

ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 517-64-01

DIST 4

HWY 3

STR SITE 34-103

Concrete Culvert, Village of Wainfleet

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# FOUNDATION INVESTIGATION REPORT

For

Concrete Culvert, Village of Wainfleet  
W.P. 517-64-01, Site 34-103  
Highway 3, District 4, Hamilton

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## INTRODUCTION

This report contains the results of a foundation investigation for the above project. Fieldwork consisted of 2 boreholes advanced during the period August 9th. to 11th., 1977, utilizing a skid mounted diamond drill.

The upper 10 feet of each borehole was cased with N size casing. Below this the boreholes were advanced uncased by the use of washboring techniques. Locations and elevations of the borings, as well as an inferred subsoil stratigraphy are shown in Drawing No. 5176401-A.

## SITE DESCRIPTION

The site is located in the Village of Wainfleet where Highway 3 crosses the abandoned Welland Feeder Canal. Wainfleet is a small community situated on the flat Haldimand Clay Plain which in this area is primarily engaged in the production of cash crops.

The existing structure is a 50 foot 2 span steel beam structure with a concrete deck. It was widened in 1929 with the widening being supported on timber piles. An earlier timber lift bridge was located at this site and was supported on timber piles the remains of which are visible in the water under the bridge.

## SUBSOIL CONDITIONS

Subsoil at the site consists of a deep lacustrine deposit consisting of silty clay to clay which was sampled to a depth of 50 feet. The upper 5 feet forms a thin desiccated crust in which the moisture content ranges

from 20 to 30 percent. Standard Penetration 'N' values in the crust range between 5 and 18 blows per foot indicating an undrained shear strength in excess of 2000 psf.

Below the crust the undrained shear strength rapidly decreases to between 500 and 1000 psf and the moisture content increases to as high as 50 percent.

The feeder canal was constructed approximately 150 years ago and has been abandoned for in excess of 50 years. In this latter period the canal has partially filled with organically contaminated sediment. Probing from the bridge deck revealed up to 3 feet of soft material in the canal bottom except in the area immediately under the bridge where the bottom was hard and irregular suggesting the use of cobbles or other debris as riprap to prevent instability of the abutments.

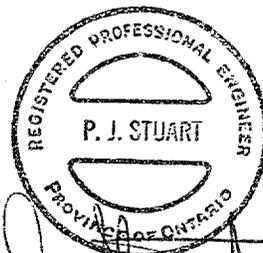
DISCUSSION AND RECOMMENDATIONS

It is proposed that the existing two span structure be replaced by a 10 foot by 8 foot box culvert. This may be accomplished by excavating the deposit of soft organically contaminated material from the bottom of the canal and replacing it with a pad of compacted granular A. In the centre of the canal the native clay soil will be reached at approximate elevation 568.

The box culvert should be placed on a granular A pad with a minimum thickness of 12 inches and may be designed with a loading of up to 1500 pounds per square foot.

The timber piles under the centre pier of the existing structure as well as any from previous structures which are located under the new culvert should be extracted or cut off at least 3 feet below the bottom of the culvert.

No dewatering problems are anticipated due to the relatively impermeable nature of the clay subsoil.



*P. J. Stuart*  
P. Stuart, P. Eng.  
Project Engineer

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

KGS/PS/bp  
August/77

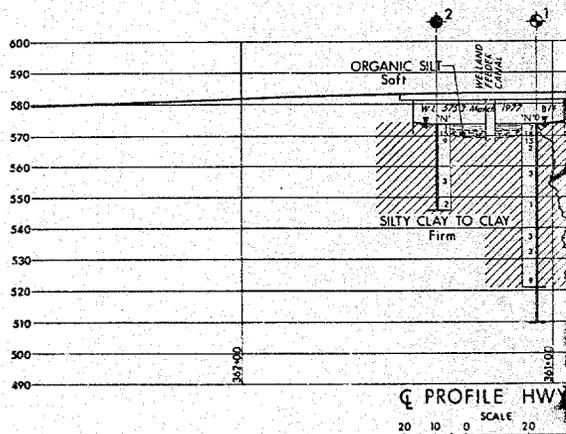
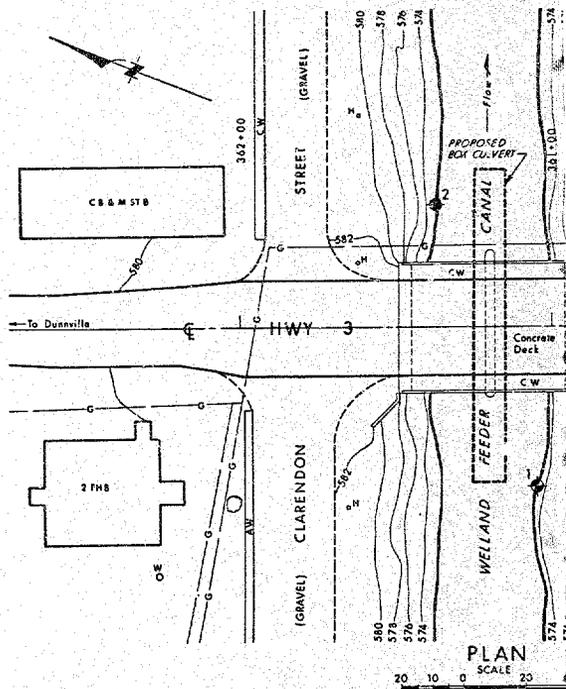
### RECORD OF BOREHOLE No 1

W P 517-64-01 LOCATION Sta. 361+05 o/s 50' Lt. & Hwy. 3 ORIGINATED BY PJS  
 DIST 4 HWY 3 BOREHOLE TYPE Washboring & Cone Test COMPILED BY PJS  
 DATUM Geodetic DATE Aug. 9 and 10, 1977 CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60						80	100	15
573.8	Ground Level																	
0.0	Silty clay to clay  Firm		1	SS	7													
			2	SS	18													
			3	SS	15													
			4	SS	2													
			5	TW	PM													
			6	TW	PM													
			7	SS	3													
			8	TW	PM													
			9	SS	1													
			10	TW	PM													
			11	SS	3													
			12	SS	2													
520.8					13	SS	9											
53.0	End of Borehole																	
509.8																		
510																		
64.0	End of Cone Test																	

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to Sensitivity      20  
 15 - 5 (%) STRAIN AT FAILURE  
 10





C PROFILE HWY  
SCALE 20 10 0 10 20

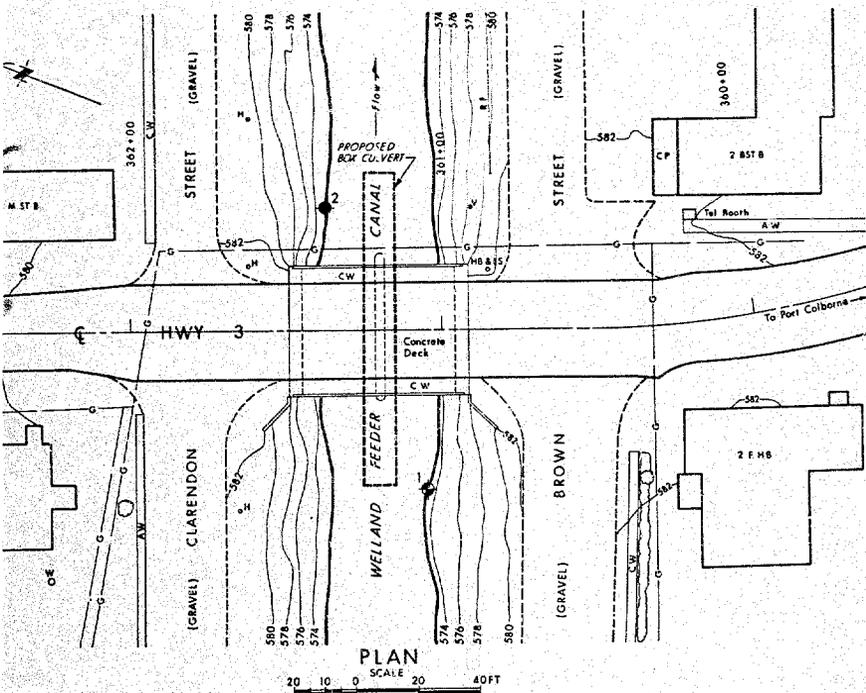
CONT No  
WP No 517-64-01



WELLAND FEEDER CANAL

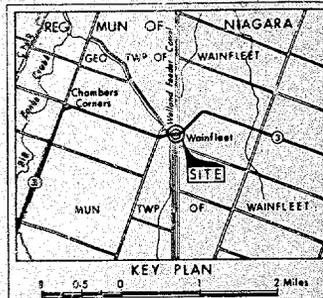
SHEET

BORE HOLE LOCATIONS & SOIL STRATA



PLAN

SCALE 0 20 40 FT

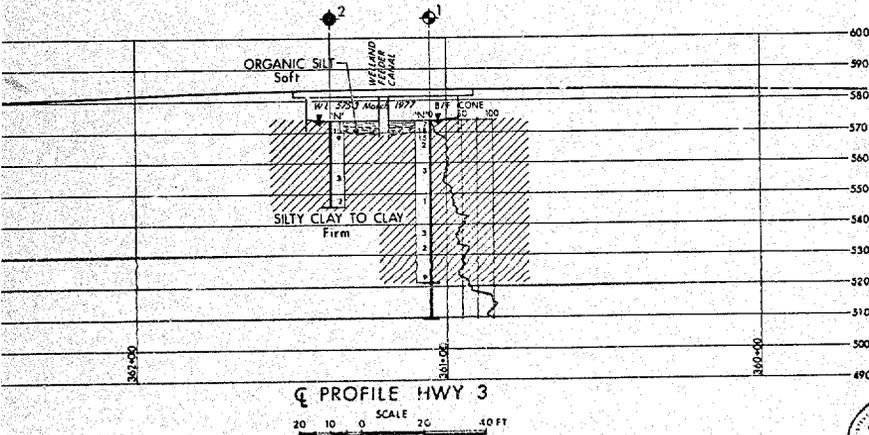


KEY PLAN

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- 1N' Blows/ft (Std Pen Test 350 ft lbs energy)
- COME Blows/ft (60° Cone, 350 ft lbs energy)
- ↓ Wt at time of investigation Aug 1977

No	ELEVATION	STATION	OFFSET
1	573.8	361+05	50' LT
2	573.8	361+37	39' RT



PROFILE HWY 3

SCALE 0 20 40 FT

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

NO	DATE	BY	DESCRIPTION

Drawn by: J.S. CHECKED: DATE: Sept 1, 1977  
 Location: 425 CHECKED: DATE: Sept 1, 1977  
 Scale: 1" = 40' SITE: 34-103  
 Cont: 5176.4D1-A



## Memorandum

To: Mr. C. Mirza,  
Head,  
Soil Mechanics Section,  
West Building, Downsview

From: G.C.E. Burkhardt,  
Structural Section,  
Central Region

Attention: Mr. K.G. Selby

Date: 1977-06-27

Our File Ref.

In Reply to

Subject: RE: Concrete Culvert, Village of Wainfleet,  
Site 34-103, W.P. 517-64-01  
Highway 3, District 4

1977 *log*

The existing Wainfleet Bridge over the abandoned feeder canal has been scheduled for replacement as a result of the structural investigation of this structure, which Mr. K. Selby was involved in.

Highway 3 is now being upgraded to current standards and as part of this program, the existing structure will be demolished and replaced with a concrete box culvert (10'x8' approx.).

The culvert will be centered in the canal where the existing pier is located.

Preliminary details of the culvert are indicated on the enclosed Bridge Site Plan E-5441-1 (2 copies).

Could you please prepare a Foundation Investigation Report of sufficient scope to facilitate the design of the proposed box culvert.

This request with its tight schedule has been previously discussed with Mr. Selby whom indicated preliminary recommendations could be made available in time for the design of the culvert. The project is scheduled for completion by 1977-08-10.

Should additional clarification and/or details be required, please do not hesitate to call this office.

RJ:gj  
Encl.

*R. A. Jeffries*  
R.A. Jeffries,  
Structural Supervisor,  
for:  
G.C.E. Burkhardt,  
Head, Structural Section

c.c. J. Anderson  
R. Fitzgibbon



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REPORT OF INVESTIGATION

GEOCRES No. 30L14-39

DIST 4 REGION CENTRAL

W.P. No. 517-64-01

CONT. No. 78-14

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

STR. SITE No. 34-103

HWY. No. 3

LOCATION CONCRETE GULCH

VILLAGE OF KATYHIEET

CREATED BY: \_\_\_\_\_

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

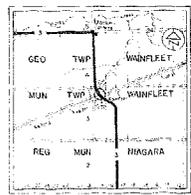
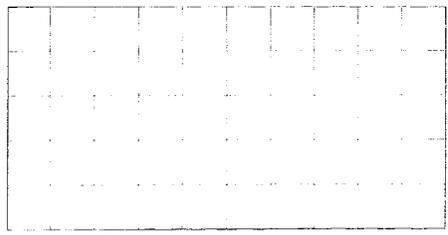
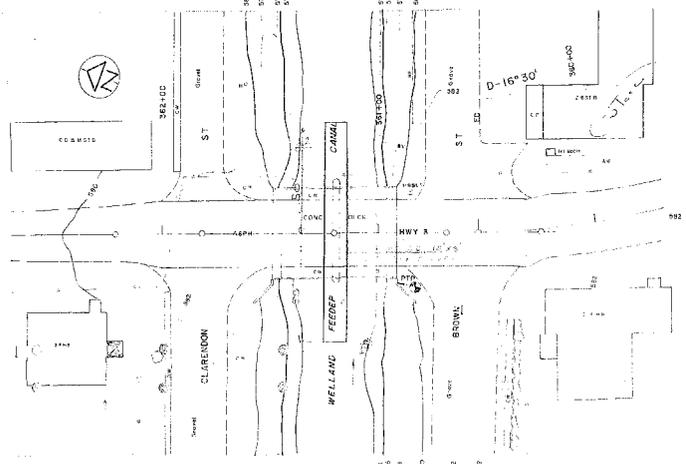
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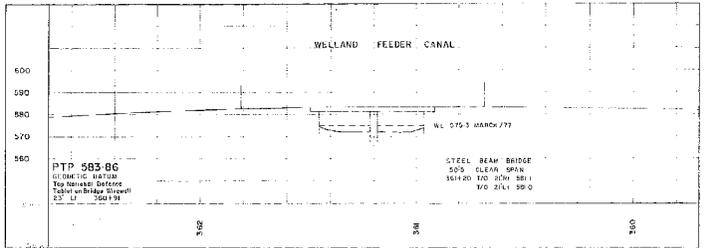


ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE

GEO TWP WAINFLEET  
 MUN TWP WAINFLEET  
 REG MUN NIAGARA  
 CON 3  
 LOT 13



KEY PLAN



PROFILE OF HWY

DHO BM 372-69  
 FL 578-416  
 Station 40+00 to 40+00.00  
 0.5' from Crown  
 100' to 100' 0.00'

PTP 583-86  
 100' to 100' 0.00'  
 The Hamilton Ontario  
 Table of Bridge Structure  
 23' 11' 3664' 93

STEEL BEAM BRIDGE  
 505' CLEAR SPAN  
 564+20 TO 570+00 SB L  
 370 TO 374.1 SB O

DATE	REVISIONS & ADDITIONS

MINISTRY OF TRANSPORTATION & COMMUNICATIONS  
 ENGINEERING SERVICES BRANCH  
 1 KING STREET WEST, TORONTO, ONTARIO

**BRIDGE SITE PLAN**  
 CROSSING *30214-89*  
 AT  
 WELLAND FEEDER CANAL  
 OVER  
 KING'S HIGHWAY 3  
 LOT 13

GEO TWP WAINFLEET MUN TWP WAINFLEET REG MUN NIAGARA  
 SCALE DISTRICT REGION  
 AS SHOWN 3 - HAMILTON CENTRAL  
 STUDY PLAN PHOTO PLAN  
 E T R 131 - 3

DATE MARCH 1977  
 DRAWN BY  
 CHECKED BY APRIL 1977  
 SITE  
 WP 517-68-01

RECEIVED  
 JUN 29 1977  
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PLAN E-5441-1

17-3107