

GEOCON LTD

HEAD OFFICE

420 MICHEL JASMIN, DORVAL, QUEBEC
TELEPHONE 631-9827

B.A. 3001
Site 37-896

DISTRICT OFFICES

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

295 EAST 11TH AVENUE
VANCOUVER 10, B.C.
TEL. 879-2620

Rexdale, Ontario.
March 18th, 1969

Fenco Harris,
2200 Yonge Street,
Toronto 12, Ontario.

Attention: Mr. H. Cooke, P. Eng.
Project Manager

Re: Soil Conditions and Foundation,
Proposed Cedarvale Tunnel,
Spadina Expressway, Toronto, Ontario

Dear Sirs:

This letter accompanies our detailed report on the above investigation. We find that the site of the proposed Tunnel is covered by a variable thickness of fill, underlain in turn by compact to very dense glacial till then compact to very dense granular strata which vary in composition from sand to silty sand.

The soil conditions at the site of the proposed structure are such that, in general, spread foundations may be used as support for the longitudinal walls of the Tunnel and retaining walls. In some areas of the site the Tunnel is influenced by the Spadina Storm Trunk Sewer with the result that pile support of the longitudinal walls will be required in places. Included in the report are recommendations from a soil mechanics standpoint which influence design and construction of the proposed structure.

We believe that this report provides all the information required from this investigation at this time. As your design develops, we are at your disposal to expand on any recommendation given herein or to provide assistance, as required.

Yours very truly,
GEOCON LTD

STRUCTURE SITE No. 37-896

D. B. Oates per J.B.S.
D.B. Oates, P. Eng.
District Engineer

T 9192
ST. JOHN'S

HALIFAX

FREDERICTON

MONTREAL

TORONTO

VANCOUVER

T 9192
REPORT
TO
FENCO HARRIS
TORONTO ONTARIO
ON
SOIL CONDITIONS AND FOUNDATIONS
PROPOSED CEDARVALE TUNNEL
SPADINA EXPRESSWAY
TORONTO ONTARIO

Distribution: 8 copies - Fenco Harris,
Toronto, Ontario.

2 copies - Geocon Ltd

GEOCON

INDEX

	<u>Page</u>
INTRODUCTION	1
SUMMARIZED SOIL CONDITIONS	1
DISCUSSION	1
1. General	1
2. Foundations	3
3. Retaining Walls	7
4. Roadway Fills	7
5. Excavations	8
PERSONNEL	12

APPENDIX I

PROCEDURE	1
SITE AND GEOLOGY	2
SOIL CONDITIONS	3
WATER CONDITIONS	8

APPENDIX II

LABORATORY FIGURES

DRAWINGS - At rear of report.

INTRODUCTION

Geocon Ltd have been retained by Fenco Harris, Consulting Engineers under the terms of our proposal of January 16th 1969, and accepted vide January 20th, 1969, to carry out a site investigation for the proposed Cedarvale Tunnel of Spadina Expressway extension south of Eglinton Avenue. The purpose of the investigation was to determine the soil and groundwater conditions at the site of the proposed structure as required for the design and construction of foundations.

SUMMARIZED SOIL CONDITIONS

The investigation indicates, over most of the site, the existence of a silty till stratum of varying thickness to a maximum of 40 feet, underlying up to about 10 feet of fill. The base of the till stratum has an elevation generally ranging between 499 and 504. No till was encountered in the boreholes situated adjacent to the Storm Trunk Sewer, recently constructed as a part of Spadina Expressway Drainage System and where deep fill deposits occur. The till stratum was found to be underlain by dense to very dense sand and silty sand. These sand layers were not completely penetrated in this investigation but are known to be underlain by two distinct layers of till separated by inter-glacial sands, silts and clay.

DISCUSSION

1. General

It is understood from Fenco Harris Drawing SE-SK-69, that the

GEOCON

1. General - Continued

proposed Cedarvale Tunnel will extend between approximate Chainages 159 + 40 and 171 + 35, and that the tunnel will have an overall internal width of about 170 feet. The Expressway will consist of three Sections, the East and the West roadway sections for northbound and southbound traffic and the central section for Rapid Transit. Drawing SE-SK-69 also indicates that the central section will be capable of accommodating four tracks of Rapid Transit. The middle two of these four tracks have a descending grade of 3.5 percent from point of vertical intersection (P. V. I.) 165 + 12 to P. V. I. 157 + 0.15. These two tracks come up a similar grade from P. V. I. 157 + 0.15 and split away from the Expressway route, the purpose of the ramp being to provide grade separation between the Southbound Expressway and the diverging Rapid Transit tracks. Consequently, the purpose of Boreholes 35, 36 and 37 was to study soil conditions as they would effect the design of this grade separation part of which is situated South of the Cedarvale Tunnel proper. The remainder of the boreholes in this investigation are related to the study of soil conditions for the design of the Cedarvale Tunnel and of the end retaining walls or wing walls.

It is our understanding that the proposed tunnel will be rectangular in cross section, having two intermediate longitudinal walls which

1. General - Continued

will split the 170 feet wide tunnel into three sections as mentioned above and also act as load bearing members. The tunnel is to be subsequently covered with fill. Markdale Avenue which is presently located on fill across the creek valley, approximately in the middle of the proposed tunnel boundaries, is to be relocated but will nevertheless pass over the Cedarvale Tunnel.

The factors involved from a soil mechanics viewpoint in the design and construction of the proposed tunnel are considered in the following sections.

2. Foundations

On the basis of the results of the present investigation, it is considered that spread footings will in general be suitable for the proposed tunnel structure, wing walls and retaining walls. The minimum depth of foundation or pile caps, where the latter are involved, should be at least 4 feet below ground level to provide adequate frost protection. It will be necessary in some cases, particularly along the east wall and at the south end of the structure, to go below this depth with foundations, because of the thickness of fill that is present, and also to avoid the influence of the existing Storm Trunk Sewer which parallels the east wall.

All foundations for the tunnel wall, retaining and wing walls, should

2. Foundations - Continued

be founded within the compact to very dense glacial till or sand strata which underlie the surficial fill and organic layers. Provided measures are taken during construction to maintain undisturbed the till or sand foundation sub-soil, spread foundations within these strata may be designed using a net allowable bearing value of 3 tons per square foot. At this bearing value, total and differential, settlements resulting from compression of the very dense till or sand will be small.

As an alternative to carrying foundations down directly to the till or sand, consideration could be given to complete excavation of the existing fill within the limits of foundations and replacement with a structural fill consisting of clean, well graded sand and gravel compacted uniformly to 100 percent of Modified A. A. S. H. O. Maximum Dry Density. In such cases, foundations could be designed using a net allowable bearing value of 2 tons per square foot. The possibility of differential settlement between sections on structural fill and others on the in-situ glacial till or sand should be considered, particularly since the design of the tunnel structure is sensitive to these effects.

This investigation has revealed the presence of significant thicknesses of fill either side of the crossing of the Spadina Storm Sewer between

2. Foundations - Continued

Chainages 159 + 00 and 161 + 00. It is understood that the sewer was constructed in open cut with excavation slopes from above invert level ranging between 1 horizontal to 1 vertical and 2 horizontal to 1 vertical. In view of the considerable depth of fill below proposed foundation elevation in this area, and also to avoid transfer of load from the tunnel structure to the sewer structure, the use of end bearing piles appears to be a more practical form of foundation over this section of the tunnel structure. Piles should be driven to end bearing within the sand strata which underlie the fill in this area and a number of displacement pile types would be suitable such as steel tube pile driven closed ended, precast concrete piles, treated timber piles, or cast-in-place concrete pedestal piles. The capacity of the piles selected for design should be confirmed in the field by a suitable programme of driving and load tests on a representative pile. Tip elevation for piles should, as a minimum, be located below a line drawn up at 45 degrees from the invert of the sewer structure. Where the east wall of the tunnel is parallel and close to the Storm Sewer, particularly at its north end, foundation elevation should be selected so that it will be below the 45 degree influence line of the Sewer. Although the glacial till occurs above this line, economic considerations may dictate some form of pile foundation as an

2. Foundations - Continued

alternative to a deep excavation for spread footings. Because of the very dense nature of the till, consideration could be given to belled caissons within the till or the use of pre-augering to facilitate the major part of penetration of a driven pile. Where preference is given to a driven pile, to limit the number of foundation types on the project, it is suggested that the piles be terminated within the sand strata to provide similar tip conditions to the piles at the south end of the tunnel where the sewer crosses the tunnel; this will permit consistent interpretation of the pile load test results.

The walls and floor of the two rapid transit tracks at their underpass at the south end of the tunnel should be entirely supported on piles between approximate Chainages 159 + 00 and 161 + 00 for the reasons outlined above. North and south of these limits, the underpass structure carrying the two rapid transit tracks will be located within natural undisturbed soils, and the walls and floor may be carried on spread foundations, except in the area of approximate Chainage 156 + 00 where the rapid transit structure will again cross the sewer. In this area piles will again be required for reasons outlined above.

Vertical joints should be provided, to separate those sections of the walls on spread footings with pile supported sections.

3. Retaining Walls

The outer walls of the Expressway Tunnel, the walls of the Rapid Transit underpass section and the retaining or wing walls, will have to be designed to resist lateral earth pressures. It is recommended that free draining well graded granular fill be provided as backfill and that suitable longitudinal and lateral drains be provided to prevent the build up of hydrostatic pressures and uplift. Where drainage is not provided, provision for resistance against hydrostatic pressures and uplift should be included in design. For the longitudinal walls of the Expressway structure and for the walls of the Rapid Transit structure, it is recommended that a coefficient of lateral 'at rest' earth pressure of 0.5 be used. For retaining walls where some yield is possible, a lateral earth pressure coefficient of 0.3 may be used; suitable vertical joints should separate the sections of structure which have different restraint conditions.

4. Roadway Fills

4. Roadway Fills - Continued

of soil which contains traces of organic material, and which underlies the existing fill layer, is limited in extent and thickness and confined to areas where no significant raising of grade is proposed. It is considered therefore that the existing fill may be left in place below the pavements. Moisture content determinations within the till stratum indicate that in general the silty till stratum that will be excavated from the area of the south-bound lanes will be suitable for rolled fill construction where a raise in grade is necessary to the underside of the Expressway pavement.

5. Excavations

On the basis of information contained on Drawing SE-SK-69, the Expressway profiles have been indicated approximately on the accompanying Drawing T 9192-1. A study of these grades indicates that considerable excavation will be required in most of the area of the proposed tunnel to attain grade level. At the same time, the depth of excavation requires is not so deep as to warrant any method other than open cut excavation. The excavation for the tunnel is considered below therefore in three parts:

- (i) general excavation of the area to attain sub-grade level for the roadway
- (ii) excavation below that indicated in (i) above as required for construction of the foundations for the longitudinal walls of the structure
- (iii) excavation below that indicated in (i) above as required for

GEOCON

5. Excavations - Continued

construction of the Rapid Transit underpass structure.

General Excavation:

General excavation will be required over an area 175 feet wide and 1,200 feet in length between elevations 519 at the north end of the structure to elevation 512 at the south end. Further, excavations will also be required for the retaining walls and wing walls.

Excavation will be required through fill and compact to very dense glacial till with a maximum depth of excavation of the order of 25 feet along the west wall. Excavation will also be required of the embankment presently carrying Markdale Avenue across the creek valley where previous investigation indicates predominantly granular fill. Observations of the ground water level at the time of investigation indicates that within the sand strata, underlying the till, the ground water level is typically between elevations 500 and 505. Although perched water level conditions may be present within the surficial fill and till strata, the impervious characteristics of the till are such that no serious problem is anticipated during excavation due to water seepage. Although slopes will stand close to 1 vertical to 1 horizontal, it is recommended that the high slopes that will be required within the till, up to 25 feet, be trimmed back to 1.5 horizontal to 1 vertical.

GEOCON

5. Excavations - Continued

General Excavation: Continued

Where general excavation grade is exposed for a long period of time, measures should be adopted to prevent ponding of water and disturbance due to construction activity. Consideration should be given to crowning of excavation grade, provision of longitudinal drains and provision of a surficial granular wearing course. Where the excavation is exposed through Winter, allowance for frost damage of the till should be made.

Footing Excavations:

Excavation for foundations or pile caps for the longitudinal walls will be carried out above the water level within the sand strata. Further, the excavations will be carried out generally within glacial till or the surficial fill layer. It is recommended that the slopes of temporary excavations for foundations be cut at 1 vertical to 1 horizontal or flatter, except where these are located at the toe of the major excavations. In such cases, the flatter slope of 1.5 horizontal to 1 vertical as indicated above should be maintained.

No serious problems are anticipated as a result of water seepage since, as mentioned above, it is anticipated that the excavations will be carried out above the ground water level. Surface run-off or seepage from any 'perched' water conditions

5. Excavations - Continued

Footing Excavations - Continued

within the fill could readily be handled by the procedure of pumping from filter equipped sumps. The base of all foundation excavations at final grade should be protected by a suitable mud mat of lean concrete to avoid disturbance of the foundation sub-soil by water or by construction activity.

Excavation for the Rapid Transit Structure:

Construction of the Rapid Transit underpass structure will require excavation to about elevation 493, with the lowest point of the Underpass occurring south of the Expressway structure close to Chainage 157 + 00. For the most part, this excavation will be above the ground water level as measured within the sand stratum but at the lowest point, the excavation will reach ground water level or be slightly below it, depending on time of construction and possible seasonal variations in the ground water level. Since the underpass structure will be carried on spread footings founded within the sand stratum, care should be taken to avoid disturbance of the foundation sub-soil. Excavations which extend below the ground water level within the sand will require dewatering procedures, such as wellpoints.

5. Excavations - Continued

Excavation for the Rapid Transit Structure: Continued

Where excavations extend to the ground water level, the surface of the sand should be protected against disturbance by such means as the provision of a sand and gravel wearing surface and the use of shallow drains to maintain the water level below excavation level.

Excavation for the Underpass structure may be carried out using cut slopes or as an alternative, since the width of excavation is limited, using sheeting and bracing. It is pointed out that particular attention should be given to the backfilling procedures where the former alternative is adopted since the performance of the backfill will influence future operation of the Expressway.

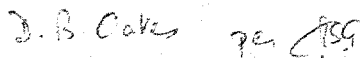
PERSONNEL

The field work for this investigation was carried out under the direction of Dr. A. Gill. This report was written by Dr. Gill and checked by Mr. D. B. Oates.

Respectfully submitted,



A. S. Gill, P. Eng.



D. B. Oates, P. Eng.

T 9192

GEOCON

APPENDIX I

PROCEDURE

SITE AND GEOLOGY

SOIL CONDITIONS

WATER CONDITIONS

OFFICE REPORTS ON SOIL EXPLORATION

GEOCON

The field work for the investigation was carried out between January 22nd and February 24th, 1969. A total of 31 boreholes was put down using a skid mounted drill rig and a mobile power auger. The boreholes were extended to depths ranging generally between 30 and 61 feet. BX size casing was used in the boreholes and samples were taken generally at 5 foot intervals. Piezometers were installed in 5 boreholes and observation pipes installed in the remainder.

The location of the boreholes together with the inferred soil stratigraphy is shown on Drawing T 9192-1 accompanying this report. A detailed log of each borehole is given on the Office Reports on Soil Exploration included in this Appendix. The locations of the boreholes with the exception of Nos. 13A, 15A and 16A were given by the Survey Staff of Fenco Harris. The need to obtain additional information on the soil conditions in the vicinity of the Spadina Storm Sewer arose when the soil investigation work was in progress and this dictated the addition of these three boreholes.

All the elevations referred to in this report are with respect to the Geodetic datum and were supplied by the Survey Staff of Fenco Harris.

The laboratory testing of the soil samples was carried out in the Soil Mechanics Laboratory of Geocon Ltd in Toronto. Results of the tests are plotted on the Office Reports of this Appendix and on the Figures in Appendix II. The samples remaining after testing will be stored until April 1970 at which time you will be contacted for instructions regarding their disposal.

The route of the proposed Spadina Expressway generally follows the bed of the Nordheimer Creek. From the site investigated to south of St. Clair Avenue, the Nordheimer Creek is no longer active having been effectively cut off by fill sections at a number of locations in its route. Local enquiries reveal that less than 20 years ago the creek used to run with a small discharge and pools of almost stagnant water were not uncommon at the proposed site of the Cedarvale Tunnel. Since then the creek bed has been fairly extensively filled up. This accounts for the considerable amount of fill encountered in most of the boreholes of the present investigation.

Cedarvale Public Park adjoins the west bank of the Nordheimer Creek Valley, whereas the area beyond the east bank is generally built up with residential houses.

The creek bed meanders considerably south of the Cedarvale Tunnel location. The general elevation of the park ground is about 540 whereas that of the existing ground along the route of the proposed Expressway is about 510. The axis of the proposed tunnel is located to the west of that of the creek and thus away from the lowest section of the valley floor. A major part of excavation for the proposed tunnel will be within the west bank of the creek.

The east and west banks of the creek are grass covered with slopes of the order of 1.5 horizontal to 1 vertical.

From geological evidence and previous work in this area, it

is known that the predominant soil types in the area are glacial tills of several distinct glaciation periods. Interglacial deposits consisting chiefly of sand, silt and some clays occur between the till sheels. Shale is known to underlie the lowest till stratum .

SOIL CONDITIONS

The principal soil strata encountered in the boreholes are described below:

1. Miscellaneous Fill - Very Loose to Very Dense

Fill of varying thickness was encountered in practically all the boreholes. The thickness of fill across the site varied generally from a few inches to about 10 feet; the latter being more typical. Exceptionally however, fill to about 25 feet depth was encountered in Borehole 13 which was located adjacent to the crossing of the Spadina Storm Sewers; other boreholes in which excessive fill was encountered were 14, 33 and 34 having thicknesses of 19, 19 and 17 feet respectively of till. These boreholes were also close to the sewer.

The principal constituent of the fill in almost all boreholes was brown and grey sand to silty sand with some organic and clay content.

Occasionally traces of concrete were encountered, as for example in Borehole 17. Traces of bricks were found in the fill of Boreholes 19 and 22. Organic content was found in the topsoil of all the boreholes; organic content was encountered in seams in Boreholes 15 and 36 at

depths of 10.5 feet below ground in each case. Mechanical analysis tests were carried out on samples from the fill and the results are given on Figure 1 in Appendix II.

Standard Penetration Tests were carried out in the fill and the "N" values found to range between more than 100 blows per foot to 1 blow per foot.

The relative density of the fill varies from very loose to very dense, being generally loose to compact.

2. Very Loose to Compact Organic Silt, Silty Sand and Sand

A stratum of dark brown to black organic silt was encountered in Boreholes 14 and 19 at depths of 19 to 20 1/2 feet and 10 to 14 feet respectively. In Borehole 17 organic silt with sand traces was found to exist between 8 to 13 feet depths below ground surface. In all these three boreholes, this stratum underlies the fill stratum.

A similar stratum of organic silt was encountered immediately below ground level in Borehole 18 to a depth of 4 feet. Sand with organics and silty sand with organics were encountered at ground level, down to 2 feet depth, in Boreholes 25 and 36.

Within the samples recovered the organic content was low and, by estimate, less than 5 percent.

Results of Standard Penetration Tests gave "N" values between 2 and 16; as such the organic silt, silty sand and sand stratum is described as very loose to compact.

3. Compact Light Brown Silt

A stratum of compact light brown silt was encountered in Borehole 19 at a depth below ground level of 14 to 19 feet. This stratum was overlain by loose organic silt stratum which in turn was overlain by fill.

A mechanical analysis test was carried out on a representative sample from this stratum and the result is given on Figure 4c in Appendix II; the test indicates 34 percent sand and 66 percent silt and clay sizes. Based on the results of the dynamic cone penetration tests and the resistance to penetration of a thin walled sampler, the relative density is estimated to be compact.

4. Dense to Very Dense Grey Clayey Silt

A stratum of clayey silt was encountered in Boreholes 24 and 25 at depths below ground of 23 to 27 and 22 to 27 feet respectively.

Mechanical analyses tests were carried out on representative samples and the results are given on Figure 3 in Appendix II; the results indicate that the sample tests contained 64 to 69 percent silt sizes and 30 to 24 percent clay sizes.

Standard Penetration Tests carried out indicated "N" values to be 82 in Borehole 25 and in excess of 100 blows per foot in Borehole 24; as such the relative density is described as very dense.

5. Compact to Very Dense Brown to Grey Till

An extensive stratum of glacial till was encountered beneath the surficial fill layer in those boreholes put down north of Markdale Avenue. This same till stratum was also encountered in most of the boreholes south of Markdale, with the exception of boreholes close to the storm sewer and those located in the creek valley along the proposed alignment of the East Tunnel wall.

This stratum is predominantly a silty till but localized variations indicate clayey silt and silty clay controlling grain size characteristics. These characteristics are shown on the Office Reports for Boreholes 17, 16 and 30. The maximum depth of till occurred in Borehole 29, where 40 feet was encountered.

Mechanical analysis tests were carried out on samples from the till stratum and the results given on Figures 2 - 2c. These results indicate the variations in controlling grain size as mentioned above. Typically, the silty till consists of 35 percent sand sizes, 45 percent silt sizes and 20 percent clay sizes. The silty clay till sample tested contained 16 percent sand sizes, 42 percent silt sizes and 42 percent clay sizes.

Natural moisture content determinations gave a range of moisture content within the silty till of 8 and 11 percent; within the silty clay till the moisture content ranged from 11 to 20 percent.

SOIL CONDITIONS - Continued5. Compact to Very Dense Brown to Grey Till - Continued

Atterberg limit tests on a sample of silty clay till gave liquid and plastic limits of 51 and 19.

A single unconfined compression test on a sample of clay till gave a value of compressive strength of 2.9 tons per square foot.

Standard Penetration Tests within the till stratum gave "N" values ranging from 20 blows per foot to in excess of 100 blows per foot.

The relative density of the till is estimated to range from compact to very dense and to be generally dense to very dense.

6. Compact to Very Dense Brown to Grey Sand to Silty Sand

All the boreholes put down in the course of this investigation were terminated in a sand stratum. This stratum was found to underlie the till stratum in all boreholes where till was encountered. In the other boreholes it was encountered directly beneath the surficial fill or silt strata. The maximum depth penetrated into this stratum was 30.5 feet in Borehole 15.

The composition of this stratum varied across the site and ranged from being predominantly medium sand to a silty fine sand. This range in composition together with the presence of thin silt and clay layers are indicated on the accompanying Office Reports; similarly Mechanical analyses tests were carried out on a number of samples and the results are plotted on Figures 4 to 4c, inclusive, in Appendix II. These results

6. Compact to Very Dense Brown to Grey Sand to Silty Sand - Continued
- reflect the variations in composition referred to above. In general the samples consisted of sand with 5 to 40 percent silt sizes. Standard Penetration Tests within this stratum gave "N" values ranging from 11 to in excess of 100 blows per foot. The lower "N" values were however obtained at the surface of the sand stratum, immediately below the extensive fill layers adjacent to the sewer. The relative density of this stratum ranges from compact to very dense and is generally dense to very dense.

WATER CONDITIONS

Piezometers were installed in Boreholes 12, 14, 19, 23 and 28 within the sand stratum at depths ranging from 26 to 58 feet. In addition, observation pipes were installed in all remaining boreholes. Observations of water levels were regularly taken in all the piezometers and observation pipes until equilibrium water levels were obtained. These are shown on the Office Reports and on Drawing T 9192-1.

The water levels in Boreholes 31 and 27 are not entirely consistent with observations from the remaining boreholes, possibly due to some malfunction of the observation tubing. In general, the ground water level within the sand ranges between elevations 515 to 490, from north to south along the alignment of the Tunnel. It is pointed out that the sequence of fill overlying glacial till and sand would permit "perched" water level conditions within the fill.

EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

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

ELEVATION AND DEPTH

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

WATER CONDITIONS

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

DESCRIPTION

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

<u>Consistency</u>	<u>U-Strength Tons/sq. ft.</u>	<u>Relative Density</u>	<u>Standard Penetration Resistance, Blows/ft.</u>
Very soft	0.03 to 0.25	Very loose	0 to 4
Soft	0.25 to 0.5	Loose	4 to 10
Firm	0.5 to 1.0	Compact	10 to 30
Stiff	1.0 to 2.0	Dense	30 to 50
Very stiff	2.0 to 4.0	Very dense	over 50
Hard	over 4.0		

STRATIGRAPHIC PLOT

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

ELEVATION SCALE

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

GRAPHS

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

OTHER TESTS

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

SAMPLES

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

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

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 10 DATUM GEODETIC CASING BX
 BORING DATE JAN. 31 / 69 REPORT DATE FEB. 22, 1969 COMPILED BY AEL CHECKED BY ASG
 SAMPLER HAMMER WT. 142 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION

☐ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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

SOIL PROFILE

CORE LOG SHEET					SAMPLES								
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W%			OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.	
					G NAT.	G LW	Δ Pw						
					DYNAMIC PENETRATION TEST BLOWS PER FOOT								
					<div>16</div>								
492.3 0.0	NO OBSERVATION	GROUND LEVEL		500									
494.3 2.0		LOOSE TO VERY DENSE SAND, CLAY AND ORGANICS FILL		490						⊗	250	1	100
		VERY DENSE BROWN TO GREY FINE SILTY SAND (Brown to grey @ 12') (Silty clay layer 20' to 30'-6")		480						⊗	DO	2	6
				470						⊗	DO	3	50
461.3 31.0		END OF HOLE		460						⊗	DO	4	27
										⊗	DO	5	>100
										⊗	DO	6	>100
										⊗	DO	7	>100

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING 11 and 12 DATUM GEODETIC CASING BX
 BORING DATE JAN 29 31/69 REPORT DATE JAN 31, 1969 COMPILED BY AEL CHECKED BY ASG
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



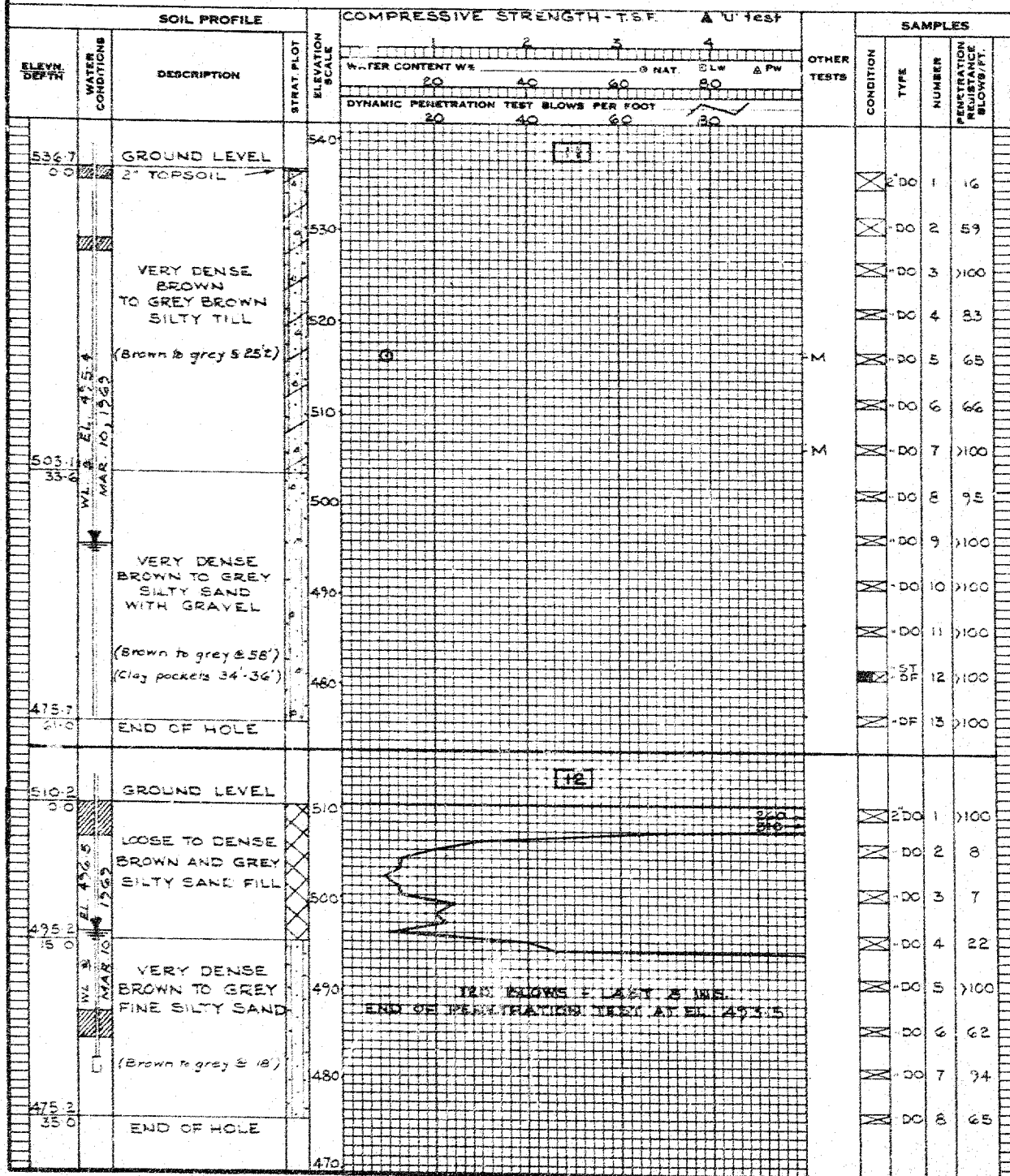
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 OC - TRIAXIAL CONSOLIDATED UNDRAINED
 O - TRIAXIAL UNDRAINED
 S - TRIAXIAL DRAINED
 1 - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 13A and 13B DATUM GEODETTIC CASING BX
 BORING DATE FEB 10 24 69 REPORT DATE FEB 12 1969 COMPILED BY AEL CHECKED BY AE
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



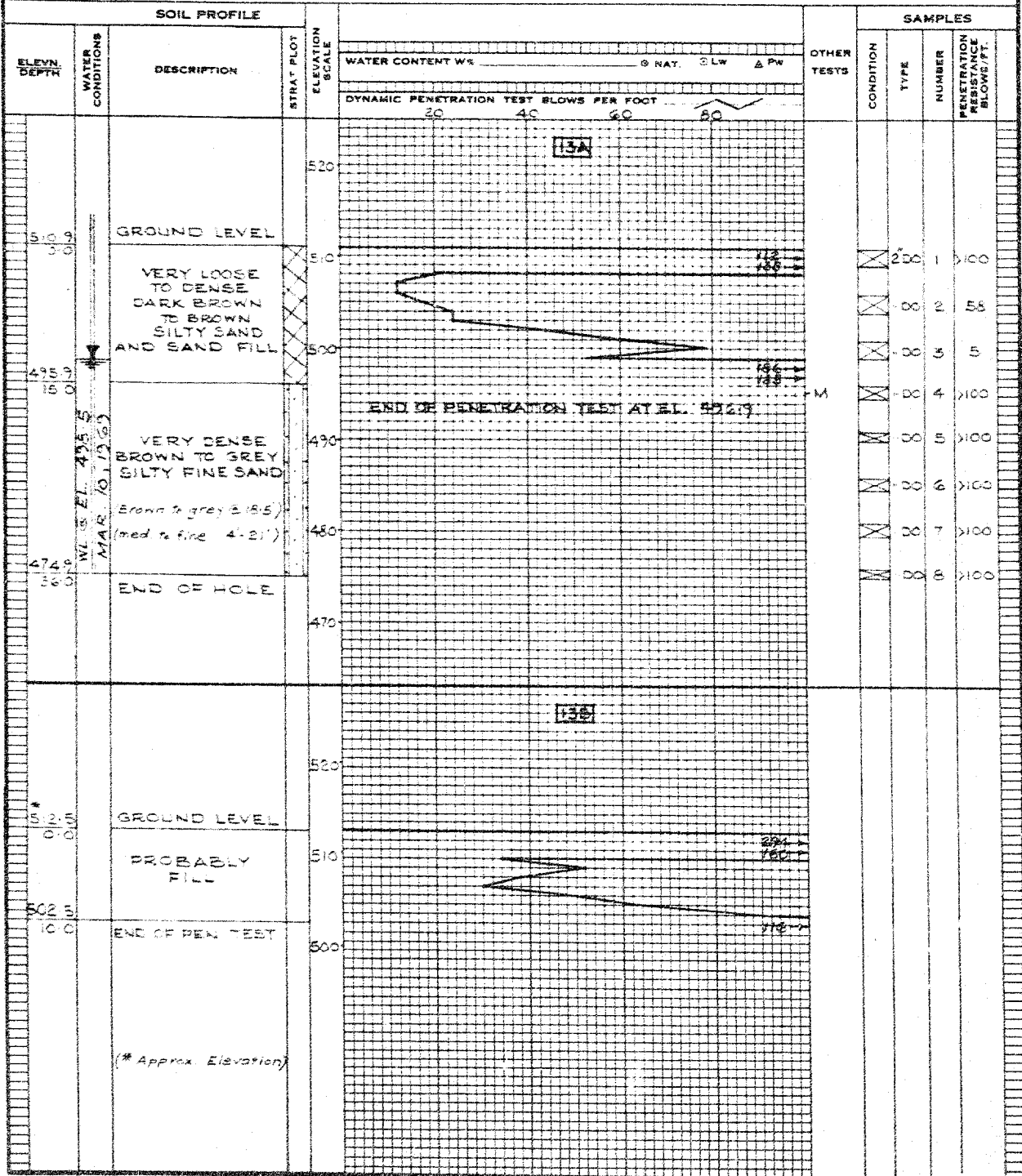
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 15 and 16 DATUM GEODETIC CASING BX
 BORING DATE JAN 24 28 1969 REPORT DATE JAN 31, 1969 COMPILED BY AEL CHECKED BY ASA
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

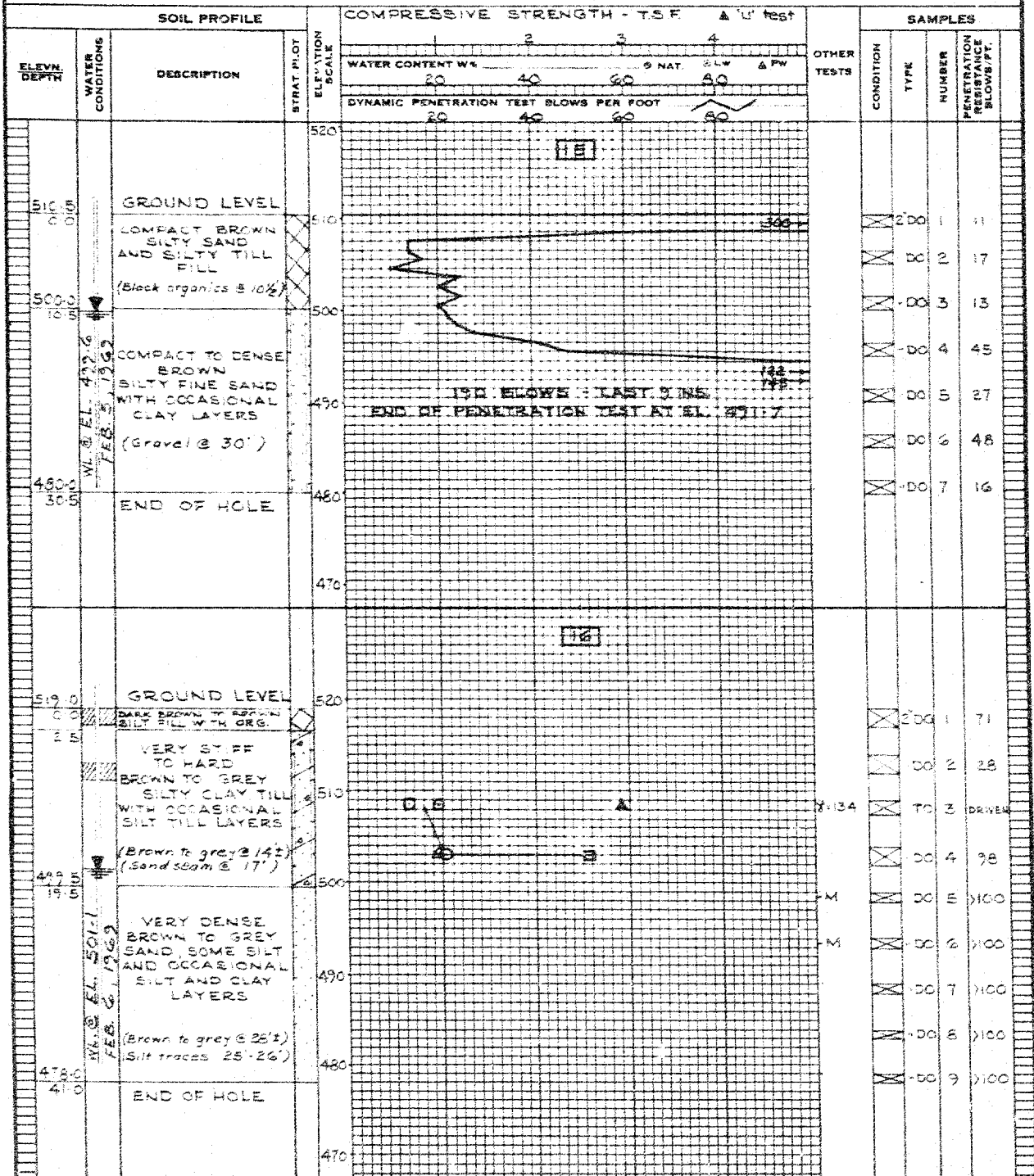
☒ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

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

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING 15A and 16A DATUM GEODETIC CASING BX
 BORING DATE FEB 10-24/49 REPORT DATE FEB 12, 1949 COMPILED BY AEL CHECKED BY ALC
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



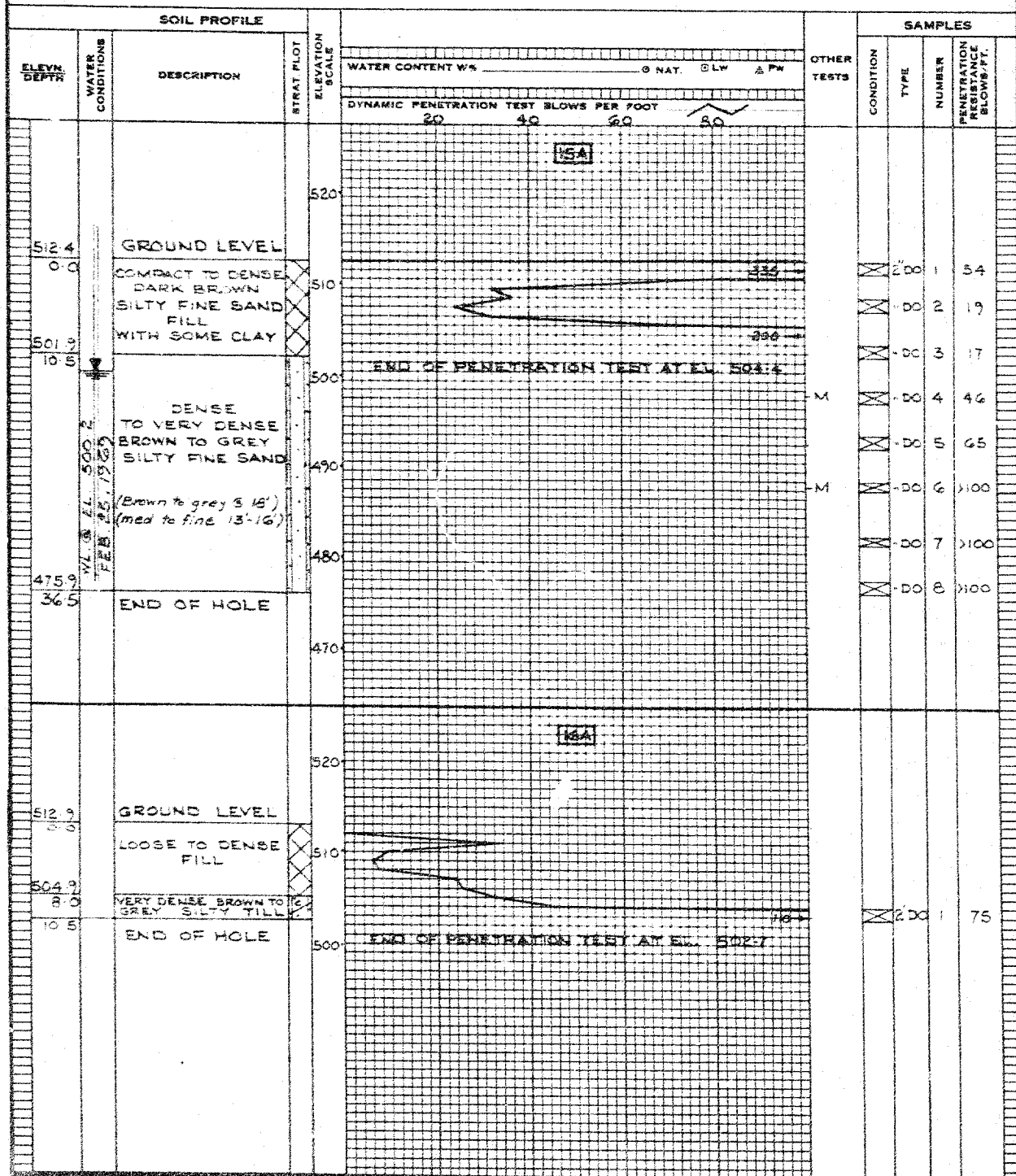
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T 9192 BORING # 17 and 18 DATUM GEODETIC CASING Bx
 BORING DATE JAN 23-24/69 REPORT DATE JAN 31, 1969 COMPILED BY AEL CHECKED BY ASG
 SAMPLER HAMMER WT 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



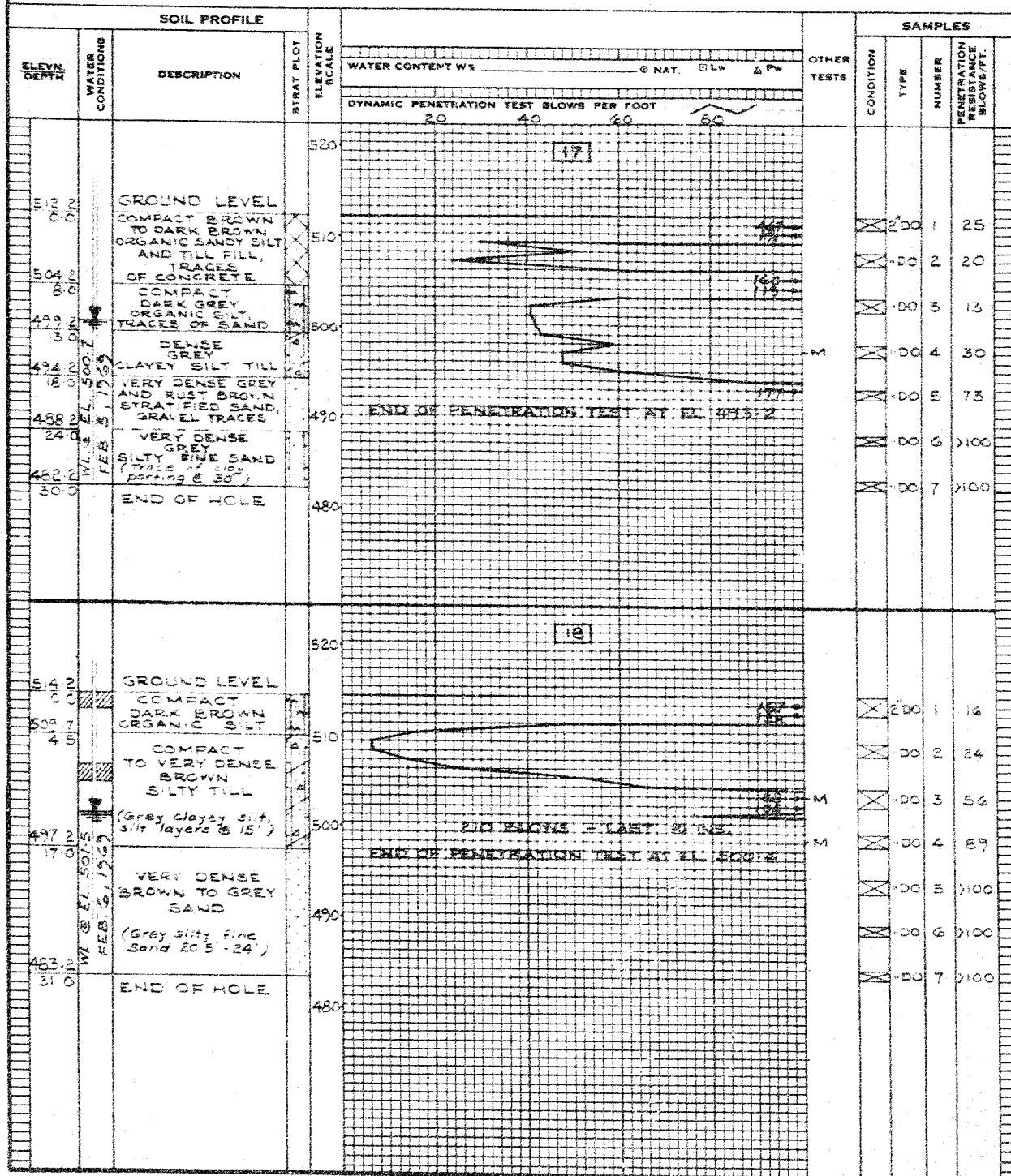
A.S. - AUGER SAMPLE
 ST. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 19 and 20 DATUM GEODETIC CASING EX
 BORING DATE JAN 22 - FEB 2 REPORT DATE FEB 4, 1969 COMPILED BY AEL CHECKED BY ASG
 SAMPLER HAMMER WT 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



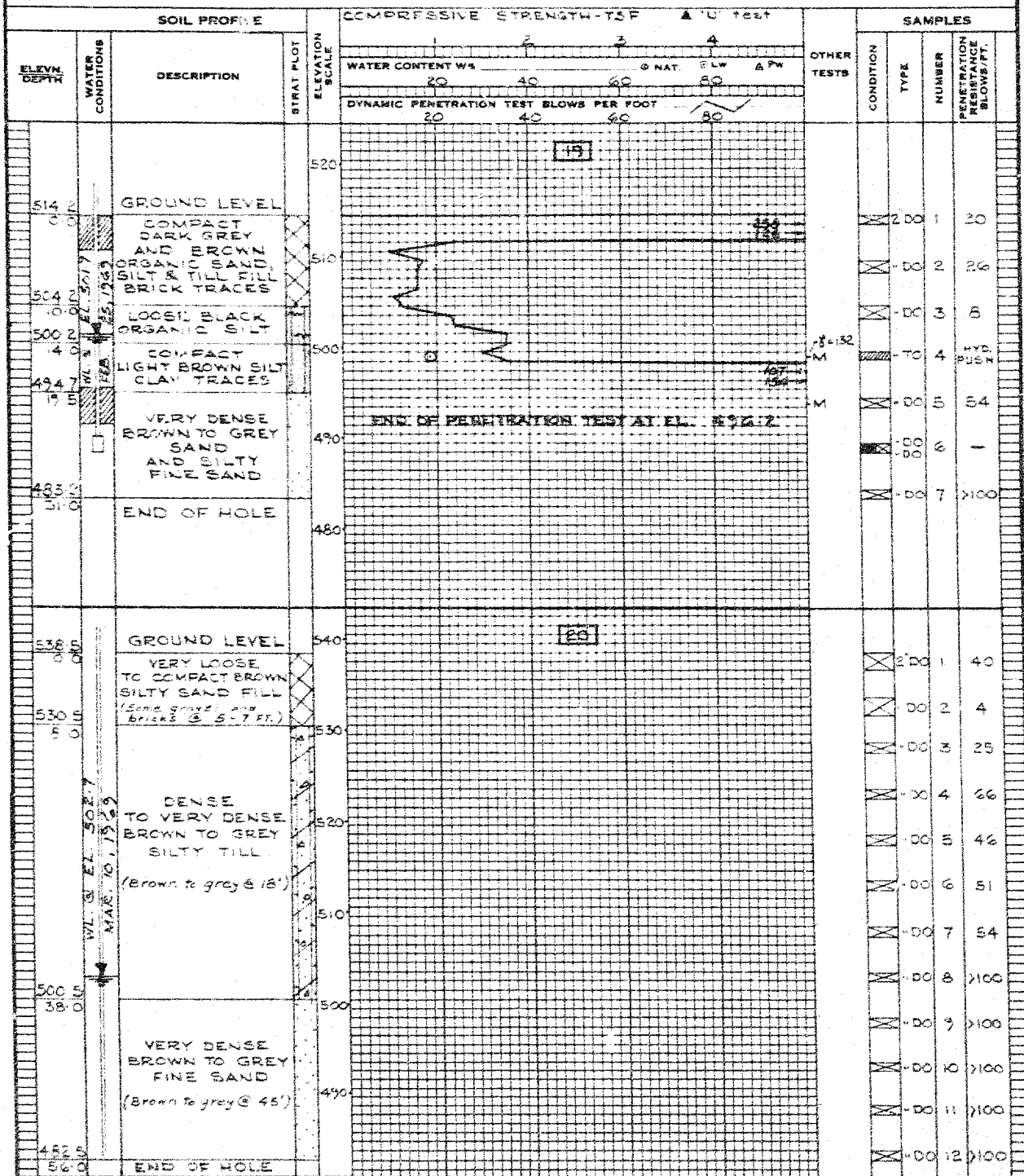
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V. - IN-SITU VANE TEST
 M. - MECHANICAL ANALYSIS
 U. - UNCONFINED COMPRESSION
 QC. - TRIAXIAL CONSOLIDATED UNDRAINED
 Q. - TRIAXIAL UNDRAINED
 S. - TRIAXIAL DRAINED
 W. - WET UNIT WEIGHT - PCF
 K. - PERMEABILITY
 C. - CONSOLIDATION
 WL. - WATER LEVEL IN CASING
 WT. - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T 9192 BORING 21 and 22 DATUM GEODETIC CASING EX
 BORING DATE FEB. 4, 1969 REPORT DATE FEB. 7, 1969 COMPILED BY AEL CHECKED BY 1
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



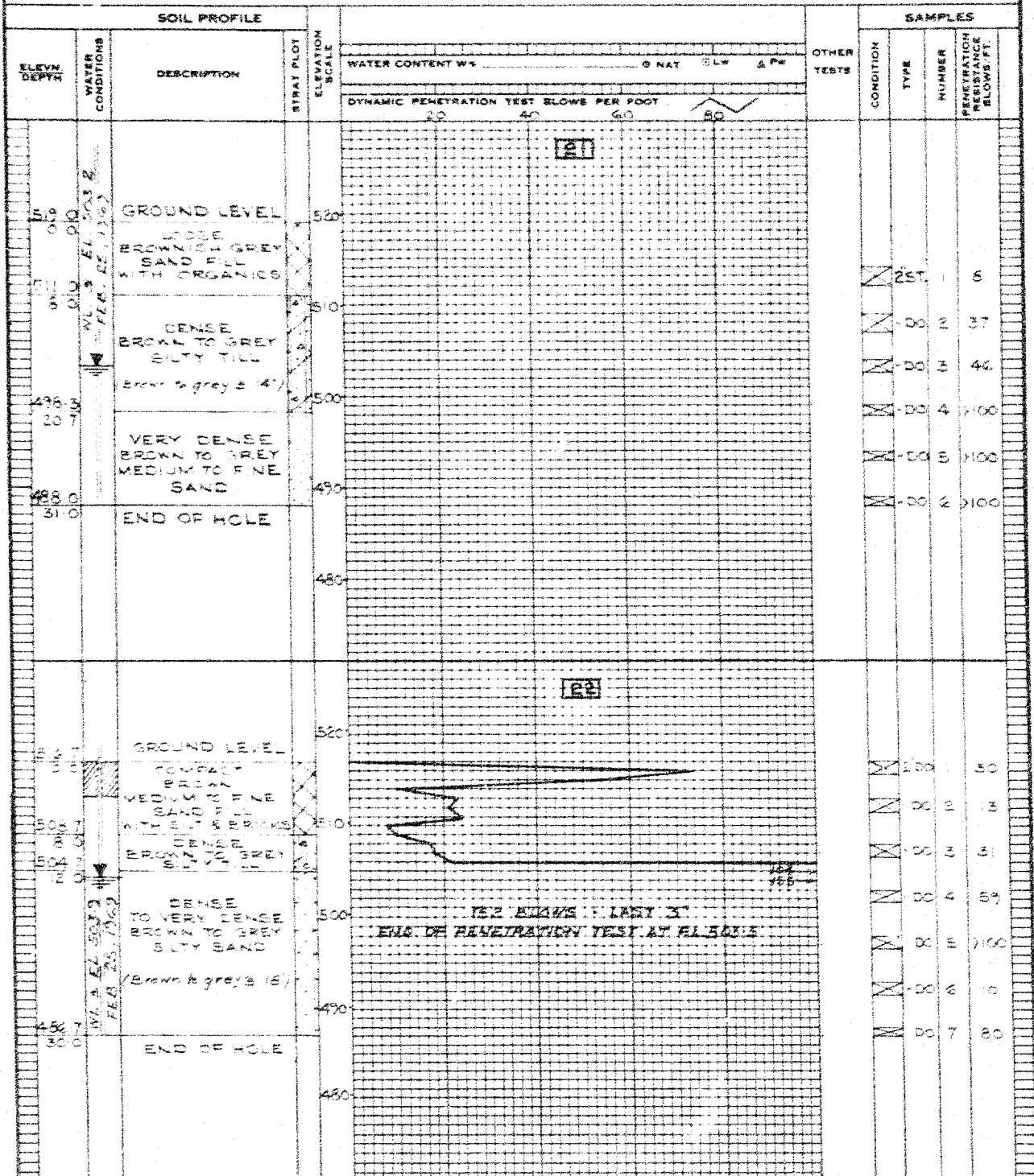
1. AUGER SAMPLE
 2. SLOTTED TUBE
 W. WASHED SAMPLE
 D. DRIVE-OPEN
 OF. DRIVE-FOOT VALVE
 CS. CHUNK SAMPLE

SAMPLE TYPES

FS. SOIL SAMPLE
 SO. SLEEVE-OPEN
 ST. SLEEVE-FOOT VALVE
 TO. THIN WALLED OPEN
 RC. ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 23 and 24 CATH GEODETTIC CASING EX
 BORING DATE FEB 17, 1969 REPORT DATE FEB 12, 1969 COMPILED BY AEL CHECKED BY AEL
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS ENERGY)

SAMPLE CONDITION



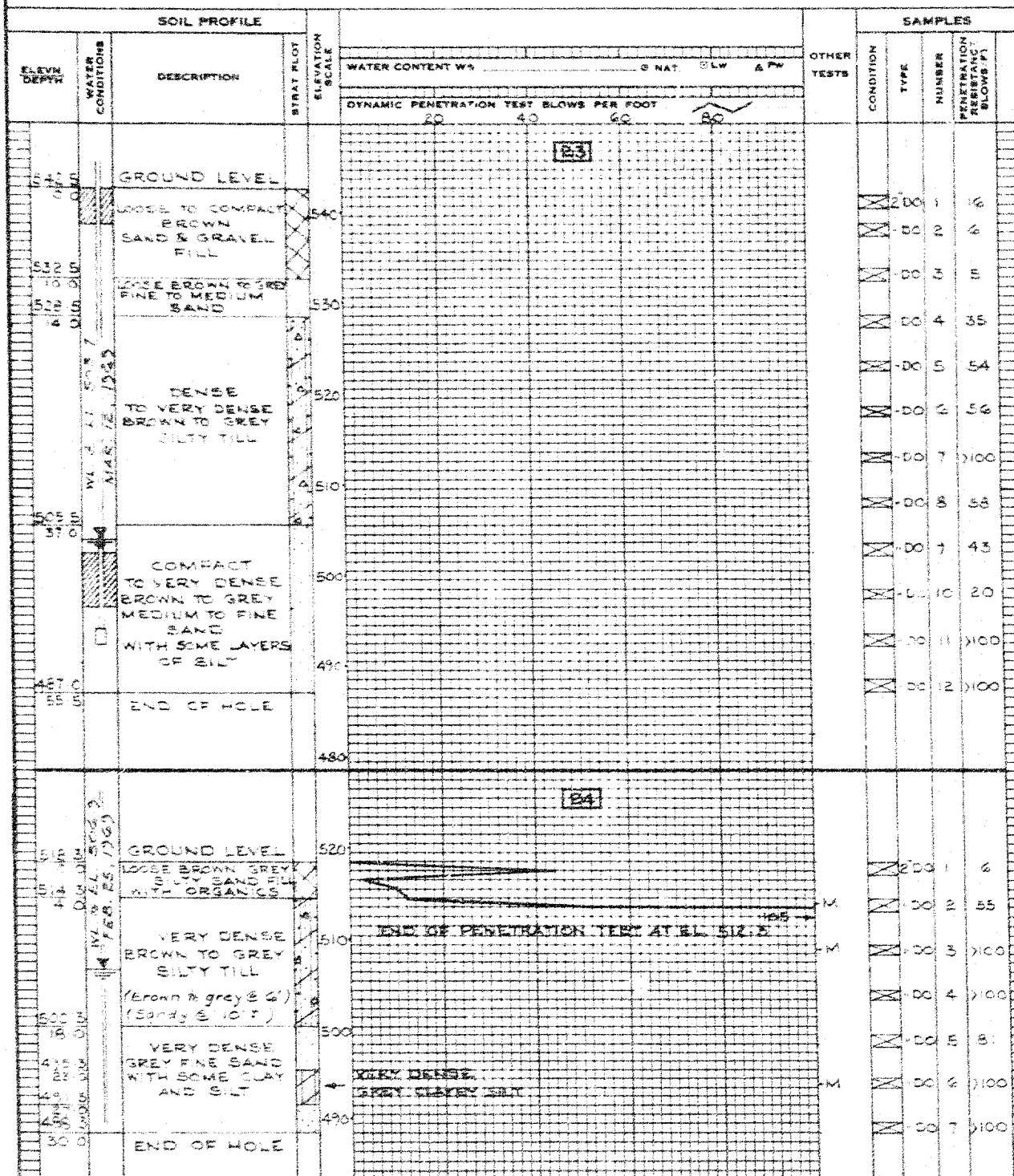
AS - AUGER SAMPLE
 ST - SLOTTED TUBE
 WS - WASHED SAMPLE
 DO - DRIVE-OPEN
 DF - DRIVE-FOOT VALVE
 CS - CHUCK SAMPLE

SAMPLE TYPES

FS - FOIL SAMPLE
 SO - SLEEVE-OPEN
 SF - SLEEVE-FOOT VALVE
 TO - THIN WALLED OPEN
 RC - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T5192 BORINGS: 25 and 26 DATUM GEODETIC CASING BK
 BORING DATE FEB 6, 1963 REPORT DATE FEB 12, 1963 COMPILED BY AEL CHECKED BY A
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY

SAMPLE CONDITION



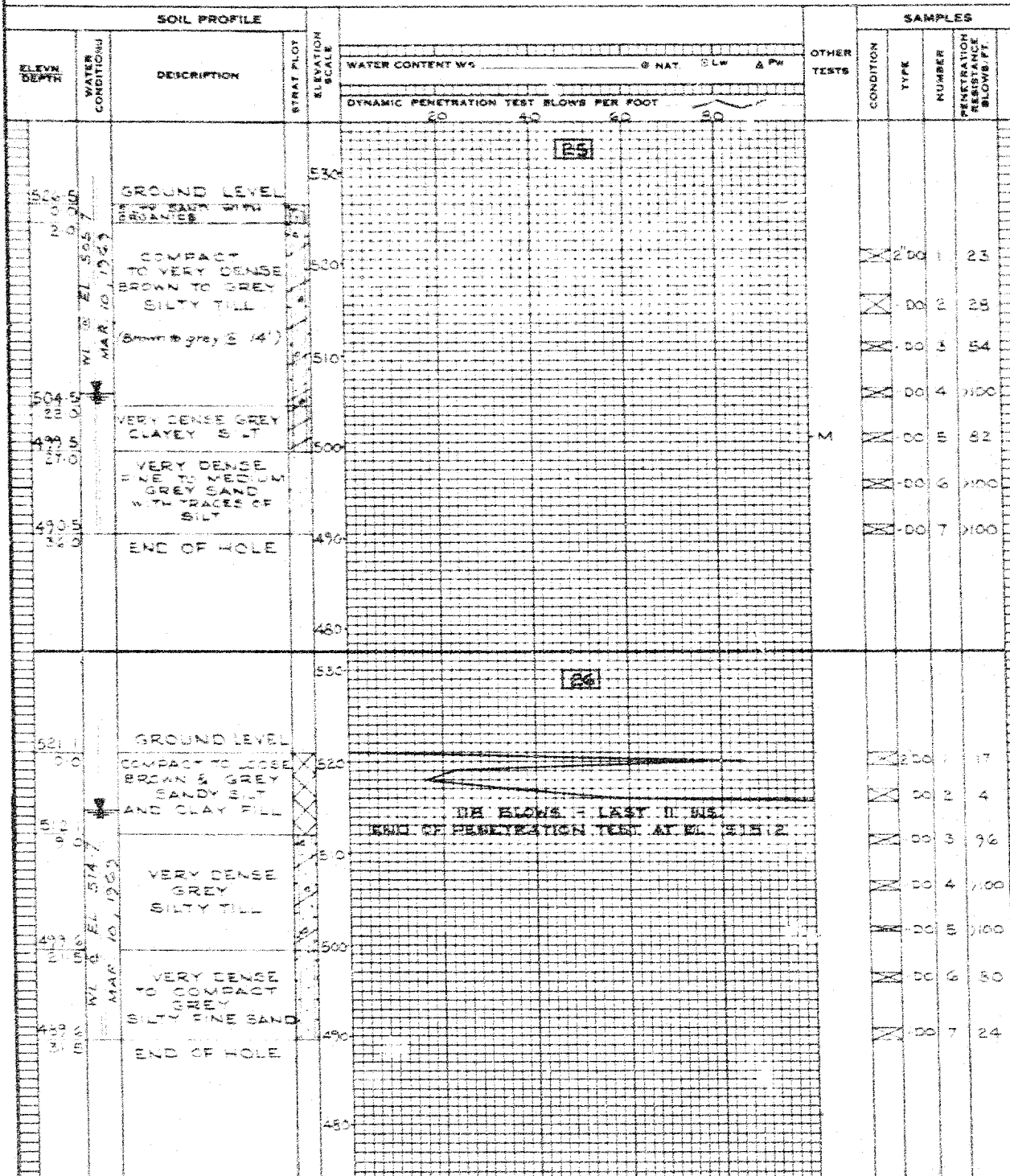
AS - AUGER SAMPLE
 ST - SLOTTED TUBE
 WS - WASHED SAMPLE
 DO - DRIVE-OPEN
 GF - DRIVE-FOOT VALVE
 CF - CHUCK SAMPLE

SAMPLE TYPES

FS - FOIL SAMPLE
 SO - SLEEVE-OPEN
 SF - SLEEVE-FOOT VALVE
 TO - THIN WALLED OPEN
 RC - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 CC - TRIAXIAL CONSOLIDATED UNDRAINED
 S - TRIAXIAL UNDRAINED
 7 - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

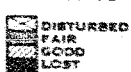


GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 19192 BORING 27 DATUM GEODETIC CASING BX
 BORING DATE FEB. 11, 1969 REPORT DATE FEB. 17, 1969 COMPILED BY AEL CHECKED BY A. S.
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

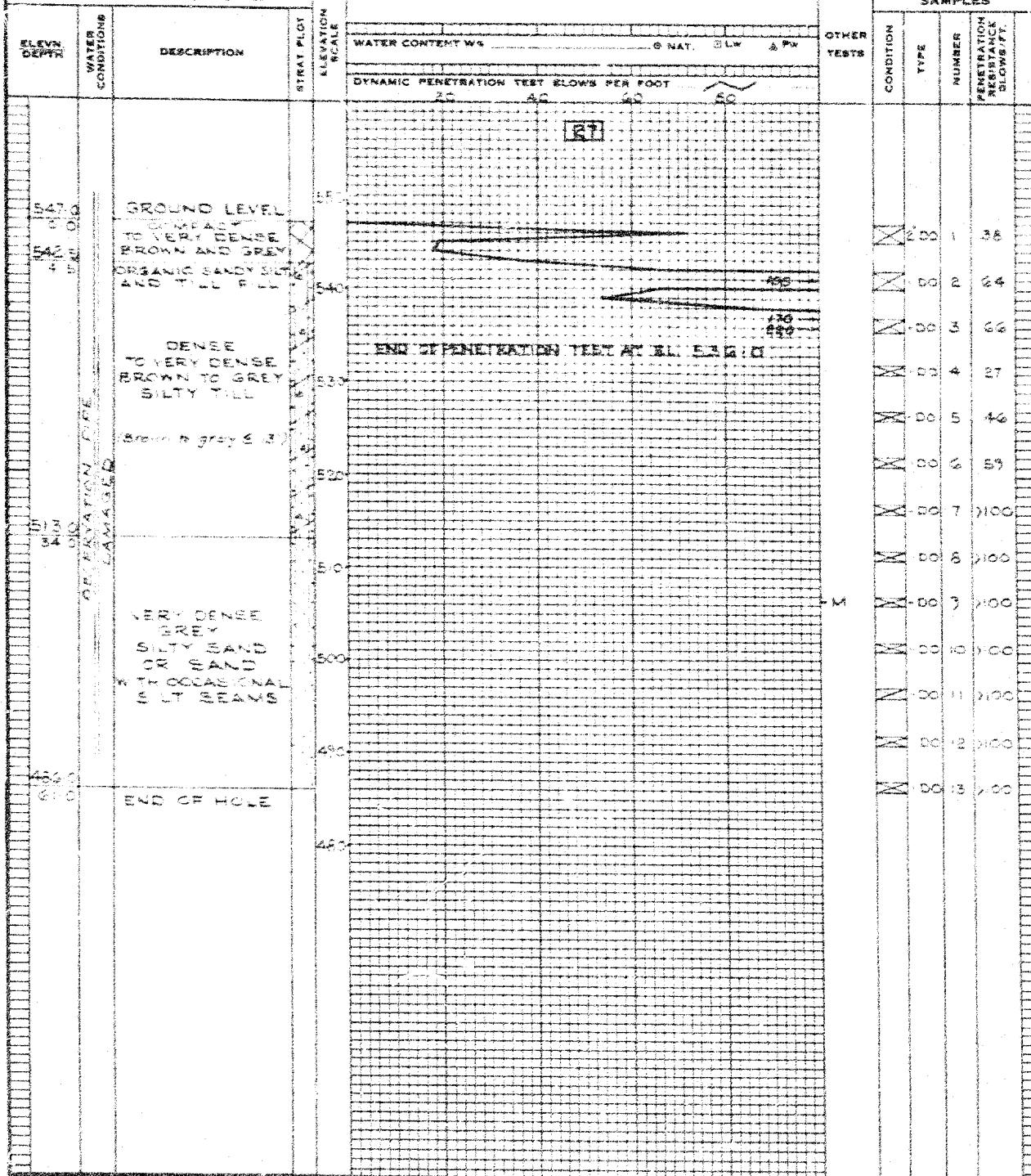
F.S. - SOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V. - IN-SITU VANE TEST
 M. - MECHANICAL ANALYSIS
 U. - UNCONFINED COMPRESSION
 CC. - TRIAXIAL CONSOLIDATED UNDRAINED
 CU. - TRIAXIAL UNDRAINED
 S. - TRIAXIAL DRAINED
 γ. - WET UNIT WEIGHT
 K. - PERMEABILITY
 C. - CONSOLIDATION
 WL. - WATER LEVEL IN CASING
 WT. - WATER TABLE IN SOIL

SOIL PROFILE

SAMPLES



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T3192 BORING # 28 DATUM GEODETIC CASING BX
 BORING DATE FEB. 11/12/63 REPORT DATE FEB. 17, 1963 COMPILED BY AEL CHECKED BY ASA
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4500 IN. LBS. ENERGY)

SAMPLE CONDITION

☒ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

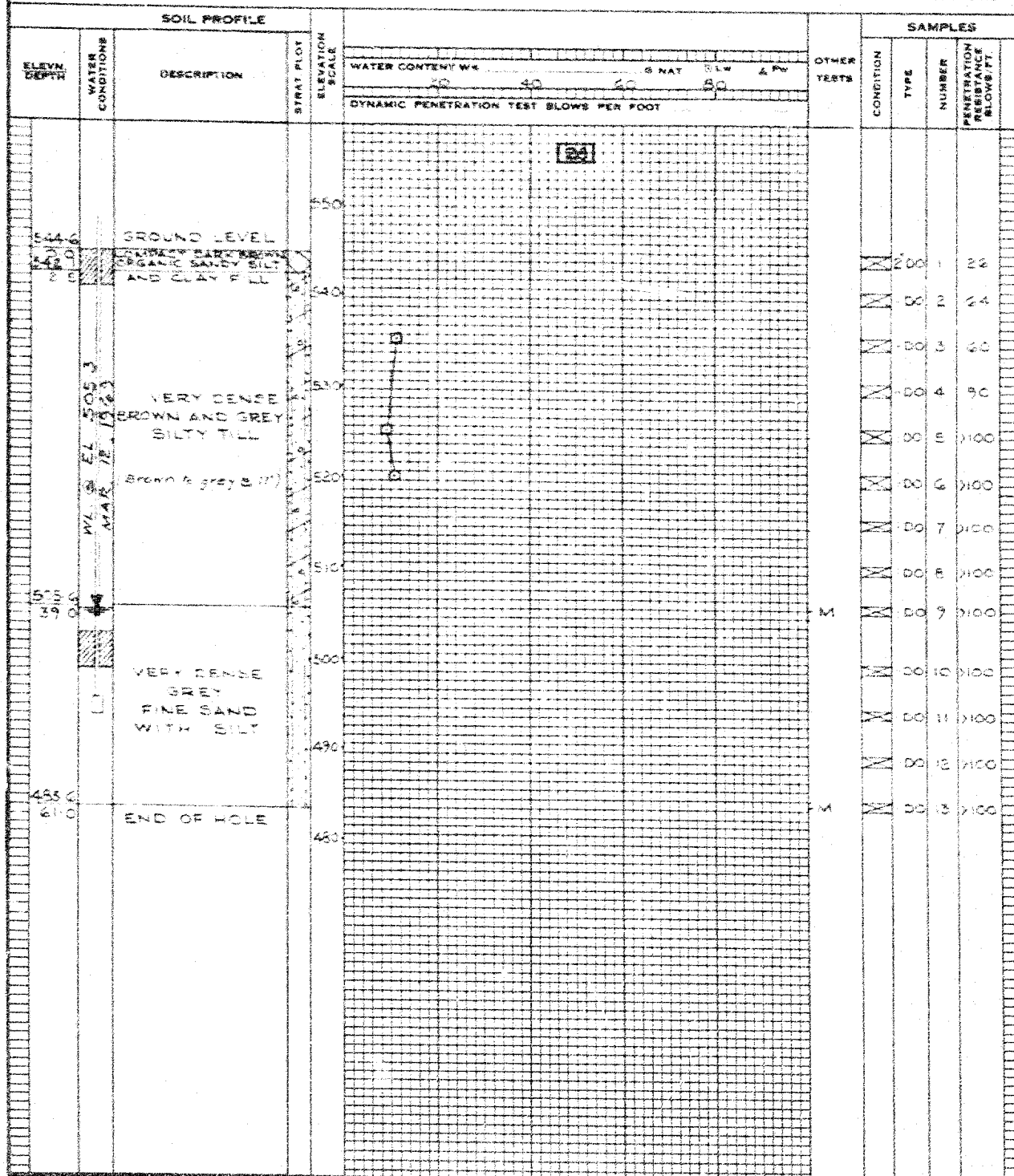
SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V. - IN-SITU VANE TEST
 M. - MECHANICAL ANALYSIS
 U. - UNCONFINED COMPRESSION
 OC. - TRIAXIAL CONSOLIDATED UNDRAINED
 C. - TRIAXIAL UNDRAINED
 S. - TRIAXIAL DRAINED
 W. - WET UNIT WEIGHT
 K. - PERMEABILITY
 C. - CONSOLIDATION
 WL. - WATER LEVEL IN CASING
 WT. - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT TS 192 BORING 29 DATUM GEODETIC CASING BX
 BORING DATE FEB 12 1969 REPORT DATE FEB 20 1969 COMPILED BY AEL CHECKED BY ASL
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS ENERGY)

SAMPLE CONDITION

☐ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

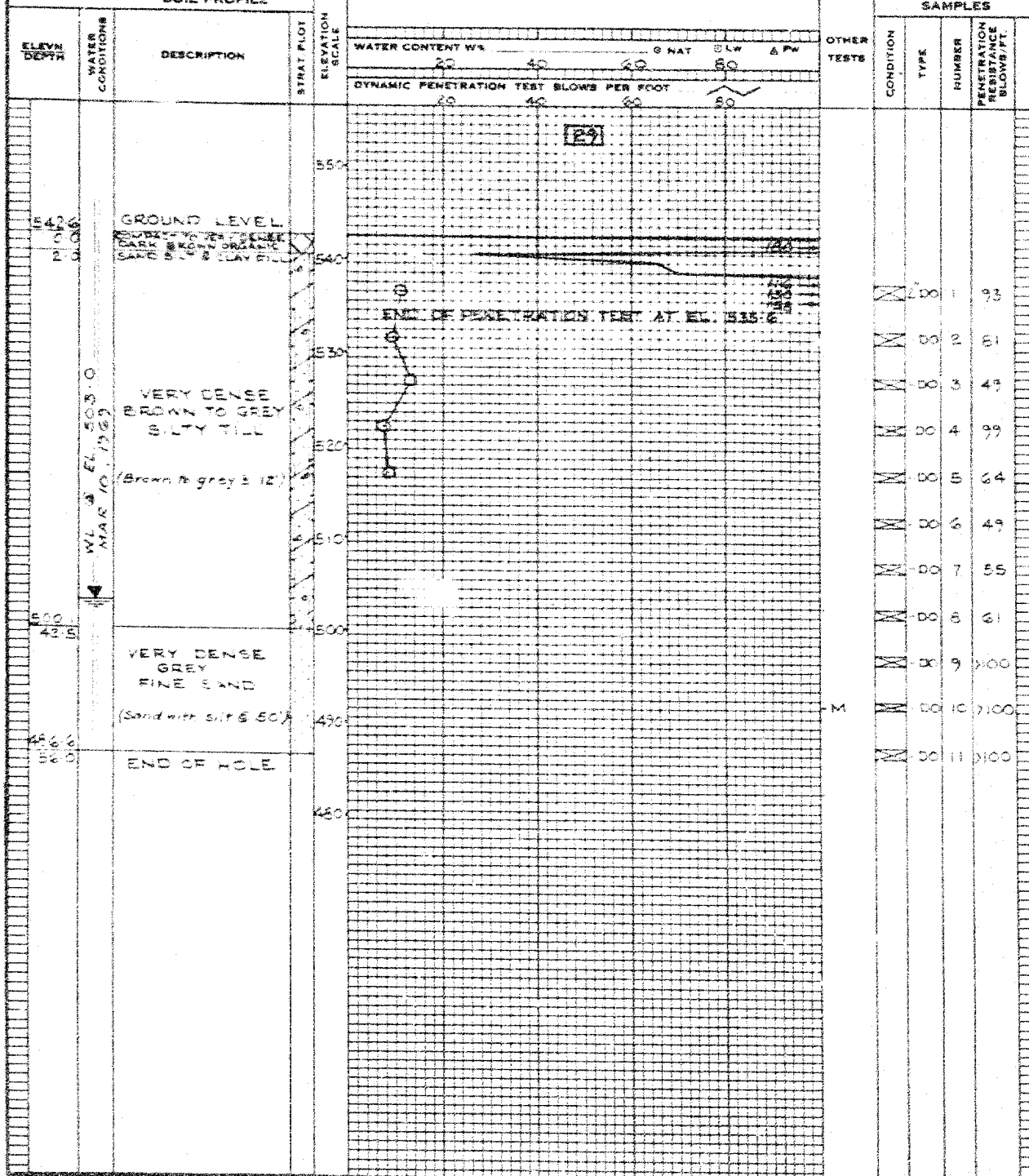
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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

SOIL PROFILE



CONTRACT T9192 BORING # 30 DATUM GEODETIC CASING EX
BORING DATE FEB. 14/69 REPORT DATE FEB. 20, 1969 COMPILED BY AEL CHECKED BY AEL
SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION

4

SAMPLE TYPES

© 2005 Blackwell Publishing Ltd *Journal of Internal Medicine* 258: 111–118

© 2006 The Authors
Journal compilation © 2006 Blackwell Publishing Ltd

[illegible]



DISTURBED
FAIR
GOOD
LOST

A5 - AUGER SAMPLE
 B1 - BLOTTED TUBE
 B2 - BURNED SAMPLE
 C0 - DRIVE OPEN
 C1 - DRIVE FOOT VALVE
 C2 - CHUCK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

ABBREVIATIONS	
V	IN-SITU VANE TEST
M	MECHANICAL ANALYSIS
U	UNCONFINED COMPRESSION
CC	TRIAXIAL CONSOLIDATED UNDRAINED
Q	TRIAXIAL UNDRAINED
S	TRIAXIAL DRAINED

7. WET UNIT WEIGHT
K. PERMEABILITY
C. CONSOLIDATION
NEED
WL. WATER LEVEL IN CASING
WT. WATER TABLE IN SOIL

SOIL PROFILE					SAMPLES					
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE	WATER CONTENT W _L	OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
					<input type="checkbox"/> NAT <input type="checkbox"/> LW <input type="checkbox"/> Pw					
					DYNAMIC PENETRATION TEST BLOWS PER FOOT					
				550						
539	0.86	GROUND LEVEL		540						
		COMPACT BROWN TO DARK BROWN SANDY SILT FILL WITH SOME ORGANICS	X	530			X	-DO-	1	53
527	0.90		X	520			X	-DO-	2	15
	W.L. @ EL. 500 MAR 12, 1969	VERY STIFF TO HARD BROWN TO GREY SILTY CLAY TILL	X	510			X	-DO-	3	17
		(Brown to grey S 15)	X	500			X	-DO-	4	>100
491	0.94		X	490			X	-DO-	5	>100
475	0.98	VERY DENSE MEDIUM TO FINE GREY SAND	X	480			X	-DO-	6	>100
		(Coarse to med 50-56)	X	470			X	-DO-	7	>100
		END OF HOLE	X	460			X	-DO-	8	39
			X	450			X	-DO-	9	>100
			X	440			X	-DO-	10	>100
			X	430			X	-DO-	11	>100
			X	420			X	-DO-	12	>100
			X	410			X	-DO-	13	>100

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 31 and 32 DATUM GEODETIC CASING BX
 BORING DATE FEB 14 1969 REPORT DATE FEB 20 1969 COMPILED BY AEL CHECKED BY AEL
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



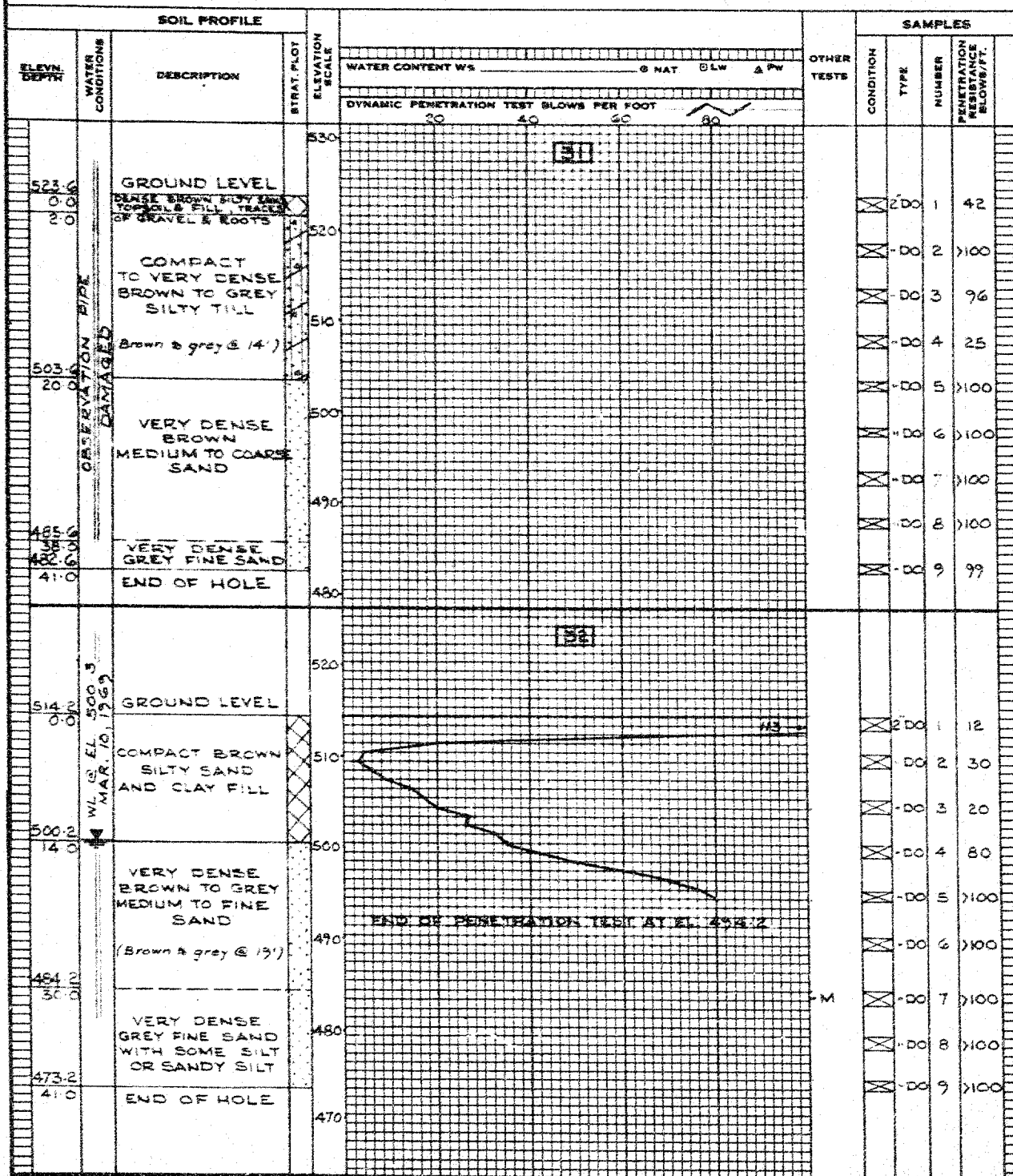
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.D. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 GC - TRIAXIAL CONSOLIDATED UNDRAINED
 QU - TRIAXIAL UNDRAINED
 S - TRIAXIAL DRAINED
 7 - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING 33 and 34 DATUM GEODETIC CASING BX
 BORING DATE FEB 17/69 REPORT DATE FEB 20, 1969 COMPILED BY AEL CHECKED BY A.C.G.
 SAMPLER HAMMER WT. 14.0 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



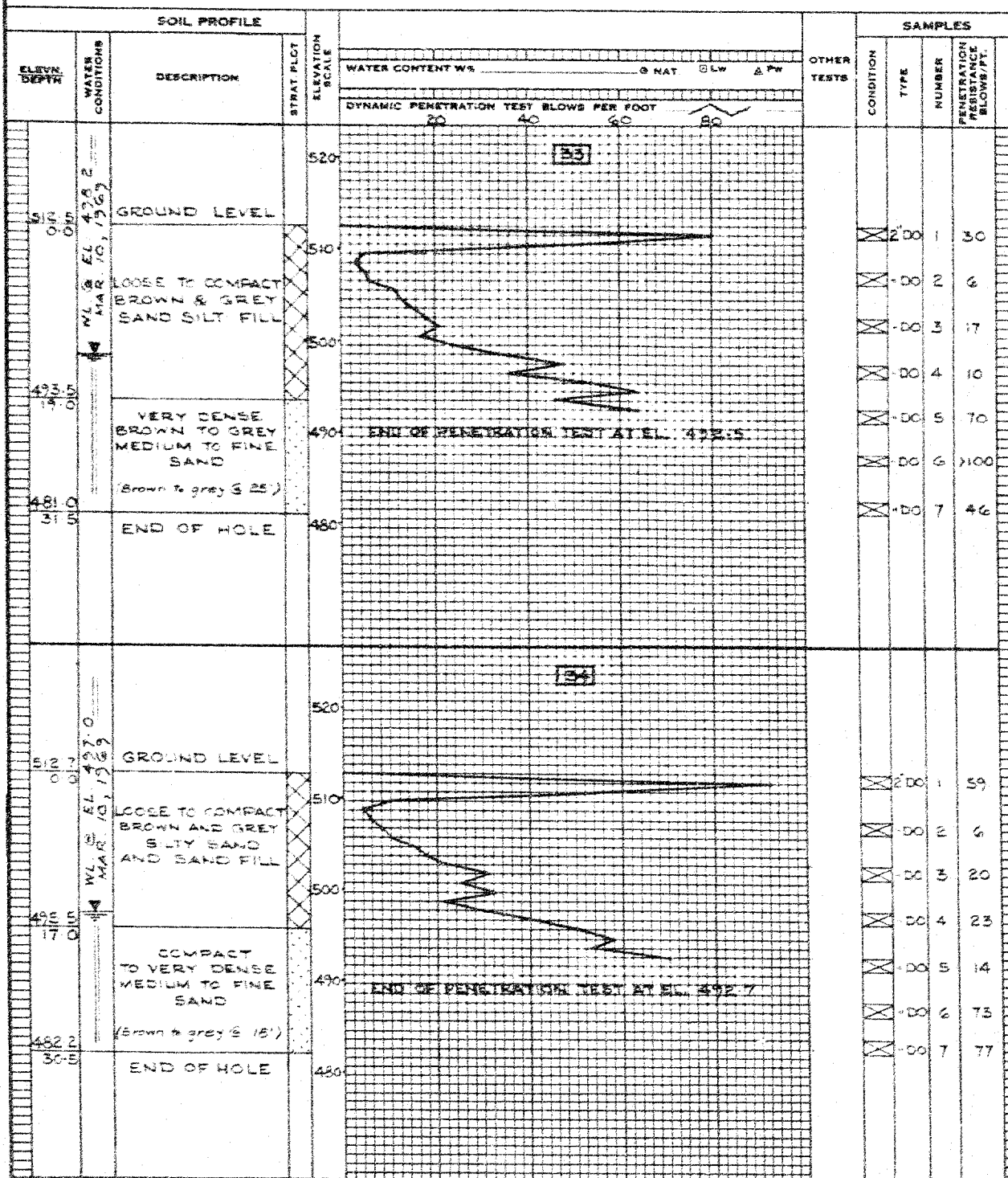
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 35 and 36 DATUM GEODEIC CASING 5X
 BORING DATE FEB 21/69 REPORT DATE FEB 22, 1969 COMPILED BY AEL CHECKED BY 4.2
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



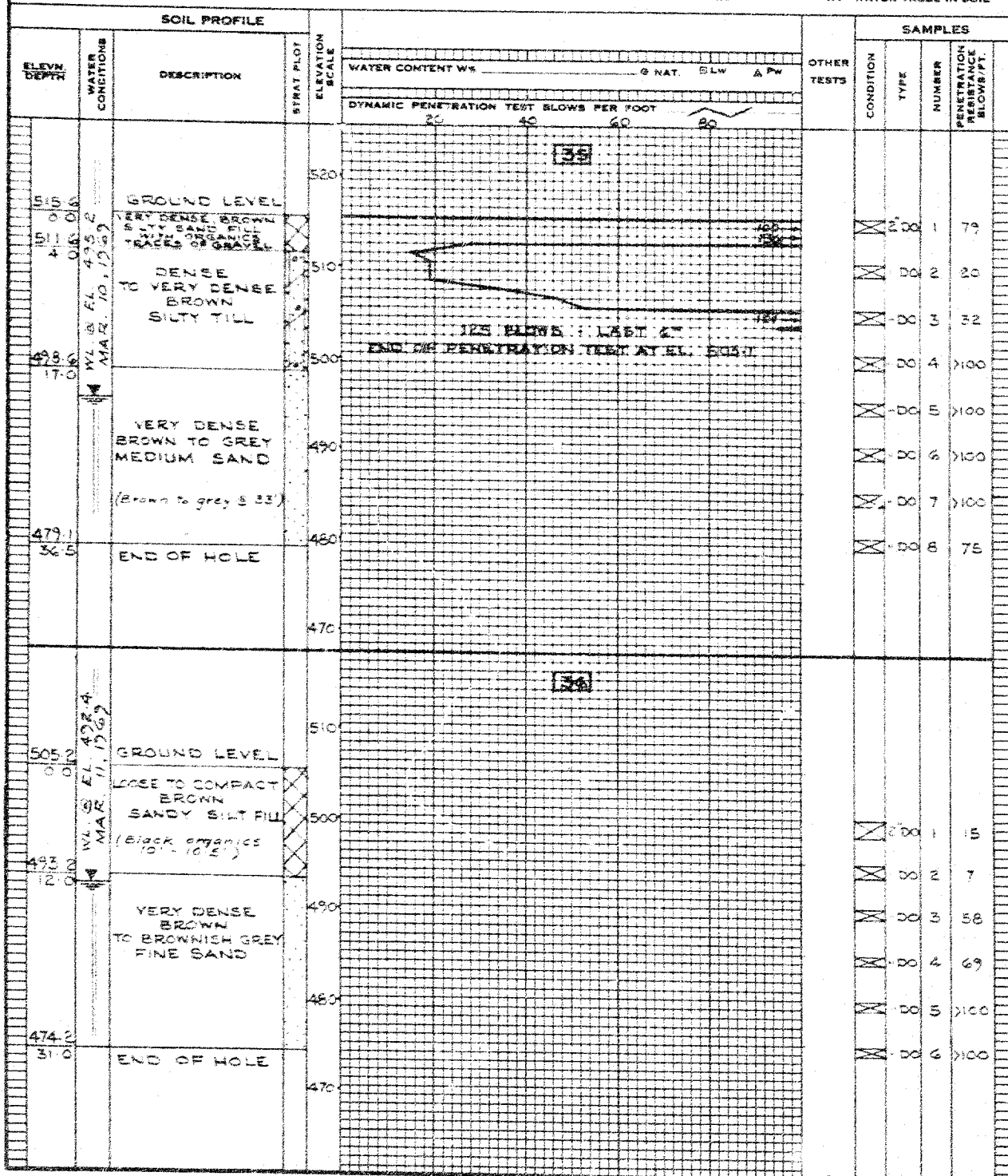
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T9192 BORING # 37 DATUM GEODETIC CASING BX
 BORING DATE FEB 22/69 REPORT DATE FEB 26, 1969 COMPILED BY AEL CHECKED BY ASG
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

☒ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.T. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

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

SOIL PROFILE				SAMPLES								
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W% _____			OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
				DYNAMIC PENETRATION TEST BLOWS PER FOOT _____								
				500								
493.1		GROUND LEVEL										
0.0		TOPOSOIL, VERY SANDY SAND AND ORGANICS		490								
20		VERY DENSE TO DENSE BROWN SAND FILL WITH GRAVEL										
451.1		(Boulders 5 to 7')		480								
12.0												
		DENSE TO VERY DENSE BROWN TO GREY FINE SAND		470								
		(Brown & grey 5-24')										
		(Silty sand 25-27')										
		(Silt & clay 30-31')										
462.1				460								
31.0		END OF HOLE										

APPENDIX II

FIGURES -- LABORATORY TESTING

GEOCON

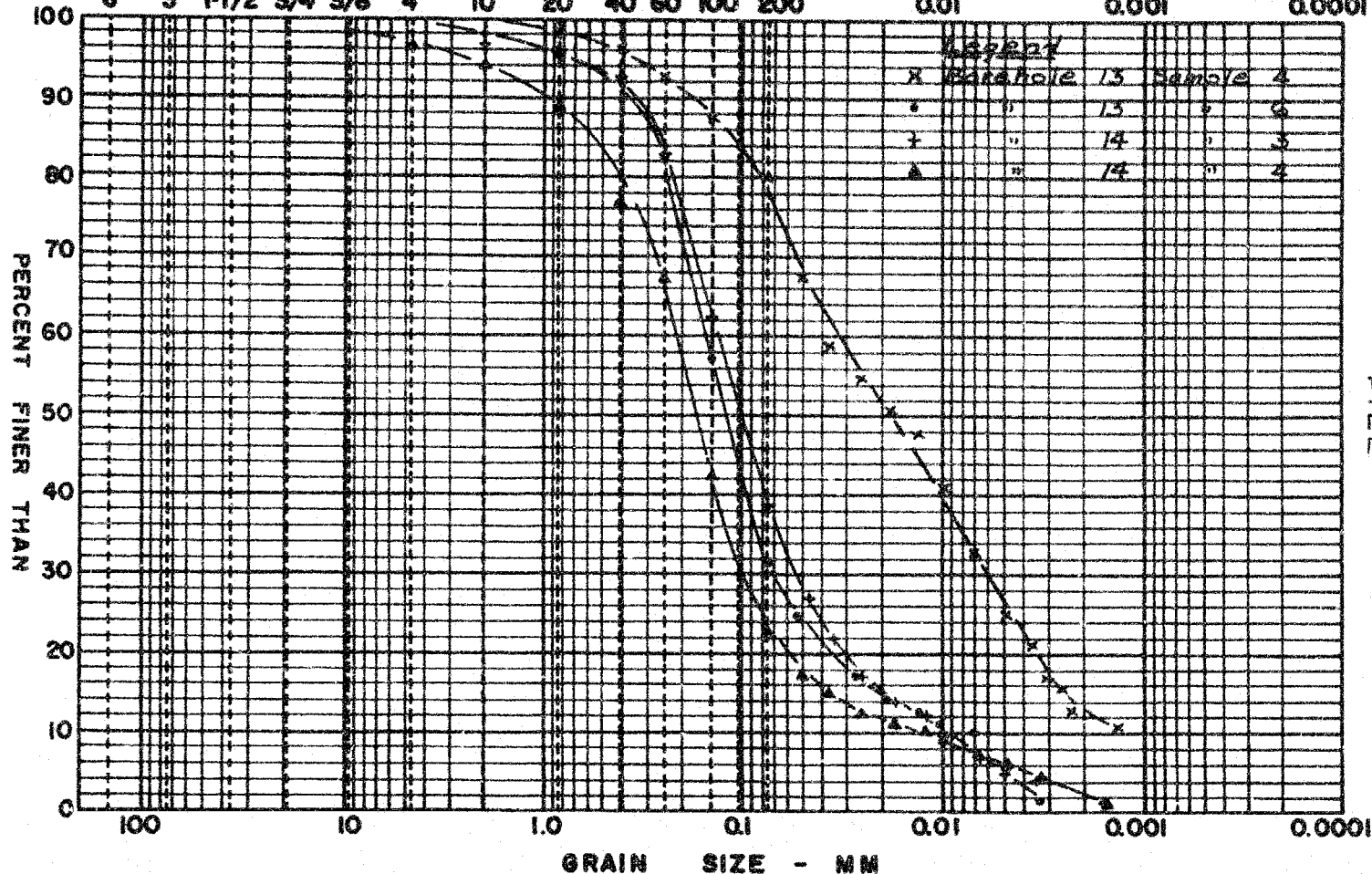
GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 1
PROJECT T9192

COBBLE	GRAVEL SIZE			SAND SIZE			FINE GRAINED	
← SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE →

SIZE OF OPENING-INS. U.S.S. SIEVE SIZE-MESHES/IN. EQUIVALENT GRAIN DIAMETER - MM

6" 3" 1-1/2" 3/4" 3/8" 4 10 20 40 60 100 200 0.01 0.001 0.0001

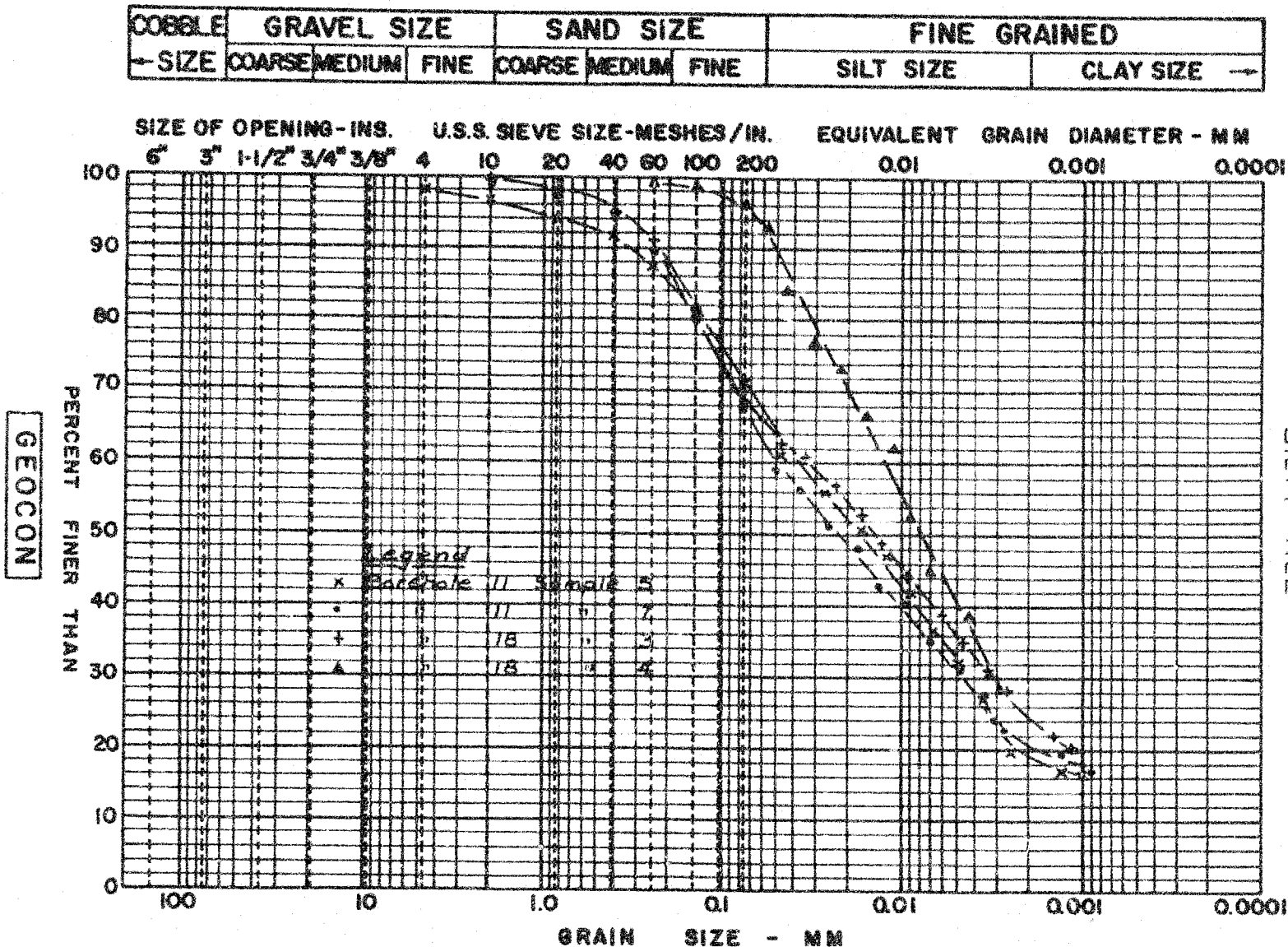


GEOCON

M.I.T. GRAIN SIZE SCALE

GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 2
PROJECT T 9192



M.I.T. GRAIN SIZE SCALE

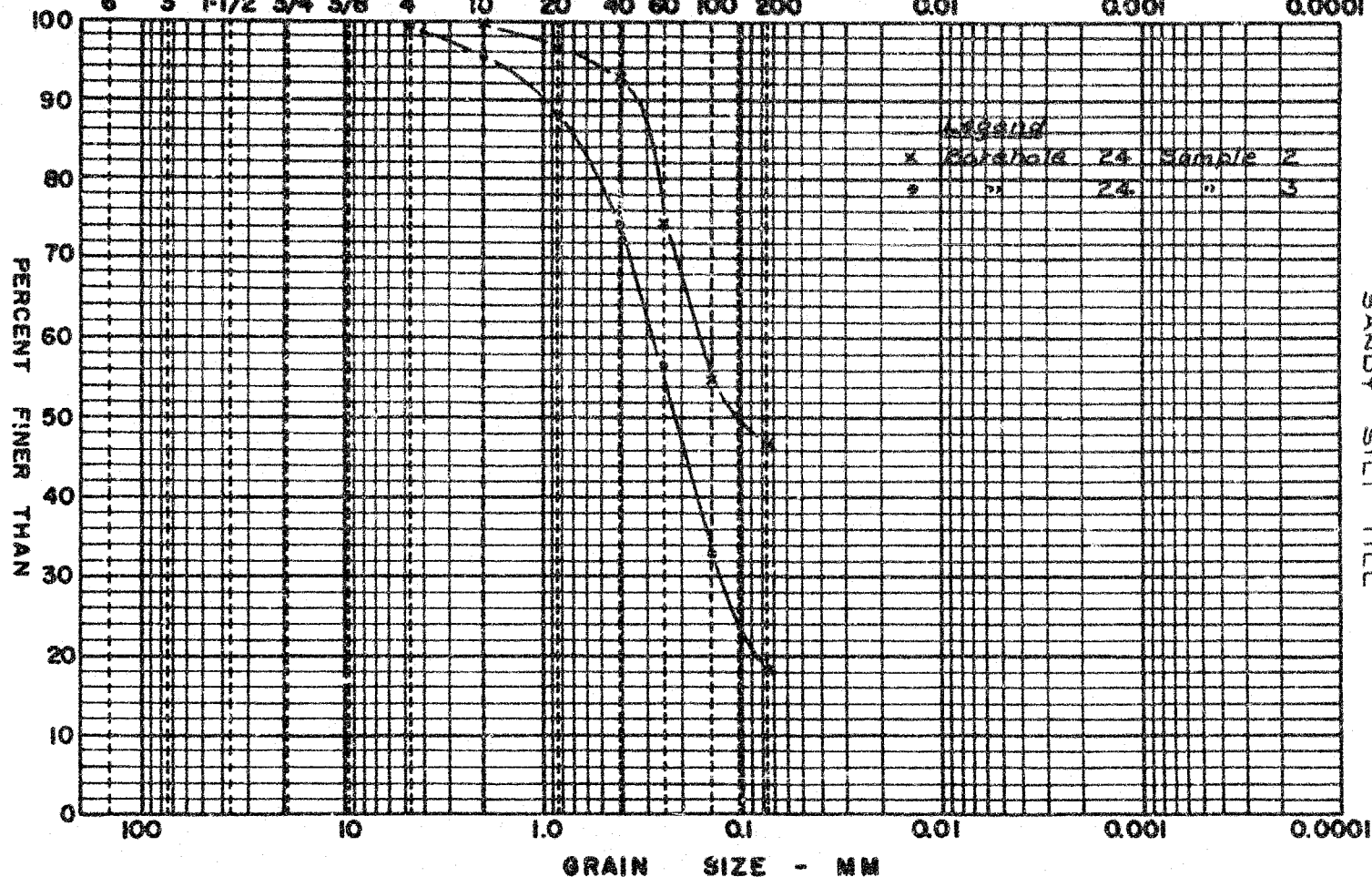
GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 2A
PROJECT T9192

COBBLE ~ SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED	
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE →

SIZE OF OPENING - INS. U.S.S. SIEVE SIZE - MESHES / IN. EQUIVALENT GRAIN DIAMETER - MM

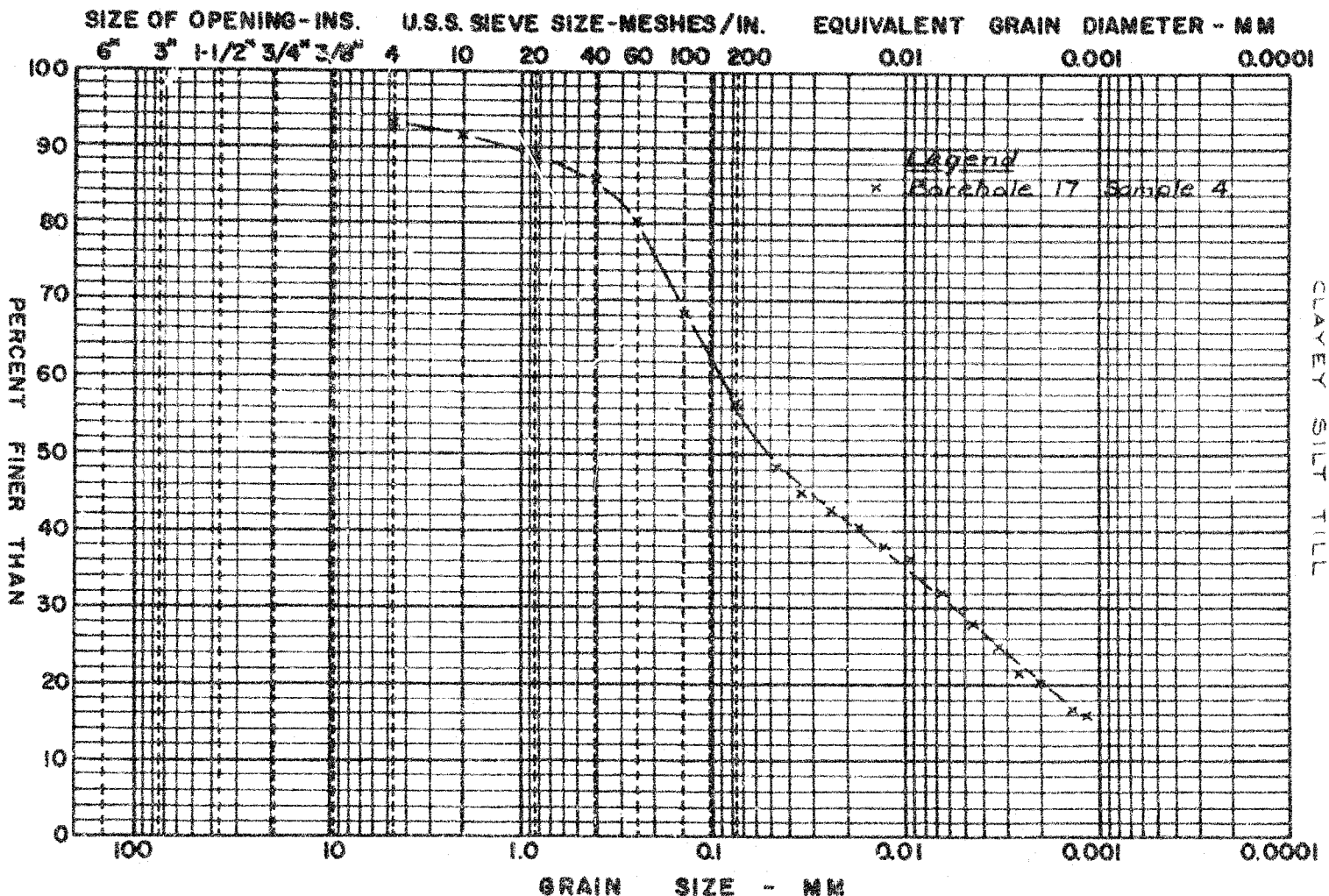
6" 3" 1-1/2" 3/4" 3/8" 4 10 20 40 60 100 200 0.01 0.001 0.0001



GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 2B
PROJECT T9192

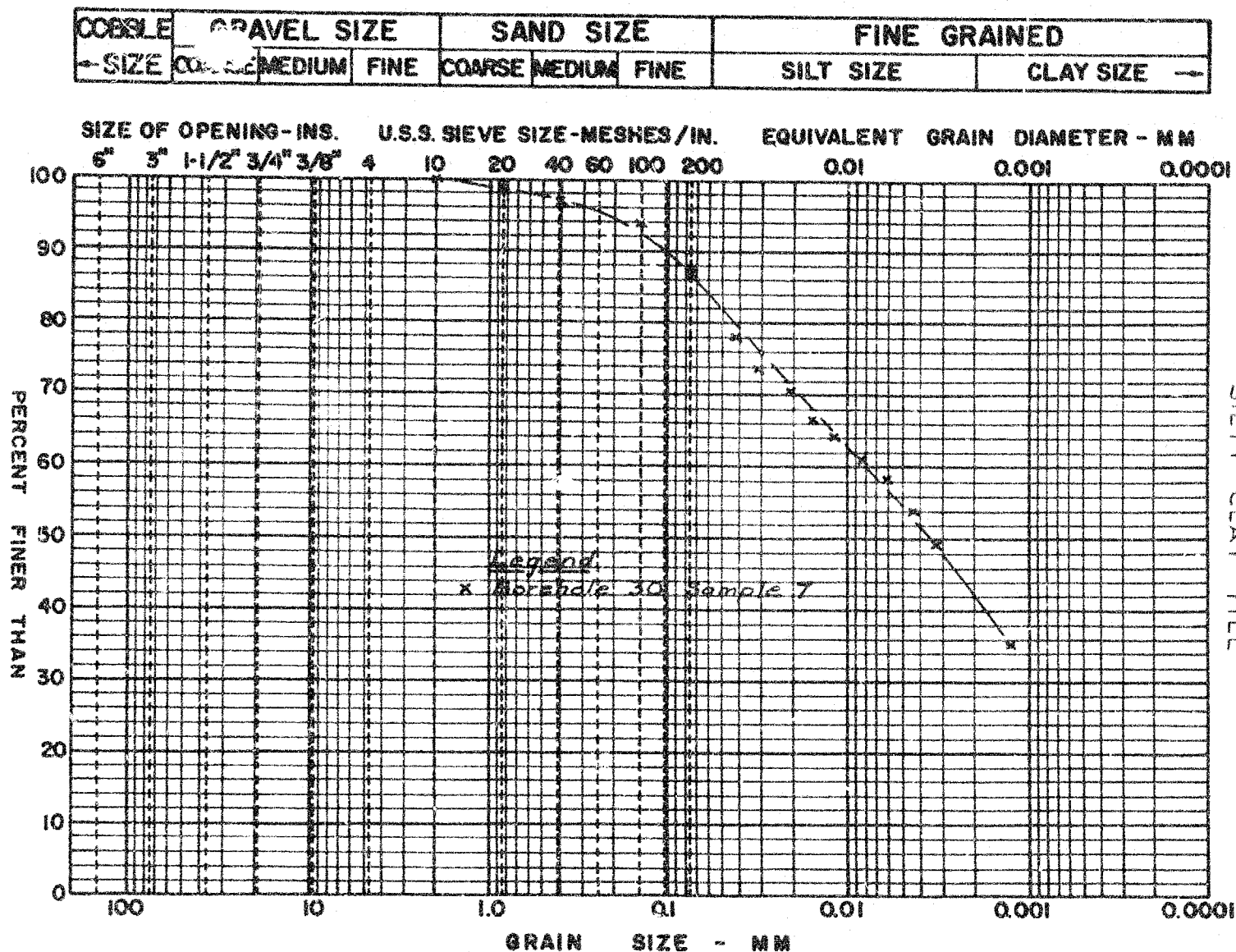
GEOCON



M.I.T. GRAIN SIZE SCALE

GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 2C
PROJECT T9192



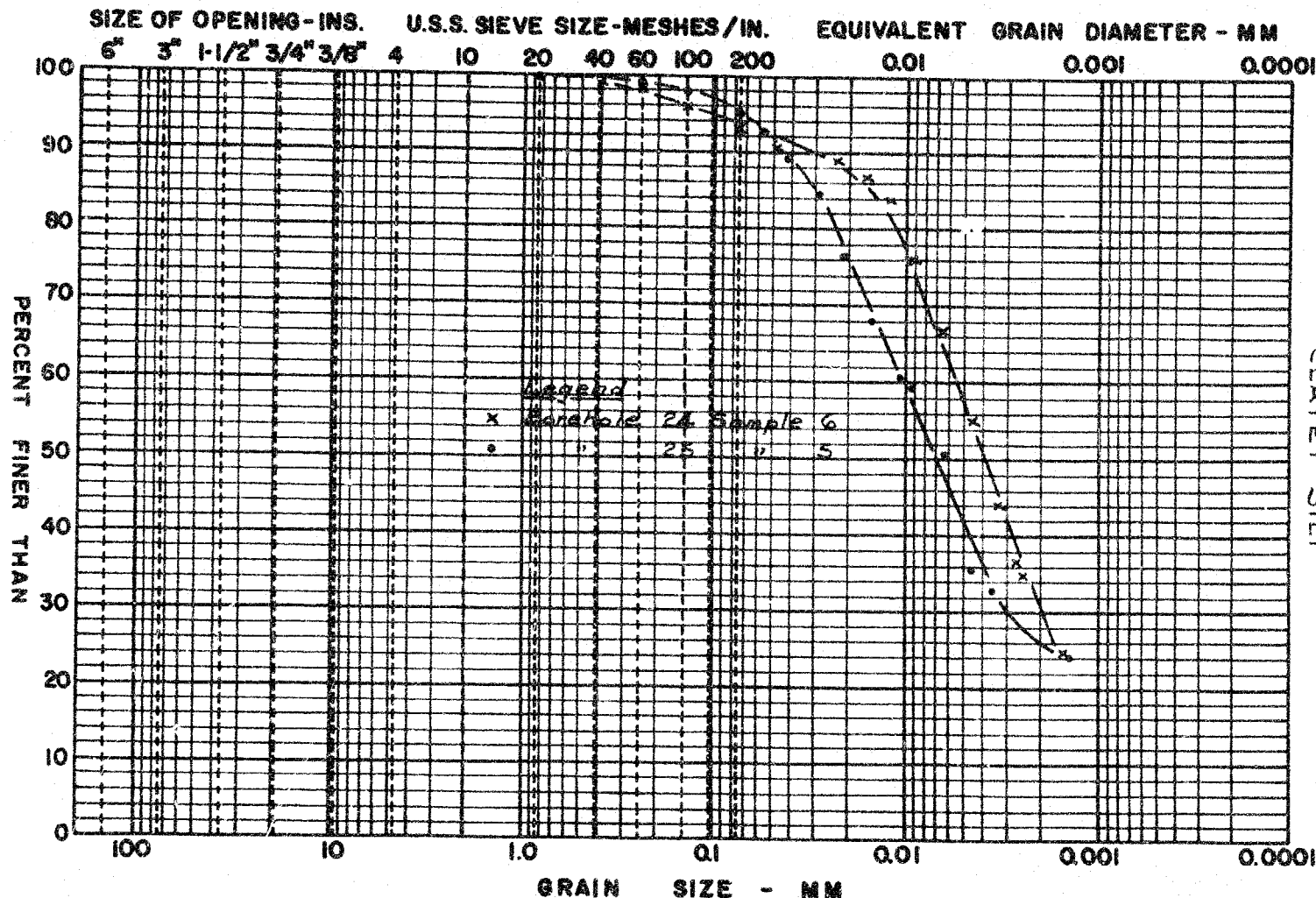
M.I.T. GRAIN SIZE SCALE

GEOCON

GRAIN SIZE DISTRIBUTION

APPENDIX 11
FIGURE 3
PROJECT T9192

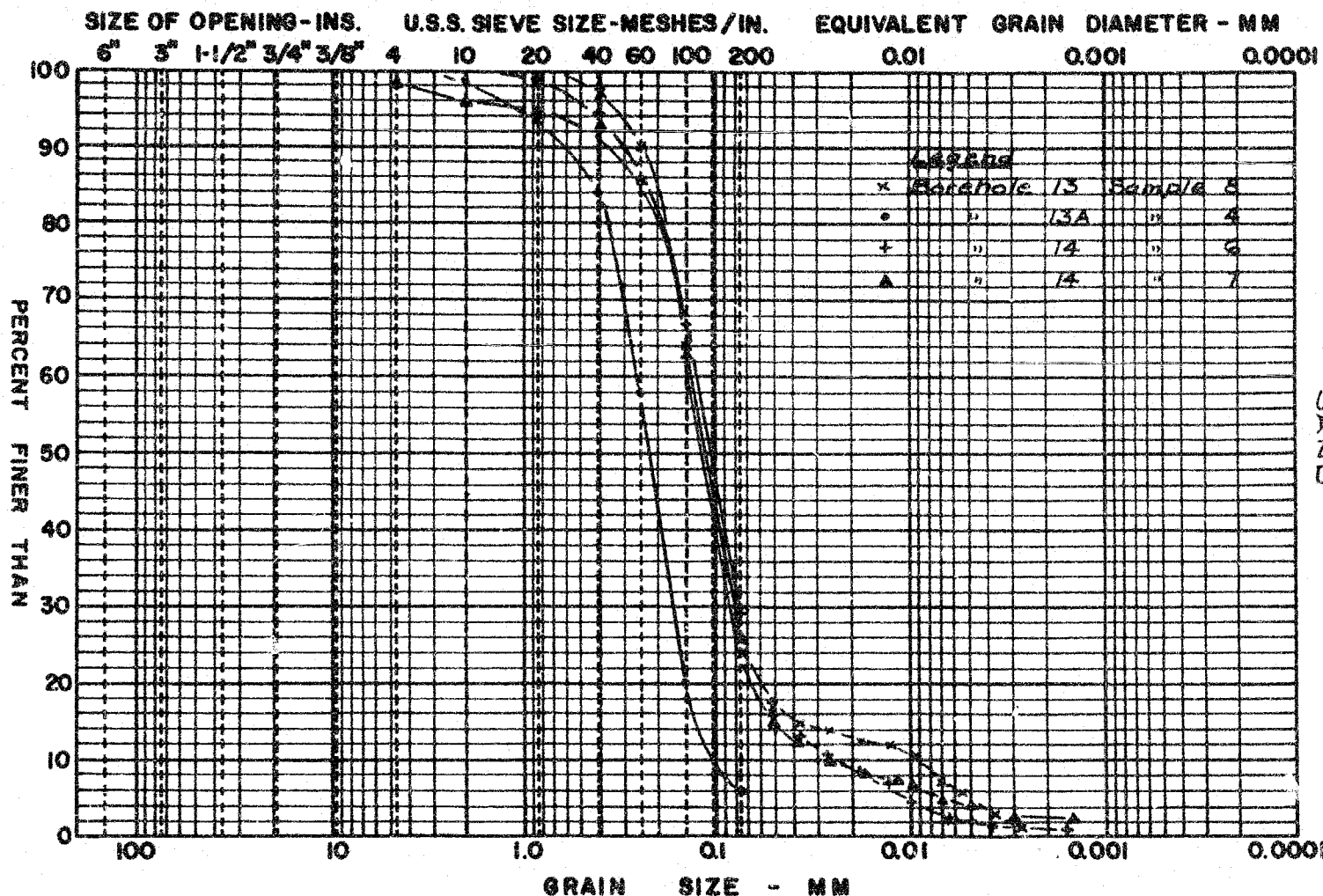
COBBLE ← SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED		CLAY SIZE →
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		



GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 4
PROJECT T9192

COBBLE		GRAVEL SIZE			SAND SIZE			FINE GRAINED	
← SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		SILT SIZE	CLAY SIZE →



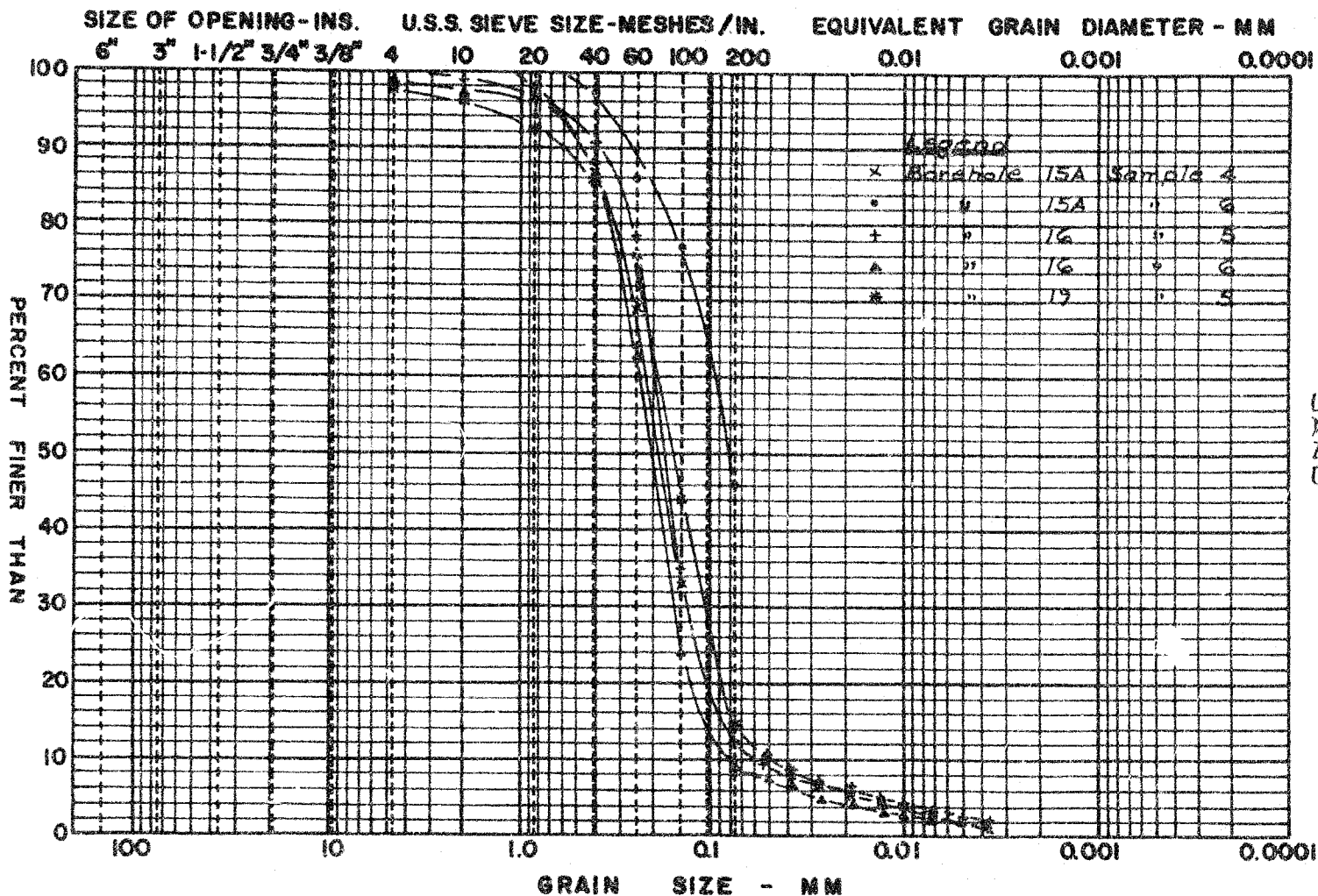
M.I.T. GRAIN SIZE SCALE

GEOCON

GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 4A
PROJECT T9192

COBBLE ← SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED		→ CLAY SIZE
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE	



M.I.T. GRAIN SIZE SCALE

GEOCON

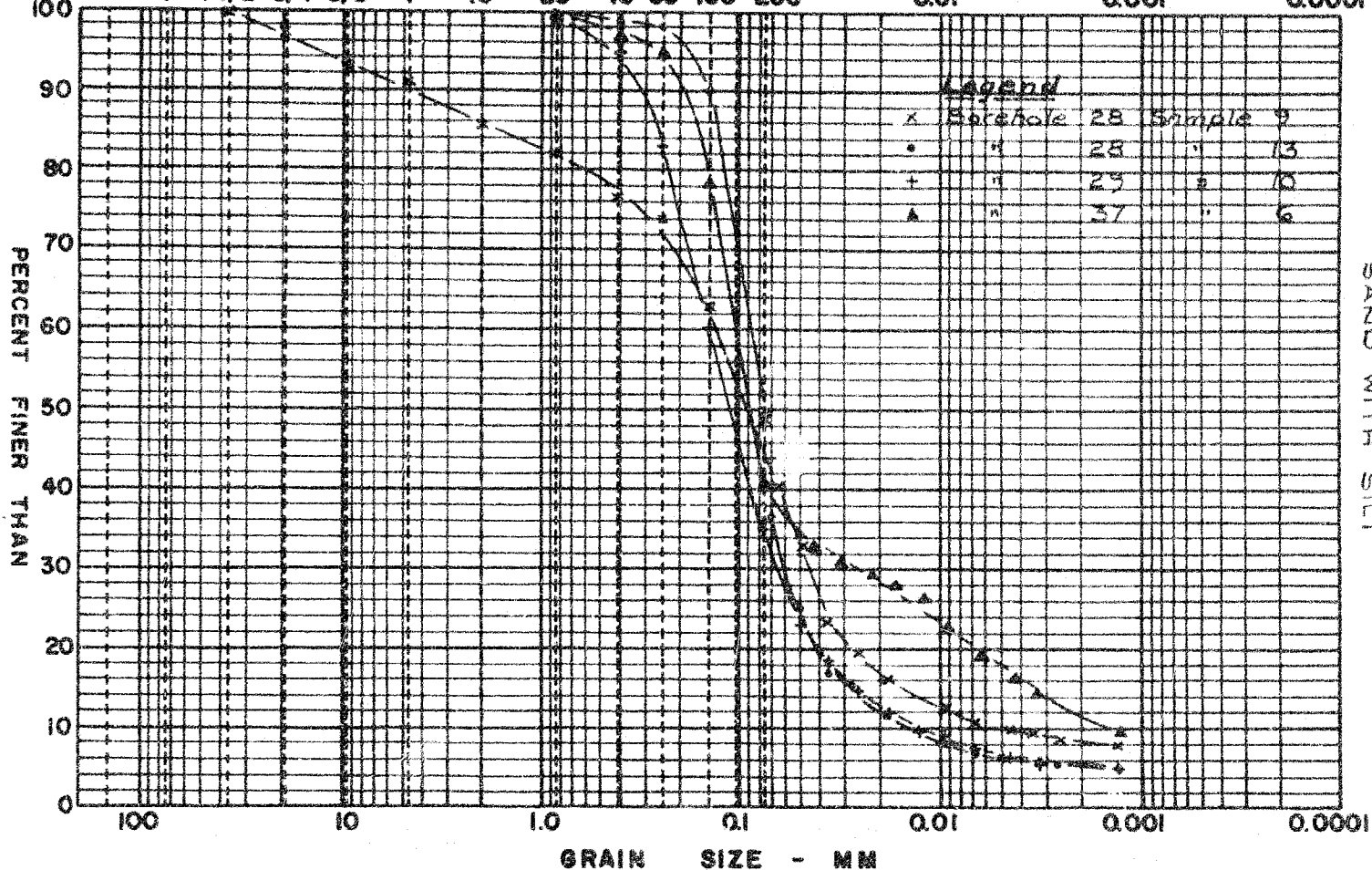
GRAIN SIZE DISTRIBUTION

APPENDIX II
FIGURE 4B
PROJECT T9192

COBBLE		GRAVEL SIZE			SAND SIZE			FINE GRAINED	
← SIZE		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE →

SIZE OF OPENING - INS. U.S.S. SIEVE SIZE - MESHES / IN. EQUIVALENT GRAIN DIAMETER - MM

6" 3" 1-1/2" 3/4" 3/8" 4 10 20 40 60 100 200 0.01 0.001 0.0001



M.I.T. GRAIN SIZE SCALE

GEOCON

GRAIN SIZE DISTRIBUTION

APPENDIX II

FIGURE 4C

PROJECT T 9192

COBBLE -- SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED		CLAY SIZE --
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		

