bedrock Sound		11	BXT	85%	1020				
1017.5										
39.0	End of Borehole					1010				

FOUNDATION SECTION

JOB	7C-11076	LOCATION	Co-ords. 15,816,765 N; 796,583 E.	ORIGINATED BY	AP
W.P.	109-68-09	BORING DATE	Sept. 4, 1970	COMPILED BY	AP
DATUM	Geodetic	BOREHOLE TYPE	Dynamic Cone Penetration Test	CHECKED BY	<i>SL</i>

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT %			
1056.3	Ground Level											
0.0	Probable Sand and gravel traces of silt & clay occ. boulders  Compact to Dense					1050						
1038.0						1040						
18.3	End of Cone Test					1030						





DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 70-11076 LOCATION Co-ords. 15,816,645 N; 796,584 E. ORIGINATED BY AP  
 W.P. 109-68-09 BORING DATE Sept. 9 - 11, 1970 COMPILED BY AP  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing, BX Core, & Cone CHECKED BY SR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$				BULK DENSITY $\gamma$ P.C.F.	REMARKS				
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.						WATER CONTENT %			
							20	40	60	80	100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE						$w_p$ — $w$ — $w_L$			
1058.1	Ground Level																				
0.0	Sand and gravel traces of silt & clay occasional boulders  Compact to Dense		1	SS	33																
			2	SS	38																
			3	SS	28																
			4	SS	40																
			5	SS	19																
1026.1	Very Dense		6	SS	95																
32.0	Dolomite Bedrock		7	BXT	40%																
1021.6	Sound		8	BXT	60%																
36.8	End of Borehole																				

▼ 1031.4  
Sept. 11/70  
44 40 (16)

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 70-11076 LOCATION Co-ords. 15,816,683 N; 796,595 E. ORIGINATED BY AP  
W.P. 109-68-09 BORING DATE Sept. 11, 1970 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY JK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	WATER CONTENT %				
1059.3	Ground Level											
0.0	Probable Sand & gravel traces of silt & Clay occasional boulders Compact to Dense											
1023.8	Probable Bedrock End of Cone Test											

1050  
1040  
1030  
1020

100/6" Hammer bouncing

FOUNDATION SECTION

JOB 70-11076 LOCATION Co-ords. 15,816,744 N; 796,614 E. ORIGINATED BY AP  
W.P. 109-68-09 BORING DATE Sept. 11 - 15, 1970 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing, BXT Core, & Cone CHECKED BY [Signature]

[illegible]

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT ——— $w$	BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	WATER CONTENT % $w_p \quad w \quad w_L$		
1061.0	Ground Level									
0.0	Probable Sand and gravel traces of silt & clay occasional boulders Compact to Dense					1060				
						1050				
						1040				
1037.7	End of Cone Test						100/4"			
23.3						1030				



FOUNDATION SECTION

JOB 70-11076 LOCATION Co-ords. 15,816,850 N; 796,648 E. ORIGINATED BY AP  
W.P. 109-68-09 BORING DATE Sept. 15 - 16, 1970 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing, BXT Core & Cone CHECKED BY [Signature]

[illegible]

## FOUNDATION SECTION

JOB	70-11076	LOCATION	Co-ords 15,816,688 N; 796,698 E.	ORIGINATED BY	AP
W.P.	109-68-02	BORING DATE	Sept. 16-17, 1970	COMPILED BY	AP
DATUM	Geodetic	BOREHOLE TYPE	Washboring, NX & BX Casing, BXT Core	CHECKED BY	AP

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

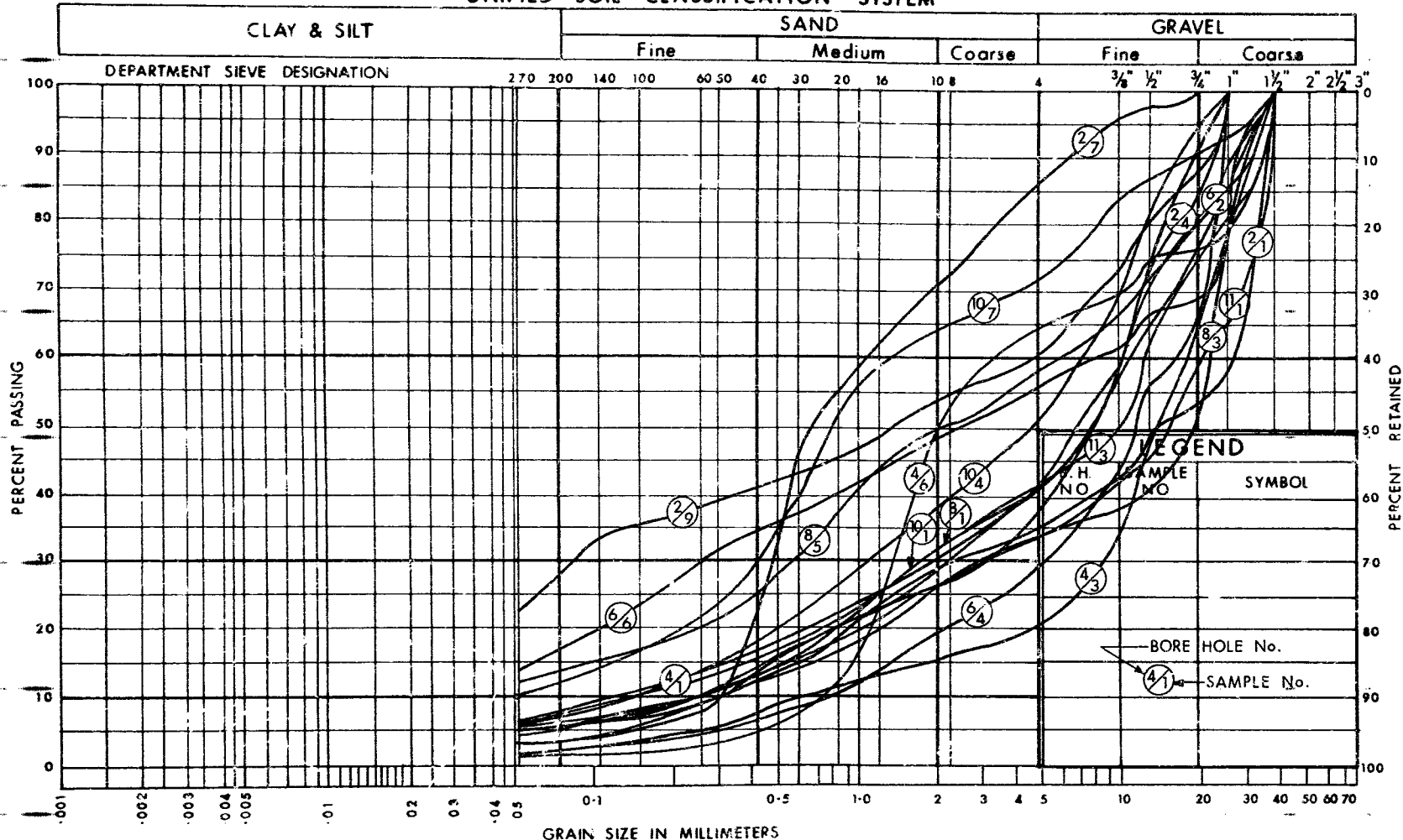
JOB 70-11076 LOCATION Co-ords 15,816,580 N: 796,861 E. ORIGINATED BY AP  
W.P. 109-68-09 BORING DATE Sept. 17 = 18, 1970 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing & BXT Core CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT %			
1037.1	Ground Level											
1036.1	Top soil											
1.0	Sand & gravel traces of silt & clay		1	SS	29	1030						
	Compact to Dense		2	SS	38							
1022.6												
14.5	Dolomite Bedrock		3	BX	50%	1020						
1018.6	Sound		4	BX	75%							
18.5	End of Borehole											
						1010						

P.C.F. GR. S.A. SI. CL.

▼ 1031.6  
Sept. 18/70

# UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## GRAIN SIZE DISTRIBUTION

SAND & GRAVEL

TRACES OF SILT & CLAY, OCC. BOULDERS

W.P. No. 109 - 68 - 09

JOB No: 70 - 11076

FIG. 1

## 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 <sub>u</sub>	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	DRAINED TRIAXIAL	S	SENSITIVITY

# ABBREVIATIONS USED IN THIS REPORT

## SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

$\pi$	= 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
$\sigma$	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	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
$\beta$	ANGLE OF SLOPE TO HORIZONTAL

MEMORANDUM

TO: Mr. A.G. Stermac,  
Principal Foundation Engineer,  
Foundation Office,  
West Bldg., Downsview.

FROM: Structural Planning,  
Southwestern Region.

ATTENTION:

DATE: January 22nd, 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Construction of C.N.R. Subway,  
Mileage 29.36 Fergus Subdivision,  
Our Ref: W.P. 109-68-09, Bridge Site 35-407,  
C.N.R. Subway #3, 0.2 miles north of  
Waterloo Avenue, Hanlon Expressway,  
Sta. 115 + 70.32, City of Guelph,  
District 3 - Stratford.

-----

Enclosed please find two sketches showing possible approaches to the problem of accommodating a 20' wide roadway under the south end span of the above structure and one copy of C.N. layout drawing AA956-29.36-1.1.

Scheme 1 proposes to take the abutment to rock and utilize the front wall of the abutment as a retaining wall.

Scheme 2 proposes to pile the abutment to rock and to utilize a retaining wall to retain the fill. It is similar to the method adopted at the Indian Road Interchange, Hwy. 402, Sarnia, W.P. 172-67-02.

It appears that the end spans shown on drawing AA956-29.36-1.1 may be lengthened by the C.N. Bridge Office in order to eliminate negative reactions at the abutments.

We would appreciate any comments on these schemes which you may have or any other proposals you may care to make.



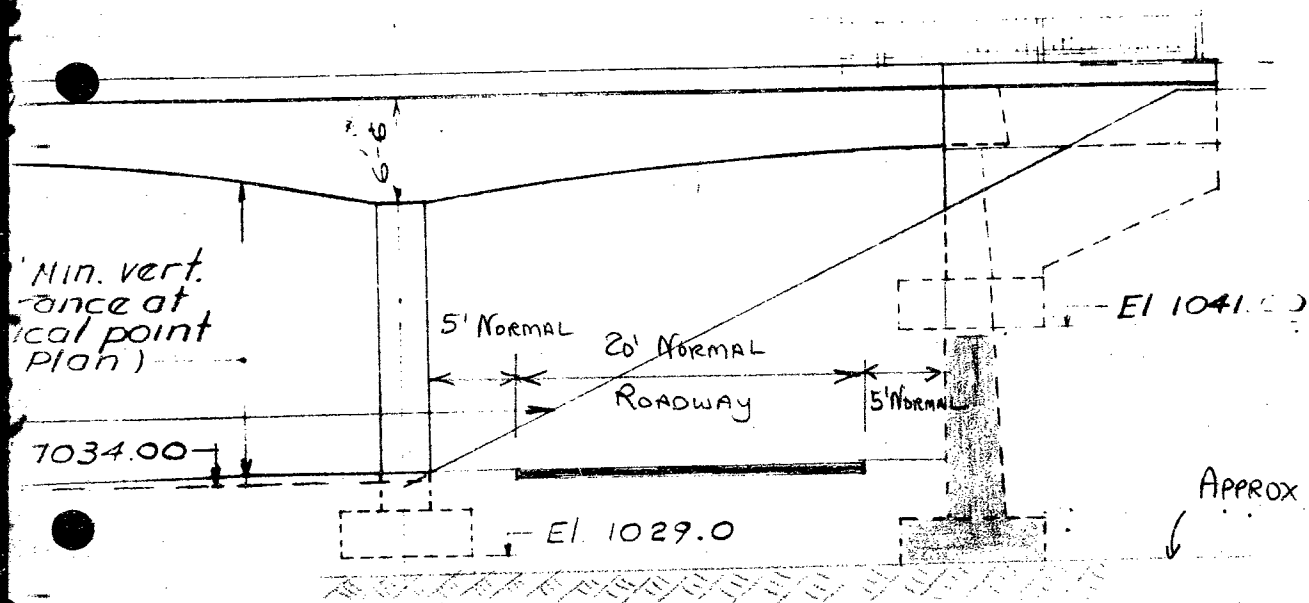
B. McKenna  
Structural Location Engineer,  
Southwestern Region.

BM/ss  
Encl.

# SCHEME 1- ABUTMENT TAKEN TO ROCK

& Pier No. 1

South to Lynszen

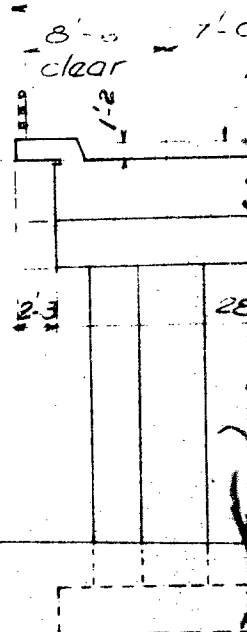


Approx Top of Rock

SCALE 1" = 10'

SECTION

& EXI





1

20' NORMAL  
ROADWAY

5' NORMAL

EI 1041

1029.0

APPRO

APPROX Top of Rock

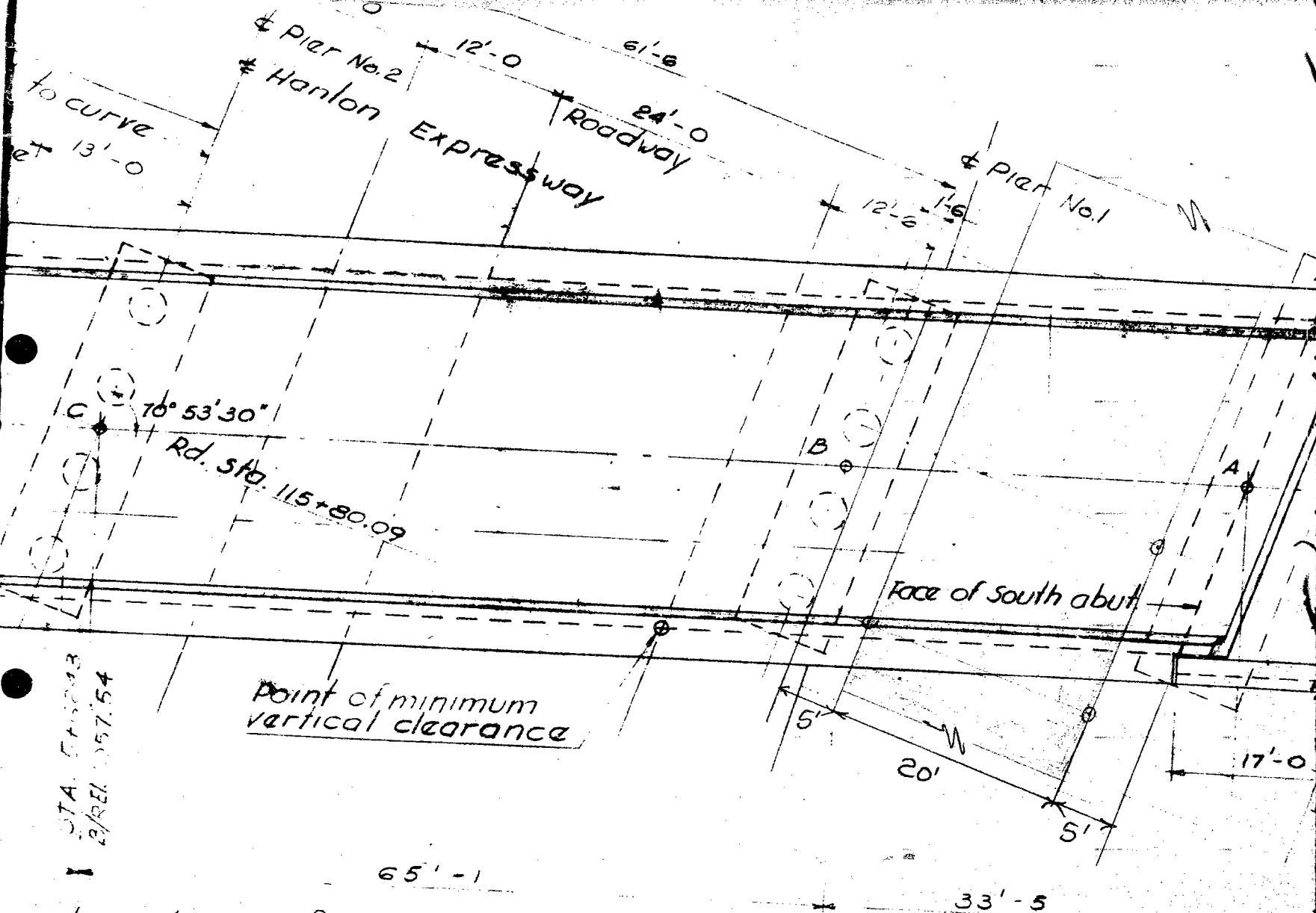
SCALE 1" = 10'

\* Exist track

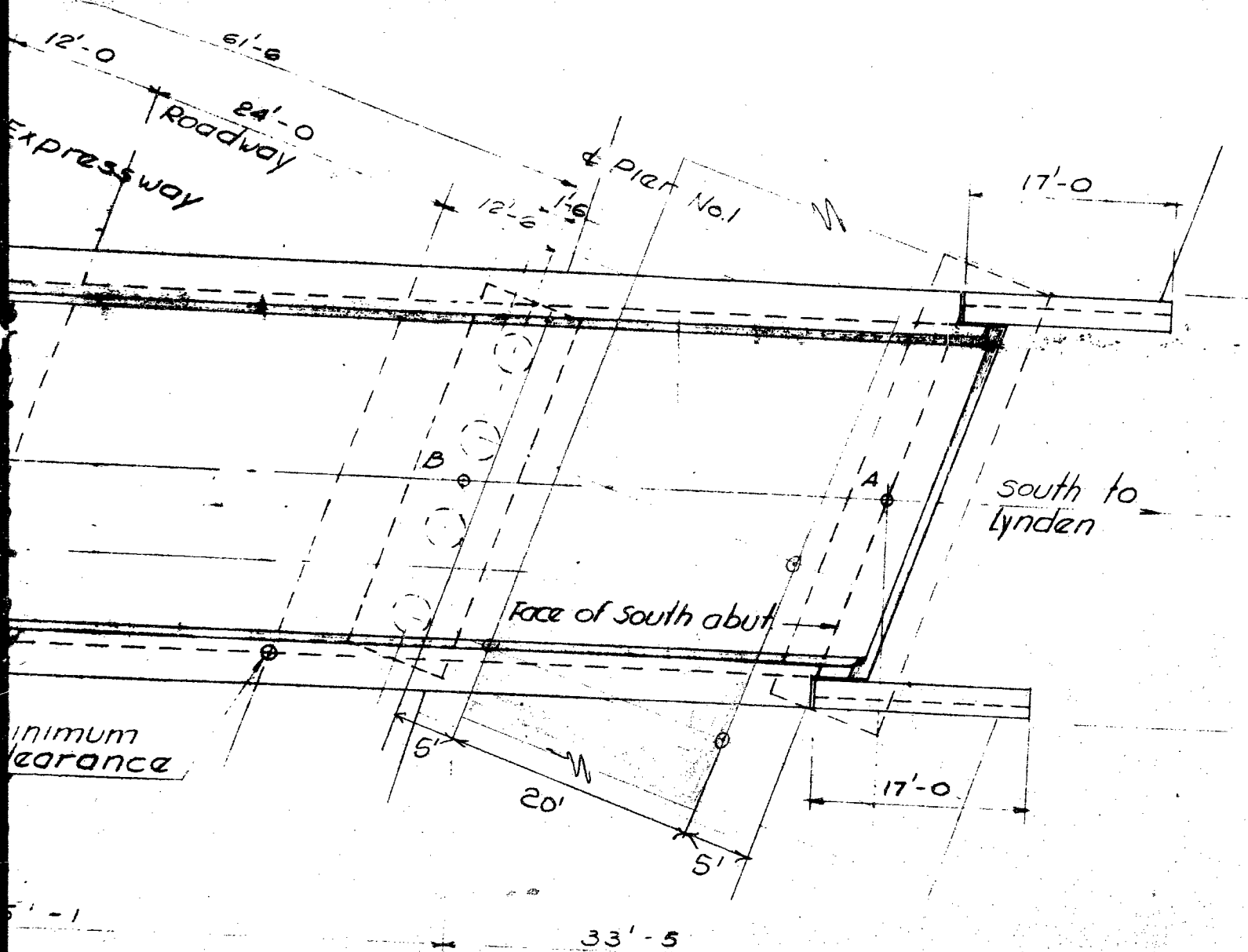
4 Future

Hand-drawn sketch of a bridge structure. The sketch shows a cross-section of a bridge with a central span and two side spans. The central span is labeled "28'-0" and is supported by a central pier. The side spans are labeled "8'-0" and "8'-0" and are supported by abutments. The total length of the bridge is labeled "3'-0" at the top. The width of the bridge is labeled "1'-4" on the left side. The bridge is labeled "B/R" (Bridle Road) in the center. The bridge is shown crossing a "Rock" area, which is indicated by a dashed line at the bottom. The sketch includes various dimension lines and labels for the bridge's components.

SECTION "A-A"



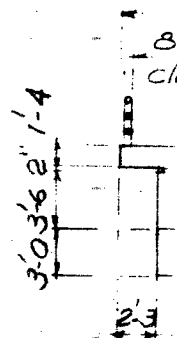
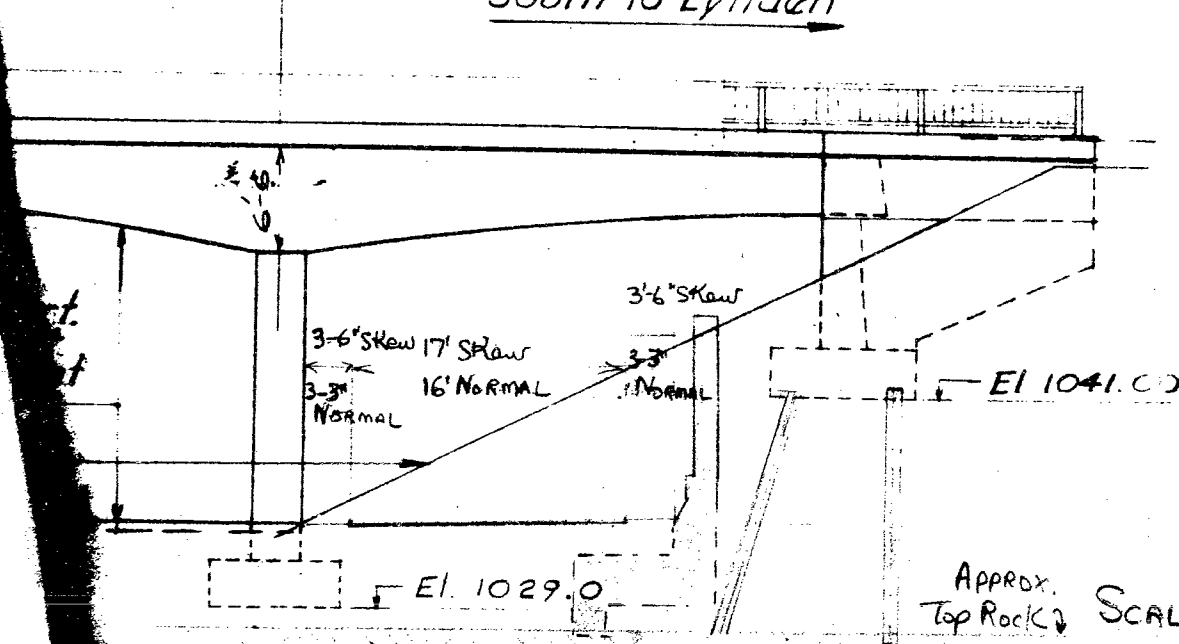
STA. 115+80.09  
2/21/54



# SCHEME 2- ABUTMENT PILED TO ROCK

at Pier No. 1

south to Lynden



APPROX.  
Top Rock  $\nearrow$  SCALE 1" = 10'

NOTE

SCHEME 2 As shown DOES NOT PERMIT 20' WIDE  
ROADWAY WITH LENGTHENED END SPANS PROPOSED BY CN 20'  
ROAD CAN BE FITTED IN

Mr. B. McKenna,  
Structural Location Engineer,  
Southwestern Region,  
London, Ontario.

Foundations Office,  
Design Services Branch,  
West Bldg., Downsview.

February 14, 1973.

C.N.R. Subway #3, Hanlon Expressway,  
City of Guelph, District #3 (Stratford)  
W.O. 70-11676, Site #35-407, W.P. 109-68-09

Further to your memo dated January 22, 1973, and our discussion by telephone on February 9, our comments relating to the future construction of a 20 ft. roadway through the south approach span of the above-mentioned structure are as follows:

1. The structure will be built during the 1973 construction programme. The question is whether the south abutment foundation should be designed now so as to accommodate the construction of a 20 ft. roadway through the south approach span at some time in excess of 20 years in the future.
2. Either of the two schemes shown on the sketches attached to your memo will simplify the future construction of the 20 ft. roadway. If it is decided to provide for this eventuality the cheapest method should be chosen.
3. Even if the south abutment is built as presently designed (i.e. spread footings at elevation 1041.0) it will still be possible to accommodate the 20 ft. roadway in the future although a more expensive underpinning scheme will be required.

If we can be of any further assistance in this matter, please contact this Office.

*K. G. Selby*

KGS/ao

K. G. Selby,  
SUPERVISING FOUNDATIONS ENGINEER.

cc: H. R. McIntyre  
J. L. Keen

Foundations Files ✓  
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac  
Principal Foundation Engineer  
Foundation Office  
West Bldg., Downsview  
ATTENTION: Mr. K. G. Selby  
Assistant Foundation Engineer

FROM: Structural Planning  
Southwestern Region

DATE: February 26, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 109-68-09, Bridge Site 35-407  
C.N.R. Subway #3  
0.2 miles north of Waterloo Avenue  
Hanlon Expressway Sta. 115 + 70.32  
City of Guelph  
District 3, Stratford

70-11-076

We are enclosing for your information one print of the C.N.R. General Layout Drawing No. AA956-29.36-1.1, Revision C, for the above project. Please note the end spans have been lengthened to eliminate negative reactions at the abutments.

The estimated cost of \$260,000 for this project has not been revised since the additional cost for the longer end spans is nearly offset by savings on the smaller abutments.

Since it is hoped to have this project under construction in the near future, we would appreciate having your comments at your very earliest convenience.

*B. J. McKenna*

B. J. McKenna  
Structural Location Engineer

BJMcK:sz  
Enc.

cc F. K. Leighton

No comments

*APR*

Mar 2, 73

# FOUNDATIONS OFFICE

## REVIEW OF DESIGN DRAWINGS:

W.P. 109 - 68 - 09  
W.O. 70 - 11076

Foundations Report by: ..... A. PRAYASH .....  
Review of Design Drawings by: ..... A. PRAYASH .....  
Design Drawing No.'s: ..... A.A. 256 - 29,36 - 1:1 ..... C  
.....

1. Does footing design comply with our report or subsequent memos? Yes
2. If answer to 1. is 'No', is present design acceptable? -
3. Has sufficient field work been done? Yes
4. Are estimated pile lengths shown on Drawings correct? If not, make a new list. -
5. If excavation of unstuitable soil is recommended, is this shown on drawings? -
6. Are approaches designed in accordance with our report? Check slopes and berm lengths. Yes
7. Do you anticipate any construction problems? i.e. dewatering, stability of temporary slopes or excavations. No
8. Summarize your comments; on separate sheet is necessary.

Drawings Received Feb. 28 ..... 1973  
Reviewed Mar. 2 ..... 1973

Signed ..... A. Prayash .....

Mr. B. J. McKenna,  
Structural Location Engineer,  
Structural Planning Office,  
Southwestern Region,  
London, Ontario.

Foundations Office,  
Design Services Branch,  
West Bldg., Downsview.

March 22, 1973.

W.P. 109-68-09      W.O. 70-11076  
C.N.R. Subway #3, Hanlon Expressway,  
City of Guelph, District #3 (Stratford)

We have reviewed the general layout drawing for the above project and find it to be in accordance with the recommendations contained in our foundation investigation report.

We have no comments to make.

*K. G. Selby*

KGS/ao

K. G. Selby,  
SUPERVISING FOUNDATIONS ENGINEER.



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac  
Principal Foundation Engineer  
Foundation Office  
West Bldg., Downsview  
ATTENTION: Mr. K. G. Selby  
Assistant Foundation Engineer

FROM: Structural Planning  
Southwestern Region

DATE: June 7, 1973

OUR FILE REF.

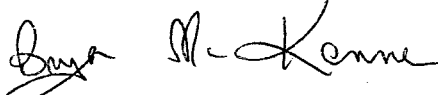
IN REPLY TO

SUBJECT: W.P. 109-68-09, Bridge Site 35-407  
C.N.R. Subway #3  
0.2 miles north of Waterloo Avenue  
Hanlon Expressway Sta. 115+70.32  
City of Guelph  
District 3, Stratford

70-11-076.

We are enclosing for your information one print of the C.N.R. General Layout Drawing No. AA956-29.36-1.1, Revision E, for the above project.

Since it is hoped to have the tender call for this project in the very near future, we would appreciate having your comments at your very earliest convenience.



B. J. McKenna  
Structural Planning Engineer

BJMcK:sz  
Enc.

cc F. K. Leighton

# FOUNDATIONS OFFICE

## REVIEW OF DESIGN DRAWINGS:

W.P. .... 109-68-09  
W.O. .... 70-11076

Foundations Report by: ..... A. Prakash  
Review of Design Drawings by: ..... A. Prakash  
Design Drawing No.'s: ..... AA 956-29.36-1.1.F

1. Does footing design comply with our report or subsequent memos? Yes
2. If answer to 1. is 'No', is present design acceptable? -
3. Has sufficient field work been done? yes
4. Are estimated pile lengths shown on Drawings correct? Not shown  
If not, make a new list.
5. If excavation of unstuitable soil is recommended, is this shown on drawings? N.A.
6. Are approaches designed in accordance with our report? yes  
Check slopes and berm lengths.
7. Do you anticipate any construction problems? No  
i.e. dewatering, stability of temporary slopes or excavations.
8. Summarize your comments; on separate sheet is necessary.

letter written

Drawings Received ..... June 26 ..... 1973  
Reviewed ..... July 11 ..... 1973

Signed ..... A.P.

Mr. A. P. Watt,  
Regional Structural Planning Eng.,  
Southwestern Region,  
London, Ontario.

Foundations Office,  
Design Services Branch,  
West Bldg., Downsview.

Mr. B. J. McKenna.

July 13, 1973.

*C.N.R. Subway #3, Hanlon Expressway  
City of Guelph, County of Wellington  
District #3 (Stratford)  
W.O. 70-11076 -- W.P. 109-68-09*

We have reviewed C.N.R. general layout Drawing No. AA 956-29.36-1.1 Revision E. Our comments are as follows:

The drawing shows that the abutments are supported on piles. However, there is no indication regarding the type and length of piles. In our report it was recommended that the piles should be driven to bedrock.

AP/ao

For:

APr

A. Prakash,  
Senior Foundations Engineer,  
K. G. Selby,  
Supervising Foundations Engineer.