

67-F-9
W.P.# 63-57 & 196-57
HWY #45
TRENT RIVER
BRIDGES.

cc: Mr. H. A. Tregaskes

Mr. E. B. Davis,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

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

August 8, 1966

AUG 8 1966

FOUNDATION INVESTIGATION REPORT BY:
E. M. Peto Associates, Limited --
Trent River Bridges at Hastings,
Hwy. 45, District 7 (Port Hope), Ont.
W.P. 63-57

67-F-9

Attached, please find the above mentioned report prepared and submitted by the consultant, E. M. Peto Associates Limited.

We have reviewed the report and feel that it contains all the information necessary for your further design work. However, should you have any additional queries regarding the foundations of these structures, please feel free to contact this Office.

AGS/WdeF
Attach.

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

cc: Messrs. E. B. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
T. J. Kovich
W. S. Melin, shyn
D. P. Collins
A. Watt

Foundations Office
Gen. Files

MEMORANDUM

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

From: Bridge Division,
Downsview, Ontario.

Date: November 24th, 1966.

Our File Ref.

In Reply To

Subject: W.P. 63-57, Site 21-35,
Trent River Bridge @ Hastings,
Hwy. 25, District 7.

We are sending to you herewith one print of Preliminary
Plan D-6016-P of the above structure.

Would you please let us have your written comments.

NZ/cew
Encl.

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

FOR INF ON LOCUS CONTRACT -
TOM SEABORN 696-2864
DEPT OF TRANSPORT

DIAL 110-
LONG DISTANCE AC. 705. ~~696-2864~~
Hastings
696-2864

e. m. peto associates ltd.

YOUR REFERENCE

WP 63/57, Site 21/36

OUR REFERENCE

66196

1287 caledonia road.

TORONTO 19, ONTARIO

Telephone: 789-1126

August 4th, 1966

Department of Highways, Ontario,
Materials and Testing Division,
Downsview, Ontario.

Attention: Mr. A. Rutka, P.Eng.

Dear Sirs:

Re: Trent River Bridges at Hastings,
Highway No. 45, District No. 7,
Port Hope, Ontario.

67-F-9

WP. 63-57

We enclose herewith our foundation investigation report on the above site.

It is suggested that all piers and abutments for these bridges over the River Trent at Hastings, be set either on spread footings on the sound bedrock at elevations varying between 595.5 and 610.2 or on short caisson type piles founded 5 ft. below these elevations. Nominal net bearing pressure at sound bedrock may be taken as 10 tons/sq.ft. Complete details of proposed foundation elevations may be found in the "Observations and Recommendations" part of this report.

If the bridge foundations are placed on spread footings, blasing or pneumatic breaking processes may be used to excavate the bedrock down to a sound depth.

In the vicinity of all boreholes, except possibly borehole 13 (depending on whether the footing is placed on the original bedrock or upon the bedrock surface resulting from excavation for the existing ruined mill) spread footings will have to be constructed below water level. This will necessitate some method of water removal from these sites. The two retaining walls for these proposed bridges may also be constructed directly on sound bedrock at the elevations given for those positions.

Department of Highways, Ontario.

-2-

Our terms of reference cover recommendations only for bridges founded on piers as shown in the plan provided by yourselves, however, in section 4.I we make suggestions for a different method of approach to this design problem. This approach, which involves dewatering of the whole main bridge site is recommended to your attention as it may greatly simplify construction difficulties.

Should there be any points that you wish to discuss further, please do not hesitate to contact us.

Yours very truly,

: E. M. PETO ASSOCIATES LTD.,

E. M. Peto

PMcG/hf

for E. M. Peto, P.Eng.

TABLE OF CONTENTS

PAGE NO.

1.	GENERAL AND INTRODUCTION	1
2.	SITE DESCRIPTION AND PHYSIOGRAPHY	1
3.	SUBSOIL STRATIGRAPHY	2
4.	OBSERVATIONS AND RECOMMENDATIONS	2
4.1	General	
4.2	Main Permanent Structure over Trent River	
4.3	Permanent Bridge over Trent River Sluiceway	
4.4	Detour over Trent River	
4.5	Detour over Trent River Sluiceway	

BOREHOLE LOGS

SITE PLAN AND PROFILES

1. GENERAL AND INTRODUCTION

The purpose of this foundation investigation is to define subsoil stratigraphy and strength parameters, and to define bedrock surface elevations and the elevations of the surface of the sound bedrock, as concerns the design and construction for bridges over the Trent River at Hastings.

Authority for this work was contained in Purchase Order No. J/34819 covered by a letter dated July 5, 1966 from Mr. A. Rutka, Materials and Testing Engineer, Ontario Department of Highways.

This investigation, which consisted of fourteen boreholes, down to a maximum depth of 20 ft. 0 inches below ground level, was carried out in mid July 1966. Boreholes were advanced using a standard diamond drill, adapted for soil sampling purposes. The samples were recovered by use of a standard 2 inch diameter split spoon, used in accordance with the requirements of the standard penetration resistance test, and also by use of diamond drill bits producing AX core and casing samples.

The boreholes were set out in the field by our field engineer and were subsequently surveyed by D.H.O. personnel.

2. SITE DESCRIPTION AND PHYSIOGRAPHY

The site of this investigation was the Trent River and Highway 45 in District No. 7 (Port Hope). Land in this area, is gently undulating in character and is, in general, used for farming.

Physiographically this area lies in the Peterborough drumlin field, (which extends from Hastings County in the East to Simcoe County in the West) and contains between 2500 and 3000 drumlins in addition to other drumlinoidal hills. In the immediate vicinity of the Trent River the rock consists of Trenton Limestone, which is a somewhat softer and less massive formation than the Black River Limestones. It is highly fossiliferous and easily disintegrated.

3. SUBSOIL STRATIGRAPHY

In this vicinity the bedrock is exceedingly close to the surface and where the river has not eroded away the soil, bedrock is overlain by a thin layer of boulder till, which in some places is supplemented by man's addition of a boulder fill.

Apart from random limestone slabs the bedrock constituting the river bed was bare of any cover.

This limestone is part of the Trenton River formation, and is, in places, highly fossiliferous and shows signs of being highly soluble. Sound rock was found at varying depths into the limestone bedrock.

4. OBSERVATIONS AND RECOMMENDATIONS

4.1 General: It is recommended that all piers, abutments and retaining walls be founded either on spread footings placed directly on the sound bedrock or on caisson type piles founded 5 ft. into the sound rock. The surface of the sound bedrock may be found at the following approximate depths and elevations:

<u>B.H. #</u>	<u>Depth of sound rock below ground or water level</u>	<u>Elevation of sound bedrock</u>
1	12 ft.	608.9
2	6.5 ft.	597.5
3	5 ft.	599.0
4	12 ft.	608.9
5	6 ft.	598.0
6	7 ft.	597.0
7	6 ft.	598.0
8	5.5 ft.	602.1
9	8 ft.	607.2
10	5.5 ft.	610.2
11	8.5 ft.	595.5
12	3 ft.	603.5
13	9.5 ft.	605.1
14	15 ft.	605.7

4. OBSERVATIONS AND RECOMMENDATIONS - continued

-3-

Nominal bearing pressure on this rock may be taken as 10 tons/sq.ft. These structures are dealt with individually below.

It is considered worthy of note that local information indicates that this canal and lock system was cut by blasting the rock (possibly producing uneven fracture). Also piles of rock slabs form shoal areas, particularly at the south side of the river.

Bearing these facts in mind and also that this limestone is unevenly weathered, it can be seen that these elevations of sound rock may only be taken as approximate, and in the event of construction conditions indicating variations from those discovered by this investigation, these foundation elevations may be modified.

Should spread footings be utilized for this project, difficulty will probably be encountered during the dewatering for excavations, particularly the piers for the river crossings.

If sheet piles are used precautions for obtaining a good seat and seal will be needed. One approach would be to remove any loose slabs from the river bed, attempt to seat the piles into the bedrock and dump a clay seal around the outside of the cofferdam.

A second approach, considered well worthy of consideration, unless extraneous circumstances prevent it being practical, is to construct the detour over the river on a fill causeway (incorporating culverts to contain the river flow) and using a lift or swing Bailey bridge to span the lock. When construction of the footings for the permanent bridge for Highway 45 is carried out, the detour culverts may be blocked and this fill used in conjunction with the present concrete and wooden dam to

4. OBSERVATIONS AND RECOMMENDATIONS - continued

-4-

dewater the site. The foundations of the new bridge may then be built in the dry, and the sluiceway used to control the water levels (with the lock also available for water flow in the event of an unforeseen emergency).

- 4.2 Main Permanent Structure Over Trent River: This structure is understood to consist of a fill, which will replace the southernmost span of the present bridge, and then a 3-span bridge taking the road to the swing bridge crossing the lock. The fill may be constructed directly on the bedrock which is apparent on the surface for most of this length. Spread footings for the retaining wall and bridge abutment (in the vicinity of borehole 12) should be founded at an elevation of 603.5. The northern abutment to the bridge will utilize the existing canal wall. (In this vicinity bedrock surface elevation is at 599.7 and the sound rock may be found at an elevation of 599.0). For the two centre piers (in the vicinities of boreholes 11 and 2) the bedrock surface is at 597.5 and 597.7 respectively, however, sound bedrock is not achieved until elevations of 595.5 and 597.5 are reached. At these elevations bearing pressures of 10 tons/sq.ft. may be used for spread footings. Where construction must be carried out below present water level, some form of dewatering system will be needed.

Alternatively, short caisson type piles may be used, founded at an elevation of 591.0.

- 4.3 Permanent Bridge over Trent River Sluiceway: This bridge and retaining wall may be founded on spread footings on the sound bedrock. This occurs in the vicinity of boreholes 4 and 14 at surface elevations of 611.4 and 606.3 becoming sound at elevation 608.9 and 605.7 respectively. Nominal bearing on sound rock may be taken as 10 tons/sq.ft. Alternatively caisson type piles drilled about 5 ft. into sound bedrock may be used.

4. OBSERVATIONS AND RECOMMENDATIONS - continued

-5-

If spread footings are used a dewatering system of some nature will be required. Difficulty may be experienced driving sheet piles through the boulder fill.

- 4.4 Detour over Trent River: It is understood that the northern pier of this detour is to be constructed on the present lock wall. In this vicinity bedrock (as indicated by borehole 7) has a surface elevation of 599.1 and becomes sound at an elevation of 598.0.

In the vicinities of the southern and central piers, (boreholes 5 and 6) surface rock elevations are 598.6 and 599.3, respectively, becoming sound at elevations of 598.0 and 597.0 respectively.

Ground elevations at the abutment locations (boreholes 13 and 8) are 614.6 and 607.6 respectively with bedrock surface occurring at elevation 606.1 and 603.6 with sound rock occurring at elevations 605.1 and 602.1 respectively.

Spread footings may be founded at sound rock elevations and be designed for a nominal bearing pressure of 10 tons/sq.ft.

If this method is used dewatering will be necessary in the vicinities of boreholes 5, 6 and 8 (and possibly borehole 13 if the foundation is set in the basement of the ruined mill rather than on the original bedrock to the south of it).

Alternatively, short caisson type piles may be sunk a further 5 ft. into the bedrock.

4. OBSERVATIONS AND RECOMMENDATIONS - continued

-6-

As a further alternative the main spans (boreholes 13, 5, 6 and 7) may be replaced by a fill as suggested in in section 4.1. This fill may be dumped on bedrock (this may necessitate the removal of rock slabs, lying randomly in this area) and nominal bearing pressures of 10 tons/sq.ft. may be used.

- 4.5 Detour over Trent River Sluiceway: Bedrock in these locations are overlain by 5 ft. of overburden. At boreholes 9 and 10 bedrock surface elevations were 610.2 and 610.5 respectively with sound rock elevations at 607.2 and 610.2 respectively.

Spread footings may be placed on sound bedrock and designed for a nominal bearing pressure of 10 tons/sq.ft., or alternatively caisson type piles may be drilled 5 ft. further into the rock.

Should spread footings be used dewatering will be necessary. Difficulty may be experienced driving sheet piles through the boulder fill.

Yours very truly,

E. M. PETO ASSOCIATES LTD.,



C.F. Freeman, P.Eng.,
Chief Engineer.

PMcG/hf

Prepared by:

Peter M.A. McGlone
P. McGlone, P.Eng.

LIST OF ABBREVIATIONS

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			
W.T.P.L.	WETTER THAN PLASTIC LIMIT		D.T.P.L.	DRIER THAN PLASTIC LIMIT	
	A.P.L. ABOUT PLASTIC LIMIT				

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W.	THINWALL OPEN
W.S	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B	SCRAPER BUCKET SAMPLE	O.S	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S	CHUNK SAMPLE	R.C.	ROCK CORE
S.T	SLOTTED TUBE SAMPLE		
	P.H.	SAMPLE ADVANCED HYDRAULICALLY	
	P.M.	SAMPLE ADVANCED MANUALLY	

SOIL TESTS

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

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	SEALAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

z	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_c	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

e.m.peto associates ltd.

Consulting soil en ineers

RECORD OF BOREHOLE NO. 1 and 2

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials & Testing

ENGINEER DMCG

GROUND ELEV. as shown

BOREHOLE TYPE _____ Standard Rig

TYPED BY LLT

[illegible]

e.m.peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO.

3 and 4

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials and Testing

ENGINEER PMCG

GROUND ELEV. as shown

BOREHOLE TYPE _____ Standard Rig _____

TYPED BY HF

SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION BLOWS / FOOT STANDARD PENETRATION TEST BLOWS/FOOT			LIQUID LIMIT _____ W _L PLASTIC LIMIT _____ W _p WATER CONTENT _____ W			REMARKS
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT	SHEAR STRENGTH C _u LB/SQ FT.			W _p W W _L WATER CONTENT %			
0.0 604.0	B.H.# 3, EL. 604.0											
4.3 599.7	WATER											
8.3 595.7	Bedrock Sound at 5.0' below ground level or elevation 599.0											
	Borehole terminated											
0.0 620.9	B.H.#4, EL. 620.9											
	Mixed granular FILL Boulders below 5.0'											
	Light brown to black		1	SS	10							
	Compact to very dense											
9.5 611.4	Bedrock, Sound at 12.0' below ground level or elevation 608.9											
17.6 603.3	Hole terminated											

e.m.peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO.

5 and 6

JOB NO.	66196	JOB NAME	Trent River Bridges	TECHNICIAN	JL
BORING DATE	July, 1966	CLIENT	Department of Highways, Ontario, Materials & Testing	ENGINEER	PMCG
GROUND ELEV.	as shown	BOREHOLE TYPE	Standard Rig	TYPED BY	BF

[illegible]

e.m. peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 1 & 8

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials and Testing

ENGINEER PMCG

GROUND ELEV. as shown

BOREHOLE TYPE	Standard Rig
---------------	--------------

TYPED BY HE

[illegible]

e. m. peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 9 and 10

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials & Testing

ENGINEER DMCG

GROUND ELEV. as shown

BOREHOLE TYPE _____ Standard Rig

TYPED BY ME

[illegible]

e.m.peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 11 and 12

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials and Testing

ENGINEER PMCG

GROUND ELEV. as shown

BOREHOLE TYPE Standard Rig

TYPED BY UE

[illegible]

e.m.peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 13 and 14

JOB NO. 66196

JOB NAME Trent River Bridges

TECHNICIAN JL

BORING DATE July, 1966

CLIENT Department of Highways, Ontario, Materials & Testing

ENGINEER PMCG

GROUND ELEV. as shown

BOREHOLE TYPE _____ Standard Rig

TYPED BY HE

[illegible]

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

DATE: March 31, 1967

OUR FILE REF.

IN REPLY TO:

- SUBJECT:
- (1) Trent River Bridge at Hastings, Hwy. #45,
Preliminary Plan #D-6016-1,
W.P. 63-57, W.J. 67-F-9, Dist. #7 (Port Hope).
 - ✓ (2) Headrace Bridge at Hastings, Hwy. #45,
Preliminary Plan #D-6043-F,
W.P. 196-57, W.J. 67-F-9, Dist. #7 (Port Hope).

About two months ago, we reviewed the above mentioned preliminary plans with regard to the Foundation Report prepared by E. M. Peto & Associates Ltd. We decided at that time, that some additional borings would be required in order to define the rock profile more accurately and that also, some of the borings which had been carried out were too far away from the proposed footings to be of much use. Accordingly, we have since drilled some additional borings, although our intended program was not fully accomplished because of the extremely rough water conditions which we understand, are likely to prevail until the middle of June. Experience in the past, has shown that lack of information in this type of rock formation (Trenton Limestone) can result in considerable expense to the Department because of irregularities discovered during construction.

We are enclosing copies of Borelog sheets No's 1A, 2A, 7A, 8A, 13A, 14A, 15A, 16A, 17A, and 18A, together with Drawing No. 67-F-9A (Borehole locations and soil strata) as the drawing to be incorporated in the contract, rather than the one supplied by E. M. Peto.

Following are our comments resulting from a review of the preliminary plans in the light of the new information:

(1) Trent River Bridge -

South Abutment	--	No comments.
Pier #1	--	No comments.

cont'd. /2 ...

March 31, 1967

(1) Trent River Bridge -

Piers #2, #3, #4 -- At these locations the bedrock profile has been arrived at by interpolating between B.N.'s 3, 12, 11, and 12, all of which are more than 25 ft. from the closest footing. Since it is not possible to obtain more field information until mid June at the earliest, we suggest that all concerned be made aware that discrepancies may be encountered and that changes in the design may be necessary. In any event, we strongly recommend that borings be carried out as soon as the site becomes accessible.

North Abutment -- No comments.

(2) Headrace Bridge -

At this structure, the new borings show the rock surface to be lower than the proposed footings over some portions. We suggest that you amend the design accordingly.

If you have any further queries regarding these projects, please contact this Office.

KGS/MieP
Attach.

cc: Messrs. C. S. Grebski (2)
R. A. Tregaskes
D. W. Warren
G. M. Winter
D. P. Gillin
W. C. Melinyshyn
T. J. Kovich

K. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

Foundations Office
Gen. Files

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1A

FOUNDATION SECTION

JOB 67-F-9 LOCATION Sta. 333 + 96 29' Lt. Line 'H' ORIGINATED BY AKB
 W. P. 53-57 BORING DATE Feb. 6, 1967 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Washboring BY Casing CHECKED BY AKB

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	BLows / Foot	PLASTIC LIMIT — WP	WATER CONTENT — W		
609.3	GROUND LEVEL											
608.3	Overburden											
1.0	Trenton Limestone		1	RC 2'								
			2	RC 3'								
	Regular Shale Seams		3	RC 5'								
	Sound											
599.3						600						
10.0	End of Borehole					590						

FOUNDATION SECTION

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 7A

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-P-9 LOCATION Sta. 333 + 96; 17' Rt. Line 'H' ORIGINATED BY AKB
 W.P. 63-57 BORING DATE February 7, 1967 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Washboring BX Casing CHECKED BY LA

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — WP	WATER CONTENT — W		
610.8	GROUND LEVEL											
609.8	Overburden					610						
1.0	Weathered		1	RC								
	Sound		2	RC								
	Limestone with shale		3	RC								
	seams.											
	Bedrock											
600.8						600						
10.0												
						590						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8 A

FOUNDATION SECTION

JOB 67-F-9 LOCATION Sta. 334 + 88; 17th Rt. Line 'H' ORIGINATED BY AKB
W. P. 63-57 BORING DATE February 7, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring, BX Casing CHECKED BY AKB

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		W _P ——— W _L WATER CONTENT %			
608.2	GROUND LEVEL					600						
607.2	Overburden		1	RC 14"								
1.0	Weathered		2	RC 18"								
	Sound		3	RC 60"								
	Limestone with shale seams.					590						
598.2	Bedrock											
10.0												

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

JOB	<u>67-F-9</u>	LOCATION	<u>Sta. 340 + 73; 33' Rt. Line 'H'</u>	ORIGINATED BY	<u>AKB</u>
W.P.	<u>63-57</u>	BORING DATE	<u>February 13, 1967</u>	COMPILED BY	<u>AKB</u>
DATUM	<u>Geodetic</u>	BOREHOLE TYPE	<u>Washboring BX Casing</u>	CHECKED BY	<u>AKB</u>

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 14 A

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-9

LOCATION Sta. 340 / 99 22' Rt. Line 'H'

ORIGINATED BY AKB

W.P. 63-57

BORING DATE February 9, 1967

COMPILED BY _____ AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Casing

CHECKED BY LK

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 15A

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-9 LOCATION Sta. 341 + 36 16' Rt. Line 'H'

ORIGINATED BY AKB

W.P. 63-57 BORING DATE february 9, 1967

COMPILED BY AKB

DATUM Geodetic BOREHOLE TYPE Washboring, BX Casing

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 16A

FOUNDATION SECTION

JOB 67-F-9 LOCATION Sta. 341 + 52.15' Rt. Line 'H' ORIGINATED BY AKB
W.P. 63-57 BORING DATE February 10, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring BX Casing CHECKED BY AK

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 17 A

FOUNDATION SECTION

JOB 67-P-9

LOCATION Sta. 340 + 60 30' Lt. Line 'H'

ORIGINATED BY AKB

W. P. 63-57

BORING DATE February 14, 1967

COMPILED BY _____ AKB

DATUM Beodetic

BOREHOLE TYPE Washboring BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT _____ WL PLASTIC LIMIT _____ WP WATER CONTENT _____ W <div><div>WP</div><div></div><div>WL</div></div>				BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %					
620.9	GROUND LEVEL															
	Sand and Gravel and Boulders					620										
			1	RC 10"												
608.9			2	RC 6"			610									
12.0	Sound Limestone Bedrock with shale seams		3	RC 60"												
			4	RC 60"			600									
598.9																
22.0	End of Borehole															

FOUNDATION SECTION

CHECKED BY *LA*.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.	 WATER CONTENT %			
615.0	Ground Level										
611.0	Gravel and Sand										
4.0	Weathered										
	Sound		1	RC		610					
606.0	Limestone Bedrock with shale seams			60*							
9.0	End of Borehole					600					

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

Attention: Mr. C. S. Grebski,
Bridge Design Engr.

DATE: August 30, 1967

OUR FILE REF.

IN REPLY TO

SUBJECT:

-- Additional Borings --
Trent River Bridge at Hastings
Hwy. #45 - District #7 (Port Hope)
W.P. 63-57 -- W.J. 67-F-9

As it was agreed upon earlier, some six additional boreholes (numbered 1B - 6B inclusive) were carried out at the locations of Piers #2, 3 and 4 of the proposed Trent River Bridge at Hastings.

Two boreholes were placed at each pier location in order to establish the precise elevations of the rock surface and the condition of the limestone.

The findings of these borings are plotted on the attached borelog sheets.

The locations of the new holes, together with the stratigraphical cross sections, are marked on the revised Drawing No. 67-F-9A (Revised Aug. 30, 1967) appended to this memo. It is suggested that this revised drawing be incorporated in the contract rather than the one submitted previously.

The original recommendations as to the bearing pressure on the bedrock are unchanged; however, we suggest that the design elevations of the pier footings be reviewed in the light of the new information.

KGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
D. P. Collins
W. S. Melinyshyn
T. J. Kovich
B. A. Singh

Foundations Files
Gen. Files

H. L. Selby
K. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-9

W. P. 63-57

DATUM Geodetic

RECORD OF BOREHOLE NO. 2B

LOCATION Sta. 337 + 57; 20' Rt. of ϕ

BORING DATE August 24, 1967

BOREHOLE TYPE Diamond Drilling

FOUNDATION SECTION

ORIGINATED BY AKB

COMPILED BY AKB

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4B

FOUNDATION SECTION

JOB 67-F-9

LOCATION Sta. 336 + 66; 20' Rt. of

ORIGINATED BY AKB

W. P. 63-57

BORING DATE August 24, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Diamond Drilling

CHECKED BY

[illegible]

FOUNDATION SECTION

CHECKED BY

[illegible]

FOUNDATION SECTION

CHECKED BY

[illegible]

OFFICE REPORT ON SOIL EXPLORATION

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1B

FOUNDATION SECTION

JOB 67-F-9 LOCATION Sta. 337 + 57; 17¹ Lt. of C ORIGINATED BY AKB
W.P. 63-57 BORING DATE August 23, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Diamond Drilling CHECKED BY _____

[illegible]