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DIST. 4 REGION

W.P. No. 411-85-02

CONT. No.

W. O. No.

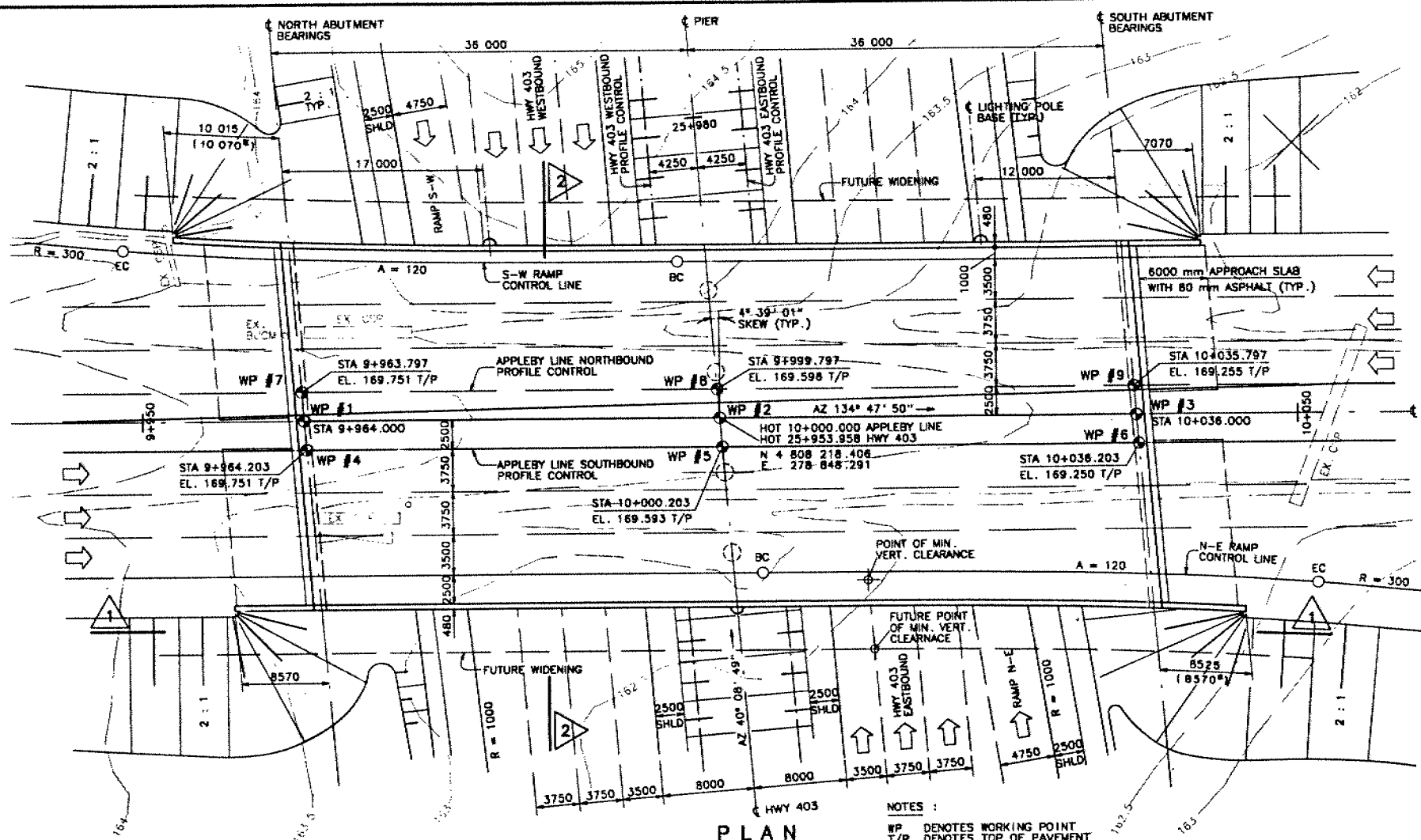
STR. SITE No. 10-229

HWY. No. 403

LOCATION HWY 403 E' APPLEBY LINE
UNDERPASS

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:



METRIC
DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE SHOWN.
ELEVATIONS, COORDINATES, CURVE
AND ALIGNMENT DATA ARE IN METRES.
STATIONS ARE IN KILOMETRES + METRES.

NOTE :
CONCRETE SLOPE PAVING
NOT PART OF THIS CONTRACT

JUL 8 1991

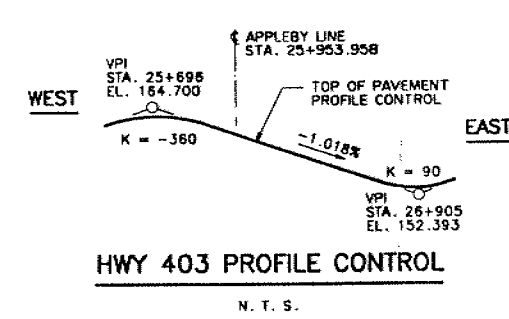
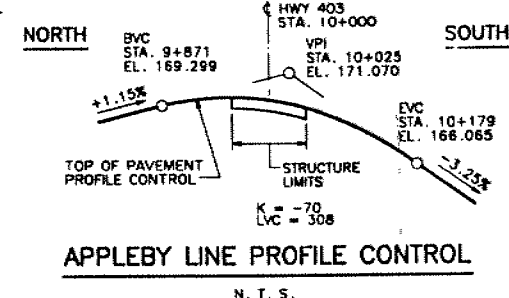
DIST. 4
CONT No
WP No 411-85-02

HWY 403 - APPLEBY LINE UNDERPASS
GENERAL ARRANGEMENT

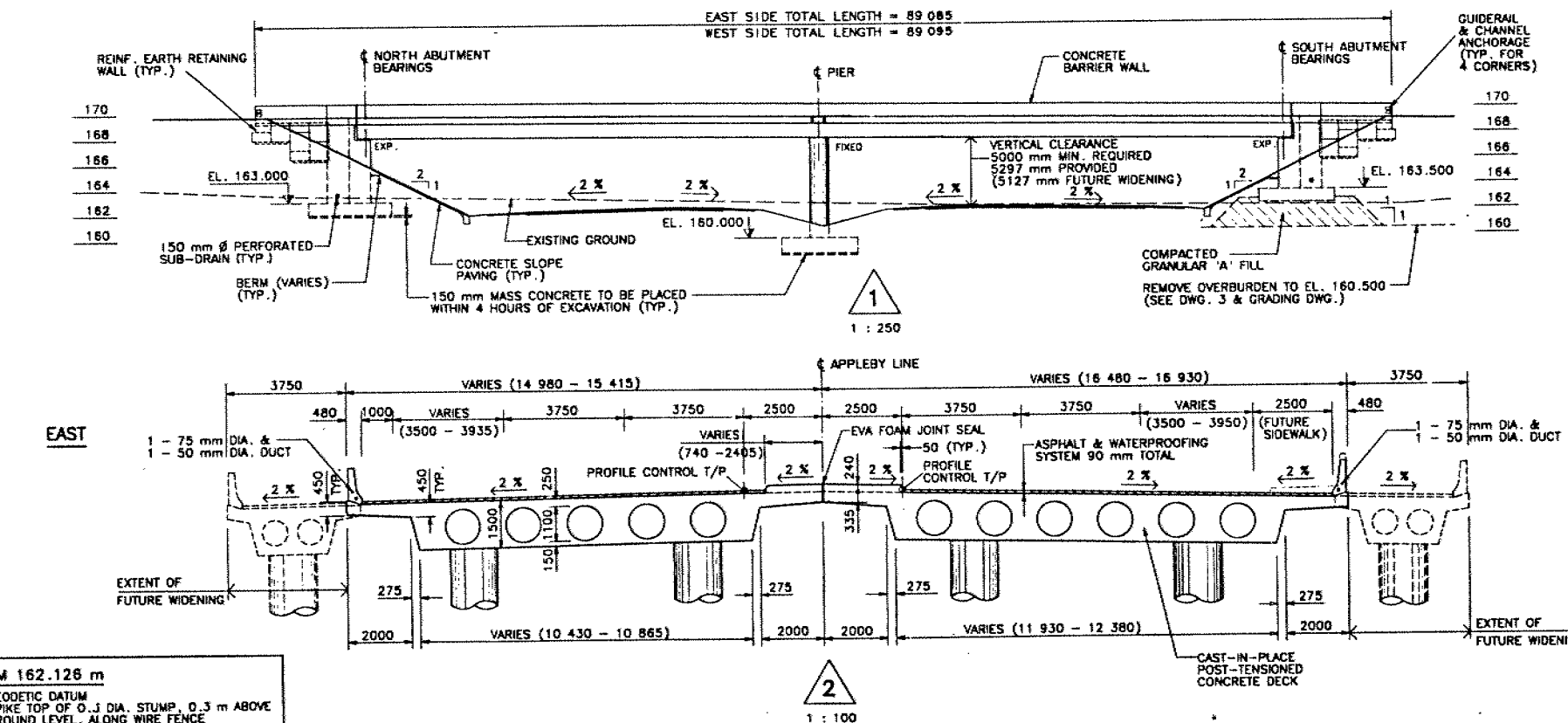
PROCTOR & REDFERN LIMITED
CONSULTING ENGINEERS, ARCHITECTS,
SCIENTISTS AND PLANNERS
TORONTO, ONTARIO.

E.O. 90354

- NOTES :**
- CLASS OF CONCRETE
DECK & PIER COLUMNS 35 MPa
REMAINDER 30 MPa
 - CLEAR COVER TO REINFORCING
FOOTINGS 100 +/- 25
ABUTMENTS & WINGWALLS 80 +/- 20
FRONT FACE 70 +/- 20
BACK FACE 80 +/- 20
PIERS 80 +/- 20
DECK 70 +/- 20
TOP 50 +/- 10
BOTTOM 60 +/- 10
SIDES 70 +/- 20 (UNLESS OTHERWISE SPECIFIED)
 - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX C DENOTE COATED BARS.
 - CONSTRUCTION NOTE :
IF THE ACTUAL BEARING HEIGHTS ARE DIFFERENT FROM THE ASSUMED BEARING HEIGHTS GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE BEARING SEAT ELEVATIONS AND THE REINFORCING STEEL TO SUIT THE ACTUAL HEIGHTS.



- LIST OF DRAWINGS**
- GENERAL ARRANGEMENT
 - BOREHOLE LOCATIONS & SOIL STRATA
 - FOOTING LAYOUT & DETAILS
 - PIERS
 - NORTH ABUTMENT
 - SOUTH ABUTMENT
 - REINFORCED EARTH RETAINING WALLS I
 - REINFORCED EARTH RETAINING WALLS II
 - DECK DETAILS & SCREED ELEVATIONS
 - LONGITUDINAL STRESSING I
 - LONGITUDINAL STRESSING II
 - NBL TRANSVERSE STRESSING
 - SBL TRANSVERSE STRESSING
 - DECK REINFORCING I
 - DECK REINFORCING II
 - DECK REINFORCING III
 - BARRIER WALLS
 - JOINT ANCHORAGE AND ARMOURING
 - 6000 mm APPROACH SLAB
 - DETAILS OF CONC. SLOPE PAVING
 - AS CONSTRUCTED ELEV. & DIM.
 - STANDARD DETAILS I
 - STANDARD DETAILS II
 - ELECTRICAL EMBEDDED WORK
 - QUANTITIES - STRUCTURE
 - QUANTITIES - STRUCTURE



T.F. WONG
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

N. D. LeBLANC
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

APPLICABLE STANDARD DRAWINGS :

| NO. | DESCRIPTION |
|---------|--|
| DD-3502 | MINIMUM GRANULAR BACKFILL REQUIREMENTS (FINAL SURFACE BELOW ORIGINAL GROUND) |
| DD-3503 | MINIMUM GRANULAR BACKFILL REQUIREMENTS (PERCHED ABUTMENTS) |
| DD-3515 | WINGWALL SLEEVE DETAILS FOR PERFORATED DRAIN |

| REVISIONS | DATE | BY | DESCRIPTION |
|-----------|------|----------|--|
| DESIGN | D.L. | CHK T.W. | CODE CHBDC-1983 LOAD CLASS A DATE MAY 1991 |
| DRAWING | S.Y. | CHK D.L. | SITE 10-229 STRUCT SCHEME DWG 1 |

RM 162.126 m
GEODETIC DATUM
SPIKE TOP OF 0.3 DIA. STUMP, 0.3 m ABOVE
GROUND LEVEL, ALONG WIRE FENCE
9.9 m LT. 10+072.85



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FOUNDATION DESIGN SECTION

foundation investigation and design report

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 411-85-02 DIST 4

HWY 403 STR SITE 10-229

Hwy. 403 - Appleby Line Underpass

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FOUNDATION INVESTIGATION REPORT
For
Bridge Structure
Hwy. 403 - Appleby Line Underpass
W.P. 411-85-02, Site No. 10-229
District 4, Burlington

INTRODUCTION

This report summarizes the information obtained from a foundation investigation carried out at the above mentioned site where a twin two span structure is proposed to carry the existing Appleby Line over the proposed Hwy. 403.

The fieldwork was carried out between 90 05 03 and 90 05 11. Seven boreholes (BH 1 to BH 7) were advanced and sampled as part of this project by means of hollow stem augers with a conventional diamond drill (NW casing and NQ core barrel) adopted for rock sampling purposes. These boreholes extended down to depths of 11.0 and 20.1 m below the existing ground surface.

This report contains factual information obtained from this investigation pertaining to structure foundations, approach embankments and related earthworks for the bridge structure as shown on Dwg. No. 4118502-A.

SITE DESCRIPTION AND GEOLOGY

The site is located on the proposed alignment of Hwy. 403 where it crosses the existing Appleby Line in the City of Burlington, Regional Municipality of Halton. The proposed structure is located approximately 1.0 km north of the existing Hwy. 5. The topography in the area is generally flat to gently undulating with ground surface sloping to the southeast. Land use in the vicinity of the site is primarily agricultural and dairy farming.

Physiographically, the site is located in the "Peel Plain" region (Ref. Chapman and Putnam, 1984) which is characterized by a 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. The overburden consists of a heterogeneous mixture of clayey silt, Sand and Gravel (cohesive glacial till) underlain by shale and siltstone bedrock. The maximum thickness of this deposit was found to be about 13.1 m at BH 1. A layer of sandy silt (non-cohesive glacial till) was encountered at four borehole locations (BH's 2, 3, 4 and 7) underneath the cohesive till deposit. The maximum thickness of this layer was found to be about 3.5 m at BH 2.

The upper portion of the shale was found to be weathered down to approximate El. 146.4 m with a maximum thickness of about 4.5 m at BH 2.

Thin layers of road fill materials and clayey silt topsoils were encountered at all seven borehole locations with the maximum thickness of about 2.4 m at BH 5.

The boundaries between the various soil types, in situ and laboratory test results are shown on the attached Record of Borehole sheets in the Appendix. The locations and elevations of the boreholes, along with two sections and a profile showing soil stratigraphy based on borehole data, are shown on Dwg. No. 4118502-A.

A detailed description of the subsurface conditions encountered is given below.

Fill Material

All seven boreholes encountered some 2.4 m of fill material whose composition ranged from a brown reworked clayey silt to sand and gravel. Through visual observation, it is apparent that the fill material can be classified as a clayey silt to sand and gravel.

Topsoil

Topsoil was encountered at two borehole locations. The thickness of this layer is about 0.5 m at BH 2 and 0.2 m at BH 6.

Through the visual observation, the material can be classified as a clayey silt.

Heterogeneous mixture of Clayey Silt, Sand and Gravel (Glacial Till)

This stratum encountered underneath the fill material or topsoil. This deposit consists of a heterogeneous mixture of clayey silt of low plasticity with varying amounts of sand and gravel. The thickness of this layer was found to be the maximum 13.1 m at BH 1 and the minimum 6.3 m at BH 4.

Atterberg Limit tests were performed on these samples and the results are plotted on Figure 1 and summarized as follows:

| <u>Property</u> | <u>Range (%)</u> | <u>Average (%)</u> |
|------------------------------|------------------|--------------------|
| Natural Moisture Content (w) | 6.5-17.5 | 11.3 |
| Liquid Limit (w_L) | 19.0-36.0 | 24.9 |
| Plastic Limit (w_p) | 12.0-17.0 | 14.2 |
| Plasticity Index (I_p) | 6.5-19.0 | 10.8 |

From the plasticity chart, it is evident that the layer can be classified as a heterogeneous mixture of clayey silt, sand and gravel with low plasticity (CL or CL-ML).

Grain Size Distribution tests were carried out on this cohesive glacial till material. Figure 2 in the Appendix shows the results. An increasing frequency of fragments of weathered shale was encountered within the lower portion of this till.

In this stratum, the 'N' value ranges from 11 to over 100 blows/0.3 m indicating the consistency of this deposit described as stiff to hard.

Heterogeneous Mixture of Sandy Silt, Gravel and Clay, (Glacial Till)

This deposit was encountered underneath the cohesive glacial till in four (4) borehole locations. The thickness of this layer ranges from 1.8 m at BH 7 to 3.5 m at BH #2.

Atterberg Limit tests were performed on this material and the results are plotted on Figure 3 and summarized as follows:

| <u>Property</u> | <u>Range (%)</u> | <u>Average (%)</u> |
|------------------------------------|------------------|--------------------|
| Natural Moisture Content (w) | 6.5-14.0 | 11.5 |
| Liquid Limit (w _L) | 15.0-17.0 | 16.0 |
| Plastic Limit (w _p) | 12.5-15.5 | 13.8 |
| Plasticity Index (I _p) | 1.0-3.0 | 2.3 |

From the plasticity chart, it is evident that the layer can be classified as a heterogeneous mixture of sandy silt, gravel and clay (ML).

Grain Size Distribution tests were carried out on this material. Figure 4 in the Appendix shows the results. This layer is basically non-plastic. In this stratum, the 'N' values range from 77 to over 100 blows/0.3 m indicating a state of compaction described as very dense.

Bedrock

In each of the borings, split spoon samples of the weathered portion of the bedrock were recovered before augering was terminated. Sound bedrock was proven in three boreholes by obtaining up to 3.0 m of NQ rock cores. The top of the bedrock ranged from El. 150.0 to 152.3 m which are corresponded to 14.1 m and 10.7 m below the existing ground surface. The upper 2.2 m to 4.5 m is in a highly weathered state, with layers of broken shale and red clayey silt.

The bedrock is a red shale with green siltstone (approximately 80% shale, 20% siltstone) of the Queenston formation. Detailed description of the rock are attached in the Appendix entitled "Rock Core Description".

The Core Recovery (CR) and Rock Quality Designation (RQD) values were determined in situ and also in the laboratory to evaluate the competence and integrity of the rock. Core Recoveries (RC) range between 68 and 100 percent and Rock Quality Designation (RQD) values range from 0 to 75 percent. Based on these results, the rock can be classified as weak to very weak and slightly weathered.

GROUNDWATER CONDITIONS

Groundwater level was encountered in three boreholes during the site investigation. Four boreholes were dry during the site investigation (BH's 3, 4, 6 and 7). Four boreholes were charged with surface water later at BH's 3, 4, 6 and 7. High water levels were detected in BH's 3 and 7, possibly due to rainfall or drilling water. Groundwater level in open boreholes was found to be approximate elevation between 146.7 m at BH 2 and 156.7 m at BH 6 which correspond to depths of 17.3 m and 8.3 m below the existing ground surface. Upon completion of rock coring, the induced drill water remained perched with the borehole, indicating a low permeability both for the till and shale strata.

DISCUSSION AND RECOMMENDATIONS

The recommendations in this report apply to the bridge structure and related approaches.

It is proposed to construct underpass structure that will carry the existing Appleby Line over the proposed Hwy. 403 eastbound and westbound lanes. The proposed structure is a twin two span bridge. A proposed Appleby Line profile grade, ranging from 169.3 m at south abutment to 169.7 m at north abutment with a proposed Hwy. 403 profile grade of about 162.0 m, will necessitate minimum approach fill in the order of 5.8 m at south abutment and 5.7 m at north abutment above the existing ground surface with approximately 2.0 m road cuts below the existing ground surface.

Recommendations pertaining to the foundations of the new structure and related earth works are summarized as follows.

Structure Foundations

South Abutment

In consideration of the weak nature of the subsoil at this location, existing fill material, topsoil and weak cohesive glacial till should be excavated down to El. 160.5 m and the excavation can be backfilled with compacted Granular 'A' as high as possible as shown on Figure 5.

For the purposes of the O.H.B.D.C. the following values are recommended:

Factored Bearing Capacity at U.L.S. 900 kPa
Bearing Capacity at S.L.S. Type II 350 kPa

Alternatively, the closed-type of abutment can be supported on spread footings within very stiff to hard glacial till for the following recommended values:

| Factored Bearing Capacity at U.L.S. (kPa) | Allowable Capacity at S.L.S. Type II (kPa) | Proposed Footing Elevation (m) |
|---|--|--------------------------------------|
| 500 | 320 | at or below 160.5 |

North Abutment

At this location, existing fill material, topsoil and weak cohesive glacial till should be also excavated down to El. 162.5 m and the excavation can be backfilled with compacted Granular 'A' as high as possible as shown on Figure 5.

For the purpose of the O.H.B.D.C. the following values are recommended:

Factored Bearing Capacity at U.L.S. 900 kPa
Bearing Capacity at S.L.S. Type II 350 kPa

Alternatively, the closed-type of abutment can be supported on spread footings within very stiff to hard glacial till for the following recommended values:

| Factored Bearing Capacity at U.L.S. (kPa) | Allowable Capacity at S.L.S. Type II (kPa) | Proposed Footing Elevation (m) |
|---|--|--------------------------------------|
| 530 | 340 | at or below 162.0 |

Pier

In consideration of the competent nature of subsoils, spread footings can be founded on native glacial till with the following design parameters.

| Factored Bearing Capacity at U.L.S. (kPa) | Allowable Capacity at S.L.S. Type II (kPa) | Proposed Footing Elevation (m) |
|---|--|--------------------------------------|
| 500 | 360 | at or below 162.0 |

A footing width of 2.5 m with an embedded depth of 1.2 m was used in the calculation of the above capacities. The magnitude of the differential settlement of the footings is anticipated to be within 25 mm, provided the subsoil is not disturbed by construction activities.

Other Considerations

Sliding Resistance

Sliding resistance may be computed by assuming a coefficient of friction of 0.57 for cohesive till and 0.7 for Granular 'A' material to apply between the underside of footings and the founding soil.

Lateral Earth Pressures on Structures

Free draining material such as Granular 'A' or Granular 'B' is recommended as appropriate backfill to the abutments to prevent hydrostatic pressure build-up.

Design parameters of the soil are given below for purpose of the O.H.B.C.D.

| | Granular 'A' | Granular 'B' |
|--|-----------------|-----------------|
| Angle of Internal Friction, ϕ | 35° | 30° |
| Unit Weight (kN/m ³), γ | 22.8 | 21.2 |
| Coefficient of Active Earth Pressure (Ka) | 0.27 | 0.33 |
| Coefficient of Earth Pressure at Rest (Ko) | 0.43 | 0.50 |

The earth pressure coefficient at rest is to be used in design of the abutment walls are rigid and unyielding. Weep holes in the abutment walls should be designed to drain any accumulation of water in the backfill.

Dewatering

No major dewatering difficulties are anticipated for footing excavations in consideration of the relatively low permeability of the glacial till. However, if localized seepage or surface water to accumulate in excavations, it can be controlled by perimeter ditches and pumping from corner sumps.

Frost Protection

The footings should be placed so as to have a minimum earth cover of 1.2 m to allow for frost protection.

Approaches and Excavations

The base of all footing excavations should be covered immediately upon exposure with a working slab of lean concrete to protect the exposed glacial till from disturbing and softening within 4 hours of exposure. All organic and softened material should be stripped from within the plan limits of the immediate approach embankments prior to placement of any fill. The site should be properly graded and ditched to allow for free drainage in order to prevent ponding of water around the structure and possible softening of the founding glacial till.

No stability problems are anticipated for permanent embankment and cut slopes constructed to a 2:1 geometry. However, the slope surface should be protected from erosion of the glacial till by a thin layer of topsoil.

Temporary cut slopes will stand at a 2.0:1 geometry, however, these slopes will weather rapidly and show signs of surficial distress if not protected in a reasonable length of time.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of Tae C. Kim, Sr. Foundation Engineer, John Petruzzello, Senior Technician and John LeMessurier, Student Engineer. The equipment was owned and operated by Marathon Drilling Co. Ltd., Ottawa.

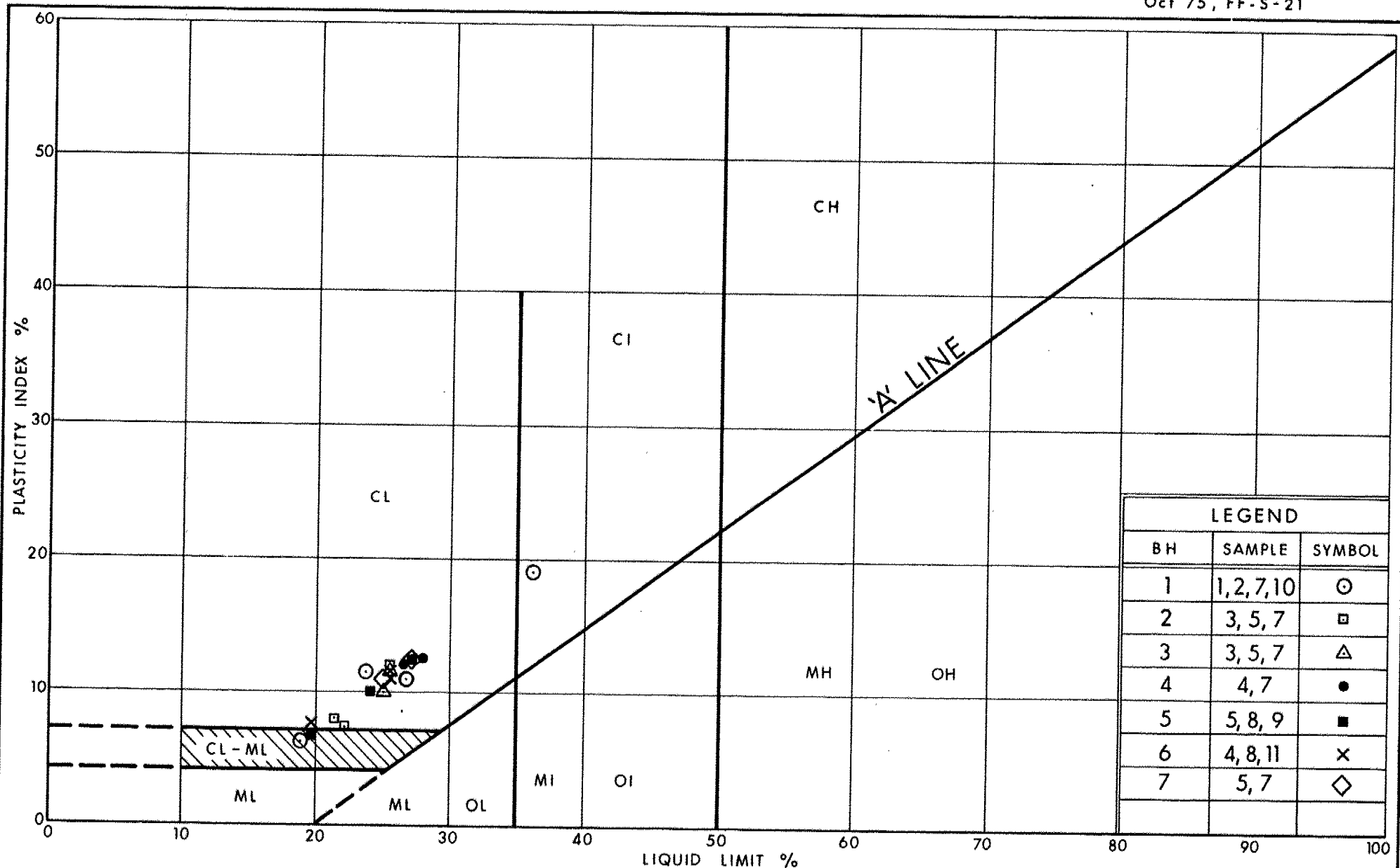
This report was written by Tae C. Kim reviewed by P. Payer, Sr. Foundation Engineer and approved by M. Devata, Chief Foundation Engineer.



Tae C. Kim
Tae C. Kim, P.Eng.
Sr. Foundation Engineer

M. Devata
M. Devata, P.Eng.
Chief Foundation Engineer

APPENDIX



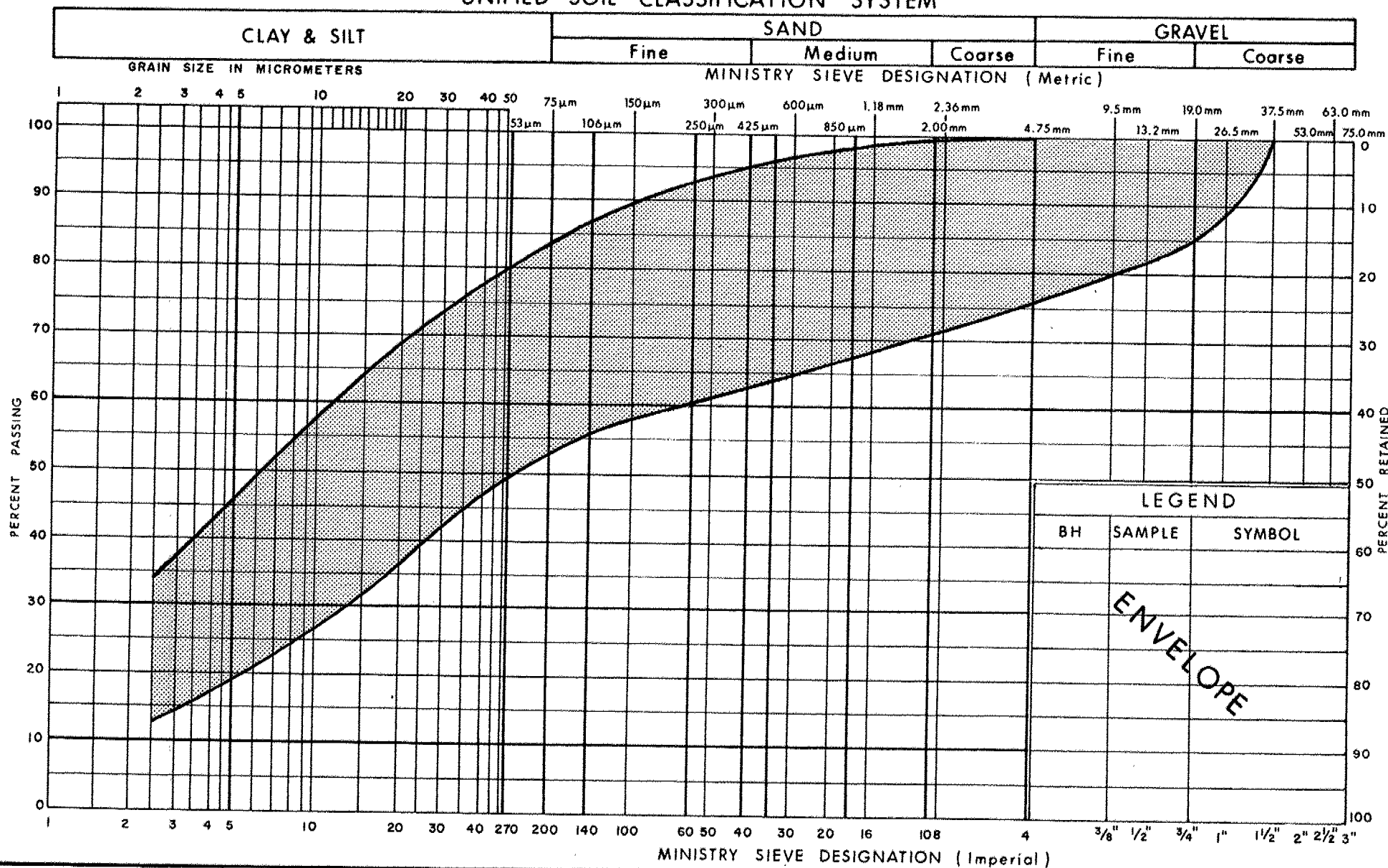
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PLASTICITY CHART HETEROGENEOUS MIXTURE OF CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 1

W P 411-85-02

UNIFIED SOIL CLASSIFICATION SYSTEM



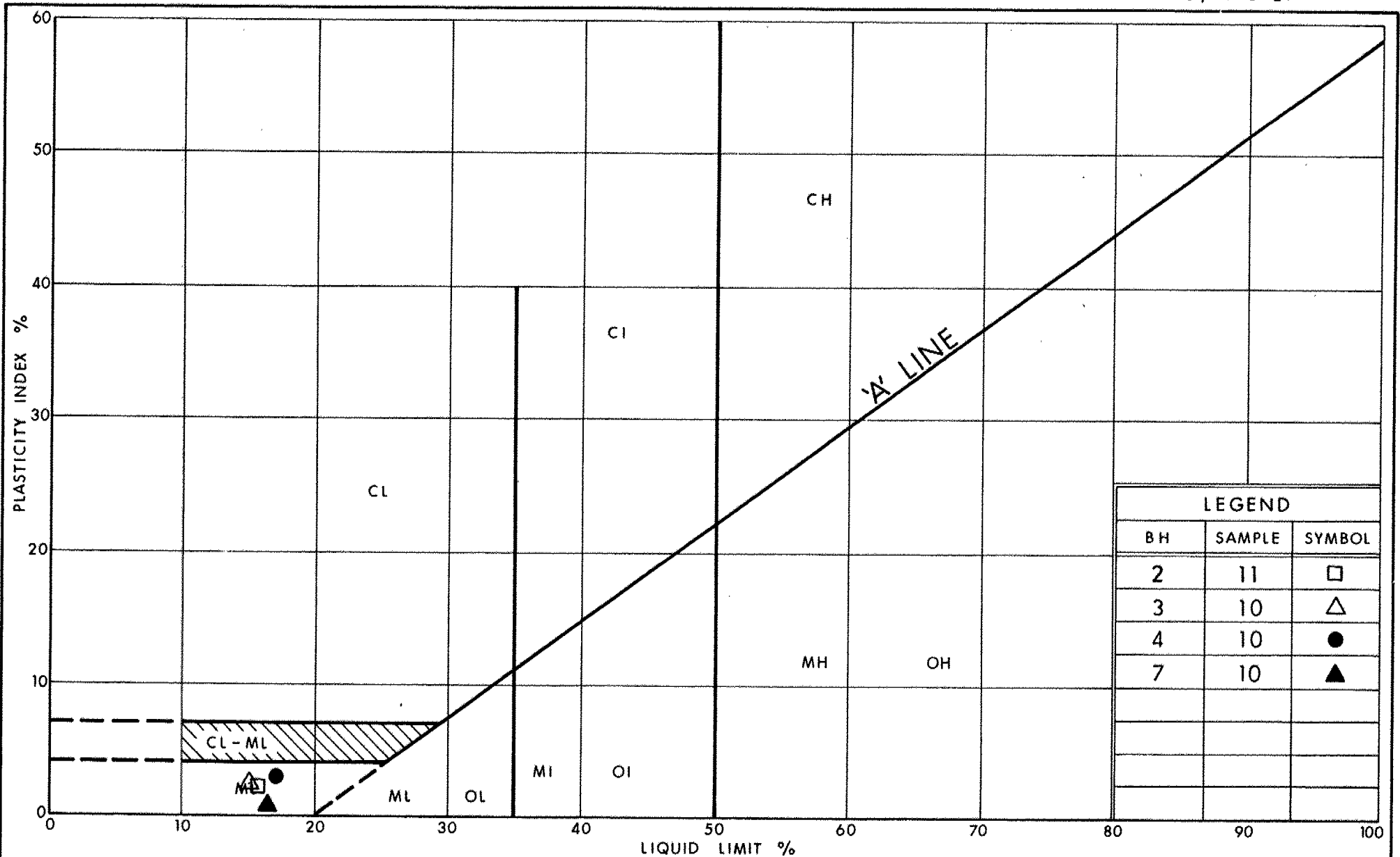
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GRAIN SIZE DISTRIBUTION
 HETEROGENEOUS MIXTURE OF
 CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 2

W P 411-85-02



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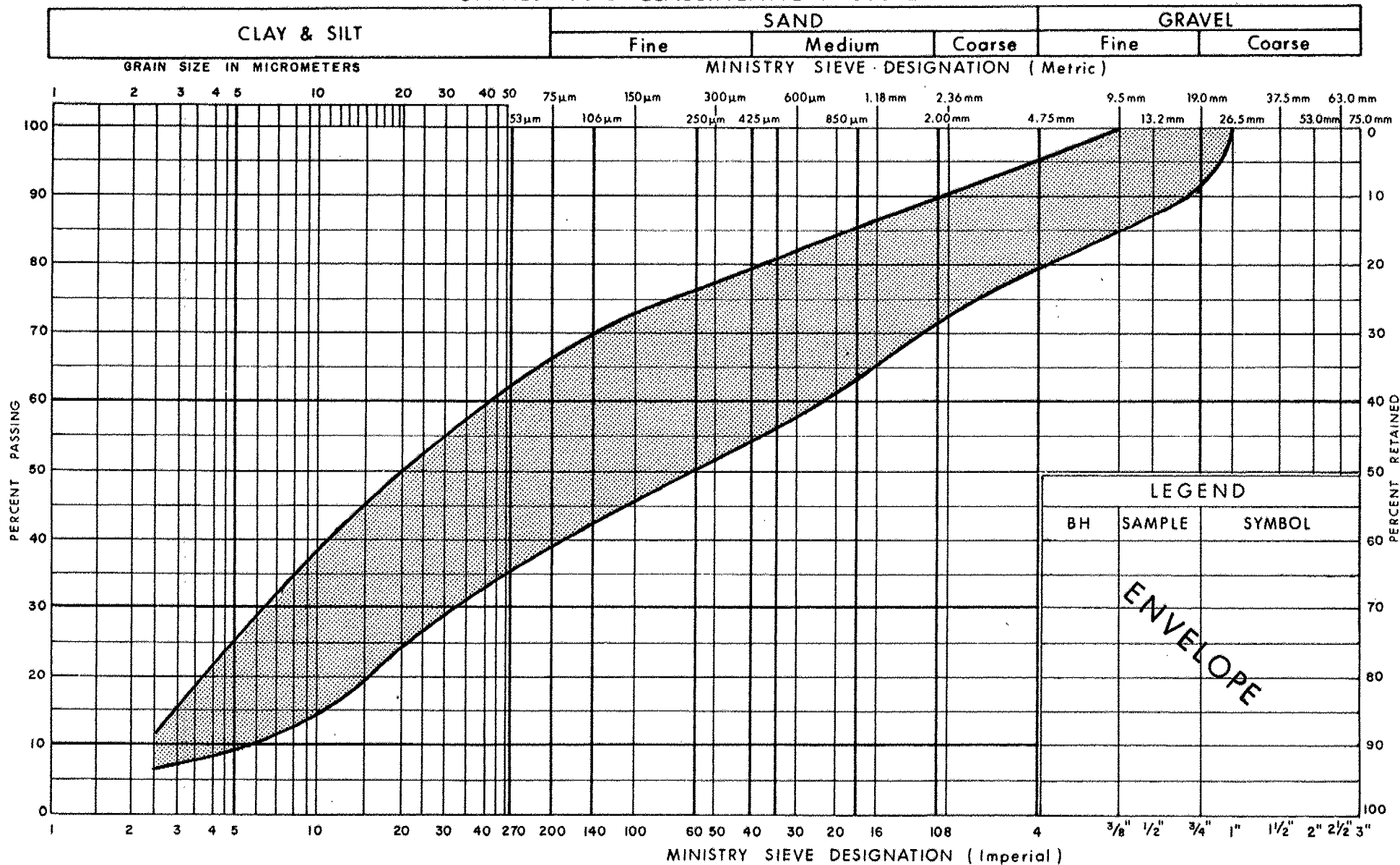
Ontario

PLASTICITY CHART
HETEROGENEOUS MIXTURE OF
SANDY SILT, GRAVEL & CLAY (Glacial Till)

FIG No 3

W P 411-85-02

UNIFIED SOIL CLASSIFICATION SYSTEM

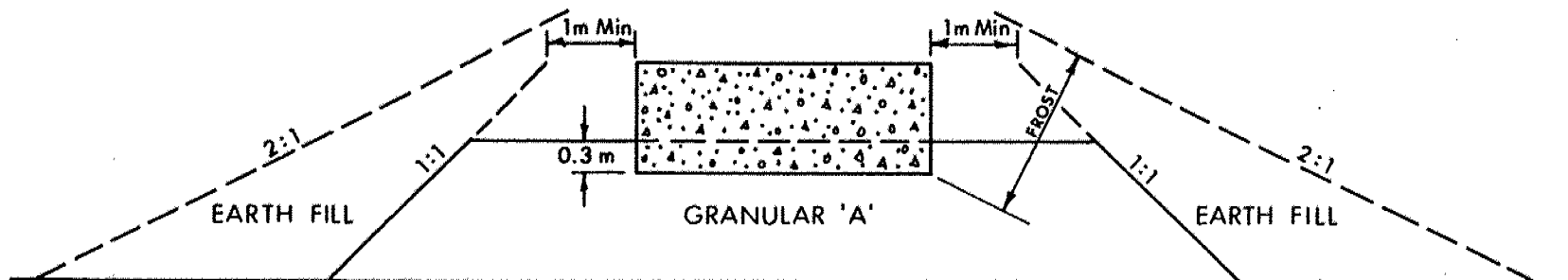


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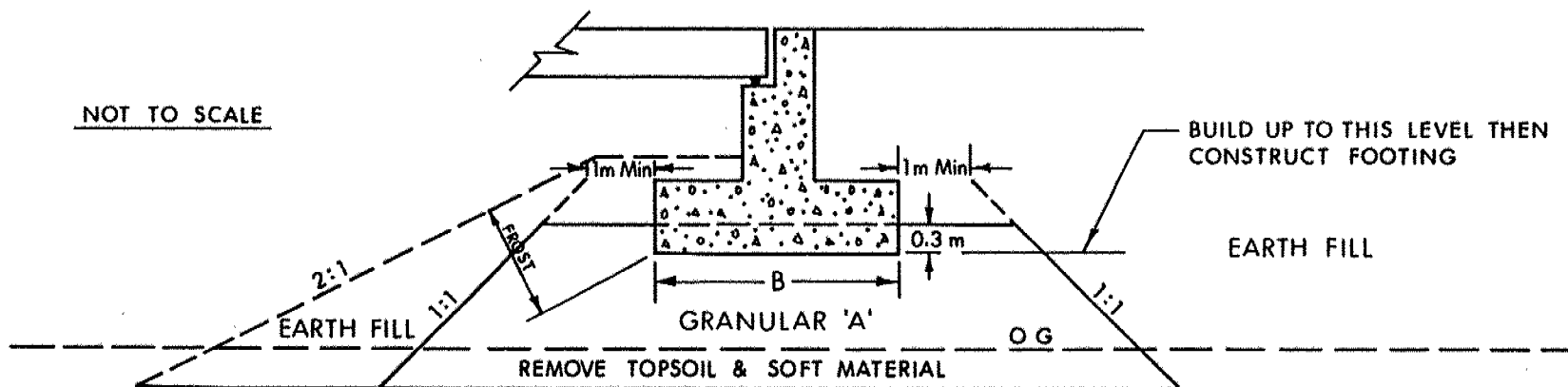
GRAIN SIZE DISTRIBUTION
 HETEROGENEOUS MIXTURE OF
SANDY SILT, GRAVEL & CLAY (Glacial Till)

FIG No 4

W P 411-85-02



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 O STANDARDS.
- 3 - CONSTRUCT CONCRETE FOOTING.
- 4 - PLACE REMAINDER OF GRANULAR 'A' & EARTH FILL AS REQUIRED.



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ABUTMENT ON COMPACTED FILL
SHOWING GRANULAR 'A' CORE

FIG No 5

W P 411-85-02

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

| | |
|------------------------|------------------------------|
| SS SPLIT SPOON | TP THINWALL PISTON |
| WS WASH SAMPLE | OS OSTERBERG SAMPLE |
| ST SLOTTED TUBE SAMPLE | RC ROCK CORE |
| BS BLOCK SAMPLE | PH TW ADVANCED HYDRAULICALLY |
| CS CHUNK SAMPLE | PM TW ADVANCED MANUALLY |
| TW THINWALL OPEN | FS FOIL SAMPLE |

STRESS AND STRAIN

| | |
|--|-------------------------------|
| u_w kPa | PORE WATER PRESSURE |
| u kPa | 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 | e 1, % | VOID RATIO | e_{min} 1, % | VOID RATIO IN DENSEST STATE |
| γ_s kN/m ³ | UNIT WEIGHT OF SOLID PARTICLES | n 1, % | POROSITY | I_D 1 | DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$ |
| ρ_w kg/m ³ | DENSITY OF WATER | w 1, % | WATER CONTENT | D mm | GRAIN DIAMETER |
| γ_w kN/m ³ | UNIT WEIGHT OF WATER | S_r % | DEGREE OF SATURATION | D_n mm | n PERCENT - DIAMETER |
| ρ kg/m ³ | DENSITY OF SOIL | w_L % | LIQUID LIMIT | C_u 1 | UNIFORMITY COEFFICIENT |
| γ kN/m ³ | UNIT WEIGHT OF SOIL | w_p % | PLASTIC LIMIT | h m | HYDRAULIC HEAD OR POTENTIAL |
| ρ_d kg/m ³ | DENSITY OF DRY SOIL | w_s % | SHRINKAGE LIMIT | q m ³ /s | RATE OF DISCHARGE |
| γ_d kN/m ³ | UNIT WEIGHT OF DRY SOIL | I_p % | PLASTICITY INDEX = $w_L - w_p$ | v m/s | DISCHARGE VELOCITY |
| ρ_{sat} kg/m ³ | DENSITY OF SATURATED SOIL | I_L 1 | LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$ | i 1 | HYDRAULIC GRADIENT |
| γ_{sat} kN/m ³ | UNIT WEIGHT OF SATURATED SOIL | I_C 1 | CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$ | k m/s | HYDRAULIC CONDUCTIVITY |
| ρ' kg/m ³ | DENSITY OF SUBMERGED SOIL | e_{max} 1, % | VOID RATIO IN LOOSEST STATE | j kN/m ³ | SEEPAGE FORCE |
| γ' kN/m ³ | UNIT WEIGHT OF SUBMERGED SOIL | | | | |

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 251.7 E 278 823.3 ORIGINATED BY T.K.
DIST 4 HWY 403 BOREHOLE TYPE Cone Test, H.S. Auger, and NO Core COMPILED BY J.L.
DATUM Geodetic DATE May 4 and 7, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------|--|---|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | W _p | W | | |
| 164.1 | Ground Surface | | | | | | | | | | | | |
| 0.0 | Clayey Silt (Fill) | | | | | | | | | | | | |
| 163.1 | | | 1 | SS | 7 | | | | | | | | 5 21 49 25 |
| 1.0 | Reddish Brown | | 2 | SS | 14 | | | | | | | | 4 20 55 21 |
| | Reddish Brown | | 3 | SS | 27 | | | | | | | | |
| | Reddish Brown | | 4 | SS | 36 | | | | | | | | |
| | Reddish Brown | | 5 | SS | 34 | | | | | | | | |
| | Reddish Brown | | 6 | SS | 25 | | | | | | | | |
| | Heterogeneous Mixture of Clayey Silt, Sand and Gravel Stiff to Hard (Glacial Till) | | 7 | SS | 18 | | | | | | | | 1 16 52 31 |
| | | | 8 | SS | 21 | | | | | | | | |
| | Sand Layer | | 9 | SS | 34 | | | | | | | | |
| | | | 10 | SS | 98 | | | | | | | | 15 27 45 13 |
| | | | 11 | SS | 100 | /11cm | | | | | | | |
| | Reddish Brown | | 12 | SS | 70 | | | | | | | | |
| 150.0 | | | 13 | SS | 100 | /19cm | | | | | | | |
| 14.1 | Red | | 14 | SS | 100 | /5cm | | | | | | | RQD 7% |
| | Bedrock | | 15 | RC | REC | | | | | | | | |
| | Weathered Sound | | 16 | RC | REC | | | | | | | | |
| | Queenston Shale | | | NQ | 89% | | | | | | | | RQD 0% |
| 144.0 | | | | | | | | | | | | | |
| 20.1 | End of Borehole | | | | | | | | | | | | |

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 241.5 E 278 816.5 ORIGINATED BY T.K.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, and H.S. Auger COMPILED BY J.L.
 DATUM Geodetic DATE May 11, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----------------------------|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × LAB VANE | | | | | | |
| 164.0 | Ground Surface | | | | | | | 20 40 60 80 100 | 10 20 30 | | | | | | |
| 0.0 | Sand and Gravel (Fill) | | | | | | | | | | | | | | |
| 162.9 | Clayey Silt (Fill) | | 1 | SS | 5 | | | | | | | | | | |
| 162.4 | Clayey Silt (Topsoil) | | 2 | SS | 13 | | | | | | | | | | |
| 1.6 | Brown | | 3 | SS | 29 | | | | | | | | | 0 8 80 12 | |
| | Reddish Brown | | 4 | SS | 34 | | | | | | | | | | |
| | Brown | | 5 | SS | 25 | | | | | | | | | | |
| | | | 6 | SS | 20 | | | | | | | | | | |
| | | | 7 | SS | 17 | | | | | | | | | 0 19 50 31 | |
| | | | 8 | SS | 41 | | | | | | | | | | |
| | | | 9 | SS | 40 | | | | | | | | | | |
| | | | 10 | SS | 100 | /23cm | | | | | | | | | |
| 154.4 | Reddish Brown | | 11 | SS | 100 | /15cm | | | | | | | | 5 38 47 10 | |
| 9.6 | Heterogeneous Mixture of Sandy Silt, Gravel and Clay Very Dense (Glacial Till) | | 12 | SS | 100 | /23cm | | | | | | | | | |
| 150.9 | Reddish Brown | | 13 | SS | 100 | /23cm | | | | | | | | | |
| 13.1 | Red | | 14 | SS | 100 | /3cm | | | | | | | | | |
| | Bedrock Queenston Shale | | 15 | SS | 100 | /10cm | | | | | | | | | |
| 146.4 | Weathered | | | | | | | | | | | | | | |
| 17.6 | End of Borehole | Sound | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: 4808 223.5 E 278 851.7 ORIGINATED BY T.K.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, H.S. Auger, and NQ Core COMPILED BY J.L.
 DATUM Geodetic DATE May 7 and 8, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|----|------------------------------------|-------------------------------------|-----------------------------------|--|--|----|-----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | | 20 | 40 | 60 | | | | | | 80 | 100 |
| 163.5 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | Clayey Silt | | 1 | SS | 13 | | | | | | | | | | | | |
| 162.1 | (Fill) SAND and Gravel | | 2 | SS | 28 | | | | | | | | | | | | |
| 1.4 | | | 3 | SS | 29 | | | | | | | | | | | | |
| | | | 4 | SS | 39 | | | | | | | | | | | | |
| | Brown | | 5 | SS | 37 | | | | | | | | | | | | |
| | Reddish Brown | | 6 | SS | 21 | | | | | | | | | | | | |
| | Heterogeneous Mixture of Clayey Silt, Sand and Gravel | | 7 | SS | 15 | | | | | | | | | | | | |
| | Stiff to Hard (Glacial Till) | | 8 | SS | 40 | | | | | | | | | | | | |
| 154.2 | | 9 | SS | 100 | /28cm | | | | | | | | | | | | |
| 9.3 | Heterogeneous Mixture of Sandy Silt, Gravel and Clay Very Dense (Glacial Till) | 10 | SS | 100 | /9cm | | | | | | | | | | | | |
| 151.3 | Reddish Brown | 11 | SS | 100 | /8cm | | | | | | | | | | | | |
| 12.2 | Red | 12 | SS | 100 | /15cm | | | | | | | | | | | | |
| | Bedrock | 13 | SS | 100 | /9cm | | | | | | | | | | | | |
| | Queenston Shale | 14 | RC | REC | | | | | | | | | | | | | |
| | Weathered Sand | | NQ | 100% | | | | | | | | | | | | | |
| 146.7 | | | | | | | | | | | | | | | | | |
| 16.8 | End of Borehole | | | | | | | | | | | | | | | | |
| | * Borehole dry upon completion charged with water later | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 195.3 E 278 880.0 ORIGINATED BY T.K.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, and H.S. Auger COMPILED BY J.L.
 DATUM Geodetic DATE May 9, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | SHEAR STRENGTH kPa | | | | |
| 163.1 | Ground Surface | | | | | | | 20 40 60 80 100 | | | | |
| 0.0 | Sand and Gravel (Fill) | | 1 | SS | 13 | | | o UNCONFINED + FIELD VANE | | | | |
| 161.7 | | | 2 | SS | 3 | | | • QUICK TRIAXIAL * LAB VANE | | | | |
| 1.4 | Clayey Silt (Fill) | | 3 | SS | 20 | | | | | | | |
| 160.8 | | | 4 | SS | 31 | | | | | | | |
| 2.3 | Heterogeneous Mixture of Clayey Silt, Sand and Gravel Very Stiff to Hard (Glacial Till) | | 5 | SS | 35 | | | | | | | |
| | | | 6 | SS | 39 | | | | | | | |
| | | | 7 | SS | 24 | | | | | | | |
| | | | 8 | SS | 68 | | | | | | | |
| 154.5 | | | 9 | SS | 100 | | | | | | | |
| 8.6 | Heterogeneous Mixture of Sandy Silt, Gravel and Clay Very Dense (Glacial Till) | | 10 | SS | 77 | | | | | | | |
| 151.8 | | | 11 | SS | 100 | | | | | | | |
| 11.3 | Bedrock | | 12 | SS | 100 | | | | | | | |
| 149.4 | | | | | | | | | | | | |
| 13.7 | End of Borehole | | | | | | | | | | | |
| | • Borehole dry upon completion charged with water later | | | | | | | | | | | |

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 185.1 E 278 873.3 ORIGINATED BY G.P.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, H.S. Auger, and NQ Core COMPILED BY J.L.
 DATUM Geodetic DATE May 3, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|---------|-------|------------|-------------------------|-----------------|--|-----------------|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | | | | | |
| 163.0 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | Sand and Gravel (Fill) | | 1 | SS | 19 | | 162 | | | | | | | |
| 161.6 | | | 2 | SS | 4 | | | | | | | | | |
| 1.4 | Clayey Silt (Fill) | | 3 | SS | 20 | | | | | | | | | |
| 160.6 | | | 4 | SS | 22 | | | | | | | | | |
| 2.4 | Heterogeneous Mixture of Clayey Silt, Sand and Gravel Very Stiff to Hard (Glacial Till) | | 5 | SS | 43 | | | | | | | | | |
| | | | 6 | SS | 45 | | | | | | | | | |
| | | | 7 | SS | 30 | | | | | | | | | |
| | | | 8 | SS | 34 | | | | | | | | | |
| | | | 9 | SS | 146 | | | | | | | | | |
| 152.3 | Reddish Brown | | 10 | SS | 187 | | 152 | | | | | | | |
| 10.7 | Bedrock Queenston Shale | | 11 | SS | 100 | | 150 | | | | | | | |
| | | | 12 | SS | 156 | | | | | | | | | |
| | | | 13 | RC NQ | REC 100% | | 148 | | | | | | | |
| 147.1 | End of Borehole | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 6

1 OF 1 METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 272.8 E 278 802.0 ORIGINATED BY T.K.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, and H.S. Auger COMPILED BY J.L.
 DATUM Geodetic DATE May 7, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | | | | | |
| 165.0 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | Sand and Gravel (Fill) | | | | | | | | | | | | | |
| 163.9 | Clayey Silt (Topsoil) | | | | | | | | | | | | | |
| 1.1 | Reddish Brown | | 1 | SS | 13 | | 164 | | | | | | | |
| | Reddish Brown | | 2 | SS | 27 | | | | | | | | | |
| | Reddish Brown | | 3 | SS | 25 | | 162 | | | | | | | 5 28 45 22 |
| | Brown | | 4 | SS | 33 | | | | | | | | | |
| | | | 5 | SS | 21 | | | | | | | | | |
| | | | 6 | SS | 11 | | 160 | | | | | | | |
| | Brown | | | | | | | | | | | | | |
| | Reddish Brown | | 7 | SS | 14 | | 158 | | | | | | | |
| | | | 8 | SS | 11 | | | | | | | | | 2 24 49 25 |
| | Heterogeneous Mixture of Clayey Silt, Sand and Gravel Stiff to Hard (Glacial Till) | | 9 | SS | 21 | | 156 | | | | | | | |
| | | | 10 | SS | 68 | | 154 | | | | | | | |
| 152.4 | | | 11 | SS | 89 | | | | | | | | | 23 24 39 14 |
| 12.6 | End of Borehole * Borehole dry upon completion charged with water later | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 7

1 OF 1

METRIC

W.P. 411-85-02 LOCATION Co-ord: N 4808 164.0 E 278 894.6 ORIGINATED BY T.K.
 DIST 4 HWY 403 BOREHOLE TYPE Cone Test, H.S. Auger COMPILED BY J.L.
 DATUM Geodetic DATE May 9, 1990 CHECKED BY T.K.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT 7 kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|-----------------|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 40 60 80 100 | 20 40 60 80 100 | | | | | |
| 162.9 | Ground Surface | | | | | | | | | | | | | |
| 0.0 | Clayey Silt (Fill) | | 1 | SS | 4 | | 162 | | | | | | | |
| 161.5 | Reddish Brown | | 2 | SS | 22 | | 160 | | | | | | | |
| 1.4 | Reddish Brown | | 3 | SS | 23 | | 158 | | | | | | | |
| | Reddish Brown | | 4 | SS | 29 | | 156 | | | | | | | |
| | Heterogeneous Mixture of Clayey Silt, Sand and Gravel | | 5 | SS | 27 | | 154 | | | | | | | |
| | Very Stiff (Glacial Till) | | 6 | SS | 28 | | 152 | | | | | | | |
| | | | 7 | SS | 17 | | | | | | | | | |
| | | | 8 | SS | 27 | | | | | | | | | |
| 153.7 | | | 9 | SS | 100 | /15cm | | | | | | | | |
| 9.2 | Heterogeneous Mixture of Sandy Silt, Gravel and Clay | | | | | | | | | | | | | |
| 151.9 | Very Dense (Glacial Till) | | 10 | SS | 100 | /20cm | | | | | | | | |
| 11.0 | End of Borehole • Borehole dry upon completion charged with water later | | | | | | | | | | | | | |

ROCK CORE DESCRIPTION **WP 411-85-02**

Page 1 of 1

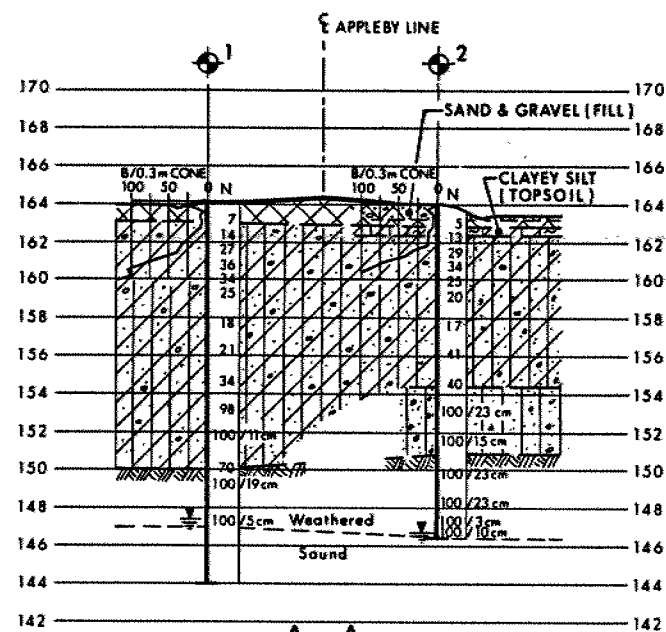
| CORE RECOVERY | | | | | CORE DESCRIPTION | |
|---------------|-----|--------------|----------|-----------|------------------|---|
| BH# | RC# | DEPTH (m) | % CR* | % RQD* | DEPTH (m) | DESCRIPTION |
| 1 | 15 | 16.97-18.49 | 68 | 7 | 16.97-20.09 | SHALE , dark reddish brown, interbedded with greyish green SILTSTONE (16%); very fine grained; weak to very weak rock; unweathered to slightly weathered (moderately weathered, 16.97-17.07 m); very close to extremely close spaced fractures. |
| | 16 | 18.49-20.09 | 89 | 0 | | |
| 2 | | | | | | SHALE , expected as above (no core recovered). |
| 3 | 14 | 15.27-16.79 | 100 | 52 | 15.27-16.79 | SHALE , dark reddish brown, interbedded with greyish green SILTSTONE (15%); very fine grained; weak to very weak rock; unweathered to slightly weathered (moderately weathered, 15.27-15.34 m); very close to close spaced fractures. |
| 4 | | | | | | SHALE , expected as above (no core recovered). |
| 5 | 13 | 14.35-15.88 | 100 | 75 | 14.35-15.88 | SHALE , dark reddish brown, interbedded with greyish green SILTSTONE (20%); very fine grained; weak to very weak rock; unweathered to slightly weathered; close to very close spaced fractures. |
| 6 | | | | | | SHALE , expected as above (no core recovered). |
| 7 | | | | | | SHALE , expected as above (no core recovered). |

*CR = CORE RECOVERY

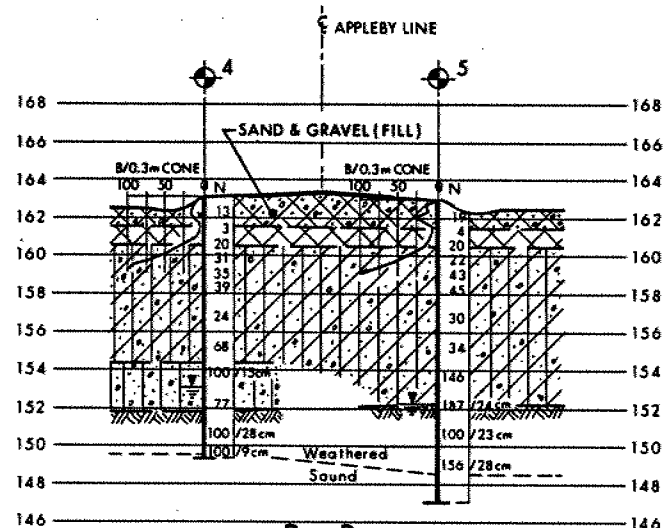
*RQD = ROCK QUALITY DESIGNATION

(NOTE: Depths are approximated where core recovery is less than 100%)

Logged by: DAW, Soils and Aggregates Section



A - A

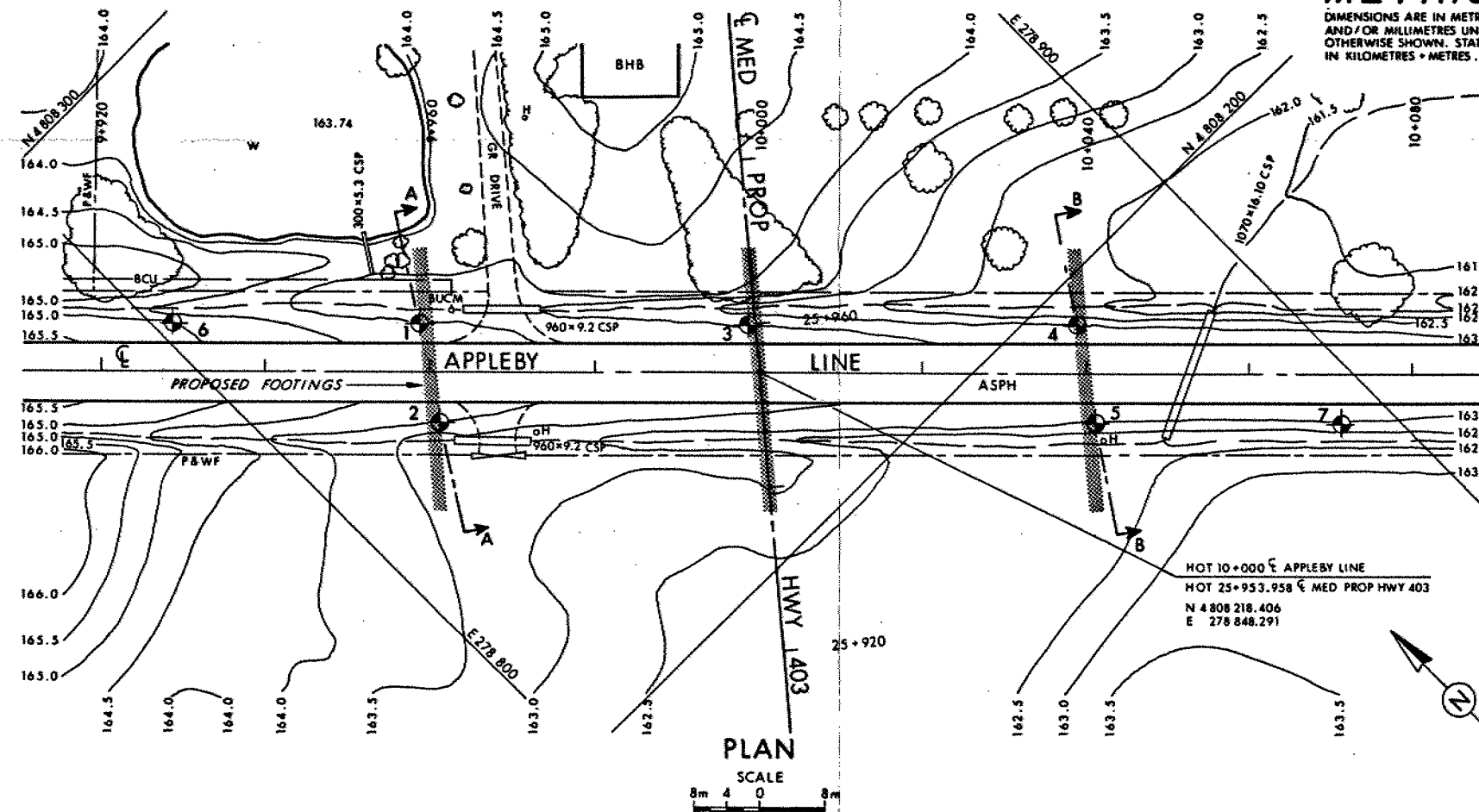


B - B
SECTIONS

SCALE
4m 2 0 4m

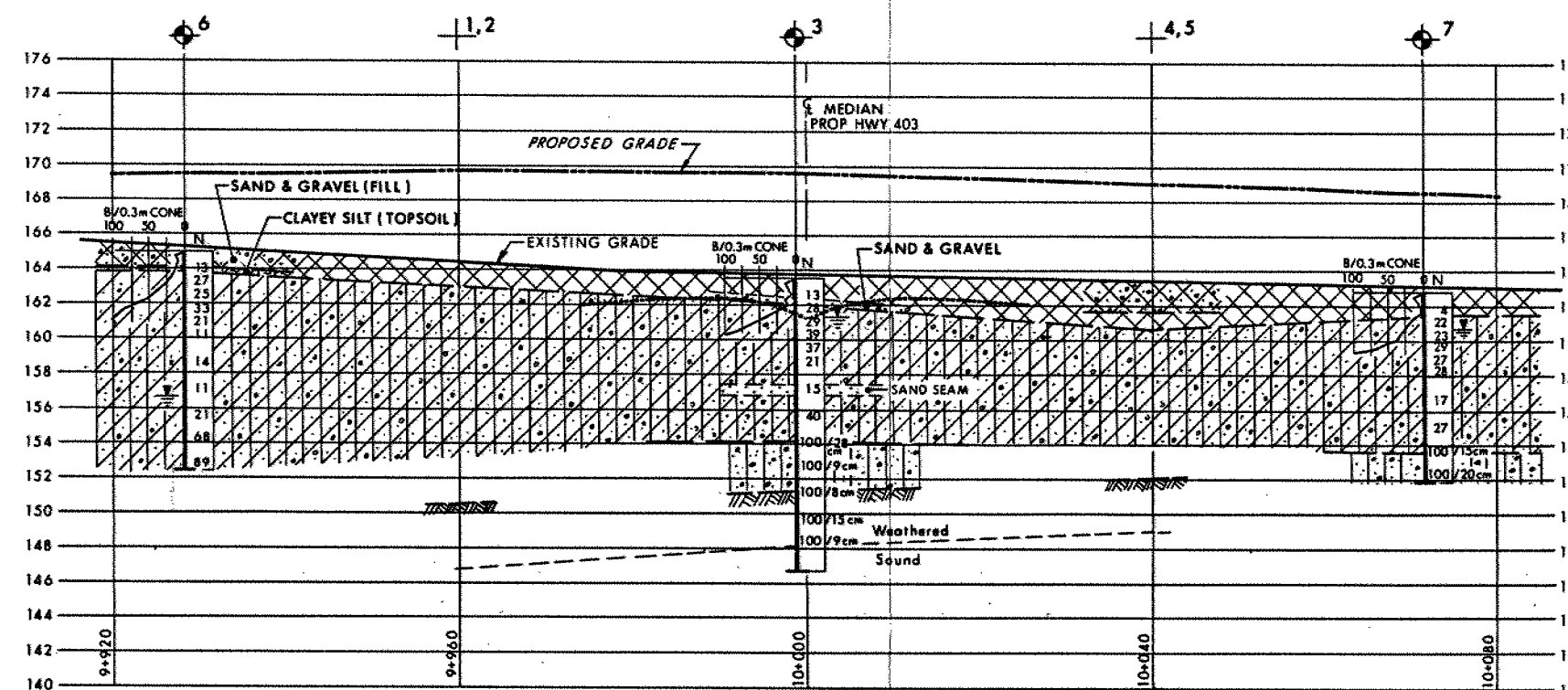
SOIL STRATIGRAPHY LEGEND

- CLAYEY SILT (FILL)
- HETEROGENEOUS MIXTURE OF CLAYEY SILT, SAND AND GRAVEL Stiff to Hard (Glacial Till)
- HETEROGENEOUS MIXTURE OF SANDY SILT, GRAVEL AND CLAY Very Dense (Glacial Till)
- BEDROCK QUEENSTON SHALE



PLAN

SCALE
8m 4 0 8m



PROFILE - APPLEBY LINE

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.

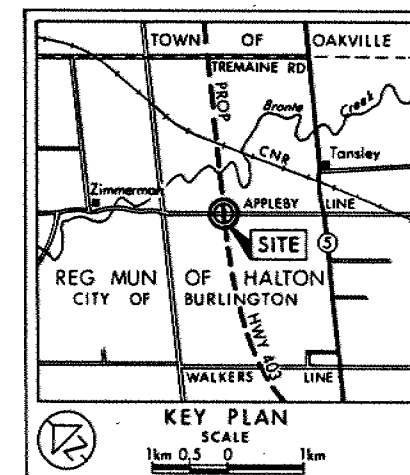
CONT No
WP No 411-85-02

APPLEBY LINE

BORE HOLE LOCATIONS & SOIL STRATA



SHEET



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 1990 05

| No | ELEVATION | CO-ORDINATES | |
|----|-----------|--------------|-----------|
| | | NORTH | EAST |
| 1 | 164.1 | 4 808 251.7 | 278 823.3 |
| 2 | 164.0 | 4 808 241.5 | 278 816.5 |
| 3 | 163.5 | 4 808 223.5 | 278 851.7 |
| 4 | 163.1 | 4 808 195.3 | 278 880.0 |
| 5 | 163.0 | 4 808 185.1 | 278 873.3 |
| 6 | 165.0 | 4 808 272.8 | 278 802.0 |
| 7 | 162.9 | 4 808 164.0 | 278 894.6 |

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 |
|---------------------------------|------|----|---------------|
| 1 | | | |
| Geocres No 30M05-166 | | | |
| HWY No 403 | | | DIST 4 |
| SUBMITTAL CHECKED DATE 90 11 08 | | | SITE 10-229 |
| DRAWN RS CHECKED APPROVED | | | DWG 4118302-A |