Province of British Columbia
Ministry of Transportation and Highways

Geotechnical and Materials Engineering Standards for Bridge Foundation Investigations

January, 1991

Ministry of Transportation and Highways
Geotechnical and Materials Engineering
Victoria, B.C.

Geotechnical and Materials Engineering Standards for Bridge Foundation Investigations

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SECTION 1
Report Outline

SECTION 1 - GEOTECHNICAL FOUNDATION INVESTIGATION REPORT OUTLINE (GUIDE)
(10 - 8 1/2" X 11" copies of report required)

1. SUMMARY/ABSTRACT

2. INTRODUCTION/SITE DESCRIPTION
- Reasons for study, scope of study
- Date of and source of request
- Location of proposed structure
- Major geological and geographical features
- Previous work in area (if applicable)

3. GEOLOGY/TERRAIN
- Description of terrain
- Surficial geology/glacial history
- Bedrock geology
- Natural hazards

4. INVESTIGATION
- Ministry Geotechnical Engineer approval required for site investigation methods
- Site inspection, drilling, test pitting, cone penetration, etc.
- Rationale - explain how method adequately determines ground conditions

5. GROUND CONDITIONS
- Description of soil and rock and engineering properties, possible strata, ground water problems

6. GEOTECHNICAL EVALUATION
- Discussion of ground conditions and how they effect foundation

7. DESIGN RECOMMENDATIONS
- Pile types, lengths, sizes, load capacities
- Footing type, size, bearing capacity
- Stability of embankments/footings
- Settlement of embankments/footings
- Special problems related to foundation/soil interaction

8. CONSTRUCTION RECOMMENDATIONS
- Discussion of sequence of construction
- Pile installation method, hammer requirements, etc.
- Duration of stage construction Construction Monitoring, settlement plates, piezometers, slope indicators, movement hubs, pile driving analysis, etc.

9. APPENDICES
- Summary Logs 8.5 X 11" (see examples Section 2.15)
- Foundation investigation drawing (see examples Section 4.10)
- Photos

SECTION 2
Summary Log

SECTION 2 - 8.5 * 11" SUMMARY LOG

2.0.... PREPARATION STANDARDS

Prepare using AutoCAD Release 10 and Geotechnical and Materials Engineering AutoCAD Prototype (GHSUM100).

In unusual circumstances, Summary Log formats different than the Ministry standard (AutoCAD - GHSUM100) may be used with the approval of the Ministry Geotechnical Project Engineer. Also, See Appendix E, F, and G.

See 2.14 - AutoCAD information
See 2.15 - Examples

See Appendix E, F, G for Rock Core Logs, Becker Holes and Cone Holes information.

2.1.... PROJECT INFORMATION (top and bottom of sheet)

- Test Hole No. (Year - Hole No.) eg. 90-1
- Project Name
- Location (Station and Offset) and/or (Easting and Northing)
- Elevation
- Driller or Drilling Firm
- Drilling Method or Drill Type
- Dates (yy-mm-dd/dd)
- Geotechnical and Materials Engineering File No.
- Prepared By eg. KFR-TAO (initials)
- Sheet # of #

2.2.... DRILLING DETAILS

- >100 Blowcount Details
- Water Table and Date
- Artesian Pressure Noted
- Instrumentation Depths and Notes
- Other Drilling Details

2.3.... DEPTH (metres - scale 1:100)

- Sheet 1 (0-18m)
- Sheet 2 (18-36m)
- Sheet 3 (36-54m)
- Sheet 4 (54-72m)

2.4.... SAMPLE TYPE

- A - Auger
- C - Core
- D - Dennison
- S - Split Spoon
- T - Shelby Tube
- W - Wash
- - Other (specify)

- Sample driven distance is graphically shown (rounded to the nearest tenth of metre)

2.5.... BLOWCOUNT

- Standard Penetration Test (ASTM 1586)
- Blowcounts over 100 are represented by >100
- Blowcounts over 100 are detailed in drilling details column

2.6.... SAMPLE RECOVERY

Soil - (metres)
Rock - (metres or %)

2.7a... SHEAR STRENGTH (kPa)

U - Unconfined Compression
Fv - Field Vane
Lv - Laboratory Vane
R - Remoulded

2.7b... ROCK QUALITY DESIGNATION (%)

Shear Strength column can double as Rock Quality Designation (%) column by changing column heading. (See 2.15 - Examples)

2.8.... GRADATION (%) TOTAL = 100

- Visual identification (V.I's) of samples are required on all samples when sufficient recoveries are obtained.
- Gravel
- Sand
- Fines (Silt and Clay)
- Organic matter content noted in description column

2.9.... INDEX PROPERTIES

wL - Liquid Limit
wP - Plastic Limit
W - Water Content

- Do sufficient Atterberg Limit Tests to determine classification of fine-grained soils, see ASTM D421, Section 4. Moisture Content Tests are not necessary for coarse grained soils.

2.10... CLASSIFICATION

- Soil Classification Symbols to be shown individually or for soils having 5-12% passing .075 sieve, a dual symbol hyphenated and plus to indicate mixture or layering of soil (eg. GP-GM+SB) (ML+SC3)
- Modified Unified Soil Classification Chart (see Appendix A)
- Driller's interpretation to be enclosed in brackets where applicable

2.11... DESCRIPTION

- Soil description as in Canadian Foundation Engineering Manual. 2nd Edition, Part 1, Section 3.1.3 and Soil Mechanics in Engineering Practice for relation of consistency of clay to number of blows on sampling spoon, when undrained shear strength is unknown
- Rock strength classification as in Canadian Foundation Engineering Manual Part 1. Section 3.2.4.1, Table 3.4
- Nouns to be capitalized
- COBBLES and Large BOULDERS to be noted (capitalized) with encountered dimension in millimeters

See Appendix B - Excerpts from Canadian Foundation Engineering Manual and Soil Mechanics in engineering practice

See 2.15 - Geotechnical and Materials Engineering examples.

2.12... OTHER TESTS

M - Mechanical Analysis
Q.R.S. - Triaxial Compression
C - Consolidation
DS - Direct Shear

2.13... REPRODUCTION AND STORAGE REQUIREMENTS

- 8.5 * 11" copies of Summary Logs to be included in Geotechnical Report
- See Summary Log Drawing Sheet instructions for preparing drawing for Bridge Contract (See Section 3)

2.14... GEOTECHNICAL ENGINEERING AUTOCAD SUMMARY LOG
(8.5" x 11" - 4 sheets, 0 m - 72 m)

PROTOTYPE FILE NAME: GHSUM100

LOAD FILENAME: FILENAME = GHSUM100 (item 1 on main Autocad menu)

VIEWS: 0, 18, 36, 54 full sheets
5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70 partial sheets

LAYERS:			
	G0FORM	0 m to 18 m	(Sheet 1, View 0)
	G0TEXT		
	G18FORM	18 m to 36 m	(Sheet 2, View 18)
	G18TEXT		
	G36FORM	36 m to 54 m	(Sheet 3, View 36)
	G36TEXT		
	G54FORM	54 m to 72 m	(Sheet 4, View 54)
	G54TEXT		

LISP: IN - - LISP routine which inserts the following blocks simply by multiplying the depth by 10.
e.g. 30 inserts block at 3.0 m
e.g. 76 inserts block at 7.6 m

BLOCKS: - Type in appropriate information with each block on the proper text layer.

T = TITLE
- insert block T at depth of 0
- array title for sheets 2, 3 and 4 when hole is greater then 18.0 m (distance factor of -180)
- change arrayed title to appropriate text layer (G##TEXT eg. G18TEXT)
- attedit sheet # of #

S0
S1
S2 = SAMPLES - S0 used for samples driven greater than 1.0m
S3 in conjunction with block S and samples
S4 with dual results.
S5 - S1 to S10 are for samples driven .1m to 1.0m.
S6
S7
S8
S9
S10

S = SINGLE LINE
- delinates sample boundaries greater than 1.0m, repeat for top and bottom of sample

E = END OF HOLE
- defines hole which has reached required depth and depth (m)

R = REFUSAL
- defines depth which hole was terminated due to material density and depth (m)

B = BOUNDARY
- defines material boundary and depth (m)

DB = DASHED BOUNDARY
- shows approximate material boundary and depth (m).

JB1 and JB2 = JOGGED BOUNDARY
- defines material boundary and depth (m) with extra space in description column

WT-M = Water Table Measured
WT-E = Water Table Estimated
WT-A = Water Table with two text lines for Artesian Source
- shows water table, and date.

D = DESCRIPTION
- inserts 4 lines of text for describing material type, approximately 35 characters per line.

BL = BLOWCOUNT DETAILS
- sub heading for Drilling Details column when blowcounts are greater than 100.

FOR EDITING BLOCKS

- set var - ATTDIA (1)
- command - DDATTE

PLOT: 1 = 1 (freeze unwanted layers)

- PLOT VIEW 0 or 18, 36, 54 for 8.5" x 11" plots
- WBLOCK for insertion onto A1 size drawing.
- Pen sizes are:
  - red = 0.25
  - yellow = 0.35
  - green = 0.50
  - cyan = 0.70

GEOTECHNICAL ENGINEERING AUTOCAD SUMMARY LOG (Scale 1:20)
(8.5" x 11" - 1 sheet, 0 m - 3.6 m) 90/06/11)

PROTOTYPE FILE NAME: GHSUM20

LOAD FILENAME: FILENAME = GHSUM20 (item 1 on main AutoCAD menu)

VIEWS: 0 - full sheets
T, 1, 2, 3 - partial sheets

LAYERS: GOFORM
GOTEXT

LISP: IN20 - - LISP routine which inserts the following blocks simply by multiplying the depth by 10.

e.g. 15 inserts block at 1.5m
e.g. 32 inserts block at 3.2m

BLOCKS: - Type in appropriate information with each block on text layer.

T = TITLE - insert block T at depth of 0

S0	S05	
S1	S15	
S2	S25 = SAMPLES	- S0 used for samples driven greater than 1.0m in conjunction with block S and samples with dual results.
S3	S35	
S4	S45	
S5	S55	- S05 to S10 are for samples driven 0.05m to 1.0m.
S6	S65	
S7	S75	
S8	S85	
S9	S95	
S10		

S = SINGLE LINE
- defines sample boundaries greater than 1.0m, repeat for top and bottom of sample.

E = END OF HOLE
- defines hole which has reached required depth and depth (m).

R = REFUSAL
- defines depth which hole was terminated due to material density and depth (m).

B = BOUNDARY

- defines defined material boundary and depth (m).

DB = DASHED BOUNDARY

- shows approximate material boundary and depth (m).

JB1 and JB2 = JOGGED BOUNDARY

- defines material boundary and depth (m) with extra space for description.

WT-M = Water Table Measured
WT-E = Water Table Estimated
WT-A = Water Table with two text lines for Artesian Source
- shows water table and date.

D = DESCRIPTION
- inserts 4 lines of text for describing material type, approximately 35 characters per line.

BL = BLOWCOUNT DETAILS
- sub heading for Drilling Details column when blowcounts are greater than 100.

FOR EDITING BLOCKS
set var - ATTDIA (1)
command - DDATTE

PLOT: 1 = 1 (freeze unwanted layers)

- PLOT VIEW 0 8.5" x 11" plot
- WBLOCK for insertion onto A1 sizes drawing.
- Pen sizes are:
  red = 0.25
  yellow = 0.35
  green = 0.50
  cyan = 0.70

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch

TEST HOLE No. 89-3

Project SQUILAX BRIDGE #481
Location STA. 7+80.4, 6.1m RT., (in river)
Driller D. ROBERTS Method DIAMOND DRILL
Elevation 341.661
Dates 89-01-14/16

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Rock Quality Designation (%)	Gradation % Gravel	Sand	Fines	Index Properties Wl	Wp	W	Classification	Description	Other Tests
GAIN WATER (ARTESIAN 4.0m HEAD @ 8.2m) — HW CASING	1											(GP)	GRAVEL	
	2												1.8m	
	3	S	7	.20		15	80	5	–	–	–	SP	Loose SAND, some to trace gravel, trace silt, subround gravel, med-coarse sand, light grey, saturated	
	4	S	5	.22		5	90	5	–	–	–	SP		
	5													
	6	S	9	.17		–	95	5	–	–	–	SP		
													6.0m	
												(ML)	SILT	
													6.7m	
	7	S	27	.10		45	35	20	–	–	–	GM2	Compact GRAVEL and SAND, silty subround gravel, med-coarse sand, light grey, sat	
	8												8.2m	
NQ3 TRIPLE TUBE	9	CORED		100%	39%									
				94%	69%									
	10													
	11			100%	90%									
	12			92%	17%							BR	GNEISS – Broken to shattered zones, some fissures and weak seams	
	13													
	14			89%	69%									
				100%	56%									
	15			100%	24%									
	16													
	17												16.0m END OF HOLE Driller interpretation in brackets	

SAMPLE TYPE
A – Auger
C – Core
D – Denison
S – Split Spoon
T – Shelby Tube
W – Wash

SHEAR STRENGTH kPa
U – Unconfined Compression
Fv – Field Vane
Lv – Lab Vane
R – Remoulded

TESTS
M – Mechanical Analysis
Q,R,S – Triaxial Compression
C – Consolidation
DS – Direct Shear
Wl,Wp – Liquid, Plastic Limits
W – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-50
DRAWN BY: ST – KFR
SHEET 01 of 01

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch

TEST HOLE No. 90–1

Project KIPP ROAD OVERPASS
Location STA. 74+03, C.L.
Driller E. SANDERS
Method DIAMOND DRILL
Elevation 353.8m
Dates 90–02–27

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Gradation % Sand	Gradation % Fines	Index Properties w_L	Index Properties w_P	Index Properties w	Classification	Description	Other Tests
	1													
	2	S	12	.2		5	55	40	–	–	–	GP + SP + SM_4	Compact to dense silty GRAVEL and SAND	
	3	S	92	.15		70	25	5	–	–	–			
	4													
	5	S	46	.25		45	45	10	–	–	–			
	6	S	20	.20		–	65	35	–	–	–			
													6.7m	
	7					–	15	85				SM_3 + ML	SILTY SAND and stiff non-plastic SILT	
	8	S	14	.25		–	–	100	–	–	–			
													8.4m	
	9	S	21	.25		–	65	35	–	–	–	SM_3	Compact SILTY SAND	
	10												10.0m	
	11	S	10	.30		–	10	90	–	–	29	ML	Soft non-plastic SILT with traces of sand	
					Lv U 25 75						31			
	12	T	–	.55	24 72	–	–	–	–	–	33			
					29 77						37			
	13				28						33			
	14	S	15	.20		–	5	95	–	–	29			
					Lv 16						32			
	15	T	–	.55	21	–	–	–	–	–	36			
					18						34			
	16				18						33		15.9m	
	17											ML + CL	Firm to hard non-plastic SILT and CLAY with traces of sand	

SAMPLE TYPE
A – Auger
C – Core
D – Denison
S – Split Spoon
T – Shelby Tube
W – Wash

SHEAR STRENGTH kPa
U – Unconfined Compression
Fv – Field Vane
Lv – Lab Vane
R – Remoulded

TESTS
M – Mechanical Analysis
Q,R,S – Triaxial Compression
C – Consolidation
DS – Direct Shear
w_L, w_P – Liquid, plastic Limits
w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01–22–80
DRAWN BY: IG/KLASSCAD
SHEET 01 of 02

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch

TEST HOLE No. 90-2

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK

Location STA. 20+86.4, .6m RT.

Elevation 326.12m

Driller D. ROBERTS Method ROTARY DRILL Dates 90-03-03

Drilling Details / Blowcount	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Details														
70/.15m	1	S	>100	.20		85	15	–	–	–	–	SB +GP	Very dense GRAVEL with some sand and COBBLES to 150mm	
60/.07m													1.5m	
	2											(GP) +LB +SB	Driller reports very dense GRAVEL with LARGE BOULDERS and COBBLES to 180mm	
80/.10m	3	S	>100	0		–	–	–	–	–	–			
70/.08m	4	S	>100	.08		30	60	10	–	–	–	SP –SM		
90-03-05 ▼													4.2m	
	5											+SB		
80/.12m	6	S	>100	.05		95	5	–	–	–	–	GP +SB	Very dense gravelly SAND and GRAVEL, some is silty, contains COBBLES to 250mm	
	7													
60/.15m		S	>100	.12		15	60	25	–	–	–	SM2 +SB		
	8													
60/.08m	9	S	>100	0		–	–	–	–	–	–	SM2 +SB		
													9.4m	
												LB	LARGE BOULDER	
	10												9.8m	
60/.10m		S	>100	.05		–	–	–	–	–	–	(GP) +(SB)	Driller reports GRAVEL and COBBLES to 100mm	
	11													
	12												11.7m	
	13											LB	LARGE BOULDER	
													13.5m	
	14													
65/.08m	15	S	>100	.07		60	35	5	–	–	–	GP +SB	Very dense sandy GRAVEL and COBBLES to 120mm	
	16													
	17													
65/.05m		S	>100	.05		100	–	–	–	–	–	GP		

SAMPLE TYPE
A – Auger
C – Core
D – Denison
S – Split Spoon
T – Shelby Tube
W – Wash

SHEAR STRENGTH kPa
U – Unconfined Compression
Fv – Field Vane
Lv – Lab Vane
R – Remoulded

TESTS
M – Mechanical Analysis
Q, R, S – Triaxial Compression
C – Consolidation
DS – Direct Shear
w_L, w_P – Liquid, plastic Limits
w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43

DRAWN BY: BK/KLASSCAD

SHEET 01 of 02

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch

TEST HOLE No. 90–2

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK

Location STA. 20+86.4, .6m RT.

Elevation 326.12m

Driller D. ROBERTS Method ROTARY DRILL

Dates 90–03–03

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Gradation % Sand	Gradation % Fines	Index Properties w_L	Index Properties w_P	Index Properties w	Classification	Description	Other Tests
Blowcount Details	19												18.4m	
	20													
100/.08m	21	S	>100	.08		–	95	5	–	–	–	SP	Very dense SAND with a trace of silt	
	22													
	23													
90/.05m	24	S	>100	0		–	–	–	–	–	–			
	25												24.6m	
	26	S	–	0		–	–	–	–	–	–	(BR)	Driller reports BEDROCK that he couldn't sample	
	27												26.5m END OF HOLE	
	28													
	29													
	30													
	31													
	32													
	33													
	34													
	35													

SAMPLE TYPE
A – Auger
C – Core
D – Denison
S – Split Spoon
T – Shelby Tube
W – Wash

SHEAR STRENGTH kPa
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Fv – Field Vane
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TESTS
M – Mechanical Analysis
Q,R,S – Triaxial Compression
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DS – Direct Shear
w_L, w_P – Liquid, plastic Limits
w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01–22–43

DRAWN BY: BK/KLASSCAD

SHEET 02 of 02

SECTION 3
Summary Log Contract Drawing

SECTION 3 - SUMMARY LOG DRAWING SHEET (AutoCAD prototype GHBASE1B)
(for inclusion with Bridge Branch Contract Drawings)

3.0.... PREPARATION STANDARDS

Prepare using AutoCAD Release 10 and Geotechnical and Materials Engineering AutoCAD Prototype (GHBASE1B)

Contract drawings using Summary Log formats (approved) which are different than the Ministry standard and not compatible with AutoCAD can be composed by attaching logs on a base sheet. (GHBASE1B). Original drawings can be created by copying onto heavy weight vellum using a large size copier.

- 6 - 8.5" * 11" summary test hole log sheets per A1 drawing sheet maximum
- Do not mix bridge projects on the same drawing sheet

See 3.5.... AutoCAD information
See 3.6.... Examples

3.1.... MATERIALS CLASSIFICATION LEGEND

See Appendix A (GLEGEND1)

3.2.... INFORMATION NOTES

NOTE: 1. The soil and groundwater conditions shown are representative at the test hole locations on the dates indicated. Conditions encountered during construction may vary. Cobble and boulder sizes are driller's estimate of the dimension encountered.

NOTE: 2. Field and laboratory logs are available for viewing at Geotechnical and Materials Engineering in Victoria. (Phone No. 387-1881)

NOTE: 3. Gradation and classification are based on a visual estimate unless otherwise noted under "other tests".

NOTE: 4. BR - Bedrock
Intact Rock Strength (See Canadian Foundation Manual, 2nd Edition, page 35.)

3.3.... GEOTECHNICAL AND MATERIALS ENGINEERING TITLE BLOCK (GHTITLE1) AND SIGNING INSTRUCTIONS (See 3.3a and 3.3b)

- Type of Drawing (SUMMARY LOGS)

SCALE NOTE 13

Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

HIGHWAY DISTRICT; HIGHWAY or ROAD NAME

NOTE 1 **PROJECT NAME**
DRAWING TYPE
PROJECT BOUNDARIES or GEOGRAPHIC LOCATION

PREPARED BY	RECOMMENDED	ACCEPTED FOR CONSTRUCTION
NOTE 2	NOTE 3	NOTE 4
DESIGN ENGINEER / SUPERVISOR DATE	DIRECTOR, GEOTECHNICAL & MATERIALS ENG. DATE	CHIEF HIGHWAY ENGINEER DATE

DESIGNED	NOTE 5	NOTE 5	NEGATIVE No.	NOTE 8	PROJECT No.	DRAWING No.	
CHECKED	NOTE 6	NOTE 6	CAD No.	NOTE 8	NOTE 10	NOTE 12	–
DRAWN	NOTE 7	NOTE 7	FILE No.	NOTE 9	REGION No. 11		

CANCEL PRINTS BEARING PREVIOUS LETTER

N.T.S.

NOTE 1 – PROJECT NAME AND SPECIFIC DRAWING INFORMATION
NOTE 2 – SENIOR DESIGNER SIGNS AND DATES
NOTE 3 – HEADQUARTERS DRAWINGS – DIRECTOR SIGNS AND DATES
REGIONAL DRAWINGS – MANAGER, PROFESSIONAL SERVICES SIGNS & DATES
DISTRICT DRAWINGS – DISTRICT HIGHWAY MANAGER SIGNS AND DATES
NOTE 4 – HEADQUARTERS DRAWINGS AND MAJOR PROJECTS – CHIEF HIGHWAY ENGINEER SIGNS AND DATES
REGIONAL AND DISTRICT PROJECTS – REGIONAL DIRECTOR SIGNS AND DATES
(Notes 3 & 4 Change Titles Accordingly)
NOTE 5 – DESIGNER INITIALS AND DATES
NOTE 6 – CHECKER INITIALS AND DATES
NOTE 7 – DRAFTSPERSON INITIALS AND DATES
NOTE 8 – NEGATIVE AND CAD NUMBER (assigned by Branch Staff)
NOTE 9 – GEOTECHNICAL AND MATERIALS ENGINEERING CORRESPONDENCE FILE NUMBER
NOTE 10 – CONTRACT DOCUMENTS PROJECT NUMBER
NOTE 11 – HIGHWAY REGION NUMBER (Project Location) [1 – 6]
NOTE 12 – BRIDGE NUMBER AND SHEET NUMBER OF CONTRACT DRAWINGS
(Assigned by Bridge Branch or Structural Designer)
NOTE 13 – BAR SCALE

NOTE 14

SCALE NOTE 13

Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

HIGHWAY DISTRICT; HIGHWAY or ROAD NAME

NOTE 1 **PROJECT NAME**
DRAWING TYPE
PROJECT BOUNDARIES or GEOGRAPHIC LOCATION

PREPARED BY	RECOMMENDED	ACCEPTED FOR CONSTRUCTION
NOTE 2	NOTE 3	NOTE 4
DESIGN ENGINEER / SUPERVISOR DATE	DIRECTOR, GEOTECHNICAL & MATERIALS ENG. DATE	CHIEF HIGHWAY ENGINEER DATE

DESIGNED	NOTE 5	NOTE 5	NEGATIVE No.	NOTE 8	PROJECT No.	DRAWING No.
CHECKED	NOTE 6	NOTE 6	CAD No.	NOTE 8	NOTE 10	NOTE 12 –
DRAWN	NOTE 7	NOTE 7	FILE No.	NOTE 9	REGION No. 11	

CANCEL PRINTS BEARING PREVIOUS LETTER

N.T.S.

NOTE 1 – PROJECT NAME AND SPECIFIC DRAWING INFORMATION
NOTE 2 – SENIOR DESIGN CONSULTANT SIGNS AND DATES
NOTE 3 – HEADQUARTERS DRAWINGS – DIRECTOR SIGNS AND DATES
REGIONAL DRAWINGS – MANAGER, PROFESSIONAL SERVICES SIGNS & DATES
DISTRICT DRAWINGS – DISTRICT HIGHWAY MANAGER SIGNS AND DATES
NOTE 4 – HEADQUARTERS DRAWINGS AND MAJOR PROJECTS – CHIEF HIGHWAY ENGINEER SIGNS AND DATES
REGIONAL AND DISTRICT PROJECTS – REGIONAL DIRECTOR SIGNS AND DATES
(Notes 3 & 4 Change Titles Accordingly)
NOTE 5 – DESIGNER INITIALS AND DATES
NOTE 6 – CHECKER INITIALS AND DATES
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NOTE 10 – CONTRACT DOCUMENTS PROJECT NUMBER
NOTE 11 – HIGHWAY REGION NUMBER (Project Location) [1 – 6]
NOTE 12 – BRIDGE NUMBER AND SHEET NUMBER OF CONTRACT DRAWINGS
(Assigned by Bridge Branch or Structural Designer)
NOTE 13 – BAR SCALE
NOTE 14 – CONSULTANT'S COMPANY NAME, ADDRESS AND LOGO (thaw layer GCONSULT)

3.4.... REPRODUCTION AND STORAGE REQUIREMENTS

- 1 - Fullsize Original A1 Size (vellum) for Bridge contract
- 1 - Fullsize copy for Geotechnical and Materials Engineering Drawing Storage
- 2 - 5.25 Floppy Disks (preferably Dysan 1.2M) for Geotechnical and Materials Engineering Storage

3.5.... SUMMARY LOG DRAWING (A1 SIZE) AUTOCAD INFORMATION
(for inclusion with Bridge Contract Drawings)

PROTOTYPE FILE NAME: GHBASE1B

LOAD FILENAME: FILENAME = GHBASE1B (item 1 on main AutoCAD menu)

VIEWS: T = zooms title block
Plot = A1 size sheet

LAYERS:

GHBASE1	- Base Sheet
GHTITLE1	- Title Block
GCONSULT	- Box above Title Block for Consultants Name, Address and Logo
GHTITREV	- Revision Box (frozen until required, move if necessary)
GWTSTINS	- Summary Logs insertion points (freeze before final plot)
GTESTHOLE	- Summary logs inserted on this layer
GLEGEND1	- Materials Classification Legend (GLEGEND1) thaw before final plot

INSERT: WBLOCKED 8.5 x 11" Summary Logs insert onto layer GTESTHOLE using upper left corner of 8.5 x 11" sheet as insertion point.

BLOCKS:

GHTITLE1 = TITLE TEXT
- insert on layer GHTITLE1 @ 0,0 and type in appropriate information.

GLEGEND1 = MATERIALS CLASSIFICATION LEGEND
- thaw layer GLEGEND1 before final plot

GHTITREV = REVISION TEXT
- insert on layer GHTITREV @ 0,0 and type in appropriate information.

PLOT:

- Freeze layer GTSTINS before final plot
- use view PLOT
- 1 = 1
- Pen sizes
  - red = 0.25
  - yellow = 0.35
  - green = 0.50
  - cyan = 0.70

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-1

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 10+14.25, 2.1m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.5m
Driller: J. SUMPTER/MOTH — Method H-RODS, MUD ROTARY — Dates 90-05-8/9

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
												PAVEMENT — 0.2m	
1	S	11	.03		50	45	5	–	–	–	GP	Loose to compact, brown-grey, medium to coarse SAND and sub-angular GRAVEL, trace silt, FILL	
2												— 2.2m	
3	S	19	0		–	–	–	–	–	–	GP	Loose to compact, brown-grey, sub-angular, fine GRAVEL, some medium to coarse sand	
4													
5	S	10	.08		80	20	–	–	–	–			
6	S	32	.05		–	–	–	–	–	–			
7													
8	S	23	.13		–	–	–	–	–	–			
												— 7.9m	
9	S	–	0		–	–	–	–	–	–	GP+SB	GRAVEL, COBBLES to about 0.2m in diameter	
												— 8.6m	
10													
11	S	>100	0		85	30	5	–	–	–	GP+SB-LB	Dense to very dense, brown-grey, sub-angular, sandy (medium to coarse) GRAVEL, trace silt, occasional cobbles and boulders, large boulder encountered from 8.6 to 9.3m	
12	S	47	.23		–	–	–	–	–	–			
13													
14	S	>100	0		–	–	–	–	–	–			
												— 14.3m	
15	S	91	.30		50	45	5	–	–	–	GP+SB	Very dense, brown-grey, medium to coarse SAND and sub-rounded GRAVEL, COBBLES, trace silt	
16													
												— 16.5m	
17					65	30	5	–	–	–		Very dense, brown-grey, sub-angular, sandy (medium to coarse) GRAVEL, trace silt, occasional COBBLES	

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 01 of 02

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-2

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 9+95.3, 5.8m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.7m
Driller: J. SUMPTER/MOTH — Method H-RODS — Dates 90-05-07

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
												PAVEMENT — 0.3m	
1	S	10	.1		65	30	5	–	–	–	GP	Loose to compact, grey-brown, sub-rounded to sub-angular, sandy (medium to coarse) GRAVEL, trace silt FILL	
2													
3	S	10	.08		–	–	–	–	–	–			
												— 4.0m	
4													
5	S	18	.25		–	–	–	–	–	–			
6	S	11	0		–	–	–	–	–	–			
7													
80/.08m	S	>100	0		55	35	10	–	–	–	GP-GM+SB	Compact to very dense, brown, medium to coarse SAND and sub-rounded GRAVEL, some silt, roots and fibres encountered from 4.3 to 4.9m, COBBLE encountered from 7.3 to 7.6m	
8													
9	S	72	.3		–	–	–	–	–	–			
												— 10.0m	
10													
50/.15m 70/.15m	S	>100	.2		–	–	–	–	–	–			
11													
12	S	57	.13		75	20	5	–	–	–	GP	Very dense, grey-brown, sandy (medium to coarse), sub-rounded to sub-angular GRAVEL, trace silt	
13							5						
90/.15m	S	>100	.08		–	–	–	–	–	–			
												— 14.3m	
14													
15	S	85	.4		30	60	10	–	–	–	SP-SM	Very dense, brown-grey, medium to coarse grained, gravelly (sub-rounded) SAND, some silt	
16													
												— 17.0m	
17					60	35	5	–	–	–	GP	Very dense, grey-brown, sub-angular, sandy (medium to coarse) GRAVEL, trace silt	

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 01 of 02

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-3

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 9+73.6, 19.3m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.6m
Driller: J. SUMPTER/MOTH — Method H-RODS, MUD ROTARY — Dates 90-05-4/8

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
1					80	15	5	–	–	–	GP	Compact, grey-brown GRAVEL, some sand, trace silt, FILL	
	S	21	.18									— 1.4m	
2					60	25	15	–	–	–	GM1	Compact, red-brown, sub-rounded, sandy (medium to coarse) GRAVEL, some silt	
												— 2.4m	
3	S	29	.2		50	40	10	–	–	–	GP-GM	Compact, brown, medium to coarse SAND and sub-rounded to sub-angular GRAVEL, trace silt	
												— 3.3m	
4	S	43	.2		65	30	5	–	–	–	SB	Gravelly COBBLES (to about 0.25m diameter	
											GP+SB		
5												— 4.3m	
6	S	35	.15		85	15	–	–	–	–	GP	Dense, grey, sub-rounded to sub-angular, sandy (medium to coarse) GRAVEL and COBBLES to about .25m diameter, trace silt	
												— 5.9m	
7												Dense, grey, sub-angular GRAVEL, some medium to coarse sand	
												— 6.8m	
8	S	82	.23		60	35	5	–	–	–	GP	Very dense, grey-brown, sub-angular to sub-rounded, sandy (medium to coarse) GRAVEL, trace silt	
9	S	58	.25		–	–	–	–	–	–			
80/.15m	S	>100	0		–	–	–	–	–	–			
												— 11.0m	
11													
12	S	58	.25		40	55	5	–	–	–	SP+GP	Very dense, brown, medium to coarse SAND and sub-rounded GRAVEL, trace silt	
13													
14	S	32	.23		–	–	–	–	–	–			
												— 14.6m	
15	S	30	.23		65	30	5	–	–	–	GP	Dense, grey-brown, sub-rounded, sandy (medium to coarse) GRAVEL, trace silt	
16													
												— 16.5m	
17					45	50	5	–	–	–	SP+GP	Dense to very dense, grey-brown, medium to coarse SAND and sub-angular to sub-rounded GRAVEL, trace silt	

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 01 of 02

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND–SILT MIXTURES
		SC*	CLAYEY SANDS SAND–CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS WI <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT–CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS WI >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOM–ACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL

*GM1; GC1; SM1; SC1: 12 – 20%
GM2; GC2; SM2; SC2: 20 – 30%
GM3; GC3; SM3; SC3: 30 – 40%
GM4; GC4; SM4; SC4: 40 – 50%

} PASSING .075mm SIEVE

REV. 89-12-01

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-1

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 10+14.25, 2.1m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.5m
Driller: J. SUMPTER/MOTH — Method H-RODS, MUD ROTARY — Dates 90-05-8/9

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
	S	91	.23		–	–	–	–	–	–			
19													
20													
21	S	>100	.08		65	30	5	–	–	–	GP+SB	Very dense, brown-grey, sub-angular, sandy (medium to coarse) GRAVEL, trace silt, occasional COBBLES	
22													
23													
24	S	90	0		–	–	–	–	–	–			
25													
26													
27												26.5m END OF HOLE	
28													
29													
30													
31													
32													
33													
34													
35													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 02 of 02

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-2

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 9+95.3, 5.8m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.7m
Driller: J. SUMPTER/MOTH — Method H-RODS, MUD ROTARY — Dates 90-05-07

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
27/.15m 60/.15m 60/.15m	S	100	.2		60	35	5	–	–	–	GP	Very dense, grey-brown, sub-angular, sandy (medium to coarse) GRAVEL, trace silt	
19												— 19.5m	
50/.15m 55/.15m 57/.15m	S	92	.2		45	50	5	–	–	–	GP	Very dense, grey-brown, medium to coarse SAND and sub-rounded GRAVEL, trace silt	
21												— 21.5m	
22													
23													
24													
84/.15m 88/.15m	S	>100	.2		70	25	5	–	–	–	GP	Very dense, grey, sub-rounded, sandy (medium to coarse) GRAVEL, trace silt	
25													
26													
80/.15m	S	>100	0		–	–	–	–	–	–			
27												27.3m END OF HOLE	
28													
29													
30													
31													
32													
33													
34													
35													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 02 of 02

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-3

Project: HIRSCH CREEK BRIDGE REPLACEMENT, No. 7892
Location: STA. 9+73.6, 19.3m RT. OF P-LINE-OLD ALIGNMENT — Elevation 14.6m
Driller: J. SUMPTER/MOTH — Method H-RODS, MUD ROTARY — Dates 90-05-4/8

Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gravel	Sand	Fines	wL	wp	w	Classification	Description	Other Tests
	S	25	.05		–	–	–	–	–	–			
19												Dense to very dense, grey-brown, medium to coarse SAND and sub-angular to sub-rounded GRAVEL, trace silt	
20													
21	S	85	.23		45	50	5	–	–	–	SP+GP		
22													
23												— 23.0m	
24	S	>100	.1		85	10	5	–	–	–	GP	Very dense, light grey to grey, sub-rounded to sub-angular GRAVEL, some coarse sand, trace silt	
175/.04m													
25													
26													
78/.15m 65/.15m	S	>100	.05		–	–	–	–	–	–			
27												27.4m END OF HOLE	
28													
29													
30													
31													
32													
33													
34													
35													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash

SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded

TESTS: M – Mechanical Analysis; G,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; wL,wp – Liquid, Plastic Limits; w – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01-61-35 | DRAWN BY: YAH/KLASSCAD | SHEET 02 of 02

GENERAL NOTES

NOTE 1) The soil and groundwater conditions shown are representative of the test hole locations only. Conditions encountered during construction may vary. Cobble and boulder sizes are driller's estimate of the dimension encountered.

NOTE 2) Field logs and laboratory logs are available for viewing at Geotechnical and Materials Engineering in Victoria. (Phone No. 387–1881)

NOTE 3) Gradation and classification are based on a visual estimate unless otherwise noted under "other tests".

NOTE 4) BR – Bedrock
Intact Rock Strength (See Canadian Foundation Manual, 2nd Edition, page 35.)

3.6

Hardy BBT Limited

KLASSCAD DRAFTING SPECIALTIES

SCALE 1:100 — 0 1:100 5m

Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

CENTRAL ISLAND DISTRICT; HIGHWAY No. 4

HIRSCH CREEK BRIDGE
SUMMARY LOGS
KENNEDY LAKE

PREPARED BY	RECOMMENDED	ACCEPTED FOR CONSTRUCTION
DESIGN ENGINEER / SUPERVISOR	DIRECTOR, GEOTECHNICAL & MATERIALS ENG.	CHIEF HIGHWAY ENGINEER
DATE 90-10-26	DATE Oct 26/90	DATE

DESIGNED	YAH	90-10-25	NEGATIVE No. 92,847	PROJECT No.	DRAWING No.
CHECKED	[illegible]	90-10-25	CAD No. CHC92847		7892–
DRAWN	KLASSCAD	90-10-23	FILE No. 01-81-35	REGION No. 8	

CANCEL PRINTS BEARING PREVIOUS LETTER

A-212 (MK-05-90)

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-1

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK
Location STA. 19+90.8, .4m RT.
Driller D. ROBERTS
Method ROTARY DRILL
Elevation 325.36m
Dates 90-02-14

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Blowcount Details	1	S	100	0		–	–	–	–	–	–	(GP) +SB		
80/.08m	2													
90/.08m	3	S	100	.05		90	10	–	–	–	–	GP +SB	Very dense GRAVEL, with some sand and COBBLES to 250mm becoming sandy and silty with depth	
90-02-27	4	S	100	.10		65	35	–	–	–	–	GP +SB		
65/.15m	5													
48/.15m	6	S	100	.22		40	50	10	–	–	–	SP -SM		
65/.15m													6.7m	
85/.15m	7	S	100	.10		25	55	20	–	–	–	SM_2	Gravelly silty SAND	
													7.6m	
	8	S	100	.08		20	30	50	–	–	–	ML	Very hard, sandy, gravelly SILT, non-plastic	
33/.15m													10.0m	
90/.10m	10	S	100	.18		30	50	20	–	–	–	SM_2		
90/.15m	11	S	100	.15		20	50	30	–	–	–	SM_3 + SB		
100/.076m	12	S	100	0		–	–	–	–	–	–		Very dense gravelly and silty SAND with some COBBLES to 200mm	
50/.15m	13													
90/.15m	14													
	15	S	100	.30		40	45	15	–	–	–	SM_1 + SB		
	16													
	17													
103/.15m		S	100	.12		20	50	30	–	–	–	SM_1		

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash
SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded
TESTS: M – Mechanical Analysis; Q,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; w_L, w_P – Liquid, plastic Limits; w – Moisture Content
Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43
DRAWN BY: BK/KLASSCAD
SHEET of 01 02

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-2

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK
Location STA. 20+86.4, .6m RT.
Driller D. ROBERTS
Method ROTARY DRILL
Elevation 326.12m
Dates 90-03-03

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Blowcount Details														
70/.15m	1	S	100	.20		85	15	–	–	–	–	SB +GP	Very dense GRAVEL with some sand and COBBLES to 150mm	
60/.07m													1.5m	
80/.10m	3	S	100	0		–	–	–	–	–	–	(GP) +LB +SB	Driller reports very dense GRAVEL with LARGE BOULDERS and COBBLES to 180mm	
70/.06m	4	S	100	.08		30	60	10	–	–	–	SP -SM		
90-03-05													4.2m	
	5											+SB		
80/.12m	6	S	100	.05		95	5	–	–	–	–	GP +SB	Very dense gravelly SAND and GRAVEL, some fs silty, contains COBBLES to 250mm	
60/.15m	7	S	100	.12		15	60	25	–	–	–	SM_2 +SB		
60/.08m	9	S	100	0		–	–	–	–	–	–	SM_2 +SB		
													9.4m	
60/.10m	10	S	100	.05		–	–	–	–	–	–	LB	LARGE BOULDER	
													9.8m	
	11											(GP) +(SB)	Driller reports GRAVEL and COBBLES to 100mm	
	12												11.7m	
	13											LB	LARGE BOULDER	
													13.5m	
	14													
65/.08m	15	S	100	.07		60	35	5	–	–	–	GP +SB	Very dense sandy GRAVEL and COBBLES to 120mm	
	16													
	17													
65/.05m		S	100	.05		100	–	–	–	–	–	GP		

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash
SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded
TESTS: M – Mechanical Analysis; Q,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; w_L, w_P – Liquid, plastic Limits; w – Moisture Content
Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43
DRAWN BY: BK/KLASSCAD
SHEET of 01 02

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-3

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK
Location STA. 19+32.8, C.L.
Driller D. ROBERTS
Method ROTARY DRILL
Elevation 350.28m
Dates 90-03-1/2

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Blowcount Details														
55/.15m	1	S	100	.08		65	35	–	–	–	–	GP +SB	Very dense sandy GRAVEL with COBBLES to 120mm	
90-03-02													2.7m	
33/.15m	2													
60/.15m	3	S	100	.20		20	65	15	–	–	–	SM_1 +SB	Very dense gravelly SAND with some silt and COBBLES to 150mm	
17/.15m	4	S	100	.18		20	50	30	–	–	–	LB	LARGE BOULDER	
87/.15m													3.9m	
	5												4.3m	
40/.15m												SM_3	Very dense silty SAND with gravel	
60/.10m	6	S	100	.08		65	35	–	–	–	–	GP	Very dense GRAVEL and SAND	
	7													
100/.05m	8	S	100	0		–	–	–	–	–	–		7.4m	
	9											GP +SB	Very dense sandy GRAVEL with trace silt and some COBBLES to 150mm	
90/.05m	10	S	100	.05		100	–	–	–	–	–			
	11	C	–	.16		60	35	5	–	–	–	GP		
												LB	LARGE BOULDER	
													11.2m	
90/.12m	12	S	100	.13		45	45	10	–	–	–	SP-SM	11.6m	
50/.15m	13													
55/.10m	14	S	100	.15		40	50	10	–	–	–	SP-SM	Very dense SAND and GRAVEL with some silt and COBBLES to 80mm	
50/.15m														
87/.15m	15	S	100	.15		20	70	10	–	–	–	SP-SM		
	16												15.2m END OF HOLE	
	17													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash
SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded
TESTS: M – Mechanical Analysis; Q,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; w_L, w_P – Liquid, plastic Limits; w – Moisture Content
Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43
DRAWN BY: BK/KLASSCAD
SHEET of 01 01

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND–SILT MIXTURES
		SC*	CLAYEY SANDS SAND–CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS WL <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT–CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS WL >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL
*GM1; GC1; SM1; SC1; 12 – 20%
GM2; GC2; SM2; SC2; 20 – 30%
GM3; GC3; SM3; SC3; 30 – 40%
GM4; GC4; SM4; SC4; 40 – 50%
} PASSING .075mm SIEVE

REV. 89-12-01

GENERAL NOTES

NOTE 1) The soil and groundwater condtions shown are representative of the test hole locations only. Conditions encountered during construction may vary. Cobble and boulder sizes are driller's estimate of the dimension encountered.
NOTE 2) Field logs and laboratory logs are available for viewing at Geotechnical and Materials Engineering in Victoria. (Phone No. 387–1881)
NOTE 3) Gradation and classification are based on a visual estimate unless otherwise noted under "other tests".
NOTE 4) BR – Bedrock
Intact Rock Strength (See Canadian Foundation Manual, 2nd Edition, page 35.)

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-1

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK
Location STA. 19+90.8, .4m RT.
Driller D. ROBERTS
Method ROTARY DRILL
Elevation 325.36m
Dates 90-02-14

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Rock Quality Designation	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Blowcount Details	19											+SB		
	20													
83/.15m	21	S	100	.12		40	50	10	–	–	–	SP -SM	Very dense SAND and GRAVEL with some silt and some COBBLES to 200mm	
	22													
	23													
100/.05m	24	S	100	0		–	–	–	–	–	–	+SB		
	25													
	26												26.5m	
100/.05m	27	S	100	.05		90	10	–	–	–	–			
	28	C	–	–	8%	80	20	–	–	–	–	(BR)	Driller suspects BEDROCK, but is unable to recover sufficient core to be certain	
	29	C	–	–	17%	80	20	–	–	–	–			
	30												30.0m END OF HOLE	
	31													
	32													
	33													
	34													
	35													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash
SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded
TESTS: M – Mechanical Analysis; Q,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; w_L, w_P – Liquid, plastic Limits; w – Moisture Content
Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43
DRAWN BY: BK/KLASSCAD
SHEET of 02 02

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch — TEST HOLE No. 90-2

Project FRASER RIVER BRIDGE No. 109, NEAR CHURN CREEK
Location STA. 20+86.4, .6m RT.
Driller D. ROBERTS
Method ROTARY DRILL
Elevation 326.12m
Dates 90-03-03

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Sand	Fines	Index Properties w_L	w_P	w	Classification	Description	Other Tests
Blowcount Details	19												18.4m	
	20													
100/.08m	21	S	100	.08		–	95	5	–	–	–	SP	Very dense SAND with a trace of silt	
	22													
	23													
90/.05m	24	S	100	0		–	–	–	–	–	–			
	25												24.5m	
	26	S	–	0		–	–	–	–	–	–	(BR)	Driller reports BEDROCK that he couldn't sample	
	27												26.5m END OF HOLE	
	28													
	29													
	30													
	31													
	32													
	33													
	34													
	35													

SAMPLE TYPE: A – Auger; C – Core; D – Denison; S – Split Spoon; T – Shelby Tube; W – Wash
SHEAR STRENGTH kPa: U – Unconfined Compression; Fv – Field Vane; Lv – Lab Vane; R – Remoulded
TESTS: M – Mechanical Analysis; Q,R,S – Triaxial Compression; C – Consolidation; DS – Direct Shear; w_L, w_P – Liquid, plastic Limits; w – Moisture Content
Blowcount – Standard Penetration Test (ASTM 1956)

FILE No. 01-22-43
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SHEET of 02 02

DRAWING REDUCED
APPROX:
HALF SIZE.

SCALE 1:100

3.6

Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

SOUTH CARIBOO DISTRICT, MEADOW CREEK ROAD
FRASER RIVER BRIDGE No. 109
TEST HOLE LOGS
NEAR CHURN CREEK

PREPARED BY	RECOMMENDED	ACCEPTED FOR CONSTRUCTION
DESIGN ENGINEER / SUPERVISOR	DIRECTOR, GEOTECHNICAL & MATERIALS ENG.	CHIEF HIGHWAY ENGINEER
DATE	DATE 90-04-25	DATE

DESIGNED	GSR	90-04-25	NEGATIVE No. 82,733	PROJECT No.	DRAWING No.
CHECKED	GSR	90-04-25	CAD No. GHO82733		109–32
DRAWN	KLASSCAD	90-04-12	FILE No. 01-22-43	REGION No. 2	

CANCEL PRINTS BEARING PREVIOUS LETTER

(90-03-20)

SECTION 4
Foundation Investigation Drawing

SECTION 4 - FOUNDATION INVESTIGATION DRAWING (AutoCAD Prototype GHBASE1A)
(for inclusion in Geotechnical Report at approximately 47% reduction, 11" X 17")

4.0.... PREPARATION STANDARDS

Preferred method of drafting, AutoCAD Release 10 and Geotechnical and Materials Engineering Standards.

See 4.8 and 4.9 - AutoCAD information
See 4.10 - Examples

4.1.... PLAN (show test hole locations and pertinent information)

- Control Line with Stationing
- Test Hole Locations and Number
- Existing and Proposed Bridge Outline
- Proposed Approach Fill Outline and Rip Rap
- Existing and Proposed Highways, Roads and Railway, etc.
- Existing and Proposed Utilities and Existing Buildings
- Water Levels and Drainage Features
- Contours (.5m or 1.0m intervals)
- Other Entities which may influence Foundation Design (eg. old piers or abutments, temporary detours, rock outcrops)
- North Arrow
- Appropriate labeling of Features
- Scale (metric)
  - Small Structures (1:100) or (1:250)
  - Large Structures (1:250)

4.2.... PROFILE (including test hole logs)

- Test hole Logs to include (see 4.9)
  - Station, Offset, Elevation and Test Hole No.
  - Water Table and Date
  - Log (conclusion of log to be designated End or Refusal)
  - Soil Classification symbols
  - Disturbed, Undisturbed and Cored samples
  - Blowcounts
  - Attebergs (wL, wP, W)
- Proposed Bridge Structure when available
- Groundline along Control Line and Finished Grade
- Axis Showing Stationing and Elevation
- Water Levels of River (extreme, high and current)
- Scale same as plan (natural)

4.3.... KEY MAP (appropriate scale to define location of site)

- Towns and Cities
- Highways, Roads, and Railways
- Lakes, Rivers and Creeks
- Bridge Site noted

4.4.... MATERIALS CLASSIFICATION LEGEND (GLEGEND1)

See Appendix A

4.5.... GEOTECHNICAL AND MATERIALS ENGINEERING TITLE BLOCK (CHTITLE1) AND SIGNING INSTRUCTIONS (See 3.3a and 3.3b)

- Type of Drawing (FOUNDATION INVESTIGATION)
- This drawing currently is not included in Bridge Contract, therefore signing by Ministry Executive and drawing number are not required.

4.6.... REPRODUCTION AND STORAGE REQUIREMENTS

- 1 - Fullsize original A1 Size (vellum) for Geotechnical and Materials Engineering Drawing Storage
-10 - Paper Copies Approximately 47% for inclusion in Geotechnical Report (11" X 17")
- 2 - 5.25 Floppy Disk (Preferably Dysan 1.2M) for Geotechnical and Materials storage

4.7.... DETAIL DRAWINGS

- Other detailed drawings maybe required to define a specific site such as cross sections, offset profiles and construction details, etc.

4.8 .... FOUNDATION INVESTIGATION AUTOCAD INFORMATION (GHBASE1A)

STANDARD LAYERS GUIDE

LAYER NAME	COLOR	LINETYPE
0		Continuus
GRCO	red	"
GYCO	yellow	"
GGCO	green	"
GCCO	cyan	"
GRDA	red	dashed
GYDA	yellow	"
GGDA	green	"
GCDA	cyan	"
CYCE	yellow	center
CRTXT	red	continuous
GYTXT	yellow	"
GGTXT	green	"
GCTXT	cyan	"

PLAN:

CENTERLINE - GYCE, GYCO

CONTOURS - GRCO, GYCO

BRIDGE OUTLINE -
- Existing - GYDA
- Proposed - GGCO
  if proposed bridge outline not available, use GYCO for existing bridge outline

ROADWAY -
- Paved - GGCO
- Gravel - GGDA
- Shoulder - GYDA

WATER LEVELS -
- Water Level - GGDA
- High Water Mark - GYDA
- Extreme W.M. - GYDA

TESTHOLES - GGCO

PROFILE:

BRIDGE - GYCO

GROUNDLINE - GGCO

GRADE - GYCO

WATER LEVELS - GYDA

TESTHOLES - GYCO

AXIS - GYCO

KEY MAP:

MAIN ROADS -
Existing - GGCO Proposed - GGDA

SECONDARY ROADS -
Existing - GYCO Proposed - GYDA

RIVERS AND LAKES - GYCO

CREEKS - GRCO

BORDERS - GCCO

LEGEND: - thaw layer GLEGEND1

TEXT:

TITLES - GGTXT

NOTATIONS - GRTXT, GYTXT, GGTXT

2.0 mm - GRTXT - RomanS
2.5 mm - GYTXT - "
3.5 mm - GCTXT - "
5.0 mm - GCTXT - "

WATER FEATURES:

2.0 mm - GRTXT - RomanS
2.5 mm - GYTXT - "
3.5 mm - GGTXT - 15° slope - RomanC
5.0 mm - GCTXT - 15° slope - "

4.9 - GEOTECHNICAL AUTOCAD TEST HOLE LOGS FOR DRAWINGS
(Scales 1:50, 1:100, 1:200, 1:250)

PROTOTYPE FILE NAME: GHLOG50, GHLOG100, GHLOG200, GHLOG250

LOAD FILENAME: FILENAME = PROTOTYPE (item 1 on AutoCAD main menu, new drawing)
eg. 90-1 = GHLOG200

VIEWS: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70
(depth in meters)

LAYERS: 0

LISP: IN - LISP routine which inserts the following blocks simply by multiplying the depth by 10.
eg. 50 inserts block @ 5.0 m
119 inserts block @ 11.9 m
(Use AutoCAD insert command to insert block - LOG)

BLOCKS: To prepare a test hole log which is mirrored, type [- L] following each block name.

eg. LOCN-L
UD6-L

- Test Hole label (verticle) insert at depth 0
- LOCN = Location, metre and blow count
- LOCA = Location, metre, blow count and atterberg symbols

- Test Hole Labels (Horizontal)
- LocN-H = Location, metre and blowcounts
- LocA-H = Location, metre, blowcount and atterberg symbols

LOG = TEST HOLE LOG OUTLINE (USE AutoCAD insert command)
- insert @ 0,0 on layer 0
(X - scale Factor = 1)
(Y - scale Factor = depth of hole)

eg. Y scale Factor 2.9 creates a test hole log 2.9 metres deep.

E = END OF HOLE
- defines test hole which has reached required depth and depth (m).

R = REFUSAL
- defines depth which hole was terminated due to material density encountered and depth (m).

B = BOUNDARY
- shows defined material boundary and depth (m).

DB = DASHED BOUNDARY
- shows approximate material boundary and depth (m).

WT-M = WATER TABLE MEASURED and date
WT-E = WATER TABLE ESTIMATED and date
WT-A = WATER TABLE ARTESIAN and date

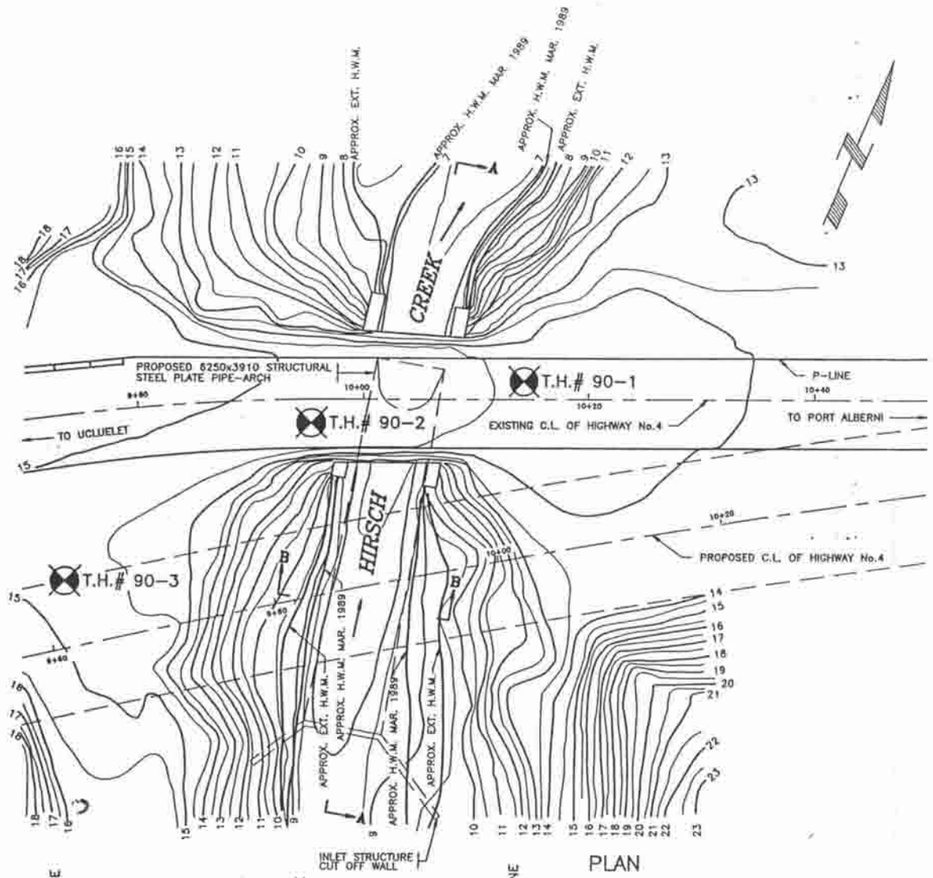
D0 = DISTURBED SAMPLES
D1 - D0 used for disturbed samples driven greater than 1.0m or samples with dual results
D2
D3
D4
D5 - D1 to D10 are for disturbed samples driven .1m to 1.0m
D6
D7
D8
D9
D10

UD1 = UNDISTURBED SAMPLES
UD2
UD3
UD4 - same as above
UD5 but with undisturbed samples
UD6
UD7
UD8
UD9
UD10

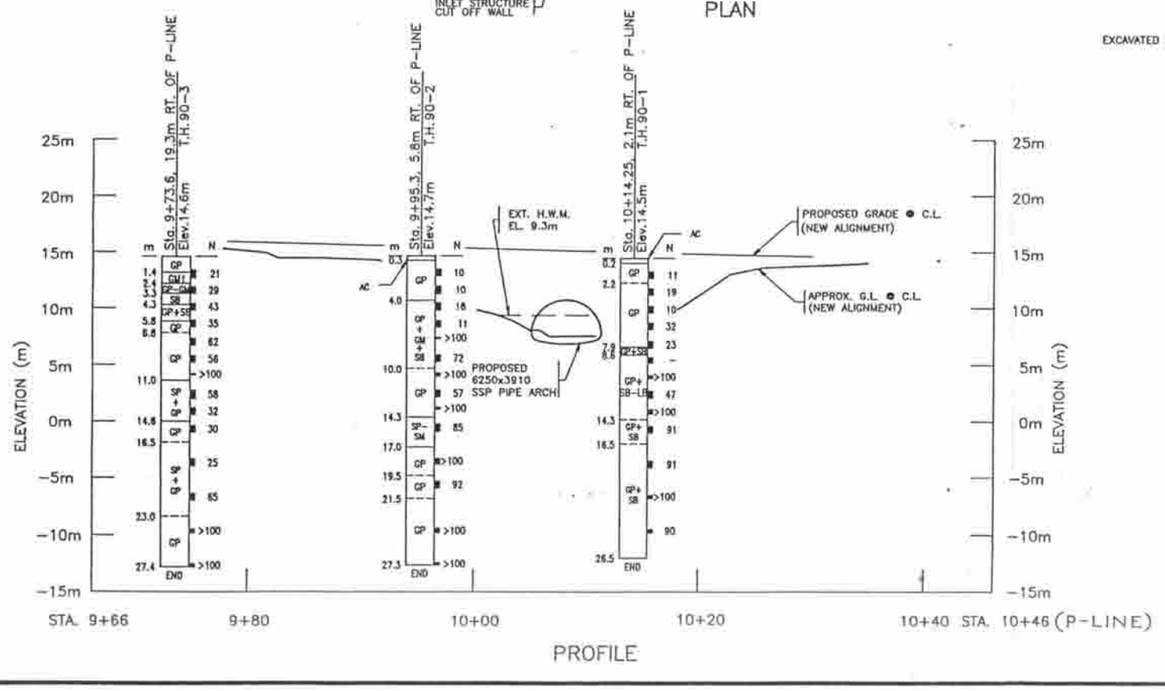
P = Piezometer
- insert @ tip elevation

WBLOCK: - each test hole log for insertion into drawing.
- insert into drawing with the following Scale Factors.

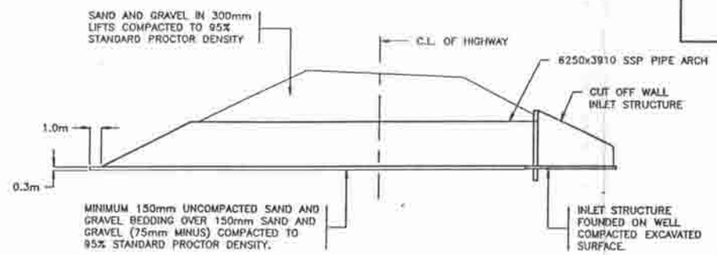
GHLOG50 1:50 Scale - Scale Factor of 2
GHLOG100 1:100 Scale - Scale Factor of 1
GHLOG200 1:200 Scale - Scale Factor of .5
GHLOG250 1:250 Scale - Scale Factor of .4



PLAN

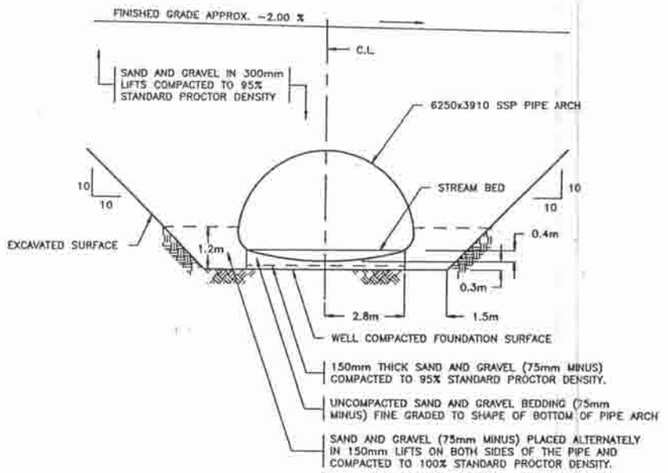


PROFILE



SECTION A-A

SCALE: 1:250

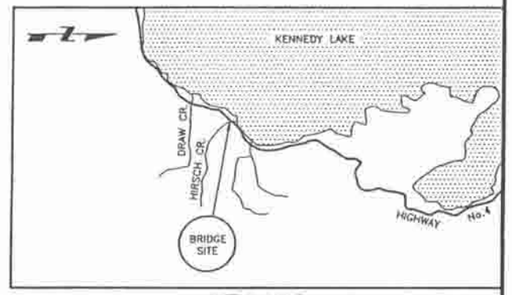


SECTION B-B

SCALE: 1:100

0 1:100 5m

DRAWING REDUCED
APPROX:
HALF SIZE.



KEY MAP

SCALE: N.T.S.

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL-SAND MIXTURES, < 5% FINES
		GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL-GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND-SILT MIXTURES
		SC*	CLAYEY SANDS SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS WI <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS WI >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 - 12% PASSING .075 SIEVE, USE DUAL SYMBOL
*GM1; GC1; SM1; SC1; 12 - 20%
GM2; GC2; SM2; SC2; 20 - 30%
GM3; GC3; SM3; SC3; 30 - 40%
GM4; GC4; SM4; SC4; 40 - 50%
PASSING .075mm SIEVE

REV. 89-12-01

4.10

Hardy BBT Limited

KLASSCAD DRAFTING SPECIALTIES

SCALE 1:250 0 1:250 10m

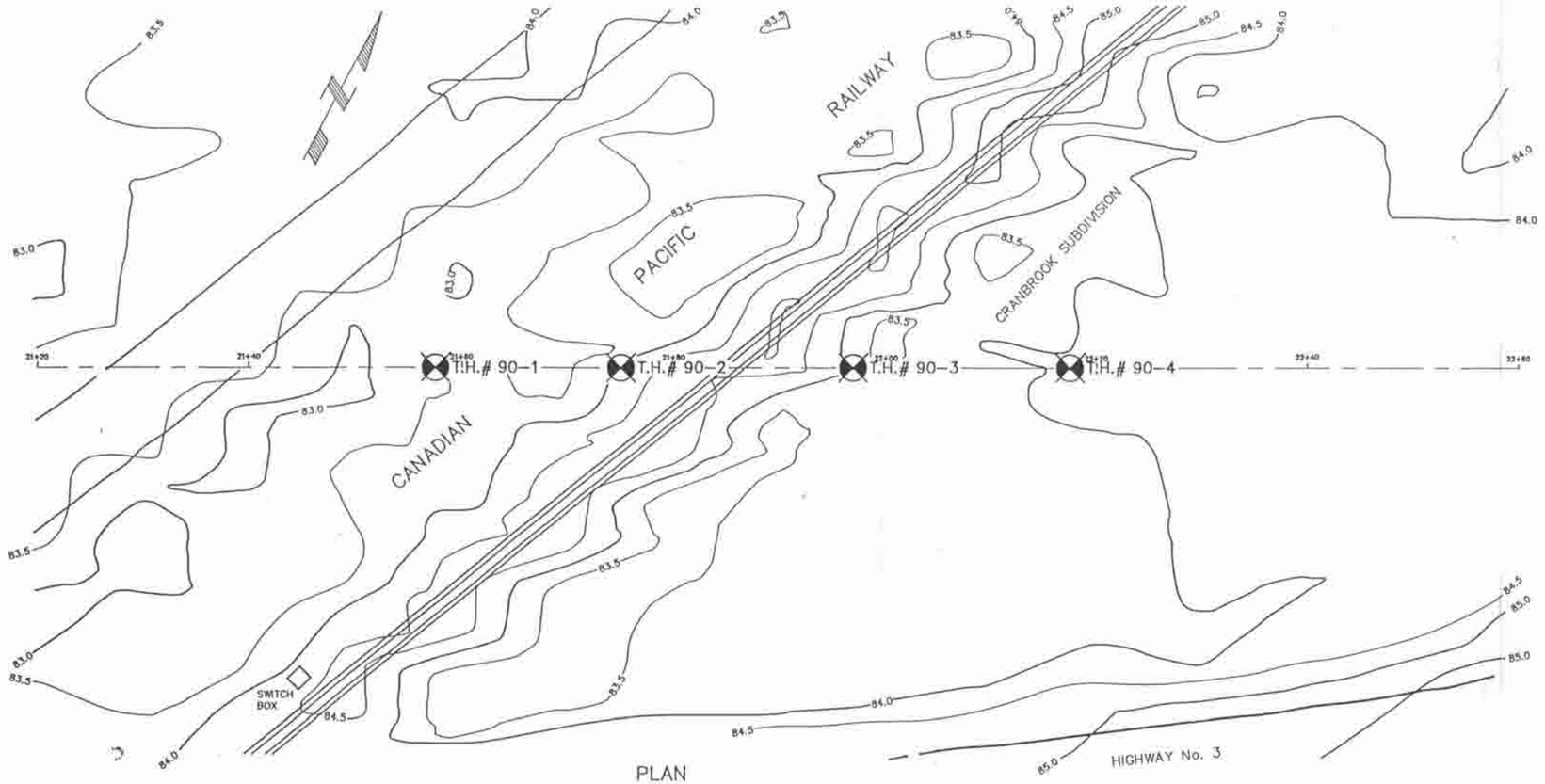
Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

CENTRAL ISLAND DISTRICT; HIGHWAY No.4
HIRSCH CREEK BRIDGE
FOUNDATION INVESTIGATION
KENNEDY LAKE

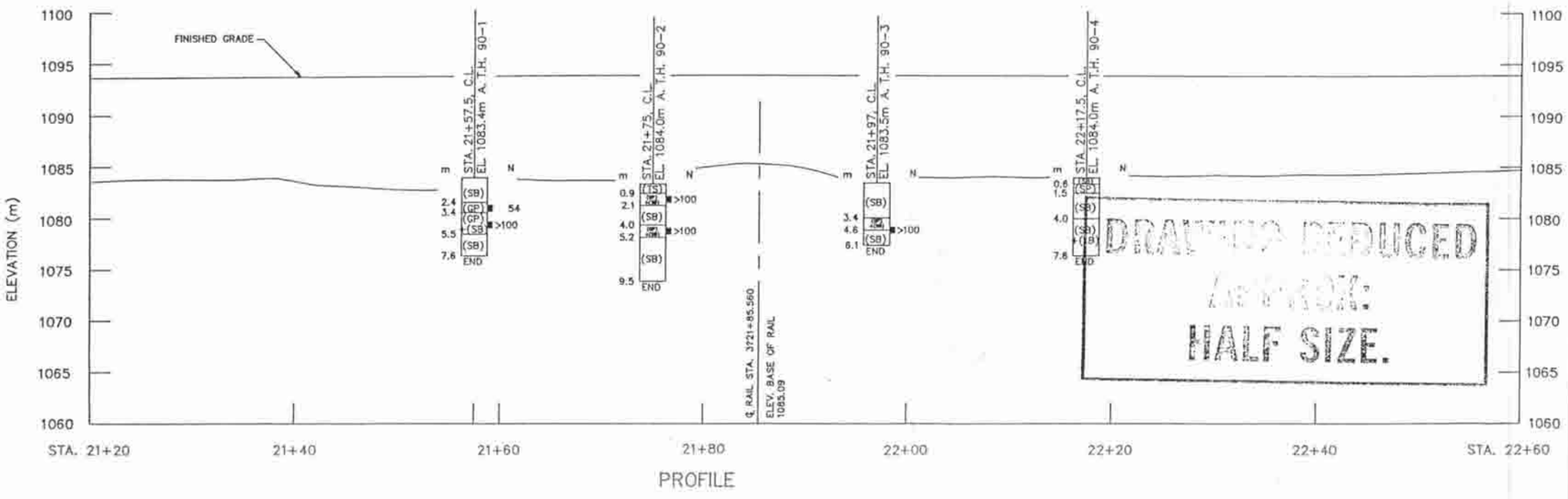
PREPARED BY		RECOMMENDED	ACCEPTED FOR CONSTRUCTION
DESIGN ENGINEER / SUPERVISOR		DIRECTOR, GEOTECHNICAL & MATERIALS ENG.	CHIEF HIGHWAY ENGINEER
DATE		DATE	DATE

DESIGNED	UMA	90-10-25	NEGATIVE No. 92,848	PROJECT No.	DRAWING No.
CHECKED	Plank	90-10-25	CAD No. GHC92848		
DRAWN	KLASSCAD	90-10-23	FILE No. 01-81-35	REGION No. 6	

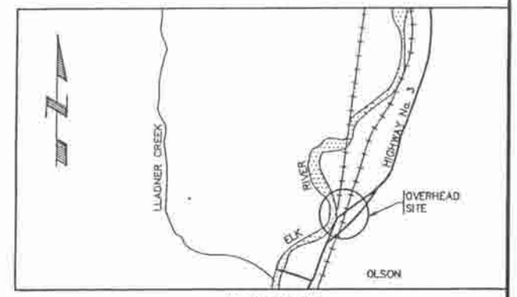
CANCEL PRINTS BEARING PREVIOUS LETTER



PLAN



PROFILE



KEY MAP
SCALE: N.T.S.

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND–SILT MIXTURES
		SC*	CLAYEY SANDS SAND–CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS W_L <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT–CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS W_L >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL
*GM1; GC1; SM1; SC1; 12 – 20%
GM2; GC2; SM2; SC2; 20 – 30%
GM3; GC3; SM3; SC3; 30 – 40%
GM4; GC4; SM4; SC4; 40 – 50%
} PASSING .075mm SIEVE

REV. 89-12-01

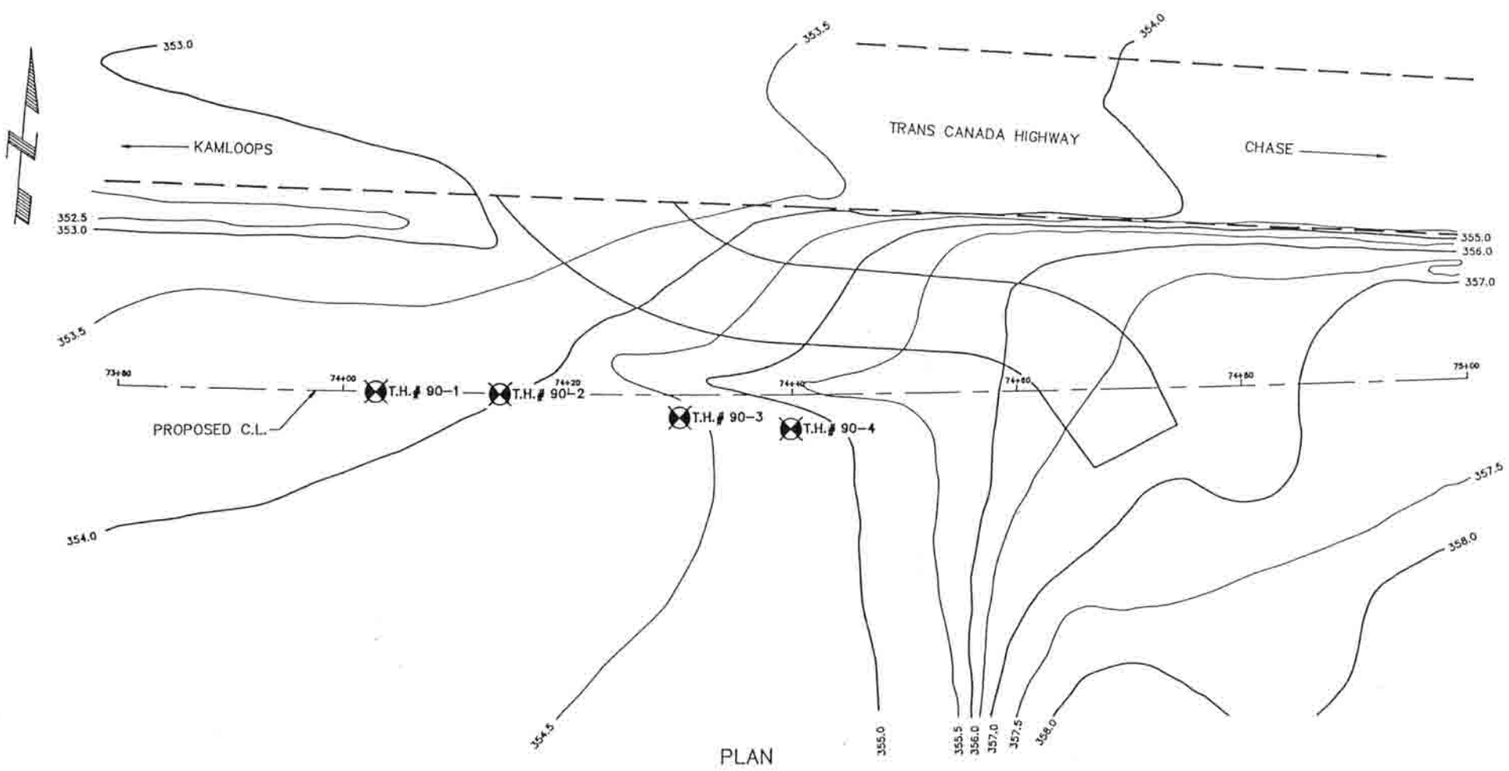
SCALE 1:250

4.10

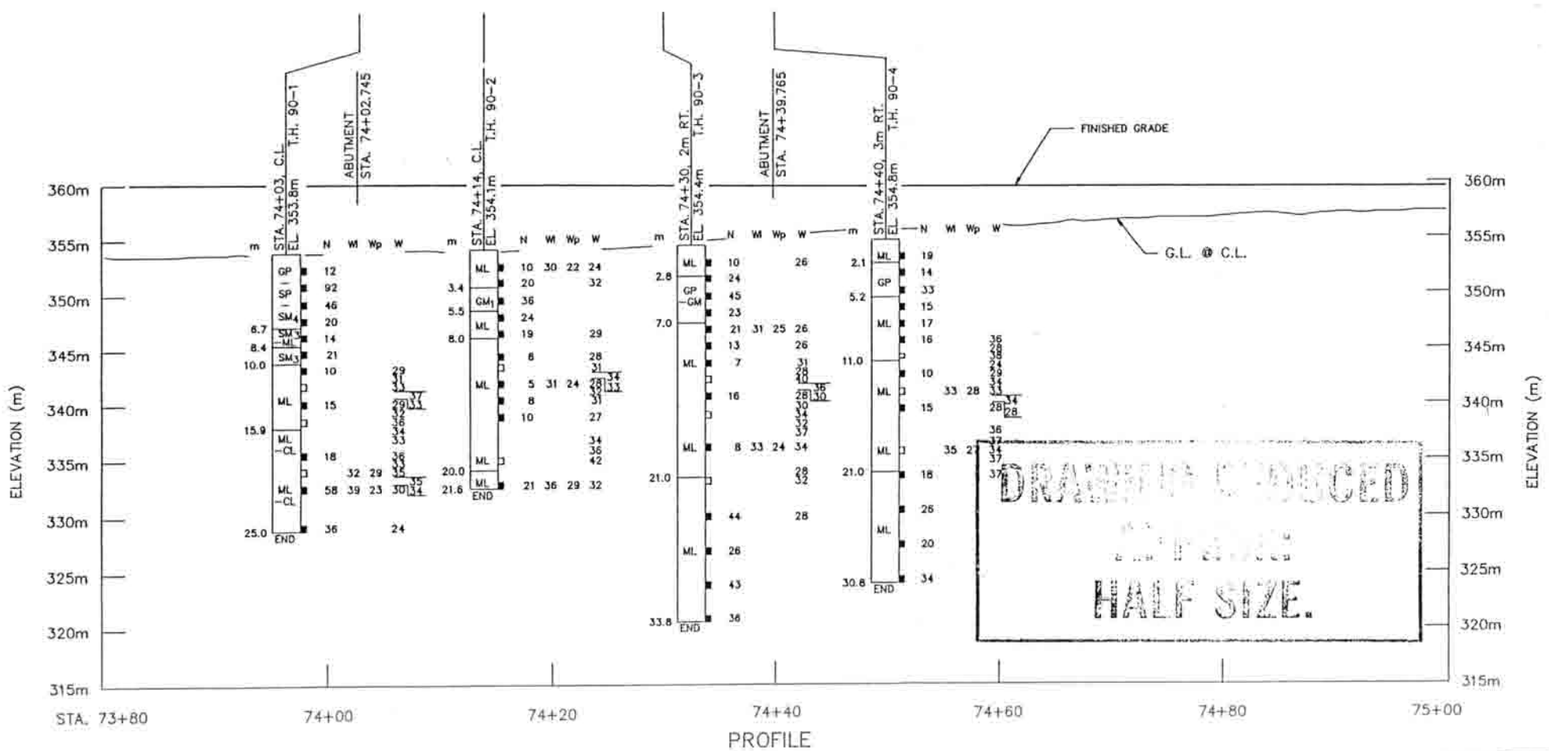
Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

EAST KOOTENAY, HIGHWAY No. 3
OLSON OVERHEAD No. 2265
FOUNDATION INVESTIGATION
C.P.R. CROSSING CRANBROOK SUBDIVISION

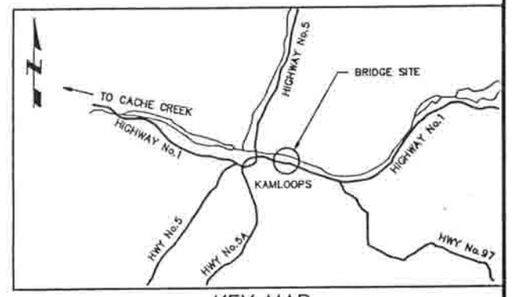
PREPARED BY		RECOMMENDED		ACCEPTED FOR CONSTRUCTION
DESIGN ENGINEER / SUPERVISOR		DIRECTOR, GEOTECHNICAL & MATERIALS ENG.		CHIEF HIGHWAY ENGINEER
DATE		DATE		DATE
DESIGNED	S. Tao	NEGATIVE No. 92,728	PROJECT No.	DRAWING No.
CHECKED	S. Tao	CAD No. GHD92728		
DRAWN	KLASSCAD 90-04-02	FILE No. 01-32-13	REGION No. 3	



PLAN



PROFILE



KEY MAP
SCALE: N.T.S.

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GM*	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC*	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SAND AND SANDY SOILS	SW	WELL–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SP	POORLY–GRADED SANDS OR GRAVELLY SANDS, < 5% FINES
		SM*	SILTY SANDS SAND–SILT MIXTURES
		SC*	CLAYEY SANDS SAND–CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS WL <50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILT–CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS WL >50	MH	INORGANIC SILTS, MICACEOUS OR DIATOM–ACEOUS FINE SANDY OR SILTY SOILS, PLASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS
TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL
*GM1; GC1; SM1; SC1; 12 – 20%
GM2; GC2; SM2; SC2; 20 – 30%
GM3; GC3; SM3; SC3; 30 – 40%
GM4; GC4; SM4; SC4; 40 – 50%
} PASSING .075mm SIEVE

REV. 89-12-01

SCALE 1:250

4.10

Province of British Columbia
MINISTRY OF TRANSPORTATION AND HIGHWAYS
GEOTECHNICAL AND MATERIALS ENGINEERING

THOMPSON DISTRICT, TRANS CANADA HIGHWAY
KIPP ROAD OVERPASS No. 2948
FOUNDATION INVESTIGATION
BARNHARTVALE TO CAMPBELL CREEK

PREPARED BY			RECOMMENDED		ACCEPTED FOR CONSTRUCTION
DESIGN ENGINEER / SUPERVISOR			DIRECTOR, GEOTECHNICAL & MATERIALS ENG.		CHIEF HIGHWAY ENGINEER
DATE			DATE		DATE
DESIGNED			NEGATIVE No. 92.749	PROJECT No.	DRAWING No.
CHECKED			CAD No. CHG92749		
DRAWN	KLASSCAD	90-04-21	FILE No. 01-22-80	REGION No. 3	

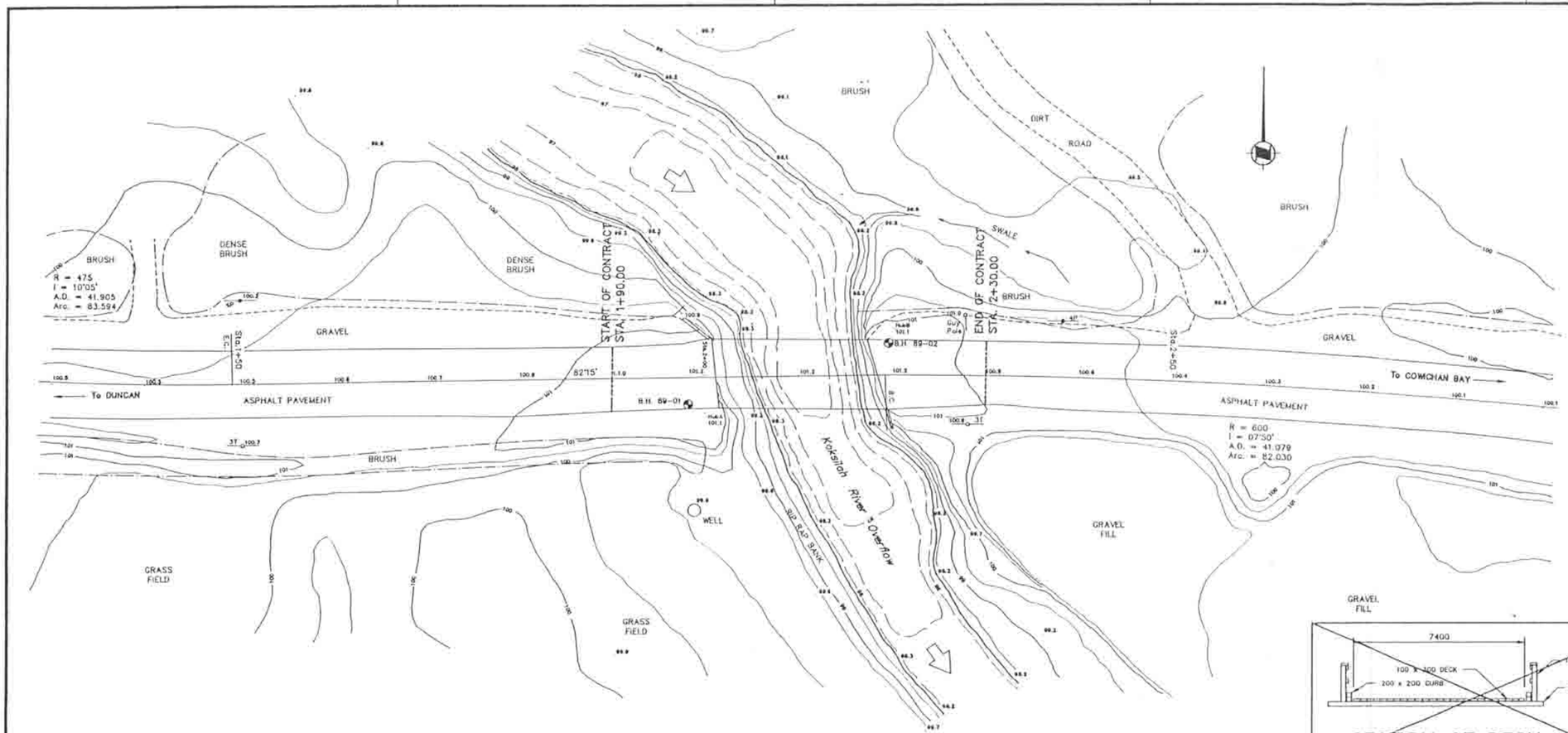
SECTION 5
Bridge Branch Site Plan

SECTION 5 - BRIDGE BRANCH SITE PLAN CONTRACT DRAWING

5.0.... REQUIREMENTS

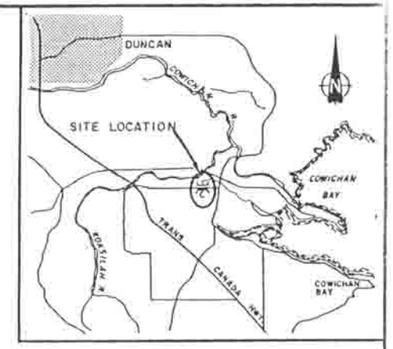
Inform structural designer of test hole locations, number and collar elevation for inclusion on Bridge Contract Site Plan drawing.

See 5.1 - Example



PLAN

1 : 250



KEY PLAN

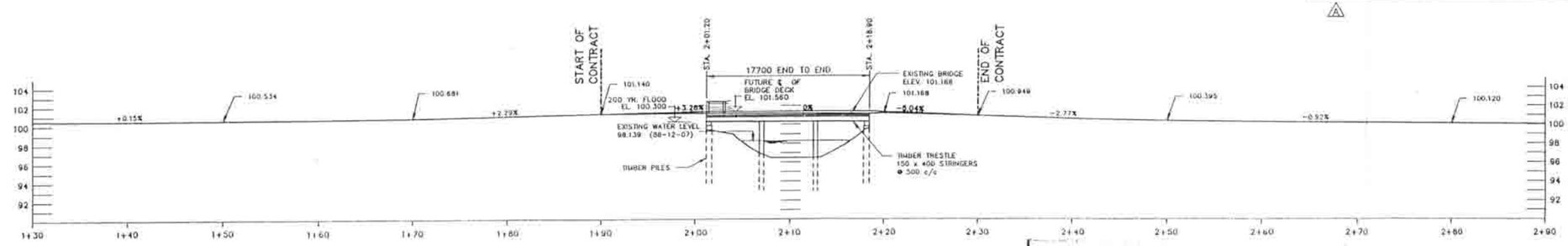
n.t.s.

VERBAL BRIDGE LOCATION

BRIDGE SITE LOCATED APPROXIMATELY 1 km EAST OF TRANS CANADA HIGHWAY TOWARD COWICHAN BAY

SECTION OF DECK

1 : 100



PROFILE

1 : 250

5.1

GENERAL NOTES

1) SITE SURVEYED BY T.M. THOMSON & ASSOCIATES LTD. 88-12-07.

2) BASE PLAN PREPARED BY T.M. THOMSON & ASSOCIATES LTD. 89-01-30.

3) B.M. "T.C." ASSUMED ELEV. 100.00, NAIL IN TELEPHONE POLE, SOUTH 7.5m FROM STA. 3+55

LIST OF DRAWINGS	
DWG. No.	TITLE
6886-1	SITE PLAN
6886-2	GENERAL ARRANGEMENT
6886-3	SUBSTRUCTURE
6886-4	SUPERSTRUCTURE
6886-5	BOREHOLE DATA

REFERENCE DRAWINGS	
DWG. No.	TITLE
2310-6	STANDARD COMPOSITE PRESTRESSED CONCRETE BOX STRINGER – MK700/15
2784-1	STANDARD BRIDGE PARAPET – 810mm HIGH
2784-2	STANDARD BRIDGE PARAPET – 810mm HIGH – TRANSITION
2784-3	STANDARD BRIDGE END DETAILS
2785-1	STANDARD BRIDGE PARAPETS – STEEL RAILING

KER, PRIESTMAN & ASSOCIATES LTD.
consulting engineers
VICTORIA VANCOUVER

D		
C		
B		
A	AS-BUILT REVISIONS	94/05/10
	REVISIONS	DATE

GOVERNMENT OF BRITISH COLUMBIA
MINISTRY OF TRANSPORTATION AND HIGHWAYS
BRIDGE ENGINEERING BRANCH

SOUTH ISLAND DISTRICT
COWICHAN BAY ROAD

TENNIS COURT BRIDGE

SITE PLAN

JAN 3 1991

PREPARED UNDER THE DIRECTION OF	DATE	SCALE: AS NOTED		MISL NO.	
CONSULTING ENGINEER	91/1/03	DRAWN: K.C-D		CHECKED: F.R.	
RECOMMENDED	DATE	ACCEPTED FOR CONSTRUCTION		DATE	DRAWING NO.
PETER BRETT DIRECTOR OF BRIDGE ENGINEERING	90/05/10	E. LUND DIST HIGHWAY ENGINEER		90/05/10	6886-1 A

SECTION 6
Geotechnical Personnel

SECTION 6 - CONTACTS

6.0.... GEOTECHNICAL AND MATERIALS ENGINEERING STAFF

- Turgut Ersoy, P. Eng. 356-0390
  Manager Geotechnical Engineer

- Kirby Rimer 387-7706
  Geotechnical Engineering Technician

DESIGN SECTION

- Bryan Kern, P. Eng. 387-7704
  Senior Geotechnical Engineer

- Shannon Tao, P. Eng. 387-7705
  Geotechnical Engineer

- Ivan Grof, P. Eng. 387-7701
  Geotechnical Engineer

TERRAIN SECTION

- Don Lister, P. Eng. 387-7703
  Senior Terrain Evaluation Engineer

- Rob Buchanan 387-7702
  Senior Terrain Analyst

GENERAL PHONE NUMBER 387-1881
FACSIMILE 356-0624

ADDRESS Geotechnical and Materials Engineering Branch
Ministry of Transportation
and Highways
4A - 940 Blanshard Street
Victoria, B.C.
V8W 3E6

6.1.... DRAFTING SERVICES

Klas CAD Drafting Specialties
4954 Wesley Road
Victoria, B.C., V8Y 1Y9
Phone No.: 658-5537
Attention: Wes or Shelley Klassen

The above firm prepares Geotechnical AutoCAD drawings. Their charge rate is approximately $30.00/hr.

SECTION 7
AutoCAD Library Disks

APPENDIX A
Legend and Definition of Aggregates

MATERIALS CLASSIFICATION LEGEND

MAJOR DIVISIONS		SYMBOL	SOIL TYPE
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
		GP	POORLY–GRADED GRAVELS OR GRAVEL–SAND MIXTURES, < 5% FINES
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		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
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TOPSOIL		TS	TOPSOIL WITH ROOTS, ETC.
COBBLES		SB	ROCK FRAGMENTS AND COBBLES, PARTICLE SIZE 75mm TO 300mm
LARGE BOULDERS		LB	BOULDERS, PARTICLE SIZE OVER 300mm
BEDROCK		BR	BEDROCK

FOR SOILS HAVING 5 – 12% PASSING .075 SIEVE, USE DUAL SYMBOL

*GM1; GC1; SM1; SC1;	12 – 20%	PASSING .075mm SIEVE
GM2; GC2; SM2; SC2;	20 – 30%	
GM3; GC3; SM3; SC3;	30 – 40%	
GM4; GC4; SM4; SC4;	40 – 50%	

REV. 90–04–26

APPENDIX A - DEFINITIONS FOR AGGREGATES

As the nominal dimensions for U. S. Standard sieves for #4 and #200 sieves are 4.75 mm and 0.075 mm respectively, the sizes indicated in my memo dated 14 December have been revised accordingly. The terms "Mineral Filler" and "Fines" have also been deleted. The revised definitions are as follows:

MINERAL: A naturally formed inorganic solid having a definite chemical composition (includes ice but excludes water or mercury).

MINERAL AGGREGATE: An aggregation of sand, gravel, crushed rock, slag or other material of mineral composition, used in combination with a binding medium to form bituminous and portland cement concrete, or alone as base course, filters, or as other construction material.

SAND: The mineral aggregate, smaller than 4.75 mm (#4 US standard sieve opening) and larger than 0.075 mm (#200 US standard sieve opening) in diameter.

GRAVEL: The mineral aggregate, smaller than 75 mm and larger than 4.75 mm in diameter.

COBBLE: The mineral aggregate, smaller than 300 mm and larger than 75 mm in diameter.

LARGE BOULDER: The mineral aggregate, larger than 300 mm in diameter.

DEBRIS: Inorganic and/or organic material deposited by the action of gravity or water. The inorganic material may range in size from boulders several metres in diameter to smaller size mineral aggregates ranging from cobbles to silt and clay sizes, and the organic material may range from whole trees to mulch.

SILT, CLAY, MINERAL DUST: Mineral soil particles smaller than 0.075 mm in diameter.

APPENDIX B
References

TABLE 3.1

COMPACTNESS CONDITION OF SANDS FROM STANDARD PENETRATION TESTS

Compactness condition	SPT N-index (blows per 0.3 m)
Very loose	0 - 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very dense	Over 50

(From Canadian Foundation Manual)

TABLE 45.2

RELATION OF CONSISTENCY OF CLAY, NUMBER OF BLOWS N ON SAMPLING SPOON

Consistency	Very Soft	Soft	Firm	Stiff	Very Stiff	Hard
N	<2	2 - 4	4 - 8	8 - 15	15 - 30	>30

(From Soil Mechanics in Engineering Practice)

3.1.3 LABORATORY IDENTIFICATION TESTS

The results of the grain-size test are used to classify the soil beyond the rough separation into fine grained and coarse grained. The classification is based on amounts by weight within the respective grain-size fractions, as follows:

noun	GRAVEL, SAND, SILT, CLAY	>50%
"and"	and gravel, and silt, etc.	>35%
adjective	gravelly, sandy, silty, clayey etc.	20 - 35%
"some"	some sand, some silt, etc.	10 - 20%
"trace"	trace sand, trace silt, etc.	1 - 10%

(From Canadian Foundation Manual)

TABLE 3.3

CONSISTENCY AND SHEAR STRENGTH OF COHESIVE SOILS

Consistency	Undrained shear strength (kPa)
Very soft	<12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very stiff	100 - 200
Hard	>200

(From Canadian Foundation Manual)

TABLE 3.4

CLASSIFICATION OF ROCK WITH REGARD TO STRENGTH

Strength Grade Classification		Field identification method	Range of unconfined compressive strength (MPa)
R0	Extremely weak	Idented by thumbnail	< 1
R1	Very weak	Crumbles under firm blows of geological hammer; can be peeled with a pocket knife	1 - 5
R2	Weak rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by a firm blow with point of geological hammer	5 - 25
R3	Medium strong	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with a single firm blow of geological hammer	25 - 50
R4	Strong	Specimen requires more than one blow of geological hammer to fracture	50 - 100
R5	Very strong	Specimen requires many blows of geological hammer to fracture	100 - 250
R6	Extremely strong	Specimen can only be chipped by the geological hammer	> 250

(From Canadian Foundation Manual)

Table 3.5.

CLASSIFICATION OF ROCK WITH REGARD TO SPACING OF DISCONTINUITIES

Spacing classification	Spacing width (m)
Extremely close	< 0.02
Very close	0.02 - 0.06
Close	0.06 - 0.20
Moderately close	0.2 - 0.6
Wide	0.6 - 2.0
Very wide	2 - 6
Extremely wide	> 6

(From Canadian Foundation Manual)

APPENDIX C
Draft Summary Log

Ministry of Transportation and Highways

TEST HOLE LOG

Geotechnical and Materials Branch

Hole No.

Project _____

Location _____ Elevation _____

Driller _____ Method _____ Dates _____

Drilling Details / ▼ Water Table	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation %			Index Properties			Classification	Description	Other Tests
						Gravel	Sand	Fines	W_L	W_P	W			

SAMPLE TYPE
A - Auger
C - Core
D - Denison
S - Split Spoon
T - Shelby Tube
W - Wash

SHEAR STRENGTH
U - Unconfined Compression
L_V - Lab Vane
F_V - Field Vane
R - Remoulded
Blowcount - Standard Penetration Test (ASTM 1586)

TESTS
M - Mechanical Analysis
Q,R,S - Triaxial Compression
C - Consolidation
DS - Direct Shear
W_L, W_P - Liquid, Plastic Limits
W - Moisture Content

File No.

Drawn By:

Sheet ____ of ____

ft. - m	ft. - m	ft. - m	ft. - m	ft. - m	ft. - m
1 - .3	26 - 7.9	51 - 15.5	76 - 23.2	101 - 30.8	126 - 38.4
2 - .6	27 - 8.2	52 - 15.9	77 - 23.5	102 - 31.1	127 - 38.7
3 - .9	28 - 8.5	53 - 16.2	78 - 23.8	103 - 31.4	128 - 39.0
4 - 1.2	29 - 8.8	54 - 16.5	79 - 24.1	104 - 31.7	129 - 39.3
5 - 1.5	30 - 9.1	55 - 16.8	80 - 24.4	105 - 32.0	130 - 39.6
6 - 1.8	31 - 9.5	56 - 17.1	81 - 24.7	106 - 32.3	131 - 39.9
7 - 2.1	32 - 9.8	57 - 17.4	82 - 25.0	107 - 32.6	132 - 40.2
8 - 2.4	33 - 10.1	58 - 17.7	83 - 25.3	108 - 32.9	133 - 40.5
9 - 2.7	34 - 10.4	59 - 18.0	84 - 25.6	109 - 33.2	134 - 40.8
10 - 3.1	35 - 10.7	60 - 18.3	85 - 25.9	110 - 33.5	135 - 41.1
11 - 3.4	36 - 11.0	61 - 18.6	86 - 26.2	111 - 33.8	136 - 41.5
12 - 3.7	37 - 11.3	62 - 18.9	87 - 26.5	112 - 34.1	137 - 41.8
13 - 4.0	38 - 11.6	63 - 19.2	88 - 26.8	113 - 34.4	138 - 42.1
14 - 4.3	39 - 11.9	64 - 19.5	89 - 27.1	114 - 34.7	139 - 42.4
15 - 4.6	40 - 12.2	65 - 19.8	90 - 27.4	115 - 35.1	140 - 42.7
16 - 4.9	41 - 12.5	66 - 20.1	91 - 27.7	116 - 35.4	141 - 43.0
17 - 5.2	42 - 12.8	67 - 20.4	92 - 28.0	117 - 35.7	142 - 43.3
18 - 5.5	43 - 13.1	68 - 20.7	93 - 28.4	118 - 36.0	143 - 43.6
19 - 5.8	44 - 13.4	69 - 21.0	94 - 28.7	119 - 36.3	144 - 43.9
20 - 6.1	45 - 13.7	70 - 21.3	95 - 29.0	120 - 36.6	145 - 44.2
21 - 6.4	46 - 14.0	71 - 21.6	96 - 29.3	121 - 36.9	146 - 44.5
22 - 6.7	47 - 14.3	72 - 22.0	97 - 29.6	122 - 37.2	147 - 44 8
23 - 7.0	48 - 14.6	73 - 22.3	98 - 29.9	123 - 37.5	148 - 45.1
24 - 7.3	49 - 14.9	74 - 22.6	99 - 30.2	124 - 37.8	149 - 45.4
25 - 7.6	50 - 15.2	75 - 22.9	100 - 30.5	125 - 38.1	150 - 45.7

in. - m	in. - m	in. - m	in. - m
2" - .05	8" - .20	14" - .36	20" - .51
4" - .10	10" - .25	16" - .41	22" - .56
6" - .15	12" - .30	18" - .46	24" - .61

APPENDIX D
Disk and File Naming

GEOTECHNICAL

FILE NAMING (AutoCAD)

Files are identified using Branch Identifier (G), Region # (1 - 6 or H for Headquarters or O for Operations), Technician or Firm designation (K), Five character Negative, Drawing number or other five character designation.

eg. GHK92689

5 or 6 Character Negative or Drawing Number

Technician or Firm designation (optional)

Highway Region # (1 - 6 or H or O)

G for Branch designation

- 2 - 5.25" Floppy Disks (preferably Dysan 1.2M).
- One A1 size drawing per disk and related blocks
- Enter disk and file name in project job listing (Geotechnical Branch)

DISK LABEL

DISK LABEL
FILE NAME
PROJECT NAME
HIGHWAY OR ROAD NAME
FIRM NAME OR CONSULTANT

- First line of disk label to be assigned by Geotechnical Branch

APPENDIX E
Rock Core Log

APPENDIX E - ROCK CORE LOG

Rock Core Logs are required when bedrock structure is pertinent to foundation design. Currently, Ministry Rock Core Logs are prepared manually using the following format and examples. In unusual circumstances other formats may be used with permission of the Ministry Geotechnical Project Engineer.

The Ministry computerized Rock Core Log has been scheduled to be included in our system in the spring of 1991.

Ministry of Transportation and Highways

ROCK CORE LOG

Geotechnical and Materials Branch

Hole No.

Project _____

Location _____ Elevation _____

Driller _____ Method _____ Dates _____

Hole Orientation _____ Logged By _____ Date _____

Drilling Details ▼ Water Table	Depth (m)	Core Recovery %	Core Condition	Discontinuity Spacing	R.Q.D.	Intact Rock Strength	Weathering	Structural Discontinuity Description	Rock Symbol	Rock Mass Description	Tests

CORE RECOVERY

$$\frac{\text{Length of core}}{\text{core run}} \times 100$$

R.Q.D.

$$\frac{\text{Sum core lengths} > 100\text{ mm}}{\text{length of core run}} \times 100$$

DISCONTINUITY SPACING
No. of fractures/m

ROCK STRENGTH (MPa)

R0 Extremely weak	<1
R1 Very weak	1–5
R2 Weak	5–25
R3 Medium strong	25–50
R4 Strong	50–100
R5 Very strong	100–250
R6 Extremely strong	>250

WEATHERING

F	Fresh
SW	Slightly
MW	Moderately
HW	Highly
CW	Completely
RS	Residual Soil

File No.

Drawn By:

Sheet ____ of ____

Ministry of Transportation and Highways

Geotechnical and Materials Branch

Victoria, British Columbia

ROCK CORE LOG

D. R. Lister, P. Eng.
Geotechnical Engineer
October 1987

DD27/DON13/bb

INTRODUCTION

The Diamond Drilling Log of Test Boring form H482 that has been used for rock cores is obsolete. For some time a new log has been considered.

The new form is similar in many respects to the Test Hole Log H181. In producing this new form, I have drawn extensively on the references listed at the end of the report and have used the preliminary work of B. Hayden and W. Eisbrenner. Logs from various geotechnical consultants have also been reviewed. The top of the log is like the top of the Test Hole Log but blank spaces for hole orientation (inclination and direction), name of person logging the core and date of logging, have been added. The log itself consists of 11 columns; the purpose of each is described below. The bottom of the log contains a brief explanation of some of the column headings.

LOG DESCRIPTION

DRILLING DETAILS - This column records information associated with the actual drilling of the hole. The type of drill, core barrel and bit are noted along with the length of casing and type of drilling fluid. The water table and location of piezometers, if installed, are also noted.

DEPTH - Depth in metres along the hole from the collar. Conversion from drillers imperial units used by the driller may be necessary. Normal practice is to use one division on the log per metre.

CORE RECOVERY - During the drilling process, the bit cuttings are removed by the drilling fluid and the core sample passes into the core barrel. Some of the core sample may be lost by erosion of soft or friable material resulting in a reduction in diameter and/or length of core. The material placed in the core box from each core run is the recovered core. If none of the sample is lost by erosion then the core recovery is 100%. Core recovery is measured by length and expressed as a percentage of the core run length.

CORE CONDITION - The state of the core recovered can be described as solid, broken, very broken, shattered, or rounded pieces. In some cases, poor quality core may be the result of the drilling method but usually reflects the state of the rock mass.

DISCONTINUITY SPACING - This is another quantitative description of the natural breaks in the rock mass. It is count of the number of natural discontinuities per unit length.

Discontinuity Spacing = No. of discontinuities/metre

A classification of rock with regard to discontinuity spacing has been developed [3].

Spacing Classficiation	Spacing Width (m)
Extremely close	< 0.02
Very close	0.02 - 0.06
Close	0.06 - 0.20
Moderately close	0.2 - 0.6
Wide	0.6 - 2.0
Very wide	2 - 6.0
Extremely wide	> 6.0

ROCK QUALITY DESIGNATION - The Rock Quality Designation[3] (RQD) is an indirect measure of the number of fractures and the amount of softening or alteration in a rock mass. It is obtained from the rock cores by summing up the length of core recovered, counting only those pieces of sound core that are 100mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total core length (core run). The classification according to the RQD-value is given below.

RQD Classification	RQD-Value (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

If the core is broken by handling or during drilling (i.e. the fracture surfaces are fresh irregular breaks rather than natural joint surfaces); the fresh broken pieces should be fitted together and counted as one piece. Some judgement is necessary in the case of thinly bedded sedimentary rocks and foliated metamorphic rocks, and the method is not so precise in these cases as it is for igneous rocks, thick-bedded limestones, sandstones, etc. However, the system has been applied successfully even for shales, although it is necessary to log the cores immediately upon removing them from the core barrel, before air-slaking and cracking can begin.

The procedure obviously penalizes rock masses where core recovery is poor. This is appropriate because poor core recovery usually reflects poor quality rock. Poor drilling equipment and techniques can also cause poor recovery. For this reason, double-tube core barrels of at least NX size (54 mm in diameter) must be used, and proper supervision of drilling is imperative.

As simple as the procedure appears, it has been found that, as an indicator of general quality of rock for engineering purposes, the RQD-value is more sensitive and consistent than gross percentage core recovery.

INTACT ROCK STRENGTH - Although rock masses are non-isotropic and the main feature of their weakness is the strength along discontinuities, it is often useful to have some information about the uniaxial compressive strength of the intact rock. The table below gives seven grades of rock strength and simple methods of identification. These grades have been based on results of unconfined compressive strength tests for which standard methods have been suggested[3].

Strength Grade	Classification	Field Identification Method	Range of unconfined Compressive strength (MPa)
R0	Extremely weak	Idented by thumbnail	< 1
R1	Very weak	Crumbles under firm blows of geological hammer; can be peeled with a pocket knife	1 - 5
R2	Weak rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by a firm blow with point of geological hammer	5 - 25
R3	Medium strong	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with a single firm blow of geological hammer.	25 - 50
R4	Strong	Specimen requires more than one blow of geological hammer to fracture	50 - 100
R5	Very strong	Specimen requires many blows of geological hammer to fracture	100 - 250
R6	Extremely strong	Specimen can only be chipped by a geological hammer	> 250

WEATHERING - These are two main results of weathering: mechanical disintegration and chemical decomposition[2]. Generally, both effects act together but, depending on the climate, one may be dominant. Chemical alteration although not a form of weathering may also be considered here. Mechanical weathering results in the opening of discontinuities, the forming of new fractures, the opening of grain boundaries and the fracture of mineral grains. Chemical weathering results in discolouration of rock and leads to the eventual decomposition of silicate minerals to clay minerals. The state of weathering can be described according to the following table.

Term	Description	Grade
Fresh	No visible sign of rock material weathering: perhaps slight discolouration on major discontinuity surfaces.	I
Slightly weathered	Discolouration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discoloured by weathering and may be somewhat weaker externally than in its fresh condition.	II
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as corestones.	III
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as corestones.	IV
Completely weathered	All rock material is decomposed and/or disintegrated to a soil.	V
Residual soil	The original mass structure is still largely intact. All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

STRUCTURAL DISCONTINUITY DESCRIPTION - A discontinuity is a general term for any mechanical discontinuity in a rock mass having zero or low tensile strength. It is the collective term for most types of joints, bedding planes, schistosity planes, shear zones, cleavage and faults.

Discontinuities can be described according to the following parameters:

Orientation - dip from long axis of the core

Form - overall shape of the discontinuity which may be planar, undulating, stepped or irregular. This parameter may be difficult to determine from a piece of core.

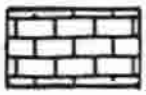
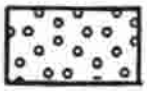
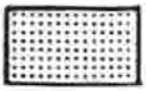
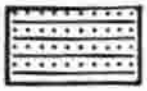
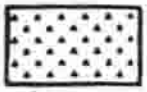
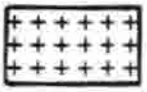
Roughness - surface roughness of the discontinuity which can be polished, smooth, rough or slickensided.

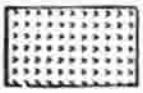
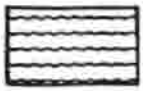
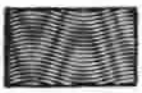
Infilling - material that separates the rock walls of the discontinuity is usually weaker than the intact rock. Typical infilling materials are clay gouge, breccia, calcite and quartz

A graphic structural log can be produced as part of the structural description. Appropriate abbreviations and symbols are noted below.

Roughness	- Polished	Po
	Smooth	Sm
	Rough	Rh
	Slickensided	Sx
Infilling	- Clay Gouge	Cg
	Calcite	Ca
	Quartz	Qz
	Rust Stained	Rt
	Breccia	Br
Form	- Planar	Pl
	Undulating	Un
	Stepped	St
	Irregular	Ir
Discontinuity	- Fault (zone)	F(Z)
	Joint	J
	Shear (zone)	S(Z)
	Bedding	B
	Cleavage	C
	Vein	V

ROCK SYMBOL - A symbolic log showing rock type C can be prepared. Suggested symbols are listed below [1]. Suitable Letraset shading numbers are included.

Limestone	LT 243	
Conglomerate	LT 129	
Sandstone	LT 912	
Greywacke	LT 164	
Siltstone	LT 153	
Shale	LT 122	
Argillite	LT 923	
Breccia	LT 970	
Pyroclastic	LT 356	
Coarse Grained Igneous	LT 959	
Medium Grained Igneous	LT 131	

Fine Grained Igneous	LT 973	
Coarse Grained Metamorphic	LT 95	
Medium Grained Metamorphic	LT 368	
Fine Grained Metamorphic	LT 189	

ROCK MASS DESCRIPTION - This column is for a general desciption of the rock mass. The intact rock should be described according to its colour, grain size, fabric, texture and rock type. Grain size refers to the average dimension of the mineral or rock fragments. For sedimentary rocks the size ranges used for soils are appropriate. Coarse grained igneous and metamorphic rocks have a grain size greater than 2 mm and fine grained igneous and metamorphic rocks have grain sizes less than .06 mm.

The texture of a rock is its general physical appearance including the geometric aspects of the component particles or crystals. e.g. size, shape and arrangement of the sedimentary particles or the crystallinity or granularity of an igneous rock. Fabric refers specifically to the arrangement of the grains. In sedimentary rocks, it is the orientation of discrete particles and in crystalline rocks for the pattern produced by the shapes and orientation of the

crystalline and non-crystalline parts. The fabric of sedimentary rocks is often related to the mode of deposition and hence bedding. Bedding is usually considered as a structure and should be described in the structural log, although a general statement about the layer thickness is appropriate in the rock mass description. Typical textural terms include porphyritic, crystalline, granular, amorphous and glassy. The principal rock name should be in capital letters e.g. calcareous SANDSTONE. This column can also be used for additional structural description or to re-emphasize the degree of weathering.

TESTS - Results of either insitu or laboratory tests can be recorded in this column.

OTHER INFORMATION - In addition to the log itself, it is preferable to have photographs of the core. Two or three photographs (1000 x 1500 mm) along the core box joined together in a strip produces a suitable size picture.

REFERENCES

1 British Standards Institution. Code of Practice for Site Investigations BS 5930:1981.

2 Brown, E.T. Rock Characterization, Testing and Monitoring, International Society for Rock Mechanics, 1981.

3 Canadian Geotechnical Society. Canadian Foundation Engineering Manual, 2nd Edition, 1985.

4 Geological Society Engineering Group Working Party. The Logging of Rock Cores for Engineering Purposes. Quarterly Journal of Engineering Geology, Vol.3 No 1, 1970.

Ministry of Transportation and Highways

ROCK CORE LOG

Geotechnical and Materials Branch

TEST HOLE No. 90–1

Project THREE VALLEY OVERHEAD – EAGLE SUMMIT
Location AVALANCHE CHUTE–OPPOSITE 3 VALLEY GAP MOTEL
Driller C. SLEASMAN Method DIAMOND DRILL
Hole Orientation – Logged By J. PUNSHON

Elevation –
Dates 90–10–20/23
Date 90–11–07

Drilling Details	Depth (m)	Core Recovery %	Core Condition	Discontinuity Spacing	R.Q.D.	Intact Rock Strength	Weathering	Structural Discontinuity Description	Rock Symbol	Rock Mass Description	Tests
	18	90%	BROKEN SOLID	38.7	43%	R2–R3	HW – MW	SOFT + SEVERELY WEATHERED, MICACEOUS, 70–80% FRACTURES		BIOTITE GNEISS MEDIUM HARD, HIGHLY MICACEOUS BIOTITE AND SOME CHLORITE SPOTS, SOME FELDSPATHIC AUGENS, PEGMATITE VEINS AND 80° \ MICACEOUS BANDS	
			SOLID	8.2		R3		STRONGLY WEATHERED 70–80° \ FRACTURES 70–80° \ PEGMATITE VEINS, MAX. DIA. 4cm.			
	19		SH–BR	66.7		R2–R3		20–40° \ 43° / SEVERELY WEATHERED FRACTURES + VERTICAL FISSURES			
			SOLID	11.1		R3	HW – MW	60–70° / SEVERELY WEATHERED, MICACEOUS FRACTURES			
		86%	SOLID	5.2	20%			40° / SEVERELY WEATHERED FRACTURES			
	20						MW	80–90° / MICACEOUS FRACTURES		PEGMATITE – BIOTITE SEAMS, SOME CHLORITE SPOTS	
										BIOTITE GNEISS WITH 30% APLITE VEIN	
										PEGMATITE – BIOTITE SEAMS, SOME CHLORITE	
	21						MW	80–90° / FRACTURES		BIOTITE GNEISS	
								80–90° / FRACTURES		PEGMATITE – BIOTITE SEAMS, SOME CHLORITE SPOTS, 30–40° APLITE VEIN IN BIOTITE GNEISS	
		100%			88%		HW–MW	50° / STRONGLY WEATHERED FRACTURES			
							MW	80° \ MICACEOUS FRACTURES AND BIOTITE BANDS		BIOTITE GNEISS	
			SOLID	7.3		R3	HW – MW	80° \ + 80° / STRONGLY WEATHERED FRACTURES		PEGMATITE – BIOTITE SEAMS	
	22							80° / MICACEOUS FRACTURES		BIOTITE GNEISS SOME CHLORITE AND GARNET SPOTS	
							MW	80° \ MICACEOUS FRACTURES AND BIOTITE BANDS		GNEISS WITH PEGMATITE SOME BIOTITE SEAMS AND CHLORITE SPOTS	
		100%			51%			30–40° / FRACT. FISS. + SEVERELY WEATH. SLICK, 80° \ MICACEOUS FRACTURES		BIOTITE GNEISS WITH GARNET SPOTS, SOME PYRITE, CHLORITE	
			BROKEN SOLID	25.9		R2–R3	HW–MW				
	23									22.8m END OF HOLE	

CORE RECOVERY
$\frac{\text{Length of core}}{\text{core run}} \times 100$

R.Q.D.
$\frac{\text{Sum core lengths} > 100\text{mm}}{\text{length of core run}} \times 100$

DISCONTINUITY SPACING
No. of fractures/m

ROCK STRENGTH (MPa)

R0	Extremely weak	<1
R1	Very weak	1–5
R2	Weak	5–25
R3	Medium strong	25–50
R4	Strong	50–100
R5	Very strong	100–250
R6	Extremely strong	>250

WEATHERING

F	Fresh
SW	Slightly
MW	Moderately
HW	Highly
CW	Completely
RS	Residual Soil

FILE No. 01–32–00
PREPARED BY: J.P. / KLASSCAD
SHEET 03 of 03

Ministry of Transportation and Highways

SUMMARY LOG

Geotechnical and Materials Branch

TEST HOLE No. 90–1

Project THREE VALLEY OVERHEAD – EAGLE SUMMIT

Location AVALANCHE CHUTE–OPPOSITE 3 VALLEY GAP MOTEL

Elevation –

Driller C. SLEASMAN Method DIAMOND DRILL Dates 90–10–20/23

Drilling Details	Depth (m)	Sample Type	Blowcount	Recovery (m)	Shear Strength (kPa)	Gradation % Gravel	Gradation % Sand	Gradation % Fines	Index Properties wL	Index Properties wP	Index Properties w	Classification	Description	Other Tests
												GP+SB	GRAVEL and COBBLES	
													0.5m	
Blowcount Details	1											LB	LARGE BOULDERS	
	2													
												SB+GP	COBBLES and GRAVEL	
													2.0m	
85/.15m	3	S	>100	0		–	–	–	–	–	–		2.4m	
												GP+LB	GRAVEL and LARGE BOULDERS	
	4												3.3m	
												LB	LARGE BOULDERS	
27/.15m 77/.15m	5	S	>100	.15		80	15	5	–	–	–		5.0m	
												GP+SB	Very dense GRAVEL and COBBLES	
	6												6.1m	
												LB	LARGE BOULDER	
	7	S	75	.10		50	45	5	–	–	–		6.8m	
												GP+SB	Very dense GRAVEL and COBBLES	
													7.6m	
	8											LB	LARGE BOULDER	
													8.0m	
												GP+SB	GRAVEL and COBBLES	
	9												8.9m	
27/.15m 55/.08m		S	>100	.13		50	45	5	–	–	–	GP+LB	Very dense GRAVEL and LARGE BOULDERS	
	10												10.5m	
												SB	COBBLES	
	11												10.7m	
	12	S	14	.15		50	45	5	–	–	–	GP+LB	Compact GRAVEL and LARGE BOULDERS	
	13													
10/.15m 7/.15m 35/.08m		S	>100	0		–	–	–	–	–	–		13.8m	
	14													
	15	S	55	.20		75	20	5	–	–	–	GP+SB	Very dense GRAVEL and COBBLES	
													15.8m	
	16											LB	LARGE BOULDER	
													16.2m	
												GP+SB	GRAVEL and COBBLES	
	17												16.6m	
												GP	GRAVEL	
													17.2m	
												BR	WEATHERED BEDROCK	
													18.0m	

SAMPLE TYPE
A – Auger
C – Core
D – Denison
S – Split Spoon
T – Shelby Tube
W – Wash

SHEAR STRENGTH kPa
U – Unconfined Compression
Fv – Field Vane
Lv – Lab Vane
R – Remoulded

TESTS
M – Mechanical Analysis
Q,R,S – Triaxial Compression
C – Consolidation
DS – Direct Shear
wL,wP – Liquid, Plastic Limits
W – Moisture Content

Blowcount – Standard Penetration Test (ASTM 1586)

FILE No. 01–32–00

PREPARED BY: RGB/KLASSCAD

SHEET 01 of 03

APPENDIX F
Cone Holes

APPENDIX F - CONE LOG

Sites requiring investigation using cone equipment are co-ordinated through our Operations Division, Burnaby. Contact person is Don Gillespie.

Cone Logs for reports and contract drawings are required to be prepared at a scale of 1:100.

See the following examples and information.

Ministry of Transportation and Highways

CONE PENETROMETER LOG

Geotechnical and Materials Branch

HOLE NO 85-01

Project **RICHMOND E-W FREEWAY**

Location **STA. 103+98, 0.5m RT.**

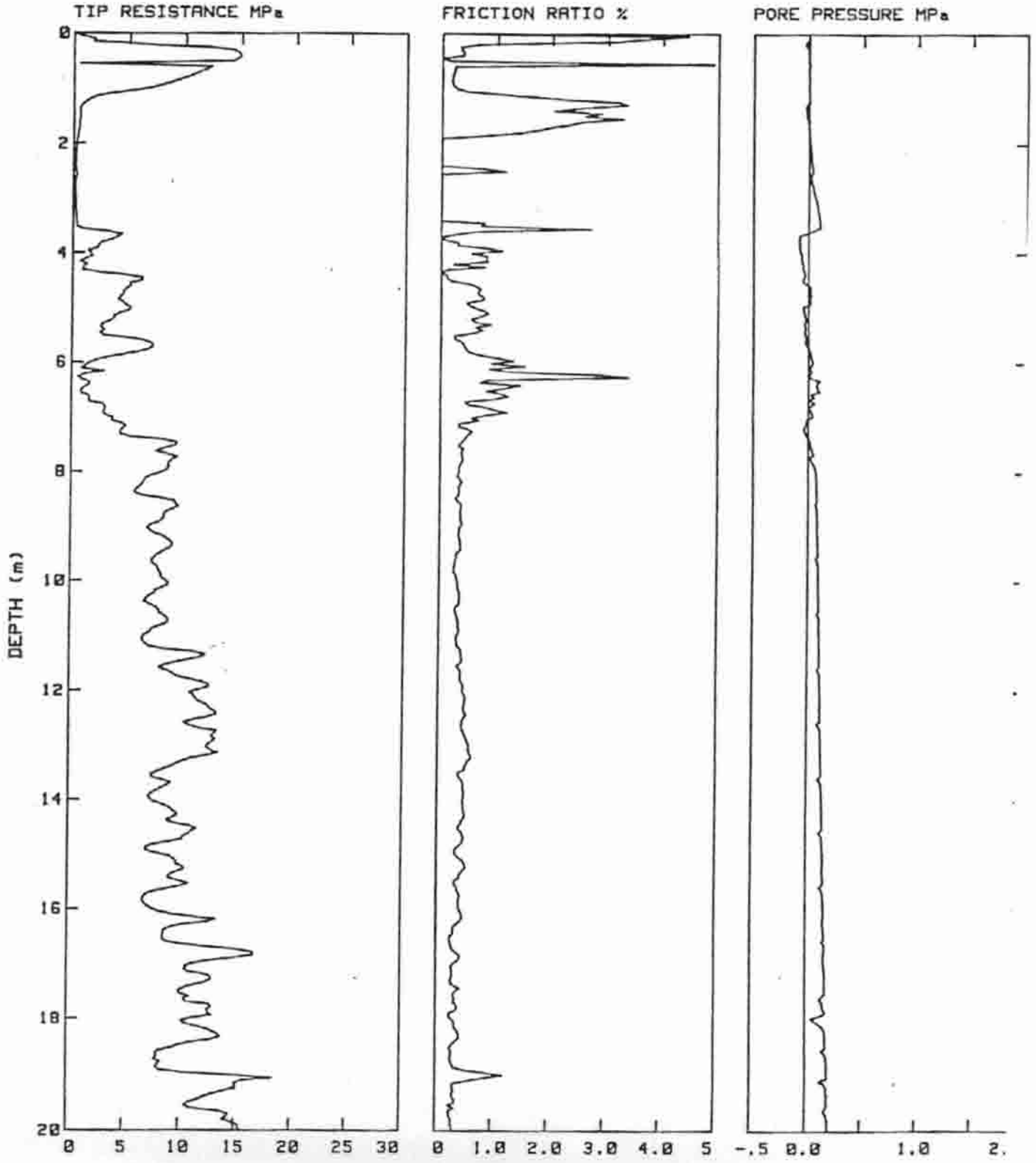
Engineer F MAXIMCHUK

File No

Elevation **1.550**

Date FEB 13 1985

(SCALE 1:100)



1/3

Ministry of Transportation and Highways

CONE PENETROMETER LOG

Geotechnical and Materials Branch

HOLE NO 85-01

Project **RICHMOND E-W FREEWAY**

Location **STA. 103+98, 0.5m RT.**

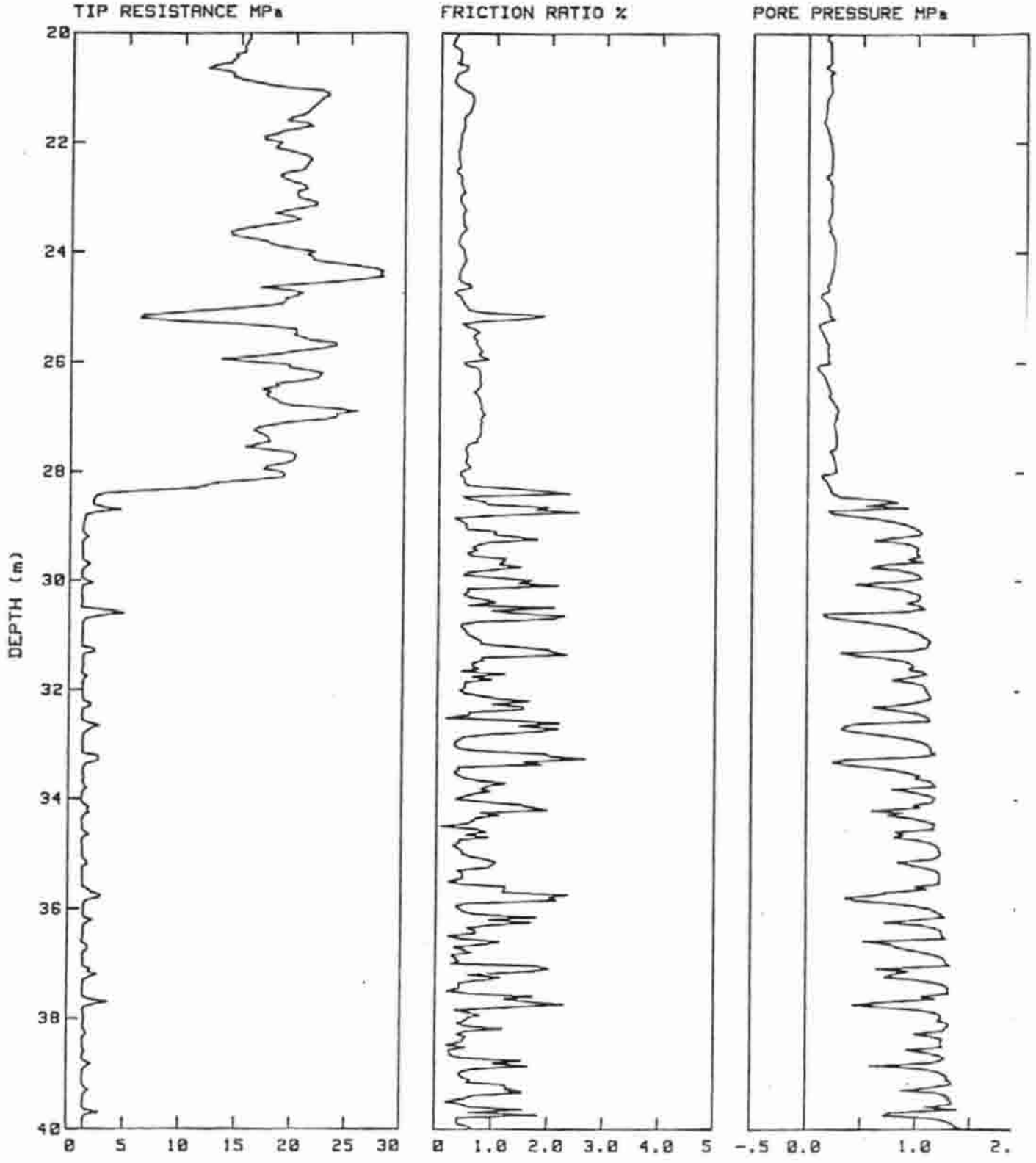
Engineer F MAXIMCHUK

File No

Elevation **1.550**

Date FEB 13 1985

(SCALE 1:100)



2/3

Ministry of Transportation and Highways

CONE PENETROMETER LOG

Geotechnical and Materials Branch

HOLE NO 85-01

Project **RICHMOND E-W FREEWAY**

Location **STA. 103+98, 0.5m RT.**

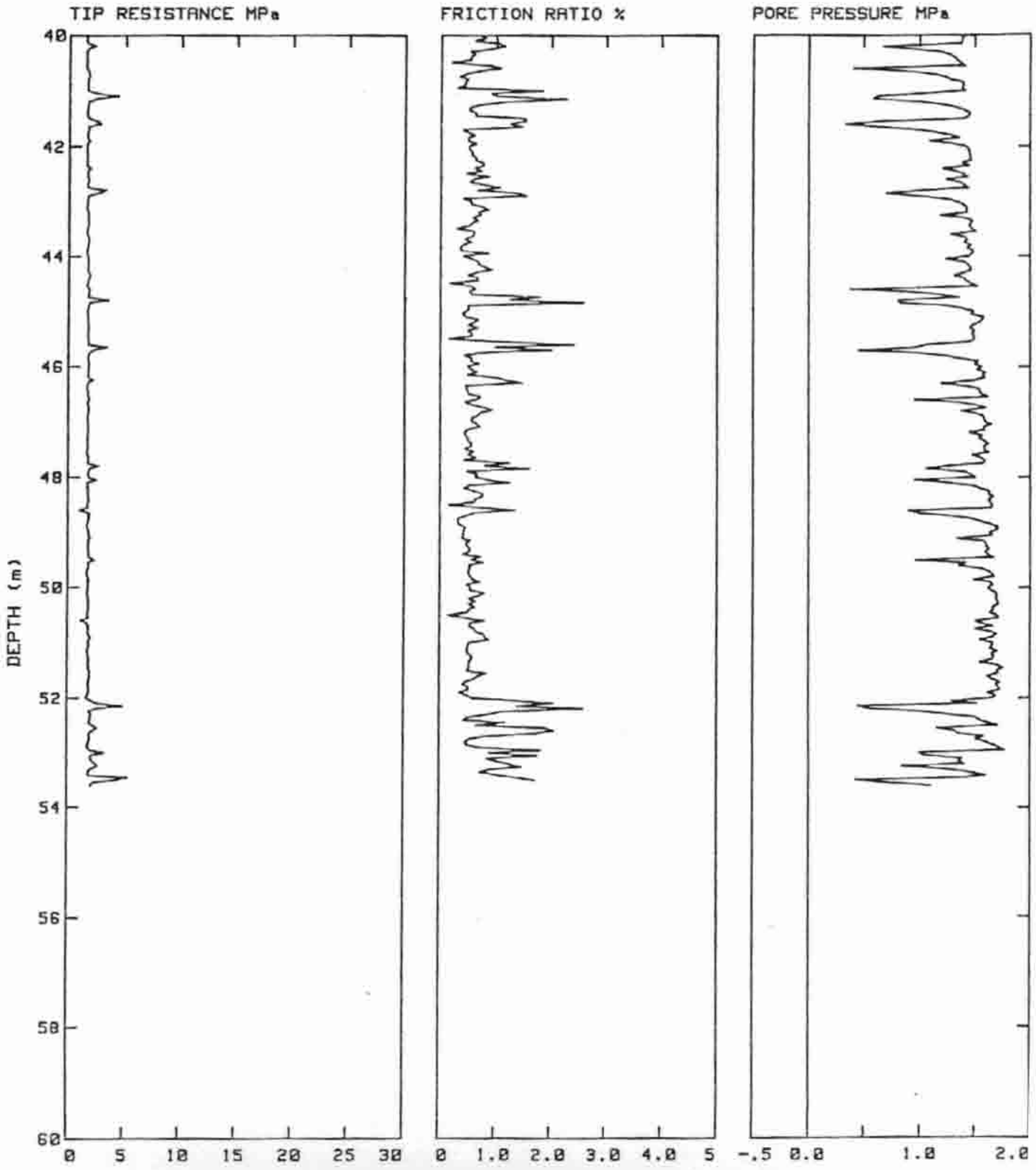
Engineer F MAXIMCHUK

File No

Elevation **1.550**

Date FEB 13 1985

(SCALE 1:100)



3/3

Province of British Columbia

Ministry of Transportation and Highways

MEMORANDUM

December 7, 1990

Kirby Rimer
Geotechnical Engineering Technician

VICTORIA

3149 Production Way
Burnaby, B.C.
V5A 3H1

RE: CPT Output

Our CPT outputs are still in the process of being upgraded to a PC environment but our present output includes:

1. Field Plots: See example #1.
   These plots have no flexibility in scale.

2. HP Plots: See example #2.
   These plots are hard copy only on 81/2" x 11" paper/mylar. They can be 1, 2 or 3 boxes and have stepwise variable depth and pressure scales.

3. ASCII files:
   PC format field depth and pressure readings.

4. Listing: See example #3.
   These are field listings and also include pore pressure data with time.

5. Pore Pressure - Time Data.
   Field listings or interpreted data are available.

Our future developments include:

1. PC/HP plots: See example #4.
   These plots have flexible depth scale, pressure scales, format (# boxes) orientation on 81/2 x 11" paper and if requested interpretation.

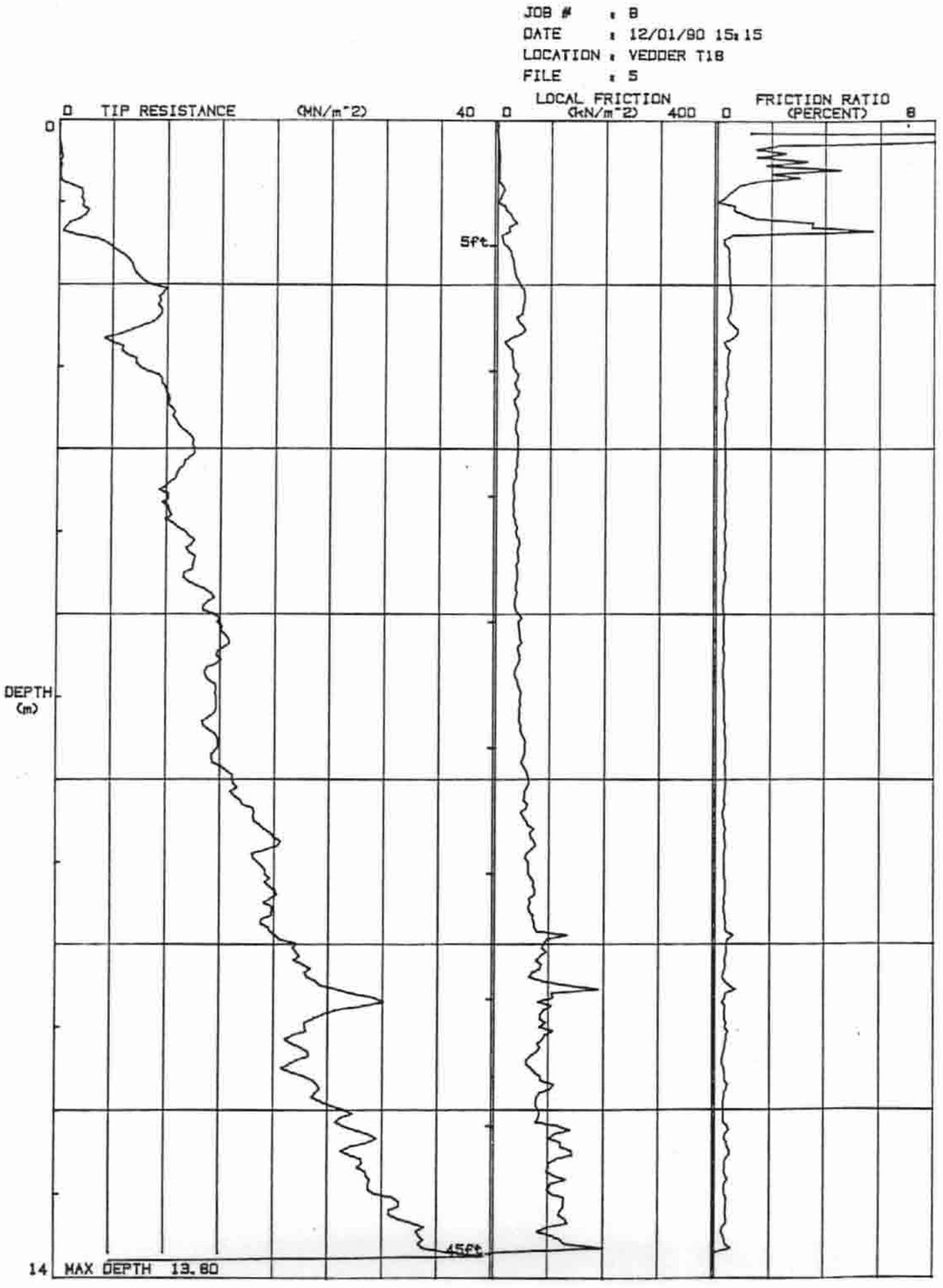
Don Gillespie
Geotechnical Engineer

for: Manager, Geotechnical Operations

DG/kb

(88/05)

EXAMPLE #1


JOB # : 8
DATE : 12/01/90 15:15
LOCATION : VEDDER T18
FILE : 5
0 TIP RESISTANCE (MN/m^2) 40
LOCAL FRICTION
0 (kN/m^2) 400
FRICTION RATIO
0 (PERCENT) 8
0
5ft
DEPTH (m)
45ft
14 MAX DEPTH 13.80

EXAMPLE #2

CONE PENETROMETER LOG

HOLE NO

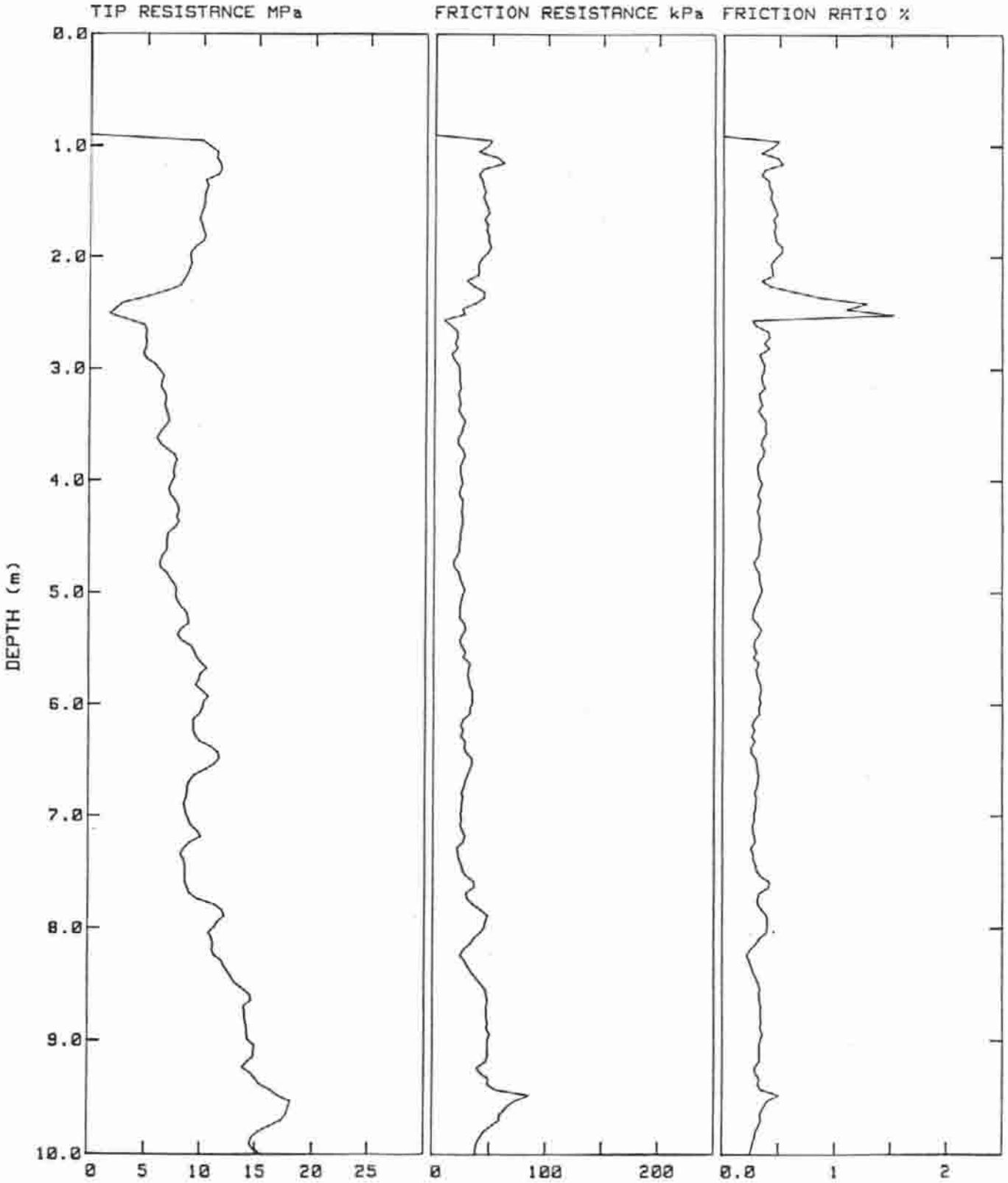
Ministry of Transportation and Highways

Geotechnical Operations
In-Situ Testing

Project _____ File No _____

Location _____ Elevation _____

Engineer GILLESPIE Date 12/01/90 11:35



EXAMPLE #3

UNDING DATA IN FILE 5 12/08/90 12:45

GINEER : GILLESPIE LOCATION : VEDDER T21

NE ID : NS10B STD JOB # : B

nistry of Transportation and Highways
otechnical and Materials Branch

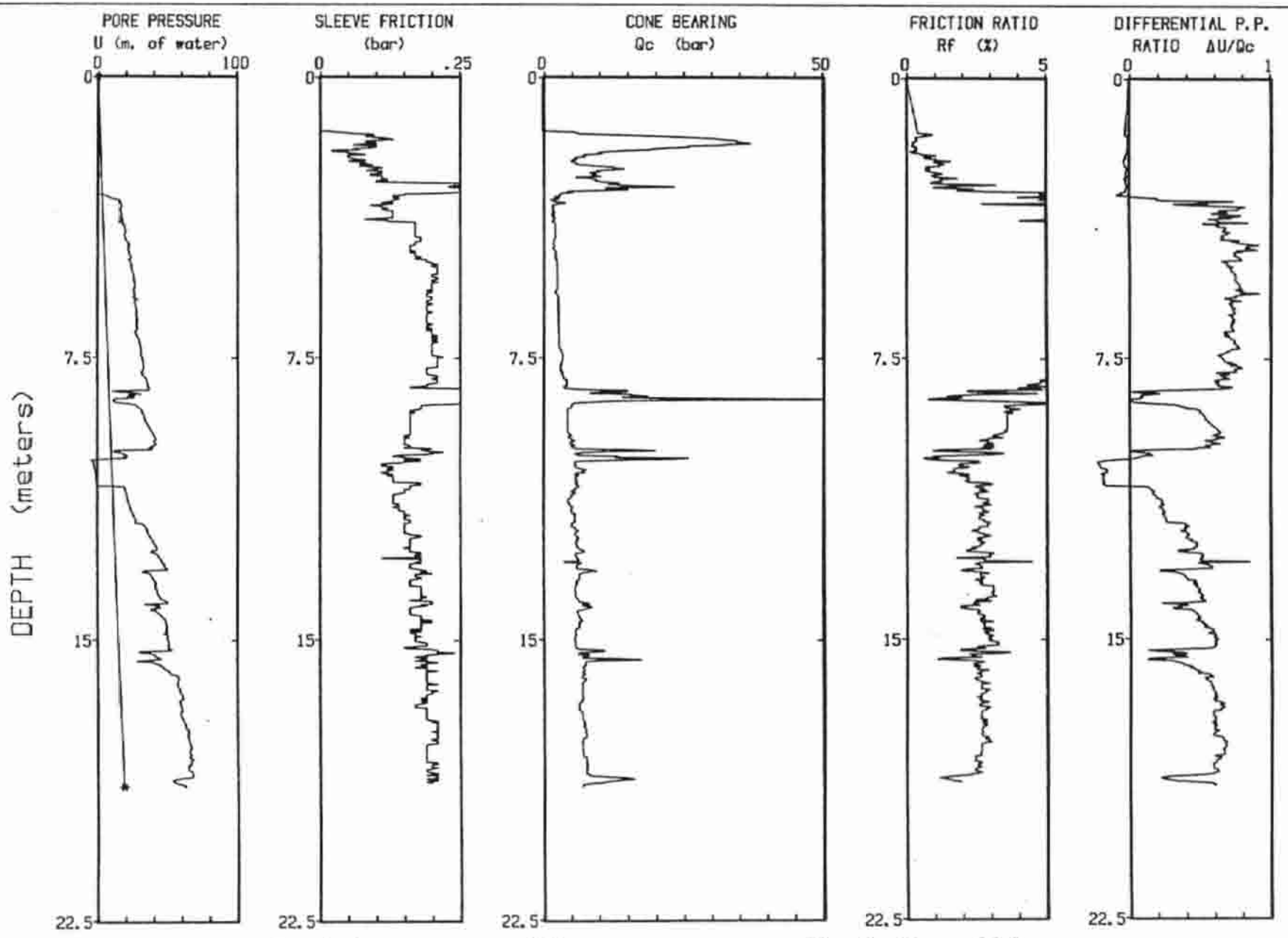
PTH ERS)	TIP RESISTANCE (MN/m^2)	LOCAL FRICTION (kN/m^2)	FRICTION RATIO (PERCENT)	PORE PRESSURE (BARS GAUGE)	DIFF P P RATIO (PERCENT)	INCLINATION (DEGREES)	TEMPERATURE (DEG C)
4.05	-0.0	-0	0.83	-0.30	-0.2	0.0	-273.1
4.10	-0.0	-0	2.99	0.00	2.	0.0	-273.1
4.15	0.0	-0	1.00	0.01	3.9	0.0	-273.3
4.20	0.2	0	0.0	0.02	1.19	0.0	-273.3
4.25	0.5	4	0.72	0.02	0.46	0.0	-273.3
4.30	0.4	10	2.16	0.03	0.63	0.0	-273.3
35	1.5	-1	0.06	0.03	0.20	0.0	-273.1
40	1.7	-0	0.01	0.03	0.19	0.0	-273.3
45	0.6	6	0.87	0.05	0.75	0.0	-273.3
50	1.0	2	0.16	0.07	0.64	0.0	-273.3
55	1.1	5	0.45	0.06	0.57	0.0	-273.3
60	0.9	6	0.70	0.07	0.75	0.0	-273.1
65	1.0	4	0.40	0.09	0.87	0.0	-273.3
70	1.6	4	0.26	0.09	0.55	0.0	-273.1
75	1.9	4	0.21	0.09	0.47	0.0	-273.1
80	1.9	7	0.34	0.05	0.23	0.0	-273.3
85	2.0	10	0.50	0.09	0.44	0.0	-273.1
90	2.1	7	0.36	0.08	0.39	0.0	-273.1
95	2.1	6	0.31	0.09	0.43	0.0	-273.1
00	2.6	13	0.51	0.10	0.37	0.0	-273.3
05	3.8	13	0.33	0.11	0.29	0.0	-273.3
.10	7.8	30	0.38	0.12	0.14	0.0	-273.4
.15	12.3	63	0.51	0.11	0.09	0.0	-273.3
.20	12.5	71	0.56	0.05	0.04	0.0	-273.1
.25	11.7	75	0.63	0.01	0.00	0.0	-273.1
.30	11.4	34	0.30	0.02	0.01	0.0	-273.3
.35	11.0	19	0.17	0.05	0.04	0.0	-273.1
.40	10.9	27	0.25	0.06	0.05	0.0	-273.3
.45	10.8	34	0.30	0.09	0.08	0.0	-273.1
.50	11.4	40	0.35	0.13	0.11	0.0	-273.1
.55	11.8	45	0.38	0.12	0.09	0.0	-273.3
.60	12.0	51	0.42	0.08	0.06	0.0	-273.1
.65	12.0	52	0.43	0.06	0.05	0.0	-273.1
.70	11.8	49	0.41	0.09	0.07	0.0	-273.1
.75	11.9	48	0.40	0.10	0.08	0.0	-273.3
.80	11.8	49	0.41	0.13	0.11	0.0	-273.3
.85	11.7	45	0.38	0.13	0.11	0.0	-273.3
.90	11.6	45	0.38	0.12	0.10	0.0	-273.3
.95	11.6	47	0.40	0.10	0.08	0.0	-273.3
.00	11.3	46	0.40	0.07	0.06	0.0	-273.3

Pre pushed

MINISTRY OF TRANSPORTATION AND HIGHWAYS

Site Location: LANGLEY RAIL CPT Date : 06/10/86 Page No: 1 / 1

On Site Loc: vacuum satur. Cone Used: #8 STD POREPRESS Comments:



Depth Increment : .025 m Max Depth : 18.9 m

APPENDIX G
Becker Hammer

APPENDIX G - BECKER HAMMER

Becker Hammers are not normally used by the Ministry. However, their use may be approved for particular sites. The following log is an example only. (Courtesy of Golder Assoc.)

RECORD OF BOREHOLE BTD 1

Location (See Figure 2)
Borehole Type Becker Hammer (10.84 kJ)
Sampler Hammer Wt. .. kg., Drop . .m.

Boring Date February 20, 1989
Borehole Diameter 140 mm
Datum Geodetic

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BOT PENETRATION TEST blows / 0.3 m.
-3.6 m	Sea Bed				20 40 60
	Very loose to loose grey fine SAND, some shells, trace gravel, becoming coarser below 3.0m				
8.84 m	Loose to compact SAND, some shells, trace to some gravel and wood particles interlayered with brown silty SAND				
11.43 m	Compact grey SAND, some silt and gravel, trace shell fragments.				
14.63 m	Compact to dense grey interlayered SAND to silty SAND, trace gravel and shells, occ. cobbles				
20.12 m	Dense to very dense grey SAND and GRAVEL, some cobbles, some to trace silt (Possible Till)				
21.03 m	End of Borehole.				

Vertical Scale: 1 : 125

Sheet 1 of 1