

Report of Foundation Investigation
for the location of
Culvert on Highway No. 3
at Station 383+00

Copies to: Mr. A. Tye
Bridge Engineer (2)
Mr. J. Walter
Design Engineer (1)
Mr. S. L. Fraser
Division Engineer London (1)
Mr. C. E. Forastatos (1)
File (1)

Project No. P-2-1

Introduction

It is proposed to put a culvert for the creek crossing Highway No. 3 at Station 383+50, about $\frac{1}{2}$ mile west of New Glasgow.

A Subsoil investigation was therefore conducted on the above site to determine the best method of foundation for the proposed culvert.

Subsoil investigation was also conducted for both the approaches of the culvert, along Highway No. 3, with the object of finding out the maximum fill that can be put on the existing ground.

Procedure

The field investigation covered the period 19th April to 7th May 1956.

Four boreroles, each preceded by a cone penetration test, were made.

Borerole #1 and Borerole #3 were made in connection with the foundation of the culvert.

Borerole #2 and Borerole #4 were made on the approaches on the west and east respectively, to find out the amount of fill that can be put on these locations.

The locations and elevations of the boreroles and their logs are found in Drawing S-35-24 and Appendix I respectively.

Soils Conditions

Stiff clay was discovered continuously in all the four boreroles, except in Borerole #4 in which the first 10 feet is top soil.

The exact thickness of the clay layer was not determined. All the boreroles were made down to about 62 feet.

Generally, the soil discovered from the four boreroles is stiff to very stiff in consistency.

Soil Conditions (cont.)

This is believed to be the same over the entire region where the proposed culvert and the approach are to be constructed. Undisturbed samples tested in the laboratory revealed that the clay has unconfined compressive strength varying from 1.5 tons per square foot to about 3 tons per square foot.

The water content of the material was found to be very consistently at about 23%. The other characteristics of the clay soil for each borehole may be obtained from the logs in Appendix 1.

Analysis of Test Results and Recommendations

From Soil Profile (3A-3B) it is observed and found necessary to place the footings of the proposed culvert at an elevation about 593.6.

According to findings from Borehole #1 and Borehole #3 the clay below the elevation 593.6 was medium to stiff in consistency. Laboratory tests made on samples from these boreholes showed that the clay has a minimum cohesion of 1,500 lbs. per square foot.

At the proposed elevation of 593.6 the estimated bearing capacity of the soil for strip footing is about 1.4 tons per square foot.

Different tests performed in the laboratory indicate that the clay obtained from Borehole #1 and Borehole #3 have nearly the same soil proportion. Thus, if the clay obtained from these boreholes are regarded as identical to each other, it is expected that any settlement due to the clay will be quite uniform if the depth of the clay is the same around the area and when under the same overburden pressure.

Stability of Earth Fill

The fill on both approaches can be made to a maximum height of 30 ft. on a slope of 1:2. These calculated values are based on $C = 1,500$ lbs per sq. ft. the cohesive value due to the clay.

Stability of Earth Fill (cont)

The fill material should be compacted to the extent that will give an unconfined strength of at least 600 lbs. per square foot in order to provide a safe maximum height of 30 ft. fill.

Consolidation tests on the clay samples obtained from Borehole #2 are still in progress. The results of the tests with respect to the amount and rate of settlement of the clay will be provided if requested.

Conclusion:

The clay below the elevation 593.6 can withstand a safe bearing load of 1.1 tons per square foot for strip footing foundation.

Differential settlement due to the clay is expected to be small or negligible in view of the uniformity of the clay material in that region.

For higher loads the width of the footings should be increased accordingly. Sheet piles should be provided to prevent any possible seepage resulting from flood.

The elevation of the footings should be checked with the elevation of the bottom of the creek. The footings should be placed at least 5 feet below the bottom of the creek.

The use of Araco-pipe culvert is ideal, provided the hydrological conditions of the creek region is satisfied.

Stability of Earth Fill

A maximum fill of 30 feet on a slope of 1:2 can be safely supported by the underlying clay soil.

-4-

Stability of Earth Fill (cont.)

At the time of this report the consolidation tests on the clay samples obtained from Borehole #2 are still in progress. These test results will be provided on request to the undersigned.

P. G. Broweridge,
Materials & Research Engineer

Per:



(G. N. Farantatos)

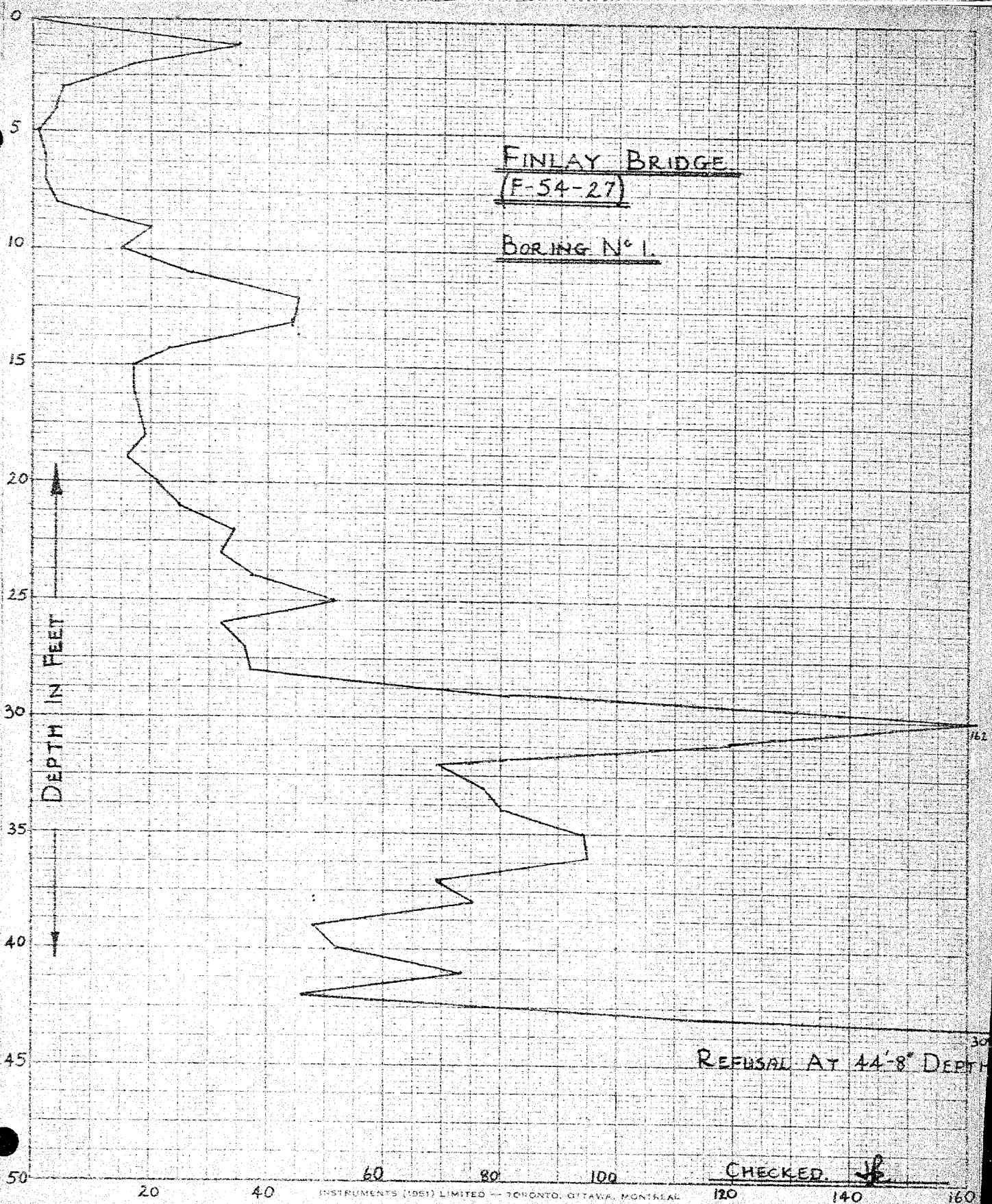
GMF:OB

APPENDIX I

FINLAY BRIDGE
(F-54-27)

BORING N° 1.

DEPTH IN FEET



REFUSAL AT 44'-8" DEPTH

CHECKED

[Signature]

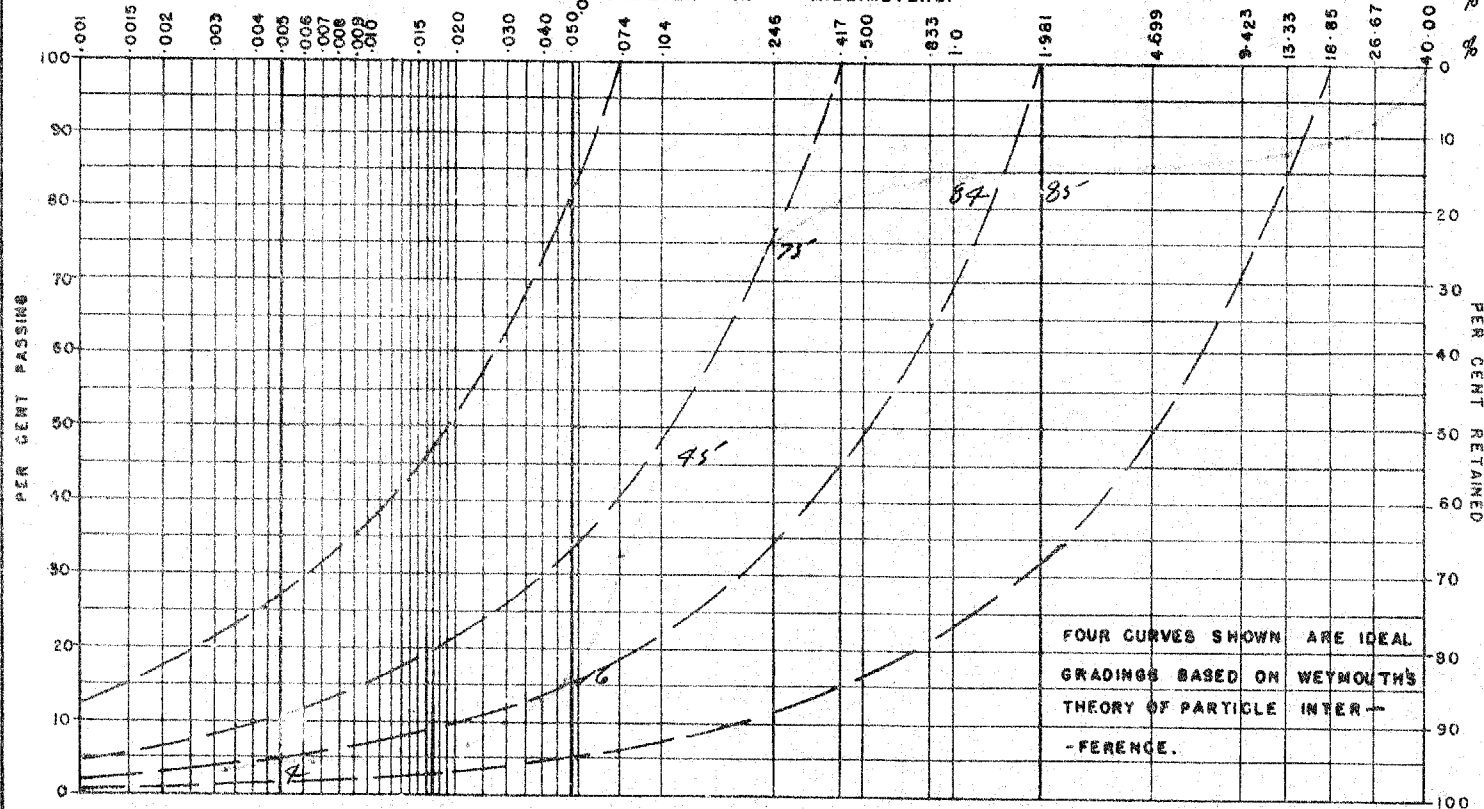
INSTRUMENTS (1951) LIMITED — TORONTO, OTTAWA, MONTREAL

BLOWS PER FOOT.

U.S. BUREAU OF SOILS CLASSIFICATION.

Clay	Silt	Very Fine Sand	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Gravel							
Binder <u>16</u>		Fine Aggregate <u>69</u>					Coarse Aggregate <u>15</u>							
TYLER Sieve Sizes		270	200	150	60	35	20	9	4	3/8"	1/2"	3/4"	1"	1 1/2"

DIAMETER IN MILLIMETERS.

% Fine Gravel 1% C. & M. Sand 18% F. & V.F. Sand 69% Silt 17% Clay 5% VF Sand & Silt 28

LIQUID LIMIT. _____

PLASTIC LIMIT. _____

PLASTICITY INDEX. _____

SPECIFIC GRAVITY. 2.72

% SAND. _____

% SILT. _____

% CLAY. _____

LAB. TEXTURE CLASS'N _____

FIELD TEXTURE CLASS'N _____

GROUP CLASSIFICATION. _____

MAXIMUM DRY WT. _____

OPTIMUM MOISTURE. _____

FIELD DENSITY. _____

FIELD MOISTURE. _____

F-54-27

R # 3

S # 2

MECHANICAL ANALYSIS AND ATTERBERG LIMITS OF SOILS


CONTRACT NO. _____ DIVISION NO. _____ HIGHWAY NO. _____
 COUNTY _____ TWP. _____ LOT _____ CONCESSION _____
 SAMPLE SUBMITTED BY _____
 SOURCE OF MATERIAL _____
 STATION _____ DISTANCE FROM L^C _____ DEPTH FROM _____ TO _____
 INTENDED USE _____
 SOIL TYPE _____ A.B.C. HORIZON _____
 DATE SAMPLED _____ SAMPLE RECEIVED _____ TESTS COMPLETED _____

COARSE MATERIAL				HYGROSCOPIC MOISTURE			
WT. OF TOTAL SAMPLE (A) : W ₁					SAMPLE A	SAMPLE B	HYDROM SAMPLE
WT. OF SAMPLE RET. #4 DRY : W ₂				WET SOIL + DISH			
WT. OF SAMPLE PASS #4 DRY : W ₃				DRY SOIL + DISH			
WT. OF TOTAL SAMPLE (B) : W ₄				MOISTURE			
WT. OF SAMPLE RET. #9 DRY : W ₅				DRY SOIL + DISH			
WT. OF SAMPLE PASS #9 DRY : W ₆				DISH			
% RET. #4 : $\frac{W_2}{W_1} \times 100$: K				WT. OF DRY SOIL			
% RET. #9 : $\frac{W_5}{W_4} (100-K)$: L				% MOISTURE			

SIEVE ANALYSIS RETAINED ON NO. 4 (W ₂)								SIEVE ANALYSIS OF HYDROM. MATERIAL (W ₁₀)							
SIEVE NO.	CUMUL. WT.	RETAINED			CUMULATIVE			SIEVE NO.	CUMUL. WT.	RETAINED			CUMULATIVE		
		WT.	% W ₂	% W ₁	% RET W ₁	% PASS W ₁				WEIGHT	% W ₁₀	% W ₁	W ₁₀	% PASS	W ₁
1 1/2"							9								
1"	27				8.0	92	20	0.6			0.5			84	
3/4"	37				10.9	89	35	5.1			4.0			81	
3/8"	40				11.8	88	60	12.8			10.1			75	
3/8"	-				-	-	150	50.6			40.0			45	
#4	46				14.1	86	200	65.3			56.6			33	
#9					14.7	85	PASS 200	66.1							
TOTAL							TOTAL	66.1							

HYDROMETER ANALYSIS OF MATERIAL PASSING NO. 9 SIEVE (W₁₀)

HYDROMETER NO. 42 SP. GR. CORR. (A) .98 DRY WT. OF SAMPLE (W₁₀) 107.6 GMS.

TIME	MIN.	TEMP. OF.	TEMP. °C.	HYDROMETER READING			H CMS	% PASS - W ₁₀ : $\frac{100 R A}{W_{10}}$	CORRECTED DIAMETER	% PASS. OF W ₁
				ORIG.		R				
1		69	20.6	21.0	-0.5	20.5	13.2		1048	16
2				19.0		18.5	14.5		1030	10
5				10.0		9.5	15.3		1023	7
15				8.0		7.5	15.6		1013	6
30	70	21.1	2.0	-0.5	-0.5	6.5	15.8		10097	5
60	71	21.7	5.5	-0.5	-0.5	5.0	16.1		10068	4
250	75	23.9	3.0	-0.5	-0.5	2.5	16.3		10033	3
1440										

COMPUTED BY _____ REPORTED BY _____ DATE _____

REMARKS:

FIELD NO.

L.S. NO. C-484

Mr. E. Toys, Bridge Engineer

July 12, 1935.

Re: Foundation Investigation

F. C. Brownridge, Materials and Research Engineer
Salvert Sta. 583/40, Hwy. #3, Vicinity
of New Glasgow

Attached please find two copies of a report on the subsoil investigation for the above site. The stiff clay soil will support the structure on spread footings and differential settlement is not expected to be serious because the soil is very uniform.

Stability determinations indicate that an embankment 30 feet in height with 2:1 slopes may be supported.

F. C. Brownridge,
Materials and Research Engineer.

Per:

M. M. D.
(H. W. Davis)

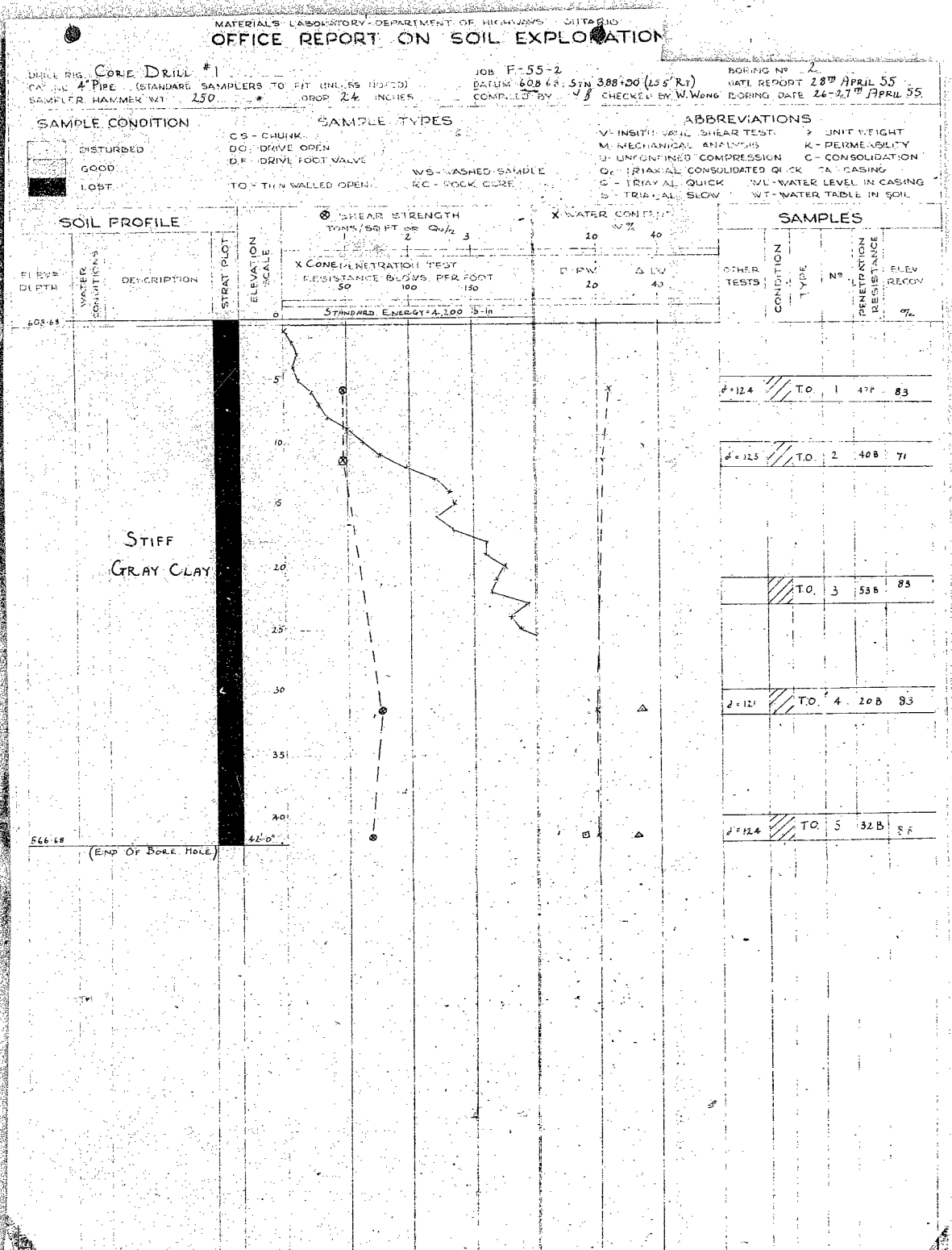
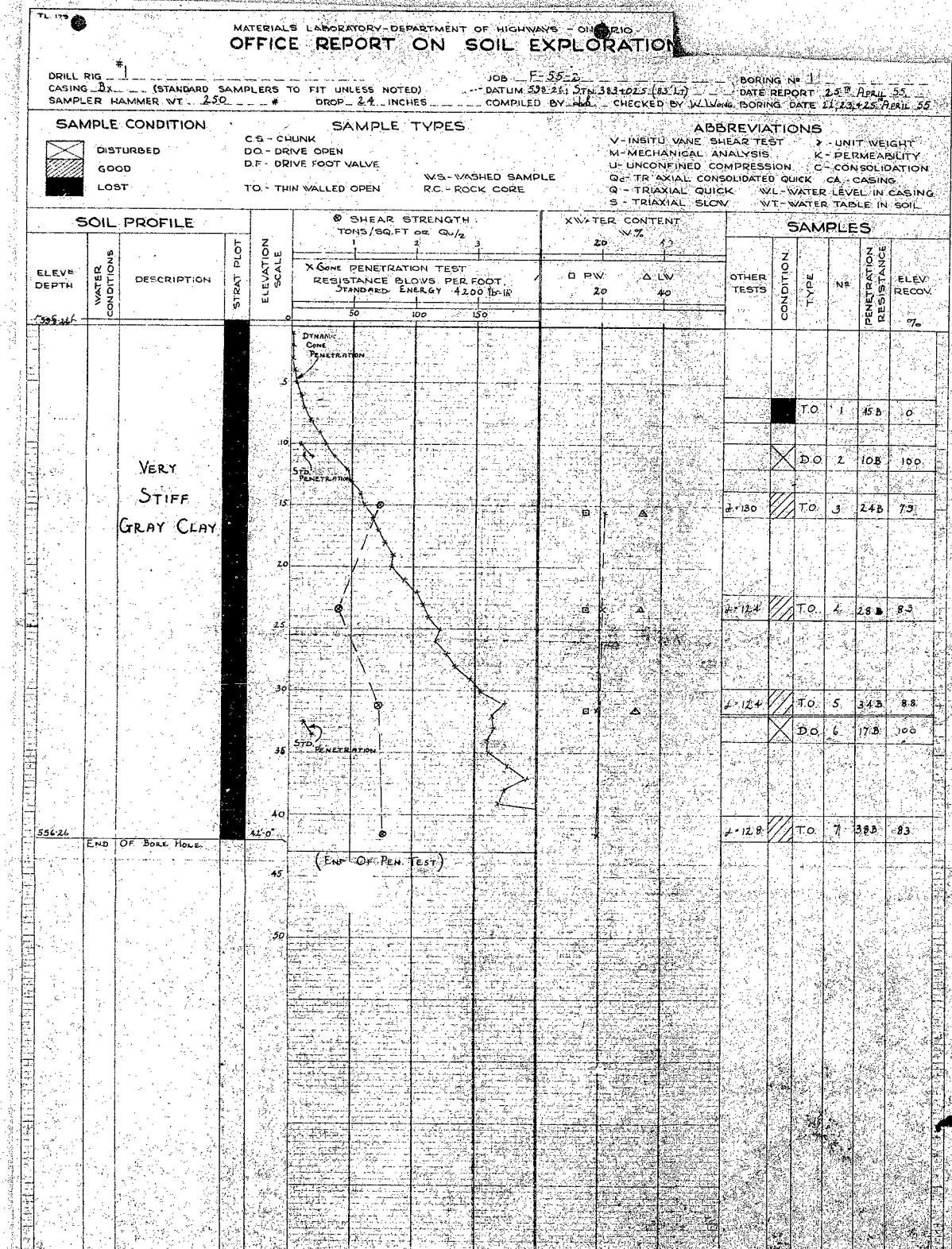
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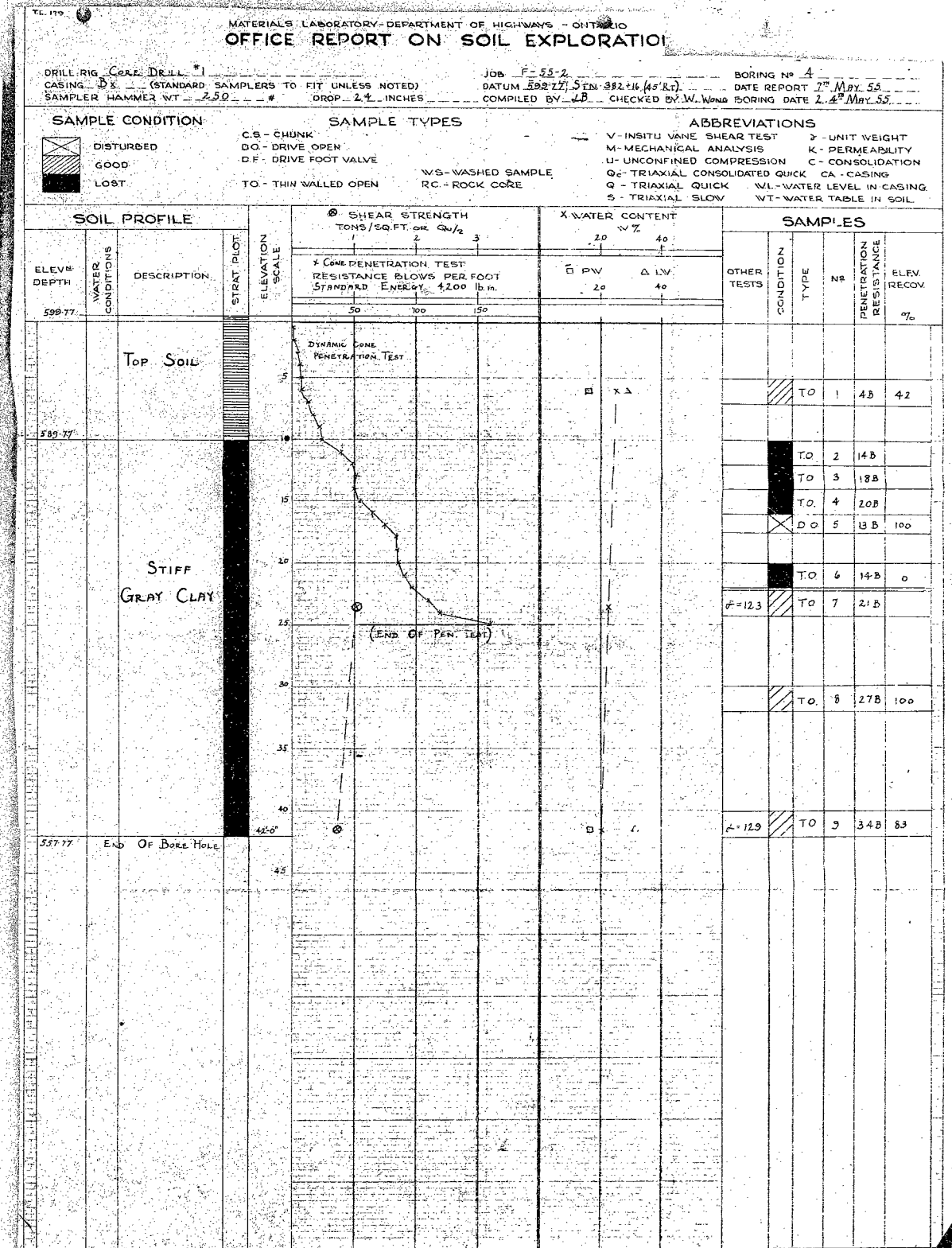
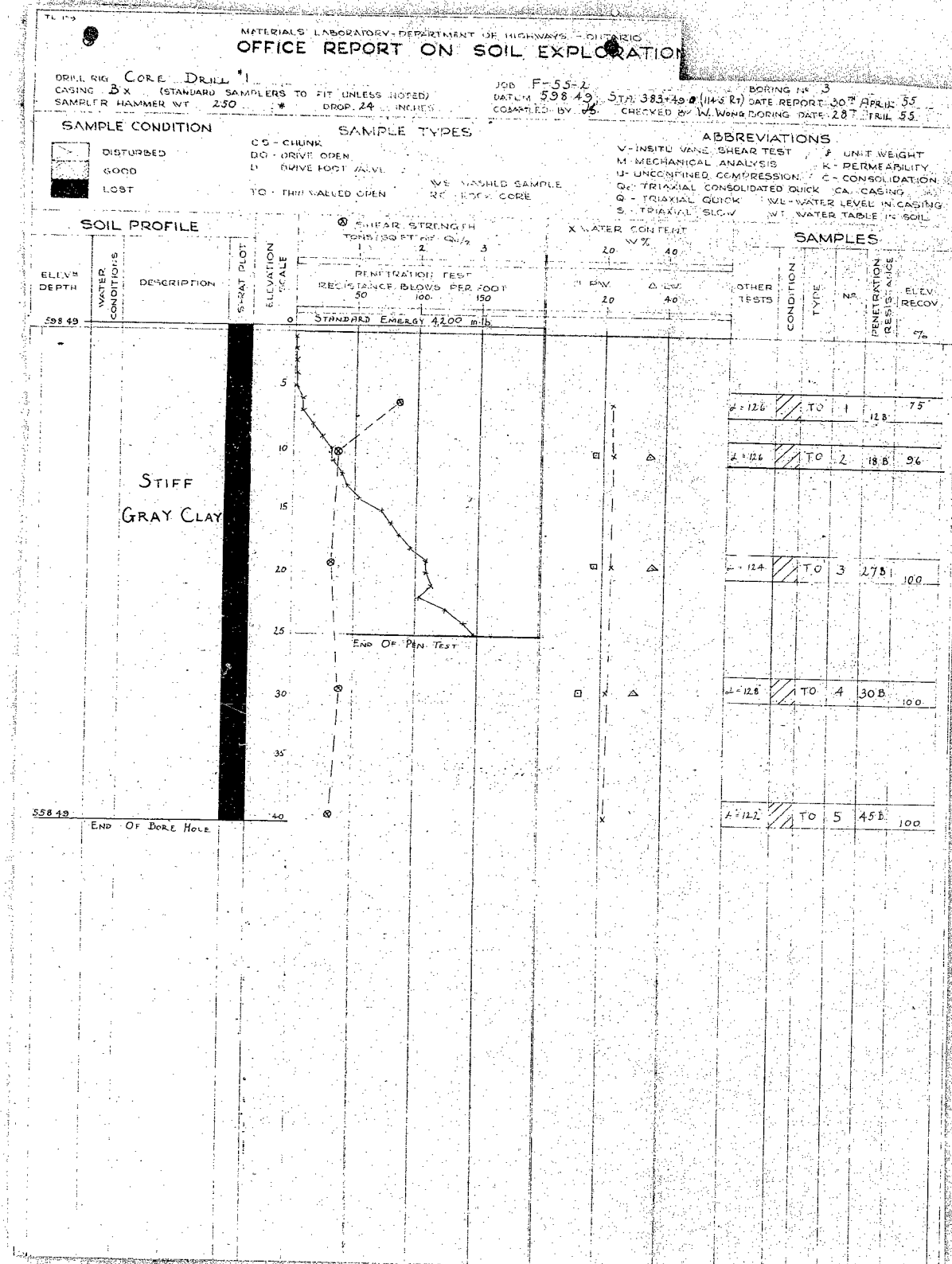
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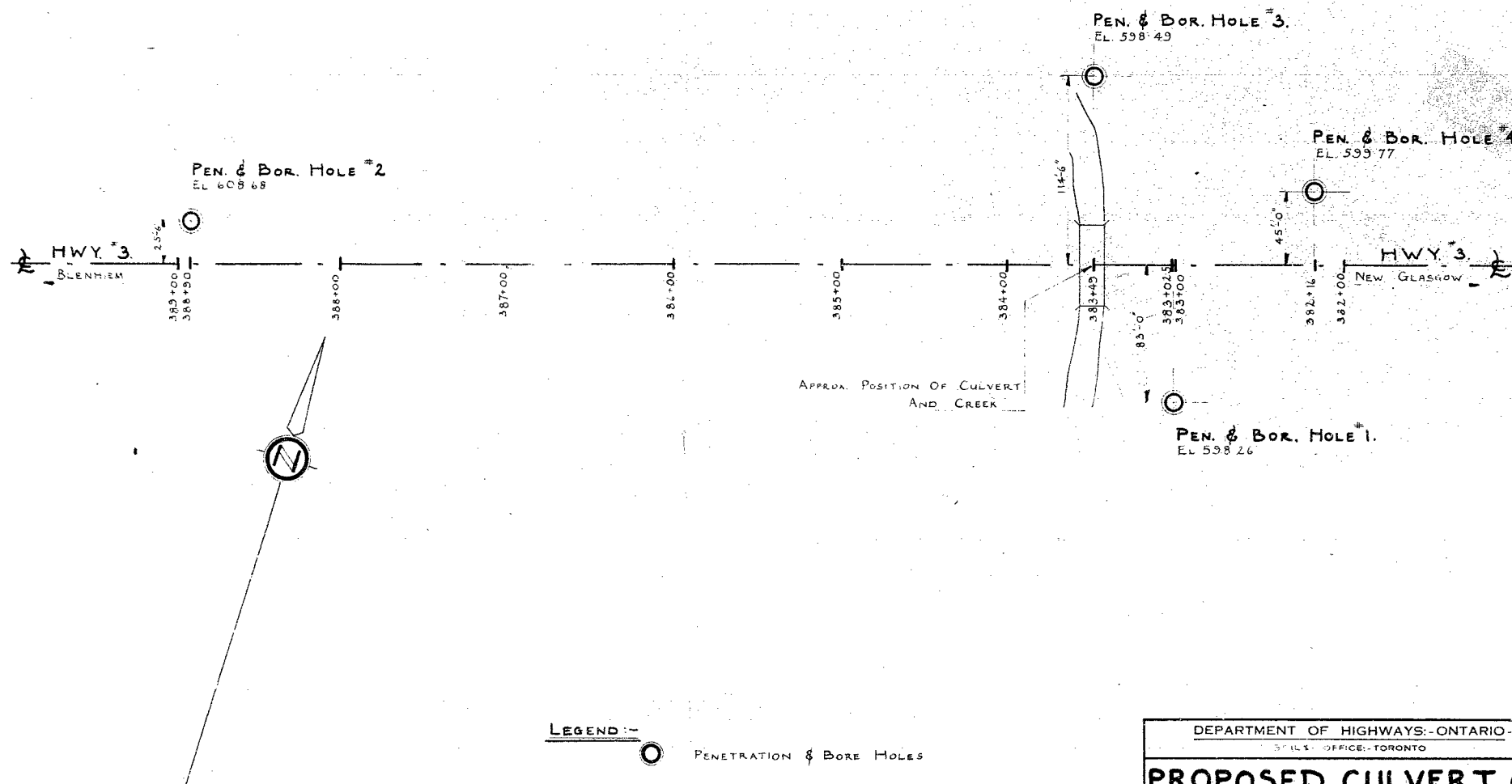
J. Haller, Design Engineer
H. L. Fraser, Division Engineer, London
G. Yarranton

#55-F-2
HIGHWAY #3
CULVERT

EDITED
FOR MICROFILMING
BY *K.P.* DATE *2/7/60*







LEGEND:  PENETRATION & BORE HOLES

SCALE: 1 INCH = 50 FEET.

PRINT RECORD		
NO.	FOR	DATE

REVISIONS:	DATE		DESCRIPTION
	DATE	BY	

DEPARTMENT OF HIGHWAYS - ONTARIO			
STREET OFFICE - TORONTO			
PROPOSED CULVERT ON			
HIGHWAY #3. ST. 383+49			
THE KING'S HIGHWAY No. 3		DIV. No.	
CO. ELGIN			
TWP. ALDBOROUGH	LOT 6	CON. XII	
PLAN OF PEN. & BOR. HOLE POSITIONS.			
APPROVED			
ENGINEER		CHIEF ENGINEER	
DESIGN	CHECK	CONTRACT NUMBERS	
DRAWING	MLF. CHECK	LOADING	
TRACING	CHECK	DRAWING NUMBER	F-55-2A
DATE 14 TH JUNE 1955			