

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 31G-28

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

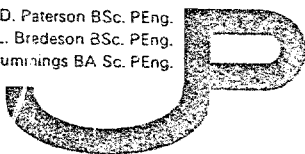
HWY. No. _____

LOCATION NEW BRIDGE (Scheme A)
STEVENS CK.,
KARS

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. NONE

REMARKS: _____

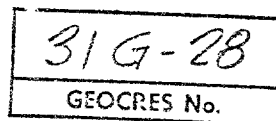
J. D. Paterson BSc. PEng.
L. Bredeson BSc. PEng.
B. F. Cummings BA Sc. PEng.



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 SOIL INVESTIGATION
SITE OF PROPOSED NEW BRIDGE (SCHEME A)
STEVENS CREEK
KARS, ONTARIO.

FOR
OTTAWA SUBURBAN ROADS COMMISSION
(CONTRACT NO. 67-13-1)

MCCORMICK & RANKIN LTD.
CONSULTING ENGINEERS

REPORT NO. S574-67
FEBRUARY 27, 1967.



INTRODUCTION

At the request of Mr. J. L. Malcolm, McCormick and Rankin Ltd., Consulting Engineers, on behalf of the Ottawa Suburban Roads Commission, a soil investigation was conducted at the site of the existing bridge over Stevens Creek at Kars, Ontario. It is proposed to replace the bridge with a new structure. A re-alignment of the new bridge, slightly to the west, is to be considered to reduce the curve at the south approach.

The investigation was conducted to determine the type of footing best suited for the proposed single span, prestressed box structure, with closed abutments, with a span of approximately 75 feet.

The fieldwork program discussed with Mr. Malcolm was to consist of two test boring holes which were tentatively located on a plan provided by Mr. Malcolm.

LOCAL GEOLOGY

At the bridge site and in the vicinity of Kars, Ontario, the unconsolidated sediments are Pleistocene in age. Gravel is the dominant material, usually morainic in origin, but possibly associated with some overlying marine gravels.

At Kars, Stevens Creek flowing eastward is only one-tenth of a mile west of its confluence with the Rideau River which flows northward to the Ottawa River.

In order to reduce the length of the existing bridge (at the time of its construction) a peninsula of miscellaneous granular materials was constructed from the north shore southward for 150 feet. This peninsula forms the north approach of the Bridge. The materials used for this operation were probably drawn from nearby gravel pits except for some of the near surface materials of each approach which do not appear to be of this origin.

FIELDWORK PROCEDURE

The test holes were relocated slightly from the locations originally proposed, but as close as conveniently possible. They were put down on diagonally opposite sides of the existing bridge as shown on the Test Boring Plan. Each was located on a fill area.

Attempts were made to drive probes at the south end of the bridge to provide some assistance in establishing a sampling program. However, the rock fill was too coarse and in a layer too thick to penetrate and attempts to drive cones from the surface were abandoned.

Because of the granular nature of the fill (and for that matter of the native soils), it was necessary to advance the casing by diamond drilling.

From 32 feet in Hole 1, a cone probe was driven to refusal at 40 feet in an attempt to locate bedrock. To determine whether the point of refusal was bedrock, a smaller diameter casing was advanced but it was drilled to 48.7 feet without encountering bedrock and the hole was terminated.

The fieldwork was done with an hydraulic drilling rig mounted in the van of a three ton truck. The rig was operated by a crew of two under the full time direction and supervision of our technical staff.

SAMPLING AND TESTING

Except for minor amounts of clay and organic contamination in the miscellaneous fill, all the materials encountered are granular. Little success resulted from attempts made to sample the fill with conventional equipment, but core samples of coarse particles were recovered by diamond drilling.

The granular material underlying the fill was sampled by means of a split spoon sampler except below a depth of 32 feet where a considerable percentage of the material is in excess of two-inch-size. Core samples of cobbles and boulders below 32 feet in Hole 1 were, however, recovered by diamond drilling.

All of the samples were examined in detail, classified, and retained in plastic bags.

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 sheets.

OBSERVATIONS

(a) Soil Types

All of the materials at this site fall into two classifications. They are fill and glacial moraine (There is a possibility that some of the material classified as moraine is marine gravel, but no shells were observed to confirm this.)

1. Fill Materials

Although no sharp division was observed at either hole, it appears from a study of the samples that a random mixture of large particles of igneous and sedimentary origin overlies a coarse gravel contaminated here and there with some clay and some pieces of wood.

In the mixture, the greater number of cobbles and boulders are of sedimentary origin (limestone/dolomite) and they may have originated from fieldstone collections of which there are a considerable number in the Kars - North Gower area.

2. Moraine Gravels

All of the gravel underling the fill is classified as moraine gravel, although some of the gravel may be of fluvial-glacial origin, or of marine origin.

Because of the coarseness of the gravel, sample recovery was only fair. Variations in gradation within the strata examined are bound to occur and where it is possible to delineate materials on the basis of coarseness or density, the divisions are shown on the Soil Profile sheets.

The gravel is brown, saturated, and of poor quality since it is composed of sandstone and weathered dolomite which make up approximately 75% of its volume. The remaining 25% is composed of igneous material. Below 28 feet, the gravel increases in coarseness and many boulders were found below 39 feet.

Details of both test holes are summarized on the Soil Profile sheets.

(b) Groundwater

During the course of and at the completion of the fieldwork, the groundwater levels in the holes were recorded. The final readings are comparable to the river level as was expected. The ice level on February 11, 1967, was at el. 279.5 and the water level in the holes was 8.6 feet (el. 278.9) and 9.0 feet (el. 279.1) in Holes 1 and 2 respectively on the same day.

(c) Test Results

The Standard Penetration Tests indicate that the gravel is medium dense to a depth of approximately 39 feet. Below 39 feet, the density increases to very dense (an interpretation based on the number of blows per foot required to drive the cone probe).

CONCLUSIONS AND RECOMMENDATIONS

The native gravel on the north side of the Creek is not suitable material on which to construct footings for the support of the pier because of its low bearing capacity.

It is recommended, therefore, that piles be driven to support the abutments of the proposed bridge. Comments concerning various pile types are offered below.

(1) Timber Piles

While timber piles would, no doubt, be the cheapest to use, it is doubtful, in our opinion, whether they could be effectively driven because of the nature of the soil. They could be damaged in the driving and may be deflected by larger boulders. A test pile might be considered.

(2) Steel H. Piles

These may be more easily driven, but will be entirely dependent on skin friction for support. They may have to be longer than a displacement type pile.

(3) Pipe Piles

Besides frictional support, this type of pile would have end bearing capacity if driven to the very dense gravel layer.

(4) Franki-Type Pile

For a bridge of this size, this type of pile may not be economically feasible. The foot or bulb of the pile should be formed at a depth not less than Elevation 247 (very dense gravel).

For design purposes, the following may be used for frictional and end bearing values in calculating pile capacity and required length.

Medium Dense Gravel -	500 lbs per sq. foot
Very Dense Gravel -	2000 lbs per sq. foot
End bearing Capacity -	
very dense gravel -	6500 lbs per sq. foot

It is expected that the minimum pile length will be approximately 26 feet at cut-off.

JOHN D. PATERSON & ASSOCIATES LTD.

L. Bredeson

JOHN D. PATRICK & ASSOCIATES LTD.

CONSULTING ENGINEERS
1479 Laperriere Ave.

Ottawa

Canada

SOIL PROFILE AND LABORATORY TESTS

Stevens Creek Bridge

LOCATION: Kars, Ontario.

Elevation (Bar Depth) B.M. Cut cross in N.W. corner of
slab 40' Lt of Sta. 14+83

Sheet No 1 of 2

Remarks: Test boring hole to 48.7'.

Date: Feb. 10, 11 & 13/67 Hole No: 1

Borings by J.B. Dufresne & Co.

Blows per Foot	Soil Description	Sample Type	Qu Tons sq. ft.	N	Depth in Feet	Elev.	Moisture Content Per Cent.				
							30	40	50	60	70
Cone	Ground Surface				0	287.5					
	A mixture of miscellaneous granular fill materials, including fragments of igneous and of sedimentary origin up to boulder size. Small isolated inclusions of clay and pieces of wood.	Core 12			3						
					6	281.5					
					9						
					12	275.5					
	Medium dense, brown, saturated coarse gravel. Most of the particles are of sedimentary origin and the larger pieces are for the greater part dolomite or sandstone. Slightly cohesive and till-like below 27 feet.	SS13		6	12	275.5					
		SS14		11	15						
		SS15		13	18	269.5					
		SS16		32	21						
					24	263.5					
		SS17	Lost	15	27						
		SS18	for	12 0.9'	30	257.5					
		SS19		18	33						
29					36	251.5					
27					39						
41	Medium dense saturated coarse gravel.				42	245.5					
48											
32											
34											
33											
102	Very dense coarse gravel with boulders to a depth of 48.7 feet. (Core from 18" dolomite boulder recovered)	Core									

Groundwater
Level 8.6 feet
Feb. 11, 1967.

JOHN D. PATTERSON & ASSOCIATES LTD.

CONSULTING ENGINEERS
1479 Laperriere Ave.

Ottawa

Canada

SOIL PROFILE AND LABORATORY TESTS

LOCATION: Stevens Creek Bridge
Kars, Ontario.Elevation (Zero Depth): B.M. Cut cross in N.W. corner at
slab 40' Lt of Sta. 14+83.

Remarks: Test boring hole to 32'

Borings By: J.B. Dufresne & Co.

Date: Feb. 2, 3 & 9/67

Sheet No: 2 of 2

Hole No: 2

Blows per Foot	Soil Description	Sample Type	No.	Cu Brwy sq. ft.	N	Depth in Feet	Elev.	Moisture Content Per Cent.				
								30	40	50	60	70
	Ground Surface					0	288.1					
	Gravelly sand with organic	BX	1									
	A mixture of miscellaneous granular fill materials, including fragments of igneous and sedimentary origin up to boulder size. Pieces of wood encountered below 9'.	BX	2			3						
		BX	3									
						6	282.1					
		SS	4		5	9						
								Groundwater Level 9.0 feet Feb. 11, 1967.				
						12	276.1					
		SS	5		18							
14.5		SS	6		22	15						
		SS	7		29	18	270.1					
	Medium dense, brown, saturated, till-like (i.e. slightly cohesive) gravel. Most of the particles are of sedimentary origin and the larger pieces are for the greater part dolomite and sandstone. Cobbles and boulders concentrated below 28'.	SS	8 (Lost)		34 for 05'	21						
		SS	9		34							
		SS	10		30	24	264.1					
						27						
						30	258.1					
32		SS	11		85 (Cobbles)							
						33	255.1					

