

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 31 G5-116

W.P. No. _____

CONT. No. _____

W. O. No. 3-237

STR. SITE No. _____

HWY. No. _____

LOCATION BRIDGE OVER RIDEAU
RIV.,

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

NONE

REMARKS: _____

BA. 1947

E. M. PETO ASSOCIATES LIMITED

1287 Caledonia Road,
Toronto 19, Ontario.
789 - 1126

Our Job Number 64191

October 23rd, 1964.

The City of Ottawa,
c/o M. M. Dillon & Co. Ltd.,
Room 202,
251 Bank Street,
Ottawa, Ontario.

3165-116

GEOCREs No.

STRUCTURE SITE No. 3-2.37

Gentlemen:

Re: Soil Foundation Investigation
Heron Road Bridge Project
Part I - Bridge over Rideau River
Colonel By Drive and Rideau Canal.

We respectfully submit our report on the foundation conditions along the strip covered by this project.

The work described herein was authorized by the Corporation of the City of Ottawa in July, 1964. The investigation included the proposed bridge over the Rideau River and Canal with the approaches, together with the Vincent Massey Interchange at Riverside Drive

The soil conditions consisted of a limestone bedrock overlain by a preconsolidated silty sand till which in turn was covered by sensitive grey and grey brown marine clay. In the vicinity of the Rideau River, the original till was largely eroded, and here the old till and bedrock were covered by fluvial sands and gravels. These were subsequently covered by the till now seen to arise to the west and east of the present river. Recent compact fill was evident between the Rideau River and the Canal.

The average ground water level in the area nearest the Rideau Canal was at elevation 231 approximately, dropping to elevation 192, or the Rideau River. Further to the west the ground water table is at about elevation 245 and is artesian in effect at hole #25 where excavation has been carried out some time in the past.

The provision of foundations for the structure over the Rideau River and Canal presents a problem, since essentially an end bearing pile foundation is preferable in all areas beyond a spread footing foundation. However, in the area of holes #1 to 5, attempting to drive piles through the bouldery layers is not considered practicable, therefore, spread footings founded at least 5 feet below bed level, subject to scour requirements, is recommended.

In all other areas on this structure, excluding holes 2, 3, and 4, end bearing piles on bedrock are recommended. Driving these to refusal on bedrock will encounter varying degrees of difficulty, probably requiring the use of jacking to facilitate penetration of approximately 10 feet of dense sand or till overlying the bedrock.

In the area of holes 2, 3 and 4 spread footings directly on rock are recommended.

The use of end bearing piles founded on bedrock is recommended for the Vincent Massey structure where unusual driving difficulties are not anticipated.

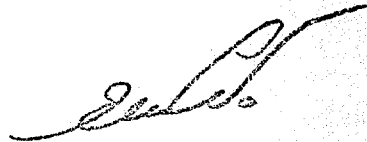
Generally embankments as proposed, do not present stability or settlement problems, with the exception of the excavation area in the vicinity of holes 24 and 25 where a berm is recommended before the construction of the main embankment.

The basic pavement construction recommended is 9 inches of reinforced concrete on 6 inches of Granular A base course. The inclusion of a 9 inch granular sub-grade is suggested in certain areas as a provisional item to overcome possible construction difficulties with the sub-grade.

We believe the report to be complete, however we shall be pleased to discuss any point you may wish to raise.

Yours very truly,

E. M. PETO ASSOCIATES LTD.

A handwritten signature in dark ink, appearing to read 'E. M. Peto', with a long, sweeping horizontal stroke extending to the right.

E. M. Peto, P. Eng.

EMP/dc

THE CITY OF OTTAWA

C/O M.M. DILLON & CO. LTD., CONSULTING ENGINEERS

SOIL FOUNDATION INVESTIGATION

FOR

BRIDGE OVER RIDEAU RIVER, COLONEL BY DRIVE
AND RIDEAU CANAL

E. M. PETO ASSOCIATES LIMITED,

1287 Caledonia Road,

Toronto 19, Ontario.

12 Copies: M.M. Dillon & Co. Ltd.
Ottawa, Ontario.

October 1964.
Job No. 64191

TABLE OF CONTENTS

Page Number

Covering Letter

Report

A.	Introduction	1
B.	Geology	2
C.	Bridge Structure	2
D.	Vincent Massey Structure	12
E.	Roadway	13

Tables I & II

Figures 1 to 9

Drawings 1 & 3

Borehole Logs

Drawing 2

A. INTRODUCTION

A.1 Authority: The work described in this report was authorized by the Corporation of the City of Ottawa on July 20th, 1964.

A.2 Scope of Work: The investigation has been divided into three parts:

- i) Bridge Structure over the Rideau River and Rideau Canal,
- ii) Interchange Structure between Riverside Drive and Heron Road, denoted as "Vincent Massey Interchange", and
- iii) Roadway (Pavement)

A.3 Fieldwork: The fieldwork was carried out during the period of July 27th to September 19th, 1964.

A.4 Laboratory Tests: A number of laboratory tests have been carried out to determine the characteristics of the deposits. The results of these tests are given in Tables and Figures, as follows:

Table I - Results of Mechanical Analyses

Table II - Results of the Atterberg Limit Tests

Figures 1 to 4 - Grading Envelopes

Figures 5 and 6 - Consolidation Tests Results

Figure 7 - Geotechnical Soil Properties, including plot of shear strength data.

A.5 General Information:

- i) The elevations given in the Figures, Drawings, Borehole Logs and in the text are based on elevations supplied by the Consulting Engineer.
- ii) A detailed soil stratification is given on the attached individual borehole logs. Simplified soil profiles, demonstrating the inferred stratigraphy, are given at the rear of the report.
- iii) The results of the Stability Analyses are given on Figure 8 for the West Abutment, and Figure 9 for the Roadway at about chainage 39+50.

B. GEOLOGY

The site is located in the vicinity of a major geological fault, known as the "Gloucester Fault"; a secondary fault crosses the area investigated at some point between the Rideau River and Colonel By Drive. Therefore, the bridge will be located in an area where a major geological faulting has taken place. The bedrock is basically a limestone of the Black River and Trenton Series.

C. BRIDGE STRUCTURE

C.1 General Observations:

- i) The proposed bridge will consist of two separate structures, each of three lanes; one for the East-bound and the other for the West-bound lane. The length of the structure between the centre lines of the abutments is:

For the West-bound line: 877.0 feet
For the East-bound line: 906.5 feet
- ii) The bridge will be composed of a series of simply supported spans between V-shaped piers. Thus, some differential settlement or movement can be safely tolerated by the structure.
- iii) The piers are all to be located outside the present water course, thus they do not restrict free water passage.
- iv) A new retaining wall is proposed at the west shore of the Rideau Canal; the Rideau Canal will be dredged to about elevation 223.5.

C.2 Soil Conditions: The soils along the proposed bridge alignment can be subdivided into:

1. Grey-brown very silty clay,
2. Grey, very silty clay (marine clay)
3. Till,
4. Silt and Clayey silt,
5. Fill, and
6. Sand and Gravel.

The apparent stratification is shown on the attached profile. Only a brief description of the main characteristics of each of the deposits is given in the following passages.

C2.1 Grey-brown very silty clay: This deposit, together with the grey very silty clay, forms the marine clay stratum at the site. It is sensitive to disturbance and has a rather high water content. Because of the varying amounts of silt and clay, the water content varies considerably. The Atterberg limits are:

Liquid limit - 33 to 55%
Plastic limit - 18 to 24%, and
Plasticity Index - 6 to 32%.

According to Casagrande's Classification System, this soil is a CI to CH type of clay, i.e. inorganic clays of medium to high plasticity.

Liquidity Indices varied between 0.4 and 0.8, therefore the natural water content was generally lower than the liquid limit of the soil.

According to the consolidation tests, this deposit as well as the underlying grey very silty clay, are pre-consolidated. The undrained shear strength varied between 900 and 1,700 lb./sq. ft. (See Figure 7)

The average values of densities are:

Bulk density - 112 lb/cu. ft.
Dry density - 82.5 lb/cu. ft.

C2.2 Grey very silty clay: The underlying grey very silty clay is much softer, with a lower shear strength. It was found above the till in the area between the Rideau River and the Rideau Canal, and west of the Rideau Canal.

The variation of natural water contents was even more pronounced than for the grey-brown very silty clay (1); the Atterberg limits were of similar range and therefore both deposits belong to the same group of soils. However, the Liquidity Indices, which varied between 0.1 and 1.4, indicate that in some instances, the soil was wetter than the Liquid limit.

Typical grading curves are given in Figure 2. Comparing these results with the grading envelope for the grey-brown very silty clay from Figure 1, it is apparent that they are similar; thus, these two layers are basically the same deposit.

The grey very silty clay material is also a pre-consolidated layer, but the average undrained shear strength is only about 900 lb/sq. ft. (see Figure 7).

The other values are:

Bulk density - 115 lb/cu. ft.

Dry density - 87 lb/cu. ft.

Shear parameters in terms of effective stresses:

Cohesive intercept $c' = 0$

Angle of internal friction $\phi' = 25^\circ$

The value of the angle of internal friction given above has been assumed and is based on the results of the previous investigations carried out in the vicinity of the present site, the information available from certain publications, and lastly on the measurement of the natural slopes on the west bank of the Rideau Canal. The value of $\phi' = 25^\circ$ is the average value which has been used in stability analyses presented in this report.

- C2.3 Till: The till deposit, classified as a silty sand till, was found west of the Rideau River.

The grading envelope is given in Figure 3.

It is evident that the density of the till varies considerably from area to area; it is compact to dense east of Rideau River (testhole #7), dense to very dense just west of the River (testholes 9 and 10), but varies from loose to dense close to the Rideau Canal (testholes 11, 12, 13, 14, 15 and 16).

The natural water contents of the various samples from this deposit are remarkably consistent, varying only slightly both vertically and horizontally, and ranging between 8 and 9%.

The bulk density of the deposit has been taken as 125 lb/cu. ft.

- C2.4 Silt and Clayey silt: This deposit was located only between the Rideau River and Rideau Canal and was a maximum of 5.5 feet thick (testhole 10). Some organic content was evident. The natural water contents varied between 22 and 35%. Due to the organic character of the deposit, it may undergo some longterm secondary settlement if surcharged.

- C2.5 Fill: The area between the Rideau River and the Rideau Canal has been filled in. The interpolated extent of the fill is shown on the attached soil profile; the maximum thickness of 11 feet occurs in the area of testhole #9. This fill is generally compact.

- C2.6 Sand and Gravel: Overlying the bedrock along the proposed East-bound line (testholes 9 and 12) for all of the area east of the Rideau River, the overburden consists of the sand and gravel deposits.

- C2.6 Sand and Gravel - Cont'd: The grading envelope is given in Figure 4, with the detailed results on Table 1. The gravel content varies between 2 and 63%, the sand content between 31 and 95%, and the silt content between 3 and 18%.

The natural water content (see Figure 7) increases with depth; the soil is generally saturated below the water level of the Rideau River.

The sand and gravel deposit is dense to extremely dense, and in the lower portion of this deposit, numerous boulders were encountered.

- C2.7 Bedrock: Due to the faulting which has taken place in the immediate vicinity, the bedrock is known to contain slicken sides. Near to the fault, which in all probability is located between the area of testholes 4 and 5, and 2 and 3, some of the fractures and fissures in the rock have been cemented.

The bedrock, which is basically a limestone, therefore cannot be regarded as intact or competent.

Some 200 feet south of the proposed alignment, there is a bedrock outcrop, and from this point, the bedrock dips sharply in a north-easterly direction.

- C.3 Water Conditions: The ground water in the area immediately adjoining the Rideau River and the Rideau Canal is affected by the water levels in these water courses. The average ground water in the area of testholes 11, 12, 13 and 14, i.e. in the area nearest to the Rideau Canal, was at about elevation 231, dropping to elevation 192 in the area of testholes 3 and 4. In the area of the sand and gravel deposit, the ground water is almost level and at elevation corresponding to the Rideau River water level. Apart from minor seepages, no unusual water conditions have been noted; no artesian water was observed in this area.

C.4 Observations and Conclusions:

C4.1 Pier Foundations:

i) From the soil stratification, it is evident that along the proposed bridge alignment, four different soil conditions exist, viz:

1. Sand and gravel deposit overlying bedrock at some depth.

(Area of testholes 1, 5, 6, 7 and 8).

2. Bedrock at shallow depth.

(Area of testholes 2, 3 and 4)

3. Till and marine clay overlying the sand stratum over bedrock.

(Area of testholes 9 and 12)

4. Marine clays overlying the loose to compact till over bedrock.

Because of the different soil stratification in the areas outlined above, there are various foundation conditions for the piers. In the area of testholes 1, 5, 6, 7 and 8 (area I), the piers may be founded either by means of spread footings in the sand and gravel deposit, or by use of piles transferring the loads to the bedrock.

In the area of testholes 2, 3 and 4, because of the very shallow depth to bedrock, spread footings may be placed without difficulty on the bedrock.

In area III, which encompasses testholes 9 and 12, piles should be used, either terminating in the sand and gravel deposit overlying the bedrock, or extending down to bedrock.

In the area comprised of testholes 10, 11, 13 and 14, (denoted as area IV) the piers are best founded on piles penetrating through the soil deposits to bedrock. Only the last 5 feet of till stratum presents a reasonable bearing medium, but by penetrating the last 5 feet, a much higher bearing can be achieved.

- iii) The allowable bearing values of the various strata are:

Sand and Gravel - for foundations placed at least 5 feet below grade - 5.0 ton/sq. ft.

Bedrock - 20.0 ton/sq. ft.

Till - 5.0 ton/sq. ft., if more than 40 blows/foot.

The allowable bearing value of the bedrock as given above, i. e. 20.0 ton/sq. ft. is conservative for sound limestone formation. However, the conservative value has been proposed because of the adjacent fault zone and the presence of slickensides, cemented jointing, etc.

In estimating the allowable bearing value of the sand and gravel deposit, the angle of internal friction was taken as $\phi = 40^\circ$.

To obtain an allowable bearing value of 5.0 ton/sq. ft., the till stratum should have a density corresponding to more than 40 blows/foot penetration (N - value), which is considered to represent an undrained shear strength of about 5000 lb/sq. ft.

- iv) It is estimated that the combined immediate and the long-term settlement, when using foundations other than piled foundations to bedrock, should in no instance exceed 1.5 inches.

- v) Difficulties will be encountered when driving piles to bedrock in area I (testholes 1, 5, 6, 7 and 8), and to lesser degree in area III (boreholes 9 and 12), because of the density of the sand and gravel deposit. In addition, the numerous boulders present in the lower portion of the sand and gravel deposits in area I may present further difficulties.

Piles penetrating to bedrock through the till stratum may also encounter some difficulties, particularly in the final 5 feet of the till before bedrock.

- vi) The spread footings, if placed in the sand and gravel deposit below the ground water level, will present some construction problem, due to the necessity of controlling the ground water condition. The permeability of the sand and gravel deposit was estimated to be between 2.5×10^{-2} and 5×10^{-3} cm/sec. It is theoretically possible to lower the water level by means of wells. It was estimated that, if the distance between two partially penetrating "slots" is not greater than 30 feet, the water level may be lowered by about 11 feet, assuming further, that the "Seepage source", i.e. the edge of the river, is not less than 50 feet away.

Alternatively, the water may be controlled by the use of a close sheeted cofferdam. To prevent piping of the excavation bottom, it was estimated that for an excavation 12 by 30 feet with an excavation depth of 5 feet below water level, the sheeting will have to extend at least 4 feet below the excavation level. However, in order to prevent a "plug" failure, i.e. to resist the uplift pressures, the depth of sheeting below the intended excavation level should be not less than 4.5 feet.

C4.2 Abutment Foundations:

- i) The west abutment preferably should be founded on piles penetrating to bedrock. The allowable bearing values given in the preceding section apply also for the West abutment.

The East abutment may be founded upon the sand and gravel deposit. The allowable bearing value of the sand and gravel deposit for the abutment foundation is 5.0 ton/sq. ft.

- ii) Spill-through abutments are proposed with a fill slope of 1 vertical to 2 horizontal. A detailed stability analysis was carried out for the worst ground condition i.e. at the West abutment at the West-bound line; this analysis showed that the proposed slope of 1 vertical to 2 horizontal is safe (see Figure 8).

The effective stress analysis gave a lower factor of safety (reference Figure 8) than the total stress analysis. Therefore, the long-term stability is more critical than the construction period.

- iii) A settlement analysis for the conditions and configuration of the embankment, as given on Figure 8, indicated that there may be settlement of the approach embankment of slightly more than 1 inch.
- iv) There should be no problem in placing foundations for the East abutment above the ground water level. If the excavation is made in open cut, slopes of 1 vertical to 2 horizontal should be adopted. Vertical excavations should be braced; the lateral forces on bracing should assume a hydrostatic earth pressure distribution of 30 lb/sq.ft. per foot height of retained soil

C4.3 Retaining Wall:

- i) It is proposed to erect a retaining wall along the west shore of the Rideau Canal. The bottom of the Rideau Canal will then be dredged to elevation 223.5; the ground level on the shore side will be maintained at about elevation 237.0.
- ii) In view of the soil conditions, it would be advisable to support the retaining wall upon a piled foundation. A stability analysis carried out for the retaining wall (see Figure 8) indicated that there is an adequate factor of safety if a piled foundation is employed. For this analysis, it was assumed that the cut-off elevation would be at 220.0.
- iii) The lateral earth pressures acting on the retaining wall may be estimated assuming a coefficient of earth pressure of 0.5 and a bulk density of the soil of 115 lb/cu. ft.
- iv) The excavation to the cut-off elevation will require water control. The water may be controlled by the use of close sheeting. In order to prevent piping, it was estimated that, for a 10 feet continuous excavation to elevation 220, with water level at elevation 231.0, and the dredged level of the Canal at elevation 223.5, the sheeting should penetrate at least 8 feet below elevation 220, i.e. should be extended at least to elevation 212.

D. VINCENT MASSEY INTERCHANGE STRUCTURE

- D. 1 General Observations: Between the Heron Road and Parkside Drive, the Vincent Massey interchange structure will be required to achieve a grade separation. Heron Road will be carried above Parkside Drive, and approaches to the structure will require embankments of about 20 feet in height.

To evaluate the soil conditions, two testholes were put down at diagonally opposite corners of the proposed structure: testholes 18 and 19. (see Drawing No. 3)

- D. 2 Soil Conditions: The main soil deposit at this site is formed by the till. The till is overlain by a sensitive, marine clay, known as a Leda clay; the till rests upon limestone bedrock. In the area of testhole 19, there was a sand and gravel deposit lodged in the till complex. The till was generally loose to compact, with only few isolated areas indicating a dense condition.

The grading curves and other properties of the till, as well as of other soil layers, have been outlined in the section dealing with the soil conditions for the bridge structure.

- D. 3 Observations and Conclusions:

- i) The interchange structure should be founded on piles extended to the bedrock. Based on the results at the two testholes, there should be no difficulties in reaching the bedrock in this area.
- ii) The allowable bearing value of the bedrock has been increased to 30 tons/sq. ft. since this location is clear of the indicated fault zone
- iii) The embankment may be constructed to a slope of 1 vertical to 2 horizontal.
- iv) Settlement of the embankment (assumed maximum of 20 feet) should not exceed 1 inch.

E. ROADWAY

E. 1 General Observations: The proposed grade of Heron Road conforms closely to the existing elevation, necessitating only a minimum amount of grading. The approaches to Vincent Massey Structure will be embankments about 20 ft. in height. From about Chainages 12 + 50 to 15 + 00, the proposed road grade conforms to existing grade, thereafter rising gently towards the East Abutments of the bridge. The height of fill at about chainage 19 + 00 is only 6 feet. On the west side of the Rideau Canal, the Heron Road will be raised about 2 feet in height, decreasing in the westerly direction to zero at about chainage 32 + 00, and then proceeding into a slight cut to chainage 38 + 00. The maximum depth of cut is about 5 feet. From chainage 38 + 00 to 40 + 50, Heron Road will cross a depressed area immediately south of the centre line; the depth of fill which will be required is about 15 feet. Review of the soil conditions has shown that there may be a stability problem in connection with support of this Heron Road fill over this depressed area between chainages 38 + 00 and 40 + 50.

E. 2 Soil Conditions: Supplementing testholes for the abutments and the Vincent Massey structure, testholes No's 17 and 22 were put down to examine the general sub-grade conditions and testholes No's 24 and 25 were drilled to determine soil characteristics for the stability analysis at about chainage 39 + 50. Beneath an organic topsoil, which did not exceed 12 inches in thickness (fill was found instead in the area of testhole 19), there was a clayey silt layer overlying a very silty clay deposit. This very silty clay layer, which is the marine clay deposit, was supported above the till layer.

The upper, desiccated, very silty, clay layer was generally drier than its plastic limit. The physical characteristics of the individual strata have previously been given in the section dealing with the bridge structure. Detailed results of the mechanical analyses are given in Table I, and on Figures 1 to 4 inclusive.

In the area of testhole 25 underlying the till stratum, there was found a sand deposit which contained water under pressure. Otherwise, the water conditions are considered as normal, with the ground water table at least 20 feet below the existing grade.

- E. 3 Pavement: Apart from the area of holes 17 and 22, the pavement sub-grade will consist of imported fill of unknown quality. However, where it is of a non-cohesive nature the bulk of it may be compacted to 95% Proctor Compaction whilst the upper 2 feet forming the sub-grade should be compacted to 100% Proctor Compaction. Where the fill is a cohesive material the compaction standard should be 95% throughout the fill.

Under these conditions, the rigid pavement construction recommended is 9 inches of concrete on 6 inches of Granular A, compacted to 100% Proctor Standard.

In the vicinity of holes 17 and 22, the sub-grade will consist of a deccated sensitive clay classified as borderline for frost heave characteristics. It may, depending on site conditions and control, cause construction problems in the preparation of the pavement. This situation can really be judged only on the site at the time of construction. For this reason, the basic pavement construction design thickness referred to above is maintained, but, the inclusion of a provisional item, covering the possible use of 9 inches of Granular B sub-base, is recommended to allow for construction difficulties in the shallow cut and grading areas on the natural clay sub-grade.

- E. 4 Stability Analysis: The results of the stability analysis carried out for Heron Road alignment at about chainage 39 + 50 are given on Figure 9. Both the short term and long term stability conditions have been considered; the short term condition, utilizing the total stress analysis, is referred to as the "construction period" condition; the long term condition is based on the effective stress analysis.

It has been found that the critical condition is given by the effective stress analysis. In the calculation of the factor of safety, the effect of the artesian water encountered in the area of testhole 25 was considered. The observations from this analysis are:

- i) For an embankment with side slopes of 1 vertical to 2 horizontal, and without any provision to counteract the effect of artesian water in the depressed area, the factor of safety is less than 1; thus, the embankment is unstable.
- ii) With provision of a berm, which should extend beyond the theoretical critical slip surface, the factor of safety is increased. It was found that a 5 feet high berm extended at least 40 feet from the toe of the embankment (see figure 9), will increase the factor of safety to 1.36.
- iii) There is no restriction to the material which may be used to construct the berm, provided a compaction standard of about 95% of Standard Proctor density can be obtained.
- iv) The recommended construction sequence is to place the berm along the entire area first, before the embankment fill. It would be preferable to construct the berm from the outer edge, working towards the existing slope.

Report Prepared by:

B. Lewicki
B. Lewicki, P. Eng.

HL/dc

E. M. PETO ASSOCIATES LTD.

C. F. Freeman
C. F. Freeman, P. Eng.,
Chief Engineer.

TABLE I
RESULTS OF MECHANICAL ANALYSES

<u>Testhole</u>	<u>Depth</u>	<u>Gravel</u>	<u>Sand</u>	<u>Silt</u>	<u>Clay</u>
1	9'6"-10'6"	63	31	6	-
5	12'6"-13'0"	2	95	3	-
6	5'0"-6'0"	11	81	8	-
6	25'0"-26'0"	4	91	5	-
7	10'0"-11'6"	-	48	36	16
7	30'0"-31'6"	34	57	9	-
8	15'0"-16'6"	24	53	18	5
9	15'0"-16'6"	26	47	18	9
10	25'0"-26'6"	19	51	22	8
11	5'0"-6'6"	-	35	40	25
11	30'0"-31'6"	14	51	23	12
12	35'0"-36'6"	16	69	15	-
13	20'0"-21'6"	23	46	21	10
14	5'0"-6'6"	-	33	48	19
14	25'0"-26'6"	21	51	19	9
15	20'0"-21'6"	20	53	19	8
16	50'0"-51'6"	15	50	23	12
17	2'0"-3'0"	-	30	50	20
17	3'6"-5'0"	-	22	58	20
18	15'0"-16'6"	21	51	19	9
19	17'6"-19'0"	20	72	8	-
22	1'0"-2'0"	2	63	28	7
22	2'0"-3'0"	-	33	42	20

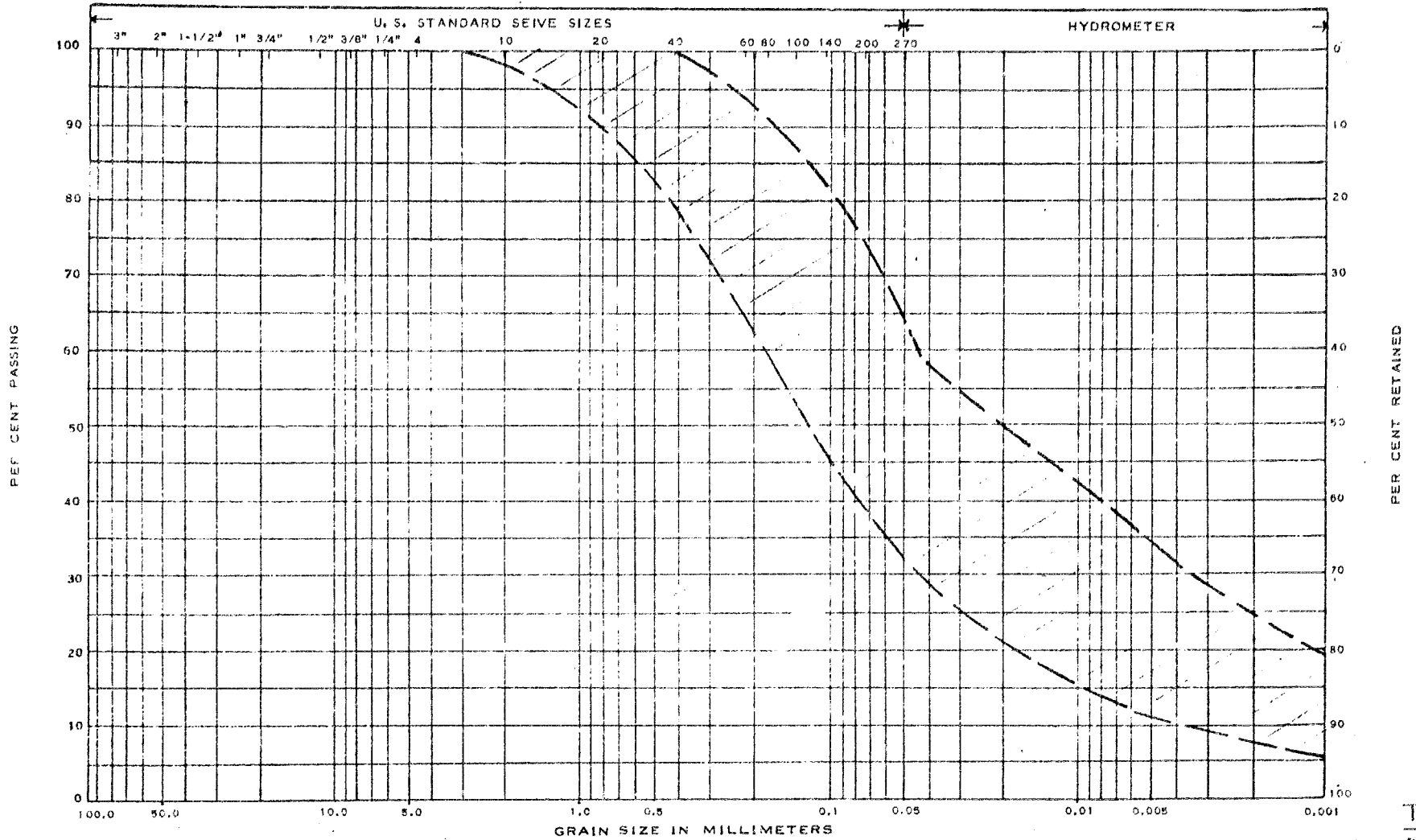
TABLE II
ATTERBERG LIMIT TESTS

Testhole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content	Liquidity Index
		LL	PL	PI	w	LI
10	5'0"-6'6"	39.6	24.3	15.3	18.7	-
11	5'0"-6'6"	55.0	23.1	31.9	36.8	0.43
11	10'0"-11'6"	43.9	13.9	25.0	37.4	0.74
12	5'0"-6'6"	35.0	15.2	19.8	30.0	0.75
14	10'0"-11'6"	26.6	20.2	6.4	25.2	0.78
15	5'0"-6'6"	31.0	15.5	15.5	22.8	0.47
16	30'0"-31'6"	26.0	15.8	10.2	30.2	1.41
17	2'0"-3'0"	40.5	17.2	23.3	17.3	0.04
17	3'6"-5'0"	41.7	15.6	26.1	-	-
19	7'6"-9'0"	47.1	23.9	23.2	32.8	0.38
22	1'0"-2'0"	33.4	18.1	15.3	27.1	0.59
22	2'0"-3'0"	56.4	26.4	30.0	29.7	0.11

Note: Liquidity Index: $L.I. = \frac{w - PL}{LL - PL}$

e. m. peto associates ltd.

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
--------	--------	-------------	-----------	-----------	-------------	-----------	-----------	------

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Heron Road Bridge JOB NO. 16-191 HOLE NO. 1 SAMPLE NO. 1

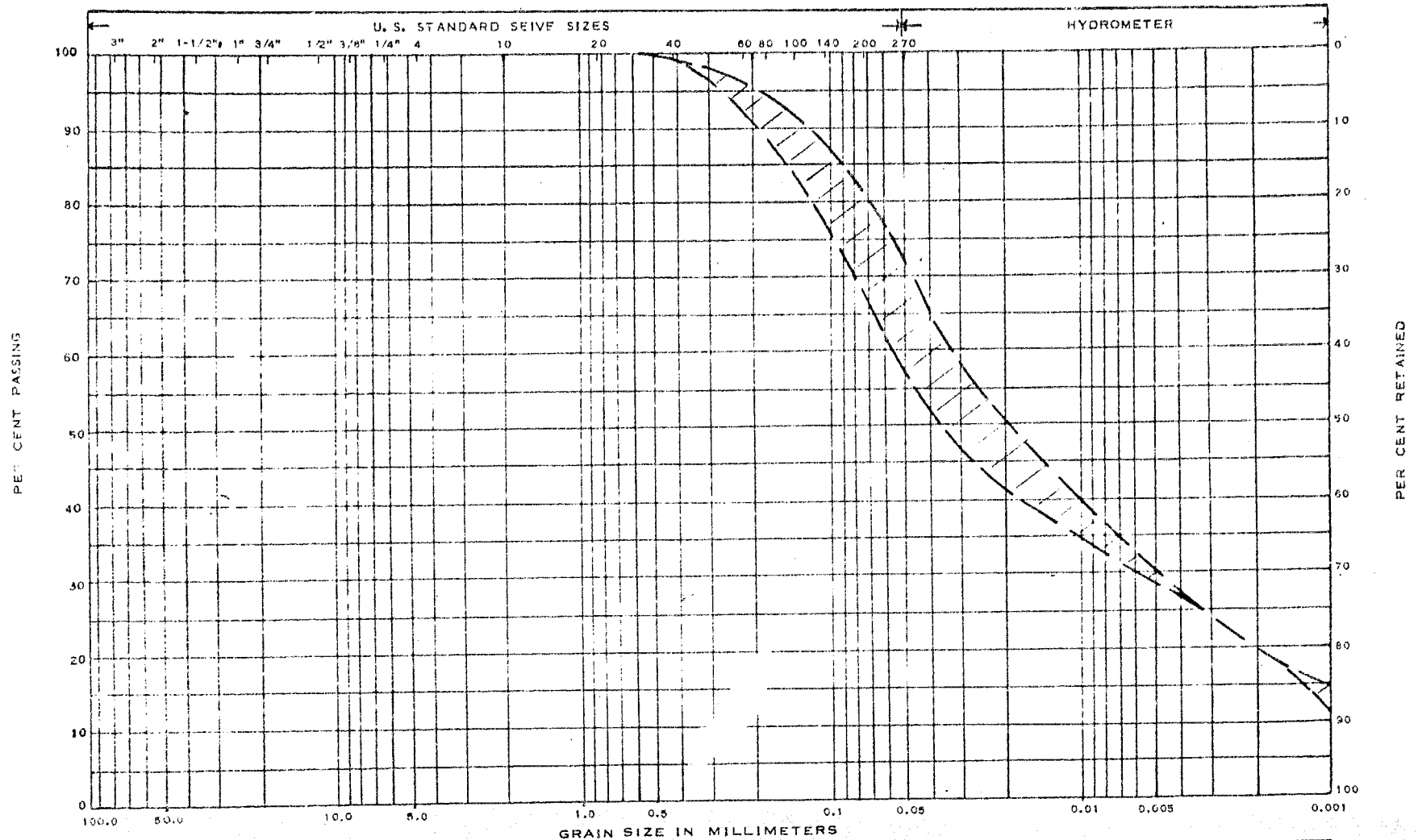
DEPTH ELEVATION REMARKS Grading Envelope for Grey-brown very silty clay

GRAIN SIZE DISTRIBUTION

Fig. NO. 1

e. m. peto associates ltd.

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
--------	--------	-------------	-----------	-----------	-------------	-----------	-----------	------

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Heron Road Bridge JOB NO. 64191 HOLE NO. 1 SAMPLE NO.

Grading Envelope For Grey very silty Clay

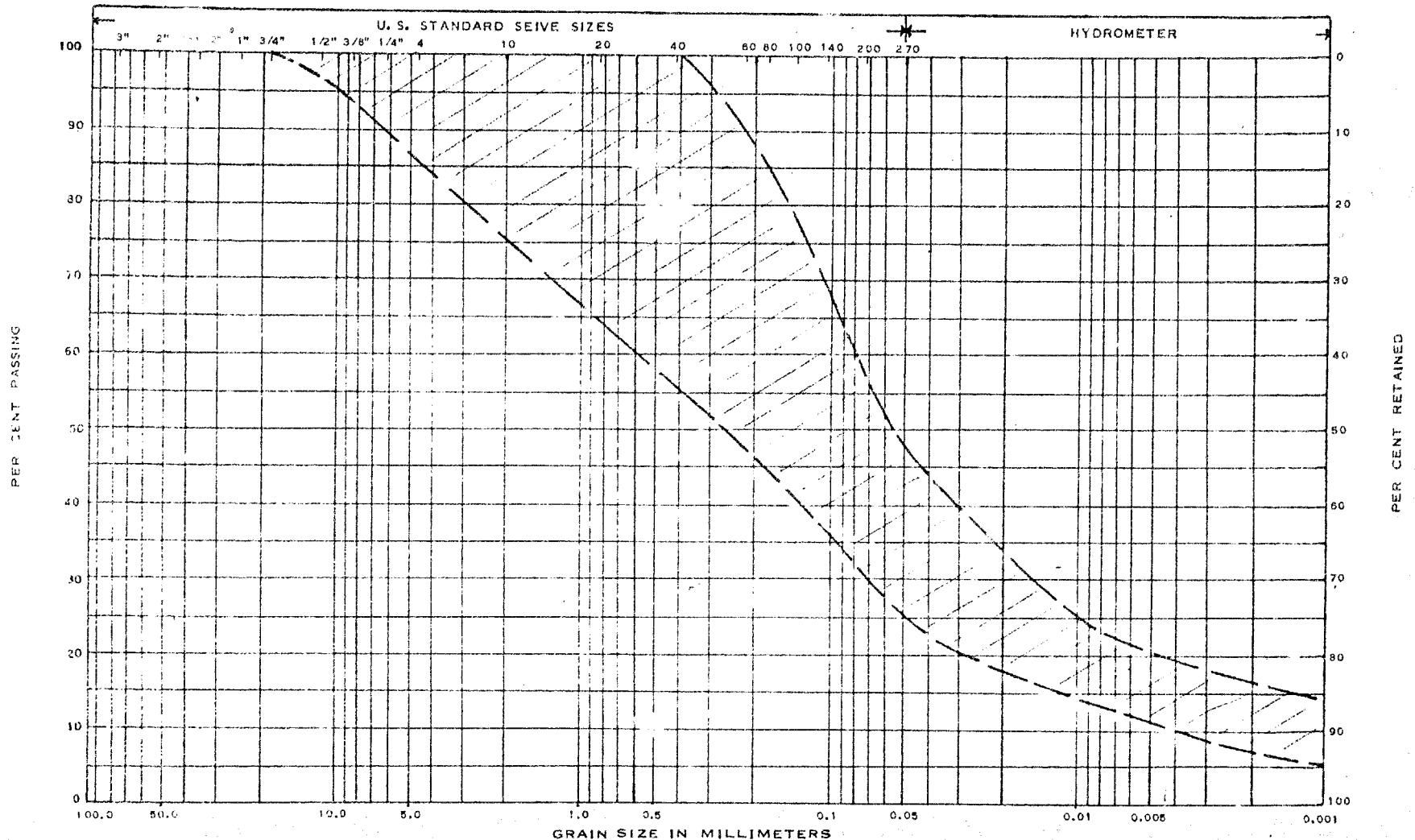
DEPTH ELEVATION REMARKS

GRAIN SIZE DISTRIBUTION

Fig. No. 2

e. m. peto associates ltd.

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY
--------	--------	-------------	-----------	-----------	-------------	-----------	-----------	------

MASS. INST. OF TECH. CLASSIFICATION

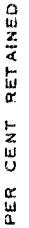
JOB NAME Heron Road Bridge JOB NO. 64191 HOLE NO. 64 SAMPLE NO. 64

DEPTH 0.0 ELEVATION 0.0 REMARKS Grading Envelope For Till

GRAIN SIZE DISTRIBUTION

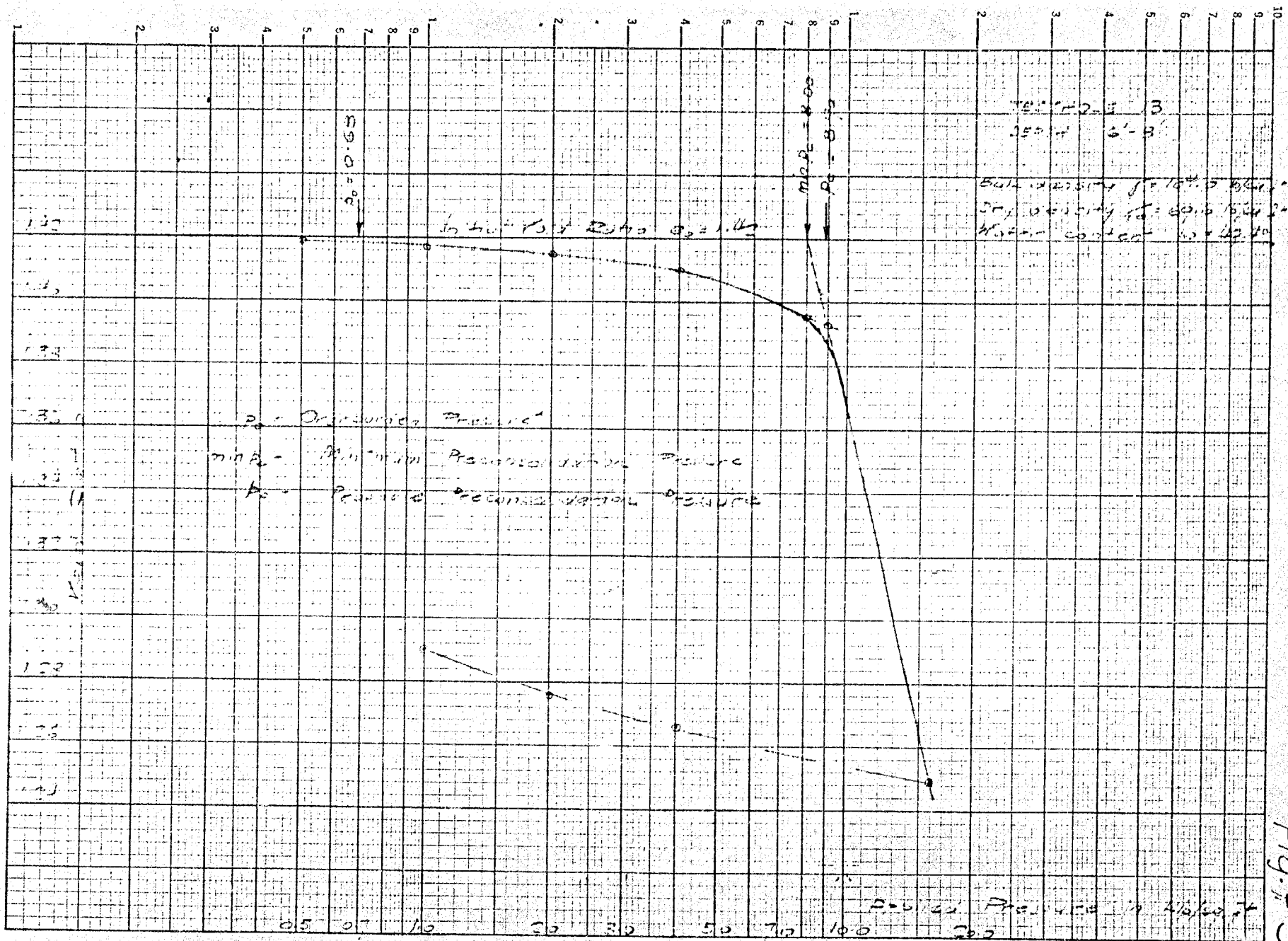
Fig. No.

Toronto 19, Ontario

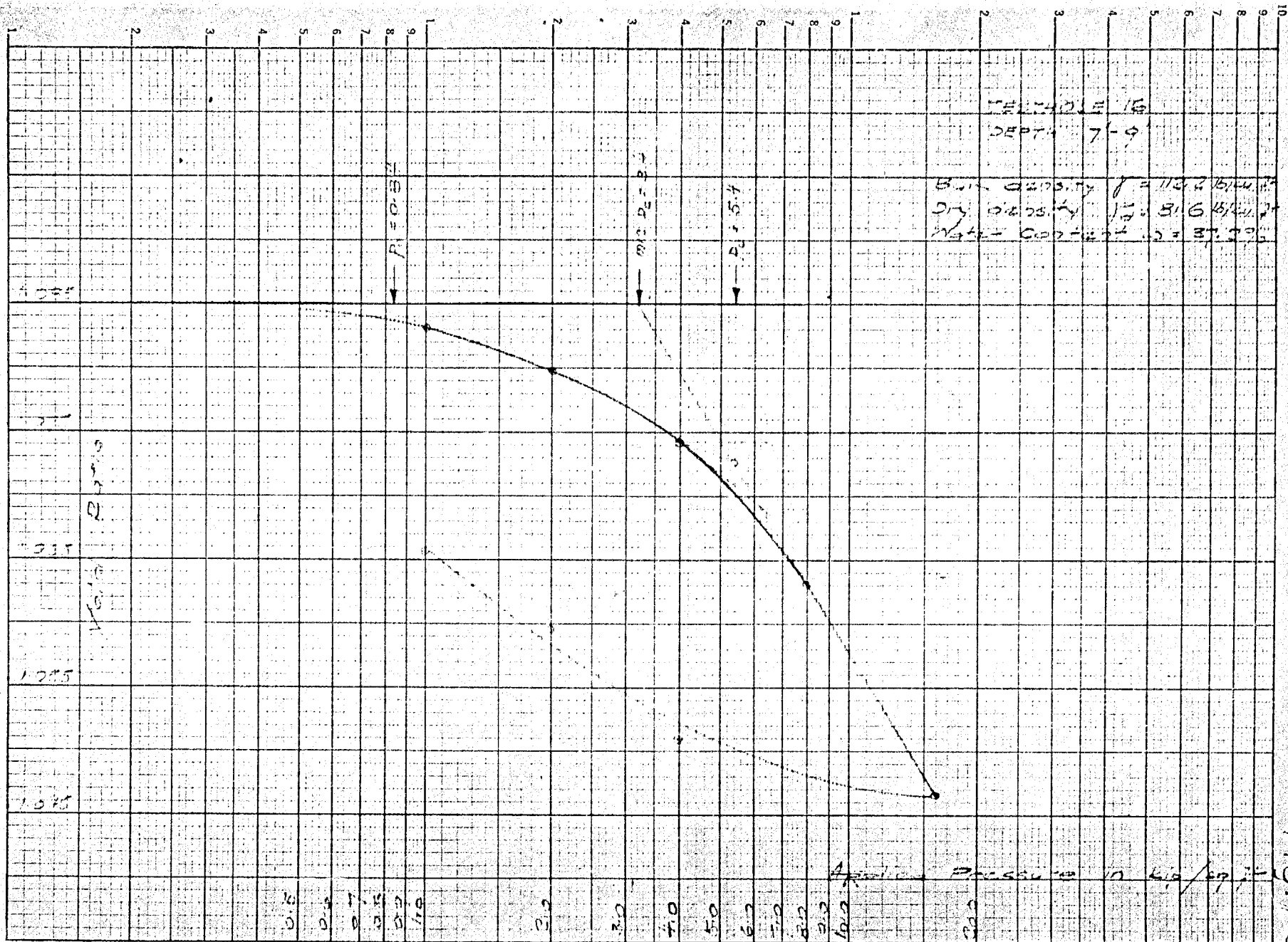


GRAIN SIZE DISTRIBUTION

Fig. No. 4



719.7



1-2-3 = 15

SEP 74 7-9

$$B_{11} = 2173.75 \quad f = 113.2 \text{ Btu/hr}^2$$

5-3 0.423 2 12 5, 6 15, 24 21

WATER - COOLING - 2 = M.T.O.

4

五

10	10	10	10
----	----	----	----

分 支 表

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

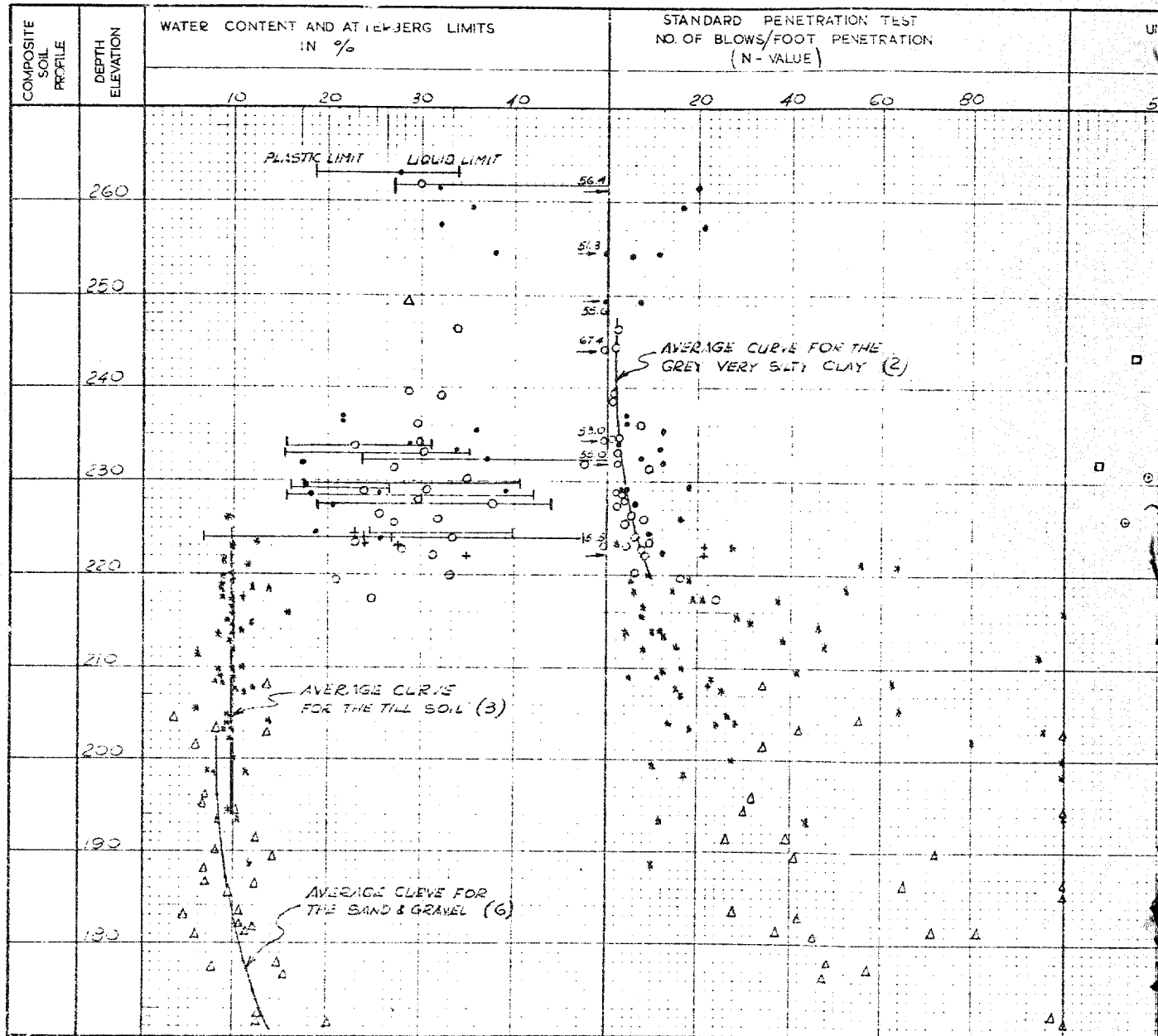
011	10
012	10
013	10
014	10
015	10
016	10
017	10
018	10
019	10
020	10
021	10
022	10
023	10
024	10
025	10
026	10
027	10
028	10
029	10
030	10
031	10
032	10
033	10
034	10
035	10
036	10
037	10
038	10
039	10
040	10
041	10
042	10
043	10
044	10
045	10
046	10
047	10
048	10
049	10
050	10
051	10
052	10
053	10
054	10
055	10
056	10
057	10
058	10
059	10
060	10
061	10
062	10
063	10
064	10
065	10
066	10
067	10
068	10
069	10
070	10
071	10
072	10
073	10
074	10
075	10
076	10
077	10
078	10
079	10
080	10
081	10
082	10
083	10
084	10
085	10
086	10
087	10
088	10
089	10
090	10
091	10
092	10
093	10
094	10
095	10
096	10
097	10
098	10
099	10

ハフボク

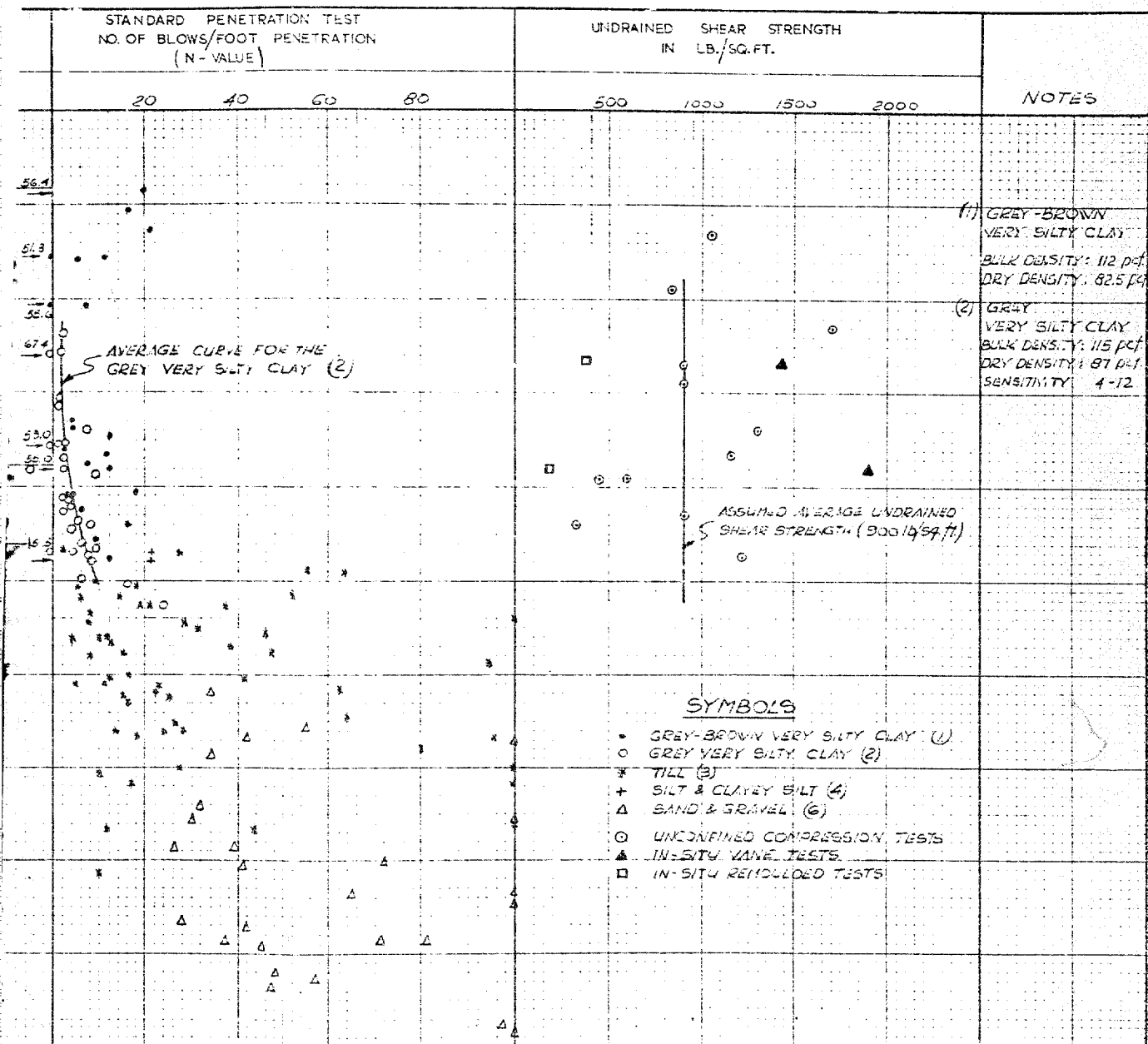
7.5 25

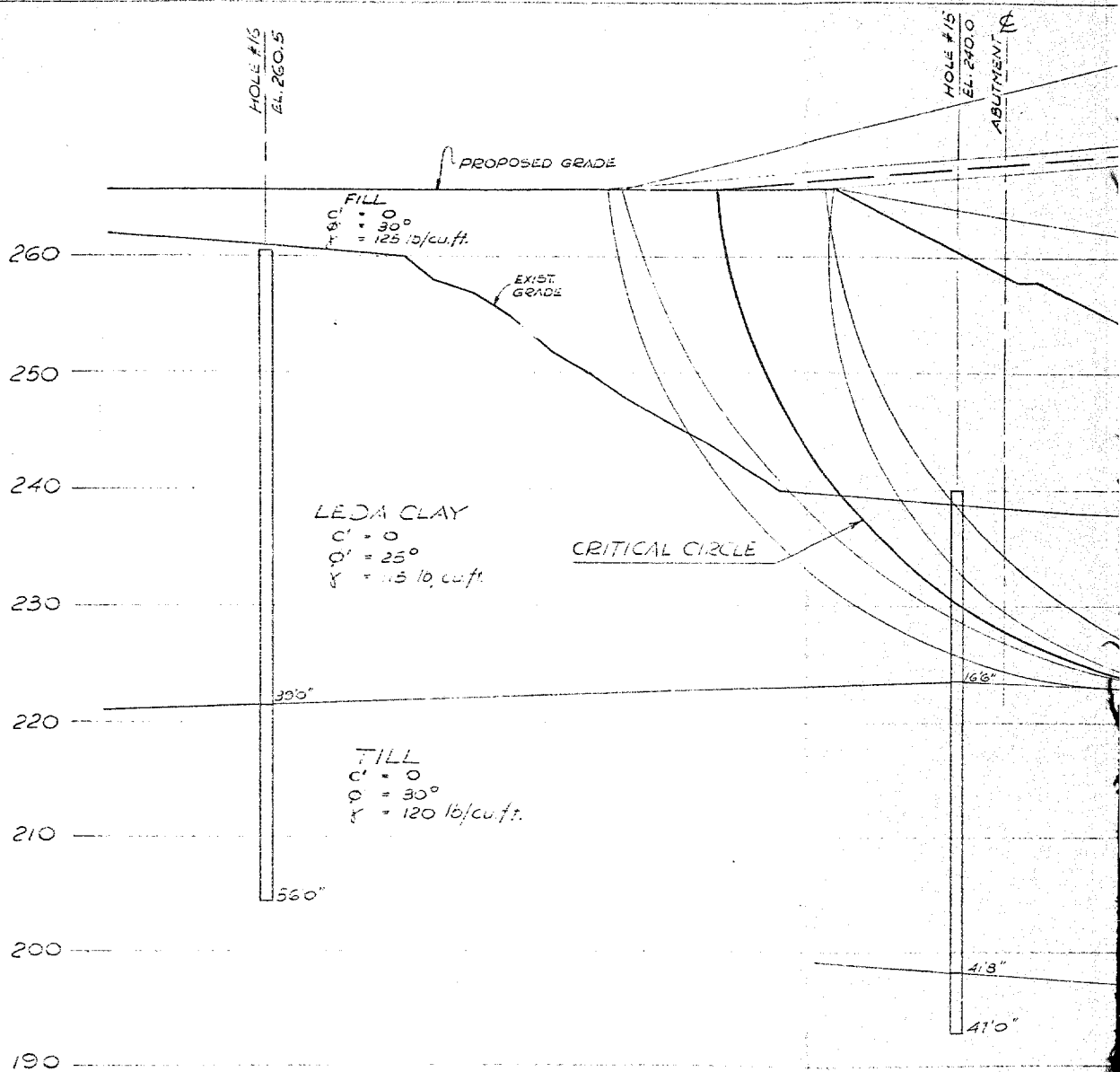
Applied Pressure in Gas Law

GEOTECHNICAL SOIL PROPERTIES

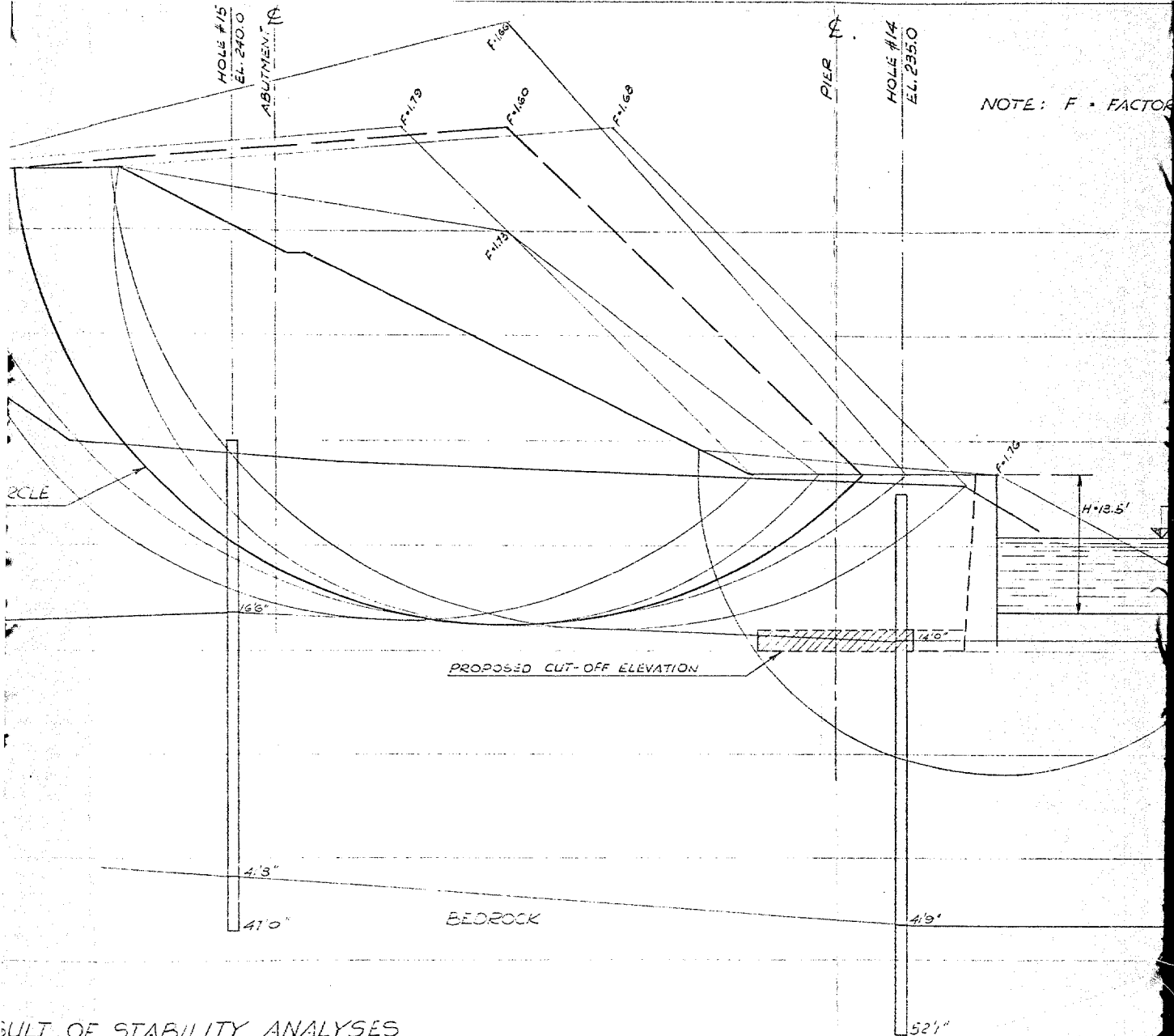


NICAL SOIL PROPERTIES





RESULT OF STABILITY ANALYSIS
 AT THE PROPOSED WEST ABUTMENT
 SCALE: 10' TO 1" (NATURAL)



RESULT OF STABILITY ANALYSES
THE PROPOSED WEST ABUTMENT
 SCALE: 10' TO 1" (NATURAL)

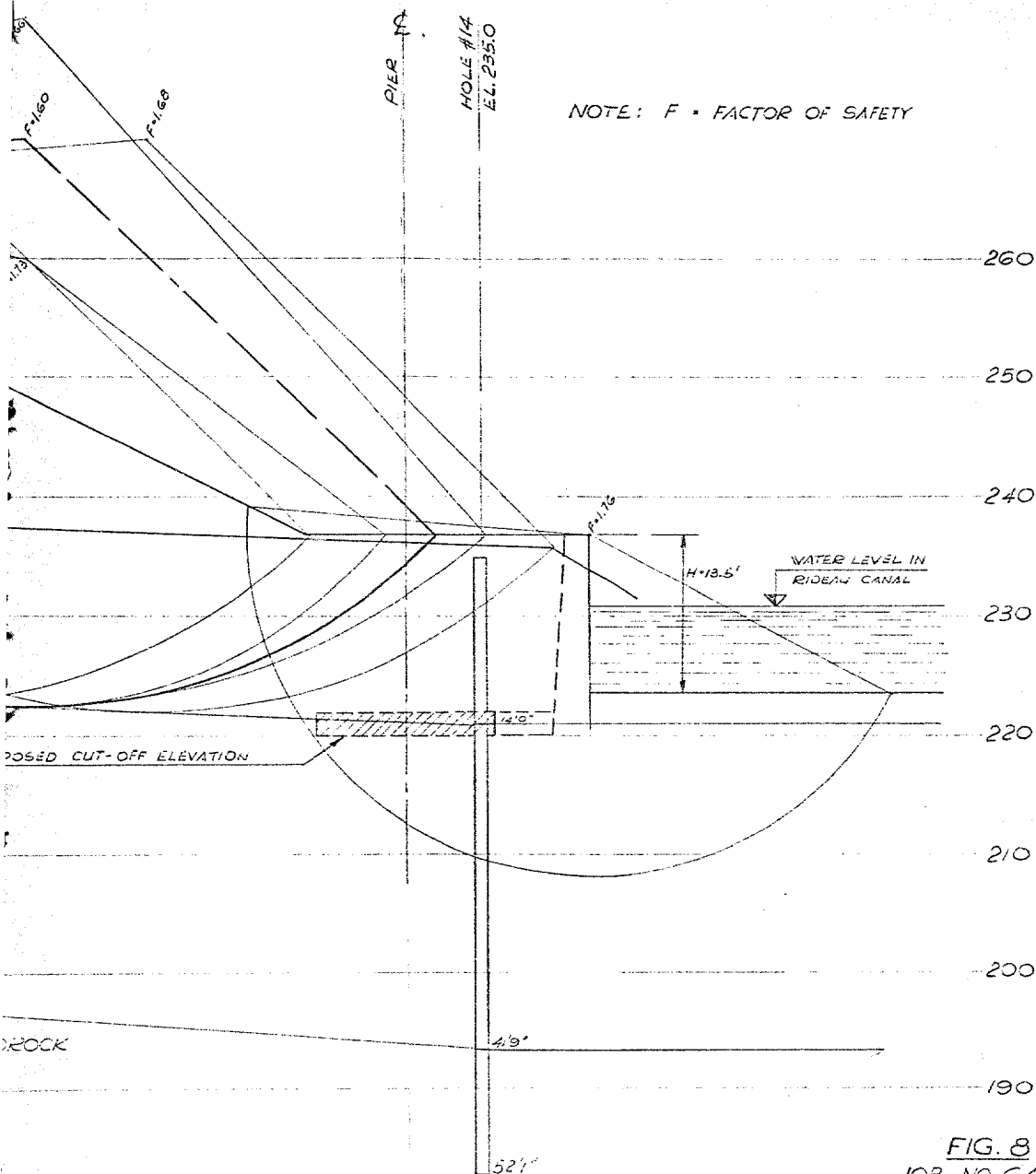
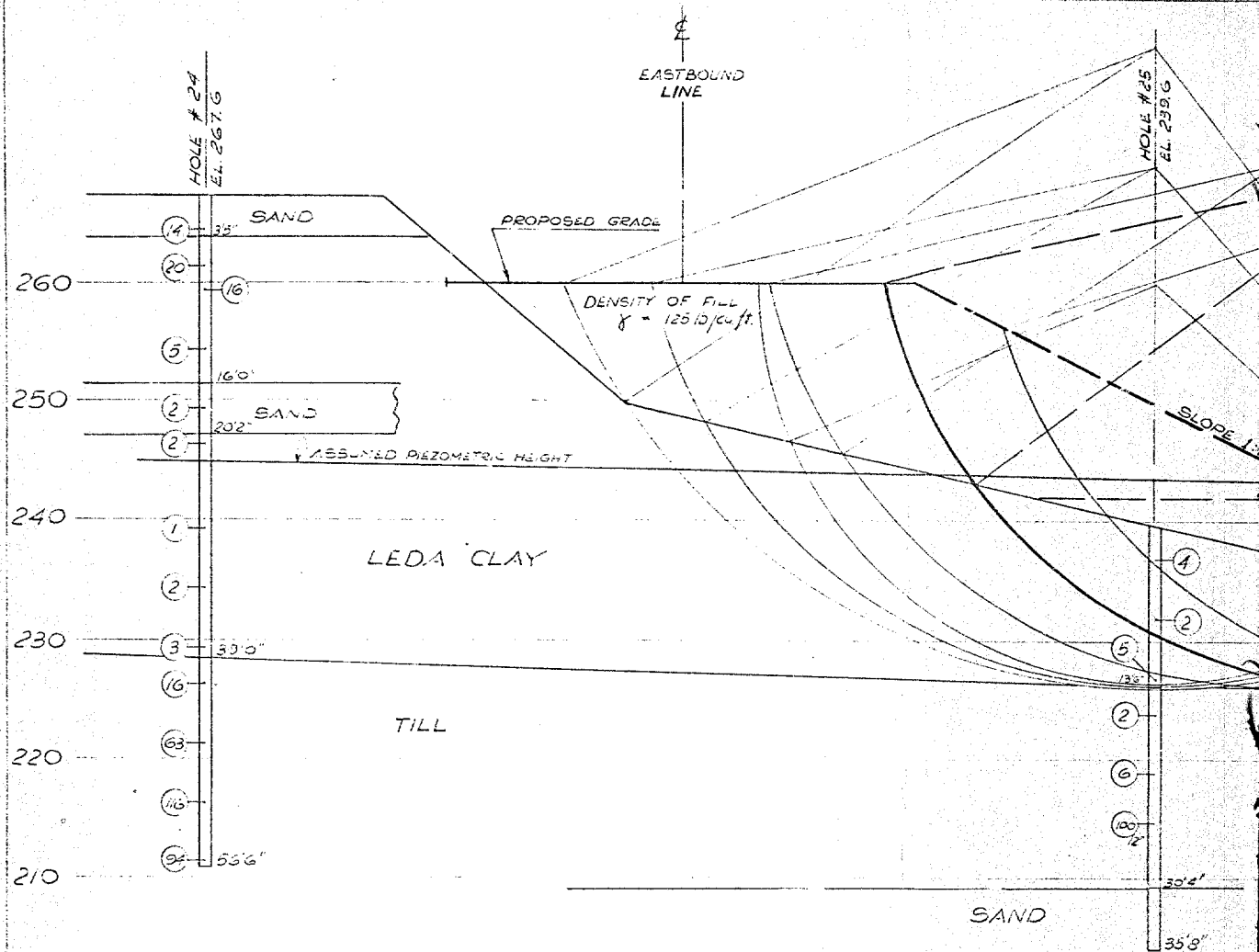
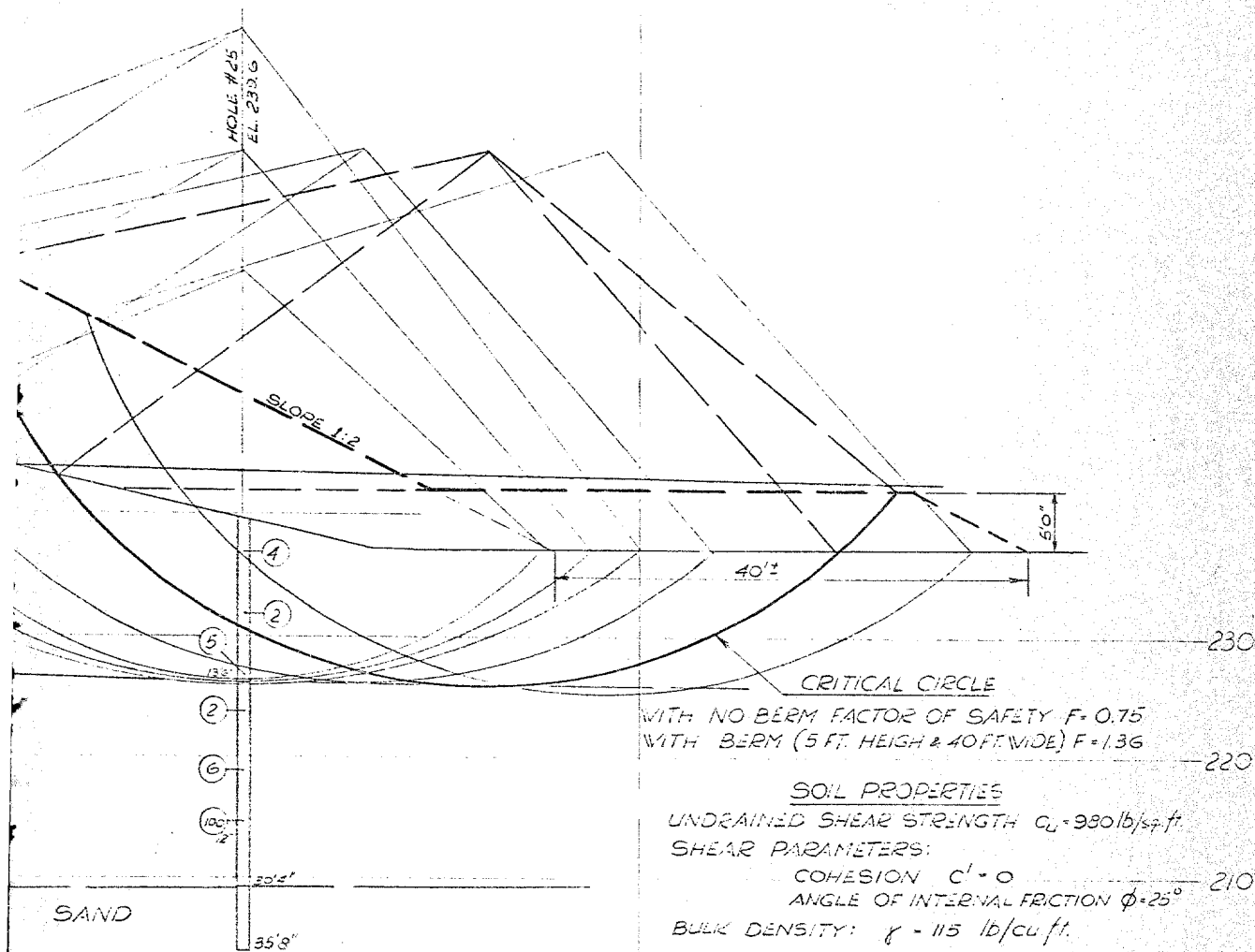


FIG. 8
JOB NO. 64191
e.m. peto associates ltd
OCT. 1964
K.K.



RESULT OF STABILITY ANALYSES
PROPOSED ROADWAY AT ABOUT CHAM

SCALE: 10' TO 1" (NATURAL)



ABILITY ANALYSES AT THE
 WAY AT ABOUT CHAINAGE 39+50

10' TO 1" (NATURAL)

FIG. 9

JOB NO. 64191

e.m. peto associates ltd.

OCT. 1964

K.K.

BOREHOLE LOG

Borchelt No. #1

Return Date: Aug. 5 - 6th, 1964

Checked By B. L.

ABBREVIATIONS

V.I. IN SITU VANE SHEAR TEST

M. MOISI

W.L. WATER LEVEL IN CASING

W.T. GROUND WATER TABLE IN SOI

W.T.P.L. WETTER THAN PLASTIC LIMIT
D.T.P.L. DRIER THAN PLASTIC LIMIT





A.P.L. ABOUT PLASTIC LIMIT

© 2000 Blackwell Science Ltd *Journal of Internal Medicine* 247: 399–406

NOTE: Ground Water Level appears to be perched in overburden over rock.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

Job Name	Heron River Bridge	Job No.	64191	Borehole No.	#2
Client	M. M. Dillon & Co. Ltd.	Casing	BX = AX	Boring Date	July 30, 1964
Elevation	195.0	Compiled By	J. F. G.	Checked By	B. L.

SAMPLE CONDITION		SAMPLE TYPE		ABBREVIATION	
	UNDISTURBED	A.S.	Auger Sample	V.T.	In Situ Vane Shear Test
	FAIR	C.S.	Casing Sample	M.	Moist
	DISTURBED	S.S.	2" Standard Split Tube Sample	W.L.	Water Level in Casing
	LOST	S.L.	Split Barrel with Liners	W.T.	Ground Water Table in Soil
		S.T.	Thin-Walled Shelby Tube Sample	W.T.P.L.	Wetter than Plastic Limit
		W.S.	Wash Sample	D.T.P.L.	Drier than Plastic Limit
		R.C.	Rock Core	A.P.L.	About Plastic Limit

SOIL DESCRIPTION	COLOUR	Depth in Casing	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft	Notes	WATER LEVELS & REMARKS
Gr and Surface			0'0"						
Coarse sand and boulders	Brown		1'6"		1	CS			
Boulders, cobbles, coarse gravel (limestone, gneiss Greenstone)	Grey, light grey pink, green		4'7"			RC			Recovery : 44%
Impure argillaceous limestone	Grey					RC			Recovery : 50%
Very impure beds						RC			Recovery : 33%
Dray folds, slickenside surfaces			10'0"			RC			Recovery: 100%
Change at about 12'	Greenish-grey					RC			Recovery: 100%
arenaceous limestone	Light greenish grey		15'5"						
Arenaceous limestone									
BORING TERMINATED AT 15'5"									

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

Job Name	Heron River Bridge	Job No.	64191	Borehole No.	#3
Client	M. M. Dillon & Co. Ltd.	Casing	BX + AX	Logging Date	July 28 & 29th, 1964
Elevation	192.2	Compiled By	J. F. G.	Checked By	B. L.

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.T.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRYER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

[illegible]

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

Job Name	Heron Road Bridge	Job No.	64191	Borehole No.	#4
Client	M. M. Dillon & Co. Ltd.	Casing	BX	Boring Date	August 1, 1964
Elevation	123.3	Compiled By	J. F. G.	Checked By	B. L.

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

DISTURBED

LOST





[illegible]

e. m. peto associates ltd.
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 64191 Borehole No. 5A & 5B
Client M. M. Dillon & Co. Ltd. Casing BR & AX Boring Date Sept. 3-4th, 1964
Elevation 193.9 Compiled By J. F. G. Checked By R. L.

SAMPLE CONDITION

 **UNDISTURBED**
 **FAIR**
 **DISTURBED**
 **LOST**

SAMPLE TYPE

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

ABBREVIATIONS

V.T. IN SITU VANE SHEAR TEST
M. MOIST
W.L. WATER LEVEL IN CASING
W.T. GROUND WATER TABLE IN SOIL
W.T.P.L. WETTER THAN PLASTIC LIMIT
D.T.P.L. DRIER THAN PLASTIC LIMIT
A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Depth of Coring	Depth Elevation	Legend	Sample Type and Location	Sample Type	No. Blows per ft	WATER LEVEL	WATER LEVELS & REMARKS
Ground Surface			0'0"						#5A
Coarse sand and gravel			25'0"		No sampling				
			26'0"						
			26'7"						Casing was bent. After pulling, casing up the last 5' casing broke off.
			TESTHOLE TERMINATED AT 26'7"						
									New borehole was started (5B)
Ground Surface			0'0"						
			25'0"		No sampling				
10-1/2" boulder at 26'2" then fine sand, limestone boulders	Grey		26'2"			RC			Recovery: 64%
Fine sand; limestone boulders; gneiss pebble	Grey					RC			Lost wash water completely Recovery: 3' (28%)
Calcareous shale with thin vertical calcite veins, very calcareous from 34'	Dark grey Greenish grey		32'2"			RC			Lost some wash water at 31'9"; Probable bedrock level at 32'2"
Argillaceous limestone	Grey								Recovery: 100%
Argillaceous limestone occasional sand lenses;	Light grey to grey					RC			
Pyrite crystallization at 39'6"			41'0"						Recovery: 100%
Calcareous shale with calcite veins	Dark grey								
			TEST HOLE TERMINATED AT 41'0"						

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge

Job No. 64101

Borehole No. #6

Client M. M. Dillon & Co. Ltd.

Casing DX & AX

Boring Date Aug. 7 & 8th, 1964

Elevation 197.0

Consulted by J. F. G.

Checked By B. L.

SAMPLE CONDITION

- ☒ UNDISTURBED
- ☒ FAIR
- ☒ DISTURBED
- ☒ LOST

SAMPLE TYPE

- A.S. WATER SAMPLE
- C.S. CASING SAMPLE
- S.S. 2" STANDARD SHELLS PER SAMPLE
- S.L. SPLIT BARREL WITH BALL
- S.T. THIN-WALLED SHELBLY TYPE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- M. MOIST
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL
- W.T.P.L. WETTER THAN PLASTIC LIMIT
- D.T.P.L. DRIER THAN PLASTIC LIMIT
- A.P.L. ABOVE PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density	Depth Elevation	Level	Sample No. and condition	Sample Type	No. of Blows per Ft.	Water Level (ft.)	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Fine-medium sand, gravel and stones	Yellow-brown	Coarse to dense	4'6"		1 <input checked="" type="checkbox"/> SS	SS	30	10.0	Saturated
Medium-coarse sand	Grey-brown	Dense			2 <input checked="" type="checkbox"/> SS	SS	39	12.2	Saturated
Odd pebble									
Ditto	Ditto	Ditto	10'2"		3 <input checked="" type="checkbox"/> SS	SS	41	14.3	Saturated
Fine-medium sand, odd pebbles and stones	Grey	Very dense	12'3"		4 <input checked="" type="checkbox"/> SS	SS	65	12.2	Wet
Coarse sand and gravel	Grey-brown	Ditto	14'0"		5 <input checked="" type="checkbox"/> SS	SS	25/3"		
Fine - medium sand and gravel	Grey	Ditto			6 <input checked="" type="checkbox"/> SS	SS	71	12.0	Saturated
Gravel			17'0"						
Coarse sand	Light grey	Dense			7 <input checked="" type="checkbox"/> SS	SS	41	15.1	Wet
			22'0"						
Ditto, slightly coarser	Grey	Very dense			8 <input checked="" type="checkbox"/> SS	SS	42	20.5	Saturated
			30'0"						
Ditto, some seams of fine-medium sand	Ditto	Extremely dense	33'0"		9 <input checked="" type="checkbox"/> SS	SS	125	14.5	Saturated Quicking-Backed Up 3 ft.
Gravelly sand	Dark grey	Ditto							
			35'10"		10 <input checked="" type="checkbox"/> SS	SS	105/10"		Refusal at 35'10"
			36'0"						Took wash sample
Impure argillaceous limestone; shaly partings reddish is noticeable in places	Grey		40'0"			RC			Recovery 91%
Few shaly side surfaces below 40'						RC			
Dense argillaceous limestone	Grey		41'0"						Recovery: 87%
Thin shaly partings, calcite and pyrite crystals						RC			
Dolomitic limestone	Lighter grey		42'11"						Recovery: 100%
BOREHOLE TERMINATED AT							49'11"		





e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 64191 Borehole No. #7
 Client M. M. Dillon & Co. Ltd. Casing 4" & 6" Boring Date Aug. 13-14th, 1964
 Elevation 221.0 Compiled By I. F. G. Checked By P. L.

SAMPLE CONDITION

-  UNDISTURBED
-  FAIR
-  DISTURBED
-  LOST

SAMPLE TYPE

- A.S. AUGER SAMPLE
- C.S. CASING SAMPLE
- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS





- V.T. IN SITU VANE SHEAR TEST
- M. MOIST
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL
- W.T.P.L. WETTER THAN PLASTIC LIMIT
- D.T.P.L. DRIER THAN PLASTIC LIMIT
- A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Moisture Content (%)	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Topsoil			0'0"						
Clayey silt	Brown		2'0"						
Sandy silt	Brown	Compact	4'0"		1	SS	16	9.9	Moist
Fill (Sandy silt, grits & pebbles)	Grey-brown	Compact to dense			2	SS	31	21	Moist
As above	As above	Dense			3	SS	47	9.1	Moist
			10'0"						
As above	As above	Compact			4	SS	16	10.3	Quite moist
As above	As above	Compact			5	SS	15	10.0	Quite moist
			15'0"						
As above	As above	Compact			6	SS	26	9.1	Quite moist
As above	As above	Compact			7	SS	27	10.0	Quite moist
			22'0"						
Fine-medium sand, some gravel	Grey								
			25'0"						
As above	As above	Extremely dense			8	SS	16.3	6.7	Wet
									Boulder (9"Ø) W.T. about 27'4"
			30'0"						
Gravelly sand (coarse-medium)	Grey & brown	Very dense			9	SS	12	6.9	Wet
			34'0"						
As above	As above	Extremely dense			10	SS	200/9"	9.1	Wet
									Boulders
			38'7"						Refusal at 33'7"
									Start diamond drilling
									core barrel broke off.
									New hole was started
			0'0"						1.5' E of original
									Hole #7A
									No sampling to refusal
									Refusal at 39'6"
									Start diamond drilling
Interruption - auger to about 40'0"			39'6"						
Auger failed to penetrate	Grey					RC			Recover 10%

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 6491 Borehole No. #7
 Client M. M. Dillon & Co., Ltd. Casing 4" D BX Boring Date Aug. 13-14th, 1964
 Elevation 221.0 Compiled By J. F. G. Checked By P. L.

SAMPLE CONDITION

-  UNDISTURBED
-  FAIR
-  DISTURBED
-  LOST

SAMPLE TYPE

- A.S. AUGER SAMPLE
- C.S. CASING SAMPLE
- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS





- V.T. IN SITU VANE SHEAR TEST
- M. MOIST
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL
- W.T.P.L. WETTER THAN PLASTIC LIMIT
- D.T.P.L. DRIER THAN PLASTIC LIMIT
- A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft	Water Level (ft)	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Topsoil			0'2"						
Clayey silt	Brown		2'0"						
Sandy silt	Brown	Compact	4'0"		1	SS	16	9.9	Moist
Till (Sandy silt, grits & pebbles)	Grey-brown	Compact to dense			2	SS	31	9.1	Moist
As above	As above	Dense			3	SS	47	9.1	Moist
			10'0"						
As above	As above	Compact			4	SS	16	10.3	Quite moist
As above	As above	Compact			5	SS	15	10.0	Quite moist
			15'0"						
As above	As above	Compact			6	SS	26	9.1	Quite moist
As above	As above	Compact			7	SS	27	10.0	Quite moist
			22'0"						
Fine-medium sand, some gravel	Grey								
			25'0"						
As above	As above	Extremely dense			8	SS	16.3	6.7	Wet
									Boulder (9" C) W.T. about 27'4"
			30'0"						
Gravelly sand (coarse-medium)	Grey & brown	Very dense			9	SS	12	6.9	Wet
As above	As above	Extremely dense			10	SS	200/2"	9.1	Wet
			35'0"						
			39'7"						
									Refusal at 39'7"
									Start diamond drilling, core barrel broke off.
									New note was started
			0'0"						1.5' E of original.
									Hole #7A
									No sampling to refusal
									Refusal at 39'0"
									Start diamond drilling
Limestone boulders to about 40"			39'6"						
Argillaceous limestone (impure; shaly parting)	Grey to dark grey					RC			Recovery: 70%
Shaleside surface at 44'						RC			
Argillaceous limestone	Dark grey								
			46'0"						Recovery: 95%
									TESTHOLE TERMINATED AT 46'0"

e. m. peto associates ltd.
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 64191 Borehole No. #8
Client M. M. Dillon & Co. Ltd. Casing 4" Aug. 3-12, 1964
Elevation 217.0 Completed By J. F. G. Boring Date Aug. 3-12, 1964
Checked By R. L.

SAMPLE CONDITION		SAMPLE TYPE		ABBREVIATIONS	
	UNDISTURBED	A.S. AUGER SAMPLE	V.T. IN SITU VANE SHEAR TEST		
	FAIR	C.S. CASING SAMPLE	M. MOIST		
	DISTURBED	S.S. 2" STANDARD SPLIT TUBE SAMPLE	W.L. WATER LEVEL IN CASING		
	LOST	S.I. SPLIT BARREL WITH LINERS	W.T. GROUND WATER TABLE IN SOIL		
		S.T. THIN-WALLED SHELBLY TUBE SAMPLE	W.T.P.L. WETTER THAN PLASTIC LIMIT		
		W.S. WASH SAMPLE	D.T.P.L. DRIER THAN PLASTIC LIMIT		
		R.C. ROCK CORE	A.P.L. ABOUT PLASTIC LIMIT		

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft.	WATER LEVEL	WATER LEVELS & REMARKS
Ground Surface			0'0"						
4" Topsoil			0'4"						
Sandy silt, traces of organic matter	Mixed brown	Very loose to loose	4'9"		1	SS	6	17.9	Moist
Layered silt and clayey silt, traces of organic matter	Olive-grey	Ditto			2	SS	4	20.8	Wet
	Ditto	Compact			3	SS	25	21.0	Saturated
Granite boulder	Pink		9'11"		3A	RC			Boulder
Fine-medium sand, grits, stones (cemented)	Grey-brown	Very dense	15'0"		4	SS	55	3.2	Wet
Ditto, more coarser	Ditto	Dense				SS	34	5.9	Wet
Ditto	Ditto	Compact to dense	20'0"		6	SS	30	6.2	Wet
Bouldery till (fine-coarse sand, minor clay content, grits, pebbles, stones)	Grey	Ditto	24'0"		7	SS	32	6.9	Saturated
Coarse sand and fine gravel	Grey	Extremely dense	30'0"		8	SS	100/6"		Saturated
Ditto, slightly less gravel	Ditto	Ditto	35'0"		9	SS	81	10.7	Saturated
Coarse sand	Grey		40'3"		10	SS	50.3"		Boulder
Fine-medium sand	Grey	Ditto			11	WS			
Medium gravel	Grey-brown	Ditto	42'10"		13	SS	123		Saturated

Soil description	Color	Texture	Depth (ft)	Moisture (%)	SS (%)	Cl (%)	LC (%)	Notes
Layered silt and clayey silt, traces of organic matter	Olive-grey	Loose to loose	4'9"	2	4	20.8		Wet
	Ditto	Compact	5'11"	3	26	21.0		Saturated
Granite boulder	Pink		11'1"	3A				Boulder
Fine-medium sand, grits, stones (cemented)	Grey-brown	Very dense	15'0"	4	55	3.2		Wet
Ditto, more coarser	Ditto	Dense	20'0"		34	5.9		Wet
Ditto	Ditto	Compact to dense	24'0"	6	30	6.2		Wet
Cloddy till (fine-coarse sand, minor clay content, grits, pebbles, stones)	Grey	Ditto	30'0"	7	32	6.9		Saturated
Coarse sand and fine gravel	Grey	Extremely dense	35'0"	8	100/6"			Saturated
Ditto, slightly less gravel	Ditto	Ditto	40'3"	9	81	10.7		Saturated
Coarse sand	Grey	Ditto	43'0"	10	50/3"			Boulder
Fine-medium sand	Grey	Ditto	48'10"	11	112	12.3		Saturated
Medium gravel	Grey-brown	Ditto	54'0"	13	123			Saturated
Fine-medium sand	Grey	Very dense	57'0"	14	67	11.5		Wet-saturated
Dense, argillaceous limestone, few study partings along bedding	Dark grey	Extremely dense	65'4"	15	120/4"			Recovery: 86%
Thinly bedded shaly limestone; few slickenside surfaces odd calcite veins along bedding	White		70'0"	16				Recovery: 92%
Impure argillaceous limestone	Grey to dark grey		77'0"					
BORING TERMINATED AT 77'0"								

BOREHOLE LOG

Borehole No. #10
Boring Date Aug. 26-28, 1964
Checked By H. L.

SAMPLE TYPE

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

[illegible]

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO





BOREHOLE LOG

Job Name Heron Road Bridge
Client M. M. Dillon & Co. Ltd.
Elevation 238.5

Job No. 64191
Casing 4 1/2 BX
Compiled By A. A. M.

Borehole No. #11
Boring Date Aug. 29, 1964
Checked By B. L.

SAMPLE CONDITION

	UNDISTURBED
	FAIR
	DISTURBED
	LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Natural Moisture Content	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Topsoil then medium to fine sand till? silt silty clay	Brown		0'2" 1'6"		1 ✓ 2 ✓	CS SS	12	35.9	Quite moist W.T.P.L.
As above	Ditto	Firm	7'0"		3 ✓	SS	7	36.8	W.T.P.L.
As above	Ditto		7'0" 10'0"		4 ✓ 	SL 	34.5		W.T.P.L. W.T. about 7'10"
As above; sandy silt pockets	Ditto	Very soft			5 ✓ 6 ✓	SS ST	2	37.4	W.T.P.L. Water seepages from 11'6" to 12'0"
2" layer of peat then organic clayey silt with some clay seams	Greenish grey	Very stiff	14'2" 1'0" 20'0"		7 ✓ 	SS	21	34.6	W.T.P.L.
Silty sand till	Light greenish grey	Compact	25'0"		8 ✓	SS	21	37.2	wet to saturated
Clayey sand till	Grey	Loose	30'0"		9 ✓	SS	8	37.7	wet to saturated Plastic too
As above	Ditto	Gumboey	30'0" 35'0"		10 ✓ 	SS	15	10.0	Wet to saturated and plastic. Start using wash water at 30'
Sandy till, silt seams	Ditto	Extremely dense	35'0"		11 ✓	SS	80	9.2	Wet
Limestone and granite-quartz boulders	Gray: light grey - tan		40'3"		12 ✓	SS RC	100, 3		Refusal at 40'3" Start diamond drilling at 40'3"; Recovery 41%
Arenaceous limestone Much broken at 42' and 45'	Grey		45'0"			RC			Recovery: 63%
Limestone few shaly partings at 40' and 45'	Grey					RC			Recovery: 97%
Arenaceous limestone	Grey		50'0"			RC			

BOREHOLE LOG

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS

 UNDISTURBED FAIR

☒ DISTURBED

 LOST

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBESAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft	Water Content	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Topsoil then medium to fine sand fill?; silt silty clay	Brown		0'2" 1'0"		1 2	CS SS	12	35.9	Quite moist W. T. P. L.
As above	Ditto	Stiff			3	SS	7	36.8	W. T. P. L.
As above	Ditto		7'0"		4	2"SL		34.5	W. T. P. L. W. T. about 7'10"
As above; sandy silt pockets	Ditto	Very soft	10'0"		5 6	SS 2"ST	2	37.4	W. T. P. L. Water seepages from 11'6" to 12'0"
2" layer of peat then organic clayey silt with some clay seams	Greenish grey	Very stiff	14'2" 1'10" 20'0"		7	SS	21	34.6	W. T. P. L.
Silty sand till	Light greenish grey	Compact	25'0"		8	SS	21	2.7	Wet to saturated
Clayey sand till	Grey	Loose	30'0"		9	SS	8	9.7	Wet to saturated Plastic too
As above	Ditto	Compac.	35'0"		10	SS	16	10.0	Wet to saturated and plastic. Start using wash water at 30'
Sandy till, silt seams	Ditto	Extremely dense	39'0"		11	SS	80	9.2	Wet
Limestone and granite-granite boulders	Grey; light grey to blue		40'3"		12	SS RC	100/3"		Refusal at 40'3" Start diamond drilling at 40'3", Recovery 41%
Argillaceous limestone Much broken in 42' and 45'	Grey		45'0"			RC			Recovery: 63%
Limestone few shaly partings at 46' and 47'	Grey					RC			Recovery: 97%
Argillaceous limestone	Grey		50'0"			RC			Recovery: 93%
			53'3"						
TESTHOLE TERMINATED AT							53'3"		

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 64181 Borehole No. 12
 Client M. M. Dillon & Co. Ltd. Casing 4" X Boring Date Sept. 1 - 2, 1964
 Elevation 239.0 Compiled By A. A. M. Checked By D. L.

SAMPLE CONDITION



UNDISTURBED
FAIR
DISTURBED
LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
 C.S. CASING SAMPLE
 S.S. 2" STANDARD SPLIT TUBE SAMPLE
 S.L. SPLIT BARREL WITH LINERS
 S.T. THIN-WALLED SHELBY TUBE SAMPLE
 W.S. WASH SAMPLE
 R.C. ROCK CORE

ABBREVIATIONS

V.T. IN SITU VANE SHEAR TEST
 M. MOIST
 W.L. WATER LEVEL IN CASING
 W.T. GROUND WATER TABLE IN SOIL
 W.T.P.L. WETTER THAN PLASTIC LIMIT
 D.T.P.L. DRIER THAN PLASTIC LIMIT
 A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No of Blows per Ft	Natural Moisture Content	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Coarse to fine sand	Brown				1	CS	Quite moist		Quite moist
As above	Dark	Firm	2'10"		2	SS	7		
Silty clay with trace of organic matter	Greenish grey		5'0"					20.4	W.T.P.L.
Silty clay with sandy silt pockets	Grey-brown	Very soft			3	SS	2	30.0	W.T.P.L. and quite moist
			10'0"		4	3"SL			
Clayey silt with fine sand pockets	Greenish grey	Soft to firm	12'6"		5	SS	4	29.1	W.T.P.L. & Wet
Silty clay, sand lenses organic clayey silt	Mottled grey-brown	Stiff	14'6"		11	SS	12	22.6	W.T.P.L.
Sand seams; stones	Greenish grey		15'9"		12	SS	7/5"	23.8	Wet
							105/6"		Start using washwater at 15'
			20'0"						
Sandy till	Grey (greenish tint)	Dense			13	SS	37	10.3	Wet
			25'0"						
		Compacted			14	SS	13		
As above	Grey		33'0"		1	WS			
Clayey sand till	Grey	Compacted			15	SS	25	11.	Wet
			37'0"						
			40'0"						
Coarse sand and fine gravel	Grey and brown	Extremely dense			17	SS	110	13.5	Wet
As above	Grey				1	WS			
Coarse to medium sand some gravel		Extremely dense	40'6"			SS	100.3		
As above					17	WS			
Bedded limestone upper two feet is very flat shaly part is below	Light grey		44'1"						Refusal at 44'1"; Sack diamond drilling
						RC			Lost some wash water at 43'7"
									Recovery: 85"
Ar. siliceous limestone numerous shaly partings	Grey		50'0"						Lost all wash water at 50'0"

BOREHOLE LOG

SAMPLE CONDITION		SAMPLE TYPE		ABBREVIATIONS	
	UNDISTURBED	A.S.	AUGER SAMPLE	V.T.	IN SITU VANE SHEAR TEST
		C.S.	CASING SAMPLE	M.	MOIST
	FAIR	S.S.	2" STANDARD SPLIT TUBE SAMPLE	W.L.	WATER LEVEL IN CASING
		S.L.	SPLIT BARREL WITH LINERS	W.T.	GROUND WATER TABLE IN SOIL
	DISTURBED	S.T.	THIN-WALLED SHELBY TUBE SAMPLE	W.T.P.L.	WETTER THAN PLASTIC LIMIT
		W.S.	WASH SAMPLE	D.T.P.L.	DRIER THAN PLASTIC LIMIT
	LOST	R.C.	ROCK CORE	A.P.L.	ABOUT PLASTIC LIMIT

[illegible]

BOREHOLE LOG

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS

UNDISTURBED

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

FAI

DISTURBED

LOST

[illegible]





e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Heron Road Bridge Job No. 64191 Borehole No. 16
 Client M. M. Dillon & Co. Casing 4 & BX Boring Date Sept. 9, 1964
 Elevation 260.5 Compiled By A. A. M. Checked By P. L.

SAMPLE CONDITION
























 UNDISTURBED
 FAIR
 DISTURBED
 LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
 C.S. CASING SAMPLE
 S.S. 2" STANDARD SPLIT TUBE SAMPLE
 S.L. SPLT BARREL WITH LINERS
 S.T. THIN-WALLED SHELBY TUBE SAMPLE
 W.S. WASH SAMPLE
 R.C. ROCK CORE

ABBREVIATIONS





V.T. IN SITU VANE SHEAR TEST
 M. MOIST
 W.L. WATER LEVEL IN CASING
 W.T. GROUND WATER TABLE IN SOIL
 W.T.P.L. WETTER THAN PLASTIC LIMIT
 D.T.P.L. DRIER THAN PLASTIC LIMIT
 A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft	Moisture Content	WATER LEVELS & REMARKS
Ground Surface			0'0"						
3" Topsoil			0'3"						
Silty clay with silt pockets, some organic matter	Grey-brown	Very soft	1'0"		1	SS	21	31.2	D.T.P.L.
As above	As above	Stiff	2'0"		2	SS	11	37.9	D.T.P.L.
			3'0"		3	2"ST			
			10'0"						
Silty clay, occasional silt pockets	As above	Firm	11'0"		4	SS	7	52.6	About P.L.
			11'30"		5	2"SL			
			11'30"						
Silty clay (Leda clay)	Grey	Very soft	22'0"		6	SS	17.1	57.4	Much W.T.P.L.
						V.I.			
As above	Grey	Very soft	23'0"		7	SS	2.1	2.3	Much W.T.P.L.
			25'0"						
As above	Grey	Very soft	28'0"		8	SS	1.1	2.7	Much W.T.P.L.
						V.I.			
As above	Grey	Very soft	30'0"		9	SS	2	20.2	Much W.T.P.L.
			32'0"						
As above	Grey	Soft to firm	33'0"		10	SS	4	31.5	W.T.P.L.
			34'0"		11	2"ST			
			35'0"						
Fill (Clayey sand, fines and gravel)	Grey	Compact	36'0"		13	SS	1	2.0	Very moist to wet
			37'0"						
As above (Sand finer)	Grey	Loose to compact	40'0"		14	SS	10	1	wet
			50'0"						
As above	Grey	Loose to compact	51'0"		15	SS	12	2.4	Wet

BOREHOLE LOG

Job Name	Heron Road Bridge	Job No.	64131	Borehole No.	16
Client	M. M. Dillon & Co.	Casing	4" & BX	Boring Date	Sept. 9, 1964
Elevation	210.5	Compiled By	A. A. M.	Checked By	P. L.

SAMPLE CONDITION

	UNDISTURBED
	FAIR
	DISTURBED
	LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.L. 2" STANDARD SPLIT TUBE SAMPLE
S.S. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

[illegible]

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO





BOREHOLE LOG

Job Name Heron Road Bridge
 Client M. M. Dillon & Co.
 Elevation 232.6

Job No. 64191
 Casing 4" pipe
 Compiled By A. A. M.

Borehole No. 17
 Boring Date Sept. 12 & 14, 1964
 Checked By B. L.

SAMPLE CONDITION







-  UNDISTURBED
-  FAIR
-  DISTURBED
-  LOST

SAMPLE TYPE

- A.S. AUGER SAMPLE
- C.S. CASING SAMPLE
- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- M. MOIST
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL
- W.T.P.L. WETTER THAN PLASTIC LIMIT
- D.T.P.L. DRIER THAN PLASTIC LIMIT
- A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Natural Moisture Content	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Topsoil (Silt loam)	Dark brown		1'0"		1	CS			Moist
Clayey silt, some organic matter	Mottled brown				2	CS			D. T. P. L.
Clayey silt, some organic matter	Mottled brown	Very stiff	3'6"		3	SS	18	17.3	D. T. P. L.
Very silty clay	Grey-brown				6	2"ST	Tapped		About P. L.
As above	As above				9	2"ST	Tapped		About P. L.
Silty clay few silt seams	Grey brown	Firm to stiff	10'0"		12	SS		27.9	P. L.
									Hole dry on completion
									TESTHOLE TERMINATED AT 10'0"

BOREHOLE LOG

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS

UNDISTURBED

FAIR

DISTURBED

LOST

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBESAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

[illegible]

BOREHOLE LOG

SAMPLE CONDITION:

SAMPLE TYPE

ABBREVIATIONS

UNDISTURBED

A.S. AUGER SAMPLE

Y.T. IN SITU VANE SHEAR TEST

 FAIR

C.S. CASING SAMPLE

M. MOIST

☒ DISTURBED

S.S. 2" STANDARD SPLIT TUBE SAMPLE

W.L. WATER LEVEL IN CASING

LOST

S.L. SPLIT BARREL WITH LINERS

W.T. GROUND WATER TABLE IN SOIL

S.T. THIN-WALLED

W.T.P.L. WETTER THAN PLASTIC LIMIT
D.T.P.L. DRIER THAN PLASTIC LIMIT

W.S. WASH SAMPLE
R.C. ROCK CORE

A.P.L. ABOUT PLASTIC LIMIT

[illegible]

[illegible]

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO





BOREHOLE LOG

Job Name Heron Road Bridge
 Client M. M. Dillon & Co.
 Elevation 267.6

Job No. 64191
 Casing 4" pipe & BX
 Compiled By A. A. M

Borehole No. 24
 Boring Date Sept. 13, 16, & 17, 1964
 Checked By B. L.

SAMPLE CONDITION

-  UNDISTURBED
 FAIR
 DISTURBED
 LOST

SAMPLE TYPE

- A.S. AUGER SAMPLE
 C.S. CASING SAMPLE
 S.S. 2" STANDARD SPLIT TUBESAMPLE
 S.L. SPLIT BARREL WITH LINERS
 S.T. THIN-WALLED SHELBY TUBE SAMPLE
 W.S. WASH SAMPLE
 R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
 M. MOIST
 W.L. WATER LEVEL IN CASING
 W.T. GROUND WATER TABLE IN SOIL
 W.T.P.L. WETTER THAN PLASTIC LIMIT
 D.T.P.L. DRIER THAN PLASTIC LIMIT
 A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS & REMARKS
Ground Surface			0'0"					
Fine sand, fair root	Strong brown	Compact	3'5"		1	SS	14	Almos dry
Very silty clay	Grey-brown	Very stiff	5'0"		2	SS	20	D. T. P. L.
Silty clay	As above	Stiff to very stiff	10'0"		3	SS	16	About P. L.
Silty clay	Grey-brown	Firm	15'0"		4	3" SL	1apped	
			16'0"		5	SS	5	W. T. P. L.
Clayey fine sand	Brownish-grey	Very loose	20'2"		6	3" ST	Pushed	
			20'2"		7	SS	2	28.4 Quite moist
Silty clay (Leda clay)	Grey	Very soft	25'0"		8	SS	2	33.5 W. T. P. L.
As above	Grey	Very soft	30'0"		9	2" ST	Pushed	
			30'0"		10	SS	1	31.9 W. T. P. L.
As above	Grey	Very soft	35'0"		11	2" ST	Pushed	
			35'0"		12	SS	2	53.0 Much W. T. P. L.
As above	Grey	Soft	39'0"		13	2" ST	Pushed	
			39'0"		14	SS	3	23.2 W. T. P. L.
Till (Clayey sand, grits and pebbles)	Grey	Compact	45'0"		15	SS	16	2.3 Wet
As above	Grey	Very dense	50'0"		16	SS	63	11.2 Wet
Till (Silty sand, grits & pebbles)	Grey	Extremely dense	50'0"		17	SS	116	15.7 Quite moist to wet

Job Name Heron Road Bridge Job No. 64191 Borehole No. 24
Client M. M. Dillon & Co. Casing 4" pipe & BX Boring Date Sept. 15, 16, & 17, 1964
Elevation 257.6 Compiled By A. A. M Checked By B. L.

[illegible]

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Heron Road Bridge

Job No. 64191

Borchale No. 25

M. M. Dillon & Co.

Casing 4" pipe & BX

Revised Date: Sept. 12 & 14, 1964

279. 6

Compiled By A. A. M.

Checked By

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS



UNDISTURBED

FAIR

☒

DISTURBED

LOST

A.S. AUGER SAMPLE

C.S. CASING SAMPLE

S.S. 2" STANDARD SPLIT TUBE SAMPLE

S.L. SPLIT BARREL WITH LINERS

S.T. THIN-WALLED SHELL BY TUBE SAMPLE

W.S. WASH SAMPLE

R.C. ROCK CORE

V.T. IN SITU VANE SHEAR TEST

MOIST

W.L. WATER LEVEL IN CASING

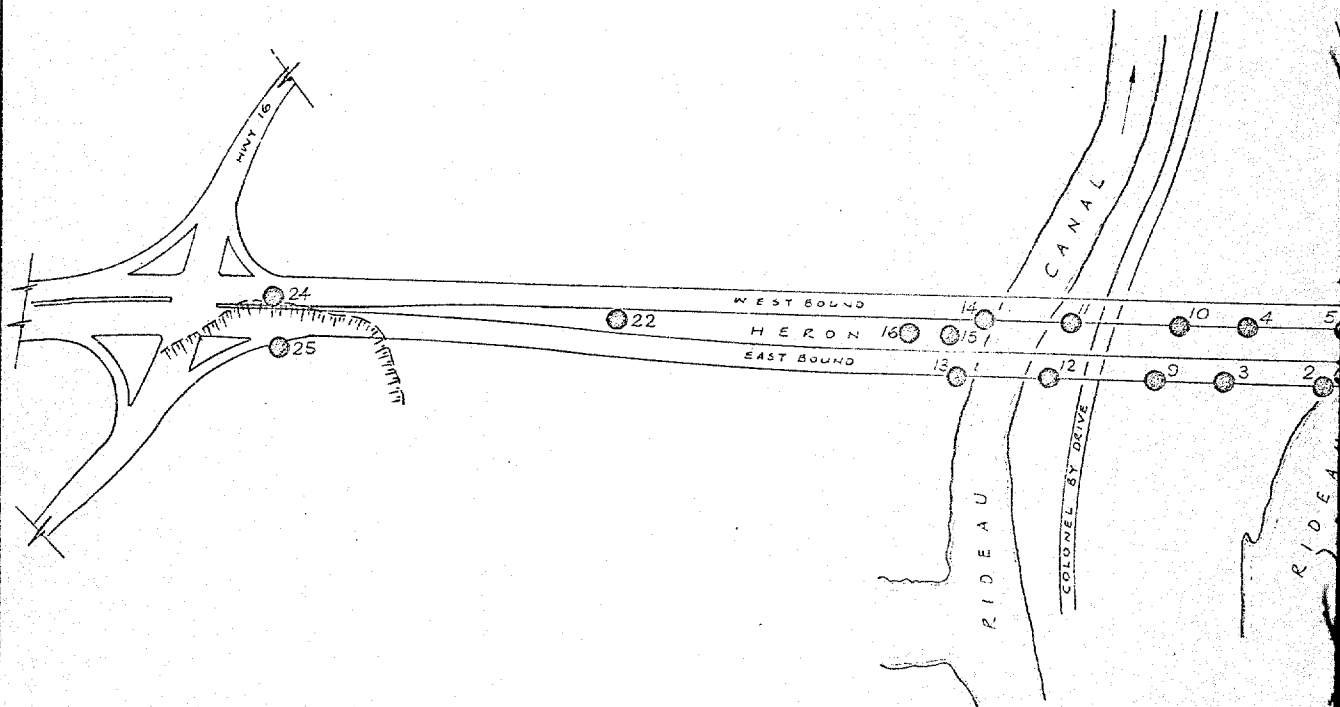
W.T. GROUND WATER TABLE IN SOIL

W.T.P.L. WETTER THAN PLASTIC LIMIT

D.T.P.L. DRIER THAN PLASTIC LIMIT

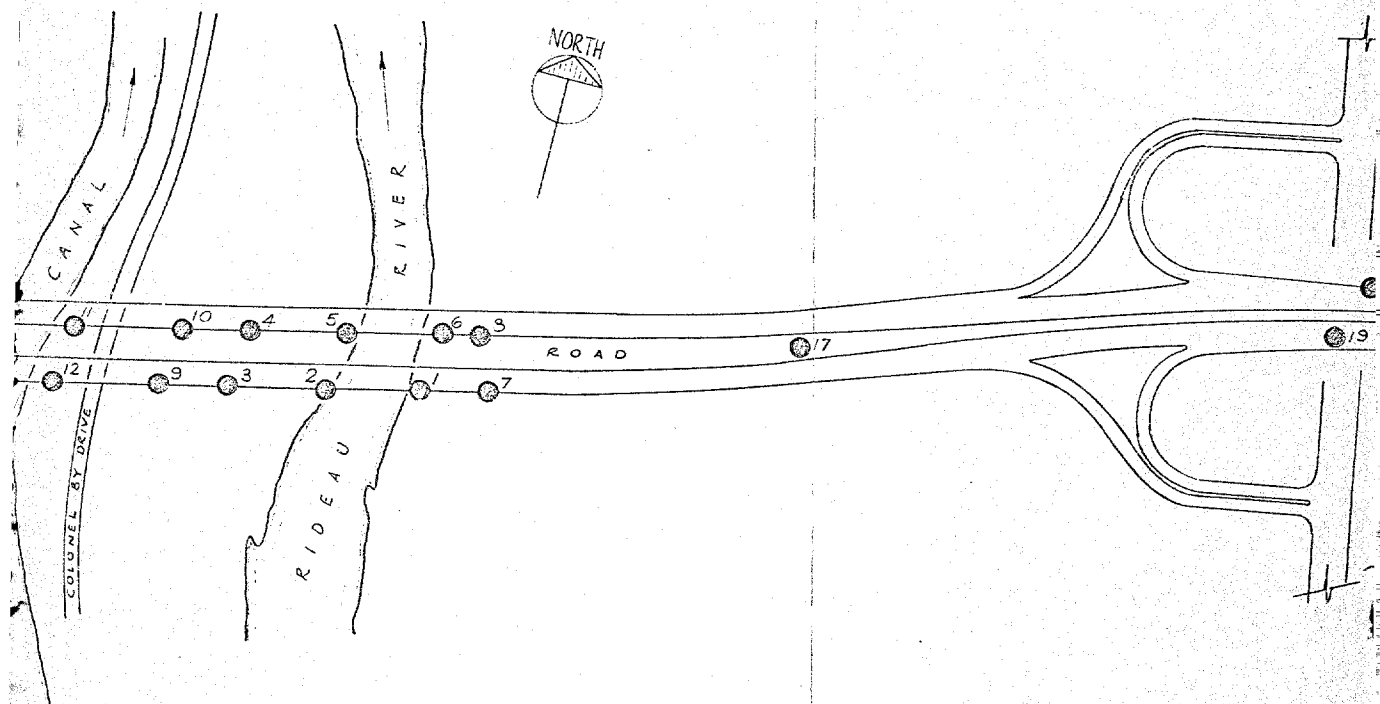
A.P.L. ABOUT PLASTIC LIMIT

[illegible]



KEY PLAN
HERON ROAD BRIDGE

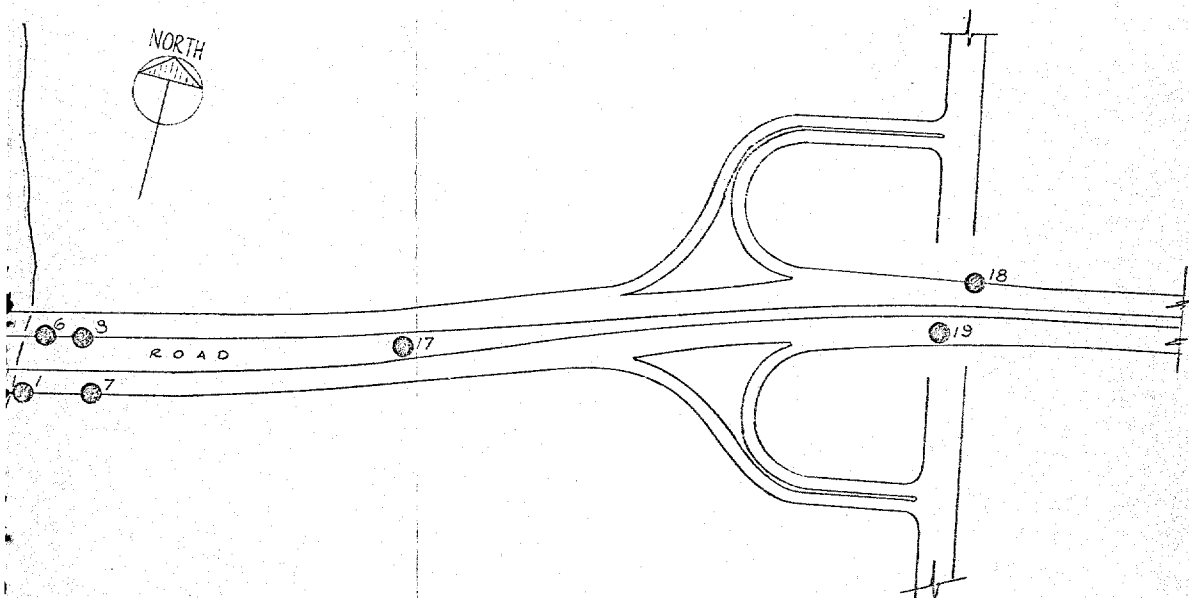
Scale: 200 ft. to 1 in.



KEY PLAN

ROAD BRIDGE PROJECT

Scale: 200 ft. to 1 in.

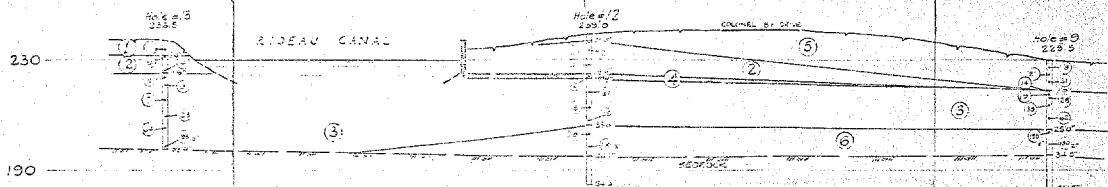
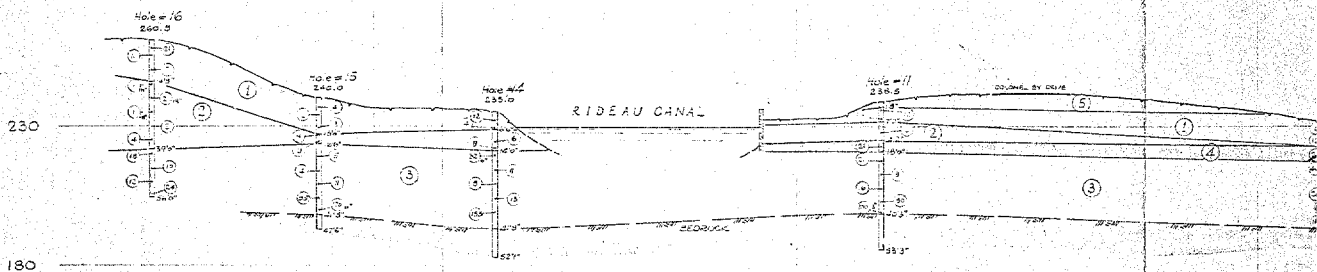
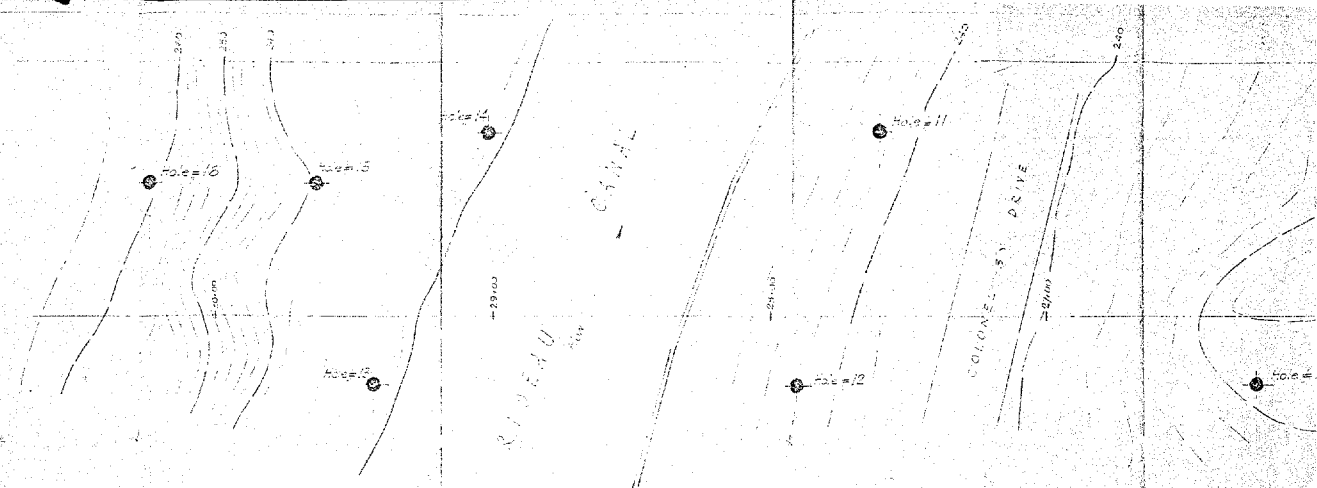


OBJECT

DRWG NO.

1

Job No. 64191
e.m.peto associates ltd.
October 1964



LEGEND

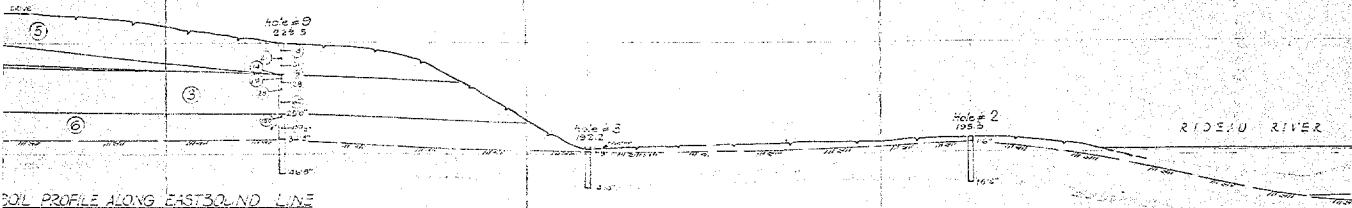
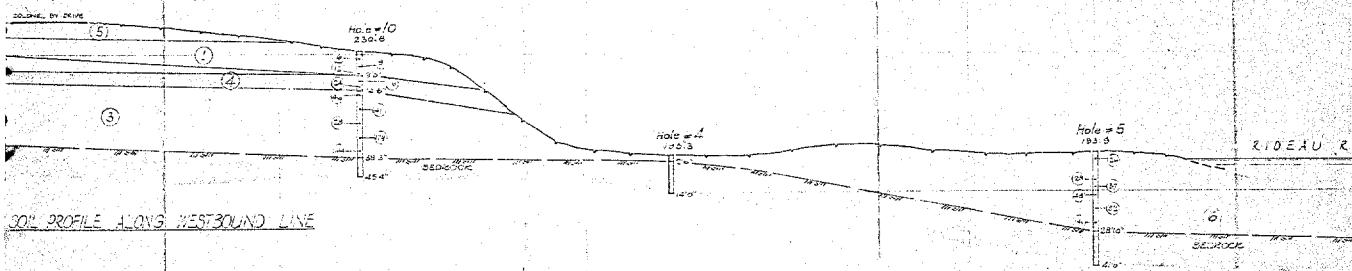
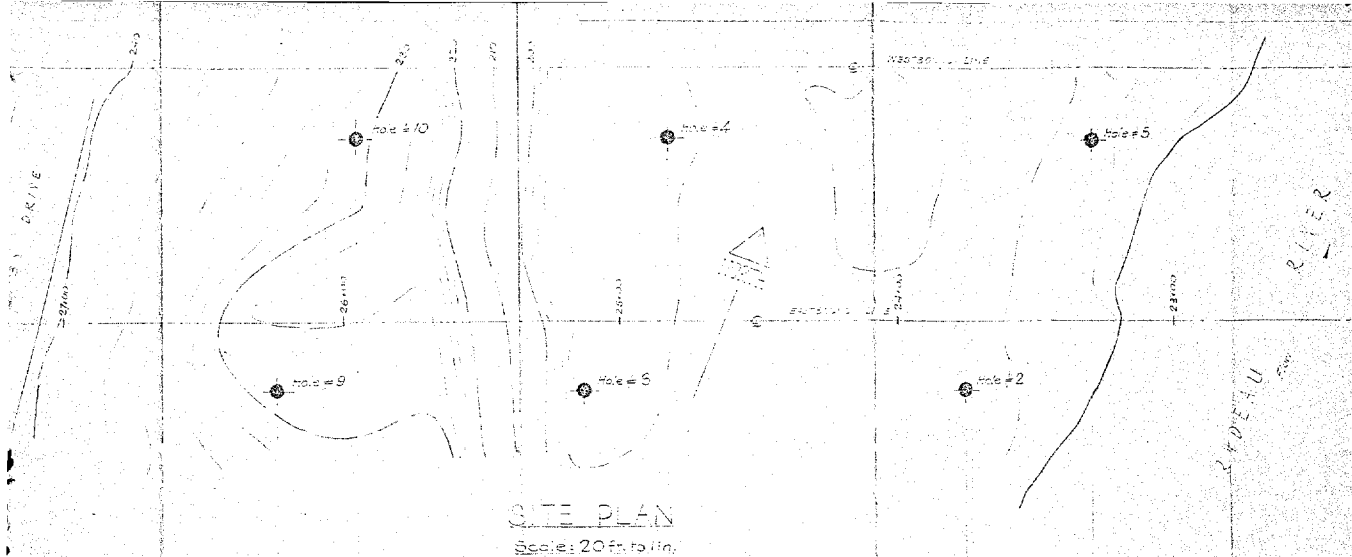
- ① Grey, brown, very silty CLAY.
- ② Grey, very silty CLAY (Mimic clay)
- ③ FILL
- ④ SILT & clayey SILT.
- ⑤ FILL
- ⑥ SAND & GRAVEL.

● TEST HOLE
 — BLIND / FOOT
 (Data pertains to test results)

NOTE:

Refer to borehole logs regarding details of soils, bedrock & ground water readings.

NOTE: The actual soil stratification has been verified from data obtained at the borehole locations only. The inferred contacts shown are based on geological evidence and these may vary from those shown between borings.

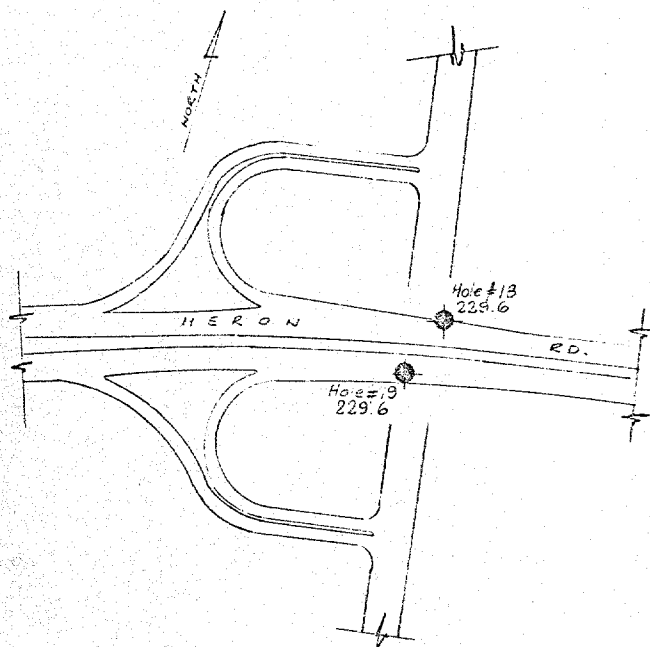


NOTE: Refer to borehole logs regarding details of soils, bearing capacity and water requirements.

NOTE: The actual soil stratification has been verified from data obtained at the borehole locations only. The inferred strata shown are based on geological evidence and those may vary from those shown between borings.

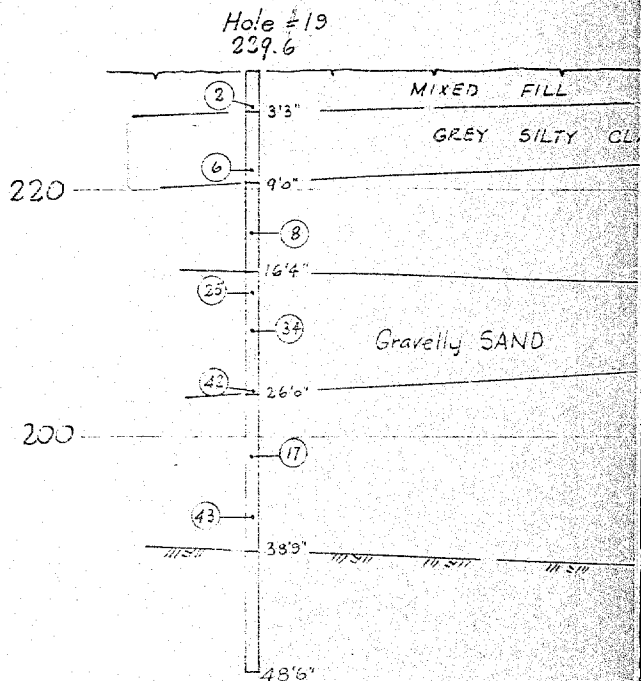
THE CITY OF OTTAWA
C.O.
M.M. DILLON AND CO. LTD.

SOIL FOUNDATION
INVESTIGATION FOR
HERON ROAD BRIDGE PROJECT



SITE PLAN

Scale: 100' to 1"



LEGEND

- Test hole
- 8 Blows / Foot

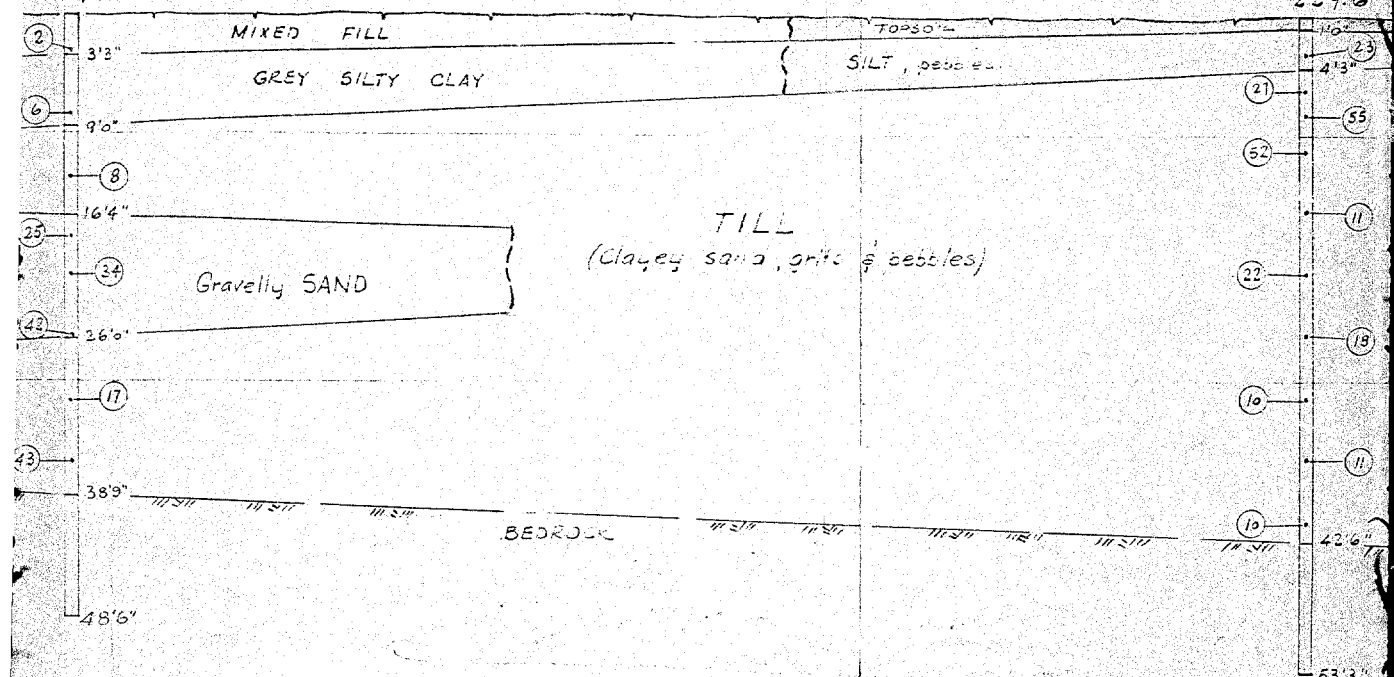
NOTES

- 1) Scales: Hor. 100'
Vert. 10'
- 2) Refer to borehole details of soils, water readings

NOTE: The actual soil stratification has been verified from data obtained at the borehole locations only. The inferred contacts shown are based on geological evidence and these may vary from those shown between borings.

Hole #19
239.6

Hole #18
239.6



SECTION ON HOLES 19 & 18
(VINCENT-MASSEY STRUCTURE)

NOTES

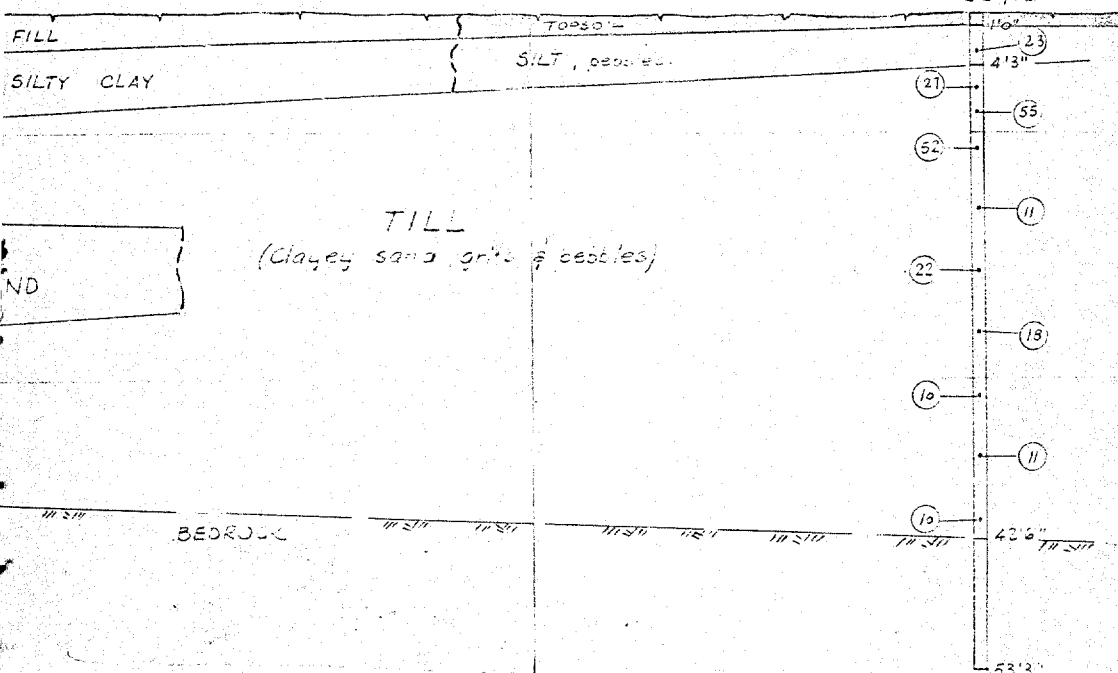
- 1) Scales: Hor. 10' to 1"
vert. 10' to 1"
- 2) Refer to borehole logs regarding details of soils, bedrock and ground water readings.

has been verified
borehole locations
own are based on
to may vary from
gs.



THE CITY OF OTTAWA c/o M.M. DILLON AND CO. LTD.	
HERON ROAD BRIDGE PROJ.	
PREPARED BY e.m. peto	associates ltd.
JOB NO. 64191	DATE October-19
SCALE As noted	

Hole #18
229.6



SECTION ON HOLES 19 & 18
(VINCENT-MASSEY STRUCTURE)

31 G5-116

GEOCREs No.

DRWG. NO.

3



NOTES

Hor. 10' to 1"
S: vert. 10' to 1"

to borehole logs regarding
of soils, bedrock and ground
readings.

THE CITY OF OTTAWA
c/o M.M. DILLON AND CO. LTD.

HERON ROAD BRIDGE PROJECT

PREPARED BY
e. m. peto associates ltd.

JOB NO.
64151

DATE
October 1964

SCALE
As noted

DWN. BY
G.T.