

February 23, 1961.

C. C. Parker & Parsons, Brinckerhoff, Ltd.,
Consulting Engineers,
795 Main Street West,
Hamilton, Ontario.

Attention: Mr. J. W. Bisher.

Re: Church Access Overhead - Chedoke Expressway
Eng. No. B 4567-BH-10 - C.C. Parker & Assoc.
Eng. No. 60-7-25 A1 - B.H.C.
W.F. 192-60 -- W.J. 60-F-25A, Hamilton, Ont.

Dear Sir:-

Attached, we are sending to you four (4) copies of the Foundation Investigation Report for the above mentioned location.

This report has been made necessary by the realignment of the Church Access, and should be read in conjunction with our previous Foundation Report, W.J. 60-F-25, dated June 17/60.

We believe the conclusions and recommendations contained in this report, are self-explanatory and adequate for your future design work; however, should any queries arise in connection with this project, please do not hesitate to call on our Office.

Yours very truly,

WCB/HCB
Attach.

L. O. Lodermus,
PRINCIPAL FOUNDATION ENGR.
Per:

cc: C.C. Parker & Assoc. (4)
A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
I. C. Campbell
J. C. Thatcher
T. J. Kovich
A. Watt

Foundations Office
Gen. Files.

Afternoon
(A. S. Sternac,
SUPERVISING FOUNDATION ENGR.)

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FOUNDATION INVESTIGATION

For

Church Access Overhead - Chedoke Expressway
Dwg. No. D 4567-3H-10 - C.C. Parker & Assoc.
Dwg. No. 60-7-25 AA - B.H.O.
W.P. 192-60 -- W.J. 60-7-25A, Hamilton, Ont.
District No. 4.

1. INTRODUCTION:

In connection with the Chedoke Expressway, a wooden overhead bridging the C.P.R. cutting and tracks between the basilica grounds and Breda Albane Street is to be replaced by a rigid framed composite bridge. A retaining wall is to be built along the base of the cutting slope running south from the south-west corner of the new structure. An investigation was carried out to determine the subsoil characteristics beneath the proposed structure and retaining wall. This report contains the resulting borehole logs and soil profiles, Standard Penetration test results, lab. testing results, along with conclusions and recommendations. This report has been made necessary by the realignment of the Church Access, and should be read in conjunction with Department of Highways' Foundation Report W.J. 60-7-25.

2. SITE DESCRIPTION & GEOLOGY:

The site lies within the area covered by the former Lake Iroquois formed in the Pleistocene Epoch. The red Queenston shale bedrock is covered by a layer of alluvium deposited from the lake waters. When the level of the lake water rose with the retreat of the ice, gravel bars were formed on top of the alluvium. The railway cutting, cut through the exposed well-cemented sand and gravel, is underlain by layers of dense silty sand and silty clay containing gravel and fragments of red shale. The bedrock is of red and grey Queenston Shale. The steep slopes of the cutting are partly covered with topsoil and vegetation.

3. FIELD INVESTIGATION AND LABORATORY TESTS:

The field work consisted of three boreholes, located as shown on the plan of the site at the rear of this folder, drilled to bedrock by a conventional diamond drill converted for soil sampling purposes. Undisturbed samples were obtained by 2" I.D. Shelby tubes. Disturbed samples and 'N' values were obtained by using a standard split spoon sampler.

All samples identified in the field were again identified in the laboratory. Routine index properties tests were performed on selective samples. The results of these tests, borehole logs and profiles, and graphical standard penetration results, are found in Appendix I.

4. SUBSOIL CONDITIONS:

4.1) General:

Originally, the site was covered with a 30.0' layer of well-cemented sand and gravel. This has been removed to form a railway cutting. Beneath this layer, is one of very dense silty sand laid down on top of a stratum of silty, inorganic grey clay of low to medium plasticity, containing some gravel and fragments of red shale. Following this, is bedrock consisting of red-grey (weathered) shale.

4.2) Well-Graded Sand & Gravel:

This well-graded, well-cemented sand and gravel has an average 'N' value of 50 and a minimum elevation of 282.0'.

4.3) Very Dense Silty Sand and Silty Clay Layers:

This very dense silty sand with silty clay layers is found between elevations 271.0' and 285.0' in B.H. 7, 266.0' and 282.0' in B.H. 5, and 271.0' and 281.0' in B.H. 6. It has an average 'N' value of 35. However, in B.H. 5, at an elevation of 275.0', the 'N' value is 16 and W/C is 18%, L.L. 29.3%, and P.L. 17.3%. A classification test shows this sample to be clayey silt. Values of P.L. = 16.9%, L.L. = 27.5%, and W/C = 17.9%, are

cont'd. /3 ...

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

4.3) Very Dense Silty Sand and Silty Clay Layers: (cont'd.) ...

average values for this stratum. In B.H. 5 between elevations 266.0' and 261.0', there exists a stratum of fine sand with fine gravel and fragments of red shale.

4.4) Silty Grey Clay of Low to Medium Plasticity, containing some Gravel and pieces of Red Shale:

This stratum extends to bedrock between elevations 250.0' and 261.0' in B.H. 5, 247.5' and 271.0' in B.H. 6, and 241.0' and 271.0' in B.H. 7. It has a minimum 'N' value of 15 and an elevation of 261.0'. Average values for P.L., L.L., and W/C are 16.0%, 28.0%, and 17.0%, respectively. The soil has an average density of 135 p.c.f.

4.5) Bedrock - Red Queenston Shale:

The bedrock of red-grey Queenston Shale was proved by drilling a 5.0' core and obtaining full recovery. In B.H. 5, 4.0' of weathered shale lies on top of the Queenston Shale.

5. GROUNDWATER CONDITIONS:

Due to a collapse of borehole walls, the water level was measured only in B.H. 7, where it was found at an elevation of 252.0'.

6. FOUNDATION CONSIDERATIONS & RECOMMENDATIONS:

The investigation has shown that the subsoil conditions are favourable and the properties of the encountered layers are such that spread footings can be considered. Both the surface layer of dense cemented, well graded sand and gravel and the underlying layer of dense silty sand with stiff to very stiff silty clay, are capable of supporting spread footings with a safe bearing capacity of 3.0 T/sq.ft. It will depend on the type of the structure, i.e., on the span where the footings will be placed.

cont'd. /4 ...

6. FOUNDATION CONSIDERATIONS & RECOMMENDATIONS: (cont'd.) ...

The condition that has to be fulfilled is adequate footing frost protection. Four to five feet of overburden cover are recommended.

It is most likely that a one-span structure with abutments at the toe of the existing slope will be chosen for this location. In such a case, the abutment footings should be placed at elevation 280.0' or 281.0' and the above mentioned safe bearing capacity taken.

During the investigation, the ground water table was established at elev. 282.0'. Because of the relatively permeable character of the soil, seepage into the footing excavations can be expected. Provisions must be taken to keep the excavation dry and in very good condition. We believe that a sump pump would be adequate and would satisfy the requirements.

The presence of a layer with less resistance, as recorded with the Standard Penetration Test, was also considered. Because of the very low plasticity and relatively low liquidity index, the settlements should be small and well within the allowable limits. It is believed that practically all the settlements will occur and take place during construction.

7. SUMMARY:

7.1) At the site a layer of dense well-cemented sand and gravel covers a stratum of dense silty sand with layers of stiff silty clay. Beneath this is a layer of grey silty clay with some gravel and fragments of red shale.

7.2) Both the layer of well-cemented sand and gravel and the underlying layer of dense silty sand with stiff clay, are capable of supporting spread footings with a bearing capacity of 3.0 T/sq.ft.

cont'd. /5 ...

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

- 7.3) Frost protection for the footings must be provided by four to five feet of overburden. If the abutments are built at the toe of the existing slope, a suitable footing elevation would be 280.0' to 281.0'.
- 7.4) Because of the very low plasticity and relatively low liquidity index, the settlements should be small and well within allowable limits. Practically all the settlements will take place during construction.
- 7.5) During the investigation the water table was placed at an elevation of 282.0' and seepage will occur into footing excavations placed below this elevation. Provision must be made to keep the excavation dry and in good condition.

8. MISCELLANEOUS:

The field work was carried out by F. Johnston Drilling Ltd., using a diamond core drill converted for soil sampling conditions. It was supervised by K. Selby, T. F. Widdis and H. Devata, Project Foundation Engineers, and was carried out from November 18th, 1960 to December 2nd, 1960.

February 1961.

REPORT PREPARED BY:

Thomas F. Widdis
.....
T. F. Widdis,
PROJECT FOUNDATION ENGR.

REPORT APPROVED BY:

A. G. Sternac
.....
A. G. Sternac,
SUPERVISING FOUNDATION ENGR.

APPENDIX I.

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 192-60

BORE HOLE NO. 5

JOB 60-F-25A

STATION See drawing.

DATUM 291.0'

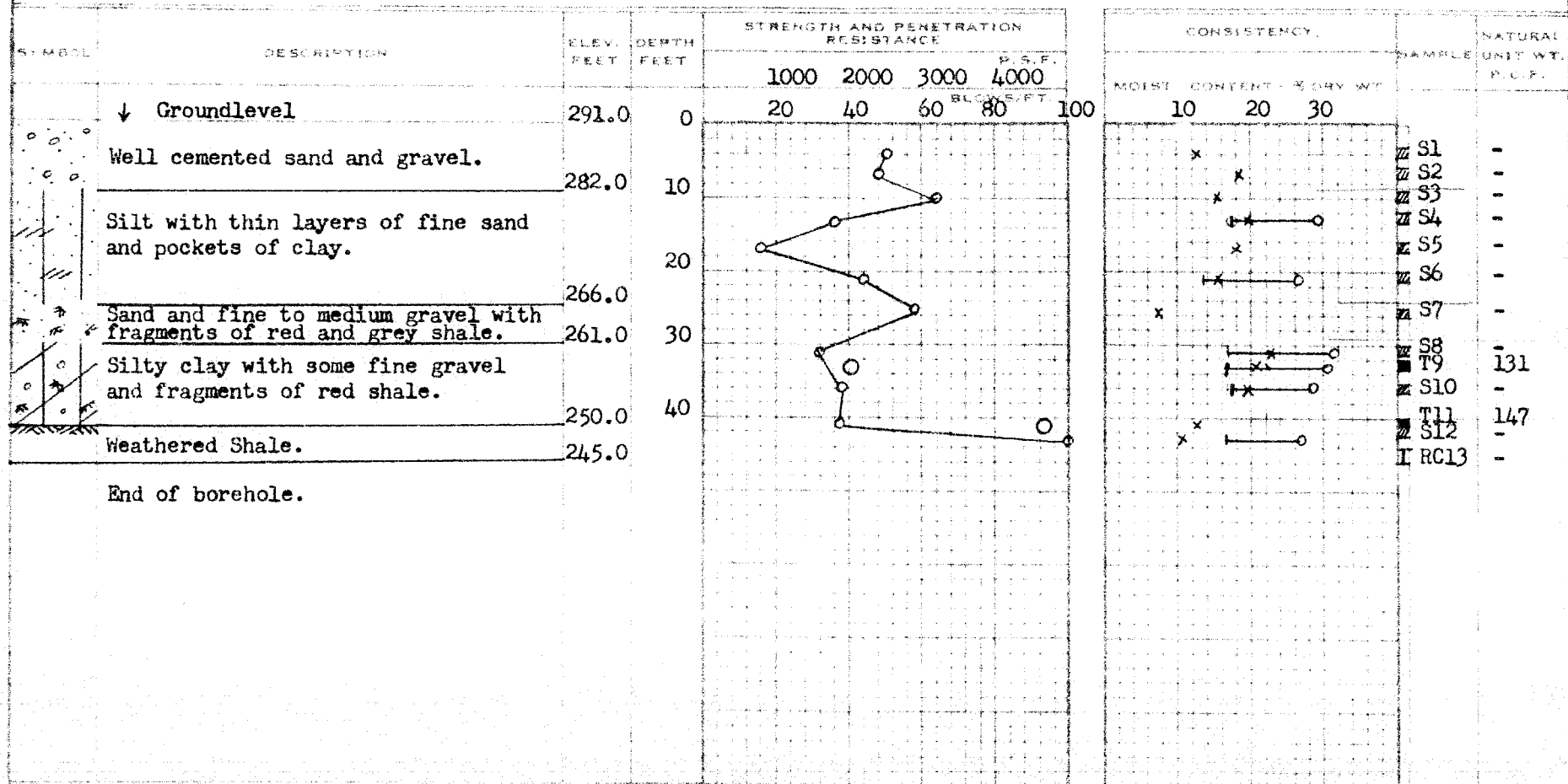
COMPILED BY B. K.

BORING DATE Nov. 30/60

CHECKED BY T. F. W.

LEGEND

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



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 192-60 BORE HOLE NO. 6

JOB 60-F-25A STATION See drawing.

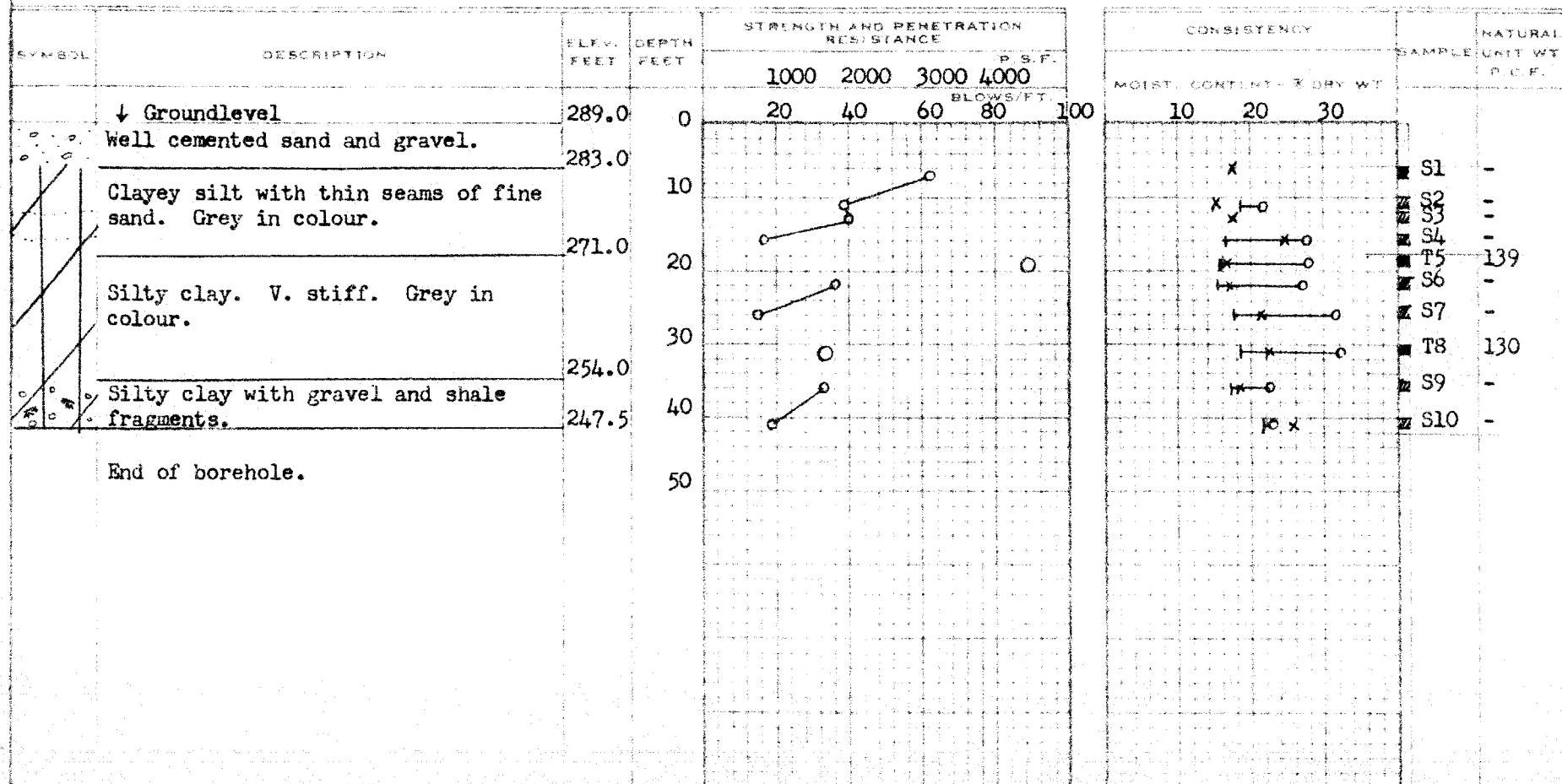
DATUM 289.0' COMPILED BY B.K.

BORING DATE Nov. 24/60 CHECKED BY T.F.W.

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)	+ ^u
NATURAL MOISTURE AND	LI
LIQUIDITY INDEX	X
LIQUID LIMIT	
PLASTIC LIMIT	



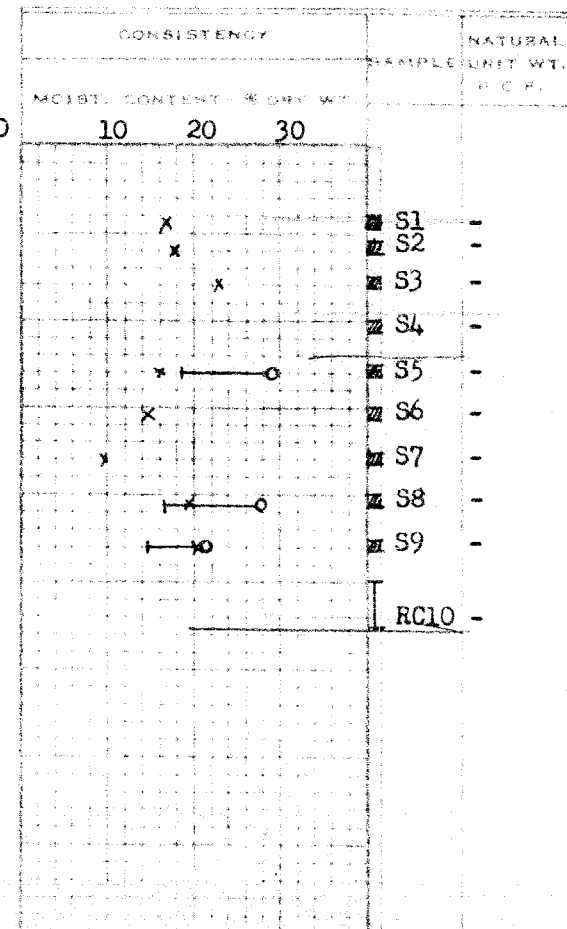
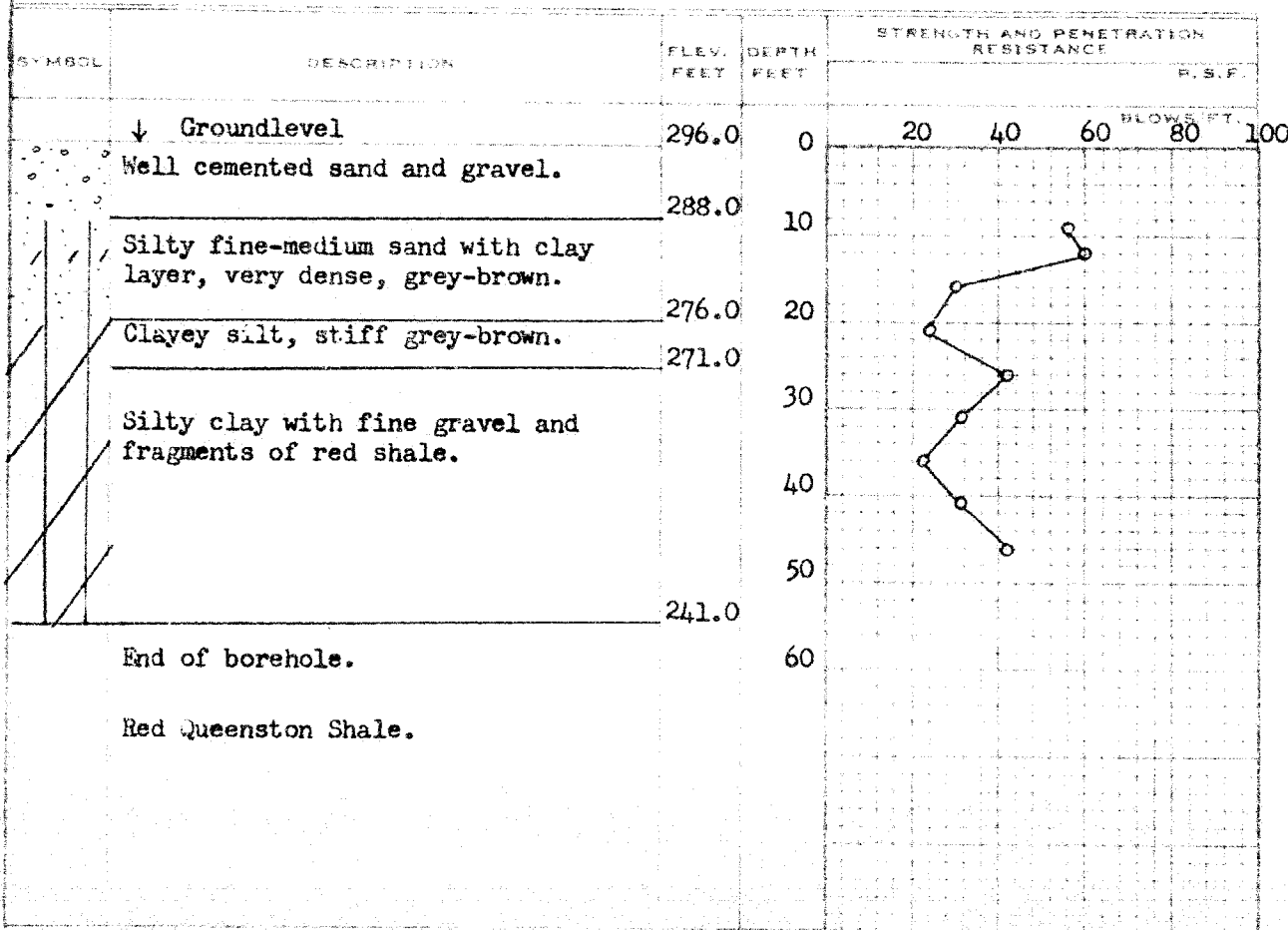
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 192-60 BORE HOLE NO. 7
JOB 60-F-25A STATION See drawing.
DATUM 296.0' COMPILED BY B.K.
BORING DATE Nov. 21/60 CHECKED BY T.F.W.

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) +s
NATURAL MOISTURE AND LIQUIDITY INDEX LI
LIQUID LIMIT Y
PLASTIC LIMIT



SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-25A

W P 192-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST BLOWS/FT	MOIST CONT %	PLASTIC LIM %	LIQUID LIM %	SHRINKAGE %	UNIT WEIGHT	REMARKS
5	S1	3'-4.5'	Fine to medium sand with medium to large gravel. Dense.	50	12.5	-	-	-	-	
	S2	6'-7.5'	Fine sand with medium to large gravel, dense, brown.	48	18.5	-	-	-	-	
	S3	9'-10.5'	Fine sand with silt seams, dense, brown.	64	15.2	-	-	-	-	
	S4	12'-13.5'	Silt with clay pockets, dense, reddish brown.	36	19.6	-	-	-	-	
	S5	16'-17.5'	Silt with thin layers of fine sand and occasional pockets of clay.	16	18.0	17.3	29.3	-	-	
	S6	20'-21.5'	Clayey silt, dense grey.	44	15.2	13.7	26.5	-	-	
	S7	25'-26.5'	Sand and fine-medium gravel with fragments of red and grey shale dense.	49	7.5	-	-	-	-	
	S8	30'-31.5'	Silty clay, with fine gravel medium dense.	16	22.5	16.7	31.7	-	-	
	T9	32'-33.5'	Silty clay, grey.	P	20.4	16.8	30.3	2040	131	
	S10	35'-36.5'	Silty clay, grey.	39	19.9	17.7	28.7	-	-	
	T11	40'-40.9'	Silt with fragments of red shale.	38-11"	12.2	-	-	4660	147	
	S12	41'-42.5'	Weathered red and grey shale.	100	10.8	16.4	27.0	-	-	
	RC13	44'-46'	Red and grey shale. 18" Recovery	-	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-25A

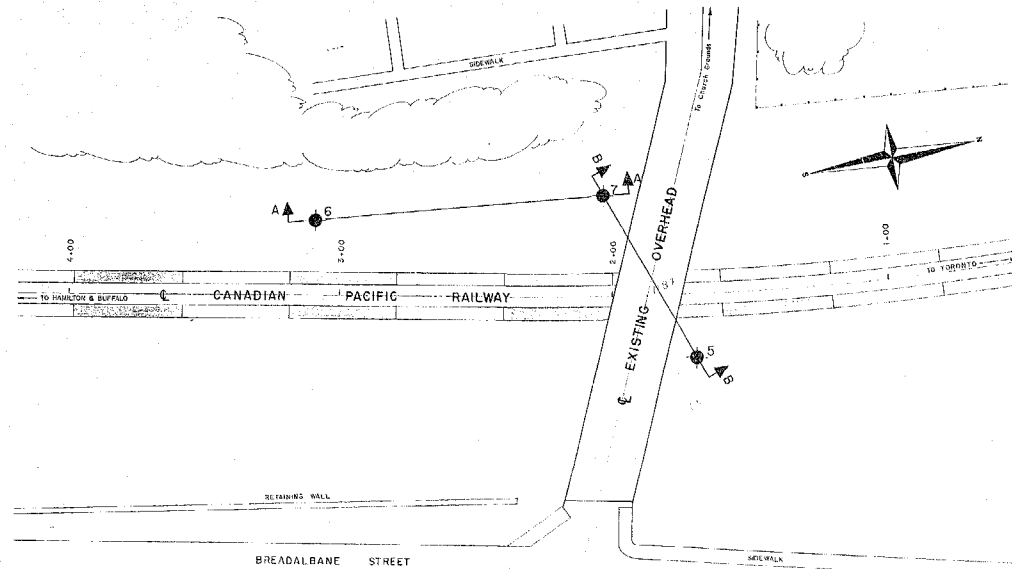
W.P. 192-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST (BLW/FT)	MOIST CONT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	SHRINKAGE (%)	DRAIN WEIGHT (%)	REMARKS
6	S1	6'-6.5'	Coarse sand, Dense.							
		6.5'-7.5'	Sandy silt, dense, brown in colour.	62	17.4	-	-	-	-	
	S2	10'-11.5'	Silt with thin seams of fine sand Dense grey in colour.	39	15.2	18.7	21.5	-	-	
	S3	12'-13.5'	Clayey silt, hard, grey.	40	17.6	-	-	-	-	
	S4	15'-16.5'	Clayey silt with thin seams of fine sand, grey in colour.	17	24.7	16.1	27.5	-	-	
	T5	18'-19.5'	Silty clay, v. stiff, grey.	P	16.3	15.7	27.8	4460	139	
	S6	21'-22.5'	Silty clay, Hard. grey.	36	16.9	15.6	27.2	-	-	
	S7	25'-26.5'	Silty clay, firm, grey.	15	21.1	17.5	31.7	-	-	
	T8	30'-31.2'	Silty clay, grey.	P	22.4	18.3	37.3	1670	130	
	S9	35'-36.5'	Silty clay, with some medium sand and gravel. grey.	33	18.5	17.2	22.9	-	-	
	S10	41.0'-42.3'	Silty clay, with fragments of shale and gravel.	19	25.8	21.7	22.9	-	-	

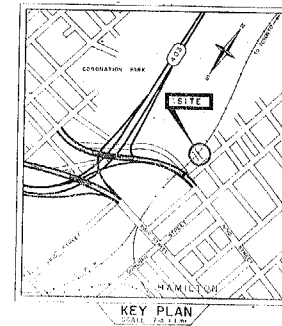
JOB 60-F-25A

W.P. 192-60

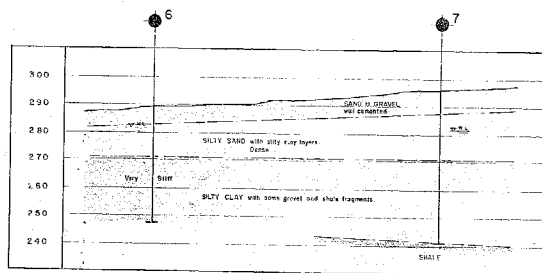
S denotes split spoon sample
T " shelby tube sample
RC " rock core



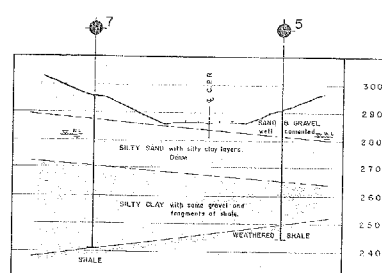
PLAN



KEY PLAN



A - A



B - B

LEGEND			
	BORE HOLE		
HOLE NO.	ELEVATION	STATION	DISTANCE FROM C
5	291.0	1+68.5	21' LT.
6	288.0	3+09.4	26' RT.
7	296.0	2+03.9	36' RT.

MINISTRY OF HIGHWAYS AND TRANSPORT MATERIALS & RESEARCH SECTION CHEDoke EXPRESSWAY CHURCH ACCESS OVERHEAD AND CANADIAN PACIFIC RAILWAY			
PROJECT NO. 1000 DRAWN BY D. THOMPSON CHECKED BY APPROVED BY	SCALE: 1" = 20' Vert 1" = 20' Hor	DATE: 3 MARCH 1961 PROJECT NO. 1000 DRAWING NO.	60-F-25A-A