

For

The Proposed Storm Sewer

along Hwy. 410 (Station 430 + 00 to Station 470 + 00)

Town of Brampton, County of Peel

District 6 (Toronto)

W.O. 73-11115

W.P. 134-73-01

1. INTRODUCTION:

The Soil Mechanics Section was requested to carry out a sub-surface investigation for the proposed Storm Sewer at Hwy. 410 and Hwy. 7 intersection, Town of Brampton, County of Peel. The request was contained in a memo from Materials and Testing Office, Central Region dated February 4, 1974. Subsequently, an investigation was carried out by this office to determine the subsoil, bedrock and groundwater conditions in this area.

This report contains the results of the investigation together with our recommendations pertaining to the design and the installation of the proposed sewer.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located along the existing Heart Lake Road at the Hwy. 7 intersection, about 1.5 miles east of Brampton city. The surrounding terrain is flat to undulating and is being developed into industrial area.

Physiographically, the site is situated in the region known as "Peel Plain." The characteristic deposit in the vicinity of the area under investigation is composed of a cohesive glacial till. Deposits of silt and sand are often found interbedded within the till.

3.

FIELD AND LABORATORY WORK:

Twenty two boreholes were put down during the course of field investigation. The borings were advanced by a Muskeg Vehicle-Mounted continuous flight auger machine (commercially known as C.M.E. 55) adapted for soil sampling purposes. At required depths samples were taken by driving the 2" O.D. split spoon sampler according to the specifications of the Standard Penetration Test.

Groundwater level observations were carried out during the period of the investigation, in the open boreholes. The subsoil and groundwater conditions encountered at the boring locations are presented in the Record of Borehole Sheets. The alignment of the proposed storm sewer as well as the borehole locations and elevations were established in the field by District 6 personnel. All elevations in this report are referred to a Geodetic datum. Boring locations and elevations, together with an estimated stratigraphical profile along the alignment of the storm sewer are shown on Drawing No. 73-11115A.

All samples were subjected to careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory tests were carried out on selected representative samples to determine the physical properties of the various soil types encountered; namely:

Natural Moisture Content

Atterberg Limits

Grain Size Distributions

The results of this testing are plotted on the Record of Borehole Sheets and summarized on Figures 1 to 7 inclusive, all contained in the appendix of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant stratum at the site is a heterogeneous deposit of clayey silt, sand and gravel (Glacial Till). This glacial deposit is generally overlain by a granular deposit consisting of silt and/or sand. Fill material up to 21 feet (6.4 m) thick was found at ground surface between station 435 + 00 and station 460 + 00. The overburden is followed by limestone bedrock which was proven at three boring locations (B.H.'s #1, #4 and #19).

The boundaries of the various deposits as determined in the boreholes are shown on the Record of Borehole sheets. The stratigraphical sections as shown on Drawing No. 73-11115A have been inferred from this data. From ground surface downward, the various soil types and bedrock encountered are described as follows:

4.2) Fill Material:

Soil investigations along the proposed Sewer line revealed the presence of fill material at ground surface in two sections as described below:

A.) Station 435 + 00 to 442 + 00 (B.H.'s 1, 5, 6, 7 and 8):

In this section the thickness of the fill material encountered varied from 5 feet (1.5 m) (B.H. #1) to 13 feet (4.0 m) (B.H. #8).

Atterberg limit tests were carried out on the samples obtained in this deposit. The results of these tests, which are plotted on the Record of Borehole sheets and the Plasticity Chart (Figure 2), are summarized as below:

		<u>Range</u>	<u>Average</u>
Liquid Limit	(W <sub>l</sub> )%	38-44	41
Plastic Limit	(W <sub>p</sub> )%	22-27	25
Natural Moisture Content (W)%		19-27	23

The material in the deposit consists of silty clay, with some sand and traces of gravel and organics. The consistency ranges from stiff to very stiff.

B.) Station 448 + 00 to 460 + 00 (B.H. 12, 13, 14, 15 and 16):

In this section the thickness of the fill material encountered varies from 13.5 feet (4.1 m) (B.H. #12) to 21 feet (6.4 m) (B.H. #15).

Atterberg limit tests were carried out on the samples obtained in the fill material. The results of these tests which are plotted on the Record of Borehole sheets and the Plasticity Chart (Figure 3), are summarized as below:

		<u>Range</u>	<u>Average</u>
Liquid Limit	(W <sub>L</sub> )%	23-40	32
Plastic Limit	(W <sub>P</sub> )%	15-24	20
Natural Moisture Content	(W) %	11-21	16

Based on the above values the fill material in this section is estimated as clayey silt of low plasticity. The grain size distribution is presented on Figure 5. The "N" values obtained from Standard Penetration Tests, range from 9 to 64 blows per foot, indicating that the consistency of this deposit varies from stiff to hard.

4.3) Granular Deposit - Silt to Silty Sand with occasional gravel:

Granular deposits of silt to silty sand with occasional gravel were encountered at the site mostly interbedded in the glacial till layer. However, in boreholes No. 20 and 21 the granular deposit extended down to the end of boring.

Grain size distribution tests were carried out on samples obtained in this material. The results, in the form of grain size distribution curves, are plotted in an envelope form on Figure 7.

Standard Penetration Tests were carried out within this deposit. The "N" values range from 30 to in excess of 100 blows per foot indicating

that this granular deposit has a relative density of dense to very dense.

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

This is the predominant stratum which was encountered immediately below the ground surface or directly under the fill material or the granular deposit where they exist. At B.H.'s #20 and #21, this glacial deposit was not encountered as the borings terminated within the granular deposit. The thickness of this glacial deposit ranges from 9.5 feet (2.9 m) (B.H. #1) to 30 feet (9.2 m) (B.H. #17).

Atterberg limit tests were performed on the samples obtained in this stratum. The results, which are plotted on the Record of Borehole sheets and the Plasticity Chart (Figure 1) are summarized as below:

		<u>Range</u>	<u>Average</u>
Liquid Limit	(W <sub>L</sub> )%	17-35	26
Plastic Limit	(W <sub>p</sub> )%	12-23	18
Natural Moisture Content	(W)%	5-20	13

Based on the above values it can be inferred that the glacial till is inorganic and of low plasticity. The grain size distribution is presented on Figure 6. The "N" values, obtained from Standard Penetration Tests, range from 46 to over one hundred blows per foot, indicating that the consistency of the glacial till is hard.

4.5) Limestone Bedrock:

Bedrock was proven at B.H.'s #1, #4 and #19 by obtaining up to 6 feet of EXL size rock core samples. The bedrock is mainly composed of limestone. At B.H. #1, the upper 1.5 feet (0.5 m) of the bedrock is however shale. The bedrock is generally in a sound condition, as indicated

by the high percentage of core recovery.

The bedrock surface as determined in the boring locations are as follows:

B.H. # 1      Elevation 683.4

B.H. # 4      Elevation 583.7

B.H. #19      Elevation 679.0

5.      GROUNDWATER CONDITIONS:

Groundwater level observations were carried out by recording the water level in the open boreholes during the period of soil investigation. These observations have been recorded on the Record of Borehole Sheets and summarized on Drawing No. 73-11115A. These measurements in the open boreholes indicate that the groundwater level at the site ranges from 2 feet (0.6 m) (B.H. #17) to 26.5 feet (8.1 m) (B.H. #15) below the existing ground surface.

6      DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a storm sewer extending north, south just east of the existing Heart Lake Road or along the proposed new Hwy. 410 at the vicinity of Hwy. 7, about 1.5 miles (2.4 km.) east of the Town of Brampton in the County of Peel. The total length of this sewer is estimated to be about 4,470' (1,360 m). The size of the sewer will be 60 inches (150 cm) in diameter.

The invert of the proposed sewer will vary from elevation 705 to 680. At these grades, the sewer will be located from 8 feet (B.H. #1) to 36 feet (11.0 m) (B.H. #16) below the existing ground surface. The excavations for the sewer will extend well below the observed groundwater level.

The predominant stratum across the site is an extensive deposit of cohesive glacial till interbedded with occasional layers of silty sand and sections of entire silty sand deposits.

It is believed that most of the sewer construction will be carried out by open cut methods. However, where the sewer crosses the existing Hwy. 7, a tunnelling operation may be employed.

6.2) Sewer Construction by Open Cut Method:

Temporary cuts of the maximum depth of about 36 feet (11.0 m) in this area will be inherently stable against a deep-seated rotational type of failure, provided the temporary slopes are no steeper than 1:1. However, if due to space restriction, slopes steeper than that quoted above or vertical cuts are used, the excavation should be properly shored.

Over the majority of the area under consideration the sewer will be located within the relatively impervious, cohesive glacial till type subsoil. Numerous sand pockets are present within this zone of the glacial till. If the bottom of the excavations intersect such granular pockets "boiling" may occur at the base of the trench. It is recommended that this isolated granular pockets at the base of the excavation be completely removed and backfilled with either granular 'A' or mass concrete.

As mentioned elsewhere, the groundwater level established during the field investigation is well above the bottom of the excavation. No major dewatering problems are anticipated, in view of the impervious nature of the glacial till. However, where the sides of the excavation intercept the water bearing granular layers within or above the glacial till, groundwater seepage into the excavation and local sloughing of the slopes are anticipated. This is particularly true between station 438 + 00 and station 445 + 00. The local sloughings, however, can be overcome as they occur, either

by flattening the affected slopes, or by shoring. The groundwater seepage may be handled by pumping from sumps.

Between stations 460 + 00 and 470 + 00 the sewer will be located within the relatively pervious granular portion of the glacial till deposit. In order to prevent "boiling" of the trench base due to unbalanced hydrostatic head, and to achieve dry safe working conditions, the hydrostatic pressures within the granular stratum must be lowered to at least 2 feet below the trench base of the sewer, and must be maintained at this level until backfilling of the sewer trench is completed. This will ensure that the foundation subsoil and the bedding material is not loosened by seeping or ponding water prior to installation of the sewer. A dewatering scheme incorporating steel sheet piling at this site may be impractical in view of the very dense relative density of the subsoil. Therefore, it will be beneficial to employ a dewatering scheme utilizing a vacuum well or wellpoint system. As such, the subgrade of the excavation can be dewatered and stabilized.

The performance of the sewer pipes will depend to a great extent on the type and quality of the bedding used. It is essential that the bedding be placed and compacted under dry conditions. It is recommended that the pipe bedding on this project adhere to standards currently used by the Ministry, specifically for Class "B" bedding on yielding foundations (Standard No. DD-823). Particular attention should be paid to the compaction and shaping of the bedding material. Backfill for the sewer excavations should comply with Standard No. DD-813-B currently used by the Ministry.

6.3) Sewer Construction by Tunnelling through the  
Overburden - (Station 461 + 20 to 465 + 40):

Between the above mentioned stations the sewer will be located beneath the existing Hwy. 7. The sewer in this section is to be installed using tunnelling methods.



Where sewers are constructed by tunnelling through the overburden, it will be necessary to lower the water level below the tunnel base, or to construct the tunnel by using air pressure greater than the prevailing hydrostatic pressure to achieve safe working conditions. In case the use of air pressure is contemplated, the contractors would be responsible for determining the air pressure to be used and also for preventing any leakage of air through the boreholes, that have been drilled at the site, insofar as it affects their operation.

#### 6.4) Other Considerations:

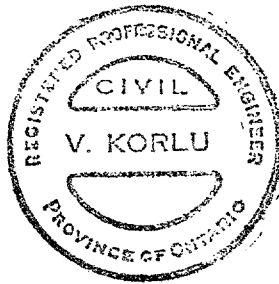
Comments relating to the dewatering which have been identified elsewhere in this report, are based on the assumptions that the groundwater conditions determined during the field investigation, will apply during construction. These assumptions cannot be ruled out. It will, however, be the responsibility of the contractor to determine the conditions which prevail during construction, and to take such steps as are necessary to ensure dry, safe working conditions. It is believed that, if the sewer is constructed continuously from the outfall end, drainage in the critical zone will occur, this could alleviate the dewatering problems considerably. Permanent drainage of the sewer trench into the various manholes should be provided using at each manhole, a short length of 6" diameter perforated pipe surrounded with suitable filter material which discharges directly into the manhole.

#### 7. MISCELLANEOUS:

The field investigation was carried out during the period of February 18 to March 6, 1974 under the supervision of Mr. V. Korlu, Project Engineer, who also prepared this report.

The drilling equipment was owned and operated by P.V.K. and Sons of Burford.

This project was carried out under the general supervision of Mr. M. Devata, Supervising Engineer, who also reviewed this Report.



*V. Korlu*  
V. Korlu, P. Eng.  
Project Engineer.

*M. Devata*  
M. Devata, P. Eng.  
Supervising Engineer.

VK/sh

April 9, 1974.

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 1

JOB 73-11115

LOCATION Co-ords. 15,878,405 N, 939,560 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 6, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E.-55

CHECKED BY *[Signature]*

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT ——— $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE ft./m	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 10 20 30
m 212.7	697.9	Ground Level									
0.0	0.0	Silty clay, traces of sand and gravel									
211.2	592.9	Fill Material Stiff		1	SS	9					
1.5	5.0	Het. mix. of clayey silt, sand and gravel (Glacial Till)		2	SS	150/	690 210.3				
208.3	683.4	Brown Hard shale		3	SS	162/	1"				
4.4	14.5	limestone		4	SS	162/					
207.1	679.4	Bedrock sound		5	BXL	100% Rec.	680 207.1				
5.6	18.5	End of Borehole									
							670 201.2				

OFFICE REPORT ON SOIL EXPLORATION

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# RECORD OF BOREHOLE NO 2

JOB 73-11115

LOCATION Co-ords. 15,878,270 N., 939,410 E.

ORIGINATED BY V.K.

W.P. 13h-73-01

BORING DATE March 5, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARK
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		$w_p$ — $w$ — $w_L$ WATER CONTENT % 10 20 30			
212.9 0.0	Ground Level										
0.0	Het. mix. of clayey silt, sand and gravel (Glacial Till)		1	SS	70						w.l. 691.0 210.6 26.58
	Brown		2	SS	68						
	Hard		3	SS	100						
208.6 4.3	End of Borehole		4	SS	100						
					680 207.3						

OFFICE REPORT ON SOIL EXPLORATION

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# RECORD OF BOREHOLE NO 3

JOB 73-11115

LOCATION Co-ords. 15,876,321 N., 939,221 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 5, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. M	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH m	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	RECS/M FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			WATER CONTENT % 10 20 30				
211.5	693.8	Ground Level												
0.0	0.0	Het. mix. of clayey silt, sand and gravel		1	SS	1007	690					○		w.l. 689.0
		(Glacial Till) Brown		2	SS	1148	210.3							210.3
		Hard		3	SS	1067	"					○	—	30 13 37 20
208.0	682.2	End of Borehole					680							
3.5	11.6						207.3							

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FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 4

JOB 73-11115

LOCATION Co-ords. 15,878,465 N., 939,087 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 5, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECK BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	DEPT. ft.		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 10 20 30				
m														
211.9	695.2	Ground Level												
0.0	0.0	Het. mix. of clayey silt, sand and gravel (Glacial Till)		1	SS	46	690							
		Brown-Grey		2	SS	106	210.3							
208.4	683.7	Hard		3	SS	100	71"							
3.5	11.5	Limestone		4	BXL	100	Rec							
207.5	680.7	Bedrock Sound												
4.4	14.5	End of Borehole					207.3							

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 5

JOB 73-11115

LOCATION Co-ords. 15,878,608 N, 938,950 E

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 5, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. 55

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$ WATER CONTENT % 10      20      30			BULK DENSITY $\gamma$ P.C.F.	REMARKS	
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE ft./m	SHEAR STRENGTH P.S.F. ○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL      x LAB VANE							
705.4	Ground Level													
0.0	Silty clay with some sand and traces of gravel and organics Fill Material		1	SS	12	700								
695.4	Stiff		2	SS	11	213.4								
10.0	Brown Grey Het. mix. of clayey silt, sand and gravel (Glacial Till)		3	SS	100/3"	690								
			4	SS	100/3"	210.3								
682.6	Hard		5	SS	100/3"									
22.8	End of Borehole					680								
						207.3								

OFFICE REPORT ON SOIL EXPLORATION

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FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 6

JOB 73-11115  
W.P. 134-73-01  
DATUM Geodetic

LOCATION Co-ords. 15,878,750 N, 938,808 E  
BORING DATE March 4, 1974  
BOREHOLE TYPE Auger and sample with C.M.E. 55

ORIGINATED BY V.K.  
COMPILED BY V.K.  
CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$ $w_p$ — $w$ — $w_L$				BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 10 20 30 40					
m 216.9 0.0	711.7 0.0	Ground Level				710									GR. SA. SI. CL.	
		Silty clay and some sand and traces of gravel and organics	1	SS	14	216.4										
		Fill Material	2	SS	14										0 16 57 27	
213.5	700.7	Stiff				700									w.l. 701.3 (213.8)	
3.4	11.0	Het. Mix. of clayey silt, sand and gravel	3	SS	81	213.4									23 13 40 24	
		Brown Grey	4	SS	135	2"										
		(Glacial Till)	5	SS	100	690										
208.51	683.9	Hard	6	SS	100	210.3									0 32 46 22	
8.39	27.8	End of Borehole				680										
						207.3										

OFFICE REPORT ON SOIL EXPLORATION



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FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 7

JOB 73-11115

LOCATION Co-ords. 15,878,896 N., 938,665 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 4, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft./m	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		BLOWS/FOOT (C.S.M.)	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT % $w_p$ $w$ $w_L$ 10 20 30		
217.2	712.7	Ground Level									
0.0	0.0	Silty clay with some sand and traces of gravel and organics Fill Material		1	SS	13	710				
							216.4				
213.8	701.7	Stiff to Very Stiff		2	SS	21					0 17 52 31
3.4	11.0	Silt with some sand and traces of gravel and clay-slightly plastic Brown Very Dense		3	SS	62	700				w.l. 701.2
							213.4				213.7
211.6	694.2	Het. mix. of clayey silt, sand and gravel (Glacial Till)		4	SS	100/6"	690				5 32 58 5
5.6	18.5	Hard		5	SS	100/6"	690				
							210.3				14 16 52 18
208.7	684.9	End of Borehole		6	SS	100/6"	680				
8.5	27.8						207.3				

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 8

JOB 73-11115

LOCATION Co-ords. 15,879,034 N., 938,527 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 1, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. / m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — W <sub>L</sub> PLASTIC LIMIT — W <sub>P</sub> WATER CONTENT — W <sub>P</sub> — W — W <sub>L</sub>			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH m	DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
217.3	712.8	Ground Level													
0.0	0.0	Silty clay with some sand and traces of gravel and organics		1	SS	11	710								
		Fill Material		2	SS	11	216.4								
		Stiff					700								
213.3	699.8			3	SS	89	213.4								
4.0	13.0	Silt with some sand and traces of gravel and clay, slightly plastic		4	SS	142	11"								
211.7	694.3	Brown Very Dense					690								
5.6	18.5	Het. mix. of clayey silt, sand and gravel (Glacial Till)		5	SS	100	210.3								
		Grey Hard		6	SS	100	6"								
203.8	684.8														
8.5	28.0	End of Borehole													
							680								
							207.3								

OFFICE REPORT ON OIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 9

JOB 73-11115

LOCATION Co-ords. 15,879,180 N., 938,390 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE March 1, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY *[Signature]*

		SOIL PROFILE		SAMPLES		ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (U.S.)		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		$w_p$ — $w$ — $w_L$ WATER CONTENT % 10 20 30			
215.1	705.8	Ground Level										
0.0	0.0	Silt with some sand and traces of gravel and clay very dense		1	SS	152						3 35 58 h
213.6	700.8											▼ w.l. = 699.8 213.3
1.5	5.0	Brown Grey Het. mix. of clayey silt, sand and gravel (Glacial Till)		2	SS	143						29 18 38 15
				3	SS	100	3"					
				4	SS	100	5"					
		Hard										
208.1	682.8			5	SS	100	4"					
7.0	23.0	End of Borehole					680 207.3					

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 10

JOB 73-11115

LOCATION Co-ords. 15,879,320 N., 938,251 E.

W.P. 134-73-01

BORING DATE March 1, 1974

ORIGINATED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

COMPILED BY V.K.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH m ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT $10.3 \frac{m}{ft}$		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE			WATER CONTENT % 10 20 30				
215.6 0.0	Ground Level													
207.2 8.5	Het. mix. of clayey silt, sand and		1	SS	78	700								w.l. 700.7 213.6 50 26 (22)
	Brown Grey gravel (Glacial Till)		2	SS	100	5213.1								2 26 57 15
			3	SS	100	5"								
	Hard		4	SS	172	110.3								
			5	SS	100	3"								
207.1 8.5	End of Borehole		6	SS	100	680								
						670								
						204.2								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 11

JOB 73-11115

LOCATION Co-ords. 15,879,464 N., 938,110 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 28, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY         

SOIL PROFILE		SAMPLES			ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % $w_p$ — $w$ — $w_L$				
216.0 0.0	708.8 0.0	Ground Level												
		Het.mix. of clayey sand and	1	SS	105									
			2	SS	100	200								
		Brown Grey	3	SS	100	213.4								
		Gravel (Glacial Till)	4	SS	100	690								
		Hard				210.3								
207.6 8.4	681.3 27.5	End of Borehole				680 207.3								
		</												

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 12

JOB 73-11115

LOCATION Co-ords. 15,879,608 N., 937,980 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 28, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with G.H.E. - 55

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							$\circ$ UNCONFINED $\bullet$ QUICK TRIAXIAL	+ FIELD VANE $\times$ LAB VANE		$w_p$	$w$	$w_L$		
220.6 0.0	723.7 0.0	Ground Level												
216.5 4.1	710.2 13.5	Clayey silt with some sand and traces of gravel and organics Fill Material	1	SS	28	720								0 28 54 18
			2	SS	9	219.5								
213.6 7.0	700.7 23.0	Stiff to Very Stiff Het. Mix. of clayey silt, sand and gravel (Glacial Till) Grey Hard	3	SS	25	710								w.l. 708.1 215.8 8 25 42 24
			4	SS	100	11"	216.4							
		End of Borehole	5	SS	100	6"								
						213.4								

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

# RECORD OF BOREHOLE NO 13

FOUNDATIONS OFFICE

JOB 73-11115

LOCATION Co-ords. 15,879,749 N., 937,833 E.

W.P. 134-73-01

BORING DATE February 28, 1974

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

ORIGINATED BY V.K.

COMPILED BY V.K.

CHECKED BY Lo

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT $w_L$		BULK DENSITY	REMARKS
ELEV. $\frac{m}{ft}$	DEPTH $\frac{m}{ft}$	DESCRIPTION	NUMBER	TYPE	STRAIT. PLOT	BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT $w_p$	WATER CONTENT $w$		
221.2	0.0	Ground Level									
217.1	4.1	Clayey silt with some sand and traces of gravel Fill Material	1	SS	28	720					
			2	SS	26	219.5					
217.1	13.5	Very Stiff	3	SS	30	710					
213.6	7.6	Ret. mix. of clayey silt, sand and gravel (Glacial Till)	4	SS	104	216.1					
213.6	25.0	Grey Hard	5	SS	100	700					
		End of Borehole				213.1					

OFFICE REPORT SOIL EXPLORATION

ORIGINATED BY V.K.

COMPILED BY V.K.

CHECKED BY                     

15  $\overset{20}{\underset{10}{\circ}}$  5 % STRAIN AT FAILURE



DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 15

JOB 73-11115

LOCATION Co-ords. 15,880,037 N., 937,560 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 26, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft./m	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 10 20 30				
222.1 0.0	Ground Level													
215.7 6.4	Clayey silt with some sand and traces of gravel and organics Fill Material		1	SS	25									
			2	SS	36	720								
						219.5								
			3	SS	26									
			4	SS	25	710								
211.7 6.4	Very Stiff to Hard					216.4								
	Het. Mix. of clayey silt, sand and gravel (Glacial Till)		5	SS	100	5"								
			6	SS	100	700								0 30 45 25 w.l. 702.3 214.1
						213.4								
211.7 10.4	Grey Hard		7	SS	112									9 12 54 25
	End of Borehole													
						690								
						210.3								

OFFICE REPORT ON OIL EXPLORATION

LOCATION Co-ords. 15,880,179 N., 937,420 E.

ORIGINATED BY V.K.

BORING DATE February 26, 1974

COMPILED BY V.K.

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY                     

15  $\frac{20}{10}$  5 % STRAIN AT FAILURE

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 17

JOB 73-11115

LOCATION Co-ords. 15,880,322 N., 937,280 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 19, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT $w_L$	PLASTIC LIMIT $w_p$	WATER CONTENT $w$	BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS/FOOT	SHEAR STRENGTH P.S.F.		WATER CONTENT %		
							$\circ$ UNCONFINED + FIELD VANE $\bullet$ QUICK TRIAXIAL x LAB VANE	$w_p$ $w$ $w_L$	10 20 30		
218.4 0.0	Ground Level										GR. SA. SI. CL
216.4	Het. Mix. of clayey silt, Brown Grey		1	SS	81	710 216.4					W.L. 714.4 217.8
	sand and gravel (Glacial Till)		2	SS	74						55 13 23 9
			3	SS	100/2900	213.4					
	Hard		4	SS	100/5"						
			5	SS	100/690	210.3					
209.2 9.2	End of Borehole		6	SS	100/2"						25 35 28 12
						380 207.3					

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 17

JOB 73-11115

LOCATION Co-ords. 15,880,322 N., 937,280 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 19, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY LS

SOIL PROFILE			SAMPLES			ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT — $w$ $w_p$ — $w$ — $w_L$ WATER CONTENT % 10 20 30			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
m 218.1 0.0	716.1 0.0	Ground Level												
		Het. Mix. of clayey silt, Brown Grey		1	SS	81	710							
				2	SS	74	216.4							
		sand and gravel (Glacial Till)		3	SS	100/2700	213.4							
		Hard		4	SS	100/5"								
				5	SS	100/690	210.3							
209.2	686.2			6	SS	100/4"								
9.2	30.2	End of Borehole												
							680 207.3							

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 18

JOB 73-11115

LOCATION Co-ords. 15,880,469 N., 937,146 E.

ORIGINATED BY V.K.

W.P. 131-73-01

BORING DATE February 18, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			$W_P$ — $W$ — $W_L$ 10 20 30			P.C.F.	GR. SA. SI. C.
219.3	719.4	Ground Level												
0.0	0.0	Clayey silt with some sand Brown												716.4 218.4
217.2	712.4	Hard	1	SS	75									0 27 58 1
2.1	7.0	Silt with traces of fine sand	2	SS	45	710								0 3 96
		Sand, traces of silt	3	SS	61	216.4								
		Grey	4	SS	110									0 90 ( 10
		Very Dense	5	SS	103	700								
			6	SS	116	213.4								
210.8	691.4		7	SS	100	3"								
8.5	28.0	Est. Mix. of clayey silt and sand				690								
209.9	688.4	(glacial till) hard	8	SS	150	210.3								8 14 53 2
9.4	30.7	End of Borehole												
						680								
						207.3								

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH		<b>RECORD OF BOREHOLE NO 19 (B.H. 3-73-11108)</b>		FOUNDATIONS OFFICE	
JOB 73-11115	LOCATION Co-ords. 15,880,616 N., 937,005 E.	ORIGINATED BY V.K.			
W.P. 134-73-01	BORING DATE February 7, 1974	COMPILED BY V.K.			
DATUM Geodetic	BOREHOLE TYPE Auger and sample with C.M.E. - 55	CHECKED BY <i>[Signature]</i>			

SOIL PROFILE			SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							$w_p$	$w$	$w_L$	10	20	30		
724.5	Ground Level													GR. SA. SI. CL.
0.0	Silty sand with traces of gravel (fill) compact		1	SS	10	720								W.L. 722.0 220.1
719.5	Clayey silt with some sand and gravel Brown		2	SS	14	219.5								16 31 38 15
5.0			3	SS	14									
712.5			4	SS	93									0 22 53 25
12.0	Silty sand with occasional layers of silt		5	SS	57	710								
			6	SS	96	216.4								0 5 95 0
			7	SS	119									0 64 ( 36)
			8	SS	142	700								
	Grey		9	SS	46	213.4								
692.5	Very Dense		10	SS	100	690								
32.0	Het. Mix. of clayey silt, sand and gravel (Glacial Till)		11	SS	100	210.3								47 36 ( 17)
		Grey												
679.0	Hard					680								
45.5	Limestone		12	EXL Re	70% Rec.	207.3								
673.0	Sound Bedrock		13	EXL	100%									
51.5	End of Borehole					670								
						204.2								

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 20

JOB 73-11115

LOCATION Co-ords. 15,880,779 N., 936,850 E.

W.P. 134-73-01

BORING DATE February 18, 1974

ORIGINATED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

COMPILED BY V.K.

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	PLASTIC LIMIT	WATER CONTENT		
m	ft.					ft./m					
221.7	727.5										
0.0	0.0										
	Ground Level										
	Sandy silt		1	SS	30	720					
			2	SS	100/5"	219.5					
	Brown Grey		3	SS	104						
			4	SS	100/5"	710					
	to silty sand with		5	SS	100	216.4					
	occasional gravel		6	SS	100/5"						
	and clay		7	SS	72	700					
			8	SS	100/5"	213.4					
			9	SS	100/5"	690					
	Dense to Very Dense		10	SS	100/5"	210.3					
209.4	687.0										
12.3	40.5										
	End of Borehole										
						680					
						207.3					

OFFICE REPORT OF SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 21

JOB 73-11115

LOCATION Co-ords. 15,880,918 N., 936,715 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 18, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY *LB*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____			LIQUID LIMIT _____ PLASTIC LIMIT _____ WATER CONTENT _____			BULK DENSITY  P.C.F.	REMARKS	
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT <small>(60.3 m)</small>	ELEV. SCALE ft./m	SHEAR STRENGTH P.S.F. ○ UNCONFINED    + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE			WATER CONTENT % <small>w<sub>p</sub>      w      w<sub>L</sub></small> 10    20    30				
730.2	Ground Level					720								
0.0	Silt to Sandy					222.5								
	silt with		1	SS	86									14 41 45
	occasional		2	SS	82	720								w.i. 722.7
			3	SS	122	219.5								220.3
			4	SS	119									
			5	SS	122									
			6	SS	104	710								0 19 77 4
						216.4								
	Brown Grey		7	SS	100 1/4"									
	gravel and		8	SS	100 1/4"	700								
	clay					213.4								
			9	SS	100 1/4"									7 11 (19)
689.7	Very Dense		10	SS	100 1/4"	690								
40.5	End of Borehole					210.3								
						680								
						207.3								

OFFICE REPORT SOIL EXPLORATION



DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 22

JOB 73-11115

LOCATION Co-ords. 15,881,060 N., 936,569 E.

ORIGINATED BY V.K.

W.P. 134-73-01

BORING DATE February 18, 1974

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. - 55

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. FT. M	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH ft. m	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT 10, 3, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 155, 160, 165, 170, 175, 180, 185, 190, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270, 275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405, 410, 415, 420, 425, 430, 435, 440, 445, 450, 455, 460, 465, 470, 475, 480, 485, 490, 495, 500, 505, 510, 515, 520, 525, 530, 535, 540, 545, 550, 555, 560, 565, 570, 575, 580, 585, 590, 595, 600, 605, 610, 615, 620, 625, 630, 635, 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690, 695, 700, 705, 710, 715, 720, 725, 730, 735, 740, 745, 750, 755, 760, 765, 770, 775, 780, 785, 790, 795, 800, 805, 810, 815, 820, 825, 830, 835, 840, 845, 850, 855, 860, 865, 870, 875, 880, 885, 890, 895, 900, 905, 910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970, 975, 980, 985, 990, 995, 1000									
220.6 0.0	Ground Level													
213.9 6.7	Sandy silt to silty sand with occasional gravel and seams of clay Very Dense Brown Grey		1	SS	94	720 219.5								719.6 219.3 22 35 39 1
			2	SS	55									
			3	SS	153	710 216.4								0 62 ( 38)
			4	SS	166	11"								0 4 ( 96)
			5	SS	100	4"								0 9 81 10
			6	SS	59									
			7	SS	92	700 213.4								0 5 71 24
			8	SS	50									
			9	SS	124									0 2 80 18
			10	SS	100	4"	690 210.3							
			11	SS	100	4"								
208.3 12.3	End of Borehole					680 207.3								

OFFICE REPORT SOIL EXPLORATION

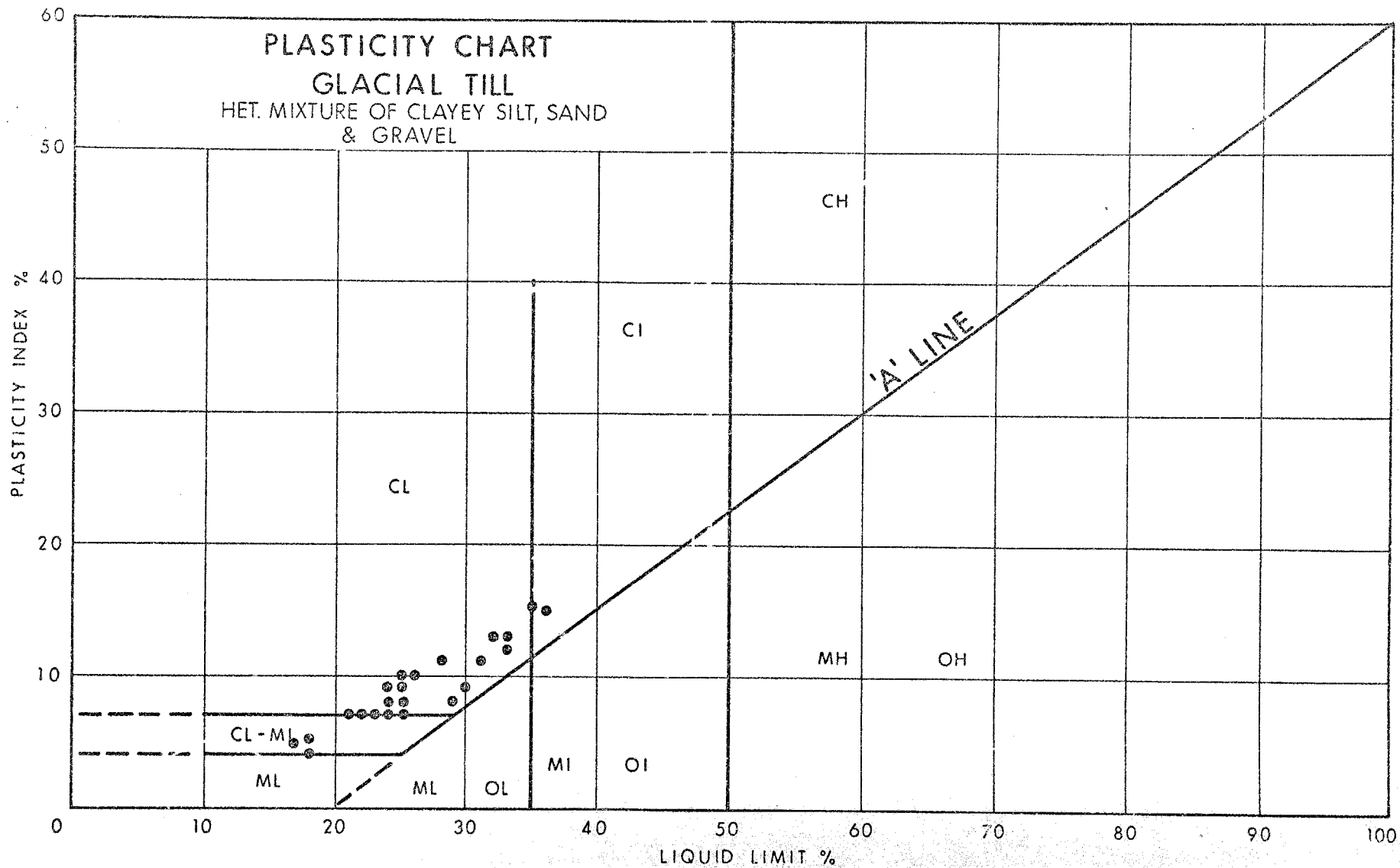


FIG. 1

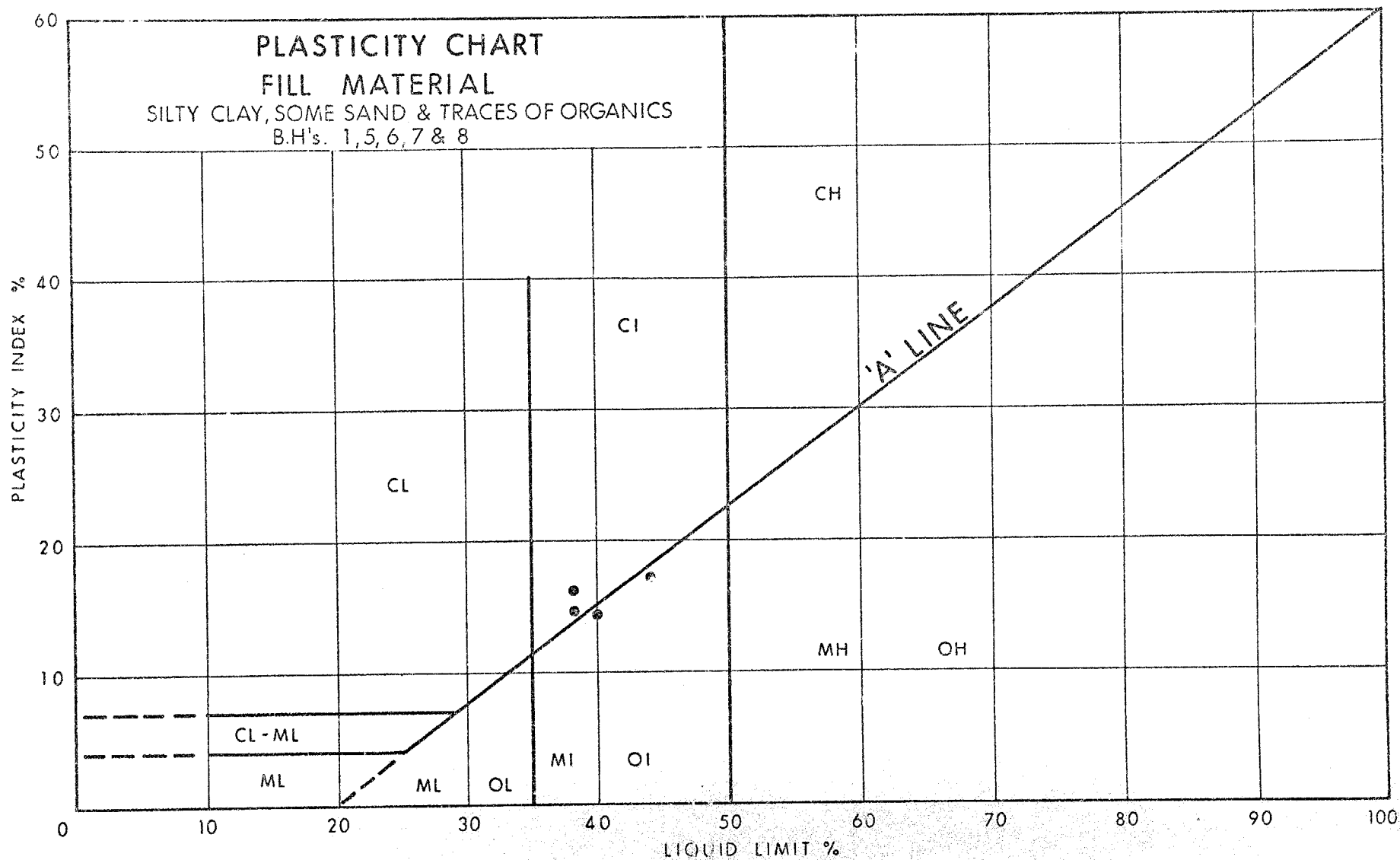


FIG 2

W.O. 73-11115

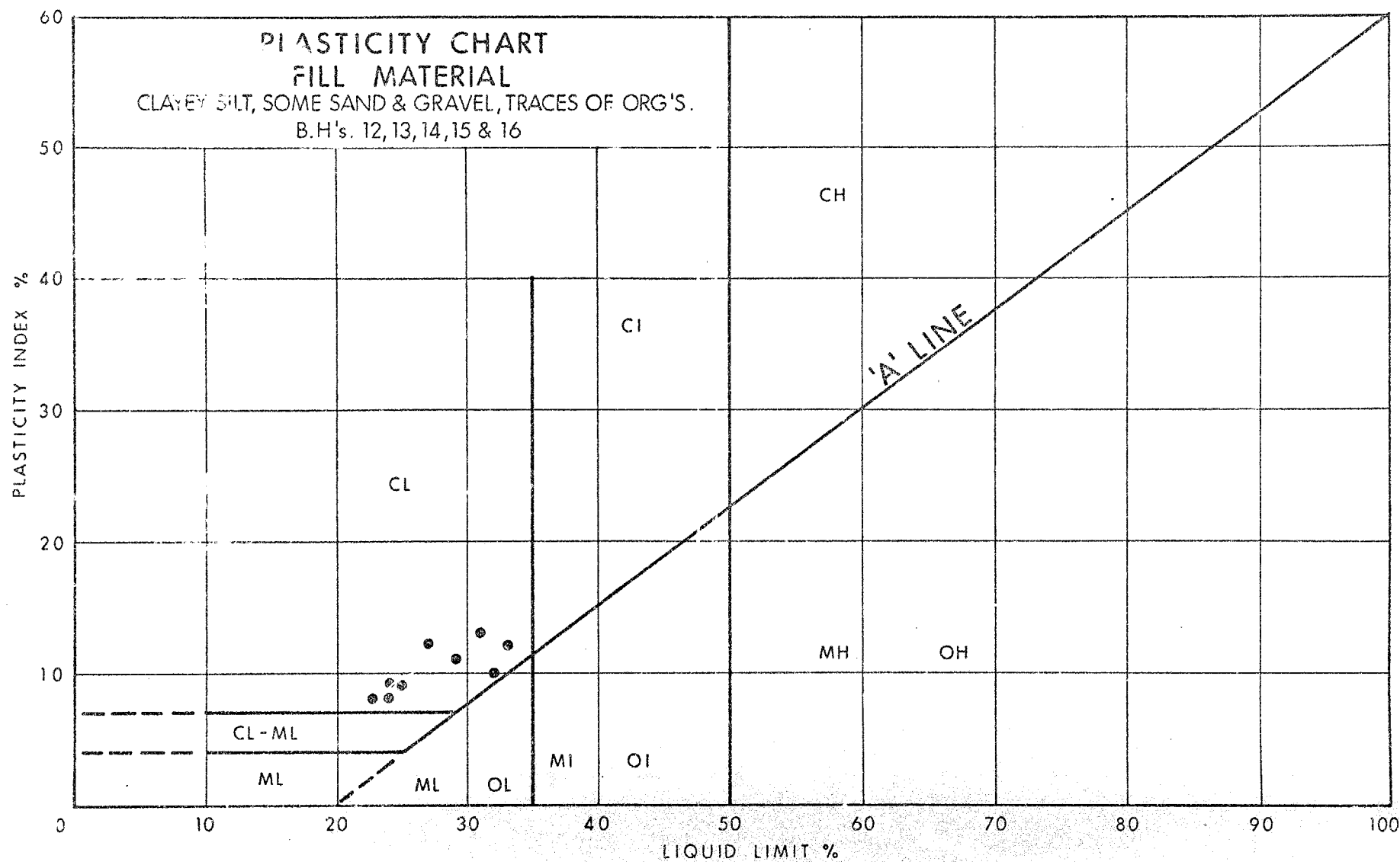


FIG. 3

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT 1976

GEOCRES No. 30M12-109

DIST. 6 REGION Central

W.P. No. 42-75-02

CONT. No. 77-46

W. O. No. \_\_\_\_\_

STR. SITE No. 24-353

HWY. No. \_\_\_\_\_

LOCATION Hwy 409 Underpass  
at Viscount Rd.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded  
before microfilmed

# FOUNDATION INVESTIGATION REPORT

For

Proposed Hwy. 409 Underpass  
at Viscount Road  
City of Mississauga  
District 6 (Toronto)  
W.P. 42-75-02 Site No. 24-353

---

*REG. MUN. OF  
PEEL*

## 1. INTRODUCTION

As a part of Hwy. 427 and 409 complex it is proposed to provide for an extension of Viscount Road by carrying it northerly over Hwy. 409. This will necessitate the construction of an underpass structure at this crossing. Soil Mechanics Section was requested by Mr. G.C.E. Burkhardt, Reg. Structural Planning Engineer, (Memo dated March 27th, 1975) to carry out a foundation investigation at the above mentioned site. Subsequently, a field investigation was carried out by this Section. Presented in this report are the results of the investigation, together with recommendations pertaining to foundation support and stability of the approaches at this site.

## 2. DESCRIPTION OF THE SITE AND GEOLOGY

The proposed bridge site is situated about 500 feet North East of the existing Airport road and Elmbank Road junction, at the entrance of Toronto International Airport. The vicinity of the area is relatively flat, mostly occupied by industrial and commercial buildings, while the structure itself will be located in an open field.

The physiography of the area is referred to as "Peel Plain". The characteristic surface feature of this plain is a gradual and fairly uniform slope towards Lake Ontario, across which deep valleys have been cut by several creeks and rivers. The underlying geological material in this area is mostly glacial till interbedded by seams of sand and underlain by shale bedrock.

### 3. FIELD INVESTIGATION AND LABORATORY WORK

Six boreholes, five of them accompanied by dynamic cone penetration tests, were put down during the course of field investigation. The borings and the penetration tests were advanced by means of a continuous flight auger machine (C.M.E. 55, M.V.H.S.) adapted for soil sampling purposes.

Samples of the overburden were obtained at required depths by means of a 2" O.D. split spoon sampler. The sampling was done according to the specifications for Standard Penetration Test. The same method was used to advance the cone penetration tests. Bedrock was proven at three boring locations by obtaining BXL size rock core samples. The groundwater conditions were observed by recording levels in the open boreholes during the period of the field investigation.

The soil, bedrock and groundwater conditions encountered in the borings are presented on the Record of Borehole sheets. The boring locations and elevations, together with estimated stratigraphical sections are shown on Drawing No. 427502-A.

Surveying was carried out by construction personnel from District 6. Elevations of the boreholes are referenced to a Geodetic Datum.

All samples were subjected to careful inspection and classification both in the field and in the laboratory. Following this examination, various laboratory tests were carried out on representative samples to determine the physical properties of the overburden, namely:-

Natural Moisture Contents  
Atterberg Limits  
Grain-size Distributions

The results of the laboratory testing are plotted on the Record of Borehole Sheets and summarized on Fig. No. 1 to 3 inclusive, all contained in the Appendix of this report.

#### 4. SUBSOIL AND BEDROCK CONDITIONS

##### 4.1. General

The predominant stratum encountered at the site is a 40 ft. thick cohesive deposit of stiff to hard clayey silt with sand and gravel. The clayey silt is underlain by a 26 to 30 ft. thick glacial till deposit consisting of a heterogeneous mixture of clayey silt, sand and gravel. The overburden is underlain by shale bedrock at a depth of 64 to 69 ft.



The boundaries of the various deposits as determined in the boreholes are shown on the Record of Borehole Sheets. The stratigraphical sections, as shown on Drawing # 427502-A, have been inferred from this data. From ground surface downward, the soil types and bedrock are described in the subsections to follow.

#### 4.2 Clayey Silt some Sand and Traces of Gravel

This is the predominant stratum which was encountered immediately below the ground surface. The material is mainly cohesive clayey silt with some sand and traces of gravel. The deposit is about 40 feet thick as confirmed in B.H. Nos. 1, 4, 5, 6. Random seams of sand upto a maximum of 2 ft. thick (B.H.4) are also present in the deposit.

Grain size distribution tests were performed on the samples obtained from this deposit. The results are summarized on Fig. 2 in an envelope form.

Atterberg Limit tests were carried out on representative samples. The results are plotted on the Record of Borehole Sheets and the Plasticity Chart (Fig. 1). Based on these results, the cohesive deposit is classified as inorganic and of low plasticity.

Standard Penetration testing carried out within this deposit gave "N" values ranging from 11 to 85 flows per foot. It is estimated that the consistency of this deposit varies from stiff to hard.

#### 4. 3. Glacial Till

(Heterogeneous Mixture of Clayey Silt, Sand and Gravel)

This deposit underlies the upper cohesive stratum. The material is a heterogeneous mixture of clayey silt, sand and gravel with occasional seams of silt, sand (B.H.1 & 5) and boulders upto max. 18" size (B.H. 5). The thickness of this deposit ranges from 26 ft. to 30 ft.

Typical grain-size distribution tests were performed on the samples. The results are summarized on Fig.3 in an envelope form. Based on Atterberg Limit test results, it is estimated that the glacial till has low plasticity. Standard Penetration test gave "N" value of in excess of 100 blows per foot. Based on these values, it is estimated that the consistency of the glacial till is hard, or very dense when the deposit is non-cohesive in nature.

#### 4. 4. Bedrock

Bedrock was proven in three boreholes (B.H.Nos. 1,4 and 5) by obtaining BXL size rock core samples.

The bedrock at this site is identified as shale of Dundas formation. The bedrock surface elevation ranges from elevation 487' in B.H. 4 to 492.4' in B.H. 5., i.e. 64 to 69 ft. below ground surface. The upper 1.5 ft. to 4 ft. of the shale is badly weathered and the remainder of the bedrock is extensively fractured.

## 5. GROUNDWATER CONDITIONS

Groundwater conditions were observed by recording the water levels in the open boreholes during the course of the field investigation. The final recordings establish the groundwater level at elevations ranging from 551 ft. (B.H.1) to 555 ft. (B.H.4) corresponding to levels from 1 ft. to 8 ft. below the existing ground surface.

## 6. DISCUSSION AND RECOMMENDATIONS

### 6.1 General

The Hwy. 409 extension will be carried under the proposed northerly extension of Viscount Road. It is proposed to construct a two span underpass structure at this intersection. The proposed Viscount Road grade will follow the existing ground elevation (+ 559 ft.) while the grade of Hwy. 409 will be at approximate elev. 538 ft.

This will necessitate a cut of about 21 ft. below the existing ground.

The predominant stratum across the site is a stiff to hard clayey silt, with some sand and gravel, underlain by a deposit of glacial till (heterogeneous mixture of clayey silt, sand and gravel) which is underlain by shale bedrock.

## 6.2 Foundations

The proposed structure can be supported on spread footings. The footings for the central pier and abutments should be placed some four ft. below the finished grade for frost protection. The footings may be designed for 3 t.s.f. safe bearing pressures if placed at elevation 531 or below

Excavations for the footings will be carried out within the cohesive deposit. No major dewatering problems are anticipated. Any minor inflow into the excavation can be handled using routine techniques such as pumping from sumps.

Alternatively, the entire structure can be supported on end bearing piles. It is estimated that steel H-piles driven down to elevation 500-505 ft. will achieve the maximum allowable load. The design load per pile will depend on section chosen, for example a design load of 90 tons per pile may be used for 12 BP 74 steel H-piles. The pile driving during construction should be controlled as per M.T.C. standard SS 3-11.

### 6.3 Stability of Cuts

No stability problems are anticipated for cuts upto 21 ft. in depth and constructed with 2 horizontal to 1 vertical slopes.

## 7. MISCELLANEOUS

The field work for this project was carried out between May 7 and 16, 1975, under the supervision of Mr. V.Korlu Project Engineer, who also prepared this report.

The drilling equipment was supplied and operated by Atcost Drilling Company.

This report was reviewed by Mr.M.Devata, Supervising Engineer.

H. Shah for

V.KORLU

Project Engineer

M. Devata

M.DEVATA

Supervising Engineer.

## ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 1

W.P. 42-75-02

LOCATION Co-ords. 15,874,798 N; 1,970,094 E.

ORIGINATED BY VK

DIST. 6 HWY. 409

BORING DATE May 9, 1975

COMPILED BY OY

DATUM Geodetic

BOREHOLE TYPE Auger &amp; sample with CME 55

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
558.8	Ground Level															
0.0	Clayey silt, some sand, <u>Brown</u> traces of <u>Grey</u> gravel, occasional sand seams.  Stiff to Hard		1	SS	28											1 20 45 34
			2	SS	45											
			3	SS	18											
			4	SS	30											
			5	SS	35											
			6	SS	27											
			7	SS	43											1 32 49 18
519.8			8	SS	205											16 54 59 11
40.0	Glacial Till  Het. mix. of clayey silt, sand & gravel.  Hard/Very Dense		9	SS	118											
			11	SS	143 76"											
			12	SS	110 76"											
488.8	Weathered		13	BXL	100% Rec											
70.0	Fractured Shale Bedrock															
481.3																
77.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

W.P. 42-75-02 LOCATION Co-ords. 15,874,826 N; 1,970,104 E.  
DIST. 6 HWY. 409 BORING DATE May 16, 1975  
DATUM Geodetic BOREHOLE TYPE Auger & Sample with CME 55

ORIGINATED BY VK  
COMPILED BY OY  
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
560.2	Ground Level															
0.0	Clayey Silt some sand — Brown — Grey traces of gravel occ. sand seams. Stiff to Hard		1	SS	34	560										
			2	SS	100	550										
			3	SS	22											
			4	SS	25	540										
			5	SS	34											
528.7			6	SS	39	530										
31.5	End of Borehole															

# RECORD OF BOREHOLE NO 3

W.P. 42-75-02

LOCATION Co-ords. 15,874,743 N; 1,970,245 E.

ORIGINATED BY VK

DIST. 6 HWY. 409

BORING DATE May 16, 1975

COMPILED BY OY

DATUM Geodetic

BOREHOLE TYPE Auger & Sample with CME 55

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
556.4	Ground Level															
0.0	Clayey silt some sand traces of gravel occ. sand seams. Brown Grey		1	SS	31	550										
			2	SS	57											6 30 49 15
			3	SS	26	540										
			4	SS	30											9 32 47 12
			5	SS	24	530										
524.9			6	SS	43											6 30 59 5
31.5	End of Borehole					520										



## ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 4

W.P. 42-75-02 LOCATION Co-ords. 15,874,772 N; 1,970,255 E. ORIGINATED BY VK  
 DIST. 6 HWY. 409 BORING DATE May 9 - May 14, 1975 COMPILED BY OV  
 DATUM Geodetic BOREHOLE TYPE Auger & sample with CME 55 CHECKED BY 26

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
556.0	Ground Level															
0.0	Clayey silt some sand <span style="margin-left: 20px;">Brown</span> <span style="margin-left: 20px;">Grey</span> traces of gravel occ. sand seams. Stiff to Hard		1	SS	17	550										
			2	SS	46											9 27 46 18
			3	SS	28	540										
			4	SS	25											5 32 48 15
			5	SS	32	530										
			6	SS	22											3 27 52 18
			7	SS	85	520										
516.0	SILTY SAND															
40.0	Glacial Till Het. mix. of clayey silt, sand & gravel.  Hard/Very Dense		8	SS	100	6"										7 34 51 8
						510										
			9	SS	120	6"										
						500										
						490										
487.0	Weathered															
69.0	Fractured															
482.0	Shale Bedrock		10	BXL	80% Rec											
74.0	End of Borehole															

W.P. 42-75-02 LOCATION Co-ords. 15,874,694N; 1,970,383E. ORIGINATED BY VK  
 DIST. 6 HWY. 409 BORING DATE May 7 - May 15, 1975 COMPILED BY OY  
 DATUM Geodetic BOREHOLE TYPE Auger & Sample with CME 55 CHECKED BY lo

20  
15 5 % STRAIN AT FAILURE  
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 6

W.P. 42-75-02 LOCATION Co-ords. 15,874,722N; 1,970,394 E. ORIGINATED BY VK  
DIST. 6 HWY. 409 BORING DATE May 8, 1975 COMPILED BY OY  
DATUM Geodetic BOREHOLE TYPE Auger & Sample with CME 55 CHECKED BY *SO*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
557.5	Ground Level															
0.0	Clayey silt some sand traces of gravel occ. sand seams.  Stiff to Hard	<i>Brown Grey</i>	1	SS	38											
			2	SS	58											
			3	SS	28											
			4	SS	30											
			5	SS	34											
			6	SS	34											
			7	SS	73											
517.5	Glacial Till Het. mix. of clayey silt, sand & gravel.  Hard/Very Dense		8	SS	150	5"										
40.0																
506.0			9	SS	250	5"										
51.5	End of Borehole															

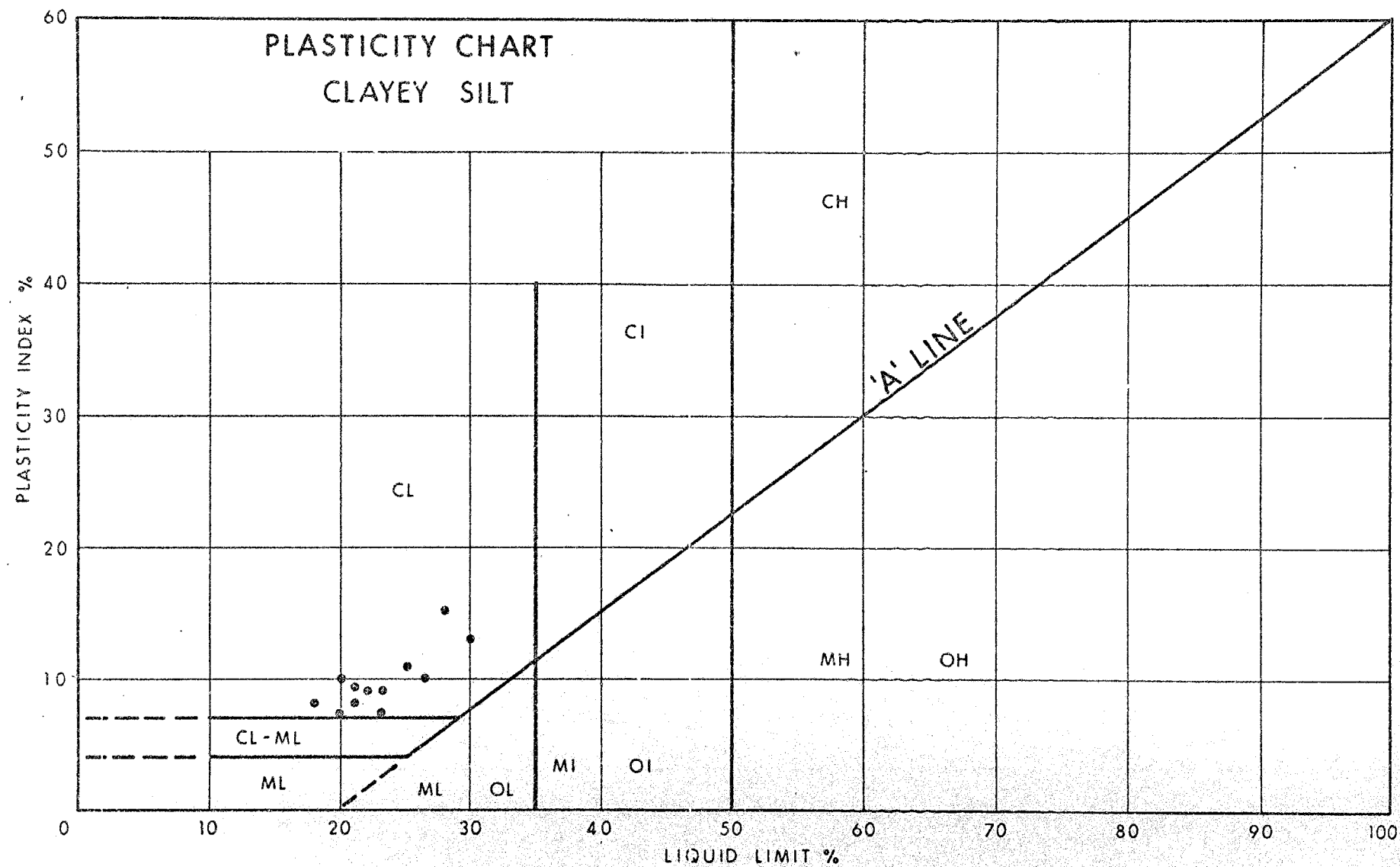


FIG. 1

## GRAIN SIZE DISTRIBUTION

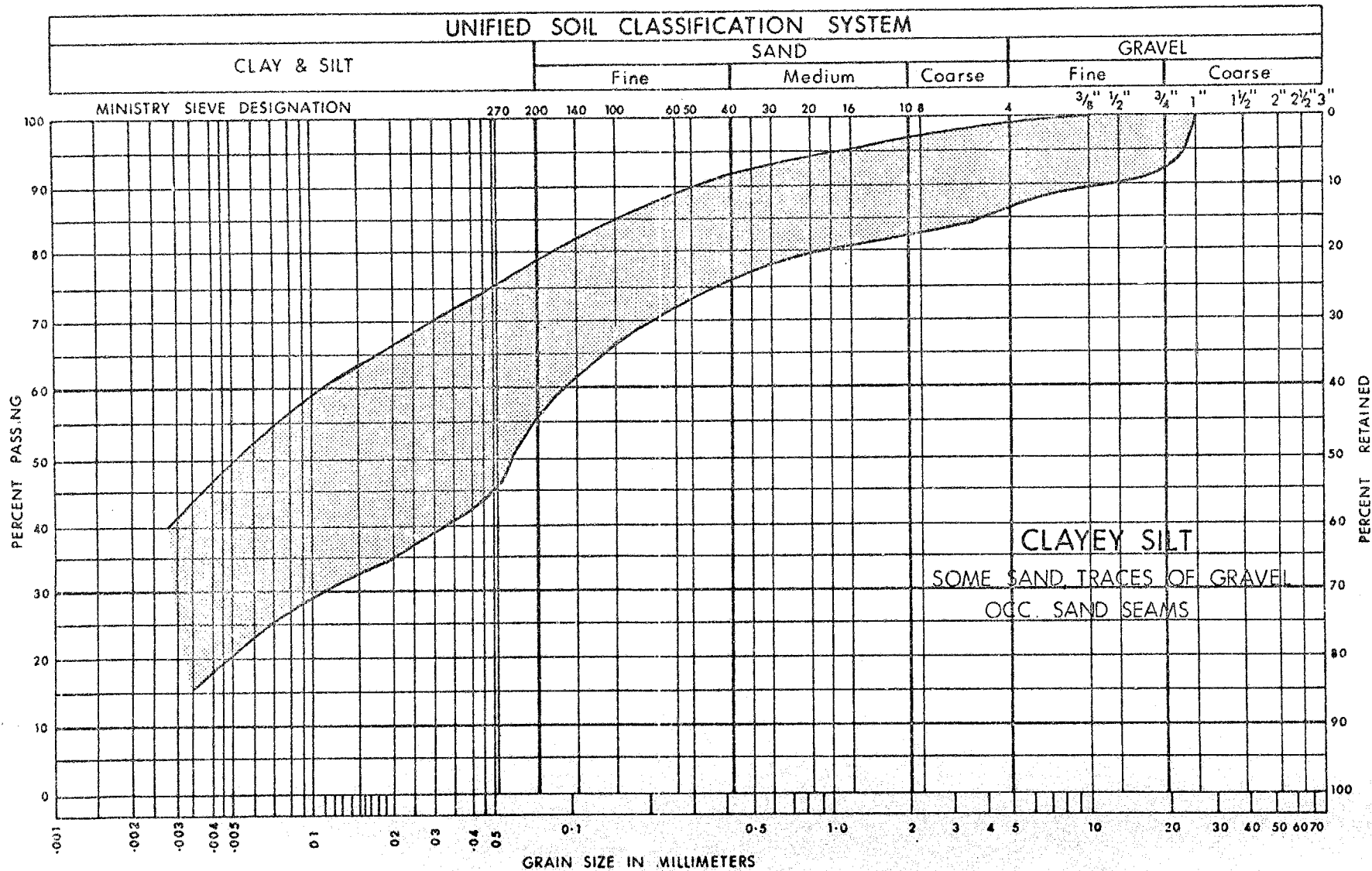


FIG. 2

W.P. 42-75-02

# GRAIN SIZE DISTRIBUTION

## UNIFIED SOIL CLASSIFICATION SYSTEM

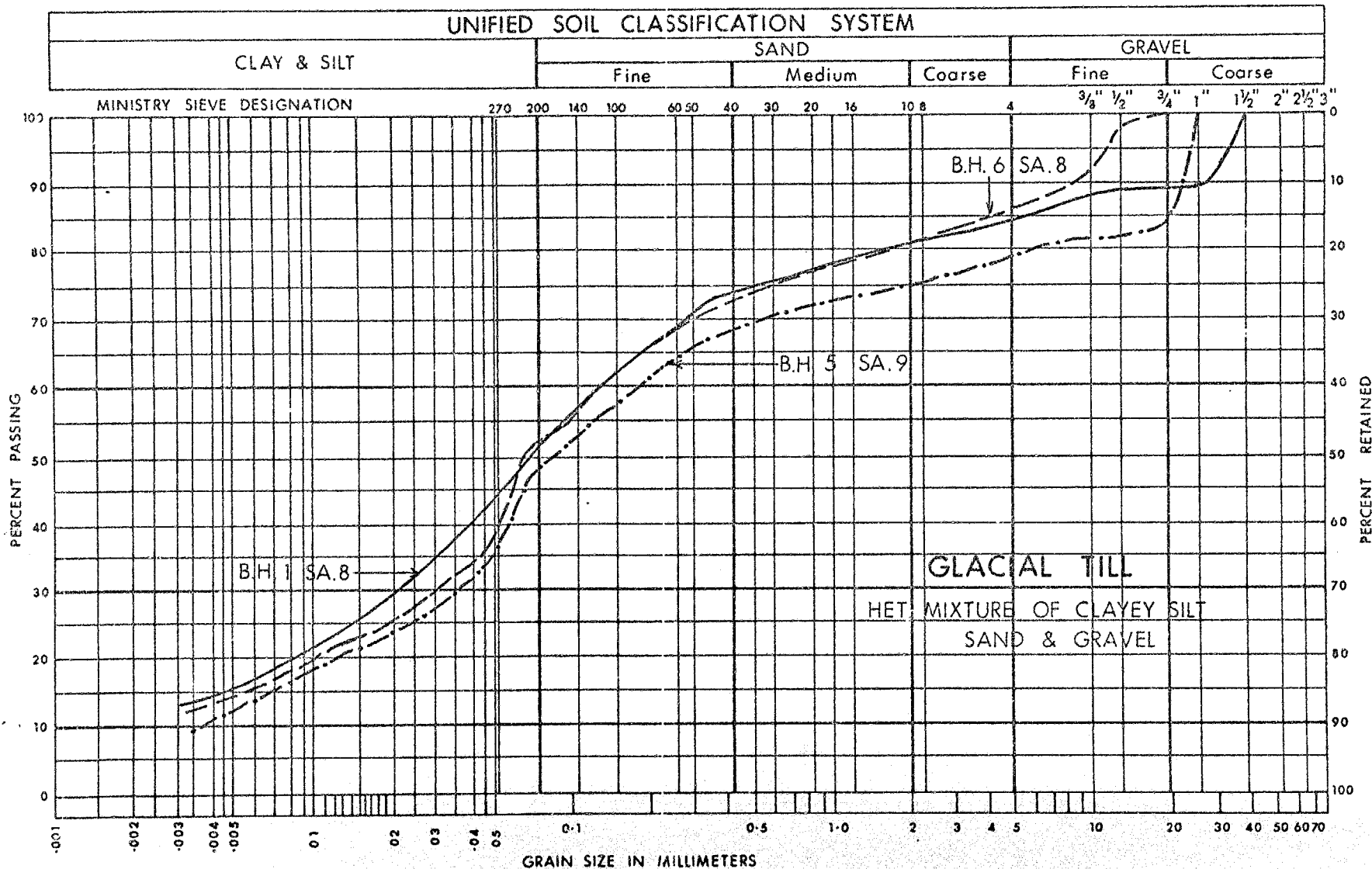
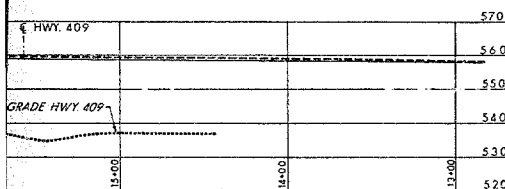
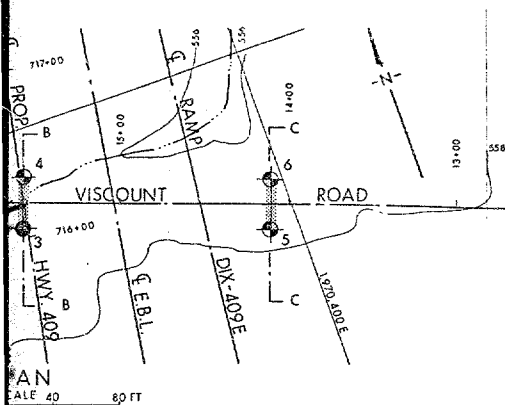


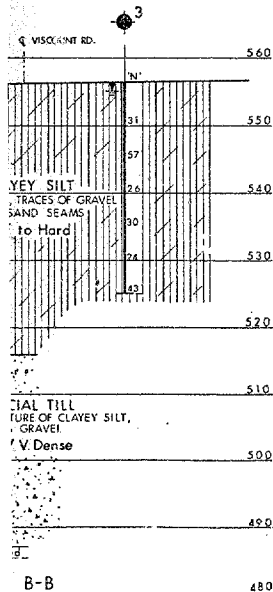
FIG. 3



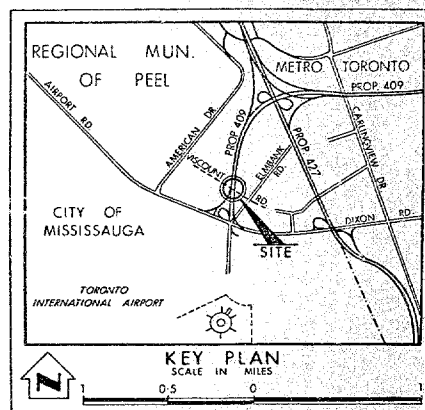
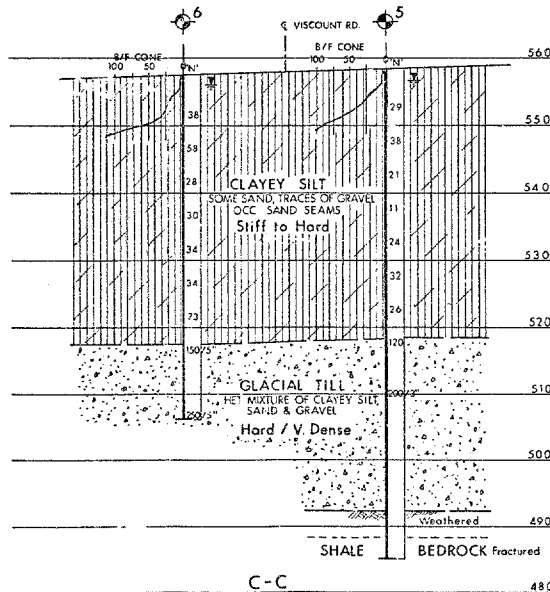


# PROFILE

SCALE 20 40 80 FT.



SCALE 10 20 FT



## LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test  
B/F CONE - Blows/Ft. Cone Test (350 lb. blow/blow)
- ⊕ Bore Hole & Cone Test
- ⬇ Water Levels established at time of field investigation. MAY 1975

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	558.8	15,874,798	1,970,094
2	560.2	15,874,826	1,970,104
3	556.4	15,874,743	1,970,245
4	556.0	15,874,772	1,970,255
5	558.4	15,874,694	1,970,383
6	557.5	15,874,722	1,970,394

## NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

## NOTE FOR CONTRACT DOCUMENT

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the TORONTO District Office.

DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEO TECHNICAL OFFICE-SOIL MECHANICS SECTION

## VISCOUNT ROAD

HIGHWAY NO. PROP 409 DIST. NO. 6  
REGIONAL MUNICIPALITY OF PEEL  
CITY OF MISSISSAUGA LOT CON

## BORE HOLE LOCATIONS & SOIL STRATA

SUBMIT V.R. CHECKED	W.P. NO. 42-75-02	DRAWING NO. 427502-A
DRAWN SO CHECKED	W.C. NO.	
DATE 5 JUNE 1975	SITE NO. 24-353	BROU DRAWING NO.
APPROVED	CONF. NO.	



Mr. C. Mirza

Mr. C.S. Grebski  
Structural Design Engineer  
West Building

G.C.E. Burkhardt  
Structural Planning Office  
3501 Dufferin Street

Mr. W. Lin  
Regional Structural Design  
Engineer

September 9th, 1976

Hwy. 409 Underpass at Viscount Road,  
(Approx. 0.2 mi north of Airport Road)  
W.P. 42-75-02, Site 24-353  
District 6, Toronto

---

The design of this bridge, as already completed by your office, was based on a 30 ft. wide local roadway. Very recently, it was pointed out by the City of Mississauga that the present standard used for an industrial road calls for a 38 ft. width (40 ft. face to face of curbs) rather than the previously considered 30 ft. dimension.

Further to this and during a meeting held with the City of Mississauga on August 23, 1976 the M.T.C. agreed to redesign and construct the intended extension of Viscount Road to the presently required width. To match the roadway cross-section it is therefore necessary to revise the design of subject grade separation.

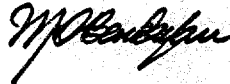
The attached bridge site drawing B.S. 48-71-01-5 (revised September 1st, 1976) along with the Appendix to the original Structural Planning Report will supply the additional information required for the new design of above bridge.

Please note that, to maintain the scheduling in effect for the intended work, the following dates should be met:

Completion date by:	December 1st, 1976
Complete D4 by:	December 15th, 1976

Drawing number 24 - 353 is to be retained for the structural design.

McCormick, Rank and Associates Limited, Consulting Engineers are handling the associated roadway and illumination works under W.P. 48-71-01 (Contract #2 of the Hwy. 427/409 Complex).



M.D. Bendayan  
STRUCTURAL PLANNING ENGINEER  
for:  
G.C.E. Burkhardt  
REGIONAL STRUCTURAL PLANNING ENG.

C.C. C.R. Wilmot  
R.S. Pillar  
R. Dorton  
M.R. Ernesaks  
H. Greenland  
C. Mirza  
R. Fitzgibbon  
J. Anderson  
R.C. McCormick (McCormick, Rankin)

CONTENTS:

MEMORANDUM OF TRANSMITTAL

APPENDIX TO THE ORIGINAL  
STRUCTURAL PLANNING REPORT

CROSS-SECTION SHEET  
(REVISED SEPTEMBER, 1976)

ATTACHMENTS:

BRIDGE SITE DRAWING

BES. 48-71-01-5  
(REVISED SEPTEMBER  
1st, 1976)

COMPUTER ALIGNMENT DATA FOR  
HWY. 409 AND VISCOUNT RD. PLUS  
PAVEMENT ELEVATION ALONG HWY. 409

(UNCHANGED)

REVISIONS AND ADDENDA:

APPENDIX TO THE  
STRUCTURAL PLANNING REPORT  
CENTRAL REGION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,  
ONTARIO

HWY. 409 U'PASS AT VISCOUNT RD. (REVISED)  
(APPROX. 0.2 MI. NORTH OF AIRPORT ROAD)

KING'S HIGHWAY No. 409

DIST. No. 6

~~XXX~~ Regional Municipality of Peel

~~XXXX~~ City of Mississauga LOT. 6 CON. VII

SITE No.

24-353

W. P. No.

42-75-02

DRAWING

No.

24-353

REGIONAL STRUCTURAL PLANNING ENG. G.C.E. Burkhardt

STRUCTURAL PLANNING ENG. M.D. Bendayan

STRUCTURAL PLANNING SUPERVISOR \_\_\_\_\_

DATE September 8th, 1976

APPENDIX TO THE ORIGINAL  
STRUCTURAL PLANNING REPORT

HWY. 409 UNDERPASS AT VISCOUNT ROAD

W.P. 42-75-02, SITE 24-353,

DISTRICT 6, TORONTO

BACKGROUND AND PROPOSED WORK:

To satisfy the traffic demands of the Malton Industrial Park (business enterprises located within the area limited by Airport Road, Indian Line Road and the C.N.R. line) the existing Viscount Road needs to be extended easterly up to the Elmbank Road/Campus Road junction. In order to effectively provide for this east-west connection, Viscount Road is to be carried over Hwy. 409 by means of a two span bridge with piers located within the Hwy. 409 centre median.

It is pointed out that such grade separation has already been designed based on a 32 ft. wide roadway (this distance measured between faces of curbs). However, due to a recently implemented City of Mississauga standard for industrial roads and after discussions held with such local authority, it has been agreed by the M.T.C. to redesign the proposed road extension and the structure under discussion to a 40 ft. width instead of the originally considered 32 ft. dimension.

The present Appendix is intended only to present the differences between the data incorporated in the Structural Planning Report issued on September 3rd, 1975 and the one resultant from the application of the new roadway conditions.

It is therefore understood that, if not stated here otherwise, the information contained in said report will still be valid, under the present design. The following paragraphs, or parts thereof, have been updated as follows:

CROSS-SECTIONS:

a) Viscount Road

The bridge deck needs to be wide enough to accommodate the 40 ft. Viscount Road width, measured between faces of curbs, plus 7' side walks on both sides. M.T.C. concrete barrier walls will be installed adjacent to these side walks as per present M.T.C. policy (see also Miscellaneous).

b) Hwy. 409

The lay-out of Hwy. 409 is unchanged. However, due to the widening of the bridge deck it should be checked if the 30' min. recovery areas are still available between the edges of ramps "Airport Road - 409E", "E409 - Airport Road" and the front face of respective bridge abutments.

Regarding this point it is understood that, due to the short time available to redesign subject bridge, it would greatly ease the intended structural work to maintain the present bridge spans and related structure depth. In such a case it has been agreed upon to tolerate the possible slight reduction of the mentioned 30' wide recovery areas.

SCHEDULE:

The revised dates are as follows:

Completion Date by: December 1st, 1976

Complete D4 by: December 15th, 1976

MISCELLANEOUS:

- Bell Canada and Hydro Mississauga have been contacted regarding their requirements at subject bridge. Bell Canada has stated that 4 x 3½" I.D. ducts should be installed under the south sidewalk whereas Hydro Mississauga requested the placement of 6 x 4" I.D. ducts at the south sidewalk.
- It has been decided to attach to the structure deck an overhead sign facing Hwy. 409 westbound traffic. Details of its location, size, etc. will be determined soon.
- Since the width of the bridge deck is to be adjusted to the new requirements of the City of Mississauga, it is recommended to use M.T.C. concrete barrier walls at both sides of the deck. This decision has been transmitted to that agency and, unless some valid objections are brought up by same, it is believed that such deck protection should be incorporated in the revised design of subject bridge.

PREPARED BY:

*W. B. B. B.*  
STRUCTURAL PLANNING ENGINEER

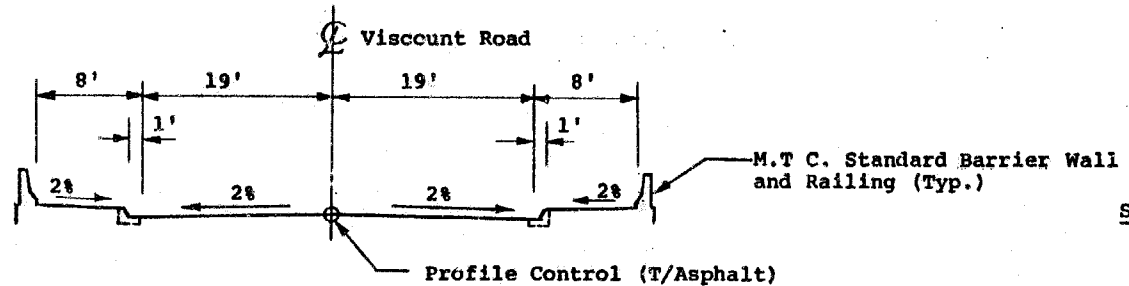
APPROVED BY:

*G. S. S. B.* *SS*  
REG. STRUCTURAL PLANNING ENG.

HWY. 409 UNDERPASS AT VISCOUNT ROAD  
W.P. 42-75-02, SITE 24-353,  
DISTRICT 6, TORONTO.

Structural Planning Office,  
September, 1976.

NORTH



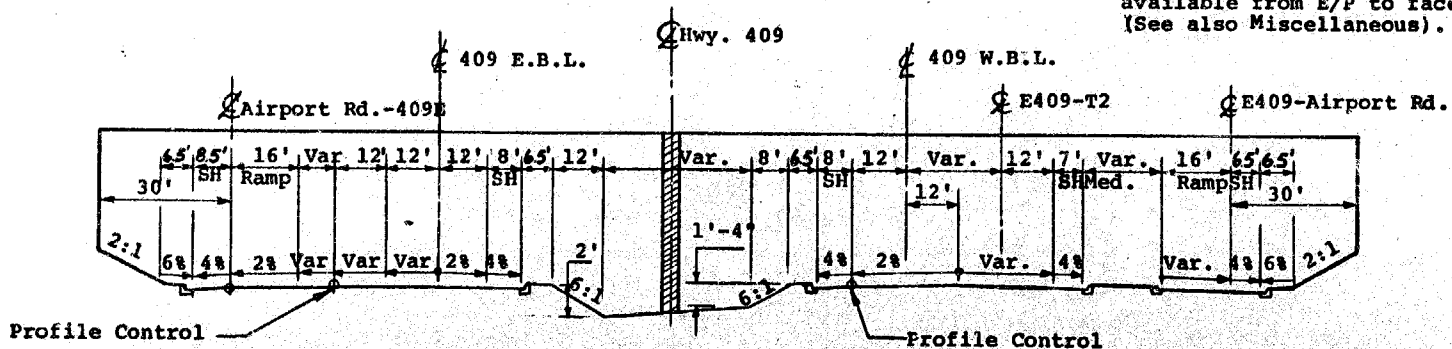
SOUTH

CROSS-SECTION OF VISCOUNT RD. OVER HWY. 409

NOTES: Min. Vertical Clearance = 15'-3"

- Pier Could be offset from the Hwy. 409 Centreline provided 15' min. are available from E/P to face of column. (See also Miscellaneous).

EAST



WEST

TYPICAL CROSS-SECTION OF HWY. 409 UNDER VISCOUNT ROAD

N.T.S.





Ministry of  
Transportation and  
Communications

## Memorandum

To: Mr. M. R. Ernesaks  
Regional Manager  
Central Region

From: Structural Office  
West Building  
Downsview, Ontario

Attention:

Date: February 22, 1977

Our File Ref.

In Reply to

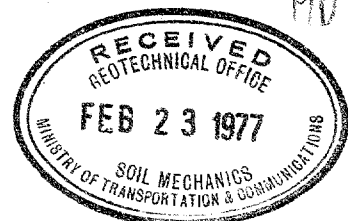
Subject: W.P. 42-75-02, Site 24-353  
Highway 409 Underpass at  
Viscount Road  
Hwy 409, District 6

Since Mississauga Hydro ducts will not be installed in the bridge as per memo dated February 17, 1977 and signed by Mr. N. D. Smith Sr. Project Manager, the corresponding tender item and Special SP - Embedded Work in Bridge (Hydro Mississauga) - should be deleted from the bridge contract documents.

NZ/bs

N. Zolnay  
Structural Contract  
Specifications Engineer

C.C. W. Lin  
J. Wear  
H. Greenland  
A. E. McKim  
B. Giroux  
G. Burkhardt  
E. Van Beilen  
C. Mirza



Mr. C.S. Grebski  
Structural Design Engineer  
Structural Design Section  
West Building, Downsview

Soil Mechanics Section  
Geotechnical Office  
West Building, Downsview

November 1, 1976

Highway 409 Underpass at  
Viscount Road  
W.P. 42-75-02, Site 24,353  
District #6, Toronto

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We have reviewed the preliminary drawings for the above mentioned structure and submit the following comments:

The subsoil at the site is a 40 ft. thick cohesive deposit of stiff to hard clayey silt with sand and gravel underlain by 26 to 30 ft. thick hard to very dense glacial till deposit. In order to attain the grade of Hwy. 409 cuts up to 23 ft. will be required. The proposed pier and the abutments are located in the competent stiff to hard clayey silt stratum. In such favourable conditions spread footings will be most logical as the solution and we are unable to understand why piles are adopted for pier and abutment foundations. It is possible that the pier may be heavily loaded but, however, the abutments should be supported on spread footings within the natural subsoil.

V. Korlu  
Project Engineer

For: M. Devata  
Supervising Engineer

MD/VK/gs

cc: G.C. Burkhardt  
Files /  
Record Services

Mr. C.S. Grebski  
Structural Office  
West Building, Downsview

Soil Mechanics Section  
Geotechnical Office  
West Building, Downsview

Mr. W. Lin

March 22, 1976

W.P. 42-75-02

Hwy. 409 U'pass at Viscount Road  
W.P. 42-75-02, Site 24-353  
Hwy. 409, District 6, Toronto

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We have reviewed the final bridge drawings and found that the designer complied with our recommendations. It should be noted that the pile driving should be controlled very carefully as per current MTC methods to attain the required design loads once the pile tip reaches elev. 518.0. Our foundation drawing showing the subsurface conditions will be sent to your office by separate mail.

V. Korlu  
Project Engineer

For: M. Devata  
Supervising Engineer

cc: Files ✓  
Record Services



## Memorandum

To: Mr. C. Mirza,  
Head, Soils Mechanics Section,  
West Building.

From: G. C. E. Burkhardt,  
Structural Planning Office,  
3501 Dufferin Street.

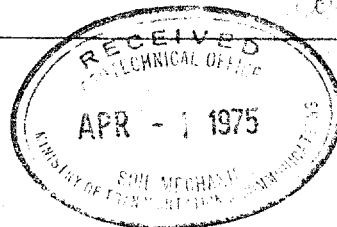
Attention: Mr. M. Devata

Date: March 27, 1975.

Our File Ref.

In Reply to

Subject: Hwy. 409 Underpass at Viscount Road,  
W.P. 42-75-02; Site 24-353,  
District 6, Toronto.



It has been recently decided to provide for an extension of Viscount Road by carrying it easterly over Hwy. 409 up to the Elmbank Road/Campus Road junction.

The construction of the bridge associated with above noted crossing has been at the present time included in Contract #2 (W.P. 48-71-01) of the Hwy. 427/409 complex.

The following attached information will enable your office to carry out the necessary Foundation Investigations at subject site:

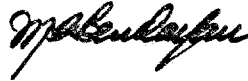
- 1) Two plans of the Hwy. 409/ Viscount Road Crossing (1" = 40')
- 2) Two profiles of Hwy. 409 E.B.L. & W.B.L. 1" = 100' Horizontal  
1" = 10' Vertical
- 3) Two profiles for Viscount Road 1" = 100' Horizontal  
1" = 10' Vertical
- 4) Two typical cross-sections of Hwy. 409 and Viscount Road 1" = 10'

We have shown in red on the 1" = 40' plans, probable footing locations, approximate lengths of the 2 spans of the intended cast-in-place post-tension type of bridge deck, chainage equation between Viscount Road and Hwy. 409 centrelines, etc.

It should be emphasized that the information depicted on the plans and profiles for Viscount Road has been plotted from previously available data and is subject to revision on completion of a field survey now being undertaken by the Regional Engineering Surveys Office (it is our understanding that the Viscount Road alignment has already been staked up in the field).

No existing utilities were detected in the general area of the proposed grade separation and no problems should be encountered to enter subject property as M.O.T. is fully aware of the work to be implemented in subject area.

Please note that, to comply with the scheduling established by the Priority Development Branch, your Foundation Investigation Report should be completed on or before June 11, 1975.



M. D. Bendayan,  
STRUCTURAL PLANNING ENGINEER,  
for:  
G. C. E. Burkhardt,  
REG. STRUCTURAL PLANNING ENG.

MDB:lm  
Attach.

c.c. D. Smith  
R. Fitzgibbon  
R. D. Gunter  
J. Anderson  
J. D. Barclay

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 20117-109

DIST 6 REGION CENTRAL

W.P. No. 42-75-02

CONT. No. 77-46

W. O. No. \_\_\_\_\_

STR. SITE No. 24-353

HWY. No. \_\_\_\_\_

LOCATION  Hwy 409 UNDERPASS AT

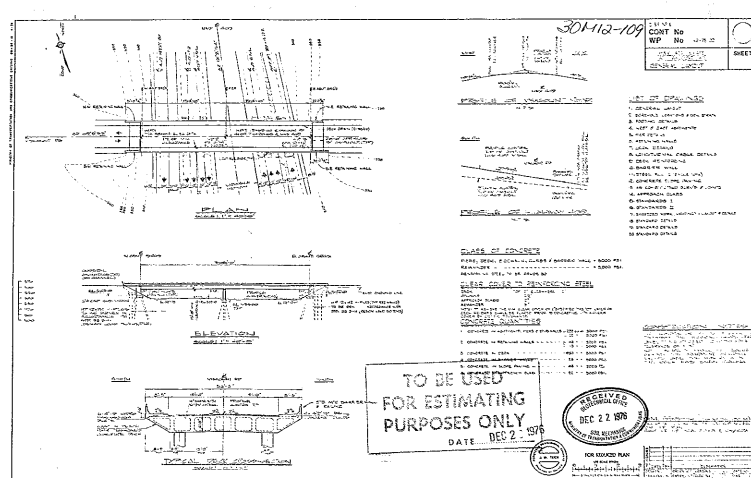
VISCOUNT RD.

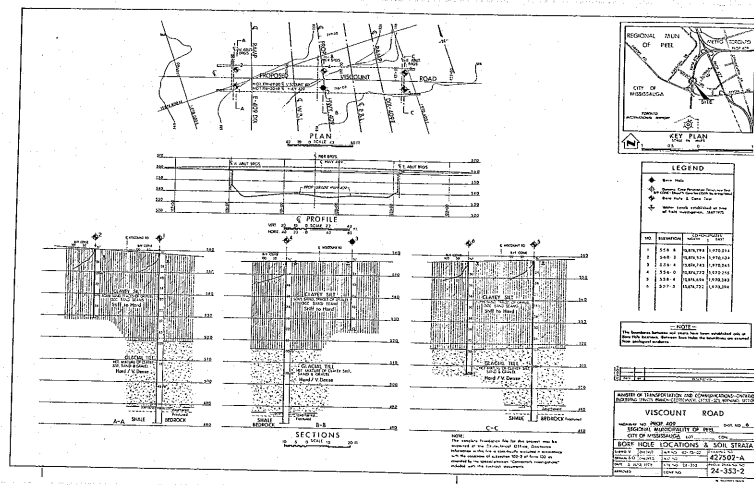
OVER-ALL DIMENSIONS TO BE INDICATED WITH THIS REPORT. 3

REMARKS: \_\_\_\_\_

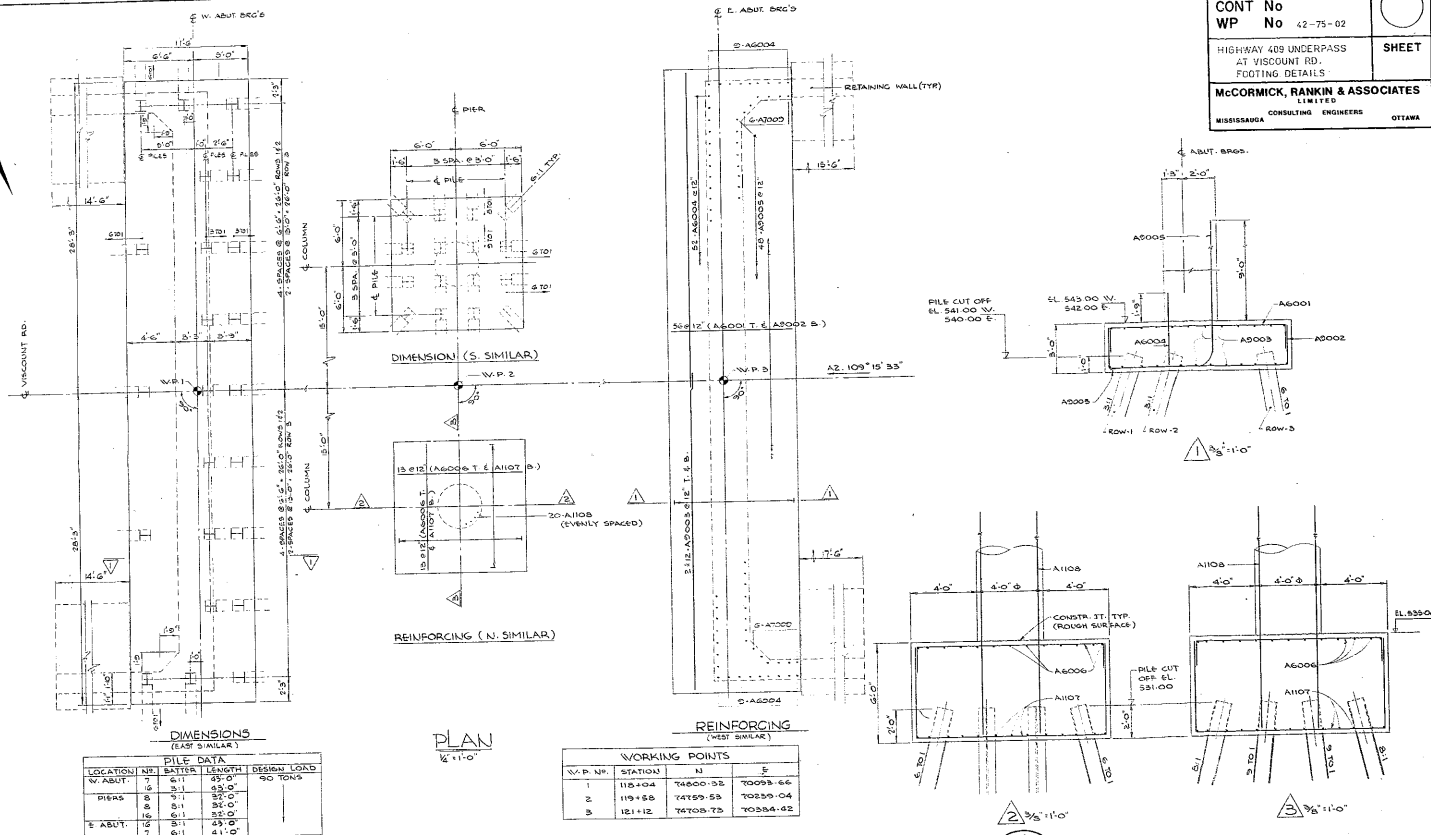
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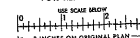




NOTE:  
HP 12x74 H-PILE SPACING MEASURED  
AT UNDERSIDE OF FOOTING.



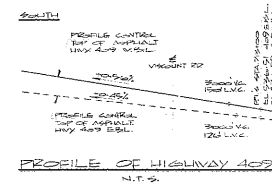
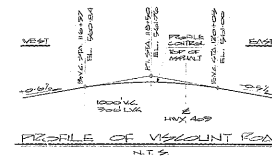
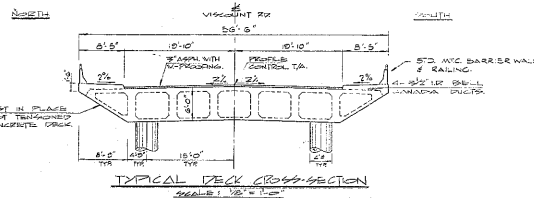
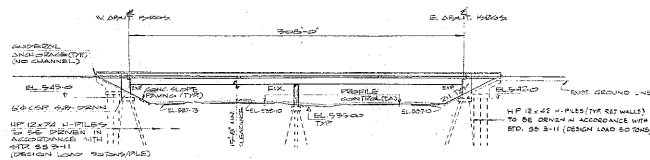
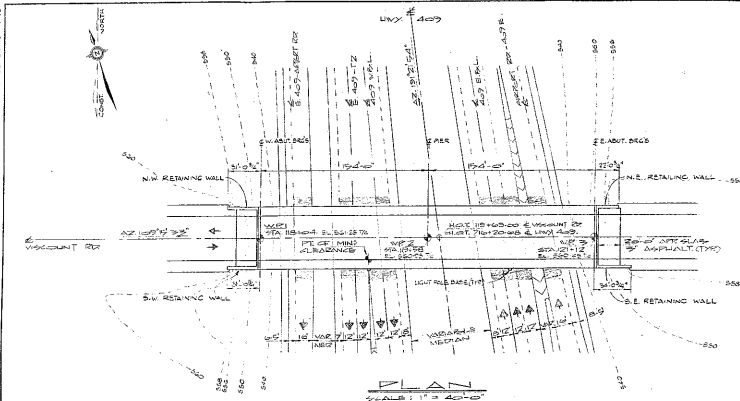
FOR REDUCED PLAN



REVISIONS		DESCRIPTION	
DATE	BY		
DESIGN JWC	CHECK H.S. LOADING HS 20-44	DATE NOV	
DRAWING D.A.	CHECK JAWA	HS 24-353	DWG 3

100% INSPECTION  
 MAR 03 1977  
 500 REGULATIONS  
 MADE IN THE UNITED STATES OF AMERICA

30412-109



## CLASS OF CONCRETE

PIERS, DECK, SIDEWALK, CURBS & BARRIER WALL - 5000 PSI.  
 REMAINDER - - - - - 3000 PSI.  
 REINFORCING STEEL TO BE GRADE 60

## CLEAR COVER TO REINFORCING STEEL

DATA TOP 1' ELEVATIONS 12"  
 COLUMN APPROACH SLAB  
 REMAINDER  
 NOTE: TO ACHIEVE THE MIN. CLEAR COVER OF 2" SPECIFIED THE TOP LAYER OF DECK REINFORCEMENT SHALL BE PLACED PRIOR TO CASTING, WITH A CLEAR COVER OF 2" TO THE TOP SURFACE.

## CONCRETE QUANTITIES (FOR LUMP SUM CONCRETE TENDER STABS)

1. CONCRETE IN ABUTMENTS, PIERS & RET. WALLS - 137.00 cu. yds. @ 5000 PSI.
2. CONCRETE IN RETAINING WALLS - 48.00 cu. yds. @ 5000 PSI.
3. PRESTRESSED CONCRETE BRIDGE DECK - 183.00 cu. yds. @ 5000 PSI.
4. CONCRETE IN BARRIER WALLS - 88.00 cu. yds. @ 5000 PSI.
5. CONCRETE IN SLOPE PAVING - 46.00 cu. yds. @ 3000 PSI.
6. CONCRETE IN APPROACH SLAB - 92.00 cu. yds. @ 3000 PSI.

## CONSTRUCTION NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE EXISTING GRADELINE. THE GRADELINE SHALL BE MAINTAINED AT THE SPECIFIED ELEVATION WITH A TOLERANCE OF ± 1".  
 NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BARRIERS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

P.M. 5-5-56 (RECORDING DESIGN)  
 HELP X CH. 600 OF EXISTING RETAIL  
 UNIT OF M.H. STA. 713+79.1 & 713+79.1



FOR REDUCED PLAN



DATE	BY	DESCRIPTION	DATE
DESIGNED	CHK	DESIGNED	DATE
DRAWN	CHK	DRAWN	DATE

M.H. 1900  
 M.H. 1900  
 M.H. 1900

DOCUMENT IDENTIFICATION

GEOCRE'S No. 30 H 12-103

DIST. L REGION CENTRAL

W.P. No. 134-73-01

CONT. No. 75-50

W. O. No. 74-11007

STR. SITE No. \_\_\_\_\_

HWY. No. \_\_\_\_\_

LOCATION STABILITY OF PROPOSED

HIGH FILL, STA. 533 + 00 TO STA. 537 + 00

RUN BRAMPTON BYPASS

CHECKED: \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

