

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-236

DIST. 6 REGION

W.P. No. 660-93-01

CONT. No. 96-12

W. O. No.

STR. SITE No. 37-0983

HWY. No. 427

LOCATION Woodbine Racetrack

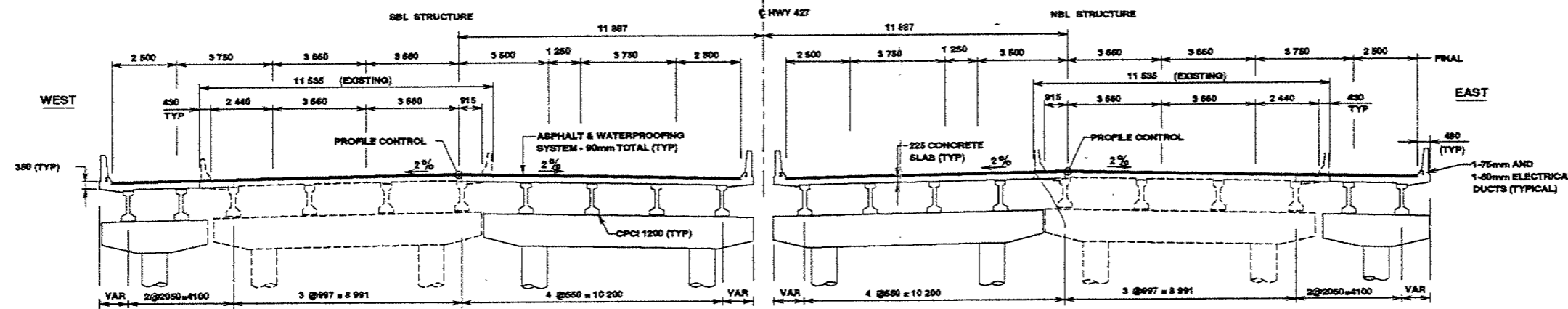
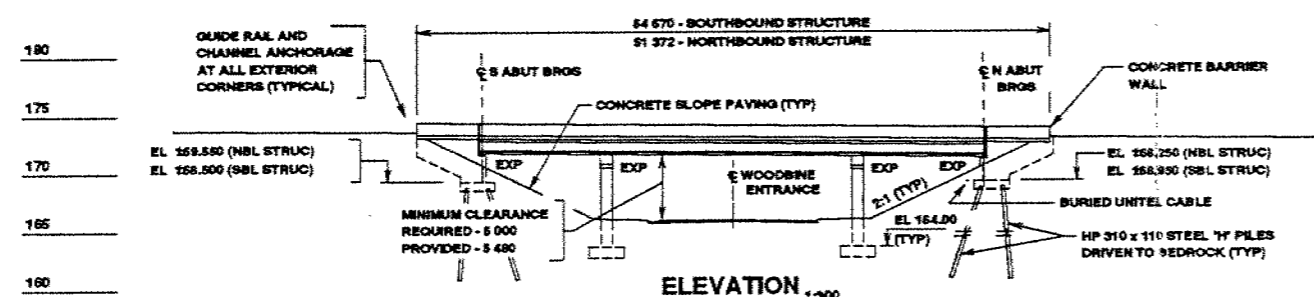
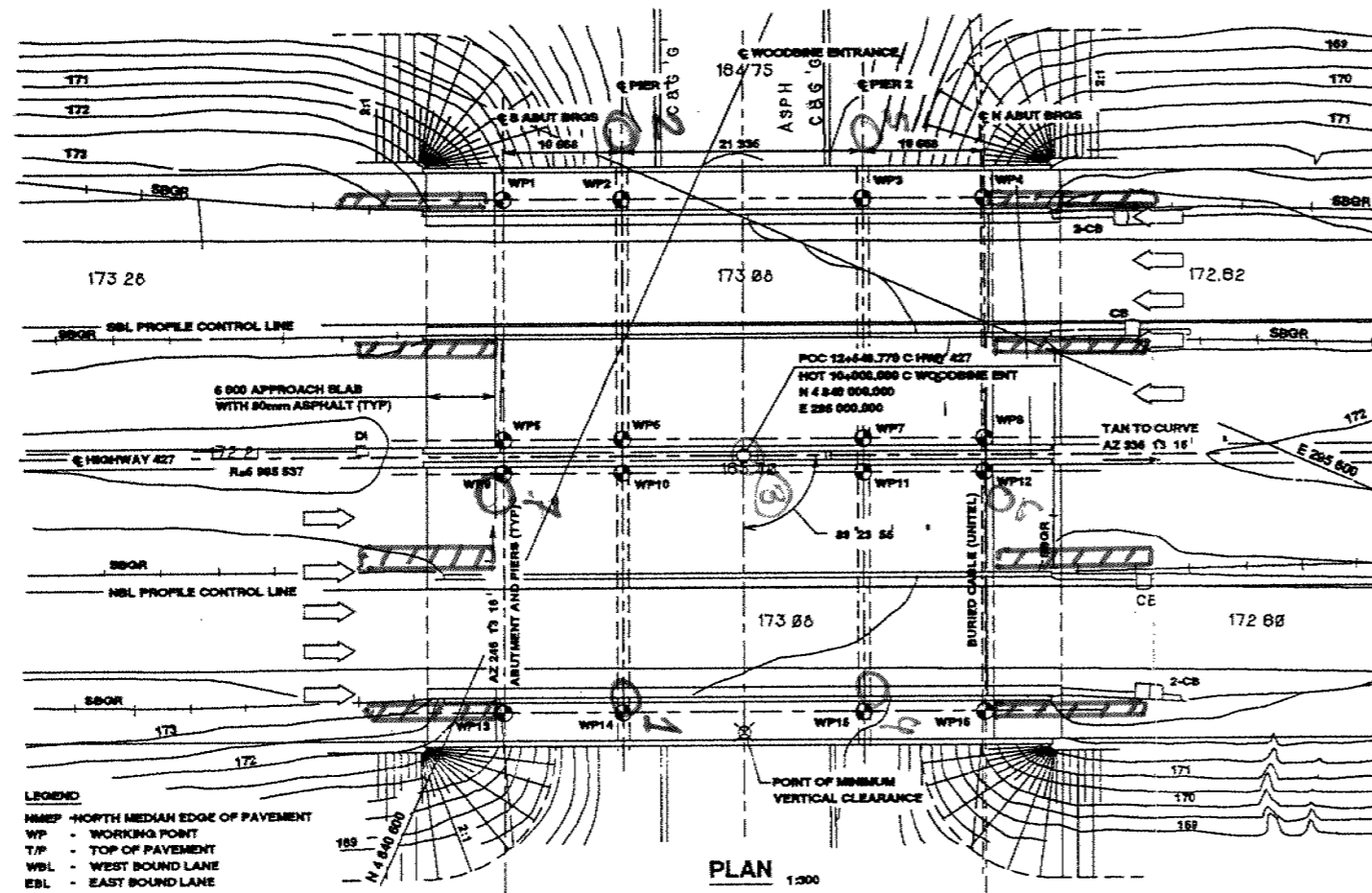
Entrance Overpass NB & SB

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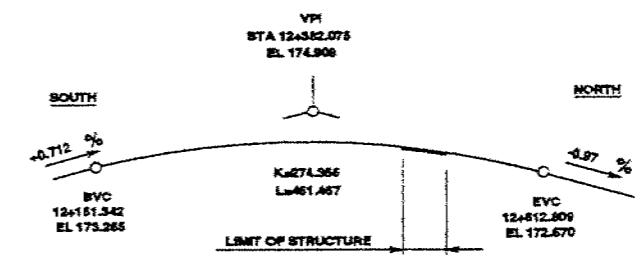
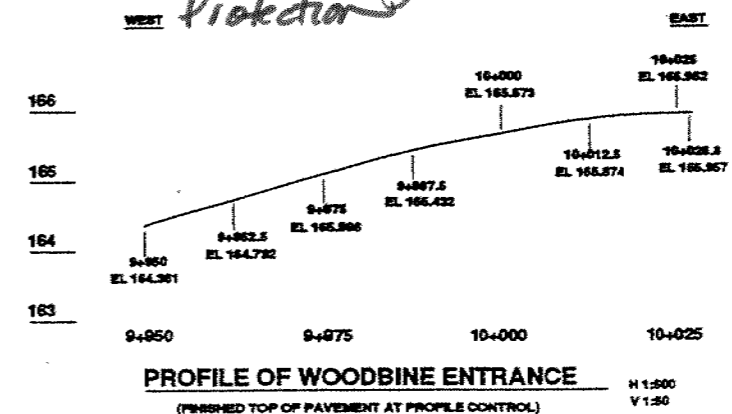
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:



METRIC
 DIMENSIONS ARE IN METRES
 AND/OR MILLIMETRES
 UNLESS OTHERWISE SHOWN

Location of Roadway Protection



DIST No 6
CONT No
WP No 660-93-01

WOODBINE ENTRANCE O'PASS
 (N.B. AND S.B. LANES)
HIGHWAY 427 WIDENING
GENERAL ARRANGEMENT

SHEET

GENERAL NOTES:

- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE EXISTING WORK AND ALL DETAILS ON SITE AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE REPAIR WORK.
- THE CONTRACTOR SHALL CHECK ALL RELEVANT DIMENSIONS AND ELEVATIONS OF THE EXISTING WORK PRIOR TO FABRICATION OF THE JOINT ASSEMBLIES. DIMENSIONS OF THE PROPOSED WORK SHALL BE ADJUSTED AS REQUIRED TO SUIT EXISTING CONDITIONS.
- UNLESS OTHERWISE SHOWN SAWCUTS SHALL BE 25mm DEEP OR TO THE FIRST LAYER OF REINFORCING STEEL, WHICHEVER IS LESS.
- FOR STAGING DETAILS AND MAINTENANCE OF TRAFFIC, SEE STAGING DRAWINGS.

CLASS OF CONCRETE

PRESTRESSED GIRDERS	40 MPa
REMAINDER	30 MPa

CLEAR COVER TO REINFORCING STEEL

ABUTMENT BEAMS AND BALLAST WALLS	FRONT FACE	80 25
	BACK FACE	70 25
DECK	TOP	70 25
	BOTTOM	40 10
FOOTINGS		70 25
REMAINDER UNLESS OTHERWISE NOTED		100 25

REINFORCING STEEL

REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX 'C' DENOTE COATED BARS.

CONSTRUCTION NOTES:

IF THE ACTUAL BEARING HEIGHTS ARE DIFFERENT FROM THE ASSUMED BEARING HEIGHTS GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE BEARING SEAT ELEVATIONS AND THE REINFORCING STEEL TO SUIT THE ACTUAL HEIGHTS.

LIST OF DRAWINGS:

- GENERAL ARRANGEMENT
- BORE HOLE DATA
- STAGING AND ROADWAY PROTECTION
- FOOTING AND PILE LAYOUT
- SOUTH-WEST AND NORTH-EAST ABUTMENT DETAILS
- SOUTH-EAST AND NORTH-WEST ABUTMENT DETAILS
- SOUTH-WEST AND NORTH-EAST WINGWALL DETAILS
- SOUTH-EAST AND NORTH-WEST WINGWALL DETAILS
- PIERS
- PRESTRESSED GIRDERS
- REMOVAL DETAILS
- DECK LAYOUT AND SLOPE ELEVATIONS
- DECK REINFORCEMENT
- 600mm APPROACH SLAB
- BARRIER WALL WITHOUT RAILING
- JOINT ANCHORAGE AND ARMOURING
- DETAILS OF CONCRETE SLOPE PAVING
- STANDARD DETAILS
- ELECTRICAL EMBEDDED WORK
- QUANTITIES - STRUCTURE I
- QUANTITIES - STRUCTURE II

NOTE:
 ALL DIMENSIONS MEASURED PERPENDICULAR TO C.O.F STRUCTURES

DRAWING NOT TO BE SCALED
 100 mm ON ORIGINAL DRAWING

DATE	BY	DESCRIPTION
DESIGN LLAM	CHK	CODE 08B0C-01
DRAWN RPL	CHK	SITE 37-083
		STRUCT
		SCHEME R
		DWG 1

Foundation Investigation Report
for
Highway 427 Overpass Widening at Woodbine Racetrack Entrance
W.P. 660-93-01, Site 37-0983
Central Region

GEOCRE # 30M12-236

CONT 96-12

The following report is a copy of the factual information from the Foundation Investigation and Design Report for WP 48-71-02, Contract 78-111. The foundation investigation report was prepared for the existing structures by MTO Foundations Unit and represents the subsurface conditions for the proposed widening of the existing overpass structures at Highway 427.

Imperial units of measure are used in the report and on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevations as a result of the construction of the existing structures.

This report contains the detailed subsurface conditions, the Record of Borehole sheets, and the location of the borings in plan.



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

FOUNDATION INVESTIGATION REPORT
For
Proposed Twin Overpass Structures
At the Crossing of Hwy. 427
And Woodbine Racetrack Entrance Road
Borough of Etobicoke, County of York
District No. 6 (Toronto)
W.O. 72-11023 -- W.P. 48-71-02

1. INTRODUCTION:

The Foundations Office was requested to carry out a subsurface investigation for the twin single span structures to be constructed at the crossing of the proposed Hwy. 427 and Woodbine Racetrack Entrance Road, in the Borough of Etobicoke, County of York. The request was contained in a memo from the Bridge Office (Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region) dated January 31, 1972. Subsequently, an investigation was carried out by this Office to determine the subsoil, bedrock and groundwater conditions at the site.

The results of the investigation are presented in this report, together with our recommendations for the design of the structure foundations as well as the stability considerations associated with the approach fills.

2. DESCRIPTION OF SITE AND GEOLOGY:

The site is located immediately to the east of the existing Indian Line road, approximately 1 mile south of Rexdale Blvd. in the Borough of Etobicoke. The area, which is within the Woodbine Racetrack compound, is grass covered. The terrain is flat to undulating in relief between elevations 540 and 550. The grade of the existing Woodbine Racetrack

entrance road is at the level of the surrounding ground.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsinian Glacial Age. In the vicinity of the area under investigation, the moraine is primarily composed of a cohesive glacial till whose thickness generally ranges from 60 to 70 feet. The overburden is underlain by grey shale bedrock of the Meaford-Dundas formation, Ordovician Period. Available geological information indicates that the surface of the bedrock is at about elevation 470 ft.

3. FIELD AND LABORATORY WORK:

Five boreholes, each of which was accompanied by a dynamic cone penetration test, was put out by augering five boreholes. Each down during the field investigation. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (C.M.E.) adapted for soil sampling purposes.

At required depths samples were obtained by means of a 2 inch O.D. split spoon sampler. The method of driving the split spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven at two of the boring locations by obtaining BX size rock core samples.

During sampling and drilling operations, detailed logs of the borings were made. These logs contain a record of the drilling and sampling techniques used, together with the soil types and bedrock encountered. The location and elevation of all the boreholes are shown on Drawing No. W.O. 72-11023A, together with estimated stratigraphical sections across the site. Surveying was carried out by the personnel from the Central Region Engineering Survey Section. The elevations given in this report are referred to a Geodetic datum.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the following physical properties of the overburden.

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

The results of these tests are plotted on the Record of Borelog sheets as well as on Figure #1, all of which are located in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant structure across the site is a cohesive glacial till, the thickness of which varies from 60.5 to 64 feet. This cohesive deposit is underlain by shale bedrock.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11023A, have been inferred from this data. From ground surface downward, the soil types and bedrock encountered are as follows.

4.2) Glacial Till (Heterogeneous Mixture of Clayey Silt, Sand and Gravel):

Directly beneath a nominal topsoil cover (1 foot) across the site is a glacial till stratum which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The thickness of this glacial till varies from 60.5 to 64 feet.

In Boreholes 3 and 4 the upper 5 ft. is made up of fill material whose composition is similar to that of the

glacial till; a trace of organic matter is, however, present throughout. In Boreholes 2, 3, 4 and 5 a layer of silty sand varying in thickness from 3 feet (B.H. 4) to 10 feet (B.H. 2) was intersected at elevations between 505 and 508. Grain-size distribution curves for samples of the cohesive stratum, obtained with a 2" O.D. split-spoon sampler, are shown on Figure No. 1 in Appendix I.

Atterberg limit tests were performed on samples of the glacial till. The results are tabulated below:

		<u>Range</u>	<u>Average</u>
(W _L)	Liquid Limit (%)	17 - 39	28
(W _p)	Plastic Limit (%)	12 - 22	17
(W)	Natural Moisture Content (%)	6.5 - 28	17

Based on these values it is estimated that the cohesive deposit has a matrix, which is inorganic and of low to intermediate plasticity.

The Standard Penetration Tests, carried out within this glacial till stratum, are plotted on Record of Borehole sheets. This testing gave "N" value range of 10 to greater than 100 blows per foot. Based on this testing it is estimated that the consistency of this cohesive deposit varies from stiff to hard. The penetration testing carried out in the granular layers within the glacial till indicate that the relative density of this layer ranges from compact to very dense.

4.3) Shale Bedrock:

The cohesive glacial till is directly underlain by bedrock which was proven in two of the boreholes by obtaining BX size rock core samples. In the remainder of the boreholes the bedrock surface was inferred to exist at the level where the auger met practical refusal. The surface of the bedrock across the site varies from elevations 479 to 482.5 which corresponds to depths of from 60.5 to 64 feet below existing

ground surface.

The bedrock is composed of a grey shale. The upper 8.5 to 10.5 feet is in a weathered condition. Below this zone the bedrock is in a reasonably sound condition as evidenced by the high percentage of core recovery.

5. GROUNDWATER CONDITIONS:

The groundwater level conditions across the site, during the period of the field investigation (February 1972), were observed by taking readings in the open boreholes. The results of the readings are shown on the borelog sheets, as well as on Drawing No. 72-11023A.

The observations indicate that the groundwater level was located between elevations 539 and 542; i.e., 2 to 4 ft. below existing ground surface.

APPENDIX



DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 1			FOUNDATIONS OFFICE			
WP 660-93-01			Co-ords. N 4840614.8, E 295645.3			IMPERIAL			
JOB 72-11023			LOCATION Co-ords. 15,881,282 N; 969,965 E.			ORIGINATED BY VK			
W.P. 48-71-02			BORING DATE Feb. 21, 1972			COMPILED BY VK			
DATUM Geodetic			BOREHOLE TYPE Auger & sample with C.M.E. machine			CHECKED BY			
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	WATER CONTENT %		
543.5	Ground Level								
0.0	Het. mix. of clayey silt, sand & gravel. (Glacial Till)		1	SS	12	540			541.0
			2	SS	14				2 27 57 14
533.5	Brown		3	SS	18				
10.0	Grey		4	SS	27	530			
	Stiff to Hard		5	SS	25				
			6	SS	27				
			7	SS	27				
			8	SS	33	520			
			9	SS	17				
			10	SS	23	510			
			11	SS	30				
			12	SS	30	500			
			13	SS	41				
			14	SS	41	490			
			15	SS	92				
480.5			16	SS	100	480			
63.0	Weathered Shale		17	BXL	100				
			18	RXL	50X				
470.0			19	BXL	100	470			
73.5	Sound Shale Bedrock								
465.5	Grey								
78.0	End of Borehole					460			

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 2			FOUNDATIONS OFFICE													
WP 660-93-01			Co-ords. N 4840 592.2; E 295 596.3 Co-ords. 15,881,208 N; 969,804 E.			IMPERIAL													
JOB 72-1023			LOCATION			ORIGINATED BY VK													
W.P. 48-71-02			BORING DATE February 27, 1972			COMPILED BY VK													
DATUM Geodetic			BOREHOLE TYPE Auger & sample with C.M.E.			CHECKED BY <i>[Signature]</i>													
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		BULK DENSITY	REMARKS										
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	20	40			60	80	100	PLASTIC LIMIT — W _P	WATER CONTENT — W	W _P — W _L	WATER CONTENT %			
513.0	Ground Level																		
0.0	Het. mix. of clayey silt, sand & gravel. (Glacial Till)		1	SS	13														
			2	SS	13														
532.0	Brown		3	SS	20														
11.0	Grey		4	SS	22														
	Stiff to Hard		5	SS	17														
			6	SS	23														
			7	SS	22														
			8	SS	21														
			9	SS	32														
			10	SS	26														
505.0	Silty sand with traces of clay.		11	SS	87														
38.0																			
495.0	Very Dense		12	SS	22														
48.0																			
482.7	Weathered		13	SS	100														
60.3	Shale Bedrock																		
472.8																			
70.2	End of Borehole																		

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 3			FOUNDATIONS OFFICE			
WP 660-93-01			Co-ords. N 4840 612.3 ; E 295 616.4			IMPERIAL			
JOB 72-11023			LOCATION Co-ords. 15,881,271 N; 969,870 E.			ORIGINATED BY VK			
W.P. 48-71-02			BORING DATE March 2, 1972			COMPILED BY VK			
DATUM Gaudetie			BOREHOLE TYPE Auger and sample with C.M.E. machine			CHECKED BY C.H.			
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	PLASTIC LIMIT — W _P	WATER CONTENT — W		
511.0	Ground Level								
0.0	Silty clay with some sand & gravel, traces of organics. Stiff		1	SS	15				3 38 48 11
532.0			2	SS	25				
5.0	Mixture of clayey		3	SS	20				
533.0	Brown Grey		4	SS	13				
11.0	Silt, sand & gravel (Glacial Till)		5	SS	14				
	with occ. layers of silty clay.		6	SS	18				
			7	SS	10				
	Stiff to Hard		8	SS	19				
			9	SS	13				
508.5			10	SS	32				0 30 69 1
35.5	Silty sand with traces of clay.		11	SS	62				
501.0	Very Dense								
43.0			12	SS	18				
			13	SS	112				
1180.0									
44.0	Weathered Shale								
473.8									
70.2	End of Borehole								

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 4				FOUNDATIONS OFFICE				
WP 660-93-01				Co-ords. N 4840 632.4; E 295 637.7				IMPERIAL				
JOB 72-11-23				LOCATION Co-ords. 15,881,360 N; 969,960 E.				ORIGINATED BY VK				
W.P. 48-71-02				BORING DATE Feb. 24, 1972				COMPILED BY VE				
DATUM Geodetic				BOREHOLE TYPE Auger and sample with C.M.E. Machine				CHECKED BY CJK				
SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		PLASTIC LIMIT — W _P		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PROF.	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	20	40	60	100		
543.8	Ground Level											
0.0	Silty clay with some sand & gravel, traces of organics. Stiff		1	SS	9	540						
538.8			2	SS	12							
532.8	Red mix of clayey		3	SS	18							
11.0	Brown Grey		4	SS	14							
	silt, sand & gravel		5	SS	23							
	(Glacial Till)		6	SS	23							
	Stiff to Hard		7	SS	25							
			8	SS	24							
			9	SS	16							
507.8			10	SS	29							
36.0	Silty sand & thin layers of clay. Compact											
39.0			11	SS	90							
			12	SS	16							
			13	SS	59							
479.8												
64.0	Weathered Shale											
473.3			14	SS	100							
70.5	End of Borehole											

DESIGN SERVICES BRANCH

WP 660-93-01

JOB 72-11023

W.P. 48-71-02

DATUM Geodetic

RECORD OF BOREHOLE NO 5

Co-ords. N 4840 609.9, E 295 587.4

Co-ords. 15,881,266 N; 969,775 E.

LOCATION

BORING DATE Feb. 29, 1972

BOREHOLE TYPE Auger and sample with C.M.E. machine

FOUNDATIONS OFFICE

IMPERIAL

ORIGINATED BY VK

COMPILED BY VK

CHECKED BY VK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT % 10 20 30			
543.2	Ground Level											
0.0	Het. mix. of clayey silty sand and gravel (Glacial Till)		1	SS	10	540						539.2
			2	SS	15							8 34 11 17
			3	SS	21							
531.7	Brown Grey		4	SS	28	530						
11.5			5	SS	20							
	Stiff to Hard		6	SS	24							
			7	SS	30	520						
			8	SS	29							
			9	SS	23							
509.2						510						
34.0	Silty sand & traces of clay & grav. Comp.		10	SS	17							1 82 (17)
506.2												
37.0			11	SS	100	500						
498.2												
45.0	Silty sand & traces of clay and gravel.		12	SS	10	490						1 86 (13)
485.2	Compact											
54.0			13	SS	100	480						
479.2												
64.0	Weathered Shale Bedrock					470						
470.7			15	PTL	27							
72.5	Sound Shale Bedrock		16	REL	100							
467.7												
75.5	End of Borehole					460						

 20
15 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

WP 660-93-01

RECORD OF BOREHOLE NO 6

 Co-ords. N 4840 634.9, E 295 612.7
 Co-ords. 881,348 N; 969,858 E.

FOUNDATIONS OFFICE

IMPERIAL

JOB 72-11023

LOCATION

ORIGINATED BY VK

W.P. 10-62-02 47-71-02

BORING DATE Nov. 13, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger & sample with QZ Machine

 CHECKED BY *[Signature]*

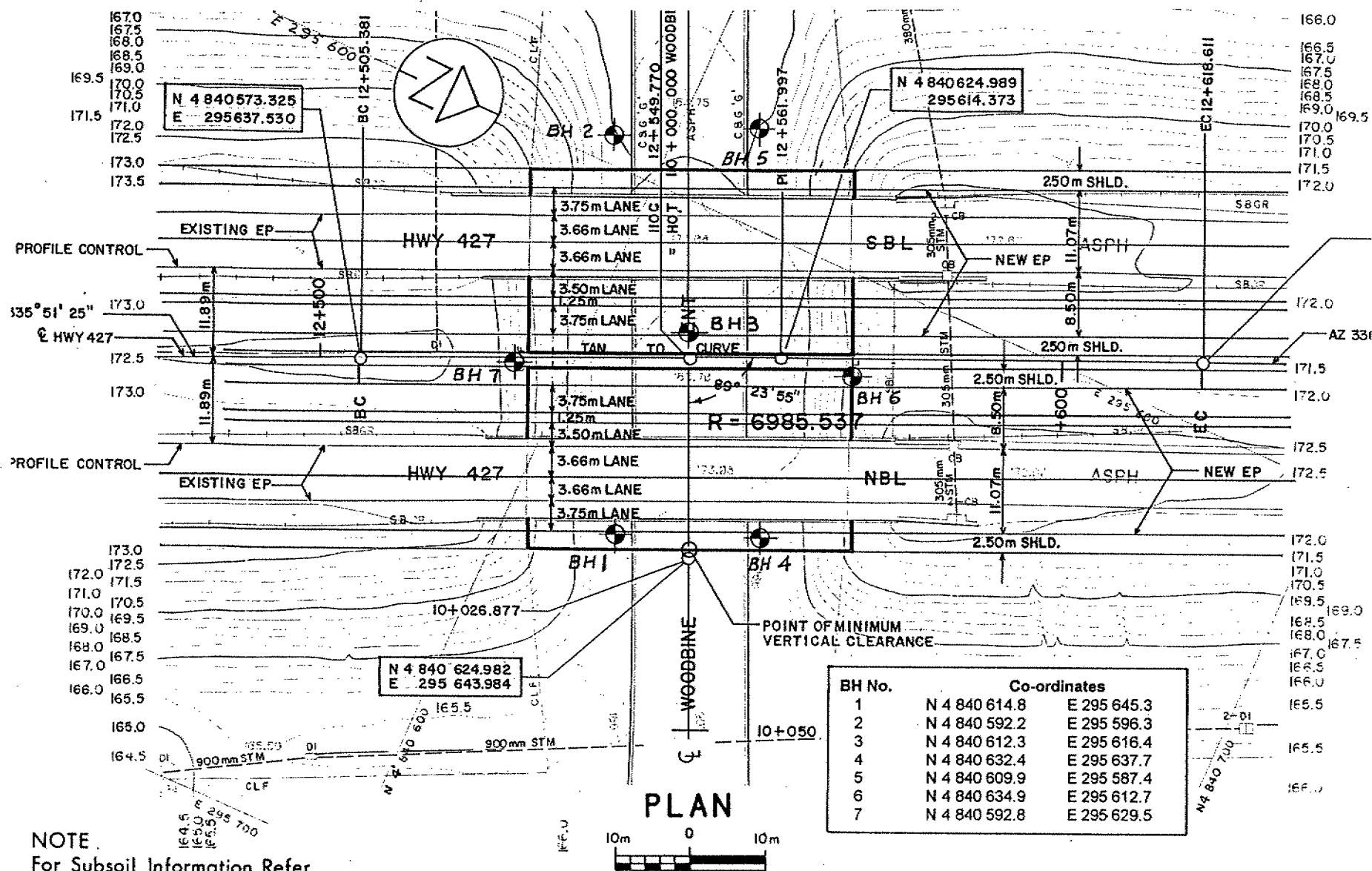
SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE					
543.8	Ground Level								
0.0									
	Brown Grey		1	SS	31				
			2	SS	15				
			3	SS	24				
	Heterogeneous mixture of clayey silt, sand and gravel		4	SS	24				
			5	SS	20				
			6	SS	24				
	(Glacial Till)		7	SS	19				
			8	SS	21				
	Stiff to Hard		9	SS	13				
			10	TV	PE				
			11	SS	149				
494.8									
49.0	Silty sand and few gravel.		12	SS	45				
486.8									
57.0	Dense								
480.8			13	SS	57				
43.0	Bedrock								
477.8	Weathered Shale								
66.0	End of Borehole								

 20
 15 \diamond 5 % STRAIN AT FAILURE
 10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 7			FOUNDATIONS OFFICE			
WP 660-93-01			Co-ords N 4840 592.8, E 295 629.5			IMPERIAL			
JOB 72-11023			LOCATION			ORIGINATED BY VK			
W.P. 10-69-09 48-71-02			BORING DATE Nov. 8, 1972			COMPILED BY VK			
DATUM Geodetic			BOREHOLE TYPE Auger & sample with CMC Machine			CHECKED BY VK			
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	20 40 60 80 100	PLASTIC LIMIT		
542.3	Ground Level								
0.0									
	Brown Grey		1	SS	13				
			2	SS	17				
			3	SS	35				
			4	SS	33				
	Heterogeneous mixture of clayey silt, sand and gravel. (Glacial Till)		5	SS	20				
			6	SS	22				
			7	SS	25				
			8	SS	13				
	Stiff to Hard		9	SS	12				
505.3									
37.0	Silty sand with few gravel.		10	SS	180				
492.3	Very Dense								
43.0			11	SS	36				
481.3			12	SS	180				
61.0	Bedrock								
	Weathered Shale								
472.3									
469.8	Sound Shale		13	EXL	900				
72.5	End of Borehole								

20
15 5 % STRAIN AT FAILURE
10



HWY 427 & WOODBINE RACETRACK ENTRANCE

WP 660-93-01
SITE 37-0983



memorandum

To: V.F. Boehnke, P. Eng.
Head, Structural Section
Central Region

1995 02 21

Attn.: Jim Marr

From: Pavements and Foundation Section
Room 315, Central Building
Downsview, Ontario

Re: Soil Parameters for Roadway Protection Design
Woodbine Racetrack Entrance Overpass
W.P. 660-93-01, Site 37-0983
Hwy 427, District 6, Toronto

Further to your request of 1995 01 24, following are the soil parameters for the design of roadway protection at the above captioned site.

Elev 173.0m to 165.5m	$\phi = 30^\circ$	$\gamma = 20.0 \text{ kN/m}^3$
Elev 165.5m to 155.5m	$\phi = 32^\circ$	$\gamma = 20.0 \text{ kN/m}^3$
Elev 155.5m to 146.5m	$\phi = 35^\circ$	$\gamma = 21.2 \text{ kN/m}^3$

Where:

ϕ = Equivalent angle of internal friction
 γ = Bulk unit weight of the soil

Water level can be assumed to be at elevation 164.7m for design purposes.

K.S.Q. Ahmad, P. Eng.
Foundation Engineer

For

D.H. Dundas, P. Eng.
Senior Foundation Engineer

memorandum



To: V.F. Boehnke, P. Eng.
Head, Structural Section
Central Region

Attn: John Lam, P. Eng.

From: Foundation Design Section
Room 315, Central Building

Subject: Proposed Hwy 427 Widening
Woodbine Racetrack Entrance Overpass
W.P.660-93-01, Site No. 37-0983
District 6, Toronto

Date: 94 05 25

We refer to your memorandum dated 94 02 15 and the updated E-plan attached therein. Based on this and the subsequent discussions, we provide herewith our detailed foundation recommendations for the proposed widening of the above structure. This memorandum is intended to include and supplement the recommendations given in our previous memorandum dated 93 12 03.

It is understood that the widening will be carried out in the median and the outer side of both the NBL and SBL. The existing overpass is a three span structure with the abutments supported by 12BP53 (HP 310X110) piles driven to bedrock. The piers are supported by shallow footings resting on native cohesive glacial till deposit at El. 535 ft. (163.1 m) with a design bearing capacity of 2.5 t.s.f.

The subsurface stratigraphy typically comprises 19 ±m of cohesive glacial till deposit overlying bedrock. Some silty sand layers were found in the glacial till stratum. From a review of the available borehole data, it is envisaged that the subsoil condition is quite uniform across the site and the present information is sufficient for us to provide with the foundation recommendations, as follows:

Foundation

Abutment -

The proposed widening can be supported by steel H-piles driven to bedrock at El 480 ±ft (146.3 m) at the abutment locations. The following pile capacities should be employed in the design as per O.H.B.D.C :

	<u>HP 310x110</u>	<u>HP310x79</u>
Factored Axial Capacity at U.L.S.	1600 kN/pile	1150kN/pile
Axial Capacity at S.L.S. Type II	1150 kN/pile	890kN/pile

The field investigation has revealed weathered shale overlying sound bedrock. The glacial till stratum typically consists of boulders. Piles should be equipped with reinforced pile tips in accordance with OPSD-3301.00. Bottom of pile caps should be located at the same elevation as the existing pile caps.

New piles should be properly arranged to avoid interference with existing piles. In addition, in order to avoid adverse effects of pile driving on the existing pile foundation, it is recommended pre-augering be carried out at new pile locations to a depth of 3 m below the bottom elevation of the existing pile cap. These pre-augered holes should be backfilled with suitable granular material upon completion of pile driving.

Pier -

At pier locations, new footings constructed immediately adjacent to the existing footings should be founded at the same elevation to avoid undermining or overstressing of footings. According to the contract drawings, the existing footings are designed to be founded at El. 535 \pm ft. (163.1 \pm m). The actual elevation (as-constructed) should be verified on site during construction. For footings founded on very stiff cohesive glacial till, the design bearing capacities as per the O.H.B.D.C. are as follows:

Factored Bearing Capacity at U.L.S. = 400 kPa
Bearing Capacity at S.L.S. Type II = 250 kPa

Based on the above design capacities, the resulting differential settlement between the new and existing footings will be less than 25 mm.

Following excavation to grade, 150 mm thick lean concrete shall be placed within 4 hours of excavation to prevent deterioration of the founding material.

Sliding resistance between concrete and native cohesive glacial till material should be calculated in accordance with O.H.B.D.C. Section 6-8.4.3 with an unfactored adhesion of 100 kPa.

For pile cap and footing construction, an earth cover of 1.2 m should be provided for

frost protection.

Alternative design -

Alternatively, the footing elements can be supported on caissons socketed 1.5 m minimum into bedrock. Minimum caisson diameter should be 900 mm to allow for down-the-hole cleaning and inspection. The overburden contains occasional non-cohesive layers and hence liners should be used in caisson construction. The following axial design values may be assumed in accordance with the O.H.B.D.C. :

Factored Bearing Capacity at U.L.S. = 3500 kPa
Bearing Capacity at S.L.S. Type II will not govern the design

For caisson foundation, the differential settlement between the new and existing foundations will be negligible.

For preliminary design purpose, the anticipated caisson tip elevation is El 475 \pm ft (144.8 m). This tip elevation is estimated based on available borehole data. Actual founding elevations may vary and have to be verified in the field.

Caisson caps should be constructed at the same elevation as the existing pile caps or footings. Alternatively, caisson caps may be omitted and pile bent type of construction be adopted.

Backfill

Backfill to abutments and retaining walls should consist of granular material in accordance with MTO Standard Special Provision No. 109F03 (92 03). Computation of earth pressure shall be in accordance with Section 6.7.4 of the O.H.B.D.C. Unfactored properties for backfill materials are provided in the following table:

<u>Material</u>	ϕ	γ
Granular 'A'	35°	22.8 kN/m ³
Granular 'B'	30°	21.2 kN/m ³

Construction

Temporary excavation is required for the construction of the pile caps and footings.

Cut slopes may be formed at an angle of 1H:1V or flatter up to a maximum height of 3 m. No major dewatering measure is required. Minor seepage from sand layers or surface runoffs can be handled by sump pumping.

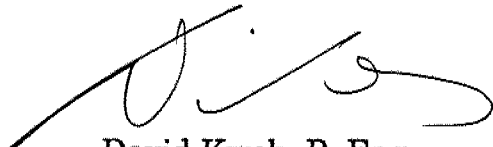
Shoring may be required when excavation is carried out close to the existing structure. Soil parameters for the design of roadway protection will be provided after the location and extent of shoring requirements are identified by your office.

Should caisson alternative be adopted, it is recommended to employ pile bent type of construction which can eliminate caisson caps and the associated shoring requirements.

Miscellaneous

The original memorandum dated 93 12 03 was prepared by David Kwok, Project Foundation Engineer for Balu Iyer, Senior Foundation Engineer.

We believe the above is sufficient for your present purposes. Should you require further information, please contact our office. We will comment further when the design drawings are available.



David Kwok, P. Eng
Project Foundation Engineer
for
Paul Payer, P. Eng.
Senior Foundation Engineer

c.c. Has Shah (Planning & Design)
George Al-Bazi (Structural Office)

memorandum



To: V.F. Boehnke, P. Eng.
Head, Structural Section
Central Region

Date: 93 12 03

Attn: John Lam, P. Eng.

From: Foundation Design Section
Room 315, Central Building

Subject: Proposed Hwy 427 Widening
Woodbine Racetrack Entrance Overpass
W.P.660-93-01, Site No. 37-0983
District 6, Toronto

Further to your memorandum dated 93 09 23, we provide herewith our foundation recommendations for the proposed widening of the above structure. It is understood that the widening will be carried out in the median.

The existing overpass is a three span structure with the abutments supported by HP 12x53 (Imperial units) piles driven to bedrock. The piers are supported by shallow footings resting on native cohesive glacial till deposit at El. 535' (163.1 m) with a design bearing capacity of 2.5 t.s.f.

The subsurface stratigraphy typically comprises 19 ±m of cohesive glacial till deposit overlying bedrock. Some silty sand layers were found in the glacial till stratum. From a review of the available borehole data, it is envisaged that the subsoil condition is quite uniform across the site and the present information is sufficient for us to provide with the foundation recommendations, as follows:

Foundation

Abutment -

The proposed widening can be supported by ~~310x110~~ steel H-piles driven to bedrock at the abutment locations. The following pile capacities should be employed in the design as per O.H.B.D.C :

	<u>HP 310x110</u>	<u>HP310x79</u>
Factored Axial Capacity at U.L.S.	1600 kN/pile	1150kN/pile
Axial Capacity at S.L.S. Type II	1150 kN/pile	890kN/pile

The field investigation has revealed weathered shale overlying sound bedrock. The glacial till stratum typically consists of boulders. Piles should be equipped with reinforced pile tips in accordance with OPSD-3301.00. Pile caps should be located at the same elevation as the existing pile caps. New piles should be properly arranged to avoid interference with existing piles.

Pier -

At pier locations, new footings constructed immediately adjacent to the existing footings should be founded at the same elevation. Construction of footings should be properly phased to minimize the effects on existing footings. For footings founded on very stiff cohesive glacial till, the design bearing capacities as per the O.H.B.D.C. are as follows. A somewhat conservative set of values is recommended in order to minimize the differential settlement between the new and existing footings.

Factored Bearing Capacity at U.L.S. = 400 kPa

Bearing Capacity at S.L.S. Type II = 250 kPa

For pile cap and footing construction, an earth cover of 1.2 m or equivalent insulation should be provided for frost protection.

Construction

Temporary excavation is required for the construction of the pile caps and footings. Cut slopes may be formed at an angle of 1H:1V or flatter up to a maximum height of 3 m. Shoring may be required when excavation is carried out close to the existing structure. No major dewatering measure is required. Minor seepage from sand layers or surface runoffs can be handled by sump pumping. The excavations should be backfilled with approved earth fill material and compacted to MTO Standards.

We believe the above is sufficient for your present purposes. Should you require further information, please contact our office. We will comment further when the design drawings are available.

A handwritten signature in black ink, appearing to read 'David Kwok', with a long horizontal stroke extending to the right.

David Kwok, P. Eng
Project Foundation Engineer
for
Balu Iyer, P. Eng.
Senior Foundation Engineer

c.c. Paul Jankowski
Sr. Project Manager

George Al-Bazi
Design Engineer