

Mr. A. Toye.

November 13th, 1957.

Bridge Engineer.

Materials & Research Section.

Re: Foundation Report - Highway 401.  
Mill Street, Newcastle.  
M.P. 61-57. W.J. F-57-34.

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Attached herewith are two copies of the above mentioned Foundation Report for your information.

This underpass will involve a slight cut on Highway 401 and the footings would be placed normally in a cut section. However, the subsoil consists of a layer of clay over till. The clay cannot support a spread footing foundation, and therefore they would have to be carried down to the till layer. Some thought might be given to the use of short end bearing piles, if this is considered more economical than a spread footing foundation with a deep footing excavation.

F. C. BROWNIDGE.  
Materials & Research Engineer.

per:



A. RUTKA.  
Principal Soils Engineer.

c.c. Mr. A. Toye.  
Mr. H. Treggidas.  
Mr. D.C. Ramsay.  
Mr. R.D. Duff.  
Foundation Section.  
File.

Foundation Report  
on  
New Bridge at Highway 401 crossing  
Mill Street, Newcastle, County of  
Durham.

Plan No: F-3130

Station No: 644 / 11

Distribution:

Mr. A. Tove  
Bridge Engineer (2)  
  
Mr. H. Tregaskes  
Construction Engineer (1)  
  
Mr. D. G. Ramsay  
Design Engineer (1)  
  
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Dist. Eng. FORT HOPE (1)  
  
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File (1)

K.P. 61-57

M.J. P-57-34

### Introduction:

A subsoil investigation was carried out to determine the bearing values of layers for supporting the foundations of the proposed structure. The location is where the new highway No. 401 crosses Mill Street in Newcastle, County Durham, (station 844/11, profile No. F-3130). The job started on Sept 14, 1957 and was completed on Sept 18, 1957.

### Procedure:

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

The locations of the boreholes are shown on drawing F-57-34A, and their elevations on log sheets under Appendix I.

### Subsoil Findings and Analysis:

The area is within the late Iroquois lake boundaries. The terrain is lacustrine formation. The subsoil investigations revealed the following stratigraphy:

Under the topsoil down to elevation 290 ft. the soil is sandy loam. From here down to elevation about 285 ft. the soil is clay loam. The underlying layer extends down to elevation about 269 ft. and is made up of grey clay; at certain elevations it is interbedded with sand seams. Below this down to bedrock at elevation about 253 ft. the layer is very dense sandy loam with gravel and boulders. The bedrock was drilled

by means of core bit, and samples extracted showed it to be limestone formation.

In the course of explorations samples were extracted and tested in the laboratory. The test results indicate that the top sandy loam layer is non-plastic, has a moisture content of 21% and density of 126 p.c.f. The standard penetration tests in this layer registered 9 blows per foot penetration. The grey clay layer has average liquid limit about 32% and plastic limit 15.5%. The soil is identified as inorganic clay of medium plasticity. This layer has a moisture content of about 30-32% and has an average density of 120 p.c.f. During sampling between elevations 260 to 270 ft., the sampler was simply pushed by hand. From all indications this layer is in an almost completely saturated state. This situation is very probably assisted or brought about by the presence of one to two inch thick interbedded sand seams detected in this layer.

The sandy loam layer with gravel and boulders is between the grey clay layer above and the limestone bedrock underneath. This layer has moisture content of 9%. In boreholes No. 1 & 4 (i.e. south side of the highway 401 central line) this layer is about 15 ft. thick, and registered about 70 blows per foot for standard penetration. In borehole No. 2 (i.e. north side of the highway 401 central line) the layer was encountered at the same elevation (270 ft.) but explorations were not carried down to bedrock.

CONCLUSIONS & RECOMMENDATIONS:

From the above discussion it will follow that:

1. The site is believed to be within the boundaries of late Iroquois lake.

The stratigraphy reveals outwash material at the top underlain by lacustrine grey clay varved with sand seams. This layer in turn underlain by till material and bedrock.

2. The new grade line indicates a cut, down to elevation 291 ft. at this crossing. Accordingly it is assumed that the footings of the new structure will be placed at elevation about 283 ft. Under these circumstances, if spread footing foundations were considered, a bearing value of 2-2.5 T.s.f. would be located at elevation about 262 ft. for both northern and southern footings. This will incur excavations of some 21 ft.
3. The use of end bearing piles will be also considered. These piles will reach refusal at about 253 ft. and will provide ample supporting value for the foundations of the proposed structure.
4. The economic considerations, in using piles, or excavating for spread footings, will be deciding factors in selecting types of foundations to be used at this site.
5. The approach fills to the structure do not present any stability problem.

V. Korlu,  
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 + PENET N JOB F-57-34 WR 91-57 BORING L STA 443+92 (40' RT)  
CASING 3X (standard samplers to fit unless noted) DATUM GLIODETIC DATE REPORT OCTOBER 1957  
SAMPLER HAMMER WT. 250 LBS. DROP 22 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 13 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
Q <sub>c</sub> - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	$\gamma$ - UNIT WEIGHT

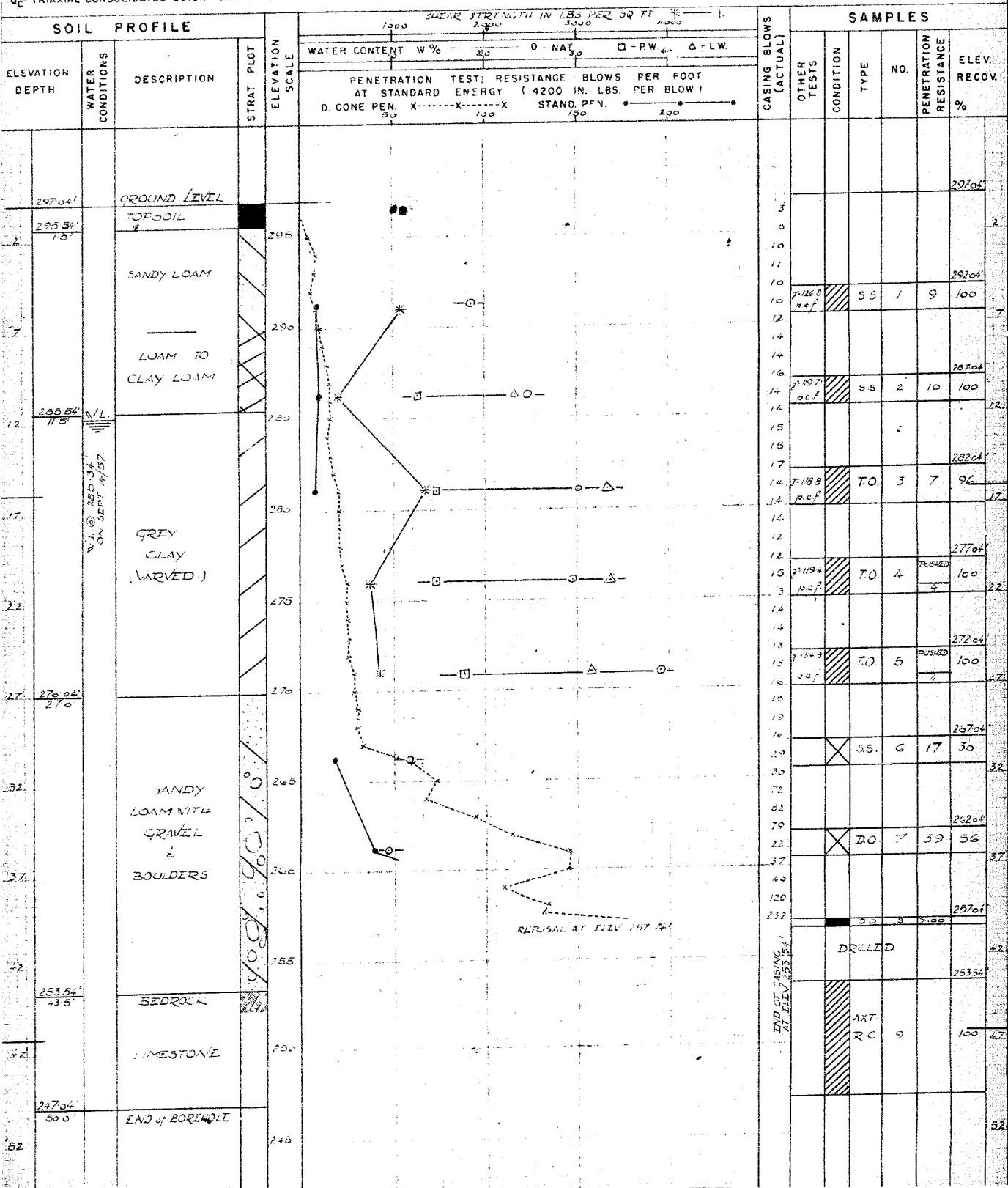
## SAMPLE TYPES

C.S. - CHUNK	S.S. - SLEEVE SAMPLE
D.O. - DRIVE OPEN	P.S. - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE	W.S. - WASHED SAMPLE
T.O. - THIN WALLED OPEN	R.C. - 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 PENETRATION JOB F-57-34 WP 61-57 BORING 3 STA. 844+52 (46' LT.)  
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 17 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  
Q<sub>c</sub> - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

**SAMPLE TYPES**

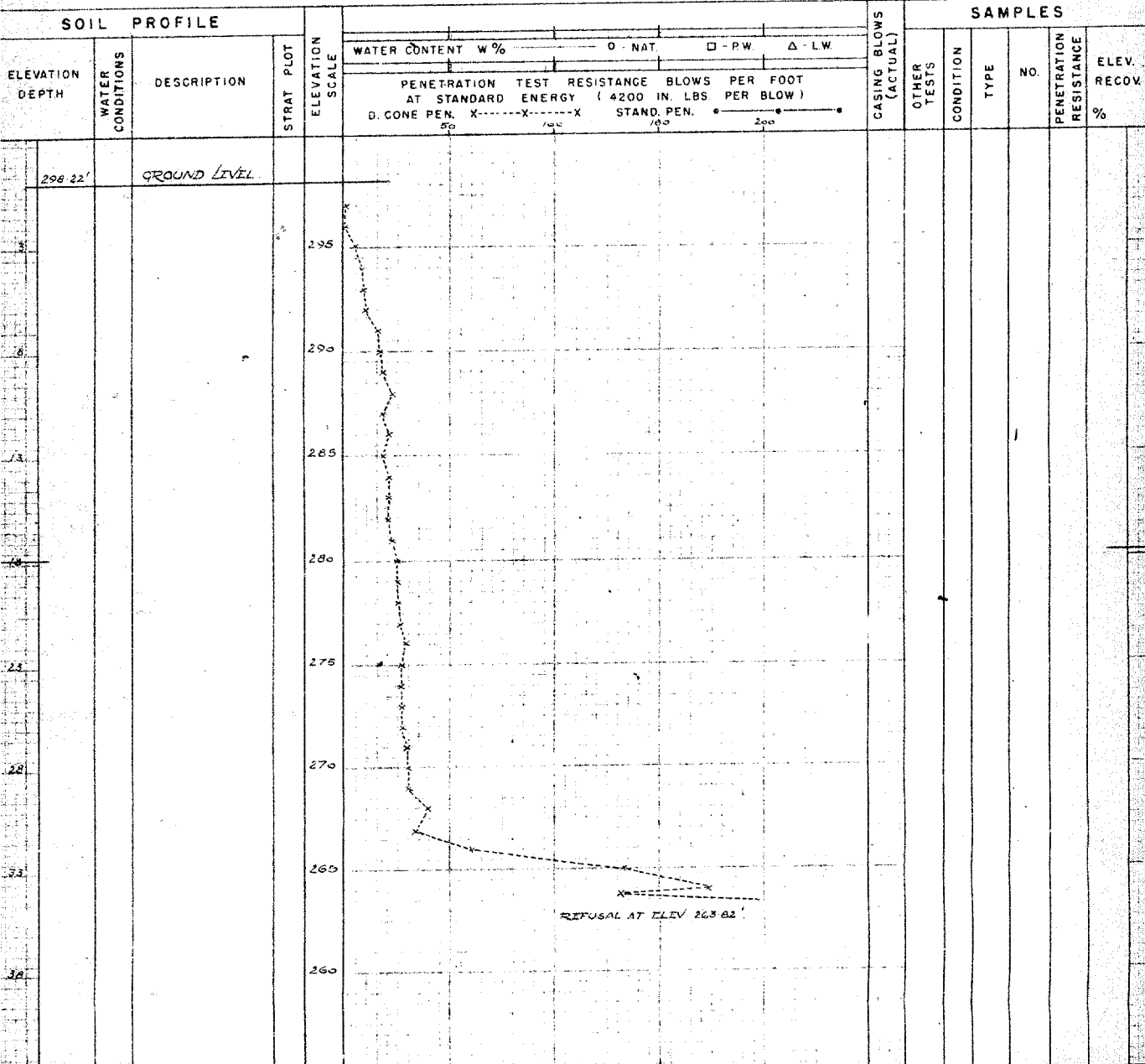
CS - CHUNK SS - SLEEVE SAMPLE  
DO - DRIVE OPEN PS - PISTON SAMPLE  
DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
TO - THIN WALLED OPEN RC - ROCK CORE

**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 BORE & PENET N JOB T-57-34 WP 61-57 BORING 4 STA. 844+52(33' RT.)  
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 18 SEPT. 1957

**ABBREVIATIONS**

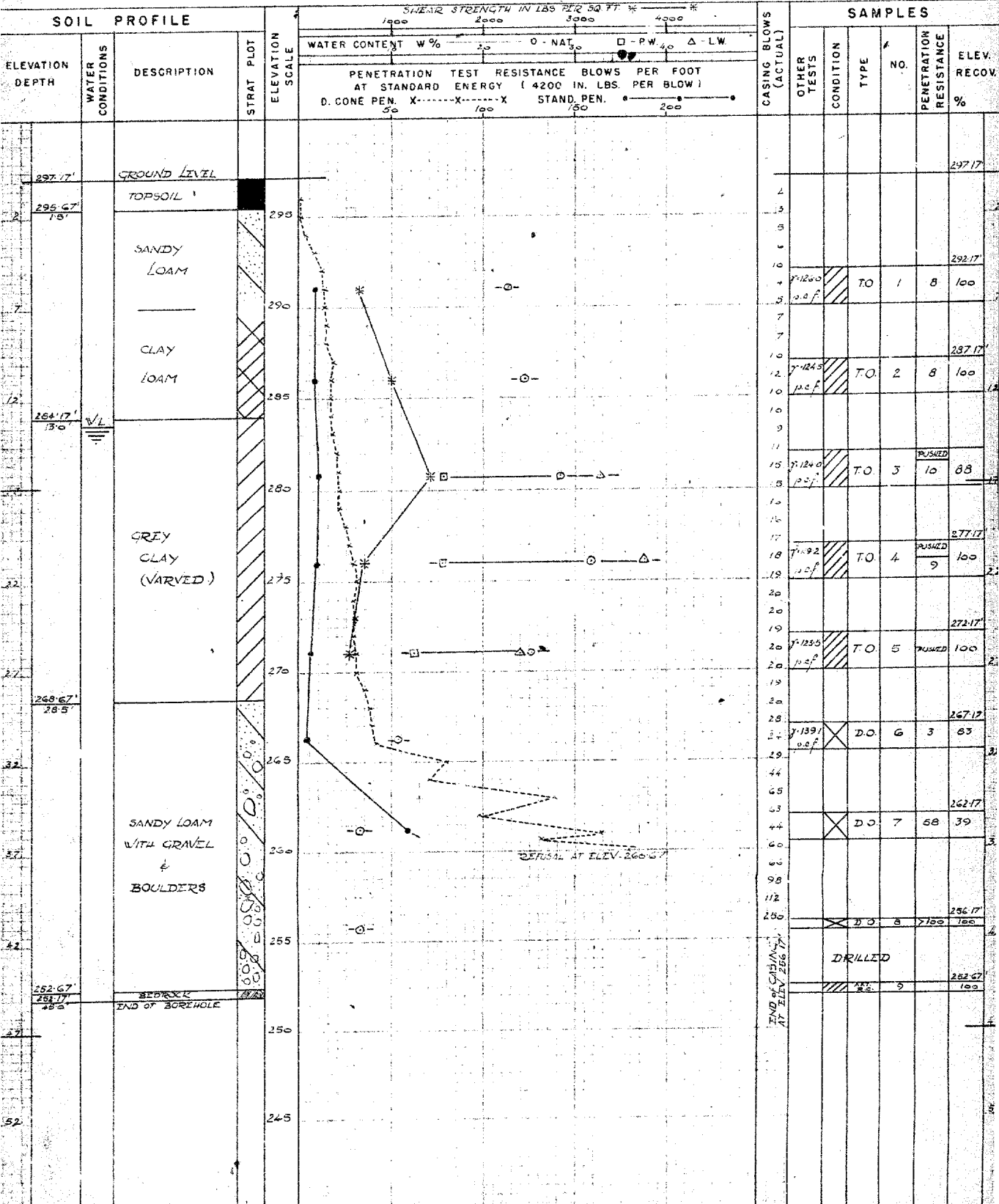
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QC - TRIAXIAL CONSOLIDATED QUICK    WT - WATER TABLE IN SOIL    γ - UNIT WEIGHT

**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



# 57-F-34  
W.P.# 61-57  
Hwy. # 401  
CROSSING  
MILL ST.  
NEWCASTLE

EDITED  
FOR MICROFILMING  
BY LB DATE 4/16/72

