Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. G. McCombie

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

May 21, 1963

FOUNDATION INVESTIGATION REPORT BY -
H. Q. Golder & Associates Ltd.- to
De Leuw, Cather & Co. of Canada Ltd.
for distribution in the D.H.O. -
HWY. #400-401 INTERCHANGE - DIST. #6.

Attached, we are sending you the above-mentioned report prepared and submitted by H. Q. Golder and Associates Ltd. We have reviewed the report and found the factual data well presented, and are in agreement with the Consultant's recommendations.

Should there be any questions that you would like to discuss, please feel free to call on our Office.

AGStermac

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MacF
Attach.

cc: Messrs. E. A. Tregaskes
H. D. McMillan
G. E. Hunter
C. Fraser
T. J. Kovich
A. Watt

Foundations Office
Gen. Files.

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DE LEUW, CATHER & COMPANY
OF CANADA LIMITED
CONSULTING PROFESSIONAL ENGINEERS
1491 YONGE STREET
TORONTO 7, ONTARIO
WALNUT 5-3124

May 17th, 1963.

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials and Research Division,
Department of Highways of Ontario,
DOWNSVIEW, Ontario.

Dear Sir:

re: Soils Investigation
Hwy. #400-401 Interchange

Under separate cover we are sending nine soils reports, prepared by H.Q. Golder and Associates Ltd., for distribution in the Department of Highways.

Yours very truly,

DE LEUW, CATHER & COMPANY OF CANADA LTD.,

H. Van Bodegom

HVB:vh

H. Q. GOLDER & ASSOCIATES LTD.

CONSULTING CIVIL ENGINEERS

H. Q. GOLDER
V. MILLIGAN
L. G. SODERMAN

2444 BLOOR STREET WEST
TORONTO 9, ONTARIO
767-9201
763-4103

WP 234-60

REPORT

TO

DE LEUW, CATHER & COMPANY OF CANADA LIMITED

ON

SOIL CONDITIONS AND FOUNDATIONS

PROPOSED HIGHWAY 400-401 INTERCHANGE

TORONTO ONTARIO

Distribution:

6 copies - De Leuw, Cather & Company of Canada Limited, Toronto, Ontario.

9 copies - Department of Highways, Ontario, Toronto, Ontario.

2 copies - H. Q. Golder & Associates Ltd., Toronto, Ontario.

May, 1963 6248

TABLE OF CONTENTS

ABSTRACT

The results of an investigation to determine the soil conditions at the site of the proposed Highway 400-401 Interchange in Toronto, Ontario are reported, and recommendations are made for the foundation design of the proposed bridge and retaining wall structures and earthfill embankments.

The site is underlain by a deep deposit of generally very stiff to stiff silty clay which contains occasional layers or lenses of silty till or sand. The upper ten to fifteen feet approximately of the clay is desiccated. Various thicknesses of fill material, generally part of the present interchange, overlie the natural soil.

The proposed structures should be founded on spread footings founded in the upper portion of the desiccated crust of the silty clay, as discussed in the report. The estimated total and differential settlements of these footings under load should be within tolerable limits for the proposed type of structures.

The proposed earthfill embankments, up to about 35 feet in height above the existing ground level, should be constructed with side and end slopes not steeper than 2 horizontal to 1 vertical to ensure the overall and surficial stability of the embankments.

INTRODUCTION

H. Q. Golder & Associates Ltd. have been retained by the Department of Highways, Ontario by letter dated August 28, 1962, to carry out a soil investigation at the site of the proposed Highway 400-401 Interchange in Toronto, Ontario.

The purpose of the investigation was to determine the soil conditions at the site and to make recommendations concerning the foundation design of the proposed bridge and retaining wall structures and earthfill embankments.

PROCEDURE

The initial stage of the field work was carried out between September 10, 1962 and October 16, 1962. During this period 14 borings, ranging in depth from about 70 to 100 feet, were put down by a mobile power auger to define the general soil conditions across the site. An additional 23 borings, generally 30 to 35 feet in depth, were put down between February 7 and February 27, 1963, by means of a mobile power auger. These additional borings were located at proposed bridge pier locations and on the alignment of proposed retaining wall structures north of Wilson Avenue.

The locations of all borings put down during the investigation are shown on Figure 2. A detailed log of each boring is given on the Records of Boreholes. Sections of the inferred soil stratigraphy are given on Figures 3, 4 and 5.

The soil samples obtained during the investigation were returned to our laboratory for examination and testing. The results of the testing are plotted on the Records of Boreholes and on the figures.

All borehole locations were set out by the Department of Highways, Ontario. The borehole elevations were determined by H. Q. Golder & Associates Ltd. with reference to geodetic benchmark No. T-200, located in west face of the north concrete abutment of the existing Highway 400 bridge over Highway 401, and from two benchmarks established by the Department of Highways, Ontario. One of the Department's benchmarks was a nail in the west face of a light standard on Leg A, Station 17+60, 279 feet right of Highway 400, while the second was the top of a fire hydrant situated on the north side of Wilson Avenue approximately 340 feet west of the present centreline of Highway 400. The elevation of geodetic benchmark T-200 is given as 426.94. The elevations of the Department of Highways, Ontario benchmarks are reported to be 432.91 and 421.00, respectively. The datum is Geodetic.

SITE TOPOGRAPHY AND GEOLOGY

The proposed interchange is to be located at the intersection of Highways 400 and 401 in Toronto, Ontario. The natural ground surface at the site is level to very gently undulating. An existing interchange at the site has earthfill embankments built up to about 20 feet in height above natural ground level.

According to Watt (1955) the site is underlain by a glacio-fluvial varved clay and silt deposit, containing minor amounts of modified till. The deposit was found in lagoons and estuaries of rivers flowing into Lake Iroquois and older glacial lakes.

Bedrock is an interbedded shale and limestone of the Dundas formation of Ordovician Age. At the proposed site the bedrock surface forms a buried valley. Ontario Department of Mines Preliminary Map 102 (1961) indicates that the depth to bedrock at the proposed interchange ranges from about 170 to 270 feet below present ground level.

SOIL CONDITIONS

The fill material in the existing earthfill embankments at the site is generally a brown and grey sandy and silty clay with some gravel size particles. Grain size distribution curves obtained from samples of the fill are shown on Figure 6 and the results of Atterberg Limit tests on this material are summarized on the plasticity chart on Figure 11. The material is generally very stiff to hard. Several borings put down close to existing road pavements at the site encountered about 2 to 4 feet of silty sand and gravel road fill.

The significant stratum at the site is a deep deposit of brown to grey silty clay which was encountered by all borings put down at the site beneath the topsoil, where it was present, or below the earthfill embankment portions of the present interchange. The stratum was penetrated for a maximum depth of about 100 feet. The upper portion of the stratum, generally about 8 to 15 feet in thickness, was brown in colour due to weathering and desiccation and exhibited some fissuring. The lower grey coloured material contained occasional sand and gravel size particles and some silt textured inclusions, whose maximum dimension was generally less than about ½ inch. Very occasional layers or lenses of clayey silt till, or fine sands were noted in the deposits at depths generally in excess of 40 feet.

Grain size distribution curves obtained from typical samples of the silty clay are shown on Figures 7 and 8. Grain size curves for lenses of till and silty sand are shown on Figures 9 and 10. The results of Atterberg Limit determinations on samples of the silty clay are summarized on the plasticity charts, Figures 12 and 13. Based on these latter figures, the material may be classified as an inorganic clay of low to medium plasticity.

The measured values of remoulded undrained shear strength, undrained shear strength, Atterberg Limits, and wet unit weights are plotted against elevation on Figure 16 for the first series of borings put down at the site (Boreholes 1 to 14) and several properties of the clay are given below.

Properties of Silty Clay

Property	Typical Range in Values
Liquid limit	27 to 40
Plastic limit	16 to 22
1) Liquidity Index	Zero to 0.7
2) Sensitivity	
(in situ vane shear tests)	1.5 to 3.0
(undrained triaxial compression tests)	1.5 to 4.0

1) Liquidity Index is defined as the ratio of moisture content minus the plastic limit to the plasticity index.

2) Sensitivity is defined as the ratio of the natural undrained shear strength to the remoulded undrained shear strength.

The shear strength and consolidation characteristics of the silty clay are discussed in a later section.

WATER CONDITIONS

Water level observation pipes were installed in all borings put down during the investigation except Borehole 2. Details of the installations are given on the Records of Boreholes. The latest available measured water levels in the pipes are plotted on the Records of Boreholes and on the stratigraphy sections, Figures 3, 4 and 5.

SHEAR STRENGTH AND CONSOLIDATION CHARACTERISTICS OF THE SILTY CLAY

The undrained shear strength of the silty clay was measured by in situ vane shear tests and undrained triaxial compression tests. The results of these tests for Boreholes 1 to 14 are summarized on Figure 16 as plots of undrained and remoulded undrained shear strength versus elevation. The results obtained for Boreholes 15 to 37, put down at proposed structural locations, are plotted on the Records of Boreholes.

The approximate range in measured undrained shear strength is shown on Figure 16. This range is quite large but based on the general characteristics of the stratum, average values of the strength at various intervals of depth have been chosen for design.

Seventeen consolidation tests were carried out on samples of the silty clay. The results of the tests are presented on Figures 17 to 21 as plots of void ratio, e, and coefficient of consolidation, c_v, versus log pressure. The results are summarized in Table I following Figure 21.

The ranges in maximum past pressures minus computed present overburden pressures, as estimated from the e-log p curve for each sample, are shown on Figure 22. The results indicate that the stratum is overconsolidated by about 4 tons/sq.ft. in the upper desiccated zone of the clay, while at a depth of about 50 feet the preconsolidation pressure is about 1 ton/sq.ft. in excess of the present overburden pressure.

DISCUSSION

General

The portion of the proposed interchange being considered in the present report comprises eleven bridge structures, numbered 1S to 11S, together with connecting and approach earthfill embankments and a retaining wall structure. The general layout for the proposed interchange is shown on Figures 1 and 2.

Earthfill Embankments

The earthfill embankments for the proposed interchange generally will not exceed about 20 feet in height above ground surface, however, at the south end of bridge structure 9S the approach embankment height is to be about 34 feet above present ground level. A total stress stability analysis for the maximum height of embankment of about 34 feet indicated that the factor of safety against a deep circular arc type failure is in excess of 1.5, assuming side slopes of 2 horizontal to 1 vertical. To ensure both the overall and surficial stability of all embankments in the interchange, and to limit possible horizontal movements of bridge abutments, the side and end slopes of these embankments should not be steeper than 2 horizontal to 1 vertical.

Topsoil should be removed prior to placing any earthfill and all slopes should be sodded or seeded and mulched to control surface erosion.

The proposed embankments will settle due to consolidation of the fill and the underlying clayey stratum. Settlement within the embankment proper may be minimized by compacting the borrow material in thin layers close to its optimum moisture content. Computations were carried out to estimate the probable settlement under the centre of embankments of various heights due to consolidation of the underlying silty clay. The computations are summarized on Figure 24 as plots of settlement below the centre of the embankment versus height of embankment assuming that the silty clay is overconsolidated below the upper desiccated crust. Based on the interpretation of the results of the consolidation tests, for embankments up to about 40 feet in height, the settlement should approximate to that shown on Figure 24.

The computations summarized on Figure 24 are based on an embankment with a crest width of 50 feet and side slopes of 2 horizontal to 1 vertical. Increasing or decreasing the crest width and/or flattening the side slopes would only alter the computed settlements by a minor amount.

To estimate the time rate of settlement of the proposed embankments due to consolidation of the silty clay, it is necessary to define the coefficient of consolidation, c_v, of the clay and the length of the drainage path in the clay. The former of these quantities, as measured in the consolidation tests, ranged generally from about 0.01 to 0.05 $ins.^2/min$. The length of the drainage path is difficult to determine and could vary over wide limits. Based on previous experience in the general area, the major portion of the settlement should occur within 2 to 4 years after construction.

Bridge Structures

The portion of the proposed interchange being considered in the present report incorporates eleven bridge structures, numbered 1S to 11S on Figure 2. The overall lengths of the proposed structures, which are of the continuous span type, range from about 100 to 750 feet, while the widths range from about 30 to 140 feet.

As the proposed bridges are to be continuous span structures, and therefore sensitive to differential settlements between supports, it is necessary in deciding upon the most suitable type of foundation to consider not only the supporting capacity of the foundation, but also the amount of settlement of the foundation that could occur under load.

The generally very stiff to stiff silty clay which underlies the site was penetrated to depths of about 100 feet by the borings. Ontario Department of Mines Preliminary Map 102 (1961), which shows bedrock contours for Metropolitan Toronto, indicates that the site overlies a buried valley with

Settlement computations (refer Appendix I) were carried out for several bridge structures to determine the expected total and differential settlements between the supports of these structures due to elastic compression and consolidation of the deep clay deposit under the additional loads of the piers, abutments and approach embankments. In the computations, the dead and live loads on each pier and abutment were supplied by De Leuw, Cather & Company of Canada Limited. The results of the computations for bridge structures 4S and 5 and 8S are given on Figure 25.

The estimated total settlements for individual piers and abutments generally do not exceed about 2.0 to 2.5 inches and the differential settlements between adjacent supports generally do not exceed about 1 to 1.5 inches. These values are understood to be satisfactory for the proposed types of structures.

It is recommended that accurate settlement observations be carried out for each pier and abutment. In this way the rate of settlement and approximate maximum settlement of each footing may be defined.

It is understood that, except where the proposed approach embankments to the structures are low enough for the abutments to be founded in natural ground, the abutments will be perched in the approach earthfill. The perched abutments could be supported on spread footings founded in the fill provided that the earthfill below the footings is well graded, is essentially granular, and is well compacted in place. Such footings may then be designed using the same bearing pressure as for the pier footings provided careful control is maintained over compaction of the granular fill below the footings. We understand that the Department of Highways, Ontario question if adequate compaction of select fill below the proposed abutments, especially in adverse weather conditions, can be ensured. It has therefore been recommended that test borings be put down through each abutment fill once it is completed, to check its state of compaction. If the compaction is inadequate, the abutment would be supported on short timber piles driven through the fill into the natural ground.

To prevent softening of the clay in excavations for spread footings due to surface water runoff or construction operations, the bottom few inches should be excavated by hand and a thin layer of lean concrete laid down immediately the excavation is down to grade.

The backfill behind the proposed abutments should be a clean free-draining, granular material, well compacted in place. The backfill should extend a minimum horizontal distance of about 4 feet away from the abutment wall and have provision for drainage to ensure that no excess hydrostatic or ice pressures build up behind the walls. In design of the abutments an earth pressure coefficient, K, of 0.3 may be used provided that some minor movement of the top of the abutment can be accommodated.

Retaining Wall

It is planned to construct a reinforced concrete cantilever type retaining wall on the west side of proposed Highway 400 north of Wilson Avenue. The proposed wall, which will have a maximum height of about 20 feet, is to extend for about 820 feet north of station 212+08.5 on Highway 400 Southbound.

The proposed retaining wall may be founded on a spread type footing founded in the upper weathered zone of the silty clay. The maximum net bearing pressure exerted by the base of the wall on the underlying soil should not exceed 4,500 lb/sq.ft. for footings founded about 4 feet below natural ground surface.

The coefficient of earth pressure, K, may be taken as 0.3 for design, providing that the top of the wall is not fixed and that the backfill for the wall is a clean free-draining granular material well compacted in place. This granular backfill should extend a minimum horizontal distance of 4 feet away from the wall. Provision should be made for adequate drainage of the backfill.

As with the spread footings for the bridge structures, the bottom few inches of excavation for the footings should be carried out by hand and a thin layer of lean concrete should be laid down immediately the excavation is down to grade to prevent softening of the clay due to surface water runoff or construction operations.

N. R. McCammon, P. Eng.

V. Milligan, P. Eng.

NRMcC:IMB
6248

APPENDIX I

A NOTE ON SETTLEMENT COMPUTATIONS

A NOTE ON SETTLEMENT COMPUTATIONS

Consolidation tests are normally carried out in the laboratory under conditions of no lateral strain and hence the pore pressures set up in a saturated sample are equal to the applied pressure prior to dissipation of these pressures. In deep compressible strata lateral strains will generally occur and this fact necessitates modification of computed settlements based on the laboratory testing. A semi-empirical method of correction has been proposed by Skempton and Bjerrum (1957) where the computed settlement is multiplied by a factor, μ, which is a function of the pore pressure parameter A, to give the estimated probable settlement. Laboratory undrained tri-axial compression tests with pore pressure measurements, Figure 23, gave values of A which ranged from about 0.4 to 0.6. From Skempton and Bjerrum (1957) and further discussion by Wood (1959), a μ value of about 0.7 is computed. The esti-mated probable settlement values shown on Figure 25 have been modified by this factor.

REFERENCES

ONTARIO DEPARTMENT OF MINES, "Metropolitan Toronto Bedrock Contours", Preliminary Map 102, Feb. 1961.

SKEMPTON, A.W., and BJERRUM, L., "A Contribution to the Settlement Analysis of Foundations on Clay", Géotechnique, Vol. VII, No. 4, December, 1957.

WATT, A.K., "Pleistocene Geology and Ground-Water Resources of the Township of North York, York County", Ontario Department of Mines, Vol. LXIV, Part 7, 1955.

WOOD, A.M.M., Discussion on "A Contribution to the Settlement Analysis of Foundations on Clay", by Skempton, A.W. and Bjerrum, L., Géotechnique, Vol. IX, No. 1, March, 1959.

LIST OF STANDARD ABBREVIATIONS

The standard abbreviations commonly employed on each "Record of Borehole", on the figures, and in the text of the report are as follows:

SAMPLE TYPES

A.S. – Auger Sample
C.S. – Chunk Sample
D.O. – Drive Open
D.S. – Denison Type Sample
F.S. – Foil Sample
R.C. – Rock Core
S.T. – Slotted Tube
T.O. – Thin-walled, Open
T.P. – Thin-walled, Piston
W.S. – Wash Sample

PENETRATION RESISTANCES

Dynamic Penetration Resistance – The energy required to drive a 2 inch diameter, 60 degree cone attached to the end of the drilling rods into the ground: expressed in blows per foot, where each blow represents 4,200 inch-pounds of energy.

Standard Penetration Resistance, N – The number of blows by a 140 pound hammer dropped 30 inches required to drive a 2 inch drive open sampler one foot into the ground.

Sampler advanced by static weight – weight, hammer – Wh
Sampler advanced by pressure – pressure,hydraulic – Ph
Sampler advanced by pressure – pressure,manual – Pm

SOIL DESCRIPTION

The standard terminology for the descriptions of the relative density of cohesionless soils and the consistency of cohesive soils is as follows:

Relative Density	N, Blows/ft.
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

Consistency	c, lb/sq. ft.
Very Soft	Less than 250
Soft	250 to 500
Firm	500 to 1,000
Stiff	1,000 to 2,000
Very Stiff	2,000 to 4,000
Hard	over 4,000

SOIL TESTS

C – Consolidation Test
H – Hydrometer Analysis
M – Sieve Analysis
MH – Combined Analysis, Sieve and Hydrometer
Q – Undrained Triaxial
Qc – Consolidated Undrained Triaxial
S – Drained Triaxial
U – Unconfined Compression
V – Field Vane Test

Note: Undrained triaxial tests in which pore pressures are measured are shown as Q' or Q'c.

SOIL PROPERTIES

γ – Total Unit Weight
γ_d – Dry Unit Weight
γ_b – Submerged Unit Weight
L_L – Liquid Limit
P_L – Plastic Limit
W – Natural Water Content
G – Specific Gravity
e – Void Ratio
K – Coefficient of Permeability
c – Undrained Shear Strength (½ Compressive Strength)
St – Sensitivity
Ø' – Effective Angle of Shearing Resistance
c' – Effective Cohesion Intercept
Cc – Compression Index
Cv – Coefficient of Consolidation

GOLDER & ASSOCIATES

ADDENDUM

TO

REPORT

TO

DE LEUW, CATHER AND COMPANY OF CANADA LIMITED

ON

PROPOSED HIGHWAY 400-401 INTERCHANGE

TORONTO ONTARIO

Distribution:

6 copies - De Leuw, Cather & Company of Canada Ltd.
Toronto, Ontario.

9 copies - Department of Highways, Ontario,
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Toronto, Ontario.

July, 1963

6248/2

GOLDER & ASSOCIATES

H. Q. GOLDER & ASSOCIATES LTD.

CONSULTING CIVIL ENGINEERS

H. Q. GOLDER
V. MILLIGAN
L. G. SODERMAN

2444 BLOOR STREET WEST
TORONTO 9, ONTARIO
767-9201
763-4163

July 26, 1963.

De Leuw, Cather & Co. of Canada Limited,
55 Eglinton Avenue East,
Toronto 12, Ontario.

Attn: Mr. H. Van Bodegom, P.Eng.

RE: PROPOSED RETAINING WALLS
NORTH OF WILSON AVENUE
HIGHWAY 400-401 INTERCHANGE
TORONTO, ONTARIO.

Dear Sirs,

This letter reports the results of an investigation carried out for six retaining wall structures to be constructed as part of the proposed Highway 400-401 Interchange in Toronto, Ontario, and forms an addendum to our report 6248, dated May, 1963. The purpose of this investigation was to define the soil conditions along the alignments of the proposed structures and, based on this information, to provide information necessary for the design of the structures. The six structures, which are called Retaining Wall No. 7 and Toe Walls Nos. 3 to 7, inclusive, are to be located adjacent to the present Highway 400 north of Wilson Avenue as shown on Figure 1.

PROCEDURE

Ten borings numbered 101 to 110 were put down at the locations shown on Figure 1 between May 16 and 23, 1963, and on June 3, 1963. Three additional borings, 111 to 113, were put down on June 19, 1963, to define the depth of fill material at the No. 7 Retaining wall alignment. Details of the borings, which were put down by mobile power auger equipment are given on the Records of Boreholes. Water level observation pipes were installed in Boreholes 101 to 110. These installations are detailed on the Records of Boreholes.

The samples obtained during the investigation were brought to our laboratory for examination and testing. The results of the testing are plotted on the Records of Boreholes.

The locations of the borings were set out by the Department of Highways, Ontario. The borehole elevations were determined by Golder & Associates Ltd., with reference to a bench mark established by the Department of Highways, Ontario. This bench mark was the top of a fire hydrant situated on the north side of Wilson Avenue some 340 feet west of the present centreline of Highway 400. The elevation of this bench mark is given as 421.00, Geodetic datum.

SUBSOIL CONDITIONS

A mottled brown and grey clayey to sandy silt fill material was encountered at surface in all the borings except 102 to 105 and 108. The fill was generally 2 to 4.5 feet in thickness but could possibly be up to 6.5 feet in thickness in borehole 101. A stratum of firm dark grey clayey silt containing some organic matter was encountered below the topsoil in borehole 103. The material extended to a depth of about 5.3 feet below ground surface.

Underlying the fill in the boreholes where it was present, and underlying the topsoil or the organic clayey silt in the other borings, was a stratum of grey silty clay or layered silty clay and clayey silt. The upper 5 to 15 feet of this stratum, which was penetrated up to about 30 feet by the borings, was mottled brown and grey in colour as a result of desiccation and weathering.

The undrained shear strength of the silty clay was measured by undrained triaxial and unconfined compression tests and in situ vane shear tests. These tests indicated that the undrained shear strength of the clay was generally in excess of 2,000 lb/sq.ft. in the upper weathered zone. The compression tests gave shear strength values ranging generally from about 2,000 lb/sq.f to 4,600 lb/sq.ft. with one higher value of about 6,700 lb/sq.ft. in this weathered zone. Below the weathered zone the undrained shear strength decreased in the majority of the borings put down to about 1,000 to 1,500 lb/sq.ft. with three low vane shear values of about 700 lb/sq.ft. in boreholes 110 and 111. A plot of undrained shear strength versus depth below ground surface for the borings put down along the alignment of retaining wall No. 7 is shown on Figure 3.

DISCUSSION

General

Six reinforced concrete cantilever retaining wall structures are to be constructed adjacent to Highway 400 to the north of Wilson Avenue in connection with the proposed alteration to the Highway 400-401 Interchange. The total length of the six walls, which are to be located as shown on Figure 1, is about 2,800 feet. The maximum heights of the walls range from about 10 to 24 feet measured from the base of the walls.

Stability and Foundations

Computations were carried out to check the overall stability of the proposed retaining walls with respect to circular arc and sliding block type failures. The computations indicate that the factor of safety against a failure of either of these types for a maximum vertical wall height of about 20 feet above the ground level in front of the wall, and assuming that the surface of the backfill is horizontal, is at least 1.3 using total stress analyses. This factor of safety is considered adequate in view of the somewhat conservative values of undrained shear strength assumed in the analyses.

The proposed cantilever walls may be founded on reinforced concrete base slabs founded in the silty clay stratum. To utilize the relatively high bearing capacity of the upper weathered portion of the silty clay, the footings should be founded not deeper than 6 feet below present ground level. The minimum founding depth should be 4 feet below ground level. In the case of Toe Wall No. 4, which is to be located adjacent to an existing drainage channel, the footings should be founded 4 feet below the bottom of the ditch.

Based on the measured undrained shearing strength of the silty clay, footings founded at the depths recommended above, should be proportioned so that the maximum bearing pressure below the footings does not exceed 4,500 lb/sq.ft.

All the retaining walls should have a factor of safety against horizontal sliding of at least 1.5. The value used for the adhesion between the base slabs and the silty clay in the computation of this factor of safety should not exceed 1,000 lb/sq.ft. The passive resistance of the soil in front of the walls should not be included in the computation.

Construction Procedures

It is recommended that the following construction procedures be carried out:

i) The last 6 inches of the excavation for the footings should not be carried out during conditions of frost or continued rainfall.

ii) Any local soft spots or local areas of fill encountered below the proposed foundation levels should be excavated and backfilled with well compacted sand and gravel or lean concrete.

iii) Water should not be permitted to lie in the excavations at any time.

iv) A thin layer of lean concrete should be laid down immediately the excavations for the base slabs are at grade to prevent softening of the clay due to surface water runoff or construction operations.

v) The proposed retaining walls should be backfilled with a clean free draining granular material well compacted in lifts not exceeding 9 inches in loose thickness. Provision should be made for adequate drainage of this backfill to ensure that no hydrostatic or ice pressures build up behind the walls.

We trust that the above information is sufficient for you to carry out the foundation design of the proposed structures. If you have any questions, or if we can be of further assistance to you, please call us.

Yours faithfully,

H. Q. GOLDER & ASSOCIATES LTD.

for N. R. McCammon, P.Eng.

NRM:ab
6248/2

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Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

Consistency	c, lb/sq. ft.
Very Soft	Less than 250
Soft	250 to 500
Firm	500 to 1,000
Stiff	1,000 to 2,000
Very Stiff	2,000 to 4,000
Hard	over 4,000

SOIL TESTS

C – Consolidation Test
H – Hydrometer Analysis
M – Sieve Analysis
MH – Combined Analysis, Sieve and Hydrometer
Q – Undrained Triaxial
Qc – Consolidated Undrained Triaxial
S – Drained Triaxial
U – Unconfined Compression
V – Field Vane Test

Note: Undrained triaxial tests in which pore pressures are measured are shown as Q' or Q'c.

SOIL PROPERTIES

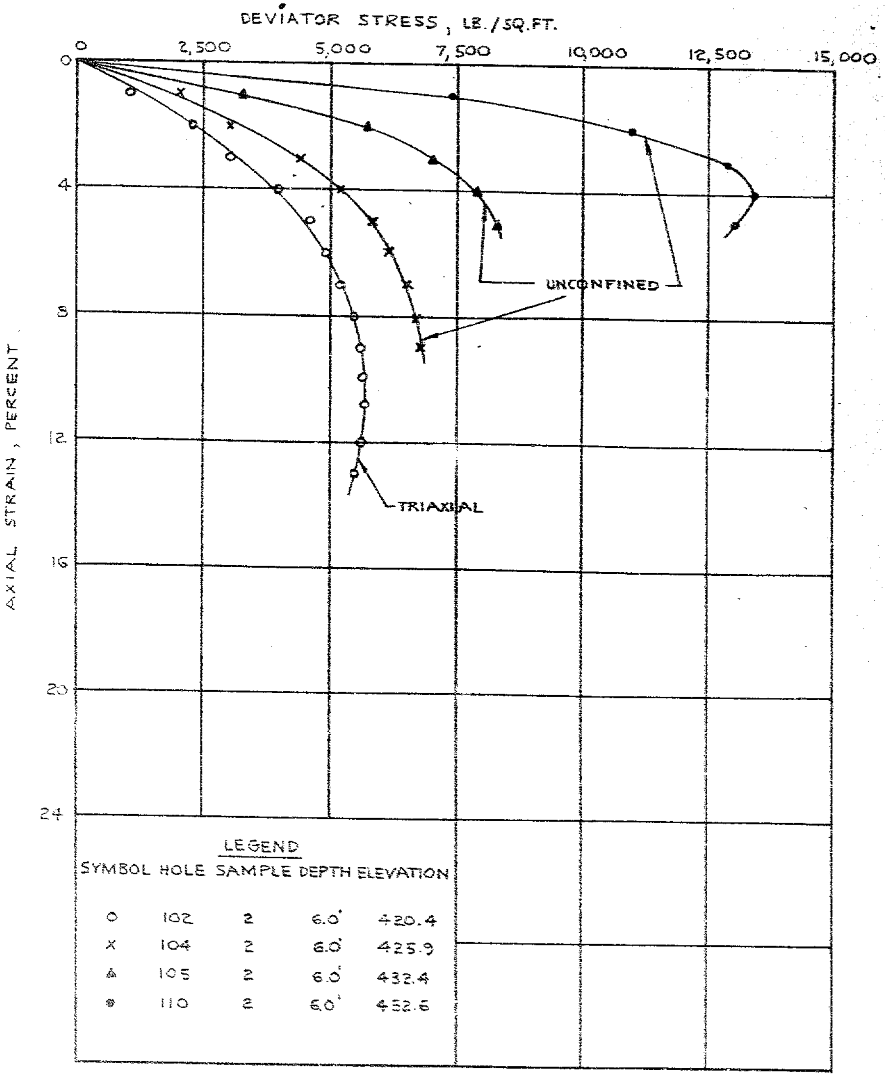
γ – Total Unit Weight
γ_d – Dry Unit Weight
γ_b – Submerged Unit Weight
L_L – Liquid Limit
P_L – Plastic Limit
W – Natural Water Content
G – Specific Gravity
e – Void Ratio
K – Coefficient of Permeability
c – Undrained Shear Strength (½ Compressive Strength)
St – Sensitivity
$\emptyset'$ – Effective Angle of Shearing Resistance
c' – Effective Cohesion Intercept
Cc – Compression Index
Cv – Coefficient of Consolidation

PROJECT No. 6248/2

UNDRAINED COMPRESSION TESTS

TYPICAL STRESS-STRAIN CURVES

FIGURE 2

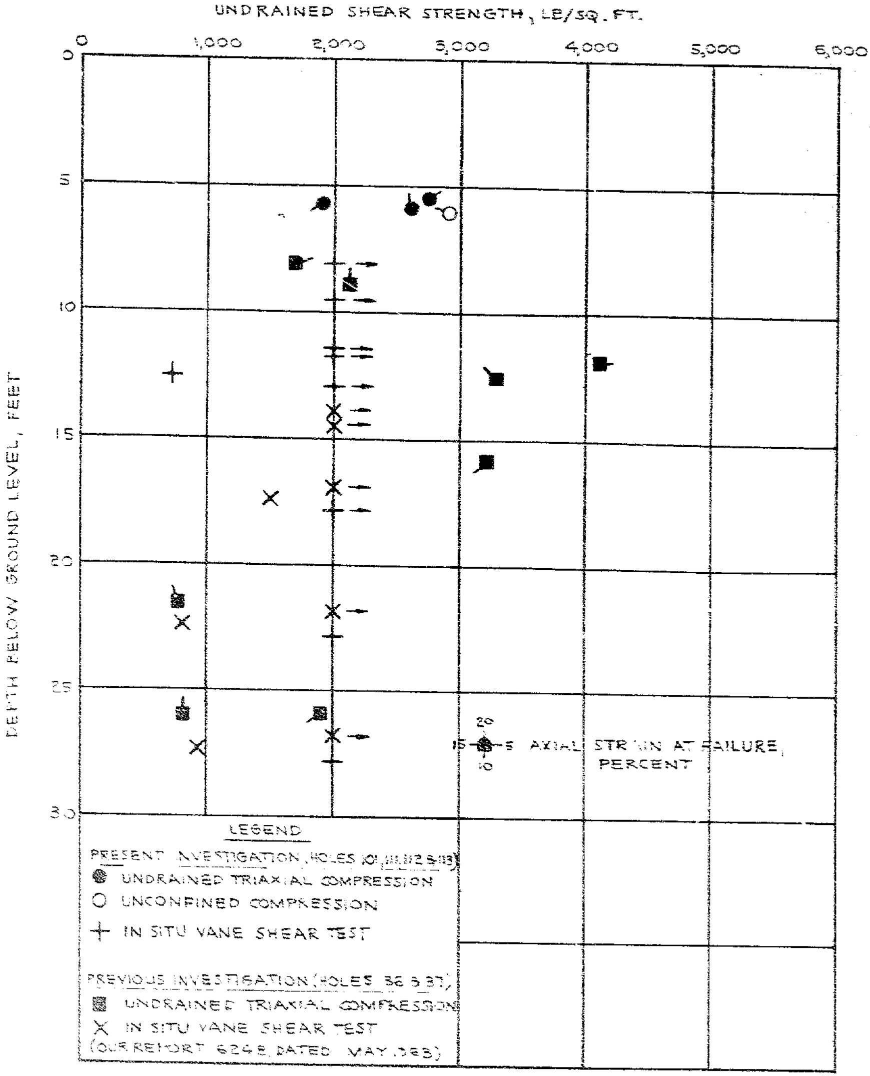


GOLDER & ASSOCIATES

UNDRAINED SHEAR STRENGTH VS DEPTH

BOREHOLES ALONG RETAINING WALL No. 7

FIGURE 3



GOLDER & ASSOCIATES

PROJECT No. ...

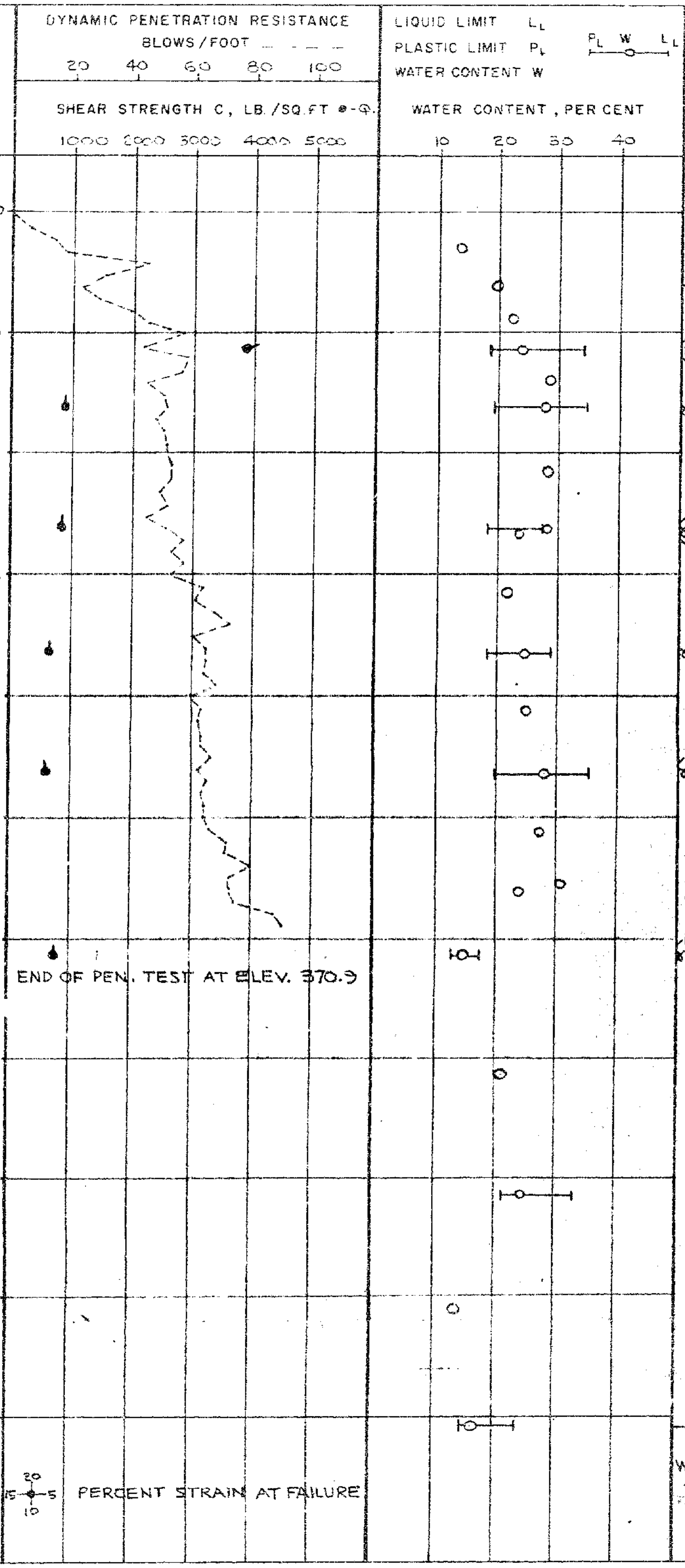
RECORD OF BOREHOLE 1

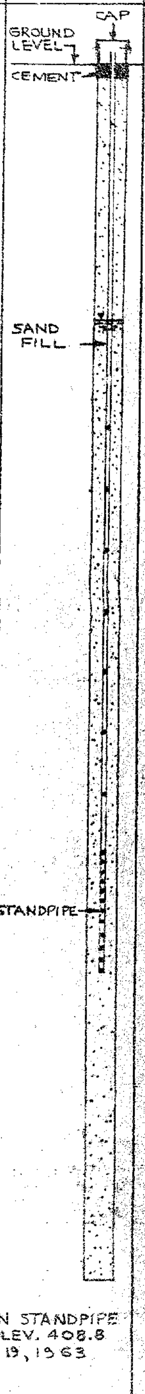
LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT. 10 - 12, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT	LAB. TESTING
429.3 / 0.0	GROUND LEVEL; BROWN SILT AND SAND WITH ORGANIC MATTER				
1.5	VERY STIFF BROWN SILTY CLAY (WEATHERED ZONE)	1	2" DO	36	
		2	"	37	MH
		3	"	26	
417.6 / 12.3		4	2" TO	16	MH γ=128 C
	FIRM GREY SILTY CLAY	5	2" DO	10	
		6	2" TO	Ph	γ=124
		7	2" DO	5	
		8	2" TO	Ph	H γ=128 C
	FEW LIGHT GREY CLAYEY SILT INCLUSIONS.	9	2" DO	7	
	OCCASIONAL COARSE SAND AND GRAVEL SIZE PARTICLES.	10	2" TO	Ph	γ=129
		11	2" DO	11	
	SOME FAINT STRATIFICATION.	12	2" TO	Ph	MH γ=123
		13	2" DO	5	
		14	"	11	
368.9 / 61.0	FIRM GREY CLAYEY SILT WITH SOME SAND AND GRAVEL (TILL LIKE STRUCTURE)	15	2" TO	Ph	MH γ=144
365.9 / 64.0	GREY SILTY CLAY	16	2" DO	20	
	OCCASIONAL COARSE SAND AND GRAVEL SIZE PARTICLES ESPECIALLY AT ABOUT EL. 338 TO 340	17	"	14	
	PROBABLY STIFF	18	"	32	
329.4 / 100.5	END OF HOLE	19	"	57	





W.L. IN STANDPIPE AT ELEV. 408.8 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [signature]

RECORD OF BOREHOLE 2

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT 12-14, 19[illegible] DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5

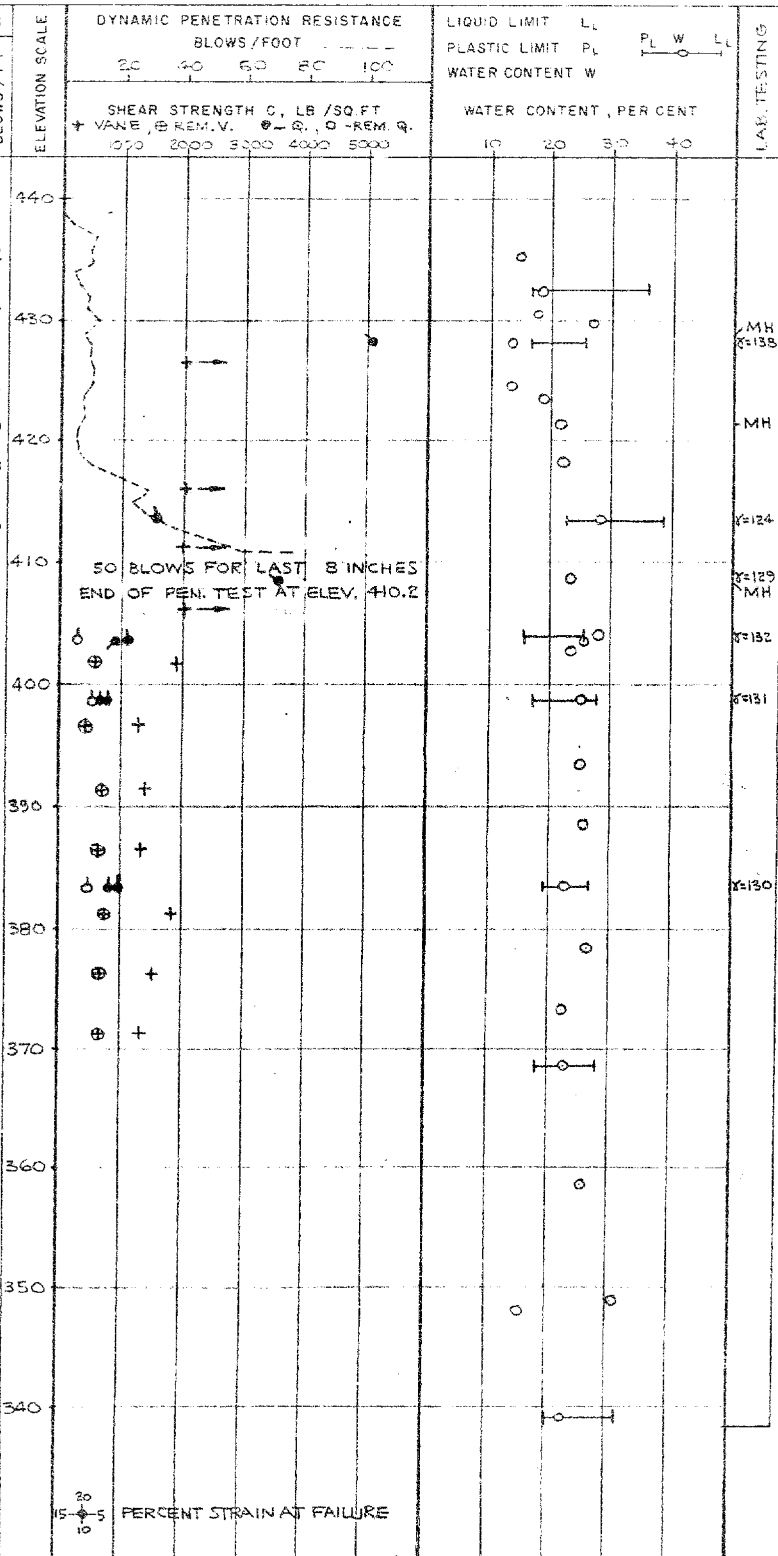
SAMPLER HAMMER WEIGHT 140 LB DROP 30 INCHES PEN TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE

ELEVN / DEPTH	DESCRIPTION
438.9 / 0.0	GROUND LEVEL
1.5	BROWN SAND & GRAVEL (FILL)
417.9 / 21.0	HARD BROWN & GREY SANDY AND SILTY CLAY WITH SOME GRAVEL SIZE PARTICLES (FILL)
407.9 / 31.0	STIFF TO VERY STIFF BROWN-GREY SILTY CLAY (WEATHERED ZONE)
338.4 / 100.5	FIRM TO STIFF GREY SILTY CLAY. OCCASIONAL SAND AND GRAVEL SIZE PARTICLES. FEW LIGHT GREY CLAYEY SILT INCLUSIONS, MAXIMUM DIMENSION GENERALLY LESS THAN 1/2 INS. SOME FAINT STRATIFICATION
	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT	LAB. TESTING
1	2" DO	12	
2	"	9	
3	"	17	
4	2" TO	3	MH, γ=138
5	2" DO	14	
6	"	10	MH
7	"	18	
8	2" TO	Ph	γ=124
9	"	Ph	γ=129, MH
10	"	Ph	γ=132
11	"	Ph	γ=131
12	2" DO	8	
13	"	7	
14	2" TO	Ph	γ=130
15	2" DO	8	
16	2" TO	Ph	
17	2" DO	10	
18	"	10	
19	"	9	
20	"	13	



VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

RECORD OF BOREHOLE 3

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT. 15 - 17, 19[illegible] DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

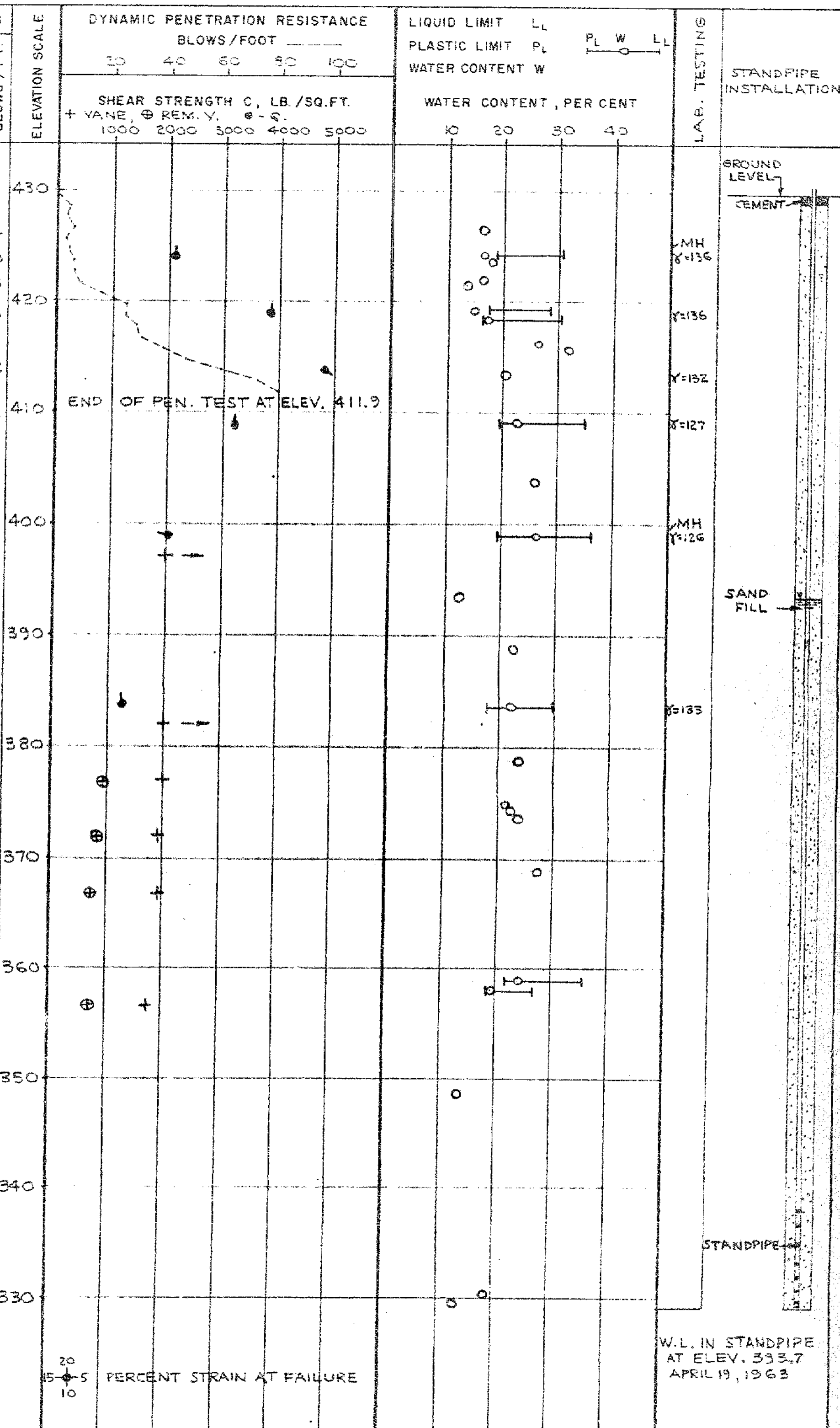
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
429.9	GROUND LEVEL
0.0	VERY STIFF TO HARD BROWN AND GREY SILTY CLAY WITH SOME SAND & GRAVEL SIZE PARTICLES. SOME ORGANIC MATERIAL BELOW EL. 417.5 (FILL)
414.1 / 15.8	VERY STIFF BROWN SILTY CLAY. FEW SAND & GRAVEL SIZE PARTICLES. (WEATHERED ZONE)
405.9 / 24.0	STIFF TO VERY STIFF GREY SILTY CLAY WITH A FEW SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION
329.4 / 100.5	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.
1	2" DO	12
2	2" TO	5
3	2" DO	13
4	2" TO	Ph
5	2" DO	11
6	2" TO	32
7	"	17
8	2" DO	13
9	2" TO	Ph
10	2" DO	15
11	2" TO	Ph
12	"	Ph
13	2" DO	14
14	2" TO	Ph
15	2" DO	12
16	2" TO	Ph
17	2" DO	55
18	"	25
19	"	57



W.L. IN STANDPIPE AT ELEV. 333.7 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [illegible]

PROJECT No. 6348

RECORD OF BOREHOLE 4

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT. 18 - 20, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN / DEPTH	SOIL PROFILE DESCRIPTION
434.8 / 0.0	GROUND LEVEL
	VERY STIFF GREY AND BROWN SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES. (FILL)
411.8 / 23.0	BROWN - GREY SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES (WEATHERED ZONE) PROBABLY VERY STIFF
404.8 / 30.0	STIFF TO VERY STIFF GREY SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION. MATERIAL BECOMES SILTY BELOW ABOUT ELEV. 347.
337.8 / 97.0	DENSE GREY FINE TO MEDIUM SAND, SOME SILT
334.3 / 100.5	END OF HOLE

SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
1	2" DO	9	
2	"	12	MH
3	"	22	
4	2" TO	Ph	γ=128
5	2" DO	13	
6	2" TO	11	
7	2" DO	13	γ=132
8	"	19	
9	2" TO	Ph	γ=129
10	2" DO	8	
11	2" TO	Ph	γ=135
12	2" DO	12	
13	2" TO	Ph	γ=133
14	2" DO	19	
15	"	13	
16	2" TO	Ph	
17	2" DO	23	
18	"	11	
19	"	42	

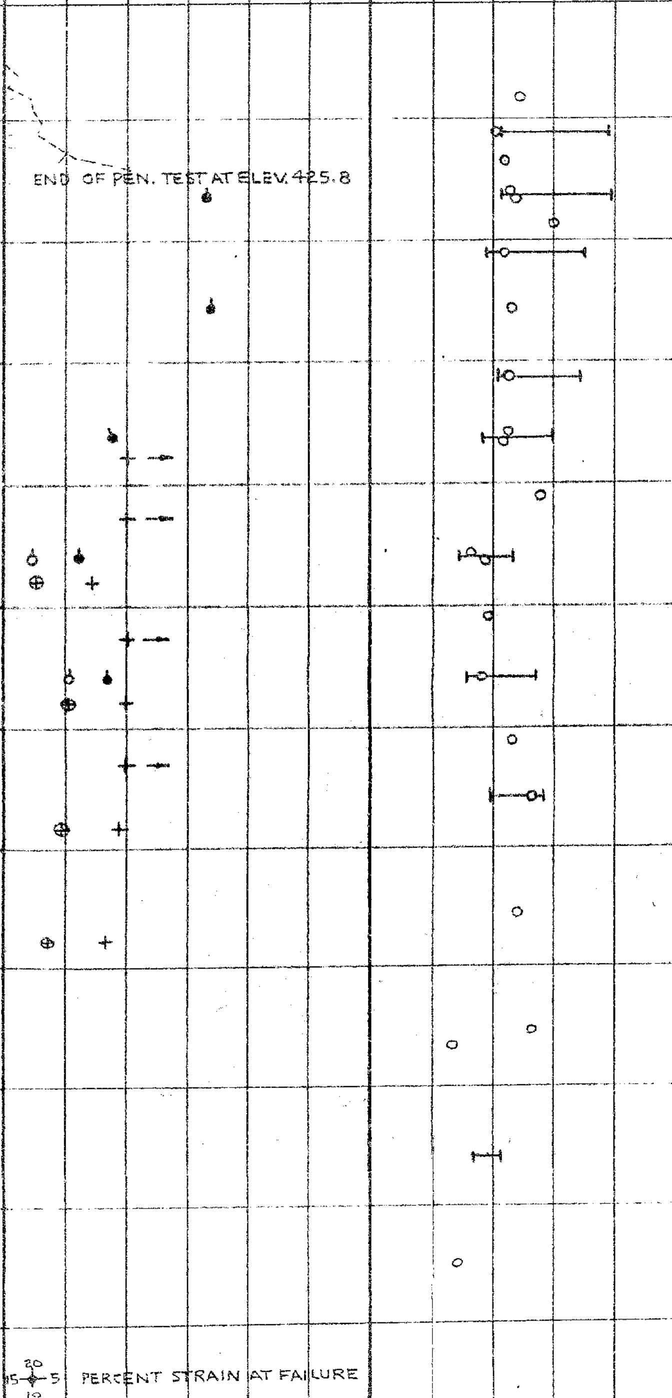
ELEVATION SCALE: 430, 420, 410, 400, 390, 380, 370, 360, 350, 340, 330

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH C, LB./SQ.FT. + VANE ⊕ REM. V. ● Q. ○ REM. Q.: 1000 2000 3000 4000 5000

LIQUID LIMIT L_L PLASTIC LIMIT P_L WATER CONTENT W

WATER CONTENT, PER CENT: 10 20 30 40



STANDPIPE INSTALLATION: CAP, GROUND LEVEL, CEMENT, SAND FILL, STANDPIPE

W.L. IN STANDPIPE AT ELEV. 380.9 OCT. 11, 1962

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED M. M.

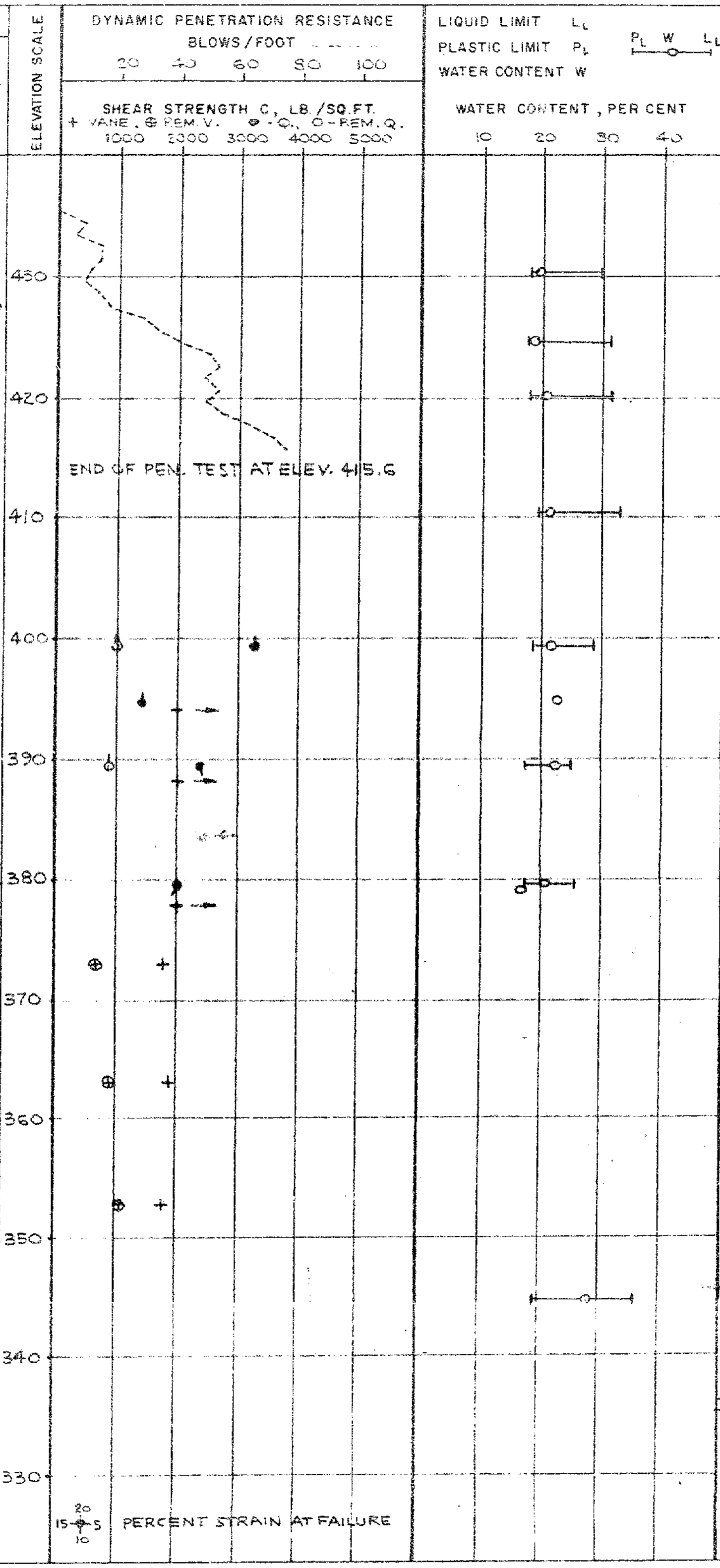
RECORD OF BOREHOLE 5

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT 20-21, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN. / DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
435.6	GROUND LEVEL				
0.0	GREY AND BROWN CLAYEY SILT WITH SOME SAND AND GRAVEL. (FILL) PROBABLY VERY STIFF	1	2" DO	21	
		2	"	19	
		3	"	20	MH
		4	"	23	
		5	"	19	
		6	"	17	
		7	"	21	
411.6 / 24.0	VERY STIFF TO STIFF BROWN SILTY CLAY WITH SOME SAND (WEATHERED ZONE)	8	"	29	
		9	"	14	
402.6 / 33.0	STIFF TO VERY STIFF GREY SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION	10	2" TO	11	MH γ=120
		11	"	Ph	γ=128
		12	"	Ph	γ=129
		13	"	Ph	
		14	"	Ph	γ=134
		15	2" DO	5	
		16	2" TO	Ph	
		17	2" DO	11	
		18	"	9	
		19	"	13	MH
335.1 / 100.5	END OF HOLE				



STANDPIPE INSTALLATION: GROUND LEVEL, CAP, CEMENT, SAND FILL, BENTONITE PLUG, STANDPIPE

W.L. IN STANDPIPE AT ELEV. 406.0 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

PROJECT No. 5248

RECORD OF BOREHOLE 6

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT. 24 - 25, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

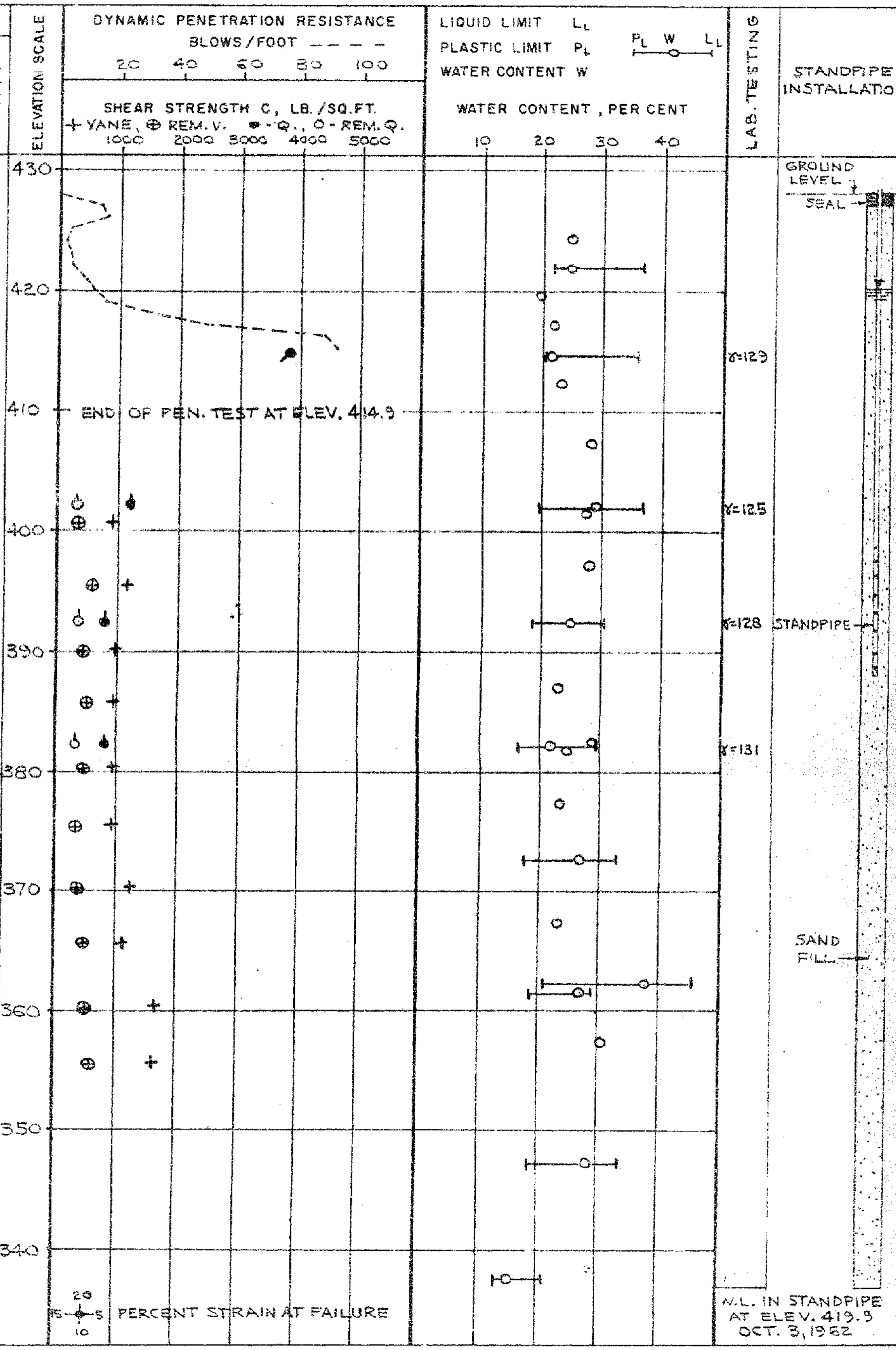
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
427.9	GROUND LEVEL
0.0	LOOSE BROWN SILTY SAND WITH PEBBLES (FILL)
2.5	MOTTLED GREY AND BROWN SILTY CLAY SOME SAND & GRAVEL (FILL)
419.5 / 8.4	VERY STIFF GREY AND BROWN SILTY CLAY, SOME SAND (WEATHERED ZONE)
406.8 / 21.1	FIRM TO STIFF GREY SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION. LAYER OR LENS OF STIFF GREY SILTY CLAY WITH SOME SAND AND GRAVEL (TILL) BETWEEN ELEV. 366 AND 370
338.9	DENSE GREY SILTY CLAY WITH SOME SAND (TILL)
336.4 / 91.5	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.
1	2" DO	6
2	"	5
3	"	16
4	"	30
5	2" TO	27
6	2" DO	13
7	"	9
8	2" TO	Ph
9	2" DO	5
10	2" TO	Ph
11	2" DO	6
12	2" TO	Ph
13	2" DO	7
14	2" TO	Ph
15	2" DO	8
16	2" TO	Ph.
17	2" DO	7
18	"	14
19	"	29



VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED M.McG.

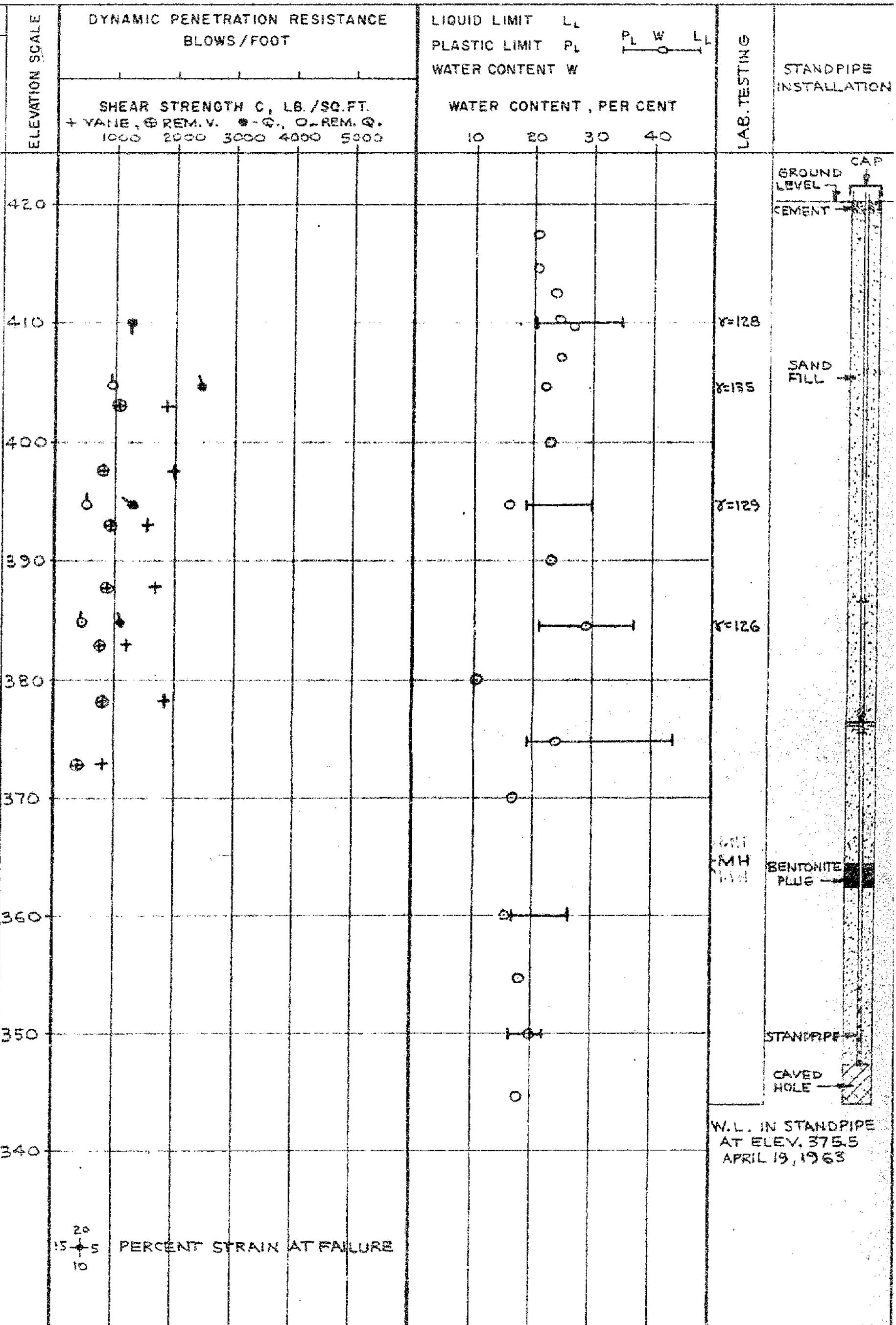
RECORD OF BOREHOLE 7

LOCATION SEE FIGURES 1 & 2 BORING DATE SEPT. 26–27, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

ELEVN. / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
420.2	GROUND LEVEL			
0.0	LOOSE BROWN SILTY FINE SAND (FILL)			
2.2	STIFF GREY-BROWN SILTY CLAY, FEW SEAMS OF FINE SAND (WEATHERED ZONE)	1	2" DO	15
		2	"	29
		3	"	25
		4	2" TO	9
407.9 / 12.3	VERY STIFF TO STIFF GREY SILTY CLAY. SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION. 2.3 FT. LAYER OR LENS OF SILTY CLAY WITH SAND AND GRAVEL (TILL LIKE STRUCTURE) AT ELEV. 380	5	2" DO	12
		6	2" TO	Ph
		7	2" DO	9
		8	2" TO	Ph
		9	2" DO	10
		10	2" TO	Ph
		11	2" DO	11
		12	2" TO	Ph
		13	2" DO	27
366.2 / 54.0	GREY SILTY FINE SAND PROBABLY LOOSE TO COMPACT	14	2" TO	Ph
361.2 / 59.0	PROBABLY STIFF GREY SILTY CLAY. FEW SAND & GRAVEL SIZE PARTICLES. 4 IN. THICK LAYER OR LENS OF SILTY SAND AT EL. 355	15	2" DO	14
		16	"	14
		17	"	24
		18	"	35
343.7 / 76.5	END OF HOLE			



W.L. IN STANDPIPE AT ELEV. 375.5 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED M.W.B.

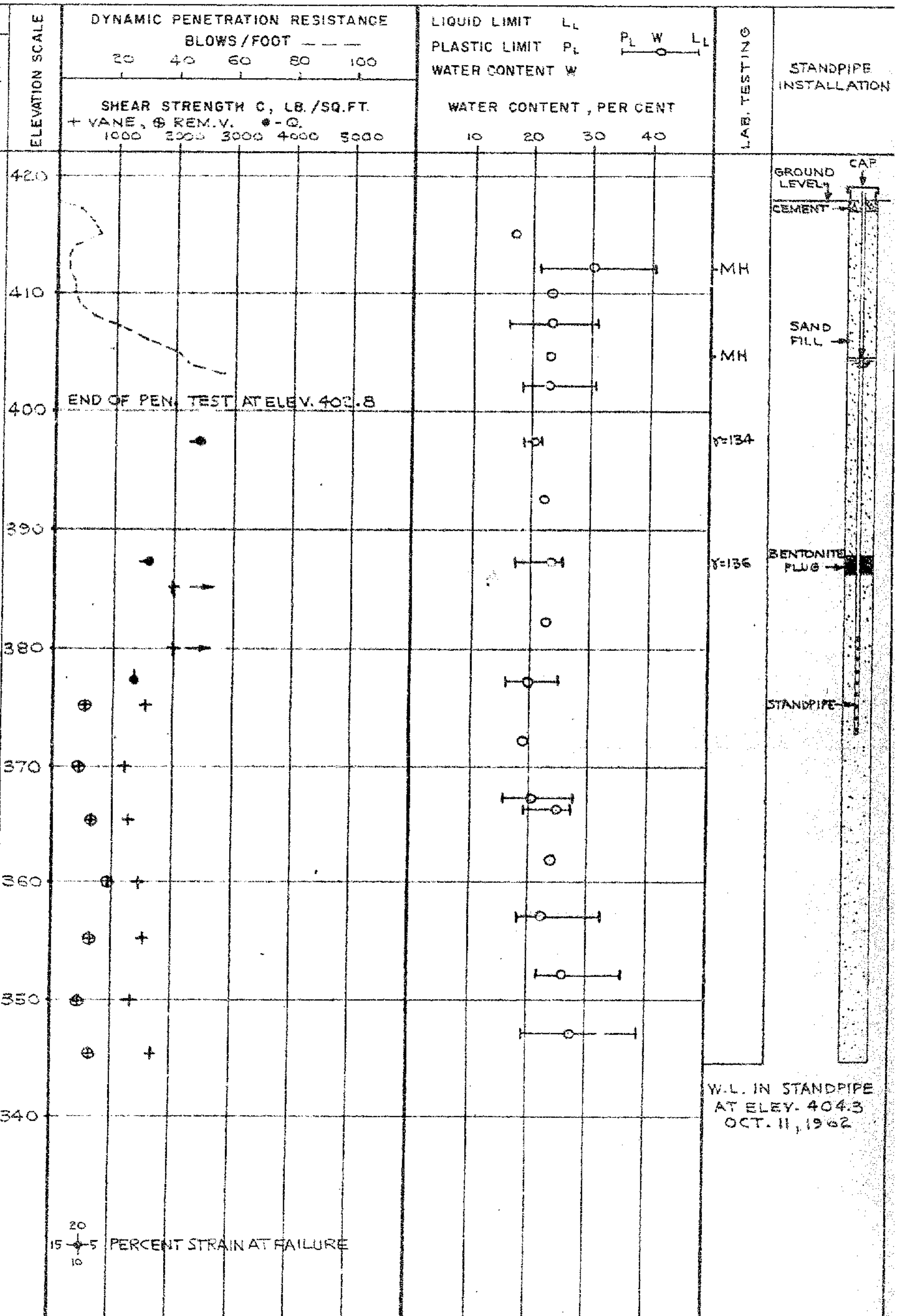
RECORD OF BOREHOLE 8

LOCATION: SEE FIGURES 1 & 2 | BORING DATE: SEPT. 27 - OCT. 1, 1962 | DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING | BOREHOLE DIAMETER: 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES | PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
417.8	GROUND LEVEL				
0.0	LOOSE TO COMPACT BROWN, LIGHT BROWN AND DARK GREY SILTY AND SANDY CLAY (FILL)	1	2" DO	17	
		2	"	8	MH
410.8 / 7.0	PROBABLY FIRM TO VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY (WEATHERED ZONE)	3	"	6	
		4	"	8	
		5	"	17	MH
		6	"	19	
401.5 / 16.3	VERY STIFF TO STIFF GREY SILTY CLAY. FEW VERY THIN FINE SAND SEAMS AND OCCASIONAL SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION	7	2" TO	Ph	γ=134
		8	2" DO	13	
		9	2" TO	Ph	γ=136
		10	2" DO	13	
		11	2" TO	Ph	
		12	2" DO	13	
		13	2" TO	Ph	
		14	2" DO	9	
		15	2" TO	Ph	
		16	2" DO	6	
		17	"	9	
344.8 / 73.0	END OF HOLE				



W.L. IN STANDPIPE AT ELEV. 404.3 OCT. 11, 1962

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [signature]

PROJECT No. 6248

RECORD OF BOREHOLE 9

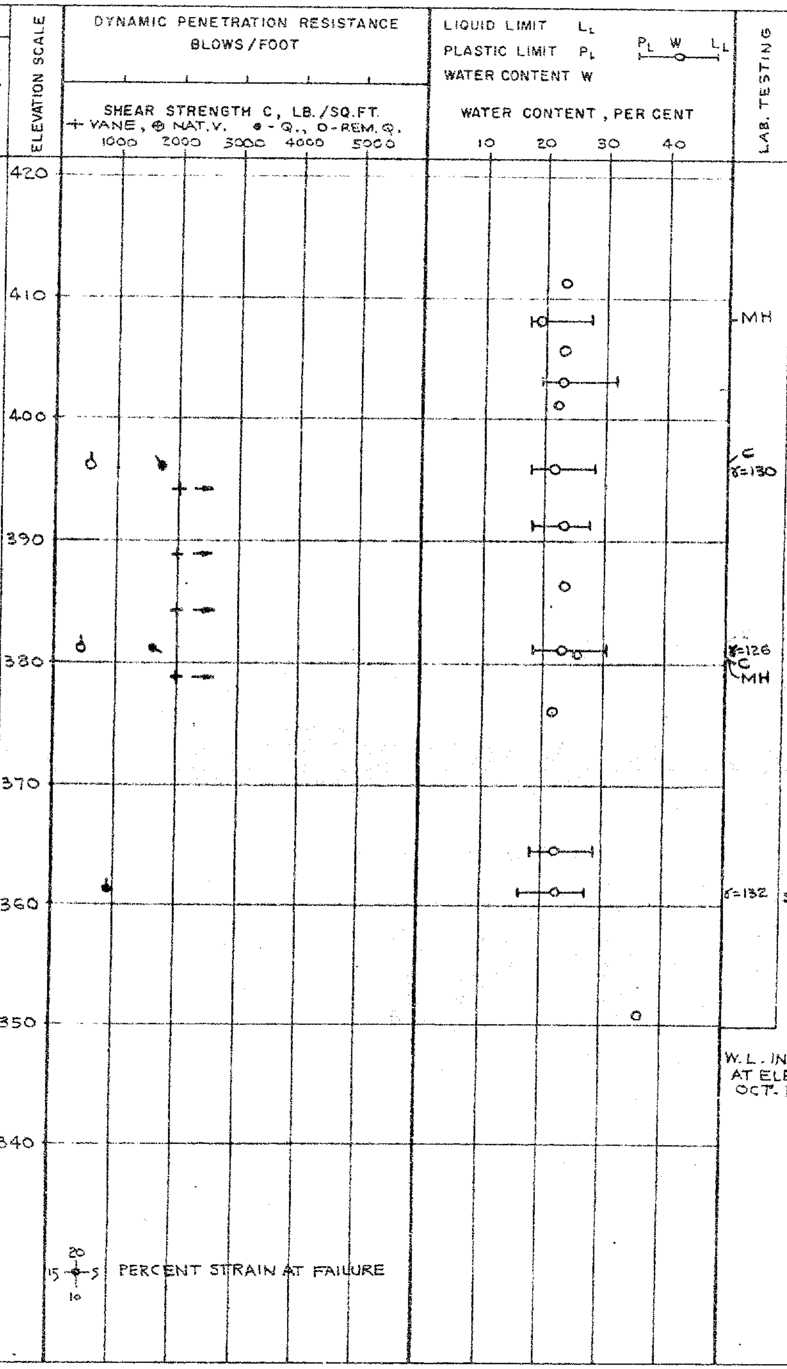
LOCATION: SEE FIGURES 1 & 2 — BORING DATE: OCT. 2-3, 1962 — DATUM: GEODETIC

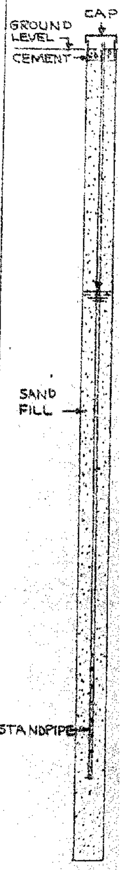
BOREHOLE TYPE: POWER AUGER BORING — BOREHOLE DIAMETER: 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	SOIL PROFILE — DESCRIPTION
416.8	GROUND LEVEL
0.0	BROWN SAND AND GRAVEL (FILL)
2.0	PROBABLY FIRM TO VERY STIFF GREY AND BROWN SILTY CLAY (WEATHERED ZONE)
402.0 / 14.8	VERY STIFF GREY SILTY CLAY; FEW THIN FINE SAND SEAMS; OCCASIONAL SCATTERED SAND AND GRAVEL SIZE PARTICLES
349.8 / 67.0	END OF HOLE

SAMPLES NUMBER	TYPE	BLOWS / FT.
1	2" DO	8
2	"	13
3	"	17
4	"	18
5	"	19
6	2" TO	Ph
7	2" DO	12
8	"	15
9	2" TO	Ph
10	2" DO	22
11	2" TO	Ph
12	"	Ph
13	2" DO	16
14	2" TO	Ph
15	2" DO	12





W.L. IN STANDPIPE AT ELEV. 396.7 OCT. 11, 1962

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

PROJECT No. 6248

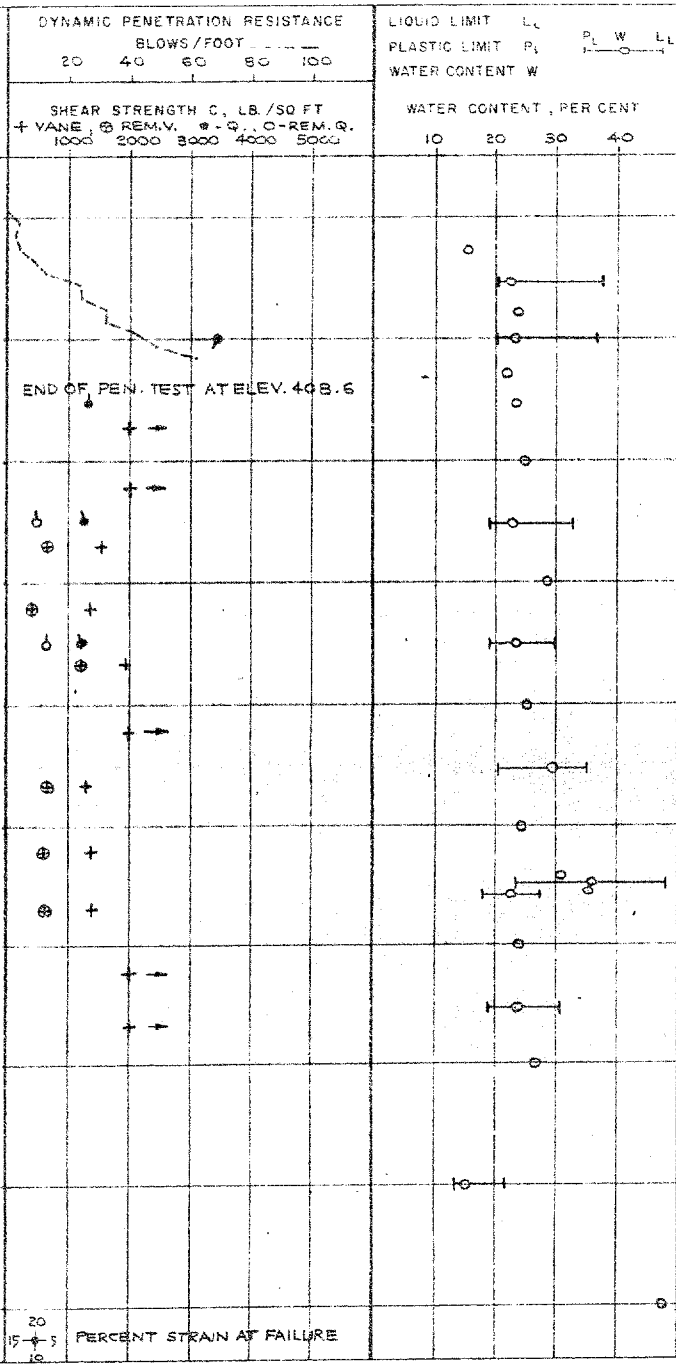
RECORD OF BOREHOLE 10

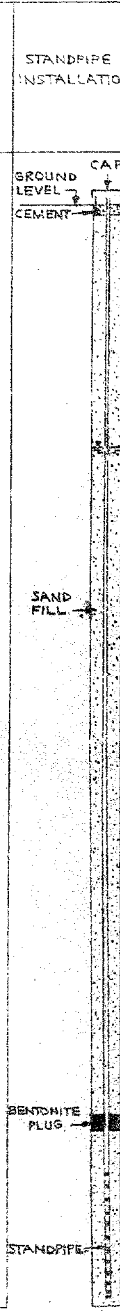
LOCATION SEE FIGURES 1 & 2 BORING DATE OCT. 3 - 4, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB DROP 30 INCHES PEN TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN / DEPTH	DESCRIPTION (SOIL PROFILE)	SAMPLE NUMBER	TYPE	BLOWS / FT.	ELEVATION SCALE	LAB. TESTING
420.6	GROUND LEVEL					
0.0	STIFF BROWN & GREY SILTY CLAY (FILL)				420	
416.9 / 3.7	VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY (WEATHERED ZONE)	1	2" DO	10		
		2	"	15		
		3	"	19		
		4	2" TO	Ph	410	γ=129
408.6 / 12.0	VERY STIFF TO STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES SOME FAINT STRATIFICATION	5	2" DO	19		
		6	2" TO	Ph		γ=129
		7	2" DO	10	400	
		8	2" TO	Ph		γ=128 C
		9	2" DO	6	390	
		10	2" TO	Ph		γ=127
		11	2" DO	15	380	
		12	2" TO	Ph		
		13	2" DO	10	370	
		14	2" TO	Ph		
		15	2" DO	11	360	
		16	2" TO	Ph		
		17	2" DO	13	350	
		18	"	28	340	
		19	"	31	330	
329.1 / 91.5	END OF HOLE					





W.L. IN STANDPIPE AT ELEV. 400.7 APRIL 19, 1965

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED

PROJECT No. 6248

RECORD OF BOREHOLE 11

LOCATION SEE FIGURES 1 & 2 BORING DATE OCT. 5-9, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
420.5	GROUND LEVEL
0.0	FIRM TO STIFF BROWN CLAYEY SILT WITH SOME SAND AND GRAVEL (FILL)
414.5 / 6.0	PROBABLY FIRM TO VERY STIFF BROWN AND GREY-BROWN SILTY CLAY SOME FISSURES (WEATHERED ZONE)
405.5 / 15.0	VERY STIFF TO STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES.
347.5 / 73.0	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
1	2" DO	6	
2	"	18	
3	"	13	
4	"	11	
5	"	7	
6	"	23	
7	2" TO	Ph	γ=127
8	"	Ph	
9	"	Ph	γ=119
10	2" DO	6	
11	2" TO	Ph	
12	"	Ph	γ=127
13	2" DO	6	
14	2" TO	Ph	
15	"	Ph	
16	2" DO	8	
17	"	9	
18	"	7	

ELEVATION SCALE

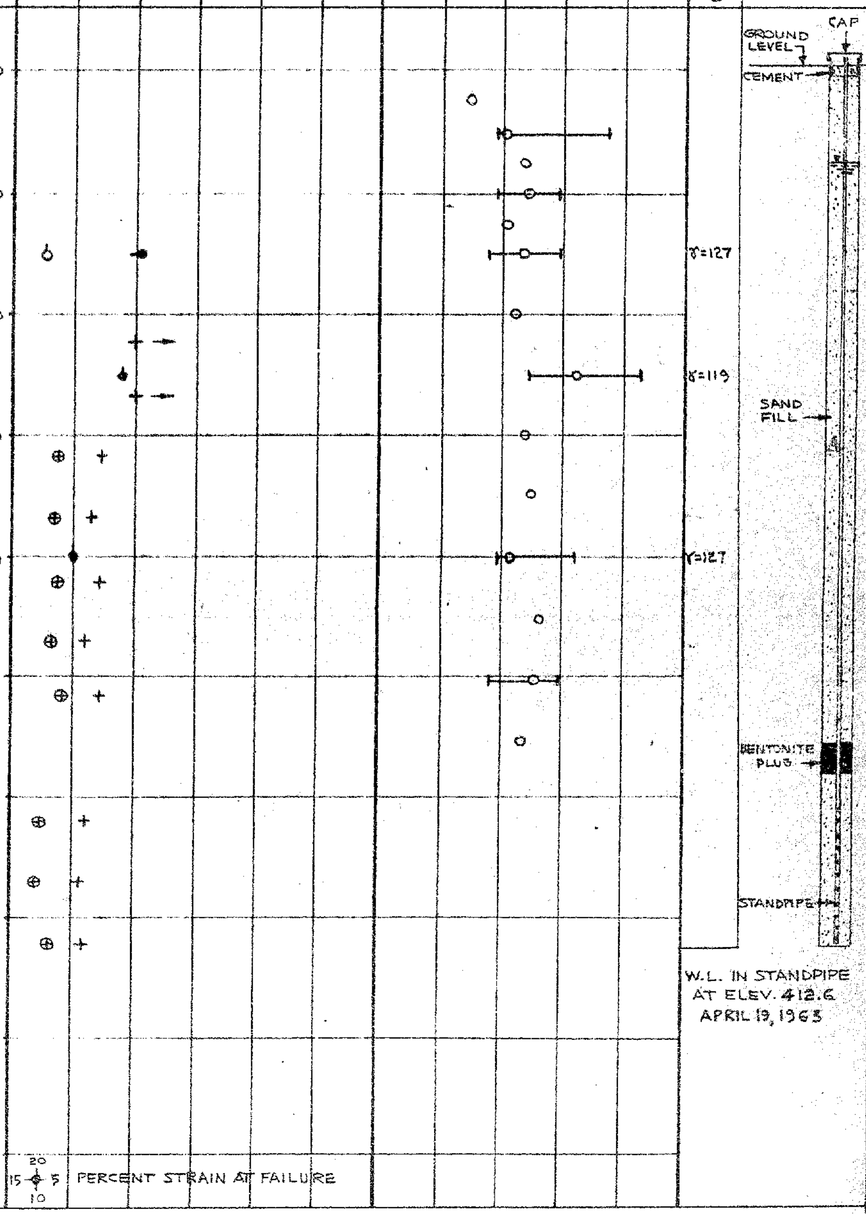
DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + VANE, ⊕ REM.V. ●-Q., ○-REM.Q.

LIQUID LIMIT L_L PLASTIC LIMIT P_L WATER CONTENT W

WATER CONTENT, PER CENT

STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 412.6 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED

PROJECT No. 6243

RECORD OF BOREHOLE 12

LOCATION: SEE FIGURES 1 & 2   BORING DATE: OCT. 10-11, 1962   DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING   BOREHOLE DIAMETER: 4.5"

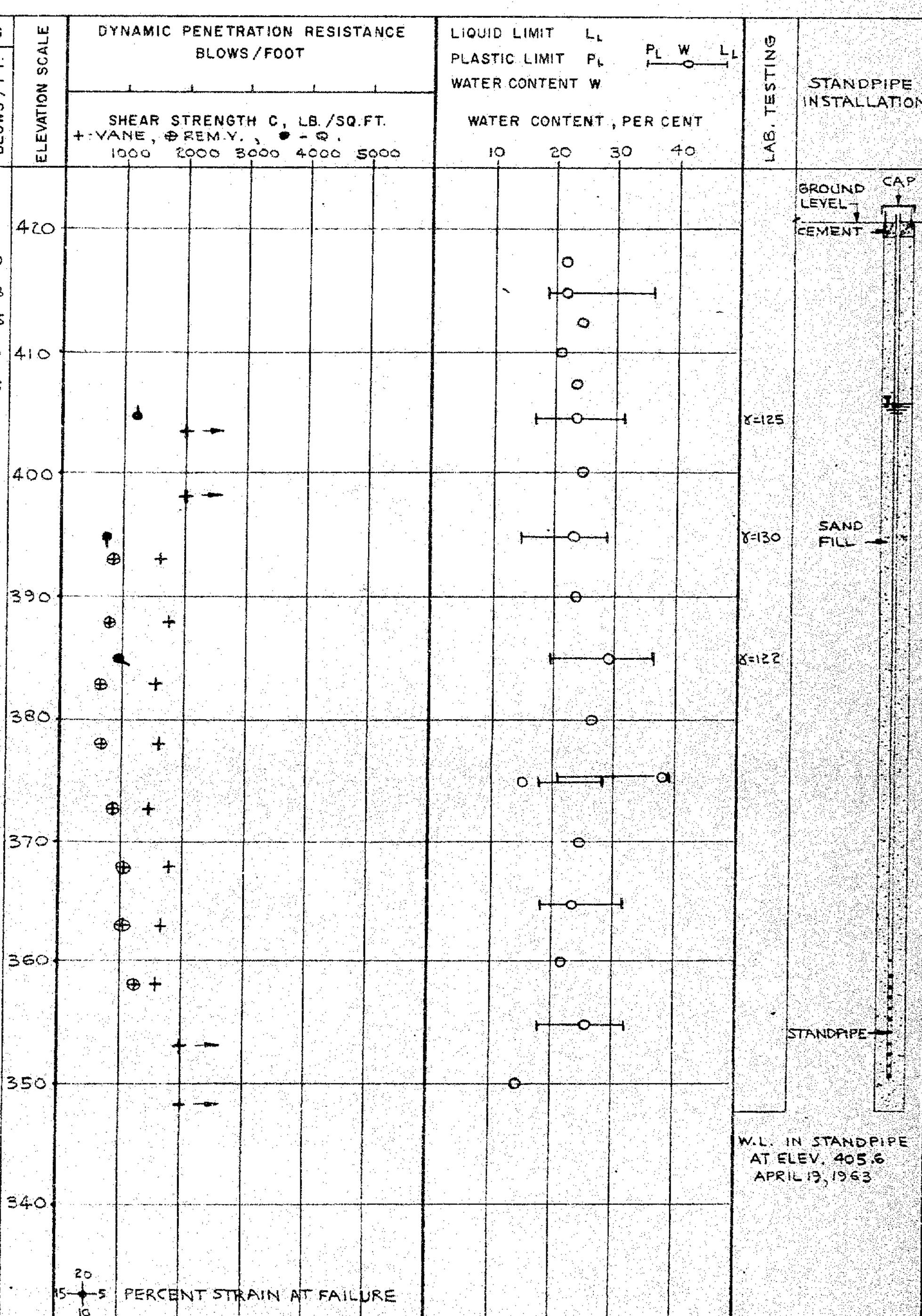
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES   PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
420.5	GROUND LEVEL
0.0	STIFF TO VERY STIFF MOTTLED BROWN AND GREY **SILTY CLAY** WITH TRACE OF FINE SAND **(WEATHERED ZONE)**
410.7 / 9.8	STIFF TO VERY STIFF GREY **SILTY CLAY** WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION
347.5 / 73.0	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
1	2" DO	19	
2	"	23	
3	"	25	
4	"	19	
5	"	8	
6	2" TO	Ph	γ=125
7	2" DO	6	
8	2" TO	Ph	γ=130
9	2" DO	8	
10	2" TO	Ph	γ=122
11	2" DO	8	
12	2" TO	Ph	
13	2" DO	12	
14	2" TO	Ph	
15	2" DO	11	
16	"	18	
17	"	18	



W.L. IN STANDPIPE AT ELEV. 405.6 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED M.McG.

PROJECT No. 6248

RECORD OF BOREHOLE 13

LOCATION SEE FIGURES 1 & 2 BORING DATE OCT. 11 - 12, 1962 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
422.8	GROUND LEVEL				
0.0	MOTTLED BROWN AND GREY SILTY CLAY (FILL)				
1.5	VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY WITH TRACE OF FINE SAND, SOME FISSURES. (WEATHERED ZONE)	1	2" DO	28	
		2	"	26	
		3	"	26	
412.5 / 10.3	STIFF TO VERY STIFF GREY SILTY CLAY WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION	4	"	14	
		5	"	9	
		6	3" TO	Ph	Qc x 4, C
		7	2" DO	5	
		8	"	6	
		9	3" TO	Ph	C
		10	2" DO	9	
		11	"	9	
		12	3" TO	Ph	C
		13	2" DO	8	
		14	2" TO	Ph	C
		15	2" DO	8	
		16	"	13	
		17	"	10	
349.8 / 73.0	END OF HOLE				

ELEVATION SCALE: 420, 410, 400, 390, 380, 370, 360, 350, 340

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM.V.
1000 2000 3000 4000 5000

LIQUID LIMIT L_L
PLASTIC LIMIT P_L
WATER CONTENT W

P_L W L_L

WATER CONTENT, PER CENT
10 20 30 40

STANDPIPE INSTALLATION: CAP, GROUND LEVEL, CEMENT, SAND FILL, STANDPIPE

W.L. IN STANDPIPE AT ELEV. 406.8 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

PROJECT No. 6248

RECORD OF BOREHOLE 14

LOCATION: SEE FIGURES 1 & 2 BORING DATE: OCT. 15-16, 1962 DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING BOREHOLE DIAMETER: 4.5"

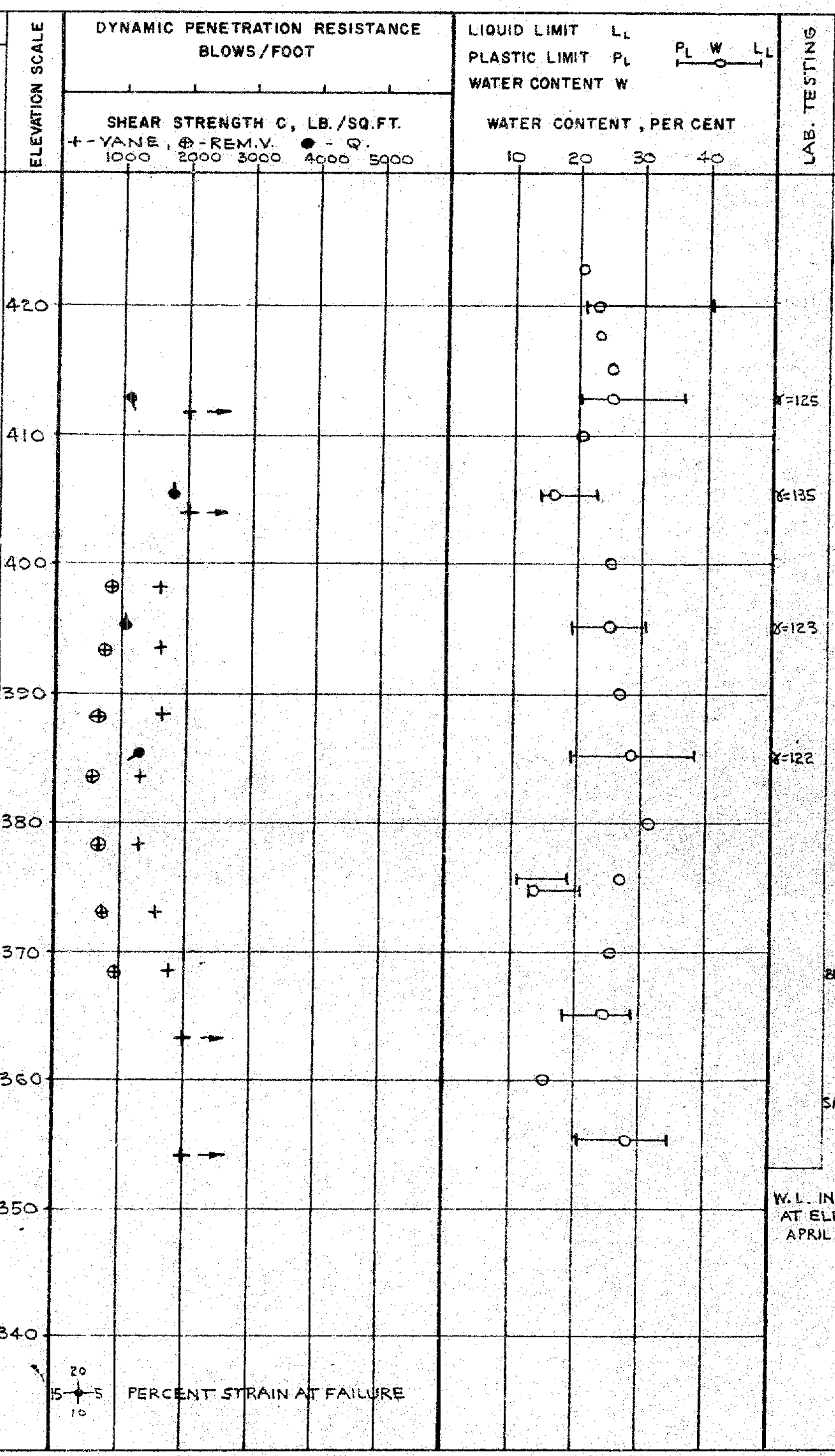
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
426.1	GROUND LEVEL
0.0	STIFF TO VERY STIFF MOTTLED BROWN AND GREY **SILTY CLAY**, TRACE FINE SAND (**WEATHERED ZONE**)
415.1 / 11.0	STIFF TO VERY STIFF GREY **SILTY CLAY** WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES. SOME FAINT STRATIFICATION
353.1 / 73.0	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.
1	2" DO	31
2	"	25
3	"	25
4	"	17
5	2" TO	Ph
6	2" DO	10
7	2" TO	Ph
8	2" DO	6
9	2" TO	Ph
10	2" DO	7
11	2" TO	Ph
12	2" DO	8
13	2" TO	Ph
14	2 DO	12
15	"	12
16	"	23
17	"	15



STANDPIPE INSTALLATION: GROUND LEVEL, CAP, CEMENT, SAND FILL, BENTONITE PLUG, SANDPIPE

W.L. IN STANDPIPE AT ELEV. 425.4 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED M.M.G.

PROJECT No. 6245

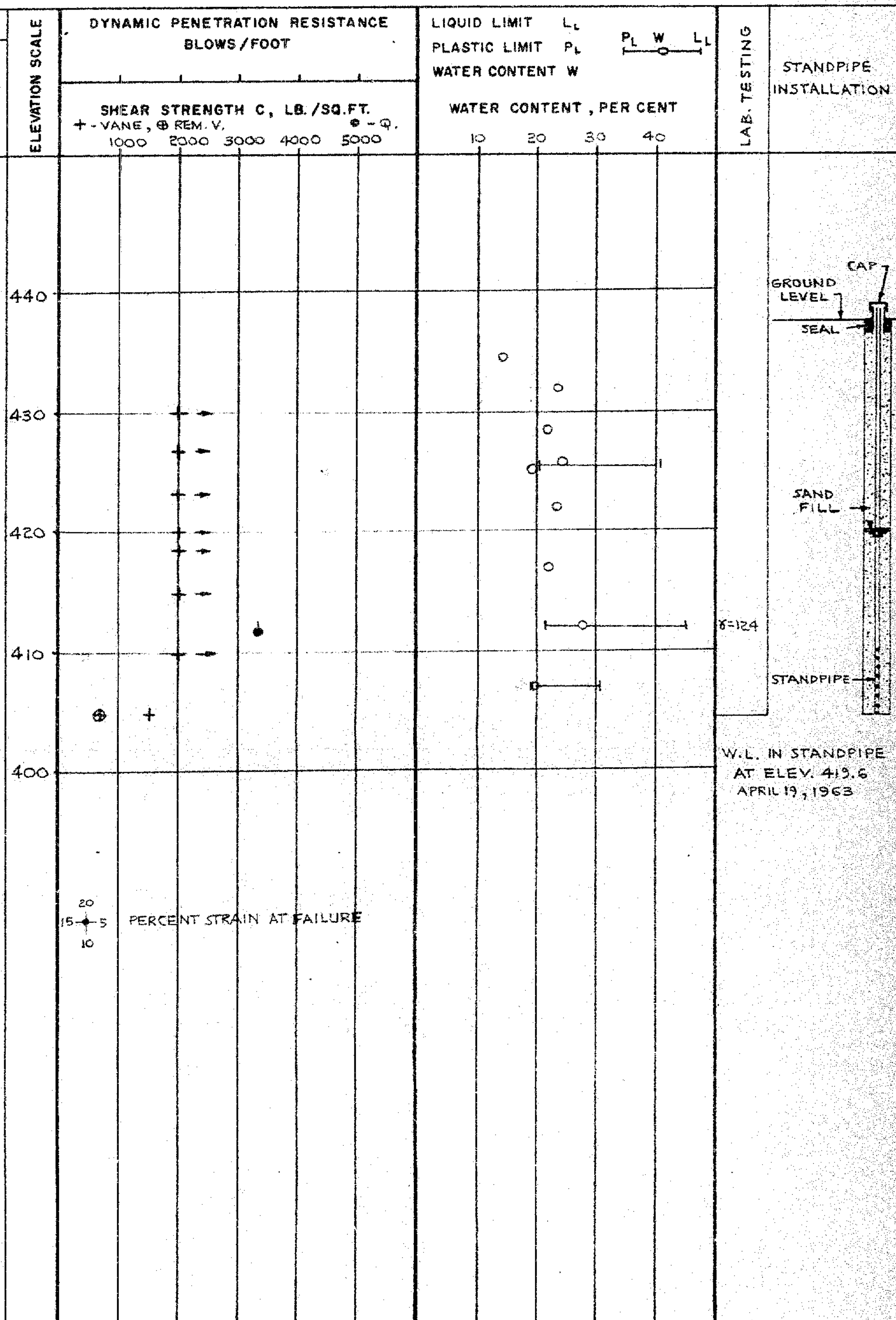
RECORD OF BOREHOLE 15

LOCATION SEE FIGURE 2 BORING DATE FEB. 7, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT - LB. DROP - INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
437.5	GROUND LEVEL			
0.0	VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY WITH SOME SAND AND GRAVEL SIZE PARTICLES (FILL)	1	2" DO	20
		2	"	16
		3	2" TO	Ph
		4	3" TO	
421.2 / 16.1	VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY, SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES (WEATHERED ZONE)	5	2" DO	18
		6	"	37
		7	2" TO	24
408.5 / 28.8	STIFF GREY SILTY CLAY WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	8	2" DO	18
404.3 / 33.0	END OF HOLE			



VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [signature]

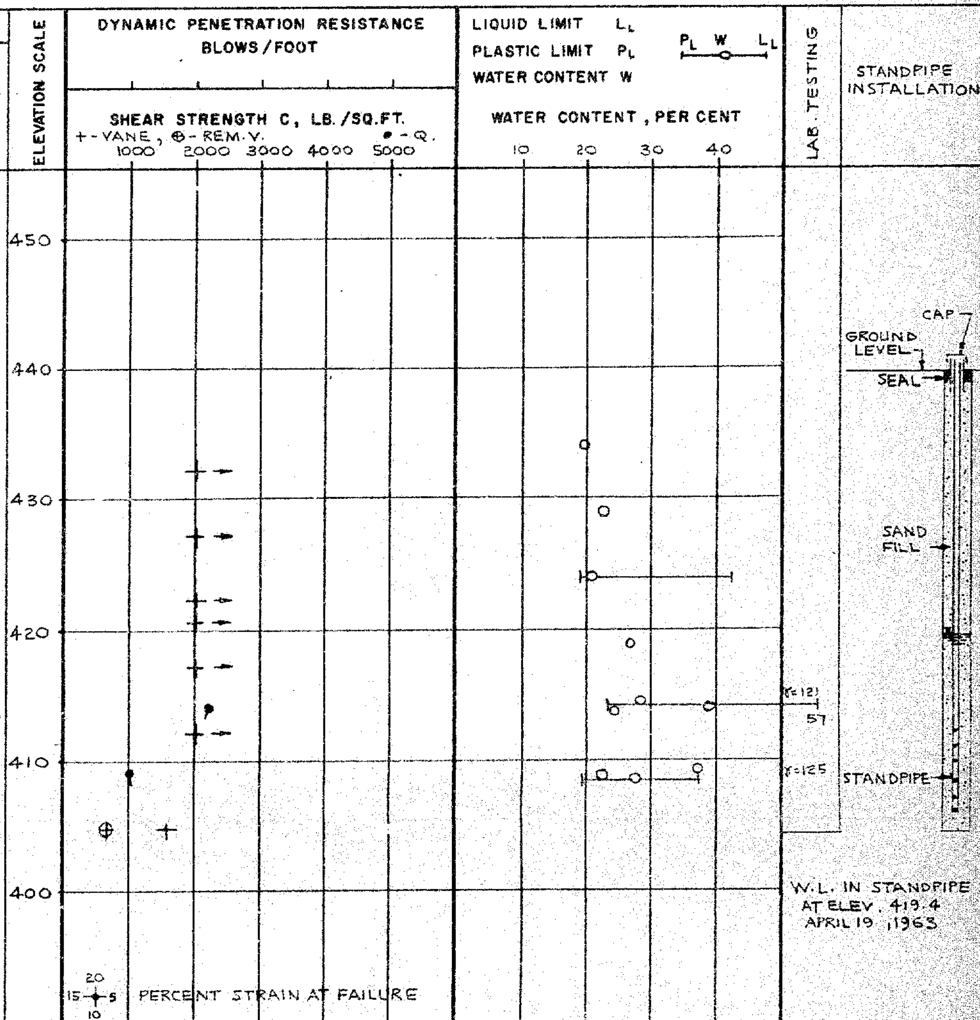
RECORD OF BOREHOLE 16

LOCATION SEE FIGURE 2 BORING DATE FEB. 12, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
439.6	GROUND LEVEL			
0.0 / 436.6 / 3.0	BROWN SILTY SAND AND GRAVEL, ESTIMATED TO BE LOOSE TO COMPACT (FILL)			
419.6 / 20.0	VERY STIFF MOTTLED GREY-BROWN SILTY CLAY (FILL)	1	2" DO	19
		2	2" DO	15
		3	2" TO	21
410.1 / 29.5	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)**	4	2" DO	20
		5	3" TO	Ph
404.1 / 35.5	STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	6	2" TO	Ph
	END OF HOLE			



W.L. IN STANDPIPE AT ELEV. 419.4 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [illegible]

RECORD OF BOREHOLE 17

LOCATION SEE FIGURE 2 BORING DATE FEB. 11, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

ELEVN / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
439.9	GROUND LEVEL			
0.0	VERY STIFF GREY-BROWN SILTY CLAY TO CLAYEY SILT SOME SAND AND GRAVEL SIZE PARTICLES **(FILL)** UPPER 4 FEET SANDY AND GRAVELLY	1	2" DO	22
		2	"	19
		3	2" TO	Ph
419.9 / 20.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)**	4	3" TO	10
		5	2" DO	34
409.4 / 30.5	STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	6	2" TO	25
404.4 / 35.5	END OF HOLE			

ELEVATION SCALE: 450, 440, 430, 420, 410, 400

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB. /SQ.FT. + - VANE, ⊕ - REM. V., ● - Q.

1000 2000 3000 4000 5000

LIQUID LIMIT L_L

PLASTIC LIMIT P_L

WATER CONTENT W

WATER CONTENT, PER CENT

10 20 30 40

LAB. TESTING: γ=125, 382; γ=134

STANDPIPE INSTALLATION: CAP, GROUND LEVEL, SEAL, SAND FILL, STANDPIPE

STANDPIPE WAS DESTROYED BY A SNOW PLOW.

20 / 15 – 5 / 10 PERCENT STRAIN AT FAILURE

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [illegible]

PROJECT No. 6248

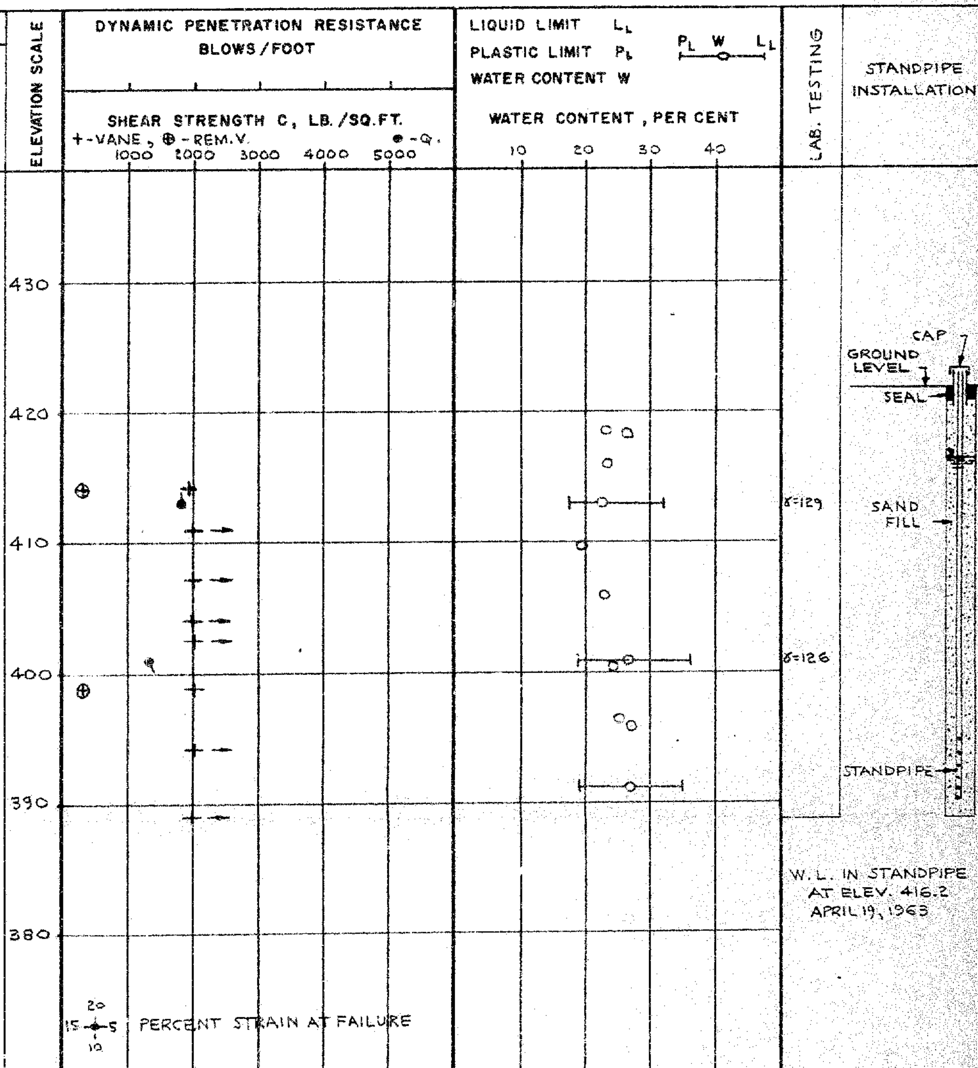
RECORD OF BOREHOLE 18

LOCATION SEE FIGURE 2 BORING DATE FEB. 7-8, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT - LB. DROP - INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
421.7	GROUND LEVEL				
0.0	STIFF TO VERY STIFF MOTTLED BROWN AND GREY **SILTY CLAY**, TRACE FINE SAND **(WEATHERED ZONE)**	1	2" DO	24	
		2	"	13	
		3	2" TO	Ph	γ=129
		4	3" TO	44	
406.1 / 15.6	STIFF TO VERY STIFF GREY **SILTY CLAY** WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	2" DO	29	
		6	2" TO	Ph	γ=126
		7	2" DO	9	
		8	"	9	
388.7 / 33.0	END OF HOLE				



W.L. IN STANDPIPE AT ELEV. 416.2 APRIL 19, 1963

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED J. McL.

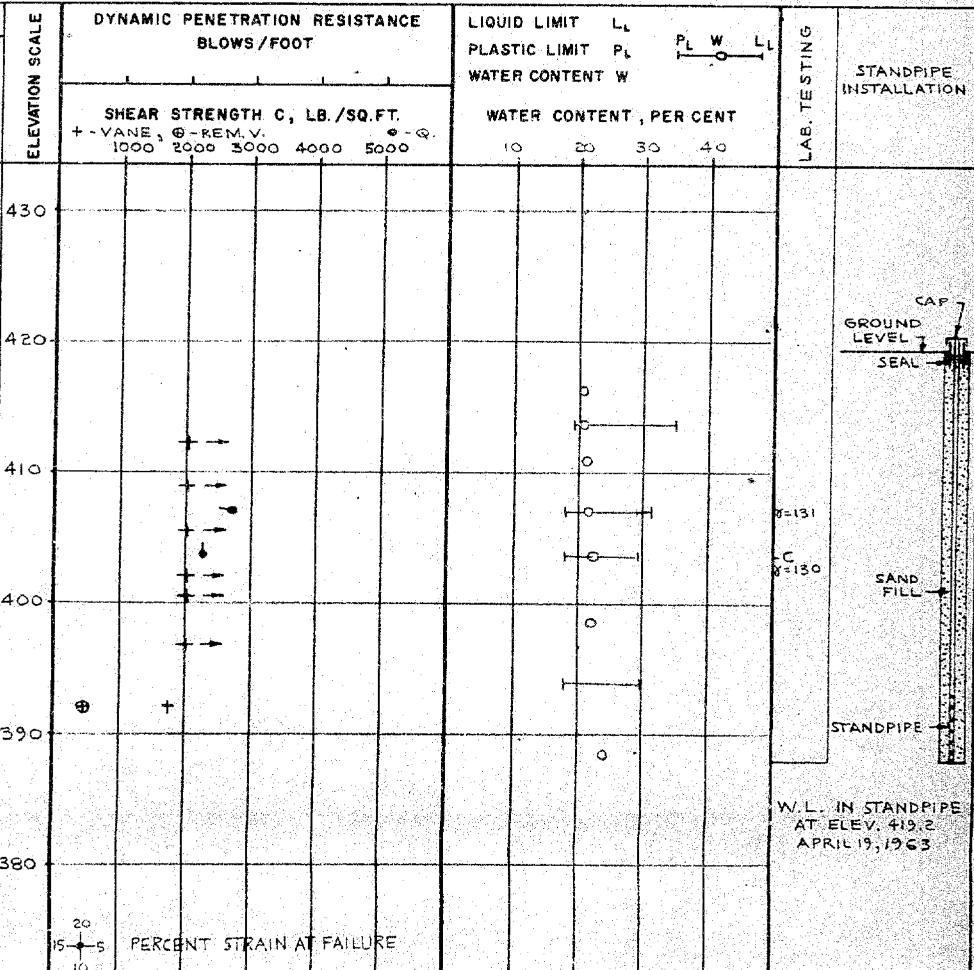
RECORD OF BOREHOLE 19

LOCATION SEE FIGURE 2 BORING DATE FEB. 8, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

SOIL PROFILE ELEVN. DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	BLOWS / FT.
19.4	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** **(WEATHERED ZONE)**	1	2" DO	22
		2	"	24
		3	"	26
		4	2" TO	Ph
03.9 / 15.5	VERY STIFF TO STIFF GREY **SILTY CLAY** WITH SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES SOME FAINT STRATIFICATION	5	3" TO	Ph
		6	2" DO	14
		7	2" TO	Ph
		8	2" DO	12
37.9 / 31.5	END OF HOLE			



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

PROJECT No. 6248

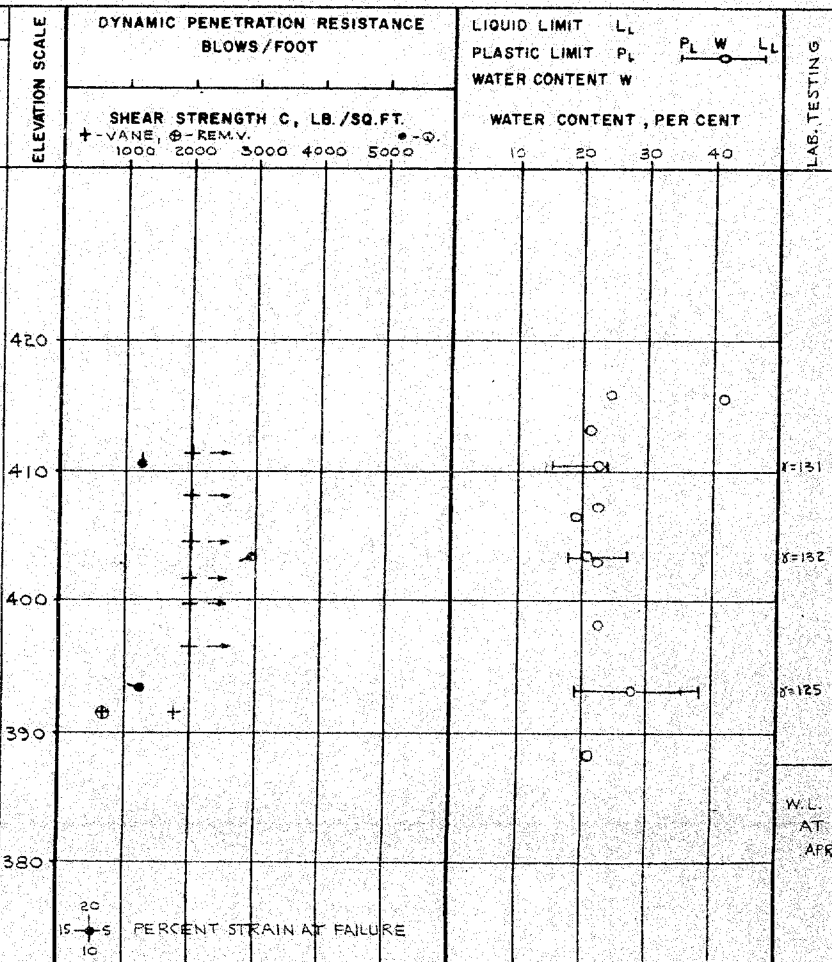
RECORD OF BOREHOLE 20

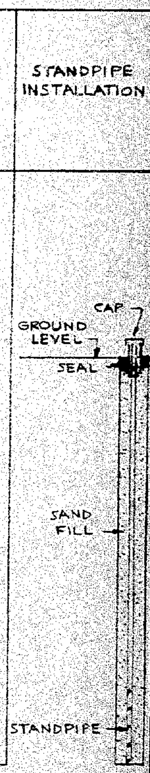
LOCATION SEE FIGURE 2 BORING DATE FEB. 13, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
419.1	GROUND LEVEL			
0.0	STIFF TO VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY**, SOME FINE SAND **(WEATHERED ZONE)** UPPER 4 FEET DARK BROWN SILTY CLAY WITH ORGANIC MATTER	1	2" DO	22
		2	"	13
		3	3" TO	8
405.6 / 13.5		4	2" DO	30
	VERY STIFF TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	2" TO	Ph
		6	2" DO	15
		7	2" TO	Ph
387.6 / 31.5	END OF HOLE	8	2" DO	7





W.L. IN STANDPIPE AT ELEV. 416.3 APRIL 19, 1963

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

PROJECT No. 6248

RECORD OF BOREHOLE 21

LOCATION SEE FIGURE 2 BORING DATE FEB. 13, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

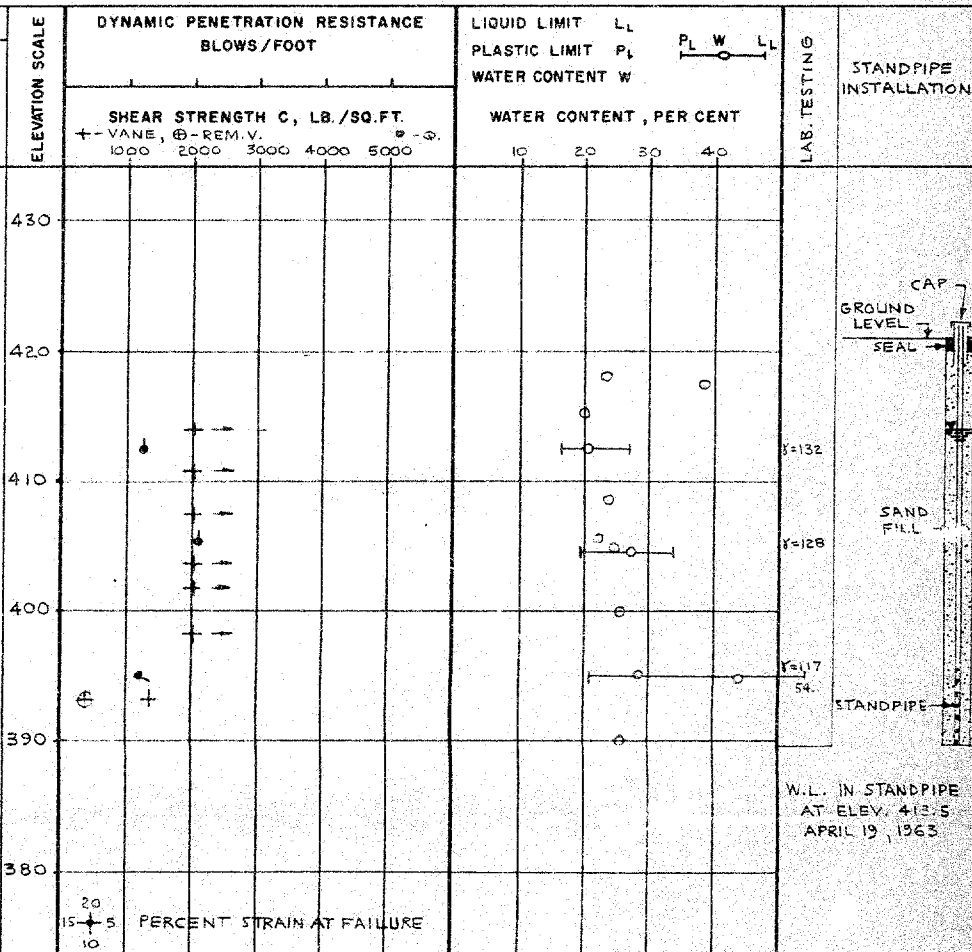
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

SOIL PROFILE

ELEVN. / DEPTH	DESCRIPTION
420.7	GROUND LEVEL
0.0	STIFF TO VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)**
407.1 / 13.6	VERY STIFF TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES
389.2 / 31.5	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.
1	2" DO	20
2	"	22
3	2" TO	Ph
4	2" DO	25
5	3" TO	Ph
6	2" DO	10
7	2" TO	Ph
8	2" DO	9



W.L. IN STANDPIPE AT ELEV. 413.5 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED M.M.S.

PROJECT No. 6248

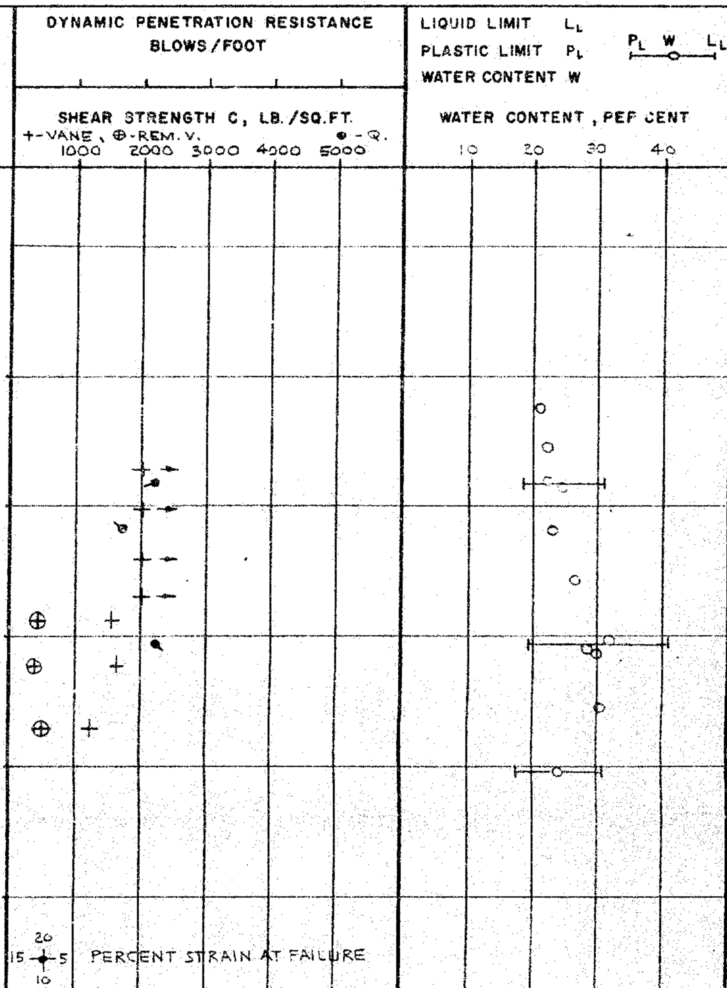
RECORD OF BOREHOLE 22

LOCATION SEE FIGURE 2 BORING DATE FEB. 11, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT - LB. DROP - INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
420.3	GROUND LEVEL			
0.0	MOTTLED BROWN & GREY SILTY CLAY, PROBABLY STIFF (FILL)	1	2" DO	28
415.8 / 4.5	VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME FINE SAND (WEATHERED ZONE)	2	"	16
		3	2" TO	Ph
409.9 / 10.4	VERY STIFF TO STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	4	3" TO	Ph
		5	2" DO	7
		6	2" TO	Ph
		7	2" DO	9
388.8		8	"	9
31.5	END OF HOLE			



LAB. TESTING: γ=129; C γ=129; γ=123

STANDPIPE INSTALLATION: CAP; GROUND LEVEL; SEAL; SAND FILL; STANDPIPE

W.L. IN STANDPIPE AT ELEV. 413.2 MAR. 7, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M. W.
CHECKED [signature]

PROJECT No. 6343

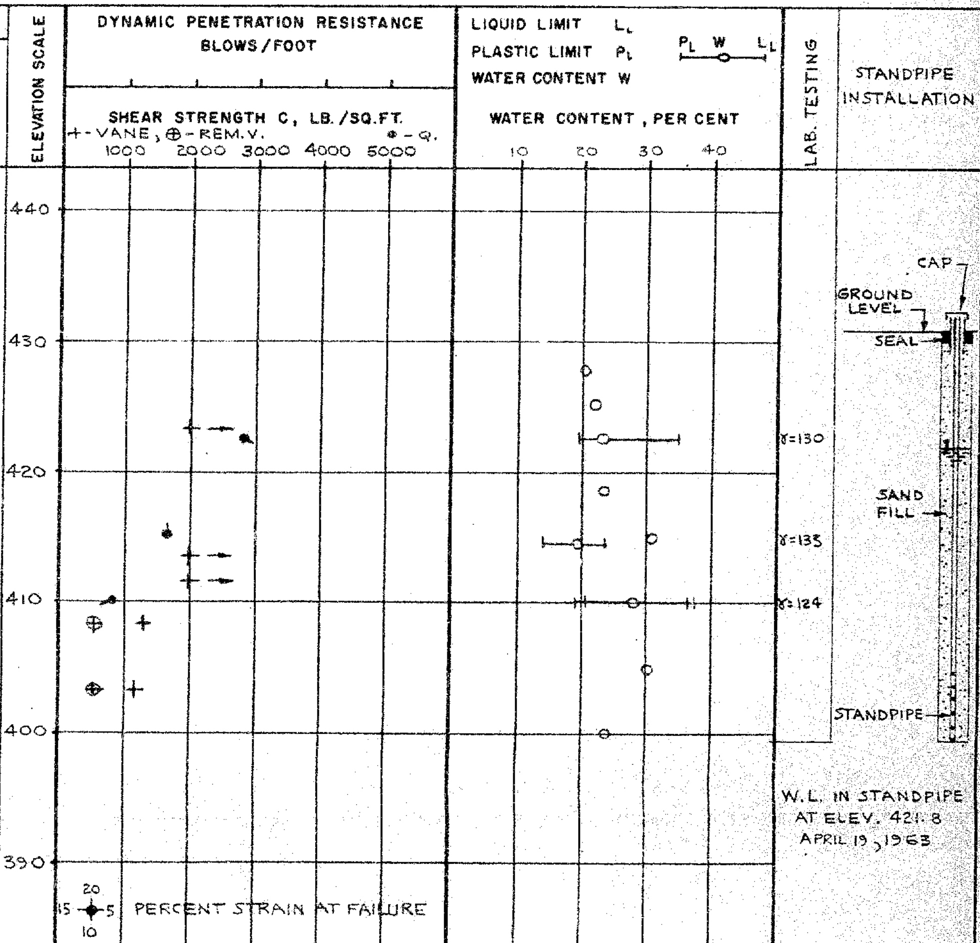
RECORD OF BOREHOLE 23

LOCATION: SEE FIGURE 2 | BORING DATE: FEB. 19, 1963 | DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING | BOREHOLE DIAMETER: 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES | PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FT.
430.8	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)** OCCASIONAL THIN (1/16") LAYERS OR LENSES OF BROWN SILT. TOP 2 FT. CONTAINS ORGANIC MAT.	1	2" DO	28
		2	"	30
		3	2" TO	4
417.3 / 13.5		4	2" DO	22
	VERY STIFF TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	Ph
		6	2" TO	Ph
		7	2" DO	7
399.3 / 31.5	END OF HOLE	8	"	10



W.L. IN STANDPIPE AT ELEV. 421.8 APRIL 19, 1963

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

PROJECT No. [illegible]

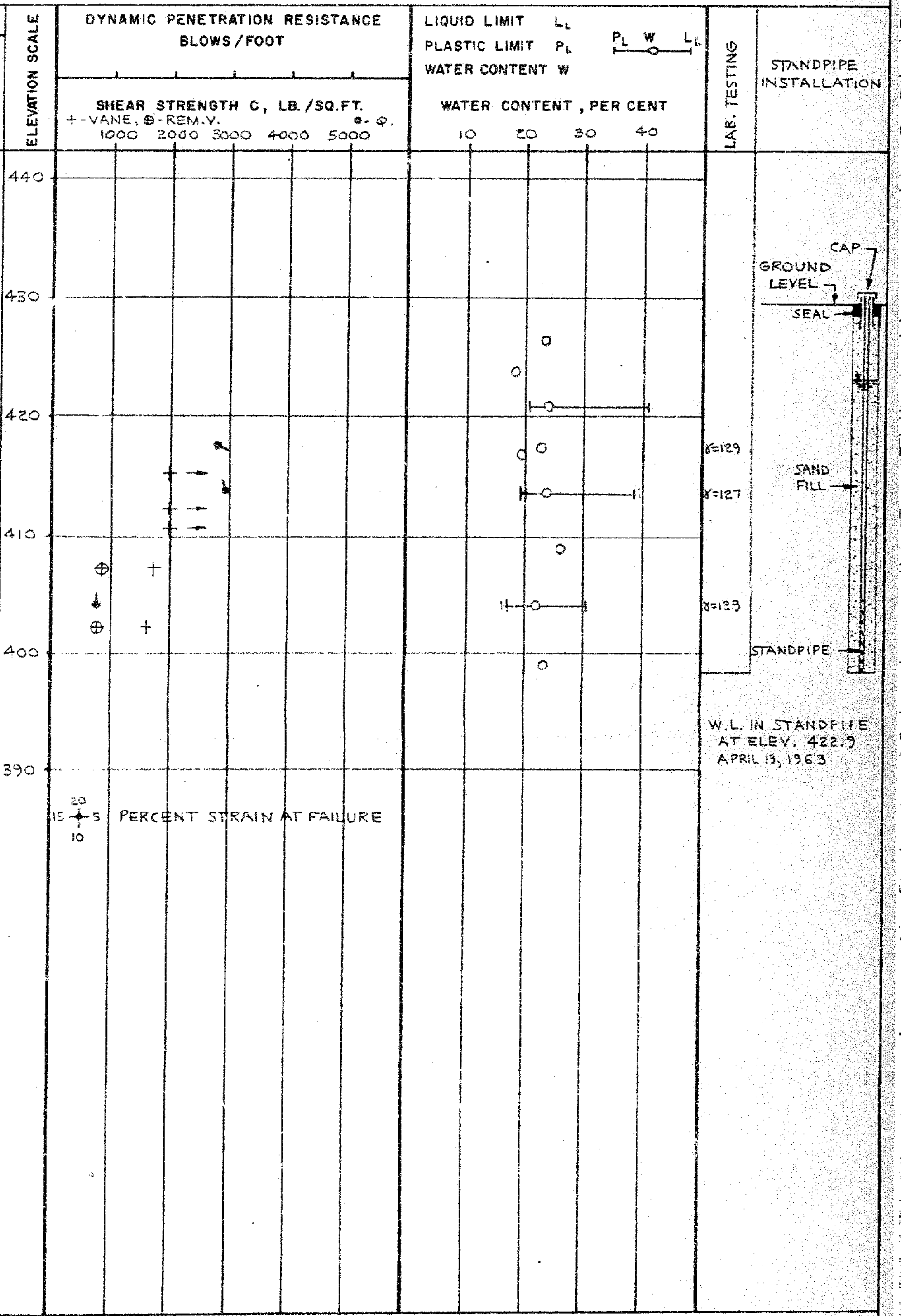
RECORD OF BOREHOLE 24

LOCATION SEE FIGURE 2 BORING DATE FEB. 20, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	SOIL PROFILE — DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
429.4	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)** TOP 2.5 FEET CONTAINS ORGANIC MATERIAL (ROOTS & TWIGS)	1	2" DO	21
		2	"	33
		3	"	22
		4	3" TO	26
414.4 / 15.0	VERY STIFF TO FIRM GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	2" TO	9
		6	2" DO	7
		7	2" TO	Ph
		8	2" DO	6
397.9 / 31.5	END OF HOLE			



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

PROJECT No. 6245

RECORD OF BOREHOLE 25

LOCATION SEE FIGURE 2 BORING DATE FEB. 20, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	DESCRIPTION (SOIL PROFILE)	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
420.4	GROUND LEVEL				
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)**	1	2" DO	20	
		2	"	24	
410.4		3	2" TO	Ph	γ=126
10.0	VERY STIFF TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	4	3" TO	Ph	γ=130
		5	2" DO	12	
		6	2" TO	Ph	γ=130
		7	2" DO	10	
388.9		8	"	8	
31.5	END OF HOLE				

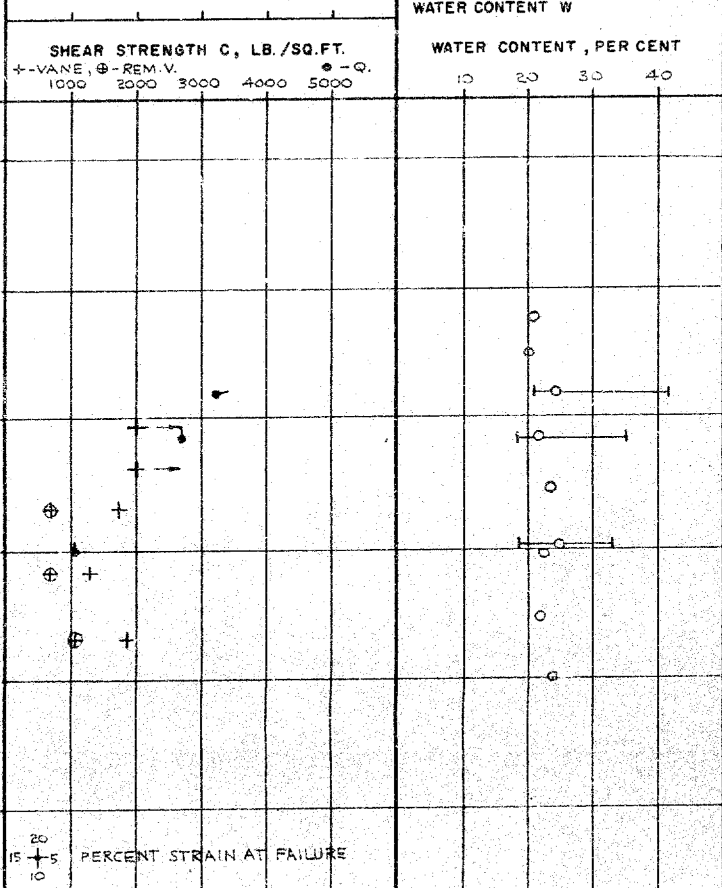
ELEVATION SCALE: 430, 420, 410, 400, 390, 380

DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT

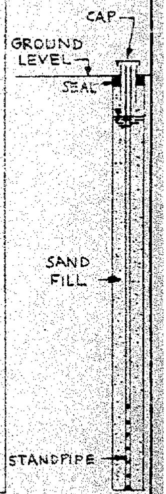
SHEAR STRENGTH C, LB./SQ.FT. +-VANE, ⊕-REM.V. ●-Q.

LIQUID LIMIT L_L PLASTIC LIMIT P_L WATER CONTENT W

WATER CONTENT, PER CENT



STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 417.3 APRIL 19, 1963

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

PROJECT No. 6248

RECORD OF BOREHOLE 26

LOCATION SEE FIGURE 2 BORING DATE FEB. 22, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

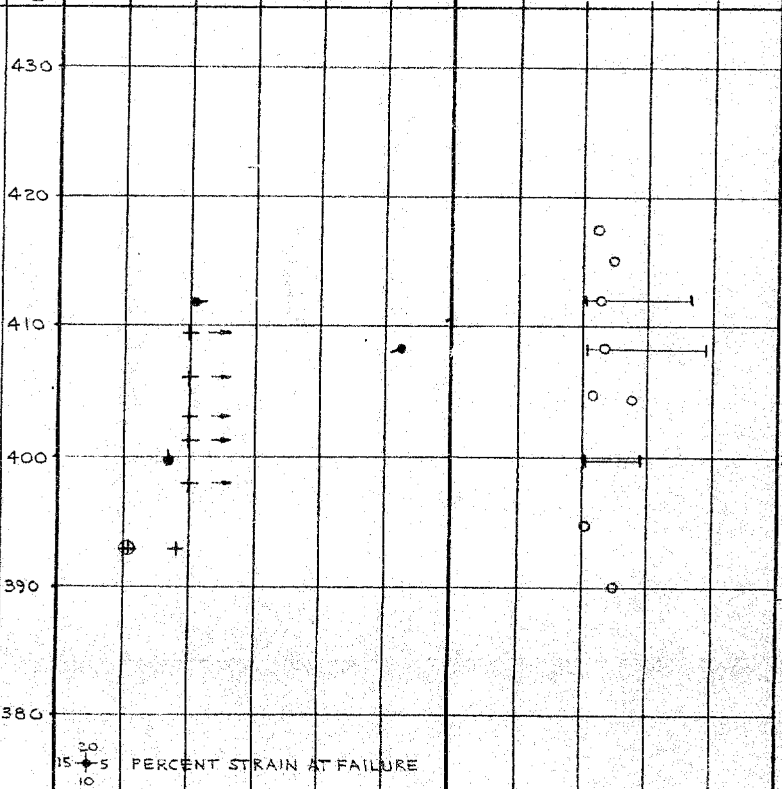
ELEVN. / DEPTH	SOIL PROFILE: DESCRIPTION	SAMPLES: NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
420.7	GROUND LEVEL				
0.0	VERY STIFF TO STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)** TOP 4 FT. CONTAINS SOME ORGANIC MATERIAL	1	2" DO	15	
		2	"	13	
		3	2" TO	Ph	γ=129
409.4 / 11.3	HARD TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	4	3" TO	Ph	γ=130
		5	2" DO	19	
		6	2" TO	Ph	γ=127
		7	2" DO	12	
389.2 / 31.5	END OF HOLE	8	"	7	

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

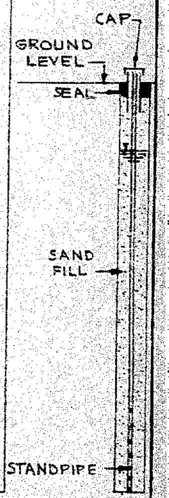
SHEAR STRENGTH C, LB./SQ.FT. +-VANE, ⊕-REM.V., ●-Q.

LIQUID LIMIT L_L PLASTIC LIMIT P_L WATER CONTENT W

WATER CONTENT, PER CENT



STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 415.4 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [signature]

PROJECT No. 6[illegible]48

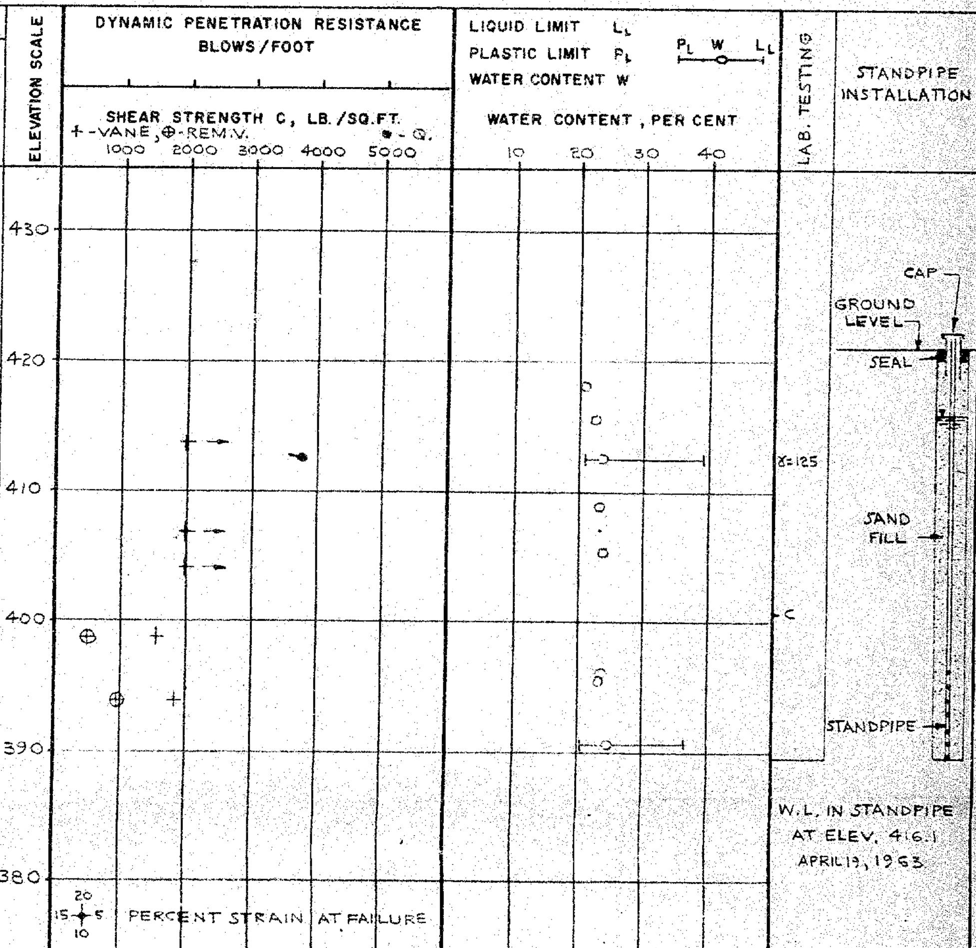
RECORD OF BOREHOLE 27

LOCATION SEE FIGURE 2 BORING DATE FEB. 21, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS / FT.
21.2	GROUND LEVEL				
0.0	VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME FINE SAND (WEATHERED ZONE)		1	2" DO	28
			2	"	22
			3	2" TO	Ph
			4	2" DO	25
07.7 / 13.5	VERY STIFF TO STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES		5	"	11
			6	3" TO	Ph
			7	2" DO	12
			8	"	8
9.7 / 1.5	END OF HOLE				



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

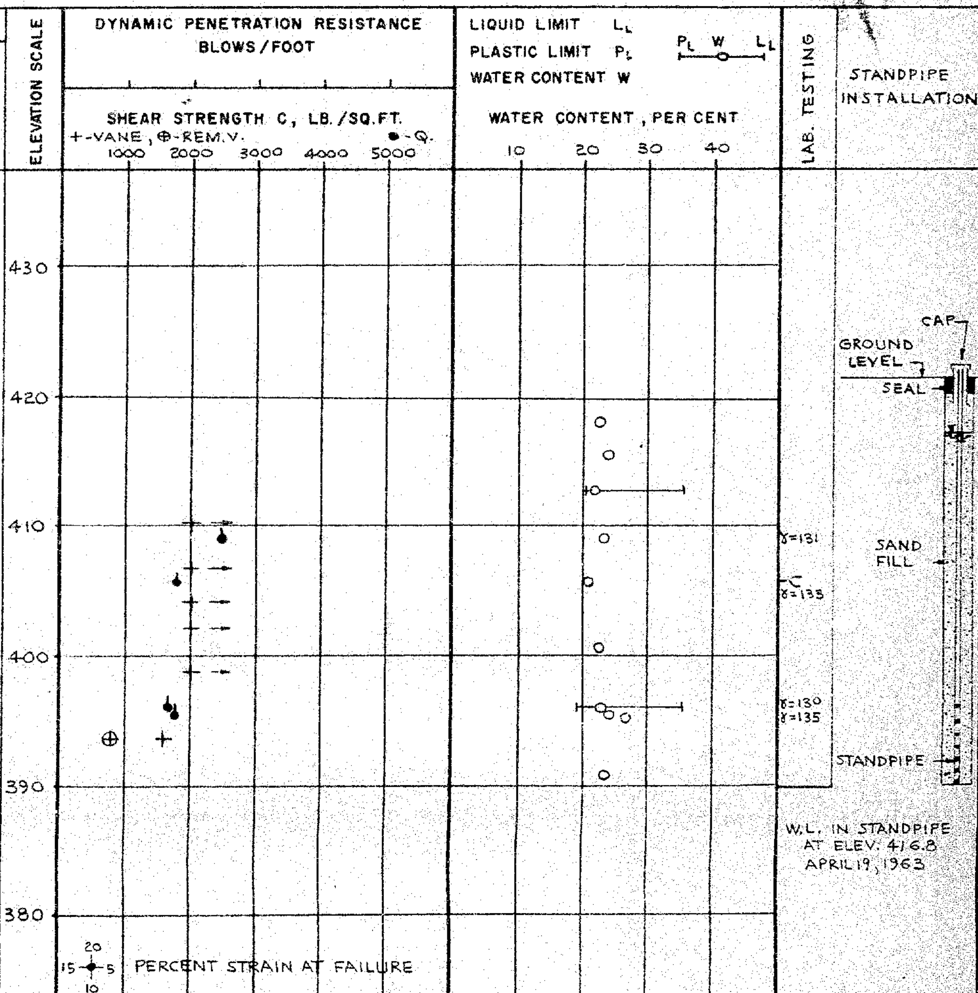
RECORD OF BOREHOLE 28

LOCATION SEE FIGURE 2 BORING DATE FEB. 21, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEV. / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
21.1	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME FINE SAND (WEATHERED ZONE) UPPER 2' TO 3' SANDY	1	2" DO	14
		2	"	9
		3	"	25
		4	2" TO	Ph
6.9 / 4.2	STIFF TO VERY STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	Ph
		6	2" DO	12
		7	2" TO	Ph
		8	2" DO	9
9.6 / 1.5	END OF HOLE			



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED

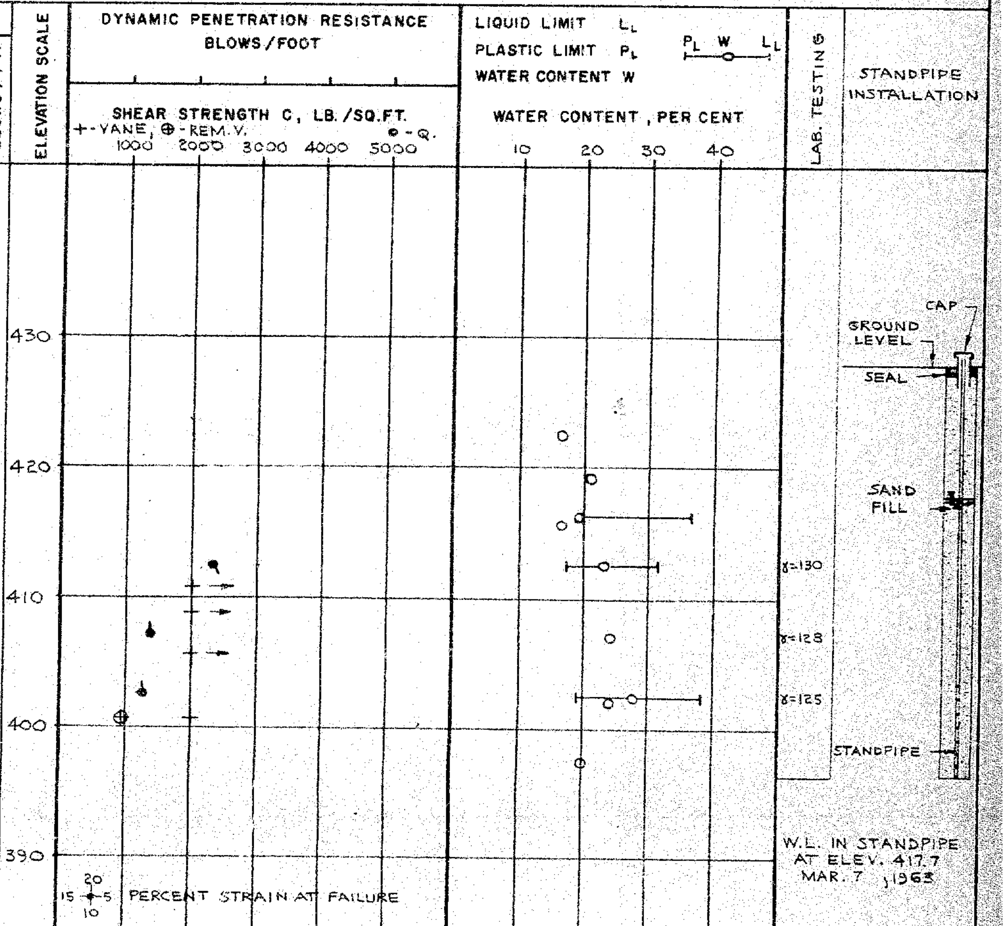
RECORD OF BOREHOLE 29

LOCATION SEE FIGURE 2 — BORING DATE FEB. 25, 1963 — DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING — BOREHOLE DIAMETER 4.5".

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
27.9	GROUND LEVEL			
0.0	VERY STIFF BROWN SILTY CLAY, OCCASIONAL SAND, GRAVEL SIZE PARTICLES, BOULDERS AND BRICK FRAGMENTS (FILL)	1	2" DO	19
19.4 / 8.5	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY**, SOME FINE SAND **(WEATHERED ZONE)**	2	"	18
		3	"	36
		4	2" TO	Ph
09.4 / 18.5	STIFF TO VERY STIFF GREY **CLAYEY SILT TO SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	Ph
		6	2" TO	Ph
96.4		7	2" DO	9
31.5	END OF HOLE			



VERTICAL SCALE
INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [signature]

PROJECT No. 6248

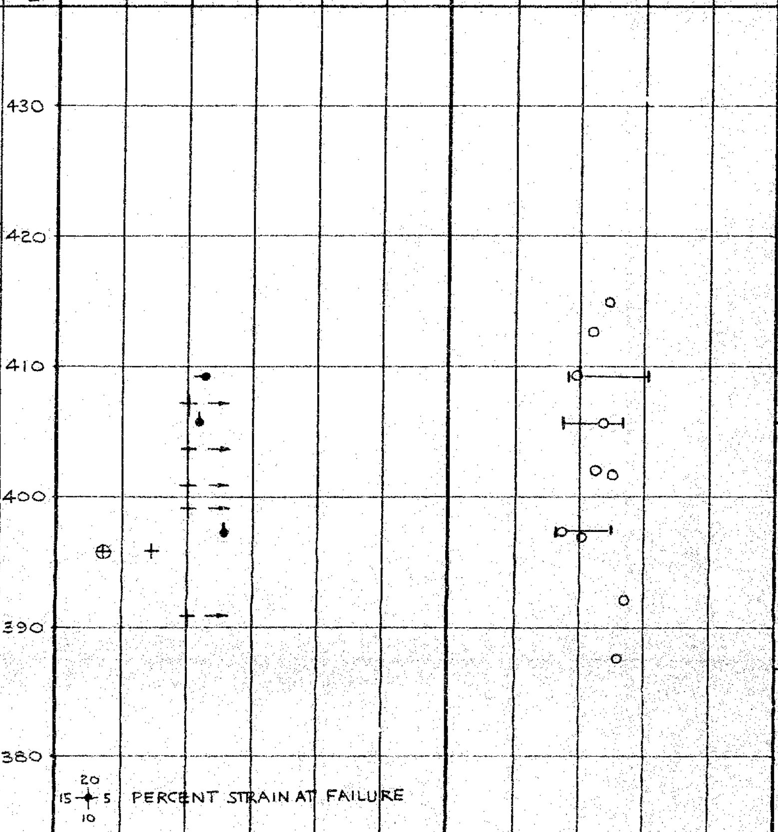
RECORD OF BOREHOLE 30

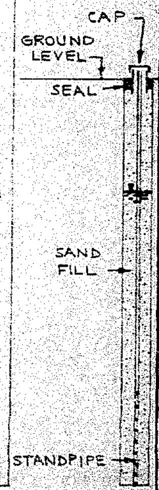
LOCATION SEE FIGURE 2 BORING DATE FEB. 25, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
8.0	GROUND LEVEL				
0.0	VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME FINE SAND (WEATHERED ZONE) UPPER 2 FEET SANDY AND GRAVELLY	1	2" DO	9	
		2	"	11	
		3	2" TO	Ph	γ=131
		4	3" TO	Ph	C
4.0 / 4.0	VERY STIFF TO STIFF GREY SILTY CLAY SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES OCCASIONAL CLAYEY SILT LAYERS OR LENSES	5	2" DO	18	
		6	2" TO	Ph	γ=135
		7	2" DO	5	
5.5		8	"	7	
1.5	END OF HOLE				





W.L. IN STANDPIPE AT ELEV. 409.2 FEB. 28, 1963

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

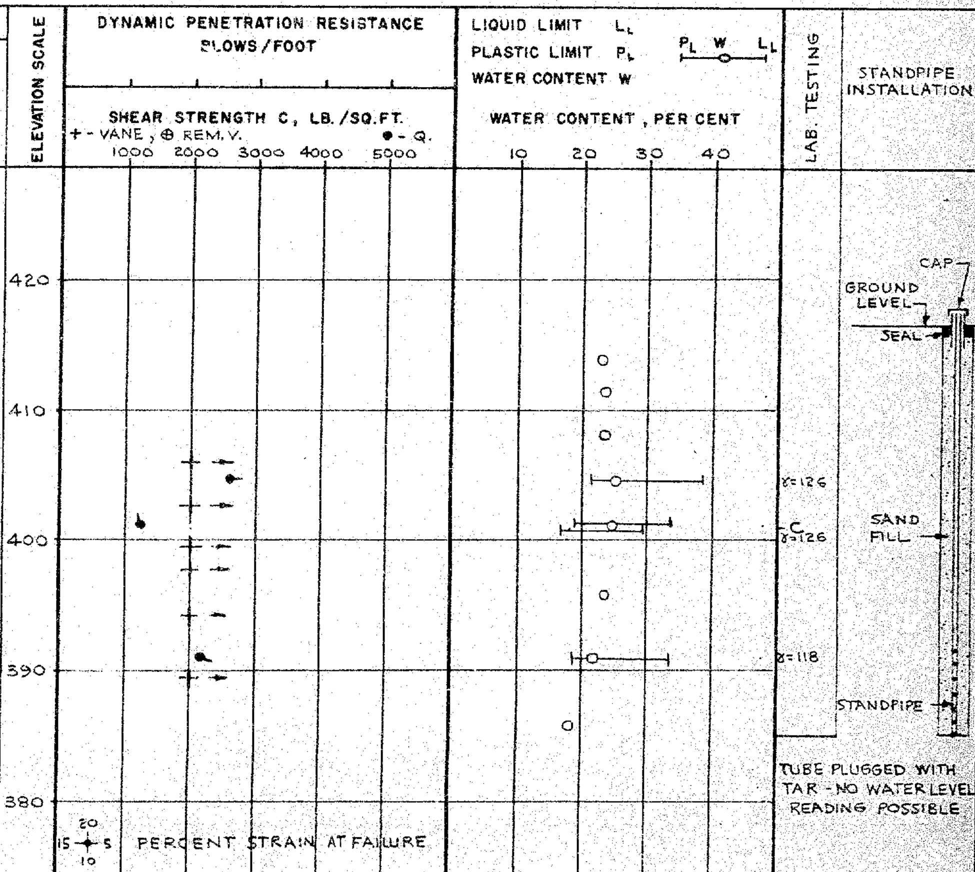
RECORD OF BOREHOLE 31

LOCATION SEE FIGURE 2 BORING DATE FEB. 19, 1968 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
416.7	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY**, SOME FINE SAND **(WEATHERED ZONE)**	1	2" DO	10
		2	"	7
		3	"	18
		4	2" TO	Ph
402.7 / 14.0	STIFF TO VERY STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	Ph
		6	2" DO	6
		7	2" TO	Ph
		8	2" DO	15
385.2 / 31.5	END OF HOLE			



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [signature]

PROJECT No. 6248

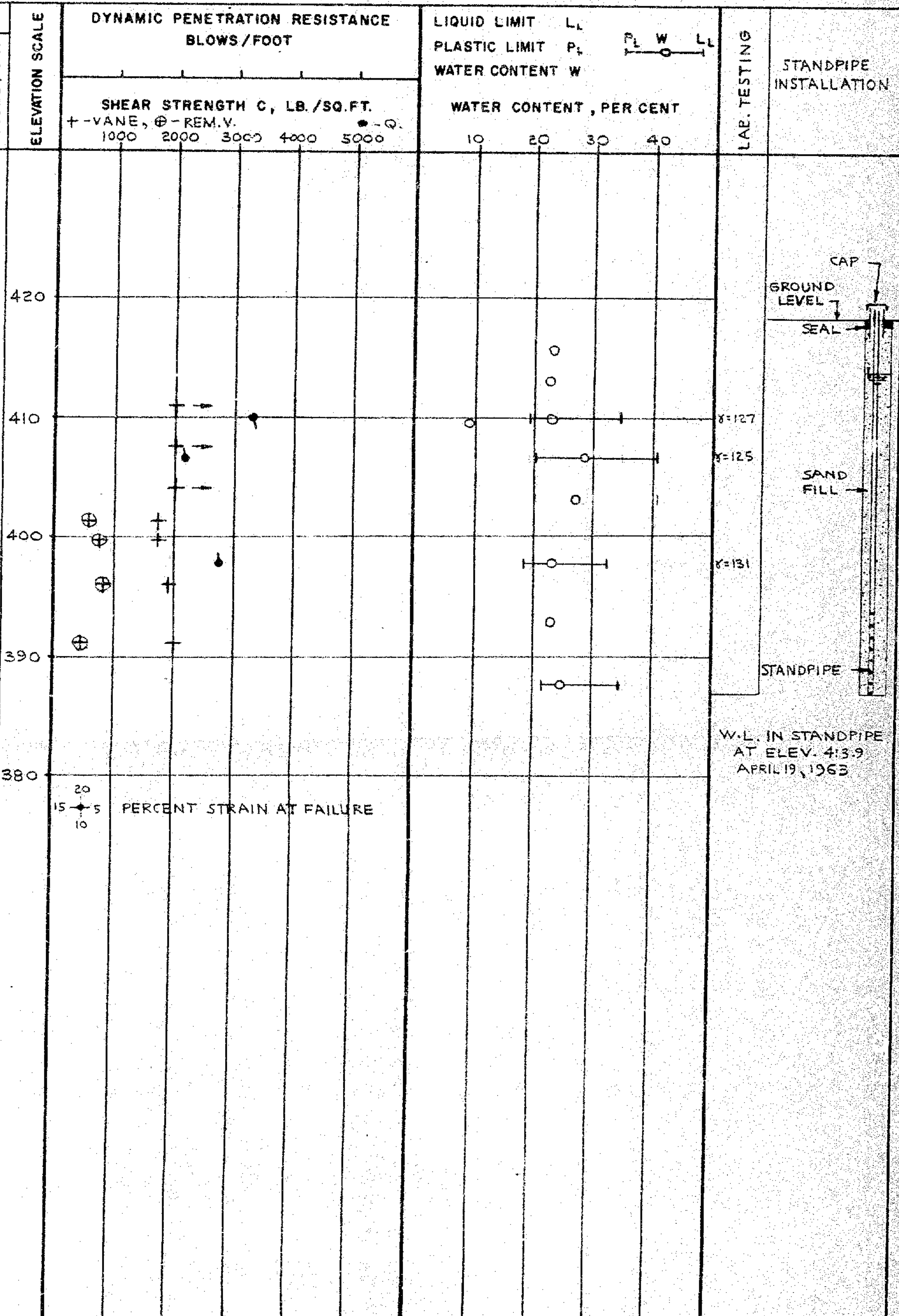
RECORD OF BOREHOLE 32

LOCATION SEE FIGURE 2 BORING DATE FEB. 14, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION (SOIL PROFILE)	SAMPLE NUMBER	TYPE	BLOWS / FT.
.6	GROUND LEVEL			
.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)**	1	2" DO	29
		2	"	22
		3	2" TO	Ph
		4	3" TO	Ph
.4 / .2	STIFF TO VERY STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	2" DO	8
		6	2" TO	Ph
		7	2" DO	9
.1		8	"	7
5	END OF HOLE			



W.L. IN STANDPIPE AT ELEV. 413.9 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [handwritten initials]

PROJECT No. 6248

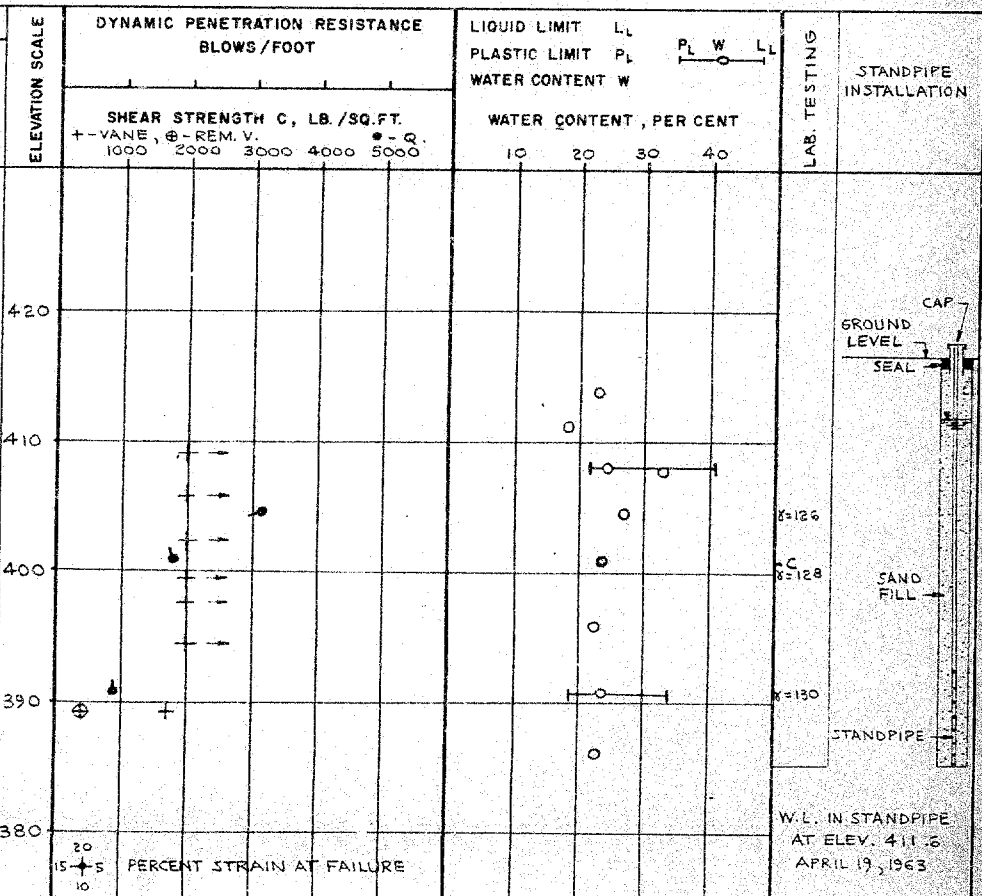
RECORD OF BOREHOLE 33

LOCATION SEE FIGURE 2 BORING DATE FEB. 14, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
416.4	GROUND LEVEL			
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY** SOME FINE SAND **(WEATHERED ZONE)** 1" LAYER OR LENS OF SHALE FRAGMENTS AT ELEV. 410.3	1	2" DO	17
		2	"	24
		3	"	18
		4	2" TO	Ph
411.9 / 4.5	STIFF TO VERY STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	Ph
		6	2" DO	13
		7	2" TO	Ph
		8	2" DO	15
384.9 / 31.5	END OF HOLE			



W.L. IN STANDPIPE AT ELEV. 411.6 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

DRAWN M.W.

CHECKED [signature]

GOLDER & ASSOCIATES

PROJECT No. 6248

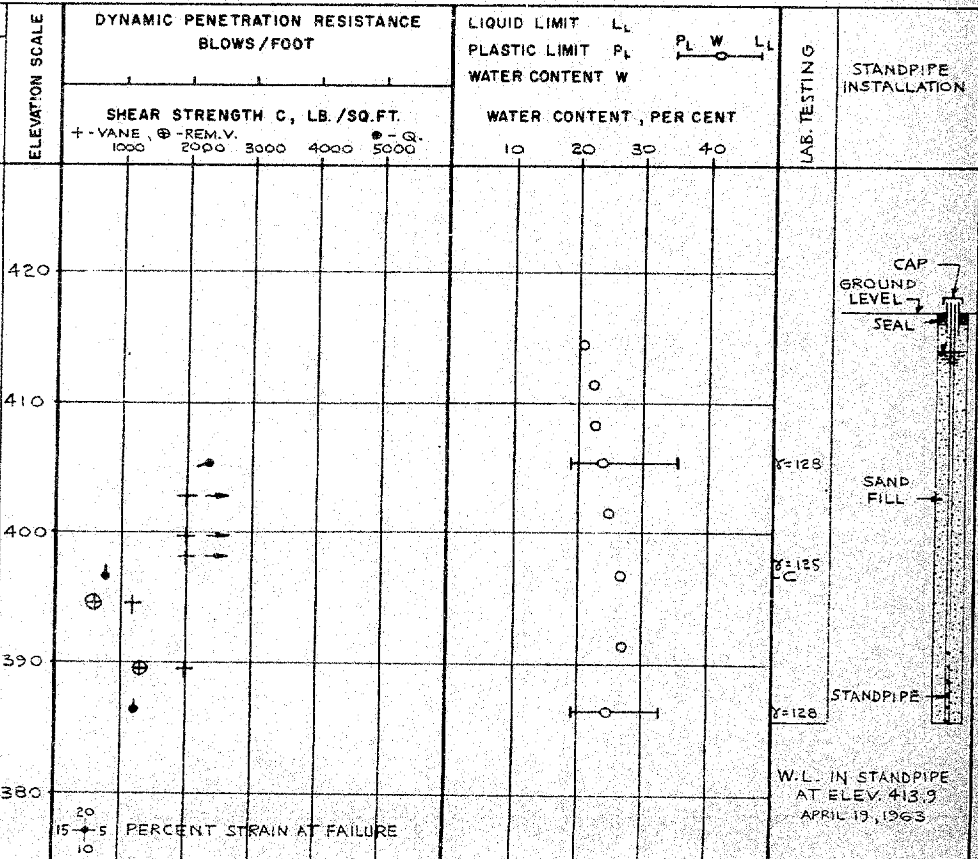
RECORD OF BOREHOLE 34

LOCATION SEE FIGURE 2 — BORING DATE FEB. 15, 1963 — DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING — BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT – LB. DROP – INCHES

ELEVN. / DEPTH	DESCRIPTION (SOIL PROFILE)	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
417.1	GROUND LEVEL				
0.0	VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY**, SOME FINE SAND **(WEATHERED ZONE)**	1	2" DO	23	
		2	"	32	
		3	"	24	
405.1 / 12.0	FIRM TO VERY STIFF GREY **SILTY CLAY**, SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	4	2" TO	Ph	γ=128
		5	2" DO	9	
		6	3" TO	Ph	γ=125 C
		7	2" DO	11	
385.6		8	2" TO	Ph	γ=128
381.5	END OF HOLE				



VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED [illegible]

PROJECT No. 248

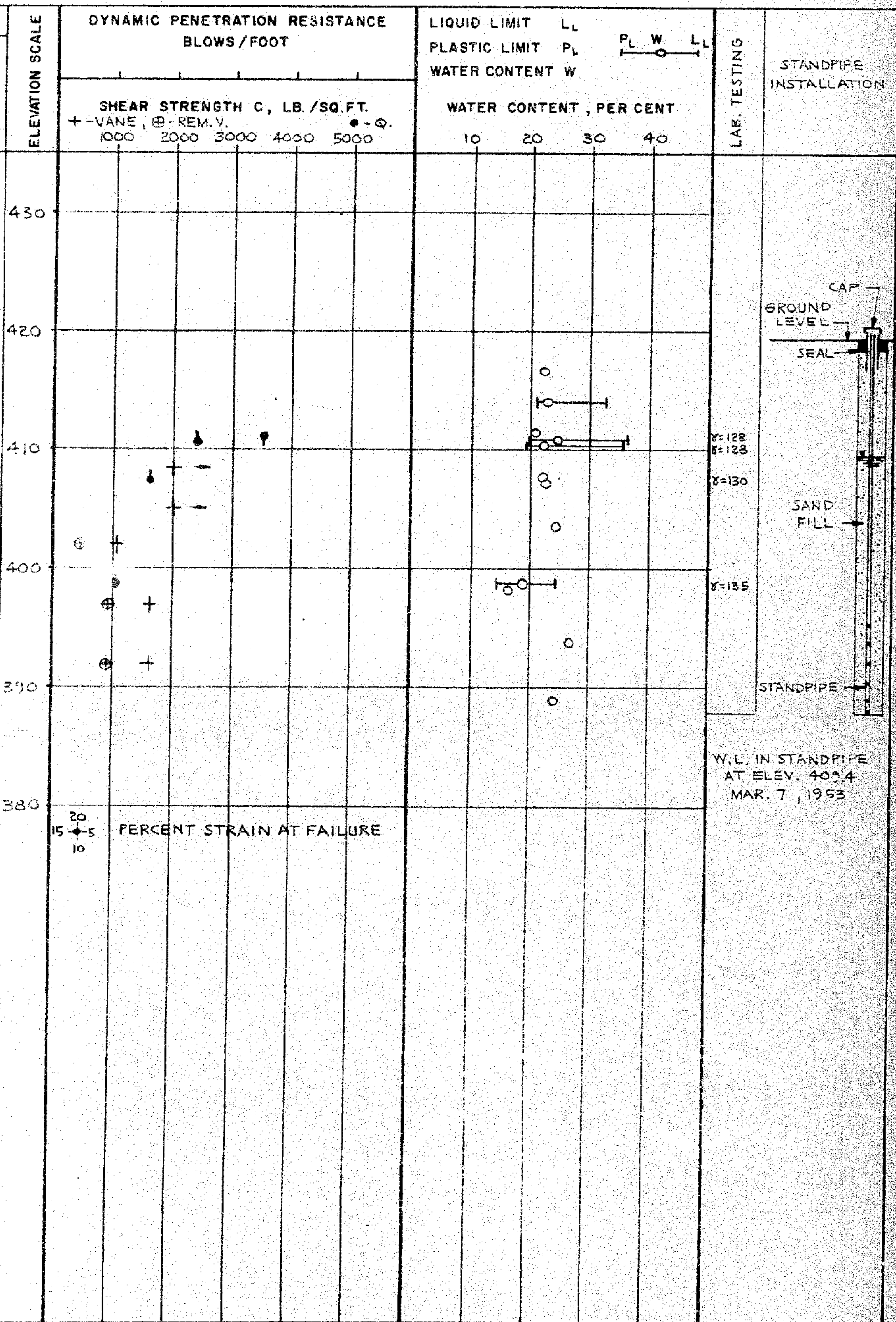
RECORD OF BOREHOLE 35

LOCATION SEE FIGURE 2 BORING DATE FEB. 27, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	SOIL PROFILE DESCRIPTION	NUMBER	TYPE	BLOWS / FT.
419.3	GROUND LEVEL			
0.0	VERY STIFF TO STIFF MOTTLED GREY AND BROWN **SILTY CLAY (WEATHERED ZONE)** UPPER 1-2 FEET ROAD FILL MATERIAL	1	2" DO	21
		2	"	17
		3	2" TO	Ph
		4	3" TO	Ph
406.8 / 12.5	VERY STIFF TO STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	2" DO	6
		6	3" TO	Ph
		7	2" DO	7
387.8 / 31.5	END OF HOLE	8	"	5



VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED

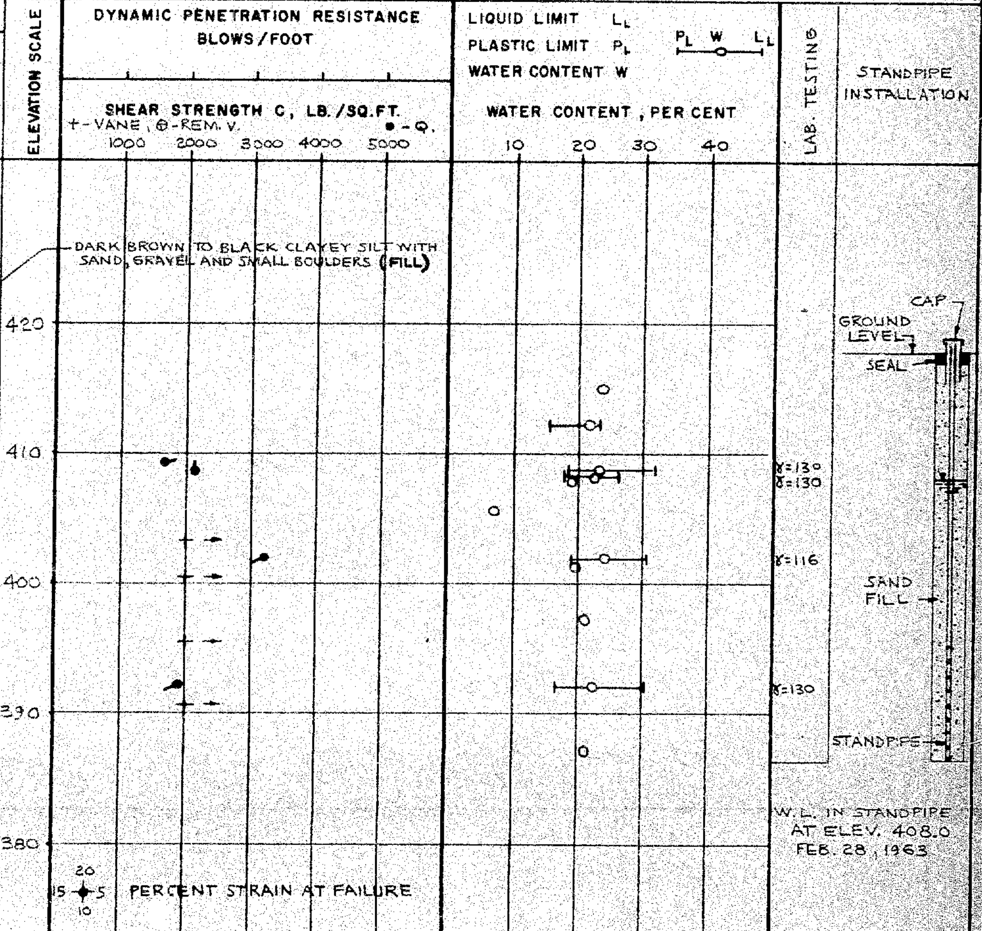
RECORD OF BOREHOLE 36

LOCATION SEE FIGURE 2 BORING DATE FEB. 26, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
7.8	GROUND LEVEL			
0.0	DARK BROWN TO BLACK CLAYEY SILT WITH SAND, GRAVEL AND SMALL BOULDERS (FILL)			
2.0	STIFF TO VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY (WEATHERED ZONE)**	1	2" DO	19
		2	"	12
		3	2" TO	Ph
4.3		4	2" DO	21
3.5	STIFF TO VERY STIFF GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	5	3" TO	16
		6	2" DO	19
		7	2" TO	Ph
6.3		8	2" DO	17
1.5	END OF HOLE			



VERTICAL SCALE
INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED

RECORD OF BOREHOLE 37

LOCATION: SEE FIGURE 2 BORING DATE: FEB. 26-27, 1963 DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING BOREHOLE DIAMETER: 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
.1 / .0	GROUND LEVEL — HARD GREY-BROWN SILTY CLAY WITH SAND, GRAVEL AND BOULDERS (FILL)				
.5	PROBABLY VERY STIFF MOTTLED GREY AND BROWN **SILTY CLAY (WEATHERED ZONE)** OCCASIONAL THIN SILT LAYERS OR LENSES	1	2" DO	32	
		2	"	20	
.9		3	"	15	
.2	HARD TO FIRM GREY **SILTY CLAY** SOME SCATTERED SAND AND GRAVEL SIZE PARTICLES	4	2" TO	Ph	γ=121, γ=127
		5	2" DO	9	
		6	3" TO	Ph	γ=125
		7	2" TO	Ph	γ=123
.6		8	2" DO	5	
.5	END OF HOLE				

DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT

SHEAR STRENGTH C, LB./SQ.FT. +-VANE, ⊕-REM.V. ●-Q. 1000 2000 3000 4000 5000

LIQUID LIMIT L_L, PLASTIC LIMIT P_L, WATER CONTENT W

WATER CONTENT, PER CENT 10 20 30 40

ELEVATION SCALE: 430, 420, 410, 400, 390, 380

20 / 15 —+— 5 / 10 PERCENT STRAIN AT FAILURE

STANDPIPE INSTALLATION: CAP, GROUND LEVEL, SEAL, SAND FILL, STANDPIPE

W.L. IN STANDPIPE AT ELEV. 413.1 APRIL 19, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

DRAWN M.W.

CHECKED [signature]

GOLDER & ASSOCIATES

PROJECT NO. [illegible]

RECORD OF BOREHOLE 101

LOCATION SEE FIGURE 1 BORING DATE JUNE 3, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

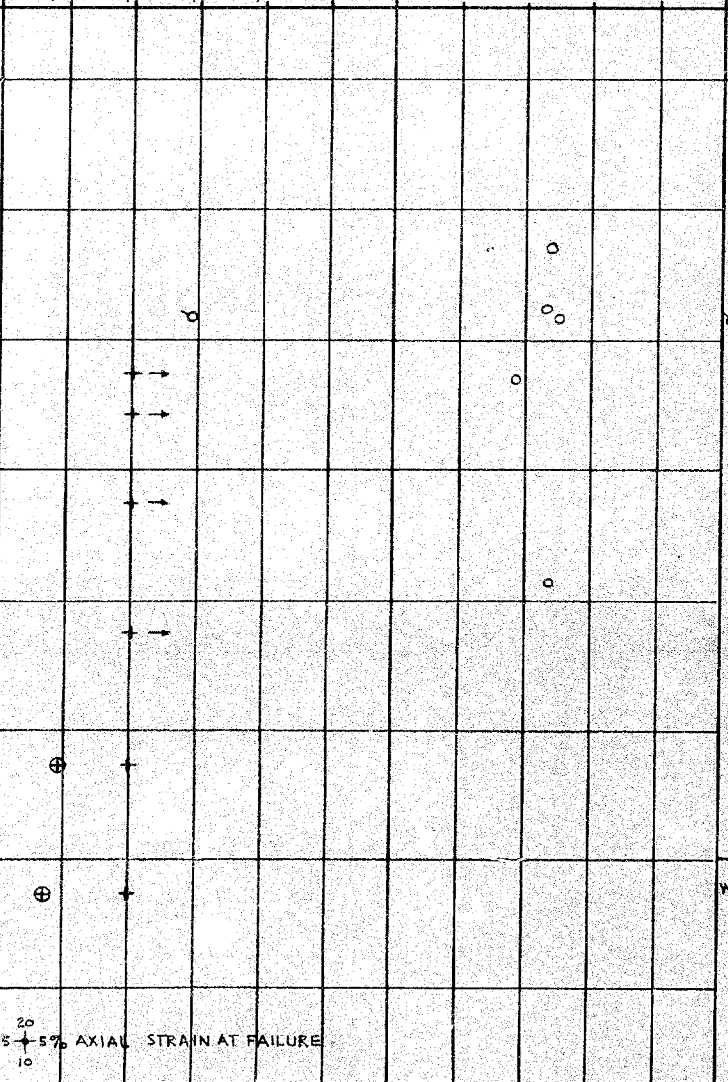
ELEVN / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
421.7	GROUND LEVEL			
0.0	TOPSOIL			
0.5	STIFF MOTTLED BROWN AND GREY CLAYEY SILT FEW THIN ROOTS, OCCASIONAL THIN FINE SAND SEAMS (FILL)	1	2" D.O.	12
417.2 / 4.5	STIFF MOTTLED BROWN AND GREY CLAYEY SILT OCCASIONAL THIN FINE SAND SEAMS (FILL ?)	2	2" T.O.	13
415.2 / 6.5	VERY STIFF BROWN, TINGED GREY SILTY CLAY	3	2" D.O.	26
		4	2" T.O.	24
411.2 / 10.5	VERY STIFF TO STIFF GREY SILTY CLAY OCCASIONAL THIN FINE SAND SEAMS	5	2" D.O.	18
		6	"	11
		7	"	14
393.7 / 28.0	END OF HOLE			

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + - VANE ⊕ - REM. V. O - U.

COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT



LAB. TESTING: γ=126

STANDPIPE INSTALLATION

W.L. IN STANDPIPE AT ELEV. 419.4 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN J. A.

CHECKED [signature]

PROJECT No. 6248/2

RECORD OF BOREHOLE 102

LOCATION SEE FIGURE 1 **BORING DATE** MAY 21-22, 1963 **DATUM** GEODETIC

BOREHOLE TYPE POWER AUGER BORING **BOREHOLE DIAMETER** 4.5"

SAMPLER HAMMER WEIGHT 140 **LB. DROP** 30 **INCHES** **PEN. TEST HAMMER WEIGHT** — **LB. DROP** — **INCHES**

ELEV. / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
6.4	GROUND LEVEL			
0.0	TOPSOIL			
0.5	VERY STIFF BROWN SILT, TRACE CLAY AND FINE SAND, SOME ORGANIC MATERIAL AND FAINT STRATIFICATION IN UPPER 3-4 FEET.	1	2" D.O.	29
		2	2" T.O.	36
		3	2" D.O.	16
4.9 / 1.5	VERY STIFF GREY SILTY CLAY OCCASIONAL THIN (<1/8") LAYERS OR LENSES OF FINE SILTY SAND	4	2" T.O.	27
		5	2" D.O.	19
		6	"	21
		7	"	19
3.4 / .0	END OF HOLE			

ELEVATION SCALE: 430, 425, 420, 415, 410, 405, 400, 395

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + - VANE ● - Q: 1000 2000 3000 4000 5000

COULD NOT PUSH VANE INTO SOIL (at elev. approx. 419.5)

COULD NOT PUSH VANE INTO SOIL (at elev. approx. 409.5)

COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT (P_L, W, L_L): 10 20 30 40

LAB. TESTING: γ=130

STANDPIPE INSTALLATION: CAP, GROUND LEVEL, CEMENT SEAL, PLASTIC TUBING, SAND FILL, PERFORATED PIPE

W.L. IN STANDPIPE AT ELEV. 423.5 JULY 10, 1963

20 / 15 + 5 / 10 — % AXIAL STRAIN AT FAILURE

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.

CHECKED H.McB.

PROJECT No. 6248/2

RECORD OF BOREHOLE 103

LOCATION SEE FIGURE 1 BORING DATE JUNE 3, 1963 DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLES – NUMBER	TYPE	BLOWS / FT.
427.3	GROUND LEVEL			
0.0 / 0.5	TOPSOIL			
	FIRM DARK GREY CLAYEY SILT WITH SOME ORGANIC MATTER	1	2" D.O.	7
422.0 / 5.3		2	2" T.O.	Ph
	VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY FEW POCKETS OF GREY SILT	3	2" D.O.	35
		4	2" T.O.	34
413.3 / 14.0		5	2" D.O.	6
	STIFF GREY SILTY CLAY OCCASIONAL ¼ INCH LAYERS OF FISSURED CLAY (FISSURES FORM ⅛ TO ¼ INCH BLOCKS)	6	"	6
		7	"	5
399.3 / 28.0	END OF HOLE			

ELEVATION SCALE: 430, 425, 420, 415, 410, 405, 400, 395

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + - VANE ⊕ - REM. V. ● - Q.

1,000 2,000 3,000 4,000 5,000

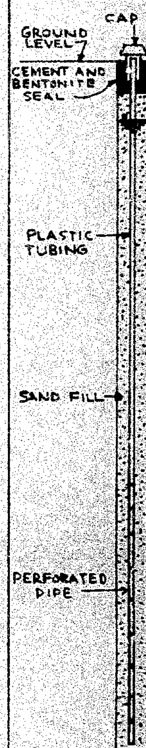
COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT P_L W L_L

10 20 30 40

LAB. TESTING: γ=121

STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 425.0 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN J.A.

CHECKED A. McB.

PROJECT No. [illegible]

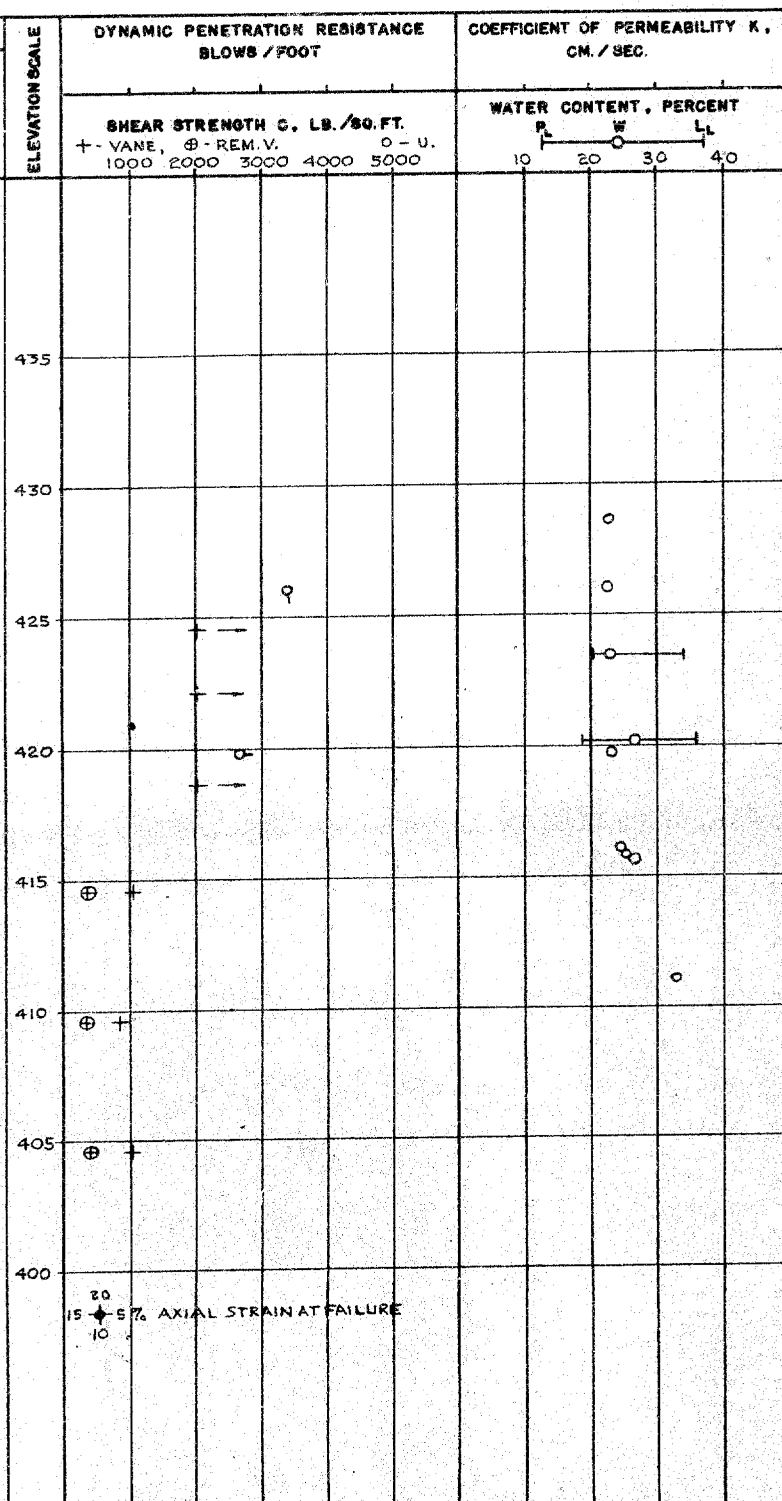
RECORD OF BOREHOLE 104

LOCATION SEE FIGURE 1 — BORING DATE MAY 23, 1963 — DATUM GEODETIC

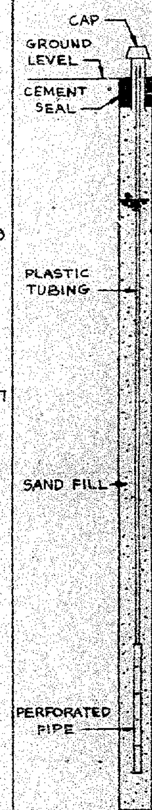
BOREHOLE TYPE POWER AUGER BORING — BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
431.9	GROUND LEVEL				
0.0	TOPSOIL				
0.5	VERY STIFF LIGHT BROWN FOLIATED CLAYEY SILT OCCASIONAL THIN (~1/16") LAYERS OF BROWN SILT. UPPER 4 FEET OF MATERIAL IS MOTTLED AND CONTAINS A FEW ROOTS. AN 11" LAYER OF FIRM SILTY CLAY AT EL. 417	1	2" D.O.	15	
		2	2" T.O.	Ph	γ=129
		3	2" D.O.	20	
		4	2" T.O.	Ph	γ=127
416.2 / 15.7	FIRM TO STIFF GREY SILTY CLAY WITH A FEW LAYERS (TO 1/4") OF GREY CLAYEY SILT	5	2" D.O.	12	
		6	"	5	
		7	2" T.O.	Ph	
403.9 / 28.0	END OF HOLE				



STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 427.0 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.
CHECKED A.[illegible]

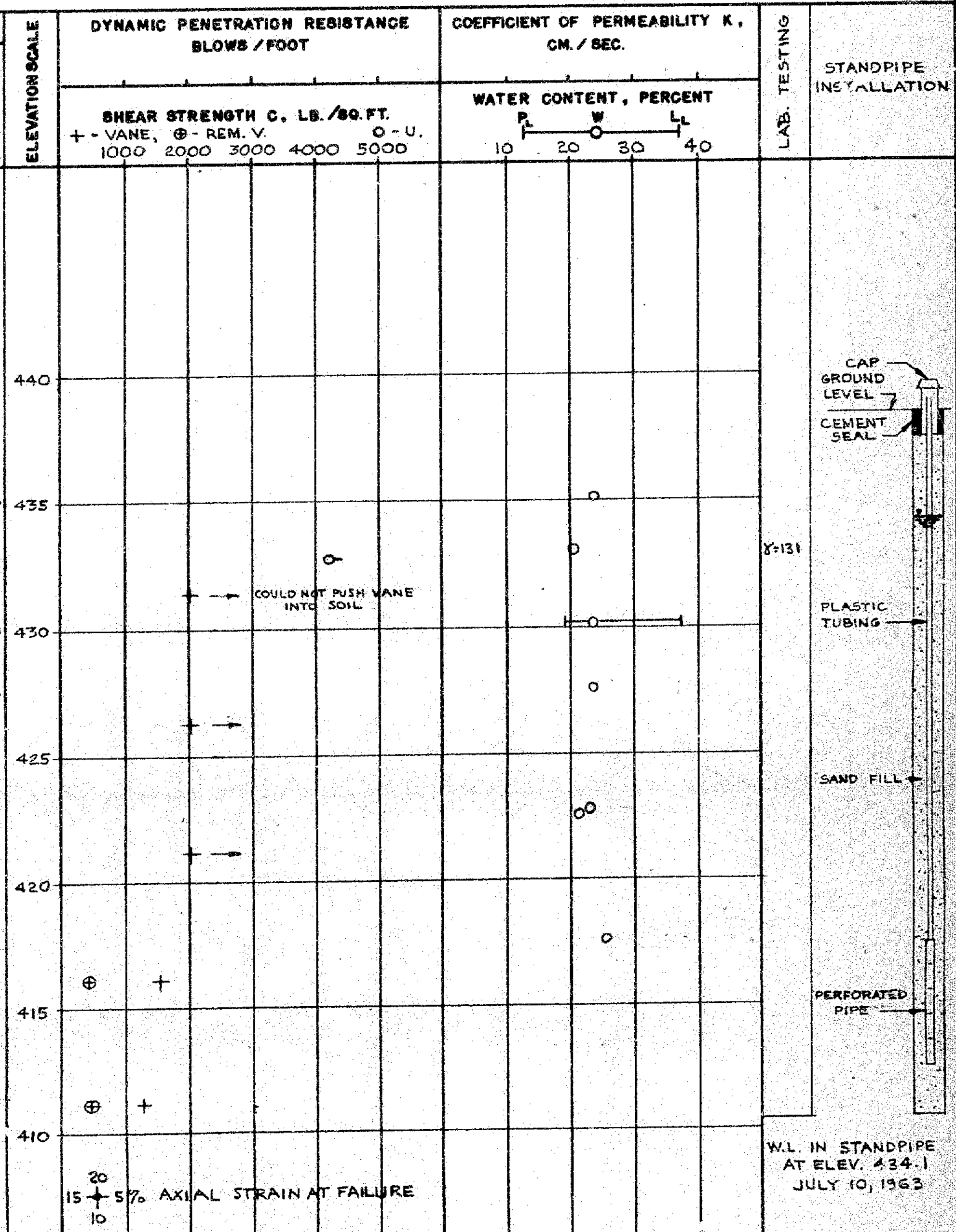
RECORD OF BOREHOLE 105

LOCATION SEE FIGURE 1 — BORING DATE MAY 21, 1963 — DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING — BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.	LAB. TESTING
438.4 / 0.0	GROUND LEVEL; TOPSOIL				
0.5	HARD TO VERY STIFF LIGHT BROWN **CLAYEY SILT** SOME ORGANIC MATERIAL IN UPPER 4 FEET	1	2" D.O.	26	
		2	2" T.O.	24	γ=131
		3	2" D.O.	29	
		4	2" T.O.	26	
425.9 / 12.5	VERY STIFF TO STIFF GREY **SILTY CLAY** WITH AN OCCASIONAL LAYER OF GREY CLAYEY SILT TO 1/4" IN THICKNESS. 1½" THCK LAYER OF CLAYEY SILT AT EL. 422	5	2" D.O.	10	
		6	"	7	
		7	"	5	
410.4 / 28.0	END OF HOLE				



W.L. IN STANDPIPE AT ELEV. 434.1 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.
CHECKED M.M.S.

RECORD OF BOREHOLE 106

LOCATION: SEE FIGURE 1 — BORING DATE: MAY 16-17, 1963 — DATUM: GEODETIC

BOREHOLE TYPE: POWER AUGER BORING — BOREHOLE DIAMETER: 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN / DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
431.9	GROUND LEVEL			
0.0	TOPSOIL			
0.5	FIRM MOTTLED DARK BROWN CLAYEY TO SANDY SILT SOME ORGANIC MATTER (FILL)	1	2" D.O.	7
427.9 / 4.0	VERY STIFF LIGHT BROWN SILT, TRACE CLAY	2	2" T.O.	37
		3	2" D.O.	38
421.4 / 10.5	VERY STIFF TO FIRM GREY CLAYEY SILT BECOMING A SILTY CLAY BELOW ABOUT EL. 419 FOLIATED STRUCTURE IN PLACES.	4	2" T.O.	16
		5	2" D.O.	9
		6	"	5
		7	2" T.O.	Ph
		8	"	Ph
398.9 / 33.0	END OF HOLE			

ELEVATION SCALE: 435, 430, 425, 420, 415, 410, 405, 400, 395

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM.V. ○ - U. 1000 2000 3000 4000 5000

COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT P_L — W — L_L 10 20 30 40

LAB. TESTING: γ=134

STANDPIPE INSTALLATION: CAP; GROUND LEVEL; CEMENT; SOD FILL; BENTONITE SEAL; SILTY CLAY FILL; PLASTIC TUBING; SAND AND GRAVEL FILL; PERFORATED PIPE

W.L. IN STANDPIPE AT ELEV. 427.0 JULY 10, 1963

20 / 15 ✛ 5% AXIAL STRAIN AT FAILURE / 10

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN — CHECKED

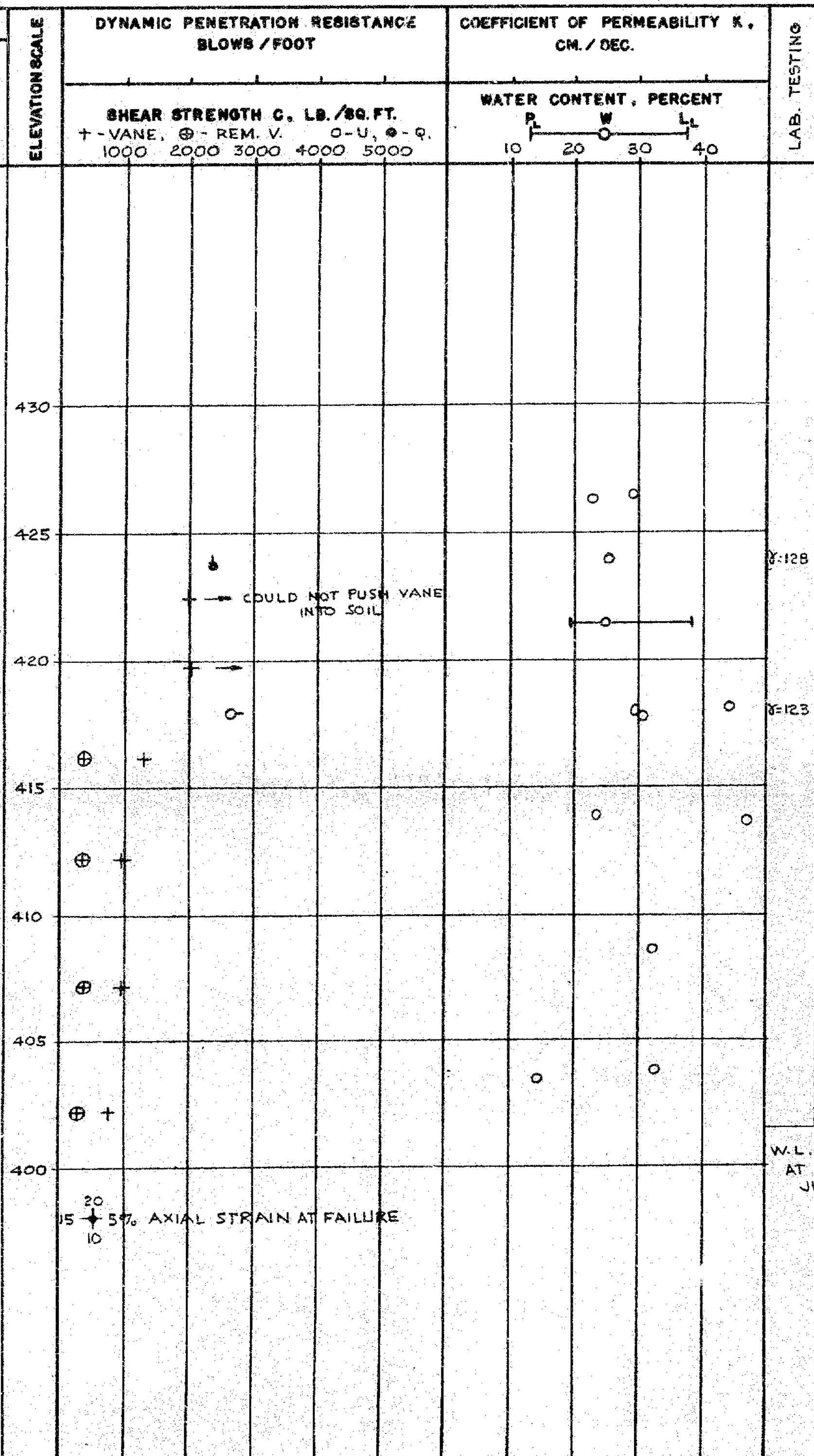
RECORD OF BOREHOLE 107

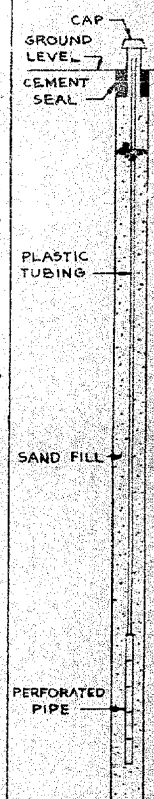
LOCATION SEE FIGURE I | BORING DATE MAY 22, 1963 | DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING | BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES | PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
429.5 / 0.0	GROUND LEVEL; **TOPSOIL**			
0.5	FIRM MOTTLED DARK BROWN CLAYEY TO SANDY SILT, SOME ORGANIC MATTER (FILL)			
426.6 / 2.9	VERY STIFF BROWN AND GREY **CLAYEY SILT**, OCCASIONAL THIN PARTINGS OF FINE SILTY SAND	1	2" D.O.	14
		2	2" T.O	15
		3	2" D.O	28
		4	2" T.O.	Ph
416.5 / 13.0	STIFF TO FIRM GREY **CLAYEY SILT** BECOMING A **SILTY CLAY** WITH INCREASING DEPTH	5	2" D.O	5
		6	"	5
		7	2" T.O.	Ph
401.5 / 28.0	END OF HOLE			





W.L. IN STANDPIPE AT ELEV. 426.5 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.

CHECKED M.M.Y.

RECORD OF BOREHOLE 108

LOCATION SEE FIGURE 1 BORING DATE MAY 16-17, 1963. DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING BOREHOLE DIAMETER 4.5"

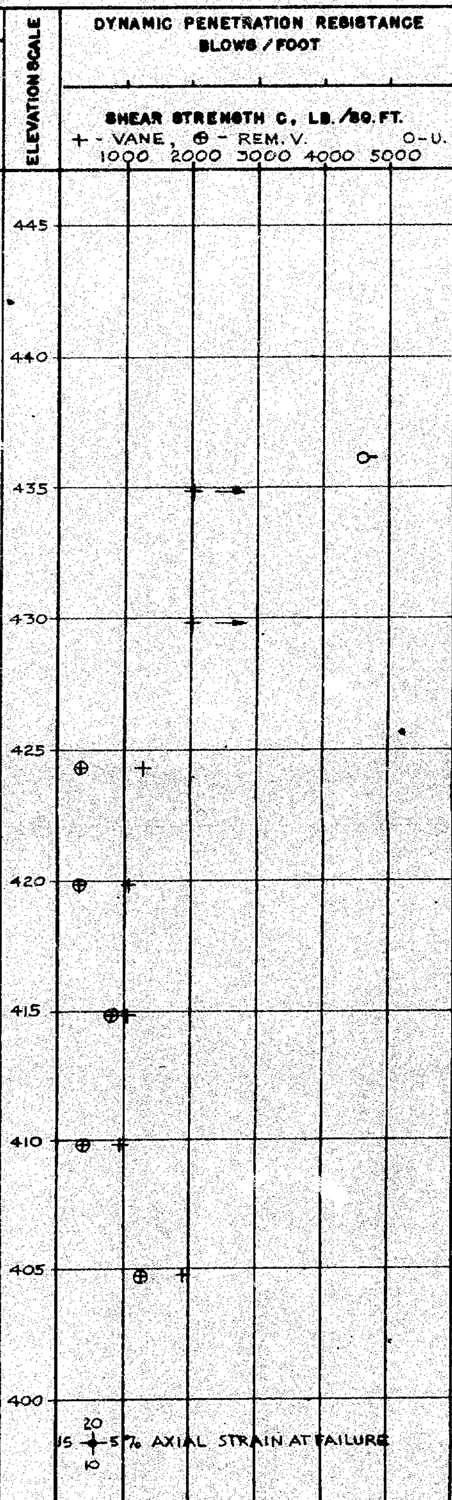
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

SOIL PROFILE

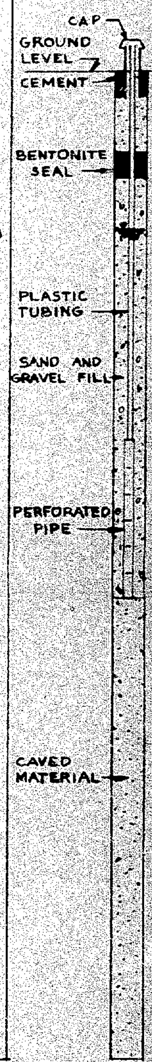
ELEVN. / DEPTH	DESCRIPTION
442.1	GROUND LEVEL
0.0	TOPSOIL
0.5	HARD TO VERY STIFF MOTTLED DARK BROWN **CLAYEY** TO **SANDY SILT** WITH A FEW ROOTS BECOMING A LIGHT BROWN **SILT**, TRACE CLAY BELOW ABOUT EL. 436
428.1 / 14.0	FIRM TO STIFF GREY **SILTY CLAY** WITH SOME LAYERS OF CLAYEY SILT SOME SAND AND GRAVEL SIZE PARTICLES BELOW ABOUT EL. 416 THE LOWER MATERIAL IS PROBABLY A MODIFIED TILL.
404.2 / 37.9	END OF HOLE

SAMPLES

NUMBER	TYPE	BLOWS / FT.
1	2" D.O.	18
2	2" T.O.	29
3	2" D.O.	27
4	2" T.O.	19
5	2" D.O.	5
6	2" T.O.	Ph
7	2" D.O.	4
8	"	6
9	2" T.O.	Ph



LAB. TESTING: γ=128



W.L. IN STANDPIPE AT ELEV. 435.9 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.
CHECKED 1. M. B.

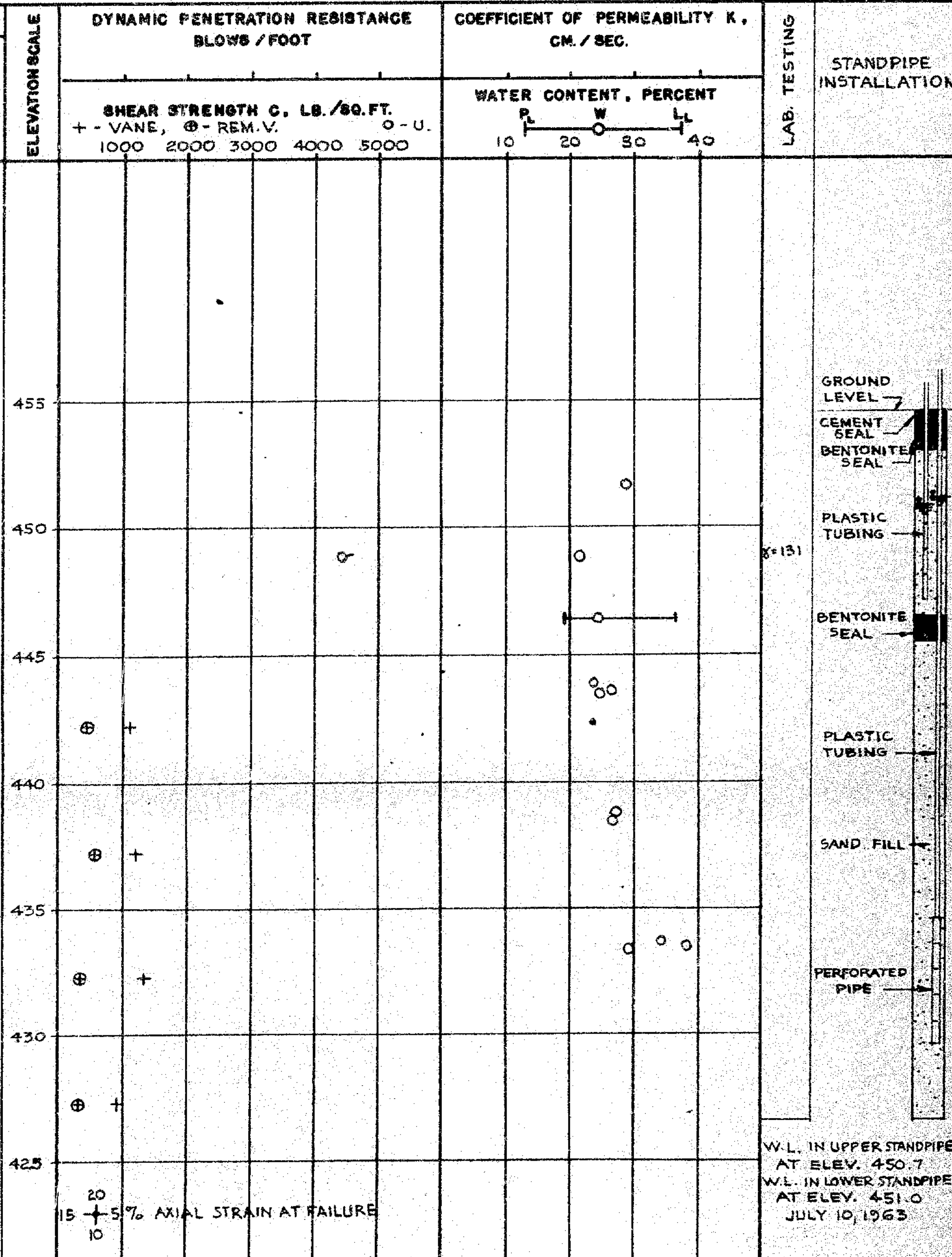
RECORD OF BOREHOLE 109

LOCATION SEE FIGURE 1 — BORING DATE MAY 17 - 21, 1963 — DATUM GEODETIC

BOREHOLE TYPE POWER AUGER BORING — BOREHOLE DIAMETER 4.5"

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES — PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
454.5	GROUND LEVEL			
0.0	TOPSOIL			
0.5	SOFT TO FIRM DARK BROWN SILTY CLAY (FILL)			
451.9 / 2.6	HARD MOTTLED BROWN & GREY SILTY CLAY, SOME FISSURES OCCASIONAL ROOT IN UPPER PORTION	1	2" D.O.	4
		2	2" T.O.	27
446.5 / 8.0	FIRM TO STIFF GREY LAYERED SILTY CLAY AND CLAYEY SILT (LAYERS GENERALLY LESS THAN ¼" THICK) BECOMING A SILTY CLAY BELOW ABOUT EL. 436	3	2" D.O.	30
		4	2" T.O.	Ph
		5	2" D.O.	6
		6	"	4
		7	"	6
426.5 / 28.0	END OF HOLE			



W.L. IN UPPER STANDPIPE AT ELEV. 450.7
W.L. IN LOWER STANDPIPE AT ELEV. 451.0
JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.
CHECKED M.M.

RECORD OF BOREHOLE 110

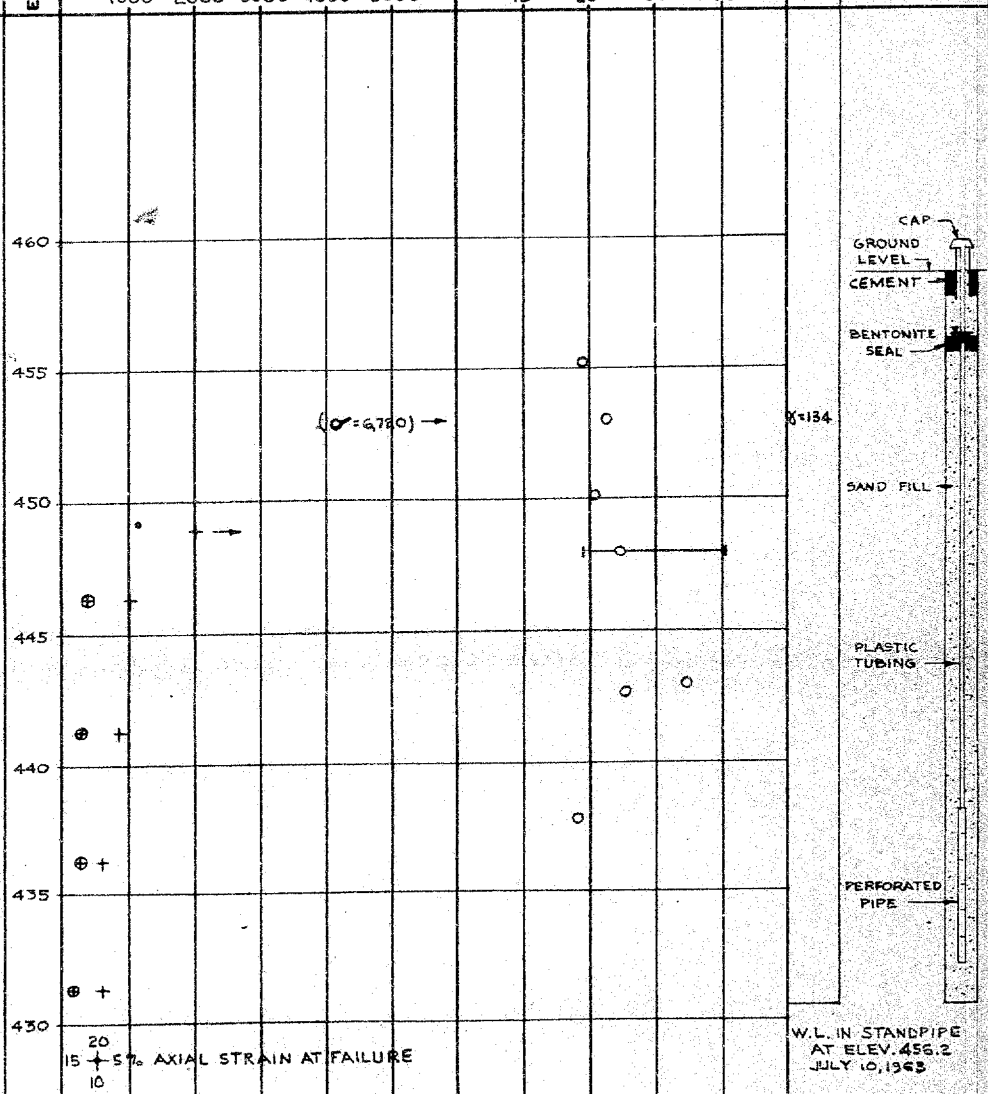
LOCATION SEE FIGURE 1 **BORING DATE** MAY 17, 1963. **DATUM** GEODETIC

BOREHOLE TYPE POWER AUGER BORING **BOREHOLE DIAMETER** 4.5"

SAMPLER HAMMER WEIGHT 140 **LB. DROP** 30 **INCHES** **PEN. TEST HAMMER WEIGHT** — **LB. DROP** — **INCHES**

ELEVN. / DEPTH	SOIL PROFILE – DESCRIPTION	SAMPLES – NUMBER	TYPE	BLOWS / FT.
458.6	GROUND LEVEL			
0.0	TOPSOIL			
0.5	SOFT TO FIRM BROWN SILTY CLAY (FILL)			
456.6 / 2.0	HARD TO VERY STIFF MOTTLED BROWN SILTY CLAY, SOME LAYERS OF SAND AND GRAVEL SIZE PARTICLES IN A SILTY CLAY MATRIX	1	2" D.O	50
		2	2" T.O	46
		3	2" D.O	23
448.1 / 10.5	FIRM GREY SILTY CLAY WITH LAYERS CONTAINING SOME SAND AND GRAVEL SIZE PARTICLES IN THE SILTY CLAY MATRIX (THESE BANDS ARE PROBABLY MODIFIED TILL)	4	2" T.O	Ph
		5	2" D.O	4
		6	"	5
		7	"	5
430.6 / 28.0	END OF HOLE			

STRAT. PLOT | ELEVATION SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM. V., O - U. | COEFFICIENT OF PERMEABILITY K, CM. / SEC. | WATER CONTENT, PERCENT P_L W L_L | LAB. TESTING | STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 456.2 JULY 10, 1963

VERTICAL SCALE 1 INCH TO 5'-0"

GOLDER & ASSOCIATES

DRAWN A.
CHECKED H.McG.

RECORD OF BOREHOLE 111, 112 & 113

LOCATION SEE FIGURE 1 **BORING DATE** JUNE 19, 1963 **DATUM** GEODETIC

BOREHOLE TYPE POWER AUGER BORING **BOREHOLE DIAMETER** 4.5"

SAMPLER HAMMER WEIGHT 140 **LB. DROP** 30 **INCHES** **PEN. TEST HAMMER WEIGHT** — **LB. DROP** — **INCHES**

Borehole 111

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
421.3	GROUND LEVEL			
0.0	STIFF MOTTLED GREY-BROWN CLAYEY SILT (FILL)	1	2" DO	11
416.8 / 4.5	VERY STIFF TO FIRM BROWN LAYERED CLAYEY SILT AND SILTY CLAY BECOMING GREY SILTY CLAY BELOW EL. 412.1	2	TO	Pm
		3	DO	13
		4	"	3
408.5 / 12.8	END OF HOLE			

W.L. IN BOREHOLE AT ELEV. 414.3 JULY 10, 1963

γ=129

Borehole 112

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
420.2	GROUND LEVEL			
0.0	FIRM TO STIFF MOTTLED GREY-BROWN CLAYEY SILT (FILL)	1	2" DO	9
415.7 / 4.5	VERY STIFF BROWN BECOMING GREY BELOW EL. 411.5 SILTY CLAY	2	TO	Pm
		3	DO	34
		4	"	18
408.7 / 11.5	END OF HOLE			

W.L. IN BOREHOLE AT ELEV. 418.1 JULY 10, 1963

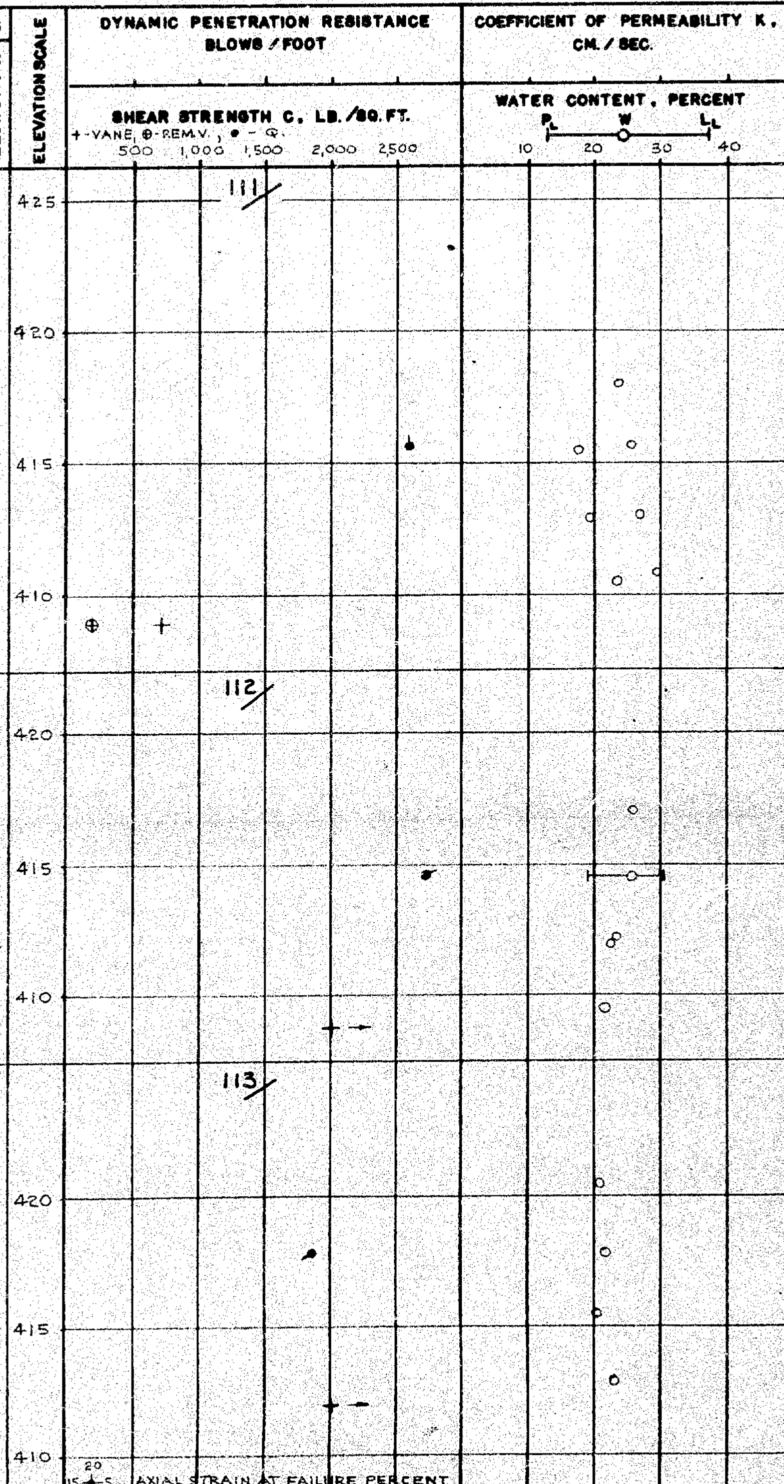
γ=125

Borehole 113

ELEVN. / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS / FT.
423.7	GROUND LEVEL			
0.0	FIRM MOTTLED BROWN CLAYEY SILT (FILL)			
420.7 / 3.0	STIFF TO VERY STIFF GREY-BROWN BECOMING GREY BELOW EL. 414.3 SILTY CLAY	1	2" DO	8
		2	TO	Pm
		3	DO	17
		4	"	22
412.2 / 11.5	END OF HOLE			

W.L. IN BOREHOLE AT ELEV. 420.5 JULY 10, 1963

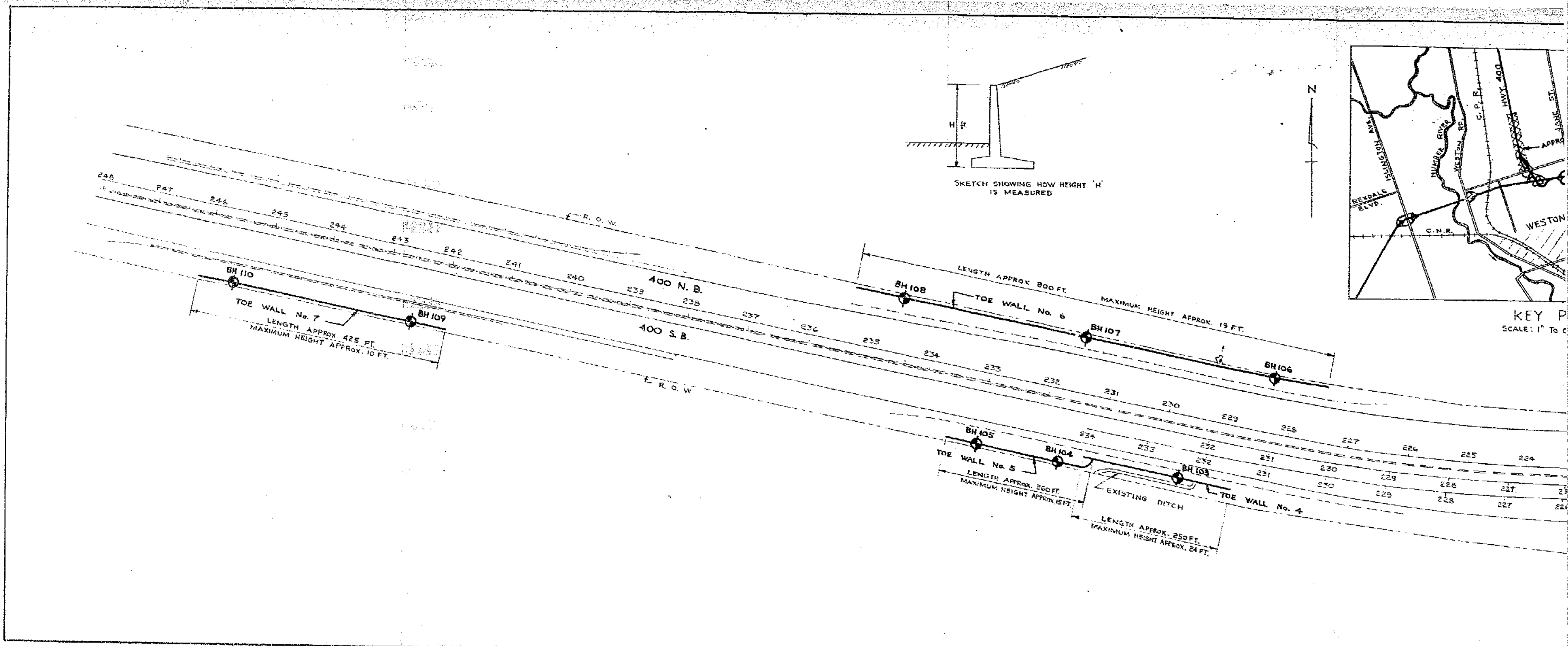
γ=128



VERTICAL SCALE 1 INCH TO 5'-0"

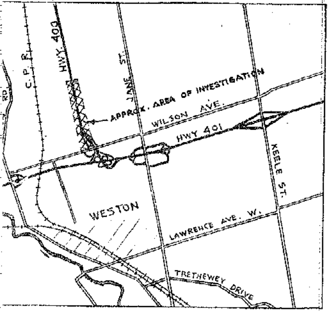
GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED [illegible]

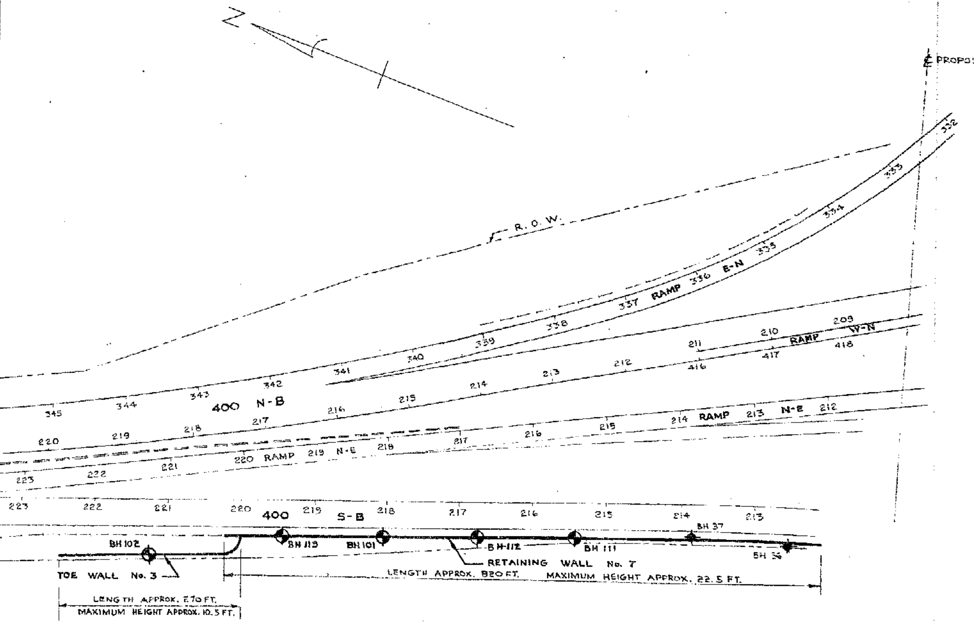

SKETCH SHOWING HOW HEIGHT 'H' IS MEASURED
H
N
℄ R. O. W.
400 N. B.
400 S. B.
BH 110
BH 109
TOE WALL No. 7
LENGTH APPROX. 425 FT.
MAXIMUM HEIGHT APPROX. 10 FT.
BH 108
BH 107
BH 106
TOE WALL No. 6
LENGTH APPROX. 800 FT.
MAXIMUM HEIGHT APPROX. 19 FT.
BH 105
BH 104
BH 103
TOE WALL No. 5
LENGTH APPROX. 260 FT.
MAXIMUM HEIGHT APPROX. 15 FT.
EXISTING DITCH
TOE WALL No. 4
LENGTH APPROX. 250 FT.
MAXIMUM HEIGHT APPROX. 24 FT.
ISLINGTON AVE.
HUMBER RIVER
WESTON RD.
C. P. R.
HWY. 400
JANE ST.
REXDALE BLVD.
C. N. R.
WESTON
KEY P
SCALE: 1" To

SITE & BORING PLAN

FIGURE 1



KEY PLAN
SCALE: 1" To 0.8 MILES



LEGEND

- BOREHOLE IN PLAN (PRESENT INVESTIGATION)
- BOREHOLE IN PLAN (REPORT 6248, DATED MAY, 1963)

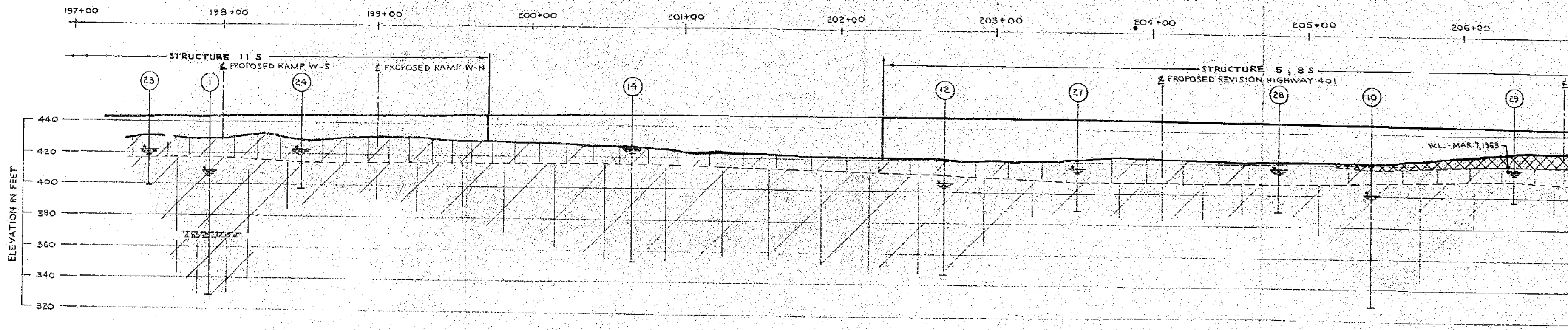
REFERENCE

PLANS SUPPLIED BY DE LEUW, CATHER AND COMPANY OF CANADA LIMITED, RECEIVED APRIL 29, 1963.
SCALE 1" To 40'-0".

SCALE: 1" TO 100'

GOLDER & ASSOCIATES

Made A.V. & J.A.
Chkd.
Appd.

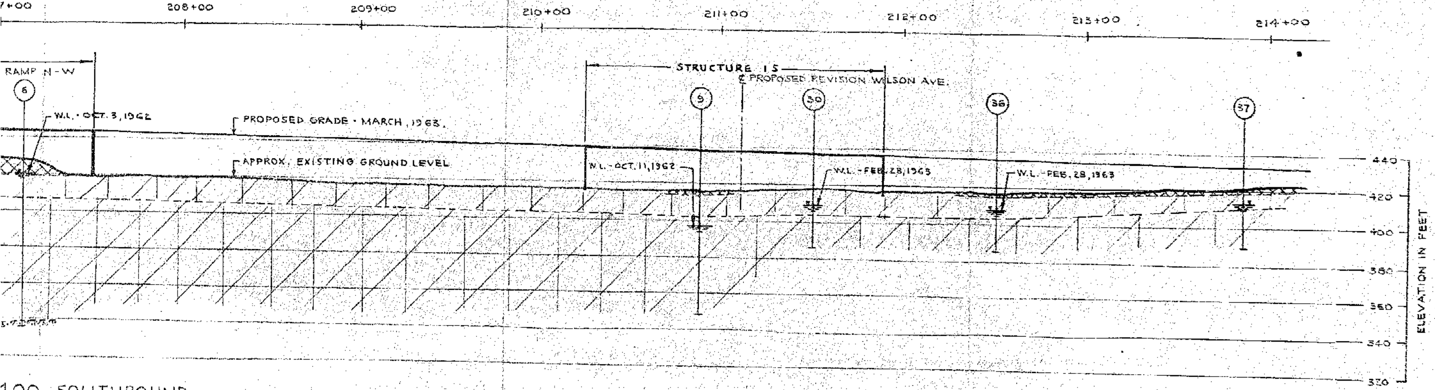


SCHEMATIC SECTION ALONG PROPOSED REVISION HIGH

(LOOKING WEST)

SOIL STRATIGRAPHY
SECTION ALONG HIGHWAY 400 S-B

FIGURE 5



400 SOUTHBOUND

LEGEND

BOREHOLE IN ELEVATION

WATER LEVEL IN STANDPIPE - APRIL 19, 1963. (EXCEPT WHERE NOTED)

SCALE 1" TO 40'-0"

STRATIGRAPHY

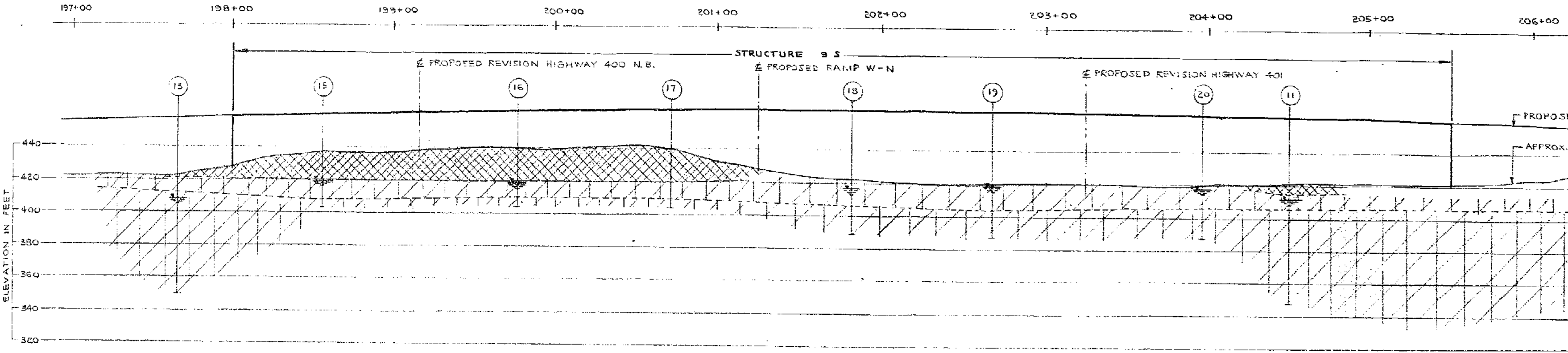
- STIFF TO VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME SAND AND GRAVEL (FILL)
- STIFF TO VERY STIFF MOTTLED GREY AND BROWN SILTY CLAY, SOME FINE SAND (WEATHERED ZONE)
- GREY SILTY CLAY, OCCASIONAL SAND AND GRAVEL SIZE PARTICLES, GENERALLY FIRM TO VERY STIFF.
- FIRM GREY CLAYEY SILT WITH SOME SAND AND GRAVEL (TILL STRUCTURE)

REFERENCE: DE LEUW CATHER & COMPANY OF CANADA LIMITED DRAWINGS 857 & 858, PROFILES OF HIGHWAY 400 SOUTHBOUND AND NORTHBOUND STA. 170+00 TO 195+00 AND STA. 195+00 TO 220+00 REC'D. APRIL 9, 1963

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

GOLDER & ASSOCIATES

Made
Chkd.
Appd.

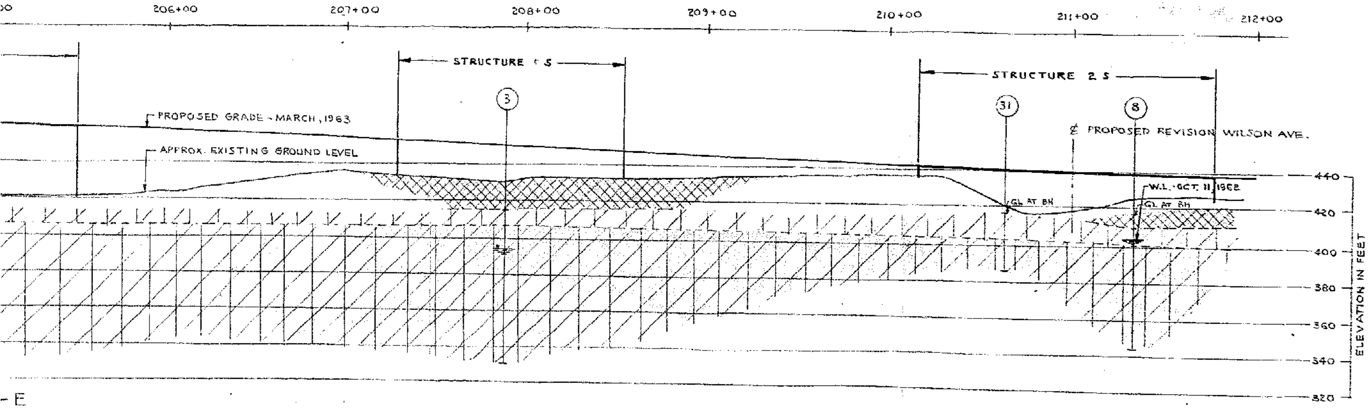


SCHEMATIC SECTION ALONG PROPOSED RAMP N-E

(LOOKING WEST)

SOIL STRATIGRAPHY
SECTION ALONG RAMP N-E

FIGURE 4



LEGEND

BOREHOLE IN ELEVATION

WATER LEVEL IN STANDPIPE - APRIL 19, 1963 (EXCEPT WHERE NOTED)

SCALE 1" TO 40'-0"

STRATIGRAPHY

VERY STIFF TO HARD BROWN AND GREY **SANDY** AND **SILTY CLAY** WITH SOME GRAVEL SIZE PARTICLES **(FILL)**

STIFF TO VERY STIFF MOTTLED BROWN AND GREY **SILTY CLAY**, FEW SAND AND GRAVEL SIZE PARTICLES **(WEATHERED ZONE)**

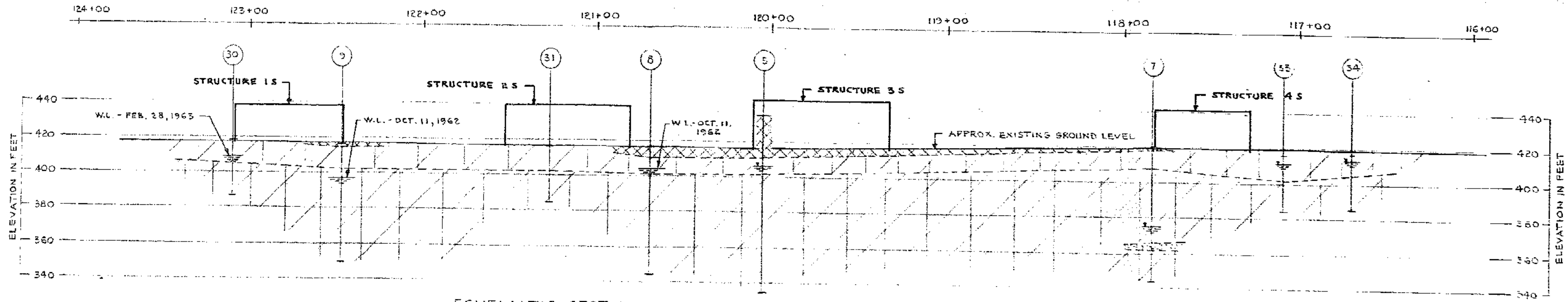
STIFF TO VERY STIFF GREY **SILTY CLAY** WITH A FEW SAND AND GRAVEL SIZE PARTICLES.

REFERENCE: DE LEUW CATHER & COMPANY OF CANADA LIMITED DRAWING 661, PROFILE - RAMP N-E, STA. 187+00 TO STA. 235+00 REC'D. APRIL 9, 1963

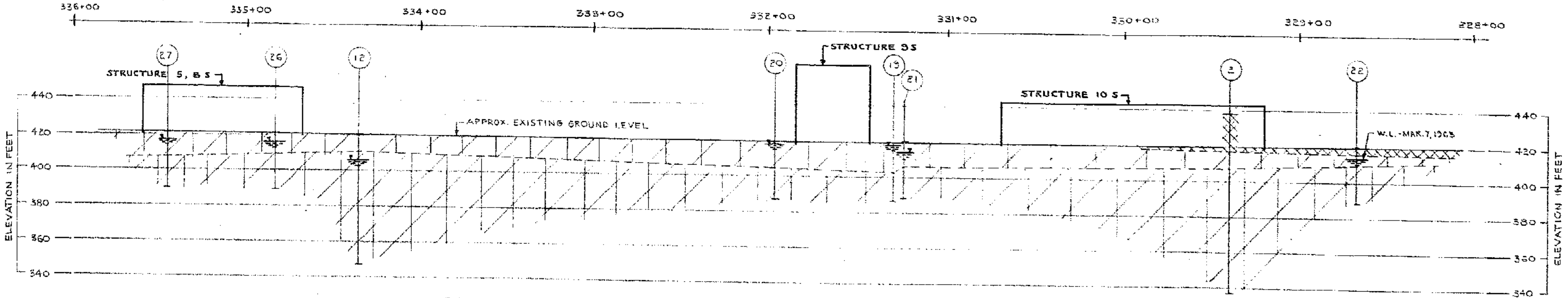
SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

GOLDER & ASSOCIATES

Made
Chkd.
Appd.



SCHEMATIC SECTION ALONG CENTRELINE PROPOSED REVISION WILSON AVE.
(LOOKING NORTH)



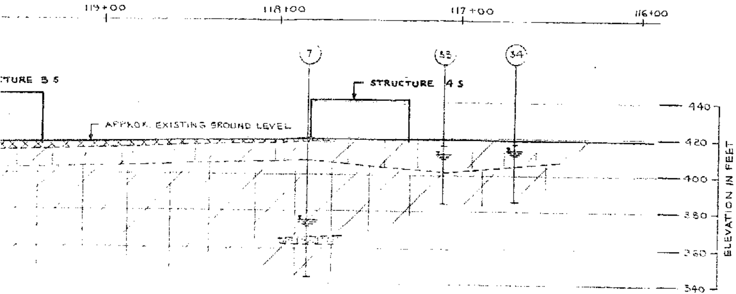
SCHEMATIC SECTION ALONG CENTRELINE PROPOSED REVISION HIGHWAY 401
(LOOKING NORTH)

SOI
SECTIO
REFEREN

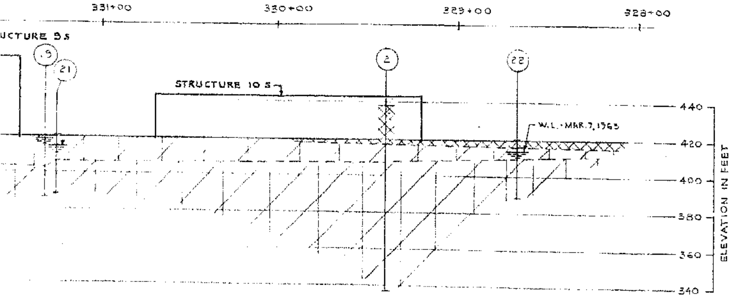
SOIL STRATIGRAPHY

SECTIONS ALONG HWY. 401 & WILSON AVE.

FIGURE 5



...POSED REVISION WILSON AVE.



...POSED REVISION HIGHWAY 401

LEGEND

BOREHOLE IN ELEVATION

WATER LEVEL IN STANDPIPE - APRIL 19, 1963 (EXCEPT WHERE NOTED)

SCALE 1" TO 40'-0"

STRATIGRAPHY

STIFF TO HARD MOTTLED BROWN AND GREY SANDY AND SILTY CLAY, WITH SOME GRAVEL SIZE PARTICLES (FILL)

STIFF TO VERY STIFF MOTTLED BROWN AND GREY SILTY CLAY WITH SOME FINE SAND (WEATHERED ZONE)

GREY SILTY CLAY, OCCASIONAL SAND AND GRAVEL SIZE PARTICLES, GENERALLY FIRM TO VERY STIFF

GREY SILTY FINE SAND, PROBABLY LOOSE TO COMPACT

REFERENCE: DE LEUW CATHER & COMPANY OF CANADA LIMITED DRAWINGS 861, 857 & 858 PROFILES OF PROPOSED HWY. 400-401 INTERCHANGE, REC'D. APRIL 3, 1963.

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE [illegible] STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

GOLDER & ASSOCIATES

Made ...
Chkd. ...
Appd. ...

PROJECT No. 6248

GRAIN SIZE DISTRIBUTION

FILL MATERIAL

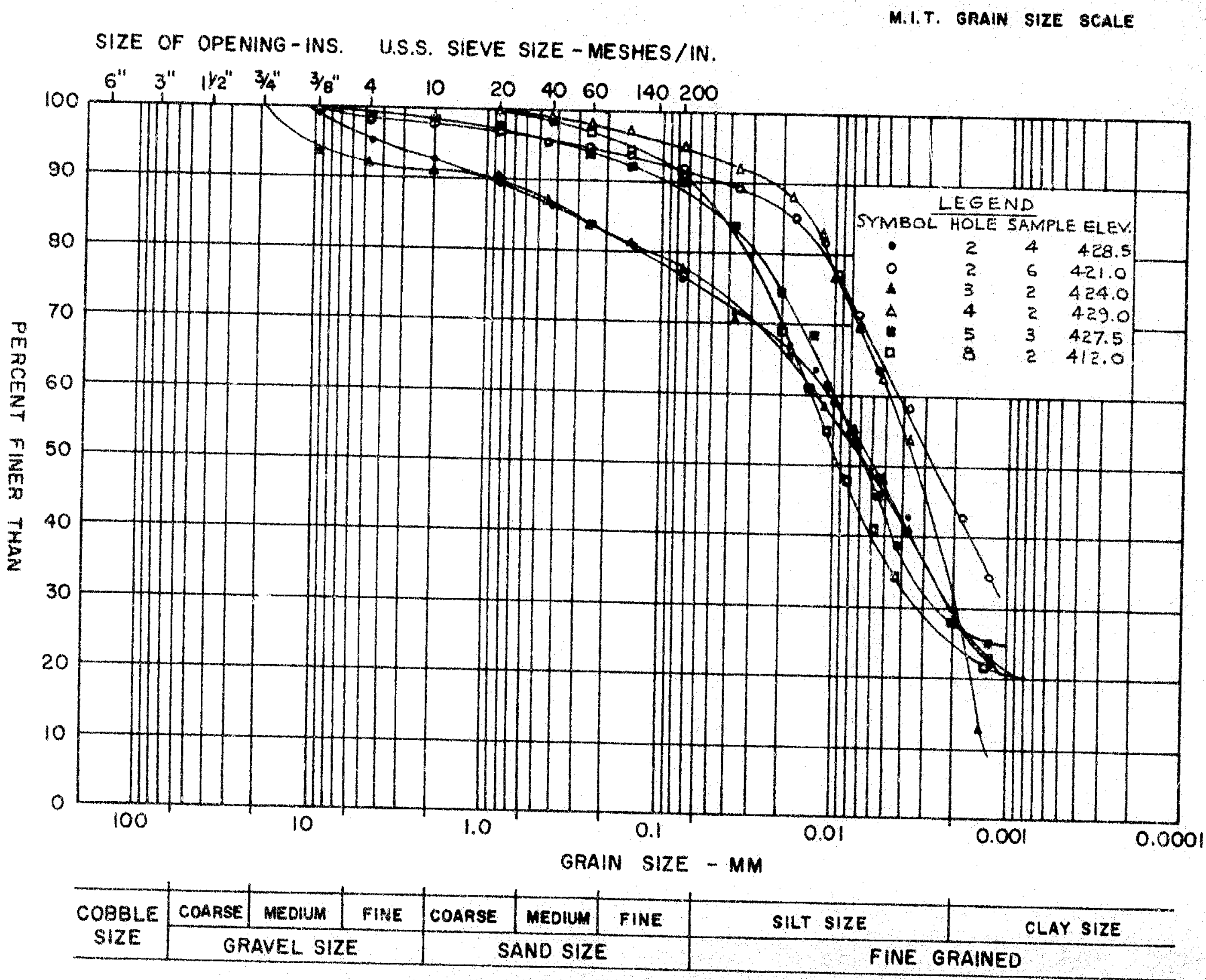
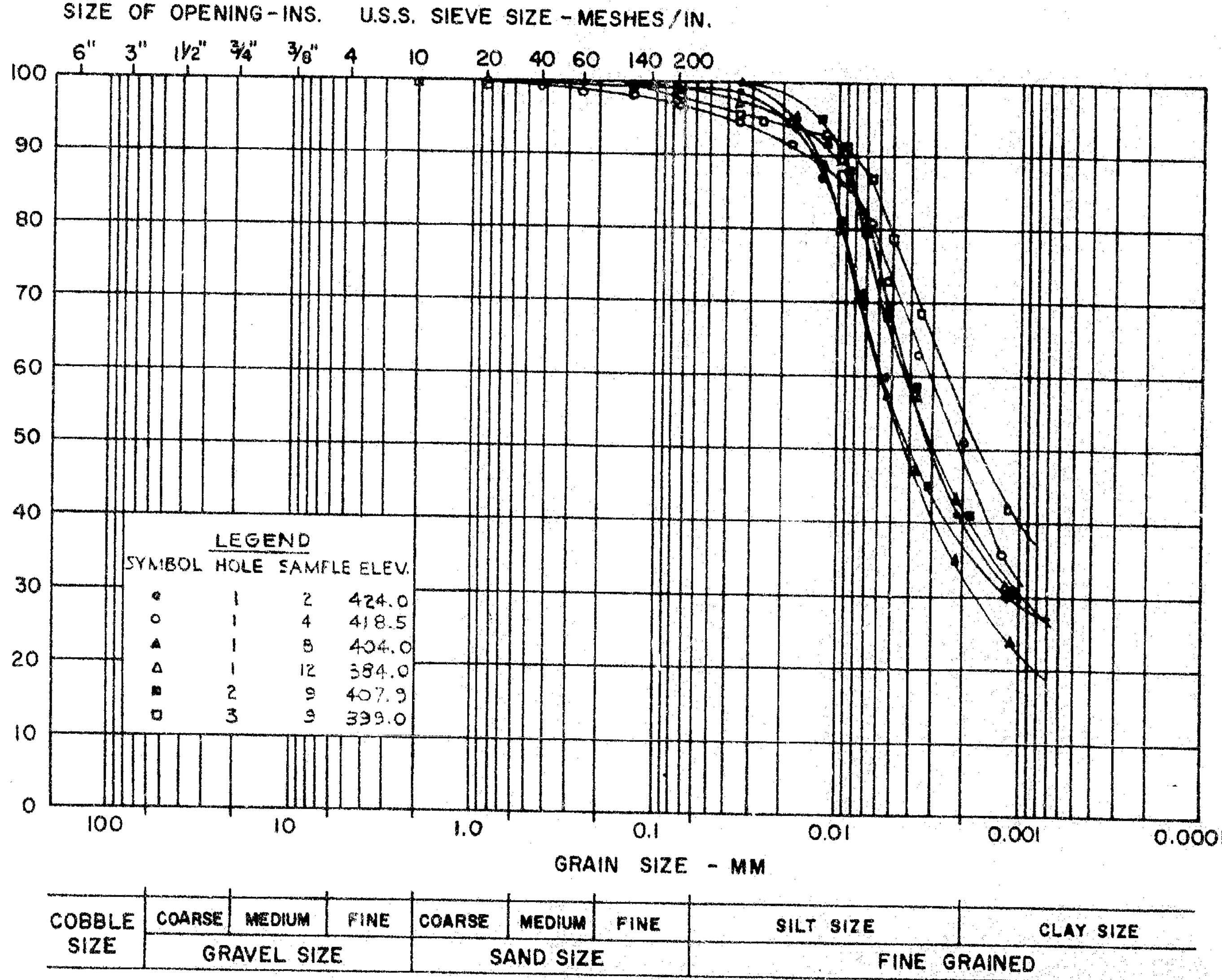


FIGURE 6

GOLDER & ASSOCIATES

PROJECT No. 6240



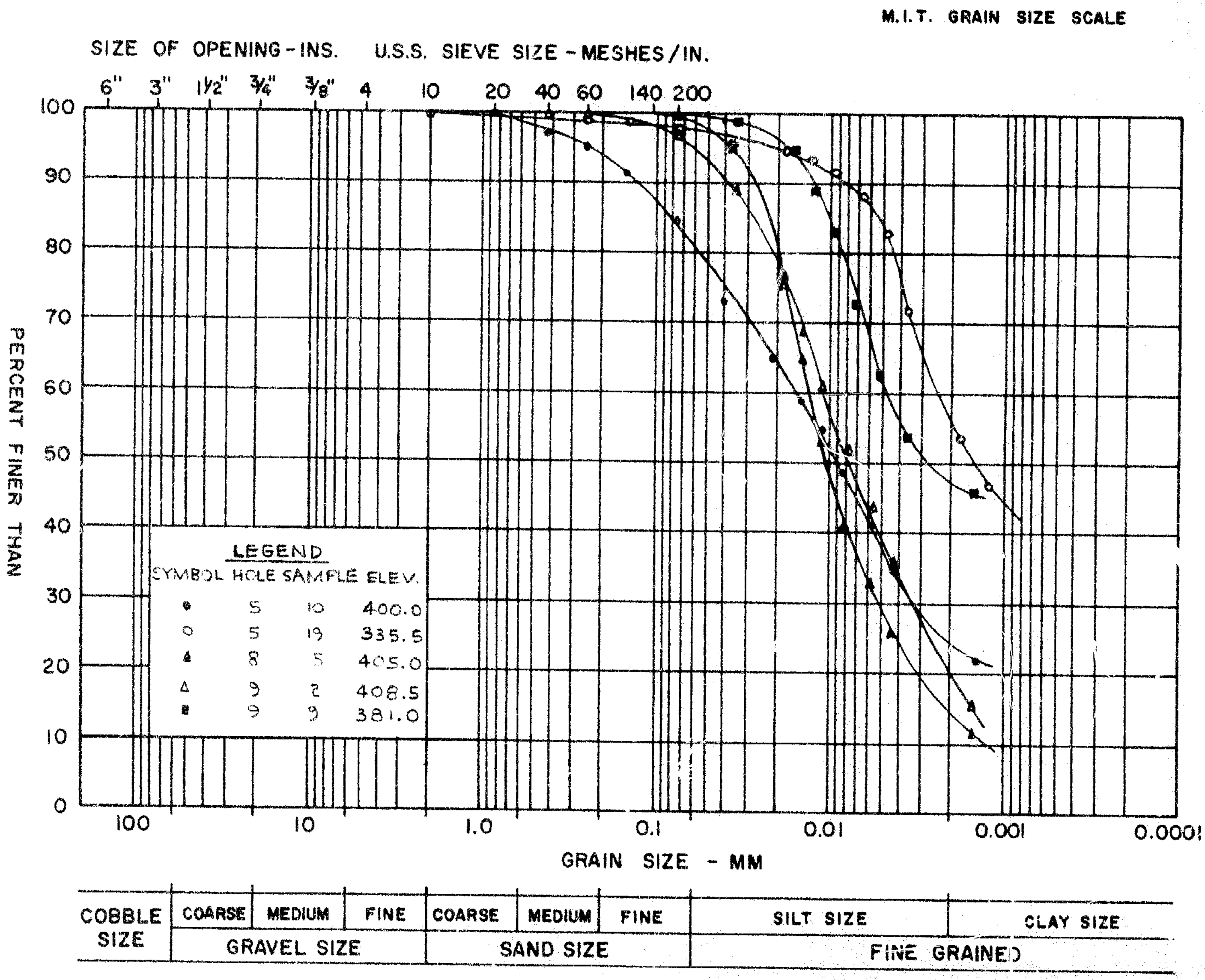
GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION

SILTY CLAY

FIGURE 7

PROJECT No. ----------

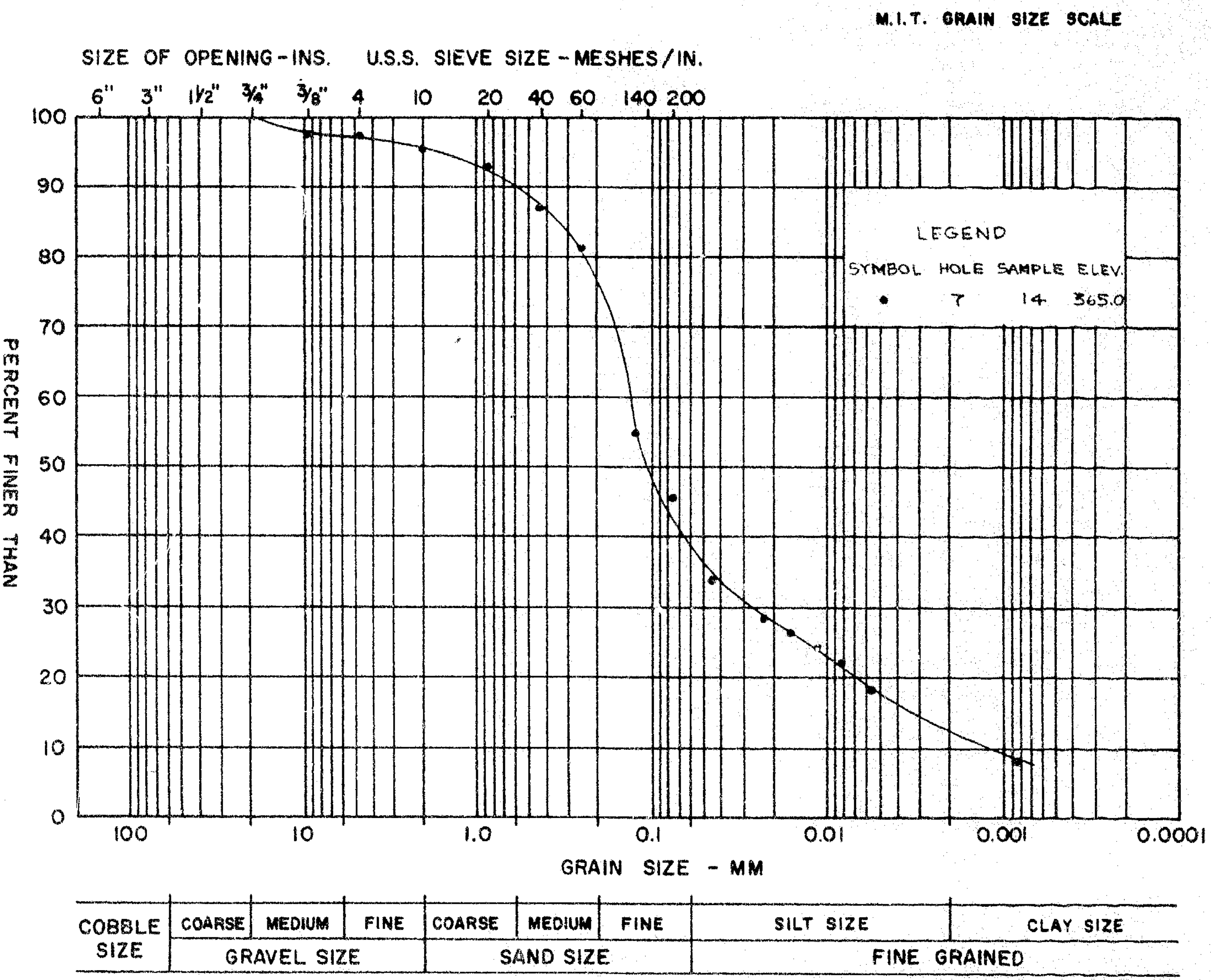


GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION

SILTY CLAY

FIGURE 8

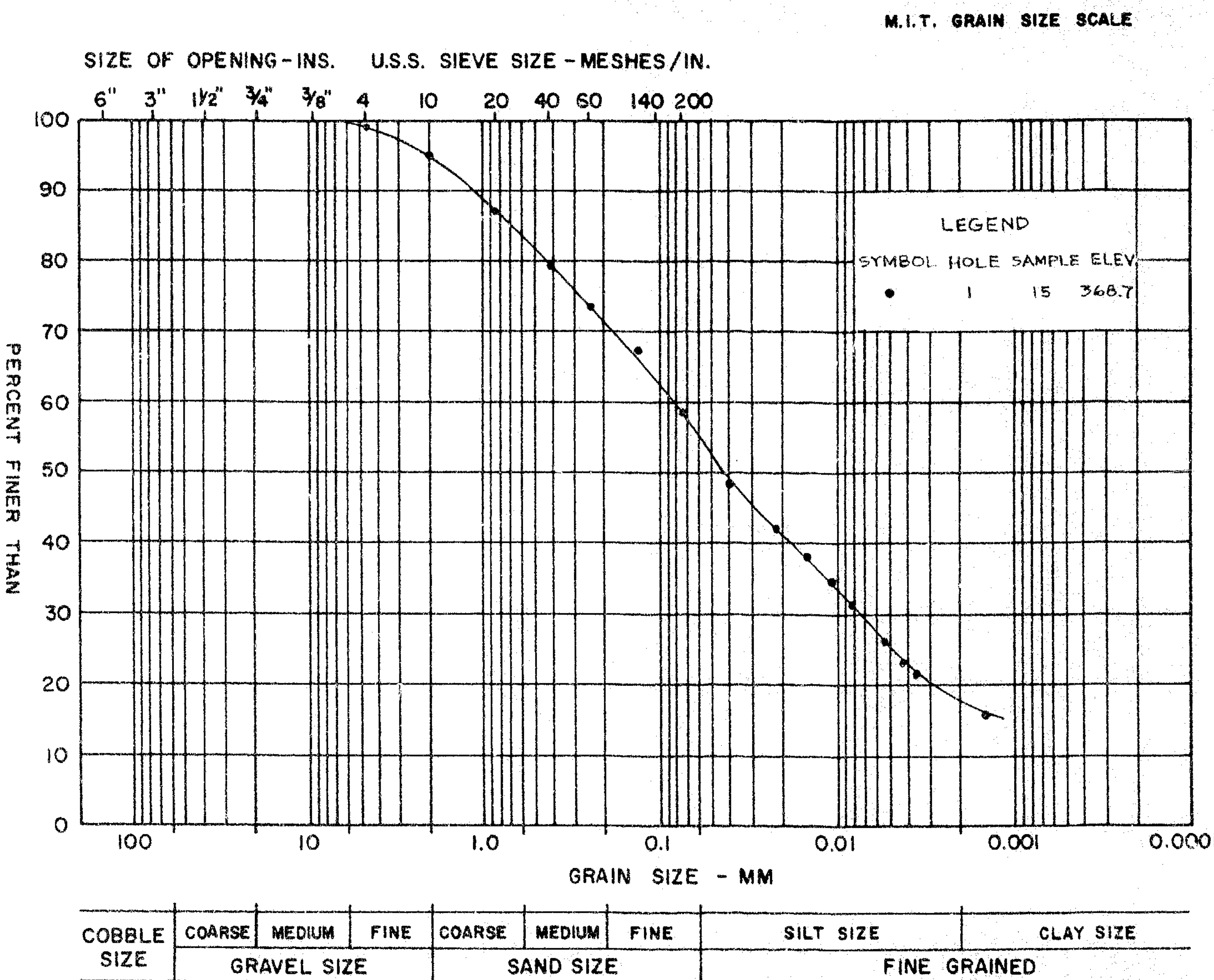


GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION

SILTY SAND LAYER IN THE SILTY CLAY

FIGURE 9



GOLDER & ASSOCIATES

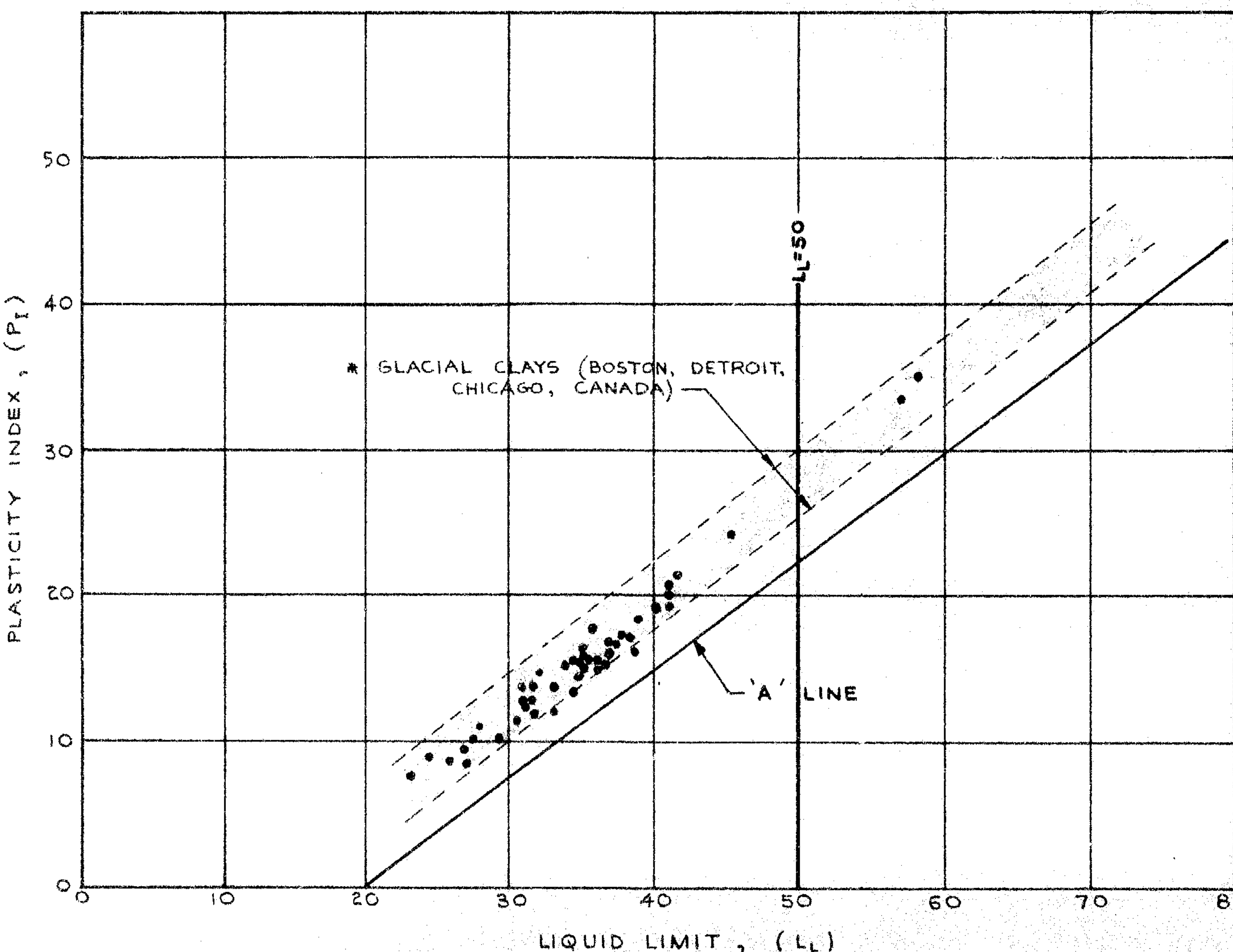
GRAIN SIZE DISTRIBUTION

CLAYEY SILT TILL LAYER IN THE SILTY CLAY

FIGURE 10

PROJECT No. [illegible]

* REFERENCE - CASAGRANDE, A., "CLASSIFICATION AND IDENTIFICATION OF SOILS," TRANSACTIONS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL. 113, P. 901, 1948.



GOLDER & ASSOCIATES

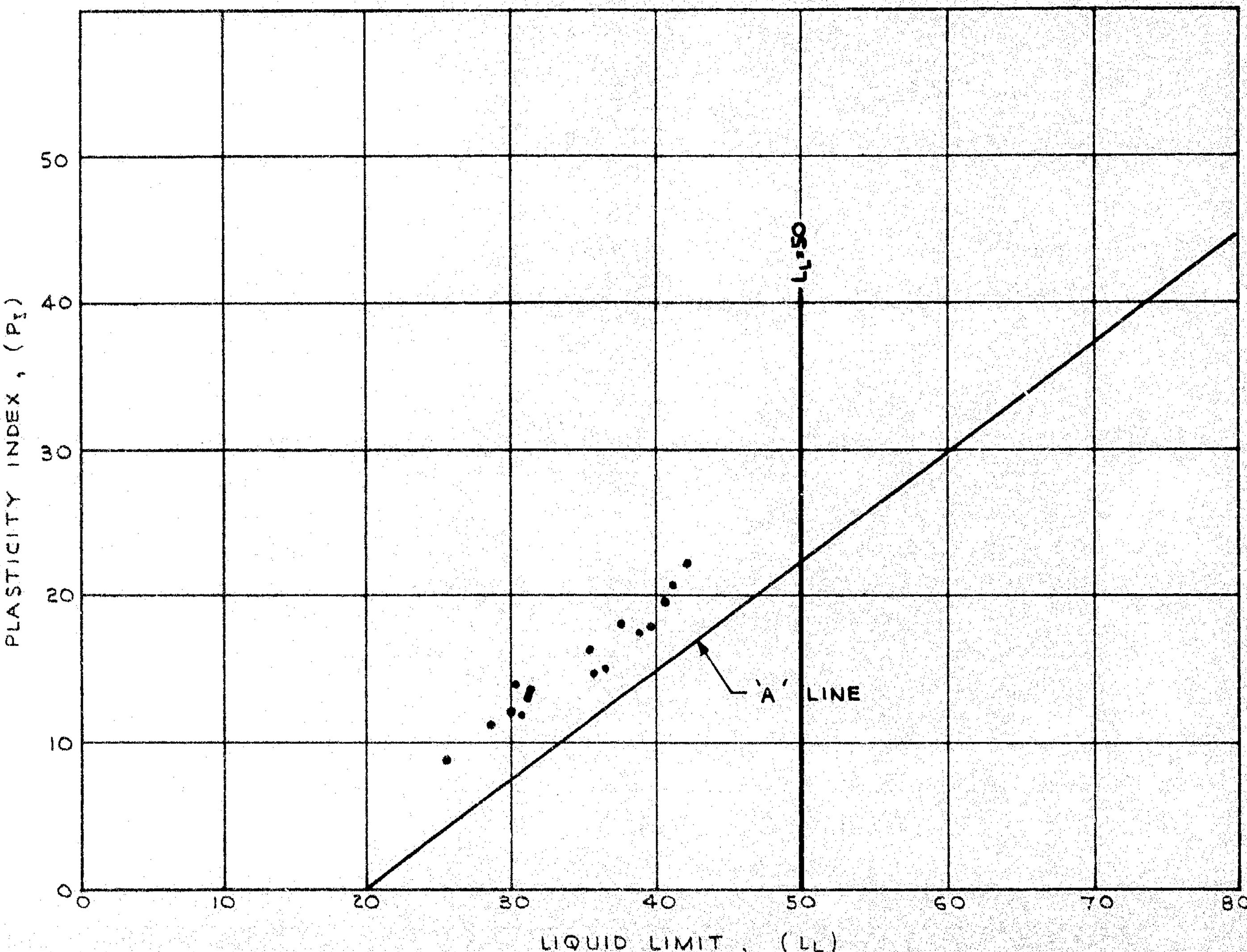
PLASTICITY CHART

BROWN SILTY CLAY (WEATHERED ZONE)

FIGURE 12

PLASTICITY CHART

FILL MATERIAL

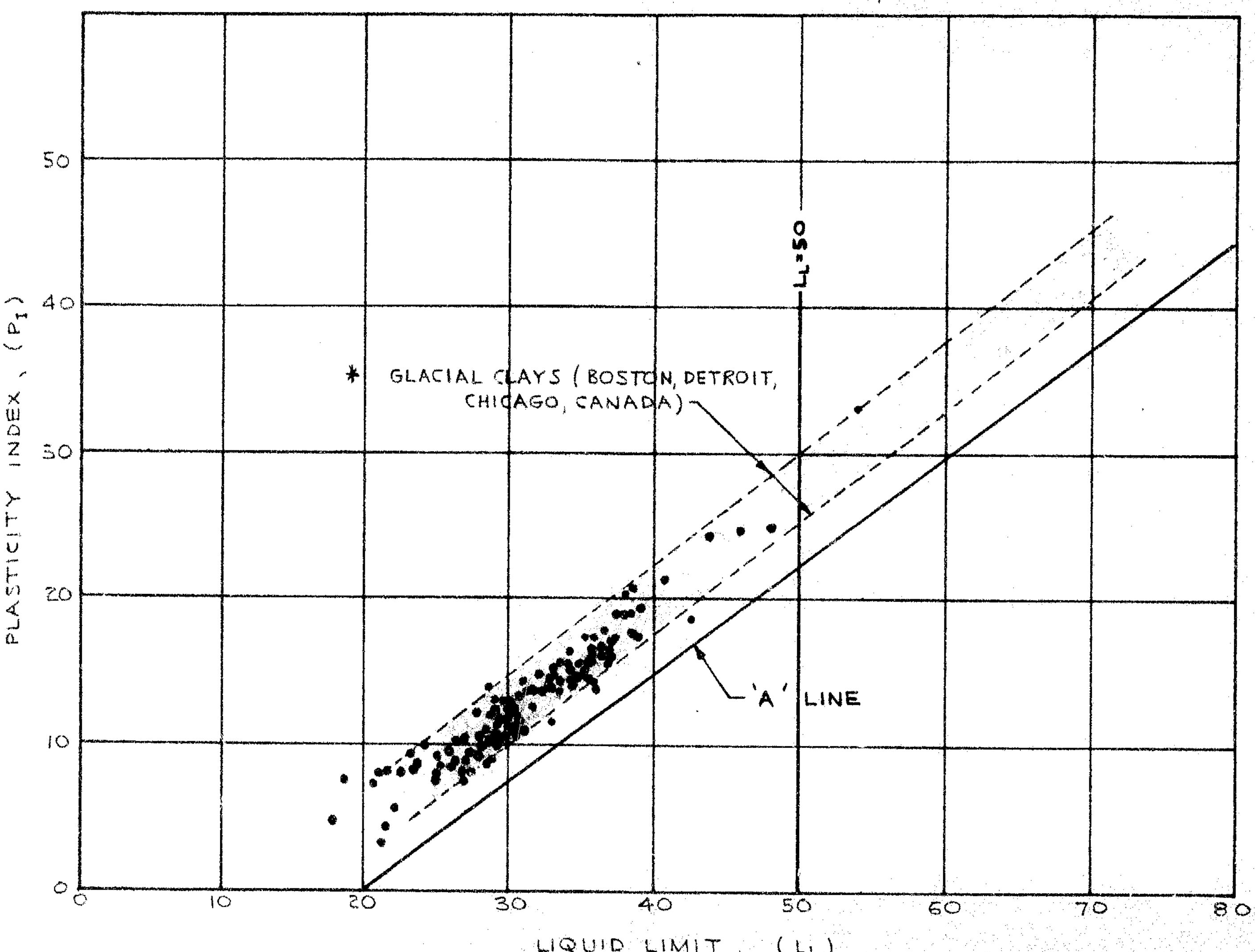


GOLDER & ASSOCIATES

FIGURE 11

PROJECT No. 6448

* REFERENCE - CASAGRANDE, A., "CLASSIFICATION AND IDENTIFICATION OF SOILS," TRANSACTIONS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, VOL. 113, P. 901, 1948.



GOLDER & ASSOCIATES

PLASTICITY CHART

GREY SILTY CLAY

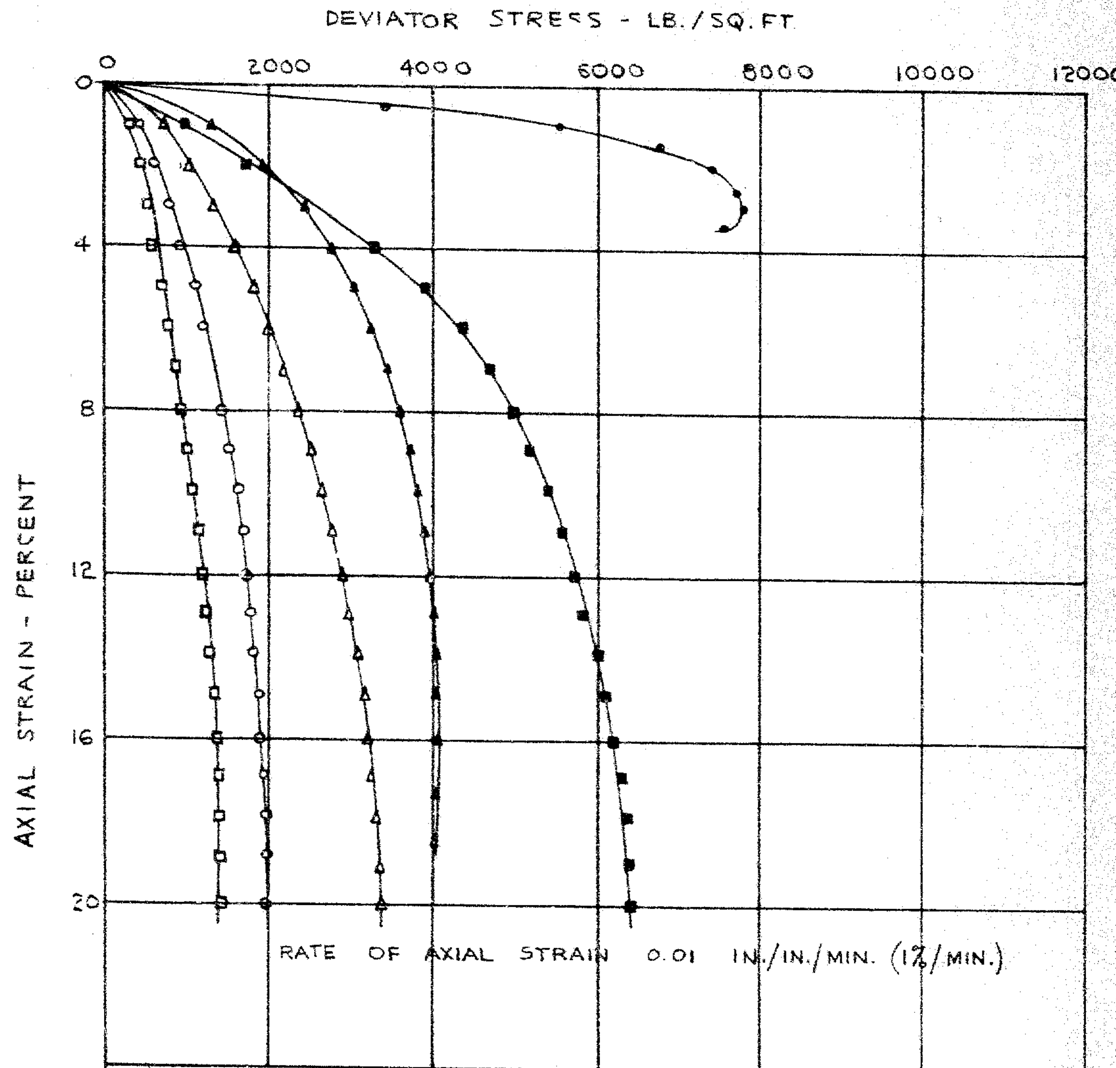
FIGURE 13

PROJECT No. 6248

UNDRAINED TRIAXIAL COMPRESSION TESTS

TYPICAL STRESS-STRAIN CURVES

FIGURE 14



LEGEND

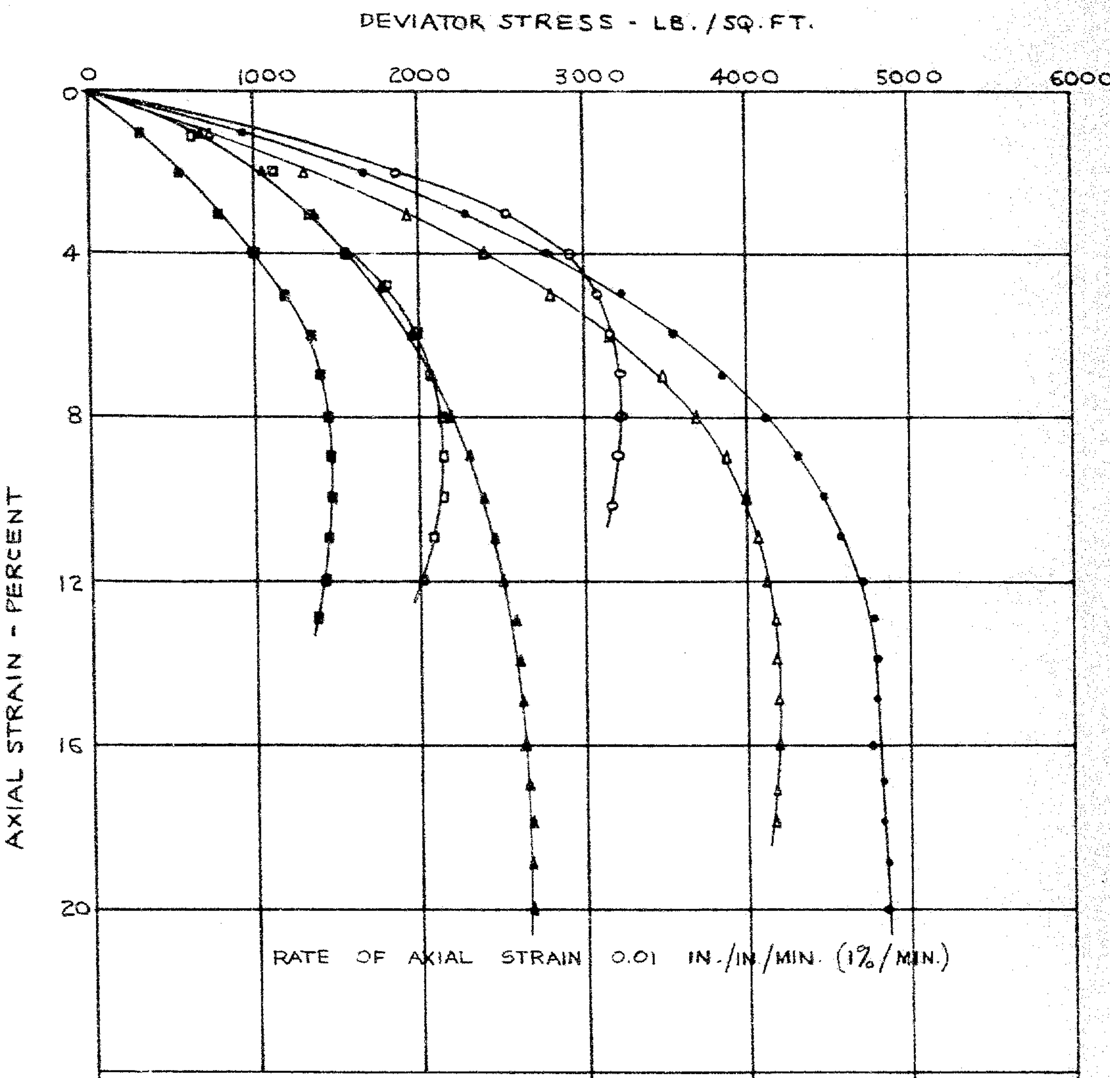
SYMBOL	HOLE	SAMPLE	ELEVATION
●	1	4	418.6
○	2	14	382.6
▲	3	9	399.1
△	4	13	383.5
■	5	10	399.3
□	6	10	391.6

GOLDER & ASSOCIATES

UNDRAINED TRIAXIAL COMPRESSION TESTS

TYPICAL STRESS-STRAIN CURVES

FIGURE 15



LEGEND

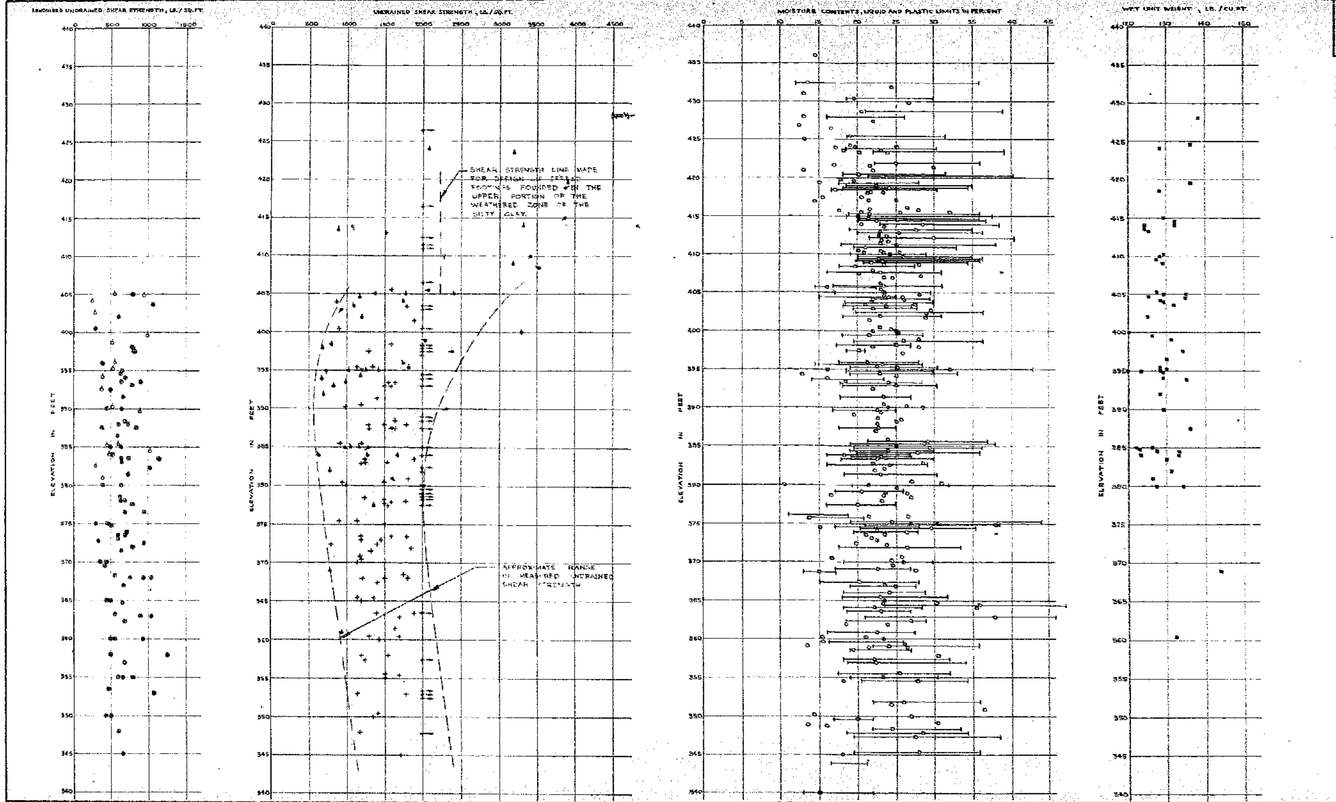
SYMBOL	HOLE	SAMPLE	ELEVATION
●	7	6	404.9
○	9	9	380.5
▲	10	6	404.3
△	11	7	404.2
■	12	8	394.0
□	14	5	412.3

GOLDER & ASSOCIATES

PROPERTIES OF SILTY CLAY

SUMMARY FOR BOREHOLES 1 TO 14

FIGURE 16



LEGEND

REMOULDED UNDRAINED SHEAR STRENGTH

REMOULDED UNDRAINED TRIAXIAL COMPRESSION TESTS .... O

REMOULDED IN SITU VANE SHEAR TESTS........................ б

UNDRAINED SHEAR STRENGTH

UNDRAINED TRIAXIAL COMPRESSION TESTS........................ ●

IN SITU VANE SHEAR TESTS.. +

20 / 15 ● 5 / 10 PERCENT AXIAL STRAIN AT FAILURE FOR TRIAXIAL COMPRESSION TESTS

MOISTURE CONTENT, LIQUID & PLASTIC LIMITS

P_L — W — L_L

P_L .... PLASTIC LIMIT

W .... MOISTURE CONTENT

L_L .... LIQUID LIMIT

WET UNIT WEIGHT

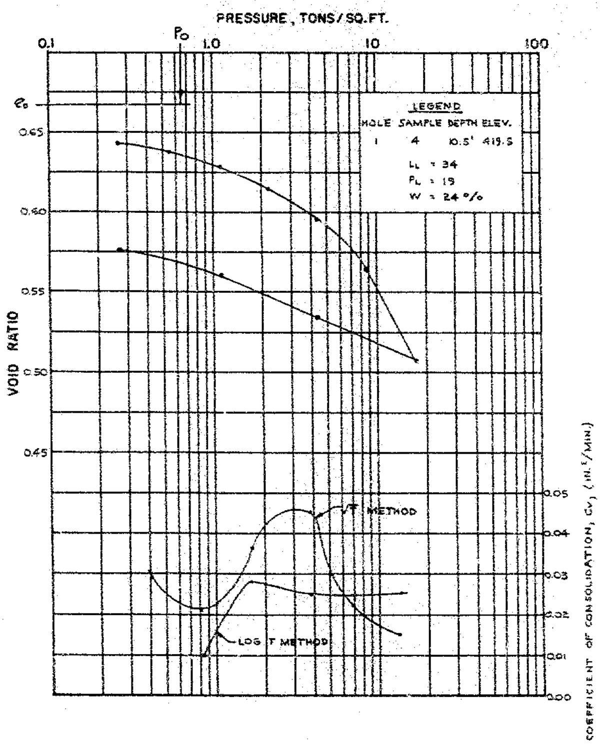
WET UNIT WEIGHTS.. ■

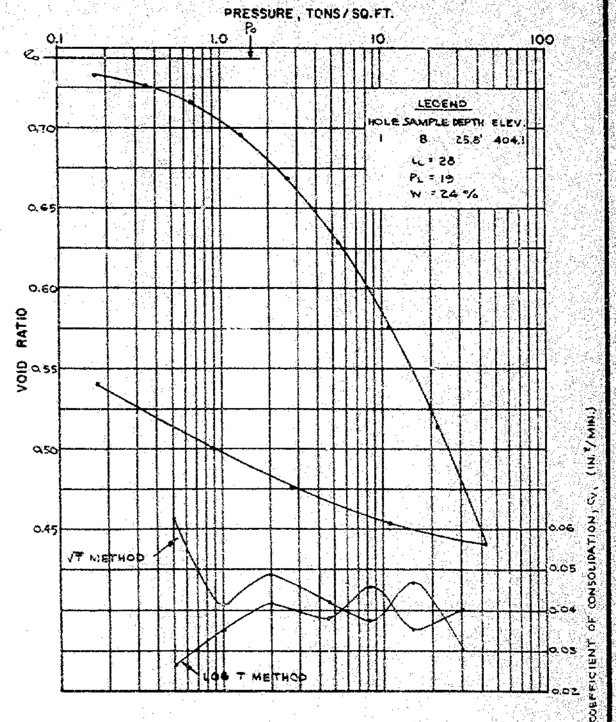
GOLDER & ASSOCIATES

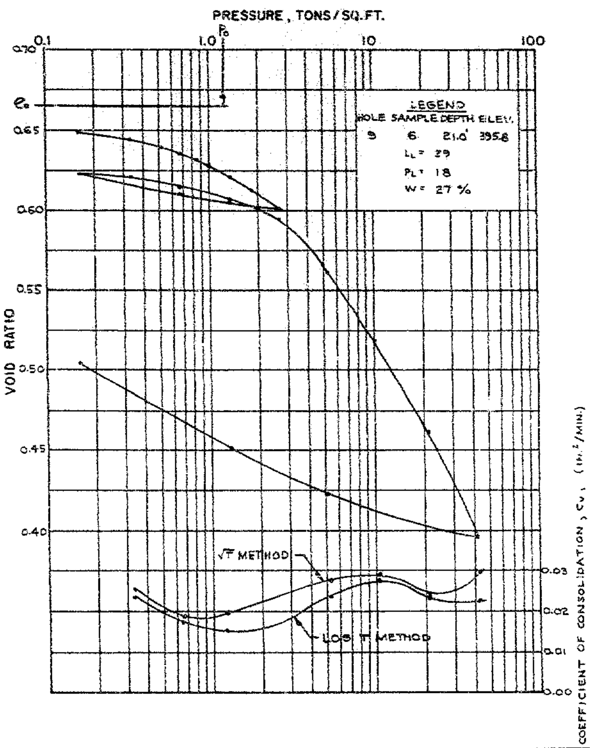
Made M.W.
Chkd
Appd

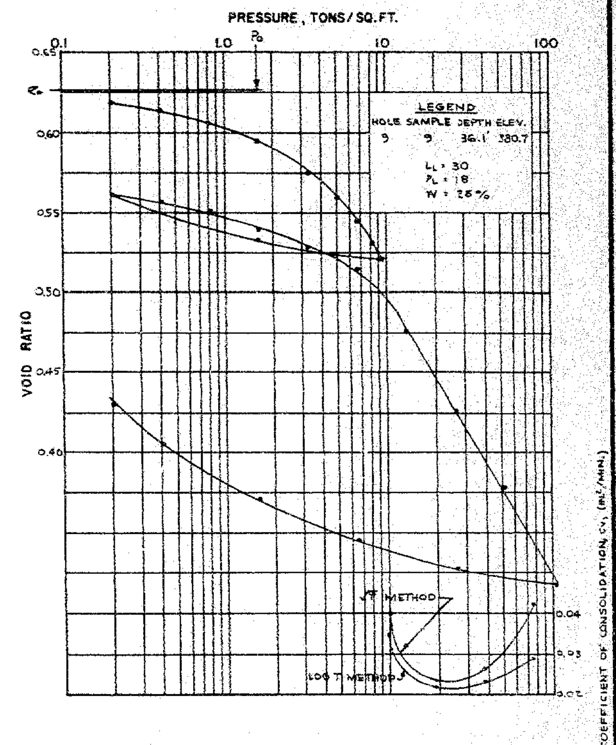
VOID RATIO - PRESSURE CURVES
CONSOLIDATION TESTS

FIGURE 17





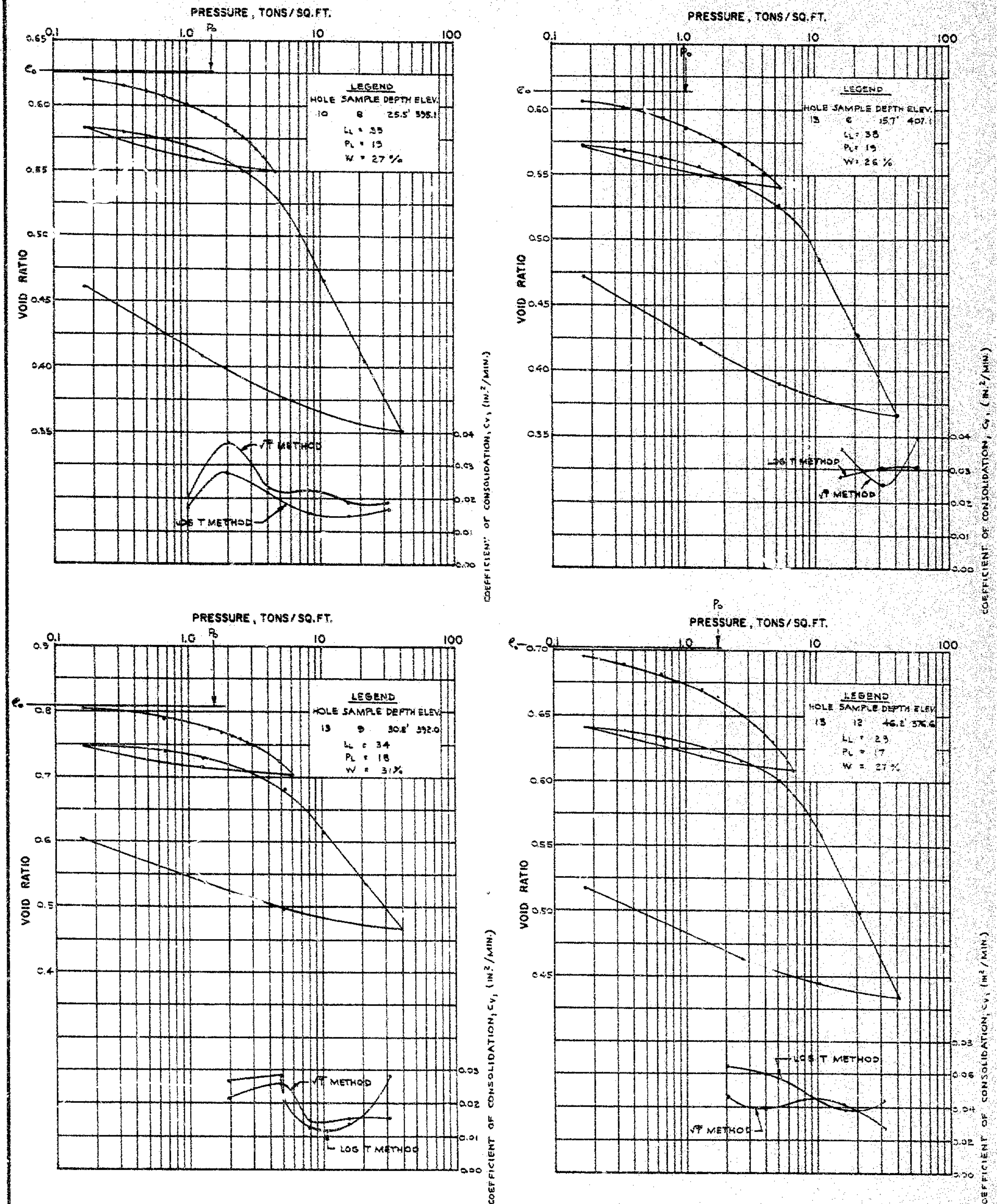




GOLDER & ASSOCIATES

VOID RATIO - PRESSURE CURVES CONSOLIDATION TESTS

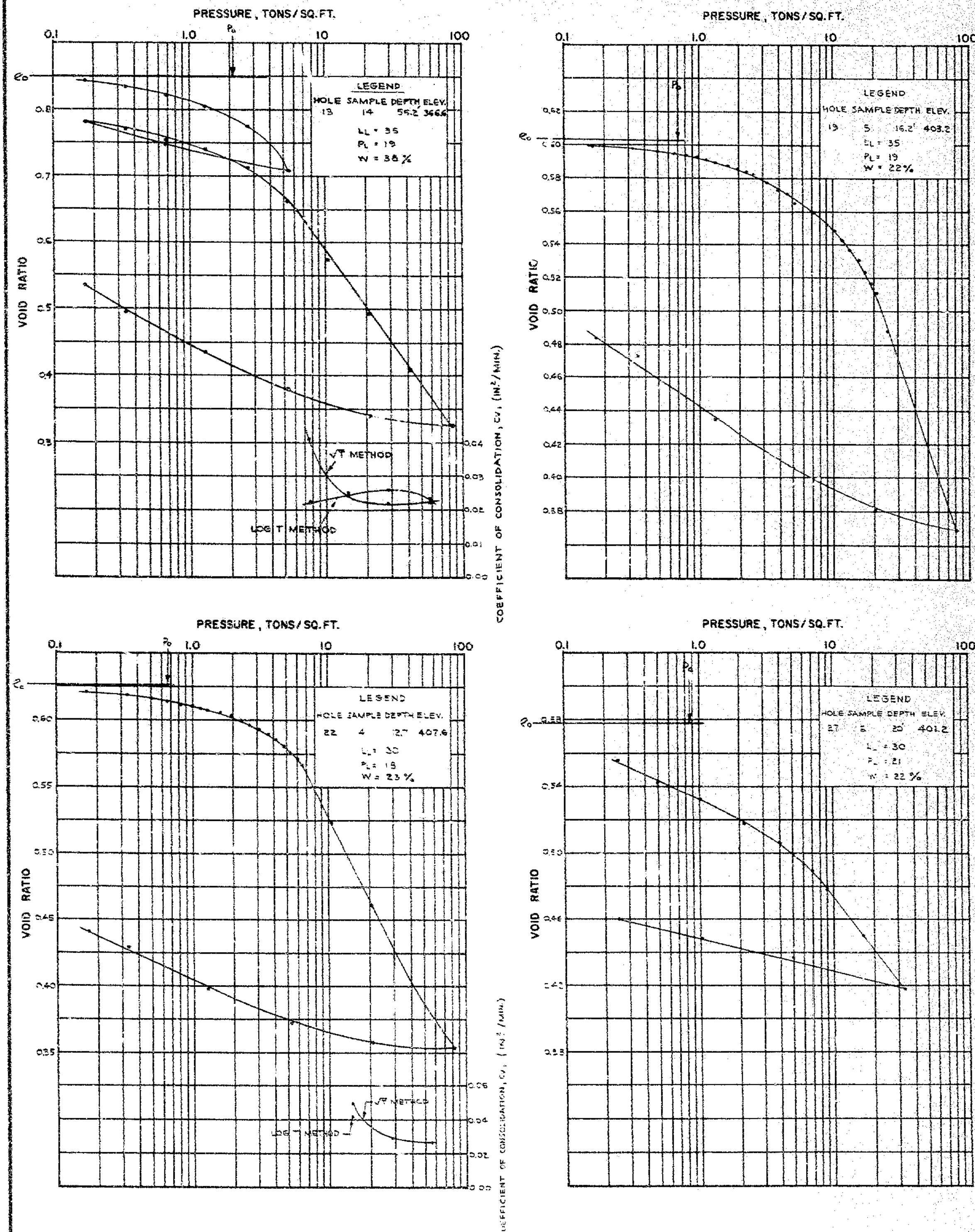
FIGURE 18



GOLDER & ASSOCIATES

VOID RATIO - PRESSURE CURVES CONSOLIDATION TESTS

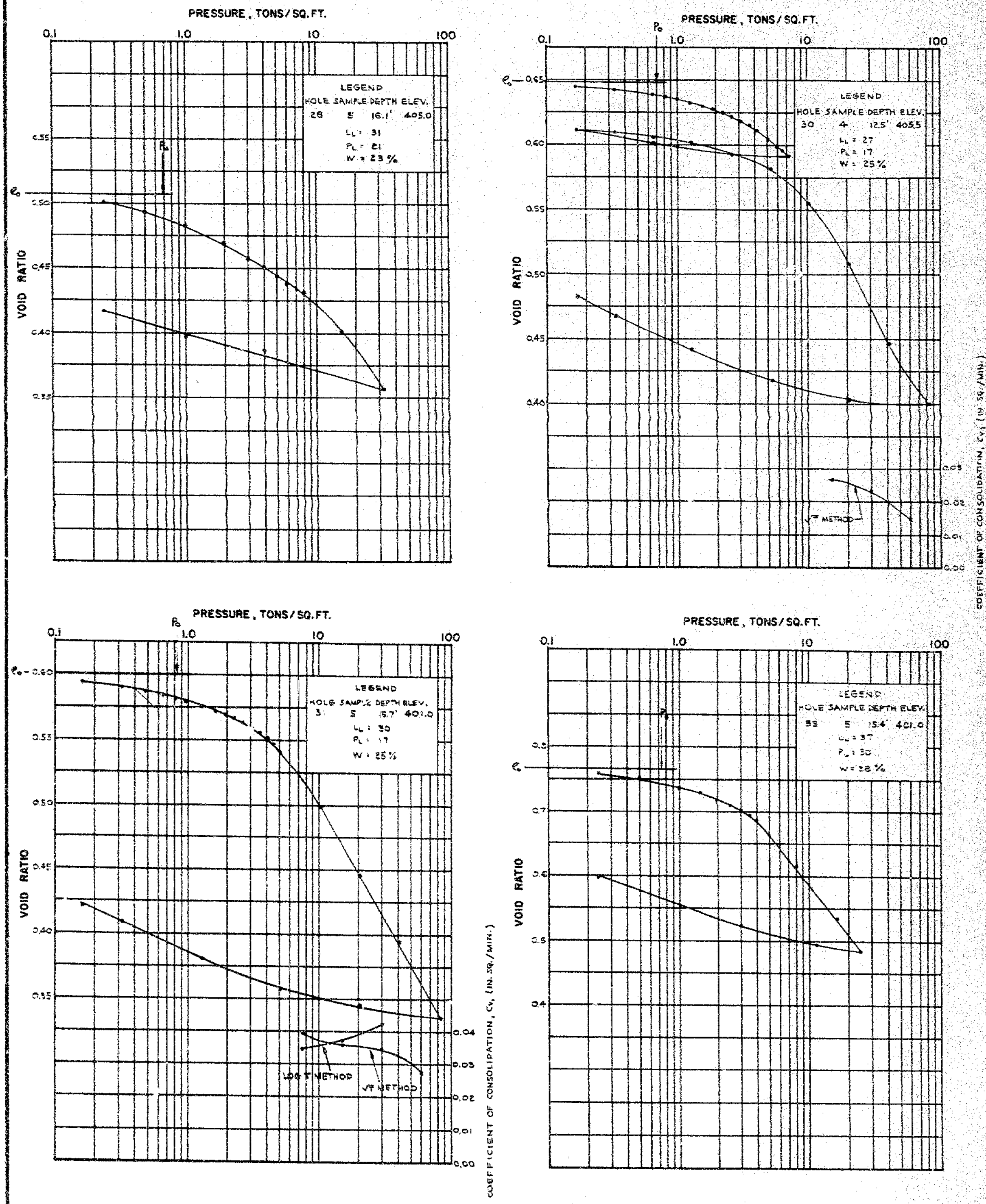
FIGURE 19



GOLDER & ASSOCIATES

VOID RATIO - PRESSURE CURVES CONSOLIDATION TESTS

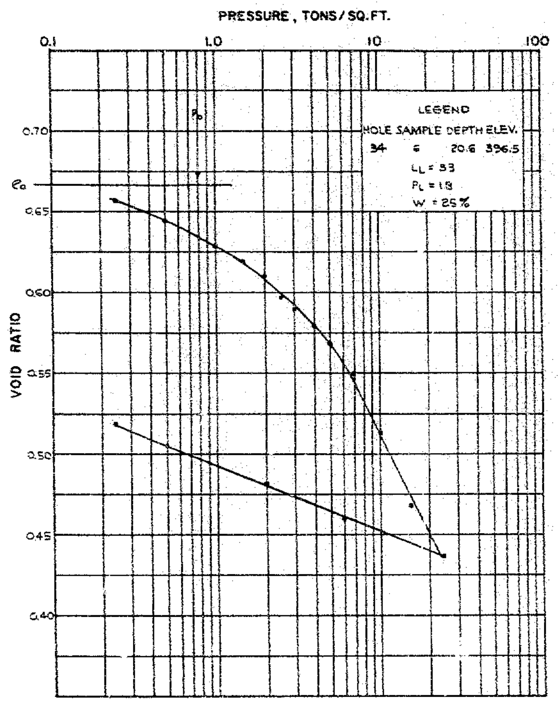
FIGURE 20



GOLDER & ASSOCIATES

VOID RATIO - PRESSURE CURVES
CONSOLIDATION TESTS

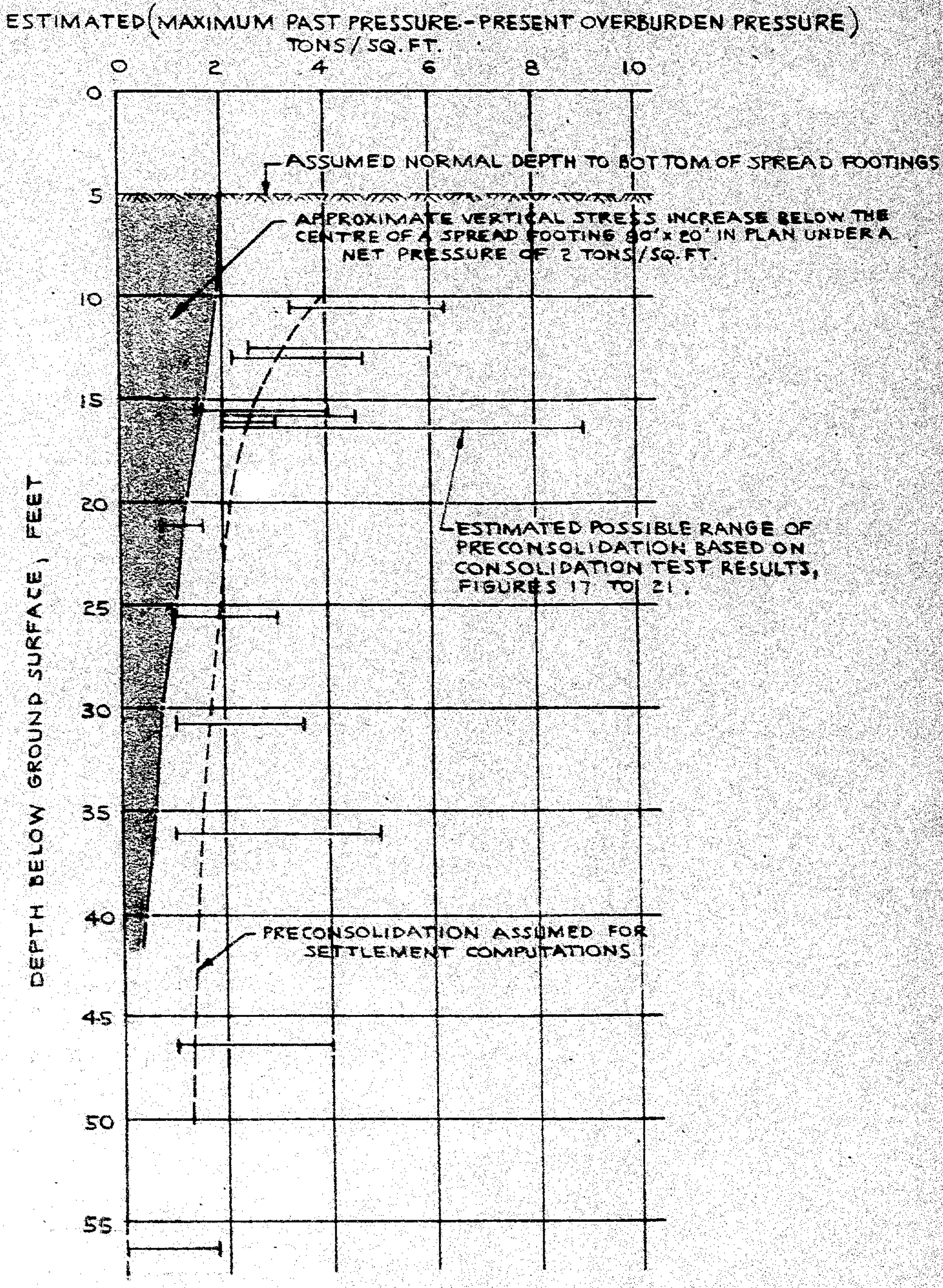
FIGURE 21



GOLDER & ASSOCIATES

POSSIBLE RANGE OF PRECONSOLIDATION PRESSURES
SILTY CLAY DEPOSIT

FIGURE 22



GOLDER & ASSOCIATES

Made M.W.
Chkd.
Appd.

TABLE I

CONSOLIDATION TESTS - SUMMARY OF RESULTS

BH	SA	Depth Ft.	Elev.	L_L	P_L	e_o	C_c	C_{cr}	Estimated range in pc-po, tsf.
1	4	10.5	419.5	34	19	0.67	0.20	0.04	3.3 - 6.3
1	8	25.8	404.1	28	19	0.74	0.21	0.04	?
9	6	21.0	395.8	29	18	0.67	0.19	0.04	0.8 - 1.6
9	9	36.1	380.7	30	18	0.63	0.22	0.03	1.0 - 5.0
10	8	25.5	395.1	33	19	0.63	0.21	0.03	1.0 - 3.0
13	6	15.7	407.1	38	19	0.62	0.20	0.02	2.0 - 4.5
13	9	30.8	392.0	34	18	0.81	0.29	0.04	1.0 - 3.5
13	12	46.2	376.6	27	17	0.70	0.21	0.02	1.0 - 4.0
13	14	56.2	366.6	35	19	0.85	0.32	0.06	0.0 - 1.8
19	5	16.2	403.2	35	19	0.60	1.23	0.04	2.0 - 9.0
22	4	12.7	407.6	30	18	0.63	0.20	0.03	2.2 - 4.7
27	6	20.0	401.2	30	21	0.58	0.11	0.02	?
28	5	16.1	405.0	31	21	0.51	0.14	0.03	?
30	4	12.5	405.5	27	17	0.65	0.20	0.02	2.5 - 6.0
31	5	15.7	401.0	30	17	0.60	0.18	0.03	1.5 - 4.0
33	5	15.4	401.0	37	20	0.77	0.25	0.05	2.0 - 3.0
34	6	20.6	396.5	33	18	0.67	0.20	0.04	?

In the above table:

L_L = Liquid Limit

P_L = Plastic Limit

e_o = Initial void ratio

C_c = Laboratory compression index

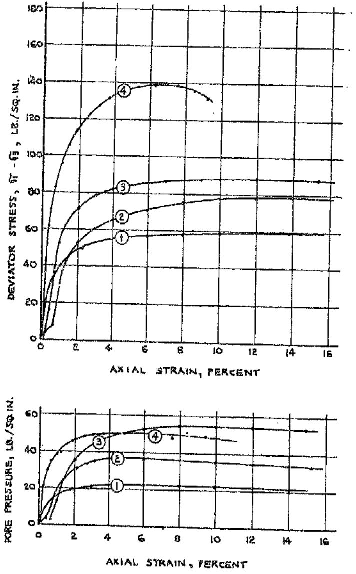
C_{cr} = Laboratory rebound compression index

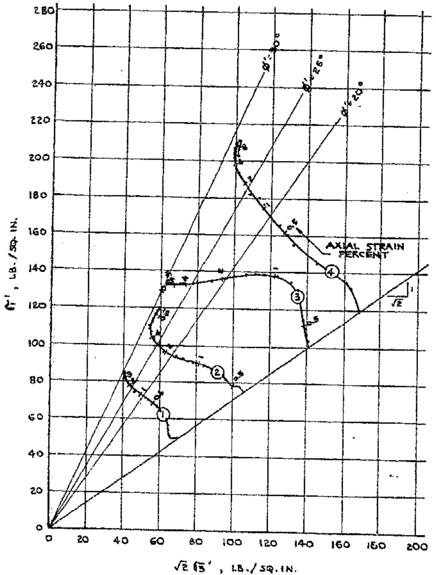
pc = Estimated preconsolidated pressure

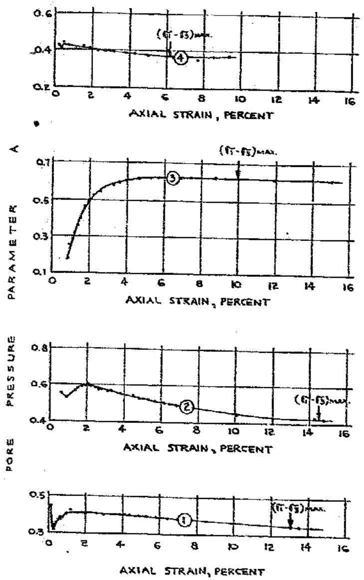
po = Computed present overburden pressure

UNDRAINED TRIAXIAL COMPRESSION TESTS
WITH PORE PRESSURE MEASUREMENTS
SILTY CLAY

FIGURE 23





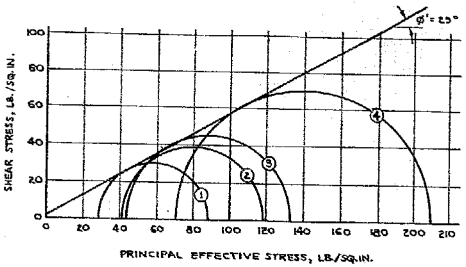


LEGEND

NUMBER	HOLE	SAMPLE	DEPTH	ELEVATION
1	13	6	15.9'	406.9
2	13	6	16.4'	406.4
3	13	6	15.3'	407.5
4	13	6	15.9'	406.9

MATERIAL: GREY SILTY CLAY.
L_L = 37 P_L = 18

NOTE: RATE OF AXIAL STRAIN 0.0002 IN./IN./MIN.
(1% / HOUR)

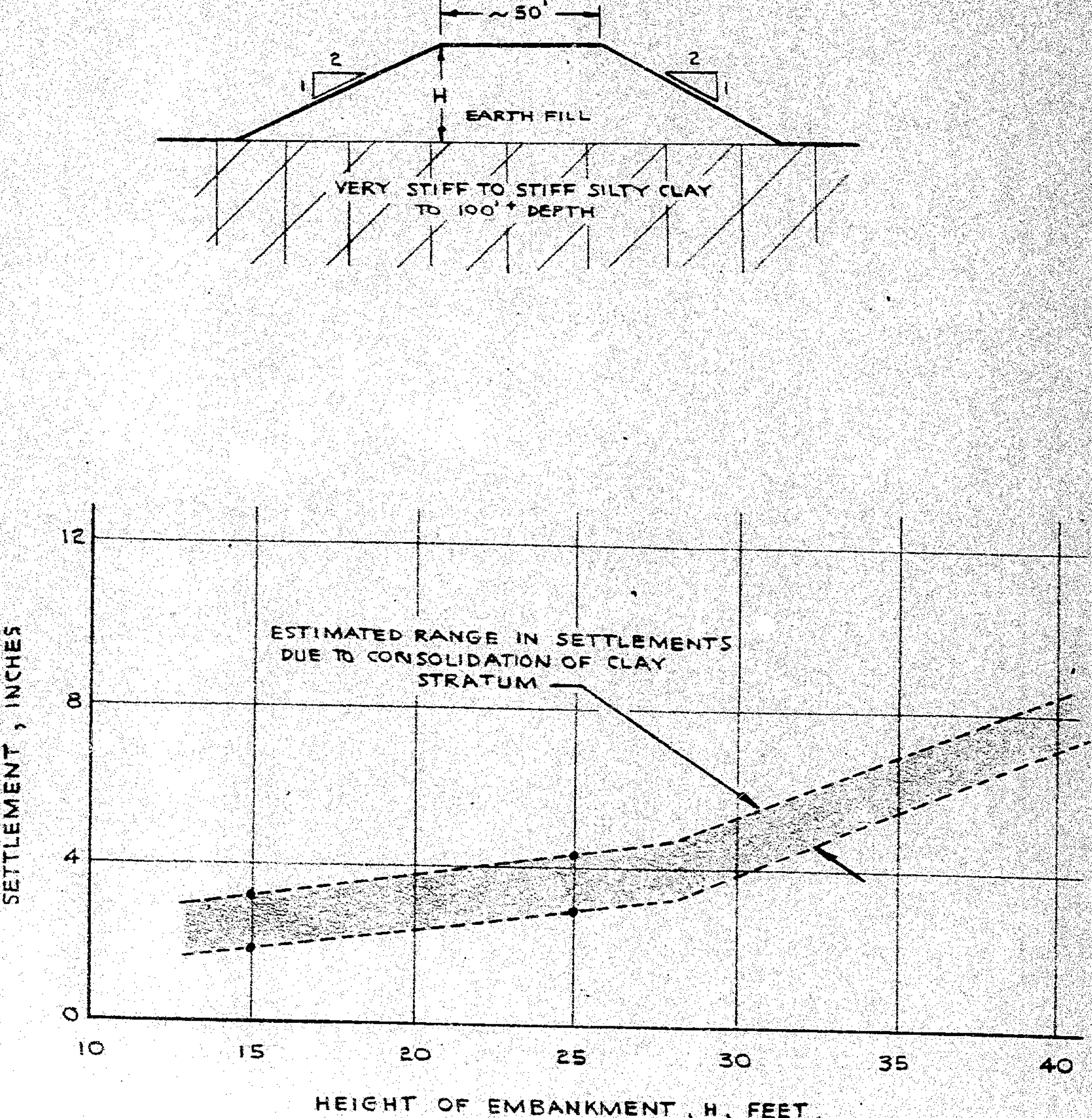


GOLDER & ASSOCIATES

PROJECT No. 6548

COMPUTED SETTLEMENTS BELOW CENTRE OF EARTH FILL EMBANKMENTS

FIGURE 24

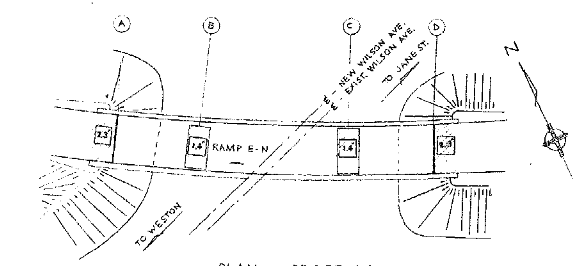


GOLDER & ASSOCIATES

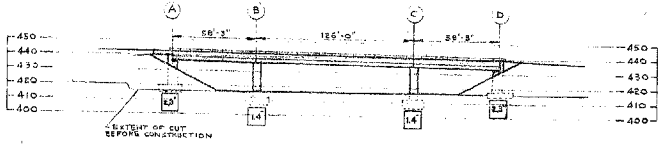
Made M.W.
Chkd. H.V.B.
Appd. [illegible]

SKETCHES SHOWING COMPUTED SETTLEMENTS
BRIDGE 4S AND BRIDGE 5 & 8 S

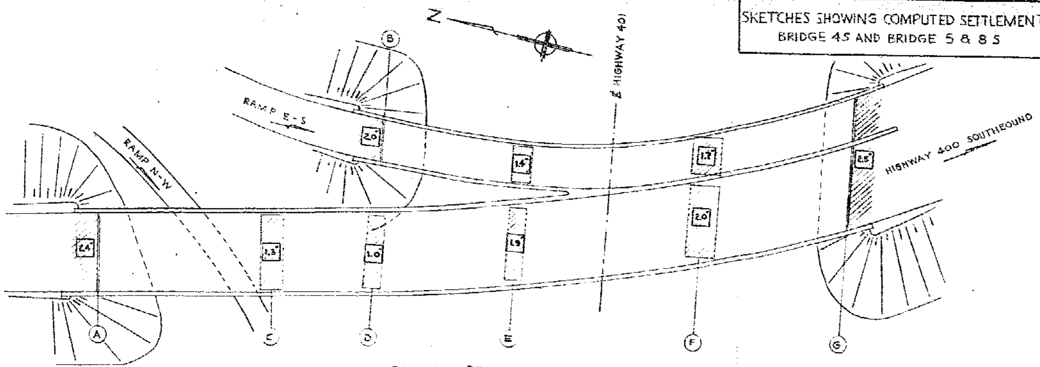
FIGURE 25



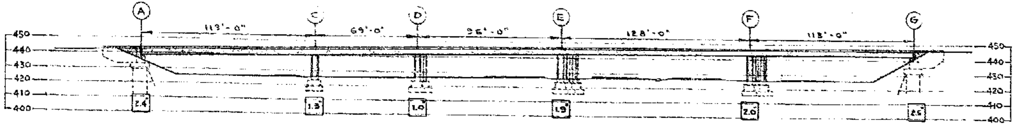
PLAN - BRIDGE 4 S



ELEVATION - BRIDGE 4 S



PLAN BRIDGE 5 & 8 S



ELEVATION - BRIDGE 5 & 8 S , HIGHWAY 400 S-B

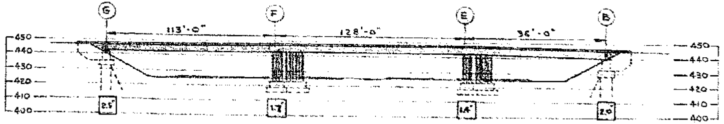
REFERENCES

1) DRAWING D 5182-1 , DE LEUW, CATHER & COMPANY OF CANADA LIMITED, HIGHWAY 400-401 INTERCHANGE, BRIDGE 4 S GENERAL ARRANGEMENT , DATED. JAN. / 65.

II) DRAWING D 5183-1 , DE LEUW, CATHER & COMPANY OF CANADA LIMITED, HIGHWAY 400-401 INTERCHANGE, BRIDGE 5 & 8 S GENERAL ARRANGEMENT, DATED. JAN. /65.

LEGEND

1.5" COMPUTED SETTLEMENT OF SUPPORT IN INCHES

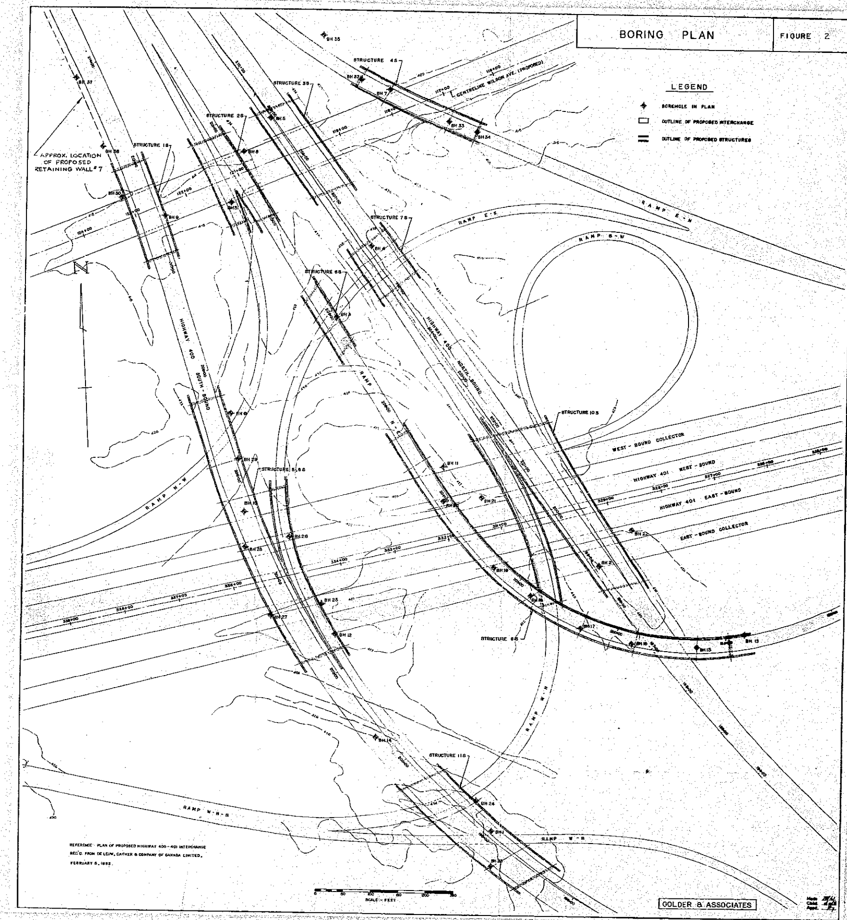


ELEVATION - BRIDGE 5 & 8 S , RAMP E-S

SCALE 1" TO 50'-0" (APPROX.)

GOLDER & ASSOCIATES

Made
Chkd.
Appd.


BORING PLAN
FIGURE 2
LEGEND
BOREHOLE IN PLAN
OUTLINE OF PROPOSED INTERCHANGE
OUTLINE OF PROPOSED STRUCTURES
APPROX. LOCATION OF PROPOSED RETAINING WALL # 7
STRUCTURE 45
STRUCTURE 35
STRUCTURE 26
STRUCTURE 18
STRUCTURE 7 S
STRUCTURE 6 S
STRUCTURE 10 S
STRUCTURE 5,6 S
STRUCTURE 8 S
STRUCTURE 11 S
CENTRELINE WILSON AVE. (PROPOSED)
RAMP E-N
RAMP E-S
RAMP S-W
RAMP N-W
RAMP N-E
RAMP W-N-S
RAMP W-S
HIGHWAY 400 SOUTH BOUND
HIGHWAY 400 NORTH BOUND
WEST - BOUND COLLECTOR
HIGHWAY 401 WEST - BOUND
HIGHWAY 401 EAST - BOUND
EAST - BOUND COLLECTOR
REFERENCE : PLAN OF PROPOSED HIGHWAY 400 - 401 INTERCHANGE
REC'D. FROM DE LEUW, CATHER & COMPANY OF CANADA LIMITED,
FEBRUARY 6, 1953.
SCALE - FEET
GOLDER & ASSOCIATES

#63-F-206-C

W.P. #233-60

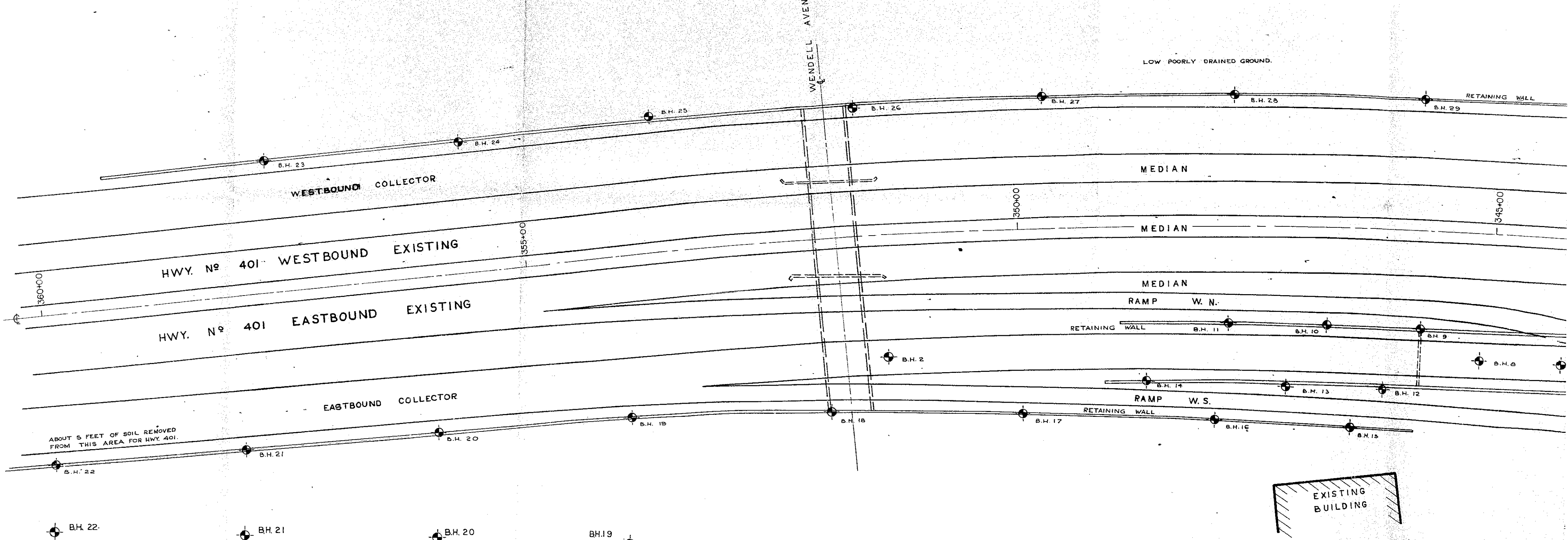
W.P. #234-60

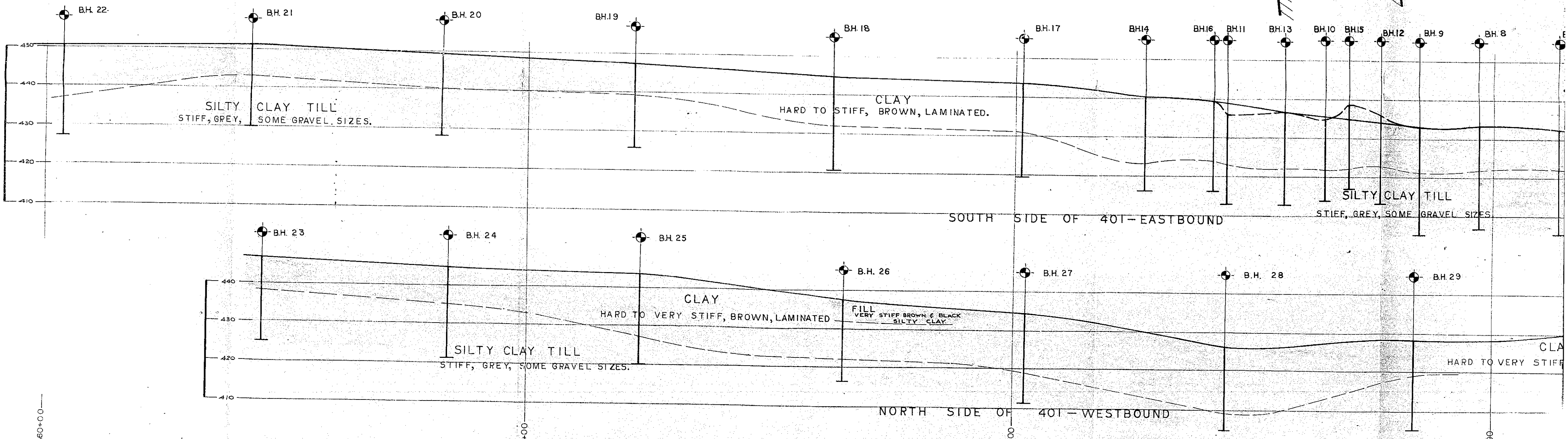
Hwy. #400 & #401

INTERCHANGE

BOREHOLE LOCATION PLAN

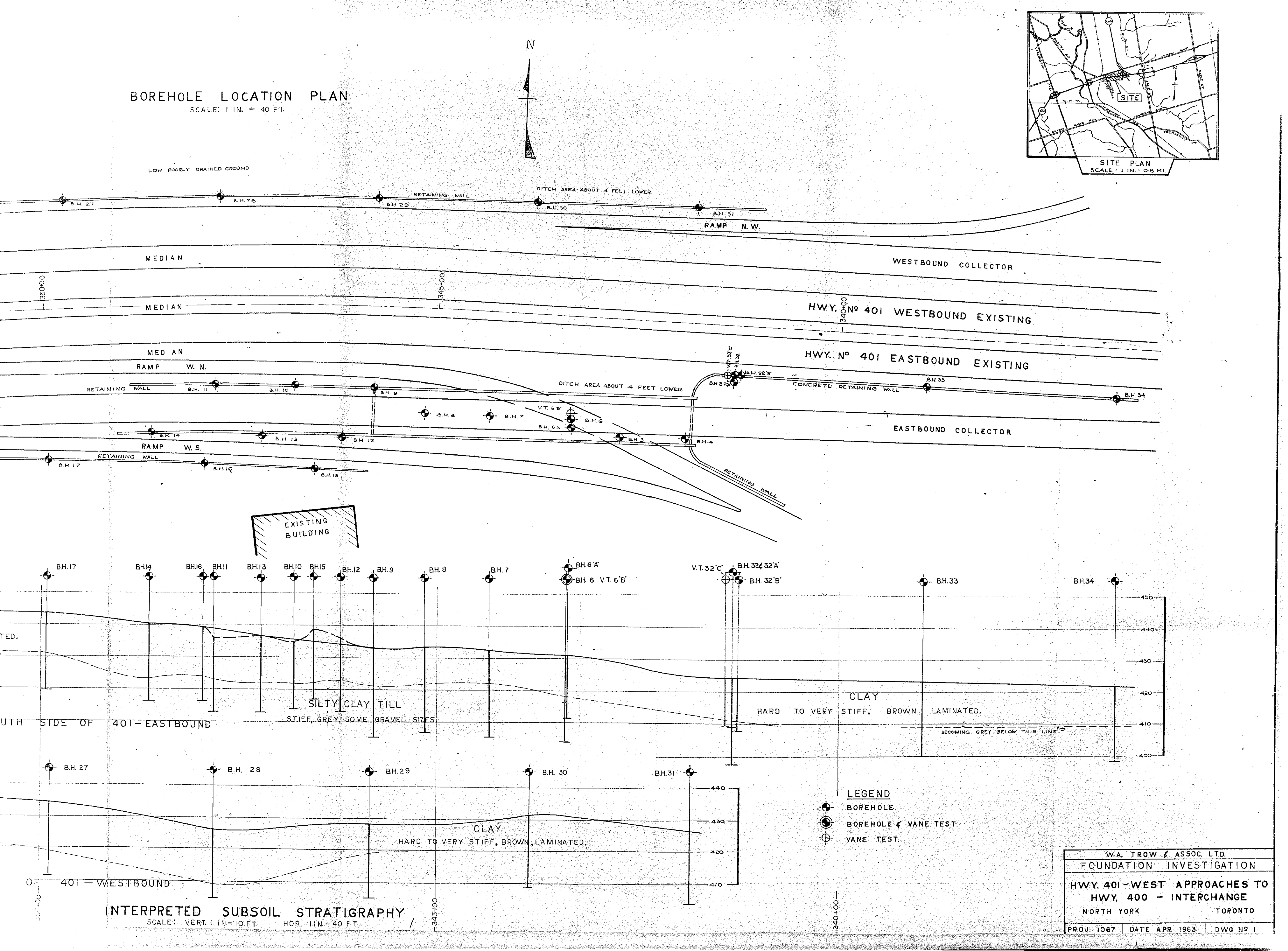
SCALE: 1 IN. = 40 FT.





INTERPRETED SUBSOIL STRATIGRAPHY

SCALE: VERT. 1 IN. = 10 FT. HOR. 1 IN. = 40 FT.



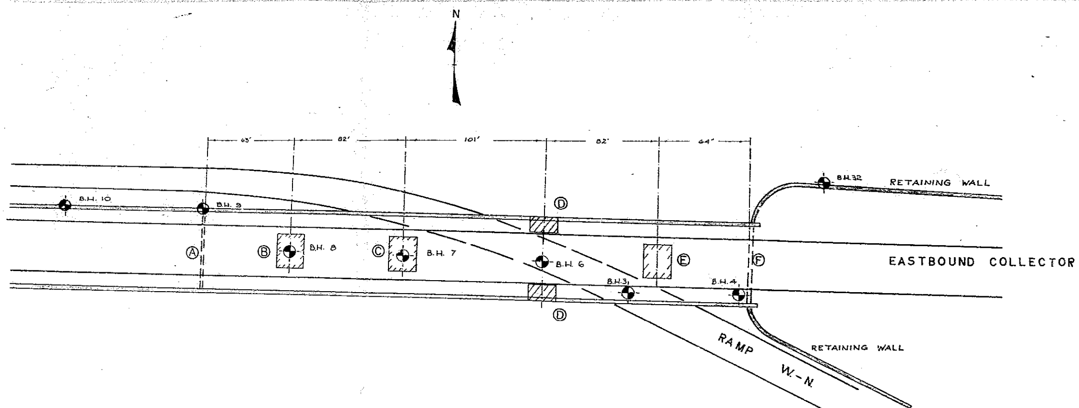
W.A. TROW & ASSOC. LTD.

FOUNDATION INVESTIGATION

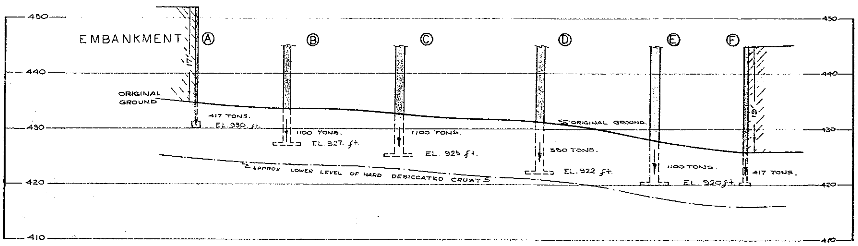
HWY. 401 - WEST APPROACHES TO HWY. 400 - INTERCHANGE

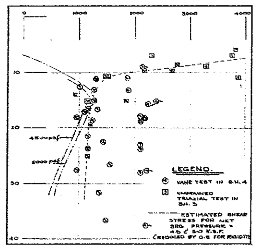
NORTH YORK TORONTO

PROJ. 1067 | DATE APR. 1963 | DWG Nº 1



PLAN
SCALE: 1 IN 40 FT.





SHEAR STRENGTH VERSUS DEPTH BELOW SURFACE.

ESTIMATED SETTLEMENT DATA.

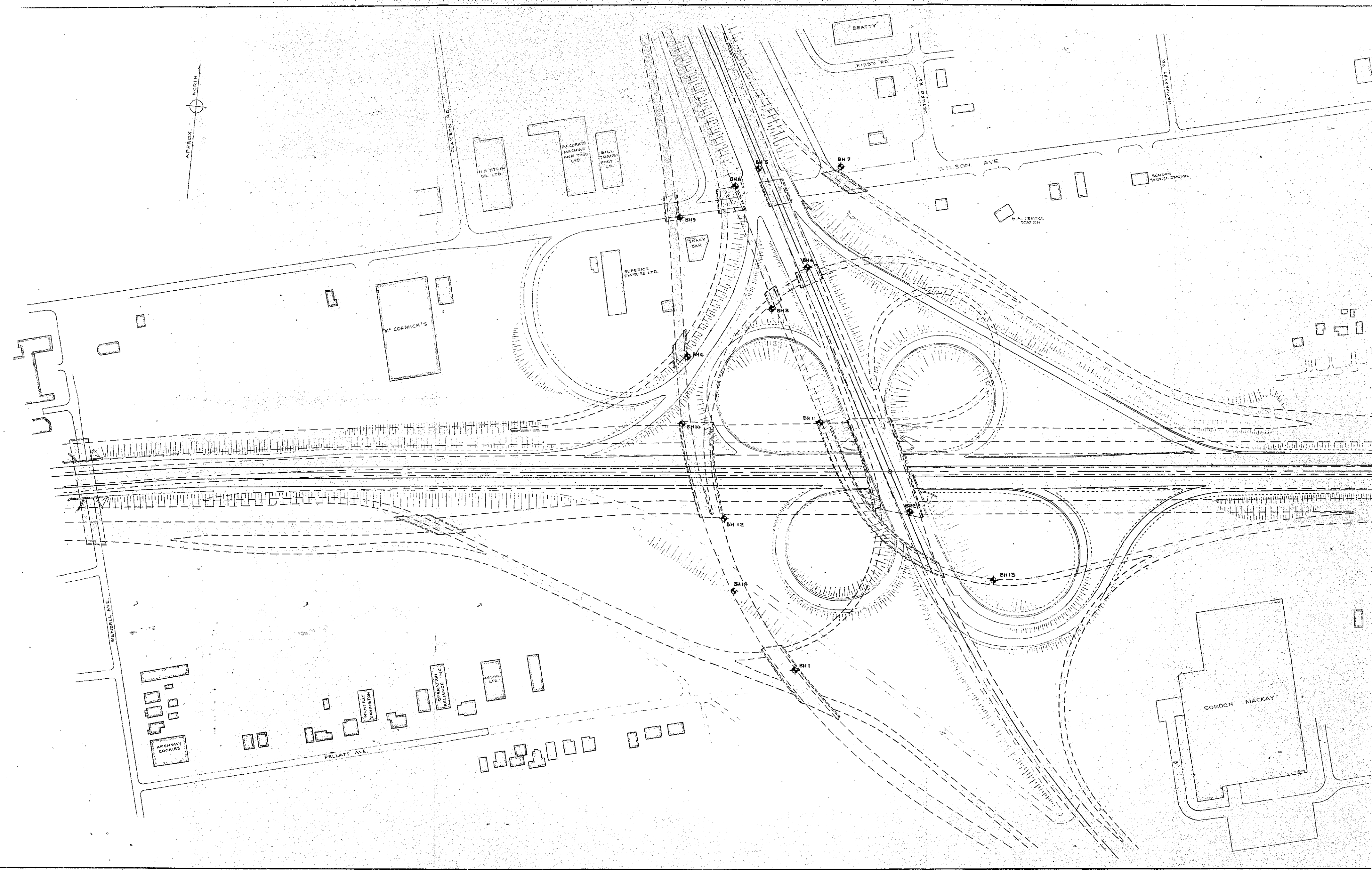
FOOTING	A	B	C	D	E	F
PROBABLE TOTAL	3.2	3.4	3. 4	2.5	3.5	3.7
ELASTIC	1.42	1.46	1.46	1.06	1.46	1.68
CONSOLIDATION	1.74	1.91	1.91	1.42	1.91	2.00
PROBABLE LONG TERM DIFFERENTIAL	0.2	—	0.5	0.5	0.1	

NOTE - ASSUMED NET BEARING STRESS = 4500 P.S.F.

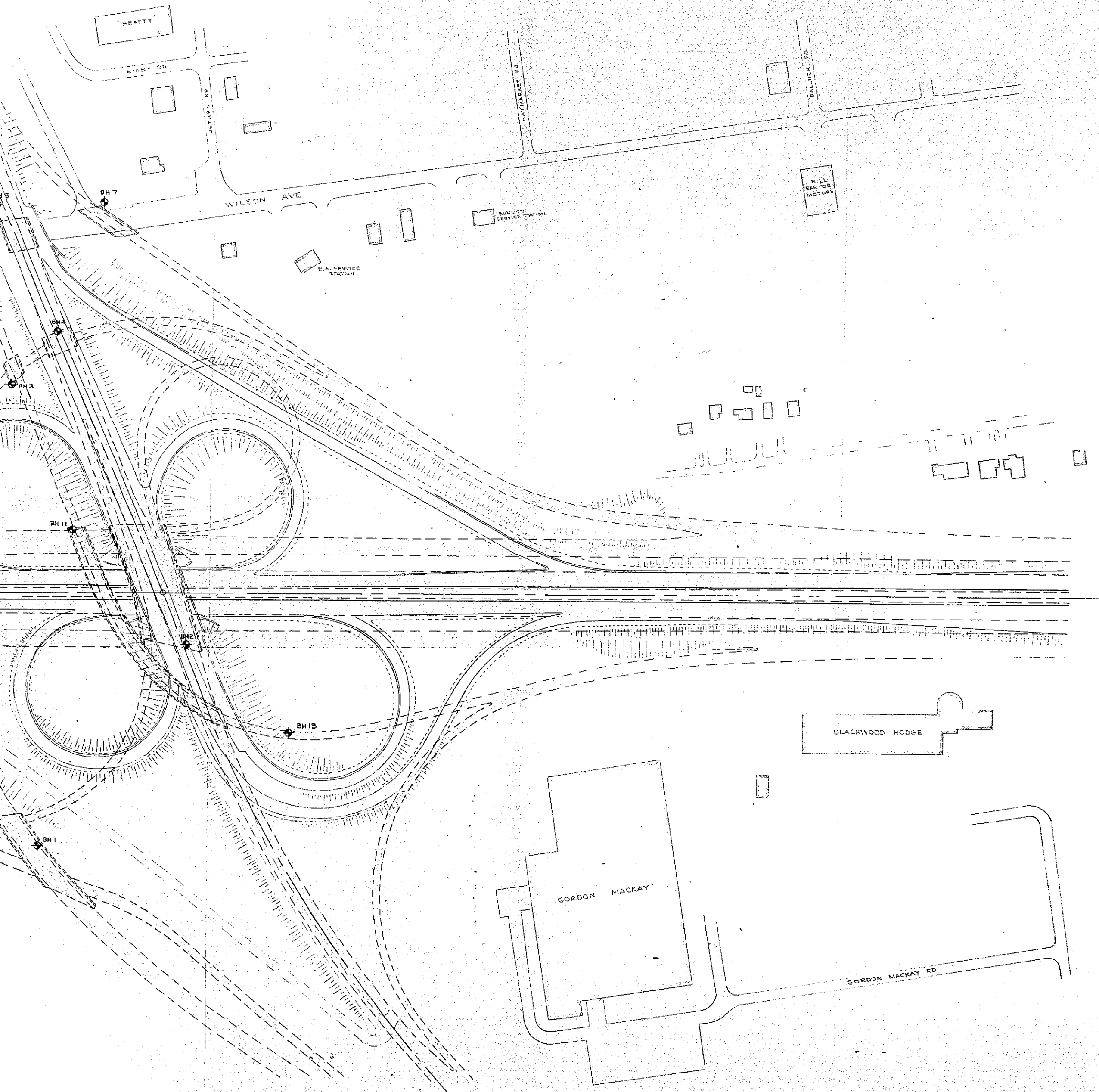
CROSS-SECTION OF EASTBOUND COLLECTOR FOOTINGS.
SCALE: VERT. 1 IN. = 10 FT. HOR. 1 IN. = 40 FT.

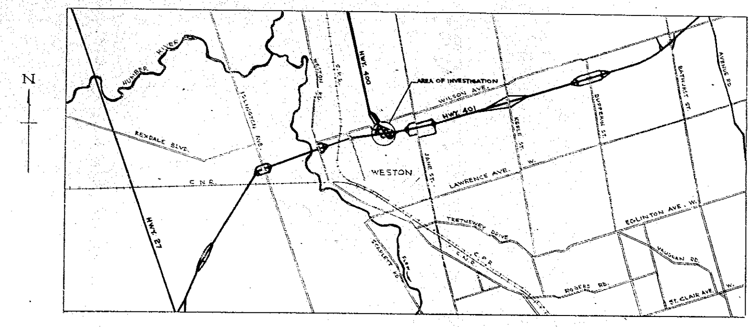
W.A. TROW & ASSOC LTD.
FOUNDATION INVESTIGATION
HWY. 401 EASTBOUND COLLECTOR
PASSING OVER
WEST- NORTH RAMP TO HWY. 400
NORTH YORK TORONTO

PROJ. 1067	DATE APR. 1963	DWG Nº 1A



APPROX. NORTH
CLAYSON RD.
H.B. STEIN CO. LTD.
ACCURATE MACHINE AND TOOL LTD.
GILL TRANS-PORT CO.
"BEATTY"
KIRBY RD
JETHRO RD.
HAYMARKET RD.
WILSON AVE
SUNOCO SERVICE STATION
B.A. SERVICE STATION
SNACK BAR
SUPERIOR EXPRESS LTD.
McCORMICK'S
BH 1
BH2
BH3
BH4
BH5
BH6
BH 7
BH8
BH9
BH10
BH 11
BH 12
BH13
BH14
WENDELL AVE.
ARCHWAY COOKIES
McNEILLY BAYINGTON
OPERATION RELIANCE INC.
DISING LTD.
PELLATT AVE.
GORDON MACKAY





KEY PLAN
SCALE: 1" TO 0.8 MILES

LEGEND

◆ BOREHOLE IN PLAN – PRELIMINARY BOREHOLES 1 TO 14 ONLY LOCATED.

PROPOSED INTERCHANGE – PRELIMINARY GENERAL ARRANGEMENT, REC'D. SEPT. 1962

PROPOSED INTERCHANGE STRUCTURES – PRELIMINARY SCHEME, REC'D. SEPT. 1962

REFERENCE	
DRWG. No.	DESCRIPTION
—	PART OF PLAN Nº 12-B-72 SHOWING THE KING'S HIGHWAY Nº 401, STA. 0+00 TO STA. 376+26.46 – COMPILED FROM AERIAL PHOTOGRAPHS FLOWN MAY, 1957 – SUPPLIED BY DEPARTMENT OF HIGHWAYS, ONTARIO. DATED: MARCH, 1959

DE LEUW, CATHER & COMPANY OF CANADA LIMITED
TORONTO ONTARIO

PROPOSED HIGHWAY 400 - 401 INTERCHANGE
TORONTO ONTARIO

GENERAL SITE PLAN

GOLDER & ASSOCIATES
CONSULTING CIVIL ENGINEERS

DATE: OCT. 9, 1962 SCALE: 1" TO 100'

MADE: J.A. CHKD.: [illegible] APPD.: [illegible] FIGURE 1