

Ontario
Department of Transportation and Communications
~~XXXXXXXXXXXXXXXXXXXX~~

MEMORANDUM

73-20
30M11-115

TO: Mr. G. C. E. Burkhardt, (2) FROM: Foundations Office,
Regional Bridge Planning Eng., Design Services Branch,
Central Region, Central Bldg., Downsview.
90 Floral Pkwy., Downsview.

ATTENTION: DATE: October 1, 1971.

OUR FILE REF. IN REF. TO: OCT 4 1971

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

Proposed Structure at the
Crossing of Belfield Expressway and
Mississauga Creek (Bridge #7)
District No. 6 (Toronto)
M.O. 71-11040 -- W.P. 275-65

CONT 73-20 site 37-969

30M11-115

GEOCREP No

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

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

AGS/so
Attach.

cc: Messrs. E. R. Davis

A. Duka
D. W. Parren
G. K. Hunter
H. Greenland
B. J. Giroux
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A. G. Sternec
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PRINCIPAL FOUNDATION ENGINEER.

Foundations Files ✓

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FOUNDATION INVESTIGATION REPORT
For
Proposed Structure at the
Crossing of Belfield Expressway and
Mimico Creek (Bridge #7)
District No. 6 (Toronto)
W.O. 71-11040 -- W.P. 276-65

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation at the crossing of proposed Belfield Expressway and Mimico Creek diversion, in the Borough of Etobicoke, York County. The request was contained in a memo from the Bridge Office (Mr. G. C. E. Burkhardt, Regional Bridge Planning Engineer), dated June 23, 1971. Subsequently, an investigation was carried out by this Section to determine the subsoil and groundwater conditions at the site.

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

2. SITE AND GEOLOGY:

The site is located between Carlingview Drive and Attwell Rd., approximately 2000 feet south of Disco Road in the Borough of Etobicoke, Metropolitan Toronto. The terrain in the immediate vicinity has relief differences of up to 26 feet; i.e. between elevations 522 and 496. The surrounding areas, however, have been developed for small industrial and commercial purposes.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsin glacial age. The overburden is underlain by grey shale bedrock of Meaford-Dundas formation, Ordovician Period. Available information indicates that the surface of the bedrock varies somewhere between elevations 463 and 470.

3. FIELD AND LABORATORY WORK:

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

Samples were obtained at required depths in a 2 inch split-spoon sampler which was hammered into the soil. The method of driving the split-spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests.

During sampling and drilling operations, detail logs of the borings were made; these logs contain a record of drilling and sampling techniques used together with the soil types encountered.

The location and elevation of all the boreholes are shown in Drawing #71-11040A and B, together with a number of estimated stratigraphical sections across the site. Surveying at the site was carried out by the personnel from the Draughting Section, Foundation Office, Department of Transportation and Communications. The elevations given in this report are referred to a geodetic datum.

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

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

The results of these tests are plotted on the Record of Borelog sheets as well as on the figures in the Appendix.

4. SUBSOIL CONDITIONS:

4.1) General:

The predominant stratum across the site is a competent glacial till, having a thickness between 25 feet and 33 feet. This stratum is overlain by a surficial deposit having a total thickness of 2 feet to 6 feet. The overburden is underlain by shale bedrock some 30 to 33 feet below the existing ground surface.

The subsoil and bedrock sequence encountered at the various borehole locations is shown on the accompanying borelog sheets. The stratigraphical sections, shown on Drawing No. W.O. 71-11040A and " have been inferred from this data.

A brief description of the subsoil and bedrock types encountered is presented in the surficial deposits.

4.2) Surficial Deposits:

Overlying the glacial till stratum, over the entire site, surficial deposits consisting of either silty sand with some gravel, trace of organics (B.H.'s #1 to #7 inclusive and 9-12 inclusive) or clayey silt with some sand (B.H.'s #8, 13 & 14) were encountered. According to available geological information the surficial material was laid down by the action of the river or creek and consequently these flood plain deposits are of an alluvial nature.* The thickness of the surficial deposit varies between 2 feet at B.H.'s #3 and 10 to 6 feet at B.H. #9.

At certain locations (B.H.'s #4, 8, 12-15 inclusive) the flood plain deposits contain organic inclusions. Wherever possible, tests were carried out to determine the organic contents. These results indicate that the organic content in the upper portion of the deposit at B.H.'s #8, 14 & 15 ranges from 1.2 to 1.6% by weight.

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*Watt, A.K.,

"Pleistocene Geology and Groundwater Resources, Township of Etobicoke," Geological Report 59; O.D.M.

4. SUBSOIL CONDITIONS: (cont'd) ...

4.2) Surficial Deposits: (cont'd) ...

Standard penetration testing was performed within this material; the values obtained are plotted on the borelog sheets. The 'N' values ranged randomly from 3 to 9 blows/ft. in the cohesive portion and from 2 to 12 blows/ft. in the non-cohesive portion of the flood plain deposits. These values indicate that the consistency of the cohesive portion of the surficial deposit ranges from soft to firm, whereas the relative density of the non-cohesive portion varies from very loose to compact.

4.3) Glacial Till:

Underlying the surficial material is a glacial till deposit ranging in thickness from 25 feet at B.H. #9 to 33 feet at B.H. #3.

This glacial deposit has a random composition ranging from a heterogeneous mixture of clayey silt, sand and gravel (cohesive) to a heterogeneous mixture of silt, sand and gravel (non-cohesive). Over the majority of the site the non-cohesive zone is sandwiched between the cohesive zones of the glacial till stratum. However, this pattern was interrupted at the location of B.H. #3 and 8 by the absence of a cohesive zone in the lower portion of the stratum and a non-cohesive zone in the middle of the deposit respectively. The thicknesses of the respective zones within the glacial till are as follows:

	<u>Thickness</u>	<u>Range</u>
Upper Cohesive Zone	3'	12'
Granular Till Zone	10'	20'
Lower Cohesive Zone	3'	12'

Grain-size distribution curves for samples obtained within the two distinct zones are plotted in envelope form on the figures listed below.

Figure No. 1 - Upper and Lower Cohesive
Glacial Till

Figure No. 2 - Granular Glacial Till

These figures are presented in Appendix I of this report.

4. SUBSOIL CONDITIONS: (cont'd) ...

4.3) Glacial Till: (cont'd) ...

Atterberg limit tests were carried out on samples from the cohesive as well as less cohesive zones of the glacial till stratum. These are plotted on the Record of Borelog Sheets and are summarized on the Plasticity Chart, Figure No. 3. The results are tabulated below:

		<u>Cohesive Zones</u> <u>Range</u>	<u>Granular Zones</u> <u>Range</u>
Liquid Limit (%)	(W_L)	15-42	13-16
Plastic Limit (%)	(W_P)	11-22	11-15
Natural Moisture Content (%)	(W)	7-28	6-16

Referring to the table, it can be seen that the cohesive portions of the glacial till are inorganic with a plasticity in the low range. The limited number of tests carried out, whenever possible, on the granular portion of the glacial till indicate that this material is basically non-plastic.

Standard penetration testing was performed within the stratum; the values obtained are plotted on borelog sheets. The 'N' values in the granular portion varied from 15 blows/ft. to 100 blows for 3 inches; whereas, the 'N' values in the cohesive zones, in general, ranged from 20 blows/ft. to 100 blows for 1 inch. This portion was altered in B.H. #7 where 'N' values as low as 5 blows/ft. were encountered in the upper cohesive glacial till stratum. Based on these results, it is estimated that the relative density of non-cohesive till is compact to very dense and the consistency of the cohesive zones generally varies from firm to hard.

4.4) Bedrock:

Bedrock was encountered beneath the glacial till deposit. The bedrock was proven in 10 of the borings by obtaining up to 9 feet of BX size rock core. The bedrock surface was encountered between elevations 463.5 and 467.5, which corresponds to depths of from 30 to 33 feet below the ground surface.

4. SUBSOIL CONDITIONS: (cont'd) ...

4.4) Bedrock: (cont'd) ...

The bedrock is composed of a grey shale, the upper 2.0 to 3.5 feet of which is in a weathered condition. Below this weathered zone the bedrock is sound as evidenced by the high percentage of core recovered.

5. GROUNDWATER CONDITIONS:

Groundwater level observations were carried out, during the period of the investigation, by recording the water levels in the open boreholes. These observations, which are recorded on the borelog sheets, are also summarized on Drawing Nos. M.O. 71-11040A and B. These observations indicate that the groundwater level ranges between elevations 496 and 498, which correspond to depths of from 3 inches to 3.5 feet below original ground surface.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

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

This discussion deals with the proposed structure at the crossing of the Belfield Expressway and the Mimico Creek diversion. Discussions with regard to other structures on the expressway will be covered under separate foundation reports.

Two alternatives are proposed for the Belfield Expressway crossing at the Mimico Creek diversion. One proposal is to construct a three span structure incorporating two piers and perched abutments at either end within the approach fills; the alternative is to construct a barrel arch culvert at the Mimico Creek diversion. The profile grade of the Belfield Expressway in the vicinity of the proposed creek crossing will be at elevation 542, i.e. in the order of 52 ft. above the creek bed.

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

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

Subsoil at this site consists of a deposit of glacial origin having a thickness of 25 to 33 ft. underlain by shale bedrock. The glacial till is overlain by surficial (flood plain) deposits of varying composition with thickness in the range of 2 ft. to 6 ft.

In this location, as already mentioned, fills up to 52 feet in height will be required for the proposed Belfield Expressway. Stability of the embankment will be the governing factor in any particular scheme chosen, such as a multi-span structure or a long barrel arch culvert. Therefore, the stability of the embankment will be discussed in the proceeding subsections prior to the foundation considerations.

6.2) Approach Fills:

6.2.1) Stability Considerations:

The subsoil conditions are generally favourable and consequently no deep-seated failures are anticipated provided that the fill material itself will be stable with standard 2:1 slopes. Stability analyses of the fill material itself have been carried out both in terms of total stresses ($\phi = 0$) as well as effective stresses by the use of an electronic computer with the following assumptions:

Width of the Embankment	- 130 feet
*Maximum Height of Embankment	- 52 feet
Slopes	- 2:1
Tension Cracks in the Fill	- H/3

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*52 feet - taken from profile grade of Belfield Expressway to the creek bed of Nimico Creek.

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

6.2) Approach Fills: (cont'd) ...

6.2.1) Stability Considerations: (cont'd) ...

Fill Material

Type of Embankment Material - Het mix of clayey silt, sand and gravel.

Bulk Density of Fill Material - 140 p.c.f.

Apparent Cohesion in Terms of Total Stresses (C_u) - 1200 p.s.f.

Apparent Angle of Shearing Resistance in Terms of Total Stresses (ϕ) - 0 degrees

Effective Cohesion Intercept in Terms of Effective Stresses (c') - 0 p.s.f.

Effective Angle of Shearing Resistance in Terms of Effective Stresses (ϕ') - 30 degrees

*Average Pore Pressure Ratio (r_u) - 0.25

Surficial Deposits

Bulk Weight of Surficial Material (Upper 6 feet) - 130 p.c.f.

Angle of Shearing Resistance - 30 degrees

In the analyses a limiting condition was chosen that circles were not permitted to pass below the surficial deposit because of the competent nature of the parent glacial till deposit.

As a result of stability analysis of the approach fill the following conclusions have been drawn.

1. Fills up to 40 feet in height will be stable with standard 2:1 slopes.
2. A mid-height berm will be required for 45 and 52 feet embankment heights, as follows:

45 feet fill - 10 feet berm

52 feet fill - 20 feet berm

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Bischof, A.W., and Morgenstern, N., - "Stability Coefficients for Earth Slopes", Geotechnique, Vol. 10, No. 4, 1960, pp. 129-150.

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

6.2) Approach Fills: (cont'd) ...

6.2.1) Stability Considerations: (cont'd) ...

Smooth transition should be effected as the berm length decreases from 20 feet to 0 feet.

It may be advantageous to construct a ditch in the middle of the berm in order to collect all surficial runoff.

3. In the valley floor the upper 4 feet of the surficial deposits containing organic material should be sub-excavated for the entire base width of the embankment between Stations 656+75 and 662+20 prior to placing any fill in this area.

Since the water table is very close to ground surface in this flood plain area, granular type of acceptable earth material should be used as backfill material.

Any additional localized organic pockets uncovered during the time of construction should be completely excavated and backfilled with proper material.

The Regional Material Section should carry out shallow borings in order to determine the depth and the nature of topsoil in the general area of the Mimico Creek crossing complex. If the topsoil is highly organic, all topsoil should be stripped prior to the construction of the embankments.

According to our recent information from the Regional Systems Design personnel 3:1 slopes may be incorporated because of other considerations. If this is the case, the mid-height berms for fills in excess of 40 feet with 2:1 slopes, quoted elsewhere in the report will not be required.

6.2.2) Settlement Considerations:

The subsoil is extremely competent and no long term settlements are anticipated due to the induced loads of the approach fills. However, the compacted fills of magnitude up to 57 feet in height may settle due to its own weight. It is extremely difficult to estimate the magnitude and time rate of settlement of compacted materials.

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

6.2) Approach Fills: (cont'd) ...

6.2.2) Settlement Considerations: (cont'd) ...

It should be noted the magnitude of the settlements of the compacted fills will depend upon the compactive efforts and the control of moisture content during the placement of the fill. As a rough estimate it can be assumed that the fills up to 25 feet in height may settle as much as 1/2 per cent of its total height, and up to 1 per cent for fills between 25 to 52 feet in height. It is believed that up to 50 per cent of the settlement should take place in a relatively short period of time. In order to minimize post construction maintenance problems fills should be constructed and left in place as long a period as possible prior to paving operations, preferably six months or more if scheduling and other requirements permit.

6.3) Three-Span Structure:

The present proposal calls for a three-span (60'-60'-60') structure over Mimico Creek. Stability requirements are such that the end spans should be lengthened in order to accommodate either the berm requirements or alternatively the 3:1 slopes in the longitudinal direction.

The subsoil conditions are very favourable for a spread footing type of foundation for the structural elements. The proposed piers may be founded below the surficial deposits in the parent glacial stratum. The pier footing locations should be governed by the hydrological as well as frost penetration requirements. Footings founded within the glacial till stratum can be designed for a safe bearing pressure of 3.5 t.s.f. If footings are located in the upper cohesive glacial till no major dewatering problems are anticipated. In order to prevent inflow of water into the excavation from the creek, a temporary diversion or an impervious earth dyke may be necessary. Any minor seepage into the excavations can be handled by ordinary pumping method from sumps. It is recommended that a lean concrete working slab should be placed immediately after the completion of the footing excavation to prevent softening of the foundation material by surface runoff.

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

6.3) Three-Span Structure: (cont'd) ...

The abutments will be 'perched' within the approach fills. The footings for these abutments can be supported on end-bearing piles driven into the very dense glacial till stratum or to the bedrock surface. It is estimated that the piles driven to approximate elevations 468 to 470 can be designed for the maximum allowable load of the pile section chosen. For example, a safe load of 95 ton/pile may be used for a 12 BP 74 Steel H pile. Pile driving during construction within the till stratum should be controlled by the use of Hiley Formula as per current Department standards.

In the areas where piles have to be driven, material containing boulders should not be used.

It is estimated that the differential settlement between piers founded on spread footings and the abutments founded on end-bearing piles should be in the order of 1/2 inch.

6.4) Barrel Arch Culvert:

Alternatively, a barrel arch culvert having a 40 foot span, may be constructed at the revised location of the Minico Creek. According to available data the invert of Minico Creek will be at approximate elevation 490 and the profile grade of Belfield Expressway at about elevation 512. As mentioned elsewhere a transverse berm of 20 feet will be necessary for a fill of 52 feet in height. The length of the culvert will be governed either by the berm requirements or 3:1 slopes in the transverse direction.

The recommendations pertaining to the footings for the barrel arch culvert should be similar to those discussed for pier footings in subsection 6.3. In view of the lengthy nature of the culvert it would be advisable to provide construction joints within its length to tolerate any possible differential settlements.

In computing the sliding resistance between the foundation base and underlying soil, a value of $\phi = 30^\circ$ should be used.

Foundation Office intends to instrument the fills in order to obtain factual data with regards to magnitude and time-rate settlements.

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

6.4) Barrel Arch Culvert: (cont'd) ...

It is, therefore, suggested that this Office should be notified at least three weeks prior to the commencement of the embankment construction by the district personnel so as to carry out the necessary instrumentation. It may be necessary to incorporate a "special" in the special information to bidders in order to ensure the safety of the settlement devices by the contractor during construction.

7. MISCELLANEOUS:

The field work was performed during the period of June 28, 1971, to July 21, 1971, under the supervision of Mr. V. Korlu, Project Foundation Engineer.

The equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd., (Toronto).

This report was prepared by Mr. M. Devata, Supervising Foundation Engineer and Mr. S. Ahmad, Project Foundation Engineer. The entire project was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer.

September, 1971.

APPENDIX 1

FOUNDATION SECTION

CHECKED BY C. D.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w	BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT				SHEAR STRENGTH P.S.F.	WATER CONTENT %
499.6	Ground Level						20 40 60 80 100	w_p ——— w ——— w_L				
0.0	Surficial deposit (silt to silty sand with gravel) Compact		1	SS	9	490					17 42 39 1	
495.1			2	SS	86							∇ 494.0
4.5	Het. mix. of clayey silt with sand and gravel. Hard Brown Grey		3	SS	33							
			4	SS	51							0 11 61 28
485.6			5	SS	27	480						
14.0	Het. mix. of silt, sand & gravel, trace of clay		6	SS	85							36 42 19 3
	Compact - Very Dense		7	SS	68							
	Glacial Till		8	SS	100	470						
471.6			9	SS	178							
28.0	Het. mix. of clayey silt with sand and gravel. Hard		10	SS	200							
461.4			11	BXL	200							
35.2	Weathered Shale											
462.1	Sound Shale Bedrock											
37.5	End of Borehole					460						

FOUNDATION SECTION

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DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 71-11040

LOCATION Co-ords, 877,142 N; 974,803 E.

ORIGINATED BY VV

W.P. 276-65

BORING DATE July 12, 1971

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Washboring with Diamond Drill

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W	BULK DENSITY Y	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	WATER CONTENT %		
							20 40 60 80 100	15 30 45		
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE			
497.3	Ground Level									
0.0	Surficial material silty sand with traces of clay & organics)									
492.3	Very Loose		1	SS	3					
5.0	Het. mix. of clayey silt trace of sand & gravel Hard		2	SS	76	490				
	Brown to Grey Glacial Till		3	SS	52					
482.8			4	SS	47					
474.5	Het. mix. of silt, sand & gravel, trace of clay. Dense to Very Dense Grey		5	SS	41	480				
			6	SS	163					
472.3			7	SS	187	471"				
25.0	Clayey silt with some sand & gravel. Hard Grey		8	SS	165	470"				
467.3										
30.0	Weathered Shale		9	BXL	40%					
463.4										
33.9	Sound Shale Bedrock		10	BXL	100%					
461.0										
36.3	End of Borehole					460				

FOUNDATION SECTION

ORIGINATED BY VK

COMPILED BY WV

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. LOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % 15 30 45			
107.0	Ground Level											
0.0	Surface material											
104.0												
3.0	Het. mix. of clayey silt with sand and gravel		1	SS	78							
	Hard. Grey		2	SS	34	490						
486.0			3	SS	55							
11.0	Het. mix. of silt, sand & gravel, trace of clay (thin seams or layers of clayey silt).		4	SS	29							
			5	SS	48	480						
	Compact to Very Dense Glacial Till		6	SS	100							
			7	SS	200							
472.0												
25.0	Het. mix. of clayey silt some sand & gravel		8	SS	200	470						
	Hard Grey		9	SS	151							
466.0												
31.0	Weathered Shale		10	BXL	100%							
463.0												
34.0	Solid Shale		11	BXL	100%	460						
456.5			12	BXL	100%							
40.5	End of Borehole					450						

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % 15 30 45			
197.0	Ground Level											
0.0	Surficial material (silty sand with grav. & traces of clay) Loose		1	SS	14							194.8
191.5			2	SS	187	490						
5.5	Het. mix. of clayey silt with traces of sand & gravel; occ. layers of silt. Very Stiff to Hard Grey		3	SS	31							
			4	SS	21							
180.0	Glacial Till		5	SS	38	480						
17.0	Het. mix. of silt, sand & gravel, trace of clay. Very Dense		6	SS	58							
			7	SS	168	10"						
170.0			8	SS	100	4"	470					
27.0	Het. mix. of clayey silt with some sand & grav. Hard		9	SS	100	5"						
166.0			10	BXL	70%							
31.0	Weathered Shale		11	BXL	100%							
162.7												
160.5	Solid Shale Bedrock											
36.5	End of Borehole					460						

FOUNDATION SECTION

ORIGINATED BY VK

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SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— w _L Plastic Limit ——— w _P Water Content ——— w	BULK DENSITY 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	w _p w w _L WATER CONTENT % 15 30 45		
497.5	Ground Level									
0.0	Surficial Material (clayey silt with trace of sand & gravel)		1	SS	5					▼ L _{94.3} Org. 1.6
492.5	Firm Brown		2	SS	30	490				
5.0	Het. mix. of clayey silt with some sand and gravel.		3	SS	157					
			4	SS	20					
	occ. layers or seams of silt.		5	SS	60	480				
			6	SS	67					
	Very Stiff to Hard		7	SS	64					13 40 37 10
	Glacial Till		8	SS	100	470				
466.6	Grey		9	SS	100					
30.9	Weathered Shale		10	BXL	90%					
461.0	Solid shale bedrock		11	BXL	100%					
36.5	End of Borehole					460				

FOUNDATION SECTION

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COMPILED BY UK

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— w_L Plastic Limit ——— w_p Water Content ——— w	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		
197.3	Ground Level									
0.0	Surficial material (silty sand with trace of clay & gravel)	X								
191.3	Dense Brown	X	1	SS	11					493.8
6.0	Het. mix. of clayey silt with sand & gravel.	X	2	SS	32	490				8 71 (21)
188.3		X	3	SS	139					
9.0	Het. mix. of silt, sand & gravel, trace of clay	X	4	SS	79					
	Very Dense	X	5	SS	167	480				24 41 30
177.3	Grey	X	6	SS	100/3"					
20.0	Het. mix. of clayey silt with trace of sand and gravel.	X	7	SS	120/4"					
	Hard Grey Glau. Till	X	8	SS	110/6"	470				
165.8	with shale fragments below el. 165.	X	9	SS	300/4"					
31.5	Weathered Shale	X	10	BYL	110/4"					
162.3	Sound Shale Bedrock	X	11	BYL	100/3"					
35.0	End of Borehole					460				

FOUNDATION SECTION

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 71-11060

LOCATION Co-ords. 877,510 N; 974,749 E.

ORIGINATED BY VK

W.P. 276-65

BORING DATE July 21, 1971

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Washbore with diamond drill

CHECKED BY

10

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p — w — w_L					
							SHEAR STRENGTH P.S.F.					WATER CONTENT %					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					15 30 45					
498.3	Ground Level																
0.0	Surficial Material (silty sand with trace of gravel and clay)																
493.8			1	SS	11												
4.5	Het. mix. of clayey silt sand & grav. Brown		2	SS	50												
	Grey		3	SS	105	490											
485.3			4	SS	33												
13.0	Het. mix. of silt, sand and gravel, trace of clay.		5	SS	113	480											
	Dense to Very Dense		6	SS	55												
			7	SS	100	470											
468.3	Glacial Till		8	SS	100	460											
30.0	End of Borehole																

492.0
12 36 42 10

18 47 (35)

FOUNDATION SECTION

ORIGINATED BY VK

COMPILED BY VI

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	WATER CONTENT % 15 30 45		
497.4	Ground Level	X								
0.0	Surficial material (silty sand with traces of clay & organics)	X								
1.02	Compact	X	1	SS	8					
5.0	Het. mix. of clayey silt	X	2	SS	26	490				
488.4	sand & gravel.	X	3	SS	42					
9.0	Het. mix. of silt, sand and gravel, trace of clay.	X	4	SS	52					17 65 (18)
		X	5	SS	62	480				
	Dense to Very Dense	X	6	SS	100/5"					22 43 (35)
		X	7	SS	100/5"					
	Glacial Till	X	8	SC	100/3"	470				
469.4	Het. mix. of clayey silt	X								
466.4	trace of sand & gravel	X	9	SS	100/4"					
31.0	End of Borehole					460				

FOUNDATION SECTION

ORIGINATED BY VX

COMPILED BY VK

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT	RESISTANCE	LIQUID LIMIT ——— w_L	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							\circ UNCONFINED \bullet QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE	w_p	w	w_L		
497.8	Ground Level												
0.0	Surficial Material		1	SS	9							495.8 31 40 23 6 Orgs. 1.2 27 50 18 5 	

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 15

FOUNDATION SECTION

JOB 71-11040

LOCATION Co-ords. 877,327 N; 973,867 E.

ORIGINATED BY VK

W.P. 276-65

BORING DATE July 20, 1971

COMPILED BY VK

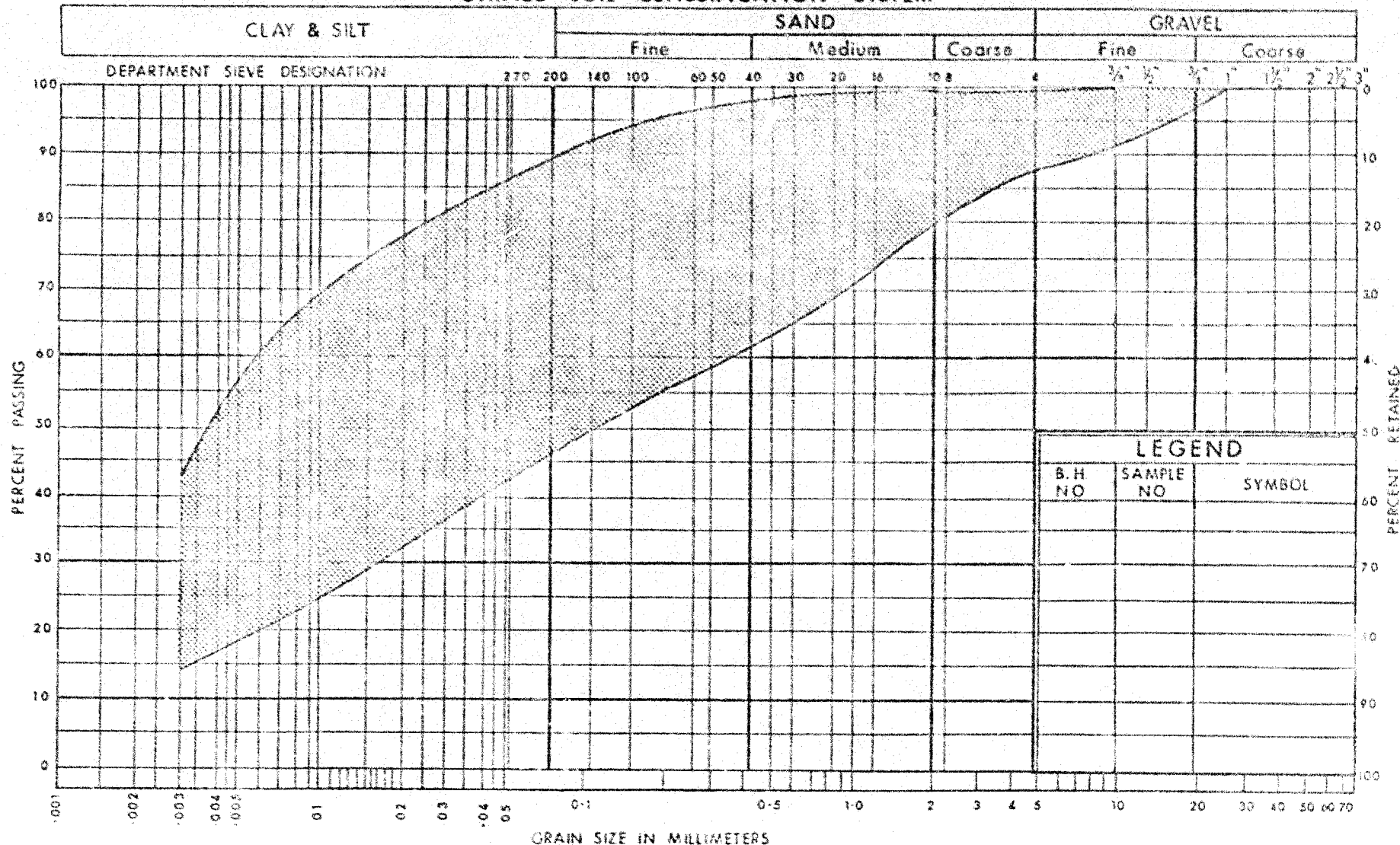
DATUM Geodetic

BOREHOLE TYPE Washbore with diamond drill

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		w_p ——— w ——— w_L WATER CONTENT %			
500.3	Ground Level						20 40 60 80 100			15 30 45		
0.0	Surficial Material sandy silt, some grav. trace of clay, traces of organics.		1	SS	2	500						497.8 Orgs. 1.3
495.3			2	SS	23							32 39 27 2
5.0	Het. mix. of silt, sand & gravel, trace of clay.		3	SS	35	490						7 76 (17)
489.3			4	SS	21							
11.0	Het. mix. of clayey silt trace of sand & grav. Glacial Till Very Stiff to Hard		5	SS	22							
480.3	Gray		6	SS	53	480						7 15 53 25
20.0	Het. mix. of silt, sand & gravel, trace of clay.		7	SS	33							
472.3	Dense to Very Dense Het. mix. of clayey silt with sand & gravel.		8	SS	124							
468.8			9	SS	60	470						
31.5	End of Borehole					460						

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND

B.H. NO	SAMPLE NO	SYMBOL

DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES
BRANCH

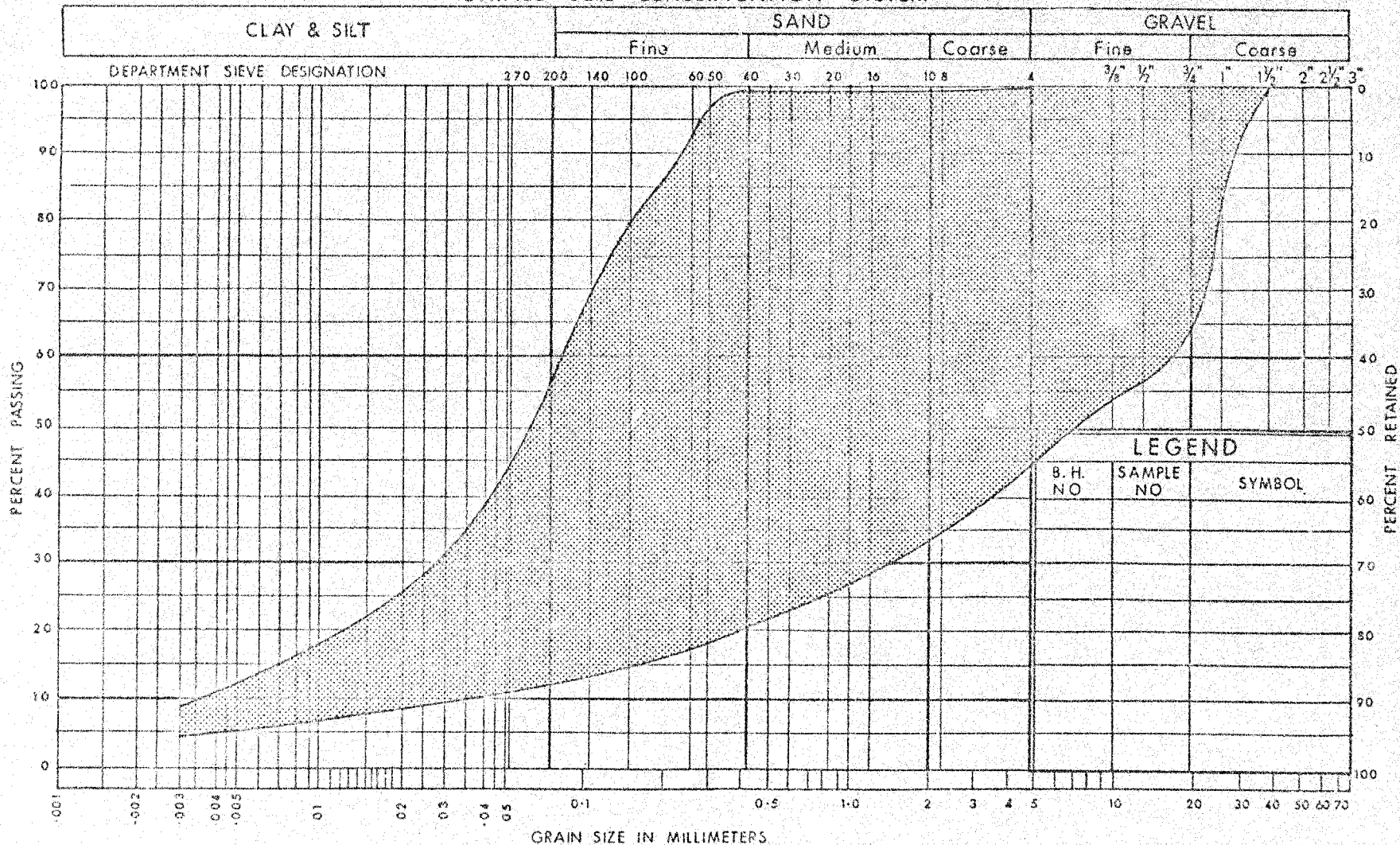
GRAIN SIZE DISTRIBUTION
GLACIAL TILL
HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL

W.P. No. 276 - 65

JOB No. 71-11040

FIG 1

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES
BRANCH

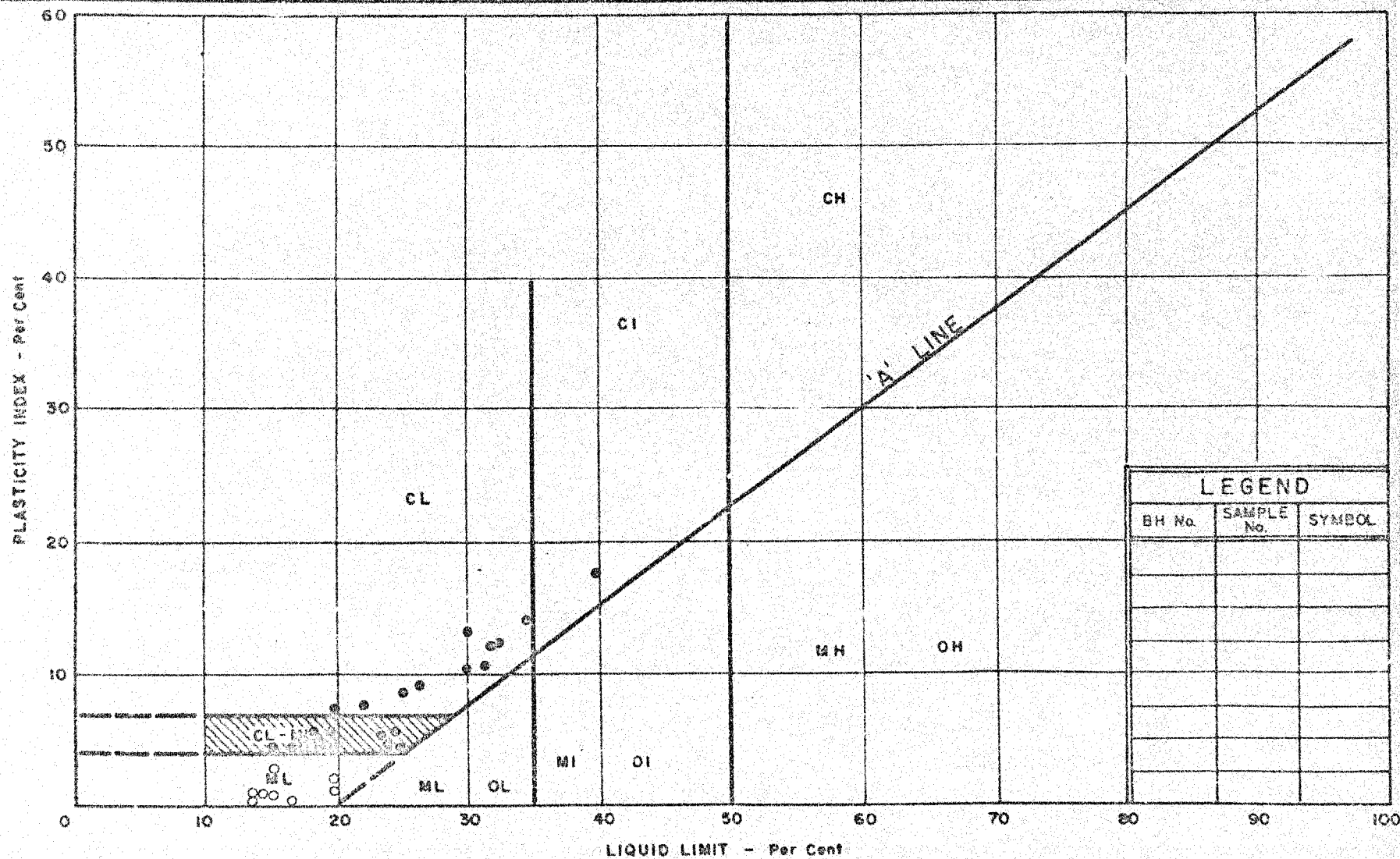
GRAIN SIZE DISTRIBUTION GLACIAL TILL

HET. MIXTURE OF SILT, SAND, GRAVEL, TRACE OF CLAY

W.P. No. 276 - 65

JOB No. 71-11040

FIG. 2



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART

- COHESIVE ZONES OF GLACIAL TILL
- NON-COHESIVE ZONES OF GLACIAL TILL

WP No. 276 - 65

JOS No. 71-11040

FIG. 3

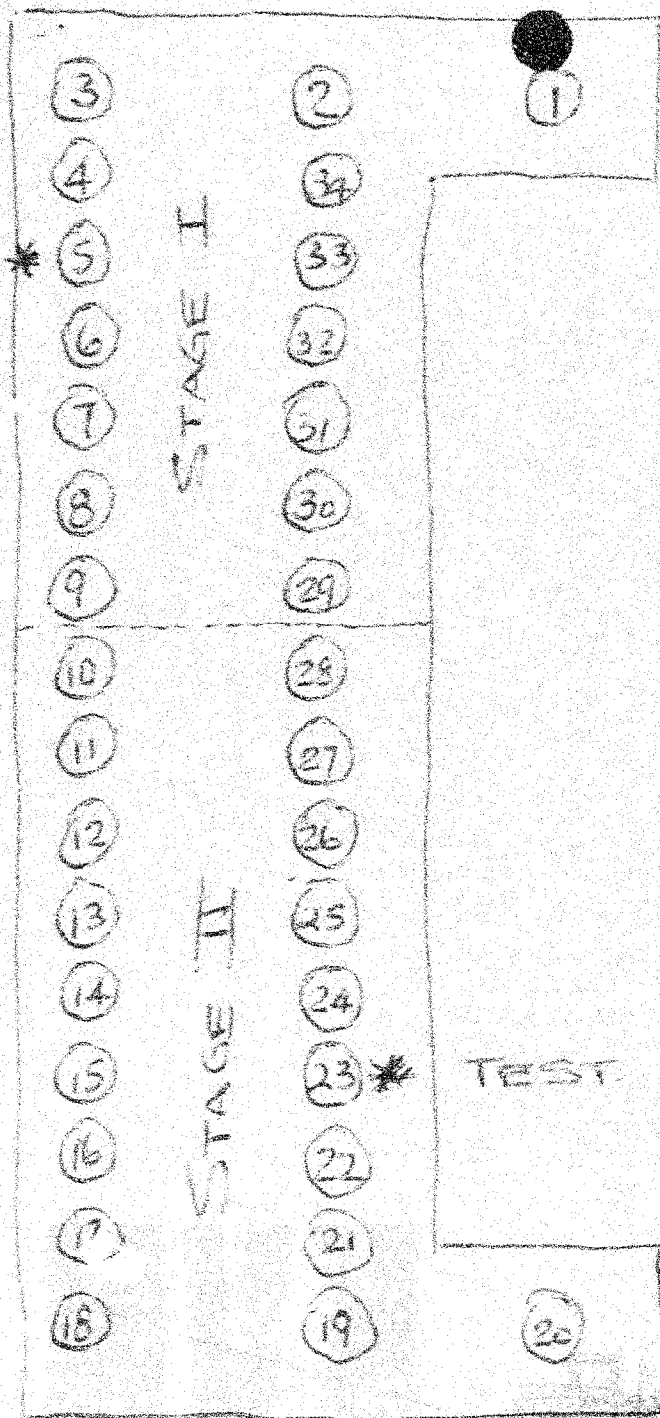
SUMMARY OF PILE DRIVING RECORDS

W.O. 71-11040 W.P. 276-65 CONT. 73-20 DIST. 6
SITE MIMICO CR. BRIDGE# 7

DATE DRIVEN AUG. 28 - SEP. 12/73 WEIGHT OF ANVIL . 25 T.

HAMMER TYPE DELTA D-12 WEIGHT 1.38 T ENERGY 22500

[illegible]



BRIDGE #7

EAST
ABUTMENT

OVER

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form CR-MT-285

DESIGN SERVICES BRANCH

(REVISED NOV. 1971)

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 6 CONTRACT NO. T3-20 STRUCTURE BRIDGE #1 (EAST ABUTMENT)
 CONTRACTOR K.V.N. DESIGN LOAD OF PILE 95 TONS
 HAMMER DETAILS: TYPE D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22.60
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 TON
 PILE DETAILS 12 BP T4 1.3
 PILE NO. 5 LOCATION EAST ABUT STAGE # I DATE DRIVEN SEPT 10 / 1973
" 12 / 1973

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
36	1	1		26	34		51			76	
4	2	4		27	35		52			77	
	3	4		28	40		53			78	
	4	4		29	44		54			79	
	5	7		30	44		55			80	
	6	10		31	50		56			81	
	7	12		32	48		57			82	
	8	13	36	33	52		58			83	
	9	14	70	34	63		59			84	
	10	15		35	80		60			85	
	11	15		36	105		61			86	
	12	17		37	110		62			87	
	13	17		38	125		63			88	
	14	16		39	130		64			89	
	15	16		40	105		65			90	
	16	13		41	88		66			91	
	17	13		42	90		67			92	
	18	14		43	100		68			93	
	19	16		44	120		69			94	
	20	18		45	145		70			95	
	21	21		46	175		71			96	
	22	23	70	47	186		72			97	
	23	25		48			73			98	
	24	27		49			74			99	
	25	34		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	15	15	16	15	15	16
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	47-8					FINAL CUT OFF ELEVATION
						528.50

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 DESIGN SERVICES BRANCH
 DEPARTMENT OF
 TRANSPORTATION AND
 COMMUNICATIONS
 DOWNSVIEW, ONTARIO

SIGNED G. Wilkins
 NAME (PRINT) G. WILKINS
 DATE Sept 13 - 73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

528.5
47.2

433.3

TIP

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285

DESIGN SERVICES BRANCH

(REVISED NOV. 1971)

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 6 CONTRACT NO. 73-20 STRUCTURE BRIDGE #7CONTRACTOR K.V.N. DESIGN LOAD OF PILE 95 TONHAMMER DETAILS: TYPE D-12 WEIGHT 138 HEIGHT OF FALL OR ENERGY 22,600 FT LBSTYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 TONPILE DETAILS 12 BP 74 8535K 118PILE NO. 23 LOCATION EAST ABUTMENT STAGE II DATE DRIVEN SEPT 6/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
36	1	2		26	38		31			75	
1	2	4		27	36		52			77	
	3	6		28	35		53			78	
	4	7		29	35		54			79	
	5	8		30	38		55			80	
	6	8		31	38		56			81	
	7	9		32	68		57			82	
	8	11	36	33	130		58			83	
	9	13	70	34	240		59			84	
	10	16		35			60			85	
	11	18		36			61			86	
	12	22		37			62			87	
	13	25		38			63			88	
	14	26		39			64			89	
	15	25		40			65			90	
	16	22		41			66			91	
	17	22		42			67			92	
	18	21		43			68			93	
	19	22		44			69			94	
	20	26		45			70			95	
	21	28		46			71			96	
	22	26		47			72			97	
	23	30		48			73			98	
	24	34		49			74			99	
	25	38		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	75	20	18	15	15	12
MEASURED REBOUND IN INCHES	FINAL INCH					
FINAL LENGTH OF PILE	36-0	FINAL CUT OFF ELEVATION 528.30				

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 DESIGN SERVICES BRANCH
 DEPARTMENT OF
 TRANSPORTATION AND
 COMMUNICATIONS
 DOWNSVIEW, ONTARIO

SIGNED G. Wilkins
 NAME (PRINT) G. WILKINS
 DATE Sept 7 - 73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

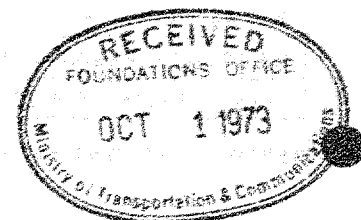
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter. e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

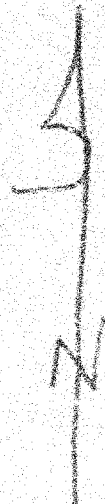
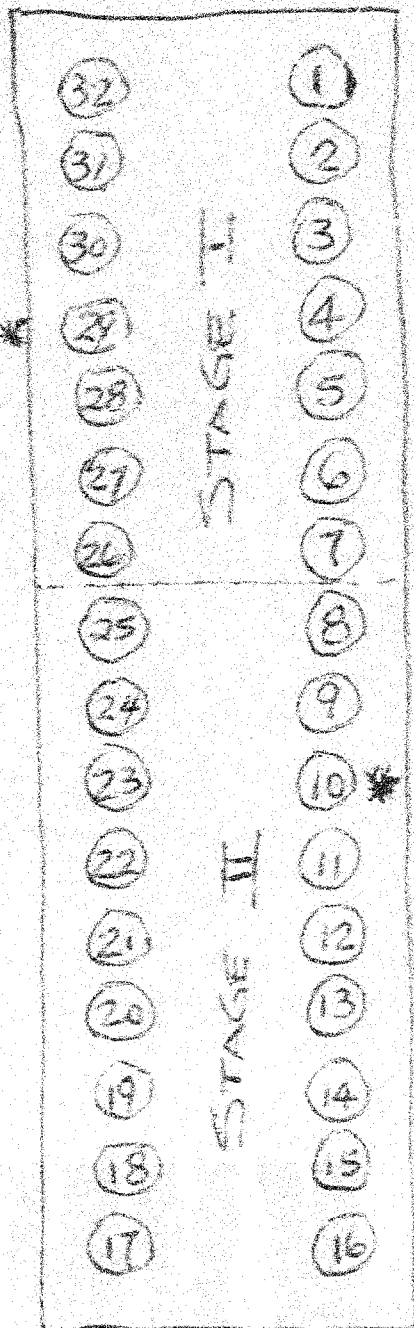
The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



TEST



BRIDGE #7 PIER I EAST

OVER

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OS-MT-285

DESIGN SERVICES BRANCH

(REVISED NOV. 1971)

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. G CONTRACT NO. 73-20 STRUCTURE BR #7CONTRACTOR K.V.N. DESIGN LOAD OF PILE 95 TON.HAMMER DETAILS: TYPE D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,600 ^{FT LBS} _{BLOW}TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 2.25 TON.PILE DETAILS 12 BP 74 ^{BATER 1:6}PILE NO. 10 LOCATION EAST PIER FTNG. #1 DATE DRIVEN 4-9-73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
36'	1	0		26	150		51			76	
	2	4		27	175		52			77	
	3	10		28			53			78	
	4	21		29			54			79	
	5	28		30			55			80	
	6	45		31			56			81	
	7	62		32			57			82	
	8	35		33			58			83	
	9	38		34			59			84	
	10	27		35			60			85	
	11	30		36			61			86	
	12	35		37			62			87	
	13	43		38			63			88	
	14	50		39			64			89	
	15	52		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
-	21	80		46			71			96	
	22	88		47			72			97	
	23			48			73			98	
-	24	100		49			74			99	
-	25	126		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	16	16	14	14	12	12
MEASURED REBOUND IN INCHES	FINAL INCH					
FINAL LENGTH OF PILE	27'-6"			FINAL CUT OFF ELEVATION		
				498.00		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED G. WilkinsNAME (PRINT) G. WILKINSDATE Sept 4/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

498.00
27.2

TOP 490.8

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

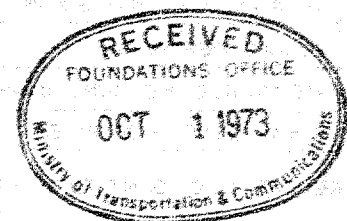
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



OVER DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
Form OB-MT-285 (REVISED NOV. 1971) DESIGN SERVICES BRANCH FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 6 CONTRACT NO. 73-20 STRUCTURE BRIDGE #7
CONTRACTOR K.V.N. DESIGN LOAD OF PILE 95 Ton
HAMMER DETAILS: TYPE D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,600 *Fr 165*
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 25
PILE DETAILS 12 BP 74 *Butter 1.6*
PILE NO. 29 LOCATION EAST PIER FING #1 DATE DRIVEN SEP 5/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
36	1	0	26	70		51			76		
	2	0	27	68		52			77		
	3	3	28	64		53			78		
	4	3	29	61		54			79		
	5	12	30	58		55			80		
	6	27	31	50		56			81		
	7	38	32	44		57			82		
	8	21	33	38		58			83		
	9	21	34			59			84		
	10	25	35			60			85		
	11	30	36			61			86		
	12	32	37			62			87		
	13	38	38			63			88		
	14	44	39			64			89		
	15	46	40			65			90		
	16	42	41			66			91		
	17	45	42			67			92		
	18		43			68			93		
	19		44			69			94		
	20	51	45			70			95		
	21	48	46			71			96		
	22	64	47			72			97		
	23	64	48			73			98		
	24		49			74			99		
	25	72	50			75			100		

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	15	15	15	12	12	10
MEASURED REBOUND IN INCHES	FINAL INCH					
FINAL LENGTH OF PILE	33'-8"					FINAL CUT OFF ELEVATION 498.00

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED G. W. L. K. N. S.
NAME (PRINT) G. W. L. K. N. S.
DATE Sept 5/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

TEST #

32	1
31	2
30	3
29	4
28	5
27	6
26	7
25	8
24	9
23	10
22	11
21	12
20	13
19	14
18	15
17	16

* TEST

5
2

BRIDGE #7 PIER # 2 WEST

OVER

Form OS-MT-285
(REVISED NOV. 1971)

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

DESIGN SERVICES BRANCH
FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 6 CONTRACT NO. 73-20 STRUCTURE BR #7CONTRACTOR K.V.N. DESIGN LOAD OF PILE 95 TONHAMMER DETAILS: TYPE D 12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22600 ft-lbTYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 25 TONPILE DETAILS 12 BP 74 ENTER: 1.6PILE NO. 11 LOCATION West PER FTNG #2 STAGE II DATE DRIVEN AUG-29-73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
36	1	0		26			51			76	
	2			27			52			77	
	3	12		28	138		53			78	
	4	20		29	150		54			79	
	5	30		30	165		55			80	
	6	44		31			56			81	
	7			32	185		57			82	
	8			33			58			83	
	9			34			59			84	
	10	50		35			60			85	
	11	52		36			61			86	
	12	55		37			62			87	
	13			38			63			88	
	14			39			64			89	
	15	60		40			65			90	
	16	60		41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20	84		45			70			95	
	21	89		46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25	115		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	15	15	15	15	15	15
MEASURED REBOUND IN INCHES	FINAL INCH					
FINAL LENGTH OF PILE	33'-0"					FINAL CUT OFF ELEVATION
						498.00

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER

DESIGN SERVICES BRANCH

DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIOSIGNED G. WilkinsNAME (PRINT) G. WILKINSDATE AUG. 31/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

498.0
32.5
465.5

710

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285

DESIGN SERVICES BRANCH

(REVISED NOV. 1971)

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 6 CONTRACT NO. 73-20 STRUCTURE BRIDGE #7CONTRACTOR KV.N. DESIGN LOAD OF PILE 95 TONHAMMER DETAILS: TYPE D-12 WEIGHT 1-38 HEIGHT OF FALL OR ENERGY 22,600 FT/LB
PER 36"TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 25 TONPILE DETAILS 12 BP T4 Hammer 1-6PILE NO. 32 LOCATION WEST PIER FDS #2 STAGE I DATE DRIVEN AUG-28/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
36	1	0		26	76		51			76	
	2	1		27	84		52			77	
	3	6		28			53			78	
	4	8		29			54			79	
	5	18		30	98		55			80	
	6	33		31	109		56			81	
	7	30		32	135		57			82	
	8	25		33	170		58			83	
	9	25		34			59			84	
	10	33		35			60			85	
	11			36			61			86	
	12			37			62			87	
	13			38			63			88	
	14	48		39			64			89	
	15	51		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20	58		45			70			95	
	21	60		46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25	72		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	15	15	14	12	12	12
MEASURED REBOUND IN INCHES	FINAL INCH					
FINAL LENGTH OF PILE	34'-1"					
FINAL CUT OFF ELEVATION	498.00					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER

DESIGN SERVICES BRANCH

DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIOSIGNED G. WilkinsNAME (PRINT) G. WILKINSDATE AUG. 31/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

498.0

33.6

46.4

TIP

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

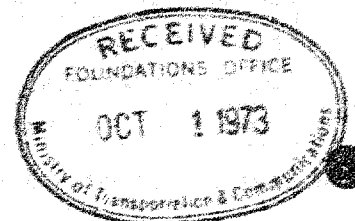
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



Mr. C. S. Grebski,
Structural Design Engineer,
Design Services Branch,
West Bldg., Downsview.

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

October 5, 1972.

Mimico Creek Overpass, Bridge #7,
W.O. 71-11040 -- W.P. 276-65-000
Rwy. #409, District #6

We have reviewed the final bridge drawings for the above-mentioned structure (Drawings No. 37-969-1, 3 and 4, dated August 1972) and submit the following comments: i) pile lengths for the east and west abutments could be reduced from 70 ft. to 65 ft. (refer to Drawing 37-969-3), and ii) the bridge drawings indicate that the two piers are to be supported on end-bearing piles. As discussed in page 10 of the foundation report, these piers could be supported on spread footings founded within the glacial till (allowable bearing pressure 3.5 t.s.f.). The proposed base of the pier foundations is at elevation 497. If shallow foundations are employed the elevation of the base of the footings would have to be lowered by anywhere from 3 to 4 feet in order to found them in the glacial till.

If the piers are pile supported the pile lengths can be reduced from 36 feet to 30 feet (refer to Drawing 37-969-3).

Shaheen Ahmad

Shaheen Ahmad,
Project Foundations Eng.,
For: M. Devata,
Supervising Foundations Eng.

SA/ao

cc: G. C. E. Burkhardt
Foundations Files ✓
Documents

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of

Mr. A. Stetmac
Principal Foundation Engineer,
Room 107, West Building.

Structural Office,
West Building, DOWNSVIEW.

September 29, 1972

Mimico Creek Overpass,
Bridge #7,
W.P. #276-65-000, Site #37-969,
Hwy. #409, District #6.

71-11-049

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

Kindly give us your comments at your earliest convenience.

CSG:dp
Attach.

C. S. Grebski,
Structural Design Engineer.

cc. Foundation Office. ✓



See our letter with comments

M. Devata
Oct 5/72

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of
A. Stermac

C. Burkhardt
Asst. Bridge Planning Engr.,
30 Floral Parkway.

Structural Office,
West Bldg., Queensview.

March 6, 1972.

Re: Missio Creek Overpass (Bridge #7),
N.P. #176-85, Site #37-268,
Highway #409, District #6.

71-11-040

Attached herewith are prints of the Preliminary
Bridge Plan Drawing D-17-268-81 for the above-mentioned
structure.

The estimated cost of the proposed structure is
\$450,000.00, which includes tender, materials, engineering
and sundry construction.

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

C.E. Greshki,
Structural Design Engineer.

CSE:ST
Attach.

C.C. A. McKim
B. Davis
A. Stermac (3)
J. Anderson
R. Fitzgibbon

*Piers can be supported on spread footings as recommended
in our foundation report.*

M. Devata
9th March/72

MEMORANDUM

71-1140

TO: Mr. A. G. Sternac,
Principal Foundation Engineer,
Room 167, Central Building.

FROM: G.C.E. Burkhardt,
Bridge Planning Office,
90 Floral Parkway.

ATTENTION: M. Devata

DATE: December 22, 1971.

COR FILE REF.

IN REPLY TO

SUBJECT: E.B. Ramp Bridge over Mimico Creek
(Bridge #11),
Site # 37-992.


N & S-W Ramp Bridge over Mimico Creek
(Bridge #13)
Site # 37-991

Retaining Wall #12 at Islington Ave.,
District 6, Highway Q.E.W.

This will confirm your receipt of marked up drawings, showing the probable location of footings for the above noted structures, on December 15th 1971. It was understood at that time you would arrange to have Foundation Investigation of sufficient magnitude to allow Structural Office to proceed with design.

Enclosed are coloured prints 69-F-6SB and 3552-17C-1 for your information.

JSR/co


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

c.c. J. Anderson
R. Fitzgibbon

MEMORANDUM

71-11-040

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

ATTENTION:

OUR FILE REF.

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

DATE: May 14, 1971.

IN REPLY TO

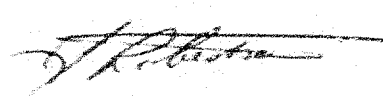
SUBJECT: Mimico Creek Bridge,
Site 37-969, W.P. 276-65,
Belfield Expressway,
District 6.

The attached marked up print 271-066, details the approximate location of the proposed footings for the above detailed structure. Also enclosed are prints taken from the Functional Planning Report showing the proposed grade.

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

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

JSR:lc
Encl.


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

c.c. R. Fitzgibbon
R. Strain

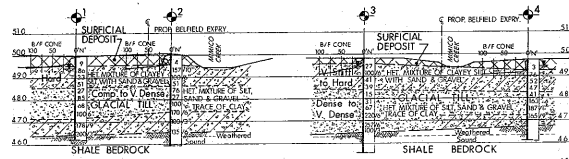
CONT. 73-20

BELFIELD 4

MIMICO CR.,

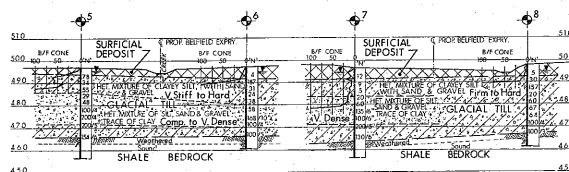
BR. #7 DIST. 6

30M11-115



A-A

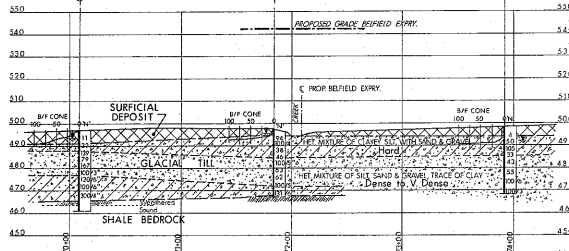
B-B



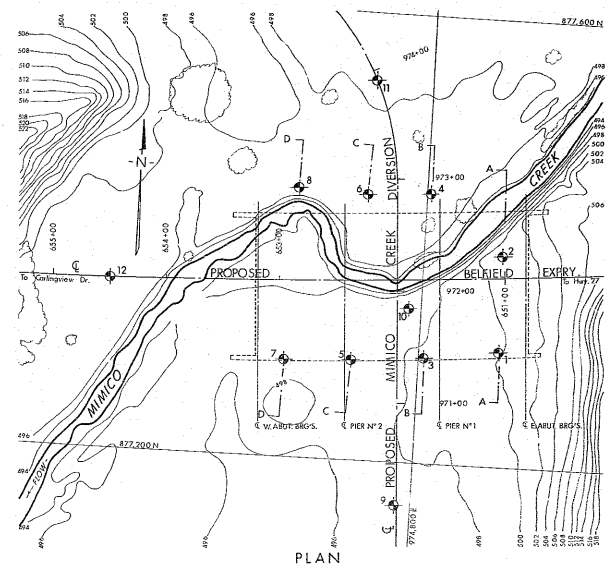
C-C

D-D

SECTIONS
VERT. 20 0 SCALE 20 40 FT.
HORIZ. 20 0 SCALE 20 40 FT.

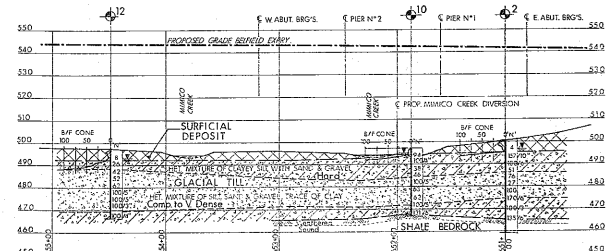


Q PROFILE PROPOSED MIMICO CREEK DIVERSION

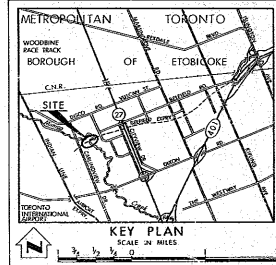


PLAN

PROFILES
VERT. 20 0 SCALE 20 40 FT.
HORIZ. 20 0 SCALE 20 40 FT.



Q PROFILE PROPOSED BELFIELD EXPRESSWAY



LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- W Water Levels established at time of field investigation, JULY 1971

NO.	ELEVATION	CO - ORDINATES	
		NORTH	EAST
1	499.6	877,303	974,872
2	500.3	877,289	974,870
3	498.0	877,294	974,805
4	497.3	877,447	974,803
5	497.0	877,289	974,740
6	497.0	877,438	974,747
7	496.7	877,286	974,681
8	497.5	877,440	974,686
9	497.3	877,165	974,786
10	497.6	877,337	974,789
11	498.3	877,549	974,749
12	497.4	877,351	974,522

NOTE

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

DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH - FOUNDATION OFFICE

MIMICO CREEK (BRIDGE N° 7)

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

BORE HOLE LOCATIONS & SOIL STRATA

DESIGNED BY	CHECKED BY	WFO NO.	276-65
DRAWN BY	CHECKED BY	JOB NO.	71-11049
DATE	22 SEPT. 1971	SITE NO.	
APPROVED BY		DATE NO.	

DRAWING NO.
71-11040A

BRIDGE DRAWING NO.

CONTE NO.

PERSONAL USE ONLY

DATE NO.

DATE NO.

DATE NO.

DATE NO.

DATE NO.

DATE NO.

DATE NO.

DATE NO.

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DATE NO.

DATE NO.

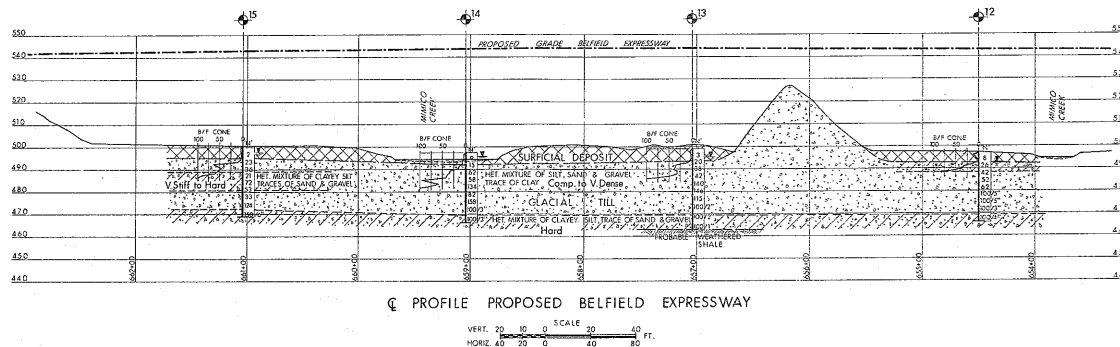
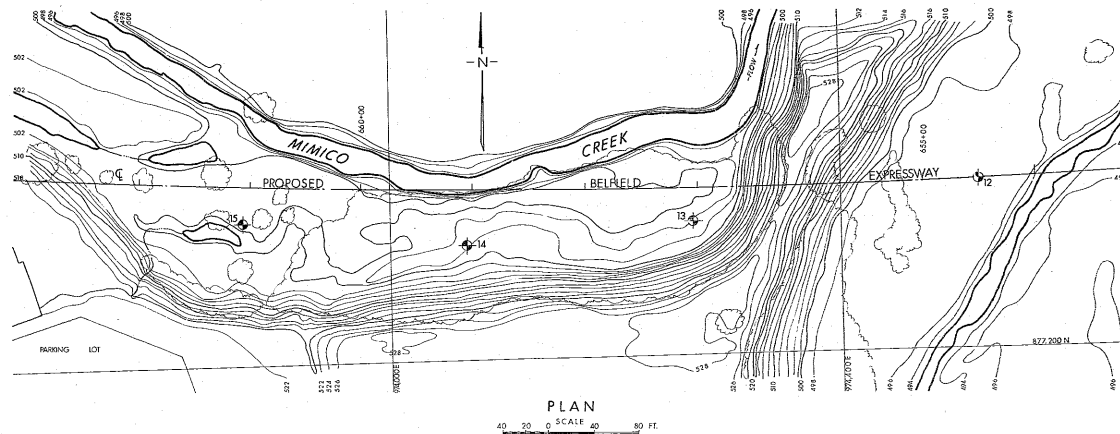
DATE NO.

DATE NO.

DATE NO.

DATE NO.

DATE NO.



SEE DRAWING NO 71-11040 A

KEY PLAN
SCALE IN MILES

LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ↓ Water Levels established at time of field investigation, JULY 1971

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
12	497.4	877,351	974,522
13	499.3	877,319	974,269
14	497.8	877,303	974,068
15	500.3	877,327	973,807

NOTE

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

TELEPHONE		GEOSCIENCE NO. 30311-1104	
DATE	BY	DESCRIPTION	
DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS DESIGN SERVICES BRANCH - FOUNDATION OFFICE			
MIMICO CREEK			
HIGHWAY NO. BELFIELD EXPRESSWAY		DIST. NO. 6	
CO. YORK		METROPOLITAN TORONTO	
TWP. ETOBICOKE	LOI.	CON.	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD. V.K. CHECKED	W.P. NO. 776-65	DRAWING NO.	
DRAWN S.O. CHECKED	JOB NO. 71-11040	71-11040 B	
DATE 20 SEP 1971	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CHIEF NO.		
REVISION	REVISION		