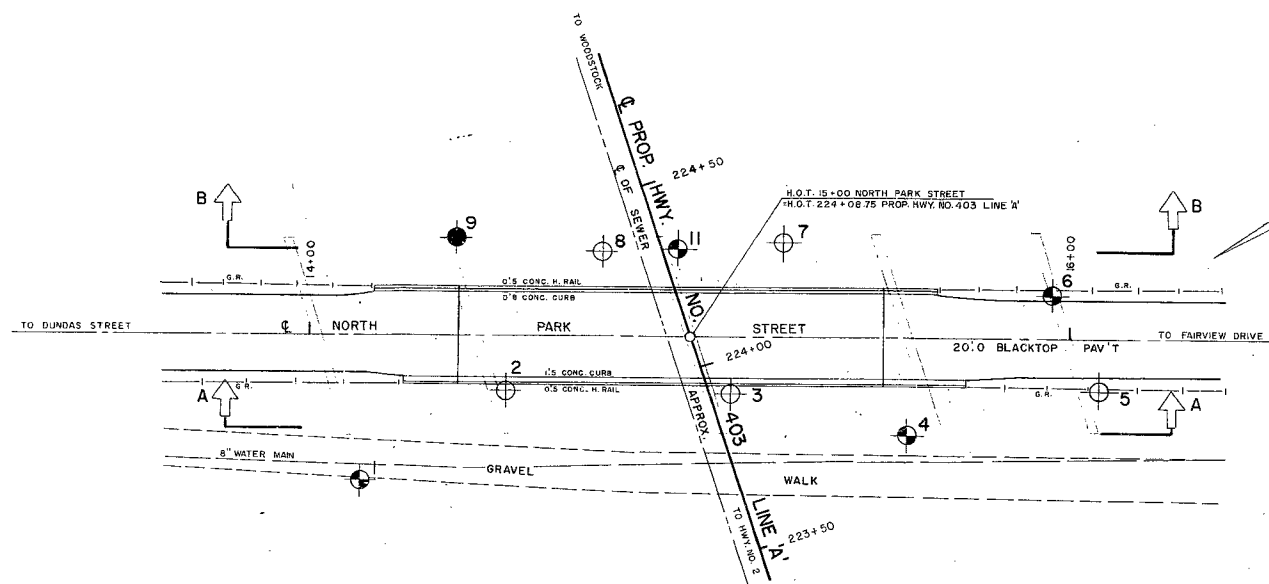
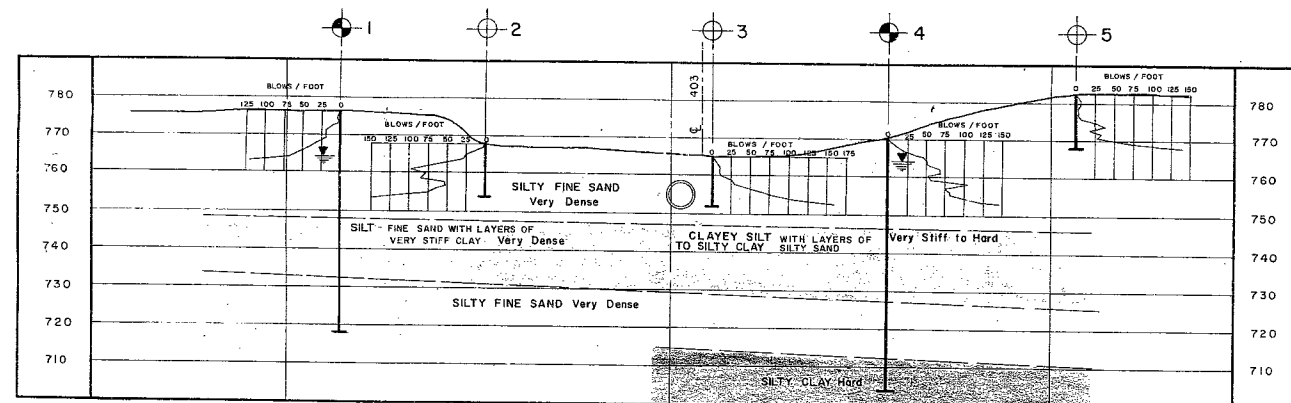


61-F-79

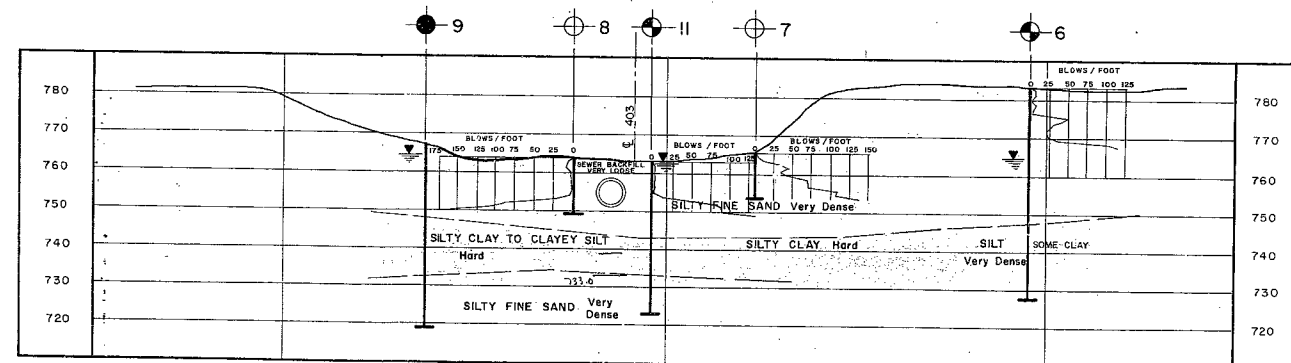
W.P. 150-60
Hwy #403
NORTH PARK
STREET



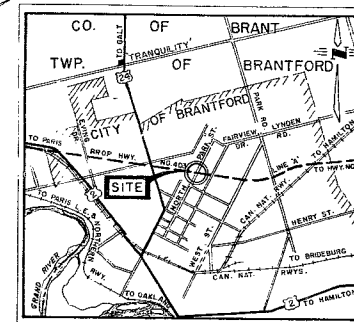
PLAN
SCALE 1 inch = 20 feet



A-A
1 inch = 20 feet



B-B
1 inch = 20 feet



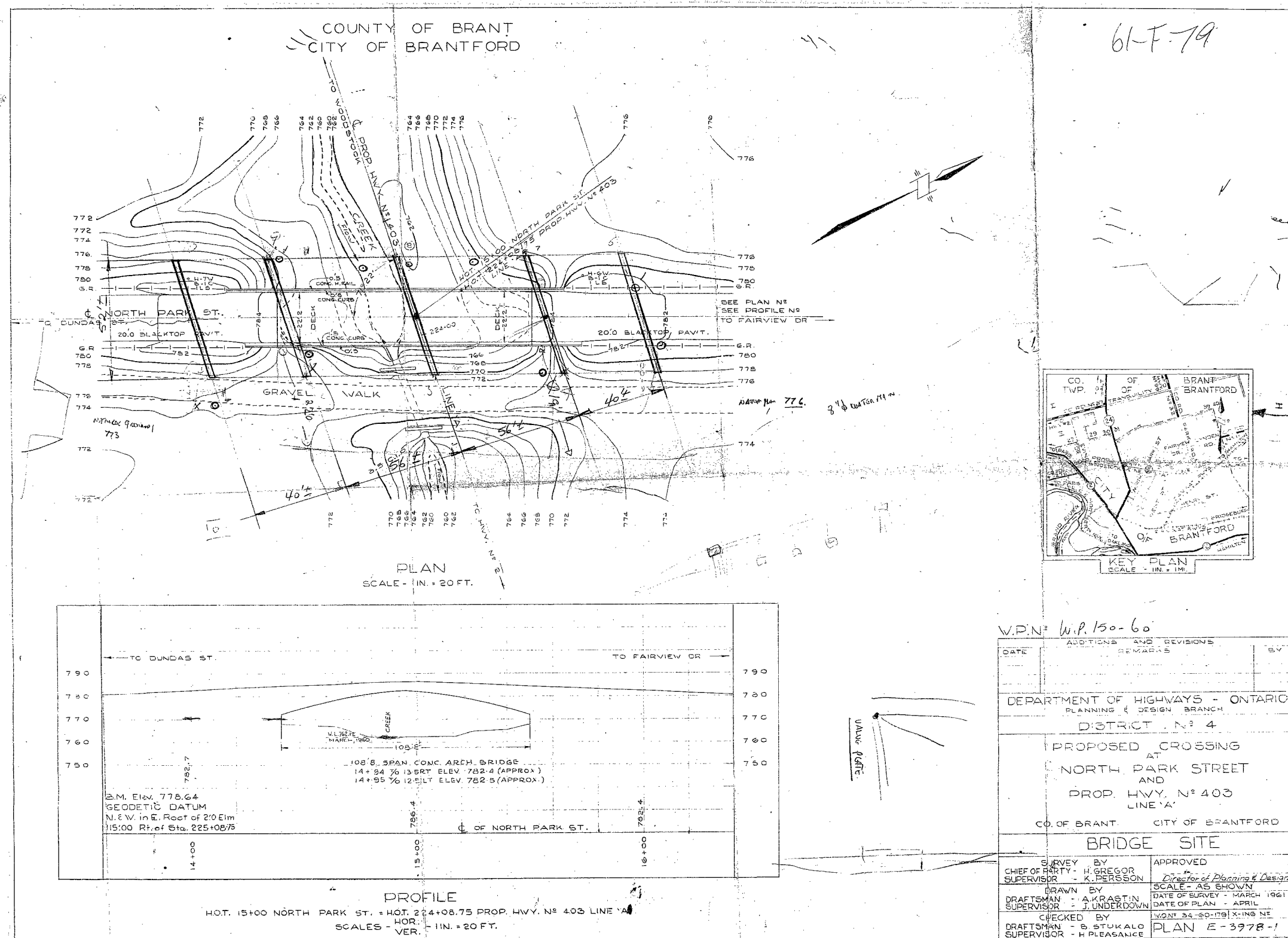
KEY PLAN
SCALE 1 inch = 1 mile

LEGEND			
	BORE & PENETRATION HOLE		
	PENETRATION HOLE (CONE)		
	BORE HOLE		
	WATER LEVELS Established At The Time of Field Investigation 14, AUG. 1961		
HOLE	ELEVATION	STATION	OFFSET
1	775.0	224+00	94' LT.
2	767.5	224+10	50' LT.
3	764.1	223+91	5' RT.
4	770.0	223+67	46' RT.
5	782.0	223+62	98' RT.
6	782.5	223+89	94' RT.
7	765.5	224+24	30.5 RT.
8	763.5	224+365	15' LT.
9	767.20	224+52	50' LT.
11	763.0	224+31	4' RT.

— NOTE —
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
NORTH PARK STREET AND PROPOSED HIGHWAY NO. 403 LINE 'A'		
ORIGINATED T. WIDDIS	DISTRICT NO. 4	DATE OCT. 5, 1961
DRAWN P. CLARK	W.P. NO. 150-60	JOB NO. 61-F-79
CHECKED	SCALE	DRAWING NO.
APPROVED	1 inch = 20 feet	61-F-79 A

REF. NO. E-3978-1



SOME DEFECTS IN NEGATIVE DUE

TO CONDITION OF ORIGINAL DOCUMENTS

Mr. A. P. Toye,
Bridge Engineer.
Materials / Research Division,
(Foundation Section).

October 27, 1961.

D.H.C. FOUNDATION INVESTIGATION
REPORT.
W.J. 61-7-79 -- W.P. 150-60.

Attention: Mr. A. McCoshie,
Bridge Planning Dept.

Re: North Park Street Underpass,
0.8 Miles East of Hwy. #24 &
Hwy. #403, Brantford, Dist. #4.

We are forwarding to you, our detailed foundation
report on the subsell conditions existing at the above site.

The conclusions and recommendations contained
therein, are self-explanatory, and we believe they should prove
adequate for your future design work.

If we can be of further assistance in connection
with this project, please feel free to contact our Office.

AGP/MAEF
Attach.

A. G. Sternas,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. . . W. Toye (2)
H. A. Tregaskes
B. B. McMillan
A. Gater (London Reg. Office handling
pre-engineering)
J. C. Thatcher
T. J. Kovich
J. Roy
J. B. Graspier
A. B. Saint
F. Norman
A. Watt
Foundation Office
Gen. Files.

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 2. DESCRIPTION OF THE SITE AND GEOLOGY.
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 - 4.3) Stratified Layers of Sand, Silt & Clay.
 - 4.4) Fine Silty Sand.
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 5. GROUND WATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS.
 7. SUMMARY.
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-

FOUNDATION INVESTIGATION

At

North Park Street Underpass,
0.6 Miles East of Hwy. 24 &
Hwy. 403, Brantford, Dist. #4.
W.P. 150-60 -- W.J. 61-F-79,
(Bridge Office Plan B-3978-1).

1. INTRODUCTION:

A foundation investigation was carried out at the location where the future Hwy. 403 will pass under North Park street, approximately 0.6 miles east of Hwy. 24 in Brantford. The purpose of the investigation was to determine the subsoil conditions and to provide information for the design of the proposed structure. The existing structure is a concrete arch structure having a span of 109 ft. This is to be replaced by a four-span structure some 50.0 ft. wide and 195.0 ft. long. Its centre line will conform with the existing North Park Street centre line. A 6.0 ft. I.D. sewer at present, runs parallel to and some 6.0 ft. left of the centre line of the proposed Hwy. 403.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site of the proposed structure lies in flat country. The existing approach embankments are 8.0 ft. high on the northern side and 11.0 ft. high on the southern side.

The site is located in the Norfolk Sand Plain. The sands, silts and clays of this region were deposited as a delta in the glacial Lakes Whittlesey and Warren. The deposits consist of a layer of silty fine sand underlain by a stratified layer of silt, clay and fine sand.

3. FIELD & LABORATORY WORK:

Field work consisted of five sampled boreholes and eight dynamic cone penetration tests. The exploration programme was carried out by a standard core drill machine adapted for soil sampling. A conventional wash boring procedure was followed. Samples were recovered at required depths, by means of a 2" O.D. split spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test.

Drawing No. 61-F-79A shows the borehole locations, their respective elevations and the estimated subsoil stratigraphy.

Samples were visually examined in the field before being transported to the laboratory. Tests were carried out in the laboratory on various representative samples to determine:

- a) Natural Moisture Contents
- b) Bulk Densities
- c) Grain Size Distribution Curves
- d) Atterberg Limits

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

4. SUBSOIL CONDITIONS:

4.1) General:

The stratigraphy of the site was found to be generally uniform. Detailed descriptions of various layers encountered in each boring, are given in Appendix I of this report.

cont'd. /3 ...

4. SUBSOIL CONDITIONS:

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

The inferred stratigraphical profile of Drawing 61-F-79A is based upon this information.

The subsoil consists of the following strata:-

- i) Silty Fine Sand
- ii) Stratified Layers of Sand, Silt and Clay.
- iii) Silty Fine Sand.
- iv) Silty Clay.

4.2) Silty Fine Sand:

This stratum of silty fine sand was found in all the boreholes. It varies in thickness from 20.0 ft. in B.H. 9 to 35.0 ft. in B.H. 6. The Standard Penetration resistances vary widely with the depth of the stratum and in each borehole, from 15 in B.H. 1, to over 100 in B.H. 6. The relative density of this material is med. dense at the surface, becoming very dense below about 12 ft.

4.3) Stratified Layers of Sand, Silt and Clay:

This stratum consists of irregularly spaced layers of silty clay, clayey silt, silt and sandy silt. It varies in thickness from 9.0 ft. in B.H. 11, to 21.0 ft. in B.H. 6. Detailed descriptions of the various materials found in this stratum are given in the Appendix of this report. 'N' values range from 23 in B.H. 4, to 114 in B.H. 9. Generally, the consistency of the clay layers may be classified as very stiff to hard. The moisture content of the silty clay varies between 13.1% and 19.9%.

cont'd. /4 ...

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

4.3) Stratified Layers of Sand, Silt and Clay: (cont'd.) ...

Average values for the Atterberg Limits of the silty clay are as follows:

Liquid Limit 27%

Plastic Limit 16%

The Moisture content of silt (slightly plastic, ranges from 15.6% to 21.0%. The Liquid Limit ranges from 17.6% to 20.8%, and the Plastic Limit ranges from 14.6% to 15.1%.

4.4) Silty Fine Sand:

A further deposit of silty fine sand was found in B.H.'s 1, 4, 9 and 11, below the stratified layers described in 4.3 above. This deposit extends for at least 15.0 ft. Standard Penetration resistances are very high, with an average of 100, indicating the material to have a relative density which is very dense.

4.5) Hard Silty Clay:

Hard silty clay was found below the fine sand in B.H. 4. The Moisture content for this material is 19.8%, Liquid Limit 29.4% and Plastic Limit 13.0%.

5. GROUND WATER CONDITIONS:

The water levels as observed in the boreholes during the period of the field investigation, are shown on the log sheets and Plan, 61-F-79A, of this report.

The observed water table at the time of investigation, was found to be at approx. elev. 764.0.

cont'd. /5 ...

6. DISCUSSION & RECOMMENDATIONS:

It is understood that a four-span underpass is to be built at this site. The subsoil conditions at the site are such that spread footings may be founded in the dense silty sand with a safe design load of 2 T.S.F.

During the construction of the 6.0 ft. I.D. sewer which runs parallel to the centre line of the proposed Hwy. 403, an excavation was made to some 10 ft. below the present ground surface. The backfill of this excavation has been poorly compacted and therefore, spread footings with a safe design load of 2 T.S.F. can only be obtained at a greater depth - i.e., approx. elev. 753.0'.

The approx. elevations for footings at the pier as well as abutment locations are given below:-

South Abutment	.....	Elev. 770.0 or below
South Pier	.....	Elev. 762.0 or below
Centre Pier	.....	Elev. 753.0 or below
North Pier	.....	Elev. 760.0 or below
North Abutment	.....	Elev. 776.0 or below

Adequate protection against frost action must be provided for footings.

The water table at the time of investigation, was very close to the existing ground surface in the area of the proposed pier footings. This will, no doubt, vary seasonally and should be determined at the time of construction. A dewatering scheme will

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

be necessary because of the presence of silty fine sand and the high water table. If sheeting is used for this, it must be driven to an adequate depth below the bottom of the excavation. This depth will depend on the height of the prevailing water table above the bottom of the excavations and should be equal to it. It is pointed out that sheeting driven to an inadequate depth could result in quick sand conditions which would lower the bearing capacity of the subsoil.

The recommended safe design loads are based on a maximum settlement below the footings of 1". Hence the design should take into consideration a maximum differential settlement of the order of $1/2 - 3/4$ ".

No approach fill stability problems are anticipated during or after construction.

7. SUMMARY:

The subsoil at the site consists of dense silty fine sand underlain by a stratified layer of sand, silt and clay. Immediately below this, a stratum of silty fine sand is encountered.

The dense silty sand is capable of supporting the structure on spread footings with a safe bearing pressure of 2 T.S.F.

It is believed that dewatering will be necessary because of the presence of silty fine sand and a high water table. If sheeting is used in order to prevent quick sand conditions, this should be driven to a depth below the footing elevation equaling the distance of the water table above the footing elevation.

cont'd. /7 ...

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

The recommended safe design loads are based on a maximum settlement below the footings of 1 inch. Hence, the design should take into consideration a maximum differential settlement of $1/2 - 3/4$ of one inch.

No approach fill stability problems are anticipated during or after construction.

8. MISCELLANEOUS:

The field work was carried out from 14th Aug. to 1st Sept., inclusive, by the Department of Highways' drilling crew. The work was supervised for the D.R.O. by Mr. T. F. Widdis of the Foundation Section.

October 1961 REPORT PREPARED BY: B. M. Ghosh.....
for T. F. Widdis,
PROJECT FOUNDATION ENGINEER.

REPORT APPROVED BY: M. Devata.....
M. Devata,
SR. PROJECT FOUNDATION ENGINEER

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-79

W.P. 150-60

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	S1	5'-6.5'	Sand, fine. Some clay and medium sand nonplastic. Medium dense brown. Uniform.	15	9.7	-	-	-	-	
	S2	9.5'-11'	Sand. Fine, uniform. Some clay and medium sand. Nonplastic. Very dense, Brown.	61	18.1	19.3	30.7	-	-	
	S3	15'-16.5'	Sand. Fine uniform. Some clay nonplastic. Very dense. Brown.	70	21.5	-	-	-	-	
	S4	20'-21.5'	Same as S. 3.	67	18.9	-	-	-	-	
	S5	25'-26.5'	Same as S. 3.	32	22.4	-	-	-	-	
	S6	30'-31.5'	Clay with silt. Low to medium plasticity. Hard. Grey.	40	15.9	15.0	25.1	-	-	
	S7	35'-36.5'	Silt with fine sand. Slight plasticity. Dense. Grey.	40	16.5	15.0	21.7	-	-	
	S8	40'-41.5'	Clay with silt. Low to medium plasticity. Very stiff. Grey.	28	18.6	14.7	28.5	-	133.4	
	S9	45'-45.5'	Silt with fine sand. Nonplastic. Very dense. Grey.	54-6"	13.0	-	-	-	-	
	S10	50'-50.8'	Sand, fine to medium. Very dense. Grey.	72-9"	10.0	-	-	-	-	
	S11	56'-56.8'	Lost.	65-9"	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-79

W.P. 150-60

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			Cone penetration only.							
3			Cone penetration only.							
4	S1	5'-6.5'	Sand. Fine uniform. Very dense. Brown.	50	15.1	-	-	-	-	
	S2	8'-9.5'	Same as S. 1.	35	19.4	-	-	-	-	
	S3	11'-12.5'	Same as S. 1.	54	19.5	-	-	-	-	
	S4	14'-15.5'	Same as S. 1.	51	16.7	-	-	-	-	
	S5	19'-20.5'	Same as S. 1.	77	17.7	-	-	-	-	
	S6	24'-25.5'	Silt, some clay. Low to medium plasticity. Very stiff. Grey.	23	17.1	14.6	21.0	-	142.9	
	S7	29'-30'	Sand with silt. Fine. Uniform. Very dense. Grey.	120	-	-	-	-	-	
	S8	33'-34.0'	Clay with silt. Low to medium plasticity. Some sand. Hard. Grey.	54	13.1	13.7	19.8	-	-	
	S9	34'-34.5'	Same as S. 8.	52	13.4	16.6	30.0	-	-	
	S10	39'-39.8'	Silt. Nonplastic. Very dense. Grey.	95-9"	15.4	-	-	-	-	
	S11	44'-45'	Sand. Fine and uniform. Very dense Grey.	123	-	-	-	-	-	
	S12	49'-49.8'	Same as S. 11.	90-9"	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-P-80

W.P. 150-60

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	SL3	54'-55.5'	Sand. Fine and uniform. Some silt. Very dense. Grey.	72	-	-	-	-	-	
	SL4	59'-60.5'	Clay with silt. Low to medium plasticity. Hard. Grey.	40	19.8	18.0	29.4	-	-	
	SL5	64'-64.8' 64.8-65.5	Sand. Fine uniform. V. dense. Clay with silt. Hard. Grey.	100	-	-	-	-	-	
5	Cone	penetration only.								
6	S1	3'-4.5'	Sand. Fine and uniform. Very loose. Brown.	2	8.9	-	-	-	-	
	S2	6'-7.5'	Sand. Fine and uniform. With some silt. Very dense. Brown.	21	8.5 7.4	-	-	-	-	
	S3	9'-11'	Same as S. 2.	27	5.1	-	-	-	-	
	S4	12'-13.5'	Same as S. 2.	41	2.4	-	-	-	-	
	S5	15'-16'	Same as S. 2.	50	32.1	-	-	-	-	
	S6	20'-21'	Same as S. 2.	95	21.8	-	-	-	-	
	S7	25'-26.5'	Same as S. 2.	95	15.9	-	-	-	-	
	S8	30'-31'	Same as S. 2.	92	18.0	-	-	-	-	
	S9	35'-36'	Same as S. 2.	156	17.4	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-79

W.P. 150-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
6	S10	40'-41.5'	Silt with some clay. Nonplastic. Very dense. Grey.	70	18.7	-	-	-	-	
	S11	45'-46.5'	Silt with some clay. Slight plasticity Dense. Grey.	40	15.6	15.1	18.5	-	-	
	S12	50'-51.5'	Silt with some clay and fine sand. Nonplastic. Very dense. Grey.	100	12.8	-	-	-	-	
	S13	55'-56'	Lost.	115	-	-	-	-	-	
7	Cone penetration only.									
8	Cone penetration only.									
9	S1	5.5'-6.3'	Sand. Fine and uniform. Very dense. Brown.	80-8"	19.8	-	-	-	-	
	S2	8'-9.5'	Sand. Fine and uniform. Some silt. Very dense. Grey.	57	19.9	-	-	-	-	
	S3	12.5'-14'	Same as S. 2.	68	20.7	-	-	-	-	
	S4	15'-16.5'	Same as S. 2.	57	19.9	-	-	-	-	
	S5	20'-21.5'	Clay with some silt. Low to medium plasticity. Hard. Grey.	40	19.1	15.7	25.6	-	-	
	S6	25'-26.5'	Silt with some clay. Slight plasticity. Very dense. Grey.	55	-	-	-	-	-	
	S7	30'-31.5'	Same as S. 6.	53	16.0	14.6	17.6	-	157.7	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-79

W.P. 150-60

OLE 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	S8	35'-35.8'	Silt with some clay. Slight plasticity. Very dense. Grey.	114-9"	16.2	15.4	19.3	-	-	
	S9	40'-40.8'	Sand. Fine and uniform. Some silt. Very dense. Grey.	110-10"	-	-	-	-	-	
	S10	45'-45.5'	Same as S. 9.	126-6"	-	-	-	-	-	
	S11	50'-51.5'	Silt with some clay. Slight plasticity. Medium dense. Grey.	20	21.0	14.6	20.8	-	-	
10	Omitted									
11	S1	5'-8'	Silty fine sand with gravel and organic matter.	1	13.6	-	-	-	-	
	S2	10'-11.5'	Sand. Fine and uniform. With some silt. Dense. Grey.	41	24.7	-	-	-	-	
	S3	15'-16.5'	Same as S. 2.	72	13.7	-	-	-	-	
	S4A	20'-21'	Same as S. 2.	39	18.7	13.3	20.0	-	-	
	S4B	21-21.5	Clay with silt. Low to medium plasticity. Hard. Grey.	-	-	-	-	-	-	
	S5	25'-26.5'	Same as S. 4B.	52	18.1	17.5	24.8	-	154.3	
	S6	30'-31.5'	Sand. Fine and uniform. With silt nonplastic. Very dense. Grey.	79	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-79

W.P. 150-60

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
11	S7	35'-36.5'	Same as S. 6.	164	-	-	-	-	-	
	S8	40'-40.8'	Same as S. 6.	139-10'	-	-	-	-	-	
			S denotes split spoon sample.							

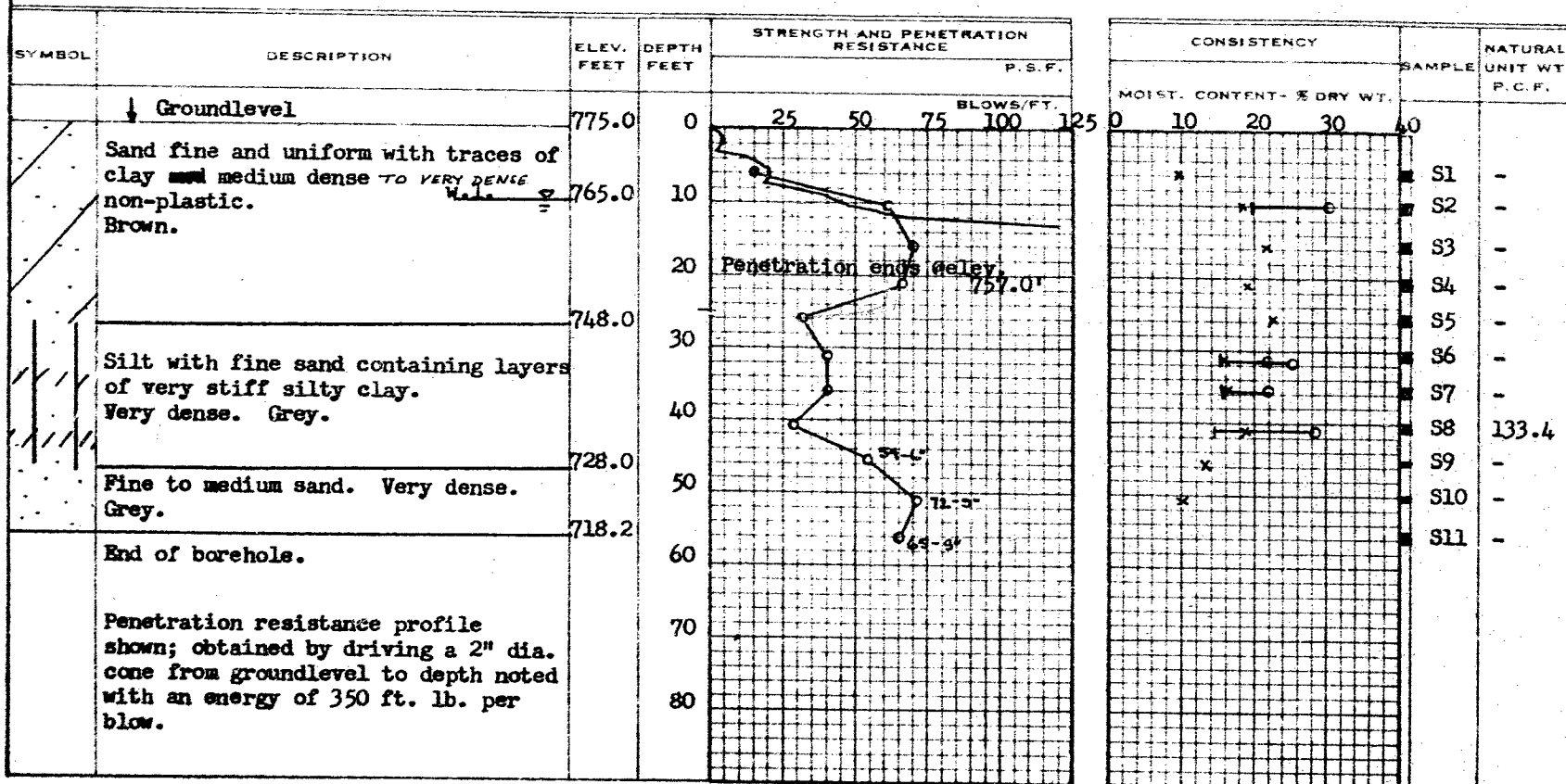
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 150-60 BORE HOLE NO. 1
JOB 61-F-79 STATION 224.00 94.0' Lt.
DATUM 775.0' COMPILED BY B.K.
BORING DATE Aug. 14/61 CHECKED BY T.F.W. & H.D.

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	o



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 150-60 _____ BORE HOLE NO. 2 _____

JOB 61-F-79 STATION 224/10 (50' Lt.)

DATUM 767.5' COMPILED BY B.K.

BORING DATE Aug. 16/61. CHECKED BY T.F.W. & M.D.

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	
				P.S.F.	
↓	Groundlevel	767.5	0	BLOWS/FT. 25 50 75 100	
			10		
			20	Penetration ends @ elev. 753.5'	
			30		
			40		
			50		

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.

[illegible]

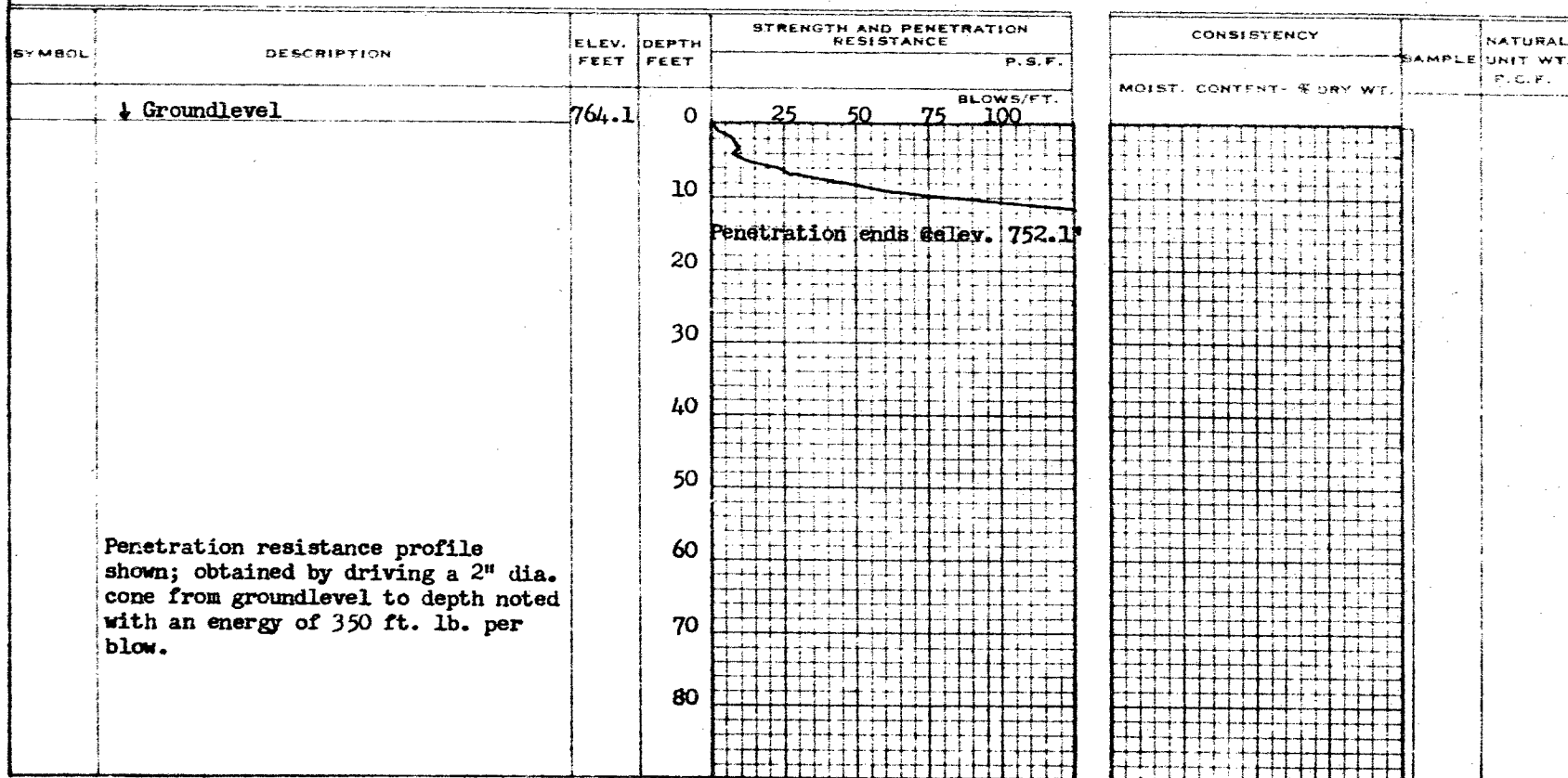
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 150-60 _____ BORE HOLE NO. 3
JOB 61-F-79 _____ STATION 223+91 5' Rt. C
DATUM 764.1' _____ COMPILED BY B.K.
BORING DATE Aug. 22/61. _____ CHECKED BY T.F.W. & M.D.

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	---	X
LIQUID LIMIT	---	
PLASTIC LIMIT	---	



DEPARTMENT OF HIGHWAYS - ONTARIO

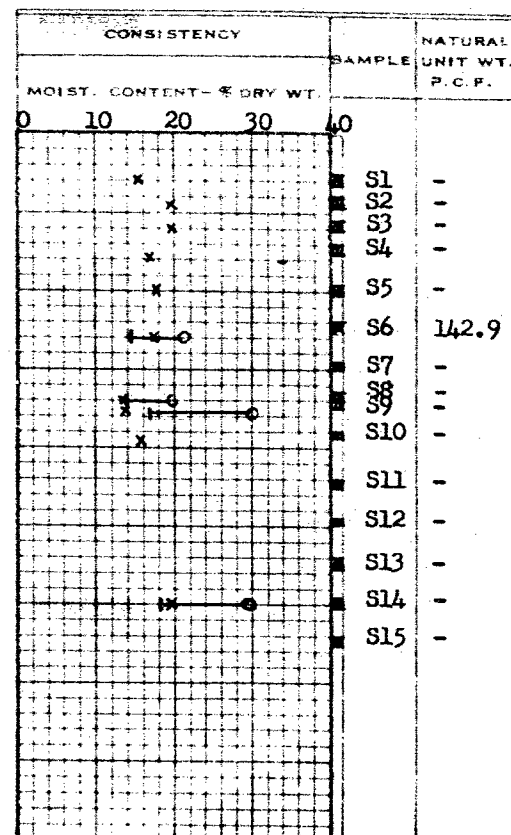
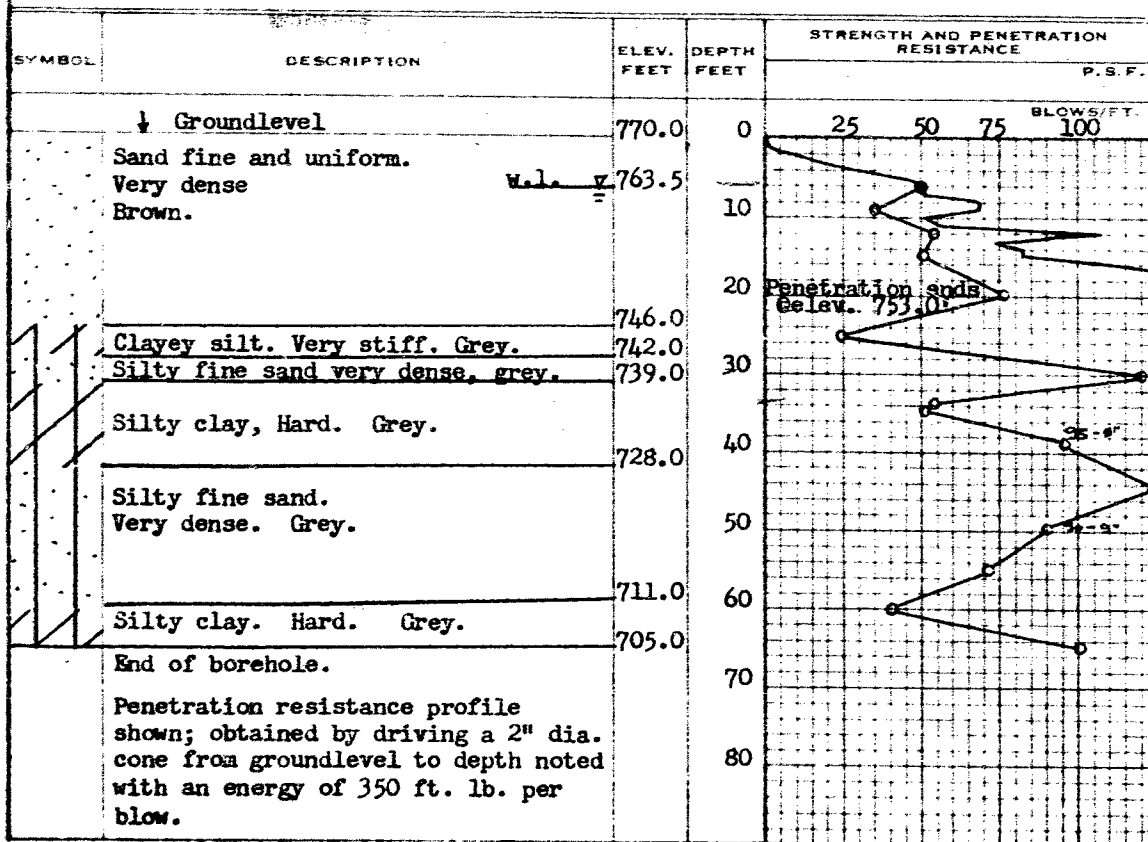
MATERIALS AND RESEARCH SECTION

W.P. 150-60 BORE HOLE NO. 4
 JOB 61-F-79 STATION 223/62 46.0' Rt. C
 DATUM 770.0' COMPILED BY B.K.
 BORING DATE Aug. 16/61. CHECKED BY T.F.W. & M.D.

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

LEGEND

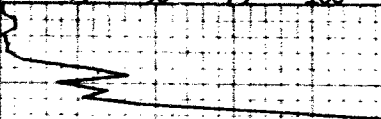
1/2 UNCONFINED COMPRESSION (Qu) ○
 VANE TEST (C) AND SENSITIVITY (S) +
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT ○
 PLASTIC LIMIT +



W.P. 150-60 BORE HOLE NO. 5
JOB 61-F-79 STATION 233+62 98.0' Rt.
DATUM 782.0' COMPILED BY B.K.
BORING DATE Aug. 21/61. CHECKED BY T.F.W. & M.D.

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) _____	+ S
NATURAL MOISTURE AND	
LIQUIDITY INDEX _____	L
LIQUID LIMIT _____	X
PLASTIC LIMIT _____	

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				P.S.F.			
	↓ Groundlevel	782.0	0	25	50	75	100
			10				
			20				
			30				
			40				
			50				
			60				
			70				
			80				

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

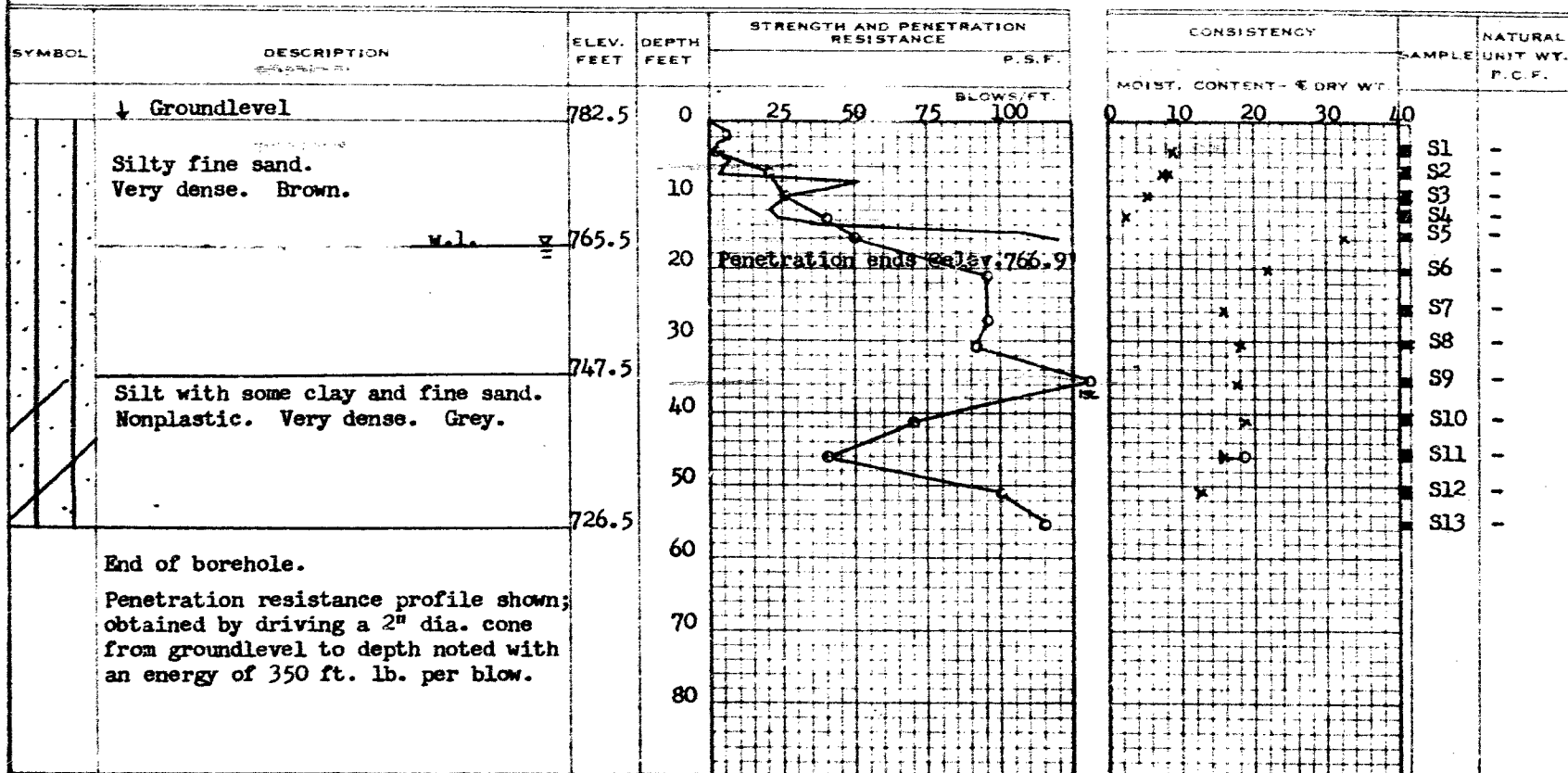
MATERIALS AND RESEARCH SECTION

W.P. 150-60 BORE HOLE NO. 6
 JOB 61-P-79 STATION 233+89 94.0' Rt.
 DATUM 782.5' COMPILED BY B.K.
 BORING DATE Aug. 21/61. CHECKED E T.F.W. & M.D.

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



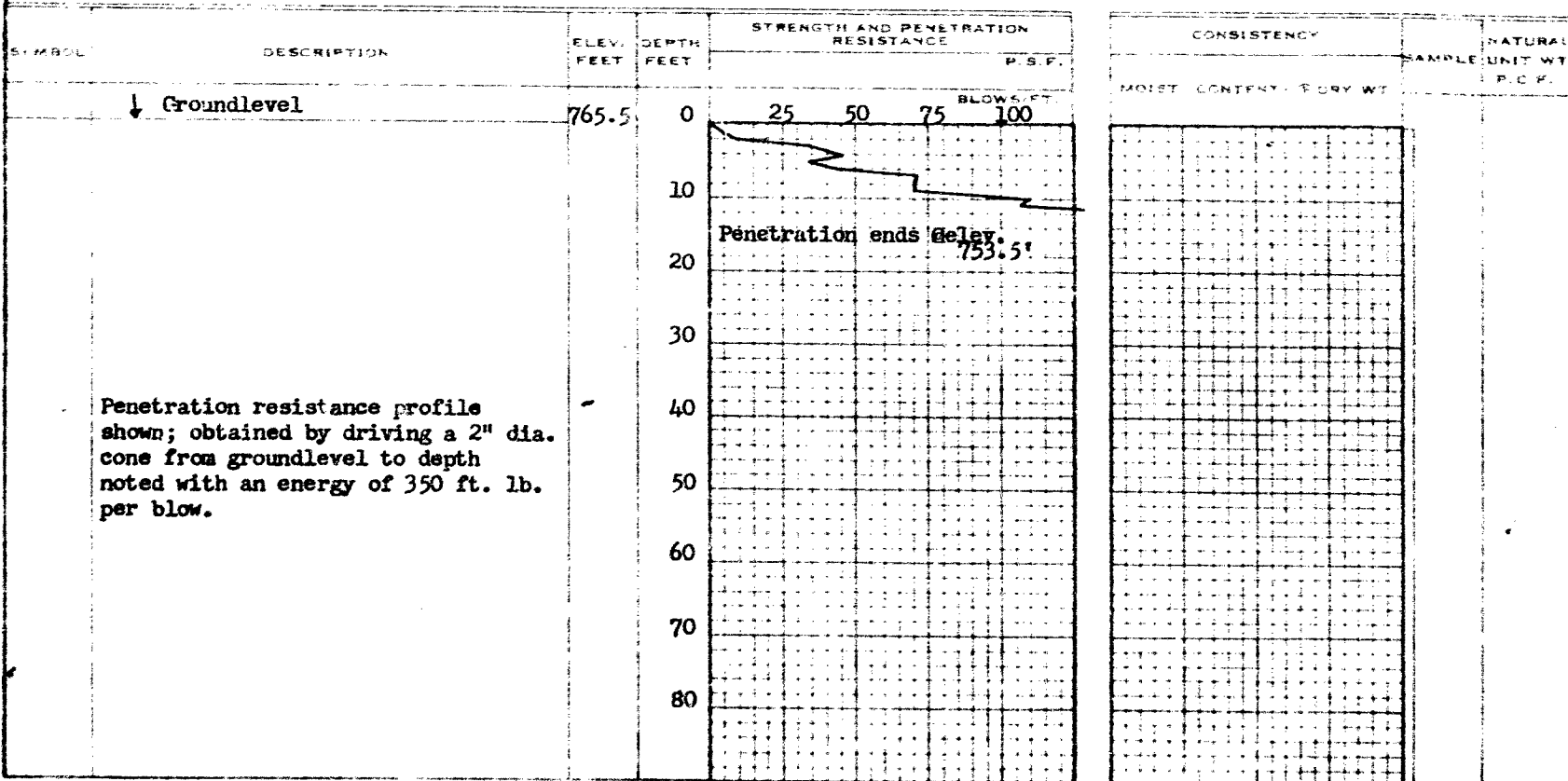
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 150-60 BORE HOLE NO. 7
 JOB 61-F-79 STATION 224/24 (30.5' Rt.)
 DATUM 765.5' COMPILED BY B.K.
 BORING DATE Aug. 23/61. CHECKED BY T.F.W. & M.D.

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



OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 150-60 BORE HOLE NO. 8

JOB 61-P-79 STATION 224+365 (15.0' Lt.)

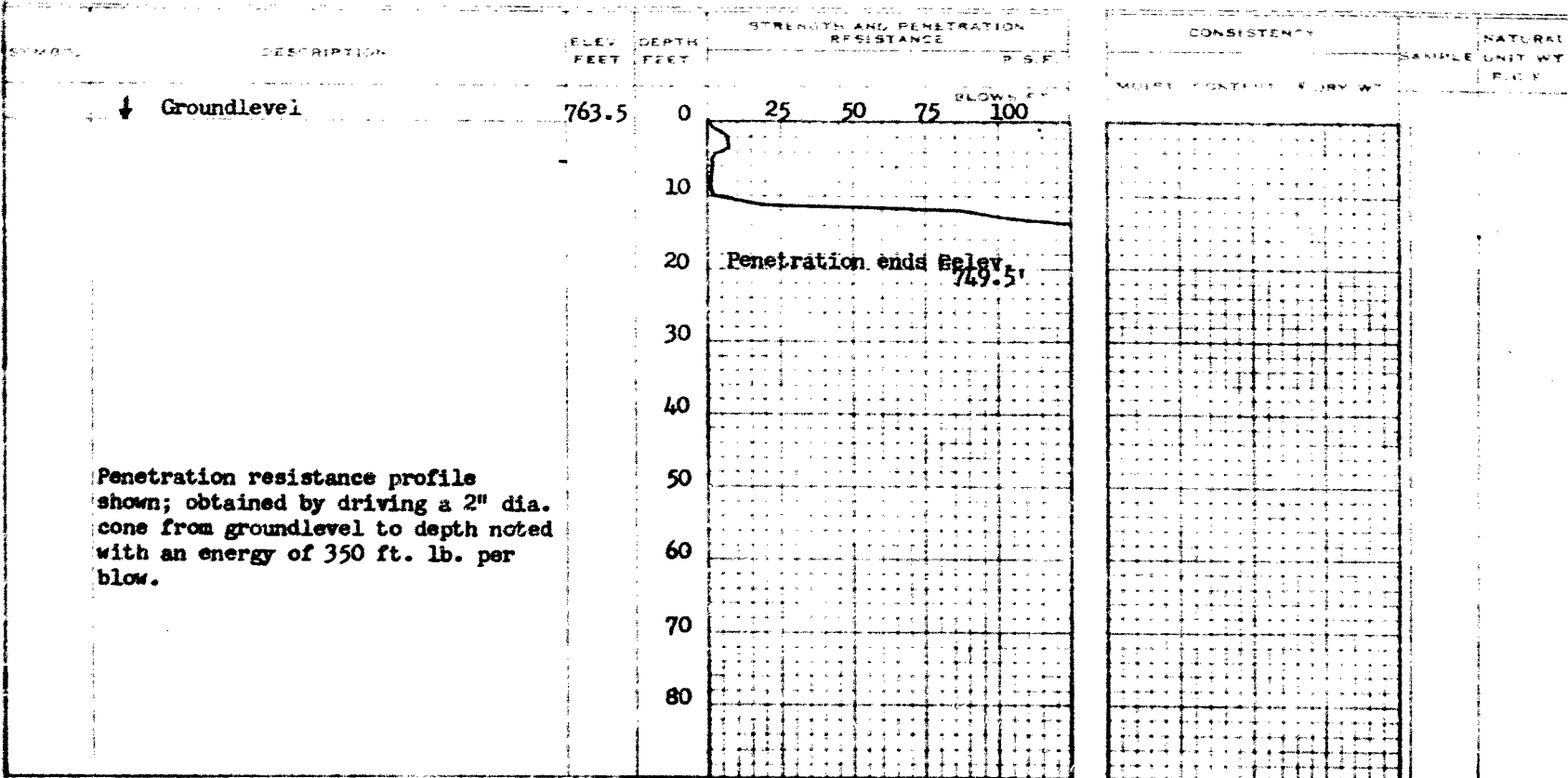
DATUM 763.5' COMPILED BY B.K.

BORING DATE Aug. 23/61. CHECKED BY T.F.W. & M.D.

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 — L
 PLASTIC LIMIT — P



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 150-60

BORE HOLE NO. 9

JOB 61-F-79

STATION 224+52.0 (50' Lt.)

DATUM 767.2'

COMPILED BY B.K.

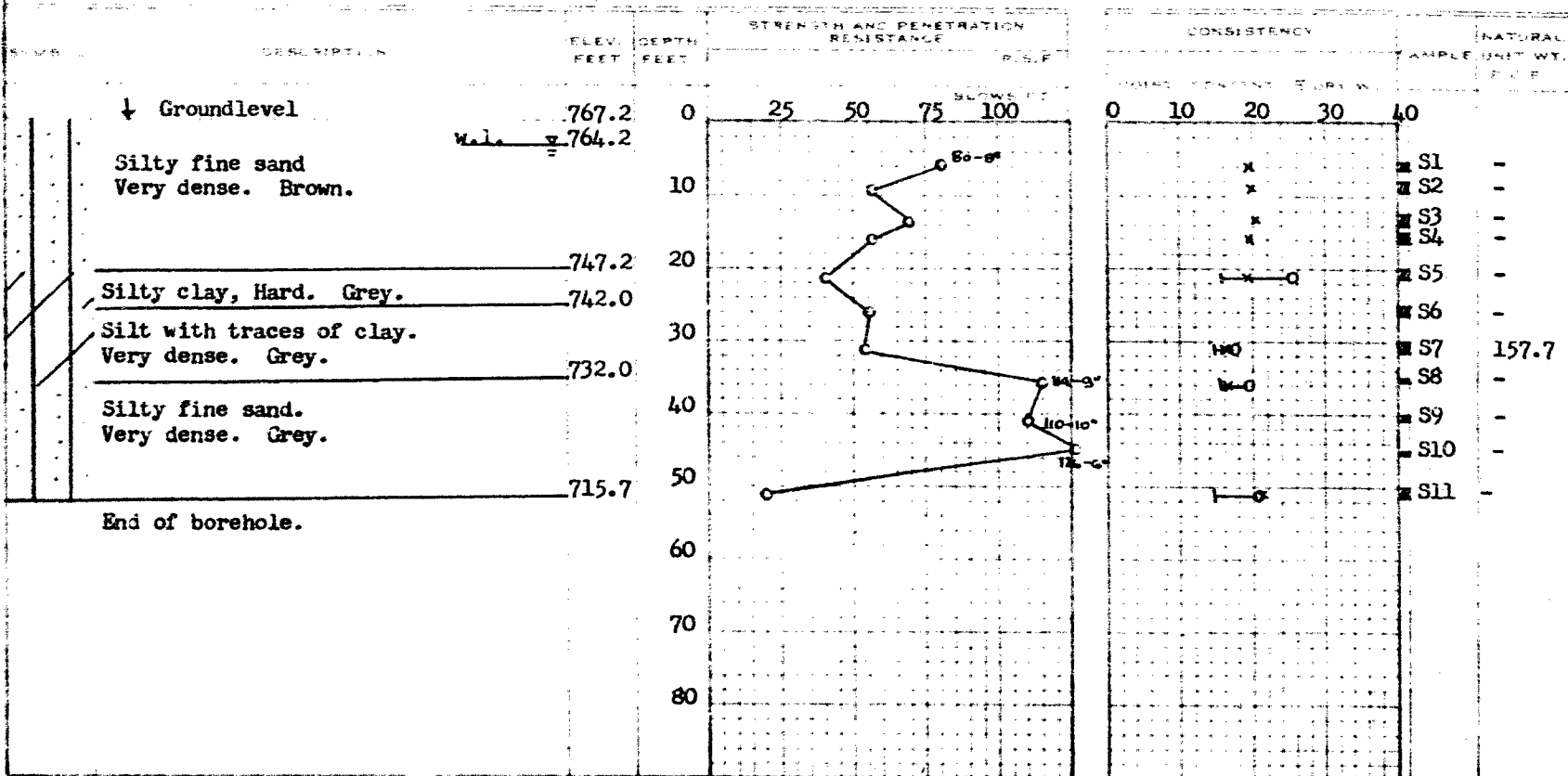
BORING DATE Aug. 24/61.

CHECKED BY T.F.W. & H.D.

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

LEGEND

UNCONFINED COMPRESSION (Q_u)
 VANE TEST (τ) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 150-60

BORE HOLE NO. 11

JOB 61-F-79

STATION 224+21 (4.0' Ht.)

DATUM 763.0'

SAMPLED BY B.K.

BORING DATE Aug. 25/61.

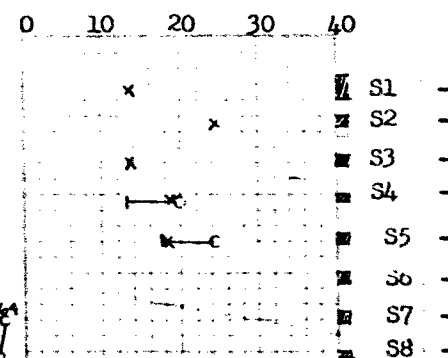
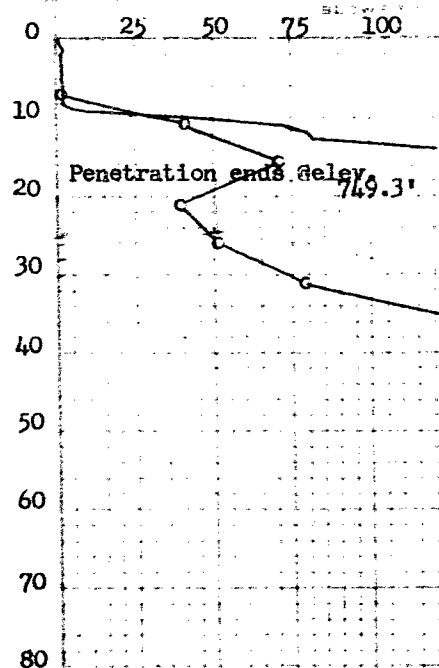
BY T.F.W. & M.D.

LEGEND

UNCONSOLIDATED COMPRESSION (QU) ○
 VENE TEST AND SENSIBILITY x
 NATURAL MOISTURE AND □
 LIQUIDITY INDEX —
 PLASTICITY INDEX —

↓ Groundlevel	w.l. = 763.0
○ Silty fine sand with gravelly organic matter. (Sewer excavation Backfill).	753.0
Silty fine sand. Dense. Grey.	743.0
Silty clay. Hard. Grey.	734.0
Silty fine sand. Very dense. Grey.	722.2
End of borehole.	

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.



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,
January 12, 1962.

61-F-79

MEMORANDUM TO:

Mr. A. Stermac,
Principal Foundation Eng.,
Department of Highways,
Room 107,
Lab. Bldg.,
Downsview, Ontario.

RE: W.P. 150-60
North Park St. Underpass
Hwy. 403 District 4

Enclosed are two prints of preliminary plan
D 4980-P1 for the subject structure.

Would you please let us have your comments.

FDeV/et

F. DeVisser
F. DeVisser,
Bridge Location Engineer.

*Ken:
Jan. 17.62 ASD*

*No Comment
Newick*

Mr. B. Davis,

January 12, 1962.

Bridge Design Engineer.

Materials & Research Division.

(Foundation Section).

Attention: Mr. C. Bassi.

Re: Proposed Structures at Brantford
W.P. 150-60 - North Park St. U'Pass
W.P. 149-60 - West. St. U'Pass.
District #4.

In reply to your memo dated Jan. 3rd. 1962 we submit the following:-

W.P.150-60 North Park St. Underpass.

Abutments & Shoulder Piers:- For these foundations we recommend 12 $\frac{1}{2}$ " O.D. tube piles (wall thickness $\frac{1}{4}$ ") with a design load of 50 tons/pile. Driving should be controlled by means of the Hiley Formula. For estimating purposes a pile tip elevation corresponding to about 15.0' below bottom of footing, may be assumed.

Median Pier:- Bored-in piles, as suggested for W.P.151-60, with a capacity of 50 tons/pile driven to approx. elevation 738.0 are recommended for this location.

W.P.149-60 West St. Underpass.

Abutments:- The tube piles should have a wall thickness of at least 0.25".

Cont'd. /2 ...

Shoulder Piers:- 12 $\frac{1}{2}$ " O.D. Tube Piles with a minimum wall thickness of 0.25" are recommended. A design load of 50 tons/pile may be used. Pile driving should be controlled by means of the Hiley Formula. For estimating purposes a pile length of 20.0' may be assumed.

Median Pier:- If care is taken it should be possible to place the bored-in piles with a clearance of 6" between piles and sewer. Approximate tip elevation of these piles is estimated to be 715.0.

KGS/tt

A. G. Stermac
Principal Foundation Engineer.

K. G. Selby
Per: K. G. Selby
Senior Project Foundation Engineer.

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



ONTARIO
DEPARTMENT OF HIGHWAYS

RM 110
POSTAL ADDRESS -
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS,
TORONTO 5, ONTARIO.

Bridge Division,
January 3, 1962.

MEMORANDUM TO:

Mr. A. G. Stermac,
Principal Foundation Engr.,
Department of Highways,
Room 107, Lab. Bldg.,
Downsview, Ontario.

Att.: Mr. K. G. Selby

RE: Proposed Structures on Brantford By-Pass,
✓ W.P. 150-60 North Park Street U'Pass,
W.P. 149-60 West Street U'Pass.

W.P. 150-60 North Park Street U'Pass

Abutments

11-1-79
The soil report recommends spread footings at El. 770 or below for South Abutment and El. 776 or below for North Abutment. The plans of the existing structure indicate that the existing foundation (approx. 38' x 28' in plan) extends to approx. El. 758.00, and it is possible that the ground may be disturbed below this elevation during demolition of the massive foundation. We would therefore like to use piles at this location and would like to know the type, capacity and the approx. pile tip elevation.

Approx 15.0' below El. 758.0
Use 50 tons / pile 12 3/4" O.D. TUBE
PILES. CONTROL WITH HULEN FORMULA

Shoulder Piers

The shoulder piers are also affected by the existing foundation as indicated above and we would again like to know the type, capacity and approx. pile tip elevation.

Median Pier

As above

There is an existing 6' diameter sewer (Invert El. 752.00 approx.) located at 5.2' south of centre line of Hwy. 403. We intend to support the pier on a single row of 12" diameter "bored in" tube piles (as suggested for W.P. 151-60 - Hwy. #24 U'Pass) driven to approx. El. 738.00 and having a capacity of 50 tons per pile. Could you please confirm this.

Yes.

.....2

RE: Proposed Structures on Brantford
By-Pass,
W.P. 150-60 North Park Street U'Pass,
W.P. 149-60 West Street U'Pass.

W.P. 149-60 West Street U'Pass

Abutments

The soil report recommends 12" diameter "thick wall" tubular steel displacement piles driven to approx. El. 733.00 having a design capacity of 50 tons per pile. Would you consider 0.25" wall thickness as "thick wall"? *Yes.*

Shoulder Piers

61-83
The soil report recommends spread footings at El. 735.00 which is about 8 ft. below the water table and 10 ft. below existing ground level. As the abutments and the median piers are to be supported on piles, we would like to use piles for shoulder piers as well. Could you please let us know the type, capacity and pile tip elevation for the piles.

Median Pier

*12" Tubes 1/4" wall drive by Hiley
Formula Est 15.0' below footing el*

There is an existing 6' diameter sewer (Invert El. 732.00) located at 4.3' North of subtangent to centre line of Hwy. 403. If we use a single row of 12" diameter piles to support the pier, we will only be able to provide a clearance of about 6" between the outside faces of the pile and the sewer. Would it be possible to work to such a close tolerance when driving these piles (same type as for W.P. 151-60 - Hwy. #24 U'Pass)? If not, we will have to straddle the sewer, with a row of piles on each side of the sewer and a 15' wide pile cap. Could you please let us have your views on this and provide us with the pile tip elevations.

If care is taken should be possible.

K. G. Bassi

KGB:go

K. G. Bassi,
Bridge Project Engineer,
for J. L. Keen,
Sr. Bridge Project Engineer.

Mr. A. M. Toye,
Bridge Engineer.
Materials and Research Division,
(Foundation Section).

November 27, 1961.

PILED FOUNDATIONS FOR
CENTRE PIERS.

Attention: Mr. C. Bassi.

Re: W.P. 149-60, ✓
W.P. 150-60,
W.P. 151-60,
Proposed Structures at
Brantford, District No. 4.

In connection with the proposed piled foundations for the centre piers of the above proposed structures, we have recently carried out one trial boring to determine the feasibility of a certain type of bored pile. This type of pile is cast in-situ in a pre-bored hole. The purpose of the trial boring was to determine whether or not, percolation of water would be rapid enough to seriously reduce the bearing capacity of the subsoil. The test was carried out at the location of W.P. 149-60, but conditions at all three sites are similar. From the results of the test boring and other considerations, we have arrived at the following conclusions:-

- (1) These piles would be suitable at all three locations, and could be placed within 12" of the existing sewer.
- (2) A pile 24" in diameter and of 25' in length (approx.), could support a design load of 50 tons. Tip elevations at the three locations should be as follows:-

W.P. 151-60	--	Elev. 748.0'
W.P. 149-60	--	Elev. 715.0'
W.P. 150-60	--	Elev. 733.0'

cont'd. /2 ...

Conclusions: (cont'd.) ...

- (3) The holes may require casing to a depth of about 2.0' below the sewer bottom. The necessity for this will be determined at the time of drilling and is dependent on the condition of the backfill material used in the sewer trench. If casing is used, the cased length of the hole will be 30" in diameter.
- (4) The borings should not stay open for more than one hour and no two adjacent holes should be open at the same time.

We have obtained an estimate from Western Foundation Borings (Ontario), Ltd., for installing this type of pile, which is as follows:-

Transportation of drill from Toronto ...	.30 cents per mile.
Piles cast in-situ (3000 p.s.i. concrete)	\$5.00 per ft.
Extra for cased length of hole	\$2.00 per ft.

In our view, this type of pile would be the most practical from both an engineering and economic viewpoint.

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

K. G. Selby

(K. G. Selby,
SR. PROJECT FOUNDATION ENGR.)

KGS/MdeF

cc: Mr. B. Davis

Foundations Office ✓
Gen. Files.