

#58-F-239-C

HWY. #401

NASSAGAWEYA

TWP. NEAR

MILTON

Department of Highways of Ontario,
280 Davenport Road
Toronto, Ontario.

58-F-239

FOUNDATION INVESTIGATION FOR PROPOSED
COUNTY ROAD AND HIGHWAY NO. 401 CROSSING
IN NASSAGAMEYA TOWNSHIP, NEAR MILTON, ONT.

Report No. S-500/T-1011

Racey, MacCallum & Associates Ltd.

January 29, 1958.

REPORT NO. 8-500/T-1014

January 29, 1958

FOUNDATION INVESTIGATION FOR PROPOSED
COUNTY ROAD AND HIGHWAY NO. 401 CROSSING
IN MASSAGAMEYA TOWNSHIP, NEAR MILTON, ONT.

LOCATION OF THE SITE AND SCOPE OF THE REPORT

This report covers the field investigation of the subsoil investigation at the site of the proposed highway No. 401 crossing in Massagameya Township, near Milton, Ontario. The location of the investigation boreholes and cone penetration tests are shown on Enclosure No 1. The report includes recommended alternative excavation depths and the allowable bearing capacity of the subsoil at those depths.

THE FIELD INVESTIGATION AND DESCRIPTION OF THE SUBSOIL

Field work commenced on January 10, 1958 at borehole location No 2, using a conventional diamond drill adapted for soil testing.

The Engineering Data Sheets giving the soil profiles for the test holes are shown on Enclosures 2 to 7 inclusive. Borehole No 2 indicated an upper two feet of clay topsoil underlain by medium to coarse red brown sand to a depth of 10 feet. This sand was loose at a depth of 2 feet and became progressively more dense with depth until it could be classified as very dense at a depth of 10 feet. Below a depth of 10 feet the soil was silt in a dense condition to a depth of approximately 16 feet, below which the subsoil became increasingly sandy again changing from sandy silt between depths of 16 and 21.5 feet to silty sand between 21.5 feet and the end of the borehole at a depth of 26 feet.

Borehole No 4 indicated sand and gravel of varying density to a depth of 21 ft. From ground surface to a depth of 3 ft the sand was in a loose state, probably due to seasonal freezing and thawing. From a depth of 3 ft to 10 ft the sand and gravel was very dense to extremely dense. At a depth of 10 ft there was a sharp decrease in the penetration resistance for a depth of approximately 5 ft. The stratum of sand between 10 and 15 ft could be termed medium dense. Below a depth of 15 ft the density again increased rapidly to extremely dense at a depth of 21 ft.

Borehole No 6 indicated soil conditions essentially similar to those encountered in Boreholes Nos 2 and 4. The upper 11.5 ft was sand and gravel which was loose for a depth of approximately 4 ft and then increased in density to dense between depths of 6 ft and 11.5 ft. Between depths of 11.5 ft and 15 ft a stratum of dense silt was encountered which was underlain by dense to very dense sand and silty sand to a depth of 26.5 ft where the borehole was terminated.

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Cone penetration tests were carried out beside each of the above boreholes in order to correlate the cone penetration test with the standard split spoon penetration resistance so that information could be obtained at other locations without recourse to a borehole. Three further cone penetration tests were carried out as shown on Enclosure No 1. Penetration tests P.1 and 5 indicated subsoil conditions close to those encountered at the three borehole locations. Penetration test P.3, however, indicated loose material for a depth of 10 ft, below which the penetration resistance increased very rapidly.

The borehole elevations given on the Data Sheets have been based upon the detailed contour plan supplied by the Department of Highways, and it will be noted that the ground surface elevation at P.3 is approximately 4 ft higher than at the other test locations.

DISCUSSION OF THE RESULTS

The subsoil over the whole site is mainly granular with some silt in a dense condition towards the south end of the site. The penetration profiles indicate that an allowable bearing capacity of 3 tsf can be assumed at a depth of 10 ft at all test locations with the possible exception of borehole location No 4. At this location a layer of medium dense material exists between depths of 10 and 15 ft. Below 15 ft the density increases rapidly. Assuming that the foundations are taken to a depth of 10 ft, shear failures are not likely to be critical and the allowable bearing capacity will be determined by the allowable settlements. The allowable bearing capacity at a depth of 10 ft in Borehole No 4 for an allowable maximum settlement of 1 inch is 2 tsf. The minimum footing dimension should be larger than 3 ft and this will bring the bulb of pressure into the dense underlying material, assuring that the depth of soil which will exhibit settlement to any appreciable degree is not greater than 5 ft. An increase in allowable bearing capacity to 3 tsf should not increase the probable maximum settlement to more than about 1.3 inches as compared with the 1 inch limit given by the chart on Page 423 of Terzaghi and Peck's "Soil Mechanics in Engineering Practice" for a 2 tsf load on a sand with a standard penetration resistance of 20 blows per ft.

These comments on allowable bearing capacity assume that Oakville Creek does not flood causing a rise in the water table. Such a rise would considerably reduce the allowable bearing capacity. If flooding is a possibility, it would appear that, in order to ensure an allowable bearing capacity of 3 tsf, it would be advisable to take the foundations to a depth of 15 ft near Borehole No 4. Under high water conditions an allowable bearing capacity of 2 tsf may be assumed at a depth of 10 ft.

The allowable bearing capacity over the remainder of the site may be assumed to be 3 tsf at elevation 855 ft, or approximately 10 ft below existing ground surface, assuming no raising of the water table.

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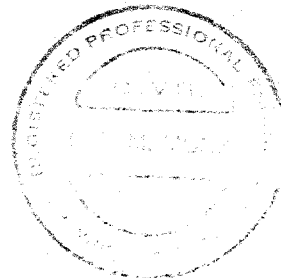
January 29, 1958

CONCLUSIONS

1. The allowable bearing capacity may be assumed to be 2 tsf at elevation 859, based on a maximum settlement of 1 inch, provided the area is not subjected to seasonal flooding.
2. The allowable bearing capacity may be increased to 3 tsf at elevation 855 ft, provided there is no danger of seasonal flooding of Oakville Creek, with a maximum settlement which will probably occur in the region of Borehole No 4 of between $1\frac{1}{4}$ and $1\frac{1}{2}$ inches.
3. If Oakville Creek is subject to seasonal flooding, it would be advisable to assume an allowable bearing capacity of 2 tsf at elevation 855 ft all over the site.
4. Excavation for the foundations should not prove troublesome since no water table was encountered in the sand subsoil. This condition would not necessarily hold if construction were attempted while Oakville Creek was in flood. It might then be necessary to install well points if the ground water table rose above the proposed excavation level.

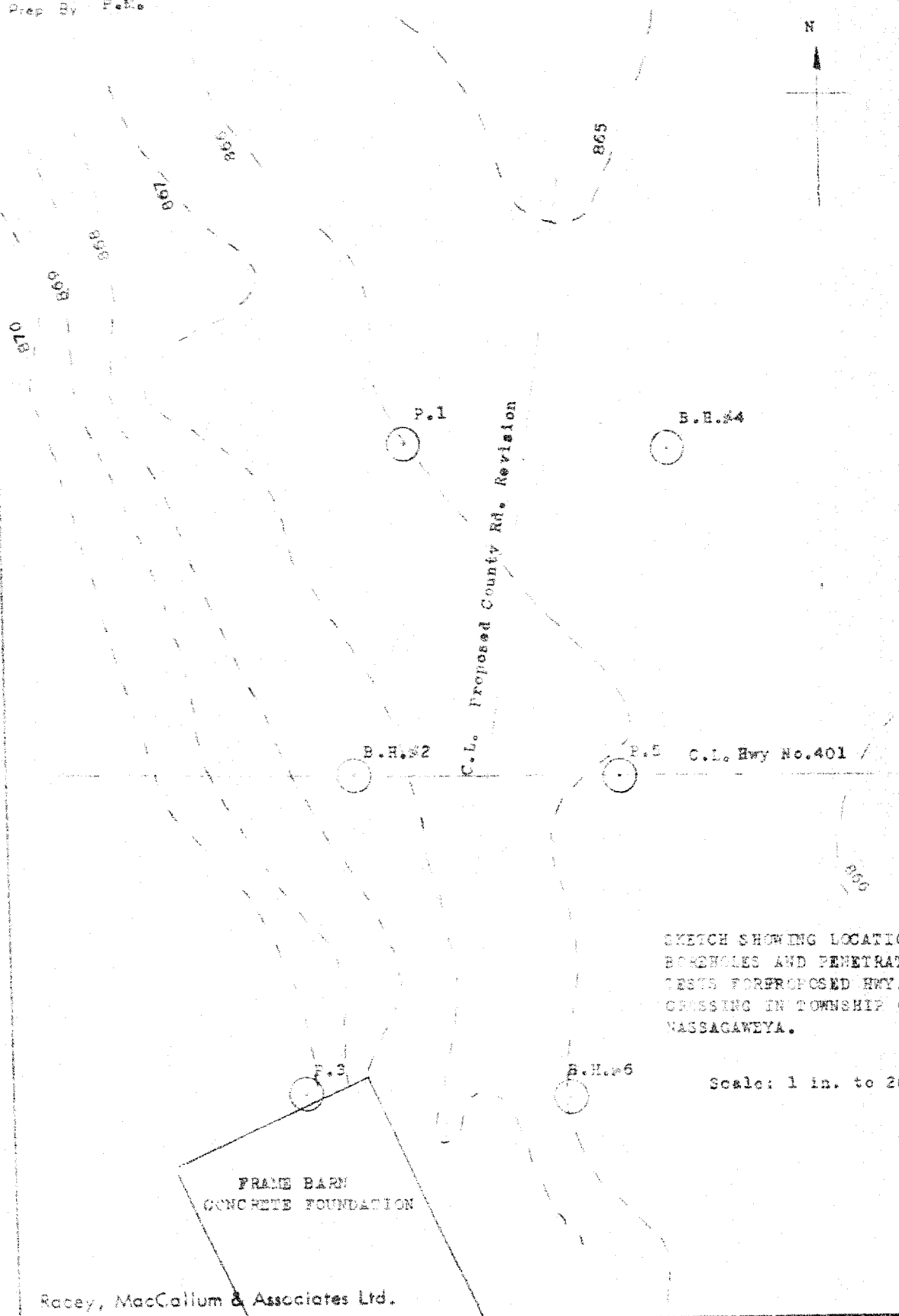
*Peter E. Martin Monk*P.E.M. Monk, P.Eng.

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Prep By P.M.

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SKETCH SHOWING LOCATION OF
BOREHOLES AND PENETRATION
TESTS FOR PROPOSED HWY. 401
CROSSING IN TOWNSHIP OF
MASSACHUSETTS.

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: **#2.**Project: **Nassagaweya Township, Hwy 401, Overpass**Location: **Near Milton, Ontario.**Hole Location: **See Enclosure #1.**Hole Elevation and Datum: **867.5; based on contours on**Field Supervisor: **Prep: Plan E-3301-1**Driller: **Checked:**

Date:

LEGEND

Shear Strength (C)

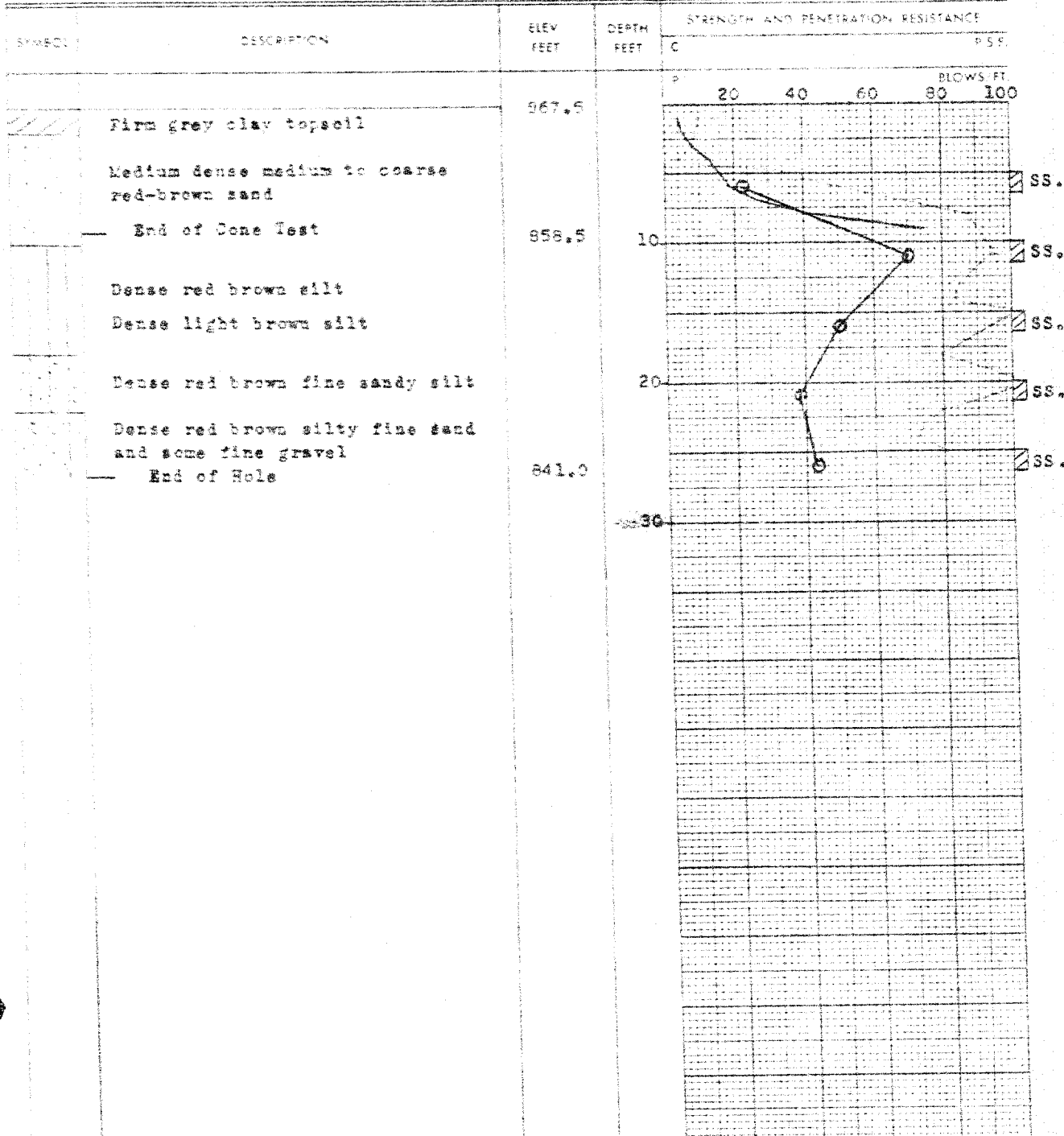
Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
4"⊕
⊕

Foundation Engineering Division

Engineering Data Sheet for Borehole: P3.

LEGEND

Shear Strength (C)

Unconfined compression.
Vane test and sensitivity (S)

Penetration Resistance P

2" Split tube

2' Dia. Core

Coping

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				C	P.S.F.
		870.5			
		859.0	10		
	End of Cone Test		20		

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Foundation Engineering Division

Engineering Data Sheet for Borehole: #4.

Project: Nassagaweya Township, Hwy. 401, Overpass
 Location: Near Milton, Ontario,
 Hole Location: See Enclosure No. 1.
 Hole Elevation and Datum: 865.5; Based on Contours on
 Field Supervisor: Prep: Plan E-3301-1
 Driller: Checked: Date:

LEGEND

Shear Strength (C)

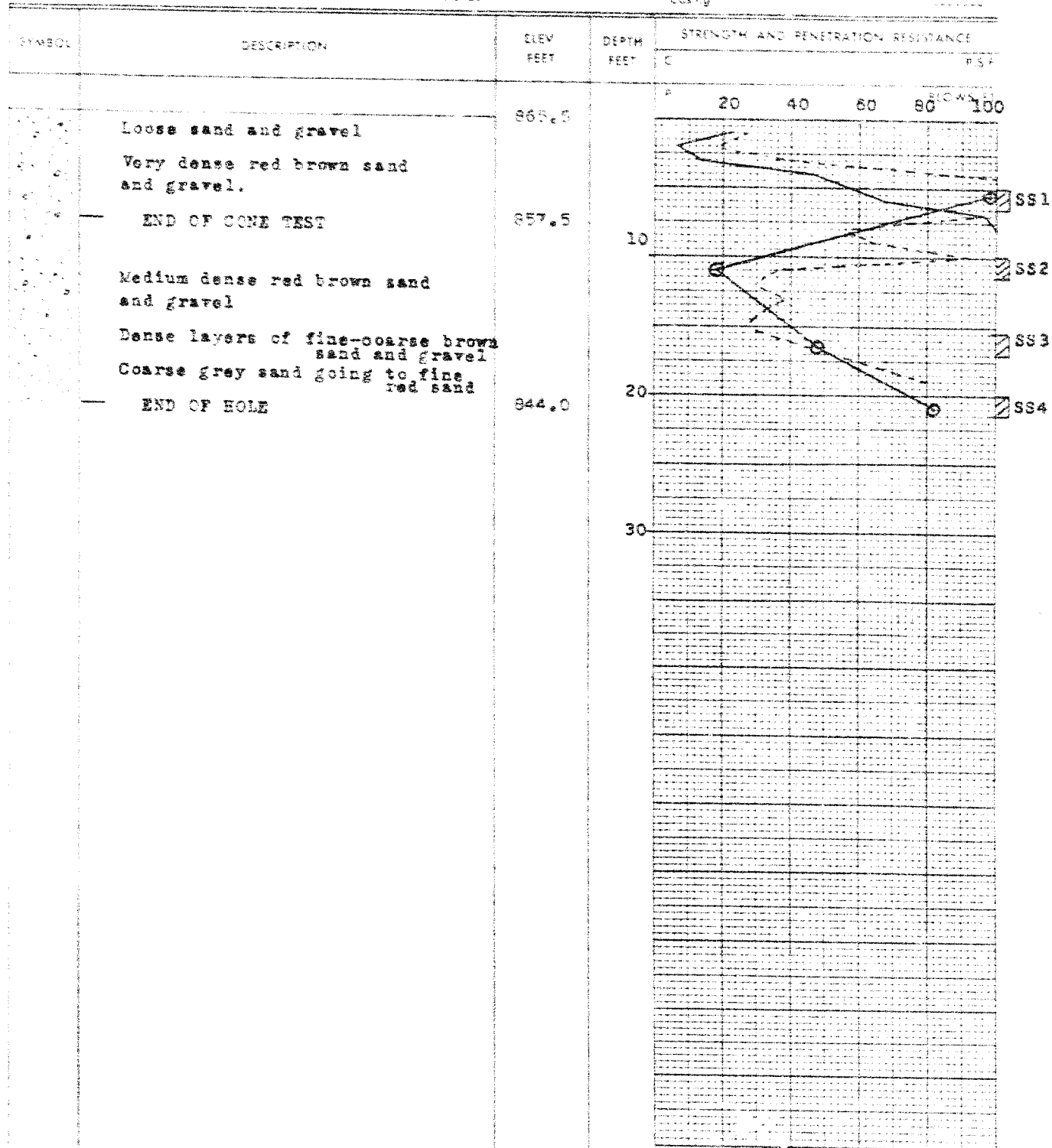
Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing



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Foundation Engineering Division

Engineering Data Sheet for Borehole: P 5.

Project: Massagaweya Township, Hwy. 401, Overpass

Location: Near Milton, Ontario.

Hole Location: See Enclosure No. 1.

Hole Elevation and Datum: 866.0; based on contours on

Field Supervisor: Prep.: Plan E-3301-1

Driller: _____ Checked: _____

LEGEND

Shear Strength (C)

Unconfined compression.

Van test and sensitivity (%)

Penetration Resistance (A)

2" Split tube

2" Dia. Cone

Casing

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				C	P.S.F.
		865.0		<div style="text-align: right;">BLOWS FT</div> <div style="display: flex; justify-content: space-between; padding: 0 10px;"> 20 40 60 80 100 </div>	
	End of Cone Test	853.5	10		
			20		

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Foundation Engineering Division

Engineering Data Sheet for Borehole: 6.

Project: Nassagaweya Township, Hwy. 401, Overpass

Location: Near Milton, Ont.

Hole Location: See Enclosure #1.

Hole Elevation and Datum: 866.0; based on Contours on

Field Supervisor: Prep.: Plan E-3301-1

Driller: Checked:

Date:

LEGEND

Shear Strength C.

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

S

4

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