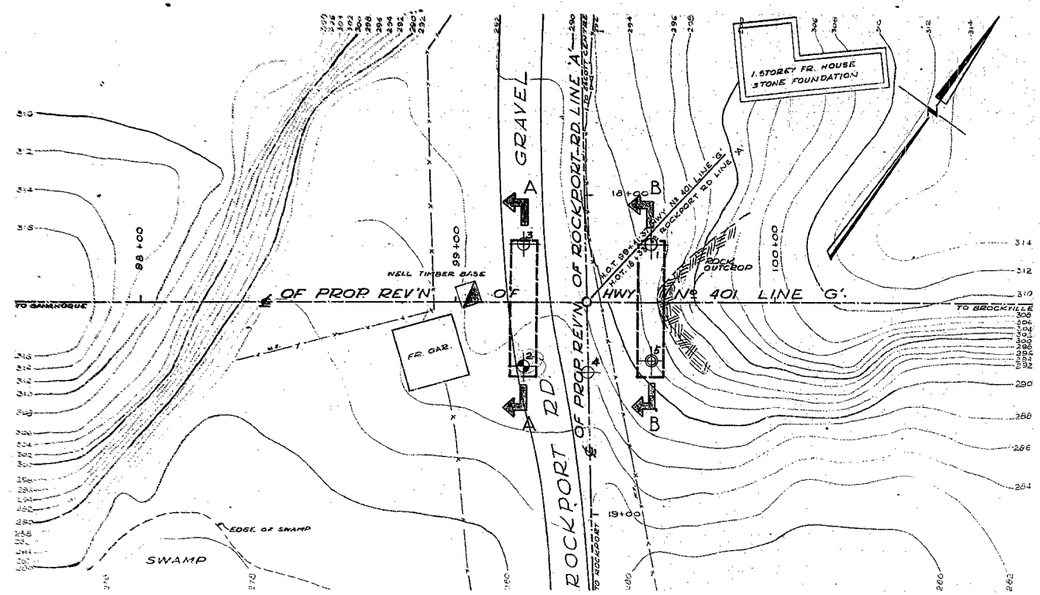
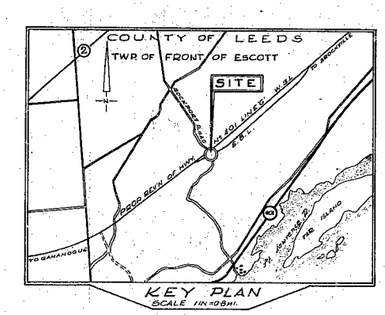
#62-F-242C
W.P.#174-61
Hwy#401 &
ROCKPORT RD.
OVERPASS

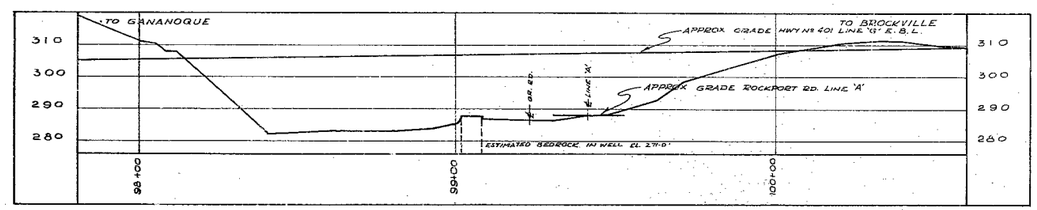


BORE HOLE LOCATION PLAN

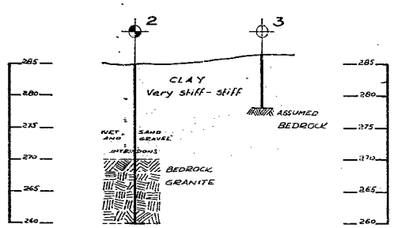


KEY PLAN
SCALE 1 IN = 0.8 MI.

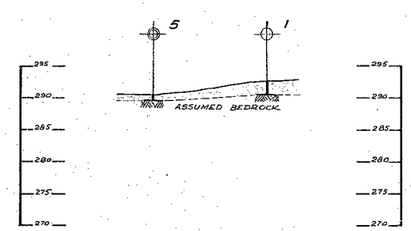
B.M. ELEV. 280·43
GEODETIC DATUM
N.E.W. IN WEST ROOT OF 1·2' ELM,
230'0 RT. OF ST. 99+60



PROFILE



SECTION A-A



SECTION B-B

LEGEND

- BORE HOLE
- PENETRATION TEST
- PROBE

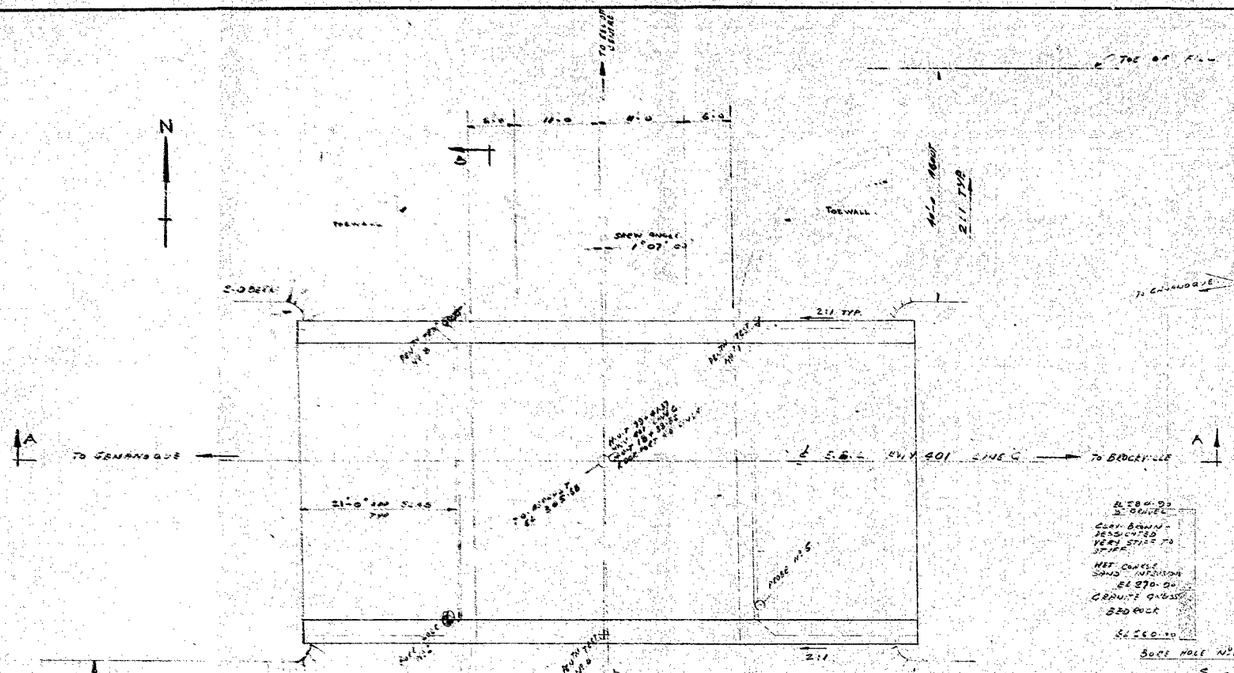
HOLE	ELEVATION	STATION	DIST. FROM ℄
1	292·47	99+61	18' LT.
2	284·95	99+21	20' RT.
3	286·76	99+21	18' LT.
4	284·95	99+41	22' RT.
5	290·24	99+61	18' RT.

W.A. TROW & ASSOC. LTD.

FOUNDATION INVESTIGATION

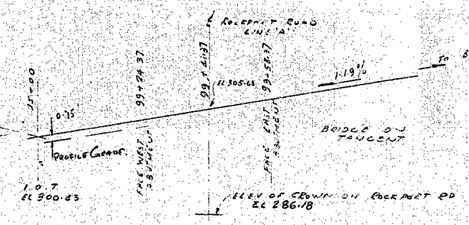
PROPOSED CROSSING AT HIGHWAY No. 401 E.B.L. LINE 'G' AND ROCKPORT RD. LINE 'A'

PROJECT No. 7967	W.P. No. 174-61	DATE NOV. 1962.	DWG. 1.



PLAN

SCALE: 1/8" TO 1'-0"



PROFILE OF FINISHED PAVEMENT AT CROWN OF ROAD

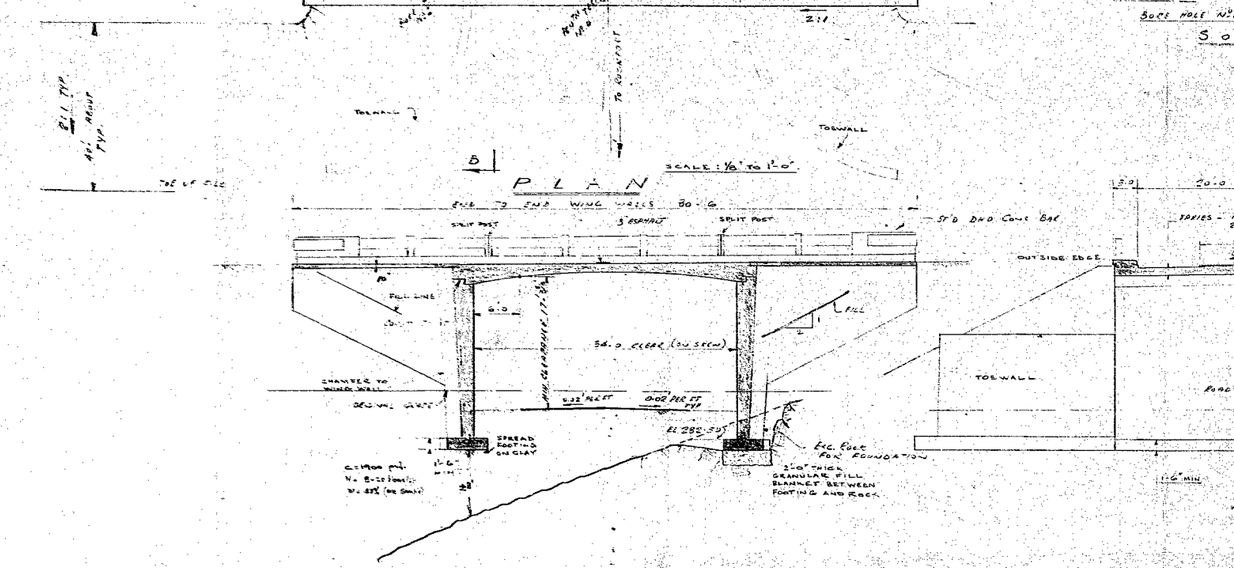
RESULTS OF BOREHOLE PROBING

CONE	No 1	EL 289.60
CONE	No 3	EL 278.70
CONE	No 4	EL 278.40
PROBE	No 5	EL 289.50

SOIL INFORMATION

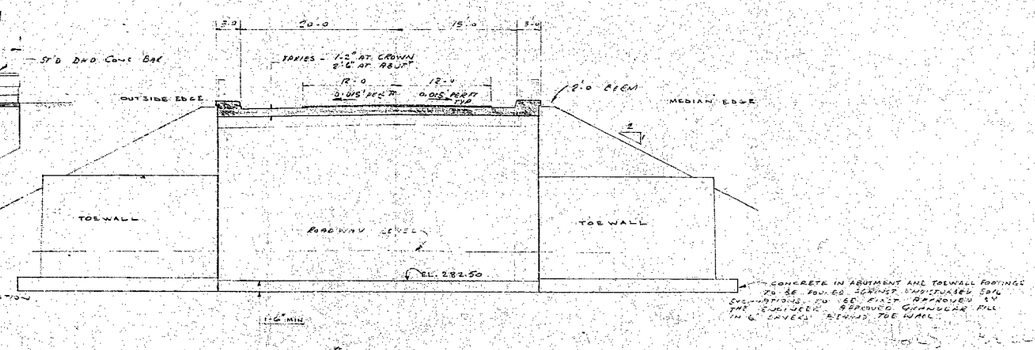
Notes:-

1. CONCRETE TO BE 3000 P.S.I. AT 28 DAYS
2. ROAD TO ROCKPORT WILL BE CLOSED DURING CONSTRUCTION OF BRIDGE
3. BRIDGE WILL EASILY ACCESSIBLE FROM ROCKPORT
4. FOOTINGS TO HAVE NOT LESS THAN 6'-0" OF EARTH COVER.
5. BACKFILL TO BE DEPOSITED BEHIND EACH ABUTMENT WILL TO ATTAIN THE SAME ELEVATION AT THE SAME TIME.
6. SAFE BEARING PRESSURE ON CLAY 4 K.S.F.
7. PROVIDE WEEP HOLES AT 10 FEET CENTRES IN ABUTMENT AND TOEWALLS.



LONG'L SECTION A-A

SCALE: 1/8" TO 1'-0"



SECTION B-B

SCALE: 1/8" TO 1'-0"

NOTE: GRADES MAY BE ALTERED BY ~~1'-0"~~ 2'-0" AS CLEARANCE IS 2'-3½" OVER MINIMUM REQUIRED

PRELIMINARY

REF:- WD 174-61-1

DEPARTMENT OF HIGHWAYS:-ONTARIO-
BRIDGE OFFICE:-TORONTO

ROCKPORT RD OVERPASS
E. B. L.

THE KING'S HIGHWAY No. 401 DIST. No. 8
CO. LEEDS
TWP. FRONT OF ESCOTT LOT 8 CON. BROKEN FRONT

GENERAL ARRANGEMENT

APPROVED

	BRIDGE ENGINEER		DESIGN. ENGINEER
DESIGN	PATER	CHECK	H.C.L.
DRAWING	FOSTER	CHECK	H.C.L.
TRACING		CHECK	
DATE	20 FEB. 63		

CONTRACT NUMBERS
LOADING H20 S16
DRAWING NUMBER D-5233-1

REVISIONS:

DATE	BY	DESCRIPTION	REFERENCE PLANS
			E-23-1
			E-23-2
			E-23-9

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engr.,
Room 107,
Lab. Building.

From: A. P. Watt

Date: April 16, 1963.

Our File Ref.

In reply to

Subject: W.P. 174-61-1, Bridge Site 17-153
Rockport Rd. E.B.L. Overpass
Hwy. #401 - District #8.

Enclosed please find one copy of the preliminary plan D-5233-1 for the above structure.

The designer appears to have complied with the requirements of the foundation report but we would appreciate any comments you wish to make.

APW/rp

A. P. Watt,
Bridge Location Engineer.

Contacted ~~with~~ Mr Trow and Associates regarding the above mentioned structure. The said consultants informed that the differential settlements between the two footings (one on bedrock and the other founded on Clay) will be in the order of 1 to 1½ inches. Ted Hanson of Bridge Office believes that the differential movements will be within tolerable limits. Informed Mr. A. Watt by ~~the~~ phone, the above mentioned facts.

M. Dwyer (April 22/63)

23-05-217

WILLIAM A. TROW AND ASSOCIATES LTD.

SITE INVESTIGATIONS
LABORATORY TESTING
SOIL MECHANICS CONSULTATION

W. A. TROW, M.A.Sc., M.E.I.C., P.ENG.

1850 JANE ST.,
WESTON, ONT.
CH. 1-4644

Project: J967

November 22, 1962

Mr. A. Rutka, P.Eng.,
Materials and Research Engineer,
Department of Highways of Ontario,
Parliament Buildings,
Toronto, Ontario

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

Re: Foundation Conditions - Rockport Road Overpass
Hwy. 401, W.P. 174-61 - 1

Dear Sirs:

This letter constitutes our report on the foundation conditions existing at this proposed crossing of Rockport Road by the eastbound lane of Highway 401. In view of the close proximity of bedrock to the ground surface at this site and the general absence of foundation problems, we take the liberty to be brief in this submission to you.

Our observations and recommendations arising out of this survey briefly are as follows:

1) Bedrock lies at very shallow depth under this bridge site. The maximum depth to rock, as determined at the south end of the west abutment, is 14.9 feet, or El 270 feet. The rock is overlain by stiff to hard marine clay.

2) It is recommended that the abutment footings of this structure be carried down to bedrock. No excavation problem is envisaged. The clay walls should stand unsupported.

3) It is probable that bedrock falls off to greater depths under the clay plain to the southwest of this bridge. However, the thickness of clay under the west embankment approach probably is not much greater than the depth indicated for hole 2 at the southwest corner of the bridge. The strength of this clay is more than sufficient to support the weight of 22 feet of approach fill, particularly since the length of this fill is limited by the rock outcrop 60 feet to the west of the bridge.

4) If the bridge is founded on rock, no settlement problems will arise. In any event, the clay is sufficiently stiff to resist the compressing effects of the embankment fill.

SITE

The site of this highway crossing lies about 1 mile north of Rockport and Highway No. 2 in the typical "rock-knob and clay flat" terrain which is characteristic of this section of Ontario. The existing Rockport Road, at this Highway 401 crossing, passes between two rock outcrops at the east end of a long poorly drained clay flat estuary. Bedrock outcrops predominate farther to the east. The granite knob immediately to the west is almost an isolated occurrence, although it probably joins with the main rock mass just below ground surface immediately to the north of this crossing. Huge stones and boulders about 12 feet thick are broken off from the edges of this isolated massive outcrop.

SUBSOIL AND GEOLOGY

The east abutment location lies just to the west of the location where bedrock rises through the overburden. Consequently, the shallow depth of the overburden was proven merely by probing. Very little cover was encountered.

The same procedure was followed at the north end of the west abutment and rock here was found to be at El 278.7.

In hole 2 at the southwest corner, very stiff dark brownish grey marine clay was encountered. This soil becomes less stiff with depth, relatively speaking, although the laboratory undrained strength on a sample from 9 feet still indicated a strength of about 1900 psf. No other laboratory testing was performed on this clay, since it is obviously strong enough to support the weight of the approach fill. In view of the close proximity of rock at all other locations, it would be unwise to support a portion of the west abutment on this clay and, consequently, the bearing capacity of the clay is not of concern. Just above bedrock, the clay contains pockets and seams of wet sand, and consequently it is somewhat weaker.

According to Chapman*, the clay in this area is a sediment of the Champlain sea invasion. The presence of tiny organic pockets in the clay and the lack of stratification confirm that this opinion is correct.

Bedrock was proven in hole 2 for a depth of 10 feet. Extremely hard granite to granite gneiss was encountered. It contained many weathered seams and joints. Poor recovery was obtained in the second drill run from 20 to 25 feet, despite the fact that the machine was on pressure at all times and full water return was noted. The core in this run was badly broken.

* "The Physiography of Southern Ontario" - Chapman and Putnam

DISCUSSION OF FOUNDATION REQUIREMENTS

As intimated in the previous sections, bedrock lies at very shallow depth at most locations and, consequently, the bridge should be supported directly on this medium. A safe net bearing value in the order of 25 tons per square foot is quite permissible.

Although very stiff competent clay occurs under the west abutment, it is recommended that the bridge abutment on this side also be taken to rock. In this way there will be no possibility of undesirable differential settlement. The excavation work through the clay should be accomplished without difficulty. The walls of the clay should stand unsupported, although light strutting may be required to hold the top of the cut, or, alternatively the banks should be cut back slightly. No excavation difficulty is envisaged when digging to bedrock through the clay.

In view of the high undrained strength of the clay, no embankment stability problem exists in the short stretch of ground between the bridge site and the rock knob 60 feet to the west. It is anticipated that the average strength of the clay mass in this area is at least equal to the value recorded for hole 2 on a sample taken from a depth of 9 feet below the surface. As well, very little settlement of this soil, under the weight of 22 feet of fill, should be anticipated. Consequently, no analyses of these aspects of the design have been considered to be necessary.

We shall be pleased to discuss the results of this investigation in more detail if you consider this to be necessary.

Yours very truly,

REGISTERED PROFESSIONAL ENGINEER
CIVIL
W. A. TROW
PROVINCE OF ONTARIO

W Trow
William A. Trow, P.Eng.

WAT/gc
Encls.

View From the South

Drill on Hole 2

View From the Northwest

Drill on Hole 2

Drill on Hole 2

View From the Southwest

Bedrock Outcrop

Looking West From Rockport Road

WILLIAM A. TROW & ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING No. 2

PROJECT No. J967

BOREHOLE No. 2

PROJECT Proposed Bridge Site, Hwy. 401 & Rockport Road

LOCATION Near Rockport, Ontario

HOLE LOCATION See Dwg. 1.

HOLE ELEVATION 284.9 ft.

DATUM See Dwg. 1.

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)

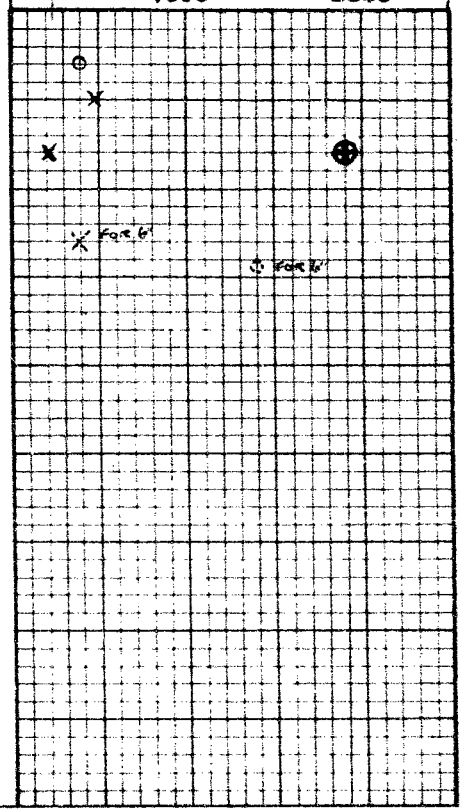
NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

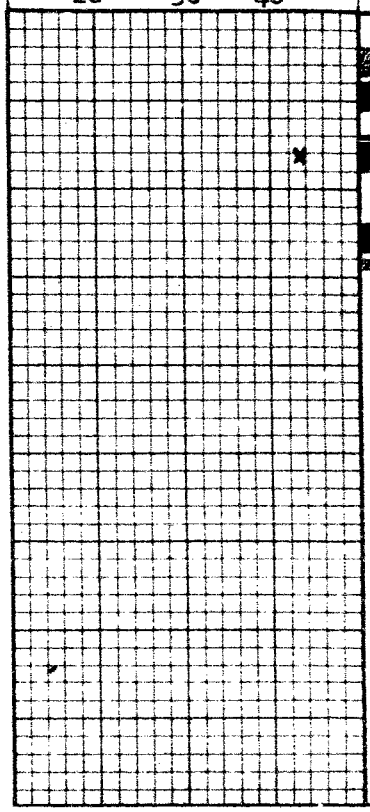
ATTERBERG LIMITS
- LIQUID LIMIT
- PLASTIC LIMIT

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

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE 350 FT. LB. BLOWS/FT (20, 40, 60, 80) / SHEAR STRENGTH PSF (1000, 2000)	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT (20, 30, 40)	SAMPLE TYPE AND No	NATURAL UNIT WEIGHT P.C.F.
	Road Surface	284.9	0				
	3 ins. gravel.						
	CLAY-brown, desiccated, with numerous fine black organic spots.						
	-very stiff - less stiff with depth.		10				
	-wet coarse sand intrusions & gravel sizes below 12 ft.						
		270.0					
	GRANITE GNEISS BEDROCK - 75% recovery.		20				
	End of Hole	260.0					
			30				
			40				

Notes: 1) Borehole cased to full depth with BX pipe.





Sample No	Natural Unit Weight P.C.F.
SS1	
TW2	
TW3	110
TW4	
SS5	

WILLIAM A. TROW & ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING No 3

PROJECT No J967

BOREHOLE No. Cones 1,3 & 4.

PROJECT Proposed Bridge Site, Hwy. 401 & Rockport Road

LOCATION Near Rockport, Ontario

HOLE LOCATION See Dwg. 1.

HOLE ELEVATION

DATUM See Dwg. 1.

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

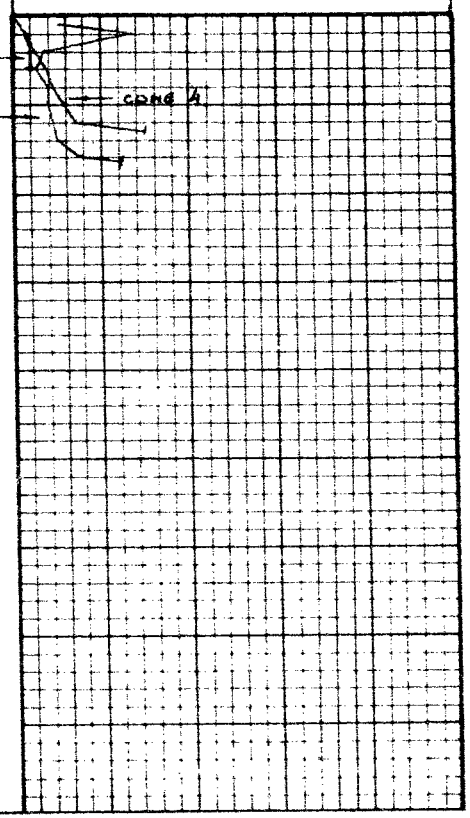
SAMPLE TYPE

2" O.D. SPLIT TUBE

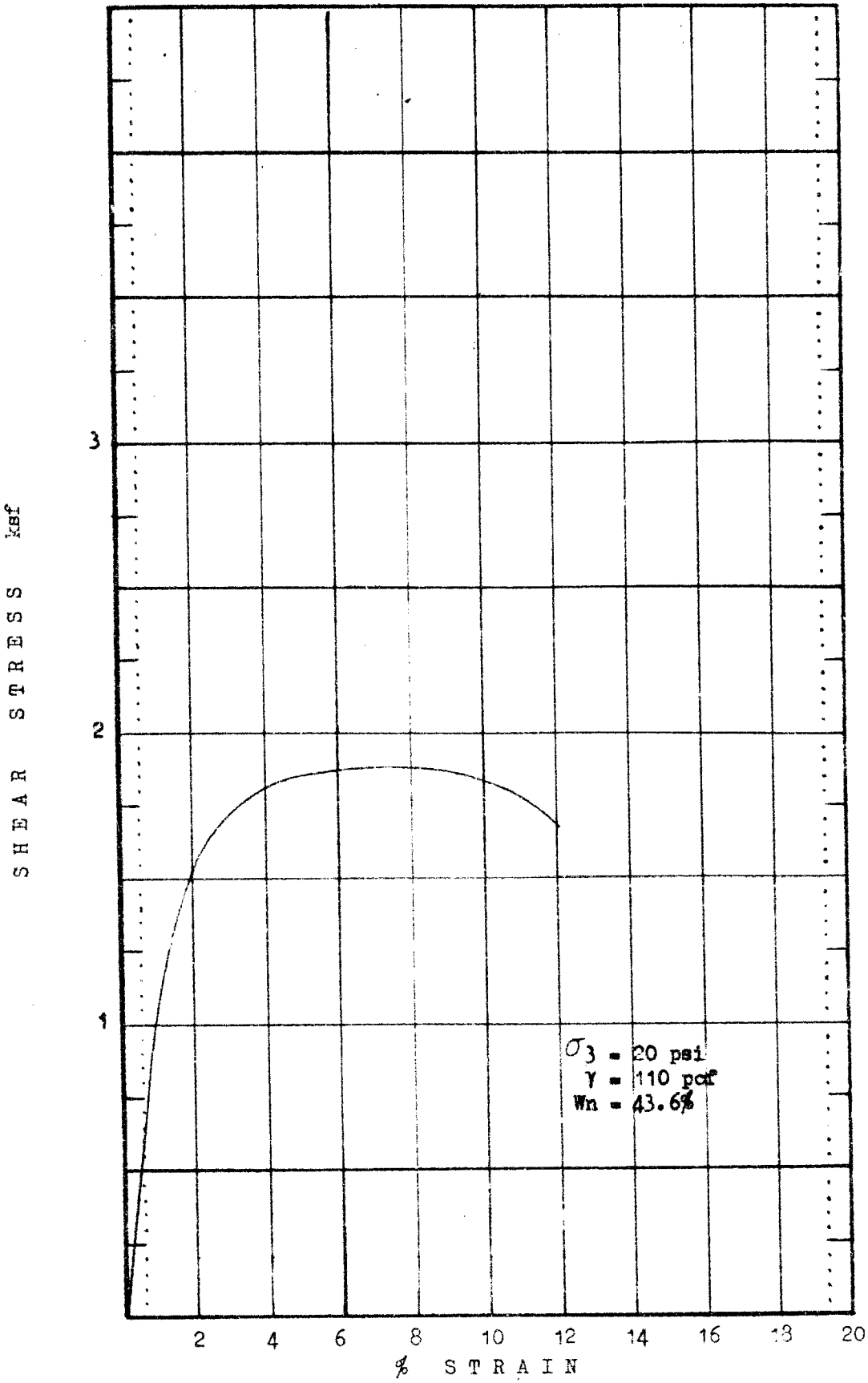
2" I.D. SHELBY TUBE

3" O.D. SHELBY TUBE

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FEET	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.
	Results of Bedrock Probings						
	Refusal Cone 1 = 289.6 Cone 3 = 278.7 Cone 4 = 278.4 Probe 5 = 289.5		0 10 20 30 40				



PROJECT NO. J967 DRAWING NO. 4



UNDRAINED TRIAXIAL TEST RESULT

HOLE 2 - 9 FEET

WILLIAM A. TROW AND ASSOCIATES

Materials and Research Division

October 18, 1962.

William A. Frow & Associates, Ltd.,
1850 Jane Street,
Weston, Ontario.

Attention: Mr. Wm. A. Frow.

Re: W.P. 174-61, Hwy. #401,
Rockport Rd. Overpass,
District #8, Kingston.

Dear Sir:-

Please consider this your authority to carry out a foundation investigation at the above site. Plans and profiles were provided to your representative on October 12, 1962.

It is understood that a qualified Soils Engineer will be in charge of the field work at all times.

Fourteen copies of the completed foundation report, plus an additional copy of the subsoil profile, should be submitted to the Foundation Section as soon as possible. Previous requirements as to preliminary borehole information and laboratory testing program, should be followed.

Charges for the work performed will be in accordance with your Schedule of Rates, dated May 24, 1957, and invoice to be addressed to the attention of the undersigned.

Note:- As Ottawa is the nearest recognized mobilization point, payment for mobilization will be from there, as discussed with your representative.

Yours very truly,

A. Putka,
MATERIALS & RESEARCH ENGINEER

MHS/Wed

cc: Messrs. H. McCombie
J. Ford
E. A. Cash
J. E. Gruspier
N. D. Smith (2)
Mrs. F. Tate
Foundations Office
Gen. Files (2)

cc: Foundations Office (Rm. 410)

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. A. McCombie.

Mr. A.G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

November 27, 1962.

FOUNDATION INVESTIGATION REPORT BY -
Wm. A. Trow & Associates, Limited,
Rockport Road Underpass, Hwy. #401,
District #8 -- W.P. 174-61.

Attached, we are forwarding to you the above-mentioned report submitted by the Consultant, Wm. A. Trow & Associates.

We have reviewed the report and found the factual information well presented and the recommendations self-explanatory.

It is believed that the information contained in the report will be adequate for your future design work. However, should there be any problems that you wish to discuss, please do not hesitate to contact our office.

K.Y.L.

K. Y. Lo,
SUPERVISING TECHNICAL ENGR.
For:

A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

KYL/MdeF
Attach.

cc: Messrs. A. M. Toye (2)
E. A. Trogmakes
R. D. McMillan
J. Ford
E. A. Cash
J. E. Grunpler
T. J. Kovich
J. Roy
E. R. Saint
F. Forman
A. Watt

Foundations Office
Gen. Files