

WILLIAM A. TROW AND ASSOCIATES LTD.

SITE INVESTIGATIONS  
LABORATORY TESTING  
SOIL MECHANICS CONSULTATION

BA1815

24-50

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

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

Project: J1922

October 9, 1963

Mr. R. Cruise, P.Eng.,  
County Engineer,  
County of Peel,  
1 Wellington Street East,  
Brampton, Ontario

Attention: Mr. K. Knudsen, P.Eng.

Re: Foundation Conditions - Proposed Crossing of Credit River  
32nd. Line at Boston Mills, Peel County

Dear Sirs:

In conformance with your instructions given on September 24, we have made an investigation of subsoil conditions at this site which is located south of the Forks of the Credit and upstream of Cheltenham, Ontario.

The new bridge will comprise part of a local improvement in the line and grade of this county road which will eliminate the very sharp bends in the roadway at the existing steel truss river crossing.

Because bedrock was relatively close to the surface and consequently, since there is no particular foundation complication, we shall take the liberty to be brief in the submission of our findings to you.

PROPOSED BRIDGE SITE

As indicated in the opening paragraphs, the new bridge will constitute a general straightening of the 32nd. line crossing of the Credit

River. The bridge width and approach grades presumably will be improved to accommodate present and anticipated future traffic.

The locations of the new bridge and the existing structure are shown on the attached sketch, Dwg. 1, and on the photographs of the area. The new bridge will meet the river on a very sharp skew and the span presumably will be much greater than the existing crossing. It is assumed that the road grade will be raised about 5 to 10 feet in order to meet the levels of the existing roads on either side of the flood plain of the river.

The Credit River flows close to the north west bank at this particular crossing location and its flood plain is about 100 feet wide. Springs and wet ground were noted on the hillside to the south of the flood plain as shown on Dwg. 1. The river bed is boulder strewn and the south bank is overgrown with weeds. The water was about 2 to 4 feet deep at the time of this survey.

#### FIELD WORK AND SUBSOIL

Two borings and two penetration tests were made at this site at the locations shown on Dwg. 1. The holes were cased with BX pipe to bedrock and bedrock was cored using AX coring bits.

Samples were taken at relatively close intervals of depth and, in most instances, they were recovered in the partially disturbed state using a 2 inch O.D. split spoon which was driven into the ground under an energy of 350 ft. lbs. per blow.

Cone tests were made in the general vicinity in order to obtain some indication of the variation in bedrock level and to determine the depth of alluvium along the route of the approach fill. The elevations of the holes and cone tests were related to the bench mark shown on Dwg. 1.

The soil encountered in the two borings is described in the borehole logs, Dwg. 2 and 3 of this report and in the stratigraphical profile of Dwg. 1. On the high north bank, made in the road shoulder, hole 1 passed through about 6 feet of loose to medium dense fine granular fill before water-sorted sand and gravel deposits were encountered. This material extended to bedrock which was intersected at relative El 83.4 feet, or about 2 feet below the river bed. Bedrock consists of red calcareous shale with increasing limestone content with depth. Recovery of core was not too satisfactory, although the rock is believed to be sound. No mud seams or voids were noted.

On the south bank, loose river alluvium was encountered to El 86 feet or  $3\frac{1}{2}$  feet below river surface level. At this depth hard silty clay was encountered which extends to bedrock at El 76.6 feet. This is about 7 feet lower than the level noted under the north bank of the stream. There appears to be some localized preglacial erosion of the river bed since the refusal level was found to be about 2 feet higher in the cone test made farther to the east of this boring.

#### FOUNDATIONS

Since fill will be required along the approaches to each end of the bridge, one obvious foundation alternative for this structure is to support it on H piles driven through the approach fill to refusal on bedrock. With this arrangement the need to excavate below river level in the free-draining sand will be eliminated. It is expected that H piles will penetrate into bedrock to some extent but refusal should be experienced at shallow depths. The permissible loading on each pile, if driven to refusal should equal its safe structural capacity when considered as a short column. Batter piles probably will be required to resist the thrust of embankment fill unless spill-through abutments are used.

An alternative to pile support at the west end of the bridge is to install the abutments directly onto bedrock which lies about 6 feet below the water level. The safe net bearing value to apply to this bedrock is estimated to be 10 tsf.

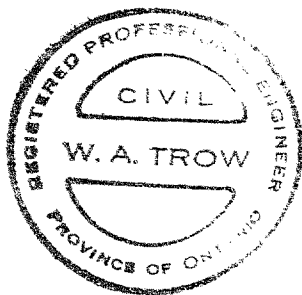
At the east end of the bridge, on the south bank, footings could be supported in the stratum of hard clay which will be encountered at the level of the existing river bed. A penetration of at least 4 feet below river bed will be required, in order to obtain protection against scour. The safe net bearing value to apply to the clay is estimated, from a triaxial test measurement, to be at least equal to 8000 psf. The excavation in the clay will stay open during the installation of the abutment footing provided that a stable dyke or other temporary water barrier is built on it and is carried above the river level. The settlement resulting from support on the hard clay will be negligible, and it will occur as load is applied.

Since the alluvial soil is essentially granular, no embankment stability problem exists. The height of fill probably will be greater than 4 feet and therefore there should be no need to remove the 12 inches of topsoil overlying the flood plain. This conforms to the standard practice of the Department of Highways.

If spill-through construction is used, or if footings extend to bedrock, rip rap protection should be provided on all areas that are exposed to river erosion.

We shall be pleased to discuss any queries you may have after you have reviewed the contents of this report.

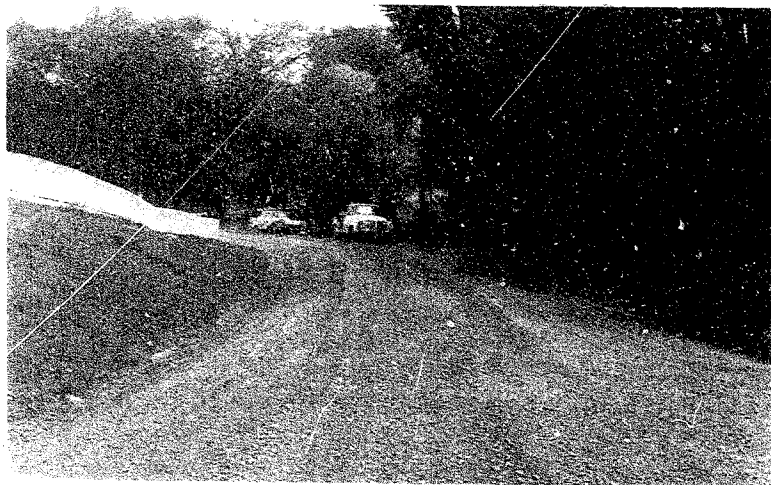
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Encls.



Yours very truly,

*W. Trow*

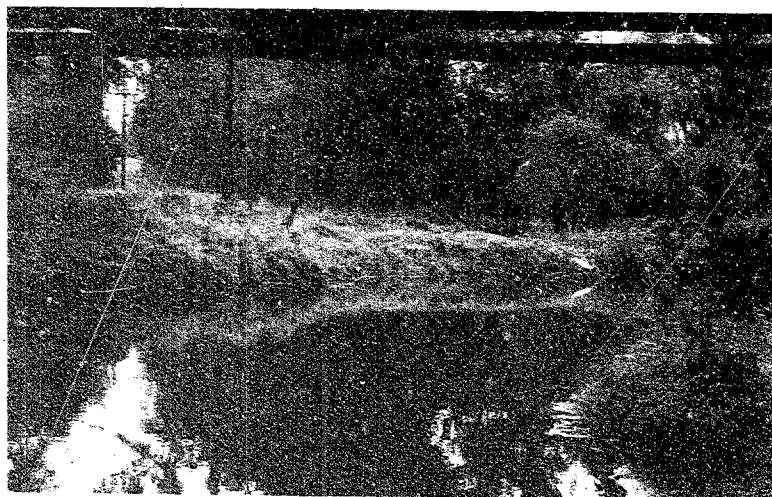
William A. Trow, P.Eng.



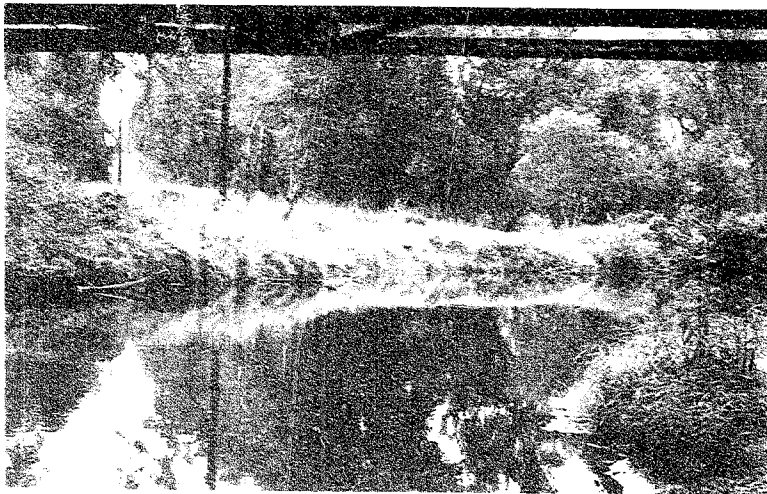
Looking East  
Along Centre Line  
Drill on B.H. 1



View of Existing Bridge  
From Downstream



Looking Downstream  
from Existing Bridge



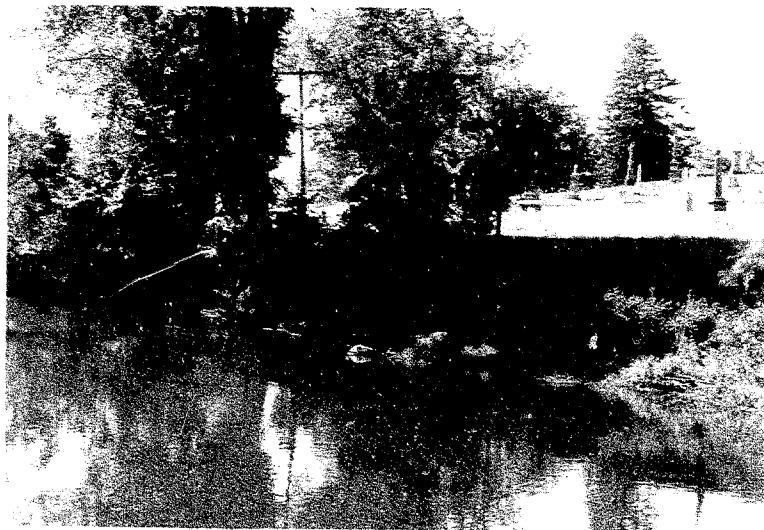


Boston Mills  
From the West Bank  
Looking Along C.I.



From the East Bank  
Looking Along C.I.

SUPERIMPOSED DOCUMENT MAY  
APPEAR AS MULTI-FEED ON FILM.





## SITE INVESTIGATIONS      SOIL MECHANICS CONSULTATION

DRAWING NO. 2  
PROJECT NO. 31222

## PENETRATION RESISTANCE

2 OD SPLIT TUBE      ○—○—○  
2 ID SHELBY TUBE      ★—★—★—★  
3 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 10 SHELBY TUBE

3 O D SHELBY TUBE

$\frac{1}{\sqrt{2}} \begin{pmatrix} 1 & i \\ 0 & 1 \end{pmatrix}$

PROJECT Boston Mills Bridge

... ACHON Credit River - 32nd Side Road

FILE LOCATION See Page 1

WIDE ELEVATION 102.75 ft.

Doc. 1.

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE				350 FT. LB BLOWS/FT 80	NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	SAMPLE TYPE AND NO	NATURAL UNIT WEIGHT P.C.F.
				20	40	60					
	Boulder of Road	102.0	0								
	Fill-medium dense silty fine sand, some organic material.										
	SAND & GRAVEL-fluvial deposits, med. dense, some pos. of wood & organic material, wet.	96.7	10							1	
	Refusal to casing & split spoon.	89.7								2	
	BEDROCK-red calcareous shale with limestone intrusions or interbeds, - light pressure on drill.	83.4	20							3	
	100% recovery AX core to 21 ft. 100% recovery below full water return).	78.5								4	
	End of Bore										
	Notes: 1) Boring cased to bedrock with BX pipe.		30								
	2) W.L. at 12.5 ft. at end of bore. Diver level = 89.3.										
	3) Cone driven 22 ft. to S.S.W. Elevation of ground = 103.3 ft. Bouncing refusal at El 86 ft.		40								

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E. INVESTIGATIONS SOIL MECHANICS CONSULTATION

CONDITIONS IN NEGATIVE DIRECTION  
CONDITION OF ORIGINAL DOCUMENT

DRAWING NO. 3  
PROJECT NO. 11222

## 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) ⊕<sup>s</sup>

### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

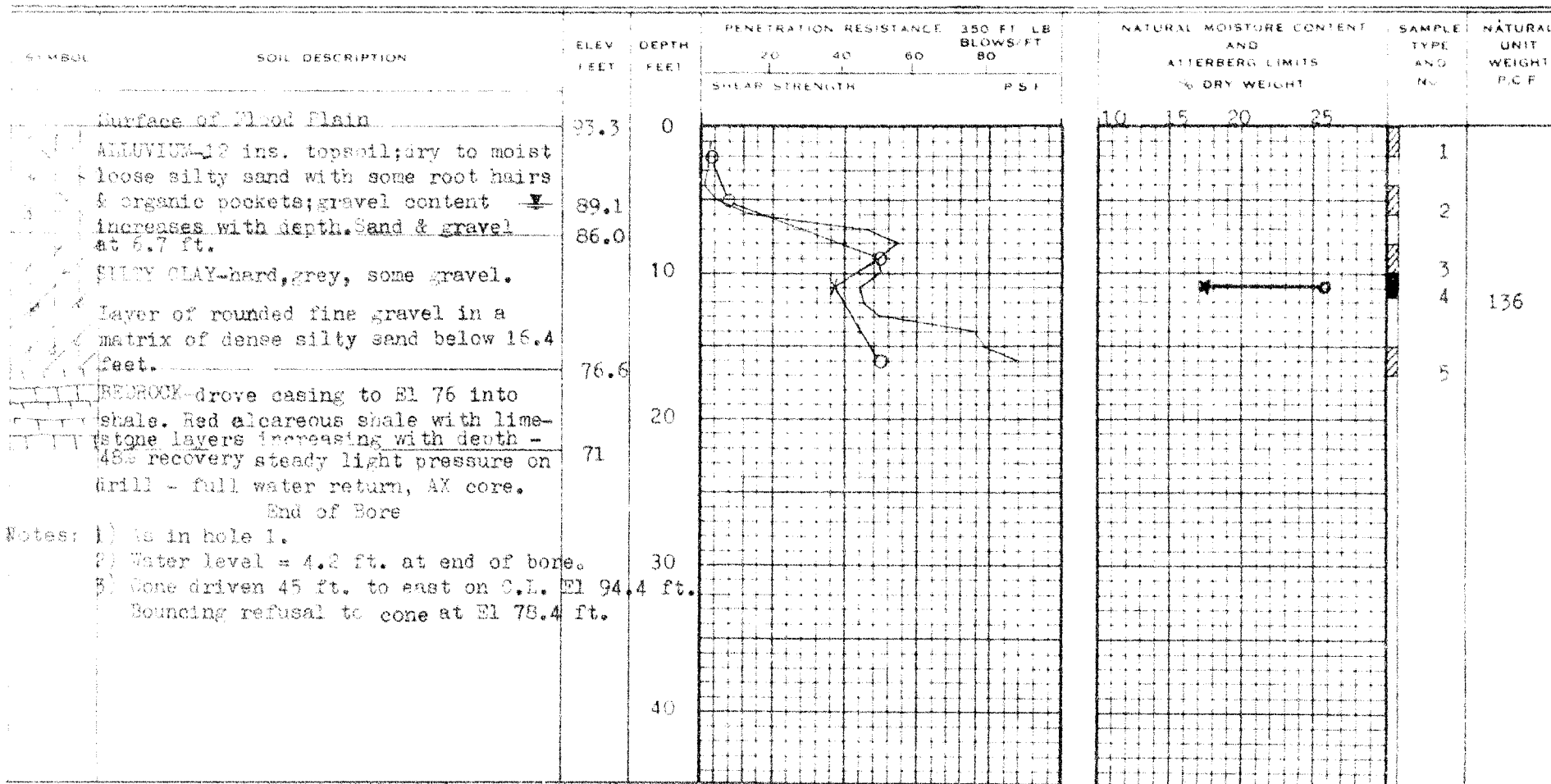
### ATTERBERG LIMITS

- LIQUID LIMIT —○—
- PLASTIC LIMIT ———

### SAMPLE TYPE

- 2" O.D. SPLIT TUBE ⊠
- 2" I.D. SHELBY TUBE ⊡
- 3" O.D. SHELBY TUBE ⊢

BOREHOLE NO. 2  
PROJECT Boston Mills, Inc.  
LOCATION Credit River - 3rd Side Road  
HOLE LOCATION See Dwg. 1.  
HOLE ELEVATION 33.3 ft.  
DATE See Dwg. 1.



SHEAR STRESS ksf

6.0

4.0

2.0

$\gamma = 136.2$  pcf  
 $\sigma_v = 10$  psi  
 $w = 17.4\%$   
 $LL = 26.8\%$   
 $PI = 17.6\%$

% STRAIN

UNDRAINED TRIAXIAL TEST RESULT

WILLIAM A. TROW AND ASSOCIATES

B.H. 2, 11 FT.

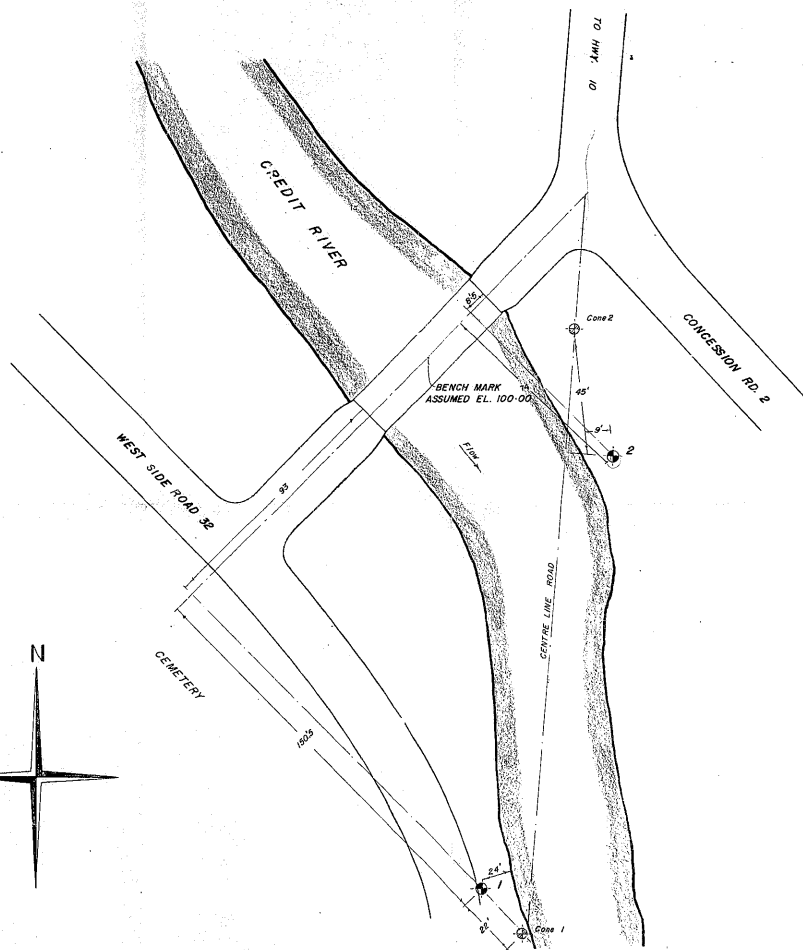
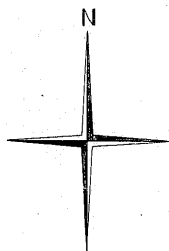
#63-F-257 M

CREDIT RIVER

32ND LINE

BOSTON MILLS

PEEL CTY.



PLAN

SCALE: 1 IN. = 20 FT.

LEGEND



Borehole



Cone test



Penetration Resistance Blows Per Foot.

