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W.P. No. 41-66-17/18

CONT. No. 78-66

W. O. No. \_\_\_\_\_

STR. SITE No. 19-536

HWY. No. \_\_\_\_\_

LOCATION Crossing at Thames  
River and Propased King's Hwy.  
402

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded  
before microfilming

## ABSTRACT

The results of an investigation to determine the subsurface conditions at the site of the proposed Thames River Crossing for the proposed King's Highway 402, Line A, in Lot 23, Range I, South Longwoods Road, Township of Caradoc, County of Middlesex, Ontario and Lot 7, Concession D, Township of Delaware, County of Middlesex, Ontario are reported. Geotechnical engineering recommendations are presented for the design and construction of the foundations, approach embankments, cut slopes and excavations for the proposed twin structures.

It was found that the site is underlain by loose sandy silt, loose silty fine sand and compact sand and gravel overlying an extensive stratum of silty clay till. Beneath the silty clay till, clayey silt till was encountered overlying silty clay. The groundwater level in the surficial granular strata appears to be perched several feet above the water level in the clayey silt till. However, the estimated water levels in the clayey silt till are several feet above the corresponding river water level.

It is recommended that the piers be founded on spread footings bearing on the very stiff silty clay till stratum. The abutments may be founded on end bearing steel H piles driven to refusal in the hard clayey silt till.

No overall stability problems are anticipated with the approach embankments at the site. However, specific recommendations are provided for blanketing and protection of both cut and fill slopes adjacent to the proposed structures.

## 1. INTRODUCTION

H. Q. Golder & Associates Ltd. has been retained by the Ministry of Transportation and Communications, Ontario to carry out a subsurface investigation at the site of the two proposed structures to be constructed for the proposed Highway 402 crossing of the Thames River. The Thames River represents the township boundaries in this area of the County of Middlesex. As a consequence the easterly abutments and piers will be in Lot 7, Concession D, Township of Delaware with the westerly abutments and piers in Lot 23, Range I, South Longwoods Road, Township of Caradoc. The site is located on the alignment of the proposed Highway 402, Line A, about 0.5 miles east of the Highway 2 crossing as indicated on the Key Plan, Figure 1. The purpose of the investigation was to determine the soil and groundwater conditions at the site of the proposed structures and to provide geotechnical engineering recommendations for the design and construction of the foundations and approach embankments required for the river crossing.

## 2. PROCEDURE

A total of twenty boreholes, sixteen accompanied by dynamic cone penetration tests, were drilled at the site; concurrently, sixteen additional cone penetration tests were carried out. All drilling and testing was performed at the locations shown on the plan, Figure 1. The boreholes were drilled between May 13 and 27, 1975 using a truck mounted power auger, a crawler mounted power auger and a raft mounted drillrig. The drillrigs and support equipment were supplied and operated by Master Soil Investigations Limited.

The soil stratigraphy encountered in the boreholes is shown in detail on the Record of Borehole sheets following the text of this report and inferred stratigraphic sections across the site are shown together with the plan on Figure 1 and on Figure 2.

Standard penetration tests were carried out in all the boreholes and, in addition, several relatively undisturbed thin walled tube samples of the very stiff silty clay till stratum were obtained. All the samples obtained during the investigation were brought to our London laboratory for detailed examination and representative classification testing. In addition, unconfined compression tests and unconsolidated undrained and consolidated undrained triaxial compression tests were carried out together with one consolidation test on the undisturbed samples of the silty clay till stratum. The results of the laboratory tests are shown on the Records of Boreholes and on Figures 3 to 12 inclusive and on Table I.

Groundwater levels were observed in the boreholes during drilling and perforated standpipes and piezometers were installed in the completed boreholes as detailed on the Record of Borehole sheets. The measured groundwater levels are shown on the Records of Boreholes and on the stratigraphic sections, Figures 1 and 2.

Ground surface elevations at borehole locations have been referred to a bench mark located on a nail and washer in a 0.4 foot diameter shaped stump 109 feet right of station 105+16 on the Highway 402 alignment. The elevation of this bench mark was given by the Ministry of Transportation and Communications, Ontario as 748.11 feet referred to geodetic datum.

The field work was supervised throughout by members of our engineering staff who located the boreholes, determined ground surface elevations at borehole locations, logged the boreholes and cared for the samples obtained. The programme of field work was carried out under the guidance of a senior geotechnical engineer.

### 3. SITE AND GEOLOGY

The proposed structures are located between the proposed Highway 402, Line A, chainage 637+75 in Lot 23, Range I, South Longwoods Road, Township of Caradoc and chainage 102+25 in Lot 7, Concession D of the Township of Delaware, County of Middlesex. This is about 1 mile south of the Village of Delaware and about 0.5 miles east of Highway 2. The site is situated in the flood plain of the Thames River which, in this area, flows generally in a north to south direction; for discussion in this report this line is chosen as nominal north-south. The flood plain at the site is generally level, sloping very gently towards the river on the west bank and away from the river on the east bank. The Thames River at the site is about 155 feet in width at normal stage and flows in a bed extending some 20 feet below the adjacent flood plain. There was about a 3 foot depth of water in the river with the river water level being at about elevation 666 at the time of the investigation.

The apparently stable river bank slopes in the vicinity of the structure have a maximum slope of about 2 horizontal to 1 vertical. However, much of the river bank in the area of the site is unstable and has slopes of up to 1 horizontal to 1 vertical. Such areas exhibit multiple tension cracks and bulging and appear to be sliding into the river as a direct result of erosion of the fine grained cohesionless material at the toe of the slope.

The east river valley wall is located about 300 feet east of the river and rises about 65 feet above the adjacent flood plain. The valley wall in the area of the site has an average existing slope of about 2.5 horizontal to 1 vertical and no overall instability was apparent. The west river valley wall is located west of Highway 2 and some 3800 feet west of the river crossing.

The site is located in the physiographic region known as the Caradoc Sand Plain. These beds of clays, silts and fine sands were deposited by the earliest glacial spillways discharging turbid water into a basin in the glacial till. When the standing water level had been lowered to the level of Lake Whittlesey, the early Thames River cut through these deposits and into the underlying till deposits to create its present valley. The river appears to have eroded away about 10 feet of till in the flood plain with a further 15 feet having been eroded to create the present river channel.

Artesian pressures have been reported at depth in deep wells drilled adjacent to the general area of the site.

Available geological data indicate that the bedrock surface at the site is at about elevation 590 or some 90 feet below ground surface. The bedrock at the site is understood to consist of grey shale and limestone of the Hamilton formation of Devonian Age.

#### 4. SUBSURFACE CONDITIONS

##### 4.1 Soil Conditions

The soil conditions at the site generally consist of topsoil overlying from 4 to 20 feet of surficial granular layers consisting of loose sandy silt, loose silty fine sand and compact sand and gravel which overly an extensive stratum

of very stiff silty clay till to about elevation 650. Beneath the silty clay till, a stratum of hard clayey silt till was penetrated for up to 13 feet. After fully penetrating the clayey silt till boreholes 11 and 16 were terminated in a layer of hard silty clay.

#### 4.1.1 Sandy Silt

Beneath the topsoil in boreholes 3, 5, 8, 11, 13, 16 and 17, and a layer of silty fine sand in boreholes 7 and 10, layers of very loose to loose sandy silt were encountered. These silt layers varied in thickness from 2 to 5 feet at borehole locations and had N values of from 2 to 8 blows per foot. The sandy silt was generally loose with a representative N value of 4 blows per foot. The natural water content of the sandy silt varied from 12 to 29 per cent with an average value of about 21 per cent. Typical grain size distribution curves for the sandy silt layers are shown on Figure 4.

#### 4.1.2 Silty Fine Sand

Underlying the sandy silt in boreholes 3, 11, 16 and 17 and the topsoil in boreholes 4, 7 and 10, layers of very loose to loose silty fine sand were encountered. Additional layers of silty fine sand were found interlayered with the sandy silt in boreholes 7, 10 and 16. The silty fine sand layers varied in thickness from 2 to 8 feet. The measured N values varied from 2 to 15 blows per foot and the silty fine sand was generally loose with a representative N value of 6 blows per foot. The natural water content of the silty fine sand varied from 13 to 35 per cent with an average value of about 22 per cent. Typical grain size distribution curves for the silty fine sand layers are shown on Figure 5.

#### 4.1.3 Sand and Gravel

Below the sandy silt and silty fine sand layers in boreholes 3, 5, 8, 10, 11, 16 and 17 and the topsoil in boreholes 1 and 2 and forming the river bed in boreholes 6, 9 and 12, strata of sand to sand and gravel were found. The sand and gravel strata varied in thickness from 1 to 13 feet at borehole locations and had N values of from 5 to greater than 100 blows per foot. The sand and gravel was generally compact with a representative N value of 23 blows per foot. The natural water content of the sand and gravel varied from 5 to 26 per cent with an average value of about 12 per cent. Typical grain size distribution curves for the sand and gravel strata are shown on Figure 6.

#### 4.1.4 Silty Clay Till

Beneath the surficial granular strata and forming the river bed in boreholes 15, 19 and 20, an extensive stratum of very stiff silty clay till was found. The silty clay till generally extended to about elevation 750 and varied in thickness from 12 to 28 feet where fully penetrated. The silty clay till had measured N values of from 9 to 56 blows per foot with a representative N value of 25 blows per foot. The natural water content of the silty clay till varied from 12 to 26 per cent with an average natural water content of about 19 per cent. The corresponding average liquid and plastic limits were 43 and 25 respectively. The silty clay till had an average bulk unit weight of 130 pounds per cubic foot. The silty clay till is identified on the plasticity chart, Figure 3, as an inorganic clay of low to intermediate plasticity.



The results of the undrained triaxial tests carried out on relatively undisturbed samples of the silty clay till are given in Table I. Based on the results of these tests and the measured N values, the undrained shear strength of this stratum is estimated to range from 1200 to 7000 pounds per square foot and is generally about 3000 pounds per square foot.

The results of a consolidation test carried out on a relatively undisturbed sample of the silty clay till from borehole 11 are shown on Figure 12. The results of this test indicated values for the recompression index  $C_r$  and compression index  $C_c$  of 0.03 and 0.27 respectively. The estimated range of preconsolidation pressure for this sample was 9 to 12 tons per square foot.

Typical grain size distribution curves for the silty clay till are shown on Figures 7 to 9 inclusive.

#### 4.1.5 Clayey Silt Till

All the boreholes which fully penetrated the silty clay till encountered a stratum of hard clayey silt till. The clayey silt till varied from 9 to 10 feet in thickness where fully penetrated. Borehole 5 was terminated in the stratum after penetrating it for 13 feet. The clayey silt till had measured N values of from 18 to greater than 100 blows per foot. The upper 3 feet of clayey silt till had a representative N value of about 30 blows per foot. Below this depth the till strata had N values generally greater than 100 blows per foot. The natural water content of the clayey silt till varied from 6 to 18 per cent with an average value of about 11 per cent. The corresponding average liquid and plastic limits were 24 and 14 respectively.

The clayey silt till is identified on the plasticity chart, Figure 3, as an inorganic clay to an inorganic clay and silt of low plasticity. Typical grain size distribution curves for the clayey silt till stratum are shown on Figure 10. The clayey silt till contained larger particle sizes than those obtained using the restricted 2 inch O.D. sampling equipment and boreholes 9 and 12 were terminated in cobbles and boulders within this stratum.

#### 4.1.6 Silty Clay

Boreholes 11 and 16 were terminated in a layer of hard silty clay underlying the clayey silt stratum. The silty clay which was penetrated for up to 7 feet had N values consistently greater than 100 blows per foot. The natural water content of the silty clay varied from 12 to 18 per cent with an average value of about 15 per cent. The corresponding liquid and plastic limits were 43 and 25 respectively. The silty clay is identified on the plasticity chart, Figure 3, as an inorganic clay of intermediate plasticity. A typical grain size distribution curve for the silty clay is shown on Figure 11.

#### 4.2 Groundwater Conditions

The groundwater levels measured from one to two weeks following installation of the piezometers and perforated standpipes varied from elevation 681 to elevation 646 or from 2 to 37 feet below existing ground surface. The corresponding water level in the Thames River was at elevation 665.2 on May 30, 1975 having varied from elevation 665.2 to elevation 666.4 during the period of the field investigation.

Based on the water level readings obtained during the limited period of the investigation, the stabilized water level in the surficial granular deposit appears to be at about elevation 677 or about 7 feet below the ground surface. The stabilized water level in the piezometers sealed into the clayey silt till is estimated to be at about elevation 670 which is about 14 feet below ground level in the flood plain and some 4 feet above the river water level at the time of the investigation. Additional groundwater level measurements should be carried out to confirm the estimated static water levels detailed above.

## 5. DISCUSSION

It is understood that two bridge structures each some 460 feet long by 36 feet wide are to be constructed at the locations shown on the plan, Figure 1, to carry the proposed King's Highway 402 over the Thames River. The bridges will have either 3 spans with welded steel plate girders or 5 spans with precast prestressed reinforced concrete girders. The proposed structure footing locations for both schemes as provided by the Ministry of Transportation and Communications, Ontario are shown on the plan, Figure 1. The abutments are to be perched in the approach fills. The proposed grade at the centreline of the span is at about elevation 716 with a 1.8 per cent grade rising to the east over the full length of the structure. Approach fills of up to 28 and 40 feet in height will be required for the east and west approaches respectively. The river bed cross section at the structure locations is to be increased to provide adequate hydraulic capacity by excavating back into the existing banks as indicated on the stratigraphic section Figure 2.

## 5.1 Foundations

### 5.1.1 Spread Footings

The proposed piers may be founded on conventional spread footings bearing on the very stiff silty clay till or hard clayey silt till. From bearing capacity considerations an allowable bearing pressure of 3 tons per square foot may be used for design for footings founded between elevation 665 and elevation 645. For footings founded at or below elevation 645, a maximum allowable bearing pressure of 8 tons per square foot may be used. The computed total settlement for footings founded on the very stiff silty clay till at elevation 655 is 1 inch. Similarly, footings founded at elevation 650 would be expected to undergo settlements of  $\frac{1}{2}$  inch. The anticipated differential settlement is approximately one half of the total settlement in each case. Settlements of less than  $\frac{1}{2}$  inch are anticipated for footings founded at elevation 645 on the hard clayey silt till.

### 5.1.2 Piles

The abutments which are to be perched in the approach fills will be founded on steel H piles driven to refusal in the hard clayey silt till. For a typical 12BP74 pile driven to a final set of at least 10 blows per inch with a steam or diesel hammer developing at least 20,000 foot-pounds of energy per blow an allowable load of 100 tons per pile may be used in design. Pile driving data should be carefully recorded and the capacity of each pile checked using the Hiley dynamic formula and making appropriate allowances for reduction in pile capacity due to negative skin friction induced by embankment and foundation settlement. It is anticipated that the required final set can be obtained by the piles penetrating

from 2 to 7 feet into the hard clayey silt till or to about the following elevations:

<u>LOCATION</u>	<u>ELEVATION</u>
Eastbound structure	
East Abutment	645
West Abutment	640
Westbound structure	
East Abutment	647
West Abutment	642

The settlement of the completed structures founded on H piles as detailed above should be less than  $\frac{1}{2}$  inch.

The outer ring of piles should be battered in all directions and the pile caps should be provided with at least 3 feet of frost cover.

As an alternative to spread footing foundations, the piers may also be founded on steel H piles driven to refusal in the hard clayey silt till as detailed above for the abutments. It is estimated that the average penetration at the pier locations for H piles driven as specified above will be to about elevation 644 for both structures.

## 5.2 Abutments

If retaining type abutments are used, it is recommended that free draining and non-frost susceptible granular backfill be used behind the abutments. The granular backfill should extend horizontally a minimum distance of 6 feet from the back of the pile cap and then slope up and away from the cap at a slope of 1 horizontal to 1 vertical. The granular backfill should be placed in horizontal lifts with a maximum thickness of 18 inches and compacted using vibratory equipment.

The granular backfill should be uniformly compacted to 100 per cent of standard Proctor maximum dry density in accordance with current Ministry of Transportation and Communications specifications. It is recommended that, providing there is effective drainage behind the walls, a coefficient of lateral earth pressure of 0.3 and a total unit weight of 135 pounds per cubic foot be used for the compacted granular backfill in the design of the walls.

In order to minimize the detrimental effects of any differential settlement between the pile supported abutments and the relatively high approach fills, it is recommended that reinforced concrete approach slabs be constructed at each abutment location.

### 5.3 Embankments

No major geotechnical problems are anticipated during the construction of the proposed 28 and 40 foot high approach fills for the east and west abutments. Native material may be used to construct these embankments in accordance with the procedures outlined in the Ministry of Transportation and Communications, Ontario Specifications, Form 214. It is understood that excavated material from the proposed cuts in the valley wall east of this site will be used to build the 40 foot high east approach fills. Based on available geological data, the borrow materials will consist primarily of clayey silt and silty clay. Provided that these materials are suitably placed and adequately compacted, standard 2 horizontal to 1 vertical side slopes may be used. Due to the presence of the 10 foot thickness of very loose to loose sandy silt and silty fine sand strata at the east abutment locations, total foundation settlements in the order of 6 inches are anticipated beneath the proposed fills in addition to the settlement within the fill itself.

The west approach fills which will have a maximum height of about 28 feet will be constructed with borrow materials obtained from cuts located to the west of the site. Available geological data suggest that the borrow material for these fills will be essentially granular in nature. Fill foundation settlements of about 2 inches are anticipated for the west approach fills.

Although no overall stability problems for the approach fills are anticipated in the areas of the abutments it is recommended that, in view of the difficulties encountered with poor performance of such fills further downstream, particularly following pile driving operations, the proposed fills be carefully instrumented and monitored.

Adequate rip-rap protection should be provided for the approach embankments. The rip-rap should be placed on a suitably graded filter material to prevent loss of fine grained fill material through the rip-rap. X

#### 5.4 Cut Slopes

The excavations required to extend the limits of the river bed as indicated on Figure 2 will extend through the strata of very loose to loose sandy silt and silty fine sand on both sides of the river. Based on the soil and groundwater conditions encountered in the boreholes drilled in the cut areas, considerable difficulty may be experienced in attempting to stabilize construction slopes. In order to stabilize these slopes, it is recommended that the completed cut slopes be carefully and immediately blanketed with a suitably graded filter material as final excavation and grading proceeds. Provided that provision is made for continuous groundwater flows into the river from both sides, standard 2 horizontal to 1 vertical cut slopes may be used.

However, based on the condition and existing slope of the river banks together with the soil and groundwater conditions, in no case should the slope of the river banks in the area of the proposed structures be allowed to exceed 2 horizontal to 1 vertical.

The completed slopes should be provided with suitably sized rip-rap protection. Depending upon the actual size of the rip-rap, a two stage filter may be required between the rip-rap and slope blanket materials.

No consideration has been given to the stability of the cut to be made in the valley wall immediately east of the site which is beyond the scope of this investigation.

#### 5.5 Excavations

The excavations for the pier foundations will probably be carried out within cofferdams of interlocking steel sheet piling driven into the silty clay till stratum. Based on the measured N values, it is considered that relatively heavy sheeting can be driven to an adequate depth. The cofferdams should be adequately strutted and braced to withstand the anticipated earth and water pressures. Particular attention will be required for the design and construction of cofferdams in the area of the river banks to ensure adequate strutting and lateral stability. Based on the estimated water levels no problems due to bottom heave of excavations of limited width open for relatively short periods of time are anticipated at this site provided that the excavations do not extend below elevation 650 and the steel sheet piling does not extend beneath the base of the excavation. If excavations are required below elevation 650, the stability of the excavations should be carefully reviewed prior to construction.

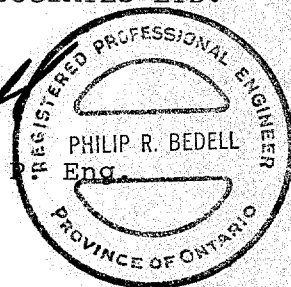


It is recommended that additional water level measurements be obtained over an extended period of time to facilitate any analyses required for the stability of deep excavations at the site.

H. Q. GOLDER & ASSOCIATES LTD.

*Philip R. Bedell*

Philip R. Bedell,



*R. A. Gould*

R. A. Gould, P. Eng.

PRB:RAG:meg

TABLE I

753073

RESULTS OF TRIAXIAL TESTINGSilty Clay Till

Proposed Crossing at Thames River  
and  
Proposed King's Highway 402  
Townships of Delaware and Caradoc  
County of Middlesex Ontario

<u>BOREHOLE NUMBER</u>	<u>SAMPLE NUMBER</u>	<u>TEST</u>	<u>CELL PRESSURE (psi)</u>	<u>UNDRAINED SHEAR STRENGTH (psf)</u>	<u>NATURAL WATER CONTENT (%)</u>	<u>UNIT WEIGHT (pcf)</u>
11	11	Unconfined	-	2160	20	132
11	11	Unconsolidated Undrained	15	3180	21	130
11	11	Consolidated Undrained	15	3020	19	134
11	13	Unconfined	-	1920	23	128
11	13	Unconsolidated Undrained	15	3020	19	134
11	13	Consolidated Undrained	15	3180	25	125

NOTE: For typical grain size distribution curves see Figures 7, 8 and 9.

## RECORD OF BOREHOLES 1 &amp; 2

LOCATION See Figure 1

BORING DATE MAY 13, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	SOIL PROFILE		SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. 20 40 60 80	COEFFICIENT OF PERMEABILITY, K, CM./SEC. 1x10 1x10 1x10 1x10	PIEZOMETER OR STANDPIPE INSTALLATION							
	ELEVATION DEPTH	DESCRIPTION	STRAT. PLAT	NUMBER					TYPE	BLOWS/FT.	SHEAR STRENGTH CU, LB./SQ.FT.	WATER CONTENT, PERCENT			
POWER AUGER 4.5" DIA. (UNCASED)	6670	GROUND SURFACE				<p><b>BH. 1</b></p> <p>CO-ORDINATES N 15,587,735 E 1,288,031</p>									
	0-0	Black sandy TOPSOIL													
	1-5	Compact to very dense brown SAND AND GRAVEL trace silt	1	2"	26										
			2	"	63										
			3	"	23										
			4	"	26										
672-5	Hard grey SILTY CLAY TILL	5	"	27											
670-5		6	"	41											
16-5	END OF BOREHOLE														
POWER AUGER 4.5" DIA. (UNCASED)	687-6	GROUND SURFACE				<p><b>BH. 2</b></p> <p>CO-ORDINATES N 15,587,627 E 1,287,950</p>									
	685-0	Black sandy TOPSOIL													
	685-2	Compact brown fine to medium SAND	1	2"	13										
			2	"	14										
	681-1			3	"										19
			4	"	19										
673-6	Compact brown SAND AND GRAVEL trace silt	5	"	26											
14-0	Hard grey SILTY CLAY TILL	6	"	35											
671-1															
16-5	END OF BOREHOLE														

GROUND SURF.  
PLASTIC TUBING  
AUGERED MATERIAL  
STANDPIPE  
CAVED MATERIAL  
WATER LEVEL IN STANDPIPE AT ELEV. 681-0 MAY 26, 1975.

GROUND SURF.  
PLASTIC TUBING  
AUGERED MATERIAL  
STANDPIPE  
CAVED MATERIAL  
WATER LEVEL IN STANDPIPE AT ELEV. 680-0 MAY 26, 1975.

0  
15 5 Percent axial strain at failure  
10

VERTICAL SCALE  
1 IN. TO — FT.

Golden Associates

DRAWN W.D.F.  
CHECKED P.R.B.

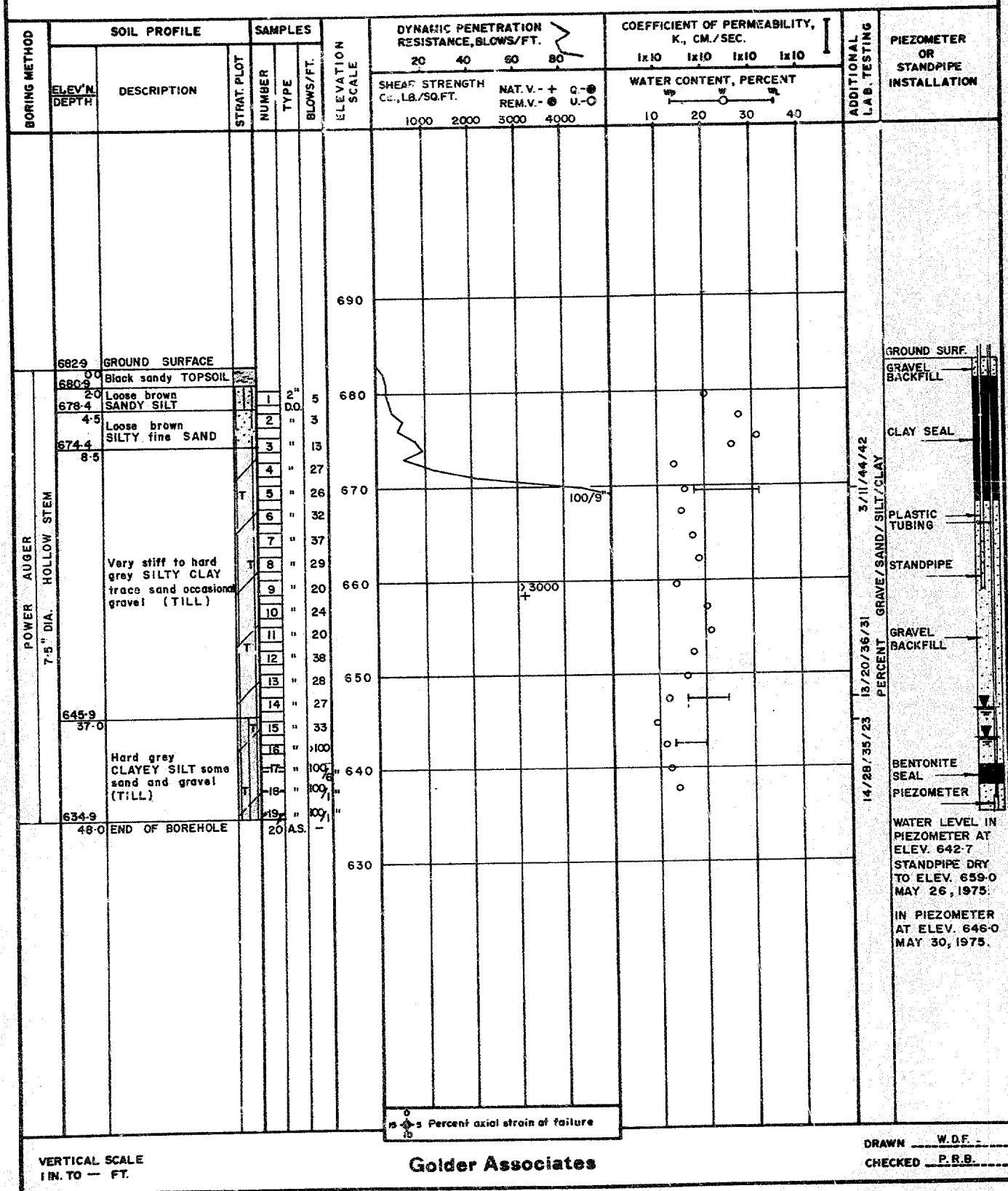
**LOCATION** See Figure 1

BORING DATE MAY 13 & 14, 1975

DATUM            GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN:



# RECORD OF BOREHOLE 4

CO-ORDINATES N 15,587,565 E 1,288,260

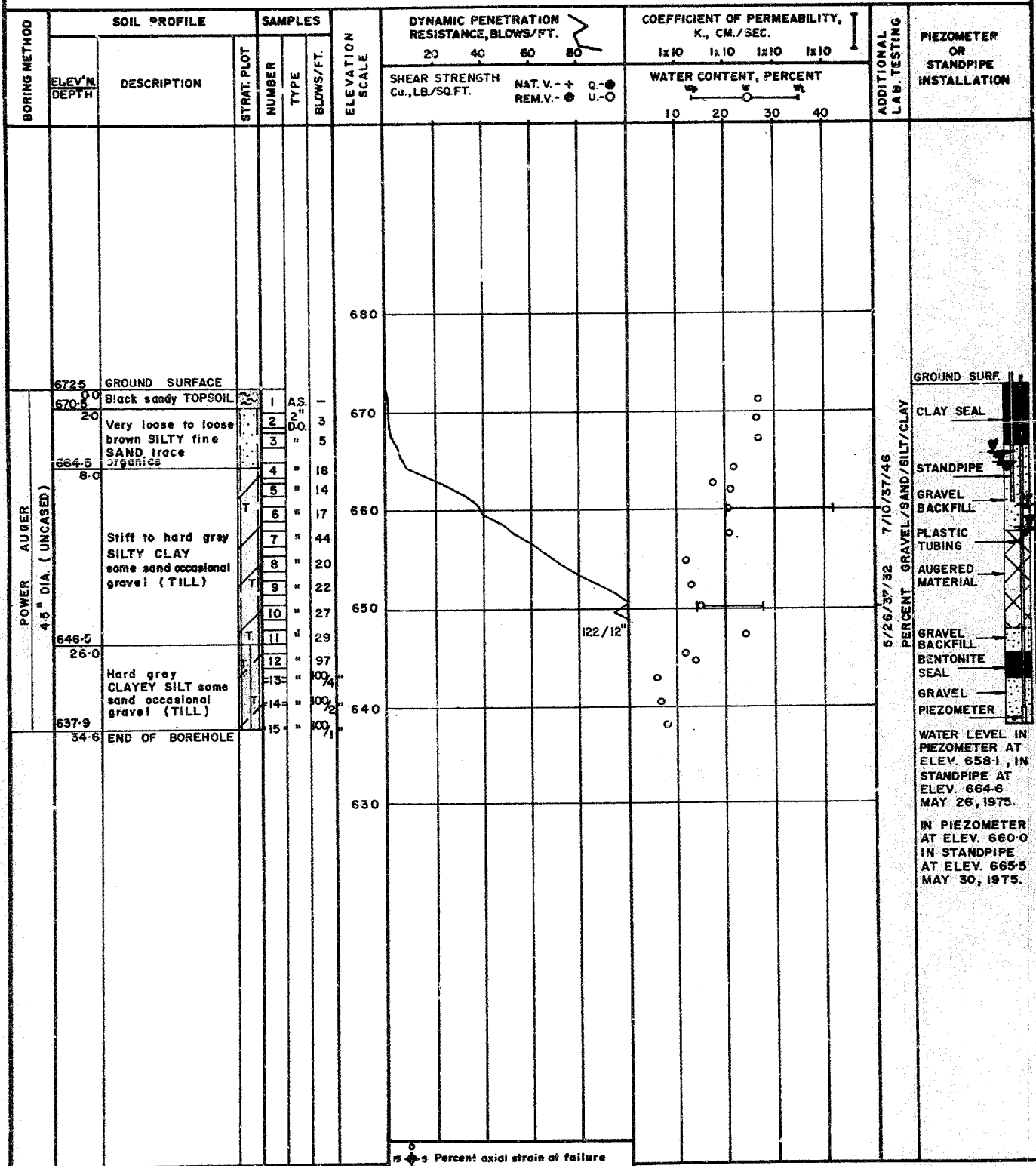
LOCATION See Figure 1

BORING DATE MAY 14, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.



Percent axial strain at failure

VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 5

CO-ORDINATES N 15,597,660 E 1,288,162

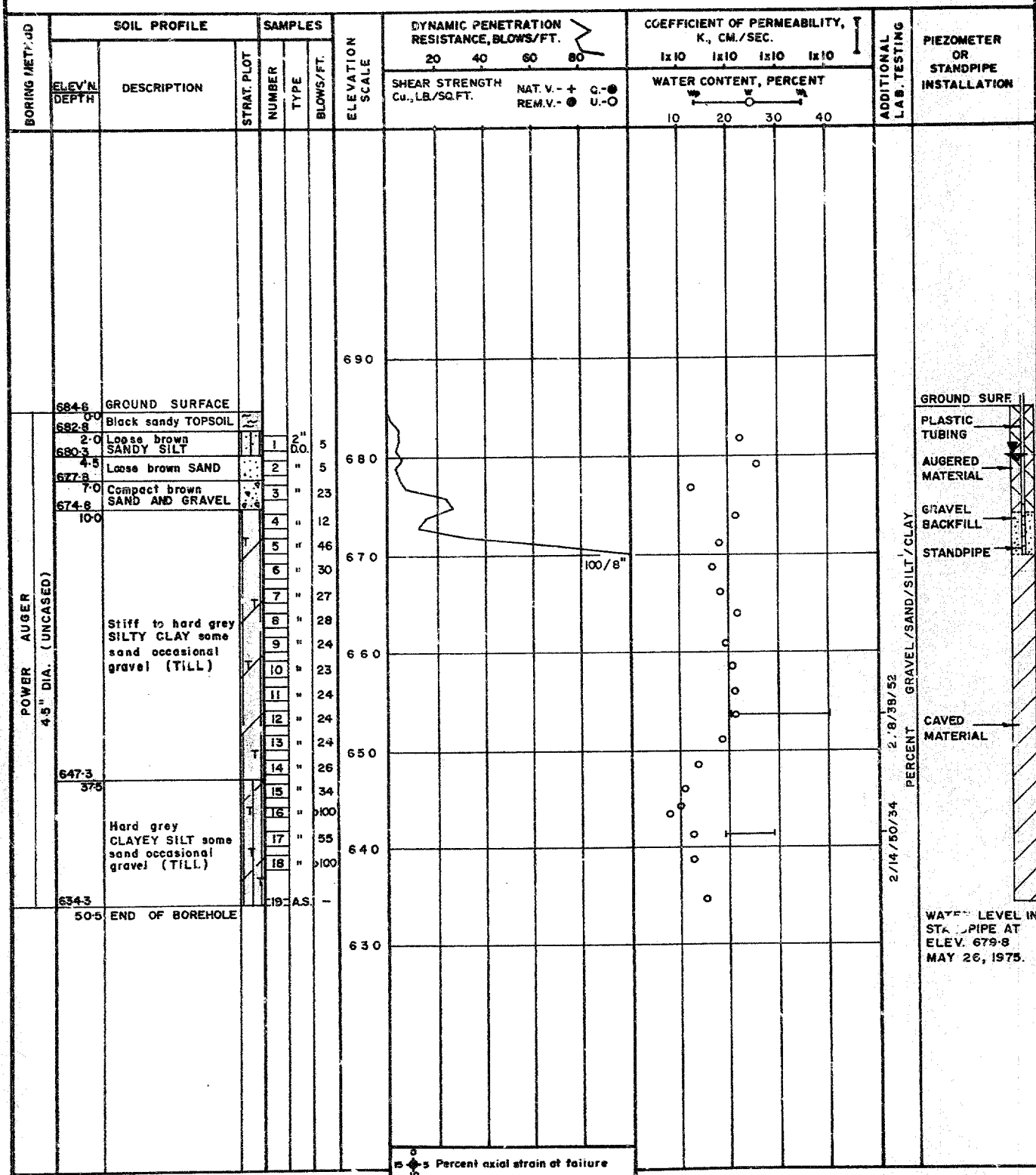
LOCATION See Figure 1

BORING DATE MAY 14 &amp; 15, 1975

DATUM GEODETTIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 6

CO-ORDINATES N 15,587,508 E 1,288,236

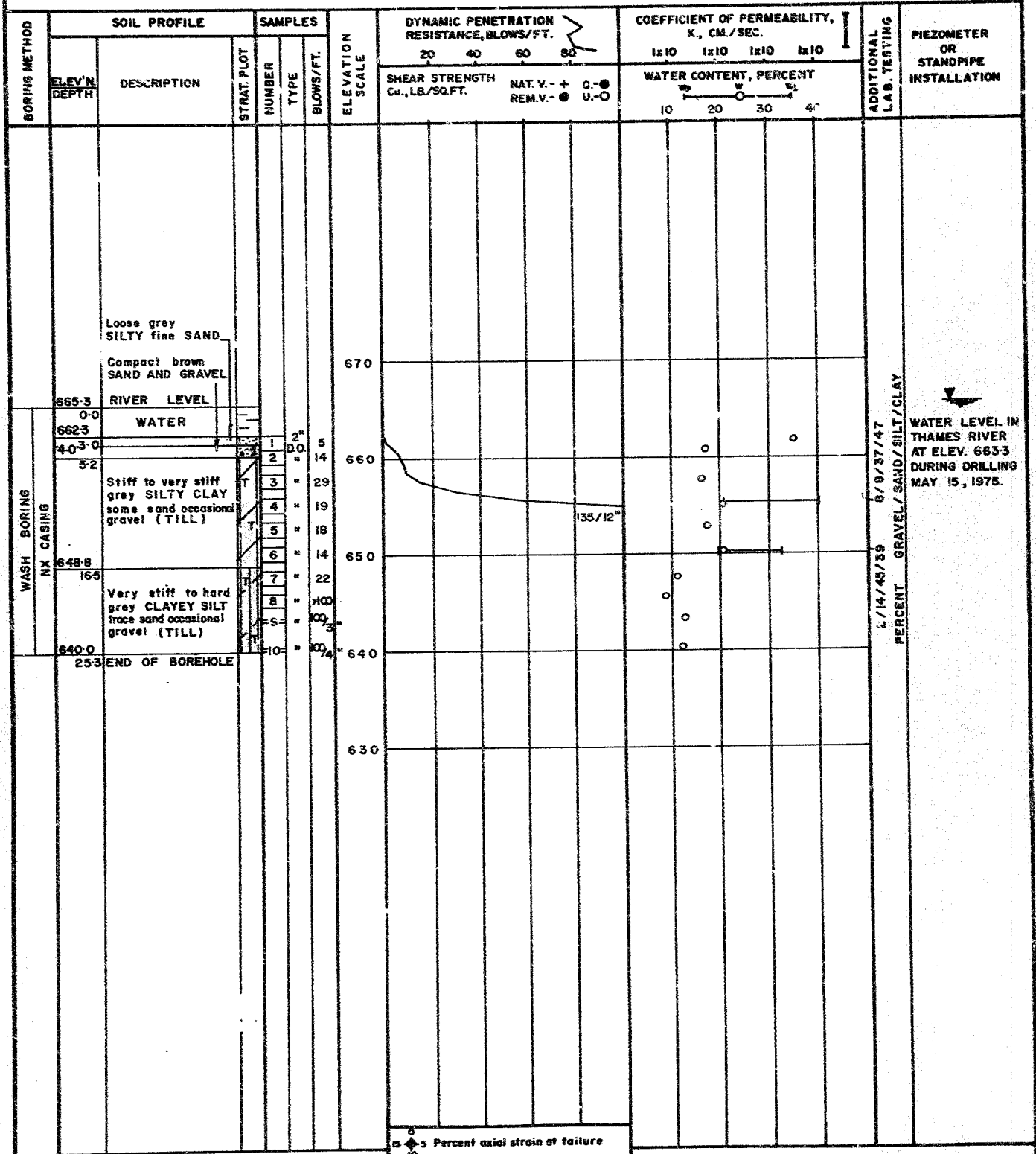
LOCATION See Figure 1

BORING DATE MAY 15, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 7

CO-ORDINATES N 15,557,450 E 1,288,487

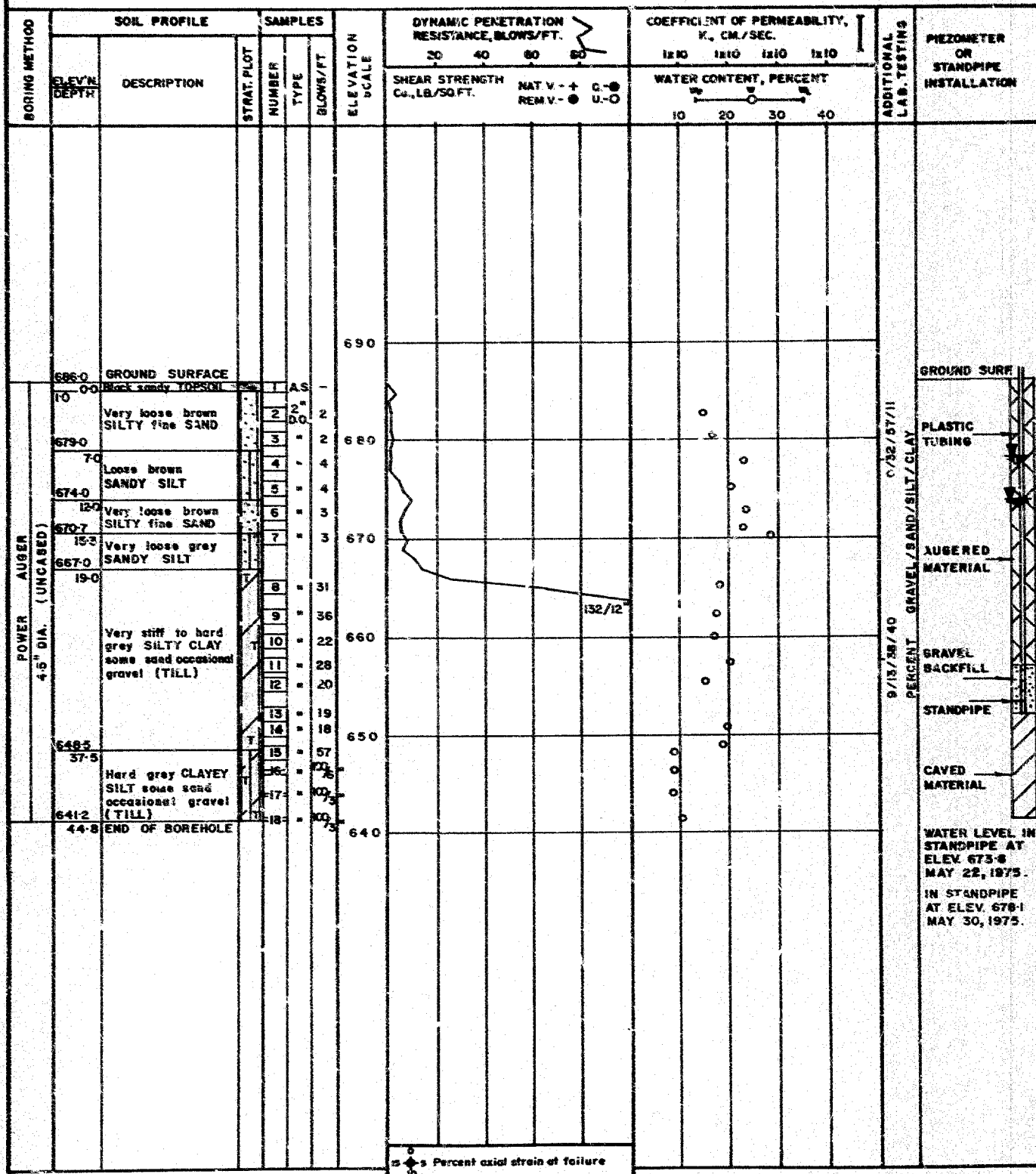
LOCATION See Figure 1

BORING DATE MAY 15 &amp; 16, 1975

DATUM GEODETTIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO - FT.

Golder Associates

DRAWN W.D.E.  
CHECKED P.R.B.



## RECORD OF BOREHOLE 8

CO-ORDINATES N 15,587,590 E 1,288,210

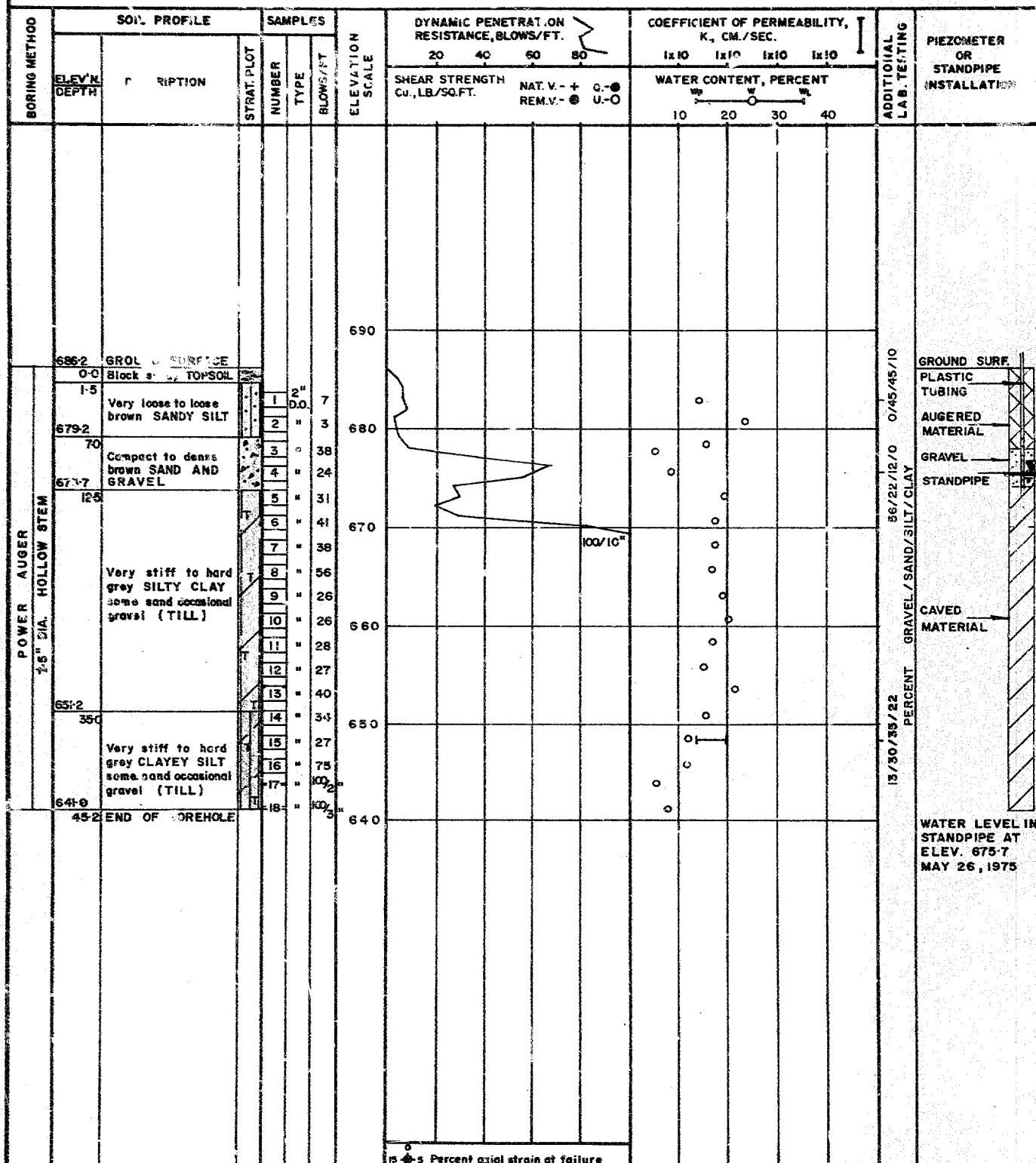
LOCATION See Figure 1

BORING DATE MAY 15 &amp; 16, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO 1 FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 9

CO-ORDINATES N 15,587,467 E 1,288,235

LOCATION: See Figure 1

BORING DATE MAY 16 &amp; 20, 1975.

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	SOIL PROFILE			SAMPLES			ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.		COEFFICIENT OF PERMEABILITY, K, CM./SEC.				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	ELEV. N DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FT.		SHEAR STRENGTH		WATER CONTENT, PERCENT					
								Co., LB./SQ.FT.	NAT. V. - + REM. V. - ● U. - ○	1x10	1x10	1x10	1x10		
VASH BORING NX CASING UNCASED	665.9	Loose grey SAND AND GRAVEL													
	665.9	RIVER LEVEL													
	661.9	WATER													
	658.9														
	658.9	Very stiff grey SILTY CLAY some sand occasional gravel (TILL)		1	2"	9									
	658.9			2	"	20									
	658.9			3	"	18									
	658.9			4	"	21									
	658.9			5	"	27									
	658.9			6	"	25									
NX TRI-CONE	658.9	Hard grey CLAYEY SILT some sand occasional gravel and cobbles (TILL)		7	"	18									
	658.9			8	"	100									
	658.9			9	"	100									
	658.9			10	"	100									
	658.7	END OF BOREHOLE													
	658.7	(BOREHOLE TERMINATED IN COBBLE AT ELEV. 658.7)													

WATER LEVEL IN THAMES RIVER AT ELEV. 665.9 DURING DRILLING MAY 16, 1975.

Percent axial strain at failure

VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.

CHECKED P.R.B.

## RECORD OF BOREHOLE 10

CO-ORDINATES N 15,587,400 E 1,288,428

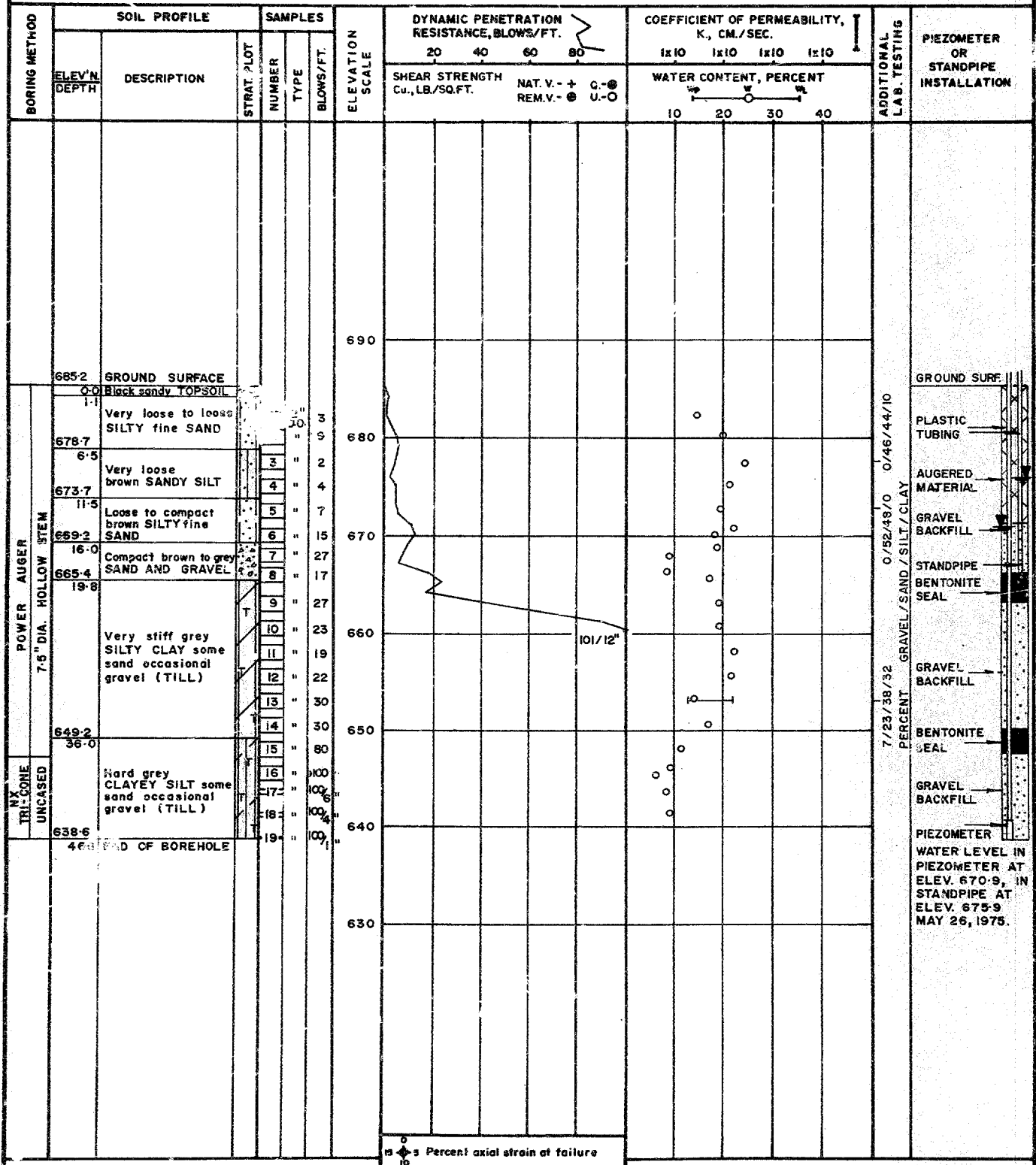
LOCATION See Figure 1

BORING DATE MAY 16, 20 &amp; 21, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO - FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.P.B.

## RECORD OF BOREHOLE II

CO-ORDINATES N 15,587,540 E 1,288,175

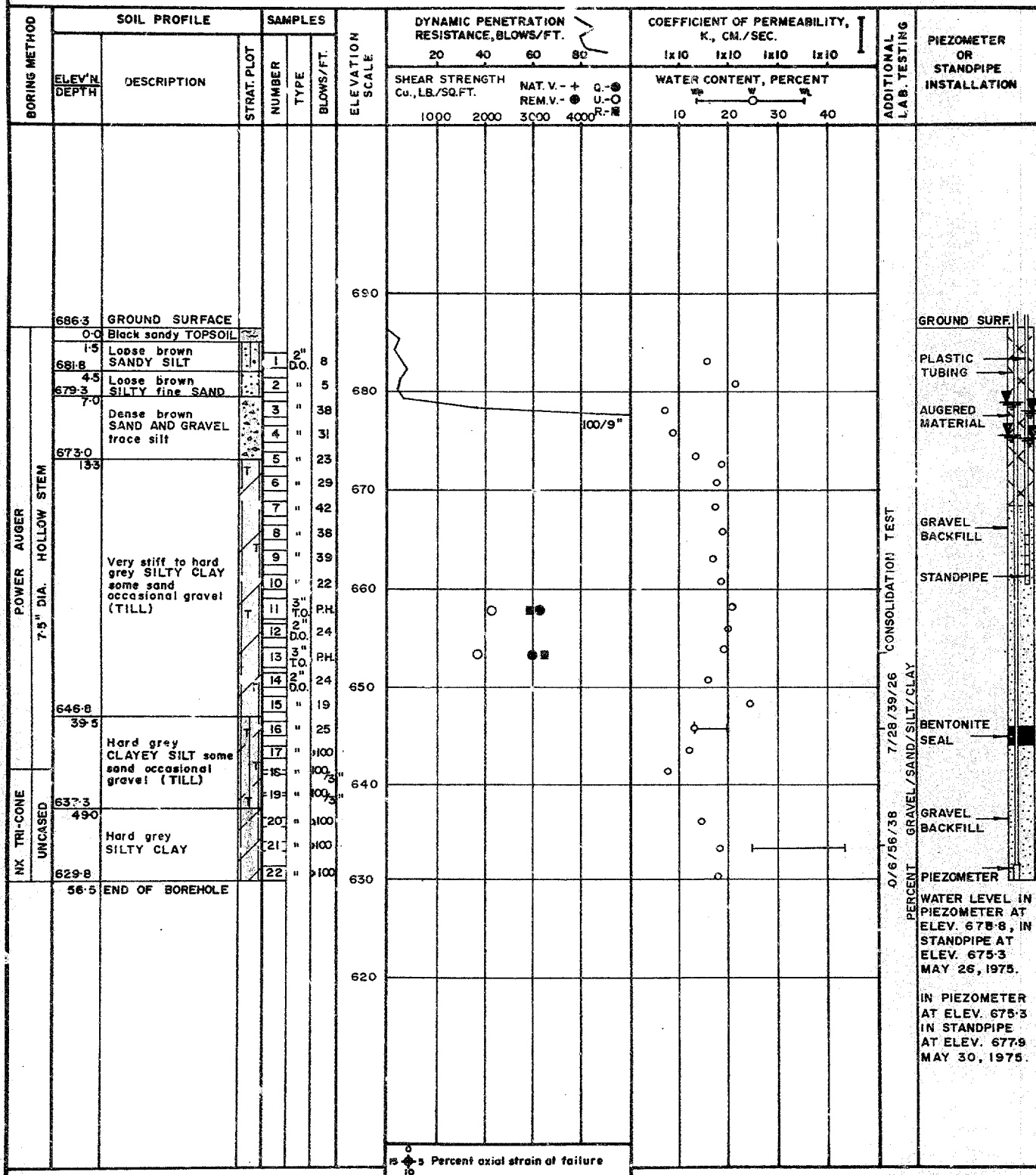
LOCATION See Figure 1

BORING DATE MAY 20 &amp; 21, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.



Golder Associates

DRAWN W.D.F.

CHECKED P.R.B.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN:

[illegible]

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN:

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 15

CO-ORDINATES N 15,587,437 E 1,288,358

LOCATION See Figure 1

BORING DATE MAY 21 &amp; 22, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	SOIL PROFILE		SAMPLES			ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.				COEFFICIENT OF PERMEABILITY, K, CM./SEC.				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
	ELEV./N. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE		BLOWS/FT.	SHEAR STRENGTH Cu., LB./SQ.FT.				WATER CONTENT, PERCENT					
								20	40	60	80	1x10	1x10	1x10			1x10
WASH BORING NX CASING	665.6	RIVER LEVEL															
	663.6	WATER															
	2.0																
		Stiff to very stiff grey SILTY CLAY some sand occasional gravel (TILL)		1	"	00.9											
				2	"	12.6											
				3	"	14.2											
				4	"	22.8											
				5	"	20.4											
				6	"	18.0											
				7	"	24.0											
	Very stiff to hard grey CLAYEY SILT some sand occasional gravel (TILL)		8	"	100.7												
			9	"	100.4												
	640.3	END OF BOREHOLE															
	25.3																

WATER LEVEL IN THAMES RIVER AT ELEV. 665.6 DURING DRILLING MAY 21, 1975.

105/12"

Percent axial strain at failure

VERTICAL SCALE  
1 IN. TO - FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

# RECORD OF BOREHOLE 16

CO-ORDINATES N15,587,333 E 1,288,472

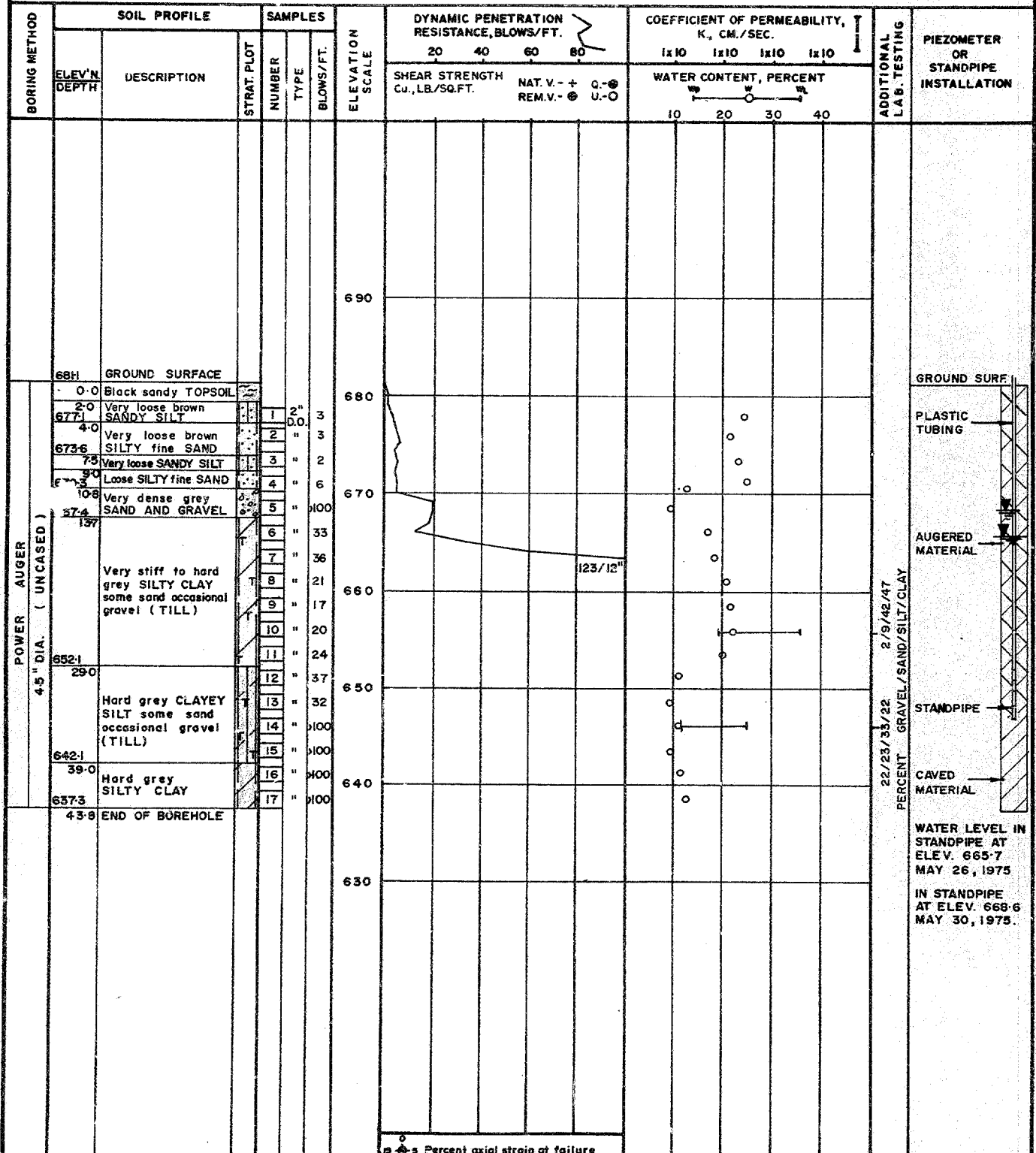
LOCATION See Figure 1

BORING DATE MAY 22, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.



VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.



## RECORD OF BOREHOLE 17

CO-ORDINATES N 15,587,440 E 1,288,550

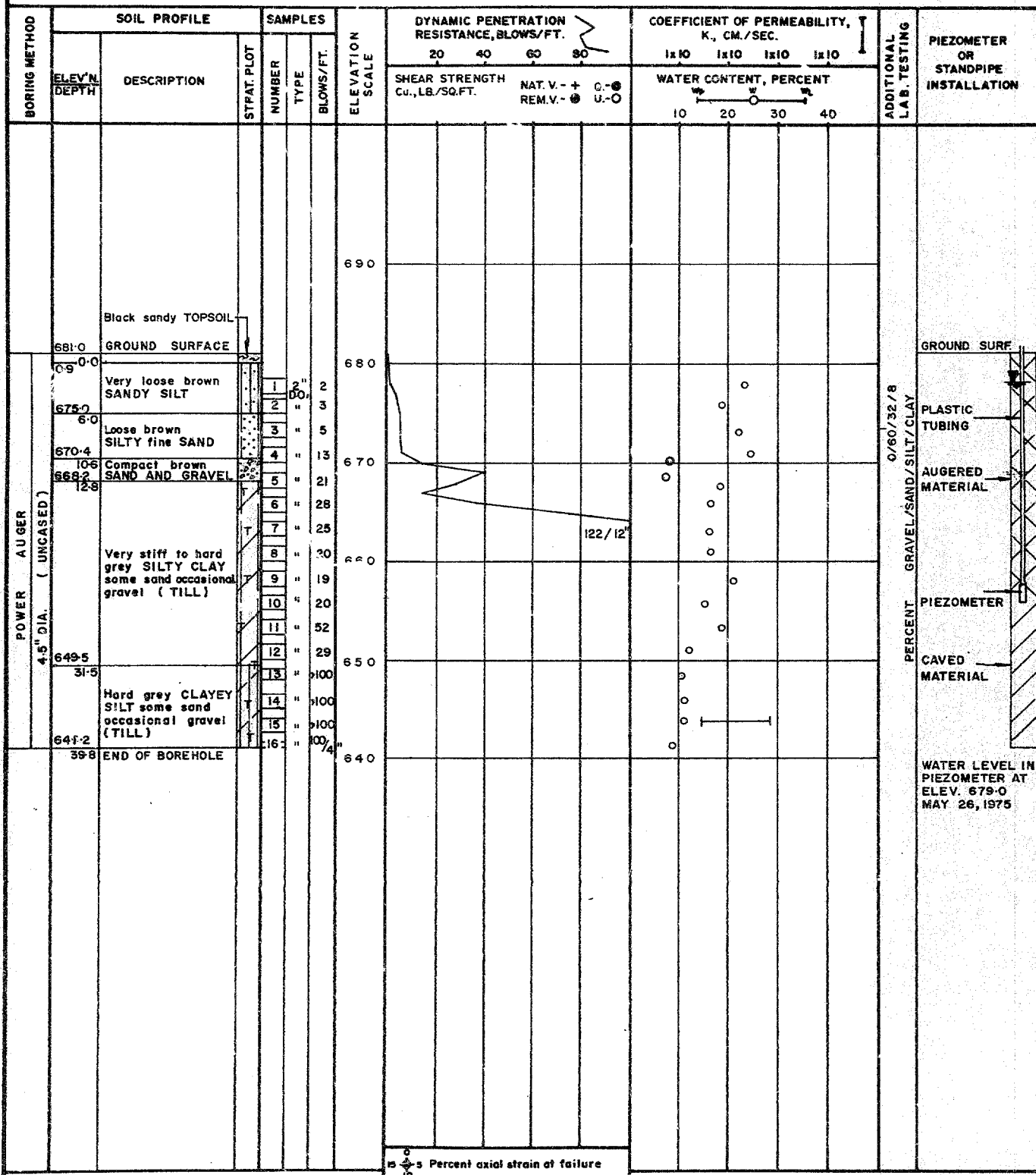
LOCATION See Figure 1

BORING DATE MAY 23 &amp; 26, 1975.

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 18

CO-ORDINATES N 15,587,485 E 1,288,400

LOCATION See Figure 1

BORING DATE MAY 22, 1975.

DATUM GECDETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	SOIL PROFILE		SAMPLES			ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.		COEFFICIENT OF PERMEABILITY, K, CM./SEC.				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
	ELEV'N DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		BLOWS/FT.	20 40 60 80		1x10 1x10 1x10 1x10					
								SHEAR STRENGTH Cu, LB./SQ.FT.		WATER CONTENT, PERCENT					
WASH BORING NX CASING	665.6	RIVER LEVEL													
	0.0	WATER													
	663.1														
	2.5														
		Stiff to very stiff grey SILTY CLAY some sand occasional gravel (TILL)		1	"	50"									
				2	"	12									
				3	"	16									
				4	"	16									
				5	"	25									
649.6			6	"	25										
16.0	Hard grey CLAYEY SILT TILL		7	"	93										
643.0			8	"	100										
			9	"	100										
	22.6	END OF BOREHOLE													

7/12/37/44 PERCENT GRAVEL/SAND/SILT/CLAY

WATER LEVEL IN THAMES RIVER AT ELEV. 665.6 DURING DRILLING MAY 22, 1975.

0 5 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF BOREHOLE 19

CO-ORDINATES N 15,587,527 E 1,288,398

LOCATION See Figure 1

BORING DATE MAY 23 &amp; 26, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.			COEFFICIENT OF PERMEABILITY, K, CM./SEC.				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
	ELEV. N. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		BLOWS/FT.	20 40 60 80			1x10 1x10 1x10 1x10					
								SHEAR STRENGTH Cu., LB./SQ.FT.			WATER CONTENT, PERCENT					
WASH BORING BX CASING	665.6	RIVER LEVEL														
	0-0	WATER														
	2-5	Very stiff grey SILTY CLAY some sand occasional gravel (TILL)		1		17										
			2	25												
			3	16												
			4	15												
			5	28												
	651-1	Hard grey CLAYEY SILT some sand occasional gravel (TILL)		6		27										
	14-5			7	27											
			8	100												
	9		100													
	10		100													
640-4	END OF BOREHOLE															

WATER LEVEL IN THAMES RIVER AT ELEV. 665.6 DURING DRILLING MAY 23, 1975.

100/12

5 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO — FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

# RECORD OF BOREHOLE 20

CO-ORDINATES N 15,587,575 E 1,268,314

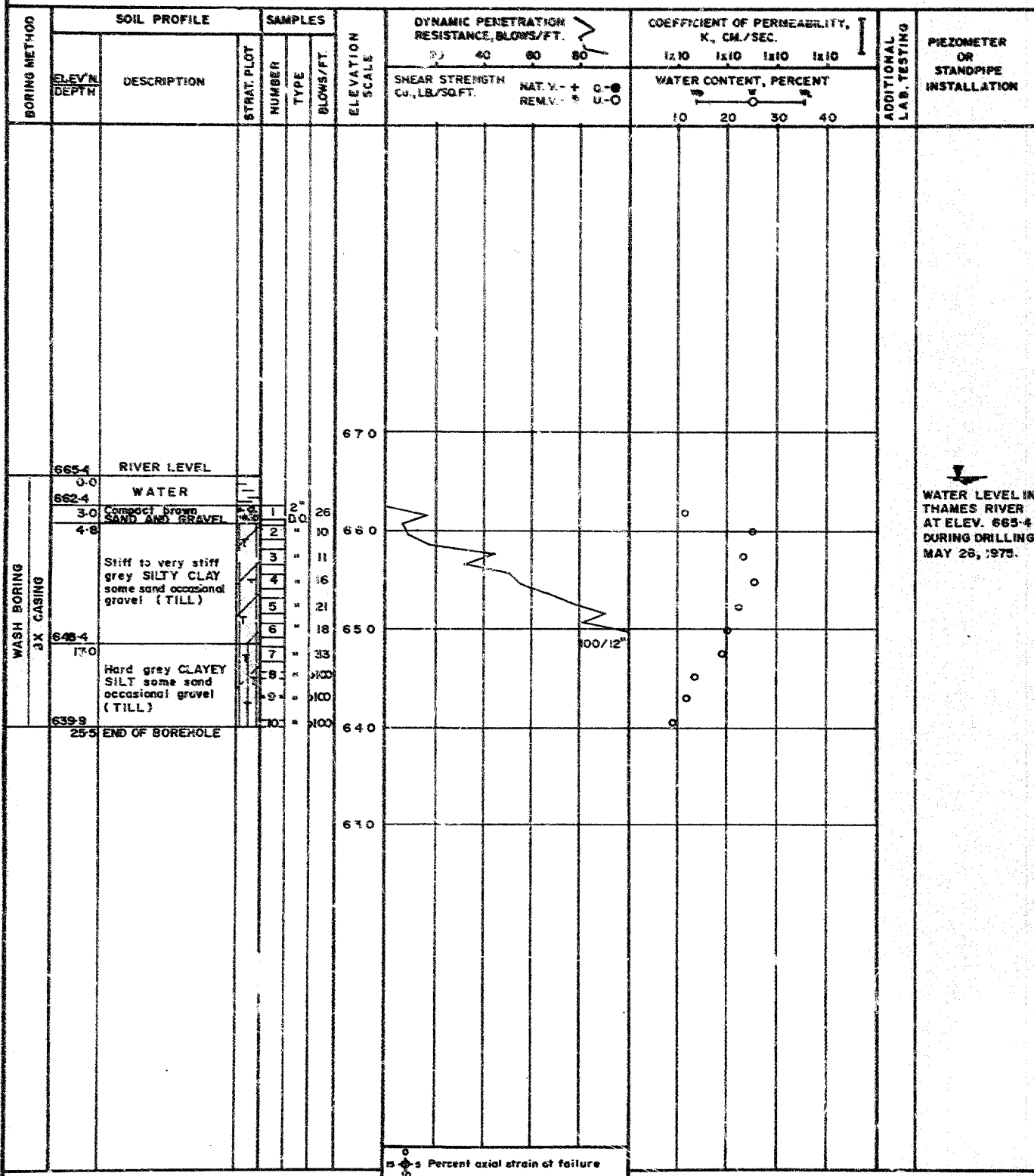
LOCATION See Figure 1

BORING DATE MAY 26 &amp; 27, 1975

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN


VERTICAL SCALE  
1 IN. TO - FT.

Golder Associates

DRAWN W.D.F.

CHECKED P.R.B.

## RECORD OF PENETRATION TESTS 21 to 24

LOCATION

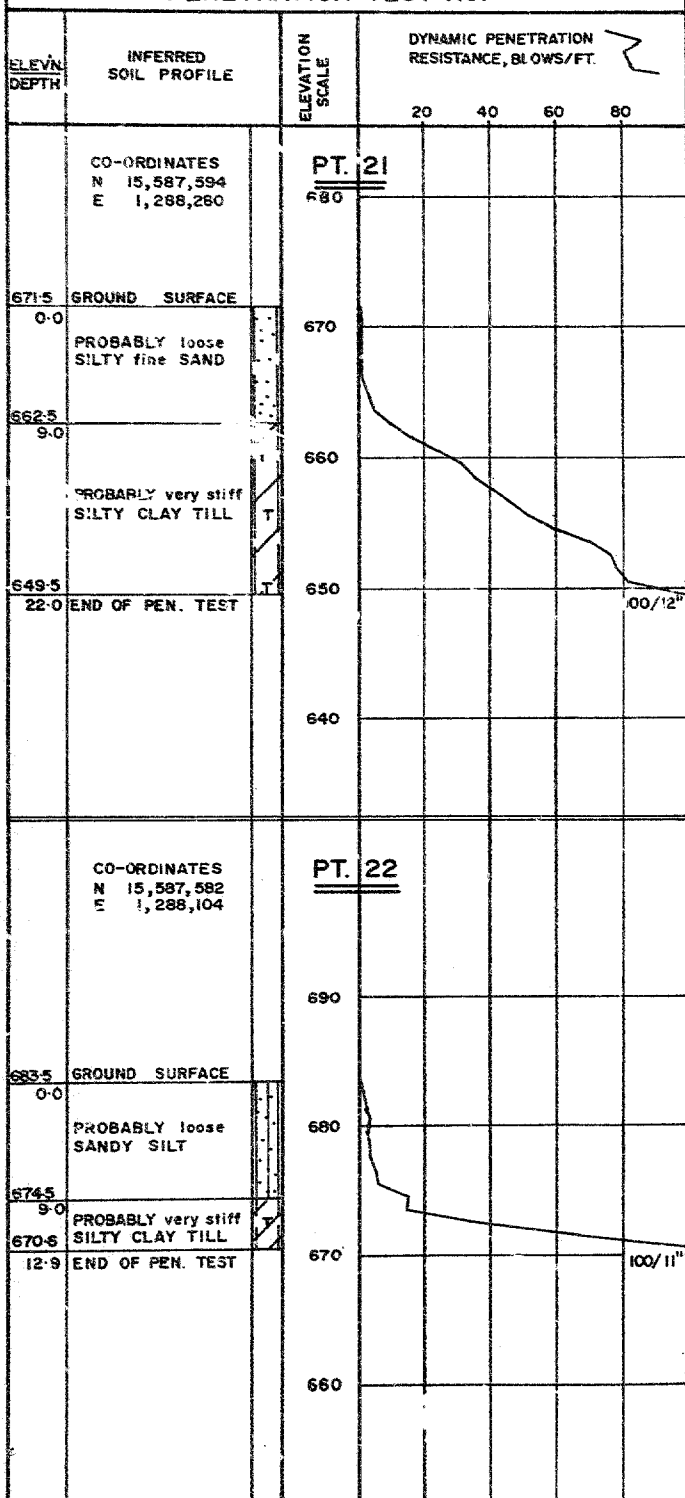
See Figure 1

DRIVING DATE MAY 14 8 16, 1975

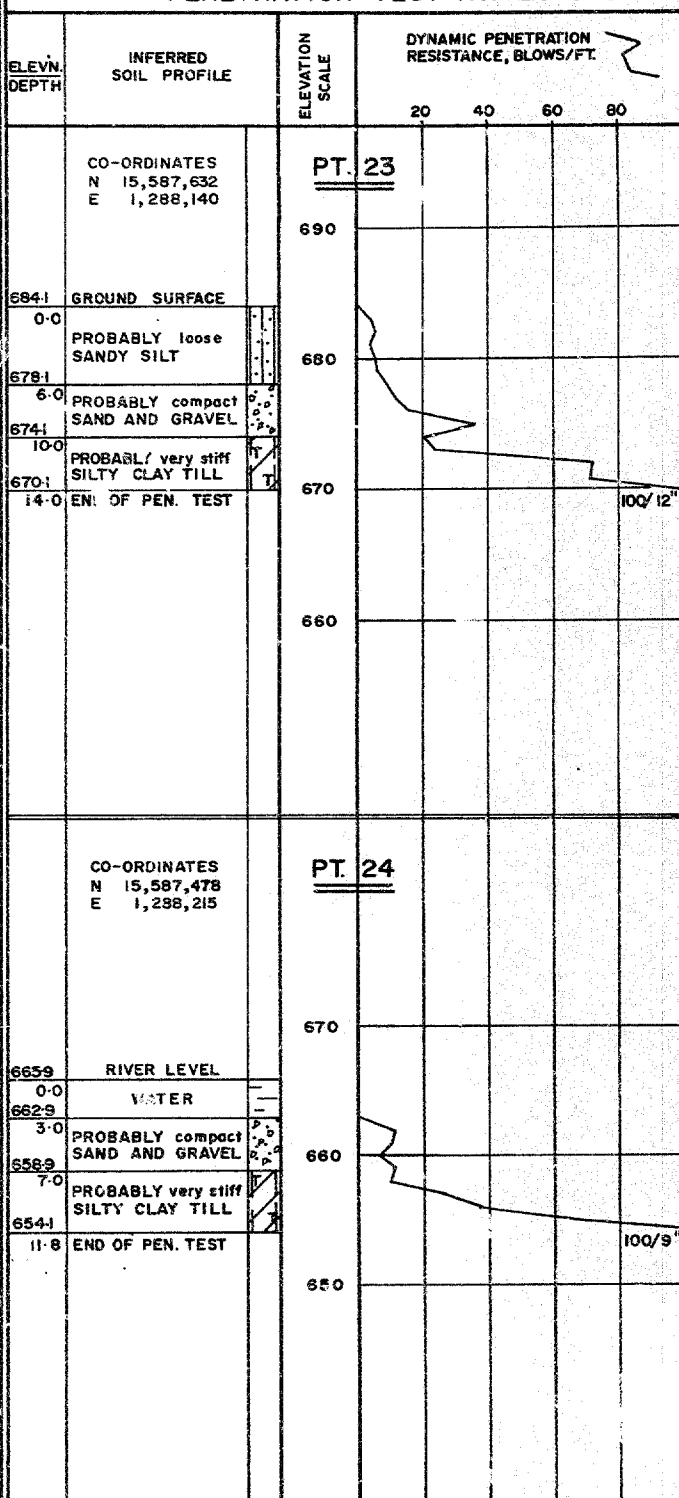
DATUM GEODETIC

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 36 IN.

## PENETRATION TEST No. 21 &amp; 22



## PENETRATION TEST No. 23 &amp; 24


 VERTICAL SCALE  
 1 IN. TO - FT.

Golder Associates

 DRAWN W.D.F.  
 CHECKED P.R.B.

## RECORD OF PENETRATION TESTS 25 TO 28

LOCATION

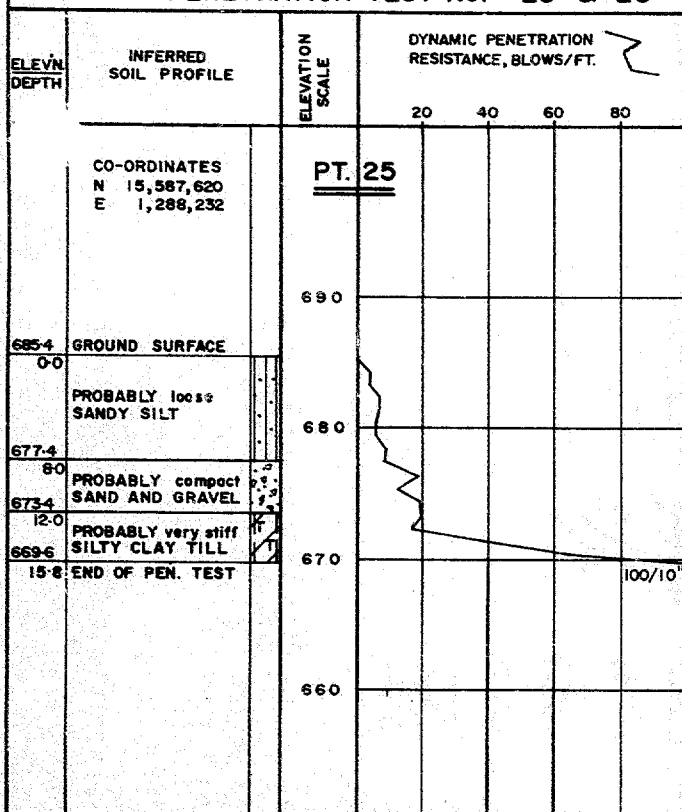
See Figure 1

DRIVING DATE MAY 14, 15 &amp; 21, 1975

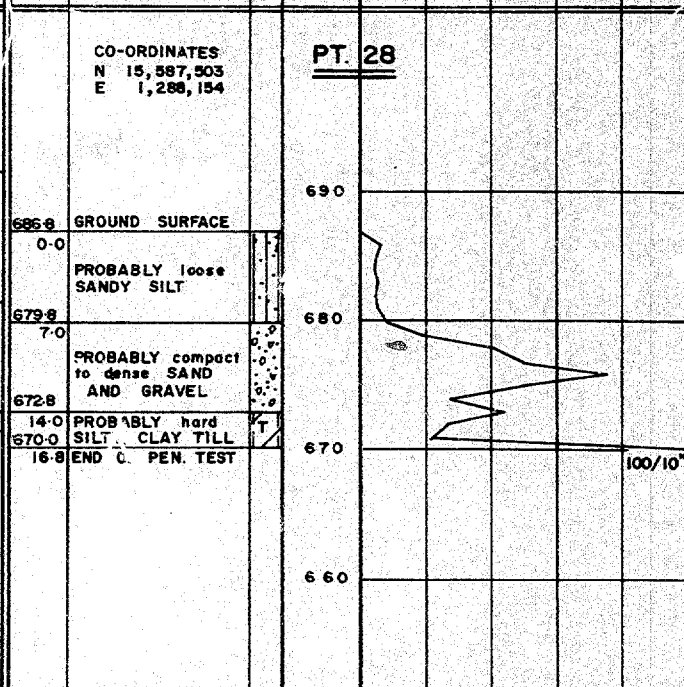
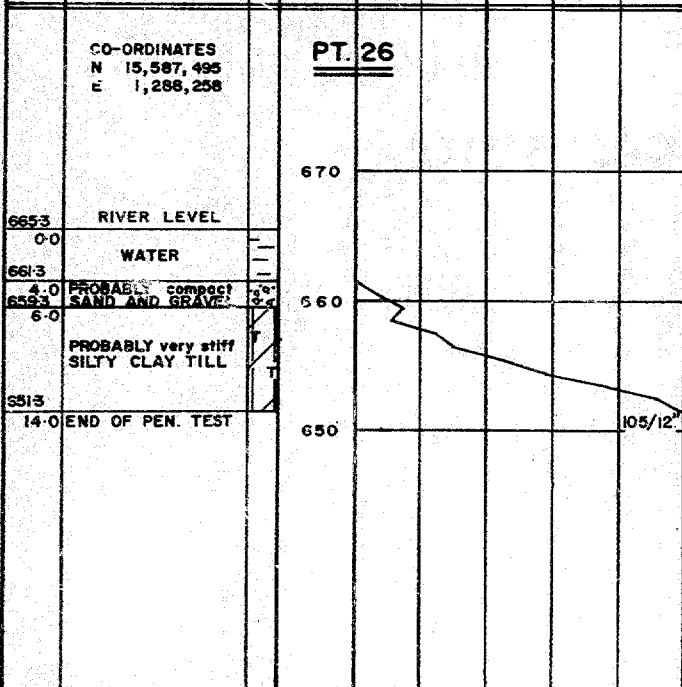
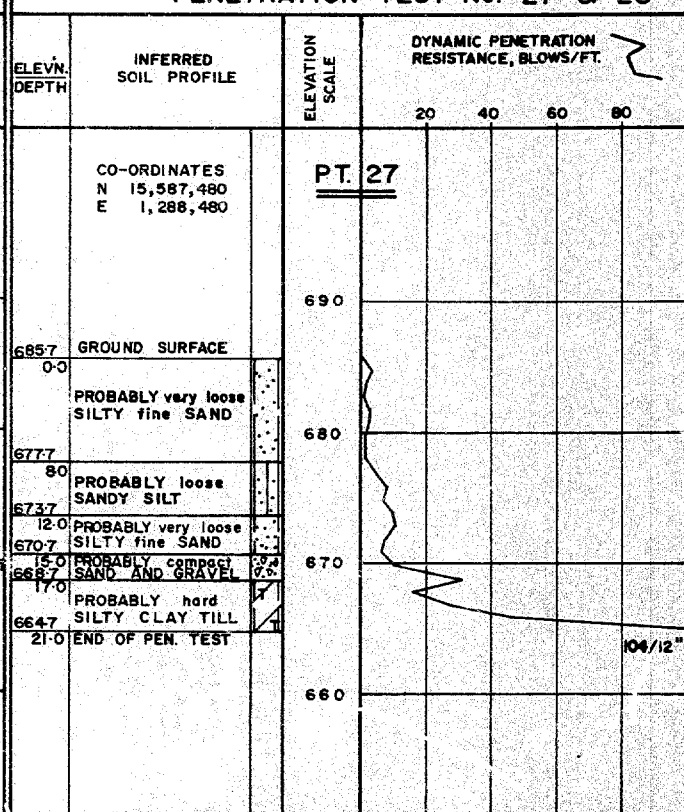
DATUM GEODETIC

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

## PENETRATION TEST No. 25 &amp; 26



## PENETRATION TEST No. 27 &amp; 28

VERTICAL SCALE  
1 IN. TO 1 FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF PENETRATION TESTS 29 TO 32

LOCATION

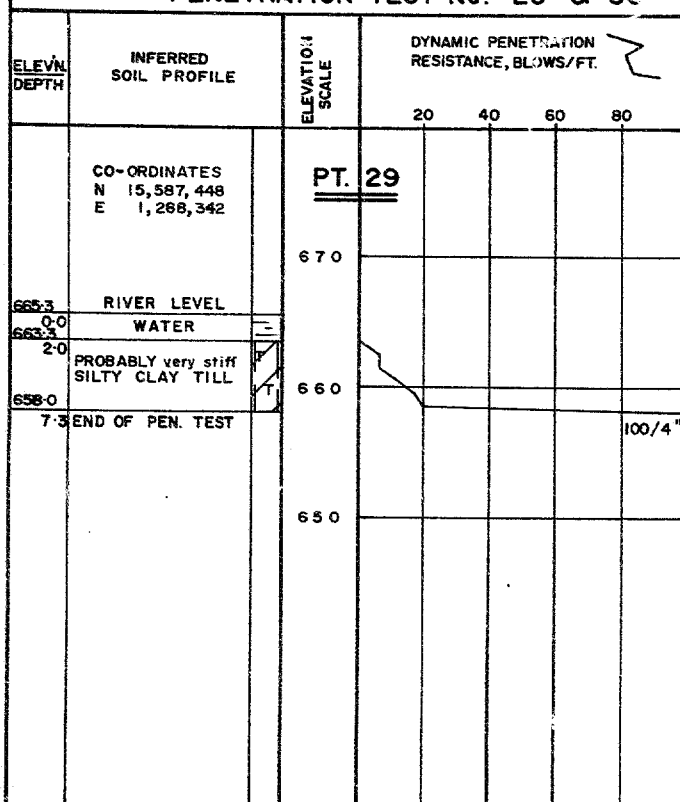
See Figure 1

DRIVING DATE MAY 15, 21 &amp; 22, 1975

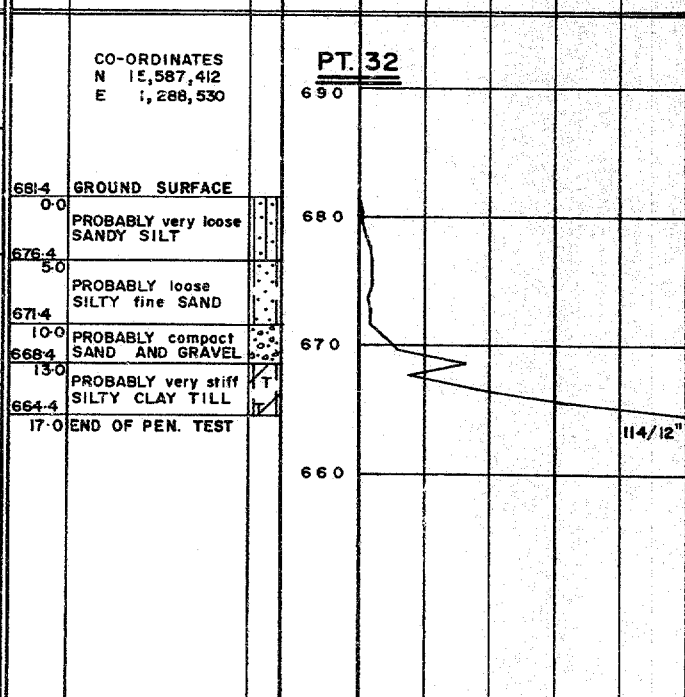
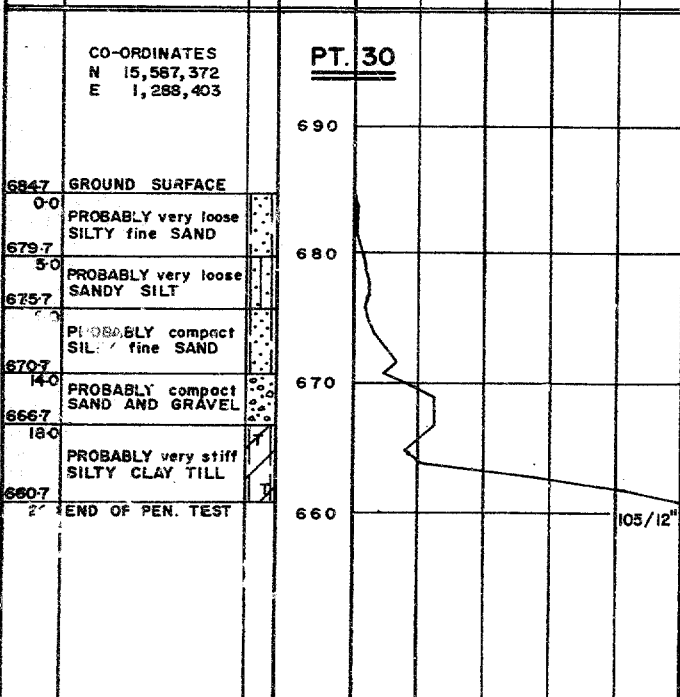
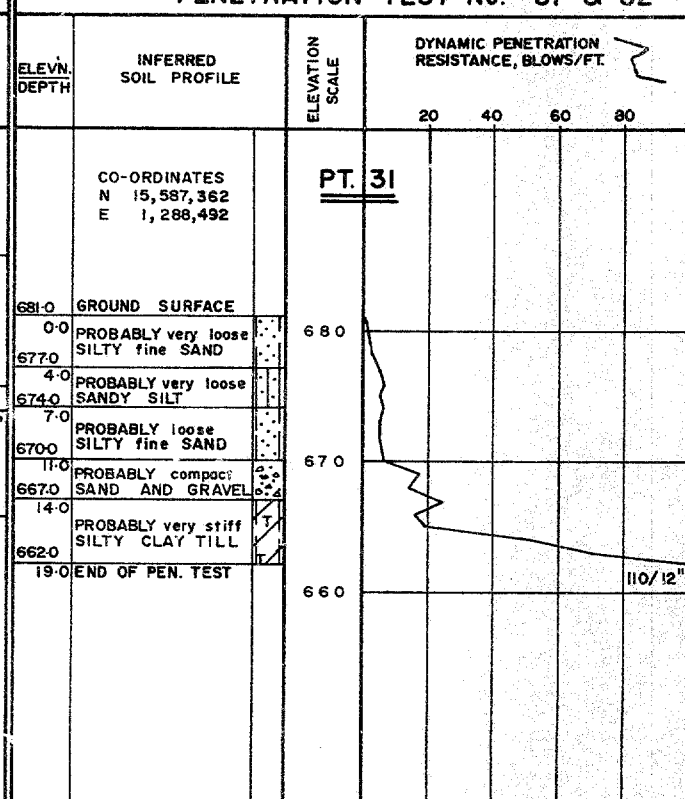
DATUM GEODETIC

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

## PENETRATION TEST No. 29 &amp; 30



## PENETRATION TEST No. 31 &amp; 32

VERTICAL SCALE  
1 IN. TO - FT.

Golder Associates

DRAWN W.D.F.  
CHECKED P.R.B.

## RECORD OF PENETRATION TESTS 33 to 36

LOCATION

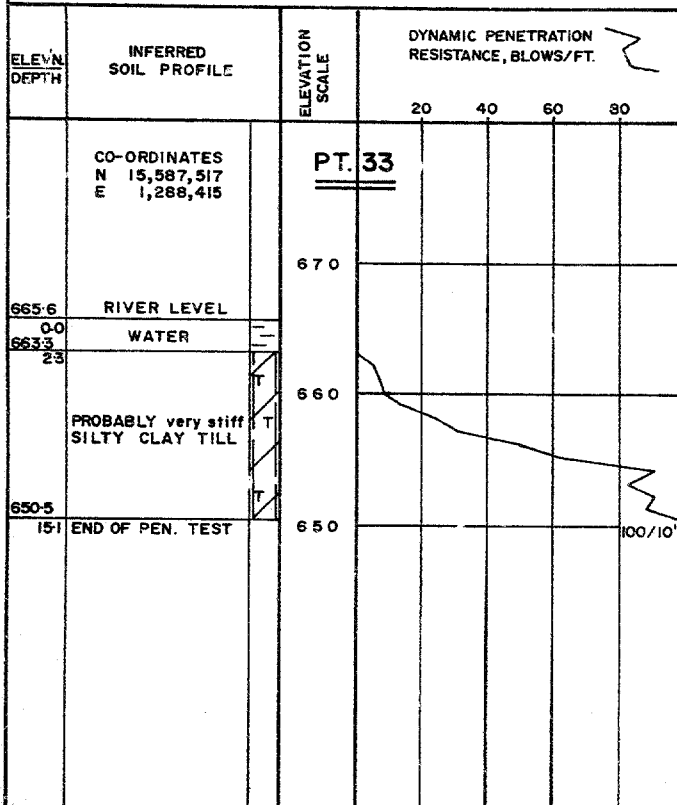
See Figure 1

DRIVING DATE MAY 21, 23 &amp; 27, 1975

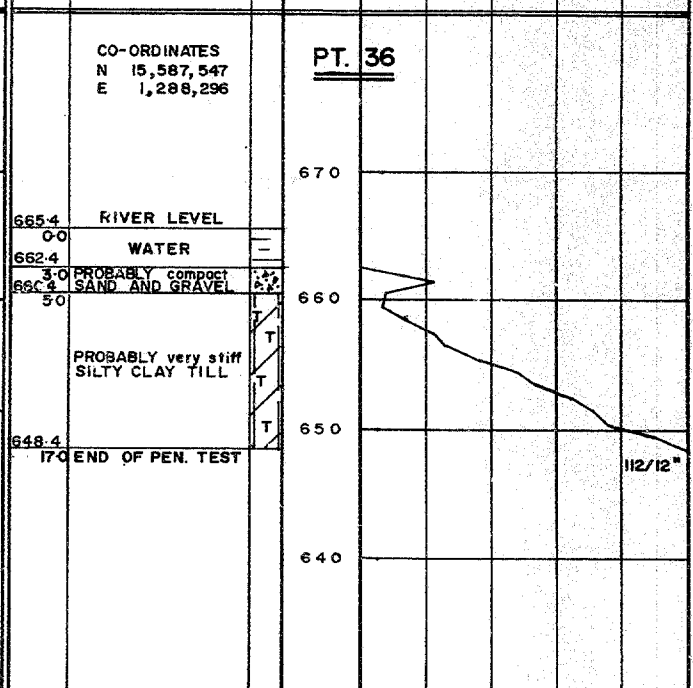
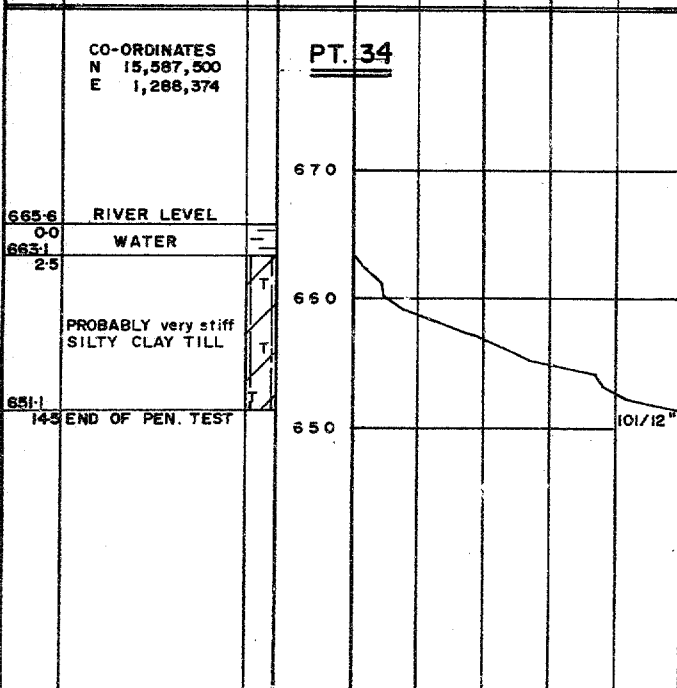
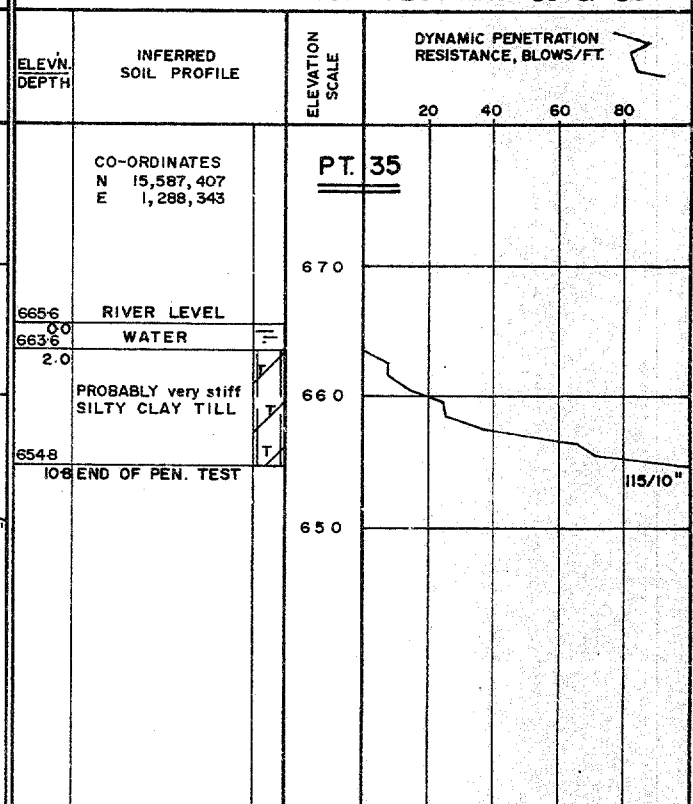
DATUM GEODETIC

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

## PENETRATION TEST No. 33 &amp; 34



## PENETRATION TEST No. 35 &amp; 36

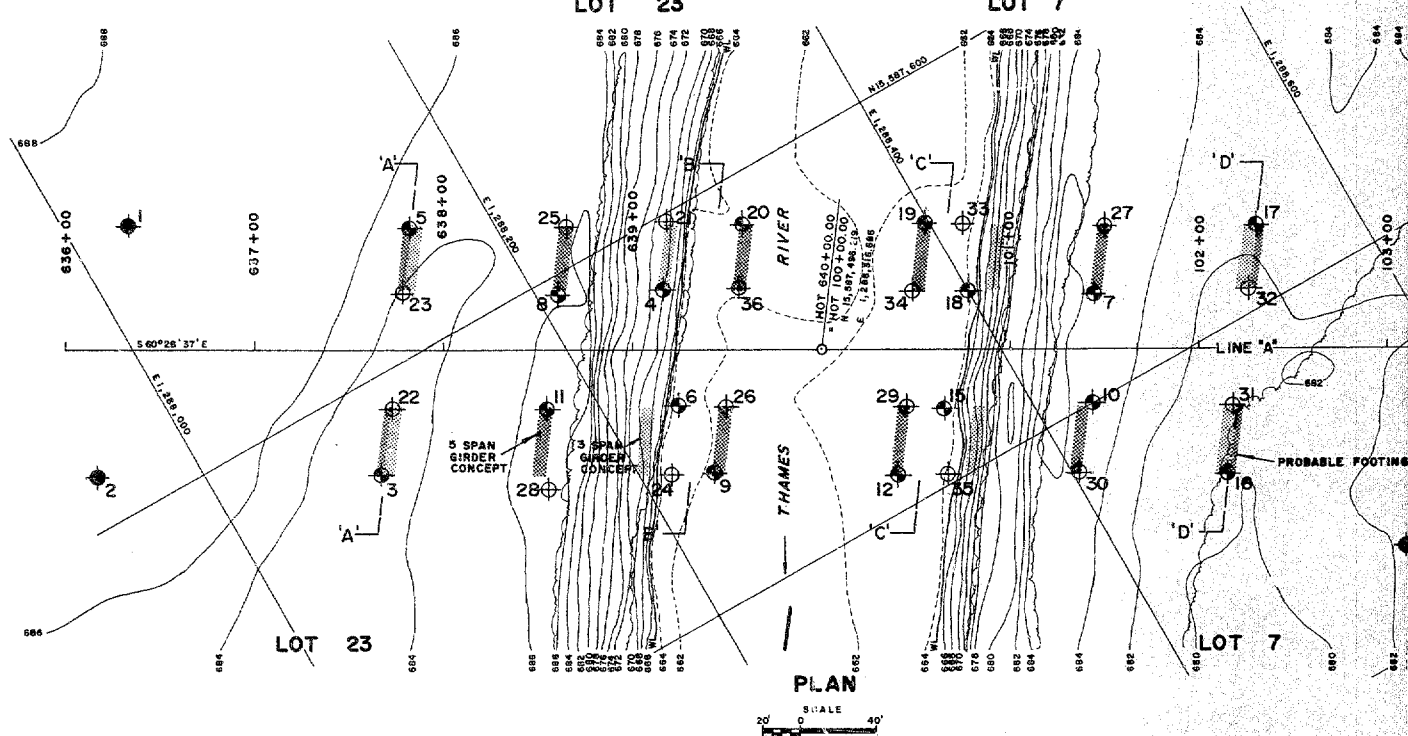
VERTICAL SCALE  
1 IN. TO — FT.

Golder Associates

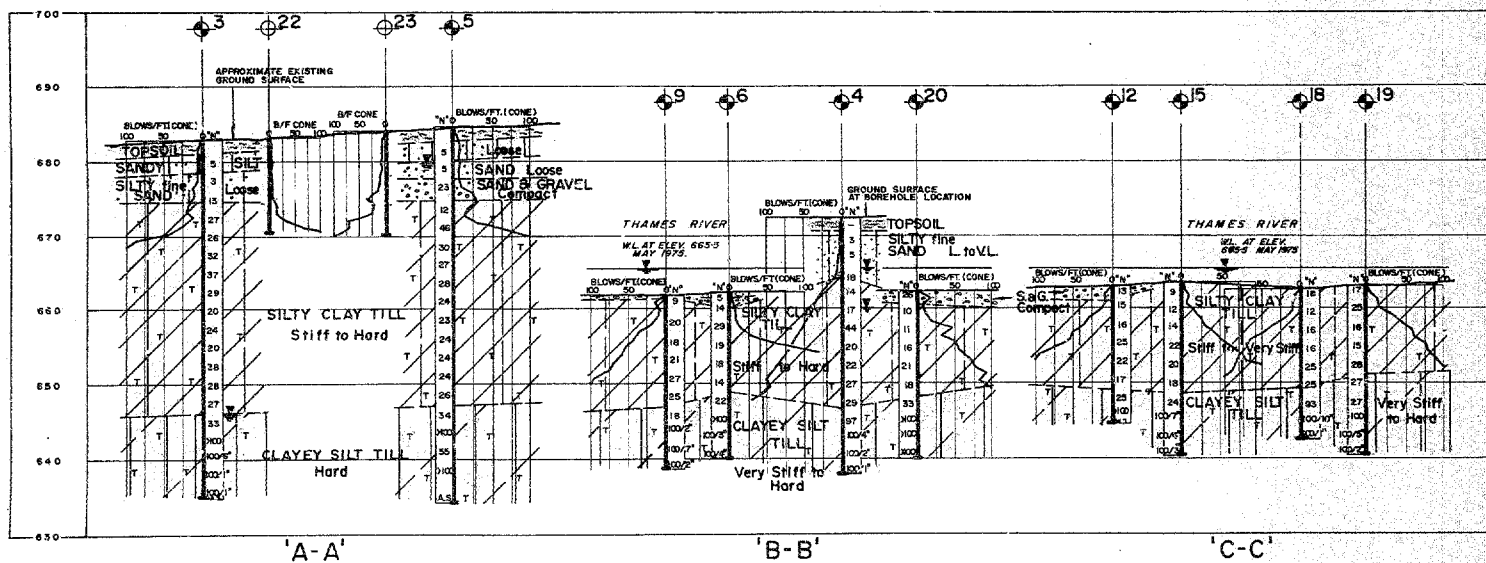
DRAWN W.D.F.  
CHECKED P.R.B.



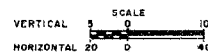
CO MIDDLESEX  
TWP CARADOC / TWP DELAWARE  
RANGE 1 SOUTH LONGWOODS ROAD CON D  
LOT 23 LOT 7



PLAN



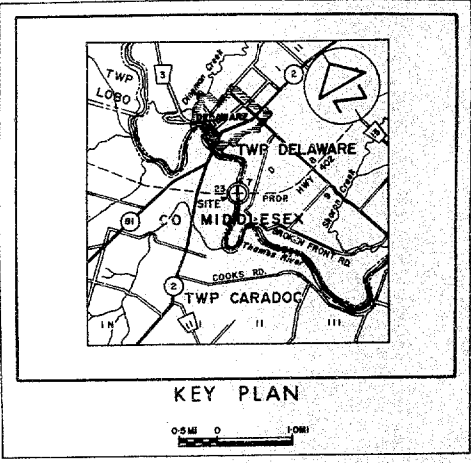
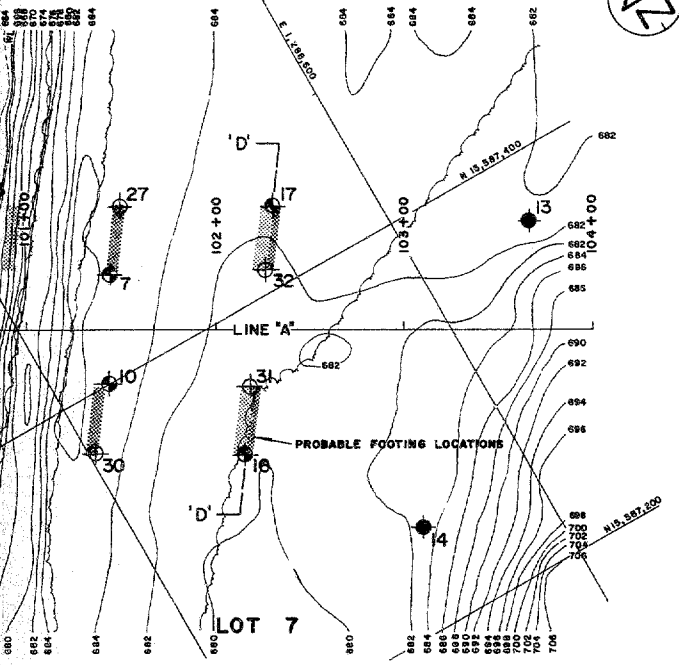
SECTIONS



DELAWARE

CON D

LOT 7



LEGEND

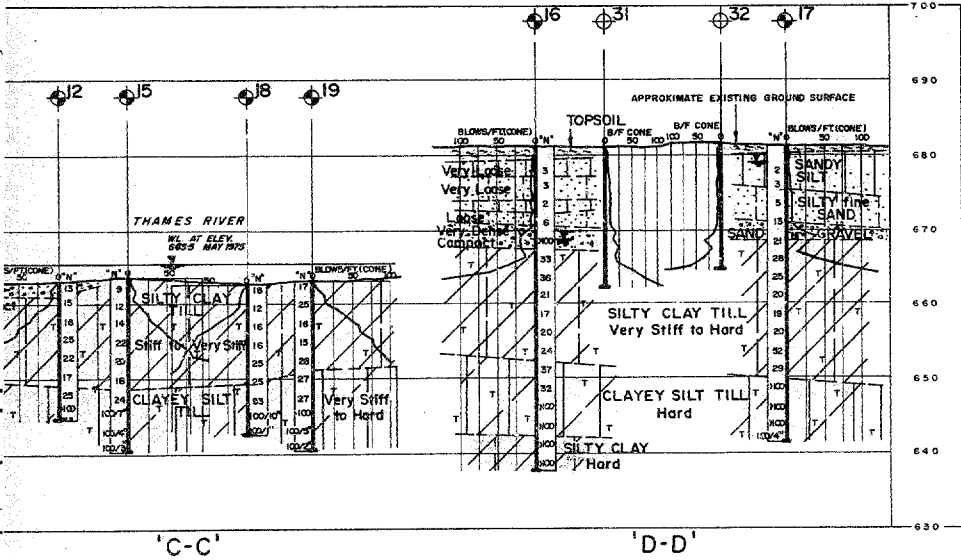
- Bore Hole
- Dynamic Cone Penetration Resistance Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation.

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	687-0	15,587,735	1,288,031
2	687-6	15,587,627	1,287,950
3	682-9	15,587,554	1,288,082
4	672-5	15,587,555	1,288,030
5	684-8	15,587,660	1,288,182
6	665-3	15,587,508	1,288,236
7	686-0	15,587,450	1,288,457
8	696-2	15,587,590	1,288,210
9	665-9	15,587,467	1,288,235
10	685-2	15,587,400	1,288,428
11	685-3	15,587,540	1,288,175
12	665-6	15,587,418	1,288,320
13	683-0	15,587,366	1,288,665
14	682-4	15,587,252	1,288,735
15	665-6	15,587,437	1,288,358
16	681-1	15,587,333	1,288,472
17	681-0	15,587,440	1,288,350
18	665-6	15,587,485	1,288,400

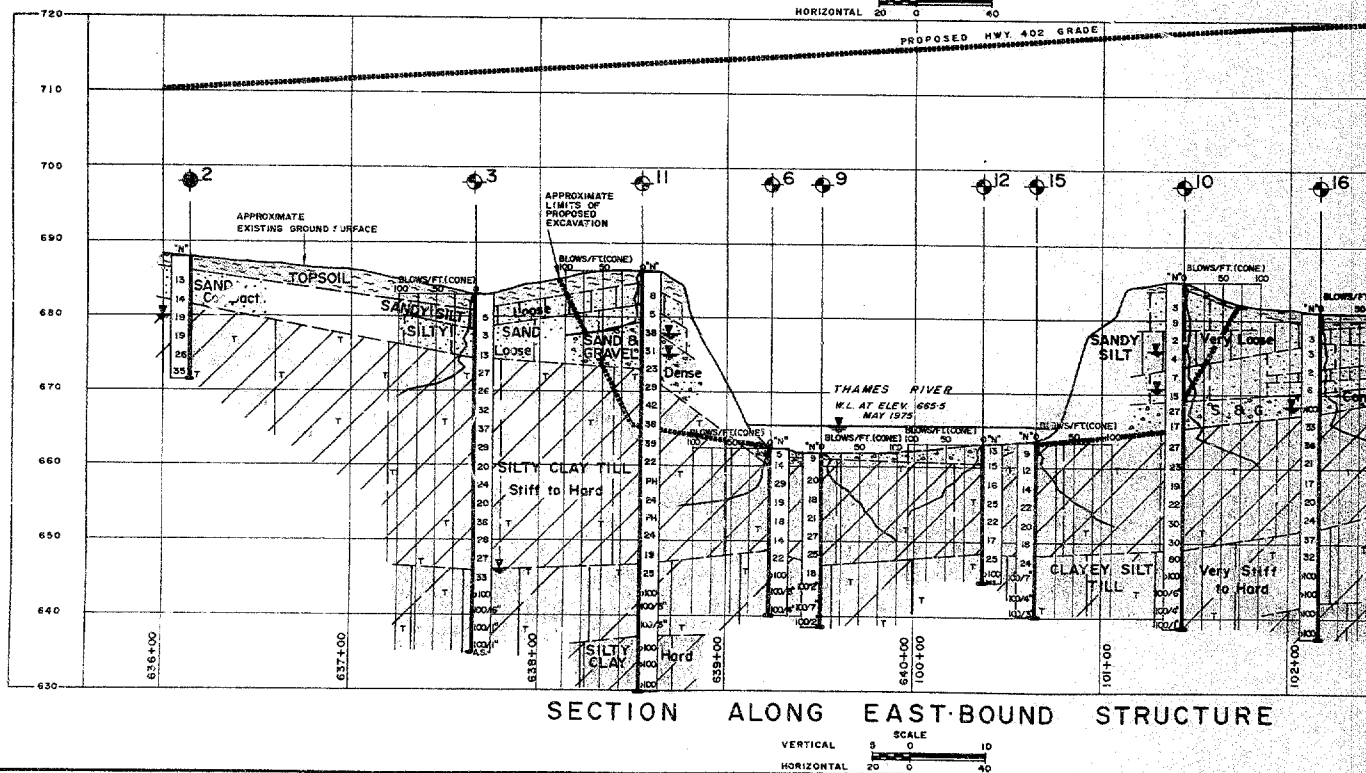
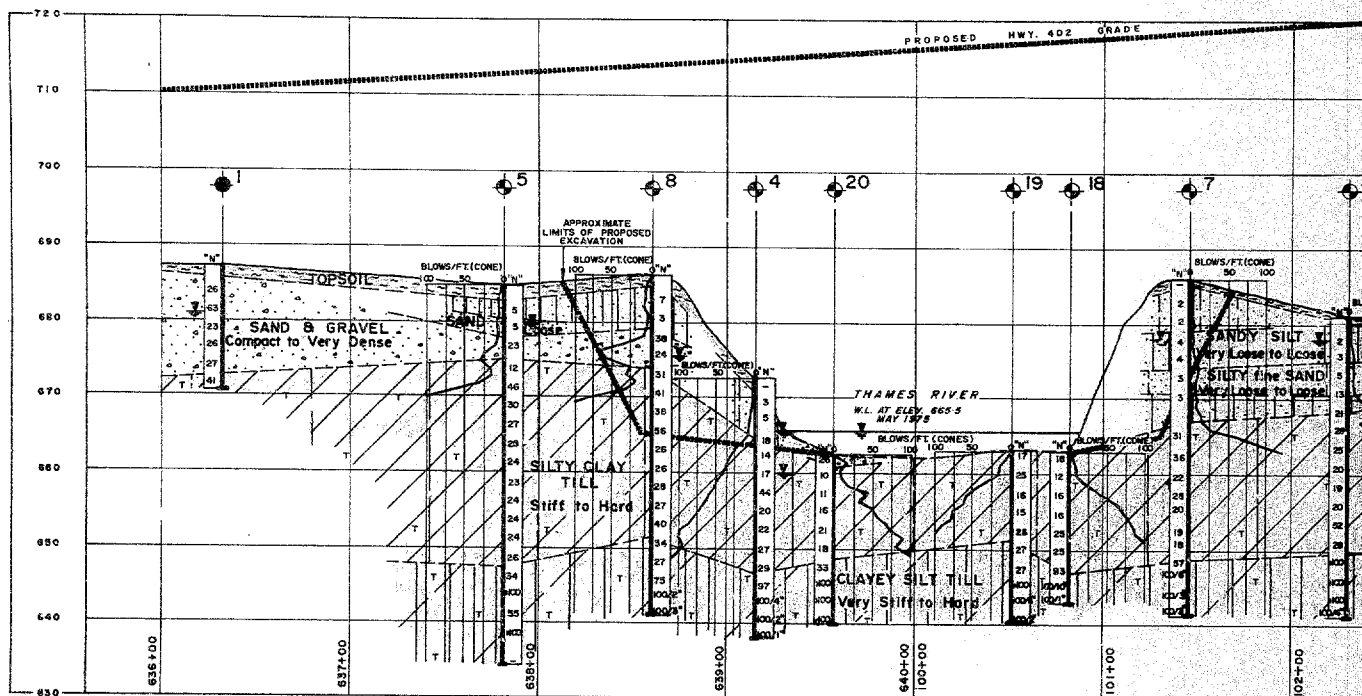
(LOCATIONS CONTINUED ON DRAWING NO. 2)

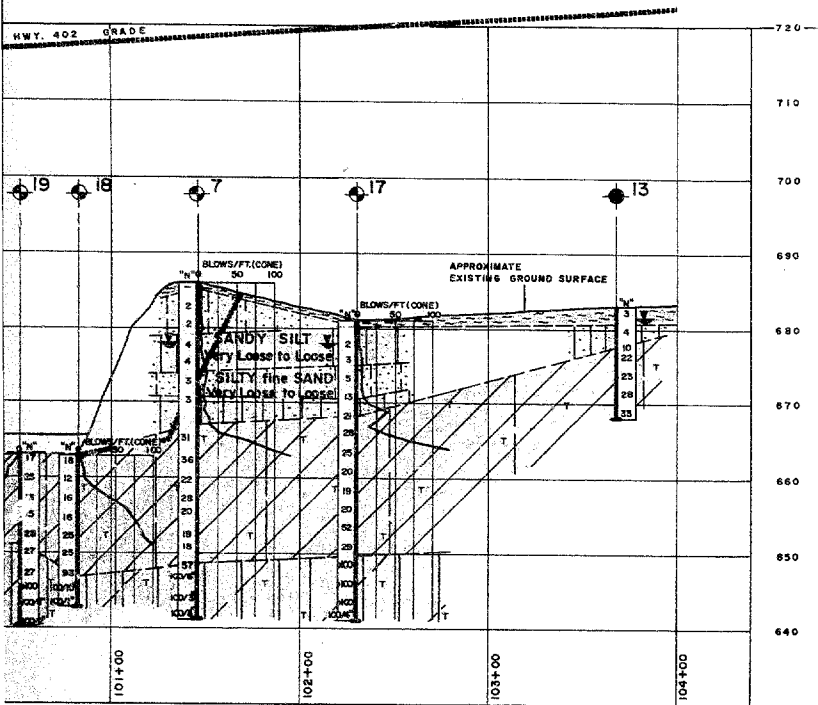
NOTE

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

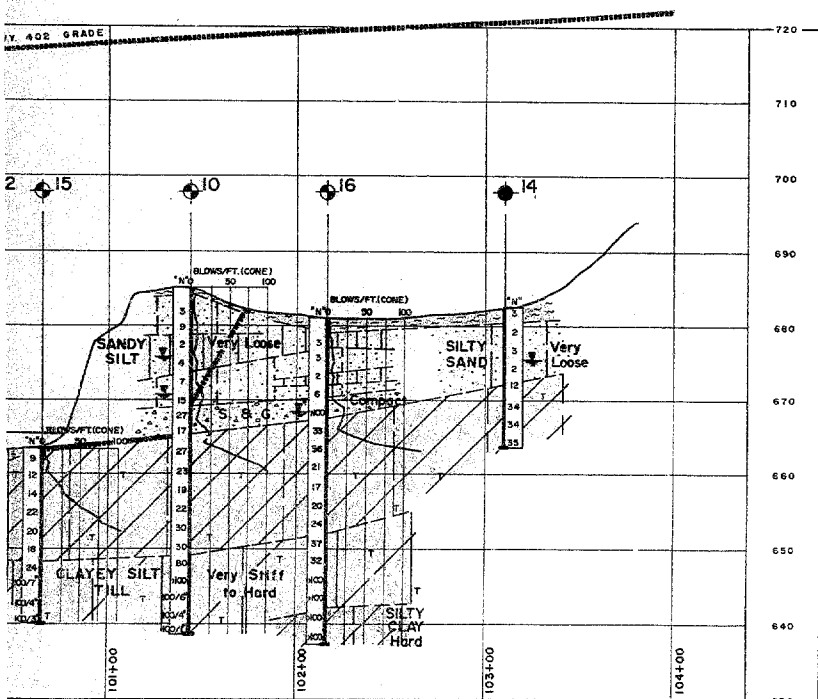


DATE	BY	DESCRIPTION
H.Q. GOLDER & ASSOCIATES LTD.		
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION		
PROPOSED CROSSING AT THAMES RIVER AND PROPOSED KING'S HWY. 402 LINE "A" HIGHWAY NO. 402 LINE "A" PROPOSED DIST NO. 2 CO. MIDDLESEX TWP. CARADOC DELAWARE LOT 23 CON. RANGE 1 SLR D BORE HOLE LOCATIONS & SOIL STRATA SUBWD. CHECKED PRE. W.P. NO. 41-66-17/18 DRAWING NO. 1 DRAWN W.D.F. CHECKED PRE. W.O. NO. 1 DATE JUNE 2, 1975 SITE NO. 19-535 BRIDGE DRAWING NO. 1 APPROVED CONT NO.		





UND STRUCTURE



UND STRUCTURE

NOTE:  
FOR KEY PLAN  
REFER TO DRAWING NO. 1

KEY PLAN

### LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test
- ⊙ Bore Hole & Cone Test
- W Water Levels established at time of field investigation, MAY 1975

### (LOCATIONS CONTINUED)

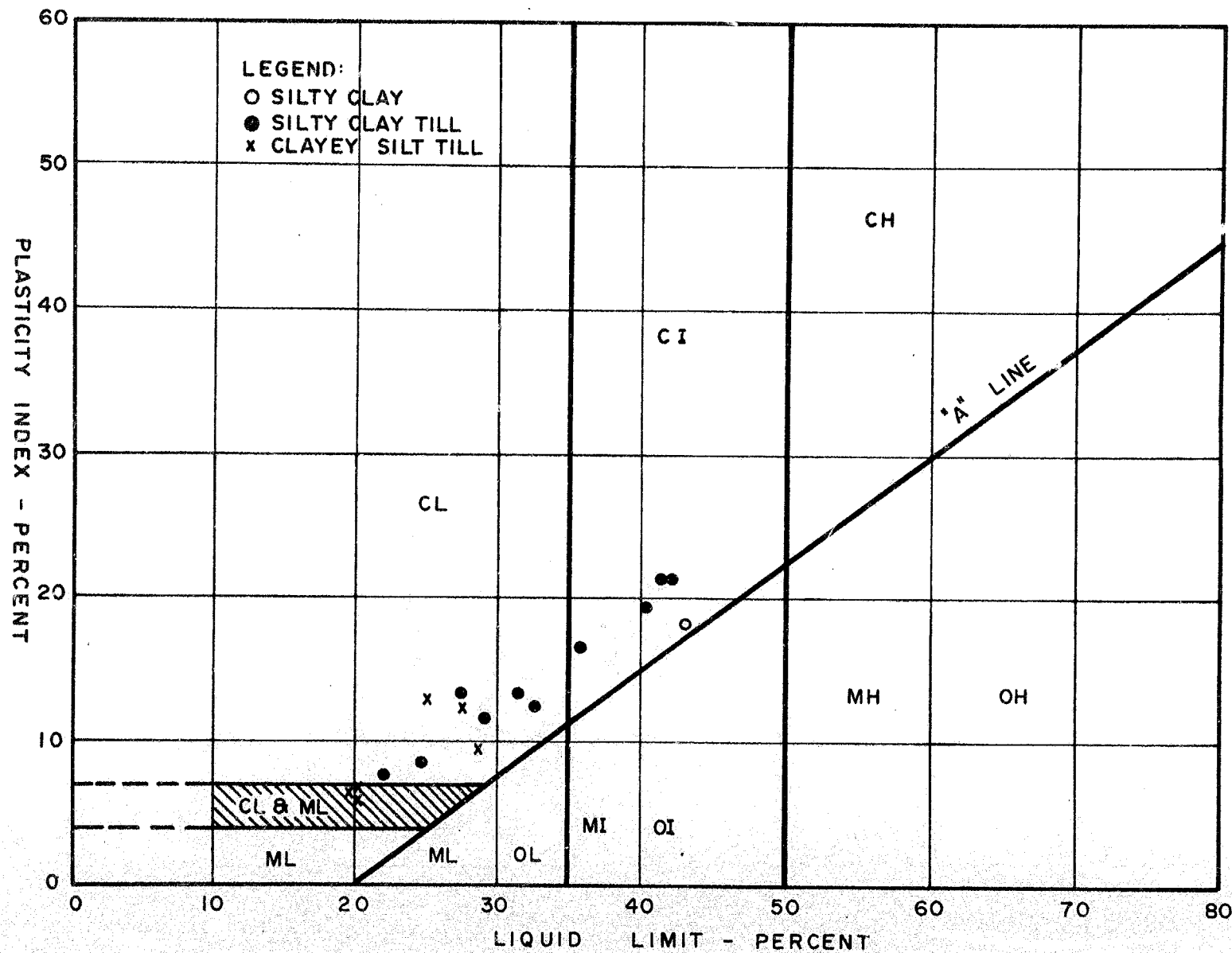
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
19	665.6	15,587,527	1,288,398
20	665.4	15,587,575	1,288,314
21	671.5	15,587,594	1,288,280
22	685.5	15,587,592	1,288,104
23	684.1	15,587,632	1,288,140
24	665.9	15,587,478	1,288,215
25	695.4	15,587,620	1,288,232
26	665.3	15,587,495	1,288,258
27	685.7	15,587,480	1,288,480
28	686.8	15,587,503	1,288,154
29	665.3	15,587,448	1,288,342
30	684.7	15,587,372	1,288,403
31	681.0	15,587,362	1,288,492
32	681.4	15,587,412	1,288,530
33	665.6	15,587,517	1,288,415
34	665.6	15,587,500	1,288,374
35	665.6	15,587,407	1,288,343
36	665.4	15,587,547	1,288,296

### NOTE

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

REVISIONS	DATE	BY	DESCRIPTION
<b>H.Q. GOLDER &amp; ASSOCIATES LTD.</b>			
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION			
<b>PROPOSED CROSSING AT THAMES RIVER</b>			
AND <b>PROPOSED KING'S HWY. 402 LINE "A"</b>			
HIGHWAY NO. 402 LINE "A" PROPOSED DIST. NO. 2			
CO. MIDDLESEX			
T.W.P. CARADOC DELAWARE		LOT 23	CON. RANGE 1 SLR
<b>BORE HOLE LOCATIONS &amp; SOIL STRATA</b>			
SUBWD.	CHECKED PRB	W.P. NO. 41-66-17/18	DRAWING NO.
DRAWN WDF	CHECKED PRB	W.D. NO.	<b>2</b>
DATE MAY 31, 1975	SITE NO. 19-536	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		

Golder Associates



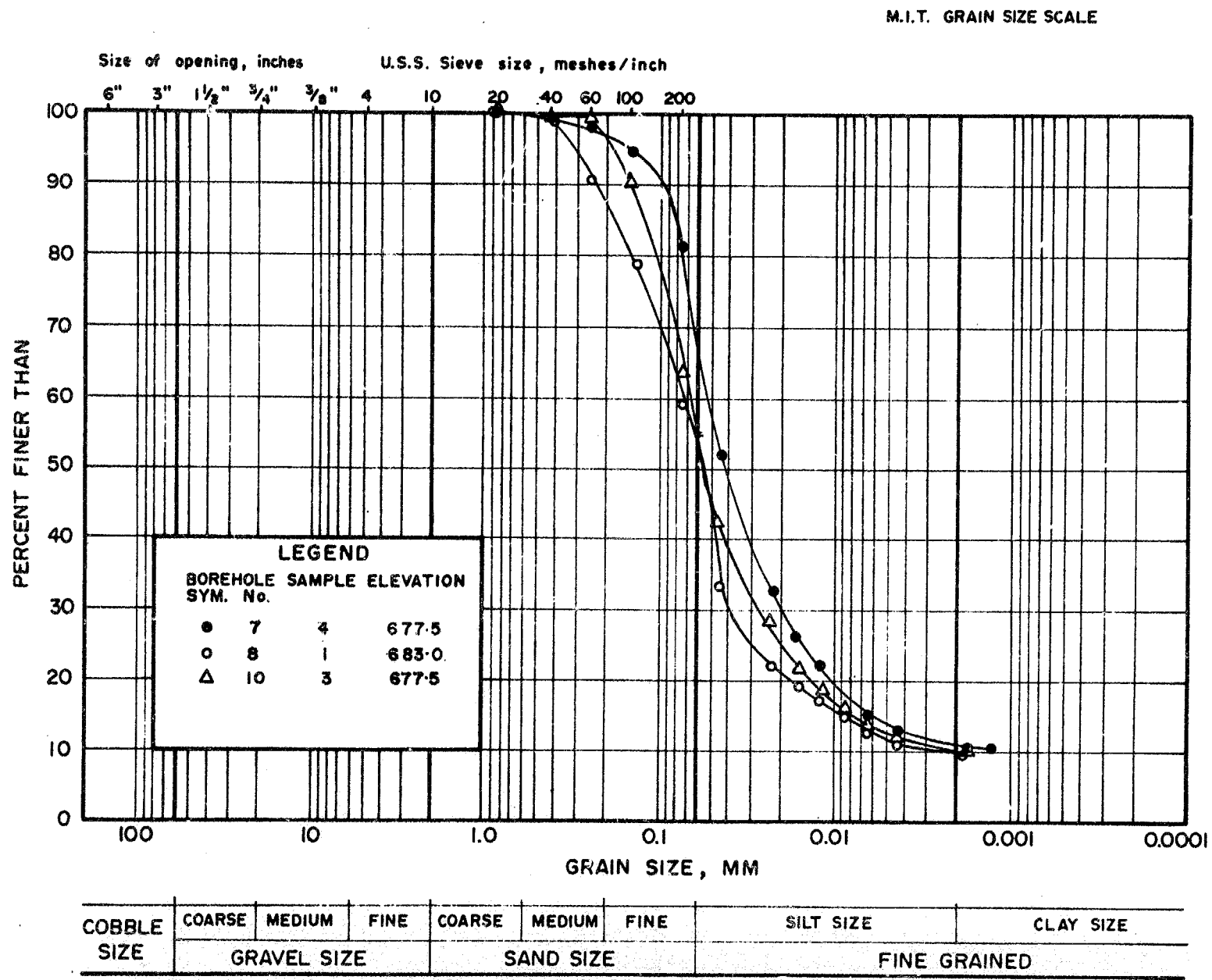
PLASTICITY CHART

FIGURE 3

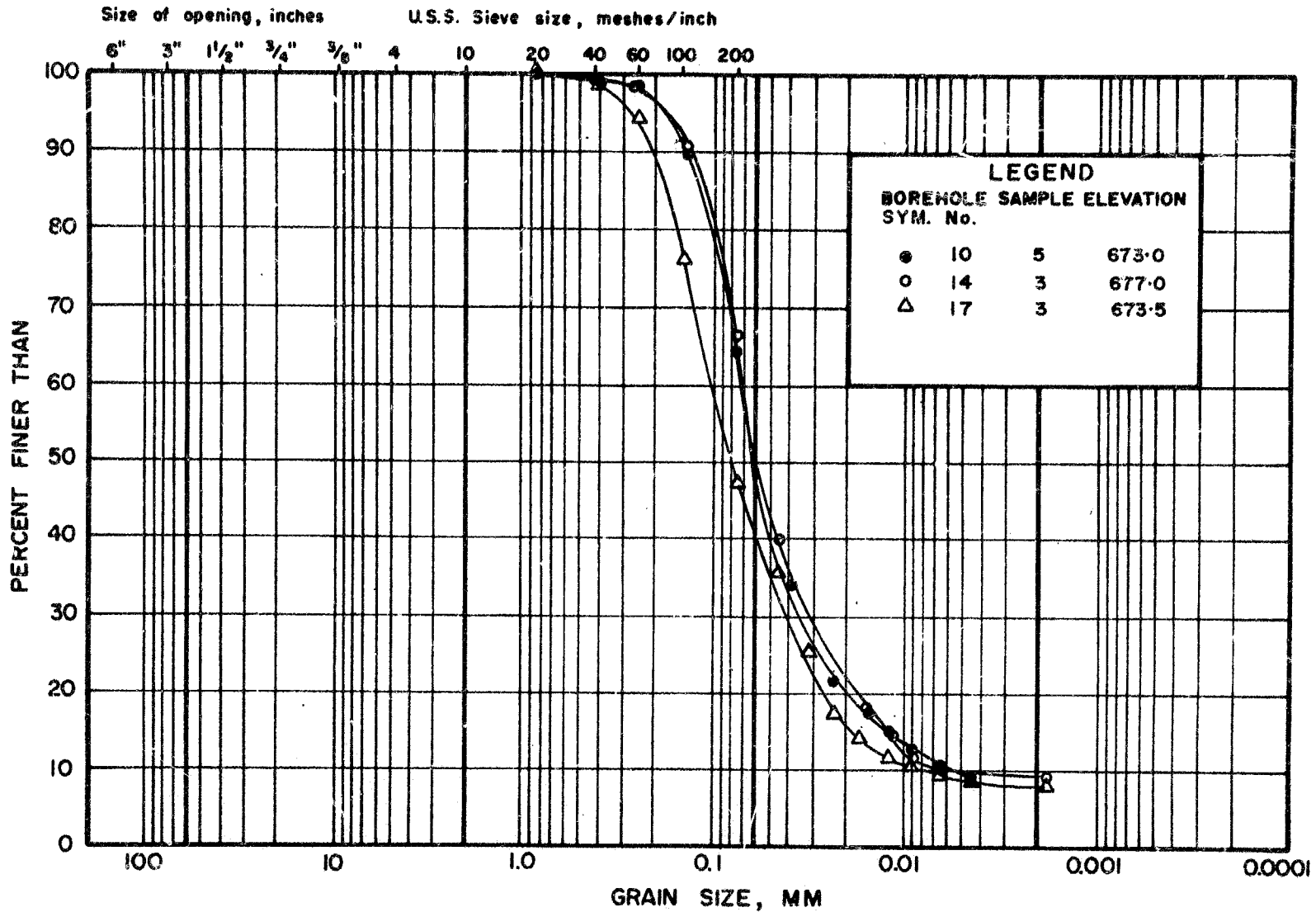
Golder Associates

GRAIN SIZE DISTRIBUTION  
SANDY SILT

FIGURE 4



M.I.T. GRAIN SIZE SCALE

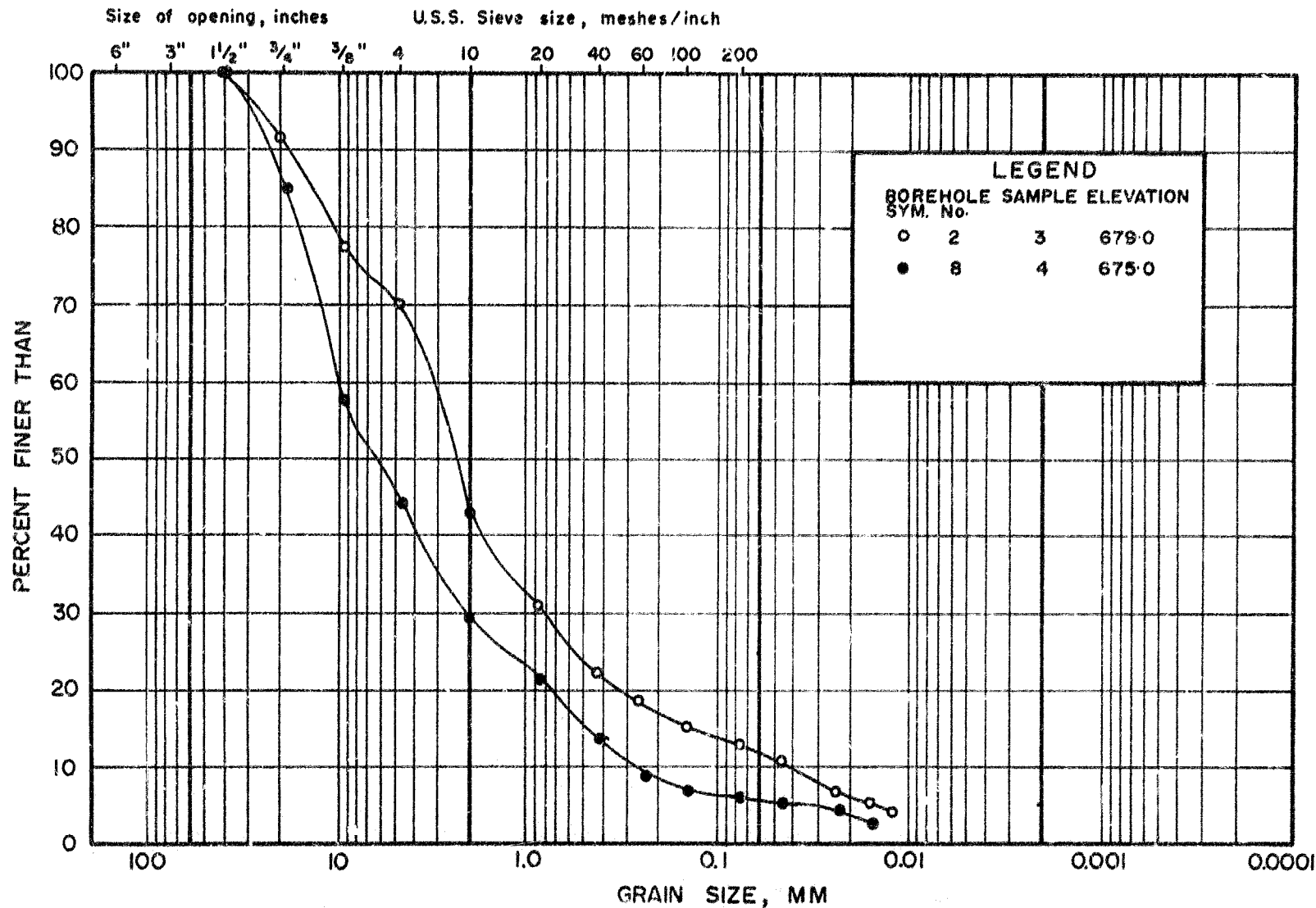


COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED		

GRAIN SIZE DISTRIBUTION  
SILTY fine SAND

FIGURE 5

M.I.T. GRAIN SIZE SCALE

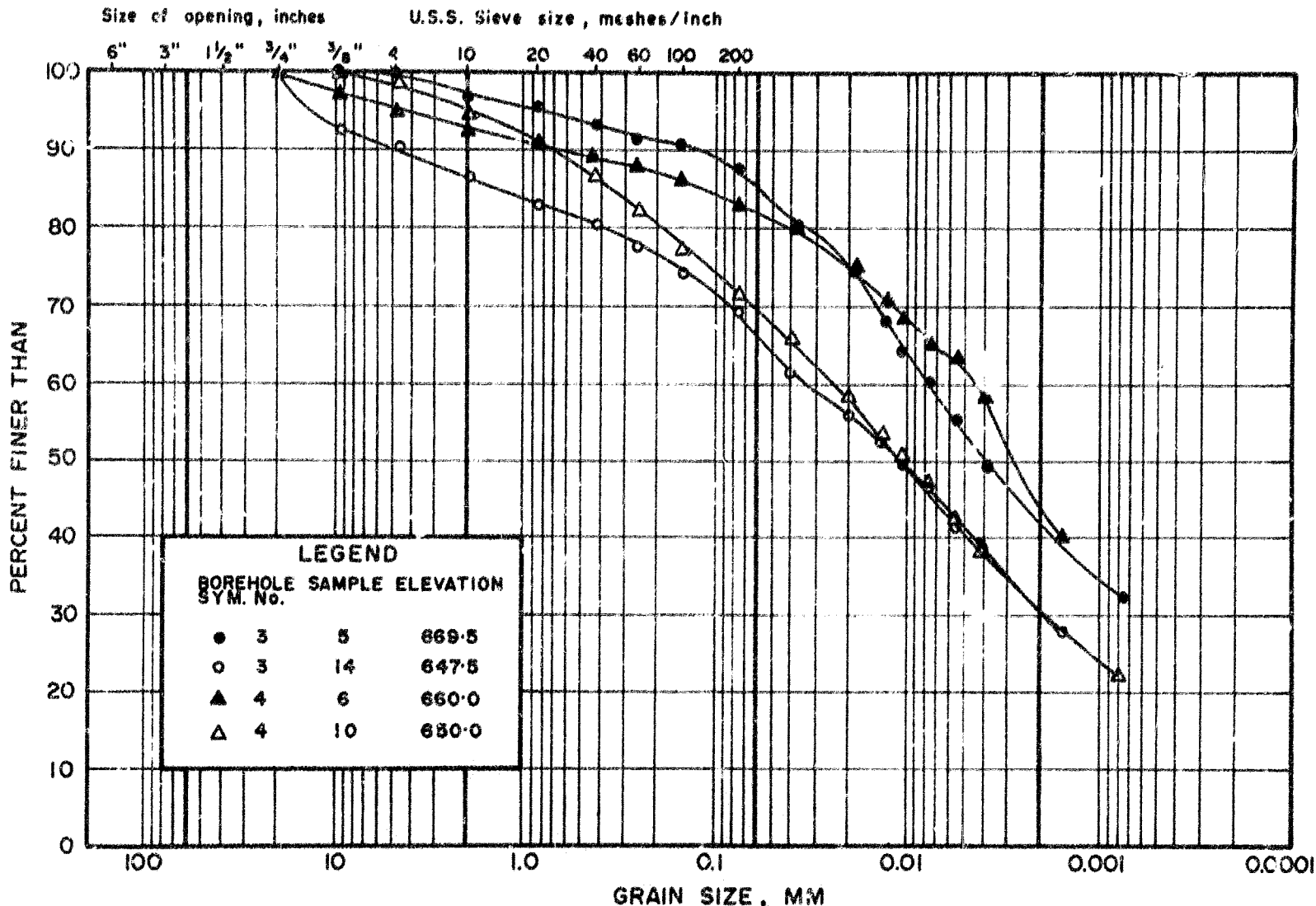


GRAIN SIZE DISTRIBUTION  
SAND AND GRAVEL

FIGURE 6



M.I.T. GRAIN SIZE SCALE



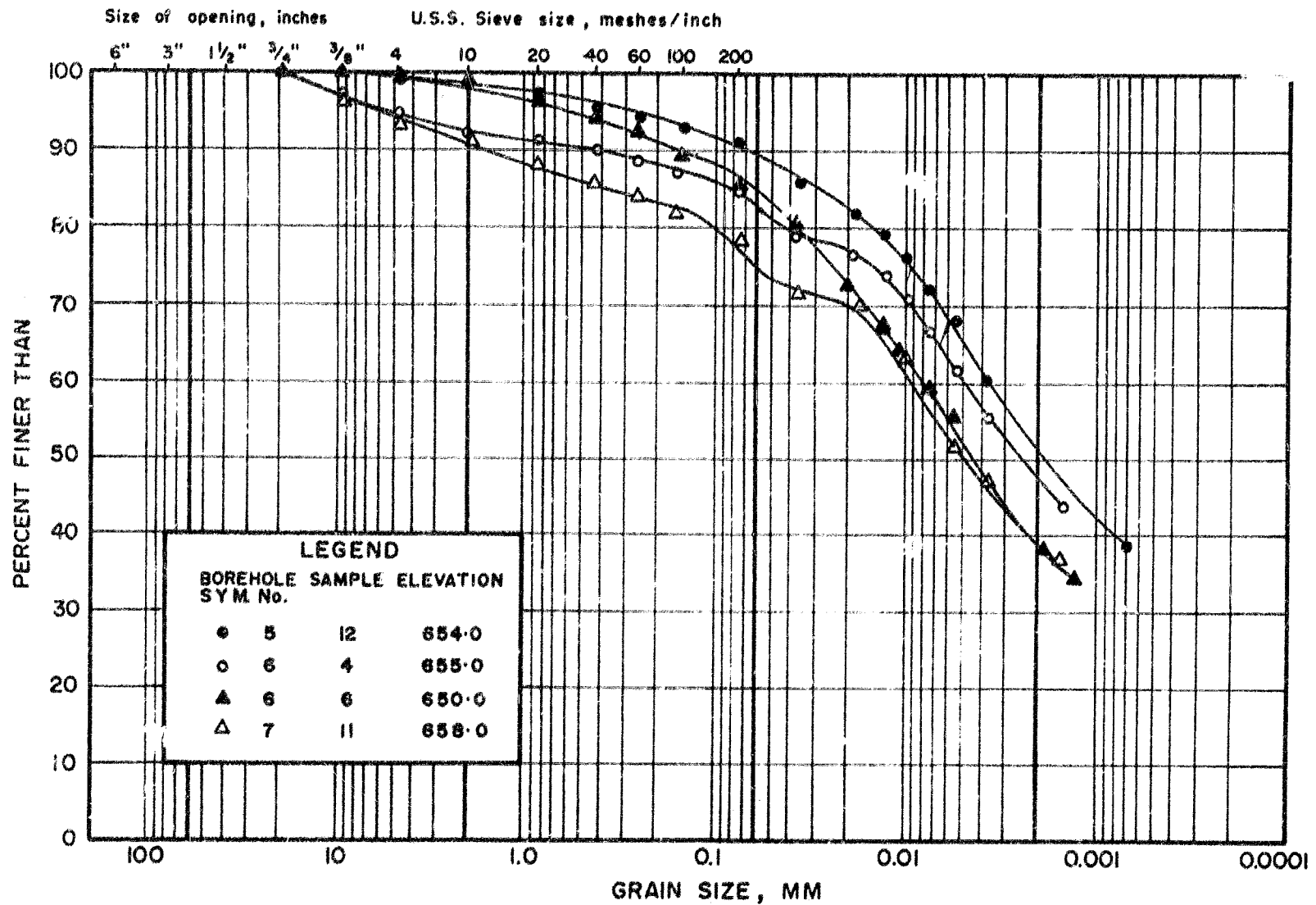
COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED		

GRAIN SIZE DISTRIBUTION  
SILTY CLAY TILL

FIGURE 7

Golder Associates

M.I.T. GRAIN SIZE SCALE.



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

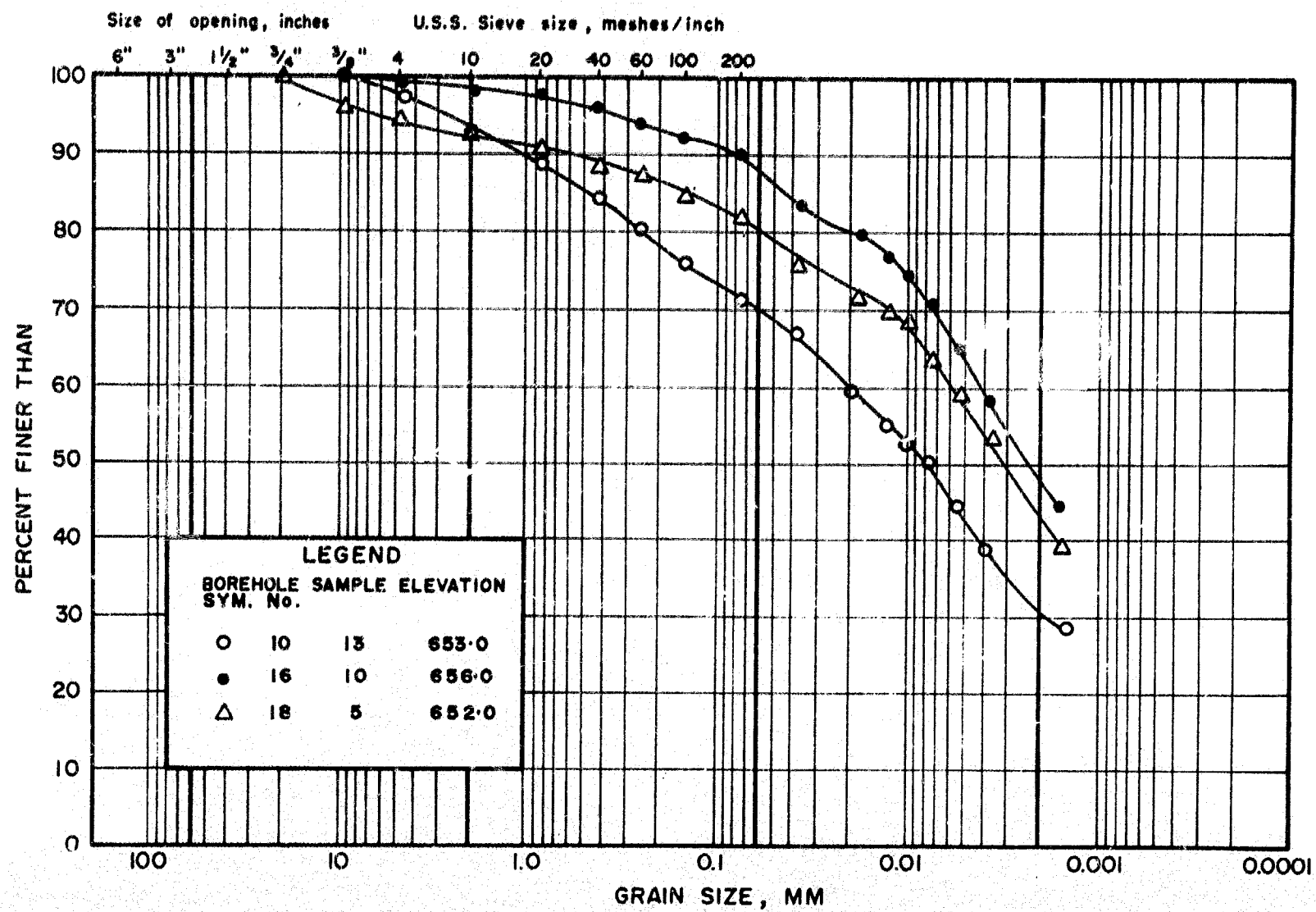
GRAIN SIZE DISTRIBUTION  
SILTY CLAY TILL

FIGURE 8

Golder Associates

Golder Associates

M.I.T. GRAIN SIZE SCALE

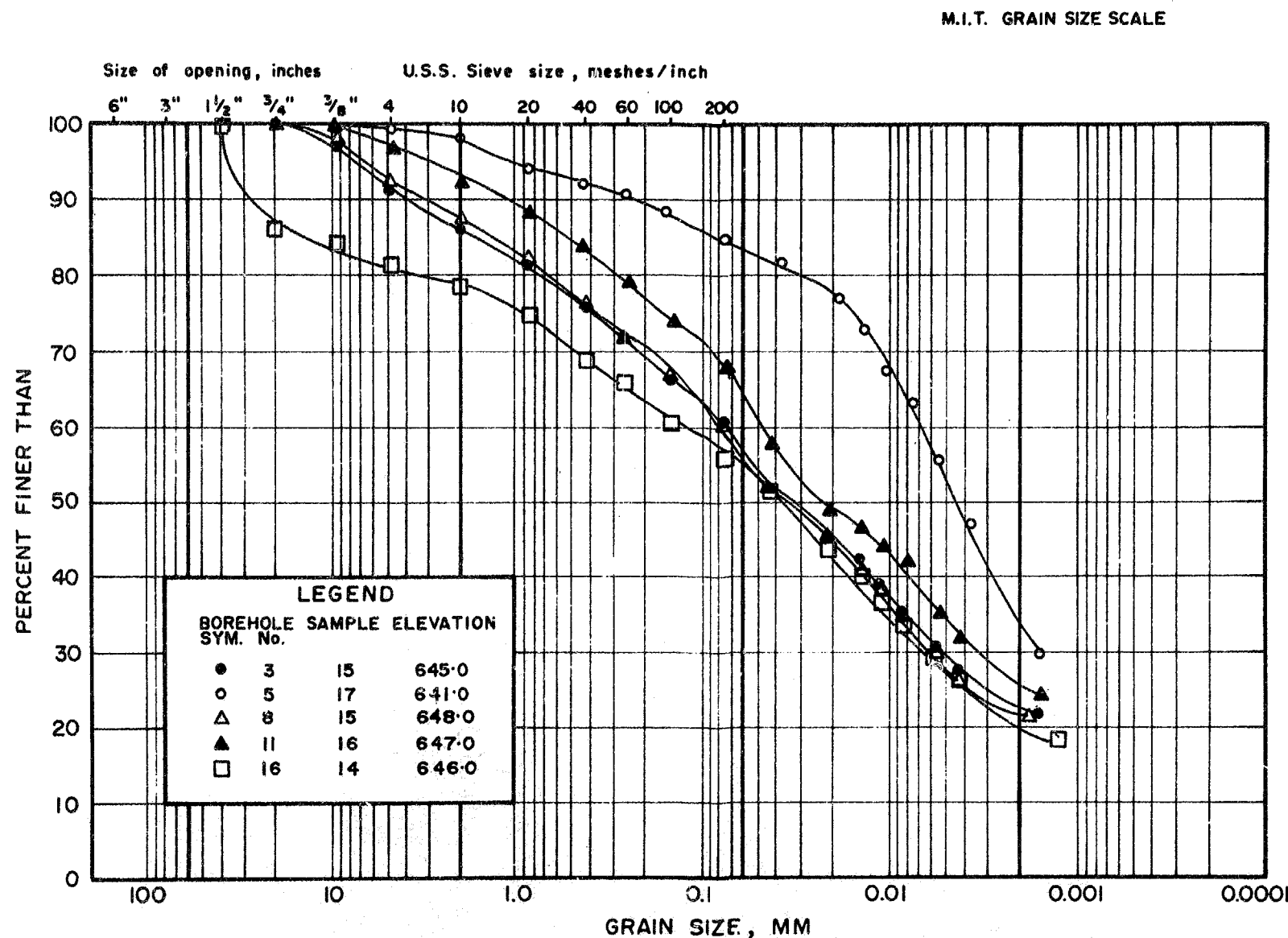


COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		CLAY SIZE	
	GRAVEL SIZE			SAND SIZE			FINE GRAINED			

GRAIN SIZE DISTRIBUTION  
SILTY CLAY TILL

FIGURE 9

Golder Associates

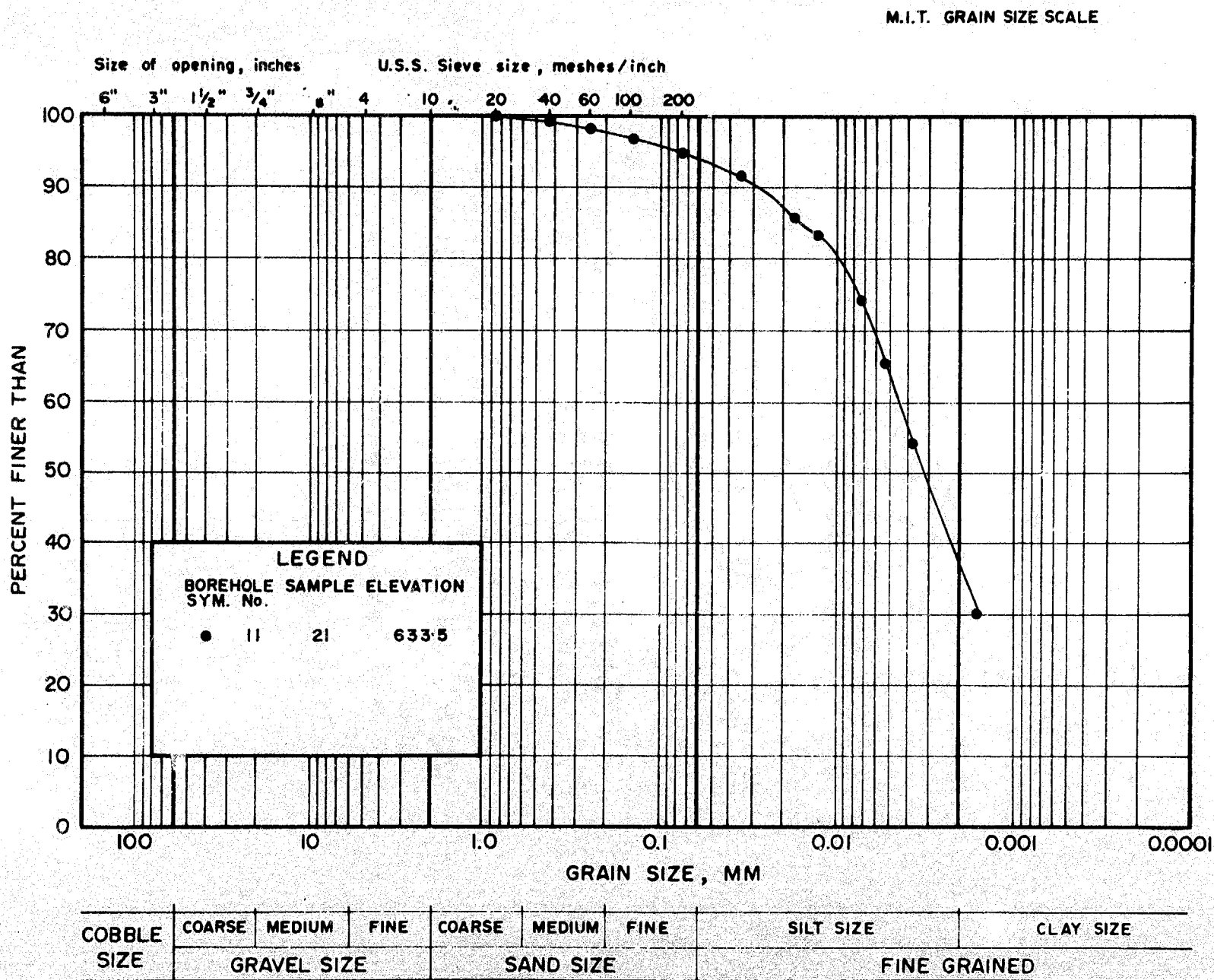


COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED	

GRAIN SIZE DISTRIBUTION  
CLAYEY SILT TILL

FIGURE 10

Golder Associates

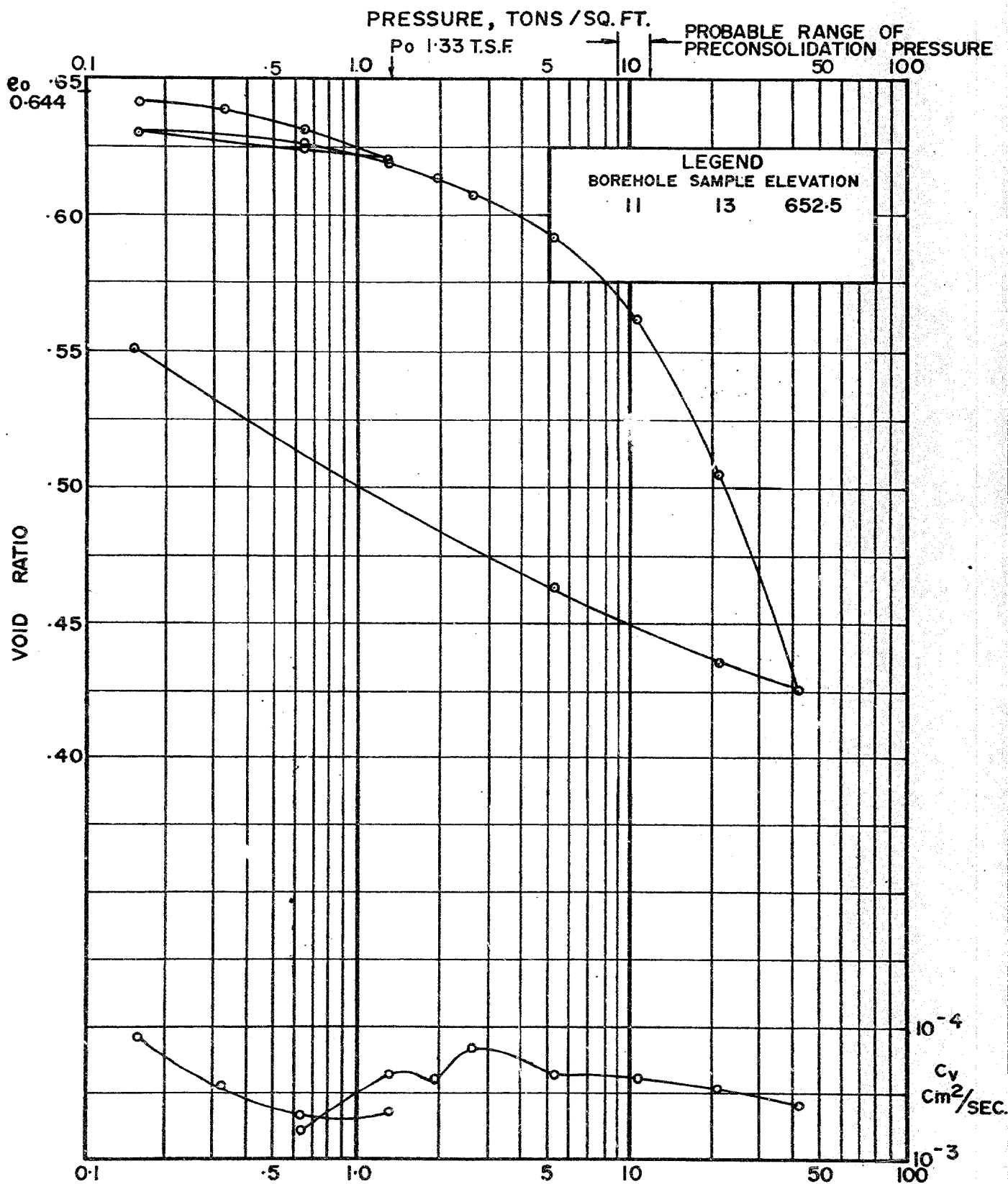


GRAIN SIZE DISTRIBUTION  
SILTY CLAY

FIGURE 11

# VOID RATIO - PRESSURE CURVES CONSOLIDATION TEST

FIGURE 12



Golder Associates

A. P. Watt (2)  
Reg. Structural Planning Engineer  
Southwestern Region, London

Soil Mechanics Section  
Geotechnical Office  
West Building, Downsview

June 3, 1975

JUN - 5 1975

**FOUNDATION INVESTIGATION REPORT**

**for**

**Hwy. 402 & Thames River Crossing  
7.8 Miles West of Hwy. 4  
Twps. of Delaware & Caradoc  
Site #19-536 W.P. 41-66-17 & 18  
Dist. #2 (London)**

Attached please find your copy of the foundation investigation report for the above mentioned projects, which was carried out by H.Q. Golder & Associates Ltd. We have reviewed the report and consider the contents in general to be sufficient for your purposes. You will note that the report recommends alternatives of spread footings and piled foundations for the piers: the decision as to which method to use should of course be based on economics. It would appear to us that the piled foundations will prove to be the most economical, however, since driving equipment will be mobilized in any event for the abutment foundations, and since the size and depth of excavations will be less than for spread footings. Cover for frost protection is recommended as 3 feet in the report: for the area in question it is our practice to use 4 feet. Please direct any queries you may have concerning this report to this Office.

*K.G. Selby*

K.G. Selby  
Supervising Engineer

c.c. E.J. Orr  
B.R. Davis  
B.J. Giroux  
G.A. Wrong  
A. Wittenberg  
J.R. Roy  
L.E. Walker  
R. Hore

J. Anderson)  
A. Crowley ) memo only

Files ✓  
Record Services

DOCUMENT INFORMATION

GEOCRES No. 40114-93

DIST. 2 REGION Southwestern

W.P. No. 41-66-17/18

CONT. No. 78-66

W. O. No. \_\_\_\_\_

STR. SITE No. 19-536

HWY. No. \_\_\_\_\_

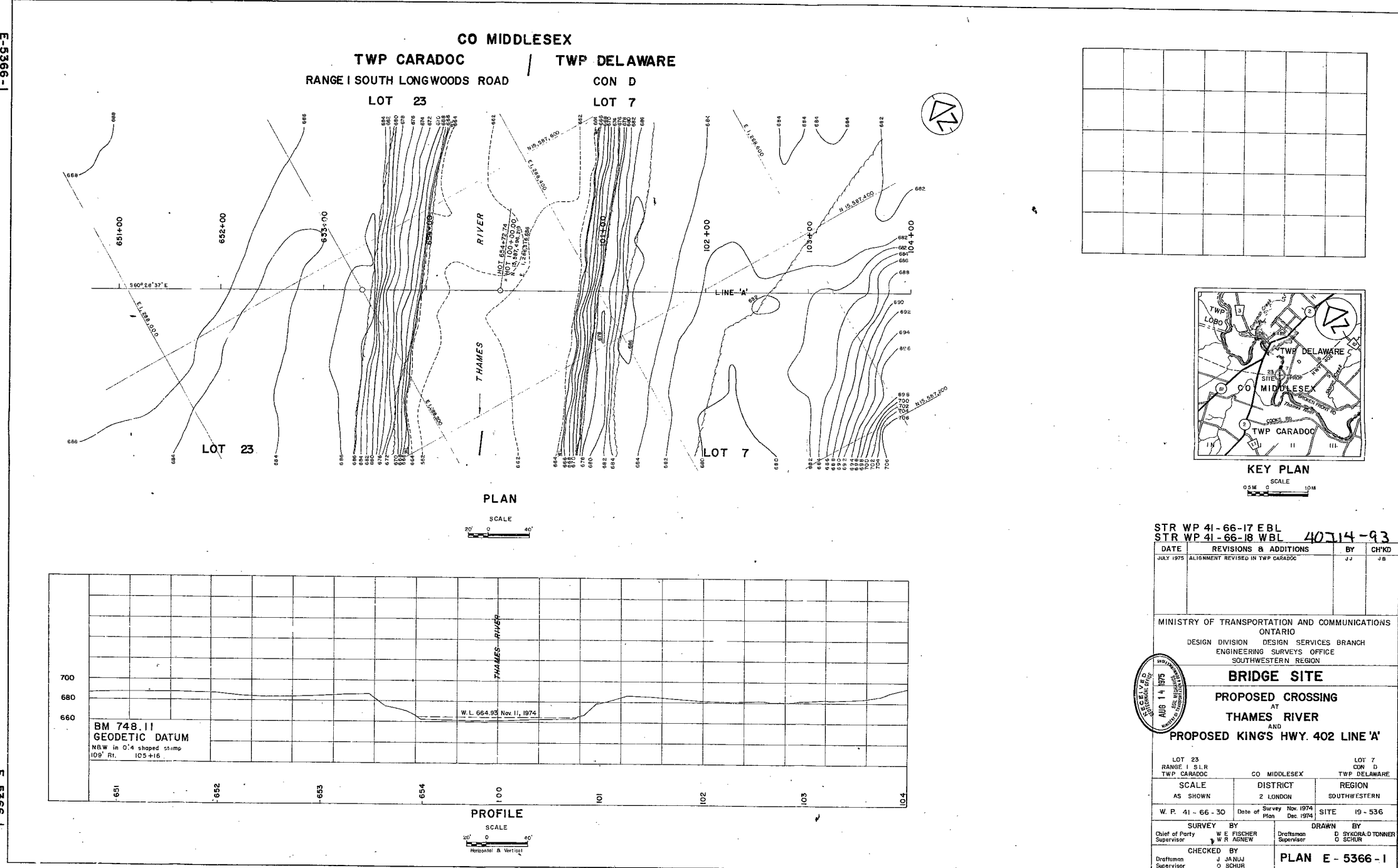
LOCATION Crossing at Thames  
River & proposed King's Hwy. 402

OVERLAY DRAWING NO. TO BE ADDED TO THE FILE 3

REMARKS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



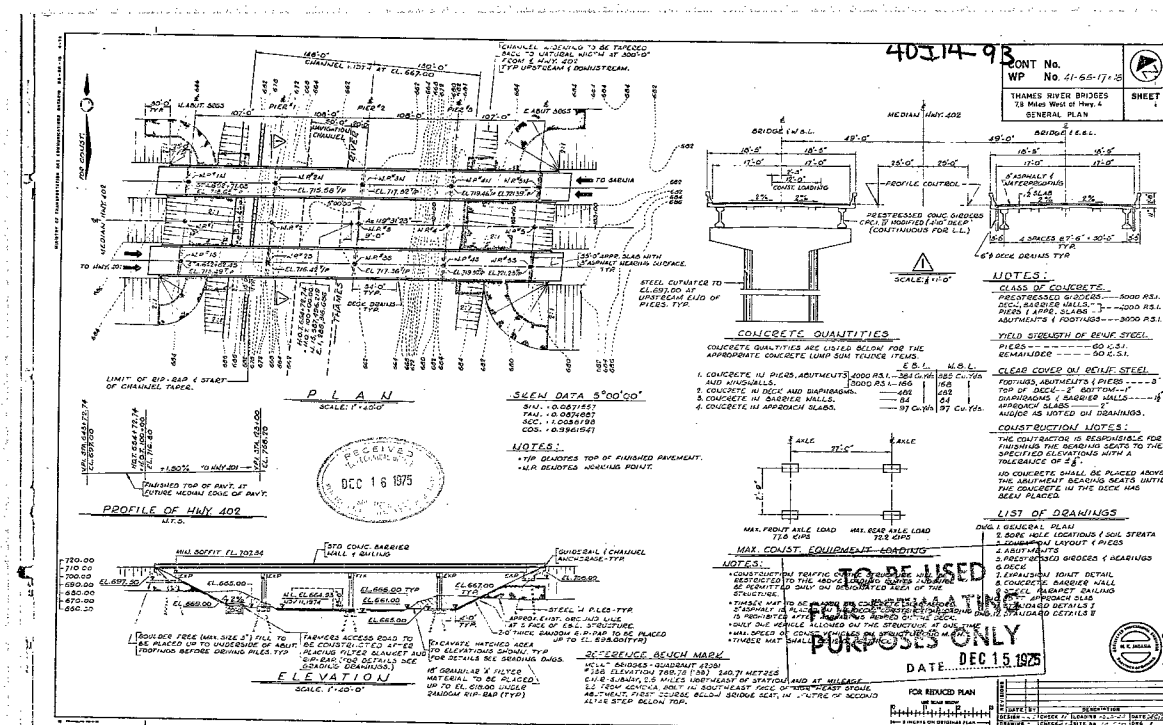
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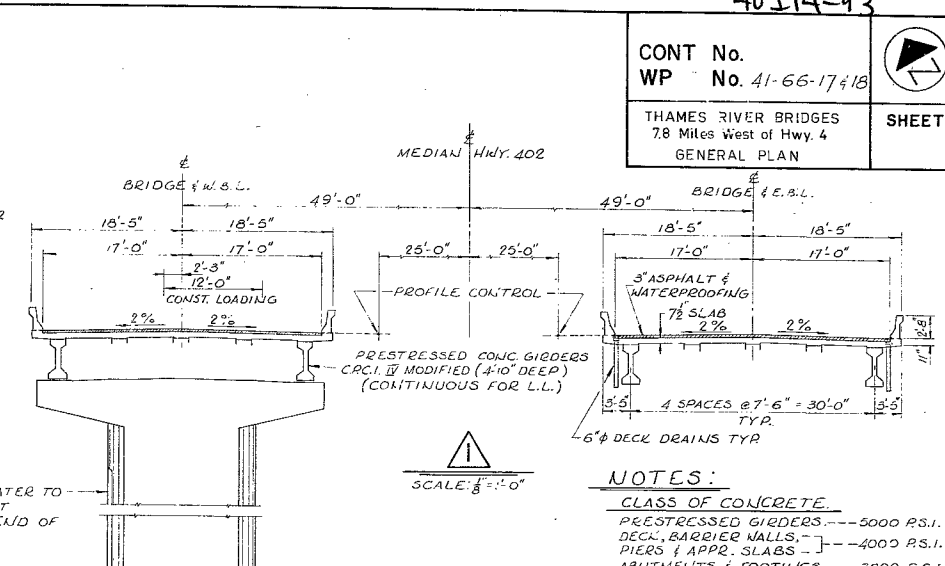
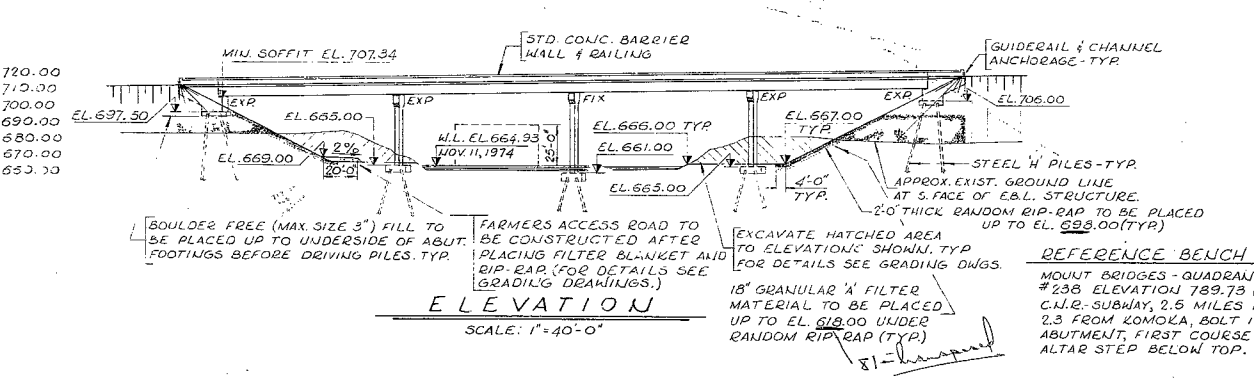
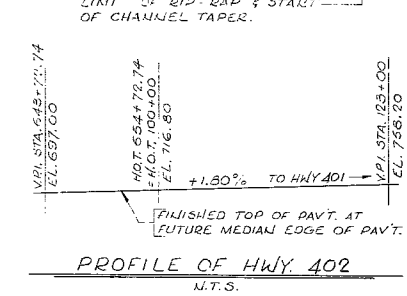
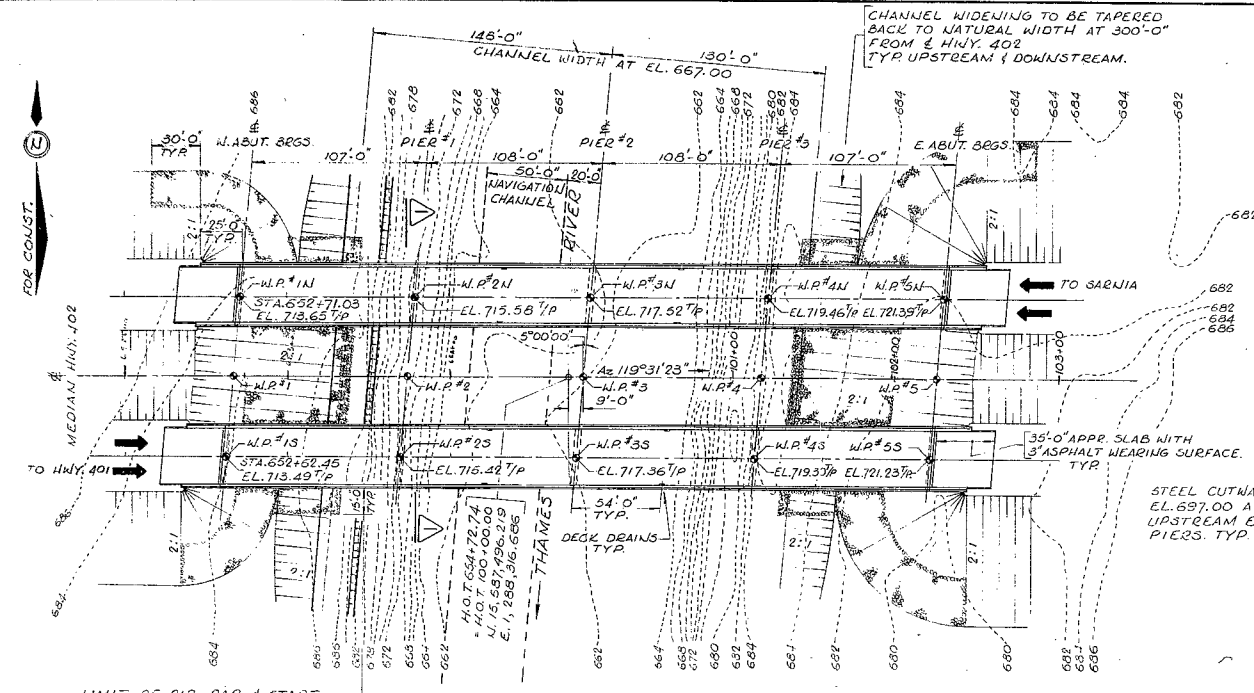


I-9966-E

E-5366-1

E-5366-1

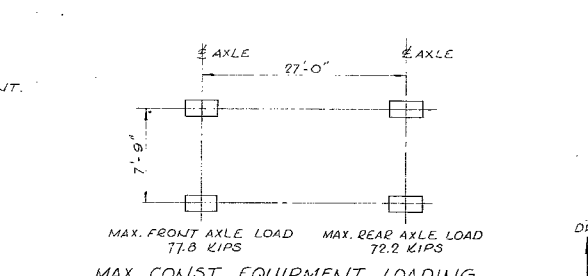




**CONCRETE QUANTITIES**

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS.

	E.B.L.	W.B.L.
1. CONCRETE IN PIERS, ABUTMENTS AND WINGWALLS.	4000 P.S.I. - 384 Cu.Yds.	385 Cu.Yds.
2. CONCRETE IN DECK AND DIAPHRAGMS.	3000 P.S.I. - 166	165
3. CONCRETE IN BARRIER WALLS.	482	482
4. CONCRETE IN APPROACH SLABS.	84	84
	97 Cu.Yds.	97 Cu.Yds.



**REFERENCE BENCH MARK**

MOUNT BRIDGES - QUADRANT 42081

#238 ELEVATION 789.73 ('33) 240.71 METRES

C.N.R. SUBWAY, 2.5 MILES NORTHEAST OF STATION AND AT MILEAGE 2.5 FROM KOMOKA, BOLT IN SOUTHEAST FACE OF NORTHEAST STONE ABUTMENT, FIRST COURSE BELOW BRIDGE SEAT, IN CENTRE OF SECOND ALTAR STEP BELOW TOP.

40314-93

CONT No.  
WP No. 41-66-17-18

THAMES RIVER BRIDGES  
7.8 Miles West of Hwy. 4  
GENERAL PLAN

SHEET

**NOTES:**

**CLASS OF CONCRETE.**

PRESTRESSED GIRDERS --- 5000 P.S.I.  
DECK, BARRIER WALLS, PIERS & APPR. SLABS --- 4000 P.S.I.  
ABUTMENTS & FOOTINGS --- 3000 P.S.I.

**YIELD STRENGTH OF REINF. STEEL**

PIERS --- 60 K.S.I.  
REMAINDER --- 50 K.S.I.

**CLEAR COVER ON REINF. STEEL**

FOOTINGS, ABUTMENTS & PIERS --- 3"  
TOP OF DECK --- 2" BOTTOM --- 1"  
DIAPHRAGMS & BARRIER WALLS --- 18"  
APPROACH SLABS --- 2"  
AND/OR AS NOTED ON DRAWINGS.

**CONSTRUCTION NOTES:**

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm \frac{1}{8}$ ".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

**LIST OF DRAWINGS**

DWG. 1. GENERAL PLAN  
2. BORE HOLE LOCATIONS & SOIL STRATA  
3. FOUNDATION LAYOUT & PIERS  
4. ABUTMENTS  
5. PRESTRESSED GIRDERS & BEARINGS  
6. DECK  
7. EXPANSION JOINT DETAIL  
8. CONCRETE BARRIER WALL  
9. STEEL PARAPET RAILING  
10. 35 FT. APPROACH SLAB  
11. STANDARD DETAILS I  
12. STANDARD DETAILS II

**FOR REDUCED PLAN**

USE SCALE BELOW

1" = 40'-0"

3 INCHES ON ORIGINAL PLAN

REVISIONS	DATE	BY	DESCRIPTION	DATE	BY
1					

DRAWING 651 CHECKED BY SITE No. 19-536 DWG. 1

