

Mr. A. Toye

October 30, 1958.

Bridge Engineer,

Materials & Research Section.

Re: Foundation Report -
Hwy 401 and Victoria Rd. crossing,
4 miles southeast of London, Twp. of
Westminster.
M.P. 9-58 W.J. F-58-23.

Attached please find two copies of the above mentioned report.

It will be seen that spread footing type foundations could be placed at about elevation 876 ft. However, in order to comply with one inch settlement limit, a design load of one T.S.F. is calculated to be permissible for a structure with fixed end supports.

For a freely supported structure the use of 2 T.S.F. design load will anticipate 3.5 inch settlement.

The use of tubular or Franki type piles will provide both frictional and end bearing support and will eliminate the settlement hazards.

It appears that the choice of the type of foundations depends on economic comparison.

AR/YS.

A. Rutka,
Acting Materials & Research Engineer.

cc:

Messrs. A. Toye
B. Tregaskes
D. C. Ramsay
W. L. Fraser
A. Watt
Mr. F. Karrow
Foundation Section
File.

Per:

V. Karlu A.L.
V. Korlu

FOUNDATION REPORT

On

New overpass bridge at Hwy 401
and Victoria Road crossing, 4
miles southeast of London, Twp
of Westminster.

Station: 103+94.18

Plan No: P-3529-10

Distribution:

Mr. A. Teye
Bridge Engineer (2)

Mr. H. Iregaskes
Construction Engineer (1)

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

Mr. W. L. Fraser
Dist. Eng. London (1)

Mr. A. Watt
Water Resources Commission (1)

Dr. P. Marrow
Department of Pines (1)

Foundation Section (1)

File (1)

W.P. 9-58

W.J. P-58-23

INTRODUCTION:

This report covers the subsoil investigations carried out at Hwy 401 crossing Victoria road 4 miles southeast of London.

From these findings the bearing values of the subsoil have been assessed and recommended for the support of the foundations of the proposed new bridge.

The site is located about 4 miles southeast of London where Hwy 401 crosses the Victoria road in lot 7 (Conc. II) Twp. of Westminster (profile No. F-3529-8 Station 103+91.18).

DESCRIPTION OF SITE AND FIELD WORK:

The physiography at the site is rather flat country with drawlins to the east. The terrain is basically til' with sand and silty clay deposits on the top and apparently of lacustrine formation.

The explorations were carried out by means of skid mounted core drill machine. In the course of the investigations four boreholes with adjacent dynamic cone penetrations were made, two on each side of the center line, corresponding to the approximate location of the footings. The borings were made by wash and drive method and at regular intervals undisturbed samples were taken and tested in the laboratory.

The location of the boreholes is shown on drawing No. F-58-23A, and their elevations on log sheets under Appendix I.

DISCUSSION OF FIELD AND LABORATORY FINDINGS:

The investigations at the site revealed the following subsoil stratification;

Under the topsoil the layer is about 30 ft. of silty sandy clay. The soil is in a loamy state with variable proportions of silt, sand and clay throughout the layer. The average liquid limit is about 22%, and plastic limit 16%. The soil is inorganic and of low plasticity. Its natural moisture content is about 18% and density about 130 p.c.f. The average shear value of the layer obtained from unconfined compression tests is about 2000 p.s.f. The average standard penetration resistance during sampling is about 35 blows per foot penetration.

This silty clay loam layer is underlain by a layer of sand about 12 - 15 ft. thick. The layer is about 11.5% saturated. The standard penetration tests indicated an average of 35 blows per foot penetration.

Underlying the sand layer and starting from elevation 842 ft. down the soil is clay loam till. Its moisture content was measured to be about 10% and density about 145 p.c.f. The standard penetration resistance during sampling was measured to be about 100 blows per foot penetration.

SUPPORT OF FOUNDATIONS:

The use of spread footing type foundations will be considered. Assuming the structure will be supported on 7 ft. wide continuous footings it will be proper to place them at

about elevation 876 ft. where the grey glacial stratification starts. The soil above this elevation is partly fill and partly brown dessicated material. The average shear value measured in a depth 2B (14 ft.) below this elevation is 2000 p.s.f. (This shear value has been measured from unconfined compression results and represents the cohesion provided by the binding materials in the layer. It is believed that the presence of considerable granular material in the layer will also act in favour of this accepted shear value). Measured by Meyerhof's formula for the bearing value in clays ($Q = \frac{C_u}{F} \cdot P_o$) the layer can provide a bearing value more than 2 T.s.f. with a safety factor of 3.

However, from the measured liquid limit (22%) and moisture content (18%) amount of anticipated settlement in the layer was calculated. These calculations revealed that, in order to comply with one inch settlement limit for fixed end structures, the allowable design load would not be more than one T.s.f.

If a freely supported structure is selected, the use of 2 T.s.f. design load will cause an anticipated 3.5 inch settlement.

The use of piles for supporting the foundations will be considered. It will appear that the use of piles will have its convenience in the way of avoiding settlement hazards. Judging from the dynamic cone penetration and the BX casing blows it appears that end bearing piles could be established

either in the sand layer or the bottom till layer. Use of tubular or Franki piles appear to be of preference in a similar stratification.

CONCLUSIONS AND RECOMMENDATIONS:

From the above discussion it will follow that:

1. The stratigraphy of the subsoil at this site is a layer of sandy silty clay loam down to elevation 855 to 860 ft. Below this layer down to elevation 842 ft. the layer is medium to dense sand. Underlying the sand layer is the layer of hard clay loam till.

2. For supporting the structure on spread footing type foundations it is assumed that 7 ft. wide continuous footings will be placed at about 10 ft. below the ground elevation (876 ft.). At this elevation, judging from the measured average shear value, the layer can provide a bearing value of more than 2 T.s.f. On the other hand a load of this order is calculated to cause some 3.5 inch settlement in the remaining 20 ft. of the layer.

From the calculations it appears that in order to be within one inch settlement limit for a fixed end structure the design load should not exceed one T.s.f. It will be possible to use 2 T.s.f. design load for a freely supported structure with an anticipated 3.5 inch settlement.

3. The use of piles for supporting the foundations will have their convenience in the way of eliminating settlement hazards. In a similar stratification tubular or Franki

type piles will provide both end bearing and frictional support.

4. It appears that the type of foundations to be adopted will depend on economic comparison between wide spread footings or piles for supporting the structure.
5. The approach fills to the new structure do not present any stability problem.

W. Kerlu

Foundation Engineer.

APPENDIX I.

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

DRILL RIG 54-6 OPERATION Bore & Penet'n
CASING BX (standard samplers to fit unless noted)
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES

JOB F-58-23 WP 9-58
DATUM GEODETIC
COMPILED BY H.S. CHECKED BY A.L.

BORING 1 STA. 104+15(45' LT.)
DATE REPORT OCT 1958
DATE BORING 10 JULY 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q_c - TRIAXIAL CONSOLIDATED QUICK

Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL

K - PERMIABILITY
C - CONSOLIDATION
CA - CASING
γ - UNIT WEIGHT

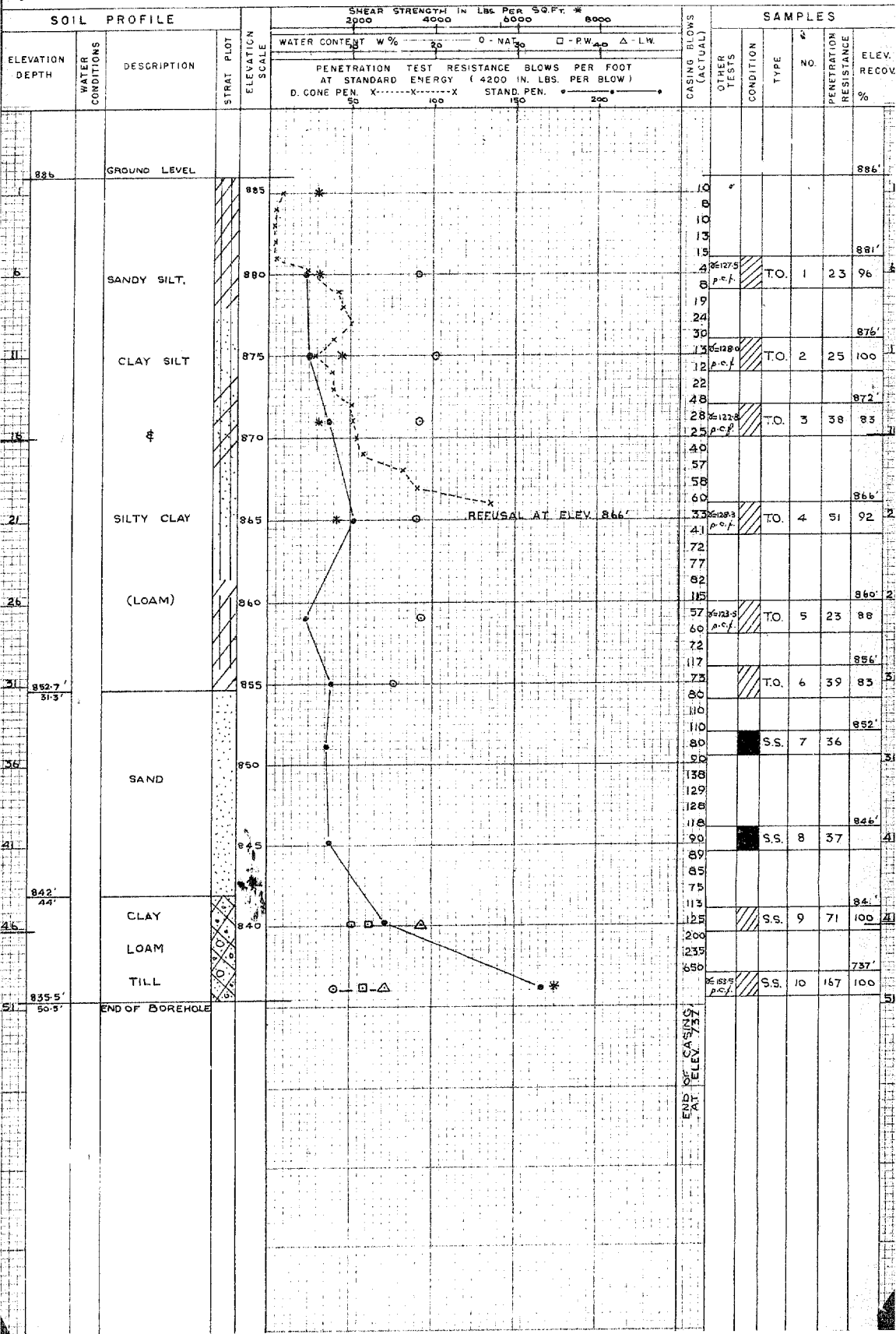
SAMPLE TYPES

CS - CHUNK
DO - DRIVE OPEN
DF - DRIVE FOOT VALVE
TO - THIN WALLED OPEN

SS - SLEEVE SAMPLE
PS - PISTON SAMPLE
WS - WASHED SAMPLE
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 54-6 OPERATION BORE & PENET'N
CASING 3 X (standard samplers to fit unless noted)
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES

JOB F. 58-23 WP 9-58
DATUM GEODETIC
COMPILED BY H.S. CHECKED BY A.L.

BORING 2 STA. 103+85 (45' E)
DATE REPORT OCT. 1958
DATE BORING 12 JULY 1959

ABBREVIATIONS

SAMPLE TYPES

SAMPLE CONDITION

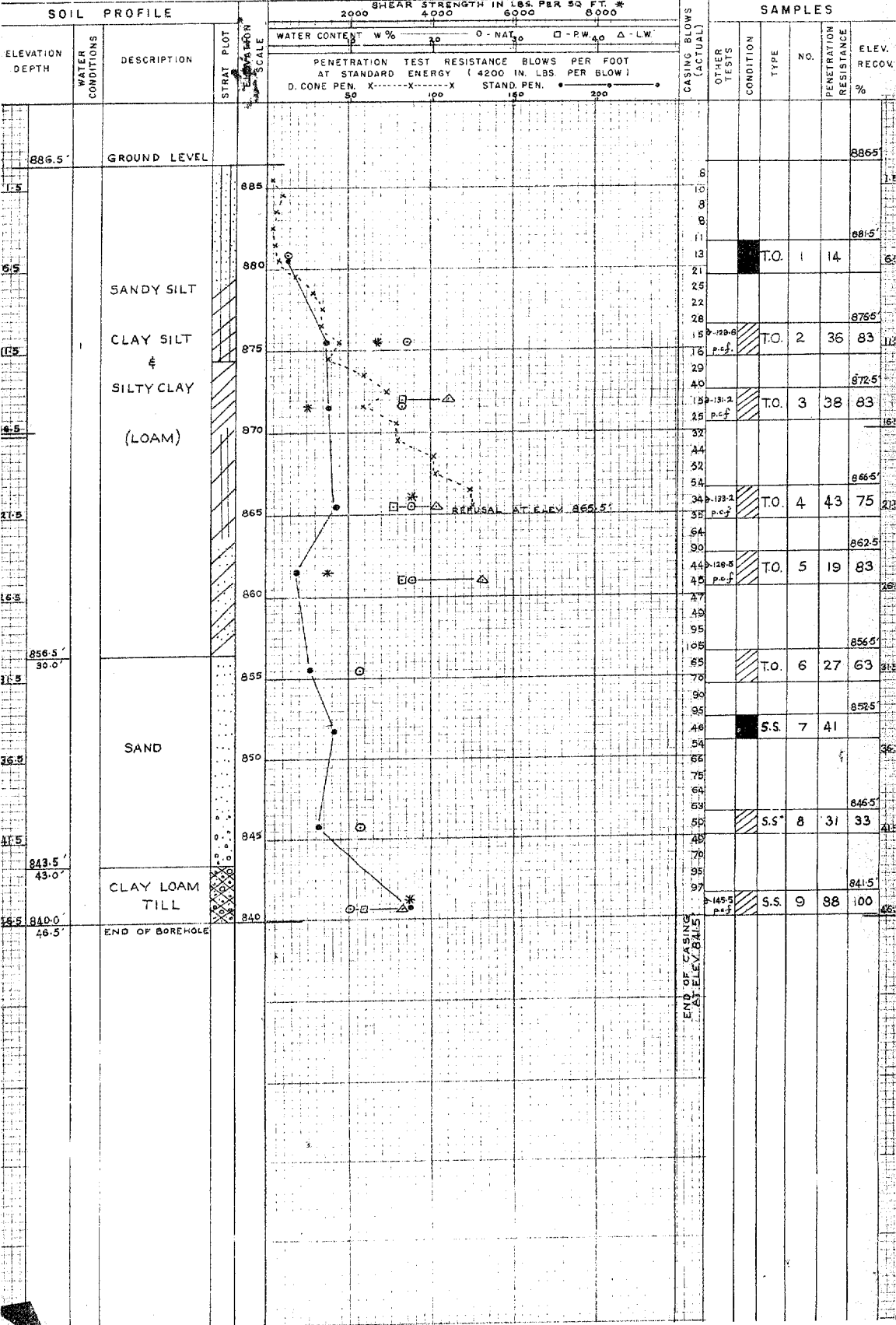
V - INSITU VANE SHEAR TEST O - TRIAXIAL QUICK K - PERMIABILITY
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
OC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL U - UNIT WEIGHT
TO - THIN WALLED OPEN

S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
WS - WASHED SAMPLE
RC - ROCK CORE



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE



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

DRILL RIG 54-6 OPERATION BORE & PENET'N JOB F-58-23 WP 9-58 BORING 3 STA 103+80 (50' RT.)
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1958
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 15 JULY 1958

ABBREVIATIONS

SAMPLE TYPES

SAMPLE CONDITION

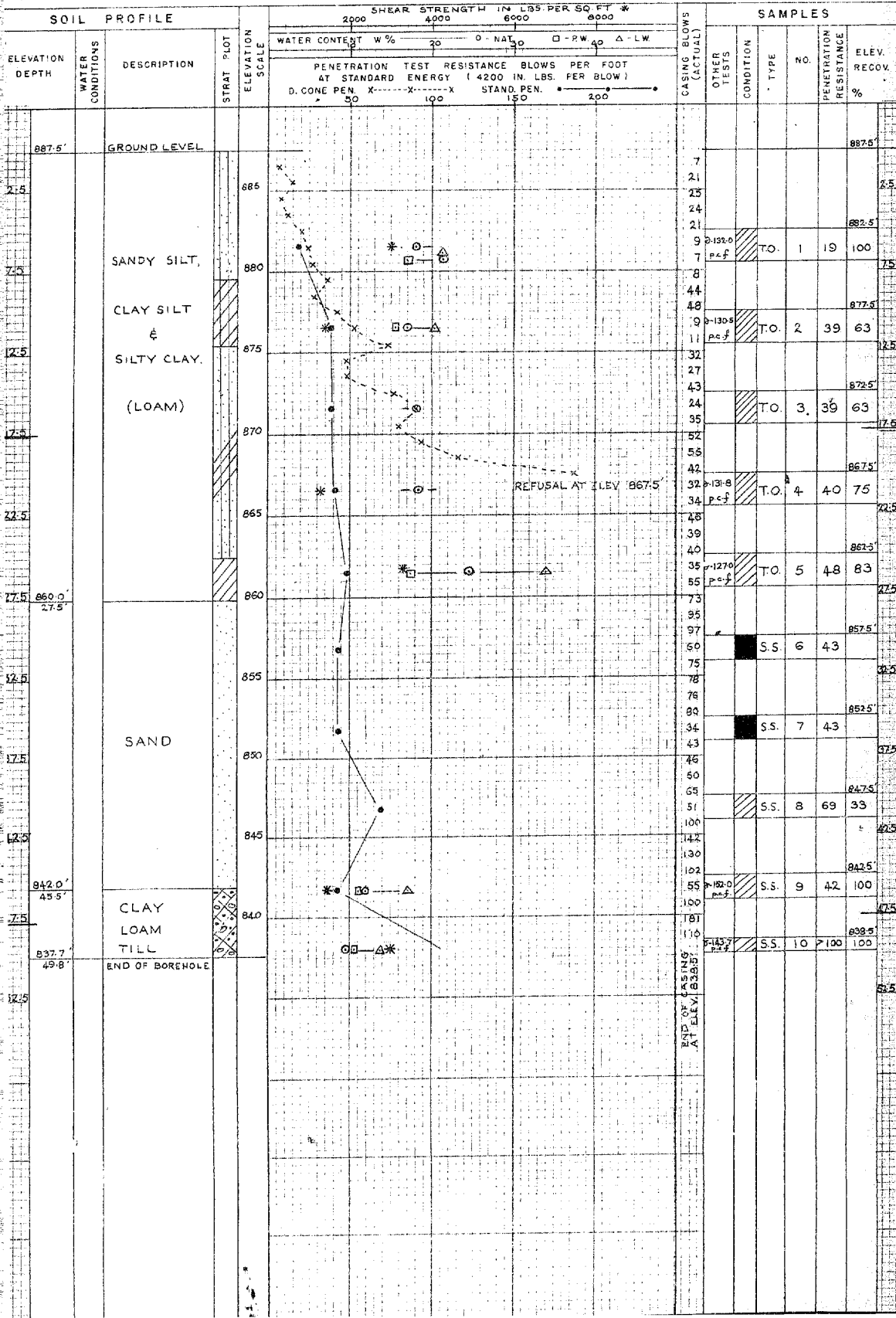
V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY CS - CHUNK SS - SLEEVE SAMPLE
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION DO - DRIVE OPEN PS - PISTON SAMPLE
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING DF - DRIVE FOOT VALVE WS - WASHED SAMPLE
QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT TO - THIN WALLED OPEN RC - ROCK CORE



- DISTURBED
- FAIR
- GOOD
- LOST


SOIL PROFILE

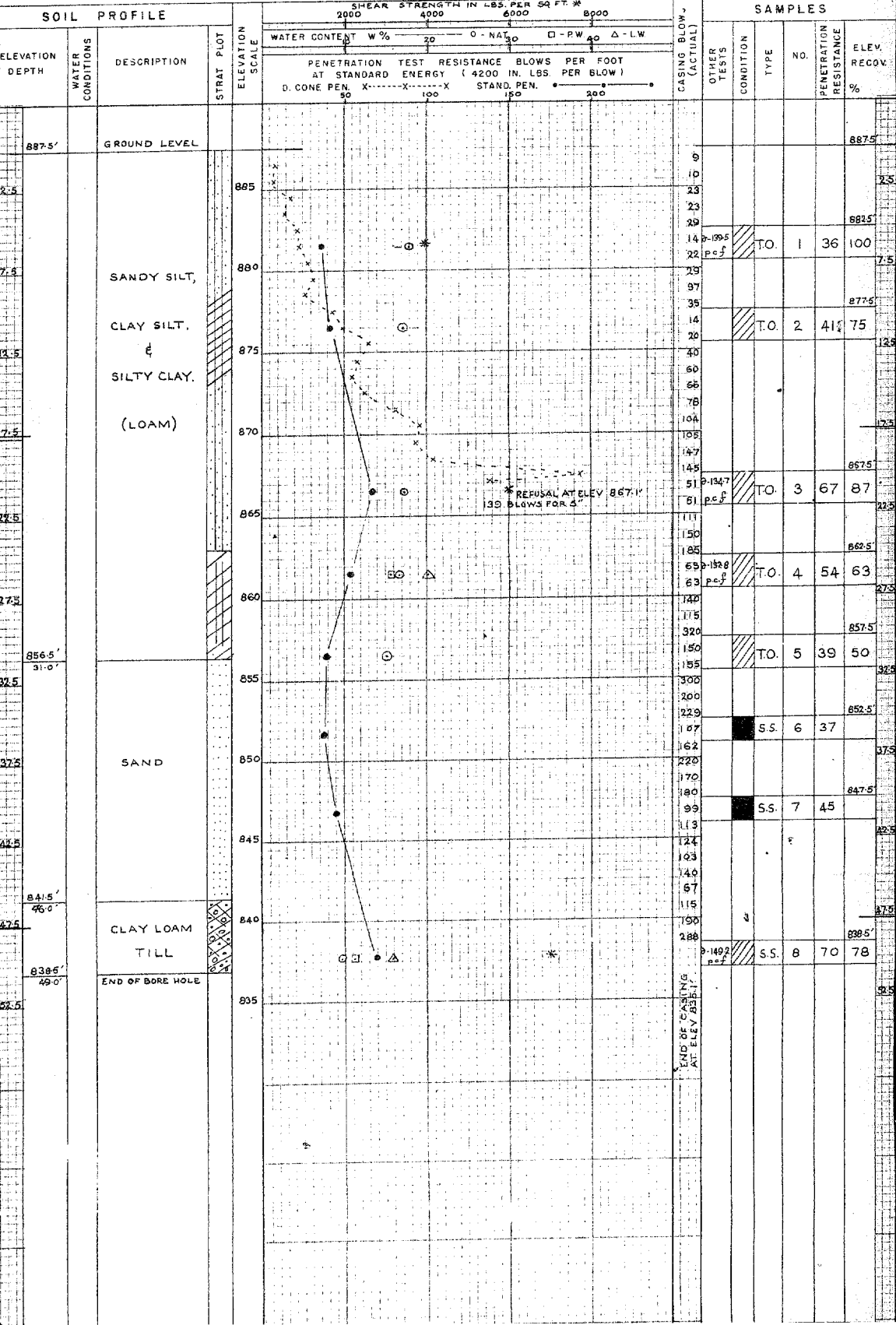
SAMPLES



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

DRILL RIG 54-6 OPERATION BORE & PENET'N JOB F-58-23 WR 9-58 BORING 4 STA. 104+20 (48' RT)
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT OCT 1958
SAMPLER HAMMER WT. 250 LBS. DROP 10 INCHES COMPILED BY H.S. CHECKED BY ALL DATE BORING 17 JULY 1958

ABBREVIATIONS				SAMPLE TYPES		SAMPLE CONDITION	
V - INSITU VANE SHEAR TEST	O - TRIAXIAL QUICK	K - PERMIABILITY	C.S. - CHUNK	SS - SLEEVE SAMPLE		- DISTURBED	
M - MECHANICAL ANALYSIS	S - TRIAXIAL SLOW	C - CONSOLIDATION	DD - DRIVE OPEN	RS - PISTON SAMPLE		- FAIR	
U - UNCONFINED COMPRESSION	WL - WATER LEVEL IN CASING	CA - CASING	DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE		- GOOD	
QC - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	γ - UNIT WEIGHT	TO - THIN WALLED OPEN	RC - ROCK CORE		- LOST	



#58-F-23

W.P. #9-58

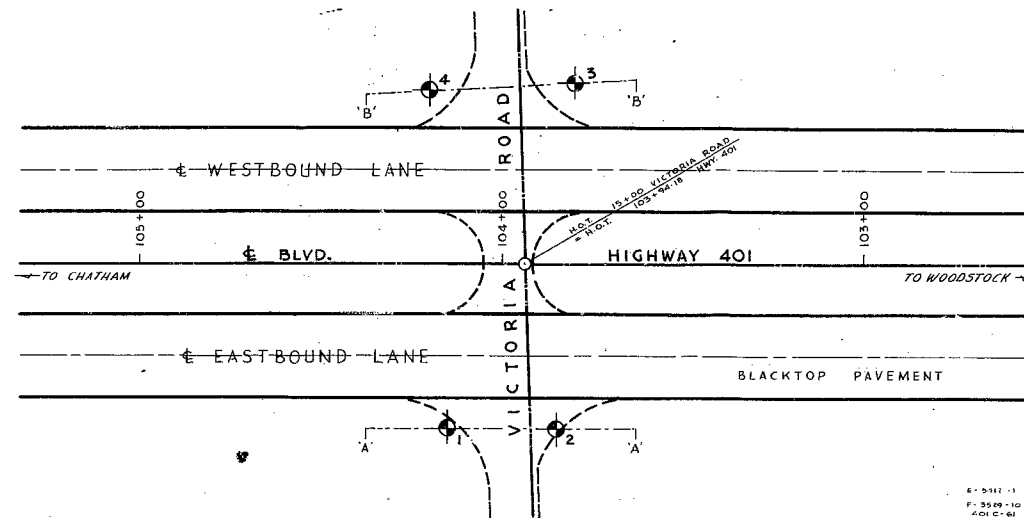


HWY. #401 &

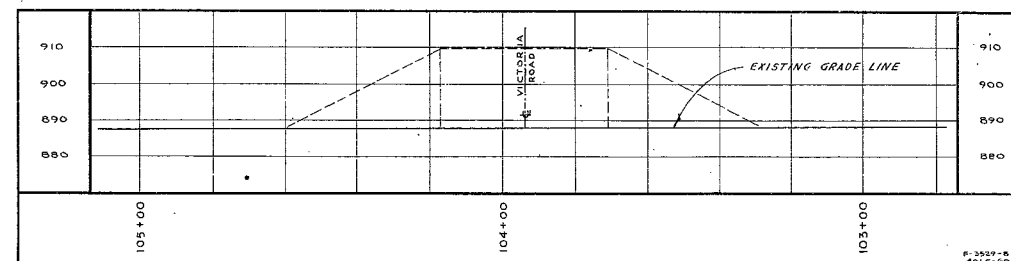
VICTORIA RD.

CROSSING 4 MI.

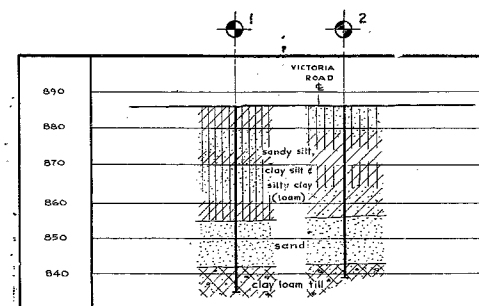
S.E. OF LONDON



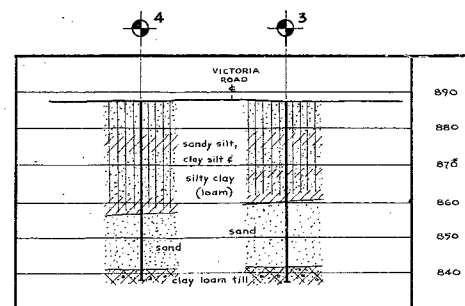
PLAN



PROFILE



A-A



B-B

LEGEND			
Bore Hole			
Penetration Hole			
Bore & Penetration Hole			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM E.
1	104+15	886.0	45' LT.
2	103+85	886.5	45' LT.
3	103+80	887.5	50' RT.
4	104+20	887.5	48' 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

**VICTORIA ROAD
PROPOSED CROSSING**
4 MILES SOUTH EAST OF LONDON
SHOWING POSITION & ELEVATION OF HOLES

HIGHWAY 401 W.P. 9-58 DISTRICT NO. 2
COUNTY MIDDLESEX
TOWNSHIP WESTMINSTER LOT 7 CON. II

SCALE 1 inch = 20 feet
DRAWN BY D.N. and H.D.R.

SUBMITTED BY V. KORLU
APPROVED BY

DATE 28 OCT. 1958
DRAWING NO. F 58-23 A