GEMTEC LIMITED
GROUND ENGINEERING
& MATERIALS TECHNOLOGY

77 Rooney Crescent, Moncton, N.B., Canada, E1E 4M4 Tel. (506) 858-7180 Fax: (506) 858-0742

Geotechnical Investigation

Proposed Bennett Lake Dam Replacement
Fundy National Park, Alma, NB

By

GEMTEC Limited

Submitted to

McCormick Rankin Corporation

FILE: 6032.01-R01
October 2008

GEMTEC LIMITED
GROUND ENGINEERING
& MATERIALS TECHNOLOGY

77 Rooney Crescent, Moncton, N.B., Canada, E1E 4M4 Tel. (506) 858-7180 Fax: (506) 858-0742

28 October 2008 File: 6032.01 – R01

McCormick Rankin Corporation
2655 North Sheridan Way
Mississauga, ON
L5K 2P8

Attention: Doug Dixon, P.Eng

Re: Geotechnical Investigation, Proposed Bennett Lake Dam Replacement
Fundy National Park, Alma, NB

Enclosed is our geotechnical report for the above noted project.

If you have any questions concerning this report or require further details, contact the undersigned.

Serge Bourque, M.Sc.E, P. Eng.

(N:\Files\6000\6032.01\2008aet0922R01.doc)

Geotechnical Investigation

Proposed Bennett Lake Dam Replacement
Fundy National Park, Alma, NB

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Geotechnical Investigation

Proposed Bennett Lake Dam Expansion
Fundy National Park, Alma, NB

1.0 INTRODUCTION

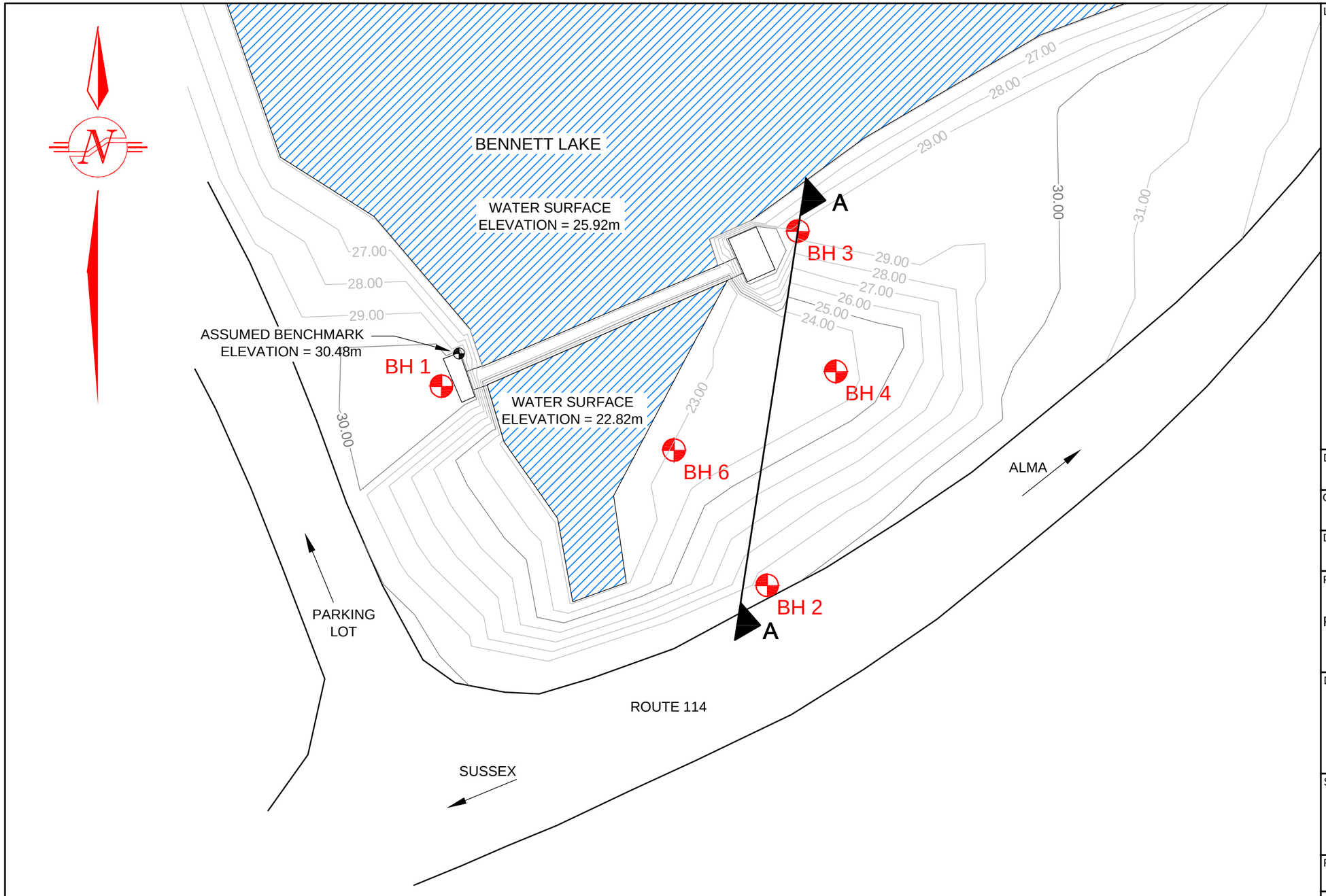
GEMTEC Limited was retained by Doug Dixon of McCormick Rankin Corporation to undertake a geotechnical investigation for a proposed new dam at Bennett Lake, which is located within Fundy National Park. We understand that the proposed dam will be located between the existing structure and Highway 114.

The purpose of our geotechnical investigation was to assess the soil, bedrock and groundwater conditions. Five boreholes (BH) were put down between 15 and 18 September 2008 using a track-mounted drill rig (CME 55) in the presence of a junior geotechnical engineer. Four of the five boreholes were taken down to bedrock.

Refer to Figure 1 for approximate borehole locations. An interpretive cross section of site is shown in Figure 2. Detailed borehole logs are appended (Appendix A).

Borehole locations and elevations were surveyed in the field by GEMTEC Limited. Borehole elevations are based on an assumed datum of 30.48 metres (100.00 feet) taken from the white paint marker on top of the west abutment of the existing dam and walkway structure.

We assume the design of the proposed new dam will be based on the design drawing Option "A" – Concrete spillway, as shown in the drawings provided by Mitchelmore Engineering Company Ltd. Drawings are appended (Appendix C).



Legend

- BOREHOLE
- BENCHMARK

Drawn By: BST	Checked By:
Calculations By:	Checked By:

Date: OCT, 2008

Project: GEOTECHNICAL INVESTIGATION, PROPOSED REPLACEMENT DAM, BENNETT LAKE, FUNDY NATIONAL PARK, NB

Drawing: SITE PLAN AND BOREHOLE LOCATIONS

Scale: 1:500

0 10 20 30m

File No.	Drawing	Revision No.
60320102	FIGURE 1	0

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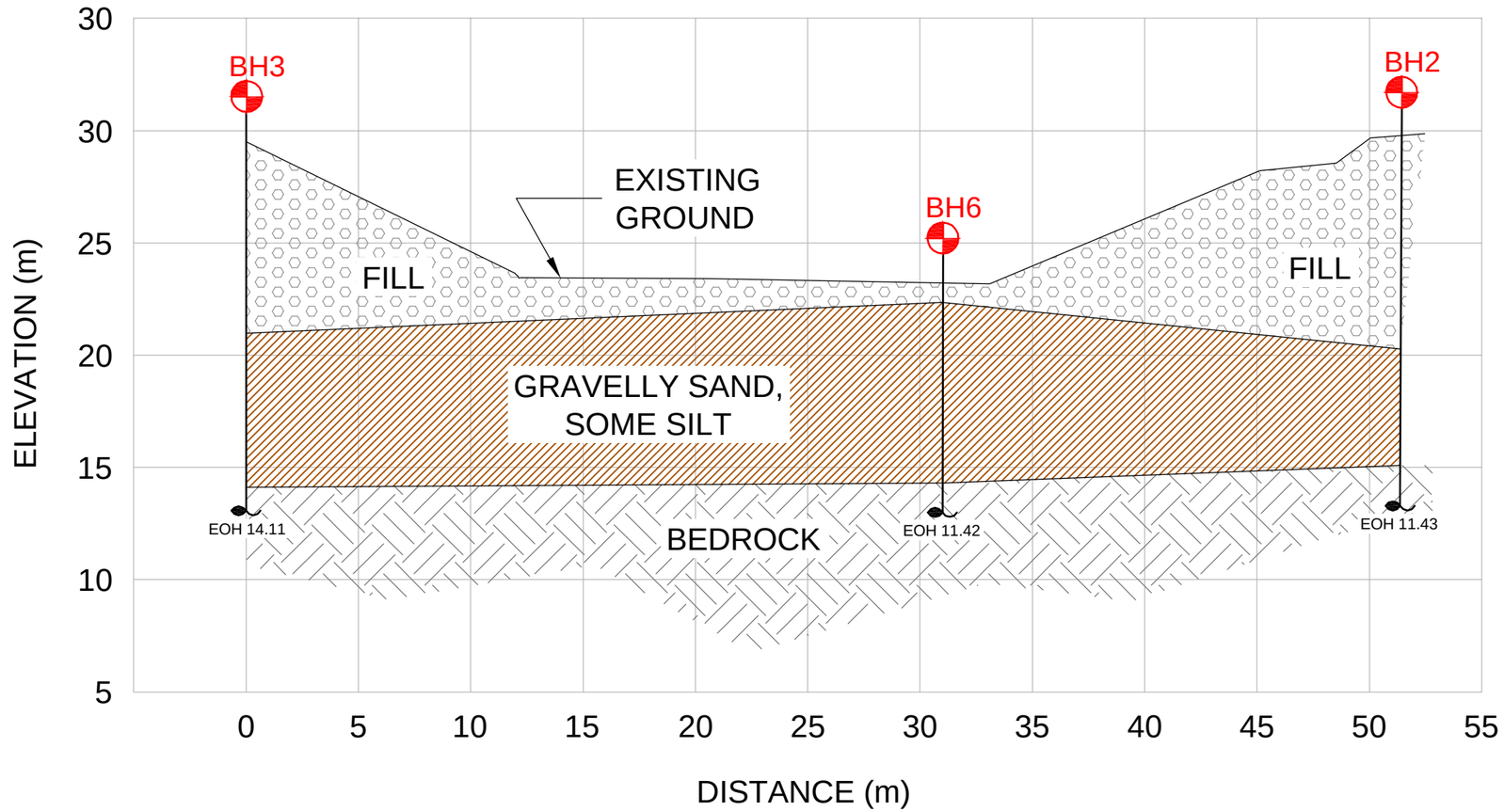

Drawn By: BST	Checked By:
Calculations By:	Checked By:
Date: OCT, 2008	

Project

GEOTECHNICAL INVESTIGATION, PROPOSED REPLACEMENT DAM, BENNETT LAKE, FUNDY NATIONAL PARK, NB

Drawing

INTERPRETIVE CROSS-SECTION A-A

Scale

1:250

0 5 10 15m

File No.	Drawing	Revision No.
60320102	FIGURE 2	0

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2.0 SITE, SOIL AND GROUNDWATER CONDITIONS

2.1 SITE CONDITIONS

The site of the proposed new dam is located south of the existing dam and north of Route 114. At the time of our field investigation, this area was mostly covered with young tree growth.

The existing dam is constructed between two former bridge abutments. BH 1 and 3 were put down within the west and east abutments, respectively.

Water seepage was observed near the toe of the east embankment, and also from the springs at the ground surface. Streams generating from springs were observed within the area between the existing dam and roadway embankments, likely due to seepage from the existing dam.

2.2 SOIL, BEDROCK AND GROUNDWATER CONDITIONS

Five boreholes were put down at the site. Two boreholes were put down through the former bridge abutments, one borehole was put down on the road shoulder of Route 114, and the remaining two boreholes were put down within the proposed dam embankment area.

Soil Conditions

The overburden soils at the site generally consist of sand and gravel fill underlain by native sand and gravel to bedrock. The compactness of the native overburden soils is medium to very dense based on the Standard Penetration Test (SPT) N-values[1], which ranged from 16 to 79, averaging 29.

At BH 6, wood debris was encountered at a depth of 0.6 metres below surface.

A summary of the soil stratigraphy is presented in Table 2.1 and detailed logs are appended (Appendix A).

---

1 The number of blows of a 475 joule hammer required to advance the 50 mm diameter split spoon sampler 300 mm.

Table 2.1: Summary of Soil Conditions

Borehole	Ground Elevation[a]	Fill Thickness	Native Sand & Gravel Thickness	Depth to Bedrock	Borehole Depth
	(m)	(m)	(m)	(m)	(m)
BH 1	29.50	2.74	--	2.74	12.19
BH 2	29.72	9.45	5.18	14.63	18.29
BH 3	29.50	8.53	6.86	15.39	17.83
BH 4	23.79	--	> 5.79	--	5.79
BH 6	23.19	1.10[b]	8.04[c]	9.14	11.77

(a) *Ground elevations are based on an assumed datum of 30.48 metres taken at the top of the west abutment.*
(b) *Wood debris encountered.*
(c) *Cobbles and boulders encountered at bottom of sand and gravel layer, see borehole log.*

Soil index testing was carried out on four representative samples of the native overburden. A summary of the test results is presented in Table 2.2 and detailed results are appended (Appendix B).

Table 2.2: Summary of Grain Size Analysis Tests

Borehole	Sample Depth	% Gravel	% Sand	% Silt and Clay
	(m)			
BH 2	9.14 – 9.75	20.2	60.9	18.9
BH 3	11.73 – 12.34	41.8	47.2	11.0
BH 4	2.59 – 3.20	33.8	55.3	10.9
BH 6	6.40 – 7.01	30.5	60.0	9.5

Based on the grain size analysis, the native overburden soil ranges from gravelly sand with some silt to sand and gravel with some silt.

The hydraulic conductivity of the native overburden soil can be estimated using the Shepard (1989) equation:

$$K = Cd_{50}^{1.5}$$

where

K = hydraulic conductivity (ft/day)
C = shape factor (100 native sand and gravel)
d_{50} = mean grain size (mm)

Refer to Table 2.3 for a summary of the calculated hydraulic conductivities of the native overburden soils.

Table 2.3: Summary of Hydraulic Conductivity Calculations

Borehole	Sample Depth (m)	d_{50} (mm)	Hydraulic Conductivity (cm/s)
BH 2	9.14 – 9.75	0.64	**1.8×10^{-2}**
BH 3	11.73 – 12.34	3.11	**1.9×10^{-1}**
BH 4	2.59 – 3.20	1.98	**9.8×10^{-2}**
BH 6	6.40 – 7.01	1.68	**7.7×10^{-2}**

The average hydraulic conductivity is 9.5×10^{-2} cm/s.

For design purposes the internal friction angle (ϕ') of the native sand and gravel soil may be taken as 34 degrees.

Bedrock Conditions

Greenish grey meta-sedimentary bedrock was encountered in four of the five boreholes. The natural bedrock fracture planes are at 45 degrees.

The Rock Quality Designation[3] (RQD) generally ranges from 25 to 93 %, averaging 59%. On this basis, the rock quality is generally fair. It should be noted that the upper five metres of bedrock at BH 1 (west abutment) is highly weathered as evidenced by RQD values of zero.

A summary of the rock core compressive strengths is presented in Table 2.4 and testing results are appended (Appendix B).

[3] Percent of core consisting of hard, sound pieces in excess of 100 mm long (excluding machine breaks).

Table 2.4: Summary of Rock Core Compressive Strengths

Borehole	Depth (m)	Peak Load (kN)	Compressive Strength (MPa)
BH 1	12.04	228.6	59.4
BH 2	17.98	120.9	37.9

Results of the rock core compressive strengths indicate that the rock strength is moderate to strong.

Groundwater Conditions

Groundwater seepage was observed in each borehole with the exception of BH 1 and BH 3. At these borehole locations the presence of groundwater seepage could not be determined due to the presence of drill water used during rock coring and advancement of the casing through the abutment fill. In BH 1 and 3, the groundwater level could be estimated at the water level of the adjacent Bennett Lake. The groundwater seepage levels measured in BH 2 and BH 6 were consistent with the nearby stream level.

3.0 DISCUSSION AND RECOMMENDATIONS

We understand that a new earth dam with a concrete spillway is being proposed to replace the existing Bennett Lake dam. The new earth dam will butt up against the existing dam as shown on the proposed Option "A" design sections (Appendix C).

Based on the foundation soil conditions encountered at the borehole locations, the proposed 3H:1V embankment slopes would be appropriate for stability purposes. The native sand and gravel layer is not susceptible to liquefaction during an earthquake event.

For design purposes the allowable bearing capacity of the native sand and gravel layer may be taken as 150 kPa. We would anticipate about 25 mm of settlement of the native sand and gravel layer under 5 metres of embankment fill. This settlement would occur practically instantaneously and should be complete by the end of embankment construction.

Because of the pervious nature of the foundation soils, either a full cutoff to bedrock will be required, consideration given to an upstream impervious blanket, or provisions made for internal drainage, relief wells, etc to guard against potential excessive seepage and piping failures through the granular foundation soils.

The creep-head ratio (L/h) should be considered in the design to prevent progressive loss of the foundation material. This is the ratio of the weighted seepage flow length (L) to the headwater (h) to tail-water. Based on the native soil conditions, this ratio (L/h) should be about 6 without a filter drain and 4.8 with a filter drain. In order to increase the creep-head ratio (i.e. increase seepage flow length) a cut off wall could be installed as shown on design drawings. In calculating creep-head ratio, Lane (1935), has adopted the following weighting factors for calculating the seepage length (L):

- Unity (1) for contact surfaces steeper than 45 degrees
- One third (1/3) for contact surfaces flatter then 45 degrees
- Two (2) for seepage path through virgin or undisturbed foundation soils.

In the event that a cut off wall is proposed in the final design, some considerations will need to given on the constructability of the cut off wall due to the granular nature of the foundation soils and existing dam seepage conditions.

GEMETEC Limited would be pleased to provide additional geotechnical design recommendations once the proposed dam design is finalized.

4.0 GENERAL

The boreholes put down at this site are widely scattered and soil conditions may vary from those encountered at the borehole locations. Although representative samples were taken throughout the site, GEMTEC Limited personnel should be contacted immediately if the soils encountered during excavations are different than those encountered in our geotechnical investigation.

The investigation outlined in this report is strictly geotechnical in nature and should not be viewed as an environmental assessment of the site.

APPENDIX A

DESCRIPTIVE TERMS AND BOREHOLE LOGS

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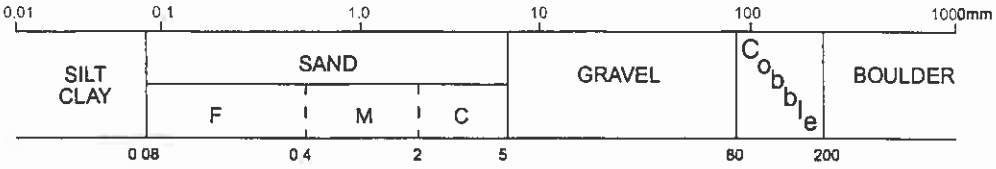
GROUND ENGINEERING & MATERIALS TECHNOLOGY
FREDERICTON, MONCTON, BATHURST, GRAND FALLS NB.

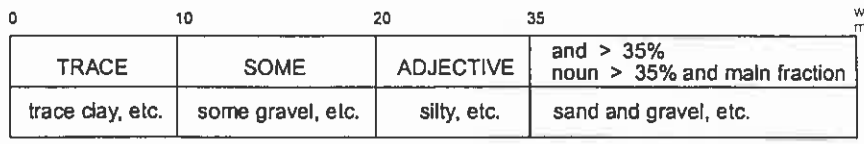
DESCRIPTIVE TERMS- BOREHOLE/TEST PIT LOG

SOILS

GRAIN SIZE



DESCRIPTIVE TERMINOLOGY



TRACE	SOME	ADJECTIVE	and > 35% noun > 35% and main fraction
trace clay, etc.	some gravel, etc.	silty, etc.	sand and gravel, etc.

COMPACTNESS gravels, sands, tills

N, RANGE	0 - 4	4 - 10	10 - 30	30 - 50	> 50
DENSITY	V. LOOSE	LOOSE	MEDIUM	DENSE	V. DENSE

CONSISTENCY silt, clay

S, KPa	< 12.5	12.5 - 25	25 - 50	50 - 100	100 - 200
CONSISTENCY	V. SOFT	SOFT	MEDIUM	STIFF	V. STIFF

ROCK

RQD	OVERALL QUALITY	FRACTURE SPACING
0 - 25	VERY POOR	VERY CLOSE 20 - 60 mm
25 - 50	POOR	CLOSE 60 - 200 mm
50 - 75	FAIR	MODERATE 200 - 600 mm
75 - 90	GOOD	WIDE 600 - 2000 mm
90 - 100	EXCELLENT	VERY WIDE 2 - 6 m

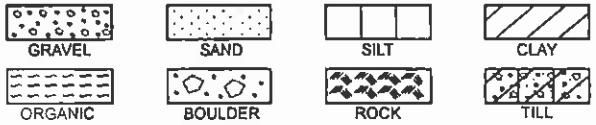
COMP. STR. MPa	1 - 5	5 - 25	25 - 50	50 - 100	100 - 250
DESCRIPTION	V. WEAK	WEAK	MODERATE	STRONG	V. STRONG

SAMPLE TYPES (location to scale on log)

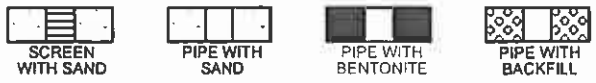
S	SPLIT TUBE	G	SHOVEL
T	SHELBY TUBE	H	CARVED BLOCK
P	PISTON	K	SLOTTED
F	AUGER	V	IN SITU VANE
W	WASH	NR	NO RECOVERY

ROCK CORES A(30mm); B(41mm); N(54mm)

LOG SYMBOLS



WELL SYMBOLS



N - standard penetration test; blows by 475 J drop hammer to advance Std. 50mm O.D. split tube sampler 0.3m
RQD - percent of core consisting of hard, sound pieces in excess of 100mm long (excluding machine breaks)
RECOVERY - sample recovery expressed as percent or length
S - shear strength , kPa; vane ⊕ ; penetrometer ■; unconfined ○
Sr - shear strength, remoulded; vane ⊗ ; penetrometer □
Dd - dry density; t/m³
W - natural moisture content, percent *
PL - plastic limit, percent ⊢
LL - liquid limit, percent ⊣
ND - non detect, total petroleum hydrocarbons (TPH) not detected in soil

Groundwater Level ↧ ; Seepage ↧

Revised March 2002

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GROUND ENGINEERING & MATERIALS TECHNOLOGY
Fredericton, Moncton, Bathurst, Grand-Sault, N.B. Canada

BOREHOLE LOGS

Client	McCormick Rankin Corporation	Proj No. 6032.01	BOREHOLE 1
Project	Geotechnical Investigation, Bennett Lake Dam	Date Drilled 18Sept2008	Page 1 of 1
Location	Bennett Lake, Alma, NB		
Ground Level, m 29.50	Datum: Assumed	Logged By AET	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100
○ Unconfined Compression ■ Pocket Penetrometer
⊕ Field Vane Test ⊗ Remoulded
Water Content & Atterburg Limits (w_P, w, w_L)
Dynamic Penetration Test, blows/0.3m ★
Standard Penetration Test, blows/0.3m ●
0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	8	360		0.14 Root mat (TOPSOIL) 29.36
1	2	S	12	230		Sand and gravel, sandstone and debris (FILL)
2	3	S	13	370		
	4	HQ	0	432		2.74 26.76
3	5	HQ	0	305		META-SEDIMENTARY BEDROCK
4	6	HQ	0	610		
5	7	HQ	0	762		
6	8	HQ	0	914		
7	9	HQ	0	1220		
8	10	HQ	25	610		
9	11	HQ	42	914		
10	12	HQ	56	432		
	13	HQ	25	1168		
11	14	HQ	72	1270		
12						12.19 17.31

End of BH 1 at 12.19 metres
Groundwaterseepage not established due to rock core sampling

GEOTG 603201.GPJ GEMTEC 2004.GDT 10/14/08

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BOREHOLE LOGS

Client	McCormick Rankin Corporation	Proj No. 6032.01	BOREHOLE 2
Project	Geotechnical Investigation, Bennett Lake Dam	Date Drilled 16Sept2008	Page 1 of 1
Location	Bennett Lake, Alma, NB		
Ground Level, m 29.72	Datum: Assumed	Logged By SWB	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100
○ Unconfined Compression ■ Pocket Penetrometer
⊕ Field Vane Test ⊗ Remoulded
Water Content & Atterburg Limits (w_P, w, w_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m
0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	10	400		Crushed sand and gravel FILL
3	2	S	35	600		
6	3	S	22	450		
9	4	S	21	300		9.45
						Gravelly SAND, some silt
12	5	S	16	400		20.27
						14.63
15	6	HQ	17	406		15.09
						META-SEDIMENTARY BEDROCK
	7	HQ	60	1295		
17	8	HQ	90	1525		
18						18.29
						11.43
						End of BH 2 at 18.29 metres
						Groundwater seepage encountered at 9.14 metres

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GROUND ENGINEERING & MATERIALS TECHNOLOGY
Fredericton, Moncton, Bathurst, Grand-Sault, N.B. Canada

BOREHOLE LOGS

Client	McCormick Rankin Corporation	Proj No. 6032.01	BOREHOLE 3
Project	Geotechnical Investigation, Bennett Lake Dam	Date Drilled 15Sept2008	Page 1 of 1
Location	Bennett Lake, Alma, NB		
Ground Level, m 29.50	Datum: Assumed	Logged By AET	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100
○ Unconfined Compression ■ Pocket Penetrometer
⊕ Field Vane Test ⊗ Remoulded
Water Content & Atterburg Limits w_P w w_L
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m
0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION	
0	1	S	11	470		0.17 Root mat (TOPSOIL)	29.33
1	2	S	5	80		Sand and gravel, some silt (FILL)	
2	3	S	6	50			
3	4	S	10	120			
	5	S	10	400			
4	6	S	25	130			
5	7	S	33	230			
6							
	8	S	35	380			
7	9	S	28	220			
8	10	S	20	470			
	11	S	38	610		8.53	20.97
9						SAND AND GRAVEL, some silt	
10	12	S	22	370			
	13	S	29	410			
11							
	14	S	79	260			
12	15	S	57	380			
13	16	S	20	260			
	17	S	33	410			
14							
15						15.39	14.11
	18	S	101	0		META-SEDIMENTARY BEDROCK	
16	19	HQ	69	1030			
17	20	HQ	80	710		17.83	11.67
						End of BH 3 at 17.83 metres Groundwaterseepage not established due to rock core sampling	

>>

GEOTG 603201.GPJ GEMTEC 2004.GDT 10/14/08

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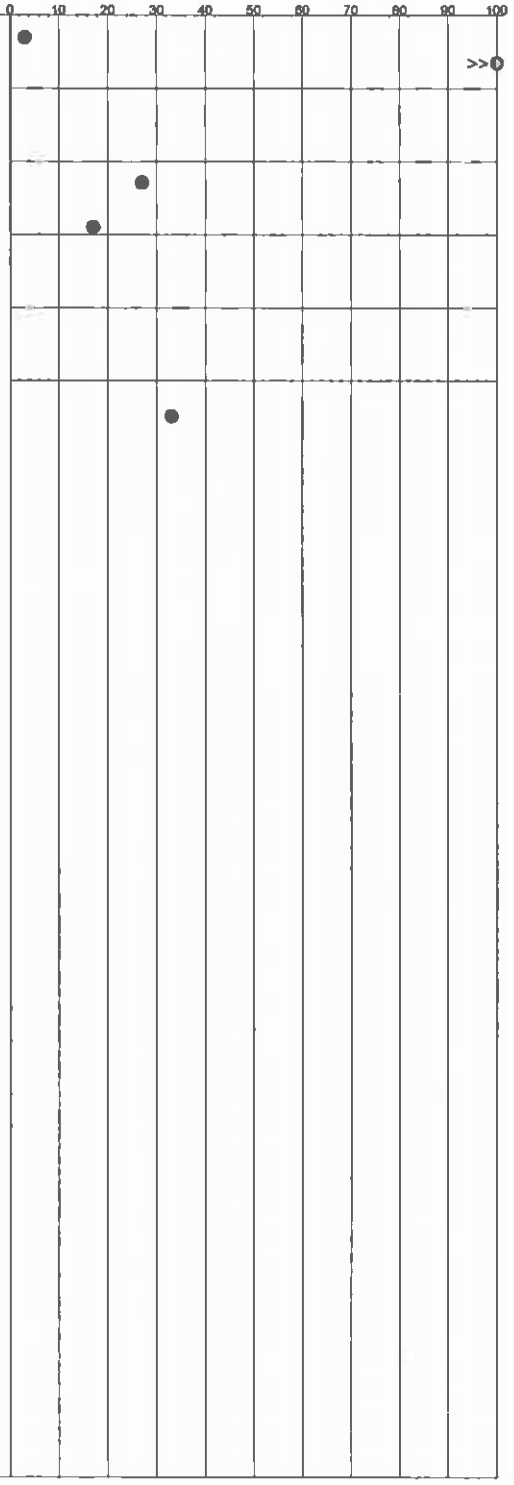
BOREHOLE LOGS

Client	McCormick Rankin Corporation	Proj No. 6032.01	BOREHOLE 4
Project	Geotechnical Investigation, Bennett Lake Dam	Date Drilled 17Sept2008	Page 1 of 1
Location	Bennett Lake, Alma, NB		
Ground Level, m 23.79	Datum: Assumed	Logged By AET	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)
○ Unconfined Compression ■ Pocket Penetrometer
⊕ Field Vane Test ⊗ Remoulded
Water Content & Atterburg Limits (w_P, w, w_L)
Dynamic Penetration Test, blows/0.3m ★
Standard Penetration Test, blows/0.3m ●

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	3	130		0.08 Root mat (TOPSOIL) 23.71
1	2	S	101	0		Gravelly SAND, some silt
2	3	S	27	0		
3	4	S	17	400		
4						
5	5	S	33			5.79 18.00
						End of BH 4 at 5.79 metres
						Groundwater seepage encountered at 2.13 metres



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BOREHOLE LOGS

Client	McCormick Rankin Corporation	Proj No. 6032.01	BOREHOLE 6
Project	Geotechnical Investigation, Bennett Lake Dam	Date Drilled 16Sept2008	Page 1 of 1
Location	Bennett Lake, Alma, NB		
Ground Level, m 23.19	Datum: Assumed	Logged By AET	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100
○ Unconfined Compression ■ Pocket Penetrometer
⊕ Field Vane Test ⊗ Remoulded
Water Content & Atterburg Limits w_P w w_L
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m
0 10 20 30 40 50 60 70 80 90 100

DEPTH m	No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION	
0	1	S	9	150		0.10 Root mat (TOPSOIL)	23.09
						0.60 SAND AND GRAVEL, some silt trace clay	22.59
1						Wood debris	
						1.10	22.09
	2	S	15	250		Gravelly SAND, some silt, trace clay	
2							
3	3	S	31	400			
4							
5	4	S	21	150			
6							
	5	S	18	300			
7	6	HQ	0	762		7.92	15.27
8	7	S	85	0		Cobbles and/or Boulders	
	8	HQ	10	508		9.14	14.05
9						META-SEDIMENTARY BEDROCK	
	9	HQ	73	686			
10	10	HQ	93	1525			
11						11.77	11.42
						End of BH 6 at 11.77 metres Groundwater seepage encountered at 1.22 metres	

APPENDIX B

LABORATORY TESTING RESULTS

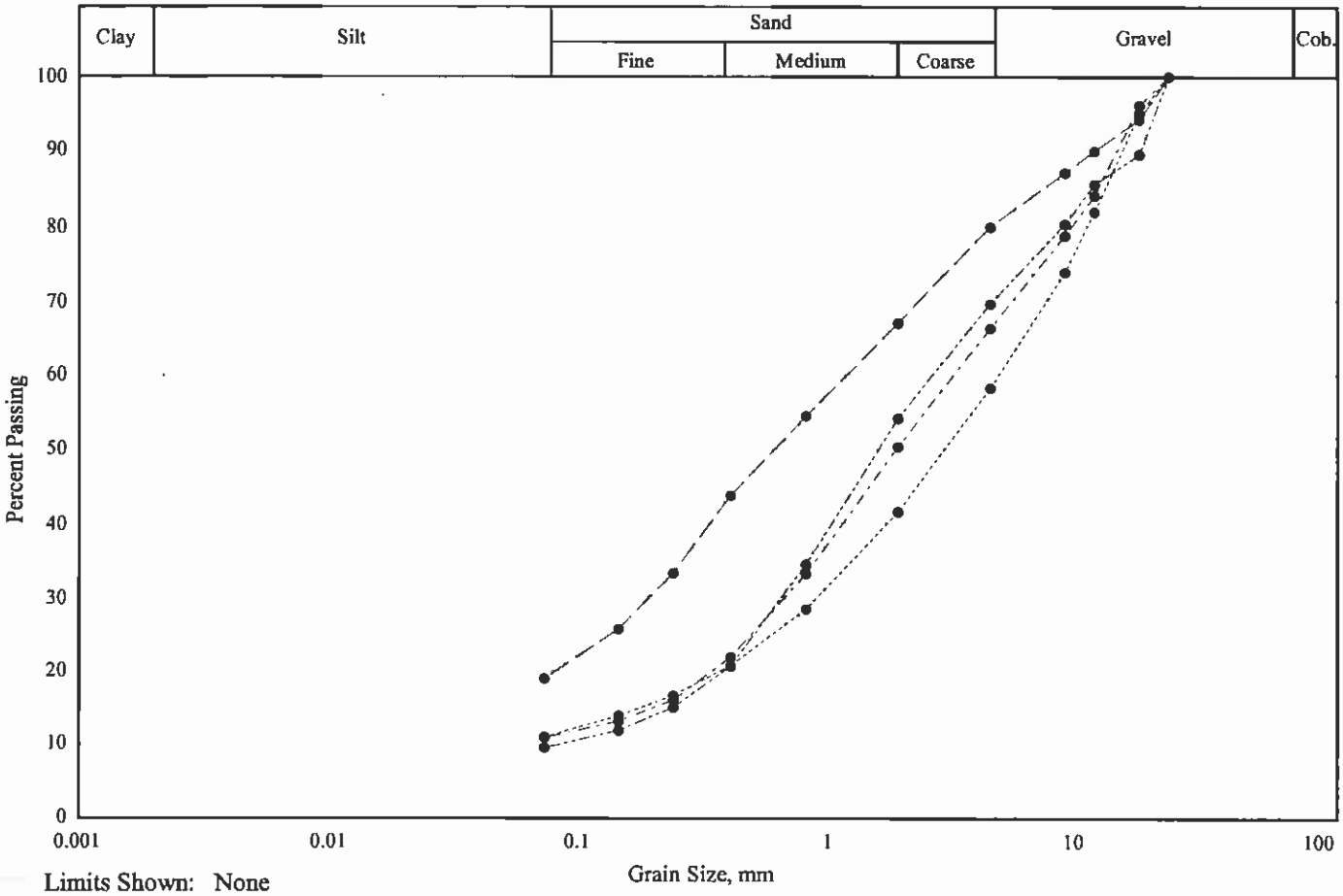
GEMTEC LIMITED
GROUND ENGINEERING & MATERIALS TECHNOLOGY

Client: McCormick Rankin Corporation

Project: Geotechnical Investigation, Proposed Replacement Dam,

Project #: 603201

Soils Grading Chart



Limits Shown: None

Line Symbol	Description	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay	Date Sampled
— — — —		2	4	9.14-9.75m	20.2	60.9	18.9		19/09/2008
.....		3	15	1.73-12.34r	41.8	47.2	11.0		19/09/2008
- - - - - -		4	4	2.59-3.20m	33.8	55.3	10.9		19/09/2008
—.—.—.—		6	5	6.40-7.01m	30.5	60.0	9.5		19/09/2008

Line Symbol	Sample Description	AASHTO	D_{10}	D_{15}	D_{50}	D_{85}	% 5-75µm
— — — —	Gravelly sand , some silt	A-1-b	---	---	0.6404	7.7741	---
.....	Sand and gravel , some silt	A-1-a	---	0.1853	3.1145	13.8022	---
- - - - - -	Gravelly sand , some silt	A-1-a	---	0.2101	1.9755	12.9237	---
—.—.—.—	Gravelly sand , trace silt	A-1-b	0.0865	0.2510	1.6750	12.1516	---

GEMTEC LIMITED
GROUND ENGINEERING & MATERIALS TECHNOLOGY

Client: McCormick Rankin Corporation

Project: Geotechnical Investigation, Proposed Replacement Dam, Bennett Lake, Fundy Natio

Project #: 603201

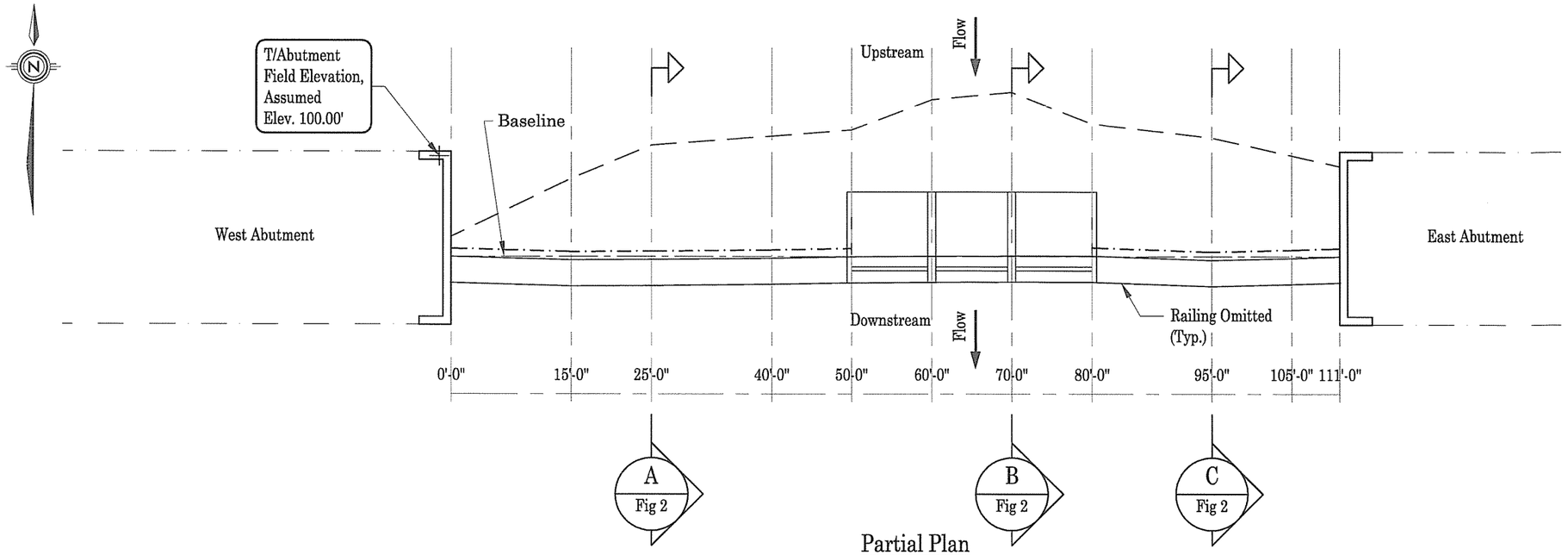
Rock Core Compressive Strength

Date/Time Sampled: 07/10/2008 2:11:00 PM	Date/Time Tested: 08/10/2008 2:12:13 P

BH	Sample No	Depth	Description	Diameter, mm	Area, mm^2	Length After Capping, mm	L/D	Load, kN	Comp. Str., MPa
2	1	17.98		63.0	3117	105	1.67	120.920	37.9
1	1	12.04m		69.0	3739	110	1.60	228.620	59.4

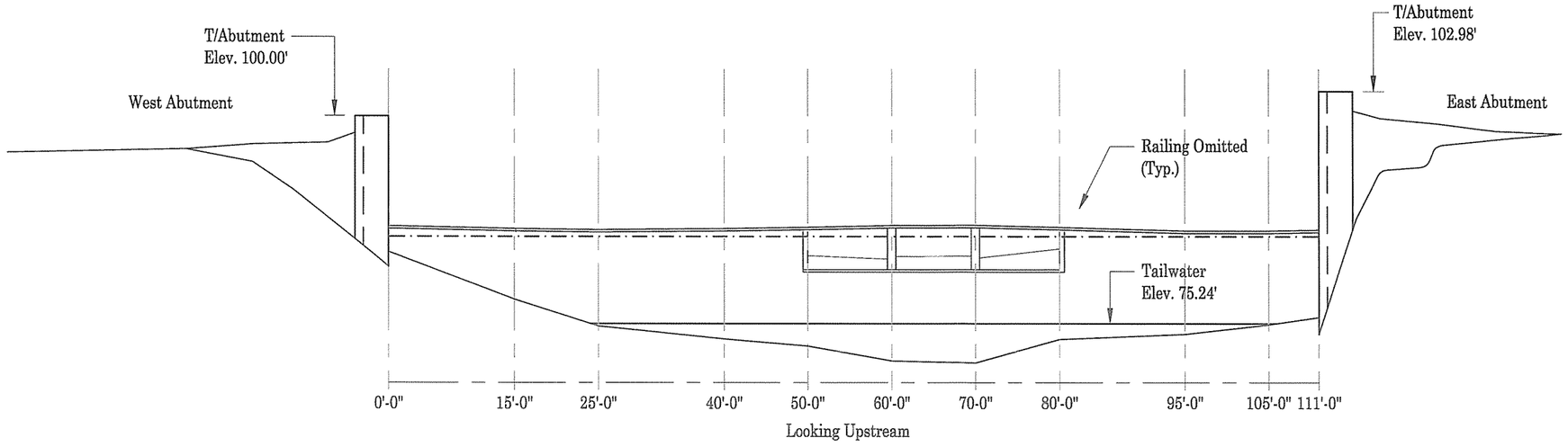
APPENDIX C

DESIGN DRAWINGS, OPTION "A" – CONCRETE SPILLWAY



Partial Plan

Scale: 1/16"=1'--0"



Profile

Scale: 1/16"=1'--0"

Notes:

1. All dimensions in feet unless otherwise noted.
2. All elevations in feet unless otherwise noted.
3. Elevations are base on the field elevation 100.00', assumed. Refer to plan this figure.
4. Partial Plan of existing structure created based on drawing provided by Owner.

Revision	Description	Date
1	Final	20/06/07
0	Draft	DD/MM/07

MITCHELMORE ENGINEERING COMPANY LTD.
INNOVATION RELIABILITY SERVICE-ORIENTED
177 Main Street, Suite 101
Dartmouth, NS B2X 1S1
Ph (902) 404-7777
Ph (902) 444-3131
www.mitchelmore-engineering.com

Client:

Public Works & Government Services Canada

Project:

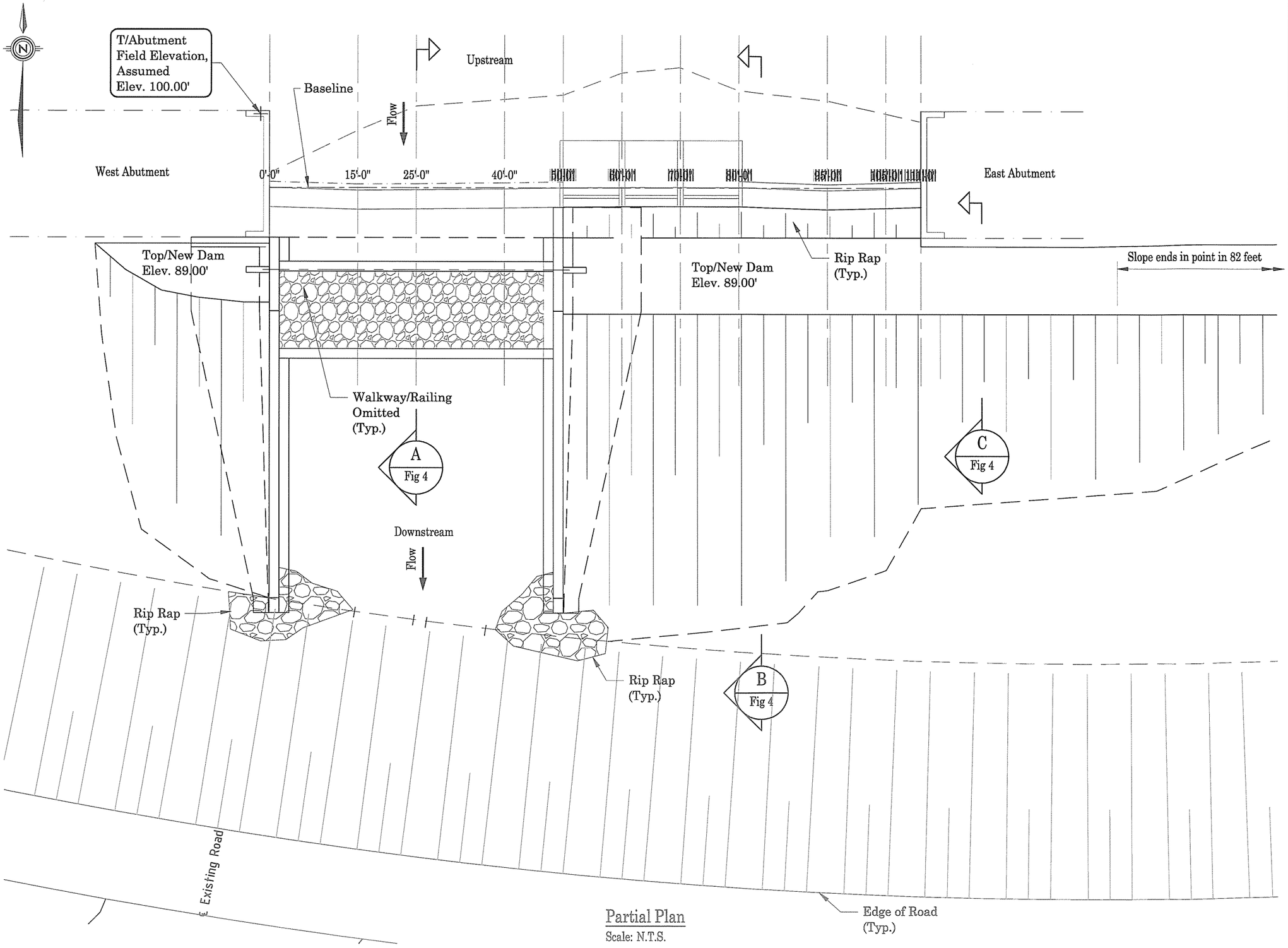
Bennett Lake Dam

Condition Assessment

Title:

Plan, Profile and Sections
Existing Conditions

Designed By:	Drafted By:
P.M.	E.C.B.
Date: 04/09/07	Scale: As Noted
Project #: P6001	Drawing No. Figure 1



Partial Plan

Scale: N.T.S.

Notes:

1. All dimensions in feet unless otherwise noted.
2. All elevations in feet unless otherwise noted.
3. Elevations are base on the field elevation 100.00', assumed. Refer to plan this drawing.

Revision	Description	Date
1	Final	20/06/07
0	Draft	DD/MM/07

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Dartmouth, NS B2X 1S1
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Ph (902) 444-3131
www.mitchelmore-engineering.com

Client:

Public Works & Government Services Canada

Project:

Bennett Lake Dam

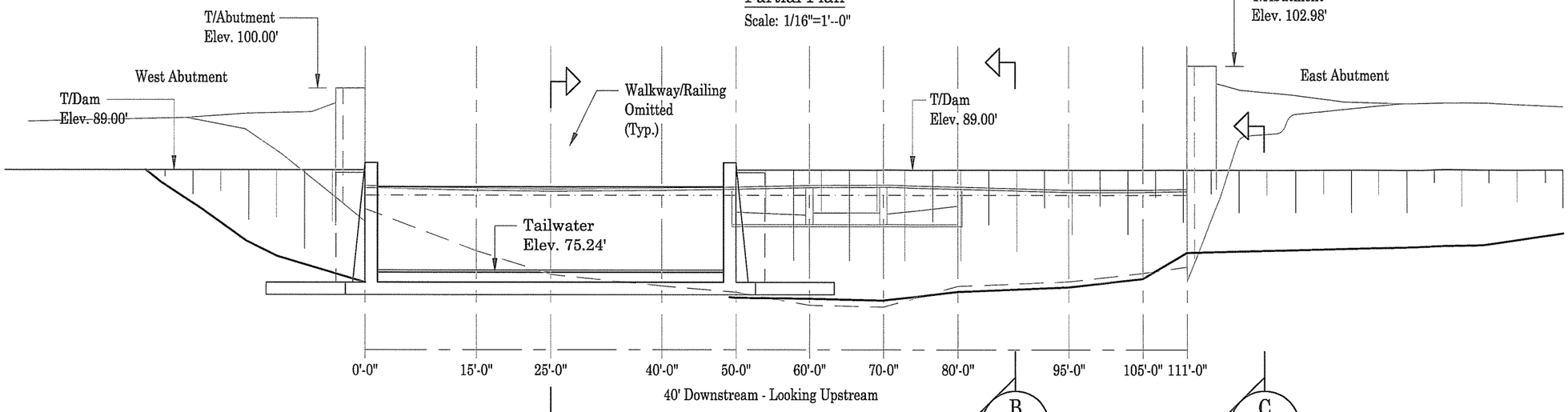
Condition Assessment

Title: Option "A" - Concrete Spillway
Plan
Proposed Dam

Designed By:	Drafted By:
P.M.	E.C.B.
Date: 04/09/07	Scale: As Noted
Project #: P6001	Drawing No. Figure 3

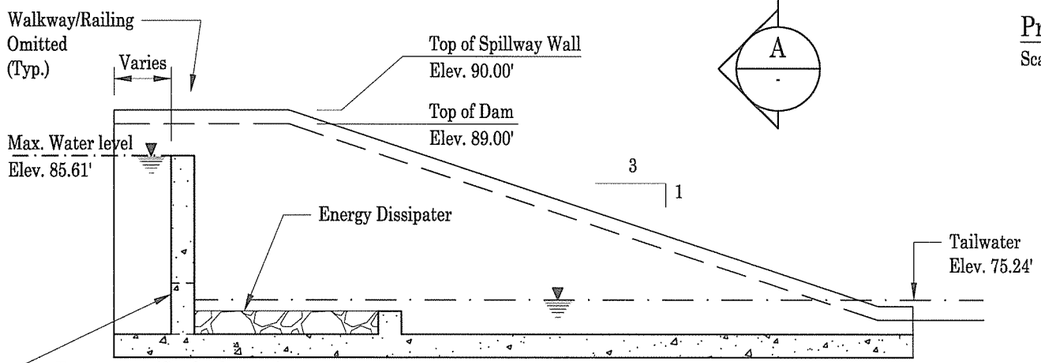
Partial Plan

Scale: 1/16"=1'--0"



Profile

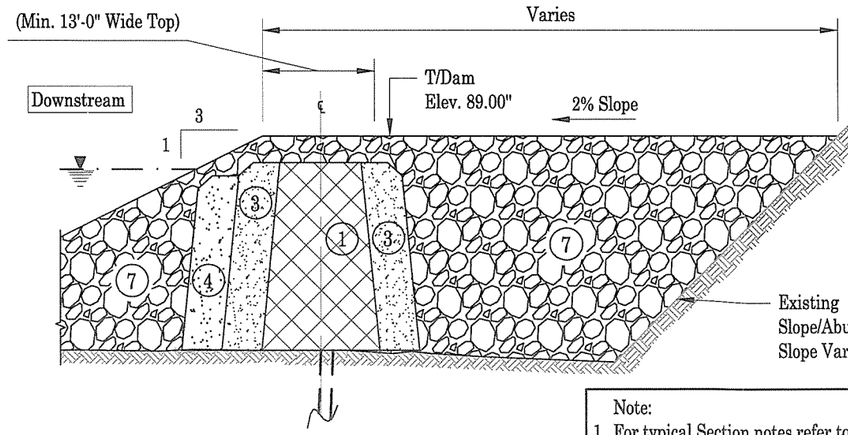
Scale: 1/16"=1'--0"



Section A

Scale: N.T.S.

Fig 3

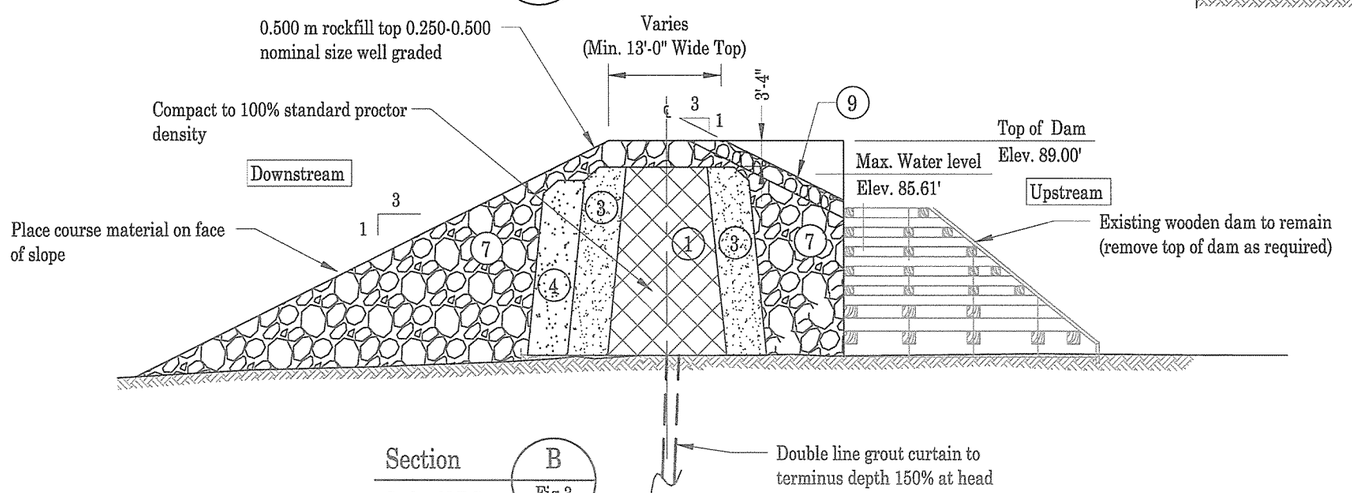


Section C

Scale: N.T.S.

Fig 3

Note:
1. For typical Section notes refer to Section B.



Section B

Scale: N.T.S.

Fig 3

Notes:
1. Upstream side of sloped rock fill to be brought up to elevation of existing embankments as required and/or as noted.
2. Dumped rock - place fill in lifts simultaneously with core material and compact to achive dense well graded fill.

Notes:
1. All dimensions in feet unless otherwise noted.
2. All elevations in feet unless otherwise noted.
3. Elevations are base on the field elevation 100.00', assumed. Refer to plan this drawing.

Legend:

Zone (1) - Impervious Fill

Zone (3) - Fine Filter

Zone (4) - Coarse Filter

Zone (7) - Rock Fill

Zone (9) - Riprap

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Client:

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Project:

Bennett Lake Dam

Condition Assessment

Title: Option "A" - Concrete Spillway
Profile and Sections
Proposed Dam

Designed By:	Drafted By:
P.M.	E.C.B.
Date: 04/09/07	Scale: As Noted
Project #: P6001	Drawing No. Figure 4