

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section.

July 12, 1960.

FOUNDATION INVESTIGATION REPORT
by: Hacey, MacCallum & Associates,
Ltd.

Attention: Mr. S. McCombie.

Re: Proposed Crossing of Hwy. 401 and
Road Allowance Between Lots 24 and 25,
Conc. 1, Twp. of Lancaster, Ontario.
W.P. 178-60 -- District No.9.

Attached, we are forwarding to you, the above mentioned report submitted by Hacey, MacCallum and Associates, Ltd. We have reviewed the presented factual data and find the recommendations adequate for your future design work.

In connection with the 'H' piles, we would like to add that the elevation at which the driving of the piles should be stopped, will most probably be between elevation 115' and 120'. At these elevations, the number of blows per foot of penetration should exceed 80. With the above criterion, the piles can be safely loaded with 35 - 40 tons per pile.

Because of the very sensitive nature of the clay layer, displacement piles should not be considered.

If there are any other questions in connection with the above site that you would like to discuss, please feel free to call on our Section.

MS/WdF
Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
D. G. Ramsay
J. Ford
L. E. Walker
J. C. Gruspe
A. Watt
Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.

Per:

(A. Stermac,
FOUNDATIONS OFFICE ENGR.)

RACEY, MacCALLUM AND ASSOCIATES
LIMITED

A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers
AND ASSOCIATED STAFF

MONTREAL



VANCOUVER

TORONTO

DONALD C. MACCALLUM, B.ENG., M.E.I.C., P.ENG.

H. JOHN RACEY, B.S.C., M.E.I.C., P.ENG.

GEORGE L. HOUGHTON, A.M.I.MECH.E., M.E.I.C., P.ENG.

TORONTO DIVISION
27 CARLTON STREET

Reference: S-500/T-2281
- Report -

28th June, 1960

Department of Highways for Ontario,
Materials and Research Section,
C/o Parliament Buildings,
TORONTO - Ontario.

Attention : Mr. A. Rutka.

RE: D.H.O. # W.P. 178 - 60
SOIL INVESTIGATION FOR
PROPOSED CROSSING OF HWY # 401 AND
ROAD ALLOWANCE BETWEEN LOTS 24 AND
25, CONG.I, TWP. OF LANCASTER, ONT.

Dear Sirs,

The enclosed report presents the results of our soil investigation at the above location.

We hope the report is satisfactory to you; if you have any questions about it please do not hesitate to get in touch with us.

Thank you for this opportunity of being of service to you.

Yours very truly,
RACEY, MacCALLUM AND ASSOCIATES LIMITED,

J. J. Schoustra, P.Eng.,
Divisional Soil Engineer.

JJS/YDP

Department of Highways for Ontario,
Materials and Research Section,
C/o Parliament Buildings,
Toronto, Ontario.

RE: D.H.O. # W.P. 178 - 60
SOIL INVESTIGATION FOR
PROPOSED CROSSING OF HWY # 401 AND
ROAD ALLOWANCE BETWEEN LOTS 24 AND
25, CONC. I, TWP. OF LANCASTER, ONT.

Reference: S-500/T-2281
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Limited.

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- Report -

28th June, 1960

LIST OF ENCLOSURES.

<u>Enclosure No.</u>	<u>Description</u>
1	Site plan.
2 - 12	Engineering data sheets.
13 & 14	Unconfined compression tests.
15 - 17	Triaxial tests.
18	Stability analysis.
19 - 22	Consolidation tests.
23	Settlement analysis.
24	Collected moisture contents and cohesion.

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MONTREAL



VANCOUVER

TORONTO

DONALD C. MACCALLUM, B.ENG., M.E.I.C., P.ENG.

H. JOHN RACEY, B.SC., M.E.I.C., P.ENG.

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TORONTO DIVISION
27 CARLTON STREET

Reference: S-500/T-2281
- Report -

28th June, 1960

D.H.O. # W.P. 178 - 60
SOIL INVESTIGATION FOR
PROPOSED CROSSING OF HWY # 401 AND
ROAD ALLOWANCE BETWEEN LOTS 24 AND
25, CONC. I, TWP. OF LANCASTER, ONT.

INTRODUCTION :

In accordance with instructions received from the Department in a letter dated 6th May, 1960, a soil investigation was carried out at the above site. The original plans called for an overpass structure, but when the first results materialised verbal change orders were issued, first to move the site 200 feet West and later to direct the investigation towards construction of an underpass. The latter order arrived too late to carry out borings at the proposed new embankment, and two additional borings or probings will be carried out by the Department, the results of which are not included in this report.

FIELD WORK :

Field work consisted in the first instance of four boreholes with adjacent cone penetration tests and two additional cone tests (numbers 1 through 9). These first holes were carried out with a continuous flight power auger, which was replaced by a diamond drill for the ensuing work. After the proposed crossing had been moved 200 feet West (see above) three additional boreholes and five cone tests were carried out (numbers 10 through 14).

Samples were taken using 2-inch diameter Shelby tubes and a standard split spoon sampler. Cone penetration tests with a 2-inch diameter cone were carried out using the same driving energy as for the split spoon (140 lbs hammer at 30 inches drop).

Field vane tests were taken at regular intervals. The remoulded shear strength was measured exactly one minute after turning the vane three times.

Reference: S-500/T-2281
- Report - Continued.

28th June, 1960

Considerable rock coring was carried out when penetrating into a gravel and boulder till layer. Progress by diamond drilling in this stratum was very time-consuming and costly on diamond wear. Since by-passing this stratum by means of conventional steel piling would appear virtually impossible, it was decided unnecessary to carry on to bedrock.

The locations of boreholes are shown on Enclosure No 1, the results of the field work on Enclosures No 2 to 12 inclusive.

LABORATORY WORK :

A number of classification tests, moisture content and natural unit weight determinations were carried out and recorded on the Engineering Data sheets. Unconfined compression tests (Enclosures No 13 and 14), triaxial tests (Enclosures No 15, 16 and 17), and consolidation tests (Enclosures No 19, 20, 21 and 22) were carried out to determine strength and compressibility of the clay stratum encountered. Moisture content and shear strength as measured in all borings have been plotted against depth on Enclosure No 24.

SUBSOIL PROFILE :

In general, the subsoil consists of two principal strata, namely a grey, soft to medium stiff sensitive clay underlain by dense boulder till. The clay layer extends to Elevation 140 feet at Borehole No 14, sloping downwards to Elevation 123 feet at Borehole No 8. This downward trend continues in an Easterly direction; at the nearby creek crossing the clay reaches to Elevation 114 feet. A thin topsoil layer is followed by a crust of the same clay soil which has a high strength as the result of desiccation. According to Chapman-Putman* the clay represents a marine deposit from the Champlain Sea period which overlies a very stony till.

No bedrock has been proved (see above), but local information would indicate the possibility of bedrock near Elevation 100 feet.

RECOMMENDATIONS :

For an underpass structure, implying approaches on the side road up to approximately Elevation 180 feet (see Plan E3768-1 of D.H.O.)

* "The Physiography of Southern Ontario".

Reference: S-500/T-2281
- Report - Continued.

28th June, 1960

the three principal problems of settlement, stability and construction support have been studied :

Stability :

A stability analysis is presented on Enclosure No 18. It is based on the following assumptions :

- a. Schematic profile as shown on the enclosure;
- b. Topsoil excavated to Elevation 154 feet;
- c. Unit weight of embankment fill 135 pcf;
angle of friction : 35 degrees;
cohesion is zero.
- d. Slope of embankment : $1\frac{1}{2}$ to 1 (side roads);
- e. Ground water elevation : 154 feet.
- f. Clay layer divided into three sections, namely :

Elevation 154-150 feet : disturbed (by construction equipment) brown clay; $c = 300$ pcf;

Elevation 150-146 feet : stiff grey clay;
 $c = 1500$ pcf;

Elevation 146-135 feet : soft grey clay;
 $c = 500$ pcf;

Angle of friction : zero.
- g. Rupture line is a circle; the final rupture line on Enclosure No 18 is the result of several trials.

The resulting factor of safety is 1.26. The effect of pile driving for the structure might cause considerable loss of strength locally. It is recommended, therefore, that the embankment fill (placed considerable time before construction, see "settlements") be removed for some distance from the area where piles will be driven. From the analysis it would seem adequate to keep the toe of the fill some 20 feet back from the nearest row of piles.

Reference: S-500/T-2281
- Report - Continued.

28th June, 1960

The construction of berms to increase the stability would would aggravate the settlement problem to some extent and is not recommended. If the calculated factor of safety of 1.26 is not felt to be adequate, an increase of the embankment slope to 2 : 1 might be considered.

Settlements :

Settlement calculations have been based on the same cross-section as described above. The results of the calculations, which are based on the consolidation test results, are shown on Enclosure No 23. Settlements have been determined for two cross-sections, arriving at a maximum value of almost two feet. This must be ascribed to the excessively high void ratio of the clay.

If the clay layer is assumed to extend to approximately Elevation 135 feet, the consolidation periods for 25%, 50% and 90% consolidation will be 1, 4 and 18 years respectively.

Foundations :

The presence of a soft clay layer relatively close to ground surface excludes a foundation on spread footings. The fact that the clay is underlain by a dense till at a reasonable depth makes a pile foundation quite attractive.

Judging from the cone penetration results, the granular fill can be penetrated to a depth of 15 - 20 feet by virtually any type of displacement piles. Below this depth boulders as much as 4 feet in size would prevent further penetration. Based on the penetration resistance, it is felt that a 40 tons per square foot safe end-bearing capacity could be allowed for displacement piles driven to approximately Elevation 130 feet. (It should be remembered that only Borings No 1, 10, 11, 12 and 13 refer to the present site.)

The disadvantage of displacement piles is the amount of disturbance they would cause in the sensitive clay, thus aggravating the stability problems. Thus it may be more advisable to use steel H-piles driven to refusal on the boulders at elevations probably varying between Elevation 120 feet and Elevation 110 feet. The size of the piles would then be decisive for the allowable bearing capacity.

CONCLUSIONS :


The results of this investigation may be summarized as follows :

Reference: S-500/T-2281
- Report - Continued.

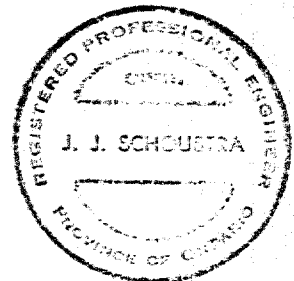
28th June, 1960

CONCLUSIONS : Continued -

1. The subsoil consists of about 20 feet of sensitive clay (the top 4 - 6 feet of which has stiffened by desiccation) underlain by a stony till with increasing boulder size.
2. Stability of a conventional fill embankment will be assured if disturbance of the clay is prevented.
3. Settlements under a fill embankment will be as high as 2 feet. The consolidation period is very long and early erection of the embankment is recommended.
4. A pile foundation, preferably of H-piles driven into the boulder till is recommended.


J. J. Schoustra, P.Eng.,
Divisional Soil Engineer.

Prepared by : H. J. Mizerio, B.Sc., M.Sc.,
Project Engineer.
Racey, MacCallum and Associates
Limited - Toronto Division.



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Foundation Engineering Division

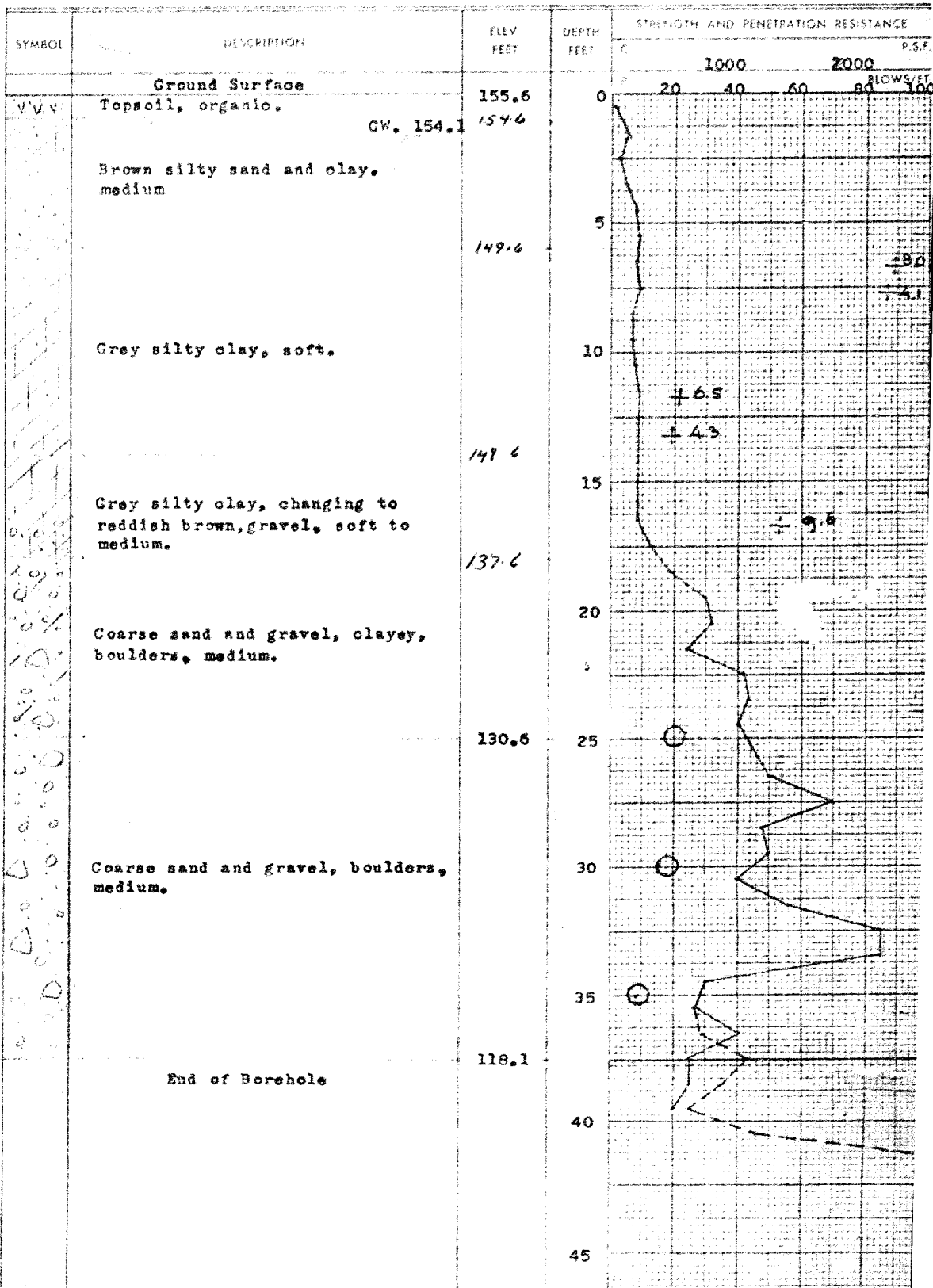
Engineering Data Sheet for Borehole: 1 & 1'

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No. 1. *W. 1/4 Sec. 27, T. 14 N., R. 10 E., S. 22 N. 17 W. 81.4'*
 Hole Elevation and Datum: 155.6 feet
 Field Supervisor: H.J.M. Prep: H.J.M.
 Driller: H.G. Checked: Date:

LEGEND

Shear Strength (C)
 Unconfined compression
 Vane test and sensitivity (S)
 Penetration Resistance (P)
 2" Split tube
 2" Dia. Cone
 Casing

3
14
100



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Engineering Data Sheet for Borehole: 1 & 1'

LEGEND**Consistency**

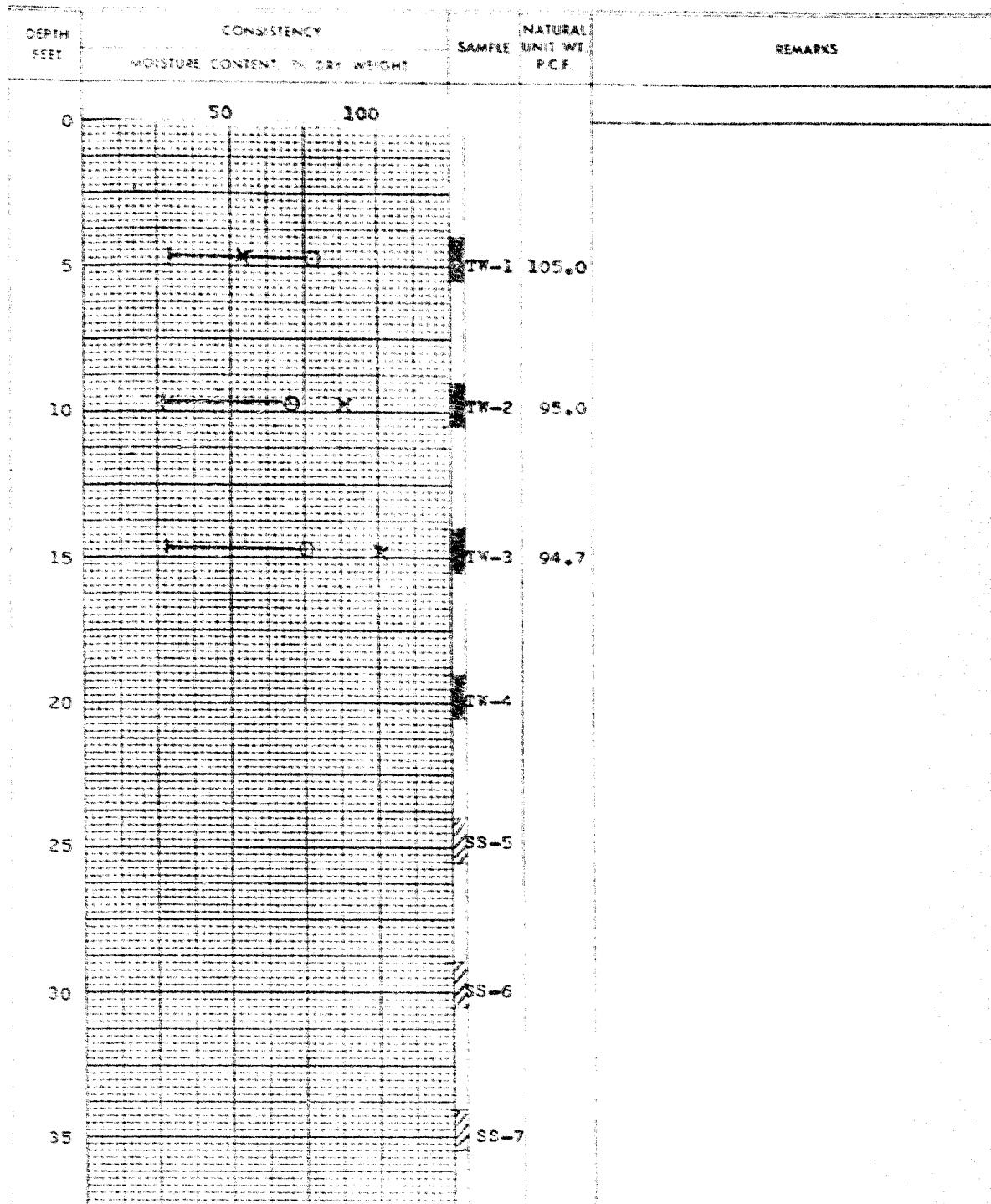
Natural moisture and
Liquidity Index (LI)
Liquid limit
Plastic limit

**Sampling Method**

2" Dia split tube



2" Shelby tube



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Engineering Data Sheet for Borehole: 4

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No. 1.
 Hole Elevation and Datum: 154.8 feet
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: H.G. Checked: Date:

LEGEND

Shear Strength (C)

Unconfined compression

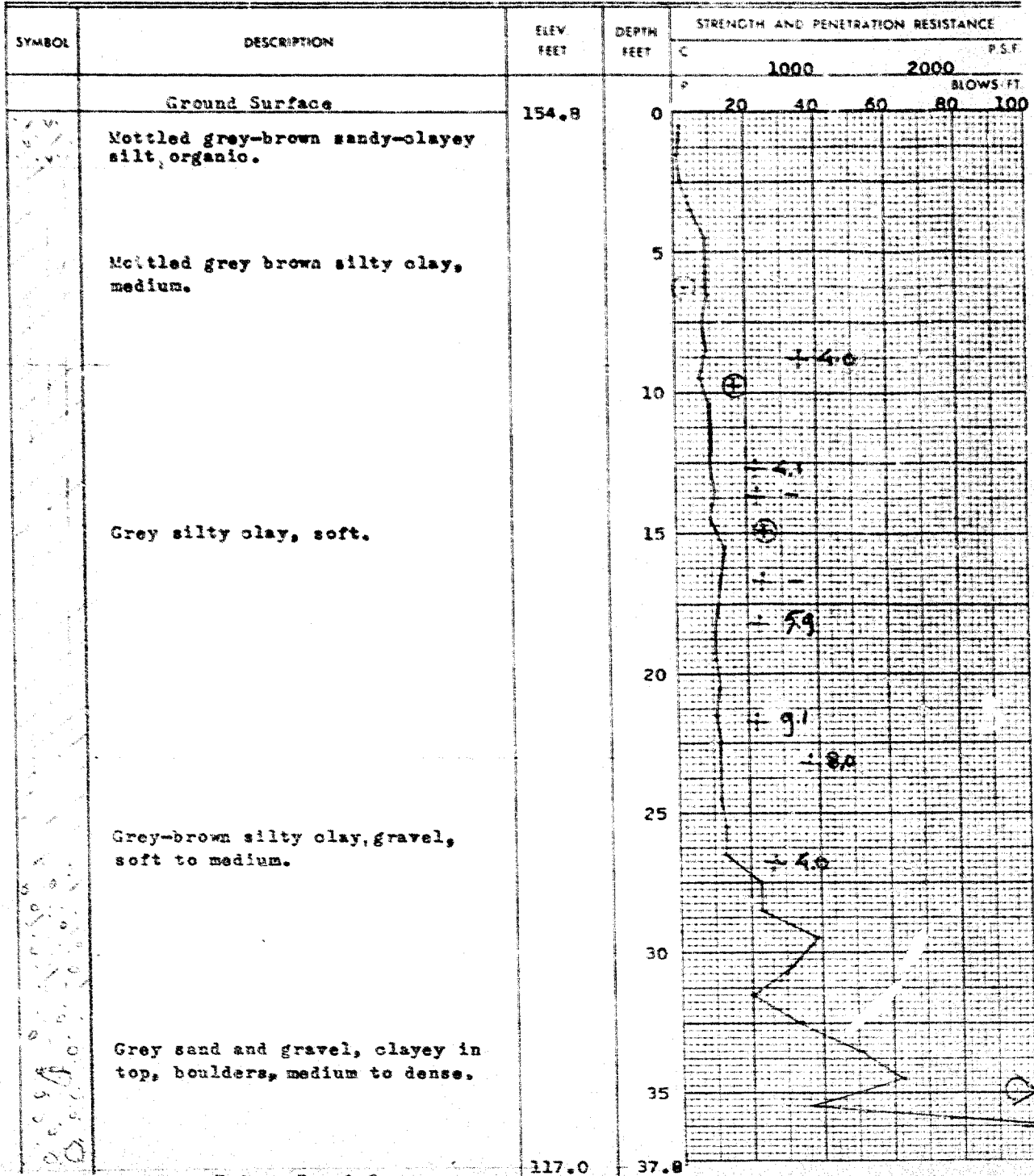
Vane test and sensitivity (S)

Penetration Resistance P:

2" Split tube

2" Dia. Cone

Casing



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Engineering Data Sheet for Borehole: 4

LEGEND**Consistency**

Natural moisture and
Liquidity Index (LI)
Liquid limit
Plastic limit

—•—•—
x LI
—O—
—P—

Sampling Method

2" Dia. split tube

2" Shelby tube



DEPTH FEET	CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.	REMARKS
	MOISTURE CONTENT, % DRY WEIGHT				
	50	100			
0					
5					
			SS-1		
10					
			TW-2	95.8	
15					
			TW-3	90.8	
20					
			TW-4		
25					
			TW-5		
30					
35					
			SS-6		

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Engineering Data Sheet for Borehole: 5

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1.
 Hole Elevation and Datum: 154.4 feet
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: H.G. Checked: Date:

LEGEND

Shear Strength (C)

Unconfined compression

Vane test and sensitivity (S)

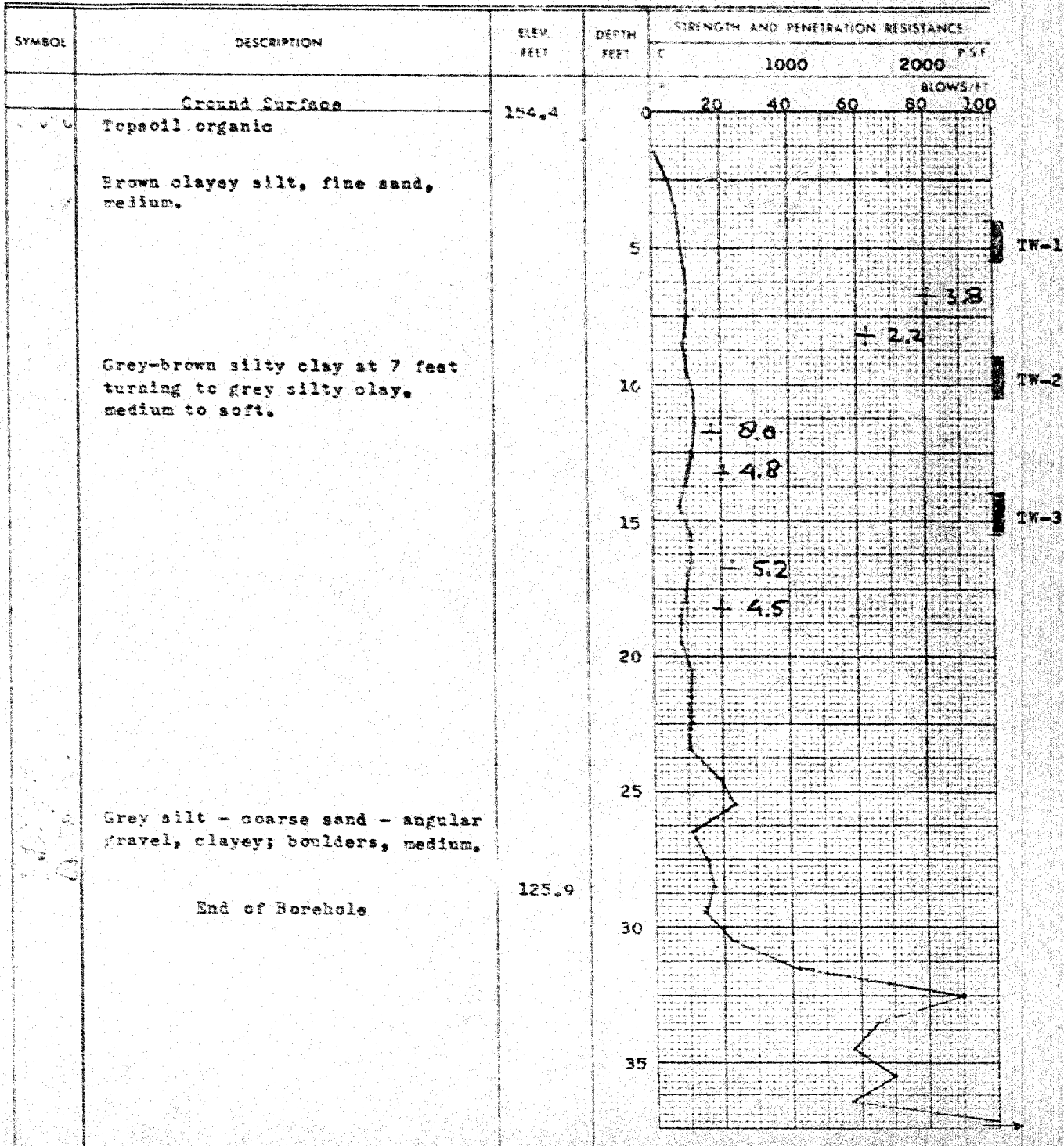
Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Coring

3



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Engineering Data Sheet for Borehole: 6

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1.
 Hole Elevation and Datum: 154.2 feet
 Field Supervisor: H.J.M. Prep H.J.M.
 Driller: H.G. Checked: Date:

LEGEND

Shear Strength C

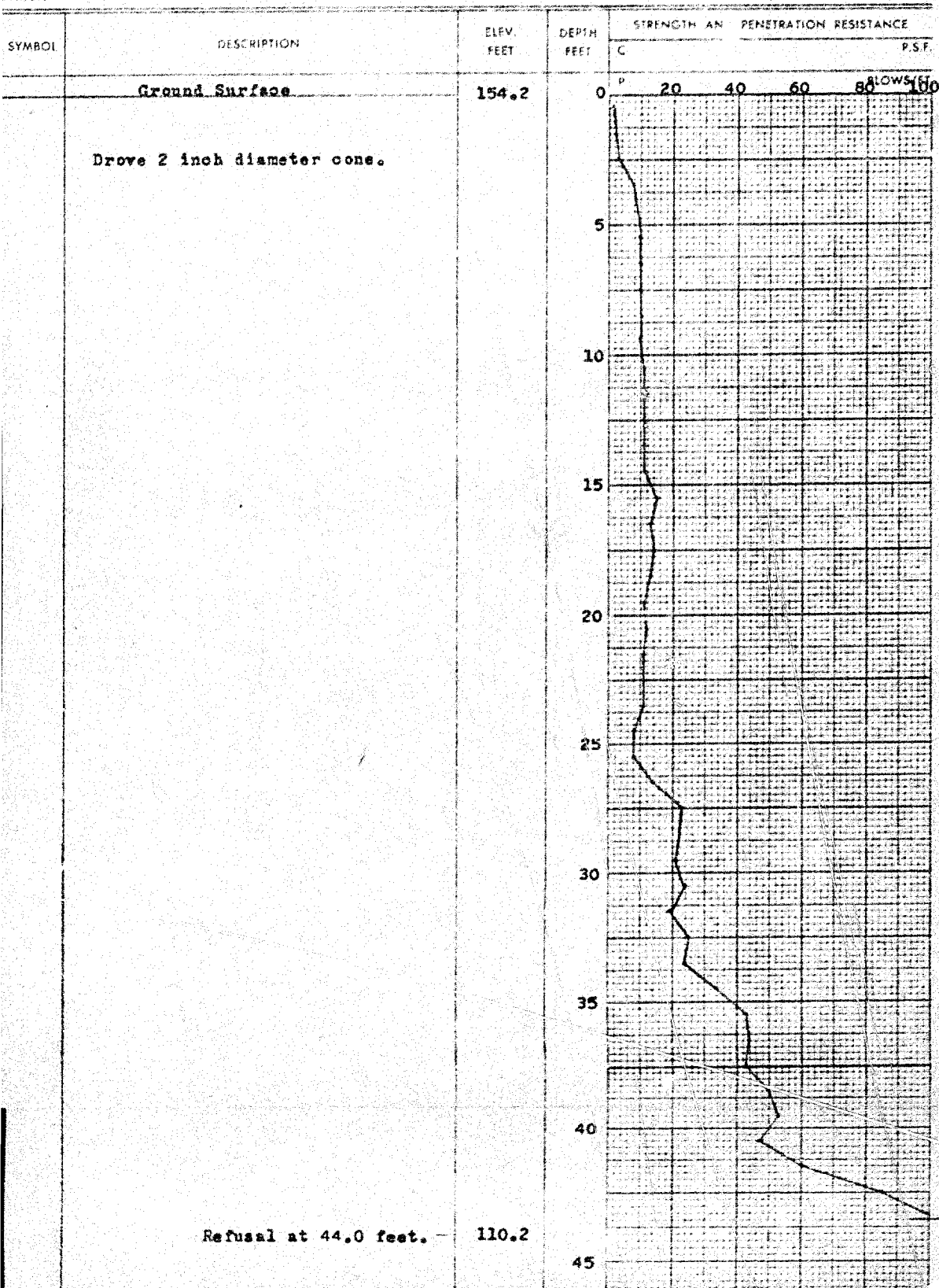
 Unconfined compression
 Vane test and sensitivity (S)

Penetration Resistance P

2" Split tube

2" Dia. Cone

Casing



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 7

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1.
 Hole Elevation and Datum: 153.4 feet
 Field Supervisor: H. J. M. Prep.: H. J. M.
 Driller: H. G. Checked: Date:

LEGEND

Shear Strength (C)

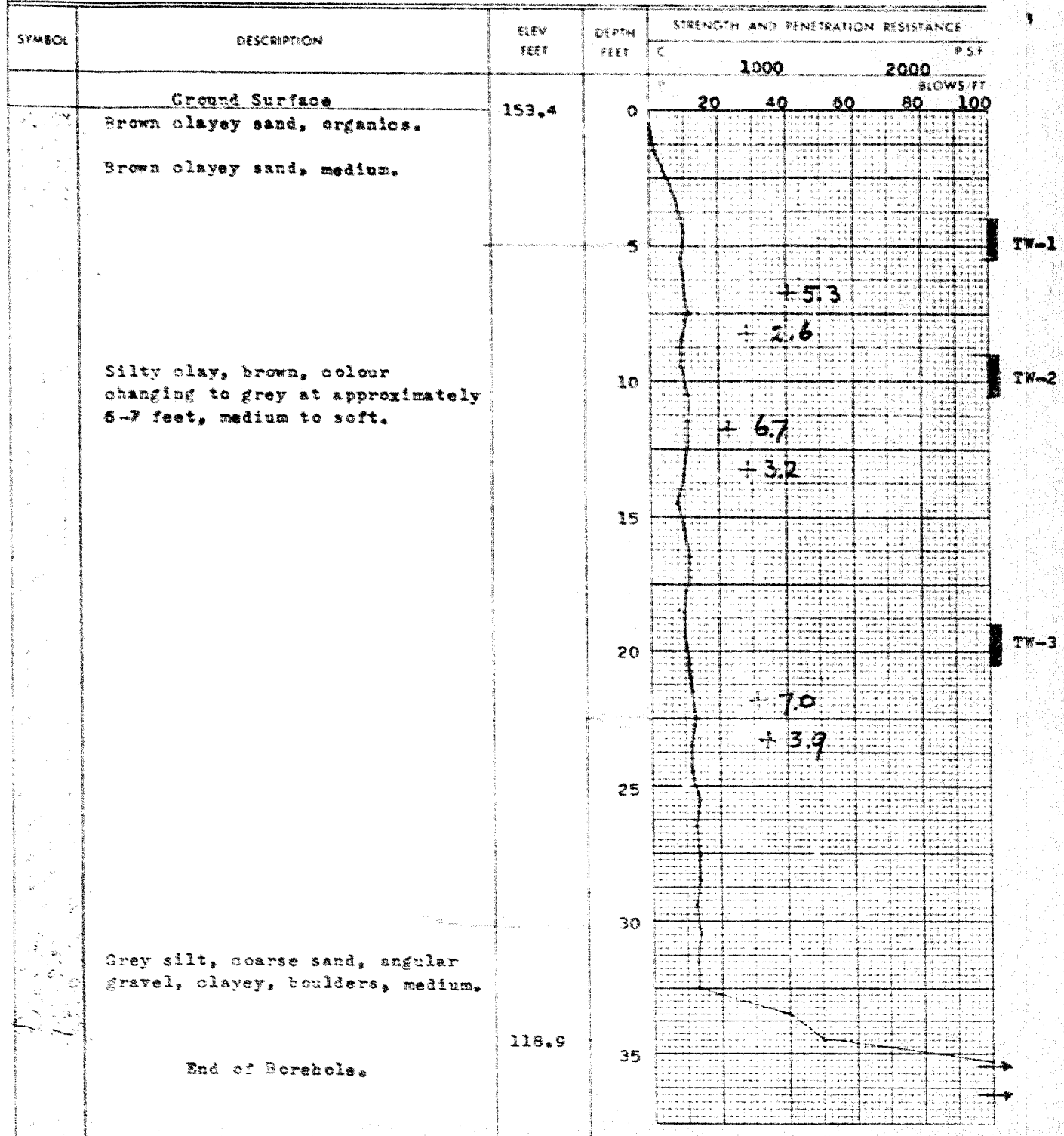
 Unconfined compression
 Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing



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Foundation Engineering Division

Improvement Data Sheet for Borehole 8

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1.
 Hole Elevation and Datum: 154.5 feet
 Field Supervisor: H.J.M. Prep: H.J.M.
 Order: H.G. Checked: Date:

SP-60

Shear Strength: 5

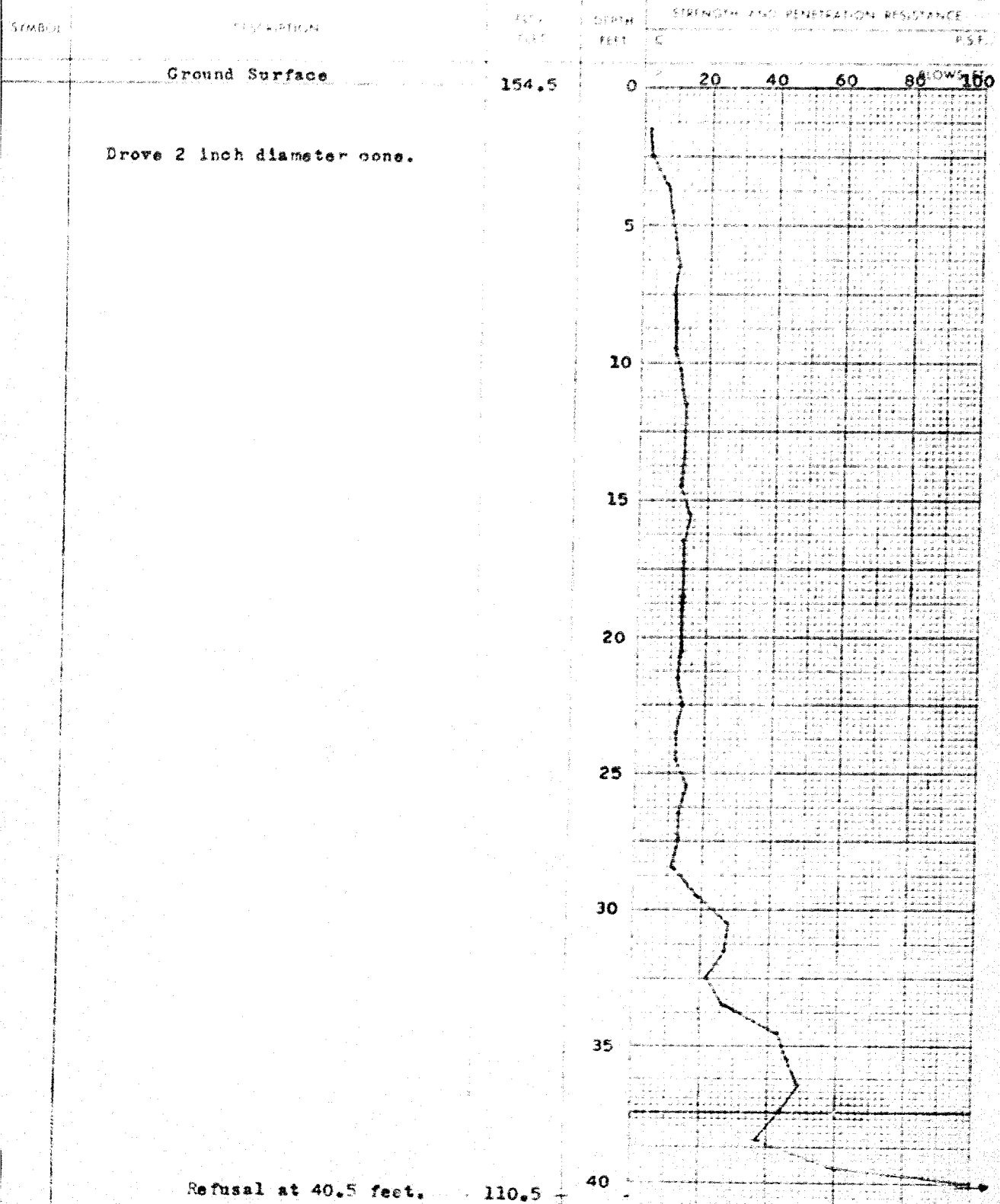
Unconfined compression
 (one test and quality 5)

Penetration Resistance: 8

2" Split tube

2" Split tube

10 mm



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 10

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No. 1. WESTLEY CR. RD.
 Hole Elevation and Datum: Approx. 155.5 feet STA. 15+34.30 RT
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: O.R. Checked: Date:

LEGEND

Shear Strength, C

Unconfined compression

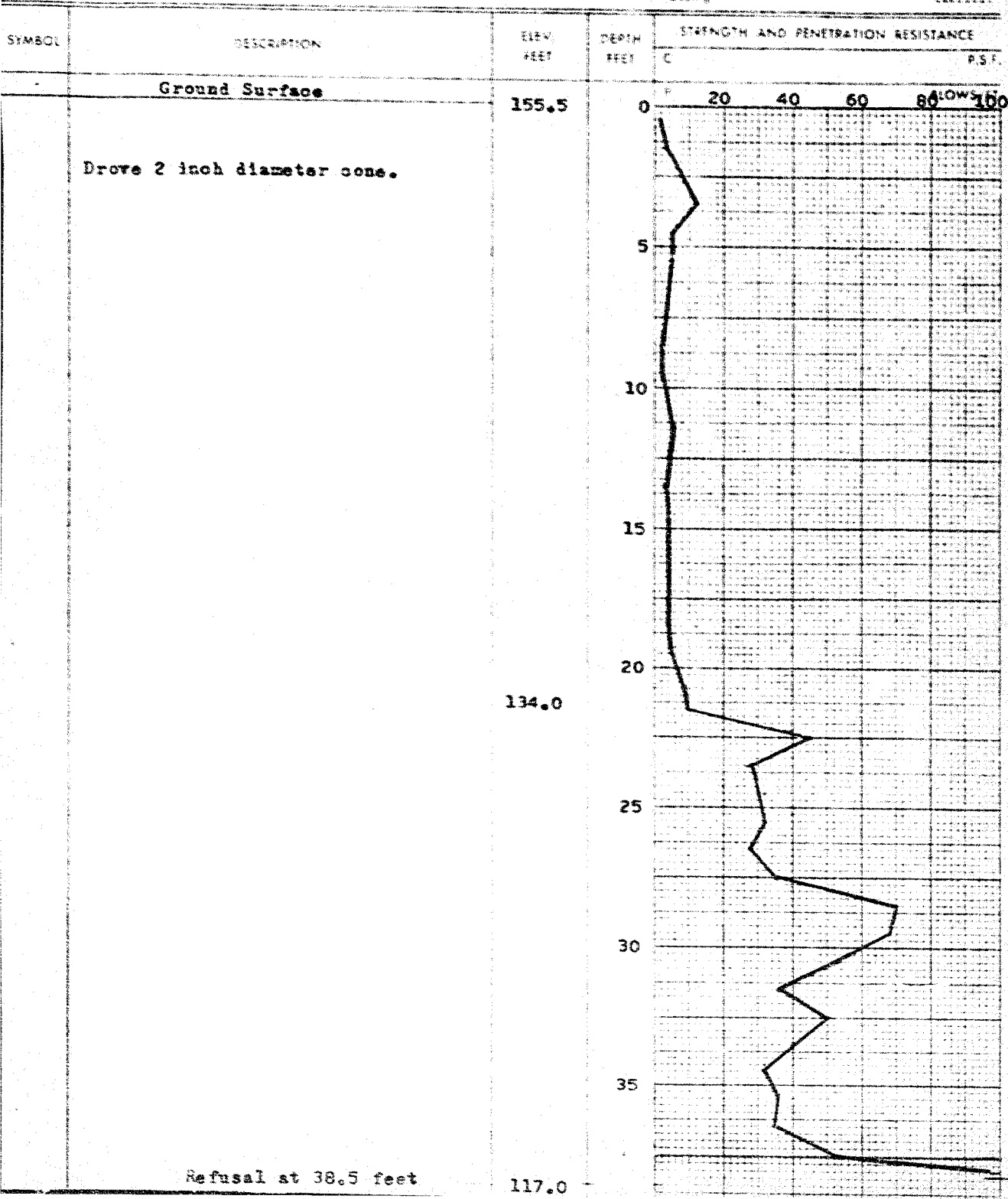
Vane test and sensitivity (S)

Penetration Resistance, P

2. Split tube

2. Dia. Cone

Casing



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 11

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No. 1. WESTLEY CREEK RD.
 Hole Elevation and Datum: approx. 156.0 feet
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: D.R. Checked: Date:

LEGEND

Shear Strength (C)

Unclassified compression

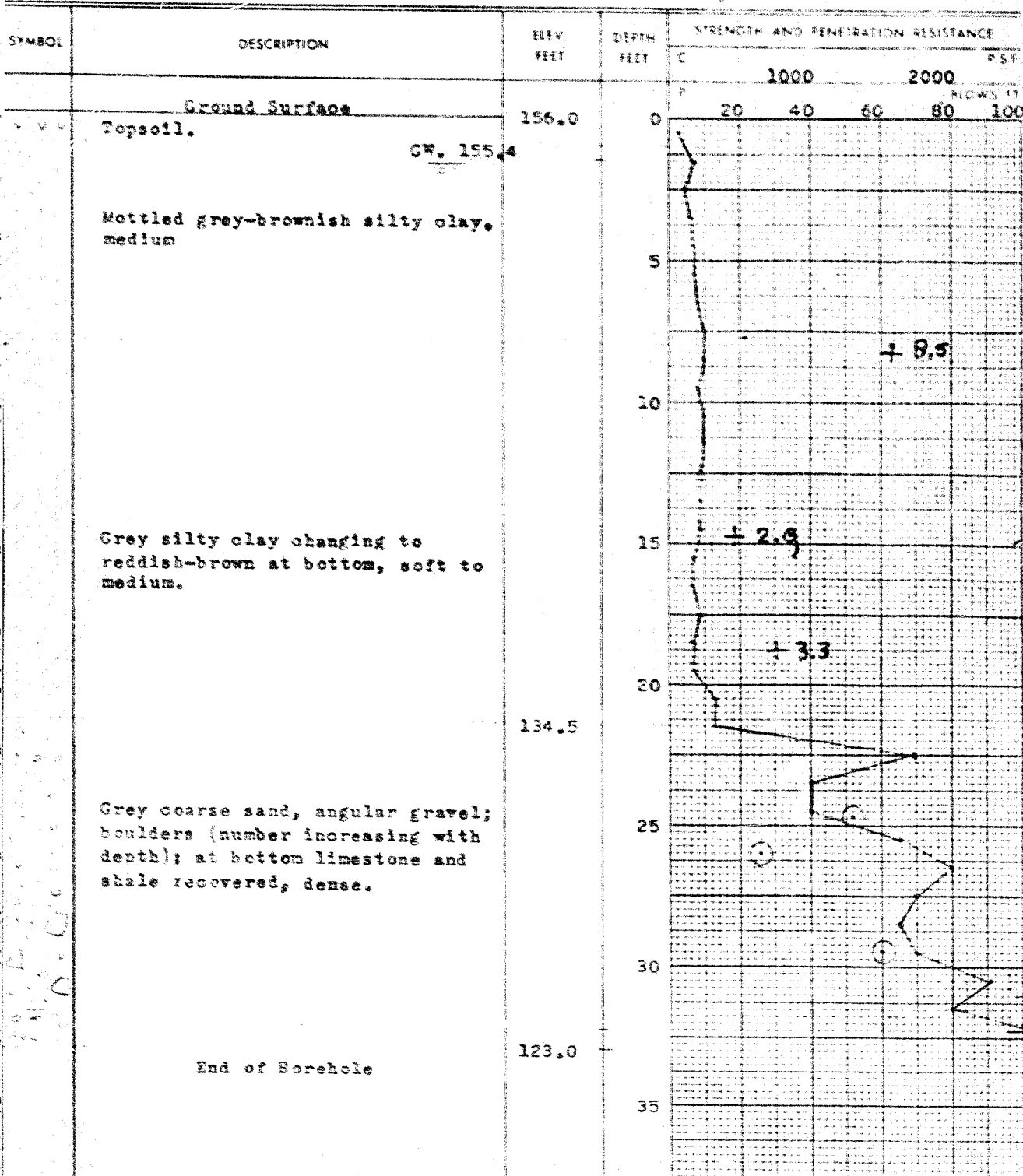
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Coring



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 11

LEGEND

Consistency

Natural moisture and

liquidity index (LI)

Liquid limit

Plastic limit



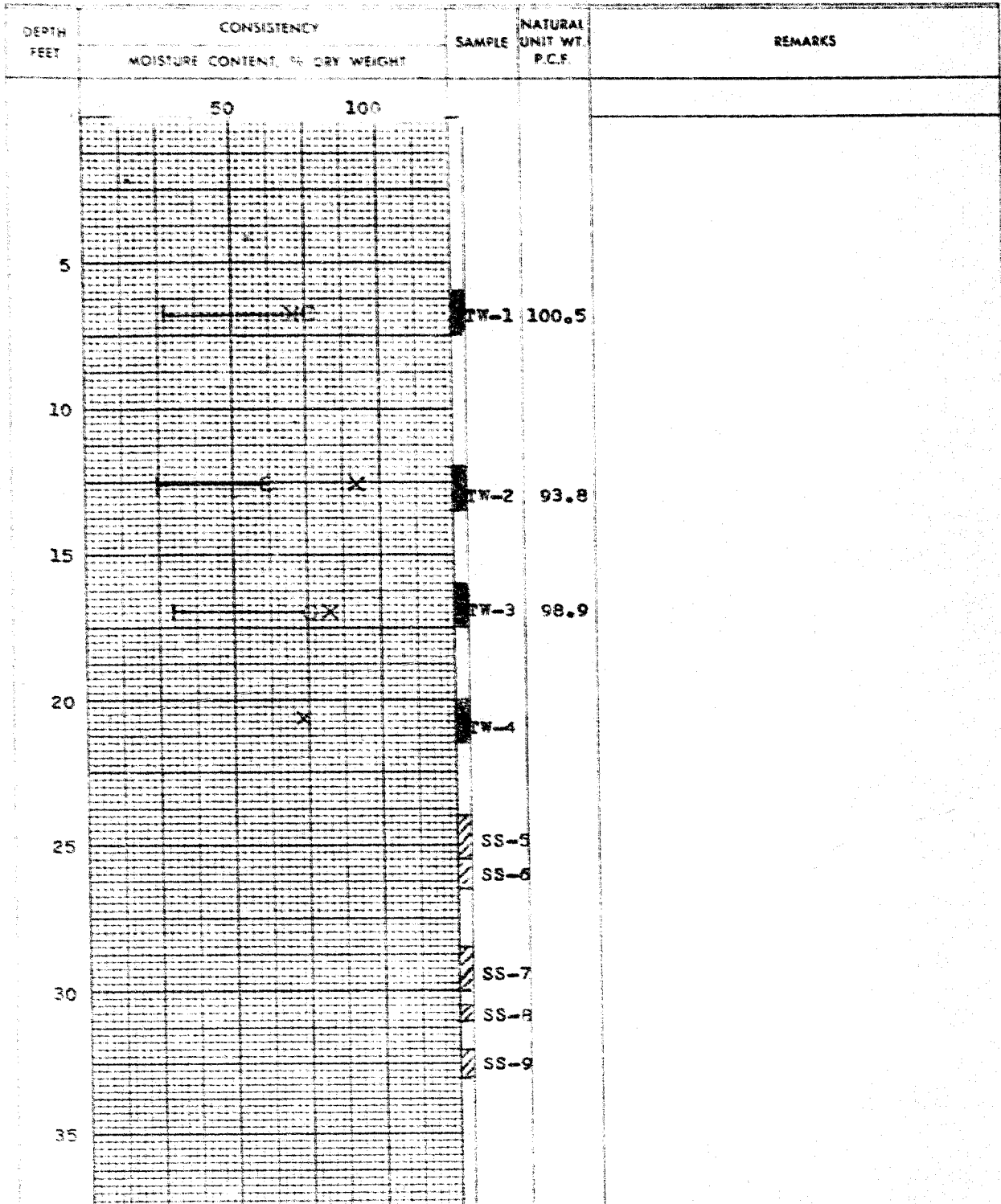
x LI



Sampling Method

2" Dia. split tube

2" Shelby tube



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Engineering Data Sheet for Borehole: 12

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No. 1. WESTLEY CR RD.
 Hole Elevation and Datum: Approx. 156.0 feet. STA. 17+34.35 LTd.
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: O.R. Checked: Date:

LEGEND

Shear Strength C

Unconfined compression

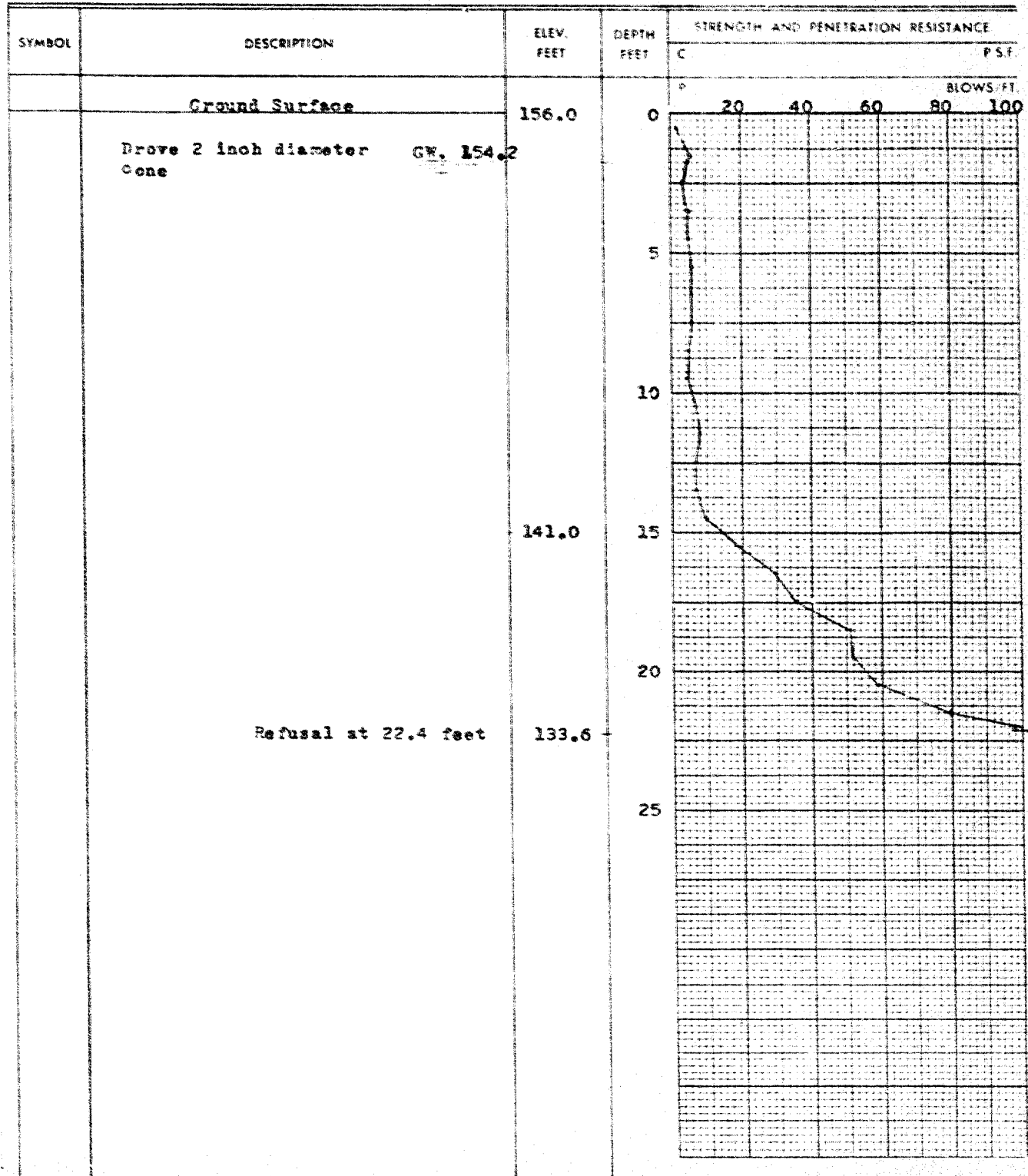
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 13

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1. WESTLEY CR. RD.
 Hole Elevation and Datum: Approx. 155.0 feet ~~SEA LEVEL~~ ~~TO L.L.~~
 Field Supervisor: H.J.M. Prep: H.J.M.
 Driller: O.R. Checked: Date:

LEGEND

Shear Strength (C)

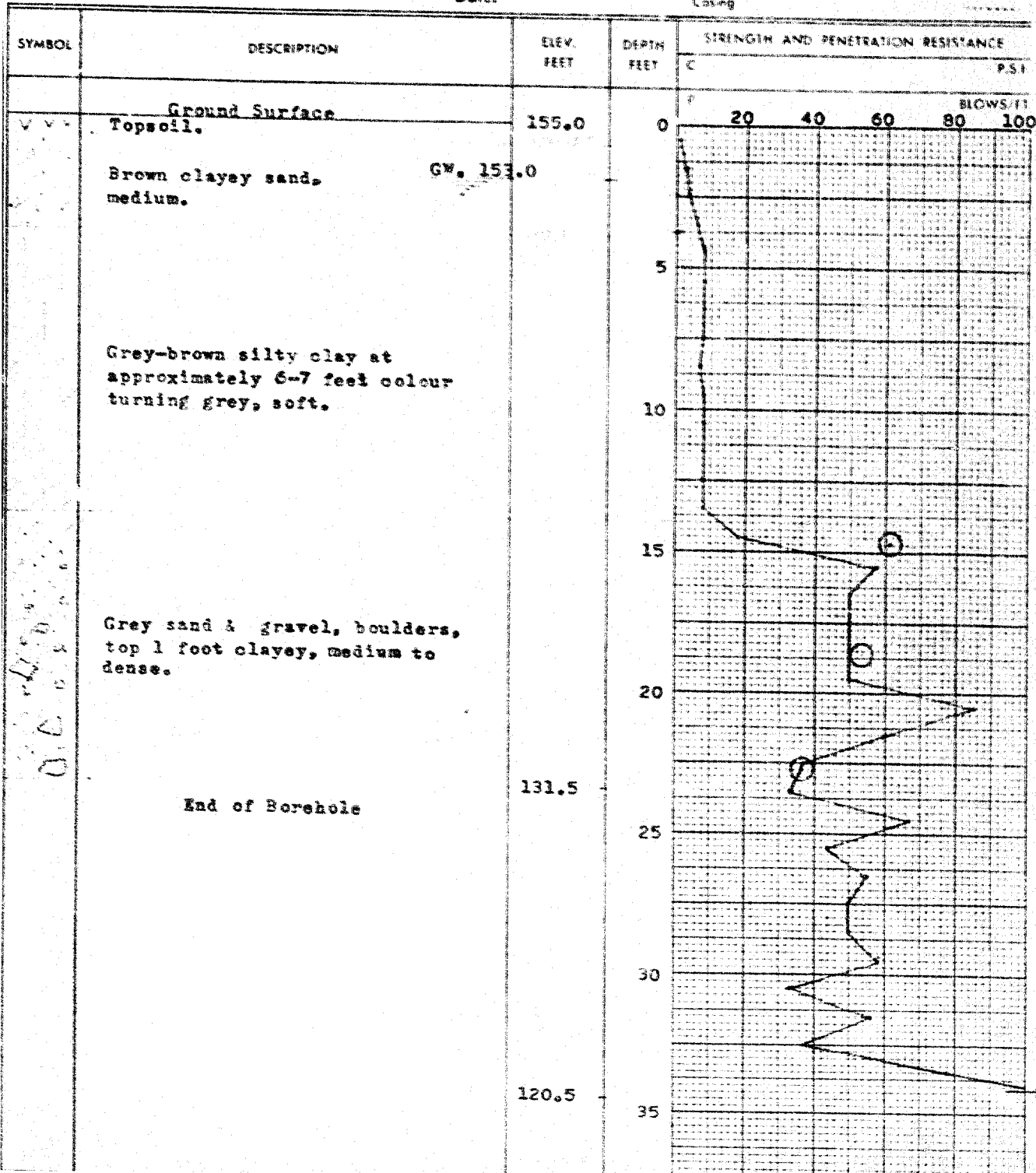
Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing



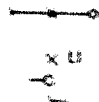
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Foundation Engineering Division

Engineering Data Sheet for Borehole: 13

LEGEND**Consistency**

Natural moisture and
Liquid limit
Plastic limit

**Sampling Method**

2" Dia. split tube



2" Shelby tube



DEPTH FEET	CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.	REMARKS
	MOISTURE CONTENT, % DRY WEIGHT				
0	50	100			
5			TK-1	105.8	
10			TK-2	94.1	
15			SS-3		
20			lost		
25			lost		
30					

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Foundation Engineering Division

Engineering Data Sheet for Borehole: 211

Project: HIGHWAY #401.
 Location: WESTLEY CREEK.
 Hole Location: See Enclosure No 1.
 Hole Elevation and Datum: Approx. 156.0 feet
 Field Supervisor: H.J.M. Prep.: H.J.M.
 Driller: O.R. Checked: Date:

LEGEND

Shear Strength C

Unconfined compression

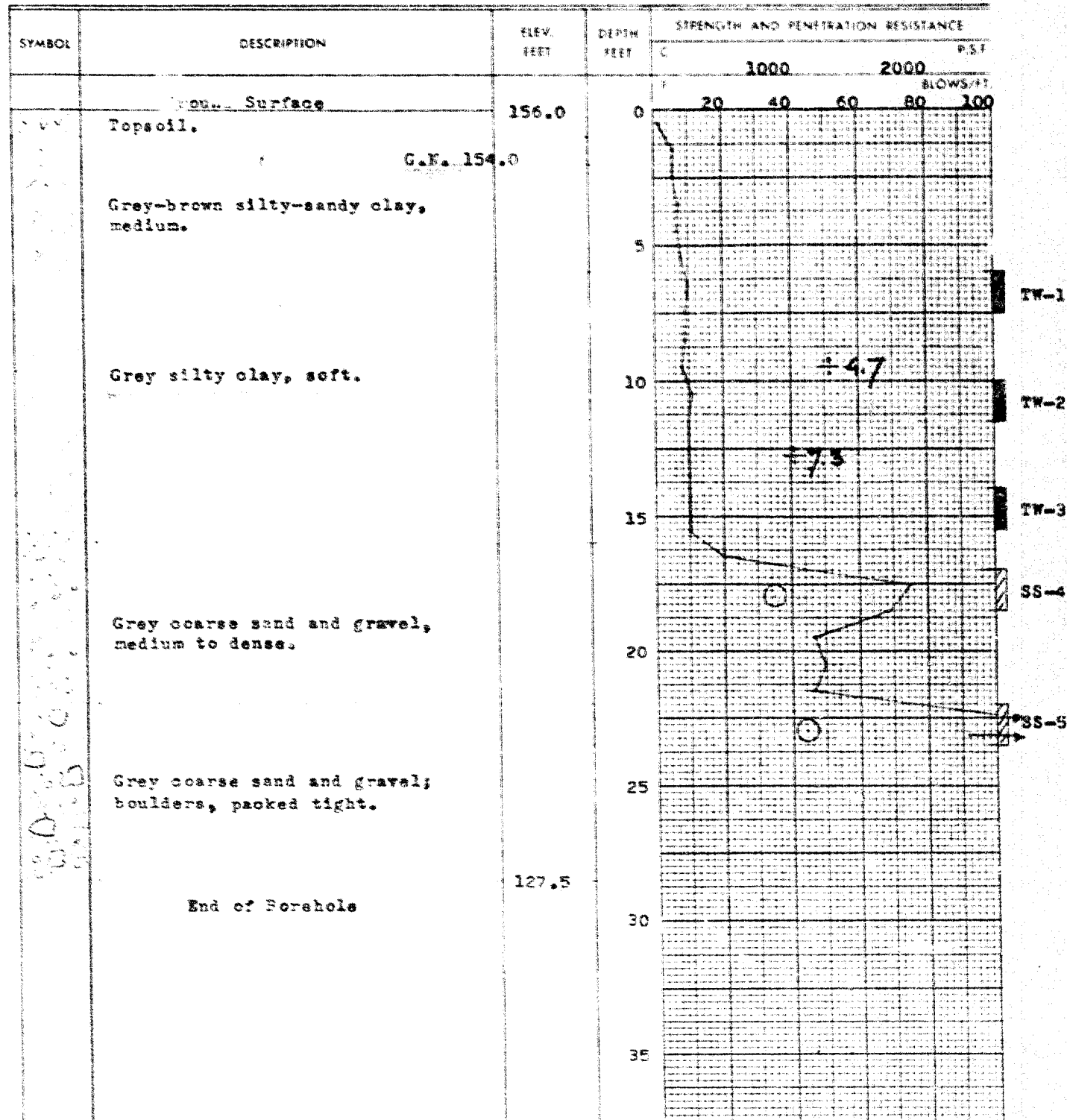
Vane test and sensitivity S_v

Penetration Resistance P

2" Split tube

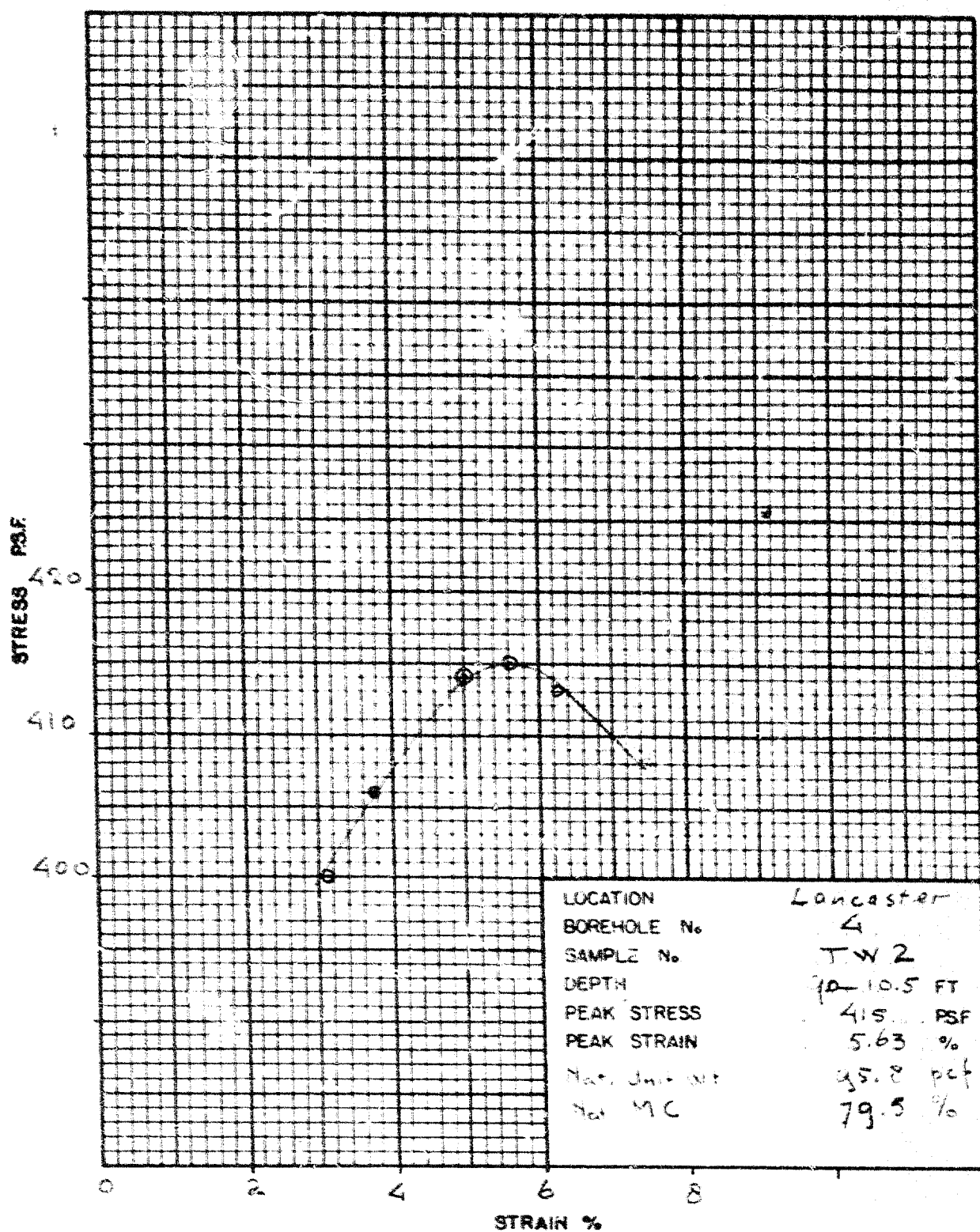
2" Dia. Cone

Casing

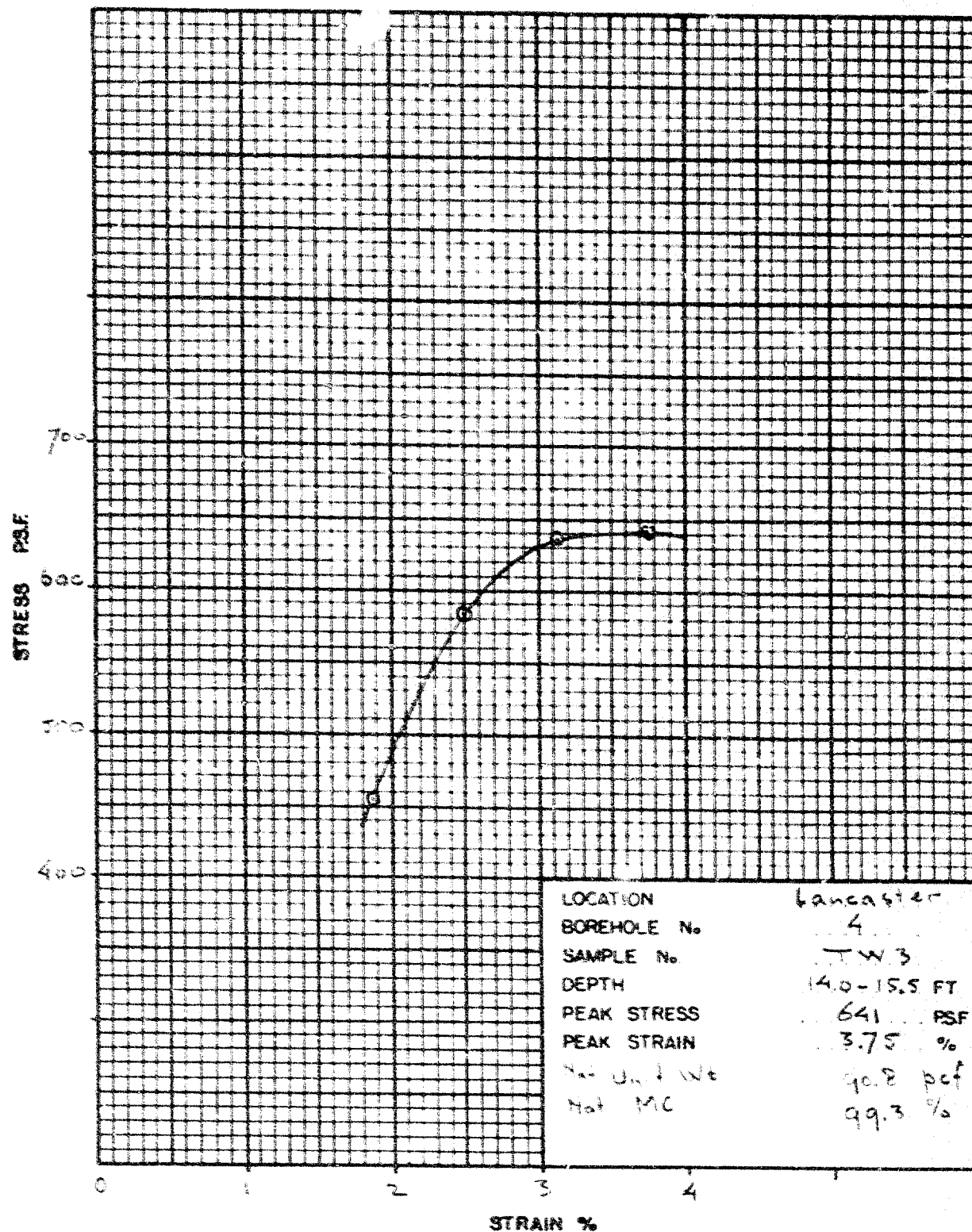


Prep. By HJM

UNCONFINED COMPRESSION TEST



UNCONFINED COMPRESSION TEST



Prep. By HJM

Triaxial tests (Undrained/Uncons.)

BH #1

TW. 1

4-5.5 ft

psf

14,000

12,000

10,000

8,000

6,000

4,000

2,000

sample 3

sample 2

$c_u = 3480$ psf
 $c_v = 2280$ psf

4,000

2,000

BH #1

TW. 2

9-10.5 ft

BH #1

TW. 3

14-15.5 ft

8,000

6,000

4,000

2,000

normal stress

$c_u = 490$ psf

2,000

8,000

6,000

4,000

2,000

shear stress

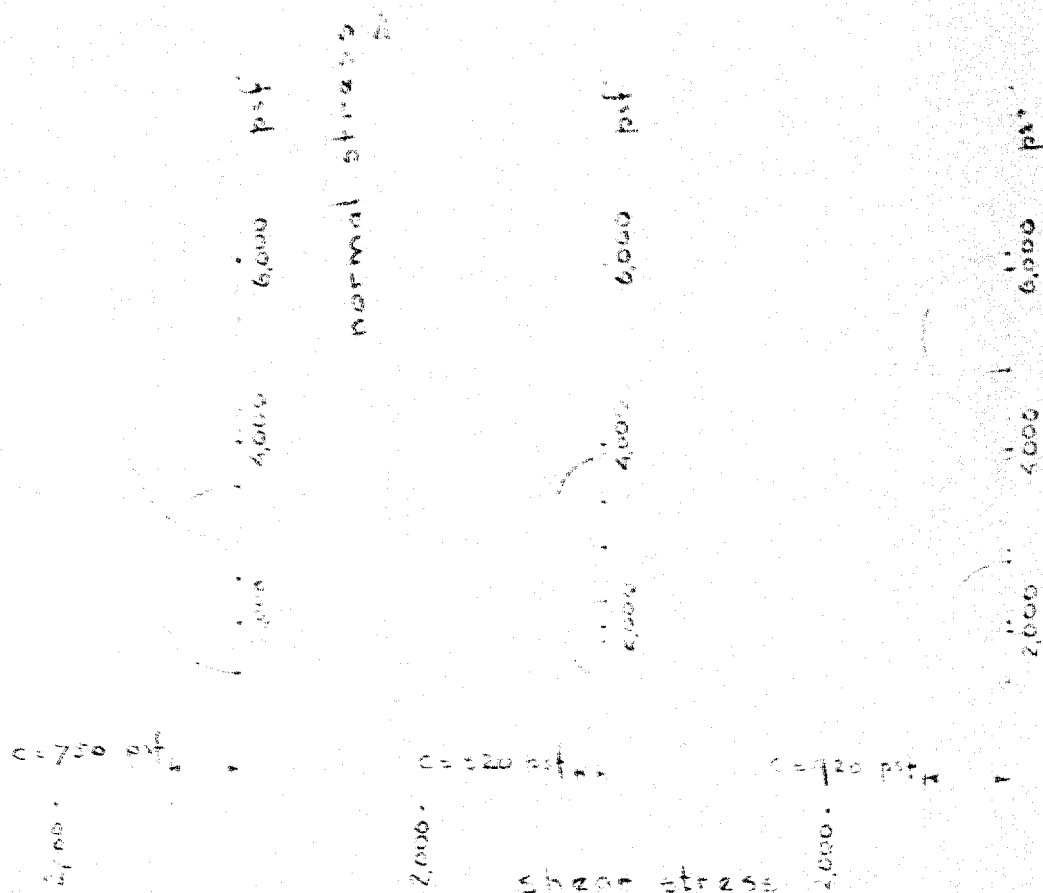
Prep. By HJM

Triaxial tests (Undrained / Uncons.)

BH II
TW 1
6-7.5 ft

BH II
TW 2
12-13.5 ft

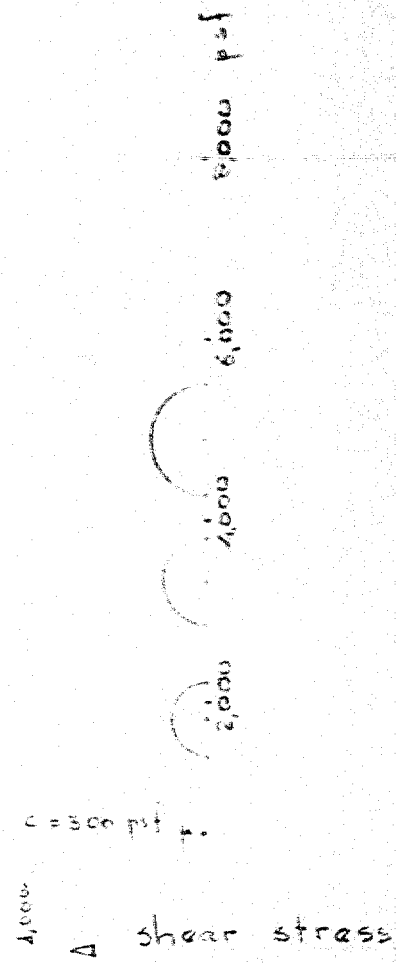
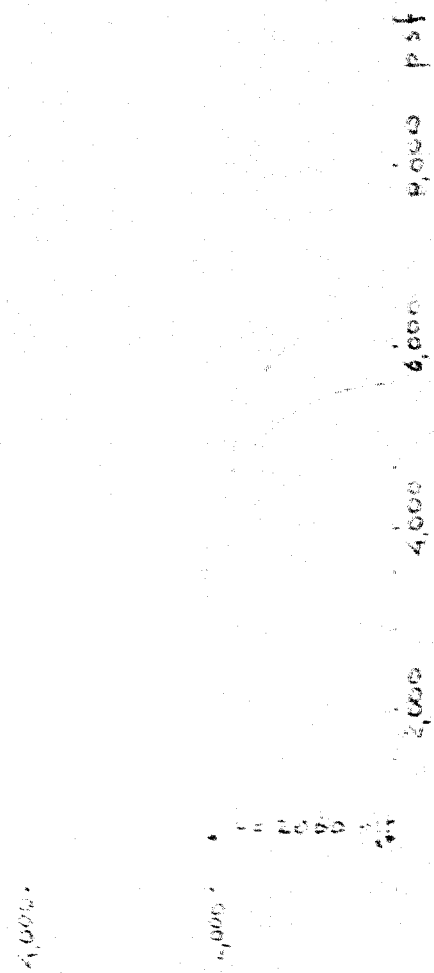
BH II
TW 3
16-17.5 ft



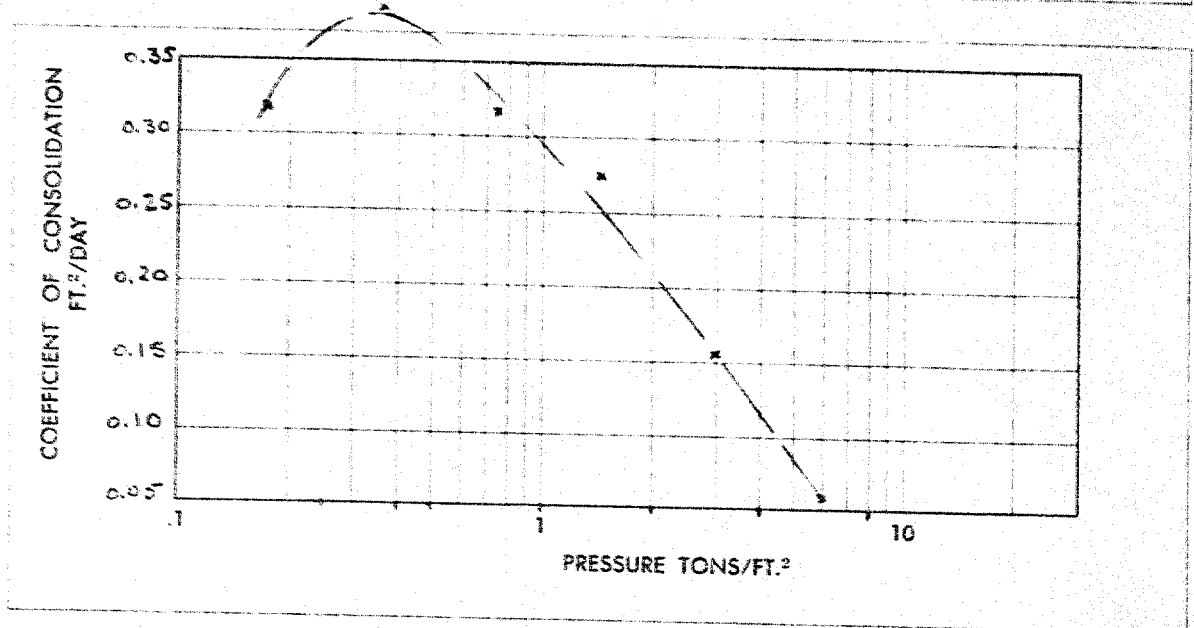
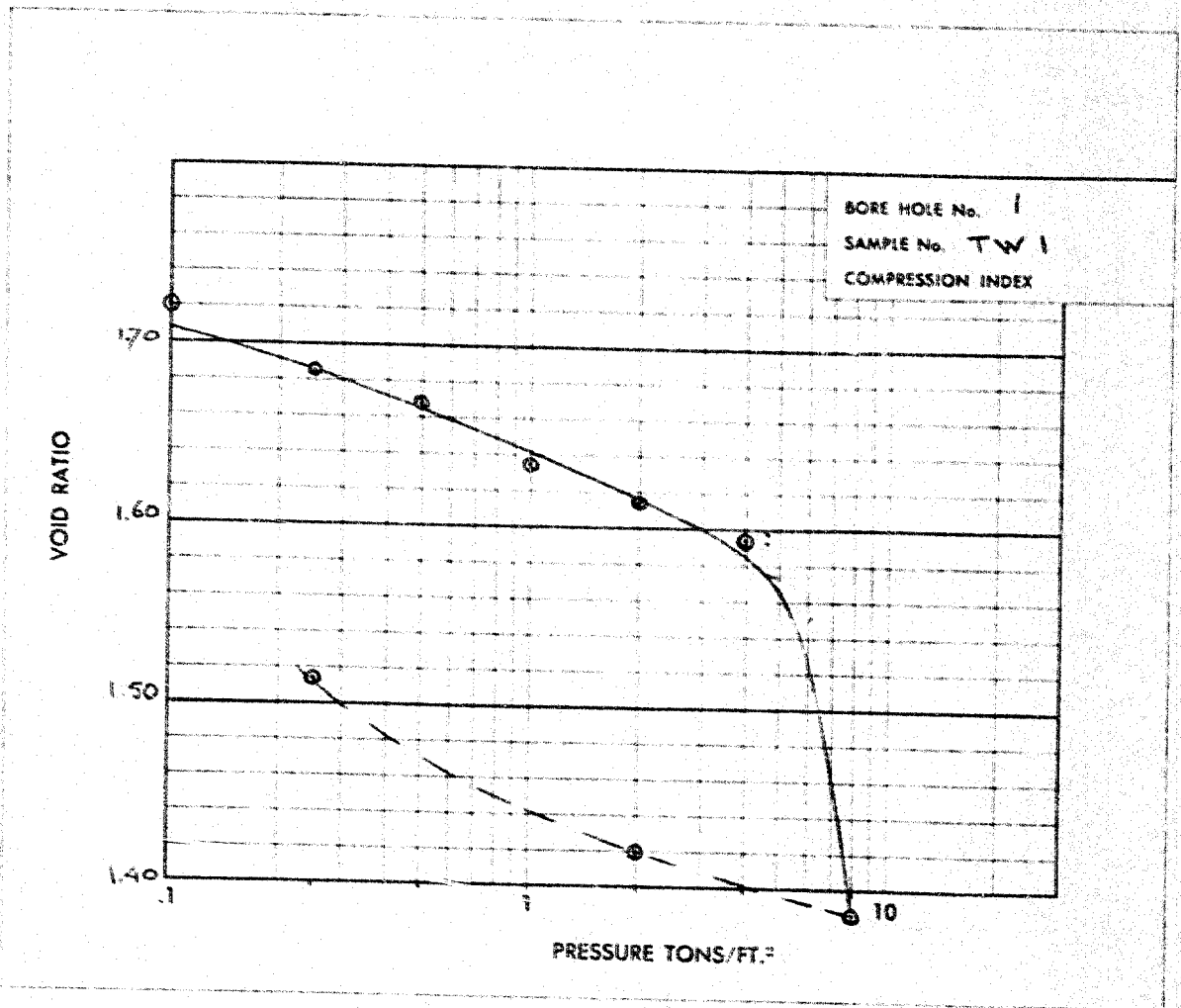
Triaxial tests (Undrained / Uncons.)

BH 13
 TW 1
 4-55 ft

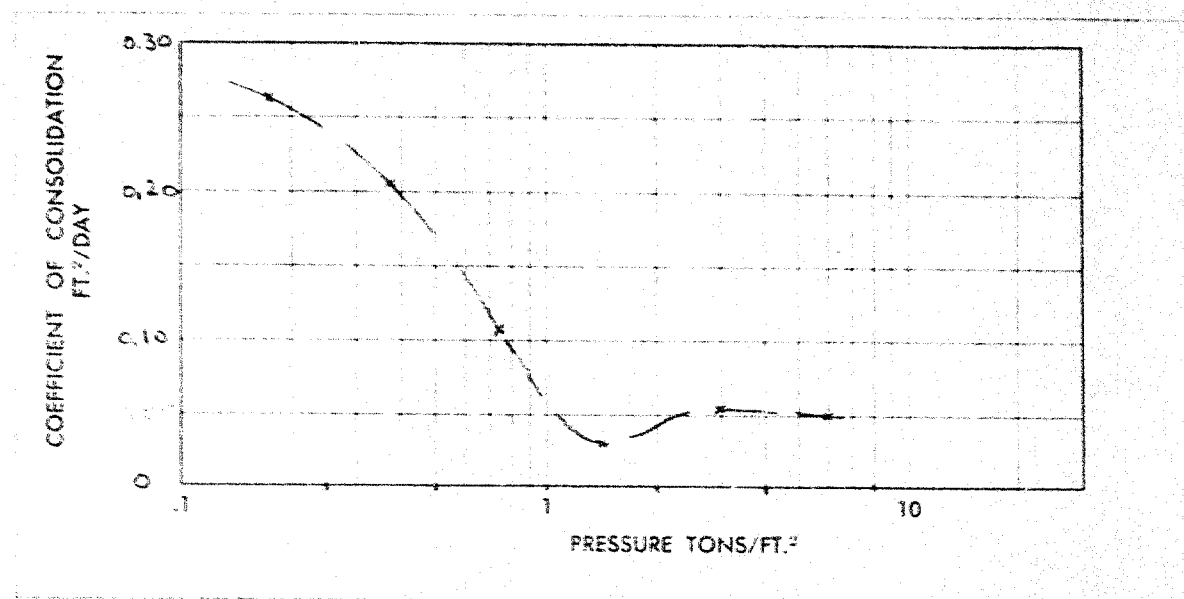
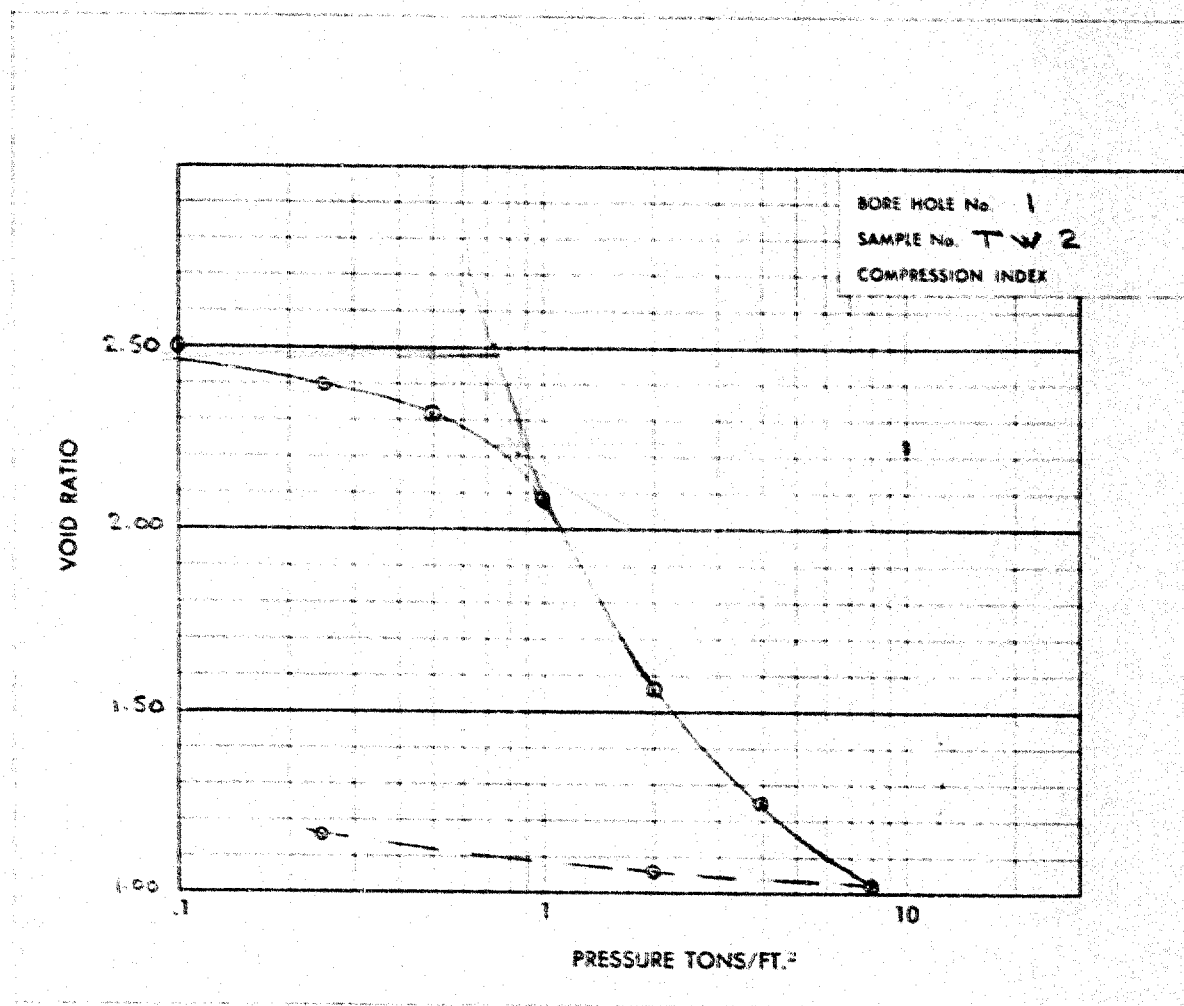
BH 13
 TW 2
 10-11.5 ft



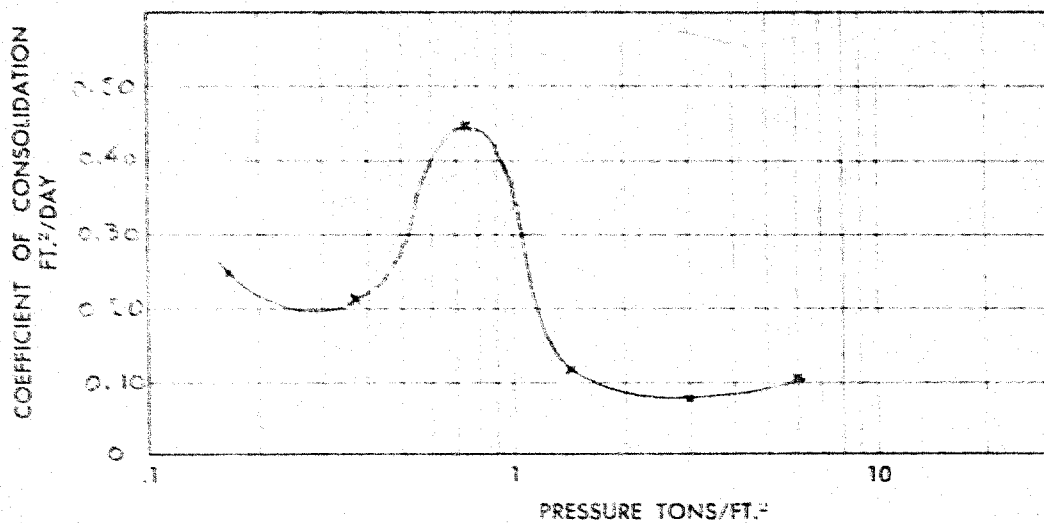
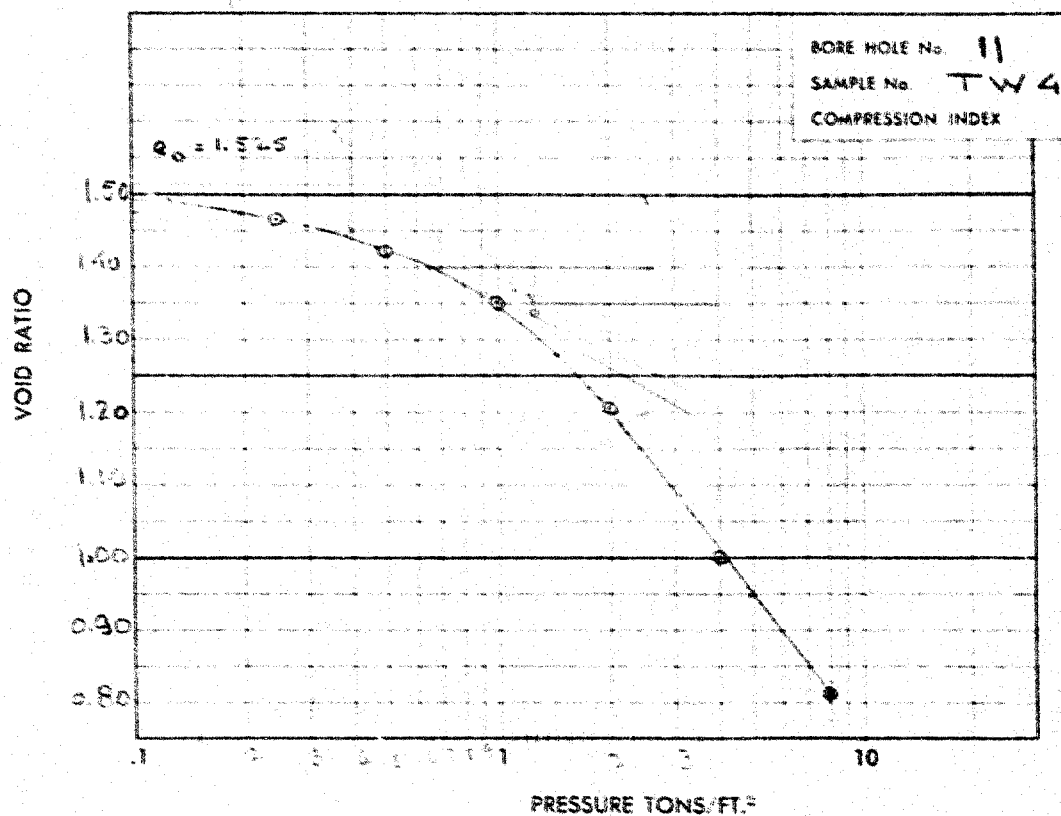
RACEY MacCALLUM AND ASSOCIATES LTD.
CONSOLIDATION TEST



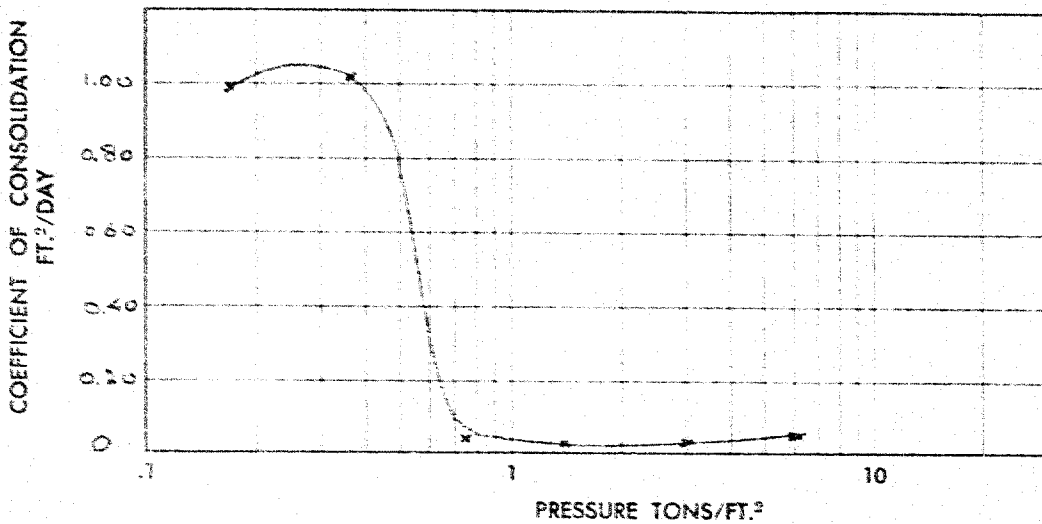
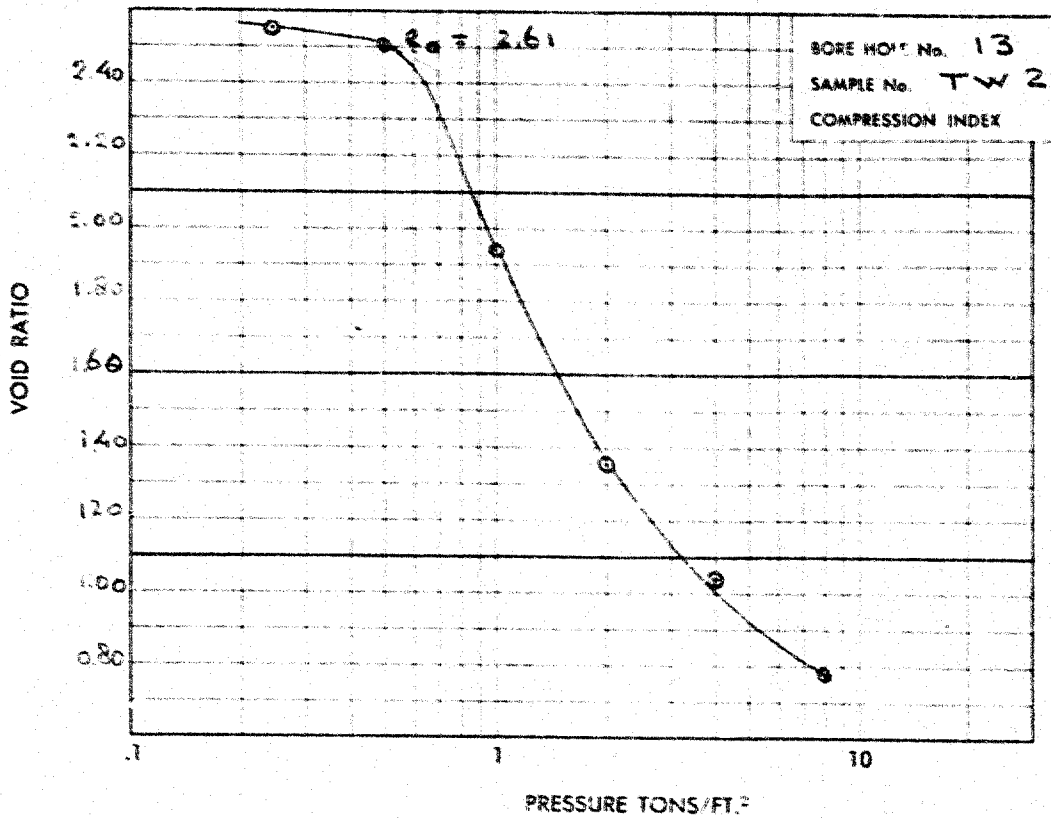
RACEY MacCALLUM AND ASSOCIATES LTD.
CONSOLIDATION TEST



RACEY MacCALLUM AND ASSOCIATES LTD.
CONSOLIDATION TEST

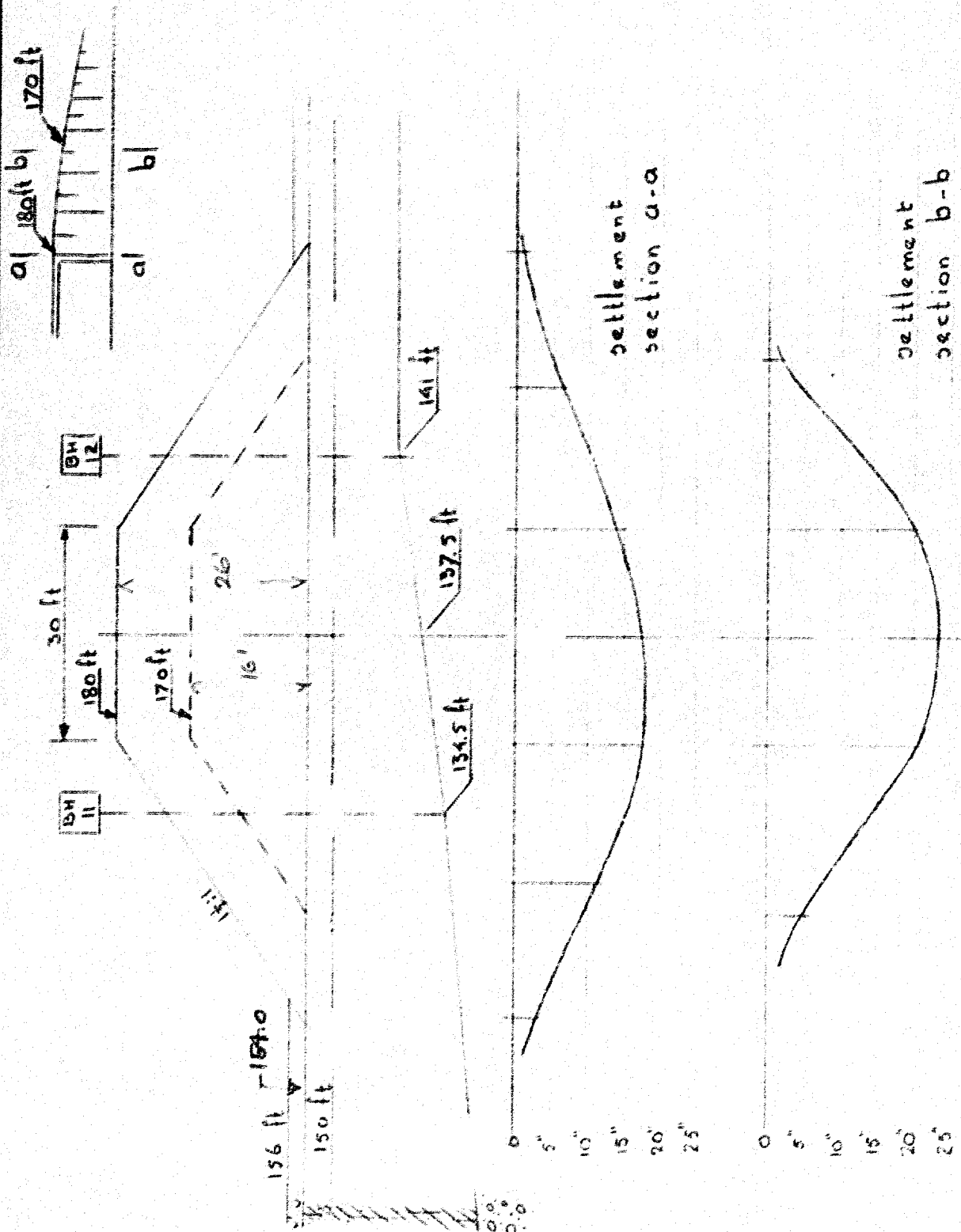


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CONSOLIDATION TEST



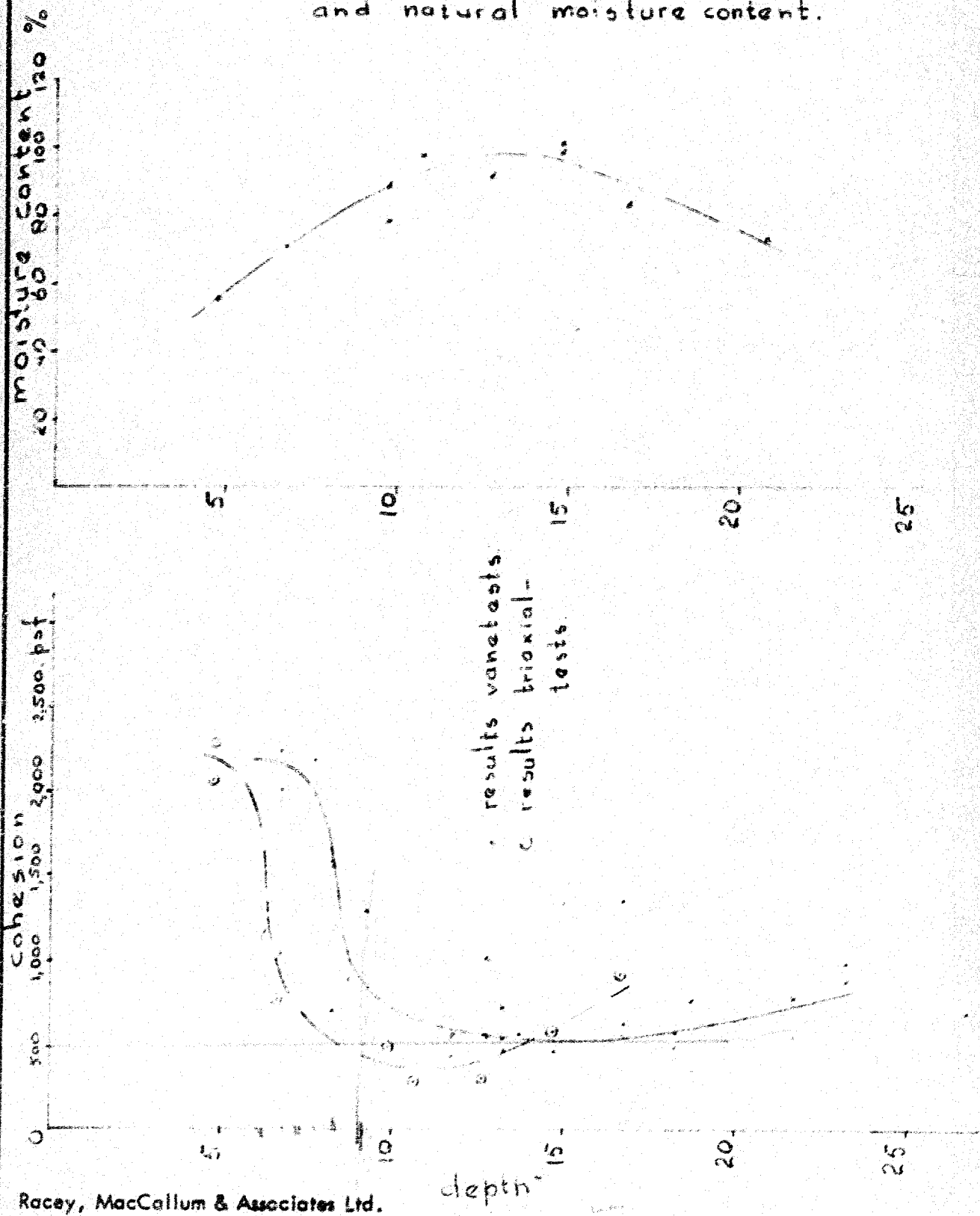
Prep. By HJM

Settlement analysis



Prep. By HJM

Collected results of
determined cohesion
and natural moisture content.





ONTARIO


DEPARTMENT OF HIGHWAYS

Memo to Mr. Ken Peaker Date June 30, 1960
Foundations Engineer Subject Re: Hwy. 401, W.P. 178-60
From M. & R. Section, Kingston Wesley Creek

Attached are the logs of the P.A. borings carried out on the proposed relocated gravel road 200' west of its present location.

Peat sampler soundings were carried out to the till stratum in the holes greater than 15' in depth. In the borehole 200' south of Hwy. 401, the soft clay extends beyond 25' in depth but this was all the pipe the party had in the field.

The depths of the soft clay stratum were phoned in to Mr. Stermac today in your absence.


J. E. Gruspier
Regional Soils Engineer

JEG/jfj

c.c. Messrs. G. A. Wrong
B. F. Jordan

File

LOG OF HOLES

Hwy. 401

Wesley Creek

W.P. 178-60

All holes referred to Sta. 167 / 30, Hwy. 401, i.e. 200' West of dirt road.

300' N g

0 - 12"	Topsoil
12" - 12'	Lt. Br. - Lt. Cl. Stiff
12' - 14'	Gr. Lt. Cl. - Si. Cl. Soft
14' - 15' /	Sa. Lo. Till

205' N g

0 - 10"	Tops.
10" - 6'	Lt. Br. - Lt. Cl. Mott
6' - 13'	Gr. Lt. Cl. - Si. Cl. Fairly Soft - Soft
13' /	NFP Power Auger Possible B/R Probably Boulder in till.

100' N g

0 - 10"	Dk. Br. Tops.
10" - 2½'	Lt. Br. F. Sa. Lo.
2½' - 3½'	Lt. Br. Lt. Cl. Mott
3½' - 17'	Gr. Lt. Cl. - Si. Cl. Soft - V Soft
17' /	NFP Peat Sampler Hard Bottom Probably Till

100' S g

0 - 12"	Dk. Br. Tops.
12" - 2½'	Lt. Br. F. Sa. Lo.
2½' - 4'	Lt. Br. Lt. Cl.
4' - 17'	Gr. Lt. Cl. - Si. Cl. Soft - V. Soft
17' /	NFP Peat Sampler Hard Bottom Probably Till

200' S g

0 - 10"	Dk. Br. Tops.
10" - 18"	Br. F. Sa. Lo.
18" - 5'	Br. Lt. Cl. Mott
5' - 25'	Gr. Lt. Cl. - Si. Cl. Soft - V Soft

300' S g

0 - 10"	Tops.
10" - 2½'	F. Sa. Lo.
2½' - 10'	Lt. Br. - Lt. Cl. Mott Fairly Stiff
10' - 23½'	Gr. Lt. Cl. - Si. Cl. Soft - V Soft
23½' /	NFP Peat Sampler Probable Till

Brian F. Jordan
June 28, 1960

/jffj

Mr. A. M. Toye,

July 12, 1960.

Bridge Engineer.

FOUNDATION INVESTIGATION REPORT

Materials & Research Section.

by: Racey, MacCallum & Associates,
Ltd.

Attention: Mr. S. McCombie.

Re: Proposed Crossing of Hwy. 401 and
Road Allowance Between Lots 24 and 25,
Cone. 1, Twp. of Lancaster, Ontario.
W.P. 178-60 -- District No.9.

Attached, we are forwarding to you, the above mentioned report submitted by Racey, MacCallum and Associates, Ltd. We have reviewed the presented factual data and find the recommendations adequate for your future design work.

In connection with the 'H' piles, we would like to add that the elevation at which the driving of the piles should be stopped, will most probably be between elevation 115' and 120'. At these elevations, the number of blows per foot of penetration should exceed 80. With the above criterion, the piles can be safely loaded with 35 - 40 tons per pile.

Because of the very sensitive nature of the clay layer, displacement piles should not be considered.

If there are any other questions in connection with the above site that you would like to discuss, please feel free to call on our Section.

AS/wdaF
Attach.

L. C. Soderman,
PRINCIPAL FOUNDATIONS ENGR.
Per:

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
B. C. Ramsay
J. Ford
L. C. Walker
J. E. Crispier
A. Watt

(A. Stermac,
FOUNDATIONS OFFICE ENGR.)

Foundations Office
Gen. Files.

Note.

Discussion with Jack Schenck. July 13th 1960

The county road should be relocated because if constructed on the present location, berms would be necessary. These berms would have to be constructed because the soil conditions are more unfavourable due to the presence of the creek bed.

The berms are necessary if the underpass is constructed on the relocated site. The road being of a secondary importance (Gravel county road) a lower factor of safety has been chosen. Maintenance of such a road is acceptable and a usual practice.

SL

COPY

For the Information of:

Mr. A. Stermac,

Bridge Division,
October 18, 1960.

MEMORANDUM TO:

Mr. P. J. Harvey,
Location Plan Engineer,
Location Section,
Downsview, Ontario.

RE: W.P. 178-60
Lancaster Twp. Br. #4,
Hwy. 401 at Wesley Creek Rd.
Dist. 9

Further to our conversation regarding berms for the fill at the above structure, I have contacted Mr. A. Stermac who advises me that no berms will be necessary at the proposed site. The abandoned location would still require berms were it to be used due to the proximity of the creek. There is a lower slope stability safety factor used because the road is of minor importance.

JBC/et

cc. Mr. A. Stermac.

J. B. Curtis,
Bridge Locations Engineer.

Mr. J. Ford,
Sr. Project Design Engr.
Toronto.

November 29, 1960.

Materials & Research Section.

Re: Soil Investigation for Proposed
Crossing of Hwy. 401 and Road
Allowance between Lots 24 and 25,
Conc. I, Twp. of Lancaster, Ont.
W.P. 178-60.

As a result of a recent discussion with the Bridge Design group, it has been concluded that approach fills for an overpass structure at this site can be limited to 20 feet. With this maximum fill height, the necessity to design an underpass has become obviated. The previous recommendation to underpass was based upon a required fill height of 25 feet.

Attached, are presented all the shear strength results from Boreholes 1, 1', 4, 5 and 7. It can be seen that 500 lb./ft.² can be taken as a minimum value of shear strength. Based on this value, the stability charts show that with a side slope of 2:1, an embankment of a maximum height of 20 feet could be safely built without any side berms. In this analysis, the effect of the desiccated upper crust was neglected.

If an overpass structure is adopted - i.e., if Hwy. 401 will go over the Wesley Creek Road, the Wesley Creek, itself, should be realigned and taken through the embankment with a culvert. A flexible type of culvert is recommended because non-uniform settlements of the ground will result due to the weight of the fill.

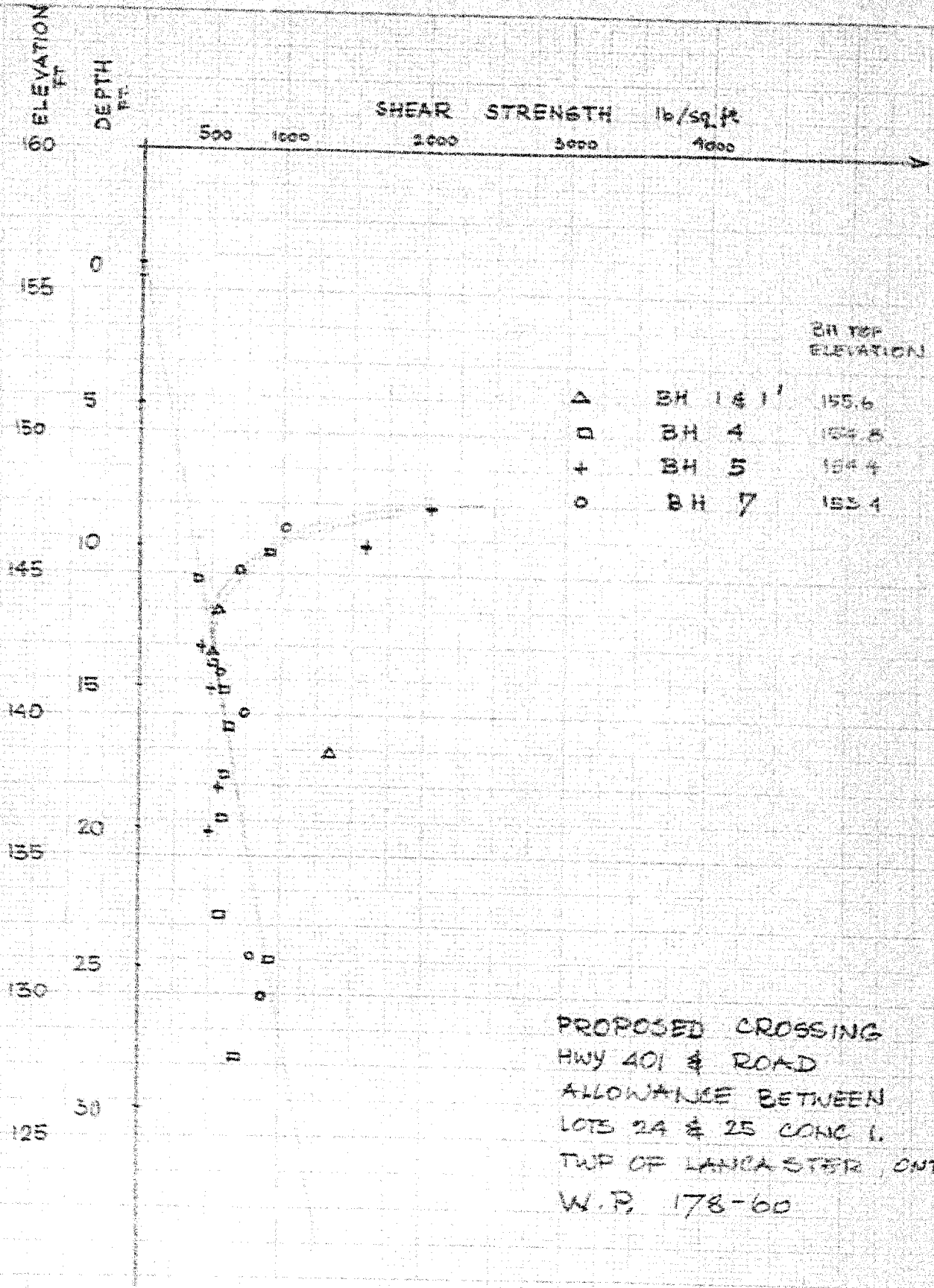
L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.
Per:



AGS/MdeF

cc: Foundations Office
Gen. Files.

(A. G. Stermac,
FOUNDATIONS OFFICE ENGR.)



OFFICE LOCATION

DOWNSVIEW AVE.,

KEELE ST. HIGHWAY 401

TORONTO, ONTARIO



ONTARIO

DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS

DEPARTMENT OF HIGHWAYS

PARLIAMENT BUILDINGS,

TORONTO 2, ONTARIO

Bridge Division,
December 8, 1960.

MEMORANDUM TO:

Mr. L. G. Soderman,
Principal Soils & Foundation Engr.,
Department of Highways,
Materials and Research Section,
Downsview, Ontario.

RE: W.P. 178-60,
Lancaster Twp. Br.#4,
Hwy. 401 @ Westley Pt. Rd.,
District #9.

Enclosed find one copy of the preliminary plan for
the above structure.

The designer appears to have complied with the re-
quirements of the foundation report but we would appreciate
any comments you wish to make.

JFC/mg

J. B. Curtis,
Bridge Location Engineer.

Mr. A. M. Toye,

Bridge Engineer.

Materials & Research Section.

December 21, 1960.

REVIEW OF PRELIMINARY PLAN

by Foundations Office.

Attention: Mr. J. B. Curtis.

Re: W.P. 178-60,
Lancaster Twp. Bridge #4,
Hwy. 401 at Westley Pt. Rd.,
District #9.

We have received for review, the preliminary plan for the above mentioned structure. From the drawing, it is evident that the solution has been adopted which provides for relocation of the Westley Road.

On the plan, the height of the South approach embankment is shown as about 30 feet high. Since this is probably the limiting height to which this embankment could be built, the following special provisions should be taken:-

1. The embankment should be instrumented (settlement plates and piezometers) so that the critical condition could be foreseen and further construction postponed.
2. The specifications should specify that if additional earth yardage will be required, it will be paid on the basis of an agreed price. This additional yardage may be required if observations of construction and instruments show that berms will be necessary.
3. A minimum interval of 8 months should be allowed between the construction of the approaches and the structure. The embankments of Hwy. 401 should be built at the same time as the Westley Road embankments.

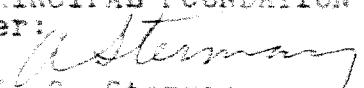
The Foundation Section should be advised about these steps so that all the necessary arrangements for the instrumentation and supervision of the construction could be made in time.

AGS/M de P

cc: Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.

Per:


(L. G. Soderman,
FOUNDATION OFFICE ENGR.)

HWY. #401 & WESTLEY CREEK RD.,

LANCASTER TWP. BRIDGE #4.

W.P. 178-60.

W.J. 62-F-81.

July 18, 1962.

- INSTRUMENTATION OF NORTH APPROACH -

At the above-mentioned location, an instrumentation programme has been started.

At Sta. 20+80 on the north approach, the future fill height will be about 18'. At this location, five settlement plates were installed on June 28, 1962.

The original Foundation Report was prepared by Racey, MacCallum, and predicted settlements of up to 2'.

Steel pipes will be drilled to contact the plates when the fill is completed. Present indications are that the fill will be completed late in 1962.

K. G. Selby,
SR. FOUNDATION ENGINEER.

✓ W.P. 178-60 West Pt Rd. /401.
x ✓ W.P. 176-60 Bensville Rd. /401
✓ W.P. 209-61 Cunningham Hill Rd. /401
✓ W.P. 175-60 Lots 1 & 2 Lane. Trg. /401

Dec. 20th 1962

Tony: -

The above structures (in the Lancaster area) are on piled foundations. The foundation reports state that a certain time must elapse between placing the fills and driving the piles. For a variety of reasons (economic and otherwise) the Road Design Office wish to drive these piles as soon as possible and would therefore like you to review as critically as is possible the recommendations relating to this matter.

Please contact Mr. S. J. MARKIEWICZ (3251)

Ken

	Full Cont. #	% Complete	Est Comp. date.
178-60	61-262	50%	APRIL ?
176-60	61-262	75%	JUNE ?
209-61	62-82?	75% Not Started	
175-60	62-82	75%	

W.P

209-61 DHO
61-F-68

Berm. Estimated settlement 24"
Waiting period 12 months.

175-60 ARES Estimated settlement ~ 24" (4-5' theor. soil)
Waiting period 12 months.

176-60 ALLOC.

62-F & 2 GEOTHERM Berm only on north-western side
Estimated settlement very large
Waiting period not mentioned

178-60 RATEY South approach fill 30' high - probably
HICALLUM the very upper limit.
Waiting period 8 months.
STABILITY CRITICAL ON SOUTH APPROACH

BERNIE : THIS FOR ME

TONY

W. P.

CONTR. NO

1 178-60

61-262 (52-59-1)

176-60

FILL PARTLY IN - FULL TERM HEIGHT

61-262 (52-59-1)

209-61

175-60

NOT STARTED

62-82 (52-59-2)

Mr. S. J. Markiewicz,
Project Design Engineer,
Road Design Division,
Planning & Design Branch.

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
January 2, 1963.

Re: W.P. 178-60, Contract No. 61-262
Westley Road Underpass

We are advised that about 50 per cent of grading has been completed on Contract 61-262, W.P. 178-60. The height of the South approach fill to the structure, Westley Road Underpass, is about 28 feet. This certainly represents the very upper height limit for the local subsoil conditions.

During the pile driving, pore pressures will be set up in the subsoil and this will result in a certain decrease of the soil strength. To limit this detrimental effect as much as possible, it is our recommendation that a pile driving sequence be worked out for this job and be incorporated in the contract.

The Foundation Section will prepare such a pile driving sequence as soon as a drawing showing the pile arrangement is received.

AGS/VdeP

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Office ✓
Gen. Files.

Mr. S. J. Markiewicz,
Project Design
Load Design Division,
Planning & Design Branch.

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
March 21, 1963

M.P. 178-60, Contract No. 61-262,
Westley Road Underpass, Hwy.'s 401 & 2,
County of Glengarry, Twp. of Lancaster,
District No. 9.

We are now in possession of Drawing No. P-4780-2, footing details for the above-mentioned job. After reviewing the details, we would like to advise you that no special pile driving sequence, as indicated in our memo to you of January 2, 1963, would be required since the piles will be prebored down to the sand and gravel stratum. In this manner, no pore water pressures that could endanger the stability of the structure will be set up.

Attached, we are returning to you, the above-mentioned drawing.

AGS/MdeF
Attach.

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Office
Gen. Files.

Field Office

File No. 613 ~~247855~~

Note:

Oct. 3, 1963

2473416

- Project supervisor phoned and advised that embankment is built of bouldery material and augering of piles is impossible through the fill.

It was arranged with Franki of Canada Corp. that piles will be driven through the fill but augered through marine clay down to sand and gravel stratum.

- Augering was tried through marine clay but proved to be impossible. When the crust is passed the clay turns into liquid due to extreme sensitivity.

It was decided (as the only possible solution) to drive piles all the way. It is a 22" casing with a concrete plug. Driving through clay should be carried out slowly and out gentle tamping should be used. Pile driving should be alternated i.e. after a pile was driven the next should be the one furthest away.

- All information given to Project supervisor Mr Harold Alguire and also to Construction Engineer Ottawa Mr Gerry McEachfe.

Note

Oct 15. 1963.

Visited the site on Oct 14. 1963 but because it was a holiday (Thanksgiving Day) the Contractor was not working. There are two more piers left and the north abutment. No instability signs were observed anywhere.

Note

Oct 15. 1963.

Joe Guzman advised that driving of Franki piles was slow through clay as required but that no sequence has been followed. The contractor was driving piles one after the other and did not stagger them as requested.

Note:

Oct 18. 1963

Project supervisor Harold Alquire phoned and advised us that the jobs been completed i.e. all piles driven. No signs of any movement observed.

JOE GROSCHETZ

TELEPHONE JUNE 30th 1960 2:30 p.m.

-WESLEY CREEK HWY 401
COUNTY RD Relocated 200' WEST
WP 178-60

BH-1	300' N	±	401	12-14'	SOFT CLAY	
BH-2	205' N	±	401	0'-12'	"	2
BH-3	100' N	±	401	3½-17'	"	1
BH-4	150' S	±	301	4-17'	"	1
BH-5	200' S	±	401	5-25'	"	1
BH-6	300' S	±	401	0-12½'	"	1

NOT TO FIRM BOTTOM X

ALL OVER TILL EXCEPT BH 5

x only 25' of pipe

All soundings below 15' were
checked with seat sampler

Tomy

#60-F-267C

W.P. #178-60

HWY #401

WESTLEY CREEK

ROAD

