

G.I.-30 SEPT. 1976

GEOCRES No. 30M14-30DIST. 6 REGION W.P. No. 43-69-04CONT. No. 79-84W. O. No. STR. SITE No. HWY. No. LOCATION Neilson Rd. & Hwy 401
Overpass at Milner Ex.No. of PAGES - =====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

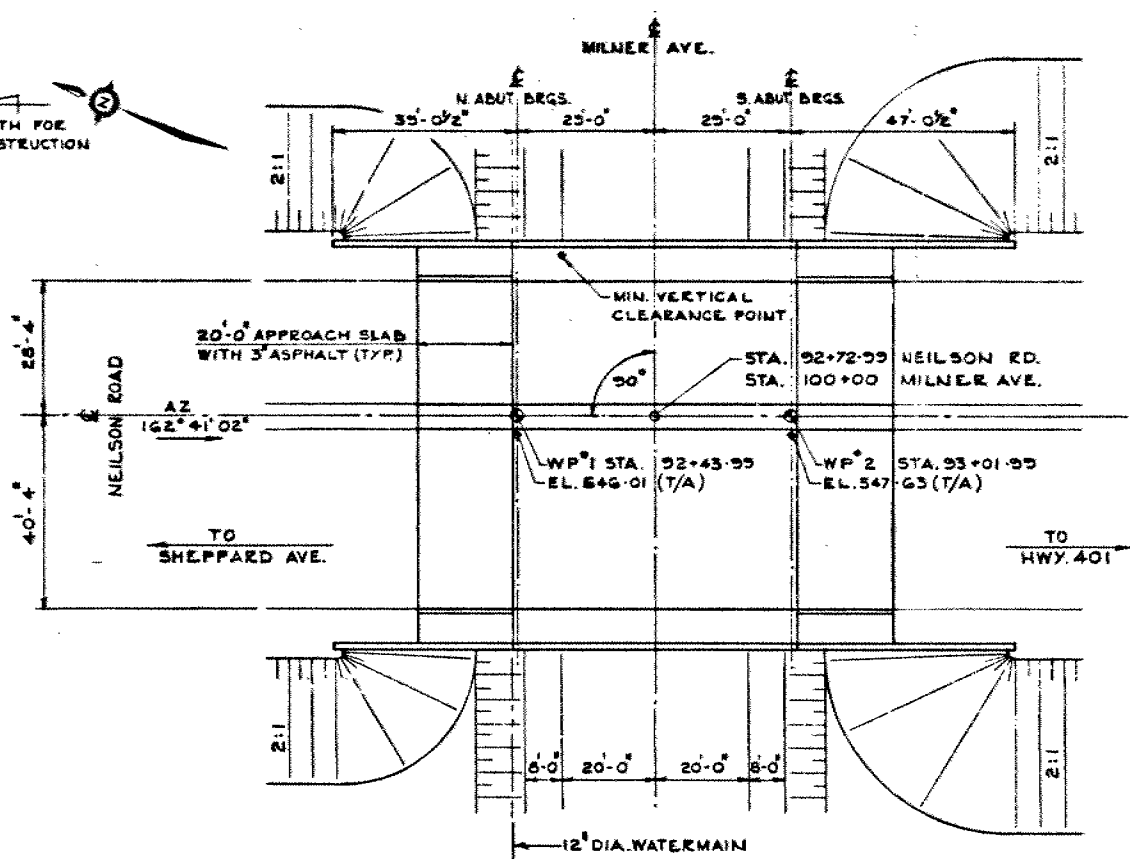


DISTRICT No 6
CONT No
WP No 43-69-04

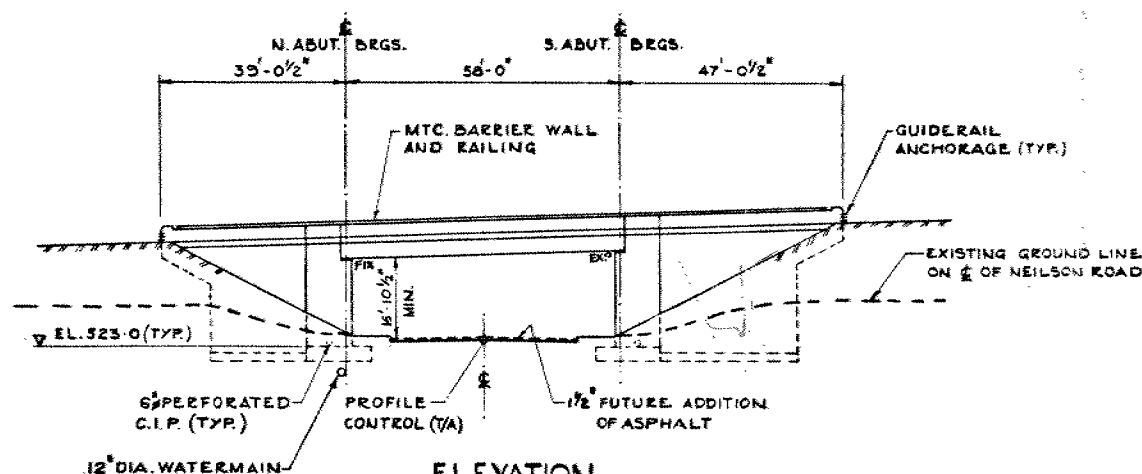
MILNER AVE OVERPASS
GENERAL ARRANGEMENT

SHEET

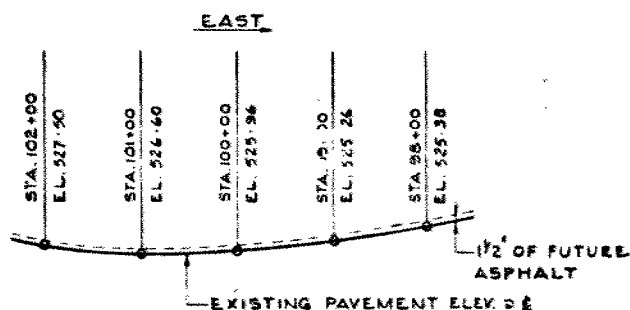
ALBURY, PULLERITS, DICKSON
& ASSOCIATES
CONSULTING ENGINEERS
TORONTO SUDBURY TELLENGUEN



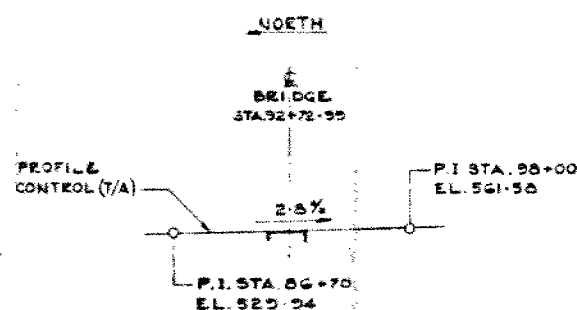
PLAN
SCALE 1"=20'



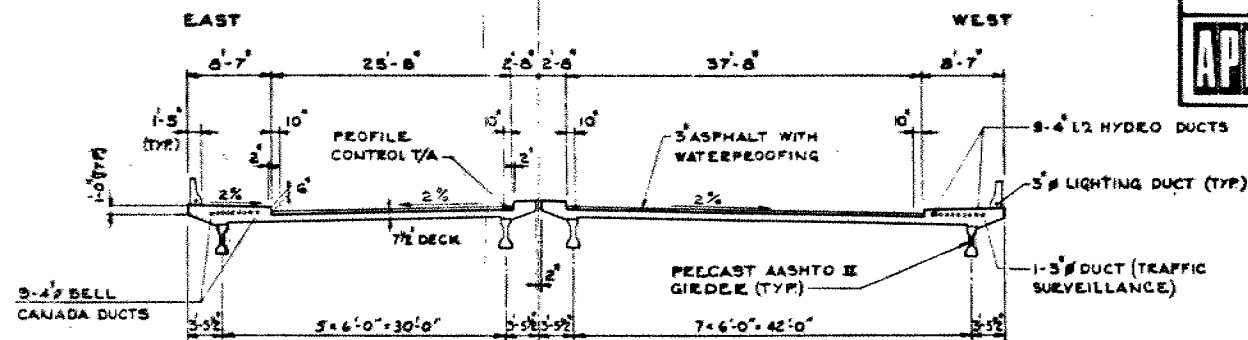
ELEVATION
SCALE 1"=20'



PROFILE OF MILNER AVE
N.T.S.



PROFILE OF NEILSON RD.
N.T.S.



TYPICAL CROSS SECTION
SCALE 1"=10'

LIST OF DRAWINGS

1. GENERAL ARRANGEMENT
2. BOREHOLE LOCATIONS & SOIL STRATA
3. FOOTING LAYOUT & REINFORCEMENT
4. ABUTMENTS
5. RETAINING WALLS & REINFORCEMENT
6. DECK REINFORCEMENT (SCREED ELEVATIONS)
7. PRESTRESSED GIRDERS & BEARINGS
8. BARRIER WALL DETAILS
9. STEEL BARRIER WALL RAIL
10. APPROACH SLAB
11. STANDARD DETAILS I
12. STANDARD DETAILS II
13. AS CONSTRUCTED ELEVATIONS & DETAILS

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEM.

6. ABUTMENTS, WINGWALLS, RETAINING WALLS.	688 cu. yd
9. DECKS AND DIAPHRAGMS.	186 cu. yd
11. BARRIER WALLS.	22 cu. yd
12. APPROACH SLABS.	93 cu. yd

NOTES

1. CLASS OF CONCRETE
DECK, SIDEWALKS & BARRIER WALLS - 4000 PSI
PRESTRESSED GIRDERS - 5000 PSI
REMAINDER - 3000 PSI
AND/OR AS NOTED
2. CLEAR COVER ON REINFORCING STEEL
FOOTINGS, ABUTMENTS & RETAINING WALLS - 3"
SIDEWALKS & APPROACH SLAB - 2"
TOP OF DECK - 2"
BOT OF DECK - 1 1/2"
DIAPHRAGMS & BARRIER WALLS - AS NOTED
3. CONSTRUCTION NOTES

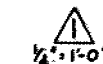
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF $\pm 1/8"$. NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

REINFORCING STEEL SHALL BE GRADE 400 EXCEPT AS NOTED. REINFORCING BARS WITH THE DESIGNATION 'C' AT THE END OF BAR MARKS SHALL BE COATED BARS.
* TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF DECK STEEL SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF $2 1/2" \pm 1/2"$ TOLERANCE.



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	10/1/78	...	LOADING HS 20-44
DRAWING	10/1/78	...	SITE No 37-1007

SHEET

APD

PLAN
3/16" = 1'-0"



REVISES	DATE BY		DESCRIPTION			
	DESIGN	W D O	CHECK	W D S	LOADING HS20-44	DATE
	DRAWING	W D O	CHECK	W D S	SITE No 37-1007	DWG 3



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

30 M14-30

TO: Mr. G. C. E. Burkhardt, (2)
Regional Structural Planning Eng.,
Central Region,
90 Floral Pkwy., Downsview.

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

ATTENTION: DATE: February 16, 1973.

OUR FILE REF.

IN REPLY TO FEB 21 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Neilson Road Overpass at Milner
Avenue Extension
(Neilson Road and Hwy. 401 Interchange)
Scarborough Twp.
District #6 (Toronto)
Site No. 37-1007
W.P. 43-69-04 -- W.O. 72-11130

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

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

AGS/ao
Atch.

cc: E. J. Orr
B. R. Davis
A. Rutka
R. S. Pillar
H. Greenland
B. J. Giroux
C. Mirza
G. A. Wrong
B. A. Singh


A.G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

Foundations Files ✓
Documents

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FOUNDATION INVESTIGATION REPORT
For
Proposed Neilson Road Overpass at Milner
Avenue Extension
(Neilson Road and Hwy. 401 Interchange)
Scarborough Twp.
District #6 (Toronto)
Site No. 37-1007
W.P. 43-69-04 -- W.O. 72-11130

1. INTRODUCTION:

In conjunction with the present Hwy. 401 Reconstruction Program it is proposed to construct a new interchange at the crossing of Neilson Road and relocated Hwy. #401, in the Borough of Scarborough, Metropolitan Toronto. The Foundations Office was requested to carry out a subsurface investigation for the two proposed structures and the associated retaining wall for this interchange. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region, dated November 22, 1972. Subsequently, an investigation was carried out by this Office to determine the subsoil and groundwater conditions in this area.

This report contains the results of the investigation, together with recommendations pertaining to the design of foundations, as well as stability and settlement considerations of the associated approaches for the overpass structure at Neilson Road and Milner Avenue extension.

Separate foundation reports will be submitted for the proposed structure at the crossing of Neilson Road and Hwy. 401 (W.O. 72-11129) and the associated retaining wall (W.O. 72-11131) for the interchange.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The proposed site is situated at halfway between Markham Road and Morningside Avenue crossing Hwy. 401 in Scarborough Township, Metropolitan Toronto. The topography at the site is flat to undulating with farmlands being developed into residential areas. The physiography of the area is referred to as "South Slope," which is the southern slope of the interlobate moraine and it includes the strip south of the Peel Plain. The south slope contains a variety of soils: the predominant ones being moraine till, lacustrine clay and isolated silt and sand deposits. The subsoil at the site is mainly clayey till underlain by silty sand deposit.

3. FIELD AND LABORATORY WORK:

Four sampled boreholes, each accompanied by a dynamic cone penetration test, were put down at this structure site. The borings were advanced by means of a C.M.E. auger machine adapted for soil sampling purposes.

Samples of the subsoil were recovered at required depths in a 2" O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests.

The locations and elevations of all the borings were surveyed in the field by personnel from the Engineering Surveys Office, Central Region; they are shown on Drawing No. 72-11130A, together with inferred stratigraphical sections. All elevations in the report are referenced to a Geodetic datum.

Samples were visually examined and identified in the field and subsequently in the laboratory. Following this examination laboratory testing was carried out on selected representative samples to determine the various physical properties; namely,

Atterberg Limits
Natural Moisture Contents
Bulk Densities
Grain-Size Distributions

The results of the laboratory testing are plotted on the Record of Borelog sheets and summarized on Figures 1 and 2, contained in the Appendix of the report.

4. SUBSOIL CONDITIONS:

4.1) General:

The predominant stratum across the site is a cohesive glacial till, the thickness of which varies from 20 ft. to 26 ft. This glacial till stratum is underlain by an extensive deposit of silty sand.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11130A, have been inferred from this data. From ground surface downward, the various soil types encountered are as follows.

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

Directly beneath a thin layer of topsoil (1 to 1.5 feet) is the predominant stratum of glacial origin which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The thickness of this deposit varies from 20 ft. (B.H. #2) to 26 ft. (B.H. #3). Grain-size distribution curves for typical samples of the cohesive glacial till stratum are shown in an envelope form on Fig. 1, in Appendix 1.

Atterberg limit testing was performed on samples of the glacial till. The results, which are shown on the borelog sheets, are tabulated below:

	<u>Range</u>
Liquid Limit (W_L) %	15 - 23
Plastic Limit (W_p) %	11 - 15
Natural Moisture Content (W) %	8 - 14

Based on these values, it is estimated that the cohesive deposit has a matrix which is inorganic and of low plasticity.

Standard Penetration Testing was carried out within this glacial till stratum and the results are plotted on the Record of Borehole sheets. This testing gave "N" values which generally range from 16 blows per foot to 175 blows per 10 inches. Based on these values, it is estimated that the consistency of the overall deposit varies from very stiff to hard.

4.3) Silty Sand with Occasional Gravel:

Underlying the glacial till is a deposit of silty sand with occasional gravel. The lower boundary of this stratum was not established in any of the boring locations. However, it was proven that this stratum is at least 70 feet thick (B.H. #3). The granular deposit is composed of fine to coarse sand with silt and occasional gravel. The "N" values vary from 6 blows per foot to 100 blows per 6 inches. It is estimated that the relative density of this granular deposit varies from loose to very dense. The average grain size distribution and moisture contents obtained from the representative samples are as follows:

Gravel %	-	3
Sand %	-	61
Silt %	-	33
Clay %	-	3
Moisture Content (W) %	-	12 - 22

Typical grain-size distribution curves for the samples obtained from this granular deposit are shown in an envelope form on Fig. 2 in the Appendix of this report.

5. GROUNDWATER CONDITIONS:

The groundwater levels across the site, during the period of the investigation (December 1972), were observed by taking readings in the open boreholes. The results of the observations are shown on the borelog sheets as well as on Drawing No. 72-11130A.

The observations indicate that the water level in the open boreholes is located between elevations 526.6 and 511.7; i.e., 3 ft. to 19 ft. below existing ground surface.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an interchange complex at the crossing of revised Hwy. 401 and Neilson Road. This complex consists of:

- i) A four-span underpass structure at Hwy. 401 and Neilson Road.
- ii) A single-span overpass structure at Neilson Road and Milner Avenue extension.
- iii) A retaining wall (No. 1) adjacent to W-S ramp.

This report will deal with the single-span overpass structure at the crossing of Neilson Road and Milner Avenue extension. Foundation report for the other two structures will be presented under W.O. 72-11129 and 72-11131.

The proposed profile grade of Milner Avenue at the structure location is at about elevation 526, whereas the profile grade of Neilson Road varies from elevation 546 to elevation 548.

The predominant stratum across the site is a very stiff to hard cohesive glacial till whose thickness ranges from 20 ft. to 26 ft., underlain by an extensive deposit of loose to very dense silty sand.

6.2) Closed-Type Abutments:

The cohesive glacial till is competent. Therefore, it is recommended that the structure be supported on spread footings founded within the till stratum. A minimum of 4 feet of earth cover should be provided to the underside of the footings for frost protection purposes. Taking this into consideration, the founding level for the footings will be at about elevation 520.

Footings so founded could be designed using an allowable bearing pressure of up to 3 t.s.f. Settlement will be induced in the cohesive glacial till by the imposed footing pressure. The cohesive till is highly preconsolidated, therefore, the settlement will be of a recompression nature; i.e., it will take place

during or immediately following the construction period. This settlement should not exceed 1 inch, provided care is exercised to ensure that the foundation subsoil is not softened by uncontrolled surface runoff or groundwater seepage. In this regard, it would be advantageous to place a lean concrete working slab over the subsoil as soon as the excavations reach the footing foundation level. The base of the footings will be located below the groundwater level recorded during the period of the field investigation. Since the excavation will be carried out within the relatively impervious glacial till, no major dewatering problems are anticipated. Any minor seepage into the foundation excavations could be controlled using conventional techniques such as pumping from sumps.

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

In order to prevent the buildup of excess hydrostatic groundwater pressure behind the abutment walls, weep holes should be provided at the base of the walls. The location and spacing of these weep holes should be determined in accordance with current M.T.C. practices.

In determining the sliding resistance between the concrete base of the footing and the underlying cohesive glacial till an adhesion value of 2,500 p.s.f. may be used. The closed-type vertical wall sections will be inherently stable with respect to a deep-seated rotational type of failure in the cohesive subsoil located beneath the abutment foundations.

6.3) Approaches:

The maximum height of the approach fill will be of the order of 18 ft. in the transverse direction to Neilson Road. In the longitudinal direction in addition to the 18 foot fills, cuts up to 5 ft. will be necessary in order to form the approaches. The subsoil across the site is competent and consequently no

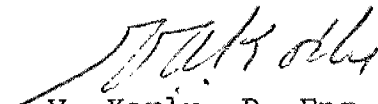
stability problems are anticipated, provided that the approaches are constructed with standard 2:1 slopes.

7. MISCELLANEOUS:

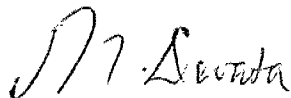
The field work, carried out during the period of December 5 to December 13, 1972, was supervised by Mr. V. Korlu, Project Foundations Engineer, who also prepared this report.

Equipment used was owned and operated by Master Soil Investigation Ltd. of Toronto.

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


V. Korlu, P. Eng.





M. Devata, P. Eng.

VK/ao

Feb. 15, 1973.

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 72-11130

LOCATION Co-ords. 65,895 N. 107,736 E.

ORIGINATED BY VK.

W.P. 43-69-04

BORING DATE December 5, 1972

COMPILED BY VK.

DATUM Geodetic

BOREHOLE TYPE Auger & Sample with CME machine

CHECKED BY *SL*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L	
530.7	Ground Level														
0.0	Heterogeneous mixture of clayey silt, sand		1	SS	23										
	Brown		2	SS	24										
	Grey and Gravel-Glacial Till		4	SS	44										
	V. Stiff to Hard		5	SS	33										
510.2			6	SS	40										
20.5			7	SS	43										
	Silty Sand with occasional gravel		8	SS	80										
	(loose to V.Dense.)		9	SS	6										
			10	SS	36										
			11	SS	180										
			12	SS	117										
445.7															
85.0	End of Borehole														

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 2

JOB 72-11130

LOCATION Co-ords. 65,948 N 107,718 E

ORIGINATED BY VK.

W.P. 43-69-04

BORING DATE December 7, 1972

COMPILED BY VK.

DATUM Geodetic

BOREHOLE TYPE Auger & Sample with CMF machine

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT —w _L PLASTIC LIMIT —w _p WATER CONTENT —w			BULK DENSITY γ	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT 20 40 60 80 100					SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					w _p — w — w _L WATER CONTENT % 10 20 30		
530.3	Ground Level																		
0.0	Heterogeneous mixture of Clayey Silt, sand & Gravel- Glacial Till		1	SS	16	530													
			2	SS	36														
			3	SS	87	520													
			4	SS	78														
	Brown		5	SS	35														
	Grey		6	SS	75	510													
510.3	V. Stiff to Hard		7	SS	27														
20.0			8	SS	53														
	Silty sand with occasional Gravel		9	SS	6	500													
	(loose to V. Dense)		10	SS	6														
			11	SS	61	490													
			12	SS	154	480													
478.8						470													
51.5	End of Borehole																		

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 72-11130

LOCATION Co-ords 65,910 N 107,603 E

ORIGINATED BY VK

W.P. 43-69-04

BORING DATE December 8, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger & Sample with CME machine

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
529.6	Ground Level									
0.0	Heterogeneous mixture of clayey silt, sand and gravel- Brown		1	SS	19					526.6
			2	SS	22					42 40 14
			3	SS	56	520				
			4	SS	43					
	Grey		5	SS	58					
	Glacial Till		6	SS	162	510				
	V. Stiff to Hard		7	SS	175/10"					
503.6			8	SS	162/11"	500				
26.0			9	SS	110/10"					71 27 2
	Silty Sand with occasional gravel		10	SS	160/9"	490				
	Very Dense		11	SS	190/10"					
			12	SS	100/6"	480				92 (5)
			13	SS	161	470				
						460				
						450				
						440				
134.6										
95.0	End of Borehole					430				

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 4

JOB 72-11130

LOCATION Co-ords 65.859 N 107.619 E

ORIGINATED BY VK

W.P. 43-69-04

BORING DATE December 13, 1972

COMPILED BY VK

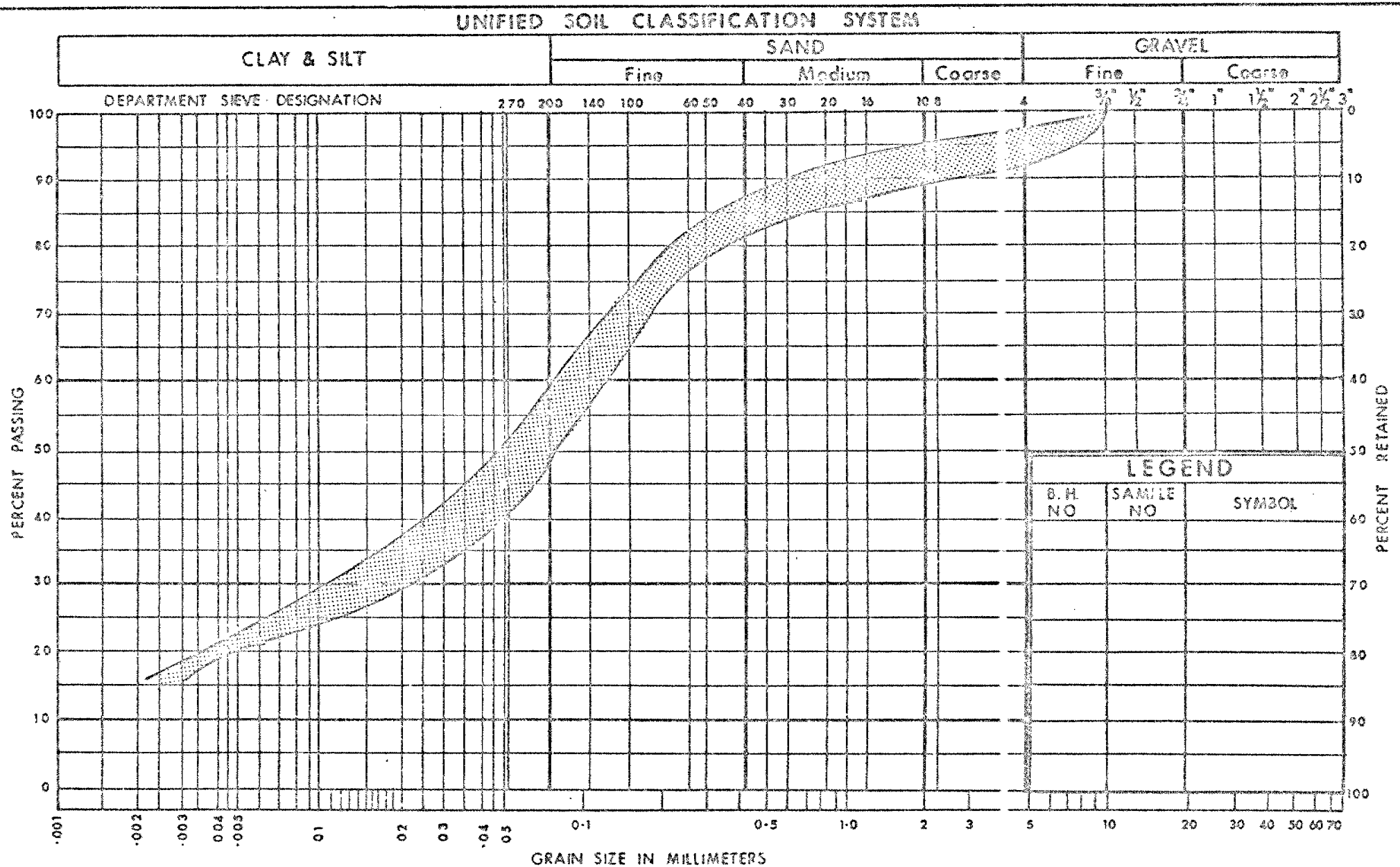
DATUM Geodetic

BOREHOLE TYPE Auger Sample with CME machine

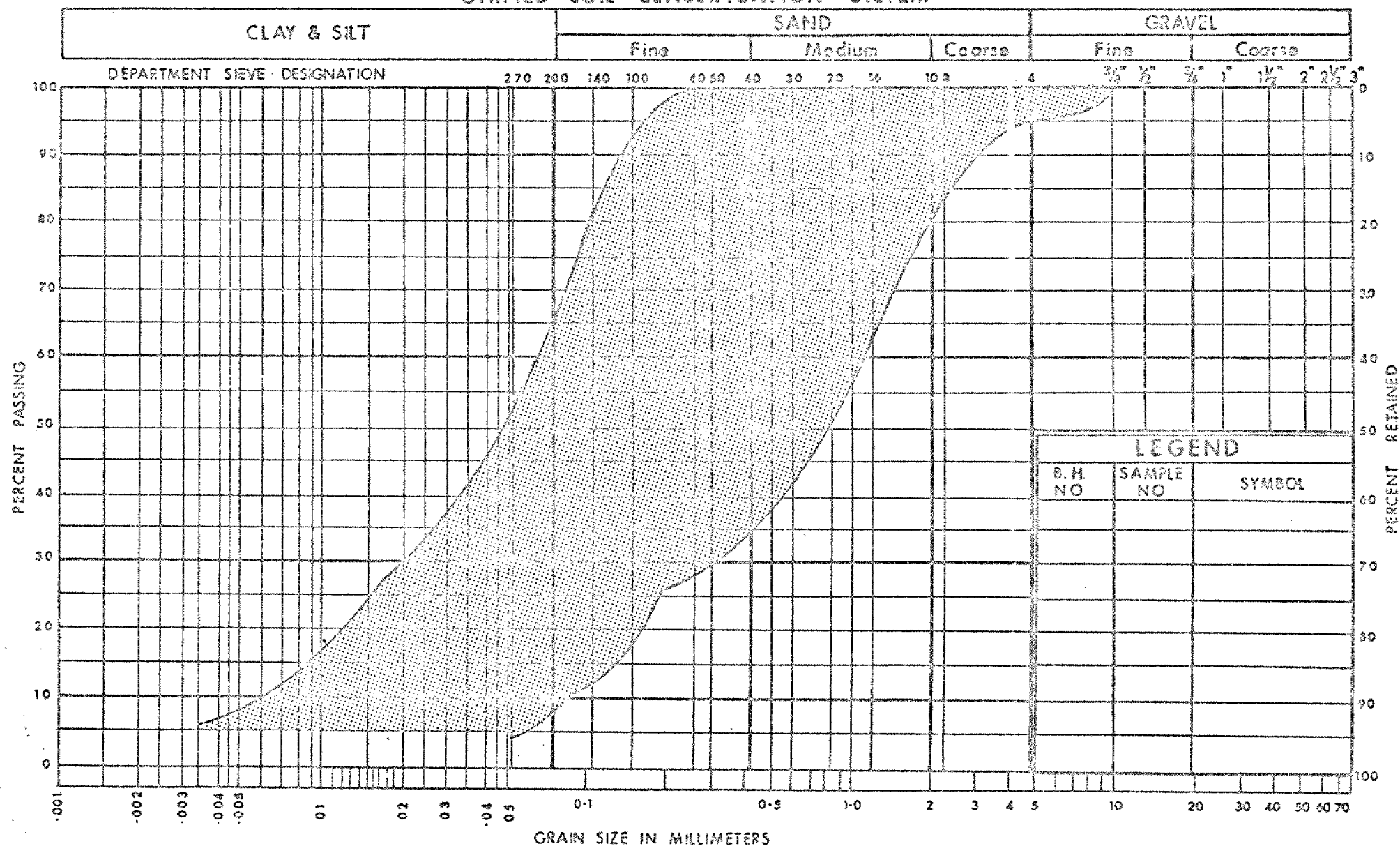
CHECKED BY VK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W	W_L		
529.7	Ground Level															
0.0	Heterogeneous mixture of Brown		1	SS	17	520										526.7
			2	SS	26											3 50 34 18
	Grey Clayey Silt, sand & gravel		3	SS	41											
	Glacial Till		4	SS	37											
	V. Stiff to Hard		5	SS	51											
507.7			6	SS	31	510										
22.0			7	SS	135	10"										
			8	SS	145	11"										5 30 65 0
	Silty sand with occasional gravel		9	SS	100	6"										
	Very Dense															
488.2			10	SS	79	490										
41.5	End of Borehole															
						480										

OFFICE REPORT SOIL EXPLORATION



UNCLASSIFIED SON CLASSIFICATION ON SCHEMES



DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION
SILTY SAND
OCC. GRAVEL

W.F. No. 43-69-04

JOB No. 72-11130

FIG. 2

FD-90 (Rev. Jan. 73)

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 - 500	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

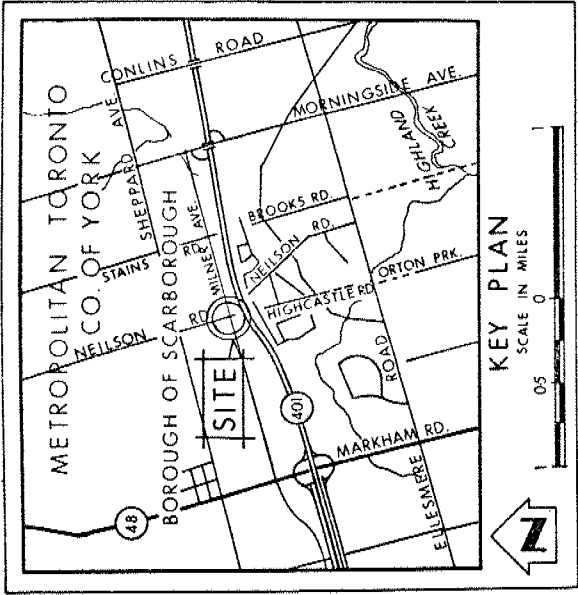
S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		



LEGEND		
	Bore Hole	
	Cone Penetration Test	
	Bore Hole & Cone Test	
	Water Levels established at time of field investigation, Dec. 1972	

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	530.7	65,895	107,736
2	530.3	65,948	107,718
3	529.6	65,910	107,603
4	529.7	65,859	107,619

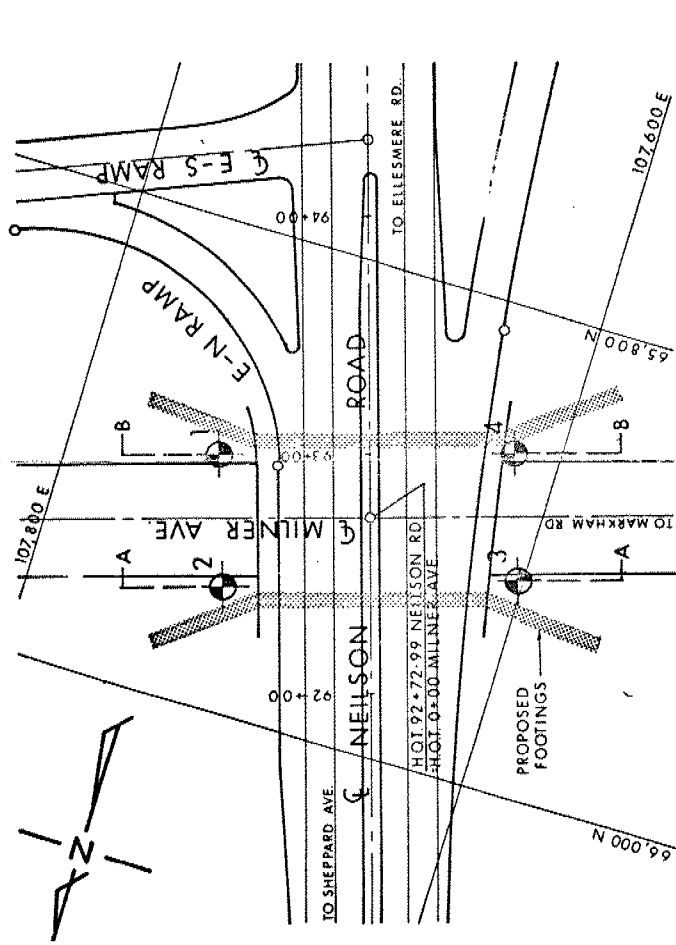
NOTE —
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS	
DATE	DESCRIPTION

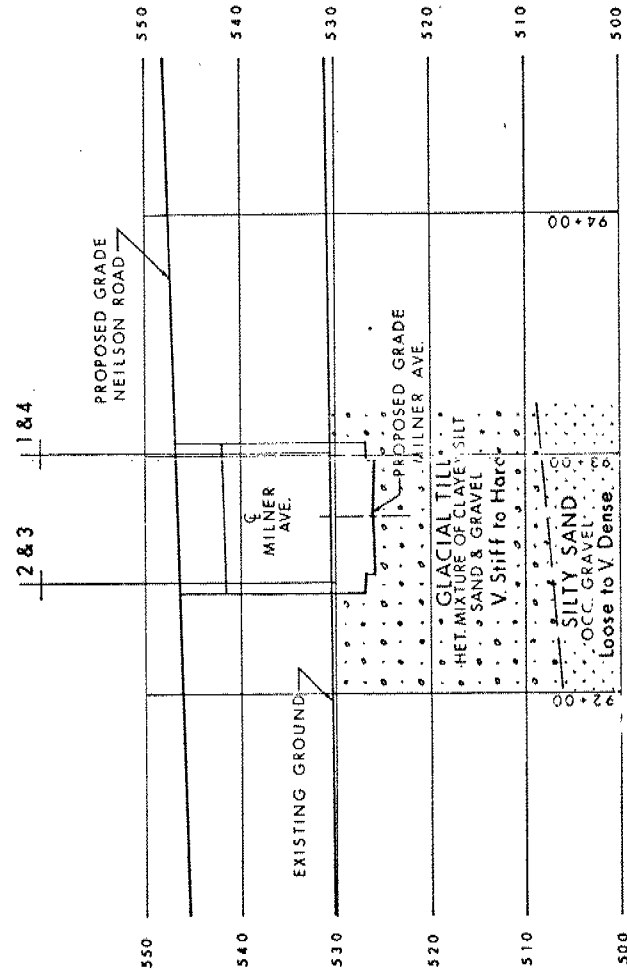
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

MILNER AVE. & NEILSON RD. EXT'N
HIGHWAY NO. 401 DIST NO. 6
CO. YORK METROPOLITAN TORONTO
TWP. SCARBOROUGH LOT CON.

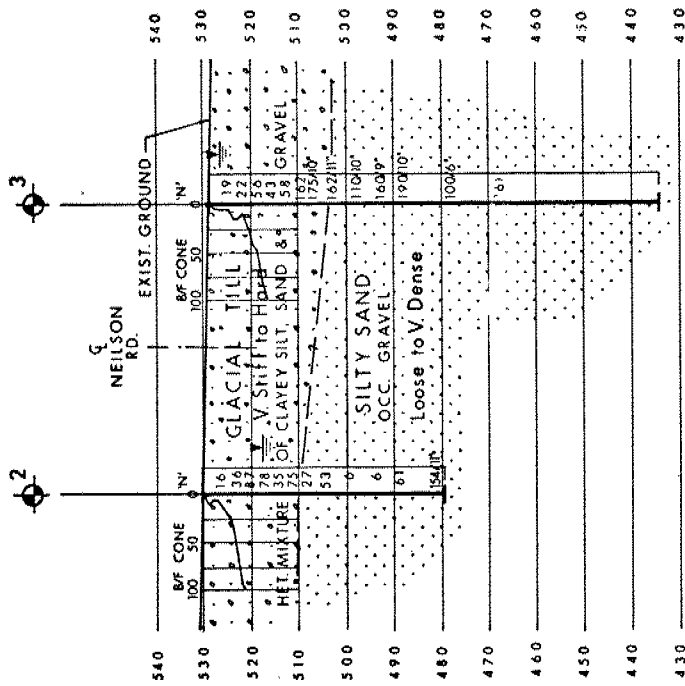
BORE HOLE LOCATIONS & SOIL STRATA
SUBWD V.K. CHECKED WP NO. 43-69-04 DRAWING NO.
DRAWN CL J. CHECKED WO NO 72-11130 72-11130A
DATE 6 FEB. 1973 SITE NO. BRIDGE DRAWING NO.
APPROVED [Signature] CONT NO.
ORIGINAL [Signature] 72-11130A



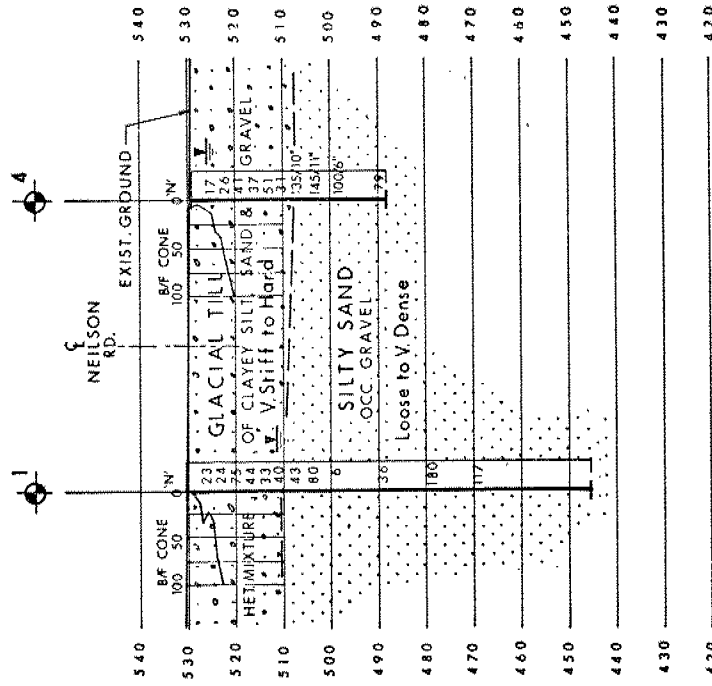
PLAN
SCALE 0 20 40 FT.



PROFILE
HOR. SCALE 0 20 40 FT.
VER. SCALE 0 10 20 FT.



A-A



B-B

SECTIONS
HOR. SCALE 0 20 40 FT.
VER. SCALE 0 10 20 FT.

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	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
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	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

π	= 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
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	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
β	ANGLE OF SLOPE TO HORIZONTAL

Mr. W.L. Lin
Design Engineer, Central Section
Structural Office
West Building

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 06 19

Re: Milner Avenue Overpass
W.P. 43-69-04, Site 37-1007
District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing 37-1007-P1 for the above mentioned structure. Changes noted in this drawing as compared to the previous drawing for this structure dated 1973 12 are:

- a) the shorter span length
- b) the incorporation of an extra 12.0 foot southbound lane
- c) the change to precast AASHTO II girders

Our subsoil investigation at this site was carried out and submitted in our "Foundation Investigation Report" dated 73 02 16. According to the preliminary plan dated 1978 06, the footings for the structure will be founded at about elevation 520.0 assuming a 3 foot thick footing. For foundations founded at or below this elevation, the recommendations in our Foundation Report should be sufficient and followed. No further soil investigation is contemplated at this site.

Upon submission of the footing design and final drawings, we would be pleased to submit our comments and/or revisions.

T. Kazmierowski
Project Engineer

TK/gs

cc: G.C.E. Burkhardt
Files ✓