

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 41E-98

DIST. 13 REGION NORTHERN

W.P. No. 73-73-04

CONT. No. 75-95

W.O. No. \_\_\_\_\_

STR. SITE No. 43-123

HWY. No. 64

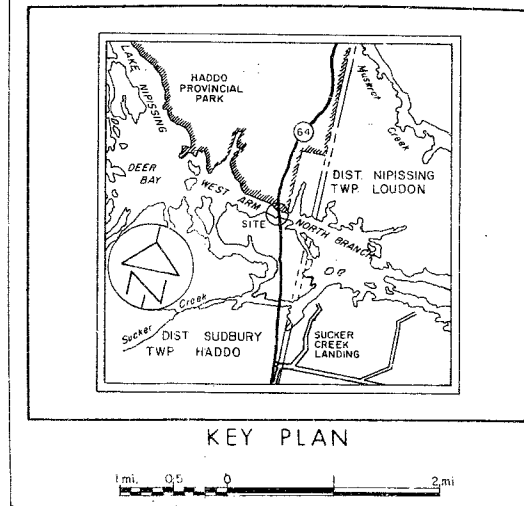
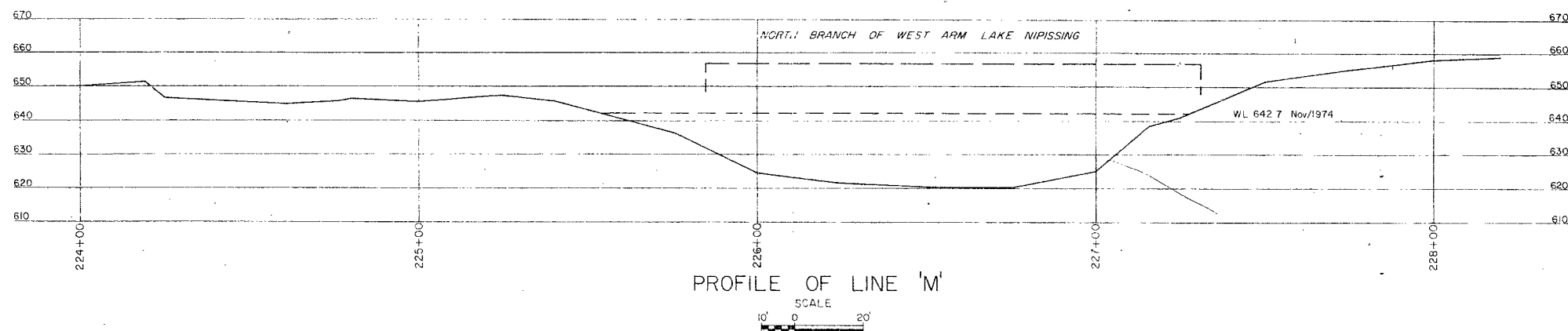
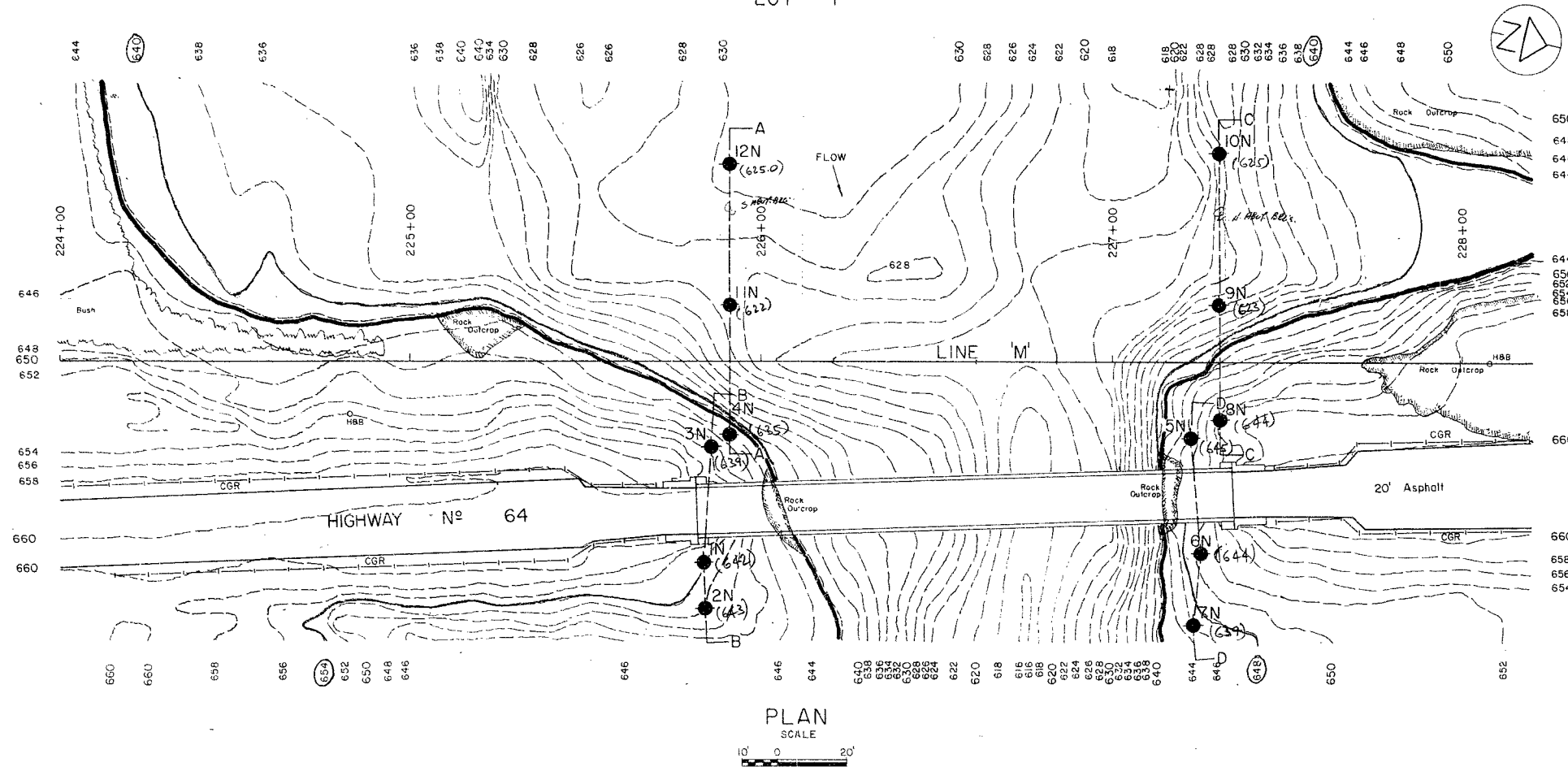
LOCATION WEST ARM L. NIPISSING

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 4

REMARKS: @ documents to be unfolded  
before microfilmed

DIST SUDBURY  
TWP HADDO

CON 3  
LOT 1



LEGEND			
	Bore Hole		
	Dynamic Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation.		
NO.	ELEVATION	STATION	OFFSET REF. LINE 'M'
1N	654.9	225+84	57.5' RT
2N	655.5	225+84	71.5' RT
3N	646.8	225+86	24.5' RT
4N	646.1	225+91	19.5' RT
5N	648.0	227+22	22.0' RT
6N	650.6	227+25	55.0' RT
7N	645.0	227+23	77.0' RT
8N	648.4	227+30	16.5' RT
9N	642.7	227+30	16.5' LT
10N	642.7	227+30	60.0' LT
11N	642.7	225+91	16.5' LT
12N	642.7	225+91	57.5' LT

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

412-98  
GEOCRESS No.

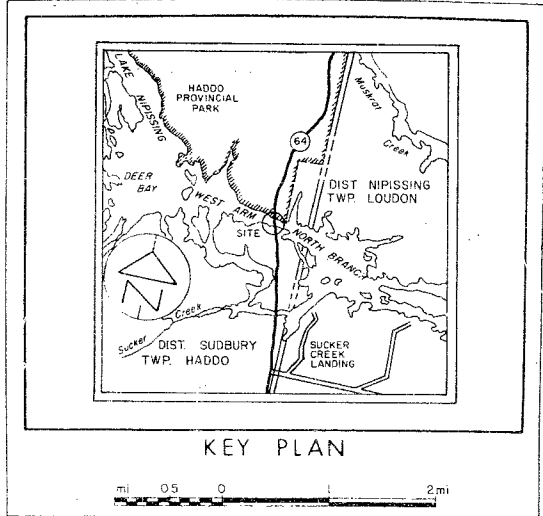
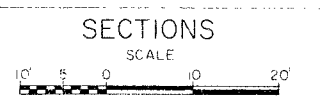
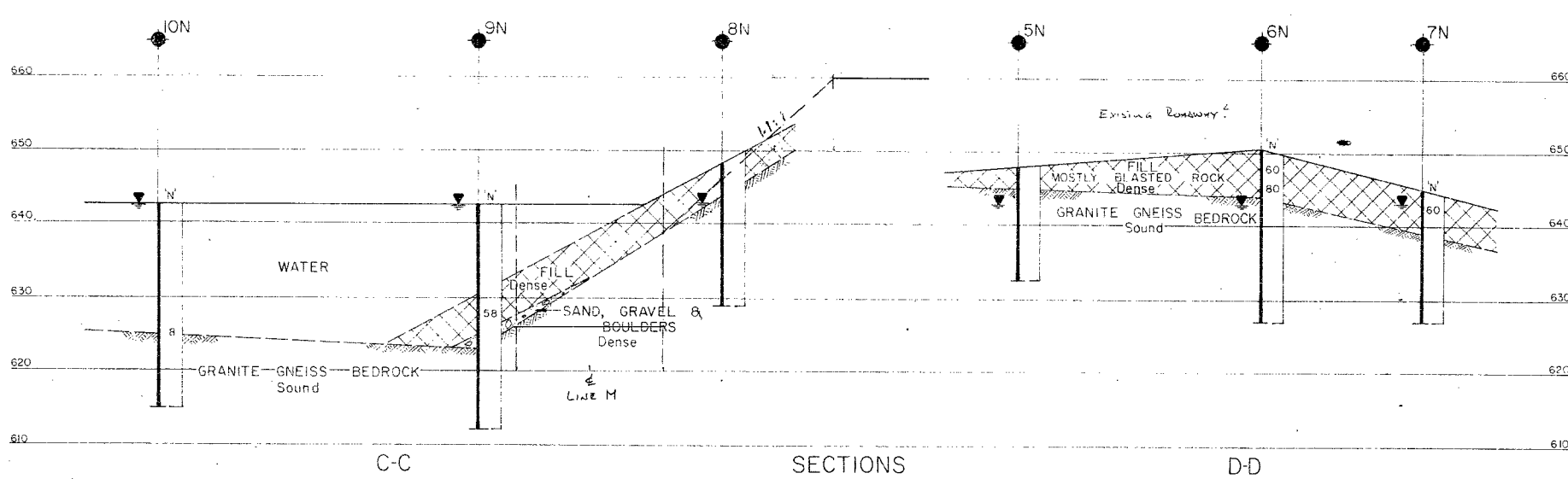
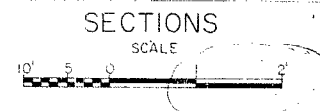
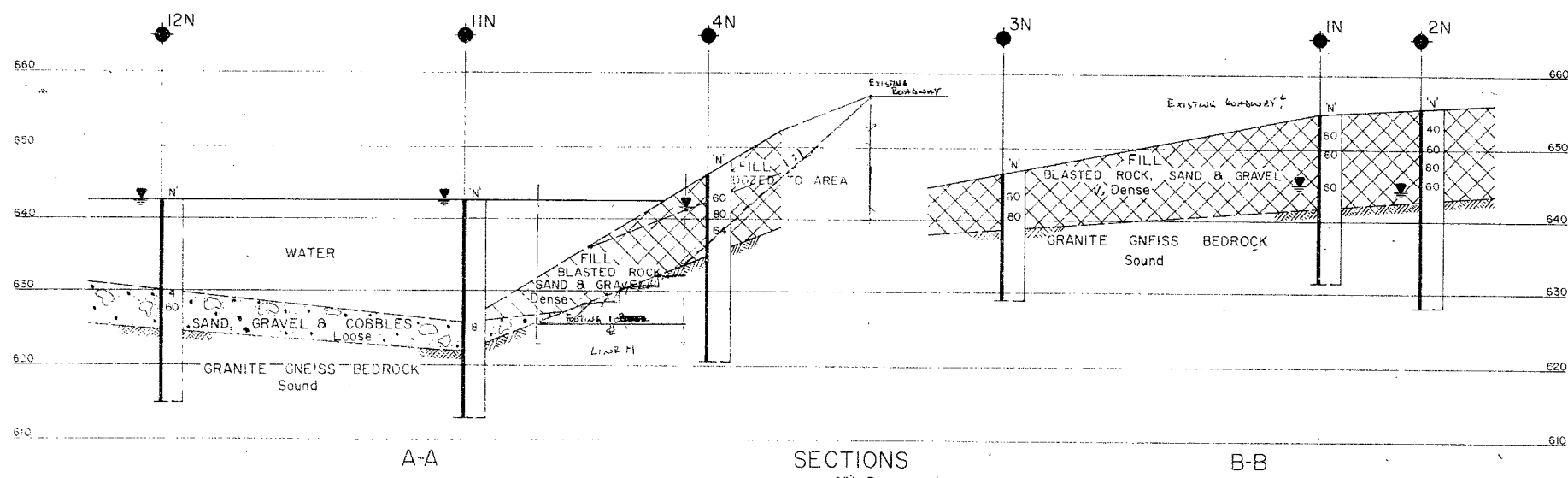
DATE	BY	DESCRIPTION

WILLIAM TROW ASSOCIATES LTD.  
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

NORTH BRANCH  
WEST ARM, LAKE NIPISSING  
HIGHWAY NO. 64 DIST NO. 13  
DIST. SUDBURY  
TWP. HADDO LOT. 1 CON. 3

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD	CHECKED	WP NO. 73-73-04	DRAWING NO.
DRAWN MHD	CHECKED	DATE	BRIDGE DRAWING NO.
DATE NOVEMBER 1974		SITE NO.	
APPROVED		CONT NO.	



**LEGEND**

- Bore Hole
- + Dynamic Cone Penetration Resistance Test
- ⬇ Bore Hole & Cone Test
- ⬇ Water Levels established at time of field investigation

NO	ELEVATION	STATION	OFFSET REF. LINE M
1N	654.9	225+84	57.5 RT
2N	654.5	225+84	71.5 RT
3N	646.8	225+86	24.5 RT
4N	646.1	225+91	19.5 RT
5N	648.0	227+22	22.0 RT
6N	650.6	227+25	55.5 RT
7N	645.0	227+23	77.0 RT
8N	648.4	227+30	16.5 RT
9N	642.7	227+30	16.5 LT
10N	642.7	227+30	60.0 LT
11N	642.7	225+91	16.5 LT
12N	642.7	225+91	57.5 LT

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

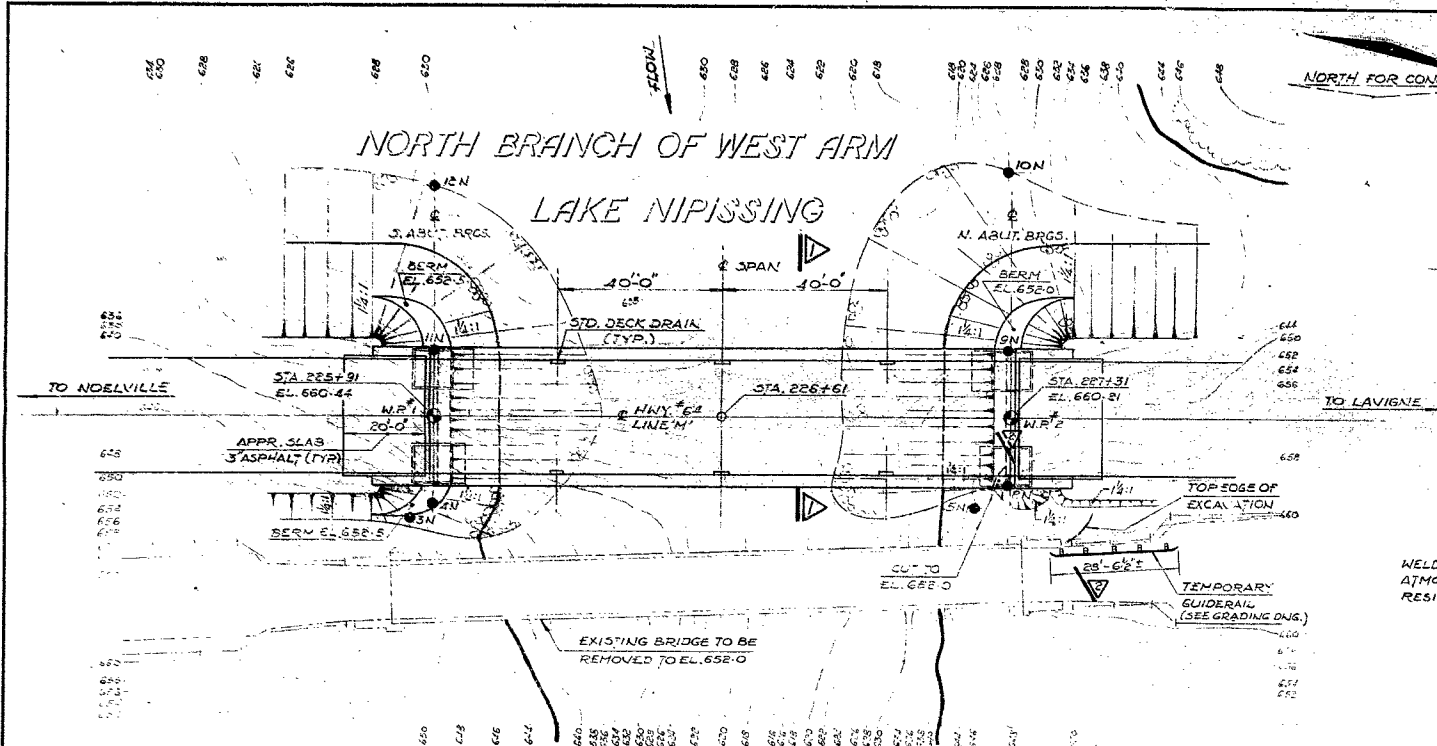
41E-98  
GEOCKES No.

WILLIAM TROW ASSOCIATES LTD.  
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO  
ROADWAY SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

**NORTH BRANCH  
WEST ARM, LAKE NIPISSING**  
HIGHWAY NO. 64 DIST. NO. 13  
DIST. SUDBURY  
TWP. HADDO LOT 1 CON. 3

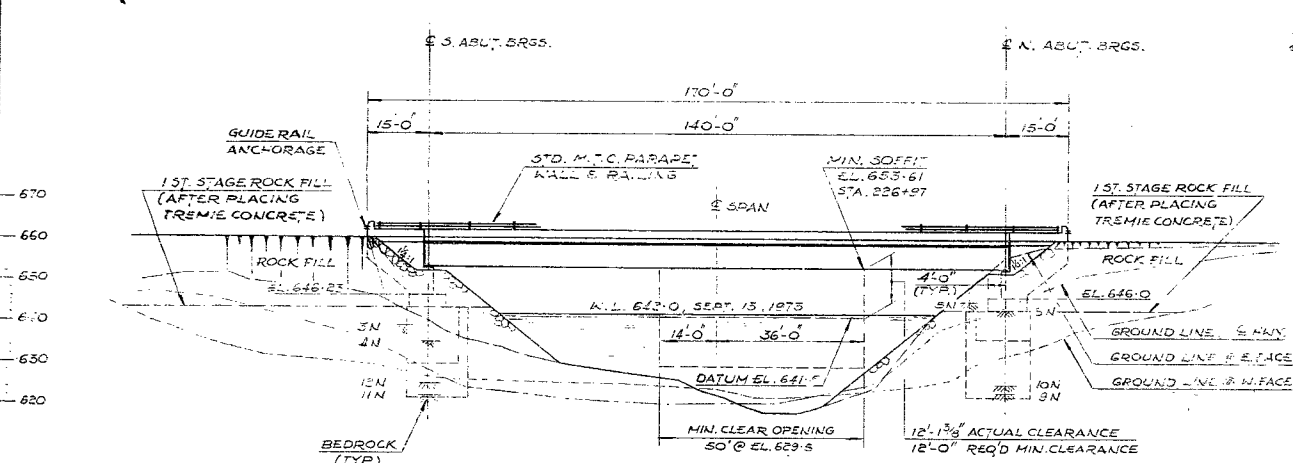
**BORE HOLE LOCATIONS & SOIL STRATA**

SURMD. CHECKED	W.P. NO. 73-73-04	DRAWING NO.
DRAWN: MHD. CHECKED		I-A
DATE: NOVEMBER 1974	SITE NO.	BRIDGE DRAWING NO.
APPROVED	CONT. NO.	

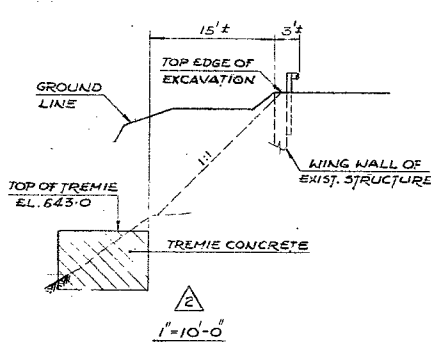


**NOTE**  
• DENOTES BORE HOLE.

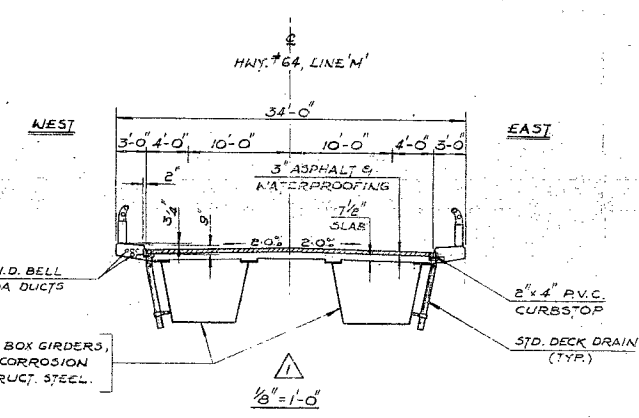
**PLAN**  
1"=20'-0"



**ELEVATION**  
1"=20'-0"



1"=10'-0"

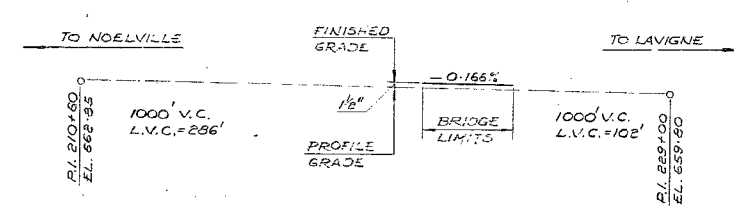


**CONCRETE QUANTITIES**

- 1. CONCRETE IN ABUTMENTS & WINGWALLS ..... 111 CY.
- 2. CONCRETE IN DECK ..... 143 CY.
- 3. CONCRETE IN PARAPET WALLS ..... 21 CY.
- 4. CONCRETE IN APPROACH SLABS ..... 38 CY.

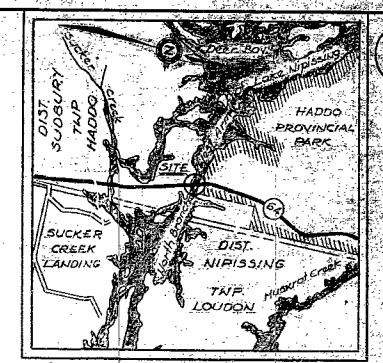
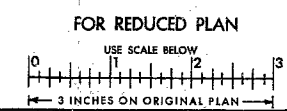
**STRUCTURAL STEEL**

81 TONS



**PROFILE GRADE @ Q. H.W. #64, LINE 'M'**  
N.T.S.

BM 655.97  
GEODETIC DATUM  
ON OR OUTCROP  
105.0' RT. 229+00



**KEY PLAN**  
1"=0.6 MI.

**NOTES**

- CLASS OF CONCRETE**  
DECK, CURBS OVER DECK & PARAPET WALLS ..... 4,000 P.S.I.  
REMAINDER ..... 3,000 P.S.I.
- CLEAR COVER ON REINFORCING STEEL**  
FOOTINGS & ABUTMENTS ..... 3"  
DECK ..... 2" TOP, 1" BOTTOM  
CURBS ..... 2"  
AND/OR AS NOTED ON DRAWINGS.
- CONSTRUCTION NOTES**  
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm \frac{1}{8}$ ".  
NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL CONCRETE IN THE DECK HAS BEEN PLACED.

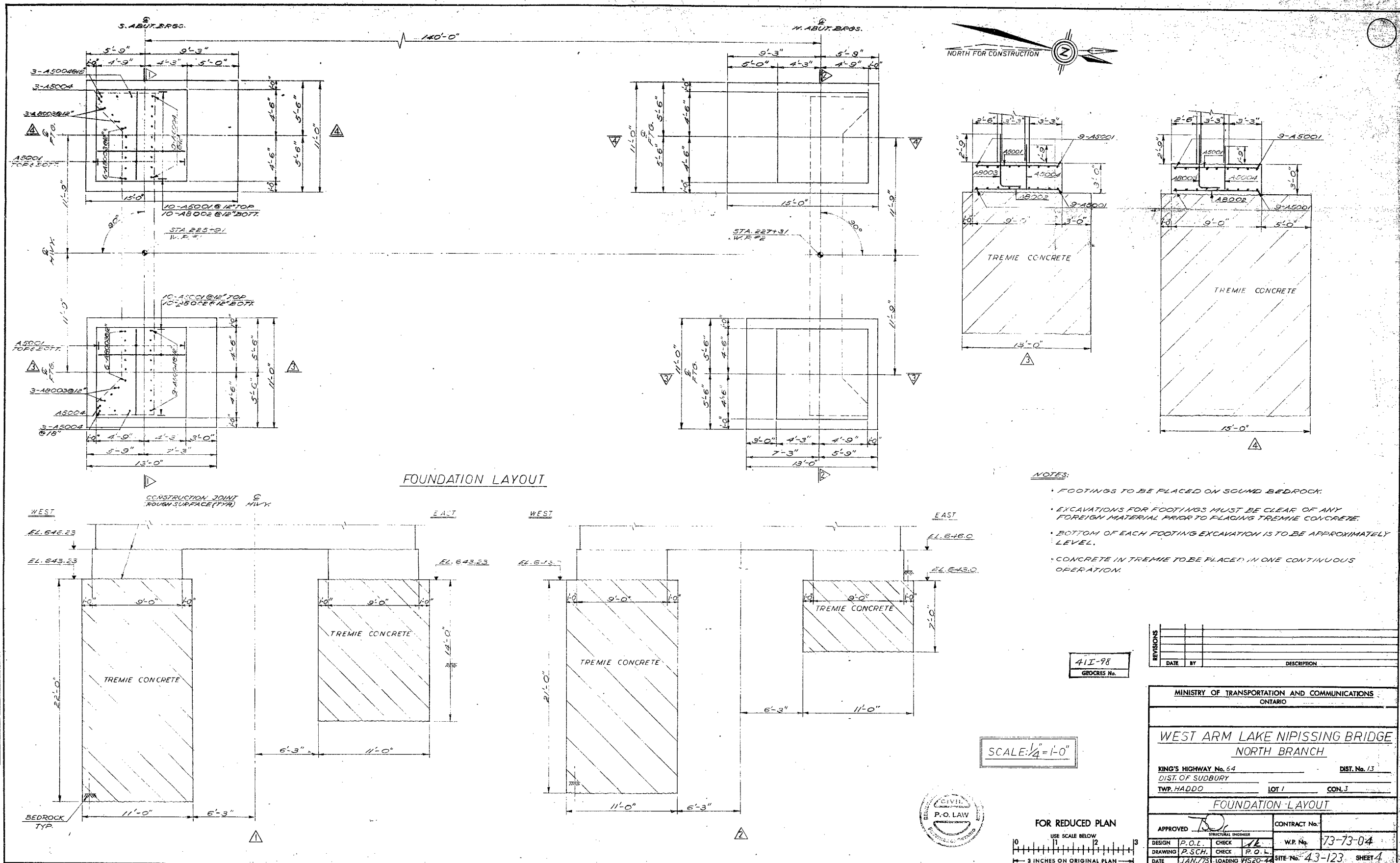
**LIST OF DRAWINGS**

- 43-123-1 GENERAL LAYOUT
- 2 BORE HOLE LOCATIONS AND SOIL STRATA
- 3 BORE HOLE LOCATIONS AND SOIL STRATA
- 4 FOUNDATION LAYOUT
- 5 ABUTMENTS
- 6 STRUCTURAL STEEL I
- 7 STRUCTURAL STEEL II
- 8 DECK DETAILS
- 9 PARAPET WALL DETAILS
- 10 STEEL PARAPET RAILING (DOUBLE TUBE)
- 11 20 FOOT APPROACH SLAB
- 12 STANDARD DETAILS I
- 13 STANDARD DETAILS II

411-98  
GROCKS No.

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO			
<b>WEST ARM LAKE NIPISSING BRIDGE</b>			
<b>NORTH BRANCH</b>			
KING'S HIGHWAY No. 64	DIST. No. 13		
DIST. SUDBURY	TWP. HADDO		
LOT 1	CON. 3		
<b>GENERAL LAYOUT</b>			
APPROVED	DESIGN	CHECK	CONTRACT No.
	P.O.L.		
DRAWING	DATE	LOADING	W.P. No.
H.N.	JAN. 75	H320-24	73-73-04
SITE No. 43-123			SHEET 1



NOTES:

- FOOTINGS TO BE PLACED ON SOUND BEDROCK.
- EXCAVATIONS FOR FOOTINGS MUST BE CLEAR OF ANY FOREIGN MATERIAL PRIOR TO PLACING TREMIE CONCRETE.
- BOTTOM OF EACH FOOTING EXCAVATION IS TO BE APPROXIMATELY LEVEL.
- CONCRETE IN TREMIE TO BE PLACED IN ONE CONTINUOUS OPERATION.

REVISIONS			
	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS  
ONTARIO

WEST ARM LAKE NIPISSING BRIDGE  
NORTH BRANCH

KING'S HIGHWAY No. 64 DIST. No. 13  
DIST. OF SUDBURY  
TWP. HADDO LOT 1 CON. 3

FOUNDATION - LAYOUT

APPROVED <i>BO</i>			CONTRACT No.	
STRUCTURAL ENGINEER				
DESIGN	P.O.L.	CHECK	W.P. No.	73-73-04
DRAWING	P.SCH.	CHECK	P.O.L.	
DATE	JAN 75	LOADING	HS 20-44	
			SITE No.	43-123 SHEET

SCALE:  $\frac{1}{4}" = 1'-0"$

FOR REDUCED PLAN

USE SCALE BELOW

0 1 2

3 INCHES ON ORIGINAL PLAN



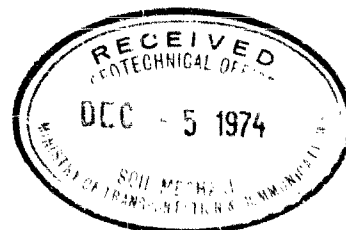
*File ✓*  
*in Mechanics* ↓

411-98
GEOTECH. No.

FOUNDATION INVESTIGATION  
PROPOSED BRIDGE REPLACEMENT  
CROSSING AT THE NORTH CHANNEL  
WEST ARM OF LAKE NIPISSING  
TOWNSHIP OF HADDON  
DISTRICT OF SUDBURY, ONTARIO  
YOUR REF. W.P. 73-73-04  
*COPY 75-95*

PREPARED FOR:  
MINISTRY OF TRANSPORTATION & COMMUNICATIONS

Project: S-2429 November 18, 1974	WILLIAM TROW ASSOCIATES LIMITED Toronto, Hamilton, Sudbury, London, Edmonton	562 Notre Dame Avenue Sudbury, Ontario (705) 674-9681
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**THE TROW  
GROUP**

CONSULTING  
ENGINEERS



S-2429

**WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED**

Soil Mechanics Consultants - Inspection and Testing Engineers  
562 Notre Dame Avenue, Sudbury, Ontario P3C 5L2  
674-9681 - 675-1600

Ian W. Gore, M.E.I.C., P.Eng.  
Manager

November 18, 1974

Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office  
Ministry of Transportation & Communications  
1201 Wilson Avenue, Design Services Branch  
First Floor, West Building  
Downsview, Ontario  
M3M 1J8

ATTENTION: Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office

RE: Foundation Investigation  
Proposed Bridge Replacement  
Crossing at the North Channel  
West Arm of Lake Nipissing  
Township of Haddo  
District of Sudbury, Ontario  
Your Ref. W.P. 73-73-04

Dear Sirs:

In accordance with your written authorization of Nov. 5th, 1974, the foundation investigation for the above mentioned bridge site has been completed.

Our findings and recommendations arising from the field work are given in the accompanying report.

Should you have any queries regarding our comments, please do not hesitate to contact this office.

Yours very truly,

I. W. Gore, P. Eng.

IWG:gmiv  
Encls.

Dist: Ministry of Transportation & Communications (12)  
Attention: Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office



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FOUNDATION INVESTIGATION  
PROPOSED BRIDGE REPLACEMENT  
CROSSING AT THE NORTH CHANNEL  
WEST ARM OF LAKE NIPISSING  
TOWNSHIP OF HADDO  
DISTRICT OF SUDBURY, ONTARIO  
YOUR REF. W.P. 73-73-04

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SUMMARY

An investigation was carried out at the above noted bridge crossing for the Ministry of Transportation and Communications. The purpose of the investigation was to establish the soil and/or bedrock profile at the site and to comment on related construction problems.

The twelve (12) boreholes confirmed that, close to the location of the existing abutments, the stratigraphy consists of blasted rock fill overlying granite gneiss bedrock. At the borehole locations, the rock fill was proved to vary from 2 to 12 feet thick. The rock fill boulders are identical to the parent rock strata and, although the bedrock is sound, it generally has a weathered zone with fractures in the upper approximately 2 feet. In some instances therefore, the bedrock surface, as interpreted from the borehole data, may vary because of the inability to differentiate between the upper fractured rock and the overlying similar large blasted rock boulders. In the mid stream borings for the west alignments, the rock in the river bed is generally overlain by a thin 4 to 5 feet thick veneer of loose sand, gravel and boulders.

No serious problems are anticipated excavating the rock fill around the existing abutments to expose the bedrock with mechanical equipment. Some slight groundwater seepages may be encountered from water perched in the rock fill, although it should be possible to remove any such seepages with conventional construction drainage. If the west alignment is selected, excavations for foundations will be more problematic, since the rock surface is located at least 17 feet below the present river level.

The upper slightly weathered bedrock around the existing abutments has an allowable bearing pressure of up to 15 t.s.f. The underlying intact rock has a much higher allowable bearing pressure, i.e., at least 50 t.s.f. If the west alignment is selected, the intact rock (12 inches below the bedrock contact) has an allowable bearing pressure of at least 50 t.s.f. In order to use this value for the design of the foundations, the bedrock surface would have to be exposed and inspected in the dry. Since it is probably not practical to form an impermeable barrier around the abutment excavation to permit construction and inspection in the dry, it is assumed that the abutment foundations will be excavated and formed under water with either a single large pier or caissons socketed into the rock using a churn drill. In either of the latter two cases, complete cleaning of the rock surface will not be possible. Therefore, it is recommended that the foundations be designed with a reduced allowable bearing pressure of 12 t.s.f. In addition to end bearing, the socketed caissons will develop some bond between the rock socket and the caisson; this may be assumed to be 50 p.s.i.

Comments on earth pressures, chemical tests and other related aspects are included in the body of the report.

## INTRODUCTION AND OBJECT

The following investigation was carried out for the Province of Ontario, Ministry of Transportation and Communications, Geotechnical Office, at the location of a proposed bridge replacement on Kings Highway No. 64, in the District of Sudbury.

The bridge is situated approximately twelve miles south of Lavigne on Highway 64, and forms the north crossing, west arm of Lake Nipissing.

The purpose of the investigation was to:

- (a) report on the type, thickness and variability of the soil and/or rock strata in the area,
- (b) establish groundwater conditions,
- (c) determine the safe bearing pressures of the various soil and rock types,
- and (d) comment on excavation conditions, earth pressure requirements, etc.

## SITE DESCRIPTION

The crossing is located in an area of predominantly outcropping bedrock. The existing steel truss bridge spans approximately 150 feet across the north channel of the west arm of Lake Nipissing. The bridge is in the order of 12 to 13 feet wide and it is proposed to replace the structure with a wider bridge close to the same alignment or upstream - either 50 or 100 feet west of the bridge.

The present abutments appear to be located on bedrock, although blasted rock fill has been 'dumped' around the abutments and over the sloping bedrock surface into the river.

## SITE GEOLOGY

From known geological information and visits to the site, it appears that the outcropping bedrock in the area comprises highly metamorphosed volcanics and sediments within the Grenville Province.

The rock, as evidenced in nearby cuts, consists of a pink granite gneiss containing mainly feldspars (plagioclase), quartz and biotite. The planes of the gneissosity generally strike almost due north and dip to the east at approximately 25 to 30 degrees.

Local folding is evident in at least three planes, but all folds are of a very minor nature.

Some surface fractures from weathering and former blasting operations are evident; however, they are surficial features and the rock at depth appears to be sound.

## FIELD WORK AND SUBSOIL

The field work comprised twelve (12) boreholes put down at the specific locations as shown on the enclosed site plan, Dwg. 1. Eight of the holes were put down on land close to the existing bridge abutments and the remaining four holes were advanced from a raft in mid stream. Details of the strata encountered in the boreholes are summarized in the logs, Dwgs. 2 to 13, inclusive, and various sections through the boreholes are plotted on Dwg. 1A.

The boreholes were advanced using a B.B.S.1 diamond drill rig, also adapted for soil sampling purposes. Samples in the overburden were obtained and recovered where possible with a 2 inch O.D. split spoon sampler, which was hammered into the soil in accordance with the specifications for the Standard Penetration Resistance Test.



Bedrock was proved in all twelve boreholes by obtained AXL size rock core samples.

The drilling equipment was provided and operated by Canadian Longyear Limited.

The eight boreholes put down on land close to the existing abutments (holes 1N to 8N) indicate that the overburden above the bedrock consists of varying depths of essentially blasted rock fill. The voids in the rock fill are generally filled with a matrix of silt, sand and gravel. Some of the rock fill boulders are up to 3 or 4 feet in diameter.

In order to expedite the drilling program, a backhoe and a dozer were used to level the rock fill on the steeply sloping banks, in the area of the existing abutments, to enable the drilling machine to set up at the specific locations requested. In this regard, many of the borehole elevations (top of ground surface) do not correlate with the elevations as interpolated from the site plan, Dwg. 1. The rock fill surface was changed only around the borehole locations. The approximate depths of fill added or removed are indicated as footnotes on the borehole logs (Dwgs. 2 to 9).

From the borehole results, it can be seen that, at these locations, the rock fill varies from approximately 2 to 13 feet thick.

Rock outcrops are visible just beyond the existing abutments and, in some instances, close to the edge of the river (see Dwg. 1). It appears that the bedrock has been levelled at the existing abutment by blasting, and the rock fragments, together with additional blasted rock fill (from adjacent cuts) have been dumped over the rock slope, as shown diagrammatically on the sketch (Dwg. 14). It can be seen from this sketch that the rock surface can vary erratically in the area of the existing abutments. Although the original rock surface sloped

towards the river, it is possible at some locations to encounter the bedrock surface at a higher elevation closer to the river.

As was outlined previously, the rock fill comprises mainly rock fragments of various sizes up to 3 feet in diameter. These rock boulders are identical to the parent rock strata in the area. It is extremely difficult, therefore, to outline accurately the exact elevation of the top of the bedrock proper. The bedrock elevations, therefore, as represented in the borehole logs, may vary slightly. To complicate the problem, the upper layer of the bedrock is visibly weathered and shows a pattern of fracturing, particularly in the initial 1 to 2 feet. This fracturing pattern and opening in joints, etc., in the upper layers has also been aggravated by 'blasting' operations during construction of the existing bridge.

In the four mid stream borings (holes 9N to 12N, inclusive), it appears that, for the most part, the bedrock is overlain by a thin veneer of sand, gravel and cobble alluvium, in the order of 3 to 5 feet thick. At the location of hole 9N, approximately 5 feet of rock fill was encountered overlying the alluvium and at hole 10N, bedrock outcrops.

The bedrock in these mid stream borings is sound, almost from the rock contact. It shows little evidence of weathering. In addition, it does not contain any cracks or open fissures, etc., which were evident in the other eight borings where blasting operations have been used previously.

#### GROUNDWATER

The groundwater table at the existing abutments is of academic interest only, since it will not cause any problems during construction of the proposed abutments.



In most instances, a stabilized water level was recorded shortly after completing the borehole at the base of the rock fill. The field work was carried out during a wet period of the year and these water levels are interpreted as 'perched' water.

#### CHEMICAL TESTS

Chemical tests were carried out on representative samples of the groundwater and river water and the results are summarized as footnotes in the enclosed borehole logs, Dwgs. 2 to 13. These results indicate a negligible concentration of sulphates in a mildly acidic environment. There should not, therefore, be any serious deterioration by sulphates in the groundwater or river water of a good quality dense concrete made from ordinary Portland cement.

#### FOUNDATION CONSIDERATIONS

It will be possible to support the proposed abutments on bedrock.

The allowable bearing pressure and type of foundation will depend on the alignment selected. If the alignment is close to the existing bridge, then the abutments can be supported by conventional spread foundations. Alternatively, if an alignment to the west of the existing bridge is selected, then the foundations would have to comprise either a caisson foundation or deep piers below the river level. These two schemes are outlined below.

##### (1) Alignment Close to Existing Structure (Boreholes 1N to 8N)

The abutments may be supported on conventional spread foundations established in the granite bedrock.

The bedrock in the upper weathered and somewhat fractured zone has an allowable bearing pressure of up to 15 t.s.f. Below the upper weathered crust, the intact granite gneiss bedrock has an allowable bearing pressure of at least 50 t.s.f.



The bedrock levels can be assumed as those represented in the borehole logs, although in some instances, these may vary slightly because of the problems differentiating between the upper fractured bedrock and overlying large blasted rock boulders.

(2) West Alignments (Boreholes 9N to 12N)

The strata in the river bed at the proposed location of the abutments generally consists of approximately 4 to 5 feet of loose to compact sand, gravel and cobbles overlying bedrock. At the location of hole 9N, some of the rock fill forming the north approach embankment for the existing bridge has spilled out into the river; consequently, the river alluvium is overlain by some rock fill in this area. At the location of hole 10N, no overburden was encountered.

The depth to bedrock in these areas appears to be approximately 17 to 20 feet below the present water level. The depth of water to the river bottom is in the order of 12 to 17 feet.

The loose river alluvium is not suitable for supporting the bridge abutments; therefore, all foundations must be supported in the underlying bedrock. The bedrock at 12 inches below the initial contact is sound and is capable of supporting a safe loading of up to 50 t.s.f. In order to support this high value, the bedrock surface must be thoroughly cleaned and provisions would have to be made to enable inspection of the rock surface in the dry.

In all probability, the abutments will be constructed under water, where strict controls are not possible and thorough cleaning of the rock surface is not practical. In this case, the allowable bearing pressure on the rock must be reduced to a value of 12 t.s.f. (assuming that the rock surface is roughly cleaned). If a caisson foundation is used (i.e., pre-drilled with a churn drill into the rock), the structural loads can also be supported by mobilizing a safe bond strength between





the concrete in the caisson and the bedrock surface of 50 p.s.i. (This is in addition to the end bearing value of 12 t.s.f.) The upper slightly shattered 12 inches of rock should, however, be neglected in calculating the supporting load gained from the bond stress.

The installation procedures are discussed more thoroughly in a later section of the report.

#### SETTLEMENTS

Provided the abutment foundations are established below any fill material or overburden in the river bottom on sound bedrock, then settlements will be negligible.

#### INSTALLATION PROBLEMS

Installation and excavation procedures for abutments at or close to the existing structure will be straightforward. On the other hand, installation of abutments at the west alignment will be more problematic, since excavation will be required below water level. The two schemes are outlined below in more detail.

##### (1) Alignment Close to Existing Structure (Boreholes 1N to 8N)

No serious problems are anticipated excavating the blasted rock fill to expose the bedrock surface.

As was pointed out in a previous section, a dozer and backhoe were used during the field drilling program to level and move the fill. No difficulties were encountered using these mechanical devices to excavate the rock fill. On the other hand, blasting techniques will be required if removal or appreciable levelling of the bedrock is required.

Any exposed bedrock surfaces close to the abutments must be protected from weathering with either adequate depths of fill or a skim coating of lean concrete. If the rock is not protected, then there is a danger that water will enter points and fissures and, during freezing periods, loosen the upper layer of rock and eventually reduce the bearing pressure.

There will probably be some minor water seepages from groundwater perched in the fill above the river level, although it should be possible to remove any such seepages by conventional construction drainage, i.e., pumping from sumps and ditches.

(2) West Alignments (Boreholes 9N to 12N)

Foundation loads must be established below any loose river alluvium and any fill material, then at least 1 foot into bedrock.

Frequently, for shallow depths of water and minimal excavations, an impermeable clay dyke can be constructed to divert the river water and permit construction in the dry. At this particular site, however, this method is probably not practical because of the large quantities of earth fill required to form berms in the deep channel.

It was recommended (in the foundation section) that either the foundations comprise a large single pier footing, or alternatively, caissons - churn drilled into the rock. The final choice depends on suitability and economical considerations.

In the former case, for a large pier footing, it is recommended that the overburden be excavated under water with a drag line and clam to expose the bedrock surface in the area of the abutment. The surface of the rock should then be levelled at a minimum depth of 1 foot below rock surface by blasting and excavating the rock debris under water. The



exposed surface should be cleaned as well as practical with a drag line and clam, etc. Concrete should then be tremied into the excavation to form a level base on which the pier can be constructed. As was indicated previously, the rock is assumed to be able to safely support a loading of up to 12 t.s.f.; however, this is dependent on machine cleaning the bedrock surface prior to pouring concrete. Divers or underwater closed circuit television would have to be used to confirm that as much of the debris as possible has been removed from the rock surface.

If the alternative scheme of caissons is selected, then it is recommended that the caissons be drilled into the bedrock using a churn drill. Since the bedrock is sound granite gneiss, considerable abuse to the equipment can be anticipated and some percentage of blasting may be required to advance the sockets. This should be confirmed with the Contractor. The rock cores will be retained for at least a further 12 months if inspection of the rock is required. It will be necessary to use either divers or under water closed circuit television to confirm that both the rock sockets and bases are sufficiently clean.

#### EARTH PRESSURES

Any fill placed behind the abutments, or any retaining wall, etc., will exert an earth pressure on the rigid structures. If the structure has been designed as a rigid member, then the earth pressure must be designed using an active coefficient of 0.5. Providing some slight inward yielding of the structure is permissible, then this earth pressure coefficient may be reduced to 0.35.

The active earth pressure at the abutments may be resisted by the sliding resistance between the base of the concrete footing and the bedrock, together with the passive resistance in front of the abutments. The sliding resistance between the concrete footing and the rock may be conservatively calculated using a coefficient of sliding



resistance ( $\tan \phi$ ) of 0.8. If the backfill in front of the footing is well compacted, good quality granular or well graded rock fill, then the passive resistance may be calculated assuming a coefficient ( $K_p$ ) of 3.0.

The resistance to sliding can also be increased if required by providing a key below the abutment footing into the rock, or alternatively, pouring the footing 'flush' with the bedrock.

#### SCOUR PROTECTION

For the west alignment, it has been recommended that footings be established at least 12 inches into the bedrock. This will provide sufficient protection against any scouring effect.

#### APPROACHES

It is understood that approach embankment heights will be in the same order as the existing banks. The existing approaches will be widened if the alignment is selected approximating to the existing route. New embankments will be required if the west alignment is chosen.

No stability problems are envisaged. In all instances, the approach fills will be placed on granular soil or directly on rock, therefore, there are no dangers of instability.

It is recommended that the side slopes be constructed at 2 horizontal to 1 vertical.

WILLIAM TROW ASSOCIATES (SUDBURY) LTD.

I. W. Gore, P. Eng.

IWG:gmw

Encls.

Dist: Ministry of Transportation & Communications (12)  
ATTENTION: Mr. A. Rutka, P. Eng.

## BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 1N

DRAWING No. 2

PROJECT Proposed Bridge Replacement

AUGER SAMPLE

NATURAL MOISTURE

LOCATION North Branch of West Arm

2" O.D. SPLIT TUBE

PLASTIC AND LIQUID LIMIT

Lake Nipissing

2" I.D. SHELBY TUBE

2" DIA. CONE

UNDRAINED TRIAXIAL AT

HOLE LOCATION AND DATUM SEE DRAWING No. 1

PUSHED

OVERBURDENED PRESSURE

VANE TEST AND SENSITIVITY (S)

% STRAIN AT FAILURE

LAB. VANE TEST

POCKET PEN.

L W G	SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT	PENETRATION RESISTANCE 350 FT. LAB. BLOWS FT.		NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	NATURAL UNIT WEIGHT P.C.F.
					20	40		
	F	FILL-mostly blasted rock frag- ments & boulders in a sand, gravel & silt matrix, moist (dense)	654.9					
	F			5				
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Run #1  
AX coreRun #2  
AX core

William Trow Associates Ltd.

CORE DRILLING RECORDS (Hole 1N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	13.0 to 18.0	86	0% to 15' then approx. 50% to 18'	Mostly broken granite gneiss to 15 ft. depth, slightly weathered to 14.5 ft. Reasonably sound below 15 ft. Full pressure, no water return - losing water around casing in overlying porous rock fill.
2	18.0 to 23.0	90	60%	Fairly sound granite gneiss, full pressure, no water return - losing water around casing in overlying porous rock fill.

# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 2N

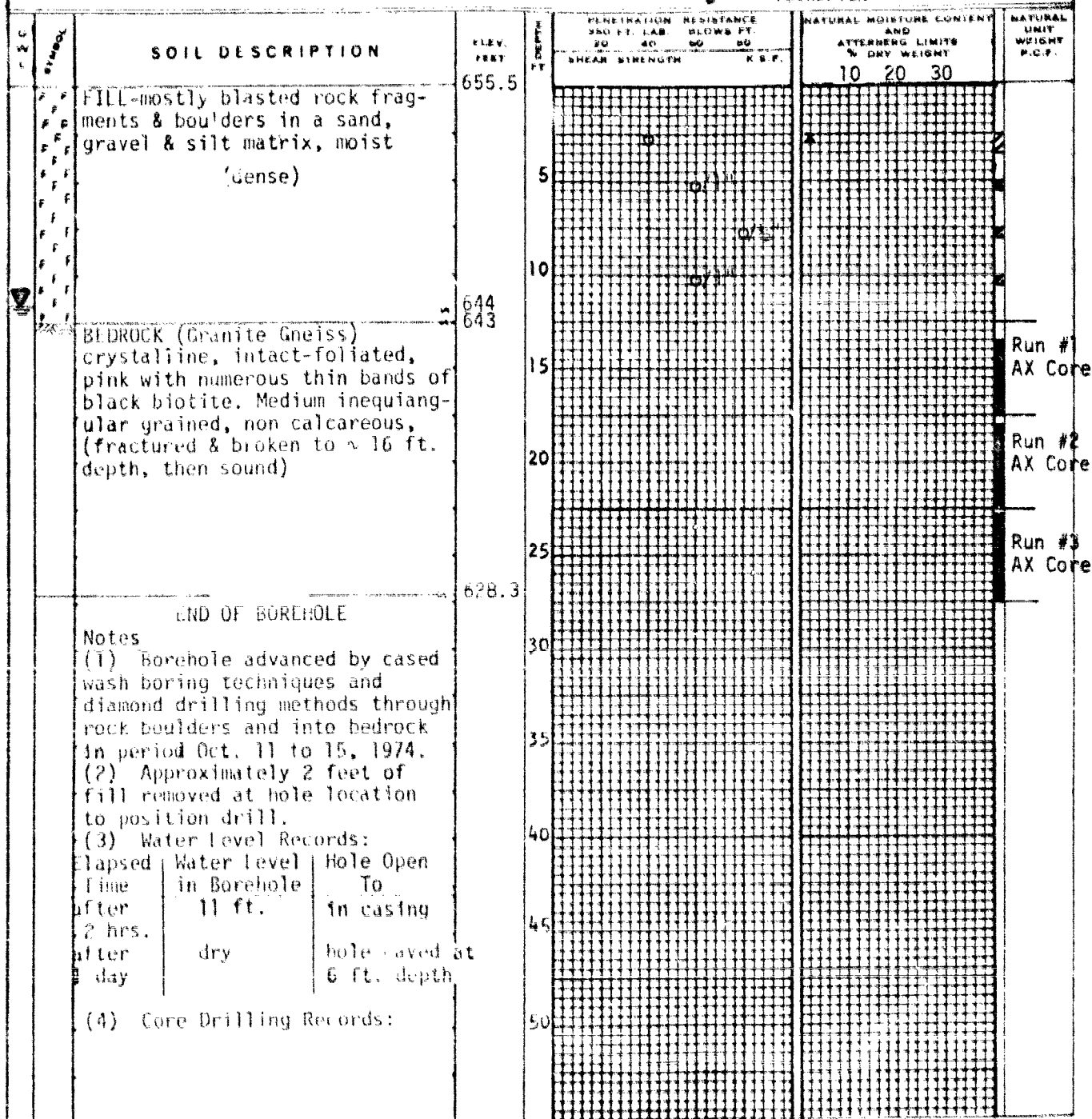
DRAWING No. 3

PROJECT Proposed Bridge Replacement  
LOCATION North Branch of West Arm  
Lake Nipissing

AUGER SAMPLE  
2" O.D. SPLIT TUBE  
2" I.D. SHELBY TUBE  
2" DIA. CORE  
FUSION  
VANE TEST AND SENSITIVITY (S)  
LAB VANE TEST

NATURAL MOISTURE  
PLASTIC AND LIQUID LIMIT  
UNDRAINED TRIAXIAL AT  
OVERBURDENED PRESSURE 15  
% STRAIN AT FAILURE  
POCKET PEN

HOLE LOCATION AND DATUM SEE DRAWING No. 1



William Trow Associates Ltd.



CORE DRILLING RECORDS (hole 2N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	12.7 to 17.7	70	10	Mostly shattered granite gneiss particularly to ~ 16 feet. Reasonably sound below 16 ft. depth, intermitted pressure loss to 16 ft. depth then full pressure below. No water return - probably losing water around the casing in upper porous rock fill.
2	17.7 to 22.7	96	20% to 20.7 ft. then 70% below	Sound granite gneiss, full pressure, no water return - losing water return around casing in upper porous rock fill.
3	22.7 to 27.7	96	80	Sound granite gneiss, full pressure, no water return - losing water return around casing in upper porous rock fill.

- (5) Could be boulders to ~ 15 feet depth (~ Elev. 640) - not possible to define rock level accurately.



# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 3N

DRAWING No. 4

PROJECT: Proposed Bridge Replacement  
 LOCATION: North Branch of West Arm  
Lake Nipissing

AUGER SAMPLE  
 2" O.D. SPLIT TUBE  
 2" I.D. SHELBY TUBE  
 2" DIA. CONE  
 PUSHED  
 VANE TEST AND SENSITIVITY (S)  
 LAB. VANE TEST

NATURAL MOISTURE  
 PLASTIC AND LIQUID LIMIT  
 UNDRAINED TRIAXIAL AT  
 OVERBURDENED PRESSURE  
 % STRAIN AT FAILURE  
 POCKET PEN.

HOLE LOCATION AND DATUM SEE DRAWING NO. 1

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT	PENETRATION RESISTANCE 350 FT. LAB. BLOWS FT.				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	NATURAL UNIT WEIGHT P.C.F.	
				20	40	60	80			
				SHEAR STRENGTH		K.S.F.				
F F F F F F F F F F	FILL-mostly blasted rock frag- ments & boulders in a sand, gravel & silt matrix, moist  (dense)	646.8								
F F										





CORE DRILLING RECORDS (hole 3N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	7.5 to 12.5	100	40% to 10 ft. then 75%	Sound granite gneiss, slightly shattered to 9 ft., full pressure, no water return, drilling water lost around casing in upper rock fill.
2	12.5 to 17.5	100	85	Sound intact granite gneiss.

## BOREHOLE No. 4N

DRAWING No. 5

HOLE LOCATION AND DATUM SEE DRAWING No. 1

LAB VANE TEST

POCKET PEN.

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**C**

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CORE DRILLING RECORDS (Hole 4N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	10.5 to 15.5	95	30% to ~ 12 ft. then 80 %	Mostly sound, intact granite gneiss slightly weathered and broken in upper 18 inches, full pressure, water return zero - losing water around casing into overlying porous rock fill.
2	15.5 to 20.5	100	40%	Mostly sound, intact granite gneiss full pressure, no water return, losing water around casing into overlying porous rock fill.
3	20.5 to 25.5	100	50%	Mostly sound, intact granite gneiss, full pressure, no water return, losing water around casing into overlying porous rock fill.

(5) Chemical Tests on Groundwater:

Sulphate Concentration

SO<sub>4</sub> p.p.m. = traces

pH = 6.9

# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 5N

DRAWING No. 6

PROJECT Proposed Bridge Replacement

LOCATION North Branch of West Arm

Lake Nipissing

HOLE LOCATION AND DATUM SEE DRAWING No. 1

AUGER SAMPLE

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

VANE TEST AND SENSITIVITY (S)

LAB. VANE TEST

NATURAL MOISTURE

PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT

OVERBURDENED PRESSURE

% STRAIN AT FAILURE

POCKET PEN.

## SOIL DESCRIPTION

ELEV.  
FEET

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50

PENETRATION RESISTANCE

350 FT LAB. BLOWS FT.

30 40 50 60 70 80

SHEAR STRENGTH

K.S.F.

NATURAL MOISTURE CONTENT

AND

ATTERBERG LIMITS

% DRY WEIGHT

NATURAL

UNIT

WEIGHT

P.C.F.

FILL-mostly blasted rock frag-  
ments in a sand, gravel & silt  
matrix, moist (dense)

BEDROCK (Granite Gneiss)  
crystalline, intact-foliated,  
pink with numerous thin bands of  
black biotite, medium inequi-  
angular grained, non calcareous,  
(badly shattered in upper ~  
2 ft., then sound)

END OF BOREHOLE

### Notes

(1) Borehole advanced by cased  
wash boring techniques and  
diamond drilling methods through  
rock boulders into bedrock on  
Oct. 17, 1974.

(2) Approximately 12 to 18 inches  
of fill added at this location to  
position drill.

### (3) Water Level Records:

Elapsed Time	Water Level in Borehole	Hole Open To
On com- pletion	1 foot	in casing
after 1 day	6.1 ft.	13.5 ft.
after 4 days	5.5 ft.	13.5 ft.

### (4) Core Drilling Record:

Run #1  
AX Core  
Run #2  
AX Core

Run #3  
AX Core



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CORE DRILLING RECORDS (Hole 5N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	2.5 to 4.5	63	0	Mostly broken and shattered granite gneiss, intermittent pressure, no water return, could be cobbles and boulders, not possible to define.
2	4.5 to 8.5	86	50%	Mostly sound, intact granite gneiss, full pressure, no water return, losing water in overlying porous rock fill around casing
3	8.5 to 13.5	98	65%	Mostly sound, intact granite gneiss, full pressure, no water return, losing water in overlying porous rock fill around casing.

# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 6N

DRAWING No. 7

PROJECT Proposed Bridge Replacement  
LOCATION North Branch of West Arm  
Lake Nipissing

AUGER SAMPLE  
2" O.D. SPLIT TUBE  
2" I.D. SHELBY TUBE  
2" DIA. CONE  
PUSHED  
VANE TEST AND SENSITIVITY (S)  
LAB. VANE TEST

NATURAL MOISTURE  
PLASTIC AND LIQUID LIMIT  
UNDRAINED TRIAXIAL AT  
OVERBURDENED PRESSURE  
% STRAIN AT FAILURE  
POCKET PEN.

N AND DATUM SEE DRAWING No. 1

## SOIL DESCRIPTION

ELEV.  
FEET

DEPTH  
FT.

PENETRATION RESISTANCE  
350 FT. LAB. BLOWS FT.  
20 40 60 80  
SHEAR STRENGTH K.S.F.

NATURAL MOISTURE CONTENT  
AND  
ATTEBERG LIMITS  
% DRY WEIGHT

NATURAL  
UNIT  
WEIGHT  
P.C.F.

FILL-mostly blasted rock frag-  
ments with boulders in a sand,  
gravel & silt matrix, moist  
(dense)

BEDROCK (granite Gneiss)  
crystalline, intact-foliated,  
pink with numerous thin bands of  
black biotite, medium inequi-  
angular grained, non calcareous  
(moderate to well fractured to  
19 ft., then sound & intact)

## END OF BOREHOLE

### Notes

(1) Borehole advanced by cased  
wash boring techniques and  
diamond drilling methods through  
rock fill into bedrock on  
Oct. 8 and 9, 1974.

### (2) Water Level Records:

Elapsed Time	Water Level in Borehole	Hole Open To
on com- pletion	7.7 ft.	in casing
after 1 day	7.6 ft.	7.8 ft.
after 3 days	dry	4.3 ft.

### (3) Core Drilling Records:

Run #1  
AX Core  
Run #2  
AX Core  
Run #3  
AX Core  
Run #4  
AX Core



CORE DRILLING RECORDS (Hole 6N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	7.0 to 11.0	85	25	Fairly sound, moderately fractured granite gneiss, 50% water return, full pressure.
2	11.0 to 15.0	90	10	Fairly sound, moderate to well fractured granite gneiss, full pressure, no water return, losing water return around casing in overlying porous rock fill.
3	15.0 to 18.7	83	10	Fairly sound, moderate to well fractured granite gneiss, full pressure, 50% water return, losing water return around casing in overlying porous rock fill.
4	18.7 to 23.7	100	85	Sound, intact granite gneiss, full pressure, 50% water return, rest of water presumed lost around casing in overlying porous rock fill.
				Casing ran approximately 2 inches into rock



# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 7N

DRAWING No. 8

PROJECT Proposed Bridge Replacement  
 LOCATION North Branch of West Arm  
Lake Nipissing  
 HOLE LOCATION AND DATUM SEE DRAWING No. 1

AUGER SAMPLE  
 1" O.D. SPLIT TUBE  
 2" I.D. SHELBY TUBE  
 2" DIA. CONE  
 PUSHED  
 VANE TEST AND SENSITIVITY (S)  
 LAB. VANE TEST

NATURAL MOISTURE  
 PLASTIC AND LIQUID LIMIT  
 UNDRAINED TRIAXIAL AT  
 OVERBURDENED PRESSURE  
 % STRAIN AT FAILURE  
 POCKET PEN.

## SOIL DESCRIPTION

ELEV.  
FEET

DEPTH  
FT.

PENETRATION RESISTANCE  
 350 FT. LAB. BLOWS FT.  
 20 40 60 80  
 SHEAR STRENGTH K.S.F.

NATURAL MOISTURE CONTENT  
 AND  
 ATTERBERG LIMITS  
 % DRY WEIGHT

NATURAL  
UNIT  
WEIGHT  
P.C.F.

FILL-mostly blasted rock frag-  
 ments & boulders in sand,  
 gravel & silt matrix, moist  
 (dense)

BEDROCK (Granite Gneiss)  
 crystalline, intact foliated,  
 pink with numerous thin bands of  
 black biotite, medium, inequi-  
 angular grained, non calcareous  
 (sound)

## END OF BOREHOLE

### Notes

(1) Bedrock advanced through  
 rock fill using cased wash  
 boring techniques and diamond  
 drilling methods through boulders.  
 Hole put down on Oct. 9, 1974.

(2) Approximately 12 inches of  
 fill added at drill location to  
 position drill.

### (3) Water Level Records:

Elapsed Time	Water Level in Borehole	Hole Open To
on com- pletion	2 ft.	
after 3 days	2 ft.	

### (4) Core Drilling Records:

0/zero penetration

Run #1  
AX Core

Run #2  
AX Core

Run #3  
AX Core



CORE DRILLING RECORDS (Hole 7N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	6.0 to 8.0	79	10	Full pressure, full water return, sound, intact, granite gneiss.
2	8.0 to 13.0	95	60	Full pressure, 80% water return, sound intact, granite gneiss.
3	13.0 to 18.0	95	40	Full pressure, full water return, rock sound, sound intact granite gneiss.

## BOREHOLE No. 8N

DRAWING No. 9

**A**

William Trow Associates Ltd.

CORE DRILLING RECORDS (Hole 8N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	4.5 to 9.5	96	0 to 6.5 ft. then 50%	Mainly broken and fractured granite gneiss to 6.5 ft., then relatively sound, intact rock below. Moderate pressure to 6.5 feet then full pressure below. No water return, losing water around casing into overlying porous rock fill. Could be a large boulder to 6.5 ft. depth.
2	9.5 to 14.5	97	98	Sound, intact granite gneiss, full pressure, no water return, losing water around casing into porous overlying rock fill.
3	14.5 to 19.5	98	100	Sound, intact granite gneiss, full pressure, no water return, losing water around casing into porous overlying rock fill.

(4) Chemical Tests on Groundwater:

Sulphate Concentration  
 SO<sub>4</sub> (p.p.m.) = traces  
 pH = 7.0

BOREHOLE No. 9N

DRAWING No.

PROJECT Proposed Bridge Replacement

## Lake Nipissing

HOLE LOCATION AND DATUM SEE DRAWING NO. 1

AUGER SAMPLE

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

### VANE TEST AND SENSITIVITY (5)

### LAB. VANE TEST

## NATURAL MOISTURE

### PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT

OVERBURDENED PRESSURE 15  5

% STRAIN AT FAILURE

POCKET PEN.



CORE DRILLING RECORDS (Hole 9N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	19.7 to 23.7	85	40	Mostly sound, relatively sound granite gneiss, full pressure, approximately 80% water return.
2	23.7 to 26.7	85	50	Mostly sound, relatively sound granite gneiss, full pressure and full water return.
3	26.7 to 30.7	95	70	Sound, intact granite gneiss, full water return and full pressure.
				Casing ran 3 inches into bedrock.

# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 10N

DRAWING No. 11

PROJECT Proposed Bridge Replacement

LOCATION North Branch of West Arm

Lake Nipissing

HOLE LOCATION AND DATUM SEE DRAWING No. 1

AUGER SAMPLE

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

VANE TEST AND SENSITIVITY (S)

LAB. VANE TEST

NATURAL MOISTURE

PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT

OVERBURDENED PRESSURE 15

% STRAIN AT FAILURE

POCKET PEN.

X

10

0

10

A

## SOIL DESCRIPTION

ELEV.  
FEET

DEPTH  
FEET

PENETRATION RESISTANCE

360 FT. LAB. BLOWS FT.

20 40 60 80

SKLAR STRENGTH

K.S.F.

NATURAL MOISTURE CONTENT

AND

ATTERBERG LIMITS

% DRY WEIGHT

NATURAL

UNIT

WEIGHT

P.C.F.

WATER

642.7

5

10

15

20

25

30

35

40

45

50

BEDROCK (Granite Gneiss)  
crystalline, intact foliated,  
pink with numerous thin bands of  
black biotite, medium inequi-  
angular grained, non calcareous  
(sound)

625

END OF BEDROCK

615

Notes

(1) Borehole advanced from  
raft using diamond drilling  
techniques on Oct. 30, 1974.

(2) Core Drilling Record:

Run #1  
AX Core

Run #2  
AX Core



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CORE DRILLING RECORDS (Hole 10N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	17.5 to 22.5	100	60	Sound, intact granite gneiss, full pressure and full water return.
2	22.5 to 27.5	100	75	Sound, intact granite gneiss, full pressure and full water return.
				Casing ran 4 inches into bedrock.

(3) Chemical Tests on River Water:

Sulphate Concentration

SO<sub>4</sub> (p.p.m.) = traces

pH = 7.0



BOREHOLE No. 11N

DRAWING No. 12

PROJECT Proposed Bridge Replacement  
LOCATION North Branch of West Arm  
Lake Nipissing

HOLE LOCATION AND DATUM SEE DRAWING No. 1

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

### VANE TEST AND SENSITIVITY (6)

### LAE. VANE TEST

### NATURAL MOISTURE

PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT

OVERBURDENED PRESSURE

% STRAIN AT FAILURE

POCKET PEN.

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	PENETRATION RESISTANCE		NATURAL MOISTURE CONTENT AND ATTEBERG LIMITS			NATURAL UNIT WEIGHT P.C.F.
				300 FT. LAB. BLOWS FT.		% DRY WEIGHT			
				20	40	60	80	10	
				SHEAR STRENGTH		K.S.F.			
	WATER	642.7							
			5						
			10						
			15						
		626	20						
	SAND-fine, grey, some cobbles & boulders, river alluvium (loose)								
		622	25						
	BEDROCK (Granite Gneiss) crystalline, intact foliated, pink with numerous thin bands of black biotite, medium inequi- angular grained, non calcareous (sound)								
		613	30						
	END OF BOREHOLE		35						
	Notes (1) Borehole advanced from raft using cased wash boring techniques then diamond drilling method on Oct. 30, 1971. (2) Core Drilling Records:		40						
			45						
			50						
									Run #1 AX Core
									Run #2 AX Core

CORE DRILLING RECORDS (Hole 11N)

RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	20.0 to 25.0	98	65	Sound, intact granite gneiss, full water return and full pressure.
2	25.0 to 30.0	100	80	Sound, intact granite gneiss, full water return and full pressure.
				Core ran 6 inches into bedrock.

# BOREHOLE LOG

JOB No. S-2429

BOREHOLE No. 12N

DRAWING No. 13

PROJECT Proposed Bridge Replacement

LOCATION North Branch of West Arm

Lake Nipissing

HOLE LOCATION AND DATUM SEE DRAWING NO. 1

AUGER SAMPLE

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

VANE TEST AND SENSITIVITY (S)

LAB. VANE TEST

NATURAL MOISTURE

PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT  
OVERBURDENED PRESSURE 15

% STRAIN AT FAILURE

POCKET PEN.

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT	PENETRATION RESISTANCE 350 FT. LAB. BLOWS FT.				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT			NATURAL UNIT WEIGHT P.C.F.
				20	40	60	80	10	20	30	
	WATER	642.7									
			5								
			10								
		630.2	15								
	SAND, GRAVEL & COBBLES-brown and grey, wet, traces of silt, river alluvium (loose then dense @ base)										
		625	20								
	BEDROCK (Granite Gneiss) crystalline, intact foliated, pink with numerous thin bands of black biotite, medium grained non calcareous, inequangular (sound)										
			25								
			30								
	END OF BOREHOLE	615	35								
	Notes (1) Borehole advanced from raft using cased wash boring techniques and diamond drilling methods on Oct. 31, 1974. (2) Core Drilling Records:		40								
			45								
			50								

Run #1  
AX Core

Run #2  
AX Core



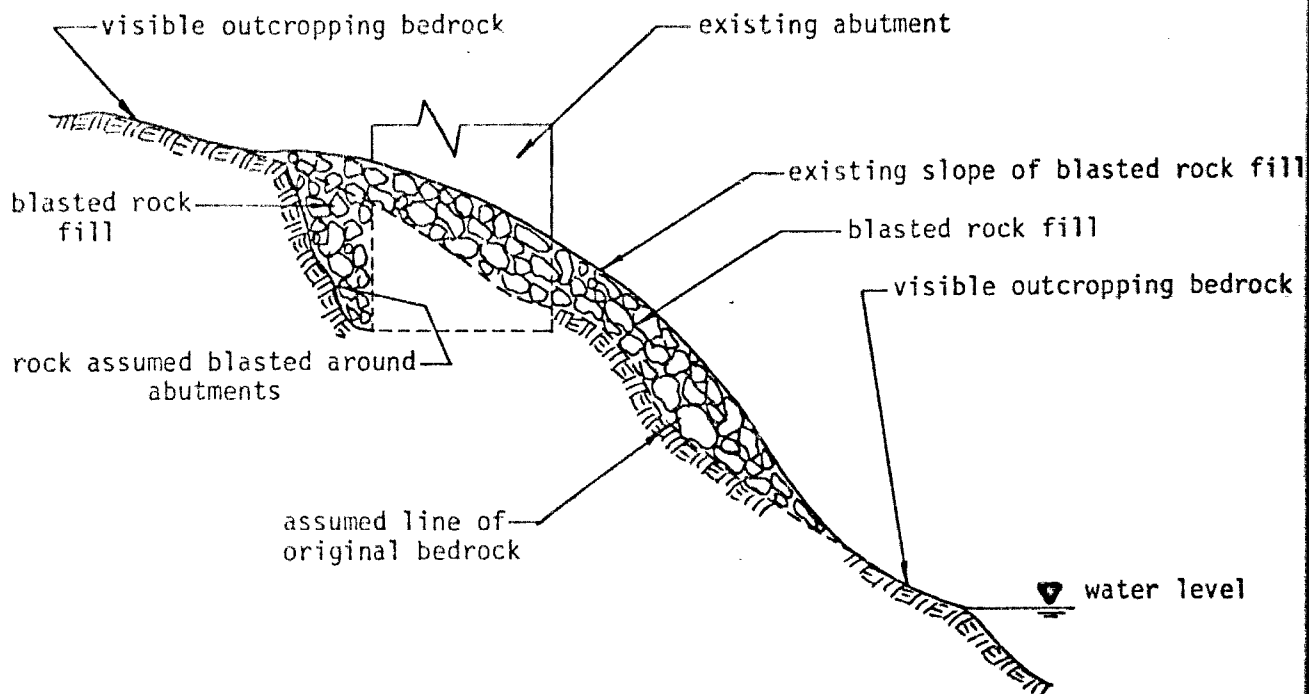
William Trow Associates Ltd.

CORE DRILLING RECORDS (Hole 12N)

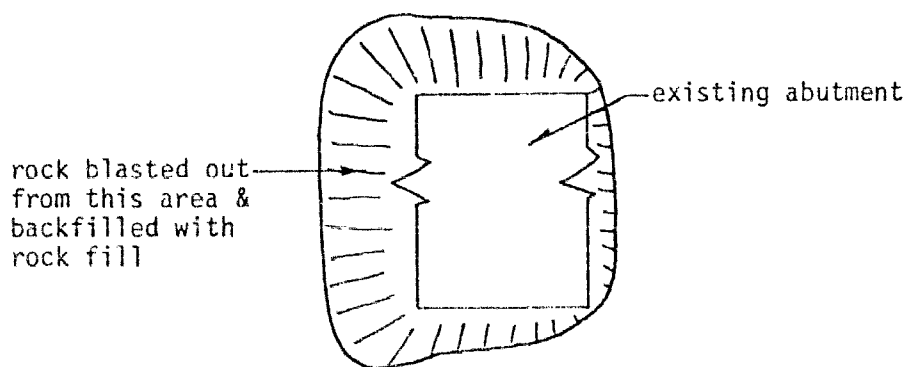
RUN NO.	DEPTH (ft.)	% REC.	R.Q.D. %	REMARKS
1	17.7 to 22.7	90	40	Sound, intact granite gneiss, 90% water return and full pressure.
2	22.7 to 27.7	100	60	Sound intact granite, full water return and full pressure.
				Casing ran 2 inches into rock.



# DIAGRAMATIC REPRESENTATION OF ROCK FILLING AT ABUTMENTS




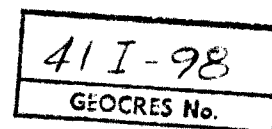
## ASSUMED TYPICAL SECTION THROUGH ABUTMENT



NOT TO SCALE

## ASSUMED PLAN AT ABUTMENT

*File*   
*Sail Mechanics*



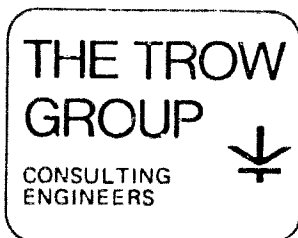
ADDENDUM 1  
FOUNDATION INVESTIGATION  
PROPOSED BRIDGE REPLACEMENT  
CROSSING AT THE NORTH CHANNEL  
WEST ARM OF LAKE NIPISSING  
TOWNSHIP OF HADDO  
DISTRICT OF SUDBURY, ONTARIO  
YOUR REF. W.O. 73-73-04  
*CONT. 75-46*

PREPARED FOR:  
MINISTRY OF TRANSPORTATION & COMMUNICATIONS

Project: S-2429  
November 21, 1974

WILLIAM TROW ASSOCIATES LIMITED  
Toronto, Hamilton, Sudbury,  
London, Edmonton

562 Notre Dame Avenue  
Sudbury, Ontario  
(705) 674-9681



S-2429

## WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED

Soil Mechanics Consultants - Inspection and Testing Engineers  
362 Notre Dame Avenue, Sudbury, Ontario P3C 5L2  
674-9681 - 675-1600

Ian W. Gore, M.E.I.C., P.Eng.  
Manager

November 21, 1974

Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office  
Ministry of Transportation & Communications  
1201 Wilson Avenue, Design Services Branch  
First Floor, West Building  
Downsview, Ontario  
M3M 1J8

ATTENTION: Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office

RE: Addendum 1  
Foundation Investigation  
Proposed Bridge Replacement  
Crossing at the North Channel  
West Arm of Lake Nipissing  
Township of Haddo  
District of Sudbury, Ontario  
Your Ref. W.O. 73-73-04

Dear Sirs:

A meeting was held at this office on November 18, 1974, with your Messrs. M. Devata, P. Eng. and A. Prakash, P. Eng. The purpose of the meeting was to discuss an alternative foundation proposal (if the west alignments are selected for this crossing) i.e., establishing the abutments on rock fill. This procedure would considerably reduce the installation problems associated with the previously recommended alternatives, using caissons or pier footings in bedrock below the water level.

Our comments related to this proposal are outlined below:

1. Referring to the midstream boreholes (9N to 10N) in Trow report S-2429 prepared on November 18, 1974, it can be seen that, in the area of the proposed abutments, the subsoil generally consists of approximately



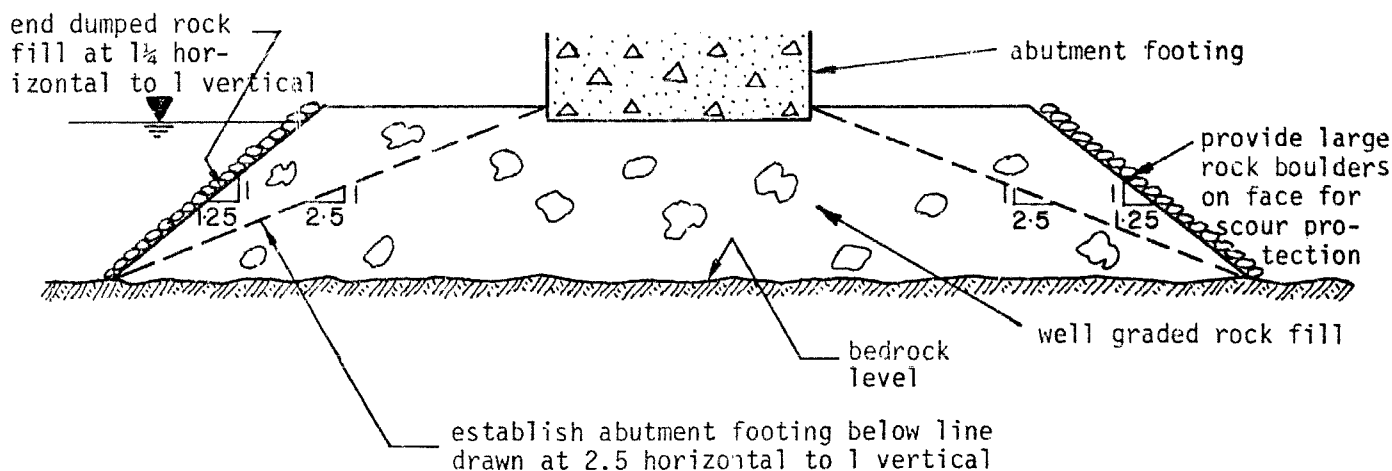
a 4 to 5 feet thick veneer of sand, gravel and boulders overlying granite gneiss bedrock. At the location of hole 9N, approximately 5 feet of rock fill was encountered overlying the sand and gravel, and at hole 10N, bedrock outcrops.

2. The depth to bedrock in these areas appears to be approximately 17 to 20 feet below present water level. The depth of water to the river bottom is in the order of 12 to 17 feet.

3. It is proposed to end dump rock fill below the water level to form the approach embankments and to establish the abutment footings on the rock fill. It is our opinion that this method is feasible provided:

(a) The rock fill selected should consist mainly of well graded rock fragments with a maximum size in the order of 12 inches. The outer limits of the fill, which do not contribute directly to supporting the abutment footing, should consist of larger boulders to provide sufficient scour protection. The size of boulders required for scour protection can be determined from maximum flows, etc.

(b) The rock fill, when end dumped into the water, will probably settle to an angle of repose of approximately  $1\frac{1}{4}$  horizontal to 1 vertical. The abutments, however, should not be set closer to the edge of the fill than a safe line drawn at  $2\frac{1}{2}$  horizontal to 1 vertical from the base of the rock fill. (See sketch below.)





(c) Once the fill reaches the water level, the surface should be compacted. This can be achieved using a heavy vibratory roller of at least 10 ton capacity, or more effectively, "deep compaction\*" using heavy weights dropped on the rock fill surface from varying heights.

4. The rock fill can be placed directly on the granular sand, gravel and boulders where it overlies the bedrock in the river bed.

5. The allowable bearing pressure on the rock fill should not exceed 4000 p.s.f.

6. It is not possible to predict accurate settlement values. Based on previous experience, it is probable that the settlements will be in the order of 0.5 % to 1.0% of the height of rock fill. If the rock fill is carefully selected as a well graded crushed rock and the surface is thoroughly compacted (as outlined above) then the settlements will probably be in the lower range, i.e., 0.5% of the height. On the other hand, if the rock fill is poorly graded (allowing potential voids), then the settlements could be much greater.

7. In order to reduce the possibility of differential settlements across the abutments, (resulting from a variable river bed and bedrock profile with corresponding irregular depths of rock fill) it is recommended that the bedrock surface be levelled prior to placing the fill. With a uniform height of rock fill beneath the abutments, differential settlements will be minimized.

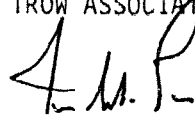
8. It may be possible to incorporate 'jacking' devices below the bridge deck across the abutments to counteract the possibility of any slight differential movement by adjusting periodically as required. It is expected that any settlements which are likely to occur will take place in the first approximately 12 months.

\*"A Low Cost Method of Consolidating Fills Dumped"  
Louis Menard

If you have any questions on the contents of this letter, please do not hesitate to contact this office.

Yours very truly,

WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED



I. W. Gore, P. Eng.

IWG:gmw

Dist: Ministry of Transportation (12)  
and Communications  
Attention: Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office

MEMORANDUM

TO: Mr. C. Mirza, Head,  
Soil Mechanics Section,  
West Bldg. DOWNSVIEW

FROM: Structural Planning  
North Bay  
Northern Region

ATTENTION: Mr. L. Colby

DATE: August 19, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT:

M.F. 73-73-04, Site 43-123,  
North Channel, West Arm Lake Nipissing,  
M.F. 73-73-02, Site 43-124,  
South Channel, West Arm Lake Nipissing,  
Hwy. # 64, District # 13, North Bay.

Attached are two copies of the Preliminary bridge drawings,  
Site plan and profile, and field reconnaissance report for the  
above structures.

Would you please arrange to have a foundations investigation  
carried out as soon as possible. We would like borehole data at  
the the locations shown in red on the bridge plans so that  
absolute bedrock locations may be established.

We would appreciate your comments and recommendations.

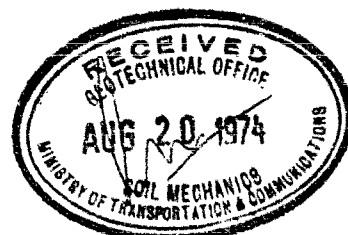
*note  
Lm*

CM/JS/004/cc

*C. Verhulst*

C. VERHULST,  
FOR: J. C. McALLISTER,  
REG. STRUCTURAL PLANNING SUPERV.

*sent copy to  
Jim Anderson*



## MEMORANDUM

TO: Mr. C. Mirza, Head,  
Soil Mechanics Section,  
West Building, Downsview.

FROM: Structural Planning Office,  
Northern Region.

ATTENTION: Mr. K. Selby

DATE: September 5, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 73-73-04, Site 43-123,  
North Channel, West Arm Lake Nipissing,  
Highway 64, District 13, North Bay.

Attached are two copies of the site plan and profile for the above structure.

*KG*  
*Note*  
*→*  
*lu*

The suggested bore hole locations have been changed from those sent to you previously due to the proposed alignment changes shown on the revised site plan.

CV:JCMcA:tp  
Attach. two (2)

*C. Verhulst*

C. Verhulst,  
For:  
J.C. McAllister,  
Reg. Structural Planning Supervisor



Mr. A. Rutka,  
Manager,  
Geotechnical Office,  
West Bldg., Downsview.

Soil Mechanics Section,  
Geotechnical Office,  
West Bldg., Downsview.

September 16th, 1974.

Request for Consultant Assignment,  
W.P. 73-73-04, Site 43-123,  
North Channel, West Arm Lake Nipissing,  
Hwy. 64, District #13, North Bay.

We received a foundation investigation request for  
the above project on September 8th, 1974.

The present work load in the Soil Mechanics Section  
exceeds its production manpower capacity and we are unable  
to comply with the schedule (due date: October 9th, 1974)  
on the above project. Consequently, we request that  
Geotechnical services be provided by one of the following  
Consultants: -

Dominion Soil Investigation Ltd.  
Morton, Dodds and Partners  
Trow, William Associates Ltd.

These Consultants have no current work assignments  
from our Section. Our current expenditure to date on  
consultants this fiscal year is zero.

We estimate the drilling costs at \$3,000 and engineering  
costs at \$3,000 for a total of \$6,000. Due to the unknown  
subsoil and terrain conditions and a possibility of alignment  
shifts as work progresses, the above estimate may be subject  
to considerable error.

P. Payer,  
Senior Engineer,  
For: C. Mirza,  
Head, Soil Mechanics Section.

PP/mj  
c.c. Files  
Documents

# MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

## MEMORANDUM

TO: Mr. A. Rutka  
Manager,  
Geotechnical Office

FROM: Soil Mechanics Section  
Geotechnical Office

ATTENTION:

DATE: September 17, 1974

OUR FILE REF. W.P. 73-73-04

IN REPLY TO

SUBJECT: REQUEST FOR CONSULTANT ASSIGNMENT  
GEOTECHNICAL CONSULTANTS - STANDING LIST DATED: SEPTEMBER 17, 1974

ENGINEERING Routine Project ☒ TECHNICIAN ☐ SPECIALIST ☐  
SERVICE Complex Project ☐ SERVICE ☐ SERVICE ☐

W.P. 73-73-04\* TYPE Str. HWY. 64 DISTRICT 13 SITE NO. 43-123

LOCATION Lake Nipissing Br. N.W. Arm, 11.9 mi N. of Sec. Hwy. 535

CURRENT PROGRAM YEAR 1976-77 VALUE \$ 140,000 SCHEDULED DUE DATE Oct. 9/74

NATURE OF ASSIGNMENT Complete foundation investigation, including drilling, testing, ~~analysis~~ and reporting.

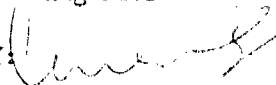
JUSTIFICATION Soil Mechanics Section presently has two vacancies in engineer complement and is unable to respond effectively to rush jobs. Also, no consultant assignments have been made to date. W.P. 73-73-02 is also being requested for assignment to consultants.

RECOMMENDED CONSULTANT(S)	EST. TOTAL COST	REMARKS
1. W. Trow Associates Ltd.	\$6,000	Because of unknown nature of subsoil (no data in GEOCRESS) & possibility of alignment shifts as work progresses, the estimated total cost may be exceeded by 50-75% due to additional drilling requirements.  For estimating purposes, engineering costs have been assumed to be equal to drilling costs.
2. Geocon Limited	\$6,000	
3. Dominion Soil Investigation Ltd.	\$6,000	
4.		

\* Group W.P. 261-62-02

cc: Files ☒  
Documents

PREPARED BY: P. Payer  
Senior Engineer

AUTHORIZED BY:   
DATE: September 17/74

GEOTECHNICAL OFFICE  
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. B. Wilkes,  
Executive Director,  
Design Division.

FROM: A. Rutka

ATTENTION:

DATE: September 18, 1974

OUR FILE REF:

IN REPLY TO:

SUBJECT:

Request for Consultant Services

I am submitting two forms requesting the hire of consultants to undertake foundation investigations for the following two projects:

1. W.P. 73-73-02 - Hwy. 64 - Lake Nipissing Br. S.W. Arm -  
10.5 Mi. N. of Sec. Hwy. 535.
2. W.P. 73-73-04 - Hwy. 64 - Lake Nipissing Br. N.W. Arm -  
11.9 Mi. N. of Sec. Hwy. 535.

I am also enclosing a standing list of Geotechnical Consultants which may be referred to in subsequent requests of this nature.

W. Trow Associates Ltd. and Geocon Ltd. have Geotechnical Offices in Sudbury and, hence, have been given preference over other consultants. In view of the close proximity of both projects, it is recommended that they be assigned to the same consultant.

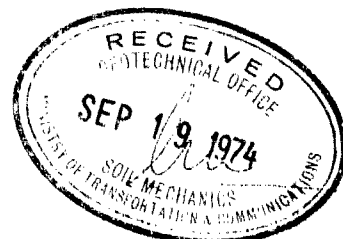
An early approval would be appreciated as our schedule due date for both projects is October 9, 1974.

*A. Rutka*

AR/MdeF  
Attach. (3)

A. Rutka  
Manager, Geotechnical Office

cc: Mr. C. Mirza:



my 7 - Please make copy for each file one for each one.

Ministry of  
Transportation  
and  
Communications

Geotechnical Office,  
1st Floor, West Building,  
1201 Wilson Avenue,  
Downsview, Ontario M3M 1J8.

Telephone: (416) 248-3255

October 7, 1974

William Trow Associates Ltd.,  
Consultants,  
43 Baywood Road,  
Rexdale, Ontario M9V 3Y8.

Attention: Dr. K. Peaker

Dear Sirs:

I am enclosing three (3) copies of the Geotechnical Services Consultant's Agreement Form for the following two projects:

1. Hwy. 64 - W.P. 73-73-04 - North Channel, West Arm,  
Lake Nipissing.
2. Hwy. 64 - W.P. 73-73-02 - South Channel, West Arm,  
Lake Nipissing.

Information on these two projects was given to your Dr. Peaker on October 3, 1974.

This Agreement Form has been signed by Mr. J. B. Wilkes on behalf of the Ministry, and we would be pleased if you would sign and seal two copies and return them to me, retaining one copy for your files.

Section 1.8.1 of this Agreement requires the Consultant to submit an estimate of total fees and staff list within seven (7) days of the execution of this Agreement. If you plan on utilizing principals and executive engineers during the course of these studies, they should be included on the staff list. As indicated in Section 1.8.1, the staff list is subject to approval by the Ministry.

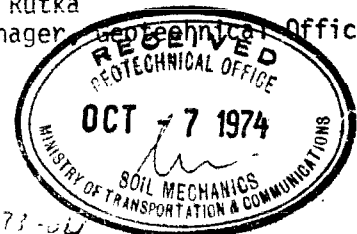
Yours truly,

AR/MdeF  
Encls. (3)

cc: Mr. J. B. Wilkes (D. Fry)

Mr. C. Mirza ✓

A. Rutka  
Manager, Geotechnical Office



*on J 2 one copies to file 73-73-04  
" " " " 73-73-02*

*this to W-Trow file*



101A  
**WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED**

Soil Mechanics Consultants - Inspection and Testing Engineers  
562 Notre Dame Avenue, Sudbury, Ontario P3C 5L2  
674-9681 - 675-1600

Ian W. Gore, M.E.I.C., P.Eng.  
Manager

**THE TROW  
GROUP**

CONSULTING  
ENGINEERS



S-2429

October 21, 1974

Mr. A. Rutka, P. Eng.  
Material & Testing Engineer  
Ministry of Transportation & Communications  
Material and Testing Division  
1201 Wilson Avenue  
Downsview, Ontario

ATTENTION: Mr. M. Devata, P. Eng.  
Supervisor - Engineering

RE: Foundation Investigation  
Proposed Crossing at  
North Branch - West Arm Lake Nipissing  
Highway 64, Township of Haddo  
District of Sudbury, Ontario

IVF 13-07-04

Dear Sirs:

We have almost completed the boreholes on land for the North Branch Crossing.

At the north abutment (east side), approximately 6 to 7 feet of blasted rock fill was encountered at each of the two borehole locations overlying sound bedrock. In the two holes on the west side (north abutment), the rock fill is somewhat deeper, in the order of 11 to 15 feet. At the south abutment (east side), the rock fill appears to be approximately 12 to 13 feet thick. We have yet to drill on the west side of the south abutment, although it appears that the rock fill will be in the same order of thickness as was encountered on the east side.



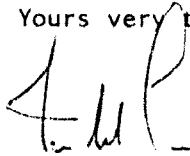
From the boreholes to date, it appears that foundation conditions will be straightforward. The sound bedrock has an allowable bearing pressure of at least 15 t.s.f. Although the fill above the rock consists mainly of large blasted rock boulders, it will be possible to excavate to rock with heavy mechanical equipment. On the other hand, excavation into the rock where required will require pre-blasting.

At this stage, it is important to let us know whether you still require the four mid stream boreholes in the North Branch Channel. We have not mobilized the raft to the site pending your decision.

For your information, we are ahead of the schedule as outlined in my letter of October 8th, 1974.

If you require any additional information, please do not hesitate to contact this office.

Yours very truly,



I. W. Gore, P. Eng.  
WILLIAM TROW ASSOC. (SUDBURY) LTD.

IWG:gmt

Dist: Ministry of Transportation & Communications (3)  
Attention: Mr. M. Devata, P. Eng.  
Supervisor - Engineering

Mr. J.E. Gruspier,  
Manager,  
Engineering Services,  
Northern Region, North Bay.

Soil Mechanics Section,  
Geotechnical Office,  
West Building, Downsview.

November 22nd, 1974.

Foundation Investigation Reports  
by William Trow Associates Ltd.

- i) South Channel West Arm of  
Lake Nipissing, W.P. 73-73-02,
  - ii) North Channel West Arm of  
Lake Nipissing, W.P. 73-73-04.
- District #13, North Bay, Highway #64.

This memo is to confirm that one copy of the  
preliminary foundation report for each of the above  
sites were given to you at your office on November 19th,  
1974.

M. Devata,  
Supervising Engineer.

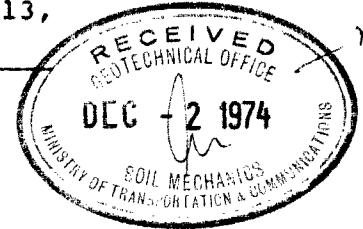
MD/mj

M Devata

MINUTES OF MEETING

NOVEMBER 26, 1974, WEST BUILDING, DOWNSVIEW.

**SUBJECT:** West Arm of Lake Nipissing Bridge,  
North Branch, Hwy. 64, District 13,  
W.P. 73-73-03. (4)



**Present:** B. Davis,  
S. McCombie,  
M. Devata,  
P.O. Law,  
C.S. Grebski.

This meeting was a sequel to the earlier meeting held in North Bay on November 18th at which time it was agreed cost estimates would be prepared for the alternate line proposed by the Structural Office. The alternate line proposed is on or near the existing line which has bedrock exposed at the surface at both abutments.

The line as set by the Region (Line 'M') has sloping bedrock at both abutments with a maximum depth of water to bedrock of 20 feet at the west side of the abutments.

In order to make the bridge abutments structurally stable on the sloping bedrock of Line 'M' it is necessary to place concrete pedestals down to bedrock through overburden and water. The Structural Office estimated the extra cost of these pedestals at about \$45,000.

Another method proposed by Mr. Devata was that of placing the abutments on concrete caissons thirty inches in diameter, however it was agreed that this method would be more expensive than the concrete pedestals.

A further method proposed by S. McCombie was to blast the sloping bedrock (underwater) and place rock fill to the underside of the abutment footings. There was some question as to whether the blasted rock should be removed and then replaced with rock fill or simply left in place. Mr. Devata stated he did not have any previous experience with this type of operation and he could not guarantee that there would be uniform settlement of the rock fill across the width of the abutment footings. Due to the uncertainties associated with this scheme it was agreed not to proceed with it.

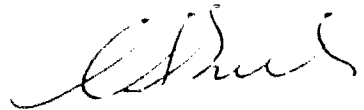
Mr. McCombie stated that changing the line to or near the existing line would necessitate a Bailey bridge for detour purposes and the Region estimated the cost of a 180 ft. bailey at \$30,000 and rock fill at \$25,000 for a total of \$55,000 however there would be a saving of about \$10,000 in roadway costs for the line proposed by the Structural Office. This gives a net extra cost of about \$45,000, hence the total costs of the two alignments would be almost the same.

Mr. Grebski stated the advantages of the proposed Structural Office alignment on or near the existing roadway would be simpler construction of the abutment footings which would be on solid bedrock. There would be less likelihood of construction problems and possible contractor claims. Also the Bailey detour would allow heavy trucks to use Hwy. 64 during the construction period. The existing bridge has a load limit of only 11 tons.

Mr. McCombie stated there were several disadvantages from the Region's viewpoint in changing the alignment as recommended by the Structural Office. These were: 1) the Region was short of survey crews and it would be difficult to schedule this work in the allotted time. (Construction is scheduled for the '75 fiscal year.) 2) It would be difficult for the Material & Testing crew to take soil samples due to frozen ground conditions. 3) Some utilities relocation has been done for Line 'M'. 4) Some pine trees would have to be cut for the Structural Office alignment.

Mr. Davis suggested a compromise alignment between the two proposed lines. Mr. McCombie said this would have little benefit.

Due mainly to the possible delay in pre-engineering it was decided not to pursue the alignment change further and to proceed with the design of the bridge using concrete pedestals to bedrock.



CSG/cf

C. S. Grebski,  
Structural Design Engineer.

c.c. All in attendance  
c.c. H. McArthur  
J. Graspier  
A. Radkowski  
J. McAllister.

# MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

## MEMORANDUM

TO: Mr. J. McAllister (2)  
Reg. Structural Planning Engineer  
Northern Region, North Bay.

FROM: Soil Mechanics Section,  
Geotechnical Office,  
West Bldg., Downsview.

ATTENTION:

DATE: December 4th, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: Foundation Investigation Report Prepared  
by William Trow Associates Ltd., for  
Proposed Replacement Structure at the  
Crossing of North Channel West Arm of  
Lake Nipissing and Highway #64,  
Township of Haddo,  
District #13, W.P. 73-73-04.

Attached we are forwarding to you a detailed foundation report on the subsoil conditions existing at the abovementioned site, prepared by William Trow Associates Ltd.

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. In order to minimize construction problems, the existing alignment is the most favourable one since the footings can be constructed on sound bedrock at a relatively shallow depth. Alternatively, the structure can also be built on Line 'M' of Hwy. 64 as chosen by the Region and for this construction a roadway protection will be necessary to ensure the stability of the existing roadway and the abutments. Since the bedrock is sloping, the abutment foundations may be supported on Concrete Caissons keyed into the bedrock. It is our recommendation that the overburden (Blasted rock fill material) be excavated under water with a dragline and clam to expose the bedrock in the area of the abutment foundations prior to the installation of the caissons. Care must be exercised during construction to ensure that the foundations are established on sound bedrock and not on boulders or blasted rock fill.

Embankment construction utilizing rock fill will be stable with  $1\frac{1}{4}$  horizontal to 1 vertical slopes. It appears that there are some minor corrections required on the drawings and a revised drawing will be forwarded to you in the near future. Should additional information be required, please do not hesitate to contact our Office.

*M. Devata*  
M. Devata,  
Supervising Engineer.

MD/mj

cc: E.J..Orr, J.E. Graspier,  
B.R. Davis, G.A..Wrong,  
H. McArthur, P. Lewycky,  
D.S..Cornell, S. McCombie.  
E.J..Giroux, Files  
Documents



## Memorandum

To: Mr. J. Hollister,  
Reg. Structural Planning Engineer,  
Structural Planning Office,  
North Bay Regional Office.

From: Structural Office,  
West Building,  
Downsview, Ontario.

Attention:

Date: December 11, 1974.

Our File Ref.

In Reply to

Subject:

West Arm Lake Nipissing Bridge  
North Branch  
W.P. 73-73-04, Site 43-123  
Rwy. #64, District #13

Attached herewith are prints of the revised  
Preliminary Bridge Plan Dwg. 43-123-P2.

Please disregard preliminary plans presently  
in your possession.

*Throw these  
out please!  
You have  
any.*

Except for revisions in the design of abutments,  
there are no other changes regarding span or clearances.

The estimated cost of the proposed structure is  
\$240,000.00 which includes tender, materials, engineering  
and sundry construction.

Any comments you may have should be submitted at  
your earliest convenience.

  
C.S. Grebski,  
Structural Design Engineer.

CSC/ac

Attached.

c.c. G.R. Davis  
W.D. Birch  
A.D. McKim  
A. Radkowski  
T. Stoyanoff  
C. Mirza ✓  
J. Anderson  
R. Murphy  
S. Edwards



Mr. C. L. Grabaki  
Structural Design Engineer  
West Building, Downsview.

Soil Mechanics Section  
Geotechnical Office  
West Building, Downsview.

Mr. A. Radkowski

December 27th, 1974

Re : Preliminary Plan  
West Area Lake Nipissing Bridge  
North Branch  
W.P. 73-73-04 : Site # 43-123  
District # 13, (North Bay)

A meeting was held between the Structural Design Section (Mr. A. Radkowski and Mr. P. O. Law) and the Soil Mechanics Section (Mr P. Payer) to discuss the design details shown on the preliminary plan (sheet P2) of the above project.

It was agreed that the 'granular backfill' to the abutments and 'tremie concrete' for the footings below the prevailing water level, will be shown on the final bridge drawing.

P. Payer  
Senior Engineer

For :

M. Devata  
Supervising Engineer

PP:jw  
cc. Files

Documents







Ministry of  
Transportation and  
Communications

## Memorandum

To: Mr. C. Mirza,  
Head, Soil Mechanics Section,  
West Building, Downsview.

From: Structural Office,  
West Building, Downsview.

Attention:

Date: January 23rd, 1975.

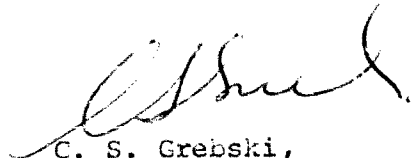
Our File Ref.

In Reply to

Subject: West Arm Lake Nipissing Bridge, North Branch,  
Twp. of Haddo, Lot 1, Conc. 3, Hwy. 64,  
W.P. 73-73-04, Site 43-123,  
District #13.

Attached herewith we are submitting the final bridge  
drawings which show the foundation design for this structure.  
Kindly give us your comments at your earliest convenience.

CSG/cf  
Atch.

  
C. S. Grebski,  
Structural Design Engineer.



Mr. C.S. Grabski,  
Structural Design Engineer,  
West Bldg., Downsview.

Soil Mechanics Section,  
Geotechnical Office,  
West Bldg., Downsview.

January 24th, 1975.

RE: West Arm Lake Nipissing Bridge,  
South Branch, Highway #64,  
District #13, North Bay,  
W.P. 73-73-02, Site 43-124.

We have reviewed the final bridge drawings for this structure and our comments are as follows:

Bedrock elevations shown on Sheet 3 do not agree with the elevations shown on the foundation drawing prepared by William Trow Associates Ltd. Elevations of bedrock surface in various boreholes, according to Trow Associates are as follows:

<u>Borehole No.</u>	<u>Bedrock Elev. in Ft.(Approx.)</u>
1S	646
2S	647
3S	655
4S	648
5S	649
6S	646
7S	649
8S	653

The bedrock should be shown at borehole locations only, and should not be connected by means of a straight line between the boreholes. A similar correction is being made on the foundation drawing.

Wording "Probable Sound Bedrock" should be changed to "Bedrock", because the bedrock is proven at the borehole locations.

These items were discussed and agreed upon by Mr. A. Radkowski during a meeting on January 22nd, 1975.

AP/ma  
c.c. Files  
Documents

A. Prakash,  
Senior Engineer.

**THE TROW  
GROUP**

CONSULTING  
ENGINEERS



S-2429

**WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED**

Soil Mechanics Consultants - Inspection and Testing Engineers  
562 Notre Dame Avenue, Sudbury, Ontario P3C 5L2  
674-9681 - 675-1600

Ian W. Gore, M.E.I.C., P.Eng.  
Manager

*WP 73-73-04*

February 17, 1975

Mr. A. Rutka, P. Eng.  
Manager, Geotechnical Office  
Ministry of Transportation & Communications  
1201 Wilson Avenue, Design Services Branch  
First Floor, West Building  
Downsview, Ontario  
M3M 1J8

ATTENTION: Mr. M. Devata, P. Eng.

RE: Addendum 2 - Foundation Investigation  
Proposed Bridge Replacement  
Crossing at the North Channel  
West Arm of Lake Nipissing  
Township of Haddo  
District of Sudbury, Ontario  
Our Ref. W.O. 73-73-04

*W.P.*

Dear Sirs:

As discussed with Messrs. M. Devata and A. Prakash, I enclose our revised drawing showing the interpreted soil strata for the above noted project.

I also include, for your information, the ground level at the present time in the immediate vicinity of the boreholes (see Table 1). These elevations are subsequent to our drilling operation and regrading procedure.



TABLE 1

APPROXIMATE ELEVATION OF GROUND LEVEL IN VICINITY OF  
BOREHOLES (RECORDED FEB. 12, 1975)

<u>BOREHOLE NO.</u>	<u>ELEVATION OF GROUND LEVEL</u>
1N	654
2N	653
3N	647
4N	645
5N	647
6N	651
7N	644
8N	648

The elevation of the bedrock remains unchanged.

If you have any questions, please do not hesitate to contact this office.

Yours very truly,  
WILLIAM TROW ASSOCIATES (SUDBURY) LIMITED

IWG:gmw  
Dist: Ministry of Transportation  
and Communications  
Attention: Mr. M. Devata, P. Eng. (3)

I. W. Gore, P. Eng.