DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-207

DIST. 6 REGION

W.P. No. 133-86-01

CONT. No. 91-18

W. O. No.

STR. SITE No. 10-68

HWY. No. 401

LOCATION Hwy 401 & Steeles Ave Underpass

No OF PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

MINISTRY OF TRANSPORTATION, ONTARIO PH-0-707 88-08

METRIC

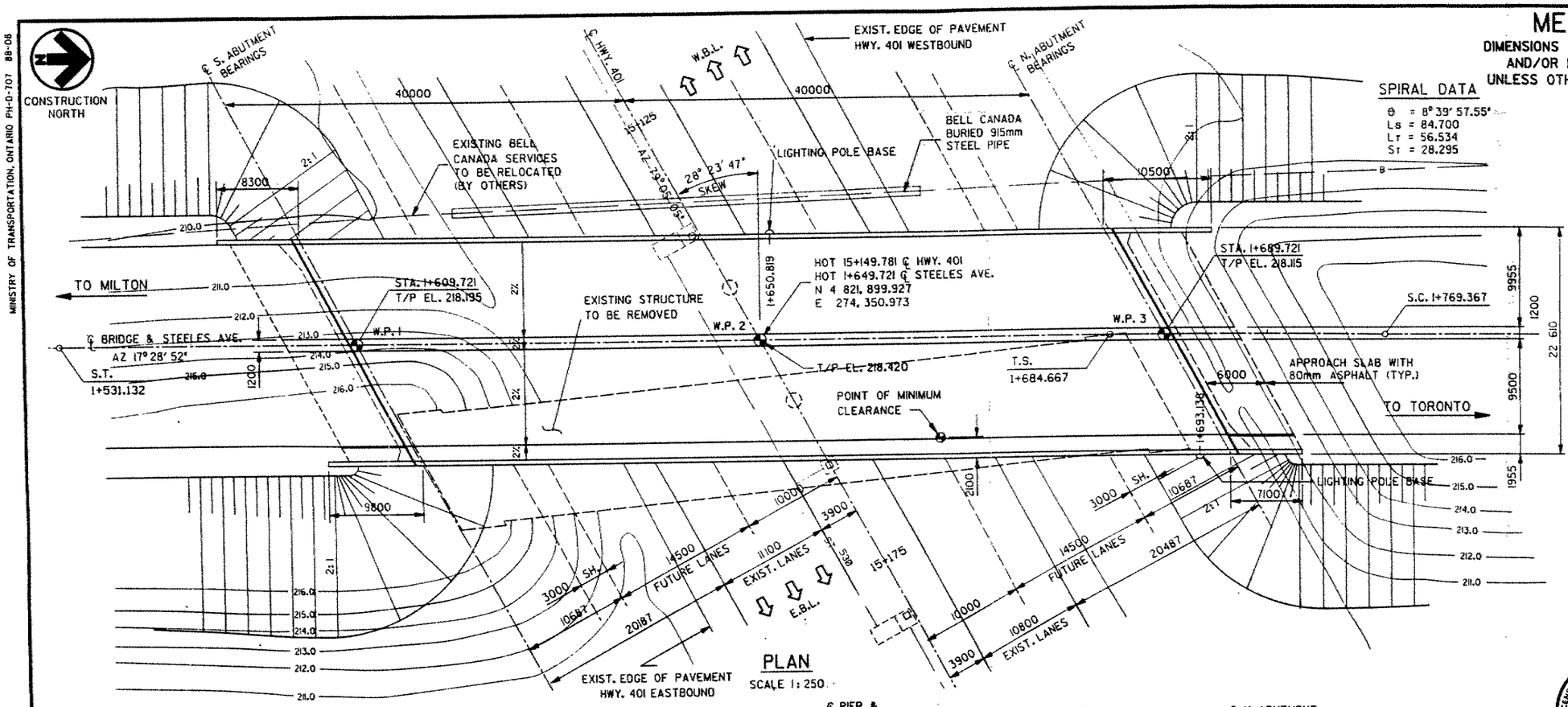
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

DIST 6
CONT No
WP No 133-86-01

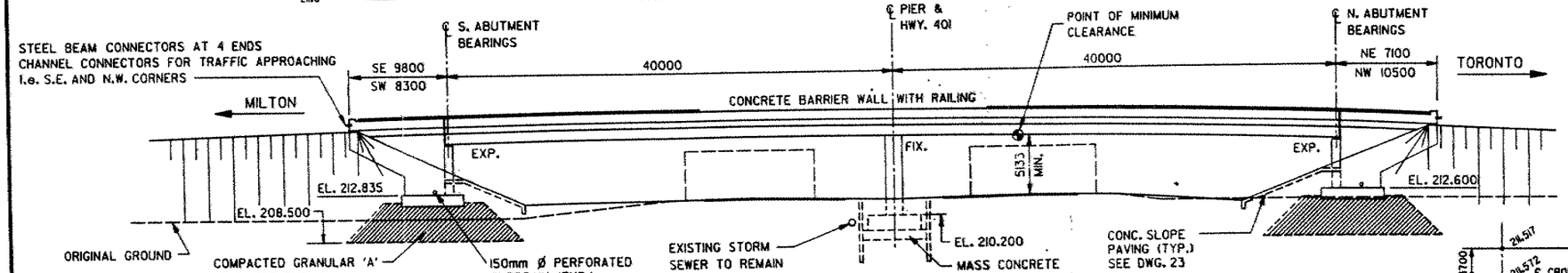
SHEET

HWY. 401 - STEELES AVE. UNDERPASS
GENERAL ARRANGEMENT

HATCH ASSOCIATES
HATCH ASSOCIATES LTD.
CONSULTING ENGINEERS AND ARCHITECT

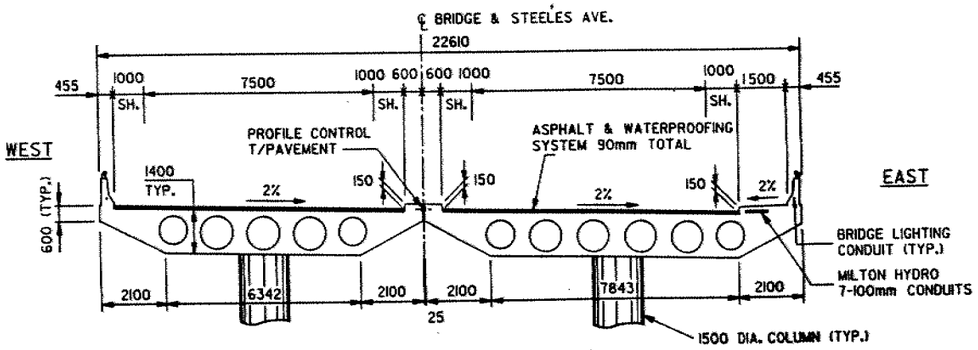


SPIRAL DATA
θ = 8° 39' 57.55"
Ls = 84.700
Lt = 56.534
St = 28.295

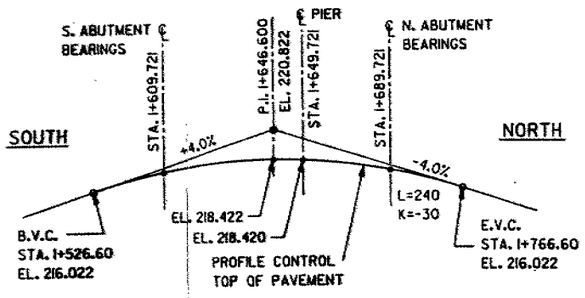


ELEVATION
SCALE 1:250

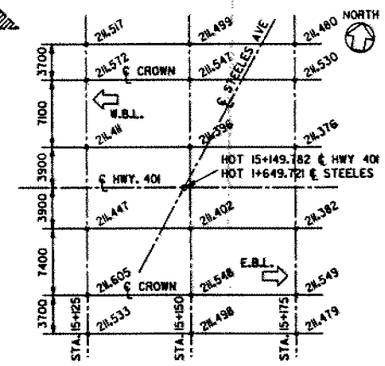
LEGEND :-
W.P. - WORKING POINT
T/P - TOP OF PAVEMENT



TYPICAL DECK CROSS-SECTION
SCALE 1:100



PROFILE OF STEELES AVE.
NOT TO SCALE



EXIST. PAVEMENT ELEVATIONS ON HWY. 401
NOT TO SCALE

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

GENERAL NOTES

1. CLASS OF CONCRETE
   - DECK, PIERS & SIDEWALKS -35MPa
   - REMAINDER -30MPa
2. CLEAR COVER TO REINFORCING STEEL
   - FOOTINGS 100 ± 25mm
   ABUTMENTS, WINGWALLS & RETAINING WALLS
   - FRONT FACE 80 ± 20mm
   - BACK FACE 70 ± 20mm
   - PIERS 80 ± 20mm
   - DECK - TOP 70 ± 20mm
   - BOTTOM AND SIDES 50 ± 10mm
   - REMAINDER 70 ± 20mm
   UNLESS OTHERWISE SPECIFIED
3. REINFORCING STEEL
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED
   - BAR MARKS WITH SUFFIX 'C' SHALL BE COATED BARS
4. CONSTRUCTION NOTE
   IF THE ACTUAL BEARING HEIGHTS ARE DIFFERENT FROM THE ASSUMED HEIGHTS GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE BEARING SEAT ELEVATIONS AND THE REINFORCING STEEL TO SUIT THE ACTUAL HEIGHTS.

LICENSED PROFESSIONAL ENGINEER C.A. Laborde-Basto PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER G. J. E. KRAMEN PROVINCE OF ONTARIO

LIST OF DRAWINGS

1. GENERAL ARRANGEMENT
2. BOREHOLE INFORMATION
3. REMOVALS AND TEMPORARY TRAFFIC PROTECTION
4. FOUNDATION LAYOUT
5. FOOTINGS AND PIER REINFORCEMENT
6. NORTH ABUTMENT LAYOUT AND DETAILS
7. SOUTH ABUTMENT LAYOUT AND DETAILS
8. NORTH ABUTMENT REINFORCEMENT
9. SOUTH ABUTMENT REINFORCEMENT
10. DECK LAYOUT AND DETAILS
11. LONGITUDINAL PRESTRESSING DETAILS
12. TRANSVERSE PRESTRESSING DETAILS
13. PRESTRESSING AND BEARING DATA
14. WEST DECK REINFORCEMENT
15. EAST DECK REINFORCEMENT
16. DECK REINFORCEMENT DETAILS - SHEET 1
17. DECK REINFORCEMENT DETAILS - SHEET 2
18. JOINT ANCHORAGE AND ARMOURING
19. BARRIER WALL WITH RAILING
20. BARRIER WALL WITH SIDEWALK
21. RAILING FOR BARRIER WALL
22. 6000mm APPROACH SLABS
23. DETAILS OF CONCRETE SLOPE PAVING
24. AS CONSTRUCTED ELEVATIONS AND DIMENSIONS
25. BRIDGE DATA AND SITE NUMBER DATA
26. STANDARDS AND DECK JOINT LAYOUT
27. ELECTRICAL EMBEDDED WORK
28. QUANTITIES - STRUCTURE I
29. QUANTITIES - STRUCTURE II

APPLICABLE STANDARD DRAWINGS

OD 3503	- MINIMUM GRANULAR BACKFILL
OPSD-508.02	- ASPHALT & WATERPROOFING SYSTEM
OD 4603	- FALSEWORK CLEARANCES
OD 3515	- WINGWALL SLEEVE DETAILS

REVISIONS

DATE	BY	DESCRIPTION

DESIGN G J E K	CHK G L B	CODE OHBDC83	LOAD CLASS A	DATE JULY 89	
DRAWN MW	CHKG J E K	SITE 10-68	STRUCT	SCHEME	DWG. 1

MINISTRY OF TRANSPORTATION, ONTARIO PH-D-TOT 88-08

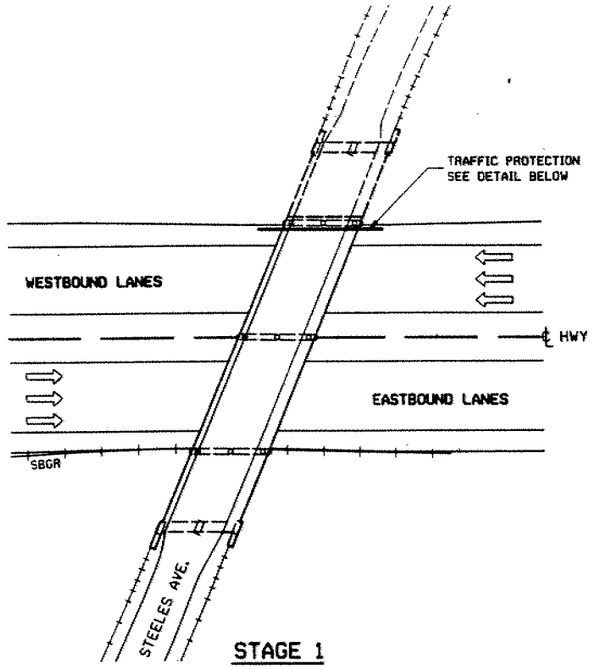
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
WP No 133-86-01

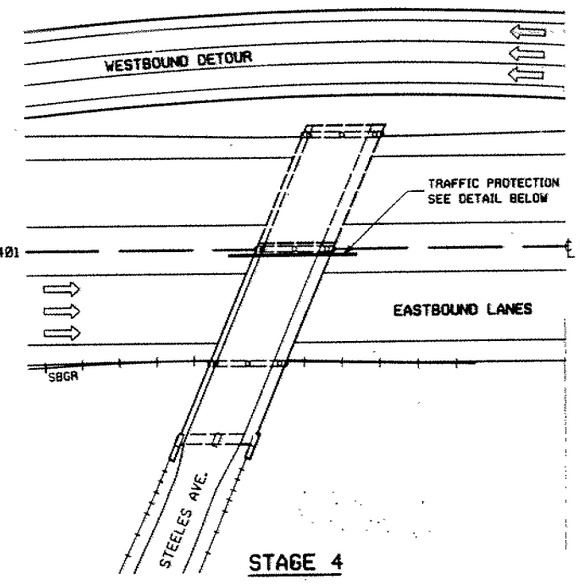
HWY. 401 - STEELES AVE.
UNDERPASS
REMOVALS & ROADWAY PROTECTION

SHEET

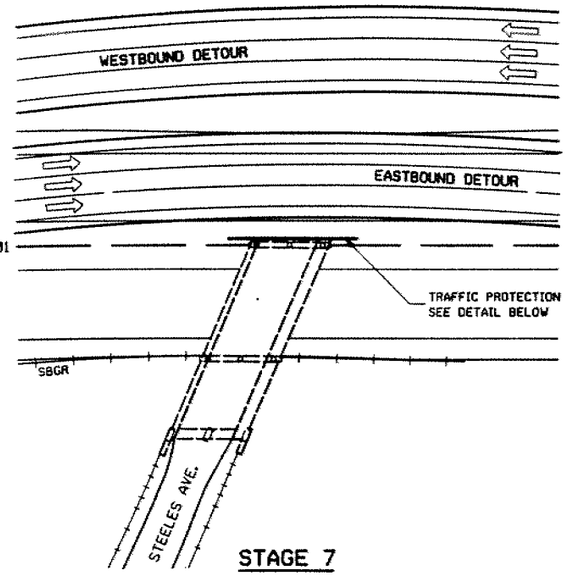
HATCH ASSOCIATES
HATCH ASSOCIATES LTD.
CONSULTING ENGINEERS AND ARCHITECT



STAGE 1



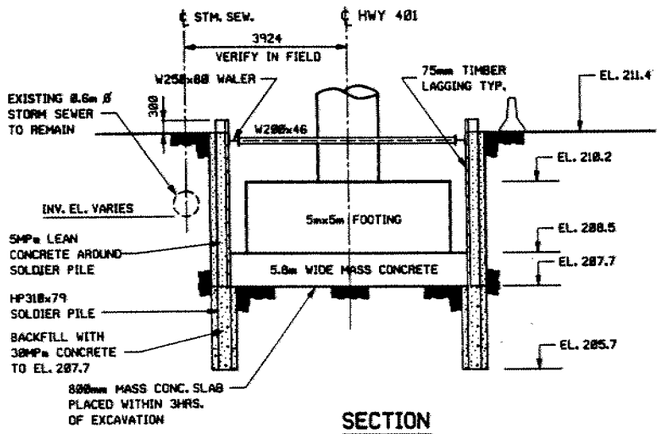
STAGE 4



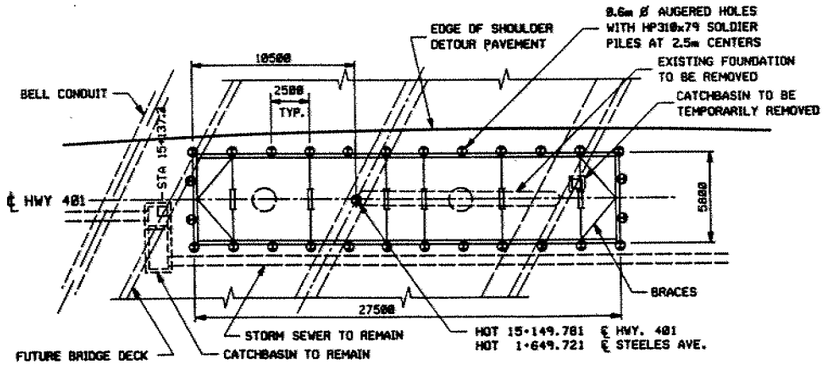
STAGE 7

BRIDGE DECK REMOVAL

NOTE: SHADED AREA INDICATES PORTION TO BE REMOVED

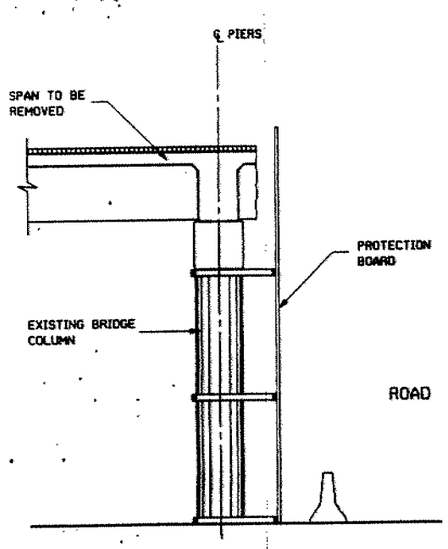


SECTION
SCALE 1 : 75



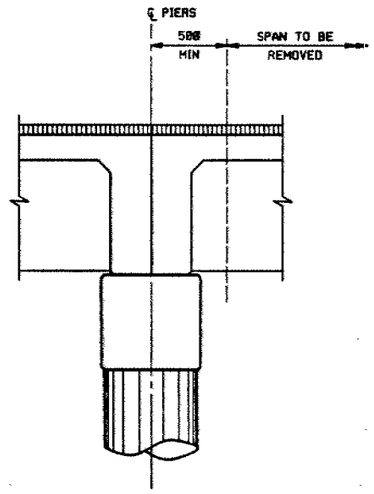
PLAN
SCALE 1 : 200

EXCAVATION & SHORING DETAILS



TEMPORARY TRAFFIC PROTECTION

N.T.S.



LIMIT OF REMOVAL OF DECK

SCALE 1 : 25

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH TRAFFIC STAGING DRAWINGS
2. TEMPORARY TRAFFIC PROTECTION SHALL BE PROVIDED PRIOR TO REMOVAL OF AN EXISTING SPAN OF THE BRIDGE

TEMPORARY SHORING

1. AUGER SOLDIER PILE TO EL. 205.7m, CARE MUST BE TAKEN TO AVOID STORM SEWER AND CATCHBASIN AT STA. 15+137.3
2. INSERT STEEL PILE
3. BACKFILL HOLE WITH 30MPa CONCRETE TO EL. 207.7m
4. BACKFILL THE REMAINING HOLE WITH 5MPa LEAN CONCRETE.
5. EXCAVATE TRENCH TO EL. 210.2m, INSTALL LAGGING AS EXCAVATION PROGRESSES.
6. INSTALL WALERS, STRUTS AND BRACES. WALER TO BE SPLICED AT STRUT LOCATIONS ONLY
7. EXCAVATE TO EL. 207.7m, WITHIN 3HRS. POUR 800mm MASS CONCRETE SLAB OVER ENTIRE BASE OF EXCAVATION AND AROUND EXISTING GRADE BEAM.
8. REMOVE EXISTING GRADE BEAM AND REMAINING COLUMNS
9. POUR MASS CONCRETE (30MPa) IN PLACE OF REMOVED GRADE BEAM
10. CONSTRUCT FOOTINGS AND PIERS
11. BACKFILL AND COMPACT TRENCH, REMOVE LAGGING AS BACKFILLING PROGRESSES
12. SOLDIER PILES TO BE TRIMMED OFF 1m BELOW FINAL GRADE
13. ALL OPERATIONS TO BE CARRIED OUT IN SUCH A WAY SO AS TO ENSURE THE STABILITY OF THE EXCAVATION AND SURROUNDING STRUCTURES AND ROADWORKS
14. STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CSA STANDARD CAN3.G40.21-M81 GRADE 300W.
15. TIMBER LAGGING SHALL BE 75mm SELECT STRUCTURAL PINE OR APPROVED EQUAL

LICENSED PROFESSIONAL ENGINEER
C.A. Laborde-Basto
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
G. J. E. KRAMER
PROVINCE OF ONTARIO

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN G.J.E.K.	CHK G.L.B	CODE OHBDC-83	LOAD CLASS A	DATE JUL 89	
DRAWN MW	CHK G.J.E.K.	SITE 18-68	STRUCT	SCHEME	DWG. 3

FOUNDATION INVESTIGATION REPORT

CONTRACT NO 91-18

Ontario

Ministry of
Transportation

INDEX

Page No.:	DESCRIPTION
1	Index
2	Abbreviations & Symbols
3 - 18	Foundation Investigation Report for Steeles Avenue Underpass W.P. 133-86-01, Site 10-68 Highway 401, Dist. 6, Toronto

Note: For purposes of the contract, this report supercedes all other Foundation Reports prepared by, or for the Ministry in connection with the above mentioned project.

EXPLANATION OF TERMS USED IN REPORT

N VALUE : THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS $\bar{N}$

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	>3m
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL

e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_p	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_p	%	PLASTICITY INDEX = $w_L - w_p$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	1,%	VOID RATIO IN LOOSEST STATE

e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

FOUNDATION INVESTIGATION REPORT

for

Hwy. 401 - Steeles Avenue Underpass

Bridge Replacement

W.P. 133-86-01, Site 10-68

District 6, Toronto

INTRODUCTION

This report summarizes the information obtained from a foundation investigation carried out at the above mentioned site during the period of June 21 to June 24, 1988.

Two boreholes (Boreholes 1 and 3) were drilled and sampled in July of 1957 as part of the foundation investigation prior to the construction of the original Hwy. 401 structure. These boreholes were advanced using a standard skid mounted drill rig with dynamic cone penetration tests. In addition, two separate dynamic cone penetration tests were carried out (Boreholes 2 and 4). All of the boreholes extended to a maximum depth of 9.5 metres below the ground surface. The results obtained from these boreholes (Boreholes 1 and 3) are utilized in this report.

During the June of 1988, five additional boreholes (Boreholes 5 to 9) were advanced and sampled as part of this project by means of hollow and solid stem augers. These boreholes extended down to depths between 6.6 metres and 17.2 metres below the ground surface.

SITE DESCRIPTION

The site is located approximately 3 km northeast of the intersection of Hwy. 401 and Hwy. 25 in the Town of Milton, Regional Municipality of Halton. The existing bridge is a 2 lane, 4 span structure with earth embankments approximately 6.0 metres in height, which was built in 1958. The topography of the area is level to gently undulating with the land in the immediate vicinity being used for industrial and farming purposes.

Physiographically, the site is located in the "Peel Plain" region which is characterized by a modified veneer of clay underlain by glacial till containing large amount of paleozoic shale. Underlying the glacial deposit are the red Queenston shale from which the till's reddish colour is derived.

SUBSURFACE CONDITIONS

The subsoil conditions encountered across the site were generally uniform consisting primarily of two distinct deposits. The upper layer consists of a clayey silt till. Underlying this stratum is a non-cohesive glacial till deposit which can be described as sandy silt to silty sand trace of clay and gravel. These deposits are of glacial origin.

The embankment of the existing structure are composed by approximately 6.4 to 7.5 metres of clayey silt fill materials.

More detailed description of the two distinct subsoil deposits and embankment fill material will be presented.

Clayey Silt to Silt (Glacial Till)

Underlying the site and explored to depths ranging from the original ground surface to depths between 4.2 and 9.6 metres, is a cohesive glacial till deposit consisting of clayey silt to silt, some sand, trace of gravel with occasional weathered shale partings. The material changes in colour from reddish grey to reddish brown at approximately elevation of 210 metres.

The results from laboratory tests performed on this material are summarzied as follows:

Properties	Range (%)
Moisture Content (w)	6.5-13.5
Liquid Limit (w_L)	17.5-27.0
Plastic Limit (w_P)	12.0-17
Plasticity Index (I_P)	4-11.0

The Atterberg Limit Test results are illustrated on the plasticity chart (Figure 1). From the chart it is evident that the layer can be classified as an inorganic clayey silt to silt with low plasticity (CL or CL-ML).

Grain size distribution tests were carried out on these materials. Figure 2 in Appendix shows the result in envelope form.

Standard Penetration Test 'N' values between 17 and over 100 blows/0.3 m indicated that the soil can be interpreted as being very stiff to hard.

Sandy Silt to Silty Sand (Glacial Till)

Silty sand to sandy silt till was encountered below the clayey silt till layer. All samples recovered from the investigation has a reddish brown to red colours.

Grain size distribution analysis indicates that the soil varies between a silty sand and sandy silt. Trace of clay and gravel are also present. This layer is basically non-plastic. The Atterberg Limit Test results are shown on the plasticity chart (see Figure 3). From the chart it is evident that the layer can be classified as sandy silt to silty sand (ML). Gradation limits for these particular soils are present in an envelope form in Figure 4.

In this stratum, the 'N' values ranged from 73 to over 100 blows/0.3 m indicating a state of compaction described as very dense.

Embankment Fill Material

The soil used in the embankment fills consists of a reddish grey clayey silt with some sand and trace of gravel. Through visual observation, it is apparent that the embankment fill material is similar to the layer of clayey silt to silt immediately below the existing ground surface. It is therefore likely that the fill material came from the immediate vicinity. Standard Penetration Test 'N' values between 9 and 17 indicate that the fill material is in a stiff to very stiff state. These fill materials extend from the existing approach surface to depths between 6.4 metres on north abutment (BH #5) and 7.5 metres on south abutment (BH #8).

Bedrock was not encountered in any of the boreholes.

GROUNDWATER CONDITIONS

The groundwater level across the site, during the period of investigations, was observed by taking readings in the open boreholes. The observations indicate that the water level in the open boreholes was found to be between elevation 206.9 and 209.0 metres, which corresponds to depths of from 2.5 to 8.4 metres below existing ground surface.

MISCELLANEOUS

The fieldwork for this investigation was carried out during the period of 88-06-21 to 88-06-24 under the supervision of Ken Zasitko (Technician). The equipment was owned and operated by Malones Soil Samples Toronto.

This report was written by T.C. Kim, Foundation Engineer and reviewed by M. Devata, Chief Foundation Engineer (East).

Tae C. Kim, P.Eng.
Foundation Engineer

Murty Devata, P.Eng.
Cheif Foundation Engineer
(East)

APPENDIX

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 1 (FORMERLY WP 40-57) METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 915.0; E 274 363.1 ORIGINATED BY VK
DIST 6 HWY 401 BOREHOLE TYPE Washboring, BX-Casing & Cone Test COMPILED BY AL/JP
DATUM Geodetic DATE 1957 07 13 CHECKED BY TCK

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.6	Ground Level										
0.0	Topsoil						210				
	Clayey Silt to Silt Some Sand Trace of Gravel (Glacial Till) Hard Reddish Brown		1	SS	61	▼				21.5	
			2	SS	142		208			20.3	
204.8			3	SS	77		206			20.6	
5.8	Sandy Silt to Silty Sand Trace of Clay and Gravel (Glacial Till) Very Dense		4	SS	162		204			21.4	
			5	SS	176					22.2	
201.2			6	SS	182		202			21.0	
9.4	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 3 (FORMERLY WP 40-57) METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 885.0; E 274 345.6 ORIGINATED BY V.K.

DIST 6 HWY 401 BOREHOLE TYPE Washboring, BX-Casing & Cone Test COMPILED BY AL/JP

DATUM Geodetic DATE 1957 07 17 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.2	Ground Level							
0.0	Clayey Silt to Silt Some Sand Trace of Gravel (Glacial Till) Hard Reddish Brown		1	SS	51	*	19.0	
			2	SS	76		20.2	
			3	SS	75		20.3	
204.7								
5.5	Sandy Silt to Silty Sand **		4	SS	158		19.6	
203.8								
6.4	End of Borehole							

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

ELEVATION SCALE 210 208 206 204

* Water Level not Established

** Trace of Clay and Gravel (Glacial Till) Very Dense

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 5 METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 938.8; E 274 373.1 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 22 - 23 CHECKED BY TCK

OFFICE REPORT ON SOIL EXPLORATION

ELEV / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
216.7	Ground Level										
0.0	Clayey Silt to Silt Some Sand Trace Gravel (Fill)		1	SS	9		216				
	Stiff to Very Stiff		2	SS	9		214				
			3	SS	11		212				
210.3	Redish Grey		4	SS	17		210	120/28cm			
6.4	Redish Brown		5	SS	19						
	Clayey Silt to Silt Some Sand Trace of Gravel Occ. Sand Seams Occ. Shale Fragments (Glacial Till)		6	SS	32	▼					
			7	SS	40		208		o——		4 19 54 23
	Very Stiff to Hard		8	SS	58						
205.0	Redish Brown		9	SS	27		206				
11.7	Red		10	SS	104/ 15cm						
	Sandy Silt to Silty Sand Some/Trace Clay Trace Gravel Occ. Shale Fragments (Glacial Till)		11	SS	130/ 23cm		204		o—H		2 27 59 12
201.1	Very Dense		12	SS	126/ 23cm		202				
15.6	End of Borehole										

NOTE: Water Level measured on 1988 6 24

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 6

METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 930.5; E 274 339.8 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 21 CHECKED BY TCK

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.8	Ground Level										
0.0 / 210.0	Clayey Silt (Fill) Brown										
0.8	Redish Brown		1	SS	25		210				
	Clayey Silt to Silt Some Sand Trace Gravel Occ. Silt Seams (Glacial Till) Hard		2	SS	30	▼			○		3 18 63 16
			3	SS	42		208				
			4	SS	105						
205.2	Redish Brown		5	SS	127		206		○		9 27 48 16
5.6 / 204.2	Sandy Silt to Silty Sand * Brown		6	SS	170				○		0 10 80 10
6.6	End of Borehole										

* Trace Clay and Gravel (Glacial Till) Very Dense

NOTE: Water Level measured 1988 06 22

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 7 METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 899.7; E 274 340.8 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 22 CHECKED BY TCK

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
211.3	Ground Level										
0.0	Clayey Silt (Fill)		1	SS	13			Augered			
209.9	Brown						210				
1.4	Redish Brown		2	SS	17				○ ⊢		12 16 53 19
	Clayey Silt to Silt Some Sand Trace Gravel Occ. Silt and Sand Seams (Glacial Till)		3	SS	27						
			4	SS	39		208				
	Very Stiff to Hard		5	SS	54	▼					
							206				
204.2			6	SS	65				○ ⊢		5 29 58 8
7.1	Sandy Silt to Silty Sand Trace Clay and Gravel (Glacial Till)						204				
			7	SS	116						
	Very Dense		8	SS	107		202		○ ⊢		1 19 72 8
200.2			9	SS	77						
11.1	End of Borehole										

NOTE:
Water Level measured during Boring Operation

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 8 METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 864.5; E 274 357.7 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 23 - 24 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
216.9	Ground Level										
0.0	Clayey Silt to Silt Some Sand Trace Gravel (Fill) Stiff		1	SS	15		216				
			2	SS	11		214				
209.4	Redish Grey		3	SS	10		212				
7.5	Redish Brown Silty Clay		4	SS	15		210			57.5 %	0 7 45 48
	Clayey Silt to Silt Trace of Sand and Gravel Occ. Silt Seams (Glacial Till) Stiff to Hard		5	SS	32	▼	208				
			6	SS	51		206				
205.2			7	SS	65						
11.7	Sandy Silt to Silty Sand Trace Clay and Gravel (Glacial Till) Very Dense		8	SS	75		204		O I		11 34 49 6
			9	SS	140/ 25cm		202				
			10	SS	150/ 23cm				O H		4 33 61 2
199.7			11	SS	73		200				
17.2	End of Borehole										

NOTE:
Water Level measured on 1988 06 24

+3, ×5 ; Numbers refer to Sensitivity

20
15 ⊹ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 9 METRIC

W P 133-86-01 LOCATION Co-ords. N 4 821 862.1; E 274 328.8 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 21 CHECKED BY TCK

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.6	Ground Level										
0.0 / 209.5	Clayey Silt (Fill) Brown		1	SS	5						
1.1	Redish Brown		2	SS	27						
	Clayey Silt to Silt		3	SS	37						12 26 44 18
	Some Clay		4	SS	101	▼					
	Trace Gravel										
	Occ. Silt and Sand Seams		5	SS	48						
	(Glacial Till)		6	SS	82						
	Very Stiff to Hard		7	SS	145/25cm						
			8	SS	151						5 27 51 17
201.0			9	SS	134/25cm						
9.6	End of Borehole										

NOTE:
Water Level measured on 1988 06 22

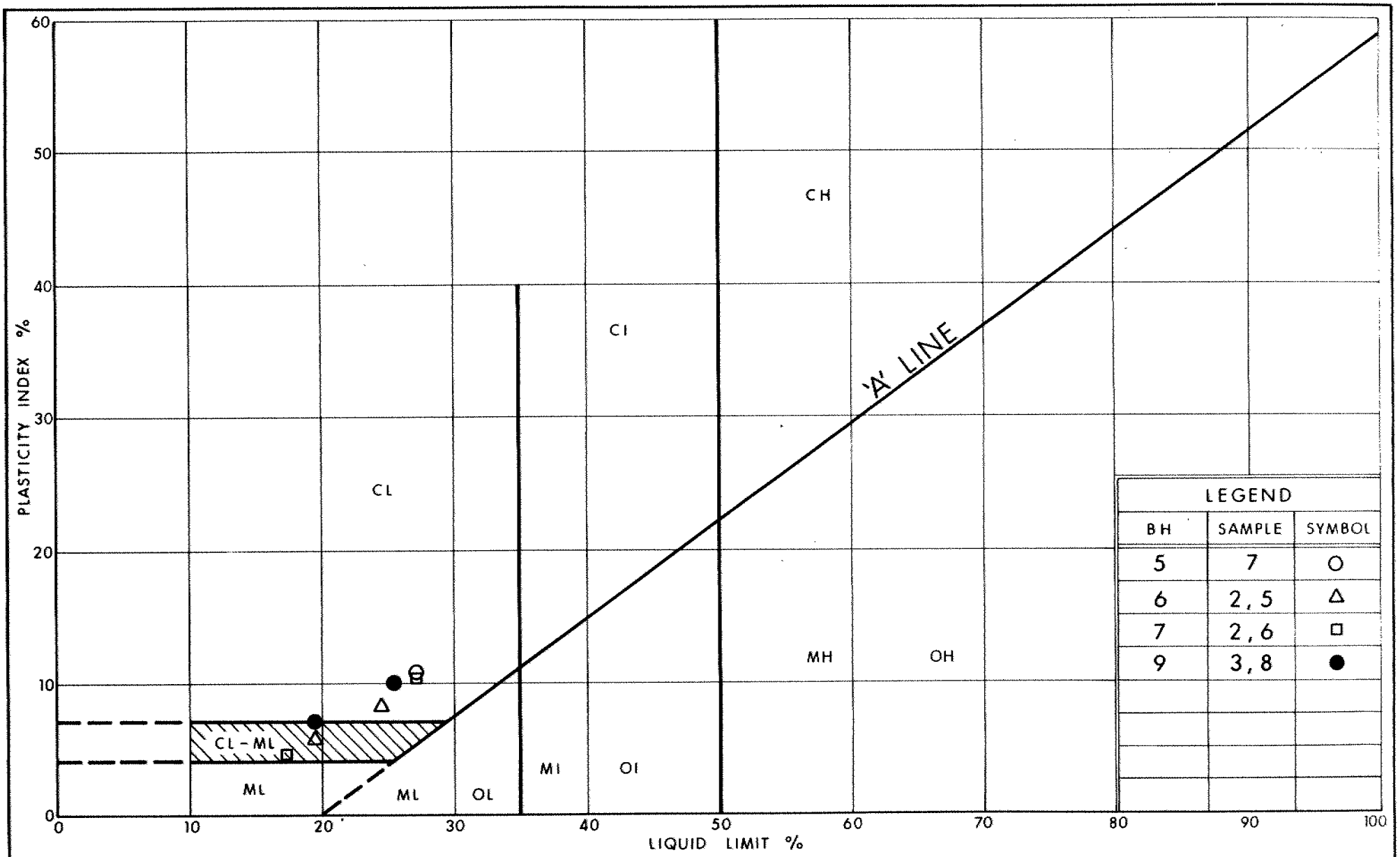
ELEVATION SCALE: 210, 208, 206, 204, 202

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 128

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

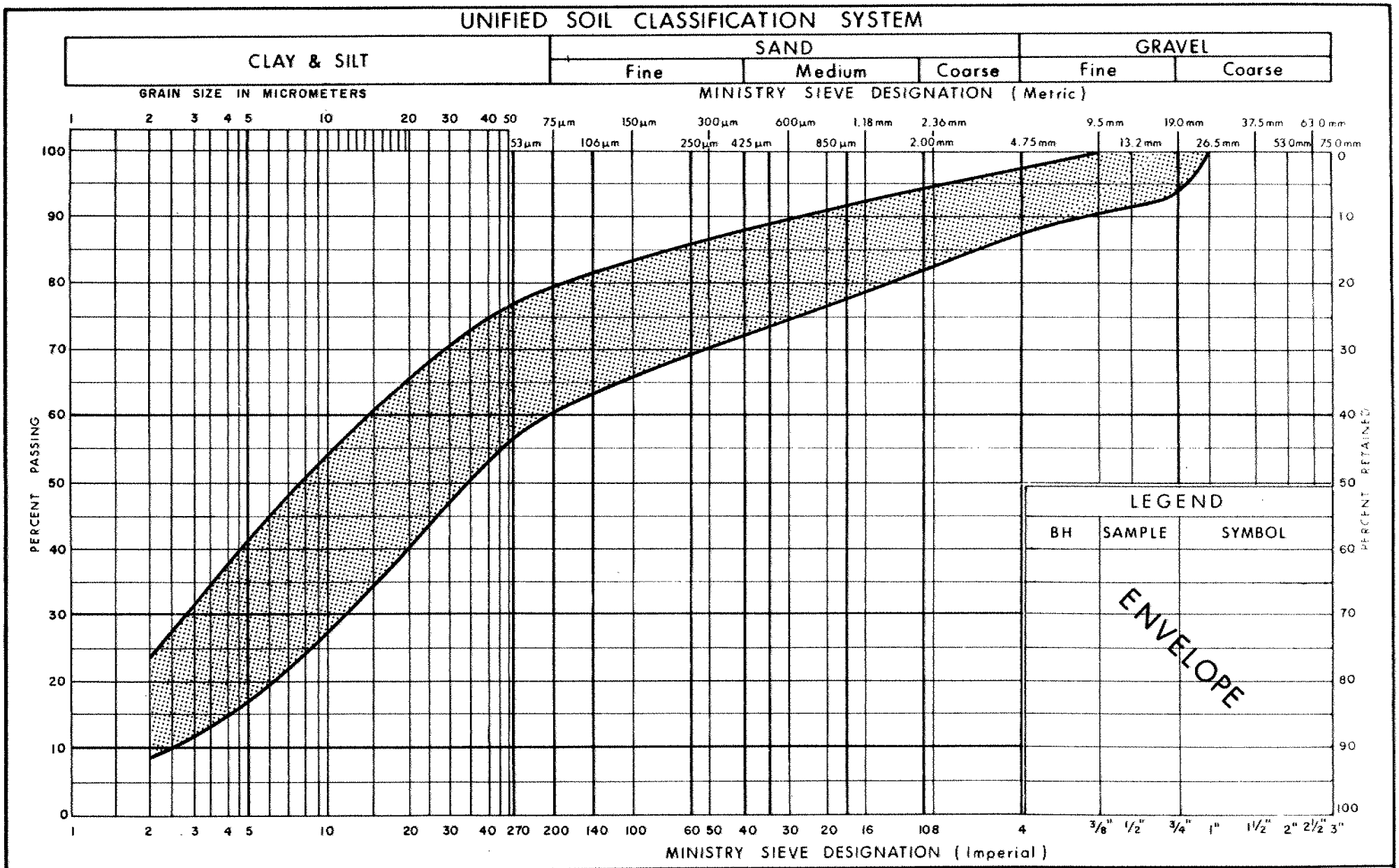
OFFICE REPORT ON SOIL EXPLORATION



Ministry of Transportation
Ontario

PLASTICITY CHART
CLAYEY SILT TO SILT (Glacial Till)
SOME SAND, TRACE OF GRAVEL

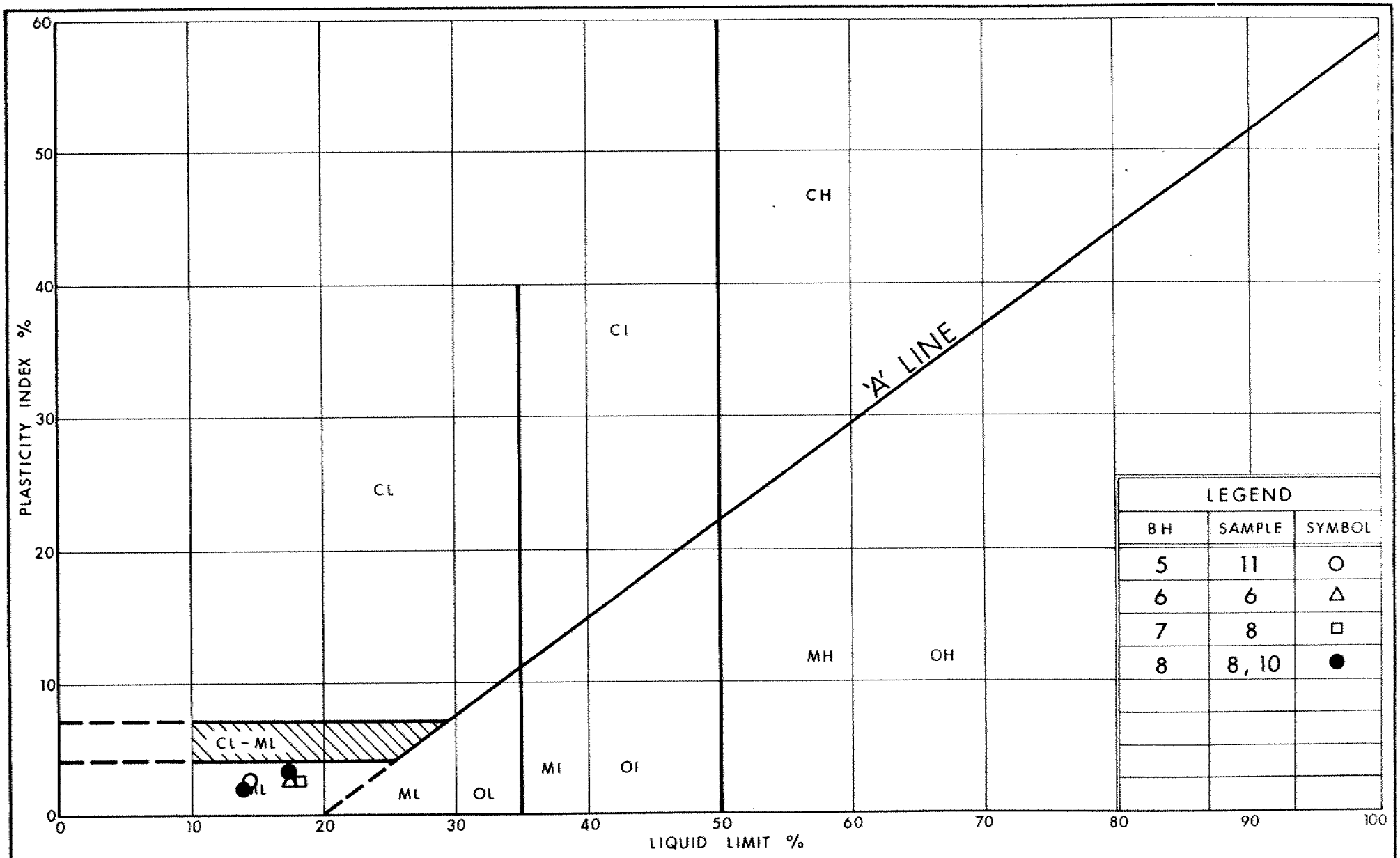
FIG No 1
WP 133-86-01



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILT (Glacial Till)
SOME SAND, TRACE OF GRAVEL

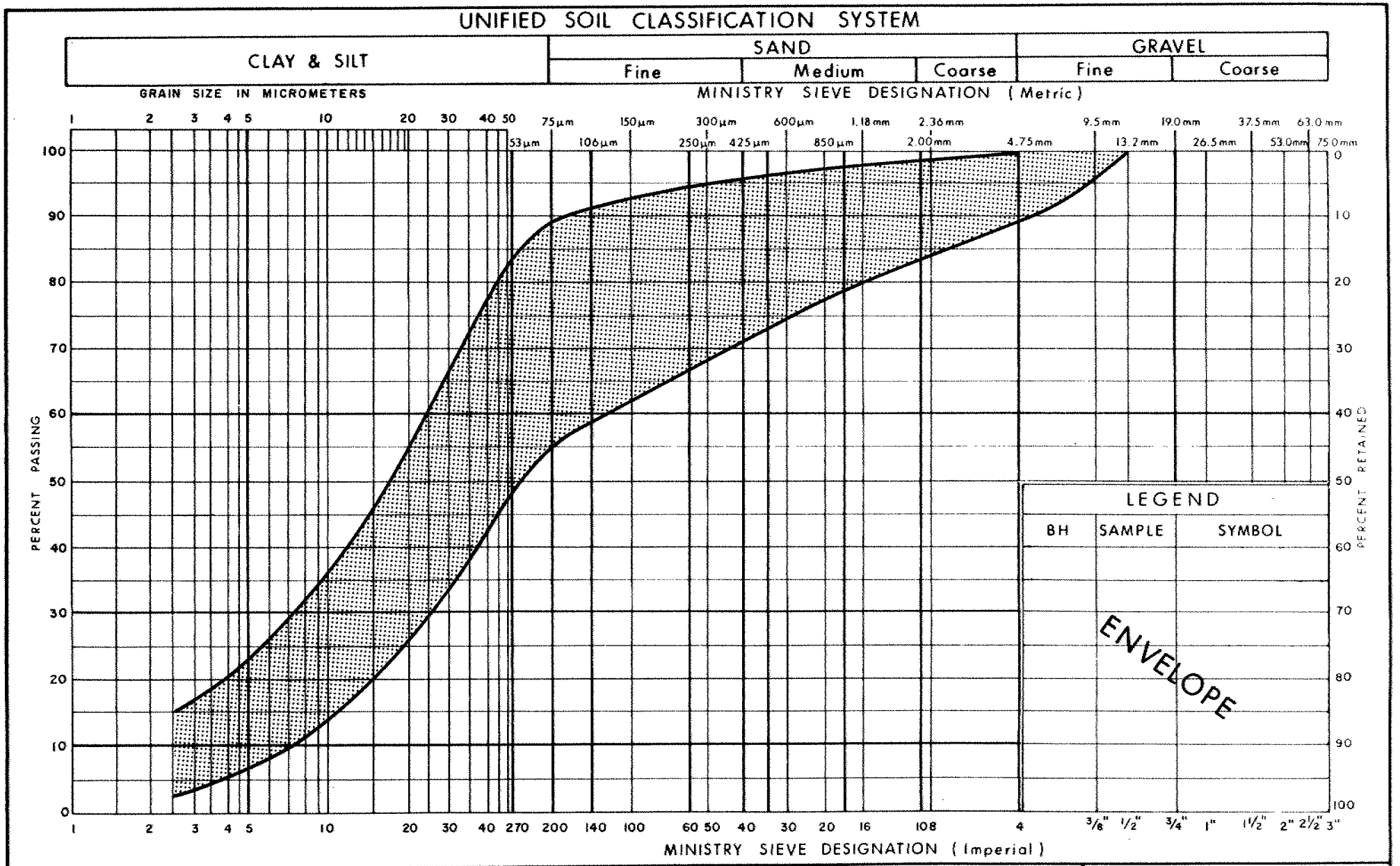
FIG No 2
WP 133-86-01



Ministry of Transportation
Ontario

PLASTICITY CHART
SANDY SILT TO SILTY SAND (Glacial Till)
TRACE OF CLAY, GRAVEL

FIG No 3
WP 133-86-01



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
SANDY SILT TO SILTY SAND (Glacial Till)
TRACE OF CLAY, GRAVEL

FIG No 4
W P 133-86-01

CONT 91-18

Ministry
of
Transportation
Ontario

FOUNDATION DESIGN SECTION

foundation investigation and design report

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 133-86-00 DIST 6

HWY 401 STR SITE 10-68

Hwy. 401 - Steeles Avenue Underpass
Bridge Replacement

CONT 91-18

DISTRIBUTION

G.C.E. Burkhardt (3)
G. Cautillo
J. Smrcka (2)
A. Wittenberg
K. Bassi
J.H. Peer
T. Yakutchuk
G. Szekreny
B. Steeves (Cover Only)
M. MacLean (Cover Only)
File

GEOCRES 30M12-207

DATE OCT 18 1988

FOUNDATION INVESTIGATION REPORT
for
Hwy. 401 - Steeles Avenue Underpass
Bridge Replacement
W.P. 133-86-00, Site 10-68
District 6, Toronto

INTRODUCTION

This report summarizes the information obtained from a foundation investigation carried out at the above mentioned site during the period of June 21 to June 24, 1988.

Two boreholes (Boreholes 1 and 3) were drilled and sampled in July of 1957 as part of the foundation investigation prior to the construction of the original Hwy. 401 structure. These boreholes were advanced using a standard skid mounted drill rig with dynamic cone penetration tests. In addition, two separate dynamic cone penetration tests were carried out (Boreholes 2 and 4). All of the boreholes extended to a maximum depth of 9.5 metres below the ground surface. The results obtained from these boreholes (Boreholes 1 and 3) are utilized in this report.

During the June of 1988, five additional boreholes (Boreholes 5 to 9) were advanced and sampled as part of this project by means of hollow and solid stem augers. These boreholes extended down to depths between 6.6 metres and 17.2 metres below the ground surface.

This report contains factual information together with recommendations pertaining to the structure replacing of the existing Steeles Avenue bridge over the Hwy. 401.

SITE DESCRIPTION

The site is located approximately 3 km northeast of the intersection of Hwy. 401 and Hwy. 25 in the Town of Milton, Regional Municipality of Halton. The existing bridge is a 2 lane, 4 span structure with earth embankments approximately 6.0 metres in height, which was built in 1958. The topography of the area is level to gently undulating with the land in the immediate vicinity being used for industrial and farming purposes.

Physiographically, the site is located in the "Peel Plain" region which is characterized by a modified veneer of clay underlain by glacial till containing large amount of paleozoic shale. Underlying the glacial deposit are the red Queenston shale from which the till's reddish colour is derived.

SUBSURFACE CONDITIONS

The subsoil conditions encountered across the site were generally uniform consisting primarily of two distinct deposits. The upper layer consists of a clayey silt till. Underlying this stratum is a non-cohesive glacial till deposit which can be described as sandy silt to silty sand trace of clay and gravel. These deposits are of glacial origin.

The embankment of the existing structure are composed by approximately 6.4 to 7.5 metres of clayey silt fill materials.

More detailed description of the two distinct subsoil deposits and embankment fill material will be presented.

Clayey Silt to Silt (Glacial Till)

Underlying the site and explored to depths ranging from the original ground surface to depths between 4.2 and 9.6 metres, is a cohesive glacial till deposit consisting of clayey silt to silt, some sand, trace of gravel with occasional weathered shale partings. The material changes in colour from reddish grey to reddish brown at approximately elevation of 210 metres.

The results from laboratory tests performed on this material are summarzied as follows:

Properties	Range (%)
Moisture Content (w)	6.5-13.5
Liquid Limit (w_L)	17.5-27.0
Plastic Limit (w_P)	12.0-17
Plasticity Index (I_P)	4-11.0

The Atterberg Limit Test results are illustrated on the plasticity chart (Figure 1). From the chart it is evident that the layer can be classified as an inorganic clayey silt to silt with low plasticity (CL or CL-ML).

Grain size distribution tests were carried out on these materials. Figure 2 in Appendix shows the result in envelope form.

Standard Penetration Test 'N' values between 17 and over 100 blows/0.3 m indicated that the soil can be interpreted as being very stiff to hard.

Sandy Silt to Silty Sand (Glacial Till)

Silty sand to sandy silt till was encountered below the clayey silt till layer. All samples recovered from the investigation has a reddish brown to red colours.

Grain size distribution analysis indicates that the soil varies between a silty sand and sandy silt. Trace of clay and gravel are also present. This layer is basically non-plastic. The Atterberg Limit Test results are shown on the plasticity chart (see Figure 3). From the chart it is evident that the layer can be classified as sandy silt to silty sand (ML). Gradation limits for these particular soils are present in an envelope form in Figure 4.

In this stratum, the 'N' values ranged from 73 to over 100 blows/0.3 m indicating a state of compaction described as very dense.

Embankment Fill Material

The soil used in the embankment fills consists of a reddish grey clayey silt with some sand and trace of gravel. Through visual observation, it is apparent that the embankment fill material is similar to the layer of clayey silt to silt immediately below the existing ground surface. It is therefore likely that the fill material came from the immediate vicinity. Standard Penetration Test 'N' values between 9 and 17 indicate that the fill material is in a stiff to very stiff state. These fill materials extend from the existing approach surface to depths between 6.4 metres on north abutment (BH #5) and 7.5 metres on south abutment (BH #8).

Bedrock was not encountered in any of the boreholes.

GROUNDWATER CONDITIONS

The groundwater level across the site, during the period of investigations, was observed by taking readings in the open boreholes. The observations indicate that the water level in the open boreholes was found to be between elevation 206.9 and 209.0 metres, which corresponds to depths of from 2.5 to 8.4 metres below existing ground surface.

DISCUSSION AND RECOMMENDATIONS

A twin, 2 span (2 x 32 m) structure, is proposed to replace the existing 4 span structure build in 1958 under contract 58-46. The existing structure will be removed before the proposed structure will be positioned on a slightly shifted alignment but essentially in the same location.

The existing structure is founded on spread footings within the approach fills on a zone composed of well compacted Granular 'A' material. It is our recommendations that the new structures should be also supported similar to the existing structure.

1) Structure Foundations

Abutments and Wingwalls

In consideration of the competent nature of the subsoils and the anticipated fill heights, a perched-type abutment founded on spread footings as high as possible within the approach fills on a zone composed of well compacted Granular 'A' material proposed as per the included current standard (see Figure 5). All surficial softened and/or organic material within the planned limits of the granular core must be subexcavated to a minimum elevation of 209.0 metres prior to placement of the granular core. For spread footings founded on a Granular 'A' core and constructed as per our standard, the following design parameters can be used:

	Factored Capacity at U.L.S. (kPa)	Allowable Capacity at S.L.S. Type II (kPa
Spread Footings	900	350

Alternatively, assuming a closed-type of abutment is more desirable, spread footings founded at or below elevation 209.0 metres can be designed for the following design parameters:

	Factored Capacity at U.L.S. (kPa)	Allowable Capacity at S.L.S. Type II (kPa
Spread Footings	525	350

Resistance to sliding of the abutment footings can be calculated assuming a coefficient of friction of 0.7 between the underside of the concrete footings and the Granular 'A' core and an adhesion of 75 kPa against sliding for the natural ground conditions.

Backfill to abutments and wingwalls should consist of Granular 'A' or Granular 'B' for which the following properties are recommended:

Granular 'A'	γ = 22.8 kN/m^3	ϕ = 35°	K_A = 0.27
Granular 'B'	γ = 21.2 kN/m^3	ϕ = 30°	K_A = 0.33

Piers

Foundations for the centre pier can be supported on spread footings founded at or below elevation 209.0 metres. At this elevation, the following design values are recommended for purpose of the O.H.B.D.C.:

Factored Bearing Capacity at U.L.S. : 525 kPa
Bearing Capacity at S.L.S. Type II : 350 kPa

2) Other Considerations

The footings should be placed so as to have a minimum earth cover of 1.2 metres to allow for frost protection. Since the water level is approximately the same level of the proposed foundation level and the foundation subsoil is of low permeability, major dewatering problems are not anticipated. If surface water does accumulate in the excavation, it should be removed by means of a sump pump.

3) Approaches

No major stability problems are anticipated provided approach fills constructed with standard 2:1 side and forward slopes. These should be keyed into the existing fills as per MTO Standards. Some differential settlements can be anticipated between the consolidated portion of existing fill and the new fill. In view of this, it is suggested that the new fills should be left in place as long as possible prior to paving operations. The settled portion of the embankment should be brought up to the required grade with fill material prior to the commencement of paving.

MISCELLANEOUS

The fieldwork for this investigation was carried out during the period of 88-06-21 to 88-06-24 under the supervision of Ken Zasitko (Technician). The equipment was owned and operated by Malones Soil Samples Toronto.

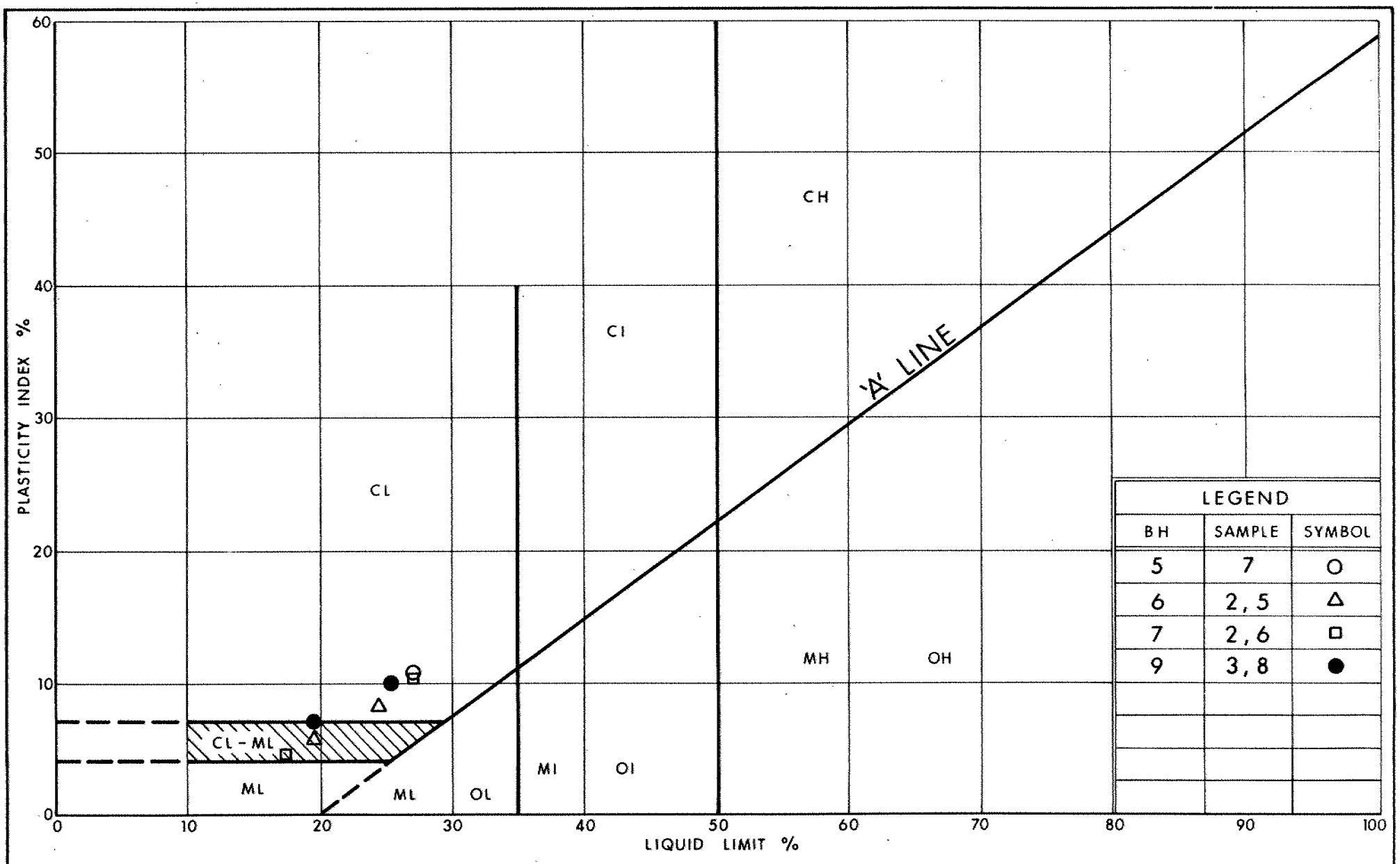
This report was written by T.C. Kim, Foundation Engineer and reviewed by M. Devata, Chief Foundation Engineer (East).

Tae C. Kim, P.Eng.
Foundation Engineer

Murty Devata, P.Eng.
Cheif Foundation Engineer
(East)

APPENDIX

Oct 75, FF-S-21



LEGEND		
BH	SAMPLE	SYMBOL
5	7	○
6	2, 5	△
7	2, 6	□
9	3, 8	●

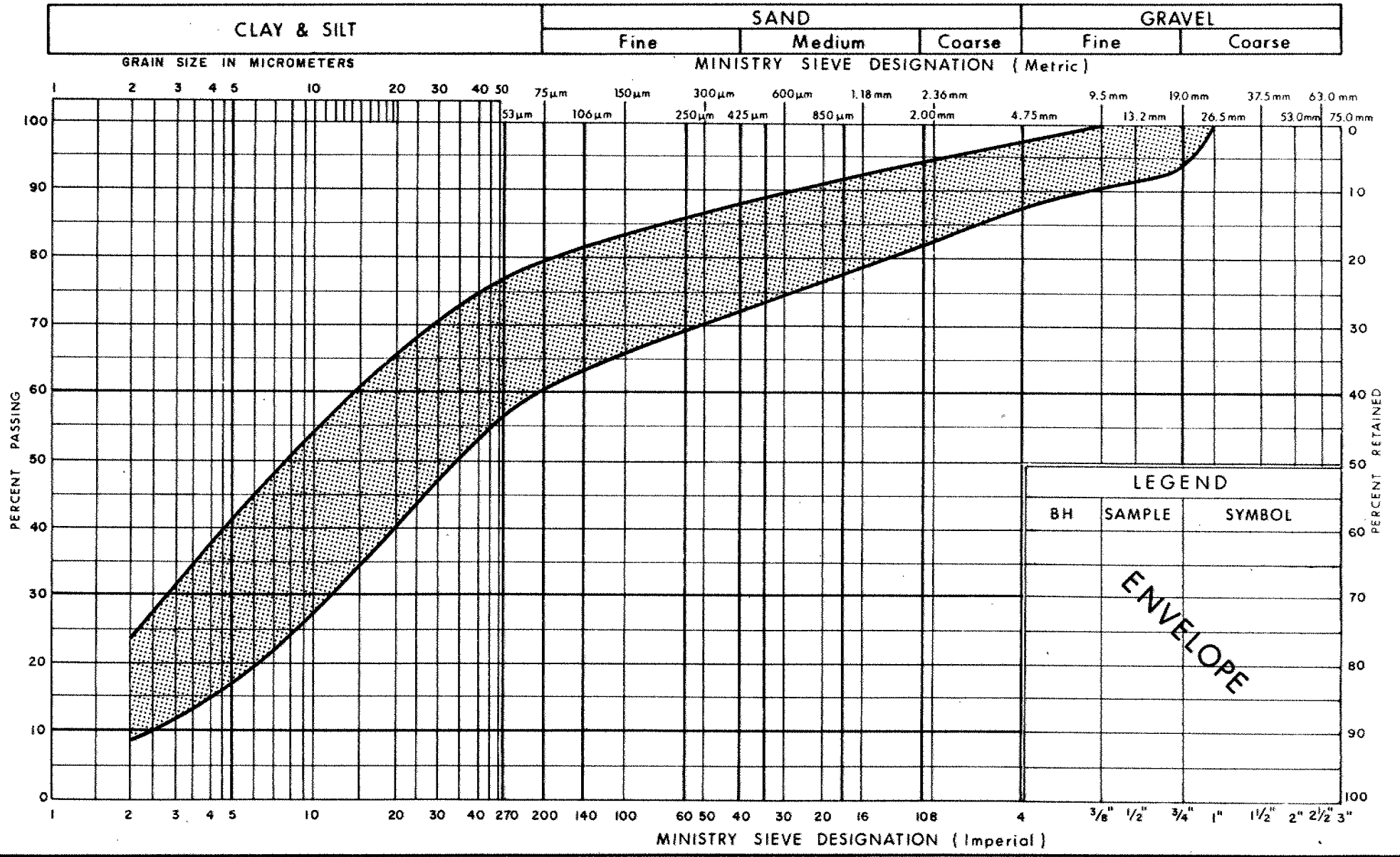
Ministry of Transportation
Ontario

PLASTICITY CHART
CLAYEY SILT TO SILT (Glacial Till)
SOME SAND, TRACE OF GRAVEL

FIG No 1
W P 133-86-00

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM

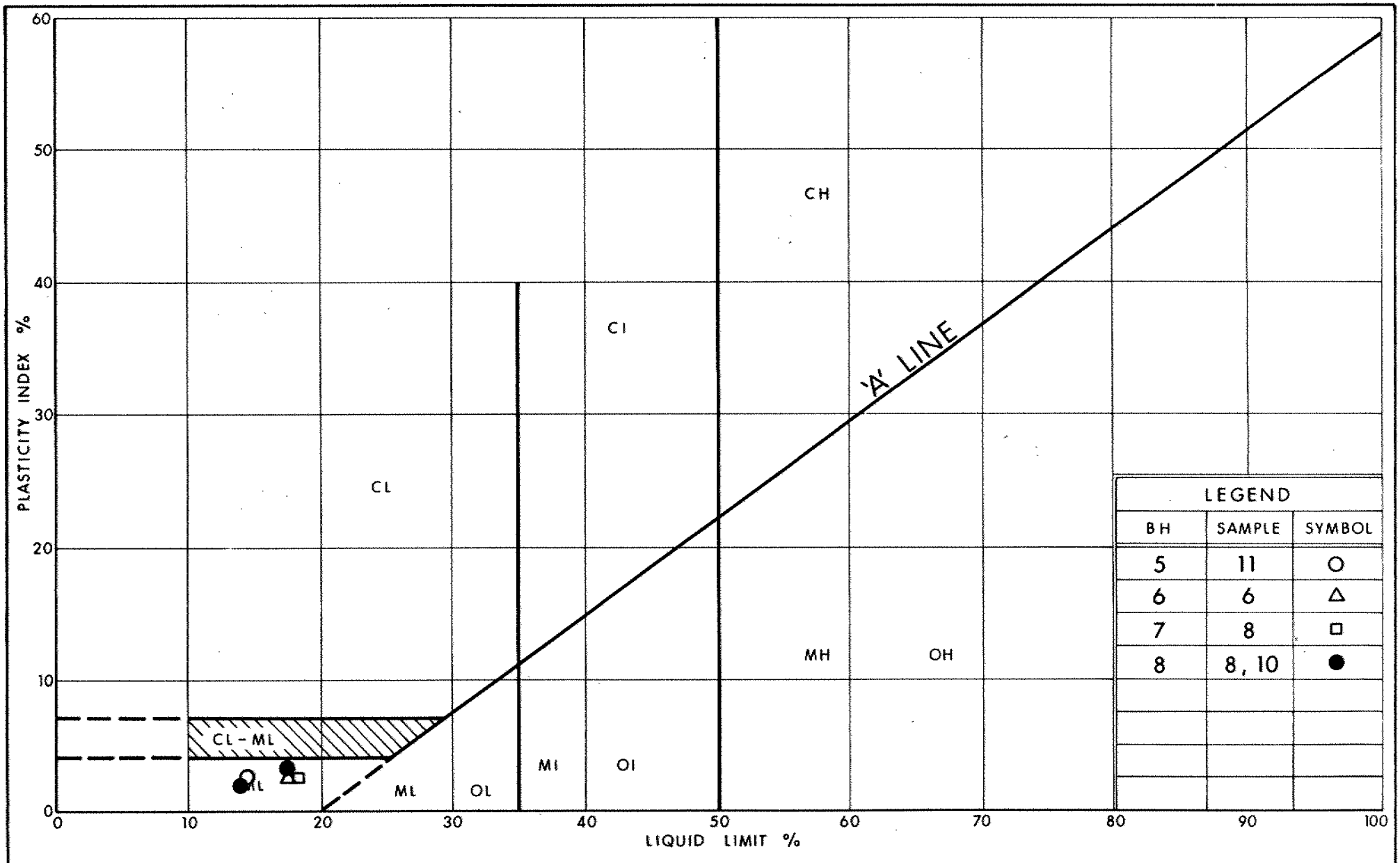


Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILT (Glacial Till)
SOME SAND, TRACE OF GRAVEL

FIG No 2
W P 133-86-00

Oct 75, FF-S-2i



LEGEND		
BH	SAMPLE	SYMBOL
5	11	○
6	6	△
7	8	□
8	8, 10	●

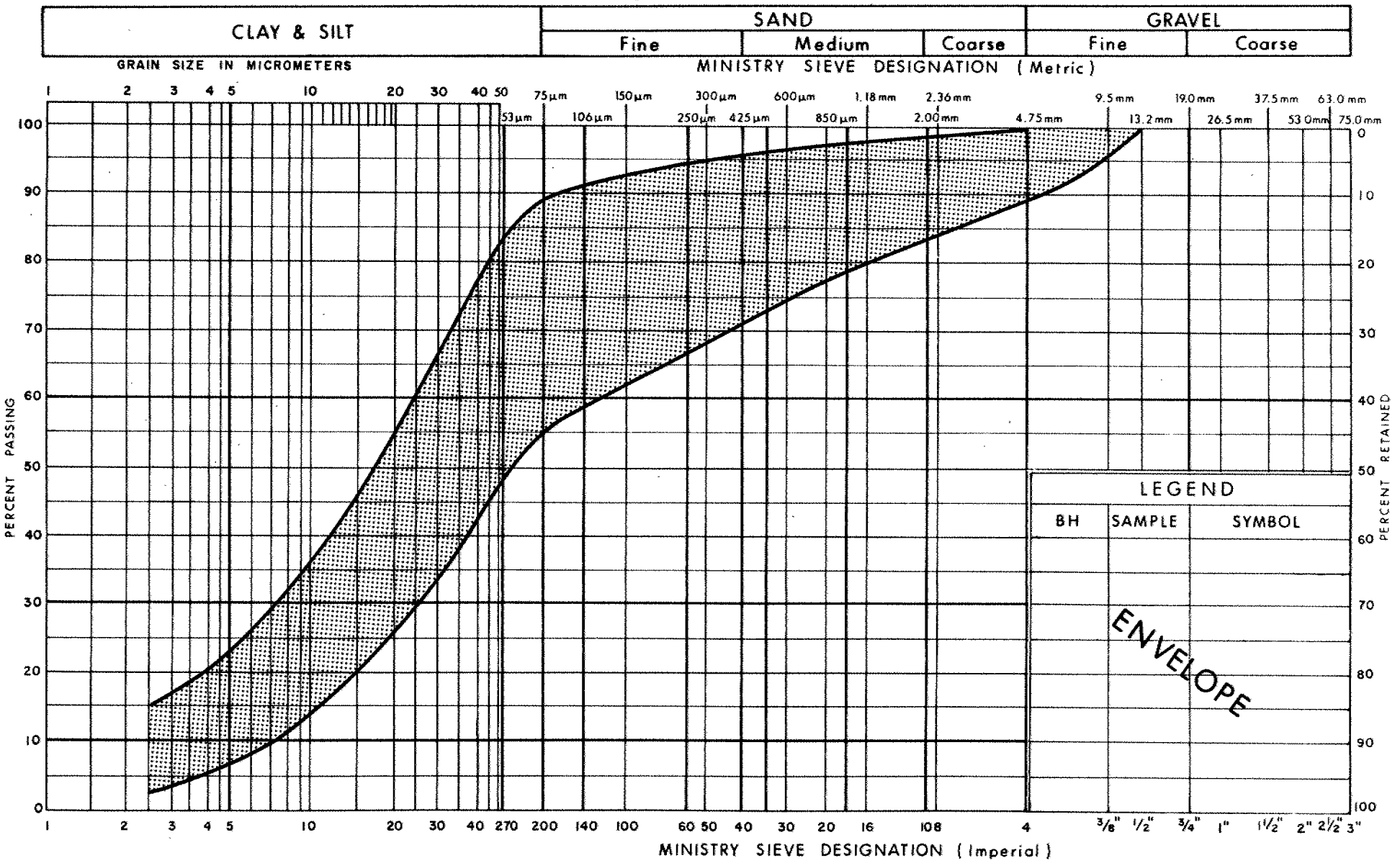
Ministry of Transportation
Ontario

PLASTICITY CHART
SANDY SILT TO SILTY SAND (Glacial Till)
TRACE OF CLAY, GRAVEL

FIG No 3
WP 133-86-00

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM

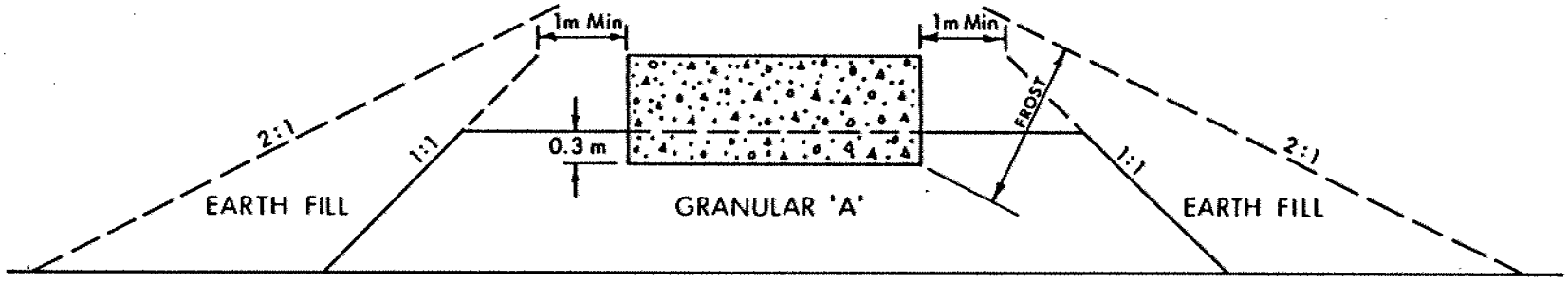


Ministry of Transportation
Ontario

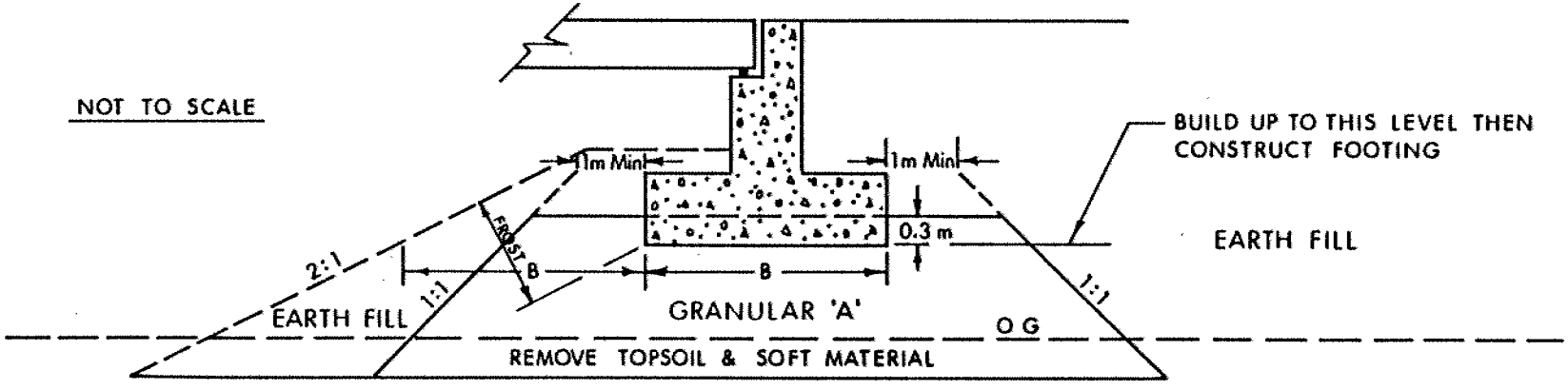
GRAIN SIZE DISTRIBUTION
SANDY SILT TO SILTY SAND (Glacial Till)
TRACE OF CLAY, GRAVEL

FIG No 4

W P 133-86-00



X SECTION



LONGITUDINAL SECTION

NOTES:

1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.

2 - PLACE GRANULAR 'A' & EARTH FILL TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M T C STANDARDS.

3 - CONSTRUCT CONCRETE FOOTING.

4 - PLACE REMAINDER OF GRANULAR 'A' & EARTH FILL AS REQUIRED.

Ministry of Transportation Ontario	ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE	FIG No 5 W P 133-86-00

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED AVERAGE N VALUE IS DENOTED THUS $\tilde{N}$.

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	>3m
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL

e	1,%	VOID RATIO	
n	1,%	POROSITY	
w	1,%	WATER CONTENT	
S_r	%	DEGREE OF SATURATION	
w_L	%	LIQUID LIMIT	
w_P	%	PLASTIC LIMIT	
w_S	%	SHRINKAGE LIMIT	
I_P	%	PLASTICITY INDEX = $w_L - w_P$	
I_L	1	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$	
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$	
e_{max}	1,%	VOID RATIO IN LOOSEST STATE	
e_{min}	1,%	VOID RATIO IN DENSEST STATE	
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$	
D	mm	GRAIN DIAMETER	
D_n	mm	n PERCENT - DIAMETER	
C_U	1	UNIFORMITY COEFFICIENT	
h	m	HYDRAULIC HEAD OR POTENTIAL	
q	m^3/s	RATE OF DISCHARGE	
v	m/s	DISCHARGE VELOCITY	
i	1	HYDRAULIC GRADIENT	
k	m/s	HYDRAULIC CONDUCTIVITY	
j	kN/m^3	SEEPAGE FORCE	

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 1 (FORMERLY WP 40-57) METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 915.0; E 274 363.1 ORIGINATED BY VK
DIST 6 HWY 401 BOREHOLE TYPE Washboring, BX-Casing & Cone Test COMPILED BY AL/JP
DATUM Geodetic DATE 1957 07 13 CHECKED BY TCK

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.6	Ground Level										
0.0	Topsoil						210				
	Clayey Silt to Silt Some Sand Trace of Gravel (Glacial Till) Hard Reddish Brown		1	SS	61	▼				21.5	
			2	SS	142		208			20.3	
			3	SS	77		206			20.6	
204.8											
5.8	Sandy Silt to Silty Sand Trace of Clay and Gravel (Glacial Till) Very Dense		4	SS	162		204			21.4	
			5	SS	176					22.2	
							202				
201.2			6	SS	182					21.0	
9.4	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 3 (FORMERLY WP 40-57) METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 885.0; E 274 345.6 ORIGINATED BY V.K.

DIST 6 HWY 401 BOREHOLE TYPE Washboring, BX-Casing & Cone Test COMPILED BY AL/JP

DATUM Geodetic DATE 1957 07 17 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.2	Ground Level										
0.0	Clayey Silt to Silt Some Sand Trace of Gravel (Glacial Till) Hard Reddish Brown		1	SS	51	*	210		○	19.0	
			2	SS	76		208		○	20.2	
			3	SS	75		206		○	20.3	
204.7											
5.5	Sandy Silt to Silty Sand **		4	SS	158		204		○	19.6	
203.8											
6.4	End of Borehole										

* Water Level not Established

** Trace of Clay and Gravel (Glacial Till) Very Dense

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 5 METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 938.8; E 274 373.1 ORIGINATED BY KZ
DIST 6 HWY 401 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY KZ
DATUM Geodetic DATE 88 06 22 - 23 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
216.7	Ground Level										
0.0	Clayey Silt to Silt Some Sand Trace Gravel (Fill)		1	SS	9						
	Stiff to Very Stiff		2	SS	9						
			3	SS	11						
210.3	Redish Grey		4	SS	17		216				
6.4	Redish Brown		5	SS	19						
	Clayey Silt to Silt Some Sand Trace of Gravel Occ. Sand Seams Occ. Shale Fragments (Glacial Till)		6	SS	32	▼	214				
			7	SS	40						4 19 54 23
	Very Stiff to Hard		8	SS	58		212				
205.0	Redish Brown		9	SS	27						
11.7	Red		10	SS	104/15cm		210	120/28cm			
	Sandy Silt to Silty Sand Some/Trace Clay Trace Gravel Occ. Shale Fragments (Glacial Till)		11	SS	130/23cm		208				2 27 59 12
201.1	Very Dense		12	SS	126/23cm		206				
15.6	End of Borehole						204				
	NOTE: Water Level measured on 1988 6 24						202				

OFFICE REPORT ON SOIL EXPLORATION

+3, x5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 6

METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 930.5; E 274 339.8 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 21 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
210.8	Ground Level										
0.0 / 210.0	Clayey Silt (Fill) Brown										
0.8	Redish Brown		1	SS	25		210				
	Clayey Silt to Silt Some Sand Trace Gravel Occ. Silt Seams (Glacial Till) Hard		2	SS	30				○		3 18 63 16
			3	SS	42	▼	208				
			4	SS	105						
			5	SS	127		206		○		9 27 48 16
205.2	Redish Brown										
5.6 / 204.2	Sandy Silt to Silty Sand * Brown		6	SS	170				○H		0 10 80 10
6.6	End of Borehole										

* Trace Clay and Gravel (Glacial Till) Very Dense

NOTE: Water Level measured 1988 06 22

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 7 METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 899.7; E 274 340.8 ORIGINATED BY KZ
DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ
DATUM Geodetic DATE 88 06 22 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
211.3	Ground Level										
0.0	Clayey Silt (Fill)							Augered			
209.9	Brown		1	SS	13		210				
1.4	Redish Brown Clayey Silt to Silt Some Sand Trace Gravel Occ. Silt and Sand Seams (Glacial Till) Very Stiff to Hard		2	SS	17				○		12 16 53 19
			3	SS	27						
			4	SS	39		208				
			5	SS	54	▼					
			6	SS	65		206		○		5 29 58 8
204.2											
7.1	Sandy Silt to Silty Sand Trace Clay and Gravel (Glacial Till) Very Dense		7	SS	116		204				
			8	SS	107		202		○		1 19 72 8
200.2			9	SS	77						
11.1	End of Borehole										

NOTE:
Water Level measured during Boring Operation

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 8 METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 864.5; E 274 357.7 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 23 - 24 CHECKED BY TCK

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
216.9	Ground Level										
0.0	Clayey Silt to Silt Some Sand Trace Gravel (Fill) Stiff		1	SS	15		216				
			2	SS	11		214				
209.4	Redish Grey		3	SS	10		212				
7.5	Redish Brown Silty Clay		4	SS	15	▼	210			57.5%	0 7 45 48
	Clayey Silt to Silt Trace of Sand and Gravel Occ. Silt Seams (Glacial Till) Stiff to Hard		5	SS	32		208				
			6	SS	51		206				
205.2			7	SS	65						
11.7	Sandy Silt to Silty Sand Trace Clay and Gravel (Glacial Till) Very Dense		8	SS	75		204		o H		11 34 49 6
			9	SS	140/ 25cm		202				
			10	SS	150/ 23cm				o H		4 33 61 2
199.7			11	SS	73		200				
17.2	End of Borehole NOTE: Water Level measured on 1988 06 24										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 ◇ 5 (20 / 10) (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 9 METRIC

W P 133-86-00 LOCATION Co-ords. N 4 821 862.1; E 274 328.8 ORIGINATED BY KZ

DIST 6 HWY 401 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY KZ

DATUM Geodetic DATE 88 06 21 CHECKED BY TCK

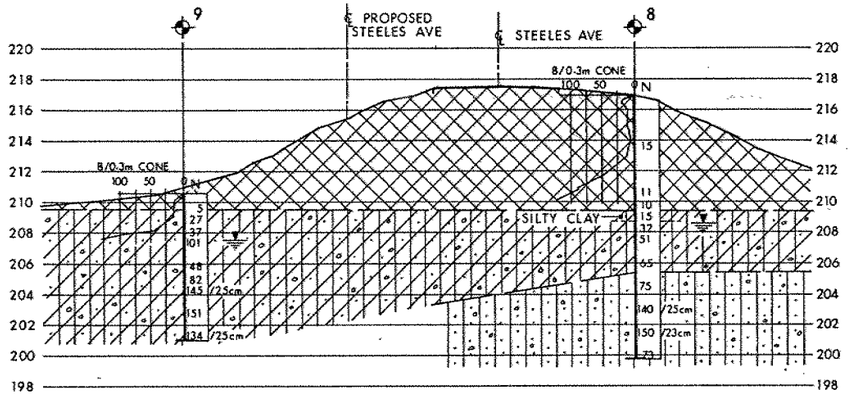
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	WATER CONTENT (%) 10 20 30		GR SA SI CL
210.6	Ground Level										
0.0 / 209.5	Clayey Silt (Fill) Brown										
1.1	Redish Brown Clayey Silt to Silt Some Clay Trace Gravel Occ. Silt and Sand Seams (Glacial Till) Very Stiff to Hard		1	SS	5		210				
			2	SS	27						
			3	SS	37		208				12 26 44 18
			4	SS	101			128			
			5	SS	48		206				
			6	SS	82						
			7	SS	145/25cm		204				
			8	SS	151						5 27 51 17
201.0			9	SS	134/25cm		202				
9.6	End of Borehole										

NOTE:
Water Level measured on 1988 06 22

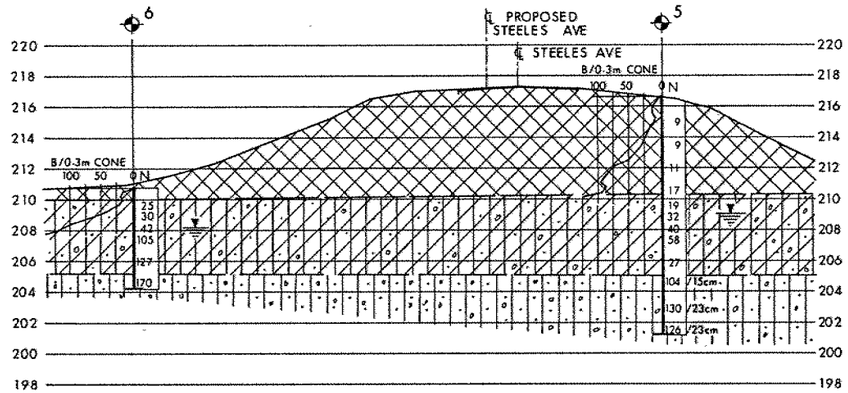
OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10



A-A



B-B

SECTIONS

SCALE

8m 4 0 8m Hor

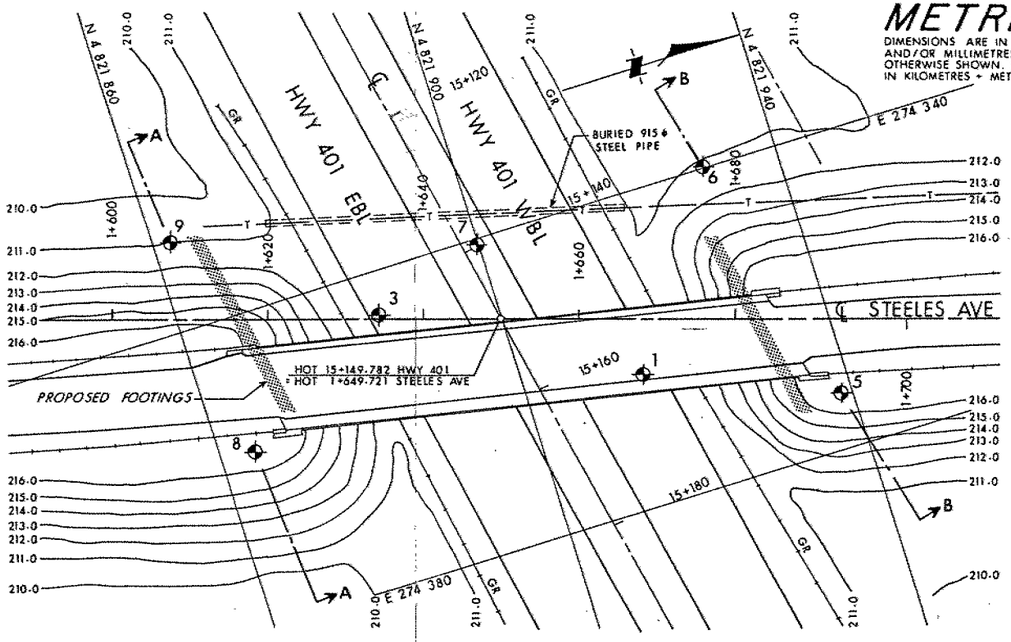
4m 2 0 4m Vert

SOIL STRATIGRAPHY LEGEND

CLAYEY SILT TO SILT
SOME SAND, TRACE GRAVEL
Stiff to Very Stiff
(FILL)

CLAYEY SILT TO SILT
TRACE/SOME SAND, SOME CLAY
TRACE GRAVEL, OCC SILT & SAND SEAMS
OCC SHALE FRAGMENTS
Stiff to Hard
(GLACIAL TILL)

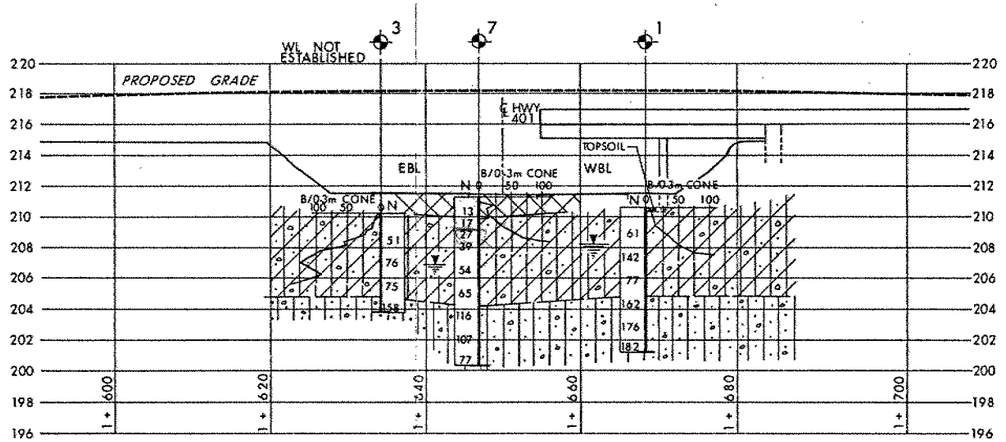
SANDY SILT TO SILTY SAND
SOME/TRACE CLAY
TRACE OF GRAVEL
OCC SHALE FRAGMENTS
Very Dense
(GLACIAL TILL)



PLAN

SCALE

8m 4 0 8m



℄ PROFILE STEELES AVE

SCALE

8m 4 0 8m Hor

4m 2 0 4m Vert

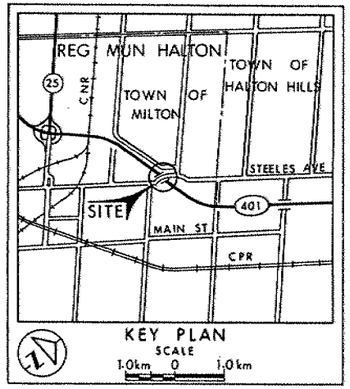
METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No
WP No 133-86-00

HWY 401 & STEELES AVE UNDERPASS
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



KEY PLAN

SCALE

1.0km 0 1.0km

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation 57 07 and 88 06

	No	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES EAST
57 07	1	210.6	4 821 915.0	274 363.1
	3	210.2	4 821 885.0	274 345.6
	5	216.7	4 821 938.8	274 373.1
	6	210.8	4 821 930.5	274 339.8
	7	211.3	4 821 899.7	274 340.8
	8	216.9	4 821 864.5	274 357.7
	9	210.6	4 821 862.1	274 328.8

NOTE

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

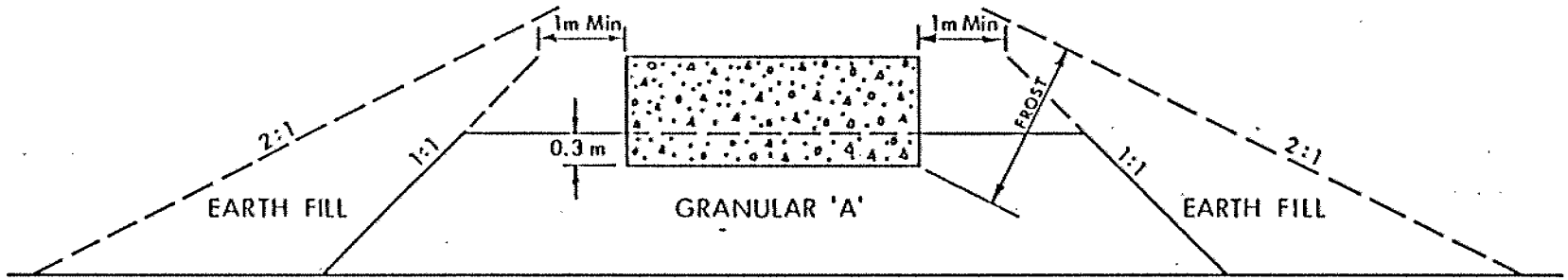
NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REV.	DATE	BY	DESCRIPTION

Geocres No 30M12-207

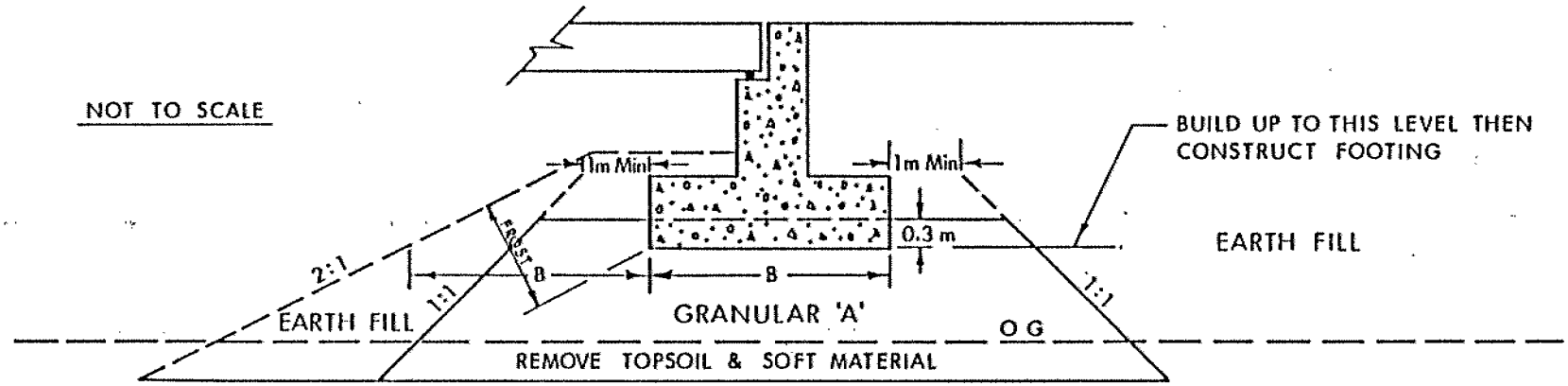
HWY No 401			DIST 6
SUBM'D TCK	CHECKED	DATE 88 10 05	SITE 10-68
DRAWN DT	CHECKED	APPROVED	DWG 1338600-A

REF No E-161-401-1, 88 05



X SECTION

NOT TO SCALE



LONGITUDINAL SECTION

NOTES:

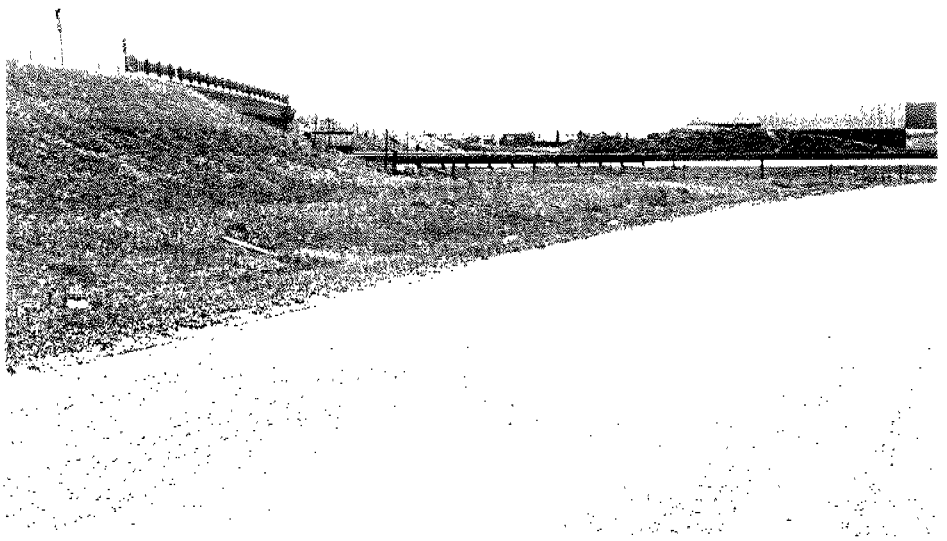
1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.

2 - PLACE GRANULAR 'A' & EARTH FILL TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M T C STANDARDS.

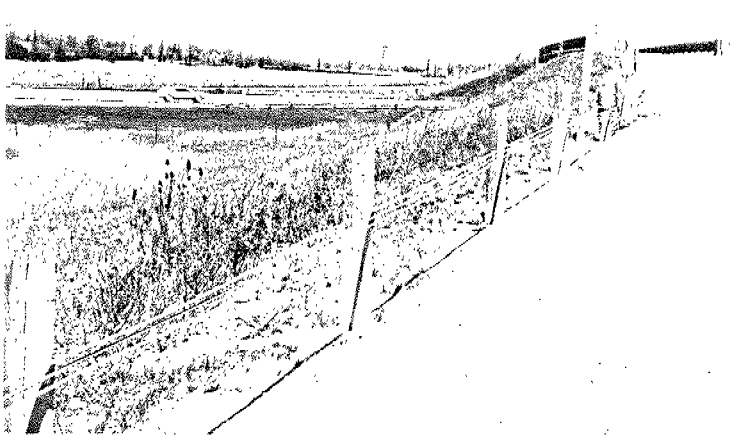
3 - CONSTRUCT CONCRETE FOOTING.

4 - PLACE REMAINDER OF GRANULAR 'A' & EARTH FILL AS REQUIRED.

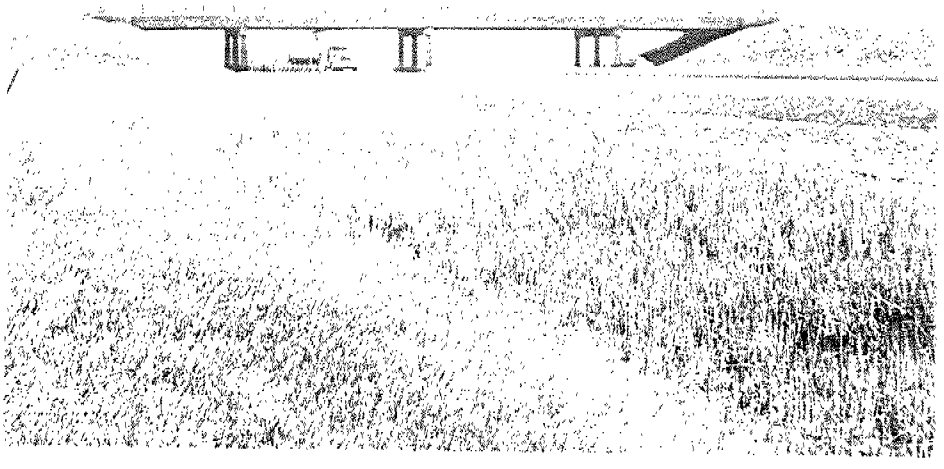
Ministry of Transportation Ontario	ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE	FIG No 1 WP 133-86-00



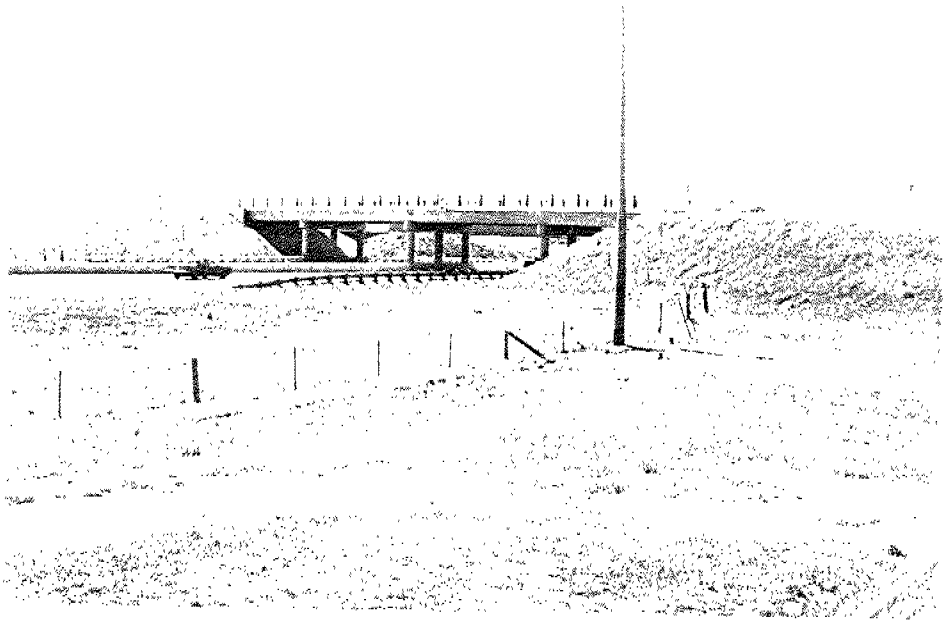
LOOKING SOUTH ALONG WEST SIDE OF STEELES AVENUE



LOOKING NORTH ALONG WEST SIDE OF STEELES AVENUE



LOOKING EAST TOWARDS STEELES AVENUE



LOOKING WEST TOWARDS STEELES AVENUE