

GEOCRES No. 3165-185DIST. 9 REGION W.P. No. 146-74-03BCONT. No. W. O. No. 92-11015STR. SITE No. HWY. No. 416LOCATION Diaphragm Walls Adjacent
to Lynwood SubdivisionNo of PAGES - Nepean

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:



Ministry
of
Transportation

FILE No. _____ DATE _____

REMARKS _____

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Bill White (819) 671-2911 (Home)

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Ministry of Transportation
Ministère des Transports

Engineering Materials Office
Foundation Design Section
Room 315, Central Bldg.
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

Tel: (416) 235-3731

November 3, 1992

Golder Associates Ltd.
2180 Meadowvale Boulevard
Mississauga, Ontario
L5N 5S3

Attn: Mr. F.J. Heffernan, P. Eng.

Re: Additional Foundation Investigation to
Determine Limits of Diaphragm Walls
Highway 416 Cut Adjacent to Lynwood
Village Subdivision, W.P. 146-74-03B
Nepean, Ontario

Dear Mr. Heffernan,

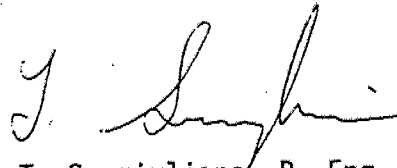
As agreed between the Foundation Design Section and Golder Associates and further to your letter dated October 2, 1992, four (4) additional boreholes were advanced in an attempt to establish the limits of the east diaphragm wall. The four (4) boreholes were advanced at the locations specified in your letter using a track mounted drilling unit employing conventional hollow stem augering techniques. Both split spoon and thin wall samples were retrieved to determine the thickness of the surficial cohesive weak silty clay to clayey silt material and in situ vane tests were conducted to determine the undrained shear strength of the cohesive soil. All boreholes were carried out to practical auger refusal, from which the bedrock surface was inferred. Groundwater levels were measured within the open boreholes.

In view of the urgency in defining the limit and arrangement of the east wall, attached please find the four (4) borehole logs and a cross section produced incorporating a number of boreholes along the proposed relocated diaphragm wall. Revised borehole logs and any further pertinent and relevant data will be provided once the laboratory analyses that includes Natural Moisture Content determination, Atterberg Limit testing, Grain-Size Distribution analyses and Unit Weight determination is completed.

.../2

The results of the recent investigation reveals that the thickness of the surficial silty clay to clayey silt ranges from 9.1 m to 7.6 m. However, beyond borehole 92-W33, the thickness of the cohesive stratum decreases to a thickness of 3 metres (see BH 9-2, Section A-A). The stratum has a surficial crust of very stiff consistency approximately 3 to 3.5 metres in thickness underlain by cohesive material of firm to stiff consistency. It was evident that the samples of the underlying weaker material contained large natural moisture contents. In situ sensitivity values ranged from 5 to 10 indicating a sensitive to extra sensitive material. The cohesive stratum is underlain by a cohesionless heterogeneous mixture of silt, sand and gravel. This deposit of glacial till origin extends to the bedrock surface and has a thickness of 1.1 m to 2.7 m.

We trust the information contained herein is sufficient in establishing the limits and arrangement of the east diaphragm wall. A meeting can be convened to finalize the east wall limits and arrangement following a review of this information by your office.



T. Sangiuliano, P. Eng.
Foundation Engineer

for

M. Devata, P. Eng.
Chief Foundation Engineer

TS/MD/jb

cc. B. Ruck (P & D)
E.C. Lane (Structural Section)
K.G. Bassi (Structural Office)
R. Temple (Fenco)
M.H. Romanowski (Fenco-Ottawa)

RECORD OF BOREHOLE No 92-W31 1 of 1 METRIC

W.P. 146-74-00-03B LOCATION Co-ords: N 5 021 360.9 E 358 907.5 ORIGINATED BY TS
 DIST 9 HWY 416 BOREHOLE TYPE HS Auger (Station 28+145, O/S 30 m Right) COMPILED BY TS
 DATUM Geodetic DATE 92 10 28-29 CHECKED BY MD

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w _p	w	w _L		
85.2	Ground Surface															
0.0	Silty Clay to Clayey Silt occasional Sand seams Brown, Very Stiff Grey, Firm to Stiff traces of Sand and Gravel		1	SS	11											
			2	SS	8											
			3	SS	2											
			4	SS	2											
			5	TW	PM											
			6	SS	2											
76.7																
8.5	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Very Loose to Loose		7	SS	3											
74.0			8	SS	9											
11.2	End of Borehole Auger Refusal(Probable Bedrock) • 92 10 30															

RECORD OF BOREHOLE No 92-W32 1 of 1 METRIC

W.P. 146-74-00-038 LOCATION Co-ords: N 5 021 383.6; E 358 896.9 ORIGINATED BY TS
 DIST 9 HWY 416 BOREHOLE TYPE HS Auger (Station 28+170, O/S 30 m Right) COMPILED BY TS
 DATUM Geodetic DATE 92 10 29 CHECKED BY MD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
85.1	Ground Surface																
0.0	Silty Clay to Clayey Silt occasional Sand Seams		1	SS	12		84										
	Brown, Very Stiff Grey, Stiff		2	SS	4		82										
			3	SS	1		80										
			4	TW	PM		78										
77.2	trace Sand and Gravel		5	SS	3		76										
7.9	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till)		6	SS	26												
74.8	Grey, Compact																
10.3	End of Borehole Auger Refusal (Probable Bedrock) • 92 10 30																

RECORD OF BOREHOLE No 92-W33 1 of 1 METRIC

W.P. 146-74-00-038 LOCATION Co-ords: N 5 021 401.8; E 358 888.4 ORIGINATED BY TS
 DIST 9 HWY 416 BOREHOLE TYPE HS Auger (Station 28+190, 30 m Right) COMPILED BY TS
 DATUM Geodetic DATE 92 10 29 CHECKED BY MD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
83.9	Ground Surface																
0.0	Silty Clay to Clayey Silt occasional Sand seams		1	SS	11		83										
	Brown		2	SS	2		81										
	Grey		3	SS	1		79										
	Very Stiff		4	SS	1		77										
76.3																	
7.6	Heterogeneous Mixture of Silt, Sand and Gravel		5	SS	23												
75.2	(Glacial Till) Grey, Compact																
8.7	End of Borehole Auger Refusal (Probable Bedrock)																
	• 92 10 30																

RECORD OF BOREHOLE No 92-W34 1 of 1 METRIC

W.P. 146-74-00-03B LOCATION Co-ords: N 5 021 403.4; E 358 915.2 (Station 28+180, O/S 55 m Right) ORIGINATED BY TS
 DIST 9 HWY 416 BOREHOLE TYPE HS Auger COMPILED BY TS
 DATUM Geodetic DATE 92 10 29 CHECKED BY MD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
84.3	Ground Surface													
0.0	Silty Clay to Clayey Silt occasional Sand seams Brown, Very Stiff Grey, Firm to Stiff		1	SS	14									
			2	SS	3									
			3	SS	1									
			4	TW	PM									
			5	SS	1									
75.2														
9.1	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Compact		6	SS	12									
74.0														
10.3	End of Borehole Auger Refusal (Probable Bedrock) * 92 10 30													

+3, x5: Numbers refer to
Sensitivity


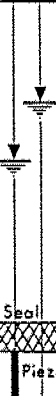





20
15-5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 9-2

METRIC

W P 127-87-02 LOCATION Co-ords: N 5 021 465.8; E 358 861.4 ORIGINATED BY AL
DIST 9 HWY 416 BOREHOLE TYPE H S Auger, BW Casing, BXL Rock Core & Cone Test COMPILED BY AL
DATUM Geodetic DATE 89 08 02 CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								○ UNCONFINED • QUICK TRIAXIAL	+ FIELD VANE x LAB VANE	W _p	W	W _L		
80.0	Ground Surface						20 40 60 80 100		20 40 60					
0.0	Silty Clay to Clayey Silt Some Sand, Occ. Sand Seams		1	TW	PH		79					18.8	0 18 45 37	
	Brown Grey		2	TW	PH		78							
	Stiff													
77.0							77							
3.0	Het. Mixture of Silt, Sand & Gravel		3	TW	PH									
76.0	(Glacial Till)													
4.0	Bedrock		4	BXL RC	REC 97%		76						RQD = 67%	
	Sandstone with Interbedded Sandy Dolostone						75							RQD = 80%
	Sound, Unweathered		5	BXL RC	REC 100%		74							
72.8			6	BXL RC	REC 100%		73						RQD = 100%	
7.2	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

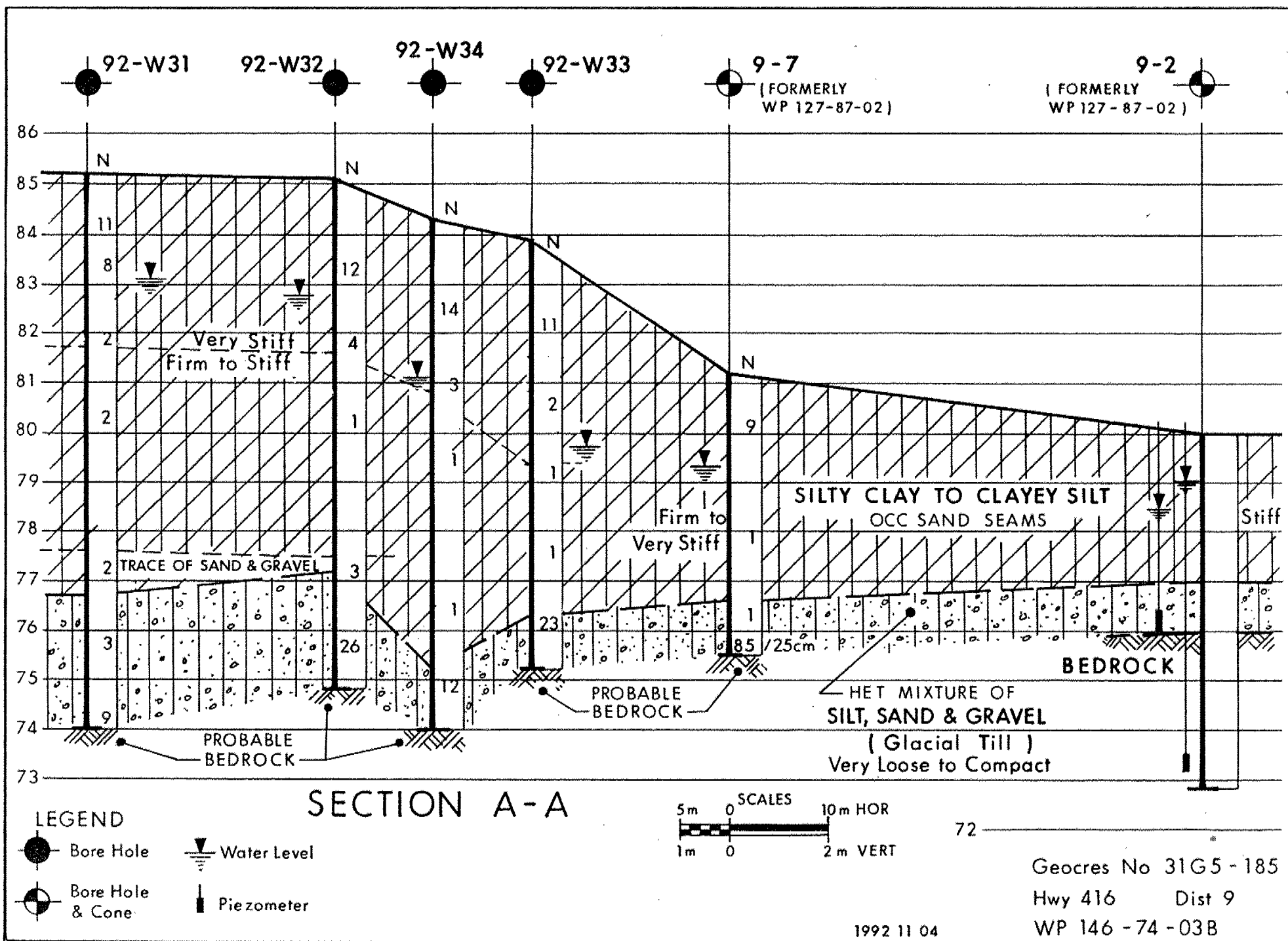
RECORD OF BOREHOLE No 9-7

METRIC

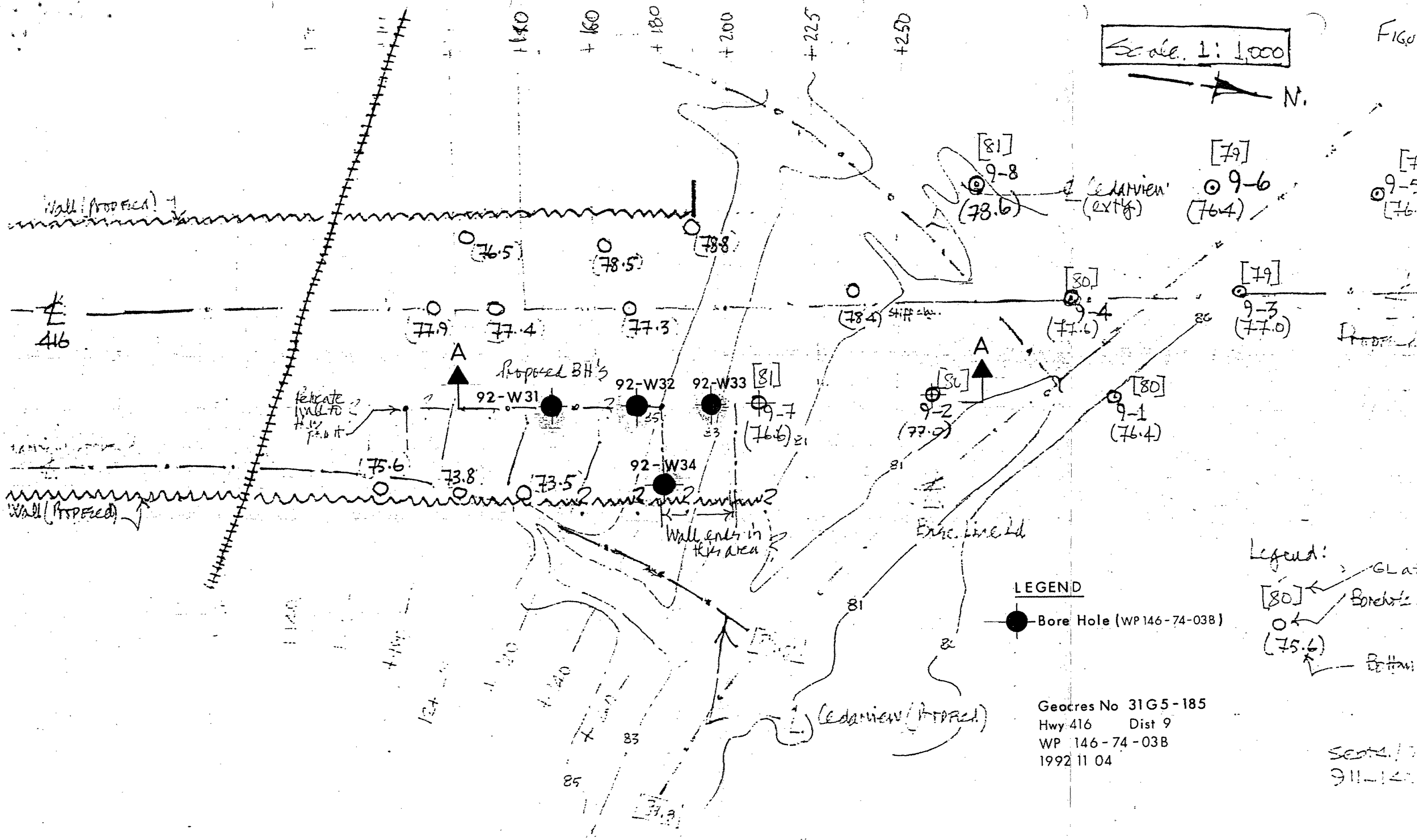
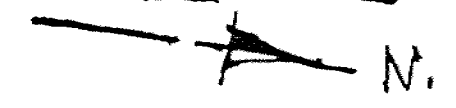
W P 127-87-02 LOCATION Co-ords: N 5 021 423.0; E 358 881.0 ORIGINATED BY TS
 DIST 9 HWY 416 BOREHOLE TYPE H S Auger & Cone Test COMPILED BY TS
 DATUM Geodetic DATE 89 08 03 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60	80	100	W _p	W		
81.2	Ground Surface															
0.0	Silty Clay to Clayey Silt Brown Grey Some Sand, Occ. Sand Seams Firm to V. Stiff		1	SS	9											
			2	TW	PH											
			3	TW	PH											
			4	SS	1											
76.6																
4.6	Het. Mixture of Silt, Sand & Gravel (Glacial Till)		5	SS	1											
75.5			6	SS	85/25cm											
5.7	End of Borehole Refusal to Auger (Probable Bedrock)															

OFFICE REPORT ON SOIL EXPLORATION



Scale 1:1,000



LEGEND

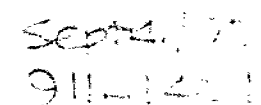
● Bore Hole (WP 146-74-038)

Legend:
[80] ← GL at
○ ← Borehole
(75.6) ← Bottom

Geocres No 31G5-185
Hwy 416 Dist 9
WP 146-74-038
1992 11 04

Sent. 11
911-12

Scale. 1: 1,000



G.I.-30 SEPT. 1976

GEOCRES No. _____

DIST. 16 REGION _____

W.P. No. _____

CONT. No. _____

W. O. No. 92-11016

STR. SITE No. 47-72

HWY. No. Municipal

LOCATION Black River Bridge

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: _____

Golder Associates Ltd.

2180 Meadowvale Boulevard
Mississauga, Ontario, Canada L5N 5S3
Telephone (416) 567-4444
Fax (416) 567-6561



October 2, 1992

911-1401

Ministry of Transportation Ontario
1201 Wilson Avenue
Central Building
Room 315
Foundation Design Section
DOWNSVIEW, Ontario
M3M 1J8



ATTENTION: Mr. M.S. Devata, P. Eng.

RE: **LIMITS OF DIAPHRAGM WALLS**
HIGHWAY 416 CUT ADJACENT TO LYNWOOD VILLAGE SUBDIVISION
NEPEAN, ONTARIO

WP 146-74-00-03B

Dear Sirs:

We have reviewed with you the detailed sections forwarded by Fenco on August 31, 1992. The results of the review are summarized on the tables for the West Wall and East Wall area.

The table for the West Wall area indicates that the limits for the diaphragm wall are from Highway 416 Station 27 + 875 to Station 28 + 190. A wall is required where the height of the slope is greater than 7 metres and relatively soft clay exists at the bottom of the slope. This is in keeping with our engineering study dated August, 1990.

The table for the East Wall indicates that the south limit of the wall should be at Cedarview Road Station 11 + 940. Our review of the Fenco detailed sections indicate that the diaphragm wall may have to be lengthened beyond 12 + 200 depending on the subsurface conditions in that area, which are undetermined at this time.

During your visit at our offices, we reviewed the soil boring logs from the proposed Baseline Road overpass. Subsequently, we have reviewed the boring plan from you and have plotted the information on the attached Figure 1, together with the information from our boreholes put down previously.

Boreholes BH 89-1 and BH 89-2 are north of Baseline Road and are not shown on Figure 1. Boreholes BH 9-1 to BH 9-6 are on either side of Baseline Road and show that the clay is of limited depth (2 to 4 metres) in this area.

Borehole BH 9-8 at about Station 28 + 270 along the line of the West Wall has limited clay thickness (2 metres) as well, which helps to confirm that no wall is needed in this area.

Borehole BH 9-7 at about Station 12 + 270 has a clay thickness of 4.6 metres indicating that the East Wall can be ended before this station.

The station where the East Wall can be ended requires further soils information. We would request that boreholes be put down at the following locations as shown on Figure 1:

BOREHOLE	STATION	OFFSET
92-W31	28 + 145	30 m Right
92-W32	28 + 170	30 m Right
92-W33	28 + 190	30 m Right
92-W34	28 + 180	55 m Right

When this borehole information is made available to us, we will review it and meet with you to determine the limit and wall arrangement at the north end along Cedarview Road.

We trust that this letter provides sufficient information for your present purposes. Should you require further information, please contact us.

Yours truly,

GOLDER ASSOCIATES LTD.



F.J. Heffernan, P. Eng.
Principal

FJH/clg

REVIEW OF FENCO (AUG. 31/92) SECTIONS – WEST WALL AREA

911-1401

Chainage	Original GL (El)	Cut Slope	Max. Cut H (m)		Soil Conditions (from nearest BH)	Comment
27+500	98.5	2.5/1	10.4		MTO-5 SAND	
+500	96.0	2.5/1	8.3		MTO-5	
+600	93.0	2.5/1	7.0		88-8 to 88-7 V. STIFF CLAY	Silt & Sand seams, Weathered Crust?
+650	<91.0	2.5/1	5.5		88-8 to 88-7	
+700	89.0	2.5/1	4.8		89-8 to 89-5 V. STIFF CLAY overlying FIRM CLAY	
+750	88.5	2.5/1	5.4		89-4 V. STIFF overlying STIFF CLAY	
+800	>88.0	2.5/1	6.0			
+850	<88.0	2.5/1	6.7			
(875)			H	Hc		
+900	>87.5		7.4	7.4	90-W11 Stiff overlying FIRM CLAY	WH* at El. 80+
+950	~87.0		8.0	8.0	90-W9	CLAY to El. 77.2
28+000	86.8		8.6	7.4	90-W9	CLAY to El. 77.2
+020	86.6		8.9	6.9	90-W5 Cut to El 78	CLAY to El. 79.7
+040	86.5	W	9.2	5.5	90-W4	CLAY to El. 81.0
+050	86.3		9.3	5.3	90-W4	CLAY to El. 81.0
+060	86.2		9.2	5.2	90-W4	CLAY to El. 81.0
+070	86.6	A	9.9	7.0	101 STIFF overlying FIRM	CLAY to El. 79.6
+080	~87.0		10.5	7.4	101	CLAY to El. 79.6
+090	87.2		10.7	8.6	106	CLAY to El. 78.6
+100	87.5	L	11.3	8.9	106	CLAY to El. 78.6
+110	~86.0		9.9	7.4	106	CLAY to El. 78.6
+120	86.2		10.4	8.5	90-W3	CLAY to El. 77.7
+130	87.5		11.8	9.8	90-W3	CLAY to El. 77.7
+140	~86.0	L	10.6	8.3	90-W3	CLAY <77.7 (77.4)
+150	85.8		10.5	7.3	90-W2	CLAY 78.5 (77.8)
+160	85.7		10.4	7.2	90-W2	CLAY to 78.5
+180	85.5		10.6	7.0	90-W1	CLAY to 78.8 (78.5)
(190)						
+200	84.5		10.2	6.0	90-W1 STIFF overlying FIRM	CLAY to 78.8 (78.5)
+225	83.8	2.5/1	~10.0	5.3	90-W1	CLAY to 78.8 (78.5)

REVIEW OF FENCO (AUG. 31/92) SECTIONS – EAST WALL AREA

911-1401

Chainage	Original GL (El)	Cut Slope	Max. Cut H (m)		Soil Conditions (from nearest BH)	Comment
			H	Hc		
11+900	87.6	>5/1	6.4	6.4	89-3 V. STIFF overlying Stiff Clay	CLAY to El. 79.8
+920	85.5	~6/1	6.7	6.7	89-3 "	CLAY to El. 79.8
(940)						
+940	87.5	W	7.0	7.0	89-3 V. STIFF overlying Stiff Clay	
+960	87.4		7.4	7.4	89-22	CLAY to < El. 77.5
+980	87.4		7.9	7.9	90-W30 Deep CLAY	CLAY to El. 74.1
12+000	~87.0		8.1	8.1	90-W27 "	CLAY to El. 72.9
+020	<87.0		8.6	8.6	90-W26 "	CLAY to El. 72.9
+040	86.5	A	8.6	8.6	90-W29 "	CLAY to El. 72.9
+050	86.4		8.9	8.9	90-W24 "	CLAY to El. 73.3
+080	86.2		9.3	9.3	90-W24 "	CLAY to El. 73.3
+100	~86.0	L	9.5	9.5	90-W23 "	CLAY to El. 74.2
+120	~87.5		10.0	10.0	90-W22 "	CLAY to El. 74.4
+140	85.8		9.0	9.0	109 "	CLAY to El. 74.5
+160	85.6	L	9.3	9.3	90-W21 "	CLAY to El. 75.6
+170					Wall re-located to west?	REFER to FIGURE 1
+180	85.5		10.3	10.3	90-W20	CLAY to El. 73.8
+200	85.5		10.0	10.0	90-W19	CLAY at ~ El. 73.5
+220	~85.0	?	10.2		Soil conditions NOT DEFINED	
+240	~85.0		10.2		Wall ends in this area?	
+260	~82+	Cut 9 m to 416	>8.4	7.0		REFER to FIGURE 1

REPLY
COPYSEND
TOA. Witell
Approach Section
Structural Office

DEPT

DATE

SUBJECT

FD NO 92-11016 Site 47-12 Dist 16 Blue River Bridge

As requested in your memo of January 5/93, we have reviewed the
 concerns on slope stability from Marko Eng. As discussed with Rade
 Mihaljevic on Jan 8/93, in our opinion we have no alternative
 but to accept Marko's recommendations. Based on the material
 presented, the recommendations appear to be reasonable. More
 specific comments would require us to analyze the slope cross sections.

If there are any questions, please call

Dave Duvich, P.Eng.

Sr. Foundation Engineer

REPLY

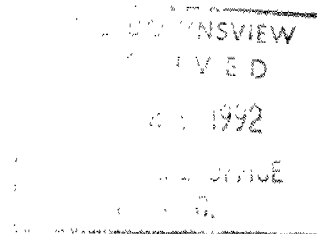
REPLY FROM

REPLY DATE



MERLEX ENGINEERING LTD.

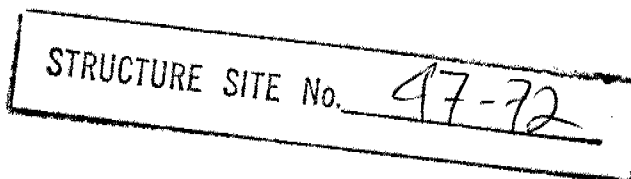
CONSULTING GEOTECHNICAL ENGINEERS



Reference No. 91/04/1041

December 16, 1992

H. Sutcliffe Ltd.
P.O. Box 1208
9 Wellington Street
New Liskeard, Ontario
POJ 1P0



Attention: Mr. I. ElAmin, P. Eng.

Re: Black River Bridge
MTO Site 47-72
Design Review Meeting
December 14, 1992

Dear Sir:

We have received, by fax transmission of December 15, 1992, your handwritten draft of the minutes of the above design review meeting. You have requested our comments on certain items in these minutes. They are as follows:

Item 12

Our report of June 26, 1992 (sections 7.3 and 7.4) states that the factor of safety of the existing forward slope is 1.3 and that no surcharge can be added without endangering the stability of the embankments. Lowering the proposed approaches by 0.5 m and eliminating the void tubes has the net effect of adding to the existing embankment about 1.5 m of normal fill. This would lower the factor of safety on the forward slope to an unacceptable value. The retention of the uniaxial geogrid membrane between the existing embankment and the new fill has only a minimal effect on the factor of safety.

Item 13

It is possible to design side berms in order to achieve stable side slopes, provided there is sufficient right of way. However, a relatively much longer forward berm would be required to secure the safety of the forward slope which would require the approaches to be moved back, resulting in a much larger bridge span.

Item 14

Forward berms (as above) were considered in our report of June 26, 1992 (section 6.1). In addition, controlled stage construction was mentioned in section 6.2. We are not aware of other viable alternatives that would merit consideration.

Item 16

There are no reliable methods (other than load tests) to accurately predict the horizontal capacity of a vertical pile. However, using the example in our report of June 26, 1992 (i.e. size 36 timber pile, 16 m long) we estimate that the horizontal capacity at ULS is about 32 kN and at SLS about 12 kN. If it is necessary to resist sustained horizontal load, e.g. due to ice, batter piles should be used.

Reference No. 91/04/1041
Date: December 16, 1992

-3-

We trust that the comments contained in this report are sufficient for your present requirements. However should you have any queries or if we could be of further assistance to you please do not hesitate to contact the undersigned.

Yours very truly,

MERLEX ENGINEERING LTD.

A handwritten signature in dark ink, appearing to read 'M. A. Merleau', with a stylized flourish at the end.

M. A. Merleau, P. Eng.

MAM/cl

memorandum



To: A. Witecki
Municipal Engineer
Approvals Section
Structural Office

From: Foundation Design Section
Room 315, Central Bldg.

Re: FDS WO 92 110016, Site 47-72
Black River Bridge
Township of Black River - Matheson
District 16, Cochrane

Date: 92 11 02

As requested in your memo of September 22/92 we have reviewed the design drawings and the revised soil report for this project.

Although the proposal is probably constructible in its present form, we have the following concerns:

- application and durability of void tubes
- cost of polystyrene backfill
- gauge of culvert proposed for void tubes should be reviewed
- geotextile is not required under the rock protection
- the need for geotextile base reinforcement has not been justified
- dewatering/stream diversion should be reviewed to ensure constructibility

If this were an MTO project, we would consider lightweight blast furnace slag in association with subexcavation, berming and a longer structure instead of void tubes. Our concern is the limited cover (0.5+m over the culverts) provides the potential for loss of culvert side support due to impact dislocation of the culvert backfill. This could lead to side wall collapse of the culverts under heavy live loading. We are also concerned with the potential loss of roadbed material through infiltration at culvert joints.

If there are any questions or if our participation is required in a meeting, please call. The Geotechnical Report and Design Plans for this project are returned under cover of this memo.

A handwritten signature in black ink, appearing to read "D. Dundas".

D. Dundas, P.Eng.
Sr. Foundation Engineer

for

M. Devata, P.Eng.
Chief Foundation Engineer

memorandum

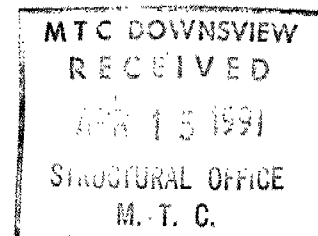


To: A.A. Witecki
Municipal Engineer
Approval Section
Structural Office

Date: 1991 04 11

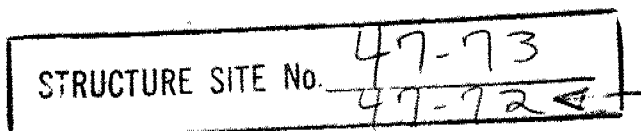
From: Foundation Design Section
Room 315, Central Bldg.

Re: Foundation Recommendations
Black River Structures
(1) Saley Bridge - M.T.O. Site No. 47-73
(2) Black Bridge - M.T.O. Site No. 47-72
Township of Black River, Matheson



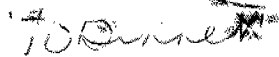
As requested in your memo dated 91 03 19, the foundation reports for the above-mentioned projects have been reviewed. The structure foundations and capacities were found to be satisfactory. However, the following supplementary information would be required by this office in order to provide additional comments:

1. The subsurface material at both sites consists of very soft silty clay that would appear extremely compressible. It is proposed to raise the profile grade at the approaches up to 1.8 m at the Saley Bridge site, and up to 2.6 m at the Black Bridge site. This fill may cause considerable settlement at the approaches. It is difficult to predict anticipated settlements of the soft material without pertinent laboratory data, e.g. Atterburg limits, consolidation characteristics.
2. More significantly, the fill could cause settlement of the footing elements at the abutments. By preloading the approaches for a period of time prior to pile driving, settlements could be accelerated and the movement of the pile caps minimized.
3. The placement of fill at both locations may jeopardize the embankment stabilities. Therefore stability analyses of the forward and side slopes would be in order at the structure sites.
4. The construction sequence for the structures has not been addressed. The drawings do not indicate whether a detour will be considered, how the pier pile caps will be constructed and whether a dewatering scheme will be required.
5. Prior to placement of the fill, it would be advisable to remove any organics or topsoil for the extent of the fill.



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When the information for the above-mentioned items becomes available we will be glad to provide additional comments.



B. Bennett, P. Eng.
Foundation Engineer

for

M. Devata, P. Eng.
Chief Foundation Engineer

BB/mmj