

CONT. 72-154

HWY. 5 AND

HWY. 27

DIST. No. 6

30M11-41

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

GE0.30M11-41

TO: Mr. G.C.E. Burkhardt, (6) FROM: Foundations Office,
Regional Structural Planning Eng., Design Services Branch,
Central Region, West Bldg., Downsview.
90 Floral Pkwy., Downsview.

ATTENTION:

DATE: June 26, 1972.

OUR FILE REF.

IN REPLY TO JUN 27 1972

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Access to Cloverdale Mall
At Hwy. #5 & Hwy. #27
District No. 6 (Toronto)
W.O. 72-11056 -- W.P. 50-72-02
CONT 72-154

30M11-41

GEOCRES No.

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.

AGS/ao

Attn.

cc: Messrs. D. W. Farren
B. R. Davis
A. Rutka
P. J. Harvey
H. Greenland
J. L. Keen
B. J. Giroux
T. J. Kovich
G. A. Wrong
B. A. Singh

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

Foundations Files
Documents

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FOUNDATION INVESTIGATION REPORT

For

Access to Cloverdale Mall

At Hwy. #5 & Hwy. #27

District No. 6 (Toronto)

W.O. 72-11056 -- W.P. 50-72-02

1. INTRODUCTION:

The Foundations Office was requested to conduct an investigation of the soil conditions at Cloverdale Mall in order that a new access can be constructed at the south-west corner of the parking area. The new access road requires that a new single-span structure be built where it crosses the existing E-N Ramp from Hwy. #5 to Hwy. #27, together with retaining walls on each approach to the structure to retain the fill on the ramp which will be heightened by some 11 feet. In addition, a 700 ft.-long retaining wall is required adjacent to the new access road entrances to the Mall. At the north end of the Mall a 60 ft.-long retaining wall is required along the east side of the Mall, commencing at the East Mall Gate. This work was requested by Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region, in a memo, dated April 21, 1972.

This report presents the results of the investigation by the Foundations Office along with recommendations for the design of the proposed structures.

2. SITE CONDITIONS:

The new access road and retaining walls are to be located in a flat, built-up urban area. The site is part of the south slope physiographic region of Southern Ontario, and is located on the southern edge of the region, bordering on the Iroquois Plain. In this area the soil is of a till nature and

tends to be clayey. Shale occurs in the till and tends to be black or grey.

A 72-inch sanitary sewer is located at this site. The invert of the sewer is at elevation 383 \pm and the centre line in plan intersects the south end of the proposed west abutment footing and the centre of the proposed east abutment footing. This sewer was constructed in 1963-69 and at this location was tunnelled.

3. FIELD WORK:

Thirteen boreholes were constructed during the field investigation. Each of these holes was advanced by a hollow stem auger adapted for soil sampling. Samples were obtained at various depths in a 2-inch O.D. split-spoon sampler which was driven according to the specifications for the Standard Penetration Test. During the sampling operation detailed boring logs were used to record the drilling and sampling techniques and the soil types encountered. All samples were examined visually in the field.

Of the thirteen boreholes, Nos. 5 & 6 were situated along the proposed retaining wall at the East Mall Gate, Nos. 1 to 4 were along the proposed retaining wall adjacent to the new access road entrances to the Mall, and Nos. 7 to 13 were located at the new single span structure site.

The location and elevation of all boreholes are shown on Drawing No. W.O. 72-11056A along with estimated stratigraphical sections across the site.

4. LABORATORY WORK:

A further visual examination of the samples was performed in the laboratory. Representative samples were then selected for laboratory testing to determine the following physical properties.

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

The results of these tests are plotted on the Record of Borehole in Appendix I of this report.

5. SUBSOIL AND GROUNDWATER CONDITIONS:

5.1) Structure on Ramp E-N and Retaining Wall Approaches:

The subsoil at this location consists of up to 10 ft. of firm to very stiff clayey silt with sand and gravel, which is fill material, underlain by deposits of hard clayey silt with sand and gravel, and very dense sandy silt to silty sand with traces of gravel. Below the fill material the subsoil is of glacial origin and extends for depths in excess of 50 ft. below ground level.

Atterberg limits and natural moisture content were determined for the above soils and the results are given below in the form of range of values with average values bracketed.

Soil	Fill Material	Hard Clayey Silt	Sandy Silt to Silty Sand
Liquid Limit, W_L (%)	28	18-37 (25)	
Plastic Limit, W_p (%)	17	11-20 (15)	
Natural Moisture Content, W (%)	15-18 (16)	8-20 (12)	6.5-16.5 (11)

From these values it can be seen that the fill material and the clayey silt material are of low plasticity. The natural moisture content is $3\frac{1}{2}\%$ below the plastic limit on an average basis.

The results of Standard Penetration Tests are recorded on the Records of Borehole along with grain size distribution. The 'N' values varied from 5 blows/ft. to 100 blows for 4 inches. The values tended to increase with depth.

The groundwater level was found to range from elevation 383 to elevation 398 or from 30 to 15 ft. below ground level.

5.2) Retaining Wall Adjacent to Access Roads N. & E.:

The subsoil at this location consists of up to 8 ft. of stiff to very stiff clayey silt with sand and gravel, fill material, followed by 6 to 14 ft. of hard clayey silt with sand and gravel, glacial till, underlain by at least 18 ft. of very dense silty sand to sandy silt with some to traces of gravel.

Atterberg limits and natural moisture content were determined for the above soils and the results are given below in the form of range of values with average values bracketed.

Soil	Fill	Glacial Till	Silty Sand to Sandy Silt
Liquid Limit, W_L (%)	25-30 (27)	18-24 (23)	
Plastic Limit, W_p (%)	16-18 (17)	14-20 (17)	
Natural Moisture Content, W (%)	12-19.5 (14)	4.5-19 (12)	5-14.5 (9)

From these values it can be seen that the fill and glacial till are of low plasticity. The natural moisture content is 3-5% below the plastic limit on average.

The results of Standard Penetration Tests are recorded on the Records of Borehole along with grain size distribution. The 'N' values varied from 9 blows/ft. to 100 blows for 3 inches. The values tended to increase with depth.

The groundwater level was found to range from elevation 404 to elevation 387 or from 14 to 24 feet below ground level.

5.3) Retaining Wall at East Mall Gate:

The subsoil at this site consists of 14 to 23 ft. of very stiff to hard clayey silt with sand and traces of gravel, underlain by 8 to 12 ft. of very dense silty sand to sandy silt with some gravel.

Atterberg limit and natural moisture content were determined for the above soils and the results are given below in the form of range of values with average values bracketed.

Soil	Clayey Silt	Silty Sand to Sandy Silt
Liquid Limit, W_L (%)	18-23 (21)	
Plastic Limit, W_P (%)	15-15 (15)	
Natural Moisture Content, W (%)	2-11.5 (9)	8.5-17 (13)

From these values it can be seen that the clayey silt is of low plasticity. The natural moisture content is 6% below the plastic limit on average.

The results of Standard Penetration Tests are recorded on the Records of Borehole along with grain-size distribution. The 'N' values varied from 18 blows/ft. to 100 blows for 6 inches. The values tended to increase with depth.

The groundwater level was found to range from elevation 402 to elevation 405 or about 21 ft. below ground level.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) Structure on Ramp E-N:

The proposed structure may be founded on spread footings at or below elevation 399.0 assuming a safe net pressure of 3.5 t.s.f. As an alternative a pile foundation may be constructed. In this case steel 'E' piles are considered to be the most suitable and it is estimated that such piles will achieve their maximum allowable load bearing capacity if driven to approximate elevation 390.0. The design and construction of this structure will be complicated due to the presence of the 72-inch sanitary sewer previously mentioned. Discussions have been held with Mr. I. Trevaline of Toronto District who advised us that this

section of the sewer tunnel was completed in the dry and that no construction problems occurred. It can be assumed, therefore, that little or no disturbance to the adjacent soil occurred. The designer must investigate as to whether or not the sewer can sustain the additional loads imposed by the new bridge structure if founded on spread footings. If the sewer cannot sustain these loads then the following applies: the new bridge should be founded on steel 'H' piles as described above with the additional provision that all piles within a horizontal distance of 12 ft. from the outside of the sewer be pre-augered to a depth at least 6 ft. below the bottom of the sewer before driving. After placing the piles in the pre-augered holes the voids should be filled with sand or weak concrete.

Dewatering of excavations should not be a problem since no groundwater was observed above elevation 398.0 which is below the recommended footing or pile cap bases.

6.2) Retaining Walls on Structure Approaches:

These retaining walls will be built to retain the additional fill for the heightening of the E-N ramp by some 11 ft. at the immediate approaches to the new structure.

The proposed walls may be founded on spread footings or on piles with the proviso that vertical expansion joints be constructed between portions with different types of support. If founded on piles recommendations are as given above for the structure. If founded on spread footings the following net safe soil pressures may be assumed for design purposes.

N.W. Wall	At or below elevation 399 - 3.5 t.s.f.
	At or below elevation 410 - 2.0 t.s.f.
S.W. Wall	At or below elevation 399 - 3.5 t.s.f.
	At or below elevation 410 - 2.0 t.s.f.
N.E. Wall	At or below elevation 399 - 3.5 t.s.f.
	At or below elevation 402 - 2.0 t.s.f.

S.E. Wall At or below elevation 399 - 3.5 t.s.f.
 At or below elevation 407 - 2.0 t.s.f.

Recommendations relating to the imposition of additional loads on the 72-inch sewer by the new bridge foundations are applicable also for the retaining wall foundations.

No dewatering problems are anticipated for footing bases above elevation 398.0.

6.3) Retaining Wall Adjacent to Access Roads N. & E.:

The finished ground level in front of this wall ranges from elevation 417.00 at the extreme north end of the wall to elevation 405 at the centre to elevation 415 at the extreme east end of the wall. It is recommended that the proposed wall be supported on spread footings placed at a minimum depth of 4 ft. below finished ground level or 4 ft. below existing original ground level whichever is lower. In this case a net safe pressure of 3.5 t.s.f. may be assumed for design purposes. If it can be justified on economic grounds the wall may be supported on steel H piles driven to approximate elevation 390 in which case the maximum allowable design load for the particular steel section adopted should be achieved.

No dewatering problems are anticipated since the groundwater level is well below the recommended footing elevations.

6.4) Retaining Wall at East Mall Gate:

The proposed wall may be founded on spread footing placed some 4 ft. below the existing sidewalk level. In this case a net safe pressure of 3.5 t.s.f. may be assumed for design purposes.

No dewatering problems are anticipated.

The following recommendations are generally applicable to the entire project:

- 1) Piles should be driven according to the Standard BD-82-7 using the appropriate design load.

- 2) All footings must have a minimum of 4 ft. of cover for frost protection.
- 3) Backfill to retaining walls should be according to the appropriate standard (SD-4-58 and SD-4-74).
- 4) In computing resistance to sliding of footing bases a friction coefficient of $\tan 27^\circ = 0.51$ may be assumed to apply for footings placed on undisturbed subsoil.

7. MISCELLANEOUS:

The field work for this project was carried out during the period of April 28 to May 2, 1972, under the supervision of Mr. P. Korgemagi.

The equipment used was owned and operated by Dominion Soil Investigation Limited.

This report was written by Mr. E. Wood, Project Foundations Engineer, and reviewed by Mr. K. Selby, Supervising Foundations Engineer.

K. G. Selby

K. G. Selby, P. Eng.

EW/ao
June 21, 1972.

Appendix I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 72-11056

LOCATION Co-ord's 184,462 N. 207,560 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE May 1, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
417.6	Ground level.															
415.9	Clayey sil. with gra. Fill - Brown															
2.0	Clayey silt to silt some sand & traces of gravel.		1	SS	53											
			2	SS	19											
406.1	Very stiff to hard. Brown		3	SS	46	410										
11.5	Grey		4	SS	37											
399.6			5	SS	48	400										
18.0	Silty sand, some gravel.		6	SS	119											
	Grey, very dense (Glacial Till)		7	SS	138.9"	390										
387.1			8	SS	135.5"											
30.5	End of borehole.					380										

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2

JOB 72-11056

LOCATION Co-ord's 184,338 N. 207,700 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE April 28, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
417.9	Ground level.															
415.4	Clayey silt Fill Brown.															
2.5	Clayey silt, some sand- traces of gra. Brown - Stiff to hard Layer of same with asphalt.		1	SS	20											
			2	SS	14	410										
			3	SS	19											
404.5	Fill		4	SS	77											
13.4	Sandy silt- some clay Grey - hard.		5	SS	58	400										0 25 (75)
399.9																
18.0	Silty sand with gravel. Very dense. Grey Till		6	SS	115											39 40 (21)
			7	SS	105	390										El. 396.6
387.0																
30.9	End of borehole.		8	SS	172	380										8 44 (48)

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 72-11056

LOCATION Co-ord's 184,340 N. 207,790 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE April 28, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
417.9	Ground level.															
415.4	Clayey sil. with sa. traces gra. - Fill															
2.5	Clayey silt, some sand and traces of gravel. Brown. Stiff to very stiff.		1	SS	14											
			2	SS	9	410										
			3	SS	30											
405.4			4	SS	91											
12.5	Sandy silt, some clay, grey, hard.		5	SS	35											
401.9																
16.0	Silty sand with traces of gravel. Grey. Very dense. Till.		6	SS	86	400										
			7	SS	150/29"											
						390										
387.0			8	SS	117/2"											
30.9	End of borehole.															
						380										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 4

JOB 72-11056

LOCATION Co-ord's 184,352 N. 207,930 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE April 27, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *SL*

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	w	W_L	
411.0	Ground level.														
0.0	Clayey silt to silt. with some sand & traces of gravel.		1	SS	55	410									
404.2	Hard. Till. Brown		2	SS	128										
6.8	Grey		3	SS	60										
399.5			4	SS	116	400									
11.5	Sandy seams.		5	SS	125										
397.0			6	SS	100	390									
14.0	Silty sand with traces of gravel.		7	SS	100										
	Grey														
	Very dense.														
	Till.														
380.7			8	SS	100	380									
30.3	End of borehole.					370									

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 5

JOB 72-11056

LOCATION Co-ord's 185,809 N. 207,440 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE May 2, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

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						
							20	40	60	80	100	WATER CONTENT w				
												w_u			w	w_L
SHEAR STRENGTH P.S.F.						O UNCONFINED + FIELD VANE			WATER CONTENT %							
X QUICK TRIAXIAL X LAB VANE									10 20 30							
423.0	Ground level.															
0.0	Clayey silt with ss. and traces gravel. Dark brown-v. stiff-till.		1	SS	18	420										
4.5	Clayey silt to silty sand with some gra. Hard and v. dense.		2	SS	102											
412.5	Hard and v. dense.		3	SS	127											
10.5	Grey.		4	SS	100/6	410										
406.5			5	SS	174/5									6 39 (55)		
16.5	Silty sand to sand with some silt and traces of gravel. Grey - Till.		6	SS	103/8	400								El. 401.6		
397.0	Very dense.		7	SS	125									3 87 (10)		
26.0	End of borehole.					390										

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 6

JOB 72-11056

LOCATION Co-ord's 185,880 N. 207,412 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE May 2, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT — w_p				
							20	40	60	80	100	WATER CONTENT — w				
												w_p	w	w_L		
SHEAR STRENGTH P.S.F.											WATER CONTENT %					
○ UNCONFINED + FIELD VANE														γ		
● QUICK TRIAXIAL x LAB VANE																
											10 20 30			P.C.F.	GR SA SI CL	
424.5	Ground level.															
0.0	2" asphalt															
420.5	2"-9" sand & gravel															
	Clayey silt - Brown															
4.0	Clayey silt to silty sand with some gra. Hard and very dense.		1	SS	30	420										
			2	SS	57/8"										24 44 (32)	
411.0	Brown		3	SS	17/8"											
13.5	Sandy silt. Grey		4	SS	102	410										
407.5	Sand seam		5	SS	22											
18.0	Clayey silt to silt some sand, traces gra. Hard.		6	SS	715											
401.5																
23.0	Silt to sandy silt with traces gravel. Grey - Hard - Till.		7	SS	42	400									1 47 (52)	
393.6			8	SS	118	10"									4 16 (80)	
30.9	End of borehole.					390										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 7

JOB 72-11056

LOCATION Co-ord's 184,242 N. 207,872 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE April 28, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT w_L		BULK DENSITY γ	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		PLASTIC LIMIT w_p						
							20	40	60	80			100	WATER CONTENT w	
														w_p — w — w_L	
						SHEAR STRENGTH P.S.F.				WATER CONTENT %					
						○ UNCONFINED + FIELD VANE									
						● QUICK TRIAXIAL x LAB VANE									
										10 20 30					
411.7	Ground level.														
0.0	6" topsoil. Clayey si. with some sa. & traces gravel - Brown					410									
406.7	Stiff - fill		1	SS	14										
5.0	Clayey si. with some sa. & traces gra. Brown		2	SS	28										
403.7	Very stiff.														
8.0	Silty sand to sandy silt with traces of gravel.		3	SS	62										
	Grey. Very dense. or hard.		4	SS	99	400									
	Till.		5	SS	607.6"							6.44 (50)			
			6	SS	78.2"	390						VEL. 392.0			
			7	SS	163							9.43 (48)			
												2.16 (82)			
380.8			8	SS	277"	380									
30.9	End of borehole.					370									

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE NO 8

JOB 72-11056

LOCATION Co-ord's 184,228 N. 207,800 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE May 1, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		PLASTIC LIMIT				
							20	40	60	80			100
							SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							O UNCONFINED + FIELD VANE		w _p w w _L		γ		
							● QUICK TRIAXIAL × LAB VANE				P.C.F.		
412.7	Ground level.									10	20	30	GR SA SI. CL
410.2	Topsoil - clayey silt - Brown - Till.	X				410							
409.2	Clayey si. with some sa. & traces of gra. Very stiff to hard.		1	SS	19								
404.2	Brown Grey		2	SS	37								
401.7			3	SS	69								
391.7	Sandy silt to silty sand with some gra. Very dense - Grey Till		4	SS	81	400							14 57 (29)
			5	SS	48								
			6	SS	125.5"								
381.7	Clayey silt with some sand and traces of gravel. Low plasticity. Grey - Hard. To silt.		7	SS	90.7"	390							
			8	SS	138								El. 382.8
			9	SS	120	380							
			10	SS	115								1 24 (75)
			11	SS	93.9"	370							
361.1			12	SS	107								
51.6	End of borehole.					360							
						350							

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 9

JOB 72-11056

LOCATION Co-ord's 184,224 N. 207,732E.

ORIGINATED BY C.R.

W.P. 50-72-02

BORING DATE May 1, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			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				
						20 40 60 80 100				WATER CONTENT — w				
						SHEAR STRENGTH P.S.F.				w_p — w — w_L				
						○ UNCONFINED + FIELD VANE				WATER CONTENT %				
						● QUICK TRIAXIAL × LAB VANE				10 20 30				
414.6	Ground level.													
0.0	6" topsoil - clayey	✗												
412.1	silt - Fill													
2.5	Clayey silt with some sand & traces of gra. Very stiff to hard.		1	SS	15	410								
			2	SS	39									
403.1	Brown.		3	SS	97									
11.5	Grey.		4	SS	67									
400.6														
14.0	Sandy silt with traces of gravel. Grey - Hard - Till		5	SS	100/5"	400								
392.6			6	SS	140/11"									
22.0	Clayey silt with sand and traces of gravel. Grey Hard. Till.		7	SS	145	390								
			8	SS	165									
			9	SS	181/11"	380								
			10	SS	244									
			11	SS	355	370								
364.0			12	SS	300/5"									
30.6	End of borehole.					360								

EL. 385.0

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 10

JOB 72-11056

LOCATION Co-ord's 184,231 N. 207,650 E.

ORIGINATED BY C.K.

W.P. 50-72-02

BORING DATE May 1, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY H.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_p	W	W_L	
417.4	Ground level.														
0.0	12" topsoil														
413.4	Fill														
4.0			1	SS	26										
			2	SS	36	410									
			3	SS	34										
404.4	Brown		4	SS	70										
13.7	Grey		5	SS	55										
	Clayey silt to silt		6	SS	30	400									
	with some sand &		7	SS	48										
	traces of gravel.														
	Very stiff to hard.					390									
	Fill.														
385.8			8	SS	77										
31.6	End of borehole.					380									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 11

JOB 72-11056

LOCATION Co-ord's 134.192 N. 207.682 E.

ORIGINATED BY C.K.L.

W.P. 50-72-02

BORING DATE April 28, 1972

COMPILED BY S.R.C.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

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					
							20	40	60	80	100	WATER CONTENT — w				
							SHEAR STRENGTH P.S.F.				w_p — w — w_L					

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 12

JOB 72-110.6

LOCATION Co-ord's 184,194 N. 207,806 E.

ORIGINATED BY C.B.

W.P.50-72-02

BORING DATE May 2, 1972

COMPILED BY S.R.

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L	
414.8	Ground level.														
0.0	Clayey silt with some sand and traces of gravel. Brown. Stiff to very stiff. Till.		1	SS	16	410									
407.8			2	SS	14										
7.0			3	SS	65										
	Brown		4	SS	66										
	Grey		5	SS	80	400									
400.2			6	SS	110	390									
14.6	Silt to silty sand with some gravel. Very dense - Grey		7	SS	130	380									1 30 (69)
393.2			8	SS	110										
21.6	Clayey silt to silt with sand and traces of gravel. Grey - Hard Till		9	SS	115										24 30 (46)
			10	SS	98										
			11	SS	111										
363.2			12	SS	86										
51.6	End of borehole.					360									2 34 (64)

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 13

JOB 72-11056

LOCATION Co-ord's 184,208 N. 207,885 E.

ORIGINATED BY C.E.

W.P. 50-72-02

BORING DATE April 28, 1972

COMPILED BY S.B.

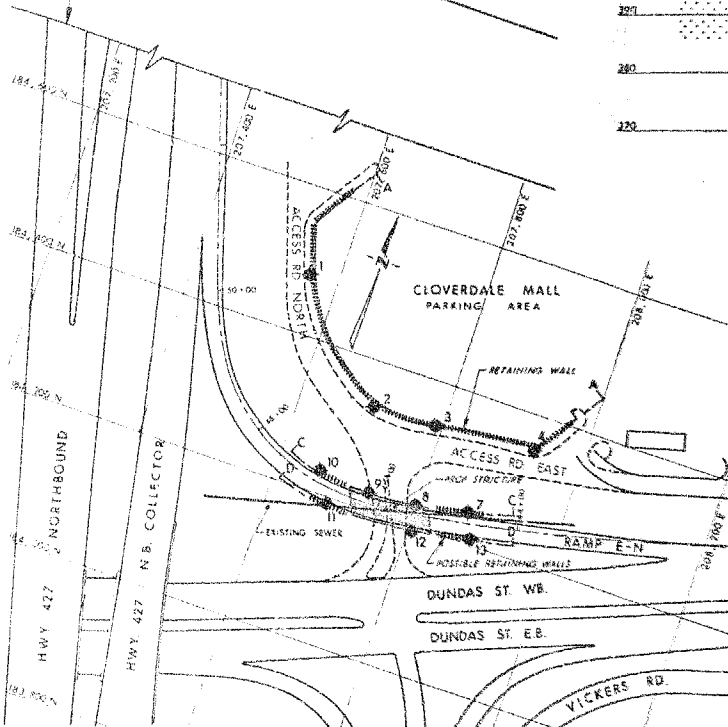
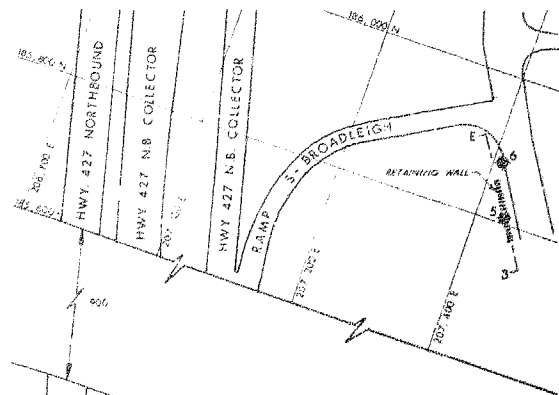
DATUM Geodetic

BOREHOLE TYPE Auger

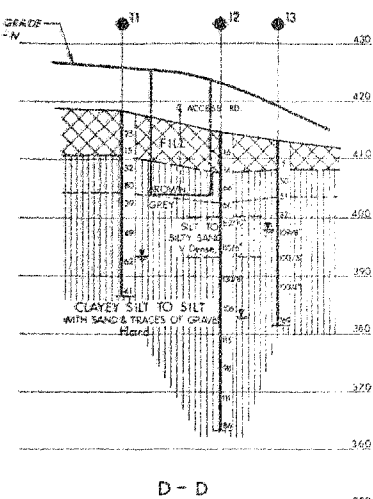
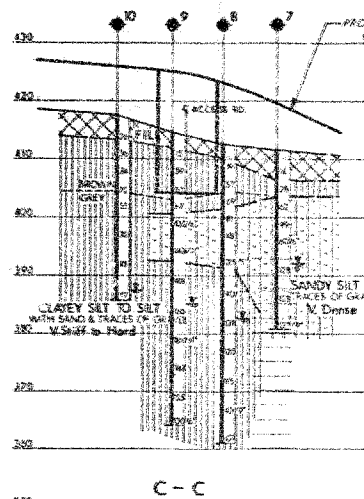
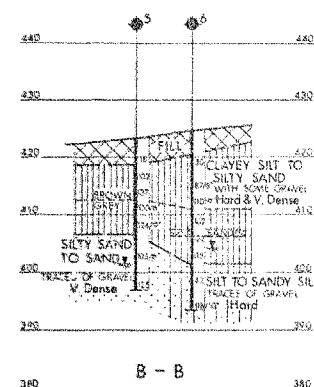
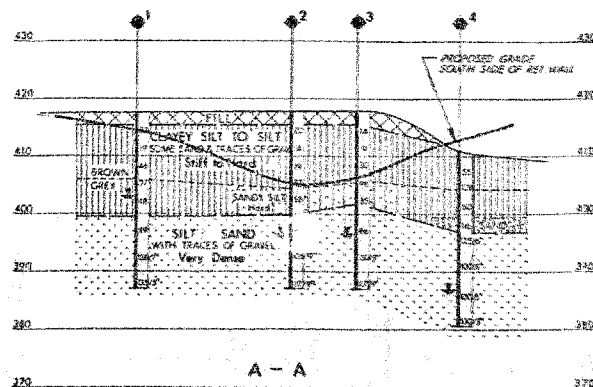
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SOIL PROFILE		STRAT. PLT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT % 10 20 30				
413.2	Ground level.															
0.0	8" topsoil. Clayey silt with some sand & traces of gravel. (Fill)	X	1	SS	5	410										
408.2			2	SS	50											
5.0			3	SS	51											
403.7	Brown		4	SS	82	400										
9.5	Grey		5	SS	109.8"											
	Clayey silt to silt with sand & traces of gravel.		6	SS	100.5"	390										
	Hard.		7	SS	100.4"											
	Till															
381.6			8	SS	109											
31.6	End of borehole.					380										
						370										

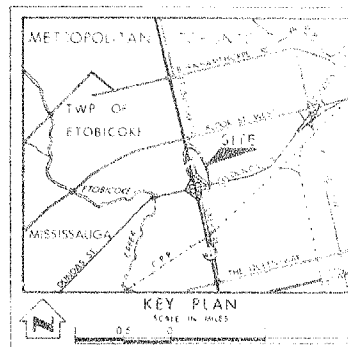
OFFICE REPORT ON SOIL EXPLORATION



PLAN
1" = 50' 0" SCALE



SECTIONS
1" = 10' 0" SCALE



LEGEND	
●	Bore hole
⊕	Cone Penetration Test
⊗	Bore Hole & Cone Test
+	Water Levels established at time of field investigation
	April & May 1972

NO	ELEVATION	SOIL TYPE	TEST
1	417.6	CLAYEY SILT TO SILT	100
2	417.9	CLAYEY SILT TO SILT	100
3	417.9	CLAYEY SILT TO SILT	100
4	417.9	CLAYEY SILT TO SILT	100
5	417.9	CLAYEY SILT TO SILT	100
6	417.9	CLAYEY SILT TO SILT	100
7	417.9	CLAYEY SILT TO SILT	100
8	417.9	CLAYEY SILT TO SILT	100
9	417.9	CLAYEY SILT TO SILT	100
10	417.9	CLAYEY SILT TO SILT	100
11	417.9	CLAYEY SILT TO SILT	100
12	417.9	CLAYEY SILT TO SILT	100
13	417.9	CLAYEY SILT TO SILT	100

NOTE
The boundaries between soil strata have been established only at Bore hole locations. Between Bore holes the soil strata are assumed from geological evidence and may be subject to considerable error.

REVISION	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

MINISTRY OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH

PROPOSED
ACCESS RD. STRUCTURE & RETAINING WALLS
(CLOVERDALE MALL)

HIGHWAY NO. 427 & DUNDAS ST. W.B. & E.B.
TWP. ETOBICOKE

BORE HOLE LOCATIONS & SOIL STRATA

SURV. P.R. CHECKED: 72-1056A
DRAWN S.K. CHECKED: 72-1056A
DATE: JUNE 15, 1972
BY: [Signature]

808

72-11-056

Mr. T.C. Muir,
Contract Control Engineer.

Mr. A.E. McKim.

July 28, 1972.

Contract 72-154, Cloverdale Mall Access,
Bridge on Ramp E-W., Sits 37-987,
Highway 5 and 427, District 46.

w P 50-71-02
50-72-03
52-72-01

Mr. J. MacDougall of Birmingham Construction phoned yesterday regarding the Special Provision for item 43, Pre-augered Holes for P Piles, which restricts the contractor to augering and driving one pile before the next hole can be drilled. In discussing this with Mr. K. Selby of the Foundation Section, he has said that he sees no reason why all the holes for any one footing could not be pre-augered, drop the piles in and back fill with the Granular "D", and then commence driving. This information has been passed on to Mr. MacDougall.

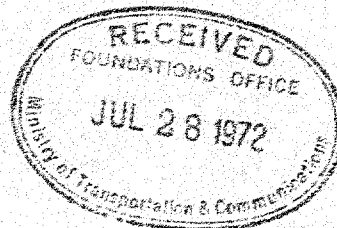
Would you please arrange to have the other bidders informed that all the holes for any one footing may be pre-augered, piles lowered into the holes and the holes back-filled and then the piles driven.

A.E. McKim

AEH/jc

A.E. McKim,
Asst. Construction Engineer,
Structures.

c.c. R. Carney
K. Selby ✓
S. McCombie





ONTARIO

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MINISTER: HONOURABLE CHARLES MacNAUGHTON

DEPUTY MINISTER: A. T. C. McNAB

ADDENDUM NO. 1

CONTRACT NO. 72-154

GRADING, DRAINAGE, GRANULAR BASE, HOT MIX PAVING, CONCRETE PAVING, LIGHTING, RETAINING WALLS AND STRUCTURE (INCLUDING PRE-STRESSED BEAMS) AND SECURITY FENCE. HWY. 42 - ENTRANCES TO CLOVERDALE MALL, FROM DUNDAS STREET AND HWY. 427 INCLUDING E-N RAMP OVERPASS AND RETAINING WALL NO. 1.

TORONTO DISTRICT.

NOTICE TO CONTRACTORS

The following will now form part of the Special Provisions for the contract and will amend the applicable information contained in the original Tendering Documents.

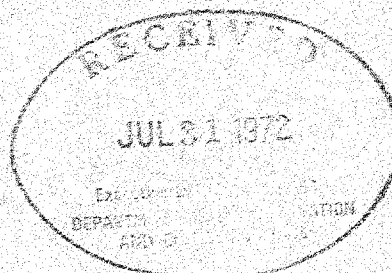
SPECIAL PROVISIONS - Page 42

PRE-AUGERED HOLES FOR "H" PILES - Item No. 43

Bidders are advised that the sequence of operations may be so altered that "all the holes for any one footing may be pre-augered, piles lowered into the holes and the holes back-filled and then the piles driven".

T. C. MUIR,
CONTRACT CONTROL ENGINEER

TORONTO, Ontario,
JULY 28th, 1972.



Mr. G. C. E. Burkhardt,
Regional Structural Planning Eng.,
Central Region,
90 Floral Pkwy., Downsview.

Foundations Office,
Design Services Branch,
Central Bldg., Downsview.

May 8, 1972.

Access to Cloverdale Mall at Hwy. #5 &
Hwy. #27, W.P. 50-72-02, W.O. 72-11056,
District No. 6 (Toronto).

We have recently completed a foundation investigation at the site of the above-mentioned project. In view of the urgency of the work we have prepared a short report of our findings which includes a brief description of subsoil conditions and makes specific recommendations with regard to the foundations for the proposed new structure and retaining walls. This report follows:

It is proposed to construct a new access to Cloverdale Mall at the south-west corner of the parking area. The new access road requires a new single span structure built where it crosses the existing E-W Ramp from Hwy. #5 to Hwy. #27, together with retaining walls on each approach to the structure to retain the fill on the ramp which will be heightened by some 11 ft. In addition, a retaining wall some 700 ft. in length will be built adjacent to the new access road entrances to the Mall. At the north end of the Mall a retaining wall some 60 ft. in length will be built along the east side of the Mall commencing at East Mall Gate. In this report the various parts of the project are discussed separately under the appropriate heading.

Structure on Ramp E-W

Subsoil at this location consists of up to 10 ft. of firm to very stiff clayey silt with sand and gravel, fill material, followed by deposits of hard clayey silt with sand and gravel, and very dense sandy silt to silty sand with traces of gravel. Below the fill material the subsoil is of glacial origin and extends for depths in excess of 50 ft. below ground level. The groundwater level was found to range from elevation 383 to elevation 398; i.e. 30 to 15 ft. below ground level.

The proposed structure may be founded on spread footings at or below elevation 399.0 assuming a safe net pressure of 3.5 t.s.f. As an alternative a piled foundation may be constructed. In this case steel 'H' piles are considered to be the most suitable and it is estimated that such piles will achieve their maximum allowable load bearing capacity if driven to approximate elevation 390.0. The design and the construction of this

structure will be complicated due the presence of a 72-inch sanitary sewer. The invert of the sewer is at elevation 383+ and the centre line in plan intersects the south end of the west abutment footing and the centre of the east abutment footing. This sewer was constructed in 1968-69 and at this location was tunnelled. Discussions have been held with Mr. I. Tremaine of Toronto District who advised us that this section of the tunnel was completed in the dry and that no construction problems occurred. It can be assumed, therefore, that little or no disturbance to the adjacent soil occurred. The designer must investigate as to whether or not the sewer can sustain the additional loads imposed by the new bridge structure if founded on spread footings. If the sewer cannot sustain these loads then the following applies: The new bridge should be founded on steel 'E' piles as described above with the additional provision that all piles within a horizontal distance of 12 ft. from the outside of the sewer be pre-augered to a depth at least 6 ft. below the bottom of the sewer before driving. After placing the piles in the pre-augered holes the voids should be filled with sand or weak concrete.

Dewatering of excavations should not be a problem since no groundwater was observed above elevation 398.0 which is below the recommended footing or pile cap bases.

Retaining Walls on Structure Approaches:

Subsoil at the location of these retaining walls is as described above for the structure on Ramp E-N.

These retaining walls will be built to retain the additional fill for the heightening of the E-N ramp by some 11 ft. at the immediate approaches to the new structure.

The proposed walls may be founded on spread footings or on piles with the proviso that vertical expansion joints be constructed between portions with different types of support. If founded on piles recommendations are as given above for the structure. If founded on spread footings the following net safe soil pressures may be assumed for design purposes:

N.W. Wall	At or below elevation 399 - 3.5 t.s.f. At or below elevation 410 - 2.0 t.s.f.
S.W. Wall	At or below elevation 399 - 3.5 t.s.f. At or below elevation 410 - 2.0 t.s.f.
N.E. Wall	At or below elevation 399 - 3.5 t.s.f. At or below elevation 402 - 2.0 t.s.f.

May 8, 1972.

S.E. Wall At or below elevation 399 - 3.5 t.s.f.
 At or below elevation 407 - 2.0 t.s.f.

Recommendations relating to the imposition of additional loads on the 72-inch sewer by the new bridge foundations are applicable also for the retaining wall foundations.

No dewatering problems are anticipated for footing bases above elevation 398.0.

Retaining Wall Adjacent to Access Roads W. & E.

Subsoil at this location consists of up to 3 ft. of stiff to very stiff clayey silt with sand and gravel, fill material, followed by 6 to 14 ft. of hard clayey silt with sand and gravel, glacial till, followed by at least 13 ft. of very dense silty sand to sandy silt with some to traces of gravel. Groundwater level ranges from elevation 404 to elevation 387; i.e. 14 to 24 feet below ground level.

The finished ground level in front of this wall ranges from elevation 417.00 at the extreme north end of the wall to elevation 405 at the centre to elevation 415 at the extreme east end of the wall. It is recommended that the proposed wall be supported on spread footings placed at a minimum depth of 4 ft. below finished ground level or 4 ft. below existing original ground level whichever is lower. In this case a net safe pressure of 3.5 t.s.f. may be assumed for design purposes. If it can be justified on economic grounds the wall may be supported on steel H piles driven to approximate elevation 390 on which case the maximum allowable design load for the particular steel section adopted should be achieved. No dewatering problems are anticipated since the groundwater is well below the recommended footing elevations.

Retaining Wall at East Wall Gate:

Subsoil at this site consists of 14 to 23 ft. of very stiff to hard clayey silt with sand and traces of gravel, followed by 8 to 12 ft. of very dense silty sand to sandy silt with some gravel.

Groundwater level ranges from elevation 402 to elevation 405; i.e. about 21 ft. below ground level.

The proposed wall may be founded on spread footings placed some 4 ft. below the existing sidewalk level. In this case a net safe pressure of 3.5 t.s.f. may be assumed for design purposes. No dewatering problems are anticipated.

May 8, 1972.

The following recommendations are generally applicable to the entire project:

- 1) Piles should be driven according to the Standard SD-82-7 using the appropriate design load.
- 2) All footings must have a minimum of 4 ft. of cover for frost protection.
- 3) Backfill to retaining walls should be according to the appropriate standard (SD-4-58 and SD-4-74).
- 4) In computing resistance to sliding of footing bases a friction coefficient of $\tan 27^\circ = 0.51$ may be assumed to apply for footings placed on undisturbed subsoil.

The information and recommendations contained in this memo were given to Mr. A. Gater of M.M. Dillon Ltd., on Thursday, May 4, by the writer.

We will be forwarding to you our complete report at the earliest possible date.

Should any questions arise in the meantime please contact this Office.

KGS/ao

K. G. Selby,
SUPERVISING FOUNDATIONS ENGINEER.

cc: W. C. Friedmann
J. Keen
A. Gater (M. M. Dillon Ltd.)

Foundations Files ✓
Documents