

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 52J-5

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. _____

LOCATION STURGEON Riv.
CROSSING, NEAR SUPERIOR JCT.

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. NONE

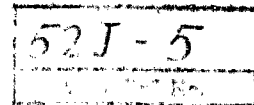
REMARKS: _____

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LIMITED

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Consulting Engineers
AND ASSOCIATED STAFF



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

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

A. ERIC RANKINE, B.SC., M.E.I.C., A.M.I.E.E.C.E., P.ENG.

TORONTO DIVISION
27 CARLTON STREET

Reference: S-500/T-710

27 June 1957.

A.M. Toye, Esq.,
Bridge Engineer,
Department of Highways of Ontario,
280 Davenport Road,
TORONTO, Ontario.

Attention: Mr. S. McCombie

RE: FOUNDATION INVESTIGATION FOR THE
STURGEON RIVER CROSSING, NEAR
SUPERIOR JUNCTION, ONTARIO.

Dear Sirs:

The report enclosed presents the results of a subsoil investigation carried out at the above site. A brief summary of the conclusions arising from the boring programme is presented below, for your convenience.

1. The subsoil conditions indicated at the site originally considered for the proposed bridge, are felt to be unsuitable for the foundations of the structure.

2. While the investigation was in progress, the above conclusion was communicated to the Bridge Division of the Department of Highways of Ontario. As a result, the work at the first site was terminated and, with the co-operation of the drilling supervisor and an engineer from the Department of Highways, another site was chosen as being more suitable.

3. An investigation was commenced at the second site. The results there indicated that a bridge of the design proposed was feasible. It should be possible to obtain refusal with piles driven to reasonable depth.

4. The possibility of scour around the piles or piers of the bridge, should be looked into.

If you have any queries regarding the report, please do not hesitate to contact us.

Yours very truly,
RACEY, MACCALLUM AND ASSOCIATES LIMITED

R. F. Scott
R. F. Scott, P. Eng.

RES/MD

Department of Highways
of
Ontario

FOUNDATION INVESTIGATION FOR
THE STURGEON RIVER CROSSING,
NEAR SUPERIOR JUNCTION, ONTARIO.

Report No.S-500/T-710

Racey, MacCallum & Associates Limited

27 June, 1957.

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27 June 1957.

FOUNDATION INVESTIGATION FOR
THE STURGEON RIVER CROSSING,
NEAR SUPERIOR JUNCTION, ONTARIO.

A foundation investigation was required at the above site, to consist of nine boreholes across the river. Initially it was thought necessary to take each borehole to refusal, but this was subsequently modified in view of the deposits encountered. In view of the width and depth of the river, it was expected to be difficult to establish the drill rig and raft accurately at each borehole location. The holes were to be related to the existing line of the proposed road, and check measurements of water elevation were to be carried out.

The results of the borings made at the first site indicated a poor foundation condition for the type of bridge envisaged. This was communicated, at the time of the borings, to Mr. S. McCombie, Assistant Bridge Engineer of the Department of Highways of Ontario, and mention was made of an apparently more suitable site half a mile upstream. As a result, a Department of Highways engineer was sent to the area from Dryden Ontario, to examine both sites and advise on a boring programme at the second location. After he had looked at the sites, he directed the drill crew to make five further borings, later modified to two borings and three penetration tests at the second site. The operations which were carried out, and the results of the borings, are presented in more detail below.

DESCRIPTION OF THE SITE

The site of the proposed bridge across the Sturgeon River is some seven miles to the east of Sioux Lookout, Ontario. The first site investigated is about four hundred yards downstream from the community of Superior Junction, a C.N.R. Halt. The second site is some eight hundred yards upstream of Superior Junction. The Sturgeon River in this neighbourhood, is about three to four hundred feet wide, and twenty to thirty feet deep at the time of the year when the investigation was carried out. Few signs of a large rise in the level of the river are evident along the banks, and it is deduced that the level is relatively constant. The river, at the proposed bridge location, flows almost due west, and the current is quite slow, not more than one or two miles an hour.

The surrounding ground is generally low and wooded, with little relief, and is typical of the glaciated areas of north west Ontario. On the north side of the river, the side

27 June 1957.

nearest to Sioux Lookout, the bank is relatively steep, with an outcropping of slaty bedrock a hundred feet from the river's edge. The other side is low lying and wet, with a surface soil of clayey silt, presumably the same as the soil encountered in the upper levels of the boreholes. At the time boring was begun, the river was free of ice, except for ten or fifteen foot wide strip, some six inches thick along the south bank. The north bank was free of snow, although the south bank still had a covering of a foot or two. From time to time, during the first week of the investigation, rotten lake ice drifted down river, but not in sufficient quantity or thickness to cause trouble.

It is probable that the river has changed its course in the area several times in the past, with the northern limit of its movement at the first site being the bedrock outcrop. The shore deposits, and those in the bed of the river, are glacial till material, reworked and redeposited by river action.

BORING SCHEDULE

The drill arrived on the first bridge site, (see site plan on enclosure no.1), on 22 April 1957 and commenced boring on the 23rd of April. The first day was spent getting the equipment from the end of the road down the steep bank to the river's edge, where the first hole was to be made. At the same time, local labour was employed to construct a raft to enable the later boring to be made in the river. This work took only a short time as the frame work of a raft, consisting of two former "Mooseman" seaplane floats and connecting pieces, had constituted part of the equipment brought to the site by the drillers. This type of raft proved very convenient and useful for carrying out the work.

Conditions proved to be difficult for boring work at the first hole, as a loose silty sand was encountered at a shallow depth. Immediately after washing of the hole to a particular required sampling depth finished, the drill rods and washing bit are extracted from the casing, and the sampling spoon is inserted. In this short interval, the loose silty sand would flow into the casing at the bottom, apparently under the influence of a slight artesian pressure, and render the sampling process very difficult. Various techniques were used to overcome this, so that satisfactory identification of the soil at all levels was obtained, but the work was delayed somewhat by the difficulty. The loose silty sand was encountered in all the holes at this site.

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When five holes had been completed, the results were communicated to the Department of Highways of Ontario, for a decision regarding the usefulness of the site and a possible discontinuance of the boring programme. Because of the distance to the Superior Junction site, and the difficulty of access to it, eight holes were actually completed before the drill crew was stopped. At this stage of the work there was a delay of one or two days before a Department of Highways Engineer arrived at the site. A more promising location for the proposed bridge was indicated to him, one half a mile upstream (see enclosure no.1), and he directed that a modified short boring programme be carried out there, to identify the deposits.

The drilling rig and raft was moved to this second site on 23 May 1957 and drilling commenced the following day, after a suitable line across the river had been located. At this site, the intention was to make three borings at intervals across the river, with two cone tests at intermediate locations but, because of difficulty due to a fine sand running into the casing, one of the boreholes was discontinued on the advice of the Department of Highways engineer. Thus, the modified schedule at the second site consisted of two boreholes and three additional cone penetration tests. Cone tests were, of course, carried out beside the boreholes in all cases.

At each borehole, split spoon samples at intervals of five feet were taken of granular materials, and shelly tube undisturbed samples of the cohesive soil. Vane tests were made to establish the shear strength of the cohesive material in place, for correlation with future laboratory work, at intervals during the advancing of the boreholes.

SUBSOIL CONDITIONS

The results of the eight boreholes and cone penetration tests performed at the first site are given in the Engineering data sheets, enclosures 4 to 11 inclusive. The two boreholes carried out at the second site, numbered 10 and 11, to avoid confusion, since borehole no.9 was not drilled, gave results which are plotted on enclosures nos. 12 and 13, together with the associated cone penetration tests. Enclosures 14 to 16 show the results of cone penetration tests at the second site, P12, P13 and P14.

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(a) The First Site

As the soils encountered vary little from borehole to borehole at the first site, except in thickness and depth, a brief description of the soil will be given, which may refer to any hole.

Typically, below a few feet of water in the river, depths of up to five or six feet of very soft fine sandy or clayey silt were met. Below this, the same material continued becoming firmer with depth, and being identified generally as a soft light gray clayey silt. The deposit varied in thickness from eight to ten feet on the north shore, to a thickness of about forty five feet on the south bank. Vane tests indicated that it would be classified as a soft material with shearing strengths varying from 500 to 750 p.s.f., but usually running close to 500 p.s.f. It was not, apparently, a very sensitive material, as its undisturbed to remoulded strength ratio averaged about two, probably due to the silt content and the fact that it may be considered to have been remoulded by river action in any case. There is a tendency for the soil to be more sensitive near the upper surface.

Below the clayey silt, a fine grey silty sand is met, varying in thickness from about thirty feet near the north bank, to ten feet at the south shore. The proportions of silt and sand vary from depth to depth, but it appears to be generally in a loose condition. There is some possibility that the silt and sand, and perhaps some clay, exist in layers. This is the material in which sampling proved difficult, although representative samples were obtained at all levels in the boreholes.

On the north shore of the river, the borings indicate that this fine sand grades into a coarser sand and gravel layer, but this was not indicated in the holes on the south shore. It is very likely however, that coarse sand and gravel does underlie the fine silty sand everywhere, as the sequence of layers appears relatively uniform. The cone penetration tests correlate well with the conclusions regarding the types of soil in the various layers.

The results of all the boreholes at the first site have been gathered together and summarised in a profile of subsoil conditions, enclosure no.2. This diagram is self-explanatory, and indicates the difficulty of obtaining good bearing material for piles at any position across the river.

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(b) The Second Site

At this location, below a few feet of water, the upper layer of soft clayey silt encountered lower down the river is missing, and the deposit consists of a fine sand, in what is estimated to be a loose to medium dense condition. Apparently this soil is underlain by gravel, which is probably true all across the river, from the indications of the cone penetration tests. The maximum depth to refusal of the cone test is about sixty feet, measured from the water surface, in borehole no. 11 where the water depth at the time of the investigation was twenty seven feet. Enclosure No. 3 presents a summary of the subsoil conditions at the second site.

CONCLUSIONS AND RECOMMENDATIONS

1. The soil at the first site consists of a soft clayey silt, underlain by a loose silty sand to depths of at least sixty feet below water level.

2. At a second site, about one half a mile up the river from the first location, the water is deeper, with a maximum depth of about twenty seven feet at the investigation date, than at the first site. The soil consists of a loose to medium dense fine sand, underlain by gravel at depths of thirty to fifty feet below water level.

3. It is felt that it would be difficult, if not impossible, to construct a bridge of the proposed type, founded on piles, at the first site chosen.

4. At the second site, although the water is deeper, the river is slightly narrower, and it is considered that piles would meet refusal at a feasible depth to form the foundation of a bridge.

From previous experience, it is thought that it might be possible to drive the piles quite easily at the second site, to a point above the gravel layer. If driving is discontinued at this point, and the piles are left for a day or two, it is thought likely that further driving would be difficult, if not impossible. It is found in such cases, that the initial driving of the piles causes liquefaction of the soil around the sides and below the pile, rendering driving easy, while if driving is interrupted the excessive water pressures dissipate, leaving the soil in a much more dense condition holding the pile firmly. This would require investigation at the site, however.

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5. At either site, particularly at the second one, the possibility of scour around future bridge piers or piles should be investigated. Although at the time of the investigation, when it might be expected that levels would be highest and velocities most rapid, the flow was actually slow, but it is possible that faster currents might occur. The fine sand at the second site would be particularly susceptible to scour.

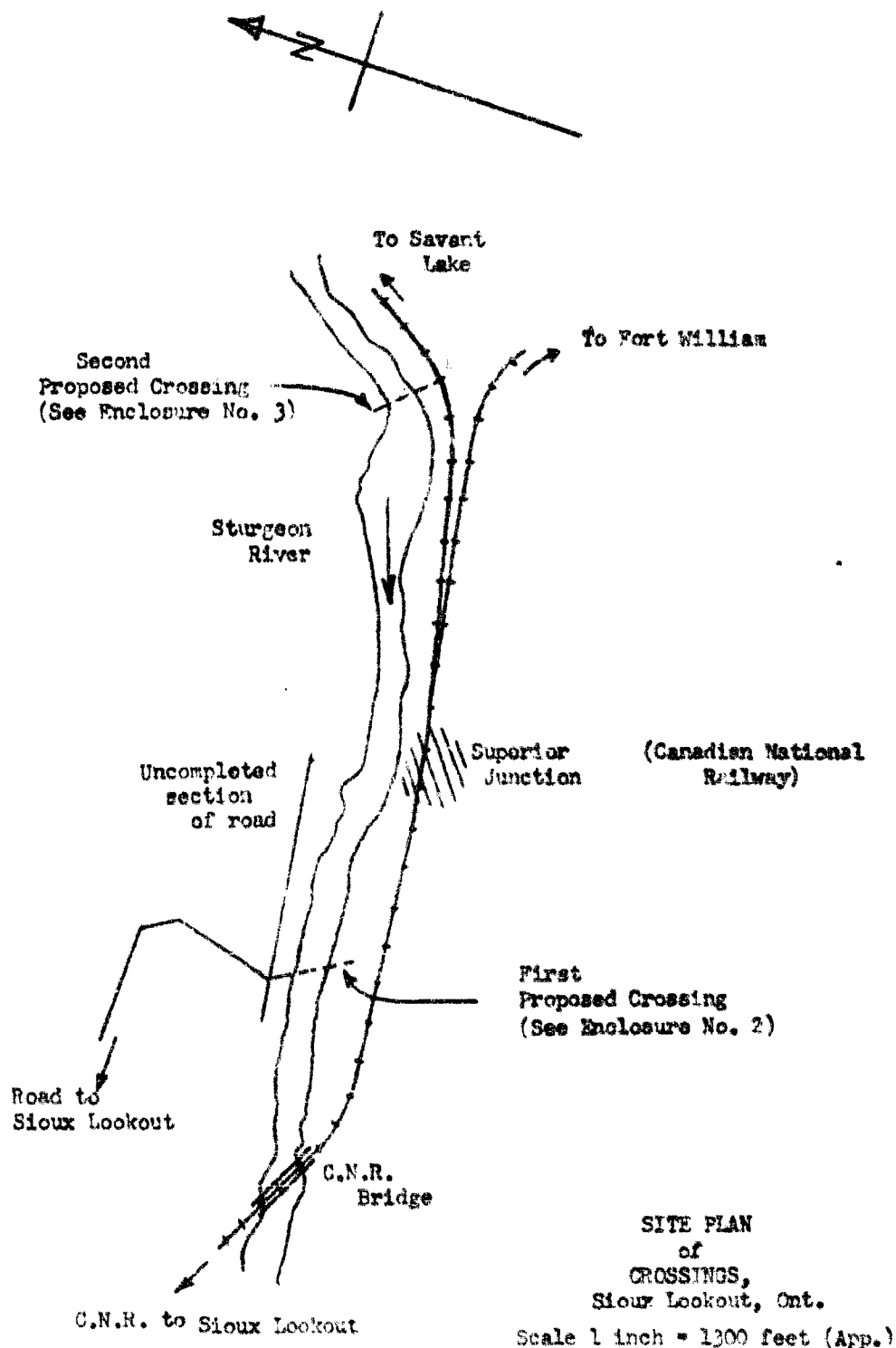
Ronald F. Scott

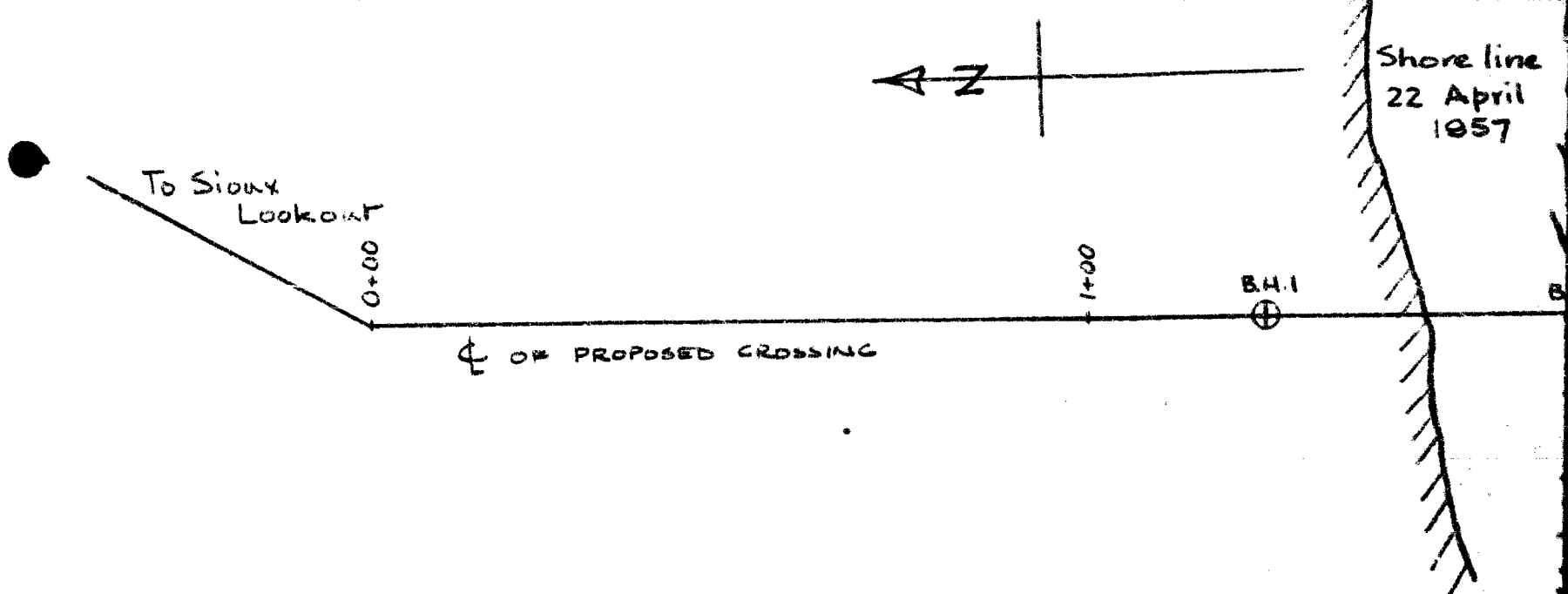
R.F.Scott, P.Eng.
Divisional Soils Engineer.

RFS/MD
In triplicate.



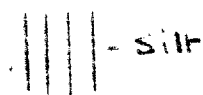
Prep. By R.F.S.





ELEVATION 1170.0
 (RIVER LEVEL
 22 APRIL 1957)

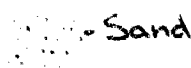
LEGEND



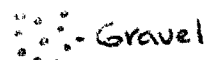
* End of borehole



└ End of cone test

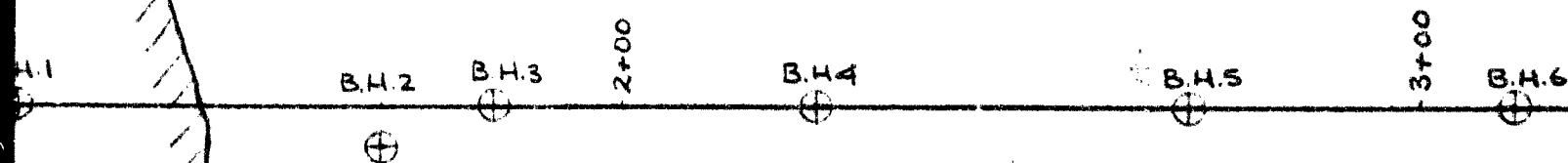


--- Cone refusal
 (greater than 80 blows/ft.)

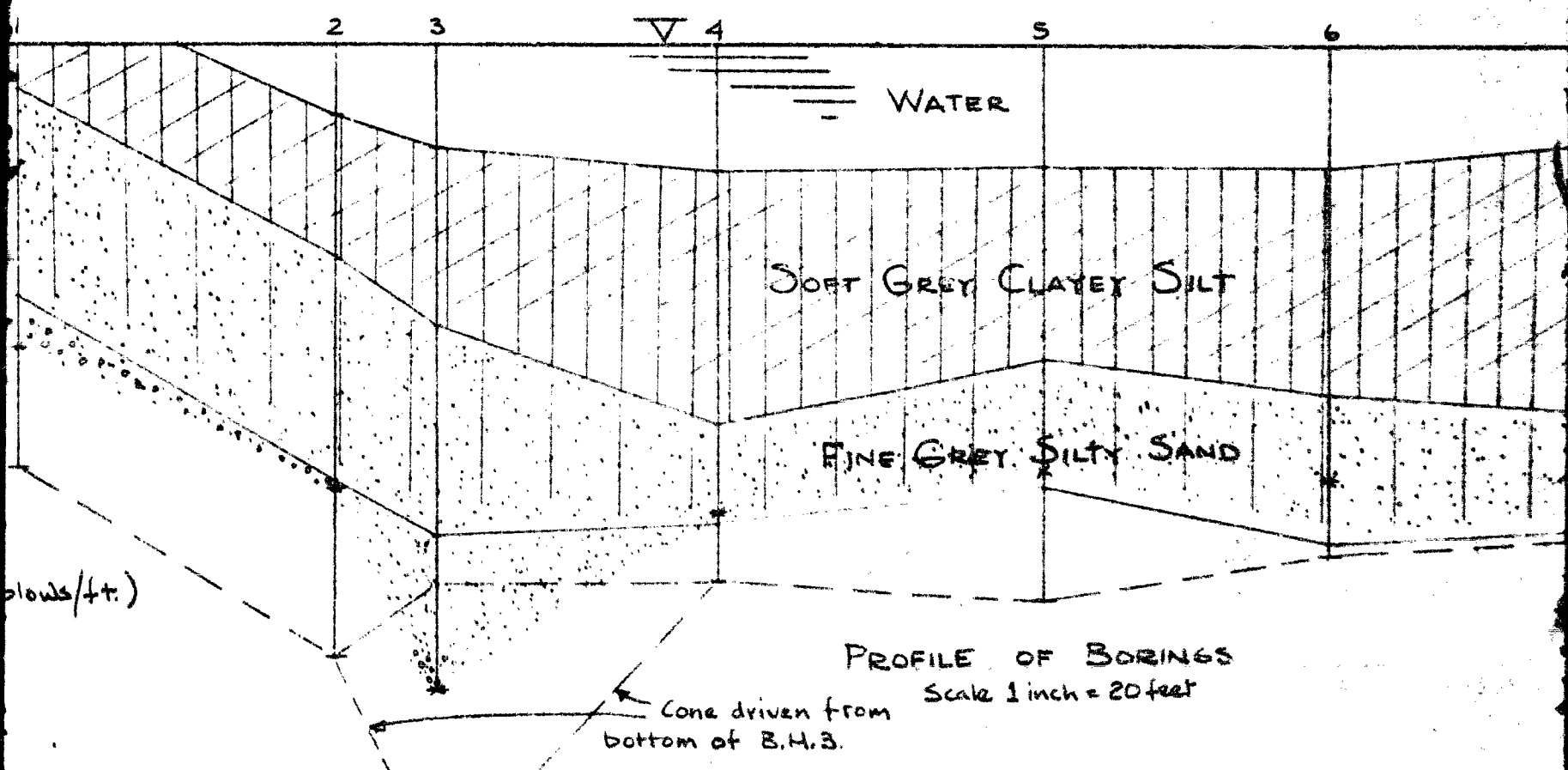


Shore line
22 April
1957

STURGEON
RIVER

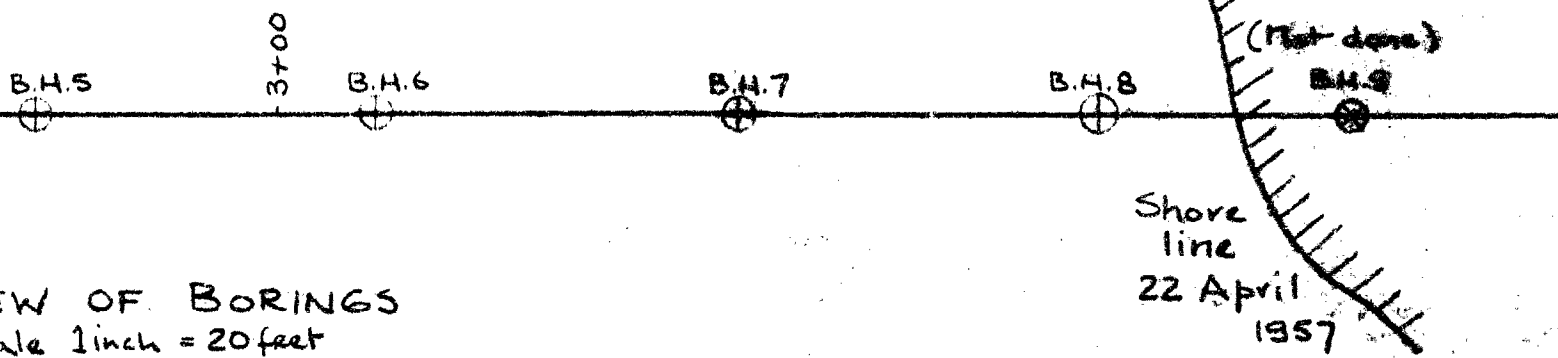


PLAN VIEW OF BORINGS
Scale 1 inch = 20 feet

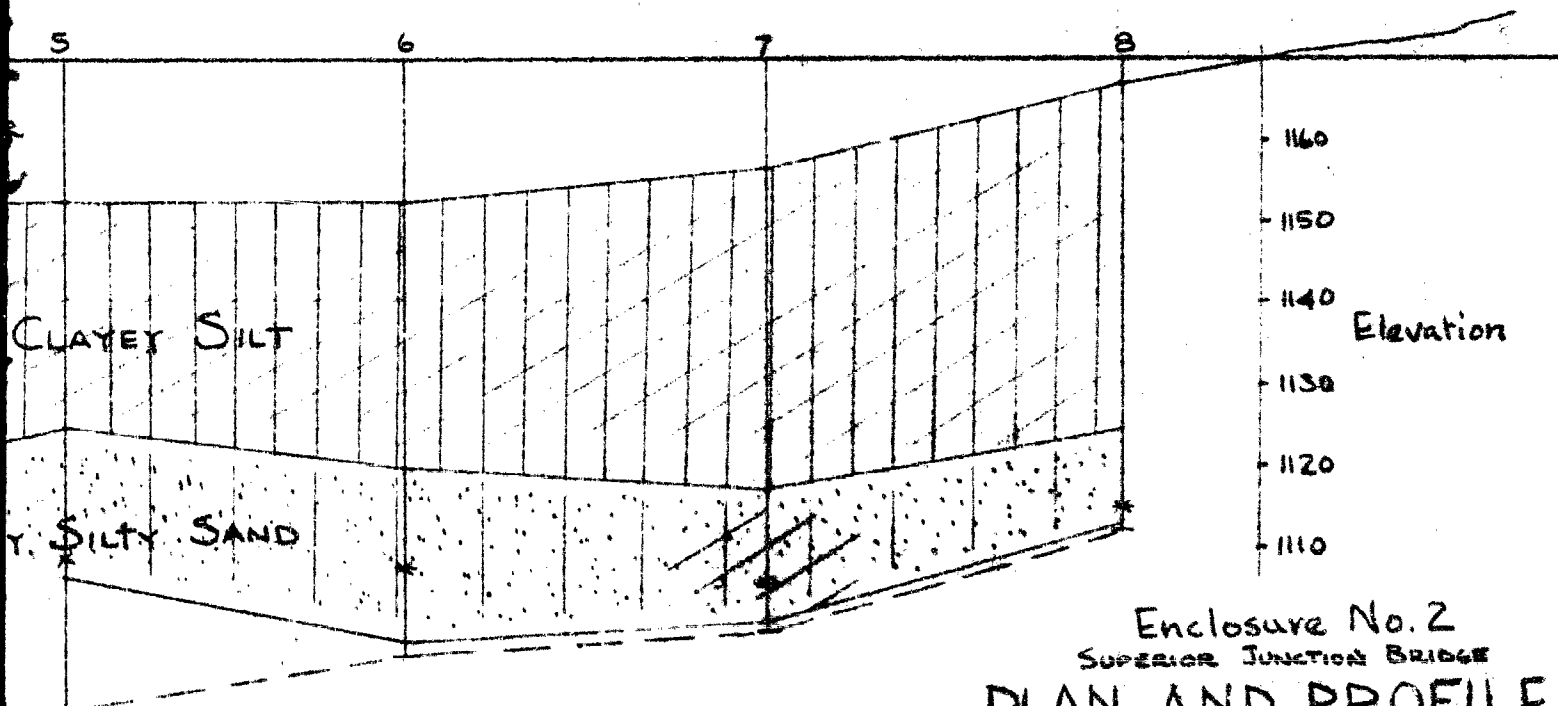


PROFILE OF BORINGS
Scale 1 inch = 20 feet

STURGEON
RIVER



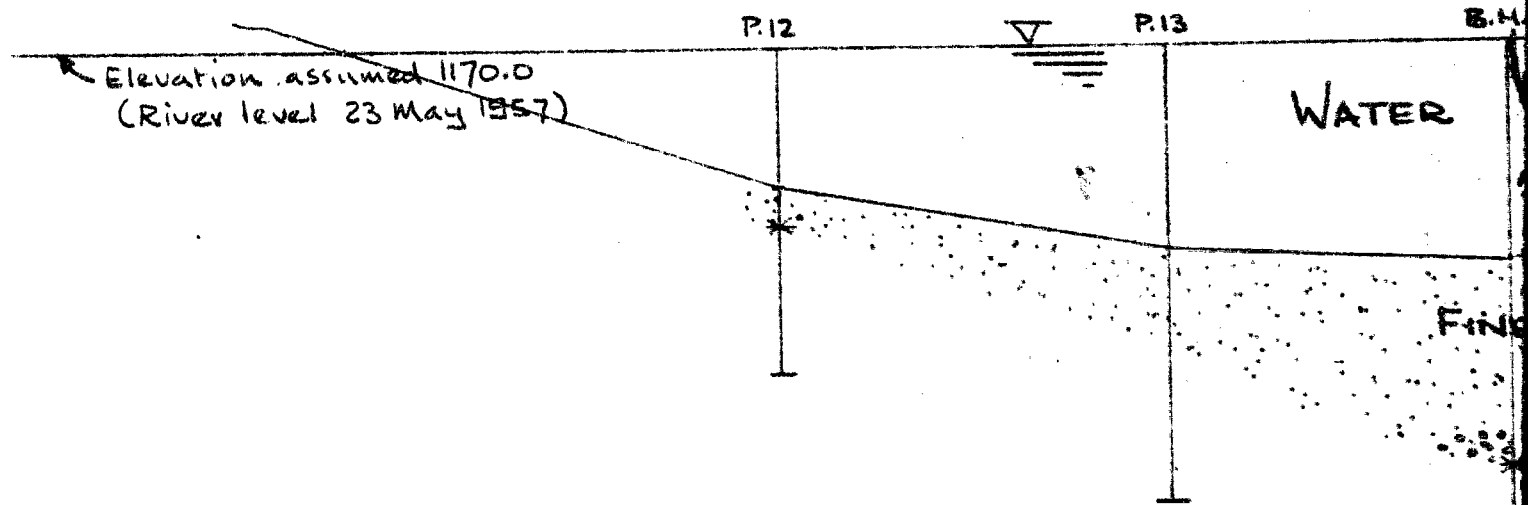
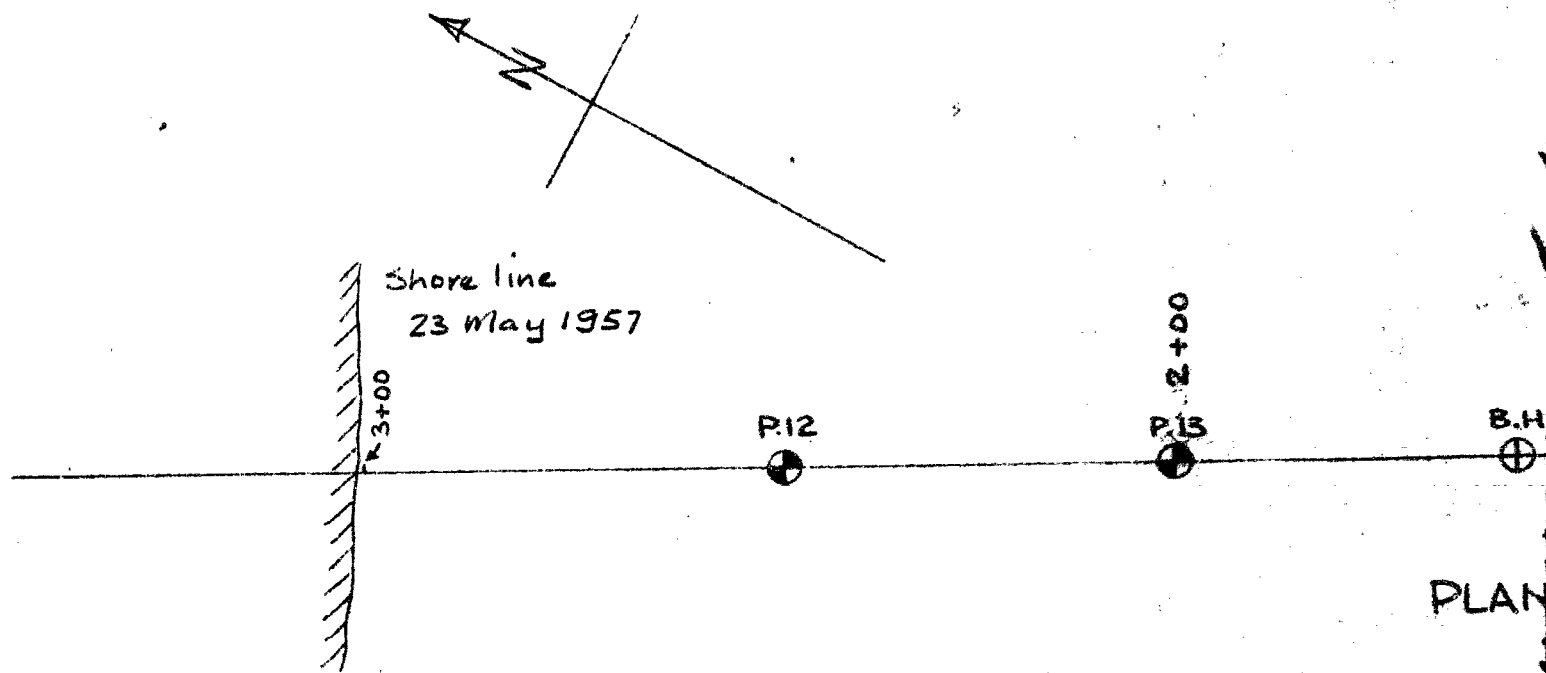
VIEW OF BORINGS
Scale 1 inch = 20 feet



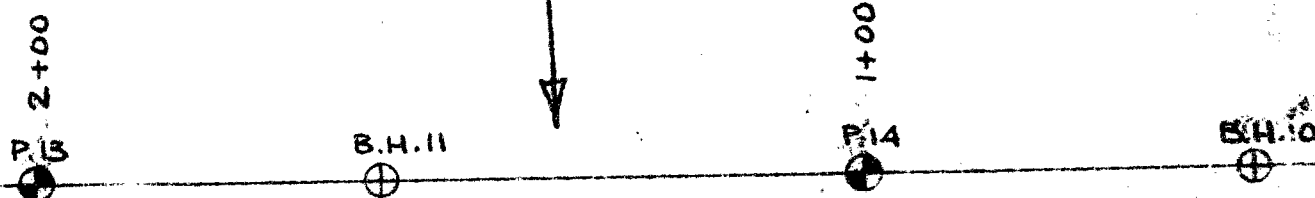
OF BORINGS
1 inch = 20 feet

Enclosure No. 2
SUPERIOR JUNCTION BRIDGE
PLAN AND PROFILE
OF FIRST SITE

Racey, MacCallum & Associates, Ltd.
Drawn by R.F.S.



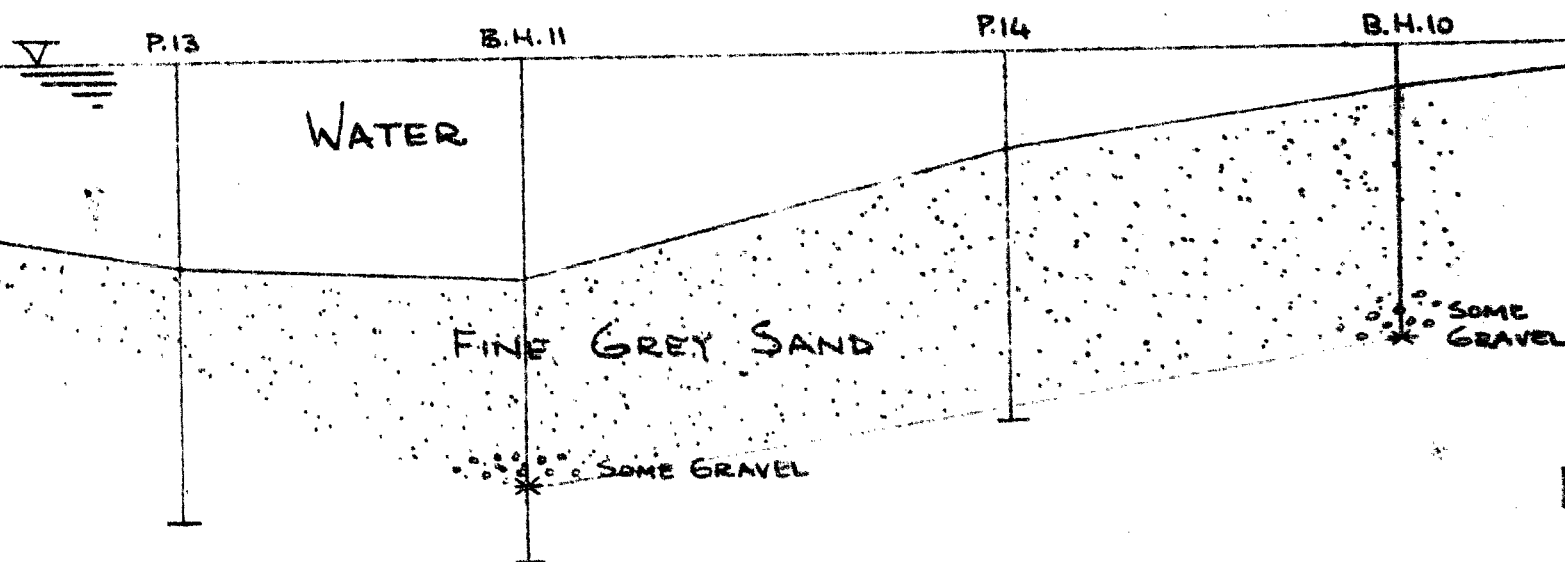
STURGEON
RIVER



PLAN VIEW OF BORINGS

Scale 1 inch = 20 feet

"P" indicates cone
test only.



PROFILE OF BORINGS

Scale 1 inch = 20 feet

PL

C

Rac

STURGEON
RIVER

Shoreline
23 May
1957

Blaze on
birch tree
on edge of
river.

VIEW OF BORINGS

Scale 1 inch = 20 feet

"P" indicates cone
test only.

P.14

B.H.10

1160

1150

1140

GREY SAND

SOME
GRAVEL

SOME GRAVEL

Enclosure No. 3
Superior Junction Bridge

PLAN AND PROFILE

OF SECOND SITE

Racey, MacCallum & Associates, Ltd.

Drawn by R.F.S.

PROFILE OF BORINGS

Scale 1 inch = 20 feet

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1.Project: SUPERIOR JCT. BRIDGE.Location: SUPERIOR JCT. BRIDGE, ONTARIO.Hole Location BH. 1, SEE SITE PLAN ENCLOSURE NO. 1.Hole Elevation and Datum: 1170 (B.M. NAIL ON TREE)Field Work Begun 22 APRIL, 1957 Ended Date: Field Supervision: E.COWIE.Driller: H. JOHNSTON.Prep.: R.F.S.Checked: Date: **LEGEND**Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

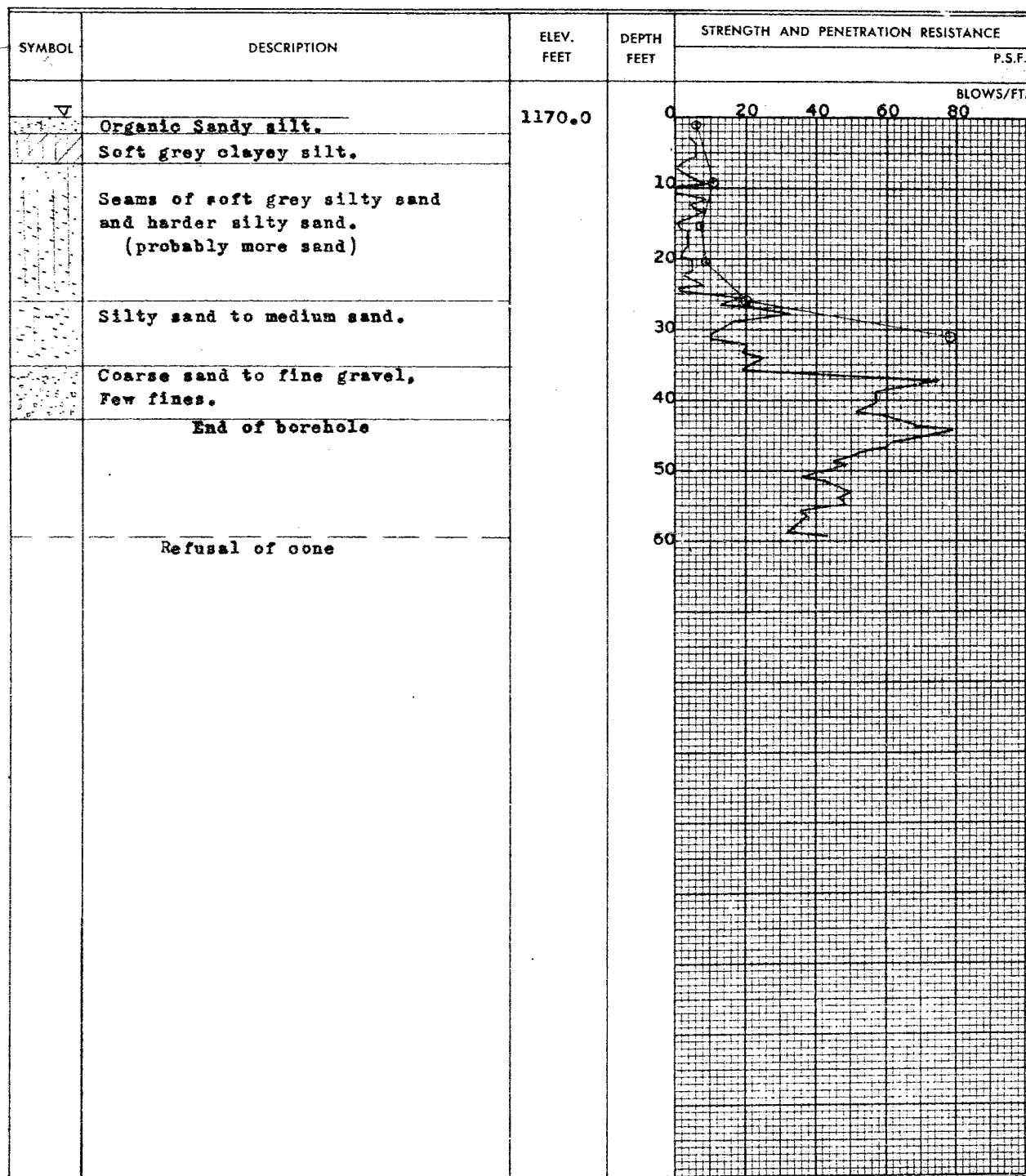
Vane test and sensitivity

Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight**CONSISTENCY AND UNIT WEIGHT**

% DR

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1.

ERIOR JCT. BRIDGE.

ERIOR JCT. BRIDGE, ONTARIO.

RH. 1, SEE SITE PLAN ENCLOSURE NO. 1.

n and Datum: 1170 (B.M. NAIL ON TREE)

egun 22 APRIL, 1957 Ended Date:

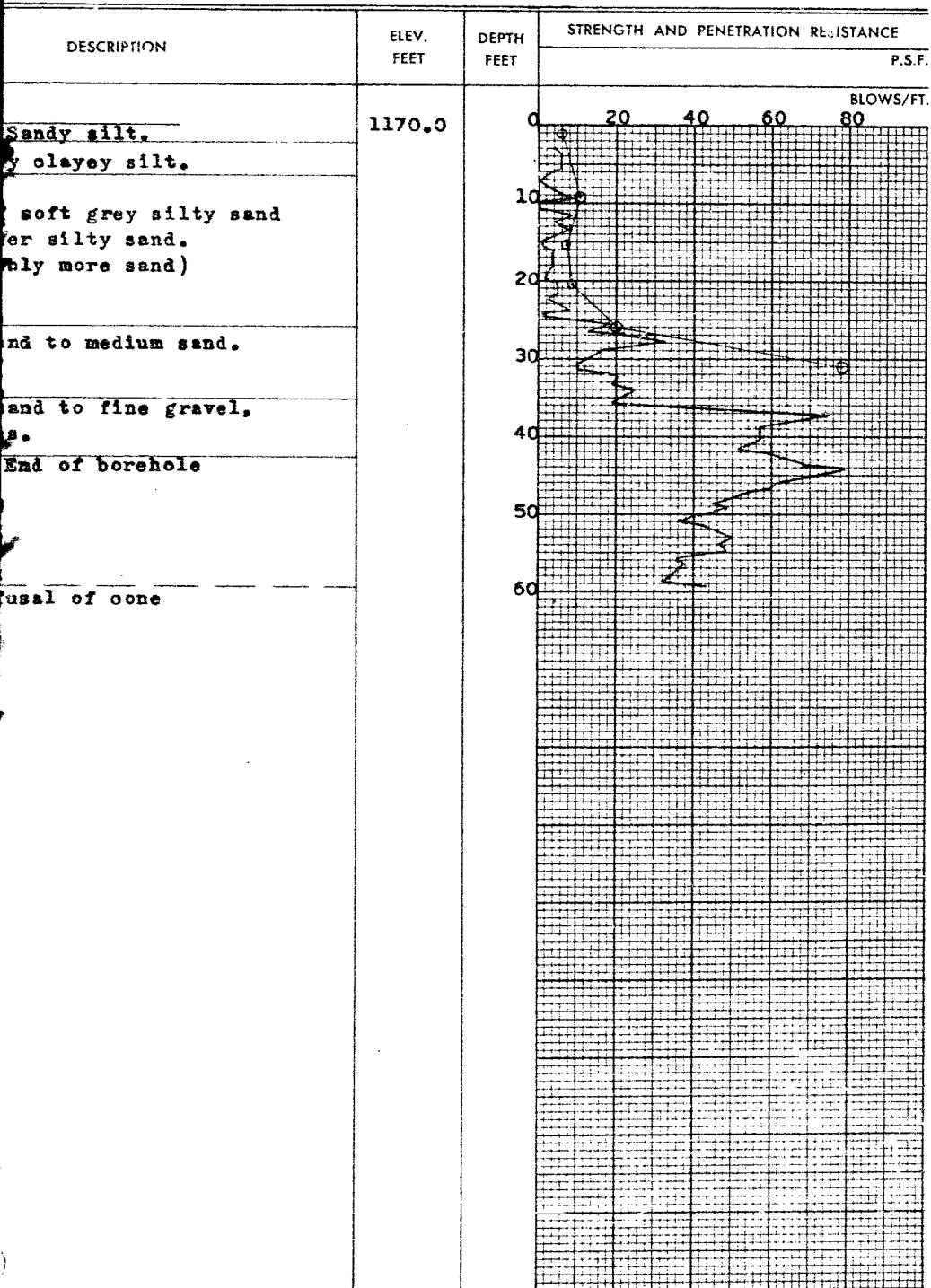
Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R. F. S.

Checked:

Date:



LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

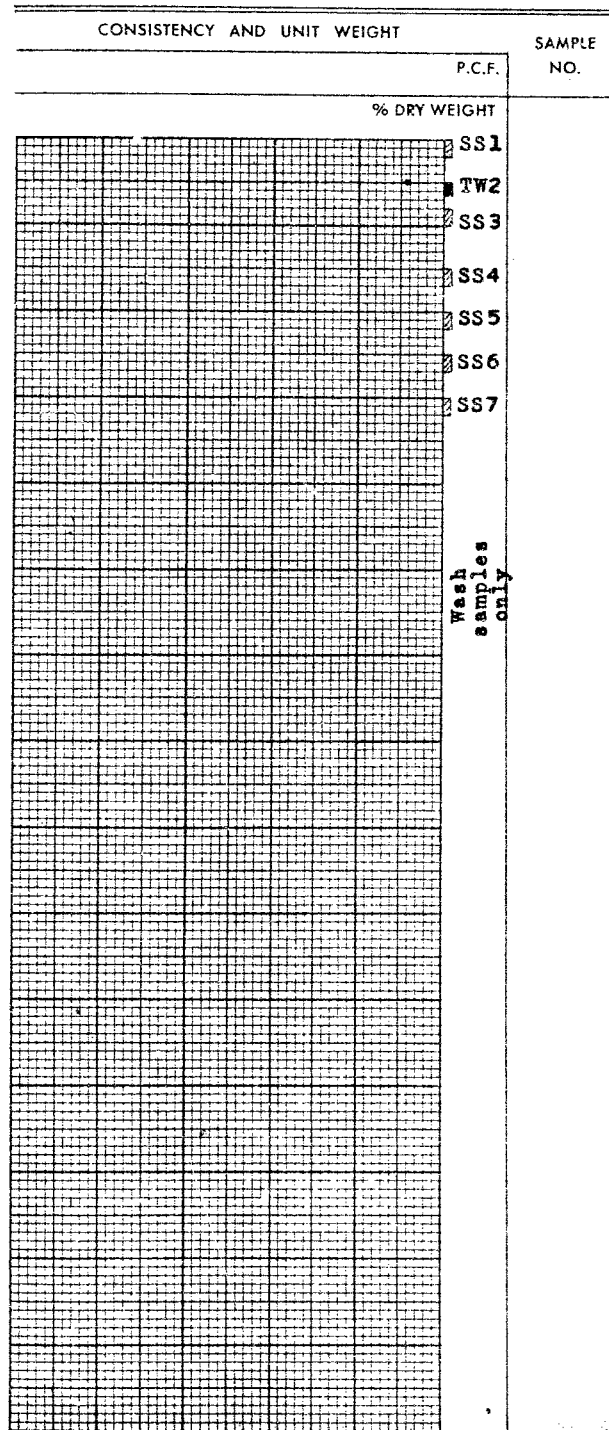
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 2.

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H. 2. SEE SITE PLAN, ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957 Ended Date:

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R. F.S.

Checked:

Date:

LEGEND**Sampling Method**

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

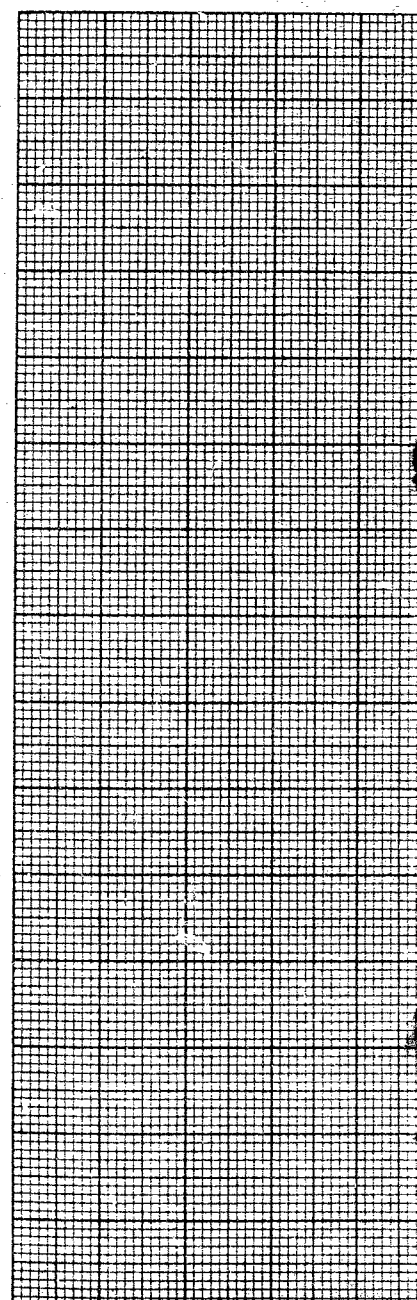
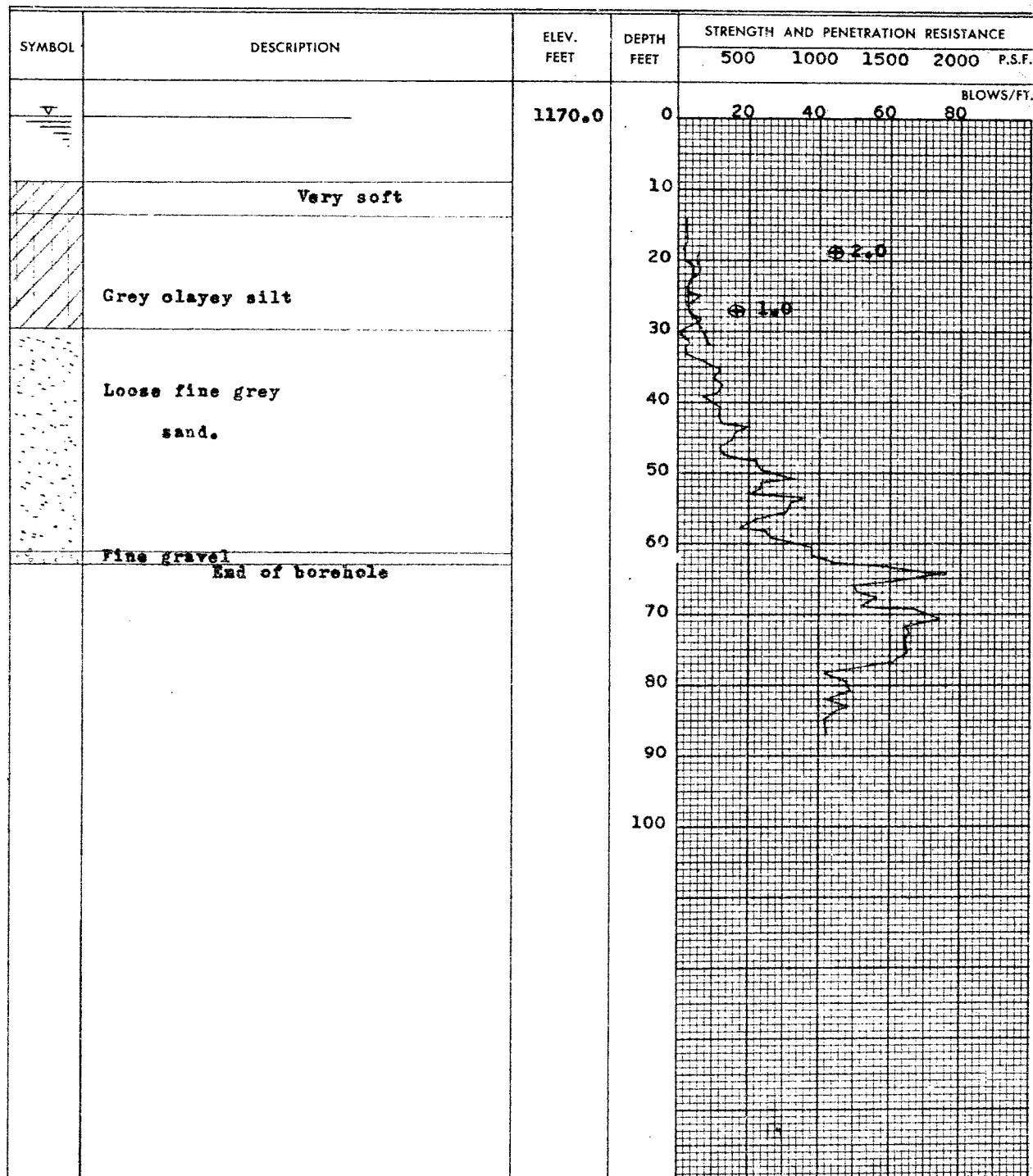
Vane test and sensitivity

Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight**CONSISTENCY AND UNIT WEIGHT**

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3.

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H. 3. SEE SITE PLAN, ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957 Ended Date:

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

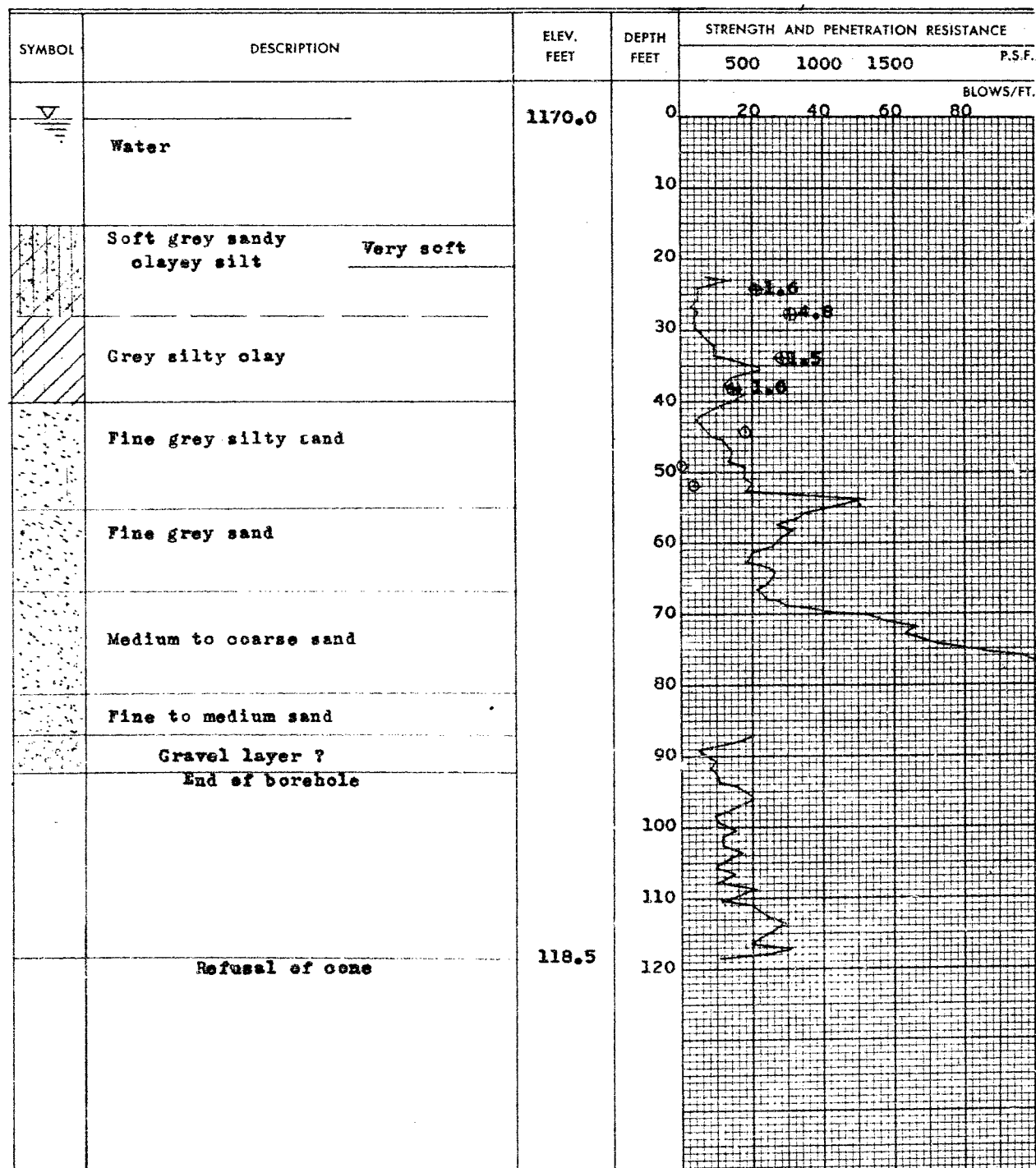
Date:

LEGENDSampling Method
2" Dia. split tube
2" Shelby tubePenetration Resistance
2" Split tube
2" Dia. Cone
CasingStrength
Unconfined compression
Vane test and sensitivityConsistency
Natural moisture
Liquid limit
Plastic limit

Natural Unit Weight

CONSISTENCY AND UNIT WEIGHT

% DRY W



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3.

RIOR JCT. BRIDGE.

ERIOR JCT. BRIDGE, ONTARIO.

H. 3. SEE SITE PLAN, ENCLOSURE NO. 1.

and Datum: 1170.0 (B.M. NAIL ON TREE)

On 22 APRIL 1957

Ended.

Field Supervision: **E. COWIE.**

Driller: H. JOHNSTON.

Prep.: R. F. S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Strength

Unconfined compression

Vane test and sensitivity

Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight,

DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
			500	1000	1500	P.S.F.
	1170.0	0	BLOWS/FT.			
		10				
sandy silt	Very soft	20				
		30				
clay		40				
silty sand		50				
sand		60				
		70				
coarse sand		80				
medium sand		90				
cl layer ?		100				
end of borehole		110				
	118.5	120				

CONSISTENCY AND UNIT WEIGHT		SAMPLE NO.
<div style="text-align: right;">P.C.F.</div> <div style="text-align: right;">% DRY WEIGHT</div>		<div style="text-align: center;">TW1</div> <div style="text-align: center;">TW2</div> <div style="text-align: center;">TW3</div> <div style="text-align: center;">SS4</div> <div style="text-align: center;">SS5</div> <div style="text-align: center;">SS6</div> <div style="text-align: center;">Wash samples only</div>

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 4.

PERIOR JCT. BRIDGE.

UPERIOR JCT. BRIDGE, ONTARIO.

on B.H. 4. SEE SITE PLAN. ENCLOSURE NO. 1.

on and Datum: 1170.0 (B.M. NAIL ON TREE)

Began 22nd APRIL, 1957. Ended

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

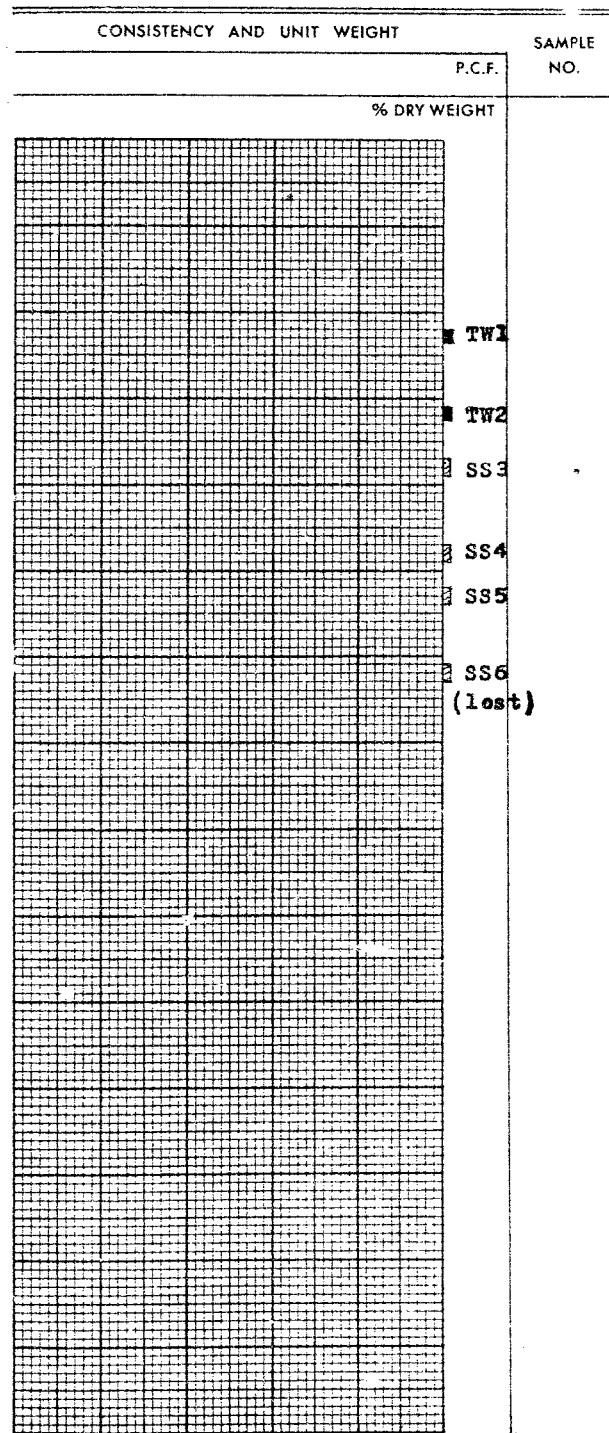
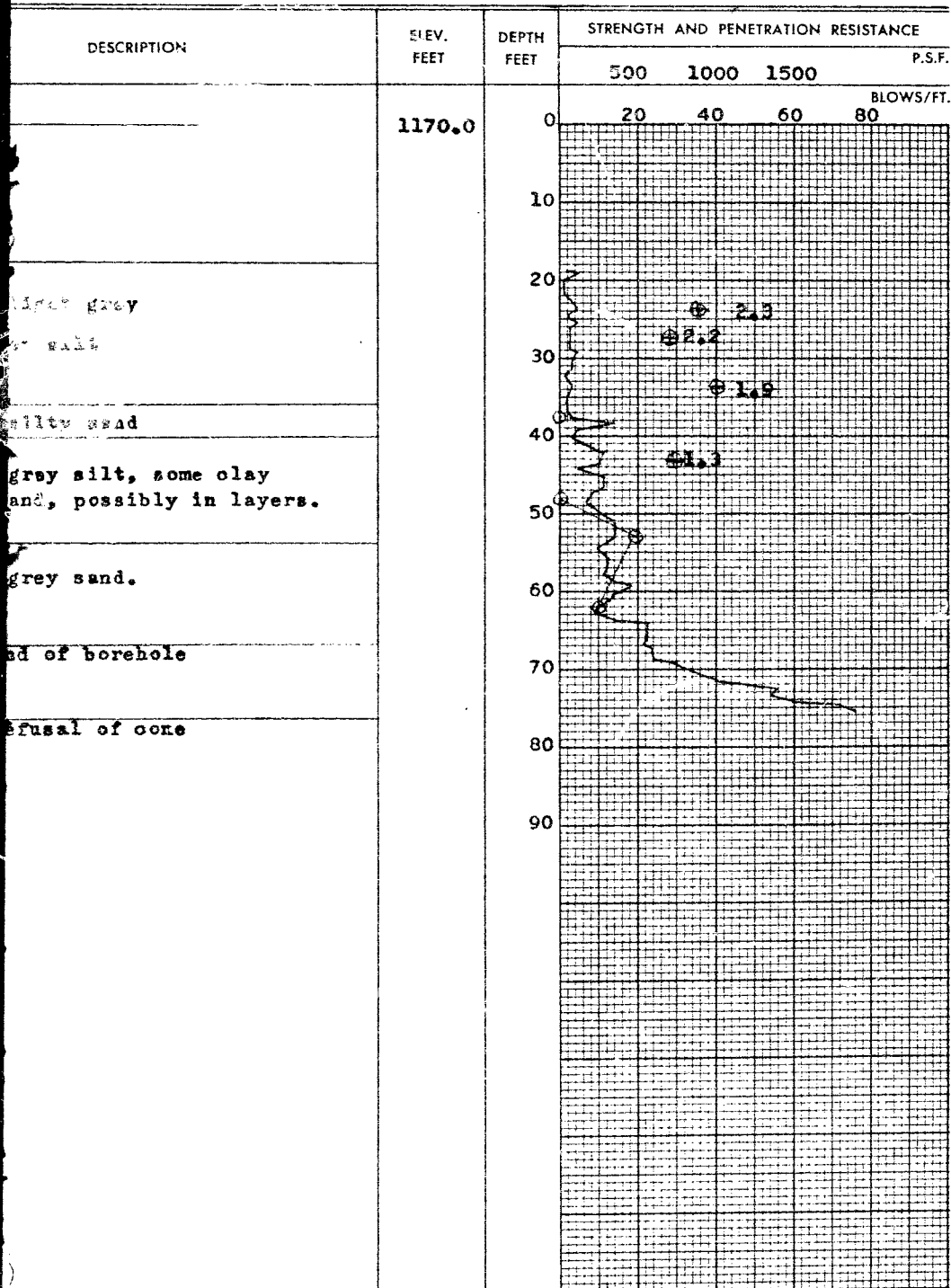
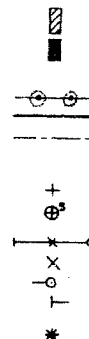
Sampling Method
2" Dia. split tube
2" Shelby tube

Penetration Resistance
2" Split tube
2" Dia. Cone
Casing

Strength
Unconfined compression
Vane test and sensitivity

Consistency
Natural moisture
Liquid limit
Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 5.

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H. 5. SEE SITE PLAN. ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957. Ended

Field Supervision: E. CONIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

Consistency

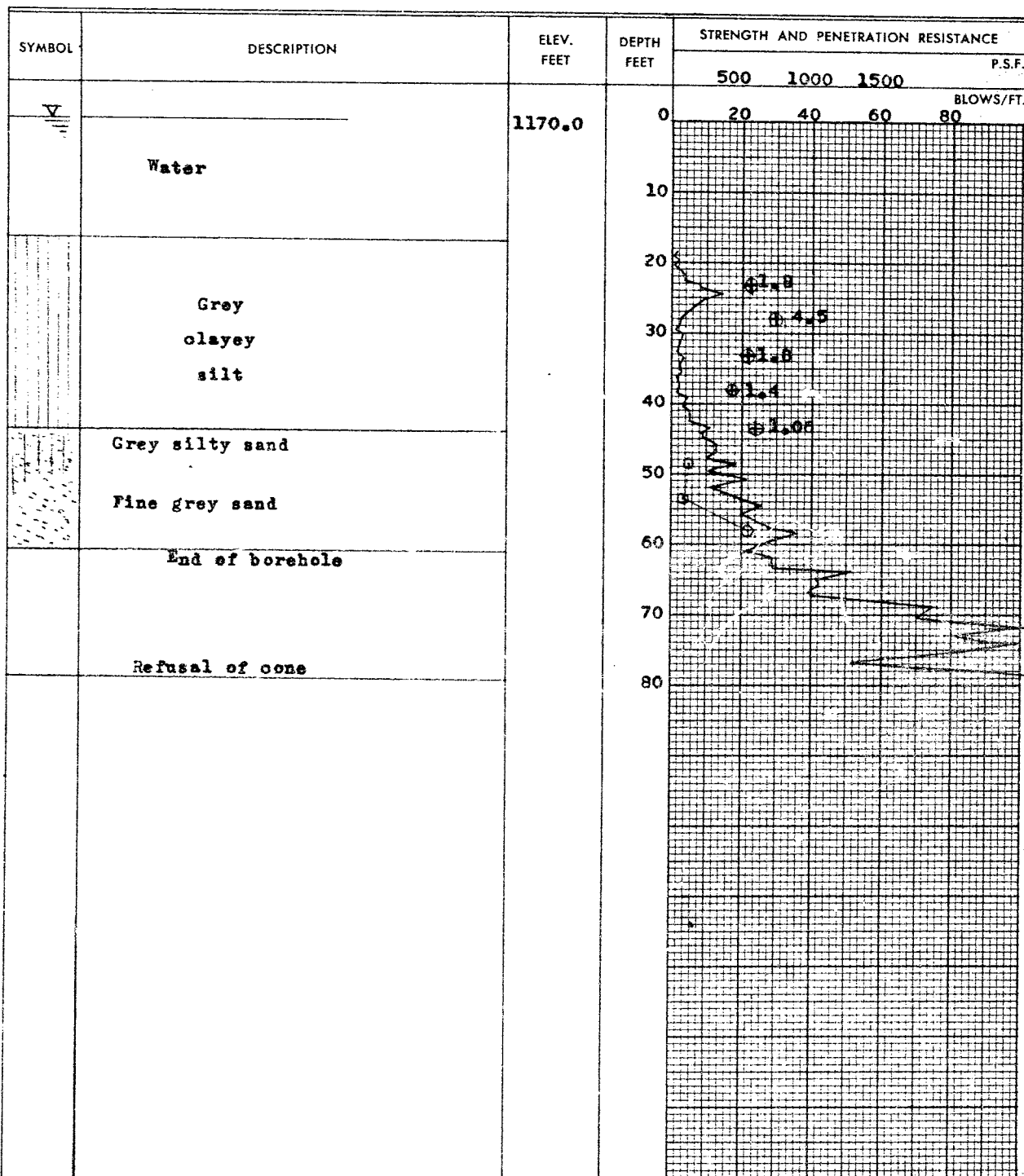
Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight

CONSISTENCY AND UNIT WEIGHT



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 5.

PRIOR JCT. BRIDGE.

PRIOR JCT. BRIDGE, ONTARIO.

P.F. 5. SEE SITE PLAN. ENCLOSURE NO. 1.

and Datum: 1170.0 (B.M. NAIL ON TREE)

Run 22 APRIL, 1957.

Ended

Field Supervision: E. COMIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

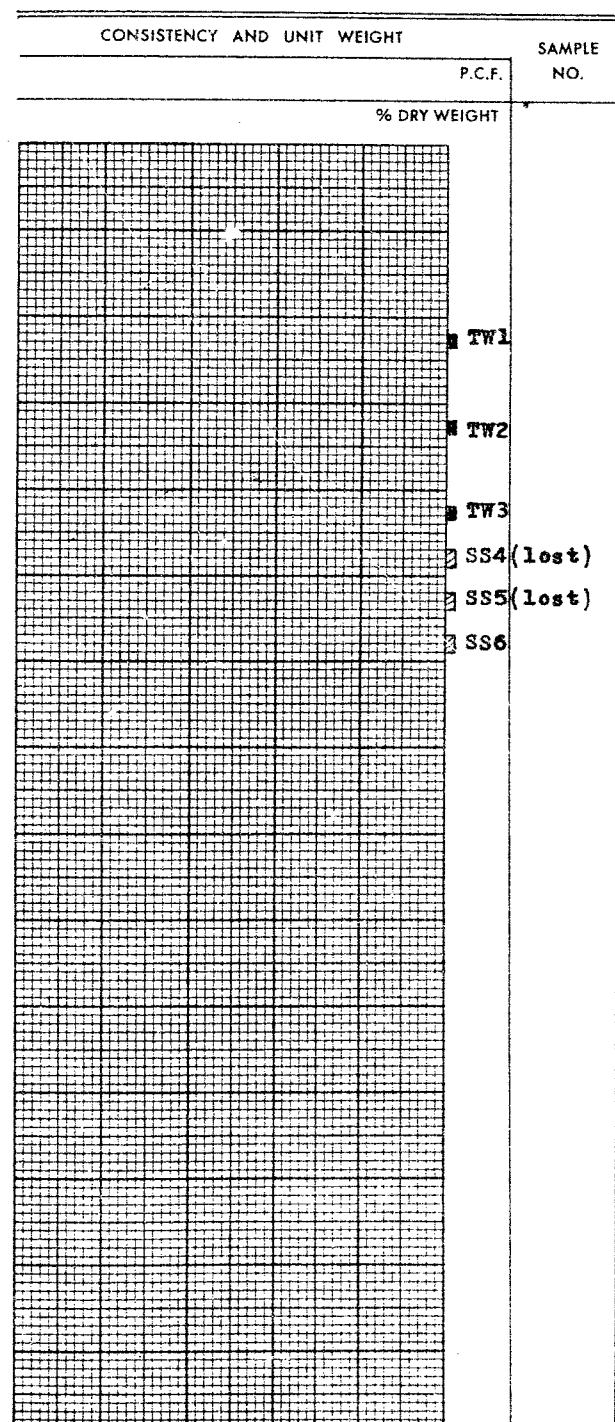
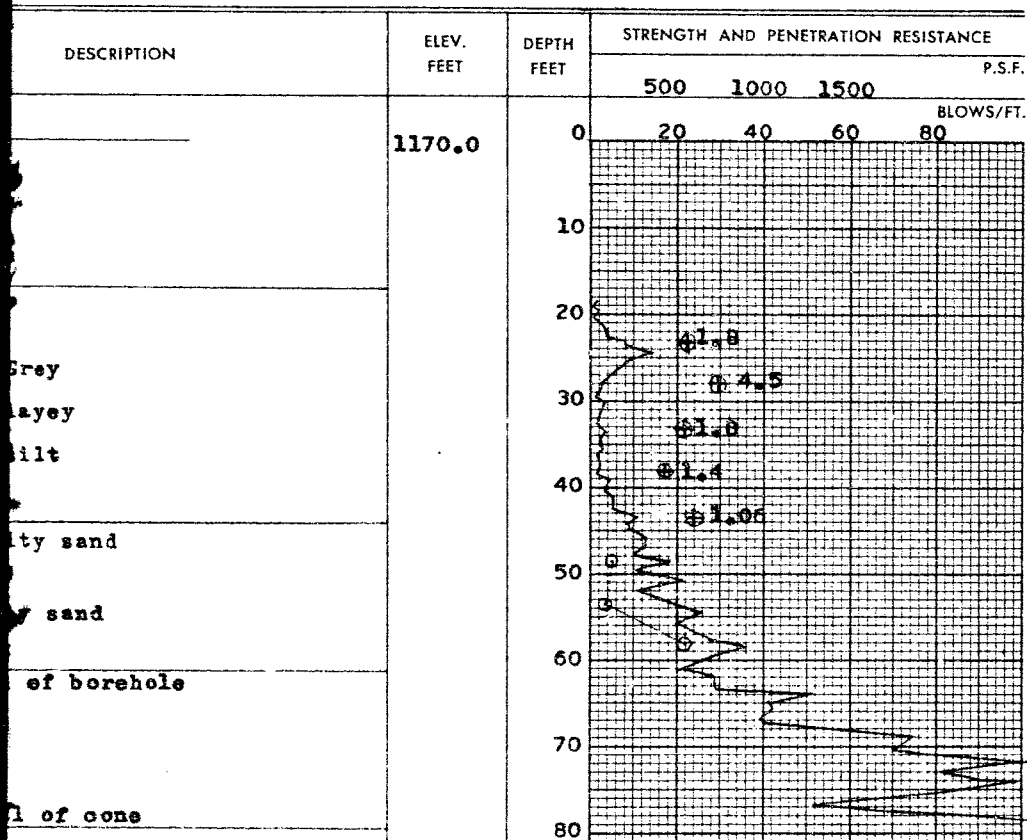
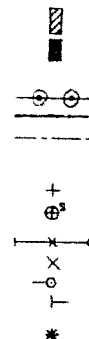
Sampling Method
 2" Dia. split tube
 2" Shelby tube

Penetration Resistance
 2" Split tube
 2" Dia. Cone
 Casing

Strength
 Unconfined compression
 Vane test and sensitivity

Consistency
 Natural moisture
 Liquid limit
 Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

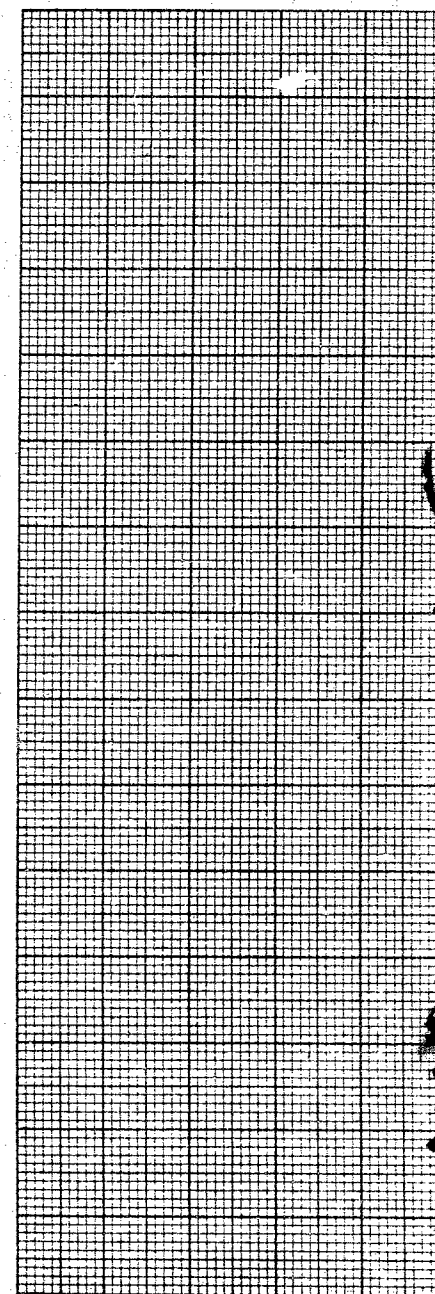
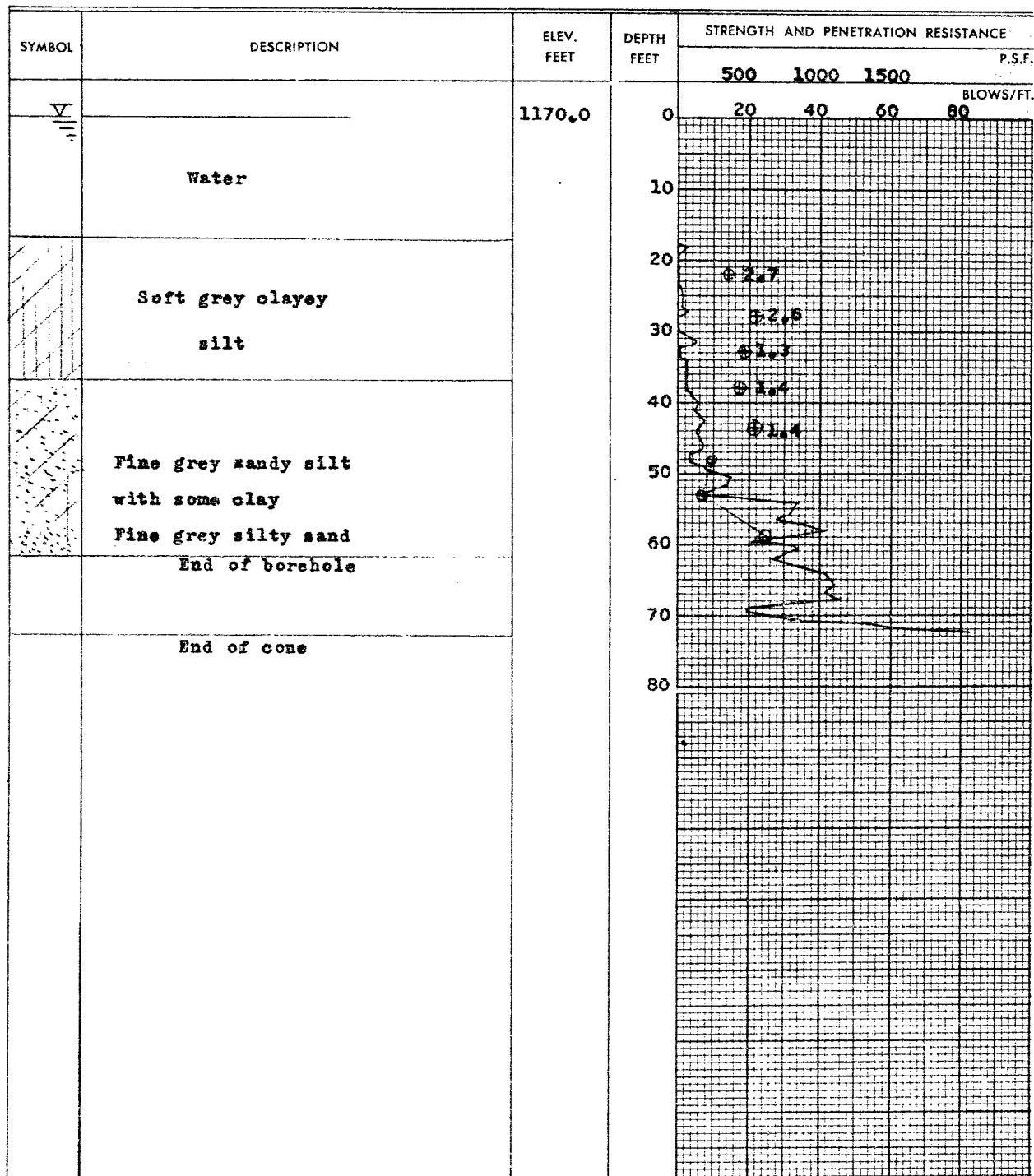
Foundation Engineering Division

Engineering Data Sheet for Borehole: 6

Project: **SUPERIOR JCT. BRIDGE.**Location: **SUPERIOR JCT. BRIDGE, ONTARIO.**Hole Location **B.H. 6. (SEE SITE PLAN.) ENCLOSURE NO. 1.**Hole Elevation and Datum: **1170.0 (B.M. NAIL ON TREE)**Field Work Begun **22 APRIL, 1957.** EndedField Supervision: **E. COWIE.**Driller: **H. JOHNSTON.**Prep.: **R. F.S.**

Checked:

Date:

LEGEND**Sampling Method**2" Dia. split tube
2" Shelby tube**Penetration Resistance**2" Split tube
2" Dia. Cone
Casing**Strength**Unconfined compression
Vane test and sensitivity**Consistency**Natural moisture
Liquid limit
Plastic limit**Natural Unit Weight****CONSISTENCY AND UNIT WEIGHT**

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 6

PRIOR JCT. BRIDGE.

PRIOR JCT. BRIDGE, ONTARIO.

B.H. 6. (SEE SITE PLAN.) ENCLOSURE NO. 1.

and Datum: 1170.0 (B.M. NAIL ON TREE)

gun 22 APRIL, 1957. Ended

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R. F.S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

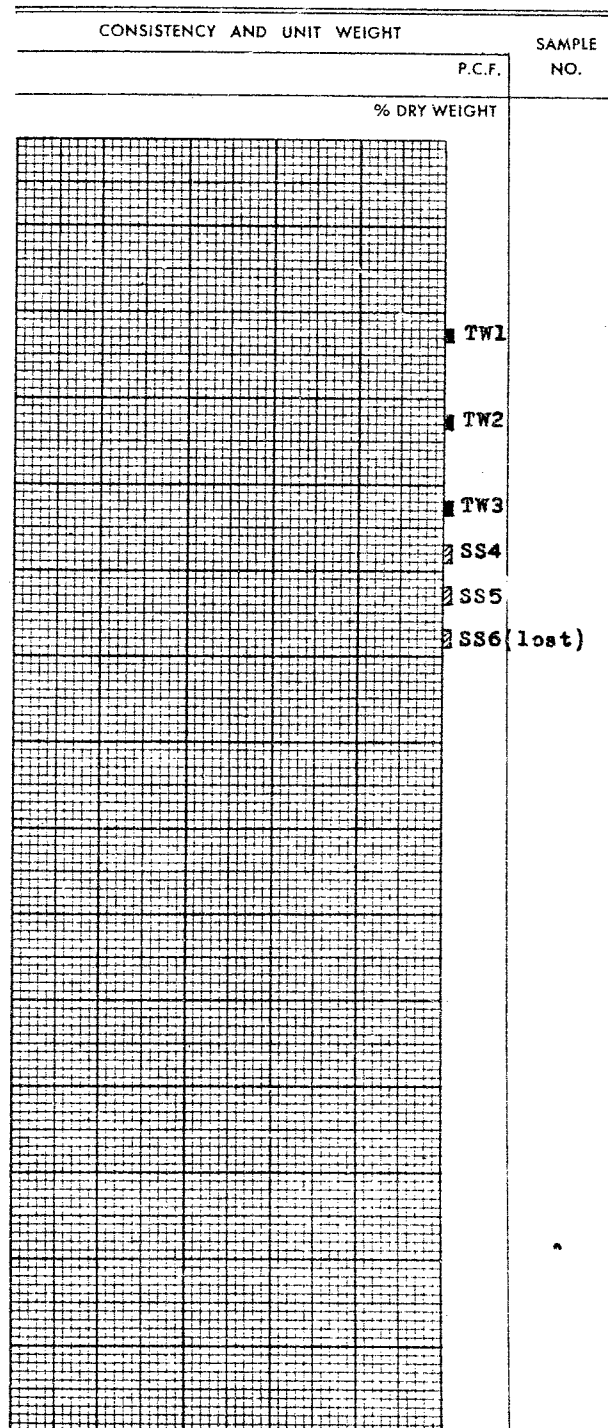
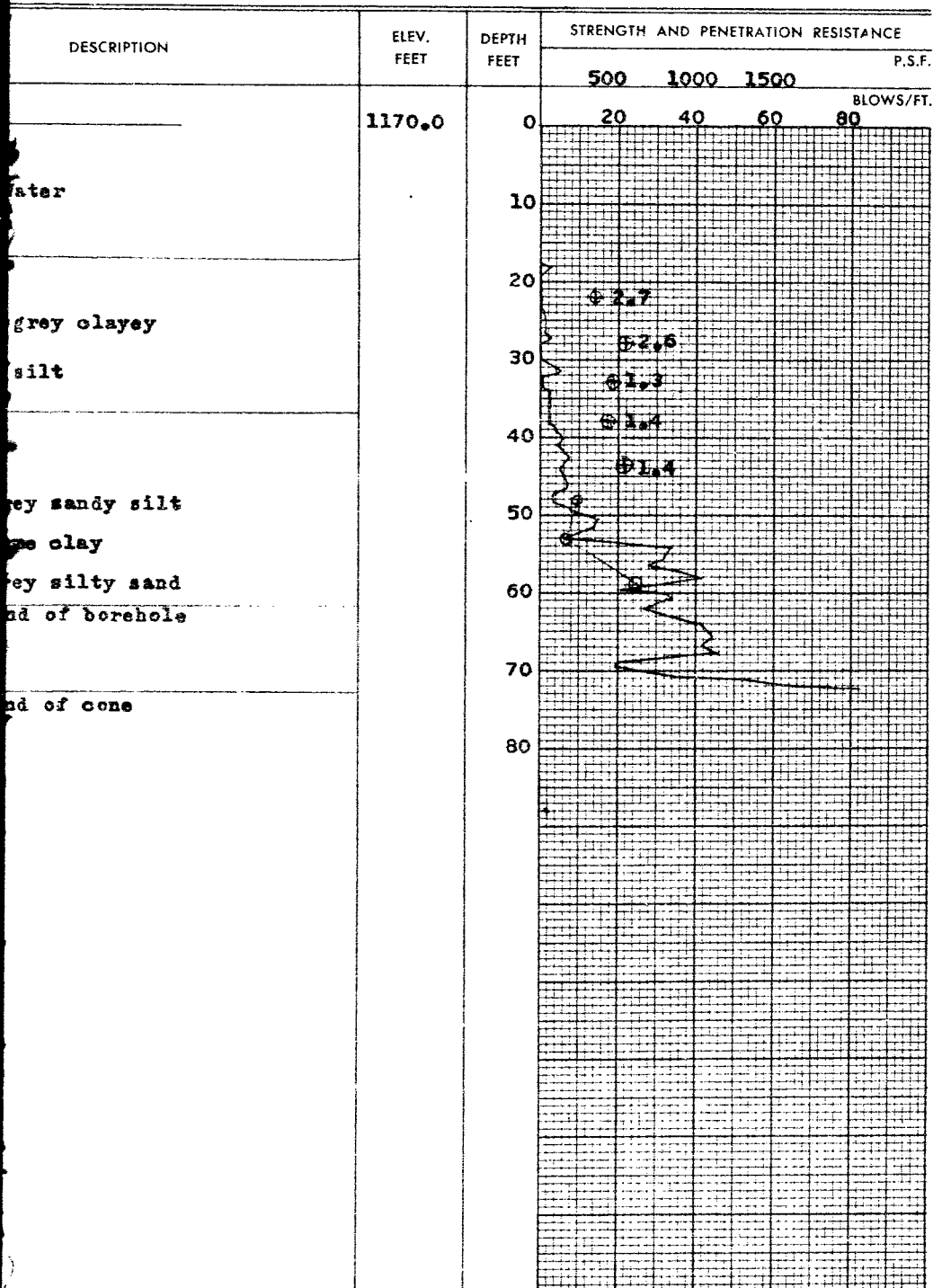
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 7.

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H.7. SEE SITE PLAN. ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957. Ended Date:

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

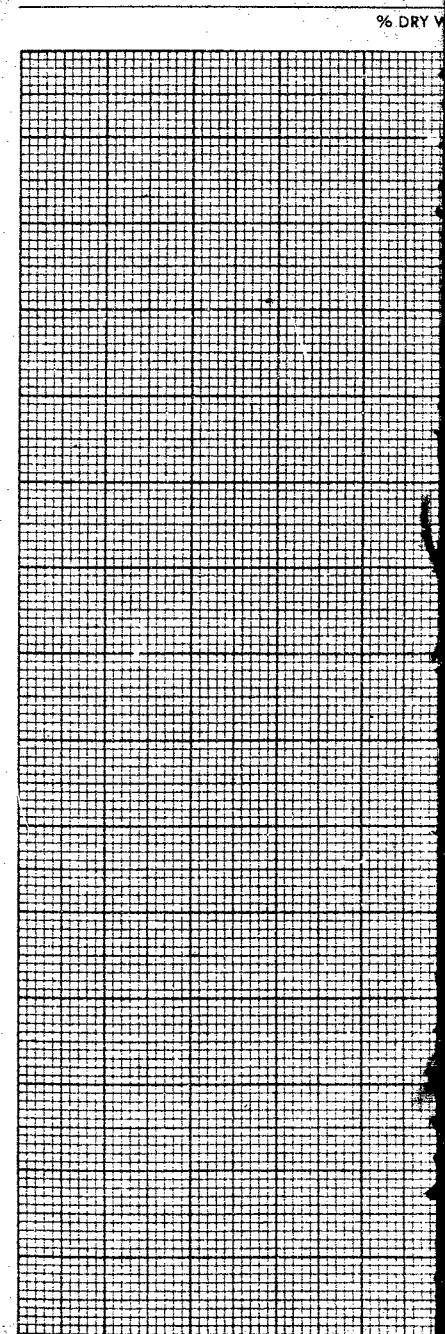
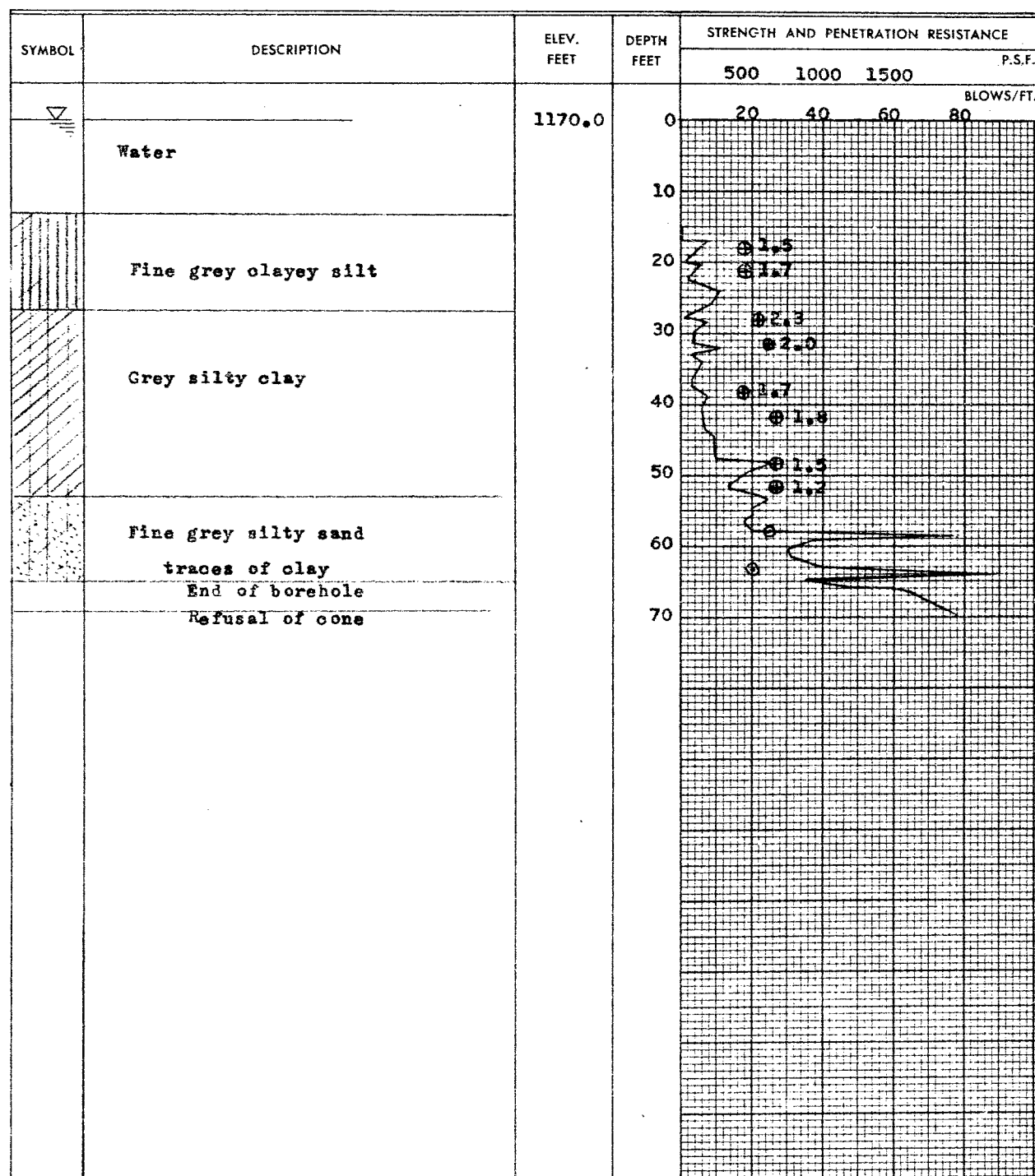
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight

CONSISTENCY AND UNIT WEIGHT

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 7.

SUPERIOR JCT. BRIDGE.

SUPERIOR JCT. BRIDGE, ONTARIO.

on B.H.7. SEE SITE PLAN. ENCLOSURE NO. 1.

on and Datum: 1170.0 (B.M. NAIL ON TREE)

Borehole Began 22 APRIL, 1957. Ended

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

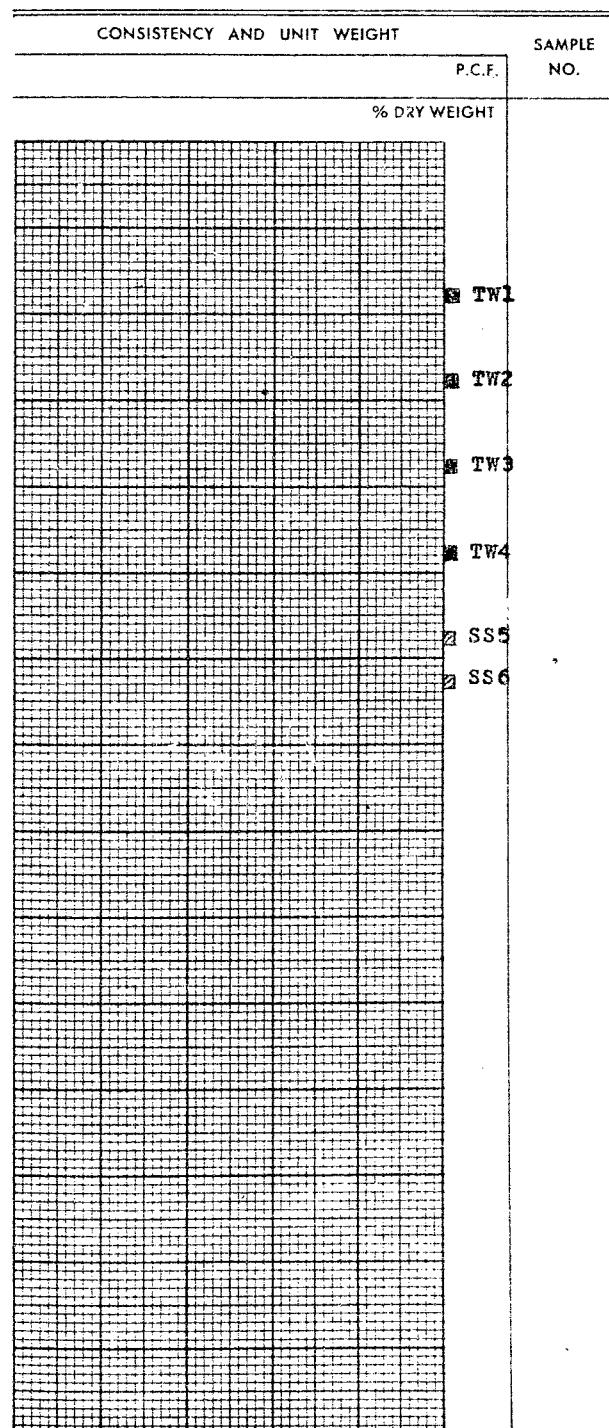
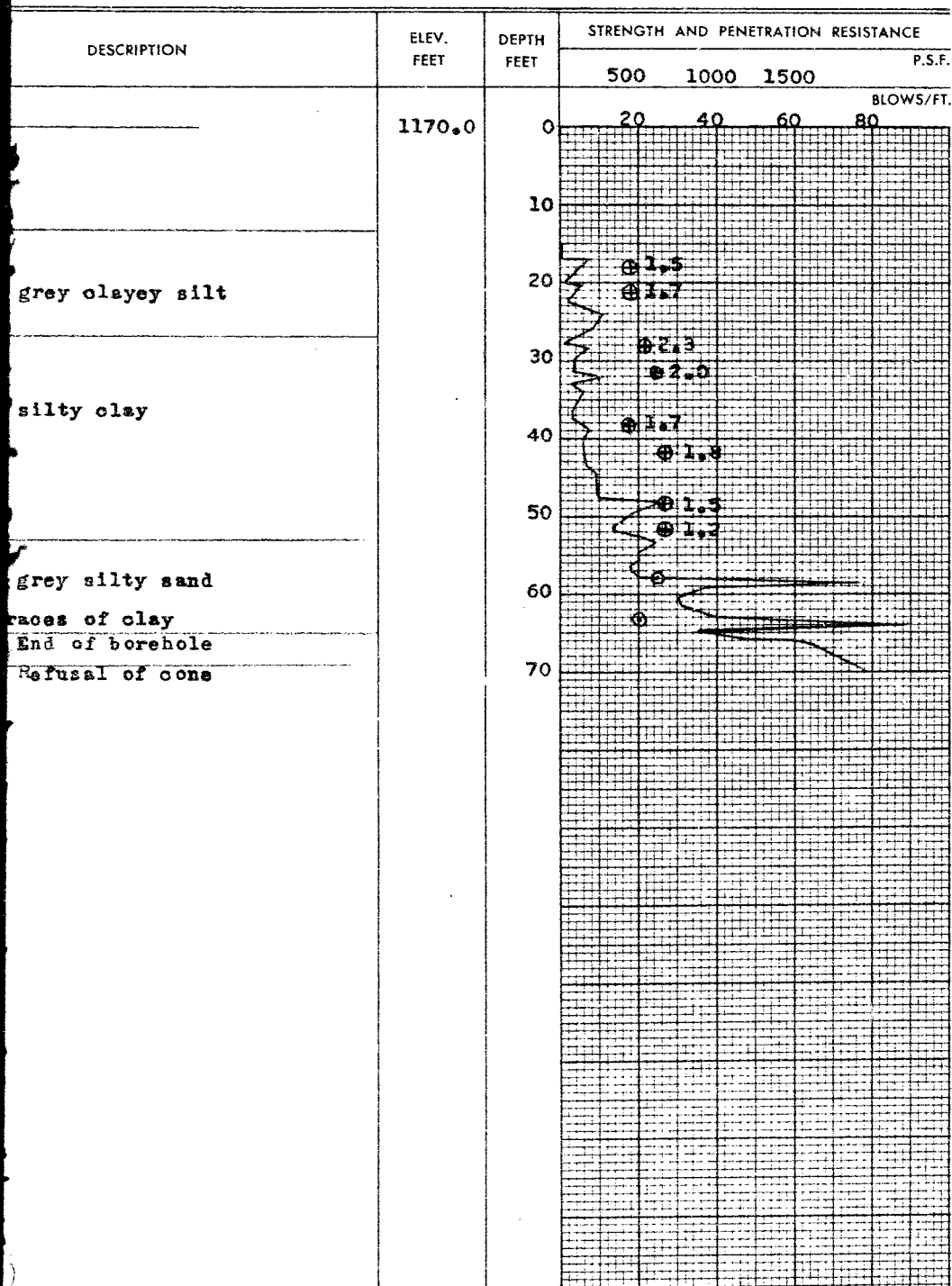
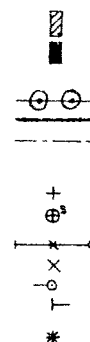
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 8.

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H. 8. SEE SITE PLAN, ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957 Ended Date: Field Supervision: **E. COWIE.**Driller: **H. JOHNSTON.**Prep.: **R. F.S.**Checked: Date: **LEGEND**Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

Consistency

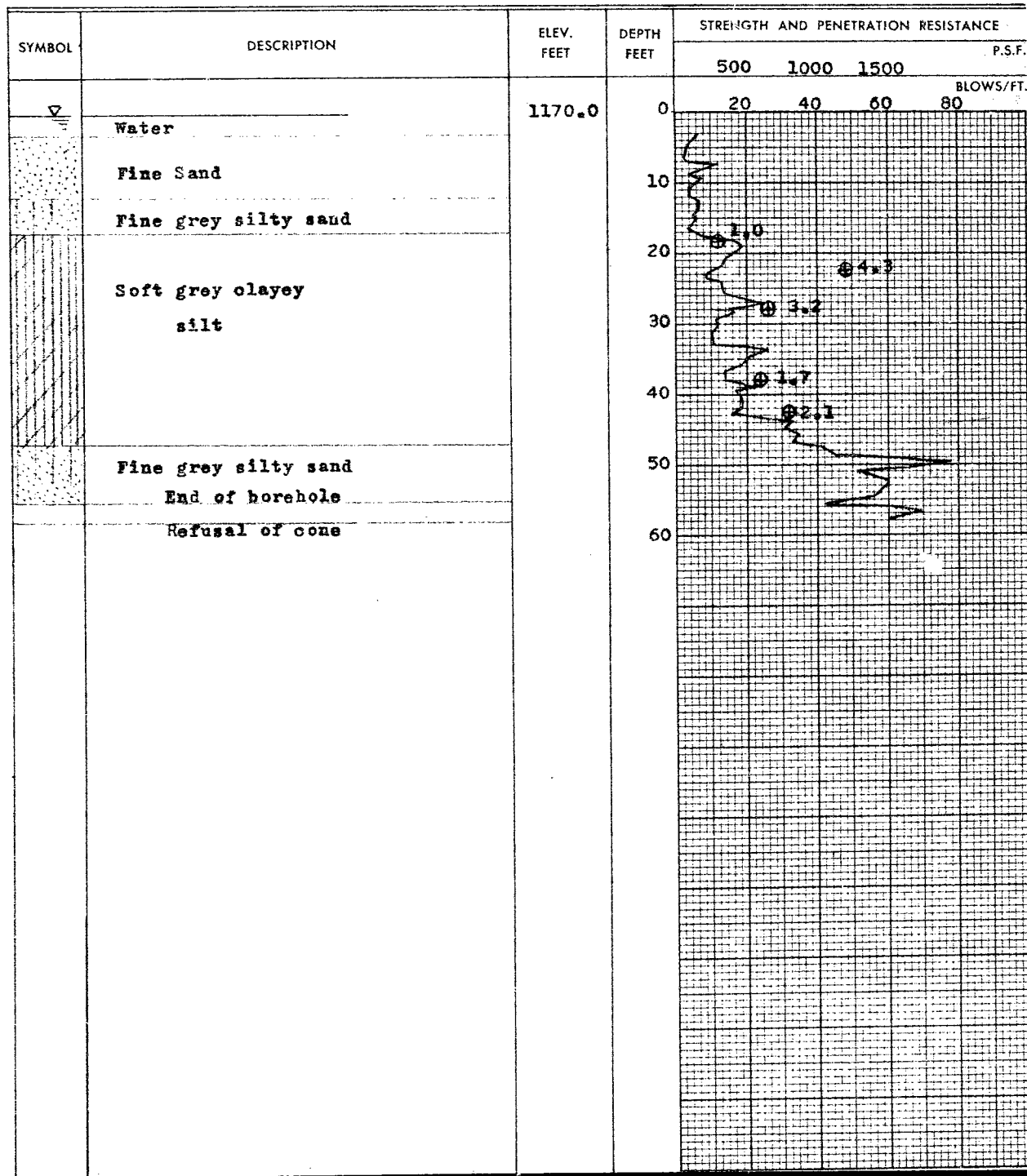
Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight**CONSISTENCY AND UNIT WEIGHT**

% DRY



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 8.

PRIOR JCT. BRIDGE.

PRIOR JCT. BRIDGE, ONTARIO.

B.H. 8. SEE SITE PLAN. ENCLOSURE NO. 1.

and Datum: 1170.0 (B.M. NAIL ON TREE)

gun 22 APRIL, 1957. Ended. Date:

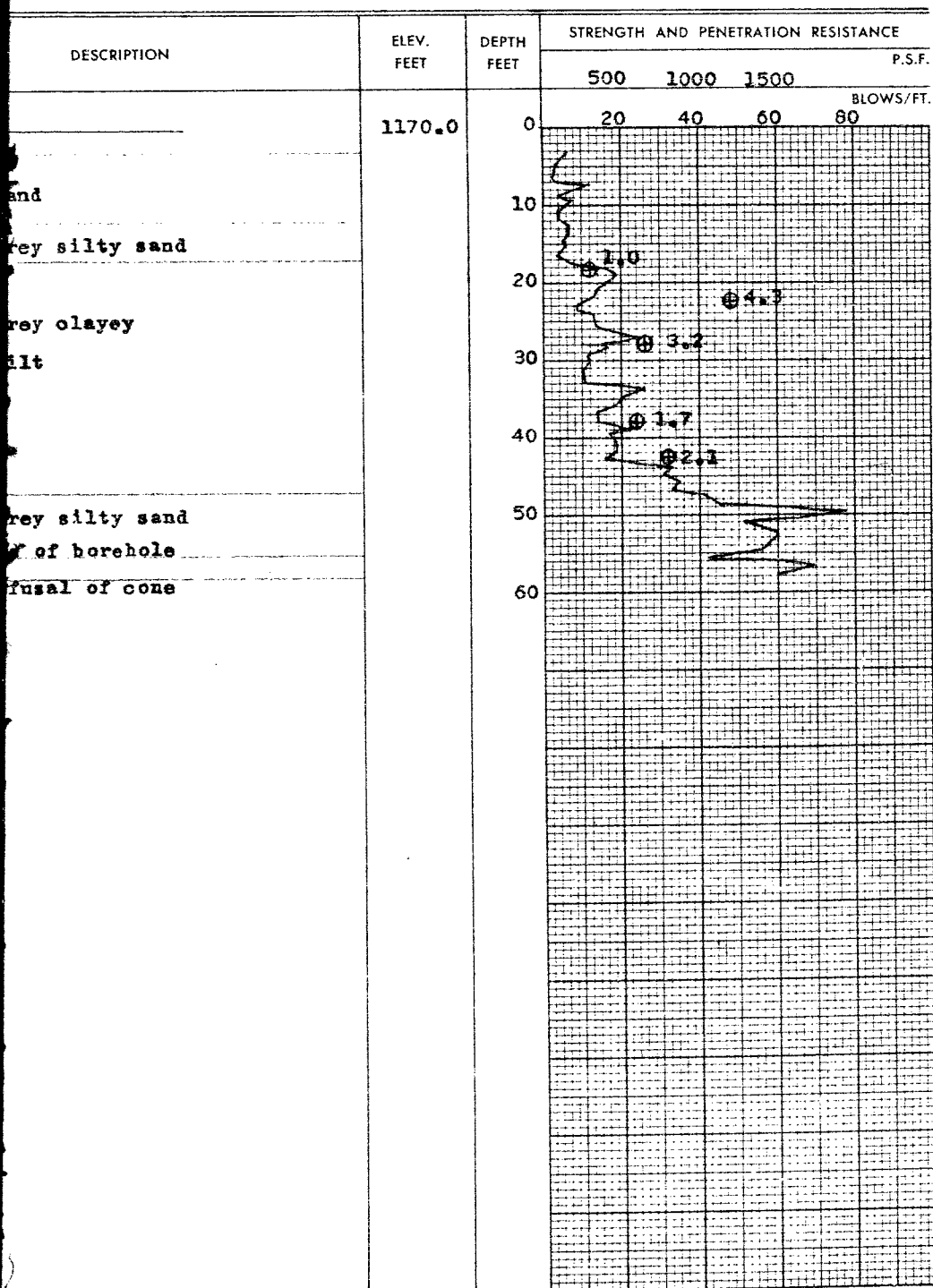
Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R. F.S.

Checked:

Date:



LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

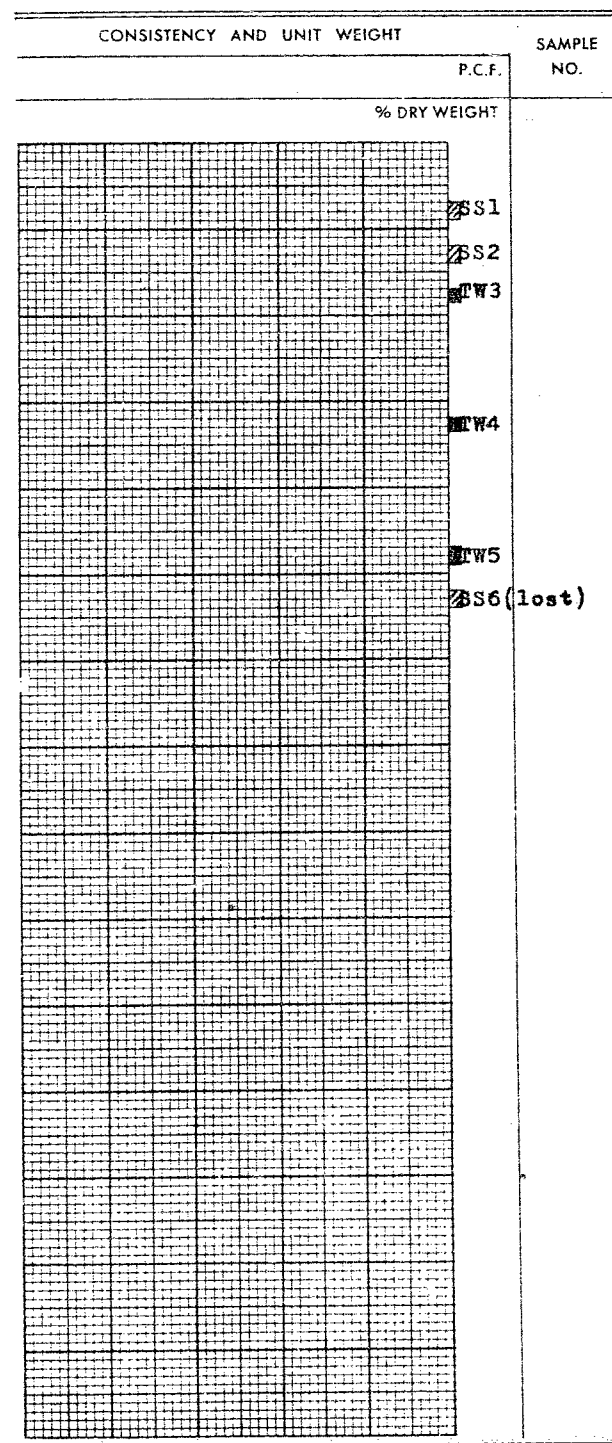
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 10

Project: SUPERIOR JCT. BRIDGE.

Location: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Location B.H. 10. SEE SITE PLAN. ENCLOSURE NO. 1.

Hole Elevation and Datum: 1170.0 (B.M. NAIL ON TREE)

Field Work Begun 22 APRIL, 1957. Ended

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

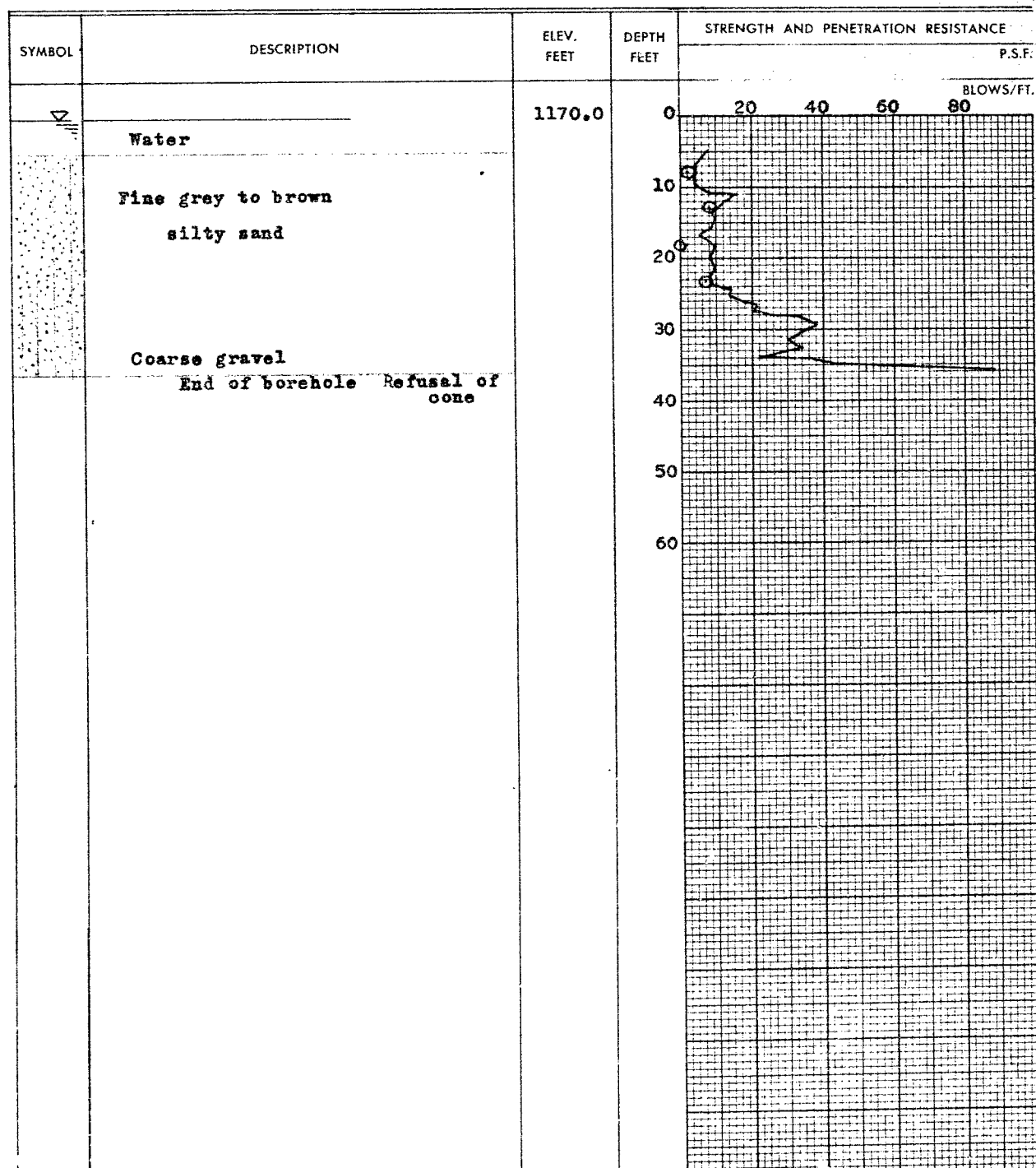
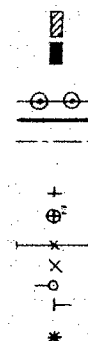
Checked:

Date:

LEGEND

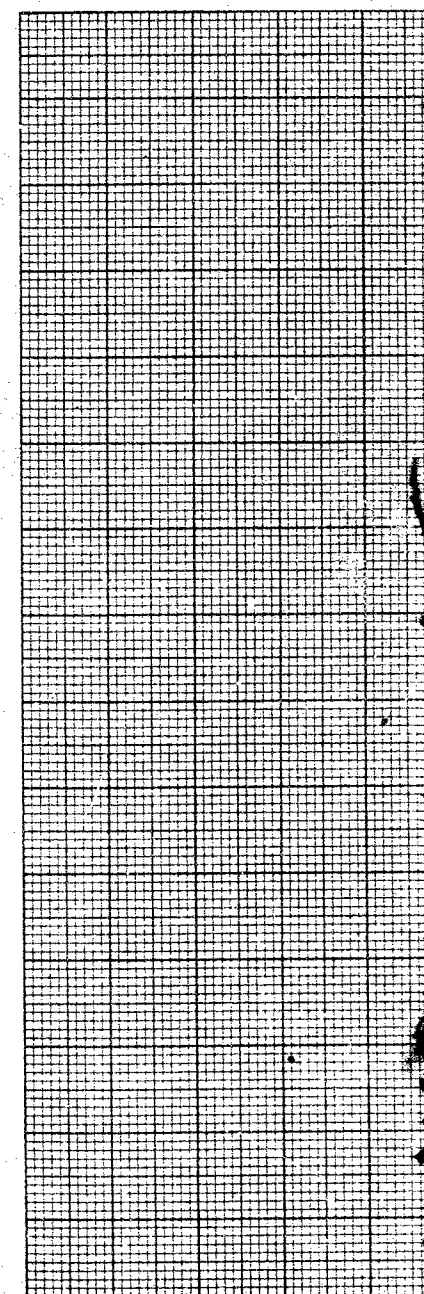
Sampling Method
2" Dia. split tube
2" Shelby tubePenetration Resistance
2" Split tube
2" Dia. Cone
CasingStrength
Unconfined compression
Vane test and sensitivityConsistency
Natural moisture
Liquid limit
Plastic limit

Natural Unit Weight



CONSISTENCY AND UNIT WEIGHT

% DRY



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 10

PRIOR JCT. BRIDGE.

PERIOR JCT. BRIDGE, ONTARIO.

B.H. 10. SEE SITE PLAN. ENCLOSURE NO. 1.

n and Datum: 1170.0 (B.M. NAIL ON TREE)

egun 22 APRIL, 1957. Ended.

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

Vane test and sensitivity

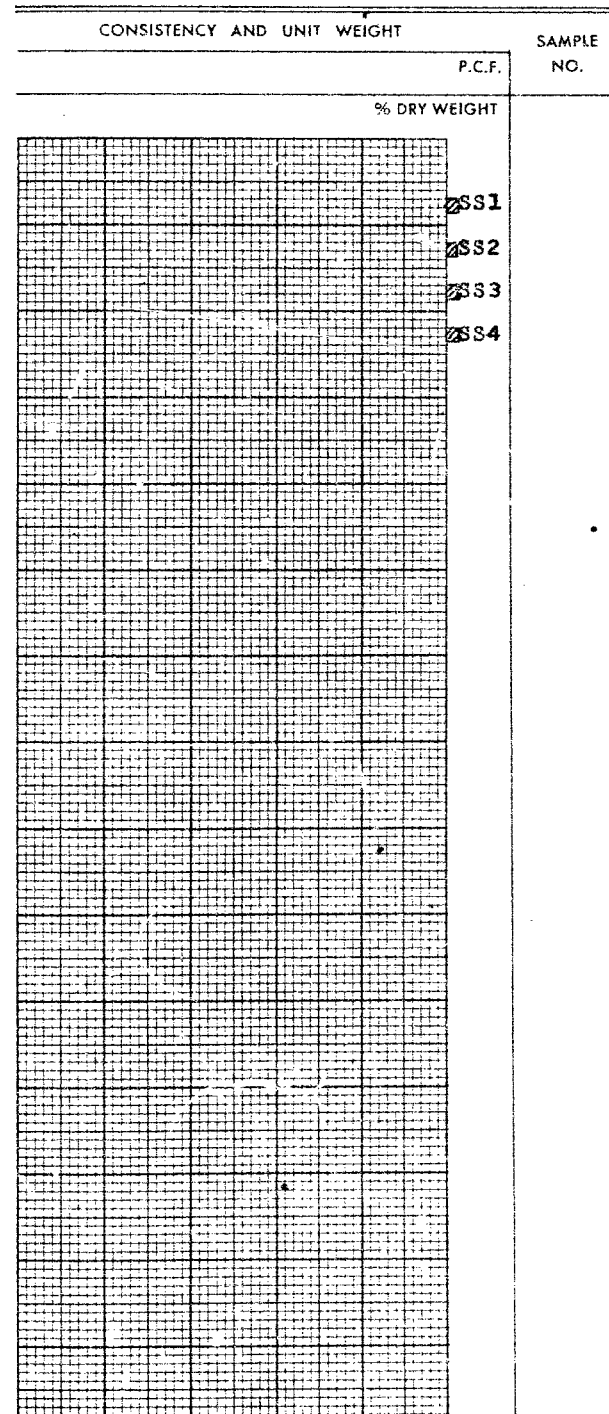
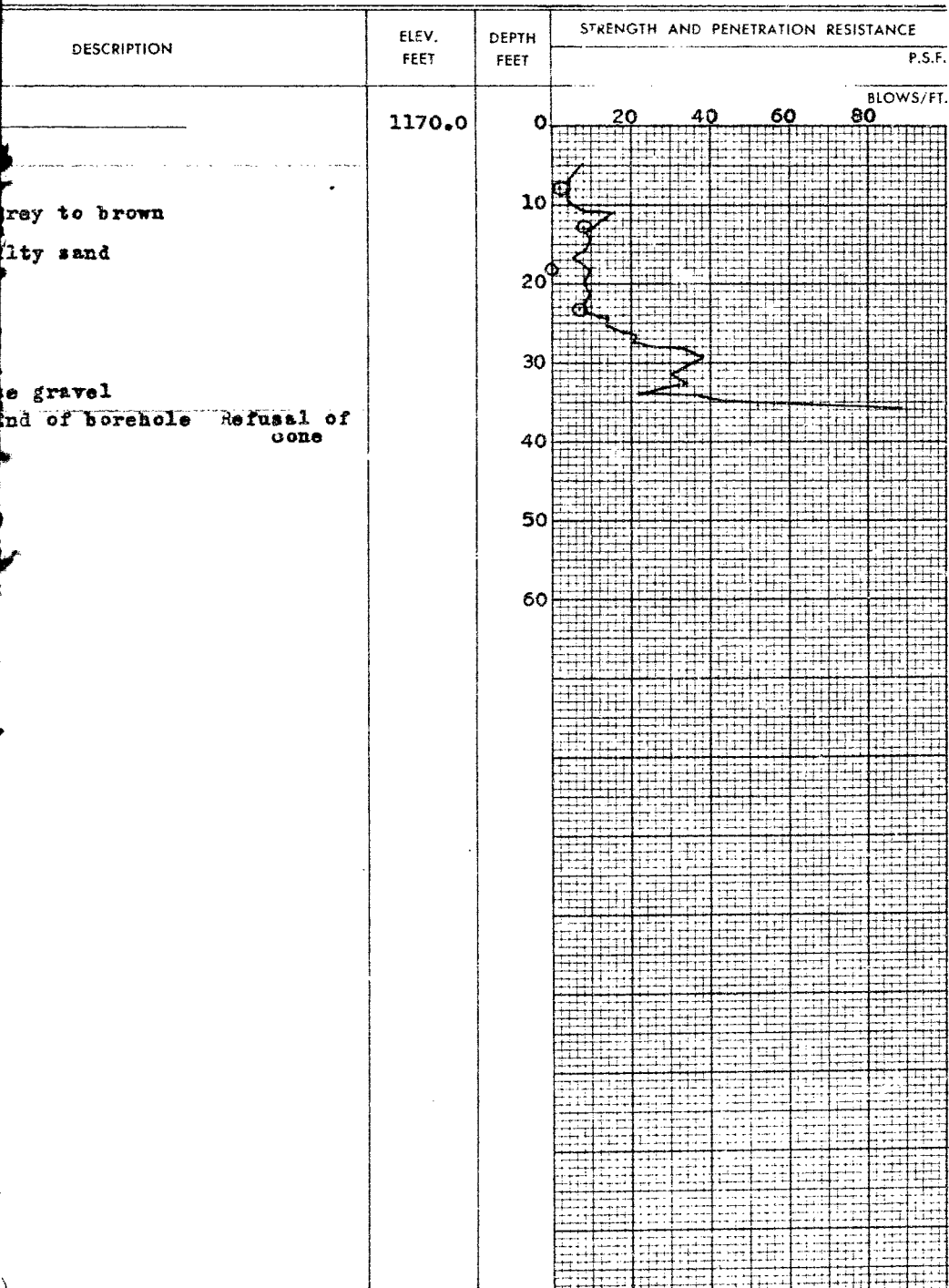
Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: **11**Project: **SUPERIOR JCT. BRIDGE.**Location: **SUPERIOR JCT. BRIDGE, ONTARIO.**Hole Location **B.H. 11. SEE SITE PLAN. ENCLOSURE NO. 1.**Hole Elevation and Datum: **1170.0 (B.M. NAIL ON TREE)**Field Work Begun **22 APRIL, 1957**

Ended

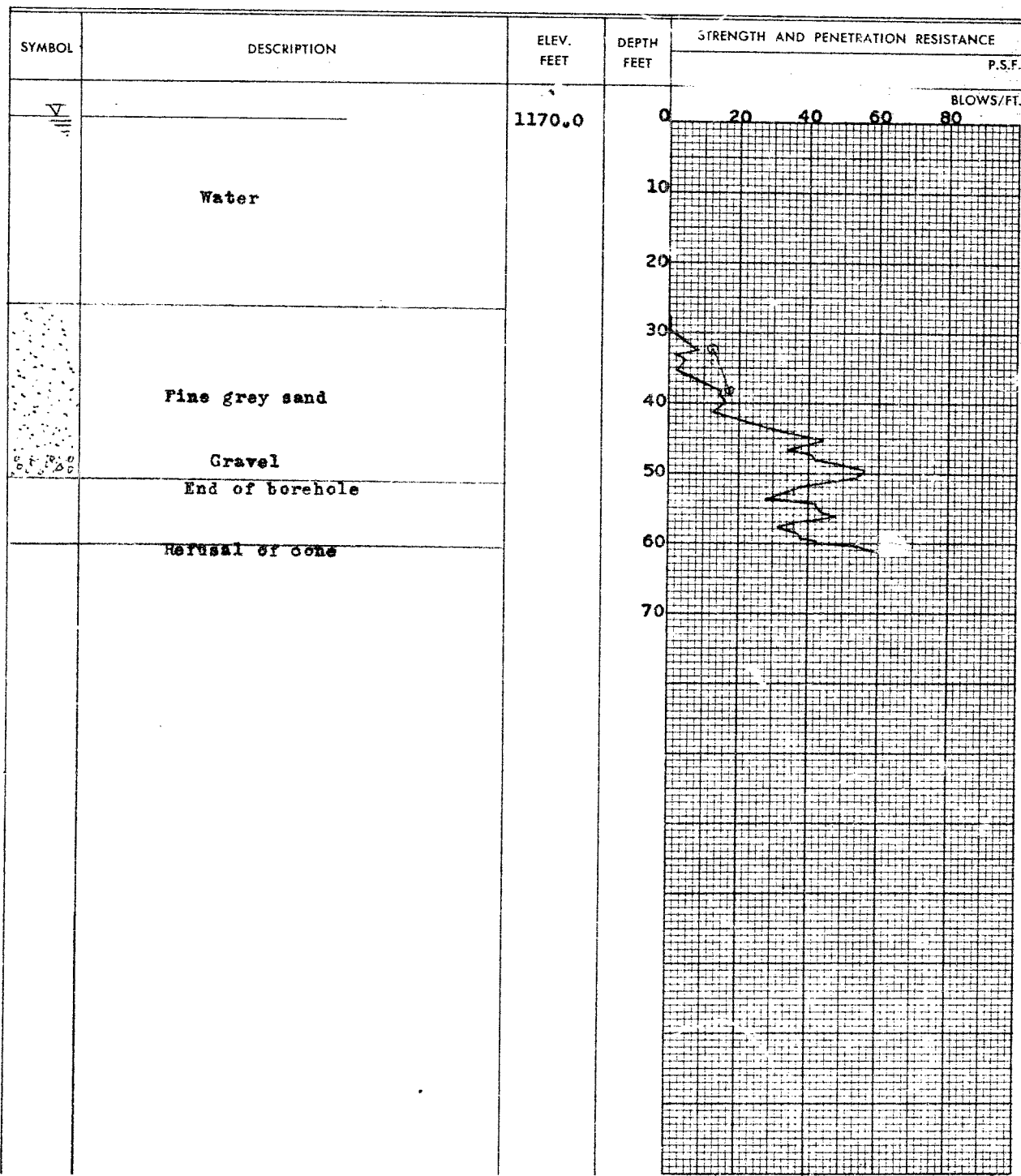
Field Supervision: **E. COWIE.**Driller: **H. JOHNSTON.**Prep.: **R. F. S.**

Checked:

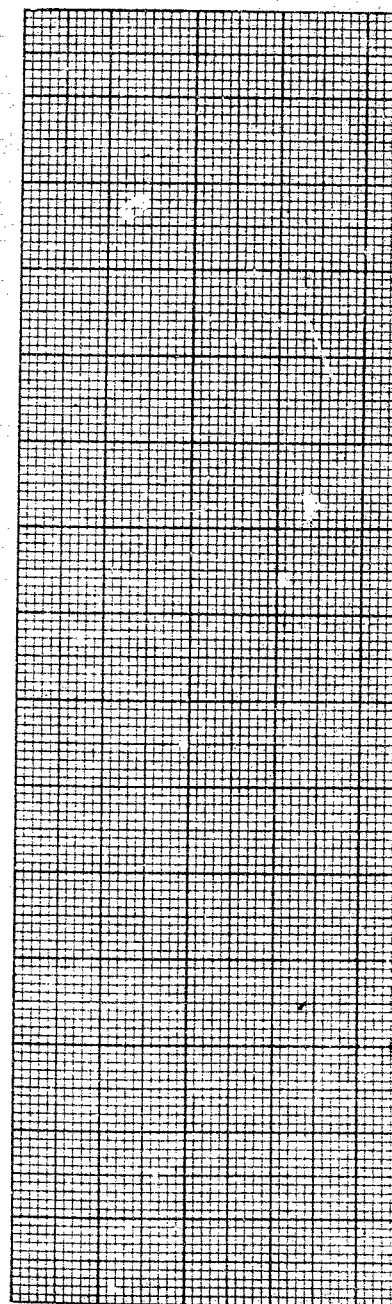
Date:

LEGENDSampling Method
2" Dia. split tube
2" Shelby tubePenetration Resistance
2" Split tube
2" Dia. Cone
CasingStrength
Unconfined compression
Vane test and sensitivityConsistency
Natural moisture
Liquid limit
Plastic limit

Natural Unit Weight



CONSISTENCY AND UNIT WEIGHT



RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 11

SUPERIOR JCT. BRIDGE.

SUPERIOR JCT. BRIDGE, ONTARIO.

on B.H. 11. SEE SITE PLAN. ENCLOSURE NO. 1.

on and Datum: 1170.0 (B.M. NAIL ON TREE)

Begun 22 APRIL, 1957

Ended

Field Supervision: E. COWIE.

Driller: H. JOHNSTON.

Prep.: R.F.S.

Checked:

Date:

LEGEND

Sampling Method
 2" Dia. split tube
 2" Shelby tube

Penetration Resistance
 2" Split tube
 2" Dia. Cone
 Casing

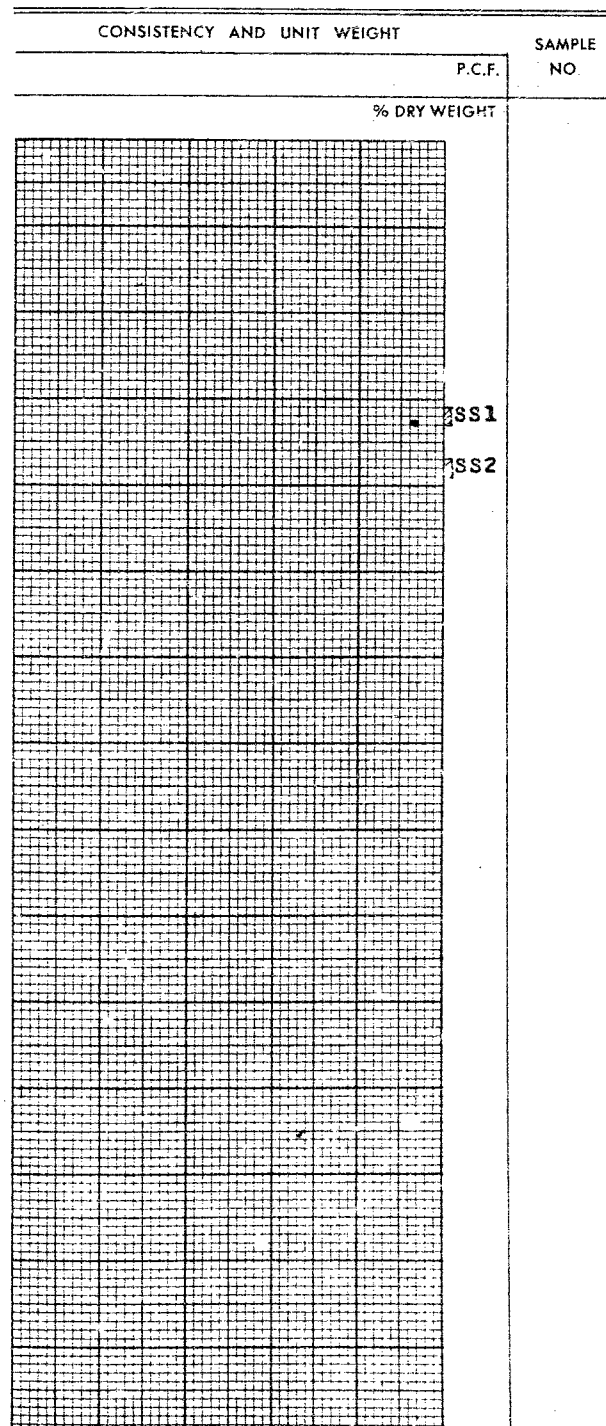
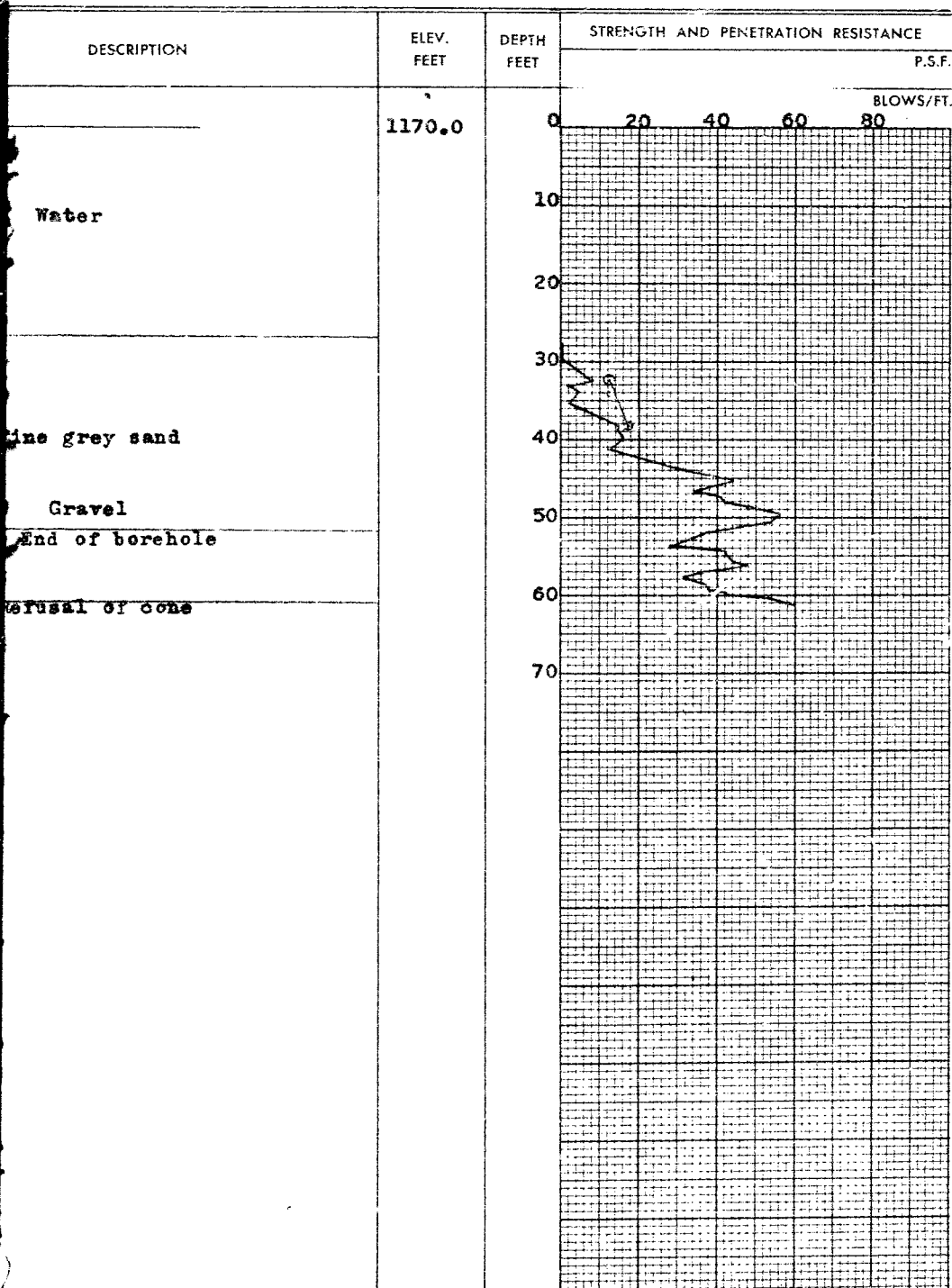
Strength

Unconfined compression
 Vane test and sensitivity

Consistency

Natural moisture
 Liquid limit
 Plastic limit

Natural Unit Weight



LIMITED

Driller

Hole Begun 22/4/57

Foundation Engineering Division

Helper

Hole Ended_____

Engineering Data Sheet for Borehole: P 12.

Job Name: SUPERIOR JCT. BRIDGE.

R. F. S.

Checked by

Job Located: SUPERIOR JCT. BRIDGE, ONTARIO.

Hole Located: CONE TEST P12. SEE SITE PLAN ENCLOSURE NO. 1.

Hole Elevation: 1170.0 Datum: RIVER LEVEL

Approx.

Day Month Year

DEPTH	EL.	THICK- NESS	SYMBOL	DESCRIPTION	TABULAR VALUES	SAMPLING METHOD
					20 40 60 80	
0				Water		
10						
20				Sand		
30				Hole ended at suggestion of D.H.O. Engineer.		
40				Refusal of cone		
50						

Order No.: S-500/T-710 RACEY, MacCALLUM AND ASSOCIATES
LIMITEDH. JOHNSTON
DrillerHole Begun 22/4/57

Foundation Engineering Division

Hole Ended _____ Engineering Data Sheet for Borehole: P 13.E. COWIE
HelperJob Name: SUPERIOR JCT. BRIDGE.R.F.S.Job Located: SUPERIOR JCT. BRIDGE, ONTARIO.

Checked by

Hole Located: CONE TEST P 13. SEE SITE PLAN ENCLOSURE NO. 1.Hole Elevation: 1170.0 Datum: RIVER LEVEL
Approx.

Day Month Year

DEPTH	EL.	THICK- NESS	SYMBOL	DESCRIPTION	TABULAR VALUES				SAMPLING METHOD
					20	40	60	80	
0				Water					
10									
20									
30									
40									
50									
60				Refusal of cone					

Order No.: S-500/T-710 RACEY, MACCALLUM AND ASSOCIATES
LIMITEDH. JOHNSTON
DrillerHole Begun 22/4/57

Foundation Engineering Division

Hole Ended _____ Engineering Data Sheet for Borehole: P 14E. COWIE
HelperJob Name: SUPERIOR JCT. BRIDGE.R.F.S.
Checked byJob Located: SUPERIOR JCT. BRIDGE, ONTARIO.Hole Located: CONE TEST P 14 SEE SITE PLAN ENCLOSURE NO. 1.Hole Elevation: 1170.0 Datum: RIVER LEVEL
Approx.

Day Month Year

DEPTH	EL.	THICK- NESS	SYMBOL	DESCRIPTION	TABULAR VALUES				SAMPLING METHOD
					20	40	60	80	
0				Water					
10									
20									
30									
40									
50				Refusal of cone					