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59-F-057

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W.P. 267-59

#

Hwy 400 &

GRAVEL ROAD

W. KING CITY

Mr. A. H. Toye,
Bridge Engineer.
Materials & Research Section.

August 14, 1959.

Re: Foundation Report -

W.P. 267-59 - W.J. P 59-57.

Attention: Mr. S. McCombie.

Re: Bay. 400 Rd. All'ce. between
Twp. of Vaughan & King, Cty. of
York - Approx. 3 1/2 mi. W. of
King City.

This memo accompanies our foundation report at the above site. Reference to the contents indicates the following conditions:-

- (1) The strength and compressibility characteristics of the glacial till subsoil are such that spread footings may be used for an overpass or underpass structure.
- (2) Footings founded at the recommended elevations can be designed using an allowable bearing capacity of 2 1/2 tons/sq. ft.
- (3) No water problems are anticipated at this site.
- (4) The soil properties of the subsoil are such that approach embankments or cuts can be designed using standard 2:1 slopes.

If you have any queries concerning the contents of this report, please contact our office.

EP/M&R
Encl.

cc: Messrs. A. H. Toye
E. A. Fregashaw
D. G. Ramsay
J. Ford
C. Fraser
F. F. Weber
A. Watt

Foundation Section.

Gen. Files.

L. G. Soderman,

PRINCIPAL SOILS & FOUNDATIONS ENGR.
per:

(E. Fonger,
Foundation Field Supervising Engr.)

W. of Vaughan and King,
about 1/2 mile - approximately
1/2 mile W. of King Hwy.

Plan No. 10-1-1.

Profile No. 10-1-1

Chainage Sta. 10+00 to 10+50
(King Twp.)

Sta. 10+00 to 10+50 -
(Vaughan Twp.)

Distribution:

Mr. A. M. Doye, Bridge Engineer.	(2)
Mr. H. A. Tregaskes, Construction Engineer.	(1)
Mr. P. G. Massey, Design Engineer.	(1)
Mr. J. Ford, Project Design Engr.	(1)
Mr. C. Fraser, District Engr., Toronto.	(1)
Mr. A. F. Weber, Regional Soils Engineer.	(1)
Mr. A. Watt, Ontario Water Resources Commission.	(1)
Foundation Section.	(1)
Gen. Files.	(1)

A.I. F 59-57.

W.F. 267-59.

INTRODUCTION:

Presented in this report are the results of a subsoil investigation carried out at a structure location approximately 1 mile south of King City Interchange where Hwy. 400 crosses the gravel road between Twp. of Vaughan and King (Sta. 478+46.22, Hwy. 400 Twp. of Vaughan - Sta. 0+00, Twp. of King, Profile No. C-1643-1). This report contains field and laboratory findings along with recommendations for the foundation of the structure.

The field work commenced on June 5th, 1959 and was completed on June 11th, 1959.

DESCRIPTION OF THE SITE & GEOLOGY:

The site is located on a moderately level ground. The areas on both sides of the gravel road are presently cultivated.

Geologically, the site under consideration is located on the Peel Plain. The Peel Plain is a level to undulating tract of clay soils covering the central portions of York, Peel and Halton Counties. The soil type in this region consists of a shallow surface of clay overlying dense silty clay to silty sand.

DESCRIPTION OF FIELD & LABORATORY WORK:

Field work consisted of four sampled boreholes carried out by a standard diamond drill adapted for soil sampling. Conventional wash boring procedures were followed and samples recovered at depths required. Samples were obtained by means of 2" I.D. thin-walled Shelby tube sampler or a 2" O.D. split-barrelled spoon sampler. The dimensions of this spoon sampler and the energy used in driving it conform to requirements of the Standard Penetration Test. In addition to the sampled boreholes, a dynamic cone profile

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

was obtained adjacent to each sampled borehole (except Borehole #3). Samples were sealed to prevent loss of moisture, and shipped to the laboratory for visual examination and identification. Routine index tests were carried out on selected representative samples.

Laboratory and field test results have been summarized in Table No. 1 and are included in this report under Appendix I.

Drawing No. P 59-57A shows the borehole locations and the estimated subsoil stratigraphy.

SUBSOIL CONDITIONS:

The proposed site is underlain by a glacial till described as grey dense silty sand and silty clay to clay.

In the order of stratigraphic succession, the following soil types are defined:

Medium to Hard Clay Containing Some Small Stones:

This material extends below the top soil approximately 12 to 18 ft. The upper zone was found to be stiff and exhibited a brown colour due to oxidation. The brown clay in Borings 3 & 4 contains organic matter approximately 8 ft. below the ground. Below the oxidized zone the colour of the clay is predominantly grey. The average unit weight and moisture content were found to be 138 p.c.f. and 15%, respectively. Liquid and plastic limits averaged 26% and 17%. The Standard Penetration tests carried out during sampling, gave average 'N' values ranging from 20 to 70 blows.

cont'd. /3 ...

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

Grey Silty Clay:

Underneath the clay crust described on the foregoing page, a thick layer of 20 to 30 ft. of medium to hard silty clay was encountered. The silty clay, grey in colour, contains approximately 37% of silt, 18% of sand and 3% of fine gravel. The natural moisture content of this stratum varied from 9 to 18%, with liquid and plastic limit values averaging 20% and 14%. The average unit weight has been determined as 140 p.s.f. Standard Penetration tests carried out during sampling, gave 'N' values varying from 30 to 80 blows.

Grey Silty Sand and Sand:

Layers of silty sand and sand were encountered underneath the stratum of hard grey silty sand. Occasional bands of silty clay were encountered in borings 1 & 3; also, a thin layer of grey silty clay was noticed at the end of these boreholes. The silty sand contains approximately 50% sand and 44% of silt. Average 'N' values in this stratum exceed 100.

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

WATER CONDITIONS:

Observations and measurements carried out during the exploration programme indicate that ground water table is approximately at Elev. 868.0' to 870.0' . In view of the fact that no artesian water conditions or water-bearing sand seams were encountered during

cont'd. /4 ...

- 4 -

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

the exploration programme, seepage in-flow during footing excavation will be local and of minor quantities.

FOUNDATION CONSIDERATIONS:

At the time of the foundation investigation, it was not known whether Highway 400 was to be built over (overpass) or under - (underpass) the gravel road. For this reason, a recommendation for both types of structures is included:-

(a) Overpass:

The thin layer of organic material encountered in boreholes 3 & 4 must be removed prior to the placing of spread footings. Spread footings may be placed at elevation 899.0' or lower. At this elevation an allowable bearing pressure of 2 1/2 tons/sq. ft. may be used for footings 7 to 10 feet in width.

No stability problem is anticipated for the approach embankments. Side slopes of 2:1 should be used.

No problems associated with seeping water are expected for footings placed at elevation 899.0'.

(b) Underpass:

The construction of an underpass at this location (i.e. - Highway 400 goes under the gravel road) will necessitate the placing of footings at approximately elevation 870'. At this elevation, footings will be founded in the dense silty sand stratum. An allowable bearing capacity of 2 1/2 tons/sq. ft. for footings 7 to 10 feet wide may be utilised near elevation 870'.

cont'd. /5 ...

FOUNDATION CONSIDERATIONS: (cont'd.) ...

At the time of the investigation, the ground water elevation was established at elevation 870'. It is to be expected that this water table will be higher during the wet seasons. Any in-flow of water can be handled with low capacity pumps, since continuous water-bearing sand seams, or artesian pressures were not encountered.

Seepage water may soften or disturb material on which the foundation is to be placed; therefore, foundations should be placed with a minimum of delay, once the excavation is made. If footings cannot be placed immediately, a weak mixture of concrete should be placed to prevent further disturbance of the material.

Side slopes of cuts should not exceed 2 horizontal to 1 vertical.

CONCLUSIONS:

- (1) The subsoil at the proposed site consists of a medium dense to dense layer of glacial till. The glacial till varies in composition from a silty clay with some stones, to a silty sand.
- (2) Consideration has been given to either an overpass or an underpass at the proposed crossing. In either case, allowable bearing capacities of 2 1/2 tons/sq. ft. at elevation 899' for an overpass, and near elevation 870' for an underpass, may be used. Settlements associated with this bearing capacity will be acceptable.

cont'd. /6 ...

CONCLUSIONS: (cont'd.) ...

- (3) Water seepage in the excavations of an under or overpass, will easily be controlled by low capacity pumps.
- (4) A thin layer of weak concrete is recommended at the bottom of footings if footings are not placed immediately. This layer will prevent further disturbance and softening of the subsoil under the footings.
- (5) No stability problem for cuts or fills is anticipated. Side slopes should be 2 horizontal to 1 vertical.

M. Devata.
M. Devata.

AL PERDIA 1.

SUMMARY OF FIELD & LABORATORY TESTS

JOB P59 - 57

W P 267 - 59

HOLE NO.	SAMP. N.	DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST BLOW/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH (PSF)	UNIT WEIGHT (PCF)	REMARKS
1	S1	5' - 6.5'	Brown medium to hard clay	20	--	--	--	-----	-----	
	S2	10' - 11.5'	Brown medium to hard clay	75	13.5	--	--	-----	-----	
	S3	15' - 16.5'	Brown medium to hard clay	62	--	--	--	-----	-----	
	S4	20' - 21.5'	Grey clay to silty clay	65	--	--	--	-----	-----	
	T5	25' - 26.5'	Grey clay to silty clay	59	16.6	--	--	2750	136.0	
	T6	30' - 31.5'	Grey hard silty clay with some sand	49	19.9	--	--	1650	134.1	
	S7	35' - 36.5'	Grey hard silty clay with some sand	136	9.4	--	--	-----	-----	
	S8	40' - 41.5'	Greyish brown sand with some gravel or silty sand with fine gravel	>100	11.1	--	--	-----	-----	
	S9	45' - 46.5'	Greyish brown sand with some gravel or silty sand with fine gravel	110	18.7	--	--	-----	-----	
	S10	50' - 51.5'	Greyish brown sand with some gravel or silty sand with fine gravel	200	14.5	--	--	-----	-----	
	S11	55' - 56.5'	Very hard grey silty clay with some sand	140	8.6	--	--	-----	-----	
2	S1	5' - 6.5'	Brown medium to hard clay	13	--	--	--	-----	-----	
	S2	10' - 11.5'	Dry brown silty clay	76	13.4	--	--	-----	-----	
	S3	15' - 16.5'	Dry brown silty clay	50	--	--	--	-----	-----	
	S4	20' - 21.5'	Medium grey clay with very little fine	40	--	--	--	-----	-----	
	T5	25' - 26.5'	Medium hard to hard grey silty clay	25	18.6	--	--	1070	131.5	
	S6	30' - 31.5'	Medium hard to hard grey silty clay	41	19.5	--	--	-----	95.4	
	T7	35' - 36.5'	Very hard grey silty clay with some sand	68	8.2	--	--	-----	-----	
	S8	40' - 41.5'	Very hard grey silty clay with some sand	80	9.6	--	--	-----	-----	
	S9	45' - 46.5'	Very hard grey fine sandy silt or silty sand with presence of clay pockets	80	18.3	--	--	-----	-----	
	S10	50' - 51.5'	Very hard grey fine sandy silt or silty sand with presence of clay pockets	108	16.2	--	--	-----	-----	
	S11	55' - 56.5'	Very hard grey fine sandy silt or silty sand with presence of clay	112	10.4	--	--	-----	-----	

SUMMARY OF FIELD & LABORATORY TESTS

JOB P59 - 57

W P 267 - 59

MOLE NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETR RESIST BLOWS/FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
3	S1	4' - 5.5'	Brown clay with organic matter	15	22.4	--	--	-----	135.0	
	S2	7' - 9.5'	Grey brown silty clay with fine to medium gravel	45	16.8	18.1	30.4	-----	139.6	
	S3	10' - 11.5'	Grey brown silty clay with fine to medium gravel	55	11.1	--	--	7000+	150.0	
	S4	13' - 14.5'	Grey brown silty clay with fine to medium gravel	42	12.6	--	--	6900	151.9	
	S5	16' - 17.5'	Stiff grey clay	57	11.6	--	--	6850	153.8	
	S6	20' - 21.5'	Stiff grey clay	30	17.6	15.0	22.6	5750	142.4	
	S7	25' - 26.5'	Stiff grey clay	47	19.0	--	--	-----	145.6	
	S8	30' - 31.5'	Medium grey silty clay (plastic when wet)	23	--	--	--	-----	-----	
	S9	33' - 34.5'	Medium grey silty clay (plastic when wet)	15	27.1	--	--	-----	138.7	
	T10	36' - 37.5'	Grey very fine silty sand	44	10.2	11.9	14.3	4280	143.6	
	S11	40' - 41.5'	Grey very fine silty sand	122	20.6	--	--	-----	-----	
	S12	45' - 46.5'	Dense very fine silty sand	118	13.5	--	--	-----	-----	
	S13	50' - 51.5'	Dense very fine silty sand	142	16.6	--	--	-----	-----	
	S14	60' - 61.5'	Very hard grey silty clay with sand	115	9.6	--	--	-----	-----	
4	S1	4.0' - 5.5'	Hard brown clay with some fine gravel	44	17.0	--	--	7000+	142.1	
	S2	7.0' - 8.5'	Hard brown clay with some fine gravel	78	16.0	--	--	7000+	137.6	
	S3	10' - 11.5'	Hard brown clay with some fine gravel	42	15.0	--	--	7000+	147.5	
	S4	13' - 14.5'	Brown silty clay	44	15.5	--	--	7000+	137.4	
	S5	16' - 17.5'	Brown silty clay	54	14.3	15.1	28.1	-----	-----	
	S6	20' - 21.5'	Medium hard grey clay	36	19.5	--	--	-----	-----	
	T7	25' - 26.5'	Grey silty clay	58	17.2	--	--	4100	136.9	
	S8	30' - 31.5'	Brown silty sand with fine gravel	72	19.4	--	--	-----	-----	
	S9	33' - 34.5'	Brown silty sand with fine gravel	57	10.2	--	--	6150	144.8	
	S10	36' - 37.5'	Grey silty clay	58	26.4	--	--	6570	-----	
	S11	40' - 41.5'	Grey fine sand	137	15.3	--	--	-----	-----	
	S12	45' - 46.5'	Grey fine sand	133	17.3	--	--	-----	-----	
	S13	50' - 51.5'	Grey fine sand	116	15.0	--	--	-----	-----	
	S14	60' - 61.5'	Grey fine sand	70	15.8	--	--	-----	-----	
			S Denotes split spoon sample							
			T Denotes thin walled Shelby tube							

DEPARTMENT OF HIGHWAYS - ONTARIO

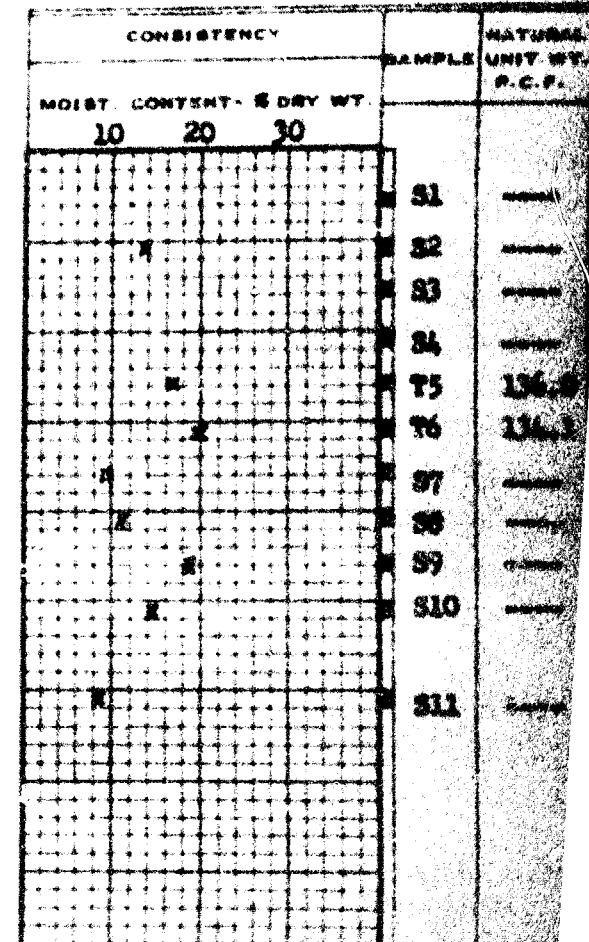
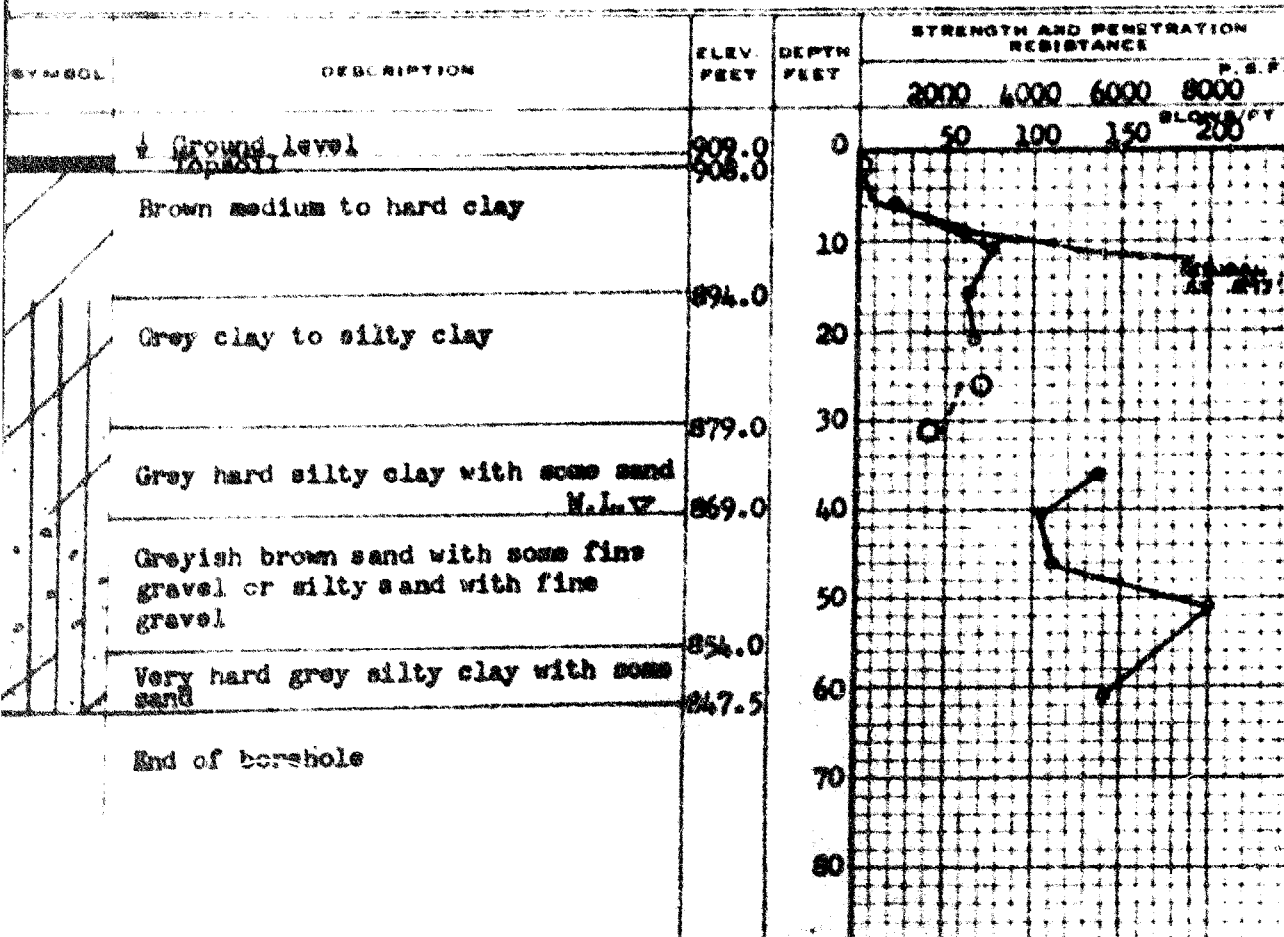
MATERIALS AND RESEARCH SECTION

W.P. 267 - 59 BORE HOLE NO. 1
 JOB P59-57 STATION Q/23 (65' RT)
 DATUM 909.0' COMPILED BY B.J.
 BORING DATE June 5/59 CHECKED BY 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



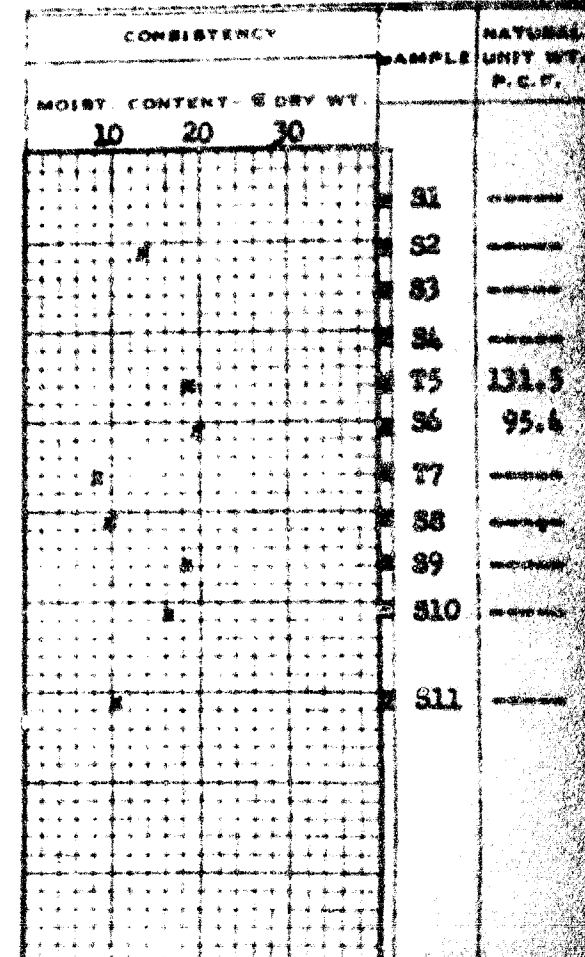
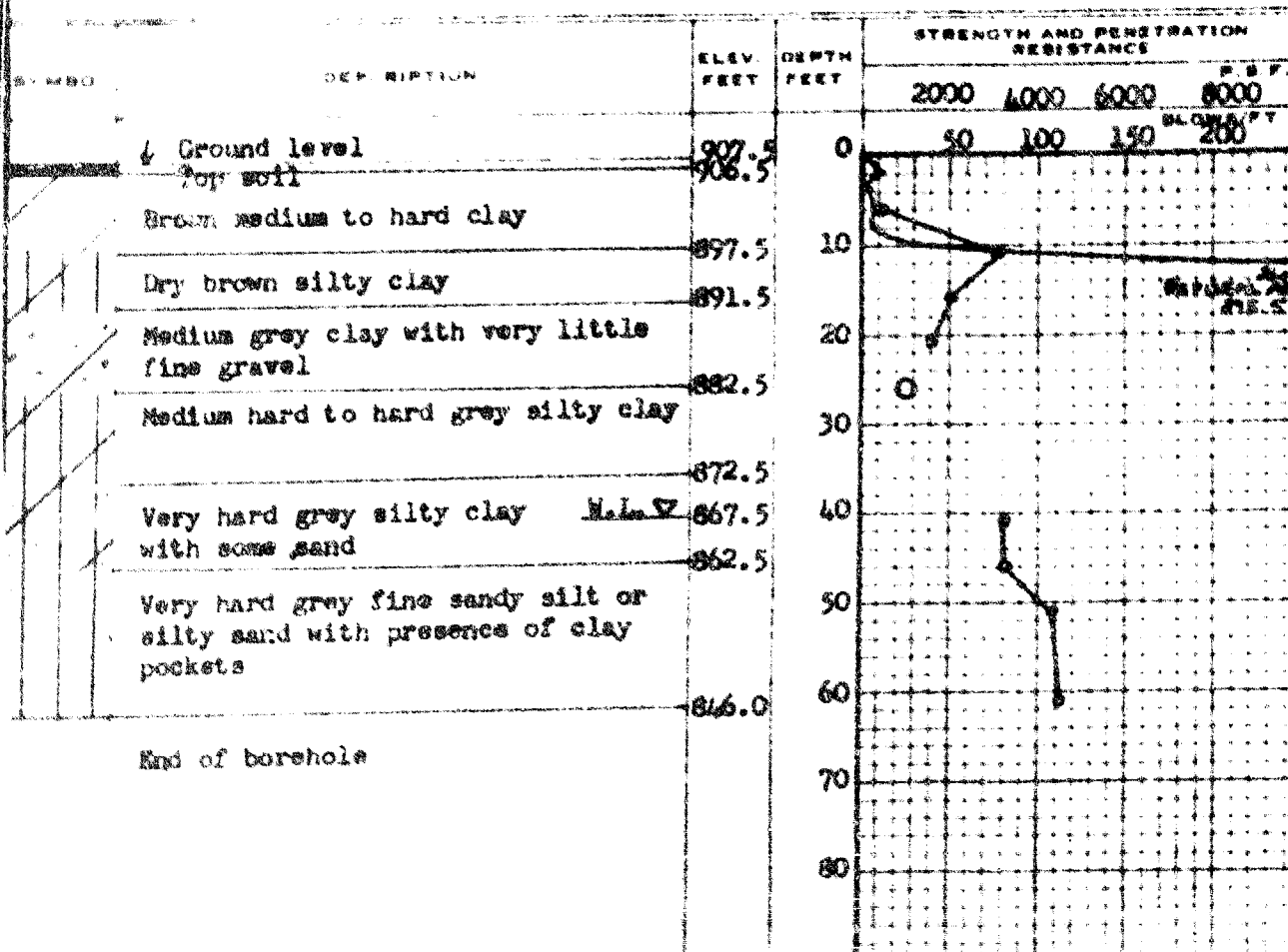
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 267 - 59 BORE HOLE NO. 2
JOB P59 - 57 STATION 448+16 (67' RT)
DATUM 277.5' COMPILED BY B.J.
BORING DATE June 2/59 CHECKED BY 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 --- X
LIQUID LIMIT --- L
PLASTIC LIMIT --- P



DEPARTMENT OF HIGHWAYS - ONTARIO

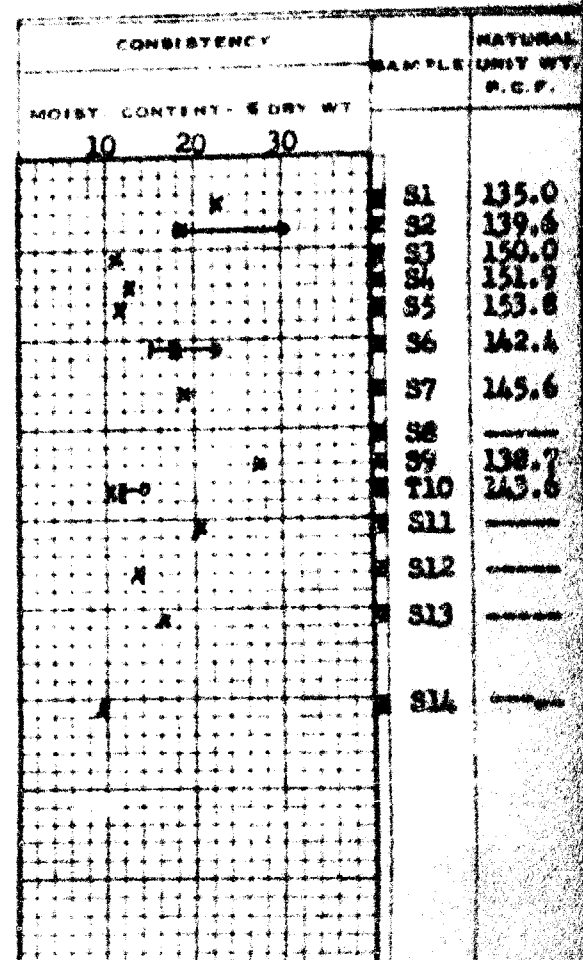
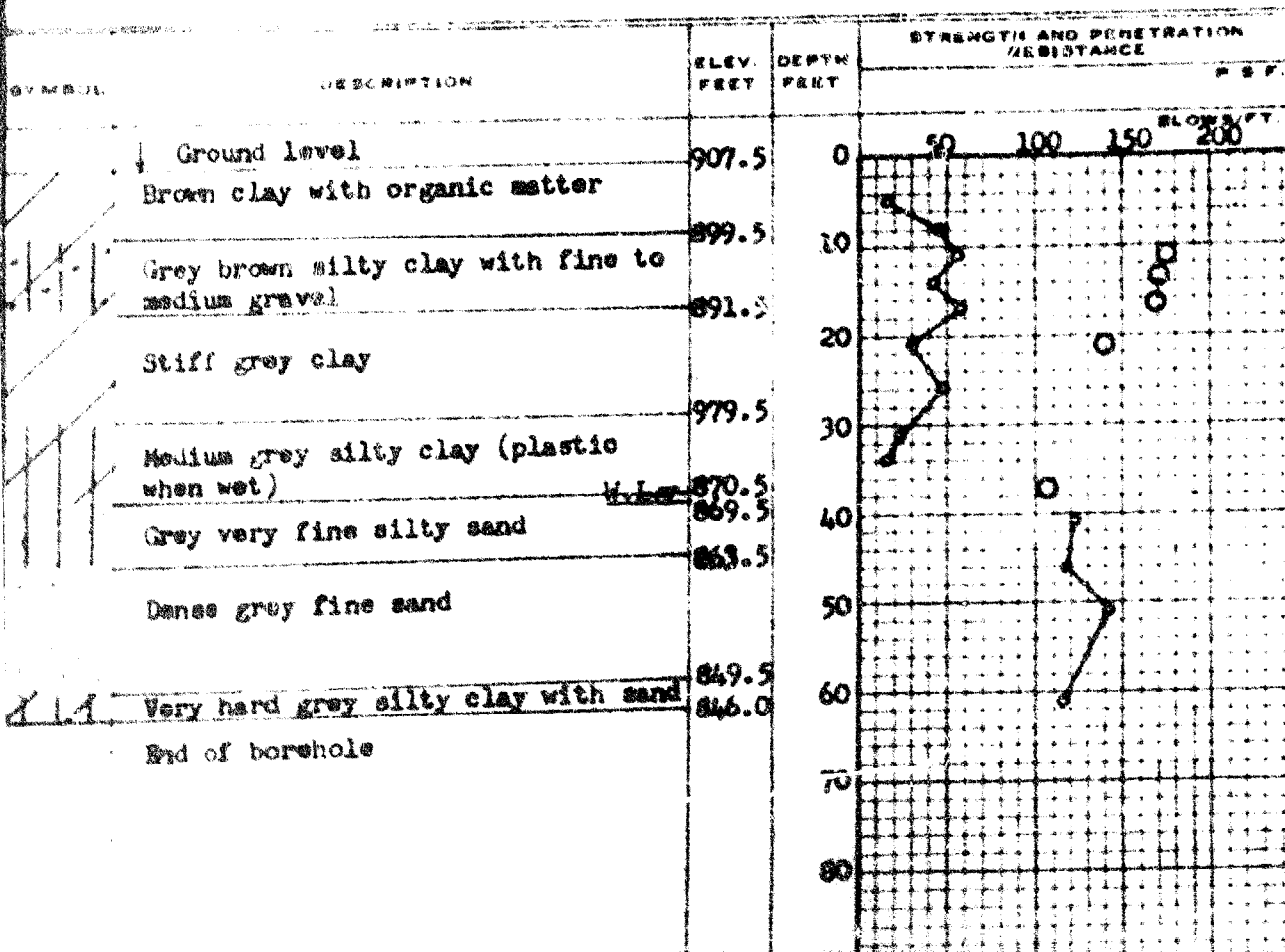
MATERIALS AND RESEARCH SECTION

LEGEND

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

W.P. 267 - 59 BORE HOLE NO. 3
 JOB 854 - 57 STATION 448+01 (65' 12")
 DATUM 907.5' COMPILED BY B.K.
 BORING DATE June 9/52 CHECKED BY M.D.

1" SPLIT TUBE — —
 2" MELBY TUBE — —
 2" SPLIT TUBE — —
 2" DIA. CONE — —
 2" MELBY — —
 CASING — —



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 267 - 59 BORE HOLE NO. A

JOB 859 - 57 STATION 0+18 (63° E)

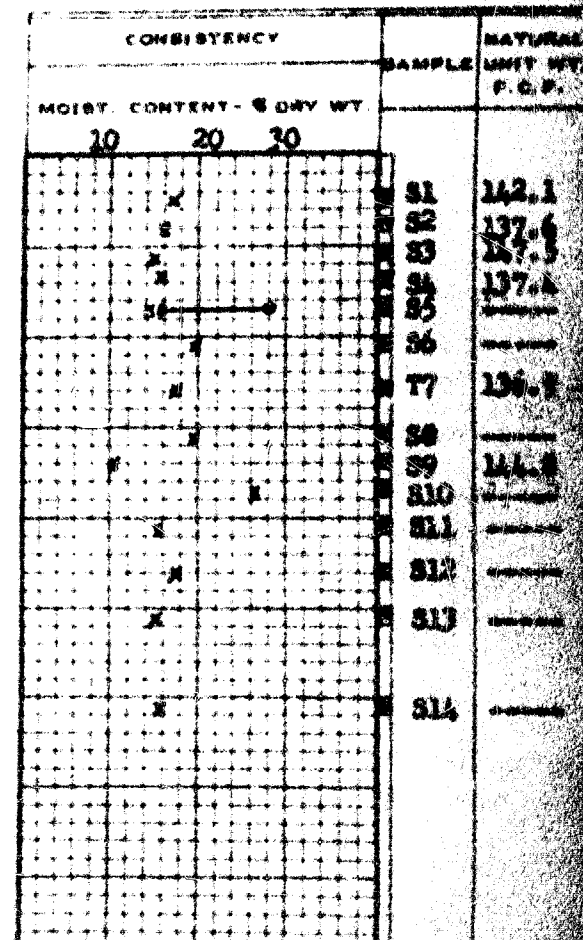
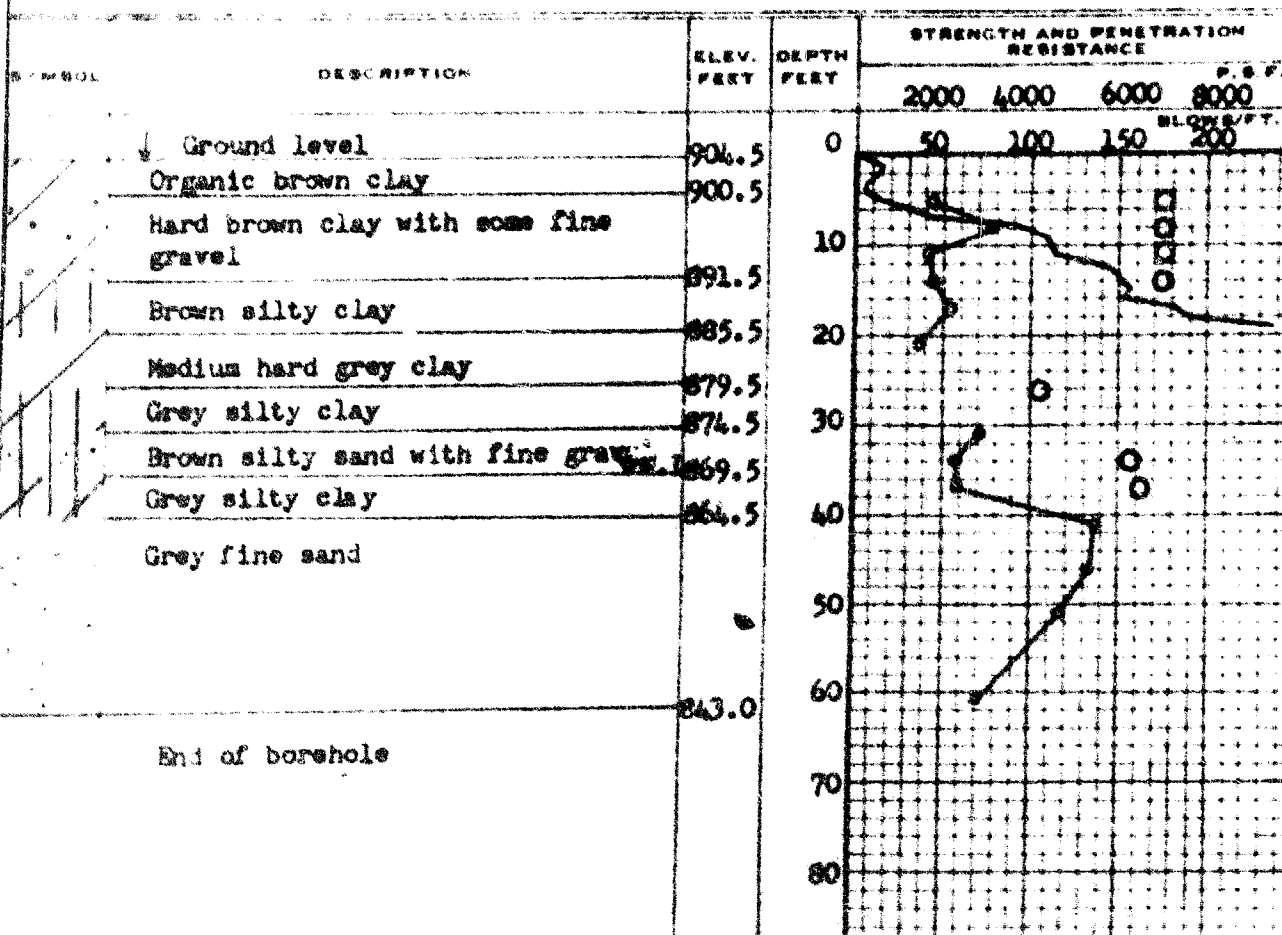
DATUM 906.5' COMPILED BY B.K.

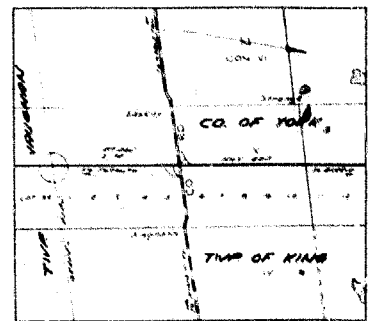
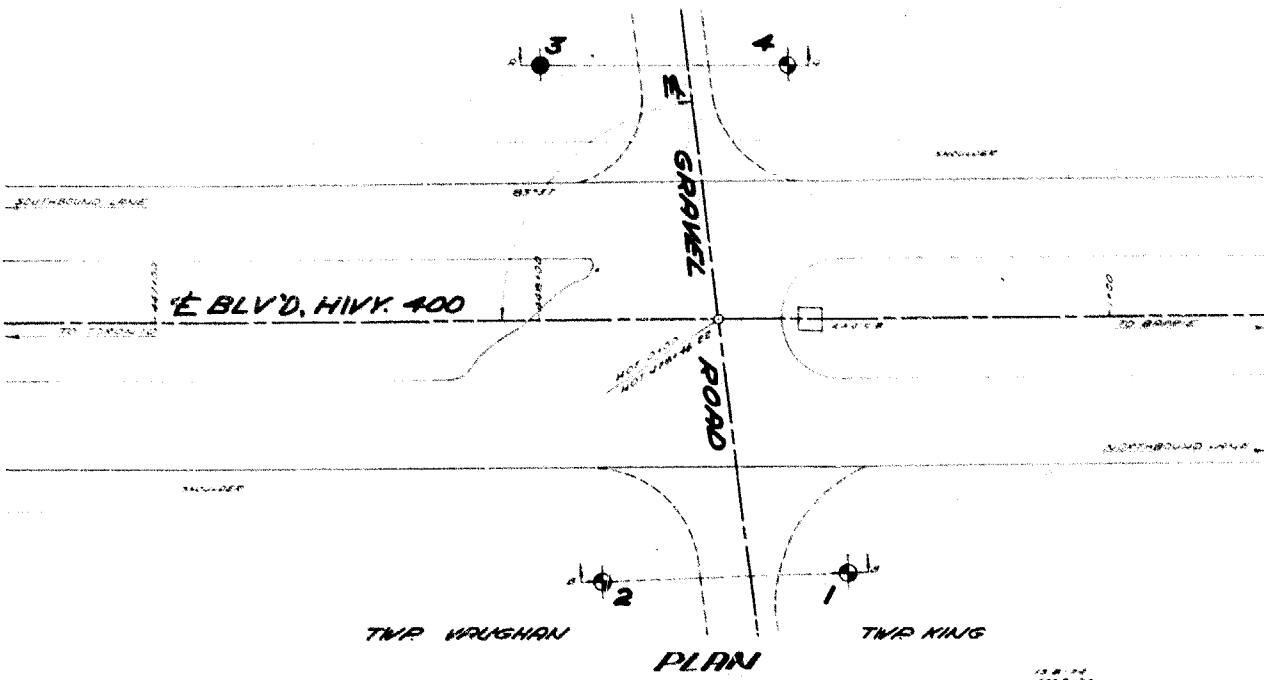
BORING DATE June 9/59 CHECKED BY M.D.

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

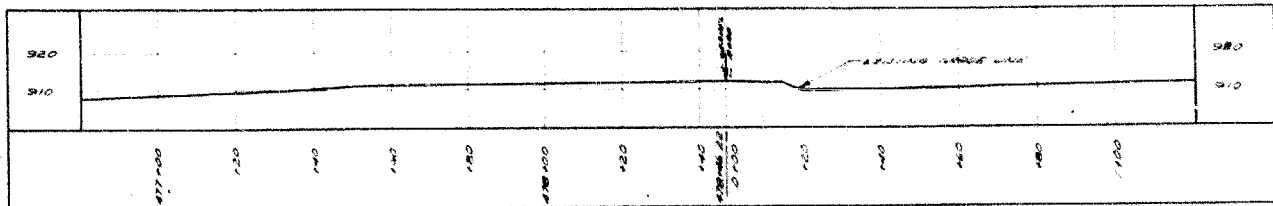
LEGEND

1/2 UNCONFINED COMPRESSION (Qu) --- O
VANE TEST (C) AND SENSITIVITY (S) --- 4
NATURAL MOISTURE AND LIQUIDITY INDEX --- LI
LIQUID LIMIT --- L
PLASTIC LIMIT --- P

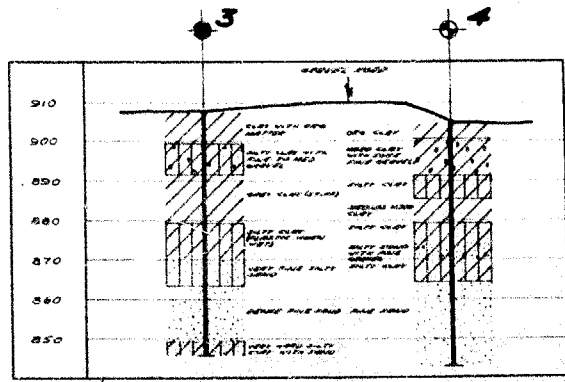




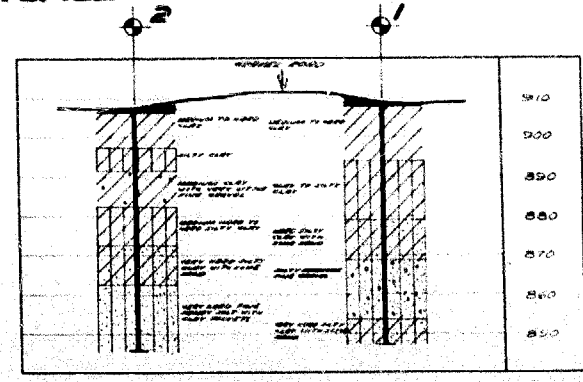
KEY PLAN
SCALE 1 IN. = 0.5 MI.



PROFILE



A-A



B-B

LEGEND				
HOLE NO.				
HOLE NO. & LOCATION				
HOLE NO. & LOCATION				
HOLE NO.	STATION	LOCATION	DISTANCE	REMARKS
1	0+00.0	STATION	65.00	
2	0+01.5	STATION	47.00	
3	0+01.5	STATION	45.00	
4	0+01.5	STATION	45.00	

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

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH SECTION			
GRAVEL ROAD PROPOSED CROSSING			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HWY. 400	DISTRICT 4	COUNTY YORK	
TOWNSHIP VAUGHAN	CONTR. YORK	LOT 1, 2, 3	
LOCATION 0+01.5 IN. W. OF KING CITY			
DRAWN BY TAYLOR	CHECKED BY	BY S. P. S. P.	
DATE JULY 28, 1977	APPROVED BY	DATE	
		FILE NO. 570	