

Ontario
Department of Transportation and Communications

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MEMORANDUM

30 M 11-58

73-20

TO: Mr. G. C. E. Burkhardt,
Regional Bridge Planning Engr.,
Central Region,
90 Florel Parkway.

FROM: Foundations Office,
Design Services Branch,
Downsview.

ATTENTION: DATE: September 2, 1971.

OUR FILE REF. IN REPLY TO

SEP 9 1971

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

The Proposed Structures
(Bridges #5 and #9)

And Related Retaining Walls at the
Crossing of Belfield Expressway and
Hwy. #27 & City View Drive

District No. 6 (Toronto)

W.O. 71-11038 -- W.P. 273-65

CENT 73-20

30 M 11-58

GROUP 1

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

We believe that the factual data and recommendations
contained therein, will prove adequate for your design
requirements. Should additional information be required,
please do not hesitate to contact our Office.

AGS/ao
Attach.

cc: Messrs. B. R. Davis

G. C. E. Burkhardt (4)

F. C. Allen (A. RUTKA)

D. W. Fairren

G. K. Hunter (2)

H. Greenland

B. J. Giroux

T. J. Kovich

B. A. Singh

De Leuw, Cather (R. Barr)

for A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

Foundations Files
Documents

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FOUNDATION INVESTIGATION REPORT
For
The Proposed Structures
(Bridges #5 and #9)
And Related Retaining Walls at the
Crossing of Belfield Expressway and
Hwy. #27 & City View Drive
District No. 6 (Toronto)
W.O. 71-11038 -- W.P. 273-65

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation at the crossing of the proposed Belfield Expressway and Hwy. #27 - City View Drive, in the Borough of Etobicoke, Metropolitan Toronto. The request was contained in a memo from the Bridge Office - (Mr. G. C. E. Burkhardt, Regional Bridge Planning Engineer), dated May 26, 1971. Subsequently, an investigation was carried out by this Section 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 cuts.

2. SITE AND GEOLOGY:

The site is located immediately south of the junction of Hwy. #27 and Belfield Rd. and east of Brockport Drive in the Borough of Etobicoke. The terrain in the area is gently undulating in relief between elevations 535 and 543. In the vicinity of the site the land has been developed commercially; there are a number of single storey industrial buildings in the area.

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 Wisconsin Glacial Age. In the vicinity of the area under investigation, the moraine is primarily composed of a basically cohesive, stoney glacial till whose thickness typically ranges between 65 and 80 feet.

2. SITE AND GEOLOGY: (Cont'd.) ...

In this region the Humber River and Etobicoke Creek have cut deep valleys into the overburden. There is, therefore, no large undrained depression, swamp or bog, although, in many of the interstream areas drainage is still imperfect.

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 varies somewhere between elevations 460 and 475.

3. FIELD AND LABORATORY WORK:

A total of nineteen sampled boreholes, each of which was accompanied by a dynamic cone penetration test, was carried out at the site during the course of the field investigation. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (Penn drill) or a diamond drill, both of which were adapted for soil sampling purposes.

Samples were obtained at required depths in a 2-inch O.D. split-spoon sampler which was hammered into the soil. 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 eight of the boring locations by obtaining BX size rock 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 and bedrock types encountered.

The location and elevation of all the boreholes are shown on Drawings #71-11038A and #71-11038B, together with a number of estimated stratigraphical sections across the site. Surveying at the site was carried out by the personnel from the Draughting Section, Materials and Testing Office, Department of Transportation and Communications. The elevations given in this report are referred to a Geodetic datum.

3. FIELD AND LABORATORY WORK: (Cont'd.) ...

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

Undrained Shear Strength Characteristics

The results of these tests are plotted on the Record of Borelog sheets as well as on Figures #1 to 3, all of which are located in the Appendix to this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant stratum across the site is composed of a very stiff to hard clayey silt with some sand and gravel; the thickness of this stratum varies from 33 to 76 feet. The cohesive subsoil is periodically underlain by a 7 to 18 feet thick deposit of very dense silty sand to sandy silt. The overburden is underlain by shale bedrock.

The subsoil and bedrock sequence encountered at the various borehole locations are shown on the accompanying borehole sheets. The stratigraphical sections, shown on Drawings No. W.O. 71-11038A and B have been inferred from this data.

A brief description of the subsoil and bedrock types encountered are presented in the sub-sections to follow.

4.2) Clayey Silt with Some Sand and Gravel:

The site is surficially covered by a thin (6 to 8 inch thick) layer of topsoil. The topsoil is underlain by the predominant stratum, which is composed of a clayey silt with some sand and gravel. The thickness of the clayey silt was found to vary between 33 and 76 feet.

4. SUBSOIL AND BEDROCK CONDITIONS: (Cont'd.) ...

4.2) Clayey Silt with Some Sand and Gravel: (Cont'd.) ...

Occasional random seams and layers of gravelly sand to sandy silt are present throughout the stratum. The maximum thickness of the seams and layers was found to be of the order of 12 inches to 4 feet, respectively. Grain-size distribution curves for samples obtained from the clayey silt stratum, as well as the granular seams and layers within this zone, are plotted in envelope form on Figure #1, located in the Appendix to this report.

The engineering characteristics of this clayey silt stratum were determined by carrying out testing both in the field and laboratory. A brief resume of the results is presented in the table to follow.

<u>Clayey Silt Stratum</u>		
<u>Identity Tests</u>		<u>Range (Average)</u>
Liquid Limit (W _L) (%)		16-39 (23)
Plastic Limit (W _P) (%)		13-21 (16)
Natural Moisture Content (W) (%)		8-23 (12)
<u>Standard Penetration Resistance</u>		
<u>Values</u> (Blows/ft.)	(N')	12- >100

The Atterberg limit tests, carried out on samples obtained from this stratum, are plotted on the Record of Borelog sheets, and summarized on the Plasticity Chart, Figure #2. Based on this testing, it is estimated that the clayey silt is inorganic with a plasticity in the low range.

The results of the Standard Penetration Testing, carried out within the stratum, indicates that the consistency of this subsoil generally ranges from very stiff to hard.

4. SUBSOIL AND BEDROCK CONDITIONS: (Cont'd.) ...

4.3) Sandy Silt to Silty Sand, Trace of Gravel:

The clayey silt stratum is periodically underlain by a very dense ('N' values 74 blows/ft. to 200 blows for 2 inches) deposit of gravelly sand to sandy silt. The thickness of the granular deposit where encountered, ranges from 7 to 18 feet. Fragments of shale are occasionally present in the lower 1 to 2 feet of the deposit. Grain-size distribution curves, for three typical samples of the granular deposit obtained, using 2-inch O.D. sampling equipment, are plotted on Figure #3.

4.4) Shale Bedrock:

Bedrock was encountered beneath the granular deposit, where it is present, or the clayey silt stratum elsewhere. The bedrock was established in 8 of the borings by obtaining from 5 to 17.5 feet of EX or BXL size rock core. The bedrock surface was encountered between elevations 465 and 473.5, which corresponds to depths of from 51 to 75 feet below the original ground surface.

The bedrock is composed of a grey shale; in certain locations the upper 1 to 8 feet is in a weathered condition. Below this upper weathered zone (where encountered) the bedrock is reasonably sound as evidenced by the high percentage of core recovered.

5. GROUNDWATER CONDITIONS:

Groundwater level observations were carried out, during the period of the investigation, by recording the water levels in the open boreholes. These observations, which are recorded on the borelog sheets, are also summarized on Drawings No. W.O. 71-11038A & B. The observations indicate that the groundwater level, in the overburden deposits, ranges from elevations 524 to 540, generally falling between elevations 531 and 535. These elevations correspond to depths of from 21 to 12 feet below original ground surface.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an east-west expressway in the vicinity of Belfield Road, which will connect Hwy. #401 in the Islington/Kipling area with the Toronto International Airport. The new Belfield Expressway will be 3.3 miles long and will require interchanges at Kipling Ave., Martin Grove Road, Attwell Drive, new Hwy. #427 and Airport Road. In addition, structures will be required at the crossings of Iron Road, Canadian National Railways, old Hwy. #27 and Mimico Creek with the proposed expressway.

This discussion deals with the proposed structures at the crossing of the Belfield Road Expressway and (i) Hwy. #27 (Bridge #5) and (ii) City View Drive (Bridge #9). In addition, recommendations pertaining to the foundation design of the associated east-west trending retaining walls, designated numbers R-4, R-5, R-6 and R-7 are presented in this report. The locations of the structures and retaining walls, in relation to one another, are shown in plan on Drawings No. W.O. 71-11038A and B. Discussions with regard to other structures on the expressway will be covered under separate foundation reports.

The structures will have closed-type abutments and 2 spans (approximately 60' - 50').

The Belfield Road Expressway will have 2 paved lanes in the Westbound direction and 3 in the Eastbound; these will be separated by a median.

The profile grade of the Expressway, in the vicinity of the structures will be at about elevation 520 - i.e., it will extend some 16 to 22 feet below the existing ground surface.

The associated retaining walls will have a clear height from the top of the walls to the finished grade beyond the toe of the walls, varying from 6 feet (west end of wall No. R-6 and R-7) to 24 feet (east end of wall No. R-4).

The predominant stratum across the site is a very stiff to hard clayey silt whose overall thickness varies from 33 to 76 feet.

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

6.1) General: (Cont'd.) ...

The cohesive stratum is periodically underlain by between 7 and 18 feet of very dense gravelly sand to sandy silt, which, in turn, is followed by shale bedrock.

The abutments and piers for the two structures, as well as the retaining walls, can be founded on shallow foundations located within the clayey silt stratum. Recommendations pertaining to the specific structure elements will be presented separately in the sub-sections to follow.

6.2) Structure Foundations - Bridges #5 and 9:

6.2.1) Centre Pier:

The centre pier for both the bridges can be founded on a spread footing, located within the clayey silt stratum. The base of the footings should be located at least 4 feet below the finished grade of the Belfield Road Expressway in order to provide sufficient frost protection. Spread footings, meeting the aforementioned requirements, can be designed using an allowable safe bearing pressure of up to 2.5 t.s.f.

6.2.2) Abutments:

The 'closed-type' abutments for Bridges #5 and 9 can be founded on spread footings using the same criteria outlined in Sub-section 6.2.1). These footings can be designed using an allowable bearing value of 2.5 t.s.f.

If the abutments are designed as rigid walls, then a coefficient of earth pressure at rest (K_0) of 0.5 should be assumed for the granular fill behind the wall, when designing the abutments. However, if some movement of the top of the wall is permitted, then a coefficient of active earth pressure (K_a) of 0.33 can be used.

It is recommended that a value of 2,000 p.s.f. be used in the computations to determine the sliding resistance between the rough concrete base of the footing and the underlying cohesive stratum.

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

6.2) Structure Foundations - Bridges #5 and 9: (Cont'd.) ...

6.2.2) Abutments:

The abutment walls will retain between 20 and 22 feet of parent subsoil. The foundation subsoil, beneath the walls, is competent, therefore, no deep-seated rotational type stability problems are anticipated.

6.2.3) Related Considerations:

Excavations for the pier and abutment footings will be carried out below the prevailing groundwater level. In view of the relatively impervious nature of the cohesive subsoil at the footing formation level, no major dewatering problems are anticipated, during the excavation phase. Any minor groundwater seepage or surface run-off into the excavations could be handled using standard techniques, such as pumping from sumps.

During construction of the abutment and pier footings, care should be taken to ensure that the foundation subsoil will not be softened by surface run-off or groundwater seepage. A lean concrete working slab should be placed at the footing formation level immediately after the completion of the excavations.

Providing this provision is adopted, the differential settlement between the spread footing supported centre pier and adjacent abutments should be negligible in magnitude. This differential should be realized during or immediately following the construction of the structures.

6.3) Retaining Walls (No's R-4, R-5, R-6 and R-7):

The retaining walls, having heights which range from 6 to 24 feet, can be founded on spread footings located within the clayey silt stratum. The founding level should be commensurate with the frost protection requirements in the area, as discussed in Sub-section 6.2.1). Spread footings, supporting these retaining walls can be designed using an allowable bearing pressure of 2.5 t.s.f.

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ..

6.3) Retaining Walls (No's R-4, R-5, R-6 and R-7): (Cont'd.) ...

Recommendations pertaining to retaining walls No. R-4 and R-5, as discussed in our Foundation Report W.O. 71-11036, dated August 24, 1971, should be read in conjunction with the comments made in previous paragraphs. Specifically between Stations 621+00 to 623+00, a softer, more compressible zone was encountered in the vicinity of the proposed footing level. In this area, if the suggested allowable bearing value (1.5 t.s.f.) is not adequate for the design requirements end-bearing piles could be employed.

The maximum differential settlement would be realized along a retaining wall which is partially supported on spread footings located in the clayey silt stratum and partially on end-bearing piles driven into the lower competent zone of the overburden. This differential settlement should be of the order of 1/2 to 3/4 inch. In order to allow for this differential movement, it is recommended that a construction joint be provided between the spread footing and pile-supported retaining wall sections.

Comments made with regard to dewatering of the excavations for the piers and abutments are applicable for the retaining wall foundations as well.

The following values can be used in the design of the retaining structure:

- Coefficient earth pressure at rest $K_o = 0.5$ (Rigid Wall)
- Coefficient of active earth pressure $K_a = 0.33$ (Some movement at the top of wall permitted)
- Sliding resistance between the concrete and the soil -
2,000 p.s.f.

In order to relieve the build-up of excess hydrostatic pressure behind the retaining structures suitable drainage measures should be provided. If the embankments are not constructed of a relatively free-draining type of granular material, the following measures should be taken:

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

6.3) Retaining Walls (No's R-4, R-5, R-6 and R-7): (Cont'd.)

An 8-ft. wide vertical strip of free-draining granular material should be provided behind the wall: the remainder of the backfill could consist of locally available earth similar to that used for embankment construction. In addition to the 8-ft. wide gravel strip behind the wall, a horizontal layer of gravel, 4 feet thick, should be built into the backfill at half the height of the wall, and should extend for a distance equal to one-half the height of the wall. No horizontal drains would be required for that portion of the retaining wall having a height of less than 12 feet. Suitable weep holes should be provided at the base of the wall at a maximum spacing of 10 ft. Department Standard SD-4-58, prepared for various retaining wall backfilling requirements for Hwy. 401 Toronto Bypass, may be used for design and construction purposes.

6.4) Approach Cuts - Vicinity of Structures:

As discussed in Sub-section 6.1), the height of the approach cuts will vary between 16 and 21 feet. No stability problems are anticipated for cuts of this height with standard 2:1 slopes.

7. MISCELLANEOUS:

The field work was performed during the period of May 10 to May 27 and also from June 7 to June 15, 1971, under the supervision of Mr. V. Korlu, Project Foundation Engineer.

Equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd., Toronto.

The investigation was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed this report.

September, 1971.

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords 877,642 N. 976,215 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 10 & 17, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE

 Power Auger (Penndrill) - Washboring, BX Rock Core
 Dynamic Cone Penetration Test Bx Casing

CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLER NUMBER	TYPE	BLOWS/FOOT	ELEV. FEET	DYNAMIC PENETRATION RESISTANCE BLOWS - FOOT					LIQUID LIMIT - W PLASTIC LIMIT - W WATER CONTENT - W			BANK DENSITY	REMARK
						20	40	60	80	100	10	20	30		
526.4	Ground level														
	Clayey silt with traces of sand and gravel.	1	SS	24											524.0
		2	SS	62	520										W.L. in open B.H.
		3	SS	69											4 32 41 23
	Very stiff to hard.	4	SS	40											May 17/71
		5	SS	57	510										
		6	SS	57											
		7	SS	85											
		8	SS	114/6"	500										
493.4		9	SS	44											
33.0		10	SS	171/6"	490										8 25 65 2
	Sandy silt, trace of gravel.	11	SS	130/5"											
	Very dense.				480										
475.2		12	SS	175/9"											
51.2	Bedrock.	BX	20%												
	Weathered shale.	13	RC	Rec.	470										
465.9	Sound	BX	75%												
		14	RC	Rec.											
60.5	End of borehole.				460										

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 71-11038 LOCATION Co-Ords 877,675 N. 976,325 E.

ORIGINATED BY V.K.

W.P. 273-65 BORING DATE May 12, 1971

COMPILED BY H.S.

DATUM Geodetic BOREHOLE TYPE Power Auger (Penndrill)
Dynamic Cone Penetration Test.

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. NO.	NUMBER	TYPE		20	40	60	80	100	W _p	W _L		
531.5	Ground level.													
	Clayey silt with traces of sand and gravel.		1	SS	37									
			2	SS	21									
			3	SS	113									
	Very stiff to hard.		4	SS	49									
			5	SS	51									
			6	SS	40									
			7	SS	65									
			8	SS	98									
			9	SS	140									
			10	SS	41									
491.5			11	SS	238/9"									
40.0	Silty sand.													
	Very dense.													
480.0			12	SS	150/4"									
51.5	End of borehole.													

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-11038 LOCATION Co-Ords 877,620 N. 976,470 E. ORIGINATED BY V.E.
W.P. 273-65 BORING DATE May 10, 1971 COMPILED BY H.S.
DATUM Geodetic BOREHOLE TYPE Washboring - NX, BK Casing
Dynamic Cone Penetration Test. CHECKED BY

SOIL PROFILE		STRAT. PLOT	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		NUMBER	TYPE		20	40	60	80	100	w_0	w_1	w_2		
533.0	Ground level.														
	Clayey silt with some sand and traces of gravel. Very stiff to hard.		1	SS	29										530.8
			2	SS	18										W.L. in open B.H. May 10/71
			3	SS	28										
			4	SS	25										
			5	SS	23										
			6	SS	33										3 62 24 11
			7	SS	26										7 37 39 17
			8	SS	59										
			9	SS	77										
			10	SS	35										
			11	SS	70										
			12	SS	87										
			13	SS	38										
471.5			14	SS	119										
61.5	End of borehole.														

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords 877,735 N. 976,534 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 13, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Pennirill)

CHECKED BY

Dynamic Cone Penetration Test

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT				W _L	W _P
							20	40				
SHEAR STRENGTH P.S.F.							WATER CONTENT %		P.C.F. GR. SA. SI. CL.			
○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE							W ₂ W ₁					
							10 20 30					
533.0	Ground level.											
	Clayey silt with some sand and traces of gravel. Very stiff to hard.		1	SS	41	530					527.7 W.L. in open B.H. May 13/71 7 30 43 20	
			2	SS	37							
			3	SS	60							
			4	SS	30	520						
			5	SS	40							
			6	SS	29							
			7	SS	35	510						
			8	SS	63							
			9	SS	91							
			10	SS	51	500						
			11	SS	144	490						
			12	SS	100/5"							
			13	SS	146	480						
			14	SS	175/6"	470						
464.3	Fragments of shale.		15	SS	450/14"	460						
68.7	End of borehole.											

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 71-1103R

LOCATION Co-Ords 877,701 N. 976,658 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 13 & 14, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Washboring - NX, BX Casing

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH PSF ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT — w _L PLASTIC LIMIT — w _P WATER CONTENT — w _c w _p — w _L — w _c WATER CONTENT % 10 20 30	BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER TYPE BLOWS / FOOT						
537.5	Ground level.								
	Clayey silt with some sand & traces of gravel.		1 SS 14	530					534.2
			2 SS 16						W.L. in
			3 SS 13						open B.H.
			4 SS 32						May 14/71
	Stiff to hard.		5 SS 25	520					9 21 53 17
			6 SS 14						4 22 51 23
			7 SS 15						
			8 SS 40	510					
			9 SS 54						
			10 SS 52	500					
			11 SS 60						
			12 SS 25	490					
			13 SS 92						
			14 SS 100/4"	480					
467.5			15 BX RC	470					
70.0	Weathered.		16 BX-RC 63%						
461.2	Bedrock - Shale Sand.		17 BX RC 100% Rec						
76.3	End of borehole.			460					

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords 877,814 N. 976,716 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 14, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill)
Dynamic Cone Penetration Test.

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT 20 40 60 80 100	RESISTANCE	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w	BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT						
533.7	Ground level.									
	Clayey silt with some sand and traces of gravel.	1	SS	25	530					531.5
		2	SS	25						5 47 43 5
		3	SS	40						
		4	SS	59	520					
	Very stiff to hard.	5	SS	30						
		6	SS	22						
		7	SS	27	510					3 32 41 24
		8	SS	28						
		9	SS	100/6"	500					
		10	SS	200/5"						9 34 47 10
		11	SS	200/5"						
		12	SS	136	490					
483.7		13	SS	124	480					
50.0	Silty sand with trace of gravel.									
	Very dense.									
472.2		14	SS	200/2"						6 45 39 8
61.5	End of borehole.				470					

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords 877,762N... 976,837 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 18, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill)

CHECKED BY

Dynamic Cone Penetration Test

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	PLASTIC LIMIT — w_p	WATER CONTENT — w		
537.9	Ground level.								
	Clayey silt with traces of sand & gravel.	1	SS	10					
		2	SS	38					
		3	SS	56					
		4	SS	39					
		5	SS	37					
		6	SS	18					
		7	SS	14					
		8	SS	24					
		9	SS	57					
	Silty sand with gra. & trace of cl. v. dense.	10	SS	105					
		11	SS	100/2"					
		12	SS	300/5"					
		13	SS	200/6"					
		14	SS	86					
476.4		15	SS	213					
61.5	End of borehole.								

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,882 N. 976,878 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 18 & 19, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill) - Washboring-BK Rock Core
Dynamic Cone Penetration Test.

CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION : RESISTANCE					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT 20 40 60 80 100					SHEAR STRENGTH P.S.F.					WATER CONTENT % 10 20 30
												O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB. VANE					
534.8	Ground level.																
	Clayey silt with some sand and traces of gravel. Stiff to hard.		1	SS	31	530									▽ 531.0 W.L. in open B.H. May 18/71 h 29 h6 21 h 37 h6 13		
			2	SS	55												
			3	SS	33												
			4	SS	21												
			5	SS	22	520											
			6	SS	20												
			7	SS	18												
			8	SS	20	510											
			9	SS	14												
			10	SS	100/5"	500											
			11	SS	100/1"												
	Silt. Very dense.		12	SS	150/6"	490											
			13	SS	26												
			14	SS	84	480											
			15	SS	180/6"												
467.8	Boulders		16	BK RC	20% Rec.	470											
67.0	Bedrock - Sound Shale		17	BK RC	100% Rec.												
462.3																	
72.5	End of borehole.					460											

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,812 N. 977,019 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 20, 21, 24 and 25, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Washboring - NX, BX Casing - BX Rock Core

CHECKED BY

Dynamic Cone Penetration Test.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT --- W _L PLASTIC LIMIT --- W _P WATER CONTENT --- W _c			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	W _L	W _P	W _c		
536.5	Ground level.														
	Clayey silt with some sand & traces of gravel. Stiff to hard.	1	SS	27											
		2	SS	30	530										
		3	SS	22											
		4	SS	12											
		5	SS	14	520										
		6	SS	21											
		7	SS	26											
		8	SS	15	510										
		9	SS	21											
	Silty sand.	10	SS	41	500										
		11	SS	132/6"											
		12	SS	100/3"	490										
		13	SS	124/6"											
		14	SS	107	480										
	Sandy gravel.	15	SS	170											
		16	SS	157	470										
466.5															
70.0	Bedrock - Sound	17	BX	Rec.											
461.0	Shale			RC 90%											
		18	BX-RC	100%											
75.5	End of borehole.				460										

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,914 N. 976,985 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE May 20 & 26, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill) - Washboring-BX Casing

CHECKED BY

Dynamic Cone Penetration Test

BX Rock Core

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT				LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W _c			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	10	20	30	
535.6	Ground level.													
	Clayey silt with some sand & traces of gravel.	1	SS	33	530									532.9
		2	SS	30										W.L. 4in
		3	SS	37										open B.H.
		4	SS	61										May 26/71
	Very stiff to hard.	5	SS	38	520									
		6	SS	26										
		7	SS	39										5 43 42 10
		8	SS	35	510									
		9	SS	24										
		10	SS	24 1/2	500									
	Gravelly sand with trace of fines.	11	SS	300/5"										41 46 (13)
		12	SS	100/1"	490									
		13	SS	87										
		14	SS	98	480									19 26 36 19
		15	SS	200/10"										
469.6		16	SS	100/5"	470									
46.0	Bedrock - Shale Weathered	17	BX RC	Rec. 44%										
	Sound	18	BX RC	Rec. 100%	460									
459.7														
76.1	End of borehole.													
					450									

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,837 N. 977,127 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE June 14 & 15, 1971

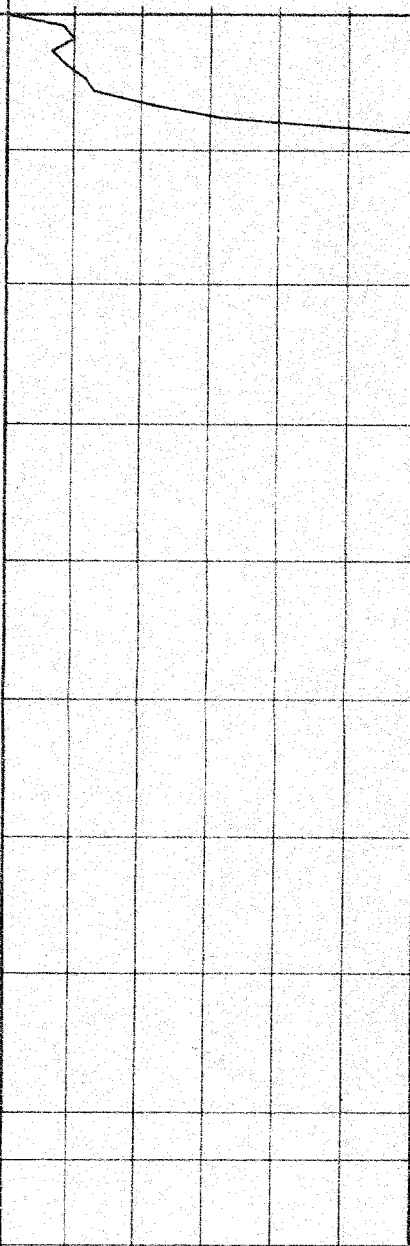
COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penn-drill) - Washboring - BX Casing
Dynamic Cone Penetration Test.

BX Rock Core

CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		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.		WATER CONTENT %														
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE			w_p — w — w_L											
539.8	Ground level.																						
	Clayey silt to silty clay with some sand and traces of gravel. Very stiff to hard.		1	SS	37	530						P.C.F. GR. SA. ST. CL.	536.3 3 25 51 21 W.L. in open B.H. June 14/71										
			2	SS	39																		
			3	SS	63																		
			4	SS	29																		
			5	SS	16	520																	
			6	SS	33																		
			7	SS	31																		
			8	SS	23																		
			9	SS	23	510																	
			10	SS	27																		
			11	SS	68																		
	Clayey silt to silt with some sand and traces of gravel.		12	SS	100/4"	490																	
			13	SS	220/6"																		
	Silty sa. with trace of clay & gravel.		14	SS	37	480																	
			15	SS	165/10"																		
			16	SS	145/2"	470																	
			17	SS	100/1 1/2"																		
464.7	Bedrock - Shale Sound.		18	SS	266/1 1/2"	460																	
75.1			19	BX-RC	100%																		
456.5			20	BX RC	Rec. 460 100%																		
83.3	End of borehole.					450																	

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 13

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,911 N. 977,113 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE June 10 & 11, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE

Power Auger (Penndrill)
Dynamic Cone Penetration Test.

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ	REMARKS		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	SHEAR STRENGTH P.S.F.					WATER CONTENT %					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE					w_p ——— w ——— w_L				
537.7	Ground level.												10 20 30			P.C. 9	GR SA SI CL
531.7	Clayey silt with some gra. & traces of sa. Firm.		1	SS	7												
6.0	Silty sand with traces of gravel.		2	SS	40												8 81 (11)
526.7	Loose to dense.		3	SS	9	530											5 85 (10)
11.0	Clayey silt to silt with some sand and traces of gravel.		4	SS	24												526.7
			5	SS	24												W.L. in
			6	SS	35	520											open B.H.
			7	SS	44												June 11/71
			8	SS	54												
			9	SS	25	510											
			10	SS	22												
			11	SS	133	500											
			12	SS	200/6"												
			13	SS	120/6"	490											
			14	SS	81												
			15	SS	126	480											
471.2			16	SS	106/3"												
66.5	End of borehole.					470											

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,947 N. 977,106 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE July 9 & 10, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill)
Dynamic Cone Penetration Test.

CHECKED BY

SOIL PROFILE		STRAT. PLOT	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		NUMBER	TYPE	BLOWS / FOOT		20	40	60	80			100
						SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE							
536.5	Ground level.												
	Clayey silt with some sand and traces of gravel. Very stiff to hard.		1	SS	26								
			2	SS	30	530							1 20 53 26
			3	SS	26								
			4	SS	24								∇ 524.5
			5	SS	17								
			6	SS	16	520							
			7	SS	28								W.L. in open B.H.
			8	SS	31	510							July 10/71
			9	SS	29								
			10	SS	19	500							
	Clayey silt to silt, with some sand and traces of gravel. Hard or very dense.		11	SS	100/6"								
			12	SS	275/6"	490							7 39 45 9
			13	SS	220/6"								
			14	SS	77	480							9 43 43 5
			15	SS	63								
471.4			16	SS	300/1"								
65.1	End of borehole.					470							

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 15

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 877,845 N. 977,215 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE June 7, 8 & 9, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill) - Washboring - BX Casing
Dynamic Cone Penetration TestCHECKED BY
BX Rock Core

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	RESISTANCE	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w		
543.7	Ground level.						20 40 60 80 100				
						SHEAR STRENGTH P.S.F.		WATER CONTENT %			
						○ UNCONFINED + FIELD VANE		w_p ——— w_L			
						● QUICK TRIAXIAL x LAB. VANE		10 20 30			
	Clayey silt with some sand and traces of gravel.	1	SS	19	540						1 8 46 45
		2	SS	49							532.7
	(Random layers of silt and sand and with traces of clay)	3	SS	58							W.L. in
		4	SS	61							open B.H.
		5	SS	70	530						June 9/71
		6	SS	31							
		7	SS	32							
		8	SS	36	520						
	Very stiff to hard.	9	SS	20							6 22 62 10
		10	SS	54	510						
		11	SS	41							
		12	SS	150/11"	500						7 49 33 11
		13	SS	100/6"							
		14	SS	100/4"	490						
		15	SS	58							
		16	SS	52	480						
		17	SS	100/3"							
468.7		18	SS	100/4"	470						
75.0	Bedrock - Shale Weathered.	19	BX RC	Rec. 10%							
		20	BX RC	Rec. 46%							
455.9	Sound.	21	BX RC	Rec. 100%	460						
87.8	End of borehole.				450						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 16

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 977,968 N. 977,185 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE June 9, 10 & 11, 1971

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill) - Washboring - BX Casing
Dynamic Cone Penetration Test BX Rock Core

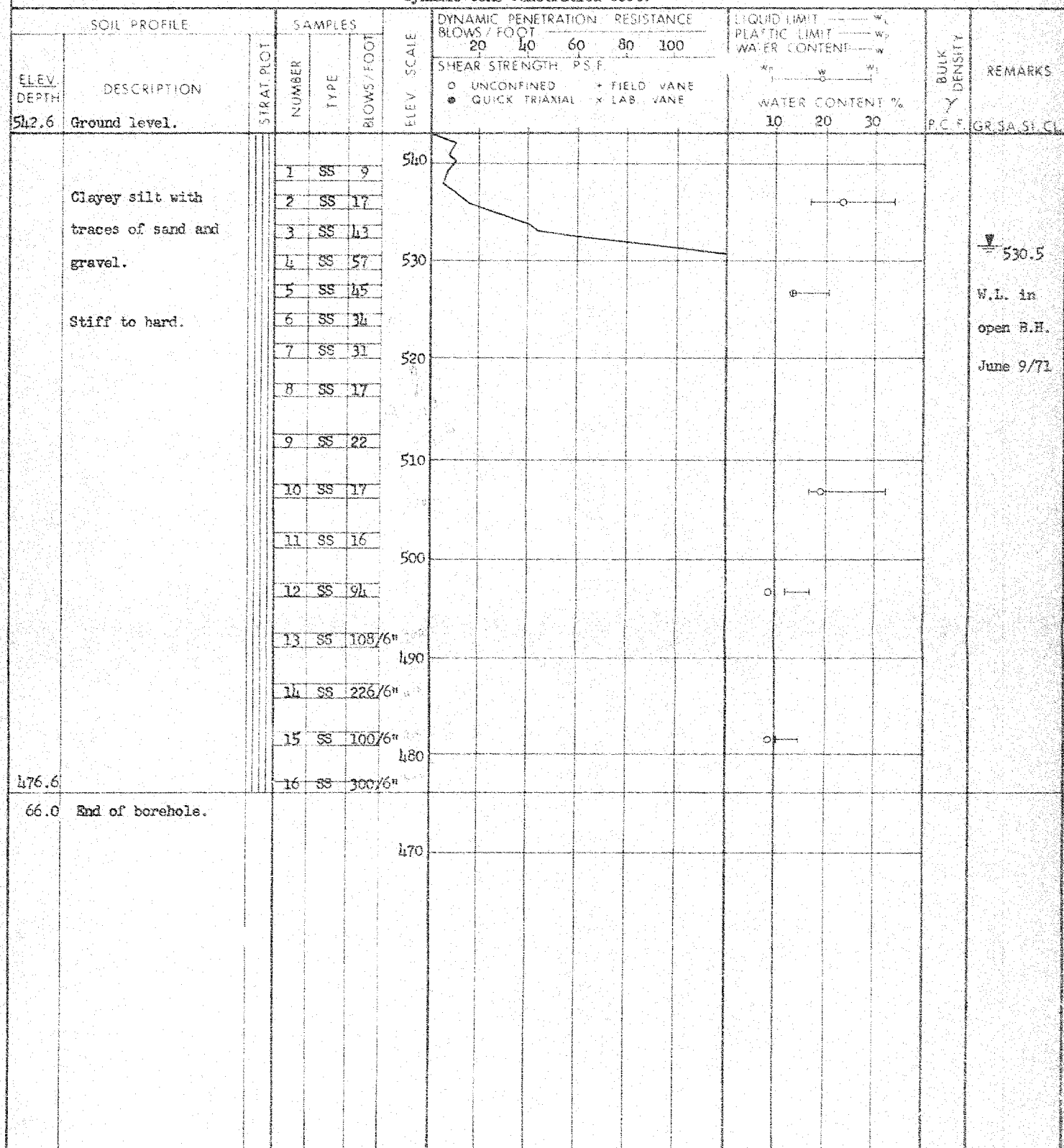
CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAIGHT	SAMPLES		BLOW/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS
			NUMBER	TYPE			20	40	60	80	100	W _L	W _P	W		
542.5	Ground level.															
	Clayey silt with some sand and traces of gravel.		1	SS	16	540										
			2	SS	40											
			3	SS	56											
			4	SS	50	530										
	Very stiff to hard.		5	SS	42											
	(Random layers of silt and sand with traces of clay)		6	SS	24											
			7	SS	19	520										
			8	SS	43											
	Very stiff to hard.		9	SS	41											
			10	SS	32	510										
			11	SS	37											
			12	SS	116	500										
			13	SS	200 1/4"											
			14	SS	153	490										
			15	SS	125 5/8"											
			16	SS	100 1/4"	480										
473.5			17	SS	150 1/4"											
69.0	Bedrock - Shale Weathered.		18	RC-BXL	42%	470										
			19	RC Rec.												
			20	RC	100%											
			21	RC Rec.												
			22	BXL	100%	460										
456.0	Sound.															
86.5	End of borehole.					450										

DEPARTMENT OF HIGHWAYS - ONTARIO		RECORD OF BOREHOLE No. 17		FOUNDATION SECTION	
MATERIALS & TESTING OFFICE					
JOB 71-11038	LOCATION Co-Ords. 877,995 N. 977,292 E.	ORIGINATED BY V.K.			
W.P. 273-65	BORING DATE June 7, 1971	COMPILED BY H.S.			
DATUM Geodetic	BOREHOLE TYPE Power Auger (Penndrill)	CHECKED BY			
Dynamic Cone Penetration Test.					

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	BLOWS / FOOT	WATER CONTENT %	WATER CONTENT %		
541.9	Ground level.										
	Clayey silt with some sand and traces of gravel. Stiff to hard.		1	SS	16						
			2	SS	34						
			3	SS	52						
			4	SS	48						
			5	SS	12						
			6	SS	20						
			7	SS	17						
			8	SS	19						
			9	SS	20						
			10	SS	24						
			11	SS	20						
			12	SS	200/6"						
485.4											
56.5	End of borehole.										

DEPARTMENT OF HIGHWAYS - ONTARIO		RECORD OF BOREHOLE No. 18		FOUNDATION SECTION
MATERIALS & TESTING OFFICE				
JOB 71-11038	LOCATION Co-Ords. 878,012 N. 977,417 E.	ORIGINATED BY V.K.		
WP 273-65	BORING DATE June 8 & 9, 1971	COMPILED BY H.S.		
DATUM Geodetic	BOREHOLE TYPE Power Auger (Permdrill)	CHECKED BY		
		Dynamic Cone Penetration Test.		



DEPARTMENT OF HIGHWAYS- ONTARIO
 MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 19

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-Ords. 878,035 N. 977,537 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE June 7, 1971

COMPILED BY H.S.

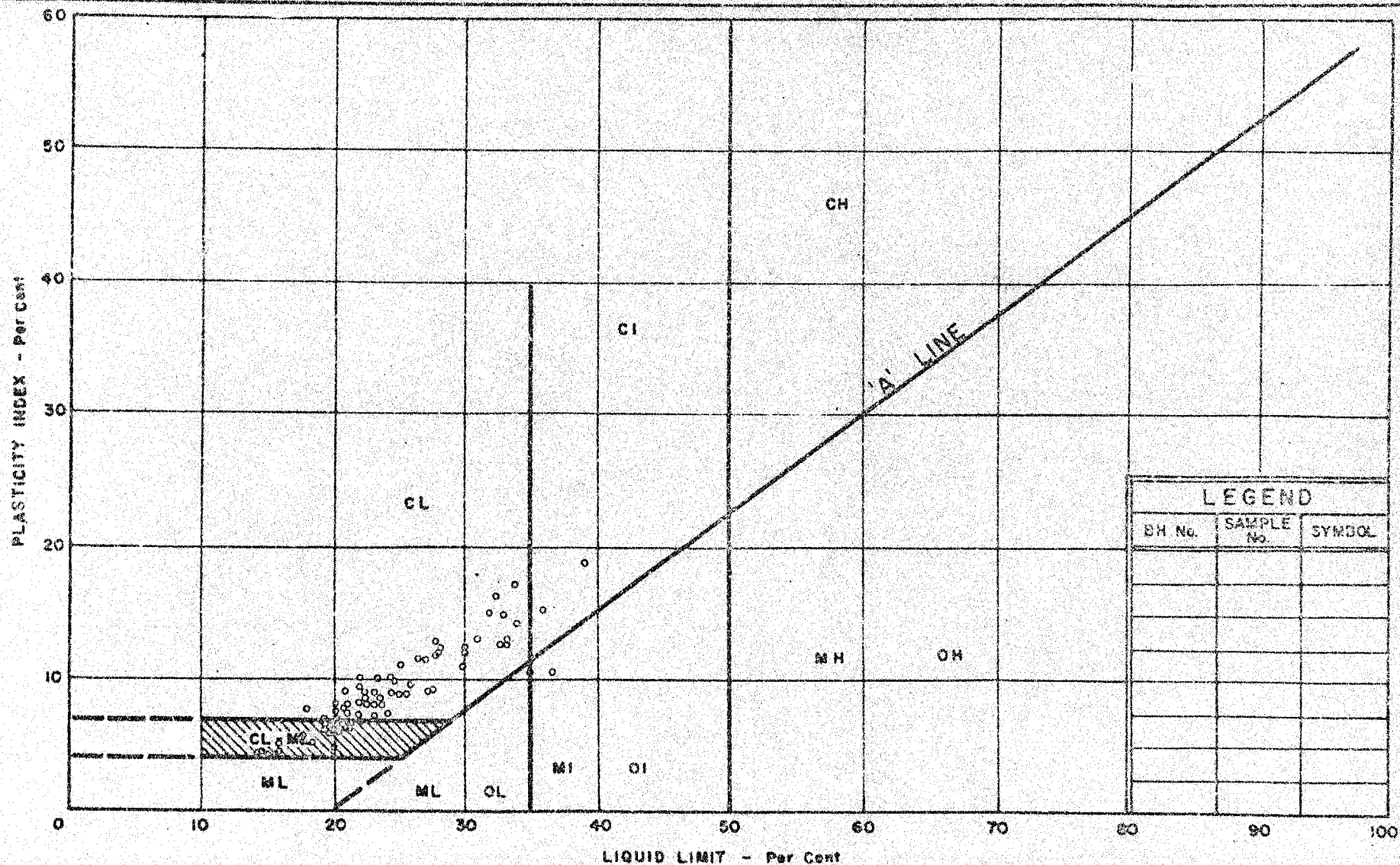
DATUM Geodetic

BOREHOLE TYPE Power Auger (Penndrill)

CHECKED BY

Dynamic Cone Penetration Test.

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 ₁ W ₂ ——— W ₃ WATER CONTENT % 10 20 30	BULK DENSITY Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER TYPE					
543.4	Ground level.							
	Clayey silt with some sand and traces of gravel. Very stiff to hard.		1 SS 16	540				
			2 SS 18					
			3 SS 62					
			4 SS 33	530				
			5 SS 28					
			6 SS 22					
			7 SS 18	520				
			8 SS 22					
			9 SS 19	510				
			10 SS 17					
			11 SS 16	500				
			12 SS 73					
			13 SS 100/6"	490				
			14 SS 100/4"					
			15 SS 250/3"					
			16 SS 150/6"	480				
			17 SS 100/4"					
467.4			18 SS 100/5"	470				
76.0	End of borehole.			460				



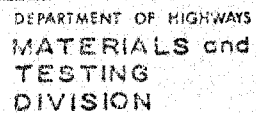
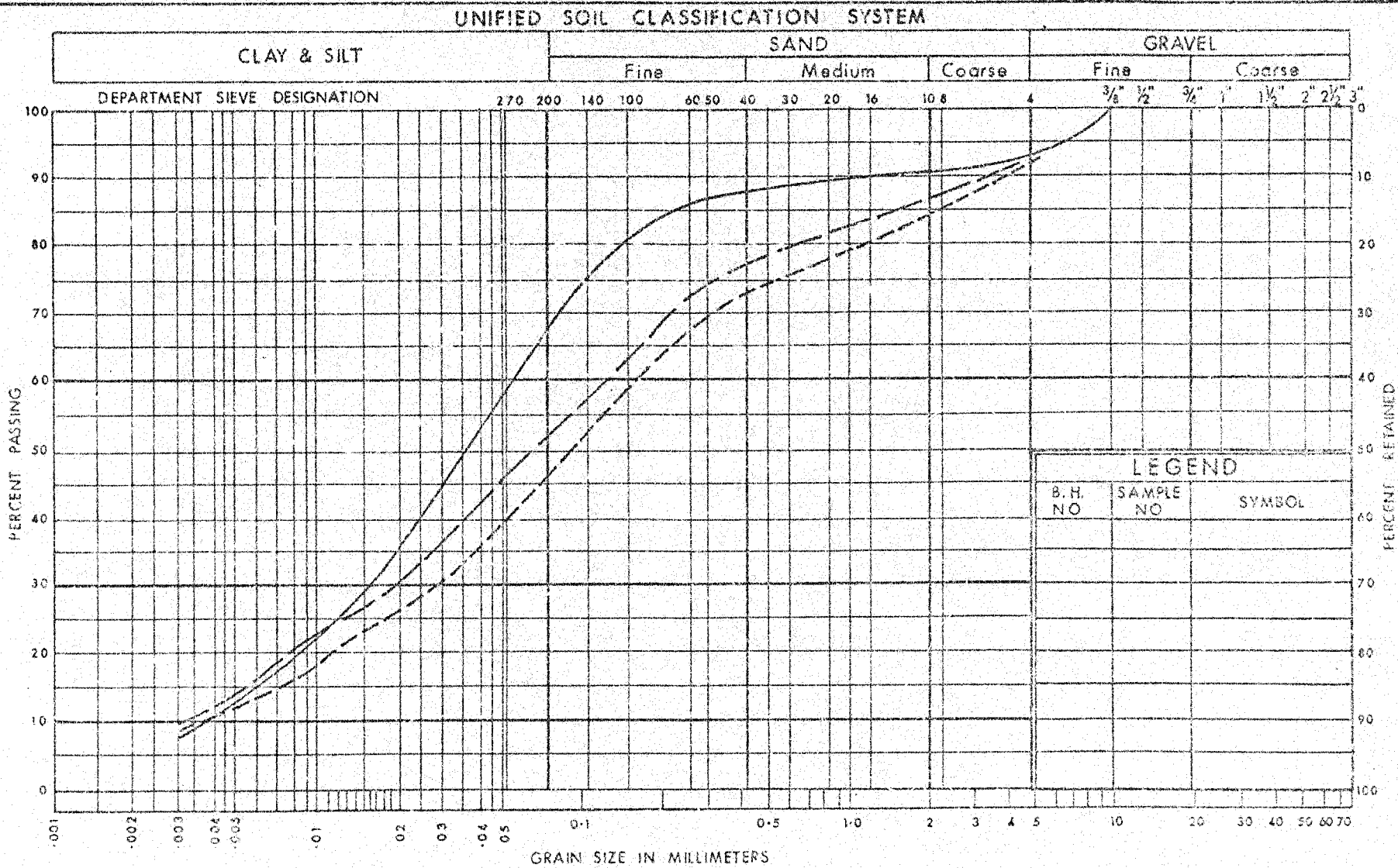
DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART CLAYEY SILT

WP No. 273-65

JOB No. 71-11038

FIG No 2



GRAIN SIZE DISTRIBUTION
SANDY SILT TO SILTY SAND

JOB No. 71-11038

FIG. No 3

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

TO: Mr. G.C.E. Burkhardt, FROM: Foundations Office,
Regional Structural Planning Engineer, Design Services Branch,
Central Region, Downsview, Ontario.
90 Floral Parkway.

ATTENTION: DATE: June 6, 1972.

OUR FILE REF.

IN REPLY TO

JUN 9 1972

SUBJECT: The Proposed Structures
(Bridges #5 and #9)
And Related Retaining Walls
(R-4, R-5, R-6, R-7) at the
Crossing of Belfield Expressway and
Hwy. #27 & Cityview Drive
District No. 6 (Toronto)
W.O. 71-11038 - W.P. 273-65

Foundation investigation for the above-mentioned structures and retaining walls was conducted by this Office during May, 1971, based on the information supplied by Regional Structural Location Section. A detailed Report W.O. 71-11038 containing all the factual information, together with recommendations pertaining to the foundation of the structures and retaining walls and stability considerations of the approach cuts, was submitted by this Office on September 9, 1971.

Since the submission of our Foundation Report W.O. 71-11038, minor changes of the alignment of the Belfield Expressway (Hwy. #409) were made and a revised Drawing (#271-325), showing the new data was submitted to this Office by Deleuw, Cather Ltd., Consulting Engineers on January 25, 1972. As a result of the review of this drawing, it was concluded that no additional investigation will be necessary for the structure foundations (Hwy. #27 and Hwy. #409), since our original borings cover the general area of the proposed footing locations. The same conclusions have been drawn with regard to retaining walls No. R-6 and R-7. The only area which may require additional borings will be at the location of retaining walls R-4 and R-5. In order to supplement additional information at these retaining wall locations, 4 additional boreholes were carried out by this Office during February, 1972. In addition, one more borehole (B.H. #23) was put down for the pier location of the Cityview Drive structure (Bridge #9).

June 6, 1972

The recent investigation revealed similar subsoil conditions to those encountered in the original investigation. Based on these conditions it is concluded that the recommendations contained in our Foundation Report W.O. 71-11038 will be applicable, taking into account the recent revisions. The enclosed additional borehole log sheets and the revised drawing (71-11038A), together with this memo, should be included with our Foundation Report.

Should you require any further information with regard to this project, please feel free to contact this Office.

MD/ht
Attach.


M. Devata
SUPERVISING FOUNDATIONS ENGINEER

c.c. B.R. Davis
H. Greenland
A. Rutka
D.W. Farren
P.J. Harvey
G.A. Wrong
B.J. Giroux
T.J. Kovich
B.A. Singh
Deleuw, Cather Ltd. (R.Barr)

Foundations Files ✓
Documents

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 20

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords. 878,044 N. 977,466 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE March 16, 1972.

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Pen Drill)

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT 20 40 60 80 100	RESISTANCE SHEAR STRENGTH P.S.F. 400 800 1200 1600 2000	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE						
542.8	Ground level.									
0.0	Clayey silt with some sand & trace of gravel.		1	SS	10					
	Occ. layer of silty clay.		2	SS	11					
	Stiff to hard.		3	SS	28					
	Brown		4	SS	45					
	Grey.		5	SS	40					
			6	SS	28					
			7	SS	17					
			8	SS	14					
			9	SS	16					
			10	SS	14					
			11	SS	14					
			12	SS	100/3"					
481.3			13	SS	100/5"					
61.5	End of borehole.									

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 21

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords. 877,928 N. 977,498 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE March 15, 1972.

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penn Drill)

CHECKED BY *SO*

SOIL PROFILE		STRAT. PLOT	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		NUMBER	TYPE		20	40	60	80			100	400	800	1200	1600	2000	WATER CONTENT % 20 40 60
543.6	Ground level.																	
0.0	Silty sand with gravel Fill.																	
538.6			1	SS	37													
5.0	Clayey silt with some sand & trace of gravel		2	SS	67													
	Occ. layer of silty clay. Stiff to hard. (Brown)		3	SS	87													
	(Grey)		4	SS	62													
			5	SS	20													
			6	SS	37													
			7	SS	18													
			8	SS	16													
			9	SS	16													
			10	SS	17													
			11	SS	12													
			12	SS	102 7/8"													
			13	SS	118													
473.0			14	SS	109 1/2"													
70.6	End of borehole.																	

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 22

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords 877,924 N. 977,363 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE March 16, 1972.

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Penn Drill)

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT		BLOWS/FOOT	RESISTANCE	WATER CONTENT — w	WATER CONTENT %		
543.6	Ground level.										
0.0	Clayey silt to silt with some sand & gravel. Fill.	1	SS	11	540						
536.6		2	SS	30							
7.0	Clayey silt with some sand & gravel. Very stiff to hard. Brown.	3	SS	25							
		4	SS	60							
		5	SS	27							
		6	SS	35							
		7	SS	30							
		8	SS	26							
		9	SS	21							
		10	SS	31							
		11	SS	16							
495.6					500						
48.0	Silty sand with some gravel. Trace of clay. Very dense.	12	SS	100/6"	490						
488.5		13	SS	100/1"							
55.1	End of borehole.				480						

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 23

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords. 877,923 N. 977,168 E.

ORIGINATED BY V.K.

W.P. 273-65

BORING DATE March 20, 1972

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Pen Drill)

CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT — w_p					
							SHEAR STRENGTH P.S.F.					WATER CONTENT — w					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					WATER CONTENT %					
						400	800	1200	1600	2000	20	40	60	P.C.F.	GR. SA. SI. CL.		
542.8	Ground level.																
0.0	Clayey silt with some sand & trace of gravel. Occ. layer of silty clay. Stiff to hard. Brown ----- Grey		1	SS	18												
			2	SS	38												
			3	SS	35												
			4	SS	51												
			5	SS	27												
			6	SS	15												
			7	SS	24												
			8	SS	28												
			9	SS	29												
			10	SS	35												
			11	SS	38												
			12	SS	100/4"												
			13	SS	77												
474.8																	
68.0	Silty sand with traces of clay & gravel. Very dense.		14	SS	100/6"												
462.3			15	SS	100/4"												
80.5	End of borehole.																

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 24

FOUNDATION SECTION

JOB 71-11038

LOCATION Co-ords. 877,995 N. 977,229 E.

ORIGINATED BY V.K.

W.P. 273-65


BORING DATE March 17, 1972.

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Power Auger (Pen Drill)

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. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ⊗ QUICK TRIAXIAL x LAB. VANE									
							400	800	1200	1600	2000	20	40	60		
542.1	Ground level.															
0.0	Clayey silt with some sand & gravel. (Occ. layer of silty clay)		1	SS	19											0 16 59 25
	Very stiff to hard.		2	SS	31											
	Brown.		3	SS	45											W.L. 535.0
			4	SS	32											4 29 51 16
			5	SS	28											
	Grey		6	SS	21											
			7	SS	20											
			8	SS	18											
			9	SS	31											
			10	SS	22											
			11	SS	24											
497.1																
45.0	Clayey silt to silt with some sand & gravel.		12	SS	100/6"											
	Very dense.		13	SS	90											
	Grey.		14	SS	100/4"											32 38 26 4
469.1																
73.0	Weathered Shale.															
461.9			15	SS	100/2"											
50.2	End of borehole.															

Retaining Walls # 4B, R.N # 6 and R.N # 7
W.O. 71-11038 H.P. 27365

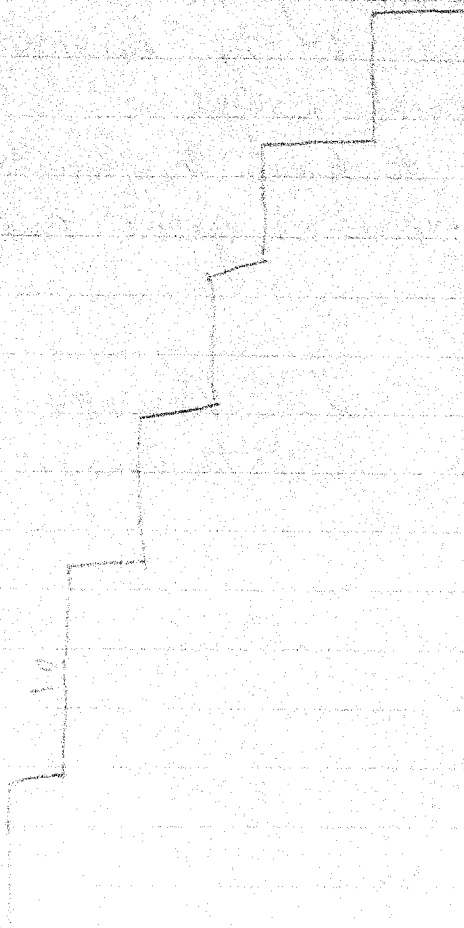
Mr. L. VanBodegom contacted A. C. Stormer on 25th June/73 regarding some factual information pertaining to soil anchors for the above mentioned retaining walls. The following information was given to him by the writer on the same day by the writer.

- 1) The subsoil is cohesive hard glacial till deposit.
- 2) The ground water line shown on the borehole log as well as on the topographical profile.
- 3) It will extremely difficult to assess the bonding strength ~~and the~~ between the expanded grout and soil without doing a field test.

M. Devata
25th June/73

C R. P

M. L



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building, DOWNSVIEW.

ATTENTION:

DATE: October 27, 1972

OUR FILE REF.

IN REPLY TO

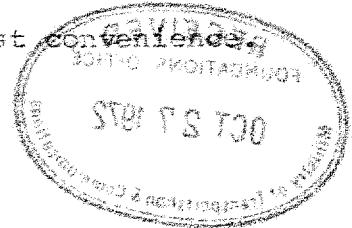
SUBJECT:

Retaining Walls No. 4B, 5B, 7, & 13B,
W.P. #218-65-07, Site #37,
Hwy. #409, District #6.

71-11-036
-038

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

Kindly give us your comments at your earliest convenience.



W. Lin

W. Lin,
Regional Structural Design Engineer,

CSG:dp
Attach.

FOR: C. S. Grebski,
Structural Design Engineer.

cc. Foundation Office.

No comment
C.P. Dec 5/72

DWG. No. 71-11036 B
Finalized 18 May 73

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building, DOWNSVIEW.

ATTENTION:

DATE: October 13, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Retaining Walls,
#1's 6, 8, 15B & 18,
W.P.#218-65-07, Site #37,
Hwy. #409, District #6.

71-11-036-271-65
038-01213-65
J. K. [unclear]

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

Kindly give us your comments at your earliest convenience.



CSG:dp
Attach.

C. S. Grebski,
Structural Design Engineer.

cc. Foundation Office.

No comments

C.P. Dec 8/72

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building, DOWNSVIEW.

ATTENTION:

DATE: September 22, 1972

OUR FILE REF.

IN REPLY TO

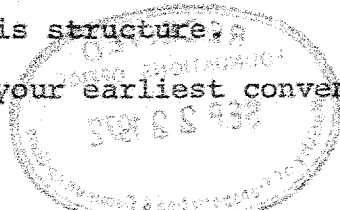
SUBJECT:

City View Drive Underpass,
Bridge #9,
? W.P. #272-65, Site #37-977,
Hwy. #409, District #6.

71-11-038

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

Kindly give us your comments at your earliest convenience.



C. S. Grebski

C. S. Grebski,
Structural Design Engineer.

CSG:dp
Attach.

cc. Foundation Office.

No comments -
M. A. ...
Oct 2/72

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, West Building.

FROM: Structural Office,
West Building, DOWNSVIEW.

ATTENTION:

DATE: September 20, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Hwy. #27 Underpass, Bridge #5,
W.P. #273-65, Site #37-967,
Hwy. #409, District #6.

71-11-038

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

Kindly give us your comments at your earliest
convenience.

CSG:dp
Attach.

C. S. Grebski,
Structural Design Engineer.

cc. Foundation Office.

No comments
for - Downata
Oct 2/72

Copy to B.O.
2 Mylars for each structure
19 Dec 72 JHL

Department of Highways Ontario

Copy for the information of

A. Stermac

G. Burkhardt,
Reg. Bridge Planning Engineer,
90 Floral Parkway.

Structural Office,
West Bldg., Downsview.

April 24, 1972.

71-11-038

Re: Highway 27 Underpass (Bridge #5),
W.P. 273-65, Site 37-967,
Hwy. No. 409, District #6,

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-37-967-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$280,000.00, which includes tender, materials, engineering and sundry construction.

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

C.S. Grebski,
Structural Design Engineer.

CSG:sr
Attach.

C.C. A. McKim
B. Davis
A. Stermac (2)
J. Anderson
E. Fitzgibbon

No comments

11/5/72
M.D.
15/5/72

MEMORANDUM

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

ATTENTION:

OUR FILE REF.

FROM: G. C. E. Burkhardt,
Bridge Planning Section,
Central Building.

DATE: May 7, 1971.

IN REPLY TO

SUBJECT: Hwy. 27 Underpass,
Site 37-967, W.P. 273-65,
C.N.R. Subways,
Site 37-966, W.P. 271-65,
Area Retaining Walls,
Belfield Expressway,
District 6.

71-11038 ✓

71-11036

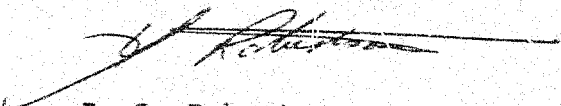
The attached marked up print #271-065 details the approximate location of the proposed footings for the above detailed structures. Also enclosed are prints taken from the Functional Planning Report showing the proposed grade.

Due to the tight schedule on this project field reconnaissance reports are not available at this time but will be forwarded in the near future.

It is noted that the E.B. lanes may be reduced from three to two which will result in a 12' northerly shift for walls etc. on the E.B. direction only. We would appreciate foundation coverage for this possibility.

Would you kindly arrange to have a foundation investigation of sufficient magnitude to allow the Bridge Office to proceed with the structure design.

JSR:lc
Attach.


J. S. Robertson,
REG. BRIDGE PLANNING SUPERVISOR,
for:
G. C. E. Burkhardt,
REG. BRIDGE PLANNING ENGINEER.

c.c. R. Fitzgibbon
R. Strain

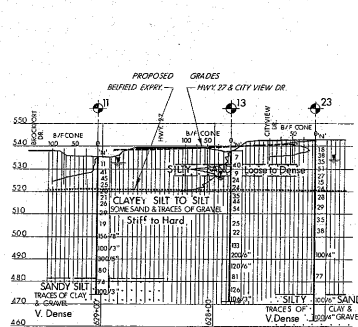
CONT. 73-20

BR. #5 + #9,

BELFIELD +

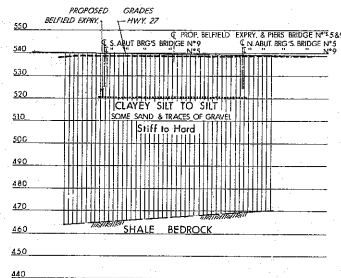
HWY. 27

30M11-58



Q PROFILE - PROP. BELFIELD EXPY.

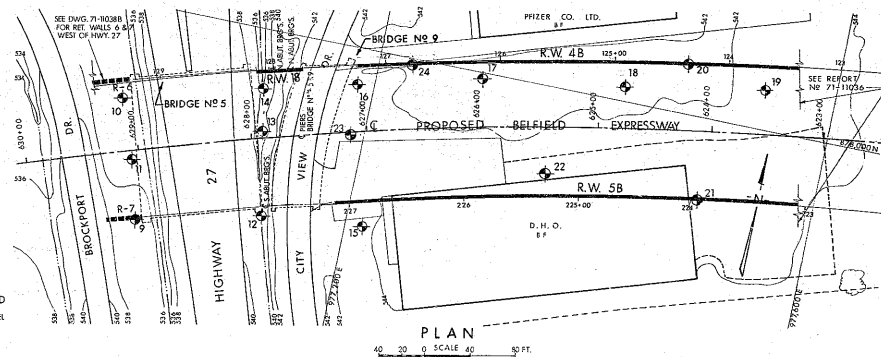
NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.



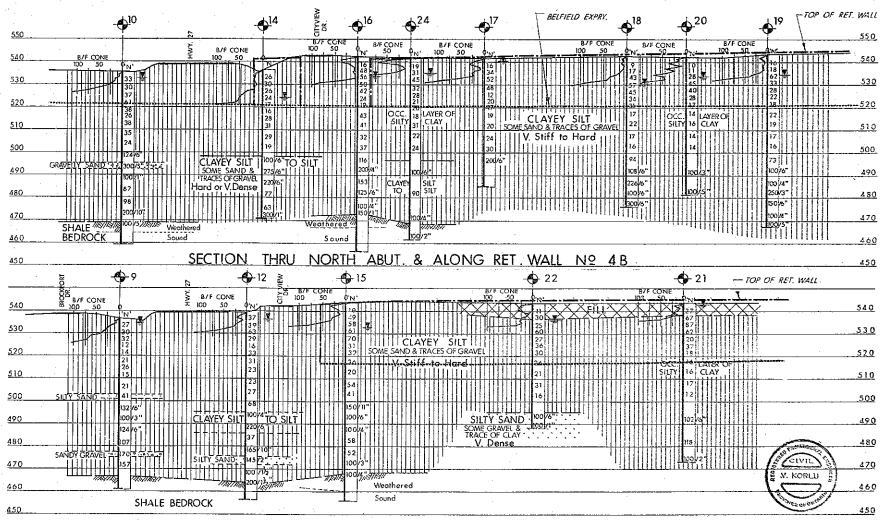
Q PROFILE - HWY. 27

PROFILES & SECTIONS

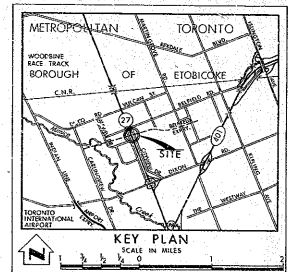
VERT. SCALE 10 20 40 FT.
HORIZ. SCALE 20 40 80 FT.



PLAN



SECTION THRU. SOUTH ABUT. & ALONG RET. WALL NO 5B



LEGEND

- ◆ Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, JUNE 1971 & MAR. 1972

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
9	53.6-5	877,812	977,019
10	53.5-6	877,914	976,985
11	53.5-5	877,863	977,105
12	53.9-0	877,837	971,127
13	53.7-7	877,911	977,113
14	53.6-5	877,947	977,106
15	54.3-7	877,845	977,212
16	54.2-5	877,948	977,185
17	54.1-9	877,995	977,292
18	54.2-6	878,012	977,417
19	54.3-4	878,035	977,537
20	54.2-8	878,044	977,546
21	54.3-6	877,928	977,496
22	54.3-6	877,924	977,363
23	54.2-8	877,923	977,188
24	54.2-1	877,995	977,229

NO.	DATE	BY	DESCRIPTION
1	MAY 27 1971	K. W. W. Z. P.	ADJUSTED
2	MAY 27 1971	K. W. W. Z. P.	ADJUSTED TO S.W.
3	MAY 27 1971	K. W. W. Z. P.	ADJUSTED TO S.W.

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH - FOUNDATION OFFICE

HWY 27 & RETAINING WALLS 4B, 5B & 18 (BRIDGES NO. 5 & 9)

HIGHWAY NO. BELFIELD EXPRESSWAY DIST. NO. 6
CO. YORK METROPOLITAN TORONTO
TWP. ETOBICOKE LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBNO. V.K. CHECKED BY W.R. NO. 313-23-07 DRAWING NO.
BRANN S.O. CHECKED BY JOB NO. 71-11038 71-11038 A
DATE 26 JULY 1971 SITE NO. BRIDGE DRAWING NO.
APPROVED BY CONE NO.
PREPARED BY

