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DIST. 6 REGION

W.P. No. 12-66-49

CONT. No. 80-37

W. O. No.

STR. SITE No. 24-275

HWY. No. 10

LOCATION Hwy 10 & Cooksville Creek Culvert Ext.

No OF PAGES -

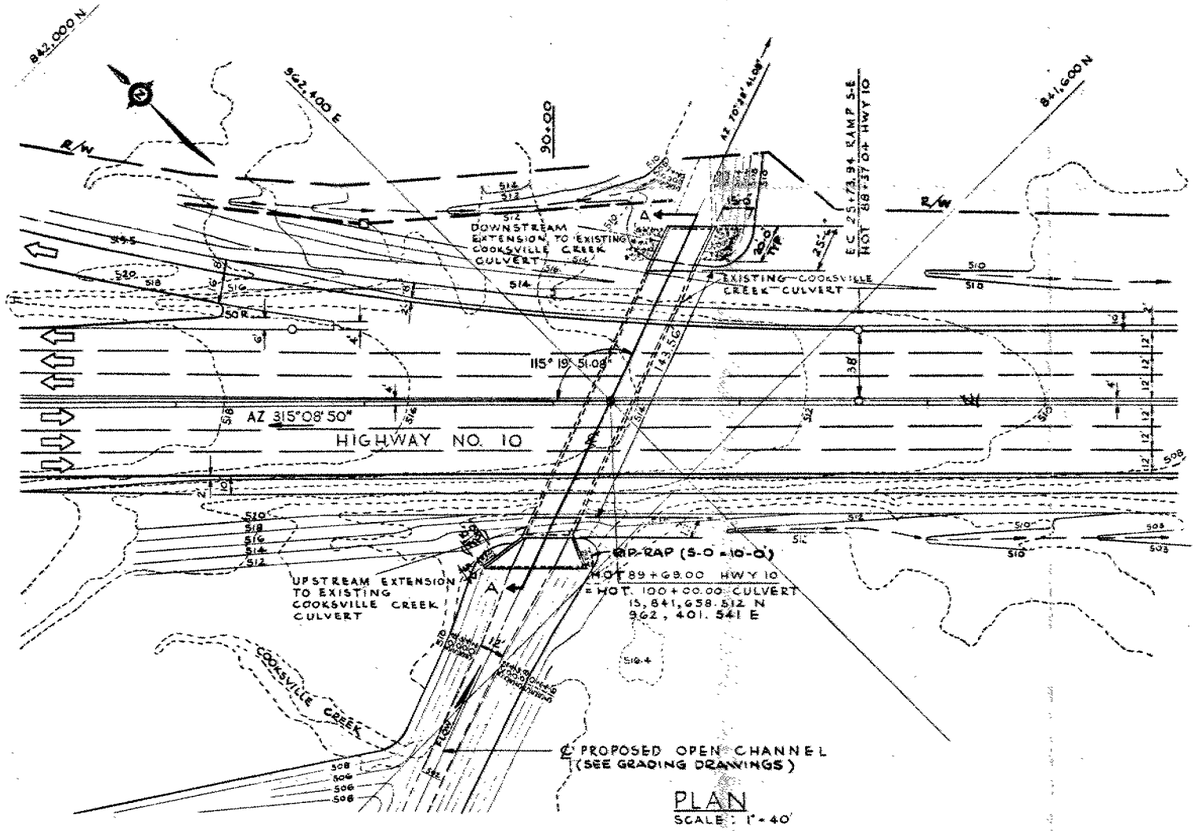
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

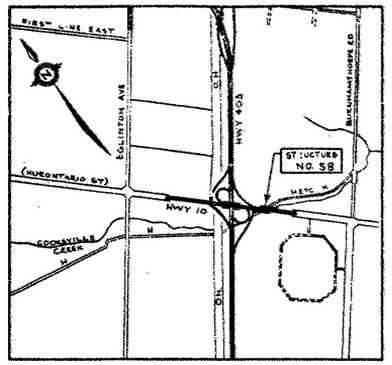
DISTRICT 6
CONT No
WP No 127-66-49

# COOKSVILLE CREEK CULVERT EXTENSION GENERAL LAYOUT

SHEET




PLAN
SCALE: 1" = 40'




KEY PLAN

## NOTES

CLASS OF CONCRETE

CULVERT & RETAINING WALLS 30 MPa
RET. WALL FTGS & CONC. LINING 20 MPa

REINFORCING STEEL GRADE 400 MPa
CLEAR COVER TO REINF. STEEL 3"
(EXCEPT AS NOTED)

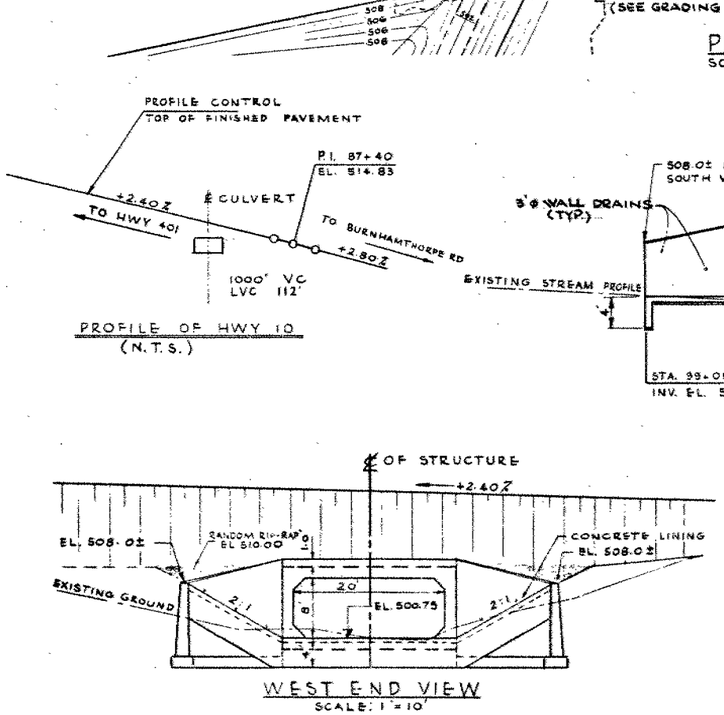
FILL SHALL BE PLACED ON BOTH SIDES OF THE CULVERT SIMULTANEOUSLY

## LIST OF DRAWINGS

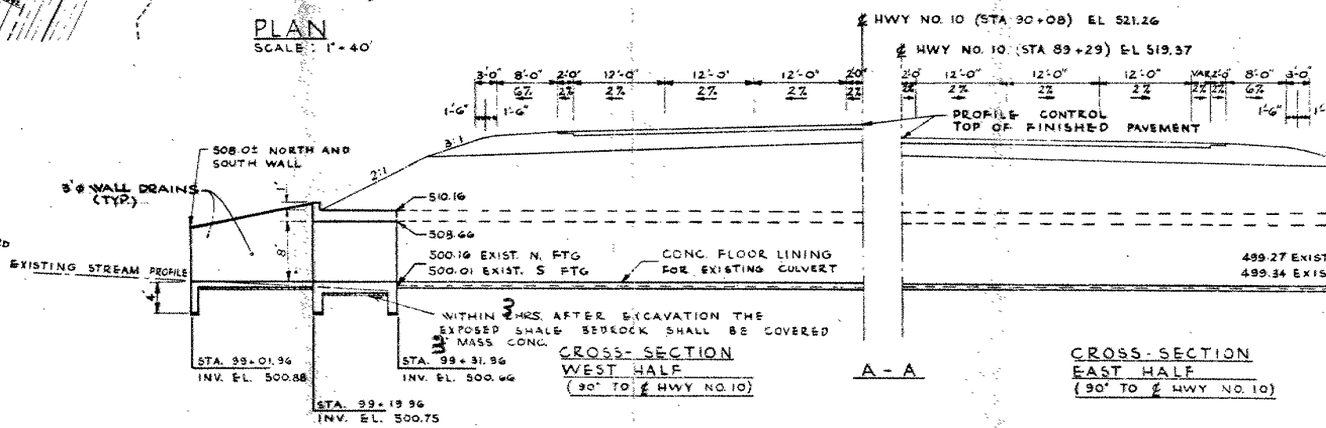


## LUMP SUM CONCRETE QUANTITIES

1. CONCRETE IN RETAINING WALLS 28 CU. YDS.
2. CONCRETE IN CULVERT 166 CU. YDS.
3. CONCRETE IN RETAINING WALL FTGS 21 CU. YDS.
4. CONCRETE IN CHANNEL LINING 26 CU. YDS.




PROFILE OF HWY 10
(N.T.S.)



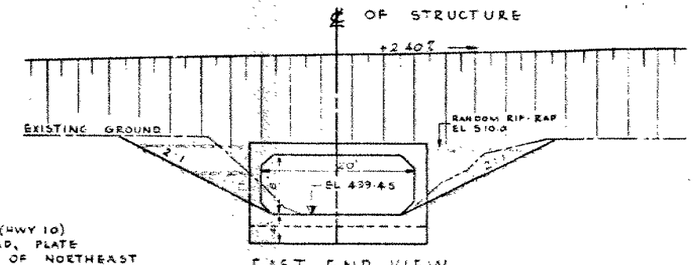

CROSS-SECTION WEST HALF
(90° TO ℄ HWY NO. 10)

A - A

CROSS-SECTION EAST HALF
(90° TO ℄ HWY NO. 10)




WEST END VIEW
SCALE: 1" = 10'




EAST END VIEW
SCALE: 1" = 10'

## GEODETIC BENCH MARK

TT-458 503.078 (GS) 155.167 METRES
CONCRETE CULVERT UNDER HURONTARIO STREET (HWY 10)
0.5 MILES NORTHWEST OF BURNHAMTHORPE ROAD, PLATE ON NORTHEAST FACE AT NORTH CORNER OF NORTHEAST END OF CULVERT. ESTABLISHED BY TOWNSHIP OF TORONTO

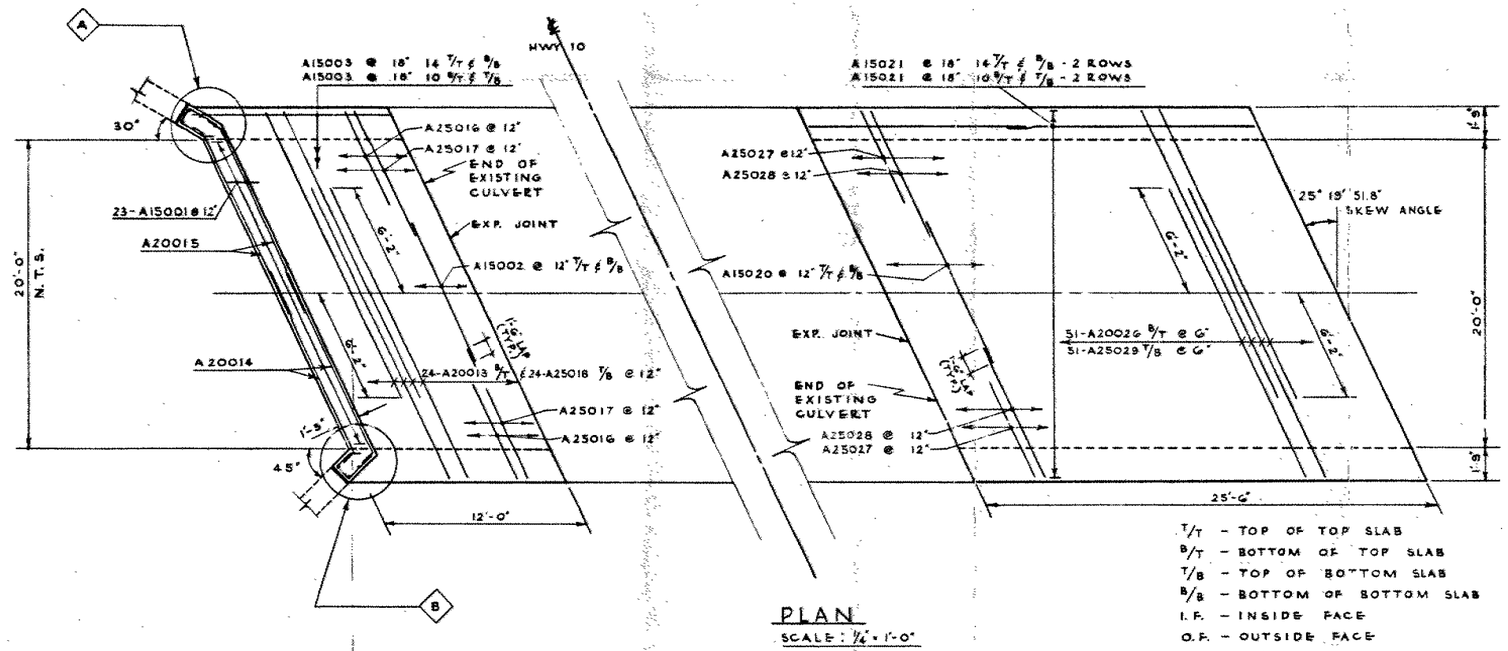
FOR REDUCED PLAN
USE SCALE BELOW
10 11 12 13
3 INCHES ON ORIGINAL PLAN

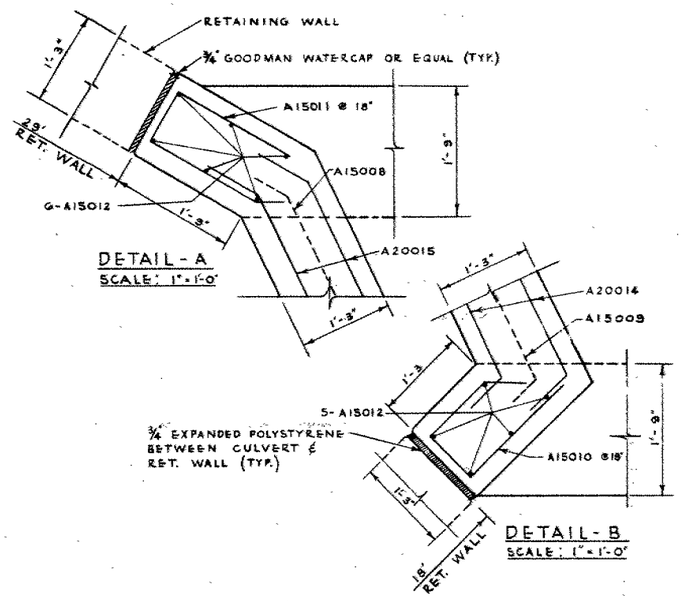
| REVISIONS | | | |
|---|---|---|---|
| DATE | BY | DESCRIPTION | |
| DESIGN | CHECK | LOADING HS 20-44 | DATE JUL/79 |
| DRAWING | CHECK | SITE No 24-275 | DWG 1 |

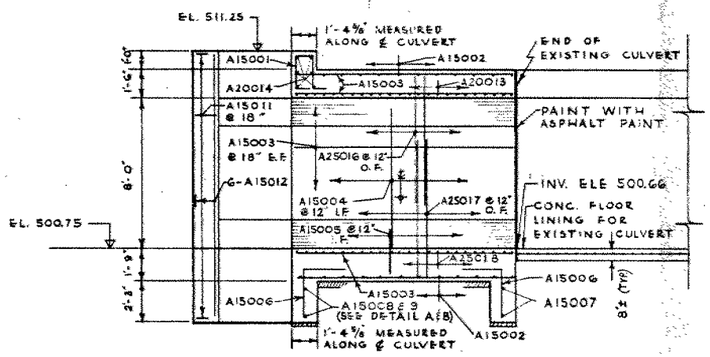
DISTRICT 6
CONT No
WP No 127-66-49

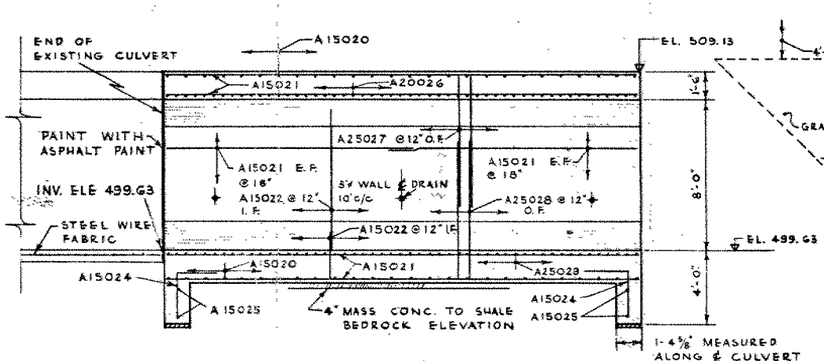
COOKSVILLE CREEK
CULVERT EXTENSION
CULVERT DETAILS

SHEET

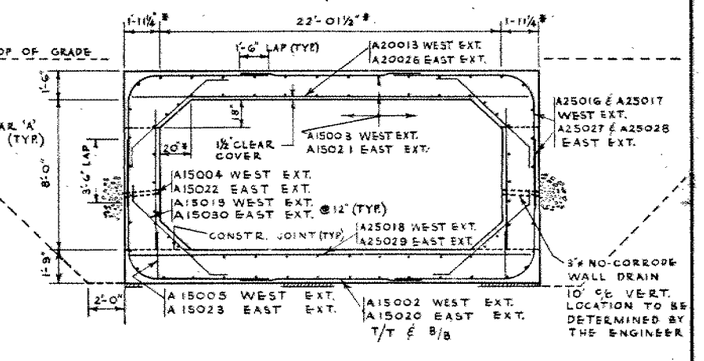



LONGITUDINAL SECTION
SCALE: 1/4" = 1'-0"




TYPICAL CROSS SECTION
SCALE: 1/4" = 1'-0"

℄ SKEW DIMENSION
N.T.S.

FOR REDUCED PLAN
USE SCALE BELOW
10 11 12 13
3 INCHES ON ORIGINAL PLAN

| REVISIONS | DATE | BY | DESCRIPTION |
|---|---|---|---|
| | | | |
| DESIGN F.D. | CHECK | LOADING HS 20-44 | DATE JUL 79 |
| DRAWING F.D. | CHECK | SITE No 24-0578 | DWG 3 |

TRANSLAR 1990-11-26

CONT 80-37 ✓

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

30 M12-68

TO: Mr. G.C.E. Burkhardt, (3)
Regional Structural Planning Eng.,
Central Region,
3501 Dufferin St., Downsview.

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

ATTENTION:

DATE: November 13, 1973.

OUR FILE REF.

IN REPLY TO NOV 16 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Extensions of the Existing
Culvert Structure at the Crossing of
Hwy. 10 and Cooksville Creek
Town of Mississauga, County of Peel
District 6, Toronto Site #24-275
W.O. 73-11080 -- W.P. 127-66-49

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

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

for A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

AGS/ao
Attch.
c.c. E. J. Orr
B. R. Davis
A. Rutka
R. S. Pillar
H. Greenland
B. J. Giroux
C. Mirza
G. A. Wrong
B. J. Singh

Foundations Files ✓
Documents

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*FOUNDATION INVESTIGATION REPORT*
*For*
*Proposed Extensions of the Existing Culvert Structure at the Crossing of Hwy. 10 and Cooksville Creek*
*Town of Mississauga, County of Peel*
*District 6, Toronto  Site # 24-275*
*W.O. 73-11080 -- W.P. 127-66-49*

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1. *INTRODUCTION:*

It is proposed to construct an interchange where the proposed Hwy. 403 crosses the existing Hwy. 10, approximately three miles south of Hwy. 401. In the vicinity of this interchange, Hwy. 10 will be widened. As a result of this, the existing Cooksville Creek culvert some 1,000 feet south of this interchange, will have to be extended by 40 feet at both ends.

The Foundations Office was requested to carry out a subsurface investigation at the above mentioned site. The request was contained in a memo from Mr. G. C. E. Burkhardt, Regional Structural Planning Engineer, Central Region, dated September 19, 1973. Subsequently, an investigation was carried out by this office to determine the subsoil, bedrock and ground water conditions at the site.

This report presents the factual data obtained from this investigation, together with recommendations pertaining to the foundation design of the proposed structure.

2. *DESCRIPTION OF THE SITE AND GEOLOGY:*

The site is about one mile south of Eglinton Avenue along Hwy. 10, in the Town of Mississauga, County of Peel.

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The topography of the terrain is flat to gently undulating in relief.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in the vicinity of the area under investigation is mainly composed of a cohesive glacial till underlain by shale bedrock.

3. *FIELD AND LABORATORY WORK:*

The subsoil investigation consisted of 4 sampled boreholes. The borings were advanced by means of a C.M.E.-750 Auger machine equipped with hollow stem augers, adapted for soil sampling purposes.

Sampling in the overburden was carried out by hammering a 2" O.D. split spoon sampler into the soil with a driving energy in accordance with the specifications for the Standard Penetration Test. In all holes the bedrock was proven by obtaining BXL size core samples.

Groundwater levels were observed in the open boreholes during the period of investigation.

The soil,bedrock and groundwater conditions encountered at the boring locations are presented in the Record of Borehole sheets. The locations and elevations of the various boreholes were surveyed by District 6 (Toronto) construction personnel. The elevations in this report are referenced to a Geodetic datum. Boring locations referenced to a co-ordinate system and elevations together with estimated stratigraphical sections are shown on Drawing No. 73-11080A.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, various laboratory tests were carried out on the selected representative samples to determine the physical properties of the soil, namely:

Natural Moisture Contents
Atterberg Limits
Grain-Size Distributions

.....3

The results of these tests are plotted on the Record of Borehole sheets and summarized on Fig. 1 and Fig. 2, all contained in the Appendix of this report.

## 4. SUBSOIL AND BEDROCK CONDITIONS:

### 4.1) General:

The predominant stratum across the site is a heterogeneous mixture of clayey silt, sand and gravel. This cohesive deposit is underlain by shale bedrock.

The boundary between the overburden and the bedrock as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 73-11080A have been inferred from this data.

### 4.2) Heterogeneous Mixture of Clayey Silt, Sand and Gravel:

The predominant stratum across the site is a deposit of heterogeneous mixture of clayey silt, sand and gravel of glacial origin, which was found underlying a thin top soil cover (maximum 1 foot). At B.H. #1, this deposit does not exist. At B.H. #3 and #4, this cohesive stratum appears to be in a disturbed state. It is believed that it was placed at this location to form the channelized Cooksville Creek during the construction of the Hwy. 10 and the concrete culvert. The thickness of this stratum ranges from 4.5 feet (B.H. #2) to 12.5 feet (B.H. #4).

This deposit is cohesive in nature. Atterberg limit tests were performed on samples obtained in this deposit. The results, which are shown on the Record of Borehole sheets and on the plasticity chart (Fig.1) are as follows:

| | Range | Average |
|---|---|---|
| Liquid Limit ($W_L$) % | 39 - 27 | 32 |
| Plastic Limit ($W_P$) % | 25 - 17 | 21 |
| Natural Moisture Content (W) % | 15 - 6 | 10 |

Based on the above values, it is estimated that the cohesive deposit has a matrix which is inorganic and generally

.....4

of low plasticity.

Grain size distribution curves for samples obtained in the material are shown in Fig. 2, in the Appendix.

The Standard Penetration Tests, carried out within this stratum, are plotted on the Record of Borehole sheets. The 'N' values obtained from these tests range from 5 blows to 31 blows per foot. It is estimated that the consistency of this deposit is firm to hard.

*4.3) Bedrock:*

Underlying the cohesive overburden deposit is the shale bedrock which was proven in all of the 4 boreholes by obtaining up to 10 feet of BXL size core samples.

The bedrock is mainly composed of a dark grey interbedded shale with occasional layers of limestone. The upper 1 to 4.5 feet of the bedrock is in a weathered condition. The bedrock surface varies in elevation from 497.6 to 501.8.

## 5. *GROUNDWATER CONDITIONS:*

The groundwater levels were established in the open boreholes during the period of field investigation (October 1973). The results of the readings are shown on the Record of Borehole sheets as well as on Drawing 73-11080A.

The observations indicate that the groundwater level varies in elevation from 501 to 505, which correspond to levels of 2 feet to 8 feet below the ground surface.

## 6. *DISCUSSION AND RECOMMENDATIONS:*

*6.1) General:*

At the present time, Cooksville Creek crosses Hwy. 10 through an existing 20' x 8' rigid frame open culvert some one mile south of Eglinton Avenue. Due to the proposed widening of Hwy. 10 in the vicinity of the proposed Hwy. 10/Hwy. 403

.....5

interchange, extensions will be required at each end of this culvert. The extension on each side will be approximately 40 feet in length.

The predominant stratum across the site is cohesive deposit of clayey silt with some sand and gravel underlain by shale bedrock.

*6.2) Rigid Frame Concrete Culvert:*

The invert of the proposed culvert extensions in general will be within the shale bedrock at approximately elevation 499. It is therefore recommended to support the open type rigid frame concrete culvert on spread footings founded within the sound shale bedrock. A minimum of 4 feet of cover should be provided to the underside of the footings since the shale bedrock is considered to be susceptible to frost action. That would place the footings at or below elevation 495.

Foundations founded as recommended could be designed using an allowable bearing value of up to 10 tsf.

The foundation excavations for the culvert will extend some 5 to 10 feet below the groundwater level established during the course of field investigation. The cohesive overburden is relatively impervious. No dewatering problems are anticipated provided that the creek is temporarily diverted during the construction period. It is believed that any minor seepage or surface runoff into the excavations could be controlled by employing conventional techniques, such as pumping from sumps.

The culvert extensions will be designed as a rigid frame. Therefore, a coefficient of earth pressure at rest ($K_o$) of 0.5 should be assumed for the granular back fill behind the wall,when designing the wall sections. In addition, the full effect of the surcharge above the top of the culvert should be included. In computing the horizontal resistance of the footings, a coefficient of friction of 1.0 may be used between the rough

.....6

concrete surface and the shale bedrock.

In order to relieve the build up of excess hydrostatic pressure behind the walls, suitable drainage measures should be provided. Weep holes, located at the base of the walls could be employed for this purpose, these holes should be spaced not more than 10 feet apart.

*6.3) Embankment Fill:*

No stability problems are anticipated for an embankment of the height contemplated (maximum 8 feet), provided:

1. 2:1 slopes are employed,
2. The fill is properly compacted,

and keyed to the existing embankment in accordance with current MTC Standard No. DD-414.

*7. MISCELLANEOUS:*

The field work, performed during the period of October 1, 1973, was supervised by Mr. V. Korlu, Project Foundation Engineer who also prepared this report.

Equipment was owned and operated by the Dominion Soils Co. of Toronto.

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

V. Korlu, P. Eng.


M. Devata, P. Eng.

VK/ji
October 25, 1973.

*APPENDIX I*

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

# RECORD OF BOREHOLE No 1

FOUNDATIONS OFFICE

JOB 73-11080 LOCATION Co-ords. 15,841,623 N; 962,291 E. ORIGINATED BY VK

W.P. 127-66-49 BORING DATE Oct. 1/73 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Auger and core drill with CME 750 CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT<br>SHEAR STRENGTH P.S.F.<br>○ UNCONFINED + FIELD VANE<br>● QUICK TRIAXIAL × LAB VANE | LIQUID LIMIT $w_L$<br>PLASTIC LIMIT $w_P$<br>WATER CONTENT $w$<br>$w_P$ $w$ $w_L$<br>WATER CONTENT % | BULK DENSITY $\gamma$ P.C.F. | REMARKS<br>GR.SA.SI.CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | | | | |
| 502.6 | Ground Level | | | | | | | | | |
| 501.6 | Topsoil | | | | | | | | | |
| 1.0 | Weathered<br>Sound | | 1 | BXL | 50% | 500 | | | | ▼ 500.6 |
| 492.6 | Shale Bedrock with occ. limestone layers. Dark Grey | | 2 | BXL | 100% | | | | | |
| 10.0 | End of Borehole | | | | | 490 | | | | |

OFFICE REPORT ON SOIL EXPLORATION

20
15 ⊹ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE No 2

JOB 73-11080 LOCATION Co-ords. 15,841,608 N; 962,310 E. ORIGINATED BY VK

W.P. 127-66-49 BORING DATE Oct. 1/73 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Auger and core drill with CME 750 CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT $W_L$ / PLASTIC LIMIT $W_P$ / WATER CONTENT $W$ | BULK DENSITY $\gamma$ P.C.F. | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE | WATER CONTENT % 10 20 30 | | GR. SA. SI. CL. |
| 506.3 | Ground Level | | | | | | | | | |
| 0.0 | Wet.mix.of clayey silt sand & gravel.(Glac. | | 1 | SS | 31 | | | | | ▼503.1 |
| 501.8 | Till) Brown.V.Stiff to Hard | | 2 | SS | 122.9" | 500 | | | | 10 10 59 21 |
| 4.5 | | | | | | | | | | |
| 497.3 | Weathered | | | | | | | | | |
| 9.0 | Sound Shale Bedrock with occ.limestone layers Dark Grey | | 3 | BXL | 100% | | | | | |
| 492.3 | | | | | | | | | | |
| 14.0 | End of Borehole | | | | | 490 | | | | |

OFFICE REPORT ON SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

# RECORD OF BOREHOLE No 3

JOB 73-11080 — LOCATION Co-ords. 15,841,716 N; 962,498 E. — ORIGINATED BY VK

W.P. 127-66-49 — BORING DATE Oct. 1, 1973 — COMPILED BY VK

DATUM Geodetic — BOREHOLE TYPE Auger and core drill with CME 750 — CHECKED BY

| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) | LIQUID LIMIT $W_L$, PLASTIC LIMIT $W_P$, WATER CONTENT $W$; WATER CONTENT % (10 20 30) | BULK DENSITY γ P.C.F. | REMARKS GR.SA.SI.CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| 509.6 | Ground Level | | | | | | | | | |
| 0.0 | Clayey silt, sand & gravel (Probably Fill Material) | | 1 | SS | 28 | | | | | ▼ 504.8 |
| | Brown | | 2 | SS | 11 | | | ○ | | 2 25 53 20 |
| 497.6 | Stiff to Very Stiff | | 3 | SS | 17 | 500 | | ○ | | |
| 12.0 | Weathered / Sound | | | | | | | | | |
| 491.3 | Shale Bedrock with occ. limestone layers Dark Grey | | 4 | BXL | 100% | | | | | |
| 18.3 | End of Borehole | | | | | 490 | | | | |

OFFICE REPORT ON SOIL EXPLORATION

15 20 10 5 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE No 4

JOB 73-11080 LOCATION Co-ords. 15,841,682 N; 962,525 E. ORIGINATED BY VK

W.P. 127-66-49 BORING DATE Oct. 1/73 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Auger and core drill with CME 750 CHECKED BY

| SOIL PROFILE | | | SAMPLES | | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT $W_L$ / PLASTIC LIMIT $W_P$ / WATER CONTENT $W$ | BULK DENSITY $\gamma$ P.C.F. | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS/FOOT | | SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE | WATER CONTENT % 10 20 30 | | GR. SA. SI. CL. |
| 510.9 | Ground Level | | | | | | | | | |
| 0.0 | Clayey silt, sand & gravel, with traces of organics (Probably Fill Material) Brown Firm to Stiff | | 1 | SS | 15 | 510 | | ○ | | 26 37 27 10 |
| | | | 2 | SS | 9 | | | ○ | | |
| | | | 3 | SS | 8 | | | | | ▼ 503.0 |
| | | | 4 | SS | 5 | | | | | |
| 498.4 | | | 5 | SS | 7 | 500 | | | Org. 7.0 | 9 42 37 12 |
| 12.5 | weathered sound Shale Bedrock with occ. limestone layers Dark Grey | | 6 | SS | 48 | | | | | |
| | | | 7 | BXL | 100% | | | | | |
| 491.7 | | | 8 | BXL | 100% | | | | | |
| 19.2 | End of Borehole | | | | | 490 | | | | |

OFFICE REPORT ON SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

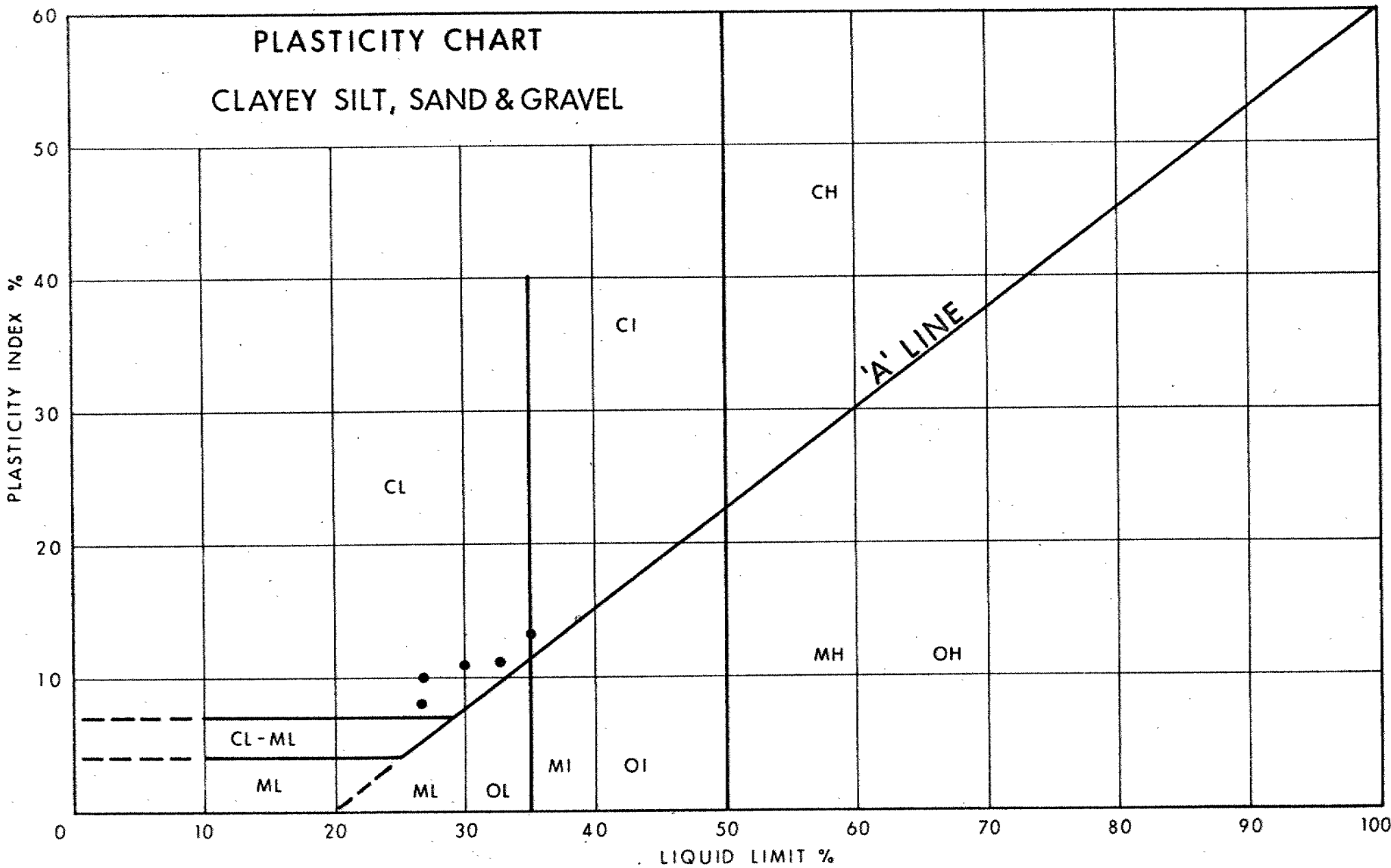
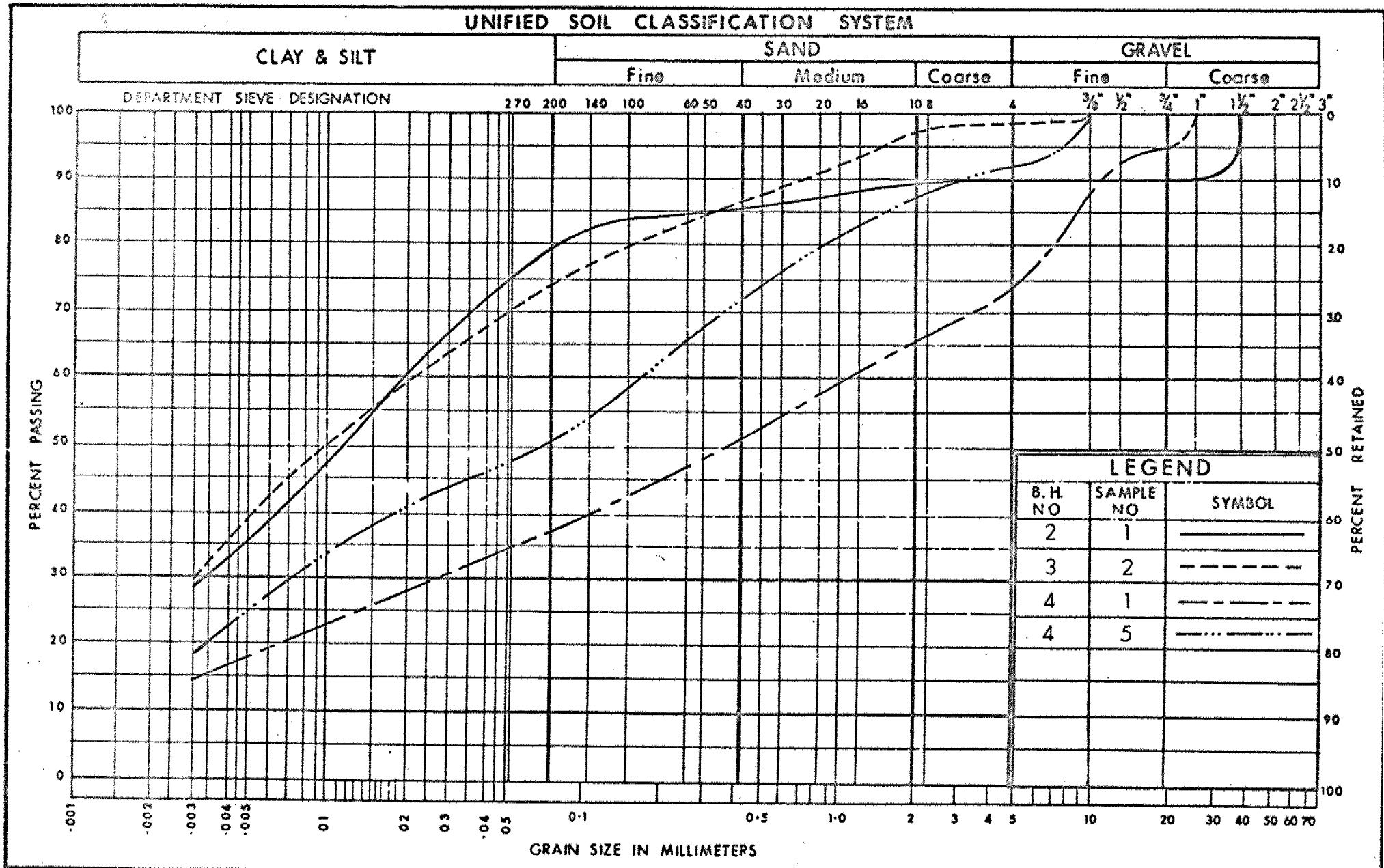



FIG. 1

W.O. 73-11080

FORM OD-MT
REV. AUG 197




DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

ENGINEERING SERVICES BRANCH

# GRAIN SIZE DISTRIBUTION

## CLAYEY SILT, SAND & GRAVEL

W.P. No. 127-66-49

JOB No. 73-11080

FIG. 2

FD-1 (Rev. Jan. 73)

# ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

## PENETRATION RESISTANCE

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

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

## DESCRIPTION OF SOIL

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

| CONSISTENCY | c LB./SQ.FT. |
|---|---|
| VERY SOFT | 0 - 250 |
| SOFT | 250 - 500 |
| FIRM | 500 - 1000 |
| STIFF | 1000 - 2000 |
| VERY STIFF | 2000 - 4000 |
| HARD | > 4000 |

| DENSENESS | 'N' BLOWS / FT. |
|---|---|
| VERY LOOSE | 0 - 4 |
| LOOSE | 4 - 10 |
| COMPACT | 10 - 30 |
| DENSE | 30 - 50 |
| VERY DENSE | > 50 |

TERMS TO BE USED IN DESCRIBING SOILS:-

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

## TYPE OF SAMPLE

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

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

## SOIL TESTS

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

FD-9b (Rev. Jan. 73)

# ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

## SOIL PROPERTIES

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

## GENERAL

| | |
|---|---|
| $\pi$ | = 3·1416 |
| e | BASE OF NATURAL LOGARITHMS 2·7183 |
| $\log_e a$ OR $\ln a$ | NATURAL LOGARITHM OF $a$ |
| $\log_{10} a$ OR $\log a$ | LOGARITHM OF $a$ TO BASE 10 |
| t | TIME |
| g | ACCELERATION DUE TO GRAVITY |
| V | VOLUME |
| W | WEIGHT |
| M | MOMENT |
| F | FACTOR OF SAFETY |

## STRESS AND STRAIN

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

## EARTH PRESSURE

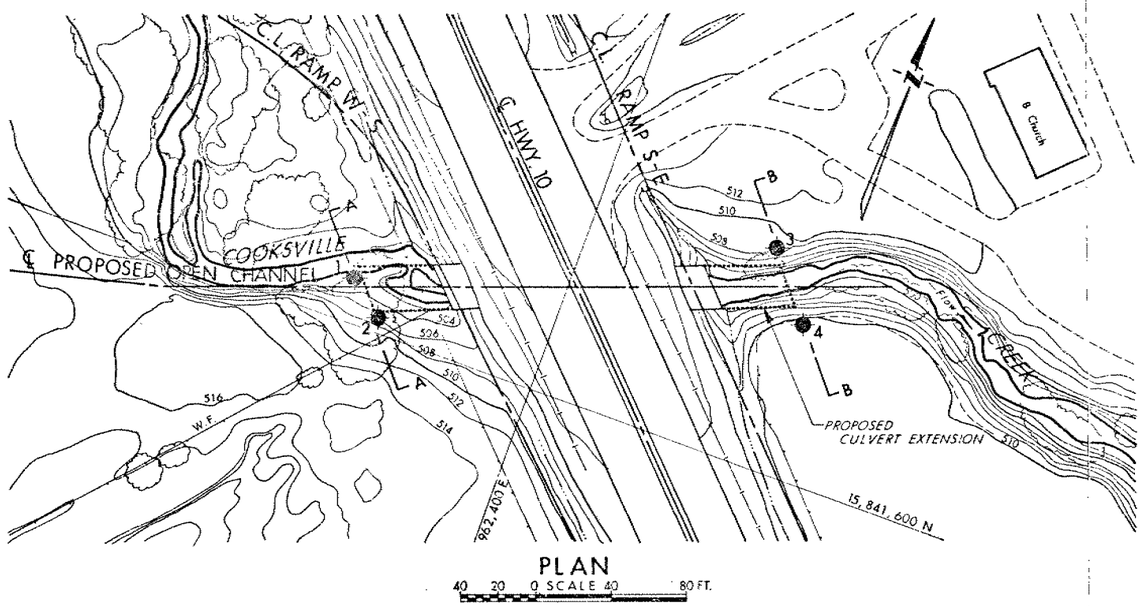
| | |
|---|---|
| d | DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE |
| $\delta$ | ANGLE OF WALL FRICTION |
| K | DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS |
| $K_o$ | COEFFICIENT OF EARTH PRESSURE AT REST |

## FOUNDATIONS

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

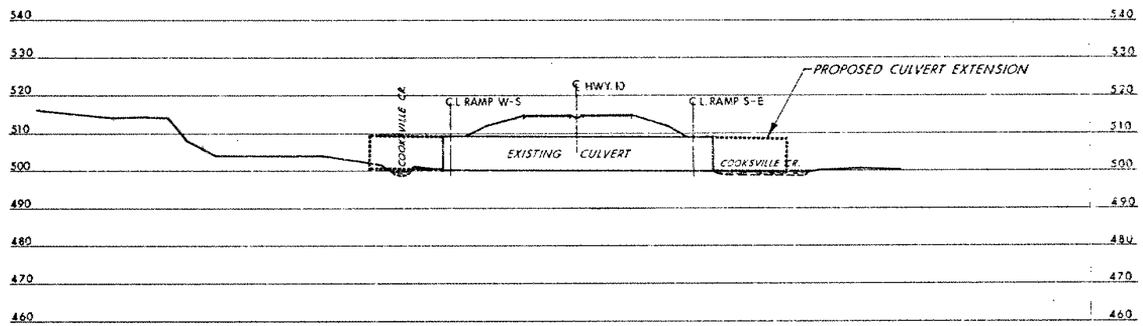
## SLOPES

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




PLAN

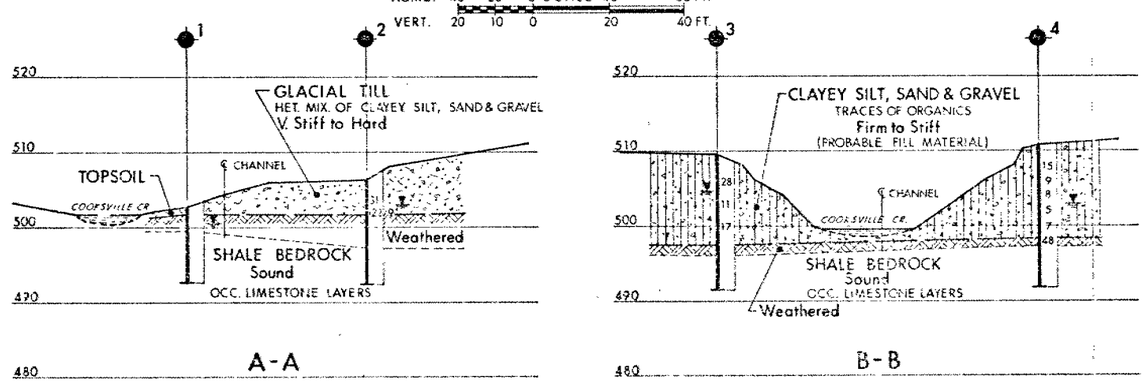
40 20 0 SCALE 40 80 FT.




PROFILE

HORIZ. 40 20 0 SCALE 40 80 FT.

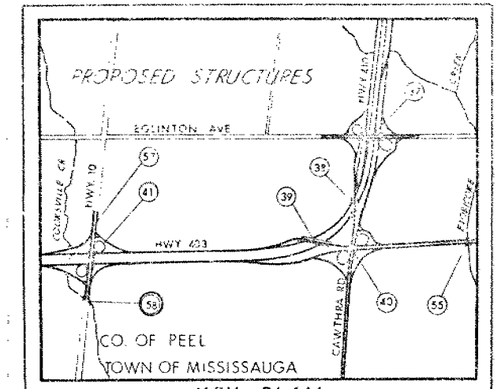
VERT. 20 10 0 20 40 FT.




A-A B-B

SECTIONS

10 5 0 SCALE 10 20 FT.




KEY PLAN

## LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. Oct. 1973

| NO. | ELEVATION | CO-ORDINATES NORTH | CO-ORDINATES EAST |
|---|---|---|---|
| 1 | 502.6 | 15,841,623 | 962,291 |
| 2 | 506.3 | 15,841,608 | 962,310 |
| 3 | 509.6 | 15,841,716 | 962,498 |
| 4 | 510.9 | 15,841,682 | 962,525 |

NOTE:
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the TORONTO District Office.

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

| REVISIONS | | |
|---|---|---|
| DATE | BY | DESCRIPTION |

REF. No. B 81 - 80

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

# BRIDGE No. 58
## COOKSVILLE CREEK

HIGHWAY NO. 10 DIST. NO. 6
CO. PEEL
TOWN OF MISSISSAUGA LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

| | | | |
|---|---|---|---|
| SUBMD V.K | CHECKED | W.P. NO. 127-66-49 | DRAWING NO. 73-11080 A |
| DRAWN S.R. | CHECKED | W.O. NO. 73-11080 | |
| DATE NOV. 1, 1973 | | SITE NO. | BRIDGE DRAWING NO. |
| APPROVED | | CONT. NO. | |

WP 127-66-49

Ministry of Transportation and Communications
Ontario

# Memorandum

To: Mr. C. S. Grebski,
Head, Central Section,
Structural Office,
2nd Floor, West Building.

Attention: Mr. W. L. Lin.

From: Pav't. and Foundation Design Section,
Engineering Materials Office,
Room 315, Central Building.

Date: 79 08 15

Our File Ref.

In Reply to

Subject: Re: Cooksville Creek Culvert Extension,
W.P. 127-66-49,
Site 24-275,
District 6, Toronto.

As per your request, we have reviewed the Preliminary Design Drawing for this project. Our comments are as follows:

1. The western portion of the proposed culvert extension will be founded in shale bedrock, whereas the eastern portion of the extension will be situated very close to shale bedrock. In view of its closeness to bedrock surface, we suggest that the eastern extension be also founded on shale bedrock by means of subexcavation and backfilling with mass concrete.

2. The shale bedrock is susceptible to deterioration by weathering once it is exposed. Therefore, the bedrock surface at the foundation level should be protected with 4 inches of mass concrete.

B. Ly

BL/cy

B. Ly,
For: M. Devata,
Supervising Engineer.

c.c. C. E. Burkhardt
Files

Ministry of Transportation and Communications
Ontario

# Memorandum

To: Mr. G.C.E. Burkhardt
Head, Structural Section
Central Region

From: Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

Attention: Mr. F.I. Hewson
Senior Structural Engineer

Date: 78 07 21

Our File Ref.

In Reply to

Subject: Re: Foundation Investigation For
Cooksville Creek Culvert
W.P. 127-66-49, Site 24-275
District 6, Toronto

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Further to your memorandum dated 78 07 14 we have reviewed the revised culvert requirements and submit the following:

1. The length of the culvert is somewhat shorter than the one originallly proposed at the time of the foundation investigation. However, the alignment is unchanged.

2. A recent site visit revealed that the bedrock is exposed at the creek bed where the western portion of the culvert extension is proposed. However, in the area where the eastern extension of the culvert is proposed, the bedrock is approximately at the same elevation as indicated in our B.H. #3 and #4.

3. The original investigation adequately covers the revised concept and in view of this we are of the opinion that no additional investigation nor updating of the foundation report will be necessary.

4. The factual data and recommendations contained in our foundation report W.O. 73-11080, dated 73 11 13, are still valid and applicable for the new concept.

M. Devata
Supervising Engineer

MD/sr

cc: C.S. Greski
Parker & Associates
Attn: Mr. E. Wilson
K. Cameron
R. Fitzgibbon
R.D. Gunter
M. Ernesaks

Files