MR. A. RUTKA, P.ENG.
CHIEF MATERIALS AND TESTING ENGINEER
DEPARTMENT OF HIGHWAYS OF ONTARIO
MACDONALD CARTIER FREEWAY AND KEELE STREET
DOWNSVIEW, ONTARIO

FOUNDATION INVESTIGATION
W.P. 331-65
AUMOND CREEK BRIDGE, HIGHWAY NO. 17
NEAR MATTAWA, ONTARIO

Project: J3372

February, 1967

William Trow Associates Limited

90 Mervan Drive
Weston, Ontario
749-1290

William Trow

Project: J3372

Soil Mechanics
Consultants
W. A. Trow
MSc. MEIC. P. Eng.
K. Peaker
PhD. MEIC. P. Eng.
D. H. Shields
PhD. MEIC. P. Eng.

Associates Ltd.

February 3, 1967

Mr. A. Rutka, P.Eng.,
Chief Materials and Testing Engineer,
Department of Highways of Ontario,
MacDonald Cartier Freeway and Keele Street,
Downsview, Ontario.

Attention: Mr. A. Rutka, P.Eng.

Foundation Investigation
W.P. 331-65
Aumond Creek Bridge, Highway No. 17
near Mattawa, Ontario

Dear Sirs:

Following your authorization of December 7th, 1966, we have carried out a foundation study at the above noted site. The field work was done during the period December 19th, 1966 to January 14th, 1967. A summary of our findings and recommendations is presented in the following paragraphs.

1) The subsoil at this site consists of very dense sand deposits containing gravel sizes and occasional boulders. A granite bedrock underlies the site at varying depths below the proposed diverted creek bed level. Water level at the time of the investigation was at approximate El 650 feet.

2) It is recommended that the bridge be founded on caissons or piles bearing on the rock. Alternatively, spread footings, bearing

on the sand and gravel deposits (or on the bedrock at some locations), can be used but excavation could be difficult.

Spread footings may be designed to a safe net bearing pressure of 5 tons per square foot provided that the footing base is not disturbed during excavation.

These points are expanded upon in the sections which follow:-

PROJECT

It is proposed to replace an existing bridge over Aumond Creek on Highway No. 17 and at the same time to divert the creek to eliminate a horseshoe bend. Present plans indicate that the structure will be a three span bridge some 115 feet in length. In addition to the foundation investigation for the bridge structure, probes were made along the line of the proposed stream diversion to detect the possible presence of bedrock above the proposed level of the new creek bed.

THE SITE

Aumond Creek is approximately 40 - 50 feet wide at this site and winds in a northwesterly direction towards the Ottawa River. The average flow in the creek was of the order of 100 ft/min.

Present water depths at the existing bridge are 3 to 4 feet. The site is situated among low hills and rock outcrops are apparent in the road cuts to the east and west of the site.

FIELD WORK AND SUBSOIL STRATIGRAPHY

The field work at this site consisted of 4 sampled boreholes at the proposed bridge location and 2 probes along the stream diversion line. These are located on the site plan drawing. All holes were advanced by wash boring and diamond drilling techniques.

The subsoil encountered is shown in detail on the borehole logs, Dwgs. 1 to 4 and in summary form on the site plan drawing. The stratigraphy was relatively simple, consisting of a very dense deposit of sand, containing gravel, and, occasionally, boulders, above a granite bedrock.

Water levels in the boreholes were found to be 5 to 10 feet above the surface of the adjacent creek. No artesian conditions were encountered.

FOUNDATIONS

The new bridge could be supported by spread footings founded at least 6 feet below the level of the new stream bed, i.e. below frost level. The actual founding level must be below

possible scour depth.

We understand that your hydrology section will advise you on the maximum depth of scour that could take place in an unprotected channel. If this depth is greater than 6 or 7 feet, then rip-rapping of the stream bed could be resorted to in reducing the depth of scour to, say, the 6 feet level.

It should be appreciated that even footings 6 feet below the stream bed will require excavation some 14 or 15 feet below the existing groundwater table. However, ringing the construction area with a ditch, and ditching to the creek to the north, would reduce the groundwater table to about El 644 feet, i.e. 1 foot above the creek level to the north. This reduces the depth of excavation below the groundwater level to possibly 8 or 9 feet. A large, oversize excavation of the approximate shape indicated in Dwg. 7 could be resorted to but the danger exists that the excellent bearing value of the founding soil could be disturbed. Alternatively, wellpoints could be used to depress the water table to the depth required. The use of wellpoints could ensure that the founding soil is not disturbed. The safe bearing value of the undisturbed sand deposit and the rock is at least 5 tsf - the value recommended for design.

It is obvious, however, that spread footings would bear on the sand and on the rock - the rock level at Hole 1 , for

instance, is at or higher than the required maximum founding level. Structurally, as well as for easier construction, it may be advantageous to design the bridge on columns bearing everywhere on rock. Cylindrical, cast-in-place piles, formed in casing jetted or drilled to rock, could extend upwards as columns to deck level for instance. If the piles are socketed or dowelled into the rock, they will be immune to scour. To assist with your appraisal of this foundation alternative, we will shortly report on the rock level at the north end of the easterly pier (between Hole 1 and 3). A cast-in-place pile foundation could do away with excavation below the groundwater table.

It is recommended that no attempt be made to support the proposed structure on driven piles. The piles would have to be pre-bored or jetted to guarantee the required penetration and scour could remove the soil from around the piles, possibly leading to their failure.

EARTH PRESSURES

If the approach fill does not spill through the abutments, they must be designed to withstand the lateral earth pressure exerted by the retained soil. Because present plans call for spill-through abutments we will not include the formulae for the earth pressures to use in the design of retaining abutments. If

retaining abutments are resorted to we would be pleased to supply the necessary design criteria.

STREAM DIVERSION

The information obtained from Holes 2 and 3 and unsampl. probes A and B, located on the site plan drawing, indicate that bedrock is below stream bed elevation - at least at these test locations. It is expected, therefore, that no rock will be encountered during excavation for the diversion.

If you would like to discuss any points arising from this report, please do not hesitate to call us. Thank you for this opportunity to be of service.

Yours very truly,

DYL/ss
Encls.
Dist:- (11)

D.Y. Larmour, MSc.

D.H. Shields, P.Eng.

WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING NO 1

PROJECT NO J3372

BOREHOLE NO. 1

PROJECT D.H.O. Br' ... .

LOCATION Hwy. 17 - Aumond Creek.

HOLE LOCATION 17.5 ft. left of Sta 416 + 61

HOLE ELEVATION 661.4 ft.

DATUM See Site Plan Dwg.

LEGEND

PENETRATION RESISTANCE
- 2" O.D SPLIT TUBE
- 2" I.D SHELBY TUBE
- 2" DIA CONE

SHEAR STRENGTH
- UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
- UNCONFINED COMPRESSION
- VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

ATTERBERG LIMITS
- LIQUID LIMIT
- PLASTIC LIMIT

SAMPLE TYPE
- 2" O.D. SPLIT TUBE
- 2" I.D SHELBY TUBE
- 3" O.D SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET
	3 inches TOPSOIL	661.4	0
	SAND- very dense, fine and medium with coarse sand and GRAVEL.		
	SAND becoming more coarse below 10 ft. depth.		10
	-Boulders at 15 ft. and 20 ft.depth and numerous gravel sizes below 22 ft.depth.		20
	BEDROCK- granite, sound.	634.4	30
	End of Borehole	627.2	

Notes: 1) Hole advanced cased using wash boring and diamond drilling techniques.
2) Water level in casing on completion 12.6 ft. On removal of casing hole open 5.5 ft., water level 5.0 ft. After 20 hours hole open and dry to 4.0 ft.
3) Dynamic cone penetration test driven 10 ft. north of borehole.

PENETRATION RESISTANCE 350 FT. LB BLOWS FT
20 40 60 80
SHEAR STRENGTH P.S.F

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND NO	NATURAL UNIT WEIGHT P.C.F.
1	
2	
3	
4	
5	
6	
7	
8	
9	
99% Recovery	
87%	

WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

DRAWING NO. 2

PROJECT NO. J3372

BOREHOLE NO. 2

PROJECT D.H.O. Bridge,

LOCATION Hwy. 17 - Aumond Creek.

HOLE LOCATION 69R of Sta 416 + 15

HOLE ELEVATION 658.9 ft.

DATUM See Site Plan Dwg.

LEGEND

PENETRATION RESISTANCE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 2" DIA. CONE

SHEAR STRENGTH
- UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
- UNCONFINED COMPRESSION
- VANE TEST AND SENSITIVITY

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

ATTERBERG LIMITS
- LIQUID LIMIT
- PLASTIC LIMIT

SAMPLE TYPE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 3" O.D. SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FEET
		658.9	0
	SAND- very dense, mainly medium and coarse, grey, moist, becoming wet at 13 ft.depth. Numerous GRAVEL.		
		650.5	10
	-large gravel sizes from 20 to 30 ft. depth.		20
	-large boulder at 36 ft.depth.		30
		619.9	40
	BEDROCK- granite, sound.		
	End of Borehole	609.6	50
			60
			70
			80
			90
			100
			110

PENETRATION RESISTANCE 350 FT LB BLOWS FT
20 40 60 80
SHEAR STRENGTH PSF

132
for 4"
for 5"
for 7"

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND NO

NATURAL UNIT WEIGHT P.C.F.

1
2
3
4
5
6
7
8

44% Recovery
100%
100%

Notes:
1) Hole advanced cased using wash boring and diamond drilling techniques.
2) Water levels on completion. With 10 ft. casing in ground hole open to 13.2 ft., water level at 10.0 ft. On removal of casing hole open to 9.7 ft., water level at 8.5 ft. After 3 hours and after 2 days hole caved and dry at 8.4 ft.
3) Dynamic cone penetration test 13 ft. west of borehole. Test 10 ft. west of borehole terminated on a boulder at 3 ft. depth.

WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING NO. 3

PROJECT NO. J3372

BOREHOLE NO. 3

PROJECT D.H.O. Bridge.

LOCATION Hwy. 17 - Aumond Creek.

HOLE LOCATION 18 ft. L of Sta 415 + 80

HOLE ELEVATION 662.9 ft.

DATUM See Site Plan Dwg.

LEGEND

PENETRATION RESISTANCE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 2" DIA. CONE

SHEAR STRENGTH
- UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
- UNCONFINED COMPRESSION
- VANE TEST AND SENSITIVITY (S$_t$)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

ATTERBERG LIMITS
- LIQUID LIMIT
- PLASTIC LIMIT

SAMPLE TYPE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 3" O.D. SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FEET
	1 inch TOPSOIL	662.9	0
	SAND- very dense, mainly medium and coarse, GRAVEL sizes, brown, moist, becoming wet at 12 ft.depth.		
	-sand becoming grey-brown and fine to medium below 14 ft. depth.	650.4	10
			20
			30
			40
	BEDROCK- granite, sound.	616.9	50
	End of Borehole	607.4	60
			70
			80
			90
			100
			110

PENETRATION RESISTANCE 350 FT. LB BLOWS/FT
20 40 60 80
SHEAR STRENGTH PSF

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND NO

NATURAL UNIT WEIGHT P.C.F.

1/2 110 Cyl 6" 110 Cyl 6" 120 Cyl 6" 130 Cyl 6" 135 Cyl 6" 100 Cyl 3"

1 2 3 4 5 6 7 8 9 10 11

95% Recovery

94%

Notes: 1) Hole advanced cased using wash boring and diamond drilling techniques.
2) Water level - in casing in morning before drilling commenced, at 14.5 ft.; on completion hole open to 12.8 ft., water level 12.7 ft. After 20 hours hole open and dry to 10.5 ft.
3) Dynamic cone penetration test driven at 9 ft. west of Hole 3.

WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING NO. 4

PROJECT NO. J3372

BOREHOLE NO. 4
PROJECT D.H.O. Bridge,
LOCATION Hwy. 17 - Aumond Creek.
HOLE LOCATION 6 R of Sta 415 + 40
HOLE ELEVATION 665.8 ft.
DATUM See Site Plan Dwg.

LEGEND

PENETRATION RESISTANCE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
SHEAR STRENGTH
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
UNCONFINED COMPRESSION
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX
ATTERBERG LIMITS
LIQUID LIMIT
PLASTIC LIMIT
SAMPLE TYPE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
3" O.D. SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET
		665.8	0
	FILL- sand, very dense, medium and coarse, brown, moist. Numerous gravel sizes.		
		659.3	10
	SAND- very dense, mainly medium, grey, moist, becoming wet at 15 ft. depth. Numerous GRAVEL sizes.		
		650.6	20
	-sand becoming finer below 30 ft. depth with fewer gravel sizes.		30
		623.8	40
	BEDROCK- granite, sound.		50
	End of Borehole	613.3	60

PENETRATION RESISTANCE 350 FT LB BLOWS FT
20 40 60
SHEAR STRENGTH PSF

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS
+ % DRY WEIGHT

SAMPLE TYPE AND No	NATURAL UNIT WEIGHT P.C.F.
1	
2	
3	
4	
5	
6	
7	
8	
9	
100% Recovery	
100%	

Notes:
1) Hole advanced cased using wash boring and diamond drilling techniques.
2) Water level in casing on completion 13.8 ft., after 12 hours 15.2 ft. After casing pulled hole open 11.4 ft., water level 10.3 ft.
3) Ground too dense for dynamic cone penetration test.

PROBE A - Elevation 662.0 feet.

Washed with open 'A' rod -

0 to 5 ft.	sand, medium and coarse with gravel sizes, cobbles at 5 ft. depth.
5 to 10 ft.	sand, fine, grey with gravel sizes at 10 ft. depth.
10 to 15 ft.	sand, medium with occasional gravel sizes, grey-brown, lost water return at 13 ft. depth and rods sanded in.

Washed down AX casing to 15 ft. depth.

Washed ahead with 'A' rods.

15 to 23 ft.	sand, fine to medium with gravel sizes. rods sanded in at 23 ft. depth.

End of probe, 23 ft. depth (El 639 feet)

PROBE B - Elevation 660.5 feet.

Washed with 'A' rod -

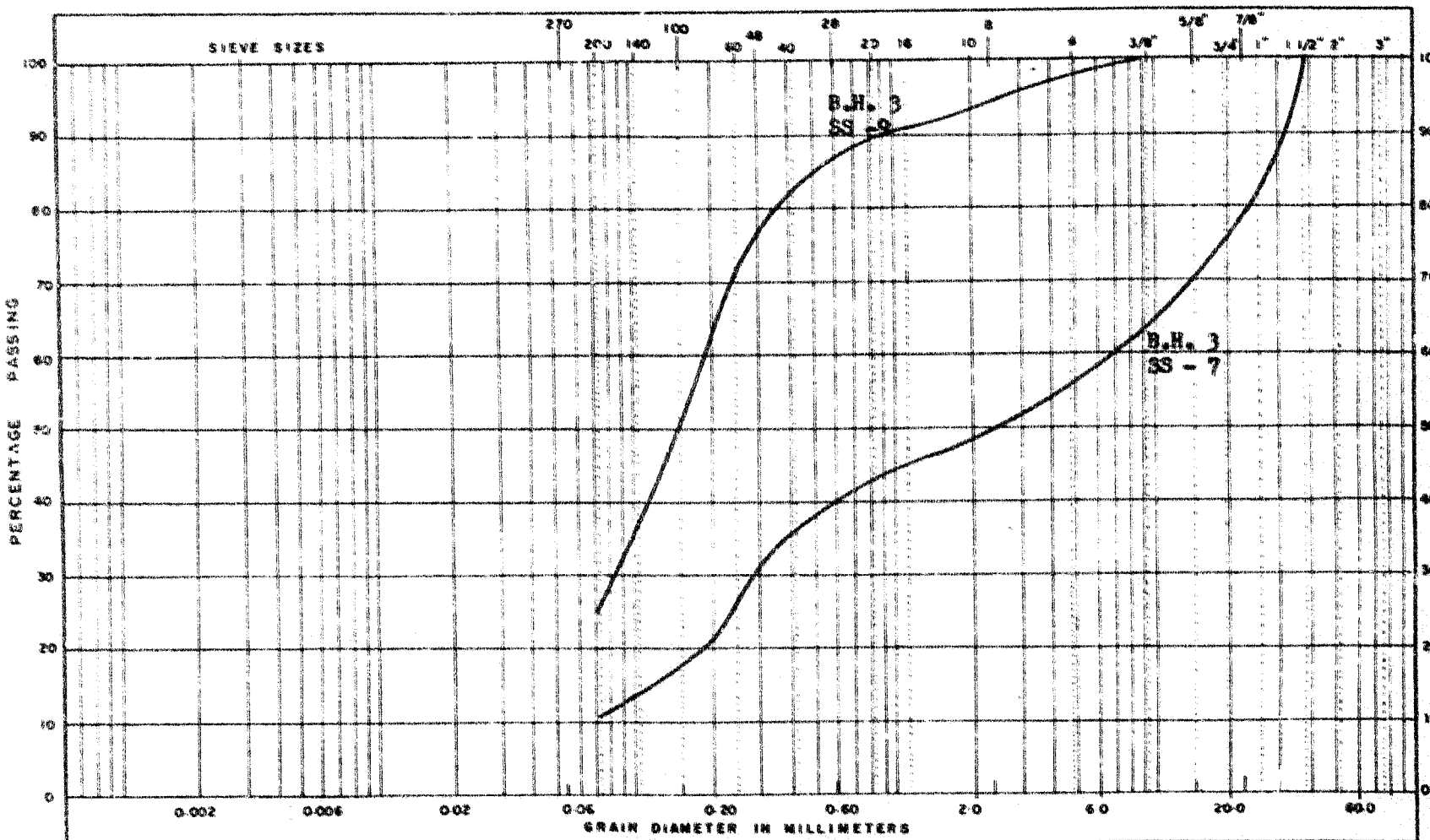
0 to 4 ft.	at 2 locations, unable to wash past 4 ft. depth
0 to 6 ft.	at 2 other locations, unable to wash past 6 ft. depth.

Drove cone tip on 'A' rods

0 to 19 ft.	drove rods to virtual refusal (400 blows/ft.) at 19 ft. depth.

End of probe, 19 ft. depth (El 641.5 feet)

MECHANICAL ANALYSIS



MODIFIED M.I.T. CLASSIFICATION

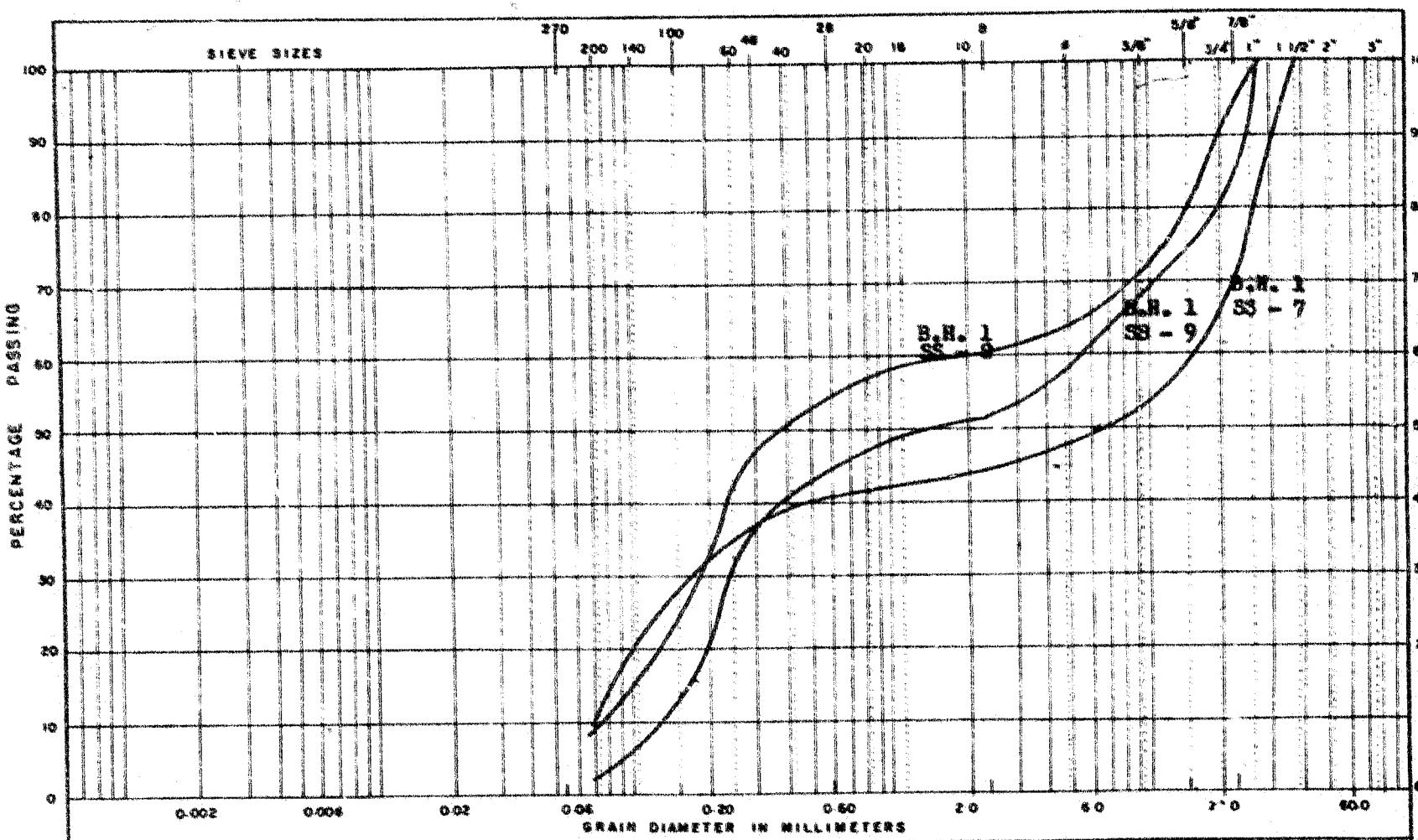
SAMPLES FROM AUMOND CREEK, near MATTAWA, Ontario
D.H.O.

WILLIAM TROW ASSOCIATES LTD.

Project: J3372

Dwg. No. 6A

MECHANICAL ANALYSIS



MODIFIED M.I.T. CLASSIFICATION

SAMPLES FROM AUMOND CREEK, near MATTAWA, Ontario
D.H.O.

WILLIAM TROW ASSOCIATES LTD.

Project: J3372

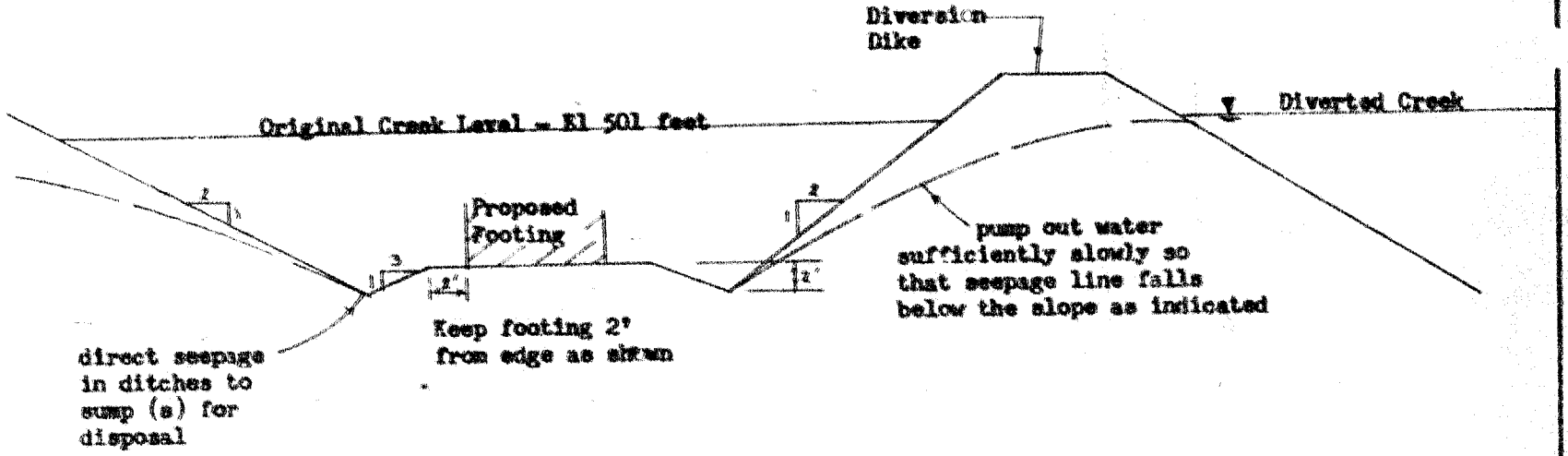
Dwg. No. 6B

WILLIAM TROW ASSOCIATES LTD.

PROJECT NO. J32 '72

DRAWING NO. 4

SKETCH SHOWING SUGGESTED METHOD OF EXCAVATING FOR BRIDGE OR ARCH FOUNDATIONS



PROCEDURE:-

1) Divert Creek
2) Excavate below water level to approximate dimensions shown
3) Pump out water
4) Prepare footing bed and install footing
5) Backfill with sand and gravel and cover with rip rap

cc: Foundations Files (Rm. 110)

180

Mr. C. S. Crebski,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

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

May 9, 1967

Amsond Creek Bridge --
10.0 Miles west of Deux Rivieres,
S.P. 331-65, Site #435-100,
Hwy. #17, District #11 (North Bay).

We have reviewed Preliminary Plan #B-6133-P1 for the above mentioned structure. Our comments are as follows:

(1) The designer appears to have complied generally with recommendations contained in the foundation report by William Trow Associates Ltd.

(2) In order to achieve the design footing pressure of 5 t.s.f., it is essential that an efficient dewatering scheme be employed since the subsoil is susceptible to conditions of unbalanced hydrostatic head. Because of the close proximity of the bedrock (to the east abutment footing) and the denseness of the soil, a scheme depending on sheeting, would probably not be practical. The importance of the dewatering should be made known to the contractor and the District construction staff.

K.G.S/Mle?

K. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. O. Stermac,
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. B. McCombie
J. B. Curtis

Foundations Files
Gen. Files

Department of Highways Ontario

Copy for the information of
Mr. A. Stermac, Principal Foundation Engineer,
Room 107, Lab. Building

Mr. J.B. Curtis,
Regional Bridge Location Engineer,
North Bay Regional Office,
North Bay, Ontario

Bridge Division,
Downsview, Ontario

May 5, 1967

Aumond Creek Bridge
10.0 Miles West of Deux Rivieres
W.P. 331-65, Site No. 43-100
Highway 17, District No. 13

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6183-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is $93,500. This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

C.S. Grzeski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. S. McCombie
A. Stermac
R. Forrest
E. Cross

cc: Foundations Office (Rm. 110)

Mr. D. R. Davis,
Bridge Engineer,
Bridge Division.

<u>Attention: Mr. E. McCombie</u>

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

February 20, 1967

FOUNDATION INVESTIGATION REPORT FOR D.H.O.
BY: WILLIAM TROW ASSOCIATES LIMITED --
Aumond Creek Bridge, Hwy. No. 17, near Mattawa, Ont.
W.P. 331-65 -- District No. 13 (North Bay).

(Report and covering memo, distributed February 9/67)

Attached, we are forwarding to you, the additional information (borehole 3) supplied by the consultant, as mentioned in our covering memo (para. 2).

Also, attached, is revised drawing showing this additional information. Would you kindly delete the existing drawing from your copy(s) of this report and replace with the revised drawing.

Thank you.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/ade
Attach. (2)

cc: Messrs. D. R. Davis (2)
H. A. Tregaskes
J. W. Ferren
M. McArthur
G. E. French
J. E. Curtis
A. E. Saint
B. A. Singh
Foundations Files
Gen. Files

cc: Foundations Office (Rm. 110)

Mr. B. A. Davis,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

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

February 9, 1967

FEB - 9 1967

FOUNDATION INVESTIGATION REPORT FOR D.E.O.
BY: WILLIAM TROW ASSOCIATES LIMITED --
Amoomi Creek Bridge, Hwy. No. 17, near Mattawa, Ont.
W.P. 331-65 -- District No. 1) (North Bay).

Attached, please find the foundation investigation report for the above mentioned site, prepared and submitted by the consultant, Wm. A. Trow Associates Ltd.

The report is self-explanatory and we believe that it contains the information you require for your future design work. As mentioned in the report, the consultant will provide some additional information on bedrock elevation between boreholes 1 and 3. This information will be passed on to you as soon as it becomes available.

In view of the problems connected with the construction of spread footings, we would suggest that the alternative, utilizing caissons keyed into rock, be given serious consideration.

Should you wish to discuss any aspects of the foundations of this structure, please feel free to contact this office.

A. O. Stermac
PRINCIPAL FOUNDATION ENGINEER

ACS/fdF
Attach.

cc: Messrs. B. A. Davis (2)
R. A. Tregunno
D. W. Farren
E. McArthur
C. A. French
J. B. Curtis
E. L. Saint
B. A. Slage
Foundations Files
Gen. Files

cc: Mr. Szymanski (2nd. copy)

Hwy. 401 & Keele St.,
Downsview, Ontario.

December 7, 1966

Materials and Testing Division

William A. Trow Associates Ltd.,
99 Silvan Drive,
Weston, Ontario.

Attention: Mr. W. A. Trow

Re: Letter of Authority — Foundation Investigations

Deux Rivieres Creek, Hwy. 17 — W.P. 142-63
C.P.R. Overhead at Deux Rivieres — W.P. 89-65
Amanda Creek Bridge, Hwy. 17 — W.P. 331-65 ✓
District No. 13 (North Bay)

Dear Sir:

Please consider this your authority to carry out foundation investigations at the above mentioned sites.

Drawings and plans showing the crossing locations and proposed footing layout, have been given to your representative on December 6, 1966.

You are requested to proceed with the investigations as soon as possible and submit the separate final reports by not later than February 1, 1967.

Eleven (11) copies of each report will be required for our distribution.

At the Amanda Creek Bridge site you are also requested to put down a number of shallow boreholes in order to establish whether bedrock is to be found above the proposed stream diversion bed. A plan with the stream diversion profile was given to your representative.

The proposed C.P.R. Overhead structure may incorporate piers built on a skew. You are, therefore, requested to establish the subsoil conditions for this alternative, also. The locations of the boreholes for this purpose are shown on the plan S-4426-1.

Crib walls will be required on the N.W. and S.E. corners of this structure, and these areas should also be included in your investigation.

cont'd. /2 ...

Although unlikely, there is still a possibility that a barrel arch type of structure could be used for the Hwy. 17 crossing of the Deux Rivieres creek (W.P. 142-63). You are, therefore, requested to also investigate the subsoil conditions to a distance approximately 70 ft. from the highway centre-line downstream as well as upstream, where the barrel arch footings would presumably end.

Should you have any queries while working in the field, please contact the Foundation Section, Downsview, or better - Mr. J. B. Curtis, Regional Bridge Location Engineer, North Bay, 181 Main Street East, P.O. Box 555, North Bay, Ontario - Telephone No. 472-7900 (Area Code 705).

According to our information, accommodation is available in the town of Deux Rivieres which is very close to all three sites.

In accordance with our terms of reference, you are to have a qualified Soils Engineer in charge of the field work at all times. Any deviation from this arrangement has to be approved by the Department. Previous requirements as to preliminary borehole information and laboratory testing program, should be followed.

Since the drawings accompanying the foundation reports, showing the location of borings, the inferred subsoil conditions, etc., are to become contract drawings, you are required to prepare them in accordance with the A.S.C.E. Standards. To enable you to do this, we are supplying you with a sample drawing with all the necessary explanations, together with linen sheets for your drawings. You are also requested to provide us with Cronaflex copies of the drawings.

Charges for the work performed will be in accordance with your Schedule of Rates, dated January 1, 1966, and invoices to be addressed to the attention of the undersigned.

We are attaching the following Purchase Orders:

E-08312 - W.P. 142-63 - Deux Rivieres Creek, Hwy. 17.
E-08313 - W.P. 80-65 - C.P.R. Overhead at Deux Rivieres.
E-08314 - W.P. 351-65 - Ammonia Creek Bridge, Hwy. 17.

covering the purchase of any new material required for this work, in order that you may use these as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

AOS/mdeF
Attach.

Yours very truly,

A. Ruttka

A. Ruttka
MATERIALS & TESTING ENGINEER

cc: Messrs. S. McCombie
H. McArthur
G. E. French
J. B. Curtis
E. S. Saint
Mrs. I. Steinberg
H. Konings
M. Szymanski (2)
A. Crowley
Foundations Office
Gen. Files (2)

WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING NO. 5

PROJECT NO. 3372

BOREHOLE NO. 5

PROJECT D.H.O. Bridge

LOCATION Hwy. 17 - Aumond Creek

HOLE LOCATION 18 ft. left of Sta. 416 + 19

HOLE ELEVATION 662.9 feet

DATUM See Site Plan Dwg.

LEGEND

PENETRATION RESISTANCE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 2" DIA. CONE

SHEAR STRENGTH
- UNDISTURBED TRIAXIAL AT OVERBURDEN PRESSURE
- UNCONFINED COMPRESSION
- VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

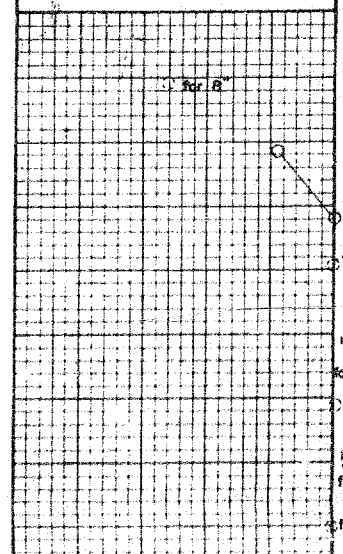
ATTERBERG LIMITS
- LIQUID LIMIT
- PLASTIC LIMIT

SAMPLE TYPE
- 2" O.D. SPLIT TUBE
- 2" I.D. SHELBY TUBE
- 3" O.D. SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FEET
		662.9	0
	FILL-sand and gravel, silty, brown, roots.	660.4	
	SAND-very dense, brown, fine, moist. Numerous gravel sizes, cobbles and boulders above 10 feet depth. Becoming wet below 10 feet depth.		10
		647.4	
	Sand and gravel with scattered boulders below 18 feet depth to 25 feet depth.		20
	Becoming grey below about 25 feet depth.		30
	Sand and gravel, partly silty, below 35 feet depth.		
		621.1	40
	GRANITE BEDROCK-76% recovery.		
	End of Borehole	613.9	50
			60
			70
			80
			90
			100
			110

PENETRATION RESISTANCE 350 FT. LB BLOWS/FT (20 · 40 · 60 · 80)

SHEAR STRENGTH P.S.F



NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND NO.	NATURAL UNIT WEIGHT P.C.F.
1	
2	
3	
4	
5	
6	
7	
8	

NOTES:

1) Hole cased with flush joint casing and advanced by conventional wash boring methods.

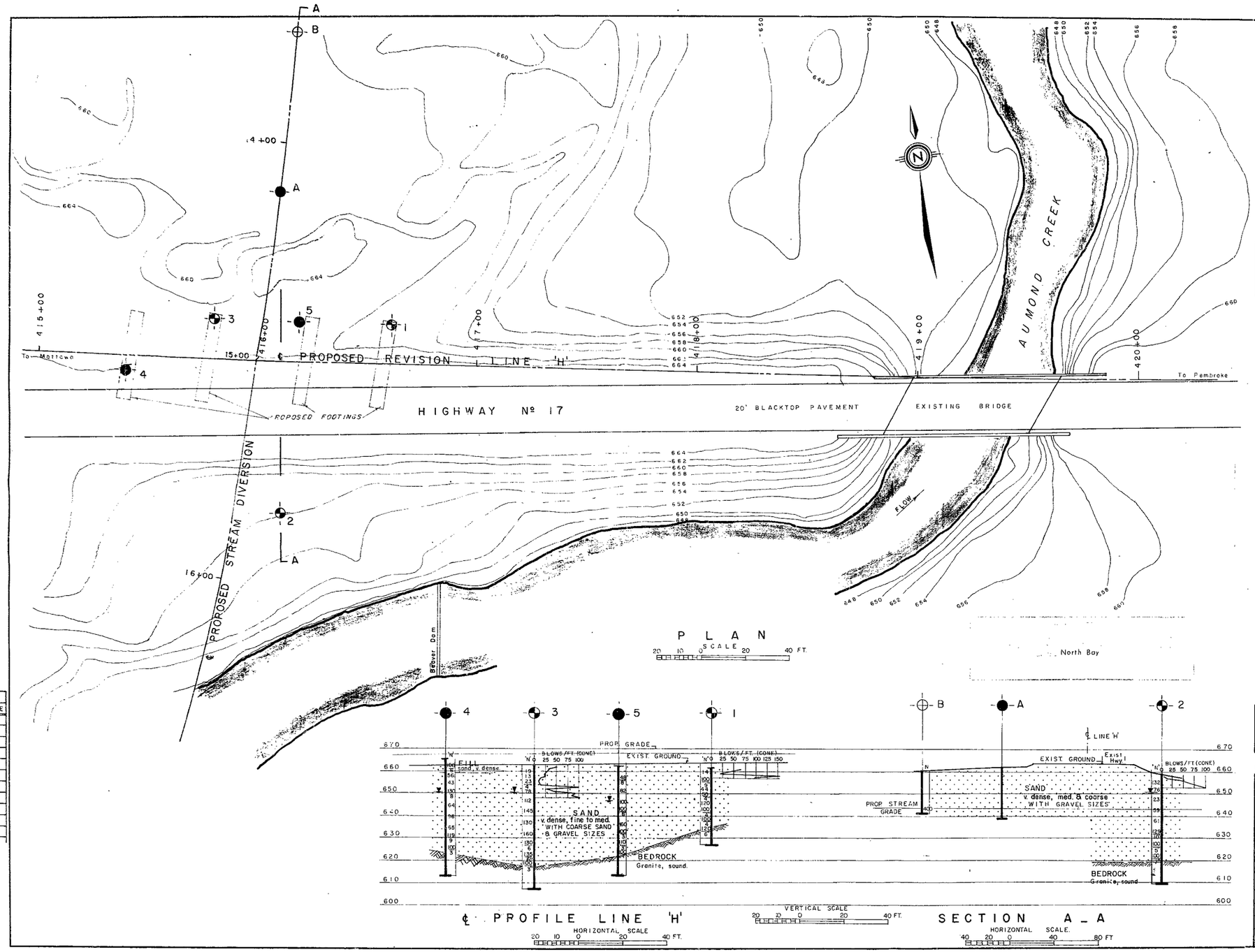
2) Stabilized water level in the casing with casing at or below 20 feet depth was 15.5 feet depth.

Water at 10.2 feet depth hole open to 14.3 feet depth on completion of boring.

Hole open to 14 ft. depth and dry after 1 week.

3) Drill on pressure at all times drilling in bedrock. Core barrel sanded in because casing could not be sealed into the rock and 15 inches of core left in the hole.

#66-F-244C
W.P.# 331-65
Hwy# 17
AUMOND
CREEK



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation.

NO.	ELEVATION	STATION	OFFSET
1	661·4	416+61	17·5' Lt.
2	658·9	416+15	69' Rt.
3	662·9	415+80	18' Lt.
4	665·8	415+40	6' Rt.
A	662·0	14+25	℄
B	660·5	13+50	℄
5	662·9	416+19	18' 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 and may be subject to considerable error.

PRINT RECORD		
NO	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

WILLIAM TROW ASSOCIATES LIMITED

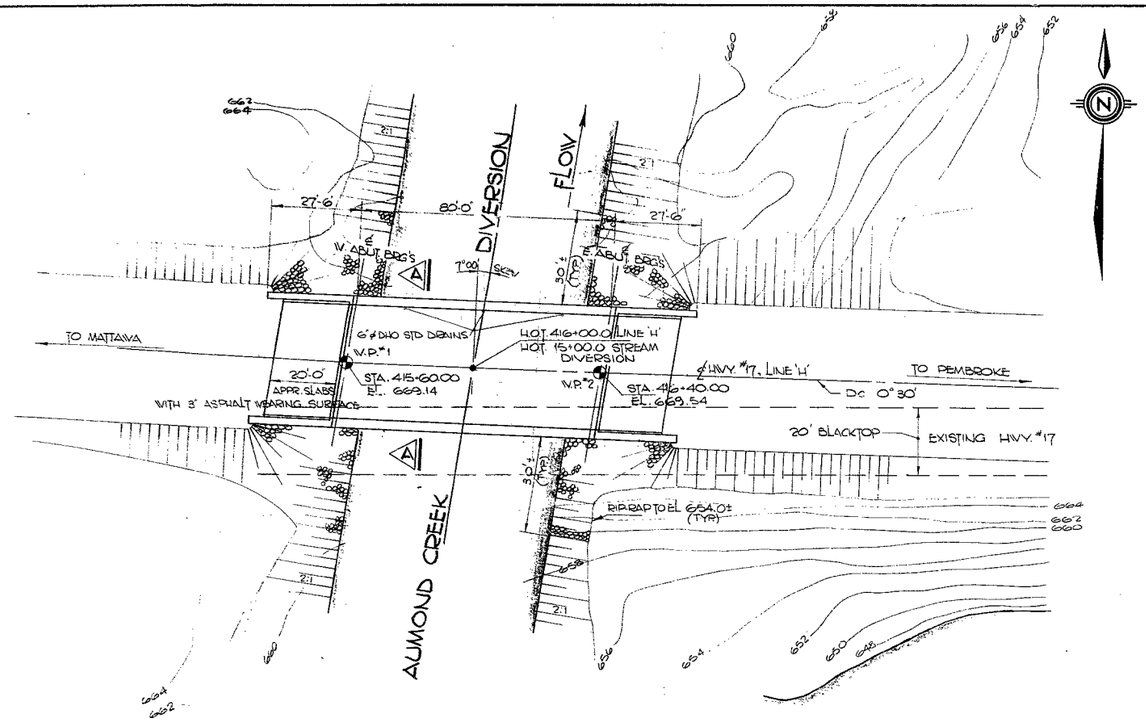
DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & TESTING DIVISION – FOUNDATION SECTION

AUMOND CREEK

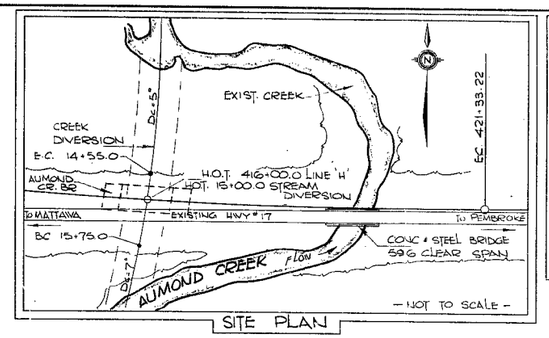
KING'S HIGHWAY NO. 17 LINE H DIST. NO. 13
TWP. CAMERON
DIST. NIPISSING LOT 16 CON. B

BORE HOLE LOCATIONS & SOIL STRATA

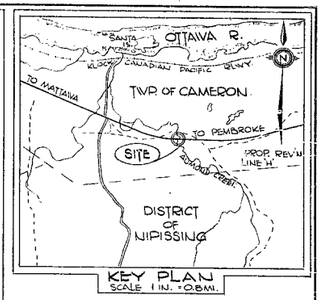
SUBM'D. D. L.	CHECKED D.L.	W.P. NO. 331-65	DRAWING NO. J-3372
DRAWN E.F.K.	CHECKED E.F.K.	JOB NO.	
DATE JAN. 1967		SITE NO.	BRIDGE DRAWING NO.
APPROVED A. Patrimas PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	



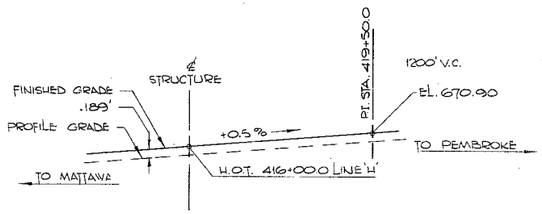
PLAN
SCALE 1"=20'-0"



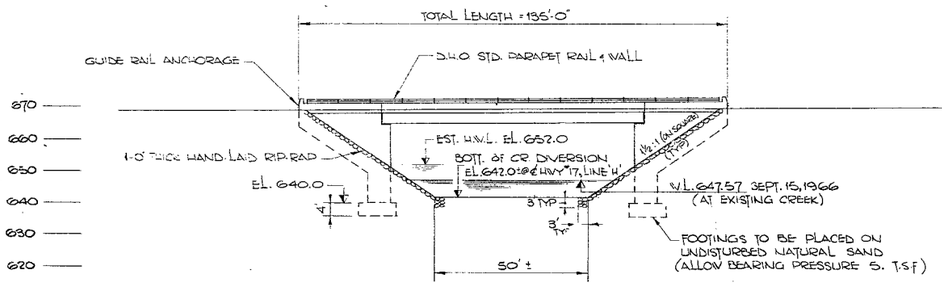
SITE PLAN



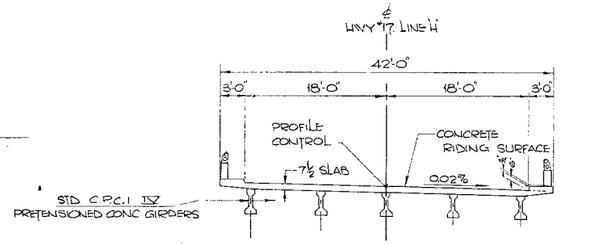
KEY PLAN
SCALE 1 IN. = 0.8 MI.



GRADE PROFILE of HWY. #17, LINE 'H'
N.T.S.



SOUTH FACE ELEVATION
SCALE 1"=20'-0"



SECTION A-A
SCALE ⅛"=1'-0"

G.B.M. № DXXX 531.80
BOULDER AT SOUTH EDGE OF STATION PLATFORM 70 FT. WEST OF STATION HOUSE. BOLT SET HORIZONTALLY IN NORTHEAST FACE. PUBLICATION № 20 'KLOCK'

PRINT RECORD		
No.	FOR	DATE

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

AUMOND CREEK BRIDGE
10.0 MILES WEST OF DEUX RIVIERES

KING'S HIGHWAY No. 17 — DIST. No. 13
DIST. OF NIPISSING
TWP. CAMERON — LOT 16 — CON. B.

PRELIMINARY PLAN

APPROVED _____ BRIDGE ENGINEER

DESIGN		CHECK	
DRAWING	G.T.	CHECK	
DATE	APRIL '67	LOADING	MS20-44

SITE No. 43S-100 — W.P. No. 331-65
CONTRACT Nos.
DRAWING No. D-6183-P1