

GEOCRES No. 30M12-110DIST. 6 REGION                     W.P. No. 103-69-00CONT. No.                     W. O. No.                     STR. SITE No.                     HWY. No. 401 & 7LOCATION PROPOSED Hwy 410From South Limits of Hwy 401 toNorth Limits - Hwy 7                      
                      
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.                     REMARKS:



## Memorandum

To: G.C.E. Burkhardt (3)  
Reg. Structural Planning Engineer  
Central Region  
3501 Dufferin St.

From: Soil Mechanics Section  
Geotechnical Office  
West Building, Downsview

Attention:

Date: July 31, 1975

Our File Ref.

In Reply to

AUG 12 1975

Subject:

PRELIMINARY  
FOUNDATION INVESTIGATION REPORT  
for

Proposed Hwy. 410 From South Limits  
of Hwy. 401 to Hwy. 7  
Regional Municipality of Peel  
Cities of Mississauga and Brampton  
District #6, Toronto  
W.P. 103-69-00

30M12-110  
GEOCRES No.

Attached we are forwarding to you our detailed Foundation Investigation Report on the subsoil conditions existing at the above mentioned site.

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

M. DEVATA  
Supervising Engineer

c.c. E.J. Orr  
B.R. Davis  
B.J. Giroux  
R.S. Pillar  
D. Gunter  
H. Greenland  
R. Hore  
J. Anderson )  
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Record Services

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PRELIMINARY  
FOUNDATION INVESTIGATION REPORT

For

Proposed Hwy. 410 From South Limits  
of Hwy. 401 to Hwy. 7  
Regional Municipality of Peel  
Cities of Mississauga and Brampton  
Dist. #6, Toronto  
W.P. 103-69-00

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1. INTRODUCTION

The preliminary design for the above mentioned project is now in progress. According to the proposed alignment Hwy. 410 is located between First and Second line east (Heart Lake Road) in the cities of Mississauga and Brampton, Regional Municipality of Peel. The design requires structures at the following locations; Industrial Access Road, Derry Road, Etobicoke Creek, Steeles Avenue, Gliddon Road, Connection to Clarence Street, C.N.R. crossing, Orenda Road, and Clark-Davidson Road.

In order to assess the foundation considerations, a detailed preliminary subsoil investigation was initiated by the Soil Mechanics Section as per request from Regional Structural Planning Office (memo dated Feb. 21/75, from G.C.E. Burkhardt, Regional Structural Planning Engineer). The main purpose of the investigation is to provide sufficient information for the study of this project. The results of this investigation will also guide Systems Design in their quest for a balanced design.

After the completion of the field work a meeting was held on July 24, 1975 between the representatives of Soil Mechanics Section and Regional Planning Office, to discuss the subsoil condition and the preliminary assessment of the foundation requirements.

This report presents all the factual information obtained from this investigation. Included are recommendations pertaining to foundation design at the various structure sites, as well as the stability and settlement considerations associated with the approach fills.

## 2. DESCRIPTION OF SITE AND GEOLOGY

The area under investigation is bounded by the following:

South - Hwy. 401

North - Hwy. 7

West - First Line

East - Second Line (Heart Lake Road)

The area is in the cities of Mississauga and Brampton, Municipality of Peel. The ground surface of the general area varies from elevation 590 to 740 ft. and is generally sloping towards Lake Ontario. The land is primarily used for farming purposes with the northern section (north of Steeles Ave.) occupied with industrial buildings. The area under investigation is drained by Etobicoke Creek and its tributaries.

The site is located in the physiographic region known as the "Peel Plain". The characteristic deposit, in the vicinity of the area under investigation, is composed of cohesive glacial till, whose thickness varies from 10.5 to 55 ft. The overburden is underlain by shale bedrock. This physiographic region is well drained by Credit, Oakville and Etobicoke Creeks, which have cut deep valleys into the overburden. There is, therefore, no large undrained depression, swamp or bog areas, although in many of the interstream areas drainage is still imperfect.

The shale bedrock is of the Meaford-Dundas formation, Ordovician Period.

## 3. FIELD AND LABORATORY WORK

Eight sampled boreholes, each accompanied by dynamic cone penetration test, were put down during the course of this field investigation. The borings were advanced by continuous Flight Auger machine (commercially known as C.M.E. 55, H.S.M.V.) adapted for soil sampling purposes. Borehole #9 was carried out in 1973 during the investigation for a storm sewer in this area (Refer W.O. 73-11115).

Samples of the overburden were obtained in a "2" O.D. split-spoon sampler at required depths. The sampler was hammered into the soil according to the specifications of Standard Penetration test. Bedrock was proven in all of the boring locations by obtaining BXL size rock core samples.

Groundwater level observations were carried out, during the period of the investigation, in the open boreholes. The soil, bedrock and groundwater conditions encountered at the boring locations, are presented in the Record of Borelog Sheets. The location and elevation of the various boreholes were provided by personnel from Engineering Surveys, Central Region. The elevations in this report are referred to a Geodetic datum. Boring locations and elevations are shown on drawing No. 1036900 A and B.

All the 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 Distribution

The results of this testing are plotted on the Record of Borelog Sheets and summarized on Figures 1 to 3, inclusive, all contained in Appendix I of this report.

#### 4. SUBSOIL AND BEDROCK CONDITIONS

##### 4.1 General

The predominant stratum across the site is composed of a heterogeneous mixture of hard clayey silt, sand and gravel (glacial till) which in turn is underlain by shale bedrock. In certain locations a deposit of silt or silty sand up to 24 ft. in thickness was observed between the glacial till and shale bedrock.

#### 4.2 Glacial Till (Clayey silt with sand and gravel)

This stratum was encountered in all boring locations. It is a heterogeneous mixture of clayey silt, sand and gravel. The thickness of this glacial till stratum varies from 10.5 ft. (B.H. 7) to 55 ft. (B.H. 1). Occasional silty sand layers up to 2.5 ft. in thickness were encountered within this stratum. Grain-size distribution curves, for the samples of this stratum, are plotted on Figure 2 of Appendix I.

Results of Atterberg Limit tests, performed on samples recovered in this stratum were plotted on the Record of Borelog Sheets, as well as on the plasticity chart, Figure 1. They are tabulated as below:

	Range	Average
Liquid Limit ( $W_L$ ) %	19 - 35	27
Plastic Limit ( $W_p$ ) %	13 - 21	17
Natural Moisture Content ( $W$ ) %	7 - 19	13

The above results indicate that the cohesive till is inorganic and of low plasticity. Based on the "N" value range of 13 to over 100 blows per foot, obtained from the Standard Penetration Tests, it is estimated that the consistency of the cohesive glacial till varies from stiff increasing with depth to hard.

#### 4.3 Silty Sand With Some Gravel & Trace of Clay

At the location of B.H. 2 (Hwy. 410 and Derry Road crossing) a deposit of silty sand extending below the glacial till stratum and above the shale bedrock was observed at B.H. 9. The thickness of this stratum is about 20 ft. at this location. A surficial layer of silty sand up to 5 ft. in thickness was also observed immediately above the glacial till stratum at B.H. #9. The "N" values obtained in this granular deposit by Standard Penetration Tests vary from 65 to over 100 blows per foot. Based on these values, it is estimated that the relative density of the granular deposit is generally very dense.

#### 4.4 Shale Bedrock

Bedrock was found underlying the glacial till stratum, or the granular deposit where it exists elsewhere. The bedrock was proven in all the boring locations by obtaining BXL size rock core samples.

The dominant type of bedrock encountered across the site is a dark grey shale with occasional bands of limestone and/or sandstone. The bedrock surface along the stretch of the proposed center line of Hwy. 410 varies from elevation 560 ft. (B.H. 1) to 685.6 ft. (B.H. 8). The bedrock appears to dip in southward direction. The bedrock in general was found to be in a sound condition, in certain boring locations, however, the upper 1 to 3.5 ft. appeared to be weathered and also fractured.

#### 5. GROUNDWATER CONDITIONS

Groundwater level observations were carried out during the period of investigation by recording the water level in the open boreholes. The observations are recorded on the Borelog sheets and summarized on Drawing No. 1036900 A and B. The results of the measurements in the open boreholes indicate that the groundwater level ranges from 6.5 to 12.5 ft. below existing ground surface, which corresponds to elevations between 603.5' (B.H. 1) and 700.0' (B.H. 9). The water level in Etobicoke Creek during the time of investigation was observed to be 609.5 ft. which corresponds to the water level in B.H. 4 as well.

#### 6. DISCUSSION AND RECOMMENDATIONS

##### 6.1 General

This report deals with the proposed Hwy. 410 extension from Hwy. 401 north ~~to~~ Hwy. 7. The overall complex is shown in plan on Drawings No. 1036900 A and B. The proposed Hwy. 410 will incorporate



a wide center median for incorporating a future mass transit system.

A number of structures are proposed for this project, specifically:

1. Hwy. 410 and Industrial Access Road
2. Hwy. 410 and Derry Road
3. Hwy. 410 and Hwy. 407 interchange complex with several structures
4. Hwy. 410 and Etobicoke Creek
5. Hwy. 410 and Steeles Avenue
6. Hwy. 410 and Glidden Road
7. Hwy. 410 and C.N.R. crossing including connection to Clarence St.
8. Hwy. 410 and Orenda Road
9. Hwy. 410 and Clark-Davidson Road

At the proposed C.N.R. overpass two possible span arrangements may be considered due to the uncertainty of the future track locations.

The subsoil, bedrock and groundwater conditions, encountered in the area under investigation, have been discussed previously in this report (Sections 4 and 5). Inferred stratigraphical profiles, along the proposed alignment, are shown on Drawings No. 1036900 A and B.

At this stage, the profile grades at the various structure crossings, as well as other pertinent data, have not been finalized. Preliminary grade lines along Hwy. 410 and the related cross roads are shown on the drawings contained in the report.

Preliminary design data recommendations pertaining to foundation design of the various structures, as well as the stability and settlement considerations for the approaches will be presented in the sub-sections to follow. For brevity sake, the recommendations will be presented in tabular form.

## 6.2 and 3 Foundations and Embankments

See the information in tabular form as follows:

6.2.1 Industrial Access Road Over Hwy. 410 - Ref. B.H. 1

Approximate Existing Ground Elevation Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thick- ness (ft.)	Recommendations		
		Structure	Approaches 1. Longitudinal - 15 ft.(Max.) 2. Transverse - 18 ft.(Max.)	Remarks
1. 615.0 ft. 2. 609.0 ft.  Proposed Grade of Industrial Road elev. 629.0	<u>Glacial till:</u> - cohesive - 0' to 55' - V.Stiff to Hard  <u>Shale bedrock:</u> - at 55 ft.	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f.  <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well- compacted granular material, using an allowable bearing pressure of 2.5 t.s.f.  2. Alternately, supported on short piles driven into the glacial till stratum (approx. elev. 585 ft.). Maximum allowable loads of the pile section chosen.	<u>Fills and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.2 Derry Road Over Hwy. 410 - Ref. B.H. 2

1. Approx. Existing Ground Elevation 2. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in ft.	Recommendations		
		Structure	Approaches 1. Longitudinal - 24 ft. 2. Transverse - 22 ft.	Remarks
1. 612 ft. 2. 615 ft.  Proposed Grade of Derry Road elev. 636.0	<u>Glacial till:</u> - cohesive - 0 to 20 ft. - V. Stiff to Hard  <u>Granular:</u> - 20 to 44.5 ft. - V. Dense  <u>Shale Bedrock</u> - at 44.5 ft.	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f.  <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on short end bearing piles driven into the granular deposit (approx. elev. 580 ft.) Max. allowable load of the pile section selected.	<u>Embankments:</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.3 Hwy. 410 and New Hwy. 407 Interchange Complex - Ref. B.H. 3

1. Approx. Existing Ground Elevation 3. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structures in the Complex	Approaches 1. Longitudinal - 20 ft. 2. Transverse - 18 ft.	Remarks
A. 635.0 ft. B. 641.5 ft.  Proposed Grade for Hwy. 407 Elev. 4020.0	<u>Glacial till:</u> - cohesive - 0 to 15 ft. - Hard <u>Shale bedrock</u> - at 15 ft. - 15 to 17' weathered - 17 to 22' sound shale	<u>Piers:</u> Spread footings founded on shale bedrock. Allowable bearing pressure up to 10 t.s.f. (Below elev. 616 ). <u>Abutments:</u> Placed on spread footings within the glacial till stratum, using an allowable bearing pressure of 5.0 t.s.f.	<u>Fills and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.4 Hwy. 410 Over Etobicoke Creek - Ref. B.H. 4

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches 1. Longitudinal - 20 16 ft. 2. Transverse - 20 16 ft.	Remarks
A. 616 ft. B. 632 ft. Proposed invert of Etobicoke Creek Elev. 612.0	<u>Glacial till:</u> - 0 to 10.5 ft. - cohesive - Stiff to Hard  <u>Shale bedrock</u> - 10.5 to 11.5 weathered - 11.5 to 16.5 sound shale	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f. (Below elevation 608 ft.)  <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on end bearing piles driven to shale bedrock (approx. elev. 598 ft.).	<u>Embankments and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.5 Hwy. 410 Under Steeles Avenue - Ref. B.H. 5

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches 1. Longitudinal - 15 ft. 2. Transverse - 15 ft.	Remarks
A. 647.5 B. 641.0  Proposed Grade of Steeles Ave. Elev. 662.0	<u>Glacial till:</u> - 0 to 35 ft. - cohesive - Hard  <u>Shale bedrock:</u> - 35 to 40.5 ft. weathered - 40.5 to 46 ft. sound shale	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f. (Below elev. 640 ft.).  <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on short end bearing piles driven into the glacial till stratum (approx. elev. 620 ft.). Max. allowable load of the pile section selected.	<u>Embankments and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.6 Hwy. 410 Over Glidden Road - Ref. B.H. 6

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant Overburden strata Approx. thick- ness in feet	Recommendations		
		Structure	Approaches 1. Longitudinal - 18 ft. 2. Transverse - 18 ft.	Remarks
A. 661.0 B. 678.0  Proposed Grade of Glidden Road Elev. 657.0	<u>Glacial till:</u> - 0 to 10.5 ft. - cohesive - stiff to hard <u>Shale bedrock:</u> - 10.5 to 13 weathered - 13 to 18.3 sound shale	<u>Piers:</u> Spread footings founded within the glacial till stratum. Allowable bearing pressure up to 5 t.s.f. (Below elev. 653 ft.). <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on end-bearing piles driven through weathered shale into sound bedrock (Approx. elev. 648 ft.).	<u>Embankments and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.7 Hwy. 410 Over C.N.R. & Go-Transit - Ref. B.H. 7

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches 1. Longitudinal - 30 ft. 2. Transverse - 29 ft.	Remarks
A. 683.3 ft. B. 715 ft.  Grade of C.N.R.- Elev. 686.0	<u>Glacial till:</u> - 0 to 10.5 ft. - cohesive - Hard  <u>Shale bedrock:</u> - 10.5 to 14 ft. weathered - 14 to 19 ft. sound shale	<u>Piers:</u> Spread footings founded within the glacial till stratum. Allowable bearing pressure up to 5 t.s.f. (Below elev. 678 ft.)  <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f.  2. Alternately, supported on end-bearing piles driven to sound shale bedrock (Approx. elev. 669 ft.).	<u>Embankments and cuts</u> 1. 2:1 side slopes 2. No stability problems.	



6.2.8 Hwy. 410 Over Orenda Road - Ref. B.H. 8

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches fills 1. Longitudinal - 10 ft. 2. Transverse - $\frac{9}{20}$ ft.	Remarks
A. 702.5 ft. B. 713 ft.  Grade of Orenda Rd. elev. 692.0	<u>Glacial till:</u> - 0' to 17 ft. - cohesive - V. Stiff to Hard  <u>Shale bedrock:</u> - 17 to 18 ft. weathered - 18 to 22 ft. sound shale	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f. (Below elev. 688 ft.) <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on end-bearing piles driven to shale bedrock (approx. elev. 684 ft.).	<u>Embankments and cuts</u> 1. 2:1 side slopes 2. No stability problems.	

6.2.9 Hwy. 410 Under Clark-Davidson Road - Ref. B.H. 9

A. Approx. Existing Ground Elevation B. Approx. Grade of Hwy. 410	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches 1. Longitudinal - 21 ft. 2. Transverse - 21 ft.	Remarks
A. 706.0 ft. B. 702.0 ft.  Grade of Clark-Davidson Road Elev. 724.0	<u>Granular:</u> - 0 to 5 ft. silt & some sand and gravel - V. Dense  <u>Glacial till:</u> - 5 to 23 ft. - cohesive - Hard	<u>Piers:</u> Spread footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f. (Below elev. 700 ft.). <u>Abutments:</u> 1. "Perched" on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. 2. Alternately, supported on end bearing piles driven into the glacial till stratum (approx. elev. 690 ft.). Max. allowable load of the pile section chosen.	<u>Embankments:</u> 1. 2:1 side slopes 2. No stability problems.	

## 7. SUMMARY

The subsurface and groundwater conditions encountered within the area to be encompassed by the proposed Hwy. ~~401~~ extension (between Hwy. 401 and Hwy. 7), are generally favourable from a foundation point of view, when considering the interchange locations and the preliminary profile grades. The predominant stratum is a competent, cohesive glacial till of variable thickness. At Derry Road crossing the till is underlain by a very dense silty sand deposit. The overburden is underlain by shale bedrock. At all the structure crossings the following apply:

- 1) Piers:- founded on spread footings located in the glacial till.
- 2) Abutments:- founded on spread footings "perched" within the approach fills, or alternately on end-bearing piles driven into the Glacial till stratum in the overburden or to sound shale bedrock.
- 3) Approaches, of the heights contemplated, (up to 30 feet) will be stable provided standard 2:1 slopes are used. The settlement, induced in the foundation subsoil by the fill loadings, will be well within tolerable limits.

It should be stressed that the recommendations given in this report are of a preliminary nature. A complete foundation investigation will be required at all the sites, once the alignment for the highway has been finalized and the design details become available.

## 8. MISCELLANEOUS

The field work, performed during the period of June 19 to July 3, 1975, was carried out under the supervision of Mr. V. Korlu, Project Engineer, who also prepared this report.

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

*Robert W. Barnes.*

*For* V. KORLU  
Project Engineer

*A. R. R. R. R.*

*For* M. DEVATA  
Supervising Engineer



July 1975

## APPENDIX

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

RECORD OF BOREHOLE NO 1

W.P. 103-69-00 LOCATION Co-ords. 861,012 N; 953,060 E. ORIGINATED BY VK  
DIST. 6 HWY. 410 BORING DATE June 30, July 3, 1975 COMPILED BY OY  
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing 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  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$	
615.0	Ground Level														
0.0															
			1	SS	33	610									4 26 42 28
			2	SS	45										
			3	SS	16	600									7 48 34 11
			4	SS	19										
			5	SS	118	590									7 30 46 17
			6	SS	140										
			7	SS	200	580									5 27 44 24
577.5			8	SS	175	570									
37.5															
574.5															
40.5															
560.0															
55.0	Bedrock		9	BXL	100% REC	560									
555.0	Sound Shale														
60.0	End of Borehole														

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

## RECORD OF BOREHOLE No 2

W.P. 103-69-00 LOCATION Co-ords. 864,490 N; 949,700 E. ORIGINATED BY VK  
DIST. 6 HWY. 410 BORING DATE June 30, 1975 COMPILED BY OY  
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing CHECKED BY [Signature]

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  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$	
611.8	Ground Level														
0.0	Het. mixture of clayey silt, sand and gravel (Glacial Till) V. Stiff to Hard		1	SS	22	610									1 9 53 37
			2	SS	26										
			3	SS	65										
			4	SS	76										4 29 49 18
			5	SS	117	600									
			6	SS	71										
591.8			7	SS	197	8"									11 36 40 13
20.0	Silty sand with some gravel & trace of clay		8	SS	149	590									
			9	SS	109										
			10	SS	91	580									17 36 42 5
			11	SS	65										
						570									15 36 42 5
567.3															
44.5	Bedrock Shale		12	BXL	REC	80%									
564.8															
47.0	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

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

## RECORD OF BOREHOLE No 3

W.P. 103-69-00 LOCATION Co-ords. 867,280 N; 946,985 E. ORIGINATED BY VK  
 DIST. 6 HWY. 410 BORING DATE June 26, 1975 COMPILED BY OY  
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing CHECKED BY [Signature]

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  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
634.5	Ground Level															
0.0	Het. mixture of clayey silt, sand and gravel		1	SS	124	630										
			2	SS	100	6"										
619.5	Hard															
617.5	Weathered		3	SS	106	6"										
17.0	Sound Shale Bedrock		4	BXL	REC											
612.0																
22.5	End of Borehole															



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

## RECORD OF BOREHOLE NO 4

W.P. 103-69-00

LOCATION Co-ords. 868,935 N; 946,010 E.

ORIGINATED BY VK

DIST. 6 HWY. 410

BORING DATE June 25, 1975

COMPILED BY OY

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & BX Casing

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	$w_p$	$w$	$w_L$		
615.7	Ground Level															
0.0	Silty sand with gravel, trace of clay															
609.7	Compact		1	SS	14	610										38 24 28 10
6.0	Het. mix. of clayey si. sa. Brown															
605.2	and gravel. Stiff to Hard Grey		2	SS	100/6"											
10.5	Weathered															
11.5	Sound Shale Bedrock		3	BXL REC	100%	600										
599.2																
16.5	End of Borehole															

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

**RECORD OF BOREHOLE NO 5**

W.P. 103-69-00

LOCATION Co-ords. 873,421 N; 944,073 E.

ORIGINATED BY VK

DIST. 6 HWY. 410

BORING DATE June 23, 1975

COMPILED BY OY

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & BX Casing

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	$w_p$	$w$	$w_L$		
647.4	Ground Level															
0.0			1	SS	30	640										12 25 53 10
	Brown Grey		2	SS	55											
	Het. Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		3	SS	60	630										19 29 40 12
			4	SS	99											
	Hard		5	SS	120	620										
			6	SS	130/5"											
612.4			7	SS	120/4"											
35.0	Weathered		8	SS	285/4 1/2"	610										
606.9																
40.5	Sound Shale Bedrock		9	BXL	REC	98%										
601.4																
46.0	End of Borehole															

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

RECORD OF BOREHOLE NO 6

W.P. 103-69-00 LOCATION Co-ords. 875,402 N; 942,048 E. ORIGINATED BY VK  
DIST. 6 HWY. 410 BORING DATE July 1, 1975 COMPILED BY OY  
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing CHECKED BY 102

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  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
660.8	Ground Level					660										
0.0	Het. mixture of clayey silt, sand & gravel (Glacial Till) Stiff to Hard		1	SS	13	660										6 25 50 19
650.3			2	SS	100/5"	650										
10.5	Weathered Sound Shale Bedrock		3	BXL	REC	100%										
642.5																
18.3	End of Borehole															

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

## RECORD OF BOREHOLE No 7

W.P. 103-69-00 LOCATION Co-ords. 876,719 N; 940,790E. ORIGINATED BY VK  
 DIST. 6 HWY. 410 BORING DATE July 1, 1975 COMPILED BY OY  
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing CHECKED BY [Signature]

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 % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100		$w_p$ $w$ $w_L$	10 20 30		
683.3	Ground Level											
0.0	Het. mixture of clayey silt, sand & gravel (Glacial Till)		1	SS	35	680						1 21 56 22
672.8	Hard		2	SS	100/6"	670						
10.5	Weathered											
	Sound Shale Bedrock		3	BXL	REC	80%						
664.3												
19.0	End of Borehole											

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

RECORD OF BOREHOLE NO 8

W.P. 103-69-00 LOCATION Co-ords. 877,610 N; 939,892 E. ORIGINATED BY VK  
DIST. 6 HWY. 410 BORING DATE July 2, 1975 COMPILED BY OY  
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & BX Casing 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  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$W_P$	$W$	$W_L$		
702.6	Ground Level															
0.0	Het. mixture of clayey silt, sand & gravel (Glacial Till)		1	SS	25	700										3 17 55 25
			2	SS	46											
			3	SS	71											
685.6	Very Stiff to Hard															
17.0	Weathered		4	BXL	REC	75%										
680.6	Shale Bedrock															
22.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

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

**RECORD OF BOREHOLE NO 9 (B.H.9-73-11115)**

W.P. 103-69-00 LOCATION Co-ords. 879,180 N; 938,390 E. ORIGINATED BY VK  
DIST. 6 HWY. 410 BORING DATE March 1, 1974 COMPILED BY VK  
DATUM Geodetic BOREHOLE TYPE Auger & Sample with C.M.E. -55 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT <u>W<sub>L</sub></u> PLASTIC LIMIT <u>W<sub>P</sub></u> WATER CONTENT <u>W</u>			UNIT WEIGHT <u>γ</u>	REMARKS  % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W <sub>P</sub>	W	W <sub>L</sub>		
705.8	Ground Level															
0.0	Silt some sand and traces of gravel and clay Very dense		1	SS	152							○				3 35 58 4
700.8																
5.0	Brown		2	SS	143	700						○				
	Grey															
	Het. mix. of clayey silt, sand and gravel (Glacial Till)		3	SS	100	3"						○				29 18 38 15
	Hard		4	SS	100	5"										
682.8			5	SS	100	4"										
23.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

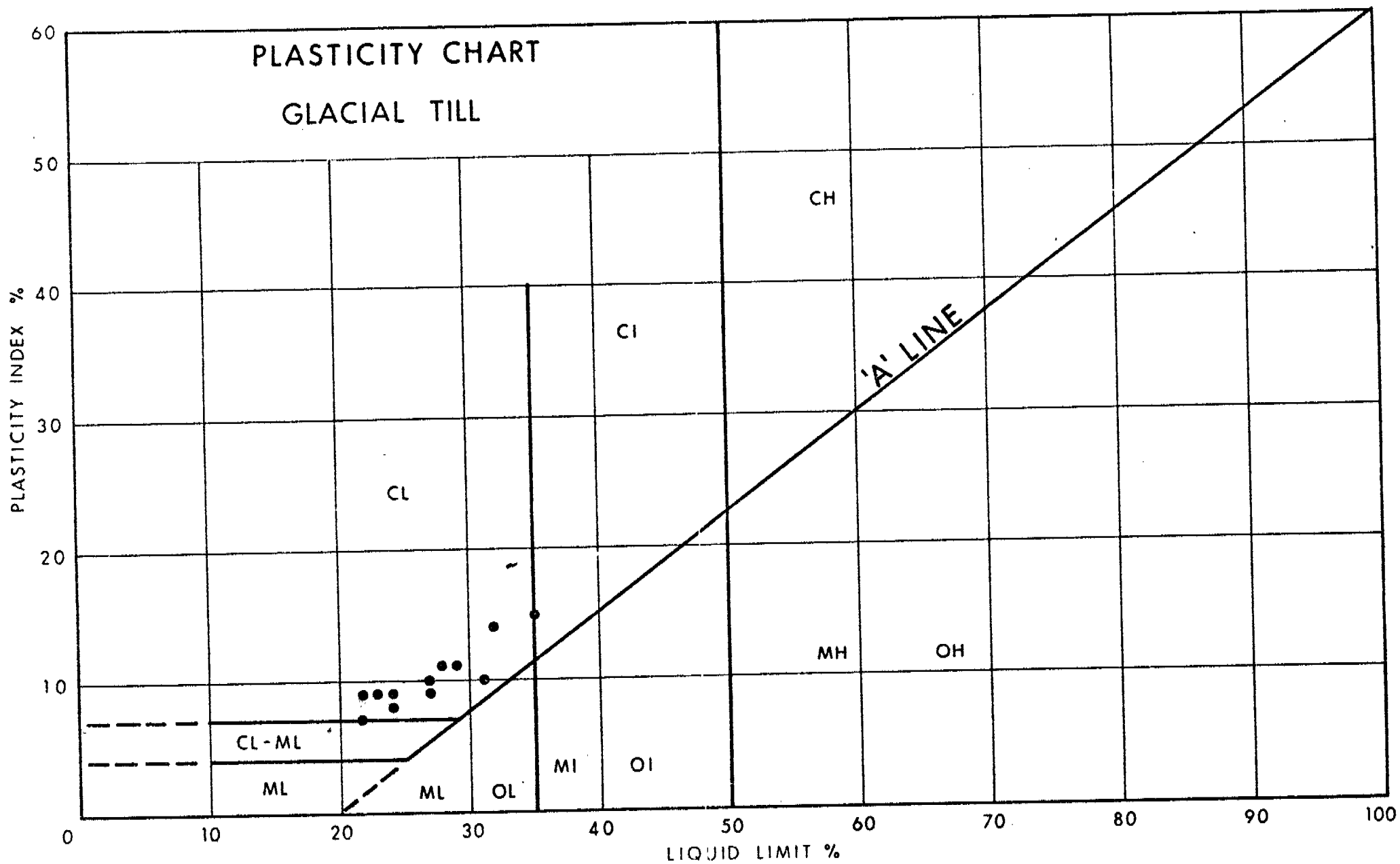


FIG. 1

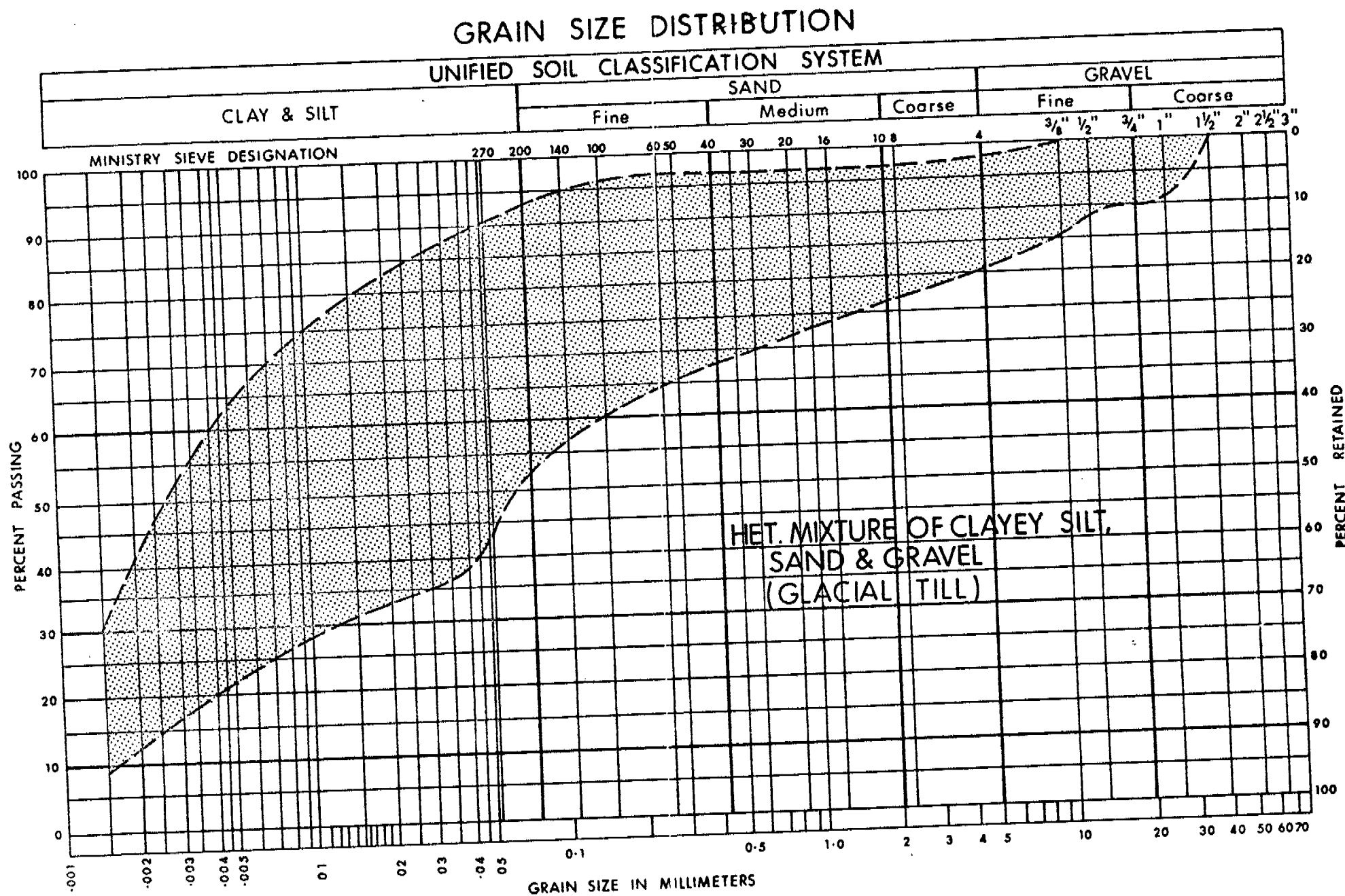


FIG. 2



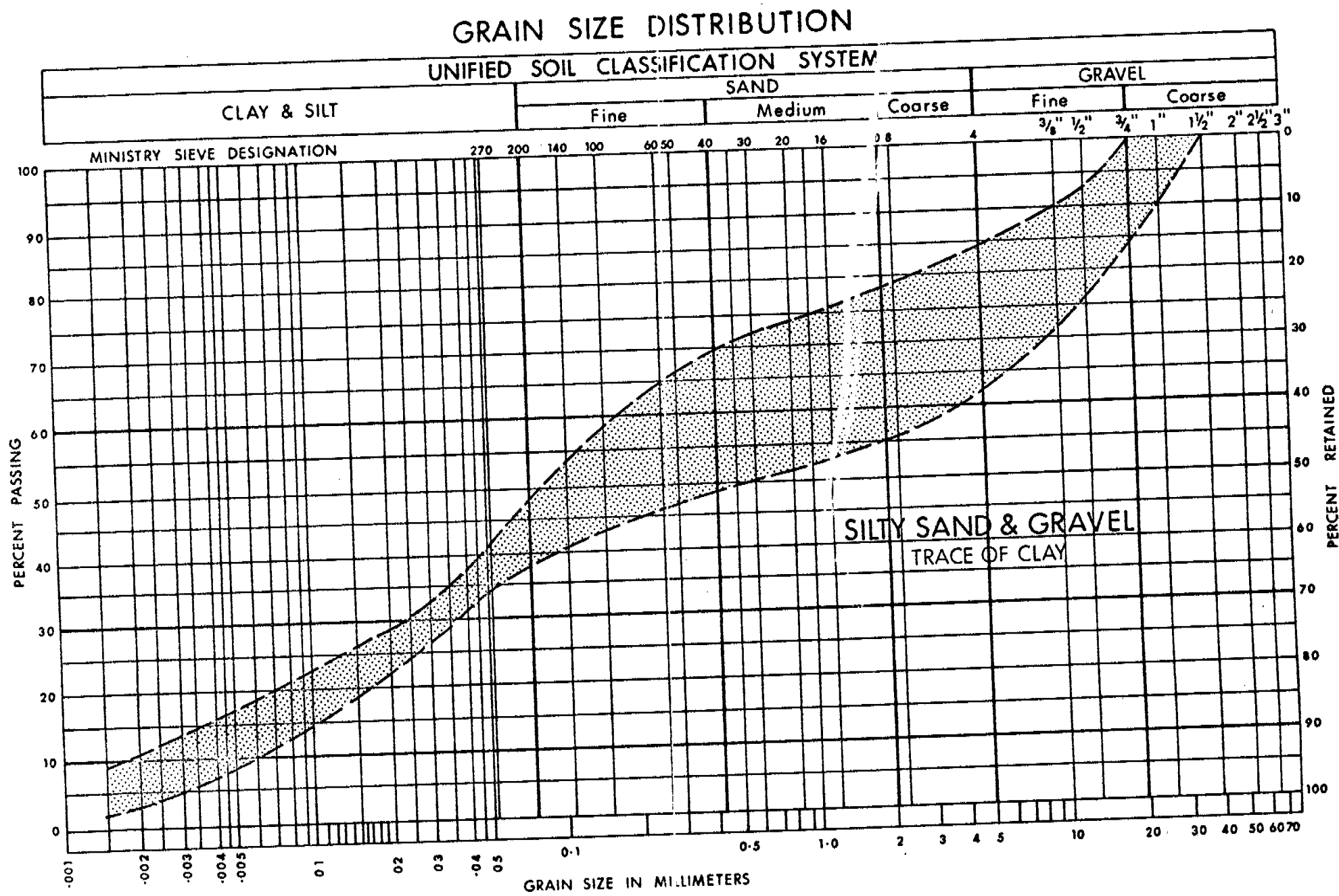


FIG. 3

# ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

## PENETRATION RESISTANCE

'N' STANDARD PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW

## DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>c LB./SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 300	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

## TYPE OF SAMPLE

S.S. SPLIT SPOON  
W.S. WASHED SAMPLE  
S.T. SLOTTED TUBE SAMPLE  
A.S. AUGER SAMPLE  
C.S. CHUNK SAMPLE

T.W. THINWALL OPEN  
T.P. THINWALL PISTON  
O.S. QESTERBERG SAMPLE  
F.S. FOIL SAMPLE  
R.C. ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY  
P.M. SAMPLE ADVANCED MANUALLY

## SOIL TESTS

U UNCONFINED COMPRESSION  
UU UNCONSOLIDATED UNDRAINED TRIAXIAL  
CIU CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL  
CID " " DRAINED "  
CAU " ANISOTROPIC UNDRAINED "  
CAD " " DRAINED "

L.V. LABORATORY VANE  
F.V. FIELD VANE  
C CONSOLIDATION  
S SENSITIVITY

# ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

## SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
$S_r$	DEGREE OF SATURATION
$w_L$	LIQUID LIMIT
$w_p$	PLASTIC LIMIT
$I_p$	PLASTICITY INDEX
$w_s$	SHRINKAGE LIMIT
$I_L$	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
$I_c$	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
$e_{max}$	VOID RATIO IN LOOSEST STATE
$e_{min}$	VOID RATIO IN DENSEST STATE
$I_D$	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY $D_r$ IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
$m_v$	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
$c_v$	COEFFICIENT OF CONSOLIDATION
$C_c$	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
$T_v$	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_i$	SENSITIVITY

IN TERMS OF  
EFFECTIVE STRESS  
 $\tau_f = c' + \sigma' \tan \phi'$

IN TERMS OF  
TOTAL STRESS  
 $\tau_f = c_u + \sigma \tan \phi$

## GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

## STRESS AND STRAIN

u	PORE PRESSURE
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

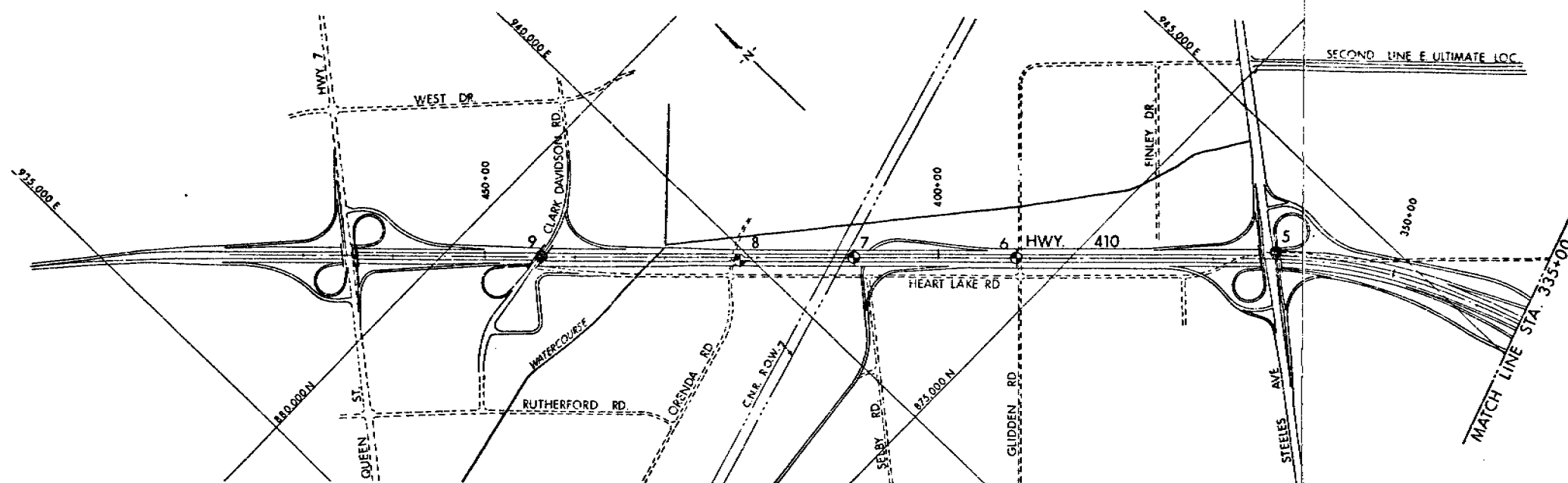
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

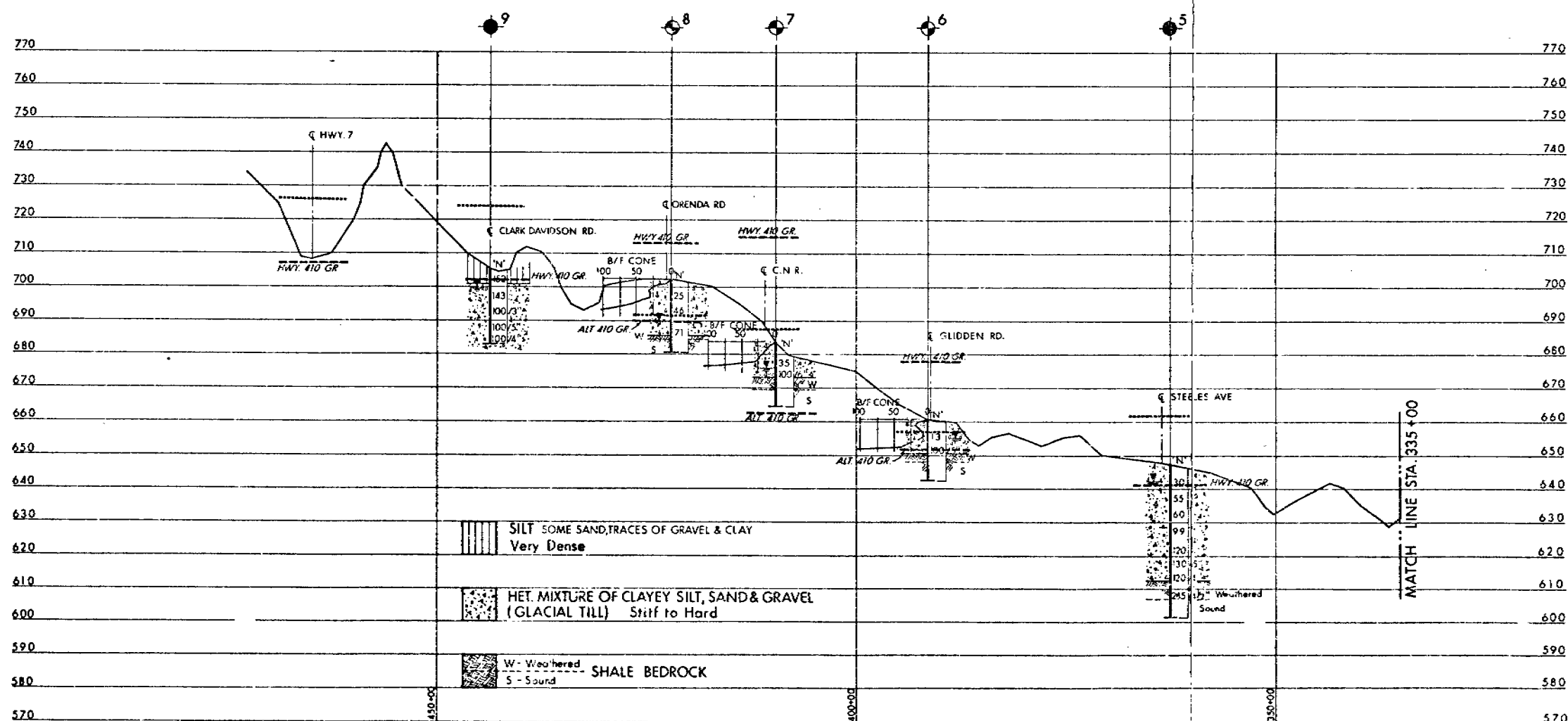
## SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



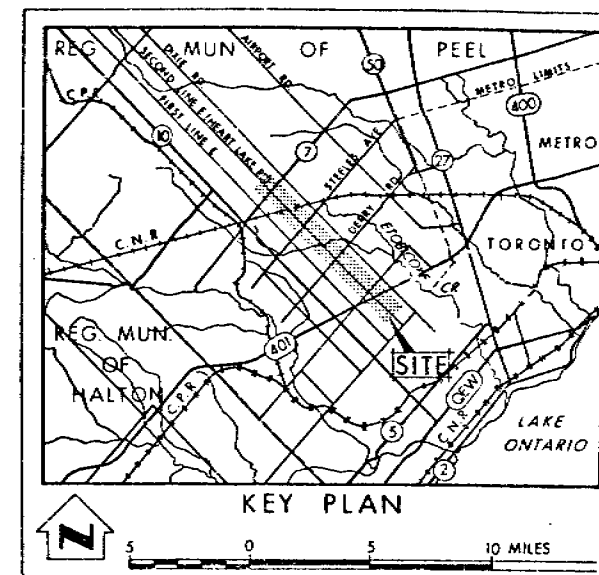
PLAN

800 400 0 SCALE 800 1600 FT.



Q PROFILE - HWY. 410

VERT 20 10 0 SCALE 20 40 FT.  
HORIZ. 800 400 0 800 1600



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test  
B/F CONE - Blows/Ft. Cone Test (350 ft. lbs. energy/blow)
- ⊕ Bore Hole & Cone Test
- W Water Levels established at time of field investigation, March 1974  
June 1975

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	867,280	946,985
4	615.7	868,935	946,010
5	647.4	873,421	944,073
6	660.8	875,420	942,048
7	683.3	876,719	940,790
8	702.6	877,610	939,892
9	705.8	879,180	938,390

NOTE

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

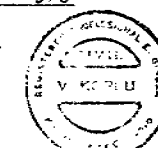
DATE	BY	DESCRIPTION

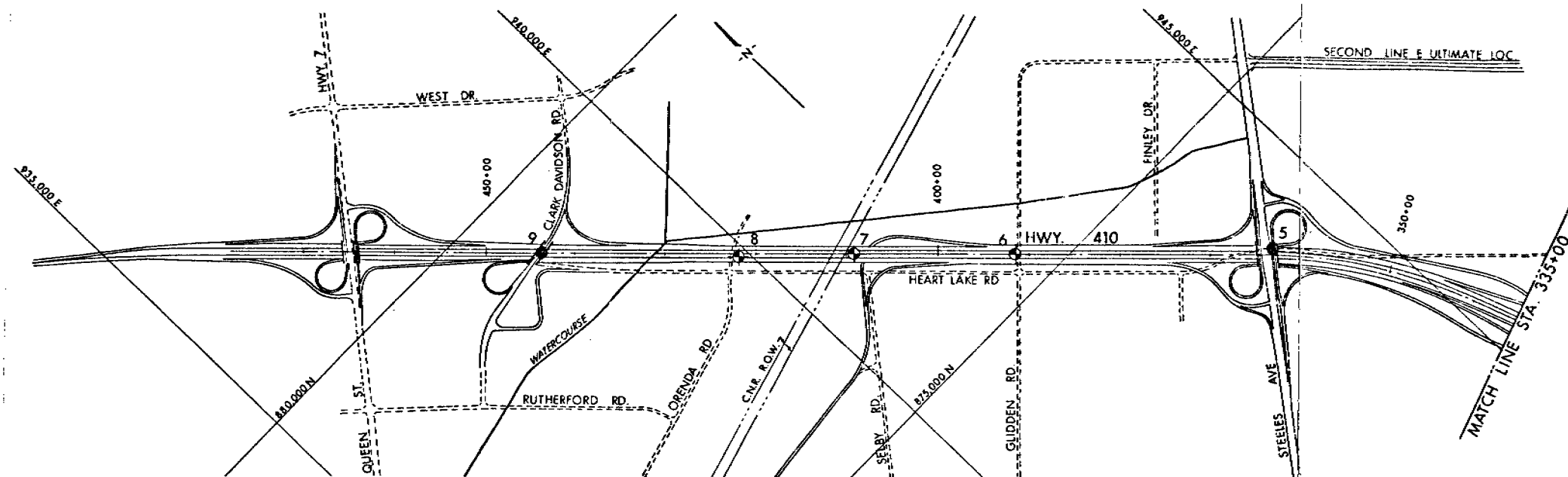
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION  
PRELIMINARY INVESTIGATION

**FROM HWY. 401 to HWY. 7**  
**PART A - STA. 335+00 TO STA. 470+00**  
HIGHWAY NO. PROPOSED 410 DIST. NO. 6  
REG. MUN. OF PEEL  
CITIES OF MISSISSAUGA & BRAMPTON

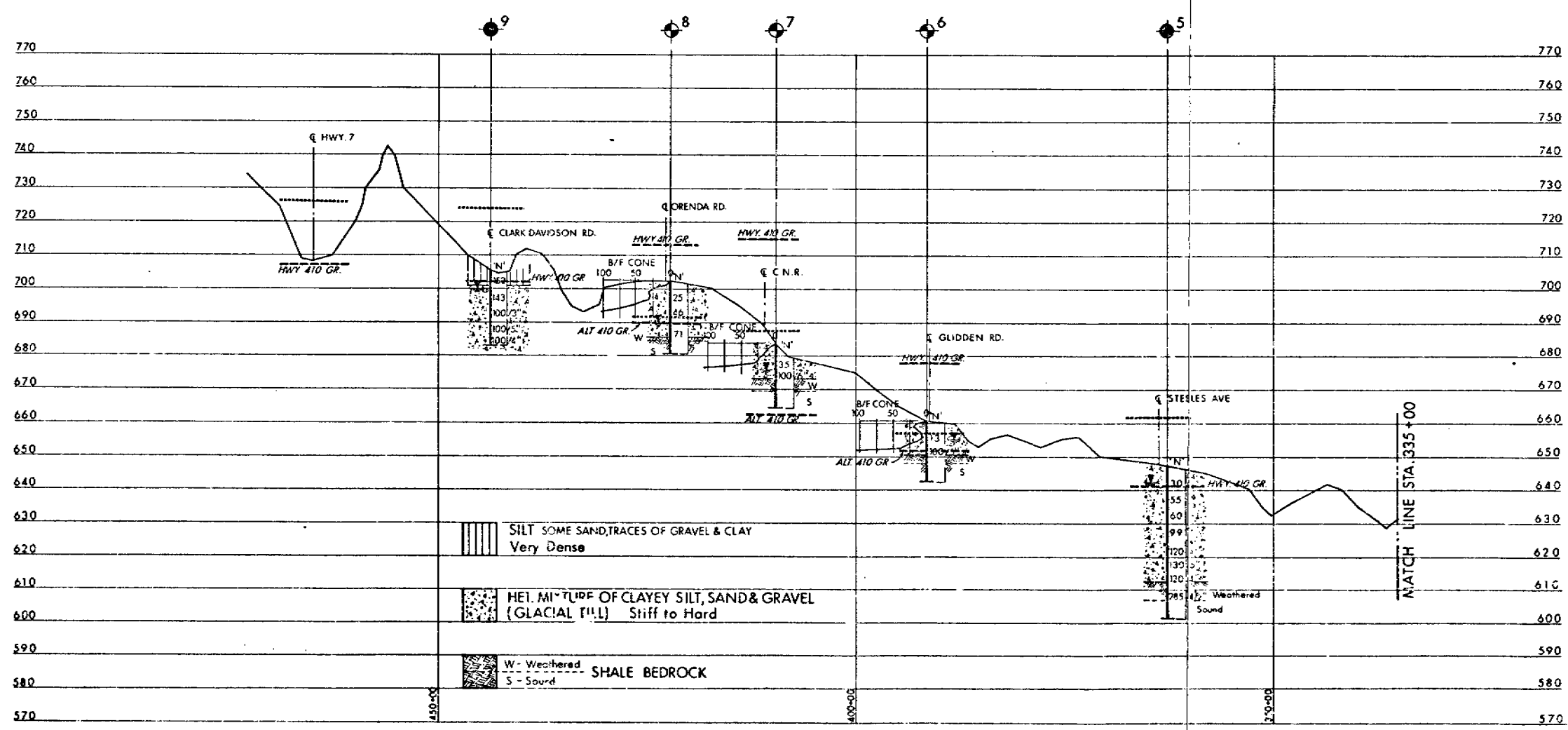
**BORE HOLE LOCATIONS & SOIL STRATA**

SUBMIT V.K. CHECKED	W.P. NO. 103-69-00	DRAWING NO.
DRAWN S.O. CHECKED	W.D. NO.	1036900-A
DATE 23 JULY 1975	S.E. NO.	BRIDGE DRAWING NO.
APPROVED	CONT. NO.	

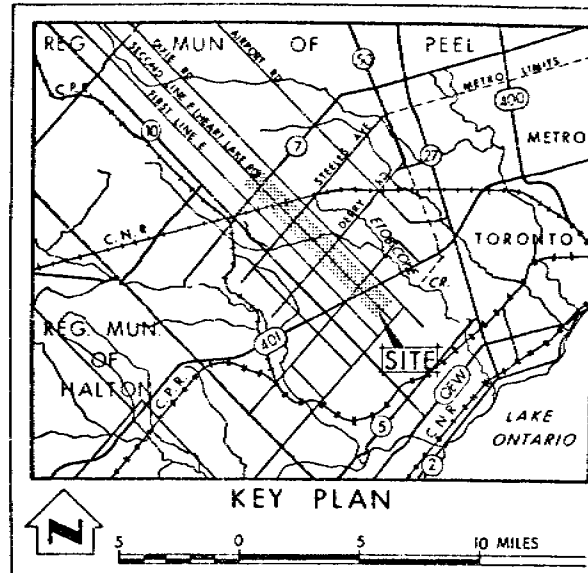




PLAN  
800 400 0 SCALE 800 1600 FT.



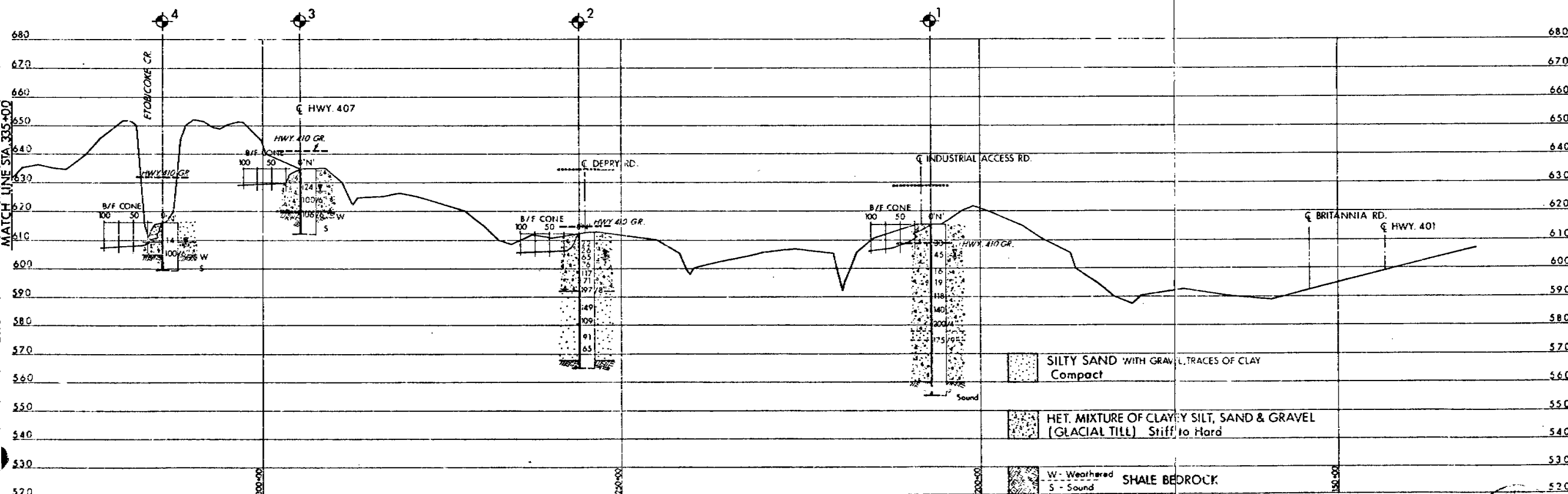
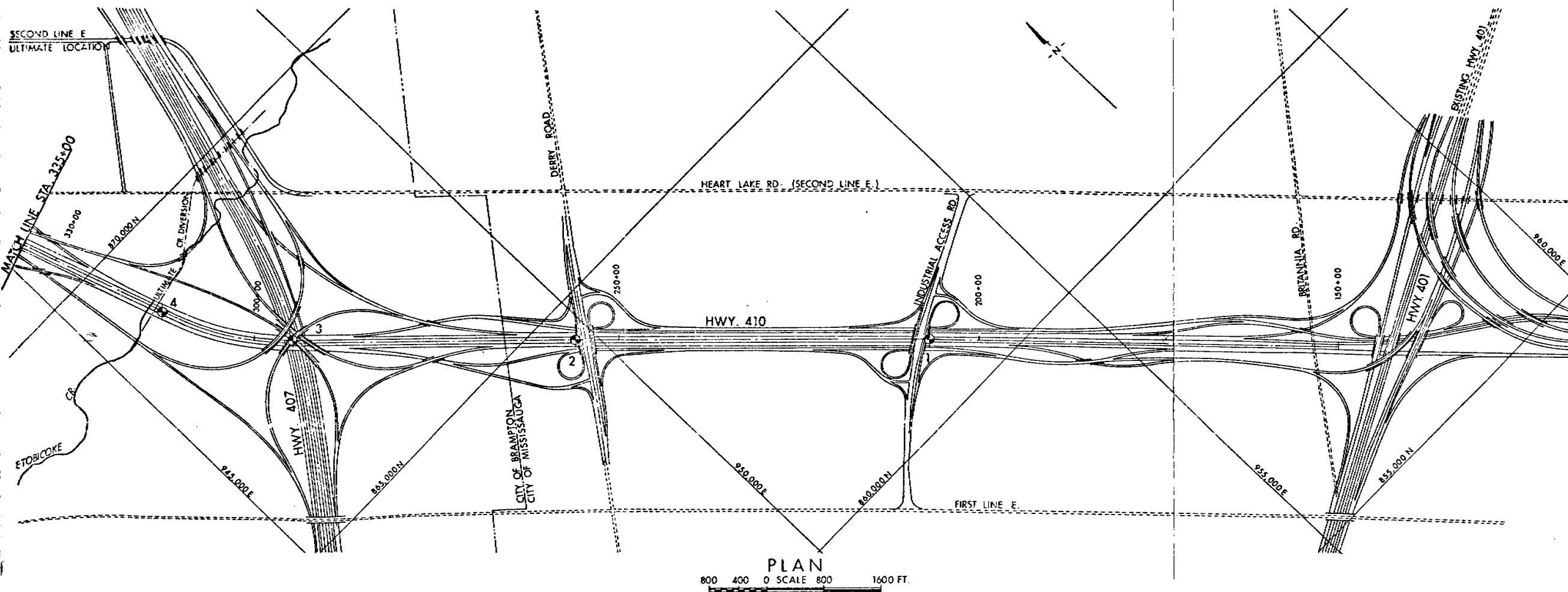
Q PROFILE - HWY. 410  
VERT 20 10 0 SCALE 20 40 FT  
HORIZ 800 400 0 SCALE 800 1600



LEGEND			
	Bore Hole		
	Dynamic Cone Penetration Resistance B/F CONE - Blows/Ft. Cone Test (350 ft. lbs. energy/blow)		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation, March 1974 June 1975		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	867,280	946,985
4	615.7	868,935	946,010
5	647.4	873,421	944,073
6	660.8	875,420	942,048
7	683.3	876,719	940,790
8	702.6	877,610	939,892
9	705.8	879,180	938,390

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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION			
PRELIMINARY INVESTIGATION			
FROM HWY. 401 to HWY. 7			
PART A - STA. 335+00 TO STA. 470+00			
HIGHWAY NO. PROPOSED 410		DIST NO. 6	
REG. MUN. OF PEEL			
CITIES OF MISSISSAUGA & BRAMPTON			
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD V. K. CHECKED	WP NO. 103-69-00	DRAWING NO.	1036900-A
DRAWN S. O. CHECKED	W. O. NO.	SITE NO.	BRIDGE DRAWING NO.
DATE 23 JULY 1975			
APPROVED	CONE NO.		



SEE DRAWING 1036900-A

KEY PLAN

### LEGEND

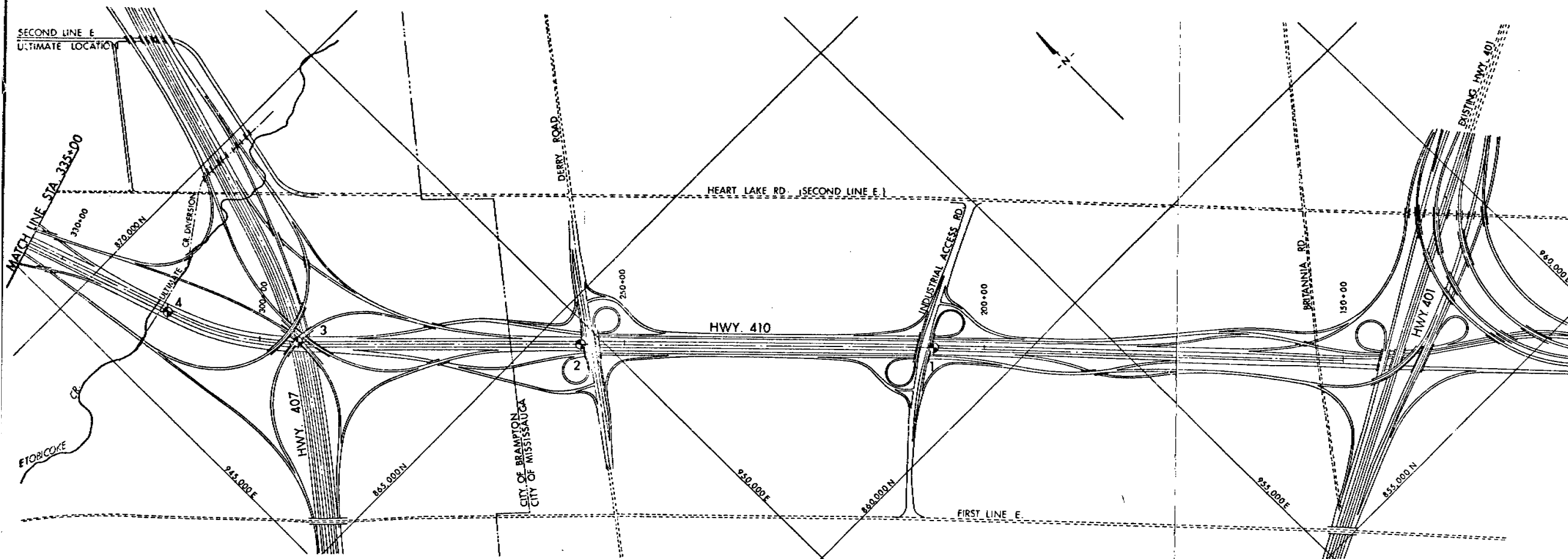
- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test
- ⊕ B/F CONE - Blows/Ft. Cone Test (150 ft. lbs. energy/blow)
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, JUNE 1975

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	857,280	946,985
4	615.7	868,935	946,010

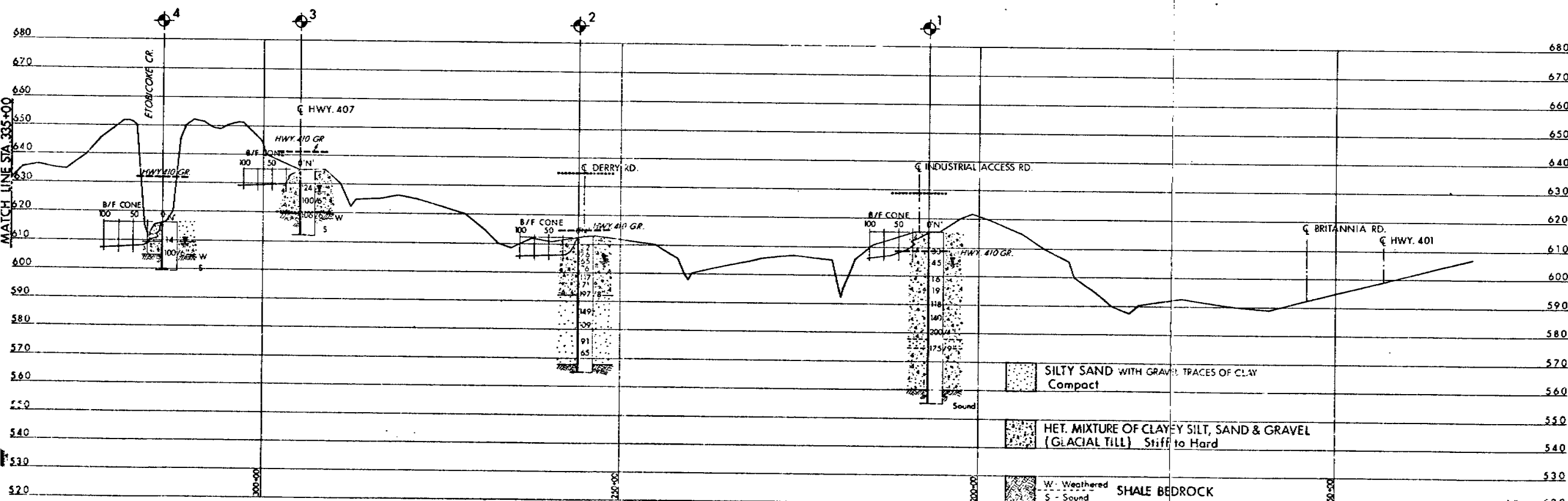
### NOTE

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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION			
PRELIMINARY INVESTIGATION			
FROM HWY. 401 to HWY. 7			
PART B - STA. 120+00 to STA. 335+00			
HIGHWAY NO. PROPOSED 410		DIST. NO. 6	
REG. MUN. OF PEEL			
CITIES OF MISSISSAUGA & BRAMPTON			
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMITTAL CHECKED	WP NO. 103-69-00	DRAWING NO.	
DRAWN BY	W.D. NO.	1036900-B	
DATE 23 JULY 1975	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		



PLAN  
800 400 0 SCALE 800 1600 FT.



PROFILE - HWY. 410  
VERT 20 10 0 SCALE 20 40 FT.  
HORIZ 800 400 0 800 1600

SEE DRAWING 1036900-A

KEY PLAN

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test  
B/F CONE - Blow/Ft. Cone Test (350 ft. lbs. energy/blow)
- ⊕ Bore Hole & Cone Test
- ≡ Water Levels established at time of field investigation, JUNE 1975

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	867,280	946,985
4	610.7	868,935	946,010

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO  
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION  
PRELIMINARY INVESTIGATION  
**FROM HWY. 401 to HWY. 7**  
**PART B - STA. 120+00 TO STA. 335+00**  
HIGHWAY NO. PROPOSED 410 DIST NO. 6  
REG. MUN. OF PEEL  
CITIES OF MISSISSAUGA & BRAMPTON

BORE HOLE LOCATIONS & SOIL STRATA			
SUBMIT V. K. K.	W.P. NO. 103-69-00	DRAWING NO.	1036900-B
DRAWN S. O. K.	W.G. NO.	BRIDGE DRAWING NO.	
DATE 23 JULY 1975	SITE NO.		
APPROVED	CONT. NO.		

# OVERSIZE DRAWING(S)



## MEMORANDUM

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

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

ATTENTION:

DATE: February 21, 1975.

OUR FILE REF.

IN REPLY TO

SUBJECT: Highway 410 from Highway 401,  
Northerly to Highway 7,  
W.P. 103-69-00, District 6.



The preliminary design for the above mentioned project has now been completed. According to the proposed alignment, Highway 410 is located between the First and Second Line East (Heart Lake Road). The design requires structures at the following locations; Industrial Access Road, Derry Road, Etobicoke Creek, Steeles Avenue, Glidden Road, Connection to Clarence Street, C.N.R. Crossing, Orenda Road and Clark - Davidson Road.

Preliminary details of the proposed structures and roadway alignment are indicated on the enclosed plans. These plans include:

410 Ultimate Profile	(2 copies)
410 Ultimate Plan - South	(2 copies)
410 Ultimate Plan - North	(2 copies)

Please note the design of the Highway 410/407 interchange is to be completed at a later date and will be dealt with elsewhere.

The initial structure design is indicated in red and the ultimate design in blue.

Dimensions shown are parallel or perpendicular to the centreline of Highway 410.

We would like to draw your attention to the median gap between the northbound and southbound structures as shown in blue on the overpass cross-sections. The possibility of a future mass transit system would require the utilization of the wide centre median of Highway 410. For this purpose the gap between structures would be closed to provide an additional centre structure.

At the proposed C.N.R. Overpass we are contemplating two possible span arrangements due to the uncertainty of the future track locations. The second scheme is shown in green. Both span layouts are tied to the centreline of the south track, and both the layouts have initial and ultimate designs.

Could you please prepare a preliminary Foundation Investigation Report of sufficient scope to cover the initial, ultimate and mass transit schemes. Your recommendations at this stage would greatly assist the development of the final design.

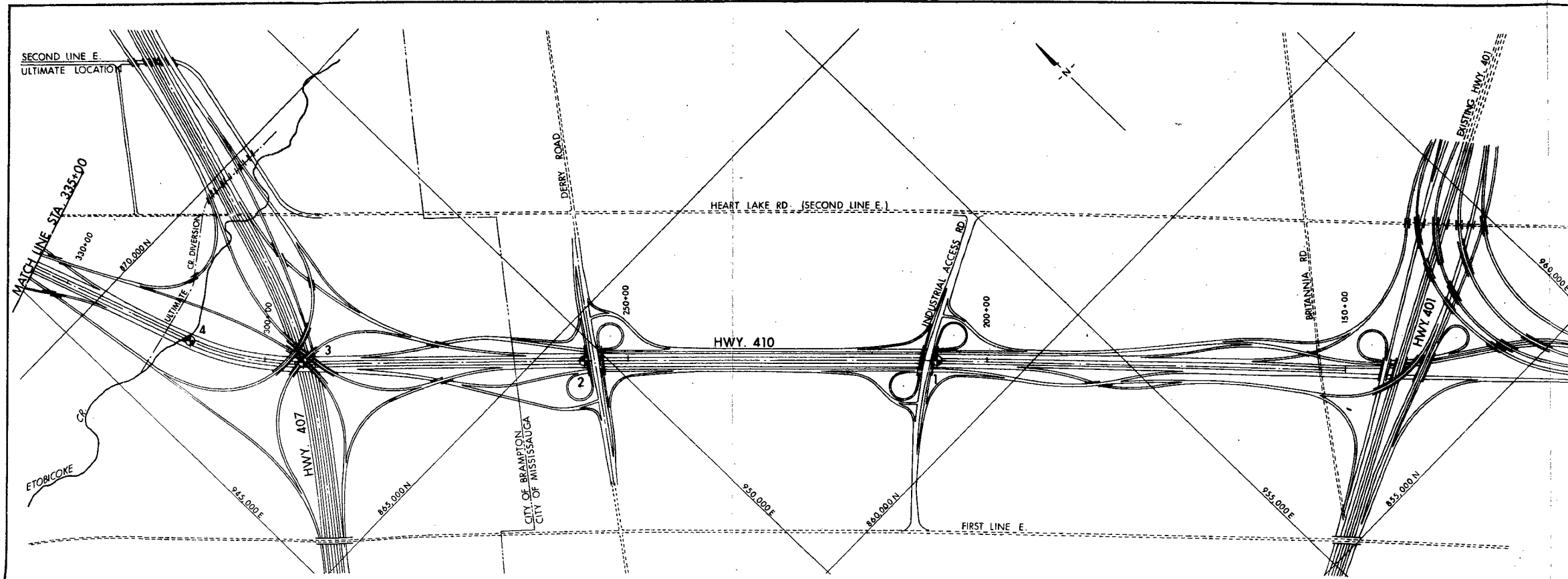
Should additional clarification and/or details be required please do not hesitate to call this office.



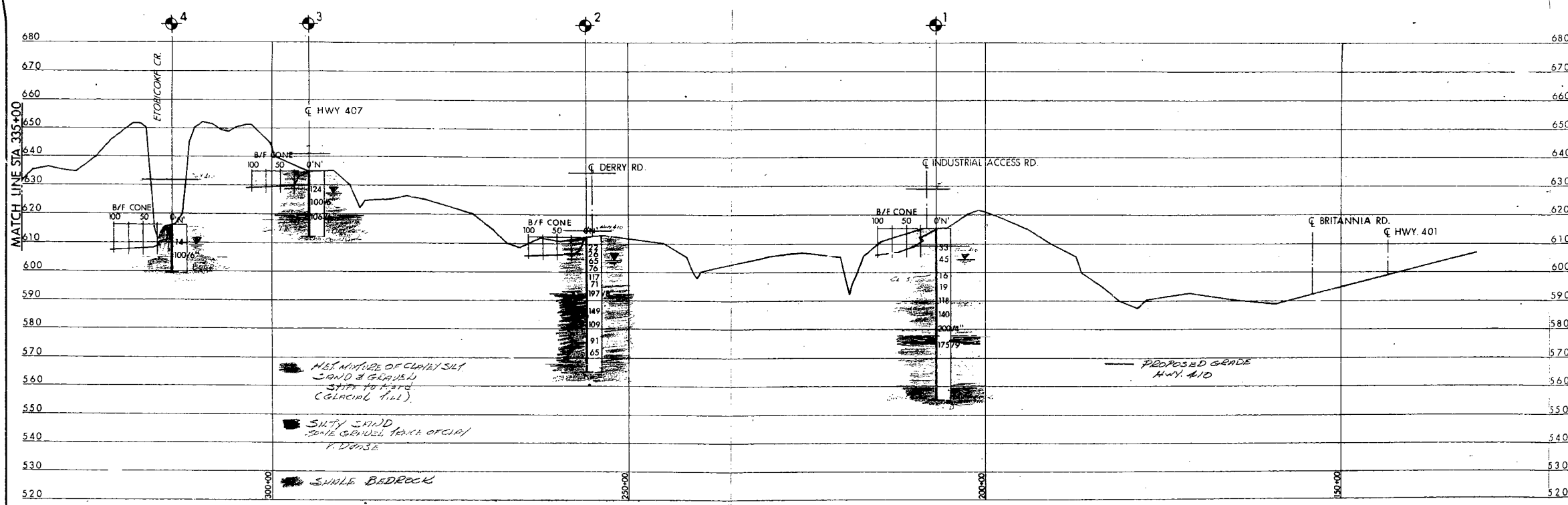
RJ:sm  
Encl.

R. Jeffries,  
STRUCTURAL PLANNING SUPERVISOR,  
for:  
G.C.E. Burkhardt,  
REG. STRUCTURAL PLANNING ENG.

cc: J. Barclay  
D. Gunter  
J. Anderson  
L. Dutchak  
R. Fitzgibbon



PLAN  
800 400 0 SCALE 800 1600 FT.



Q PROFILE - HWY. 410  
VERT. 20 10 0 SCALE 20 40 FT.  
HORIZ. 800 400 0 SCALE 800 1600

SEE DRAWING 1036900-A

KEY PLAN

LEGEND

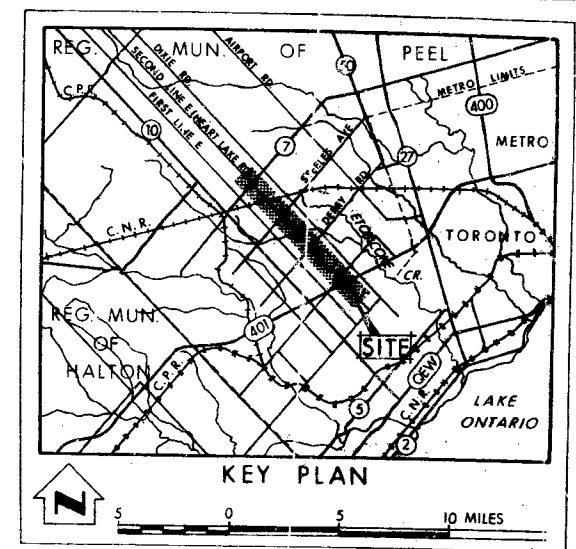
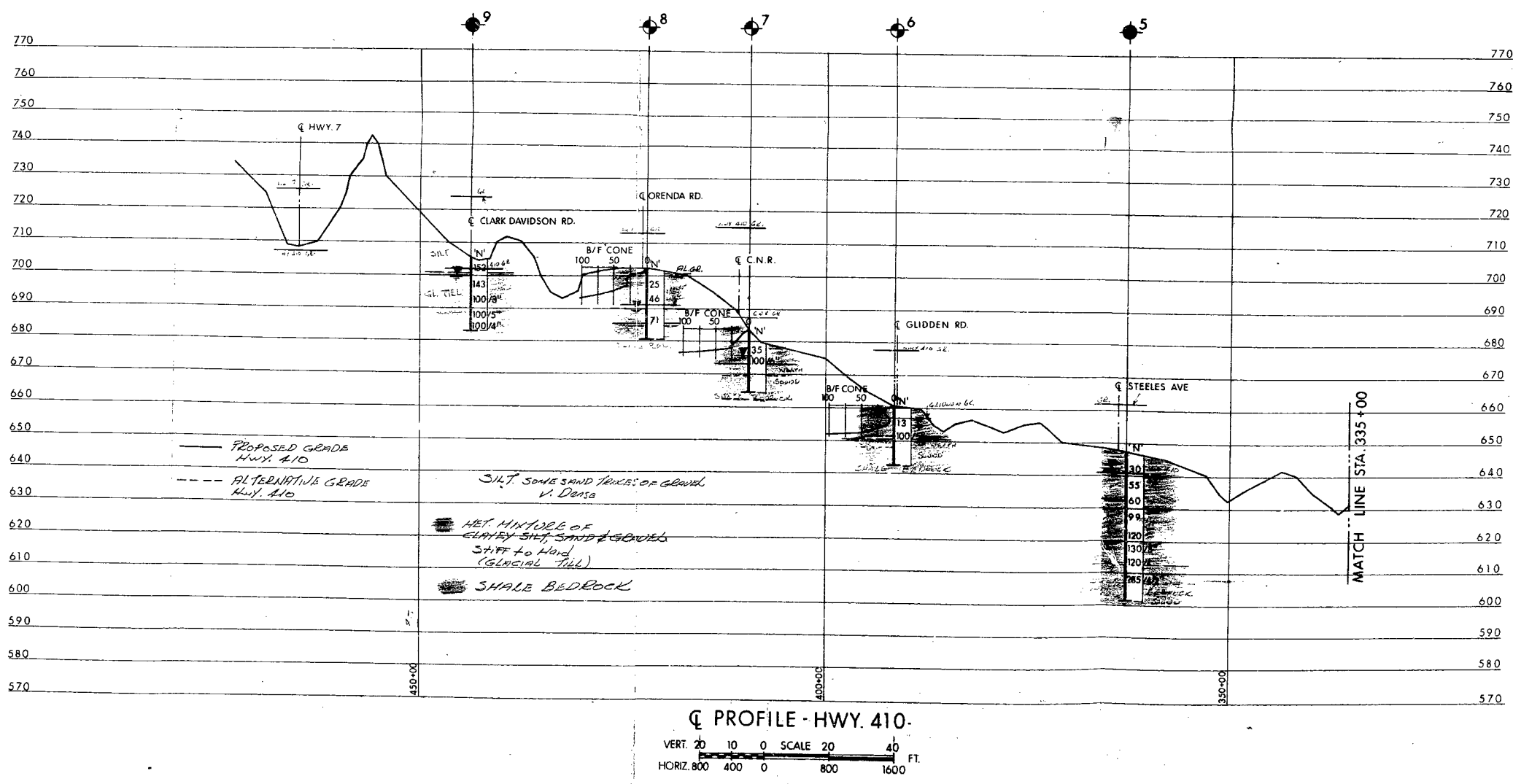
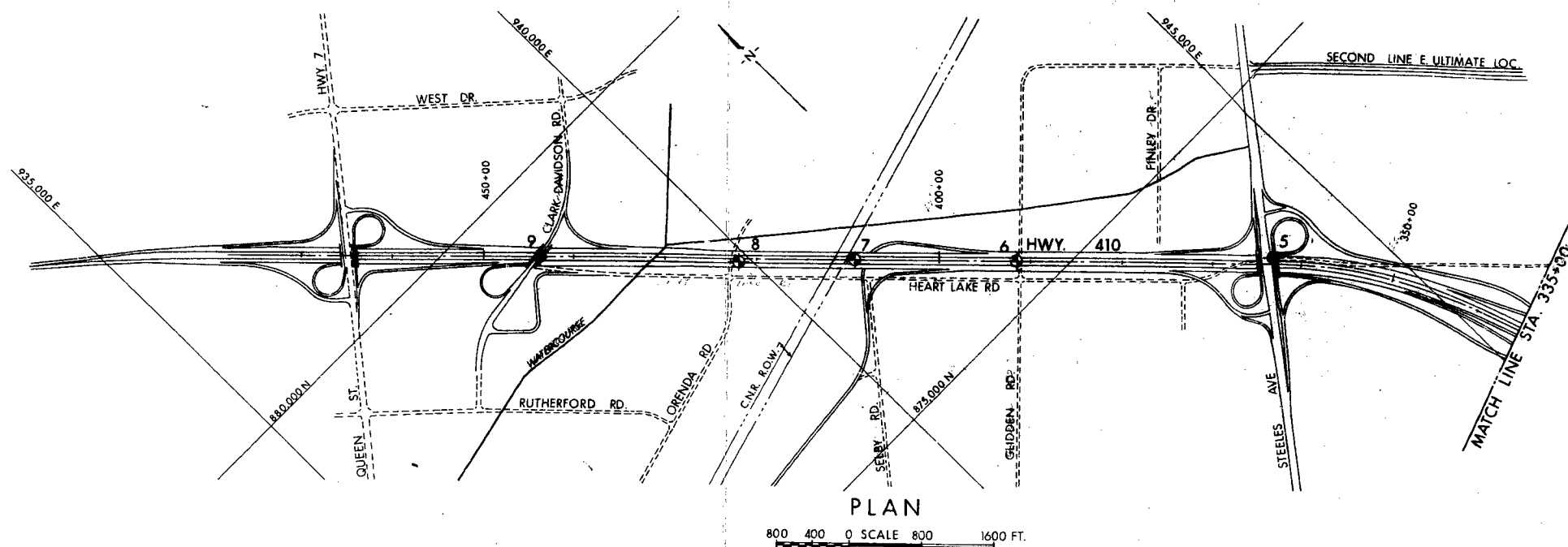
- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test  
B/F CONE - Blows/Ft. Cone Test (350ft.lbs. energy/blow)
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation.

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	867,280	946,985
4	615.7	868,935	946,010

NOTE

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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION			
PRELIMINARY INVESTIGATION			
FROM HWY. 401 to HWY. 7			
PART B - STA. 120+00 TO STA. 335+00			
HIGHWAY NO. PROPOSED 410		DIST. NO. 6	
REG. MUN. OF PEEL			
CITIES OF MISSISSAUGA & BRAMPTON			
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD V.K.	CHECKED	W.P. NO. 103-69-00	DRAWING NO.
DRAWN S.O.	CHECKED	W.O. NO.	1036900-B
DATE	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		



LEGEND			
	Bore Hole		
	Dynamic Cone Penetration Resistance Test B/F CONE - Blows/Ft. Cone Test (350 ft. lbs. energy/blow)		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation.		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	615.0	861,012	953,060
2	611.8	864,490	949,700
3	634.5	867,280	946,985
4	615.7	868,935	946,010
5	647.4	873,421	944,073
6	660.8	875,420	942,048
7	683.3	876,719	940,790
8	702.6	877,610	939,892
9	705.8	879,180	938,390

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

REVISIONS	DATE	BY	DESCRIPTION

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

PRELIMINARY INVESTIGATION  
**FROM HWY. 401 to HWY. 7**  
PART A - STA. 335+00 TO STA. 470+00  
HIGHWAY NO. PROPOSED 410 DIST. NO. 6  
REG. MUN. OF PEEL  
CITIES OF MISSISSAUGA & BRAMPTON

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBMD. V.K.	CHECKED	WP. NO. 103-69-00	DRAWING NO.
DRAWN S.O.	CHECKED	WO. NO.	<b>1036900-A</b>
DATE		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT. NO.	