DOCUMENT MICROFILMING IDENTIFICATION.

GEOCRES No. 40P9-24

DIST. 3 REGION south western

W.P. No.

CONT. No.

W. O. No.

STR. SITE No.

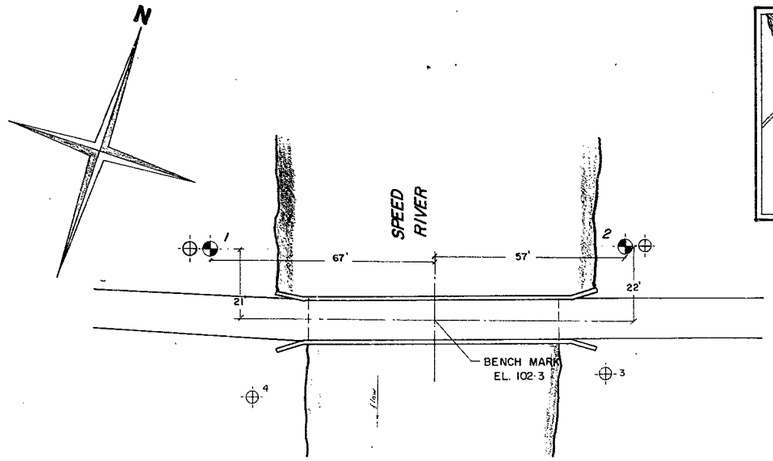
HWY. No.

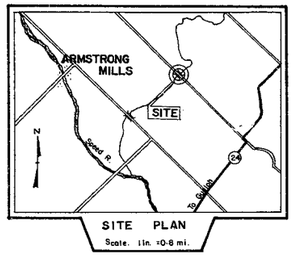
LOCATION SPEED RIVER (SOUTH OF ARMSTRONG MILLS)

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT: 1

REMARKS:

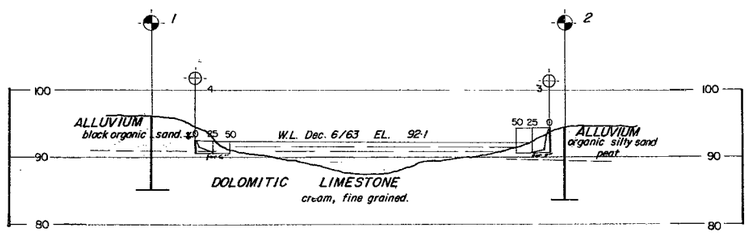
GI-20 SEPT. 1975





PLAN

SCALE: 1 IN. = 20 FT.



INTERPRETED SUBSOIL STRATIGRAPHY

SCALE: HOR. 1 IN. = 20 FT. VERT. 1 IN. = 10 FT.

LEGEND

- BOREHOLE
- CONE

40P7-24
GEOCRES No.

WILLIAM A. TROW AND ASSOCIATES LIMITED

FOUNDATION INVESTIGATION

BUCHANAN BRIDGE OVER SPEED RIVER

TWP. PUSLINCH ONTARIO

PROJ. 1333 | DATE FEB. 1964 | DWG. Nº 1

Plot on 40P9

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: J1333

March 6, 1964

40P9-24
GEOCRES No.

Mr. F.R. Astrop, P.Eng.,
Consulting Engineers,
4 Hughson Street South,
Hamilton, Ontario

Re: Soil Conditions, Buchanan Bridge Over Speed River, Wellington County, Ontario

Dear Sirs:

In conformance with your authorization of January 17th, 1964, we have carried out a site investigation at Buchanan Bridge over Speed River in Wellington County, Ontario. This work consisted of 2 boreholes taken into bedrock and 4 dynamic cone tests driven to refusal.

Briefly, the findings of this report are as follows:

1. Dolomitic limestone bedrock was encountered about 2 feet below the stream surface by the boreholes and dynamic cone tests. Loose alluvium, consisting of organic silty sand, gravel, boulders and peat lenses, overlies the bedrock on either side of the river.

2. It is recommended that the abutments and wing walls be founded in the dolomitic limestone bedrock. The footings of these bridge segments, taken at least 1 foot into the sound rock, may be safely loaded to at least 10 tsf.

3. It will be necessary to form a sheeted cofferdam around the abutments during excavation work. This may be formed by dumping coarse rubble fill around the pier location to form a small dam.

4. No stability problem is anticipated with the approach embankments, although care should be taken to check that no soft peaty areas exist under the new embankment. This may be checked by digging with a backhoe at intervals across the ground prior to approach road embankment construction.

Descriptions of the site, field work carried out and brief comments on the soil conditions as they affect foundation design and construction are given in the following sections.

THE SITE

Buchanan Bridge crosses the Speed River about 1.5 miles south of Guelph to the north of Highway 24, (see Key Plan, Dwg. 1.) The existing bridge is a single span structure consisting of a steel truss supporting a wooden deck. The bridge spans about 75 feet and rests on masonary abutments founded on bedrock.

The Speed River flows in a southerly direction at the bridge crossing. The water level varied from 1 foot at the edge to about 6 feet in the centre of the river at the time of the investigation. During this time the river was understood to be at a normal level. The average surface velocity was determined to be 4 fps for this condition. Cobbles and boulders from 6 inches to 3 feet in dimension were observed on the stream bed and rock outcrops were observed along

the sides of the river channel near to the bridge abutments. The ground on either side of the stream is low-lying and supports a grass and tree cover. The roadway has been built up on either side of the bridge.

FIELD INVESTIGATION AND SUBSOIL

Two boreholes were put down at the locations indicated on the site plan, Dwg. 1. Dolomitic limestone bedrock was encountered by both borings under about 5 feet of alluvial sand and gravel deposits. This bedrock was proven by AX coring. The core recovery was 99 and 86 percent in boreholes 1 and 2 respectively. The dolomitic limestone is of a cream white colour and has a slightly pitted appearance. It effervesced on application of dilute hydrochloric acid.

Borehole records, which include the depths drilled, strata encountered and samples recovered are compiled in Dwgs. 2 and 3.

Dynamic cone tests were carried out adjacent to boreholes 1 and 2. The number of hammer blows of 350 ft. lbs. energy, required to advance the 2 inch diameter, 60 degree, apex angle cone was recorded. Two additional cone tests were carried out on the south side of the bridge, one on either side of the stream. Their records are also given on Dwg. 1.

The reduced levels of the boreholes were referred to a temporary bench mark located at the centre of the bridge deck, (Dwg. 1). The reduced level of this mark was taken as 102.5 feet.

FOUNDATION CONSIDERATIONS

Reference to the borehole records, the estimated stratigraphical profile, Dwg. 1, and the dynamic cone records indicates a relatively uniform dolomitic limestone upper horizon between Elevation 89.3 and 90.9 feet. It is believed that the most satisfactory founding means is spread footings bearing on bedrock.

Based on a visual examination of the small AX core, recovered during drilling, the dolomitic limestone is competent to safely support footings loaded to 20 ksf. The footings should be founded below any zones of very weathered, shattered or soft rock and at least 1 foot into the dolomitic limestone.

Settlement of such footings will be of an elastic nature and of a very small magnitude.

Scour around the abutment piers will present no problem, provided that the footings are taken down to relatively unweathered rock, as mentioned above.

EXCAVATIONS

Excavations for the abutment piers will be below the water table in a fast-flowing river. It will therefore be necessary to control the flow of water around the abutments by constructing a cofferdam. In view of the very shallow depth of alluvium overlying bedrock, it is likely that steel sheet piles could not be driven to

sufficient depth to generate adequate fixity to support the water pressures after the alluvium has been excavated from behind them.

Excavation works may be carried out in the following manner. Closely spaced timbers may be driven through the alluvium just outside the limits of the proposed abutment foundations. Rockrubble, tipped on either side of the timber to form a small dam, will give the timber sheeting support. The toe of this dam should be located about 3 feet from the edge of the abutment excavation. The excavation may then be dug out inside this protection and a lean trenie concrete placed to bring the foundation up to water level.

EARTH RETAINING WALLS

Well compacted granular fill should be placed behind the abutment and retaining walls. In order to allow for the rigidity of the walls, it is recommended that an earth pressure coefficient $K = 0.35$ be assumed for design purposes. The earth pressure acting at any depth, h, below the top of the fill may be estimated from the expression:

$$P = K \left\{ \gamma (h - h_1) + \gamma^1 h_1 + q \right\}$$

where: γ and γ^1 are the bulk and submerged natural densities of the backfill soil (assumed = 130 and 70 pcf)

h_1 is the height of the water table above the point being considered

q is the surcharge, if any, acting at the top of the fill

In the above expression no allowance has been made for water collecting behind the wall above the water level in the stream. Provision should be made by weeper drains to draw off any water which collects behind the walls.

Since the alluvium overlying bedrock is of a granular nature, it is expected that the construction of the approach embankments will present no problems. The approach road will be at least 10 feet above existing ground level on either side of the bridge. It is, however, recommended that checks be made in advance of embankment construction to confirm that there are no very soft areas or pockets of peat in this alluvium. This may be accomplished by a backhoe run across the site of the embankment at intervals. If any very weak areas are encountered they must be removed prior to embankment construction.

Paving of the road surface over the new embankment fills should be delayed until they have settled to their final position. This will prevent cracking of the surface.

We hope that the information in this report will be of assistance to you in the preparation of a foundation design for this bridge.

Yours very truly,

T.H. Hanna

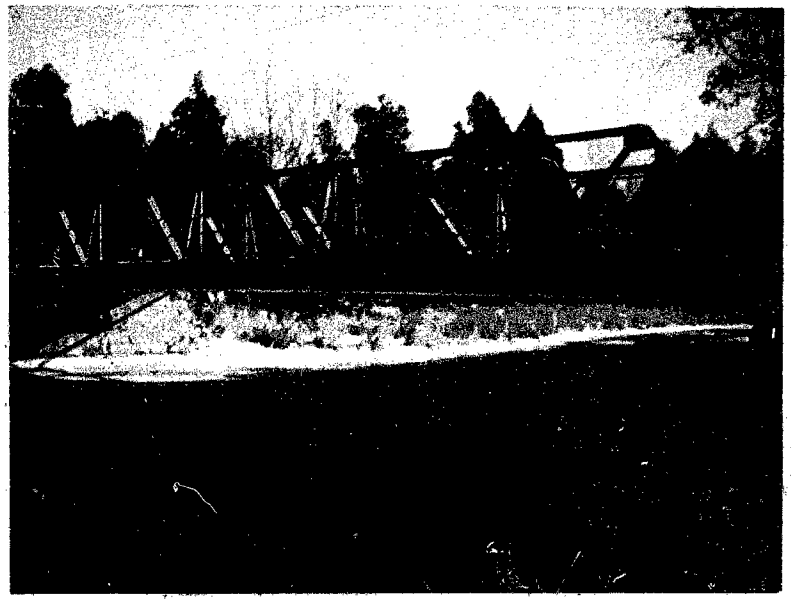
T.H. Hanna, P.Eng.

THH/gs
Encls.

View Looking East

View Looking West

View Looking North West



View Looking South

WILLIAM A. TROW & ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING No. 2

PROJECT No. J1333.

BOREHOLE No. 1

PROJECT Buchanan Bridge.

LOCATION Speed River, Wellington County.

HOLE LOCATION See Dwg. 1.

HOLE ELEVATION 96.0 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 X^{LI}

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
		96.0	0
	ALLUVIUM-black organic sand, gravel thin topsoil layer. ▽	93.0	
		90.9	
	DOLOMITIC LIMESTONE-cream, fine grained. No loss of pressure during coring.		10
	End of Bore	85.0	
			20
			30
			40

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

Refusal

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND No

Recovery.

AX Core 89%

NATURAL UNIT WEIGHT P.C.F.

Notes:

1) Hole advanced by wash boring methods to 5.1 ft. and completed using rotary core drilling methods.

2) Dynamic cone driven 6 ft. west of borehole.

WILLIAM A. TROW & ASSOCIATES LTD.

SITE INVESTIGATIONS · SOIL MECHANICS CONSULTATION

DRAWING No. 3

PROJECT No. J1335.

BOREHOLE No. 2

PROJECT Buchanan Bridge, Over Speed River.

LOCATION Township of Puslinch, Wellington County.

HOLE LOCATION See Dwg. 1.

HOLE ELEVATION 94.3 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) $+^{S}$

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX X^{LI}

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
		94.3	0
	ALLUVIUM-black organic silty sand, peat, boulders. ▽	92.9	
		89.3	
	DOLOMITIC LIMESTONE-cream, fine grained. No loss of pressure during coring.		10
	End of Bore	83.5	

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

Refusal

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT

SAMPLE TYPE AND NO	NATURAL UNIT WEIGHT P.C.F.
Recovery.	
SS1	
AX Core 86%	

Notes:
1) Hole augered by continuous flight methods to 4 ft. Hole completed using rotary core drilling methods with BX casing.
2) Dynamic cone driven 6 ft. east of borehole.