

CONT. 71-104

BRUCE AVE.

EXT. + GRAND

MARAI DRAIN

40J6-7





( RPT 110 248 Bldg ) 71-104

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. B. R. Davis,  
Bridge Engineer,  
Bridge Office,  
Admin. Bldg.\*  
ATTENTION: Mr. S. McCombie.

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

DATE: June 5, 1970.

OUR FILE REF.

IN REPLY TO 111L - 7 1970

SUBJECT:

40J-40

FOUNDATION INVESTIGATION REPORT  
For  
Proposed Structure at Bruce  
Ave. Ext. & Grand Marais Drain  
E. C. Rowe Expressway  
City of Windsor  
District No. 1 (Chatham)  
W.C. 70-11040 -- W.P. 257-66-18

40J6-7  
GEOCREs No.

Cont 71-104 site # 6-265

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

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

AGS/hrd  
Attach.

*A. G. Stermac*  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

- cc: Messrs. B. R. Davis
- H. A. Tregaskes
- D. W. Farren
- W. Zonnenberg
- F. C. Brown
- A. P. Watt (2)
- J. Roy
- B. A. Singh

Foundation Files  
General Files

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FOUNDATION INVESTIGATION REPORT  
For  
Proposed Structure at Bruce  
Ave. Ext. & Grand Marais Drain  
E. C. Rowe Expressway  
City of Windsor  
District No.1 (Chatham)  
W.O. 70-11040 -- W.P. 257-66-18

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1. INTRODUCTION:

A request for a foundation investigation for a proposed new structure at the crossing of the Grand Marais drain and Bruce Avenue extension in the City of Windsor was received from Mr. A. P. Watt, Regional Bridge Planning Engineer, in a memorandum dated April 30, 1970.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site of the proposed structure is located in the south part of the City of Windsor and lies just north of the existing junction of West Grand Blvd. and Bruce Avenue. The channel of the Grand Marais drain, which flows in a south-westerly direction, is approximately 8 ft. deep and approximately 40 ft. wide. Apart from the drain channel the general area is relatively flat.

Physiographically, the site is located in the region referred to as the St. Clair Clay Plain.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURE:

A total of two sampled Boreholes and four dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of a continuous flight, auger machine. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler: the energy used in driving it conformed to the requirements of the standard penetration test.

Dynamic cone penetration tests were carried out adjacent to each Borehole and at two other locations; driving energy used to advance the cone was 350 ft.-lbs. per blow. 'Undisturbed' samples were recovered using 2-inch I.D. Shelby tubes which were pushed into the soil manually. Where possible, field vane tests were carried out at elevations 12 inches below sample depths.

The locations and elevations of the borings are shown on Drawing No. 70-11040A, which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection laboratory tests were carried out on selected samples to determine the following physical properties:

- Atterberg limits
- Moisture content
- Grain size distribution
- Bulk density
- Undrained shear strength

The test results are summarized on the record of borehole sheets contained in the appendix of this report.

4. SOIL TYPES AND SOIL CONDITIONS:

4.1) General:

The subsoil at the site was found to be fairly uniform.

From ground level downward, the following soil types were observed:

4.2) Clayey Silt with Sand and Traces of Gravel:

This deposit was encountered immediately below the subsoil at all boring locations and extended to an approximate depth of 115 ft.

The material consists of silt and clay with sand and traces of gravel.

Physical properties of the material, as determined from laboratory tests, are as follows:

Natural moisture content:	12%	-	23%
Liquid limit:	23%	-	32%
Plastic limit:	13%	-	16%
Undrained shear strength (Laboratory):	370p.s.f.	-	5420p.s.f.
Field vane test:	800p.s.f.	-	2000p.s.f.
Bulk density:	128p.s.f.	-	130p.s.f.
Sensitivity:	1.4	-	2.2

Typical grain-size distribution curves are included in the Appendix of this report.

The consistency of the overall stratum ranges from soft to hard. Immediately beneath the extreme upper 4 - 5 ft. frost affected zone, the material appears to be desiccated. Laboratory shear strength measurements indicated that the shear strength of the material is in excess of 4000 PSF. The thickness was found

to be approximately 10 ft. in BH #4. This desiccated hard zone is somewhat less in thickness (4 ft.) in BH #2. Below this hard zone the shear strength was found to decrease with increasing depth until a minimum value is reached from which point on it increases again. Unconfined and triaxial compression tests carried out on 'undisturbed' samples, gave shear strength values, in general, lower than the field vane tests carried out at the corresponding sample elevations.

5. GROUNDWATER LEVEL:

The groundwater level was observed to be at el. 594 in BH #2.

No water was found to be present in BH #4 due to the relative impermeability of clayey silt material and the short duration of the field work.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to build a single span (70 ft.) structure at this location. The proposed grade line will be at el. 604 which is approximately 4 ft. above the original ground.

As described in the previous paragraphs the subsoil consists of soft to hard clayey silt with sand and traces of gravel.

Two types of foundations are recommended for consideration:

(1) Spread Footing:

The proposed new structure may be supported on spread footing type foundations between El. 585 and El. 590. If scour is a problem protection can be afforded by sheet piling left

permanently in place round the footings.

A safe design load of 2.0 tons per sq. ft. may be used for design purposes. For frost protection it will be necessary to ensure that the footings are at least 4 ft. below the lowest established water level.

(2) File Foundation:

As an alternative the footings may be supported on timber piles. In the case of No. 14 treated timber piles 20 tons design load per pile for 40' penetration into original ground is recommended.

The topsoil stripping should be in accordance with the current D.H.O. standards.

Pile caps should be placed a minimum of 4 ft. below the lowest established water level in order to provide adequate frost protection.

No problems are anticipated for the proposed approach embankments provided 2:1 slopes are constructed. Protection against scour should be provided up to H.W.L. in the vicinity of the structure.

7. MISCELLANEOUS:

The field investigation was carried out from May 12 to May 15, 1970. The equipment used on the site was owned and operated by P.V.K. and Sons Drilling Company.

The supervision of the field work, together with the preparation of this report, was carried out by Mr. P. Payer, Project Foundation Engineer. Mr. K. G. Selby, Supervising Foundation Engineer reviewed this report.

May 1970.

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-11040 LOCATION Co-ords. 98,387 N; 66,817 E. ORIGINATED BY PP  
 W.P. 257-66-18 BORING DATE May 13, 1970 COMPILED BY GC  
 DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT ——— $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		25	50	75	100	125	WATER CONTENT % $w_p$ ——— $w$ ——— $w_L$				
600.0	Ground Level															
0.0	Probably Clayey Silt															
587.1																
12.9	End of Cone Test															

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No.2

FOUNDATION SECTION

JOB 70-11040 LOCATION Co-ords. 98,380 N; 66,781 E. ORIGINATED BY PP  
 W.P. 257-66-18 BORING DATE May 13 - 14, 1970 COMPILED BY GC  
 DATUM Geodetic BOREHOLE TYPE Auger - AX Casing CHECKED BY [Signature]

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS	
			NUMBER	TYPE	BLOWS / FOOT		25	50	75	100	125	W <sub>L</sub>	W <sub>P</sub>			W
600.0	Ground Level															
0.0	Clayey Silt with Sand and Traces of Gravel	[Strat. Plot]	1	SS	10											
			2	SS	32											
590			3	SS	22											2 30 39 29
			4	SS	18											
			5	TW	PH										138	
			6	TW	PH										135	
580			7	TW	PH										135	
			8	TW	PH										135	
			9	TW	PH										136	
70			10	TW	PH										134	3 27 44 26
			11	TW	PH										139	
560			12	TW	PH										133	2 28 44 26
			13	TW	PH										131	
550			14	TW	PH										130	
			15	TW	PH										128	
540																
530																
	16	SS	1													
520																
510																
	17	SS	7											6 13 51 30		
500																
	18	SS	16													
490																
480																
484.8	End of Borehole															
485.2	Probable Bedrock															

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-11040 LOCATION Co-ords. 98,454 N; 66,767 E. ORIGINATED BY PP  
 W.P. 257-66-18 BORING DATE May 14, 1970 COMPILED BY G.C.  
 DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS/FOOT	BLOWS / FOOT					PLASTIC LIMIT — $w_p$			
						25	50	75	100	125	WATER CONTENT — $w$				
						SHEAR STRENGTH P.S.F.					$w_p$ — $w$ — $w_L$				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					WATER CONTENT %				
600.0	Ground Level														
0.0	Probably Clayey Silt														
585.0															
15.0	End of Cone Test														

MEMORANDUM

To: Mr. A. Stermac,  
Principal Foundation Eng.,  
Downsview.

FROM: Bridge Planning,  
Southwestern Region.

ATTENTION:

DATE: April 30, 1970.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 257-66-18, Bridge Site 6-265,  
Bruce Avenue Extension Bridge,  
over Grand Marais Drain,  
E.C. Row Expressway,  
District 1, Chatham.

-----

Would you kindly arrange to have a foundation investigation conducted at the above location.

I have enclosed two copies of the bridge site plan E-4879-1 with the probable footing locations marked in red.

*S. Jants*

SJ/lj  
Encl.

FOR: S. JANTS,  
Bridge Planning Technician,  
A.P. WATT,  
Reg. Bridge Planning Eng.,  
Southwestern Region.

c.c. J. Switzer.  
S. McCombie.  
A. Crowley.

JULY 8, 1970.

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 70-11040 LOCATION Co-ords. 98,464 N; 66,802 E. ORIGINATED BY pp  
W.P. 257-66-18 BORING DATE May 14 - 15, 1970 COMPILED BY GC  
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY [Signature]

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY γ	REMARKS				
			NUMBER	TYPE	BLOWS / FOOT		25	50	75	100	125	w <sub>p</sub>	w	w <sub>L</sub>			P.C.F.	GR.	SA.	SI.
600.0	Ground Level																			
0.0	Clayey Silt with Sand and Traces of Gravel	[Hatched]	1	TW	PH													138		
			2	TW	PH	590													142	
			3	TW	PH														137	6 28 42 24
			4	TW	PH	580													135	
			5	TW	PH														134	
			6	TW	PH	570													135	
			7	TW	PH	560													133	2 28 44 26
			8	TW	PH	550													127.5	
			9	TW	PH	540													128	
537.0	End of Borehole																			
63.0																				

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

~~Mr. A.P. Watt.~~

Reg. Bridge Planning Engineer,  
S.W. Region, London

Bridge Office,  
Downsview

April 5, 1971

Bruce Avenue Extension Bridge  
over Grand Marais Drain  
W.P. 257-66-18, Site No. 6-265  
City of Windsor, District No. 1

70-11-040

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6913-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$125,000, which includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

C.S. Grebski,  
Bridge Design Engineer

CSG:rd

Attach.

c.c. B. Davis  
A. Stermac (2)  
J. Anderson  
A. Crowley

K. [unclear]

MEMORANDUM

To: Mr. A. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Bldg.

FROM: C. S. Grebski,  
Bridge Office.

ATTENTION:

DATE: May 10, 1971.

OUR FILE REF.

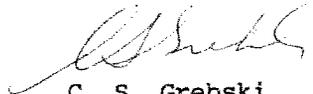
IN REPLY TO

SUBJECT: Bruce Avenue Extension Bridge,  
Over Grand Marais Drain,  
W.P. 257-66-18, Site #6-265  
E.C. Row Expressway, District #1.

70-11-040

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

  
C. S. Grebski,  
Bridge Design Engineer.

CSG/mh  
ENCL\*  
cc: Foundation Office.

No comments

AK

(4/5/71)  
Kege.