

DOCUMENT MICROFILMING IDENTIFICATION

GFOCRES No. 31G-104

W.P. No. \_\_\_\_\_

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. 3-98

HWY. No. \_\_\_\_\_

LOCATION Co. RD. 13 & NEW  
MUD CREEK, BRIDGE

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

NONE

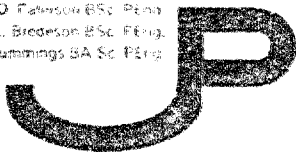
REMARKS: \_\_\_\_\_

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J. D. Paterson BSc. P.Eng.  
L. Bredeson BSc. P.Eng.  
B. F. Cummings BA Sc. P.Eng.



**JOHN D. PATERSON & ASSOCIATES LTD.**

Consulting Engineers & Geologists

Soil Investigations

Inspection & Testing Services

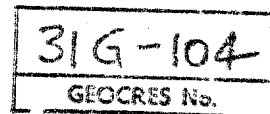
Damage Claims

Offices & Laboratory

1479 Laperriere Ave.

Ottawa 3, Canada

Telephone (613) 728-3505



REPORT OF SUBSURFACE INVESTIGATION

PROPOSED NEW MUD CREEK BRIDGE

COUNTY ROAD NO. 13

STRUCTURE SITE No. 3-98

FOR

OTTAWA SUBURBAN ROADS COMMISSION

MCCORMICK, RANKIN & ASSOCIATES LTD.

CONSULTING DESIGN ENGINEERS

REPORT NO. S724-68

JANUARY 16, 1969.



## INTRODUCTION

At the request of McCormick, Rankin & Associates Ltd., Consulting Engineers, on behalf of the Ottawa Suburban Roads Commission, a subsurface soil investigation was conducted at the site of the Mud Creek Bridge on County Road No. 13 near Manotick, Ontario.

The existing 2-lane bridge, which is no longer suitable, is to be replaced by a new structure with the same alignment.

Before the fieldwork was undertaken, it was established with the Consulting Engineers that two designs were being considered for the new bridge. The one was to be more or less similar to the existing bridge with a span of 40 feet supported by abutments on footings located 5'  $\pm$  below the stream bed. The other was to be an 80' span with the abutments supported by footings 5'  $\pm$  below finished grade.

## FIELDWORK PROCEDURE

Two full scale test holes were put down at the locations shown on the Test Boring Plan. At each location, casing was advanced by diamond drilling, the soils were sampled at regular intervals, and bedrock was located.

An hydraulic drilling rig, mounted in the van of a three-ton truck and operated by a crew of two, was used to do the fieldwork. A Soils Technician from our staff supervised and directed the field operation at all times.

## SAMPLING AND TESTING

Samples of cohesive soils were recovered by means of thin-walled steel tubes. Each tube was sealed airtight and kept from freezing. At our laboratory, the sample was extruded from each tube and tested for unconfined compressive strength, moisture content, and unit weight.

Samples of granular materials were recovered by a split spoon sampler. Each sample was classified and retained in a plastic bag. During the recovery of each split spoon sample, the Standard Penetration Test was conducted and the results are recorded as "N" values on the Soil Profile and Test Data sheets.

Core samples of bedrock were recovered by diamond drilling. The core was logged petrographically and retained in core boxes.

## OBSERVATIONS

### (a) Soil Types

At this site Mud Creek has cut a valley through the greater part of the unconsolidated sediments of a three layered geological profile. The uppermost layer consists of a clay (over which the fill of each approach has been placed) about 20 feet thick. Sandwiched between the clay above and bedrock below is a layer of sandy gravel of irregular thickness, but generally between 5' and 8' thick. The bedrock is almost flat lying.

The details of the soils stratigraphy are shown on the Soil Profile sheets.

### (b) Rock Types

The bedrock core represents part of the Oxford Formation which is Ordovician in age. It consists of grey limestone (in places shaly) and grey dolomite (in places sandy).

### (c) Groundwater

The groundwater observations are recorded below.  
The ice surface of Mud Creek was at el. 84 on December 23, 1968.

Hole No.	Collar El.	Dec. 17		Dec. 18		Dec. 23	
		Depth	El.	Depth	El.	Depth	El.
1	100.2	20.0	80.2	13.5	86.7	13.6	86.6
2	99.4	-	-	20.0	79.4	12.9	86.5

### (d) Test Results

#### Granular Material

Because the sandy gravel contains boulders, it was difficult to conduct the Standard Penetration Test. Of the three tests attempted, only SS12 was completed without hitting a boulder. On the basis of the result of the Standard Penetration Test, conducted during the recovery of SS12 (i.e., N=13), the sandy gravel layer is judged to be compact in density.

### Cohesive Material

The results of the tests conducted on the clay samples are summarized below.

Hole No.	Collar El.	Sample No.	Location Depth	El.	Unconfined Compressive* Strength in p.s.f.	Water Content	Unit Weight p.c.f.
1	100.2	TW3	6.5/8	93.7/92.2	4080	40.3%	110.4
		TW4	10/11.5	90.2/89.7	3760	52.1%	104.4
		TW5	15/15.5	85.2/84.7	840	N.V.	111.0
2	99.4	TW9	5/6.5	94.4/92.9	3020 H.P.	N.V.	112.9
		TW10	10/11.5	89.4/87.9	2920	46.5%	109.5
		TW11	15/16.5	84.4/82.9	900	33%	114.2

\*Note: Shear strength is 1/2 of the unconfined compressive strength.

### Bedrock

Core samples of bedrock were not tested for strength because of our familiarity with this rock type. However, if loads in excess of those discussed under the following are anticipated, strength tests should be conducted by this firm on the core samples retained for this purpose.

### CONCLUSIONS AND RECOMMENDATIONS

#### Bridge 40' Span

Neither the soft clay nor compact sandy gravel are suitable materials on which to place footings for the support of a bridge and short piles or piers founded on bedrock are required to support the structure. When the above information was passed on verbally to the Design Consultants, a structure similar in design to the existing one was more or less ruled out.

Bridge 80' Span

Foundation Design

It is our opinion that the clay at normal footing depths is not an acceptable material on which to place footings for the support of the proposed bridge. Although a large footing pad could be designed to accommodate the allowable bearing value of 3000 pounds per square foot, we are concerned with the unpredictable behaviour of the fissured/crumbly clay where slope stability is involved.

We recommend, therefore, that the bridge be supported by piles driven to refusal at the bedrock surface. Piles driven to bedrock and cut-off at elevation 95 will be 22' - 25' long.

Except for timber piles, any of a variety of steel, or concrete (cased or uncased) pile types can be used. Steel H piles could possibly be driven a few inches into the bedrock, especially if shale and/or weathered bedrock (which can be expected in minor amounts) are encountered. No difficulty is anticipated in designing individual piles 16" in diameter with a carrying capacity of 200 kips.

JOHN D. PATERSON & ASSOCIATES LTD.



LB:bc

L. Bredeson, P. Eng.

## JOHN D. PATERSON &amp; ASSOCIATES LTD.

Consulting Engineers &amp; Geologists

1479 Laperriere Ave.

Ottawa 3 Canada

## SOIL PROFILE AND TEST DATA

Mud Creek Bridge  
County Road No. 13  
Near Manotick, Ontario.

Datum Sta 75+00 (Bridge deck assumed el. 100.0)

Remarks Test boring hole to bedrock. Bedrock confirmed by diamond drilling.

Sheet No 1 of 2

Borings By J.B. Dufresne &amp; Co. Ltd.

Date Dec. 13 &amp; 17, 1968.

Hole No 1

SOIL DESCRIPTION	SAMPLE		q <sub>u</sub> TONS psf	N	DEPTH FEET	ELEV	Penetration Resistance Blows/ft 6-2 inch Diameter Cone				MOISTURE CONTENT IN %			
	Type	No.												
Ground Surface					0	100.2					20	40	60	80
Topsoil & gravel fill. 1.2														
Very stiff dark greenish-grey (larger fissure-faces stained brown) silty fissured CLAY with an odd horizontal silt seam and root hole. 9	BX	1			3									
	SS	2		12	6	94.2								
	TW	3	2.04		9									
Stiff, light greenish-grey (some brown staining) silty fissured CLAY, lightly stratified with silt. Odd root hole. 13.5	TW	4	1.88		12	88.2								
Interbanded, soft, grey silty clay and dark grey fissured clay. 22	TW	5	0.42		15									
					18	82.2								
					21									
Compact, grey, sandy gravel with a few boulders. 27.0	SS	6		51 for 0.8' (refusal)	24	76.2								
	SS	7		9 for 0.9' (refusal)	27									
Bedrock. 27-27.8 grey limestone with shale seams- 30.2	Run 1	Core			30	70.2								
27.8-34.5 grey limestone with small cavities & an odd large calcite crystal. 34.5-34.9 grey sandy dolomite 34.9-35.5 as 27.8-34.5 35.5	Run 2	Core			33									
	98.5%	Recovery			36	64.2								

Groundwater Level  
13.5 feet  
December 23, 1968.

Stream bottom el. 84.5

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1479 Laperrere Ave.

Ottawa 3, Canada

## SOIL PROFILE AND TEST DATA

Mud Creek Bridge

County Road No. 13

Near Manotick, Ontario.

Datum Sta 75+00 (Bridge deck) assumed el. 100.0

Remarks Test boring hole to bedrock. Bedrock confirmed by diamond drilling. H.P. = Hand penetrometer.

Sheet No 2 of 3

Borings By J.B. Dufresne &amp; Co. Ltd.

Date December 18, 1968.

Bore No 2

## SOIL DESCRIPTION

SAMPLE

q<sub>u</sub>

N

DEPTH

ELEV

Penetration Resistance Blows/ft

— 2 inch Diameter Cone

— MOISTURE CONTENT IN %

Ground Surface

FILL:  
0.2' topsoil over sandy  
gravel fill contaminated  
with pieces of wood.

BX

8

0 99.4

3

Stiff dark greenish-grey  
crumbly silty CLAY with  
minor roots & root holes.

TW

9

1.51

H.P.

6 93.4

Stiff greenish-brown (in  
places mottled pink) fis-  
sured silty CLAY with an  
odd pebble & minor roots.

TW

10

1.46

9

12 87.4

Interbanded, soft, grey  
silty clay and dark grey  
fissured clay.

TW

11

0.45

15

18 81.4

Compact, grey sandy gravel  
with a few boulders.

SS

12

13

21

24 75.4

Bedrock  
29.5-30 limestone mottled  
with shale.  
30-34.2 dense grey limestone  
slightly mottled with shale  
below 31.3

Run 1 Core

82% Recovery

30 69.4

33

36 63.4

Groundwater Level  
12.6 feet  
December 23, 1968.Stream  
Bottom  
el. 84



NO. 1  
STA 74+31.5  
15.5 RT.  
100.2

MUD

Ice el.  
85.2

74+00

75+00

CREEK

B.M. BRIDGE DECK  
STA. 75+00 ASSUMED  
ELEVATION 100.0

NO. 2  
STA 75+81  
14.5 RT  
99.4

76+00

TEST BORING PLAN  
PROPOSED  
MUD CREEK BRIDGE  
CARLETON COUNTY RD. NO. 13  
NEAR MANOTICK

Report No. S724-68  
JAN. 1969  
SCALE 1" = 30'

JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Engineers and Geologists

1479 LAPERRIERE AVE.

OTTAWA 3, CANADA