

Mr. A. Toye,

December 6, 1957.

Bridge Engineer.

Materials & Research Section.

Re: Foundation Report -  
Hwy. #401 and Hwy. #115 Interchange,  
W.P. 60-57      W.J. # 57-37

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We are submitting herewith 2 copies of the above mentioned Foundation Report.

The subsoil in this particular area consists of a veneer of lacustrine clay over till. This clay layer is variable in depth and does not contain sufficient bearing capacity to support spread footing foundations. The till layer becomes more dense with depth and, as a result, the bearing capacity may be increased with depth. In this respect, it would seem that the type of foundation chosen should depend upon economical considerations - i.e., spread footing or short end bearing piles.

F. C. Brownridge,  
MATERIALS & RESEARCH ENGR.

Per:



(A. Rutka,  
Principal Soils Engr.)

AR/MaeF

Encl.

cc: Messrs. E. Tregaskes  
D. G. Ramsay  
H. D. Duff

Foundation Section

File

FOUNDATION REPORT

on

New bridge at Highway 401 crossing  
proposed Highway 115, 2 miles west  
of Newcastle.

Plan No: F-3130

Station: 735+88.52

Distribution.

Mr. A. Toye  
Bridge Engineer (2)

Mr. H. Tregaskes  
Construction Engineer (1)

Mr. D. G. Ramsay  
Design Engineer (1)

Mr. H. D. Duff  
Dist. Eng. Port Hope (1)

Foundation Section (1)

File (1)

W. P. 60-57

W. J. F-57-37

## Introduction.

A subsoil investigation was carried out to determine the bearing values of layers for supporting the foundations of the proposed structure.

The site is located about two miles west of Newcastle, where the new highway, 401 intersects proposed leg "A" of highway No. 115.

The job started on Sept. 19, 1957 and was completed on October 1, 1957.

## Procedure.

The subsoil investigations were carried out by means of skid mounted coredrill machine. In the course of investigations three boreholes with dynamic cone penetrations and three separate dynamic cone penetration tests were made.

The locations of the boreholes are shown on drawing No. F-57-37A, and their elevations on log sheets under Appendix I.

## Subsoil Findings and Analysis:

The site is within the late lake Iroquois shoreline. The terrain is basically lacustrine material deposited on gravelly sandy loam till.

The subsoil explorations revealed the following stratigraphy: Under the topsoil down to elevation about 280 ft. the layer is grey clay loam with some gravel. Below this down to elevation about 265 ft. the layer is made up of grey sandy clay loam with gravel. In boreholes No. 1 and 4 down at elevation about 280 ft. a very soft saturated seam was detected. In borehole No. 4 at the same elevation the waterhead reached the top of the casing.

The samples extracted from the boreholes were tested in the laboratory. From these test results the soil down to elevation about 290 ft. is of medium plasticity. It has an average moisture content of

25%, and has a density of 125 p.c.f. Unconfined compression tests in this section registered about 2000 p.s.f. Below this elevation down to elevation 280 ft. the soil is of very low plasticity. Its moisture content is about 10% and has a density of 150 p.c.f. Due to the loamy and gravelly nature of the soil no reliable unconfined compression results could be obtained. Below elevation 280 ft. to the end of boreholes, the soil is very hard gravelly sandy clay loam. It is non plastic, has a moisture content of 8% and density of 154 p.c.f.

#### Conclusions and Recommendations.

From the above discussion it will follow that:

1. The stratigraphy of the site presents basically glacial till with possibly lacustrine or alluvial deposits on the top. This deposit material assumed to be above elevation about 280 ft. presents variable composition, consistency, and index properties. This situation is a great handicap in evaluating the true bearing values of the layer.
2. Below elevation about 280 ft. the layer seems to be quite consistent in its properties and structure. It is assumed to be very hard gravelly sandy clay till.
3. If spread footing type foundations were considered it would be difficult to find dependable bearing values more than 1 t.s.f. above elevation 290 ft. At elevation 300 ft. the layer could provide a bearing value of 2 t.s.f. with a safety factor of 2. On the other hand at elevation 280 ft. and below the layer can provide 2.5 - 3 T.s.f. bearing value with a safety factor of 3.
4. Considering the depth of excavations, the use of piles for supporting the foundations would seem preferable. Especially the economic factors should be considered. If the use of piles were chosen, it is assumed that the pile would be driven to refusal at about elevation 275 ft. and will provide both end-bearing and friction to support the foundations of the proposed structure.

5. The approach fills to the structure do not present any stability problem.

V. Korla,

Foundation Engineer.

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG 54-2 OPERATION BORE PENETRATION JOB F-57-57 WP 60-57 BORING 1 STA 736+28(38.17)  
 CASING BX (standard samplers to fit unless noted) DATUM CEODETIC DATE REPORT OCT. 1957  
 SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 20 SEPT. 1957

## ABBREVIATIONS

V - INSITU VANE SHEAR TEST O - TRIAXIAL QUICK K - PERMIABILITY  
 M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION  
 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING GA - CASING  
 QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL S - UNIT WEIGHT

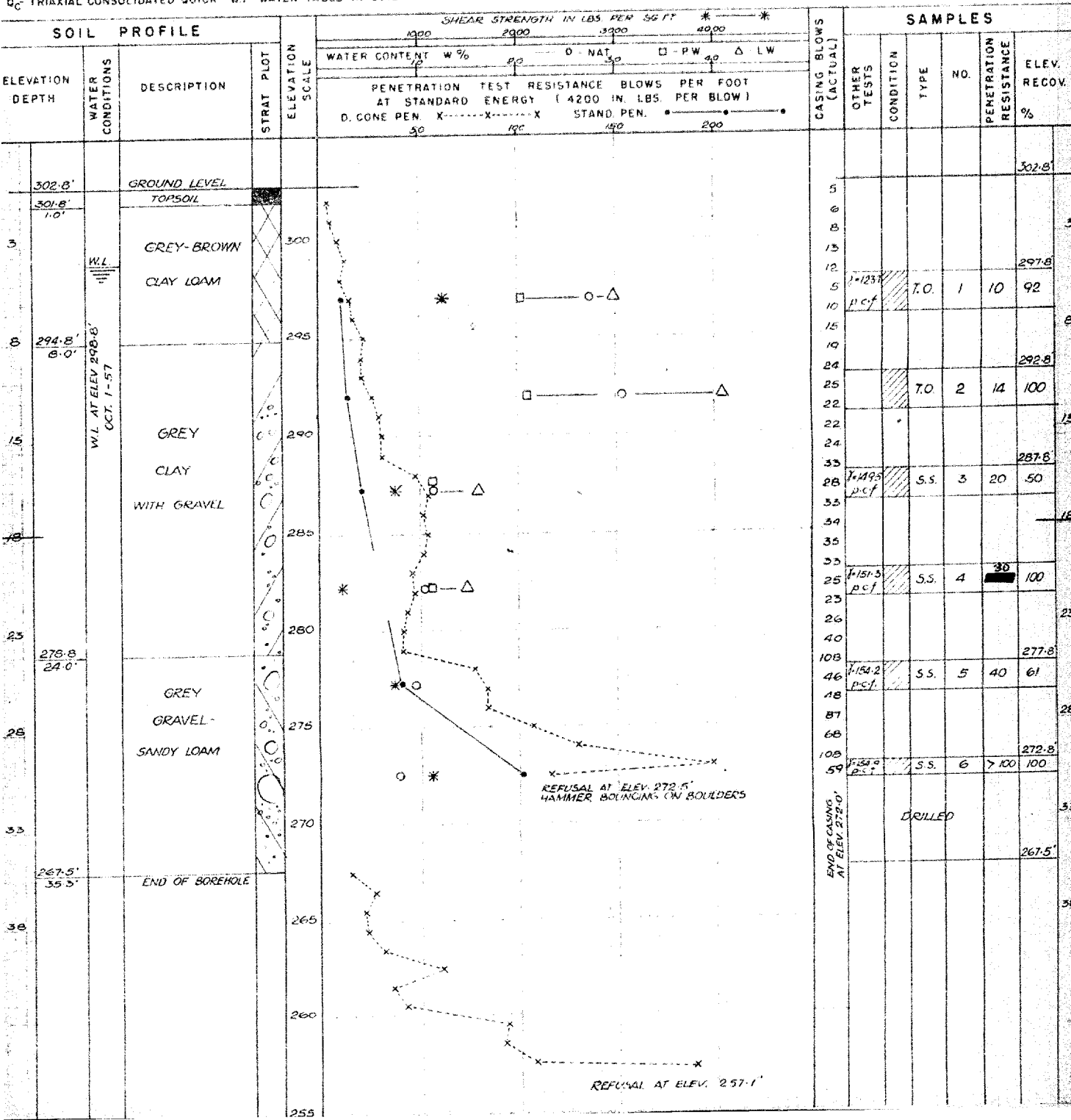
## SAMPLE TYPES

CS - CHUNK SS - SLEEVE SAMPLE  
 OO - DRIVE OPEN PS - PISTON SAMPLE  
 OF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

## SAMPLE CONDITION



- DISTURBED  
 - FAIR  
 - GOOD  
 - LOST



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG 54-2 OPERATION BORE & PENET'N JOB E-57-37 " WP CO-57 BORING 2 STA. 735+74 (711)  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT. 1957  
SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 25 SEPT. 1957

**ABBREVIATIONS**

- V - INSITU VANE SHEAR TEST    Q - TRIAXIAL QUICK    K - PERMIABILITY  
M - MECHANICAL ANALYSIS    S - TRIAXIAL SLOW    C - CONSOLIDATION  
U - UNCONFINED COMPRESSION    WL - WATER LEVEL IN CASING    CA - CASING  
Qc - TRIAXIAL CONSOLIDATED QUICK    WT - WATER TABLE IN SOIL    γ - UNIT WEIGHT

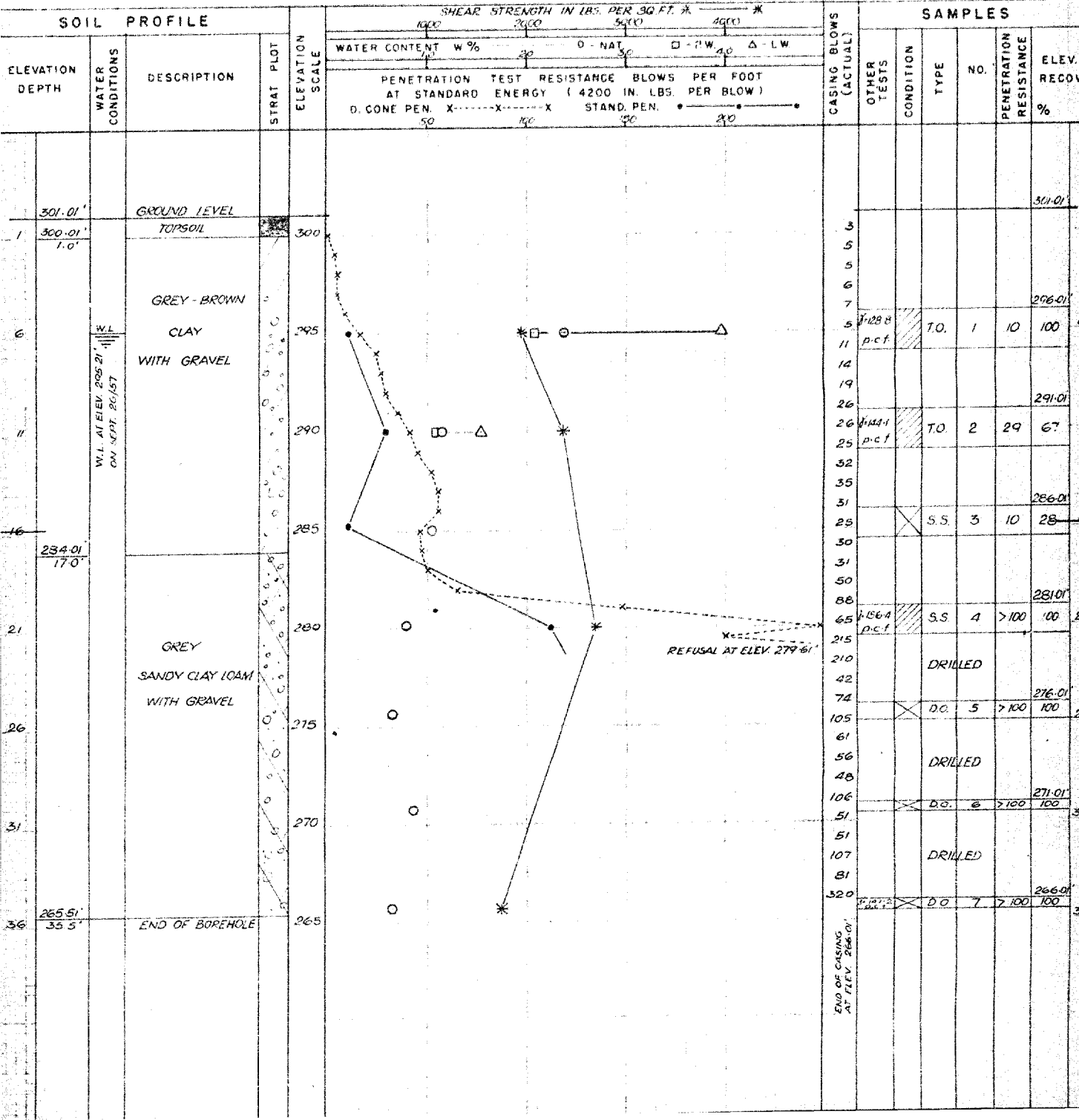
**SAMPLE TYPES**

- CS - CHUNK    SS - SLEEVE SAMPLE  
DO - DRIVE OPEN    PS - PISTON SAMPLE  
DF - DRIVE FOOT VALVE    WS - WASHED SAMPLE  
TO - THIN WALLED OPEN    RC - ROCK CORE

**SAMPLE CONDITION**

-  - DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

**SOIL PROFILE**





DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG 54-2 OPERATION PENETRATION JOB F-57-37 WP 60-57 BORING 3 STA. 736+02 (94'11")  
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1957  
 SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 27 SEPT 1957

## ABBREVIATIONS

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY  
 M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION  
 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING  
 QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

## SAMPLE TYPES

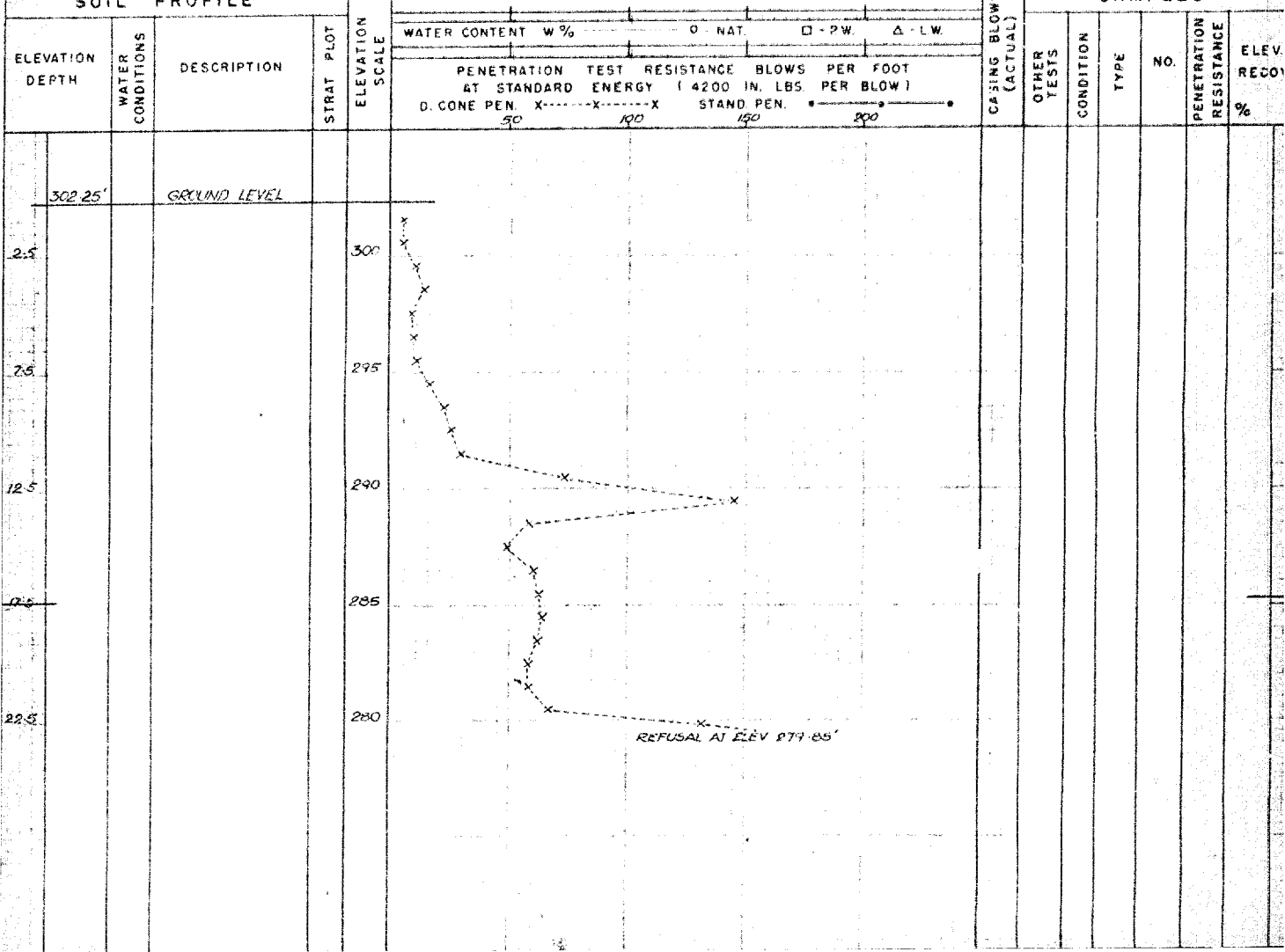
CS - CHUNK SS - SLEEVE SAMPLE  
 DO - DRIVE OPEN PS - PISTON SAMPLE  
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

## SAMPLE CONDITION

 - DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

## SOIL PROFILE

## SAMPLES



DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG 54-2 OPERATION BORE & PENET JOB E-57-57 W.P. 60-57 BORING 4 STA. 755+66 (BO'RT)  
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT. 1957  
 SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY HS CHECKED BY AL DATE BORING 30 SEPT. 1957

## ABBREVIATIONS

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY  
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 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING  
 Qc - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL  $\gamma$  - UNIT WEIGHT

## SAMPLE TYPES

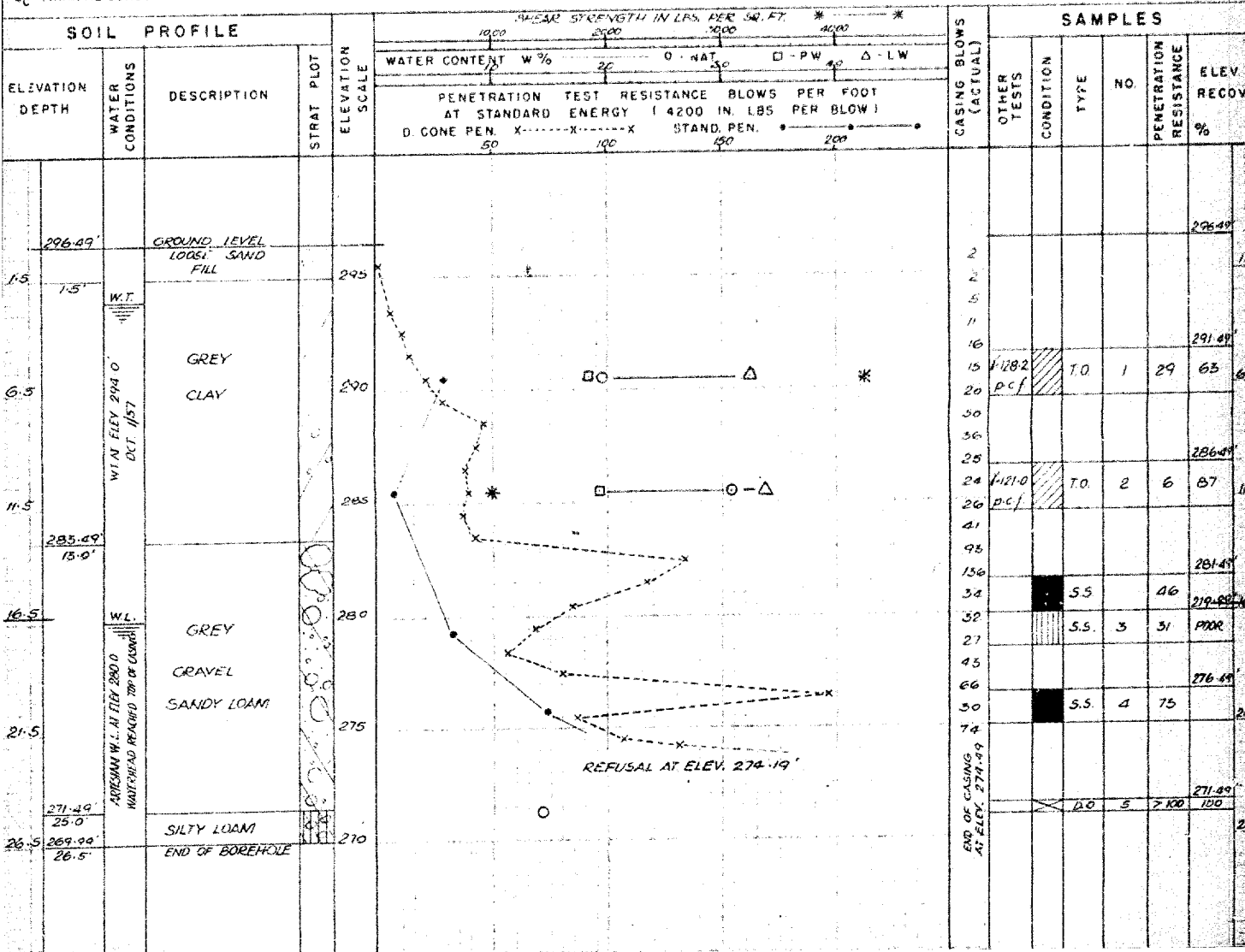
CS - CHUNK SS - SLEEVE SAMPLE  
 DO - DRIVE OPEN PS - PISTON SAMPLE  
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

## SAMPLE CONDITION



- DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

## SOIL PROFILE



DRILL RIG 34-E OPERATION PENETRATION JOB F 57-37 WP 60-57 BORING 5A STA 234130(80R)  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1957  
SAMPLER HAMMER WT 250 LBS DROP 22 INCHES COMPILED BY H.S. CHECKED BY --- DATE BORING 1 OCT 1957

## SAMPLE TYPES

## SAMPLE CONDITION

C.S. - CHUCK  
DO - DRIVE OPEN  
DF - DRIVE FOOT VALVE  
TO - THIN WALLED OPEN

SS - SLEEVE SAMPLE  
PS - PISTON SAMPLE  
WS - WASHED SAMPLE  
RC - ROCK CORE

- DISTURBED
- FAIR
- GOOD
- 1951

## SAMPLES

[illegible]



DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG SA-2 OPERATION PENETRATION JOB F-57-57 WP 60-57 BORING S.C. STA. 734+35(80'RT)  
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1957  
 SAMPLER HAMMER WT. 250 LBS. DROP 23 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 1 OCT 1957

**ABBREVIATIONS**

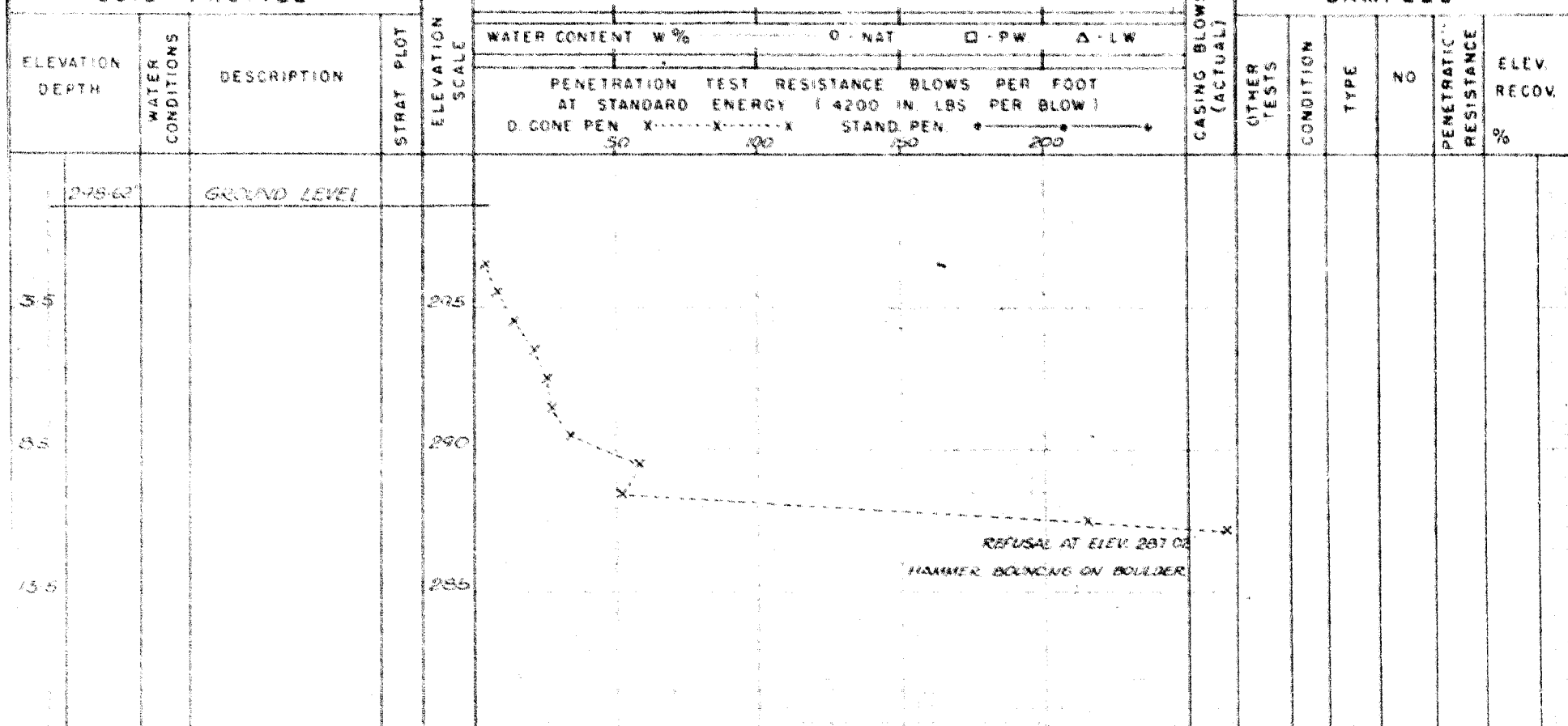
V - INSITU VANE SHEAR TEST O - TRIAXIAL QUICK K - PERMEABILITY  
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 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING  
 QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL  $\gamma$  - UNIT WEIGHT

**SAMPLE TYPES**

CS - CHUNK SS - SLEEVE SAMPLE  
 DO - DRIVE OPEN PS - PISTON SAMPLE  
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

**SAMPLE CONDITION**

- DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

**SOIL PROFILE****SAMPLES**

DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
**OFFICE REPORT ON SOIL EXPLORATION**

DRILL RIG 54-2 OPERATION PENETRATION JOB F-57-57 WP 60-57 BORING 5 D STA. 734+25(90' RT)  
 CASING 3X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1951  
 SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY LLS CHECKED BY AL DATE BORING 1 OCT 1951

**ABBREVIATIONS**

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK X - PERMIABILITY  
 M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION  
 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING  
 QC - TRIAXIAL CONSOLIDATED QUICK; WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

**SAMPLE TYPES**

CS - CHUNK SS - SLEEVE SAMPLE  
 DO - DRIVE OPEN PS - PISTON SAMPLE  
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

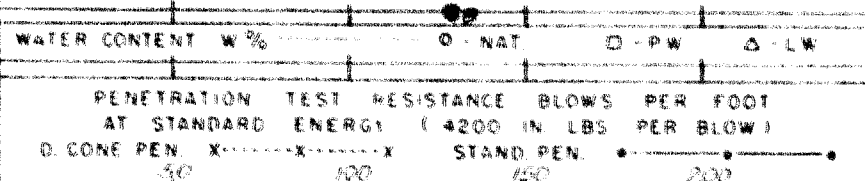
**SAMPLE CONDITION**



- DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

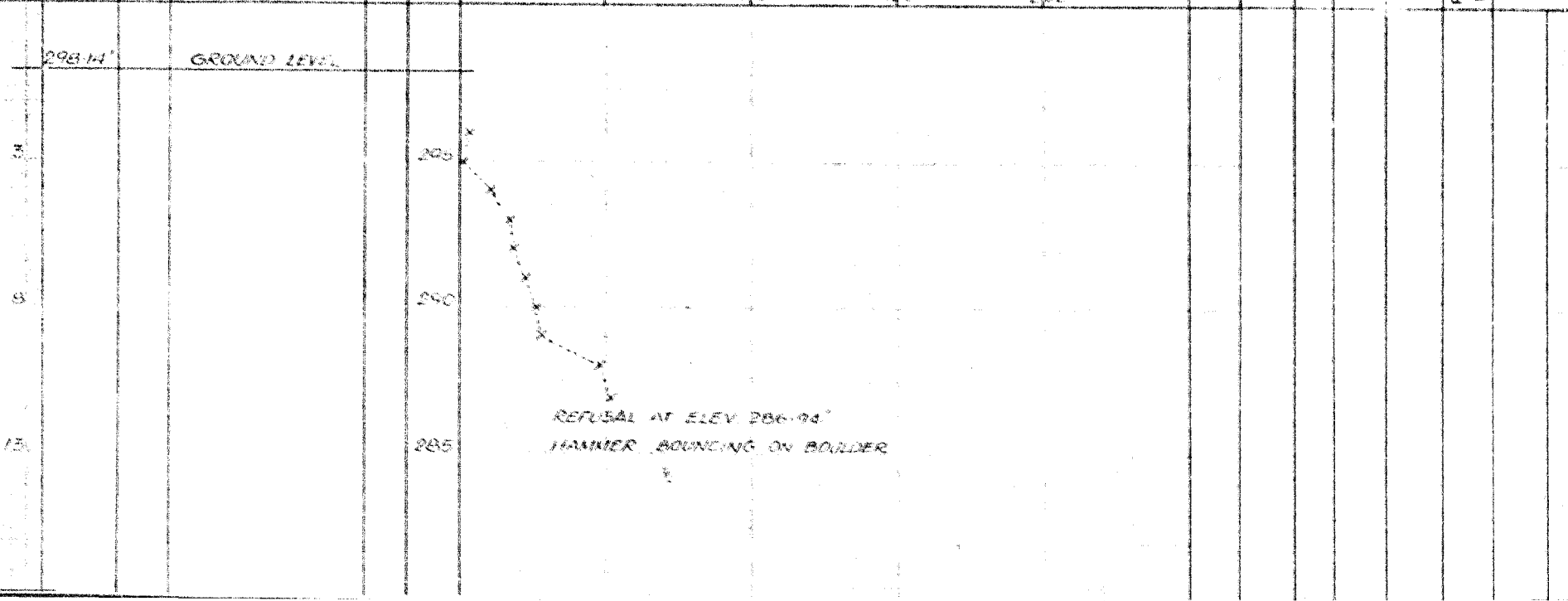
**SOIL PROFILE**

ELEVATION  
 DEPTH  
 WATER  
 CONDITIONS  
 DESCRIPTION  
 STRAY PLOT  
 ELEVATION  
 SCALE



**SAMPLES**

CASING BLOWS  
 (ACTUAL)  
 OTHER  
 TESTS  
 CONDITION  
 TYPE  
 NO  
 PENETRATION  
 RESISTANCE  
 ELEV.  
 RECOV.  
 %



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW  
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION Penetration  
CASING BC (standard samplers to fit unless noted)  
SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES

JOB # 57-57 WP 40-57  
 DATUM *GENUINE*  
 COMPILED BY *HS* CHECKED BY *AL*

BORING G STA 135+25 (100' RT)  
DATE REPORT  
DATE BORING

## ABBREVIATIONS

V - INSITU VANE SHEAR TEST      Q - TRIAXIAL QUICK      K - PERMIABILITY  
M - MECHANICAL ANALYSIS      S - TRIAXIAL SLOW      C - CONSOLIDATION  
U - UNCONFINED COMPRESSION      WL - WATER LEVEL IN CASING      CA - CASING  
Q - TRIAXIAL CONSOLIDATED QUICK      WT - WATER TABLE IN SOIL      D - UNIT WEIGHT

## SAMPLE TYPES

CS - CHUCK	SS - SLEEVE SAMPLE
DO - DRIVE OPEN	PS - PISTON SAMPLE
DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE
TO - THIN WALLED OPEN	RC - ROCK CORE

## SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

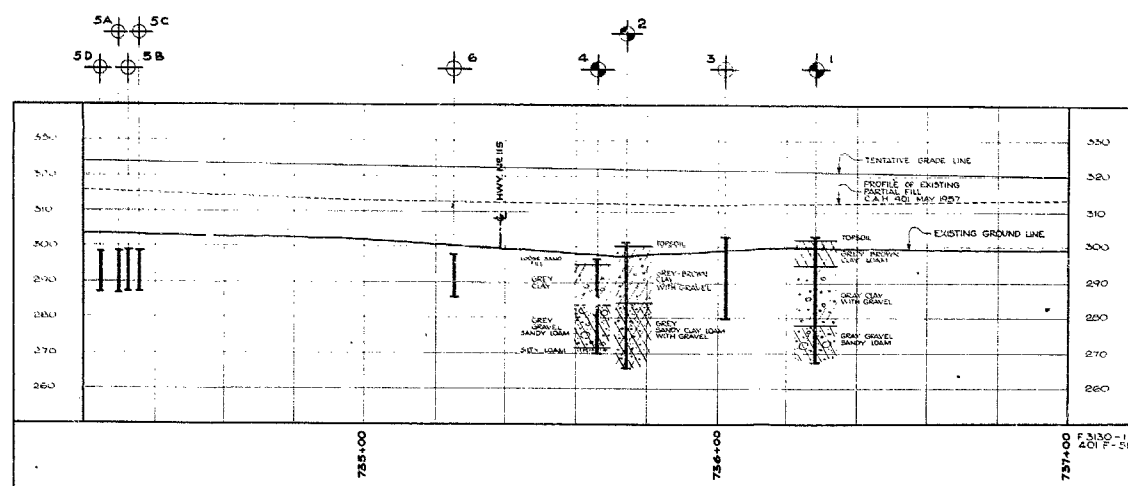
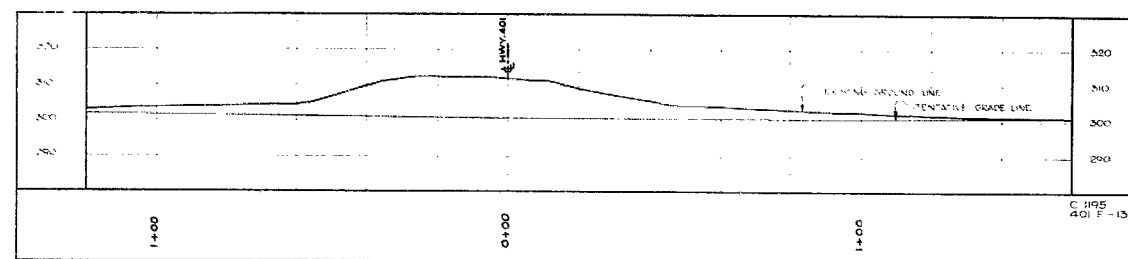
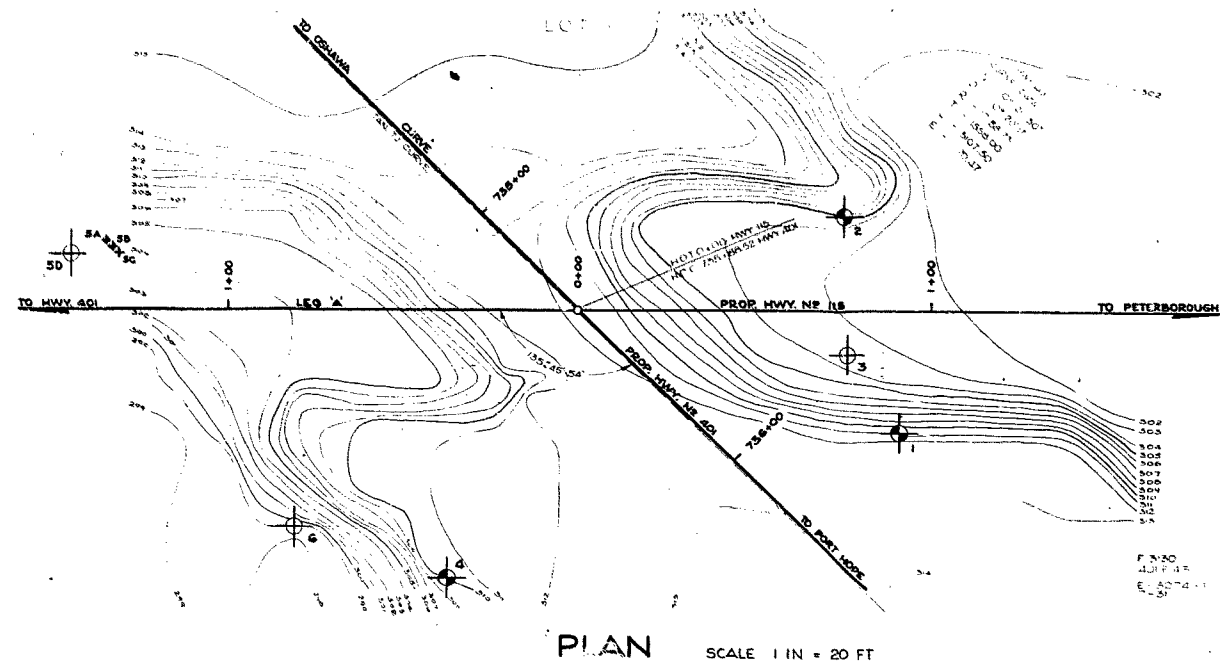
## SOIL PROFILE

SOIL PROFILE					SAMPLES									
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE	WATER CONTENT W%			CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO	PENETRATION RESISTANCE	ELEV. RECOV
					O - NAT	CI - PW	Δ - LW							
					PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN LBS PER BLOW)									
					O - CONE PEN	X	X	STAND. PEN	•					
					50		100	150	200					
207.65		GROUND LEVEL												
2.3				205	X	X	X	X						
7.5				200	X	X	X	X						
28				285	X	X	X	X						
					REFUSAL AT ELEV. 285 AS HAMMER BOUNCING ON BOULIERS									

# 57-F-37  
W.P. # 60-57  
Hwy. # 401  
CROSSING PROP.  
Hwy. # 115  
2 MILES W. OF  
NEWCASTLE

EDITED  
FOR MICROFILMING  
BY *MB* DATE *4/14/52*





LEGEND			
BORE HOLE			
PENETRATION HOLE			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM 1/2
1	302.3'	736+25	18' RT
2	301.0'	736+70	7' RT
3	302.25	736+02	25' RT
4	296.40	736+25	60' RT
5A	298.24	734+50	10' RT
5B	298.00	734+32	60' RT
5C	298.62	734+35	80' RT
5D	298.14	734+05	70' RT
6	297.40	735+25	100' 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 - DOWNSVIEW		
<b>HWY. NO 115 PROPOSED CROSSING 2 MILES W. OF NEWCASTLE</b> SHOWING POSITION & ELEVATION OF HOLES		
HWY. NO. 401 CO. DURHAM TWP. DARLINGTON	W.P. 60-57 LOT. 1	DIV. NO. 7 B.F. CON.
SCALE AS SHOWN	SUBMITTED BY	DATE 8 NOV. 1957
DRAWN BY R.E.F.	APPROVED BY	DRAWING NO. F-57-37A