

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

FOUNDATION INVESTIGATION
PROPOSED CROSSING AT TAYLOR MUNICIPAL DRAIN
KINGS HIGHWAY NO. 16, DISTRICT NO. 9
TOWNSHIP OF NORTH GOWER - COUNTY OF CARLETON
W.P. 443-64 SITE NO. 3-227

Project: J3038

June, 1966

William Trow Associates Limited

Project: J3038

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.

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

June 10, 1966

Attention: Mr. A.G. Stermac, P.Eng.

Foundation Investigation
Proposed Crossing at Taylor Municipal Drain
Kings Highway No. 16, District No. 9
Township of North Gower - County Carleton
W.P. 443-64 Site No. 3-227

Dear Sirs:

In conformance with your authorization of May 30th,
a foundation investigation has been completed at the above
mentioned site for a proposed replacement of the existing
concrete culvert.

In view of the light weight of the proposed structure
and the relatively uncomplicated foundation conditions, we
shall take the liberty to limit our report on this project
to the following comments.

1) The site is underlain by about 22 feet of highly
plastic soft to firm clay which is slightly silty and which
contains harder pockets of clay. The clay is in turn underlain



by approximately 3 feet of dense sandy gravel which extends to limestone bedrock at a depth of 24 to 26 feet. The bedrock was proven for 14 feet to a total depth of 35 feet below the creek bed.

2) At the time of this investigation water was running through the existing culvert at a depth of about 1.6 feet. Some evidence of an artesian condition was noted when the gravel stratum above bedrock was encountered during the boring.

3) The proposed replacement for the existing structure may be supported by spread footings founded in the clay or by end-bearing piles driven to refusal in the dense gravel or on bedrock at a depth of about 24 feet below the creek bed. The safe loading for a timber pile, the preferred foundation scheme, will equal its permissible capacity when considered as a short column. Care must be taken to terminate driving at the bedrock level to avoid damage to the piles. Since the safe net bearing value of the clay is only of the order of 1 ksf, bridge support on it probably must take the form of a closed box culvert or flexible pipe culvert. Allowing for the surcharge effect of the adjacent road fill the gross bearing value will approach 2000 psf.



4) Excavation for the proposed replacement, assuming that it will also be a culvert type structure, may be carried out by diverting the creek well away from the construction area. The bottom of the excavation in the sensitive clay will become quite soft if walked on and it is recommended that a 6 inch layer of crusher-run gravel topped by 6 inches of $\frac{3}{4}$ inch crushed gravel be placed on the clay to facilitate construction and to form a base for the culvert.

5) All exposed banks should be protected against erosion with rip-rap placed on a bed of pit-run gravel and should be carried up to the highest flood level of the embankments. If the structure is supported on piles this rip-rap should also be placed to protect the piles from possible abrasion.

6) Some very minor inconsequential settlement of the new road shoulders should be expected as a result of the widening of the existing road.

7) The minor earth pressures from the road fill can be accommodated by batter piles or by the horizontal members of the closed abutment. With granular backfill, the earth pressure exerted against the wall at any depth, h , will be approximately equal to $p = 35 h$ psf. To this must be added an allowance for traffic.



PROJECT AND SITE DESCRIPTION

The proposed replacement of the culvert over Taylor Municipal Drain will permit the widening of Kings Highway No. 16 at this location. The site is situated in the Township of North Gower, Carleton County along proposed revision line 'F'. The purpose of this investigation is the determination of the subsoil conditions at the site and the most feasible means of support for the proposed replacement structure.

The existing structure was built in 1920 and is an open concrete culvert about 20 feet wide. Water flows in a south easterly direction through the culvert and at the time of this investigation was flowing at a depth of about 1.6 feet. The highway embankments which form the approach to the existing culvert extend about 4 feet above the nearby ground surface, and about 6 feet above the creek water level.

FIELDWORK

Three cased boreholes were put down at this site at the locations shown on the enclosed drawing. These borings were advanced by conventional diamond drilling equipment with sampling

at regular intervals. The borings were taken to depths of 7, 24 and 39 feet with 14 feet of AXT bedrock core being recovered from the deeper hole. Disturbed and undisturbed subsoil samples were taken by conventional sampling methods. Field vanetests were carried out in the clay immediately after the removal of samples from above. Dynamic penetration cones were also driven near the boreholes to aid in the determination of the hard bearing layers.

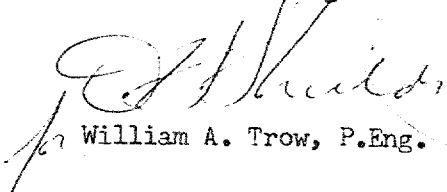
The elevations of the top of each borehole are referred to the benchmark reference on your plan No. E-4614-1.

If you have any queries regarding the contents of this report, please do not hesitate to contact this office.

Yours very truly,

WLW/gh
Encls.
Dist: -Dept. of Hwys of Ont. (10)

W.L. White, M.Eng.


for William A. Trow, P.Eng.

WILLIAM TROW ASSOCIATES LTD.


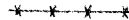




SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

DRAWING No. 1
PROJECT No. J3038

LEGEND


BOREHOLE No. 1
PROJECT Proposed Culvert Replacement
LOCATION Hwy. 16 - Taylor Drain - North Gower,
HOLE LOCATION See Site Plan W.P. 443-64
HOLE ELEVATION 286.9 feet
DATUM See Site Plan

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 

2" O.D. SHELBY TUBE 

SYMB	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE		350 FT. LB BLOWS/FT	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	SAMPLE TYPE AND No	NATURAL UNIT WEIGHT P.C.F.
				20	40	60			
	2 inches topsoil	286.9	0	1000		2000			
	CLAY-very stiff, brown, becomes grey and firm only below 5 feet.		10	+ S = 4.6					1 Levered 6"
			20	+ S = 12.0					2 Levered
			30	+ S = 2.0					3 Levered
			40						4 Levered
	SAND & GRAVEL-very dense, silty.	264.9							5
	End of Borehole	260.8							6
	Refusal to casing.								
Notes:	1) Boring cased to full depth with NX pipe.								
	2) Water level = 2 feet at end of bore.								

WILLIAM TROW ASSOCIATES LTD.




SITE INVESTIGATION 5 SOIL MECHANICS CONSULTATION

LEGEND




DRAWING NO. 2
PROJECT NO. J3038

BOREHOLE NO. 2
PROJECT Proposed Culvert Replacement
LOCATION Hwy. 16 - Taylor Drain - North Gower,
HOLE LOCATION See Site Plan W.P. 443-64
HOLE ELEVATION 287.7 feet
DATUM See Site Plan

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 IS  ⁵




NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

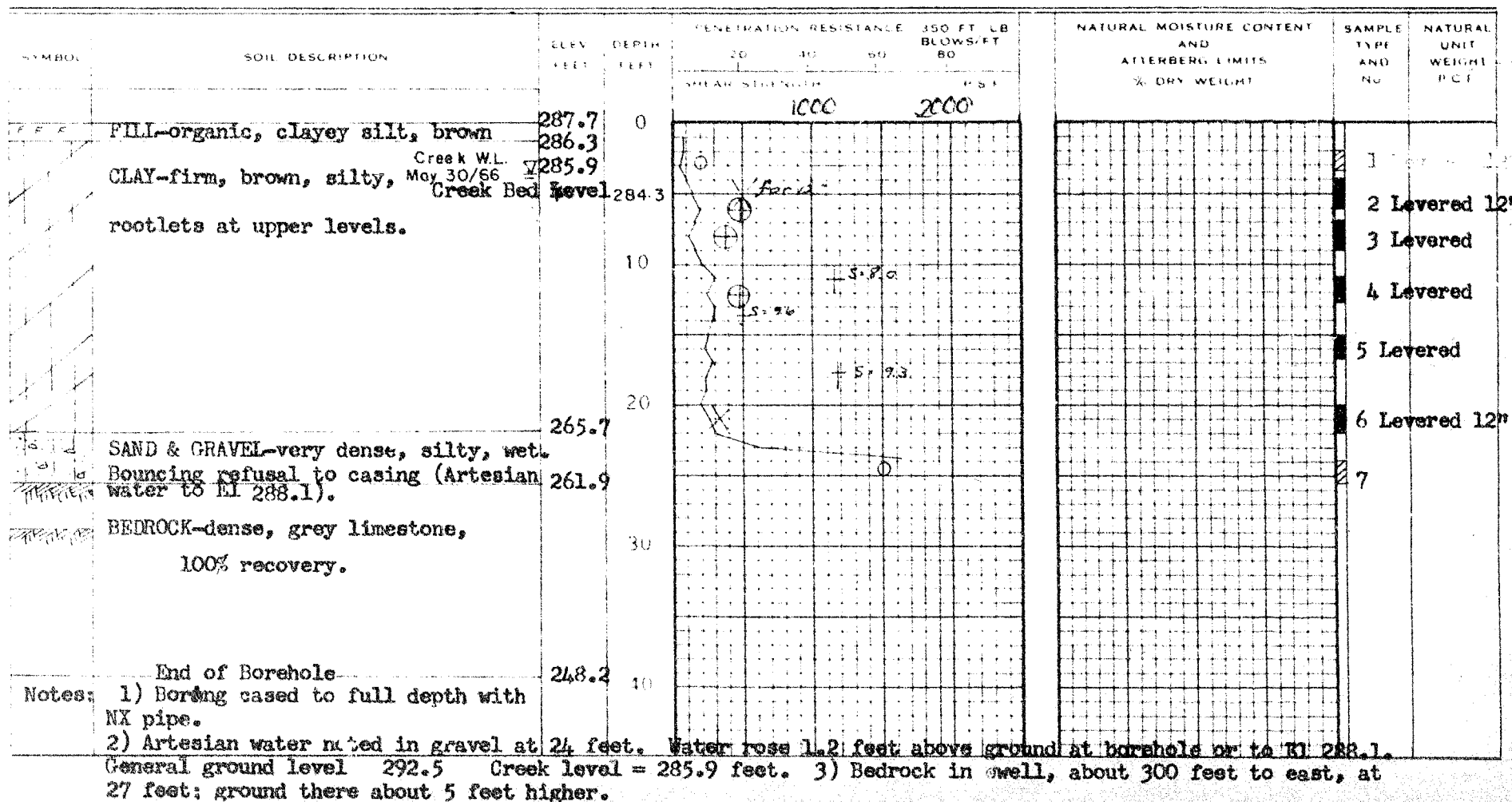
 LI

ATTERBERG LIMITS

LIQUID LIMIT 
PLASTIC LIMIT 

SAMPLE TYPE

2" O.D. SPLIT TUBE 
2" I.D. SHELBY TUBE 
3" O.D. SHELBY TUBE 

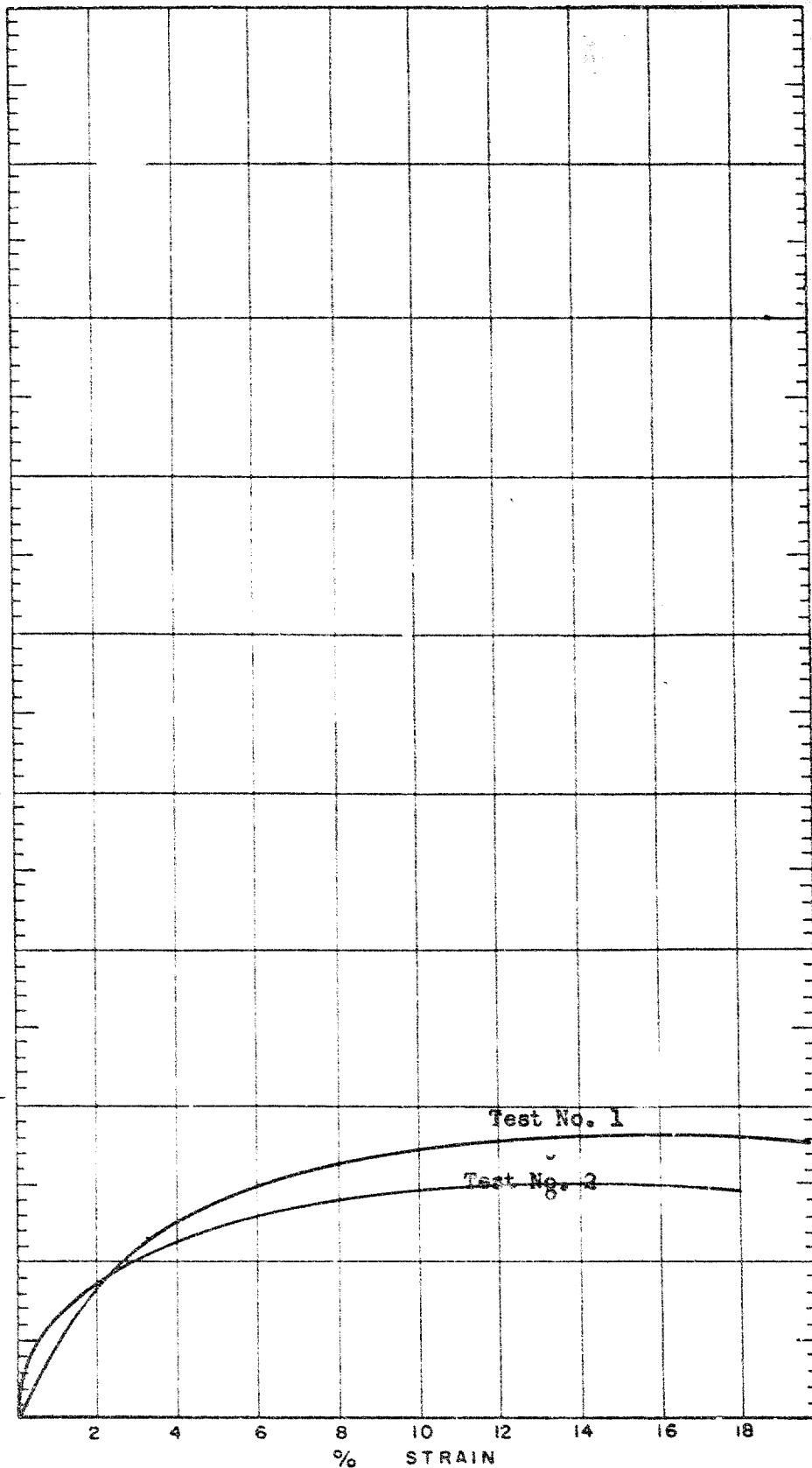




SHEAR STRESS KSI

0.5

1.0



% STRAIN

TRIAXIAL TEST RESULTS

TEST N^o 1

TEST Undrained

B.H. 2 DEPTH 5'-7'

C = 460 P.S.F.

E = 104.5 P.C.F.

W = %

 $\sigma_3 = 4.5$ P.S.I.

SOIL

Grey Silty Clay

TEST N^o 2

TEST Undrained

B.H. 2 DEPTH 7'-9'

C = 390 P.S.F.

E = 103.0 P.C.F.

W = %

 $\sigma_3 = 5.5$ P.S.I.

SOIL

Grey Silty Clay

TEST N^o

TEST

B.H. DEPTH

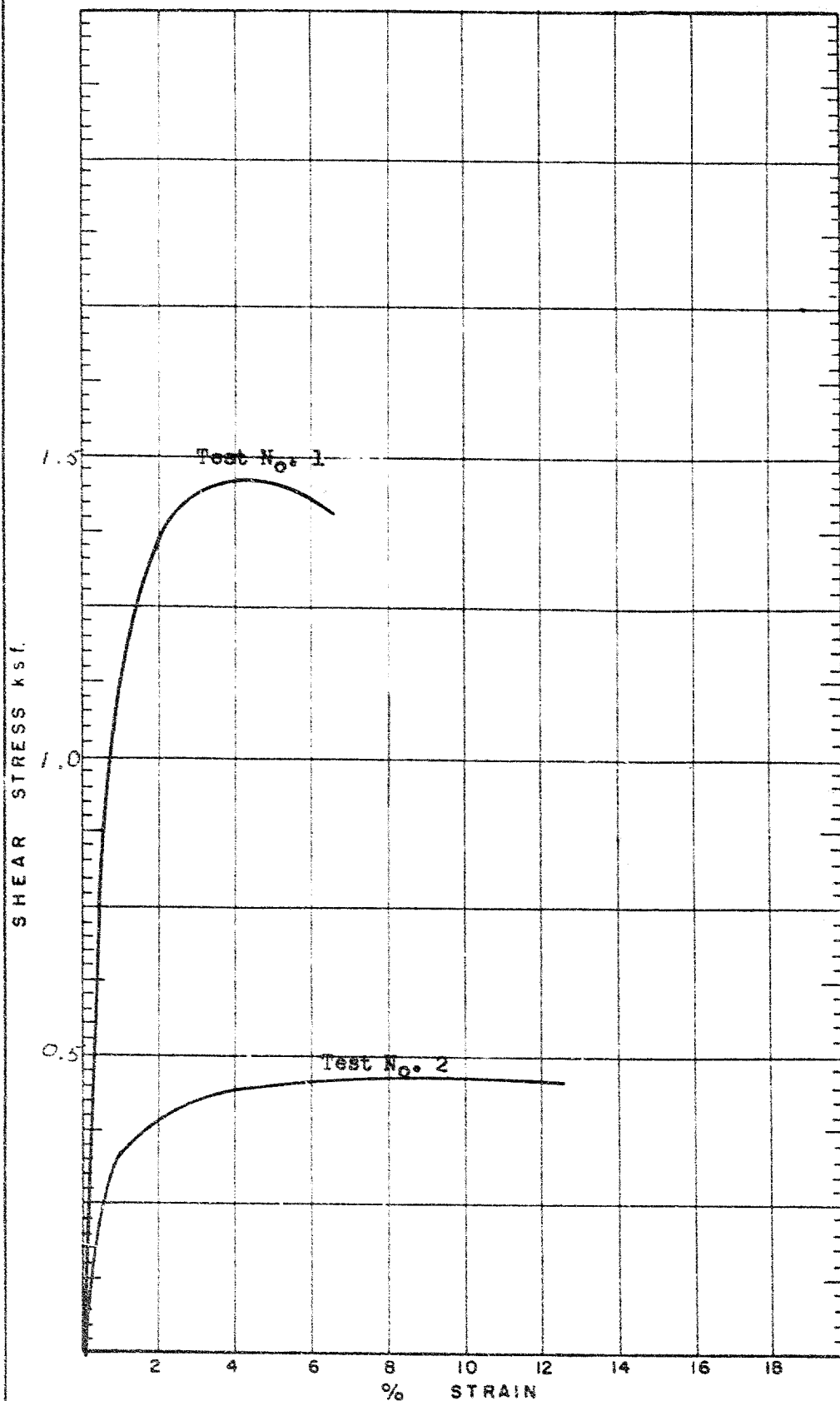
C = P.S.F.

E = P.C.F.

W = %

 $\sigma_3 =$ P.S.I.

SOIL



TEST NO 1
 TEST Undrained
 B.H. 1 DEPTH 5'-7"
 C = 1470 P.S.F.
 γ = 108.6 P.C.F.
 W = %
 σ₃ = 4.5 P.S.I.
 SOIL - clay

TEST NO 2
 TEST Undrained
 B.H. 2 DEPTH 11'-12"
 C = 470 P.S.F.
 γ = 97.9 P.C.F.
 W = %
 σ₃ = 8.0 P.S.I.
 SOIL

Grey varved clay

TEST NO
 TEST
 B.H. DEPTH
 C = P.S.F.
 γ = P.C.F.
 W = %
 σ₃ = P.S.I.
 SOIL

TRIAXIAL TEST RESULTS

Mr. G. Scott,
Regional Bridge Location Engineer,
Bridge Section,
Regional Office, Kingston.
Attn: Mr. J. A. Fisher

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

December 6, 1966

W.P. #288-62 - Stevens Creek - Site #3-171.
W.P. #443-64 - Taylor Municipal Drain - Site #3-227.
-- Hwy. #16 - District #9 (Ottawa) --

With respect to your memo of December 2, 1966,
pertaining to the Preliminary plans for the above mentioned
structures, we wish to advise you that we have no comments
to make.

The foundations of the structures are designed in
accordance with the recommendations contained in the respective
foundation investigation reports.

AGS/ndef

cc: Foundations Office (2) ✓
Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

MEMORANDIUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Laboratory Building,
DOWNSVIEW, Ontario.

From: Bridge Section,
KINGSTON.

DATE: December 2, 1966.

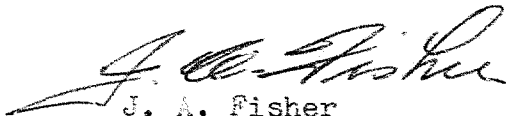
Our File Ref.

IN REPLY TO:

SUBJECT: W.P. #288-62. Stevens Creek. Site #3-171.
W.P. #443-64. Taylor Municipal Drain. Site #3-227
Hwy. #16. District #9. Ottawa

We are sending you herewith one print of Preliminary plan #D-6009-1P and D-6015-P1 pertaining to the above listed structure.

Would you kindly let us have your written comments?



J. A. Fisher
For: G. Scott,
REGIONAL BRIDGE LOCATION ENGINEER.
JAF/GS/lm

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

Materials and Testin. Division

November 9, 1966

Mr. R. D. Nairn, P. Eng.,
McCormick & Rankin Limited,
Consulting Engineers,
8 Stavebank Road,
Port Credit, Ontario.

Re: Steven Creek Bridge -- W.P. 288-62; and
Taylor Municipal Drain Bridge -- W.P. 443-64
Township of North Gower, Hwy. No. 16,
Your Files: W.O. 313-66 & W.O. 314-66.

Dear Sir:

This is to acknowledge the receipt of your letter dated November 7, 1966, regarding the above mentioned structures.

We are in agreement with your proposal regarding the use of steel tube piles on both projects. On piles that are driven into dense till, care should be taken that "practical refusal is reached." We would suggest about 20 blows/inch using a Delmag D-22 hammer.

Yours very truly,

AGS/Mief

A. G. Sternac
A. G. Sternac,
Principal Foundation Engineer

cc: Mr. C. S. Grebski, P. Eng.

Foundations Office (2) ✓

Gen. Files

**MCCORMICK & RANKIN
LIMITED**

CONSULTING ENGINEERS

PORT CREDIT OTTAWA

E. D. MCCORMICK, P. ENG.
G. A. RANKIN, P. ENG.
ASSOCIATES
R. C. MCCORMICK, P. ENG.
R. D. NAIRN, P. ENG.
J. F. SEATON

**8 STAVEBANK ROAD
PORT CREDIT, ONTARIO
TELEPHONE 274-3477**

November 7th, 1966

Mr. A. G. Stermac, P. Eng.,
Principal Foundation Engineer,
Materials and Testing Division,
DEPARTMENT OF HIGHWAYS,
DOWNSVIEW, Ontario.

RE: STEVEN CREEK BRIDGE - W. P. 288-62
 ✓ TAYLOR MUNICIPAL DRAIN BRIDGE - W. P. 443-64
 Township of North Gower, Hwy. No. 16.
 Our Files : W. O. 313-66 & W. O. 314-66

Dear Sir:

We have been retained by the Department to design the
above-noted structures.

After discussion with Mr. C. Grebski and Mr. W.
McFarlane, it was decided that the Taylor Municipal Drain Bridge will
be a three-span structure with pier caps supported by concrete filled
steel tube piles (12 3/4" o.d., 0.25 wall).

The foundation report BA 2341 for the Steven Creek Bridge
recommends the use of timber piles driven into till. In view of the dense
nature of the till and the fact that steel tube piles will be required for the
Taylor Municipal Drain Bridge (W. P. 443-64), we wish to suggest that steel
tube piles be utilized on W. P. 288-62 also.

The possibility of utilizing steel tube piles on both W. P. 288-62
and W. P. 443-64 was discussed with W. Trow Associates Ltd. and they are
of the opinion that steel tube piles would be acceptable on both projects.
The piles would be designed as end bearing piles with a design load of 75 tons.

We would appreciate receiving your comments and/or approval
of the use of steel tube piles on these projects.

Yours very truly,
MCCORMICK & RANKIN LIMITED

R. D. Nairn

R. D. Nairn, P. Eng.

RDN/MA

c.c. Mr. C. Grebski, P. Eng.,
Mr. W. Trow, P. Eng.

Hwy. 401 & Keele St.
Downsview, Ontario.

May 30, 1966

Materials and Testing Division

William A. Trow Associates Ltd.,
90 Milvan Drive,
Weston, Ontario.

Attention: Mr. Wm. A. Trow.

Re: Foundation Investigations - Letter of Authority -

- (1) W.P. 288-62 - Site #3-171, Stevens Creek in
E. Gower, Hwy. No. 16, District #9.
 - (2) W.P. 443-64 - Site #3-227, Taylor Municipal Drain,
Hwy. No. 16, District #9.
-

Dear Sir:

This is to authorize you to carry out the foundation investigations for the above mentioned sites.

The necessary plans have been given to your representative, on May 27, 1966.

During the telephone discussion with your Dr. E. Peaker regarding the above investigations, it was pointed out that there is considerable urgency, and therefore, it was agreed that the jobs will be started either on Monday, May 30, or sometime during the same week. The start will depend to a certain degree on the completion of another job in the same district.

Because of the urgency of the jobs, you are requested to advise us of the results of the field investigations as soon as these become available. If necessary, we shall arrange for a meeting with the designer so as to enable him to proceed with the design. The final reports (10 copies of each project) will then be submitted at a later stage - however, as soon as possible.

For any survey information or assistance, please contact Mr. Joe Boucher in Kingston, as indicated on the drawings.

Since the drawings accompanying the foundation reports, showing the location of borings, the inferred subsoil conditions,

cont'd. /2 ...

Mr. Wm. A. Trow -
William A. Trow Assoc. Ltd.

- 2 -

May 30, 1966

etc., are to become contract drawings, you are requested to prepare them in accordance with the D.E.O. 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:

J 34813 - W.P. 238-62 (Site #3-171, Stevens Creek),

J 34814 - W.P. 443-64 (Site #3-227, Taylor Municipal Drain),

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.

AGS/H3EP
Attach.

Yours very truly,

A. Rutka

A. Rutka,
MATERIALS & TESTING ENGINEER

cc: Messrs. S. McComble
R. S. Pillar
L. E. Walker
J. E. Crispier
Mrs. I. Steinberg
H. Konings
A. Crowley
H. Szymanski (2) ✓
Foundations Office
Gen. Files (2)

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

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

Attention: Mr. S. McCombie

June 14, 1966

JUN 15 1966

FOUNDATION INVESTIGATION REPORT BY:
William Trow Associates Limited --
Proposed Crossing at Taylor Municipal Drain,
King's Highway No. 16, Township of North Gower,
County of Carleton, District No. 9 (Ottawa).
M.P. 443-64 -- Site No. 3-227

Attached, please find the report for the above mentioned site, prepared and submitted by the consultant, William Trow Associates Ltd.

We have reviewed the report and are of the opinion that it contains all the data necessary for your future design work.

Should you, however, have any questions pertaining to this project that you would like to discuss, please feel free to contact this Office.

AGS/maef

Attach.

cc: Messrs. B. B. Davis (2)

H. A. Tregaskes

D. W. Farran

R. B. Piller

L. B. Walker

J. E. Crispier

A. Watt

A. G. Sterner
A. G. Sterner,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office/
Gen. Files

#66-F-241

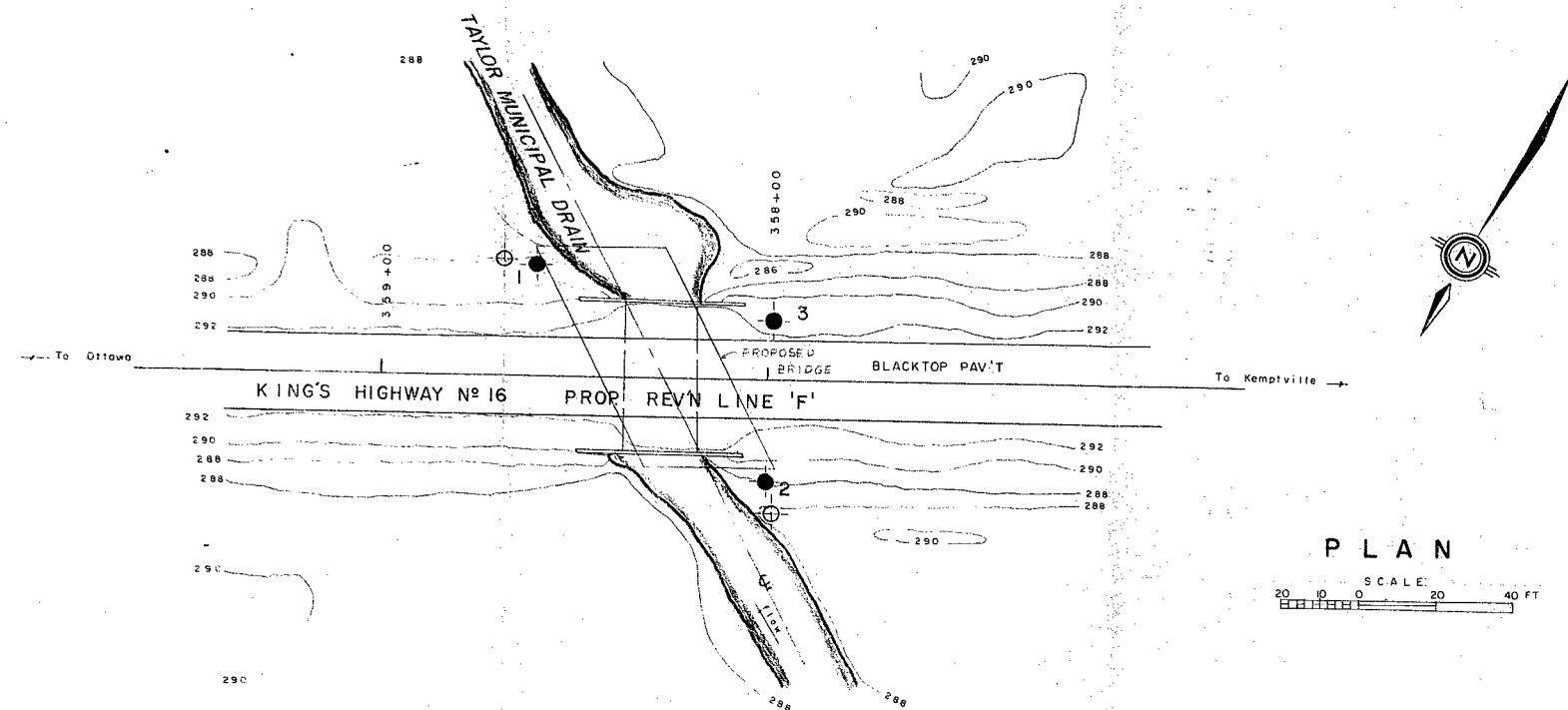
W.P. #443-64

HWY. #16

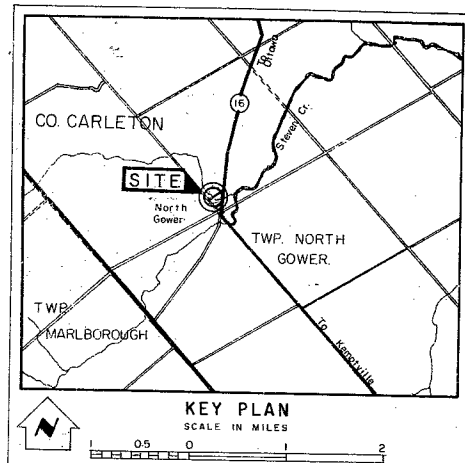
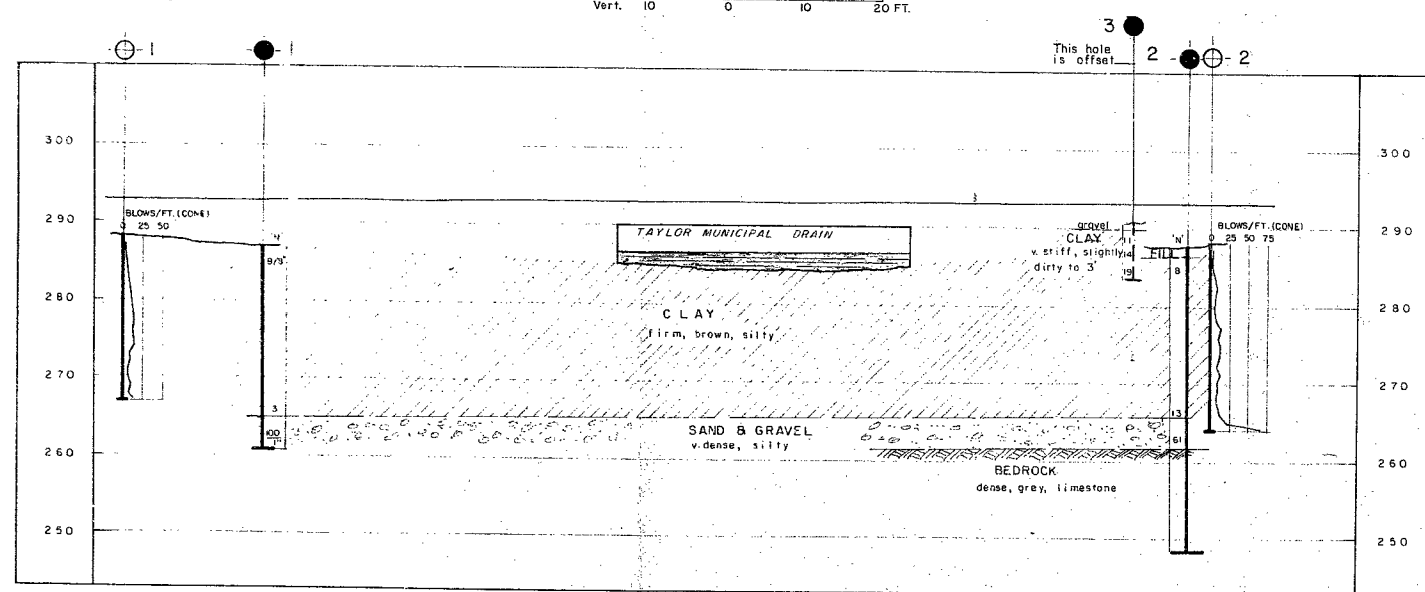
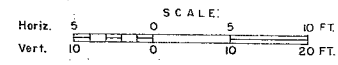
TAYLOR

MUNICIPAL

DRAIN BRIDGE



PROFILE



LEGEND

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

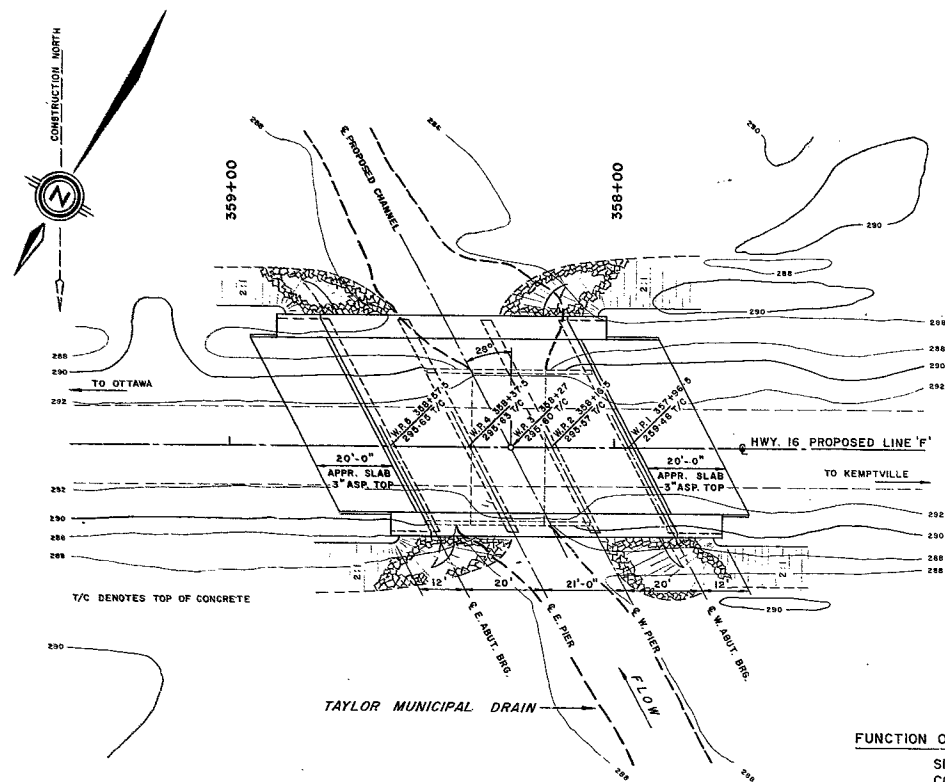
NO.	ELEVATION	STATION	OFFSET
1	286.9	358+60	28' RT.
2	287.7	358+00	26' LT.
3	291.6	357+99	15' RT.

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

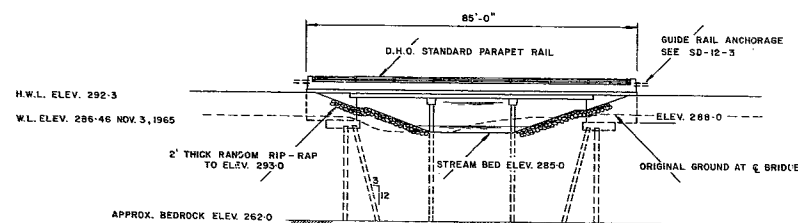
PRINT RECORD	NO.	FOR	DATE

WILLIAM TROW ASSOCIATES LIMITED	
DEPARTMENT OF HIGHWAYS - ONTARIO	
MATERIALS & TESTING DIVISION - FOUNDATION SECTION	
PROPOSED CROSSING	
TAYLOR MUNICIPAL DRAIN	
KING'S HIGHWAY NO. 16	LINE 'F' DIST. NO. 9
CO. CARLETON	
TWP. NORTH GOWER	LOT 20 CON. 3
BORE HOLE LOCATIONS & SOIL STRATA	
SUBM'D. B.W.	CHECKED B.W. W.P. NO. 443 - 64
DRAWN E.F.K.	CHECKED E.F.K. JOB NO.
DATE JUNE, 1966	SITE NO.
APPROVED	CONT. NO.
J-3038	
BRIDGE DRAWING NO.	

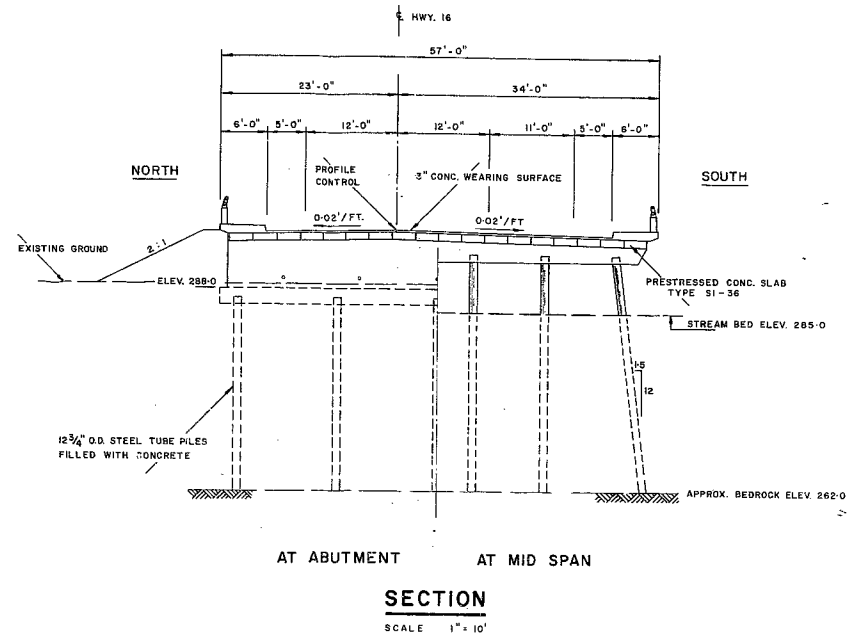


PLAN
SCALE 1" = 20'

FUNCTION OF SKEW ANGLE 28°00'
SIN. .4694716
COS. .8829476
TAN. .5317094

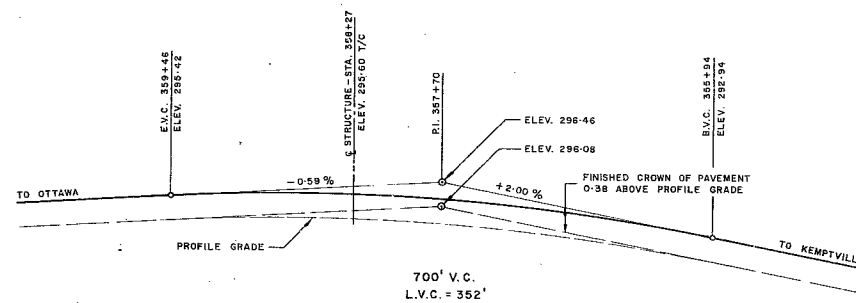


ELEVATION
SCALE 1" = 20'



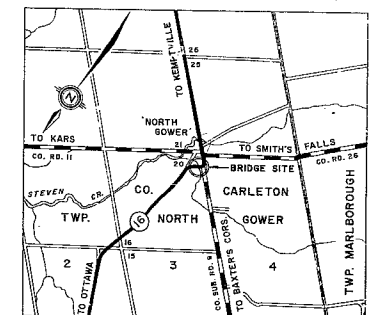
AT ABUTMENT AT MID SPAN

SECTION
SCALE 1" = 10'



PROFILE OF HWY. 16
N.T.S.

G.B.M. N° 119-A ELEV. 287.28
DOUBLE CONCRETE BOX CULVERT UNDER C.P.R. TRACKS.
1 1/2 MILES NORTH OF STATION AND AT MILEAGE 18.9 FROM
OTTAWA WEST. SOUTH END OF WEST FACE. BOLT SET
HORIZONTALLY. PUBLICATION N° 19 08600DE.
B.M. ELEV. 291.13 (GEODETIC DATUM)
NAIL AND WASHER IN N.E. ROOT OF 3" MAPLE, 22'-0" LT.
OF STA. 357+27.



KEY PLAN
SCALE 1" = 1 MILE

CONSTRUCTION NOTES

- CLASS OF CONCRETE
DECK, SIDEWALK, PARAPET WALLS - 4000 P.S.I.
PRESTRESSED CONCRETE SLABS - 5000 P.S.I.
ALL OTHER - 3000 P.S.I.
- CLEAR COVER ON REINFORCING STEEL
FOOTINGS 3"
ABUTMENTS 3"
SIDEWALKS 1 1/2"
PARAPET WALLS 1 1/2"

LIST OF DRAWINGS
1. GENERAL ARRANGEMENT

REVISIONS		DATE		BY		DESCRIPTION	
<p align="center">PRELIMINARY ONLY</p> <p align="center">DEPARTMENT OF HIGHWAYS ONTARIO</p> <p align="center">BRIDGE DIVISION</p> <p>Port Credit McCORMICK & RANKIN LIMITED Ottawa</p> <p align="center">CONSULTING ENGINEERS</p> <p align="center">TAYLOR MUNICIPAL DRAIN BRIDGE</p> <p align="center">0.1 MILE NORTH OF 'NORTH GOWER'</p> <p>KING'S HIGHWAY No. 16 DIST. No. 9</p> <p>CO. CARLETON</p> <p>TWP. NORTH GOWER LOT 20 CON. 3</p> <p align="center">GENERAL ARRANGEMENT</p> <p>APPROVED 3-227 W.P. No. 443-64</p> <p>DESIGN L. H. CHECK R. D. N.</p> <p>DRAWING R. M. T. CHECK L. H.</p> <p>DATE NOV. 1966 LOADING H.S. 20-44</p> <p align="right">D 6015-PI</p>							