PLOT on 30M11 map

BA 1676

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Rexdale, Ontario,
April 29th, 1963.

30M11-173
GEOCRES No.

Fenco-Harris, Consulting Engineers,
2200 Yonge Street,
Toronto 12, Ontario.

Attention: Mr. M. C. Douglas, P. Eng.,
Project Manager.

Re: Investigation of Slip Area,
Don Valley Parkway at Minton Place,
Toronto, Ontario.

Dear Sirs:

This letter accompanies our detailed report on the above investigation.

The soil conditions encountered at the site consist of a combined thickness of about 45 feet of gravelly to silty sands and glacial till, then 45 feet of very stiff to hard clayey silt. The clayey silt stratum is underlain by very dense sands.

The results of the investigation indicate that the slip has been caused by softening of the stiff clayey silt near the surface by seeping water. We find that, considering the slope as a whole, the area involved in the silt is comparatively shallow and there is ample factor of safety against a deep-seated failure of the overall slope. Recommendations for remedial measures, from a soil mechanics standpoint, are given in the report.

We believe that our report details the information required from this study. Should you require further information, or wish to discuss any aspect of this report, please give us a call.

Yours very truly,

GEOCON LTD

M.A.J. Matich

M. A. J. Matich, P. Eng.,
Vice-President and Chief Engineer.

MAJM/dw
T7489

T7489

REPORT

TO

FENCO-HARRIS, CONSULTING ENGINEERS

ON

SOIL CONDITIONS AND STABILITY STUDIES

DON VALLEY PARKWAY SLOPE AT MINTON PLACE

TORONTO ONTARIO

Distribution:

4 copies - Fenco-Harris, Consulting Engineers,
Toronto, Ontario.

3 copies - Geocon Ltd,
Rexdale, Ontario.

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INDEX

INTRODUCTION

Geocon Ltd has been retained by Fenco-Harris, Consulting Engineers, to investigate an earth slide on the slope of the Don Valley Parkway opposite Minton Place. The purpose of the investigation was to determine the soil and water conditions causing the slide and make recommendations from a soil mechanics standpoint with regard to corrective measures to repair the slope.

HISTORY OF MOVEMENT

It is understood that the first signs of movement were observed in the fall of 1962 when a crack opened and some downward displacement occurred. The movement apparently continued at a very slow pace during the winter and it was not until the thaw began to come out of the ground in March 1963 that the movement increased and a slip occurred.

At the time that the present investigation was commenced, the block of dislocated soil had dropped a sufficient distance to expose a near vertical slip surface in excess of 10 feet in height at the centre of the slide.

Immediately after the main slippage, the bulged toe of the slope was pulled down by a gradall to fill the ditch at the toe and provide a counterbalancing force to resist further movement. Although some additional movement has occurred, it has been of minor proportations.

Since the initial main slippage, the slip scarp has flattened considerably from its initial vertical angle. As a result it is estimated that the top of the slip surface has migrated up the bank as much as 5 feet in some places. Most of the migration has occurred as a result of sloughing of the face as the frost has come out of the ground. Some sloughing is continuing, however, in those areas where water is seeping from the exposed face.

SUMMARIZED SOIL CONDITIONS

The road cut in the slip area has an overall depth of between 80 and 90 feet. It passes through about 45 feet of very stiff to very hard, fissured, clayey silts overlain by about 45 feet of gravelly to silty sands and glacial till. At depth the fissured clayey silts are underlain by very dense sands.

At the time of the investigation, the groundwater level occurred about 8 to 10 feet above the top of the hard clayey silt stratum within a stratum of gravelly to silty sand. From the boring programme and a detailed inspection of the site, it appears as though this water is directly responsible for softening of the fissured clayey silts near the surface, with resultant instability of the slope at this point.

Two cross sections of the area showing the soil stratigraphy and the nature of the slip are shown on Drawing T7489-1.

DISCUSSION

From an engineering point of view the most significant soil stratum at the site is the thick, highly fissured clayey silt. Of equal importance is the perched water table in the gravelly to silty sand stratum above the clayey silt. The combination of a steep slope (1 vertical to 1.5 horizontal) and an abundance of water which was not completely intercepted, lead to a gradual softening of the clayey silt near the surface and resulted in instability of the slope. Back calculation of the insitu shear strength along the slip plane and reference to the laboratory strength results indicates that the shear strength of the clayey silt has decreased from a value of at least 3000 pounds per square foot to a present value of about 560 pounds per square foot, in the period since the slope was excavated.

Computations also indicate that the initial factor of safety of the part of the slope which slipped due to softening, was of the order of 5.

The laboratory strength results indicate that the clayey silt comprising the bulk of the slope is still as strong as it ever was, the shear strengths obtained by unconfined compression tests on samples from boreholes 1 and 2 averaging 3.2 tons per square foot. It is considered that softening has occurred chiefly along the slip plane, and in a relatively shallow surficial zone.

For long term stability analyses, the effective stress parameters of the clayey silt as determined from consolidated undrained triaxial tests with pore pressure measurements are as follows:

Effective angle of internal friction, $\phi' = 34^\circ$
Cohesion intercept, $c' = 0$

Using these strength parameters, and assuming that the groundwater is coincident with and seeping parallel to the slope, computations of long term stability indicate that a stable long term slope angle, without special provisions, would be about 18 degrees or about 1 vertical to 2.75 horizontal. Observations of natural slopes in the area indicate that most of them occur at approximately this angle. In order for slopes cut in the fissured clayey silt and subject to groundwater seepage, to stand for long periods of time at slopes steeper than this, positive drainage or other measures would be required.

Several types of remedial measures are suitable in such cases; for example the slopes may be flattened without drainage provisions to 1 vertical to 2.75 horizontal, or steeper slopes may be used and provided with a retaining structure at the toe, and positive drainage ditches and buried drains installed in the slope beneath a blanket of free draining granular material. Flattening of the slope under study to 1 vertical to 2.75 horizontal would involve the expropriation of at least two and possibly four houses and their adjoining properties at the top of the slope. In view of the cost involved in expropriation, a crib wall and drainage provisions may afford the most economical remedial method. The actual selection of the remedial measures to be employed is beyond the scope of this report. Further comments in this discussion pertain to the design of a suitable crib type retaining wall, granular surfacing and drainage for the slope.

A cross section showing the proposed retaining wall and the slope repairs is shown on Drawing T7489-2. The following considerations have been included in the design.

1. The recommended profile for the slope is shown on the cross section. The original slope of 1 vertical to 1.5 horizontal has been retained at the top of the slope in the sands above the water table. The lower slope which consists of granular fill is inclined at 1 vertical to 2 horizontal. A bench, and drainage ditch consisting of half round corrugated pipe, having a total width of 10 feet should be constructed at the change in slope as shown on the drawing. The lower portion of the slope may be protected by a crib wall founded at a maximum elevation of 320 feet. If any softened clay is encountered during excavation for the crib wall it should be removed and the crib wall founded at a lower elevation on very stiff soil. The height of this wall above the shoulder of the parkway will be about 13 feet. The overall height of the wall including the buried portion would be at least 20 feet.

2. An interceptor drain will be required at the top of the clayey silt stratum to intersect the water flowing from the gravelly sand stratum and draw the water level down from the face of the slope. This drain should extend for the full length of the slope and should grade downwards towards the north and south along the slope so that all water is carried away from the slide area.

3. Most of the soil involved in the slip should be removed as shown on the cross section. The softened nature of the clay along the slip surface is such that there would not be an adequate factor of safety against further slippage if all of the soil involved in the slip is left in place. With a small segment left in place as

shown on the cross section to facilitate reconstruction, and all of the softened clay along the slip surface removed, the shallow circle has a factor of safety of 1.2 against short term failure and 1.5 against long term failure. If this small segment is also removed, the short term factor of safety increases to 1.5. If the segment of disturbed clayey silt is left in place, drains running down slope to the crib wall will have to be cut through it to prevent the collection of water.

4. The bulk of the granular fill to be placed on the slope behind the crib wall should consist of well graded, free draining granular material. Soils having gradation characteristics falling within the granular "B" classification for roadways would be satisfactory. All of this fill should receive as much compaction as possible.

5. It is recommended that a wedge of well graded, free draining filter material be placed above the drain running along the top of the clayey silt stratum. The purpose of this wedge to ensure drainage of the water in the stratified gravelly to silty sand into the drain. A suitable filter material is shown on Figure 1 in Appendix II. It is also recommended that this filter material be extended up the slope as counterfort drains approximately 4 feet deep, 3 feet wide, and spaced at 20 foot intervals. These drains would extend up past the till layer and would drain the overlying sands in the event of a temporary rise in the groundwater level.

6. It is recommended that the crib wall extend for the entire length of the cut slope beyond the limits of the slide. In these areas the sand fill may be placed directly on the clayey silt after removal of all sod, topsoil and softened clayey silt. The overall slope profile should be similar at all locations.

7. The backfill used within the crib wall itself should consist of well compacted sandy gravel. The drains beneath the walls, should drain along the length of the wall. It is recommended that the wall itself consist of a double crib as illustrated on the cross section in order to provide greater strength.

8. During excavation for the crib wall, the side of the trench should be carefully inspected for softened layers of silt or clay, and the material above any such layers should be removed, and replaced by well compacted, free draining sand and gravel. This inspection would preferably be carried out by a qualified soils engineer familiar with the Don Valley area.

CONCLUSIONS AND RECOMMENDATIONS

1. The slope was originally cut in a very stiff to hard, fissured, clayey silt stratum capped by granular deposits. The clayey silt has subsequently been softened near the surface by groundwater seepage resulting in a slip. The clayey silt comprising the bulk of the slope, however, has not be affected.

2. The groundwater level occurs within a gravelly to silty sand stratum directly above the clayey silt stratum.

3. Considering the slope as a whole, the depth of material involved in the slip was relatively shallow. Computations show that the overall slope has ample factor of safety against a deep-seated failure.

4. Remedial measures which may be taken include flattening the entire slope, constructing a crib wall and draining the slope or possibly a combination of both.

5. Special design and construction considerations to ensure drainage and stability are discussed in the report.

PERSONNEL

The investigation has been carried out under the overall supervision of R. M. Quigley. The report was written by R. M. Quigley, and reviewed by M. A. J. Matich, P. Eng.

R. M. Quigley

R. M. Quigley, P. Eng.

REGISTERED PROFESSIONAL ENGINEER
R. M. QUIGLEY
PROVINCE OF ONTARIO

RMQ/dw
T7489

APPENDIX I

Procedure
Site and Geology
Soil Conditions
Water Conditions
Office Reports on Soil Exploration

PROCEDURE

The field work for the deep holes at the top and bottom of the slope was carried out between March 22nd and 28th, 1963, using a mobile power auger. Five additional shallow hand auger holes were put down on the side of the slope on April 16th and 17th, using manual augering equipment.

The locations of the boreholes together with the inferred soil stratigraphy are shown on Drawing T7489-1 located at the rear of the report. Detailed logs of each borehole are given on the Office Reports on Soil Exploration in Appendix I. The results of the laboratory testing, which was performed in the Toronto Soils Laboratory of Geocon Ltd, are presented on the Office Reports and on the Figures in Appendix II. The samples remaining after testing will be stored until November 1st, 1963, at which time you will be contacted for instructions regarding their disposal.

Elevations are referred to City of Toronto Datum and are referenced to the centre of the mall at the north end of the Beechwood Avenue Bridge which has elevation 334.0. The two cross sections of the slide area and the elevations of the holes were obtained by Fenco-Harris surveyors.

SITE AND GEOLOGY

The site occurs on the east bank of the Don River Valley in a deep road cut excavated for the Don Valley Parkway opposite Minton Place. The overall depth of the cut below the original ground surface is about 80 feet. The slope which failed was originally cut to an angle of 1 vertical to 1½ horizontal.

At the time of the investigation, some of the soil which had slipped and formed a hump near the toe of the slope had been dragged down into the ditch by a gradall to provide a counterbalancing weight of material to resist the sliding of the soil mass.

From available geological information and visits to the site it was known that the slope consisted of a thick sequence of very stiff to hard clayey sediments of glacial and interglacial origin overlain by several feet of granular soil which is frequently water bearing along this part of the Don Valley.

SOIL CONDITIONS

The following soil strata were encountered in the boreholes and in some cases observed on the face of the failure scarp.

Topsoil

A layer of loamy to clayey topsoil, which varies from 0.5 to 2 feet in thickness and supports a good growth of grass, covers the entire slope. Most of this material was probably placed as fill after the slope was cut. In some parts of the slide area, the sod appears to have slid along very smooth secondary slip surfaces located between the fill and the underlying natural soil.

Dense to Very Dense Brown Fine Sand

A 19 foot thick stratum of brown fine sand containing a highly variable content of small size gravel was encountered at the top of the slope in borehole 3. A similar thickness of this same stratum was encountered in hole 155 put down by others for the initial Parkway investigation as shown on one of the cross sections on Drawing T7489-1.

Five standard penetration resistance values, one of 55 and the others of greater than 100 blows per foot were obtained in the stratum indicating that it is generally very dense.

For purposes of engineering design, the stratum may be assumed to have an insitu wet unit weight of 130 pounds per cubic foot and an angle of internal friction of 40 degrees.

Very Dense Grey Sandy to Clayey Silt Till

An 8 foot thick layer of very dense, well graded soil which looks very much like a glacial till was encountered below the previously described sand stratum in borehole 3. About 3 feet of the bottom portion of this stratum was observed in the exposed slip surface near hole 6. At this location, the base of the till was observed to slope down towards the north. It is possible therefore that it may thicken towards the north and thin towards the south.

In composition, the material consists of abundant pebbles up to 2 inches in diameter embedded in a matrix of clayey to sandy silt. Frequent pockets of well sorted fine to medium sand also occur within the stratum. Much of the soil may have been derived from the underlying sands which are highly distorted possibly as a result of pushing by a moving ice mass.

Two standard penetration resistance values of greater than 100 blows per foot were obtained in the till in borehole 3 indicating that it is very dense.

Very Dense Grey Sandy to Clayey Silt Till (continued)

For purposes of engineering design, the layer may be assumed to have a wet unit weight of 135 pounds per cubic foot and an angle of internal friction of 45 degrees.

Very Dense Stratified Gravelly to Silty Sand

A water bearing stratum of irregularly stratified gravelly to silty sand was encountered below the till in borehole 3 and clearly exposed in the failure surface. The layer was about 11 feet thick in borehole 3 and consisted primarily of silty brown sand with irregular layers of well graded grey clayey to gravelly sand. The beds of sand were observed to be highly distorted, some of them sloping nearly vertically. As mentioned previously, the high degree of disturbance was probably caused by over-riding ice during deposition of the overlying till. At the north end of the slide at point "A" on Drawing T7489-1, water was observed continuously flowing from a thin layer of gravelly sand directly on top of the underlying hard clay stratum. In auger holes 4, 5 and 6 the sand was brown, silty and wet, and continually caved into the holes during augering.

The elevation of the base of this layer, which is also the top of the laminated silt and clay stratum is about 268. In the centre of the slip near augerhole 6, the sands may extend a little deeper.

Two representative channel samples of the sand were taken from the slip face at stations 250+50 and 251+50. The grain size curves obtained on the samples are quite similar as shown on Figure 1 in Appendix II. Also shown on the figure are the limits for suitable filter materials to be placed against the sand during repairs to the slope.

Two standard penetration resistance values of greater than 100 blows per foot were obtained indicating that the material is very dense.

For design purposes the layer has been assumed to have a wet unit weight of 130 pounds per cubic foot and an angle of internal friction of 40 degrees.

Very Stiff to Hard Laminated Silts and Clays

A thick layer of very stiff to hard, grey, clearly to poorly laminated silts and clays were encountered below the gravelly sand stratum. Borehole 3 terminated in this layer after passing 22 feet

Very Stiff to Hard Laminated Silts and Clays (continued)

into it whereas boreholes 1 and 2 at the toe of the cut slope passed completely through the lower portion of it. The stratum has an overall thickness of about 60 as shown on the stratigraphic sections on Drawing T7489-1.

At certain locations the material consists of massive hard clayey silt with a variable amount of sand and gravel and looks like a till. At other locations it consists very clearly to indistinctly laminated silts and clays. In all cases the material is highly fissured and breaks up into tiny blocks when either air dried or exposed to water. Although probably a complex interstratified sequence of clayey till and lacustrine clays, the bulk properties are believed to be about the same from an engineering point of view so all of the material has been grouped into a single stratum.

Four standard penetration resistance or "N" values of greater than 100 blows per foot were obtained in the upper part of the stratum in borehole 3. The clayey silt was so hard that the sampler could not be driven far enough to obtain samples for testing. In borehole 1 at the toe of the slope, six "N" values varying from 13 to 61 and averaging 41 blows per foot were obtained in the lower part of the stratum indicating a lower consistency at depth.

Liquid and plastic limits obtained by others in the previous investigation averaged 34.2 and 18.4 respectively. In the lower, softer part of the stratum the liquid limit was a little higher than near the top.

The insitu unit weight of the material varied from 125 to 144 and averaged 133 pounds per cubic foot in boreholes 1 and 2. The insitu moisture contents varied from about 29 to 10 percent and averaged 21 percent. An average unit weight of 135 pounds per cubic foot was used for design.

Unconfined compressive strengths varying from 2.4 to 4.0 and averaging 3.2 tons per square foot were obtained in samples from boreholes 1 and 2 which pass through the bottom softer portion of the stratum. On the basis of these tests and 5 others from the initial investigation, the strength of the stratum is known to vary from about 9 tons per square foot near the top to about 3 tons per square foot at the bottom. The stratum is therefore very stiff to very hard in consistency.

Back computations of the insitu shear strength along the failure plane gives a value of about 560 pounds per square foot. The

Very Stiff to Hard Laminated Silts and Clays (continued)

clay has therefore softened along the failure plane from an initial shear strength of at least 3000 pounds per square foot to a value of 560 pounds per square foot since the slope was cut.

Three effective stress circles obtained from consolidated undrained triaxial tests with pore pressure measurements are shown in Figure 3. On the basis of these test results, an effective friction angle, ϕ', of 34 degrees and a cohesion intercept, c', of zero have been used for design.

Very Dense Dark Grey Sandy Silt

A 9 foot thick layer of dark grey sandy silt was encountered below the clayey silt stratum in boreholes 1 and 2. The material was generally very dry and of a rather crumbly nature.

Three standard penetration resistance values all greater than 100 blows per foot indicate that it is very dense.

One unconfined compression test run on a sample of the silt from borehole 1 gave a strength of 1.65 tons per square. This value is low probably because there was no clay binder in the sample and is not believed to be representative of the stratum as a whole.

For purposes of design, the stratum was assumed to have a wet unit weight of 135 pounds per cubic foot and an angle of internal friction of 40 degrees.

Very Dense Fine Sand

Very dense, fine sand changing in colour from a light yellow-brown to grey at depth was encountered in boreholes 1 and 2, immediately below the dark grey silt layer. The yellow brown sand was very dry whereas the grey sand was damp to wet. Both holes terminated in the stratum after passing through it for about 20 and 30 feet, respectively.

Standard penetration resistance values varying from 40 to greater than 100 blows per foot were obtained in the stratum, the higher values occurring in the upper dry sand.

For design purposes the sand may be assumed to have an insitu unit weight of 110 pounds per cubic foot where dry and 130 pounds per cubic foot where wet. The angle of internal friction is estimated to be about 40 degrees.

WATER CONDITIONS

An observation pipe extending to the fine grey sand was installed in borehole 1 and a piezometer extending into the stratified gravelly to silty sand was installed in borehole 3. Borehole 1 was dry at the time of the investigation and has remained dry to April 11th, the date of the last reading. It is believed, however, that the water level must rise close to the top of the grey sands and is probably related to the colour change.

The piezometer in borehole 3 recorded the ground water level within the stratified gravelly to silty sand stratum at elevation 375.7 feet on March 29th, 1963. The water level has subsequently dropped below the elevation of the end of the piezometer. Water was also observed seeping out a coarse sand seam at the base of this stratum at point "A" on the exposed face of the slip plane. Auger holes 4, 5 and 6 all penetrated the lower part of this layer either in the undisturbed soil or in the slip block. In every case, the sand was saturated and caused rapid caving of the holes.

In auger holes 7 and 8 which were put down through the slip block, a softened wet zone about 1 foot across was encountered in the hard clayey silt at depths of 10 and 7 feet respectively. It is believed that this zone represents the failure surface and that the water has seeped down the failure plane from the overlying stratified sands.

EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

The object of this form is to enable a comprehensive study of the soil to be made by combining on one sheet all of the information obtained from the boring. An explanation of the various columns of the report follows.

ELEVATION AND DEPTH

This column gives the elevation and depth of boundaries between the various soil strata. The elevation is referred to the datum shown in the general heading.

WATER CONDITIONS

In this column the water level in the casing at the time of boring or the water table in the ground, determined by a series of observations in a piezometer or standpipe, is indicated to scale by a horizontal line with the symbol W.L. or W.T. above the line. A notation of any complicated groundwater conditions will be made in this column.

DESCRIPTION

A description of the soil, using standard terminology, is contained in this column. The consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

Consistency	U-Strength Tons/sq. ft.
Very soft	0.03 to 0.25
Soft	0.25 to 0.5
Firm	0.5 to 1.0
Stiff	1.0 to 2.0
Very stiff	2.0 to 4.0
Hard	over 4.0

Relative Density	Standard Penetration Resistance. Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

STRATIGRAPHIC PLOT

The stratigraphic plot follows the standard symbols of the National Research Council, Canada.

ELEVATION SCALE

The information in all columns is plotted to a true elevation scale which is shown in this column.

GRAPHS

The main body of the report forms a graph which is used to plot to correct elevation the important soil properties which are obtained through field and laboratory tests. The scales and symbols for the plotting are shown at the head of the column.

OTHER TESTS

In this column are shown, by symbol, the other field or laboratory tests which have been performed on the soil and for which the results have not been plotted on the above graph.

SAMPLES

The first three columns describe the condition, type and number of each sample obtained from the boring. The location and extent of each sample is plotted to scale.

In the last column is shown the penetration resistance in blows of 4200 inch-pounds required to drive one foot of the sampler into the ground. When a 2 inch Drive Sampler is used the result obtained is termed the "Standard Penetration Resistance".

GEOCON

30M11-173
GEOCRES No.

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T 7489 BORING # 1 DATUM CITY OF TORONTO CASING –
BORING DATE MAR 22, 1963 REPORT DATE MAR. 27, 1963 COMPILED BY A.E.L. CHECKED BY [illegible]
SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION
- DISTURBED
- FAIR
- GOOD
- LOST

SAMPLE TYPES
- A.S. - AUGER SAMPLE
- S.T. - SLOTTED TUBE
- W.S. - WASHED SAMPLE
- D.O. - DRIVE-OPEN
- D.F. - DRIVE-FOOT VALVE
- C.S. - CHUNK SAMPLE
- F.S. - FOIL SAMPLE
- S.O. - SLEEVE-OPEN
- S.F. - SLEEVE-FOOT VALVE
- T.O. - THIN WALLED OPEN
- R.C. - ROCK CORE

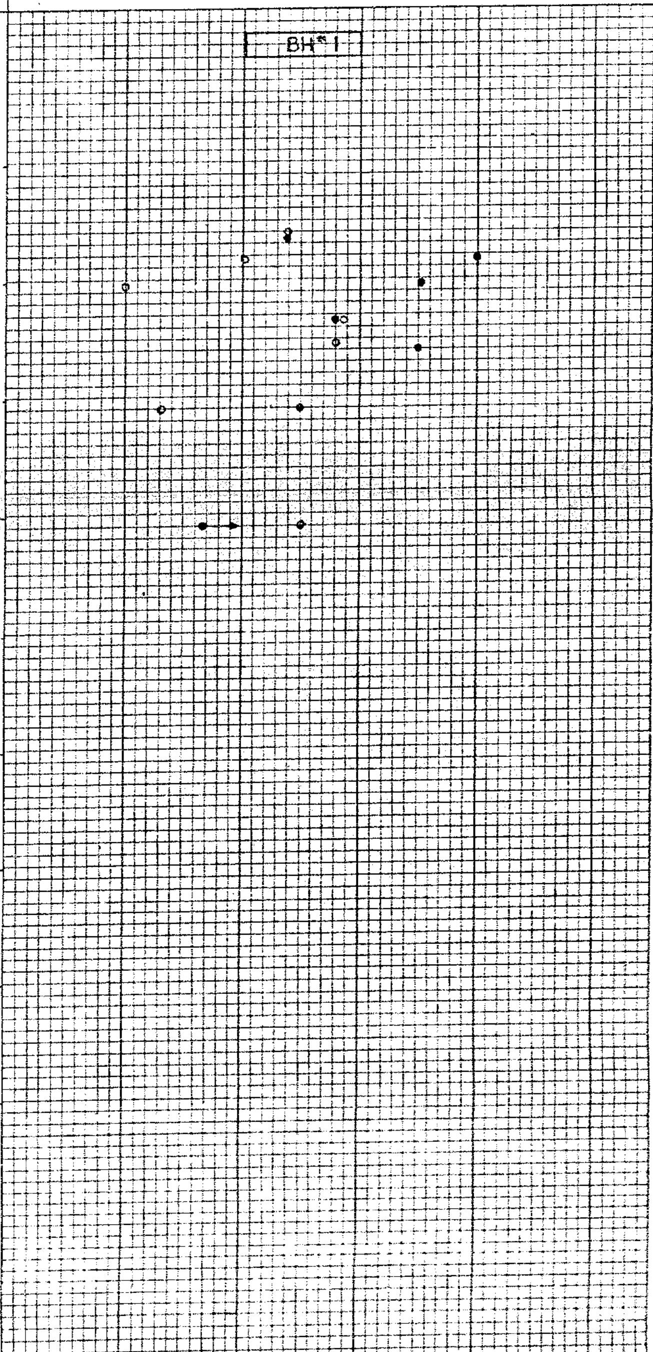
ABBREVIATIONS
- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- Qc - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW
- γ - WET UNIT WEIGHT
- K - PERMEABILITY
- C - CONSOLIDATION
- WL - WATER LEVEL IN CASING
- WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION
329.0 / 0.0	OBSERVATION PIPE	GROUND LEVEL
		LUMPS OF CLAYEY SILT FILL
326.0 / 3.0		ORGANIC TOPSOIL
4.0		VERY STIFF TO HARD GREY CLAYEY SILT
309.0 / 20.0	BOREHOLE DRY MAR 22, 1963	VERY DENSE DARK GREY (SANDY) SILT
299.5 / 29.5		VERY DENSE YELLOW-BROWN FINE SAND
285.0 / 44.0		VERY DENSE GREY FINE SAND
280.0 / 49.0		END OF HOLE

UNCONFINED COMPRESSIVE STRENGTH ● TONS/SQ.FT. (1.0, 2.0, 3.0, 4.0, 5.0)
WATER CONTENT W% ○ NAT. □ Lw △ Pw (10, 20, 30, 40, 50)
DYNAMIC PENETRATION TEST BLOWS PER FOOT

ELEVATION SCALE: 330, 320, 310, 300, 290, 280



SAMPLES

OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
		CS.	1	–
γ = 130		2" SO.	2	13
γ = 131		SO.	3	31
γ = 143		SO.	4	61
γ = 125		SO.	5	48
γ = 132		SO.	6	37
γ = 144		SO.	7	59
γ = 132		SO.	8	>100
		AS.	9	–
		SO.	10	>100
		AS.	11	–

GEOCON

30M11-173

GEOCRES No.

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T 7489 BORING # 2 DATUM CITY OF TORONTO CASING —
BORING DATE MAR. 25, 1963 REPORT DATE MAR. 27, 1962 COMPILED BY AEL CHECKED BY
SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SAMPLE TYPES

- A.S. - AUGER SAMPLE
- S.T. - SLOTTED TUBE
- W.S. - WASHED SAMPLE
- D.O. - DRIVE-OPEN
- D.F. - DRIVE-FOOT VALVE
- C.S. - CHUNK SAMPLE
- F.S. - FOIL SAMPLE
- S.O. - SLEEVE-OPEN
- S.F. - SLEEVE-FOOT VALVE
- T.O. - THIN WALLED OPEN
- R.C. - ROCK CORE

ABBREVIATIONS

- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- Qc - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW
- γ - WET UNIT WEIGHT
- K - PERMEABILITY
- C - CONSOLIDATION
- WL - WATER LEVEL IN CASING
- WT - WATER TABLE IN SOIL

UNCONFINED COMPRESSIVE STRENGTH • TONS / SQ. FT. 1.0 2.0 3.0 4.0 5.0
WATER CONTENT W% O NAT. □ Lw △ Pw 10 20 30 40 50
DYNAMIC PENETRATION TEST BLOWS PER FOOT

BH #2

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
327.4 / 0.0		GROUND LEVEL	330					
		LUMPS OF CLAYEY SILT FILL						
324.4 / 3.0		VERY STIFF GREY CLAYEY SILT		γ=128	GOOD	2" TO	1	HYD. PUSH
			320	γ=131 3Qc	FAIR	- TO	2	"
					FAIR	- TO	3	"
313.4 / 14.0		VERY DENSE DARK GREY (SANDY) SILT			DISTURBED	- 50	4	>100
			310		DISTURBED	- DO	5	>100
					LOST	- AS	6	-
304.4 / 23.0	WL. @ ELEV. 283 (ESTIMATED) MAR. 26 1963	VERY DENSE YELLOW BROWN FINE TO MEDIUM SAND	300		DISTURBED	- DO	7	>100
					DISTURBED	- DO	8	>100
					DISTURBED	- DO	9	>100
			290		DISTURBED	- DO	10	40
283.4 / 44.0	▽	DENSE TO VERY DENSE GREY FINE TO MEDIUM SAND			DISTURBED	- DO	11	70
			280		DISTURBED	- DO	12	59
					DISTURBED	- AS	13	-
273.4 / 54.0		END OF HOLE	270					

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

30M11-173

CONTRACT T7482 BORING # 3 DATUM CITY OF TORONTO CASING –
BORING DATE MAR. 26, 1963 REPORT DATE MAR. 29, 1963 COMPILED BY A.E.L. CHECKED BY
SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION
- DISTURBED
- FAIR
- GOOD
- LOST

SAMPLE TYPES
- A.S. - AUGER SAMPLE
- S.T. - SLOTTED TUBE
- W.S. - WASHED SAMPLE
- D.O. - DRIVE-OPEN
- D.F. - DRIVE-FOOT VALVE
- C.S. - CHUNK SAMPLE
- F.S. - FOIL SAMPLE
- S.O. - SLEEVE-OPEN
- S.F. - SLEEVE-FOOT VALVE
- T.O. - THIN WALLED OPEN
- R.C. - ROCK CORE

ABBREVIATIONS
- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- Qc - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW
- γ - WET UNIT WEIGHT
- K - PERMEABILITY
- C - CONSOLIDATION
- WL - WATER LEVEL IN CASING
- WT - WATER TABLE IN SOIL

WATER CONTENT W% — O NAT. □ Lw △ Pw
DYNAMIC PENETRATION TEST BLOWS PER FOOT

BH # 3

Water conditions: PIEZOMETER; WL @ ELEV. 375.7 MAR. 29, 1963; BENTONITE PLUG

ELEVN. / DEPTH	DESCRIPTION
406.7 / 0.0	GROUND LEVEL; 0.5 TOPSOIL
	DENSE TO VERY DENSE BROWN FINE SAND (FEW PEBBLES)
387.7 / 19.0	VERY DENSE GREY SANDY TO CLAYEY SILT TILL
379.7 / 27.0	VERY DENSE BROWN TO GREY STRATIFIED GRAVELLY TO CLAYEY SAND
368.7 / 38.0	HARD GREY LAMINATED SILTS AND CLAYS
346.7 / 60.0	END OF HOLE

SAMPLES

TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
2" DO.	1	55
DO.	2	>100
DO.	3	>100
DO.	4	>100
DO.	5	>100
DO.	6	>100
DO.	7	>100
DO.	8	>100
TO.	9	>100
SO.	10	>100
SO.	11	>100
SO.	12	>100
SO.	13	>100

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

30m11-173
GEOCRES No.

CONTRACT T7489 BORING # 4 DATUM GEODETIC CASING –
BORING DATE APR. 18 1963 REPORT DATE APR. 18 1963 COMPILED BY AEL CHECKED BY
SAMPLER HAMMER WT. – LBS. DROP – INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SAMPLE TYPES

- A.S. - AUGER SAMPLE
- S.T. - SLOTTED TUBE
- W.S. - WASHED SAMPLE
- D.O. - DRIVE-OPEN
- D.F. - DRIVE-FOOT VALVE
- C.S. - CHUNK SAMPLE
- F.S. - FOIL SAMPLE
- S.O. - SLEEVE-OPEN
- S.F. - SLEEVE-FOOT VALVE
- T.O. - THIN WALLED OPEN
- R.C. - ROCK CORE

ABBREVIATIONS

- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- QC - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW
- γ - WET UNIT WEIGHT
- K - PERMEABILITY
- C - CONSOLIDATION
- WL - WATER LEVEL IN CASING
- WT - WATER TABLE IN SOIL

SOIL PROFILE | WATER CONTENT W% — O NAT. □ Lw △ Pw | DYNAMIC PENETRATION TEST BLOWS PER FOOT | OTHER TESTS | SAMPLES (CONDITION, TYPE, NUMBER, PENETRATION RESISTANCE BLOWS/FT.)

AH # 4

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	REMARKS	TYPE	NUMBER	PENETRATION RESISTANCE
369.7 / 0.0		GROUND LEVEL	370				
		WET BROWN SILTY FINE TO MEDIUM SAND			AS.	1	–
363.7 / 6.0		GREY CLAYEY SILT			AS.	2	–
359.4 / 10.3		END OF HOLE	360		AS.	3	–

AH # 5

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	REMARKS	TYPE	NUMBER	PENETRATION RESISTANCE
369.1 / 0.0		GROUND LEVEL	370				
		WET BROWN FINE TO MEDIUM SAND					
367.1 / 2.0				MOIST GREY FISSURED CLAYEY SILT			
3.0		DRY GREY CLAYEY SILT					
362.1 / 7.0		END OF HOLE	360				

AH # 6

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	REMARKS	TYPE	NUMBER	PENETRATION RESISTANCE
371.1 / 0.0		GROUND LEVEL	370				
		WET BROWN FINE TO MEDIUM SAND WITH PEBBLES			AS.	1	–
366.1 / 5.0		WET GREY CLAYEY TO SILTY SAND		ENCOUNTERED FLOWING WATER AT 8 FT.	AS.	2	–
361.1 / 10.0		GREY CLAYEY SILT	360		AS.	3	–
11.5		END OF HOLE					

AH # 7 (INCLINED HOLE)

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	REMARKS	TYPE	NUMBER	PENETRATION RESISTANCE
351.3 / 0.0		GROUND LEVEL	350				
		DRY GREY CLAYEY SILT			AS.	1	–
					AS.	2	–
341.3 / 10.0				WET GREY CLAYEY SILT PROBABLY SLIP SURFACE			
11.0		DRY GREY CLAYEY SILT	340		AS.	3	–
337.3 / 14.0		END OF HOLE					

AH # 8

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	ELEVATION SCALE	REMARKS
347.6 / 0.0		GROUND LEVEL	350	
		GREY CLAYEY SILT.		
337.6 / 10.0		END OF HOLE	340	ENCOUNTERED WATER AT 7 FT. PROBABLY SLIP SURFACE

GEOCON

30m 11 - 173

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT I7489 PEN. TEST [redacted] DATUM CITY OF TORONTO CASING —

BORING DATE MAR. 26, 1963 REPORT DATE MAR. 27, 1963 COMPILED BY AEL CHECKED BY

SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SAMPLE TYPES

- A.S. - AUGER SAMPLE
- S.T. - SLOTTED TUBE
- W.S. - WASHED SAMPLE
- D.O. - DRIVE-OPEN
- D.F. - DRIVE-FOOT VALVE
- C.S. - CHUNK SAMPLE
- F.S. - FOIL SAMPLE
- S.O. - SLEEVE-OPEN
- S.F. - SLEEVE-FOOT VALVE
- T.O. - THIN WALLED OPEN
- R.C. - ROCK CORE

ABBREVIATIONS

- V - IN-SITU VANE TEST
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- Qc - TRIAXIAL CONSOLIDATED QUICK
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- S - TRIAXIAL SLOW
- γ - WET UNIT WEIGHT
- K - PERMEABILITY
- C - CONSOLIDATION
- WL - WATER LEVEL IN CASING
- WT - WATER TABLE IN SOIL

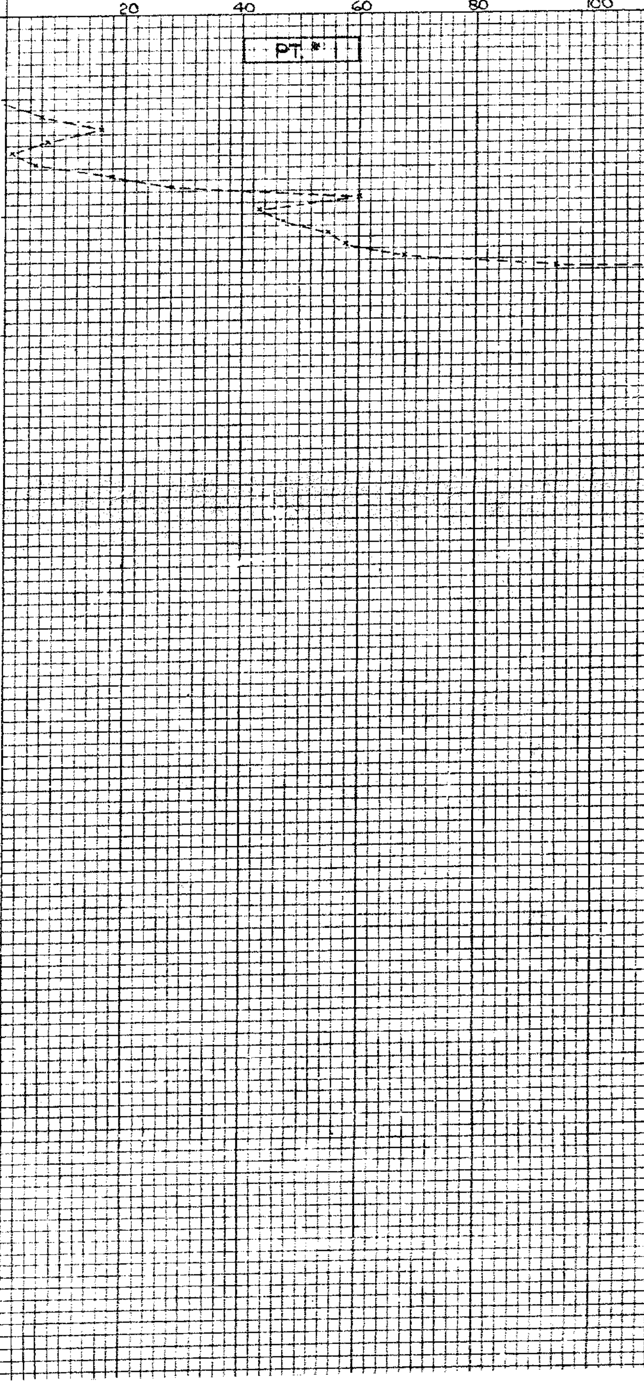
SOIL PROFILE

ELEVN. / DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT
329.7 / 0.0		GROUND LEVEL / LUMPS CLAY FILL	
1.0		PROBABLY FIRM TO STIFF GREY CLAYEY SILT	
323.7 / 6.0		PROBABLY VERY STIFF GREY CLAYEY SILT	
315.7 / 14.0		END OF PEN. TEST	

ELEVATION SCALE: 330, 320, 310

WATER CONTENT W% — O NAT. □ Lw △ Pw

DYNAMIC PENETRATION TEST BLOWS PER FOOT: 20, 40, 60, 80, 100

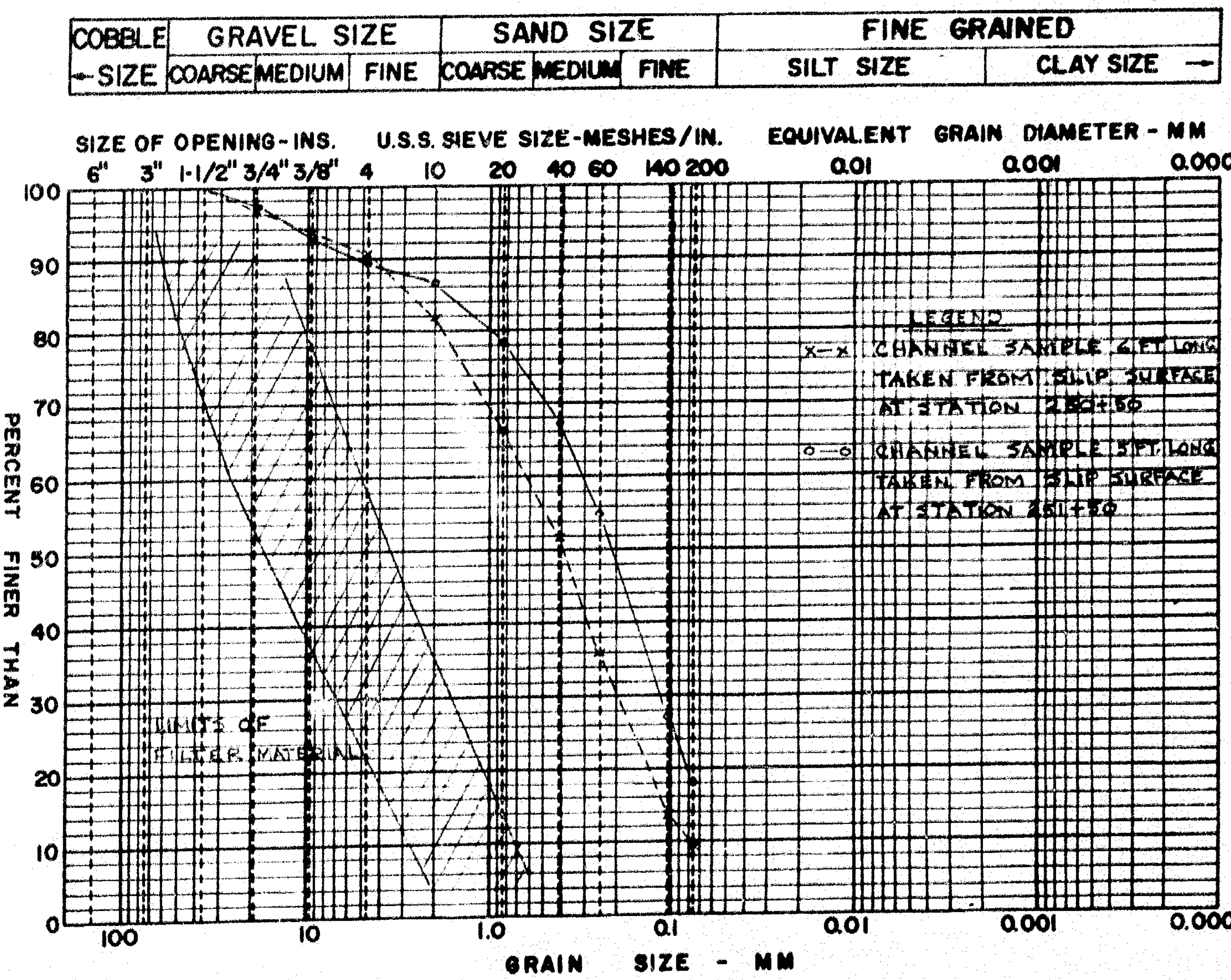


OTHER TESTS

SAMPLES: CONDITION | TYPE | NUMBER | PENETRATION RESISTANCE BLOWS/FT.

APPENDIX II

Figures - Laboratory Testing
Drawing T7489-2 Remedial Design



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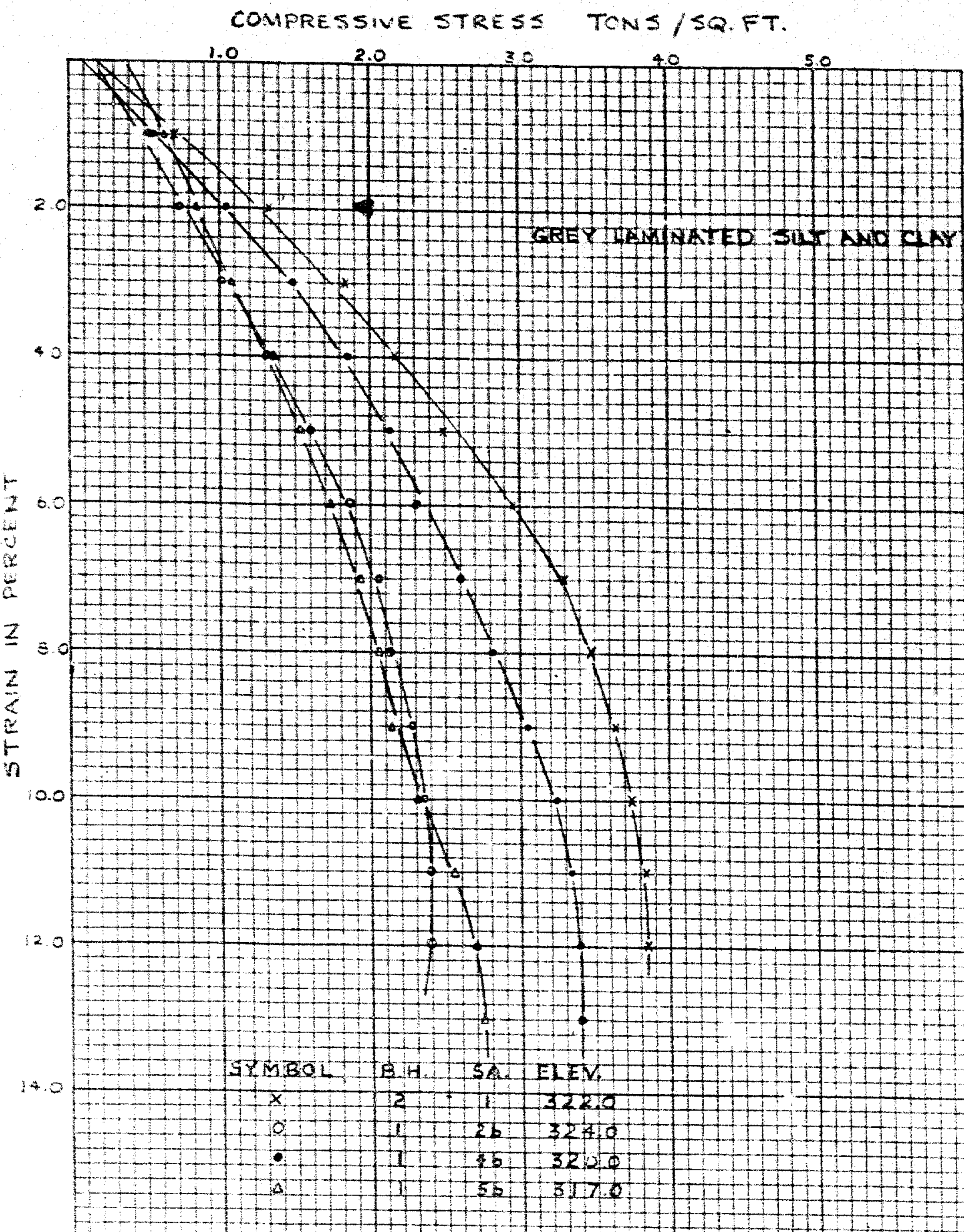
M.I.T. GRAIN SIZE SCALE

GRAIN SIZE DISTRIBUTION

STRATIFIED GRAVELLY TO SILTY SAND

APPENDIX II
FIGURE I
PROJECT T7489

UNCONFINED COMPRESSION TESTS TYPICAL STRESS-STRAIN CURVES	APPENDIX II FIGURE 2 PROJECT T 7489



SYMBOL	B.H.	SA.	ELEV.
×	2	1	322.0
○	1	2b	324.0
●	1	4b	320.0
△	1	5b	317.0

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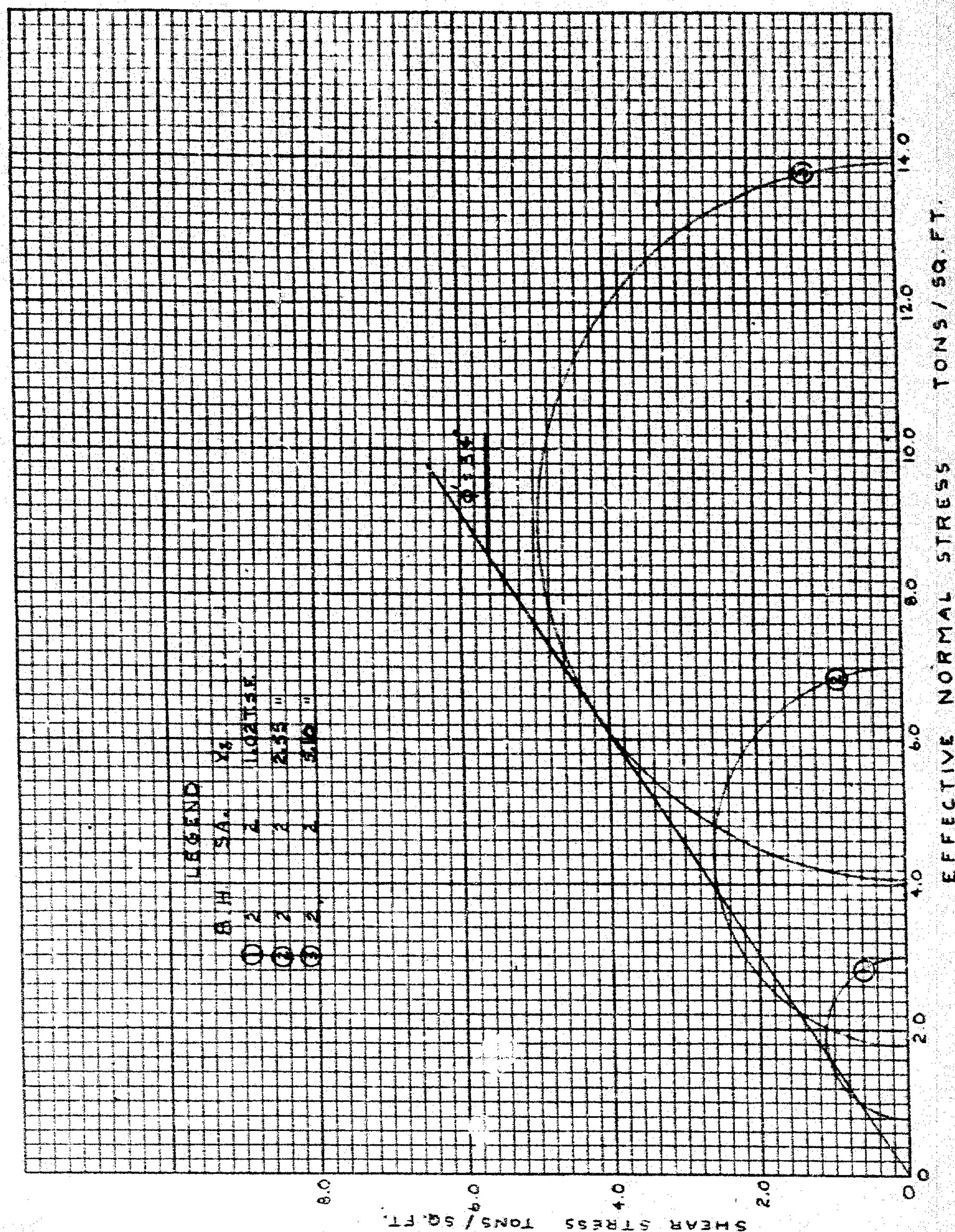
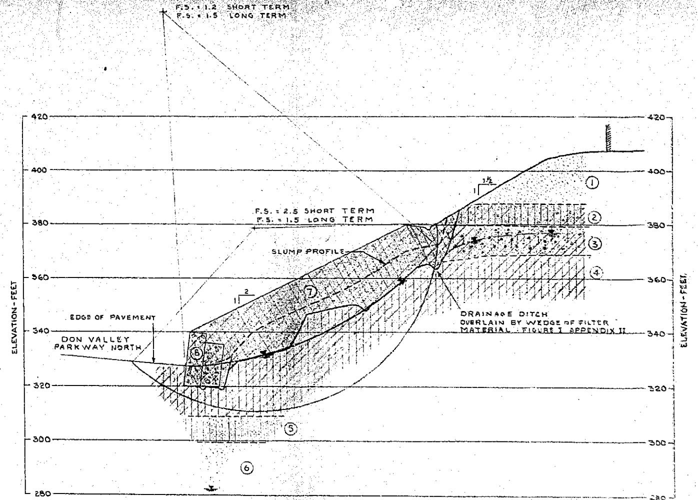
CONSOLIDATED UNDRAINED TRIAXIAL TESTS
WITH
PORE PRESSURE MEASUREMENTS

APPENDIX II
FIGURE 3
PROJECT T7489

GREY LAMINATED SILT AND CLAY



GEOCON



TYPICAL SECTION
REPAIRED SLOPE WITH CRIB WALL
HORIZ. AND VERT. SCALE 1" = 20'-0"

ENGINEERING PROPERTIES USED IN DESIGN

① DENSE TO VERY DENSE, BROWN FINE SAND
γ_T = 130 LBS./CU.FT. $\phi = 40°$

② VERY DENSE GREY, SANDY TO CLAYEY SILT TILL
γ_T = 135 LBS./CU.FT. $\phi = 45°$

③ VERY DENSE, STRATIFIED GRAVELLY TO SILTY SAND
γ_T = 130 LBS./CU.FT. γ' = 68 LBS./CU.FT. $\phi = 40°$

④ VERY STIFF TO HARD LAMINATED SILT AND CLAY γ_T = 135 LB. CU.FT. (AVERAGE)
COHESION ALONG FAILURE SURFACE = 560 LBS./SQ.FT. $\phi' = 34°$
COHESION OUTSIDE FAILURE SURFACE = 3000 LBS./SQ.FT.

⑤ VERY DENSE DARK GREY SANDY SILT
γ_T = 135 LBS./CU.FT. $\phi = 40°$

⑥ VERY DENSE FINE SAND γ_{DRY} = 110 LBS./CU.FT.
$\phi = 40°$ γ_{WET} = 130 LBS./CU.FT.

⑦ COMPACTED, FREE DRAINING GRANULAR FILL
γ_T = 125 LBS./CU.FT. $\phi = 34°$

⑧ COMPACTED SAND AND GRAVEL FILL IN CRIB WALL
γ = 125 LBS./CU.FT. $\phi = 40°$

NOTES -

1) GROUND WATER LEVEL, ASSUMED AS SHOWN, ▽
2) FACTORS OF SAFETY COMPUTED WITH CRIB WALL IN PLACE
3) THE SMALL BLOCK OF CLAYEY SILT MAY BE LEFT IN PLACE AS A WORKING PLATFORM OR COMPLETELY REMOVED. IF REMOVED, THE FACTOR OF SAFETY INCREASES TO 1.5. IF LEFT IN PLACE, THE BLOCK SHOULD BE DRAINED BY DITCHES BACKFILLED WITH SAND, EXTENDING DOWN THE SLOPE TOWARDS THE CRIB WALL.

30m11-173
GEOCRS No.

REFERENCE	
DWG. NO.	DESCRIPTION
	CONTOUR MAP PREPARED IN 1956 BY HUNTING SURVEY CORPORATION LTD. FOR DON VALLEY PARKWAY DEVELOPMENT

FENCO-HARRIS, CONSULTING ENGINEERS
TORONTO ONTARIO

DON VALLEY PARKWAY AND MINTON PLACE
TORONTO ONTARIO

REMEDIAL DESIGN

GEOCON LTD

DATE: APRIL 24, 1963 SCALE AS SHOWN

MADE	CHKD	APPD	NO.
RAM	R.W.Q.	M.A.J.M.	T 7489-2

GEOCON LTD

HEAD OFFICE
180 VALLÉE ST., MONTREAL 18, QUEBEC
TELEPHONE UN. 6-7632

DISTRICT OFFICES

14 HAAS ROAD
REXDALE, TORONTO, ONT.
TEL. 244-6476

1425 WEST PENDER ST.
VANCOUVER 5, B.C.
TEL. MU. 1-8926

Rexdale, Ontario,
May 28th, 1963.

Fenco-Harris, Consulting Engineers,
1200 Yonge Street,
Toronto 12, Ontario.

Attention: Mr. M. C. Douglas, P. Eng.,
Project Manager.

Re: Addendum to Report,
Soil Conditions and Stability Studies,
Don Valley Parkway Slope at Minton Place,
Toronto, Ontario.

Dear Sirs:

Subsequent to the submission of our original report on the above investigation, dated April 29th, 1963, several meetings were held between representatives of the Roads Department of the Municipality of Metropolitan Toronto, Fenco-Harris and Geocon Ltd. At these meetings a number of additional possible remedial schemes for the slope were discussed as outlined in the letter dated May 2nd, 1963 from Fenco-Harris to the Municipality of Metropolitan Toronto. This addendum presents the results of our soil engineering studies on the following two schemes which seemed to merit additional consideration.

1) Trim the existing slope within the present right of way with a view to reducing the height of the crib wall below that proposed in our original report.

2) Purchase the two properties at the top of the slope and stabilize the slope without the aid of a retaining wall by reducing the overall slope angle.

The first scheme is a refinement of that originally proposed in our report dated April 29th, 1963 and is considered to be a positive remedial solution for this particular slope. The second scheme, although it has some apparent advantages over a crib wall solution, is subject to uncertainties from a long term stability point of view, based on currently available data. Dr. R. M. Hardy, Soils Consultant whom we have consulted as arranged with regard to this problem, agrees with our general approach and our conclusion that a crib wall solution is the most practical and positive remedial scheme for this particular slide. This addendum, therefore, discusses only the crib wall scheme in detail. However, the results of our computations on the other alternative studied are summarized on Drawing T7489-4.

It should be noted that the slide has extended itself by a series of slow slippages to the north and south of the original slide area, since our original report was submitted. In addition, the failure scarp has migrated up the slope a distance of between 5 and 10 feet. Because of the extent of the disruptions, it will now be necessary to excavate slump material from the entire length of the slope prior to placing the free draining granular backfill.

Recommended Alternative Scheme

Trim Top of Slope Within Present Right of Way

This scheme is a refinement of that proposed in our original report. For this scheme the upper part of the slope in the slide area would be cut back within the present right of way and flattened from 1 vertical to 1.5 horizontal to 1 vertical to 1.75 horizontal. In addition the bench would be lowered from elevation 380 to elevation 375 permitting a reduction in the height of the crib wall. The details of the scheme are shown on Drawing T7489-3.

From an engineering point of view, this scheme is considered to be as good as that given in our original report. In addition, it is understood that there would be some saving effected by reducing the crib wall height and the quantity of fill despite the difficulty of trimming the slope.

The following additional points are pertinent to the scheme:

1) It is recommended that all of the slump material be removed from all parts of the slope prior to placing the granular fill so that an adequate factor of safety against failure during construction is obtained.

2) It must be assumed that the clay in the unfailed portions of the slope has also softened and that the factor of safety against failure during construction may be quite low. It is recommended, therefore, that if this method is adopted, the softened material be removed as part of the remedial works. It is suggested that the decision as to what material should be removed be made by the Supervising Engineer.

3) It is recommended that the interceptor ditch extend to a minimum depth of 5 feet below the top of the laminated clay and silt stratum. The actual position of the ditch will have to be determined in the field during construction. It is probable, however, that the bottom of the ditch will be located between elevations 358 and 360.

4) It is recommended that the lower two feet of the interceptor ditch be coated with an impermeable, permanent lining which will permit rapid escape of the water which collects in the drain and therefore provide a minimum possibility for water to seep into the underlying clay. In addition, a perforated pipe should be installed in the drain to handle the flow.

5) In order to maintain the stability of the sands at the top of the slope, it is recommended that counterfort drains extend from the interceptor ditch up the slope beyond the till stratum as shown on Drawing T7489-3 and as discussed in the original report. These drains should be backfilled with the filter material shown on Figure 1 of Appendix II.

6) The counterfort drains are to be connected to a wedge of similar filter sand which is to be used to backfill the interceptor ditch. This wedge of filter sand should be at least 6 feet thick and may be built up in stages as a sloping filter as shown on Drawing T7489-3.

7) The granular soil trimmed from the top of the slope may be used as fill provided a thick blanket of free draining granular fill is placed directly above the clay and connects with the drains at the base of the crib wall and provided it is placed at least 4 feet from the surface of the slope.

8) The excavation for the crib wall should extend at least 6 feet below the shoulder of the existing and future roadway. The crib wall may be founded directly on the base of this excavation, or alternatively on a well compacted layer of free draining granular fill not exceeding 2 feet in thickness. Using this latter scheme, the crib wall itself would extend 4 feet below final grade of the shoulder and would bear on 2 feet of granular fill.

9) The granular fill at the front of the crib wall next to the shoulder of the road should be well compacted so that full passive resistance can be mobilised under small yield.

10) Positive drainage must be provided at the base of the granular fill beneath the retaining wall.

11) It is recommended that construction be carried out during summer conditions and that any clay which is softened by rain water during construction be allowed to dry out or be scraped off the slope prior to placing the sand fill.

We trust that this addendum presents sufficient information to permit you to proceed with the remedial measures. Please insert this addendum in the copies of the report dated April 29th, 1963, which has already been submitted to you. Should you require any further information, or if we can be of assistance otherwise, please give us a call.

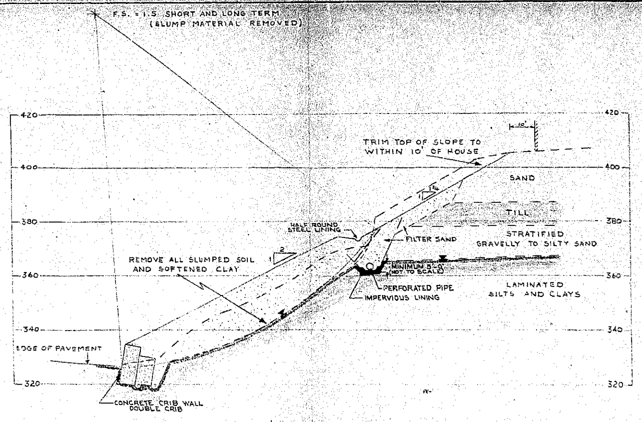
Yours very truly,

GEOCON LTD

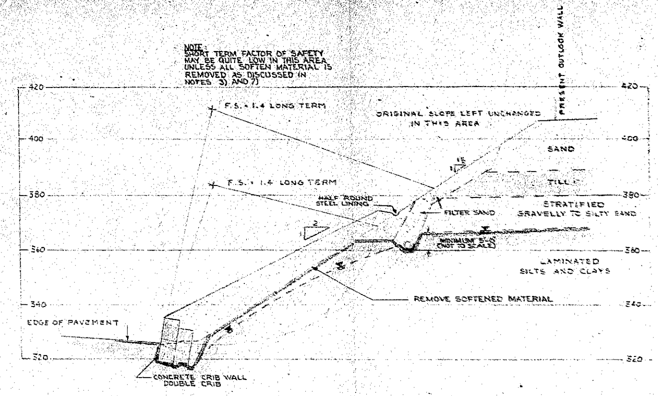
R. M. Quigley

RMQ/dw
T7489

R. M. Quigley, P. Eng.,
Senior Soils Engineer.



TRIM TOP OF SLOPE WITHIN PRESENT RIGHT OF WAY
PARKWAY CHAINAGE 249 + 25 TO 250 + 50
FAILED SECTION OF SLOPE



INSUFFICIENT SPACE TO TRIM TOP OF SLOPE
PARKWAY CHAINAGE 250+50 NORTH
NORTH OF MAIN FAILURE AREA

RECOMMENDED ALTERNATIVE

TRIM TOP OF SLOPE WITHIN PRESENT RIGHT OF WAY
ADD CRIB WALL AND FILL AT TOE OF SLOPE

1) THE PURPOSE OF THIS ALTERNATE IS TO REDUCE THE QUANTITY OF FILL AND THE HEIGHT OF CRIB WALL WITH RESPECT TO THE ORIGINAL SCHEME.
2) IT IS RECOMMENDED THAT THE SLUMP MATERIAL BE REMOVED TO OBTAIN AN ADEQUATE FACTOR OF SAFETY AGAINST FAILURE DURING CONSTRUCTION.
3) IT MUST BE ASSUMED THAT THE CLAY IN THE UNFAILED PORTION OF THE SLOPE HAS ALSO SOFTENED. SEE NOTE 7) BELOW.
4) NOTE THAT THE CONFIGURATION OF THE SLOPE IS DIFFERENT IN THE SLIDE AREA AND THE UNFAILED AREA AS SHOWN ON THE TWO SECTIONS.
5) COUNTERFORT DRAINS SHOULD EXTEND UP THE SLOPE TO THE TOP SAND LAYER AS DISCUSSED IN THE SOILS REPORT.
6) THE GRANULAR SOIL TRIMMED FROM THE TOP OF THE SLOPE MAY BE USED AS FILL PROVIDED A THICK BLANKET OF FREE DRAINING FILL IS PLACED DIRECTLY ABOVE THE CLAY AND CONNECTS WITH THE DRAINS BELOW THE CRIB WALL.
7) IN THE UNFAILED AREA, ALL SOD, TOPSOIL AND SOFTENED CLAY MUST BE REMOVED PRIOR TO PLACING THE FILL.
8) IT IS RECOMMENDED THAT THE DRAINAGE DITCH BE COATED WITH AN IMPERVIOUS PERMANENT LINING TO PREVENT SOFTENING OF THE UNDERLYING CLAY.

REFERENCE	
DWG NO.	DESCRIPTION
T 7489	GEOCON LTD. REPORT ON SOIL CONDITIONS AND STABILITY STUDIES : DON VALLEY PARKWAY SLOPE AT MINTON PLACE DATED APRIL 29, 1963.

FENCO-HARRIS, CONSULTING ENGINEERS
TORONTO ONTARIO

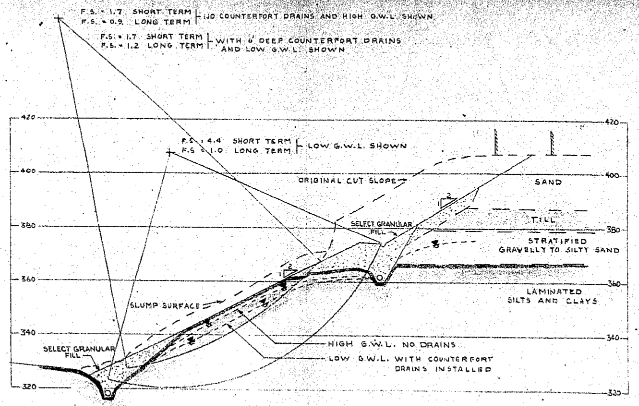
DON VALLEY PARKWAY AND MINTON PLACE
TORONTO ONTARIO

RECOMMENDED ALTERNATIVE SCHEME

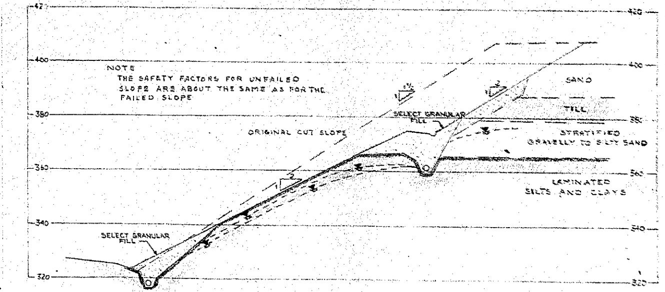
GEOCON LTD

DATE MAY 8, 1963 SCALE 1" = 20'-0"

MADE	CHKD	APPD	NO.
RAM.	RHO	HATM	T7489-3



EXPROPRIATE AND CUT BACK TOP OF SLOPE
FAILED SECTION OF SLOPE



EXPROPRIATE AND CUT BACK TOP OF SLOPE
UNFAILED SECTION OF SLOPE

SUGGESTED ALTERNATIVE – NOT APPLICABLE

EXPROPRIATE ADJACENT PROPERTIES AND CUT BACK UPPER SLOPE
TRIM ALL SLOPES TO 2 HORIZONTAL TO 1 VERTICAL

1) THE AIM OF THIS ALTERNATE IS TO ELIMINATE ALL FILL AND THE CRIB WALL, IF POSSIBLE

2) THE CONFIGURATION OF THE SLOPE IS THE SAME THROUGHOUT.

3) IT MUST BE ASSUMED THAT THE CLAY HAS SOFTENED IN THE UNFAILED PORTION OF SLOPE. THE FACTORS OF SAFETY SHOWN WILL THEREFORE APPLY TO ALL AREAS OF THE SLOPE.

4) TRIMMING THE LOWER SLOPE MARKEDLY INCREASES THE SHORT TERM FACTOR OF SAFETY OF THE BLOCK OF SLUMPED SOIL. THE LONG TERM FACTOR OF SAFETY IS NOT SUFFICIENT, HOWEVER, UNLESS EITHER COUNTERFORT DRAINS ARE INSTALLED OR A GRAVEL BLANKET IS PLACED ON THE SLOPE.

5) EVEN WITH COUNTERFORT DRAINS OR A GRAVEL BLANKET, THE COMPUTED LONG TERM STABILITY OF THE SLOPE AGAINST DEEPER FAILURE IS MARGINAL.

6) COUNTERFORT DRAINS ARE RECOMMENDED FOR THE UPPER SLOPE AS PREVIOUSLY DISCUSSED.

7) IT IS RECOMMENDED THAT THE DRAINAGE DITCH BE COATED WITH AN IMPERVIOUS LINING TO PREVENT SOFTENING OF THE UNDERLYING CLAY.

SPECIAL NOTE

IN VIEW OF THE HISTORY OF RAPID SOFTENING IT IS NOT RECOMMENDED THAT THIS SCHEME BE USED ON THIS PARTICULAR SLOPE FOR REASONS GIVEN IN THE SOILS REPORT

REFERENCE	
DWG. NO.	DESCRIPTION
T 7489	GEOCON LTD. REPORT ON SOIL CONDITIONS AND STABILITY STUDIES - DON VALLEY PARKWAY SLOPE AT MINTON PLACE. DATED APRIL 29, 1963

FENCO-HARRIS, CONSULTING ENGINEERS
TORONTO ONTARIO
DON VALLEY PARKW[illegible] AND MINTON PLACE
TORONTO ONTARIO
SUGGESTED ALTERNA[illegible]VE – NOT APPLICABLE

GEOCON LTD

DATE MAY 8, 1963 SCALE 1" = 20'-0"

MADE	CHKD	APP'D	NO.
R.A.M.	R.H.Q.	M.A.M.	T 7489 - 4

DOCUMENT MICROFILMING IDENTIFICATION.

G.1-30 SEPT. 1976

GEOCRES No. 30M11-173

DIST. 6 REGION CENTRAL

W.P. No.

CONT. No.

W. O. No.

STR. SITE No.

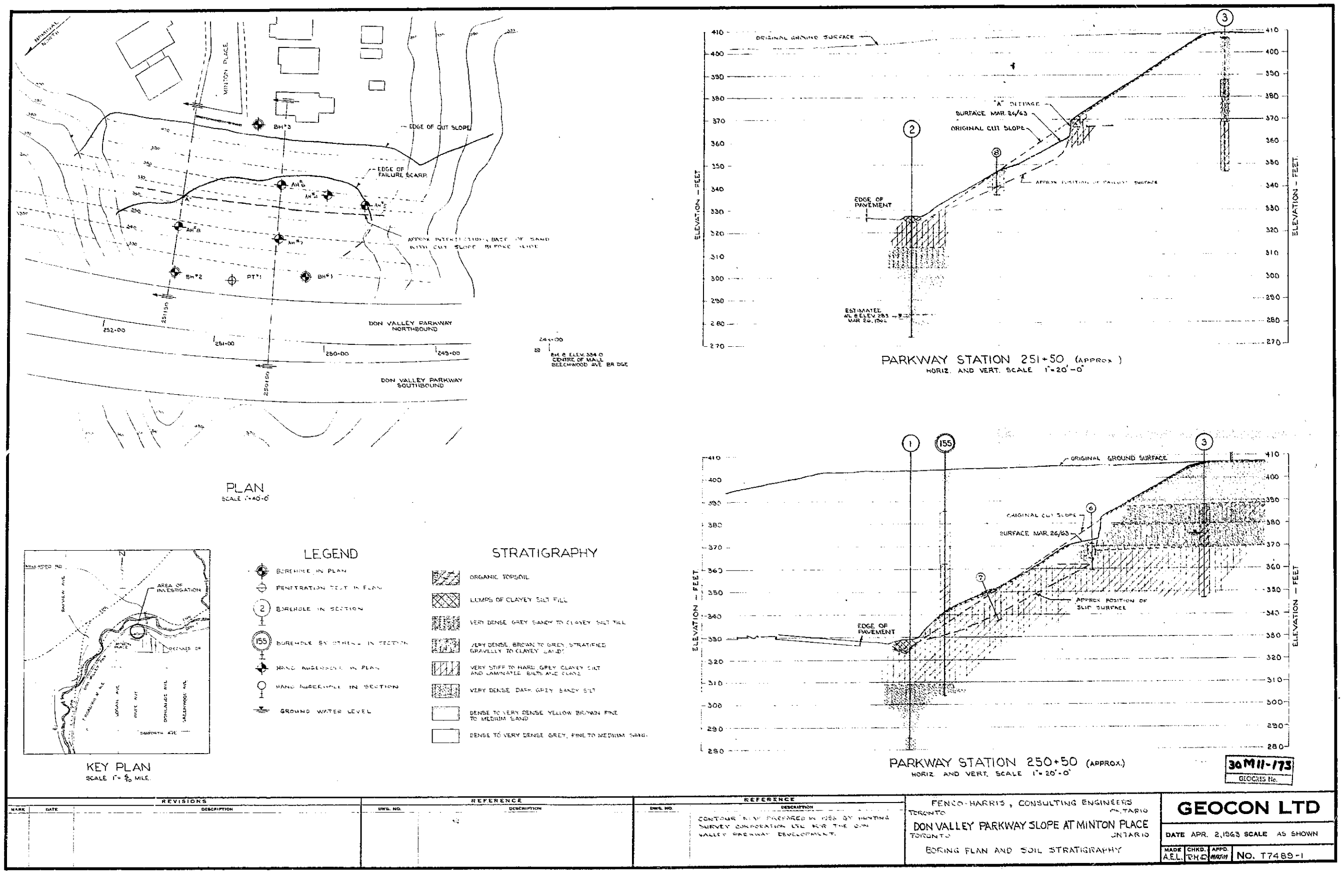
HWY. No.

LOCATION DON VALLEY PARKWAY AT MINTON PLACE

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 1

REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE MICROFILMED

SOME DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENTS


PLAN
SCALE 1"=40'-0"
MINTON PLACE
EDGE OF CUT SLOPE
EDGE OF FAILURE SCARP
DON VALLEY PARKWAY NORTHBOUND
DON VALLEY PARKWAY SOUTHBOUND
KEY PLAN
LEGEND
BOREHOLE IN PLAN
BOREHOLE IN SECTION
GROUND WATER LEVEL
STRATIGRAPHY
ORGANIC TOPSOIL
LUMPS OF CLAYEY SILT FILL
DENSE TO VERY DENSE YELLOW BROWN FINE TO MEDIUM SAND
ORIGINAL GROUND SURFACE
EDGE OF PAVEMENT
ORIGINAL CUT SLOPE
ELEVATION - FEET
PARKWAY STATION 251+50 (APPROX.)
HORIZ. AND VERT. SCALE 1"=20'-0"
PARKWAY STATION 250+50 (APPROX.)
HORIZ. AND VERT. SCALE 1"=20'-0"
30M11-173
GEOCRES No.
REVISIONS
REFERENCE
DWG. NO.
DESCRIPTION
FENCO-HARRIS, CONSULTING ENGINEERS
TORONTO ONTARIO
DON VALLEY PARKWAY SLOPE AT MINTON PLACE
TORONTO ONTARIO
BORING PLAN AND SOIL STRATIGRAPHY
GEOCON LTD
DATE APR. 2, 1963 SCALE AS SHOWN
MADE A.E.L. CHKD. R.H.C.
NO. T7489-1