

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

Attention: Mr. S. McCombie

DATE: November 15, 1966

OUR FILE REF.

IN REPLY TO: NOV 22 1966

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
At the Proposed Crossing of  
Queen Elizabeth Way and County Rd. 26,  
Ontario Street, County of Lincoln.  
District #4 (Hamilton)

W.J. 66-F-82 -- W.P. 221-63

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

cc: Messrs. B. R. Davis (2)  
H. A. Tregaskes  
D. W. Farren  
G. K. Hunter (2)  
E. Greenland  
W. S. Melinyshyn  
T. J. Kovich  
A. Watt  
  
Foundations Office  
Gen. Files ✓

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

## TABLE OF CONTENTS

1. INTRODUCTION.
  2. DESCRIPTION OF THE SITE.
  3. FIELD AND LABORATORY INVESTIGATION PROGRAM.
  4. SUBSOIL CONDITIONS:
    - 4.1) General.
    - 4.2) Clayey Silt with some Sand and Gravel.
    - 4.3) Silty Sand to Sandy Silt.
    - 4.4) Bedrock.
  5. GROUNDWATER.
  6. DISCUSSION AND RECOMMENDATIONS.
  7. SUMMARY.
  8. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT  
At the Proposed Crossing of  
Queen Elizabeth Way and County Rd.26,  
Ontario Street, County of Lincoln.  
District #4 (Hamilton)  
W.J. 66-F-82      --      W.P. 221-63

1. INTRODUCTION:

In a memo, dated July 12, 1966, the Regional Bridge Location Engineer requested a foundation investigation, to be carried out at the proposed site of Queen Elizabeth Way and County Road 26, Ontario Street crossing.

Accordingly, a field and laboratory investigation was undertaken by the Foundation Section, the results of which are presented in this report, together with recommendations pertaining to the foundations.

2. DESCRIPTION OF THE SITE:

The site is located in the County of Lincoln, some 4.5 miles east of Grimsby. The general area is known as the Niagara Fruit Belt, which is part of the Iroquois Plain physiographic region. The plain is cut by a number of smaller streams; all of them are drowned in their lower courses, producing lagoons or marshes cut off from Lake Ontario by a barrier beach.

From Grimsby east, the lake plain contains areas of sandy soils which have enabled the area to become an outstanding fruit-growing region. As the beds of sand are never very deep and often overlie clay at two to three feet, drainage is usually a problem.

cont'd. /2 ...

### 3. FIELD AND LABORATORY INVESTIGATION PROGRAM:

3.1) Seven boreholes, and adjacent to the borings, seven dynamic cone penetration tests were undertaken during the field investigation. The field work was carried out by means of a conventional diamond drill rig adapted for soil sampling purposes. Samples were recovered by means of a 2-inch O.D. split-spoon sampler and occasionally by 2-inch I.D. Shelby tubes. Standard penetration tests were performed by driving the split-spoon sampler, utilizing a driving energy of 350 ft.-lbs. Rock core samples were obtained by means of an AXT diamond core barrel.

Locations and elevations of the borings as well as the stratigraphical profile, are presented on the attached Drawing #66-F-82A.

3.2) In the laboratory, soil samples were visually examined and identified for classification purposes. Laboratory tests were performed on representative samples, including tests of Atterberg limits, natural moisture content, laboratory vane, unconfined and triaxial compression tests.

Field and laboratory test results are compiled on the borelog sheets accompanying this report.

### 4. SUBSOIL CONDITIONS:

#### 4.1) General:

The general stratigraphy of the site consists of a 34 - 35-ft. deep overburden of glacial origin, underlain by weathered and sound shale bedrock. The overburden material may further be subdivided to cohesive and granular deposits.

A brief description of the various strata are given as follows:

cont'd. /3 ...

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

4.2) Clayey Silt with some Sand and Gravel:

This is the uppermost material in all the boreholes except in hole #6 where a granular type of glacial deposit was encountered. The thickness of the layer ranges between 24 and 35 ft., extending down to el. 255.0 - 243.0 ft. The upper 5 to 20 ft. of the till layer contains some sand and gravel, the consistency being stiff to hard. A limited number of undisturbed Shelby tube samples was taken from this stratum, on which undrained shear strength tests were carried out in the laboratory. The results are somewhat scattered, but considering the heterogeneous nature of such glacial deposits, this was rather expected. The weakest layer within the stratum was found around 10 to 15 ft. below ground, the average value of shear strength being about 1000 p.s.f.

Most of the samples exhibited some plasticity, the natural moisture contents falling near or below the plastic limits, indicating that the material is overconsolidated.

Generally below el. 257 - 265 ft. the clayey silt was recovered with numerous fragments of shale and shaley limestone. Due to the presence of rock fragments, the consistency of this portion is generally very hard with 'N' values in the order of 100 blows for 3 - 4 inches.

4.3) Silty Sand to Sandy Silt:

Underlying the clayey silt, a granular type of the glacial till was observed, and identified as silty sand to sandy silt with fragments of shale and shaley limestone. This material was not observed in B.H.'s 1 and 7. The relative density of the stratum was found to be very dense, indicated by 'N' values in excess of 100 blows/ft. The thickness of the layer varies between 6 and 10 ft. (el. 255 ft. to 245.5 ft.).

cont'd. /4 ...

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

4.4) Bedrock:

Between el. 243 and 247, shale bedrock was encountered. The upper 2 to 8 ft. of the shale was found to be extensively weathered, under which the sound shale follows. Some 10 to 15 ft. thickness of the rock was proved by drilling by means of an AXT core barrel.

5. GROUNDWATER:

Groundwater level was established in each borehole location at approx. el. 275 - 273, some 5 - 7 ft. below existing ground elevation.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a 6-span underpass structure at the crossing of Q.E.W. and Ontario St., County Rd. 26. It is understood that the future grade of Q.E.W. will lie at or near the existing one, whereas the grade of the bridge will be around el. 301.0, necessitating approach fills of the height of about 20 ft.

Considering a spread footing type foundation for the piers, some 4 - 5 ft. cover should be provided above the footing bases for frost protection. The piers should, therefore, be founded at el. 275.0, within the stiff to very stiff clayey silt stratum. It was mentioned earlier that the weakest zone of the clayey silt stratum lies between el. 264 - 269, some 6 to 11 ft. below the recommended footing bases. Because of this, a simply-supported structure should be considered, with a safe pressure of 2 t.s.f.

In view of the foregoing, it is our opinion that a spread footing type of foundation may not be the most economical proposition and, therefore, a piled type of foundation should be considered. By adopting piled foundations, the settlements will

cont'd. /5 ...

6. DISCUSSION AND RECOMMENDATIONS:

practically be eliminated. The use of steel H-piles is suggested, to be driven to practical refusal, which is expected to be reached at a relatively short distance. For estimating purposes, the elevations at which refusal can be anticipated during pile driving, are given below at each location:

Footing Location (Refer Respective Borehole)	Elevation of Anticipated Refusal (ft.)
B.H. #1	260
B.H. #2	260
B.H. #3	260
B.H. #4	260
B.H. #5	254
B.H. #6	254
B.H. #7	254

The structural strength of the particular H-section used may be assumed as the safe load on the piles, driven according to above recommendations.

The pile caps at the pier locations should be placed four ft. below finished grade; at the locations of the abutments they may be placed within the approach fills.

No major dewatering problems are foreseen for the excavations. The approach fills will be stable, provided they are constructed with standard slopes of two horizontal to one vertical.

cont'd. /6 ...

7. SUMMARY:

A foundation investigation for the proposed underpass at the crossing of Q.E.W. and Ontario Street, County Road 26 is reported.

Subsoils at the site consist of some 34 - 35 ft. deep overburden of glacial till, followed by shale bedrock. Due to the anticipated differential settlements under an assumed spread footing type foundation, footings supported on short steel H-piles may be more economical. An allowable load equal to the structural strength of the H-section used may be used for design purposes, provided that the piles are driven to practical refusal. The assumed elevations where practical refusal will be reached, were given under Section 6 of this report.

No stability problems for the approach fills, and no dewatering problems of the excavations are foreseen.

8. MISCELLANEOUS:

The field investigation carried out during the period September 12 - 16, 1966, was supervised by Mr. V. Korlu, Project Foundation Engineer. Equipment used was owned and operated by Johnston Drilling Company Limited.

This report was written by Mr. A. K. Barsvary, Senior Foundation Engineer.

The entire project was under the general supervision of Mr. M. Devata, Supervising Foundation Engineer.

November 1966

## APPENDIX I

## 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.	SCRAFER 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

$\gamma$	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
$\phi'$	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
$\sigma'$	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

CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		WATER CONTENT %				
							20	40	60	80			100
280.0	Ground Level												
	Brown to grey clayey silt with some sand and gravel Stiff to very stiff		1	SS	30								
			2	SS	51								
			3	SS	17	270							
			4	SS	29								
265.0			5	SS	100 for 3"								
15.0	with fragments of shale and shaley limestone		6	SS	100 for 5"	260							
			7	SS	100 for 4"								
			8	SS	100 for 4"	250							
245.5		9	SS	100 for 4"									
34.5	Weathered shale			AXT	40%								
				AXT	no recovery	240							
237.5													
42.5	Sound shale			AXT	100%								
228.5				AXT	100%	230							
51.5	End of Borehole												
						220							

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 66-F-82 LOCATION O.E.W.-Ontario St. Sta. 31+50 44' Rt. ORIGINATED BY Vk  
W.P. 221-63 BORING DATE September 12, 1966 COMPILED BY VK  
DATUM Geodetic BOREHOLE TYPE Drive & Drill BX casing & Wash CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	WL		
279.6	Ground Level														
	Brown to grey clayey silt with traces of sand & gravel stiff to very stiff		1	SS	17										
			2	SS	21										
			3	SS	11	270									
			3A	T.W.P.											
			4	SS	17										
264.6															
15.0	With fragments of shale and shaley limestone		5	SS	100 for 6"										
			6	SS	100 for 4"	260									
			7	SS	100 for 5"										
251.6															
28.0	Sandy silt with fragments of shale and shaley limestone		8	SS	100 for 4"	250									
245.6															
34.0	weathered shale		9	SS	100 for 3"										
242.9															
36.7	Sound shale			AXT	75%	240									
				AXT	100%										
234.5															
45.1	End of Borehole					230									

El. 272.6  
W.L.

123  
135

13%Gr 27%Sa  
52%Si 8%Cl



RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 66-F-82

LOCATION Q.E.W., - Ontario St. Sta. 30400 361 Rt.

ORIGINATED BY VK

W.P. 221-63

BORING DATE September 13, 1966.

COMPILED BY \_\_\_\_\_ VK

DATUM Geodetic

BOREHOLE TYPE Drive & Drill EX casing and wash

CHECKED BY                     

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	Liquid Limit — WL	BULK DENSITY Y P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT — WP			
							20 40 60 80 100	WATER CONTENT — W			
							SHEAR STRENGTH P.S.F.	wp — w — WL			
							o triaxial x lab. vane				
							500 1000 1500 2000 2500		WATER CONTENT %		
							20 40 60				
279.0	Ground Level										
	Brown to grey Clayey silt with some sand and gravel		1	SS	38	270				Elev. 274.5 ▼ W.L.	
	Stiff to very stiff		2	SS	22						
			3	T.W.	P						
			4	SS	18						
264.0			5	SS	72	260					
15.0	With fragments of shale and shaley limestone		6	SS	100	For 5"					
			7	SS	100	For 6"					
255.0			8	SS	100	For 3"					
24.0	Sandy silt with fragments of shaley limestone					250					
246.0											
33.0	Weathered Shale										
241.0											
35.0											
	Sound Shale			AXT	100%	240					
					AXT	100%					
234.0											
45.0	End of Borehole					230					

## RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOS 66-E-82

LOCATION C.E.W.-Ontario St. 29-23 40' Lt.

ORIGINATED BY VK

W.P. 221-63

BORING DATE September 13, 1966.

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Drive & Drill BX casing & Wash

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS					
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.						WATER CONTENT %				
							20 40 60 80 100 O triaxial X lab. vane										
279.1	Ground Level						500	1000	1500	2000	2500	3000	20	40	60		
	Brown to grey clayey silt with some sand and gravel stiff to hard		1	SS	25	270										141	
	2		SS	48													
	3		SS	30													
	4		SS	15													
	5		SS	36													
259.1			6	SS	100	260											
20.0	with fragments of shale and shaley limestone		7	SS	100	for 6"											
254.1			8	SS	100	for 3"											
25.0	silty sand with fragments of shale & shale limestone					250											
247.6																	
31.5	weathered shale					240											
244.6																	
34.5	Sound shale																
238.6																	
40.5	End of Borehole																

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 66-E-82

LOCATION Q.E.W.-Ontario St. 28/58 30' Rt.

ORIGINATED BY           VK          

W. P. 221-63

BORING DATE September 15, 1966

COMPILED BY \_\_\_\_\_ VK

DATUM Geodetic

BOREHOLE TYPE Drive & Drill BX casing and wash

CHECKED BY \_\_\_\_\_

[illegible]

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 66-F-82

LOCATION Q.E.W. - Ontario St. 28422 42' Lt.

ORIGINATED BY VK

W.P. 221-63




BORING DATE September 16, 1966

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Drive &amp; Drill BX casing and wash

CHECKED BY *VR*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	WL	W		
278.3	Ground Level						500	1000	1500	2000		20	40	60		
	Brown to grey Clayey silt with Some sand and gravel Stiff to very stiff		1	SS	46											
			2	SS	29	270										
			3	T.W. P												
			4	T.W. P												
			5	SS	26	260										
			6	SS	90											
257.3 21.0	With fragments of shale and shaley limestone		7	SS	100 for 6"	250										
			8	SS	100 for 5"											
243.3 35.0	Sound shale			AXT	70%	240										
				AXT	100%											
233.3 45.0	End of Borehole					230										

El. 271.3

W.L.

8%Gr 32%Sa  
54%Si 6%Cl

Department of Highways Ontario  
Copy for the information of

Mr. A. Stermac

Mr. W. Meliowsky,  
Regional Bridge Location Engineer,  
Central Region,  
Administration Building

Bridge Division,  
Downsview, Ontario

December 1, 1967

Ontario St. Underpass  
4.5 Miles East of Grimsby  
W.P. 221-63, Site 18-198  
C.E.W., District No. 4

Attached herewith are prints of the Preliminary Bridge  
Plan Drawing D-6108-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$270,000.  
This cost includes tender, materials, engineering and sundry  
construction.

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

CSG:rd

C.S. Grebaki,  
Bridge Design Engineer

Attach.

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

H piles driven to bedrock instead to  
the point of refusal

*Also*

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

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

December 15, 1967

Ontario Street Underpass  
4.5 Miles East of Grimsby -- Q.E.W.  
W.P. 221-63, Site 18-198, W.J. 66-F-82  
District No. 4 (Hamilton)

---

We have reviewed the Preliminary Bridge Plan Drawing D-6108-F1 for the above mentioned structure and submit the following comments:

In general, we note that you have followed our recommendations. With regard to H-piles, it appears that you have assumed that these will reach bedrock. We believe the required capacity will be achieved at a much higher elevation as suggested in our Foundation Report.

MD/MaeF

*M. Devata*  
M. Devata,  
SUPERVISING FOUNDATION ENGINEER  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. S. McCombie  
W. S. Melinyshyn

Foundations Files  
Gen. Files

MEMORANDUM

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

From: Bridge Division,  
Downsview, Ontario

ATTENTION:

DATE: August 6, 1968

OUR FILE REF:

IN REPLY TO

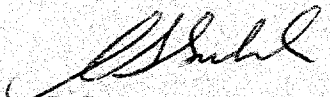
SUBJECT: Ontario St. Underpass  
4.5 Miles East of Grimsby  
W.P. 221-63, Site 18-198  
Q.E.W., District No. 4

Attached herewith we are submitting the final bridge drawings  
which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

CSG:rd

Attach.

  
C.S. Grebski,  
Bridge Design Engineer

66-F-92

NO COMMENTS

7. AUG. 68

A.W.E.

M.S.



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

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

December 15, 1967

Ontario Street Underpass  
4.5 Miles East of Grimsby -- Q.S.N.  
W.P. 221-63, Site 18-198, W.J. 66-F-82  
District No. 4 (Hamilton)

We have reviewed the Preliminary Bridge Plan  
Drawing D-6108-P1 for the above mentioned structure  
and submit the following comments:

In general, we note that you have followed our  
recommendations. With regard to H-piles, it appears  
that you have assumed that these will reach bedrock.  
We believe the required capacity will be achieved at a  
much higher elevation as suggested in our Foundation Report.

MD/MdeF

*M. Devata*  
M. Devata,  
SUPERVISING FOUNDATION ENGINEER  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

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

Foundations Files  
Gen. Files