

Mr. A. M. Teye,
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August 3, 1962.

D.H.O. FOUNDATION INVESTIGATION
REPORT -

Materials & Research Division.

W.J. 61-F-100 -- W.P. (Nil)

(Foundation Section)

Attention: Mr. S. McCombie.

Re: Embankment Approaches, Sta. 23+00 to
31+00 Huntsville By-Pass, Hwy. #11,
District #11.

Attached, we are forwarding to you, our detailed foundation investigation report outlining the subsoil conditions at the above-mentioned site, as well as recommendations for the stability of the embankment.

We believe you will find the information contained in this report, adequate for your future design work. Should you require additional data, or clarification of the contents of this report, please do not hesitate to contact our Office.

KYL/tt
Attach.

cc: Messrs. A. M. Teye (2)
H. A. Tregaskes
H. D. McMillan
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For: A. G. Stermac
Principal Foundation Engineer.

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FOUNDATION INVESTIGATION AND STABILITY ANALYSIS

For the

Embankment Approaches, Sta. 23+00 to 31+00
Huntsville By-Pass, Hwy. #11, District #11.

W.J. 61-F-100

1. INTRODUCTION:

Presented in this report are the results of a subsoil investigation carried out at the location of the approach fills for the proposed southbound lane of Hwy. 11 and the C.N.R. overhead, approximately $1\frac{1}{2}$ miles west of Huntsville, Lots 8 and 9, Con. I. This report contains field and laboratory findings and recommended procedures for the construction of the proposed embankments.

2. DESCRIPTION OF SITE AND GEOLOGY:

Hwy. 11, running north to south, consists of two lanes at present and overpasses a single track of the C.N.R. It bypasses the Town of Huntsville about $1\frac{1}{2}$ miles off to the west. The area on the south side of the track is generally flat. It is penetrated by narrow creeks and the entire area is swampy, waterlogged and overgrown with weeds. The ground surface on the north side of the track is undulating and is under pasture. There are domestic dwellings further to the north.

Geologically, the site under consideration is located in the area of the Canadian Shield.

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

Field work consisted of fifteen sampled boreholes and four dynamic cone penetration tests. In addition, probing was done by a hand-auger in the swampy area on the south side, to determine the depth of the organic muck encountered.

The exploration programme was carried out by a standard core drill machine adapted for soil sampling. Conventional wash boring procedure was followed. Samples were recovered at required depths, by means of a 2-inch I.D. Shelby tube and by a 2-inch O.D. split-spoon sampler. The dimensions of this spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. Use of the Osterberg sampler was also frequently made for obtaining undisturbed samples in very soft material.

Wherever possible, in-situ vane tests were carried out to determine the shear strength of the cohesive deposits.

Drawing No. 61-F-100A shows the borehole locations, their respective elevations and the estimated subsoil stratigraphy.

Samples were visually examined and identified in the field before being transported to the laboratory. Tests were carried out in the laboratory on a selection of both disturbed and undisturbed samples for the determination of moisture content, density, grain size distribution, Atterberg limits, undrained shear strength, and shear strength parameters C' and ϕ' in terms of effective stress.

Laboratory and field test results have been summarized and are included in this report under Appendix I.

4. SUBSOIL CONDITIONS:

4.1) General:

The investigation has shown that the stratification of the subsoil can be considered as regular. Below a layer of topsoil and fill material, five distinct layers were encountered in the following succession:

Organic Muck

Silty Clay and Clayey Silt

Silt

Sand and Gravel

Rock

A detailed description of the four main subsoil layers is given below.

4.2) Organic Muck:

On the south side of the C.N.R. track, a layer of organic muck and decayed root material exists throughout the entire area. The depth of this highly compressible layer varies from a minimum of 4 ft. to a maximum of 10 ft. In Borings 1, 2 and 9 which were drilled in the proximity of an old gravel road, sand and gravel were encountered, along with some organic muck. The relative density of this deposit is generally very loose to loose. This layer was not encountered on the north side of the track.

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Silty Clay and Clayey Silt:

This layer was encountered in all borings. The material in this layer consists of silty clay and clayey silt with silt seams. This layer is stratified throughout its entire depth. In Borings 1A and 13, varves were observed.

In borings drilled on the south side of the tracks, the depth of this layer varies from a minimum of 13 ft. to a maximum of 24 ft., between elev. 903' and 932'. The consistency is very soft, becoming stiff with increasing depth, with values of in-situ shear strength in the range of 200 to 1200 P.S.F. The color is predominantly grey, darker in shade for the clayey portion and lighter in shade for the silty portion.

In borings drilled on the north side of the tracks, the depth of this layer varies from a minimum of 8.0 ft. to a maximum of 24 ft., between elev. 909' and 946.5'. The consistency is medium stiff to very stiff, with values of in-situ shear strength in the range of 800 to upwards of 2000 P.S.F. Standard Penetration tests taken in this layer show values of 'N' ranging from a low of 4 to a high of 26 blows/ft. The color is brownish-grey to grey and the top part of the layer is desiccated. In this layer some organic material was traced, mostly in the upper portion. This is probably due to the proximity of the boreholes to an existing creek.

In this layer, the values of the Atterberg limits are as below:

cont'd./5 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Silty Clay and Clayey Silt: (cont'd.) ...

	L.L. %	P.L. %	M.C. %	Unit Wt. (P.C.F.)
Silty Clay	36 - 50	22 - 28	25 - 49	107 - 120
Clayey Silt	25 - 34	19 - 24	24 - 40	112 - 125
Unseparated Material	26 - 41	20 - 27	21 - 46	110 - 120

4.4) Silt:

This layer of silt was encountered in all borings. The depth of this layer varies from a minimum of 3 ft. (Boring 4) to a maximum of 15 ft. (Boring 11), between elevations 889' and 938', but the exact boundary of this layer and the upper clayey silt and silty clay layer is not always very distinct. The denseness of this layer can be taken as compact with average value of 'N' as 15. The color of this layer is predominantly grey.

4.5) Sand and Gravel:

This layer was encountered in all borings below the above-mentioned layer of silt. Its depth varies from a few inches to a maximum of 11.5 feet. It was intercepted between approximate elevations 935' and 883.5'. The boundary between this layer and the underlying rock was not investigated in detail in all borings, as this layer will have no effect on the stability of the proposed embankments. The depth of this layer may be large and it is possible that huge boulders may lie in it.

The granular material encountered in this layer is poorly graded. The minimum and maximum sizes of gravel encountered are 1/4" and 1", respectively. An artesian water pressure was encountered

cont'd. /6 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.5) Sand and Gravel: (cont'd.) ...

in the upper portion of this layer; therefore, the relative density of the deposit could not be judged from the 'N' values obtained in the field, but it is the contention of the writer, that it may be medium dense to very dense. The color of this layer is grey and brown.

4.6) Rock:

Below the layer of sand and gravel, rock surface was encountered in the entire area investigated. Bedrock was proved in Borings 4 and 10, and it is of quartz, micaceous schist variety. From the results of this investigation, it seems probable that boulders exist below the layer of sand and gravel and above the bedrock level.

5. GROUND WATER CONDITIONS:

Observations and measurements carried out during boring and sampling operations, indicate that the water table lies at approx. elevation 932' on the south side. Exact water level elevations for the borings are given in the table below.

An artesian water condition was observed in some of the borings and the approximate elevations are as follows:

cont'd. /7 ...

5. GROUND WATER CONDITIONS: (cont'd.) ...

<u>Boring No.</u>	<u>G.W. Elev.</u>	<u>Elev. at Which Artesian Pressure Observed</u>	<u>Elev. of Head of Water</u>
1	933.5	901.5	936.1
1A	933.5	896.0	936.3
2	933.0	899.5	938.5
6	929.8	-	-
7	-	900.0	933.0
8	-	905.0	937.1
9	931.5	891.0	935.0
10	932.0	891.0	937.0
10A	932.0	-	-
11	931.5	888.5	931.8
12	932.0	892.0	932.8
13	931.8	-	-

No water was observed in borings done on the extreme north side. On the south side, the water level is above the existing ground level in the swamp area which is criss-crossed by shallow creeks. This may be stagnant water due to lack of drainage in the area. At the time of the investigation, culverts which were silted up were cleaned and the flow of water was maintained. In this way, the water table was lowered by 4" to 6". Thus, the existing water level may change at the time of construction, depending on the drainage conditions.

cont'd. /8 ...

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an overhead structure approximately 1/4 mile south-west of Huntsville for the future southbound lane of Hwy. #11.

At the time of writing this report, it was not decided where the exact location of the proposed overhead structure would be. However, the investigation was carried out under the assumption that the proposed structure may be located 190 ft., 300 ft., or 375 ft. left of centre line of the present structure. This investigation revealed that there is no considerable change in subsoil conditions at these three locations and therefore, the recommendations will apply to all three possible alignment lines.

Subsoil at the site generally consists of stratified layers of silty clay and clayey silt followed by a deposit of compact silt, sand and gravel, followed by bedrock. On the south side of the C.N.R. only, the above deposits are overlain by soft organic material (muck).

The different foundation problems associated with the project are discussed below under the appropriate headings.

6.2) South Approach Embankment:

The centre line profile of the proposed embankment is shown on Dwg. 61-F-100A. The maximum height of embankment will be in the order of 35 ft.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment: (cont'd.) ...

At the site of the south approach, the area is covered with 4 ft. to 10 ft. of soft organic material (muck). It is recommended that all this soft material should be removed and backfilled with free draining sandy type material. The excavation and backfill procedures should be carried out as per D.H.O. Standards.

Three alternative methods of construction of embankments are discussed below:

1. Embankment with berms.
2. Embankment constructed in stages.
3. Embankment constructed after excavation of soft clay material.

6.2.1) Embankment with Berms:

Stability analyses in terms of total stresses have been carried out with the following assumptions:

Maximum height of embankment	-	35 ft.
Top width of embankment	-	50 ft.
Side Slopes	-	2:1

Fill Material -

Type of material - Free draining sandy type material.

$$\gamma = 120 \text{ p.c.f.}$$

(neglecting the strength of the fill)

cont'd. /10 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment: (cont'd.) ...

6.2.1) Embankment with Berms: (cont'd.) ...

Subsoil -

Elev. 931 - Elev. 923 - Muskeg replaced by free
draining sandy type material.

$$\gamma = 120 \text{ p.c.f.}$$

$$\gamma' = 60 \text{ p.c.f.}$$

$$\phi = 30^{\circ}$$

Elev. 923 - Elev. 910⁺ - stratified layers of silty
clay and clayey silt.

$$\gamma = 110 \text{ p.c.f.}$$

$$\gamma' = 50 \text{ p.c.f.}$$

$$C = 300 \text{ p.s.f.}$$

On the basis of stability analyses, it was concluded that berms would be required for fills above 8 ft. in height to ensure embankment stability. The required height and length of berms are given on Dwg. 61-F-100B.

6.2.2) Embankment Constructed in Stages:

Where property restrictions do not permit berm construction, the structure may be lengthened to reduce the height of the fill required, or stage construction may be used.

Due to the layered structure of varved clay and the marked difference in grain size and plasticity of the individual laminae comprising a varve, the horizontal permeability greatly exceeds the vertical permeability. The practical implication is that this type of foundation material has a relatively

cont'd. /11 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment: (cont'd.) ...

6.2.2) Embankment Constructed in Stages: (cont'd.) ...

high rate of consolidation and consequent gain in strength under the influence of an applied load. It is therefore suggested that consideration be given to a stage construction procedure for the south approach.

Recently, the Department of Highways carried out a detailed field instrumentation programme at the location of the existing C.P.R. overhead. This contributed valuable information pertaining to the induced pore pressure and rate of dissipation with respect to the embankment loading. The subsoil conditions at the existing structure site are very similar to those of the proposed overhead site.

Analyses were carried out in terms of effective stresses with the assumptions as previously noted. The effective shear strength parameters of the varved clay are $C' = 120$ p.s.f.
 $\phi' = 27^\circ$.

Fill Material -

Type of material - Free draining sandy material.

$$\gamma = 120 \text{ p.c.f.}$$

(neglecting the strength of the fill)

Material Below Ground -

Elev. 931 - Elev. 923 - Organic material removed and backfilled with granular material.

$$\gamma = 120 \text{ p.c.f.}$$

$$\gamma' = 60 \text{ p.c.f.}$$

$$\phi = 30^\circ$$

cont'd. /12 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment: (cont'd.) ...

6.2.2) Embankment Constructed in Stages: (cont'd.) ...

Elev. 923 - Elev. 910[±] - Stratified layers of soft clayey silt and silty clay.

$$\gamma = 110 \text{ p.c.f.}$$

$$\gamma' = 50 \text{ p.c.f.}$$

$$C' = 120 \text{ p.s.f.}$$

$$\phi' = 27^{\circ}$$

Field measurements on the pore pressure set up due to embankment loading and the rate of dissipation, carried out at the existing structure, gave the following average values:

$$\bar{B} = \frac{\Delta u}{\Delta \sigma_v} = \frac{\text{increase in pore pressure}}{\text{increase in } \sigma_v \text{ of fill added}} = 0.62$$

$$\text{Rate of dissipation} = \frac{\Delta u}{\Delta t} = 0.03 \text{ p.s.i./day}$$

Using the above values in the effective stress analyses, results of calculations indicated that the south approaches may be constructed in stages as follows:

<u>Stage No.</u>	<u>Height of Fill</u>	<u>Time (in days)</u>
1	8.0	0 - 100
2	8 - 12.0	100 - 200
3	12 - 16.0	200 - 260
4	16 - 20.0	260 - 320
5	20 - 24.0	320 - 380
6	24 - 27.0	380 - 420
7	27 - 30.0	420 -

cont'd. /13 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment:

6.2.2) Embankment Constructed in Stages: (cont'd.) ...

Field measurements of pore water pressure during embankment loading should be carried out as indicated on Dwg. 61-A-100C for the following reasons:

(a) The pore water pressures used in our analyses are based upon results obtained at the existing overhead structure location. It is possible that induced pore water pressures at the proposed structure site may be higher than those at the existing structure and should this be the case, stability of the south approach fills can only be assured by increasing the number of stages.

(b) Recorded P.W.P. during embankment loading operations in difficult soil conditions such as soft, compressible varved clays, will allow confirmation of stability analysis techniques currently used in the design.

The installation of piezometers and observations required during embankment loading, can be carried out by a member of the Foundation Section. At least one month's notice in advance of start of construction should be given to this Section to place the piezometers.

6.2.3) Embankment Constructed after Excavation of Soft Clay Material:

Consideration should be given to excavating some of the silty clay and clayey silt material on the south side of the C.N.R. Approximately 10 ft. of organic material has to be

cont'd. /14 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) South Approach Embankment: (cont'd.) ...

6.2.3) Embankment Constructed after Excavation of Soft Clay Material: (cont'd.) ...

removed in any event. An additional excavation of about 15 ft. would improve conditions to such an extent that neither berms nor stage construction would be necessary. If this proposal is considered, the Foundation Section will specify the exact limits and depth of soft clay material to be removed.

6.3) North Approach Embankment:

Subsoil conditions on the north side of the C.W.R. were found to be more favourable than on the south side. Stability analyses in terms of total stresses, indicate that the proposed 35 ft. high embankments will be stable provided that they are constructed with side slopes 2 horizontal to 1 vertical. It is recommended that the topsoil should be stripped and also any compressible organic material found in the vicinity of the existing creeks should be removed prior to placing the approach fills.

6.4) Structure Foundations:

The strength and compressibility of the soft to stiff stratified layers of silty clay and clayey silt are such that very low safe bearing loads will have to be used. Therefore, it is recommended that the structure be founded on small displacement end-bearing piles driven to bedrock. For steel 'H' piles (12 BP 53) a design load of 60 Tons/pile may be used.

cont'd. /15 ...

7. SUMMARY:

Subsoil at the site generally consists of stratified layers of silty clay and clayey silt followed by compact silt, sand and gravel, followed by bedrock. On the south side of the C.N.R. only, the above deposits are overlain by soft organic material.

SOUTH APPROACH EMBANKMENT

At this location the site is generally covered with 4 to 10 ft. of soft organic material. It is recommended that all this soft material should be removed and replaced with free draining sandy type of material. The excavation and backfill procedures should be carried out as per D.H.O. Standards.

Subsoil conditions at this location are somewhat unfavourable because of the low shear strength of the silty clay deposit. Three alternative methods of construction are discussed under Section 6.2.

NORTH APPROACH EMBANKMENT

Stability problems are not anticipated provided the approaches are constructed with side slopes 2 horizontal to 1 vertical.

cont'd. /16 ...

7. SUMMARY: (cont'd.) ...

STRUCTURE FOUNDATIONS

It is recommended that the structure be founded on small displacement end-bearing piles driven to bedrock. For steel 'H' piles (12 BP 53) 60 tons per piles may be used for design.

8. MISCELLANEOUS:

The field work, performed during the period from September 27, 1961 to October 19, 1961, together with the preparation of this report, was undertaken by Mr. B. M. Ghadieli, Foundation Section, D. H. O. The investigation was carried out under the general supervision of Mr. M. Devata, who also reviewed this report.

Equipment used, was owned by Johnston Drilling Co., Ltd., Ottawa.

August 1962.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

HOPE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS/FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S1	3'-4.5'	Silty sand. Loose. Grey. Silty clay and organic decayed material.	8	30.5	26.2	39.6	-	-	
	S2	6'-7.5'	Silty clay with silt partings some organic root material. Med. stiff grey.	9	28.2	20.2	30.1	-	-	
	S3	9'-10.5'	Silty clay. Soft. Grey.	3	44.0	26.1	42.3	-	-	
	S4	12'-13.5'	Silty clay and silt. V. soft. Grey.	1	49.4	28.0	45.0	-	-	
	S5	15'-16.5'	Silty clay, soft. Grey.	4	-	-	-	-	-	
	S6	20'-21.5'	Silt. Some clay binder. Compact. Grey.	20	-	-	-	-	-	
	S7	25'-26.5'	Silt. Compact. Grey.	21	-	-	-	-	-	
	S8	30'-31.5'	" " "	10	-	-	-	-	-	
1A	T1	9.5'-11'	Silty clay. V. soft. Grey.	P	45.5	-	-	-	-	
	VANE	12.5'		-	-	-	-	200	-	Sens: 4.0
	T2	15'-16.5'	Silty clay with silt and clayey silt partings. Med. stiff. Grey.	P	47.8	-	-	485	108.9	
	VANE	18'		-	-	-	-	800	-	Sens: 4.4
	T3	20'-21.5'	Silty clay with silt partings. Varved. Med. stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	1520	-	Sens: 5.1

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENETIN RESIST. BLOWS/FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1A	T4	25'-26.5'	Silt. Compact. Grey.	P	-	-	-	-	-	Sens: 4.5
	VANE	28'		-	-	-	-	720	-	
	T5	30'-31.5'	Silt. Compact. Grey.	P	-	-	-	-	-	
	VANE	33'		-	-	-	-	560	-	
	T6	35'-36.5'	Silt. Trace of fine sand. Compact. Grey.	P	-	-	-	-	-	
	S7	38'-39.5'	Silty sand and gravel. (1" max. size) Dense. Grey-yellow.	35	-	-	-	-	-	
2	S1	3'-4.5'	Silty clay and clayey silt. Some organic decayed material. Med. stiff grey.	7	29.2	Oven Dried 28.2 36.2	-	-	-	Sens: 7.0
			Air Dried 28.8 39.0							
	S2	5'-6.5'	Silty clay and silt stratified. Trace of organic decayed material. Stiff. Grey.	18	26.8	Oven Dried 21.6 33.0	-	124.9		
			Air Dried 19.8 34.5							
	T3	9'-10.5'	Clayey silt. Stiff. Grey.	P	23.6	23.4	27.6	2940	125.8	
	VANE	12'		-	-	-	-	1120	-	
	T4	15'-16.5'	Silty clay and clayey silt. Stratified. Stiff. Grey.	P	47.6	28.4	38.2	755	112.4	
	VANE	18'		-	-	-	-	1120	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
2	T5	20'-21.5'	Silty clay and silt. Stratified. Stiff. Grey.	P	28.5	23.5	37.2	-	-	Sens: 4.0
	VAME	23'		-	-	-	-	1520	-	
	T6	25'-26.5'	Silt. Trace of clay binder. Compact. Grey.	P	23.4	-	-	>5000	124.8	
	T7	30'-31.3'	Silt. Compact. Br. grey.	P	24.4	-	-	>5000	124.0	
	T8	35'-36.5'	Silt. Compact. Br. grey.	P	29.4	-	-	-	-	No recovery.
	S9	35.5'-37'	Silty sand and gravel. Dense. Brown.	35	-	-	-	-	-	
	S10	40'-40.4'	Sand - Gravel.	100-5"	-	-	-	-	-	
	RC11	41.3'-43.3'	Micacious Schist Rock. Grey. Pink granite intrusions.	-	-	-	-	-	-	
3	RC12	43.3'-48.5'	Micacious Schist Rock. Grey.	-	-	-	-	-	-	
	S1	3'-4.5'	Clayey silt. Organic silt and decayed wood material. Med. stiff. Grey-black.	9	38.4	-	-	-	-	
	S2	6'-7.5'	Silty clay and clayey silt. Stratified. V. stiff. Brown-grey.	22	21.3	21.6	31.0	-	-	
	S3	9'-10.5'	Silty clay and clayey silt. Med. stiff. Brown-Grey.	7	40.0	26.3	40.8	-	-	

JOB 61-F-100

W.P. _____

[illegible]

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
5	S1	3'-4.5'	Clayey silt and silt, in very thin layers dessicated. V. stiff. Br. grey.	26	22.4	-	-	-	-	Sens: 4.9
	S2	6'-7.5'	Clayey silt and silt in very thin layers. Stiff. Grey and brown.	9	39.4	27.0	42.8	-	-	
	S3	9'-10.5'	" " " "	12	32.1	25.2	29.0	-	120.0	
	S4	12'-13.5'	Clayey silt changing to silt. Stiff Grey.	13	34.2	26.4	32.1	-	-	
	S5	15'-16.5'	Silt. Compact. Grey.	14	28.8	-	-	-	-	
	VANE	18'		-	-	-	-	1360	-	
	S6	20'-21.5'	Silt. Compact. Grey.	15	28.0		-	-	-	
6	S7	25'-26.5'	Sand and gravel. (Max. size 1") Some non-plastic silt fines. Dense. Grey.	48	12.4	-	-	-	-	
	S1	3'-4.5'	Silty clay. Stiff. Br. grey.	9	30.8	26.6	54.2	-	118.8	
	S2	6'-7.5'	Silty clay and silt in very thin layers. Varved. V. stiff. Grey and brown.	21	25.2	-	-	-	-	
	S3	9'-10.5'	Clayey silt and silty clay. Stratified. Stiff. Grey.	11	25.2	-	-	-	-	
	S4	12'-13.5'	Clayey silt and silty clay. Trace of organic muck. Med. stiff. Grey.	4	28.0	20.5	26.1	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENETIN RESIST BLOWS FT.	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
6	VANE	15'		-	-	-	-	800	-	Sens: 5.7
	T5	15'-16.5'	Silty clay. Stiff. Grey.	P	43.3	26.4	47.3	1470	110.8	
	VANE	18'		-	-	-	-	1160	-	Sens: 4.1
	T6	20'-21.5'	Silty clay and clayey silt. Stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	2000	-	Sens: 4.2
	T7	25'-26.5'	Clayey silt changing to silt. Stiff. Grey.	P	25.0 29.9	-	-	3500	124.8	
	VANE	28'		-	-	-	-	1120	-	Sens: 4.0
	T8	30'-31'	Silt. Compact. Br. grey.	P	9.6	-	-	-	-	
	S9	31'-32.5'	" " "	14	28.4	-	-	-	-	
	S10	35'-36.5'	Silt changing to sand and gravel. (Max. 1/2" size). Med. dense. Grey and brown.	28	-	-	-	-	-	
7	S1	3'-4.5'	Silty clay with some very thin silt layers. decayed root material. Med. stiff. Br. grey.	5	27.9	19.8	34.8	-	-	
	S2	6'-7.5'	" " " "	10	25.0	18.7	26.4	-	-	
	T3	9'-10.5'	Silty clay, trace of decayed material. Stiff. Grey.	P	30.7	18.5	29.6	1770	117.0	
	VANE	12'		-	-	-	-	1280	-	Sens: 1.2

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p s f	UNIT WEIGHT p c f.	REMARKS
7	T4	12'-13.5'	Silty clay and clay. Stratified. Med. stiff. Grey.	P	44.0	27.0	47.2	-	108.1	Sens: 4.3
	VANE	15'		-	-	-	-	960	-	
	T5	15'-16.5'	Silty clay, silt and v. fine sand seams. Stratified. Stiff. Grey.	P	28.7	22.9	34.5	3120	121.7	Sens: 4.1
	VANE	18'		-	-	-	-	1120	-	
	T6	20'-21.5'	Silt. Compact. Grey.	P	33.8	26.8	42.5	-	-	No recovery.
	T7	25'-26.5'	" " "	P	24.3	-	-	-	125.9	
	S8	30'-31.5'	" " "	7	30.4	-	-	-	-	
	S9	33'-34.5'	Sand and gravel. Med. dense.	11	-	-	-	-	-	
8	S10	36.5'-38'	Sand and gravel. (1/8" to 1" size) Med. dense. Grey.	27	6.1	-	-	-	-	
	S1	3'-4.5'	Clayey silt and silt. Trace of organic material. Dessicated. V. stiff. Br. grey.	25	21.2	-	-	-	-	
	S2	6'-7.5'	Clayey silt and silt. Stratified. V. stiff. Br. grey.	17	25.4	-	-	-	-	
	T3	9'-10.5'	Silty clay and silt. Stiff. Br. grey.	P	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

PILE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psf	UNIT WEIGHT pcf	REMARKS
8	VANE	12'		-	-	-	-	1040	-	Sens: 4.7
	T4	12'-13.5'	Silty clay and clay. Stratified. Stiff. Grey.	P	43.0	28.0	47.0	1055	111.5	
	VANE	15'		-	-	-	-	1200	-	Sens: 5.0
	T5	15'-16.5'	" " " " "	P	-	-	-	-	-	
	VANE	18'		-	-	-	-	1440	-	Sens: 3.6
	T6	20'-21.5'	Clayey silt and silt. Stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	1600	-	Sens: 3.6
	T7	25'-26.5'	Silt. Compact. Grey.	P	24.2	-	-	>5000	122.1	
	T8	30'-31.5'	" " "	P	-	-	-	-	-	
9	S9	35'-36.5'	Silty sand and gravel (Max. size 1") Loose. (Quick condition) Grey.	7	-	-	-	-	-	
	S10	43'-43.5'	Sand and gravel. V. dense. Grey.	82-6"	-	-	-	-	-	
	S1	3'-4.5'	Clayey silt and organic material. Stiff. Greenish grey.	13	-	-	-	-	-	
	S2	6'-7.5'	Organic silt and decayed root material. Silty clay. Soft to med. stiff. D. brown and grey.	9	-	-	-	-	-	
	VANE	9'	(Not representative)	-	-	-	-	1120	-	Sens: 2.2
	T3	9'-10.5'	Silty clay, trace of organic material. Soft. Grey.	P	44.5	23.5	42.3	266	108.7	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-P-100W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
9	VANE	12'		-	-	-	-	600	-	Sens: 5.0
	VANE	13.5'		-	-	-	-	440	-	Sens: 5.5
	T4	15'-16.5'	Silty clay. Soft. Grey.	P	30.2	19.7	25.2	610	120.2	
	VANE	18'		-	-	-	-	280	-	Sens: 7.0
	T5	20'-21.5'	Silty clay and clayey silt. Stratified. Med. stiff. Grey.	P	46.1	-	-	700	108.0	
	VANE	23'		-	-	-	-	560	-	Sens: 5.6
	T6	25'-26.5'	Silty clay and clayey silt. Med. Stiff. Grey.	P	-	-	-	-	-	
	VANE	28'		-	-	-	-	920	-	Sens: 3.8
	T7	30'-31.5'	" " " " "	P	-	-	-	-	-	
	VANE	33'		-	-	-	-	1000	-	Sens: 4.2
	T8	35'-36.3'	Silt. Compact. Grey.	P	-	-	-	-	-	
	VANE	37.3'		-	-	-	-	760	-	Sens: 2.9
	S9	40'-41.5'	" " "	P	-	-	-	-	-	
	VANE	43'		-	-	-	-	680	-	Sens: 2.5
	S10	45'-46.5'	Sand and gravel. (Max. size $\frac{3}{4}$ " Med. dense. Grey.	19	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST. BLOWS/FT	MOIST. CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
10	S1	3'-4.5'	Organic muck. V. soft. Br. grey.	P	-	-	-	-	-	
	S2	5'-6.5'	Organic muck and clayey silt. V. soft. Br. grey.	1-19"	261.0	-	-	-	-	
	S3	7'-8.5'	" " "	1-18"	-	-	-	-	-	
	S4	10'-11.5'	Silty clay. V. soft. Grey.	4	-	-	-	-	-	
	S5	14'-16'	Clayey silt. V. soft. Grey.	1-24"	39.6	25.0	25.9	-	-	
	S6	18'-19.5'	Silty clay and silt. Stratified. V. soft. Grey to Br. grey.	2	-	-	-	-	-	
	S7	20'-21.5'	Silty clay and clayey silt. V. soft. Grey.	1-18"	37.5	26.6	38.4	-	-	
	S8	23'-24.5'	Clayey silt and silt. Compact. Grey.	4	-	-	-	-	-	
	S9	26'-27.5'	Silt. Compact. Grey.	6	-	-	-	-	-	
	S10	30'-31.5'	" " "	8	-	-	-	-	-	
	S11	35'-36.5'	" " "	10	28.1	-	-	-	-	
	S12	40'-41.5'	Silt and silty sand. Loose. Grey.	9	-	-	-	-	-	
	S13	42.5'-44'	Sand and gravel (1/4" to 3/4" size) Med. dense. Grey.	16	-	-	-	-	-	
	RCL	48.6'-53.6'	Quartz Schist, with pink granite intrusions.	-	-	-	-	-	-	76% Recovery.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

SOLE NO	TEST NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH pcf	UNIT WEIGHT pcf	REMARKS
10A	VANE	8.5'		-	-	-	-	120	-	Sens: 6.0
	T1	10'-12.5'	Silty clay. V. soft.	P	-	-	-	-	-	No recovery.
	VANE	14'		-	-	-	-	300	-	Sens: 7.5
	O2	15'-16.5'	Silty clay and clayey silt. Soft. Grey.	F	51.5	-	-	439	107.0	
	VANE	20'		-	-	-	-	480	-	Sens: 8.0
	O3	20'-22.5'	Silty clay and clayey silt. Soft. Grey.	P	-	-	-	-	-	
	VANE	24'		-	-	-	-	900	-	Sens: 3.8
	T4	25'-26.5'	Clayey silt and silt. Compact. Grey.	P	-	-	-	-	-	
	VANE	28'		-	-	-	-	1200	-	Sens: 3.3
	T5	30'-31.5'	" " "	P	-	-	-	-	-	
	VANE	32.8'		-	-	-	-	1200	-	Sens: 4.0
	VANE	38'		-	-	-	-	520	-	Sens: 1.7
11	S1	5'-6.5'	Organic muck and silty clay. V. soft. Br. grey.	P	148.4	-	-	-	-	
	VANE	8'		-	-	-	-	260	-	Sens: 4.3
	O2	10'-12.5'	Clayey silt and silty clay. Stratified. Soft. Grey.	4	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

HOLE NO.	SAMP NO.	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT.	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
11	VANE	14'		-	-	-	-	300	-	Sens: 5.0
	O3	15'-17.5'	Silty clay and clayey silt. Stratified. Soft. Grey.	P	47.2 48.4	24.7 27.4	41.6 44.5	366 375	112.1 108.9	
	VANE	19'		-	-	-	-	400	-	Sens: 5.0
	T4	20'-21.5'	Silty clay and clayey silt. Stratified. Med. stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	1000	-	Sens: 3.6
	T5	25'-26.5'	" " "	P	-	-	-	-	-	
	VANE	28'		-	-	-	-	1120	-	Sens: 4.0
	T6	30'-31.5'	Silt. Trace of clay binder. Compact. Grey.	P	-	-	-	-	-	
	VANE	33'		-	-	-	-	1040	-	Sens: 3.7
	T7	35'-36.5'	Silt. Compact. Grey.	P	-	-	-	-	-	
	VANE	38'		-	-	-	-	560	-	Sens: 3.1
	T8	40'-41.5'	Silt. Compact. Grey.	P	-	-	-	-	-	
	S9	43.5'-45'	Sand and excess of gravel. (1/8" to 3/4" size) Med. dense. grey.	19	5.8	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT	MOIST CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f	UNIT WEIGHT p.c.f	REMARKS
12	S1	5'-6.5'	Organic muck and clayey silt. V. soft. Grey.	P	-	-	-	-	-	
	VANE	8'		-	-	-	-	320	-	Sens: 4.0
	O2	10'-12.5'	Silty clay and clayey silt. Soft. Grey.	P	29.2	19.5	26.5	-	122.1	
	VANE	14'		-	-	-	-	300	-	Sens: 5.0
	O3	15'-17.5'	" " " "	P	-	-	-	-	-	
	VANE	19'		-	-	-	-	640	-	Sens: 4.6
	T4	20'-21.5'	Clayey silt. Med. stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	1120	-	Sens: 4.7
	T5	25'-26.5'	Silty clay and clayey silt. Stratified. Stiff. Grey.	P	27.8	-	-	>4900	122.2	
	VANE	28'		-	-	-	-	1520	-	Sens: 4.0
	T6	30'-31'	Silt. Compact. Grey.	P	-	-	-	-	-	
	VANE	32'		-	-	-	-	1040	-	Sens: 4.3
	S7	35'-36.5'	Silt. Compact. Grey.	13	-	-	-	-	-	
	S8	40'-41'	Sand and excess of gravel (1/4" to 1/2" size) V. dense. Br. grey.	107	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100W.P. -

NO. HOLE	SAMP NO.	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f	UNIT WEIGHT p.c.f	REMARKS
13	S1	3'-4.5'	Organic muck. D. brown.	P	-	-	-	-	-	
	VANE	6'		-	-	-	-	240	-	Sens: 12.0
	S2	6'-7.5'	Silt and clayey silt. Varved. Organic muck. Soft. Grey.	5	26.3	-	-	-	-	
	VANE	9'		-	-	-	-	400	-	Sens: 5.0
	O3	10'-11.5'	Silty clay, soft. Grey.	P	-	-	-	-	-	
	VANE	13'		-	-	-	-	400	-	Sens: 5.6
	O4	15'-17.5'	Silty clay and clay, Stratified. Med. stiff. Grey.	P	47.2	27.0	50.2	593	111.0	
	VANE	19'		-	-	-	-	880	-	Sens: 3.4
	T5	20' 21.5'	Clayey silt and silty clay. Stiff. Grey.	P	-	-	-	-	-	
	VANE	23'		-	-	-	-	1120	-	Sens: 3.1
	T6	25'-26.5'	" " "	P	-	-	-	-	-	
	VANE	28'		-	-	-	-	1040	-	Sens: 4.0
	T7	30'-31.5'	Silt. Compact. Grey.	P	16.3	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-100

W.P. -

HOLE NO	SAMP NO	SAMPLE DEPTH FEET	MATERIAL DESCRIPTION	PENET N RESIST. BLOWS/FT	MOIST. CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p s f.	UNIT WEIGHT p c f.	REMARKS
13	S8	35'-36.5'	Silt. Compact. Grey.	7	-	-	-	-	-	
	S9	40'-41.5'	Sand and excess of fine gravel. Dense. Grey.	48	-	-	-	-	-	
			O denotes Osterberg sample.							
			S " split spoon "							
			T " shelby tube "							

DEPARTMENT OF HIGHWAYS - ONTARIO

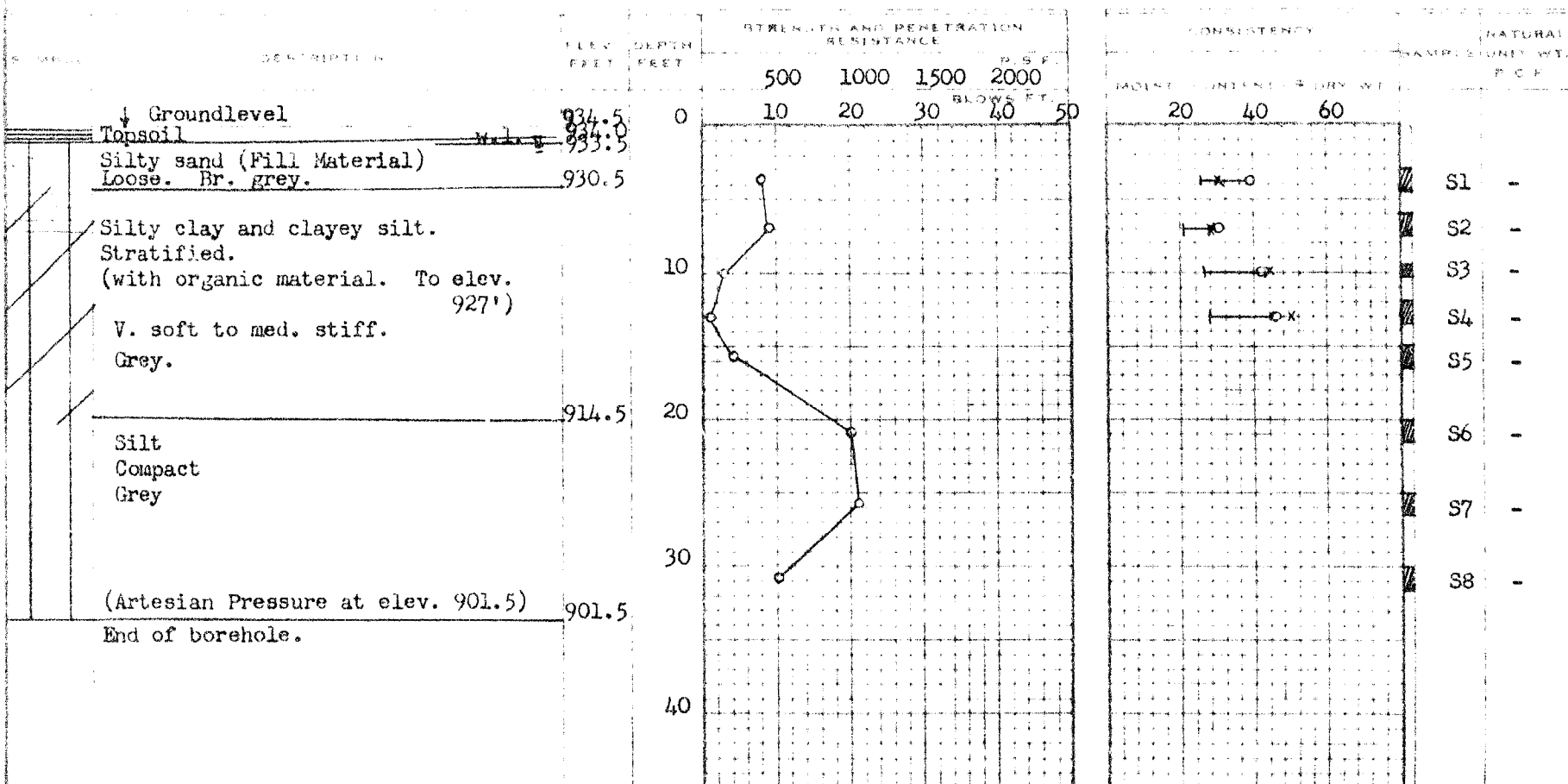
MATERIALS AND RESEARCH SECTION

W.P. - BORE HOLE NO 1
 JOB 61-F-100 STATION 25+90 (190' Lt.)
 DATUM 934.5' COMPILED BY B.K.
 BORING DATE Sept. 27/61. CHECKED BY B.M.G.

2" DIA SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA CONE
 2" SHELBY
 CASING

LEGEND

UNCONFINED COMPRESSION (QU) O
 VANE TEST (C) AND SENSITIVITY (S) +
 NATURAL MOISTURE AND LIQUIDITY INDEX X
 LIQUID LIMIT -
 PLASTIC LIMIT -



MATERIALS AND RESEARCH SECTION

2" DIA SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA CONE
2" SHELBY
CASING

1/2 UNCONFINED COMPRESSION (Qu) _____ 0
VANE TEST (C) AND SENSITIVITY (S) _____ +2
NATURAL MOISTURE AND
LIQUIDITY INDEX _____ 1
LIQUID LIMIT _____ 4
PLASTIC LIMIT _____

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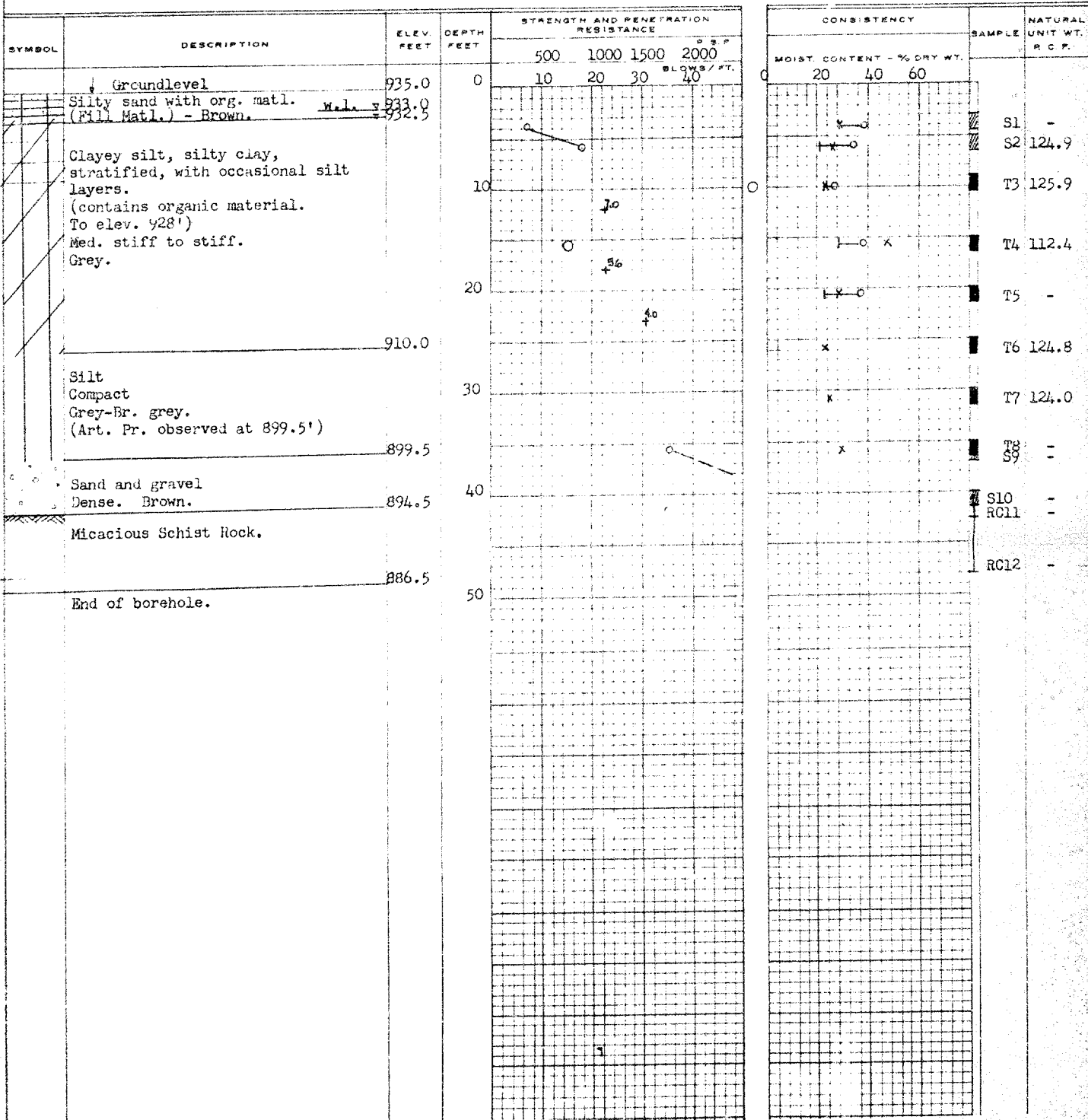
DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 2
 JOB 61-F-100 STATION 25+00 (300' Lt.)
 DATUM 935.0' COMPILED BY B.K.
 BORING DATE Sept. 29/61. CHECKED BY B.M.G.

2" DIA SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) 0
 VANE TEST (C) AND SENSITIVITY (S) +5
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT X
 PLASTIC LIMIT 0



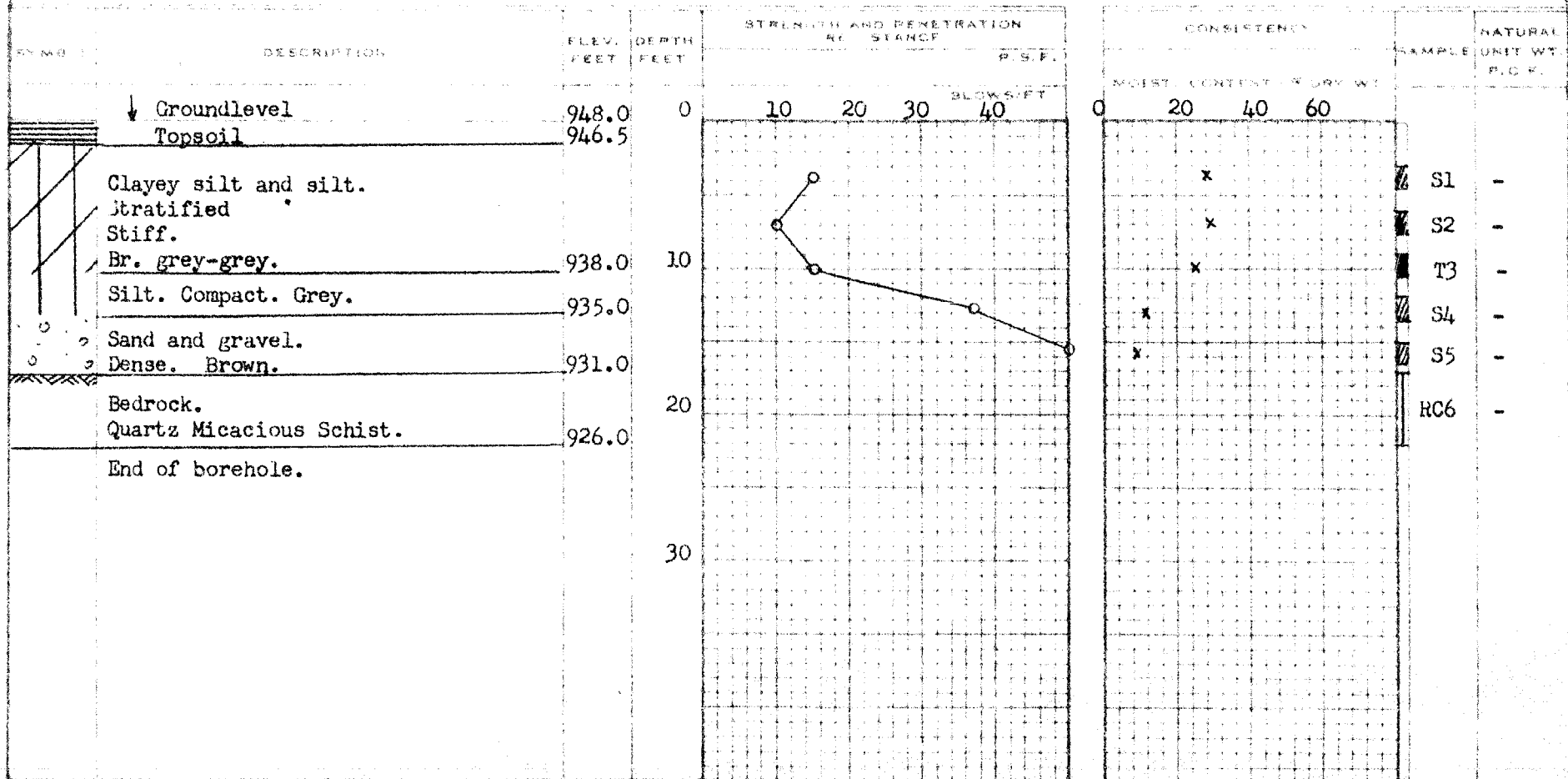
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 4
 JOB 61-F-100 STATION 31+00 (300' Lt.)
 DATUM 948.0' COMPILED BY B.K.
 BORING DATE Oct. 4/61. CHECKED BY B.H.G.

2" DIA SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____
 VANE TEST (C) AND SENSITIVITY (S) _____
 NATURAL MOISTURE AND LIQUIDITY INDEX _____
 LIQUID LIMIT _____
 PLASTIC LIMIT _____



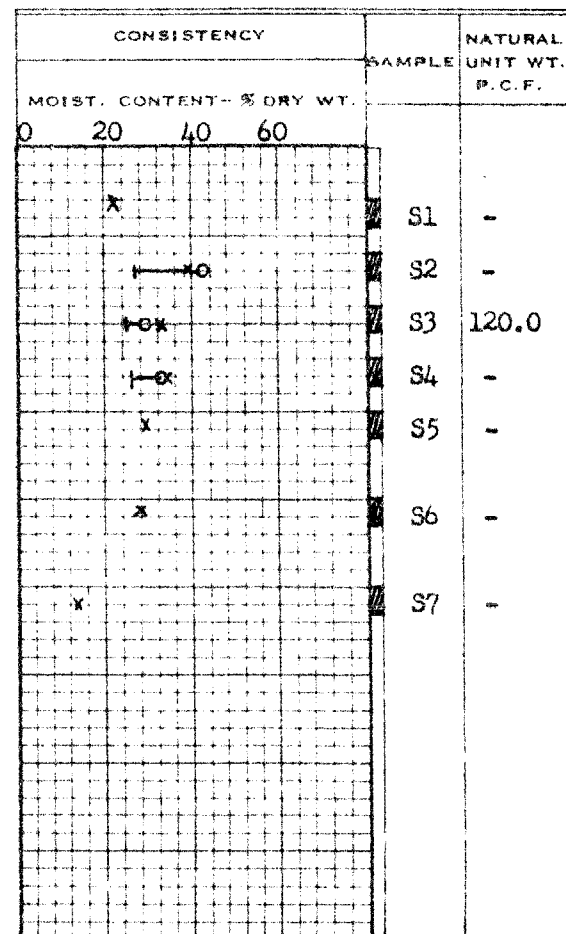
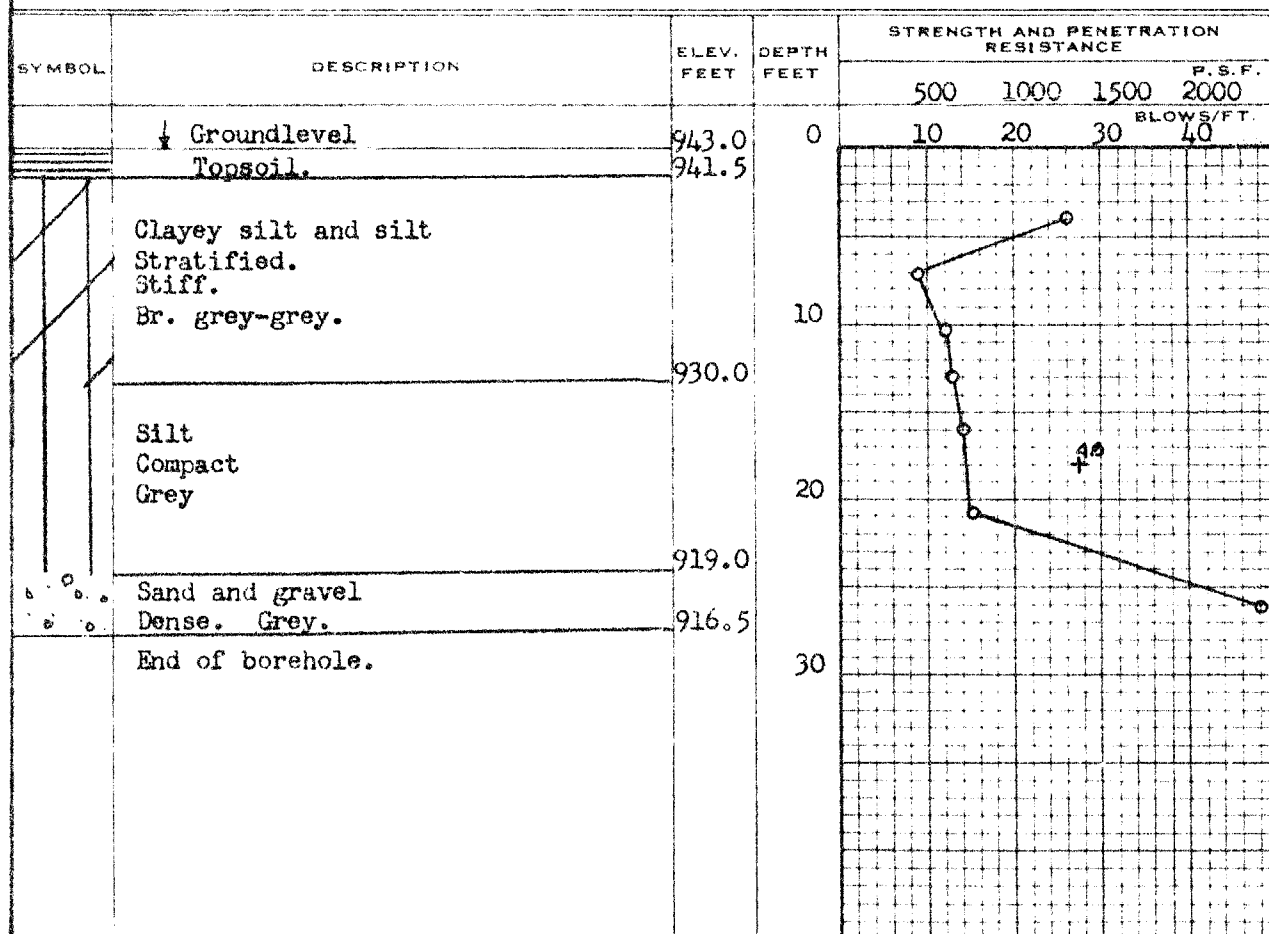
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 5
JOB 61-F-100 STATION 29+00 (300' It.)
DATUM 943.0' COMPILED BY B.K.
BORING DATE Oct. 4/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE _____
2" SHELBY TUBE _____
2" SPLIT TUBE _____
2" DIA. CONE _____
2" SHELBY _____
CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____ O
VANE TEST (C) AND SENSITIVITY (S) _____ +
NATURAL MOISTURE AND LIQUIDITY INDEX _____ LI
LIQUID LIMIT _____ X
PLASTIC LIMIT _____



DEPARTMENT OF HIGHWAYS - ONTARIO

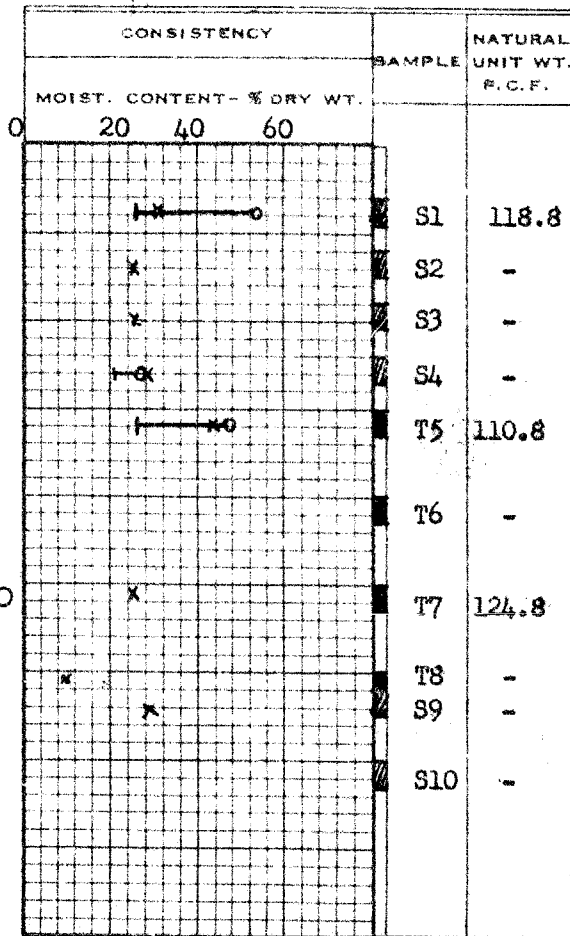
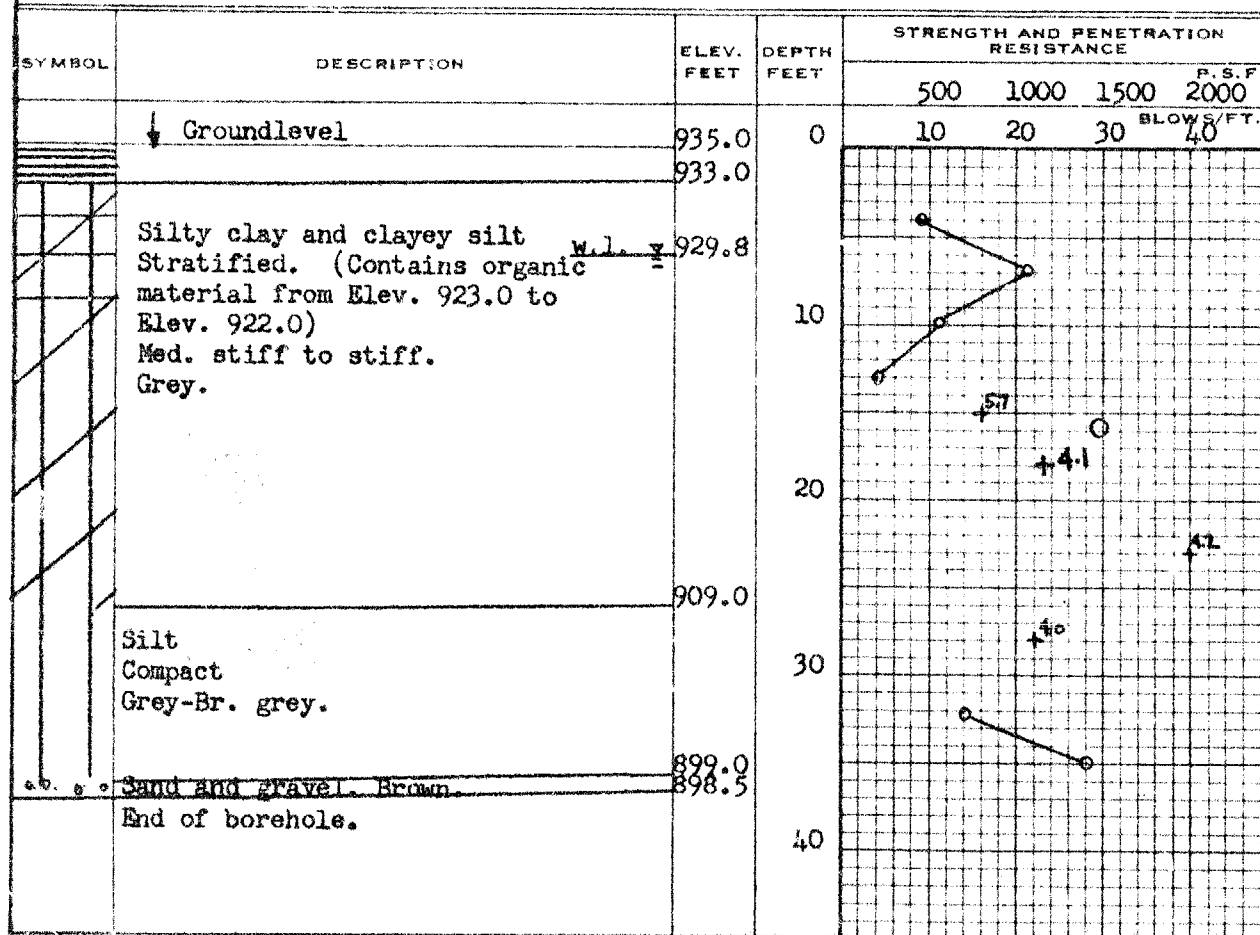
MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 6
 JOB 61-F-100 STATION 30+00 (190' It.)
 DATUM 935.0' COMPILED BY B.K.
 BORING DATE Oct. 5/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA. CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____
 VANE TEST (C) AND SENSITIVITY (S) _____
 NATURAL MOISTURE AND LIQUIDITY INDEX _____
 LIQUID LIMIT _____
 PLASTIC LIMIT _____



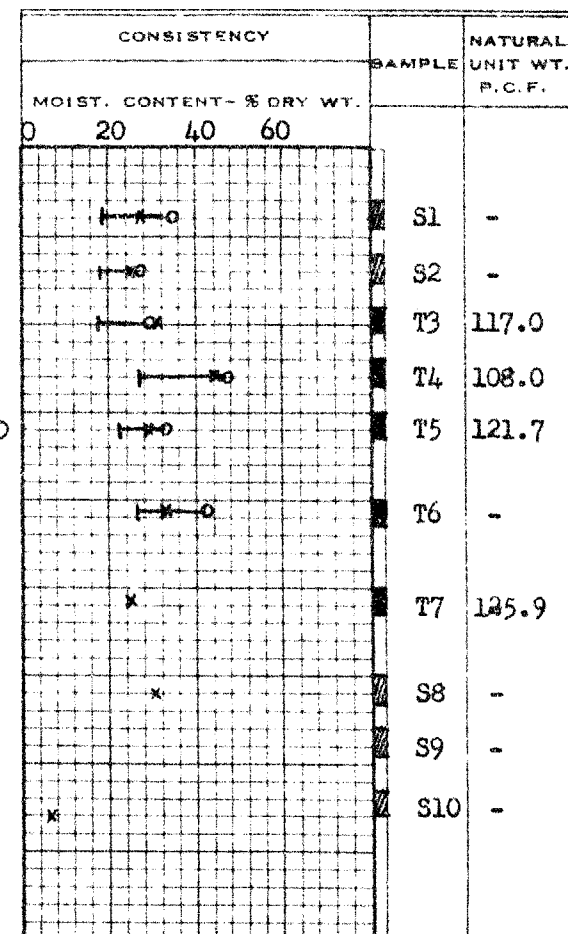
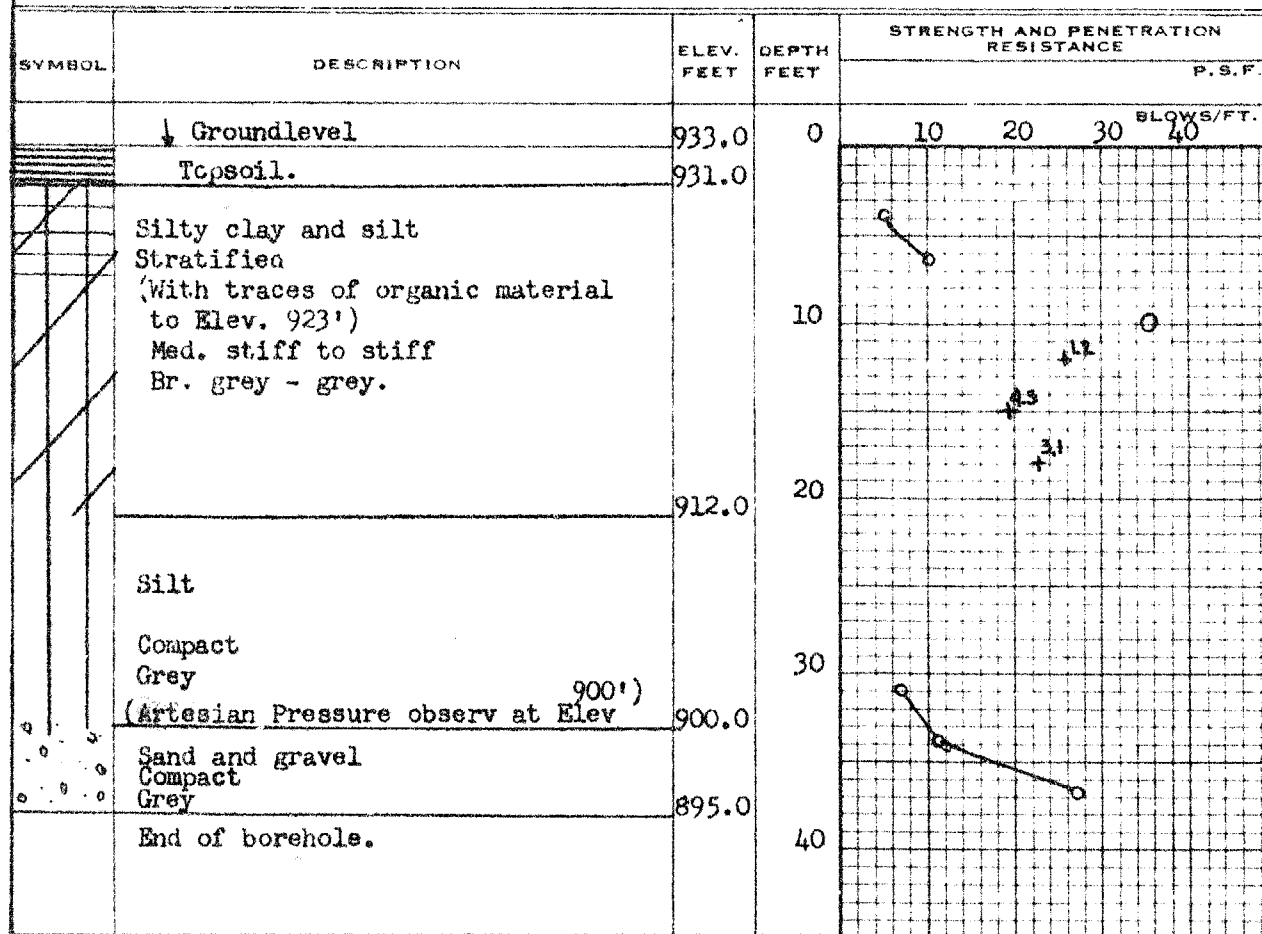
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. - BORE HOLE NO. 7
JOB 61-F-100 STATION 29+00 (190' Lt.)
DATUM 933.0' COMPILED BY B.K.
BORING DATE Oct. 5/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO

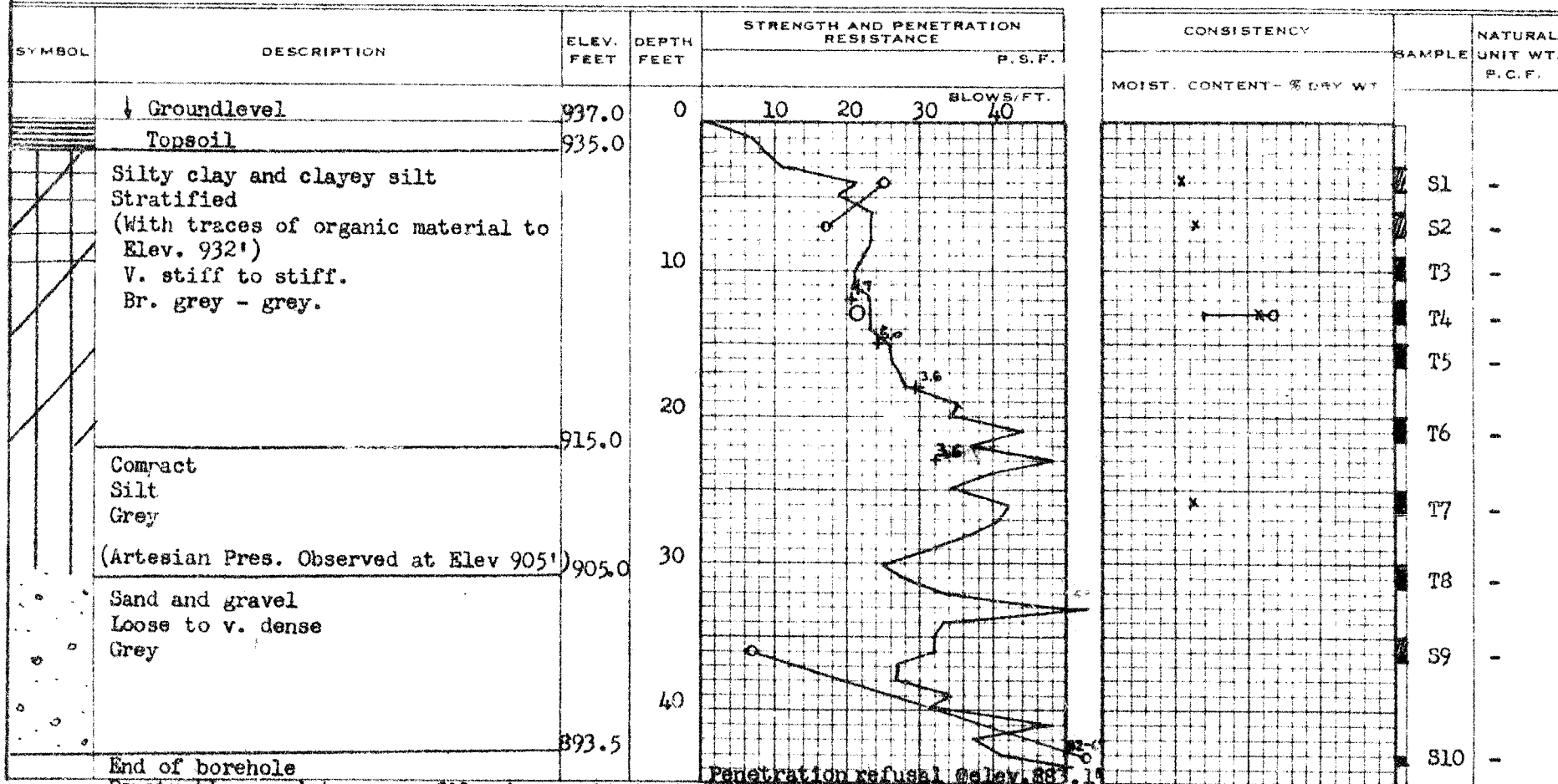
MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 8
 JOB 61-F-100 STATION 27+00 (300' Lt.)
 DATUM 937.0' COMPILED BY B.K.
 BORING DATE Oct. 6/61 CHECKED BY B.M.G.

2" DIA. SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA. CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____
 VANE TEST (C) AND SENSITIVITY (S) _____
 NATURAL MOISTURE AND LIQUIDITY INDEX _____
 LIQUID LIMIT _____
 PLASTIC LIMIT _____

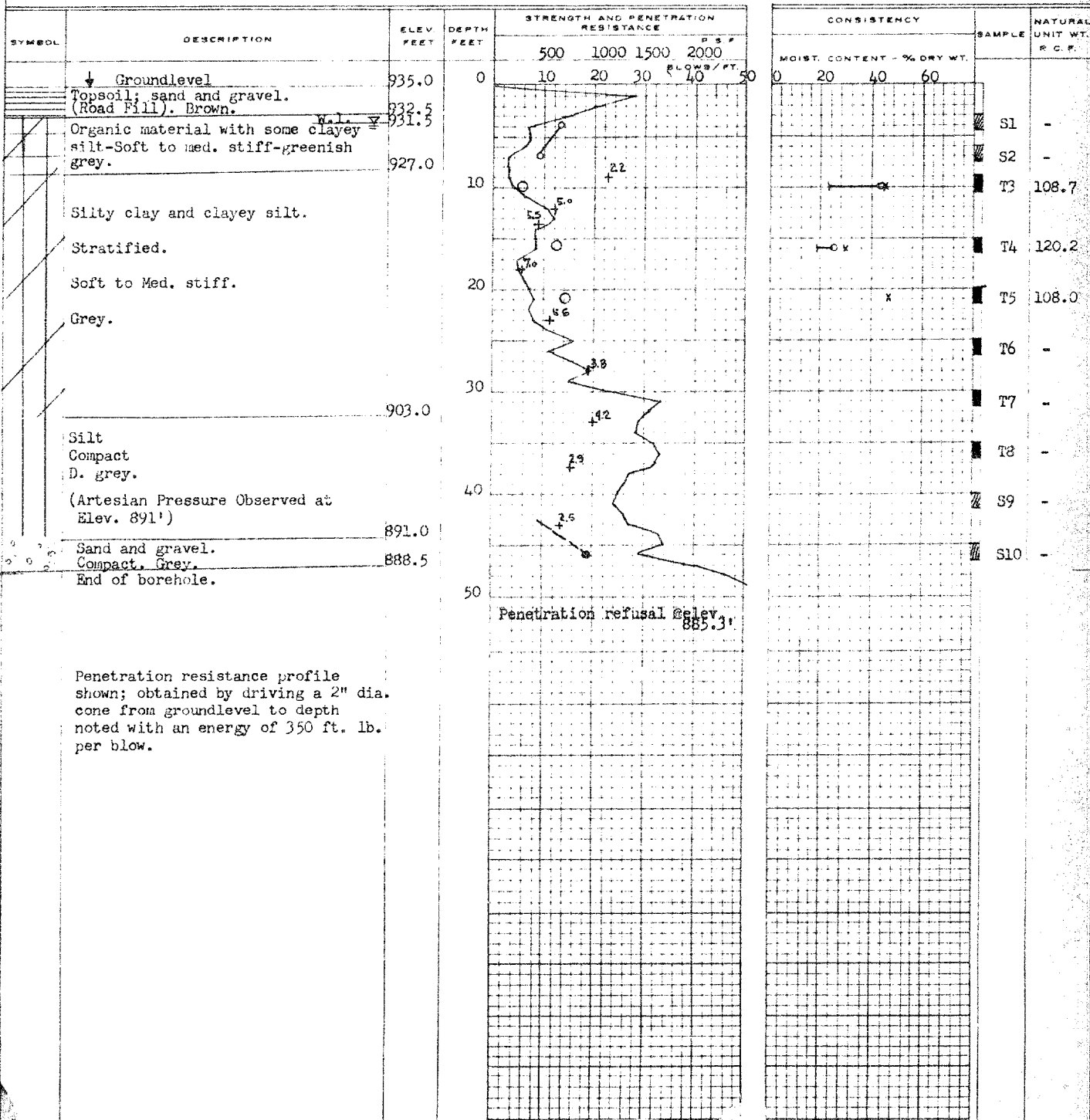


DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 9
 JOB 61-F-100 STATION 24/40 (375' Lt.)
 DATUM 935.0' COMPILED BY B.K.
 BORING DATE Oct. 10/61. CHECKED BY B.M.G.

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) 0
 VANE TEST (C) AND SENSITIVITY (S) +5
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT X
 PLASTIC LIMIT —



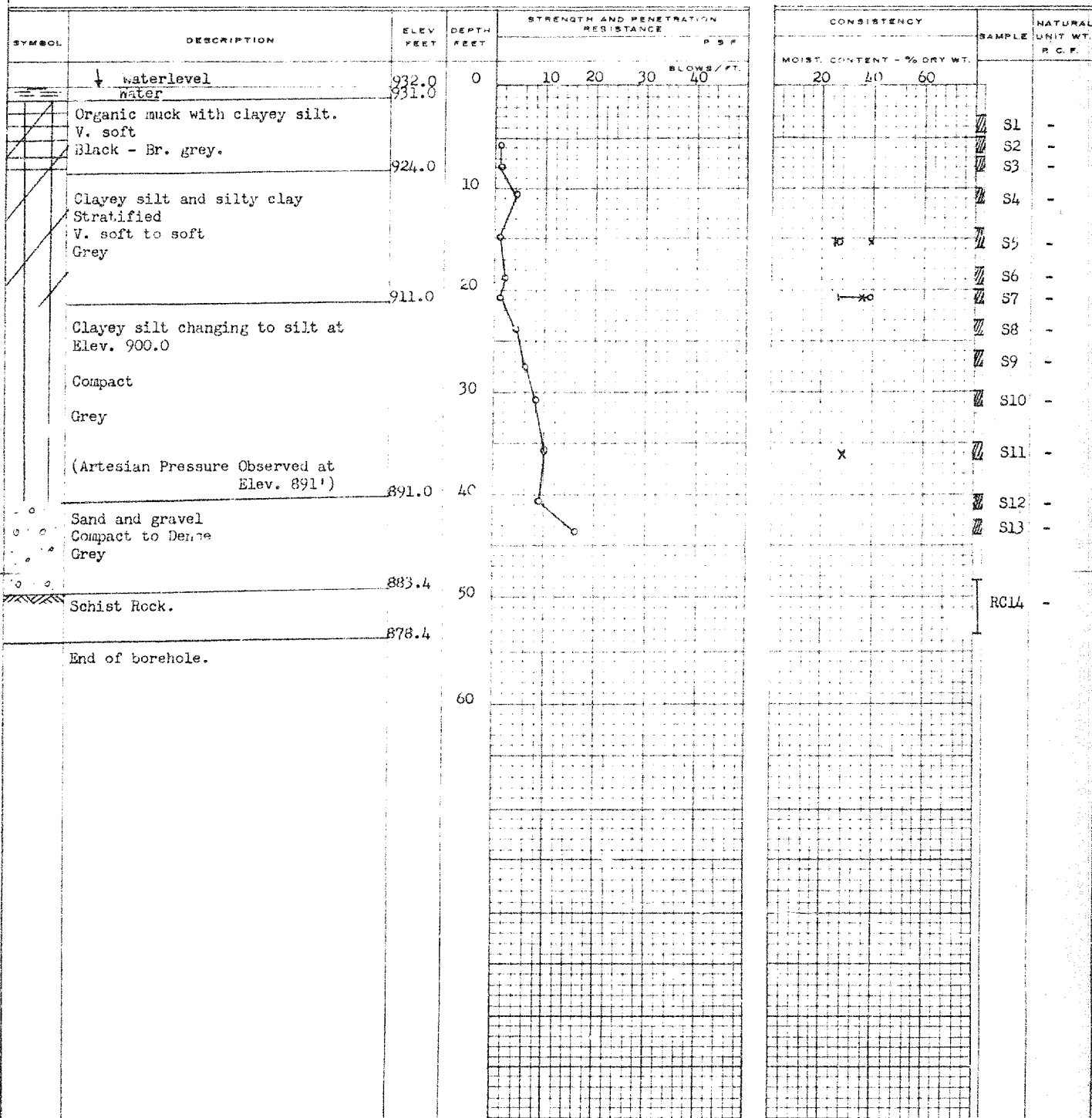
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. - BORE HOLE NO. 10
JOB 61-F-100 STATION 24+00 (300' Lt.)
DATUM 932.0' COMPILED BY B.K.
BORING DATE Oct. 12/61. CHECKED BY B.M.G.

2" DIA SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) 0
VANE TEST (C) AND SENSITIVITY (S) --- +S
NATURAL MOISTURE AND LIQUIDITY INDEX LI
LIQUID LIMIT --- X
PLASTIC LIMIT --- 1



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

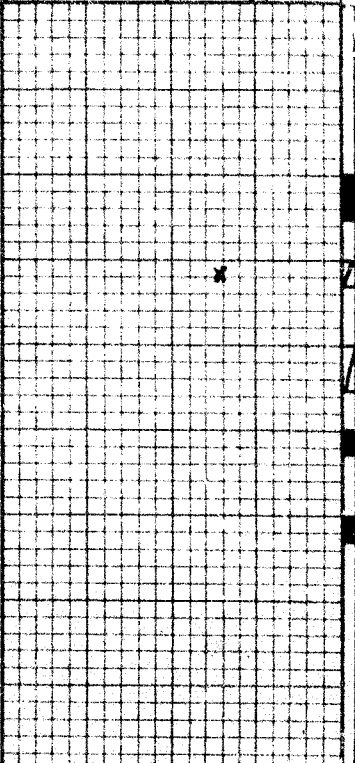
W.P. ----- BORE HOLE NO. 10A
 JOB 61-F-100 STATION 24+00 (305' Lt.)
 DATUM 931.0' COMPILED BY B.K.
 BORING DATE Oct. 13/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE -----
 2" SHELBY TUBE -----
 2" SPLIT TUBE -----
 2" DIA. CONE -----
 2" SHELBY -----
 CASING -----

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) ----- O
 VANE TEST (C) AND SENSITIVITY (S) ----- +
 NATURAL MOISTURE AND LIQUIDITY INDEX ----- LI
 LIQUID LIMIT ----- X
 PLASTIC LIMIT -----

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE				
				500	1000	1500	2000	P.S.F.
	↓ Waterlevel	932.0	0	10	20	30	40	BLOWS/FT.
	Water	931.0						
	Organic muck with clayey silt. V. soft Black-Br. grey.	924.0	10					
	Clayey silt and silty clay Stratified V. soft to soft. Grey.	911.0	20					
	Clayey silt changing to silt at Elev. 900.0 Compact Grey	894.0	30					
	End of borehole.		40					

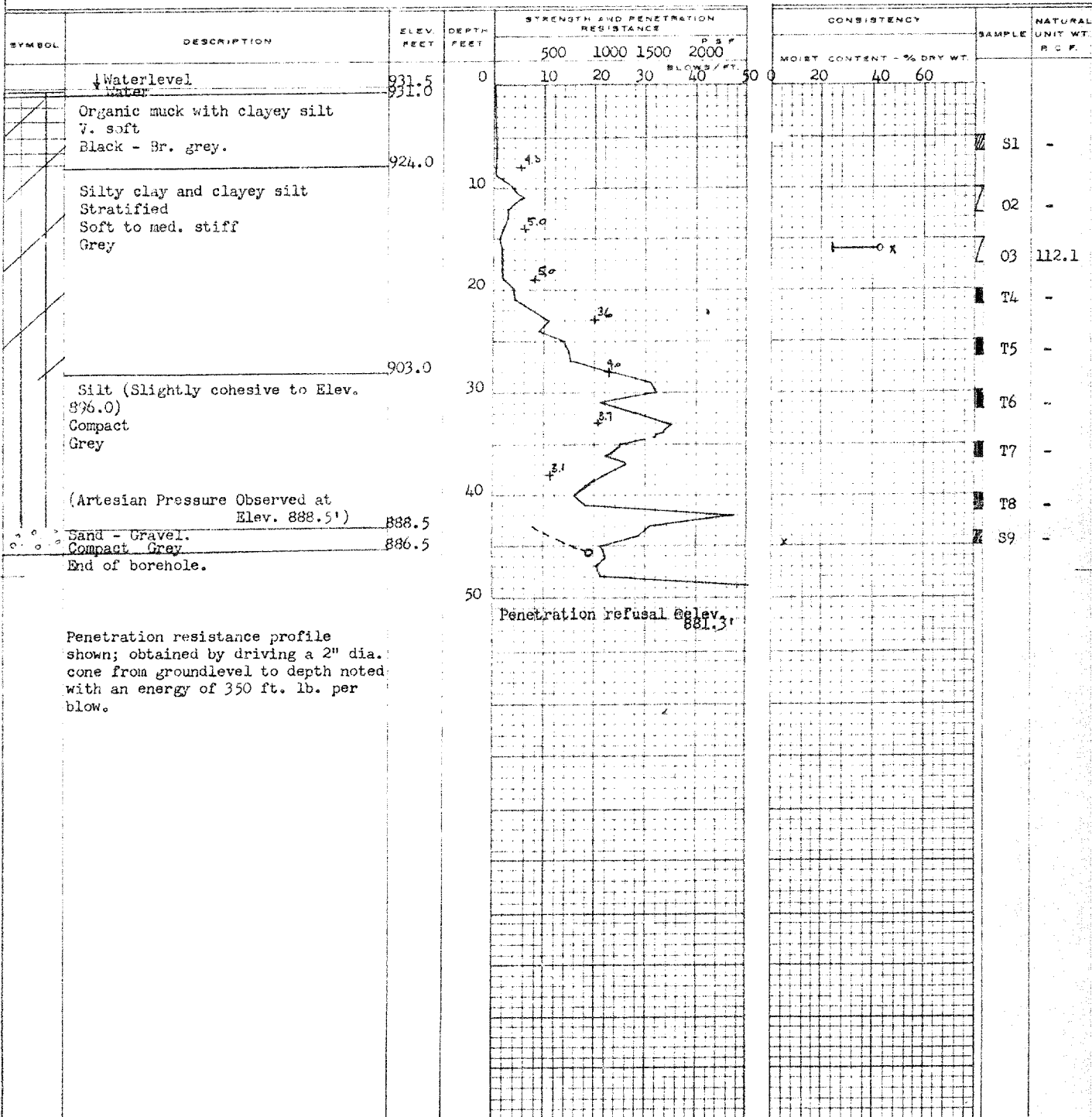
CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			T1	-
			O2	107.0
			O3	-
			T4	-
			T5	-

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 1
 JOB 61-F-100 STATION 23+00 (300' L.L.)
 DATUM 931.0' COMPILED BY B.K.
 BORING DATE Oct. 16/61. CHECKED BY B.M.G.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) 0
 VANE TEST (C) AND SENSITIVITY (S) --- +5
 NATURAL MOISTURE AND LIQUIDITY INDEX X
 LIQUID LIMIT --- 0
 PLASTIC LIMIT --- 0



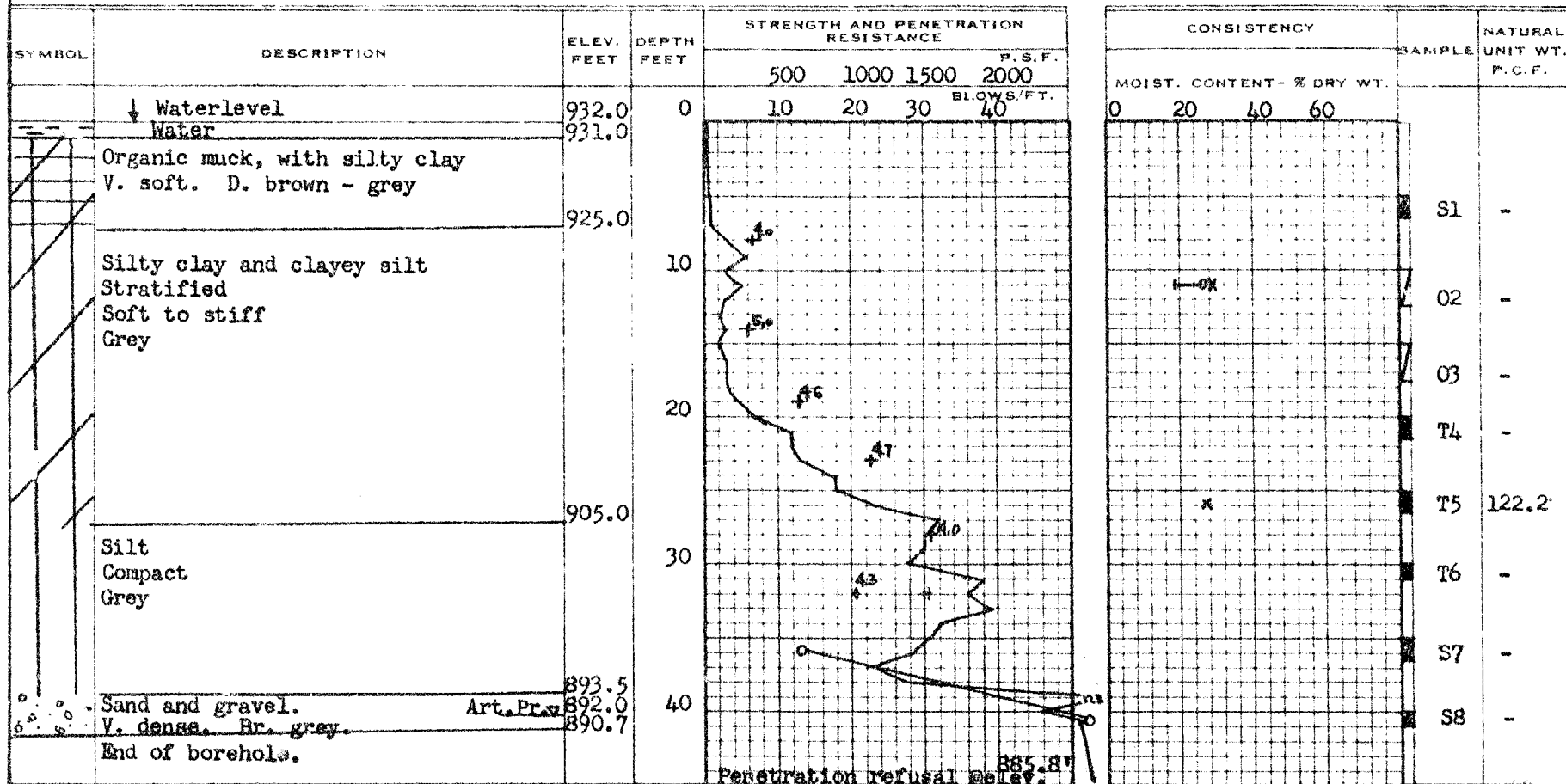
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 12
 JOB 61-F-100 STATION 25+00 (190' Lt.)
 DATUM 931.1' COMPILED BY B.K.
 BORING DATE Oct. 16/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA. CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____ O
 VANE TEST (C) AND SENSITIVITY (S) _____ +
 NATURAL MOISTURE AND LIQUIDITY INDEX _____ LI
 LIQUID LIMIT _____ X
 PLASTIC LIMIT _____



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 13JOB 61-F-100 STATION 24+00 (190' Lt.)DATUM 931.83 COMPILED BY B.K.BORING DATE Oct. 18/61. CHECKED BY B.M.G.

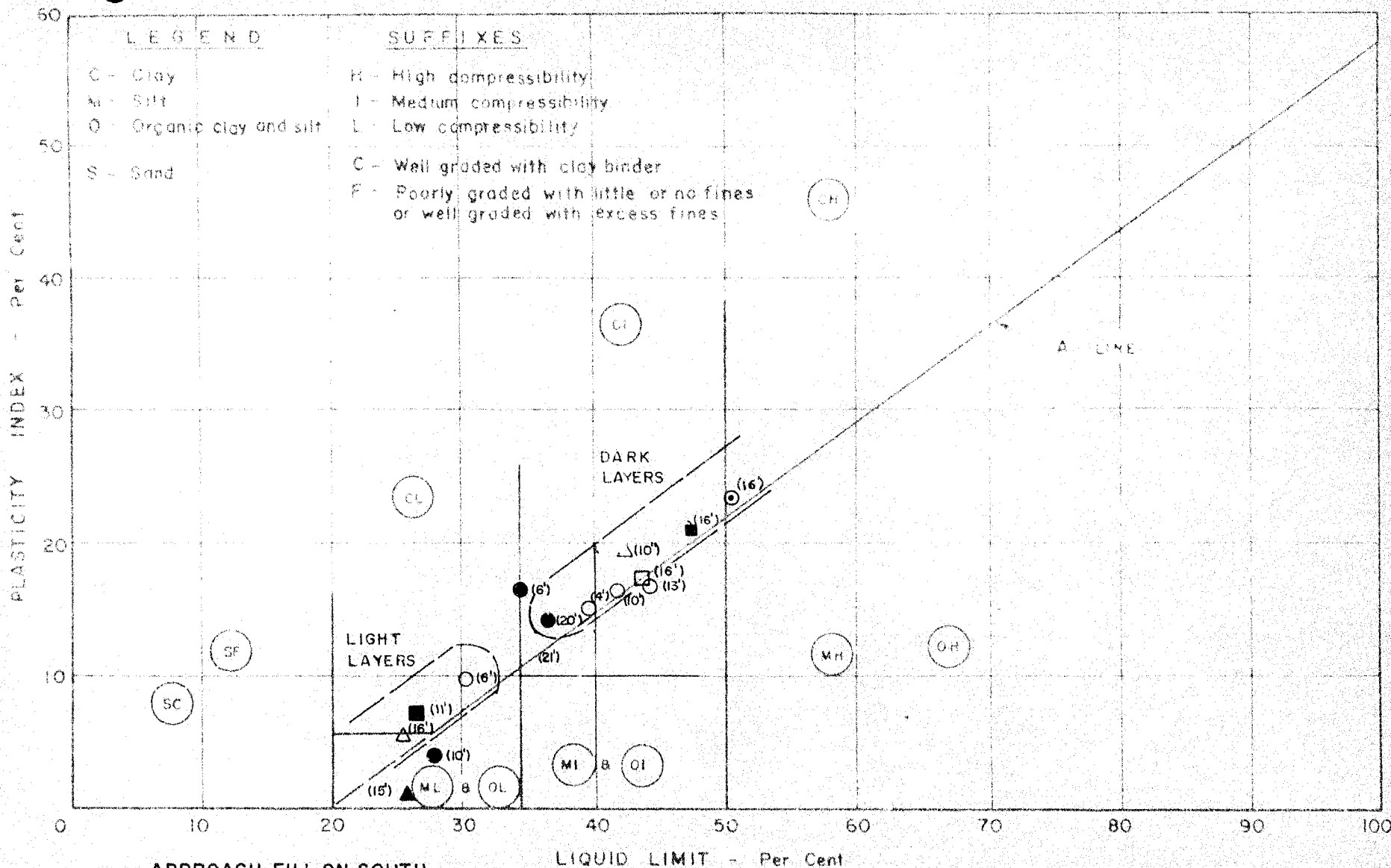
2" DIA. SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA. CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____ O
 VANE TEST (C) AND SENSITIVITY (S) _____ +
 NATURAL MOISTURE AND LIQUIDITY INDEX _____ LI
 LIQUID LIMIT _____ X
 PLASTIC LIMIT _____

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				500	1000	1500	2000
				P. S. F. BLOWS/FT.			
	Waterlevel	931.83	0	10	20	30	40
	Organic muck with clayey silt, V. soft D. brown - grey	931.0					
		924.83	10				
	Silty clay and clayey silt Stratified. Soft to stiff		20				
		904.83	30				
	Silt Compact Grey		40				
	Sand and gravel Dense, Grey	892.83					
	End of borehole.	890.33					

CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.					
0	20	40	60		
				S1	-
				S2	-
				O3	-
				O4	111.0
				T5	-
				T6	-
				T7	-
				S8	-
				S9	-



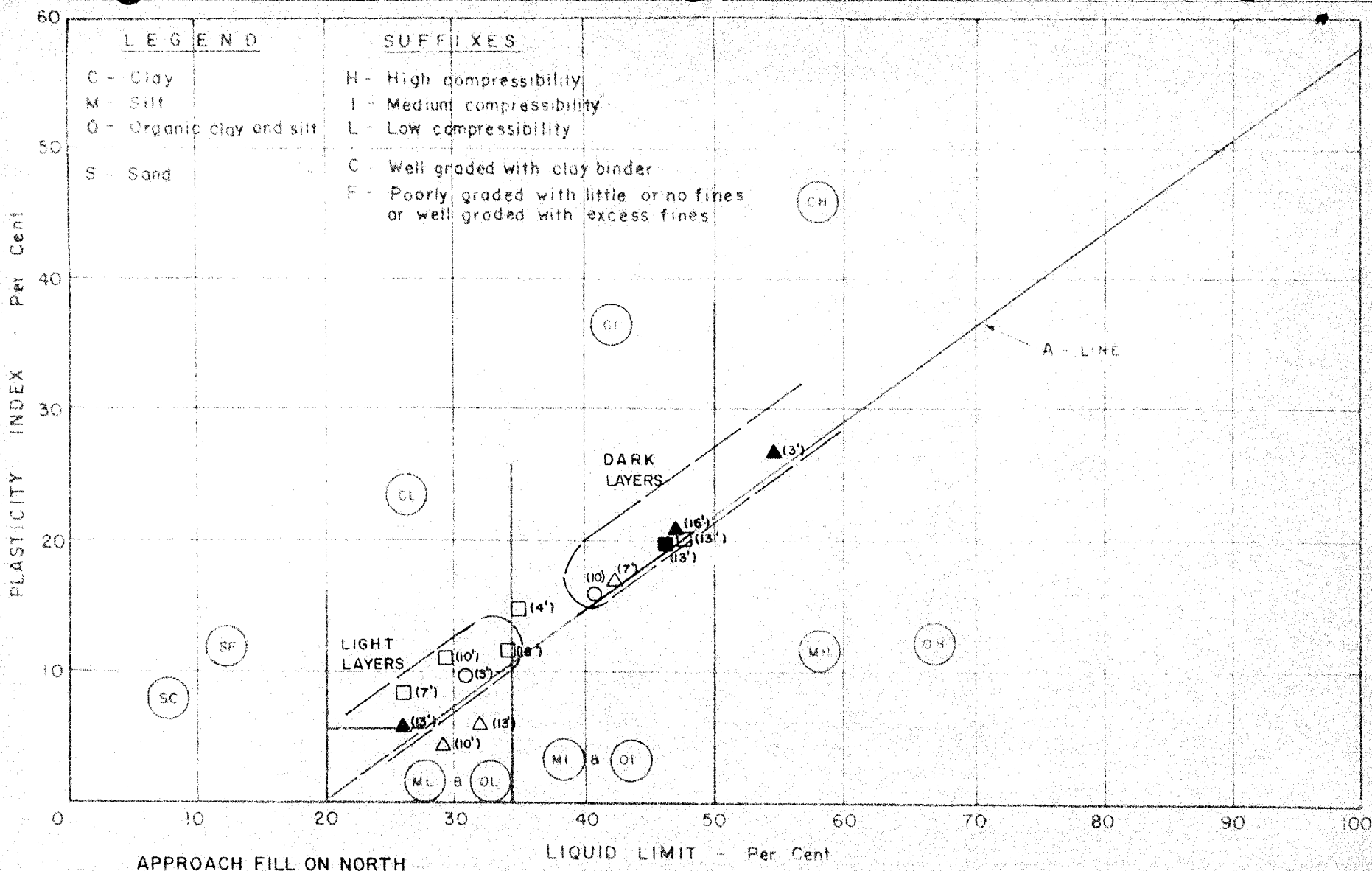
NOTES

- - B.H. NO. 1
- - B.H. NO. 2
- △ - B.H. NO. 9
- ▲ - B.H. NO. 10 & 10A

□ - B.H. NO. 12
 ⊙ - B.H. NO. 13
 Sample depths shown in brackets

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 PLASTICITY CHART

Job No. 61 - F - 100 W.P. No. —
 Location Huntsville By-Pass HIGHWAY 11



NOTES ○ - B.H. NO. 3
 △ - B.H. NO. 5
 ▲ - B.H. NO. 6

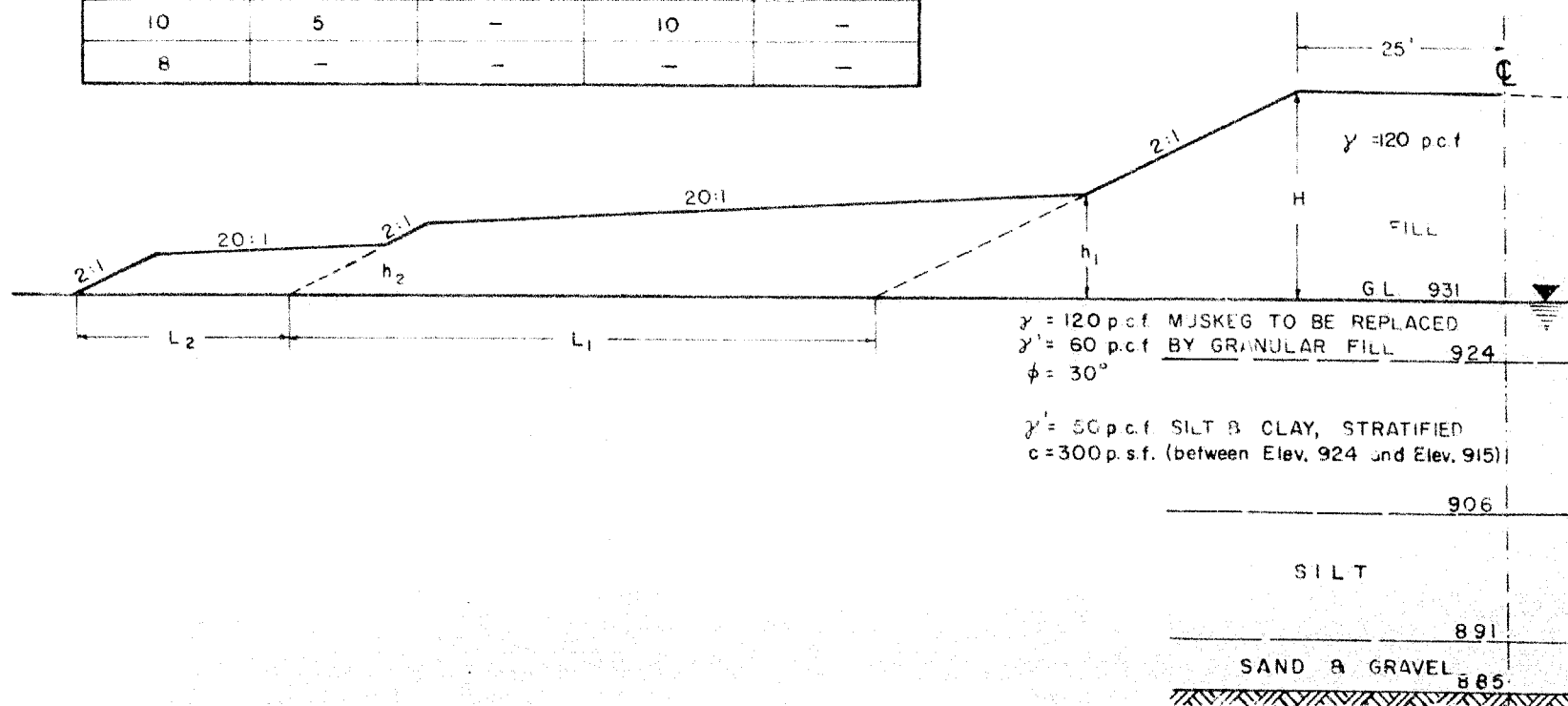
□ - B.H. NO. 7
 ■ - B.H. NO. 8

Sample depths shown in brackets

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 PLASTICITY CHART

Job No. 61 - F - 100 W.P. No. —
 Location HUNTSVILLE BY-PASS HIGHWAY II

HEIGHT OF FILL IN FEET	HEIGHT OF MAJOR BERM IN FEET	HEIGHT OF MINOR BERM IN FEET	LENGTH OF MAJOR BERM IN FEET	LENGTH OF MINOR BERM IN FEET
H	h ₁	h ₂	L ₁	L ₂
35	17.5	8	120	35
30	15	8	110	30
25	12.5	6	70	25
20	10	5	55	15
15	8	-	25	-
10	5	-	10	-
8	-	-	-	-

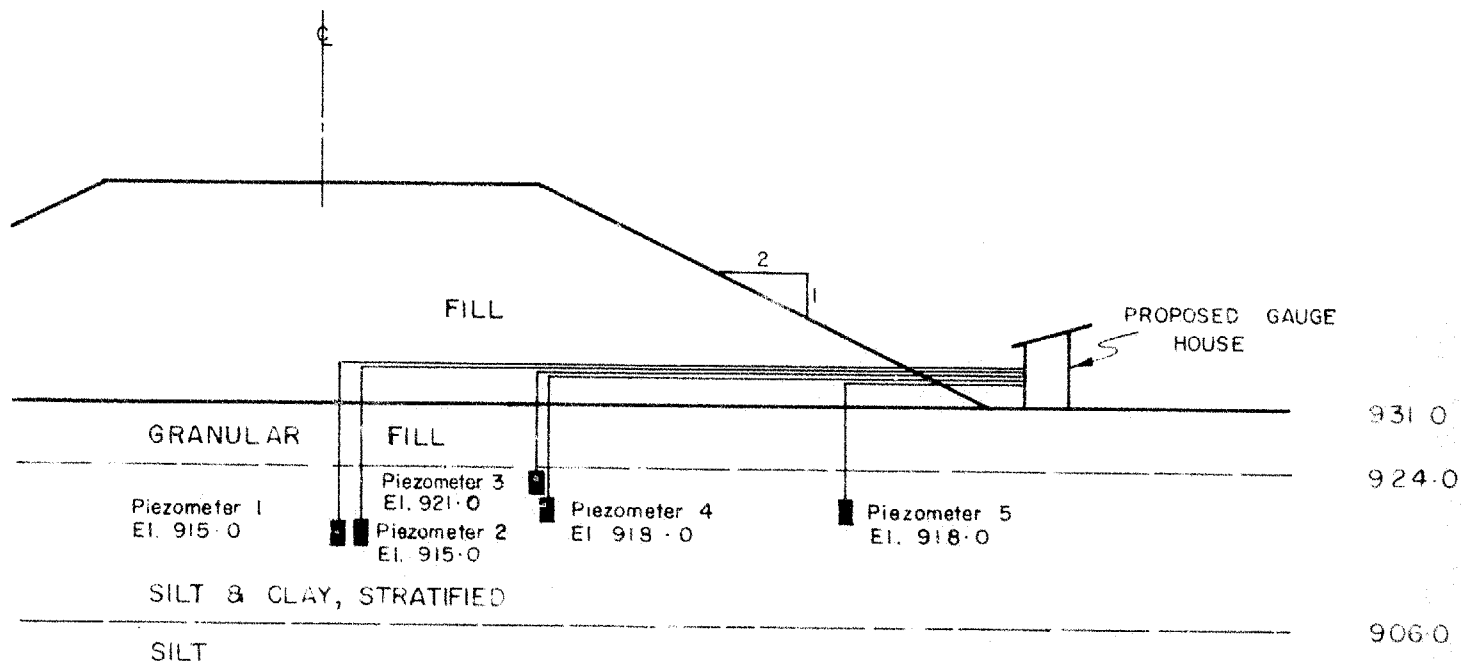


ORIGINATED B. GHADIAL
 DRAWN A. CHOPOFF
 CHECKED
 APPROVED
 DATE 10 JAN 1962
 DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 TYPICAL BERM DETAILS
 SOUTH EMBANKMENT
 SCALE 1 inch = 20 feet
 W.P. NO.
 JOB NO. 61-F-100
 DWG. NO. 61-F-100B

ORIGINATED B. GHADIALI
DRAWN D. MUMFORD
CHECKED
APPROVED
DATE 25 JULY 1962

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION
PIEZOMETER LOCATIONS
SOUTH EMBANKMENT

SCALE 1 inch = 20 feet
W.P. NO.
JOB NO. 61-F-100
DWG NO. 61-F-100C



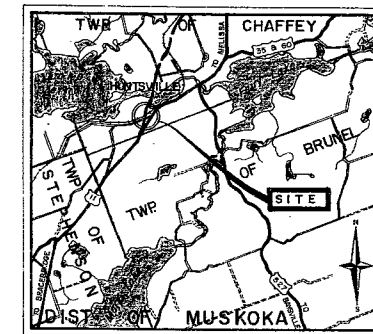
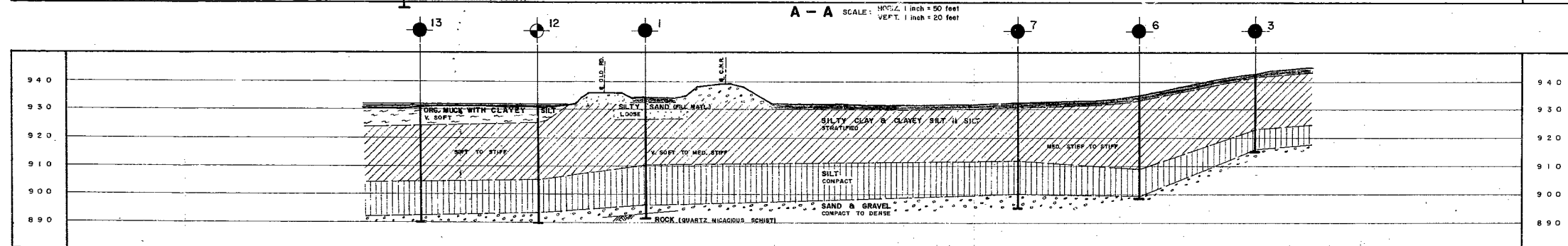
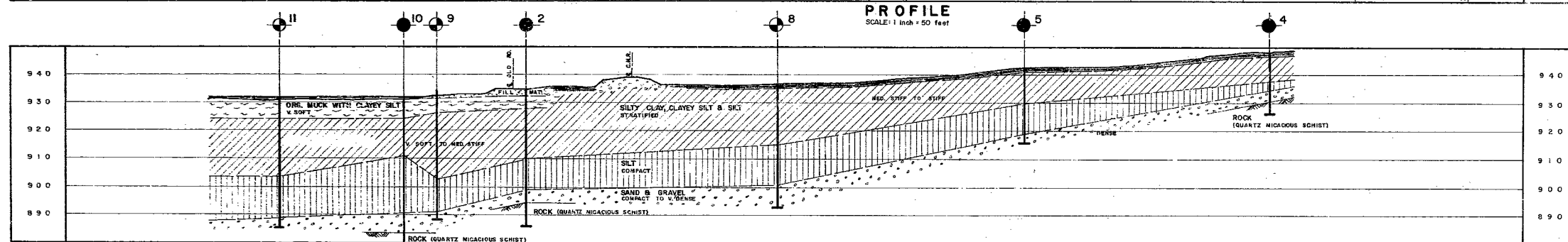
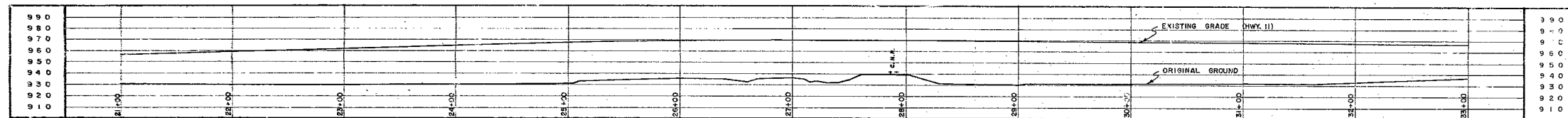
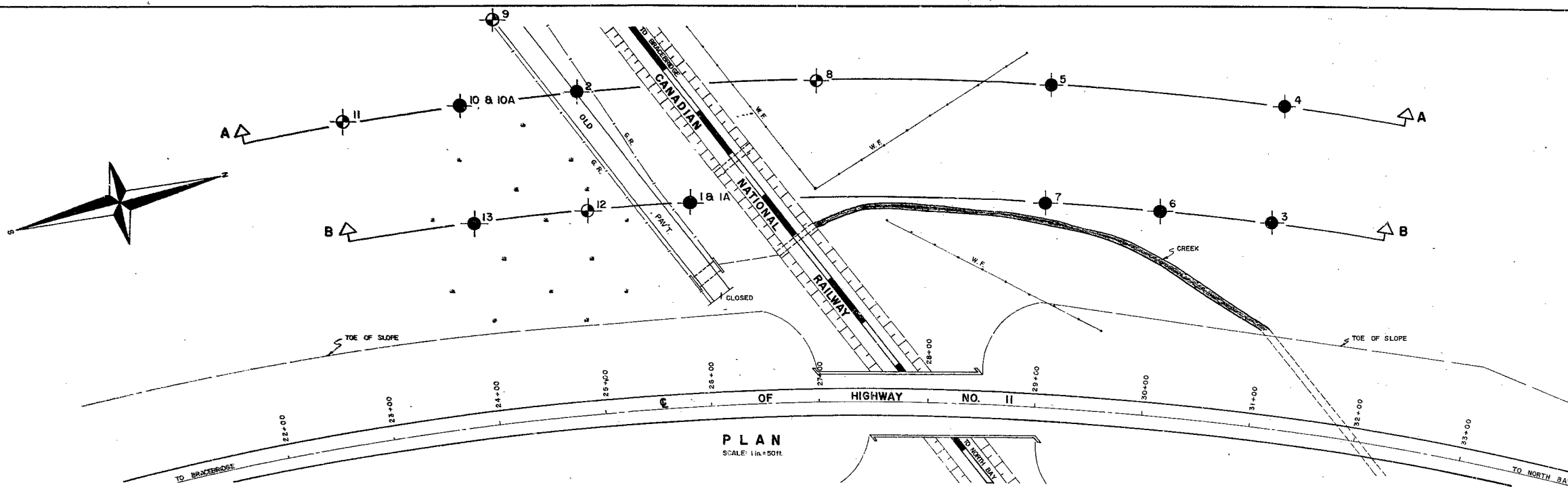
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61-F-100

HWY #11

HUNTSVILLE

By-Pass



LEGEND			
	BORE & PENETRATION HOLE		
	BORE HOLE		
	WATER LEVELS established at time of field investigation (SEPT. 1961)		
HOLE	ELEVATION	STATION	OFFSET
1	934.5	25+90	190' LT.
1A	934.5	25+85	190' LT.
2	935.0	25+00	300' LT.
3	943.0	31+00	190' LT.
4	948.0	31+00	300' LT.
5	943.0	29+00	300' LT.
6	935.0	20+00	190' LT.
7	933.0	29+00	190' LT.
8	937.0	27+00	300' LT.
9	935.0	24+40	375' LT.
10	931.0	24+00	300' LT.
10A	931.0	24+00	300' LT.
11	931.0	23+00	300' LT.
12	931.0	25+00	190' LT.
13	931.0	24+00	190' LT.

637600
5019350
31 EGE
17

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH SECTION		
CANADIAN NATIONAL RAILWAY AND HIGHWAY NO. 11 (HUNTSVILLE BYPASS)		
ORIGINATED B. GHADALI	DISTRICT NO. 11	DATE 22 NOV. 1961
DRAWN D. MUMFORD	W.P. NO.	JOB NO. 61-F-100
CHECKED <i>AK</i>	SCALE	DRAWING NO.
APPROVED <i>M. Devata</i>	AS SHOWN	61-F-10CA