64-F-246M

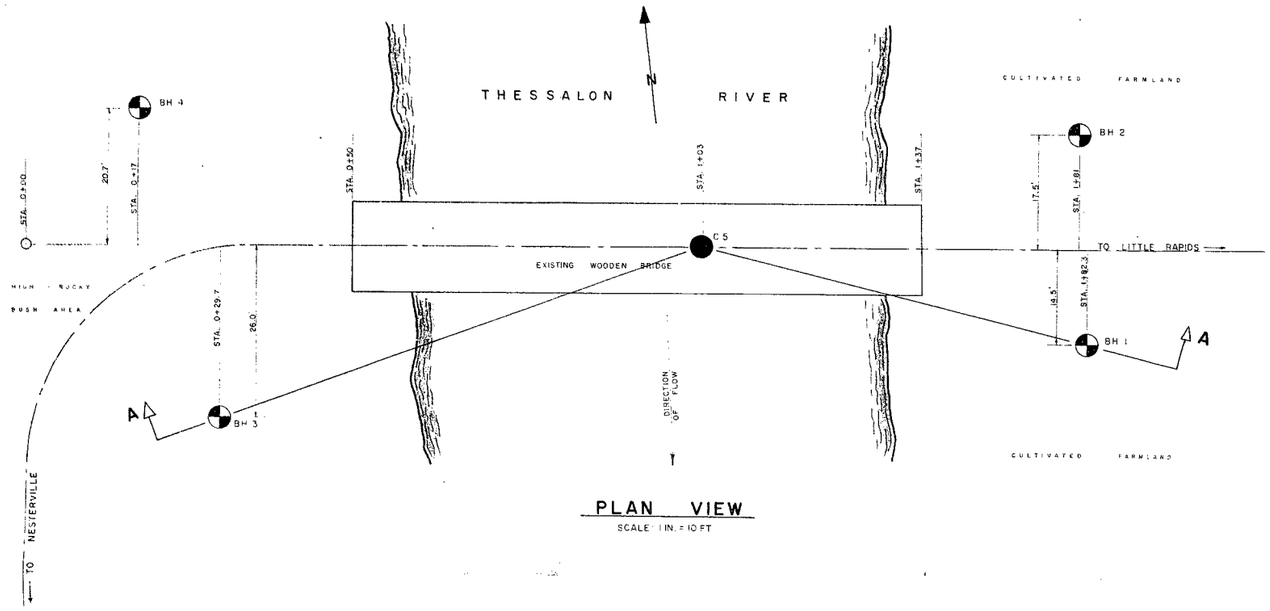
THESSALON RIVER

AT LITTLE RAPIDS

MacDONALD BRIDGE

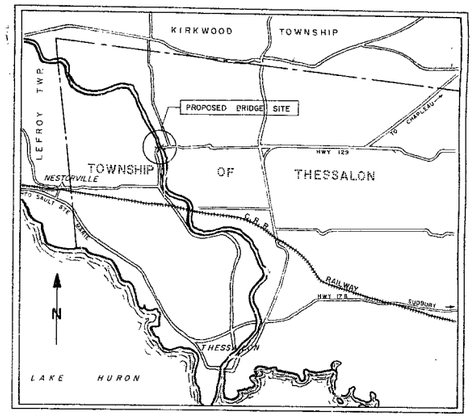
LOTS 17+19

RIVER RANGE



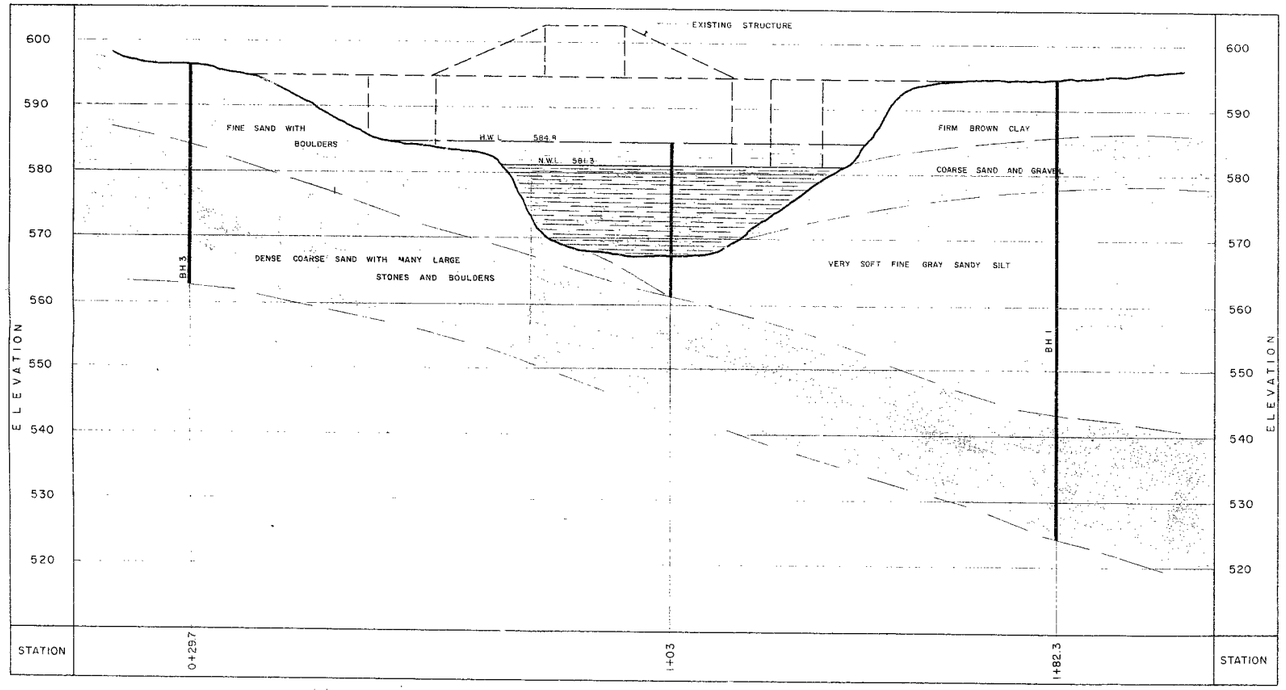
PLAN VIEW

SCALE: 1 IN. = 10 FT



KEY PLAN

SCALE: 1 IN. = 600 FT



SECTION A—A PROFILE

SCALE 1 IN = 10 FT

NOTE

THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS.
BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE CHANGE.

NO	REVISION	DATE

M. R. WRIGHT & ASSOCIATES
CONSULTING ENGINEERS
SAULT STE. MARIE ONTARIO

DRAWN J	PROJECT - PROPOSED MacDONALD BRIDGE OVER THE THESSALON RIVER AT THESSALON ONT
CHECKED W	
APPROVED	DETAIL SOIL TESTING PLAN AND PROFILE
DATE June 1964	
SCALE As Noted	OWNER TOWNSHIP OF THESSALON

PROJECT NO. 1033 DWG. NO. ONE

Mr. G. C. E. Burkhardt, P. Eng.,
Municipal Bridge Checking Engr.,
Bridge Division.

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

March 23, 1965

Your Memo -- March 18/65

Township of Thessalon,
MacDonald's Bridge over the Thessalon River,
Lots 17 and 19, River Range,
District of Algoma,
Structure Site No. 38-195 - Your File No. BA 1872

With reference to your memo of March 16th and the above-mentioned report, we herewith submit our comments for your consideration:

Steel H-piles as supports for both the East and West abutments, are recommended by the Consultant. At the West abutment the proposed footing elevation is 579.0 and the piles are supposed to be driven to El. 563.0 where refusal should be met.

In our opinion, it is very doubtful whether piles can be driven that far. In the course of the investigation, it was impossible to advance casing and drive the Standard Penetration Sampler beyond El. 579.0, and drilling had to be resorted to. The material of the banks is scour susceptible and footings that would derive their bearing from the layer lying below the present river bottom (approx. El. 568.0) are desirable. However, due to the above-mentioned, this may prove to be either impossible or very difficult to achieve.

At the East abutment, the pile tip elevation - i.e., the elevation where refusal is to be met, is given as 540.0. Here, however, the reported conditions are such (penetration in B.H. 2 possible without drilling) that piles may not meet refusal and could penetrate much farther.

The estimated cost of $47,239.00 for the proposed bridge at this site is, of course, based on the described foundation alternative. However, in view of the comments in connection with the possible early pile refusal on the West bank and the possible deeper pile penetration on the East bank, the cost of foundations may differ quite significantly from the assumed one.

Should there be any additional questions that you would like to discuss, please feel free to call on our office.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeP
cc: Foundations Office
Gen. Files

B.A. 1872

M. R. WRIGHT & ASSOCIATES

CONSULTING ENGINEERS

PHONE 254-1422
14 QUEEN ST. EAST, SUITE 4
SAULT STE. MARIE
ONTARIO

June 8th, 1964.

The Reeve and Council,
Township of Thessalon,
c/o Mr. J. McLean, Clerk,
Little Rapids, Ontario.

64-F-246 M

RE: Soils Investigation for a Proposed New MacDonald Road Bridge Over the Thessalon River at Little Rapids, Ontario.

Dear Sirs:

Please find enclosed our report concerning soil conditions at the site of the above mentioned project.

As stated more fully in the enclosed report, soil conditions on either side of the river are quite different from each other. On the east side of the river the soil consists of strata of firm brown clay and fine sand, overlying a deep layer of soft sandy-silt. Below this occurs a deep stratum of sand, gravel and boulders. The soil on the west side of the river consists of shallow strata of fine sand, or clay, overlying a deep dense stratum of sand, gravel and boulders.

For support of foundations for the proposed bridge structure we would recommend the use of steel H-piles driven into the dense sand-gravel stratum. Steel piles would probably penetrate this dense sand-gravel stratum approximately twenty to thirty feet before attaining sufficient resistance required for load support. Steel bearing piles would probably range in length from twenty-five feet on the west side of the river to fifty-five feet on the east side.

The dense-gravel stratum on the west side of the river would probably be encountered during construction due to its high elevation. Excavation of this soil for the placing of abutment footings would probably be difficult, however it is not expected that blasting would be required.

Excavation for abutment footings on the east side of the river should be relatively easy, however work would probably be required in the soft sandy-silt stratum which occurs at approximate elevation 576 feet, which could present construction problems due to the unstable nature of this soil.

We trust the enclosed report is adequate for your consideration, and will enable you to proceed with design of the structure. We would be pleased to answer any questions which might arise in connection with this report, during the progress of the work.

Yours very truly,

M. R. Wright

M. R. Wright,
P. Eng.

MRW:jm
Encl.

PROPOSED NEW MACDONALD BRIDGE OVER THE THESSALON RIVER AT LITTLE RAPIDS, ONTARIO

OWNER: Township of Thessalon,
Little Rapids, Ontario.

TABLE OF CONTENTS

ENCLOSURES

SOILS INVESTIGATION FOR PROPOSED MACDONALD BRIDGE OVER THE THESSALON RIVER AT LITTLE RAPIDS, ONTARIO

This report contains comments and recommendations concerning foundations for a proposed new Road Bridge over the Thessalon River, located on the road between Nesterville, Ontario, and Little Rapids, Ontario, in the Township of Thessalon. These recommendations are based on the results of test borings which were made at the site during April 24th to 29th, 1964.

DESCRIPTION OF THE SITE:

The site of the proposed new structure is located in a rural farm area. The land eastward from the Thessalon River is relatively flat, cultivated farmland. Westward from the river the land is rocky, and rises quite abruptly. This area is covered with rock outcroppings and trees. About one quarter mile westward from the site occurs hills consisting of Pre-Cambrian Shield bedrock.

An existing bridge is now located where the new structure is being proposed. This is an old dilapidated wooden structure supported on wooden piles. This structure has been condemned, and is now closed to traffic.

The existing road approaches the bridge from the east in a straight direction, then turns sharply southward and proceeds along the west side of the Thessalon River. The river banks in this area are approximately ten feet high and are quite steep. The river elevation on April 24th, 1964 was 584.8 feet and the velocity was 3 feet per second. However these measurements were taken during the spring runoff. The normal water level of the

of the river in this area is 581.3 feet, and normal water velocity is about one foot per second. Local information, and local signs of spring flooding indicate that the high water level would be approximately 586.5 feet.

The location of soil test borings is shown on enclosed drawing No. 1 and the results of samples and testing is shown on the enclosed borehole logs.

DESCRIPTION OF TEST METHODS:

Test holes 1 to 4 were advanced by the wash and chop method until bedrock was encountered or "refusal" was reached. "Refusal" is defined as a condition where 100 blows from a standard hammer fails to advance a standard split spoon sampler any appreciable distance through the soil. Standard split spoon samples were taken at five foot intervals, or sooner when felt necessary. The number of blows required to advance the standard sampler during sampling were recorded, these being a measure of the strength of granular soils when interpreted according to the text entitled "Soil Mechanics in Engineering Practice," by Terzaghi and Peck. The standard split spoon sampler consists of a 2 inch diameter thick walled sampling spoon, and it is driven under an energy of 4200 inch pounds 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 one inch settlement.

The granular nature of soils at this site precluded the necessity of any "undisturbed" sampling. However, a vane shear test was conducted in the shallow clay layer in borehole No. 1 to determine the shear strength of this clay.

When refusal was reached in boreholes, 1 and 3, diamond drilling was used to advance the hole further and determine the nature and extent of the hard stratum at greater depth.

Test hole No. 5 was advanced using a standard two inch diameter penetration cone driven to refusal. The "B" Values shown on borehole log No. 5 indicate the number of blows required to advance the cone one foot through the soil. This test was taken in order to determine the approximate nature of the river bed at the centre of the river.

SOIL CONDITIONS:

Soil conditions on each side of the river differed greatly from each other, hence conditions on each side will be discussed separately.

Soil conditions on the east side of the river consist generally of the following, from grade downwards:

- firm brown clay
- fine grey sand
- fine grey sandy silt.
- dense sand with gravel, stones and boulders.

The clay stratum occurs from grade to approximate depth eight feet. A vane shear test taken in this soil indicated that the clay had a shear strength of 1425 pounds per square foot and a safe bearing capacity of approximately 2850 pounds per square foot.

Coarse sand and gravel from depths eight to sixteen feet when tested with the standard penetration test, revealed an allowable bearing capacity of 3000 pounds per square foot.

From approximate depths sixteen to forty seven feet occurs a very soft unstable stratum of fine grey sandy silt. This soil is completely saturated with water and would be unsuitable as support for even the lightest of structural loads.

At approximate depth forty-seven feet occurs a stratum of sand, gravel and boulders, so dense that it was very difficult to advance the drill casing and sampler through the material. Diamond drilling was used periodically to penetrate through large boulders, and rock cores were recovered from this drilling. Test holes were advanced to seventy-one feet and seventy-six feet in this soil, and test results indicated that the stratum becomes more dense with increasing depth.

Soil conditions on the west side of the river were generally as follows:

- fine sand, or clay.
- dense sand and gravel with rocks and boulders.

One test hole revealed fine sand from grade to depth twelve feet. Tests revealed this soil to have an allowable bearing capacity of 2500 pounds per square foot.

Another test hole revealed a soft brown clay layer from grade to depth six feet. This clay was very soft and had very little safe bearing strength.

Below the soils discussed above occurs a dense stratum of sand, gravel and boulders. Advancing drill casing and sampling spoons through this material was very difficult, due to the dense nature of the soil. In borehole No. 3 the drill casing could not be advanced past depth seventeen feet. Diamond drilling was used

to advance this hole from depths seventeen to thirty-five feet. Short lengths of solid rock core were recovered from the diamond drilling process. The "no recovery" areas of core indicated sand and gravel soils at this depth.

A cone penetration test was taken in the river bed near the centre of the existing bridge. This test revealed the river bottom to consist of approximately five feet of quite soft soil, followed at greater depth by a very dense material. At depth twenty-four feet below high water level, 100 blows were required to advance the penetration cone three inches.

The water table was located at approximate elevation 585.8 feet which is approximately one foot above the level of the river at the time of testing. It appears evident that the ground water table in this area approximates the level of water in the river.

PROPOSED FOUNDATIONS:

Due to the soft underlying sandy-silt stratum which occurs from depths sixteen to forty-seven feet at the east side of the river, the possibility of spread footings is immediately ruled out.

Timber piles, driven to practical refusal in the dense sand gravel layer at greater depth could be used. These piles could be 12 inches in diameter with a load bearing capacity of twenty tons. However, due to the long lengths of pile required on the east side of the river, it is doubtful that timber piles would prove economical. Also, due to the large boulders present, driving of wooden piles would be difficult without breakage. If wooden piles are used the tips should be protected with a steel driving

shoe to prevent breakage when penetrating the dense sand, gravel and boulders. Penetration of wooden piles into this dense stratum would be approximately ten feet.

For support of the proposed structure we would recommend the use of steel "H"-piles driven into the lower dense sand-gravel stratum. Safe bearing capacities for some steel piling sections are listed below:

10BP @ 42 lbs./ft. - Capacity - 50 Tons

10BP @ 57 lbs./ft. - Capacity - 65 Tons

12BP @ 53 lbs./ft. - Capacity - 60 Tons

12BP @ 74 lbs./ft. - Capacity - 80 Tons

Steel bearing piles would probably penetrate the dense sand-gravel stratum twenty to thirty feet before reaching practical refusal.

It should be brought to the designer's attention that piles driven through the soft sandy-silt stratum on the east side of the river should be checked for lateral support in this soil. This unstable material would not offer much lateral support to piles and it is possible that the "Slenderness Ratio" of piles through this soil could be a controlling factor in pile design.

The pile formula to be used in determining static load resistance from a drop hammer is as follows:

$$Qa = \frac{2\ WH'}{p" + 1"}$$ (Engineering News Record Formula)

for a single acting steam or air hammer

$$Qa = \frac{2\ WH'}{p" + 0.1"}$$

where: Qa is the allowable static load per pile in pounds.

W is the weight of hammer in pounds

H' is the drop in feet

p" is settlement per blow in inches.

EXCAVATION AND CONSTRUCTION CONDITIONS:

Excavations for abutment footings on the west side of the river would probably extend into the dense sand-gravel stratum. Excavation of this soil would be difficult, however it is not felt that blasting would be required.

Excavation for abutment footings on the east side of the river should prove quite easy, however the soft sandy silt stratum would probably be encountered. This soil is quite loose and, due to its high water content, could prove troublesome.

Borehole No. 5 has indicated a dense stratum at the centre of the river at approximate depth twenty four feet below high water level. Temporary erection frames, if required during construction, should be carried to this depth for sound support.

Granular materials for the existing road on either side of the bridge consist generally of the following:

surface - 2 inches of granular "A"

sub-base - 10 inches of granular "B" or pit-run.

sub-grade - soft brown clay to fine sand.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
M. R. WRIGHT
PROVINCE OF ONTARIO

Respectfully submitted,

M. R. Wright

M. R. Wright,
P. Eng.

MRW:jm

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE MACDONALD BRIDGE CONTRACT 1033 SHEET 1 OF 5

LOCATION TOWNSHIP OF THESSALON INSPECTOR H DATE APRIL 24,196

OWNER TOWNSHIP OF THESSALON BOREHOLE NO. BH1 DATUM SEE NOTE

MISCELLANEOUS DATA

LENGTH OF HOLE 71.2 FT

ROCK NONE FOUND ~~XX~~

WT OF HAMMER 140 LBS

AVGE FALL OF HAMMER 30 INS

ELEV OF GROUND WATER 585.8 FT

SAMPLE LEGEND

D - DISTURBED

W - WASH

U - UNDISTURBED

C - ROCK

ELEVATION	DEPTH	SAMPLE NO	PENETRATION RESISTANCE	DESCRIPTION
594.5	0			Organic overburden.
	0'-6"			
	4'-0	V1		Vane shear test.(Shear strength of clay = 1425 p.s.f.)
	5'-0	D1	N=8	Firm brown clay.
	8'-0			
W.T.	10'-0	D2	N=12	Coarse sand and gravel.
	15'-0	D3	N=20	
	16'-0			
	19'-0			Fine uniformly graded grey sand.
	21'-0	D4	N=½	
	26'-0	D5	N=2	
	31'-0	D6	N=1	
	36'-0	D7	N=2	Soft, very fine grey sandy-silt.
	41'-0	D8	N=4	
	46'-0	D9	N=4	
	49'-0			
	51'-6			Fine sand with gravel stones and boulders.
	52'-0	D10	N=103	
	54'-0	D11	N=116	
	61'-0	D12	N=60	Dense fine sand with stones interspersed throughout. Also, larger boulders are present. Diamond Drilling used to drill through larger boulders.
	66'-0	D13	N=85	
	70'-0	D14	N=150	
523.3	71.2			

Benchmark - Geodetic No.616 Elevation 594.469 -C.P. Ry. bridge over Thessalon River, southwest face of south concrete retaining wall at east end of bridge, 1 foot from south face of abutment and 1 foot above bridge seat. Bolt set horizontally.

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE MACDONALD BRIDGE CONTRACT 1033 SHEET 2 OF 5

LOCATION TOWNSHIP OF THESSALON INSPECTOR H DATE APRIL 26/6

OWNER TOWNSHIP OF THESSALON BOREHOLE NO. BH2 DATUM SEE BH1

MISCELLANEOUS DATA

LENGTH OF HOLE 76.0 FT

ROCK NONE FOUND FT

WT OF HAMMER 140 LBS

AVGE FALL OF HAMMER 30 INS.

ELEV. OF GROUND WATER 585.2 FT.

SAMPLE LEGEND

D - DISTURBED

W - WASH

U - UNDISTURBED

C - ROCK

STRATIFICATION ELEVATION	LEGEND	DEPTH	SAMPLE NO.	PENETRATION RESISTANCE	STANDARD PENETRATION BLOWS (0 20 40 60 80 100)	DESCRIPTION
593.6'		0'				
		5'-0	D1	N=18		Firm brown clay.
		6'-0				
W.T.		10'-0	D2	N=20		Coarse sand and gravel.
		15'-0	D3	N=8		
		16'-0				
		21'-0	D4	N=½		
		26'-0	D5	N=1		Soft, very fine grey sandy silt.
		31'-0	D6	N=1		
		36'-0	D7	N=2		
		41'-0	D8	N=1		
		45'-0	D9	N=½		
		46'-0				
		51'-0	D10	N=40		Fine sand and gravel with some boulders.
		57'-0	D11	N=44		
		66'-0	D12	N=31		
		70'-0	D13	N=56		
517.6		76'-0	D14	N=96		

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS — STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE MACDONALD BRIDGE — CONTRACT 1033 — SHEET 3 OF 5

LOCATION TOWNSHIP OF THESSALON — INSPECTOR H — DATE APRIL 28/64

OWNER TOWNSHIP OF THESSALON — BOREHOLE NO. BH3 — DATUM SEE BH1

MISCELLANEOUS DATA

LENGTH OF HOLE 35.0 FT.

ROCK BEDROCK NOT FOUND ~~FT.~~

WT. OF HAMMER 140 LBS.

AVGE. FALL OF HAMMER 30 INS.

ELEV. OF GROUND WATER 585.2 FT.

SAMPLE LEGEND

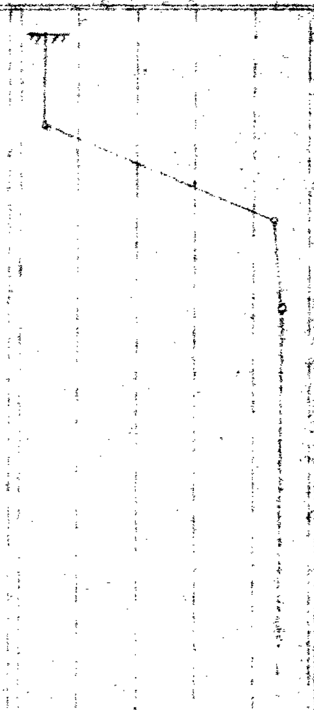
D - DISTURBED

W - WASH

U - UNDISTURBED

C - ROCK

STRATIFICATION: ELEVATION	LEGEND	DEPTH	SAMPLE NO.	PENETRATION RESISTANCE	STANDARD PENETRATION BLOWS (0 20 40 60 80 100)	DESCRIPTION
596.0		0'				
		5'-0	D1	N-10		Dense fine sand with boulders.
		10'-0	D2	N=86		
W.T.		12'-0				
		15'-0	D3	N-90		Coarse sand and gravel. - Very difficult to advance testing apparatus.
		17'-0				Dense coarse sand with large rocks and boulders. Diamond drilled from depth 17 ft. to 35 ft. Drill core revealed gravel and short lengths of rock core. (Impossible to drive casing.)
561.0		35'-0				



M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE MACDONALD BRIDGE CONTRACT 1033 SHEET 4 OF 5

LOCATION TOWNSHIP OF THESSALON INSPECTOR H DATE APRIL 29/64

OWNER TOWNSHIP OF THESSALON BOREHOLE NO. BH4 DATUM SEE BH1

MISCELLANEOUS DATA

LENGTH OF HOLE 16 FT.

ROCK BEDROCK NOT FOUND

WT OF HAMMER 140 LBS.

AVGE FALL OF HAMMER 30 INS.

ELEV OF GROUND WATER 585.2 FT.

SAMPLE LEGEND

D - DISTURBED

W - WASH

U - UNDISTURBED

C - ROCK

STRATIFICATION			SAMPLE NO.	PENETRATION RESISTANCE	STANDARD PENETRATION BLOWS	DESCRIPTION
ELEVATION	LEGEND	DEPTH			0 20 40 60 80 100	
597.6		0'				
		5'-0	D1	N=1		Soft brown clay.
		6'-0				
		10'-0	D2	N=30		Very d nse gravel with large boulder .
W.T.						
		15'-0	D3	N=112		
581.6		16'-0				

M.R. WRIGHT & ASSOCIATES

SAULT STE. MARIE ONT.

SOILS INVESTIGATIONS STRUCTURAL ENGINEERS

BORING LOG

STRUCTURE MACDONALD BRIDGE CONTRACT 1033 SHEET 5 OF 5

LOCATION TOWNSHIP OF THESSALON INSPECTOR H. DATE APRIL 29/64

OWNER TOWNSHIP OF THESSALON BOREHOLE NO C5 DATUM SEE BH1

MISCELLANEOUS DATA

LENGTH OF HOLE ___ FT.

ROCK ___ FT.

WT. OF HAMMER ___ LBS.

AVGE FALL OF HAMMER ___ INS.

ELEV. OF GROUND WATER ___

SAMPLE LEGEND

D - DISTURBED

W - WASH

U - UNDISTURBED

C - ROCK

STRATIFICATION ELEVATION	LEGEND	DEPTH	SAMPLE NO.	PENETRATION RESISTANCE	STANDARD PENETRATION BLOWS 0 20 40 60 80 100	DESCRIPTION
584.8		0'				Elevation of river surface.
						This penetration cone was driven to determine approximately the nature of the riverbed at the centre of the river.
						Water in river.
567.3		17'-5				
		18'-0		B-10		Soft reverbed material.
		22'-0		B-10		
		23'-0				
560.8		24'-0				100 blows for 3" penetration. (Dense stratum assumed.)

*B - denotes number of blows from a 140 lb. hammer falling 30 inches, required to advance a standard 2 inch diameter cone one foot through the soil.

Mr. K. L. Kleinsteiber,
Municipal Bridge Liaison Engr.,
Bridge Division.

Attn: Mr. G. E. R. Burkhardt

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

July 16, 1964

Township of Thessalon,
Bridge over the Thessalon River,
Lots 17 & 19 (MacDonalds Bridge)
Structure Site No. ~~50~~-195
Your File No. B& 1872

We have reviewed the attached report and herewith submit our comments for your consideration:

The proposed alternative for footings to be founded on steel H-piles driven into the dense sand stratum with gravel and boulders, seems to be the best solution. Because of the presence of seemingly large boulders, it is practically impossible to predict how far the piles will penetrate into this layer. We would suggest that the bearing capacity of the piles be checked by the Hiley Formula in case refusal is not met, by hitting a boulder.

We would also like to point out that scour protection measures should be undertaken in the bridge area.

Should you require any other information, please feel free to call on our office.

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER

A.G./dcf

cc: Foundations Office
Gen. Files

P.S. -- Your Soils Report (M. L. Wright & Assoc.) returned herewith.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: A. Stermac, P. Eng.,
Principal Foundation Engineer,
Materials & Research Section,
Downsview, Ontario.

From: Bridge Division,
Downsview, Ontario.

Date: July 15, 1964.

Our File Ref.

In reply to

Subject: Township of Thessalon,
Bridge over the Thessalon River
River Lots 17 & 19 (MacDonalds Bridge)
Structure Site No. 50S-195
Our File No. BA 1872

Attached please find one copy of the Foundation Report by M. R. Wright and Associates, for your comments.

The report is made for a future structure, bridging the Thessalon River at above mentioned location. Size, type and exact location of the bridge is not known at the present time. The existing structure is a multiple timber pile bent with stone filled cribs acting as abutments. The total length of the structure is approximately 85 feet. The existing structure is in a very bad condition. The road has been closed for traffic.

We would appreciate it very much, if we could have your comments on or before July 24th, 1964.

We would like to have the copy of the report sent back to us, since this is the only copy available to the Bridge Office at the present time.

GCEB/sp

G. C. E. Burkhardt, P. Eng.,
Municipal Bridge Checking Engineer.

M. R. WRIGHT & ASSOCIATES

CONSULTING ENGINEERS

PHONE 254-1422
14 QUEEN ST. EAST, SUITE 4
SAULT STE. MARIE
ONTARIO

November 4th, 1964.

64-F-2464

The Reeve & Council,
Township of Thessalon,
c/o Mr. J. A. MacLean, Clerk,
Little Rapids, Ontario.

RE: Proposed Construction of the
MacDonald Bridge Over the
Thessalon River.

Gentlemen:

Enclosed please find our Preliminary Study Report concerning a new Bridge to replace the existing MacDonald Bridge over the Thessalon River near Little Rapids, Ontario.

As stated more fully in the report, the existing timber bridge has been condemned, and is closed to traffic, hence a new bridge is needed. We would recommend that the new bridge be an eighty foot long composite steel-concrete structure, with a 14 foot roadway width. The estimated cost of this structure is $47,239.00, as detailed in enclosed Schedule "B".

We have also examined the requirements of a temporary walkway and cattle crossing bridge, to be used during construction of the new Bridge. Our estimate of cost revealed that a Bailey Bridge would prove most economical, and would cost approximately $3850.00. However, we would recommend against the use of a temporary bridge, due to the little use it would receive, compared to the cost involved.

Based on the above summary, the cost of a new Bridge would be approximately $47,239.00. If an eighty per cent subsidy on construction work is received from the Department of Highways the Township's share of cost would be approximately $9,447.80.

We trust the enclosed is adequate for your consideration, and would be pleased to meet with Council and answer any questions which might arise concerning this work.

Yours very truly,

M. R. Wright

M. R. Wright,
P. Eng.

MRW:jm

PRELIMINARY REPORT

FOR THE

PROPOSED MACDONALD BRIDGE OVER THE THESSALON RIVER

NEAR LITTLE RAPIDS, ONTARIO

OWNERS: The Township of Thessalon,
The Ontario Department of Highways

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

Project 1032

November 2,1964.

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SCHEDULE "B" - COST ESTIMATE FOR SINGLE SPAN BRIDGE

SCHEDULE "C" - COST ESTIMATE FOR THREE SPAN CONTINUOUS BRIDGE

PRELIMINARY REPORT FOR CONSTRUCTION OF THE MACDONALD BRIDGE OVER THE THESSALON RIVER

This report contains comments and recommendations concerning the proposed construction of a new Bridge known as the MacDonald Bridge over the Thessalon River. Comments are based on the results of soils investigations, a field survey which was made at the site, and preliminary construction cost extimates for bridge construction.

GENERAL SITE INFORMATION:

The bridge site is located on a road in the Township of Thessalon, which runs between the towns of Nesterville and Little Rapids. An existing timber bridge at this site has been condemned, and is now closed to traffic. The surrounding area is farm and bushland.

Due to the bridge being closed, it was difficult to assess the volume of traffic which would normally pass over this bridge. However, because the bridge has been closed for some time without serious results, it is felt that traffic in this area would be relatively light under normal conditions. The distance from Little Rapids to Nesterville is approximately 3½ miles along this route. The alternative route between these two towns via highways 129 and 17 involves a distance of approximately seven miles.

A local farmer who lives on the east side of the Thessalon River in this area, has most of his farmland located on the west side of the river, hence the bridge is important to this person for the transfer of dairy cattle to and from pasture.

PRELIMINARY SELECTION OF BRIDGE TYPE:

A type of bridge is proposed in this report, and this choice has been based on the results of discussions with the Thessalon Township Council, the Ontario Department of Highways, and information obtained from a survey and soils investigations which were made at the site.

Due to the low traffic volume in the area, a single lane bridge has been proposed, having a travel width of fourteen feet. Standard H20-S16 design loading is recommended in order that the bridge can accommodate logging trucks and other heavy vehicles.

The soils investigation revealed a deep layer of very soft sandy-silt along the east bank of the river. This soil has very poor load supporting properties, hence piles would be required to support the bridge loads. A more comprehensive discussion of this aspect of the work is contained in the soils report.

Due to the heavy ice conditions on this river in the spring, and also because of the large amounts of debris which are present onthe water during spring run-off, we have recommended against using a centre pier in bridge design. A bridge with a central pier located about six miles downstream, failed during spring run-off a number of years ago. The cause of the collapse was due to ice being trapped around the centre pier until loads became sufficient to cause failure.

Based on the above information, a single span, single lane bridge was chosen, and preliminary cost estimates of various single span bridge types were investigated. Since it was felt that a temporary bridge would be necessary in order to allow the local farmer to transfer cattle to and from pasture during construction of a new bridge, estimates of cost for a temporary bridge have been included.

PRELIMINARY COST ESTIMATES:

Enclosed Schedule "A" contains cost estimates for two types of temporary bridge. Proposal I consists of a fabricated temporary bridge six feet wide, for an estimated cost of $4,800.00. Proposal II consists of a single lane bailey Bridge which could be supplied at an estimated cost of $3,350.00. Bailey Bridge sections for this type of work are loaned from the Department of Highways warehouse at North Bay, Ontario, free of charge. The Township however would be required to pay for all shipping, erection and dismantling of Bailey Bridge Sections, and also timber for decking and cribs. The use of a Bailey Bridge would be the cheaper of the two above mentioned proposals.

Preliminary cost studies for a permanent bridge were made on the four following types of Bridge, based on a width of fourteen feet:

- 80 foot single span Composite Steel-Concrete Bridge.
- 105 foot three span continuous Steel-Concrete Bridge.
- 80 foot single span Steel girder, concrete deck Bridge.
- 80 foot single span Steel girder, wood deck Bridge.

Schedule "B" outlines our cost estimate for an 80 foot Single span Composite Steel-Concrete Bridge, which proved to be the most economical bridge type for this location. The estimated cost for dismantling the existing, structure, driving piles, bridge construction, approach work, Engineering and miscellaneous, was $47,239.00.

Schedule "C" outlines our cost estimate for a 105 foot Three Span Continuous Steel-concrete Bridge, which was estimated at $48,536.50.

Preliminary cost estimates for the two other bridge types mentioned, revealed that these types would not prove more economical than the Composite Steel-Concrete Bridge. The timber deck bridge also had the additional disadvantage of requiring more maintainance.

RECOMMENDATIONS:

As a conclusion to this report we would recommend an 80 foot long, single span, single lane bridge with a 14 foot travel width, of Composite Steel-Concrete construction, designed for H20-S16 Highway loading. Our estimated cost for this bridge is $47,239.00. Based on an eighty per cent subsidy from the Department of Highways, the Township's share of cost would be $9,447.80. Based on a 10 year debenture at 6 per cent interest, the Township's annual cost for this bridge would be approximately $1,230.00

It is our opinion that a temporary bridge would not be necessary on this project, provided suitable arrangements could be made with the one local farmer whose farm is located on both sides of the river.

If arrangements for other grazing land could be made for this farmer's cattle, the cost of a temporary bridge could be avoided. The estimated cost of temporary access is $3,850.00, of which the Township's share would be 20 per cent.

Based on reasonable notice to proceed with this work, plans and specifications for the work could be completed and Tenders called by Spring, 1965. It is estimated that construction could be completed in four months.

Respectfully submitted,

M. R. Wright,
P. Eng.

MRW:jm

SCHEDULE "A"

ESTIMATE OF COSTS FOR TEMPORARY WALK BRIDGE AND CATTLE CROSSING

* Proposal I consists of a fabricated wood-steel bridge as shown on enclosed Drawing P3.

* Proposal II consists of a Bailey Bridge loaned from the Department of Highways and transported from North Bay to the site.

UNIT	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Proposal I - Fabricated Bridge.					
1.	Supply and drive piles.	L.S.			$ 400.00
2.	Steel - supply, fabricate and erect.	Tons	4	$500.00	2,000.00
3.	Timber deck, approaches, and railing, supply and erect.	L.S.			1,600.00
4.	Dismantle and remove.	L.S.			800.00
			Total		$4,800.00
Proposal II - Bailey Bridge.					
1.	Loan from Department of Highways.				NIL
2.	Transport Bailey Bridge from North Bay and return.	Tons	30	$ 30.00	$ 900.00
3.	Erect Bridge, including ramps.	L.S.			800.00
4.	Timber deck, and ramps, supply and erect.	L.S.			900.00
5.	Place footings.	L.S.			350.00
6.	Dismantle Bailey Bridge.	L.S.			900.00
			Total		$3,850.00

SCHEDULE "B"

ESTIMATE OF COST FOR 80 FOOT LONG SINGLE SPAN

COMPOSITE STEEL CONCRETE BRIDGE

WITH 14 FOOT ROAD WIDTH

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	SUB TOTAL	TOTAL
I.	Remove existing bridge.	L.S.				$ 2,500.00
II	Sub-surface work.					
	- de-water abutments.	L.S.			$2,000.00	
	- supply and place piles.	L.S.			7,000.00	
			Total			$ 9,000.00
III	Bridge construction*					
	- excavate for abutments	L.S.			600.00	
	- concrete and steel for abutments.	L.S.			6,000.00	
	- concrete and steel for deck.	L.S.			2,200.00	
	- deck drains.	L.S.			300.00	
	- granular back-fill.	L.S.			900.00	
	- structural steel- supply & fabricate.	Tons	24	$380.00	9,120.00	
	- structural steel - erect	Tons	24	70.00	1,680.00	
	- structural steel - clean and paint.	L.S.			900.00	
	- Bridge guide-rail	L.F.	160	11.00	1,760.00	
	- supply and place rip-rap.	L.S.			800.00	
			Total			$25,260.00
IV	Approach construction.					
	- roadway excavation.	L.S.			900.00	
	- roadway fill.	L.S.			1,000.00	
	- roadway drainage and guide-rail.	L.S.			1,200.00	
			Total			$ 3,100.00
V	Miscellaneous.					
	- Engineering and Contingencies @ 15%	L.S.			5,579.00	
	- Engineer's construction office.	L.S.			500.00	
	- Materials testing.	L.S.			900.00	
			Total			$ 7,379.00

SCHEDULE "B" (Cont'd)

Total Construction Cost $47.239.00

* Cost only for Bridge Construction =

$\frac{\$25,260.00}{(16 \times 80) \text{ sq. ft.}}$ = $19.72/sq. ft. of deck area.

SCHEDULE "C"

ESTIMATE OF COST FOR 105 FOOT LONG 3-SPAN CONTINUOUS (25'-55'-25') TYPE STEEL-CONCRETE BRIDGE WITH 14 FOOT ROAD WIDTH

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	SUB TOTAL	TOTAL
I	Remove existing Bridge.	L.S.				$ 2,500.00
II	Sub-surface work.					
	- de-water abutments.				NIL	
	- supply and place piles.	L.S.			11,000.	
			Total			$11,000.00
III	Bridge Construction *					
	- excavate for abutments.	L.S.			600.	
	- supply and place pier caps and concrete for interior piers.	L.S.			2,000.	
	- concrete and steel for abutments.	L.S.			4,500.	
	- concrete and steel for deck.	L.S.			4,700.	
	- deck drains	L.S.			450.	
	- granular backfill.	L.S.			250.	
	- structural steel- supply and fabricate.	Tons	20	$380.	7,600.	
	- structural steel - erect	Tons	20	70.	1,400.	
	- structural steel - clean and paint.	L.S.			1,100.00	
	- bridge guide-rail	L.F.	210	11.	2,310.	
			Total			$24,910.00
IV	Approach construction.					
	- roadway excavation				900.	
	- roadway fill.				1,000.	
	- roadway drainage and guide-rail.				1,200.	
			Total			$ 3,100.00
V	Miscellaneous.					
	- Engineering and Contingencies.@ 15%				6,626.50	
	- Engineer's construction office.				500.00	
	- Material testing.				900.00	
			Total			$ 8,026.50

SCHEDULE "C" (Cont'd)

Total Construction Cost	$49,536.50

* Cost only for Bridge Construction =

$$\frac{\$24,910.00}{(16X105)\text{ sq.ft.}} = \$14.93/\text{sq. ft. of deck area.}$$