

#55-A-9

HWY. # 401 AT  
ORMOND ST.  
BROCKVILLE



7-79  
34-90

# MATERIALS LABORATORY - DEPARTMENT OF HIGHWAYS - ONTARIO OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG - CORE DRILL #4  
CASING - BX (STANDARD SAMPLERS TO FIT UNLESS NOTED)  
SAMPLER HAMMER WT 250 INCHES

JOB F-55-9 Brockville  
DATUM STA 257+69.2 R.L. 48 @ 105' 15"  
BORING NO 2  
DATE REPORT  
COMPILED BY B.H. CHECKED BY W. Wong BORING DATE 10.11.1955

## SAMPLE CONDITION



## SAMPLE TYPES

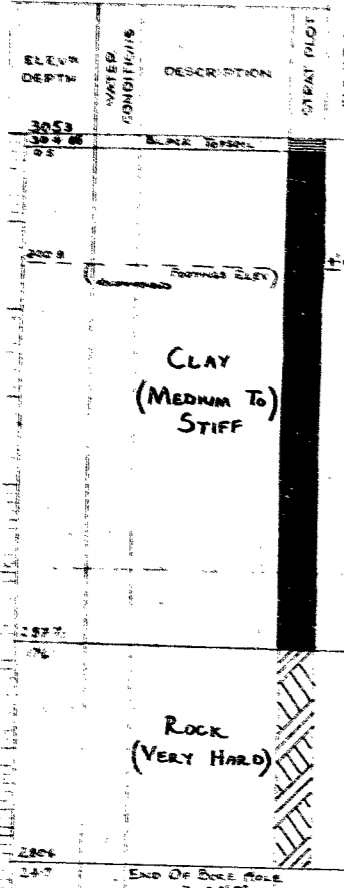
CS - CHUNK  
DO - DRIVE OPEN  
DF - DRIVE FOOT VALVE  
TO - THIN WALLED OPEN

VS - WASHED SAMPLE  
RC - ROCK CORE

## ABBREVIATIONS

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

## SOIL PROFILE



## X SHEAR STRENGTH TONS/SQ FT OR Q<sub>u</sub>/2

PENETRATION TEST  
RESISTANCE BLOWS PER FOOT  
20 40 60

## X WATER CONTENT W %

Δ PW Δ LV

## SAMPLES

OTHER TESTS	CONDITION	TYPE	Nº	PENETRATION RESISTANCE	ELEV. RECOV.
				No. Of Blows Per Foot Std. En. 4200 lb in	
		T.O. 3'	1	53	301.3 100
		T.O. 3'	2	29	297.3 100
		T.O. 3'	3	13	295.3 79
		T.O. 2'	4	15	292.3 100
		T.O. 2'	5	12	290.3 100
					287.7 100

RC 6

7-79  
34-90

# MATERIALS LABORATORY - DEPARTMENT OF HIGHWAYS - ONTARIO OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG - CORE DRILL #4  
CASING - BX (STANDARD SAMPLERS TO FIT UNLESS NOTED)  
SAMPLER HAMMER WT 250 INCHES

JOB F-55-9 Brockville  
DATUM STA 257+18.1 L.L. 48 @ 76' 15"  
BORING NO 8  
DATE REPORT  
COMPILED BY B.H. CHECKED BY W. Wong BORING DATE 12.11.1955

## SAMPLE CONDITION



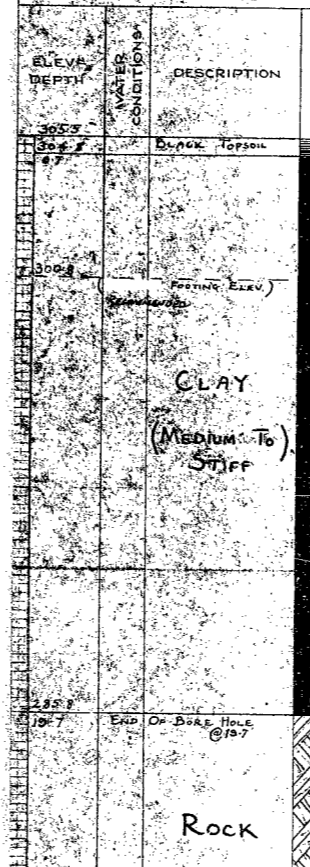
CS - CHUNK  
DO - DRIVE OPEN  
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## ABBREVIATIONS

V - INSITU VANE SHEAR TEST  
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WL - WATER LEVEL IN CASING  
WT - WATER TABLE IN SOIL

## SOIL PROFILE



## X SHEAR STRENGTH TONS/SQ FT OR Q<sub>u</sub>/2

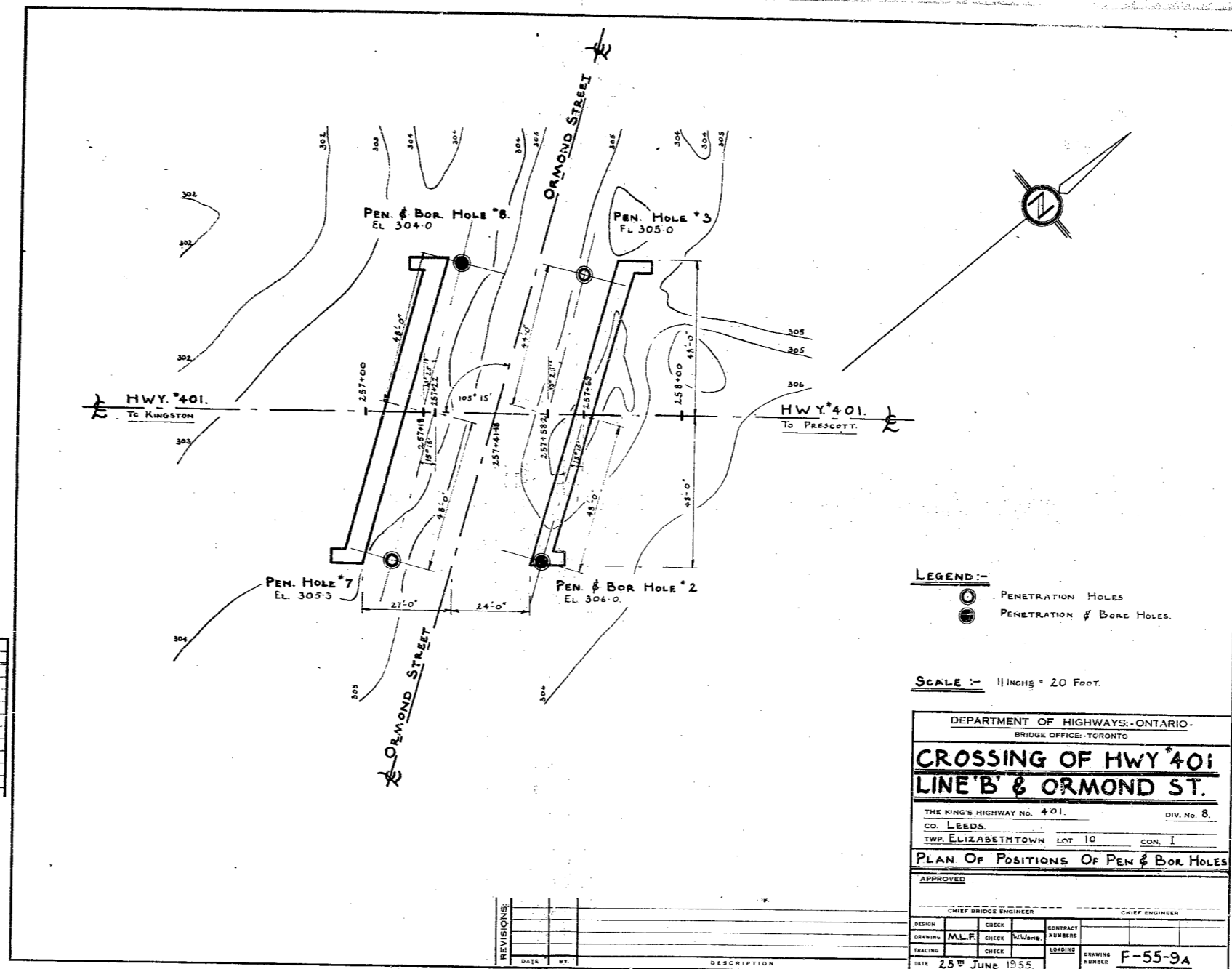
PENETRATION TEST  
RESISTANCE BLOWS PER FOOT  
20 40 60

## X WATER CONTENT W %

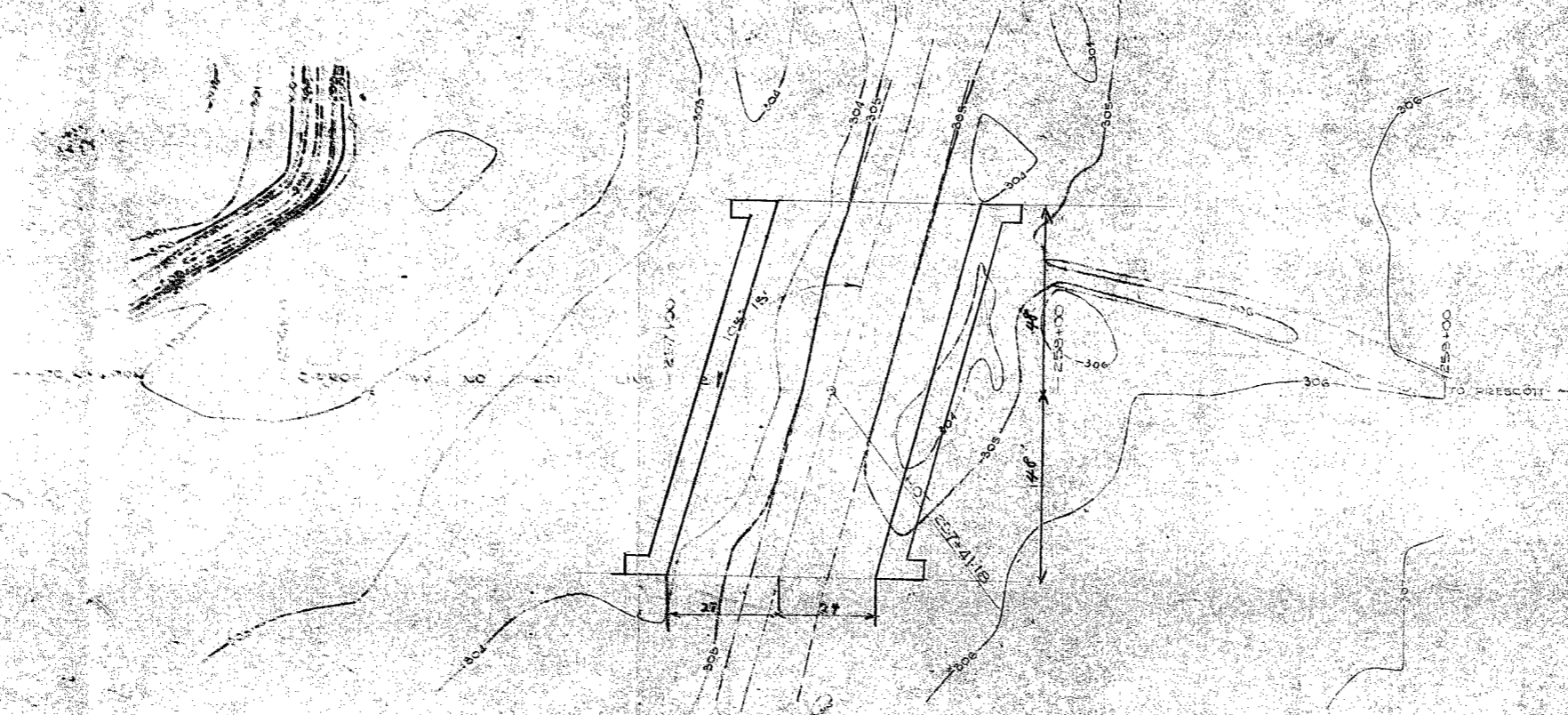
Δ PW Δ LV

## SAMPLES

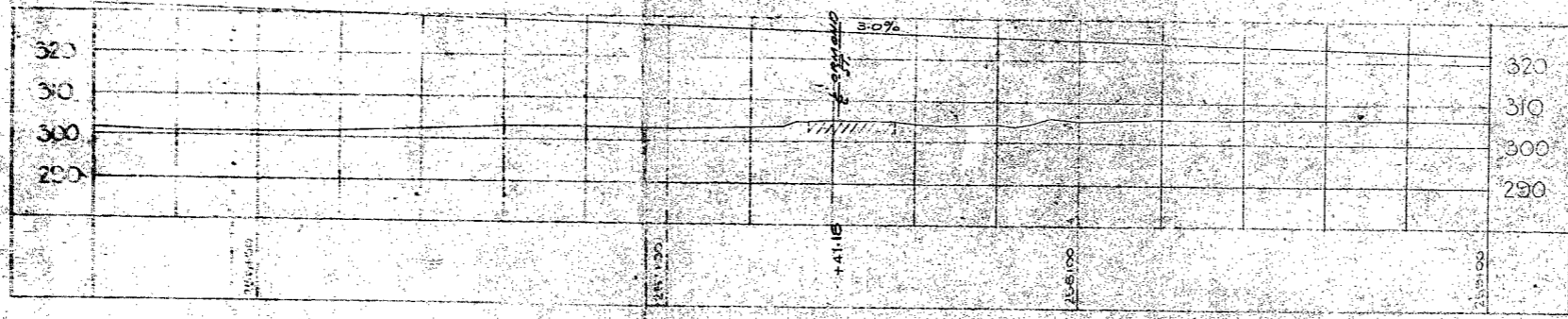
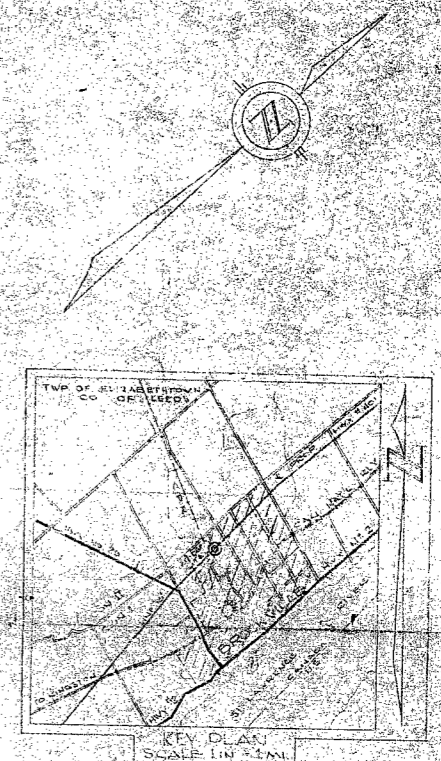
OTHER TESTS	CONDITION	TYPE	Nº	PENETRATION RESISTANCE	ELEV. RECOV.
				No. Of Blows Per Foot Std. En. 4200 lb in per Blow	
		T.O. 3'	1	35	299.5 100
		T.O. 3'	2	55	296.5 44
		T.O. 2'	3	16	293.5 77
		T.O. 2'	4	11	290.5 75
		T.O. 2'	5	8	288.5 100
		T.O. 2'	6	8	285.5 100

[illegible]

TOWNSHIP OF ELIZABETHTOWN  
COUNTY OF LEEDS  
LOT 10 CON. I



SEE PLAN E-30114  
SEE PROFILE E-30116



DEPARTMENT OF HIGHWAYS - ONTARIO	
SURVEYS BRANCH	
DIVISION No. 9	
PROPOSED CROSSING	
AT THE PROPOSED KINGS HWY. NO. 40	
LINE 8	
AND	
ORMOND ST. IN THE CITY OF BROCKVILLE	
LOT 10 CON. I	
TOWNSHIP OF ELIZABETHTOWN (15) COUNTY OF LEEDS	
BRIDGE SITE	
SURVEY BY CHIEF OF PARTY: B. SCHOLAR SUPERVISOR: J. N. DODGE	APPROVED DATE: 17 JULY 1953
DRAWN BY CAPTAIN: E. POLLOCK SUPERVISOR: J. J. DEWITT	SCALE: 1" = 20' HOR. 1" = 10' VERT.
CHECKED BY CAPTAIN: A. AUGULIS SUPERVISOR: J. J. DEWITT	PLAN E-2

PRINTED BY	DATE
4 D. S. F.	11/1/53
2 C. S. F.	11/1/53
11 S. S. F.	11/1/53

Project F-55-9.

Mr. A. R. Rye, Bridge Engineer

August 11, 1935

Highways Lab., 1200 Sheppard Ave., Tor.

Re: Overpass Foundation Report  
Box. 401 and Grand Tr., at Brockville  
Site plan B2214-1, Alton station rep.  
Bridge #13.

Attached herewith is the foundation report for the above noted structure.  
This investigation was requested by Mr. B. Davis of your staff last spring and  
the results are self-explanatory.

This structure is located within a section proposed for a grading contract  
in 1936.

F. C. Brownridge,  
Materials and Research Engineer.

Per:


Q. R.

(A. R. Rye)

AK:FE

Copies to:

Mr. J. Walker  
Mr. A. Rye  
Mr. J. Walker  
Mr. J. Parenteau  
File



Twp: Elizabethtown

Date: April 23/85

Hole #1: 200' South C/L 401 12' East C/L Ormond St. (-9")

0-6" Black clay loam topsoil  
6"-9" Light brown light-medium clay (sl. loamy) moist-wet  
(H.M. 6'-7') 55293  
9'-11' Gray brown light-medium clay (wet) water  
enter at 9', plastic (M. 9'-10') 55294  
11-12 1/2' Blue gray light-medium clay (wet) plastic  
12 1/2' Bedrock N.F.P.

Hole #2: 6' East front face South East Corner (-8")  
Surface water this area

0-6" Black clay loam topsoil  
6"-10" Light brown light-medium clay (sl. loamy) moist  
wet-sl. Mott.  
10'-16" Blue gray light-medium clay (water enter 10')  
wet-plastic, Hole flooding (M 11'-12') 55295

Hole #3: 20' East front face North East corner (-11")

0-6" Black clay loam topsoil  
6"-10" Light Brown light-medium clay (moist-sl. Mott)  
(H.M. 6'-7') 55296  
10'-16" Blue gray light-medium clay (moist-sl.  
indurated) H.M. 11'-12') 55297

Hole #4 12' East C/L Park St. 5' South of North East elev. 304.8 approx

0-18" Black clay loam topsoil and gravel mix  
18"-10" Light brown light-medium clay (moist-sl. Mott)  
10'-16" Blue gray light-medium clay (moist)

Hole #5: 200' North C/L 401 - 12' West C/L Park St. (1/2")  
Creek 35' North

0-6" Black clay loam topsoil & gravel mix.  
6"-10" Light brown light-medium clay (moist-sl. Mott)  
Moist-wet 9'-10' (M. 9'-10') 55298  
10'-15" Blue gray light-medium clay (moist - wet)

Hole #6 12' East front face South West Corner (1/11")

0-12" Black clay loam topsoil & gravel mix  
12"-10" Light brown light-medium clay (sl. Mott-Moist  
Wet) water enter at 2'  
Hole caved in.

Hole #7: 3' West 2' South of Front Face S.W. corner (1/3")  
Surface water this area.

0-5" Black clay loam topsoil (wet)  
5"-10" Light brown light-medium clay (M. Mott) 5'-Moist  
(M. 9'-10') 55299  
10'-12" Gray brown light medium clay (moist)  
12'-15" Blue gray light-medium clay (moist-wet-sl. plastic)

Hole #8: 2' north East of Front Face North West Corner (-6")

0-8" Black clay loam topsoil (moist-wet)  
8"-9" Light brown light-medium clay (moist - M. Mott to 8')  
9'-12" Gray brown light-medium clay (moist)  
12'-15" Blue. Gr. Lt.-M.Cl. (moist-wet-sl. Plastic (M14'-15') 552100

Properties

Brockville

ORION ST

DATE APRIL 23/85

HOLE #1 200' SOUTH &amp; 401 12' E &amp; PARK ST (-9")

0-6" Bl. CL Lo TFC  
 6'-9' LT BR LT-M CL (SL LOAMY) MOIST-WET (H.M. 6'-7') 55z93  
 9'-11' GE BR LT-M CL (WET) WATER ENTER AT 9' PLASTIC (H. 2'-10') 55z94  
 11'-12 1/2' Blu GR LT-M CL (WET) PLASTIC  
 12 1/2'- FLECKOCK N.F.P.

HOLE #2 6' E FRONT FACE S.E. CORNER T1 (-8")

0-6" Bl. CL Lo TFC  
 6'-10' LT BR LT-M CL (SL LOAMY) MOIST-WET - SL MOTT  
 10'-13' Blu GR LT-M CL (WET) WATER ENTER AT 11' PLASTIC (H. 11'-12') 55z95  
 HOLE FLOODING

HOLE #3 25' E FRONT FACE NE CORNER T1 (-11")

0-6" Bl. CL Lo TFC  
 6'-10' LT BR LT-M CL (MOIST - SL MOTT) (H.M. 6'-7') 55z96  
 10'-16' Blu GR LT-M CL (MOIST - SL INDURATED) (H.M. 11'-12') 55z97

HOLE #4 12' E &amp; 12' W ST S. S. OF N.E. ELEV. 304.8 ABOVE

0-18" Bl. CL Lo TFC & GRAY MIX  
 18"-10' LT BR LT-M CL (MOIST - SL MOTT)  
 12'-16' Blu GR LT-M CL (MOIST)

HOLE #5 200' S &amp; 401 E 12' E PARK ST (+2")

0-6" Bl. CL Lo TFC & GRAY MIX  
 6'-10' LT BR LT-M CL (MOIST - SL MOTT) MOIST WET SLIP (H. 9'-10') 55z98  
 10'-12' Blu GR LT-M CL (MOIST)

HOLE #6 12' E FRONT FACE S.W. CORNER (+11")

0-18" Bl. CL Lo TFC & GRAY MIX  
 18"-12' LT BR LT-M CL (MOIST - SL MOTT) WATER ENTER AT 2'  
 FLOODING

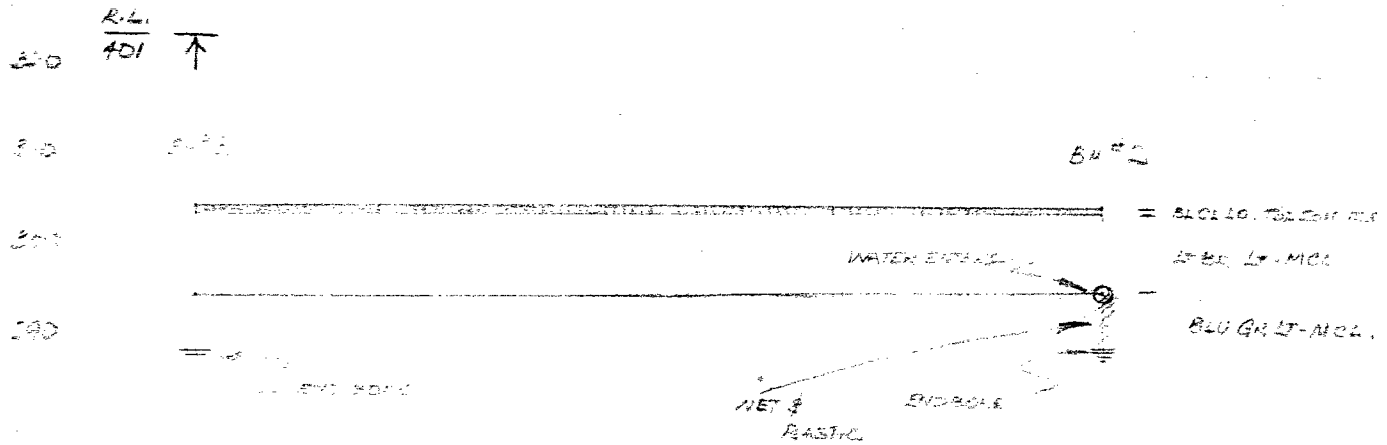
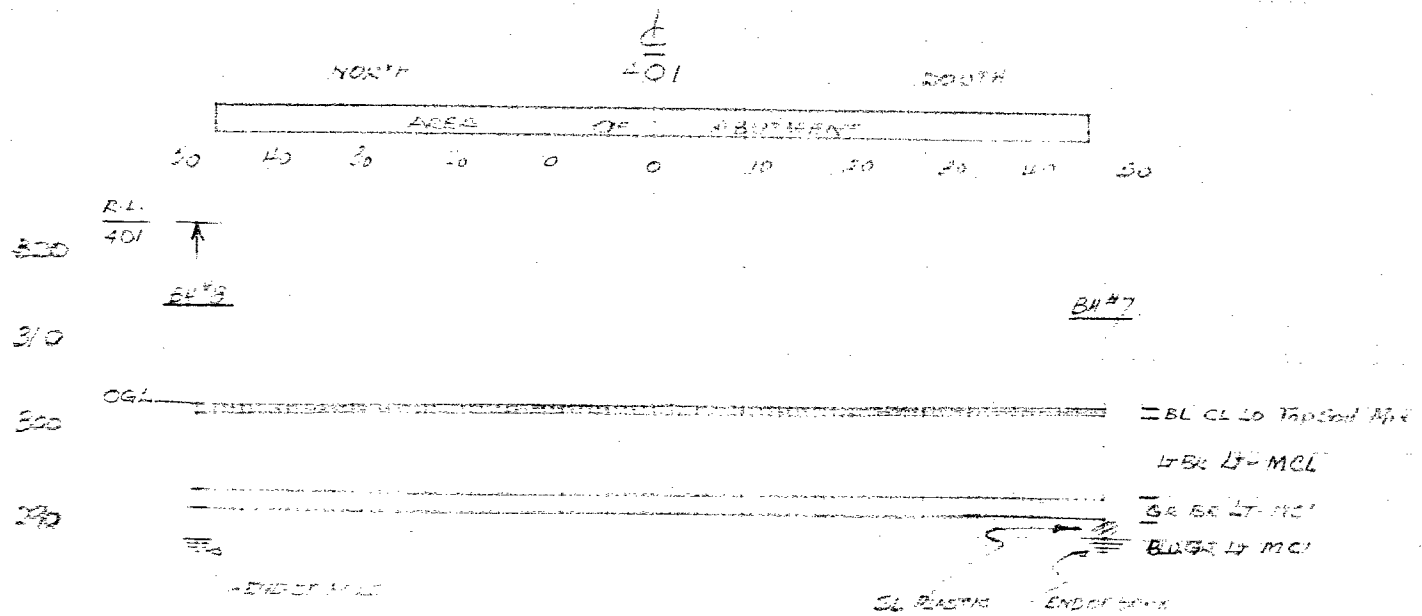
HOLE #7 12' E &amp; 12' W ST S.W. CORNER (+3")

0-5" Bl. CL Lo TFC (WET)  
 5'-10' LT BR LT-M CL (MOIST TO S' - MOIST) (H. 9'-10') 55z99  
 10'-12' GE BR LT-M CL (MOIST)  
 12'-13' Blu GR LT-M CL (MOIST - WET - SL PLASTIC)

HOLE # 8      2' N      'E OF FRONT FACE N.W. CORNER

0 - 8'	B. G. L. T. P. S. L. (MOIST - WET)	
8' - 9'	L. P. S. L. - M. G. (MOIST - M. MOTT TO 8')	
9' - 12'	G. R. L. - M. G. (MOIST)	
12' - 13'	B. G. L. - M. G. (MOIST - WET - S. P. R. A. C. I. C.)	(M 14-15) 55z100

# 401 OVERPASS ORMOND ST - BROOKVILLE STN. 257+41.18



BL #7 SL PLASTIC ELEV 290.0 - 292.0  
 BL #8 SL PLASTIC ELEV 289.0 - 292.0

J C B I File

65-F-9

Preliminary Bridge Site Investigation

28/4/55

Highway 401 Overpass Armond St., Brockville

Station 257/41      Profile 401-H-21

Location 1½ miles North Hwy. #2 at Brockville

Introduction:

Power auger boring were undertaken to a depth of 15'0" at this site in the hope of finding the elevation of bed rock.

Rock has been found to the South East and West of the site at the surface on shallow depths.

Soil Profile:

The soil type on this site was found to be a light to medium clay. Approximately the upper 10'0" is light brown in colour, the remaining 5'0" being grey blue and becoming slightly plastic at 12'0". Water entered one hole at an elevation of 295.50.

Recommendation:

The water condition at this site indicates the bed rock will be found probably at a depth of less than 25'0". The site appears to be located over a trough in the bedrock level.

Core drilling should be undertaken to bed rock as the lower clay may become quite wet as rock level is approached.

Tests   Unconfined Compression  
         Consolidation

Samples 2" and 3"

A. Thorley

Site plan E2814-11

Twp: Elizabethtown

Date: April 23/55

Hole #1: 200' South C/L 401 12' East C/L Ormend St. (-9")

0-6" Black clay loam topsoil  
6"-9' Light brown light-medium clay (sl. loamy) moist-wet  
(H.M. 6'-7') 55293  
9'-11' Gray brown light-medium clay (wet) water  
enter at 9', plastic (M. 9'-10') 55294  
11-12½' Blue gray light-medium clay (wet) plastic  
12½' Bedrock N.F.P.

Hole #2: 6' East front face South East Corner (-8")  
Surface water this area

0-6" Black clay loam topsoil  
6"-10' Light brown light-medium clay (sl. loamy) moist  
wet-Sl. Mott.  
10'-16' Blue gray light-medium clay (water enter 10')  
wet-plastic, Hole flooding (M 11'-12') 55295

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10'-16' Blue gray light-medium clay (moist-Sl.  
indurated) H.M. 11'-12') 55297

Hole #4 12' East C/L Park St. 5' South of North East elev. 304.8 approx

0-18" Black clay loam topsoil and gravel mix  
18"-10' Light brown light-medium clay (moist-Sl. Mott)  
10'-16' Blue gray light-medium clay (moist)

Hole #5: 200' North C/L 401 - 12' West C/L Park St. (½")  
Creek 35' North

0-6" Black clay loam topsoil & gravel mix.  
6"-10' Light brown light-medium clay (moist-sl. mott)  
Moist-wet 9'-10' (M. 9'-10') 55298  
10'-15' Blue gray light-medium clay (moist - wet)

Hole #6 12' East front face South West Corner (½")

0-12" Black clay loam topsoil & gravel mix  
12"-10' Light brown light-medium clay (sl. Mott-Moist  
Wet) water enter at 2'  
Hole caved in.

Hole #7: 3' West 2' South of Front Face S.W. corner (⅓")  
Surface water this area.

0-5" Black clay loam topsoil (wet)  
5"-10' Light brown light-medium clay (M. Mott) 5'-Moist  
(M. 9'-10') 55299  
10'-12' Gray brown light medium clay (moist)  
12'-15' Blue gray light-medium clay (moist-wet-sl. plastic)

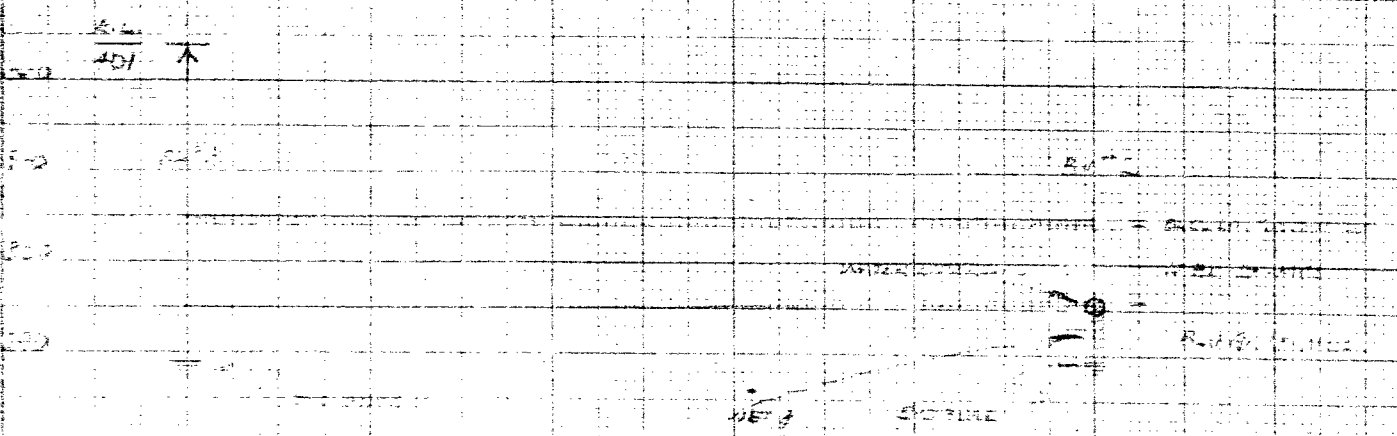
Hole #8: 2' north East of Front Face North West Corner [-6")

0-8" Black clay loam topsoil (moist-wet)  
8"-9' Light brown light-medium clay (moist - M. Mott to 8')  
9'-12' Gray brown Light-medium clay (moist)  
12'-15' Blue. Gr. Lt.-M.Cl. (moist-wet-Sl. Plastic (M14'-15') 552100

401 OVERPASS DEMAND ST - BERRYVILLE STN. 57-4118



WEST ABUTMENT



EAST ABUTMENT

401 OVERPASS DEMAND ST - BERRYVILLE STN. 57-4118

65-100

Preliminary Bridge Site Investigation

28/4/55

Highway 401 Overpass Armond St., Brockville

Station 257/41      Profile 401-H-81

Location 1½ miles North Hwy. #1 at Brockville

Introduction:

Power auger boring were undertaken to a depth of 18'0" at this site in the hope of finding the elevation of bed rock.

Rock has been found to the South East and West of the site at the surface on shallow depths.

Soil profile:

The soil type on this site was found to be a light to medium clay. Approximately the upper 10'0" is light brown in colour, the remaining 8'0" being grey blue and becoming slightly plastic at 18'0". Water entered one hole at an elevation of 295.50.

Recommendation:

The water condition at this site indicates the bed rock will be found probably at a depth of less than 25'0". The site appears to be located over a trough in the bedrock level.

Core drilling should be undertaken to bed rock as the lower clay may become quite wet as rock level is approached.

Tests   Unconfined Compression  
         Consolidation

Samples 2" and 3"

A. Thorley

REPORT OF FOUNDATION INVESTIGATION  
FOR PROPOSED OVERPASS BRIDGE  
HIGHWAY 401 AT  
OSWEGO STREET, STOCKVILLE

Copies to:

Mr. A. Foye  
Bridge Engineer (2)  
Mr. J. Walter  
Design Engineer (1)  
Mr. ~~J. Walter~~ L.E. Walker  
Division Engineer, ~~Osborne~~ (1) Kingston  
Mr. G. Perantatos (1)  
File (1)

Project P-35-9

## INTRODUCTION

An overpass bridge is to be built for Highway No. 401 at Ormond Street in Brockville.

Subsoil investigation on the proposed bridge site was therefore carried out with the object of discovering the best method of foundation for the proposed bridge.

## PROCEDURE

The exploration on the foundation site started on the 10th of May and completed on the 14th of May, 1955.

Preliminary tests were made by dynamic cone penetration, followed by boring tests, where desired.

Altogether four penetration tests were performed along with two boreholes one on each abutment. The locations and logs of the boreholes are shown in Drawing F-55-9A and Appendix I respectively.

## SOIL CONDITION

B.H. #2 and B.H. #8 were made on abutments on the east side and west side respectively.

The soil profiles obtained from these boreholes are the same. They both indicate that a layer of glacial clay, soft to medium in consistency, exists from ground surface to top of bedrock.

Bedrock is hard limestone and is found at a depth of about 17' - 6".

## WATER CONDITION

There was no indication of the existence of a water table except for the water which remained inside the hole after boring operations.

## ANALYSIS OF TEST RESULTS AND RECOMMENDATIONS

The foundation of the proposed bridge will be founded on the clay on spread footing, unless an attempt is made to use piles driven down to bedrock.

The clay has a good bearing value for spread footing foundation according to unconfined compression tests performed in the laboratory.

Assuming the elevation of the footing to be at 300.8 it has been calculated from the unconfined compression test results that the clay under both abutments can support a bearing load of 2.0 tons per sq. ft.

Consolidation tests in the laboratory indicate that the clay is preconsolidated, and the effect of the preconsolidation has been taken into account for the estimation of ultimate settlement of clay.

Under a bearing load of 2.0 tons per sq. ft., however, the estimated ultimate settlement due to the clay below the east abutment is about 2.0", and that under the west abutment is about 4.0". Under such a loading condition, an ultimate differential settlement of about 2.0" is expected to occur between the two abutments.

A simply supported structure is therefore advisable if spread footings are to be used.

For a rigid framed structure on spread footings, provisions should be made against the differential settlement. This can be done either by using a lower value of bearing capacity in order to reduce the effect of differential settlement to within a limit tolerable by rigid frame structure, or, by adopting a foundation on piles.

Due to the small thickness of the clay and the existence of the bedrock immediately below it, a pile foundation is preferable. Cast-in-place concrete piles are recommended. Such piles will carry 100 tons or more per pile and they can be driven either with a mandrel or with an auger. Companies such as Reynold Pile Co., Franki Pile Co., or Spencer, White & Prentis could be asked to perform the foundation work.

### CONCLUSION

For spread footing foundation the elevation of the footing is recommended at 300.8, i.e. about  $4\frac{1}{2}$  ft. below the ground surface. At this elevation the safe bearing capacity of the soil is 2.0 tons per sq. ft.

In view of the estimated 2" ultimate differential settlement between the two abutments if a load of 2.0 tons per sq. ft. is used, it is advisable that the proposed bridge be a simply supported structure.

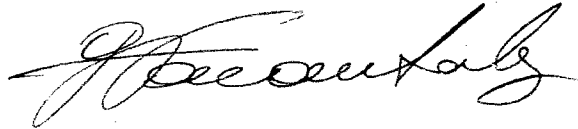
For a rigid framed structure on spread footing provisions should be made against the differential settlement. This can be done by using a bearing capacity load less than 2.0 tons per sq. ft. in order to reduce the effect on differential settlement to within a safe limit. A graph for this consideration can be found in Fig. I.

Because of the shallow position of the bedrock the use of piles driven to the surface of bedrock is the most desirable foundation.

Cast-in-place concrete piles are recommended. Such piles to bedrock will carry 100 tons or more per pile, and they can be driven with a mandrel or with an auger and should not be unduly expensive.

F. C. Brownridge  
Materials and Research Engineer.

Per:

A handwritten signature in cursive script, appearing to read "G. N. Farantatos".

(G. N. Farantatos)

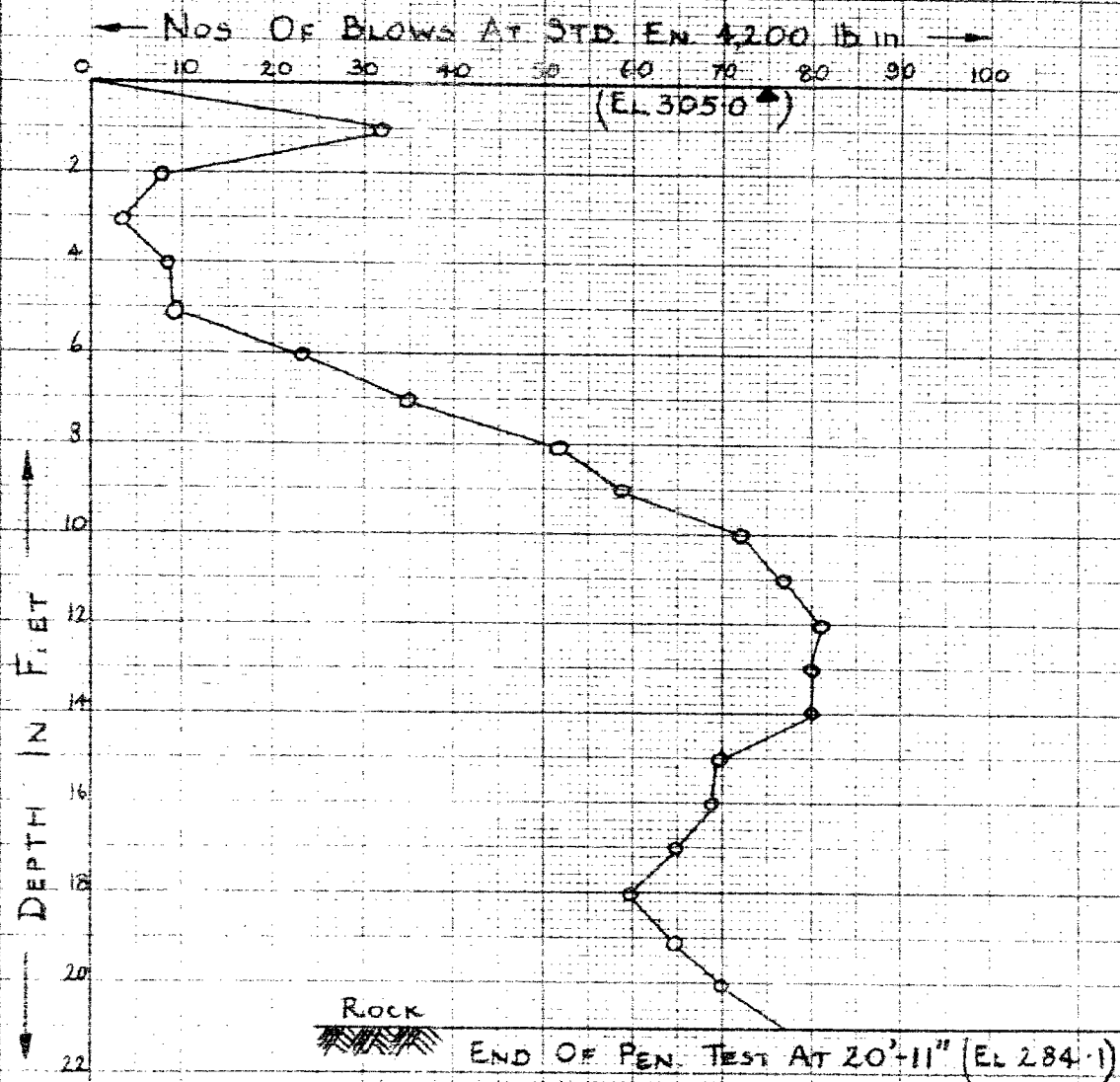
GNF:HR

APPENDIX I.

# GRAPH OF CONE PENETRATION TEST

PEN. HOLE N°3 JOB F-55-9

LOCATION STA. 257+58.2; LT. 44' @ 76° 75'



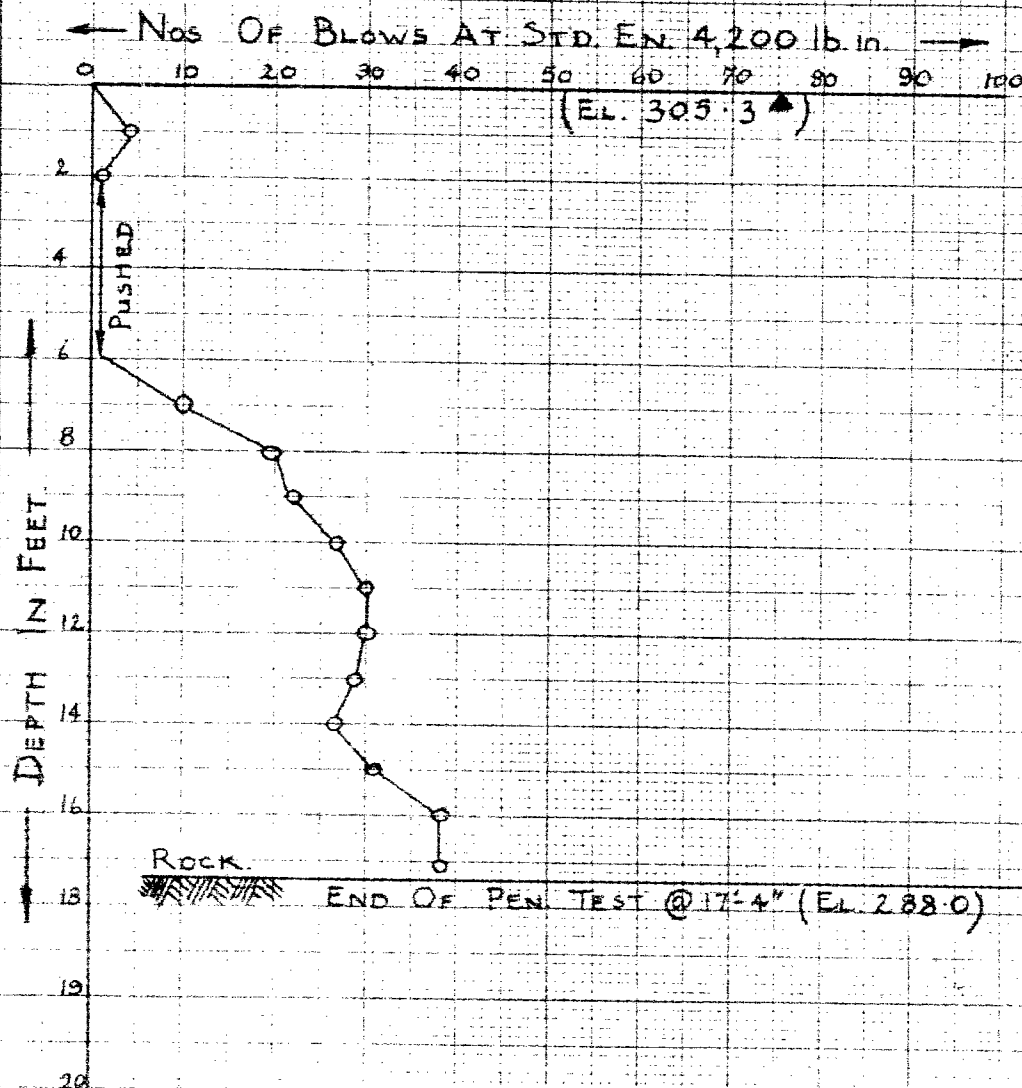
CHECKED W. WONG

# GRAPH OF CONE PENETRATION TEST

PEN. HOLE N° 7

JOB F-55-9

LOCATION STA 257+22; RT 48° @ 105° 15'

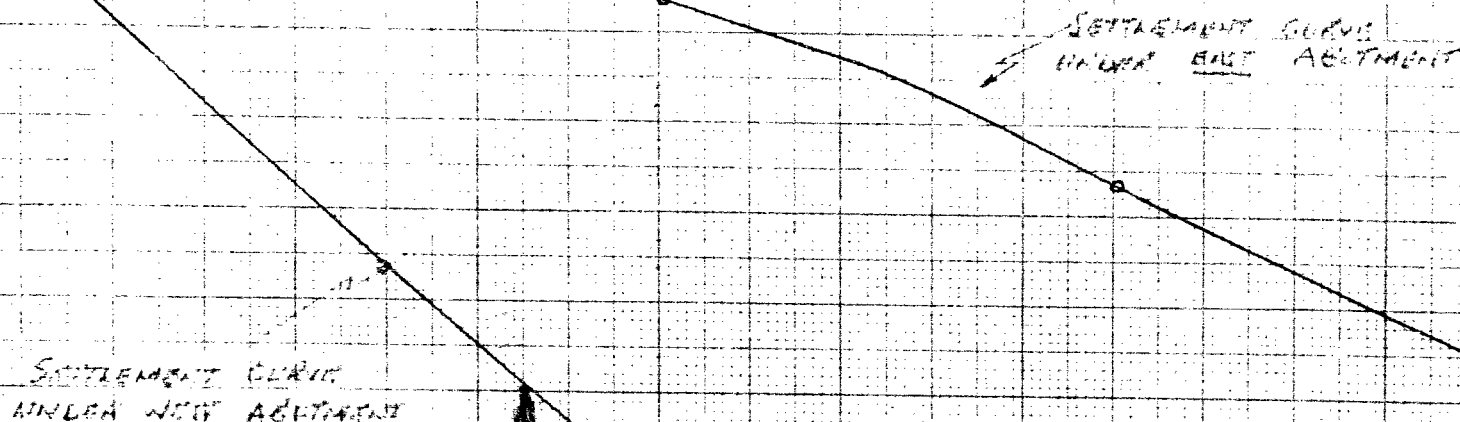


CHECKED W. WONG

APPLIED PRESSURE LOAD IN TONS/SG. FT.

APPLIED PRESSURE LOAD IN TONS/SG. FT.

PROJECT F-55-9



NOTE: THE DIFFERENCE BETWEEN THE TWO CURVES GIVES THE AMOUNT OF DIFFERENTIAL SETTLEMENT BETWEEN THE TWO ABUTMENTS

PROJECT F-55-9

APPLIED PRESSURE LOAD IN TONS/SG. FT.

CHECKED BY W. W. W.

(F-2)