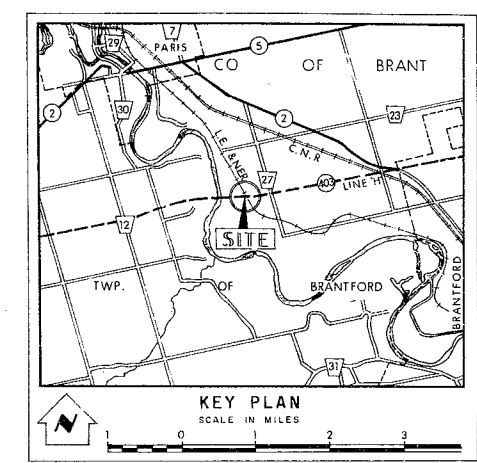


65-F-32
W.P. # 158-60
Hwy. # 403
LAKE ERIE &
NORTHERN
RAILWAY
SUBWAY

553250 E
4779 300 N 17 40 P 1 W



LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊗ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation Jan. 1966

NO.	ELEVATION	STATION	OFFSET
5	804.0	443+03	30' RT.
6	801.0	443+37	31' RT.
7	800.5	443+61	81' RT.
8	798.5	444+06	81' RT.
9	799.5	443+09	32' LT.
10	803.5	442+88	32' LT.
11	800.0	443+00	82' LT.
12	805.5	442+15	82' LT.
13	800.5	442+83	80' RT.
14	799.0	443+35	81' 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.

REVISIONS

DATE	BY	DESCRIPTION

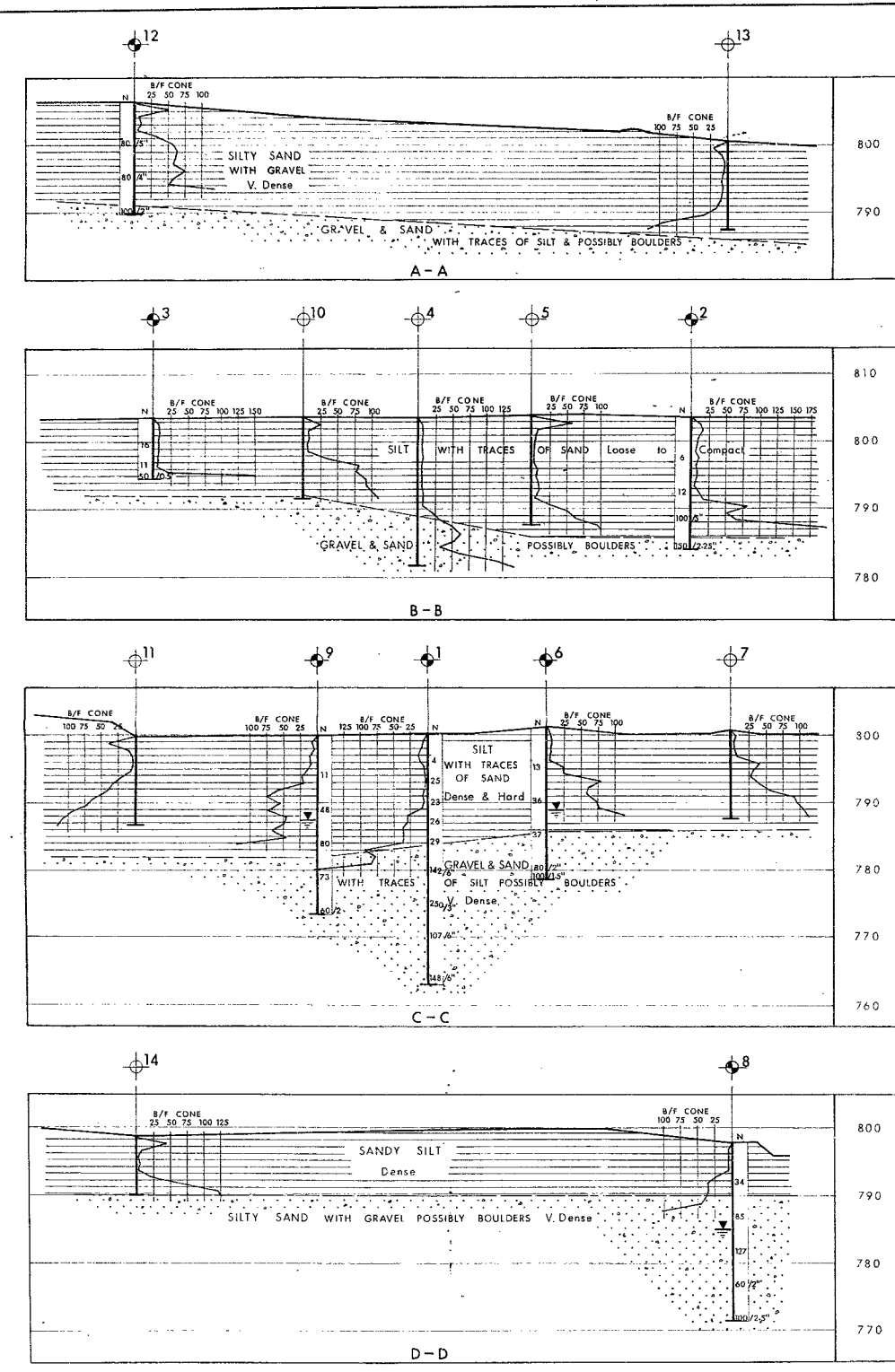
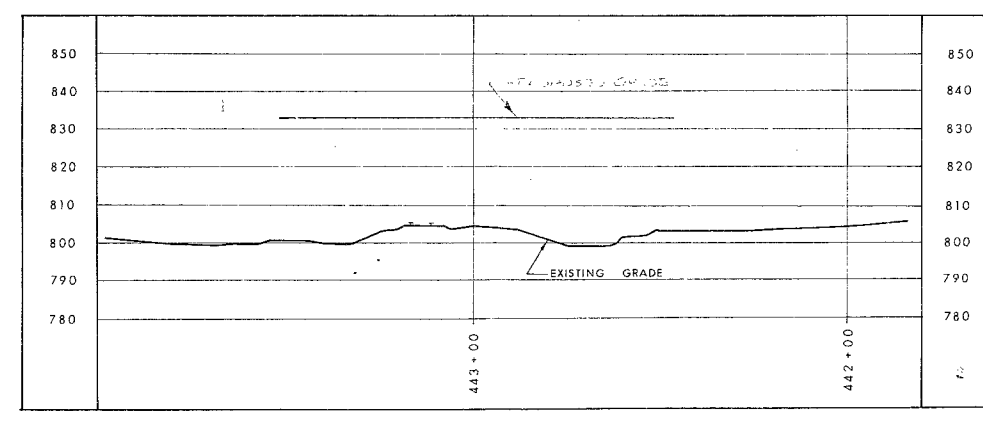
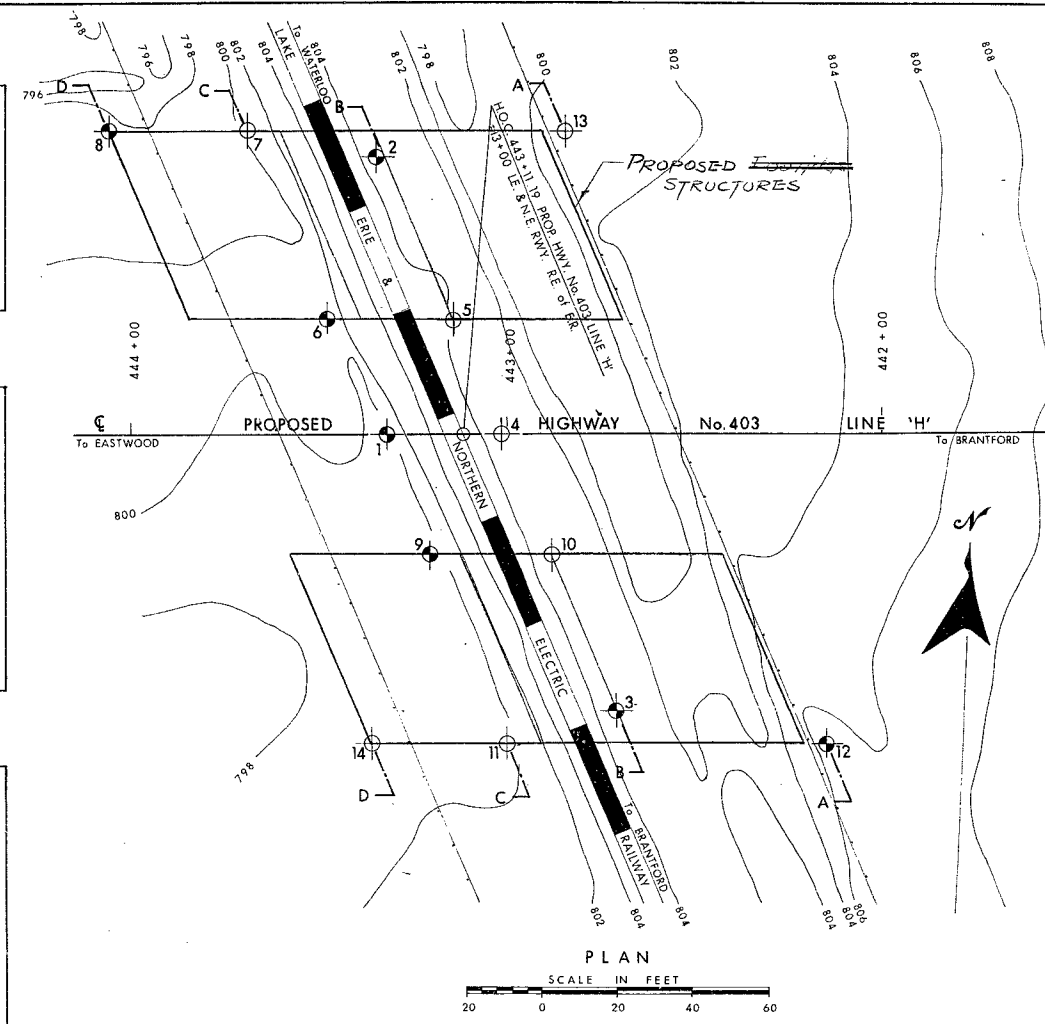
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

LAKE ERIE & NORTHERN ELECTRIC RAILWAY

KING'S HIGHWAY NO. 403 LINE 'H' DIST. NO. 4
CO. BRANT
TWP. BRANTFORD LOT 17 CON. II

BORE HOLE LOCATIONS & SOIL STRATA

SUB'D. A.B.	CHECKED	W.P. NO. 158-60	M.B.T. DRAWING NO.
DRAWN D.G.H.	CHECKED W.P.	JOB NO. 65-F-32	65-F-32 B
DATE 25 FEB. 1966	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i>	CONT. NO.		



PRINT RECORD

NO.	FOR	DATE

REF. No. E-4361-1

MEMORANDUM

cc: GEN. FILES

W.P. 158-60

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

DATE: August 23, 1965

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Proposed Hwy. #403 and Lake Erie
and Northern Railway Subway
District #4 (Hamilton)

W.J. 65-F-32 -- W.P. 158-60

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements. Should you require additional information, please do not hesitate to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
H. Greenland
T. J. Kovich
A. Watt

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office
Gen. Files ✓

TABLE OF CONTENTS

1. INTRODUCTION.
 2. SITE INVESTIGATION AND PHYSIOGRAPHY.
 3. FIELD INVESTIGATION.
 4. SUBSOIL CONDITIONS:
 - 4.1) General.
 - 4.2) Silt with Traces of Sand.
 - 4.3) Gravel with Sand, Traces of Silt.
 5. GROUND WATER.
 6. DISCUSSION AND RECOMMENDATIONS.
 7. SUMMARY.
 8. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Proposed Hwy. #403 and Lake Erie
and Northern Railway Subway
District #4 (Hamilton)
W.J. 65-F-32 -- W.P. 158-60

1. INTRODUCTION:

A request dated February 15, 1965, for a foundation investigation at the site of the proposed subway at the crossing of Hwy. #403, Line 'H' and the Lake Erie and Northern Electric Railway, was received by this Office from Mr. G. Scott, Regional Bridge Location Engineer.

A field investigation was subsequently carried out by this Section. Presented in this report are the results of this investigation, together with recommendations pertaining to the foundation design for this structure.

2. SITE INVESTIGATION AND PHYSIOGRAPHY:

The vicinity of this site consists of undulating arable and pasture farmland with the occasional copse. It is also worthy of note that this area contains many large gravel quarries.

Physiographically, this area is part of the Horseshoe Moraines of Southern Ontario.

3. FIELD INVESTIGATION:

A total of three sampled boreholes and four dynamic cone penetration tests was carried out during the course of the field

cont'd. /2 ...

3. FIELD INVESTIGATION: (cont'd.) ...

investigation using a conventional diamond drill adapted for soil sampling purposes.

Samples were obtained using a 2" O.D. split-spoon soil sampler advanced by blows of a 140-lb, hammer falling a distance of 30" thus imparting an impulse of 350 ft.-lbs./blow.

The locations and elevations of all boreholes were surveyed by the Engineering Field Survey Section of the London District and are shown on Dwg. #65-F-32A which accompanies this report.

Samples were visually examined in the field prior to transportation to the laboratory where they were re-examined. Subsequently, combinations of the following tests were carried out on selected samples:

Atterberg Limits

Moisture Contents

Grain Size Distributions

The laboratory test results are summarized on the bore-log sheets attached to the Appendix of this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil stratifications were found to be generally uniform.

Detailed descriptions of the soil in each borehole are

cont'd. /3 ...

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

4.1) General: (cont'd.) ...

appended to this report, together with the inferred stratigraphical profile of the area in question.

From ground level downwards, the soil types encountered were as follows:

4.2) Silt with Traces of Sand:

This layer extends from ground surface in all places and varies in thickness between 9' in B.H. #3 and 19' in B.H. #1.

Slight cohesion is exhibited near ground level, but this property appears to disappear 6' below ground level.

By far, the main constituent is silt (occasionally exhibiting visible signs of stratification) with very occasional traces of gravel, sand and clay.

The denseness of this brown material can be described as loose to compact, becoming denser with depth.

4.3) Gravel with Sand, Traces of Silt:

This brown to brownish-grey coarse granular soil is exceptionally dense.

It is apparently the same material as that in a nearby quarry which consists of all sizes of gravel, sand and silt with occasional boulders.

5. GROUND WATER:

No ground water was observed in any of the holes. B.H. #1 remained open to El. 763.5 and was dry at this depth.

It is concluded that ground water will occur below the footing foundation level and hence, no major dewatering problems are anticipated.

cont'd. /4 ...

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to build a subway at this site to carry the Lake Erie and Northern Railway over proposed Hwy. #403.

It is recommended that this bridge be founded on spread footings with a base elevation of about 779.0. The design bearing capacity for this depth is estimated to be 3.5 t.s.f.

No major dewatering problems are anticipated as the ground water level is below the footing base elevation.

No stability problem for the cut is anticipated, provided standard 2:1 slopes are adhered to.

It should be noted that the very dense lower layer contains gravel and may also contain boulders.

7. SUMMARY:

A subway to take proposed Hwy. #403 under the Lake Erie and Northern Railway, is proposed.

Spread footings with an allowable bearing pressure of 3.5 t.s.f. are recommended for the foundations to this bridge.

No major dewatering problems are anticipated.

No stability problems should occur with standard 2:1 slopes.

Boulders may be encountered in the lower soil layer.

8. MISCELLANEOUS:

The field equipment was owned and operated by the F. E. Johnston Drilling Co. Ltd. This project was supervised by

cont'd. /5 ...

8. MISCELLANEOUS: (cont'd.) ...

Mr. P.M.A. McGlone, Project Foundation Engineer, who also prepared this report.

The investigation was carried out under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer, who also reviewed this report.

August 1965

APPENDIX 1.

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 65-F-32LOCATION Prop. Hwy #403 Line 'H' Sta. 443+32, EORIGINATED BY P. McGW.P. 158-60BORING DATE July, 1965.COMPILED BY DATUM G.S.C.BOREHOLE TYPE Washboring NX & BX Casing.CHECKED BY HR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	w_p — w — w_L	WATER CONTENT % 20 40 60		
800.0 0.0	Silt with traces of fine sand. Brown. Loose to compact.		1	SS	4							
			2	SS	25							
			3	SS	23	790						
			4	SS	26							
			5	SS	29							
781.0			6	SS	142	780						
19.0	Gravel with sand, traces of silt and possibly boulders. Brown to Brownish-Grey. Very dense.				for 6"							
					SS 250							
					for 3"							
			7	SS	107	770						
					for 6"							
763.5					SS 140							
36.5	End of borehole.				for 6"	760						

Gr1%Sa6%
Si91%
Cl 2%

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 65-F-32

LOCATION Prop. Hwy #403 Line 'H' Sta. 443+32, 73' Rt.

FOUNDATION SECTION

ORIGINATED BY P. McG

W.P. 158-60

BORING DATE July, 1965.

COMPILED BY

DATUM G.S.C.

BOREHOLE TYPE Washboring - NX & BX Casing.

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W wp w WL ----- WATER CONTENT % 20 40 60	BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.			
804.5										
0.0	Silt to clayey silt with traces of sand. Brown. Loose to compact.					800				
			1	SS	6			10-1		
			2	SS	12			o		
789.5			3	SS	100	790				
15.0	Gravel & sand with some silt & possibly boulders. Brown-grey.	0.0 0.0 0.0 0.0			5"					Gr45%Sa30% Si&Cl 15%
784.3				SS	150					
20.2	Very dense. End of borehole.				for 2 1/4"	780				

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 65-F-32

W.P. 158-60

DATUM G.S.C.

RECORD OF BOREHOLE NO. 3

LOCATION Prop. Hwy. #403 Line 'H' Sta. 442+71, 73' Lt.

BORING DATE Aug 19, 1965.

BOREHOLE TYPE Washboring - NX & BX Casing.

FOUNDATION SECTION

ORIGINATED BY P. McG

COMPILED BY

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					w _p ——— w ——— w _L				
							25	50	75	100	125	WATER CONTENT % 20 40 60				
							SHEAR STRENGTH P.S.F.									
804.2																
0.0	Silt Brown Compact.					800										
			1	SS	16											
795.2			2	SS	11											
				SS	50											
9.0	End of borehole.			for 1"		790										

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 65-F-32

LOCATION Prop. Hwy. #403 Line 'H' Sta. 443+02 E

ORIGINATED BY P. McG

W.P. 158-60

BORING DATE Aug. 1965.

COMPILED BY

DATUM G.S.C.

BOREHOLE TYPE Cone Test

CHECKED BY

[illegible]

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H.	SAMPLE ADVANCED HYDRAULICALLY	
	P.M.	SAMPLE ADVANCED MANUALLY	

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNPAINED TRIAXIAL	F.V	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_i	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

MEMORANDUM

W.P. 158-60.

Le:

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: February 25, 1966

OUR FILE REF.

IN REPLY TO

SUBJECT: This report to be included in your copy of
original Foundation Report 65-F-32.

FOUNDATION INVESTIGATION REPORT
For
Lake Erie & Northern Railway Overhead,
Hwy. #403, District #4 (Hamilton).

W.J. 65-F-32 -- W.P. 158 -60

Attached, we are forwarding to you, our detailed
foundation investigation report on the subsoil conditions
existing at the above structure site.

We believe that you will find the factual data and
recommendations contained therein, adequate for your design
requirements. Should additional information be required,
please do not hesitate to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
H. Greenland
T. J. Kovich
A. Watt

Foundations Office
Gen. Files ✓

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. SUBSOIL CONDITIONS.
 3. RECOMMENDATIONS.
 4. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Lake Erie & Northern Railway Overhead,
Hwy. #403, District #4 (Hamilton).
W.J. 65-F-32 -- W.P. 158-60

1. INTRODUCTION:

In a memo, dated January 11, 1966, from the Bridge Location Section, the Foundation Section were advised that a major change in the grade of Hwy. #403 would necessitate a modification of the above crossing. The new design calls for an overhead crossing, rather than the original proposal of a subway.

The information available in the original soils and foundation report (65-F-32) was felt to be inadequate for the modified design; consequently, an additional field and laboratory study was carried out.

2. SUBSOIL CONDITIONS:

The field work consisted of bore and cone penetration holes at the proposed footing locations, in order to establish the depth of the previously identified very dense gravelly layer.

The locations and elevations of the new boreholes, as well as an estimated soils profile, are plotted on the attached drawing No. 65-F-32B. The soils stratigraphy and the field and laboratory test results may be seen on the Borelog sheets, also appended to this report.

The boreholes confirmed the existence of the very dense silty sand layer with gravels at each footing location. The depth of the upper surface of the very dense stratum varies between El. 786.5' and 788.0' at the proposed North structure, while at the South structure, it lies between El. 787.0' and 795.0'.

cont'd. /2

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

The sandy silt deposit, which overlies the gravelly silty sand, has an average value of the standard penetration test of 35 blows/ft. The corresponding values in the very dense layer are above 100 blows/ft.

3. RECOMMENDATIONS:

Based upon the foregoing, recommendations as to the footings are given as follows:

a) The entire structure may be supported on piled foundations. Large displacement end-bearing piles appear to be the practical solution. The approximate elevations of the tip of the piles are tabulated below:

	-- ELEVATIONS OF TIP OF PILES --			
	East Abutment	East Pier	West Abutment	West Pier
North Structure	785.0'	785.0'	785.0'	785.0'
South Structure	790.0'	790.0'	782.0'	790.0'

In the case of 12 $\frac{3}{4}$ " diam. steel tube piles driven down to the specified elevations, a design load of 65 T/pile may be assumed.

b) As an alternative, the piers may be supported on spread footings. The suggested elevations of the bottom of footings are as follows:

	-- ELEVATIONS OF BOTTOM OF SPREAD FOOTINGS	
	East Pier	West Pier
North Structure	792.0'	792.0'
South Structure	795.0'	792.0'

cont'd. /3

3. RECOMMENDATIONS: (cont'd.) ...

A design load of 2 t.s.f. may be achieved on the spread footings, provided they are placed at or below the suggested elevations.

Ground water level was observed to be between El. 789' and 785' in boreholes No. 6, 8 and 9, while no water level was encountered down to El. 763.5' during the first investigation in August 1965. Because, even the highest water level observed is below the suggested excavation, no dewatering will be necessary.

Approach fills, built with side slopes 2 horizontal to 1 vertical appear to be stable.

4. MISCELLANEOUS:

The field work, performed during the period of January 25 - February 1, 1966, was supervised by Mr. W. W. Kulmatickas, Project Foundation Engineer.

Equipment used was owned and operated by Johnston Drilling Co. Ltd.

This report was prepared by Mr. A. K. Barsvary, Project Foundation Engineer, under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer.

February 28, 1966

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 65-F-32LOCATION Hwy. 403, Line "H" Sta. 443+03; 30' Rt. of EORIGINATED BY W.K.W.P. 158-60BORING DATE Feb. 1, 1966.COMPILED BY A.B.DATUM GeodeticBOREHOLE TYPE Cone Penetration.CHECKED BY W.D.

SOIL PROFILE

SAMPLES

DYNAMIC PENETRATION RESISTANCE

BLOWS / FOOT

20 40 60 80 100

SHEAR STRENGTH P.S.F.

LIQUID LIMIT ——— WL

PLASTIC LIMIT ——— WP

WATER CONTENT ——— W

WP ——— W ——— WL

WATER CONTENT %

10 20 30

BULK
DENSITYY
P.C.F.

REMARKS

ELEV.
DEPTH

DESCRIPTION

STRAT. PLOT

NUMBER

TYPE

BLOWS / FOOT

ELEV. SCALE

804.0

Groundlevel

0.0

800

790

780

Hammer Bouncing @ El. 787.5

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 65-F-32LOCATION Hwy. 403 Line "H" Sta. 443+37; 31' Rt. of EORIGINATED BY W.K.W.P. 158-60BORING DATE Jan. 26, 1966.COMPILED BY A.B.DATUM GeodeticBOREHOLE TYPE Washboring.CHECKED BY L.D.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w _L PLASTIC LIMIT — w _p WATER CONTENT — w			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT 20 40 60 80 100					w _p — w — w _L 10 20 30				
							SHEAR STRENGTH P.S.F.					WATER CONTENT %				
801.0	Groundlevel															
0.0	Silt with traces of sand. Stiff to hard.					800									Sal ⁴ % Si93% Cl 3%	
			1	SS	13											
			2	SS	36	790										
			3	SS	37										W.L. El. 791.0	
783.0	Sand and gravel. Very dense.															
18.0			4	SS	80/2"	780										
773.3			5	SS	100/1.5"											
22.7	End of borehole.															

Hammer Bouncing
@El. 788.0

FOUNDATION SECTION

ORIGINATED BY W.K.

COMPILED BY A.B.

CHECKED BY 130

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— w_L	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— w_p		
800.5	Groundlevel						20 40 60 80 100			
0.0						800				
						790				
						780				

Hammer Bouncing
@El. 787.5

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 65-F-32LOCATION Hwy. 403 Line "H" Sta. 444/06; 81' Rt. of EORIGINATED BY W.K.W.P. 158-60BORING DATE Jan. 25, 1966.COMPILED BY A.B.DATUM GeodeticBOREHOLE TYPE WashboringCHECKED BY L.D.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	wp	w	wL		
798.0	Groundlevel															
0.0	Sandy silt. Dense.															
			1	SS	34											
790.0						790										
8.0			2	SS	85											
	Silty sand with gravel.		3	SS	127											
						780										
	Very dense.		4	SS	60/2"											
771.5			5	SS	100/2.5"											
26.5	End of borehole.					770										

Hammer Bouncing
@El. 786.5Sa18%
Si79%
Cl 3%Gr33%
Sa47%
Si&Cl 20%

MATERIALS & TESTING DIVISION

JOB 65-F-32LOCATION Hwy. 403, Line "H" Sta. 443+09, 32' Lt. of EORIGINATED BY W.K.W.P. 158-60BORING DATE Jan. 27, 1966.COMPILED BY A.B.DATUM GeodeticBOREHOLE TYPE Washboring.CHECKED BY LD

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	W	WL		
799.5	Ground level															
0.0	Sandy silt. Compact to dense.		1	SS	11	790										Sa6% Si93% Cl 1%
			2	SS	48											
783.5	Silty sand with gravel. Very dense		3	SS	80	780										Sa21% Si68% Cl 2% W.L. @El. 789.5 Gr24% Sa54% Si&Cl 22%
16.0																
			4	SS	73											
773.0	End of borehole.		5	SS	60/2"											Gr7% Sa51% Si&Cl 42%
26.5																

Hammer Bouncing
@El. 783.6

FOUNDATION SECTION

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT % wp ——— w ——— WL			
803.5	Ground level											
0.0												
						800						
						790						
						780						

11

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

JOB 65-F-32

LOCATION: Hwy. 403, Line "H", Sta. 443+00, 82' Lt. of E

ORIGINATED BY W.K.

W.P. 158-60

BORING DATE Jan. 27, 1966.

COMPILED BY _____ A.B.

DATUM Geodetic

BOREHOLE TYPE Cone Penetration.

CHECKED BY L.D.

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 65-F-32

LOCATION Hwy. 403 Line "H", Sta. 442/83, 80' Rt. of C

ORIGINATED BY W.K.

W.P. 158-60

BORING DATE Feb. 2, 1966.

COMPILED BY A.B.

DATUM Geodetic

BOREHOLE TYPE Cone Penetration

CHECKED BY AD

[illegible]

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 65-F-32

LOCATION Hwy. 403, Line "H", Sta. 443/35, 81' Lt. of E

ORIGINATED BY W.K.

W. P. 158-60

BORING DATE Feb. 1, 1966.

COMPILED BY A.B.

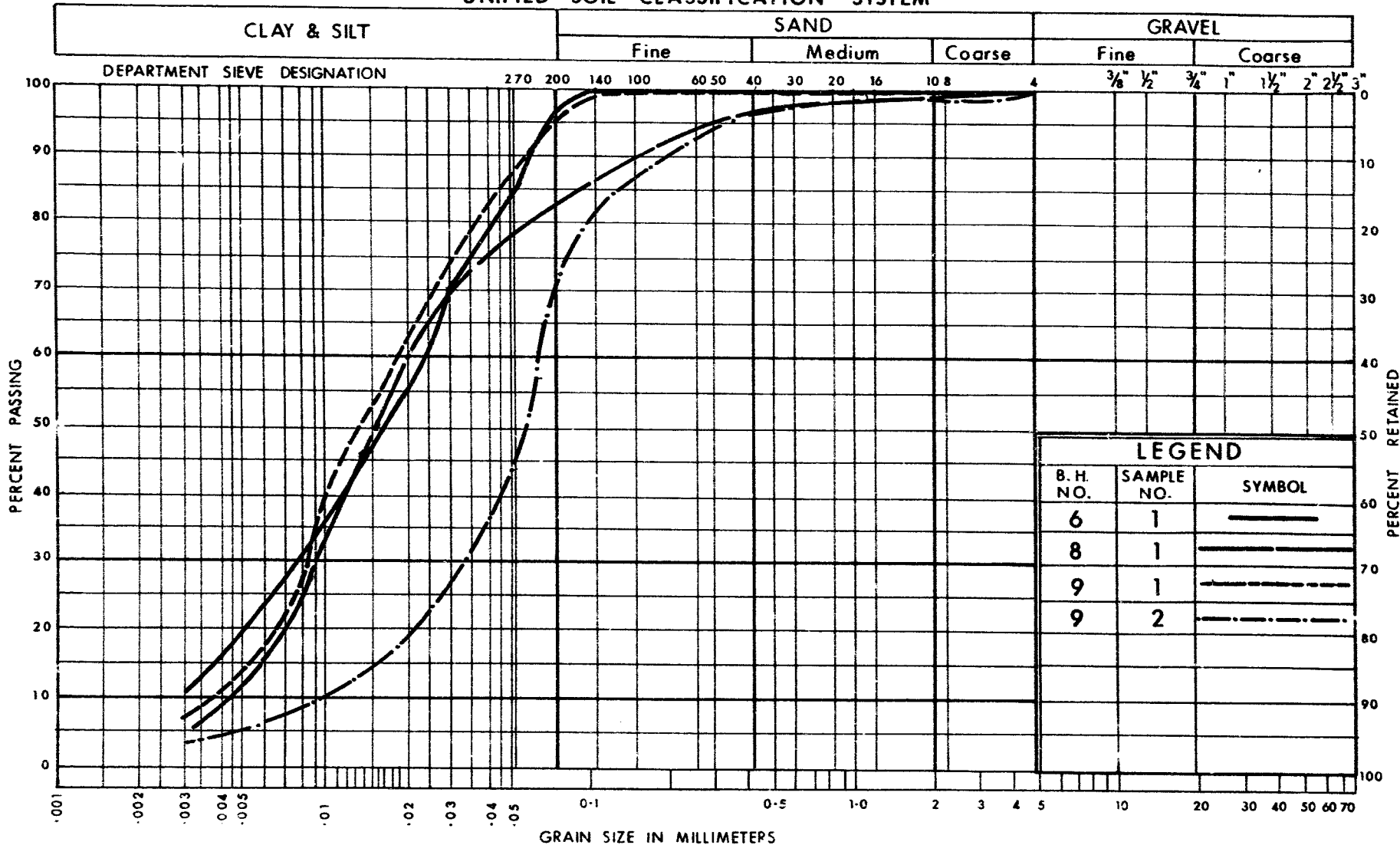
DATUM Geodetic

BOREHOLE TYPE Cone Penetration.

CHECKED BY J. D.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— w_L	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— w_p		
799.0	Groundlevel						SHEAR STRENGTH P.S.F.	w_p ——— w ——— w_L		
0.0								WATER CONTENT %		

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
SANDY SILT.



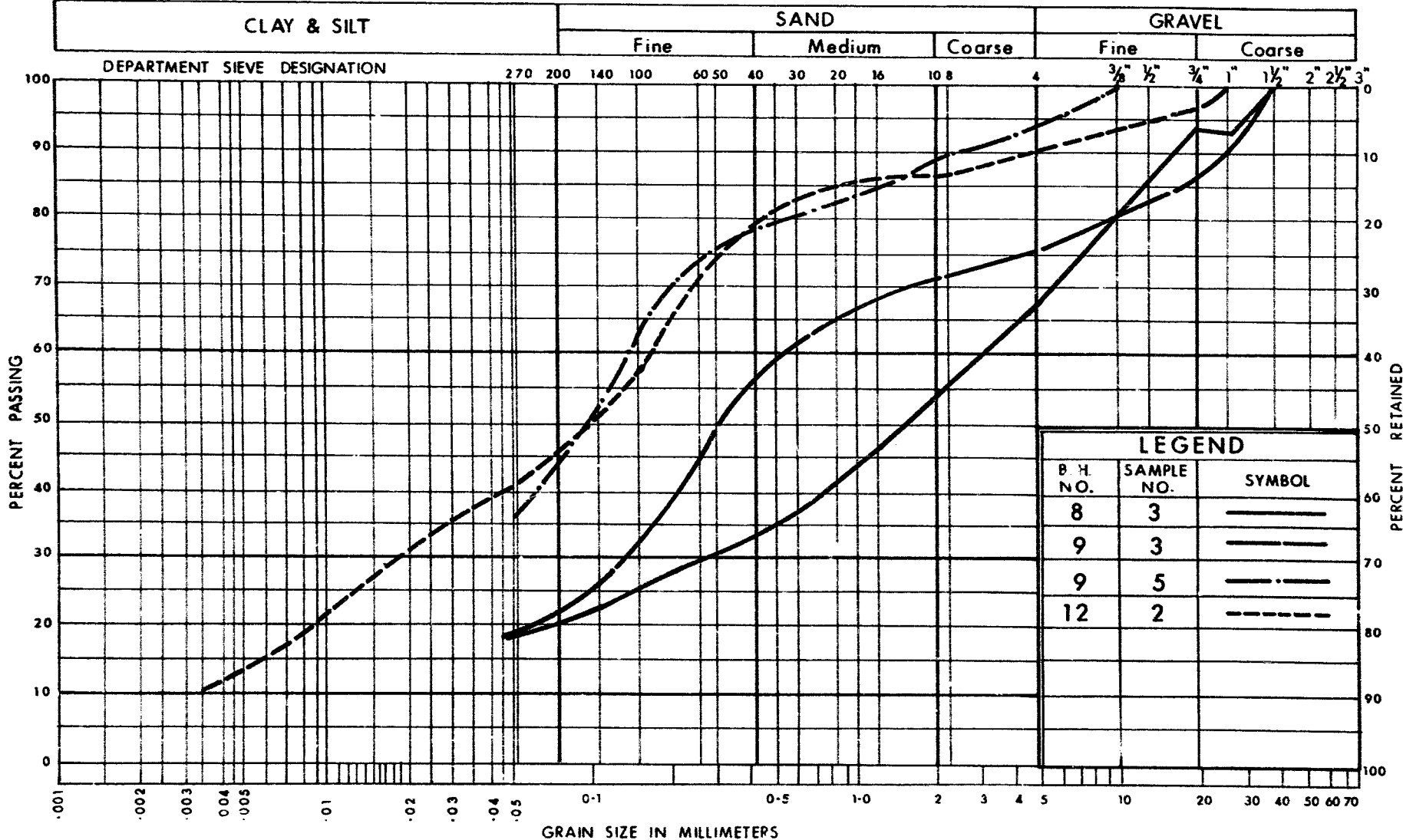
DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

W.P. No. 158 - 60

JOB No. 65 - F - 32

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION

SILTY SAND WITH GRAVEL

W.P. No. 158-60

JOB No. 65-F-32

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Building.

FROM: Bridge Division,
Downsview, Ontario

DATE: January 11, 1966

OUR FILE REF.

IN REPLY TO


SUBJECT: W.P. 158-60
Site 1-158
Lake Erie and
Northern Railway
~~Overload~~ ^{Overhead}
Highway 403, District 4

65-8-32

The attached Bridge Site Plan E4327-1 is a re-issue of plan sent on February 15, 1965. It is caused by a major change in the grade of Highway 403 whereby Highway 403 now crosses the railway rather than under the railway as was the case in the previous issue.

We will be pleased to have your views regarding the foundation for this structure.

NZ/pr
Encl.


N. Zoltay,
Bridge Location Engineer

cc. S. McCombie
G. Scott

210

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attn: Mr. N. Zoltay,
Bridge Location Engr.

January 13, 1966

Lake Erie and Northern Railway Overhead,
Highway 403, District 4 (Hamilton)
-- W.P. 158-60 --

With regard to your memo dated January 11, 1966, the original foundation investigation (65-P-32), was reviewed.

The previous design called for a subway crossing rather than an overhead, and the soils investigation was carried out concerning a proposed cut. It is felt that the soils information available is not adequate for the foundation recommendations of the changed overhead design. A few new boreholes and laboratory tests would be necessary in order to suggest the footing and slope stability of the overhead.

Would you please advise us whether the new investigation is to be carried out.

AB/MieP

A. G. Sternac
A. G. Sternac,
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Office ✓
Gen. Files

Calculate bearing capacity of piles

2 Jan 77

Timber pile

Embedded length (ave) 10'

End area $R = 4.5 = 0.38'$

$$A_p = 0.38^2 \times \pi = 0.14 \times 3.14 = \underline{0.45} \text{ SFT}$$

Circumference $= L \times 2\pi =$

$$D = 10' = 0.83'$$

$$A_s = 10 \times 0.83 \times 3.14 = \underline{26.2} \text{ SFT}$$

$$Q_{ULT} = 4 N A_p + \frac{N A_s}{50} = 4 \times 100 \times 0.45 + \frac{12 \times 26.2}{50} =$$

$$N = 100$$

$$\bar{N} = 12$$

(AVE)

$$= 400 \times 0.45 + \frac{314}{50} = 180 + 6 = 186$$

$$Q_{SAFE} = \frac{Q_{ult}}{3} = \frac{186}{3} = \underline{62} \text{ TST}$$

Take 12 3P 74 H pile

Length (emb) = 10'

End area $\cdot 21.76 \text{ SQ IN.} = 0.15 \text{ SFT} = A_p$ Circumf $\cdot 4 \text{ FT.} \times 10 \text{ FT.} = 40 \text{ SFT} = A_s$

$$Q_{ULT} = 4 N A_p + \frac{N A_s}{100} = 400 \times 0.15 + \frac{12 \times 40}{100} =$$

$$= 60 + \frac{480}{100} = 60 + 4.8 = 64$$

$$Q_{SAFE} = \frac{Q_{ult}}{3} = \frac{64}{3} = \underline{21} \text{ TST}$$

cont. next page.

Take end area = 1 SFT.

$$Q_{ult} = 4 \times 100 \times 1 + \frac{\bar{N} \Delta s}{100} = 400 + 4.4$$

$$Q_s = \frac{Q_{ult}}{3} = \frac{404}{3} = \underline{\underline{134 \text{ TSF}}}$$

Recommend: Piled foundation. Piles driven to the gravel and sand stratum. The upper surface of the gravel & sand varies, in BH - 1 & 4 it was found around El. 780' so pile length will be (estimated) some 20', in BH 2 & 3 the top of layer is around 790-795'; est. length = approx 9-15'. Safe bearing capacity of a timber pile = 20 TSF in 12 SP 74 a pile = 90 TSF. Because the top of the dense gravel layer is not known at the statements, no recommendation can be given concerning the type of piling. It is felt that additional BH's are necessary.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: February 25, 1966

OUR FILE REF.

IN REPLY TO

777ar. 3/66

SUBJECT: This report to be included in your copy of
original Foundation Report 65-F-32.

FOUNDATION INVESTIGATION REPORT
For
Lake Erie & Northern Railway Overhead,
Hwy. #403, District #4 (Hamilton).

W.J. 65-F-32 -- W.P. 158 -60

Attached, we are forwarding to you, our detailed
foundation investigation report on the subsoil conditions
existing at the above structure site.

We believe that you will find the factual data and
recommendations contained therein, adequate for your design
requirements. Should additional information be required,
please do not hesitate to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
H. Greenland
T. J. Kovich
A. Watt

Foundations Office ✓
Gen. Files

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. SUBSOIL CONDITIONS.
 3. RECOMMENDATIONS.
 4. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Lake Erie & Northern Railway Overhead,
Hwy. #403, District #4 (Hamilton).
W.J. 65-F-32 -- W.P. 158-60

1. INTRODUCTION:

In a memo, dated January 11, 1966, from the Bridge Location Section, the Foundation Section were advised that a major change in the grade of Hwy. #403 would necessitate a modification of the above crossing. The new design calls for an overhead crossing, rather than the original proposal of a subway.

The information available in the original soils and foundation report (65-F-32) was felt to be inadequate for the modified design; consequently, an additional field and laboratory study was carried out.

2. SUBSOIL CONDITIONS:

The field work consisted of bore and cone penetration holes at the proposed footing locations, in order to establish the depth of the previously identified very dense gravelly layer.

The locations and elevations of the new boreholes, as well as an estimated soils profile, are plotted on the attached drawing No. 65-F-32B. The soils stratigraphy and the field and laboratory test results may be seen on the Borelog sheets, also appended to this report.

The boreholes confirmed the existence of the very dense silty sand layer with gravels at each footing location. The depth of the upper surface of the very dense stratum varies between El. 786.5' and 788.0' at the proposed North structure, while at the South structure, it lies between El. 787.0' and 795.0'.

cont'd. /2

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

The sandy silt deposit, which overlies the gravelly silty sand, has an average value of the standard penetration test of 35 blows/ft. The corresponding values in the very dense layer are above 100 blows/ft.

3. RECOMMENDATIONS:

Based upon the foregoing, recommendations as to the footings are given as follows:

a) The entire structure may be supported on piled foundations. Large displacement end-bearing piles appear to be the practical solution. The approximate elevations of the tip of the piles are tabulated below:

	-- ELEVATIONS OF TIP OF PILES --			
	East Abutment	East Pier	West Abutment	West Pier
North Structure	785.0'	785.0'	785.0'	785.0'
South Structure	790.0'	790.0'	782.0'	790.0'

In the case of 12 $\frac{3}{4}$ " diam. steel tube piles driven down to the specified elevations, a design load of 65 T/pile may be assumed.

b) As an alternative, the piers may be supported on spread footings. The suggested elevations of the bottom of footings are as follows:

	-- ELEVATIONS OF BOTTOM OF SPREAD FOOTINGS	
	East Pier	West Pier
North Structure	792.0'	792.0'
South Structure	795.0'	792.0'

cont'd. /3

3. RECOMMENDATIONS: (cont'd.) ...

A design load of 2 t.s.f. may be achieved on the spread footings, provided they are placed at or below the suggested elevations.

Ground water level was observed to be between El. 789' and 785' in boreholes No. 6, 8 and 9, while no water level was encountered down to El. 763.5' during the first investigation in August 1965. Because, even the highest water level observed is below the suggested excavation, no dewatering will be necessary.

Approach fills, built with side slopes 2 horizontal to 1 vertical appear to be stable.

4. MISCELLANEOUS:

The field work, performed during the period of January 25 - February 1, 1966, was supervised by Mr. W. W. Kulmatickas, Project Foundation Engineer.

Equipment used was owned and operated by Johnston Drilling Co. Ltd.

This report was prepared by Mr. A. K. Barsvary, Project Foundation Engineer, under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer.

February 28, 1966

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 65-F-32

LOCATION Hwy. 403, Line "H" Sta. 443+03; 30' Rt. of E

ORIGINATED BY W.K.

W. P. 158-60

BORING DATE Feb. 1, 1966.

COMPILED BY A.B.

DATUM Geodetic

BOREHOLE TYPE Cone Penetration.

CHECKED BY _____

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 65-F-32

LOCATION Hwy. 403 Line "H" Sta. 443/37; 31' Rt. of E

ORIGINATED BY W.K.

W.P. 158-60

BORING DATE Jan. 26, 1966.

COMPILED BY A.B.

DATUM Geodetic

BOREHOLE TYPE Washboring.

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	W _P	W	W _L		
801.0	Groundlevel															
0.0	Silt with traces of sand. Stiff to hard.		1	SS	13	800										Sal _s 7 S _{193%} Cl 3% W.L. El. 791.0
			2	SS	36	790										
			3	SS	37											
			4	SS	80/2"	780										
783.0	Sand and gravel. Very dense.		5	SS	100/1.5"											
22.7																
	End of borehole.															

Hammer Bouncing
@El. 788.0

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 65-F-32

LOCATION Hwy. 403, Line "H" Sta. 443+61; 81' Rt. of C

W P 158-60

SORING DATE Jan. 25, 1966.

DATUM Geodetic

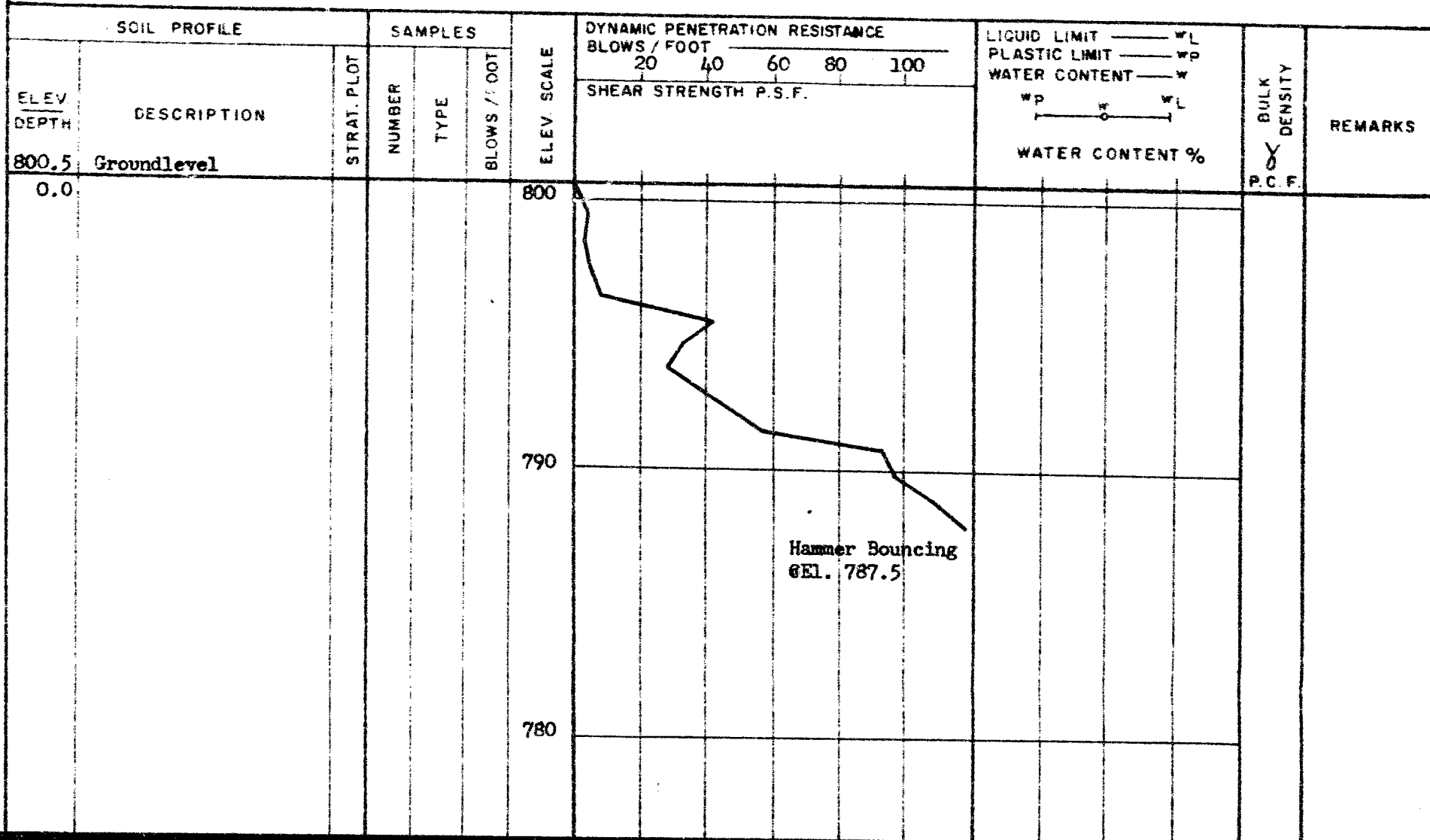
BOREHOLE TYPE Cone Penetration

FOUNDATION SECTION

ORIGINATED BY W.A.

COMPILED BY A.B.

CHECKED BY



MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 65-P-32

LOCATION Hwy. 403 Line "H" Sta. 444+06; 81' Rt. of E

ORIGINATED BY W.K.

W.P. 158-60

BORING DATE Jan. 25, 1966.

COMPILED BY A.B.

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	WL	W		
798.0	Groundlevel															
0.0	Sandy silt. Dense.															
			1	SS	34											
790.0						790										
8.0																
			2	SS	85											
	Silty sand with gravel.		3	SS	127											
						780										
	Very dense.															
			4	SS	60/2"											
771.5			5	SS	100/2.5"	770										
26.5	End of borehole.															

Hammer Bouncing
CEL. 786.5

Sal 18%
Si 17%
Cl 3%

Gr 33%
Sal 7%
Si & Cl 20%

FOUNDATION SECTION

CHECKED BY

[illegible]

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

ORIGINATED BY W.K.

COMPILED BY A.B.

CHECKED BY

[illegible]

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

CHECKED BY _____

[illegible]

CHECKED BY _____

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 13

FOUNDATION SECTION

JOB 65-F-32

LOCATION Hwy. 403 Line "H", Sta. 442/83, 80' Rt. of E

ORIGINATED BY W.K.

W. P. 158-60

BORING DATE Feb. 2, 1966.

COMPILED BY A.B.

DATUM Geodetic

BOREHOLE TYPE Cone Penetration

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— w _L	BULK DENSITY	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	PLASTIC LIMIT ——— w _p			WATER CONTENT %	
800.5	Groundlevel						SHEAR STRENGTH P.S.F.	w _p ————— w _L ----- w	P.C.F.			
0.0						800	<p style="text-align: center;">Hammer Bouncing @El. 787.5</p>					
						790						
						780						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 65-F-32

LOCATION Hwy. 403, Line "H", Sta. 443/35, 81' Lt. of E

FOUNDATION SECTION

ORIGINATED BY W.K.

W. P. 158-60

BOIRING DATE Feb. 1, 1966.

COMPILED BY _____ A.B.

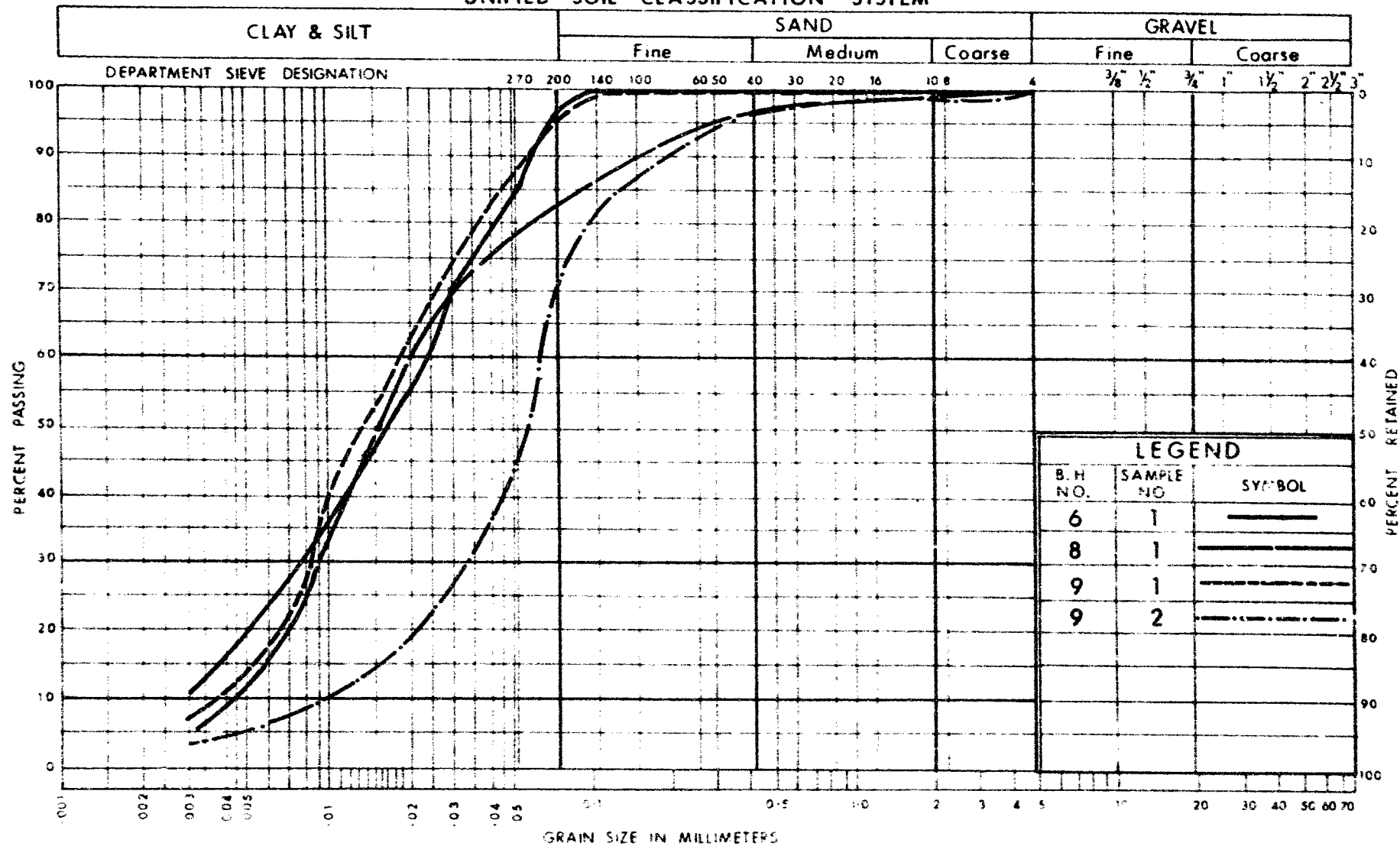
DATUM Geodetic

BORE HOLE TYPE Cone Penetration.

CHECKED BY

[illegible]

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO

DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

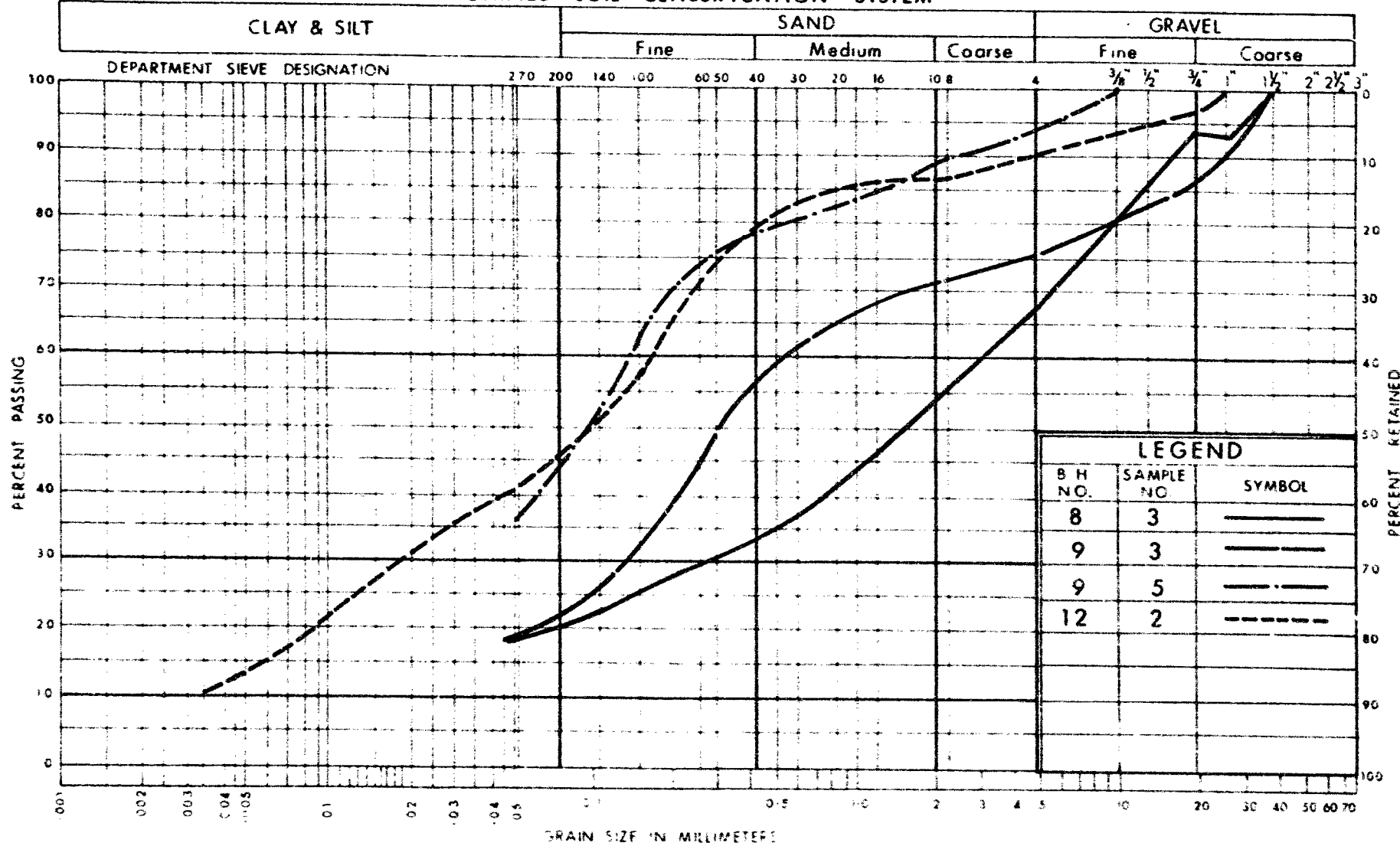
GRAIN SIZE DISTRIBUTION

SANDY SILT.

W.P. No. 158-60

JOB No. 65-F-32

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION

SILTY SAND WITH GRAVEL

W P No. 158-60

JOB No. 65-F-32

Hwy. 401 & Keele St.,
Downsview, Ontario.

65-F-38

Materials and Testing Division

August 9, 1965

H. Reid, Esq.,
R.R. #6,
Brantford, Ontario.

Dear Mr. Reid:

Upon receipt of your letter dated August 4, 1965,
I immediately called the F. E. Johnston Drilling Co. Ltd.
of 378 Bering Street, Toronto.

I was assured by them that the matter of payment
for the water supplied to them by yourself, would be
investigated at once.

It is entirely possible that you will have been
contacted by them before you receive this letter, in which
case, I would like to express my regret over this affair.

Should you need to contact me again, please do not
hesitate to do so.

I remain

PMAMcG/MdeF

Yours faithfully,

Peter M. A. McGlone