

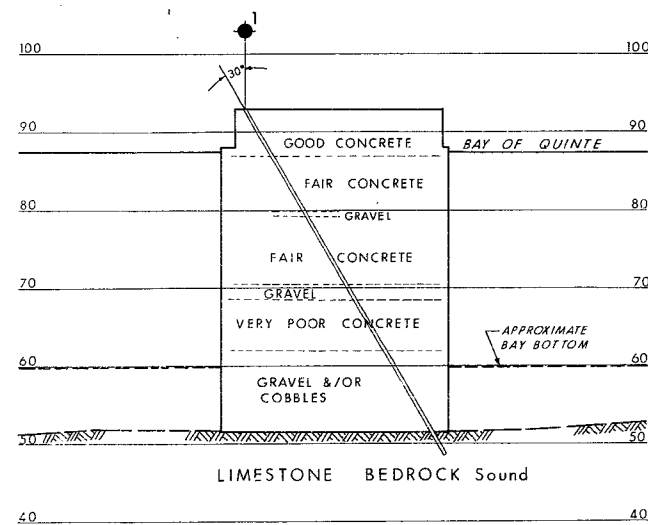
CONT. 73-24

HWY. 14

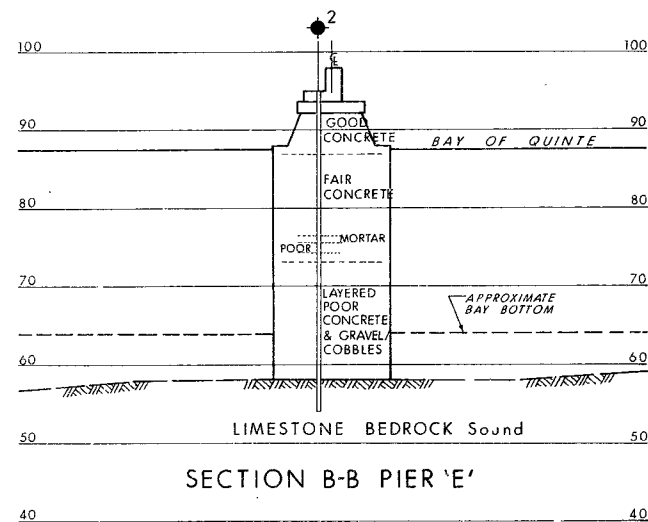
BAY OF QUINTE

FIERS DYE

31C-116

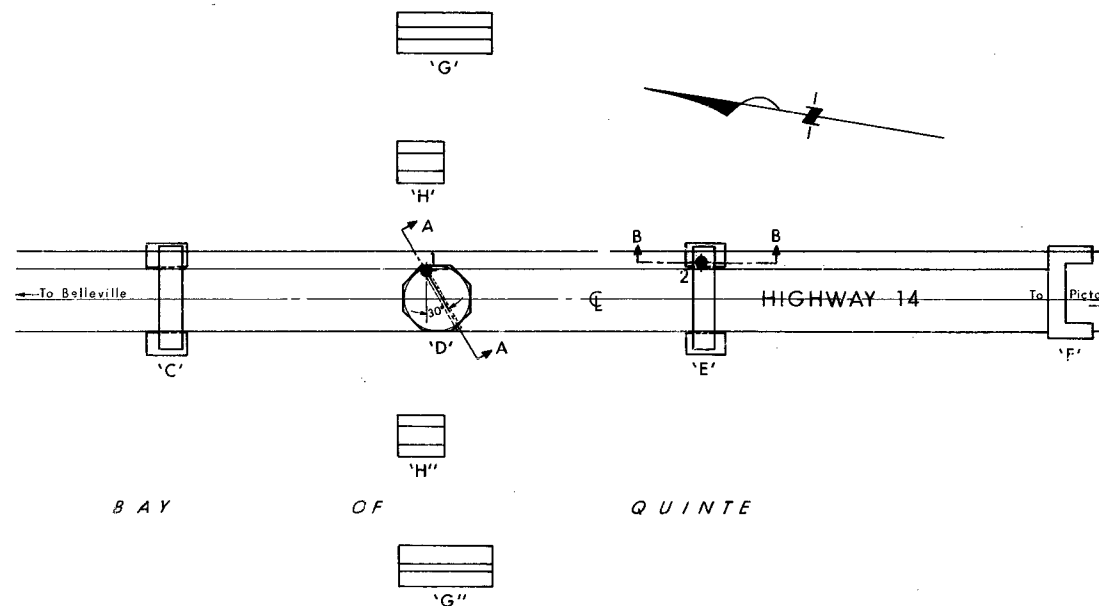


SECTION A-A PIER 'D'



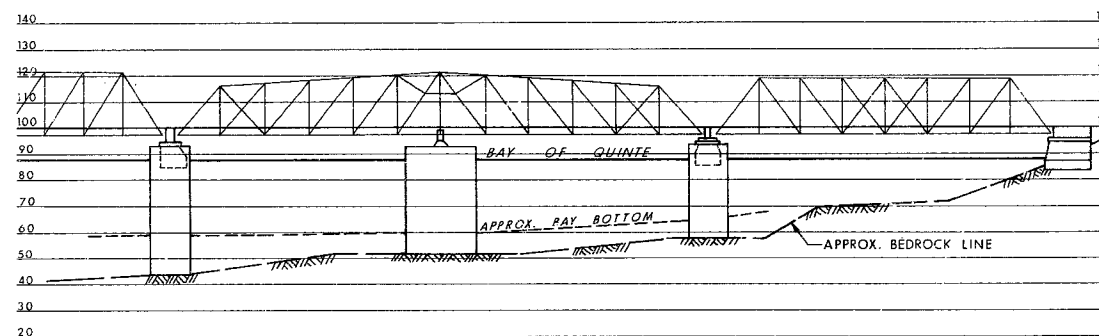
SECTION B-B PIER 'E'

SECTIONS
SCALE
10 5 0 10 20 FT.



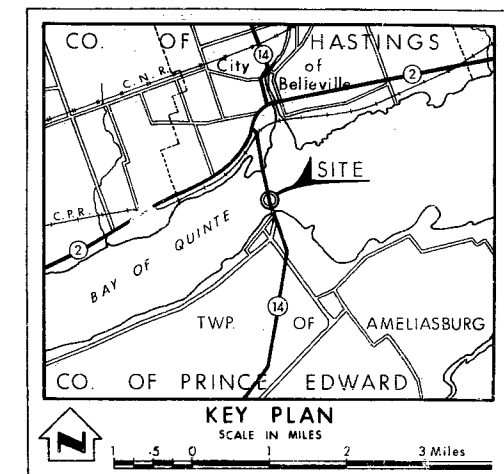
PLAN

SCALE
30 20 10 0 30 60 FT.



PROFILE

SCALE
30 20 10 0 30 60 FT.



LEGEND

- Bore Hole
- ⊗ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⬇ Water Levels established at time of field investigation, Oct. 1972

NO.	ELEVATION	LOCATION
1	93.0	AS SHOWN
2	95.0	ON PLAN

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

GEOLRES No. 31C-116

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

BAY OF QUINTE

(PIERS 'D' & 'E' SWING BRIDGE)

HIGHWAY NO. 14 (South Bridge) DIST. NO. 7
CO. PRINCE EDWARD

TWP. AMELIASBURG LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBWD. C.P.	CHECKED	W.P. NO. 83-71-01	DRAWING NO.
DRAWN	CHECKED	W.O. NO. 72-11112	72-11112A
DATE Nov. 2, 1972	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		
PRINCIPAL FOUNDATION ENGINEER			



72-86
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

31C-116

TO: Mr. C. S. Grebski,
Structural Design Engineer,
Design Services Branch,
West Bldg., Downsview.

FROM: Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION: Mr. W. Lin.

DATE: November 3, 1972.

OUR FILE REF.

IN REPLY TO NOV - 8 1972

SUBJECT:

FOUNDATION INVESTIGATION
For
Piers 'D' & 'E', Swing Bridge
Hwy. #14 and Bay of Quinte
District #7 (Port Hope)
W.O. 72-11112 -- W.P. 83-71-01

Str. repairs w P. 83-71-03 Cont # 73-24

~~Deel w P 83-71-02 Cont # 72-80~~

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

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

ACS/ao
Attach.

cc: D. P. Collins
G.C.E. Burkhardt
B. A. Singh
J. Alleong (Totten, Sims, Hubicki Associates Ltd.)
Foundations Files ✓
Documents

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

TABLE OF CONTENTS

1. INTRODUCTION.
2. SITE AND DRILLING OBSERVATIONS.
3. CONCLUSIONS.

FOUNDATION INVESTIGATION

For

Piers 'D' & 'E', Swing Bridge

Hwy. #14 and Bay of Quinte

District #7 (Port Hope)

W.O. 72-11112

--

W.P. 83-71-01

1. INTRODUCTION:

The Foundations Office was requested to carry out a detailed investigation at the above-mentioned site. The request was contained in a memorandum from Mr. C. S. Grebski, Structural Design Engineer, dated October 5, 1972. The purpose of this investigation was to determine if Piers 'D' and 'E' were concrete-filled as indicated on existing Bridge Drawings. An investigation was subsequently carried out by this Office. This report contains all the factual information obtained during the course of the field investigation, together with suggested measures to strengthen the substructures of the swing bridge.

2. SITE AND DRILLING OBSERVATIONS:

The site is situated in the physiographical region known as "Prince Edward Peninsula," where thin overburden deposits are underlain by limestone bedrock.

A total of two boreholes was put down during the course of the field investigation, using a BBS1 diamond drill rig. The borehole, put down at Pier 'D', was drilled at an angle of 30° to the vertical. The borehole, put down at Pier 'E', was drilled vertically. In both boreholes, continuous core samples of the concrete and the underlying limestone bedrock were taken by diamond drilling techniques. The sampling procedures and the description of the core samples recovered are presented on the Record of Borehole sheets contained in the Appendix of this report. The

locations and elevations of the borings are shown on Drawing No. 72-11112A. The elevations in this report are referenced to the top of the Bridge Deck which is assumed to be at elevation 100. The water level of the Bay of Quinte was at elevation 87.5 during the field investigation.

The cores recovered were examined carefully in the field and subsequently in the laboratory. No laboratory testing was carried out on the core samples. A description of the quality of the concrete as encountered at boring locations is presented as follows:

Pier 'D' (Refer to B.H. #1)

<u>Depth</u> (from top of pier)	<u>Description</u>
0.0' - 6.0'	Good concrete
6.0' - 22.5'	Fair concrete with gravel layers up to 6" thick throughout
22.5' - 24.5'	Gravel
24.5' - 31.0'	Very poor concrete with gravel layers up to 15" thick throughout
31.0' - 41.5'	Gravel and/or cobbles with occasional small pieces of concrete
41.5' - 44.2'	Limestone bedrock

Pier 'E' (Refer to B.H. #2)

<u>Depth</u> (from top of pier)	<u>Description</u>
0' - 8.0'	Good concrete
8.0' - 21.7'	Fair concrete with minor gravel layers throughout
21.7' - 36.9'	Layered poor concrete and gravels/cobbles
36.9' - 41.0'	Limestone bedrock

The Bay of Quinte water level, during the field investigation, was at elevation 87.5, which is 5.5 and 7.5 feet below the top of piers 'D' and 'E', respectively. It is, therefore, interpreted that both pier 'D' and pier 'E' were concrete-filled and that the concrete above the bay water level is good. However, the concrete below the bay water level varies progressively with depth from fair to very poor with numerous layers of gravel and/or cobbles. It is believed that the piers were poured under water which

resulted in aggregate segregation.

3. CONCLUSION:

It is our opinion that pressure grouting techniques be employed to strengthen the bottom portion of both pier 'D' and pier 'E'

C. S. Poon
C. S. Poon, P. Eng.



M. Devata
M. Devata, P. Eng.

CSP/ao

Nov. 2, 1972.

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 72-11112

LOCATION Pier 'D' Swing Bridge, Hwy. #14 & Bay of Quinte

ORIGINATED BY CSP

W.P. 83-71-01 & 02

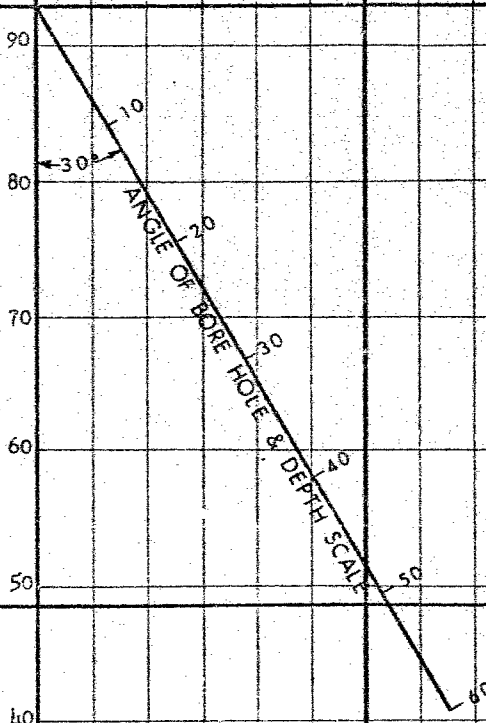
BORING DATE Oct. 11 - 18, 1972

COMPILED BY CSP

DATUM Assumed

BOREHOLE 1 ^{NXL} BXL and AXT Rock CoreCHECKED BY *JK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W $W_p \rightarrow W \rightarrow W_L$ WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	RECOVERY					
93.0	Top of Pier 'D'									
0.0	Good Concrete		1	NXL	100%	90				
87.0			2	NXL	95%					
7.0	Fair Concrete		3	NXL	90%					
	gravel		4	NXL	70%					
	(with gravel layers up to 6" thick throughout)		5	NXL	95%					
			6	NXL	95%					
70.5			7	NXL	83%					
26.0	Gravel		8	NXL	50%					
28.3	Very poor concrete (with gravel layers up to 15" thick throughout)		9	BXL	71%					
			10	BXL	67%					
62.0			11	BXL	70%					
			12	BXL	76%					
35.7	Gravel, and/or cobbles with occ. small pieces of concrete.		13	BXL	20%					
			14	BXL	35%					
51.5			15	AXT	20%					
48.0	Bedrock Limestone									
48.8	Sound		16	AXT	100%					
51.3	End of Borehole									



OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2

JOB 72-11112

LOCATION Pier 'E' Swing Bridge, Hwy. #14 & Bay of Quinte

ORIGINATED BY CSP

W.P. 83-71-01 & 02

BORING DATE 18 - 20, 1972

COMPILED BY CSP

DATUM Assumed

BOREHOLE TYPE NXL, BXL and AXT Rock Cores

CHECKED BY *[Signature]*

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT %			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			RECOVERY	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			
95.0	Top of Pier 'E'		1	NXL	83%	90					87.5 Bay of Quinte
0.0	Good Concrete		2	NXL	100%						
87.0	Fair concrete with minor gravel layers throughout		3	NXL	100%	80					
8.0			4	NXL	100%						
73.3			5	NXL	75%						
21.7	cement mortar gravel & poor concrete Layered poor concrete and gravel/cobble		6	NXL	60%	70					
			7	BXL	62%						
			8	BXL	58%						
			9	BXL	85%						
58.1			10	BXL	60%	60					
35.9	Bedrock Limestone		11	BXL	87%						
54.0	Sound		12	AXT	73%						
41.0	End of Borehole					50					

OFFICE REPORT ON SOIL EXPLORATION



totten sims hubicki associates limited

G.L. TOTTEN B.Sc., P. Eng.
R.E. SIMS B.A.Sc., P. Eng.
J.M. HUBICKI B.A.Sc., P. Eng.
R.L. WINDOVER M.Sc., P. Eng.
P.C. EBERLEE B.A.Sc., P. Eng.

1500 HOPKINS ST., P.O. BOX 149
WHITBY, ONTARIO (416) 668-9363

SYNOPSIS

February 28th, 1973

RE: W.P. #83-71-02 (Site #28-3) - Bridge No. 2 - South Bridge on Causeway
across the Bay of Quinte at Belleville, Highway #14, District No. 7

WORK TYPE AND OBJECTIVE:

- Structural - Concrete and Structural Steel; Repairs to substructure of Bridge No. 2.
- The superstructures of Bridge No. 1 and Bridge No. 2 were improved under Contract No. 72-80.

FIELD INSPECTION:

- Of the substructure of Bridge No. 1 and Bridge No. 2 was carried out by Totten Sims Hubicki in July, 1972.
- Ministry of Transportation and Communications, Foundations Office, extracted cores from Piers D and E of Bridge No. 2 in October, 1972.
- No immediate repair work is recommended for Bridge No. 1 substructure.
- Recommended repairs to Bridge No. 2 substructure are reflected in the Contract work.

CONTRACT WORK: (BRIDGE NO. 2)

- Cleaning out caissons and cleaning exposed concrete pier caps.
- Fastening existing steel sheet pile caissons encompassing Piers B and C to existing concrete piers, and grouting voids between the steel sheet piles and concrete piers.
- Protection of exposed faces of Piers B, C, D and E with a prefabricated steel collar and grouting of voids between the steel collar and concrete pier caps.
- Removal and disposal of buffer Piers H and H'.

PROVISIONS FOR TRAFFIC DURING CONSTRUCTION:

- Contractor to maintain normal two-way vehicular traffic on Bridge No. 2 (Highway #14) at all times.
- Contractor to comply with the regulations embodied in the Navigable Waters Protection Act and maintain the minimum navigation clearances indicated on the drawings.

ESTIMATED COST SUMMARY:

Cleaning Operations	\$ 15,500.00
Structural Steel	\$ 74,500.00
Grouting	\$ 19,000.00
Removals	\$ 5,000.00
Others	\$ 33,000.00
TOTAL	<u>\$147,000.00</u>

R. L. Windover

R. L. Windover, P. Eng.

72-11112
AGS
D.L.
Structural Office,
West Building,
1201 Wilson Avenue,
DOWNSVIEW, Ontario.

Tel. 248-3516

January 3rd, 1973.

Totten Sims Hubicki Associates Ltd.,
Consulting Engineers,
1500 Hopkins Street,
P.O. Box 149,
WHITBY, Ontario.

Attn. Mr. G. L. Aleong, P. Eng.

Dear Sir:

RE: Bay of Quinte Bridge #2
Substructure repairs,
W.P.#83-71-03,
Hwy. #24, District #7.

Judging from your inspection report and comments from Mr. W. E. Dcnahoe, P. Eng., of Intrusion-Prepakt Ltd., there is no immediate necessity for grouting the lower portion of piers "D" and "E" as mentioned in the Foundation Report.

We will, therefore, proceed as per the contract with the repairing of the upper portion of the piers as shown in your drawing.

If required, the "Stop Grouting Method" could be carried out at a later date once settlement of the pier foundation is discovered.

Yours truly,

W. Lin, P. Eng.,
Reg. Structural Design
Engineer.

WL:dp

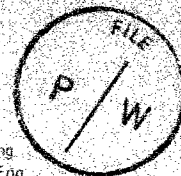
cc. M. Devata, Foundations Office. ✓



totten sims hubicki associates limited

72-11-112

G.L. TOTTEN B.Sc., P. Eng.
R.E. SIMS B.A.Sc., P. Eng.
J.M. HUBICKI B.A.Sc., P. Eng.
R.L. WINDOVER M.Sc., P. Eng.
P.C. EBERLEE B.A.Sc., P. Eng.



1500 HOPKINS ST., P.O. BOX 149
WHITBY, ONTARIO (416) 668-9363

Mr. C.S. Grebski, P. Eng.
Structural Design Engineer
Ministry of Transportation and Communications
Downsview, 464, Ontario

December 29, 1972

Attention: Mr. W.L. Lin, P. Eng.
Regional Structural Design Engineer

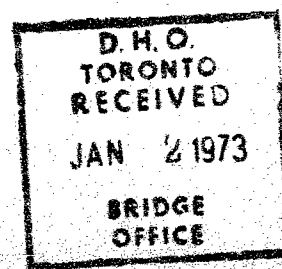
Re: Bay of Quinte Bridge #2
W.P. #83-71-03
Highway #14, District #7

Dear Sir:

Further to our letter of December 1, 1972, and subsequent conversations relative to the Foundation Report and pressure grouting techniques required to strengthen the lower portion of Piers 'D' and 'E' of the above noted bridge, we enclose for your information, a copy of a self-explanatory letter from Intrusion-Prepakt Limited dated December 21, 1972 relative to the above noted project.

The Pressure Grouting Specialists indicate that utilization of the "Stop Grouting Method" will require drill holes spaced at about five feet centres, and the estimated cost of \$18,000 to strengthen each pier assumes that one lane of the existing bridge would be closed for the duration of the grouting operations to facilitate the drilling of the grout holes and the grouting of the voids. We consider the estimated cost provided by Intrusion-Prepakt Limited for the grouting operations to be a minimum, and the actual cost may be considerably higher.

It is further noted that grouting of the voids would only achieve concrete strengths in the piers equal to the strength of the weakest concrete in the existing piers. Mr. W.E. Donahoe, P.Eng., Chief Engineer, Intrusion-Prepakt Limited concluded that no work need be carried out on the concrete inside the timber cribs at the present time, as the concrete and other materials would appear to be fully contained.



This is in agreement with the recommendations contained in our Substructure Inspection Report, dated November, 1972.

The Ministry's review of the above and enclosure, and any further comments regarding pressure grouting of the lower portion of Piers 'D' and 'E' will be greatly appreciated.

Yours very truly

A handwritten signature in dark ink, appearing to read 'G.L. Aleong', with a stylized flourish at the end.

G.L. Aleong, P.Eng.

GLA/mc

72-11-112

CONCRETE-MASONRY STRUCTURALLY CONDITIONED

59 - NO. 7 HIGHWAY EAST P.O. BOX NO. 660

TELEPHONE 888-6291

Totten, Sims, Hubicki Associates Ltd.
1500 Hopkins Street
P. O. Box 149
Whitby, Ontario

Attention: Mr. G. L. Aleong, P.Eng.

RE: Bay of Quinte Bridges
Belleville, Ontario

DEC 27 1972

TOTTEN SIMS BURNING
WHITEY - ONTARIO

Receipt of your letter dated December 11, 1972 with attachments is acknowledged.

We have reviewed the Foundation Investigation Report for Piers 'D' and 'E' of Bridge No. 2 and feel that by utilization of the "Stop Grouting Method" i.e. drilling from the top to first seam, then pressure washing sand out, then filling void with Intrusion Grout and redrilling to next seam, etc. downward, this method would increase the bearing capabilities of the piers to the strength of the weakest concrete in the pier. This method has been utilized in the past on several installations and proved satisfactory. A ball-park figure to carry out this work would be \$18,000.00 per pier based on similar type projects.

If the close faced timber crib is in good condition, it is this writer's opinion that no work need be carried out on the concrete inside the cofferdam at the present time as the concrete and other materials are fully contained. Repairs on that portion above water line including all of the cap should be carried out.

If we can be of further assistance, please do not hesitate in contacting us.

Yours very truly,

INTRUSION-PREPAKT LIMITED.

W. E. Donahoe, P.Eng.
Chief Engineer

[illegible]

WED:nt
Enc.

Design Services Branch,
12'1 Wilson Avenue,
Downsview 464, Ontario.

October 20, 1972.

Telephone: 248-3282.

Canadian Longyear Limited
35 Brydon Drive,
Rexdale, Ontario.

Dear Sirs:

This letter confirms our request of October 10, 1972, for the supply of a diamond drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Belleville, Ontario, on October 11, 1972.

Mobilization will be from Toronto, Ontario.

Our Project Number is W.O. 72-11112.

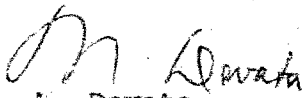
Yours truly,

MD/ao

cc: W. W. Fry
(Attn: Mrs. M. Andrews)

Foundations Office
Documents

For:


M. Devata,
Supervising Foundations Eng.,
A. G. Sternac,
Principal Foundations Eng.

72-11112
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building, DOWNSVIEW

ATTENTION:

DATE: October 5, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Bay of Quinte Bridges Nos. 1 & 2,
W.P. #83-71-01-02, -03
Site #'s 28-3 & 11-193,
Hwy. #14, District #7.

An investigation is being prepared by the consultants, Totten, Sims, Hubicki & Associates, to determine the extent of repairs to the substructures of the above bridges.

As the visibility of the water at this location is rather poor, the divers were unable to examine closely the crib foundations of Pier "D" & "E". It is our interest to determine whether these cribs are concrete filled or plain rock filled.

It was proposed that cores be made in the cribs. We would like to know if your office could provide us with this information by carrying out the drilling work. Your finding will be most helpful in preparing the final contract for the substructure repairs of this project.

WL:dp

Watone Lin

Watone Lin,
Regional Structural Design Engineer

FOR: C. S. Grebski,
Structural Design Engineer.