#58-F-248-C

HWY. 401 - COUNTY RD. OXFORD BRIDGE NO. #5

BA 805

RACEY, MacCALLUM AND ASSOCIATES
LIMITED

A COMPANY OW[illegible]ECTED AND OPERATED BY
Con[illegible] Engineers
AND A[illegible]TED STAFF

58-F-248c

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

TORONTO DIVISION
27 CARLTON STREET
Toronto 2.

Reference: S-500/T-1385.

23 September, 1958.

Department of Highways of Ontario,
280, Davenport Road,
TORONTO - Ontario.

Attention: Mr. J. MeAllister.

RE: FOUNDATION INVESTIGATION FOR A PROPOSED UNDERPASS OF HIGHWAY NO. 401, AT BLANDFORD TOWNSHIP NO. 5 - ONTARIO.

Dear Sir,

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

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

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

Yours sincerely,
RACEY, MacCALLUM AND ASSOCIATES LIMITED,

Ronald F. Scott.

Ronald F. Scott, P.Eng.,
Divisional Soil Engineer.

RFS:YDP

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

FOUNDATION INVESTIGATION FOR A PROPOSED UNDERPASS OF HIGHWAY NO. 401, AT BLANDFORD TOWNSHIP NO. 5 - ONTARIO.

Reference: S-500/T-1385.

Racey, MacCallum and Associates Limited.

23 September, 1958.

RACEY, MacCALLUM AND ASSOCIATES
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A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers
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TORONTO DIVISION
27 CARLTON STREET
Toronto 2.

Reference: S-500/T-1385. 23 September, 1958.

FOUNDATION INVESTIGATION FOR A PROPOSED UNDERPASS OF HIGHWAY NO. 401, AT BLANDFORD TOWNSHIP NO. 5 - ONTARIO.

This investigation was carried out between 12 and 19 September, 1958, and consisted of four borings to a maximum depth of 46 feet, with adjacent cone penetration tests. The report presents a summary of the subsoil conditions encountered, and recommendations regarding the depth of foundations and the permissible footing loads.

FIELD WORK :

The site is located at the road allowance between Lots No 6 and 7, Concession II at Blandford Township, see Enclosure No 1. The surrounding land is partly sandy and partly poorly drained clay land. The sandy fields are used for tobacco crop; the clay fields for pasture. The site is bounded on the North-East side by a sandy field, which slopes upwards from the existing gravel road; the other fields surrounding the site are clay pastures.

The first boring was carried out using a standard diamond drill, but when stiff clay soils were encountered a power auger was brought to the site to speed up the field work. Samples were taken using a standard 2-inch outside diameter split spoon sampler, and 2-inch inside diameter thin-walled Shelby tubes. Adjacent to each boring a 2-inch diameter 60-degree point angle cone was driven, using the same driving energy as for the split spoon (140 lb hammar, 30 inches drop). Undisturbed thin-walled samples were difficult to obtain, because of the relatively high gravel content of the clay till, which damaged the Shelby tubes, and consequently only five samples were recovered in a relatively undisturbed state.

The borings on the East side of the gravel road were located in a ditch, and some difficulties were encountered in moving the drill into position. At these locations, Borings No's 3 and 4, a sand layer

was encountered below the ground water level, which was found at approximate Elevation 980 feet, and a length of 5-inch diameter casing was used in the auger hole to keep the sand from running into the borehole.

SUBSOIL CONDITIONS :

The results of the four borings and probings are presented on the Engineering Data Sheets, Enclosures No 2 to 5. It can be concluded at once that the soil profile shows very little consistency as far as the relative density of the subsoil is concerned, although all deposits found below the top layer of organic soil have a glacial origin. The subsoil can generally be described as a medium stiff to hard glacial till, with numerous pockets of fine and coarse granular material. Although the clay content of the till is sufficiently high in most cases to give the soil some cohesion, silt may be considered the dominant constituent.

At the two borings on the East side of the gravel road, No's 3 and 4, the top 7 - 13 feet of soil is not of glacial origin. At Boring No 3 a three foot layer of brown clay overlies about 4 feet of water-bearing sand; at Boring No 4, 11 feet of soft organic silt was found on top of a 2 foot sand layer.

The glacial till layer which extends to at least 46 feet below the ground surface, was found to become more compact and the sand and gravel content to increase with depth.

In view of the erratic subsoil profile and the sudden changes from silt to clay, it was felt that the results of laboratory tests on individual samples would have to be considered with some reservation. Three unconfined compression tests were carried out on undisturbed samples, each of which indicated a shear strength in excess of 2500 psf. The samples failed either on a granular enclosure, or reached the maximum deformation without a shear failure. The natural moisture contents of three out of the four samples tested was below 15%, which may be considered very low for cohesive soils. The natural unit weight of the samples was over 130 pcf. From these observations it may be concluded that the till soil is at least of medium stiffness and appears to be of a low compressibility.

DISCUSSION OF RESULTS :

The abutments for the underpass will reach about 25 feet above the present average level of the site. The high approaches and the abutment and wing walls will cause considerable pressures on the underlying soils. On the basis of the penetration and laboratory test results, it is felt that the weight of the embankments, which will be of the order of 2500 psf and less, will not cause appreciable settlements

in the subsoil, provided the topsoil and the soft organic soil found near Boring No 4 are removed prior to filling.

The glacial till layer will also supply a safe support for the abutments and wing wall footings. At the North abutment the footings could be constructed at about 7 feet below present grade, or Elevation 977 feet. The safe bearing capacity should be determined conservatively because of the changeable conditions. For large footings the bearing capacities at 7 foot depth, based on the penetration and laboratory test results, could be taken as being of the order of 4000 psf increasing to 8000 psf at 15 foot depth.

Unfortunately, for the South abutment, the depth at which the bearing capacity is sufficiently high varies from Elevation 977 feet at Boring No 1, to Elevation 968 feet at Boring No 4, or respectively 11 feet and 12 feet below present grade. In that case it would probably be more practical to build the South abutment and wing walls on piles, reaching to a depth of approximately Elevation 970 feet at Boring No 1, and to Elevation 955 feet at Boring No 4. It seems probable, however, that the pile lengths will vary considerably along the abutment. Piles that can be easily cut off to the required length, such as steel and timber piles, would be preferable. The latter would have to be capped with concrete below the lowest ground water level. Steel H piles cannot be utilised to their full extent, unless driven into very hard soil, and monotube steel piles would probably be most suitable. The safe bearing capacity of these piles can be predetermined with one of the prevailing pile driving formulae, and the piles can be driven to the required refusal and cut off. It is felt that the safe bearing capacity of piles driven to the above recommended depths would be of the order of 20 - 30 tons per square foot of cross-sectional area.

The high fill embankment will cause considerable horizontal thrust against the abutment walls. This will lead to high toe pressures on the North abutment footings, and probably to the need of batter piles for the South abutment. The extent of these lateral thrusts depends on the fill to be used and on the depth of the abutment footings.

CONCLUSIONS :

Summarising the results of this investigation, the following conclusions may be drawn :

1. Apart from a few localised deposits of soft organic soil, the subsoil at the site consists of a glacial till varying considerably both in density and consistency.

Reference: S-500/T-1385. 23 September, 1958.
- Continued -

CONCLUSIONS : Continued -

2. The North abutment of the proposed underpass could be founded at about 7 feet below present grade; the safe bearing capacity at that depth would be about 4000 psf.

3. The South abutment could be constructed on piles to a depth varying from 15 to 25 feet. Steel monotube piles or capped timber piles would appear to be advisable.

4. The high embankments will give considerable horizontal thrust on the abutments and wing walls, which will have to be accommodated by the foundations.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
J. J. SCHOUSTRA
PROVINCE OF ONTARIO

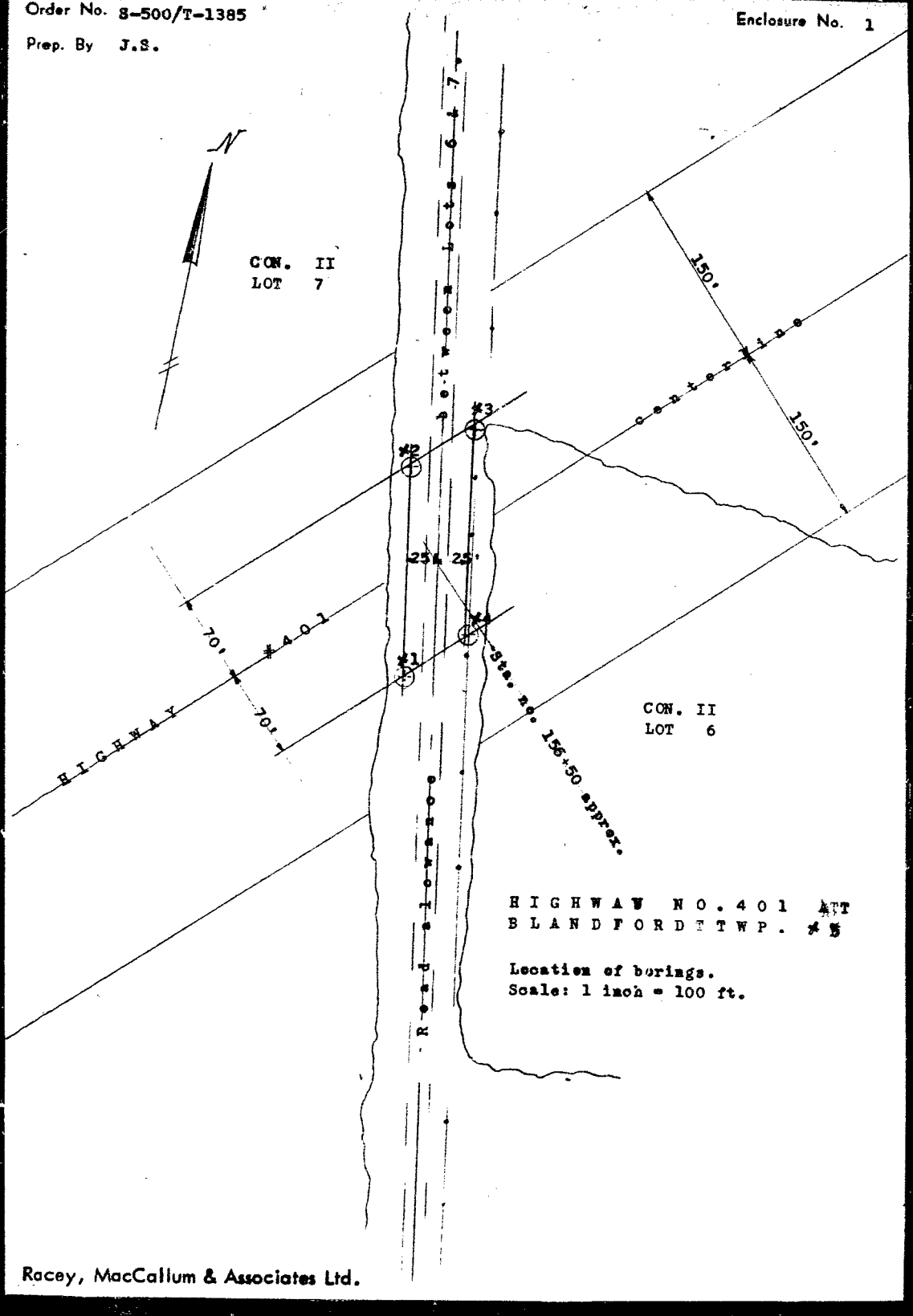
J. J. Schoustra, P.Eng.,

JJS:YDP

Order No. S-500/T-1385

Prep. By J.S.

Enclosure No. 1



HIGHWAY NO. 401 AT BLANDFORD TWP. #5

Location of borings.
Scale: 1 inch = 100 ft.

Racey, MacCallum & Associates Ltd.

Order No. S-500/T-1385 Enclosure No. 2

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1

Project: HIGHWAY 401 AT BLANDFORD TWP. # 5.
Location: CON.II, LOTS 6 AND 7, BLANDFORD TWP.
Hole Location: See Enclosure No. 1.
Hole Elevation and Datum: 986.3 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: F.V. Checked: J.S. Date: 19. 9. '58.

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground level.	986.3	0
	Loose sandy topsoil changing to medium dense brown sandy silt with some fine gravel.	977.3	10
	Medium stiff to stiff grey silty clay and clayey silt with fine to medium gravel. (Glacial till).	946.3	40
	Some coarse gravel and very dense brown sand.	939.3	45
	End of boring.		50

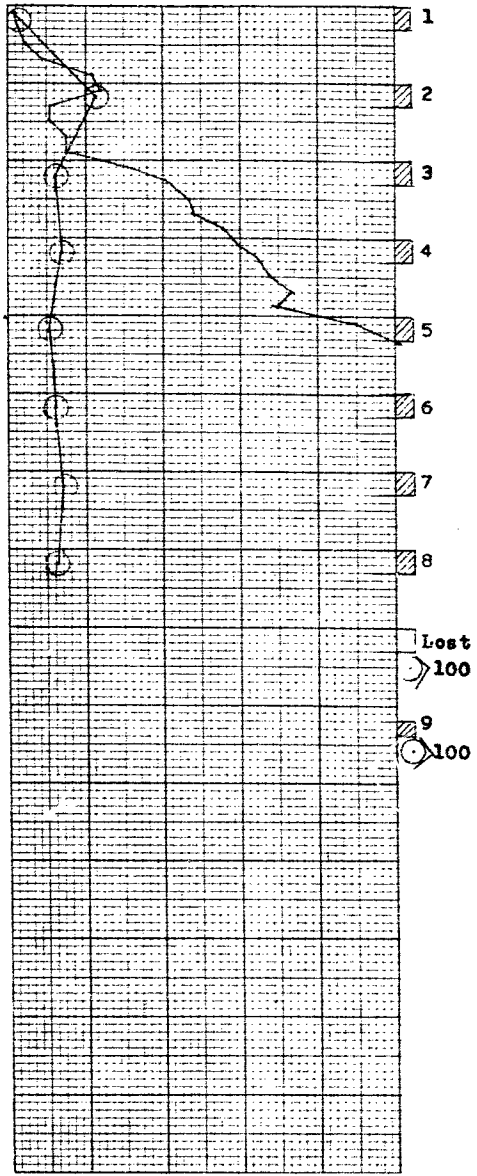
LEGEND :

Split spoon sample - ▨

STRENGTH AND PENETRATION RESISTANCE

C P.S.F.

P BLOWS/FT. 20 40 60 80 100



Order No. S-500/T-1385 Enclosure No. 3

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

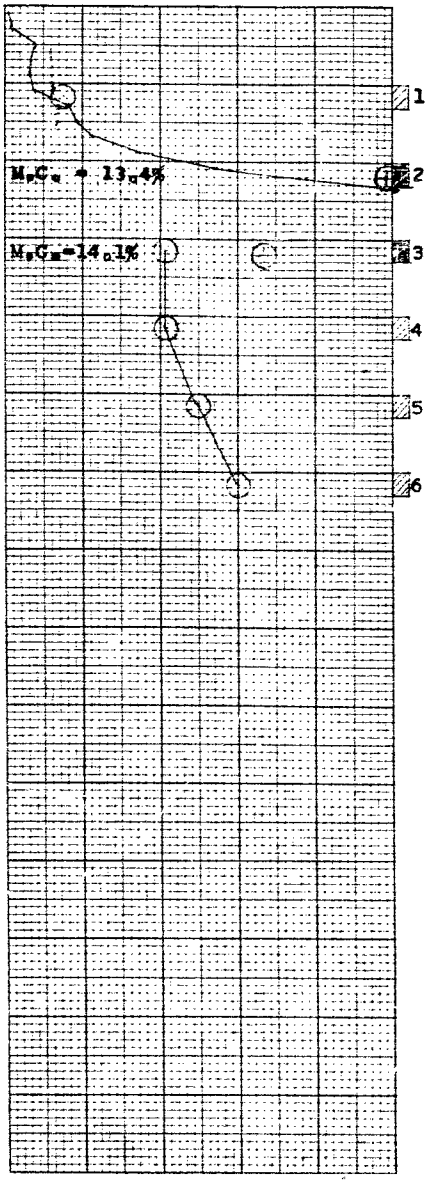
Engineering Data Sheet for Borehole: 2

Project: HIGHWAY 401 AT BLANDFORD TWP. # 5
Location: CON. II, LOTS 6 AND 7, BLANDFORD TWP.
Hole Location: See Enclosure No. 1.
Hole Elevation and Datum: 984.5 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: F.V. Checked: J.S. Date: 19. 9. 58.

LEGEND
Shear Strength (C)
Unconfined compression ⊕
Vane test and sensitivity (S) $+^S$
Penetration Resistance (P)
2" Split tube ⊖⊖
2" Dia. Cone
Casing

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground level.	984.5	0
	Soft organic topsoil.	983.0	
	Medium stiff to hard clayey silt and silty clay with fine to medium gravel. (Glacial till).	978.5	5
			10
			15
			20
	Ground water at 6 feet.		25
			30
	End of boring.	953.0	35
			40

STRENGTH AND PENETRATION RESISTANCE
C 2000 4000 P.S.F.
P 20 40 60 80 100 BLOWS/FT.



LEGEND :

Split spoon sample -

Thin-walled sample -

Order No. S-500/T-1385

Enclosure No. 4

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3

Project: HIGHWAY 401 AT BLANDFORD TWP. # 5
Location: CON.II, LOTS 6 AND 7, BLANDFORD TWP.
Hole Location: See Enclosure No. 1.
Hole Elevation and Datum: 984.6 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: F.V. Checked: J.S. Date: 19. 9. '58

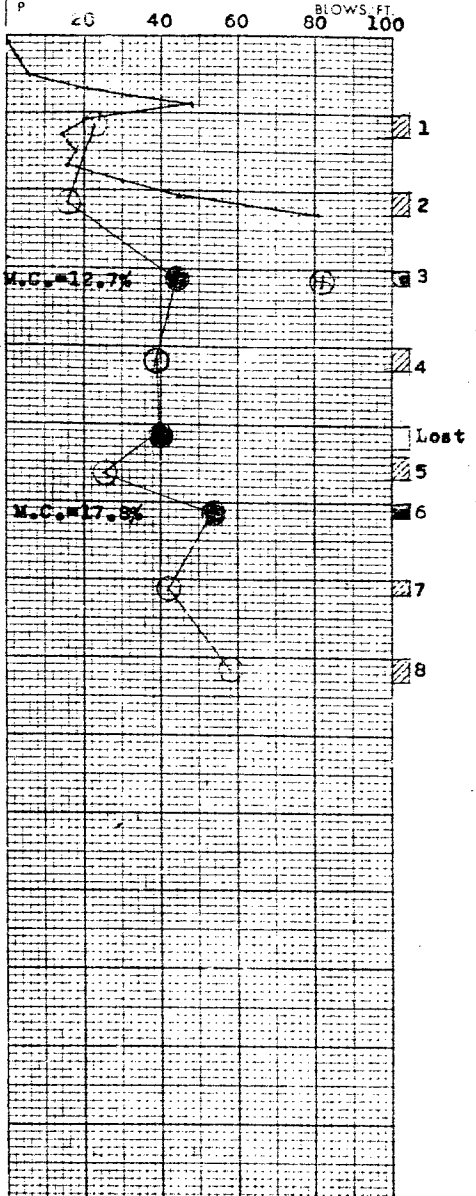
LEGEND
Shear Strength (C)
Unconfined compression ⊕
Vane test and sensitivity (S) $+^S$
Penetration Resistance (P)
2" Split tube ⊖⊖
2" Dia. Cone
Casing

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground level.	984.6	0
	Topsoil and brown clay.	981.6	
	Medium dense brown silty sand and gravel. Ground water at 3.6 ft.	977.1	5
	Medium stiff to hard grey sandy clayey silt and gravel with silty clay pockets. (Glacial till).		10
			15
	Waterbearing sand layer at about 21 feet.		20
			25
			30
			35
			40
		943.1	45
			50

STRENGTH AND PENETRATION RESISTANCE

C 2000 4000 P.S.F.

P 20 40 60 80 100 BLOWS/FT.



LEGEND :

Split spoon sample –

Thin-walled sample –

Order No. S-500/T-1385 Enclosure No. 5

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

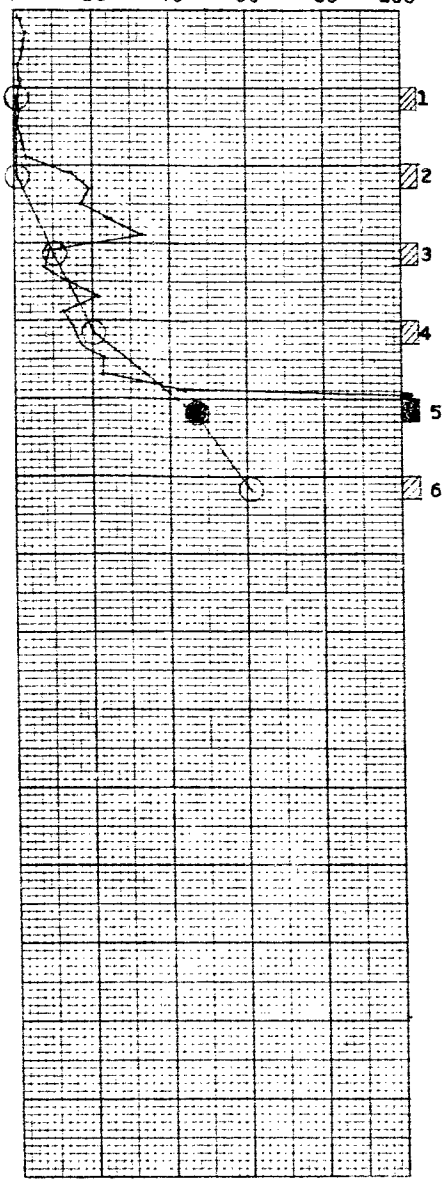
Engineering Data Sheet for Borehole: 4

Project: HIGHWAY 401 AT BLANDFORD TWP. # 5.
Location: CON. II, LOTS 6 AND 7, BLANDFORD TWP.
Hole Location: See Enclosure No. 1.
Hole Elevation and Datum: 979.9 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: F.V. Checked: J.S. Date: 19. 9. '58

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground level.	979.9	0
	Very soft, black-brown organic silt. Ground water at surface.		5
		968.9	10
	Medium dense brown sand.	966.9	
	Medium stiff to stiff, grey sandy clayey silt with fine to medium gravel.		15
			20
		955.9	25
	Very stiff to hard grey clayey silt and silty clay with fine to medium gravel.		30
		948.4	
	End of boring.		35

STRENGTH AND PENETRATION RESISTANCE
C 2000 4000 P.S.F.
P 20 40 60 80 100 BLOWS/FT.



LEGEND :

Split spoon sample –

Thin-walled sample –

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Consulting Engineers
AND ASSOCIATED STAFF

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

TORONTO DIVISION
27 CARLTON STREET
Toronto 2.

Reference: S-500/T-1561.

6 February, 1959.
59-F-213C

Department of Highways of Ontario,
Bridge Office,
280, Davenport Road,
TORONTO - Ontario.

Attention: Mr. J. McAllister.

RE: ADDITIONAL BORINGS, BRIDGE NO 5 -
HIGHWAY # 401 AT BLANDFORD TWP.,
ONTARIO.

Dear Sir,

Following your recent request, we carried out three more borings and one cone penetration test at the above site, in order to determine subsoil conditions at the two extremes and the centre of the proposed structure. A summary of our findings and recommendations will be presented in the following paragraphs.

FIRST REPORT :

At a previous investigation, in September, 1958, we carried out four borings at the assumed locations of the abutments of the bridge. Our findings were laid down in a report, No S-500/T-1385 dated 23rd September, 1958. They were summarised as follows :

1. Apart from some localised deposits of soft, organic soils, the subsoil at the site consists of a glacial till varying considerably both in density and consistency.

2, The North abutment of the proposed underpass (see borings No 2 and 3, indicated on Enclosure No 1 of this letter), could be founded at about 7 feet below present grade (Elevation 977 feet); the safe bearing capacity at that depth would be about 4000 psf. At 15 feet this could be increased to 8000 psf.

3. The South abutment (borings No 1 and 4) could be constructed on piles to a depth varying from 15 to 25 feet (Elevation 970 - 955 feet). Bearing capacity of piles could be predetermined with one of the prevailing pile driving formulas, and piles could be cut off when required set is reached. At above elevations pile bearing capacity of 20 - 30 tons psf of cross-sectional area may be expected. Steel monotube piles or capped timber piles would be recommended.

4. No appreciable settlements are anticipated under the weight of the embankment, provided the topsoil and soft organic soil are removed prior to filling.

ADDITIONAL BORINGS :

It was decided after the above report had been submitted that more borings would be required, in view of a proposed construction with three piers and two abutments. The additional borings, No 5, 6 and 7, and one cone penetration test, No 8, are located as shown on Enclosure No 1. The boring results are presented on the Engineering Data Sheets, Enclosures No 2, 3, 4 and 5.

The soil conditions encountered at the new locations did not reveal any new features, but enabled us to extend our recommendations to the proposed centre pier and the new locations of the abutments.

Boring No 6, North of borings No 2 and 3, indicates conditions similar to those at these borings. A great number of thin-walled samples were taken, but due to the high gravel content it was impossible to obtain representative laboratory results.

Boring No 5, at the centre of the proposed bridge, indicates a top layer of about 10 feet of soft, organic soil, similar to that encountered at boring No 1 and No 4. The till layer below appears to have a higher penetration resistance than at the latter borings.

Boring No 7 indicates conditions identical to those at No 4, whereas cone test No 8 would suggest slightly better conditions.

The ground water level at the time of the new borings appeared to be quite close to the surface. It may well be assumed that the drainage pattern is somewhat disturbed, due to the frozen condition of the topsoil and the snow cover.

RECOMMENDATIONS :

From the above results it may be concluded that the varying soil conditions prevail over the full area of the site. Pursuing the line of thought of our original report, the following recommendations are arrived at :

North abutment (Borehole No 6) : Footing foundation at Elevation 980 feet (4000 psf) or Elevation 977 feet (6000 psf).

North pier (Boreholes No 2 and 3) : Footing foundation at Elevation 977 feet (4000 psf) or Elevation 969 feet (8000 psf).

Centre pier (Borehole No 5) : Pile foundation down to approximate Elevation 969 feet. Required refusal or set can be predetermined with pile driving formula; pile length may vary considerably.

South pier (Boreholes No 1 and 4) : Piles to Elevation 970 to 955 feet.

South abutment (Boreholes No 7 and 8) : Piles to Elevation 970 to 960 feet.

For a common 4-span structure the above recommendations would probably be most economical. If a rigid frame construction is considered, however, different means of support for the various piers and abutments cannot be recommended. The recommended footing loads have been based, as is common procedure, on allowable settlements of one inch. If part of the construction is founded on piles, this might lead to very high stresses in the frame. Consequently, for a rigid frame construction, we would recommend piles under each abutment and pier. The depth of pile penetration might vary as follows :

North abutment	:	Elevation 973 - Elevation 970 ft.
North pier	:	Elevation 973 - Elevation 969 ft.
Centre pier	:	Elevation 969 ft. approximate.
South pier	:	Elevation 970 - Elevation 955 ft.
South abutment	:	Elevation 970 - Elevation 960 ft.

Required set can be predetermined, as mentioned before. The soil has sufficient density at greater depth to acquire any reasonable pile bearing capacity.

We have given the above information verbally to Messrs. Laurence Cazaly, the structural consultants.

Reference: S-500/T-1561
- Continued -

6 February, 1959.

We trust this will give you sufficient information for your purposes, and we thank you for this opportunity of being of service to you. If you have any further questions please do not hesitate to get in touch with us.

Yours very truly,
RACEY, MacCALLUM AND ASSOCIATES LIMITED,

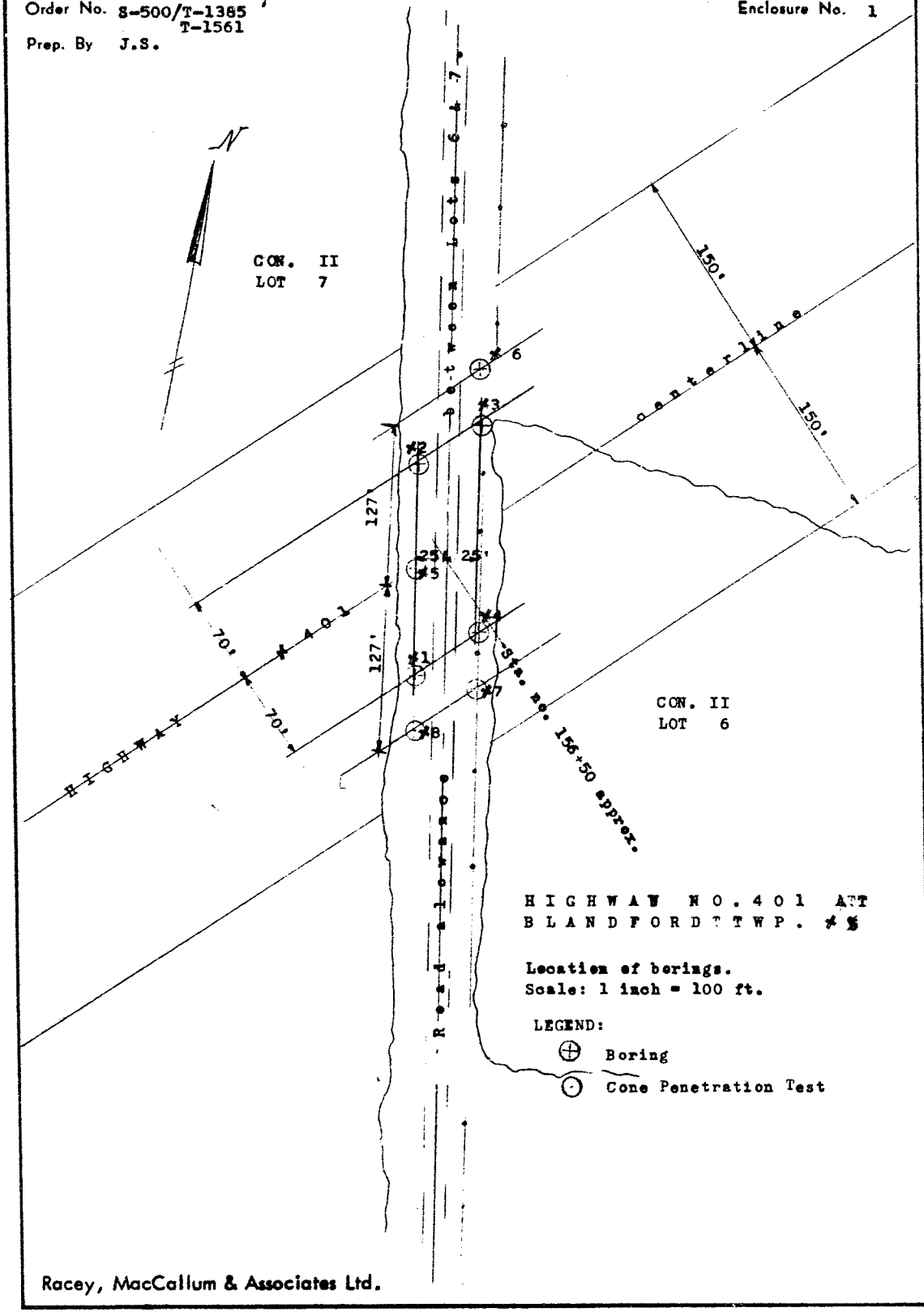
J. J. Schoustra, P.Eng.,
Divisional Soil Engineer.

JJS:YDP

Order No. S-500/T-1385
T-1561

Prep. By J.S.

Enclosure No. 1



HIGHWAY NO. 401 ATT
BLANDFORD TWP. #5

Location of borings.
Scale: 1 inch = 100 ft.

LEGEND:

⊕ Boring

⊙ Cone Penetration Test

Racey, MacCallum & Associates Ltd.

Order No. S-500/T-1561 Enclosure No. 2

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

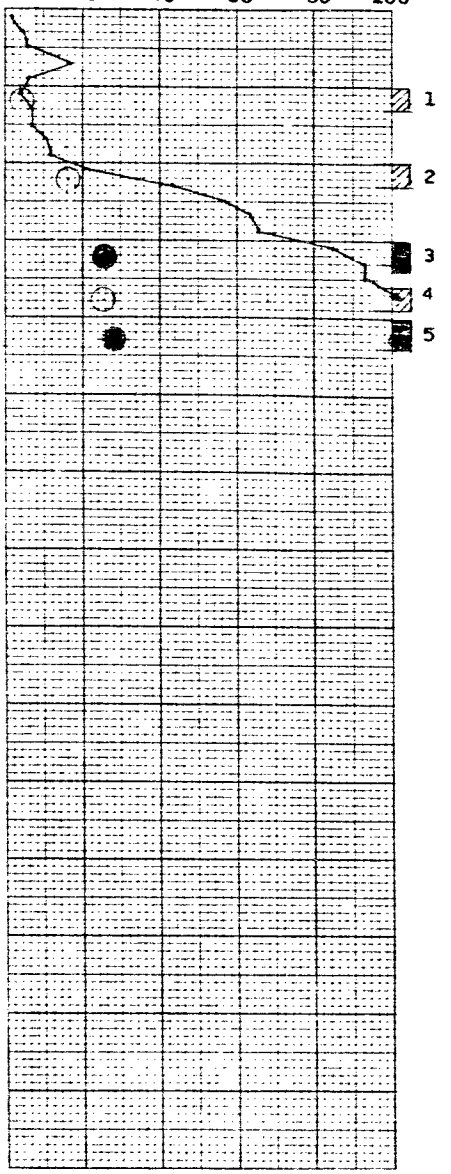
Engineering Data Sheet for Borehole: # 5

Project: HIGHWAY #401 AT BLANDFORD TWP. # 5
Location: CON.II LOTS 6 AND 7, BLANDFORD, ONTARIO.
Hole Location: See Enclosure No 1.
Hole Elevation and Datum: 984.0 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: E.A. Checked: Date: 4.2.'59

LEGEND
Shear Strength C)
Unconfined compression ⊕
Vane test and sensitivity (S) $+^S$
Penetration Resistance (P:
2" Split tube ⊖⊖
2" Dia. Cone
Casing .....

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground surface.	984.0	0
	Soft organic clay changing to soft sandy clay with some fine gravel. Water level at 1' 9".	982.2	
	Stiff to very stiff brown clayey silt and silty clay with fine to medium gravel. (Glacial till).	974.0	10
	End of boring.	962.0	20
			30
			40

STRENGTH AND PENETRATION RESISTANCE
C P.S.F.
P BLOWS/FT.
20 40 60 80 100



LEGEND :

Split spoon sample -

Thin-walled sample -

Order No. S-500/T-1561 Enclosure No. 3

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

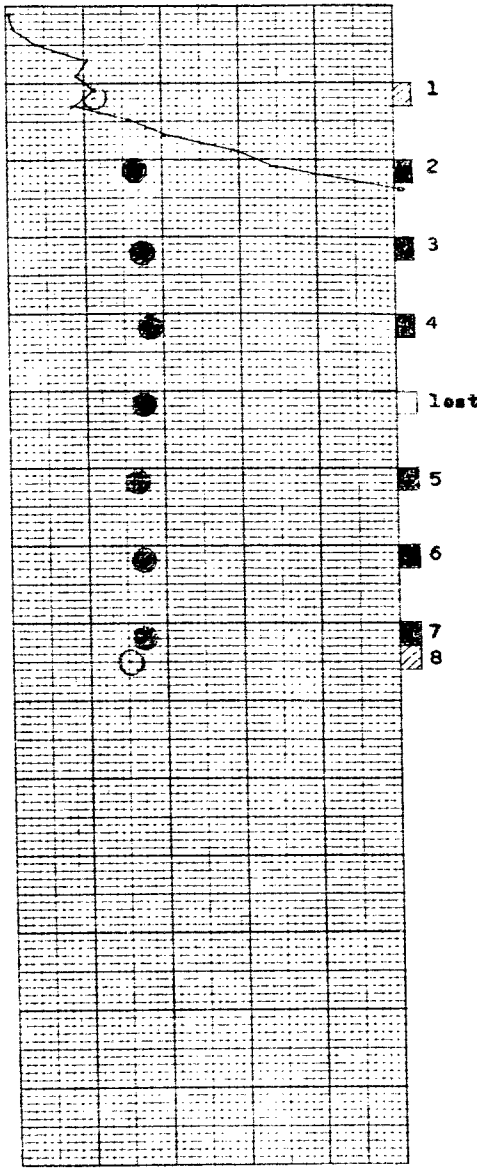
Engineering Data Sheet for Borehole: # 6

Project: HIGHWAY # 401, AT BLANDFORD TWP. # 5
Location: CON. II LOTS 6 AND 7, BLANDFORD, ONTARIO.
Hole Location: See Enclosure No 1.
Hole Elevation and Datum: 987.5 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: E.A. Checked: Date: 4.2.'59

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground surface.	987.5	0
	Topsoil and medium dense brown clayey sand with gravel. Water level at 2.3 feet.	985.2	
	Stiff to very stiff brown clayey silt and silty clay with fine to medium gravel. (Glacial till).		10
			20
			30
			40
	End of boring.	944.5	

STRENGTH AND PENETRATION RESISTANCE
C P.S.F.
P 20 40 60 80 100 BLOWS/FT.



LEGEND :

Split spoon sample -

Thin-walled sample -

Order No. S-500/T-1561 Enclosure No. 4

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

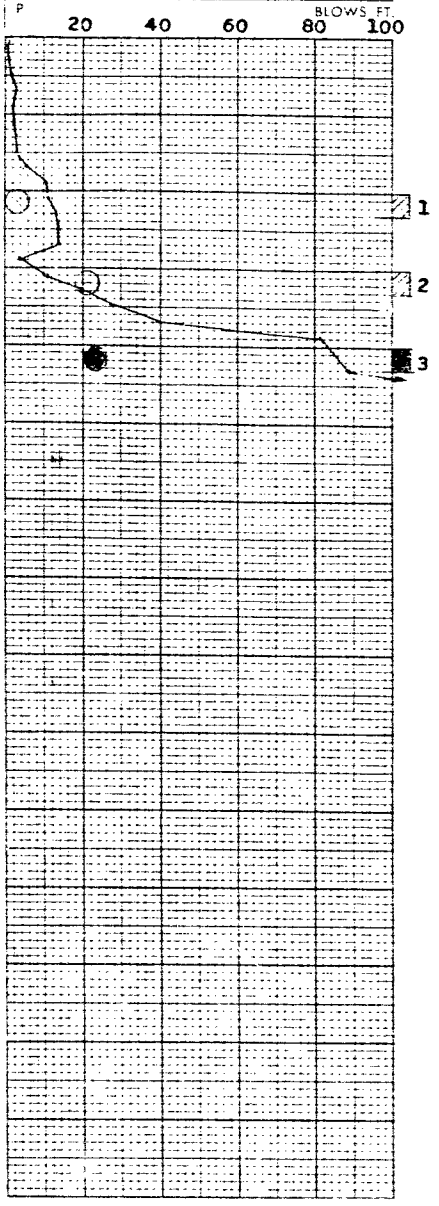
Engineering Data Sheet for Borehole: # 7

Project: HIGHWAY #401, AT BLANDFORD TWP. # 5
Location: CON.II LOTS 6 AND 7, BLANDFORD, ONTARIO.
Hole Location: See Enclosure No 1.
Hole Elevation and Datum: 979.0 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: E.A. Checked: Date: 4.2.'59

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground surface.	979.0	0
	Soft brown-black organic sandy silt with some loose sand layers. Loose gravel and sand at 13 - 14 feet.		10
	Medium stiff to stiff grey olayey silt and silty olay with fine to medium gravel.		20
	End of boring.	957.5	
			30

STRENGTH AND PENETRATION RESISTANCE
C P.S.F.
P BLOWS FT.
20 40 60 80 100



LEGEND :

Split spoon sample -

Thin-walled sample -

Order No. S-500/T-1561

Enclosure No. 2

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for [redacted]: Cone test # 8

Project: HIGHWAY #401, AT BLANDFORD TWP. # 5
Location: CON. II LOTS 6 AND 7, BLANDFORD, ONTARIO.
Hole Location: See Enclosure No 1.
Hole Elevation and Datum: 985.0 Feet. M.S.L.
Field Supervisor: B.M. Prep.: J.S.
Driller: E.A. Checked: Date: 4.2.'59

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Ground surface.	985.0	0
	Drove 2-inch diameter cone. Refusal at 12 feet.	973.0	10
			20

STRENGTH AND PENETRATION RESISTANCE
C P.S.F.
P BLOWS/FT.
20 40 60 80 100