

G.I.-30 SEPT. 1976

GEOCRES No. 42D-10DIST. 18 REGION W.P. No. 3-73-04CONT. No. 79-408W. O. No. STR. SITE No. 48E-042HWY. No. 627LOCATION Ext. of Hwy 627
Pic River BridgeNo of PAGES -

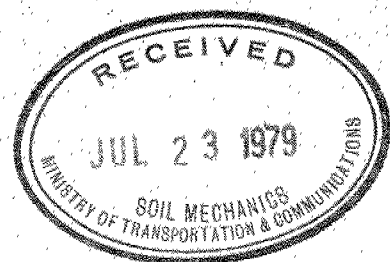
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

FOUNDATION INVESTIGATION REPORT

CONTRACT NO 79-408



Ministry of
Transportation and
Communications



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NOTE: For purposes of the contract this report supercedes all other foundation reports prepared by or for the Ministry in connection with the above mentioned project.

EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS N_c .

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON "A" SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH AS FOLLOWS:

S_u (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCK QUALITY: ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4" IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

TRIAXIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG. $\bar{C}U$ = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

S S SPLIT SPOON
W S WASH SAMPLE
S T SLOTTED TUBE SAMPLE
B S BLOCK SAMPLE
C S CHUNK SAMPLE
T W THINWALL OPEN
T P THINWALL PISTON
O S OSTERBERG SAMPLE
F S FOIL SAMPLE
R C ROCK CORE
P H T.W. ADVANCED HYDRAULICALLY
P M T.W. ADVANCED MANUALLY

EARTH PRESSURE TERMS

μ COEFFICIENT OF FRICTION
 δ ANGLE OF WALL FRICTION
 k_o COEFFICIENT OF EARTH PRESSURE AT REST
 k_A COEFFICIENT OF ACTIVE EARTH PRESSURE
 k_P COEFFICIENT OF PASSIVE EARTH PRESSURE
 i ANGLE OF INCLINATION OF SURCHARGE
 w SLOPE ANGLE-BACKFACE OF WALL
 β ANGLE OF SLOPE
 N, N_q, N_c BEARING CAPACITY FACTORS
 D_f DEPTH OF FOOTING
 B, L FOOTING DIMENSIONS

INDEX PROPERTIES

γ UNIT WEIGHT OF SOIL (BULK DENSITY)
 γ_w UNIT WEIGHT OF WATER
 γ_d UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
 γ' UNIT WEIGHT OF SUBMERGED SOIL
 G_s SPECIFIC GRAVITY OF SOLIDS
 e VOIDS RATIO
 e_o INITIAL VOIDS RATIO
 e_{max} * IN LOOSEST STATE
 e_{min} * IN DENSEST STATE
 D_r RELATIVE DENSITY = $\frac{e_{max} - e}{e_{max} - e_{min}}$
 n POROSITY
 w WATER CONTENT
 w_L LIQUID LIMIT
 w_P PLASTIC LIMIT
 w_S SHRINKAGE LIMIT
 I_P PLASTICITY INDEX = $w_L - w_P$
 I_L LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
 I_C CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
 A_c ACTIVITY = $\frac{I_P \text{ of soil}}{I_P \text{ of } \mu m \text{ Soil Fraction}}$
 O_m ORGANIC MATTER CONTENT
 S_r DEGREE OF SATURATION
 S SENSITIVITY = $\frac{S_u \text{ (undisturbed)}}{S_u \text{ (remoulded)}}$

STRENGTH PARAMETERS

ϕ ANGLE OF SHEARING RESISTANCE
 τ_f PEAK SHEAR STRENGTH
 τ_R RESIDUAL SHEAR STRENGTH
 c COHESION INTERCEPT
 $\sigma_1, \sigma_2, \sigma_3$ NORMAL PRINCIPAL STRESSES
 u PORE WATER PRESSURE
 u_e EXCESS u
 r_u PORE PRESSURE RATIO
 q_u UNCONFINED COMPRESSIVE STRENGTH
 s_u UNDRAINED SHEAR STRENGTH
 ϵ LINEAR STRAIN
 γ SHEAR STRAIN
 ν POISSON'S RATIO
 E MODULUS OF ELASTICITY
 G MODULUS OF SHEAR DEFORMATION
 k_s MODULUS OF SUBGRADE REACTION
 m, n STABILITY COEFFICIENTS
 A, B PORE PRESSURE COEFFICIENTS

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:
 ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE;
 σ' = EFFECTIVE NORMAL STRESS

HYDRAULIC TERMS

h HYDRAULIC HEAD OR POTENTIAL
 q RATE OF DISCHARGE
 v VELOCITY OF FLOW
 i HYDRAULIC GRADIENT
 j SEEPAGE FORCE PER UNIT VOLUME
 η COEFFICIENT OF VISCOSITY
 k COEFFICIENT OF HYDRAULIC CONDUCTIVITY
 k_h k IN HORIZONTAL DIRECTION
 k_v k IN VERTICAL DIRECTION
 α_v COEFFICIENT OF VOLUME CHANGE
 α_v COEFFICIENT OF CONSOLIDATION
 C_c COMPRESSION INDEX
 C_r RECOMPRESSION INDEX
 d DRAINAGE PATH DISTANCE
 T_v TIME FACTOR
 U DEGREE OF CONSOLIDATION
 O_r OVERCONSOLIDATION RATIO (OCR)

FOUNDATION INVESTIGATION REPORT

For

Pic River Bridge, Site 48E-42
Hwy. 627 Extension Line 'B'
District 18, Sault Ste. Marie
W.P. 3-73-04

INTRODUCTION

This report contains the results of a foundation investigation which was carried out at the site of the above mentioned project. Fieldwork was done during the periods March 6-15, 1973 and February 26 to March 10, 1975, utilizing a conventional diamond drill adapted for soil sampling purposes. Boreholes were cased with NX size (3 inch I.D.) and/or BX size (2 3/8 inch I.D.) casings. Bedrock was proven in some boreholes by recovering AXT size (1 9/32 inch diameter) rock core samples. In addition to the sampled boreholes a large number of deep probes were carried out to accurately define the bedrock surface. These probes consisted of advancing BX casing through the overburden using washboring techniques and by driving with a 400 lb. hammer. Bedrock was assumed to be the level where absolute refusal to further penetration was encountered.

SITE DESCRIPTION

The site is located approximately 1 mile south of Pic River #50 Indian Reserve or about 3 miles north of the Pic River inlet at Lake Superior.

The width of Pic River at the proposed crossing is approximately 440 feet and the maximum measured depth is about 22 feet.

The surrounding terrain on the east side of the river is flat and bush covered. Frequent rock outcrops are the main features of the west side.

SUBSURFACE CONDITIONS

General

The subsoil was found to be quite uniform in the horizontal direction over the proposed site area, but changes in the vertical direction.

The material consists predominantly of silty sand and sandy silt with traces of clay. The deposit is underlain by schist bedrock.

The detailed stratigraphy encountered in each boring is shown on the Record of Borehole Sheets in the Appendix. The estimated stratigraphical profile of Drawing 48E-42-2 of the Contract Drawing is based upon this information.

From ground level downwards the different soil types encountered are described in detail below.

Silty Sand and Sandy Silt, Trace of Clay

This stratum was intersected immediately below the shallow layer of topsoil or at the bottom of the river. The lower boundary coincides with the underlying bedrock surface. The thickness varies from 3 feet in the vicinity of the west shore to over 200 feet on the east shore.

The chief constituents in the deposit were found to be sand and silt with traces of clay. The proportions of the sand and silt sizes varied considerably. Typical grain size distribution curves are included in the Appendix (Fig. 1).

The natural moisture content ranges from 4% to 37%, the average percentage being about 24.

Occasional layers of slightly plastic silt were found within the main deposit.

Standard penetration tests carried out within this zone indicated a very loose to dense relative density. The obtained 'N' values

ranged from 1 to 40 blows per foot. No pattern can be established between the denseness of the deposit and the depth.

Part of the extreme upper portion of the ground on the west shore appears to be bouldery.

Bedrock

A schist type of bedrock was proven in B.H.'s 2, 4, 6, 8, 10 and 14 by obtaining AXT rock core samples at various elevations. References should be made to the Record of Borehole Sheets for bedrock surface elevation at a given location. Based on the observation of the rock outcrops in the vicinity it is assumed that bedrock surface consists of a series of ledges. Consequently, it is difficult to estimate the bedrock surface elevation between borings. In general, the rock surface is sloping towards east, being at elevation 998+ (Sta. 205 + 02) and below elevation 798+ (Sta. 199 + 40).

Groundwater Conditions

During the investigation (March, 1973) the water (ice) level of the Pic River was at elevation 994.4. In B.H.'s 1 and 3, on the east bank, water level elevations were at 997.0 and 998.5 respectively, while in B.H.'s 11 and 16 on the west bank, water levels were encountered at elevations 1009.0 and 1009.3. No artesian conditions were observed at this site.

K.G. Selby

K.G. Selby, P. Eng.
Supervising Engineer

APPENDIX



RECORD OF BOREHOLE No 1

W P 3-73-04 LOCATION Sta. 199+40 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing and Cone Test COMPILED BY P.P.
DATUM Geodetic DATE March 6, 8, 9, 11, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
604.7	Ground Level																
0.0																	
	Silty Sand and Sandy Silt		1	SS	3		600										0 45 54 1
			2	SS	1												
	Trace of Clay		3	SS	3												
			4	SS	4		590										
	Very Loose to Compact		5	SS	5												0 91 (9)
			6	SS	11												
			7	SS	9		580										
			8	SS	10												
			9	SS	11												0 36 58 6
			10	SS	14		570										
			11	SS	15												0 72 (28)
			12	SS	5		560										
			13	SS	7		550										0 16 78 6
			14	SS	7		540										0 4 86 10
			15	SS	19		530										
			16	SS	9		520										0 2 92 6
			17	SS	6		510										
			18	SS	9		500										
485.7							490										
119.0																	

Continued

*3, x5: Numbers refer to
Sensitivity20
15
10
5 (%) STRAIN AT FAILURE

Continued

RECORD OF BOREHOLE No 1 Continued

W P 3-73-04 LOCATION Sta. 199+40 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing and Cone Test COMPILED BY P.P.
DATUM Geodetic DATE March 6, 8, 9, 11, 1973 CHECKED BY [Signature]

[illegible]

+3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

20
5
10

1

RECORD OF BOREHOLE No 2

W P 3-73-04 LOCATION Sta. 200+97 o/s 13' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore NX and BX Casing and Cone Test COMPILED BY P.P.
 DATUM Geodetic DATE March 6, 8, 1973 CHECKED BY P.P.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH PSF					
600.6	Water (Ice) Level							○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE	WATER CONTENT (%)				
0.0	Water						600							
							590							
							580							
577.4	River Bottom													
23.2	Silty Sand and Sandy Silt													
	Trace of Clay													
	Loose to Dense													
			1	SS	46		570							0 75 24 1
			2	SS	17									0 54 43 3
			3	SS	30									0 5 85 10
			4	SS	15		560							0 16 79 5
			5	SS	9									
			6	SS	17									
			7	SS	12		550							0 3 88 9
			8	SS	10									
			9	SS	15									
			10	SS	11		540							
			11	SS	21									
							530							
			12	SS	9									0 2 89 9
							520							
			13	SS	14									
							510							
							500							
			14	SS	40									
			15	SS	23									0 0 93 7
							490							
481.6														

Continued

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

Continued



RECORD OF BOREHOLE No 2 Continued

W P 3-73-04 LOCATION Sta. 200+97 o/s 13' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore NX and BX Casing and Cone Test COMPILED BY P.P.
DATUM Geodetic DATE March 6, 8, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
481.6	Continued																
119.0	Silty Sand and		16	SS	11		480										
476.7	Sandy Silt																
123.9	Schist		17	RC	Rec												
	Bedrock (Sound)			AXT	95%												
			18	RC	Rec		470										
465.8				AXT	100%												
134.8	End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No. 3

W P 3-73-04 LOCATION Sta. 198+86 o/s 14' Rt. & Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washbore NX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 10, 1973 CHECKED BY OP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100										WATER CONTENT (%)	10 20 30	PCF	GR SA SI CL
								SHEAR STRENGTH PSF													
								○ UNCONFINED + FIELD VANE													
								● QUICK TRIAXIAL × LAB VANE													
605.7	Ground Level																				
0.0	Silty Sand and Sandy Silt Trace of Clay Very Loose to Loose	.	1	SS	4	.	600										0 10 79 11				
			2	SS	1																
			3	SS	2																
			4	SS	5																
			5	SS	5																
			6	SS	5																
			7	SS	4																
			8	SS	7																
			9	SS	8																
574.2																	0 27 66 7				
31.5	End of Borehole																				

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 4

W P 3-73-04 LOCATION Sta. 202+22 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 11, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT Σ					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	Water (Ice) Level						600										
0.0	Water						590										
584.6	River Bottom						580										
16.0	Sand and Silt						570										
							560										
							550										
							540										
534.5							530										
66.1	Schist		1	RC AXT	Rec 97%												
529.3	Bedrock Sound																
71.3	End of Borehole																

+3, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 5

W P 3-73-04 LOCATION Sta. 200+26 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 12, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	Water (Ice) Level						600										GR SA SI CL
0.0	Water						590										
584.6	River Bottom						580										
16.0	Sand and Silt						570										
							560										
							550										
							440										
	Sand and Silt						430										
							420										
							410										
407.6																	
193.0	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 6

W P 3-73-04 LOCATION Sta. 203+47 o/s 14' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 12, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT Σ					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ pcf	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	Water (Ice) Level																
0.0	Water						600										
589.6	River Bottom						590										
11.0	Silty Sand																
	Trace of Clay																
	Loose		2	SS	8		580										0 95 (5)
			3	SS	9												
			4	SS	7		570										
			5	SS	9												0 99 (1)
561.1	Schist		6	RC AXT	Rec 96%		560										
			7	RC AXT	Rec 100%												
551.1	Bedrock (Sound)																
49.5	End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 7

W P 3-73-04 LOCATION Sta. 200+82 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY JP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	Water (Ice) Level						600										
0.0	Water						590										
579.6	River Bottom						580										
21.0							570										
							560										
	Sand and Silt						550										
							480										
							470										
							460										
452.6																	
148.0	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE



W P 3-73-04 LOCATION Sta. 204+12 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 13, 1973 CHECKED BY CP

[illegible]

+3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



W P 3-73-04 LOCATION Sta. 201+12 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY M.Y.
DIST 18 HWY 627 BOREHOLE TYPE Washboring COMPILED BY G.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY G.P.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			
600.6	Water (Ice) Level						600						
0.0	Water						590						
579.6	River Bottom						580						
21.0	Sand and Silt						570						
							560						
							550						
							540						
							530						
							520						
							510						
							500						
							490						
484.6													
116.0	End of Borehole Probable Bedrock												

+3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 10

W P 3-73-04 LOCATION Sta. 204+49 o/s 12' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 13, 1973 CHECKED BY JP

[illegible]

*3, x5: Numbers refer to Sensitivity

20
15 \diamond 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 11

W P 3-73-04 LOCATION Sta. 204+90 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									
								SHEAR STRENGTH									
								</									

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 12

W P 3-73-04 LOCATION Sta. 204+33 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
602.8	Ground Level															
0.0	Sand and Silt					600										
						590										
586.3	End of Borehole (Probable Bedrock Refusal)															
16.5	Note: Water Level Not Established															

*3, *5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 13

W P 3-73-04 LOCATION Sta. 204+97 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Cone Test Only COMPILED BY P.P.
 DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

Geodetic		DATE		MATCH NO.										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
620.3	Ground Level						620							
0.0	Probable Sand and Silt						610							
601.2														
19.1	End of Cone Test (Probable Redrock)													
					</									

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 14

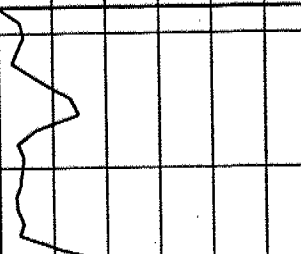
W P 3-73-04 LOCATION Sta. 205+02 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
621.6	Ground Level																
0.0	Silty Sand and Sandy Silt, Trace of Clay Loose to Compact		1	SS	9		620										0 96 (4)
			2	SS	24												
			3	SS	9												
			4	SS	11		610										0 12 81 7
604.6			5	SS	4												
17.0	Schist Bedrock		6	RC AXT	Rec 82%		600										
599.6																	
22.0	End of Borehole Note: Water Level Not Established																

+3, x⁵ : Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

W P 3-73-04 LOCATION Sta. 205+19 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Cone Test Only COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100					
621.7	Ground Level												
0.0	Probable Sand and Silt						620						
602.6													
19.1	Probable Bedrock End of Cone Test							100/L" Refusal					



RECORD OF BOREHOLE No 16

W P 3-73-04 LOCATION Sta. 205+30 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
621.6	Ground Level																
0.0	Silty Sand and Sandy Silt Trace of Clay Loose to Dense		1	SS	5												
			2	SS	39												
			3	SS	6												
			4	SS	4												
602.4																	
19.2	End of Borehole Probable Bedrock Refusal																

+3, x⁵: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 17

W P 3-73-04 LOCATION Sta. 204+05 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	Water (Ice) Level																
0.0	Water						600										
593.2	River Bottom																
7.4	Sand and Silt						590										
582.3	Probable Bedrock																
18.3	Refusal End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 18

W P 3-73-04 LOCATION Sta. 204+00 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
EYE DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100						SHEAR STRENGTH		
600.6	Water (Ice) Level						600													
0.0	Water																			
589.6	River Bottom							590												
11.0	Sand and Silt																			
582.6	Probable Bedrock Refusal End of Borehole																			
18.0																				

+3, x5: Numbers refer to Sensitivity

20
15 ✱
10

OFFICE REPORT ON *SOIL EXPLORATION

W P 3-73-04 LOCATION Sta. 203+93 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY [Signature]

*3, *5: Numbers refer to Sensitivity



RECORD OF BOREHOLE No 20

W P 3-73-04 LOCATION Sta. 203+86 o/s 12' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY GP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
600.6	Water (Ice) Level						600										
0.0	Water																
589.6	River Bottom						590										
11.0	Sand and Silt																
582.2	Probable Bedrock																
18.4	Refusal End of Borehole																








+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 21

W P 3-73-04 LOCATION Sta. 203+80 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH									
								20	40	60	80	100					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT (%)				
600.6	Water (Ice) Level						600										
0.0	Water																
590.2	River Bottom						590										
10.4	Sand and Silt						580										
571.6	Probable Bedrock																
29.0	Refusal End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE



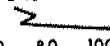
RECORD OF BOREHOLE No 22

W P 3-73-04 LOCATION Sta. 203+73 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY OP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT (%)						
600.6	Water (Ice) Level						600											
0.0	Water																	
590.2	River Bottom						590											
10.4	Sand and Silt																	
							580											
							570											
567.8	Probable Bedrock																	
32.8	Refusal End of Borehole																	

RECORD OF BOREHOLE No 23

W P 3-73-04 LOCATION Sta. 203+68 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 14, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH					WATER CONTENT (%)				
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	x LAB VANE	W _p	W	W _L			
600.6	Water (Ice) Level						600										
0.0	Water																
590.2	River Bottom						590										
10.4	Sand and Silt						580										
567.9	Probable Bedrock						570										
32.7	Refusal End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

W P 3-73-04 LOCATION Sta. 203+61 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY CF

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 25

W P 3-73-04 LOCATION Sta. 203+51 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 14, 1973 CHECKED BY [Signature]

DATUM		Geodetic		DATE													
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
600.6	Water (Ice) Level						600										
0.0	Water																
590.2	River Bottom						590										
10.4	Sand and Silt						580										
							570										
564.1	Probable Bedrock																
36.5	Refusal End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 26

W P 3-73-04 LOCATION Sta. 203+36 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 14, 1973 CHECKED BY [Signature]


SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT Σ					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
600.6	Water (Ice) Level															
0.0	Water					600										
589.6	River Bottom					590										
11.0	Sand and Silt					580										
						570										
						560										
559.1	Probable Bedrock															
41.5	Refusal End of Borehole															

+3, x5: Numbers refer to 20
Sensitivity 15 \diamond 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 27

W P 3-73-04 LOCATION Sta. 203+25 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore AX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY *CP*

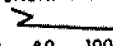
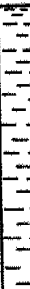
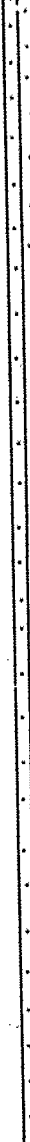

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									
								SHEAR STRENGTH									
600.6	Water (Ice) Level						600										
0.0	Water																
589.2	River Bottom						590										
11.4	Sand and Silt						580										
							570										
							560										
551.5	Probable Bedrock																
49.1	Refusal End of Borehole																

+3, x5: Numbers refer to Sensitivity 20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 28

W P 3-73-04 LOCATION Sta. 201+22 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY DP

SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	SHEAR STRENGTH					WATER CONTENT (%)							
600.6	Water (Ice) Level						600											
0.0	Water							590										
579.2	River Bottom							580										
21.4	Sand and Silt							570										
									560									
									550									
									540									
									530									
									520									
									510									
									500									
492.4	Probable Bedrock																	
108.2	End of Borehole Refusal																	

+3, x5: Numbers refer to
Sensitivity

20
15 \diamond 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 29

W P 3-73-04 LOCATION Sta. 201+33 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore-BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										
600.6	Water (Ice) Level																	
0.0	Water						600											
							590											
579.2	River Bottom						580											
21.4	Sand and Silt						570											
							560											
							550											
							540											
							530											
							520											
							510											
							500											
497.5	Probable Bedrock																	
103.1	Refusal End of Borehole																	

+3, x5 : Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 30

W.P. 3-73-04 LOCATION Sta. 202+42 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore-BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE								● QUICK TRIAXIAL		x LAB VANE
600.6	Water (Ice) Level						600													
0.0	Water						590													
585.6	River Bottom																			
15.0	Sand and Silt						580													
							570													
							560													
							550													
							540													
535.1	Probable Bedrock																			
65.5	Refusal End of Borehole																			

+3, x5: Numbers refer to
Sensitivity

20
15 \diamond 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 31

W P 3-73-04 LOCATION Sta. 202+32 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore-BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
600.6	(Water (Ice) Level)						600										
0.0	Water						590										
584.6	River Bottom						580										
16.0	Sand and Silt						570										
							560										
							550										
							540										
537.4	Probable Bedrock																
63.2	Refusal End of Borehole																

+3, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 32

W P 3-73-04 LOCATION Sta. 202+12 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
DIST 18 HWY 627 BOREHOLE TYPE Washbore-BX Casing COMPILED BY P.P.
DATUM Geodetic DATE March 15, 1973 CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH					WATER CONTENT (%)			
600.6	Water (Ice) Level						600									
0.0	Water						590									
583.6	River Bottom						580									
17.0	Sand and Silt						570									
							560									
							550									
							540									
533.6	(Probable Bedrock)															
67.0	Refusal End of Borehole															

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 33

W.P. 3-73-04 LOCATION Sta. 202+02 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore - BX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 15, 1973 CHECKED BY CP

DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p		NATURAL MOISTURE CONTENT W		LIQUID LIMIT W _L		UNIT WEIGHT Y		REMARKS & GRAIN SIZE DISTRIBUTION (%)					
20 40 60 80 100		W _p		W		W _L		Y		GR SA SI CL					
SHEAR STRENGTH		O UNCONFINED		+ FIELD VANE		• QUICK TRIAXIAL		x LAB VANE							
ELEVATION SCALE		600		590		580		570		560		550		540	
SOIL PROFILE		DESCRIPTION		STRAT PLOT		NUMBER		TYPE		'N' VALUES		GROUND WATER CONDITIONS			
600.6		Water (Ice) Level													
0.0		Water													
582.6		River Bottom													
18.0		Sand and Silt													
533.4		(Probable Bedrock)													
67.2		Refusal End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (% STRAIN AT FAILURE



RECORD OF BOREHOLE No 34

W P 3-73-04 LOCATION Sta. 202+52 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.P.
 DIST 18 HWY 627 BOREHOLE TYPE Washbore-BX Casing COMPILED BY P.P.
 DATUM Geodetic DATE March 15, 1973 CHECKED BY P.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
600.6	Water (Ice) Level						600										
0.0	Water						590										
587.6	River Bottom																
13.0							580										
	Sand and Silc						570										
							560										
							550										
							540										
537.5	(Probable Bedrock)																
63.1	Refusal End of Borehole																

+3, x5 : Numbers refer to
Sensitivity

20
15 \diamond 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 51

W P 3-73-04 LOCATION Sta. 201+15 o/s 30' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE February 26, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)
								20 40 60 80 100										
601.0	Water (Ice) Level						600											
0.0	Water						590											
579.0	River Bottom						580											
22.0	Silt and Sand						570											
							560											
							520											
	Silt and Sand						510											
							500											
							490											
478.6							480											
122.4	End of Borehole Probable Bedrock																	

+3, x5: Numbers refer to Sensitivity 20
15 5 (%) STRAIN AT FAILURE
10

W P 3-73-04 LOCATION Sta. 201+51 o/s 10' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.F.
DATUM Geodetic DATE March 1, 1975 CHECKED BY CF

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 52

W P 3-73-04 LOCATION Sta. 201+51 o/s 30' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX and AX Casing COMPILED BY G.P.
DATUM Geodetic DATE February 27, 1975 CHECKED BY *GP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water						590										
579.0	River Bottom						580										
22.0	Silt and Sand						570										
							560										
							550										
							540										
							530										
							520										
							510										
501.5							500										
99.5	Boulders (Rock Rubble)		1	AXT RC	72% Rec.												
			2	AXT RC	50% Rec.												
			3	AXT RC	25% Rec.												
489.0							490										
112.0	End of Borehole																

+3, x5: Numbers refer to
Sensitivity

20
15 \pm 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 54

W P 3-73-04 LOCATION Sta. 201+51 o/s 50' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing AXT Rock Core COMPILED BY G.P.
DATUM Geodetic DATE March 1, 1975 CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60					
601.0	Water (Ice) Level														
0.0	Water														
579.0	River Bottom														
22.0	Silt and Sand														
492.2															
108.8	Schist Bedrock		1	AXT	100%										
487.0	Sound			RC	Rec.										
114.0	End of Borehole														


+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 55

W.P. 3-73-04 LOCATION Sta. 201+15 o/s 50' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 3, 1975 CHECKED BY GP.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH					WATER CONTENT (%)			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
601.0	Water (Ice) Level															
0.0	Water															
577.0	River Bottom															
24.0	Silt and Sand															

+3, x5: Numbers refer to Sensitivity 20 15 10 (% STRAIN AT FAILURE

W P 3-73-04 LOCATION Sta. 202+00 o/s 48' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 3, 1975 CHECKED BY OP.

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 57

W P 3-73-04 LOCATION Sta. 202+48 o/s 48' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 3, 1975 CHECKED BY G.P.

[illegible]

+3, x⁵: Numbers refer to Sensitivity

OFFICE REPORT ON* SOIL EXPLORATION

RECORD OF BOREHOLE No 58

W P 3-73-04 LOCATION Sta. 203+11 o/s 44' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
 DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
 DATUM Geodetic DATE March 3, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water						590										
587.7	River Bottom						580										
13.3	Silt and Sand						570										
							560										
							550										
							540										
							530										
522.5																	
78.5	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 59

W P 3-73-04 LOCATION Sta. 203+54 o/s 44' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 4, 1975 CHECKED BY OP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH									
601.0	Water (Ice) Level																
0.0	Water						600										
587.7	River Bottom						590										
13.3	Silt and Sand						580										
							570										
							560										
							550										
							540										
539.5	End of Borehole Probable Bedrock																
61.5																	



RECORD OF BOREHOLE No 60

W P 3-73-04 LOCATION Sta. 203+54 o/s 24' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 4, 1975 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water																
590.0	River Bottom						590										
11.0	Silt and Sand						580										
							570										
562.5																	
38.5	End of Borehole Probable Bedrock																

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 61

W P 3-73-04 LOCATION Sta. 203+08 o/s 24' Lt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY C.P.
DATUM Geodetic DATE March 4, 1975 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water																
588.8	River Bottom						590										
12.2	Silt and Sand						580										
							570										
							560										
							550										
543.0																	
58.0	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (% STRAIN AT FAILURE



RECORD OF BOREHOLE No 62

W P 3-73-04 LOCATION Sta. 202+50 o/s 28' Lt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 5, 1975 CHECKED BY [Signature]












SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
601.0	Water (Ice) Level						600										
0.0	Water						590										
585.9	River Bottom						580										
15.5	Silt and Sand						570										
							560										
							550										
							540										
							530										
523.7																	
77.3	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to Sensitivity
20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 63

W P 3-73-04 LOCATION Sta. 202+00 o/s 28' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 5, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water						590										
580.0	River Bottom						580										
21.0	Silt and Sand						570										
							560										
							550										
							540										
							530										
523.5																	
77.5	End of Borehole Probable Bedrock																


+3, x5: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 64

W P 3-73-04 LOCATION Sta. 201+33 o/s 30' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.J.S.
DATUM Geodetic DATE March 5, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH					WATER CONTENT (%)				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE											
601.0	Water (Ice) Level						600										
0.0	Water						590										
579.0	River Bottom						580										
22.0	Silt and Sand						570										
							560										
							550										
							540										
							530										
							520										
							510										
							500										
							490										
487.7																	
113.3	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 65

W P 3-73-04 LOCATION Sta. 201+24 o/s 30' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.J.S.
DATUM Geodetic DATE March 6, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water						590										
							580										
577.0	River Bottom						570										
24.0	Silt and Sand						560										
							550										
							510										
							500										
							490										
							480										
478.5																	
122.5	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 66

W P 3-73-04 LOCATION Sta. 202+00 o/s 29' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washbore BX Casing COMPILED BY P.J.S.
DATUM Geodetic DATE March 6, 1975 CHECKED BY P.

[illegible]

+3, x5 : Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 67

W P 3-73-04 LOCATION Sta. 202+25 o/s 48' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing AXT Rock Core COMPILED BY G.P.
DATUM Geodetic DATE March 6, 1975 CHECKED BY

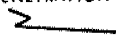

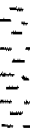



SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level						600										
0.0	Water						590										
583.6	River Bottom						580										
17.4	Silt and Sand						570										
							560										
							550										
							540										
							530										
528.5	Schist Bedrock Sound		1	AXT RC	80% Rec.												
523.5																	
77.5	End of Borehole																

+3, x5: Numbers refer to 20
Sensitivity 15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 68

W P 3-73-04 LOCATION Sta. 203+11 o/s 7' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 7, 1975 CHECKED BY GP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)			
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	x LAB VANE										
601.0	Water (Ice) Level																				
0.0	Water																				
587.1	River Bottom																				
13.9	Silt and Sand						600														
							590														
							580														
							570														
							560														
							550														
	540																				
	530																				
524.8	End of Borehole Probable Bedrock																				
76.2																					

+3, x5: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 69

W P 3-73-04 LOCATION Sta. 203+54 o/s 27' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing AXT Rock Core COMPILED BY G.P.
DATUM Geodetic DATE March 7, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level																
0.0	Water																
589.0	River Bottom																
12.0	Silt and Sand																
554.6	Schist Bedrock																
46.4																	
549.6	Sound		1	AXT RC	97% Rec.												
51.4	End of Borehole																

RECORD OF BOREHOLE No 70

W.P. 3-73-04 LOCATION Sta. 203+32 o/s 27' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 7, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water (Ice) Level																
0.0	Water						600										
589.0	River Bottom						590										
12.0	Silt and Sand						580										
							570										
							560										
							550										
544.5																	
56.5	End of Borehole Probable Bedrock																

+³, x⁵: Numbers refer to
Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 71

W P 3-73-04 LOCATION Sta. 203+11 o/s 10' Rt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 8, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
601.0	Water (Ice) Level						600										
0.0	Water																
588.4	River Bottom						590										
12.6	Silt and Sand						580										
							570										
							560										
							550										
543.0	End of Borehole Probable Bedrock																

+3, x5 : Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 72

W P 3-73-04 LOCATION Sta. 203+29 o/s 24' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
 DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
 DATUM Geodetic DATE March 8, 1975 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT WL	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH									
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
601.0	Water (Ice) Level																
0.0	Water						600										
588.8	River Bottom						590										
12.2	Silt and Sand						580										
							570										
562.9																	
38.1	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to Sensitivity 20
15 \div 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 73

W P 3-73-04 LOCATION Sta. 203+19 o/s 14' Lt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 8, 1975 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
601.0	Water(Ice) Level																
0.0	Water						600										
588.9	River Bottom						590										
12.1	Silt and Sand						580										
							570										
							560										
552.1																	
48.9	End of Borehole Probable Bedrock																

+3, x5: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 74

W P 3-73-04 LOCATION Sta. 202+07 o/s 38' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 8, 1975 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						
601.0	Water (Ice) Level															
0.0	Water						600									
							590									
580.6	River Bottom						580									
20.4	Silt and Sand						570									
							560									
							550									
							540									
							530									
							520									
							510									
502.6																
98.4	End of Borehole Probable Bedrock															

*3, x⁵: Numbers refer to
Sensitivity

20
15-20 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 75

W P 3-73-04 LOCATION Sta. 201+32 o/s 50' Rt. & Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
 DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
 DATUM Geodetic DATE March 10, 1975 CHECKED BY [Signature]

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20	40	60	80	100					
601.0	Water (Ice) Level															
0.0	Water					600										
						590										
						580										
576.3	River Bottom															
24.7	Silt and Sand					570										
						560										
						530										
						520										
						510										
						500										
						490										
483.1																
117.9	End of Borehole Probable Bedrock															

+3, x5: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 76

W P 3-73-04 LOCATION Sta. 202+25 o/s 28' Lt. of Hwy. 627, Line 'B' ORIGINATED BY P.J.S.
DIST 18 HWY 627 BOREHOLE TYPE Washboring BX Casing COMPILED BY G.P.
DATUM Geodetic DATE March 10, 1975 CHECKED BY GP

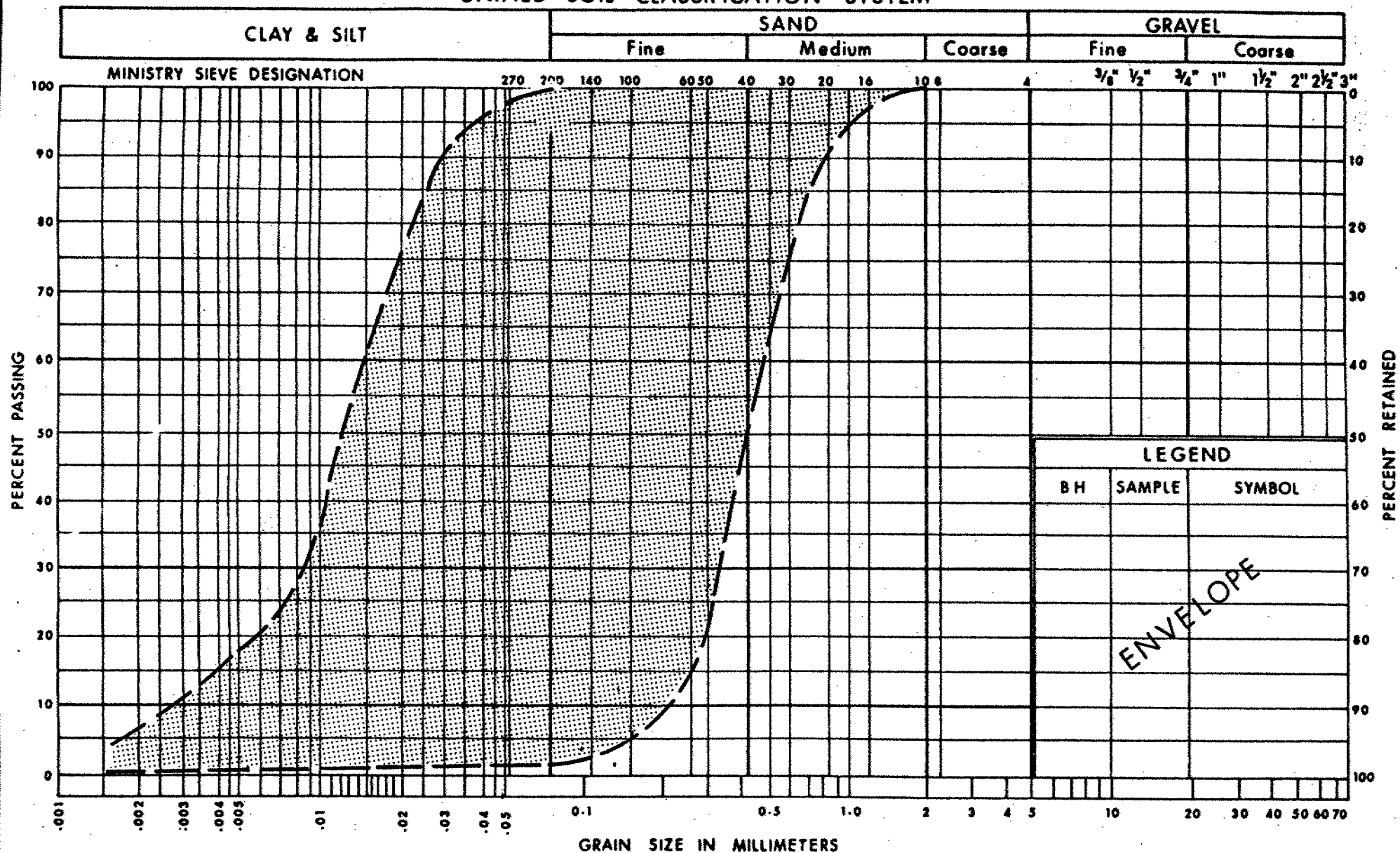
[illegible]

*3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

UNIFIED SOIL CLASSIFICATION SYSTEM



**Ministry of
Transportation and
Communications**

GRAIN SIZE DISTRIBUTION SILTY SAND & SANDY SILT

FIG No 1

WP 3-73-04

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

42 D - 10

TO: Mr. P. D. Lester, (2)
Regional Structural Planning Eng.,
Northwestern Region,
Thunder Bay, Ontario.

FROM: Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION:

DATE: November 12, 1973.

OUR FILE REF.

IN REPLY TO

NOV 19 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Crossing of Pic River
And Hwy. #627 Extension, Site No. 48E-42
District of Thunder Bay, Twp. of Pic
District #18 (Sault Ste. Marie)
W.O. 72-11169 -- W.P. 3-73-00

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

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

AGS/ao
Attch.

c.c. E. J. Orr
B. R. Davis
A. Rutka
W. L. Lees
G. E. French
B. J. Giroux
R. Morgenroth
G. A. Wrong
B. A. Singh

Al Stornace
A. G. Stornace,
PRINCIPAL FOUNDATIONS ENGINEER.

Foundations Files ✓
Documents

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-

FOUNDATION INVESTIGATION REPORT
For
The Proposed Crossing of Pic River
And Hwy. #627 Extension, Site No. 48E-42
District of Thunder Bay, Twp. of Pic
District #18 (Sault Ste. Marie)
W.O. 72-11169 -- W.P. 3-73-00

1. INTRODUCTION:

A request for a foundation investigation at the crossing of Pic River and Hwy. #627 extension into the new Federal Pukaskwa Park, was received from Mr. P. D. Lester, Regional Structural Planning Engineer, in a memorandum dated February 15, 1973.

Following this request a field investigation was carried out by the Foundations Office to determine the subsoil conditions existing at the proposed structure site.

This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The proposed structure site is located approximately 1 mile south of Pic River #50 Indian Reserve or about 3 miles north of the Pic River inlet at Lake Superior.

The width of Pic River at the proposed crossing is approximately 440 ft. wide and the maximum measured depth is about 22 ft.

The surrounding terrain on the east side of the river is flat and bush covered. Frequent rock outcrops are the main features of the west side.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of seven sampled boreholes and four dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. During the field work disturbed samples were obtained by means of a standard split-spoon sampler; the energy used in driving it conformed to the requirements of the Standard Penetration Test.

Dynamic cone penetration tests were carried out adjacent to two boreholes and also at two other locations. Driving energy to advance the cone was 350 ft.-lbs. per blow.

In addition to regular boring and sampling methods the depth to the bedrock or refusal zone was determined at twenty-three other locations.

All boreholes were surveyed in the field by personnel from the Regional Engineering Surveys Section. The locations and elevations of the borings are shown on Drawing No. 72-11169A which accompanies this report.

For vertical measurements (elevations) assumed bench mark(s) were used. When the Geodetic datum is available, all the assumed elevations contained in this report should be revised and the Foundations Office should be advised accordingly.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection laboratory tests were carried out on selected samples to determine the following physical properties:

- Natural Moisture Content
- Liquid Limit
- Plastic Limit
- Grain-Size Distribution

The test results are summarized on the Record of Borehole sheets contained in the Appendix of this report.

4. SOIL TYPES AND SOIL CONDITIONS:

4.1) General:

The subsoil was found to be quite uniform in the horizontal direction over the proposed site area, but changes in the vertical direction.

The material consists predominantly of silty sand and sandy silt with traces of clay. The deposit is underlain by schist bedrock.

The detailed stratigraphy encountered in each boring is shown on the Record of Borehole sheets in the Appendix. The estimated stratigraphical profile of Drawing 72-11169A is based upon this information.

From ground level downwards, the following soil types were encountered.

4.2) Silty Sand and Sandy Silt, Trace of Clay:

This stratum was intersected immediately below the shallow layer of topsoil or at the bottom of the river. The lower boundary coincides with the underlying bedrock surface. The thickness varies from 3 ft. in the vicinity of the west shore to over 200 ft. on the east shore.

The chief constituents in the deposit were found to be sand and silt with traces of clay. The proportions of the sand and silt sizes varied considerably. Typical grain-size distribution curves are included in the Appendix (Fig. 1).

The natural moisture content ranges from 4% to 37%, the average percentage being about 24.

Occasional layers of slightly plastic silt were found within the main deposit.

Standard penetration tests carried out within this zone indicated a very loose to dense relative density. The obtained 'N' values ranged from 1 to 40 blows per foot. No pattern can be established between the denseness of the deposit and the depth.

Part of the extreme upper portion of the ground on the west shore appears to be bouldery.

4.3) Bedrock:

A schist type of bedrock was proved in B.H.'s 2, 4, 6, 8, 10 and 14 by obtaining AXT rock core samples, at various elevations. References should be made to the record of borehole sheets for bedrock surface elevation at a given location. Based on the observation of the rock outcrops in the vicinity it is assumed that bedrock surface consists of a series of ledges. Consequently, it is difficult to estimate the bedrock surface elevation between borings. In general, the rock surface is sloping towards east, being at elevation 998₊ (Sta. 205 + 02 and below elevation 798₊ (Sta. 199 + 40).

5. GROUNDWATER CONDITIONS:

During the investigation (March 1973) the water (ice) level of the Pic River was at elevation 994.4. In B.H.'s 1 and 3, on the east bank, water level elevations were at 997.0 and 998.5 respectively, while in B.H.'s 11 and 16 on the west bank, water levels were encountered at elevations 1009.0 and 1009.3. No artesian conditions were observed at this site.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to cross Pic River by means of a three-span (150'-250'-150') structure at this location. The exact footing locations were not determined at the time of report writing, nor were the final roadway grades, however, for preliminary purposes, a grade of 30 feet above ice level has been assumed.

Subsoil across the site area consists of a thin layer of topsoil followed by a deposit of silty sand to sandy silt which in turn is underlain by sound schist bedrock. The bedrock surface tilts towards east being at elevation 998₊ at St. 205 + 02

and below elevation 798+ at Sta. 199+40. In addition, the bedrock surface appears to be stepped in a series of ledges between the above two stations. In view of the subsoil conditions our recommendations for the structure footings are as follows:

6.2) West Abutment Footing:

It is recommended that the west abutment be supported on steel H piles driven to bedrock (ie approximate elevation 975 to 995 depending on final footing location). In this case, the maximum allowable load for the section used may be assumed for design.

Because of the sloping nature of the bedrock surface and inferred series of rock ledges at the site, care should be taken to prevent the piles from sliding on the inclined rock surface. To safeguard against sliding the piles should penetrate the rock for a distance of about 2-3 inches. To achieve this the following procedure is suggested:

"Driving should be carried out by means of a drop hammer. Immediately contact with the rock is made, driving should be stopped and the pile elevation measured. Driving should then be continued using small heights of drop of the Ram (6 - 8 inches). After the pile has been subjected to so many series (at least 5 series each of twenty blows) that penetration has ceased, the fall should be increased to double the height. In this way, the driving should be continued with a step-wise increase in the height of the drop until no further penetration is observed. By the great number of blows delivered in this procedure, it should be possible to chisel the pile into the rock, until a satisfactory contact area is achieved. It is recommended that Oslo Points be fitted to the piles. For H piles the points should be made of tempered steel bars of 4 inch diameter, with the lower end hollow ground. A slice is cut into the web of the H section and the bar is welded to the profile."

Further information about these points may be obtained

from the Norwegian Geotechnical Institute Publication No. 23, or Geotechnique, Vol. VII, P. 73, 1957.

The pile cap should be placed such that a minimum of 7 feet of cover is provided above the base of the cap, for frost protection purposes. In order to prevent the necessity of a dewatering scheme, the pile cap should be placed within the approach fill above the river high water level.

6.3) Pier Footings:

The subsoil at the probable pier locations is not suitable for spread footing type foundations. If the final locations for the piers are west of Station 200 + 80 (measured along the centre-line of Line A, Hwy. 627 extension), the piers may be supported on steel H piles driven to bedrock. Depending on exact pier locations, these H piles would be minimum 40 to 130 feet long. Because of the sloping nature of the bedrock surface, it is recommended that the piles also be fitted with Oslo Points and driven according to the method suggested in subsection 6.2.

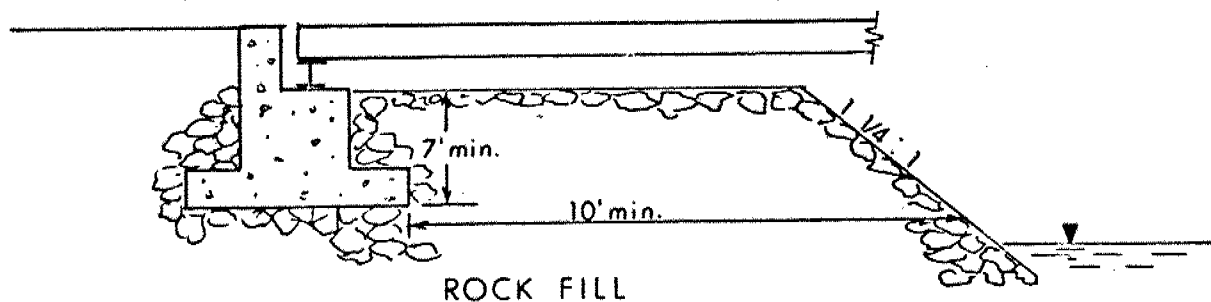
The bases of the pile caps should have a minimum cover of 7 feet for frost protection purposes. If the pile caps are placed on the river bed (elevation 974_± to 985_±) adequate cover for frost protection will be provided by the water. In this case a major dewatering scheme will be necessary in order to pour the pile caps in the dry; for example pumping from sheet pile cofferdams. To avoid the necessity of such a dewatering scheme, consideration should be given to having the H piles extend above the water surface and pouring the pile caps at an elevation such that the bridge deck is supported directly on the top surface of the caps.

In any case, piers or piles should be provided with protection against lateral pressure and impact forces imposed on them by ice and/or logs since it is understood that the river is used for logging operations.

6.4) East Abutment Footing:

At the probable east abutment footing location, the bedrock surface elevation was not located, but is below elevation 800 (ie greater than 200 feet below the ground surface). The subsoil does not appear to be suitable for spread footing type foundations. In view of this, it is recommended that the east abutment be constructed within the approach embankment and supported on piles driven through the fill into the original ground to elevation 960 \pm . If timber piles are used they should be treated as the upper portion of such piles will be above the ground water table. For No. 14 timber piles, 50 feet long with 40 feet of their length embedded in the original ground, it is estimated that a capacity of 24 Tons/pile will be achieved. In any case, piles should be driven in accordance with MTC standard BD 82-6 or 82-7.

As an alternative, the east abutment may be supported on spread footings placed within the approach embankment. If the approach embankment is constructed of rock fill, the spread footing may be placed within the rock fill embankment.



If however, the approaches are constructed of earth fill, the spread footing should be placed on a Granular 'A' core, fully compacted to current MTC standards, within the embankment. A detailed construction scheme is outlined in figure 2 of the Appendix.

For either scheme, a design load of 2.5 TSF may be assumed.

In either case, the footing should be placed so as to provide a minimum cover of 7 feet for frost protection. No dewatering problems are anticipated if the footing is placed above the river high water level.

Regardless of the foundation scheme selected for the east abutment, it would be advantageous to provide for shimming up the bridge deck to accommodate settlements, which may occur after the completion of the project.

6.5) Approach Embankments:

Provided that the topsoil is excavated before the approach embankments are constructed, no special problems are foreseen for the stability of the fills up to 30 feet in height. The embankment may be built following normal construction procedures, using either rock fill or granular type fill up to at least 3 feet above the high water level. If granular type fill is used, it is recommended that a 5 foot thick blanket of rock be provided on forward and side slopes up to at least 3 feet higher than the high water level to protect against wave action, where slopes are exposed to areas of open water.

Rock fill embankments may be constructed with 1-1/4:1 or flatter forward and lateral slopes. Granular fills should be constructed with 2:1 forward and side slopes. With either type of embankment, care should be taken to ensure that no bouldery fill is placed within the embankments through which piles are to be driven, and it is recommended that this portion of the fill contain grain sizes no larger than 3 inches.

In conclusion, it is pointed out that since final footing locations and road grades are not known at this time, the recommendations in this report are of a necessarily general nature. When the final grades and footing locations are known, the Foundations Office should be advised of the same, at which time it may be desirable to perform another field investigation to determine exact bedrock elevations at abutment and pier locations. We also understand that we will receive geodetic


elevations in place of the assumed elevations shown on F plan 5137-1, when they become available from Engineering Surveys.

7. MISCELLANEOUS:

The field investigation was carried out during the period March 6 - 15, 1973 under the supervision of Mr. P. Payer and Mr. M. Young, Project Foundation Engineers. This report was prepared by Mr. L. J. Hodge, Project Foundation Engineer and was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

Equipment used was owned and operated by Master Soil Investigation Limited.


L. J. Hodge



LJH/ji

K. G. Selby, P. Eng.

November 6, 1973

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 72-11169

LOCATION Sta: 199 + 40: 0 Line 'A'

ORIGINATED BY M.Y.

W.P. 3-73-00

BORING DATE March 6, 8, 9, 11, 1973

COMPILED BY P.P.

DATUM Assumed

BOREHOLE TYPE Washbore - BX Casing and Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_P WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_P	w	w_L		
998.5 0.0	Ground Level															
	Silty Sand and Sandy Silt Trace of Clay V. Loose to Compact		1	SS	3											EL. 997.0 0 45 54 1
			2	SS	1											
			3	SS	3											
			4	SS	4											
			5	SS	5											0 91 (9)
			6	SS	11											
			7	SS	9											
			8	SS	10											
			9	SS	11											0 36 58 6
			10	SS	14											
			11	SS	15											0 72 (28)
			12	SS	5											0 16 78 6
			13	SS	7											0 4 86 10
			14	SS	7											
			15	SS	19											
			16	SS	9											0 2 92 6
			17	SS	6											

 20
15 \diamond 5 % STRAIN AT FAILURE
10

Continued

RECORD OF BOREHOLE NO 1 Continued

JOB 72-11169

LOCATION Sta: 199 + 40; @ Line 'A'

ORIGINATED BY M.Y.

W.P. 3-73-00

BORING DATE March 6, 8, 9 & 11, 1973

COMPILED BY P.P.

DATUM Assumed

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY OK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80		
							SHEAR STRENGTH P.S.F.		w_p — w — w_L WATER CONTENT % 10 20 30			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
			18	SS	9	890						
						880						
						870						
						860						
						850						
						840						
						830						
						820						
						810						
						800						
797.5	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

20
15 ϕ 5 % STRAIN AT FAILURE
10

CHECKED BY OK

Continued

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2 Continued

JOB 72-11169 LOCATION Sta. 200 + 97; 3' RT. of Line 'A' ORIGINATED BY P.P.
 W.P. 3-73-00 BORING DATE March 6 & 8, 1973 COMPILED BY P.P.
 DATUM Assumed BOREHOLE TYPE Washbore - Nx & Bx Casing CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 10 20 30				
			15	SS	25									
						880								
			16	SS	11									
870.5						870								
123.9	Schist		17	RC	95%									
	Bedrock (sound)			Axt										
			18	RC	100%									
859.6				AxT		860								
134.8	End of Borehole													

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 72-11169 LOCATION Sta: 198 + 86; 4' RT. of Line 'A' ORIGINATED BY M.Y.
W.P. 3-73-00 BORING DATE March 10; 1973 COMPILED BY P.P.
DATUM Assumed BOREHOLE TYPE Washbore - Nx Casing CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 10 20 30				
999.5	Ground Level													
0.0														
	Silty Sand		1	SS	4	990								
	and		2	SS	1									
	Sandy Silt		3	SS	2									
			4	SS	5									
	Trace of		5	SS	5	980								
	Clay		6	SS	5									
			7	SS	4									
	V. loose		8	SS	7									
	to					970								
	Loose													
968.0			9	SS	8									
31.5	End of Borehole													

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 4

JOB 72-11169

LOCATION Sta: 202 + 22; 0 'A'

ORIGINATED BY P.P.

W.P. 3-73-00

BORING DATE March 11, 1973

COMPILED BY P.P.

DATUM Assumed

BOREHOLE TYPE Washbore - Ax Casing

CHECKED BY *ML*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT						
994.4	Water (Ice) Level										
0.0	Water					990					
978.4	River Bottom					980					
16.0	Sand and Silt					970					
						960					
						950					
						940					
						930					
928.3	Schist		1	RC	97%						
66.1	Bedrock sound			AXT							
923.1	End of Borehole					920					
71.2											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 5

JOB 72-11169

LOCATION Sta: 200 + 26; ϕ Line 'A'

ORIGINATED BY M.Y.

W.P. 3-73-00

BORING DATE March 12, 1973

COMPILED BY G.P.

DATUM Assumed

BOREHOLE TYPE Washbore - Bx Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L			BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %						
994.4 0.0	Water (Ice) Level					990										
	Water					980										
978.4 16.0	River Bottom					970										
	Sand and Silt					960										
						950										
						940										
						830										
						820										
						810										
801.4 193.0	End of Borehole Probable Bedrock					800										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 6

JOB 72-11169

LOCATION Sta: 203 + 47; 4' RT, Line 'A'

ORIGINATED BY P.P.

W.P. 3-73-00

BORING DATE March 12, 1973

COMPILED BY P.P.

DATUM Assumed

BOREHOLE TYPE Washbore - Bx Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %					
							O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE				w_p w w_L 10 20 30					
994.4	Water (Ice) Level															
0.0	Water					990										
983.4	River Bottom															
11.0	Silty Sand					980										
	Trace of Clay		2	SS	8										-0 95 5	
	Loose		3	SS	9	970										
			4	SS	7											
			5	SS	9	960									-0 99 1	
954.9	Schist		6	RC	96%											
39.5				AXT		950										
944.9	Bedrock (Sound)		7	RC	100%											
49.5	End of Borehole			AXT												
						940										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 7

JOB 72-11169

LOCATION Sta: 200 + 82; ϕ Line 'A'

ORIGINATED BY M.Y.

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY G.P.

DATUM Assumed

BOREHOLE TYPE Washbore - Ax Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W $W_P \quad W \quad W_L$ WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS/FOOT					
994.4 0.0	Water (Ice) Level					990				
	Water					980				
973.4 21.0	River bottom					970				
	Sand and Silt					960				
						950				
						940				
						870				
						860				
						850				
846.4 148.0	End of Borehole Probable Bedrock					840				

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 8

JOB 72-11169

LOCATION Sta: 204 + 12: 0 Line 'A'

ORIGINATED BY P.P.

W.P. 3-73-00

BORING DATE March 13, 1973

COMPILED BY P.P.

DATUM Assumed

BOREHOLE TYPE Washbore - Bx Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W		BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		W_P — W — W_L WATER CONTENT %			
994.4	Water (Ice) Level											
0.0	River bottom											
2.0	Sand and Silt					990						
						980						
974.3	Schist		1	RC	82%	970						
20.1	Bedrock			Axt								
969.3	End of Borehole											
25.1						960						

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 9

JOB 72-11169

LOCATION Sta: 201 + 12 0 Line 'A'

ORIGINATED BY M.Y.

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY G.D.

DATUM Assumed

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
994.4 0.0	Water (Ice) Level					990				
	Water					980				
973.4 21.0	River Bottom					970				
	Sand and Silt					960				
						950				
						940				
						930				
						900				
						.890				
878.4 116.0	End of Borehole Probable Bedrock					880				

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 10

JOB 72-11169

LOCATION Sta: 204 + 49; 2' Rt of Line 'A'

ORIGINATED BY PP

W.P. 3 - 73 - 00

BORING DATE March 13, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore - Bx Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % W_P — W — W_L				
996.1	Ground Level														
0.0	Sand & Silt														
1.5	Schist		1	RC	100%										
			2	RC	100%										
989.5	Bedrock (Sound)		3	RC	100%	990									
6.6	End of Borehole														
						980									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 11

JOB 72-11169 LOCATION Sta: 204 + 90; Ø Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 15, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore - Bx Casing CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % w_p w w_L 10 20 30				
1013.2	Ground Level													
0.0	Sandy Silt Trace of Clay V. loose to loose		1	SS	50	1010								W.L. El. 1009.0
			2	SS	9									
			3	SS	6									
						1000								
996.5			4	SS	3									
16.7	End of Borehole (Probable Bedrock) Refusal					990								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 12

JOB 72-11169

LOCATION Sta: 204 + 33 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore - Bx Casing

CHECKED BY *gfk*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT W_L		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT	PLASTIC LIMIT W_P	WATER CONTENT W		
996.6	Ground Level										
0.0	Sand and Silt										
980.1											
16.5	End of Borehole (Probable Bedrock) Refusal										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 13

JOB 72-11169

LOCATION Sta: 204 + 97 0 Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY

DATUM Assumed

BOREHOLE TYPE Cone Test only

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L	BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
1,014.1	Ground Level									
0.0	Probable Sand and Silt					1010				
						1000				
995.0	End of Cone Test									
19.1	(Probable bedrock)					990	Refusal			

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 14

JOB 72-11169

LOCATION Sta. 205 + 02 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore BX Casing

CHECKED BY *AK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT —WL PLASTIC LIMIT —WP WATER CONTENT —W Wp — W — WL WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT						
1015.4	Ground Level										
0.0	Silty sand and sandy silt, trace of clay. Loose to Compact		1	SS	9	1010					0 96 (4) W.L. not observed
			2	SS	24						
			3	SS	9						
			4	SS	11						
998.4			5	SS	4	1000					0 12 81 7
17.0	Schist		6	RC							
993.4	Bedrock			AXT	82%						
22.0	End of Borehole										

FOUNDATIONS OFFICE

JOB 72-11169 LOCATION Sta. 205 + 19 @ Line 'A' ORIGINATED BY PP
W.P. 3-73-00 BORING DATE March 15, 1973 COMPILED BY PP
DATUM Assumed BOREHOLE TYPE Cone Test Only CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT					
1015.5	Ground Level									
0.0	Probable sand & silt									
996.4										
19.1	Probable Bedrock End of Cone Test						100/1" Refusal			

20
15 ϕ 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 16

JOB 72-11169

LOCATION Sta. 205 + 30 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore BX Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT						
1015.4	Ground Level										
0.0	Silty sand and sandy silt, trace of clay. Loose to Dense		1	SS	5	1010					
			2	SS	39						
			3	SS	6						
			4	SS	4	1000					
996.2											
19.2	End of Borehole Probable Bedrock refusal										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 17

JOB 72-11169 LOCATION Sta. 204 + 05 Ø Line 'A' ORIGINATED BY PP
W.P. 3-73-00 BORING DATE March 14, 1973 COMPILED BY PP
DATUM Assumed BOREHOLE TYPE Washbore AX Casing CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L WATER CONTENT % γ			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
994.4	Water (Ice) Level					990										GR. SA. SI. CL.
0.0	Water															
987.0	River Bottom															
7.4	Sand and Silt					980										
976.1	Probable Bedrock															
18.3	Refusal End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 18

JOB 72-11169 LOCATION Sta. 204 + 00 @ Line 'A' ORIGINATED BY PP
W.P. 3-73-00 BORING DATE March 14, 1973 COMPILED BY PP
DATUM Assumed BOREHOLE TYPE Washbore AX Casing CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT W_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT W_p	WATER CONTENT W		
994.4	Water (Ice) Level											
0.0	Water					990						
983.4	River Bottom											
11.0	Sand and Silt					980						
976.4	Probable Bedrock Refusal											
18.0	End of Borehole											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 19

JOB 72-11169

LOCATION Sta. 203 + 93 @ Line "A"

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore AX Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE				WATER CONTENT % W_P — W — W_L				
994.4	Water (Ice) Level														
0.0	Water					990									
983.4	River Bottom														
11.0	Sand and Silt														
979.3	Probable Bedrock					980									
15.1	Refusal End of Borehole														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 20

JOB 72-11169 LOCATION Sta. 203 + 86 2' Rt @ Line 'A' ORIGINATED BY PP
 W.P. 3-73-99 BORING DATE March 11, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore AX Casing CHECKED BY PP

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L WATER CONTENT %			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
994.4	Water (Ice) Level													
0.0	Water					990								
983.4	River Bottom													
11.0	Sand and Silt					980								
976.0	Probable Bedrock													
18.4	Refusal End of Borehole													

OFFICE RECORD ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 21

JOB 72-11169 LOCATION Sta. 203 + 80 @ Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 14, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore - AX Casing CHECKED BY PP

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L WATER CONTENT % γ			BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
994.4	Water (Ice) Level												
0.0	Water					990							
984.0	River Bottom												
10.4	Sand and Silt					980							
						970							
965.4	Probable Bedrock												
29.0	Refusal End of Borehole												

OFFICE RECORD ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 22

JOB 72-11169

LOCATION Sta. 203 + 73 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00



BORING DATE March 14, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore - AX Casing

CHECKED BY *PP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT %				
994.4	Water (Ice) Level												
0.0	Water					990							
984.0	River Bottom												
10.4	Sand and Silt					980							
							970						
661.6	Probable Bedrock												
32.8	Refusal End of Borehole												

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 23

JOB 72-11169 LOCATION Sta. 203 + 68 @ Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 14, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore AX Casing CHECKED BY PP

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \quad w \quad w_L$				BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT %					
994.4	Water (Ice) Level															
0.0	Water					990										
984.0	River Bottom															
10.4						980										
	Sand and Silt					970										
961.7	Probable Bedrock															
32.7	Refusal End of Borehole															

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 24

JOB 72-11169

LOCATION Sta. 203 + 61 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore AX Casing

 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
994.4	Water (Ice) Level					990										
984.0	River Bottom					980										
10.4	Sand and Silt					970										
961.7	Probable Bedrock															
32.7	Refusal End of Borehole															

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 25

JOB 72-11169

LOCATION Sta. 203 + 51 Ø Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore AX Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT ——— w_L				BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT				PLASTIC LIMIT ——— w_p					
							SHEAR STRENGTH P.S.F.				WATER CONTENT — w					
994.4	Water (Ice) Level															
0.0	Water					990										
984.0																
10.4						980										
	Sand and Silt					970										
						960										
957.9	Probable Bedrock															
36.5	Refusal End of Borehole															

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 26

JOB 72-11169

LOCATION Sta. 203 + 36 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 14, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore AX Casing

 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % W_P W W_L					
994.4	Water (Ice) Level															
0.0	Water					990										
983.4	River Bottom															
11.0	Sand and Silt					980										
						970										
						960										
952.9	Probable Bedrock															
41.5	Refusal End of Borehole															

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 27

JOB 72-11169 LOCATION Sta. 203 + 25 Ø Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 15, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore AX Casing CHECKED BY PP

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____			LIQUID LIMIT _____w _L PLASTIC LIMIT _____w _p WATER CONTENT _____w <div><div>w_p</div><div>○</div><div>w</div><div>○</div><div>w_L</div></div>			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %					
994.4	Water (Ice) Level													P.C.F.	GR.SA.SI.CL.
0.0	Water					990									
983.0	River Bottom														
11.4	Sand and Silt					980									
						970									
						960									
						950									
945.3	Probable Bedrock														
49.1	Refusal End of Borehole														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 28

JOB 72-11169

LOCATION Sta. 201 + 22 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore

 CHECKED BY *PP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L PLASTIC LIMIT W_p WATER CONTENT W W_p — W — W_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
994.4	Water (Ice) Level									
0.0										
	Water					990				
						980				
973.0	River Bottom									
21.4						970				
	Sand and Silt					960				
						950				
						940				
						930				
						910				
						900				
						890				
886.2	Probable Bedrock									
108.2	End of Borehole Refusal									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 29

JOB 72-11169 LOCATION Sta. 201 + 33 @ Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 15, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore - BX Casing CHECKED BY PP

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
994.4	Water (Ice) Level									
0.0	Water					990				
						980				
973.0	River Bottom									
21.4	Sand and Silt					970				
						960				
						950				
						940				
						930				
						920				
						910				
						900				
891.3	Probable Bedrock									
103.1	Refusal. End of Borehole									

20
 15 ϕ 5 % STRAIN AT FAILURE
 10

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 30

JOB 72-11169

LOCATION Sta. 202 + 42 Ø Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY *PP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT W_L		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT W_p	WATER CONTENT W		
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	W_p — W — W_L	W_p — W — W_L			
994.4	Water (Ice) Level											
0.0	Water											
979.4	River Bottom											
15.0												
	Sand and Silt											
928.9	Probable Bedrock											
65.5	Refusal End of Borehole											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 31

JOB 72-11169

LOCATION Sta. 202 + 32 Ø Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY *PP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT					
994.4	Water (Ice) Level									
0.0	Water					990				
278.4	River Bottom					980				
16.0	Sand and Silt					970				
						960				
						950				
						940				
931.2	Probable Bedrock									
63.2	Refusal End of Borehole					930				

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 32

JOB 72-11169

LOCATION Sta. 202 + 12 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

DATUM Assumed

BOREHOLE TYPE Washbore-BX Casing

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE		WATER CONTENT %			
994.4	Water (Ice) Level											
0.0	Water					990						
977.4	River Bottom					980						
17.0	Sand and Silt					970						
						960						
						950						
						940						
						930						
927.4	(Probable Bedrock)											
67.0	Refusal End of Borehole											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 33

JOB 72-11169 LOCATION Sta. 202 + 02 @ Line 'A' ORIGINATED BY PP
 W.P. 3-73-00 BORING DATE March 15, 1973 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Washbore - BX Casing CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
994.4	Water (Ice) Level									
0.0	Water					990				
976.4	River Bottom					980				
18.0	Sand and Silt					970				
						960				
						950				
						940				
						930				
927.2	(Probable Bedrock)									
67.2	Refusal End of Borehole									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 34

JOB 72-11169

LOCATION Sta. 202 + 52 @ Line 'A'

ORIGINATED BY PP

W.P. 3-73-00

BORING DATE March 15, 1973

COMPILED BY PP

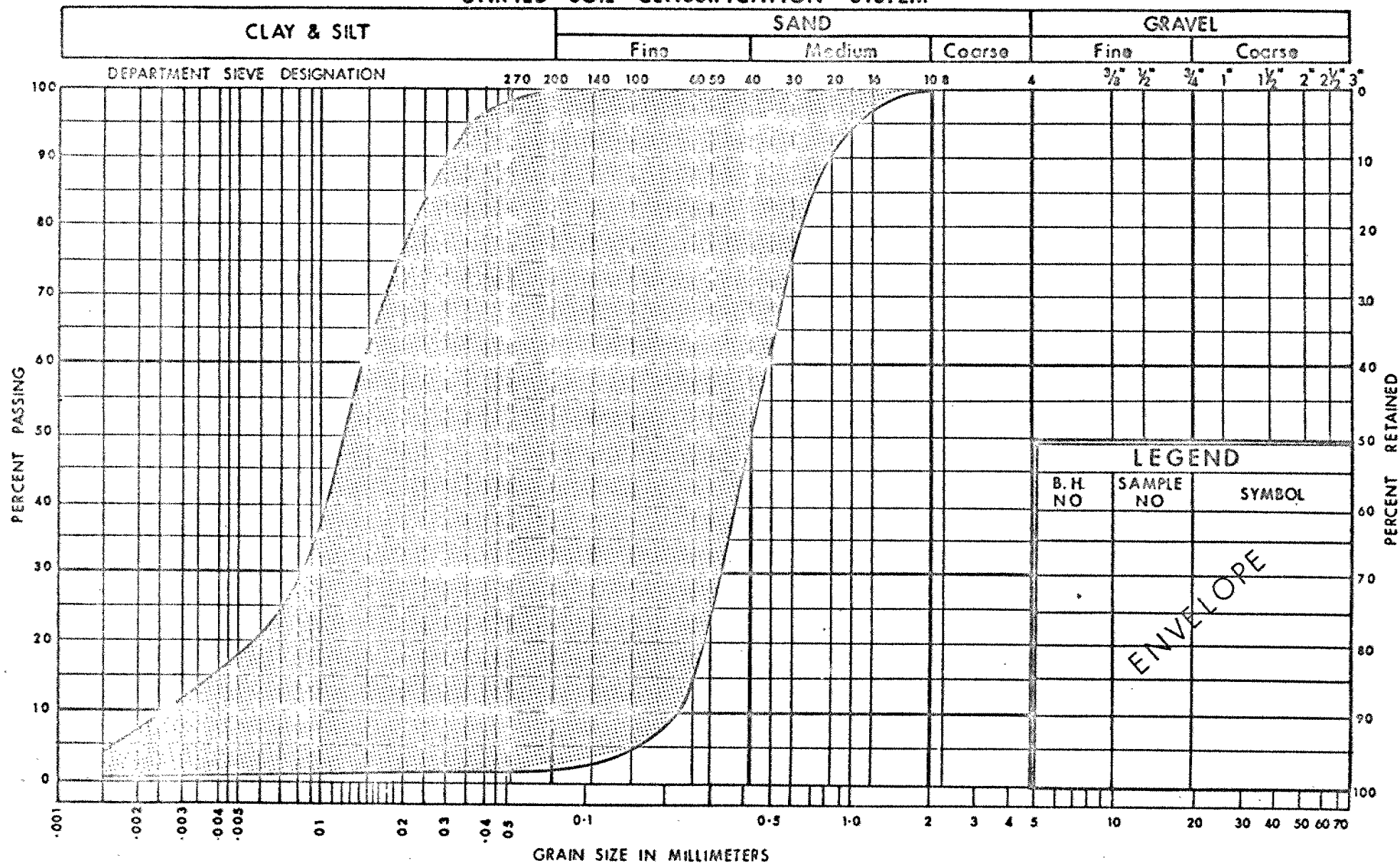
DATUM Assumed

BOREHOLE TYPE Washbore-BX Casing

CHECKED BY *PP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W		BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE		W_P W W_L WATER CONTENT %			
994.4	Water (Ice) Level											
0.0	Water					990						
981.4	River Bottom					980						
13.0	Sand and Silt					970						
						960						
						950						
						940						
631.3	(Probable Bedrock)					930						
63.1	Refusal End of Borehole											

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES
BRANCH

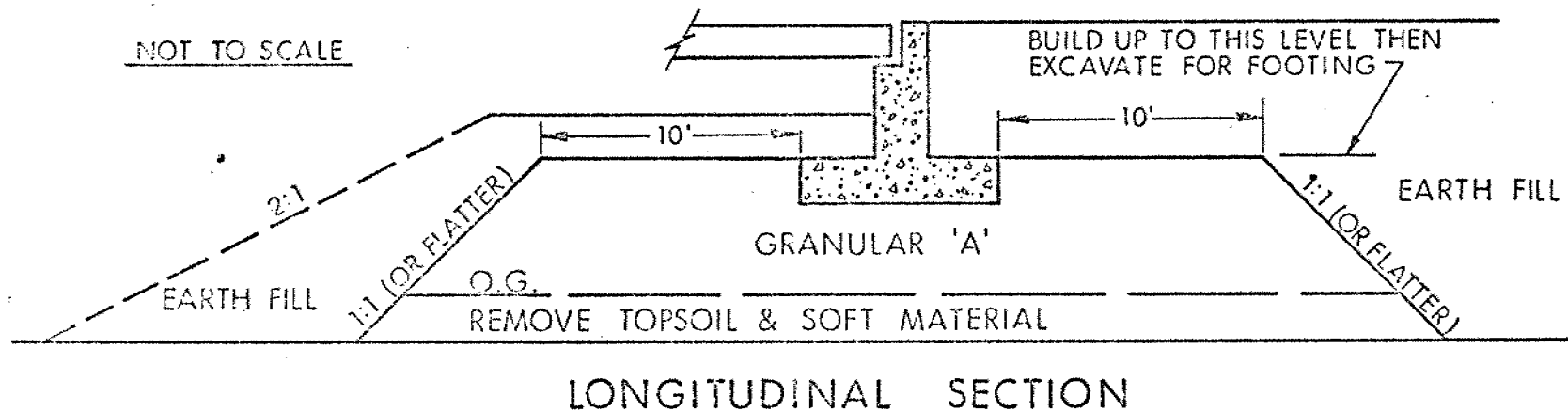
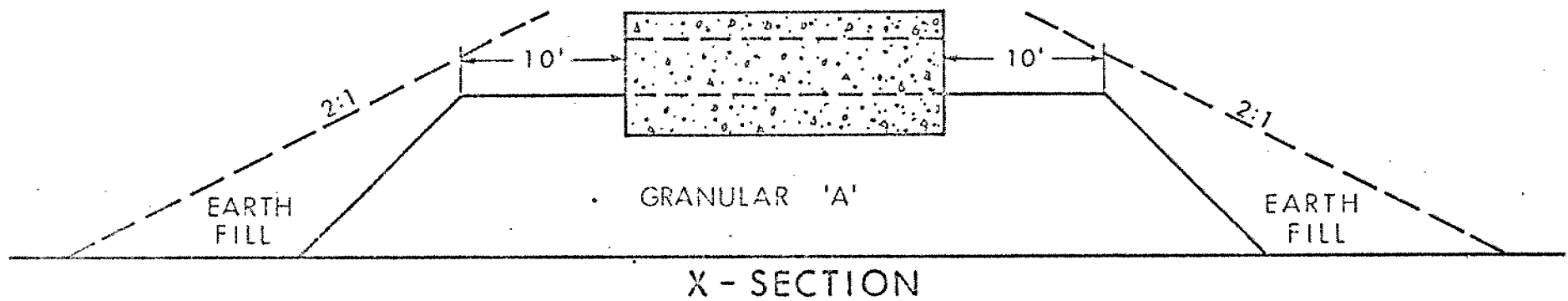
GRAIN SIZE DISTRIBUTION
SILTY SAND & SANDY SILT

W.P. No. 3-73-00

JOS 115.72-11169

FIG. NO. 1

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

FIG. 2

W.O. 72- 11169

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

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

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

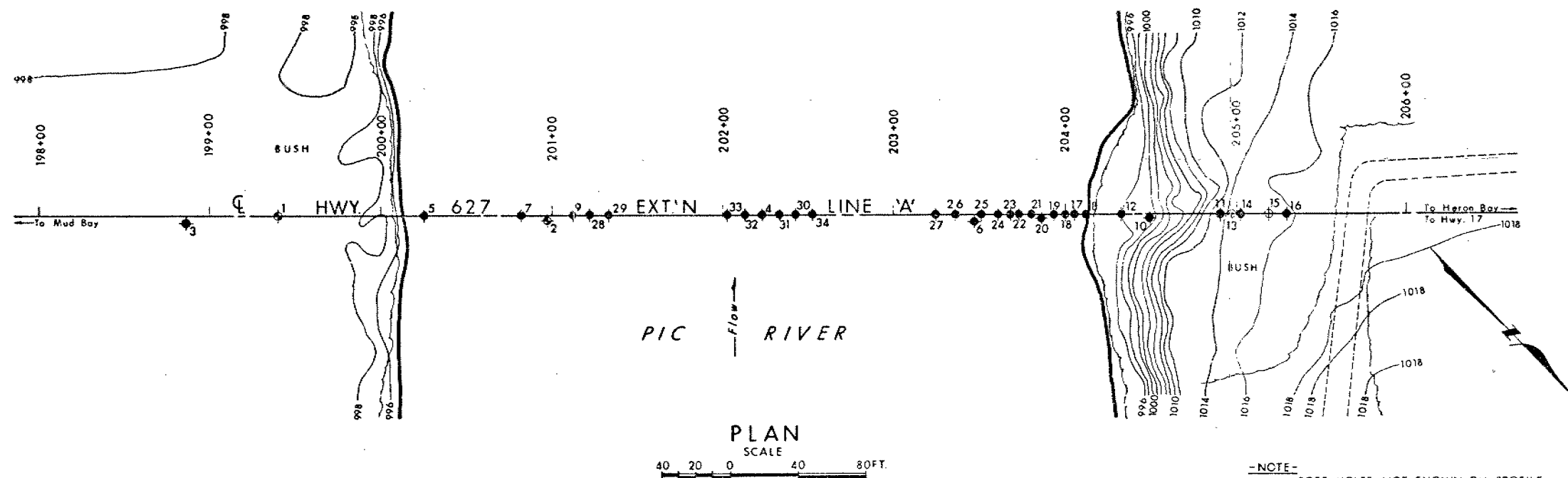
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

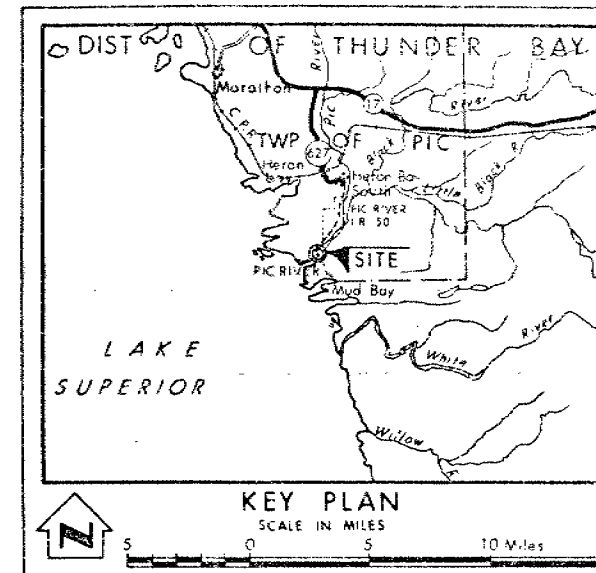
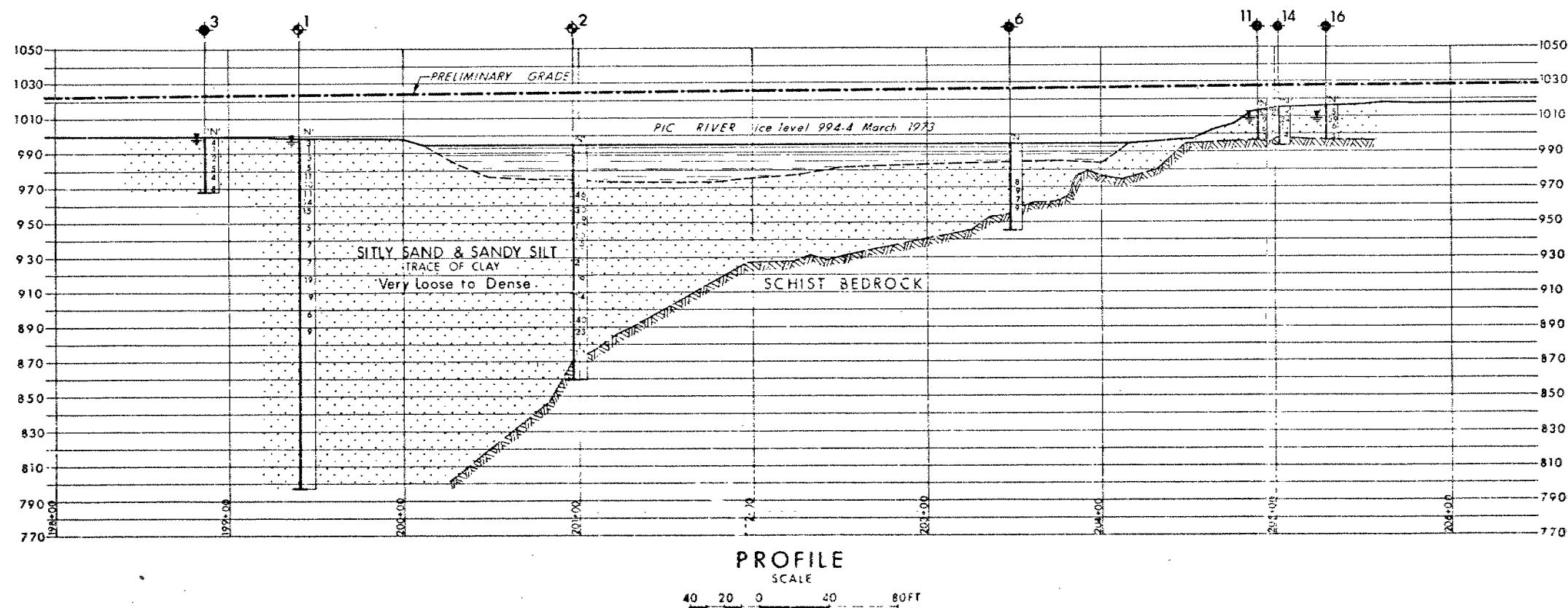
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



-NOTE-
BORE HOLES NOT SHOWN ON PROFILE
WERE NOT SAMPLED AND WERE
ADVANCED TO THE BEDROCK SURFACE BY
WASHBORING OR CONE PENETRATION METHODS.
FOR COMPLETE DETAILS REFER TO RECORD OF
BOREHOLE SHEETS IN FOUNDATIONS REPORT



LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation, March, 1973		
NO.	ELEVATION	STATION	OFFSET
1	996.5	199+40	
2	994.4	200+97	3' RT.
3	999.5	198+86	4' RT.
4	994.4	202+22	
5	994.4	200+26	
6	994.4	203+47	4' RT.
7	994.4	200+82	
8	994.4	204+12	
9	994.4	201+12	
10	996.1	204+47	2' RT.
11	1013.2	204+90	
12	996.6	204+33	
13	1014.1	204+97	
14	1015.4	205+02	
15	1015.5	205+19	
16	1015.4	205+30	
17	994.4	204+05	
18	994.4	204+00	
19	994.4	203+93	
20	994.4	203+86	2' RT.
21	994.4	203+80	
22	994.4	203+73	
23	994.4	203+68	
24	994.4	203+61	
25	994.4	203+51	
26	994.4	203+36	
27	994.4	203+25	
28	994.4	201+22	
29	994.4	201+33	
30	994.4	202+42	
31	994.4	202+32	
32	994.4	202+12	
33	994.4	202+02	
34	994.4	202+52	

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

PIC RIVER

HIGHWAY NO. 627 EXT'N LINE 'A' DIST. NO. 18
Dist. THUNDER BAY
TWP. PIC LOT 13 CON. II

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD P.F. CHECKED	WP NO 3-73-00	DRAWING NO.
DRAWN & CHECKED	WO NO 72-11169	72-11169A
DATE May 15, 1973	SITE NO	BRIDGE DRAWING NO
APPROVED [Signature]	CONT NO	

PRINCIPAL FOUNDATION ENGINEER

REF NO E-5137-1