

Mr. H. McMillan,
Road Design Engineer.

F. C. Brownridge
per: A. Rutka

May 21, 1957.

Re: H.P. 619-56 - Hwy. #11

Callander Diversion.

South

Attention: Mr. G. Hunter

Further to your memorandum of April 11/57 to Mr. D. G. Ramsay and to our telephone conversation of April 29/57, in connection with the fill over the culvert at station 13/30. You will recall that our soils report of Feb. 20/57 indicated very poor subsoil conditions between stations 12/60 - 15/00 and to overcome this problem, berms were recommended. In view of the fact that the property requirements had already been purchased, your above mentioned memorandum of April 29/57 suggested the possibilities of a rock fill and berms in order to avoid the purchase of additional right-of-way. Because the unit weight of rock is in the same neighbourhood as that for sand, there is no advantage in using rock fill. As a matter of fact, berms of the same dimensions as discussed in the report would still have to be used for a rock fill. The other alternative, would be to construct the fill to a 2:1 slope but to employ stage construction of the fill. This procedure would permit the construction of the fill within the property already purchased.

Comprehensive calculations were made, and the following stage construction procedures are recommended for the fill between stations 12/60 - 15/00 as an alternative to berms:

1. Stage 1 - Approximately 20' of fill may be placed initially - i.e. to elevation 668.
2. Stage 2 - Upon completion of the first stage and after a waiting period of 120 days, an additional 10' of fill may be placed - i.e. to elevation 679.
3. Stage 3 - Upon completion of the second stage and after a waiting period of 120 days, the remainder of the fill may be placed to profile grade.

The calculations were based on granular type fill because this type of material is readily available with fairly short haul distances. In any case, granular type material is highly desirable. If a portion of this fill consists of rock, it is important to construct the embankment to a 2:1 slope in order to distribute the load over a wider base area than would be required for a rock fill alone.

In view of the fact that stage construction will likely be employed between stations 124/60 - 157/00, the same consideration might be given at the approaches over the C.N.R. crossings at station 114/75. As you may be aware, additional foundation investigations were carried out by the consultants Racey, MacCallum and Associates, using the vane test and this method indicated higher shear strengths of the clay layer than the unconfined compression results carried out by the soils section. We presume you have a copy of their report dated May 3, 1957. I asked Mr. S. McCombie of the Bridge Office to send you a copy of this report if you did not have one. Our report submitted on Feb. 13/57 recommended berms. Basically, their recommendations for the section between stations 112/00 - 122/00 is as follows:

1. Construct the embankment with 3:1 slopes or 2:1 slopes with side berms of 10' x 32'. In both cases, the embankment could be built in one stage.

Or -

2. Construct the embankment with 2:1 slopes but employ stage construction. The first stage could be built with a 21' fill or to approximately elevation 709 and after a waiting period of 200 days, the remainder of the fill could be added.

The embankment in the immediate area of the proposed structure should be constructed to a 3:1 slope to incorporate a larger factor of safety. It is understood that the Bridge Office have accepted this proposal and are having the structure designed accordingly. It would be advisable to check with the Bridge Office to determine the limits of the 3:1 embankment slopes.

F. C. Brownridge
MATERIALS & RESEARCH ENGR.

per:

QR

AR/MieF

cc: Messrs. H. Tregaskes

D. Foster

E. Saint

Foundation Section

File

A. Rutka

PRINCIPAL SOILS ENGINEER

Mr. A. Teye,

February 15, 1957

Bridge Engineer.

F. C. Brownridge

Per: A. Rutka

Re: Foundation Report -

C.N.R. Crossing South Callander By-pass

Station 24/00 - Line 'D',

W.P. 620-56 W.J. 7-56-16

We are forwarding herewith two copies of the above mentioned foundation report.

You will note that this structure foundation will be located entirely on rock and no problems at this site with respect to the foundation or with the immediate approach fills are anticipated. Rather, this report may appropriately be called the investigation of the Burford Creek site about 1,000' south of the C.N.R. crossing. This report deals almost entirely with the section between stations 13/00 - 15/00.

Briefly, the recommendations are:-

1. That flexible pipe be used for the culvert side at Burford Creek in view of the anticipated total settlement of one ft.
2. That a berm be constructed on both sides of the fill between stations 13/00 - 15/00, about 20' high and 50' wide. The top of berm elevation should be in the neighbourhood of 668.
3. That a camber of one ft. be placed on the flexible pipe to take care of anticipated settlement.

F. C. Brownridge
MATERIALS & RESEARCH ENGR.

A. Rutka
Per: A. Rutka

AR/WdeF

cc: Messrs. A. Teye
H. Tregaskes
D. G. Ramsay
D. Foster

Foundation Section
File

FOUNDATION REPORT

on

Proposed C.N.R. Crossing, Hwy. No. 11
South of Callander

Site Plan No. E-3164-1
Profile No. P-3279-31

Distribution:

| | |
|---|-----|
| Mr. A. Toye, Bridge Engineer | (2) |
| Mr. H. Tregaskes, Construction Engineer | (1) |
| Mr. D. G. Ramsay, Design Engineer | (1) |
| Mr. D. Foster, District Engineer, North Bay, Ontario. | (1) |
| Foundation Section | (1) |
| File | (1) |

W.P. 620-56

W.J. P-56-16

Proposed C.N.R. Crossing, Hwy. No. 11
South of Callander

INTRODUCTION:

This report covers the subsoil investigation at the site where Hwy. No. 11 , proposed revision Line 'D' crosses the Canadian National Railways 3 miles south of Callander at station 24/00, Profile No. F-3279-31.

The object of the investigation was to examine the soil conditions that may affect the structure to be constructed and the stability of the approach embankments.

PROCEDURE:

The investigation was carried out by a skid-mounted core drill machine. The work was started on Oct. 15, 1956 and completed on Oct. 30, 1956.

In the course of investigation 6 boreholes with dynamic cone penetration tests and 2 separate dynamic cone penetration tests were made.

The locations of the boreholes are shown in Drawing No. F-56-16A and their logs under Appendix I.

SOIL CONDITIONS:

The site is outcropped with bedrock on the surface. The bedrock is composed of granite gneiss. The extent of outcropping is shown in Drawing No. F-56-16A.

The terrain is of primarily outwash materials overlying bedrock. The investigation revealed the stratigraphy as alternating layers of sand, clay and sandy clay loam, sand, gravel and boulders and underlying all these, is the bedrock.

SOIL CONDITIONS: (cont'd.)

On the extreme southern side of the C.N.R. track - (B.H. #2) the stratigraphy revealed a layer of sand underlain by a layer of gravel and boulders. The bouldery nature of this layer, hard enough to refuse cone penetration at comparatively small depth, handicapped any further advance of the borehole. In the other boreholes (B.H. Nos. 1, 3, 4, 5 & 6), similar stratigraphy was presented except that the layer of sand is intercepted by a layer of sandy clay loam, clay and clay loam, whereas the layer of gravel and boulders is reached at a greater depth.

The upper layer of sand contains some 10% silt in it with its thickness ranges from 7.5 ft. in Borehole No. 6 to 20 ft. in Borehole No. 1. Due to the presence of water table at or close to the ground level, this layer of sand between station 13/00 and station 14/50 (B.H. Nos. 5 & 6) is in a submerged state, resulting in an average cone penetration resistance of about 4 blows per foot. In the other boreholes (B.H. Nos. 1, 2, 3 & 4) the sand is in a medium state of packing with a cone penetration resistance of 10 to 15 blows per foot.

The layer of sandy clay loam, clay and clay loam is of inorganic nature and laboratory tests on samples extracted from the boreholes show that it has a low plasticity and a high moisture content of some 33%. Due to the high percentage of moisture content and loamy nature of the samples, laboratory unconfined compression test results are not available. However, judging its consistency from the cone penetration resistance, which

SOIL CONDITIONS: (cont'd.)

in this case is averaged about 5 blows per foot, a shearing strength of about 0.25 t.s.f. is provided.

The lower layer of sand can be considered as the same deposits of the upper layer and is in a medium to dense state of packing. It has an average cone penetration resistance of about 15 blows per foot lying on top of a layer of gravel and boulders, whose bouldery nature handicapped the extraction of samples at this depth. Underlying this layer, bedrock is probably located. No attempt was made to core drill since the depths of overburden make the elevation of bedrock unimportant.

WATER CONDITIONS:

From visual observation it was seen that the water table at the site between station 12/85 and station 14/50 was at [~]a close to the ground level. Water levels in the boreholes were recorded and are shown in their logs. They confirm that the ground water table between station 12/85 and station 14/50 (B.H. Nos. 5 & 6) is at approximately elevation 645.0'. In the other boreholes (B.H. Nos. 1, 2, 3 & 4) water levels recorded, indicate that the ground water table might be located at the top layer of sandy clay loam, clay and clay loam. Artesian water conditions were met in the lower sand layer underneath the layer of sandy clay loam, clay and clay loam at 20 ft. depth or elevation 627.0' in Borehole No. 5 and at 27 ft. depth or elevation 629.9' in Borehole No. 6. During the time of boring, the head of water reached the top of the casing. This was not found in any of the other boreholes.

APPROACH EMBANKMENTS:

Under the proposed grade line, the most critical section of the approach fills is between station 13+00 and station 15+00 (B.H. Nos. 5 & 6) where the fill is of some 40 ft. high. As such, all calculations in connection with the stability of the approach fill were based on subsoil conditions as revealed by B.H. Nos. 5 & 6.

(Fill material of $C = 700$ p.s.f. $\phi = 5^\circ$ Unit Weight = 120 p.c.f. ^massured.)

Under a load of some 40 ft. height of fill, settlement due to compression of the underlying strata is expected. The amount of settlement varies with the height of the fill and under a 40 ft. high fill the layer of sandy clay loam, clay and clay loam is anticipated to have an ultimate settlement in the order of one ft.

The layer of sandy clay loam, clay and clay loam underneath the sand can only carry 20 ft. height of fill (critical height 20 ft. with safety factor of 1.5) with side slopes of 2 to 1 without being subjected to the hazard of embankment slip caused by shear failure. This leaves 20 ft. height of fill to reach the proposed grade line as the fill at this section is 40 ft. high. The stability of this 40 ft. high embankment can still be provided, however, by adding a berm of some 20 ft. high and 50 ft. wide along the toe thereby decreasing the shearing stress on the layer of sandy clay loam, clay and clay loam. This will give a safety factor of about 2. These sizes of berms are conservative since no account has been taken of the fact that the weight of the embankments will increase ~~with~~ the shearing strength of the layer

of sandy clay loam, clay and clay loam.

CONCLUSIONS AND RECOMMENDATIONS:

From the foregoing discussion it can be concluded that:

1. The structure at the C.N.R. crossing can be founded on spread footings directly on top of the bedrock.
2. In view of the fact that the Burford's Creek is quite shallow and settlement is expected to take place in the layer of sandy clay loam, clay and clay loam, a flexible structure is recommended.
3. Fill material of $C = 700$ p.s.f. $\phi = 5^\circ$ Unit Weight = 120 p.c.f. will be used:-

Settlement is expected to take place and its amount varies with the height of the fill. At the most critical section (between sta. 13/00 and sta. 15/00) the layer of sandy clay loam, clay and clay loam will have an ultimate settlement in the order of one ft.

The layer of sandy clay loam, clay & clay loam can only carry 20 ft. height of fill with side slopes of 2 to 1 without being subjected to the hazard of embankment slip caused by shear failure.

In order to provide this stability for embankments, higher than 20 ft., it is recommended that a berm be constructed along the toe. For a 40 ft. high embankment this berm should be of about 20 ft. high and 50 ft. wide. This berm will only be necessary between sta. 12/60 and sta. 15/00.

A. Loh
Foundation Engineer

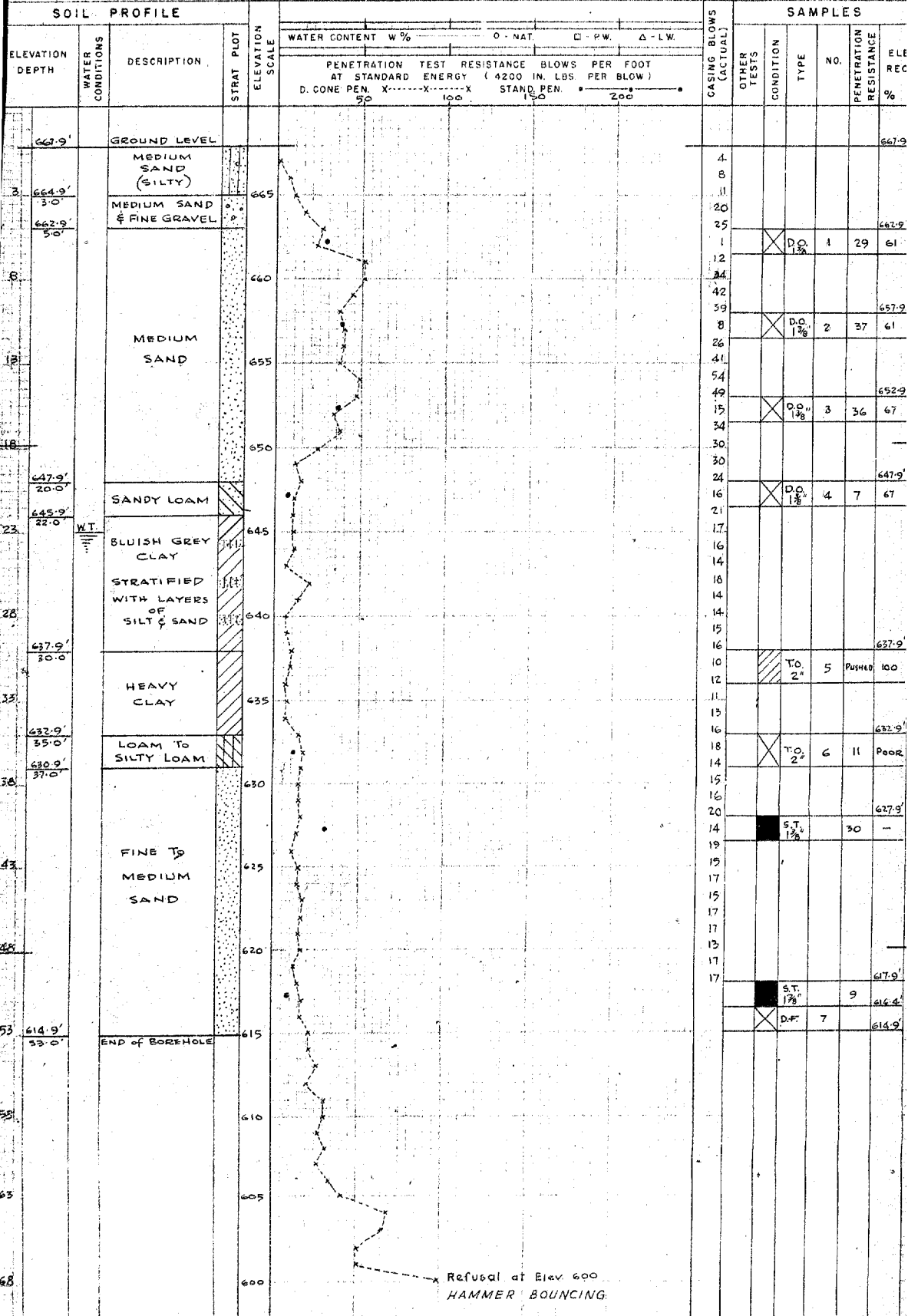
APPENDIX I.

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION BORE & PENET'N JOB F-56-16 WP 620-56 BORING 1 STA. 12+25.3
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC 1956
 SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 2 OCT 1956

| | | |
|--|--|---|
| ABBREVIATIONS V - INSITU VANE SHEAR TEST M - MECHANICAL ANALYSIS U - UNCONFINED COMPRESSION Q - TRIAXIAL CONSOLIDATED QUICK | SOIL TYPES Q - TRIAXIAL QUICK S - TRIAXIAL SLOW WL - WATER LEVEL IN CASING WT - WATER TABLE IN SOIL | SAMPLE TYPES K - PERMIABILITY C - CONSOLIDATION CA - CASING & - UNIT WEIGHT 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 54-2 OPERATION BORE & PENET'N JOB F-56-16 WP 620-56 BORING 2 STA. 20+48.4
CASING B-X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC 1956
SAMPLER HAMMER WT. 350 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 1 Nov. 1956

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

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

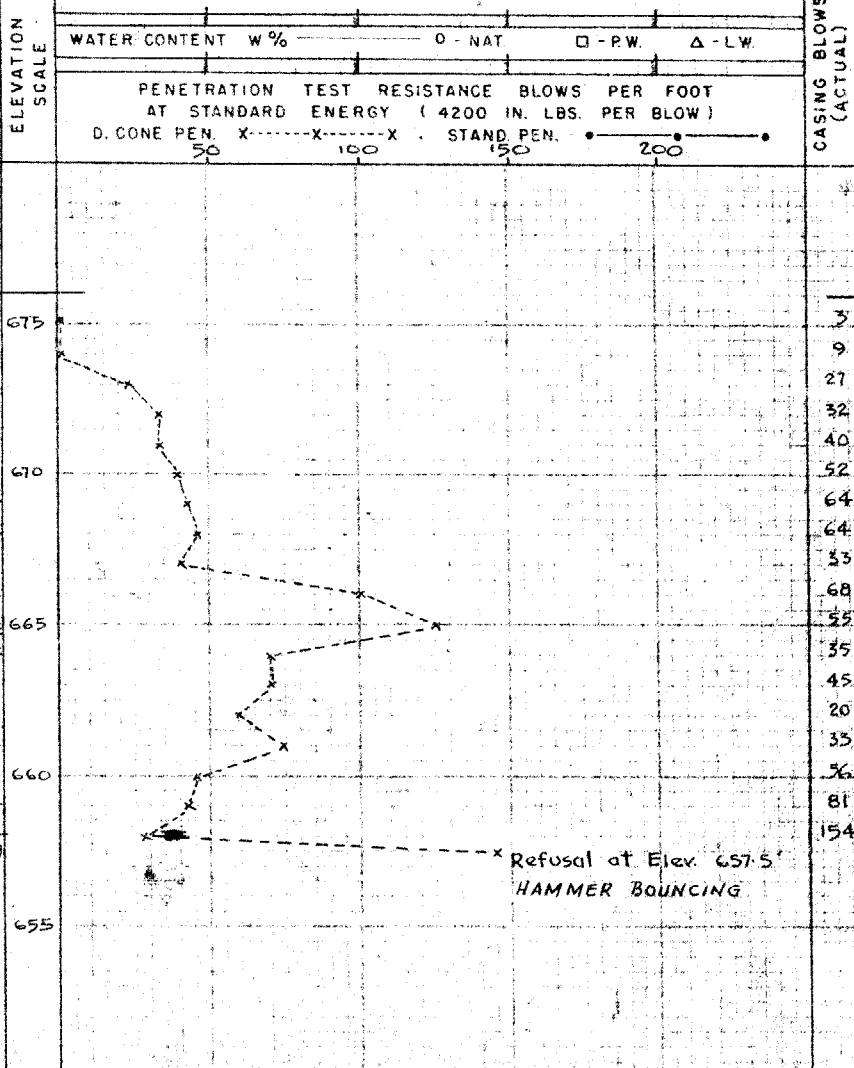
SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

| ELEVATION DEPTH | WATER CONDITIONS | DESCRIPTION | STRAT. PLOT |
|--------------------|---------------------|--|-------------|
| 676.0' | | GROUND LEVEL | |
| 668.0' 8.0' | | SILTY SAND BOULDERY | |
| 664.0' 12.0' | | SAND & GRAVEL (COMPACTED) BOULDERY | |
| 658.0' 18.0' | W.T. | MEDIUM SAND BOULDERY | |
| | | BOULDERS END OF BOREHOLE | |



SAMPLES

| OTHER TESTS | CONDITION | TYPE | NO. | PENETRATION RESISTANCE | ELEV. RECOV. |
|----------------|-----------|------|-----|---------------------------|-----------------|
| | | | | % | |
| | | | | | 676.0' |
| | | | | | 675' |
| | | | | | 670' |
| | | | | | 668.0' |
| | | | | | 664.0' |
| | | | | | 665' |
| | | | | | 660' |
| | | | | | 655' |
| | | | | | 657.5' |
| | | | | | 658.0' |

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION PENETRATION JOB F-56-16 WP 620-56 BORING 3A STA. 17+40.5 4' LT
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC. 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 3 Nov. 1956

ABBREVIATIONS

| | | |
|----------------------------------|----------------------------|------------------------|
| V - INSITU VANE SHEAR TEST | Q - TRIAXIAL QUICK | K - PERMEABILITY |
| 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

| | |
|-------------------------|----------------------|
| 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

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. |
| | | | | | 0 - NAT. | □ - P.W. | Δ - L.W. | | | | | | | |
| | | | | | PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW) D. CONE PEN. X-----X-----X STAND. PEN. •-----•-----• | | | | | | | | | |
| | | | | | 50 100 150 200 | | | | | | | | | |
| 2 | | GROUND LEVEL | | 670 | | | | | | | | | | |
| 12 | | | | 660 | | | | | | | | | | |
| 22 | | | | 650 | | | | | | | | | | |
| 32 | | | | 640 | | | | | | | | | | |
| 42 | | | | 630 | | | | | | | | | | |
| 52 | | | | 620 | | | | | | | | | | |
| 62 | | | | 610 | | | | | | | | | | |
| 72 | | | | 600 | | | | | | | | | | |
| | | | | | Refusal at Elev. 598.8' HAMMER BOUNCING | | | | | | | | | |

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

DRILL RIG 54-2 OPERATION PENETRATION JOB F-56-16 WP 620-56 BORING 3B STA. 16+40.25 LT.
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC. 1956
 SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 5 Nov. 1956

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

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

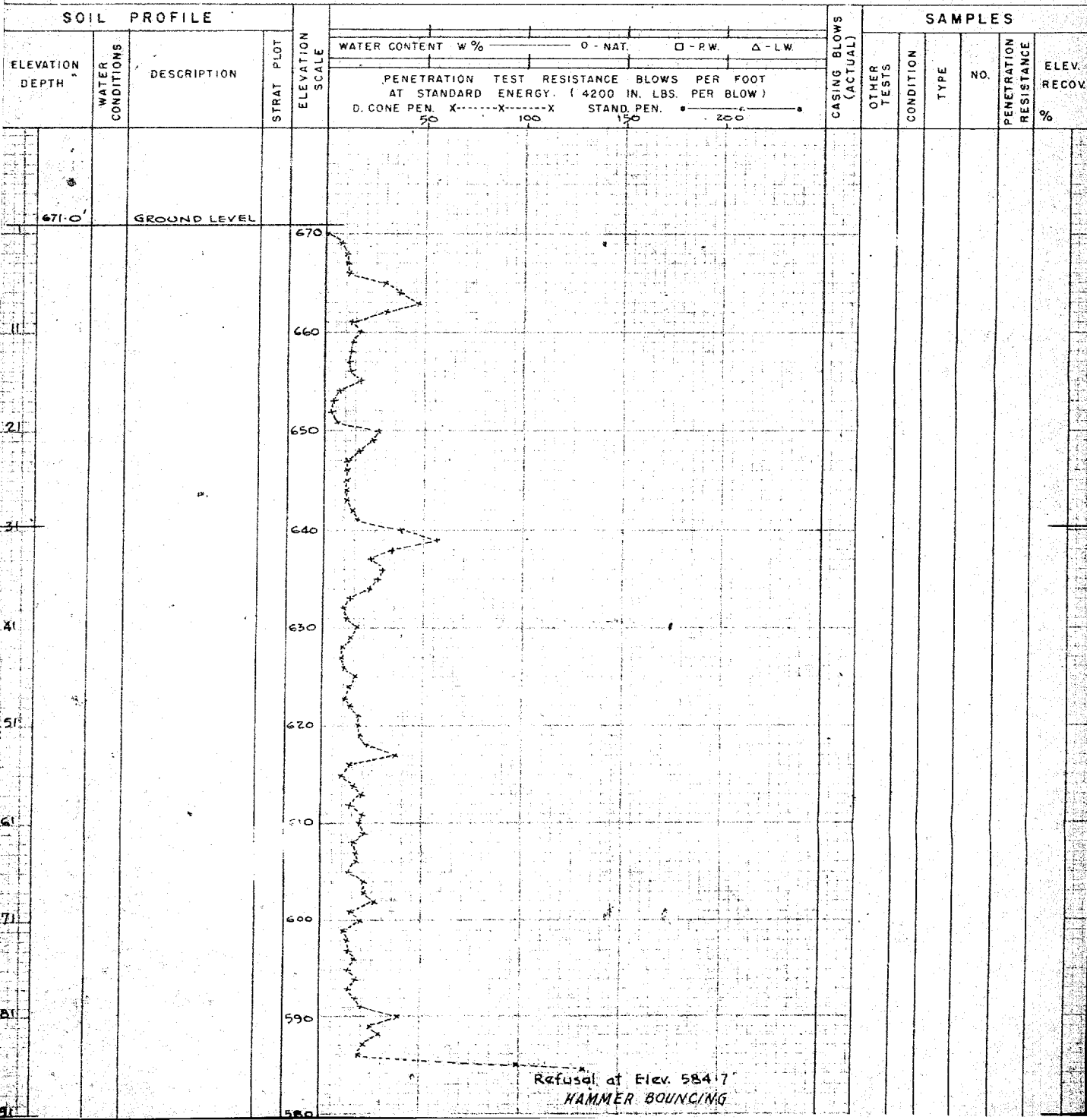
SAMPLE CONDITION



- DISTURBED
 - FAIR
 - GOOD
 - LOST

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 N. JOB F-36-16 WP 620-56 BORING 4 STA 15+08.9 FT.
 CASING B-X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC. 1956
 SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 5 Nov. 1956

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

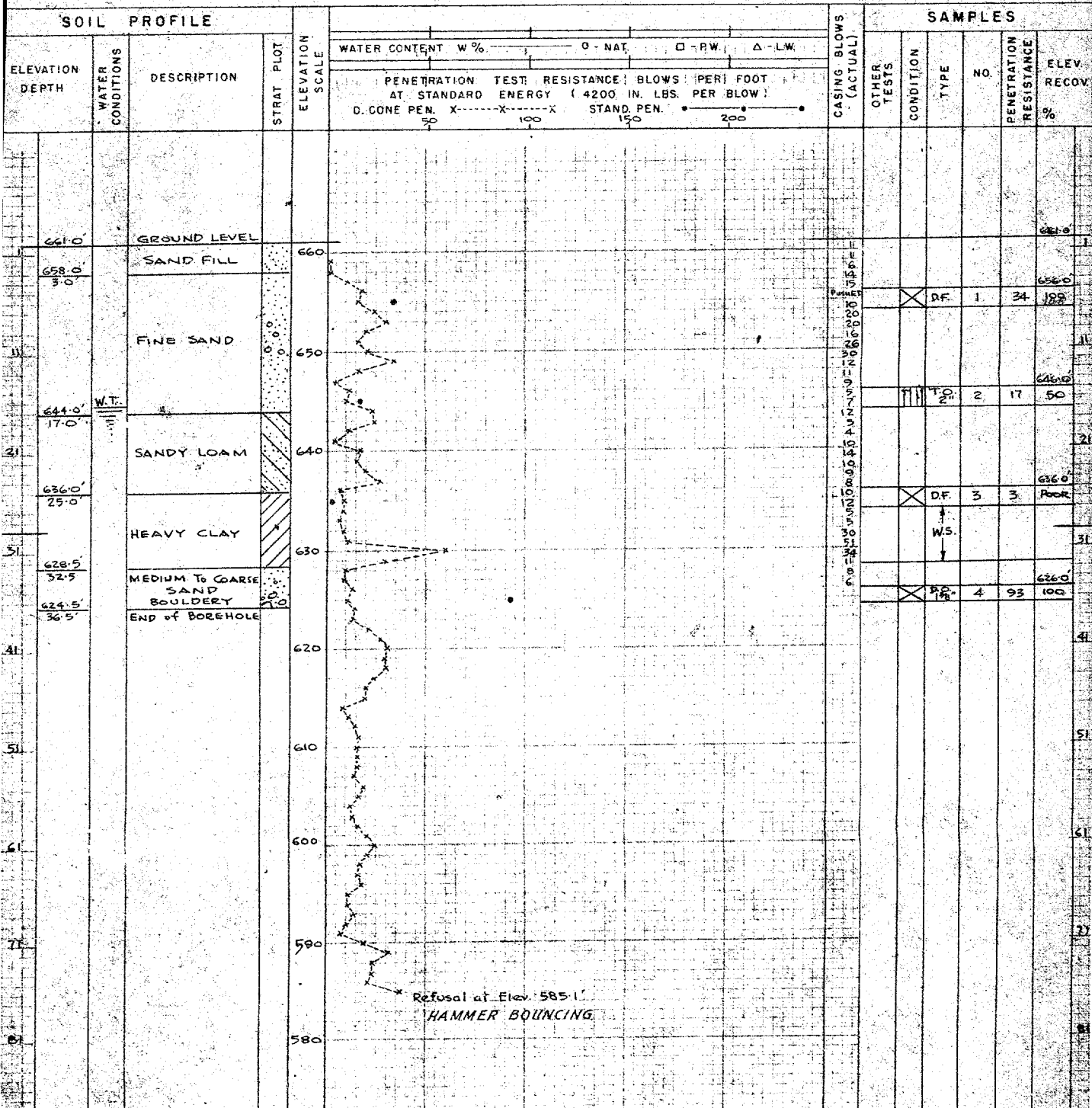
CS - CHUNK SS - SLEEVE SAMPLE
 DO - DRIVE OPEN PS - PISTON SAMPLE
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE
 TO - THIN WALLED OPEN RC - ROCK CORE

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'N JOB F-56-16 WP 620-56 BORING 5 STA 13+12 15' LT
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 6 Nov. 1956

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

C.S. - CHUNK D.O. - DRIVE OPEN PS - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE WS - WASHED SAMPLE
T.O. - THIN WALLED OPEN R.C. - ROCK CORE

SAMPLE CONDITION

 - DISTURBED
 - FAIR
 - GOOD
 - LOST

SOIL PROFILE

| ELEVATION DEPTH | WATER CONDITIONS | DESCRIPTION | STRAT PLOT | ELEVATION SCALE |
|--------------------|---------------------|-------------------------------------|------------|--------------------|
| 647.0' | | GROUND LEVEL | | |
| 642.0' 5.0' | W.T. | SILTY SAND | | 645 |
| 637.0' 10.0' | | MEDIUM TO COARSE SAND | | 640 |
| 632.0' 15.0' | | SANDY LOAM | | 635 |
| 630.0' 17.0' | | HEAVY CLAY | | 630 |
| 627.0' 20.0' | | CLAY LOAM | | 625 |
| 617.0' 30.0' | | MEDIUM TO COARSE SAND | | 620 |
| | | BOULDERY COARSE GRAVEL | | 615 |
| | | COARSE GRAVEL | | 610 |
| | | BOULDERY COARSE GRAVEL | | 605 |
| | | BOULDERS & GRAVEL | | 600 |
| 597.2' 49.8' | | PROBABLY BEDROCK END OF BOREHOLE | | 595 |

WATER CONTENT, W% 0 - NAT. □ - P.W. Δ - L.W.
PENETRATION TEST RESISTANCE BLOWS PER FOOT
AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)
D. CONE PEN. X-----X-----X STAND. PEN. •-----•-----•

SAMPLES

| CASING BLOWS (ACTUAL) | OTHER TESTS | CONDITION | TYPE | NO. | PENETRATION RESISTANCE | ELEV. RECOVER |
|--------------------------|----------------|-----------|------------|-----|---------------------------|------------------|
| 1 | | | | | | 647.0 |
| 1 | | | | | | |
| 2 | | | | | | |
| 4 | | | | | | 642.0 |
| 2 | | X | D.F. | 1 | 8 | 100 |
| 6 | | | | | | |
| 2 | | | W.S. | | | |
| 2 | | | | | | 637.0 |
| PUSHED | | | T.O. 2" | 2 | PUSHED | 100 |
| PUSHED | | | | | | |
| 3 | | | | | | |
| 5 | | | | | | 632.0 |
| 6 | | | | | | |
| PUSHED | | | T.O. 2" | 3 | PUSHED | |
| PUSHED | | | | | | |
| 1 | | | W.S. | | | |
| 2 | | | | | | 627.0 |
| 5 | | | | | | |
| 7 | | X | D.F. | 4 | 14 | 100 |
| 8 | | | | | | |
| 6 | | | | | | |
| 8 | | | | | | |
| 10 | | | W.S. | | | |
| 14 | | | | | | |
| 17 | | | | | | |
| 21 | | | | | | |
| 25 | | | | | | 617.0 |
| 2 | | X | S.T. | 5 | 17 | 100 |
| 12 | | | | | | |
| 8 | | | | | | |
| 5 | | | | | | |
| 2 | | | | | | |
| 7 | | | W.S. | | | |
| 18 | | | | | | 37 |
| 21 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 52 | | | | | | |
| 92 | | | | | | 42 |
| 50 | | | | | | 604.0 |
| 12 | | ■ | D.O. | 23 | | |
| 18 | | | | | | |
| 16 | | | | | | |
| 12 | | | W.S. | | | 47 |
| 11 | | | | | | |
| 19 | | | | | | 597.2 |

Refusal at Elev. 597.8'
HAMMER BOUNCING

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-56-16 WP 620-56 BORING G STA 14+22.10 RT
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT DEC 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES. COMPILED BY H.S. CHECKED BY A.L. DATE BORING 7 Nov 1956

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 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

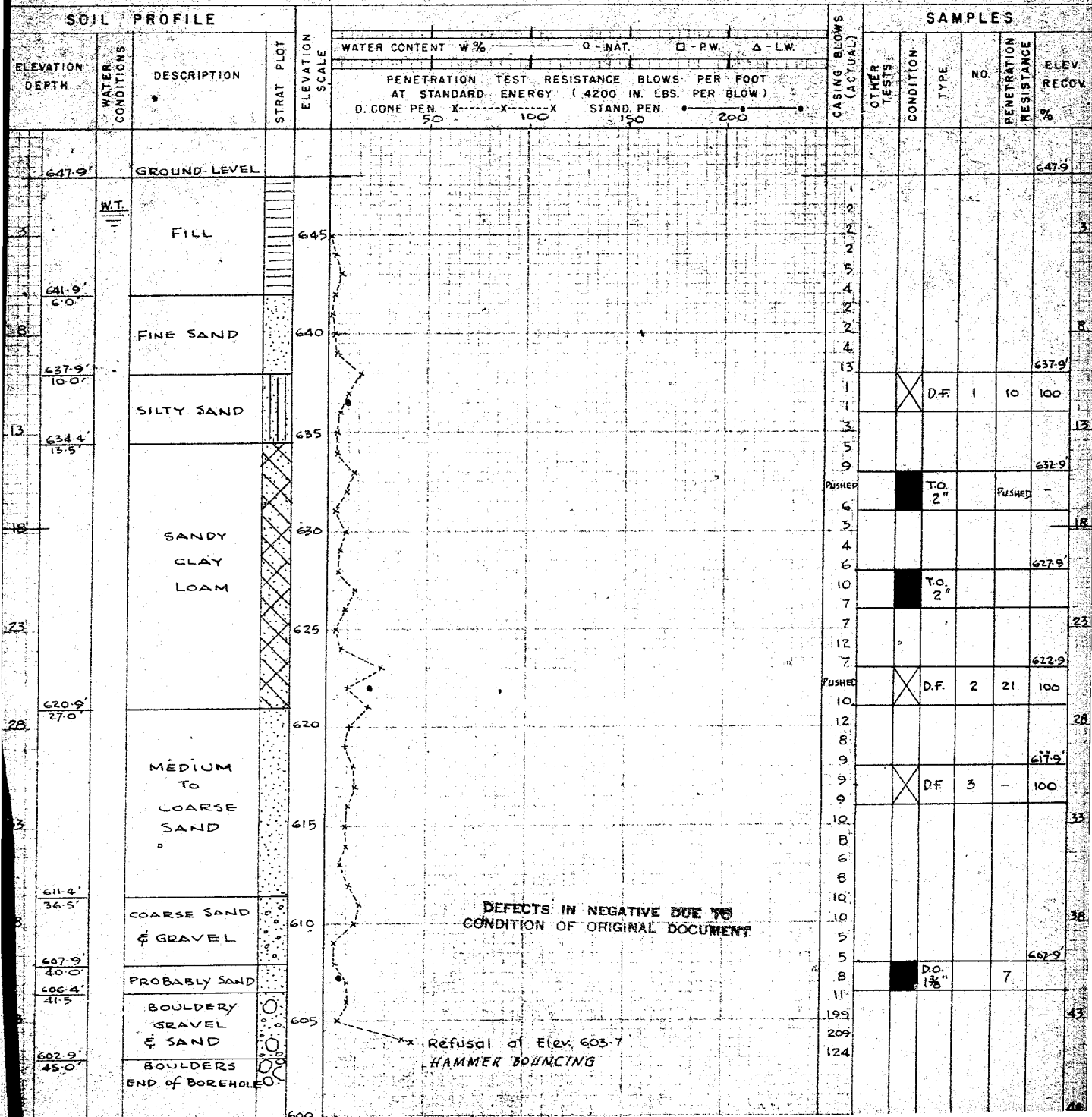
SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

SAMPLES



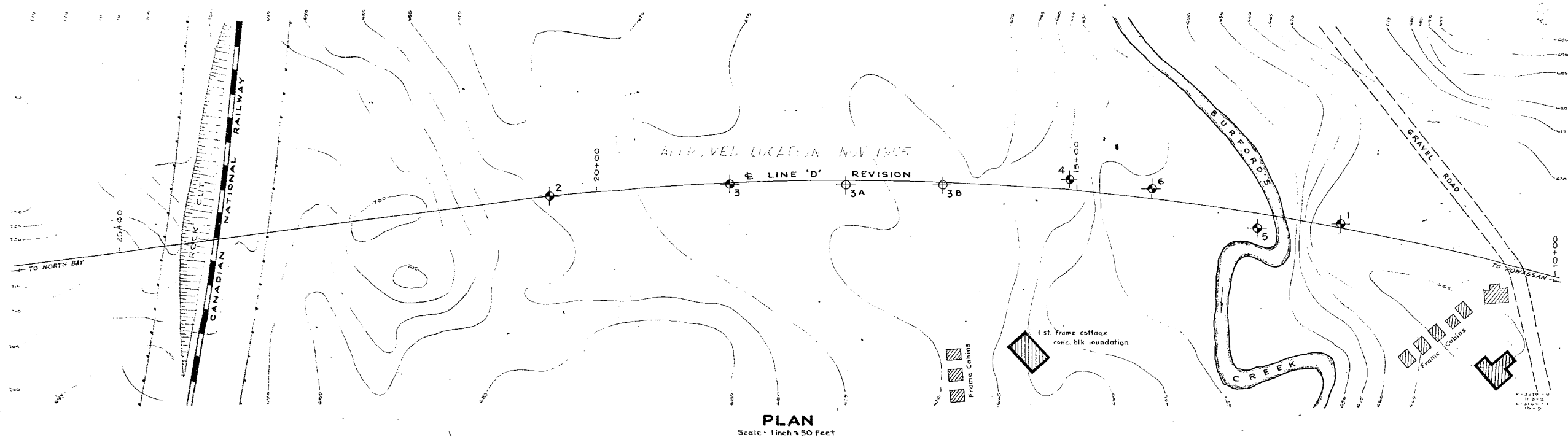
#⁵⁶56-F-16

WP. #620-56

HWY #11 S. OF

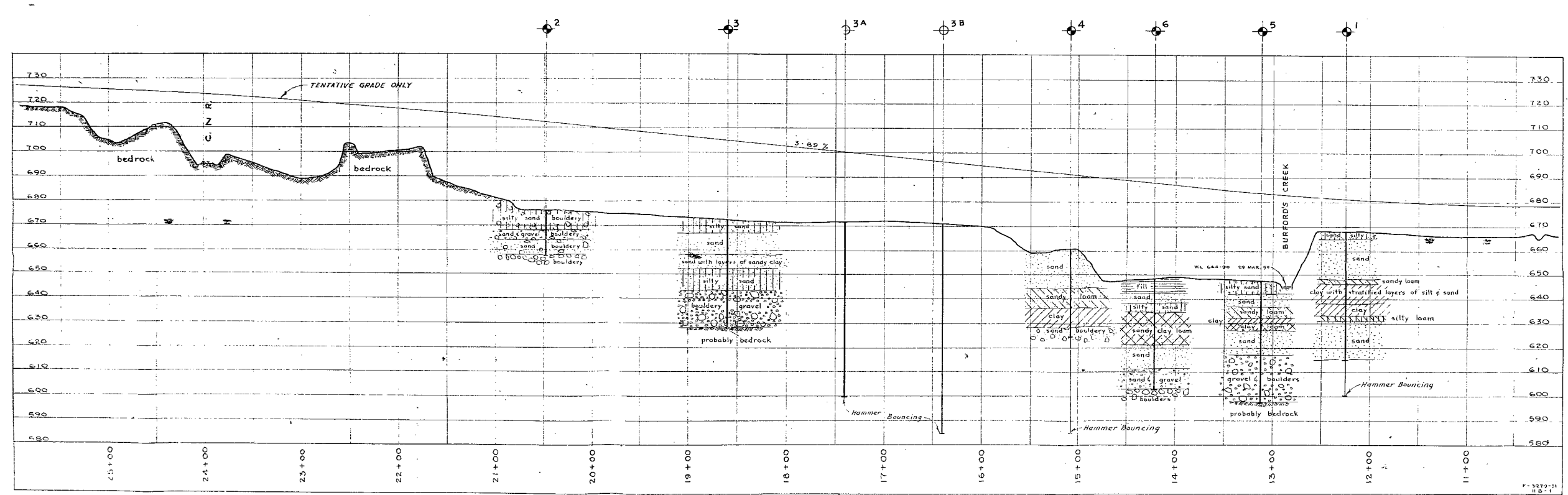
CALLANDER

EDITED
FOR MICROFILMING
BY E.C. DATE 3/1/60



| LEGEND | | | | |
|-------------------------|-----------|---------|-----------------|--|
| Bore Hole | | | | |
| Penetration Hole | | | | |
| Bore & Penetration Hole | | | | |
| HOLE NO. | ELEVATION | STATION | DISTANCE FROM E | |
| 1 | 667.9 | 12+25 | 3' RT. | |
| 2 | 676.0 | 20+48 | E | |
| 3 | 672.0 | 18+60 | 2' LT. | |
| 3A | 671.8 | 17+40.5 | 4' LT. | |
| 3B | 671.0 | 16+40 | 7.5' LT. | |
| 4 | 661.0 | 15+08 | 9' RT. | |
| 5 | 647.0 | 13+12 | 15' LT. | |
| 6 | 647.9 | 14+22 | 10' 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 | | | |
| PROPOSED C.N.R. CROSSING SOUTH OF CALLANDER | | | |
| THE KING'S HIGHWAY No. 11 (LINE 'D') | | DIV. No. 13 | |
| CO. PARRY SOUND | | | |
| TWP. NORTH HIMS WORTH | LOT 2 | CON. XXV | |
| POSITIONS & ELEVATIONS of HOLES | | | |
| APPROVED | | | |
| ENGINEER | | CHIEF ENGINEER | |
| DESIGN | CHECK | CONTRACT NUMBER | W.P. |
| DRAWING | H.D.R. | 620-56 | |
| TRACING | CHEER | LOADING | F- |
| DATE 8 JANUARY 1957 | | DRAWING NUMBER 3A | |