

56-F-218C

Hwy # 11

SHEKAK RIVER

RACEY, MACCALLUM AND ASSOCIATES **B.A. 513**  
LIMITED

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REPORT NO: S-500-504/56/T-238-2

310 Odeon Building,  
20 Carlton Street,  
Toronto, Ontario.

Department of Highways of Ontario,  
c/o Sir Alexander Gibb and Partners,  
4 Wellington Street East,  
TORONTO, Ontario.

17 April 1956.

Attention: Mr. C.C. Marshall

56-F-218C

RE: SOILS INVESTIGATION FOR  
PROPOSED BRIDGE OVER THE  
SHEKAK RIVER, NEAR HEARST, (Hwy 11)  
ONTARIO.

Dear Sirs:

We have completed our investigation of the Shekak River and submit the attached report, which shows the results obtained during our second visit to the site and which is based on a correlation of these results with the information from our preliminary investigation. A summary of our comments is presented here for your consideration:-

1. The information obtained during our final testing confirms the opinions presented to you in our interim report.
2. The suggested fault was not clearly defined and, so far as foundation upon bedrock is concerned, seems unimportant. The rock sampled during our final investigation was biotite gneiss.
3. The stability of the west bank is good.
4. Further questioning of local residents suggests that the fill to be placed against the abutments should be protected. The existing east abutment fill has, in the past, been subjected to scour during spring flood.

It will be seen from enclosure no.1 that the piers at stations 1843 + 92 and 1844 + 47 may be founded easily upon bedrock. In reference to our conversation of 6 April 1956, during which a footing depth

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of six feet below the river bed was mentioned for the piers at stations 1845 + 02 and 1845 + 57, we would like to point out that although from the point of view of bearing capacity this depth is adequate, the determining factor would seem to be the effect of scour, coupled with the longitudinal and lateral thrusts which the piers must accomodate during periods of spring breakup. Since no direct observation or analysis of the rate of scour has been possible, it seems advisable to follow such empirical rules as exist. Factors which are considered to effect scour in a manner which may not be predictable are:-

1. Placement of the piers themselves.
2. Bridges with a low superstructure which may become immersed with a consequent increase in flow rate.
3. Streams that may become filled with heavy ice cakes during spring breakup.
4. Streams that are used for transporting logs, which may cause jams.

Terzaghi states \*that where no direct observations of the effect of scour have been made, in view of the inevitable uncertainty involved in forecasts, a large margin of safety is required.

Should you have any further queries in connection with this report, we will be very pleased to discuss them with you, at your convenience. The attached report was written by Mr. P.E.M. Monk, who supervised the drilling work in the field. I have reviewed the report and am in accord with it.

Yours very truly,  
RACEY, MacCALLUM AND ASSOCIATES LIMITED

*W.A. Trow*

W.A. Trow, P. Eng.

Original and 3 copies - Sir Alexander Gibb and Partners, Toronto.  
c.c's.                   1 - Racey, MacCallum & Associates Limited, Montreal.  
                          2 - Soils Engineers.

\* Terzaghi & Peck, Soil Mechanics in Engineering Practice, page 411.

SOILS INVESTIGATION  
FOR  
PROPOSED BRIDGE OVER  
THE SHEKAK RIVER, NEAR  
HEARST, ONTARIO.

Report No: S-500-504/56/T-238-2

Racey, MacCallum & Associates Limited

17 April 1956.

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17 April 1956.

SOILS INVESTIGATION FOR THE  
PROPOSED BRIDGE OVER THE SHEKAK  
RIVER, NEAR HEARST, ONTARIO.

PURPOSE OF THE INVESTIGATION

This report covers the drilling operations for the determination of the pier and abutment foundations at positions determined subsequent to our preliminary investigation.

DRILLING WORK AND SUBSOIL CONDITIONS

The drill arrived on the site on Tuesday 13 March and remained until Tuesday 20 March. Ice conditions had been greatly improved, due to the clearing and packing during the preliminary investigation, and no difficulties were encountered from this source. The boreholes were located at the piers and west abutment and their positions are shown on enclosure no.1. At all locations bedrock was of biotite gneiss.

Drilling on borehole No.7 commenced on Wednesday 14 March and was completed on 16 March. The depth of the river was 9.5 feet and from that depth to bedrock at 17 feet, a very dense silt containing medium gravel was encountered.

Borehole no.6 was commenced on 16 March and completed the same day. The depth of water was 7.5 feet and from that depth to bedrock at 8.7 feet, an unsampled, apparently dense silt with fine gravel was encountered. Borehole no.8 was started on 16 March and completed on 17 March. The depth of water was 11.3 feet and from this depth to 23 feet the soil graded from a very stiff clay to a very stiff silt. At 23 feet a boulder horizon was encountered, which made sampling impossible. The wash water indicated silt. Bedrock was encountered at 27 feet.

Borehole no.9 was started on 17 March and completed on 19 March. The depth of water was 10 feet and from that depth to 29 feet, a very dense silt was encountered. From 29 feet to bedrock at 36 feet, a boulder horizon was encountered, preventing sampling.

Borehole no.10 was started on 19 March and completed the next day. From ground level to six feet, the soil was firm silt with fine gravel. At six feet and down to 16 feet, boulders prevented sampling, but small pieces obtained from the flush joint casing indicate a stiff silty clay with fine gravel. From 16 to 24 feet, the soil was a stiff silty clay. Between 24 and 36 feet more boulders were encountered, in a matrix of stiff silty clay with gravel. Bedrock was at 36 feet.

DISCUSSION OF THE RESULTS

At all points tested either rock, or extremely dense soil, was encountered and the support for bridge piers is, therefore, extremely good.

The lowest value of penetration resistance, using a standard two inch O.D. split spoon, was 50 blows per foot. This confirms the value for allowable bearing of 4 tons/sq.ft., given in our interim report.

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Laboratory tests indicate that the natural water content of the soil is at its plastic limit and, therefore, is in a relatively incompressible state.

The west bank of the river should be stable, although as previously mentioned, it may be advisable to protect the abutment fill, due to the high spring water.

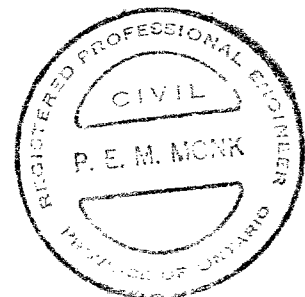
#### CONCLUSIONS

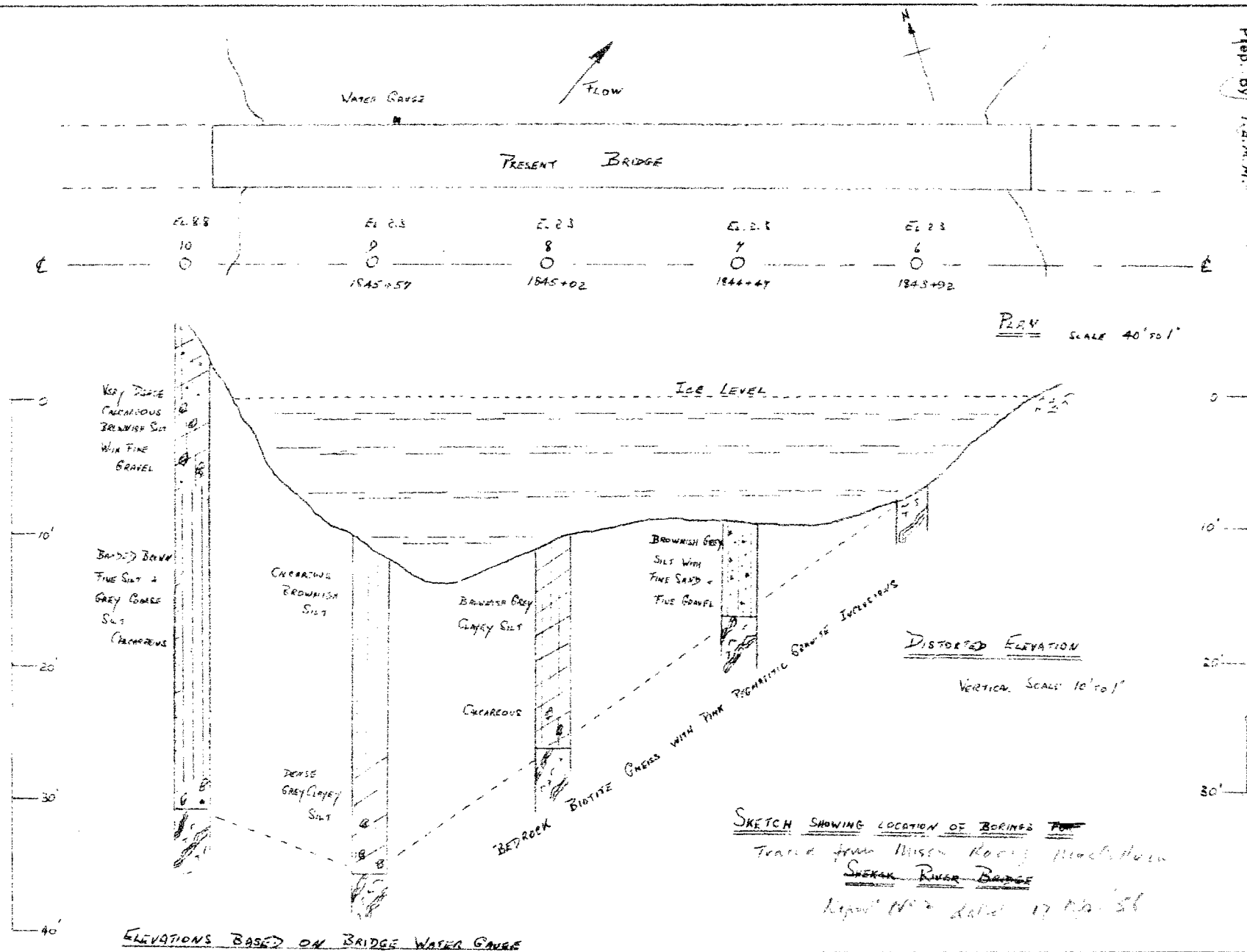
1. The foundation conditions, whether rock or subsoil, are good. Laboratory tests indicate the soil to be stable and it should be relatively incompressible.
2. The safe bearing value for a simply supported structure of the nature suggested, is 4 tons/sq.ft.
3. No observations were possible on the rate of scour, and the effect of pier placement is uncertain. Terzaghi recommends that, where no direct observations of the effect of scour have been made, in view of the inevitable uncertainty involved in forecasts, a large margin of safety is required.
4. The river is used for logging and must withstand probable log or ice jams, causing considerable lateral thrust, with a point of action close to the deck. There may be longitudinal thrusts placed upon the piers by the wedging effect of such jams.
5. The depth at which the pier foundations are to be placed should be sufficient to ensure safety from scour due to soil disturbance resulting from the placement of the piers, and to accommodate the lateral and longitudinal thrusts resulting from log or ice jams.
6. The embankment fill will probably require rip-rap protection against spring flooding, particularly on the east bank.

*P. E. M. Monk*

P. E. M. Monk, P. Eng.

PEMM/MD







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Foundation Engineering Division

Engineering Data Sheet for Borehole: #7

Project: SHEKAR RIVER BRIDGELocation: SHEKAR RIVER HIGHWAY 11 35 MILES WEST OF HAST

Hole Location

Hole Elevation and Datum: 2.3 EXISTING BRIDGE RIVER GAGEField Work Begun 13/3/56 Ended 15/3/56Field Supervision: P.E.M.M.Driller: CONSTANTINEAUPrep.: T.E.M.M.

Checked:

Date: 3/4/56**LEGEND**Sampling Method

2" Dia. split tube

2" Shelby tube

Penetration Resistance

2" Split tube

2" Dia. Cone

Casing

Strength

Unconfined compression

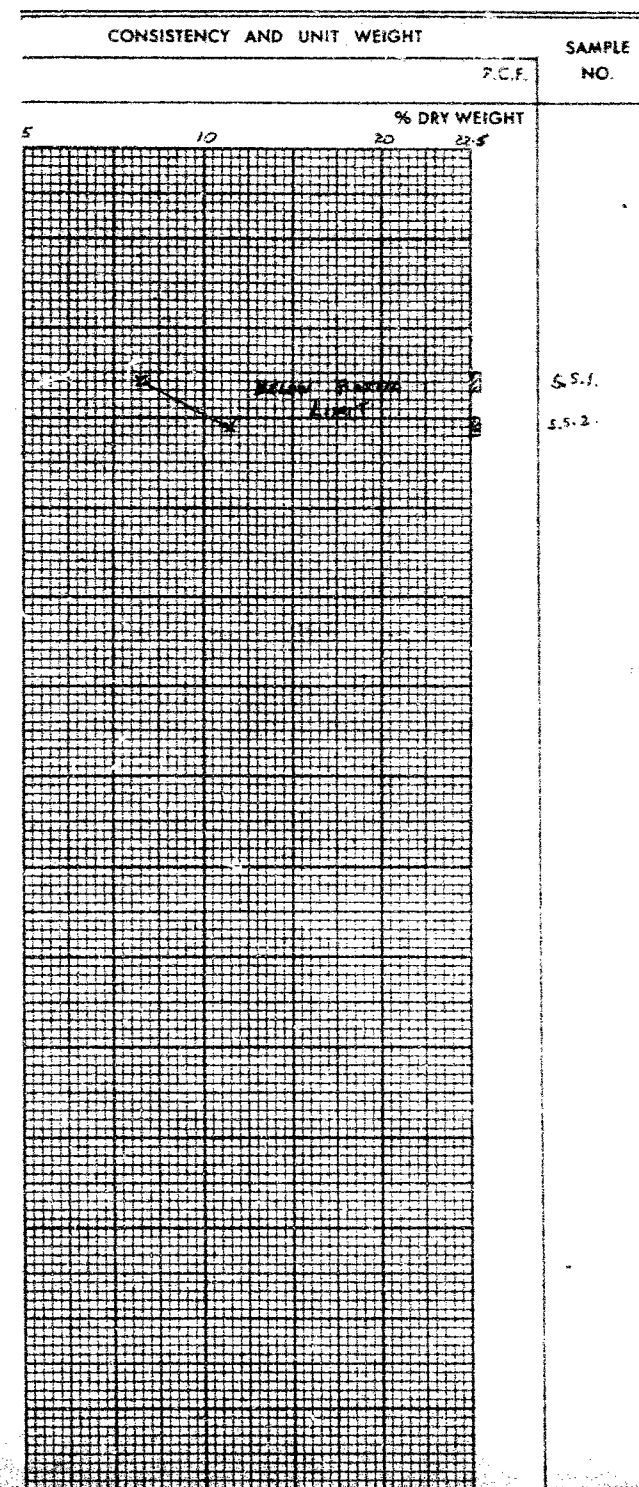
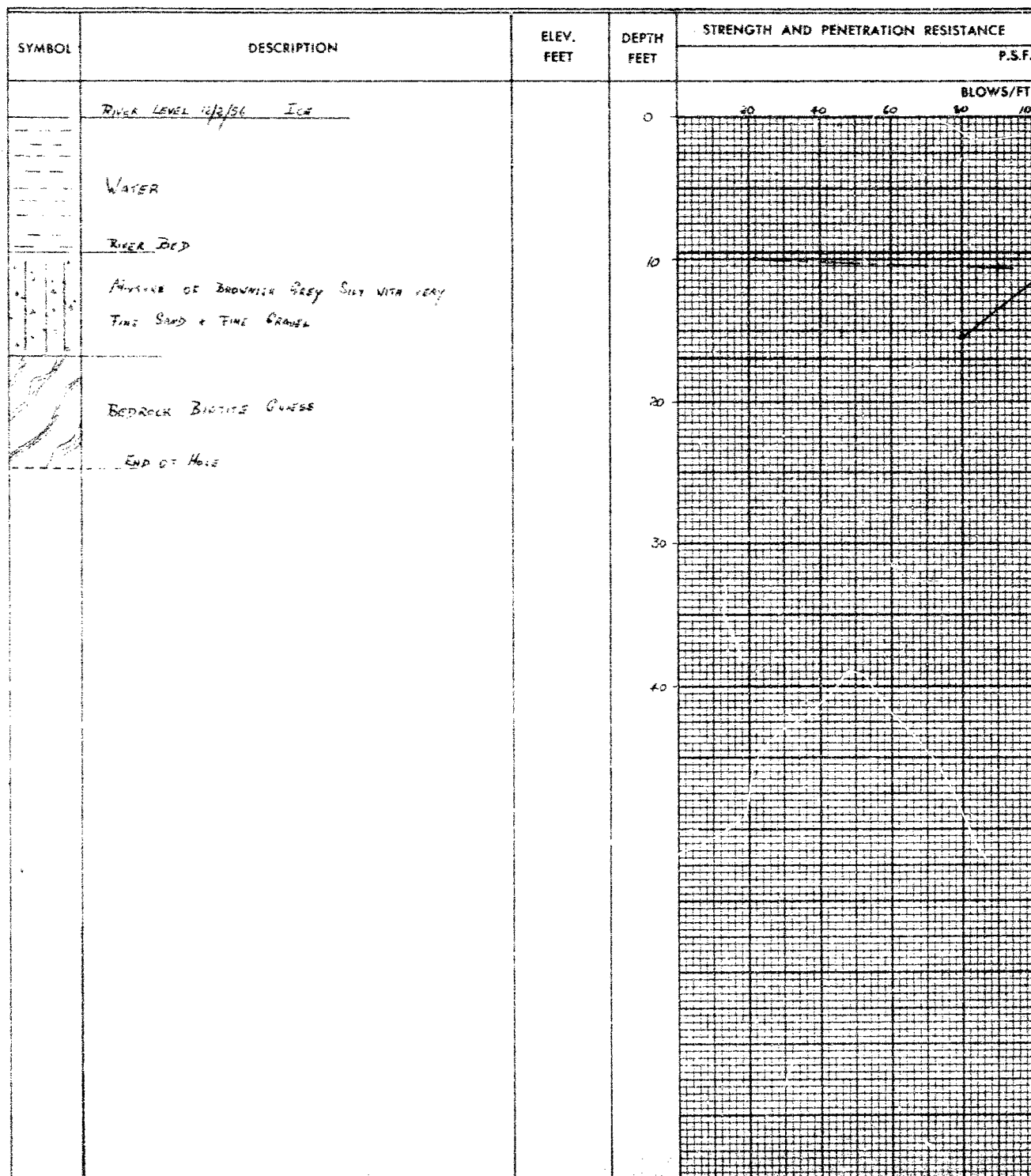
Vane test and sensitivity

Consistency

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight

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Foundation Engineering Division

Engineering Data Sheet for Borehole: 8

Project: SNEHAN RIVER BRIDGE

Location: ~~Sheran~~ River Highway 11 35 Miles West of Hearst

Hole Location

Hole Elevation and Datum: 2-3 EXISTING BRIDGE RIVER GAUGE

Field Work Begun 16/3/56 Ended 17/3/56

Field Supervision: *P.F.M.*

Driller: R. GUSTAFSON

Prep: 7.5 x 4

Checked:

Date: 5/4/54

### LEGEND

### Sampling Method

2" Dia. split tube

2" Shelby tube

### Penetration Resistance

2" Split tube

2" Dia. Cone

### Casing

### Strength

### Unconfined compression

### Yane test and sensitivity

### Consistency

**Natural moisture**

Liquid limit

Plastic limit

### Natural Unit Weight

SYMBOL	DESCRIPTION	100 FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE				
				BLOWS/FT.	P.S.F.			
	RIVER LEVEL 10/2/56 ICE		0	20	40	60	80	100
	WATER		10					
	RIVER BED		20					
	CONTINUOUS BROWNISH GREY CLAYEY SILT		30					
	BETWEEN BENTONITE GRILLS		40					
	END OF HOLE							

CONSISTENCY AND UNIT WEIGHT		SAMPLE NO.
P.C.F.		
% DRY WEIGHT		
10	15	30
		S.S. 1 S.S. 2 S.S. 3

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Foundation Engineering Division

Engineering Data Sheet for Borehole: #9

Project: SASKIA RIVER BRIDGE

Location: SASKIA RIVER Highway 11 35 Miles West of HEART

Hole Location

Hole Elevation and Datum: 2.2 EXISTING BRIDGE RIVER GAUGE

Field Work Begun 12/3/56

Ended 12/3/56

Field Supervision: P.E.M.

Driller: R. GUYOTTEAU

Prep.: R.E.M.

Checked:

Date: 9/4/56

**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

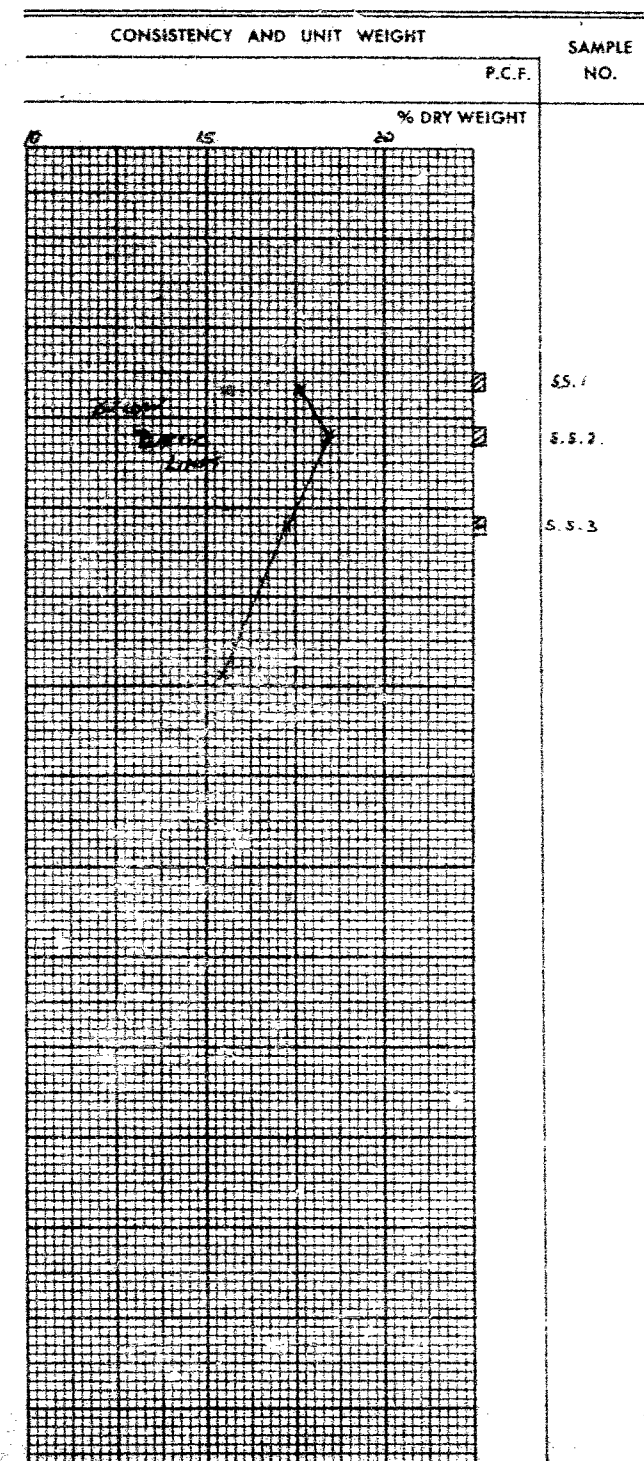
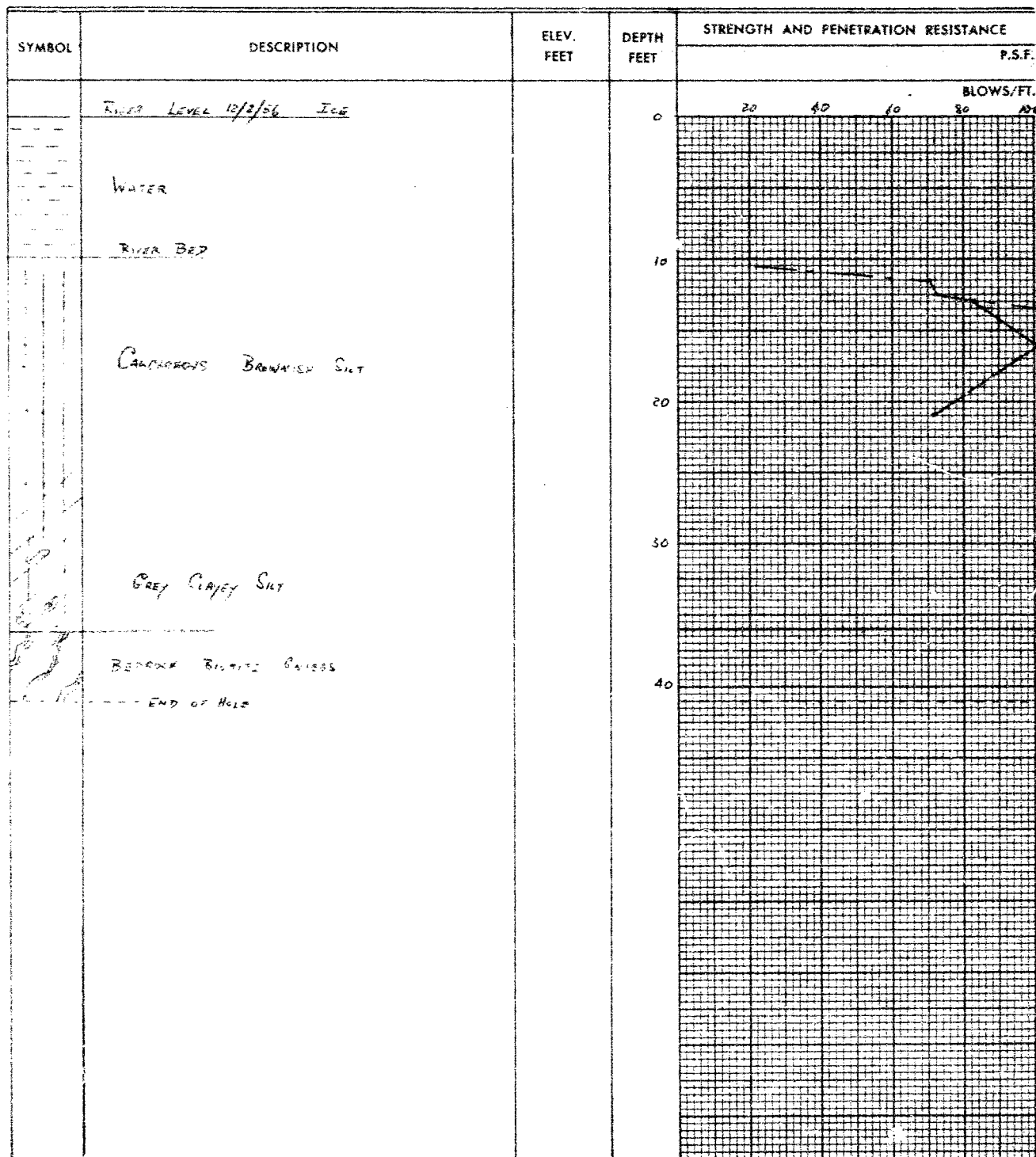
**Consistency**

Natural moisture

Liquid limit

Plastic limit

Natural Unit Weight



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 10

Project: SHERAK RIVER BRIDGE

Location: SHERAK RIVER Highway 11 35 Miles West of HEART

Hole Location

Hole Elevation and Datum: 8.8 EXISTING BRIDGE RIVER GANGE

Field Work Begun 10/1/56 Ended 20/2/56 Date: 9/4/57

Field Supervision: P.E.A.M.

Driller: R. CONSTANTINEAU

Prep.: P.E.A.M.

Checked:

Date: 9/4/57

**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**