

Mr. A. M. Toye,

March 9, 1959.

Bridge Engineer.

Materials & Research Section.

Attention: Mr. B. McCusbie

Re: Foundation Investigation,
Proposed Crossing -
Hwy. 401 & Dodd's Creek,
3 1/2 Miles N.W. of Talbotville Royal,
Con. III, Twp. of Southwold,
W.P. 21-59.

Enclosed herewith is our report presenting the results of a subsoil investigation recently completed at the above site. For your convenience, the principal comments contained in this report are summarized as follows:-

- (1) The upper strata in existence at this site, vary from a loose sand to a relatively soft composite of sand and clay. It is recommended that footings be founded below these upper layers at elevation 745.0. At this elevation (approximately 9 feet below existing ground surface) a stiff layer of silty clay was encountered in all borings. A safe allowable bearing pressure of 3 tons/sq. ft. can be applied to the subsoil at this recommended footing placement elevation.
- (2) The upper sand strata were found to be water-bearing at the time of this investigation. If high water table conditions are present during construction, shoring and pumping of the excavations will be necessary.
- (3) The subsoil has sufficient strength to safely support the proposed embankment loadings.

As noted in the contents of the report, the borings were made at a contemplated structure location. If the final location is appreciably different from the location of the borings carried out, an additional boring at the precise location should be carried out.

A. Ruthka,
ACTING MAT'L'S. & RESEARCH ENGR.
per:

L. C. Soderman

(L. C. Soderman,
PRINCIPAL SOILS & FOUNDATION ENGR.)

LGS/MacF
Attach.

cc: Messrs. A. M. Toye
H. A. Fregaskes
D. C. Hansay
A. Watt
Dr. P. Karrow
W. L. Fraser
Foundation Section ✓

File

FOUNDATION REPORT

on

Hwy. No. 401 & Dodd's Creek Crossing,
3 1/2 Miles N.W. of Talbotville Royal,
Con. III, Township of Southwold.

Plan No: F-3529-18

Profile No: F-3529-16

Distribution:

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Bridge Engineer. (2)

Mr. H. A. Tregaskes,
Construction Engineer. (1)

Mr. D. G. Ramsay,
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Mr. W. L. Fraser,
District Engineer,
London, Ontario. (1)

Mr. A. Watt,
Water Resources Commission. (1)

Dr. P. Karrow,
Department of Mines. (1)

Foundation Section. (1)

File. (1)

W.P. 21-59.

W.J. P-58-42.

INTRODUCTION:

An investigation has been carried out to determine the competence of the subsoil layers for supporting the foundations of the proposed structure located some 3 1/2 miles N.W. of Talbotville Royal where proposed Hwy. 401 Line 'C' crosses the Dodd's Creek in Con. III, Township of Southwold.

A study of the plan (No. F-3529-18) and profile - (No. F-3529-16) indicates that a diversion or realignment of the Dodd's Creek at the site appears to be necessary. At the time of the investigation, information regarding corrective measures of the creek was not available. The following report, therefore, deals with subsoil conditions for a structure contemplated at approximately Station 797+00 only.

The field work commenced on November 7, 1958 and was completed on November 26, 1958.

DESCRIPTION OF THE SITE & GEOLOGY:

Physiographically, the site is located on the Ekfrid Clay Plain, a small clay plain below the Whittlesey Delta. The surface is generally level except where it is cut by the creek and its gullies. The crossing site itself, is located on the flood plain of the Dodd's Creek, which meanders at the site, flowing at a fairly slow velocity. Most of the land around the site is in pasture or woods. At this site a layer of alluvial deposits of silty sand or clay sand overlies the stiff clay stratum. According to available geological information, this stiff clay stratum extends to a considerable depth over bedrock.

DESCRIPTION OF FIELD & LABORATORY WORK:

Field work consisted of 4 sampled boreholes, carried out by a skid-mounted coredrill machine adapted for soil sampling. Boreholes were advanced by the conventional wash boring procedure and samples were recovered at depth intervals of five feet. In the cohesive material encountered, relatively undisturbed 2" I.D. thin walled shelby tube samplers were used. In the granular material, samples were recovered by means of a 2" O.D. split barrelled spoon sampler. The dimensions of this sampler and the energy used in driving it conform to the requirements of the Standard Penetration Test. In addition, a dynamic cone penetration resistance profile was obtained adjacent to each sampled borehole and 4 in-situ vane shear tests were performed in Borehole No. 2.

Upon receipt in the laboratory, samples were visually examined and identified. Routine index tests were performed on selected representative samples. The results of laboratory tests have been presented in the borehole logs and detailed in tabular form.

The location plan and subsoil profile are presented in Drawing No. F-58-42A.

SUBSOIL CONDITIONS:

Reference to the borehole logs shows that uniform subsoil conditions are evident. The stratigraphy of the site is composed of a homogeneous stratum of stiff silty clay overlain by alluvial deposits of loose brown silty sand or clay sand.

cont'd. /3 ...

SUBSOIL CONDITIONS: (cont'd.) ...

On the west side of the contemplated crossing (approximately Sta. 797+00) in Boring 1, the topsoil was found to be underlain by a layer of loose brown silty sand between Elevations 753.8' and 749.3'. Underneath the silty sand, the stratum of stiff silty clay was encountered. The upper zone of the clay stratum between Elevations 749.3' and 743.8' has been subjected to oxidation resulting in its present brownish color. Below the oxidized zone, the color is predominantly grey. Similar subsoil conditions were encountered in Boring 2 where a layer of brown sandy clay silt was intersected between the topsoil and soft brownish grey clay at Elev. 749.6' and the stiff silty clay at Elev. 744.6'.

On the east side of the contemplated crossing (approximately Sta. 797+00) the stiff silty clay stratum was encountered at Elevations 750' and 748' in Borings 3 and 4, respectively. In Boring 3, the topsoil was found to be underlain by the silty clay stratum, the upper zone of which, between Elevations 753.9' and 745.9' has been oxidized to its present brownish color. The fact that the upper portion of the stiff brown clay between Elevations 753.9' and 745.9' has been subjected to softening process, was evidenced. Below the oxidized zone, the color is again predominantly grey. In Boring 4, however, a layer of loose brown clay sand with some gravel in it was encountered between the topsoil and the stiff silty clay. No oxidized zone in the stiff silty clay was found to exist in this boring.

cont'd. /4 ...

SUBSOIL CONDITIONS: (cont'd.) ...

In general, the stiff clay contains approximately 20% silt, 10% sand and 5% fine to medium gravel throughout the depth of boring. The averaged unit weight and moisture content were found to be 130 p.c.f. and 20%, respectively. Liquid and plastic limits averaged 31% and 15%. Laboratory and field shear strength tests show an averaged value of 3200 p.s.f. to be representative for the upper 20 ft. Field and laboratory tests have been summarized in Table No. 1 and are included in this report. Judging from its moisture contents and Atterberg limits, the stiff silty clay appears to be fully saturated and preconsolidated.

WATER CONDITIONS:

From visual observations it was seen that the water level at the site was at or close to the normal creek water level. Water levels in the boreholes were recorded during the time of boring and they confirmed that the ground water table was at approximately Elev. 751.0'. A flooded condition in and around the creek was observed when thawing and raining occurred immediately after the completion of Boring 3. It has been reported that the site was flooded in the spring. No artesian water conditions were encountered.

FOUNDATION SUPPORT:

The loose brown sand or the softened portion of the oxidized stiff silty clay can not be relied upon to provide satisfactory foundation support for the proposed structure. Spread footing support for a bridge or culvert structure can be obtained in the stiff silty clay at Elevation 745' (approximately 9 ft. below ground surface) or below. At this elevation, field and

FOUNDATION SUPPORT: (cont'd.) ...

laboratory shear strength measurements are such that an allowable bearing capacity of at least 3 t.s.f. can be provided by the stiff silty clay. This allowable bearing pressure incorporates a safety factor of 3. Settlement consequent upon application of this load will be of the order of one inch. Final depth of footings to be founded will depend upon the depth of the realigned channel of the creek. Consideration should be given to placing the footings below the stream bed elevation in order to avoid the hazard of undermining of the foundations due to scouring action.

In view of the high water table conditions and the presence of water-bearing sand immediately below the ground surface, shoring and sump pumping operations appear to be necessary in placing the footings when encountered.

The proposed grade line presents no approach fill stability problem.

CONCLUSIONS & RECOMMENDATIONS:

From the foregoing discussion, it follows that:-

- (1) The site is covered by deep deposits of stiff silty clay overlain by loose silty sand or clay sand.
- (2) Subsoil conditions are such that spread footing support for the proposed structure can be obtained at Elev. 745' (approximately 9 ft. below ground surface) or below. At this elevation, an allowable bearing capacity of at least 3 t.s.f. can be provided by the stiff silty clay. Settlement

CONCLUSIONS & RECOMMENDATIONS: (cont'd.) ...

(2) (cont'd.) ...

consequent upon application of this bearing pressure will be of the order of one inch. Consideration should be given to founding the footings below the elevation of the bottom of the realigned channel of the creek.

(3) The presence of water-bearing sand immediately below the ground surface, necessitates shoring and sump pumping operations in the placing of footings when encountered.

(4) No approach fill stability problem is anticipated.

Abner Loh
A. Loh,
Foundation Engineer.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB P-58-42

W.P. 21-59

OLE NO.	SAMP. NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET N. RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
1	S1	5 - 7	Loose brown silty sand up to 5'6". Stiff brownish grey sandy clay from 5'6" to 9'0".	19	-	-	-	-	-	Approximately 5% gravel throughout.
1	T2	10 - 12	Stiff silty clay, brown from 10'-11', and grey from 11'-12'.	20	25.4	20.0	39.7	2650	123.3	
1	T3	15 - 17	Stiff grey silty clay.	25	-	-	-	-	-	
1	T4	20 - 22	Stiff grey silty clay.	28	21.5	15.0	30.8	2680	123.8	
1	S5	25-26'6"	} Stiff grey silty clay with sand.	21	-	-	-	-	-	
1	S6	30-31'6"		10	-	-	-	-	-	
1	S7	34-35'6"		10	-	-	-	-	-	
2	T1	5 - 7	Sandy Silt.	37	12.9	-	-	6860	137.8	
2		11'6"	Stiff grey silty clay.	-	-	-	-	3150	-	} - In-Situ Vane Test.
2		13'0"	" " " "	-	-	-	-	3750	-	
2	T2	13 - 15	Stiff grey silty clay.	19	18.	-	-	3370	133.	
2		16'6"	" " " "	-	-	-	-	3750	-	} - In-Situ Vane Test.
2		18'0"	" " " "	-	-	-	-	3750	-	
2	T3	18 - 20	Stiff grey silty clay with sand.	36	16.2	8.7	16.8	-	-	

cont'd. /2


SUMMARY OF FIELD & LABORATORY TESTS

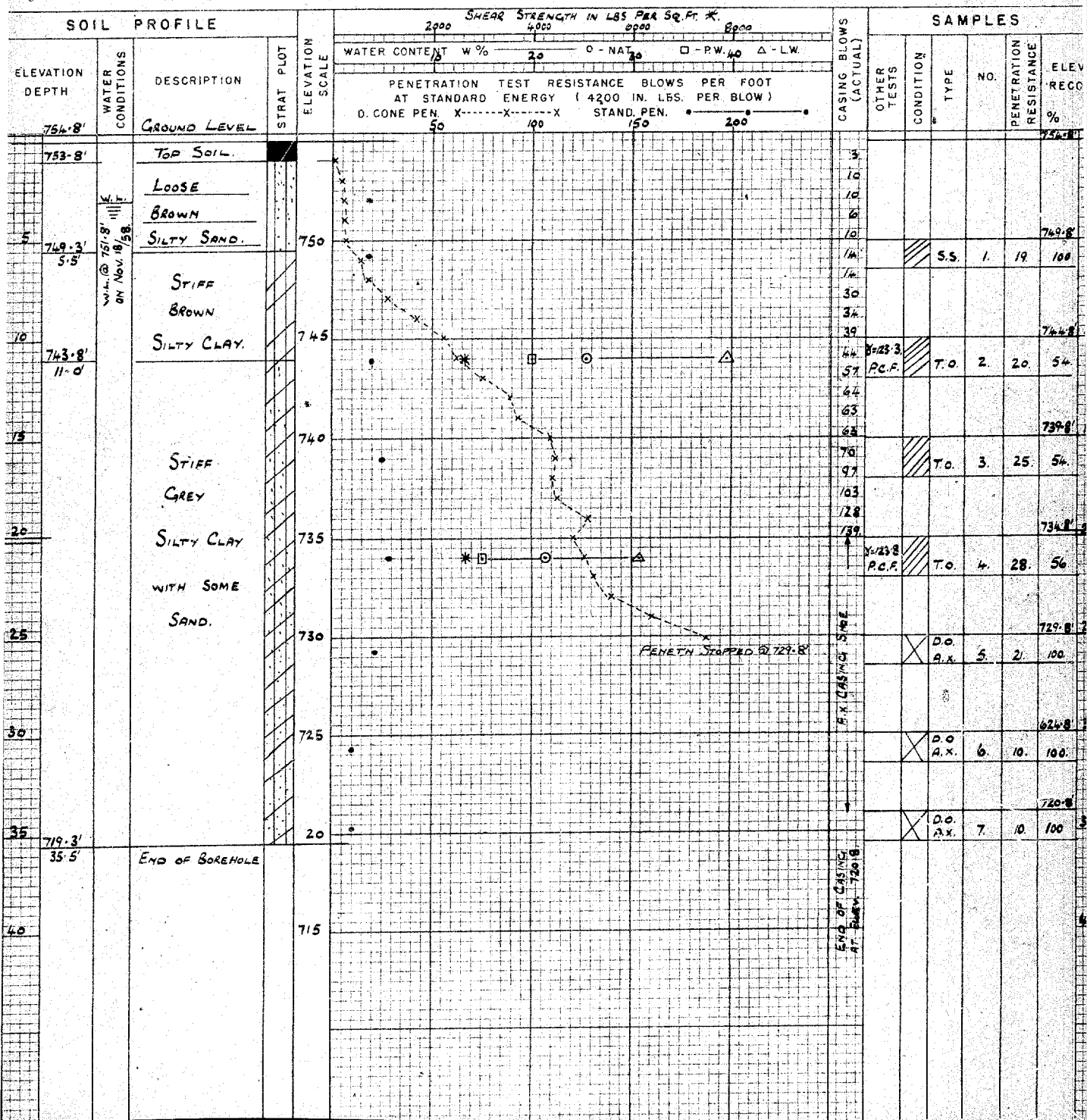
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DRILL RIG 54 - 5 OPERATION BORE & PENET'N. JOB F-58-42 WP. 21-59 BORING 1 STA. 797+55 (45' A)
CASING 8X & AX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JAN. 1959
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 14 Nov. 1958

SAMPLE TYPES

SAMPLE CONDITION

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



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

DRILL RIG 54-5 OPERATION BORE & PENET. JOB F-58-42 WP 21-59 BORING 2 STA. 797+62 (39' 4")
CASING BX & AX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JAN. 1959
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 18 Nov. 1958

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

SAMPLE TYPES

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

SAMPLE CONDITION

 - DISTURBED
 - FAIR
 - GOOD
 - LOST

SOIL PROFILE

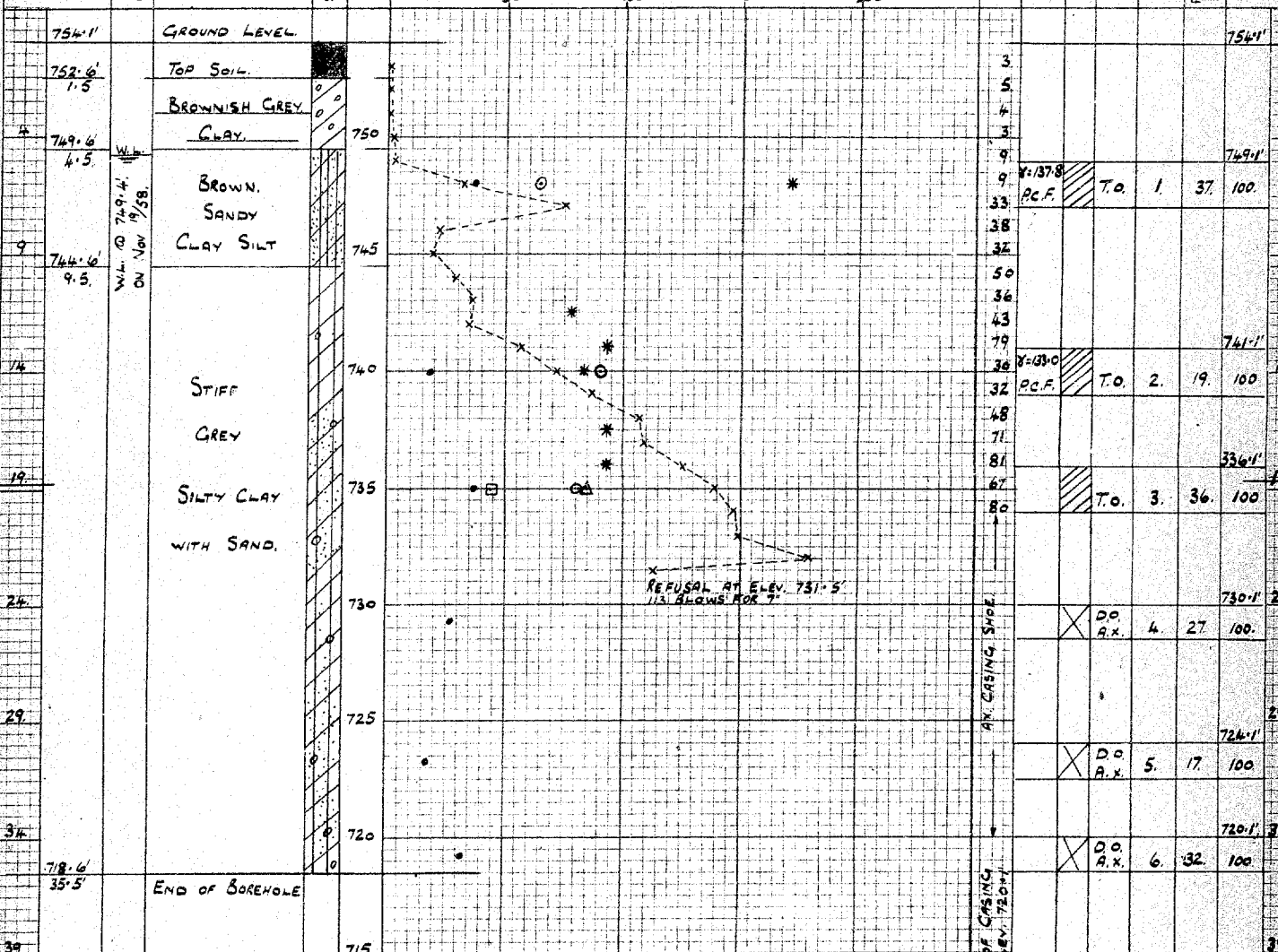
SHEAR STRENGTH IN LBS PER SQ FT

WATER CONTENT W% — 20 — 40 — 60 — 80 — 100 —
O - NAT 30 □ - P.W. 40 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

OTHER TESTS
CONDITION
TYPE
NO.
PENETRATION RESISTANCE
ELEV. RECO
%



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

DRILL RIG 54-5 OPERATION BORE & PENET'N. JOB F-58-42 WP 21-59 BORING 3 STA. 796+91 (32' RT.)
CASING BK & AX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JAN. 1959
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 20 Nov. 1958

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

SAMPLE TYPES

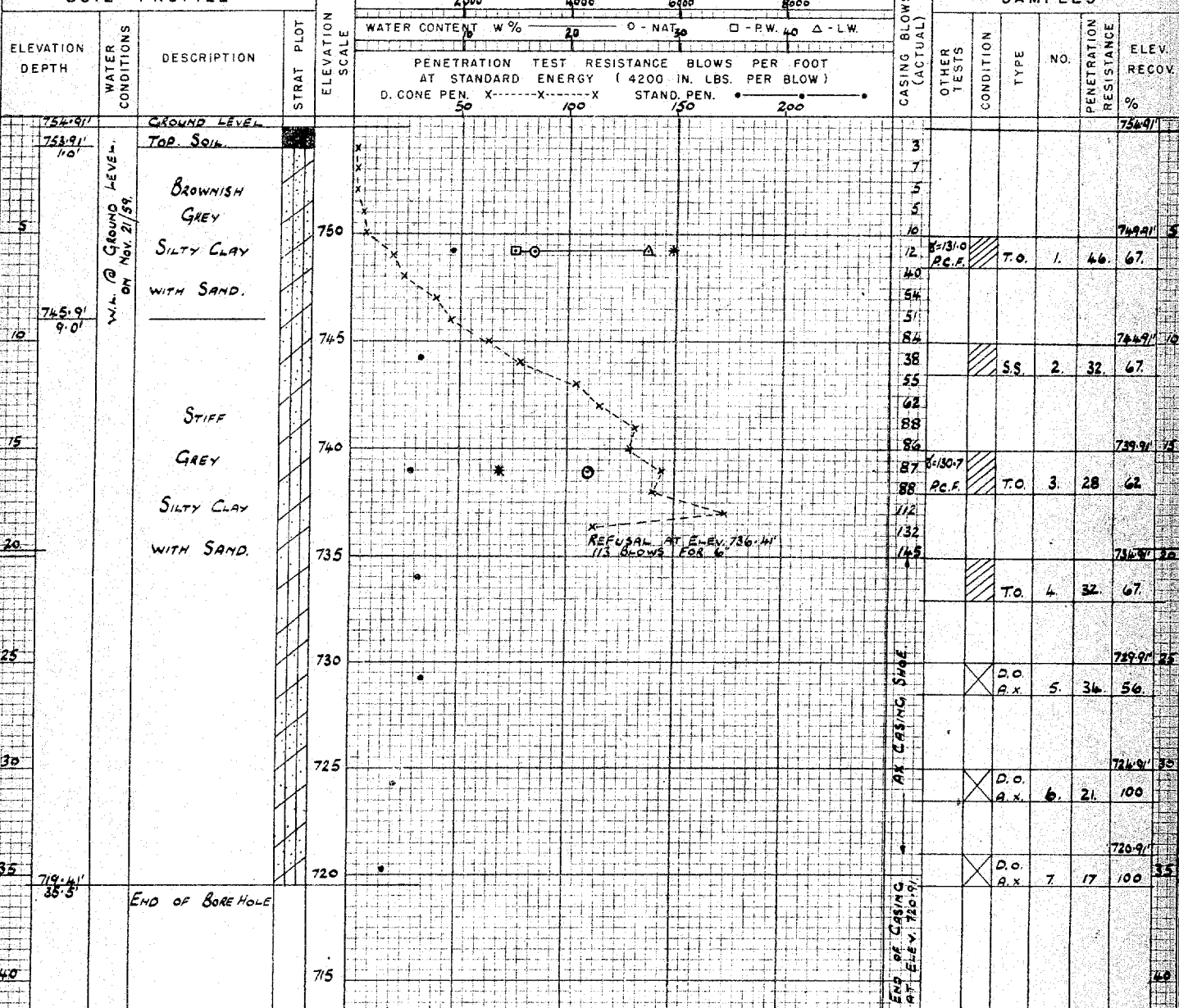
CS - CHUNK S.S. - SLEEVE SAMPLE
D.O. - DRIVE OPEN PS - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE WS - WASHED SAMPLE
T.O. - THIN WALLED OPEN R.C. - ROCK CORE

SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE



DRILL RIG 54-5 OPERATION BORE & PENET'N. JOB F-58-42 WP. 21-59 BORING 4 STA 797+00 (42'
CASING BX BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JAN. 1959.
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 25 Nov. 1958.

SAMPLE TYPES

SAMPLE CONDITION

ABBREVIATIONS			SAMPLE TYPES
V - INSITU VANE SHEAR TEST	Q - TRIAXIAL QUICK	K - PERMIABILITY	S.S. - SLEEVE SAMPLE
M - MECHANICAL ANALYSIS	S - TRIAXIAL SLOW	C - CONSOLIDATION	P.S. - PISTON SAMPLE
U - UNCONFINED COMPRESSION	WL - WATER LEVEL IN CASING	CA. - CASING	W.S. - WASHED SAMPLE
Qc - TRIAXIAL CONSOLIDATED QUICK	WT. - WATER TABLE IN SOIL	γ - UNIT WEIGHT	R.C. - ROCK CORE
			D.O. - DRIVE OPEN
			D.F. - DRIVE FOOT VALVE
			T.O. - THIN WALLED OPEN

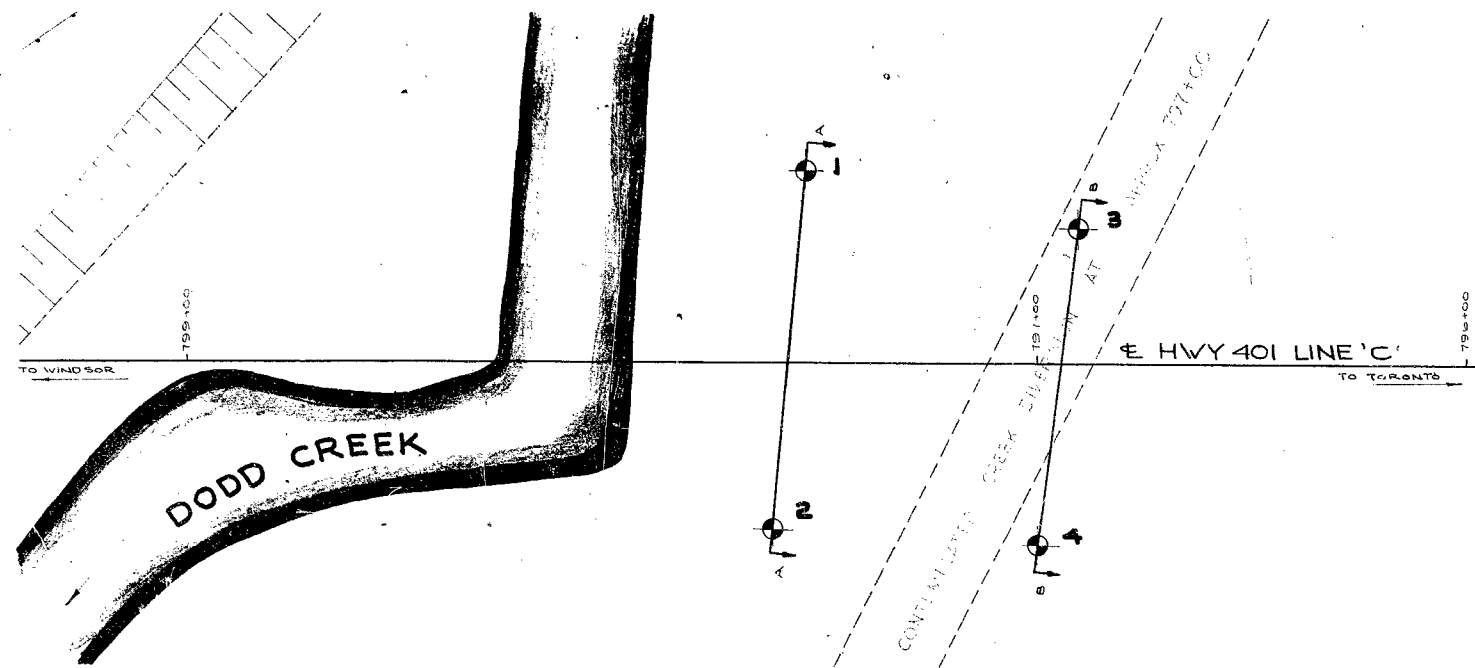


- DISTURBED
- FAIR
- GOOD
- LOST

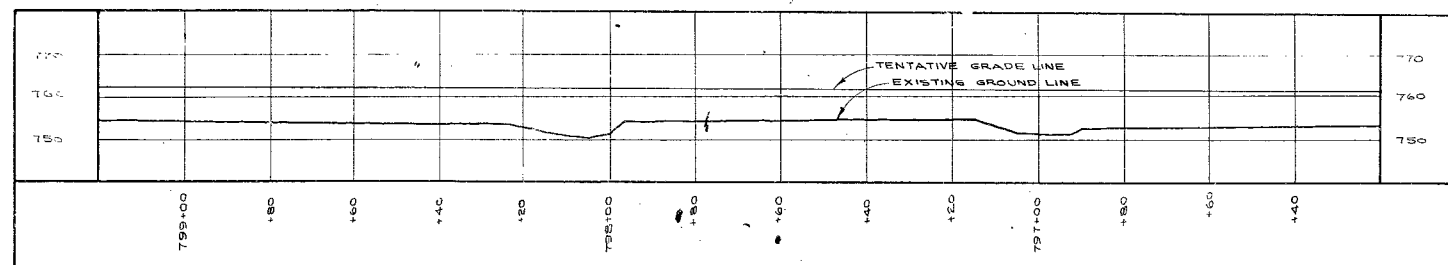
SAMPLES

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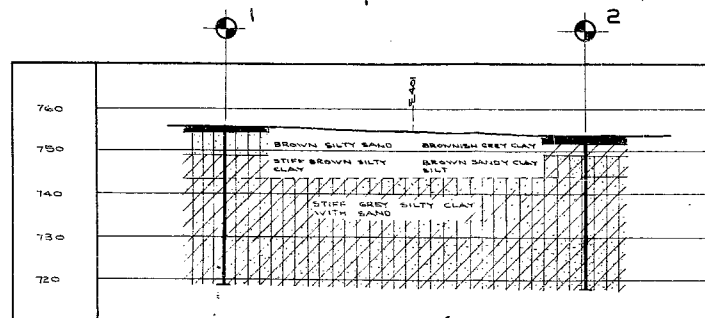
58-F-42
W.P. # 21-59
Hwy. # 401
CROSSING
DODD'S CREEK
CON. # 3
3 1/2 MILES N.W.
OF TALBOTVILLE
ROYAL



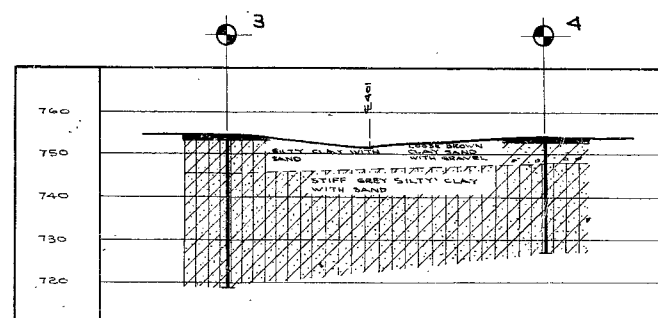
PLAN



PROFILE



A-A



B-B

LEGEND			
BORE HOLE			
PENETRATION HOLE			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM E
1	754.8	797+55	45' RT.
2	754.1	797+62	39' LT.
3	754.91	796+91	32' RT.
4	754.41	797+00	42' LT.

— 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

**DODD CREEK
PROPOSED CROSSING**

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 401 DISTRICT 2 COUNTY ELGIN
TOWNSHIP SOUTHWARD LOT 24 CON. III
LOCATION 2.5 MI. NW. OF TALBOTVILLE RURAL

DRAWN BY T. MELLORS CHECKED BY: W.P. 21-59
DATE: FEB. 23, 1959 APPROVED BY: DRAWING NO. F58-42A
SCALE 1"=20'