

DOCUMENT MICROFILMING IDENTIFICATION.

GEOCRES No. 41 J - 35

DIST. 18 REGION NORTHWESTERN

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. 17 B

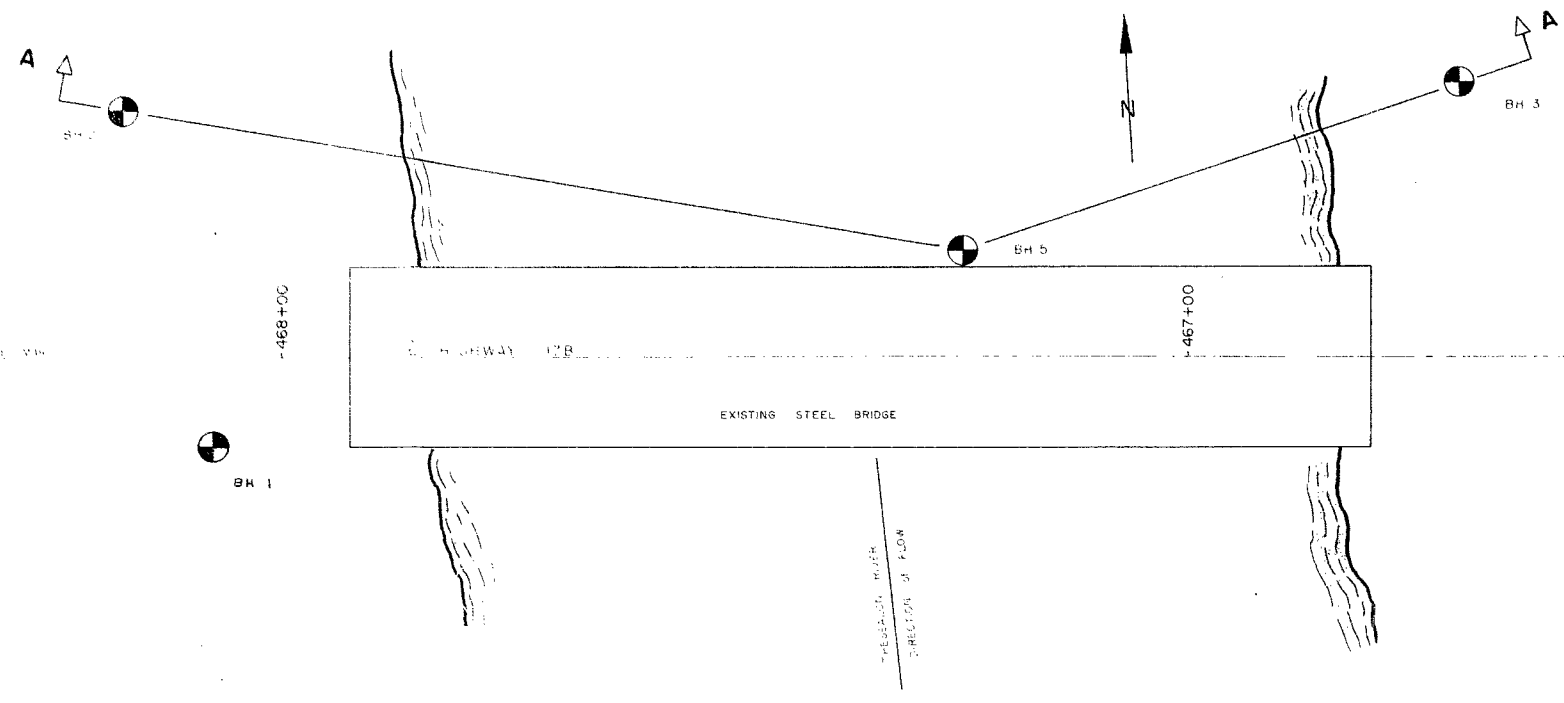
LOCATION HWY 17B & THESSALON
RIVER.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 1

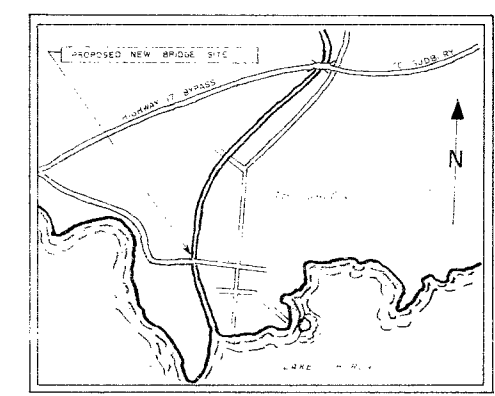
REMARKS: _____

G.I.-30 SEPT. 1976

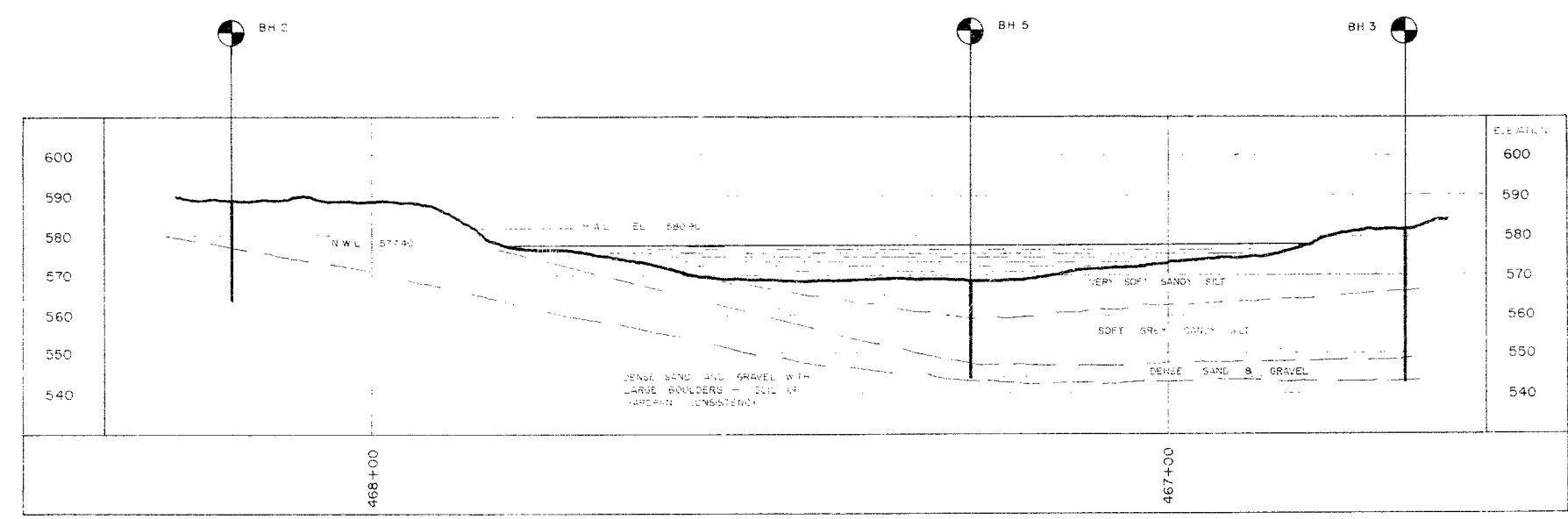
41 J



PLAN VIEW
SCALE: 1" = 10'-0"



KEY PLAN
SCALE: 1" = 600'-0"



SECTION A - A PROFILE

NOTE
The soil samples between the bridge and the highway 17 bypass are of the same type and consistency. The soil samples between the bridge and the highway 17 bypass are of the same type and consistency.

41J-35
GEORES No.

M. R. WRIGHT & ASSOCIATES			
CONSULTING		ENGINEERS	
SAULT STE. MARIE		ONTARIO	
DRAWN W.M.	PROJECT REPOSEL HURON INT. BRIDGE OVER THE MISSISSAUGA RIVER AT SAULT STE. MARIE		
CHECKED S.A.	APPROVED		
DATE	SCALE		
PROJECT NO.	DWG. NO.		
PROJECT NO. 6-69		DWG. NO. ONE	

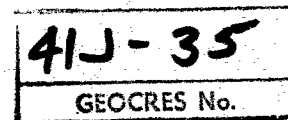
1207 on 41 J

M. R. WRIGHT & ASSOCIATES
CONSULTING ENGINEERS

BA 1686

PHONE AL. 4-1422
14 QUEEN ST. EAST, SUITE 4
SAULT STE. MARIE
ONTARIO

August 6, 1963.



Mayor and Council,
Town of Thessalon,
Thessalon, Ontario.

Re: Soils Investigation for Proposed New Bridge on Huron Street
Over the Thessalon River.

Dear Sirs:

Enclosed herewith is our report concerning soil conditions
at the site of the above mentioned project.

As stated in greater detail in the enclosed report the soil
conditions consist of a layer of soft sandy-silt starting at
surface on the west side of the river and extending from surface
to approximate depth thirty feet on the east side of the river.
Below this material occurs a very dense sand-gravel layer of
hardpan consistency. This hardpan is suitable as a foundation
material.

Piles with end bearing in the dense sand-gravel stratum
are recommended for the support of bridge abutments. End bearing
piles, either timber, steel pipe filled with concrete, or steel
"H"-piles would all provide solutions to this support problem.
The probable maximum length of pile would be about thirty-five
feet, driven to practical refusal in the dense stratum.

The dense gravel stratum at surface on the west side of
the river would probably have to be blasted when excavating
for abutment foundations. Utilities in the vicinity of the bridge
would have to be protected and maintained during construction.

We trust the enclosed report provides you with sufficient
information to proceed with design of the bridge foundations.
Should additional questions arise please do not hesitate to
contact us.

Yours very truly,

M. R. Wright

M. R. Wright, P.Eng.

MRW/pw

PROPOSED NEW HIGHWAY BRIDGE ON HURON STREET
OVER THE THESSALON RIVER, THESSALON, ONTARIO

OWNER: TOWN OF THESSALON
THESSALON, ONTARIO

ONTARIO DEPARTMENT OF HIGHWAYS

Project: C61.89

M. R. Wright and Associates
Sault Ste. Marie, Ontario

August 6, 1963

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BOREHOLE LOG -----	BH 3
BOREHOLE LOG -----	BH 4
BOREHOLE LOG -----	BH 5

SOILS INVESTIGATION FOR PROPOSED NEW HIGHWAY BRIDGE
ON HURON STREET OVER THE THESSALON RIVER
AT THESSALON, ONTARIO

This report contains comments and recommendations concerning the foundation for a proposed New Highway Bridge on Huron Street over the Thessalon River at Thessalon, Ontario. These recommendations are based on the results of soil borings made at the site during July 24th to July 30th, 1963.

DESCRIPTION OF THE SITE

An existing bridge is now situated precisely where the proposed new structure is to be located. Highway 17B crosses this bridge, sloping downward from the west, onto the present bridge which runs in an east-west direction. The existing bridge slopes gently downward to the east, as does the eastern approach to the bridge. The present river banks range from five to ten feet in height. The site is in a built-up area in the town of Thessalon, with houses located on both sides of the river.

An existing 6 inch diameter cast iron watermain runs along the riverbed, directly below the north truss of the existing bridge, and into the ground under the bridge abutments. A 12 inch diameter storm and sanitary sewer drains from the east to a collection box just south of the existing east bridge abutment, and thence into the river. A sanitary sewer drains from the west to the river just north of the west bridge abutment. Hydro lines cross the river just north of the existing bridge. Care should be taken to avoid damaging these services by accident during construction.

The river elevation on July 24th, 1963, was 577.40 feet above sea level and the river velocity was very slow at approximately 10 feet per minute. Information from local residents indicated that the highest water elevation during spring flooding over the last 30 years was approximate elevation 580.9 feet.

DESCRIPTION OF TEST METHODS

Test holes 1 to 4 were advanced by the wash and chop method to refusal. Samples were taken at five foot intervals, or at lesser intervals when felt necessary. Standard split spoon samples were taken and a record kept of the number of penetration blows required to advance the sampler. These penetration blows are a measure of the strength of granular soils and an interpretation of this is given by Terzaghi and Peck in "Soil Mechanics in Engineering Practice". The standard split spoon sampler consists of a 2 inch diameter thick walled sampling spoon driven under 4,200 inch-pounds of energy per blow. The safe bearing capacity of granular soils is based on a tabulated comparison between the penetration resistance offered by the standard split spoon and the bearing pressures applied in plate loading tests at 1 inch settlement.

After refusal was reached in two holes, diamond drilling was employed to determine the nature of the hard stratum.

Test hole No. 5 was advanced using a standard 2 inch diameter penetration cone driven to refusal. The "N" values shown on borehole log No. 5 were modified to correspond to "N" values derived from the standard split spoon samples. This modification was interpreted from tests made at the site between standard split spoon, and cone penetration tests.

SOIL CONDITIONS

The soil generally consists of a soft layer of sandy silt overlying a very hard stratum of dense sand and gravel with interspersed boulders. The soft sandy silt layer is very shallow on the west side of the river, as shown by Borehole logs 1 and 2, but deepens to approximate depth twenty-five feet below normal water level at the east side of the river. Borehole No. 5 also indicates that this soft layer extends about eighteen feet below normal water level at the middle of the river.

Borehole No. 1 indicates a dense sand-gravel layer approximately ten feet deep at surface followed by a layer of fine sand with grey silt. It is the writer's opinion that this sand-gravel layer at surface consists of backfill used behind the west abutment of the existing bridge.

The dense sand-gravel layer at greater depths in the boreholes is a very hard material and appears to be hardpan. The casing could not be driven through this material and at times the split spoon sampler could not be driven far enough to get a sample. Extending these holes by diamond drilling produced small amounts of core, probably from boulders, and the remaining material was in the form of sand washings from the hole.

SOIL CONDITIONS (Cont'.)

Information from local residents to the west of the bridge revealed that this sand-gravel hardpan occurs near the surface westward from the bridge, and that blasting is necessary in order to dig house foundation walls and basements. This material could not be dug with a back-hoe shovel or front end loader.

The water table was reached at approximate elevation 577.40 feet in all boreholes which is the present elevation of the river. This presence of water is also a cause for the weak state of the sandy-silt material.

PROPOSED FOUNDATIONS

Since the soft sandy-silt layer of soil extends so deep on the east end of the bridge, the possibility of spread footings is immediately ruled out. Pile foundations are the only reasonable answer for the support of bridge abutments.

Timber piles, driven to practical refusal in the dense sand-gravel layer would be feasible. Timber piles 12 inches in diameter with a load bearing capacity of twenty tons could be used. The tips should be protected with a steel shoe because of possible encounters with boulders during driving, and also to prevent breakage when entering the dense end bearing material.

Steel pipe piles are also recommended. They should be driven with open ends into the hardpan gravel, washed out and filled with concrete. These open end pipe piles would probably penetrate the dense stratum two to four feet before reaching practical refusal. Ten inch diameter pipe piles filled with concrete would have a load bearing capacity of 80 tons. Heavy pipe sections should be used to withstand damage caused by driving around boulders.

Steel "H"-piles are also a possible means of foundation support. 10BP @ 57 piles would have a bearing capacity of 65 tons each. 12 BP 74 piles would have a bearing capacity of 80 tons each. Steel "H"-piles would probably penetrate the dense gravel stratum from two to four feet before reaching practical refusal.

EXCAVATION AND CONSTRUCTION CONDITIONS

Excavation in the dense sand-gravel stratum would probably be required at the west bridge abutment. Blasting will probably be necessary to remove this material. Excavation in the soft sandy-silt material at the east abutment will probably be required below water level and the usual below water excavation problems could be expected.

As mentioned previously in this report, special note should be made of watermains, sewer lines and the overhead hydro crossing at the bridge site. Care must be taken with machinery and construction to insure that these services are not interrupted.

Borehole No. 5 has indicated the dense stratum to be located at approximate depth thirty-four feet below normal water level at the middle of the river. Temporary erection frames should be carried to this depth for sound support.

Test holes H6 to H9 were taken to maximum depth ten feet in the road sub-base on the east and west bridge approaches. Following is a summary of test results.

<u>TEST HOLE</u>	<u>LOCATION</u>	<u>SUB-BASE MATERIAL</u>
H6	300 feet east of existing east bridge abutment	-surface to depth ten feet-dense sand and gravel
H7	150 feet east of existing east bridge abutment	-surface to depth ten feet-dense sand and gravel
H8	150 feet west of existing west bridge abutment	-surface to depth five feet-firm clay with sand. Hardpan encountered at depth five feet
H9	300 feet west of existing west bridge abutment	-surface to depth five feet-firm clay with sand. Hardpan encountered at depth four feet.

MRU/pw



Respectfully Submitted,

M. R. Wright
M. R. Wright, P.Eng.

M.R. WRIGHT & ASSOCIATES

SAULT STE MARIE ONT.

SOILS INVESTIGATIONS

STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE Thessalon River Bridge- Huron CONTRACT 61.89 SHEET 1 OF 5
 LOCATION Thessalon, Ontario Street INSPECTOR W DATE July 24 '63
 OWNER Town of Thessalon BOREHOLE NO BH 1 DATUM Note Below

MISCELLANEOUS DATA

LENGTH OF HOLE 40 FT
 ROCK Not Encountered FT
 WT OF HAMMER 140 LBS
 AVGE FALL OF HAMMER 30 INS
 ELEV OF GROUND WATER 577.4 ft.

SAMPLE LEGEND

D - DISTURBED
 W - WASH
 U - UNDISTURBED
 R - ROCK
 —X— water table

STRATIFICATION

ELEVATION	DEPTH	SAMPLE NO	PENETRATION RESISTANCE	DESCRIPTION
587.8	0'			
	6'	D1 N=33		Dense sand and gravel. (Possibly fill material which was placed behind abutment of existing bridge.)
577.4	10'	D2 N=30*		
W.T.	11'			Dense fine sand with a large per centage of grey silt
	16'	D3 N=29*		
	20'			
	21'	D4 N=67		Dense gravel, sand and large boulders
	25'	D5 N=44		
	27'			
	29'	D6 N=75		
				Very dense sand with gravel hard pan with boulders
	35'	D7 N=100		
547.8	40'	D8 N=100		

*These N values have been modified to compensate for penetration blows in fine sand and silt below the water table. $N'(\text{MODIFIED}) = 15 + \frac{1}{2} (N-15)$

Datum Elevation 587.644 - Geodetic Bench Mark No. 3109 Post Office at Main and Algoma Street East; Tablet in southeast concrete foundation wall, 1 foot from northeasterly corner and 2 feet below brick.

M.R. WRIGHT & ASSOCIATES

SAULT STE MARIE ONT

SOILS INVESTIGATIONS

STRUCTURAL ENGINEERS

BORING LOG

LOCATION: Thessalon River Bridge -Huron 61.89 SHEET 2 OF 5
 ADDRESS: Thessalon, Ontario Street W DATE July 25 '63
 TOWN: Town of Thessalon BOREHOLE NO. BH 2 DATUM: See BH 1

DEPTH 25
 Not encountered
 140
 30
 577.4 ft.

SAMPLES
 DISTURBED
 WASH
 UNDISTURBED
 ROCK
 water table

588.3—0'

5' D1 N=24 Firm sand with large boulders

577.4—11' D2 N=50

W.T.

C3 Core Dense sand and gravel with large boulders throughout. Too hard to drive casing or take split spoon samples. Core recovery consisted of short lengths of very hard gabbro rock.

563.3—25'

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS

STRUCTURAL ENGINEERS

BORING LOG

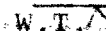
STRUCTURE **Thessalon River Bridge - Huron Street** 61.89 SHEET 3 OF 5
 LOCATION **Thessalon, Ontario** M.M. DATE **July 28 1963**
 OWNER **Town of Thessalon** BOREHOLE NO. **BH 3** DATUM **See BH 1**

MISCELLANEOUS DATA

LENGTH OF LOG 38 FT
 ROCK **Not encountered**
 WEIGHT OF HAMMER 140 LB
 FREE FALL OF HAMMER 30 FT
 ELEV. OF GROUND WATER 577.4 ft.

SAMPLE LOG

1. **COLLECTED**
 2. **WITH**
 3. **UNDISTURBED**
 ROCK
 water table

W.T. 

STRATIFICATION

ELEVATION	LOG	DEPTH	TEST	DESCRIPTION
581.1		0'		
577.4		6'	D1 N=1	Grey silt with minor amounts of fine sand and black organic material throughout
		11'	D2 —	Sampler sank under own weight
		12'	D3 N=2	
		16'	D4 N=2	
		18'		
		21'	D5 N=5	
				Grey sandy-silt
		26'	D6 N=6	
		30'		
		31'	D7 N=100	Very dense sand and gravel
		33'	D8 N=120	
543.1		38'	D9 Core	Very dense cemented sand and gravel with very hard diabase boulders

M.R. WRIGHT & ASSOCIATES

SOILS INVESTIGATIONS

STRUCTURAL ENGINEERS

BORING LOG

Thessalon River Bridge -Huron
Thessalon, Ontario Street
Town of Thessalon

61.89

M.M.

BH 4

4 5

July 30 '63

See BH 1

32

Not encountered

140

30

577.4 Ft.

W.T. A

water table

580.7

0'

577.4

W.T. A

5' D1 N=1

Grey silt with minor amounts of fine sand and black organic material throughout.

11' D2 —

Sampler sank under own weight

16' D3 N=1

20' D4 N=1

21' D5 N=5. Sandy silt with some organic material

25' D6 N=17

Gravel and sand

548.7

32' D7 N=120

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE, ONT.

SOILS INVESTIGATIONS

STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE Thessalon River Bridge -Huron / 61.89 5 5
LOCATION Thessalon, Ontario Street M.M. July 27 '63
OWNER Town of Thessalon BH 5 See BH 1

LENGTH OF 34
ROCK Not encountered
WT OF HAMMER 140
AVG FALL OF HAMMER 30
ELEV OF GROUND WATER 577.4 ft.

STRATIFICATION

ELEVATION	DEPTH	LEGEND	TESTS	DESCRIPTION
577.4	0'			Surface of River
				Water
568.3	9'	D1 N= 3		Riverbed
	12'	D2 N= 4		Soft loose saturated soil
	15'	D3 N= 3		
	18'	D4 N= 5		
	21'	D5 N=24		
	24'	D6 N=25		Firm soil
	27'	D7 N=34		
	30'	D8 N=39		
543.3	34'	D9 N=80		Dense soil

NOTE: A penetration cone was used on this hole to determine the approximate bearing characteristics of the soil at the middle of the river. The "N" values were interpolated from tests at the site to correspond to the characteristic "N" values.