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GEOCRES No. 41J-59

DIST. 18 REGION

W.P. No. 14-74-08

CONT. No.

W. O. No.

STR. SITE No. 385-331

HWY. No. 129

LOCATION Proposed ^{CREEK} GRAVEL

(SHARPSAND R #1)

No of PAGES -

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

OVERSIZE DRAWING

Mr. W. Lees
Manager
Northwestern Region

Soil Mechanics Section
Engineering Materials Office
West Bldg.

77 07 20

Structure at the Crossing of
Gravel River #1 and
Relocated Hwy. 129 (Line M)
District #18 (Sault Ste Marie)
W.P. 14-74-08, Site No. 385-331 332

Further to our memorandum of July 18, 1977, please find attached the information provided by the Geotechnical Consultants, Morton, Dodds and Partners Ltd. at the request of the Soil Mechanics Section.

The information includes a figure showing the results of gradation tests performed on representative samples recovered from the sand stratum together with details of the size of cobbles and boulders in the upper granular stratum at the above site. This data is essential for dewatering requirements and will be incorporated into the appropriate contract documents by this Section.

M. MacLean
Project Engineer

For: M. Devata
Supervising Engineer

MM/bp

CC: R. McKenna	R.S. Pillar
C.M. Smith	R. Hore
D.A. Jarvis	N. Maluzinaky
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DOUGLAS J. BISHAW, P. ENG.
KENNETH H. KING, P. ENG.

July 18th, 1977
Ref. No. 01-7705-133

Ministry of Transportation &
Communications-Ontario,
Highway Engineering Division,
Engineering Materials Office,
Soil Mechanics Section,
1201 Wilson Avenue,
DOWNSVIEW, Ontario,
M3M 1J8

ATTENTION: MR. MALCOLM MACLEAN

RE: NEW STRUCTURE OVER GRAVEL RIVER NO. 1. (WP 14-74-08)
DISTRICT 18, SAULT STE. MARIE, ONTARIO

Dear Sir:-

As per your request by telephone on July 15th, 1977, enclosed please find a figure showing the results of gradation tests performed on representative samples recovered from the sand stratum at the above site.

Sizes of cobbles and boulders encountered in the excavated probe holes range from 4 to 5 inches and 8 to 10 inches respectively. However boulders up to 16 inches in size were observed on the existing bed of the river channel. The above information on sizes of cobbles and boulders must be regarded as approximate only since they are the recollection of our field staff and not the actual measurements.

Yours very truly,

MORTON, DODDS & PARTNERS LIMITED

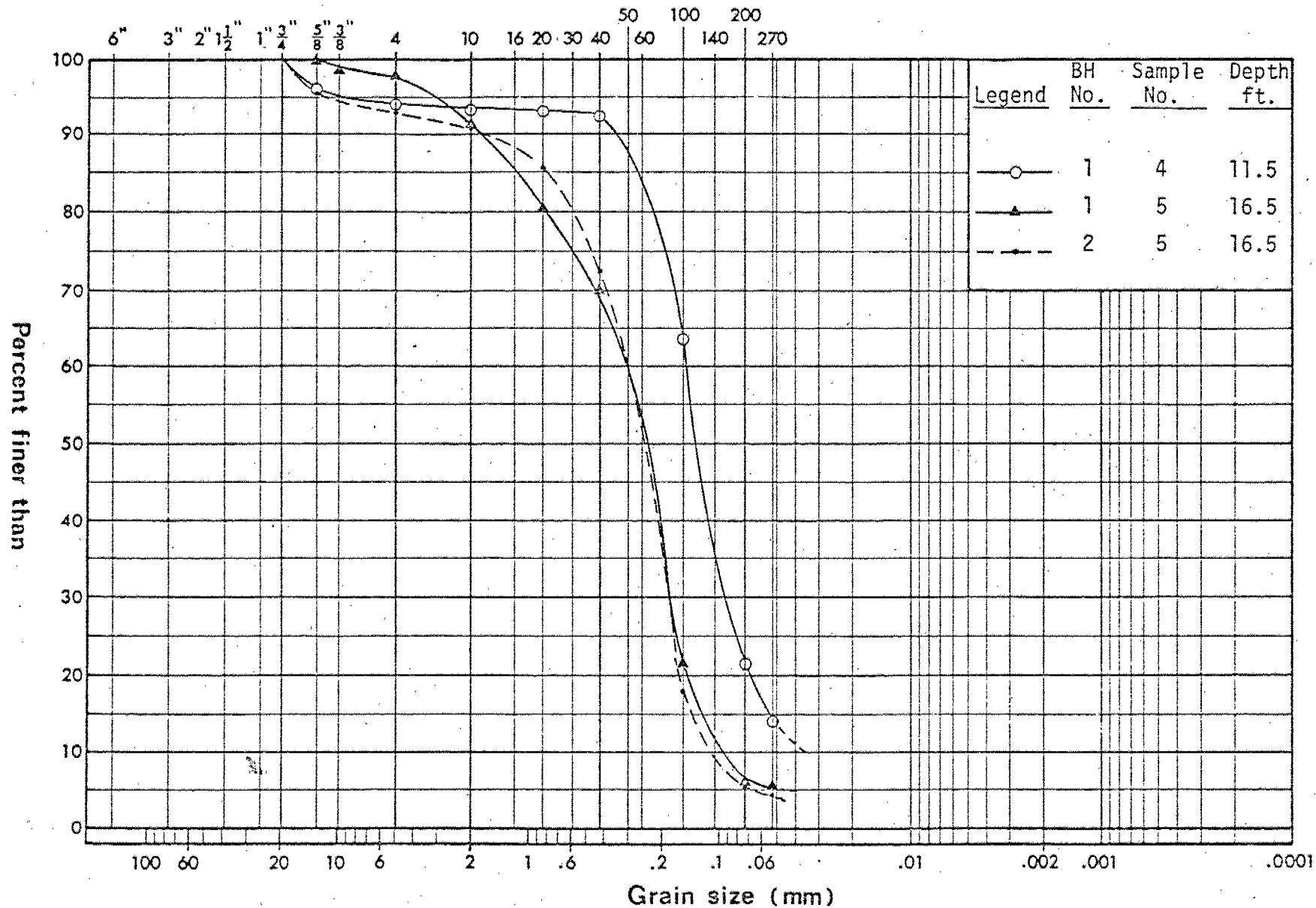


KAM K. TSUI, Ph.D., P.Eng.

KKT/ms



Size of opening (in) U.S. Standard sieve size (meshes/in)



COBBLE	coarse	medium	fine	coarse	medium	fine	SILT	CLAY
	GRAVEL			SAND			FINE GRAINED	

M. I. T. CLASSIFICATION

GRAIN SIZE DISTRIBUTION

PROJECT: 01.7705.103
DWG. No.

Mr. W. Lees
Manager
Northwestern Region
Thunder Bay, Ontario

Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

77 07 18

Structure at the Crossing of
Gravel River #1 and
Relocated Hwy. 129 (Line M)
District #18, (Sault Ste. Marie)
W.P. 14-74-08, Site No. 38S-331

Morton, Dodds and Partners Ltd. Consulting Geotechnical and Geological Engineers, were retained by the Ministry to carry out a subsurface investigation at the above mentioned site and provide the necessary recommendations for design and construction for the proposed structure. The Soil Mechanics Section recently received the completed report prepared by the Geotechnical Consultants and after careful review, our comments are as follows:

1. The spread footings suggested at elevation 1073 with an allowable bearing pressure of 3 t.s.f. appears to be satisfactory provided, the founding elevations meet the Hydrological requirements. This aspect should be reviewed by the Hydrology section of the Ministry.
2. In the foundation report it is recommended that an allowable bearing pressure of 1.5 t.s.f., for footings founded in the sand stratum. In our opinion the allowable bearing pressure should be 2.5 t.s.f., and a positive dewatering scheme will be necessary during construction since footing base will be located below the prevailing water in the granular stratum. If such measures are not carried out the footing base will be subjected to 'boiling' due to unbalanced hydrostatic head.
3. The foundation report does not provide specific recommendations pertaining to pile foundations as an alternative. In our opinion, the most suitable type of piled foundation will be #14 timber pile driven some 45 feet into the granular stratum. Such piles will provide a safe load of 30 tons/pile. Driving of timber piles during construction in the granular stratum should be controlled by Hiley formula as per current M.T.C. standards to achieve the desired design load. It is essential that the upper 10 foot thick deposit of cobbles and boulders should be excavated in the areas where piles are to be driven.
4. This Section requested the Geotechnical consultant to provide sufficient details on the size of cobbles and boulders in the upper granular stratum, so that we can provide factual information to the contractor. In addition we have also requested the consultant to provide typical grain-size distribution curves for the sand deposit. This information is essential for dewatering requirements.

cont'd ...

We believe that the aforementioned comments together with the enclosed foundation report submitted by the Geotechnical Consultant will be adequate for your immediate requirements. Should you have any other quiriies, please contact our office.

M. Devata
Supervising Engineer

MD/kr

Attach.

cc: B. McKenna
C.M. Smith
D.A. Jarvis (2)
W.A. Stewart (2)

A. Radkowski
G.A. Wronq
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R.S. Pillar

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SOILS INVESTIGATION
NEW STRUCTURE OVER GRAVEL RIVER NO. 1
(WP 14-74-08)
DISTRICT #18
SAULT STE. MARIE, ONTARIO


Ref. No. 01-7705-133
July, 1977

Prepared for:
Ministry of Transportation and Communications-Ontario
Highway Engineering Division
Engineering Material Office
Soil Mechanics Section
1201 Wilson Avenue
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By:
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JUL 20 1977



Ref. No. 01-7705-133


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ENCLOSURES

Borehole Location and Soil Strata
Record of Boreholes

Drawing No. 147408-A
Enclosures # 1-6



Ref. No. 01-7705-133

1.0 INTRODUCTION

Morton, Dodds & Partners Limited, Consulting Geotechnical and Geological Engineers, were retained by the Ministry of Transportation and Communications of Ontario to carry out a soils investigation at the site of the proposed new structure over Gravel River No. 1, Hwy. 129, WP 14-74-08, Site No. 38S-331, District #18, Sault Ste. Marie, Ontario.

The proposed structure at the site will consist of the construction of a bridge across the west channel of the river and its approach fills. The purpose of this investigation was to determine the subsurface conditions, including groundwater conditions, at the above site in order that recommendations could be made for the design and construction of the proposed structure.

2.0 SITE DESCRIPTION

The site is located at the crossing of the Gravel River No. 1 on the proposed realignment line "M" of Highway 129 between Thessalon and Chapleau. The valley floor of the river at the site is relatively flat. The river course at the site comprises two channels separated by a small island. The separation starts at about 36.7 metres (120 feet) south of Line "M" and the two channels converge again at about 24.5 metres (80 feet) north of Line "M". The general flow direction is from ~~South to North~~ ^{East to West}. The western channel at the crossing of Line "M" is approximately 3.1 metres (10 feet) wide. The ~~eastern~~ ^{western} channel is generally wider and shallower than the western channel. The depth of water in the western channel at the time of investigation was about half a foot.

3.0 FIELDWORK

Fieldwork was carried out during the period of June 15th to June 18th, 1977 and consisted of advancing 2 boreholes, 2 Dynamic Cone Penetration tests and 2 shallow excavation probe holes at locations shown on Drawing 147408-A at the back of the report. In addition Dynamic Cone Penetration tests were also performed for Boreholes 1 and 2 extending from the bottoms of the holes to considerable depths. The borings were advanced by means

of a drilling unit (CME 55) mounted on a bombardier. Standard Penetration tests were taken at frequent intervals of depth in order to determine the relative density of the subsurface strata and to recover representative samples.

Elevations of the boreholes and test holes were determined in the field referring to the local bench mark provided by the Ministry. Water level inside the open boreholes and of the river channel were also observed during the period of fieldwork.

4.0 SUBSURFACE CONDITIONS

Details of the stratification encountered together with the observed water levels are shown on the individual Record of Borehole sheets on Enclosures 1 to 6 inclusive and on the inferred subsurface profiles on Drawing 147408-A. The predominant strata encountered are composed of a stratum of 2.8 to 3.1 metres (9.0 to 10.0 feet) COBBLES and BOULDERS and an underlying stratum of compact to dense SAND, the thickness of which is probably over 22.6 metres (73.8 feet). A description of the principal strata encountered is as follows:

TOPSOIL

Starting from the ground surface, a layer of black, sandy TOPSOIL of a thickness of about 0.3 metres (1.0 feet) was encountered at Borehole 1 only.

COBBLES AND BOULDERS

Underlying the layer of TOPSOIL in Borehole 1 and starting from the ground surface at Borehole 2, a stratum of COBBLES and BOULDERS with sand and gravel was encountered. The thickness of this stratum varies from 2.8 to 3.1 metres (9.0 to 10.0 feet) from Borehole 1 to Borehole 2. Shallow excavations at Probes 5 and 6 also reveal the presence of this stratum.

SAND

Beneath the stratum of COBBLES and BOULDERS in Boreholes 1 and 2 a stratum of brown, fine to coarse SAND with some fine to coarse gravel and a trace of silt was encountered. This stratum was not fully penetrated and its maximum thickness is probably over 22.6 metres (73.8 feet) as inferred by the results of Dynamic Cone Penetration Tests. Standard Penetration Tests carried out on this stratum indicate that its relative density ranges from compact to dense.

5.0 GROUNDWATER CONDITIONS

Groundwater level observations were carried out, during the period of investigation by measuring in the boreholes. The observations are presented on the Record of Borehole sheets, as well as on Drawing 147408-A. The results indicate that the groundwater level in the surficial deposits is generally lower than the water level in the western channel of the Gravel River No. 1 at the time of investigation.

6.0 LABORATORY

All soil samples obtained from the boreholes were visually examined and identified in the field, and re-examined for their textural classification in our laboratory.

7.0 DISCUSSIONS

7.1 General

It is understood that the proposed structure will consist of a bridge across the western channel of the Gravel River No. 1 and a substantial length of approach fill, the height of which will be up to 9.2 metres (30 feet) at the crossing of the eastern channel. Information regarding type and design of the bridge is not available to us at the time of writing this report, therefore the following discussions should be considered in general terms only.

7.2 Foundations

The piers and abutments of the proposed bridge can be supported by conventional spread footings founded on the stratum of cobbles and boulders with sand and gravel. For the purpose of scour protection however, the foundation level should be at least 5 feet below the bed of the river channel. Our survey in the field indicates the river bed is at about Elevation 1078.4 feet. Therefore the shallowest suggested foundation level will be at Elevation 1073.4. With this provision requirement for frost protection (minimum 5 feet of earth cover) will also be satisfied. For this foundation level in the stratum of cobbles and boulders, a net allowable bearing pressure of 287 Kpa (6 ksf) is recommended and a maximum settlement of 1" or less is expected. Settlement should occur rapidly in response to the applied loading and should be substantially complete at the end of construction.

Due to the fact that the proposed approach fill will extend across the whole river valley, the general floodway will be highly restricted. This in turn will severely affect the flow regime and the scour pattern. Further discussion on scour protection will be given later. If analysis of the river flow as modified by the proposed structure indicates the above design does not provide sufficient scour protection, then the spread footings have to be lowered into the sand stratum. For spread footings founded on the sand stratum a net allowable bearing pressure of 144 Kpa (3 ksf) is recommended and a maximum settlement of 1" or less is expected. Again settlement should occur rapidly in

response to the applied loading and should be substantially complete at the end of construction.

Another alternative to foundation design is to support the bridge by piles driven into the sand stratum. Displacement piles such as steel tube piles are considered suitable in this case, however, the presence of cobbles and boulders must be contended with when driving the piles. This would require precased holes through the upper cobble and boulder bed.

7.3 Excavations and Dewatering

Excavations in excess of 1.2 metres (4 feet) depth must be shored and braced in order to comply with safety regulations. Because of the proximity of the river channel and the depth of excavation it is not considered feasible to slope the sides of the excavation for stability. For excavation below groundwater level at the time of construction, relatively high inflow can be expected from both the stratum of cobbles and boulders and the stratum of sand. For spread footings founded on the cobbles and boulder stratum excavations would not be deeper than 3 to 4 feet below the groundwater level. In this case excavation could be carried out by using soldier beams and lagging and the flow of water might be handled by pumping from perimeter sumps. However for excavations exceeding this depth such as the case for founding the spread footings in the sand stratum, other alternative of dewatering such as well points around the entire perimeter of the excavation would be required. Installation of well points would have to be carried out by drilling due to the presence of cobbles and boulders at the site.

It is also suggested to make use of the existing river flow pattern to enhance any dewatering scheme. Prior to the footing excavation the western channel of the Gravel River No. 1 could be blocked off at the narrowest point upstream of the excavation and all the water would flow via the eastern channel downstream. With such a temporary diversion during construction, it is expected that the inflow of river water into the excavation would be reduced substantially.

The blocking of the western channel would easily be accomplished by dumping the available earth material at the site onto the channel since it is narrow and shallow. Once the construction of the footings and backfilling of the excavation is completed, flow in the western channel could be restored by removing the blockage.

7.4 Scour

The depth of scour will depend primarily on the flow velocities and directions. As mentioned above the flow would be significantly restricted by the proposed highway embankment or approach fill. In addition ice jams would also reduce the flow area. Increased flow velocities due to these factors should be incorporated in any design of scour protection. Data regarding the anticipated flow velocities are not available at the time of writing this report, therefore the depth of scour protection considered necessary will depend upon data available from the Hydrology Section of the Geotechnical Office.

The rule of thumb commonly used is that the depth of protection against scour should be in the order of two times the flood water depth, however, it can be appreciated that the depth of scour does not depend upon flood water depth but upon the velocity of flow. A table is given below showing the average grain size that will be moved by various velocities of flow.

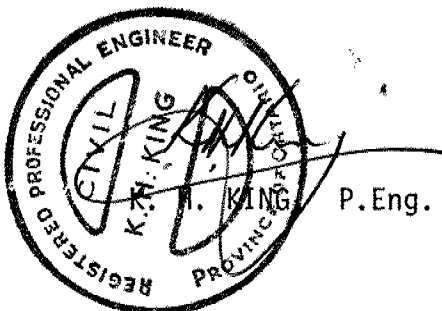
AVERAGE GRAIN SIZE (mm)	MAXIMUM VELOCITY (ft./sec.)
0.2	0.3
0.6	0.5
2.0	0.8
6.0	1.5
40.0	3.5
100.0	5.0

The upper stratum of cobbles and boulders present at the proposed bridge site and extending several feet below the bed of flow channel provides a natural protection against scour action. If further protection is warranted, the use of gabion baskets filled with boulders to backfill the excavation around the foundation is suggested.

7.5 Approach Fill

Prior to construction of the approach fills all topsoil should be removed. Side slopes of the approach fills will depend upon the material used in the fill and the shear strength of the underlying soil stratum. Since the fill will be directly on top of the stratum of cobbles and boulders, stability of the foundation soil strata will not be a problem. It is understood that the anticipated fill material will be sand and gravel with occasional boulders. For the purpose of initial design calculations a side slope of 2 horizontal to 1 vertical may be assumed for the approach fill.


Settlement of the approach fill is expected to be within tolerable limits and should be substantially complete at the end of construction provided the fill is firmly compacted. Differential settlements between the bridge deck and the approach fills are also expected to be small however, a granular back fill cushion should be provided at the junction of the approach fill and the bridge abutment as per MTC Specification DD-415 in order to minimize any differential settlement.

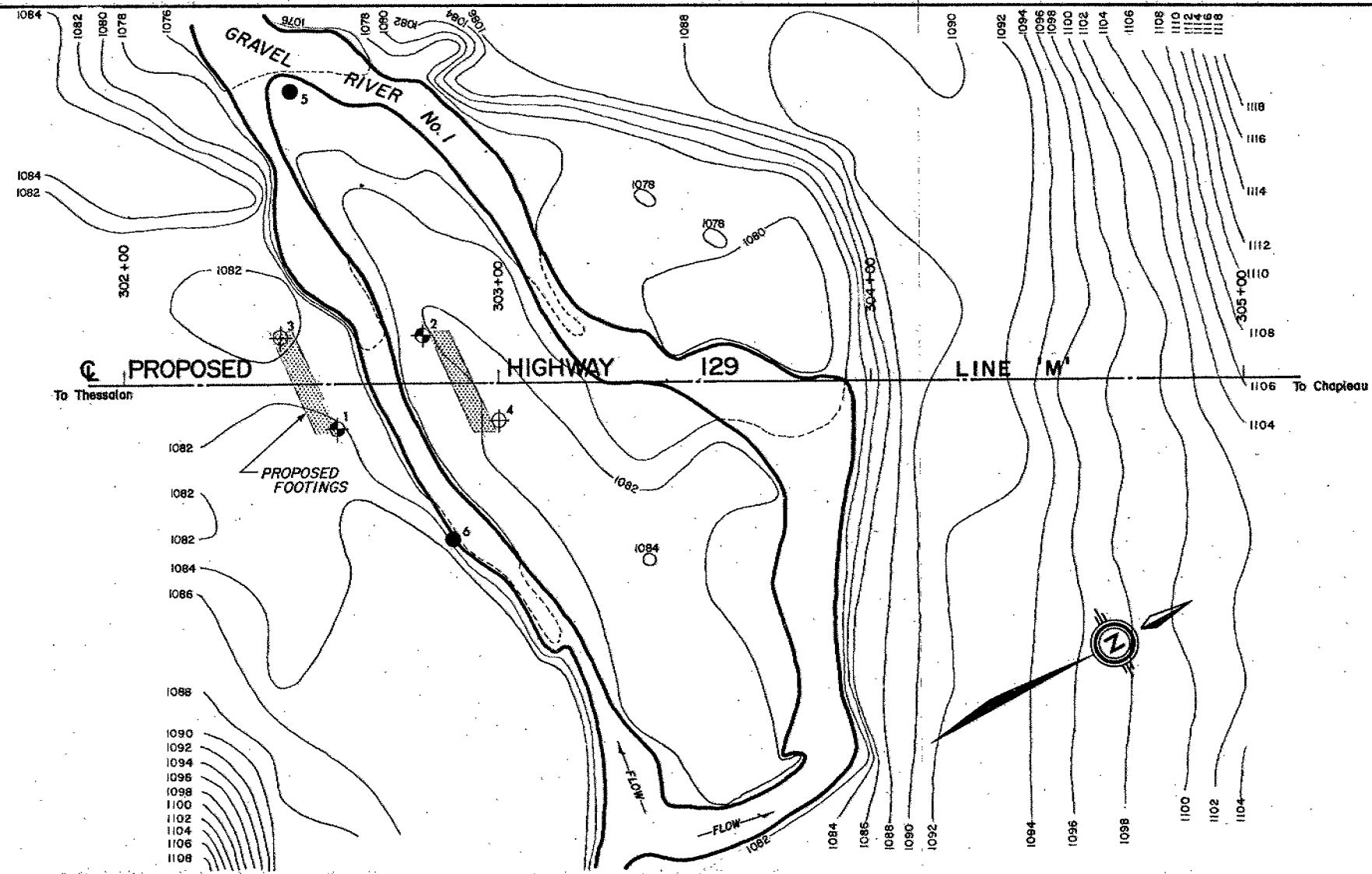


P.Eng.

/ms

Respectively submitted,
MORTON, DODDS & PARTNERS LIMITED


For K. K. TSUI, Ph.D., P.Eng.



CONT No
WP No 14-74-08

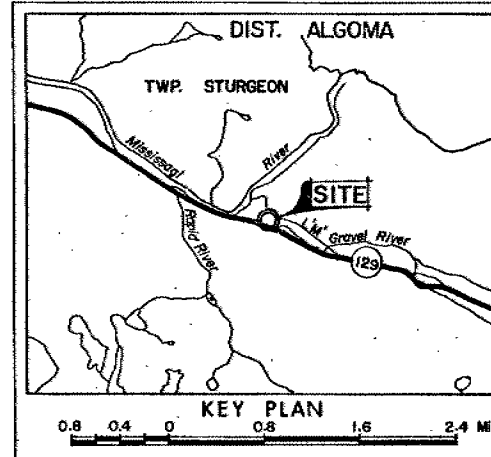


GRAVEL RIVER No. 1

SHEET

BORE HOLE LOCATIONS & SOIL STRATA

Morton Dodds & Partners Limited



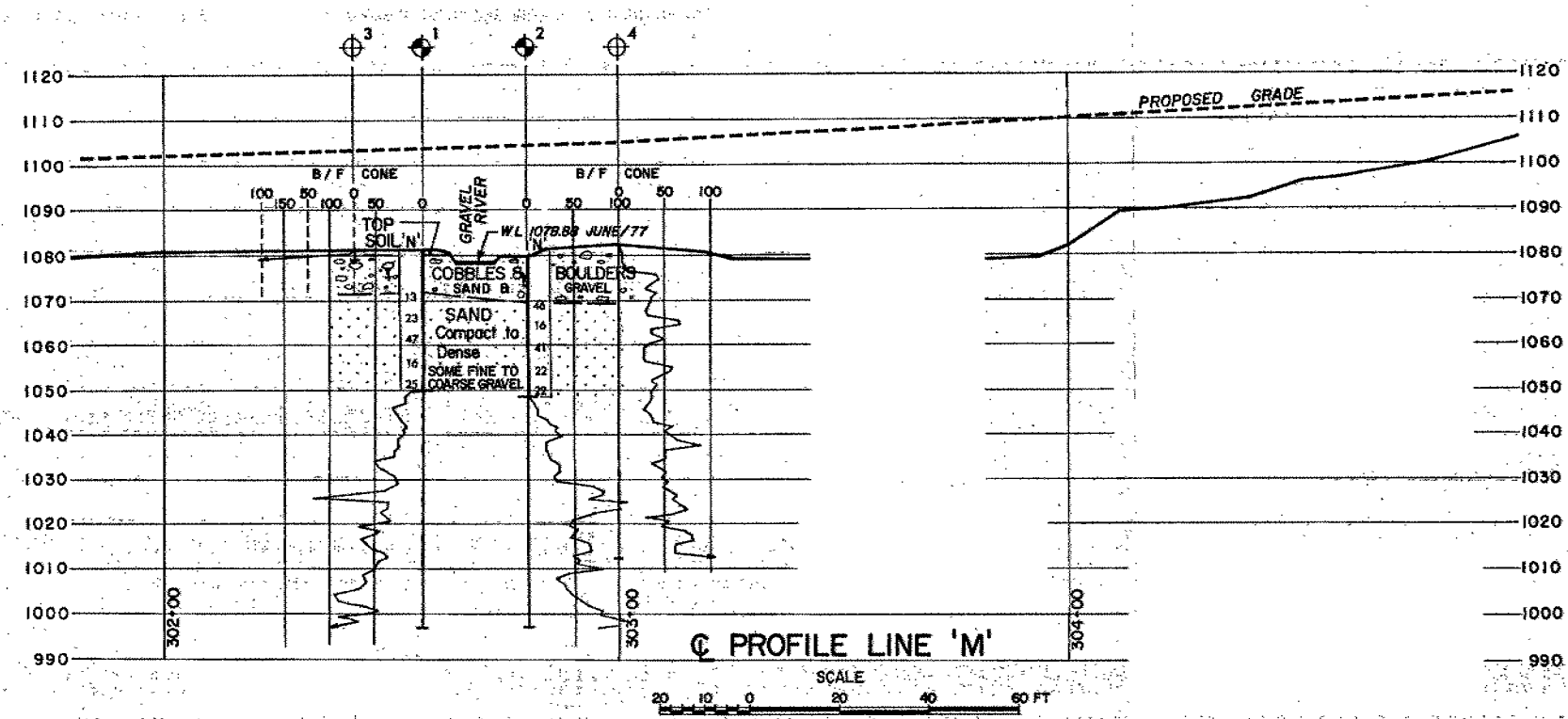
LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone, 350ft lbs energy)
- ↓ WL at time of investigation June, 1977
- Probe Hole

No	ELEVATION	STATION	OFFSET
1	1081.5	302+57	12' RT
2	1079.9	302+80	12.5' LT
3	1081.7	302+42	12' LT
4	1082.0	303+00	10' RT
5	1076.6	302+45	78' LT
6	1079.8	302+87	43' RT

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.



REF. No. E-5180-1 Nov. 1973

REVISIONS	DATE	BY	DESCRIPTION

HWY No 129 LINE 'M'	DIST 18
SUBMD CHECKED DATE July 8, 1977	SITE 38S-331
DRAWN WC CHECKED	DWG 147408-A

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 1

W P 14-74-08 LOCATION Sta. 302+57, O/S 12' Rt. @ LINE 'M' ORIGINATED BY DP
 DIST 18 HWY 129 BOREHOLE TYPE AUGERING & WASHBORING - H,N & BW CASING, COMPILED BY JOH
 DATUM GEODETIC DATE June 15,16, 1977 DYNAMIC CONE PENETRATION TEST
 CHECKED BY KLT

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
1081.5	GROUND LEVEL													
0.0	TOPSOIL		1	AS			1080							
1.0	COBBLES & BOULDERS - with some fine sand and gravel		2	WS										
1071.5			3	WS										
10.0	SAND - Brown, with some fine to coarse gravel and a trace of silt, compact to dense		4	SS	13		1070							
			5	SS	23									
			6	SS	47		1060							
			7	SS	16									
1050.0			8	SS	25		1050							
31.5	END OF BOREHOLE													
							1040							
							1030							
							1020							
							1010							
							1000							
997.7														
83.8	END OF CONE TEST													

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 2

WP 14-74-08 LOCATION Sta. 302+80, O/S 12'5 Lt. @ LINE 'M' ORIGINATED BY DP
DIST 18 HWY 129 BOREHOLE TYPE AUGERING & WASHBORING - NW, BW CASING COMPILED BY JOH
DATUM GEODETIC DATE June 16, 17, 1977 DYNAMIC CONE PENETRATION TEST CHECKED BY KKT

[illegible]

+3, x5: Numbers refer to Sensitivity

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 3

W P 14-74-08 LOCATION Sta. 302+42, O/S 12' Lt. Q LINE 'M' ORIGINATED BY DP
 DIST 18 HWY 129 BOREHOLE TYPE DYNAMIC CONE PENETRATION TEST COMPILED BY JOH
 DATUM GEODETIC DATE June 16, 1977 CHECKED BY KLT

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
1081.7	GROUND LEVEL																
0.0																	
							1081										
							1080										
1079.5																	
2.2	END OF CONE TEST																

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 4

W P 14-74-08 LOCATION Sta. 303+00, O/S 10' RL. @ LINE 'M' ORIGINATED BY DP
DIST 18 HWY 129 BOREHOLE TYPE DYNAMIC CONE PENETRATION TEST COMPILED BY JOH
DATUM GEODETIC DATE June 17, 1977 CHECKED BY KLT

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
1082.0	GROUND LEVEL						1080					
0.0							1070					
							1060					
							1050					
							1040					
							1030					
							1020					
1012.3												
69.7	END OF CONE TEST						1010					

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 5

W P 14-74-08 LOCATION Sta 302+45 O/S 78' Lt Q LINE 'M' ORIGINATED BY DP
 DIST 18 HWY 129 BOREHOLE TYPE EXCAVATED PROBE HOLE COMPILED BY JOH
 DATUM Geodetic DATE June 18th, 1977 CHECKED BY MT

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN-SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
1076.6	GROUND LEVEL																
0.0	COBBLES - with medium to coarse sand						1076										
1074.2							1075										
1.9	END OF EXCAVATION																

OFFICE REPORT ON SOIL EXPLORATION



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 6

W P 14-74-08 LOCATION Sta 302-87 O/S 43' Rt Q LINE 'M' ORIGINATED BY DP
DIST 18 HWY 129 BOREHOLE TYPE EXCAVATED PROBE HOLE COMPILED BY JOH
DATUM GEODETIC DATE June 18, 1977 CHECKED BY KUT

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
1079.8	GROUND LEVEL																
0.0	SAND - Brown medium to coarse, with cobbles																
							1979										
1077.9							1978										
1.9	END OF EXCAVATION																

+3, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



Memorandum

To: Mr. E. Van Beilen
Head, Northwestern Section
Structural Office
2nd Floor, West Building

Attention:

From: Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

Date: 78 07 28

*Our File Ref. W.P. 14-74-06/07/08/09

In Reply to

Subject:

Re: Deferment and Changes to Metric of
W.P.'s 14-74-06 (Site 38S-10), 14-74-07 (Site 38S-13)
14-74-08 (Site 38S-332) and 14-74-09 (Site 38S-331)
Hwy. 129, District 18, Sault Ste. Marie

Program status reports dated 78 06 07 and 78 06 09, received yesterday in this office, indicate that the above noted projects have been deferred. W.P. 14-74-06 has been deferred to 1981 and the other three have been deferred to 1982. Consequently, these will become metric projects.

Since this Section has already produced the foundation reports (all by consultant services purchase) and your office has already completed preliminary drawings in the Imperial system, I think that it would be very desirable to coordinate the preparation of the new metric drawings in both areas. This will ensure that our plan layout matches your general layout (Drawing No. 1) as the switch is made to metric.

This is for your information and future reference.

C. Mirza
Head
Soil Mechanics Section

CM/gs

cc: W. Kulmatickas
S. Osellame
Files

Mr. E. Van Beilen
Head, Northern and NW Section
Structural Office
West Building, Downsview

Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

78 02 01

Mr. A. Radkowski

Re: Gravel River Bridge No. 1
Hwy. 129 (Line M)
W.P. 14-74-08, Site 38S-331
District 18, Sault Ste. Marie

We have reviewed the Preliminary Bridge Plan Drawing 38S-331-P1. Our comments are as follows:

1. The footings are founded at a depth of about 7.5 feet below the river bed. It is believed this is for the purpose of scour protection.
2. A dewatering scheme will be required in order to place concrete in the dry since the footings are situated below the water level in a granular subsoil.

B. Ly
Senior Engineer

For: M. Devata
Supervising Engineer

MD/BL/gs

cc: J. Harris
Files ✓

✓

Mr. W. Lees
Manager
Northwestern Region

Soil Mechanics Section
Engineering Materials Office
West Bldg.

77 07 20

Structure at the Crossing of
Gravel River #1 and
Relocated Hwy. 129 (Line M)
District #18 (Sault Ste Marie)
W.P. 14-74-08, Site No. 38S-331

Further to our memorandum of July 18, 1977, please find attached the information provided by the Geotechnical Consultants, Morton, Dodds and Partners Ltd. at the request of the Soil Mechanics Section.

The information includes a figure showing the results of gradation tests performed on representative samples recovered from the sand stratum together with details of the size of cobbles and boulders in the upper granular stratum at the above site. This data is essential for dewatering requirements and will be incorporated into the appropriate contract documents by this Section.

M. MacLean
Project Engineer

For: M. Devata
Supervising Engineer

MM/bp

CC: R. McKenna	R.S. Pillar
C.M. Smith	R. Hore
D.A. Jarvis	N. Maluzinaky
W.A. Stewart	J. Anderson
A. Radkowski	G. Sloan
G.A. Wrong	Files
B.J. Giroux	Record Services
J.D. Harris	

MORTON, DODDS & PARTNERS LIMITED
CONSULTING ENGINEERS & SPECIALISTS

50 GALAXY BLVD., UNIT 11,
REXDALE, ONTARIO, CANADA M9W 4Y5
TELEPHONE: (416) 675-1440
TELEX: 06-968749

JOHN D. MORTON, P. ENG.
ROBERT B. DODDS, P. ENG.
DOUGLAS J. BELSHAW, P. ENG.
KENNETH H. KING, P. ENG.

July 18th, 1977
Ref. No. 01-7705-133

Ministry of Transportation &
Communications-Ontario,
Highway Engineering Division,
Engineering Materials Office,
Soil Mechanics Section,
1201 Wilson Avenue,
DOWNSVIEW, Ontario,
M3M 1J8

ATTENTION: MR. MALCOLM MACLEAN

RE: NEW STRUCTURE OVER GRAVEL RIVER NO. 1. (WP 14-74-08)
DISTRICT 18, SAULT STE. MARIE, ONTARIO

Dear Sir:-

As per your request by telephone on July 15th, 1977, enclosed please find a figure showing the results of gradation tests performed on representative samples recovered from the sand stratum at the above site.

Sizes of cobbles and boulders encountered in the excavated probe holes range from 4 to 5 inches and 8 to 10 inches respectively. However boulders up to 16 inches in size were observed on the existing bed of the river channel. The above information on sizes of cobbles and boulders must be regarded as approximate only since they are the recollection of our field staff and not the actual measurements.

Yours very truly,

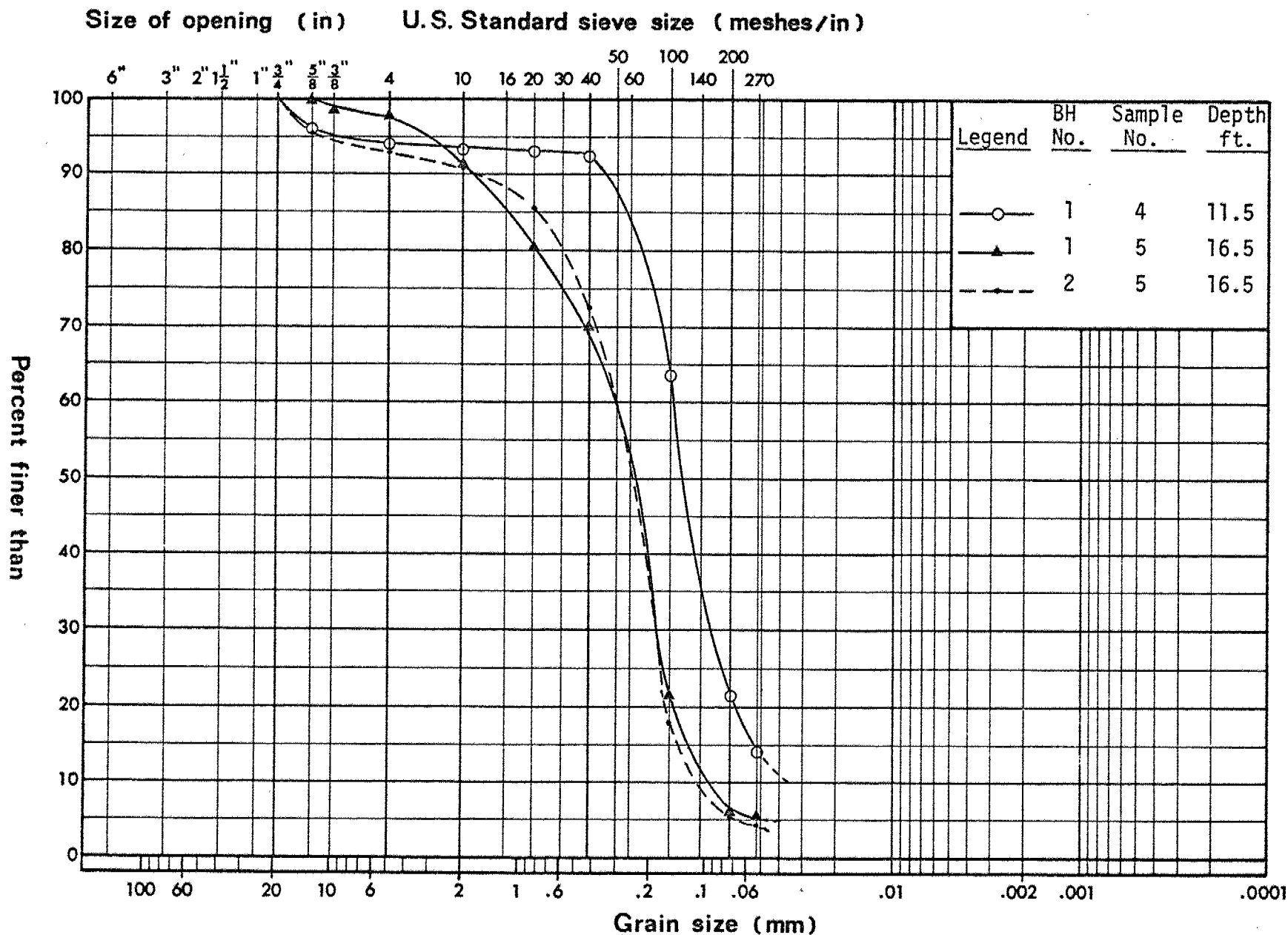
MORTON, DODDS & PARTNERS LIMITED



KAM K. TSUI, Ph.D., P.Eng.

KKT/ms





GRAIN SIZE DISTRIBUTION

PROJECT: 01.7705.133
DWG. No.

COBBLE	coarse	medium	fine	coarse	medium	fine	SILT	CLAY
	GRAVEL			SAND			FINE GRAINED	

M. I. T. CLASSIFICATION

Mr. W. Lees
Manager
Northwestern Region
Thunder Bay, Ontario

Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

77 07 18

Structure at the Crossing of
Gravel River #1 and
Relocated Hwy. 129 (Line M)
District #18, (Sault Ste. Marie)
W.P. 14-74-08, Site No. 38S-331

Morton, Dodds and Partners Ltd. Consulting Geotechnical and Geological Engineers, were retained by the Ministry to carry out a subsurface investigation at the above mentioned site and provide the necessary recommendations for design and construction for the proposed structure. The Soil Mechanics Section recently received the completed report prepared by the Geotechnical Consultants and after careful review, our comments are as follows:

1. The spread footings suggested at elevation 1073 with an allowable bearing pressure of 3 t.s.f. appears to be satisfactory provided, the founding elevations meet the Hydrological requirements. This aspect should be reviewed by the Hydrology section of the Ministry.
2. In the foundation report it is recommended that an allowable bearing pressure of 1.5 t.s.f., for footings founded in the sand stratum. In our opinion the allowable bearing pressure should be 2.5 t.s.f., and a positive dewatering scheme will be necessary during construction since footing base will be located below the prevailing water level in the granular stratum. If such measures are not carried out the footing base will be subjected to 'boiling' due to unbalanced hydrostatic head.
3. The foundation report does not provide specific recommendations pertaining to pile foundation as an alternative. In our opinion, the most suitable type of piled foundation will be #14 timber pile driven some 45 feet into the granular stratum. Such piles will provide a safe load of 30 tons/pile. Driving of timber piles during construction in the granular stratum should be controlled by Hiley formula as per current M.T.C. standards to achieve the desired design load. It is essential that the upper 10 foot thick deposit of cobbles and boulders should be excavated in the areas where piles are to be driven.
4. This Section requested the Geotechnical consultant to provide sufficient details on the size of cobbles and boulders in the upper granular stratum, so that we can provide factual information to the contractor. In addition we have also requested the consultant to provide typical grain-size distribution curves for the sand deposit. This information is essential for dewatering requirements.

cont'd ...

✓

We believe that the aforementioned comments together with the enclosed foundation report submitted by the Geotechnical Consultant will be adequate for your immediate requirements. Should you have any other queries, please contact our office.

M. Devata
Supervising Engineer

MD/kr

Attach.

cc: B. McKenna
C.M. Smith
D.A. Jarvis (2)
W.A. Stewart (2)

A. Radkowski
G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

N. Maluzinsky
J. Anderson
G. Sloan

Files ✓

J.D. Harris

Regional Geotechnical Section,
P. O. Box 1177,
Thunder Bay "F", Ontario.

May 16, 1977.

Morton Dodds & Partners,
Consulting Geotechnical & Geological Engineers,
50 Galaxy Blvd., Unit 11,
Rexdale, Ontario.
M9W 4Y5

Attention: Mr. J. Morton, M. Eng., P. Eng.

Dear Sirs:

Re: Subsurface Investigation for Proposed Bridge over
Sharp Sand River (western most crossing), Provincial
Highway 129, Line M Revision, South of Chapleau,
Ontario - Work Project 14-74-08

In your memo dated May 10, 1977, you requested information on the above river crossing. I telephoned Mr. Peter Hegler, Project Co-Ordinator for your firm, and we discussed the site at that time.

Although the design of this project is not advanced far enough to be sure where the material for the approach fills will come from, it is anticipated that the material will be sand and gravel with occasional boulders.

Your firm carried out the soils investigation of this portion of Highway 129 for us during 1976 under Work Project 14-74-02 and we have not been on the site since that time. In conversation with Peter, he indicated that he has been there this year and that he was able to identify the site. Staking should be adequate for your purposes although some stakes may have fallen down during the past winter.

If you have any further queries please do not hesitate to contact us.

Yours truly,

H. Munford

H. MUNFORD,
Senior Soils Supervisor,

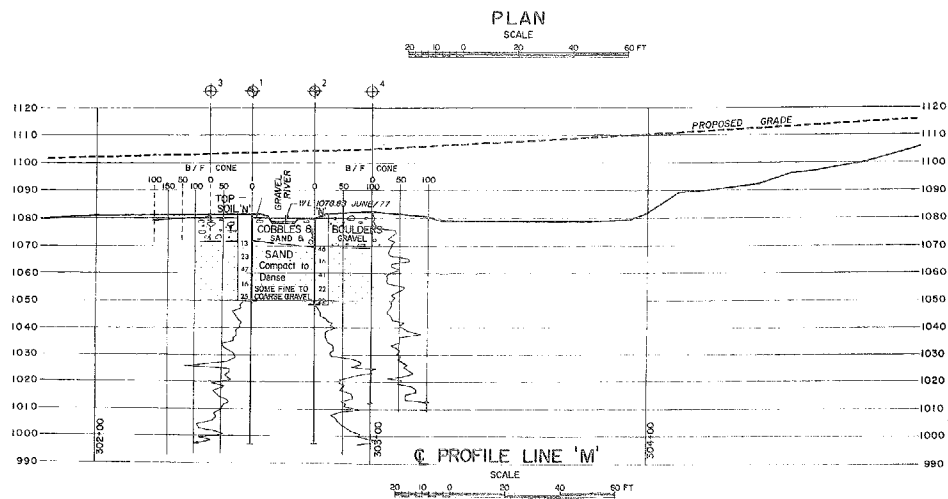
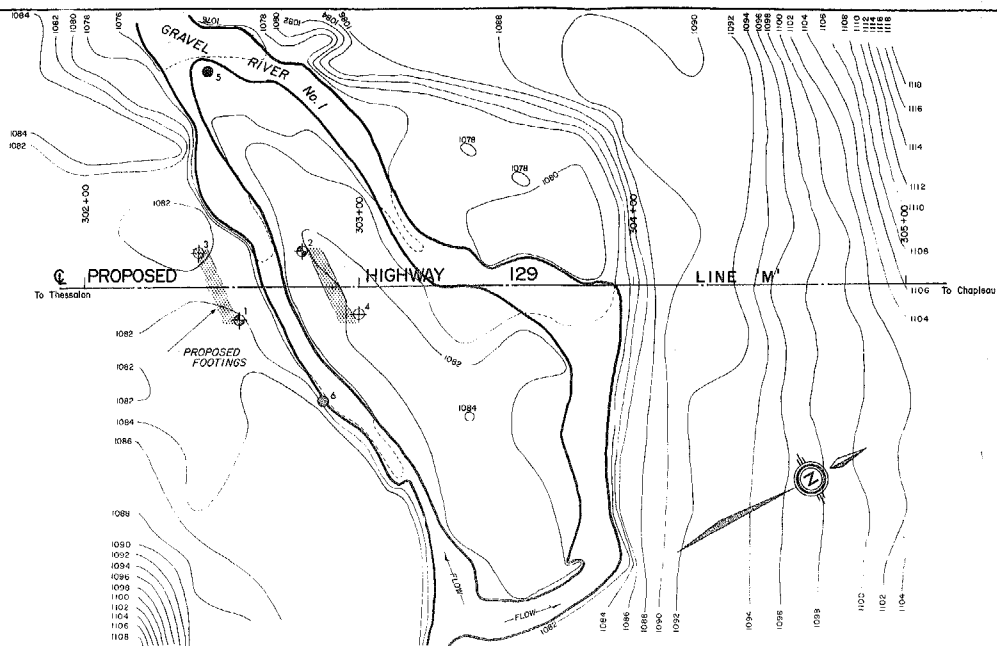
FOR:

C. M. SMITH,
Head, Geotechnical Section.

HM/bh

cc--Mr. P. Hegler
Mr. C. Mirza





CONT No
WP No 14-74-08

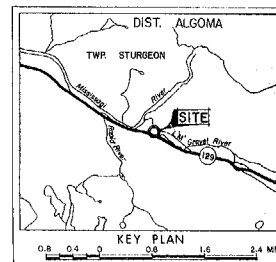
GRAVEL RIVER No. 1

BORE HOLE LOCATIONS & SOIL STRATA



SHEET
1

Morton Dodds & Partners Limited



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N' Blow/ft (50 Pen Test 350 ft lbs energy)
- CONE Blows/ft (60° Cone, 350 ft lbs energy)
- ↓ W.L. at time of investigation June, 1977
- ⊕ Probe Hole

No	ELEVATION	STATION	OFFSET
1	1081.5	302+57	12' RT
2	1079.9	302+80	12.5' LT
3	1081.7	302+42	12' LT
4	1082.0	303+00	10' RT
5	1076.6	302+45	78' LT
6	1079.8	302+87	43' RT

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

DATE	BY	DESCRIPTION

HWY No 129 LINE 'M'	DATE July 8, 1977	SITE 388-331
DRAWN WC	CHECKED	DWG 147408-A

REF. No. E-5160-1, Nov. 1975

