



FOUNDATION TECHNICAL MEMORANDUM

For

**POTTAWATOMI RIVER BRIDGE ON HIGHWAY 6
MTO WEST REGION 59 STRUCTURE REHABILITATIONS
SITE 8-414, CONTRACT 2
GWP 3125-03-00
OWEN SOUND, ONTARIO**

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TABLE OF CONTENTS

1. INTRODUCTION	1
2. PROJECT SITE BACKGROUNDS AND GEOLOGY	2
3. SOURCE OF INFORMATION	2
4. SITE RECONNAISSANCE	3
5. PREVIOUS FOUNDATION INVESTIGATION AND SUBSURFACE CONDITIONS	3
6. FOUNDATION	6
6.1 Previous Foundation Recommendations	6
6.2 Assessment of Foundation Parameters	8
7. DISCUSSION	8
8. CLOSURE	10

Table 1 – List of Standard Specifications

Figure 1 – Key Plan

Appendix A – Previous Foundation Investigation Report (GEOCRES 41A-048)

– General Layout Plan

Appendix B – Site Photographs

FOUNDATION TECHNICAL MEMORANDUM
For
Pottawatomie River Bridge on Highway 6
MTO West Region 59 Structure Rehabilitations
Site 8-414, Contract 2, GWP 3125-03-00
Owen Sound, Ontario

1. INTRODUCTION

The Foundation Engineering Services for the present project involves the detail foundation investigation and design for rehabilitation of 59 structures in MTO West Region along Highways 4, 6, 401, 402 and 403. Ten (10) Group Work Projects (GWP's) are contemplated to be completed between 2014 and 2020.

This technical memorandum summarizes the factual results of geotechnical data based on review and compilation of existing subsurface information from relevant reports in MTO GEOCREST Library for the Pottawatomie River Bridge. The Foundation Engineering recommendations from the initial bridge foundation reports are summarized with reference to the "Highway Bridge Design Code" (CHBDC) and follow in general the "Guidelines for Professional Engineers providing Geotechnical Engineering Services".

From the Minutes of Meeting Report, dated May 5, 2014, it is understood that rehabilitation of the bridge structure is anticipated and that rehabilitation will be completed in two stages with the use of temporary portable signals to maintain one lane of traffic in each direction and two turning lanes. In addition, in-water work is anticipated for the rehabilitation work. However, a Permit to Take Water (PTTW) is not considered for the rehabilitation work at the structure location.

The purpose of the technical memorandum is to summarize the subsurface and groundwater conditions and foundation recommendations based on available reports at the bridge location for the design project team's reference.



2. PROJECT SITE BACKGROUNDS AND GEOLOGY

The Pottawatomni River Bridge on Highway 6 is located about 1.1 km south of Springmount, Ontario. A key plan is shown in Figure 1.

The current bridge is a single span reinforced concrete rigid frame bridge that carries four through lanes and two turning lanes on Highway 6.

The Pottawatomni River runs from a southwesterly to northeasterly direction and through the Pottawatomni Conservation Area. In the vicinity of the bridge, commercial and industrial buildings are located north of Highway 6 and residences at the south of Highway 6. A gasoline station (ESSO) is located west of the site location.

Physiographically, the site of the bridge is located in the region referred to as Bruce Peninsula. A shallow overburden scattered over dolomite bedrock is the characteristic of this region. The bedrock in the area belongs to Guelph Formation of Middle and Lower Silurian period.

3. SOURCE OF INFORMATION

The following report and drawing, appended in Appendix A, were available for review and information for the bridge structure, subsoil information and original foundation recommendations.

1. Foundation Investigation Report for Pottawatomni River Bridge Extension, East of Hwys. 21 and 70, W.P. 141-70-03, Site 8-16, Hwy. 21, District 5, Owen Sound, dated May, 1977. GEOCRE 41A-148.
2. Pottawatomni River Br#1: Immediately E. of Jct. Hwy. 6, 21 & 70, General Layout, Sheet 37, Loading HS20-44, Site 8-414, DWG 1, dated July, 1977.



4. SITE RECONNAISSANCE

As part of the current foundation engineering assessment study, site reconnaissance of the Pottawatomni River Bridge was carried out on May 10, 2014. A photographic record of the site visit is attached in Appendix B.

At the time of the site reconnaissance, Pottawatomni River depth was about 0.5 m. The side slopes were moderately vegetated. Slope surface erosion of the south slopes adjacent to the abutments was observed including scouring of the earth at the slope toe (Photographs 1 and 2). In photograph 1, it is conspicuous that erosion has affected the south slope adjacent to the west abutment. At the north slopes adjacent to the abutments, erosion of the slope face was also observed; however, rock fragments were probably placed to mitigate erosion of the slope surface (Photographs 3 and 4). Scouring effect below the water at the abutment walls could not be verified (Photographs 5 and 6).

Further, weep drains out of the abutment walls were observed and inferred to be functioning satisfactorily.

5. PREVIOUS FOUNDATION INVESTIGATION AND SUBSURFACE CONDITIONS

A foundation investigation report (referred in Section 3) was prepared by MTC, dated May, 1977. A total of fifteen boreholes were investigated at the site location. At that time, two structural schemes were being considered with the reconstruction of the junction of the proposed Owen Sound By-pass and existing Highway 70 and Highways 21 and 6. The two schemes considered were:

- Widening of the existing single span bridge to the north and to the south to accommodate the planned by-pass and ramps. It was indicated that the single span bridge was founded within the bedrock at elevation 230.7±.
- Diversion of the river and construction of two single span structures for future Owen Sound by-pass and one for the widened Highway 21 and 6.



The foundation investigation report includes the borehole location plan, Record of Borehole sheets and summary of the field and laboratory tests. The General Layout of the bridge is shown in reference 2.

The field investigation for the Pottawatomie River Bridge was carried out from March 2 to 10, 1977 and included fifteen boreholes (2 to 8, 10, 16, 18, 21 and 30 to 33). The boreholes were investigated by using a continuous flight auger machine mounted on a muskeg vehicle and equipped with 3 1/4" I.D. hollow stem and 5 inch diameter solid augers and coring in rock was carried out using BXL size rock coring equipment. The drilling equipment was provided by Geocon Ltd.

The boreholes were investigated to depths of 1.1 to 6.4 m, elevation 227.8 to 233.3. The subsurface in the boreholes included 0.8 to 3.6 m thick overburden mantling dolomite bedrock.

Organics

Excluding boreholes 5, 7, 8 and 31, surficial 300 to 600 mm organic material was encountered in the remaining boreholes.

Fill

A 2.5 and 0.9 m thick fill was encountered in boreholes 8 and 31 and extended to elevation 231.3 and 234.2, respectively. Two N values recorded were 3, and 3 blows for 5 cm penetration (refusal met on bedrock) in borehole 8.

Organic and Sand

A 0.8 m thick surficial organic and sand layer was encountered in borehole 2, which extended to the bedrock elevation 231.8. Boulders were encountered in the layer.



Sand

A loose to compact sand layer was encountered below the surficial organic layer in boreholes 16, 18, 21 and 30 to 33 and below fill layer in borehole 31. The sand layer extended to 0.9 to 2.4 m, elevation 230.9 to 233.7. N values recorded were between 7 and 30 with high N values of 1 to 24 blows for 15 cm penetration where refusal was encountered on bedrock or boulders. Two moisture content determinations were about 11 and 12%

Glacial Till

A local 0.3 m thick glacial till was encountered below sand in borehole 21 at 0.9 m, elevation 233.7 and extended to bedrock at 1.2 m, elevation 233.4. One N value recorded was 7 blows for 5 cm penetration where refusal on bedrock was encountered.

Sand and Gravel

Compact to very dense sand and gravel layer was encountered in all boreholes, excluding boreholes 2, 8, 21, 32 and 33, below the surficial organic and sand layers. The sand and gravel layer extended to 1.1 to 3.6 m, elevation 230.8 to 233.3, which mantled the probable bedrock/bedrock. N values recorded ranged from 21 to 100 with high N values of 15 blows for 13 cm penetration to 20 blows for 3 cm penetration where refusal was met on bedrock/probable bedrock.

Grain size distribution results of four selected sand and gravel samples included 5 to 8% clay, 7 to 17% silt, 22 to 49% sand and 35 to 56% gravel sized particles. Moisture content determinations ranged from 7 to 16%.



Bedrock/Probable Bedrock

Dolomite rocks were encountered in shallow depths below the overburden depth at elevations 230.8 to 233.4. Boreholes 4, 7 and 30 were terminated on probable bedrock at 1.1 to 1.4 m, elevation 232.7 to 233.3. The bedrock surface was confirmed by drilling core holes of 1.5 to 3.1 m in all boreholes, except in boreholes 4, 7 and 30, from the encountered bedrock surface, elevation 230.8 to 233.4, to the termination depths of the boreholes, elevation 227.8 to 230.9.

A detailed description of the rock cores retrieved from the twelve boreholes is provided in the Diamond Drill Record Sheets in the previous foundation investigation report (GEOCRE 41A-148). The bedrock recovered was light grey dolomite. The measured core recovery varied from 77 to 100%. The RQD determined from the rock cores typically ranged from 10 to 35%, with a local 0% RQD in borehole 6 from 2.8 to 3.4 m, elevation 231.2 to 231.8, indicating very poor to poor quality.

Groundwater

At the time of investigation, the fieldwork indicated that the sand layer was water bearing and that of perched condition. The water levels encountered were between elevations 231.6 and 233.8. In boreholes 7 and 30, groundwater was not encountered and in boreholes 4 and 31, groundwater was not established.

6. FOUNDATION

6.1 Previous Foundation Recommendations

The foundation report (reference 1) indicated, based on a previous construction drawing (D-3371-1), that the previous single span structure was founded within the bedrock at elevation 230.7±.

Based on the foundation investigation, it was recommended that the proposed extensions or new structures be supported on spread footings placed on portion of the sound bedrock and that the footings should not be placed higher than 0.6 m below the river bed.



It was recommended that mass concrete be placed, as required, where the sound bedrock was found to be at a lower elevation.

Allowable loads up to 1915 kPa (20 tsf) were suggested to be used for design purposes.

Excavation below the observed ground and river water level was anticipated for the footings. However, considerable seepage of water into excavations was expected since the bedrock mass was found to contain numerous open fissures along vertical joint and horizontal bedding planes. It was recommended that tremie concrete seal of sufficient thickness be used to balance the prevailing hydrostatic head.

For the second structural scheme, where the diversion of Pottawatomie River was considered, it was anticipated that 1.5 to 1.8 m of rock excavation would have been required to provide channel bed at approximate elevation 231.6±. The report indicated that for the width and depth of the new river channel bed, the hydrological report by Hydrology Section should be consulted when it became available.

A 2H:1V slope was recommended for the overburden and near vertical slopes in the bedrock was recommended for the new channel. Further, a granular pad, composed of Granular A, was to be placed on the surface of the slopes in the overburden to act as a filter over the subjected seepage area. The pad was to extend to an elevation approximately 0.3 m over the observed high groundwater level. It was recommended that the exact requirements of the granular filter blanket be determined during construction.

Further, no stability issues were anticipated at the site location for the fill materials subjected to removal of organics within the construction area.

A General Layout of the bridge is appended in Appendix A. Based on the General Layout drawing, the river bed channel was at elevation 231.6. The spread footings of the abutments were to be founded below the river channel bed at about elevation 230.7.



6.2 Assessment of Foundation Parameters

Based on the subsurface encountered, a factored geotechnical bearing resistance at ULS of 2.5 MPa on sound uniform bedrock is recommended. The geotechnical resistance at SLS is not applicable for footing founded on bedrock, since the bedrock is considered to be non-yielding. The geotechnical bearing resistance for inclined loads should be reduced in accordance with the requirements of clause 6.7.4 of the CHBDC.

The foundation frost penetration depth at the site is 1.2 m according to OPSD 3090.101. However, the frost depth is not considered for foundations placed directly on bedrock.

The seismic site coefficient for the conditions at this site is 1.0 (soil profile Type 1, Canadian Highway Bridge Design Code (CHBDC) 2006 Edition, clause 4.4.6).

7. DISCUSSION

The Pottawatomni River Bridge on Highway 6 is located about 1.1 km south of Springmount, Ontario and the current bridge is a single span reinforced concrete rigid frame bridge that carries four through lanes and two turning lanes on Highway 6. The Pottawatomni River runs from a south-westerly to north-easterly direction and through the Pottawatomni Conservation Area.

From the site reconnaissance, it is evident that the second structural scheme, where the diversion of Pottawatomni River was considered, was adopted. Based on the field investigation, it was anticipated that 1.5 to 1.8 m of rock excavation would have been required to provide channel bed at approximate elevation 231.6±.

From a geotechnical point of view, at the present time, foundation work for the Pottawatomni River bridge structure is not expected provided the total dead load on the bridge does not increase or decrease by more than 10%.



It is understood that rehabilitation of the Pottawatomie River bridge structure is anticipated including removal of existing asphalt and waterproofing and the existing barrier walls. Further, the rehabilitation will be completed in two stages with the use of temporary portable signals to maintain one lane of traffic in each direction and two turning lanes. It is indicated that the traffic will operate at Level D or better during Friday afternoon peak.

In addition, in-water work is anticipated for the rehabilitation work for the deck soffit and abutment walls. The need for a PTTW is being reviewed by the Primary Consultant for the rehabilitation work at the structure location.

Further, it is suggested that the weep holes out of the abutment walls should be maintained and cleaned at a regular basis to prevent any clogging of the holes. Regular maintenance of the weep holes will keep the water flowing from behind the abutment walls and will mitigate hydrostatic pressure to build-up behind the abutment walls.

In addition to rehabilitating the bridge, the face of the adjacent slopes should be protected from erosion and the edge of the slope toes from scouring effects with rock protection, rip-rap or equivalent materials. The aggregate materials should conform to OPSS.PROV 1004 and the construction of the rock protection, rip-rap or equivalent should conform to OPSS 511.



8. CLOSURE

This Technical Memorandum was prepared by Mr. Nazibur Rahman, P.Eng and was reviewed by Mr. Robert Ng, PhD, P.Eng., Senior Project Engineer. Mr. Brian R. Gray, MEng, P.Eng., MTO Designated Principal Contact conducted an independent review of the report.

We trust this memo is sufficient for your immediate needs. Please, do not hesitate to contact us if you have any inquiries and/or comments.

Yours very truly,

Peto MacCallum Ltd.



Nazibur Rahman, P.Eng.
Project Engineer, Geotechnical Services



Robert Ng, MBA, PhD, P.Eng.
Senior Project Engineer



Brian R. Gray, MEng, P.Eng.
MTO Designated Principal Contact

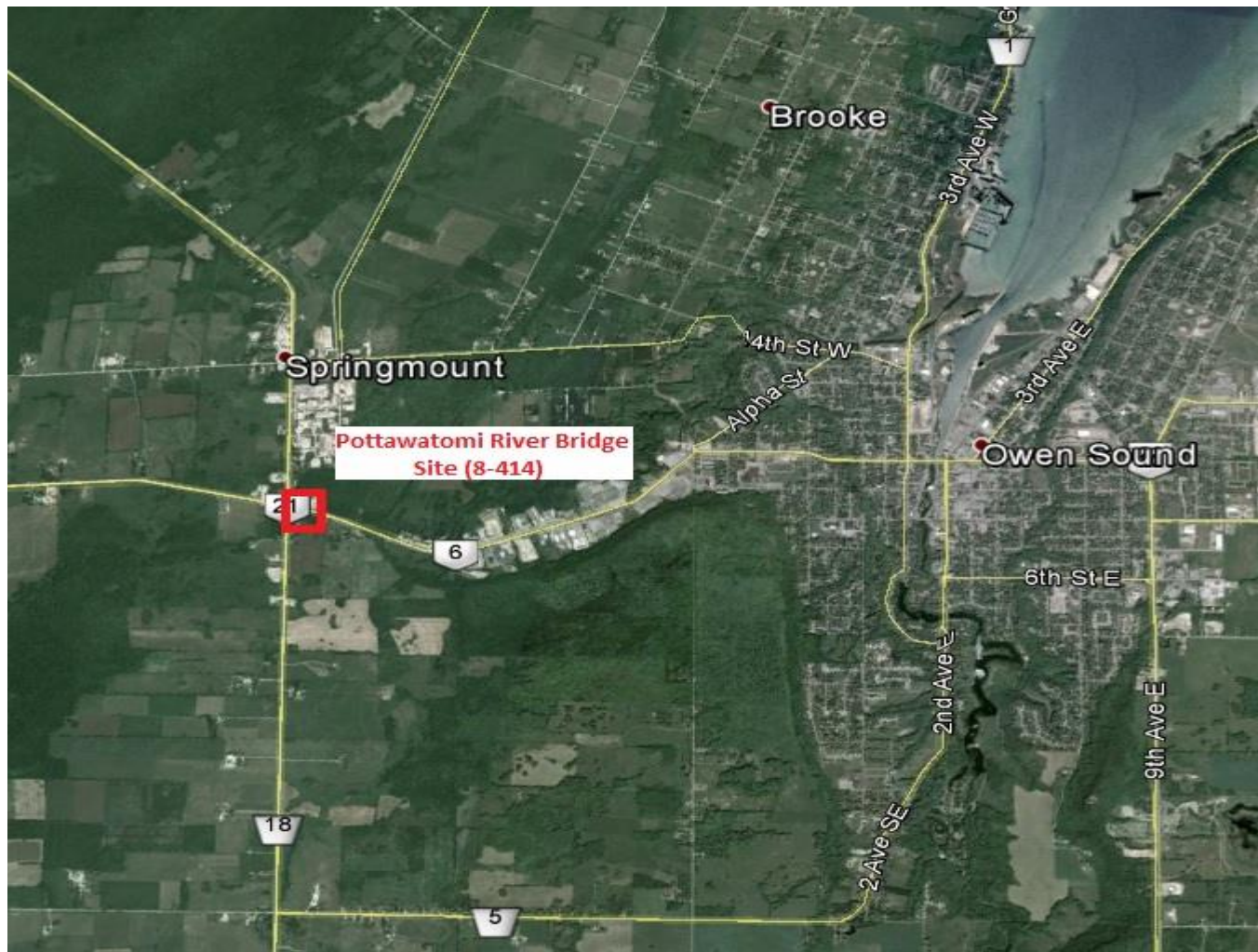


TABLE 1

LIST OF STANDARD SPECIFICATIONS REFERENCED IN REPORT

DOCUMENT	TITLE
OPSS 511	Construction Specification for Rip-Rap, Rock Protection, and Granular Sheeting
OPSS.PROV 1004	Material Specification for Aggregates - Miscellaneous
OPSD 3090.101	Foundation Frost Depth for Southern Ontario

Figure 1 – Key Plan





APPENDIX A

Previous Foundation Investigation Report (GEOCRES 41A-048)
General Layout Plan

Contract 2

Pottawatomí River Bridge

PROJECT NO. 141-70-02

GEOCRES No. 41A-148

DIST. 5 REGION SOUTHWESTERN

W.P. No. 141-70-02

CONT. No. 78-10

W.O. No. _____

STR. SITE No. 8-16

HWY. No. 21

LOCATION POTTAWATOMI R.

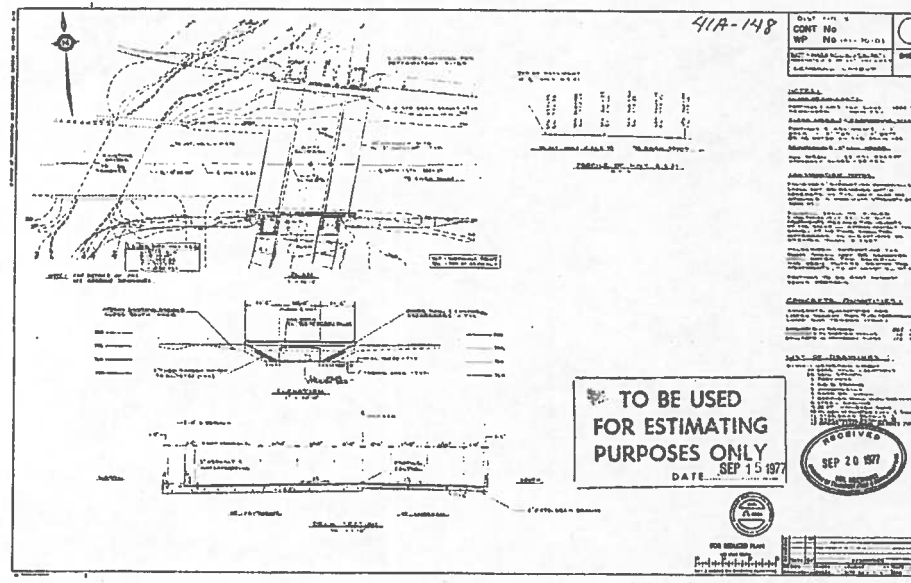
BRIDGE EXTENSION

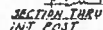
REMARKS 3

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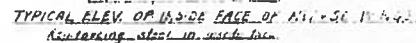




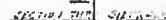
SEC 1000 NW, SE Nauch showing H₂
H₂ similar to NE-SW

1. ~~Selection of a half-acre site in the vicinity of the two existing~~
~~factories at Highway No. 22, Santa Rosa, 1955. Plans are~~
~~and the proposed development will be to the industrial~~
~~quarters which data copies of which may be obtained from~~
~~the Town Engineer~~

Don't let this be the last time you see me.



THE GUL FLY OF INSIDE PAGE OF SW + NE WINGS
Reinforcing steel in inside face



SECTION 7.0 - 3.000 C.R.B. M.L.

[illegible]

DEPARTMENT OF HIGHWAYS-ONTARIO

BRIDGE OFFICE-TORONTO

41A-78

**SPRINGMOUNT BRIDGE
OVER THE
POITAVATTAMI RIVER**

THE KING'S HIGHWAY No. 21 DIST. NO. 5

CO. G.R.E.

TWP. D.P.S. LOT 17 CON. 1

W.D. Smith & Son Ltd., Kitch.

APPROVED

NOTED
FEB 18 1977
STANDARD

Drawn By _____

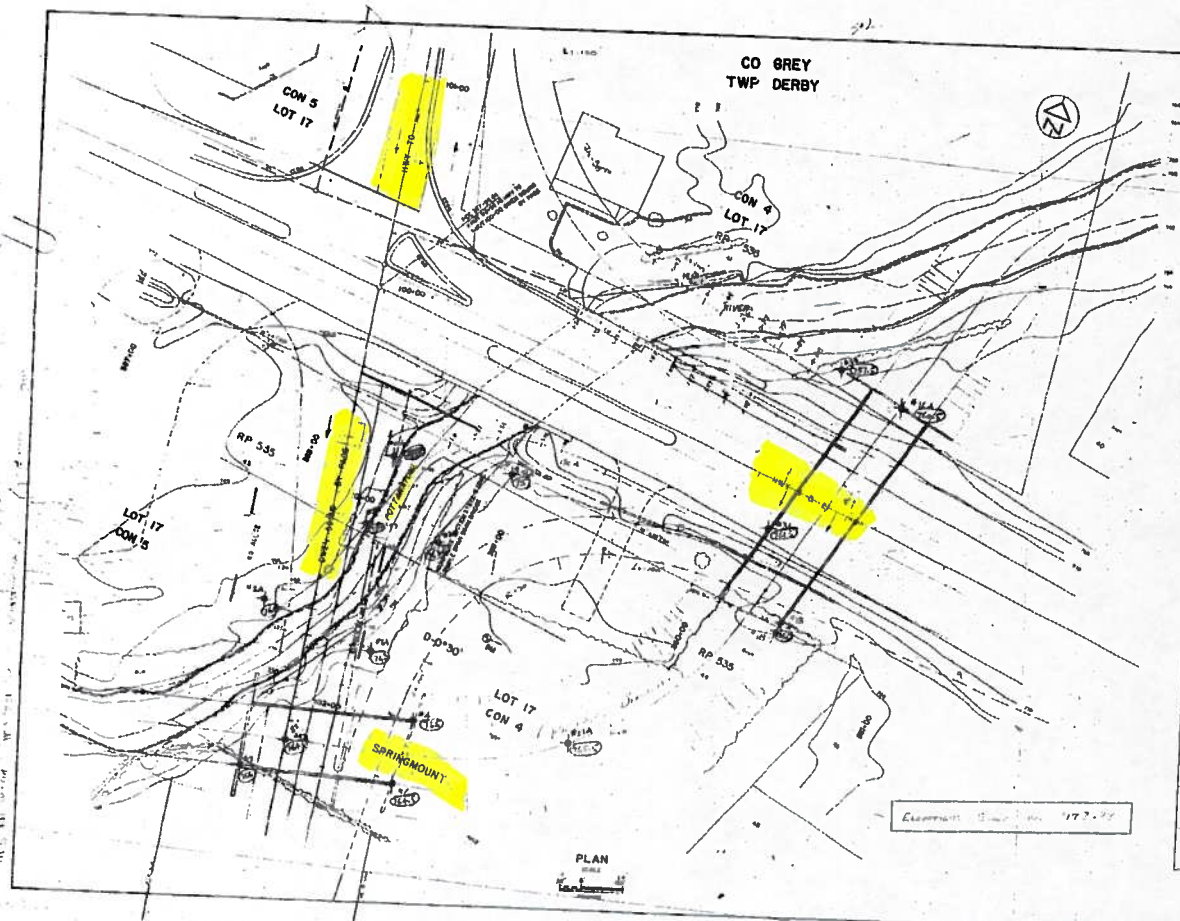
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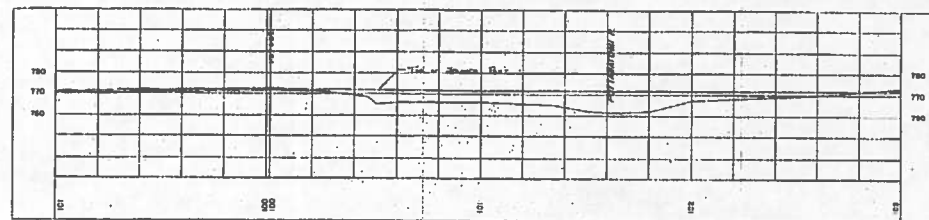
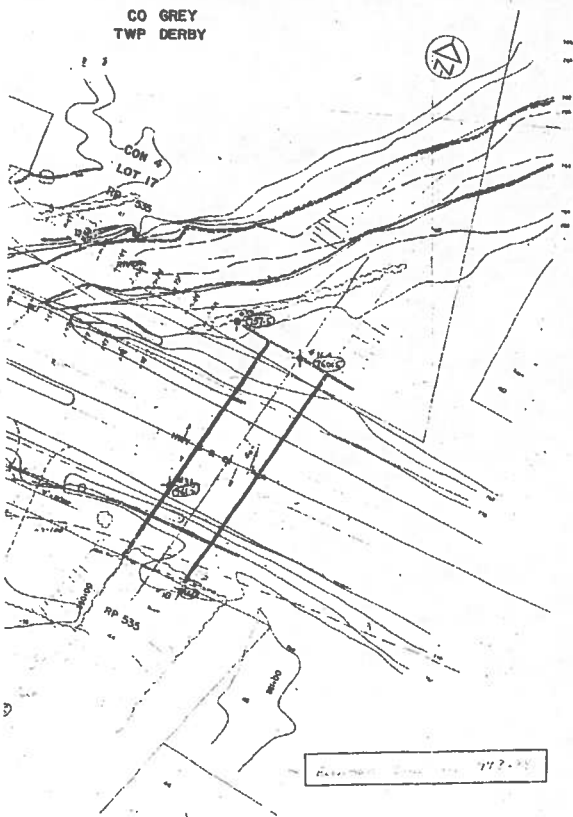
Estimated By _____

Approved By _____

Contract No. P-16 Job No. 52-88

Project No. D3371-3

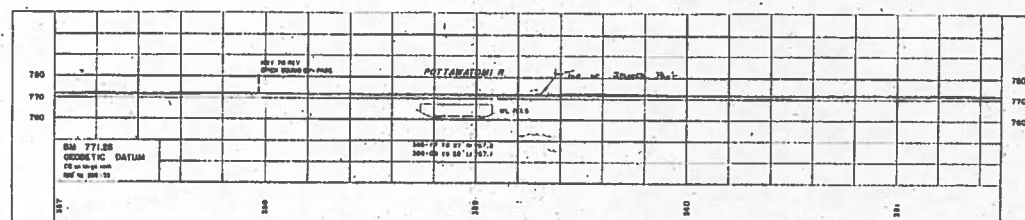




PROFILE HWY 70 REV. OWEN SOUND BY-PASS

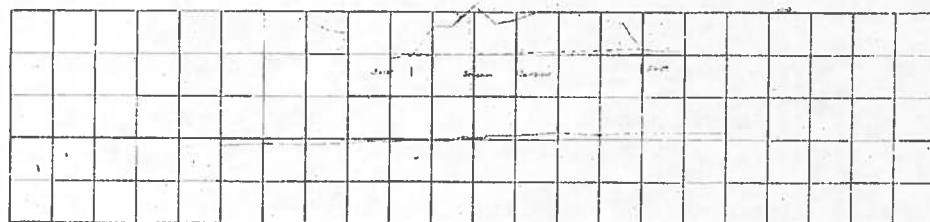
10+00 TO 11+00 + 100-00 Bridge Span 10' - 10' + 100-00 to 12+00 + 100-00

SCALE
1" = 100'-0"

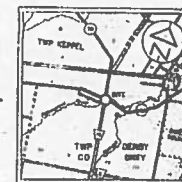


PROFILE HWY 6 & 21

SCALE
1" = 100'-0"



POTTAWATOMI RIVER



KEY PLAN

Scale 1" = 100'-0"

WP 141-70-03

DATE	REVISIONS & ADDITIONS	BY	CHKD
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO DESIGN DIVISION - DESIGN SERVICES BRANCH ENGINEERING SURVEYS OFFICE			
BRIDGE SITE CROSSING HWY 6 & 21, OWEN SOUND BY-PASS over POTTAWATOMI RIVER APPROX 3.7 mi WEST HWY 40			
SCALE AS SHOWN	DISTRICT 100' to 100-00'	DATE OF PLAN FEB 11 1971	CHECKED BY E-5381-1
SURVEY BY 100' to 100-00'	CHECKED BY 100' to 100-00'	SCALE 1" = 100'-0"	PLAN E-5381-1

4/17-14P

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 41A-148

DIST 5 REGION Southwestern

W.P. No. 141-70-03

CONT. No. 78-10

W. O. No. _____

STR. SITE No. 8-16

HWY. No. 21

LOCATION Pottawatomie River Bridge
Extension

OVERLAP OPENINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded
before microfilming
photos included

FOUNDATION INVESTIGATION REPORT
For
Pottawatomí River Bridge Extension
East of Hwys. 21 and 70
W.P. 141-70-03, Site 8-16
Hwy. 21, District 5, Owen Sound

INTRODUCTION

This report contains the results of our foundation investigation at the above described location. The field investigation was carried out during the period from March 2, 1977 to March 10, 1977, utilizing a continuous flight auger machine mounted on a muskeg vehicle and equipped with 3 1/4" I.D. hollow stem and 5 inch diameter solid augers.

SITE DESCRIPTION

The site is located at the crossing of Hwy. 6 and 21 and Pottawatomí River immediately east of the existing 'T' junction of Hwy. 70 and Hwy. 7 and 21. The Pottawatomí River flows from a southwesterly to northeasterly direction. The bottom of the river bed is at approximate elevation 760± while the surrounding original ground level is about 6-8 feet higher. The slope of the river bank varies from about 2:1 to 4:1. The existing Hwy. 6 and 21 grade level is at about elevation 772±. Commercial buildings (gasoline stations) are located west of the existing single span structure. The eastern part is covered with light to medium bush.

Physiographically the site is located in the region referred to as the Bruce Peninsula. This region has only a little overburden scattered over grey coloured dolomite bedrock.

SUBSURFACE CONDITIONS

Overburden

The overburden (apart from the existing roadway fill) at this location was found to be about 10 feet (maximum) in thickness. In general, about 1-2 feet of surficial black coloured organic material is followed by loose to compact sand, followed by compact to very dense sand and gravel, some silt and clay (glacial till). Refusal to augering was reached between elevation 757 and elevation 765. References should be made to the Record of Borehole Sheets contained in the Appendix for soil types and boundary elevations at the borehole locations.

Bedrock

The bedrock was proved at all but three borehole locations by using BXL size rock coring equipment. The upper surface of the bedrock was found to vary between elevation 757± and elevation 765±. The bedrock, as described by MTC geologist, Z. Koniuszy, is light grey dolomite. The quality and rock type encountered at the boring locations are described in a report which is attached to the Appendix.

Groundwater

Water level observations carried out during the fieldwork indicate that, in general, the sand layer is water bearing. This is believed to be a perched condition with downward drainage occurring into the underlying dolomite bedrock and into the river. It is also assumed that the presence of water is seasonal only. It is pointed out that at the time of the field investigation (early March), the ground was covered with an approximate 4 feet of deep snow and the temperatures were over the freezing mark, thus causing melting and consequently run-off conditions.

A list of the encountered water levels is as follows:

B.H. #	Elev.
#2	759.7
3	763.4
4	Not established
5	766.5
6	766.6
7	Dry
8	762.6
10	761.0
16	767.0 ✓
18	766.0 ✓
21	765.1
30	Dry
31	Not established ✓
32	765.0
33	761.2

Depth range is from 2-3 feet below the ground surface.

DISCUSSION AND RECOMMENDATIONS

General

As requested by Mr. A.P. Watt, Structural Planning Engineer, Southwestern Region, London, a foundation investigation consisting of 15 boreholes was carried out at this location.

Two schemes are outlined on Plan E-5351-1 in connection with the reconstruction of the junction of the proposed Owen Sound By-pass and existing Hwy. 70 and Hwy. 21 and 6.

1. Widening of the existing bridge to the north (some 55' in length) and to the south (for a distance of about 160') to accommodate the planned by-pass and ramps.
2. Diversion of the river and construction of two single span structures, one for the future Owen Sound By-pass and one for the widened (future) Hwy. 21 and 6.

The existing single span structure has a span length of about 30.8 feet. According to the construction drawing (D-3371-1) the existing structure is founded within the bedrock at elevation 757±.

Recommendations (Scheme 1 and 2)

Sound bedrock of dolomite type was encountered between elevation 757± and elevation 765± at the boring locations. It is, therefore, recommended that the proposed extensions or new structures be supported on spread footings placed within the sound portion of the bedrock. In any case the base of the footings should not be placed higher than 2 feet below the river bed.

Mass concrete should be placed up to the required level where the surface of the sound bedrock was found to be at a lower elevation. The level of the sound bedrock may be interpreted from the borehole information.

Allowable loads up to 20.0 T.S.F. may be used for design purposes.

The excavation for the footings will be carried out below the observed ground and river water level. Since the bedrock contains numerous open fissures along the vertical joints and horizontal bedding planes, considerable seepage into the excavations may be expected. A tremie concrete seal of sufficient thickness should be placed on the base of excavations to balance the prevailing hydrostatic head.

If scheme #2 is adapted a new channel will be required for Pottawatomi River. Borings indicate that the bedrock level varies from elevation 759± (at Hwy. 21 and 6) to elevation 765.5± (at proposed Owen Sound By-pass). Considering a channel bed level of elevation 760±, up to about 5-6 feet of rock excavation will be required. The width and depth of the river bed depends on hydrological considerations and the recommendations will be given by the Hydrology Section.

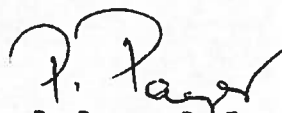
It is recommended that the channel be built with 2:1 slopes in the overburden and near vertical slopes in the bedrock. Upon completion of the excavation, a granular pad to act as a filter should be placed on the surface of the slopes in the overburden over the area subjected to seepage. The granular blanket should consist of a minimum thickness of 18 inches Granular 'A' and should extend to an elevation approximately one foot above the observed high groundwater level. The exact requirements for the granular filter blanket would best be determined at the time of construction since the amount of seepage and the level to which the groundwater will be depressed cannot be predicted with certainty.

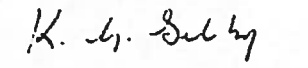
The profile grade of the existing Hwy. 21 and 6 is at elevation 772± which is the same as of the future Owen Sound By-pass, some 12 feet above the river bed level.

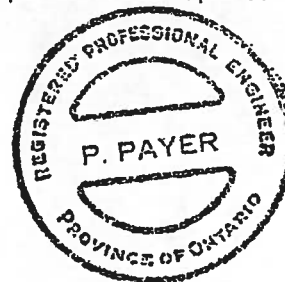
No stability problems are anticipated for the fills, provided all material of organic nature has been removed within the construction area. 2:1 slopes are recommended.

MISCELLANEOUS

The equipment used for the field exploration was owned and operated by Geocon Ltd. The fieldwork was supervised by Mr. P. Payer, who also prepared this report.


P. Payer, P. Eng.
Senior Engineer


K.G. Selby, P. Eng.
Supervising Engineer



KGS/PP/gs
May, 1977

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 141-70-03 LOCATION Sta. 358+11 o/s 158' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 2, 1977. COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY AS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
762.9	Ground Level															
0.0	Organics & Sand		1	R.C.	94%	760										
760.4	Boulders															
2.5	Bedrock		2	BX	100%											
	Dolomite		3	RC	Rec											
	Sound		4	R.C.	100%											
751.9																
11.0	End of Borehole					750										

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

WP 141-70-03 LOCATION Sta. 358+69 o/s 159' RT C Hwy 6 & 21 ORIGINATED BY PP
DIST 5 HWY 6 & 21 BORING DATE March 8, 1977 COMPILED BY RS
DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

15 $\frac{20}{10}$ 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 141-70-03 LOCATION Sta. 359+02 o/s 180' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 7, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
769.9	Ground Level														
0.0	<u>Organics</u>														
765.2	Sand & Gravel Dense			SS	40								0		51 35 7 7
4.7	Refusal Probable Bedrock End of Borehole														
						760									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 141-70-03 LOCATION Sta 358+50 o/s 215' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 7, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
768.5	Ground Level													
0.0	Sand & Gravel, Some Silt & Clay													
764.3	Dense		1	SS	207									
4.2	Bedrock Dolomite		2	BX RC	97% REC	760								
	Sound		3	BX RC	77% REC									
754.3														
14.2	End of Borehole					750								

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 141-70-03 LOCATION Sta 359+06 o/s 212' RT of Hwy 6 & 21 ORIGINATED BY PF
 DIST 5 HWY 6 & 21 BORING DATE March 4, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
769.7	Ground Level															
0.0	Organics															
764.4	Sand & Gravel Some Silt & Clay Compact		1	SS	28											56 22 17 5
5.3	Bedrock Dolomite Fractured		2	BX 100% R.C. REC		760										
754.1			3	BX 100% R.C. REC												
15.6	End of Borehole															

20
15 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 141-70-03 LOCATION Sta. 358+35 o/s 236' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 7, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				
769.1	Ground Level															
0.0	Sand & Gravel, some silt & Clay															
765.4	Compact		1	SS	12/2"											
3.7	Refusal, Probable Bedrock End of Borehole															
						760										

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

WP 141-70-03 LOCATION Sta. 358+94 o/s 53' RT C Hwy 6 & 21 ORIGINATED BY PP
DIST 5 HWY 6 & 21 BORING DATE March 8, 1977 COMPILED BY RS
DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
767.0	Ground Level															
0.0	Fill Material Sand, Some industrial waste		1	SS	3	760										
758.9	Loose		2	SS	3 1/2											
8.1	Bedrock Dolomite Sound		3	BX R.C.	90% REC											
748.9			4	BX R.C.	100% REC	750										
18.1	End of Borehole					740										

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 10

WP 141-70-03 LOCATION Sta. 358+38 o/s 70' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 3, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p - w - w_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
763.0	Ground Level													
0.0	Sand <u>Organic</u> & Gravel, some Silt & Clay (Compact)					760								
5.7	Bedrock Dolomite		1	BX RC	100% REC									
752.4	Sound													
10.6	End of Borehole					750								

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 16

WP 141-70-03 LOCATION Sta. 360+47 o/s 58' LT C Hwy. 6 & 21 ORIGINATED BY PP
DIST 5 HWY 6 & 21 BORING DATE March 9, 1977 COMPILED BY RS
DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
767.0	Ground Level															
0.0	Sand Organics															
763.5	Compact		1	SS	21											
3.5	Sand & Gravel		2	SS	15/5"											
759.3	Some Silt & Clay Compact															
7.7	Bedrock Dolomite		3	BX	92%											
	Sound															
750.8			4	BX	100%											
16.2	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 18

WP 141-70-03 LOCATION Sta. 360+42 o/s 65' RT of Hwy. 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 3, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p - w - w_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
767.6	Ground Level													
0.0	Sand Organics													
763.1	Loose		1	SS	9									
4.5	Sand & Gravel, Some Clay & Silt-V. Dense		2	SS	62									
7.0	Bedrock Weathered		3	BX	92%									
755.6	Dolomite Sound			R.C.	REC									
12.0	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 21

WP 141-70-03 LOCATION Sta. 359+76 o/s 157' RT C Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 3, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
769.8	Ground Level													
0.0	Sand <u>Organics</u>													
766.8	Loose													
3.0	Glacial Till		1	SS	7/2"									
4.1	Bedrock		2	BX	100% R.C. REC									
	Dolomite													
	Sound		3	BX	100% R.C. REC	760								
755.6														
14.2	End of Borehole					750								

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 30

WP 141-70-03 LOCATION Sta. 358+75 o/s 98' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 8, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				
768.0	Ground Level															
0.0	Sand <u>Organics</u>					Hole										
763.5	Loose		1	SS	7	Dry										
4.5	Refusal, Probable Bedrock End of Borehole					760										

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 31

WP 141-70-03 LOCATION Sta. 360+16 o/s 22' RT C Hwy. 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 9, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
771.5	Ground Level													
0.0	Roadway Fill													
768.5	(Sand & Gravel)													
3.0	Sand		1	SS	21									
763.5	Compact		2	SS	30									
8.0	Sand & Gravel, Some													
759.8	Silt & Clay Very Dense		3	SS	100									
11.7	Bedrock Dolomite Sound		4	BX	87% R.C. REC									
750.5			5	BX	95% R.C. REC									
21.0	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 32

WP 141-70-03 LOCATION Sta. 360+13 o/s 61' LT C Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 3, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
765.0	Ground Level															
0.0	Sand Organics Boulders		1	SS	267	6"										
757.5	Compact		2	SS	177	5"										
7.5	Bedrock Dolomite Sound		3	BX R.C.	98% REC											
747.5			4	BX R.C.	93% REC	750										
17.5	End of Borehole															
						740										

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 33

WP 141-70-03 LOCATION Sta. 358+40 o/s 105' RT of Hwy 6 & 21 ORIGINATED BY PP
 DIST 5 HWY 6 & 21 BORING DATE March 10, 1977 COMPILED BY RS
 DATUM Geodetic BOREHOLE TYPE Auger & Rock Core CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
763.0	Ground Level									
0.0	Sand, Some Organics Compact		1	SS	1/6"					
3.9	Bedrock Dolomite		2	EX R.C.	100% REC					
754.1	Sound									
8.9	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION



Ministry of
Transportation and
Communications

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 1

DIP

PROPERTY W.P. 141-70-03
LOCATION Springmount
Int. Hwys. 21 & 70
LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER		REMARKS
FROM	TO				
		HOLE No. 2A			
1'7"	11'	Dolomite, light grey to buffy-grey, med. textured, hard, pitted, light discoloration on first foot.			Horizontal joints RQD - 33%
		HOLE No. 5A			
4'2"	9'8"	Dolomite, buffy to yellowish, med. textured, hard (except on weathered zone 6'4"), pitted, discoloration common. Slightly weathered zones on joints. Open vertical joint on 9'2". Short vertical cracks throughout.			Core badly broken. RQD - 15%
9'8"	14'2"	Dolomite, mottled buffy-grey, fine textured, hard, pitted. Vugs covered by small calcite crystals. Vertical joint on 12' - faces of joint covered with small calcite crystals.			Core badly broken. RQD - 10%
		HOLE No. 3A			
6'1"	10'3"	Dolomite, light grey to buffy grey, slightly mottled, fine textured, very hard, slightly pitted. 1 vug lined with calcite crystals.			RQD - 15% Core moderately broken

DATE OF EXAMINATION March, 1977

Z. Koniuszy



Ministry of
Transportation and
Communications

Ontario

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 2

DIP

PROPERTY LOCATION W.P. 141-70-03
Springmount
Jcts. Hwys. 21 & 70
LATITUDE _____
DEPARTURE _____
BEARING _____

90°

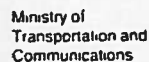
TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER			REMARKS
FROM	TO					
		HOLE No. 3A (Cont'd)				
10'3"	11'3"	Dolomite, yellowish-grey, slightly mottled, med. textured, hard, pitted				RQD - 50%
		HOLE No. 6				
5'3"	9'3"	Dolomite, buffy (yellowish on joint faces), med. textured, pitted, hard. Joint faces mostly horizontal, yellowish, med. hard.				8'3" - vertical joint RQD - 25%
9'3"	11'3"	Dolomite, buffy (yellowish on joint faces), med. textured, pitted, hard. Joint faces mostly horizontal, yellowish, med. hard.				Cone badly ground RQD - 0
11'3"	15'6"	Dolomite, buffy to grey, mottled in some sections, fine to med. textured, hard, pitted. Few vugs lined with calcite.				RQD - 30%

DATE OF EXAMINATION March, 1977

Z. Koniuszy



HOLE NO. _____ SHEET NO. 3

DLF

PROPERTY LOCATION W.P. 141-70-03
Springmount
Jcts. Hwys. 21 & 70
LATITUDE
DEPARTURE
BEARING

90 ⁽¹⁾	
TOTAL FOOTAGE	

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION March, 1977

Z. Koniuszy



HOLE NO. _____ SHEET NO. 4

RIP

PROPERTY LOCATION W.P. 141-70-03
Springmount
Jcts. 21 & 70
LATITUDE
DEPARTURE
BEARING

90 ¹⁾	
TOTAL FOOTAGE	

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER		REMARKS
FROM	TO				
		<u>HOLE No. 18</u>			
7'0"	7'0"	Dolomite, buffy, with few grey spots, fine to med. textured, hard (except on joint weathering zone) pitted, vuggy. Larger pits and vugs lined with calcite crystals.			8'4" - 8'9" - weathered zone RQD - 25% Yellow discoloration on most horizontal joints. Core moderately broken.
		<u>HOLE No. 21A</u>			
4'2"	14'7"	Dolomite, buffy to mottled grey, fine to med. textured, hard except on joints, weathering zones pitted, fossiliferous. Larger pits and vugs lined with calcite crystals.			Joints mostly horizontal, but some not open, vertical cracks visible. Core broken moderately, two sections ground. RQD - 35%

DATE OF EXAMINATION March, 1977

Z. Koniuszy

Ministry of
Transportation and
Communications

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 5

DIP

PROPERTY W.P. 141-70-03
LOCATION Springmount
Jcts. 21 & 70
LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE _____

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION March, 1977

Z. Koniuszy



Ministry of
Transportation and
Communications

DIAMOND DRILL RECORD

DIP

HOLE NO. _____ SHEET NO. 6

PROPERTY _____ W.P. 141-70-03
LOCATION _____
_____ Springmount
_____ Jcts. 21 & 70
LATITUDE _____
DEPARTURE _____
BEARING _____

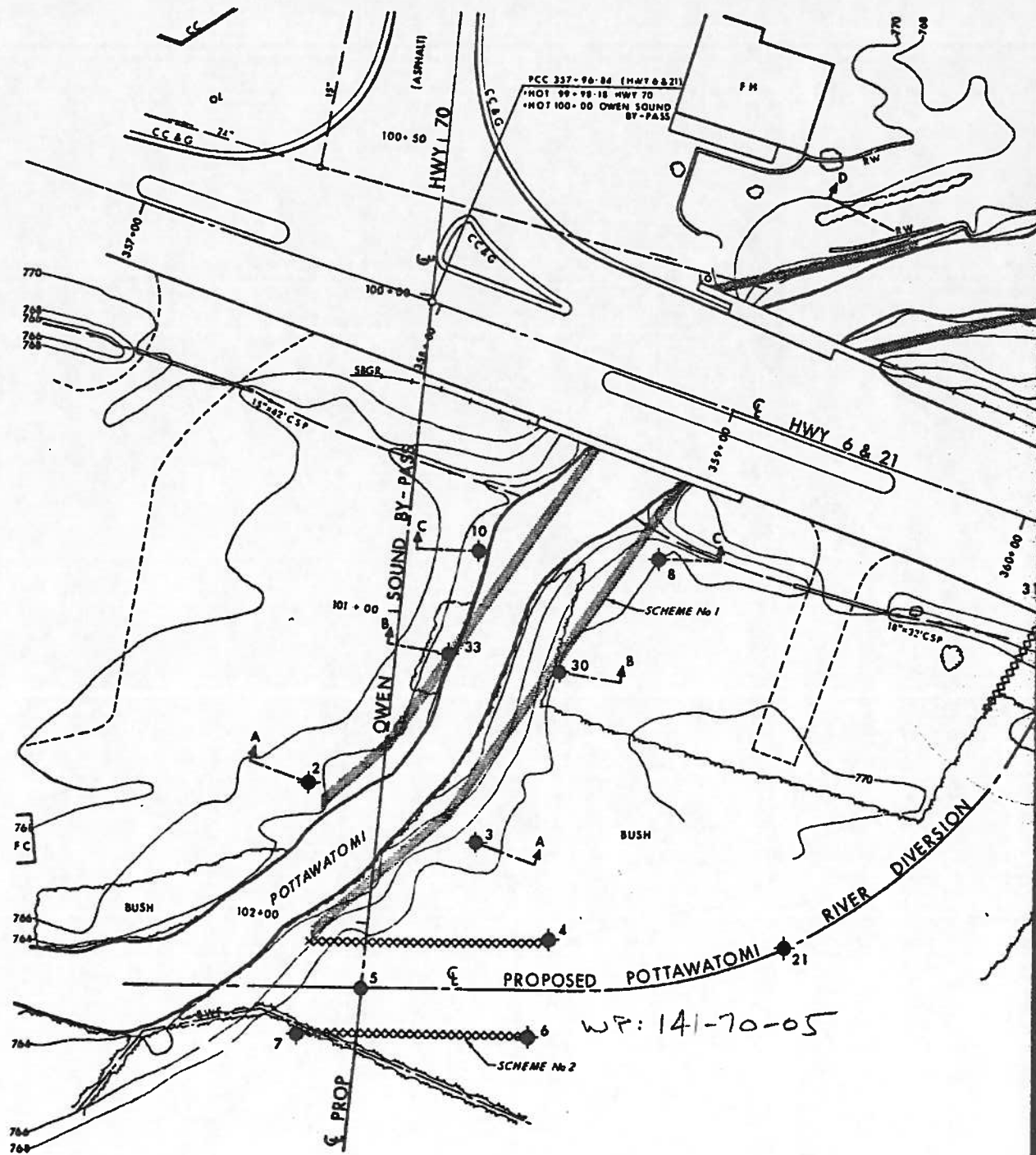
90°
TOTAL FOOTAGE _____

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

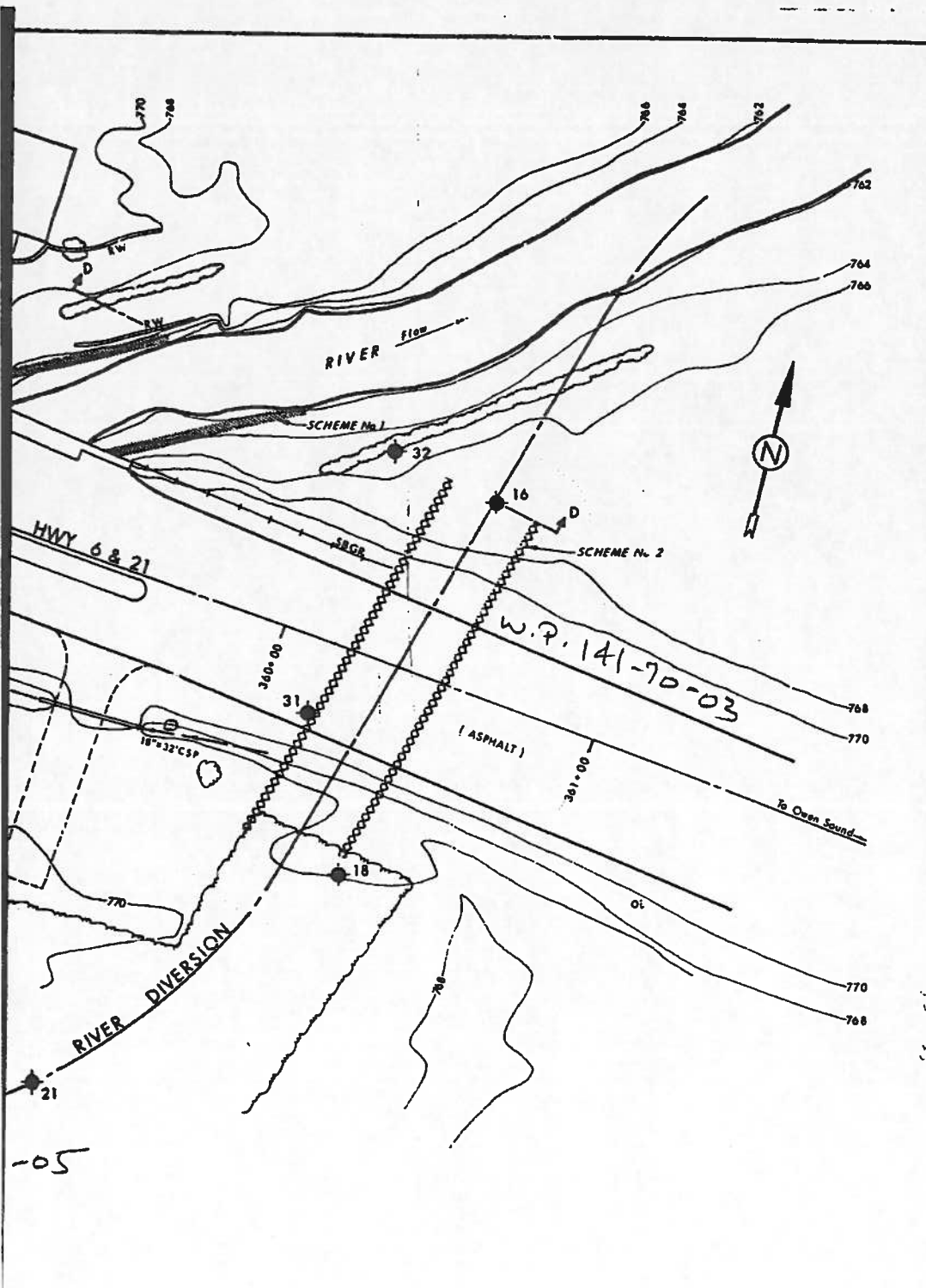
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DATE OF EXAMINATION March, 1977

Z. Koniuszy



PLAN
 20 0 SCALE 20 40 FT

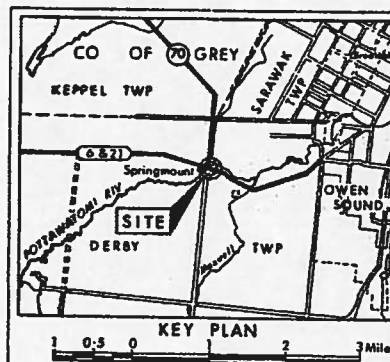


CONT No
WP No 141-70-03



POTTAWATOMI RIVER
IMMEDIATELY EAST OF JCT HWYS 21 & 70
BORE HOLE LOCATIONS

SHEET



LEGEND

- ◆ Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ◆ Bore Hole & Cone
- W Blows/ft (2nd Pen Test 350 ft lb energy)
- CONE Blows/ft (60° Cone, 350 ft lb energy)
- ↓ WL at time of investigation March 1977
- WL for Bore Holes No 4 & 31 not established.

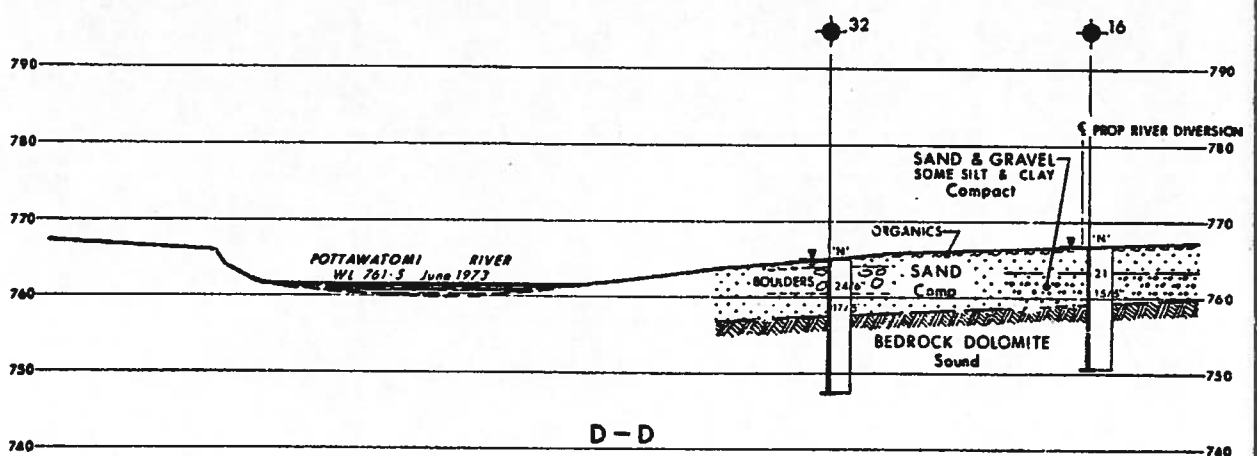
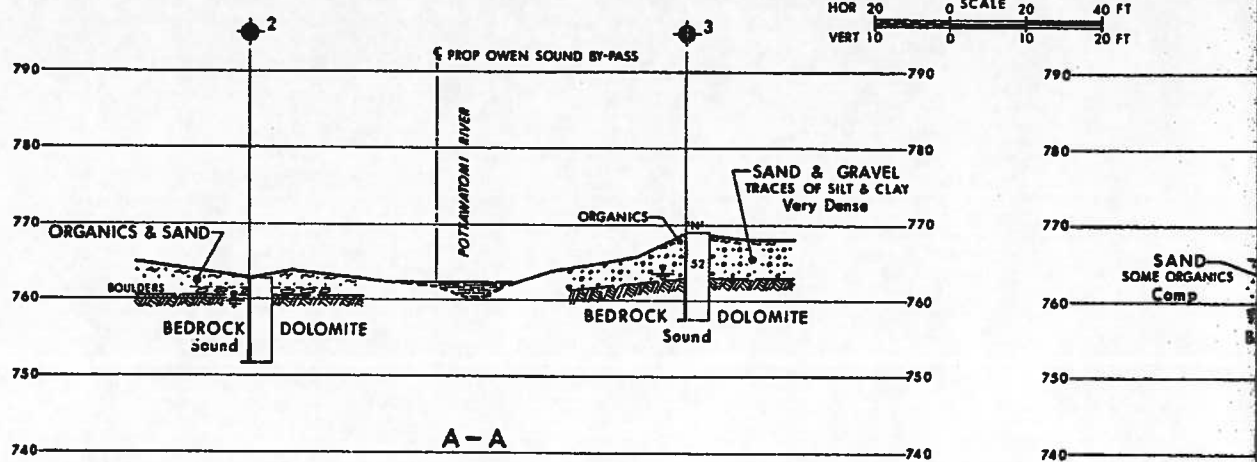
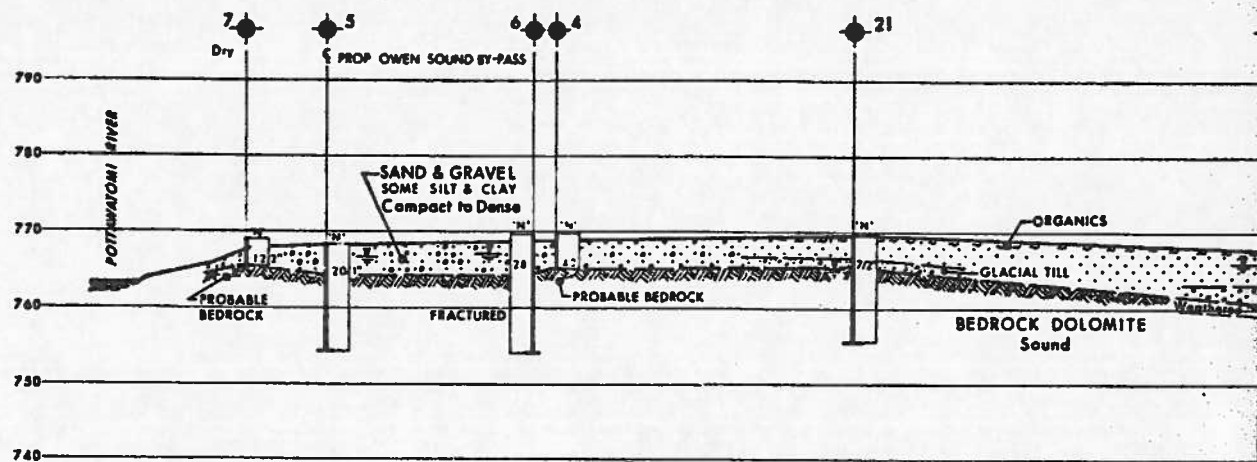
No	ELEVATION	STATION	OFFSET & HWY 6 & 21
2	762.9	358+11	158' RT
3	769.0	358+69	159' RT
4	769.9	359+02	180' RT
5	768.5	358+50	215' RT
6	769.7	359+06	212' RT
7	769.1	358+35	236' RT
8	767.0	358+94	57' RT
10	763.0	358+38	70' RT
16	767.0	360+47	58' LT
18	767.6	360+42	65' RT
21	769.8	359+76	157' RT
30	768.0	358+75	98' RT
31	771.5	360+16	22' RT
32	765.0	360+13	61' LT
33	763.0	358+40	105' RT

-NOTE-

The boundaries between soil strata have been established only on Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

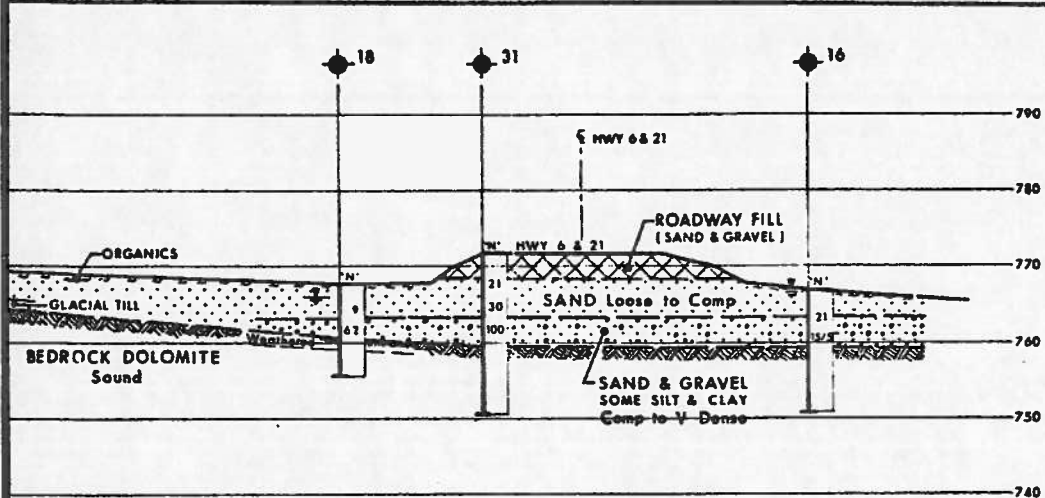
REVISIONS	DATE	BY	DESCRIPTION

HWY No. 6 & 21
SYMBOLS CHECKED DATE APR 20 1977
DRAWN BY CHECKED DATE APR 20 1977
PWS1417003-A



SECTIONS





CONT No
WP No 141-70-03

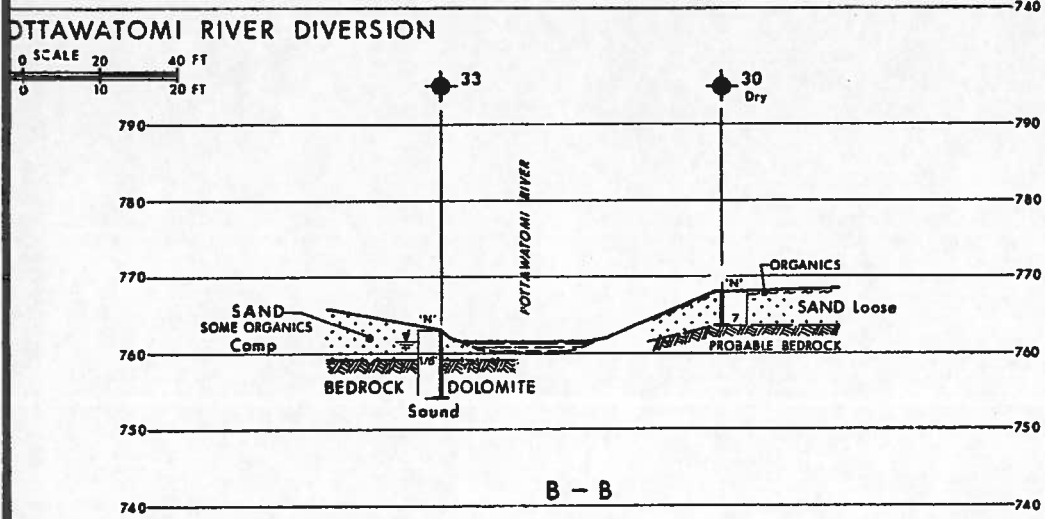
POTTAWATOMI RIVER
IMMEDIATELY EAST OF JCT HWYS 21 & 70
SOIL STRATA



SHEET

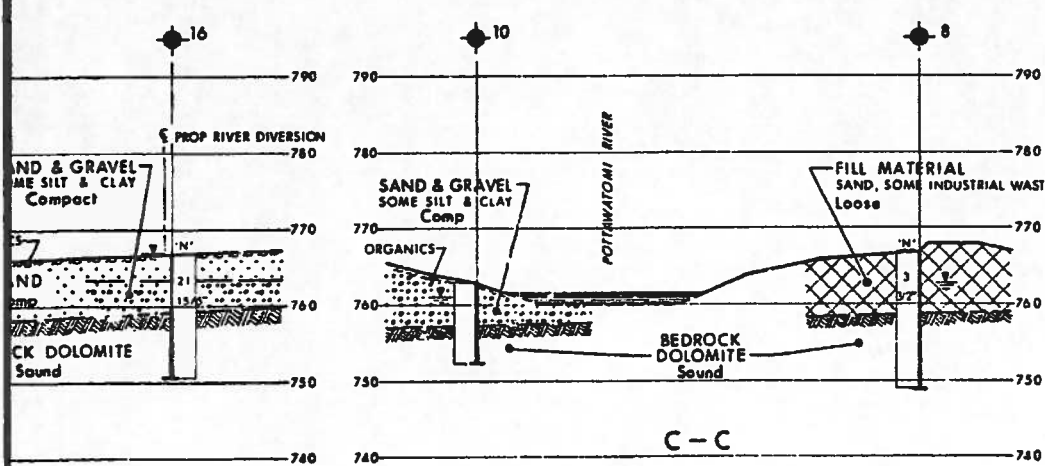
SEE DWG No 1417003-A

KEY PLAN



- LEGEND**
- Bore Hole
 - ⊕ Dynamic Cone Penetration Test (Cone)
 - ⊗ Bore Hole & Cone
 - "N" Blows/ft (Std Pen Test 350 ft lbs energy)
 - CONE Blows/ft (60° Cone, 350 ft lbs energy)
 - W.L. at time of investigation March 1977
 - W.L. for Bore Holes No 4 & 31 not established.

No	ELEVATION		



NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

SECTIONS

SCALE 10 20 FT

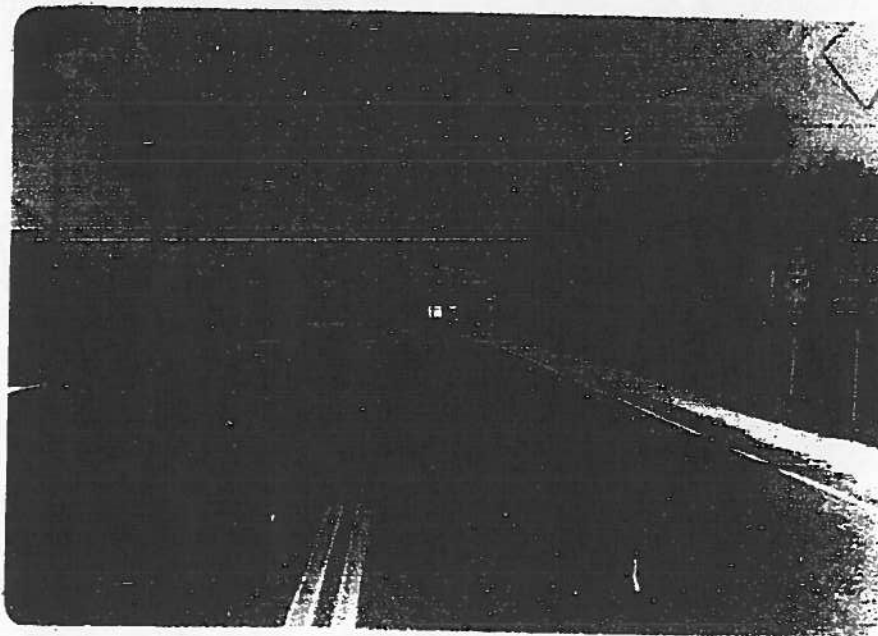
REVISIONS	DATE	BY	DESCRIPTION

HWP No 6 & 21
 S. BARDPP CHECKED DATE Apr 26, 1977
 DRAFTER'S CHECKED DATE
 DIST 5
 S.F. 8-16
 NO 1417003-B

WP 141-70-03 BRIDGE SITE 8-16
POTTAWATOMI RIVER BRIDGE HWY 21 DIST. 5 J.W. SQUAD



LOOKING EAST ALONG HWY 21 AND OVER
POTTAWATOMI RIVER BRIDGE



LOOKING WEST ALONG HWY 21 AND
OVER POTTAWATOMI RIVER BRIDGE



Mr. P. Payer

November 23, 1977

Meeting of

Structural Review Committee

Time: 9:00 a.m. November 23, 1977.

Place: Boardroom "B", West Building.

Attending: Messrs. A. E. McKim - Construction Branch
M. Stoyanoff - Construction Branch
J. Meyer - Structural Office
N. Zoltay - Structural Office
K. Jorns - Hydrology Section (part time)
P. Payer - Soil Mechanics Office (part time)
F. Gormek - Inspection Engineer

Project Reviewed

Group W.P. 141-70-04

W.P. 141-70-03, Site 8-414, ✓
Pottawatomie River Bridge #1.
W.P. 141-70-05, Site 8-415,
Pottawatomie River Bridge #2.

Highway 6, District 5.

The following points were put forth as noted with recommendations where applicable.

Pottawatomie River Bridge #1 (W.P. 141-70-03)

Foundations

The Committee questioned the note in drawing which requires to place tremie concrete immediately after excavation. It is felt that placing the concrete immediately is difficult task for the Contractor to carry out and it is not necessary. The note is to be deleted.

The Designer in consultation with the Soil Mechanics Section will investigate the need of well compacted material behind footings.

Hydrology

The toe of the rip-rap is to be carried down to bedrock.

Structure

Drawing #13

Junction box for lighting standards and the expansion joints details are to be deleted from the drawing.

Standard for construction joint details is to be included in the drawings.

Machine finishing of the deck is required.

.....



Pottawatomie River Bridge #2 (W.P. 141-70-05)

Foundation

Same comments as for W.P. 141-70-03.

Mr. Payer also requested that the 2:1 slope in the rock portion of the channel bank is to be changed to near vertical however the slope is to remain 2:1 in the overburden.

Hydrology

Same comments as for W.P. 141-70-05.

Mr. Jorns also requested that the Designer is to contact the Regional Planning and Design Office to ensure that the diversion will be blocked by rip-rap.

Structure

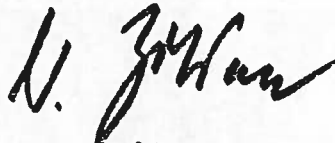
Drawing #10

The Designer is to ensure that Standard SS-5-3 apply for rock cut.

Standard for construction joint details is to be included in the drawings.

Machine finishing of the deck is required.

The meeting adjourned at 10:45 a.m.



NZ/im

N. Zoltay,
Structural Contract
Specifications Engineer.

c.c. All present
J. B. Wilkes
R. A. Dorton
A. E. McKim
C. S. Grebski
E. Van Beilen
K. G. Bassi
A. Wittenberg
J. H. Blevins



Ministry of
Transportation and
Communications

Memorandum

To: Mr. K.D. Selby, Supervising Engineer, From: A.P. Watt,
Soil Mechanics Section, Regional Structural Planning Engineer.
West Bldg., Downsview. Southwestern Region.

Attention:

Date: February 16, 1977.

Our File Ref.

In Reply to

Subject: W.P. 141-70-03, Bridge Site 8-16
Pottawatomi River Bridge
Immediately east of Jct. Hwy 21 & 70
Hwy 21
District 5, Owen Sound

Would you kindly arrange to have a Foundation Investigation conducted for the structures in the following two schemes (1) and (2) along with cores along the diversion to obtain a rock profile.

Scheme 1 is the widening of the existing bridge to the north and to the south as shown on the attached bridge site plan in red.

Scheme 2 involves two bridges and a stream diversion as shown in blue. As it is felt that the stream diversion will be going through bouldery material or bedrock, would you kindly take some cores along the diversion in order to obtain a profile of the bedrock along the proposed stream diversion.

Enclosed please find two copies of the bridge site plan E-5351-1 showing the probable footing locations in red and blue. Also enclosed is a print of the ETR sheet number 314-21/13-0 showing the utilities in the area; hydro, bell and gas.

In Scheme 2, permission to enter the Doyles Marine Property, if required, north of Hwy 21 will have to be obtained by Soil Mechanics Section. The Ministry has possession of the property along the diversion to the south of Hwy 21.

A Field Reconnaissance Report, pictures of the site and the drawings of the existing bridge D-3371-1 to 4 are enclosed for your use.

Please consider this request as urgent and kindly arrange to do it as soon as possible. We would also like a letter of recommendation for all structure foundations and the bedrock profile of the diversion within five weeks.

Thanking you kindly.

A.P. Watt,
Regional Structural Planning Engineer.

APW:ed
Encl.

c.c. A. Crowley
J. Anderson
R. Jenkins
J. Forster



Mr. A.P. Watt
Structural Planning Engineer
Southwestern Region, London

Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

77 03 24

Re: Pottawatomi River Bridge
Immediately East of Jct. Hwy. #70 and #21
W.P. 141-70-03, Site 8-16
Hwy. #21, District 5, Owen Sound

As per your request of 77 02 16, a foundation investigation consisting of 15 boreholes was carried out at this location.

According to Plan E-5351-1, two structure schemes are being considered in connection with the reconstruction of the junction of Owen Sound By-pass and Hwy. #70 and #21.

1. Widening of the existing bridge to the north (some 55' in length) and to the south for a length of about 160 feet.
2. Diversion of the river and construction of two single span structures, one for the future Owen Sound By-pass and one for the future widened Hwy. #21.

Due to the urgency of this project, we have been requested that the recommendation(s) be submitted at our earliest convenience.

The encountered subsurface conditions at each borehole location are shown in tabulated form on Table 1 (and 2). It is pointed out that due to the inaccessibility of the north extension at the time of the fieldwork, (scheme #1) no borings were carried out. To confirm the subsurface conditions at this location boreholes will be put down at a later date.

Our recommendations are as follows:

Scheme #1 and 2

The proposed extensions or new structures may be supported on spread footings placed some two feet below the river bottom (elev. 760±) within the sound portion of the dolomite bedrock. Sound bedrock was found between elevation 757 and elevation 764.5. Design loads up to 20 tsf. may be used for design purposes. Mass concrete should be placed up to the required level where the surface of the sound bedrock was found to be at a lower elevation. Up to 6 feet of rock excavation will be required for the proposed river diversion.

All soft organic surficial material should be removed to its full depth (0 to 4') within the construction area.

cont'd.....

No stability problems are anticipated for the proposed fills.

The above recommendations should enable you to prepare a comparative cost estimate for both schemes. Our somewhat more detailed report will follow in the near future.

If further information is required, please contact our Office.

R. Van Vels

for

P. Payer
Senior Engineer

For: K.G. Selby
Supervising Engineer

ATTACH.

PP/gs

cc: Files
Record Services

W.P. 141-70-03

Owen Sound By-Pass Chainage

B.H.	Sta.	Off-Set	Ground Elevation	Overburden and Groundwater Level	Bedrock Elevation
2A	101+57	24' rt	762.9	0.0-1.7 organics and sand 1.7-2.5 boulders G.W.L: 3.2' below ground level	760±
3A	101+70	32' lt	769±	0.0-3.5' organics and sand 3.5-5.9 granular till N value = 52 B/F G.W.L: 5.4' below ground level	763±
4	101+98	59' lt	769.9	0.0-1.0 organics and sand 1.0-4.7 granular till N value = 40 B/F	765± (probable)
5A	101+32	±/	768.5	0.0-1.0 organics (topsoil) 1.0-2.0 sand 2.0-4.2 granular till N value = 20/1" G.W.L: 1.9' below ground level	764.3
6	102+30	55' lt	769.7	0.0-1.0 organics (topsoil) 1.0-3.0 sand 3.0-5.3 granular till N value = 28 B/F G.W.L: 2.8' below ground level	764.3
7	102+37	19' rt	769.1	0.0-0.5 organics (topsoil) 0.5-2.5 sand 2.5-3.7 granular till N value = 12/2" G.W.L: Borehole dry	766± (probable)
8A	100+73	81' lt	767±	0.0-7.8 fill (sand) G.W.L: 4.2' below ground level	759±
10A	100+76	24' lt	763±	0.0-1.8 organics 1.8-3.0 sand 3.0-5.7 granular till G.W.L: 2.0' below ground level	757±

cont'd/

B.H.	Sta.	Off-Set	Ground Elevation	Overburden and Groundwater Level	Bedrock Elevation
21A	101+92	134' 1t	769.8	0.0-1.0 organics (topsoil) 1.0-2.0 sand 2.0-4.1 granular till N value = 7½" G.W.L: 4.4' below ground level	765.6
30	101+13	53' 1t	768±	0.0-1.0' organics (topsoil) 1.0-4.6 granular till G.W.L: Borehole dry	763.4
33	101+11	17' 1t	763±	0.0-3.0 mixture of sand and organics 3.0-3.9 granular till G.W.L: 1.5' below ground level	759±

Hwy. #21 Chainage

16A	360+47	58' 1t	767±	0.0-1.0' organics (topsoil) 1.0-3.5' sand 3.5-7.7' granular till N value = 21-15/5" G.W.L: at ground surface	759.3
18	360+42	69' rt	767.6	0.0-2.5 organics and sand 2.5-4.0 silty sand (N value = 9) 4.0-7.1 granular till N value = 62 B/F G.W.L: 1.5' below ground level	760.5
21	360+16	22' rt	771.5	0.0-8.0 silty sand-fill N value = 21-30 B/F 8.0-11.0 granular till N value = 100 B/F G.W.L: not observed	760.5
32	360+13	61' 1t	765±	0.0-1.0' organics (topsoil) 1.0-7.5' sand and boulders G.W.L: at ground surface	757.5



Memorandum

To: Mr. K.D. Selby, Supervising Engineer, From: A.P. Watt,
Soil Mechanics Section, Regional Structural Planning Engineer.
West Bldg., Downsview. Southwestern Region.

Attention:

Date: February 16, 1977.

Our File Ref.

In Reply to

Subject: W.P. 141-70-03, Bridge Site 8-16
Pottawatomi River Bridge
Immediately east of Jct. Hwy 21 & 70
Hwy 21
District 5, Owen Sound

Would you kindly arrange to have a Foundation Investigation conducted for the structures in the following two schemes (1) and (2) along with cores along the diversion to obtain a rock profile.

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Scheme 2 involves two bridges and a stream diversion as shown in blue. As it is felt that the stream diversion will be going through bouldery material or bedrock, would you kindly take some cores along the diversion in order to obtain a profile of the bedrock along the proposed stream diversion.

Enclosed please find two copies of the bridge site plan E-5351-1 showing the probable footing locations in red and blue. Also enclosed is a print of the ETR sheet number 314-21/13-0 showing the utilities in the area; hydro, bell and gas.

In Scheme 2, permission to enter the Doyles Marine Property, if required, north of Hwy 21 will have to be obtained by Soil Mechanics Section. The Ministry has possession of the property along the diversion to the south of Hwy 21.

A Field Reconnaissance Report, pictures of the site and the drawings of the existing bridge D-3371-1 to 4 are enclosed for your use.

Please consider this request as urgent and kindly arrange to do it as soon as possible. We would also like a letter of recommendation for all structure foundations and the bedrock profile of the diversion within five weeks. *SK* *18/2/77*

Thanking you kindly.

A.P. Watt,
Regional Structural Planning Engineer.

APW:ed
Encl.

c.c. A. Crowley
J. Anderson
R. Jenkins
J. Forster

Full

RECEIVED

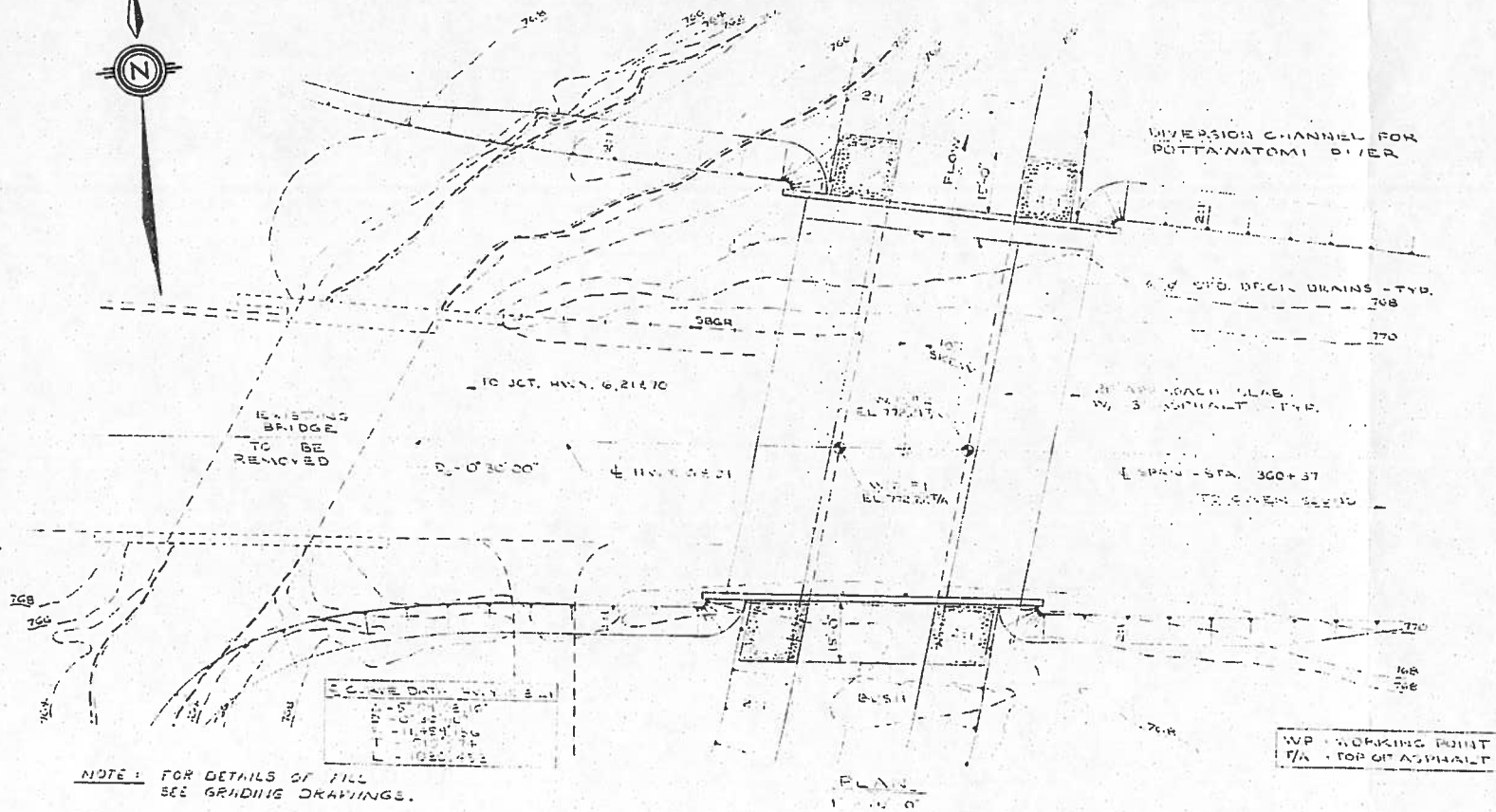
18/2

18/2/77

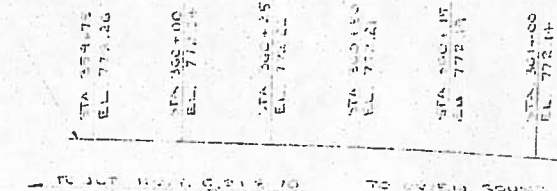
J. Anderson



18/2/77



TOP OF PAVEMENT
E & HWY. 6 & 21



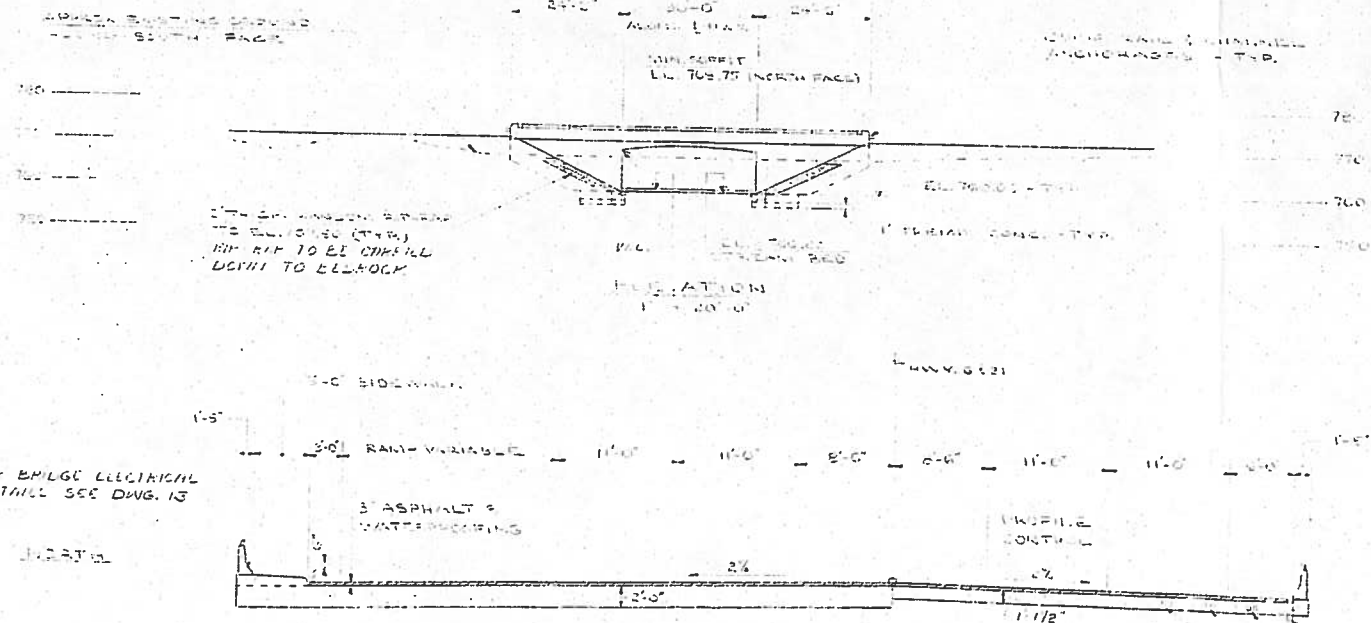
CONSTRUCTION SEQUENCE

STAGE I

DETOUR TRAFFIC TO THE SOUTH OF E HWY. 6 & 21 AND CONSTRUCT NORTH PART OF BRIDGE FROM THE NORTH FACE TO THE CONSTRUCTION JOINT AT THE E HWY. 6 & 21. THE FOOTING EXCAVATION SHALL BE COMPLETED FOR A DISTANCE OF FIVE FEET BEYOND (I.E. SOUTH) E HWY. 6 & 21.

STAGE II

WHEN THE BRIDGE CONCRETE HAS ATTAINED ITS REQUIRED STRENGTH, PLACE BACKFILL AND DETOUR TRAFFIC TO THE COMPLETED PORTION OF THE BRIDGE AND CARRY OUT REMAINING CONSTRUCTION.



FOR BRIDGE ELECTRICAL
DETAILS SEE DWG. 13

SOUTH

3\"/>

6\"/>

DIST NO. 5
CONT No 78-10
WP No 141-70-03

POTTAWATOMI RIVER BRIDGE
IMPROVEMENTS & REPAIRS
GENERAL LAYOUT

SHEET
37

NOTES:

CLASS OF CONCRETE

FOOTING & APPROACH SLABS - 3000 PSI
REMAINDER - 4000 PSI

CLEAR COVER TO REINFORCING STEEL

FOOTINGS & ABUTMENTS - 3\"/>

REINFORCING STEEL GRADE

ALL STEEL - 50 KSI, EXCEPT
APPROACH SLABS - 50 KSI

CONSTRUCTION NOTES

FALSEWORK SUPPORTING WINGWALLS
SHALL NOT BE REMOVED UNTIL
CONCRETE IN THE DECK SLAB HAS
ATTAINED A MINIMUM STRENGTH OF
3000 PSI.

BACKFILL SHALL BE PLACED
IMMEDIATELY BEHIND PIER
ABUTMENTS KEEPING THE HEIGHTS
OF THE BACKFILL APPROXIMATELY THE
SAME AT NO TIME SHALL THE
DIFFERENCE IN ELEVATIONS BE
GREATER THAN 2 FEET.

FALSEWORK SUPPORTING THE
DECK SHALL NOT BE REMOVED
UNTIL AFTER THE BACKFILL
HAS BEEN PLACED BEHIND THE
ABUTMENTS TO AT LEAST EL. 707.00

POST SIGN TO BE ERCT AGAINST
SOUND FENCE.

COMPLETE QUANTITIES:

CONCRETE QUANTITIES AND
LISTED BELOW FOR THE APPROPRIATE
LUMP SUM TENDER ITEM:

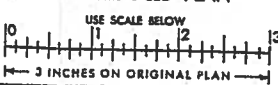
CONCRETE IN BRIDGE 365 CUM.
CONCRETE IN APPROACH SLABS 12 CUM.
CONCRETE IN OVERLY SLABS 112 CUM.

LIST OF DRAWINGS:

1. GENERAL LAYOUT
2. HOLE LOCATIONS
3. SOIL TESTS
4. FOOTINGS
5. PIER & ABUT.
6. WINGWALLS
7. BARRIER WALLS
8. BARRIER AND WINGWALLS
9. STEEL RAILING
10. 10 FT. APPROACH SLAB
11. AS CONSTRUCTED PLAN & DIM.
12. STANDARD DETAILS
13. STANDARD DETAILS
14. BRIDGE ELECTRICAL DETAILS TYPE IV



FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

DESIGN	WMM	CHECK	JLK	LOADING	H-20-44	DATE	JUL 77
DRAWING	WMM	CHECK	JLK	SITE	No 8-914	DWG	1

TWP# 314-414-1-A



APPENDIX B

Site Photographs



Photograph 1: Looking west at the adjacent south slope of the west abutment from the south slope of the east side of the bridge. Erosion of the slope face and scouring of the slope toe was observed. (May 10, 2014).



Photograph 2: Looking east at the south slope adjacent to the east abutment. Slight erosion of the slope face with scattered rocks placed were observed. Further, scouring of the slope toe was observed. (May 10, 2014)



Photograph 3: Looking west at the north slope adjacent to the west abutment. Erosion of the slope face with rocks scattered to mitigate further erosion was observed. Slight scouring of the slope toe was also observed. (May 10, 2014)



Photograph 4: Looking east at the north slope adjacent to the east abutment. Rocks placed on the slope with slight erosion on the slope face was observed. Further, scouring of the slope toe was also observed. (May 10, 2014)



Photograph 5: Looking west from the south slope of the east side of the bridge towards the west abutment wall. Weep holes out of the abutment wall as observed. Scouring below the water could not been observed. (May 10, 2014)



Photograph 6: Looking east from the south slope of the west side of the bridge towards the east abutment wall. Weep holes out of the abutment wall as observed. Scouring below the water could not been observed. (May 10, 2014)