

MEMORANDUM

31G-62

To: Mr. S. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

FROM: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

ATTENTION:

DATE: June 22, 1970

OUR FILE REF.

IN REPLY TO

JUN 26 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Underpass Structure at the Crossing
Of Proposed Hwy. #417
And County Rd. #21
Kenyon Township -- Glengarry County
District No. 9 (Ottawa)
W.O. 70-11032 -- W.P. 36-66-10

CONT. 72-146

Attached, we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

AGS/MSF
Attach.

A. G. Stern
A. G. Stern
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. S. R. Davis
H. A. Trepasko
D. W. Farron
S. J. Markiewicz
J. E. Callaghan
T. C. Kingsland (2)
J. E. Gaspier
K. A. Brzezinski (2)
B. A. Singh
Foundations Files
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Underpass Structure at the Crossing
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And County Rd. #21
Kenyon Township -- Glengarry County
District No. 9 (Ottawa)
W.O. 70-11032 -- W.P. 36-66-10

1. INTRODUCTION:

The Foundation Section was requested to carry out an investigation at the above mentioned crossing of proposed Hwy. #417. The request was contained in a memo from the Eastern Region Bridge Section (Mr. T. C. Kingsland, Regional Bridge Planning Engineer) dated April 3, 1970. An investigation was subsequently carried out by this Section to determine the subsoil, bedrock and groundwater conditions at this site.

This report contains the factual results obtained from this investigation, together with recommendations pertaining to the foundations of the proposed structure, as well as the stability and settlement of the associated earth fill embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site under investigation is located in a cultivated field immediately east of County Rd. #21, approximately 1 1/2 miles north of the Village of Denvegan. The surrounding terrain is flat to gently undulating in relief.

2. DESCRIPTION OF THE SITE AND GEOLOGY: (con't.)...

Physiographically, the site is on the northern boundary of the region known as the "Glengarry Till Plain". The area is characterized by a relatively thin, often bouldery glacial till deposit, which is underlain by limestone bedrock of the Trenton and Black River Groups, Ordovician Period.

3. FIELD AND LABORATORY WORK:

Eight sampled boreholes, all of which were accompanied by dynamic cone penetration tests, were put down in the course of the field investigation. The borings were advanced by means of conventional diamond drill rigs adapted for soil sampling purposes.

Samples of the topsoil and glacial till deposit were obtained in a 2" O.D. split-spoon sampler, which was hammered into the subsoil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven in all of the borings by obtaining AXT size rock core samples.

The locations and elevations of all the borings were surveyed in the field by personnel from the Eastern Region Engineering Surveys Section. They are shown on Drawing No. W.O. 70-11032A, together with the estimated stratigraphical profile along the centre-line of the re-aligned County Rd. #21. All elevations were referenced to a Geodetic datum.

3. FIELD AND LABORATORY WORK: (con't.)...

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. In addition, certain selected samples were subjected to the following laboratory tests:

Natural Moisture Content

Grain-Size Distribution

Atterberg Limits

The results of the laboratory testing are plotted on the Record of Borelog sheets and Figure #1, all of which are contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

Across the site there is a thin layer of topsoil with gravel, which is, less than 2 feet thick. The topsoil is generally underlain by a thin (1 to 2 feet thick) deposit of competent glacial till. The glacial till is, in turn, underlain by limestone bedrock.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying borehole sheets. The stratigraphical profile, shown on Drawing No. W.O. 70-11032A, is inferred from this boring data:

From ground surface downwards, the various soil types are as follows:

..... 4

4. SUBSOIL AND BEDROCK CONDITIONS: (con't.)...

4.2) Topsoil:

Across the site there is about 1 to 3 feet of topsoil, which contains gravel, and occasional boulders up to 6 inches in size.

4.3) Heterogeneous Mixture of Clay, Silt, Sand, and Gravel (Glacial Till):

The topsoil is underlain by a deposit of glacial till, which varies from 1 to 2 feet in thickness.

The glacial till is composed of sandy gravel which is well-graded. A predominant feature of this till is the relatively large percentage of gravel that it contains. Grain-size distribution curves for samples of this deposit, obtained with 2" O.D. sampling equipment, are plotted on Figure #1.

The standard Penetration Tests, carried out within the glacial till deposit, are plotted on the Record of Borelog sheets. This testing gave "N" values from 30 to 40 blows/ft. Based on these values, the relative density of the glacial till is dense.

4.4) Limestone Bedrock:

The shallow overburden deposits are directly underlain by bedrock, which was proven in all of the eight boreholes, by obtaining from 5 to 14 feet of AXT size rock core samples. Over the site, the bedrock surface was found to vary between elevations 227 and 235. (1 to 3 feet below ground surface).

The bedrock is composed of limestone which contains

4. SUBSOIL AND BEDROCK CONDITIONS: (cont'd.)...

4.4) Limestone Bedrock: (cont'd.)...

numerous irregular seams and interbeds of black shale which are up to $\frac{1}{2}$ inch in thickness.

The upper 3 to 4 feet of the bedrock often has open joints and fractures; below this zone the bedrock is sound, as indicated by the relatively high percentage of core recovery.

5. GROUNDWATER CONDITIONS:

During the period of the investigation, groundwater level observations were carried out in all of the open boreholes. All of the holes were found to be dry. In the course of the drilling procedures, it was observed that no water was returning.

6. DISCUSSIONS AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a two span underpass structure at the crossing of Hwy. #417 and County Rd. #21, in the Township of Kenyon, County of Glengarry. The structure will be 34 feet wide and approximately 222 feet long. In the vicinity of the structure, County Rd. 21 will have a profile grade between elevations 253 and 255. The associated approach fills will, therefore, have a maximum height of approximately 18 feet.

In the immediate area, limestone bedrock is encountered beneath a thin surficial glacial till deposit.

6. DISCUSSIONS AND RECOMMENDATIONS: (cont'd)...

6.2) Structure Foundations: (cont'd)...

6.2.1) Centre Pier Foundation: (refer to BH's #3 and 4)

At the location of the pier the bedrock is 2 to 3 feet below the ground surface. For this reason, the pier can be founded on a spread footing located on bedrock, i.e. at or below elevation 233.

An allowable bearing value of up to 10 t.s.f. can be used in the design of the footing. Any shattered material at the surface of the bedrock should be stripped prior to placement of the footing. In view of the relative dryness of this site, there will be no dewatering problems.

It is to be noted that the bedrock contains interbeds of black shale which can heave or deteriorate when subjected to the elements. This particular type of shale is also susceptible to frost action. For these reasons, it is recommended that at least 3 feet of cover be provided from the base of the footing.

6.2.2) Abutment Foundations: (refer to B.H.'s #1,2,5,6)

The proposed abutments may be constructed within the approach fills; two alternative methods are given for the foundation support of the abutments:

- i) The abutments may be supported on spread footings perched within the approach fills. The material, below the tops of the footings, should consist of well compacted G.B.C. Class 'A' material, and should extend to a horizontal distance of at least 10 feet from the footing edges in the plane of the footing

6. DISCUSSIONS AND RECOMMENDATIONS: (cont'd.)...

6.2) Structure Foundations: (cont'd.)...

6.2.2) Abutment Foundations: (cont'd.)...

i) (cont'd.)...

tops. This portion of the fill should be constructed with side slopes no steeper than 2:1. The remainder of the fill should be completed to about profile grade for a distance of about 50 feet behind the abutments before re-excavating for the abutment footings. An allowable bearing value of 2.5 t.s.f. may be used in footing design.

ii) The abutments for the structure may be supported on end-bearing piles driven to bedrock. The approximate tip elevations would be 230 to 232 at the north abutment, and 231 to 235 at the south abutment. The allowable loads would depend on the pile section chosen (eg., 12 BP 7h steel H piles may be designed for 95 tons/pile.) No bouldery or rock fill should be used in areas in which piles are to be driven.

6.2.3) Differential Settlement Between Structure Elements:

The maximum differential settlement would take place between the pier and the abutments founded on spread footings; however, this settlement would be negligible.

6.3) Approach Embankments:

The approach fills would be of the order of 18 feet in height. No stability problems are anticipated for embankments of this height, if constructed of properly compacted fill with standard 2:1 slopes.

6. DISCUSSIONS AND RECOMMENDATIONS: (cont'd.)...

6.3) Approach Embankments: (cont'd.)...

The settlement induced in the foundation subsoil by the approach fill surcharge loading is expected to be negligible.

7. MISCELLANEOUS:

The field work, performed during the period of June 2 to 4, 1970, was supervised by Mr. F. A. Patterson, Student Technician (field). The equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd.

The preparation of this report was undertaken by Mr. F. A. Patterson.

The investigation was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who reviewed this report.

June 1970

APPENDIX I

FOUNDATION SECTION

ORIGINATED BY FP

COMPILED BY FF

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— w _L Plastic Limit ——— w _P	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	WATER CONTENT ——— w	
							SHEAR STRENGTH P.S.F.	w _p ——— w _L	
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE 400 800 1200 1600 2000	WATER CONTENT %	
236.4	Ground Level								
235.4	Topsoil (with stones)		1	SS	18	235			
1.0									
	Fractured Zone		2	AXT	50%				
			3	AXT	05%				
	Limestone Bedrock with irregular shale seams up to ½" thick		4	AXT	95%	230			
226.4									
10.0	End of Borehole					225			
						220			

FOUNDATION SECTION

ORIGINATED BY FP

COMPILED BY FP

CHECKED BY 

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					PLASTIC LIMIT				
							20	40	60	80	100	WATER CONTENT				
							SHEAR STRENGTH P.S.F.					WATER CONTENT %				
						400 800 1200 1600 2000					w _p ——— w _L			P.C.F.	GR. SA. SI. CL.	
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE								γ		
234.2	Ground Level															
232.7	Topsoil (with stones)		1	SS	96											
1.5			2	AFT	75%											
	Fractured Zone		3	AFT	80%	230										
226.7	Limestone Bedrock with irregular shale seams up to 1/2" thick															
7.5	End of Borehole					225										
						220										

FOUNDATION SECTION

CHECKED BY 

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _P WATER CONTENT ——— w			BULK DENSITY Y P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	SHEAR STRENGTH P.S.F.					WATER CONTENT % 20 40 60
							u UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB. VANE	400 800 1200 1600 2000	w _p w w _L				
236.9	Ground Level												
0.0	Topsoil with stones & gravel		1	SS	28	235						79 16 (5)	
234.4			2	SS	37/5"								
2.5	Fractured Zone		3	AXT	85%								
			4	AXT	60%								
	Limestone Bedrock with irregular shale seams up to 1/2" thick	5	AXT	80%	230								
		6	AXT	100%	225								
220.4													
16.5	End of Borehole					220							
						215							

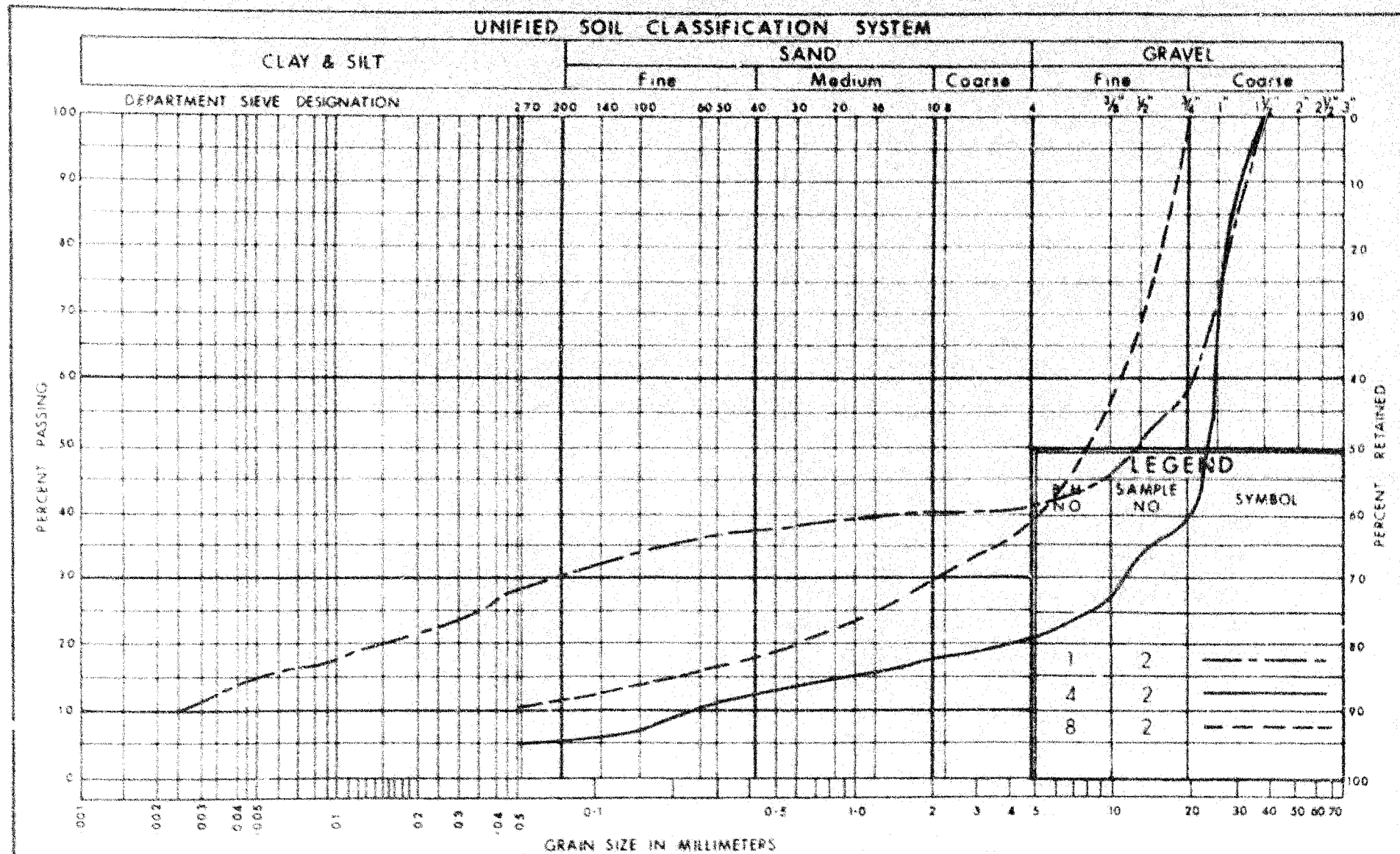
FOUNDATION SECTION

ORIGINATED BY FP

COMPILED BY FP

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — w _L PLASTIC LIMIT — w _P WATER CONTENT — w		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION:	STRAT. PT.	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	WATER CONTENT %			
							O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
							20 40 60 80 100				
							400 800 1200 1600 2000				
235.5	Ground Level										
0.0											
233.5	Topsoil (some gravel)		1	SS	3h						
2.0	Glac. Till - Dense		2	SS	1h/5"						
			3	ATT	100%						
			4	ATT	100%						
	Fractured Zone		5	ATT	45%						
			6	ATT	100%						
						230					
	Limestone Bedrock with irregular shale seams up to 1/2" thick		7	ATT	100%						
			8	ATT	100%						
						225					
221.2											
14.3	End of Borehole										
						220					
						215					



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION
WELL GRADED SANDY GRAVEL
(GLACIAL TILL)

WP No. 33-66-10

JOB No. 70-11032

FIG. 1

FIELD RECONNAISSANCE REPORT

REQUIRED BY FOUNDATION SECTION
FORPF-69
SEPT. 1968W.P. NO. 3666-10 HIGHWAY NO. A17 DISTRICT 9 SITE PLAN NO. E 4093-1 PROFILE NO. 2
RIVER CROSSING ☐ GRADE SEPARATION ☒ R.R.X. ☐ OTHER (SPECIFY) _____
ALTERNATE SCHEME (IF ANY) _____

EXISTING SITE CONDITIONS

DESCRIPTION:

TOPOGRAPHY: HILLY ☐ ROLLING ☐ VALLEY ☐ GULLED ☐ FLAT ☒
VEGETATION: TREES ☒ BRUSH ☐ GRASS ☐ SWAMP ☐ FARM CROPS ☒ CLEARED ☐
SNOW COVER: 0"-6" ☐ 6"-12" ☐ >12" ☒
ROCK OUTCROP (SPECIFY LOCATIONS) NONE VISIBLE

UNDERGROUND UTILITIES:

UTILITY COMPANY

TELEPHONE NO. FOR DEFINITE LOCATION

1 NONE VISIBLE (6'-8' SNOWBANKS EITHER SIDE OF ROAD)

2 _____

AERIAL 3 TELEPHONE WIRES WEST SIDE OF C-7 RD 204 TELEPHONE & HYDRO WIRES SOUTH SIDE OF 9th LON RD

5 _____

EXISTING STRUCTURE(S):

N/A

FOUNDATIONS: SPREAD FOUNDATIONS ☐ SIZE _____ ELEVATION(S) _____PILES ☐ TYPE _____ LENGTH(S) _____

DESIGN LOAD _____ T.S.F. _____ TONS/PILE

CONDITION OF STRUCTURE _____

APPROACHES: CUT ☐ FILL ☐ SIDE SLOPES _____BERMS YES ☐ NO ☐

OTHER OBSERVATIONS (USE BACK OF SHEET TO DESCRIBE ANY FAILURES IN AREA, PAST PERFORMANCE OF EXISTING APPROACHES & STRUCTURE, ETC.)

ACCESSIBILITY

IS STRUCTURE LOCATED ON D.H.O. RIGHT OF WAY? YES ☐ NO ☒ IF NO,HAS PERMISSION BEEN OBTAINED TO ENTER PROPERTY? YES ☐ NO ☒ IF NO,

PROPERTY OWNER(S):

NAME

ADDRESS

TELEPHONE NO

1 CONTACT PROPERTY SECTION EASTERN REGION

2 _____

3 _____

4 _____

WHO WILL OBTAIN NECESSARY PERMISSION? PROPERTY SECTION EASTERN REGIONHAS SITE BEEN SURVEYED & STAKED? YES ☒ NO ☐ IF YES, DATE OF MOST RECENT SURVEY _____WILL CLEARING BE NECESSARY TO ENTER SITE AREA? YES ☐ NO ☒IS SITE ACCESSIBLE TO WHEELED VEHICLES? YES ☒ NO ☐

IF RIVER CROSSING:

WILL A RAFT BE NECESSARY? YES ☐ NO ☐ IF YES, GIVE MAX. DEPTH OF WATER _____CURRENT: SWIFT ☐ MODERATE ☐ SLOW ☐

DRILLING OPERATIONS

NEAREST SOURCE OF WATER (GIVE HAULING DISTANCE, IF KNOWN) FARM NEAR SITE

ADDITIONAL INVESTIGATION REQUIRED FOR THE FOLLOWING PURPOSES:

ALTERNATE SCHEME: YES ☐ NO ☐ IF YES, SPECIFY _____HYDROLOGIC REASONS: YES ☐ NO ☐ IF YES, SPECIFY (SCOUR, ETC.) _____

REMARKS

NEAREST AVAILABLE ACCOMMODATION: HOTEL MODERNE, ST. ISIDORE DE PRES COIT

OTHER COMMENTS: _____

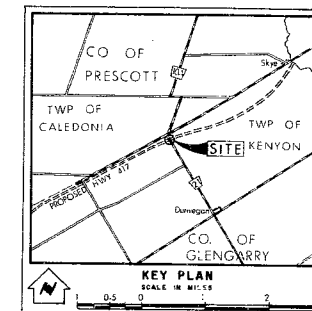
DATE MARCH 18, 1970REGIONAL BRIDGE LOCATION ENGINEER
PLANNING*W. H. H. H. H.*





CONT. 72-146

HWY. 417 &

COUNTY RD. #21

31G-62



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Cone & Bore Penetration Hole		
	Water Levels established at time of field investigation, JUNE, 1978		
NO WATER ENCOUNTERED.			
NO.	ELEVATION	STATION	OFFSE
1	234.9	98+72	17' L
2	236.4	98+72	17' R
3	234.2	99+33	17' L
4	236.9	99+33	17' R
5	234.9	100+42	17' L
6	235.6	100+42	17' R
7	229.8	102+00	6
8	235.5	97+00	6

- NOTE -

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

RELOCATED COUNTY ROAD NO.

KING'S HIGHWAY NO. PROP. 417 E.B.L. & W.B.L. DIST. NO.
CO. GLENGARRY
TWP. KENYON LOT 24 CON. EXT.

BORE HOLE LOCATIONS & SOIL STRATA

SCHEM'D. F.P.	CHECKED <i>GP</i>	W.P. NO. 33-66-10	M.S.T. DRAWING NO.
DRAWN E.D.	CHECKED <i>HL</i>	JOB NO. 70-11032	70-1103
DATE JUNE 23, 1970	SITE NO	BRIDGE DRAWING NO.	
APPROVED <i>A. B. Thomas</i>	CONT. NO.		

REF. NO. E-4693-1

GEOPRES NO 316-62

