

#67-F-280 M

KOCH BRIDGE

NITH RIVER

WILMOT TWP.

D.H. 2010
Site 33-69

E. M. PETO ASSOCIATES LTD.

SOIL INVESTIGATION REPORT
KOCH BRIDGE OVER NITH RIVER

for

TOWNSHIP OF WILMOT
c/o McCargar and Hachborn Ltd.
Kitchener, Ontario

67-F-280M

DISTRIBUTION:

4 c.c. Addressee
1 c.c. File

JOB NO. 67 F201

SEPTEMBER, 1967

e. m. peto associates ltd.

YOUR REFERENCE..

OUR REFERENCE.. 67 F201

1287 caledonia road.

TORONTO 19, ONTARIO

Telephone: 789-1128

September 29, 1967.

Township of Wilmot,
c/o McCargar and Hachborn Ltd.,
546 Belmont Avenue West,
Kitchener, Ontario.

Attention: Mr. G. Hill, P.Eng.

Dear Sirs:

Re: Koch Bridge

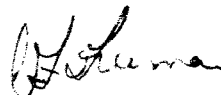
We enclose herewith our report on the soils investigation carried out in connection with the above project.

The boreholes showed very stiff or hard tills overlain by shallow deposits of alluvial material. Spread footings may be used for the bridge foundations set in the till material. Site conditions in general are good. However, it may be necessary to replace some of the alluvial material depending on the prevailing site conditions at the time of construction.

Whilst we believe that this report is complete within our terms of reference, we will be pleased to discuss any points which you may wish to raise.

Yours very truly,

E. M. PETO ASSOCIATES LTD.



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

DJB/jw

1. INTRODUCTION

- 1.1 Authority: The work described in this report was authorized on behalf of the Township of Wilmot by McCargar and Hachborn Ltd. of Kitchener, in a verbal message from Mr. G. Hill on September 14th, 1967.
- 1.2 Site and Proposal: The site of the investigation is in the Township of Wilmot in the 2nd Concession, north of Phillipsburg approximately 250 ft. south-east of the existing bridge over the River Nith. It is proposed to construct a new bridge over the River Nith as part of road improvement works, the new Koch Bridge being a three span prestressed concrete structure. The river at the proposed location is approximately 50 ft. wide and at the time of the investigation approximately 10 inches deep. It is anticipated that the river will be widened at this location when the new bridge is constructed to approximately 75 ft. The site is fairly flat and grass covered to the river edge with the banks of the river up to about 8 ft. above the river bed level. The purpose of the investigation is to ascertain the soil conditions at the site of the new bridge to allow design proposals for the foundations to be made.
- 1.3 Field Work: Four boreholes, one to 40 ft. 0 inches below ground level and three to a depth of 20 ft. 0 inches were sunk at the locations shown on the site plan. In addition a fifth borehole to 9 ft. 0 inches was sunk to ascertain soil conditions in a swampy area approximately 100 ft. east of the bridge site. The work was carried out during September by a self propelled, track mounted 3½ inch diameter flight auger. Standard penetration tests were carried out at intervals of 2 ft. 6 inches during the first 15 ft. 0 inches and thereafter at 5 ft. intervals. Ground water conditions were observed carefully during drilling operations.

1. INTRODUCTION - cont'd

1.4 Report Preparation: The detailed description of the strata is given in the appended borehole logs together with the results of the in situ penetration tests and laboratory moisture content determinations from the samples taken. A simplified soil profile showing the inferred strata between boreholes is included with the site plan. The elevations referred to in the borehole logs and soil profiles are given relative to an assumed bench mark of 100.0 on the south-east corner of the south-west abutment of the existing bridge.

2. SOIL CONDITIONS

2.1 General: The soils encountered were in the main glacial till material overlain by relatively recent alluvial deposits. In general boreholes 1 and 4 showed a sandy silt topsoil to depths between 6 inches and 4 ft. 0 inches overlying alluvial clay sand and gravel to between 4 ft. 0 inches and 5 ft. 6 inches below ground level. Below this level a very stiff or hard grey silty clay till was encountered to between 20 ft. 8 inches and 26 ft. 6 inches below ground level overlying a hard grey silt or sandy silt till to termination in all the boreholes. Borehole 5 showed a very clayey silt to a depth of 4 ft. 10 inches overlying gravelly sand to 5 ft. 0 inches, in turn overlying grey silty clay till to termination at 9 ft. 0 inches.

2.2 Ground Water Conditions: After the installation of "H" casing to depths between 6 ft. 6 inches and 10 ft. 0 inches the boreholes were dry and open with the soils moist. The ground water table is perched above the relatively impervious tills and is related to the river level.

3. OBSERVATIONS AND RECOMMENDATIONS

The soil conditions indicate that a safe allowable bearing capacity of 4 tons/sq.ft. may be used in the design of spread footings set in the grey silty clay till at a depth of 6 ft. 0 inches below the upper boundary of this material where such footings lie in the existing river or within the anticipated boundary of the river. Where the footings lie outside the anticipated river boundary, these may be designed on the basis of a safe allowable bearing capacity of 3 tons/sq.ft. set in the grey silty clay till at a minimum depth of 6 ft. 0 inches below ground level. If these recommendations are adopted, settlements are anticipated to be of a low negligible order.

In order to excavate for these footings, it is recommended that sheet piling be employed, driven into the grey silty clay till.

The soft materials in boreholes 4 and 5 overlying the grey silty clay till may present construction difficulties. However, this will be dependent on the site conditions prevalent at the time of construction, and a decision as to their removal and replacement with granular material should be made then. If these materials can be left in place, limited settlement will however, occur where the embankment lies over such material and it is recommended that embankment construction be so phased that as large an amount as possible of the total settlement occurs before road construction commences. Excess material available from the excavations for the footings may be used in the embankments depending on its suitability in respect of water content for compaction at the time of construction.

E. M. PETO ASSOCIATES LTD.

D. J. Belshaw

D. J. Belshaw

C. F. Freeman

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

DJB/jw

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		

e.m. peto associates ltd.

RECORD OF BOREHOLE NO. 1

Consulting soil engineers

JOB NO. 67 F201

JOB NAME Koch Bridge over Nith River

TECHNICIAN H.K.

BORING DATE Sept. 20/67

CLIENT Township of Wilmot

ENGINEER D.D.

GROUND ELEV. 88.43

BOREHOLE TYPE 3" Auger

TYPED BY J.W.

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.					WATER CONTENT % W_p W W_L 10 20 30			
						10	20	30	40	50				
0'0"	TOPSOIL, fine sandy silt													
1'6"	CLAYEY SAND, brown clayey silty sand with fine to coarse gravel. Wet		1	SS	15									Water at river level. See elevation.
5'6"	Less clay content		2	SS	19									Installed "H" casing to 6'6"
	TILL, grey silty clay till.		3	SS	22									Hole now dry and open.
	Moist		4	SS	27									
	Wet gravel pocket		5	SS	27									Hole dry and open.
			6	SS	32									
			7	SS	24									
22'2"	Very stiff													
	TILL, grey silt till. Moist													
	Hard		8	SS	57									
26'6"	Terminated at 26'6" With casing at 6'6" hole was dry and open After pulling casing hole was filling fast to river level													

e. m. peto associates ltd.

RECORD OF BOREHOLE NO. 2

Consulting soil engineers

JOB NO. 67 F201

JOB NAME

Koch Bridge over Nith River

TECHNICIAN H.K.

BORING DATE Sept. 19/67

CLIENT Township of Wilnot

ENGINEER D.B.

GROUND ELEV. 87.18

BOREHOLE TYPE 3" Auger

TYPED BY J.W.

SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT STANDARD PENETRATION TEST BLOWS/FOOT 10 20 30 40 50					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 % 10 20 30			
0'0"														
0'6"	TOPSOIL, silty sand													
	GRAVEL, fine to coarse													
	sandy silty gravel		1	SS	16									
	with some clay content													
4'6"	Wet, compact													
			2	SS	21									After 5' sa. water in hole level with riv.
	TILL, grey silty clay													See elevation
	till.		3	SS	21									
	Very stiff, silt seams													
			4	SS	32									After 7' sa. "H" casing to 6'6"
			5	SS	40									Hole now dry and open
			6	SS	54									
	becoming very silty with high gravel content.													After 25' sa. hole dry and open.
			7	SS	40									
25'3"	Hard		8	SS	45/6"									
	TILL, grey sandy silt till.													After 35' sa. hole dry and open.
	Boulders		9	SS	55									
	Moist		10	SS	64									At completion of hole with "H" casing at 6'6" hole open and no water.
41'0"	Hard		11	SS	90									
	Terminated at 41'6" After pulling casing hole was filling up with water fast.													

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

e.m.peto associates ltd.

RECORD OF BOREHOLE NO. 3 & 5

Consulting soil engineers

JOB NO. 67 F201

JOB NAME Koch Bridge over Nith River

TECHNICIAN H.K.

BORING DATE Sept. 20/67

CLIENT Township of Wilmot

ENGINEER D.B.

GROUND ELEV. 89.03

BOREHOLE TYPE 3" Auger

TYPED BY J.W.

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 % 10 20 30			
						10	20	30	40	50				
0'0"	TOPSOIL, brown sandy silt													Water at river level. See elevation.
1'7"	SANDY CLAY, brown silty													
2'8"	very fine, sandy clay		1	SS	21									
4'0"	CLAYEY SAND, brown clayey silty sand with fine to coarse gravel													After 5' sa. "H" casing to 6'6".
	TILL, grey silty clay till.		2	SS	21									
	Very stiff		3	SS	32									
	Moist.													Hole now dry and open.
			4	SS	31									
			5	SS	32									
														Hole #3 At completion with casing at 6'6" hole dry and open.
			6	SS	36									
20'8"	Hard		7	SS	21									After pulling casing hole filled up fast to river level
	TILL, light grey sandy silt till.													
	Moist													
25'6"	Hard		8	SS	60/5"									Terminated at 25'6"
	Terminated at 25'6"													
0'0"	B.H.#5 Ground surface													Terminated at 9'0"
	very clayey silt dark brown													
	Very moist													
4'10"	GRAVELLY SAND, wet													Terminated at 9'0"
6'0"	TILL, grey silty clay.													
9'0"	Moist													
	Terminated at 9'0"													

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

e.m. peto associates ltd.

RECORD OF BOREHOLE NO. 1

Consulting soil engineers

JOB NO. 67 P201

JOB NAME Loch Bridge over N. B. River

TECHNICIAN H. J.

BORING DATE Sept. 20/67

CLIENT Township of Alton

ENGINEER P. D.

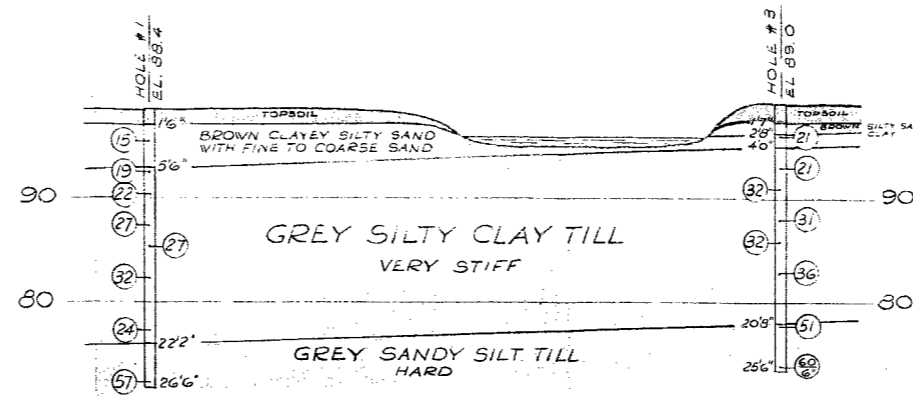
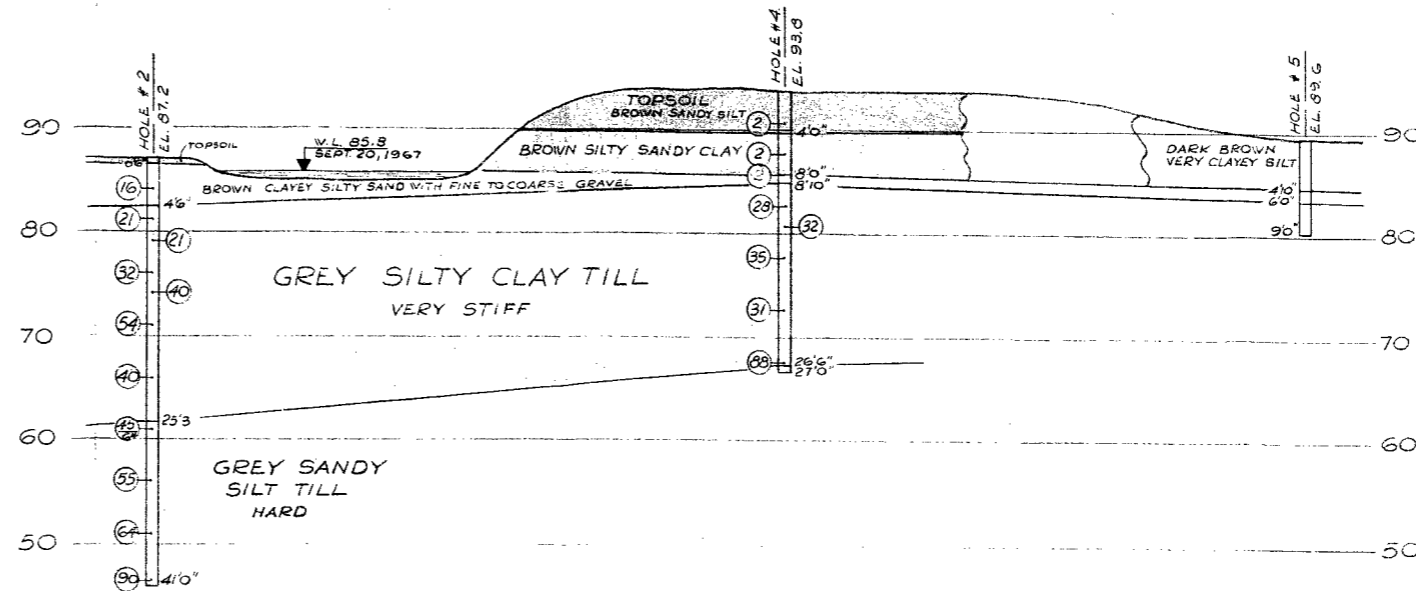
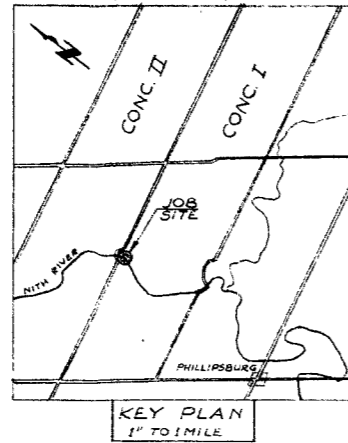
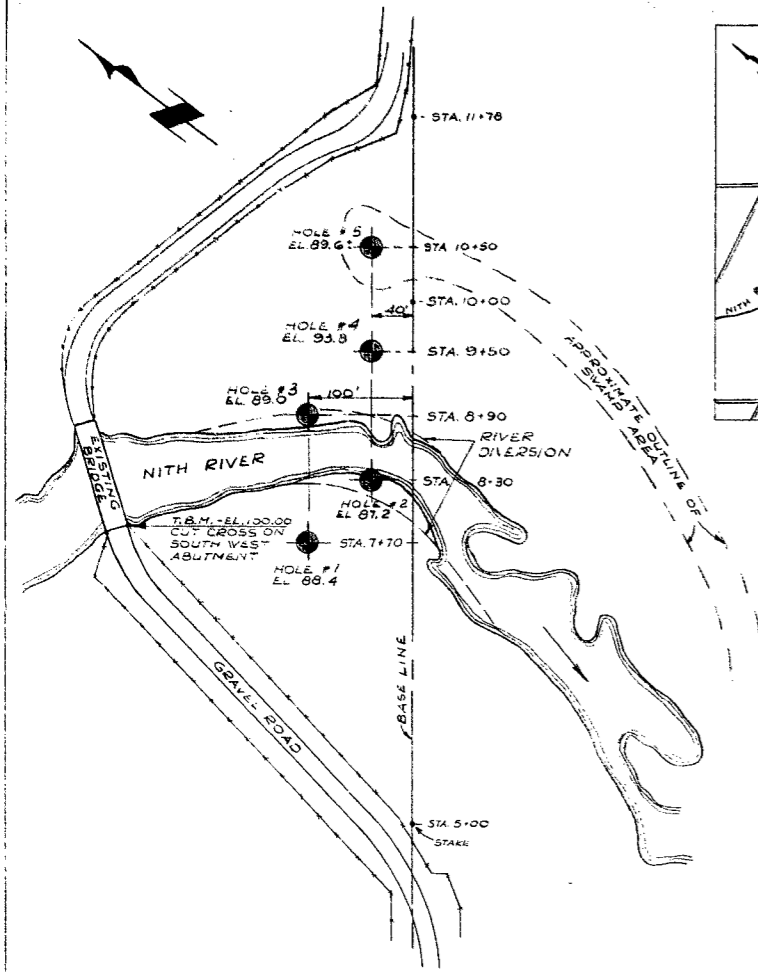
GROUND ELEV 93.21

BOREHOLE TYPE 3" Auger

TYPED BY C. J.

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"														
	TOP SOIL													
	brown sandy silt		1	SS	2									
4'0"	Soft		2	SS	2									
	SANDY CLAY, brown silt													
	very fine sandy clay.		3	SS	2									
	Wet													
8'0"	Soft		3	SS	2									
8'10"	SAND, clayey silty sand													
	with gravel													
	TILL, grey silty		4	SS	28									
	clay till.													
	Very stiff		5	SS	32									
	Moist		6	SS	35									
	Silt seams		7	SS	31									
			8	SS	38									
26'6"	Hard													
27'0"	TILL, sandy silt, brown till													
	Terminated at 27'0"													
	with casing at 10'0"													
	Hole was dry and open.													
	After pulling casing hole													
	filled fast to river													
	level.													

REMARKS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT



LEGEND

- BOREHOLE
- BLOWS/FOOT

SCALES

HOR. 20' TO 1"
VERT. 10' TO 1"

NOTE

SEE BOREHOLE LOGS FOR
FOR COMPLETE SOIL DATA.

NOTE: The actual soil stratification has been verified from data obtained at the borehole locations only. The inferred contacts shown are based on geological evidence and these may vary from those shown between borings.



TOWNSHIP OF WILMONT
% M. CARGAR & HACHBORN, CONS. ENGINEERS

KOCH BRIDGE OVER NITH RIVER

PREPARED BY
em. peto associates ltd.

JOB NO. 67-F 201	DATE SEPTEMBER 1967	DWN. BY K. K.	CHECKED BY D. S.
---------------------	------------------------	------------------	---------------------