

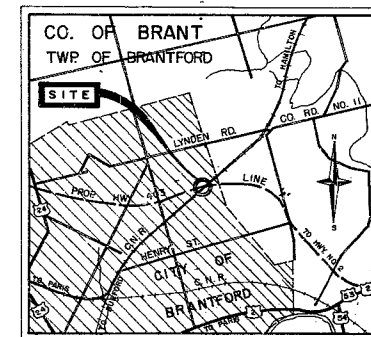
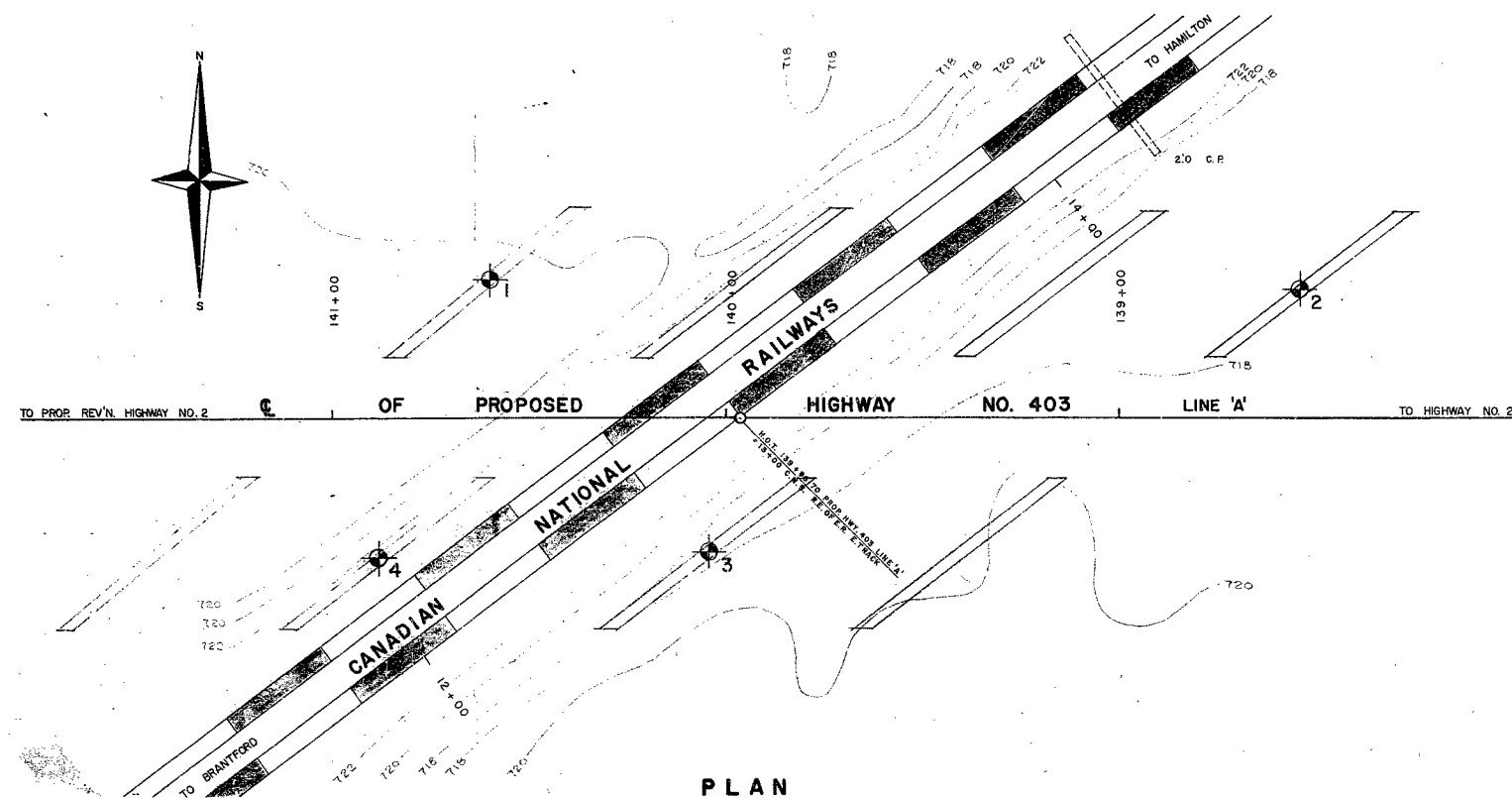
61-F-77

W.P. [#]146-60

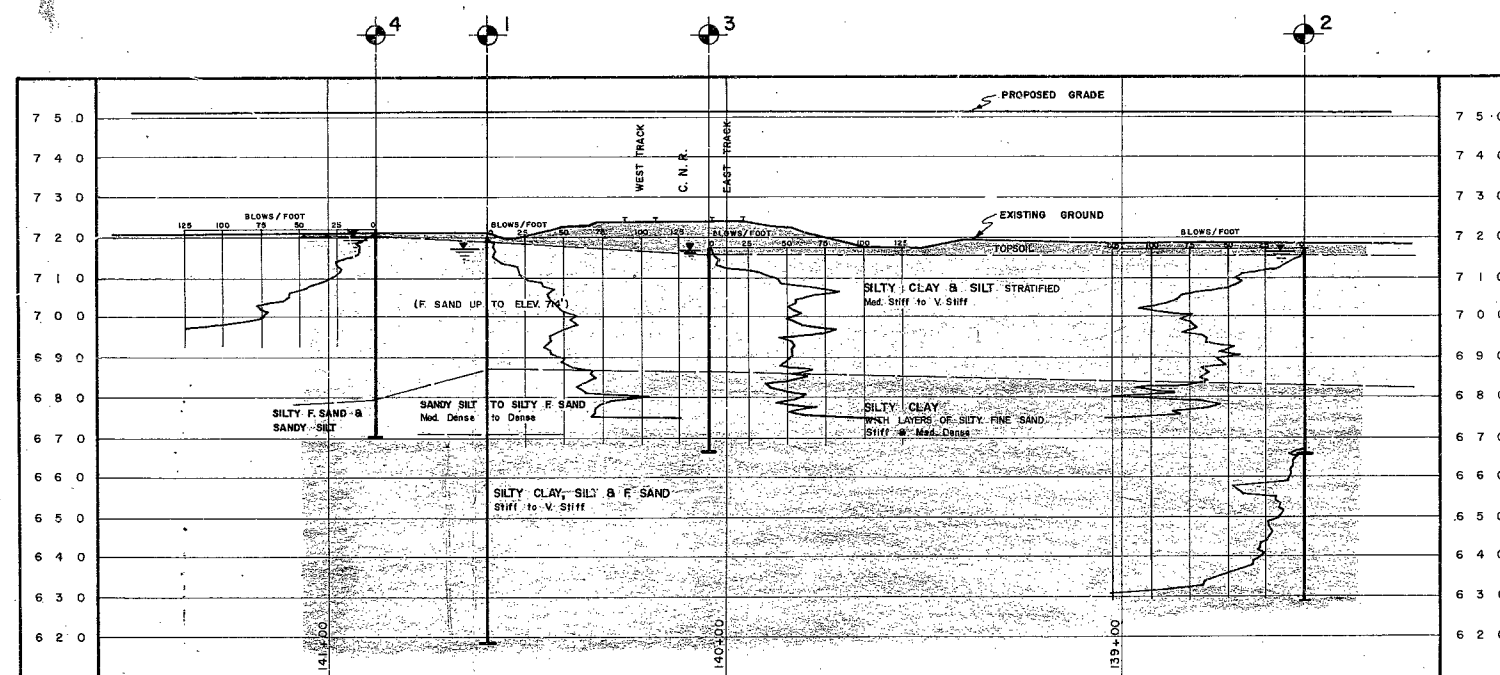
Hwy [#]403

C. N. R.

BRANTFORD



KEY PLAN
SCALE: 1 inch = 1 mile



PROFILE AT CL

LEGEND			
	BORE & PENETRATION HOLE		
	WATER LEVEL		
	BLOWS / FOOT - DYNAMIC CONE		
HOLE	ELEVATION	STATION	OFFSET
1	720.2	140+60	35' RT.
2	717.4	138+54	33' RT.
3	717.7	140+04	34' LT.
4	722.0	140+88	35' LT.

DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
C.N.R. IN BRANTFORD AND PROPOSED HIGHWAY NO. 403 LINE "A"		
ORIGINATED B. GHADIALI	DISTRICT NO. 4	DATE 12 SEPTEMBER 1961
DRAWN D. MUMFORD	W.P. NO. 146-60	JOB NO. 61-F-77
CHECKED <i>[Signature]</i>	SCALE	DRAWING NO.
APPROVED <i>[Signature]</i>	1 INCH = 20 FEET	61-F-77A

REF. NO. E-3980-1

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Division,
(Foundations Office).

November 1, 1961.

ADDITIONAL INFORMATION -
D.H.O. FOUNDATION INVESTIGATION
W.J. 61-F-77 -- W.P. 146-60.

Attention: Mr. C. Bassi

Re: Approaches for the proposed Overhead Structure
over C.N.R. Tracks, for Hwy. #403, City of
Brantford, District No. 4.

With regard to your query in connection with the approach fill for the above-mentioned structure, we are of the opinion that the forward slopes may be constructed 1-1/2 horizontal to 1 vertical.

Since this is less than the standard slopes, care should be taken that the required and specified density of the fill material be achieved.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.
Per:

BMG/MdeF

B. M. Ghadiali
(B. M. Ghadiali,
PROJECT FOUNDATION ENGR.)

cc: Mr. B. Davis

Foundations Office ✓
Gen. Files.

61-F-77

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Division,
(Foundation Section)
Attention: Mr. Frank Gormek.

December 21, 1961.

Re: Hwy. #403 Overpasses -
✓ W.P. 146-60 and
W.P. 149-60, District #4

This is to confirm our telephone conversation of today's date, December 21st, regarding the friction between the footing and granular material.

Recent investigations carried out by G. G. Meyerhof and reported at the 15th Canadian National Soil Mechanics Conference, held in Montreal, 1961, have shown that the angle of skin friction is between 0.9 and 1.0 of the angle of internal friction.

If the foundation material consists of well-compacted granular material with an assumed angle of internal friction of 35° , a co-efficient of friction of 0.7 can be used for design purposes.

AGS/MdeF

agf
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Mr. B. Davis

Foundations Office
Gen. Viles.

OFFICE LOCATION -

DOWNSVIEW AVE.,
KEELE ST. - HIGHWAY 401
TORONTO, ONTARIO.



ONTARIO

DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS -

DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS,
TORONTO 5, ONTARIO.

Bridge Division,
December 27, 1961.

Murphy
Jan 2, 1962
ago

MEMORANDUM TO:

Mr. A. Stermac,
Principle Foundation Eng.,
Department of Highways,
Room 107, Lab. Bldg.,
DOWNSVIEW, Ontario.

RE: W.P. 146-60
C.N.R. Overhead
2.1 mi. East of Hwy. #24
Hwy. No. 403-Dist. No. 4

Attached please find one print of Plan D4960-P1
for the subject structure.

Would you please let us have your comments.

P. Le Tissier

FDeV/ea

F. Levisser,
Bridge Location Engineer.

Discussed with Mr. Frank Turner of Bridge Office (Room 3516)
about the excavation procedure for pier footings, under the fill material.
It would be specified in Construction Plans that proper bracing should
be provided at the time of pier footing excavations.
Elec. for piers on E. West side may be moved to 718'. Drafted a letter.

B. M. G.

Jan. 8, 1962

Mr. J. Regan,
Construction Supervisor,
Hamilton District.

Materials & Research Division.

October 8th, 1963.

Hwy. #403, Cont. #63-03, Gravel Fill Foundation
under T.H. & B. and C.H.R. O'head Abutment.

This memo refers to discussions in the field with you on the morning of October 3rd, 1963, and with Mr. Tansley later that day.

Compaction check results are much too uneven. The percent Proctor compaction fluctuates between 100% and 90%, with an average to-date of just over 95%.

The specified compaction for these fills which will carry bridge abutments is 100%.

It appears to me that an improvement will not be achieved until fill operations are organized in such a manner that each layer is spread and rolled in its entirety before trucks dump further gravel for the next layer.

RS/hl
c.c. J. Tansley,
A. Stormac, ✓
T.J. Kovich,
Files.

R. Schopf
R. Schonfeld,
For: T.J. Kovich,
Regional Materials Engineer.

Mr. Stormac contacted R. Schopf and as pointed out again strongly about the compaction operation to be carried out at the above mentioned job. He also mentioned that Mr. Levata was here on 8th Oct/63 and observed that the compaction operation is going at a very rapid rate.
Mr. Levata
Oct 14/63

cc: Foundations Office

GEN. FILES 23-63-03

Refer also 63-F-97

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section,
(Foundations Office)

September 28, 1961.

D.H.C. FOUNDATION INVESTIGATION
REPORT -
W.J. 61-F-77 -- W.P. 146-60.

Attention: Mr. S. McCombie.

Re: Proposed Overhead Structure over C.N.R. Tracks,
for Hwy. 403, City of Brantford, County of Brant.
District No. 4.

Accompanying this memo, is our detailed foundation
report on the subsoil conditions existing at the above structure
location.

We believe you will find the conclusions and recom-
mendations summarized therein, adequate for your future design
work.

If we can be of further assistance in connection with
this project, please do not hesitate to contact our Office.

AGG/WdeP
Attach.

A. C. Sterns
A. C. Sterns,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
B. D. McMillan
I. C. Campbell
J. C. Thatcher
I. J. Kovich
J. Roy
E. R. Saint
J. E. Gruspier
F. Norman
A. Watt
Foundations Office ✓
Gen. Files.

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-

FOUNDATION INVESTIGATION

For

Proposed Overhead Structure over C.N.R. Tracks
for Hwy. 403, City of Brantford, County of Brant,
W.J. 61-P-77 -- W.P. 146-60 -- District 4

1. INTRODUCTION:

It is proposed to construct an overhead at the intersection of proposed Hwy. 403 and C.N.R., approximately 2 miles east of the junction of Hwy. 24 and proposed Hwy. 403, in the City of Brantford and County of Brant, (Sta. 139+96.70, Plan No. E 3980-1).

A subsoil investigation was carried out at the above-mentioned overhead location. The field and laboratory findings, as well as recommendations, are presented in this report.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site under consideration, is generally flat and consists mostly of farm land. Physiographically, this area is known as the Haldimand Clay Plain.

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

Field work consisted of four sampled boreholes supplemented by dynamic cone penetration tests adjacent to each borehole. The exploration programme was carried out by a standard coredrill machine adapted for soil sampling. Conventional wash boring procedure was followed. Samples were recovered at required depths, by means of

cont'd. /2 ...

3. DESCRIPTION OF FIELD AND LABORATORY WORK: (cont'd.) ...

a 2-inch I.D. Shelby tube and by a 2-inch O.D. split spoon sampler. The dimension of this spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration test. In-situ vane tests were carried out wherever possible, in order to determine the shear strength of the cohesive deposits.

Drawing No. 61-F-77A 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, to determine:-

- a) Natural moisture contents
- b) Bulk densities
- c) Grain Size distribution
- d) Atterberg limits
- e) Undrained Shear Strengths
- f) Consolidation curves

Laboratory and field test results have been summarized and are included under Appendix I of the report.

4. SUBSOIL CONDITIONS:

4.1) General:

The stratigraphy of the soil at the site was found to be generally uniform. Detailed descriptions of various types encountered in each boring, are shown in Appendix I of this report. The estimated stratigraphical profile of Drawing 61-F-77A is based upon this information.

cont'd. /3 ...

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

4.1) General: (cont'd.) ...

The subsoil consists of the following strata:-

- i) Silty clay and silt, stratified.
- ii) Silty clay with layers of silty fine sand, or sandy silt to silty fine sand.
- iii) Silty clay, silt and fine sand, stratified.

4.2) Silty Clay & Silt, stratified:

This stratum extends below the topsoil to a depth of 30 ft. to 34 ft. The upper 10 ft. of this deposit were found to be in a stiff state and exhibited a brown colour due to oxidation. Immediately below the oxidized layer, the non-oxidized portion of the cohesive deposit was encountered. This was marked by a definite change in colour from brown to grey-brown. The individual layers or stratifications are predominantly composed of either silty clay or silt, and vary randomly and widely in thickness from 1/8 inch to a foot or more. Generally, the clay is of low to intermediate plasticity, whereas the silt is of low plasticity. The shear strengths obtained in the laboratory agree closely with field vane. The shear strength of this material varies from 610 p.s.f. to 2000 p.s.f.

The standard penetration values obtained in the stratum ranged from 6 to 20 blows/ft. These, together with the shear strengths quoted above, indicate that the consistency of the clay and silt layers varies from med. stiff to very stiff.

The wet unit weight of this stratified silty clay and silt varies from 118 p.c.f. to 125 p.c.f. The moisture content of this layer range from 26% to 29%, with an average value of 26.3%. The liquid limits range from 25% to 37%, with an average of 31.2%, and

cont'd. /4 ...

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

4.2) Silty Clay & Silt, stratified: (cont'd.) ...

the plastic limits range from 15% to 19%, with an average of 18%.

Consolidation tests were carried out on some of the thicker clay layers and the e log p curves are presented in this report (Appendix I). Laboratory test results show that the pre-consolidation effect due to desiccation evidenced in the upper oxidized zone, extends into the non-oxidized silty clay.

4.3) Silty Clay with Layers of Silty Fine Sand or Sandy Silt to Silty Fine Sand:

In B.H. No's. 3 and 4, underlying the stratified silty clay and silt, a layer approx. 15 ft. thick of stiff silty clay with layers of silty fine sand, was found, whereas in B.H. No's. 1 and 2 immediately below the stratified silty clay and silt, a layer approx. 10 ft. to 18 ft. thick of med. dense to dense silt to silty fine sand, was encountered.

The Standard Penetration resistances obtained in the non-cohesive silt and silty fine sand stratum ranged from 18 to 47 blows per foot which indicates the relative density of this material to vary from med. dense to dense.

The cohesive deposit of silty clay is generally of low to intermediate plasticity. Occasional layers of fine sand were observed within this deposit. Shear strength measurements vary from 1000 p.s.f. to 1640 p.s.f. which indicates the consistency of this material to be stiff.

cont'd. /5 ...

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

4.4) Silty Clay, Silt and Fine Sand, stratified:

This material was encountered in B.H. No. 1 at approx. elev. 670.0' immediately below the non-cohesive deposit of silt and silty fine sand. The thickness of this layer was not established because the borehole was terminated at elev. 620.0'. The shear strength of the cohesive layer varies from 1120 p.s.f. to 2000 p.s.f. which indicates the consistency of this deposit to be from med. stiff to stiff. The Standard Penetration resistances, or 'N' values which were obtained in the fine sand layers with an average of 40 blows per ft., indicate the relative density of non-cohesive layers to be generally dense.

5. GROUND WATER CONDITIONS:

Observations and measurements carried out during boring and sampling operations, indicate the water level to be at the approximate elevation 716'. The exact depths at which the water level was observed in each boring, are given below:-

<u>Borehole</u>	<u>G.W. Elevations</u>	<u>B.H. Elevations</u>
1	717.1'	720.2'
2	715.1'	717.4'
3	716.7'	717.4'
4	720.5'	722.0'

The above depths have been established at the time of the investigation. It is possible that the water table at different times, may vary, and it is therefore recommended that the ground water table be established prior to the beginning of the construction.

6. DISCUSSION AND RECOMMENDATIONS:

The proposed overhead which will carry the future Hwy. 403 over the C.N.R. lines is conceived as a 3-span structure. At the chosen location the subsoil conditions are generally uniform. The uniformity of the subsoil and the presence of a pre-consolidated zone 10 ft. deep, with higher shear strengths than the underlying soil, indicates that spread footings should be considered for the foundations of the structure. In order to confine the major effects of the induced stresses caused by the structural load to the top layer of the soil, the footings should be placed as high in this layer as frost conditions will allow - i.e., 5 ft. below ground level. It is recommended to use a safe bearing load of 1.5 T/sq.ft. for footing design with a minimum width of footing 6 ft. to 7 ft. The approx. elevations for footings at the pier locations are given below:-

South-East Pier Elev. 716.0'

North-West Pier Elev. 713.0'

It appears that two proposals can be considered for abutment supports:

i) Abutments can be supported on spread footings founded in the compacted fill, using a safe bearing pressure of 2 T/sq.ft.

ii) Abutments can be supported on 12" Ø friction piles driven to a depth of 45 ft. below the natural ground in the underlying stratified silt, silty clay and fine sand. For piles driven to this depth, a design load of 20 T/pile can be used.

cont'd. /7 ...

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

In considering proposal (ii), it must be noted that friction piles do not necessarily eliminate or diminish settlements. Therefore, it is our recommendation that proposal (i) - i.e., spread footings for the abutment, should be adopted, provided the approach fills are constructed at least 6 months prior to the construction of the piers and the deck. The embankment fill should be constructed in 6" layers to a specified 100% density of the current D.H.O. method. This degree of compaction will have to be confirmed during construction by in-situ density tests.

No dewatering problems during excavation, can be anticipated because of the low permeability of the clayey subsoil. The quantity of seepage inflow should be small and readily handled by low-capacity pumps.

The proposed embankment at the approaches will be approx. 27 ft. high. No approach fill stability problems are anticipated provided that the side slopes are 2 horizontal to 1 vertical.

Due to the presence of compressible layers of clay in the subsoil, some settlements of the footings are to be expected. It is very difficult to estimate the probable differential settlements because of the stratified nature of the subsoil. In view of the fact that settlements are anticipated, it is recommended that a simply supported structure be designed. Provisions for jacking at the abutments and pier locations should be provided. It is already mentioned elsewhere in the report that the approach fills should be constructed at least six months prior to the construction of the structure, which also will accelerate the settlements.

cont'd. /8 ...

7. SUMMARY:

The subsoil generally consists of stratified silty clay, silt and fine sand.

The strength and compressibility characteristics of the stiff crust of clay are such that spread footings can be used at the recommended depth of 5 ft. below present ground level. Permissible loading at the base of the footings for the piers, typically 6 ft. to 7 ft. wide, is not to be greater than 1.5 T/sq.ft. Recommended footing elevations at the pier locations are as follows:

North-West Pier Elev. 713.0'

South-East Pier Elev. 716.0'

Spread footing supports for the abutments can be obtained in the compacted approach fill. In such a case, a safe bearing pressure of 2 T/sq.ft. can be used for footing design.

As an alternative to spread footings, abutments may be supported on 12" \emptyset friction piles driven to a depth of 45 ft. below the natural ground in the underlying stratified silt, silty clay and fine sand. For piles driven to this depth, a design load of 20 T/pile can be used.

It must be noted that friction piles do not necessarily eliminate or diminish settlements and, therefore, spread footings for the abutments should be adopted.

It is our recommendation that the approach fills be constructed at least 6 months prior to the construction of the structure. The embankment fill should be constructed in 6" layers to the specified 100% density of the current D.M.C. method. This degree of compaction will have to be checked during construction, by in-situ

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

density tests.

No embankment stability problems are anticipated. It is recommended that the approach fills be constructed with side slopes of 2 horizontal and 1 vertical.

Ground water conditions are such that the excavations for footings at the above recommended depth, may not be dry. However, any seepage inflow could be readily handled by low-capacity pumps.

Due to the presence of the compressible clayey layers, settlement of the footings is anticipated. Therefore, a simply supported structure is recommended with provisions for jacking.

8. MISCELLANEOUS:

Field work was commenced on Aug. 11, 1961, and was completed by Aug. 18, 1961. Equipment was owned and operated by a crew of Johnston's Drilling Co. of Ottawa.

Supervision of the field work was done by Mr. B.M. Ghadiali of this section.

September 1961.

REPORT PREPARED BY :

Robert T. W. Allen
.....
B. M. Ghadiali,
PROJECT FOUNDATION ENGR.

REPORT APPROVED BY :

M. Devata
.....
M. Devata,
SR. PROJECT FOUNDATION ENGR.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-77

W.P. 146-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PEN. 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 clay. Med. stiff. Brown.	6	-	-	-	-	-	
	S2	6'-7.5'	Silt, silty clay and fine sand. Soft. Saturated. Brown.	2	-	-	-	-	-	
	T3	10'-11.5'	Silty clay. Stiff. Br. grey.	17	-	-	-	-	-	
	T4	15'-16.5'	Silty clay and silt, stratified, stiff Br. grey.	-	27.0	-	-	-	-	
	VANE	18'		Pushed	40.9	18.1	31.5	1130	122.8	
	T5	20'-21.5'	" " " "	-	-	-	-	1440	-	Sens: 5.3
	VANE	21.5'-22.5'		Pushed	-	-	-	-	-	
	T6	25'-26.5'	" " " "	-	-	-	-	>2000	-	
	VANE	28'		Pushed	24.8	-	-	-	-	
	VANE	31.5'		Pushed	36.3	19.2	28.1	1355	125.9	
	T7	32'-33.5'	Silty clay and silt, stratified. Med. stiff. Sandy silt. Dense. Br. grey.	-	-	-	-	1600	-	Sens: 4.0
	S8	35'-36.5'	Sandy silt med. dense. br. grey.	-	-	-	-	1560	-	Sens: 4.9
	S9	40'-41.5'	Silty sand and clayey sand. Dense. Grey.	16	-	-	-	-	-	
	S10	50'-52.5'	Silty sand and clayey sand. Dense. Grey.	20	20.6	-	-	-	-	
	VANE	52.5'-53.0'	Silty clay and silt, (stratified) stiff Br. grey.	46	-	-	-	-	-	
				7	-	-	-	-	-	
				-	-	-	-	>2000	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-77

W.P. 146-60

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
1	T11	60'-61.5'	Silty clay and silt, (stratified) stiff. Br. grey.	Pushed	-	-	-	-	-	Sens: 3.9
	VANE	61.5'-63.0'	" " " "	-	-	-	-	>2000	-	
	T12	70'-71.5'	" " " "	Pushed	-	-	-	-	-	
	VANE	71.5'-73.0'	" " " "	-	-	-	-	1120	-	
	SI3	100'-101.5'	Silty clay and silt. V. stiff Br. grey.	15	-	-	-	-	-	
2	S1	5'-6.5'	Silt and silty clay. V. stiff. Br. grey.	20	18.8	-	-	-	-	Sens: 3.8
	S2	10'-11.5'	" " " "	16	-	-	-	-	-	
	S3	15'-16.5'	Silty clay and silt, stratified, stiff. Br. grey.	7	31.3	18.0	36.6	-	-	
	T4	20'-21.5'	Silt, clayey silt and fine sand seams med. stiff. Br. grey.	Pushed	-	-	-	-	-	
	VANE	23'	" " " "	-	-	-	-	1440	-	
	T5	25'-26.5'	Silty clay and silt. Stiff.	Pushed	27.5 42.9	- 19.1	- 32.4	- 873	- 122.0	
	VANE	28'	" " " "	-	-	-	-	1360	-	
	T6	30'-31.5'	Silty clay. Stiff. Grey.	Pushed	-	-	-	-	-	
	VANE	33'	" " " "	-	-	-	-	1040	-	Sens: 3.7

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-77

W.P. 146-60

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	S7	35'-36.5'	Silty fine sand and sandy silt Med. dense. Br. grey.	25	-	-	-	-	-	
	T8	40'-41.5'	Silty clay and silt, stratified. Stiff. Br. grey.	Pushed	-	-	-	-	-	
	VANE	43'		-	-	-	-	1680	-	Sens: 3.7
	VANE	51.5'		-	-	-	-	1520	-	Sens: 3.6
3	S1	3'-4.5'	Silt and silty clay. Stiff. Brown.	14	-	-	-	-	-	
	S2	6'-7.5'	Silt and silty clay, stratified. V. stiff. Br. grey.	29	-	-	-	-	-	
	S3	10'-11.5'	Silt, silty clay and fine sand seams. Hard. Br. red and grey.	35	-	-	-	-	-	
	T4	15'-16.5'	Silty clay and silt, stratified. Stiff. Br. grey.	Pushed	28.3	18.9	33.9	539	118.1	
	VANE	16.5'-18.0'		-	-	-	-	>2000	-	
	T5	20'-21'	" " " "	Pushed	-	-	-	-	-	
	T6	25'-26.5'	" " " "	Pushed	-	27.8 27.0	19.2 18.0	32.5 27.0	- 610	- 119.9
	VANE	28'		-	-	-	-	960	-	Sens: 4.8

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-77

W.P. 146-60

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
3	T7	30'-31.5'	Silty clay, silt and sandy silt. Stiff. Br. red and grey.	12	-	-	-	-	-	Sens: 3.8
	T8	40'-41.5'	Silty clay and silt, stratified. Stiff. Br. grey.	Pushed	33.6	-	-	950	120.8	
	VANE	43'		-	-	-	-	1200	-	
	T9	50'-51.5'	" " " "	9	-	-	-	-	-	
4	S1	5'-6.5'	Silt, sandy silt and clayey silt. Stiff and med. dense. Brown.	12	-	-	-	-	-	
	S2	10'-11.5'	Silty clay. Stiff. Br. grey.	12	23.4	18.6	32.7	-	-	
	S3	15'-16.5'	Silty clay and silt, stratified. Stiff. Br. grey.	13	-	-	-	-	-	
	S4	20'-21.5'	" " " "	10	20.1	15.0	25.9	-	-	
	S5	25'-26.5'	Silty clay and silt, stratified. V. stiff. Br. grey.	17	-	-	-	-	-	
	T6	30'-31.5'	Silty clay and silt. Stiff. Br. grey.	4	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-77

W.P. 146-60

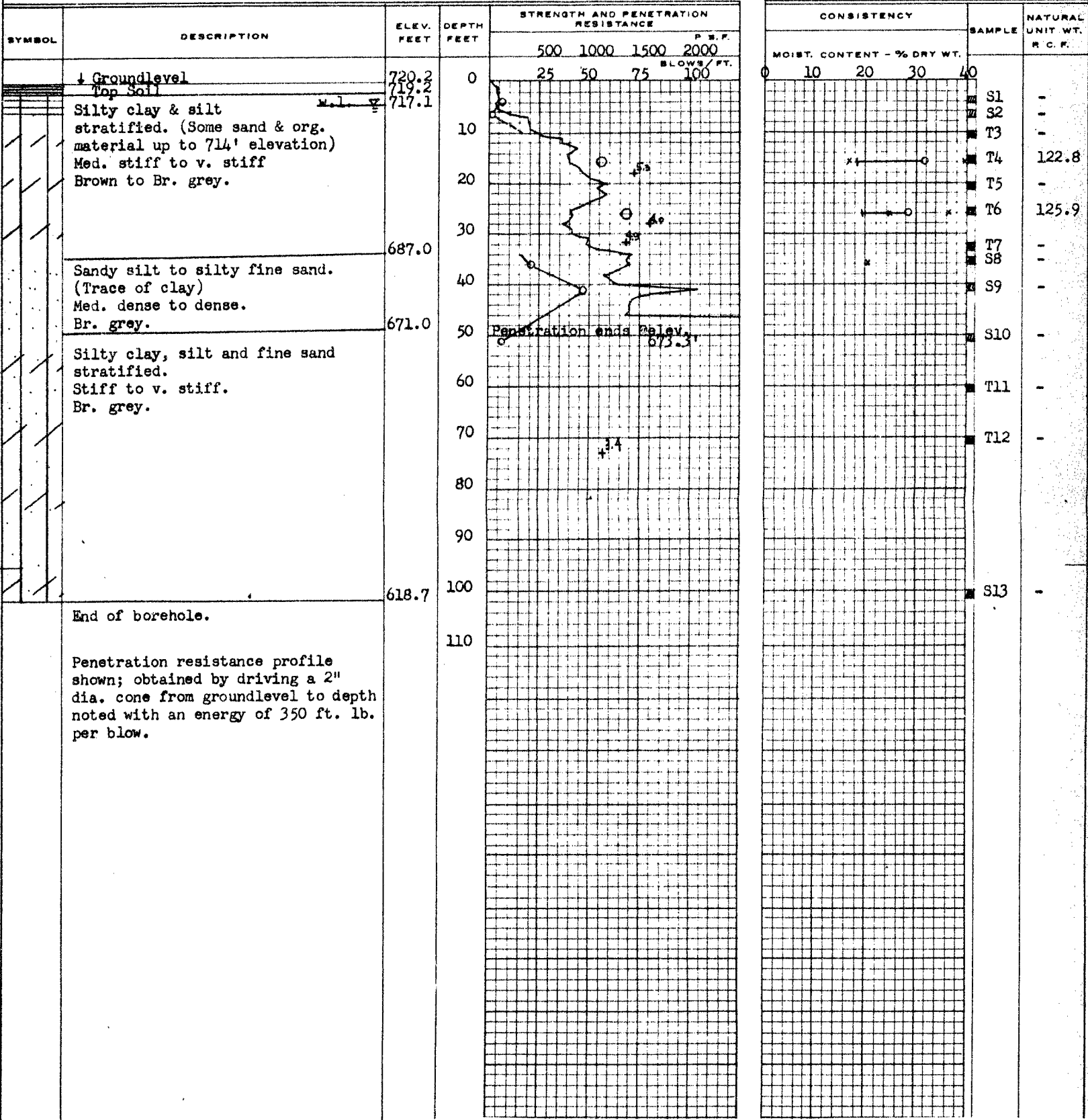
HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	VANE	33'		-	-	-	-	1520	-	Sens: 3.6
	T7	40'-41.5'	Silt, silty clay and fine sand. Stiff. to medium stiff. Br. grey.	Pushed	-	-	-	-	-	
	S8	50'-51.5'	Silty sand and silty clay Med. dense and stiff. Br. grey.	18	18.6	12.6	15.3	-	-	
			S denotes split spoon sample							
			T " shelby tube "							

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P.146-60 BORE HOLE NO. 1
JOB 61-F-77 STATION 140+60 (35' Rt.)
DATUM 720.2' COMPILED BY B.K.
BORING DATE Aug. 11/61. 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 -



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 146-60 BORE HOLE NO. 2

JOB 61-P-77 STATION 138+54 (33' Rt.)

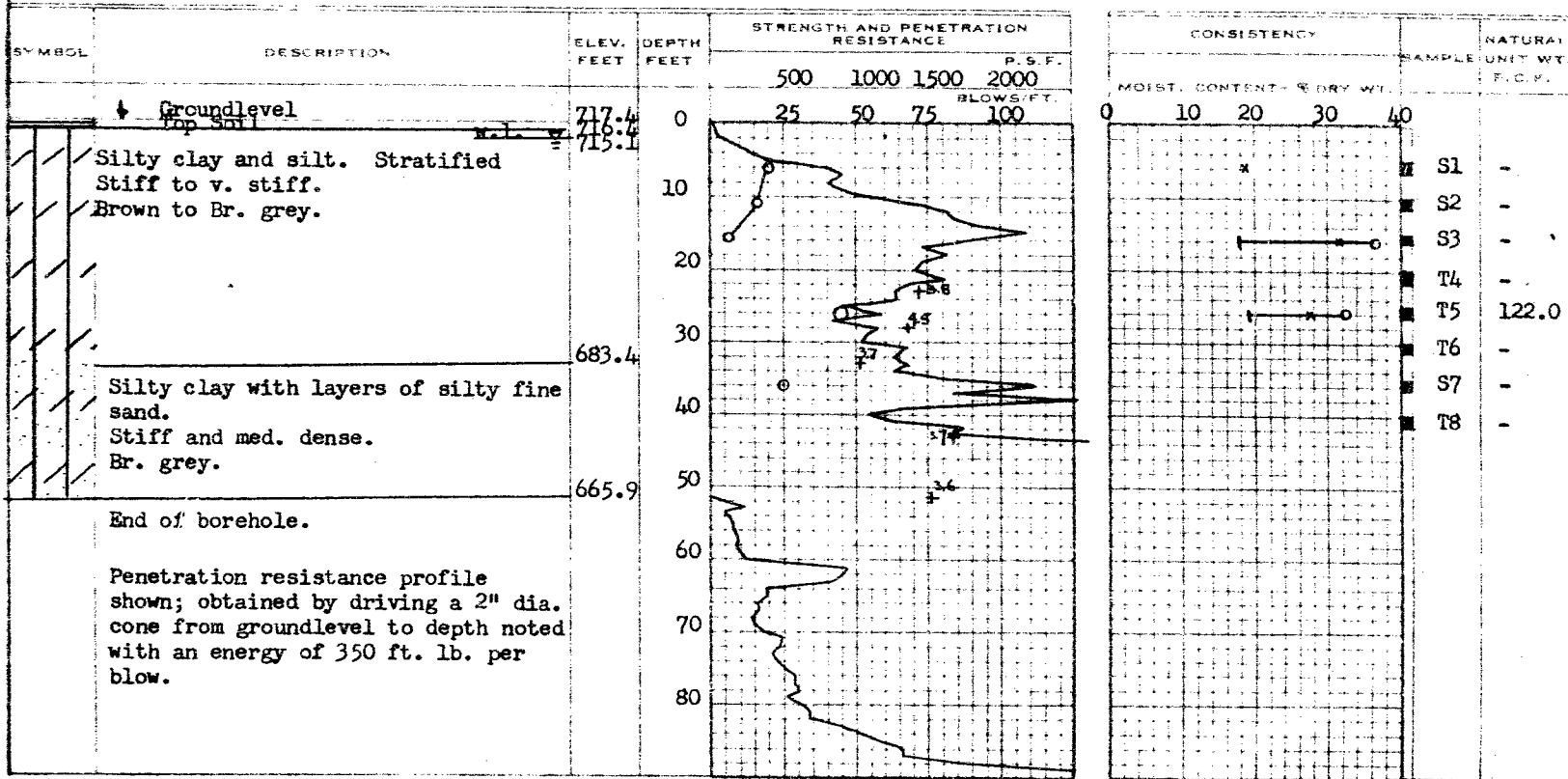
DATUM 717.4' COMPILED BY B.K.

BORING DATE Aug. 14/61. 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



Penetration ends @ elev. 628.9'

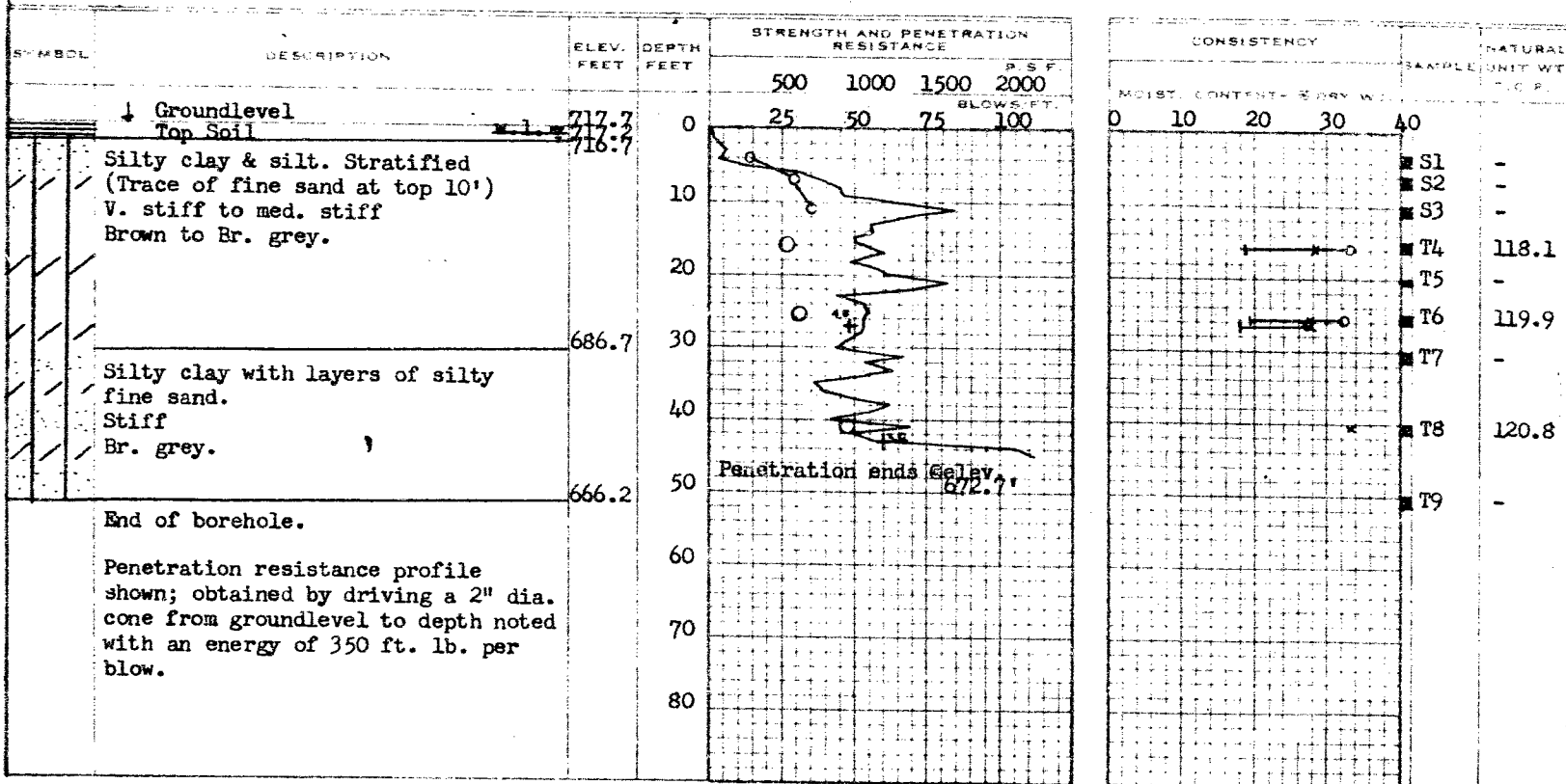
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 146-60 BORE HOLE NO. 3
 JOB 61-F-77 STATION 140/04 (34' Lt.)
 DATUM 717.7' COMPILED BY B.K.
 BORING DATE Aug. 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)
 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. 146-60

BORE HOLE NO. 4

JOB 61-F-77

STATION 140+88 (35' Lt.)

DATUM 722.0'

COMPILED BY B.K.

BORING DATE Aug. 17/61.

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) \circ
 VANE TEST (C) AND SENSITIVITY (S) $+$
 NATURAL MOISTURE AND LIQUIDITY INDEX Δ
 LIQUID LIMIT \sim
 PLASTIC LIMIT \vdash

