

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 42H-17

DIST. 16 REGION           

W.P. No. 7-81-08 of  
130 1-80-00

CONT. No. 81-454

W. O. No.           

STR. SITE No. 39E-199

HWY. No.           

LOCATION Debour Lake Rd  
Trib. Luis River

No of PAGES -           

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.           

REMARKS:

# RECORD OF BOREHOLE No 1

W P 7-81-08 LOCATION STA 25+817.0 18 m RT C/L Detour LK. Rd. ORIGINATED BY P.P.  
 DIST 16 HWY Detour LK. Rd. BOREHOLE TYPE Hollow Stem Augers COMPILED BY R.M.  
 DATUM Geodetic DATE 80-11-02 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
494.4	Ground Level												
0.0	MIXTURE OF ORGANICS, SAND AND SILTY CLAY SOFT		1	SS	5		494						Org. 16.9
490.9			2	SS	100/	10 cm	492						
3.5	GRANITE BEDROCK		3	R.C.	100%		490						
488.5	SOUND		4	R.C.	100%								
5.9	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

\*3, \*5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

# RECORD OF BOREHOLE No 2

W P 7-81-08 LOCATION STA 25+824.0 2.5 m LT. C/L Detour Lk. Rd. ORIGINATED BY P.P.  
DIST 16 HWY Detour Lk. Rd. BOREHOLE TYPE Hollow Stem Augers COMPILED BY R.M.  
DATUM Geodetic DATE 80 - 11 - 02 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
497.1	Ground Level											
0.0	SILTY CLAY TRACE OF SAND FIRM FILL MATERIAL		1	SS	5	496						0 2 62 36
493.6	SILTY CLAY STIFF TRACE OF ORGANICS		2	SS	13	494						Org: 1.7% 0 4 42 54
3.5	End of Borehole					492						
490.7												
6.4	End of Cone Hole Probable Bedrock						REFUSAL					

+3, x5: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 3

W P 7-81-08 LOCATION STA 25+779.0 12 m LT C/L Detour Lk. Rd. ORIGINATED BY P.P.  
DIST 16 HWY Detour Lk. RD BOREHOLE TYPE Hollow Stem Augers COMPILED BY R.M.  
DATUM Geodetic DATE 80-11-04 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		W <sub>p</sub>	W	W <sub>L</sub>		
								SHEAR STRENGTH						
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		25 50 75			KN/M <sup>3</sup> GR SA SI CL		
							20 40 60 80 100		25 50 75					
493.7														
493.2	PEAT													
0.5														

+3, +5 : Numbers refer to  
Sensitivity

20  
15  
10  
5  
0  
5  
10  
(%) STRAIN AT FAILURE



# RECORD OF BOREHOLE No 4

W P 7-81-08

LOCATION 25+769.5 3.5 m RT. C/L Detour LK. Rd.

ORIGINATED BY P.P.

DIST 16 HWY Detour LK Rd.

BOREHOLE TYPE Hollow Stem Augers

COMPILED BY R.M.

DATUM Geodetic

DATE 80 - 11 - 05

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES									
497.1														
0.0	SILTY CLAY TRADE OF SAND FIRM						496							
494.6	FILL MATERIAL		1	SS	12									5 12 39 44
2.5	PEAT (SOME CLAY)						494							Org. 40.9
493.6			2	SS	6									
3.5	End of Borehole													
	PROBABLE SILTY CLAY						492							
							490							
							488							
							486							
							484							
482.2							482							
14.9	End of Cone Hole													

3, x 5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

W P 7-81-08 LOCATION STA. 25+ 805.0 4.0 m RT. C/L Detour LK Rd. ORIGINATED BY P.P.  
DIST 16 HWY Detour Lk. Rd. BOREHOLE TYPE BX Casing & Wash & Cone Test COMPILED BY R.M.  
DATUM Geodetic DATE 80-11-11 CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT	Liquid Limit	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	W		
493.9													
0.0	PEAT Black												
492.4													
1.5	SILTY Brown Clay with organics												
490.5													
3.4	End of Borehole PROBABLE SILTY CLAY												
486.5													
7.4	End of Cone Hole PROBABLE BEDROCK							REFUSAL					

**+3, x5 : Numbers refer to Sensitivity**

15  $\phi$  5 (%) STRAIN AT FAILURE

## RECORD OF BOREHOLE. No. 6

W P 7-81-08

LOCATION STA. 25+ 805.0 4.5 m LT. Detour LK. RD.

ORIGINATED BY **P.P.**

DIST 16 HWY Detour LR RD.



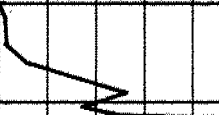

BOREHOLE TYPE BX Casing & Wash

COMPILED BY R.M.

DATUM Geodetic

DATE 80-11-11

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	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	W <sub>p</sub>	W			W <sub>L</sub>
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE	WATER CONTENT (%)				
493.8														
0.0	PEAT Black													
492.3							492							
1.5	Brown Silty Clay with organics													
490.5							490							
3.4	End of Borehole PROBABLE SILTY CLAY													
488.2							488							
5.6	End of Cone Test PROBABLE BEDROCK							REFUSAL						

OFFICE REPORT ON SOIL EXPLORATION

<sup>+</sup><sub>3</sub>, <sup>+</sup><sub>5</sub>: Numbers refer to Sensitivity

20  
15  $\phi$  5 (%) STRAIN AT FAILURE  
10

## EXPLANATION OF TERMS USED IN REPORT

**N VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST:** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**CONSISTENCY:** COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $c_u$ ) AS FOLLOWS:

$c_u$ (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

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 OF THE CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100mm+ 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	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS AND SYMBOLS

### FIELD SAMPLING

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	FOIL SAMPLE

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$r_u$	1	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$C_v$	m <sup>2</sup> /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{v0}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_r$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

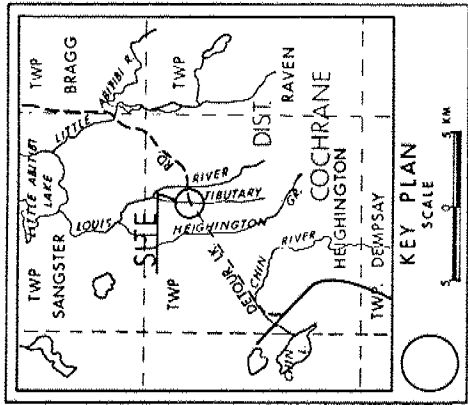
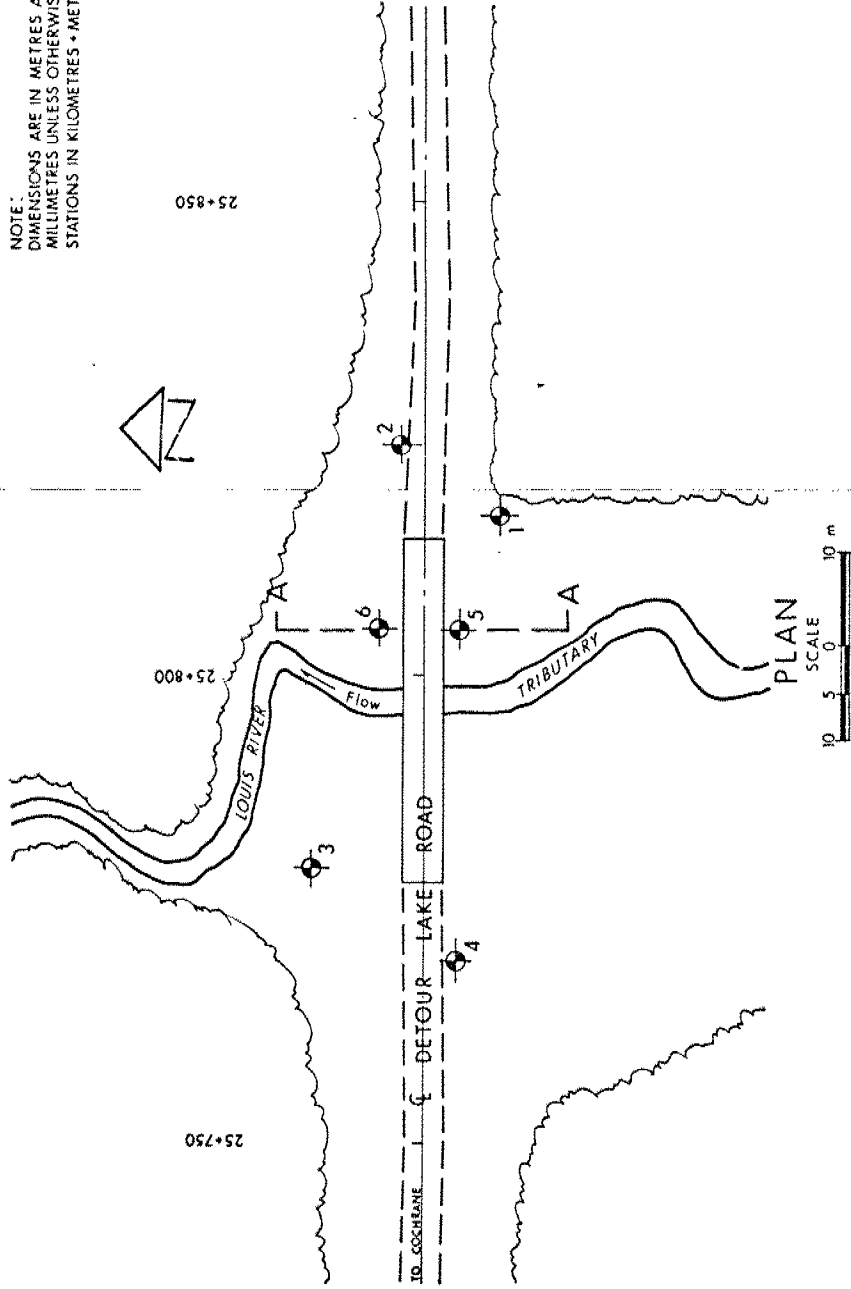
### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	kg/m <sup>3</sup>	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	kg/m <sup>3</sup>	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	kN/m <sup>3</sup>	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	kg/m <sup>3</sup>	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	kg/m <sup>3</sup>	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	m <sup>3</sup> /s	RATE OF DISCHARGE
$\gamma_d$	kN/m <sup>3</sup>	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	kg/m <sup>3</sup>	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{sat}$	kN/m <sup>3</sup>	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	kg/m <sup>3</sup>	DENSITY OF SUBMERGED SOIL	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m <sup>3</sup>	SEEPAGE FORCE
$\gamma'$	kN/m <sup>3</sup>	UNIT WEIGHT OF SUBMERGED SOIL						



METRIC

NOTE:  
DIMENSIONS ARE IN METRES AND/OR  
MILLIMETRES UNLESS OTHERWISE SHOWN  
STATIONS IN KILOMETRES + METRES



- LEGEND
- Bore Hole
  - Dynamic Cone Penetration Test (Cone)
  - Bore Hole & Cone
  - N Blows/0.3m (Std Pen Test, 475 J/blow)
  - CONE Blows/0.3m (60° Cone, 475 J/blow)
  - WL at time of investigation 80 11 02
  - NO WL Established in BH No 2, 4, 5 & 6

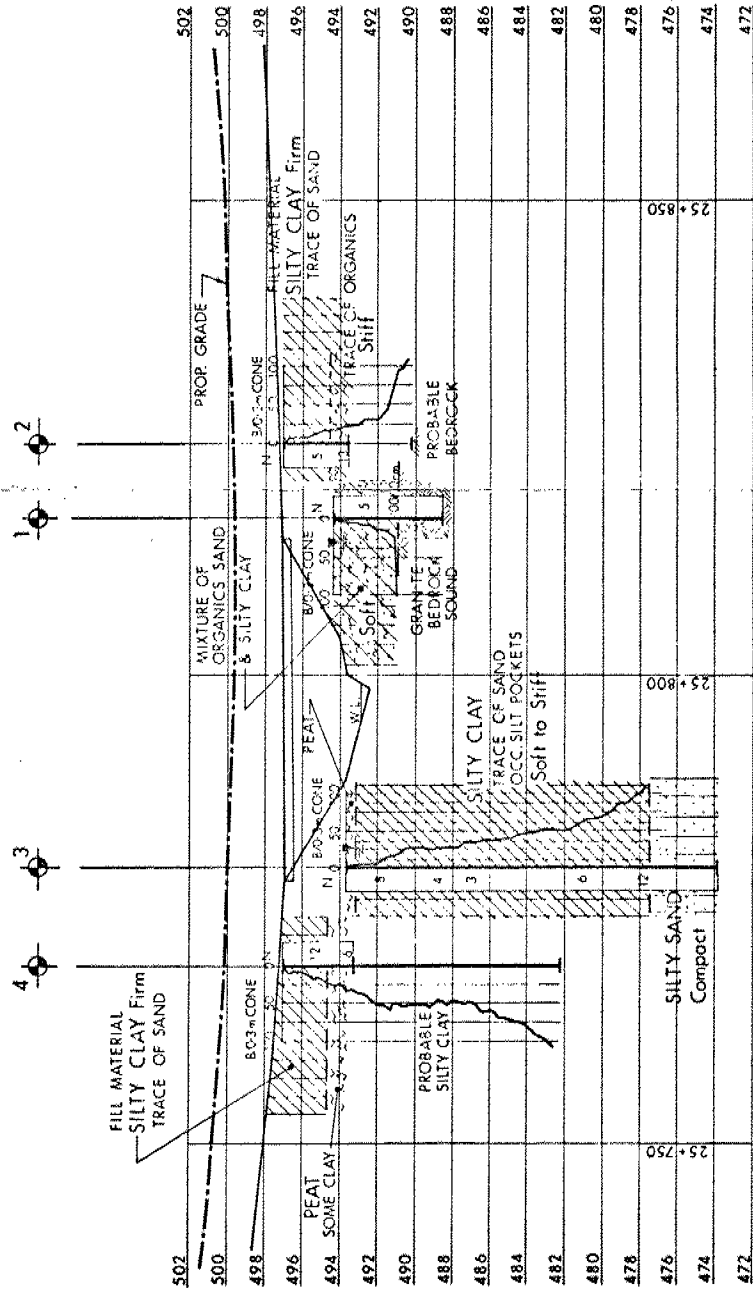
No	ELEVATION	STATION	OFFSET
1	494.4	25+817.0	18.0 RT.
2	497.1	25+824.0	2.5 LT.
3	493.7	25+779.0	12.0 LT.
4	497.1	25+769.5	3.5 RT.
5	493.9	25+805.0	4.0 RT.
6	493.8	25+805.0	4.5 LT.

NOTE=  
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

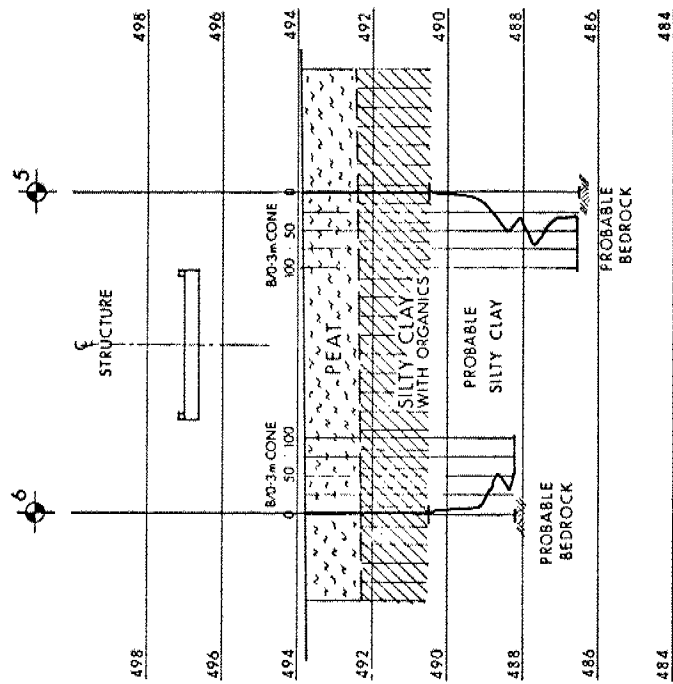
Geocres No 42H-17

HWY No DETOUR LAKE RD	DIST 15
SUBWD P. CHECKED SCALE 81 04 16	SITE 30E-199
DRAWN BY J. CHECKED /	DWG 78-28-A



PROFILE DETOUR LAKE RD.

HOR SCALE 10 5 2.5 0 5  
VERT SCALE 10 5 2.5 0 5



SECTION A-A

SCALE 2 1 0 2 m

Mr. S. McCombie  
Head, Structural Section  
Northwestern Region

1981 04 27

Attention: Mr. J.C. McAllister

From: Pavement & Foundation Design Section  
Room 313, Central Building  
Downsview

Re: Detour Lake Access Road Line 'A'  
W.P. 7-81-07; Site 39E-198  
W.P. 7-81-08; Site 39E-199  
District #16, Cochrane, Ontario

Attached please find the foundation drawings and record of borehole sheets for construction purposes for the above project. It is our understanding that the structure replacement will be carried out on an equipment rental basis. The recommendations for design purposes were provided to your Office on 81 03 03. No formal foundation investigation and design reports will be issued for these projects.

Should further information be required, please contact our Office.

P. Payer  
Foundations Engineer

PP:ea

Attach.

cc: S.C. Grebski  
J.M. Bernhardt  
B. MacKinnon

# memorandum



To: Mr. S. McCombie  
Head, Structural Section  
Northern Region

Date: 1981 03 03

Attention: J. McAllister

From: Pavement & Foundation Design Section  
Room 313, Central Building  
Downsview

Re: Advanced Foundation Recommendations for the Proposed Structure  
Replacements at Louis River (W.P. 7-81-09)  
Trib. Louis River (W.P. 7-81-08)  
Heightington Creek (W.P. 7-81-07)  
Existing Chin River  
Detour Lake Road  
Group W.P. 1301-80-00 (R)  
District #16 (Cochrane)

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## Introduction

In view of your revised proposals for the above crossings, our recommendations are as follows.

Louis River (34.7 km N. of Sec. Hwy. #652)

W.P. 7-81-09, Site: 39E-200

Existing structure: 12 m long, five span timber pile bent bridge.

River bed elevation 487.8 (metric).

Bridge deck (at  $\ell$ ) elevation 491.9.

## Design Proposals:

- a) 5.5 m (18 ft.) C.I.P. culvert.
- b) single span structure.

## Recommendations:

- a) Culvert: Install culvert as per figure #3.
- b) Structure: 1) #36 (#14) timber piles  
Working Load: 9kN per meter of embedded length.  
2) End-bearing steel piles ('H' or tube)  
driven to elevation 462 $\pm$ .  
Working Load: 650 kN per pile.  
Pile driving should be in accordance with Standard SS 3-11.

continued...../2

Approaches: Safe height: 4.2 m (el. 492). The encountered soft organic (peat) material should be removed as outlined on Figure #2. (Estimated bottom of sub-excavation el. 487+).

Trib. Louis River (33.6 km N. of Sec. Hwy. 652)

W.P. 7-81-08, Site: 39E-199

Existing structure: 36.6 m long, 14 span timber pile bent bridge.

River bed elevation 492.7.

Bridge deck (at 0) elevation 499.8.

Design Proposals:

2.4 to 3.0 m (8' to 10') dia. C.I.P. culvert.

Proposed profile grade: elevation 500+.

Proposed invert elevation 492.3.

Recommendations:

Culvert: Install C.I.P. as per Figure #3.

Approaches: Safe height (without berm): 5.5 m (el. 498.2).

Up to 11 m long, half height berms will be required. (See Figure #1).

Should the proposed profile grade be lowered to el. 498+, no berms will be required. (2:1 slopes).

In any case, the organic material should be removed as outlined on Figure #2 (estimated bottom of sub-excavation el. 492.5+).

Heightington Creek (30.7 km N. of Sec. Hwy. #652)

W.P. 7-81-07, Site: 39E-198

Existing structure: 36.6 m long, 14 span timber pile bent bridge.

Creek bed elevation 504.5.

Bridge deck (at 0) elevation 510.3.

Design Proposals:

2.4 to 3.0 m (8' to 10') dia. C.I.P. culvert.

Proposed profile grade elevation 515.1.

Proposed invert elevation 504.3.

Recommendations:

Culvert: Install C.I.P. as per Figure #3.

Approaches: Safe height (without berm) 6.1 m (el. 510.6).

Up to 27.5 m long, half height berms will be required (see Figure #1).

Should the proposed profile grade be lowered to el. 510.6 $\pm$ , no berms will be required (2:1 slopes).

In any case, the organic material should be removed as outlined on Figure #2. (Estimated bottom of sub-excavation el. 502.5 $\pm$ ).

Existing Chin River Structure

23.1 km N. of Sec. Hwy. #652  
W.P. Nil, Site: Nil

It is proposed to place a 42.7 m long D.S. Bailey over the existing 36.6 m long, 14 span, timber pile bent bridge. The profile grade will remain unchanged (el. 500 $\pm$ ).

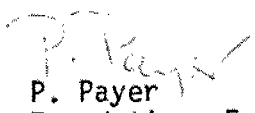
The ends of this temporary Bailey Bridge may be supported on timber cribs. Should piling be considered #36 timber piles are recommended. A working load of 12 kN per meter of embedded length is suggested.

A new structure will be erected on a revised alignment up-stream of the existing bridge. A field investigation will be carried out in the near future and recommendations will be provided accordingly.

Foundation Investigation and Design Reports will be issued for the first three projects in April, 1981.

Should further information be required, please contact our Office.

PP:ea

  
P. Payer  
Foundations Engineer  
For:  
K.G. Selby  
Senior Foundations Engineer



## BERM DESIGN

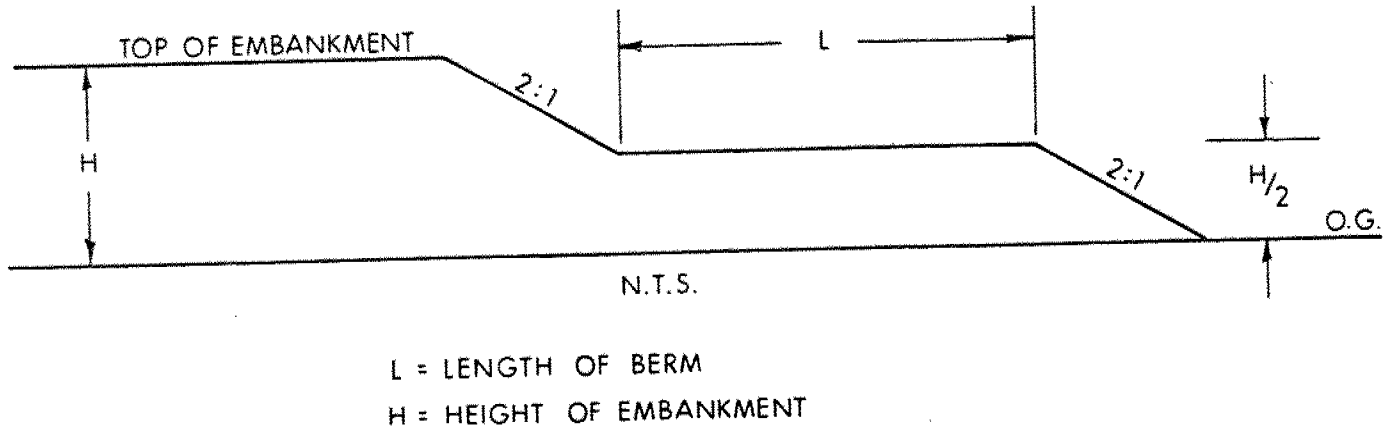
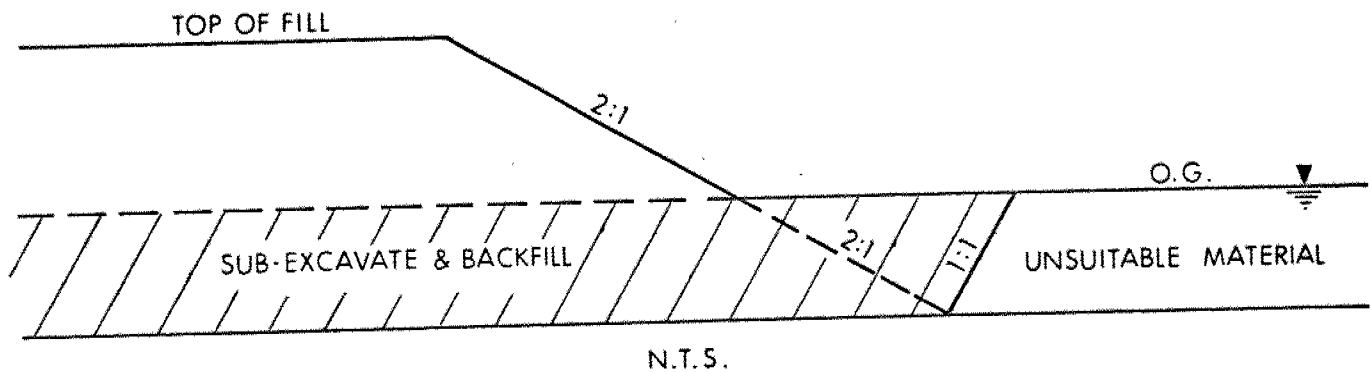


Figure 1

## SUB-EXCAVATION FOR EMBANKMENTS



### CONSTRUCTION SEQUENCE

- 1) EXCAVATE UNSUITABLE MATERIAL AS OUTLINED
- 2) BACKFILL WITH NON-COHESIVE MATERIAL TO ORIGINAL GROUND LEVEL
- 3) CONSTRUCT EMBANKMENT TO PROFILE GRADE WITH WELL COMPACTED ACCEPTABLE MATERIAL

Figure 2

MINIMUM BEDDING AND BACKFILL REQUIREMENTS FOR CULVERTS

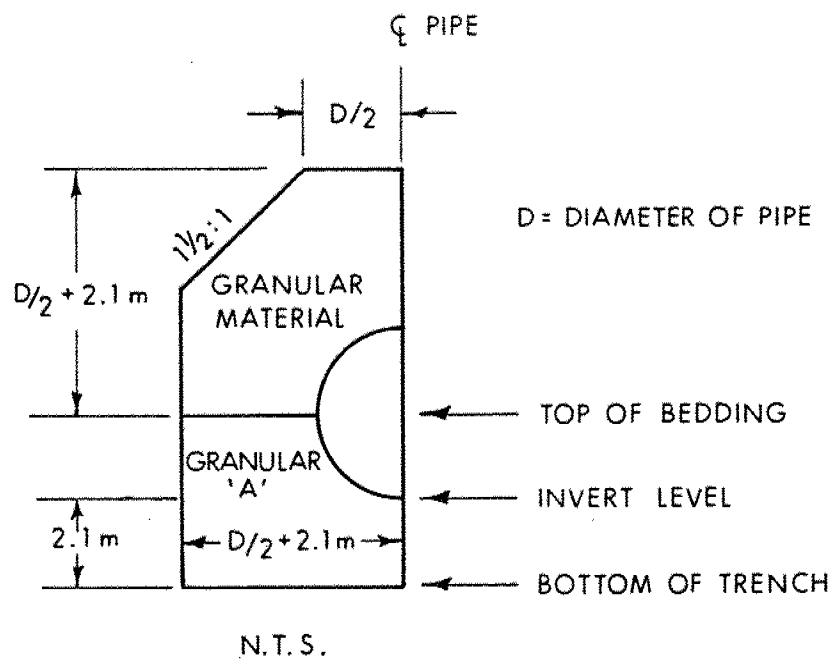


Figure 3



LOOKING NORTH.



UPSTREAM VIEW

SITE # 2