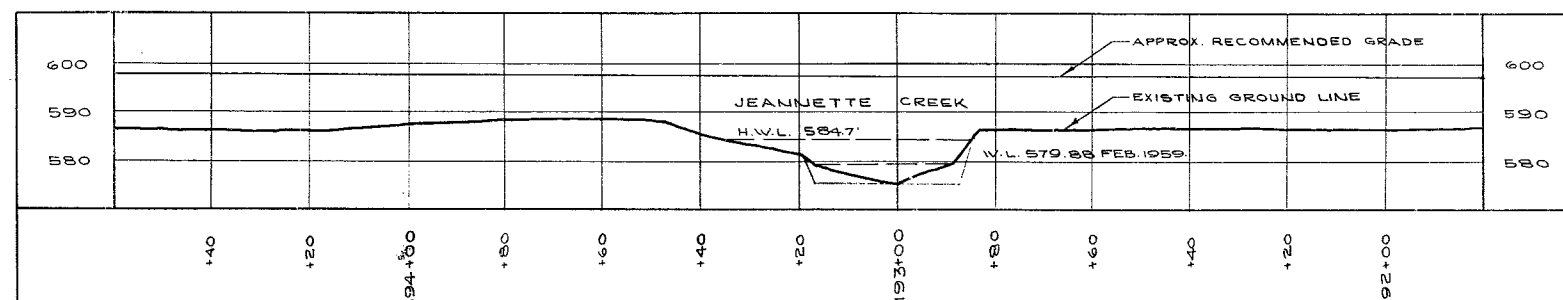
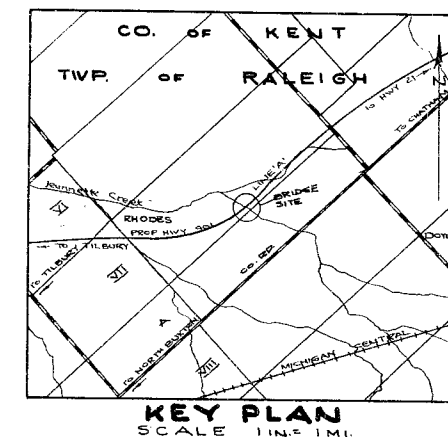
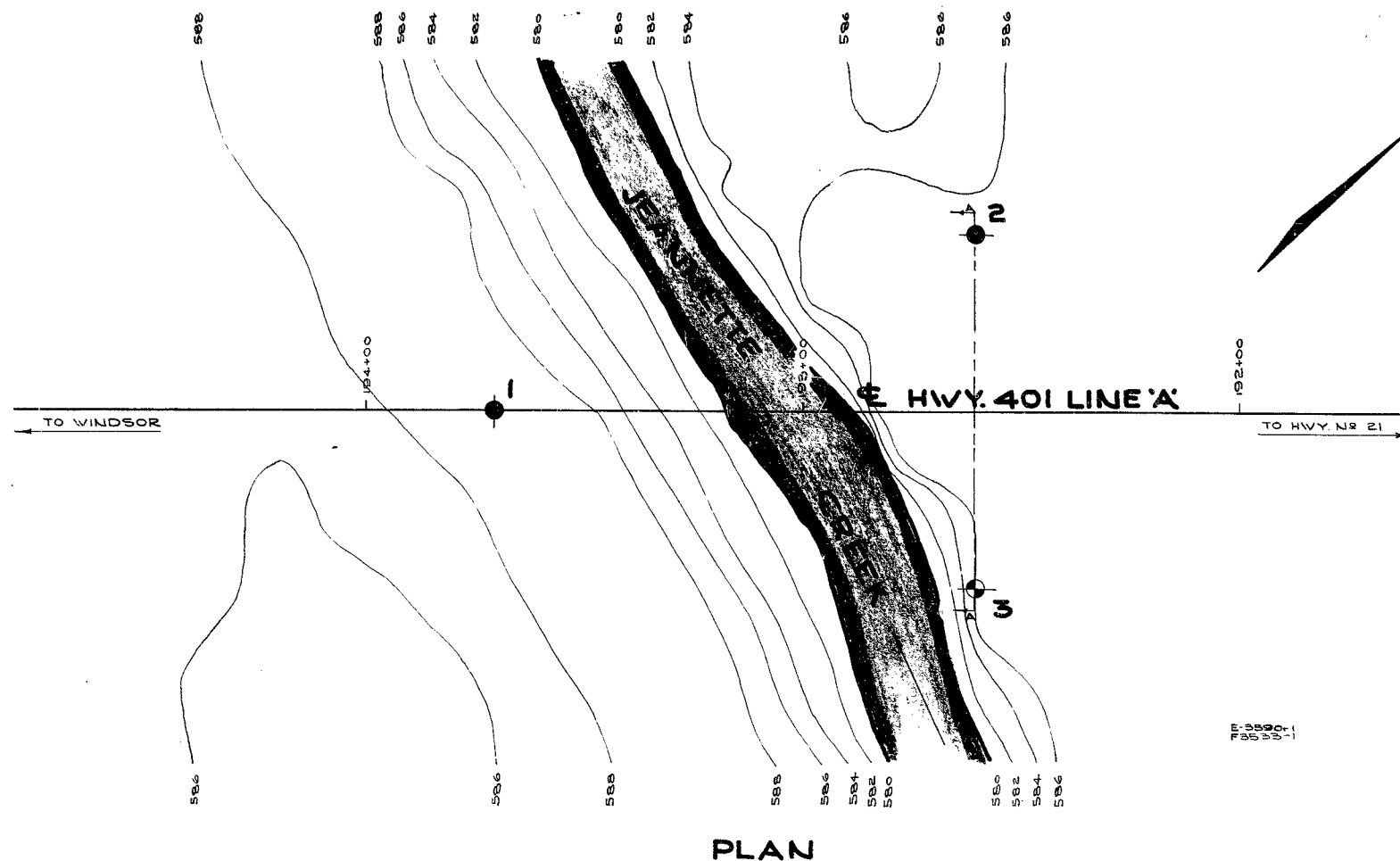


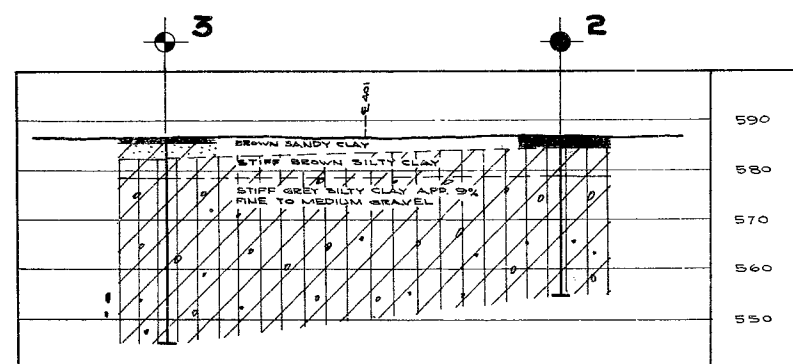
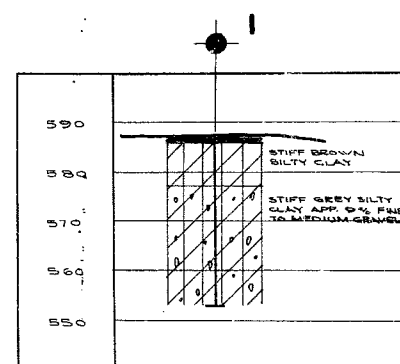
# 59-F-14  
W.P.# 13-59  
Hwy.# 401  
CROSSING  
JEANNETTE CR.  
6½ MILES S. OF  
CHATHAM



LEGEND			
BORE HOLE			
PENETRATION HOLE			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE
1	587.70	193+70	E.
2	586.70	192+60	40' RT.
3	586.70	192+60	40' LT.

- 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			
<b>DITCH (JEANNETTE CREEK) PROPOSED CROSSING</b>			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HWY. 401	DISTRICT 1	COUNTY KENT	
TOWNSHIP RALEIGH	LOT 15 & 16	CON. VII	
LOCATION APP. 6 1/2 MI. S. OF CHATHAM			
DRAWN BY: T. MELLORES	CHECKED BY: [Signature]	W.P. 13-59	
DATE 6 MAY 1959	APPROVED BY: [Signature]	DRAWING NO.	
SCALE 1" = 20'		<b>F59-14A</b>	

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

May 11, 1959.

FOUNDATION REPORT -

Attention: Mr. S. McCombie.

Re: Hwy. #401, Line 'A' and  
Jeannette Creek Crossing  
Lots 15 & 16, Con. VII,  
Twp. of Raleigh - Approx.  
6 1/2 Miles South of Chatham.

Enclosed herewith is our Foundation Report on the subsoil conditions existing at the above noted site. Reference to the contents of this report shows that the site is underlain by a layer of stiff silty clay which was proven for a depth of 42 feet.

Recommendations pertinent to the foundation design, are summarized as follows:-

- (1) Subsoil conditions are such that at Elev. 575' or below in the stiff silty clay, for footings typically 7' to 10' wide, a safe footing pressure of 2 1/2 t.s.f. can be used for spread footing design. In order to protect footings from stream erosion and scour, and to allow for future deepening of the channel, it is recommended that footings be founded at Elev. 567' (approximately 8 ft. below stream bed elevation.)
- (2) Long-term settlements resulting from abutment and embankment loadings have been estimated not to exceed 5 inches. For a single-span structure, differential settlements are considered tolerable.
- (3) No excessive seepage problems with respect to footing excavations are anticipated.

cont'd. /2 ...

- (4) No approach fill stability problems are anticipated.  
Bank slope on the upstream side of the structure should  
be protected by rip-rap.

*L. G. Soderman*

L. G. Soderman,  
PRINCIPAL SOILS & FOUNDATION ENGR.

per:

AL/MdeF  
Encl.

(A. Loh,  
FOUNDATION ENGR.)

cc: Messrs. A. Tøye ✓  
H. A. Tregaskes  
D. G. Ramsay  
G. U. Howell  
J. Roy  
Dr. P. Karrow  
Foundations Office.  
File

# FOUNDATION REPORT

on

Hwy. #401, Line 'A' and  
Jeannette Creek Crossing  
Lots 15 & 16, Con. VII,  
Twp. of Raleigh - Approx.  
6 1/2 Miles South of Chatham.

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Site Plan No: E-3590-1  
Plan No: F-3533-1  
Profile No: F-3533-3  
Chainage: Sta. 193+00.

## Distribution:

Mr. A. M. Teye,  
Bridge Engineer. (2)

Mr. H. A. Tregaskes,  
Construction Engineer. (1)

Mr. D. G. Ramsay,  
Design Engineer. (2)

Mr. G. U. Howell,  
District Engineer,  
Chatham, Ontario. (1)

Mr. J. Roy,  
Regional Soils Engr.  
London Regional Office. (1)

Dr. P. Karrow,  
Department of Mines. (1)

Foundation Office. (1)

File. (1)

W.P. 13-59.

W.J. F-59-14.

## INTRODUCTION:

Presented in this report are the results of a subsoil investigation carried out at a structure location approximately 6 1/2 miles south of Chatham where proposed Hwy. 401, Line 'A' crosses Jeannette Creek in Lots 15 & 16, Con. VII, Township of Raleigh (Sta. 193+00, Profile No. F-3533-3). This report contains the results of field and laboratory findings and recommendations for the foundation of the proposed structure.

The field work commenced on February 14, 1959 and was completed on February 16, 1959.

## DESCRIPTION OF THE SITE AND GEOLOGY:

The site and its surrounding areas are generally flat farmlands; the areas on both sides of Jeannette Creek are presently under cultivation. At the time of the investigation the creek and its banks were covered with ice and snow.

Physiographically, the site is located on the St. Clair Plains, inundated by Glacial Lakes Whittlesey and Warren. According to available geological information, these extensive plains, covering a large area of South-Western Ontario, are covered by deep deposits of clay, underlain by limestone bedrock. At this site the upper 10 feet of the clay stratum has been subjected to oxidation, resulting in its present brownish colour.

## DESCRIPTION OF FIELD & LABORATORY WORK:

Field work consisted of 3 sampled boreholes carried out by means of a trailer-mounted coredrill machine adapted for soil sampling. Conventional auger boring procedures were followed

cont'd. /2 ...

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

and samples were recovered at depths required. 2" I.D. thin walled shelby tube samplers were used in the cohesive subsoil.

Upon receipt in the laboratory, samples were visually examined and identified. Routine index tests were performed on selected representative samples. Laboratory test results have been presented in the borehole logs and detailed in tabular form.

The location plan and subsoil profile are presented in Drawing No. F-59-14A.

SUBSOIL CONDITIONS:

Subsoil conditions are similar to all other sites previously investigated in this area. Reference to the borehole logs shows that the site is underlain by a stiff silty clay stratum, the upper zone of which has been subjected to oxidation. According to our boring data in this locality, this stiff clay stratum is underlain by a deep deposit of soft to medium clay extending over a considerable depth over bedrock.

In each of the sampled boreholes the frozen topsoil was found to be underlain by the stiff silty clay stratum. The upper 10 feet of the clay stratum has been oxidized to its present brownish colour. Below the oxidized zone the colour is predominantly grey. The stiff condition of the clay stratum is believed to be the result of desiccation. This stratum was explored to a depth of 42 feet below the existing ground surface (i.e. Elev. 545') to confirm the stiff nature of the clay. In view of the similarity

cont'd. /3 ...

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

in geological formation, as well as subsoil conditions, between this site and the other sites previously investigated in this area, it is believed that the thick stratum of soft to medium clay would most likely be encountered at some depth below the stiff clay stratum.

In general, the stiff clay contains 25% silt, 20% sand and 9% fine to medium gravel throughout. The average unit weight and moisture content were found to be 132 p.c.f. and 18%. Liquid and plastic limits averaged 27% and 16%. Laboratory shear strength tests show an average of 2000 p.s.f. to be representative for the stiff clay stratum. A plot of shear strength versus depth has been presented and is included in this report under Appendix I. Judging from its moisture content and Atterberg limits, it appears that the stiff silty clay is saturated and preconsolidated.

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

WATER CONDITIONS:

Due to the low permeability of the clayey subsoil, it was not possible to accurately establish the ground water table of the site during the boring programme. Samples recovered from the boreholes were saturated and the ground water table has been assumed to be at the seasonal water level of Jeannette Creek at approximately Elev. 580' to 585'. In view of the fact that no water-bearing sand seams of any significance or artesian water conditions were encountered during the boring programme, seepage inflow during footing excavations will be local and of minor quantities, only.



FOUNDATION CONSIDERATIONS:

The stiff silty clay stratum is competent to provide adequate foundation support for the proposed structure. Laboratory strength and compressibility characteristics are such that spread footing support can be obtained at Elev. 575' or below. At this elevation or below, for footings of 7' to 10' wide, an allowable bearing pressure of 2 1/2 t.s.f., incorporating a safety factor of 3 can be used for spread footing design. In order to avoid undermining of footings due to stream erosion and scour action, and to allow for future deepening of the channel, it is recommended that footings be founded at Elev. 567' (approximately 8 ft. below stream bed assuming stream bed elevation at 575').

Long-term settlements under the footings as a result of application of 2 1/2 t.s.f. abutment pressure and embankment load due to the weight of 7' to 10' fill have been estimated as not to exceed 5 inches. In view of the relatively uniform subsoil conditions at the site, little differential settlement need be anticipated of a single-span structure since each abutment will virtually settle the same amount. If centre piers are incorporated in the design, long-term differential movement between the piers and abutments would result, since consolidation under the footings of the piers would be unaffected by the approach fill adjacent to the abutments. It appears that if a multi-span structure is contemplated, a rigid-frame design is favourable only if it can tolerate differential settlement of the order of 2" to 2 1/2".

No excessive seepage problems during footing excavations are anticipated.

cont'd. /5 ...

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

Under the proposed grade line, the maximum height of fill is approximately 7' to 10'. The subsoil has sufficient strength to safely support this embankment loading. Bank slopes on the upstream side of the structure should be protected by rip-rap.

CONCLUSIONS & RECOMMENDATIONS:

- (1) The site is underlain by stiff silty clay, followed by deep deposits of soft to medium silty clay.
- (2) Subsoil conditions are such that spread footing support can be obtained in the stiff clay at Elev. 575' or below. At this elevation or below, for footings of 7' to 10' in width, an allowable bearing pressure of 2 1/2 t.s.f. can be used for spread footing design. In order to avoid undermining of footings due to stream erosion and scour action, and to allow for future deepening of the channel, it is recommended that footings be founded at Elev. 567' (approximately 8 ft. below stream bed elevation).
- (3) Long-term settlements under the footings resulting from abutment and embankment loadings, have been estimated as not to exceed 5 inches. If a single-span structure is used, differential settlements are considered tolerable.
- (4) No excessive seepage problems with respect to footing excavations are anticipated.

cont'd. /6 ...

CONCLUSIONS & RECOMMENDATIONS: (cont'd.) ...

- (5) The proposed grade line does not present any approach fill stability problems. Bank slopes on the upstream side of the structure should be protected by rip-rap.

*L G Solomon*  
for A. Loh,  
FOUNDATION ENGR.

APPENDIX I.

TABLE NO. I .

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB F 59-14.W.P. 13-59.

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	T1	5'-7'	Stiff brown silty clay with some sand.	-	31.6	-	-	-	-	Approximately 9% fine to medium gravel throughout.
	T2	10'-12'	Stiff grey silty clay.	-	20.7	18.3	31.0	3720	130.0	
	T3	15'-17'	" " " "	-	18.5	-	-	2002	133.0	
	T4	20'-22'	" " " "	-	18.8	16.8	26.1	-	130.2	
	T5	25'-27'	" " " "	-	17.6	-	-	1928	131.0	
	T6	33'-35'	" " " "	-	17.2	15.2	28.0	-	129.4	
2	T1	5'-7'	Med. Stiff brown silty clay.	-	22.0	-	-	1385	121.0	Approximately 9% fine to medium gravel throughout.
	T2	10'-12'	Stiff grey silty clay.	-	19.5	-	-	3320	133.8	
	T3	15'-17'	" " " "	-	17.9	-	-	2430	132.6	
	T4	20'-22'	" " " "	-	18.9	-	-	1820	132.2	
	T5	25'-27'	" " " "	-	18.0	15.7	26.2	-	132.0	
	T6	30'-32'	" " " "	-	17.2	17.5	28.4	3100	128.7	
3	T1	3'-5'	Stiff brown sandy clay.	-	16.8	-	-	7490	129.0	Approximately 9% fine to medium gravel throughout.
	T2	6'-8'	Stiff brown silty clay.	-	15.6	-	-	7920	133.0	
	T3	10'-12'	Stiff grey silty clay.	-	15.6	16.1	24.0	-	136.8	
	T4	15'-17'	" " " "	-	17.8	16.1	27.8	2140	133.3	
	T5	20'-22'	" " " "	-	19.2	-	-	1640	124.0	
	T6	25'-27'	" " " "	-	19.0	16.7	27.1	1930	131.2	
	T7	30'-32'	" " " "	-	19.0	-	-	2560	132.0	
	T8	40'-42'	" " " "	-	20.0	16.0	25.5	1530	129.0	

T1 - denotes thin walled Shelby sample.

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 13-59 BORE HOLE NO. 1  
 JOB F 59-14 STATION 193+70 E  
 DATUM Geodetic COMPILED BY B.K.  
 BORING DATE Feb. 16/59 CHECKED BY A.L.

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 ( $C_v$ ) AND SENSITIVITY ( $S_v$ )  
 NATURAL MOISTURE AND  
 LIQUIDITY INDEX  
 LIQUID LIMIT  
 PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				2000	4000	6000	8000
				P.S.F.			
				BLOWS/FT.			
	Ground Level.	587.7		50	100	150	200
	Frost and Topsoil.	585.7					
	Stiff brown silty clay.						
		577.7	10				
	Stiff grey silty clay - approximately 9% fine to medium gravel.		20				
			30				
		552.7	40				
	End of Borehole.						

CONSISTENCY			NATURAL
MOIST. CONTENT - % DRY WT.			SAMPLE UNIT WT. P.C.F.
10	20	30	
		X	TW 1 -
	X	O	TW 2 130.0
	X		TW 3 133.0
	X	O	TW 4 130.2
	X		TW 5 131.0
	X	O	TW 6 129.4

Borehole No. 1

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 13-59 BORE HOLE NO. 2.  
JOB F 59-14. STATION 192+60(40' Rt.)  
DATUM Geodetic COMPILED BY B.K.  
BORING DATE Feb. 16/59. CHECKED BY A.L.

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 — X  
LIQUID LIMIT —  
PLASTIC LIMIT —

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				2000	4000	6000	8000 P.S.F.
	Ground Level.	586.7		50	100	150	200
	Frost and Topsoil.	584.7					
	Stiff brown silty clay.	578.7	10				
	Stiff grey silty clay - approximately 9% fine to medium gravel.	554.7	20				
	End of Borehole.	32.0'	30				
			40				

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT				
10	20	30		
		X	TW 1	121.0
		X	TW 2	133.8
		X	TW 3	132.6
		X	TW 4	132.2
		X ————— O	TW 5	132.0
		X ————— O	TW 6	128.7

Borehole No. 2.

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 13-59.

BORE HOLE NO. 3.

JOB F 59-14.

STATION 192+60 (40' Lt.)

DATUM Geodetic.

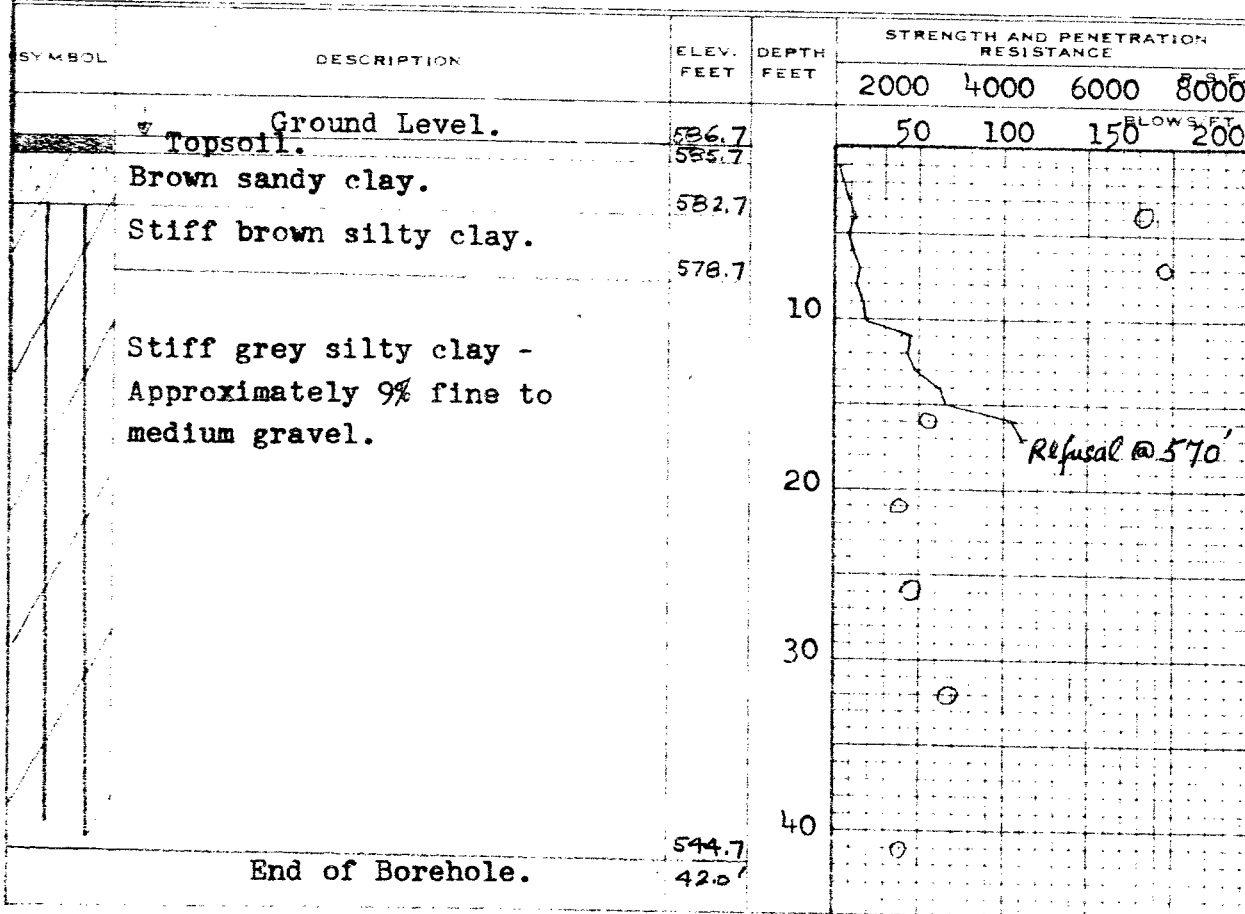
COMPILED BY B.K.

BORING DATE Feb. 14/59. CHECKED BY A.L.

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 — X  
LIQUID LIMIT — —  
PLASTIC LIMIT — —



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
10	20	30		
			TW 1	129.0
			TW 2	133.0
			TW 3	136.8
			TW 4	133.3
			TW 5	124.0
			TW 6	131.2
			TW 7	132.0
			TW 8	129.0



## SHEAR STRENGTH IN P.S.F.

