

#69-F-99

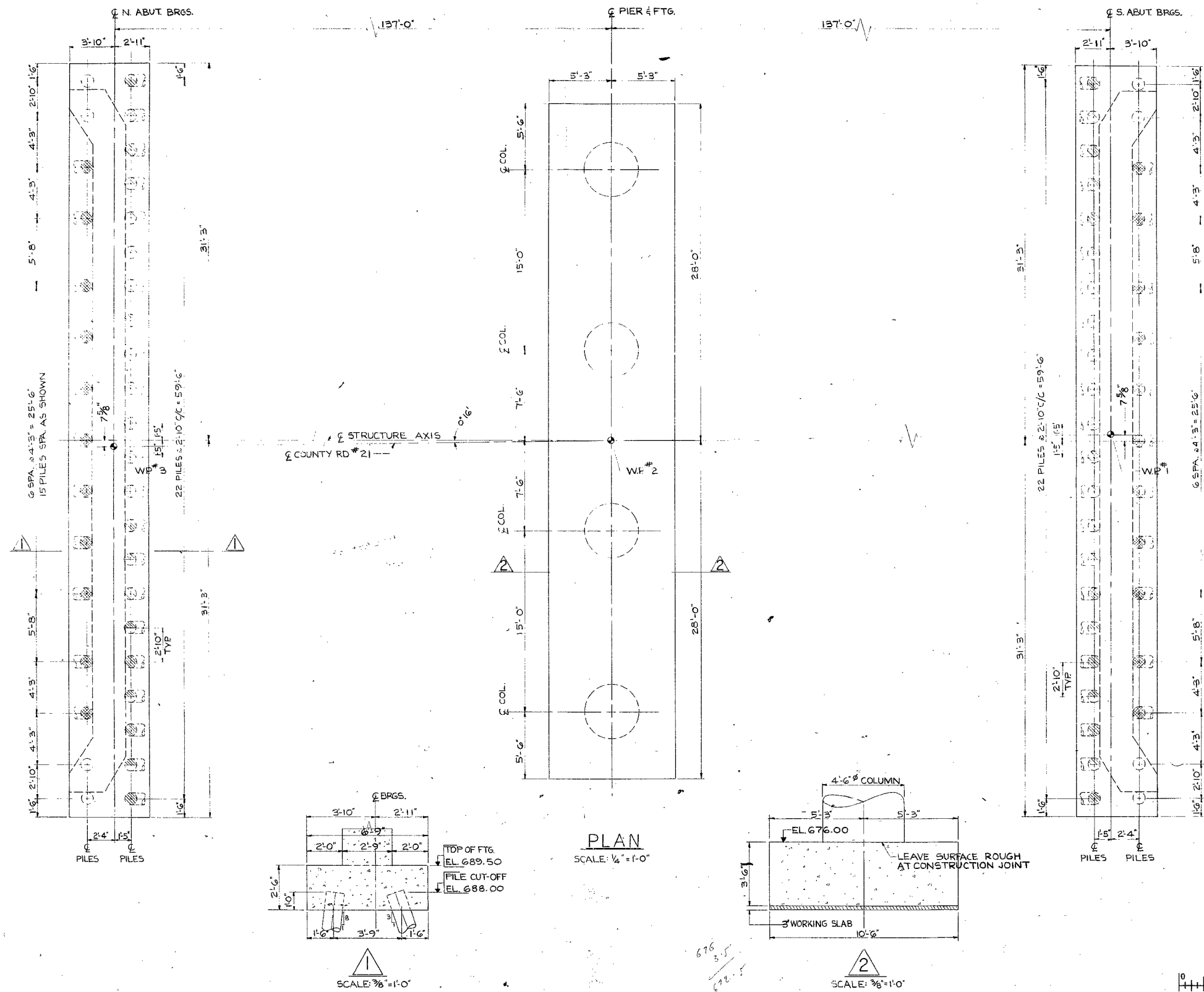
W.P. 43-66-12

HWY. #402, LINE 'C',

AND C.A.H.

COUNTY ROAD #21





PILES SUPPLIED			
LOCATION	NO.	LENGTH	TYPE
N. ABUT.	37	19' 0"	12 1/4" O.D. STEEL TUBE
S. ABUT.	37	19' 0"	PILES 5 x 0.250" WALL THICK.

#### LEGEND

- PILE BATTER 3:1
- PILE BATTER 5:1
- PILE BATTER 8:1
- PILE DRIVEN VERTICAL

#### NOTES

- DIMENSIONS & PILE LAYOUT SIMILAR FOR BOTH ABUTMENT FOOTINGS.
- PILE SPACING TO BE MEASURED AT UNDERSIDE OF FOOTING.
- ALL PILES ARE 12 1/4" O.D. x 0.250" WALL STEEL TUBE PILES.
- TUBE PILES TO BE FILLED WITH 3000 PSI. CONCRETE AFTER INSTALLATION & INSPECTION.
- PILES SHALL BE DRIVEN IN ACCORDANCE WITH BD 86-7, BUT IN NO CASE SHALL BE DRIVEN BELOW EL. 670.00.
- FOR BD STANDARDS SEE D6807-13

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE OFFICE	
69-F-99	
COUNTY RD #21 INTERCHANGE U'PASS	
KING'S HIGHWAY No. 402	DIST. No. 1
CO. LAMBERTON	
TWP. PLYMPTON	LOT 15, 16 CON. 5
FOUNDATION LAYOUT	
APPROVED _____	SITE No. 14-349 W.P. No. 23-66-12
DESIGN J.S. / H.Z. CHECK J.L.K.	CONTRACT No. _____
DRAWING B.M.G. CHECK J.S. / H.Z.	DRAWING No. D-6807-3
DATE DEC. 70	LOADING 15-20-44

AM. 110 LAB B. 06

afp

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. B. R. Davis,  
Bridge Engineer,  
Bridge Office,  
Admin. Building.

FROM: Foundation Section,  
Materials and Testing Office,  
Room 107, Lab. Building.

ATTENTION: Mr. S. McCombie

DATE: December 30, 1969

Our File Ref.

IN REPLY TO

JAN 14 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

Proposed Bridge Construction  
at the crossing of Co. Rd. #21  
and C.A.H. #402, Line 'C'  
Lots 15 and 16, Concession 5  
Twp. of Plympton - County of Lambton  
W.J. 69-F-99 -- W.P. 43-66-12

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

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

*A. G. Stermac*

A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

AGS/jm  
Attach.

cc: Messrs. B. R. Davis (2)  
H. A. Tregaskes  
D. W. Farren  
W. Sonnenberg  
F. C. Brown  
A. P. Watt  
J. Roy  
E. A. Singh  
Foundations Files  
Gen. Files

## TABLE OF CONTENTS

1. INTRODUCTION
2. DESCRIPTION OF SITE
3. FIELD AND LABORATORY INVESTIGATION
4. SUBSOIL CONDITIONS:
  - 4.1) General.
  - 4.2) Silty Clay with some Sand and traces of Gravel.
  - 4.3) Clayey Silt.
  - 4.4) Bedrock.
5. GROUNDWATER CONDITIONS
6. DISCUSSION AND RECOMMENDATIONS:
  - 6.1) General
  - 6.2) Structure Foundations
  - 6.3) Approach Fills
7. MISCELLANECUS

FOUNDATION INVESTIGATION REPORT  
For  
Proposed Bridge Construction  
at the crossing of Co. Rd. #21  
and C.A.H. #402, Line 'C'  
Lots 15 and 16, Concession 5  
Twp. of Plympton - County of Lambton  
W.J. 69-F-99 -- W.P.43-66-12

---

1. INTRODUCTION:

A request for a foundation investigation at the above mentioned site was received from Mr. A. Watt, Regional Bridge Planning Engineer, in a memo dated October 29th, 1969.

An investigation was carried out by this section to determine the subsoil conditions at the site of the proposed structure. Presented in this report are the results of this investigation, together with the recommendations regarding the design of the bridge foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site is located 15 miles West of Sarnia and 3/4 mile North of Hwy. #7, on Co. Rd. 21.

The topography is flat and consists of farmland.

Physiographically, the area is known as the St. Clair Clay Plain.

3. FIELD AND LABORATORY INVESTIGATION:

The field work consisted of six sampled boreholes and twelve dynamic cone penetration tests. Of the boreholes, boreholes 2 and 11 were sampled to bedrock and cored using a B.X.L. core barrel. Boreholes 6 and 7 were sampled to 40 feet and from thereon, augered down without sampling until practical refusal was reached. Boreholes 3 and 10 were terminated at 40 feet.

Equipment used consisted of a Penn Auger and a Diamond Drill adapted for soil sampling purposes.

Disturbed samples were obtained using a 2" O.D. split spoon sampler, of which the energy used for driving conformed to requirements of the Standard Penetration Test. Undisturbed samples were obtained by means of 2" I.D. Shelby tubes pushed hydraulically into the subsoil. The material was too hard to permit any in-situ vane tests.

All samples were visually identified in the field and then returned to the laboratory where further tests were carried out to determine Atterberg Limits and moisture contents, density, particle size distribution and unconfined shear strength.

#### 4. SUBSOIL CONDITIONS:

##### 4.1) General:

The subsoil at the site consists of a shallow layer of silty clay some 5 feet thick overlying a deep stratum of clayey silt extending down to bedrock which was found at a depth of around 88 feet.

##### 4.2) Silty Clay with some sand and traces of Gravel:

This material was found in all boreholes extending to a depth of around 5 feet below ground surface. 'N' values as obtained from the Standard Penetration Test ranged from 7 blows/ft. to 18 blows/ft. indicating a consistency ranging from 'Firm' to 'Very Stiff' though generally 'Stiff'.

Moisture contents as determined from lab. tests ranged from 17% to 26%.

##### 4.3) Clayey Silt with some Sand and traces of Gravel:

This material underlies the silty clay layer and extends down to the surface of the bedrock. A plot of Plasticity Index against Liquid Limit shows the material to fall within the CL zone, apart from 2 samples which can be classed as CI; no evidence of any definite stratum of silty clay is present and hence the whole deposit is classed as clayey silt.

'N' values as determined from the Standard Penetration Test ranged from 14 blows/ft. to 70 blows/ft., indicating a consistency of 'Stiff' to 'Hard' though generally 'Very Stiff' to 'Hard'.

Laboratory tests gave the following results:

Grain size distribution:	Gr.	Sa.	Si.	Cl.
	0 - 3%	10 - 11%	50 - 53%	34 - 36%
Moisture content	10% - 24% (mean 17%)			
Liquid Limit	26% - 38%			
Plastic Limit	14% - 19%			
Density	131.5 - 139 p.c.f.			
Unconfined shear strength	3,100 p.s.f. - 5,800 p.s.f.			

A plot of Plasticity Index vs. Liquid Limit is shown in Fig. (1) and Grain Size distribution Fig. (2). The shear strength varies from a maximum of 5800 p.s.f. in the upper region of the stratum to a minimum of 3100 p.s.f. around elev. 655.0; below this level the shear strength remains constant at 3100 p.s.f. to elev. 628. No strength tests were undertaken below this elevation. A plot of shear strength against depth is shown in Fig. (3).

#### 4.4) Bedrock:

Black shale bedrock was found at elevations ranging from 588.4 in BH #2 to 590.7 in BH #7.

### 5. GROUNDWATER ELEVATIONS:

Groundwater elevations observed several days after completing the investigation were found to be as follows:

Borehole 2	675.3	Borehole 7	675.7
3	676.4	10	674.6
6	674.8	11	674.6

### 6. DISCUSSION AND RECOMMENDATIONS:

#### 6.1) General:

It is proposed to construct a bridge at this site to carry Lambton County Road #21 over the new Hwy. #402, Line 'C'. The bridge will have spans of 35' - 73.7' - 73.7' - 73.7' - 35.0' and will have a grade such that approach fills of 22' will be required.

As described earlier in the report, the subsoil consists of a shallow layer of silty clay with some sand and traces of gravel overlying a deep deposit of clayey silt, with some sand



and traces of gravel. This latter deposit has a consistency of 'Very Stiff' to 'Hard' and shear strengths in excess of 3000 p.s.f.

6.2) Structure Foundations:

(a) Abutments and Piers on Spread Footings

The abutments and piers can be supported on spread footings placed at or below elev. 672.0. A safe pressure of 3.0 t.s.f. may be assumed for design purposes.

No dewatering problems are anticipated but it is recommended that the base of the footing excavations be protected by a concrete working slab immediately on exposure since the soil rapidly loses strength on contact with water.

From experience with similar structures and subsoil conditions in the Sarnia area it is estimated that maximum settlement under the pier footings will not exceed  $1\frac{1}{2}$ ".

(b) Abutments on Spread Footings on compacted Fill

The abutments may be supported on spread footings placed on well compacted suitable granular material within the approach fills. A safe design load of 2.0 t/sq.ft. may be assumed. The granular material should consist of G.B.C. Class 'A' and should be fully compacted according to the current D.H.O. Standards. A detailed construction scheme is outlined in Fig. 4 of the appendix.

(c) Perched Abutments on Short Piles

Another alternative would be to construct the abutments within the approach fills and support them on short piles driven through the fill and to elev. 670.0 in the case of 12 3/4" O.D. and steel tube piles a safe design load of 25 tons/pile may be used.

The safe design load mentioned is based on experience with similar structures and subsoil conditions in the Sarnia area; more detailed information will be available when a full scale pile loading test is completed. This is due to take place within the first few months of 1970.

Regardless of which of the above methods (a), (b) or (c), is adopted for the abutments, consolidation settlements in the order of 4" can be expected in the subsoil beneath them. This estimate is based on experience with similar structures and subsoil conditions in the Sarnia area.

Differential settlements between the abutments and the piers are estimated to be in the order of 3"  $\pm$  over a term period. The structure should therefore be designed accordingly.

(d) Abutments and Piers on End bearing piles

The abutments and piers may also be supported on steel 'H' piles driven to bedrock. For 12 BP 53 a safe design load of 70 T/pile may be assumed.

6.3) Approach Fills:

The shear strength of the subsoil is such that it will be able to safely support the 22 ft. high approach fills constructed with 2:1 side slopes.

The fill should consist of well compacted acceptable material and the portion through which piles have to be driven should not contain grain sizes larger than 3".

Settlements under the approach fill based on experiences with structures in the immediate area, are anticipated to be in the order of 4"  $\pm$ . It is recommended that the fills be built as far in advance of the structure as possible to minimize the differential settlement between the abutments and the piers.

The topsoil and any soft organic material should be removed in accordance with the pertinent D.H.O. Standards within the construction area.

7. MISCELLANEOUS:

The field investigation was carried out during the period Nov. 12 and 13, 1969 under the supervision of Mr. G. Allen and Mr. P. Payer, Project Foundation Engineers. Equipment used was owned and operated by Dominion Soil Investigation Ltd. and G. Wimpey and Co. Ltd.

This report was prepared by Mr. G. Allen and reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

December, 1969

APPENDIX I

CHECKED BY

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION BLOWS / FOOT	RESISTANCE	LIQUID LIMIT ——— $w_L$	PLASTIC LIMIT ——— $w_p$	WATER CONTENT ——— $w$	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.	$w_p$	$w$	$w_L$	P.C.F.	GR. SA. SI. CL.
678.8 0.0	Ground Level						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					
667.8 11.0	End of Cone Test					670						

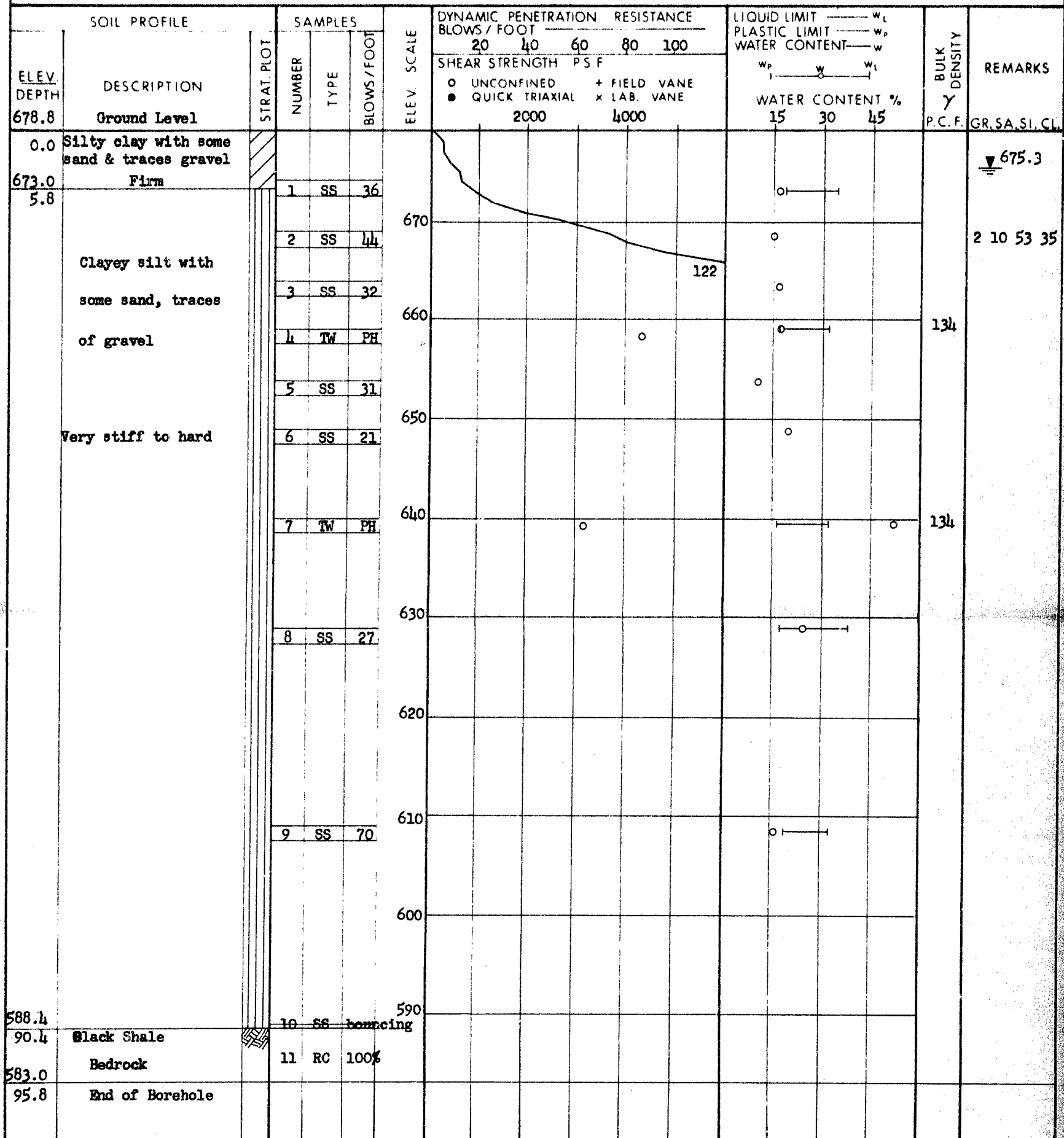
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-99 LOCATION Sta. 98 + 51 22' Rt.  
 W.P. 43-66-12 BORING DATE Nov. 12 & 13, 1969  
 DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger

ORIGINATED BY PP  
 COMPILED BY QA  
 CHECKED BY











DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-99 LOCATION Sta. 99 + 60 24' Rt. ORIGINATED BY GA  
 W.P. 43-66-12 BORING DATE Nov. 12, 1969 COMPILED BY GA  
 DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY *DR.*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	20	40	60	80	100	WATER CONTENT % 15 30 45			
678.1	Ground Level														
0.0	Silty Clay with some sand, traces gravel. Stiff		1	SS	11										
673.0			2	SS	62	670									
5.1	Clayey silt with some sand, traces of gravel		3	SS	35										
			4	SS	36										
			5	SS	45	660									
			6	SS	38										
	Hard		7	SS	43	650									
			8	SS	36										
			9	SS	40	640									
			10	SS	35										
						630									
						620									
						610									
						600									
590.6	Auger grinding prb. bedrock														
87.5	End of Borehole														

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 7


FOUNDATION SECTION

JOB 69-F-99  
W.P. 43-66-12LOCATION Sta. 100 + 40 15' Lt.  
BORING DATE Nov. 13, 1969ORIGINATED BY GA  
COMPILED BY GA  
CHECKED BY

DATUM Geodetic

BOREHOLE TYPE Auger

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
678.7	Ground Level															
0.0	Silty clay with some sand & traces gravel.		1	SS	12											
673.0	Stiff		2	SS	20											
5.7	Clayey silt with some sand and traces of gravel		3	SS	40											
			4	SS	32											
			5	TW	PH											
			6	SS	38											
			7	SS	36											
			8	SS	31											
			9	SS	31											
			10	TW	PH											
590.7	Auger grinding prob.															
88.0	Bedrock															
	End of borehole															

CHECKED BY 

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— w <sub>L</sub> PLASTIC LIMIT ——— w <sub>p</sub> WATER CONTENT ——— w			BULK DENSITY	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.					w <sub>p</sub> ——— w ——— w <sub>L</sub> WATER CONTENT %			γ	
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE								P.C.F.	GR. SA. SI. CL.
677.7	Ground Level															
0.0																
665.7						670										
12.0	End of Cone Test						124									

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 69-F-99

W.P. 43-66-12

DATUM Geodetic

LOCATION Sta. 101 + 11 13' Lt.

BORING DATE Nov. 12, 1969

BOREHOLE TYPE Cone Penetration Test

ORIGINATED BY PP

COMPILED BY GA

CHECKED BY

SOIL PROFILE			SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT 20 40 60 80 100	RESISTANCE	LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT ——— $w$  <div> <math>w_p</math> ——— <math>w</math> ——— <math>w_L</math> </div> WATER CONTENT %  	BULK DENSITY  $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE						
678.6 0.0	Ground Level									
666.6 12.0	End of Cone Test					670				

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 69-F-99

LOCATION Sta. 101 + 11 23' Rt.

ORIGINATED BY GA

M.P. 43-66-12

BORING DATE Nov. 12, 1969

COMPILED BY GA

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— $w_L$		BULK DENSITY	REMARKS					
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT	20	40	60			80	100	PLASTIC LIMIT ——— $w_p$	WATER CONTENT ——— $w$	
				SHEAR STRENGTH P.S.F.								WATER CONTENT %		
				○ UNCONFINED + FIELD VANE								$w_2$ ——— $w_1$ ——— $w_3$		
				● QUICK TRIAXIAL x LAB. VANE								15 30 45		
677.6	Ground Level				2000	4000				15	30	45	136	GR. SA. SI. CL.
0.0	Silty clay with some sand & traces gravel. Stiff	1	SS	9										
673.0		2	TW	PH										
4.6		3	SS	37										
	Clayey silt with some sand	4	SS	32										
	traces of gravel	5	SS	30										
	Very stiff to hard	6	SS	26										
		7	SS	26										
		8	TW	PH										
		9	SS	27										
636.1		10	SS	29										
41.5	End of Borehole													

674.6

136

DEPARTMENT OF HIGHWAYS- ONTARIO

MATERIALS &amp; TESTING OFFICE

## RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 69-F-99

LOCATION

Sta. 101 + 50 13' Lt.

ORIGINATED BY GA

W.P. 43-66-12

BORING DATE

Nov. 12 &amp; 13, 1969

COMPILED BY

GA

DATUM Geodetic

BOREHOLE TYPE

Cont. Flight Auger

CHECKED BY

GA

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS / FOOT	20	40	60	80	100	$w_p$	$w$	$w_L$		
678.6	Ground Level														
0.0	Silty clay with some sand & traces gravel		1	SS	7										▽ 674.6
673.0	Firm		2	SS	28										
5.6			3	TW	PH										
	Clayey silt with some sand and traces of gravel		4	SS	30										2 11 53 34
			5	SS	27										
			6	SS	26										
	Very stiff to hard.		7	SS	27										
			8	SS	14										
			9	SS	29										
			10	TW	PH										
			11	SS	59										
			12	SS	30										
591.8															
586.8	Black Shale Bedrock		13	RC	80%										
589.3															
589.3	End of Borehole														

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING OFFICE

## RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 69-F-99

LOCATION Sta. 101 + 50 23' Rt.

ORIGINATED BY PP

W P 43-66-12

BORING DATE Nov. 12, 1969

COMPILED BY GA

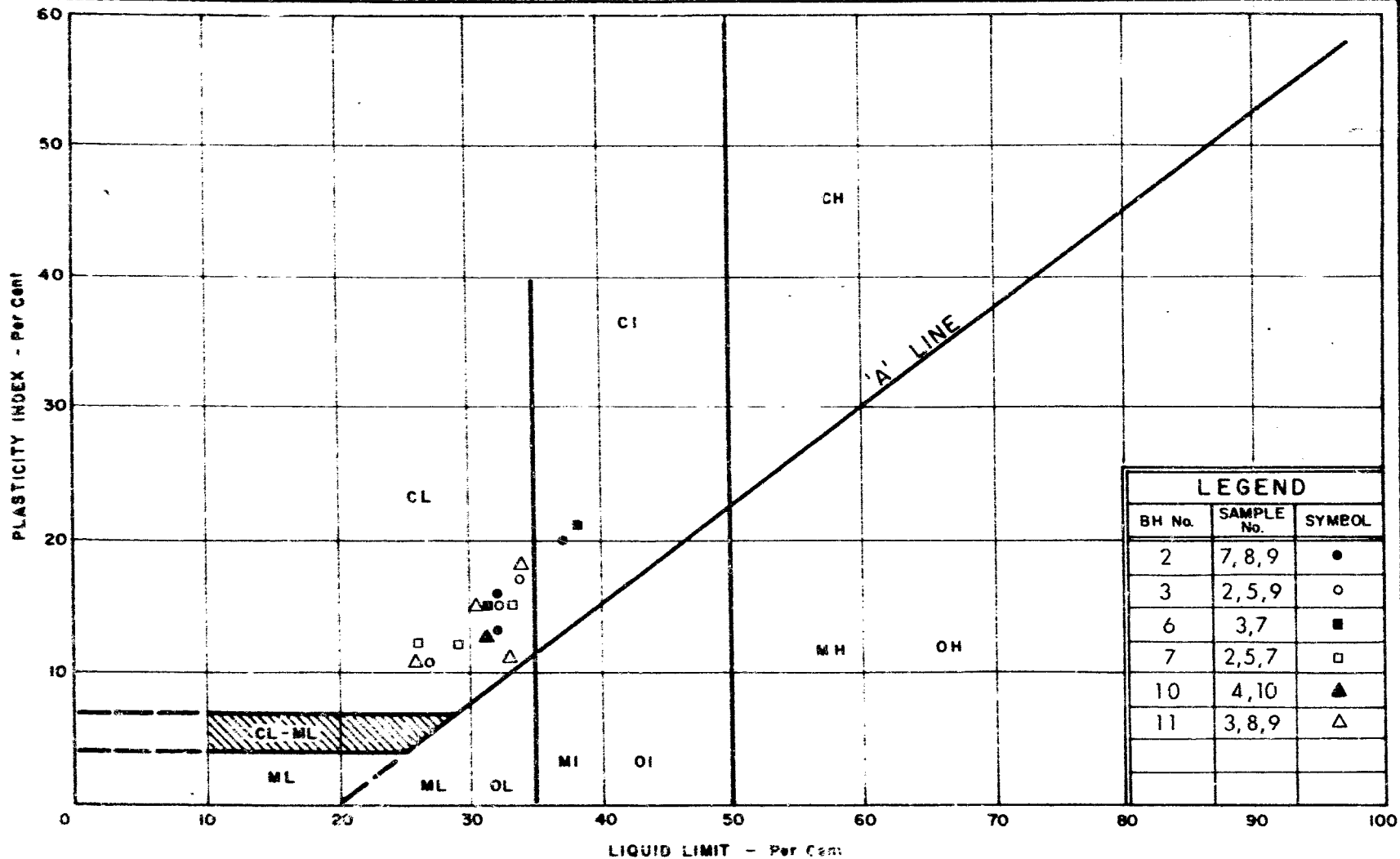
DATUM Geodetic

BOREHOLE TYPE Cone Penetration Test

CHECKED BY

4K

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — $w_L$		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT	RESISTANCE	PLASTIC LIMIT — $w_p$	WATER CONTENT — $w$		
677.6					20 40 60 80 100				
670									
664.6									
13.0	End of Cone Test					127			



DEPARTMENT OF HIGHWAYS  
 MATERIALS and  
 TESTING  
 DIVISION

# PLASTICITY CHART CLAYEY SILT

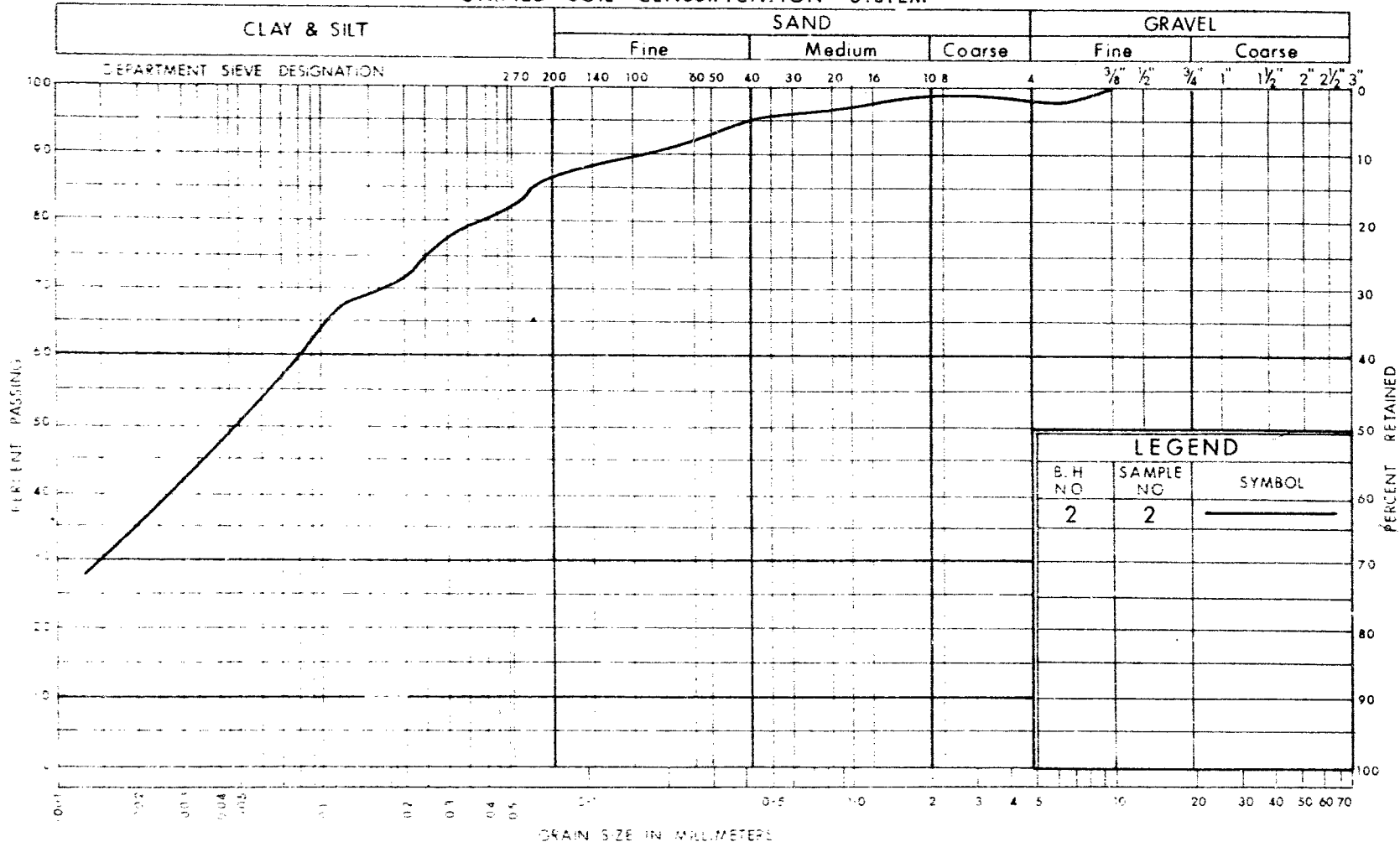
WP. No. 43 - 66 - 12

JOB No. 69 - F - 99

FIG. 1



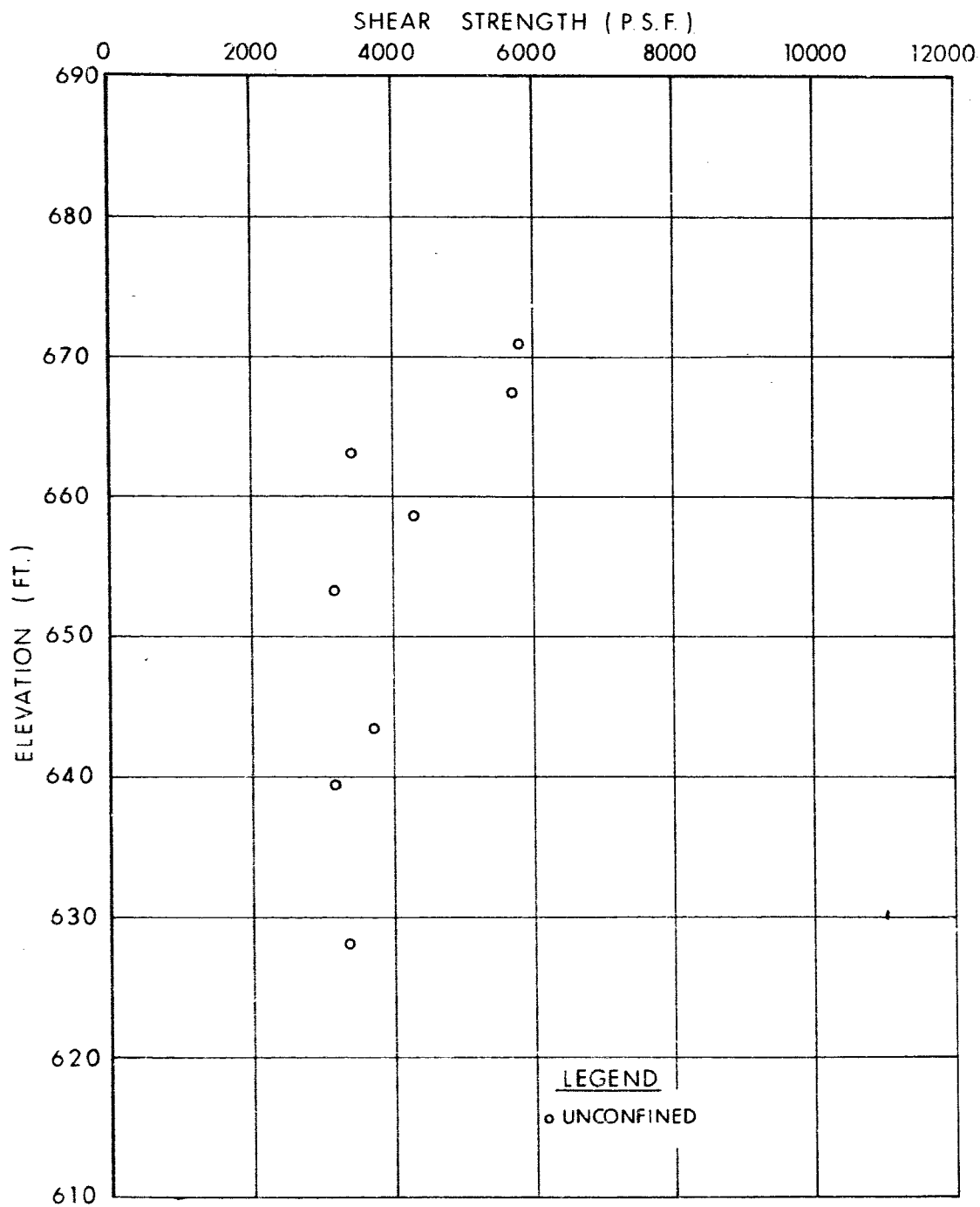
# UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS  
MATERIALS AND  
TESTING  
DIVISION

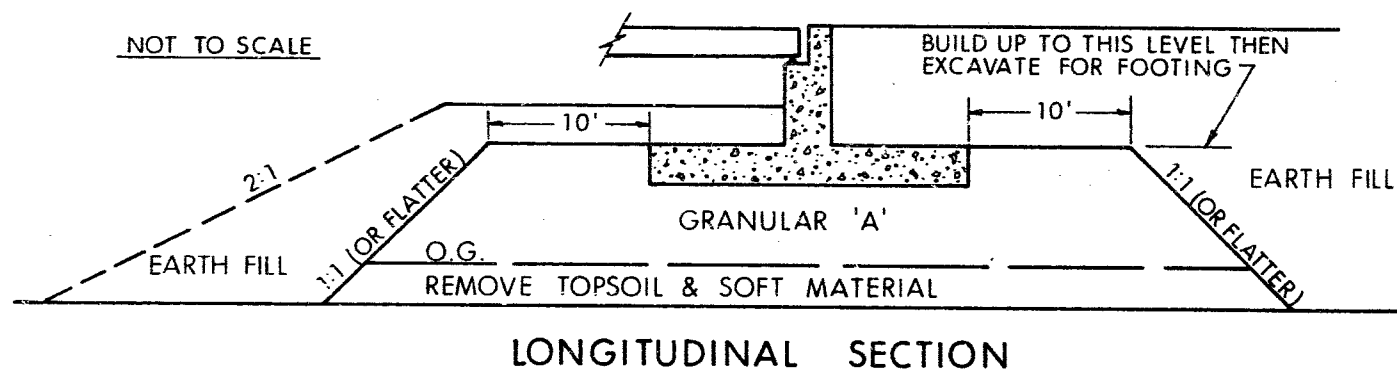
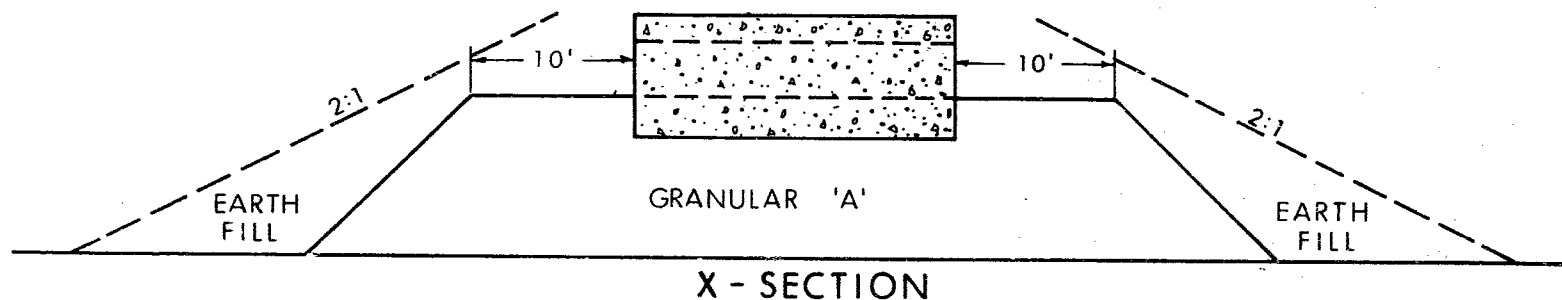
GRAIN SIZE DISTRIBUTION  
CLAYEY SILT  
SOME SAND & TRACES OF GRAVEL

W.P. No. 43-66-12  
JOB No. 69-F-99  
FIG. 2



ELEVATION VS SHEAR STRENGTH

## ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



### NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT D.H.O. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

## 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	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

### GENERAL

$\pi$	= 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
$\sigma$	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

### EARTH PRESSURE

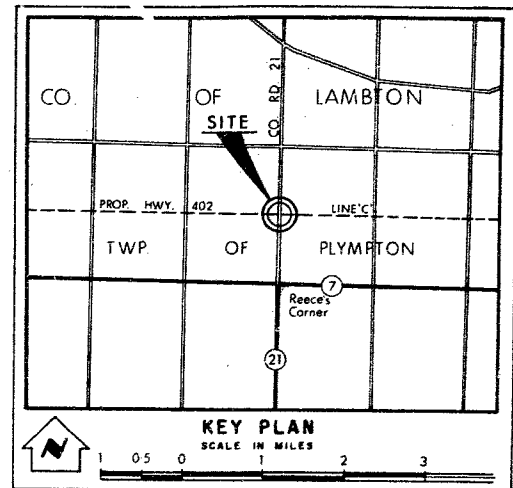
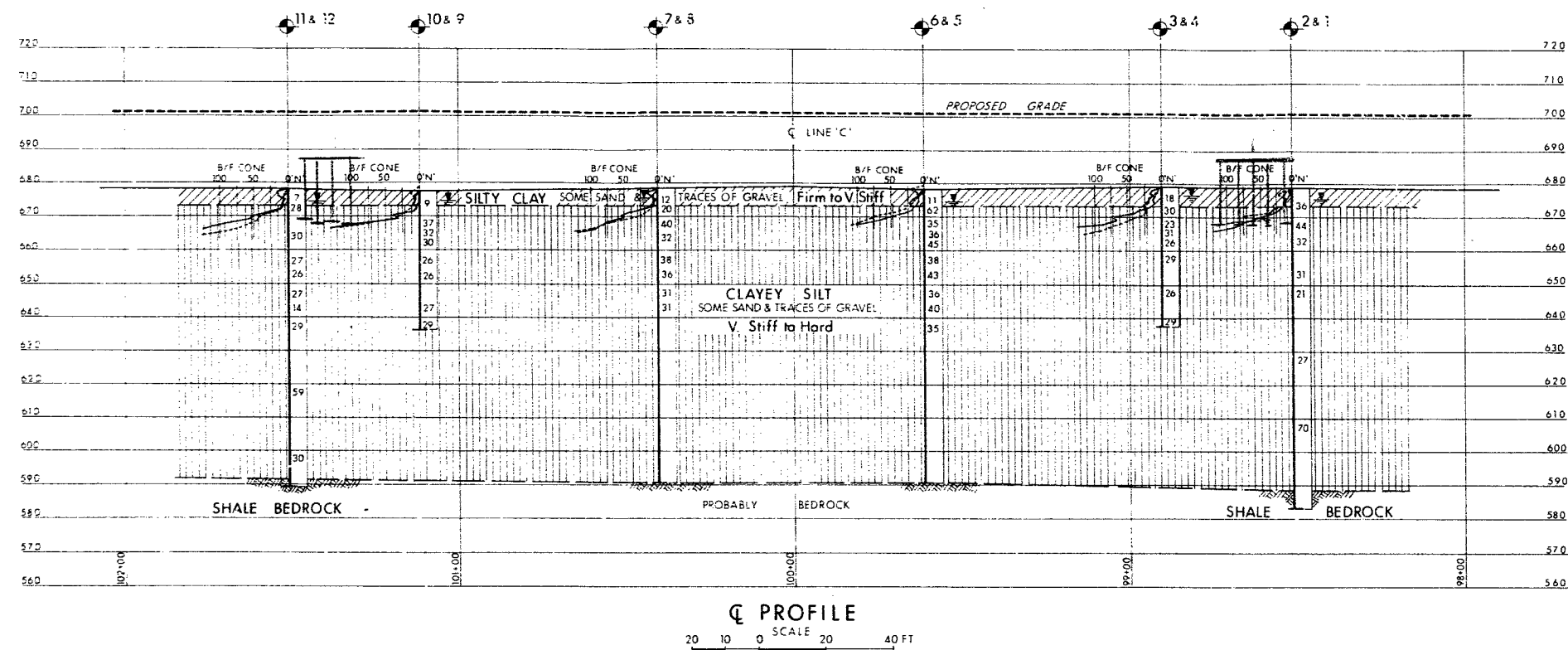
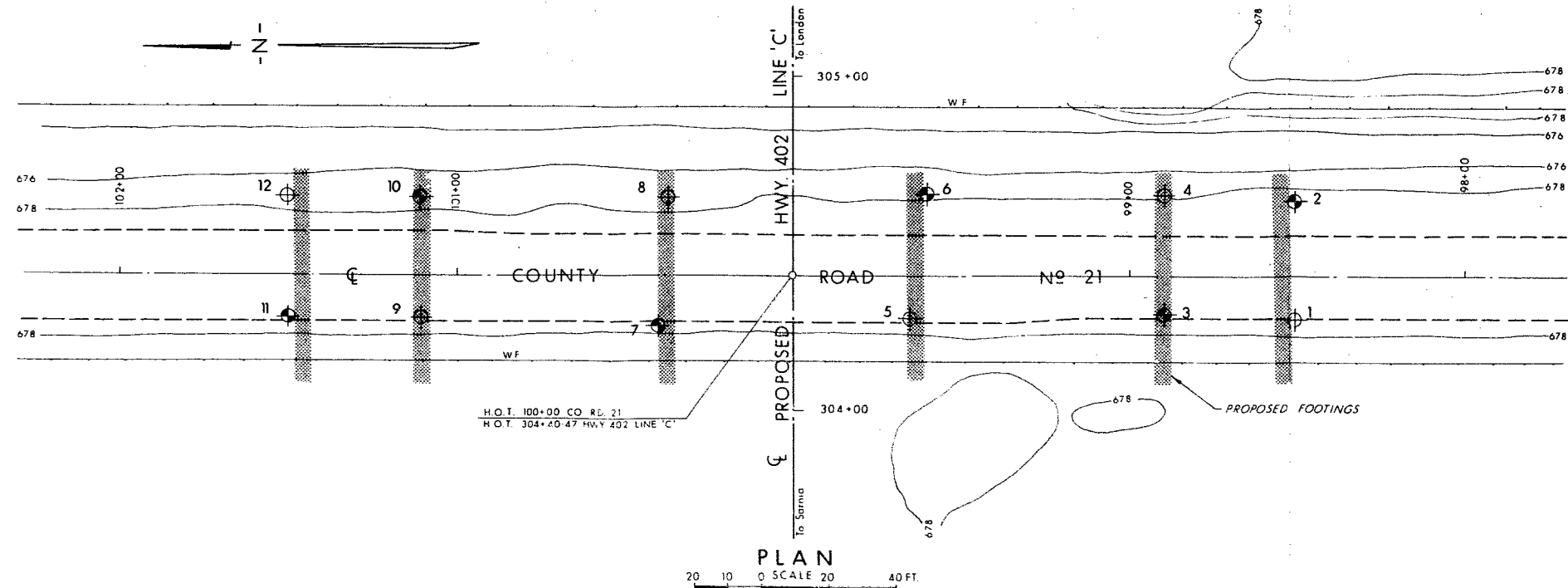
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

### 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
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, NOV 1969		

NO.	ELEVATION	STATION	OFFSET
1	678.8	98+51	13' LT.
2	678.8	98+51	22' RT.
3	679.1	98+90	12' LT.
4	678.9	98+90	24' RT.
5	679.1	99+65	13' LT.
6	678.1	99+60	24' RT.
7	678.7	100+40	15' LT.
8	677.7	100+37	23' RT.
9	678.6	101+11	13' LT.
10	677.6	101+11	23' RT.
11	678.6	101+50	13' LT.
12	677.6	101+50	23' 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.

REVISIONS	DATE	BY	DESCRIPTION

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

**COUNTY ROAD NO. 21**

KING'S HIGHWAY NO. 402 LINE 'C' DIST. NO. 1  
CO. LAMBTON  
TWP. PLYMPTON LOT. 15 & 16 CON. V

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBM'D. G.A. CHECKED	W.P. NO. 43-66-12	M.B.T. DRAWING NO.
DRAWN S.O. CHECKED	JOB NO. 69-F-99	<b>69-F-99A</b>
DATE 31 DEC. 1969	SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>A. Thomas</i>	CONT. NO.	

**1633**

HAMMER TYPE B-300 WEIGHT 7700 lb ENERGY

[illegible]

# DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

DESIGN SERVICES BRANCH

OVER

FOUNDATION OFFICE

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. #21

CONTRACTOR BER MINGHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 1100

TYPE OF ANVIL OR CAP STEEL PIPE WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12 1/2" X 25" WALL 33-38 LB/FT. 3 1/2" GALLER. STEEL W/ 13 1/2" X 1"

PILE NO. 33 LOCATION NORTH ABUT. DATE DRIVEN NOV-22/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
22' 1"	1	2	26	26	51	76					
	2	4	27	27	52	77					
	3	5	28	28	53	78					
	4	7	29	29	54	79					
	5	8	30	30	55	80					
	6	8	31	31	56	81					
	7	9	32	32	57	82					
	8	12	33	33	58	83					
	9	13	34	34	59	84					
	10	16	35	35	60	85					
	11	14	36	36	61	86					
	12	16	37	37	62	87					
	13	21	38	38	63	88					
	14	24	39	39	64	89					
	15	28	40	40	65	90					
	16	35	41	41	66	91					
	17	45	42	42	67	92					
	18	50	43	43	68	93					
	19	56	44	44	69	94					
	20		45	45	70	95					
	21		46	46	71	96					
	22		47	47	72	97					
	23		48	48	73	98					
	24		49	49	74	99					
	25		50	50	75	100					

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	4	4	4	5
MEASURED REBOUND IN INCHES					3/4"	3/4"
FINAL LENGTH OF PILE	19'			FINAL CUT OFF ELEVATION 688		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. Steveley  
NAME (PRINT) D. STEVELEY  
DATE NOV-30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

688.0  
18.0  
670.0  
TIP



**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vert. cut. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

**BRIDGE CONSTRUCTION - PILE DRIVING RECORD**

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD #21  
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TONS.  
HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY \_\_\_\_\_

TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 1100  
SIDE L. PILE DETAILS 12 1/2" O.D. x .25" WALL 33.38' LONG. 5-1 BATTEN. STEEL SAME 13 1/2" x 1"  
PILE NO. 17 LOCATION NORTH ABUT. DATE DRIVEN NOV. 22/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
2' 4"	1	2	26	51	76						
	2	4	27	52	77						
	3	6	28	53	78						
	4	7	29	54	79						
	5	8	30	55	80						
	6	7	31	56	81						
	7	9	32	57	82						
	8	12	33	58	83						
	9	14	34	59	84						
	10	16	35	60	85						
	11	14	36	61	86						
	12	14	37	62	87						
	13	12	38	63	88						
	14	14	39	64	89						
	15	17	40	65	90						
	16	19	41	66	91						
	17	20	42	67	92						
	18	24	43	68	93						
	19	26	44	69	94						
	20	28	45	70	95						
	21		46	71	96						
	22		47	72	97						
	23		48	73	98						
	24		49	74	99						
	25		50	75	100						

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	2	2	2	3	3
MEASURED REBOUND IN INCHES					1/4"	1/4"
FINAL LENGTH OF PILE	20'					FINAL CUT OFF ELEVATION 688

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. Stevely  
NAME (PRINT) D. STEVELY  
DATE NOV. 30/73  
ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. # 21

CONTRACTOR PERKINHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP  WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12" DIA. DR. 29' W.W. 33-38 LBS. 8-1 BATER. STEEL SHOE 13" X 1"

PILE NO. 10 LOCATION NORTH ABUT. DATE DRIVEN NOV 21/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
41' 4"	1	1		26			76				
	2	4		27			77				
	3	9		28			78				
	4	8		29			79				
	5	8		30			80				
	6	9		31			81				
	7	10		32			82				
	8	12		33			83				
	9	20		34			84				
	10	23		35			85				
	11	22		36			86				
	12	17		37			87				
	13	16		38			88				
	14	16		39			89				
	15	16		40			90				
	16	21		41			91				
	17	24		42			92				
	18	30		43			93				
	19	31		44			94				
	20			45			95				
	21			46			96				
	22			47			97				
	23			48			98				
	24			49			99				
	25			50			100				

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	2	3	3	3	3
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	19			FINAL CUT OFF ELEVATION 688		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. Steveley

NAME (PRINT) D. STEVELEY

DATE NOV. 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

688.0  
18.8  
669.2

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

**BRIDGE CONSTRUCTION - PILE DRIVING RECORD**

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY-RD. #21

CONTRACTOR BERMINHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 1100

TYPE OF ANVIL OR CAP STEEL PILE WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12' dia - 25' WALL. 33-38 CFT. VERTICAL - STEEL SHANK 13 1/2" X 1"

PILE NO. 2 LOCATION NORTH ABUT. DATE DRIVEN NOV-20/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
40' 6"	1	1	26	26	51	76					
	2	2	27	27	52	77					
	3	2	28	28	53	78					
	4	4	29	29	54	79					
	5	5	30	30	55	80					
	6	7	31	31	56	81					
	7	10	32	32	57	82					
	8	9	33	33	58	83					
	9	10	34	34	59	84					
	10	9	35	35	60	85					
	11	12	36	36	61	86					
	12	14	37	37	62	87					
	13	14	38	38	63	88					
	14	13	39	39	64	89					
	15	17	40	40	65	90					
	16	22	41	41	66	91					
	17	30	42	42	67	92					
	18	31	43	43	68	93					
	19	30	44	44	69	94					
	20		45	45	70	95					
	21		46	46	71	96					
	22		47	47	72	97					
	23		48	48	73	98					
	24		49	49	74	99					
	25		50	50	75	100					

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	2	2	3	3	3
MEASURED REBOUND IN INCHES					7/2	7/2
FINAL LENGTH OF PILE	20			FINAL CUT OFF ELEVATION 688		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. Steveley  
NAME (PRINT) D. STEVELEY  
DATE NOV 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

688-0  
20.0  
688-0  
TIP

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

# DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285

(REVISED NOV. 1971)

DESIGN SERVICES BRANCH

**OVER**

FOUNDATION OFFICE

69-2-99

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. #21

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP WEIGHT OF ANVIL OR CAP 1100

STEEL TYPE 12 3/4" OD X .25" WALL 33.38 LB/FT 3:1 BATTER STEEL SHOE 13 1/2" X 1"

PILE NO. 35 LOCATION SOUTH ABUT. DATE DRIVEN NOV-27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
22' 8"	1	2		26		61			76		
	2	4		27		52			77		
	3	6		28		53			78		
	4	8		29		54			79		
	5	7		30		55			80		
	6	9		31		56			81		
	7	12		32		57			82		
	8	12		33		58			83		
	9	13		34		59			84		
	10	15		35		60			85		
	11	16		36		61			86		
	12	18		37		62			87		
	13	21		38		63			88		
	14	20		39		64			89		
	15	20		40		65			90		
	16	28		41		66			91		
	17	31		42		67			92		
	18	45		43		68			93		
	19	50		44		69			94		
	20			45		70			95		
	21			46		71			96		
	22			47		72			97		
	23			48		73			98		
	24			49		74			99		
	25			50		75			100		

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	4	4	4	4
MEASURED REBOUND IN INCHES					3/4"	1/4"
FINAL LENGTH OF PILE	19' 5"					FINAL CUT OFF ELEVATION 688

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER

DESIGN SERVICES BRANCH

DEPARTMENT OF

TRANSPORTATION AND

COMMUNICATIONS

DOWNSVIEW, ONTARIO

SIGNED

NAME (PRINT)

DATE

ATTACH SKETCH OF PILE NUMBERING SYSTEM

6880

12 4

669.6

TIP



**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

DESIGN SERVICES BRANCH  
FOUNDATION OFFICE

# BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. #21

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS: STEEL. PILE. OD. 12 3/4" X .25" WALL. 33.38 LB/FT. 3:1 BATTER. STEEL SHANKS 1 1/2" X 1"

PILE NO. 27 LOCATION SOUTH ABUT. DATE DRIVEN NOV. 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
4' 6"	1	2	26	61	76						
	2	2	27	52	77						
	3	4	28	53	78						
	4	4	29	54	79						
	5	4	30	55	80						
	6	8	31	56	81						
	7	12	32	57	82						
	8	12	33	58	83						
	9	20	34	59	84						
	10	23	35	60	85						
	11	17	36	61	86						
	12	15	37	62	87						
	13	14	38	63	88						
	14	15	39	64	89						
	15	20	40	65	90						
	16	29	41	66	91						
	17	34	42	67	92						
	18	35	43	68	93						
	19	39	44	69	94						
	20		45	70	95						
	21		46	71	96						
	22		47	72	97						
	23		48	73	98						
	24		49	74	99						
	25		50	75	100						

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	3	4	4	4	4	4
MEASURED REBOUND IN INCHES					3"	7"
FINAL LENGTH OF PILE	19' 2"					FINAL CUT OFF ELEVATION 688

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. STEVELEY  
NAME (PRINT) D. STEVELEY  
DATE NOV. 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

# DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OS-MT-285

(REVISED NOV. 1971)

DESIGN SERVICES BRANCH

**OVER**

FOUNDATION OFFICE

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. # 21

CONTRACTOR BERMINHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 1100

TYPE OF ANVIL OR CAP STEEL SHOE WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12 3/4" DIA. 250 W. 33 3/8" L. 5:1 BATHEN. STEEL SHOE 13 1/2" x 1"

PILE NO. 17 LOCATION SOUTH ABUT. DATE DRIVEN NOV. 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
39' 11"	1	2		26			51			76	
	2	2		27			52			77	
	3	4		28			53			78	
	4	5		29			54			79	
	5	5		30			55			80	
	6	5		31			56			81	
	7	6		32			57			82	
	8	10		33			58			83	
	9	12		34			59			84	
	10	15		35			60			85	
	11	17		36			61			86	
	12	19		37			62			87	
	13	20		38			63			88	
	14	21		39			64			89	
	15	22		40			65			90	
	16	26		41			66			91	
	17	29		42			67			92	
	18	33		43			68			93	
	19	36		44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	3	3	3	3	3	3
MEASURED REBOUND IN INCHES					1/2	1/2
FINAL LENGTH OF PILE	19'			FINAL CUT OFF ELEVATION 688		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER

DESIGN SERVICES BRANCH

DEPARTMENT OF

TRANSPORTATION AND

COMMUNICATIONS

DOWNSVIEW, ONTARIO

SIGNED

NAME (PRINT) D. STEVELEY

DATE NOV. 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

8850

106

6694

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

**BRIDGE CONSTRUCTION - PILE DRIVING RECORD**

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY RD-#21

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 1100

TYPE OF ANVIL OR CAP STEEL TUBE WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12 3/4" O.D. X 25' W.H. 33.38 LB/FT. VERTICAL STEEL SHOE 13 1/2" X 1"

PILE NO. 14 LOCATION SOUTH ABUT DATE DRIVEN NOV. 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
41' 6"	1	3		26			51			76	
	2	2		27			52			77	
	3	3		28			53			78	
	4	4		29			54			79	
	5	5		30			55			80	
	6	6		31			56			81	
	7	7		32			57			82	
	8	9		33			58			83	
	9	14		34			59			84	
	10	15		35			60			85	
	11	15		36			61			86	
	12	16		37			62			87	
	13	17		38			63			88	
	14	20		39			64			89	
	15	25		40			65			90	
	16	26		41			66			91	
	17	28		42			67			92	
	18	30		43			68			93	
	19	33		44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	3	3	3	3	3
MEASURED REBOUND IN INCHES					1/4	1/8
FINAL LENGTH OF PILE	19' 1"					FINAL CUT OFF ELEVATION 688

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. STEVELEY  
NAME (PRINT) D. STEVELEY  
DATE NOV. 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

DESIGN SERVICES BRANCH  
FOUNDATION OFFICE

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 73-86 STRUCTURE CTY. RD. #21

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TONS

HAMMER DETAILS: TYPE B 300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP STEEL PLATE WEIGHT OF ANVIL OR CAP 1100

PILE DETAILS 12 1/2" O.D. X 25' WALL - 33-38 LBS/FT. 8:1 RATIO. STEEL SHOE 12 1/2" X 1"

PILE NO. 7 LOCATION SOUTH ABUT. DATE DRIVEN NOV. 24/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
42' 10"	1	2		26			51			76	
	2	2		27			52			77	
	3	4		28			53			78	
	4	3		29			54			79	
	5	5		30			55			80	
	6	8		31			56			81	
	7	13		32			57			82	
	8	14		33			58			83	
	9	17		34			59			84	
	10	26		35			60			85	
	11	29		36			61			86	
	12	27		37			62			87	
	13	27		38			63			88	
	14	28		39			64			89	
	15	30		40			65			90	
	16	37		41			66			91	
	17	40		42			67			92	
	18	43		43			68			93	
	19	50		44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	4	4	5	5
MEASURED REBOUND IN INCHES					3"	3"
FINAL LENGTH OF PILE	19' 2"			FINAL CUT OFF ELEVATION 688		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
DESIGN SERVICES BRANCH  
DEPARTMENT OF  
TRANSPORTATION AND  
COMMUNICATIONS  
DOWNSVIEW, ONTARIO

SIGNED D. Stevely  
NAME (PRINT) D. STEVELEY  
DATE NOV. 30/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM



**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

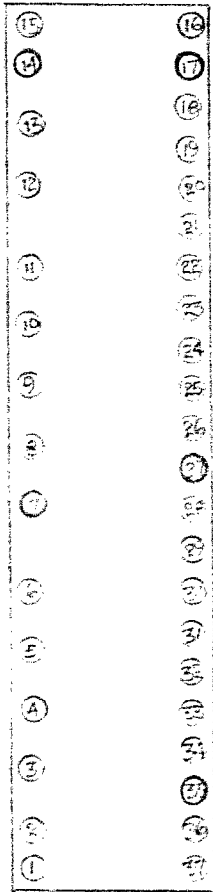
Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

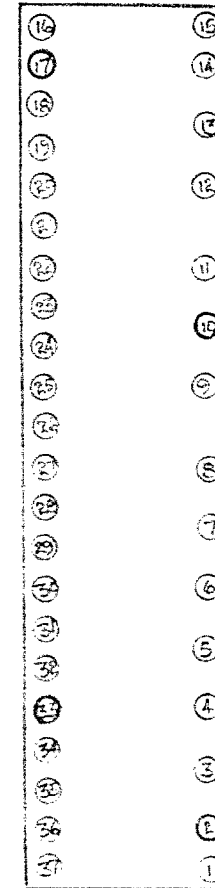
The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

COUNTY RD #21 INTERCHANGE U'PASS  
PIT NUMBERING SYSTEM



SOUTH ABUTMENT



NORTH ABUTMENT

→ NORTH

Department of Highways Ontario

Copy for the information of

Foundation Office

Mr. A. Stermac,

Principal Foundation Engineer,  
Room 107, Lab. Bldg.

C.S. Grebski,  
Bridge Office

December 23, 1970

County Rd. #21 Interchange Underpass  
W.P. 43-66-12, Site No. 14-349  
Highway 402, District No. 1

69-1299

Attached herewith we are submitting the final  
bridge drawings which show the foundation design for  
this structure.

Kindly give us your comments at your earliest  
convenience.

C.S. Grebski,  
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Office

30. Dec 70.

*Pile lengths & design loads on piles  
should be subject to pile loading tests.*

A. 4. 3.

*Off.*  
20 Jan 71

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT <u>65T99</u>		SITE <u>COPD 21</u>		BOREHOLE No. <u>2</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	0-10	1/4"	Sub Angular	3	6	91	High	Dull	None	High	Earthy	Brown	Strong		Clayey Silt. to med. Ss & Gr	CL
2	10-20	1/4"	"	4	7	89	"	"	"	"	"	Dark Grey	"		"	CL
3	20-30	1/4"	"	1	6	93	"	"	"	"	"	"	"		"	CL
4	30-40	1/4"	"	2	15	83	"	"	"	"	"	"	"		Clayey silt with med. Ss & Gr	CL
5	40-50	1/4"	"	-	5	95	"	Very Silty	"	"	"	"	"		Clayey silt. Silty clay silt to Ss	CL
8	50-60	1/4"	"	-	3	97	"	Briny	"	"	"	Grey	"		Very clayey silt and med. Ss & Gr	CI
9	60-70	1/4"	"	6	8	86	"	Dull	"	"	"	Grey	"		Clayey silt to Ss & Gr	
10	70-80	1/4"	"													

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT 69 F 99 SITE Co Rd #21 BOREHOLE No. 3 GROUND ELEVATION \_\_\_\_\_

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3.0 4.5	5/16"	Sub Ang	2	18	70	High	Dull	None	High	Earthy	Mottled Brown Grey	Strong		Clayey Silt, with some Sa, & Gra	CL
2	6.0 7.5	3/16"	"	1	10	89	"	"	"	"	"	"	"		Clayey Silt with tra Sa & Gra.	CL
3	9.0 10.5	1/4"	"	1	5	94	"	"	"	"	"	DR Grey	"		Clayey Silt, tra Sa & Gra.	CL
4	12.0 13.5	3/8"	Sub R	2	6	92	"	"	"	"	"	DR Grey	"		as above	CL
5	15.0 16.5	1/4"	"	2	7	91	"	"	"	"	"	"	"		" "	CL
6	18.0 19.5	1/4"	"	3	8	89						"	"		" "	CL
8	27.0 31.5	3/8"	"	2	7	93						"	"		" "	CL
10	40.0 41.5	1/2"	"	1	8	91						"	"		" "	CL

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT <u>CORd #21</u> SITE <u>CORd #21</u> BOREHOLE No. <u>6</u> GROUND ELEVATION _____																	
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL			
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE													
				GRAVEL	SAND	SILT & CLAY											
1	0.0 1.5	1/4"	Sub Ang	4	20	76	High	Shiny	None	High	Earthy	Mottled Grey Br	Strong	Clayey Silt-SiCl. w some Sand & Gr	CL		
2	6.0 7.5	1/4"		1	7	92		Dull		"	"	Br.	"	Clayey Silt, tra Sa & Gr	CL		
3	8.0 10.0	5/8"	Sub Round	5	17	88		"		"	"	DK. Grey	"	As above	CL		
4	12.0 13.5	1/2"	"	2	4	94		"		"	"	Grey	"	As above	CL		
5	15.0 16.5	1/2"	"	-	5	95		"				"	"	"	CL		
6	20.0 21.5	3/8"	"	2	7	91		"				"	"	"			
7	24.0 26.0	1/2"	"	1	5	94		"				"	"	"			
8	30.0 31.5	1/2"	Sub Ang	1	5	94						"	"	"			
9	35.0 36.5	3/8"	"	+	7	92								CL Si tra Sa			
10	38.0 41.5	1/2"	"	-	6	94								As above			

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT 69 F 99 SITE CoRd #21 BOREHOLE No. 7 GROUND ELEVATION \_\_\_\_\_

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3 0 4 5	1/2"	Sub R	5	20	75	High	Dull		High	Earthy	Mott'd Br Grey	Strong		Clayey Silt w some Sand & Gr	CL
2	6 0 7 5	1/2"	Sub Ang	2	3	90						"	"		Clay Silt w trace Sand & Gr	CL
3	8 0 10 5	1/2"	"	3	7	90						"	"		" " " " " "	CL
4	12 0 13 5	3/8"	"	1	5	94						DK Grey			" " " " " "	CL
6	20 0 21 5	1/2"	"	2	6	92						"			Clayey Silt with trace Sand & Gravel	CL
7	25 0 26 5	1/2"	"	"	7	93						"			" " " " " "	CL
3	30 0 31 5	3/8"	"	2	5	93						"			" " " " " "	CL
9	35 0 36 5	3/8"	"	2	4	94						"			" " " " " "	CL
															" " " " " "	

NOTES:— VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:—

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT <u>GS F 899</u>		SITE <u>CORd #21</u>		BOREHOLE No. <u>10</u>		GROUND ELEVATION _____								
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL SAND SILT & CLAY										
1	3.0 4.5	1/4"	Sub Ang	100	High	Shiny	None	High	Earthy	Mottled Br Grey	Weak		Clayey silt, silty clay, with some sand, slight trace gravel	CL CI
2	8.0 10.5	1/4"	"	15	"	Dull	None to slow	"	"	Grey (sl Br)	Strong		Clayey silt with trace sand, slight trace gravel	CL
4	12.0 13.0	1/4"	"	"			"	"	"	Grey	"		" " " " " "	CL
5	18.0 16.0													
6	26.0 21.0													
7	28.0 24.5													
9	36.0 36.5													
10	40.0 41.5													

NOTES:— VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:—



DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT <u>69 F. 99</u>		SITE <u>CORP #21</u>		BOREHOLE No. <u>11</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	3.0 4.0	1/4" 3/8"	Sub Ang	-	14	86		Shiny	None	Earthy	Light Grey Brown	Weak	Clayey Silt & Clay with some sand	CL		
2	6.0 7.5	3/8" 1/2"	Sub Round	1	7	92					Light Grey Brown	Strong	Clayey Silt with trace sand & gravel	CL		
4	15.0 16.0	3/8" 1/2"	Sub Round	2	5	93					Grey	"	Clayey Silt with trace sand & Gr	CL		
5	20.0 21.0	1/2" 3/4"	Sub Ang	1	6	93					Grey	"	As above	CL		
6	25.0 26.0												" "	CL		
7	30.0 31.0												" "	CL		
8	35.0 36.0	3/8" 1/2"	Sub Ang	1	7	92						"	Clayey Silt & clay with trace sand & Gr	CL CI		
9	40.0 41.0															
11	50.0 51.0	1/4" 3/8"	Sub Ang	1	7	92		Dull Shiny		Earthy	Grey	"	Clayey Silt, trace sand & Gr	CL		
12	55.0 56.0	250	-	-	3	95					Grey	"	Silty Clay with trace sand (silty clay)	CI		

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-