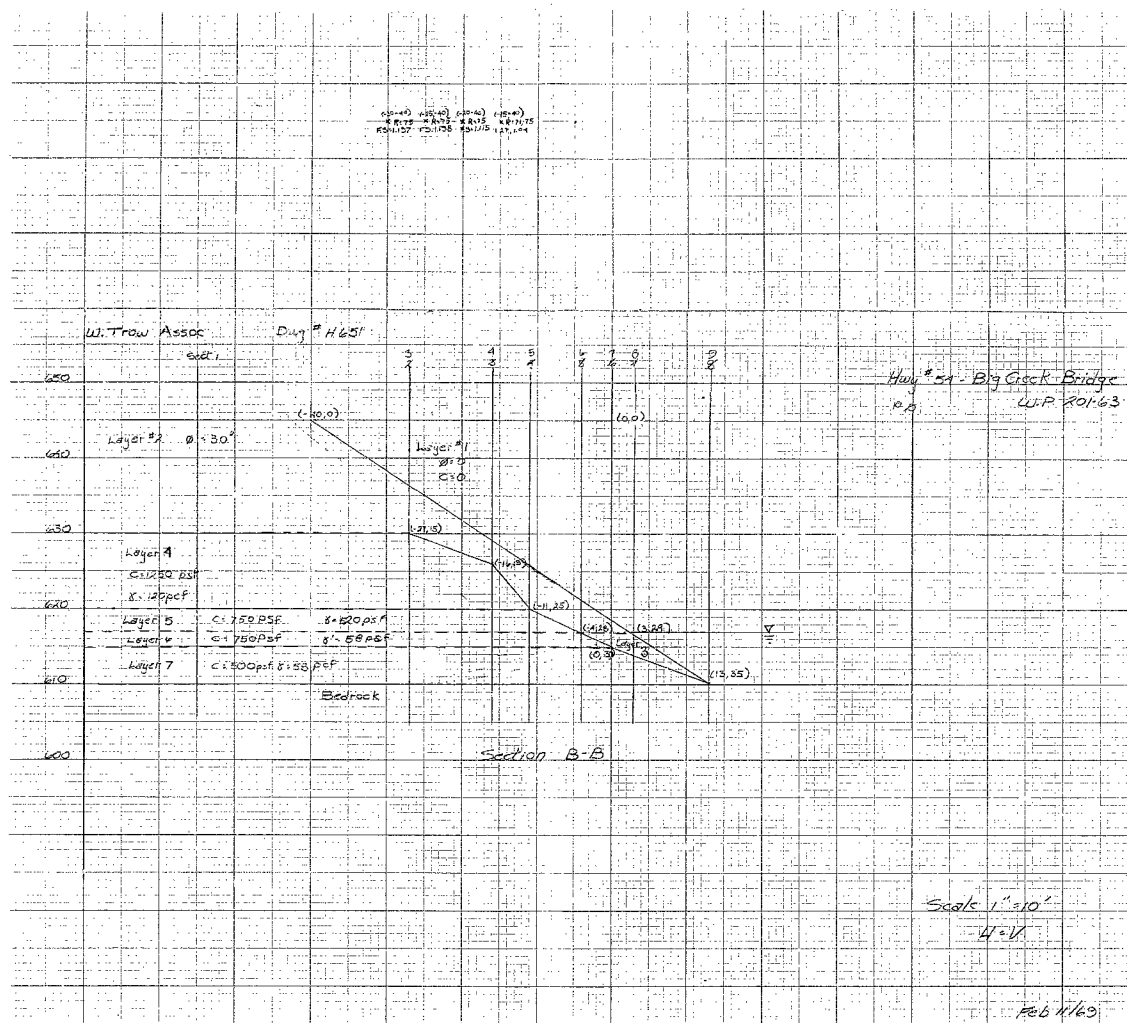


# 67-F-216  
W.P. # 201-63  
HWY. # 54 &  
BIG CREEK  
BRIDGE

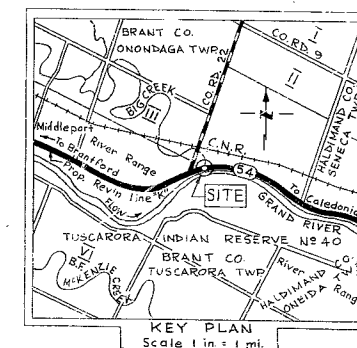
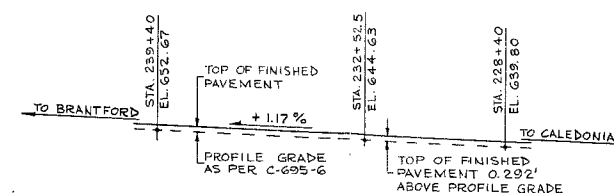












NOTES:

CLASS OF CONCRETE	
DECK, CURBS AND PARAPET WALLS	4000 p.s.i.
REMAINDER	3000 p.s.i.

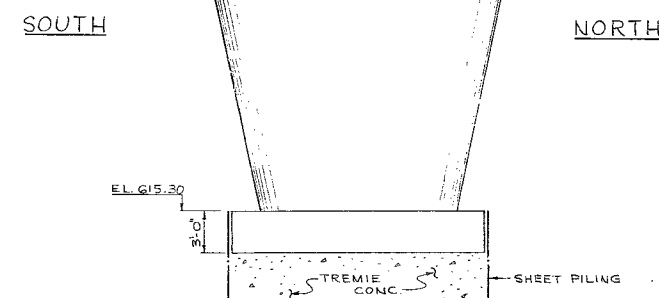
CLEAR COVER ON REINFORCING STEEL

FOOTINGS, ABUTMENTS AND PIER 3"  
TOP OF DECK — 1 1/2"  
BOT. OF DECK — 1"  
SIDE WALKS — 2"  
PARAPET WALLS — 1 1/2"

CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm 1/8"$

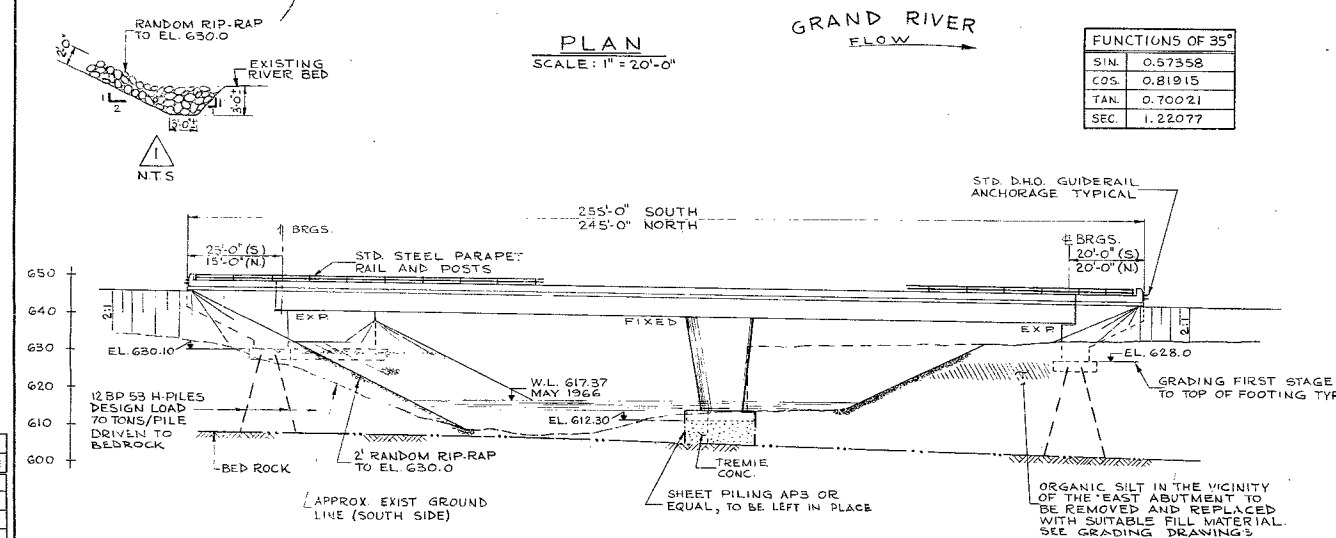
NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED



CROSS SECTION AT PIER

SCALE:  $\frac{3}{4}" = 1'-0"$

FUNCTIONS OF 35°	
SIN.	0.57358
COS.	0.81915
TAN.	0.70021
SEC.	1.22077



SOUTH ELEVATION

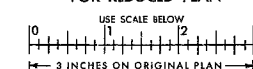
SCALE :  $1^{\circ} = 20' - 0''$

## LIST OF DRAWINGS

- D-6607:1 GENERAL LAYOUT  
-2 BORE HOLE LOCATIONS AND SOIL STRATA  
-3 FOOTING LAYOUT AND PIER DETAILS  
-4 WEST ABUTMENT  
-5 EAST ABUTMENT  
-6 STRUCTURAL STEEL DETAILS I  
-7 STRUCTURAL STEEL DETAILS II  
-8 DECK REINFORCEMENT AND DETAILS  
-9 PARAPET WALL DETAILS  
-10 STANDARD STEEL PARAPET RAIL  
-11 STANDARD DETAILS



FOR REDUCED PLAN



REVISIONS			
DATE	BY	DESCRIPTION	

DEPARTMENT OF HIGHWAYS ONTARIO  
BRIDGE DIVISION

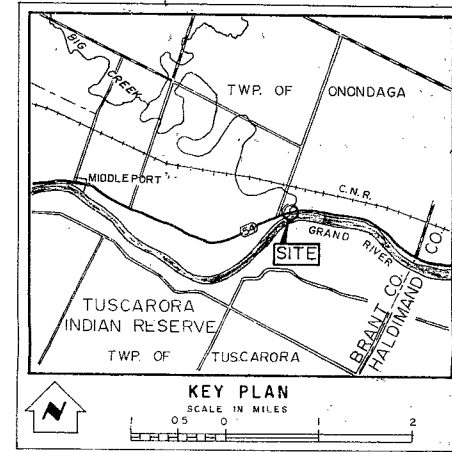
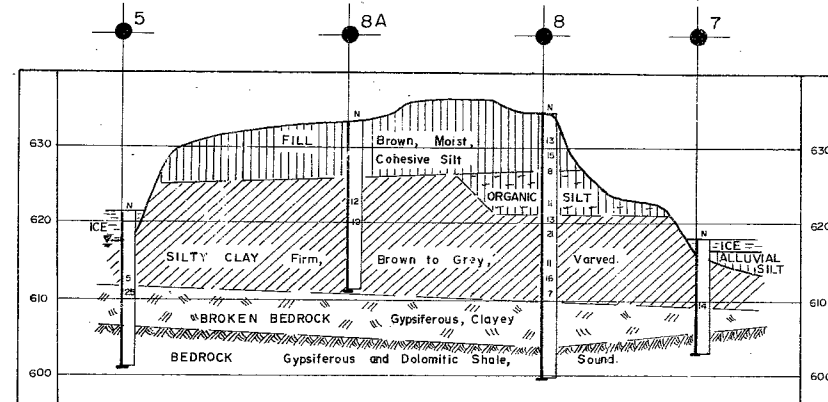
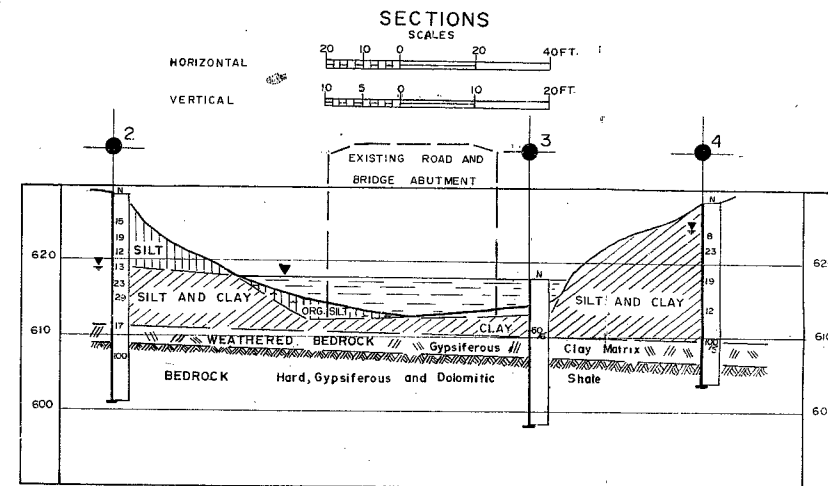
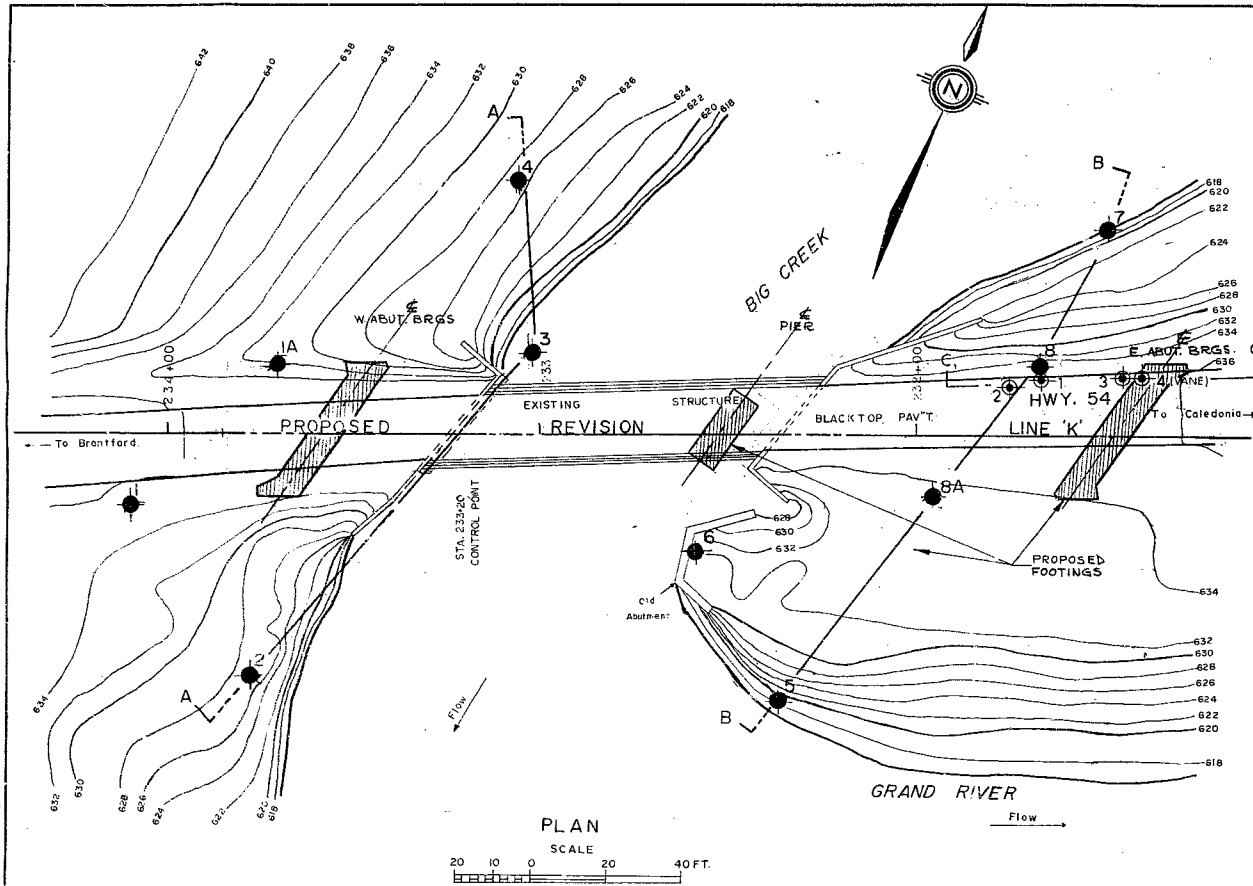
## BIG CREEK BRIDGE

4.6 MI. W. OF CALEDONIA

KING'S HIGHWAY No. 54 DIST. No. 4  
CO. BRANT  
TWP. ONONDAGA LOT 79 CON. RIVER RANGE

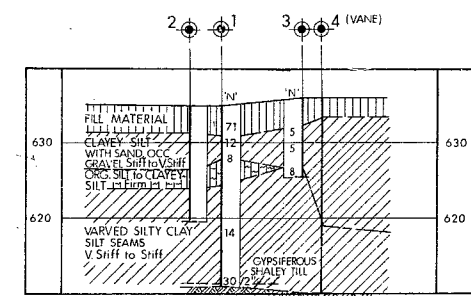
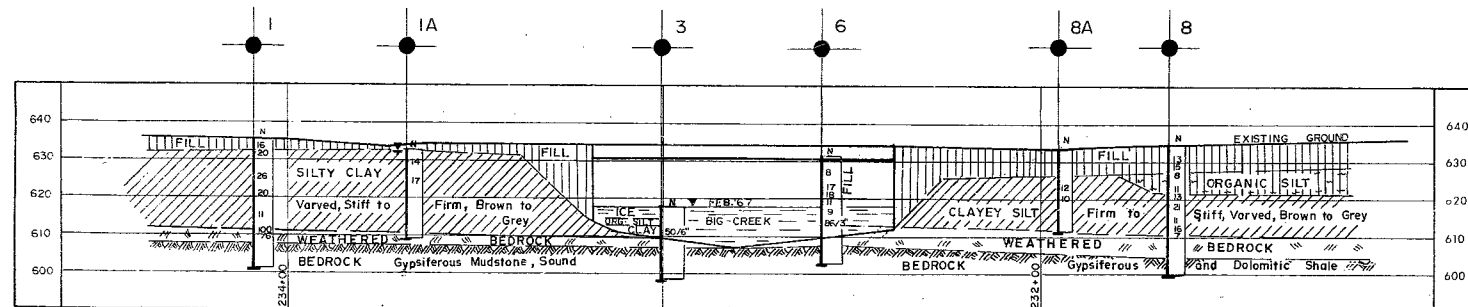
## GENERAL LAYOUT

APPROVED _____				SITE No. 1-116		W.P. No. 201-63	
BRIDGE ENGINEER				CONTRACT No.			
DESIGN	K.Z.S.	CHECK	R.H.	DRAWING No.		D-6607-1	
DRAWING	G.F.M.S.	CHECK	R.P.				
DATE	FEB./70	LOADING	H520-44				



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation		
	Holes done by D.H.O. March 1969		
NO.	ELEVATION	STATION	OFFSET
1	625.2	234 + 10	19' LT.
1A	632.4	233 + 68	28' RT.
2	629.2	233 + 76	64' LT.
3	618.1	233 + 00	22' RT.
4	628.4	233 + 06	66' RT.
5	621.5	232 + 38	71' LT.
6	631.7	232 + 60	31' LT.
7	618.3	231 + 48	55' RT.
8	635.1	231 + 66	19' RT.
8A	633.5	231 + 96	16' LT.

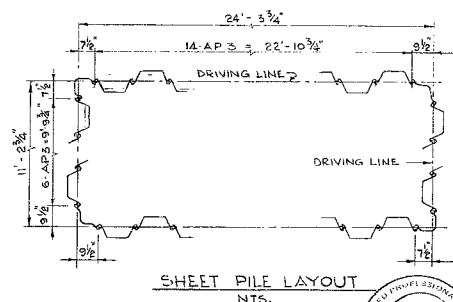
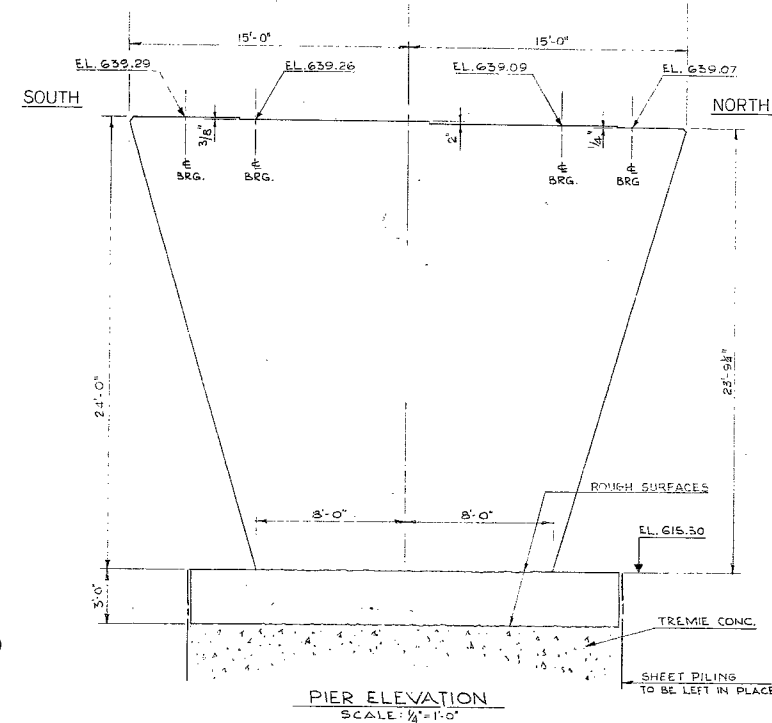
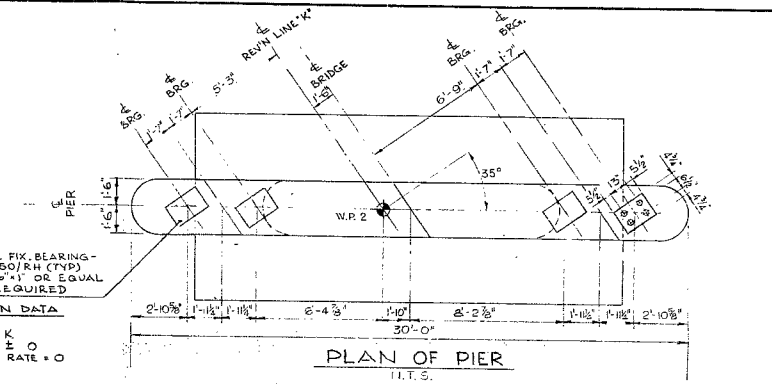
**NOTE**  
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.



BORE HOLES DONE BY D.H.O.			
BH 1	635.0	231 + 67	15' RT.
BH 2	635.0	231 + 75	13' RT.
BH 3	636.0	231 + 45	16' RT.
B.H. 4	636.0	231 + 40	16' RT (VANE TEST ONLY)

PROFILE LINE 'K'  
SCALE 20 10 0 20 40 FT.

REVISIONS		DATE		BY		DESCRIPTION	
MAY 69		S.O.		D.H.O. BORE HOLES 1, 2, 3 & 4 & SECTION C-C ADDED			
WILLIAM TROW ASSOCIATES LTD.							
DEPARTMENT OF HIGHWAYS - ONTARIO							
MATERIALS & TESTING DIVISION - FOUNDATION SECTION							
BIG CREEK							
KING'S HIGHWAY NO. 54 LINE 'K'				DIST. NO. 4			
CO. BRANT							
TWP. ONONDAGA				LOT 79		CON. R.R.	
BORE HOLE LOCATIONS & SOIL STRATIGRAPHY							
SUBM'D.	CHECKED J.M.	W.P. NO. 20 L. #3	DRAWING NO.				
DRAWN M.K.	CHECKED	JOB NO.	H 651				
DATE 6 MAR. 1967	SITE NO. 1-1/2	BRIDGE DRAWING NO.					
APPROVED	CONT. NO.	D 6607-2					



LOCATION	No. of PILES	PILES SUPPLIED	DESIGN LOAD	TYPE
WEST ABUT.	9	25'	70 TONS/PILE	12 BP 5
	3	23'	70	
EAST ABUT.	9	25'	70	
	3	23'	70	

STEEL H-PILES TO BE DRIVEN TO REFUSAL ON BEDROCK  
FOR DETAILS OF SHOE PLATES SEE STANDARD DETAILS DRAWING

NOTE  
STEEL SHEET PILES ARE  
BETHLEHEM AP3 OR EQUAL  
SUPPLIED BY DEPARTMENT

FOR REDUCED PLAN


[illegible]DEPARTMENT OF HIGHWAYS ONTARIO  
BRIDGE DIVISION

BIG CREEK BRIDGE  
4.6 MI. W. OF CALEDONIA

KING'S HIGHWAY No. 54 DIST. No. 4  
CO. BRANT  
TWP. ONONDAGA LOT 79 CON. RIVER RANG

FOOTING LAYOUT &amp; PIER DETAILS

APPROVED				1-116		201-6	
BRIDGE ENGINEER				CONTRACT		*	
DESIGN	K.Z.S.	CHECK	K.P.	Nos.			
DRAWING	S.M./ZK.	CHECK	K.Z.S.	DRAWING		D-6607-3	
DATE	FEB. 1970	LOADING	415 20-44	No.			



MR. A. RUTKA, P.ENG.  
DEPARTMENT OF HIGHWAYS OF ONTARIO  
MATERIALS AND TESTING DIVISION  
HWY. 401 AND KEELE STREET,  
DOWNSVIEW, ONTARIO.

FOUNDATION INVESTIGATION  
BIG CREEK BRIDGE, HWY.54 - W.P.201-63  
DISTRICT NO.4, HAMILTON.

Project: H651

William Trow Associates Limited

March 1967

Project: H651

Soil Mechanics  
Consultants  
W. A. Trow  
MSc. MEIC. P. Eng.  
K. Peaker  
PhD. MEIC. P. Eng.  
D. H. Shields  
PhD. MEIC. P. Eng.



Associates Ltd.

Mr. A. Rutka, P.Eng.,  
Department of Highways of Ontario,  
Materials and Testing Division,  
Hwy. 401 and Keele Street,  
Downsview, Ontario.

March 14, 1967

Attention: Mr. A.G. Stermac, P.Eng.

Foundation Investigation  
Big Creek Bridge, Hwy. 54 - W.P.201-63  
District No.4, Hamilton

Dear Sirs:

With reference to your authorization dated January 31st, 1967, we enclose the results of our completed foundation investigation of the above site. A skewed three-span bridge about 200 feet long with a centre span of approximately 80 feet and with the banks sloped at 2 horizontal to 1 vertical down from the abutments to the piers at the river bank is proposed. The existing bridge is a single span structure with abutments near the pier locations of the proposed replacement. Approach to the bridge will increase fill heights by approximately 10 feet.

For your convenience, our findings and recommendations are briefly summarized:

1. The site of the proposed bridge is located at the confluence of Big Creek with Grand River, so that the southern side of the structure lies within about 50 feet of the bank of



the Grand River. Both the creek and river channels are directly underlain by gypsiferous and shaley dolomites of the Salina Formation. A natural varved and moderately sensitive silty clay overburden, containing many layers of highly plastic (fat) clay, overlies the rock in both abutments.

2. Foundations for the abutments can be established as either spread footings at relatively shallow depth, or H piles driven to refusal on bedrock.

3. The central piers and associated retaining walls must be founded on bedrock about 10 feet below creek level and approximately a foot or so below the maximum erosion level in the centre of the creek channel. Sulphate resistant concrete must be employed.

4. Water level in both the creek and the adjacent river is presently controlled by the overspill level of the Caledonia Dam, about five miles downstream from the bridge site. This dam is to be replaced in the near future with a new structure which may slightly increase the average water level in the river and creek. Because of this downstream control, deep scour of the main channel of Big Creek is not anticipated - hence our suggestion that footings be taken barely 1 to 2 feet below present bottom, or to approximately El. 604.5; i.e., maximum depth to sound bedrock in borehole 8.

5. No problems are to be associated with settlement of the approach embankments at this site. Stability of the proposed structure has also been examined and, despite the moderate to low

shear strength recorded in the lower varved overburden clay, it appears to be safe. Northward or southward sliding of the east approach fill and abutments has been judged to be the worst possible case.

Our expanded comments follow:

## 1.0 SITE

The proposed crossing of Big Creek by Proposed Revision Line K of Highway 54, is located approximately  $2\frac{1}{2}$  miles east of Middleport in the Township of Onondaga, County Brant, Ontario. The confluence of Big Creek with the Grand River occurs within 100 feet of the proposed bridge centre line. The level and flow rates of both Big Creek and the Grand River are controlled to a large extent by the 'overspill type' dam at Caledonia, approximately five miles downstream, on the Grand River.

## 2.0 INVESTIGATION

### 2.1 Field Work

The site investigation comprised nine borings, located as shown on the site plan Dwg.1. All the boreholes were advanced using conventional washboring procedures. A muskeg tractor equipped with a dozer blade was used to facilitate moving and setting up the drill at various borehole locations.

Sampling was carried out using conventional thin walled Shelby tubes for relatively undisturbed samples, and a standard split spoon. Penetration resistances were recorded. Where permitted by the cohesive



strength of the overburden soil, in-situ vane tests were performed using a vane apparatus which does not incorporate a strain control device. Bedrock was proved in all holes using AX size core-drilling equipment. Individual borehole records are attached as Dwg. 2 to 11 inclusive.

## 2.2 Subsoils and Geology

Subsoil at the site consists of a stiff to firm varved silty clay which exhibits a decreasing strength and consistency with increasing depth. A moderate to high sensitivity was recorded in some layers by the field vane tests. A small pocket of organic silt occupied an apparent small terrace which was intersected in borehole 8. This pocket of organic material does not extend beyond the centre line of the road, as witnessed by its absence in borehole 8A.

Bedrock beneath the silty clay overburden consists of gypsiferous dolomitic mudstones and shales, shaley thin bedded dolomites and pure gypsum seams of the Salina Formation. The upper 2 to 3 feet of the rock is everywhere severely disturbed and weathered. This weathered zone appears to have been largely removed from the channel bottom of Big Creek.

The natural overburden soils are covered by a highly irregular thickness of derived fill soil, associated with the present and former bridge structures. This fill soil is particularly dominant immediately behind the present and former abutments, where it entirely replaces the natural overburden section.

### 2.3 Laboratory Testing

In view of the possibility of founding the two abutments on spread footings, a laboratory test programme was initiated to substantiate the information obtained during the field drilling. Results of the various tests are shown graphically on both the respective borehole logs, particularly for borehole 1 and borehole 8A, and in Dwgs. 12 and 13. A summary of the shear strength as related to depth, i.e., geodetic elevation, has been added as Dwg. 14. The shear strength results have also been considered for stability analysis.

Because of the relatively small amounts of additional embankment fill, a consolidation test analysis of the softer lower silty clay zone was not performed, since an estimate of settlement based on the field test data and visual examination of the samples recovered indicates that such settlement is unlikely to exceed a maximum of about 1 inch.

### 3.0 ENGINEERING CONSIDERATIONS

#### 3.1 Foundations, East and West Abutments

Since the overburden soil at both abutment locations is to be protected from stream erosion by the central piers and their attendant wing walls, support of the abutments on spread footings has been considered.

In the case of the west pier, footings set on or at very shallow depth below the natural clay soil contact must be designed to an allowable bearing pressure of 2.5 ksf, due to partial softening of the soil by seasonal volume changes - see the result of Triaxial Test No.1. However, if the footings are set a few feet lower, at approximately El. 627-628, the stiffer clay at this level will safely support net loads of 4 ksf.

At the east abutment, partial erosion of the upper, stiffer clay crust, and the presence of less competent firm clay within the zone of influence beneath the footing, requires adoption of a safe net bearing pressure of 2 ksf, with the footing stepping down along the natural clay soil contact from El. 626 at the south side, to El. 621 at the north side.

The foregoing recommendations are based on visual examination of all samples recovered, and on the application of field and laboratory shear strength test results in the general bearing capacity equation:

$$q_{allow} = \frac{c + \bar{\sigma} \tan \phi}{F} \text{ psf}$$

where:

- c = 1250 psf average for the upper seasonably softened soils at the west abutment above El. 628-630 approx. ,
- = at least 2000 psf for the stiff clay crust below about El. 630 at the west abutment. ,
- = 1300 psf for the moderately stiff clay near the upper contact at the east abutment, where the major part of the desiccated crust zone has been removed by erosion, reducing to an average 750 psf for the lowermost 6 to 8 feet of clay overburden.

$N_c = 6.0$ , the bearing capacity factor relating footing size and shape to depth.

$F = 3$ , the factor of safety usually applied to footings in clay.

An alternative procedure will be to support the abutments on H piles driven to refusal on sound bedrock at approximately El. 605-608.\* This anticipated refusal depth represents a maximum penetration, and it is possible that some of the piles will refuse at higher levels in the unevenly weathered bedrock 'head'. Permissible loads will be as for short columns. Some batter piles will be required to resist various horizontal stresses exerted on the abutment by supported fill and traffic.

### 3.2 Central Piers and Associated Retaining Walls

Combined results of various probings conducted by your own Department in the summer of 1966 and our subject test borings, indicate that the channel of Big Creek has been eroded down to the bedrock contact. Footings for the two central piers and their associated wing wall structures must therefore be founded directly on bedrock.

A uniform founding level at El. 604.5 is suggested in order to bring the foundations into contact with sound bedrock, at least 1 to 2 feet below maximum creek bottom level. A safe net bearing pressure of 10 tsf may be utilized.

The highly gypsiferous nature of the foundation bedrock will require the use of sulphate resistant concrete.

\* Assume final set of 20 blows per inch under 24 foot kips driving energy.



Dewatering of the foundation excavations for the two central piers and wing walls will pose a considerable problem during construction, since the suggested founding level lies approximately 12 feet below Creek level. However, the presence of 2 to 3 feet of softish weathered bedrock above suggested founding level, should allow sufficient penetration of sheet piling to provide some form of bottom seal. The sheet piling will require bracing.

There will be no settlement of any foundations supported directly on bedrock.

### 3.3 Stability of Approaches

A moderate increase of 8 to 10 feet in the height of the fills approaching this bridge crossing is expected, with the final roadway surface being some 30 to 35 feet above creek bed level and/or bedrock contact. Consideration has therefore been given to the overall stability of the approaches, since

- a) the clay overburden supporting the fills and possibly also the abutment structures, is a moderately sensitive layered clay with frequent very plastic seams
- b) lower levels of the clay immediately above bedrock are not particularly strong.

Using the relationship:  $H_c = \frac{N_s c}{Y}$  \*

for the critical height of a slope of given angle  $\beta$  as a first approximation, the critical height of the abutment areas, - i.e.,

\* Terzaghi and Peck. "Soil Mechanics in Engineering Practice"  
12th Edit. Wiley, 1962.

combined fill and natural silty clay subsoil is approximately 38 feet,

where:  $N_s = 7.0$ , a stability factor  
 $c = 50$  psf the minimum shear strength value obtained.  
 $\gamma = 100$  pcf, the average unit weight of the complete soil section, considering submergence of the lowermost 10 feet of clay subsoil.

This result indicates a minimum factor of safety against failure of about 1.1 for a full 35 foot fill height. However, the values applied in the equation are very conservative, since

- a) the worst shear strength value applicable to only the lowermost few feet of subsoil was assumed for the full soil section
- b) pore pressures in the foundation will be small, as they will result only from the additional 8 to 10 feet of fill.
- c) at least 25 feet of the final 'embankment' height consists of already stabilized soil
- d) the new fill will react over only a limited width
- e) existing creek banks upstream from the bridge are standing at steeper slopes and to a height equal to or greater than the proposed approach grade.

The actual operating factor of safety is therefore assumed to be considerably higher, and a more detailed stability analysis has not been performed.

### 3.4 Settlements

Settlement of both the bridge and approach fills is not expected to be a problem, though total movements of as much as 1 to 1½ inches will be involved, using a spread footing design for the abutments. Almost all of this settlement will occur as differential between the two abutments and the two centre piers, which are to be founded on rock. Considerably less movement will occur in the case of a piled abutment foundation.

We trust you will find our investigation and this report in order, and will be pleased to answer any queries you may have.

Yours very truly,

WILLIAM TROW ASSOCIATES LIMITED



John D. Morton, P.Eng.

JDM/yg

Encls.

Dist: Dept. of Highways of Ontario (11)



Wm. A. Trow, P.Eng.

# WILLIAM TROW ASSOCIATES LTD.




SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

DRAWING NO. 1  
PROJECT NO. H651




## LEGEND

BOREHOLE NO. 1  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION West abutment  
HOLE ELEVATION 635.2  
DATUM D.H.O. Project

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 

### SHEAR STRENGTH




UNDRAINED TRIAXIAL  
AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 

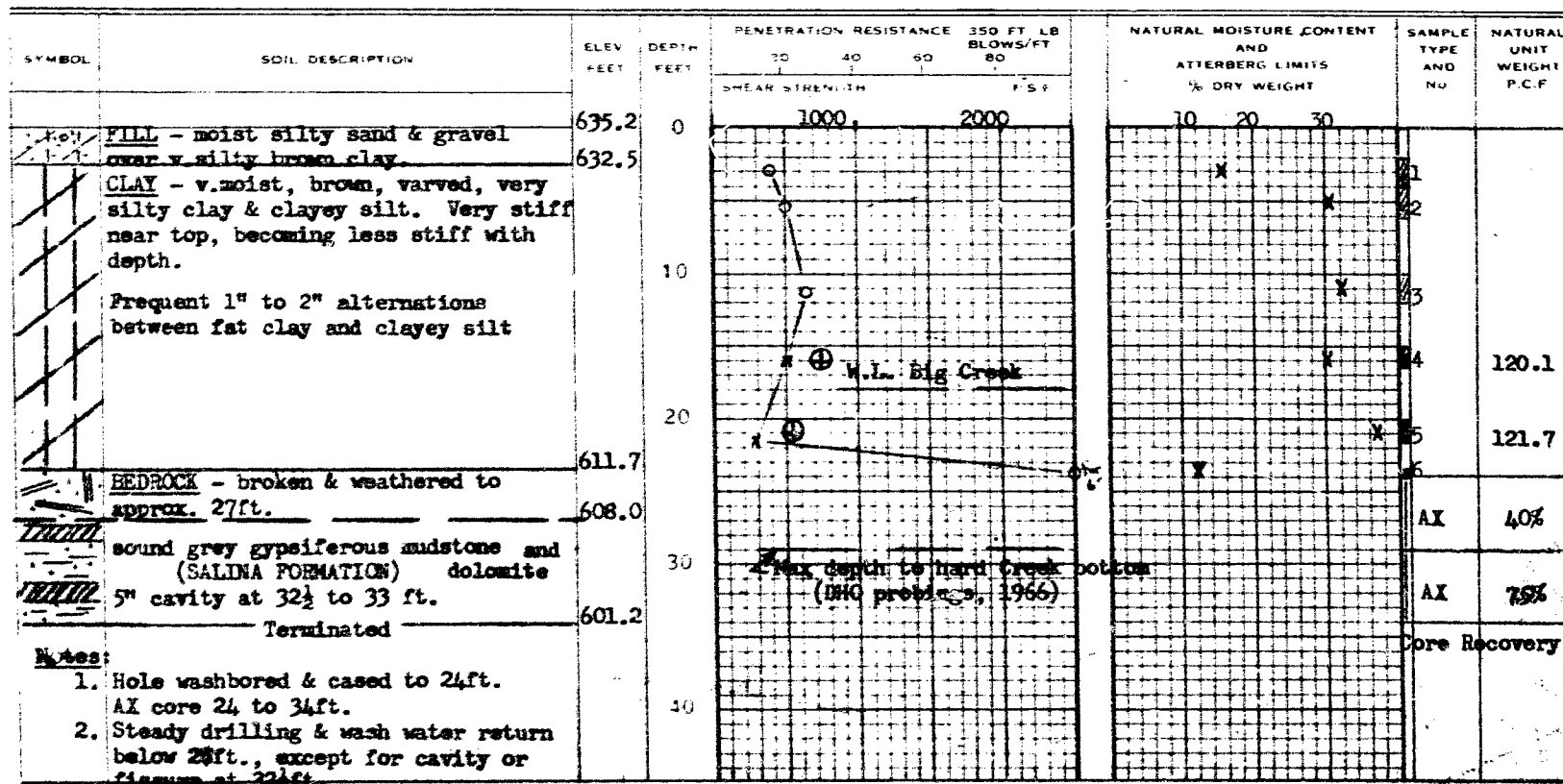
### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

### ATTERBERG LIMITS

LIQUID LIMIT   
PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 

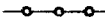




Borehole 1, West Abutment






## LEGEND

## PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
 2" I.D. SHELBY TUBE   
 2" DIA. CONE 

## SHEAR STRENGTH




UNDRAINED TRIAXIAL  
AT OVERBURDEN PRESSURE   
 UNCONFINED COMPRESSION   
 VANE TEST AND SENSITIVITY (S) 

NATURAL MOISTURE CONTENT  
AND LIQUIDITY INDEXLI  
X

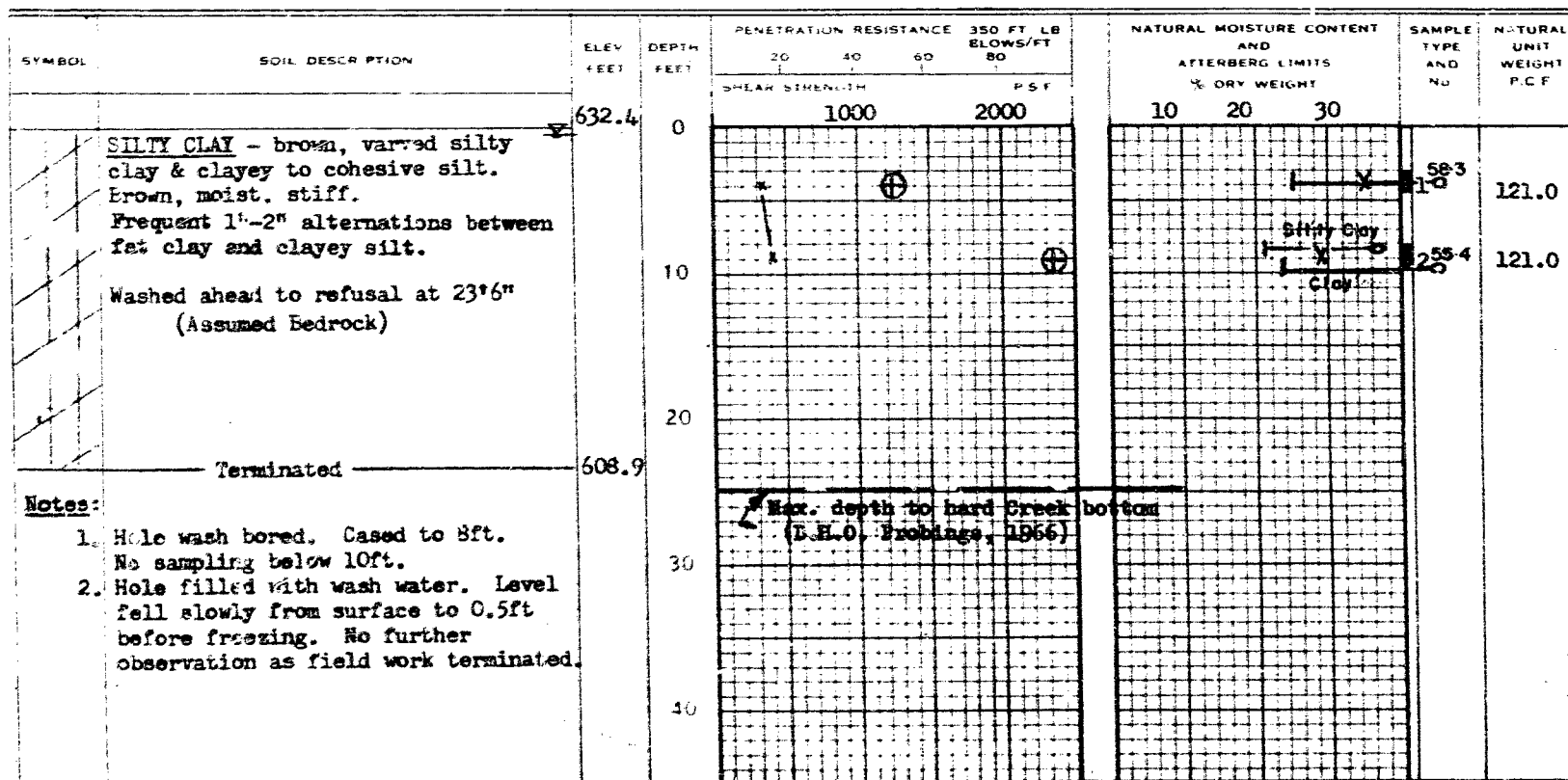
## ATTERBERG LIMITS

LIQUID LIMIT PLASTIC LIMIT 

## SAMPLE TYPE

2" O.D. SPLIT TUBE   
 2" I.D. SHELBY TUBE   
 3" O.D. SHELBY TUBE 

BOREHOLE NO. 1A  
 PROJECT Bridge over Big Creek  
 LOCATION Hwy. 54, nr. Middleport, Ont.  
 HOLE LOCATION West abutment  
 HOLE ELEVATION 632.4  
 DATUM D.H.O. Project



# WILLIAM TROW ASSOCIATES LTD.

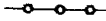
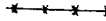
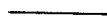
SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND




DRAWING NO 3  
PROJECT NO H651

BOREHOLE NO 2  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr Middleport, Ont.  
HOLE LOCATION South end, West Wing Wall  
HOLE ELEVATION 629.2  
DATUM D.H.O. Project

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 

### SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 




### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

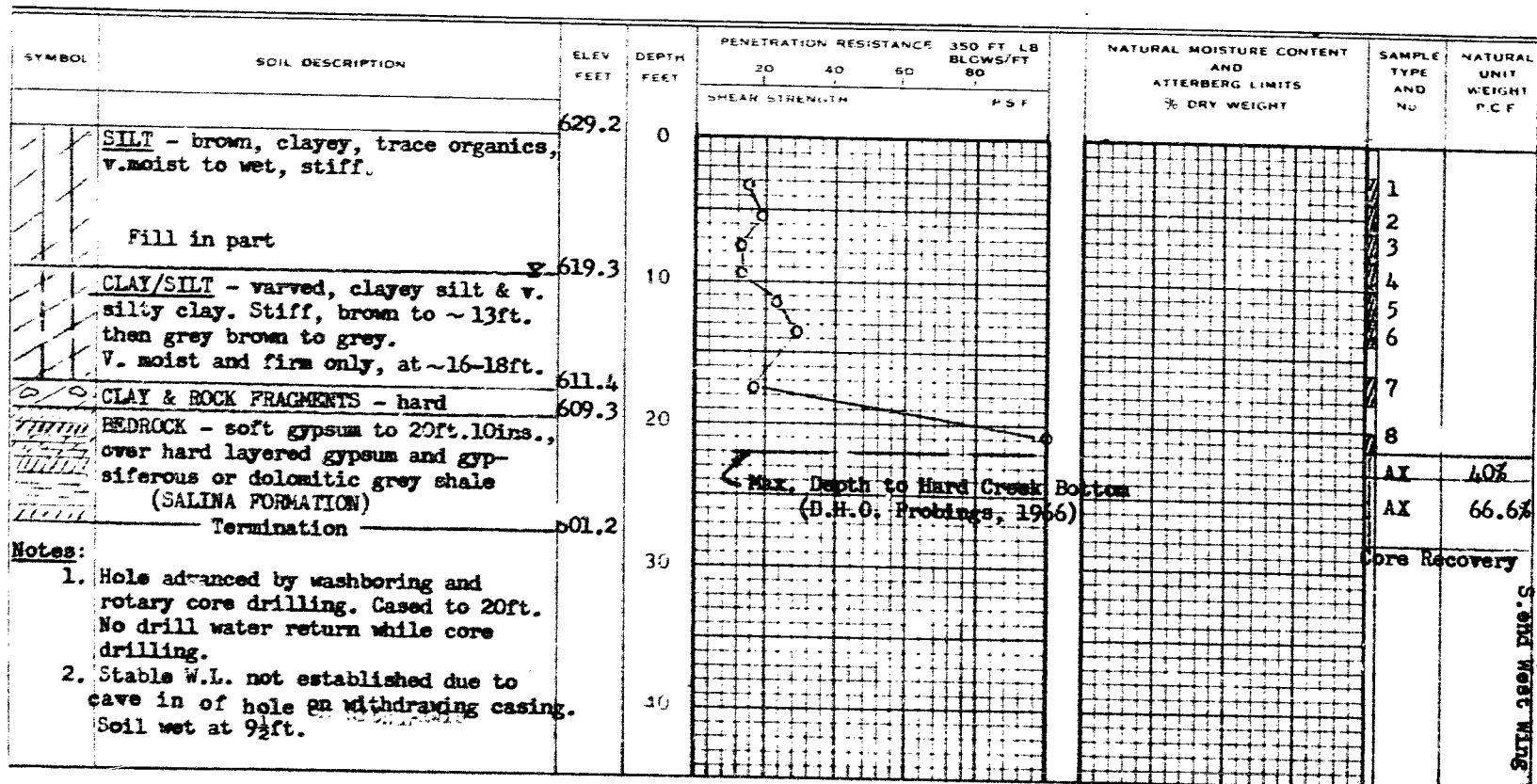
### ATTERBERG LIMITS

LIQUID LIMIT 

PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 



Borehole 2  
S. end West Wing Wall

# WILLIAM TROW ASSOCIATES LTD.







SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND

DRAWING NO. 4  
PROJECT NO. H651

BOREHOLE NO. 3  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION West pier  
HOLE ELEVATION 618.1  
DATUM D.H.O. Project

### PENETRATION RESISTANCE




2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE   
SHEAR STRENGTH  
UNDRAINED TRIAXIAL  
AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 






### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

#### ATTERBERG LIMITS

LIQUID LIMIT   
PLASTIC LIMIT 

#### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS		SAMPLE TYPE AND NO.	NATURAL UNIT WEIGHT P.C.F
				20	30	60	350 FT LB BLOWS/FT 80	% DRY WEIGHT			
		618.1	0								
	WATER & ICE										
	Creek Bottom	614.6									
	ORGANIC SILT	613.0									
	CLAY - wet, firm, brownish grey	610.5									
	WEATHERED BEDROCK - broken gypsum	607.5	10								
	BEDROCK - hard, well bedded gypsiferous & shaley dolomite (SALINA FORMATION)										
	Terminated	598.2	20								
Notes:											
1. Hole wash bored & cased to 8ft. Rotary core drilled to 19.9ft.											
2. Drill set up on ice surface.											
			30								
			40								
			50								
			60								
			70								
			80								
			90								
			100								
			110								
			120								
			130								
			140								
			150								
			160								
			170								
			180								
			190								
			200								
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			930								
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			950								
			960								
			970								
			980								
			990								
			1000								

Borehole 3, West Pier

# WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

DRAWING No 5  
PROJECT No H651

## LEGEND

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE —○—○—○—  
2" I.D. SHELBY TUBE \*—\*—\*—\*—  
2" DIA. CONE —————

### SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE ⊕  
UNCONFINED COMPRESSION ⊗  
VANE TEST AND SENSITIVITY (S) +<sup>s</sup>

### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

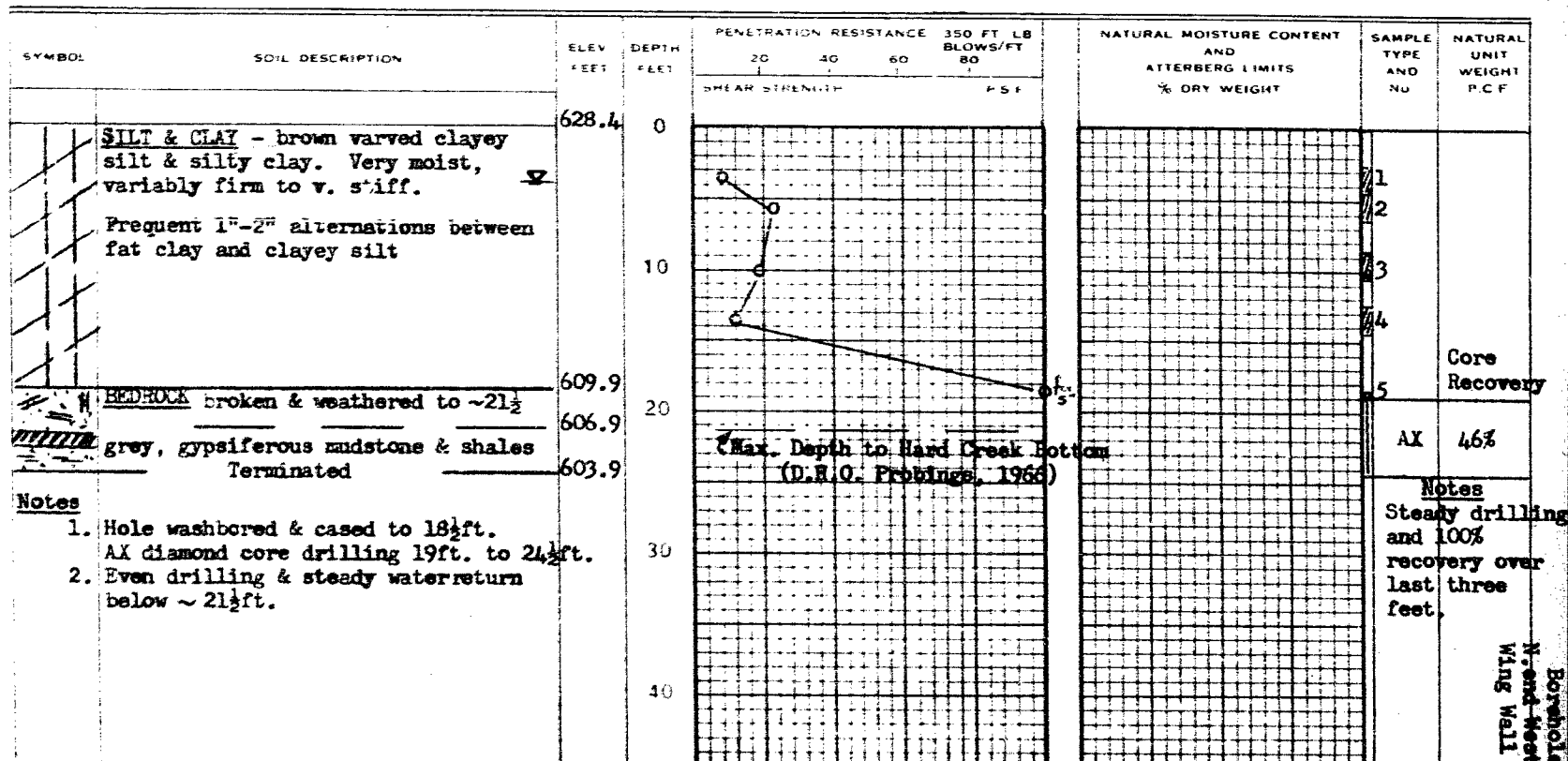
### ATTERBERG LIMITS

LIQUID LIMIT —○—  
PLASTIC LIMIT ———

### SAMPLE TYPE

2" O.D. SPLIT TUBE ———  
2" I.D. SHELBY TUBE ———  
3" O.D. SHELBY TUBE ———

BOREHOLE No 4  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION North end of west wing wall  
HOLE ELEVATION 628.4  
DATUM D.H.O. Project



# WILLIAM TROW ASSOCIATES LTD.




SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND




DRAWING NO 6  
PROJECT NO H651

BOREHOLE NO 5  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54, nr. Middleport, Ont.  
HOLE LOCATION East Wing Wall, S. End  
HOLE ELEVATION 621.5  
DATUM D.H.O. Project

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 


### SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S)  <sup>S</sup>


### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

### ATTERBERG LIMITS

LIQUID LIMIT 

PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE 

2" I.D. SHELBY TUBE 

3" O.D. SHELBY TUBE 

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	SAMPLE TYPE AND NO	NATURAL UNIT WEIGHT P.C.F
				20	40	60	350 FT LB BLOWS/FT 80			
	ICE - broken ice, marginal to Grand River	621.5	0							
	CLAY - silt to firm, grey, v. silty, layered, sticky.	617.5 617.0								
	BROKEN ROCK, CLAY & SOFT GYPSUM v. poor core recovery, despite even drilling pressure & progress below 12ft.	611.5	10							
	BEDROCK - sound, well-bedded grey shaley dolomite, minor gypsiferous zones.	606.5								
	Terminated	601.0	20							
Notes:										
1. Hole advanced by washboring & rotary core drilling. Cased to lift.										
2. River level @ El. 617										

Borehole 5  
S. end, East Wing Wall


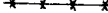

# WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION




DRAWING NO. 7  
PROJECT NO. H651

## LEGEND

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 

### SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 




### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

### ATTERBERG LIMITS

LIQUID LIMIT 

PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 

BORERHOLE NO. 6  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION East pier  
HOLE ELEVATION 631.7  
DATUM D.H.O. Project

SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FEET	PENETRATION RESISTANCE 350 FT. LB BLOWS/FT				NATURAL MOISTURE CONTENT, AND ATTERBERG LIMITS % DRY WEIGHT	SAMPLE TYPE AND NO.	NATURAL UNIT WEIGHT P.C.F.
				20	40	60	80			
				SHEAR STRENGTH P.S.F.						
	FILL - brown, compact to dense silt and fine sand. Cohesive in part. Moist to wet. Organic cohesive silt below 11ft.8ins. (Fill behind Old Bridge Abutment)	631.7	0						1	
			10						2	
									3	
									4	
									5	
									6	
	WEATHERED BEDROCK - clayey broken gypsiferous shale & dolomite	613.0	20							
	BEDROCK - sound well bedded gypsiferous shaley dolomite & shale.	608.7							AX	34%
	Terminated	602.4	30						AX	78%
Notes:								Core Recovery		
1. Hole wash bored and cased to 20ft. Core drilled to 29ft.4 ins.										

Max. depth to hard creek bottom (DHD Probing, 1965)

Borehole 6, East Pier

# WILLIAM TROW ASSOCIATES LTD.




SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND




DRAWING NO. 8  
PROJECT NO. H651

BOREHOLE NO. 7  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION North end of East Wing Wall  
HOLE ELEVATION 618.3  
DATUM D.H.O. Project

### PENETRATION RESISTANCE


2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 


### SHEAR STRENGTH

UNDRAINED TRIAXIAL  
AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 




### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

### ATTERBERG LIMITS

LIQUID LIMIT 

PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 

SYMBOL	SOIL DESCRIPTION	ELEV FEET	DEPTH FEET	PENETRATION RESISTANCE				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	SAMPLE TYPE AND NO	NATURAL UNIT WEIGHT P.C.F
				20	40	60	350 FT. LB BLOWS/FT 80			
		618.3	0	SHEAR STRENGTH						
	WATER & ICE	616.5								
12	ALLUVIAL SILT - organic	615.3								
11	CLAY - v. silty, varved, grey-brown, firm to stiff, wet.									
10		609.0								
9	WEATHERED BEDROCK	606.9	10							
8	BEDROCK - sound, layered, brownish- grey shaley dolomite, some gypsum seams									
7	Terminated	603.0								
Notes:										
1. Hole washbored to 9 1/2 ft. & cased. Core drilled to 15 ft. 4 ins.										
2. Drill set up on ice surface, with hole located right at the creek edge										
			20							
			30							
			40							

Max. depth to hard Creek bottom  
(DHO Probing, 1966)

1

AX

69%

Core Recovery

Borehole 7, N. end of East  
Wing Wall

# WILLIAM TROW ASSOCIATES LTD.


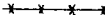

SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND




DRAWING No. 9  
PROJECT No. H651

BOREHOLE NO. 8  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54, nr. Middleport, Ont.  
HOLE LOCATION East Abutment  
HOLE ELEVATION 635.1  
DATUM D.H.O. Project

### PENETRATION RESISTANCE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA CONE 

### SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 




### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

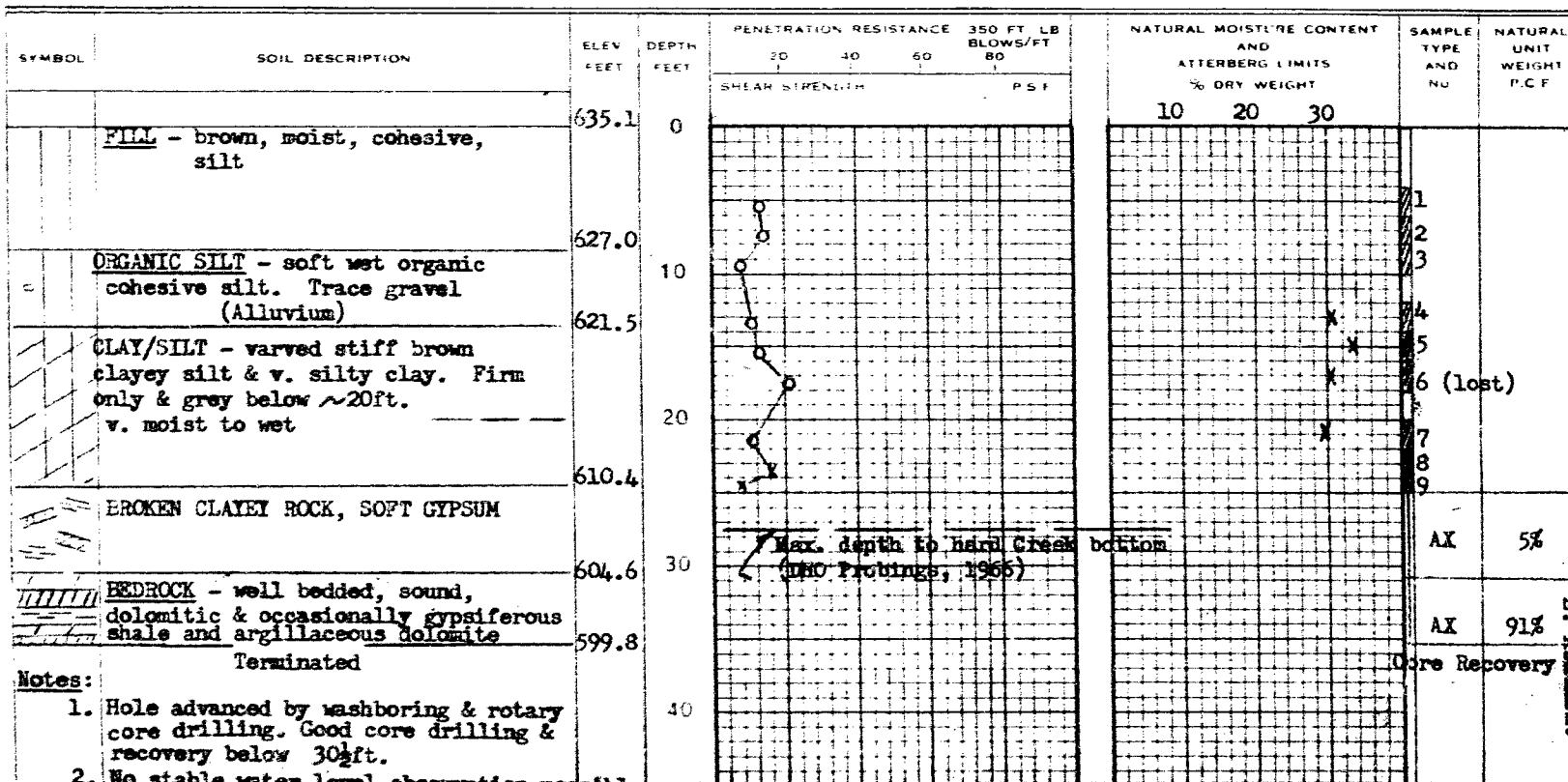
### ATTERBERG LIMITS

LIQUID LIMIT 

PLASTIC LIMIT 

### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 





# WILLIAM TROW ASSOCIATES LTD.




SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

## LEGEND




DRAWING No. 10  
PROJECT No. H651

BOREHOLE No. 8A  
PROJECT Bridge over Big Creek  
LOCATION Hwy. 54 nr. Middleport, Ont.  
HOLE LOCATION East Abutment  
HOLE ELEVATION 633.5  
DATUM D.H.O. Project

### PENETRATION RESISTANCE


2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
2" DIA. CONE 

### SHEAR STRENGTH




UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE   
UNCONFINED COMPRESSION   
VANE TEST AND SENSITIVITY (S) 

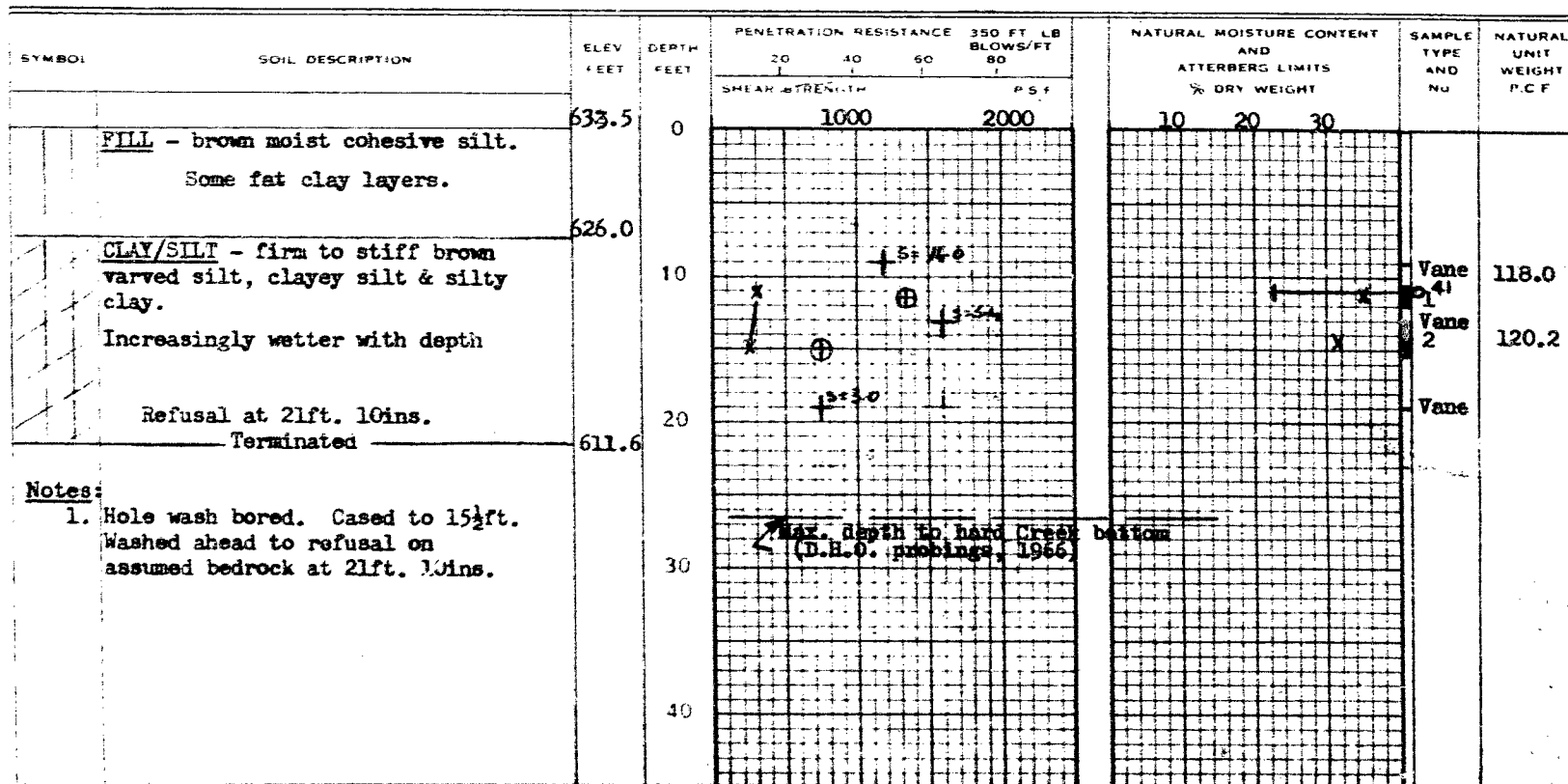
### NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

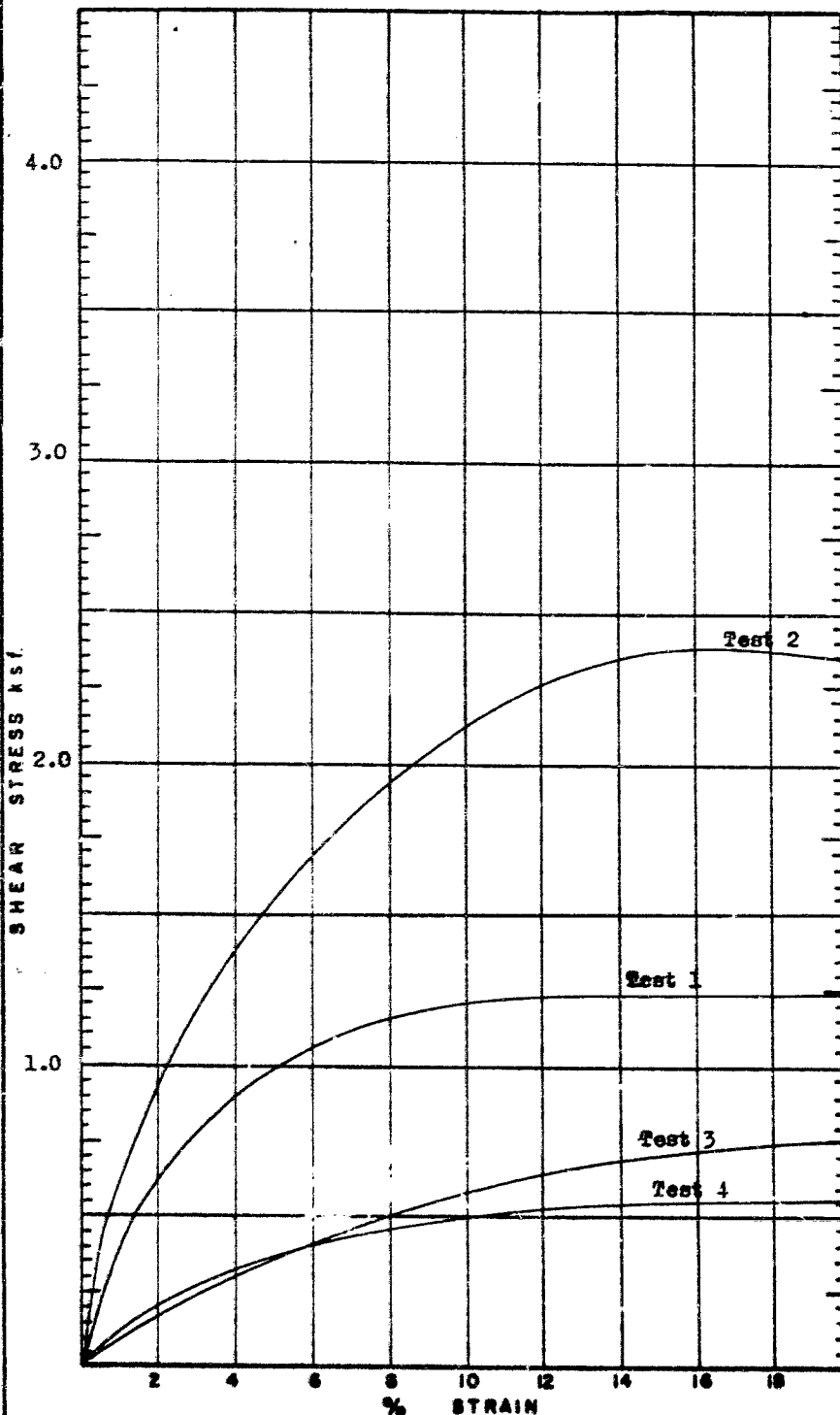
#### ATTERBERG LIMITS

LIQUID LIMIT   
PLASTIC LIMIT 

#### SAMPLE TYPE

2" O.D. SPLIT TUBE   
2" I.D. SHELBY TUBE   
3" O.D. SHELBY TUBE 



TEST NO 1

TEST Undrained Tx.

B.H. 1A DEPTH 3-4 1/2'

C = 1230 P.S.F.

γ = 121 P.C.F.

W = 35.2 %

σ<sub>s</sub> = 5 P.S.I.

Soil: Varved silty clay

TEST NO 2

TEST Undrained Tx.

B.H. 1A DEPTH 8-9 1/2'

C = 2350 P.S.F.

γ = 121 P.C.F.

W = 29.0 %

σ<sub>s</sub> = 7.5 P.S.I.

Soil: Varved silty clay

TEST NO 3

TEST Undrained Tx.

B.H. 1 DEPTH 16'

C = 750 P.S.F.

γ = 120.1 P.C.F.

W = 32.1 %

σ<sub>s</sub> = 13.4 P.S.I.

Soil: Varved clay and cohesive silt

TEST NO 4

TEST Undrained Tx.

B.H. 1 Depth: 21'

C = 550 P.S.F.

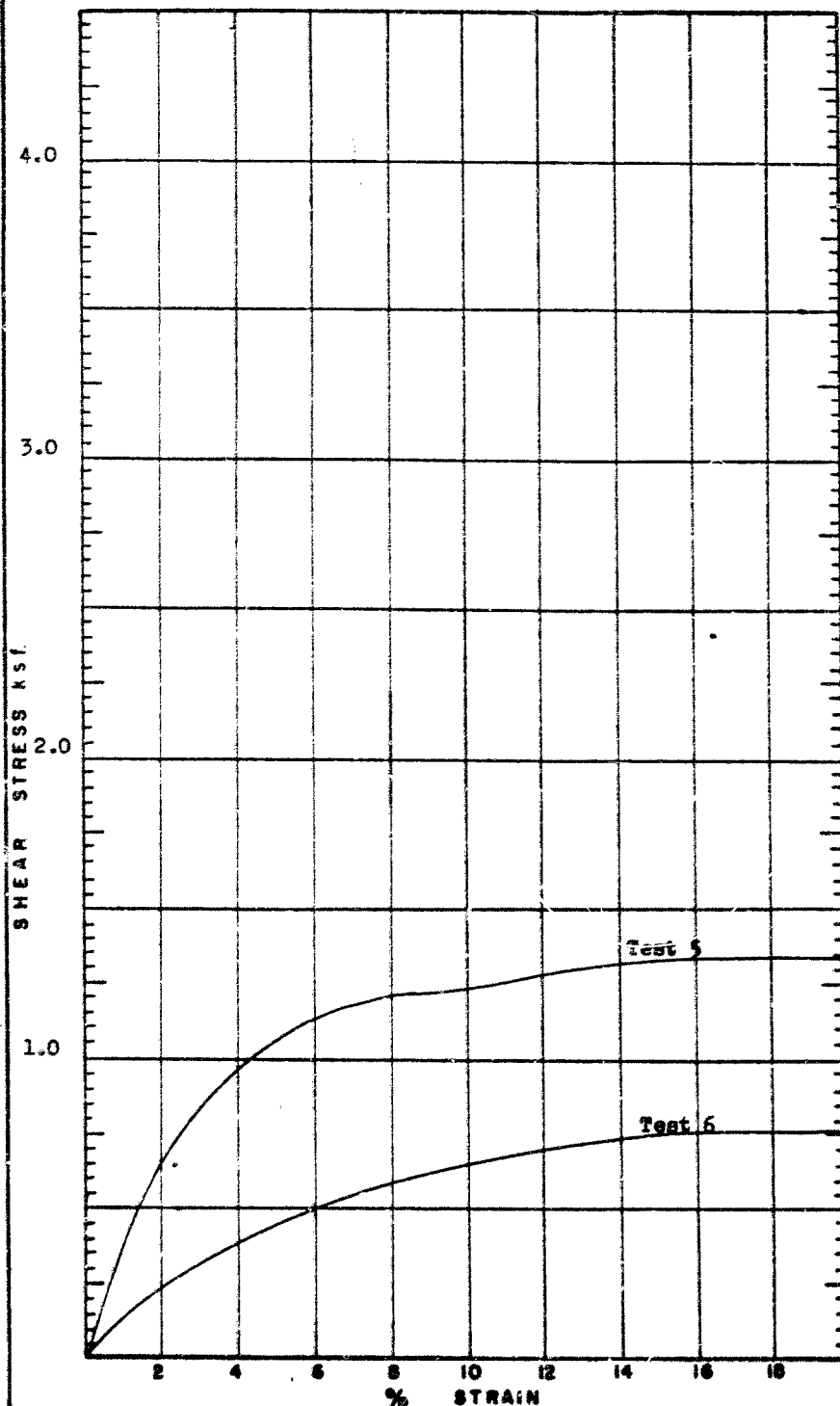
γ = 121.7 P.C.F.

W = 37.1 %

C<sub>u</sub> = 17.7 P.S.I.

Soil: Varved clay and cohesive silt

TRIAXIAL TEST RESULTS



TEST NO 5

TEST Undrained Tx.

S.M. 8A DEPTH 10<sup>1</sup>/<sub>2</sub>-12<sup>1</sup>/<sub>2</sub>

C = 1345 P.S.F.

E = 118 P.C.F.

W = 35.3 %

G<sub>s</sub> = 9 P.S.I.SOIL Varved clay  
and cohesive silt

TEST NO 6

TEST Undrained Tx.

S.M. 8A DEPTH 15<sup>1</sup>/<sub>2</sub>

C = 760 P.S.F.

E = 120.2 P.C.F.

W = 31.4 %

G<sub>s</sub> = 12.5 P.S.I.SOIL Very silty  
clay

TEST NO

TEST

S.M. DEPTH

C = P.S.F.

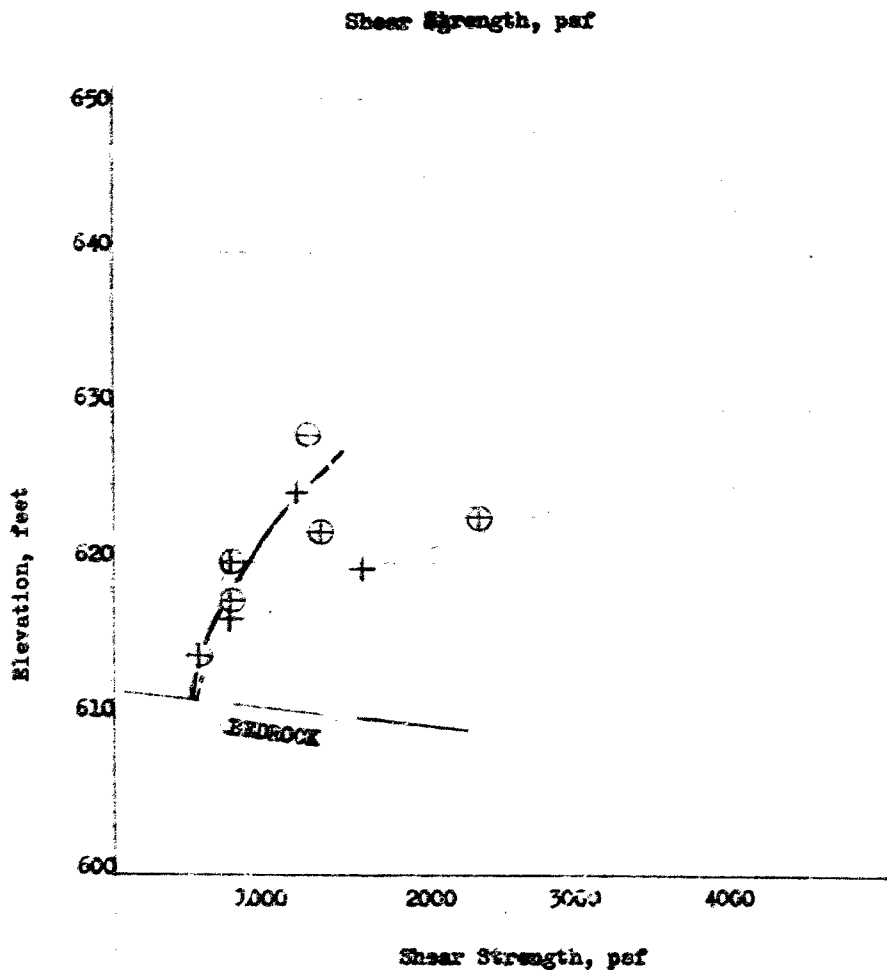
E = P.C.F.

W = %

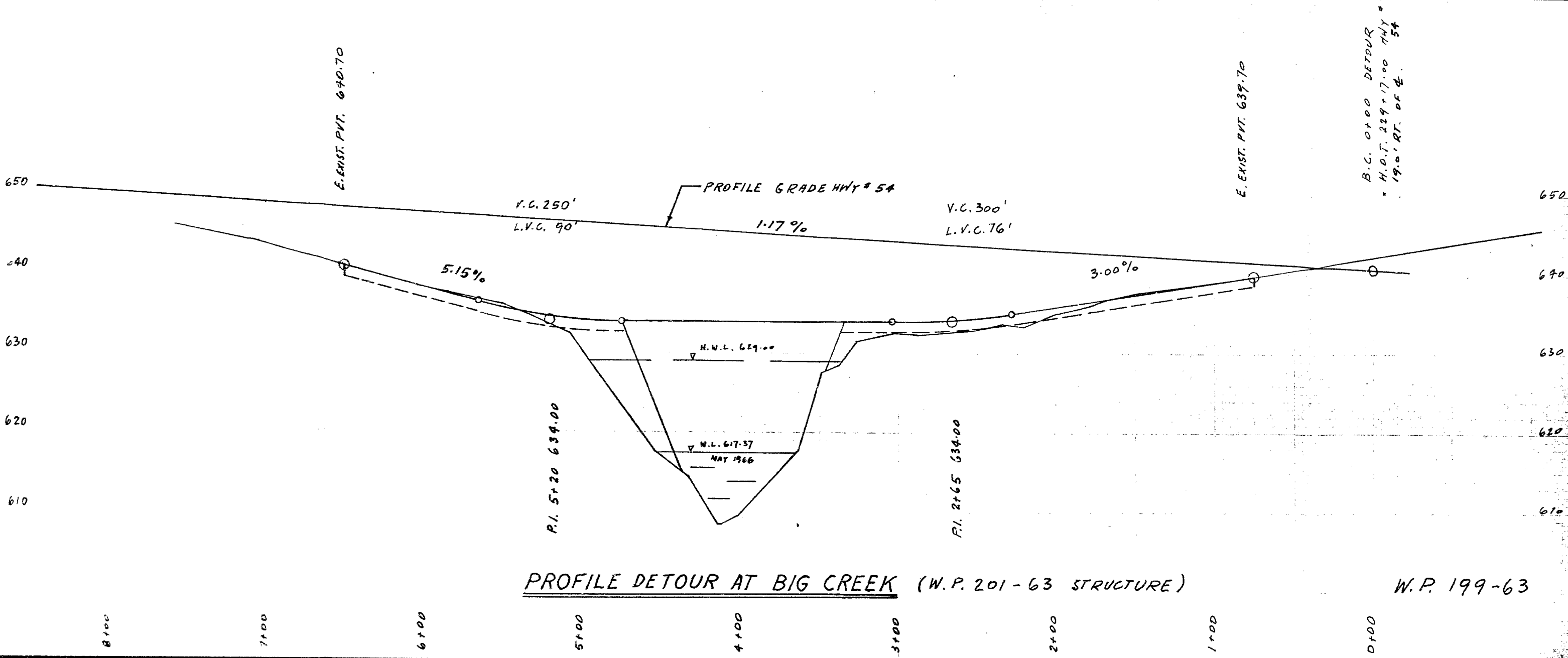
G<sub>s</sub> = P.S.I.

SOIL

TRIAXIAL TEST RESULTS



RELATIONSHIP OF UNDRAINED SHEAR STRENGTH TO DEPTH  
FOR NATURAL VARVED SILTY CLAY.



E-4.54-1

SOUNDING

VAREN TRUSS BRIDGE  
61.5' CLEAR SPAN

P.C.O. RD. 22  
CURVE DATA  
D-250.25.15  
R-240.01.15  
T-238.73  
-53.85  
-105.92  
E-6.00

GRAVEL

LINE 'K'

1 Sty Conc BIK Ho.  
Conc. BIK Fan

DETOUR ③  
A - 19° 50'  
D - 200  
R - 286.48'  
L - 99.17'  
T - 50.08'  
E - 4.35'

(TOWPATH)

RESERVE

DETOUR  
A - 17° 20'  
D - 200  
R - 286.48'  
L - 86.67'  
T - 43.67'  
E - 3.31'

E. R. NUNN

OWN

STRUCT

APPROVE

ALIGN



Department of Highways Ontario

Copy for the information of

Foundation Office

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

**C.S. Grebski,  
Bridge Office**

**February 20, 1970**

**Big Creek Bridge  
4.6 Mi. W. of Caledonia  
W.P. 201-63, Site 1-116  
Highway 54, District 4**

*From 167*

**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.**

**CSG:rd**

**C.S. Grebski,  
Bridge Design Engineer**

**Attach.**

**c.c. Foundation Office**

*Advised John Kern with regard to the blue  
prints and he mentioned that with date 1/20*

*JM-Denton  
Feb 20*

*cc: [unclear] [unclear] [unclear]  
[unclear] [unclear] [unclear] [unclear]  
[unclear]*

*cc: [unclear]*

*dlr.*



Copy for the information of

Mr. A. Stermac

Mr. W. Malinschyn,  
Reg. Bridge Planning Engineer,  
Central Region, Admin. Bldg.

C.S. Grebaki

August 11, 1969

Big Creek Bridge  
4.6 Mi. W. of Caledonia  
W.P. 201-63, Site No. 1-116  
Highway 54, District No. 4

*Trans 167*

Attached herewith are prints of the revised Preliminary Bridge Plan Drawing D-6607-P2 for the above-mentioned structure.

The estimated cost of the proposed structure is \$145,000. \* This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

CSG:rd

C.S. Grebaki,  
Bridge Design Engineer

Attach.

c.c. S. McCombie  
A. Stermac (2)  
J. Anderson

\* This cost does not include cost of detour or removal of the existing structure.

*W. Swata*  
*Aug 19/69*

*See copy 10/2/69*

MEMORANDUM

*See app*

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

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

ATTENTION: Mr. S. McCombie

DATE: April 17, 1969

OUR FILE REF:

IN REPLY TO

SUBJECT:

Big Creek Bridge -- Highway #54  
W.P. 201-63 -- District #4 (Hamilton)  
(Report by William Trow Associates)

We have reviewed the preliminary Bridge Plan D-6207-P1 with regard to subsoil conditions and recommendations contained in the report prepared by William Trow and Associates Ltd. Some time ago it was drawn to our attention by the Hamilton District that failures had, from time to time, occurred on the north side of the East approach embankment of the existing structure. Since the consultant's report gave no recommendations relating to the removal of soft organic material in the problem area, it was decided by this Section, to investigate this particular aspect in some detail. Four additional borings were carried out in the vicinity of the East abutment location. These borings revealed the presence of soft organic silt. A revised drawing, showing the new information, will be sent to you in the near future.

As a result of our review and subsequent field investigation, the following recommendations are made:

i) All organic material in the vicinity of the East abutment should be removed and replaced with suitable fill material.

ii) The forward and side slopes of both the approach embankments should be 2 horizontal and 1 vertical.

The remainder of the consultant's recommendations relating to structure foundations, are still applicable.

MD/WdeF

cc: Messrs. B. R. Davis (2)  
H. A. Tregaskes  
D. W. Farrer  
G. K. Hunter (2)  
H. Greenland  
W. S. Melinyshyn  
T. J. Kovich  
B. A. Singh

*M. Devata*  
M. Devata,  
SUPERVISING FOUNDATION ENGINEER  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

Foundations Files ✓  
Gen. Files

## MEMORANDUM

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

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

ATTENTION: Mr. S. McCombie

DATE: June 10, 1969

OUR FILE REF:

IN REPLY TO

## SUBJECT:

Big Creek Bridge -- Highway #54  
W.P. 201-63 -- District #4 (Hamilton)  
(Report by William Trow Associates)

Additional borings - vicinity of  
E abutment location - reference:  
Our memo to you of April 17, 1969

Attached, please find Revised Drawing No.  
H-651, to be inserted in your copy(s) of the  
Consultant's report.

MD/MdeF  
Attach.

*M. Devata*  
M. Devata,  
SUPERVISING FOUNDATION ENGR.  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGR.

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

Foundations Files ✓  
Gen. Files

Project: H651

198 Superior Street  
Hamilton, Ontario  
547-6385

**William Trow  
Associates**

Soil Mechanics  
Consultants

W. A. Trow,  
M.Sc., M.E.I.C., P.Eng.  
K. Parker,  
Ph.D., M.E.I.C., P.Eng.



**(Hamilton) Ltd.**

C. D. Thompson, M.Sc., M.E.I.C., P.Eng.  
Manager

February 21, 1969

Department of Highways of Ontario  
Materials and Testing Division  
Downsview, Ontario

Attention: Mr. M. Devata

Slope Stability at Big Creek Bridge, Highway 54

Dear Sirs:

This refers to our telephone conversations of February 13 and 18, 1969, about the slope stability of the embankments leading up to the proposed bridge reconstruction at this site. You requested us to review Department of Highways of Ontario, Bridge Division, Drawing No. D-6607-P in view of the slope stability problems, which have been encountered along this Highway, on the basis of the information obtained for our Report No. H651 of March 14th, 1967, at this site.

We have visited the site, and examined the critical embankment, which is behind the northeast abutment. The pavement above this slope is cracked and has been repaired, which might indicate progressive failure of the slope. Also a fence at the toe of the slope is further from the centre line of the road than it is in the area where the road is at grade or in a cut, and this might indicate movement of the slope. However the cracking may well have been caused by movement of a small retaining wall at the edge of the road.

This retaining wall consists of timber lagging behind guide wire supports. It is badly tilted away from the road. Also there was no visible evidence of movement of the embankment into the streambed of Big Creek at the time of our visit. It is therefore concluded that the embankments at the existing bridge are probably stable, although in view of the unstable embankments in the area, their factor of safety may be only just greater than 1.

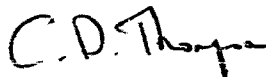
Our review of our Report No. H651 on the project indicates that the critical soil stratum under the embankments is a varved material with silt and clay layers. The lowest shear strength measured in our investigation was 550 p.s.f. At this strength a 35 feet high 2:1 embankment, will be just safe as discussed in Report H651. However it is quite likely that the mode of failure of an embankment on this soil would be movement along a very weak horizontal plane in the soil which may not have been sampled in our investigation. An approximate analysis of the existing embankment behind the northeast abutment assuming a factor of safety of 1 indicates that the shear strength of the clay is approximately 450 p.s.f. It is therefore concluded that a 35 feet high 2:1 embankment at this site does not have an adequate factor of safety against shear failure. The new embankment should be stable with side slopes of 2.5:1.

Drawing No. D-6607-P shows slopes of the abutments as 2:1 on the side slopes. It is recommended on the basis of this present review that these slopes should be flattened to  $2\frac{1}{2}$ :1.

We trust that this brief review is satisfactory for your purposes. At the time of our Report No. H651, we were not aware of the slope stability problems in this area, and consequently assumed that the slopes designed on the minimum strengths obtained during our testing would be safe. These views have been changed by the information presented by you to us during the past two weeks.

If you have any questions about this report, please do not hesitate to contact this office.

Yours very truly,  
WILLIAM TROW ASSOCIATES (HAMILTON) LIMITED



C. D. Thompson, P.Eng.

Dist: Department of Highways of Ontario (11)

Department of Highways Ontario  
Copy for the information of

Mr. A. Stermac

Mr. W. Malinsbryn,  
Rng. Bridge Location Engineer,  
Central Region,  
Admin. Building

Bridge Office,  
Downsview

January 27, 1969

Big Creek Bridge  
W.P. 201-63, Site 1-116  
Highway 54, District 4

*Draw 167*

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6607-F for the above-mentioned structure.

The estimated cost of the proposed structure is \$109,000. This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

JSB:rd

G.S. Grebaki,  
Bridge Design Engineer

Attach.

c.c. S. McCombie  
A. Stermac (2)  
J. Anderson

## MEMORANDUM

Telephone: 248-3415

To: Mr. W.D. Birch,  
Bridge Maintenance Engineer,  
Maintenance Division,  
Administration Bldg.

FROM: A.G. Kelly,  
Toronto Regional Road Design.

DATE: March 4, 1968.

□ IN FILE REF.

IN REPLY TO

SUBJECT: Re: Proposed Bailey Bridge Detour,  
Highway 54 at Big Creek,  
District 4, Hamilton,  
W.P. 201-63.

*Trow/67*

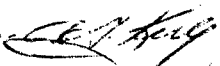
Attached is a plan and profile for a proposed Bailey Bridge at the above site.

The following is Road Design's detour standards:

- Width of detour approaches - 30'.
- Grade is top of granular (detour not to be paved).
- CL detour 48' from CL, Highway 54, Line K.
- Granular depths - 6" G.B.C. "A" and 9" sand cushion.

It should be noted that with the alignment shown a long span Bailey would result in less approach fill being placed in the river. The fill will have to be protected by a toe of fill rock dike to elevation 631.0.

It also appears that there may be foundation difficulties at this site.

  
A.G. Kelly  
Sr. Project Design Engineer  
For:  
G.K. Hunter  
Regional Road Design Engineer

AGK/GB  
Attach.

c.c. A.G. Stermac ✓  
T. Kovich  
W. Melinyshyn  
H. Greenland  
J. Tamulionis



Department of Highways Ontario

Copy for the information of

Mr. A. Stermac,  
Principal Foundation Engineer

Mr. W. Melinyskyn,  
Reg. Bridge Location Engineer,  
Central Region,  
Administration Building

Bridge Division,  
Downsview, Ontario

September 25, 1967

Big Creek Bridge  
W.P. 201-63, Site 1-116  
Highway 54, District No. 4

*Trow/67*

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6207-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$137,000. This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

CSG:rd

C.B. Grebski,  
Bridge Design Engineer

Attach.

c.c. S. McCombie  
A. Stermac (2)  
R. Forrest  
E. Cross

*No Comment Mf*

10  
REC 50 1001

May. 401 & Route 104  
 Downview, Ontario.

January 31, 1967

Materials and Testing Division

William A. Trow Associates Ltd.,  
 43 Wilton Drive,  
 Weston, Ontario.

Attention: Mr. W. A. Trow

Re: Letter of Authority -- Foundation Investigation  
 Big Creek Bridge, Hwy. No. 54 - E.R. 201-63,  
 District No. 6 (Hamilton).

Dear Sir:

Please consider this your authority to carry out a foundation investigation of sufficient scope for the above mentioned crossing.

The available necessary E-plan was given to your representative on January 27, 1967. On this plan the proposed location and spans of the bridge are shown, and the new grade is also indicated.

You are requested to start the field work as soon as possible and submit twelve (12) copies of your final report to the Foundation Section by not later than March 10, 1967.

Should you require additional information, or should any problems arise, you are to contact the Foundation Section, or Mr. W. G. Melnyshyn, Regional Bridge Location Engineer - Toronto - (Tel. No. 243-3506). Mr. I. J. Davich, Regional Materials Engineer, is also being advised that your organization is carrying out this investigation, and should you wish to contact him for certain information, you are welcome to do so.

We understand that you will undertake this investigation from your Hamilton Office.

The field work should, at all times, be supervised by a qualified Civil Engineer. Any deviation from this agreement has to meet our prior approval.

sent 4. /2 ..

William A. Trow Assoc. Ltd.  
Attn: Mr. Wm. A. Trow

- 2 -

January 31, 1966

Previous requirements as to preliminary borehole information and laboratory testing program, should be followed.

Since the drawing accompanying the foundation report, showing the location of borings, the inferred subsoil conditions, etc., is to become a contract drawing, you are requested to prepare it in accordance with the D.M.C. Standards. To enable you to do this, we are supplying you with a sample drawing with all the necessary explanations, together with lined sheet for your drawing. You are also requested to provide us with a Gromaflex copy of the drawing.

Charges for the work performed will be in accordance with your Schedule of Rates, dated January 1, 1966, and invoices to be addressed to the attention of the undersigned.

We are attaching Purchase Order 2-08821, covering the purchase of any new material required for this work, in order that you may use this as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

Yours very truly,



A. Zukas,

MATERIALS & TESTING ENGINEER

AWS/ser  
Attch.

cc: Messrs. S. McCumbe  
C. A. Hunter  
H. Greenland  
H. S. Melinshyn  
T. J. Kovich  
H. Konings  
Mrs. I. Steinberg  
H. Skymanski (2)✓  
A. Crowley  
Foundations Files  
Gen. Files (2)

Mr. B. A. Davis,  
Bridge Engineer,  
Bridge Division,  
Main Bldg.

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

Attention: Mr. E. McCosbie

March 15, 1967

MAR 15 1967

FOUNDATION INVESTIGATION REPORT FOR D.H.C.  
BY: WILLIAM TROW ASSOCIATES LIMITED --  
Big Creek Bridge, Hwy. 54 -- W.P. 201-55,  
District No. 4 (Hamilton).

Attached, please find the above mentioned report prepared and submitted by the consultant, William Trow Associates Ltd.

We have reviewed the report and are of the opinion that it contains all the data pertaining to the foundations that are required for your further design work.

Should you have some questions that you would like to discuss, please feel free to contact this Office.

AGB/ldf  
Attach.

cc: Messrs. B. A. Davis (2)  
B. A. Tregeakes  
C. W. Farren  
C. A. Hunter (2)  
H. Greenland  
A. C. Melinyanyn  
T. J. Kovich  
E. A. Blagh

Foundations Office Files  
Gen. Files

*Alfred*  
A. C. Sterner  
PRINCIPAL FOUNDATION ENGINEER

④

Hwy 51 - Big Creek Bridge  
W.P. 201-63

Fill

$\phi = 30^\circ$   
 $\gamma = 125 \text{ pcf}$

$C = 750 \text{ pcf}$ ;  $\delta = 120 \text{ pcf}$

$C = 950 \text{ pcf}$ ;  $\delta = 88 \text{ pcf}$

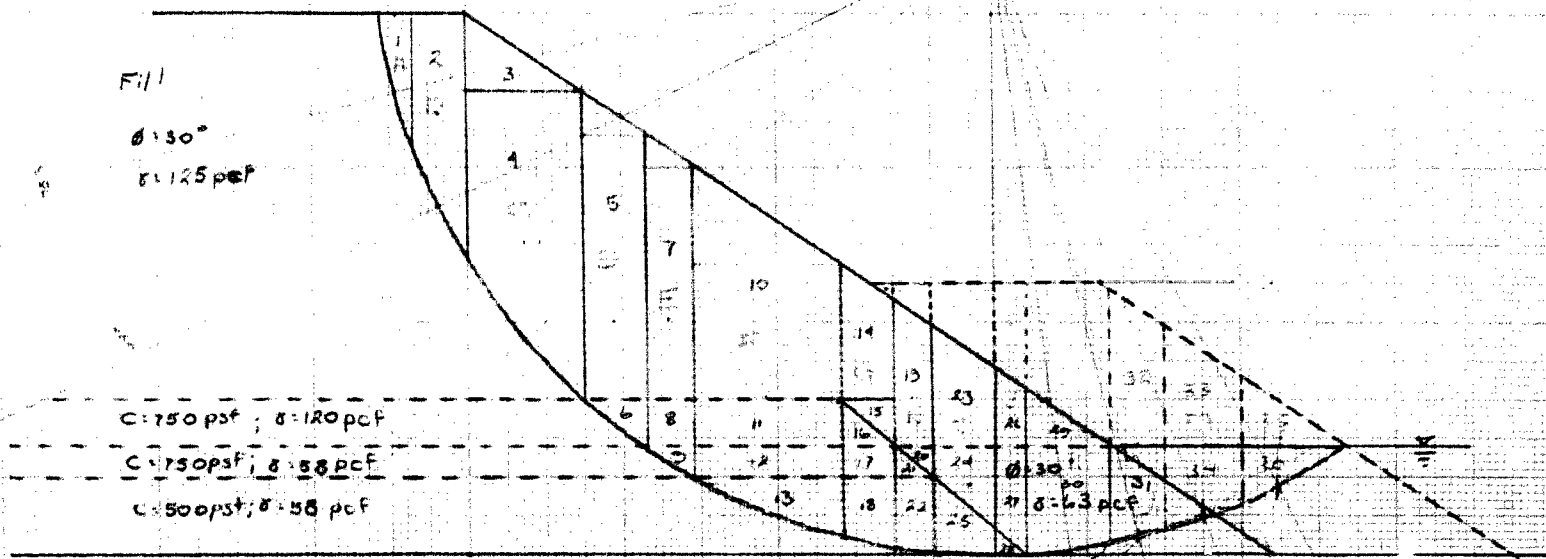
$C = 800 \text{ pcf}$ ;  $\delta = 58 \text{ pcf}$

R=40

sect. A-A

Scale 1"=10'

on H.



# Hwy 59 - Big Creek Bridge Section A-A

①

MADE BY: W.H.  
 LOCATION  
 CHECKED  
 CIRCLE LOCATION  
 DATE

DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & TESTING DIVISION

TOTAL STRESS ANALYSIS

Slice No.	OVERTURNING MOMENT							RESISTING MOMENT								
	y or y'	b	h	Area	W = Weight Kip/linft	r	① $M_o = \sum \pm W_r$ Kip-ft	c	l	R	② c L R	$\tan \phi$	$\Delta$	$\cos \Delta$	③ $\pm W R \cos \Delta$ $\tan \phi$	$M_r = \textcircled{2} + \textcircled{3}$
1	125	2	$\frac{8.5}{2}$	8.5	1.1											
2	125	3.5	$\frac{8.5+16}{2}$	42.5	5.4											
3	125	7.5	$\frac{5}{2}$	18.7	2.3											
4	125	7.5	$\frac{11+20}{2}$	116.2	14.5											
5	125	4	$\frac{20+17}{2}$	74.0	9.3											
6	120	4	$\frac{3}{2}$	6.0	0.7											
7	125	3	$\frac{17+15}{2}$	48.0	6.0											
8	125	3	3	9.0	1.1											
9	58	3	$\frac{3}{2}$	3.0	0.2											
10	125	9.5	$\frac{5+8.5}{2}$	112.0	14.0											
11	120	9.5	3	28.5	3.4											
12	58	9.5	2	19.0	1.1											
13	58	9.5	$\frac{7}{2}$	19.0	1.1											
14	125	3.5	$\frac{8.5+6.5}{2}$	26.2	3.3											
15	125	3.5	$\frac{3}{2}$	5.3	0.7											

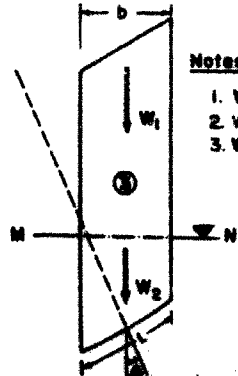
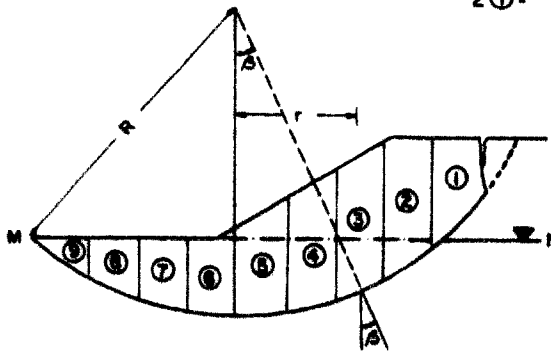
$\Sigma \textcircled{1} =$

$\Sigma \textcircled{2} + \textcircled{3} =$

$F = \frac{\Sigma \textcircled{2} + \textcircled{3}}{\Sigma \textcircled{1}} =$

Notes:-

1.  $W = W_1 + W_2$
2.  $W_1$  Weight of Slice above MN, computed from Bulk density
3.  $W_2$  Weight of Slice above MN, computed from Submerged density



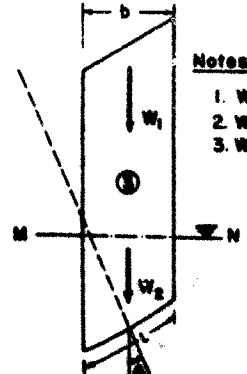
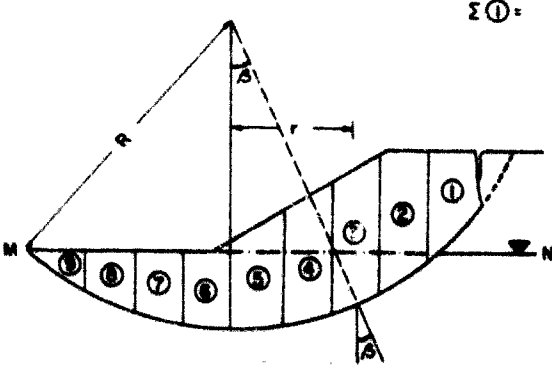
SOIL PROPERTIES				
TYPE	$\gamma$	$\gamma'$	$c$	$\phi$

CIRCLE NO.  
 RADIUS  
 JOB NO. W.D. 201-63  
 SHEET NO.

# Big Creek Bridge

BASE ST.  
LOCATION  
CHECKED  
CIRCLE LOCATION  
DATE

Slice No.	$y$ or $y'$	OVERTURNING MOMENT						RESISTING MOMENT								$M_r = \textcircled{2} + \textcircled{3}$
		$b$	$h$	Area	$W = \text{Weight}$	$r$	$\textcircled{1}$ $M_o = \sum \pm W_r$	$c$	$l$	$R$	$\textcircled{1}$ $c \cdot l \cdot R$	$\tan \phi$	$\Delta$	$\cos \Delta$	$\textcircled{3}$ $\pm WR \cos \Delta / \tan \phi$	
16	120	3.5	$\frac{1}{2}$	5.3	0.6											
17	58	3.5	2	7.0	0.9											
18	58	$3.5(\frac{4+4.5}{2})$		14.0	0.9											
19	125	$2.5(\frac{3.5+5}{2})$		21.8	2.7											
20	63	2.5	$\frac{3}{4}$	2.5	0.2											
21	58	2.5	$\frac{1}{2}$	2.5	0.1											
22	58	$2.5(\frac{4.5+5}{2})$		10.9	0.6											
23	125	$4(\frac{8+5}{2})$		26.0	3.3											
24	63	$4(\frac{2+5.5}{2})$		15.0	0.9											
25	58	$4(\frac{3+1.5}{2})$		13.0	0.8											
26	125	$2(\frac{5+1}{2})$		9.0	1.1											
27	63	$2(\frac{5.5+7}{2})$		12.5	0.8											
28	58	2	$\frac{1.5}{2}$	1.5	0.1											
29	125	5.5	$\frac{1}{2}$	11.0	1.4											
30	63	$5.5(\frac{7+6}{2})$		35.8	2.3											
31	63	6	$\frac{1}{2}$	21.0	1.3											



Notes:-  
 1.  $W = W_1 + W_2$   
 2.  $W_1$  Weight of Slice above MN, computed from Bulk density  
 3.  $W_2$  Weight of Slice below MN, computed from Submerged density

$\sum \textcircled{2} + \textcircled{3} =$   
 $F = \frac{\sum \textcircled{2} + \textcircled{3}}{\sum \textcircled{1}} =$

SOIL PROPERTIES				
TYPE	$\gamma$	$\gamma'$	$c$	$\phi$

DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS & TESTING DIVISION  
 TOTAL STRESS ANALYSIS  
 CIRCLE NO.  
 RADIUS  
 JOB NO.  
 SHEET NO.

Big Creek Bridge

Slice No.	OVERTURNING MOMENT							RESISTING MOMENT								$M_r = \textcircled{2} + \textcircled{3}$
	$y$ or $y'$	$b$	$h$	Area	$W = \text{Weight}$	$r$	$M_o = \Sigma \pm W_r$	$c$	$l$	$R$	$\textcircled{2}$ $c \cdot l \cdot R$	$30^\circ$ $\tan \phi$	$\beta$	$\cos \beta$	$\textcircled{3}$ $\pm W R \cos \beta$ $\tan \phi$	
A					1.1	38.8	41.8					0.577	75.3	0.254	6.6	
B					5.4	35.8	193.3					0.577	64	0.438	54.6	
C					16.8	30.3	510.0					0.577	49.4	0.650	250.0	
D					10.0	21.5	245.0	750	5	40	150					
E					7.2	21.0	151.0	750	3.5	40	105					
F					16.6	14.8	246.0	500	10.5	40	210					
G					5.9	8.3	49.0	500	3.5	40	70					
H					3.6	5.3	19.1	500	2.5	40	50					
I					5.0	2.0	10.0	500	4.0	40	80					
J					2.0	1.0	- 2.0	500	2.0	40	40					
K					3.7	4.8	- 17.7					0.577	7°	0.993	84.6	
L					1.3	9.8	- 12.7				<del>40</del> 705	0.577	14.2°	0.960	<u>29.0</u>	
															<del>10</del> 124.8	
																1129.8

$\Sigma \textcircled{1} = 1432.8$

$\Sigma \textcircled{2} + \textcircled{3} = 1129.8$

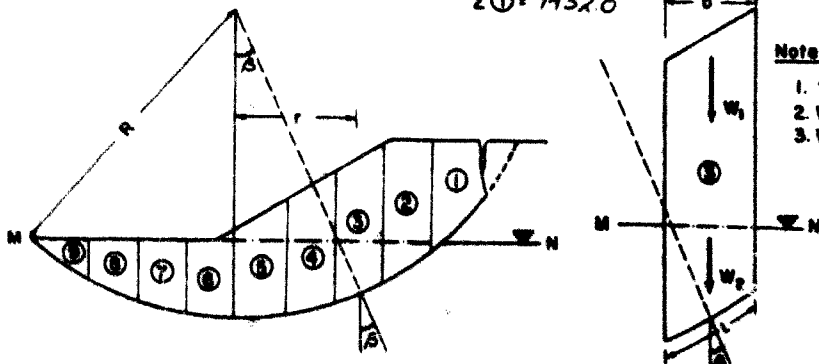
$F = \frac{\Sigma \textcircled{2} + \textcircled{3}}{\Sigma \textcircled{1}} = 0.786$

Computer 0.747

Notes:-

1.  $W = W_1 + W_2$
2.  $W_1$  Weight of Slice above MN, computed from Bulk density
3.  $W_2$  Weight of Slice above MN, computed from Submerged density

SOIL PROPERTIES				
TYPE	$\gamma$	$\gamma'$	$c$	$\phi$



MADE BY:  
LOCATION  
CHECKED  
CIRCLE LOCATION  
DATE

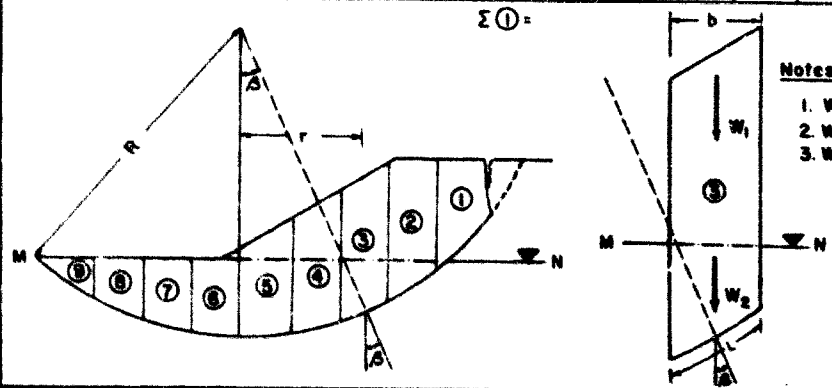
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION  
TOTAL STRESS ANALYSIS

CIRCLE NO.  
RADIUS  
JOB NO.  
SHEET NO.



Hwy 54 - Big Creek Bridge Section AA

15' Berm

[illegible]

**Notes:—**

1.  $W = W_1 + W_2$   $\Sigma \textcircled{1}$   
 2.  $W_1$  Weight of Slice above MN, computed from Bulk density  
 3.  $W_2$  Weight of Slice above MN, computed from Submerged density

$$F = \frac{\Sigma (2) + (3)}{\Sigma (1)} =$$

SOIL PROPERTIES				
TYPE	$\gamma$	$\gamma'$	c	$\phi$

MADE BY:	
LOCATION	
CHECKED	
CIRCLE LOCATION	
DATE	

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION

---

TOTAL STRESS ANALYSIS

**CIRCLE NO.**

**RADIUS**

**JOB NO.**

**SHEET NO.**

$$F = \frac{\Sigma ② + ③}{\Sigma ①} = 1.2$$

1.  $W = W_1 + W_2$
2.  $W_1$  Weight of Slice above MN, computed from Bulk density
3.  $W_2$  Weight of Slice above MN, computed from Submerged density

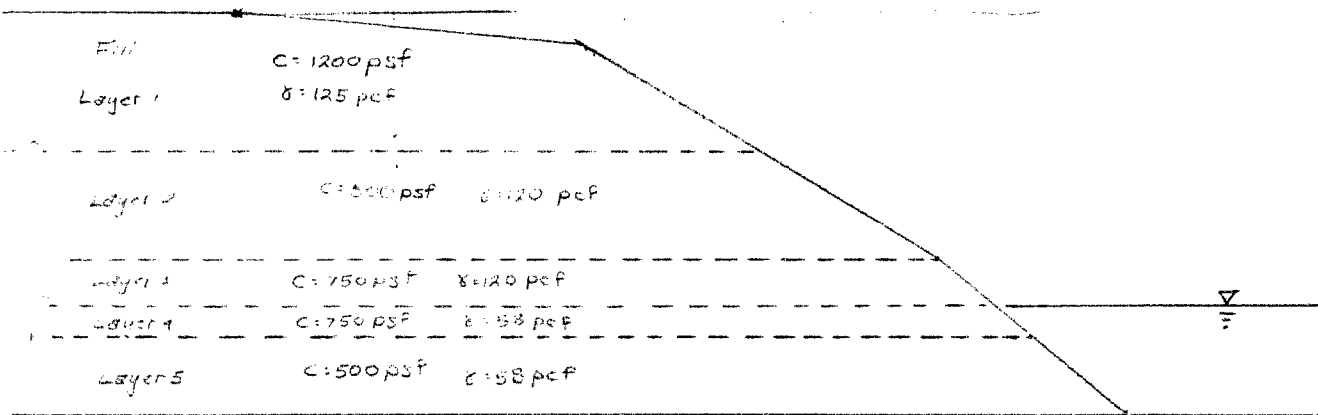
650

640

630

620

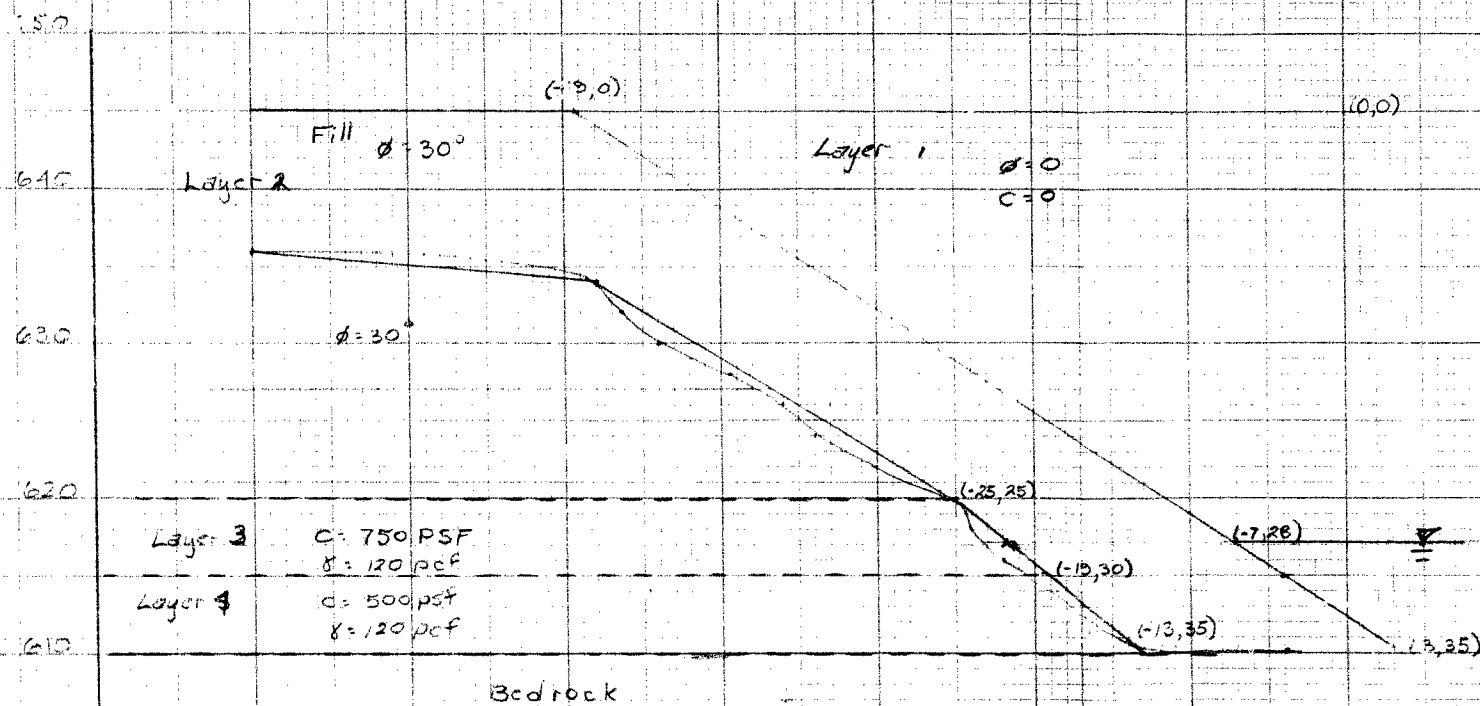
610



Sect A-A

Scale 1"=10'

H=U



SECTION A-A  
see Dwg D-6607-P copy 1

Scale 1"=10' H=V

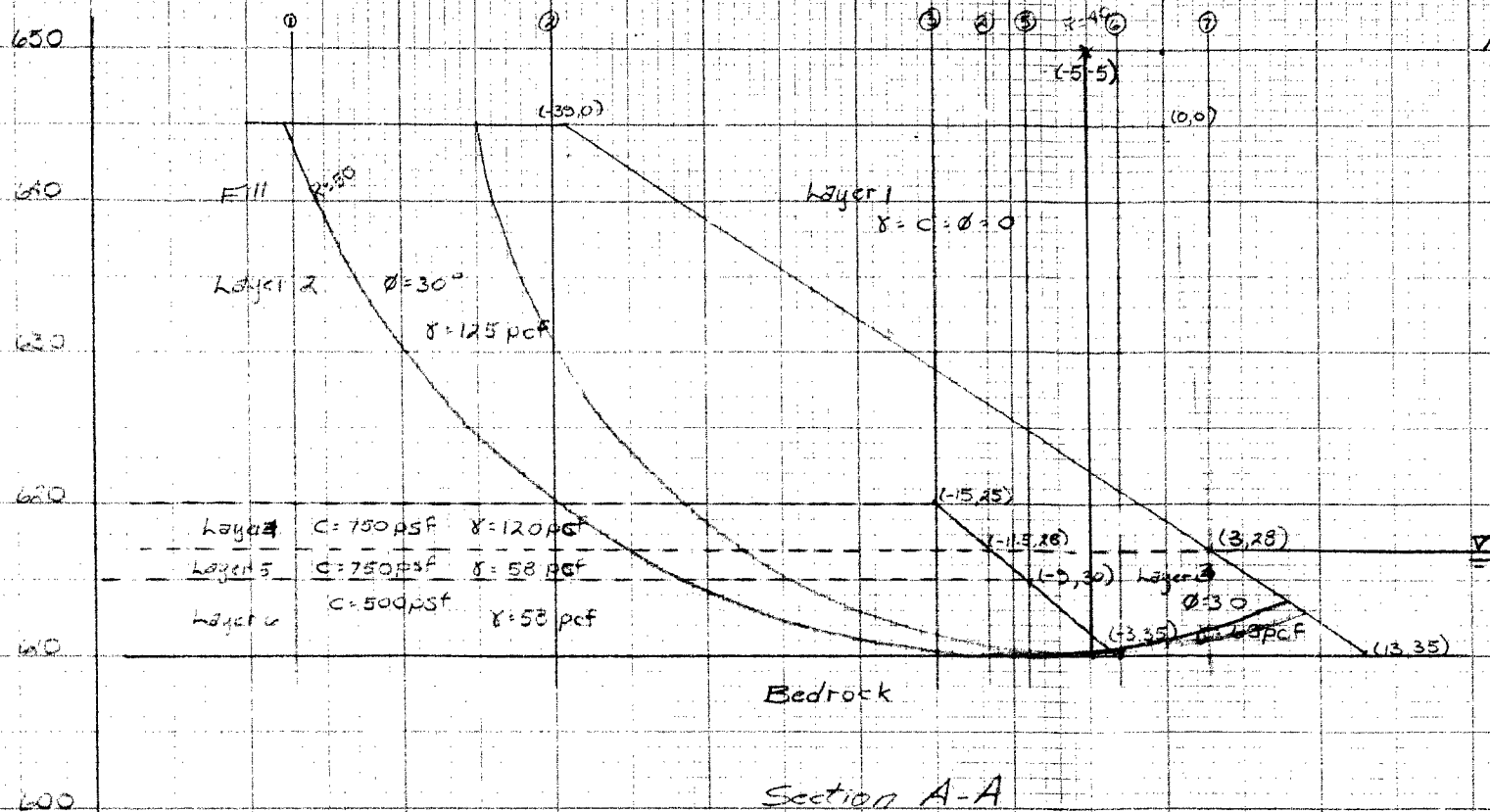
CM Feb 6/69

10 X 10 TO THE INCH 47 0780

W. Trow Assoc Dwg # H651

R150

Hwy #54 Big Creek Bridge  
WP 201-63



Scale 1" = 10'

H = V

W. Trow Assoc Dwg # H651

Hwy # 54 - Big Creek Bridge  
W.P. 201-63

650

640

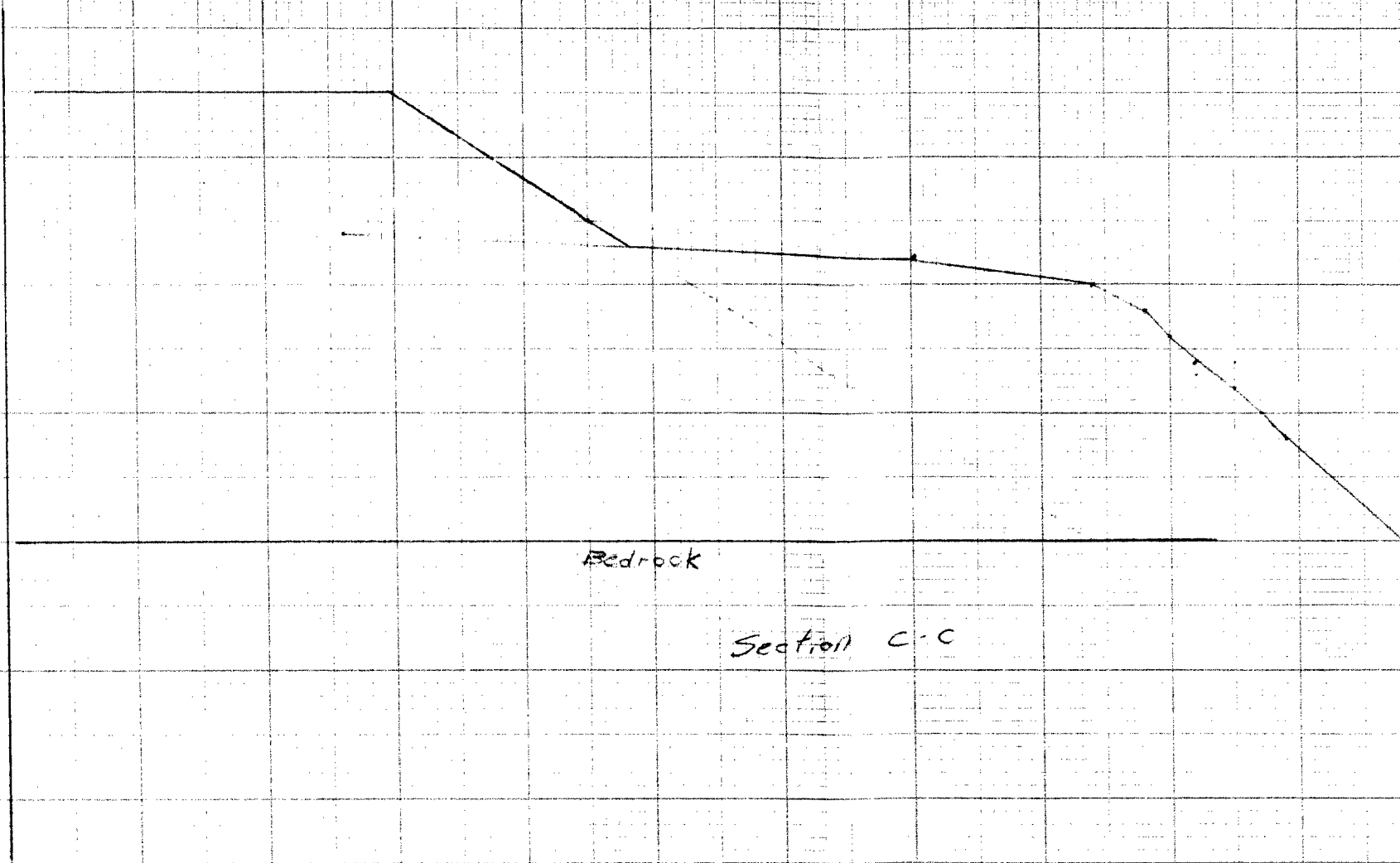
630

620

610

Bedrock

Section C-C



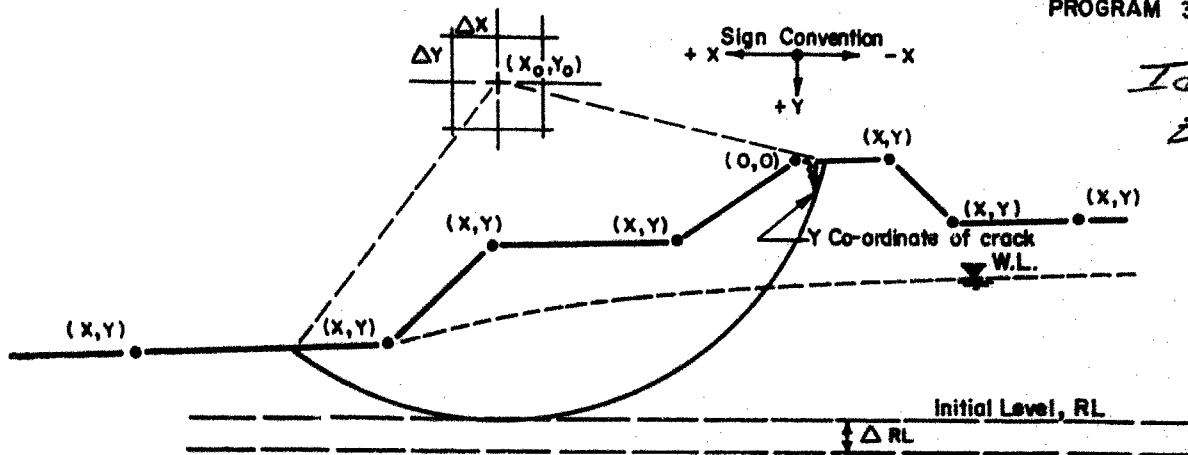
## STABILITY ANALYSIS (COMPLEX SLOPE)

MADE BY. W. Hutton

DATE Feb 11/69 JOB NO. 201-63

~~PROGRAM 32 (C.S.D. analysis)~~

**PROGRAM 33 ( $\emptyset = 0$  analysis)**



Identical to  
ECB No 212047

Except  
For  
Soil Property  
Sheet

9		18		48		80	
PROG. NO.		JOB TITLE		DATE		JOB NO.	
33		HWY 54 BIG CREEK BRIDGE SEC B-B		FEB 11 69		WUP 201-63	

## GEOMETRY OF SLOPE & INITIAL TRIAL CIRCLE

[illegible]

## SECTION DETAILS

## REMARKS

Sect B-B

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER. SOIL BOUNDARY	WATER LEVEL
1	4	11	14	20 25
1	-2.00:0	1	0:0	2.8:0
1	:	2	0:0	:
1	:	3	1.5:0	:
1	:	4	1.5:0	:
1	:	5	2.5:0	:
1	:	6	2.8:0	:
1	:	7	3.0:0	:
2	-4.0:0	1	0:0	2.8:0
2	:	2	0:0	:
2	:	3	1.5:0	:
2	:	4	1.5:0	:
2	:	5	2.5:0	:
2	:	6	2.8:0	:
2	:	7	3.0:0	:
3	-2.7:0	1	0:0	2.8:0
3	:	2	8:5	:
3	:	3	1.5:0	:
3	:	4	1.5:0	:
3	:	5	2.5:0	:
3	:	6	2.8:0	:



## SECTION DETAILS

REMARKS

Sect 08

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
3		7	3.0:0	
4	- 1.6:0	1	0:0	2.8:0
4		2	1.6:0	
4		3	1.9:0	
4		4	1.9:0	
4		5	2.5:0	
4		6	2.8:0	
4		7	3.0:0	
5	- 1.1:0	1	0:0	2.8:0
5		2	1.9:0	
5		3	2.5:0	
5		4	2.5:0	
5		5	2.5:0	
5		6	2.8:0	
5		7	3.0:0	
6	- 4:0	1	0:0	2.8:0
6		2	2.4:0	
6		3	2.8:0	
6		4	2.8:0	
6		5	2.8:0	

## SECTION DETAILS

## REMARKS

Sect B-B

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
4		11	14	20 25
6	:	6	2.8:0	:
6	:	7	3.0:0	:
7	0:0	1	0:0	2.8:0
7	:	2	2.6:5	:
7	:	3	2.8:0	:
7	:	4	3.0:0	:
7	:	5	3.0:0	:
7	:	6	3.0:0	:
7	:	7	3.0:0	:
8	3:0	1	0:0	2.8:0
8	:	2	2.8:0	:
8	:	3	2.8:0	:
8	:	4	3.1:0	:
8	:	5	3.1:0	:
8	:	6	3.1:0	:
8	:	7	3.1:0	:
9	1.3:0	1	0:0	2.8:0
9	:	2	2.8:0	:
9	:	3	2.8:0	:
9	:	4	3.5:0	:



## SOIL PROPERTIES

REMARKS

[illegible]

57	63.00	-5.00	-40.00	2.014
58	67.00	-5.00	-40.00	1.628
59	71.00	-5.00	-40.00	1.264
60	75.00	-5.00	-40.00	1.035

IHC2101	PROGRAM	INTERRUPT(P)	CLD	PSW	IS	FFE5000F8202D2E6
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61	55.00	0.0	-40.00	0.0
62	59.00	0.0	-40.00	0.956
63	63.00	0.0	-40.00	2.028
64	67.00	0.0	-40.00	1.806
65	71.00	0.0	-40.00	1.329
66	75.00	0.0	-40.00	1.086
70	62.00	-50.00	-35.00	3.459
71	66.00	-50.00	-35.00	2.448
72	70.00	-50.00	-35.00	1.799
75	58.00	-45.00	-35.00	3.872
76	62.00	-45.00	-35.00	2.954
77	66.00	-45.00	-35.00	2.235
78	70.00	-45.00	-35.00	1.573
80	54.00	-40.00	-35.00	3.793
81	58.00	-40.00	-35.00	3.412
82	62.00	-40.00	-35.00	2.511
83	66.00	-40.00	-35.00	1.839
84	70.00	-40.00	-35.00	1.396
85	50.00	-35.00	-35.00	2.700
86	54.00	-35.00	-35.00	3.172
87	58.00	-35.00	-35.00	2.949
88	62.00	-35.00	-35.00	2.138
89	66.00	-35.00	-35.00	1.623
90	70.00	-35.00	-35.00	1.244
91	50.00	-30.00	-35.00	2.200
92	54.00	-30.00	-35.00	2.810
93	58.00	-30.00	-35.00	2.628
94	62.00	-30.00	-35.00	1.910
95	66.00	-30.00	-35.00	1.400
96	70.00	-30.00	-35.00	1.190
97	50.00	-25.00	-35.00	1.820
98	54.00	-25.00	-35.00	2.532
99	58.00	-25.00	-35.00	2.347
100	62.00	-25.00	-35.00	1.647
101	66.00	-25.00	-35.00	1.340
102	70.00	-25.00	-35.00	1.150
103	50.00	-20.00	-35.00	1.523
104	54.00	-20.00	-35.00	2.545
105	58.00	-20.00	-35.00	2.122
106	62.00	-20.00	-35.00	1.590
107	66.00	-20.00	-35.00	1.254
108	70.00	-20.00	-35.00	1.066
109	50.00	-15.00	-35.00	1.280
110	54.00	-15.00	-35.00	2.214
111	58.00	-15.00	-35.00	2.019
112	62.00	-15.00	-35.00	1.569

	RADIUS	XC	YC	F. OF S.
4	67.00	-50.00	-40.00	3.480
5	71.00	-50.00	-40.00	2.591
6	75.00	-50.00	-40.00	1.797
9	63.00	-45.00	-40.00	4.025
10	67.00	-45.00	-40.00	2.838
11	71.00	-45.00	-40.00	2.110
12	75.00	-45.00	-40.00	1.660
14	59.00	-40.00	-40.00	3.731
15	63.00	-40.00	-40.00	3.404
16	67.00	-40.00	-40.00	2.502
17	71.00	-40.00	-40.00	1.770
18	75.00	-40.00	-40.00	1.409
19	55.00	-35.00	-40.00	2.784
20	59.00	-35.00	-40.00	3.206
21	63.00	-35.00	-40.00	2.966
22	67.00	-35.00	-40.00	2.146
23	71.00	-35.00	-40.00	1.558
24	75.00	-35.00	-40.00	1.243
25	55.00	-30.00	-40.00	2.291
26	59.00	-30.00	-40.00	2.852
27	63.00	-30.00	-40.00	2.595
28	67.00	-30.00	-40.00	1.873
29	71.00	-30.00	-40.00	1.449
30	75.00	-30.00	-40.00	1.194
31	55.00	-25.00	-40.00	1.913
32	59.00	-25.00	-40.00	2.572
33	63.00	-25.00	-40.00	2.383
34	67.00	-25.00	-40.00	1.719
35	71.00	-25.00	-40.00	1.372
36	75.00	-25.00	-40.00	1.169
37	55.00	-20.00	-40.00	1.613
38	59.00	-20.00	-40.00	2.578
39	63.00	-20.00	-40.00	2.250
40	67.00	-20.00	-40.00	1.612
41	71.00	-20.00	-40.00	1.250
42	75.00	-20.00	-40.00	1.068
43	55.00	-15.00	-40.00	1.365
44	59.00	-15.00	-40.00	2.244
45	63.00	-15.00	-40.00	2.043
46	67.00	-15.00	-40.00	1.624
47	71.00	-15.00	-40.00	1.301
48	75.00	-15.00	-40.00	1.024
49	55.00	-10.00	-40.00	1.155
50	59.00	-10.00	-40.00	2.060
51	63.00	-10.00	-40.00	2.165
52	67.00	-10.00	-40.00	1.590
53	71.00	-10.00	-40.00	1.243
54	75.00	-10.00	-40.00	0.992
55	55.00	-5.00	-40.00	0.968
56	59.00	-5.00	-40.00	1.107

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8		3	28.00	
8		4	31.00	
8		5	31.00	
8		6	31.00	
8		7	31.00	
9	13.00	1	0.0	28.00
9		2	28.00	
9		3	28.00	
9		4	35.00	
9		5	35.00	
9		6	35.00	
9		7	35.00	
10	200.00	1	0.0	28.00
10		2	28.00	
10		3	28.00	
10		4	35.00	
10		5	35.00	
10		6	35.00	
10		7	35.00	

SOIL PROPERTIES				
SOIL TYPE	COHESION	PHI	BULK DENSITY	SUBMERGED DENSITY
1	0.0	0.0	0.0	0.0
2	0.0	30.0	125.0	63.0
3	0.0	30.0	63.0	63.0
4	1250.	0.0	125.0	63.0
5	750.	0.0	120.0	58.0
6	750.	0.0	58.0	58.0
7	500.	0.0	58.0	58.0

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HWY 54 BIG CREEK BRIDGE SEC B-B FEB 11 69 WP 201-63

RUN DATE FEB 19, 1969

SLICES	X-INIT.	Y-INIT.	DELX	DELY	TANG.	R.L.	INCR.	NO. R	TENSION CRACK	NO. PTS.%-X<	NO. PTS.%&X<	CUT-OFF%-X<	CUT-OFF%&X<
25	-25	-15	5.0	5.0	15.0		4.0	6	0.0	1	3	-200.0	200.0

X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD
-200.00	0.0	3.00	28.00	13.00	35.00	200.00	35.00				

## SECTIONAL DETAILS

SECTION	X COORD	SOIL TYPE	Y COORD	WATER	LE
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1	-200.00	1	0.0		
1		2	0.0		
1		3	15.00		
1		4	15.00		
1		5	25.00		
1		6	28.00		
1		7	30.00		
2	-40.00	1	0.0	28.00	
2		2	0.0		
2		3	15.00		
2		4	15.00		
2		5	25.00		
2		6	28.00		
2		7	30.00		
3	-27.00	1	0.0	28.00	
3		2	8.50		
3		3	15.00		
3		4	15.00		
3		5	25.00		
3		6	28.00		
3		7	30.00		
4	-16.00	1	0.0	28.00	
4		2	16.00		
4		3	19.00		
4		4	19.00		
4		5	25.00		
4		6	28.00		
4		7	30.00		
5	-11.00	1	0.0	28.00	
5		2	19.00		
5		3	25.00		
5		4	25.00		
5		5	25.00		
5		6	28.00		
5		7	30.00		
6	-4.00	1	0.0	28.00	
6		2	24.00		
6		3	28.00		
6		4	28.00		
6		5	28.00		
6		6	28.00		
6		7	30.00		
7	0.0	1	0.0	28.00	
7		2	26.50		
7		3	28.00		
7		4	30.00		
7		5	30.00		
7		6	30.00		
7		7	30.00		
8	3.00	1	0.0	28.00	
8		2	28.00		



# CRITICAL CIRCLE

RADIUS	XC	YC	F. OF S.
55.00	0.0	-40.00	0.0
50.00	0.0	-35.00	0.0
45.00	0.0	-30.00	0.0
40.00	-5.00	-25.00	0.0
40.00	0.0	-25.00	0.0
35.00	-5.00	-20.00	0.0
35.00	0.0	-20.00	0.0
30.00	-5.00	-15.00	0.0
30.00	0.0	-15.00	0.0
34.00	0.0	-15.00	0.0
25.00	-5.00	-10.00	0.0
25.00	0.0	-10.00	0.0
29.00	0.0	-10.00	0.0
20.00	-10.00	-5.00	0.0
20.00	-5.00	-5.00	0.0
20.00	0.0	-5.00	0.0
24.00	0.0	-5.00	0.0
15.00	-10.00	0.0	0.0
15.00	-5.00	0.0	0.0
19.00	-5.00	0.0	0.0
15.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
10.00	-5.00	5.00	0.0
14.00	-5.00	5.00	0.0
10.00	0.0	5.00	0.0
14.00	0.0	5.00	0.0
13.00	0.0	10.00	0.0
18.00	0.0	5.00	0.829
39.00	0.0	-20.00	0.842
25.00	-10.00	-10.00	0.848
44.00	0.0	-25.00	0.866
24.00	-5.00	-5.00	0.874
45.00	-5.00	-30.00	0.877
30.00	-10.00	-15.00	0.879
29.00	-5.00	-10.00	0.881
49.00	0.0	-30.00	0.884

THIS JOB COMPLETED. RUNNING DATE FEB 19, 1969 TIME ELAPSED # 59 SECONDS

635	26.00	-20.00	5.00	1.467
636	30.00	-20.00	5.00	1.081

639	18.00	-15.00	5.00	3.244
640	22.00	-15.00	5.00	2.162
641	26.00	-15.00	5.00	1.542
642	30.00	-15.00	5.00	1.155
644	14.00	-10.00	5.00	0.952
645	18.00	-10.00	5.00	3.286
646	22.00	-10.00	5.00	2.559
647	26.00	-10.00	5.00	1.654
648	30.00	-10.00	5.00	1.219

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

649	10.00	-5.00	5.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

650	14.00	-5.00	5.00	0.0
651	18.00	-5.00	5.00	1.560
652	22.00	-5.00	5.00	3.012
653	26.00	-5.00	5.00	1.951
654	30.00	-5.00	5.00	1.391

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

655	10.00	0.0	5.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

656	14.00	0.0	5.00	0.0
657	18.00	0.0	5.00	0.829
658	22.00	0.0	5.00	2.679
659	26.00	0.0	5.00	2.337
660	30.00	0.0	5.00	1.725
701	21.00	-20.00	10.00	3.649
702	25.00	-20.00	10.00	2.455
706	17.00	-15.00	10.00	6.944
707	21.00	-15.00	10.00	3.793
708	25.00	-15.00	10.00	2.481
711	13.00	-10.00	10.00	24.207
712	17.00	-10.00	10.00	7.829
713	21.00	-10.00	10.00	4.095
714	25.00	-10.00	10.00	2.796
717	13.00	-5.00	10.00	1.374
718	17.00	-5.00	10.00	9.878
719	21.00	-5.00	10.00	4.805
720	25.00	-5.00	10.00	3.179

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

723	13.00	0.0	10.00	0.0
724	17.00	0.0	10.00	1.108
725	21.00	0.0	10.00	6.425
726	25.00	0.0	10.00	3.834

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518	24.00	-5.00	-5.00	0.874
519	28.00	-5.00	-5.00	2.574
520	32.00	-5.00	-5.00	2.160
521	36.00	-5.00	-5.00	1.468
522	40.00	-5.00	-5.00	1.180

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
523	20.00	0.0	-5.00	0.0

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
524	24.00	0.0	-5.00	0.0
525	28.00	0.0	-5.00	0.919
526	32.00	0.0	-5.00	2.796
527	36.00	0.0	-5.00	1.866
528	40.00	0.0	-5.00	1.404
552	35.00	-35.00	0.0	1.534
557	31.00	-30.00	0.0	1.434
558	35.00	-30.00	0.0	1.340
562	27.00	-25.00	0.0	1.772
563	31.00	-25.00	0.0	1.309
564	35.00	-25.00	0.0	1.182
567	23.00	-20.00	0.0	2.312
568	27.00	-20.00	0.0	1.686
569	31.00	-20.00	0.0	1.256
570	35.00	-20.00	0.0	1.124
571	15.00	-15.00	0.0	0.892
572	19.00	-15.00	0.0	3.176
573	23.00	-15.00	0.0	2.374
574	27.00	-15.00	0.0	1.608
575	31.00	-15.00	0.0	1.293
576	35.00	-15.00	0.0	1.018

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
577	15.00	-10.00	0.0	0.0
578	19.00	-10.00	0.0	0.939
579	23.00	-10.00	0.0	2.821
580	27.00	-10.00	0.0	1.965
581	31.00	-10.00	0.0	1.403
582	35.00	-10.00	0.0	1.035

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
583	15.00	-5.00	0.0	0.0

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
584	19.00	-5.00	0.0	0.0
585	23.00	-5.00	0.0	2.488
586	27.00	-5.00	0.0	2.544
587	31.00	-5.00	0.0	1.716
588	35.00	-5.00	0.0	1.161

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
589	15.00	0.0	0.0	0.0

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6				
590	19.00	0.0	0.0	0.0
591	23.00	0.0	0.0	0.915
592	27.00	0.0	0.0	2.903
593	31.00	0.0	0.0	2.022
594	35.00	0.0	0.0	1.438
629	26.00	-25.00	5.00	1.480
630	30.00	-25.00	5.00	1.201

440	29.00	-15.00	-10.00	2.258
441	33.00	-15.00	-10.00	1.980
442	37.00	-15.00	-10.00	1.490
443	41.00	-15.00	-10.00	1.177
444	45.00	-15.00	-10.00	1.023
445	25.00	-10.00	-10.00	0.848
446	29.00	-10.00	-10.00	0.947
447	33.00	-10.00	-10.00	2.055
448	37.00	-10.00	-10.00	1.623
449	41.00	-10.00	-10.00	1.255
450	45.00	-10.00	-10.00	0.934

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

451	25.00	-5.00	-10.00	0.0
452	29.00	-5.00	-10.00	0.881
453	33.00	-5.00	-10.00	2.541
454	37.00	-5.00	-10.00	1.680
455	41.00	-5.00	-10.00	1.285
456	45.00	-5.00	-10.00	1.035

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

457	25.00	0.0	-10.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

458	29.00	0.0	-10.00	0.0
459	33.00	0.0	-10.00	0.916
460	37.00	0.0	-10.00	2.503
461	41.00	0.0	-10.00	1.595
462	45.00	0.0	-10.00	1.195
465	36.00	-35.00	-5.00	1.683
466	40.00	-35.00	-5.00	1.356
490	32.00	-30.00	-5.00	1.924
491	36.00	-30.00	-5.00	1.493
492	40.00	-30.00	-5.00	1.173
495	28.00	-25.00	-5.00	2.198
496	32.00	-25.00	-5.00	1.634
497	36.00	-25.00	-5.00	1.316
498	40.00	-25.00	-5.00	1.388
500	24.00	-20.00	-5.00	2.186
501	28.00	-20.00	-5.00	2.043
502	32.00	-20.00	-5.00	1.545
503	36.00	-20.00	-5.00	1.297
504	40.00	-20.00	-5.00	1.002
505	20.00	-15.00	-5.00	0.916
506	24.00	-15.00	-5.00	2.592
507	28.00	-15.00	-5.00	2.208
508	32.00	-15.00	-5.00	1.681
509	36.00	-15.00	-5.00	1.156
510	40.00	-15.00	-5.00	1.016

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

511	20.00	-10.00	-5.00	0.0
512	24.00	-10.00	-5.00	0.943
513	28.00	-10.00	-5.00	2.497
514	32.00	-10.00	-5.00	1.715
515	36.00	-10.00	-5.00	1.315
516	40.00	-10.00	-5.00	1.049

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

517	20.00	-5.00	-5.00	0.0
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367	30.00	-20.00	-15.00	1.139
368	34.00	-20.00	-15.00	2.130
369	38.00	-20.00	-15.00	2.000
370	42.00	-20.00	-15.00	1.510
371	46.00	-20.00	-15.00	1.251
372	50.00	-20.00	-15.00	0.993
373	30.00	-15.00	-15.00	0.949
374	34.00	-15.00	-15.00	2.003
375	38.00	-15.00	-15.00	1.951
376	42.00	-15.00	-15.00	1.522
377	46.00	-15.00	-15.00	1.103
378	50.00	-15.00	-15.00	0.936
379	30.00	-10.00	-15.00	0.879
380	34.00	-10.00	-15.00	0.954
381	38.00	-10.00	-15.00	2.037
382	42.00	-10.00	-15.00	1.618
383	46.00	-10.00	-15.00	1.174
384	50.00	-10.00	-15.00	0.978

INCH	PROGRAM	INTERRUPT(P)	OLD PSW	IS	FF5000F8202D2E6
385	30.00	-5.00	-15.00	0.0	
386	34.00	-5.00	-15.00	0.893	
387	38.00	-5.00	-15.00	2.323	
388	42.00	-5.00	-15.00	1.752	
389	46.00	-5.00	-15.00	1.334	
390	50.00	-5.00	-15.00	1.014	

INCH	PROGRAM	INTERRUPT(P)	OLD PSW	IS	FF5000F8202D2E6
391	30.00	0.0	-15.00	0.0	

INCH	PROGRAM	INTERRUPT(P)	OLD PSW	IS	FF5000F8202D2E6
392	34.00	0.0	-15.00	0.0	
393	38.00	0.0	-15.00	1.647	
394	42.00	0.0	-15.00	2.122	
395	46.00	0.0	-15.00	1.491	
396	50.00	0.0	-15.00	1.231	
414	45.00	-40.00	-10.00	1.526	
418	37.00	-35.00	-10.00	2.200	
419	41.00	-35.00	-10.00	1.729	
420	45.00	-35.00	-10.00	1.326	
423	33.00	-30.00	-10.00	2.529	
424	37.00	-30.00	-10.00	1.894	
425	41.00	-30.00	-10.00	1.346	
426	45.00	-30.00	-10.00	1.209	
428	29.00	-25.00	-10.00	2.340	
429	33.00	-25.00	-10.00	2.172	
430	37.00	-25.00	-10.00	1.654	
431	41.00	-25.00	-10.00	1.271	
432	45.00	-25.00	-10.00	1.050	
433	25.00	-20.00	-10.00	1.052	
434	29.00	-20.00	-10.00	2.252	
435	33.00	-20.00	-10.00	2.006	
436	37.00	-20.00	-10.00	1.466	
437	41.00	-20.00	-10.00	1.162	
438	45.00	-20.00	-10.00	1.069	
439	25.00	-15.00	-10.00	0.929	

298	47.00	-25.00	-20.00	1.577
299	51.00	-25.00	-20.00	1.308
300	55.00	-25.00	-20.00	1.046
301	35.00	-20.00	-20.00	1.238
302	39.00	-20.00	-20.00	2.278
303	43.00	-20.00	-20.00	2.105
304	47.00	-20.00	-20.00	1.555
305	51.00	-20.00	-20.00	1.193
306	55.00	-20.00	-20.00	1.009
307	35.00	-15.00	-20.00	1.015
308	39.00	-15.00	-20.00	2.128
309	43.00	-15.00	-20.00	2.009
310	47.00	-15.00	-20.00	1.484
311	51.00	-15.00	-20.00	1.143
312	55.00	-15.00	-20.00	0.993
313	35.00	-10.00	-20.00	0.895
314	39.00	-10.00	-20.00	1.932
315	43.00	-10.00	-20.00	2.074
316	47.00	-10.00	-20.00	1.621
317	51.00	-10.00	-20.00	1.170
318	55.00	-10.00	-20.00	0.977

INC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFF5000FB202D2E6

319	35.00	-5.00	-20.00	0.0
320	39.00	-5.00	-20.00	0.906
321	43.00	-5.00	-20.00	2.094
322	47.00	-5.00	-20.00	1.602
323	51.00	-5.00	-20.00	1.270
324	55.00	-5.00	-20.00	1.015

INC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFF5000FB202D2E6

325	35.00	0.0	-20.00	0.0
326	39.00	0.0	-20.00	0.842
327	43.00	0.0	-20.00	1.946
328	47.00	0.0	-20.00	1.956
329	51.00	0.0	-20.00	1.382
330	55.00	0.0	-20.00	1.068
342	50.00	-45.00	-15.00	1.757
347	46.00	-40.00	-15.00	1.852
348	50.00	-40.00	-15.00	1.524
352	42.00	-35.00	-15.00	2.210
353	46.00	-35.00	-15.00	1.508
354	50.00	-35.00	-15.00	1.296
356	34.00	-30.00	-15.00	2.596
357	38.00	-30.00	-15.00	2.513
358	42.00	-30.00	-15.00	1.875
359	46.00	-30.00	-15.00	1.360
360	50.00	-30.00	-15.00	1.211
361	30.00	-25.00	-15.00	1.419
362	34.00	-25.00	-15.00	2.535
363	38.00	-25.00	-15.00	2.197
364	42.00	-25.00	-15.00	1.567
365	46.00	-25.00	-15.00	1.262
366	50.00	-25.00	-15.00	1.049

233	56.00	-25.00	-25.00	1.243
234	60.00	-25.00	-25.00	8.005
235	40.00	-20.00	-25.00	1.336
236	44.00	-20.00	-25.00	2.281
237	48.00	-20.00	-25.00	2.060
238	52.00	-20.00	-25.00	1.547
239	56.00	-20.00	-25.00	1.229
240	60.00	-20.00	-25.00	1.064
241	40.00	-15.00	-25.00	1.102
242	44.00	-15.00	-25.00	2.126
243	48.00	-15.00	-25.00	2.144
244	52.00	-15.00	-25.00	1.493
245	56.00	-15.00	-25.00	1.168
246	60.00	-15.00	-25.00	1.001
247	40.00	-10.00	-25.00	0.924
248	44.00	-10.00	-25.00	2.046
249	48.00	-10.00	-25.00	1.962
250	52.00	-10.00	-25.00	1.543
251	56.00	-10.00	-25.00	1.208
252	60.00	-10.00	-25.00	0.980

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

253	40.00	-5.00	-25.00	0.0
254	44.00	-5.00	-25.00	0.926
255	48.00	-5.00	-25.00	2.100
256	52.00	-5.00	-25.00	1.650
257	56.00	-5.00	-25.00	1.257
258	60.00	-5.00	-25.00	1.008

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

259	40.00	0.0	-25.00	0.0
260	44.00	0.0	-25.00	0.866
261	48.00	0.0	-25.00	2.080
262	52.00	0.0	-25.00	1.881
263	56.00	0.0	-25.00	1.384
264	60.00	0.0	-25.00	1.066
270	55.00	-50.00	-20.00	2.334
275	51.00	-45.00	-20.00	2.263
276	55.00	-45.00	-20.00	1.807
280	47.00	-40.00	-20.00	2.552
281	51.00	-40.00	-20.00	1.860
282	55.00	-40.00	-20.00	1.487
285	43.00	-35.00	-20.00	2.876
286	47.00	-35.00	-20.00	2.029
287	51.00	-35.00	-20.00	1.553
288	55.00	-35.00	-20.00	1.369
290	39.00	-30.00	-20.00	2.617
291	43.00	-30.00	-20.00	2.432
292	47.00	-30.00	-20.00	1.787
293	51.00	-30.00	-20.00	1.414
294	55.00	-30.00	-20.00	1.108
295	35.00	-25.00	-20.00	1.524
296	39.00	-25.00	-20.00	2.338
297	43.00	-25.00	-20.00	2.214

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173	61.00	-20.00	-30.00	1.238
174	65.00	-20.00	-30.00	1.065
175	45.00	-15.00	-30.00	1.192
176	49.00	-15.00	-30.00	2.191
177	53.00	-15.00	-30.00	2.051
178	57.00	-15.00	-30.00	1.550
179	61.00	-15.00	-30.00	1.193
180	65.00	-15.00	-30.00	1.010
181	45.00	-10.00	-30.00	0.992
182	49.00	-10.00	-30.00	1.877
183	53.00	-10.00	-30.00	1.957
184	57.00	-10.00	-30.00	1.532
185	61.00	-10.00	-30.00	1.231
186	65.00	-10.00	-30.00	0.973
187	45.00	-5.00	-30.00	0.877
188	49.00	-5.00	-30.00	0.975
189	53.00	-5.00	-30.00	1.939
190	57.00	-5.00	-30.00	1.676
191	61.00	-5.00	-30.00	1.190
192	65.00	-5.00	-30.00	1.010

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFE5000F8202D2E6

193	45.00	0.0	-30.00	0.0
194	49.00	0.0	-30.00	0.884
195	53.00	0.0	-30.00	2.050
196	57.00	0.0	-30.00	1.732
197	61.00	0.0	-30.00	1.346
198	65.00	0.0	-30.00	1.056
203	56.00	-50.00	-25.00	2.667
204	60.00	-50.00	-25.00	2.097
208	52.00	-45.00	-25.00	3.019
209	56.00	-45.00	-25.00	2.087
210	60.00	-45.00	-25.00	1.706
213	48.00	-40.00	-25.00	3.375
214	52.00	-40.00	-25.00	2.415
215	56.00	-40.00	-25.00	1.768
216	60.00	-40.00	-25.00	1.405
218	44.00	-35.00	-25.00	3.024
219	48.00	-35.00	-25.00	2.784
220	52.00	-35.00	-25.00	2.197
221	56.00	-35.00	-25.00	1.636
222	60.00	-35.00	-25.00	1.254
223	40.00	-30.00	-25.00	2.007
224	44.00	-30.00	-25.00	2.587
225	48.00	-30.00	-25.00	2.454
226	52.00	-30.00	-25.00	1.890
227	56.00	-30.00	-25.00	1.456
228	60.00	-30.00	-25.00	1.123
229	40.00	-25.00	-25.00	1.628
230	44.00	-25.00	-25.00	2.369
231	48.00	-25.00	-25.00	2.242
232	52.00	-25.00	-25.00	1.715

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113	66.00	-15.00	-35.00	1.278
114	70.00	-15.00	-35.00	1.020
115	50.00	-10.00	-35.00	1.071
116	54.00	-10.00	-35.00	2.048
117	58.00	-10.00	-35.00	2.055
118	62.00	-10.00	-35.00	1.543
119	66.00	-10.00	-35.00	1.230
120	70.00	-10.00	-35.00	0.983
121	50.00	-5.00	-35.00	0.903
122	54.00	-5.00	-35.00	1.041
123	58.00	-5.00	-35.00	2.024
124	62.00	-5.00	-35.00	1.659
125	66.00	-5.00	-35.00	1.245
126	70.00	-5.00	-35.00	1.014

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFE5000F8202D2E6

127	50.00	0.0	-35.00	0.0
128	54.00	0.0	-35.00	0.906
129	58.00	0.0	-35.00	1.949
130	62.00	0.0	-35.00	1.702
131	66.00	0.0	-35.00	1.334
132	70.00	0.0	-35.00	1.085
137	61.00	-50.00	-30.00	2.559
138	65.00	-50.00	-30.00	2.026
142	57.00	-45.00	-30.00	2.835
143	61.00	-45.00	-30.00	2.137
144	65.00	-45.00	-30.00	1.602
147	53.00	-40.00	-30.00	3.254
148	57.00	-40.00	-30.00	2.467
149	61.00	-40.00	-30.00	1.865
150	65.00	-40.00	-30.00	1.413
152	49.00	-35.00	-30.00	3.151
153	53.00	-35.00	-30.00	2.938
154	57.00	-35.00	-30.00	2.135
155	61.00	-35.00	-30.00	1.577
156	65.00	-35.00	-30.00	1.248
157	45.00	-30.00	-30.00	2.104
158	49.00	-30.00	-30.00	2.771
159	53.00	-30.00	-30.00	2.601
160	57.00	-30.00	-30.00	1.849
161	61.00	-30.00	-30.00	1.442
162	65.00	-30.00	-30.00	1.148
163	45.00	-25.00	-30.00	1.727
164	49.00	-25.00	-30.00	2.544
165	53.00	-25.00	-30.00	2.316
166	57.00	-25.00	-30.00	1.689
167	61.00	-25.00	-30.00	1.289
168	65.00	-25.00	-30.00	1.103
169	45.00	-20.00	-30.00	1.428
170	49.00	-20.00	-30.00	2.253
171	53.00	-20.00	-30.00	2.086
172	57.00	-20.00	-30.00	1.567

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## SECTION DETAILS

## REMARKS

Sect A-A

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
1	4	11	14	20 25
1	-200:0	1	0:0	2.8:0
1	:	2	0:0	:
1	:	3	2.5:0	:
1	:	4	2.5:0	:
1	:	5	2.8:0	:
1	:	6	3.0:0	:
2	-39:0	1	0:0	2.8:0
2	-3:0	2	0:0	:
2	:	3	2.5:0	:
2	:	4	2.5:0	:
2	:	5	2.8:0	:
2	:	6	3.0:0	:
3	-1.5:0	1	0:0	2.8:0
3	:	2	1.6:0	:
3	:	3	2.5:0	:
3	:	4	2.5:0	:
3	:	5	2.8:0	:
3	:	6	3.0:0	:
4	-11:5	1	0:0	2.8:0
4	:	2	1.8:5	:

## SECTION DETAILS

## REMARKS

Sect A-A

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
1	:	3	2.8:0	:
4	:	4	2.8:0	:
4	:	5	2.8:0	:
4	:	6	3.0:0	:
5	- .9:0	1	0:0	2.8:0
5	:	2	2.0:0	:
5	:	3	2.8:0	:
5	:	4	3.0:0	:
5	:	5	3.0:0	:
5	:	6	3.0:0	:
6	- .3:0	1	0:0	2.8:0
6	:	2	2.4:0	:
6	:	3	2.8:0	:
6	:	4	3.5:0	:
6	:	5	3.5:0	:
6	:	6	3.5:0	:
7	3:0	1	0:0	2.8:0
7	3:0	2	2.8:0	:
7	:	3	2.8:0	:
7	:	4	3.5:0	:



## SOIL PROPERTIES

REMARKS

[illegible]

SLICES	X-INIT.	Y-INIT.	DELX	DELY	TANG. R.L.	INCR.	NO. R	TENSION CRACK	NO. PTS. 2-X<	NO. PTS. 2&X<	CUT-OFF 2-X<	CUT-OFF 2&X<
23	-25	-15	5.0	5.0	15.0	4.0	6	0.0	1	3	-200.0	200.0

X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD
-200.00	0.0	3.00	28.00	13.00	35.00	200.00	35.00				

## SECTIONAL DETAILS

SECTION	X COORD	SOIL TYPE	Y COORD	WATER TABLE
1	-200.00	1	0.0	28.00
1		2	0.0	
1		3	25.00	
1		4	25.00	
1		5	28.00	
1		6	30.00	
2	-39.00	1	0.0	28.00
2		2	0.0	
2		3	25.00	
2		4	25.00	
2		5	28.00	
2		6	30.00	
3	-15.00	1	0.0	28.00
3		2	16.00	
3		3	25.00	
3		4	25.00	
3		5	28.00	
3		6	30.00	
4	-11.50	1	0.0	28.00
4		2	18.50	
4		3	28.00	
4		4	28.00	
4		5	28.00	
4		6	30.00	
5	-9.00	1	0.0	28.00
5		2	20.00	
5		3	28.00	
5		4	30.00	
5		5	30.00	
5		6	30.00	
6	-3.00	1	0.0	28.00
6		2	24.00	
6		3	28.00	
6		4	35.00	
6		5	35.00	
6		6	35.00	
7	3.00	1	0.0	28.00
7		2	28.00	
7		3	28.00	
7		4	35.00	
7		5	35.00	
7		6	35.00	
8	200.00	1	0.0	28.00
8		2	28.00	
8		3	28.00	
8		4	35.00	
8		5	35.00	
8		6	35.00	

## SOIL PROPERTIES

SOIL TYPE	COHESION	PHI	BULK DENSITY	SUBMERGED DENSITY
1	0.0	0.0	0.0	0.0

3	0.0	30.0	63.0	63.0
4	750.	0.0	120.0	58.0
5	750.	0.0	58.0	58.0
6	500.	0.0	58.0	58.0

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	RADIUS	XC	YC	F. OF S.
4	67.00	-50.00	-40.00	3.211
5	71.00	-50.00	-40.00	2.266
6	75.00	-50.00	-40.00	1.715
9	63.00	-45.00	-40.00	4.076
10	67.00	-45.00	-40.00	2.595
11	71.00	-45.00	-40.00	1.900
12	75.00	-45.00	-40.00	1.486
14	59.00	-40.00	-40.00	3.456
15	63.00	-40.00	-40.00	3.370
16	67.00	-40.00	-40.00	2.320
17	71.00	-40.00	-40.00	1.638
18	75.00	-40.00	-40.00	1.306
19	59.00	-35.00	-40.00	2.882
20	59.00	-35.00	-40.00	2.850
21	63.00	-35.00	-40.00	2.833
22	67.00	-35.00	-40.00	1.979
23	71.00	-35.00	-40.00	1.512
24	75.00	-35.00	-40.00	1.134
25	59.00	-30.00	-40.00	2.364
26	59.00	-30.00	-40.00	2.351
27	63.00	-30.00	-40.00	2.419
28	67.00	-30.00	-40.00	1.839
29	71.00	-30.00	-40.00	1.348
30	75.00	-30.00	-40.00	1.067
31	59.00	-25.00	-40.00	1.971
32	59.00	-25.00	-40.00	2.033
33	63.00	-25.00	-40.00	2.050
34	67.00	-25.00	-40.00	1.736
35	71.00	-25.00	-40.00	1.280
36	75.00	-25.00	-40.00	1.041
37	59.00	-20.00	-40.00	1.657
38	59.00	-20.00	-40.00	1.745
39	63.00	-20.00	-40.00	1.820
40	67.00	-20.00	-40.00	1.576
41	71.00	-20.00	-40.00	1.153
42	75.00	-20.00	-40.00	0.925
43	59.00	-15.00	-40.00	1.405
44	59.00	-15.00	-40.00	1.508
45	63.00	-15.00	-40.00	1.596
46	67.00	-15.00	-40.00	1.505
47	71.00	-15.00	-40.00	1.173
48	75.00	-15.00	-40.00	0.950
49	59.00	-10.00	-40.00	1.189
50	59.00	-10.00	-40.00	1.306
51	63.00	-10.00	-40.00	1.404
52	67.00	-10.00	-40.00	1.414
53	71.00	-10.00	-40.00	1.172
54	75.00	-10.00	-40.00	0.875
55	59.00	-5.00	-40.00	0.995
56	59.00	-5.00	-40.00	1.131

57	63.00	-5.00	-40.00	1.240
58	67.00	-5.00	-40.00	1.314
59	71.00	-5.00	-40.00	1.123
60	75.00	-5.00	-40.00	0.884
61	55.00	0.0	-40.00	0.855
62	59.00	0.0	-40.00	0.980
63	63.00	0.0	-40.00	1.094
64	67.00	0.0	-40.00	1.190
65	71.00	0.0	-40.00	1.122
66	75.00	0.0	-40.00	0.881
70	62.00	-50.00	-35.00	3.357
71	66.00	-50.00	-35.00	2.276
72	70.00	-50.00	-35.00	1.698
75	58.00	-45.00	-35.00	4.081
76	62.00	-45.00	-35.00	2.675
77	66.00	-45.00	-35.00	1.936
78	70.00	-45.00	-35.00	1.503
80	54.00	-40.00	-35.00	3.415
81	58.00	-40.00	-35.00	3.335
82	62.00	-40.00	-35.00	2.315
83	66.00	-40.00	-35.00	1.643
84	70.00	-40.00	-35.00	1.286
85	50.00	-35.00	-35.00	2.800
86	54.00	-35.00	-35.00	2.786
87	58.00	-35.00	-35.00	2.783
88	62.00	-35.00	-35.00	1.568
89	66.00	-35.00	-35.00	1.505
90	70.00	-35.00	-35.00	1.133
91	50.00	-30.00	-35.00	2.275
92	54.00	-30.00	-35.00	2.318
93	58.00	-30.00	-35.00	2.358
94	62.00	-30.00	-35.00	1.824
95	66.00	-30.00	-35.00	1.336
96	70.00	-30.00	-25.00	1.060
97	50.00	-25.00	-35.00	1.875
98	54.00	-25.00	-35.00	1.957
99	58.00	-25.00	-35.00	2.024
100	62.00	-25.00	-35.00	1.683
101	66.00	-25.00	-35.00	1.247
102	70.00	-25.00	-35.00	1.021
103	50.00	-20.00	-35.00	1.570
104	54.00	-20.00	-35.00	1.669
105	58.00	-20.00	-35.00	1.754
106	62.00	-20.00	-35.00	1.545
107	66.00	-20.00	-20.00	1.137
108	70.00	-20.00	-35.00	0.920
109	50.00	-15.00	-35.00	1.317
110	54.00	-15.00	-35.00	1.432
111	58.00	-15.00	-35.00	1.530
112	62.00	-15.00	-35.00	1.462

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113	66.00	-15.00	-35.00	1.148
114	70.00	-15.00	-35.00	0.878
115	50.00	-10.00	-35.00	1.106
116	54.00	-10.00	-35.00	1.234
117	58.00	-10.00	-35.00	1.340
118	62.00	-10.00	-35.00	1.372
119	66.00	-10.00	-35.00	1.126
120	70.00	-10.00	-35.00	0.861
121	50.00	-5.00	-35.00	0.918
122	54.00	-5.00	-35.00	1.064
123	58.00	-5.00	-35.00	1.178
124	62.00	-5.00	-35.00	1.268
125	66.00	-5.00	-35.00	1.100
126	70.00	-5.00	-35.00	0.896

INC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD5000F8203AAE6

127	50.00	0.0	-35.00	0.0
128	54.00	0.0	-35.00	0.922
129	58.00	0.0	-35.00	1.037
130	62.00	0.0	-35.00	1.137
131	66.00	0.0	-35.00	1.096
132	70.00	0.0	-35.00	0.866
137	61.00	-50.00	-30.00	2.259
138	65.00	-50.00	-30.00	1.757
142	57.00	-45.00	-30.00	2.685
143	61.00	-45.00	-30.00	1.961
144	65.00	-45.00	-30.00	1.507
147	53.00	-40.00	-30.00	3.309
148	57.00	-40.00	-30.00	2.194
149	61.00	-40.00	-30.00	1.655
150	65.00	-40.00	-30.00	1.291
152	49.00	-35.00	-30.00	2.717
153	53.00	-35.00	-30.00	2.732
154	57.00	-35.00	-30.00	1.961
155	61.00	-35.00	-30.00	1.432
156	65.00	-35.00	-30.00	1.136
157	45.00	-30.00	-30.00	2.180
158	49.00	-30.00	-30.00	2.242
159	53.00	-30.00	-30.00	2.256
160	57.00	-30.00	-30.00	1.706
161	61.00	-30.00	-30.00	1.306
162	65.00	-30.00	-30.00	1.009
163	45.00	-25.00	-30.00	1.782
164	49.00	-25.00	-30.00	1.877
165	53.00	-25.00	-30.00	1.956
166	57.00	-25.00	-30.00	1.662
167	61.00	-25.00	-30.00	1.173
168	65.00	-25.00	-30.00	0.978
169	45.00	-20.00	-30.00	1.477
170	49.00	-20.00	-30.00	1.589
171	53.00	-10.00	-30.00	1.685
172	57.00	-20.00	-30.00	1.522

173	61.00	-20.00	-30.00	1.122
174	65.00	-20.00	-30.00	0.918
175	45.00	-15.00	-30.00	1.229
176	49.00	-15.00	-30.00	1.355
177	53.00	-15.00	-30.00	1.462
178	57.00	-15.00	-30.00	1.423
179	61.00	-15.00	-30.00	1.069
180	65.00	-15.00	-30.00	0.865
181	45.00	-10.00	-30.00	1.023
182	49.00	-10.00	-30.00	1.161
183	53.00	-10.00	-30.00	1.275
184	57.00	-10.00	-30.00	1.328
185	61.00	-10.00	-30.00	1.099
186	65.00	-10.00	-30.00	0.849
187	45.00	-5.00	-30.00	0.880
188	49.00	-5.00	-30.00	0.998
189	53.00	-5.00	-30.00	1.116
190	57.00	-5.00	-30.00	1.221
191	61.00	-5.00	-30.00	1.031
192	65.00	-5.00	-30.00	0.847

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD5000F8203AAE6

193	45.00	0.0	-30.00	0.0
194	49.00	0.0	-30.00	0.891
195	53.00	0.0	-30.00	0.984
196	57.00	0.0	-30.00	1.085
197	61.00	0.0	-30.00	1.086
198	65.00	0.0	-30.00	0.831
203	56.00	-50.00	-25.00	2.325
204	60.00	-50.00	-25.00	1.755
208	52.00	-45.00	-25.00	2.729
209	56.00	-45.00	-25.00	1.874
210	60.00	-45.00	-25.00	1.496
213	48.00	-40.00	-25.00	3.290
214	52.00	-40.00	-25.00	2.238
215	56.00	-40.00	-25.00	1.648
216	60.00	-40.00	-25.00	1.306
218	44.00	-35.00	-25.00	2.655
219	48.00	-35.00	-25.00	2.686
220	52.00	-35.00	-25.00	1.967
221	56.00	-35.00	-25.00	1.435
222	60.00	-35.00	-25.00	1.138
223	40.00	-30.00	-25.00	2.082
224	44.00	-30.00	-25.00	2.164
225	48.00	-30.00	-25.00	2.235
226	52.00	-30.00	-25.00	1.895
227	56.00	-30.00	-25.00	1.317
228	60.00	-30.00	-25.00	1.006
229	40.00	-25.00	-25.00	1.685
230	44.00	-25.00	-25.00	1.794
231	48.00	-25.00	-25.00	1.889
232	52.00	-25.00	-25.00	1.569

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233	56.00	-25.00	-25.00	1.162
234	60.00	-25.00	-25.00	3.670
235	40.00	-20.00	-25.00	1.380
236	44.00	-20.00	-25.00	1.507
237	48.00	-20.00	-25.00	1.614
238	52.00	-20.00	-25.00	1.434
239	56.00	-20.00	-25.00	1.108
240	60.00	-20.00	-25.00	0.915
241	40.00	-15.00	-25.00	1.138
242	44.00	-15.00	-25.00	1.276
243	48.00	-15.00	-25.00	1.393
244	52.00	-15.00	-25.00	1.344
245	56.00	-15.00	-25.00	1.086
246	60.00	-15.00	-25.00	0.852
247	40.00	-10.00	-25.00	0.945
248	44.00	-10.00	-25.00	1.086
249	48.00	-10.00	-25.00	1.209
250	52.00	-10.00	-25.00	1.256
251	56.00	-10.00	-25.00	1.063
252	60.00	-10.00	-25.00	0.788
253	40.00	-5.00	-25.00	0.871
254	44.00	-5.00	-25.00	0.939
255	48.00	-5.00	-25.00	1.056
256	52.00	-5.00	-25.00	1.166
257	56.00	-5.00	-25.00	1.019
258	60.00	-5.00	-25.00	0.837

IHC210I PROGRAM INTERRUPT(P) CLD PSW IS FFD500GF8203AAE6

259	40.00	0.0	-25.00	0.0
260	44.00	0.0	-25.00	0.884
261	48.00	0.0	-25.00	0.940
262	52.00	0.0	-25.00	1.036
263	56.00	0.0	-25.00	1.034
264	60.00	0.0	-25.00	0.831
270	55.00	-50.00	-20.00	1.842
275	51.00	-45.00	-20.00	1.948
276	55.00	-45.00	-20.00	1.508
280	47.00	-40.00	-20.00	2.257
281	51.00	-40.00	-20.00	1.676
282	55.00	-40.00	-20.00	1.273
285	43.00	-35.00	-20.00	2.640
286	47.00	-35.00	-20.00	1.862
287	51.00	-35.00	-20.00	1.425
288	55.00	-35.00	-20.00	1.147
290	39.00	-30.00	-20.00	2.086
291	43.00	-30.00	-20.00	2.174
292	47.00	-30.00	-20.00	1.690
293	51.00	-30.00	-20.00	1.255
294	55.00	-30.00	-20.00	0.989
295	35.00	-25.00	-20.00	1.582
296	39.00	-25.00	-20.00	1.711
297	43.00	-25.00	-20.00	1.820

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298	47.00	-25.00	-20.00	1.543
299	51.00	-25.00	-20.00	1.154
300	55.00	-25.00	-20.00	0.902
301	35.00	-20.00	-20.00	1.281
302	39.00	-20.00	-20.00	1.424
303	43.00	-20.00	-20.00	1.544
304	47.00	-20.00	-20.00	1.299
305	51.00	-20.00	-20.00	1.047
306	55.00	-20.00	-20.00	0.862
307	35.00	-15.00	-20.00	1.049
308	39.00	-15.00	-20.00	1.157
309	43.00	-15.00	-20.00	1.323
310	47.00	-15.00	-20.00	1.310
311	51.00	-15.00	-20.00	1.029
312	55.00	-15.00	-20.00	0.838
313	35.00	-10.00	-20.00	0.901
314	39.00	-10.00	-20.00	1.016
315	43.00	-10.00	-20.00	1.143
316	47.00	-10.00	-20.00	1.215
317	51.00	-10.00	-20.00	1.010
318	55.00	-10.00	-20.00	0.818

1HC2101	PROGRAM	INTERRUPT(P)	OLD PSW	IS	FFD5000F8203AAE6
319	35.00	-5.00	-20.00	0.0	
320	39.00	-5.00	-20.00	0.912	
321	43.00	-5.00	-20.00	1.002	
322	47.00	-5.00	-20.00	1.119	
323	51.00	-5.00	-20.00	0.998	
324	55.00	-5.00	-20.00	0.801	

1HC2101	PROGRAM	INTERRUPT(P)	OLD PSW	IS	FFD5000F8203AAE6
325	35.00	0.0	-20.00	0.0	
326	39.00	0.0	-20.00	0.876	
327	43.00	0.0	-20.00	0.922	
328	47.00	0.0	-20.00	0.994	
329	51.00	0.0	-20.00	1.026	
330	55.00	0.0	-20.00	0.813	
342	50.00	-45.00	-15.00	1.571	
347	46.00	-40.00	-15.00	1.637	
348	50.00	-40.00	-15.00	1.304	
352	42.00	-35.00	-15.00	1.890	
353	46.00	-35.00	-15.00	1.374	
354	50.00	-35.00	-15.00	1.092	
356	34.00	-30.00	-15.00	2.008	
357	38.00	-30.00	-15.00	2.115	
358	42.00	-30.00	-15.00	1.598	
359	46.00	-30.00	-15.00	1.225	
360	50.00	-30.00	-15.00	1.014	
361	30.00	-25.00	-15.00	1.474	
362	34.00	-25.00	-15.00	1.626	
363	38.00	-25.00	-15.00	1.752	
364	42.00	-25.00	-15.00	1.475	
365	46.00	-25.00	-15.00	1.088	
366	50.00	-25.00	-15.00	0.901	

367	30.00	-20.00	-15.00	1.181
368	34.00	-20.00	-15.00	1.339
369	38.00	-20.00	-15.00	1.473
370	42.00	-20.00	-15.00	1.376
371	46.00	-20.00	-15.00	1.033
372	50.00	-20.00	-15.00	0.855
373	30.00	-15.00	-15.00	0.970
374	34.00	-15.00	-15.00	1.119
375	38.00	-15.00	-15.00	1.255
376	42.00	-15.00	-15.00	1.269
377	46.00	-15.00	-15.00	0.972
378	50.00	-15.00	-15.00	0.781
379	30.00	-10.00	-15.00	0.890
380	34.00	-10.00	-15.00	0.964
381	38.00	-10.00	-15.00	1.083
382	42.00	-10.00	-15.00	1.176
383	46.00	-10.00	-15.00	0.995
384	50.00	-10.00	-15.00	0.777

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

385	30.00	-5.00	-15.00	0.0
386	34.00	-5.00	-15.00	0.904
387	38.00	-5.00	-15.00	0.968
388	42.00	-5.00	-15.00	1.074
389	46.00	-5.00	-15.00	0.979
390	50.00	-5.00	-15.00	0.777

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

391	30.00	0.0	-15.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

392	34.00	0.0	-15.00	0.0
393	38.00	0.0	-15.00	0.919
394	42.00	0.0	-15.00	0.973
395	46.00	0.0	-15.00	0.996
396	50.00	0.0	-15.00	0.808
414	45.00	-40.00	-10.00	1.353
418	37.00	-35.00	-10.00	1.814
419	41.00	-35.00	-10.00	1.408
420	45.00	-35.00	-10.00	1.120
423	33.00	-30.00	-10.00	2.066
424	37.00	-30.00	-10.00	1.609
425	41.00	-30.00	-10.00	1.205
426	45.00	-30.00	-10.00	0.971
428	29.00	-25.00	-10.00	1.542
429	33.00	-25.00	-10.00	1.687
430	37.00	-25.00	-10.00	1.402
431	41.00	-25.00	-10.00	1.090
432	45.00	-25.00	-10.00	0.863
433	25.00	-20.00	-10.00	1.087
434	25.00	-20.00	-10.00	1.257
435	33.00	-20.00	-10.00	1.405
436	37.00	-20.00	-10.00	1.301
437	41.00	-20.00	-10.00	0.972
438	45.00	-20.00	-10.00	0.842
439	25.00	-15.00	-10.00	0.942

440	29.00	-15.00	-10.00	1.053
441	33.00	-15.00	-10.00	1.191
442	37.00	-15.00	-10.00	1.211
443	41.00	-15.00	-10.00	0.941
444	45.00	-15.00	-10.00	0.768
445	25.00	-10.00	-10.00	0.869
446	29.00	-10.00	-10.00	0.952
447	33.00	-10.00	-10.00	1.039
448	37.00	-10.00	-10.00	1.126
449	41.00	-10.00	-10.00	0.965
450	45.00	-10.00	-10.00	0.779

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

451	25.00	-5.00	-10.00	0.0
452	29.00	-5.00	-10.00	0.893
453	33.00	-5.00	-10.00	0.963
454	37.00	-5.00	-10.00	1.042
455	41.00	-5.00	-10.00	0.949
456	45.00	-5.00	-10.00	0.770

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

457	25.00	0.0	-10.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

458	29.00	0.0	-10.00	0.0
459	33.00	0.0	-10.00	0.911
460	37.00	0.0	-10.00	0.974
461	41.00	0.0	-10.00	0.998
462	45.00	0.0	-10.00	0.799
485	36.00	-35.00	-5.00	1.442
486	40.00	-35.00	-5.00	1.155
490	32.00	-30.00	-5.00	1.559
491	36.00	-30.00	-5.00	1.238
492	40.00	-30.00	-5.00	0.977
495	28.00	-25.00	-5.00	1.635
496	32.00	-25.00	-5.00	1.420
497	36.00	-25.00	-5.00	1.063
498	40.00	-25.00	-5.00	0.877
500	24.00	-20.00	-5.00	1.192
501	28.00	-20.00	-5.00	1.349
502	32.00	-20.00	-5.00	1.299
503	36.00	-20.00	-5.00	1.002
504	40.00	-20.00	-5.00	0.794
505	20.00	-15.00	-5.00	0.938
506	24.00	-15.00	-5.00	1.033
507	28.00	-15.00	-5.00	1.145
508	32.00	-15.00	-5.00	1.166
509	36.00	-15.00	-5.00	0.916
510	40.00	-15.00	-5.00	0.766

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

511	20.00	-10.00	-5.00	0.0
512	24.00	-10.00	-5.00	0.949
513	28.00	-10.00	-5.00	1.036
514	32.00	-10.00	-5.00	1.113
515	36.00	-10.00	-5.00	0.948
516	40.00	-10.00	-5.00	0.752

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

517	20.00	-5.00	-5.00	0.0
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518	24.00	-5.00	-5.00	0.878
519	28.00	-5.00	-5.00	0.965
520	32.00	-5.00	-5.00	1.054
521	36.00	-5.00	-5.00	0.958
522	40.00	-5.00	-5.00	0.747

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
523	20.00	0.0	-5.00	0.0

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
524	24.00	0.0	-5.00	0.0
525	28.00	0.0	-5.00	0.904
526	32.00	0.0	-5.00	0.977
527	36.00	0.0	-5.00	1.033
528	40.00	0.0	-5.00	0.791
552	35.00	-35.00	0.0	1.178
557	31.00	-30.00	0.0	1.217
558	35.00	-30.00	0.0	1.005
562	27.00	-25.00	0.0	1.409
563	31.00	-25.00	0.0	1.059
564	35.00	-25.00	0.0	0.877
567	23.00	-20.00	0.0	1.335
568	27.00	-20.00	0.0	1.281
569	31.00	-20.00	0.0	1.013
570	35.00	-20.00	0.0	0.805
571	15.00	-15.00	0.0	0.925
572	19.00	-15.00	0.0	1.061
573	23.00	-15.00	0.0	1.171
574	27.00	-15.00	0.0	1.176
575	31.00	-15.00	0.0	0.952
576	35.00	-15.00	0.0	0.789

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
577	15.00	-10.00	0.0	0.0
578	19.00	-10.00	0.0	0.945
579	23.00	-10.00	0.0	1.060
580	27.00	-10.00	0.0	1.153
581	31.00	-10.00	0.0	0.937
582	35.00	-10.00	0.0	0.754

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
583	15.00	-5.00	0.0	0.0
584	19.00	-5.00	0.0	0.855
585	23.00	-5.00	0.0	0.965
586	27.00	-5.00	0.0	1.058
587	31.00	-5.00	0.0	1.001
588	35.00	-5.00	0.0	0.775

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
589	15.00	0.0	0.0	0.0

IHC2101 PROGRAM INTERRUPT(P) CLD PSW IS FFD500CF8203AAE6				
590	19.00	0.0	0.0	0.0
591	23.00	0.0	0.0	0.855
592	27.00	0.0	0.0	0.981
593	31.00	0.0	0.0	1.092
594	35.00	0.0	0.0	0.835
629	26.00	-25.00	5.00	1.164
630	30.00	-25.00	5.00	0.933
634	22.00	-20.00	5.00	1.376
635	26.00	-20.00	5.00	1.084
636	30.00	-20.00	5.00	0.830

639	18.00	-15.00	5.00	1.341
640	22.00	-15.00	5.00	1.329
641	26.00	-15.00	5.00	1.016
642	30.00	-15.00	5.00	0.839
644	14.00	-10.00	5.00	0.945
645	18.00	-10.00	5.00	1.142
646	22.00	-10.00	5.00	1.288
647	26.00	-10.00	5.00	1.038
648	30.00	-10.00	5.00	0.816

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

649	10.00	-5.00	5.00	0.0
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IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

650	14.00	-5.00	5.00	0.0
651	18.00	-5.00	5.00	0.973
652	22.00	-5.00	5.00	1.113
653	26.00	-5.00	5.00	1.115
654	30.00	-5.00	5.00	0.868

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

655	10.00	0.0	5.00	0.0
-----	-------	-----	------	-----

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

656	14.00	0.0	5.00	0.0
657	18.00	0.0	5.00	0.916
658	22.00	0.0	5.00	0.988
659	26.00	0.0	5.00	1.161
660	30.00	0.0	5.00	0.919
701	21.00	-20.00	10.00	1.490
702	25.00	-20.00	10.00	1.039
706	17.00	-15.00	10.00	2.198
707	21.00	-15.00	10.00	1.384
708	25.00	-15.00	10.00	1.016
711	13.00	-10.00	10.00	2.225
712	17.00	-10.00	10.00	1.923
713	21.00	-10.00	10.00	1.415
714	25.00	-10.00	10.00	1.032
717	13.00	-5.00	10.00	1.456
718	17.00	-5.00	10.00	1.482
719	21.00	-5.00	10.00	1.473
720	25.00	-5.00	10.00	1.088

IHC2101 PROGRAM INTERRUPT(P) OLD PSW IS FFD5000F8203AAE6

723	13.00	0.0	10.00	0.0
724	17.00	0.0	10.00	1.173
725	21.00	0.0	10.00	1.150
726	25.00	0.0	10.00	1.177

# CRITICAL CIRCLE

RADIUS	XC	YC	F. OF S.
50.00	0.0	-35.00	0.0
45.00	0.0	-30.00	0.0
40.00	0.0	-25.00	0.0
35.00	-5.00	-20.00	0.0
35.00	0.0	-20.00	0.0
30.00	-5.00	-15.00	0.0
30.00	0.0	-15.00	0.0
34.00	0.0	-15.00	0.0
25.00	-5.00	-10.00	0.0
25.00	0.0	-10.00	0.0
29.00	0.0	-10.00	0.0
20.00	-10.00	-5.00	0.0
20.00	-5.00	-5.00	0.0
20.00	0.0	-5.00	0.0
24.00	0.0	-5.00	0.0
15.00	-10.00	0.0	0.0
15.00	-5.00	0.0	0.0
15.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
10.00	-5.00	5.00	0.0
14.00	-5.00	5.00	0.0
10.00	0.0	5.00	0.0
14.00	0.0	5.00	0.0
13.00	0.0	10.00	0.0
40.00	-5.00	-5.00	0.747
40.00	-10.00	-5.00	0.752
35.00	-10.00	0.0	0.754
40.00	-15.00	-5.00	0.766
45.00	-15.00	-10.00	0.768
45.00	-5.00	-10.00	0.770
35.00	-5.00	0.0	0.775
50.00	-5.00	-15.00	0.777
50.00	-10.00	-15.00	0.777

THIS JOB COMPLETED. RUNNING DATE FEB 14, 1969 TIME ELAPSED # 52 SECONDS



## SECTION DETAILS

## REMARKS

Sect B.B.

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
1	-200:0	1	0:0	2.8:0
1	:	2	1.5:0	:
1	:	3	1.5:0	:
1	:	4	2.5:0	:
1	:	5	2.8:0	:
1	:	6	3.0:0	:
2	13:0	1	0:0	2.8:0
2	:	2	1.5:0	:
2	:	3	1.5:0	:
2	:	4	2.5:0	:
2	:	5	2.8:0	:
2	:	6	3.0:0	:
3	24:0	1	0:0	2.8:0
3	:	2	1.9:0	:
3	:	3	1.9:0	:
3	:	4	2.5:0	:
2	:	5	2.8:0	:
3	:	6	3.0:0	:
4	29:0	1	0:0	2.8:0
4	:	2	2.5:0	:

## SECTION DETAILS

## REMARKS

Set B-B

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
4		3	2.5:0	
4		4	2.5:0	
4		5	2.8:0	
4		6	3.0:0	
5	3.6:0	1	0:0	2.8:0
5		2	2.8:0	
5		3	2.8:0	
5		4	2.8:0	
5		5	2.8:0	
5		6	3.0:0	
6	4.0:0	1	0:0	2.8:0
6		2	2.8:0	
6		3	3.0:0	
6		4	3.0:0	
6		5	3.0:0	
6		6	3.0:0	
7	5.3:0	1	0:0	2.8:0
7		2	2.8:0	
7		3	3.5:0	
7		4	3.5:0	







BERM LENGTH	FACTOR OF SAFETY	RADIUS	X COORD OF CENTRE	Y COORD OF CENTRE
30.00 FEET	1.411	90.0 FEET	45.0 FEET	-55.0 FEET
25.00 FEET	1.291	90.0 FEET	37.5 FEET	-55.0 FEET

THIS JOB COMPLETED. RUNNING DATE FEB 19, 1969 TIME ELAPSED # 142 SECONDS

HWY 54 BIG CREEK BRIDGE SECT B-B

RUN DATE FEB 19, 1969

SLICES	X-INIT.	Y-INIT.	DELX	DELY	TANG.	R.L.	INCR.	NO. R	TENSION CRACK	NO. PTS. 2-X<	NO. PTS. 20X<	CUT-OFF 2-X<	CUT-OFF 20X<
25	25	-50	5.0	5.0	25.0	2.0	6	0.0	1	4	-200.0	200.0	

ALLOWABLE FACTOR OF SAFETY # 1.300

BERM LENGTH INCREMENT # 5.00

MAX. BERM LENGTH ALLOWED # 100.0

X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD
-200.00	0.0	26.25	17.50	56.25	17.50	82.50	35.00	200.00	35.00		

SECTIONAL DETAILS

SECTION	X COORD	SOIL TYPE	Y COORD	WATER TABLE
1	-200.00	1	0.0	28.00
1		2	15.00	
1		3	15.00	
1		4	25.00	
1		5	28.00	
1		6	30.00	
2	13.00	1	0.0	28.00
2		2	15.00	
2		3	15.00	
2		4	25.00	
2		5	28.00	
2		6	30.00	
3	24.00	1	0.0	28.00
3		2	19.00	
3		3	19.00	
3		4	25.00	
3		5	28.00	
3		6	30.00	
4	29.00	1	0.0	28.00
4		2	25.00	
4		3	25.00	
4		4	25.00	
4		5	28.00	
4		6	30.00	
5	36.00	1	0.0	28.00
5		2	28.00	
5		3	28.00	
5		4	28.00	
5		5	28.00	
5		6	30.00	
6	40.00	1	0.0	28.00
6		2	28.00	
6		3	30.00	
6		4	30.00	
6		5	30.00	
6		6	30.00	
7	53.00	1	0.0	28.00
7		2	28.00	
7		3	35.00	
7		4	35.00	
7		5	35.00	
7		6	35.00	
8	200.00	1	0.0	28.00
8		2	28.00	
8		3	35.00	
8		4	35.00	
8		5	35.00	
8		6	35.00	



# SECTION DETAILS

## REMARKS

Sect A-A.

SECTION NO.	X CO-ORDINATE OF SECTION	SOIL TYPE	Y CO-ORD. OF UPPER SOIL BOUNDARY	WATER LEVEL
1	4	11	14	20 25
1	200:0	1	0:0	2.8:0
1	:	2	2.5:0	:
1	:	3	2.5:0	:
1	:	4	2.8:0	:
1	:	5	3.0:0	:
2	2.4:0	1	0:0	2.8:0
2	:	2	2.5:0	:
2	:	3	2.5:0	:
2	:	4	2.8:0	:
2	:	5	3.0:0	:
3	2.7:5	1	0:0	2.8:0
3	:	2	2.8:0	:
3	:	3	2.8:0	:
3	:	4	2.8:0	:
3	:	5	3.0:0	:
4	3.0:0	1	0:0	2.8:0
4	:	2	2.8:0	:
4	:	3	3.0:0	:
4	:	4	3.0:0	:
4	:	5	3.0:0	:





BERM LENGTH

FACTOR OF SAFETY

RADIUS

X COORD OF CENTRE

Y COORD OF CENTRE

\* 30.00 FEET

0.885

50.0 FEET

35.0 FEET

-35.0 FEET

THE CALCULATED F.S. SMALLER THAN THE ALLOWABLE F.S. BY MORE THAN .35, JOB TERMINATED

THIS JOB COMPLETED. RUNNING DATE FEB 19, 1969 TIME ELAPSED # 46 SECONDS



HWY 54 BIG CREEK BRIDGE SECT A-A

RUN DATE FEB 19, 1969

SLICES	X-INIT.	Y-INIT.	DELX	DELY	TANG.	R.L.	INCR.	NO. R	TENSION CRACK	NO. PTS. 2-X<	NO. PTS. 2&X<	CUT-OFF 2-X<	CUT-OFF 2&X<
25	25	-15	5.0	5.0	15.0	4.0	6	0.0	1	4	-200.0	200.0	

ALLOWABLE FACTOR OF SAFETY # 1.300

BERM LENGTH INCREMENT # 5.00

MAX. BERM LENGTH ALLOWED # 100.0

X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD	X COORD	Y COORD
-200.00	0.0	26.25	17.50	56.25	17.50	82.50	35.00	200.00	35.00		

## SECTIONAL DETAILS

SECTION	X COORD	SOIL TYPE	Y COORD	WATER TABLE
---------	---------	-----------	---------	-------------

1	-200.00	1	0.0	28.00
---	---------	---	-----	-------

1		2	25.00	
---	--	---	-------	--

1		3	25.00	
---	--	---	-------	--

1		4	28.00	
---	--	---	-------	--

1		5	30.00	
---	--	---	-------	--

2	24.00	1	0.0	28.00
---	-------	---	-----	-------

2		2	25.00	
---	--	---	-------	--

2		3	25.00	
---	--	---	-------	--

2		4	28.00	
---	--	---	-------	--

2		5	30.00	
---	--	---	-------	--

3	27.50	1	0.0	28.00
---	-------	---	-----	-------

3		2	28.00	
---	--	---	-------	--

3		3	28.00	
---	--	---	-------	--

3		4	28.00	
---	--	---	-------	--

3		5	30.00	
---	--	---	-------	--

4	30.00	1	0.0	28.00
---	-------	---	-----	-------

4		2	28.00	
---	--	---	-------	--

4		3	30.00	
---	--	---	-------	--

4		4	30.00	
---	--	---	-------	--

4		5	30.00	
---	--	---	-------	--

5	36.00	1	0.0	28.00
---	-------	---	-----	-------

5		2	28.00	
---	--	---	-------	--

5		3	35.00	
---	--	---	-------	--

5		4	35.00	
---	--	---	-------	--

5		5	35.00	
---	--	---	-------	--

6	200.00	1	0.0	28.00
---	--------	---	-----	-------

6		2	28.00	
---	--	---	-------	--

6		3	35.00	
---	--	---	-------	--

6		4	35.00	
---	--	---	-------	--

6		5	35.00	
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## SOIL PROPERTIES

SOIL TYPE	COHESION	PI	BUCK DENSITY	SUBMERGED DENSITY
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1	0.0	30.0	125.0	63.0
---	-----	------	-------	------

2	0.0	30.0	63.0	63.0
---	-----	------	------	------

3	750.	0.0	120.0	58.0
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4	750.	0.0	58.0	58.0
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5	500.	0.0	58.0	58.0
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DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB W. Trow Project H651 LOCATION Sta 231+67 E. Prop. Fein Hwy 54 Line 'K' 0/315 RT ORIGINATED BY CM  
W.P. 201-63 BORING DATE March 26, 1969 COMPILED BY CM  
DATUM Geodetic BOREHOLE TYPE Penn Drill 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. X Lab Vane    O Triaxial comp O Unconfined comp					WATER CONTENT % WP — W — WL				
635.0	Ground Level						500	1000	1500	2000	2500					
631.0	Fill Material Asphalt & ABC "B"		1	SS	71											
628.0	clayey silt with sand & gravel		2	SS	12	630										
628.0	clayey silt		3	SS	8											
624.5	organic clayey silt Dark Brown		4	TW	PH										11.8	
624.5	Varved silty Clay, clayey silt to silt seams. Mottled Brown v. stiff to stiff.		5	TW	PH										11.9	
624.5			6	TW	PH	620									11.7	
624.5			7	TW	PH											
624.5			8	SS	14											
610.8	Gypsiferous clayey Till.		9	SS	3 1/2"	610										
14.2	End of Borehole Probably weathered bedrock.					600										Practical Refusal to split spoon

201-63  
420

FOUNDATION SECTION

ORIGINATED BY CH

BORING DATE March 26, 1969

COMPILED BY CH

BOREHOLE TYPE Penn Drill

CHECKED BY: \_\_\_\_\_

[illegible]



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB W. Trow Project H 651LOCATION Sta. 231+40 & Prop Rev'n Hwy 54 Line K o/s 16' RTORIGINATED BY CMW.P. 201-63BORING DATE March 26, 1969COMPILED BY CMDATUM GeodeticBOREHOLE TYPE Penn Drill - Vane Tests only

CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. + Field Vane	WATER CONTENT %			
636.10	Ground Level										
633.5 2.5	Fill Material										
	clayey silt with some sand & occ. gravel. occ. sand seams Brown v. stiff					630	+ <sup>8</sup>	10 +→ +→ +→			soil strata established by visual observations during augering
619.0 17.0	Silty clay, Grey stiff					620	+ <sup>3</sup>				
610.0 26.0	End of Borehole Probably weathered Bedrock					610	+ <sup>3</sup>				
						600					Refusal to Vane Penetration



A total of 4 <sup>was</sup> ~~was~~ horseholes ~~was~~ carried out along the north shoulder of the east approach of existing Hwy 54 to the bridge across Big Creek, by means of a Penn Drill auger machine. The subsoil conditions between Stations 231+40 to 231+75 only were investigated. The purpose of the investigation was to determine the presence of and delineate the extent of a <sup>soft</sup> ~~soft~~ organic silt ~~stratum~~ stratum reported to have been encountered in this area by W. Trow Associates Ltd. during their <sup>foundations</sup> investigation (Project # 651, Report dated March 14, 1967) for a proposed new structure at the site.

The present investigation has confirmed the original findings, in that an organic silt stratum was encountered ~~between~~ <sup>(Proposed deviation, Hwy 54, line K)</sup> ~~Station~~ west of Station 231+67. The lateral extent of this organic silt stratum (i.e. away from the shoulder towards Big Creek, or in towards the pavement) was not established. This stratum was encountered between about elevations 624 and 628 and was found, on the basis of laboratory testing to have a shear strength in the order of

500 psf. The organic silt is overlain by approximately 7 to 8.5 ft of fill and clayey silt with sand and gravel and is underlain by a varved silty clay deposit of stiff to very stiff consistency.

The existing <sup>(cracks along in the centre)</sup> ~~construction~~ of the pavement in the vicinity of Sta. 231+ between Stations 231+50 and 231+95 seem to indicate that the overlying fill material has been rendered unstable as a result of the due to the presence of this organic silt stratum.

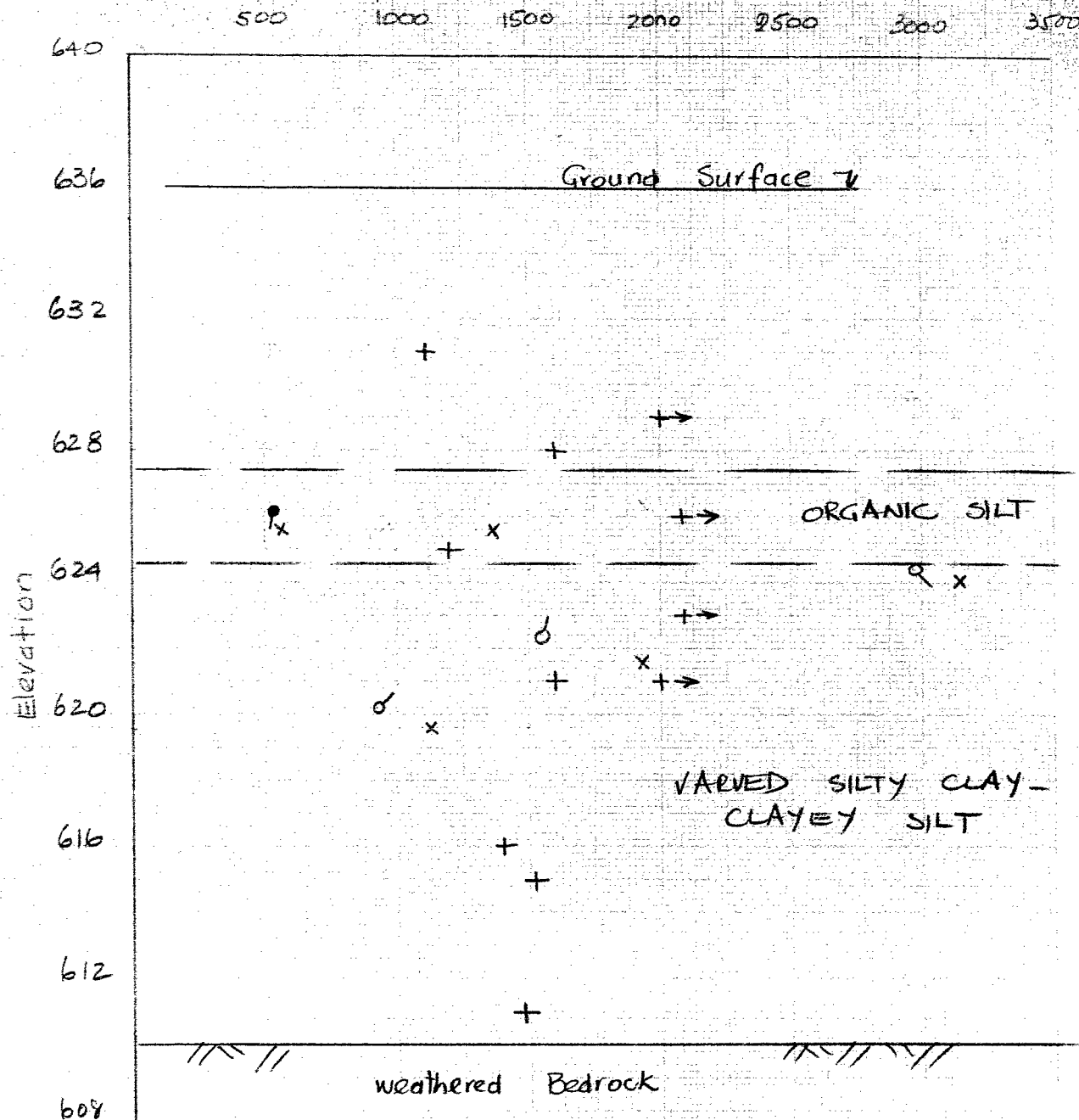
Therefore

It is recommended that, prior to addition of fill in this area, the existing ground should be subexcavated to at least elevation 624, i.e. to the upper boundary of the varved silty clay deposit. The plan limits of this excavation ~~sh~~ will be controlled by the lateral extent of the soft organic silt deposit. It is ~~understood~~ that the backfill behind the existing east abutment of the bridge is not suitable ~~that can be~~ determined either

The proposed grade of new Hwy 54 will be at <sup>(about)</sup> elevation 645 i.e. some 20 ft above the subexcavation level. ~~Such~~ <sup>fills up to 20 ft in height</sup> ~~fills~~ can be constructed from elevation 624 <sup>with</sup> standard 2:1 side slopes without danger of major instability. ~~It should be mentioned here that,~~ ~~only the east approach~~ ~~the above remarks~~ ~~apply only to the east approach.~~

O.M.  
March 27/69

W Trow Project H 651 WP-201-63 Hwy 1- Big Creek  
 Undrained shear strength - psf



Results of Field & Lab Investigation  
March 26-27, 1969

C.M.



# LABORATORY VANE TEST

Project \_\_\_\_\_ B.H. No. 1 Sample No. 4 Depth 9' 5"

Lab. No. \_\_\_\_\_ Operator CC Date of test 27/3/69

Sample description Brown Clayey Silty

## UNDISTURBED SHEAR STRENGTH

Test location		Small Vane			
Spring no.		<u># 3</u>			
Initial stress reading	degrees	<u>209</u>			
Final stress reading	degrees	<u>216</u>			
Stress scale difference	degrees	<u>7</u>			
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (A)	lbs./sq.ft.	<u>564</u>			
Initial strain reading	degrees	<u>3</u>			
Final strain reading	degrees	<u>12</u>			
Strain scale difference	degrees	<u>9</u>			
Strain at failure	%	<u>25</u>			
Specimen moisture content	%				
Specimen density	lbs./cu.ft.				

## Remarks

## REMOLDED SHEAR STRENGTH

Spring no.		<u># 1</u>			
Initial stress reading	degrees	<u>179</u>	<u>179</u>	<u>179</u>	
Final stress reading	degrees	<u>183</u>	<u>180</u>	<u>181</u>	
Stress scale difference	degrees	<u>4</u>	<u>1</u>	<u>2</u>	
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (B)	lbs./sq.ft.	<u>163</u>	<u>26</u>	<u>52</u>	
Sensitivity of material = ( $\frac{A}{B}$ )		<u>55</u>	<u>22</u>	<u>11</u>	
Initial strain reading	degrees	<u>52</u>	<u>62</u>	<u>68</u>	
Final strain reading	degrees	<u>55</u>	<u>63</u>	<u>70</u>	
Strain scale difference	degrees	<u>3</u>	<u>1</u>	<u>2</u>	
Strain at failure	%	<u>18</u>	<u>3</u>	<u>16</u>	

## Calculations:

Vane diameter (d) = 0.5 ins.

Vane height (h) = 0.5 ins.

$$\text{Torque (T) lbs./in.} = C \pi \left( \frac{d^2 h}{2} + \frac{d^3}{6} \right)$$

$$\therefore \text{Shear stress (C)} = \frac{T}{0.262} \text{ lbs./sq.in.}$$

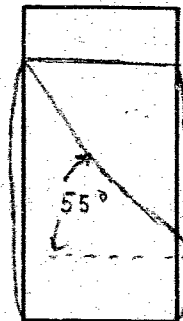
~~UNCLASSIFIED~~ **QUICK TRIAXIAL COMPRESSION TEST**

Project 69-F-2 B.H. No. 1 Sample no. 4 Depth 8' 10"  
 Lab. no. 69-B-2 Operator CC Date of test 27/3/69  
 Diameter of specimen 2 inches Cross-sectional area 3.14 sq. ins.  
 Height of specimen 7 inches Volume of specimen 12.56 cu. ins.  
 Lateral pressure  $\sigma_3$  7 p.s.i. Rate of strain 0.067 ins./min.

## Sample description:

PR 711						
STRAIN			AREA	STRESS		
Dial .001 in.	%		sq. ins.	Dial .0001 in.	lbs.	lbs./sq. in.
0	0	0		0		
15	20			50		
30	40	1		74		
45	60			89		
60	80	2		101		
75	100			112		
90	120	3		120		
105	140			128		
120	160	4		138		
135	180			147		
150	200	5		154	*	
180	240	6		162		
210	280	7		174		
240	320	8		187		
270	360	9		190		
300	400	10		199		
330	440	11		210 x .075		
360	480	12		213		
390	520	13		217		
420	560	14		230		
450	600	15		231		
480	640	16		240		
510	680	17		248		
540	720	18		248		
570	760	19		259		
600	800	20		269		

## FAILURE SKETCH



## Remarks

\* Start of  
Shear

Sample wt. 389 gms.Wet density 118 p.c.f.

Moisture %

Dry density p.c.f.

Overburden P tons

Void ratio

Comp. stress 7.44 p.s.i.Comp. stress 1070 p.s.f.Shear stress 535 p.s.f.Strain at failure 11 %

# LABORATORY VANE TEST

Project 69-F B.H. No. 1 Sample No. 5 Depth 10' 11"

Lab. No. 69-B Operator CC Date of test 27/3/69

Sample description Brown Clayey silt

## UNDISTURBED SHEAR STRENGTH

Test location		Small Vane			
Spring no.		# 1			
Initial stress reading	degrees	178			
Final stress reading	degrees	300			
Stress scale difference	degrees	122			
Torque (T)	lbs./in.	1.19			
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.	2.15			
Shear stress (A)	lbs./sq.ft.	2.30			
Initial strain reading	degrees	4			
Final strain reading	degrees	16			
Strain scale difference	degrees	2			
Strain at failure	%	3.3			
Specimen moisture content	%				
Specimen density	lbs./cu.ft.				

Remarks

## REMOLED SHEAR STRENGTH

Spring no.		#3			
Initial stress reading	degrees	207	210	209	
Final stress reading	degrees	217	220	218	
Stress scale difference	degrees	10	10	9	
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (B)	lbs./sq.ft.	805	805	725	
Sensitivity of material = ( $\frac{A}{B}$ )		3.9	3.9	4.3	
Initial strain reading	degrees	26	38	55	
Final strain reading	degrees	30	40	61	
Strain scale difference	degrees	4	2	6	
Strain at failure	%	1.1	.6	.17	

Calculations:

Vane diameter (d) = 0.5 ins.

Vane height (h) = 0.5 ins.

$$\text{Torque (T) lbs./in.} = C \pi \left( \frac{d^2 h}{2} + \frac{d^3}{6} \right)$$

$$\therefore \text{Shear stress (C)} = \frac{T}{0.262} \text{ lbs./sq.in.}$$

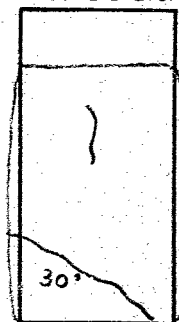
DEPARTMENT OF HIGHWAYS ONTARIO  
MATERIALS AND TESTING DIVISION**UNCONFINED AND SHEAR TESTS** **COMPRESSION TEST**Project W.P. # 201-63 B.H. No. 1 Sample no. 5 Depth 10'4"Lab. no. 62-B Operator C.C. Date of test 27/3/69Diameter of specimen 2 inches Cross-section area 3.14 sq. ins.Height of specimen 4 inches Volume of specimen 12.56 cu. ins.Lateral pressure  $\sigma_3$  — p.s.i. Rate of strain 0.08 ins./min.

## Sample description:

Brown clayey silt710

STRAIN			AREA sq. ins.	STRESS		
Dial .001 in.	%			Dial .0001 in.	lbs.	lbs./sq. in.
0	0	0		0		
15	20			30		
30	40	1		206		
45	60			270		
60	80	2		327		
75	100			361		
90	120	3		394		
105	140			425		
120	160	4		452		
135	180			475		
150	200	5		496	$\times$	
180	240	6		534	$\times$ 0.374	1000
210	280	7		556	$\times$ 0.370	205
240	320	8		561	$\times$ 0.366	205
270	350	9		518		
300	400	10				
350	440	11				
360	480	12				
390	520	13				
420	560	14				
450	600	15				
480	640	16				
510	680	17				
540	720	18				
570	760	19				
600	800	20				

## FAILURE SKETCH



## Remarks

\* Start of  
ShearSample wt. 392 gms.Wet density 110 p.c.f.Moisture — %Dry density — p.c.f.Overburden P — tonsVoid ratio —Comp. stress 205 p.s.i.Comp. stress 200 p.s.i.Shear stress 100 p.s.i.Strain at failure 7 %

# LABORATORY VANE TEST

Project \_\_\_\_\_ B.H. No. 1 Sample No. 6 Depth 13' 5"

Lab. No. \_\_\_\_\_ Operator CC Date of test \_\_\_\_\_

Sample description Brown clayey silt

## UNDISTURBED SHEAR STRENGTH

Test location		Small Vane		
Spring no.		<u>3</u>		
Initial stress reading	degrees	<u>207</u>		
Final stress reading	degrees	<u>231</u>		
Stress scale difference	degrees	<u>24</u>		
Torque (T)	lbs./in.			
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.			
Shear stress (A)	lbs./sq.ft.	<u>1032</u>		
Initial strain reading	degrees	<u>5</u>		
Final strain reading	degrees	<u>14</u>		
Strain scale difference	degrees	<u>9</u>		
Strain at failure	%	<u>25</u>		
Specimen moisture content	%			
Specimen density	lbs./cu.ft.			

Remarks

## REMOLDED SHEAR STRENGTH

Spring no.		<u>3</u>		
Initial stress reading	degrees	<u>209</u>	<u>212</u>	<u>210</u>
Final stress reading	degrees	<u>216</u>	<u>216</u>	<u>213</u>
Stress scale difference	degrees	<u>7</u>	<u>4</u>	<u>3</u>
Torque (T)	lbs./in.			
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.			
Shear stress (B)	lbs./sq.ft.	<u>564</u>	<u>322</u>	<u>262</u>
Sensitivity of material = ( $\frac{A}{B}$ )		<u>34</u>	<u>6</u>	<u>8</u>
Initial strain reading	degrees	<u>39</u>	<u>47</u>	<u>56</u>
Final strain reading	degrees	<u>41</u>	<u>49</u>	<u>57</u>
Strain scale difference	degrees	<u>2</u>	<u>2</u>	<u>1</u>
Strain at failure	%	<u>6</u>	<u>6</u>	<u>3</u>

Calculations:

Vane diameter (d) = 0.5 ins.

Vane height (h) = 0.5 ins.

$$\text{Torque (T) lbs./in.} = C\pi \left( \frac{d^2 h}{2} + \frac{d^3}{6} \right)$$

$$\therefore \text{Shear stress (C)} = \frac{T}{0.262} \text{ lbs./sq.in.}$$

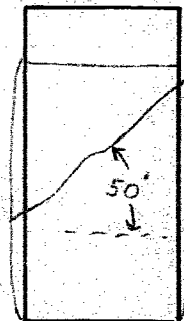
**UNCONFINED AND QUICK TENSILE COMPRESSION TEST**Project WP-201-63 B.H. No. 1 Sample no. 6 Depth 12'9"Lab. no. \_\_\_\_\_ Operator CC Date of test \_\_\_\_\_Diameter of specimen 2 inches Cross-sectional area 3.14 sq. ins.Height of specimen 4 inches Volume of specimen 12.56 cu. ins.Lateral pressure  $\sigma_3$  - p.s.i. Rate of strain 0.05 ins./min.

Sample description:

Brown Clayey S.H.710

STRAIN			AREA	STRESS		
Dial .001 in.	%	sq. ins.	Dial .0001 in.	lbs.	lbs./sq. in.	
0	0	0	0			
15	20		140			
30	40	1	228			
45	60		262	$\times .0392$	10.28	
60	80	2	272	$\times .0392$	10.61	
75	100		268			
90	120	3				
105	140					
120	160	4				
135	180					
150	200	5				
180	240	6				
210	280	7				
240	320	8				
270	360	9				
300	400	10				
330	440	11				
360	480	12				
390	520	13				
420	560	14				
450	600	15				
480	640	16				
510	680	17				
540	720	18				
570	760	19				
600	800	20				

FAILURE SKETCH



Remarks

\* Start of  
ShearSample wt. 987 gms.Wet density 117 p.c.f.

Moisture %

Dry density p.c.f.

Overburden P tons

Void ratio

Comp. stress 10.61 p.s.i.Comp. stress 1528 p.s.f.Shear stress 764 p.s.f.Strain at failure 2 %

# LABORATORY VANE TEST

Project \_\_\_\_\_ B.H. No. 1 Sample No. 7 Depth 15' 5"

Lab. No. \_\_\_\_\_ Operator CC Date of test 3/27/69

Sample description Brown Silty Clay

## UNDISTURBED SHEAR STRENGTH

Test location		Small Vane			
Spring no.		# 3			
Initial stress reading	degrees	207			
Final stress reading	degrees	221			
Stress scale difference	degrees	14			
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (A)	lbs./sq.ft.	1127			
Initial strain reading	degrees	5			
Final strain reading	degrees	9			
Strain scale difference	degrees	4			
Strain at failure	%	1/1			
Specimen moisture content	%				
Specimen density	lbs./cu.ft.				

Remarks

## REMOLED SHEAR STRENGTH

Spring no.		# 3			
Initial stress reading	degrees	207	210	206	
Final stress reading	degrees	216	216	213	
Stress scale difference	degrees	9	6	7	
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (B)	lbs./sq.ft.	725	483	564	
Sensitivity of material = ( $\frac{A}{B}$ )		15	25	2	
Initial strain reading	degrees	25	36	49	
Final strain reading	degrees	28	38	51	
Strain scale difference	degrees	3	2	2	
Strain at failure	%	8	6	6	

Calculations:

Vane diameter (d) = 0.5 ins.

Vane height (h) = 0.5 ins.

$$\text{Torque (T) lbs./in.} = C \pi \left( \frac{d^2 h}{2} + \frac{d^3}{6} \right)$$

$$\therefore \text{Shear stress (C)} = \frac{T}{0.262} \text{ lbs./sq.in.}$$





DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND TESTING DIVISION  
**LABORATORY VANE TEST**

Project \_\_\_\_\_ B.H. No. 2 Sample No. 1 Depth 10' 5"

Lab. No. \_\_\_\_\_ Operator CC Date of test 3/27/69

Sample description Brown Silty Clay

**UNDISTURBED SHEAR STRENGTH**

Test location		Small			
		Vane			
Spring no.		* 3			
Initial stress reading	degrees	207			
Final stress reading	degrees	224			
Stress scale difference	degrees	17			
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (A)	lbs./sq.ft.	1369			
Initial strain reading	degrees	4			
Final strain reading	degrees	14			
Strain scale difference	degrees	10			
Strain at failure	%	28			
Specimen moisture content	%				
Specimen density	lbs./cu.ft.				

Remarks

**REMOLDED SHEAR STRENGTH**

Spring no.		* 3			
Initial stress reading	degrees	208	207	210	
Final stress reading	degrees	213	212	213	
Stress scale difference	degrees	5	5	3	
Torque (T)	lbs./in.				
Shear stress ( $\frac{T}{0.262}$ )	lbs./sq.in.				
Shear stress (B)	lbs./sq.ft.	403	403	242	
Sensitivity of material = ( $\frac{A}{B}$ )		3.5	3.5	5.5	
Initial strain reading	degrees	33	44	50	
Final strain reading	degrees	35	47	52	
Strain scale difference	degrees	2	3	2	
Strain at failure	%	6	8	6	

Calculations:

Vane diameter (d) = 0.5 ins.

Vane height (h) = 0.5 ins.

$$\text{Torque (T) lbs./in.} = C \pi \left( \frac{d^2 h}{2} + \frac{d^3}{6} \right)$$

$$\therefore \text{Shear stress (C)} = \frac{T}{0.262} \text{ lbs./sq.in.}$$



Dredging near Trans BH-B  
North Shoulder of Hwy 54,  
57' east of E. abut of bridge  
across Big Creek.

C. Mirza  
March 26/69



SITE 600'± east of Bridge  
on Hwy 54 across Big creek  
South side of Hwy 54 - Failure.

WP 201-63 ?

C Mirza  
March 26/69

K B 1 K 9 3 1



WP 201-63

General view, looking west along  
Hwy. 24, if existing Bridge  
across Big Creek. Big Creek at  
right of Picture. Grand River  
" in left top background.

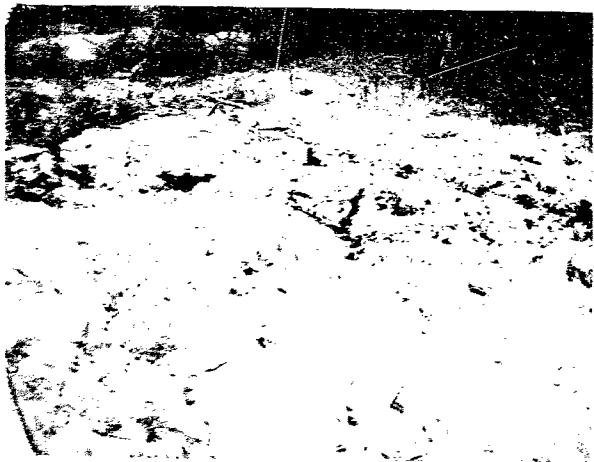
C. M. 22

Mar 26/59

K 81 K 9 3 1







View looking south (downslope  
towards Grand River) of  
South side slope of Hwy 54  
some 600' east of Bridge  
across Big Creek

view shows failure of  
slope.

photos

Note drainage [created in the  
the surface by seeping water

C.M. 129

Mar 26/69





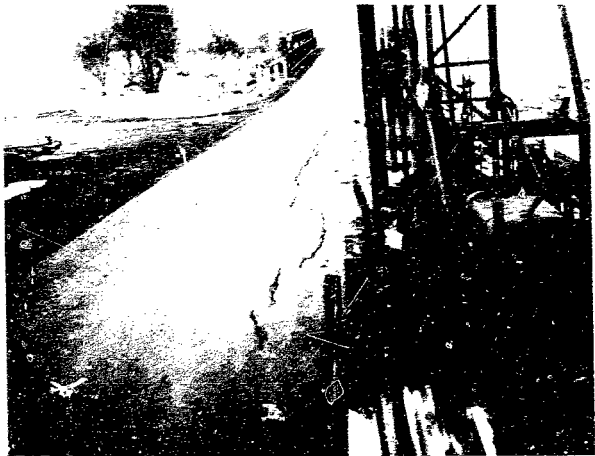
WP 201-63.

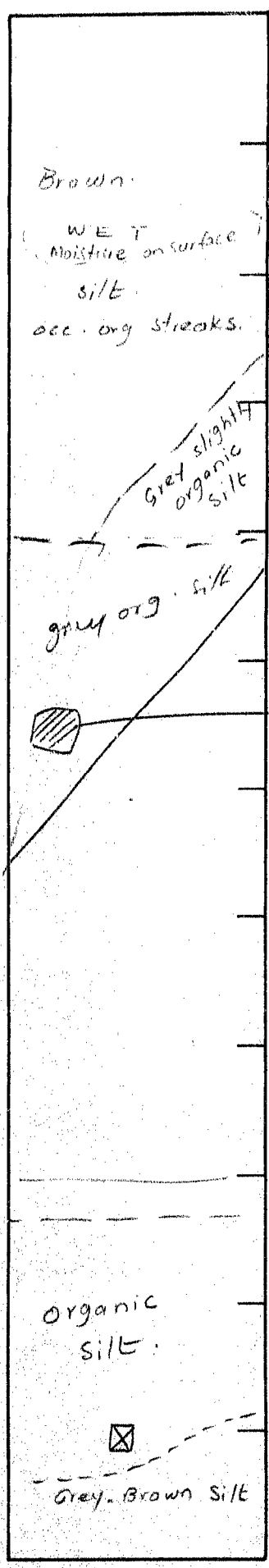
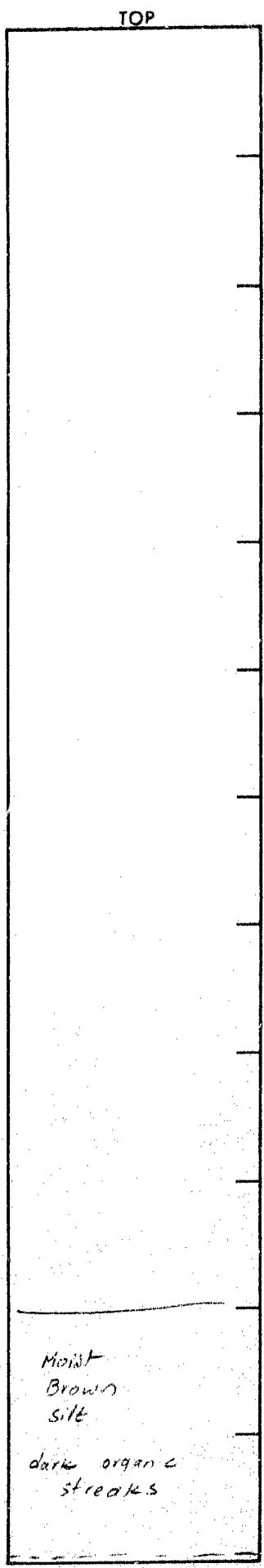
View looking east along north  
fence of May 24 picture taken  
from a point some 150' east of  
East end of Bridge across Big Creek  
& located at end of fence.

The picture shows failure  
in South Bank of Big Creek,  
some 100' upstream from the Bridge  
1005400

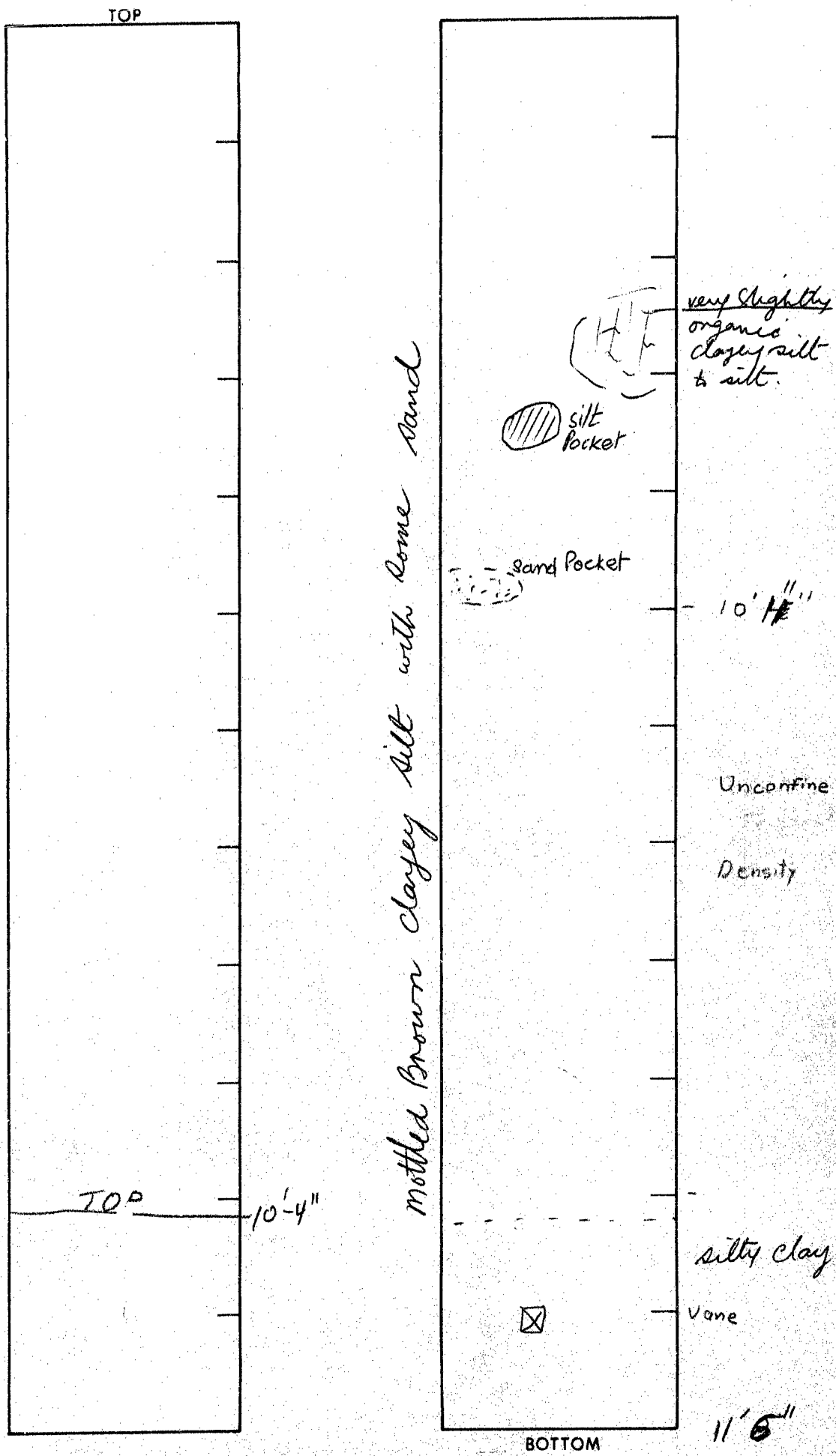
C. Mirza  
Mar 25/69

1  
2  
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12





2" DIA. SAMPLE



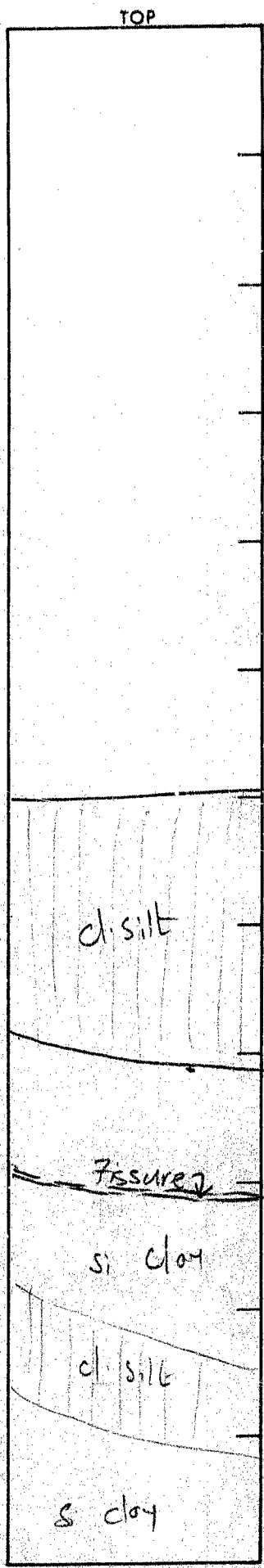
2" DIA. SAMPLE



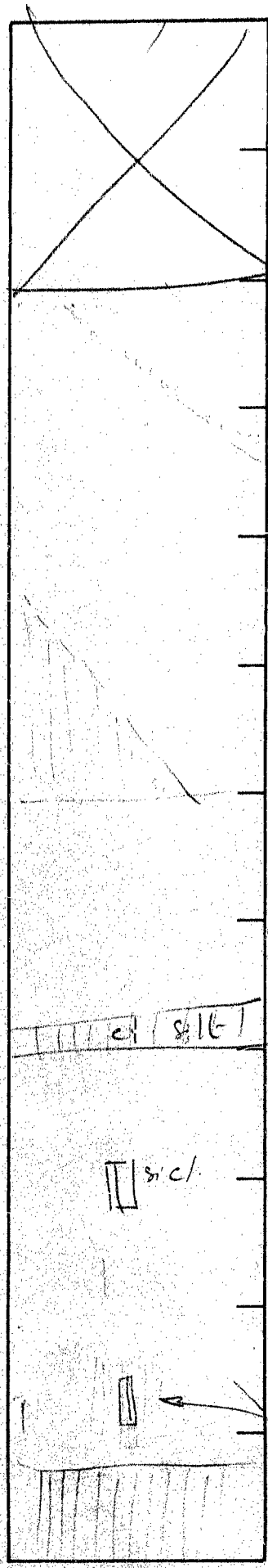
[illegible]

13' 6"

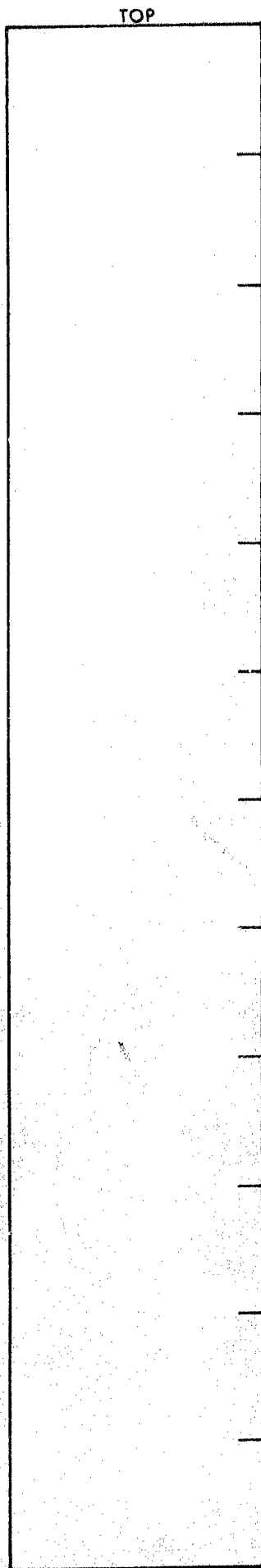
FF 39



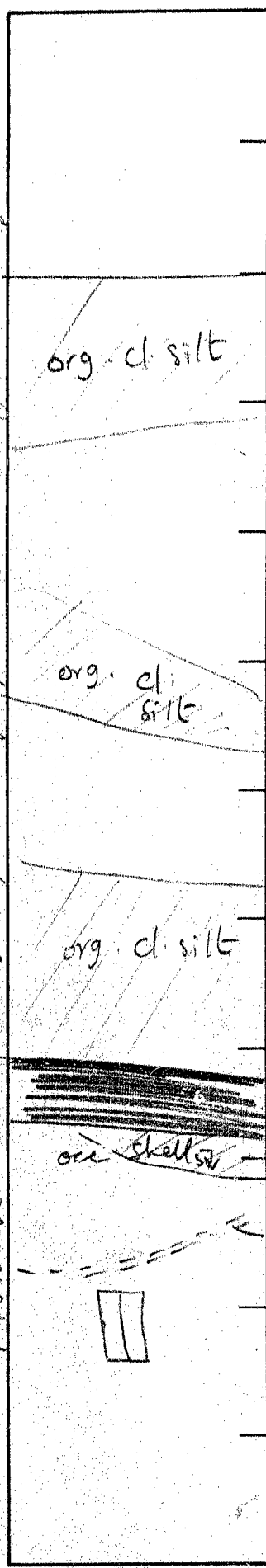
mottled Brown "varved" silty clay, cl. silt varves.



2" DIA. SAMPLE



Mottled Brown - Grey clayey silt with organic layers.



9 1/8"

org. cl. silt

org. cl. silt

org. cl. silt

decayed wood

ore shells

org. cl. silt

sand seam



none

10 1/2"

BOTTOM

2" DIA. SAMPLE

# VISUAL CLASSIFICATION SHEET

OVER																			
PROJECT <u>WP 201-63</u>					SITE <u> Hwy 54- Big Creek</u>					BOREHOLE No. <u>1 (Near Tinto's BHB)</u>					GROUND ELEVATION <u>          </u>				
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			PERCENTAGE			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE		GRAVEL	SAND	SILT & CLAY												
1	2-3 1/2	1/4"	ang.																
2	4-5 1/2	1"	subang.	30	20	50		dull	none low	Med	Earthy	Brown to Grey	strong			asphalt. Bdry ... Brown coarse sand. Clayey silt with some sand & gravel - Fill	SW CL		
3	6-7 1/2	1/2"	"	10	20	70		dull	none	low	"	Brown	slow			Fill as above - Bdry with Br. clayey silt with some f. sand	CL		
* 8	16-17 1/2	-	-	0	Tr	100		dull-shiny	none to <del>weak</del>	low	"	Mottled Br to Grey	strong			varved silty clay with silt seams	CI		
9	24-24 1/2	1/2"	Subround	15	15	70		shiny	none	Med	"	Grey	"			Grey gypsiferous shaley glacial Till			

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

REMARKS:- \* see diagram on back.

# 8

OVER

PROJECT No. 9-201-68 SITE 400' S - 10' E BOREHOLE No. 1 (See Map) GROUND ELEVATION

[illegible]

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

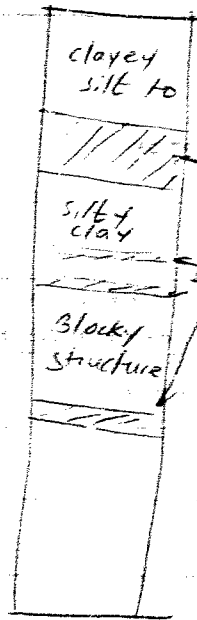
REMARKS: - \* see description on back

PROJECT WP 201-63 SITE shory 54- Big Creek BOREHOLE No. 3 GROUND ELEVATION \_\_\_\_\_

FF 22

# VISUAL CLASSIFICATION SHEET

# 3



GROUND ELEVATION

BOREHOLE NO

SITE

PROJECT

## GRAIN SIZE DISTRIBUTION

### PERCENTAGE

75 MICRONS  
47.5 MICRONS  
25 MICRONS  
15 MICRONS  
7.5 MICRONS  
4.75 MICRONS  
2.5 MICRONS  
1.18 MICRONS  
0.6 MICRONS  
0.3 MICRONS  
0.15 MICRONS

PERCENTAGE  
PASSING  
NO. 20  
NO. 40  
NO. 60  
NO. 100  
NO. 200  
NO. 400  
NO. 600  
NO. 840  
NO. 1060  
NO. 1490  
NO. 2000  
NO. 2800  
NO. 3550  
NO. 4750  
NO. 6000  
NO. 7500  
NO. 10000  
NO. 15000  
NO. 20000  
NO. 25000  
NO. 30000  
NO. 35000  
NO. 40000  
NO. 45000  
NO. 50000  
NO. 55000  
NO. 60000  
NO. 65000  
NO. 70000  
NO. 75000  
NO. 80000  
NO. 85000  
NO. 90000  
NO. 95000  
NO. 100000

WATER CONTENT  
FLUIDITY

SHRINKAGE

UNSATURATED

PERCENTAGE

WATER

FLUIDITY

UNSATURATED

PERCENTAGE

WATER

FLUIDITY

UNSATURATED

PERCENTAGE

WATER

FLUIDITY

UNSATURATED

PERCENTAGE

WATER

FLUIDITY

NOTED - VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES HAVE BEEN OBTAINED

REMARKS:

# FIELD BORING LOG

DRILLING CO. PVIC DATUM ELEV. 660.0 B.H. NO. 1  
 DRILLER Steve GROUND ELEV. 633.4 JOB NO. Tron  
 ENGINEER LM CASING SIZE None DATE Mar 26/69  
 SITE LOCATION  Hwy 54 - Brg Cr.  
 HOLE LOCATION  57' E of abut. along N. shoulder of Hwy 54  
 REMARKS  snowing, windy, 25°F.

DEPTH	FEET	DESCRIPTION	SAMPLE TYPE, NO. & RECOVERY	METHOD OR BLOWS & DISTANCE
0	2	avg. - 6" asphalt, 1.5' road fill w/BCB		
		grey, 3/4" size and less.		
2	3.5	some sp. sp. s.s. gr. followed by old asphalt from 3.5' depth	SS # 1	10-56-15
2	4	avg. - fill material, sand & fine gravel at top.		
4	5.5	sp. sp. - C. silt. clayey silt w/ s.s. gr.	SS # 2	12-6-6
4	6	avg. - Br. cl. silt w/ s.s. gr. at top.		
6	7.5	sp. sp. - Br. cl. silt, s.s. gr. w/ 7. sand clams.	SS # 3	2-3-5
6	8	avg. - Br. cl. silt to silt at top.		
8	9.5	Pink Shelly - Grey silt & cl. silt at base, Brown silt & cl. silt at top.	TW # 4	PH
8	10	avg. -		
10	11.5	Br. cl. silt - silt	TW # 5	PH
10	12	avg. -		
12	13.5	Br. cl. silt - silt	TW # 6	PH
12	14	avg. -		
14	15.5	Br. clayey silt - v. sh. silt	TW # 7	PH
14	16	avg. - Br. clayey silt with s.s. at top.		
16	17.5	mostly or clayey silt of mottled brown to grey silt layers. <del>from 16-17' depth</del>	SS # 8	6-7-7
16	18	avg. - grey s. s. - w/ clay lumps		
18	19.5	lumps - clayey silt <del>probably from 16-17' depth</del>	SS # 9	20-2-1
		grey shales - weathered & cracked.		
		backfill hole		



DRILLING CO. <u>PVIC</u>	DATUM ELEV. <u>6600</u>	B.H. NO. <u>2</u>
DRILLER <u>Stone</u>	GROUND ELEV. <u>635±</u>	JOB NO. <u>Trow</u>
ENGINEER <u>CM</u>	CASING SIZE <u>None</u>	DATE <u>Mar 26/69</u>
SITE LOCATION <u>Big Creek - Hwy 54</u>		
HOLE LOCATION <u>7 ft. west (along shoulder) of BH-1</u>		
REMARKS <u>Perm Drill</u>		

DEPTH FEET		DESCRIPTION	SAMPLE TYPE, NO. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
0	4	auger - 3" asphalt followed by gray s.s. gr. till to 3.8' changing to brown sand w/ fine gravel & lime clay.		
4	9	auger - Brown clayey silt with some sand & Ti. gravel to 8.5' changing to dark <del>gray</del> black organic clayey silt		
9	10 1/2		TW # 1	
10 1/2	12	Vane Und (30 + 50) @ 12" = 1200 PSF Rem (13 + 13) @ 12" = 520 PSF		
9	14	auger - Brown, with occasional dark brown patches, clayey silt with trace sand.		
14	15 1/2	Push vane with difficulty Undest > (52 + 52) @ 12" = > 2000 PSF.		
		End Borehole.		
		?		

# FIELD BORING LOG

DRILLING CO.	PWK	DATUM ELEV.	Good	B.H. NO.	3
DRILLER	Steve	GROUND ELEV.	636 ±	JOB NO.	Two
ENGINEER	CM	CASING SIZE	None	DATE	Mar 26/69
SITE LOCATION	Hwy 54 Big Creek				
HOLE LOCATION	20' east of BH-1.				
REMARKS	Perm Drill.				

DEPTH FEET		DESCRIPTION	SAMPLE TYPE, NO. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
0	4	auger - fill material.		
4	5.5	Br. f sand <sup>or silt</sup> in clayey silt or vice versa.	SS # 1	2-2-3
4	6	auger - Br. clayey silt w/ some sand, oc. gt or wood.		
6	7 1/2	Br. clayey silt, oc. wood chips, sand seam 2" thick @ 7' depth.	SS # 2	2-3-3
7 1/2	9	same 40 + 40 @ 12" = 1600 Psf Rem. 12 + 12 @ 6" = 240 Psf		
6	9	auger.		
9	10 1/2	Mottled Brown stiff clayey silt to silt.	SS # 3	2-3-5
		End of Borehole.		

# FIELD BORING LOG

DRILLING CO. PVK DATUM ELEV. Good B.H. NO. 4  
 DRILLER Stone GROUND ELEV. 636 ± JOB NO. Iron  
 ENGINEER CRD CASING SIZE None DATE 3/26/69  
 SITE LOCATION Big creek - Hwy 54  
 HOLE LOCATION 5' east of B.H. 3  
 REMARKS Penn Drill - Vane only

DEPTH FEET		DESCRIPTION	SAMPLE TYPE, NO. & RECOVERY	METHOD OR BLOWS & DISTANCE
FROM	TO			
0	4	auger - 2'5' fill, then brown clayey sand with gravel		
4	5 1/2	vane 28+28 @ 12" = 1120 PSF 7+7 @ 6" = 140 PSF	S=8	
4	6	auger - Brown clayey silt occasional f.m. sand clams		
6	7 1/2	vane 752 @ 12" = 7200 PSF remoulded (12+12) @ 6" = 240 PSF	S=10±	
6	9	auger - Brown clayey silt with sand		
9	10 1/2	vane 752 @ 12" = 7200 PSF could not turn for remould		
9	12	auger - Brown clayey silt with some sand		
12	13 1/2	vane - hard to push beyond 13 ft. 752 @ 12" = 7200 PSF could not remould.		
12	14	auger - Br. clayey silt &		
14	15 1/2	vane (40+40) @ 12" = 1600 PSF rem (28+28) @ 6" = 560 PSF		
14	19	auger - grey clayey silt to silty clay from 17' depth		
19	20 1/2	vane (35+35) @ 12" = 1400 PSF rem (16+16) @ 6" = 320 PSF		
20 1/2	21 1/2	vane (35+35) @ 12" = 1520 PSF rem (22+22) @ 6" = 440 PSF		
19	24	auger -		
24	25 1/2	vane (36+36) @ 12" = 1480 PSF rem (24+24) @ 6" = 480 PSF		
25 1/2	26	Push Vane - Refusal @ 26'. EN B me hole		

Mr. H. H. Haller,  
Construction Engineer,  
District #4, Hamilton.

Soil Mechanics Section,  
Geotechnical Office,  
West Building, Downsview.

June 11th, 1974.

Big Creek & Highway 54 Crossing.  
Foundations for Bailey Bridge on  
Temporary Detour, Contract 74-09,  
District #4, Hamilton,  
H.O. 57-11216.

The abovementioned site was visited by the writer on June 7th, 1974 at the request of Mr. R. Jasper, Project Supervisor to inspect the west approach of the temporary detour which had settled some 5 ft. the previous evening, immediately after being constructed. Following is a summary of observations made by the writer, together with recommendations as to the remedial measures.

1. From a station just west of C.L. Brgs. of the West Abutment of the future Bailey Bridge, the approach fill has settled about 5 ft. and moved forward into the river. Soft material in the river bed can be seen to have heaved up in front of the toe of the fill. The height of the fill was originally about 17 ft. above waterlevel (about 22 ft. above the river bed).
2. Subsoil at the site consists of stiff to firm clay overlying bedrock. Within the river bed, however, organic silt and soft clay layers are present, and it is probably within these layers that failure has occurred.
3. The East Abutment Approach has also been constructed and appears to be stable although it is also possible that some soft material may exist below the front portion of the fill.
4. Recommendations: - In order to ensure stable foundations and approaches for the future Bailey Bridge, it will be necessary to (a) lengthen the Bailey Bridge sufficiently so that the foundations are beyond possible failure zones or (b) stabilize the approaches by constructing bents into the river. If method (a) is used the total length of the Bailey Bridge should be increased from 140 ft. to 170 ft. The West Abutment should be moved westerly 20 ft. and the East Abutment should be moved easterly 10 ft. Forward slopes at the

Mr. R.A. Walley - RE: W.C. 67-11216.

approaches should be flattened or benched to accommodate these new foundation locations. If method (b) is used it will first be necessary to carry out soil borings to acquire information necessary to design stabilizing berms since the subsoil conditions in the river are not known precisely. By constructing berms in the river, some undesirable constriction of the waterway will occur. This river is subject to frequent floods and any constricting at this location will increase the danger of washout. In our view method (a) should be adopted.

The foregoing was discussed with Mr. R. Jasper on June 7th and with Mr. R. Harris by telephone on June 10th.

If we can be of further assistance please contact this office.

RAG/mj

c.c. J. Callaghan  
W. Birch  
W. MacFarlane

Files  
Incumbents

R.G. Selby,  
Supervising Engineer.