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CV-043
CV-042
CV-041
CV-210
CV-040
CV-039
CV-038
CV-037
CV-036
CV-211
CV-212
N
0.5 0.25 0 0.5 km
SCALE

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FISH BARRIER
- FALLS
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © (1:50 000) HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 50 M AND IS IN METRES.

REV	DD/MM/Y10	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
-	DDMMM10	ISSUED FOR ---	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3i

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-

DATE: 01/09/2010 REV -

Path: G:\MARYRIV_GDB\EIS_GDB\EIS_Figures_2010EIS_Figures\MXD\LowerTrophic

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle habitat with cobble substrate.

Figure 2: Upstream view from proposed crossing showing more riffle habitat.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-40

UTM: 17W 0535175 / 7920305

Watercourse Name: Unknown River

Site Description

Watershed Size:	12.021 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	19.0 m
Wetted Width:	12.0 m
Riffle-Crest Depth:	0.11 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.34 m
Bank Height:	0.23 m
D_{95}:	1.16 m
D:	0.001 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	2.5^0
Turbidity:	0.00 FTU
Side Slope	R – 7%; L – 7%
Approach:	R – 93%; L – 93%
Bank Stability:	Low-Moderate
Erosion Potential:	Moderate
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 95%; Pool – 5%
Substrate Composition:	Cobble – 80%; Boulder – 10%; Sand – 3%; Gravel – 3%
Stream Cover:	Boulders – 10%
Riparian Vegetation:	Moss, grasses
Aquatic Vegetation:	Algae
Unique Features:	None
Summary:	This is a large-sized waterbody consisting almost exclusively of riffles and cobble habitat. The banks have moderate erosion potential and boulders represent the only available cover.

Fish Habitat Quality

Marginal

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Possible
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Although a large river, water levels were relatively low during sampling in August thus limiting use by larger fish. As water levels continue to decrease into the fall it is unlikely that adult fish would be migrating upstream to spawn near the crossing. No juveniles were captured during fisheries investigations. This crossing may be too far removed from more suitable habitat (ie. abundant pools) thus significantly reducing use by smaller fish.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-040	**UTM:**	17W 535170 7920316
Site:	DS	**Dates Surveyed:**	24-Jun-08; 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spr	Sum
Bankfull Width (m):	36.56	36.56
Wetted Width (m):	25.59	6.80
Riffle-Crest Depth (m):	0.31	0.18
Pool Depth (m):	0.20	0.12
D (m):	NM	NM
D_{95} (m):	2.00	2.00
Point Velocities (m/s)		
Riffle:	0.94	0.16
Pool:	0.37	0.00
Culverts (L/R):	1.45/0.88	0.43

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 80% cobble, 19% gravel, 1% boulder

Stream Cover: 41% lg. cobble/boulder

Aquatic Vegetation: Flooded terrestrial

Riparian Vegetation: Grasses and moss

Barriers Present (Y/N): Y
Location: DS ~ 1 km

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Flooded	0.10/0.10
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	71.0	26.8
TDS (g/l):	0.05	0.17
DO (mg/l)	14.35	11.62
%DO:	102.5	NM
Water Temp (˚C):	1.0	6.9

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - L NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-040 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-040 during summer 2008.

Figure 3. View from the downstream end of the culvert at crossing CV-040 during spring (a) and summer (b) 2008. View of the road washout that occurred at crossing CV-040 during spring 2008 (c).

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-040	**UTM:**	17W 535154 7920361
Site:	US	**Dates Surveyed:**	24-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spr	Sum
Bankfull Width (m):	29.25	29.25
Wetted Width (m):	20.11	15.70
Riffle-Crest Depth (m):	0.37	0.18
Pool Depth (m):	0.35	0.10
D (m):	NM	NM
D_{95} (m):	1.30	1.30
Point Velocities (m/s)		
Riffle:	0.47	0.31
Pool:	0.18	0.00
Behind a rock:	NM	NM

Stream/Riparian Habitat

Channel Morphology: 75% riffle, 25% pool

Substrate Composition: 69% cobble, 20% sand, 10% gravel, 1% boulder

Stream Cover: 60% lg. cobble

Aquatic Vegetation: Flooded terrestrial

Riparian Vegetation: Grasses and mosses

Barriers Present (Y/N): N
Location: NA

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Flooded	0.05/0.05
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	71.0	27.0
TDS (g/l):	0.05	0.18
DO (mg/l)	14.67	11.61
%DO:	103.9	NM
Water Temp (˚C):	1.0	7.0

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - L NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-040 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-040 during summer 2008.

Figure 3. View from the upstream end of the culverts at crossing CV-040 during spring (a) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-040
Site: DS

UTM / Chainage: 17W 535175 7920305 / 72 + 263
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	36.56	36.56
Wetted Width (m):	27.42	8.60
Riffle Depths (m):	0.11, 0.08	0.05, 0.05
Pool Depth (m):	0.12	0.10
Culvert Depths (L, R) (m):	-, 0.46	0.31, 0.45
Maximum Depth (m):	0.65	0.60
Point Velocities (m/s)		
Riffles:	0.33, 0.50	0.19, 0.35
Pool:	0.01	0.00
Culverts (L, R):	-, 0.17	0.09, 0.07

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 50% sm. cobble, 25% lg. cobble, 15% gravel, 5% sand, 5% boulder

Stream Cover: 30% lg. cobble/ boulder, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss

Barriers Present (Y/N): Y
Location: Somewhere between crossing and DS overwintering site

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	102	363
pH:	8.42	8.59
Water Temp (˚C):	8.1	3.2

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-040 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-040 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-040
Site: US

UTM / Chainage: 17W 535175 7920305 / 72 + 263
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	29.25	29.25
Wetted Width (m):	22.85	8.70
Riffle Depths (m):	0.09, 0.12	0.06, 0.01
Pool Depth (m):	0.20	0.08
Culvert Depths (L,R) (m):	-, 0.26	0.09, 0.15
Maximum Depth (m):	0.30	0.20
Point Velocities (m/s)		
Riffles:	0.19, 0.40	0.29, 0.36
Pool:	0.09	0.00
Culverts (L, R):	-, 0.44	0.26, 0.47

Stream/Riparian Habitat

Channel Morphology: 60% riffle, 40% pool

Substrate Composition: 40% sm. cobble, 35% lg. cobble, 10% gravel, 10% sand, 5% boulder

Stream Cover: 40% lg. cobble/ boulder, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss

Barriers Present (Y/N): Y
Location: Somewhere between crossing and DS overwintering site

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	100	-
pH:	8.43	-
Water Temp (˚C):	8.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-040 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-040 during late August, 2009.

538,000
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540,000
541,000
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543,000
544,000
545,000
7,923,000
7,922,000
7,921,000
7,920,000

Murial Lake

CV-212
CV-033
CV-031
CV-032
BG-33
CV-030
BG-32
CV-213
CV-214
CV-215
CV-217
CV-216
BG-31
CV-023

SCALE 0.5 0.25 0 0.5 km

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FISH BARRIER
- FALLS
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © (1:50 000) HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 50 M AND IS IN METRES.

REV	DD/MMM/10	ISSUED FOR ---	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3j

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV -

Path: \\terastation\GIS\Projects\Other\Mary River Freshwater\2010\Genrtd_Data\Report_Maps\ToteRD

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-030	**UTM / Chainage:**	17W 540123 7921310 / 77 + 506
Site:	DS	**Dates Surveyed:**	4-Jul-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	8.6
Wetted Width (m):	8.6
Riffle Depth (m):	0.09
Cascade Depth (m):	N/A
Pool Depth (m):	0.15
Culvert Depth (m):	0.13
Maximum Depth (m):	0.25
Point Velocities (m/s)	
Riffle:	0.55
Cascade:	N/A
Pool:	0.13
Culvert:	1.14

Stream/Riparian Habitat

Channel Morphology: 100% pool

Substrate Composition: 90% sand/silt, 5% sm. cobble, 5% gravel

Stream Cover: 40% d. pool, 20% sub. terr.

Aquatic Vegetation: N/M

Riparian Vegetation: all

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring
Bank Height (m):	N/A
Bank Stability:	Low
Erosion Potential:	High

Water Quality

	Spring
Specific Conductance (µS/cm):	214
pH:	8.08
Water Temp (˚C):	8.5

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L
Migration:	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-030 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-030	**UTM / Chainage:**	17W 540123 7921310 / 77 + 506
Site:	US	**Dates Surveyed:**	4-Jul-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	1.0
Wetted Width (m):	1.0
Riffle Depth (m):	0.05
Pool Depth (m):	N/M
Culvert Depth (m):	0.05
Maximum Depth (m):	0.25
Point Velocities (m/s)	
Riffle:	0.15
Pool:	0.00
Culvert:	0.69

Stream/Riparian Habitat

Channel Morphology: 95% pool, 5% riffle

Substrate Composition: 90% sand/silt, 5% sm. cobble, 5% gravel

Stream Cover: 25% d. pool, 10% undercut

Aquatic Vegetation: N/M

Riparian Vegetation: all

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring
Bank Height (m):	0.00-0.15
Bank Stability:	Low
Erosion Potential:	High

Water Quality

	Spring
Specific Conductance (µS/cm):	210
pH:	8.09
Water Temp (˚C):	8.5

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L
Migration:	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-030 during early July, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-32
Site: DS

UTM / Chainage: 17W 540706 7921622 / 78 + 161
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	3.80	3.80
Wetted Width (m):	3.80	3.80
Pool Depth (m):	0.88	0.83
Left Culvert Depth (m):	0.80	0.80
Maximum Depth (m):	> 2.00	> 2.00
Point Velocities (m/s)		
Pool:	0.05	0.00
Left Culvert:	0.02	0.09

Stream/Riparian Habitat

Channel Morphology: 100% pool

Substrate Composition: 95% sand, 5% sm. cobble

Stream Cover: 90% deep pool, 5% under-cut banks

Aquatic Vegetation: None

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.35-0.40	0.35-0.40
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	248	450
pH:	8.35	8.31
Water Temp (˚C):	8.5	4.2

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - M	ARCH - N NNST - N
Feeding:	ARCH - H NNST - H	ARCH - H NNST - H
Migration:	ARCH - H NNST - H	ARCH - H NNST - H

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-32 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at BG-32 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-32
Site: US

UTM / Chainage: 17W 540706 7921622 / 78 + 161
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	4.00	4.00
Wetted Width (m):	4.00	4.00
Pool Depth (m):	0.85	0.80
Left Culvert Depth (m):	0.75	0.79
Maximum Depth (m):	1.50	1.50
Point Velocities (m/s)		
Pool:	0.05	0.05
Left Culvert:	0.05	0.06

Stream/Riparian Habitat

Channel Morphology: 95% pool, 5% run

Substrate Composition: 95% sand, 5% sm. cobble

Stream Cover: 90% deep pool, 5% under-cut banks

Aquatic Vegetation: None

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.35-0.40	0.35-0.40
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	253	-
pH:	8.35	-
Water Temp (˚C):	8.4	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - M	ARCH - N NNST - N
Feeding:	ARCH - H NNST - H	ARCH - H NNST - H
Migration:	ARCH - H NNST - H	ARCH - H NNST - H

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-32 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-32 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing flat, sandy habitat habitat with large, unnamed lake visible.

Figure 2: Upstream view from proposed crossing showing flat, sandy habitat.

Figure 3: View across CV-217.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-217

UTM: 17W 0542218 / 7922157

Watercourse Name: Unknown River

Site Description

Watershed Size:	153.045 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	162.0 m
Wetted Width:	124.0 m
Flat Depth:	0.42 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	7.37 m
Bank Height:	6.95 m
D_{95}:	0.05 m
D:	<0.001 m
Confinement:	Partially Confined
Channel Morphology:	Flat
Channel Gradient:	0^0
Turbidity:	0.00 FTU
Side Slope	R – 15%; L – 15%
Approach:	R – 85%; L – 85%
Bank Stability:	Low
Erosion Potential:	High
Undercut Banks:	None

Mesohabitat Composition:	Flat – 100%
Substrate Composition:	Sand – 60%; Gravel – 40%
Stream Cover:	None
Riparian Vegetation:	Small intermittent patches of small plants, willows and grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is an extra large-sized waterbody consisting almost exclusively of flat habitat with fine substrates. The banks have high erosion potential and there is no significant cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Yes
Rearing:	Possible
Overwintering:	Possible

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Yes
Overwintering:	Possible

Comments

This waterbody, which is the major outlet of a large lake, is unlike most crossings along the bulk transport road. It is deep and relatively slow-moving and may not freeze entirely during winter, thus allowing for potential overwintering. However, a lack of cover and fine substrates are not ideal conditions for juveniles in a river that is accessible to adult char. Therefore juvenile use is likely limited and possibly migratory only. Spawning may occur near the crossing or further upstream so this area could be important during fall. In addition, this habitat is more suitable for stickleback use and one was captured during fisheries investigations.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-217
Site: DS

UTM / Chainage: 17W 542219 7922158 / 79 + 915
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	155.38	155.38
Wetted Width (m):	137.10	71.29
Run Depths (m):	0.38, -	0.22, 0.25
Pool Depth (m):	0.50	-
Culvert Depths (L, C, R) (m):	Unsafe	0.62, 0.95, 0.86
Sea Can Depths (from left #'s 1, 2, 7, 8) (m):	-, 0.75, -, -	0.88, -, 0.50, 0.34
Maximum Depth (m):	> 2.00	~ 1.00
Point Velocities (m/s)		
Runs:	0.21, -	0.40, 0.76
Pool:	0.00	-
Culverts (L, C, R):	Unsafe	1.11, 0.96, 1.09
Sea Cans (1, 2, 7, 8):	-, 0.25, -, -	0.04, -, 0.14, 0.21

Stream/Riparian Habitat

Channel Morphology: 70% run, 30% pool

Substrate Composition: 50% gravel, 40% sand, 10% sm. cobble

Stream Cover: 60% deep run, 10% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	77	80
pH:	8.05	8.11
Water Temp (˚C):	4.3	7.2

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - L NNST - L	ARCH - L NNST - L
Migration:	ARCH - H NNST - H	ARCH - H NNST - H

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the sea can crossing at CV-217 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the sea can crossing at CV-217 during late August, 2009.

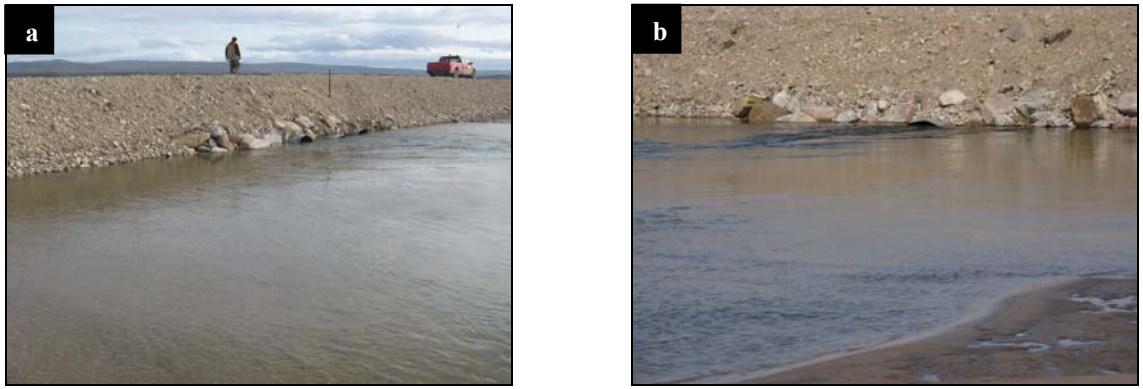

Figure 3. View during early July (a) and late August (b) at the habitat assessment site downstream of the culvert crossing at CV-217.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-217
Site: US

UTM / Chainage: 17W 542219 7922158 / 79 + 915
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/A

Hydrology

	Spring	Fall
Bankfull Width (m):	N/A	N/A
Wetted Width (m):	N/A	N/A
Maximum Depth (m):	N/A	N/A
Point Velocities (m/s)	N/A	N/A

Stream/Riparian Habitat

Channel Morphology: 100% lake

Substrate Composition: 90% sand, 10% gravel

Stream Cover: N/A

Aquatic Vegetation: N/A

Riparian Vegetation: N/A

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.40
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	N/M	-
pH:	N/M	-
Water Temp (˚C):	N/M	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - H NNST - H	ARCH - H NNST - H
Feeding:	ARCH - H NNST - H	ARCH - H NNST - H
Migration:	ARCH - H NNST - H	ARCH - H NNST - H

Tote Road Aquatic Habitat Assessment

Figure 1.Photos not taken of upstream lake.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing flat, shallow, sandy habitat habitat and exposed sand bar preventing access to large lake.

Figure 2: Upstream view from proposed crossing showing flat, sandy habitat.

Figure 3: View across CV-216.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-216

UTM: 17W 0542773 / 7921699

Watercourse Name: Unknown River

Site Description

Watershed Size:	13.318 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	38.0 m
Wetted Width:	28.0 m
Flat Depth:	0.09 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.63 m
Bank Height:	0.54 m
D_{95}:	0.04 m
D:	<0.001 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Flat
Channel Gradient:	0^0
Turbidity:	0.00 FTU
Side Slope	R – 10%; L – 10%
Approach:	R – 90%; L – 90%
Bank Stability:	Low
Erosion Potential:	High
Undercut Banks:	None

Mesohabitat Composition:	Flat – 98%; Riffle – 2%
Substrate Composition:	Sand – 95%; Gravel – 5%
Stream Cover:	None
Riparian Vegetation:	Small plants and grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized waterbody consisting almost exclusively of flat habitat with fine substrates. The banks have high erosion potential and there is no significant cover.

Fish Habitat Quality

Marginal

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

This waterbody is a smaller outlet of the same lake CV-217 drains. However, at the time of sampling there was no actual connection with the lake as water levels were too low. It is highly unlikely that adult fish use this tributary, particularly for fall spawning migrations. Due to a lack of preferred habitat (larger substrate sizes and deeper pools) juvenile use is likely also limited. There is also likely little use by sticklebacks.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-216	**UTM / Chainage:**	17W 542774 7921700 / 80 + 646
Site:	DS	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	46.61	46.61
Wetted Width (m):	6.40	7.31
Riffle Depth (m):	0.05	0.05
Right Culvert Depth (m):	0.07	0.11
Maximum Depth (m):	0.07	0.11
Point Velocities (m/s)		
Riffle:	0.26	0.26
Right Culvert:	0.33	1.06

Stream/Riparian Habitat

Channel Morphology: 80% flat, 20% riffle

Substrate Composition: 90% sand, 10% gravel

Stream Cover: None

Aquatic Vegetation: None

Riparian Vegetation: Grasses

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	1078	2035
pH:	8.30	8.26
Water Temp (˚C):	13.4	6.1

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - M NNST - N	ARCH - M NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-216 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-216 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-216
Site: US

UTM / Chainage: 17W 542774 7921700 / 80 + 646
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	40.22	40.22
Wetted Width (m):	29.25	22.85
Flat Depth (m):	0.03	0.06
Right Culvert Depth (m):	0.07	0.16
Maximum Depth (m):	0.10	0.16
Point Velocities (m/s)		
Flat:	0.16	0.18
Right Culvert:	0.59	0.78

Stream/Riparian Habitat

Channel Morphology: 90% flat, 10% riffle

Substrate Composition: 90% sand, 10% gravel

Stream Cover: None

Aquatic Vegetation: None

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	1050	-
pH:	8.31	-
Water Temp (˚C):	13.3	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - M NNST - N	ARCH - M NNST - N

Baffinland Iron Mines
Mary River Project

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Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-216 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-216 during late August, 2009.

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7,920,000
7,919,000
7,918,000

CV-023
BG-29
CV-022
CV-021
BG-30
CV-020
CV-018
CV-019
CV-017
BG-28
CV-016
BG-27
CV-013
BG-25
CV-015
BG-26
CV-014
CV-218
BG-23
BG-24
CV-012
CV-011
CV-010
CV-009
BG-22
BG-21
BG-20
CV-008
BG-19
BG-18
BG-17
BG-16
BG-15

David Lake

SCALE 0.5 0.25 0 0.5 km

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FISH BARRIER
- FALLS
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © (1:50 000) HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DD/MM/M10	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
-	01/09/2010	ISSUED FOR ---	-	-	-	-

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3k

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO. -
REF NO. -
DATE: 01/09/2010
REV -

Path: \\terrastation\GIS\Projects\Other\Mary River Freshwater\2010\Genrtd_Data\Report_Maps\ToteRD

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-29	**UTM / Chainage:**	17W 546229 7919877 / 84 + 805
Site:	DS	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Confined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	2.3	2.3
Wetted Width (m):	2.3	2.3
Riffle Depth (m):	0.05	0.05
Cascade Depth (m):	N/A	N/A
Pool Depth (m):	0.52	0.68
Culvert Depth (m):	0.10	0.07
Maximum Depth (m):	0.52	N/M
Point Velocities (m/s)		
Riffle:	0.26	0.24
Cascade:	N/A	N/A
Pool:	0.00	0.01
Culvert:	0.68	0.62

Stream/Riparian Habitat

Channel Morphology: 70% pool, 30% riffle

Substrate Composition: 60% sand, 25% gravel, 10% sm. cobble, 5% lg. cobble

Stream Cover: 35% d. pool, 10% undercut

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.2-0.4	N/M
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	177	205
pH:	8.25	8.42
Water Temp (˚C):	5.6	8.8

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - M	ARCH - M NNST - M
Migration:	ARCH - L NNST - L	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

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Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-29 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-29 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-29
Site: US

UTM / Chainage: 17W 546229 7919877 / 84 + 805
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Confined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	12.8	12.8
Wetted Width (m):	5.6	5.1
Pool Depth (m):	0.31	0.27
Culvert Depth (m):	0.15	0.12
Maximum Depth (m):	0.35	0.24
Point Velocities (m/s)		
Pool:	0.02	0.01
Culvert:	0.70	0.78

Stream/Riparian Habitat

Channel Morphology: 95% pool, 5% riffle

Substrate Composition: 40% sand/silt, 40% gravel, 20% sm. cobble

Stream Cover: 20% d. pool, 5% cobble, 10% sub. veg.

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	N/A	N/M
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	175	N/M
pH:	8.26	N/M
Water Temp (˚C):	5.6	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - M	ARCH - M NNST - M
Migration:	ARCH - L NNST - L	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

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Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-29 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-29 during fall, 2009.

Bulk Sample Road Watercourse Crossing Assessment

No Figure Available

Location

Site: BG-28

UTM: 17W 0547567 / 7919479

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.166 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	N/A
Wetted Width:	N/A
Flat Depth:	N/A
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	N/A
D:	N/A
Confinement:	N/A
Channel Morphology:	N/A
Channel Gradient:	N/A
Turbidity:	N/A
Side Slope	N/A
Approach:	N/A
Bank Stability:	N/A
Erosion Potential:	N/A
Undercut Banks:	N/A

Mesohabitat Composition:	N/A
Substrate Composition:	N/A
Stream Cover:	N/A
Riparian Vegetation:	N/A
Aquatic Vegetation:	N/A
Unique Features:	N/A
Summary:	This is an extra-small-sized waterbody that is almost completely dry with no existing connection to a lake downstream.

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

This waterbody is likely only a spring runoff stream and provides no suitable fish habitat for any life cycle stage or species.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

NORTH/SOUTH CONSULTANTS INC.
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Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing cascade, cobble habitat and downstream lake.

Figure 2: Upstream view from proposed crossing more cascade habitat.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: BG-27

UTM: 17W 0547876 / 7919342

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.553 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	7.0 m
Wetted Width:	5.0 m
Riffle-Crest Depth:	0.05 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.50 m
Bank Height:	0.45 m
D_{95}:	0.27 m
D:	0.05 m
Confinement:	Partially Confined
Channel Morphology:	Cascade-Pool
Channel Gradient:	7^0
Turbidity:	0.00 FTU
Side Slope	R – 2%; L – 2%
Approach:	R – 98%; L – 98%
Bank Stability:	Moderate
Erosion Potential:	Moderate
Undercut Banks:	Some

Mesohabitat Composition:	Cascade – 90%; Pool – 10%
Substrate Composition:	Cobble – 70%; Gravel – 10%; Sand – 10%; Boulders – 10%
Stream Cover:	Boulders – 10%; Undercut – 2%; Overstream Vegetation – 2%
Riparian Vegetation:	Moss, small plants, willows and grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a small-sized waterbody consisting almost exclusively of cascade habitat with cobble substrate. The banks have moderate erosion potential and there is a variety of available cover.

Fish Habitat Quality

Marginal

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	Possible
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Relatively low water levels and higher velocities likely limit use of this habitat by both stickleback and juvenile char. It is accessible from a nearby lake downstream so there is probably some intermittent use. Adult char do not use this habitat at any time.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-27
Site: DS

UTM / Chainage: 17W 547876 7919342 / 86 + 609
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	5.6	5.6
Wetted Width (m):	1.3	1.3
Riffle Depth (m):	0.05	0.03
Cascade Depth (m):	0.02	0.01
Pool Depth (m):	N/A	N/A
Culvert Depth (m):	0.05	0.04
Maximum Depth (m):	0.20	N/M
Point Velocities (m/s)		
Riffle:	0.43	0.38
Cascade:	0.81	0.45
Pool:	N/A	N/A
Culvert:	1.04	0.83

Stream/Riparian Habitat

Channel Morphology: 55% cascade, 40% riffle, 5% pool

Substrate Composition: 65% sm. cobble, 15% lg. cobble, 10% gravel, 10% sand

Stream Cover: 15% cobble

Aquatic Vegetation: N/M

Riparian Vegetation: grass, willow

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.30	N/M
Bank Stability:	Moderate	N/M
Erosion Potential:	Moderate	N/M

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	59	496
pH:	8.33	8.57
Water Temp (˚C):	6.4	5.1

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

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Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-27 during spring, 2009.

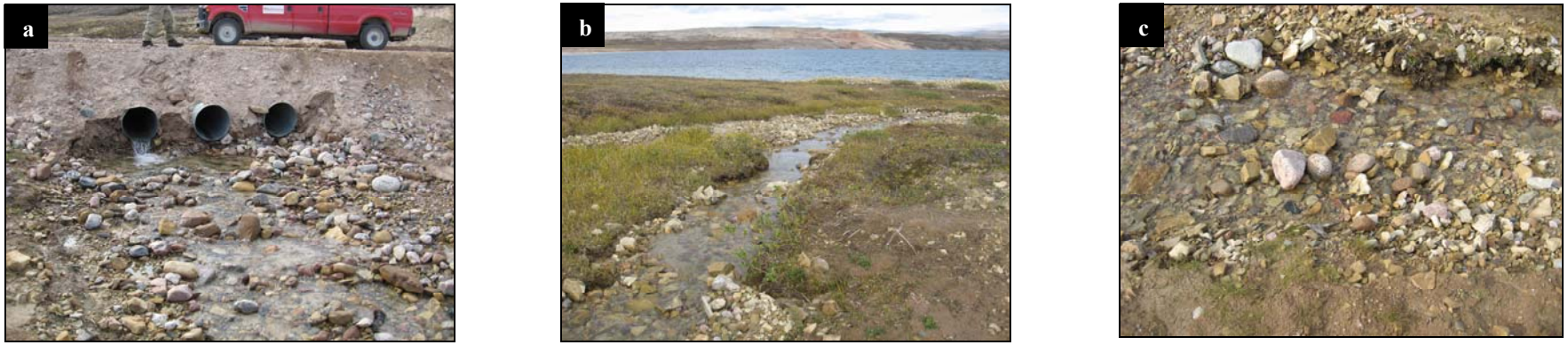

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-27 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-27	**UTM / Chainage:**	17W 547876 7919342 / 86 + 609
Site:	US	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	4.5	N/M
Wetted Width (m):	1.4	1.0
Riffle Depth (m):	0.08	0.02
Cascade Depth (m):	0.03	0.01
Pool Depth (m):	0.09	0.1
Culvert Depth (m):	0.09	0.06
Maximum Depth (m):	0.10	0.24
Point Velocities (m/s)		
Riffle:	0.67	0.36
Cascade:	0.96	0.96
Pool:	0.01	0.00
Culvert:	0.75	0.72

Stream/Riparian Habitat

Channel Morphology: 45% riffle, 45% cascade, 10% pool

Substrate Composition: 40% lg. cobble, 40% sm. cobble, 10% gravel, 10% sand

Stream Cover: 40% cobble

Aquatic Vegetation: N/M

Riparian Vegetation: grass, willow

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.05-0.02	N/M
Bank Stability:	Moderate	N/M
Erosion Potential:	Moderate	N/M

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	60	N/M
pH:	8.30	N/M
Water Temp (˚C):	6.4	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-27 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-27 during fall, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle and cobble habitat habitat and downstream lake.

Figure 2: Upstream view from proposed crossing showing riffle-pool habitat.

Figure 3: Aerial view of BG-24 showing braided channel.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site:	BG-24	**Watercourse Name:**	Unknown River
UTM:	17W 0548766 / 7918877		

Site Description

Watershed Size:	5.506 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	62.0 m
Wetted Width:	5.5 m
Riffle-Crest Depth:	0.12 m
Pool Depth:	0.30 m
Residual Pool Depth:	0.18 m
Bankfull Depth:	0.63 m
Bank Height:	0.45 m
D_{95}:	0.35 m
D:	0.02 m
Confinement:	N/A (braided channel)
Channel Morphology:	Riffle-Pool
Channel Gradient:	4.5^0
Turbidity:	0.00 FTU
Side Slope	R – 2%; L – 2%
Approach:	R – 98%; L – 98%
Bank Stability:	Moderate-High
Erosion Potential:	Moderate
Undercut Banks:	Moderate

Mesohabitat Composition:	Riffle – 95%; Pool – 5%
Substrate Composition:	Cobble – 90%; Gravel – 5%; Boulders – 5%
Stream Cover:	Boulders – 5%; Undercut – 10%
Riparian Vegetation:	Moss, willows and grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a medium-sized waterbody consisting almost exclusively of riffle habitat with cobble substrate. The banks have moderate-high erosion potential and there is a variety of available cover. The stream is split into three separate wetted channels (3.5, 1, and 1 m wetted widths) at the proposed crossing.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Though the wetted areas are relatively small, there is sufficient suitable habitat for juvenile char. This area is likely an important rearing/refuge area from the lake downstream. Several small char were observed or captured during fisheries investigations. Water levels are probably not high enough even during spring for any significant use by adult char.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-24
Site: DS

UTM: 17W 548793 7918898
Dates Surveyed: 23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spr	Sum
Bankfull Width (m):	4.50	4.50
Wetted Width (m):	3.00	3.40
Riffle-Crest Depth (m):	0.16	0.22
Pool Depth (m):	0.65	0.06-0.45
D_{95} (m):	0.38	0.38
Point Velocities (m/s)		
Riffle:	0.99	0.80
Pool:	0.03	0.00
Culvert:	2.20	2.12

Stream/Riparian Habitat

Channel Morphology: 70% riffle, 30% pool

Substrate Composition: 50% gravel, 40% cobble, 10% sand

Stream Cover: 30% UC banks, 30% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss, willows

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef/0.45	Undef/0.45
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	100.0	22.7
TDS (g/l):	0.07	0.15
DO (mg/l)	14.06	12.61
%DO:	102.3	NM
Water Temp (˚C):	2.0	4.3

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - L	ARCH - N NNST - L
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - M NNST - N	ARCH - M NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of BG-24 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of BG-24 during summer 2008.

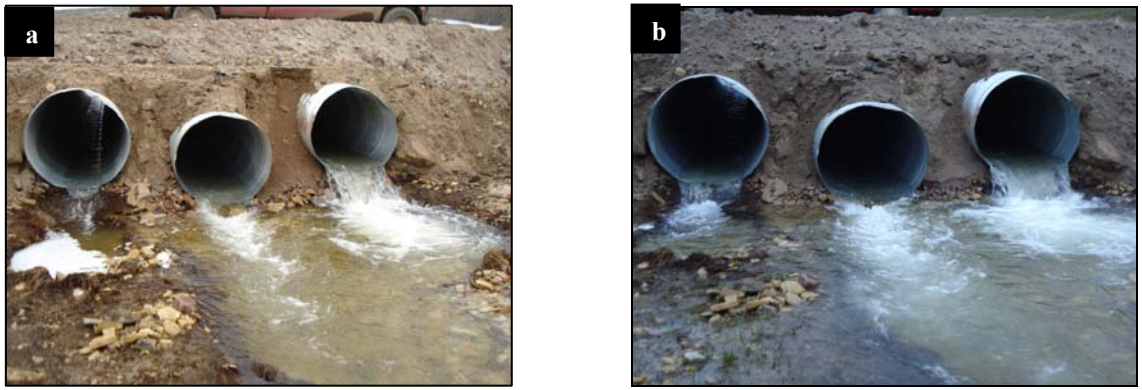


Figure 3. View from the downstream end of the culverts at crossing BG-24 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-24	**UTM:**	17W 548770 7918871
Site:	US	**Dates Surveyed:**	23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2˚

Hydrology

	Spr	Sum
Bankfull Width (m):	6.50	6.50
Wetted Width (m):	6.50	6.00
Riffle-Crest Depth (m):	0.15	0.18
Pool Depth (m):	0.26	0.40
D_{95} (m):	0.38	0.38
Point Velocities (m/s)		
Riffle:	0.40	0.52
Pool:	0.20	0.20
Cascade:	1.40	NM

Stream/Riparian Habitat

Channel Morphology:	40% pool, 30% riffle, 30% cascade
Substrate Composition:	50% gravel, 35% cobble, 15% sand
Stream Cover:	10% undercut banks 10% deep pools
Aquatic Vegetation:	Periphyton,
Riparian Vegetation:	Moss, grasses, and willows
Barriers Present (Y/N):	N
Location:	NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	96.0	22.6
TDS (g/l):	0.06	0.15
DO (mg/l)	14.35	12.49
%DO:	105.3	NM
Water Temp (˚C):	2.0	4.2

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - M NNST - N
Migration:	ARCH - L NNST - N	ARCH - M NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of BG-24 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from from the habitat assessment upstream of BG-24 during summer 2008.

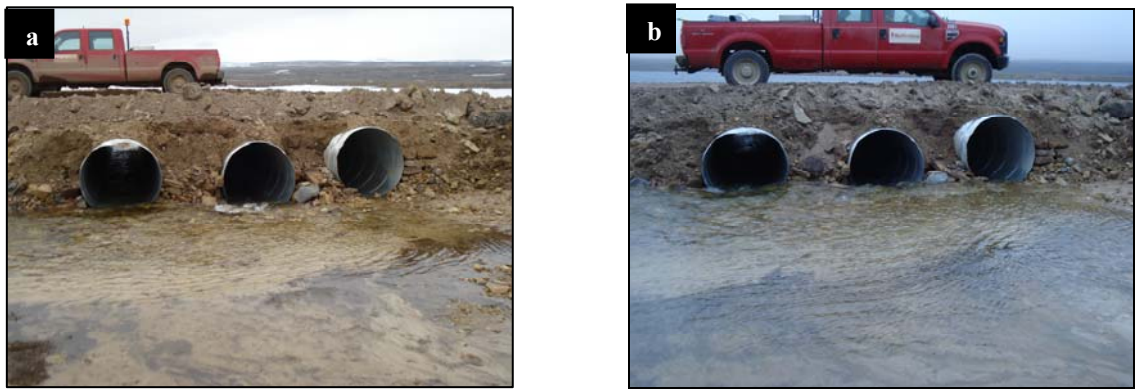


Figure 3. View from the upstream end of the culverts at crossing BG-24 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-24	**UTM / Chainage:**	17W 548766 7918878 / 87 + 710
Site:	DS	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	3.80	3.80
Wetted Width (m):	1.80	1.80
Riffle Depth (m):	0.15	0.03
Pool Depth (m):	0.36	0.38
Cascade Depth (m):	0.09	0.08
Right Culvert Depth (m):	0.26	0.18
Maximum Depth (m):	0.40	0.38
Point Velocities (m/s)		
Riffle:	0.45	0.55
Pool:	0.01	0.05
Cascade:	1.41	1.33
Right Culvert:	0.67	0.49

Stream/Riparian Habitat

Channel Morphology: 70% riffle , 20% pool, 10% cascade

Substrate Composition: 70% sm. cobble, 20% lg. cobble , 10% gravel

Stream Cover: 30% under-cut banks, 20% lg. cobble, 10% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10-0.40	0.10-0.40
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	130	515
pH:	8.38	8.45
Water Temp (˚C):	5.5	4.6

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-24 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-24 during late August, 2009.

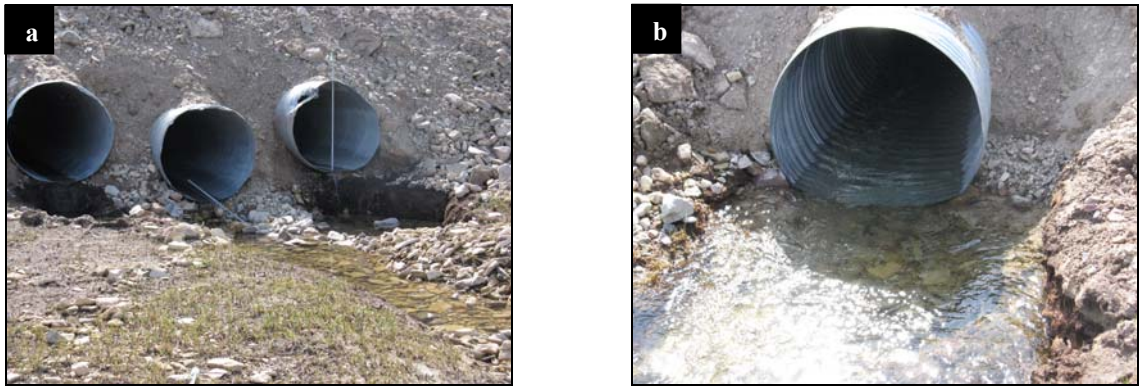


Figure 3. View of old (a) and new culvert(s) (b) installed at crossing at BG-24.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-24
Site: US

UTM / Chainage: 17W 548766 7918878 / 87 + 710
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 5-10˚

Hydrology

	Spring	Fall
Bankfull Width (m):	20.00	20.00
Wetted Width (m):	2.50	2.30
Riffle Depth (m):	0.20	0.09
Cascade Depth (m):	0.03	0.04
Pool Depth (m):	0.60	0.49
Right Culvert Depth (m):	0.24	0.14
Maximum Depth (m):	0.60	0.49
Point Velocities (m/s)		
Riffle:	0.50	0.86
Cascade:	0.97	0.64
Pool:	0.00	0.00
Right Culvert:	0.54	0.55

Stream/Riparian Habitat

Channel Morphology: 40% riffle, 40% cascade, 20% pool

Substrate Composition: 50% sm. cobble, 40% lg. cobble, 10% gravel

Stream Cover: 40% lg. cobble , 10% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	127	-
pH:	8.36	-
Water Temp (˚C):	5.6	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-24 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-24 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle-pool habitat, cobble/gravel/sand substrate.

Figure 2: Upstream view from proposed crossing showing more riffle-pool habitat.

Figure 3: View across BG-17.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: BG-17

UTM: 17W 0550703 / 7917643

Watercourse Name: Unknown River

Site Description

Watershed Size:	13.767 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	9.0 m
Wetted Width:	8.0 m
Riffle-Crest Depth:	0.19 m
Pool Depth:	0.30 m
Residual Pool Depth:	0.11 m
Bankfull Depth:	0.95 m
Bank Height:	0.65 m
D_{95}:	0.10 m
D:	0.06 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	1^0
Turbidity:	22.95 FTU
Side Slope	R – 10%; L – 10%
Approach:	R – 90%; L – 90%
Bank Stability:	Low
Erosion Potential:	High
Undercut Banks:	Some

Mesohabitat Composition:	Riffle – 50%; Pool – 50%
Substrate Composition:	Cobble – 40%; Gravel – 30%; Sand – 30%
Stream Cover:	Instream Vegetation – 3%
Riparian Vegetation:	Grasses, moss, thrift, small plants, and willows
Aquatic Vegetation:	Submerged grasses
Unique Features:	None
Summary:	This is a large-sized waterbody with abundant riffle and pool habitat and a mixture of cobble, gravel, and sand substrate. The banks have high erosion potential. There is some flooded vegetation provding potential cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	Possible
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Possible
Overwintering:	None

Comments

This site provides abundant, suitable habitat for juvenile char. The extent of use by adults is unknown though the area at the proposed crossing is unlikely to be used for spawning. Increased turbidity levels and pool habitat may provide suitable habitat for stickleback though only small char were captured in fisheries investigations.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-17
Site: DS

UTM / Chainage: 17W 550703 7917643 / 90 + 167
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	9.14	9.14
Wetted Width (m):	5.48	3.30
Riffle Depth (m):	0.08	0.11
Pool Depth (m):	0.38	0.40
Run Depth (m):	0.30	0.28
Left Culvert Depth (m):	0.36	0.32
Maximum Depth (m):	0.50	0.45
Point Velocities (m/s)		
Riffle:	0.63	0.67
Pool:	0.12	0.00
Run:	0.39	0.62
Left Culvert:	0.39	0.70

Stream/Riparian Habitat

Channel Morphology: 50% run, 30% riffle , 20% pool

Substrate Composition: 50% sm. cobble, 30% gravel, 15% lg. cobble, 5% sand

Stream Cover: 20% deep run, 10% deep pool, 15% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	93	97
pH:	8.08	8.12
Water Temp (˚C):	6.5	8.8

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - M	ARCH - N NNST - N
Feeding:	ARCH - H NNST - M	ARCH - H NNST - M
Migration:	ARCH - H NNST - M	ARCH - H NNST - M

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-17 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-17 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-17
Site: US

UTM / Chainage: 17W 550703 7917643 / 90 + 167
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	15.54	15.54
Wetted Width (m):	11.88	10.97
Run Depth (m):	0.28	0.24
Left Culvert Depth (m):	0.24	0.29
Maximum Depth (m):	0.35	0.30
Point Velocities (m/s)		
Run:	0.13	0.17
Left Culvert:	0.81	0.43

Stream/Riparian Habitat

Channel Morphology: 100% run

Substrate Composition: 75% sand/silt, 15% sm. cobble, 5% lg. cobble, 5% gravel

Stream Cover: 20% deep pool, 10% submerged veg., 5% lg. cobble

Aquatic Vegetation: Periphyton, submerged veg.

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	94	-
pH:	8.08	-
Water Temp (˚C):	6.4	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - M	ARCH - N NNST - N
Feeding:	ARCH - H NNST - M	ARCH - H NNST - M
Migration:	ARCH - H NNST - M	ARCH - H NNST - M

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-17 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-17 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Upstream view from proposed crossing showing nearly dry habitat and empty fuel drums.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: BG-16
UTM: 17W 0550742 / 7917611
Watercourse Name: Unknown River

Site Description

Watershed Size:	0.064 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	N/A
Wetted Width:	N/A
Riffle-Crest Depth:	N/A
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	N/A
D:	N/A
Confinement:	N/A
Channel Morphology:	N/A
Channel Gradient:	N/A
Turbidity:	N/A
Side Slope	N/A
Approach:	N/A
Bank Stability:	N/A
Erosion Potential:	N/A
Undercut Banks:	N/A

Mesohabitat Composition:	N/A
Substrate Composition:	N/A
Stream Cover:	N/A
Riparian Vegetation:	N/A
Aquatic Vegetation:	N/A
Unique Features:	N/A
Summary:	This is an extra small-sized waterbody that is steep and nearly dry at the time of sampling It is likely only a spring run-off stream

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

This site is a tributary of BG-17 and likely only contributes runoff to the much larger BG-17. There appears to be little available fish habitat and, therefore little to no importance for fish populations. There are also empty fuel drums rusting in the stream.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-16
Site: Entire stream

UTM / Chainage: 17W 550742 7917611 / 90 + 218
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-10˚

Hydrology

	Spring	Fall
Bankfull Width (m):	N/M	N/M
Wetted Width (m):	N/M	N/M
Pool Depth (m):	N/M	N/M
Maximum Depth (m):	N/M	N/M
Point Velocities (m/s)		
Pool:	N/M	N/M

Stream/Riparian Habitat

Channel Morphology: 50% pool, 50% riffle

Substrate Composition: 50% sand, 50% gravel

Stream Cover: N/A

Aquatic Vegetation: None

Riparian Vegetation: Grasses

Barriers Present (Y/N): Y
Location: Drains from hills into BG-17; inaccessible from BG-17 DS

L/R Bank Characteristics

	Spring	Fall
Bank Height (L/R; m):	N/M	N/M
Bank Stability:	N/M	N/M
Erosion Potential:	N/M	N/M

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	N/M	N/M
pH:	N/M	N/M
Water Temp (˚C):	N/M	N/M

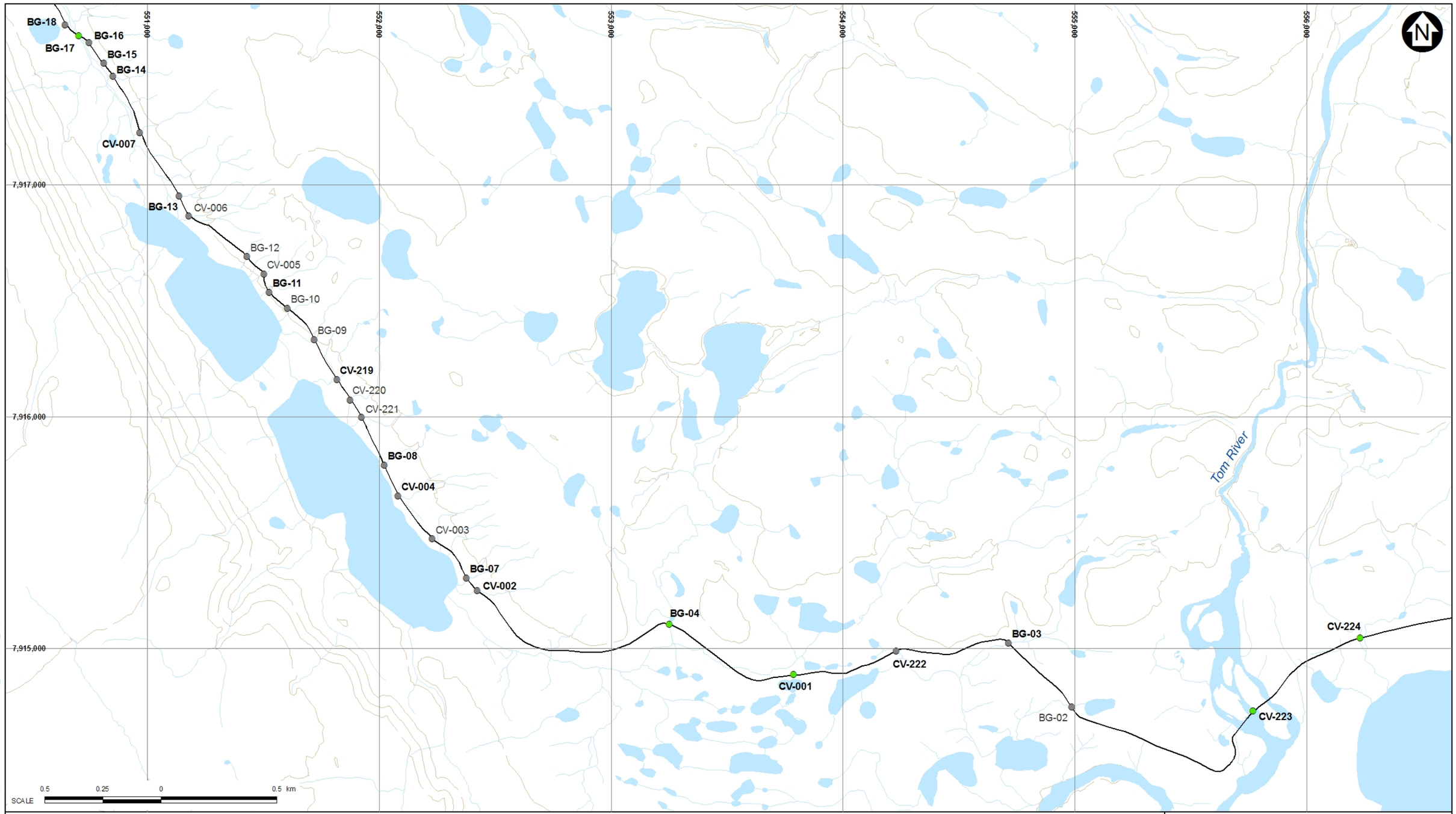
Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View of downstream (a) and upstream (b) steep gradient barriers and turbid pond below the upstream barrier (c) at BG-16 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site for crossing BG-16 during late August, 2009.



LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FISH BARRIER
- FALLS
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © (1:50 000) HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DD/MMM/10	ISSUED FOR ---	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3I

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV -

Path: \\teranastation\GIS\Projects\Other\Mary River Freshwater\2010\GenItd_Data\Report_Maps\ToteRD

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-04
Site: DS
UTM / Chainage: 17W 553250 7915113 / 94 + 148
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	20.11	20.11
Wetted Width (m):	12.80	9.14
Riffle Depth (m):	0.09	0.09
Pool Depth (m):	0.34	0.25
Culvert Depths (L, R) (m):	-, 0.16	0.04, 0.14
Maximum Depth (m):	0.40	0.35
Point Velocities (m/s)		
Riffle:	0.42	0.44
Pool:	0.08	0.00
Culverts (L,R):	-, 0.89	0.33, 1.26

Stream/Riparian Habitat

Channel Morphology: 90% pool, 10% riffle

Substrate Composition: 60% sand, 25% gravel, 10% sm. cobble, 5% lg. cobble

Stream Cover: 30% deep pool, 5% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.00-0.50	0.00-0.50
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	102	116
pH:	8.13	8.15
Water Temp (˚C):	11.8	9.0

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - M NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-04 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-04 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-04	**UTM / Chainage:**	17W 553250 7915113 / 94 + 148
Site:	US	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	27.42	27.42
Wetted Width (m):	20.11	20.11
Pool Depth (m):	0.80	0.70
Culvert Depths (L, R) (m):	-, 0.20	0.08, 0.20
Maximum Depth (m):	> 1.00	> 1.00
Point Velocities (m/s)		
Pool:	0.00	0.00
Culverts (L, R):	-, 0.96	0.24, 1.09

Stream/Riparian Habitat

Channel Morphology: 95% pool, 5% riffle

Substrate Composition: 60% sand, 25% gravel, 10% sm. cobble, 5% lg. cobble

Stream Cover: 80% deep pool, 5% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.00-0.50	0.00-0.50
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	102	-
pH:	8.15	-
Water Temp (˚C):	11.9	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-04 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-04 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-001	**UTM / Chainage:**	17W 553782 7914922 / 94 + 728
Site:	DS	**Dates Surveyed:**	30-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Fall
Bankfull Width (m):	3.80
Wetted Width (m):	1.40
Riffle Depths (m):	0.12, 0.04
Pool Depth (m):	0.26
Centre Culvert Depth (m):	0.11
Maximum Depth (m):	0.26
Point Velocities (m/s)	
Riffles:	0.52, 0.63
Pool:	0.02
Centre Culvert:	0.36

Stream/Riparian Habitat

Channel Morphology: 50% riffle, 50% pool

Substrate Composition: 50% sand, 40% gravel, 9% sm. cobble, 1% lg. cobble

Stream Cover: 50% UC banks, 1% lg. cobble

Aquatic Vegetation: Periphyton, FT

Riparian Vegetation: Grasses, Arctic cotton

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Fall
Bank Height (m):	0.40
Bank Stability:	Mod
Erosion Potential:	Mod

Water Quality

	Fall
Specific Conductance (µS/cm):	159
pH:	7.60
Water Temp (˚C):	8.1

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - M
Feeding:	ARCH - H NNST - H
Migration:	ARCH - M NNST - H

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-001 during late August, 2009.

Figure 2.View from the downstream end of the culverts at crossing CV-001 during late August (a), 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-001	**UTM / Chainage:**	17W 553782 7914922 / 94 + 728
Site:	US	**Dates Surveyed:**	30-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Fall
Bankfull Width (m):	22.90
Wetted Width (m):	22.90
Pool Depth (m):	0.75
Centre Culvert Depth (m):	0.22
Maximum Depth (m):	0.75
Point Velocities (m/s)	
Pool:	0.00
Centre Culvert:	0.00

Stream/Riparian Habitat

Channel Morphology:	100% pool
Substrate Composition:	90% sand/silt/FT, 5% sm. cobble, 5% gravel
Stream Cover:	60% FT, 25% deep pools
Aquatic Vegetation:	Periphyton, FT
Riparian Vegetation:	Grasses, Arctic cotton
Barriers Present (Y/N):	Y
Location:	~200 m US no more surface water

L/R Bank Characteristics

	Fall
Bank Height (m):	Undef.
Bank Stability:	Mod
Erosion Potential:	Mod

Water Quality

	Fall
Specific Conductance (µS/cm):	-
pH:	-
Water Temp (˚C):	-

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - H
Feeding:	ARCH - M NNST - H
Migration:	ARCH - N NNST - M

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-001 during late August, 2009.

Figure 2. View from the upstream end of the culverts at crossing CV-001 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream aerial view from proposed crossing showing riffle-pool habitat and multiple wetted channels.

Figure 2: Upstream aerial view from proposed crossing showing the braided channel.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-223

UTM: 17W 0555817 / 7914691

Watercourse Name: Unknown River

Site Description

Watershed Size:	59.240 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	195.0 m
Wetted Width:	117.0 m
Riffle-Crest Depth:	0.27 m
Pool Depth:	0.30 m
Residual Pool Depth:	0.03 m
Bankfull Depth:	1.40 m
Bank Height:	1.1 m
D_{95}:	0.49 m
D:	0.03 m
Confinement:	N/A (braided channel)
Channel Morphology:	Riffle-Pool
Channel Gradient:	1^0
Turbidity:	8.67 FTU
Side Slope	R – 15%; L – 15%
Approach:	R – 85%; L – 85%
Bank Stability:	Low
Erosion Potential:	High
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 50%; Pool – 50%
Substrate Composition:	Cobble – 60%; Gravel – 30%; Boulders – 10%
Stream Cover:	Boulders – 10%
Riparian Vegetation:	Grasses, moss, and willows
Aquatic Vegetation:	Algae
Unique Features:	None
Summary:	This is an extra large-sized waterbody with abundant riffle and pool habitat with cobble and gravel substrate. The banks have high erosion potential. Boulders are the only significant available cover. The channel is braided with three wetted channels measuring 18 m, 35 m, and 64 m wide.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Possible
Migration:	Possible
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

This river is a major tributary of Mary Lake. This site provides suitable habitat for juvenile and occasionally adult char. The site provides suitable rearing and refuge habitat and may also be used for spawning or feeding of adults from Mary Lake. The habitat is probably unsuitable for significant stickleback use.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-223
Site: DS

UTM / Chainage: 17W 555818 7914691 / 97 + 155
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	84.09	84.09
Wetted Width (m):	69.46	39.10
Rapids Depths (m):	0.40, 0.25	0.12, 0.16
Pool Depth (m):	-	0.27
Sea Can Depths (from left #'s 5, 8, & last) (m):	0.32, -, -	0.15, 0.03, 0.09
Centre Culvert Depth (m):	-	0.58
Maximum Depth (m):	0.50-1.00	0.50-1.00
Point Velocities (m/s)		
Rapids:	1.26, 0.93	0.39, 0.44
Pool:	-	0.01
Sea Cans:	0.24, -, -	1.35, 0.66, 0.71
Centre Culvert:	-	0.57

Stream/Riparian Habitat

Channel Morphology: 90% rapid/riffle, 10% pool

Substrate Composition: 45% lg. cobble, 35% sm. cobble, 10% gravel, 5% sand, 5% boulder

Stream Cover: 50% lg. cobble/ boulder

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	32	182
pH:	8.09	8.32
Water Temp (˚C):	7.8	6.2

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-223 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-223 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-223
Site: US

UTM / Chainage: 17W 555818 7914691 / 97 + 155
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	125.22	125.22
Wetted Width (m):	54.84	58.50
Pool Depth (m):	-	-
CentreCulvert Depth (m):	-	-
Sea Can Depths (m):	-	-
Maximum Depth (m):	> 1.50	~ 1.00
Point Velocities (m/s)		
Pool:	-	-
Centre Culvert:	-	-
Sea Cans:	-	-

Stream/Riparian Habitat

Channel Morphology: 75% run, 25% rapid/riffle

Substrate Composition: 45% lg. cobble, 35% sm. cobble, 10% gravel, 5% sand, 5% boulder

Stream Cover: 50% lg. cobble/ boulder

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	-	-
pH:	-	-
Water Temp (˚C):	-	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-223 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-223 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle-pool habitat and cobble substrate.

Figure 2: Upstream view from proposed crossing showing more riffle habitat.

Figure 3: View across CV-224.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-224

UTM: 17W 0556238 / 7915043

Watercourse Name: Unknown River

Site Description

Watershed Size:	2.835 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	33.0 m
Wetted Width:	9.5 m
Riffle-Crest Depth:	0.03 m
Pool Depth:	0.22 m
Residual Pool Depth:	0.19 m
Bankfull Depth:	1.22 m (left), 1.44 (right)
Bank Height:	1.00 m (left), 1.22 (right)
D_{95}:	0.45 m
D:	0.01 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	2^0
Turbidity:	0.00 FTU
Side Slope	R – 20%; L – 5%
Approach:	R – 80%; L – 95%
Bank Stability:	Low
Erosion Potential:	High
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 95%; Pool – 5%
Substrate Composition:	Cobble – 60%; Gravel – 25%; Sand – 10%; Boulders – 5%
Stream Cover:	Boulders – 5%, Instream Vegetation – 1%
Riparian Vegetation:	Grasses and willows
Aquatic Vegetation:	Submerged grasses
Unique Features:	None
Summary:	This is a medium-sized waterbody with dominant riffle and mostly cobble habitat. The banks have high erosion potential, particularly on the right bank. Vegetation and boulders are the only significant available cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

This site provides suitable habitat for juvenile char to rear or take refuge from larger char in the lake downstream. However, due to the relatively low water levels, adult use is unlikely. Higher velocities also probably limit stickleback presence.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-224
Site: DS

UTM / Chainage: 17W 556238 7915044 / 97 + 758
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Confined

Channel Gradient: 2˚

Hydrology

	Spring	Fall
Bankfull Width (m):	7.60	7.60
Wetted Width (m):	4.00	3.60
Riffle Depths (m):	0.06, -	0.05, 0.11
Pool Depth (m):	0.12	0.12
Left Culvert Depth (m):	0.12	0.10
Maximum Depth (m):	0.25	0.22
Point Velocities (m/s)		
Riffles:	0.35, -	0.12, 0.27
Pool:	0.03	0.00
Left Culvert:	0.31	0.89

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 40% gravel, 39% sm. cobble, 20% sand, 1% lg. cobble

Stream Cover: 1% lg. cobble, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	110	222
pH:	8.25	8.32
Water Temp (˚C):	13.3	7.5

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - M NNST - N	ARCH - H NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-224 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-224 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-224
Site: US

UTM / Chainage: 17W 556238 7915044 / 97 + 758
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2˚

Hydrology

	Spring	Fall
Bankfull Width (m):	18.40	18.40
Wetted Width (m):	10.80	6.70
Riffle Depths (m):	0.07, 0.04	0.07, 0.04
Pool Depth (m):	0.12	0.10
Left Culvert Depth (m):	0.03	0.06
Maximum Depth (m):	0.12	0.10
Point Velocities (m/s)		
Riffles:	0.23, 0.25	0.29, 0.38
Pool:	0.00	0.00
Left Culvert:	1.07	0.89

Stream/Riparian Habitat

Channel Morphology: 70% riffle, 30% pool

Substrate Composition: 70% sm. cobble, 20% gravel, 5% lg. cobble, 5% sand

Stream Cover: 5% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.40	Undef-0.40
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	110	-
pH:	8.26	-
Water Temp (˚C):	13.4	-

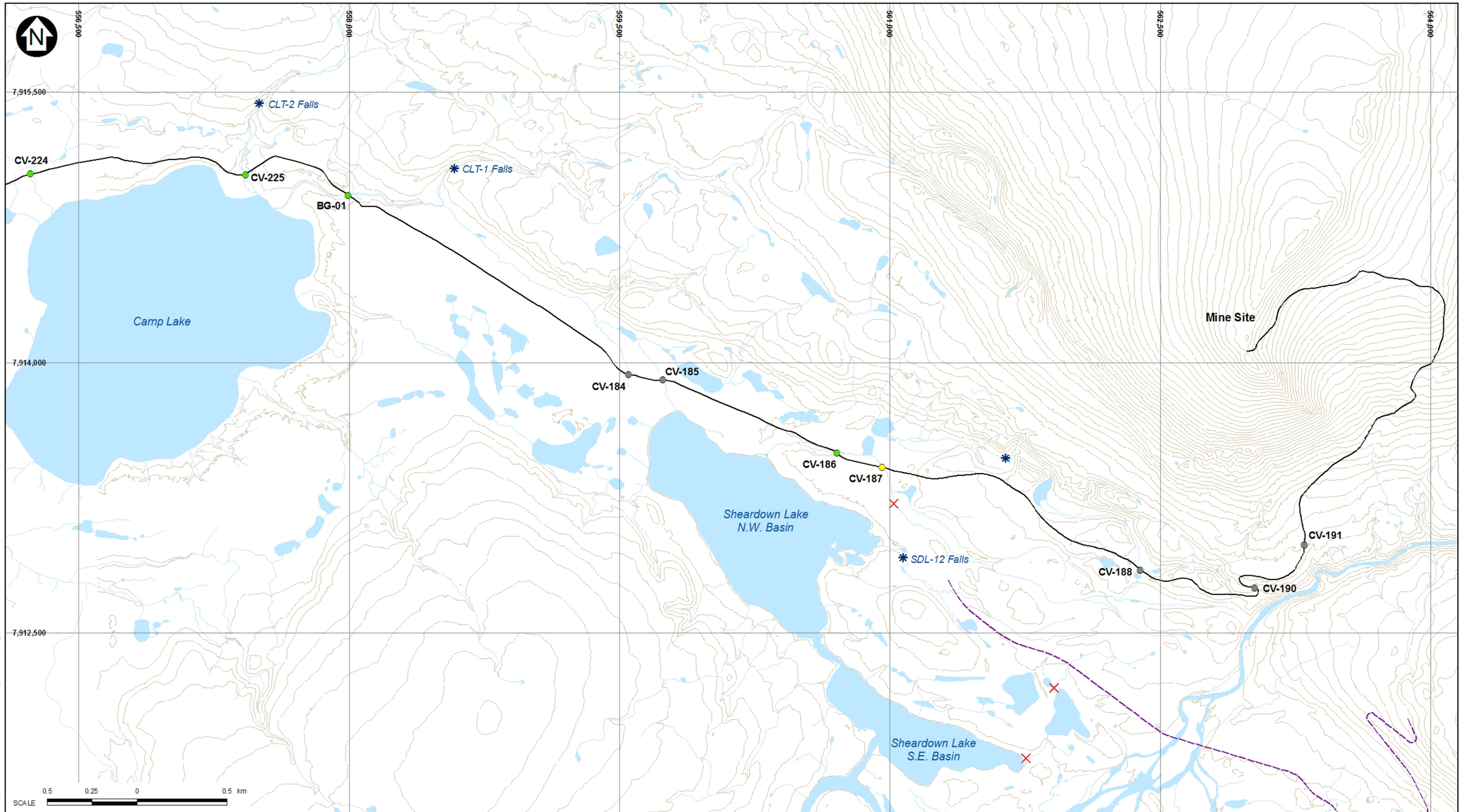
Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - M NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-224 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-224 during late August, 2009.



Path: \\terrastation\GIS\Projects\Other\Mary River Freshwater\2010\Genrtd_Data\Report_Maps\ToteRD

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FISH BARRIER
- FALLS
- CONSTRUCTION ACCESS ROAD (PROPOSED)
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

REV	DD/MMM/10	ISSUED FOR ---	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

NOTES:

1. BASE MAP: © (1:50 000) HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 10 M AND IS IN METRES.
5. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO.: RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010.dwg

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3m

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV -

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle-pool habitat, cobble substrate, and Camp Lake.

Figure 2: Upstream view from proposed crossing showing more riffle-pool habitat.

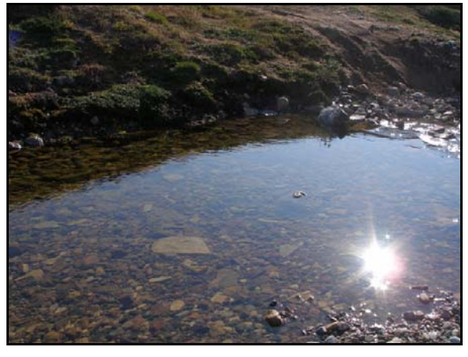


Figure 3: View across CV-225.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-225

UTM: 17W 0557406 / 7915137

Watercourse Name: Unknown River

Site Description

Watershed Size:	12.180 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	31.0 m
Wetted Width:	7.0 m
Riffle-Crest Depth:	0.12 m
Pool Depth:	0.28 m
Residual Pool Depth:	0.16 m
Bankfull Depth:	0.83 m
Bank Height:	0.55 m
D_{95}:	0.86 m
D:	0.03 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	3^0
Turbidity:	0.00 FTU
Side Slope	R – 1%; L – 1%
Approach:	R – 99%; L – 99%
Bank Stability:	Low-Moderate
Erosion Potential:	Moderate
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 60%; Pool – 40%
Substrate Composition:	Cobble – 75%; Gravel – 15%; Boulders – 10%
Stream Cover:	Boulders – 10%
Riparian Vegetation:	Grasses and moss
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized waterbody consisting of riffle-pool habitat with mostly cobble substrate. The banks have moderate erosion potential and boulders are the only significant available cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Another tributary of Camp Lake, this site provides suitable habitat for juvenile char to rear or take refuge from larger char in the lake. Spawning likely doesn't occur at the proposed crossing due to low water levels but may occur further downstream closer to the lake. Several small char were captured during fisheries investigations of this creek. The habitat is less suitable for sticklebacks.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-225	**UTM:**	17W 557466 7914968
Site:	DS	**Dates Surveyed:**	23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1.5˚

Hydrology

	Spr	Sum
Bankfull Width (m):	19.20	19.20
Wetted Width (m):	14.60	19.20
Riffle-Crest Depth (m):	0.26	0.25
Pool Depth (m):	0.20	0.25
D_{95} (m):	0.40	0.40
Point Velocities (m/s)		
Riffle:	0.92	1.03
Pool:	0.12	0.00
Culvert:	2.23	2.85

Stream/Riparian Habitat

Channel Morphology: 70% riffle, 30% pool

Substrate Composition: 40% cobble, 40% sand, 20% gravel

Stream Cover: 30% deep pools, 25% UC banks, 20% lg cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss, flowers, willows

Barriers Present (Y/N): Y

Location: Culvert

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	0.05/0.05	Flooded
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	31.0	12.2
TDS (g/l):	0.02	0.08
DO (mg/l)	14.13	11.77
%DO:	104.1	NM
Water Temp (˚C):	2.5	7.2

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - L
Feeding:	ARCH - H NNST - L	ARCH - H NNST - M
Migration:	ARCH - H NNST - L	ARCH - M NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-225 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-225 during summer 2008.

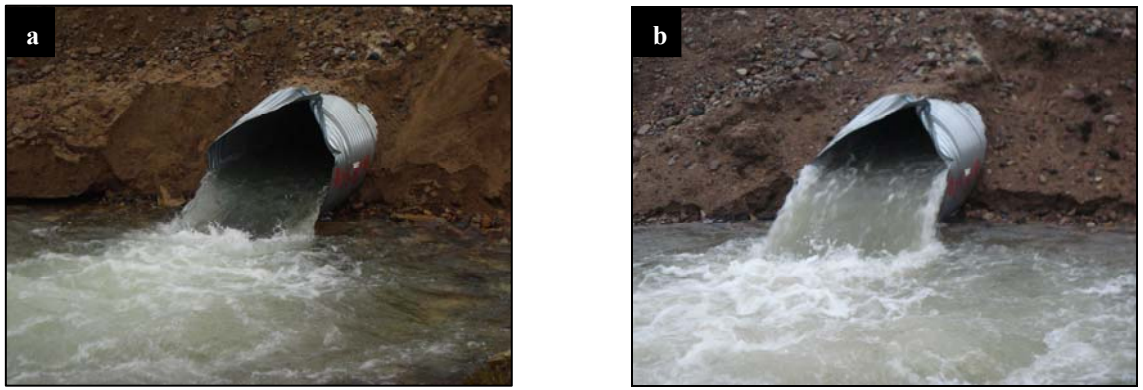


Figure 3. View from the downstream end of the culvert at crossing CV-225 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-225
Site: US
UTM: 17W 557405 7915080
Dates Surveyed: 23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2.5˚

Hydrology

	Spr	Sum
Bankfull Width (m):	27.50	27.50
Wetted Width (m):	7.80	27.43
Riffle-Crest Depth (m):	0.20	0.18
Pool Depth (m):	0.31	>1.00
D_{95} (m):	0.43	0.43
Point Velocities (m/s)		
Riffle/rapid:	1.35	0.47
Pool:	0.01	0.00
Behind a rock:	NA	NA

Stream/Riparian Habitat

Channel Morphology: 75% riffle, 25% pool (spring); 50% run, 25% riffle, 25% pool (summer)

Substrate Composition: 70% cobble, 20% boulder, 10% sand

Stream Cover: 10% deep pools

Aquatic Vegetation: Periphyton,

Riparian Vegetation: Moss, grasses and willows

Barriers Present (Y/N): Y
Location: Culvert

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	32.0	12.3
TDS (g/l):	0.02	0.08
DO (mg/l)	14.05	11.50
%DO:	102.9	NM
Water Temp (˚C):	2.0	7.2

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-225 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-225 during summer 2008.

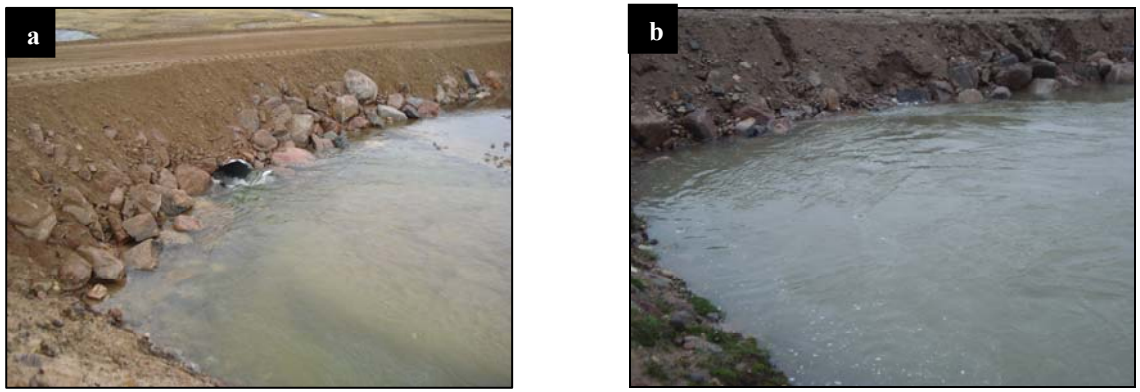


Figure 3. View from the upstream end of the culverts at crossing CV-225 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-225	**UTM / Chainage:**	17W 557407 7915138 / 98 + 989
Site:	DS	**Dates Surveyed:**	3-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1.5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	14.60	14.60
Wetted Width (m):	7.20	7.20
Riffle Depths (m):	0.10, 0.07	0.12, 0.13
Culvert Depth (m):	0.23	0.16
Maximum Depth (m):	>1.00	1.20
Point Velocities (m/s)		
Riffles:	0.38, 0.98	0.34, 0.50
Culvert:	1.79	1.61

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 49% lg. cobble, 40% sm. cobble, 5% gravel, 1% boulder

Stream Cover: 50% lg. cobble/ boulder, 20% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows

Barriers Present (Y/N): Y

Location: Perched culvert prevents access for YOY ARCH

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.30	0.30
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	48	227
pH:	8.23	8.46
Water Temp (˚C):	5.0	7.2

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - M
Migration:	ARCH - H NNST - L	ARCH - H NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at habitat assessment site downstream of crossing at CV-225 during early July, 2009.

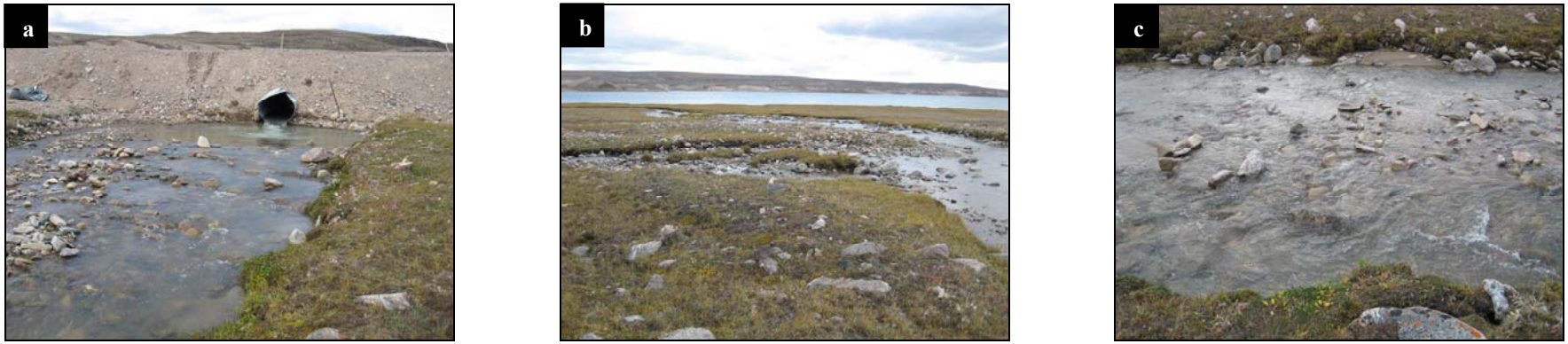


Figure 2. View upstream (a), downstream (b), and across (c) at habitat assessment site downstream of crossing at CV-225 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-225
Site: US

UTM / Chainage: 17W 557407 7915138 / 98 + 989
Dates Surveyed: 3-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2.5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	27.50	27.50
Wetted Width (m):	6.10	3.80
Riffle Depths (m):	0.20, -	0.11, 0.08
Run Depth (m):	0.19	0.35
Culvert Depth (m):	-	0.20
Maximum Depth (m):	0.50	-
Point Velocities (m/s)		
Riffles:	0.86, -	0.86, 0.29
Run:	0.54	0.30
Culvert:	-	1.27

Stream/Riparian Habitat

Channel Morphology: 50% run, 40% cascade, 10% pool

Substrate Composition: 50% sand, 35% lg. cobble, 10% boulder, 5% sm. cobble

Stream Cover: 45% lg. cobble/ boulder, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses & willows

Barriers Present (Y/N): Y
Location: Perched culvert prevents access for YOY ARCH and NNST

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.30	Undef-0.30
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	49	-
pH:	8.20	-
Water Temp (˚C):	5.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at habitat assessment site upstream of crossing at CV-225 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at habitat assessment site upstream of crossing at CV-225 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle-pool habitat and cobble substrate.

Figure 2: Upstream view from proposed crossing showing more riffle-pool habitat.

Figure 3: View across BG-01.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site:	BG-01
UTM:	17W 0557991 / 7914918
Watercourse Name:	Unknown River

Site Description

Watershed Size:	5.612 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	5.0 m
Wetted Width:	5.0 m
Riffle-Crest Depth:	0.18 m
Pool Depth:	0.30 m
Residual Pool Depth:	0.12 m
Bankfull Depth:	0.58 m
Bank Height:	0.40 m
D_{95}:	0.80 m
D:	0.06 m
Confinement:	Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	3.5^0
Turbidity:	0.00 FTU
Side Slope	R – 1%; L – 1%
Approach:	R – 99%; L – 99%
Bank Stability:	Low-Moderate
Erosion Potential:	Moderate-High
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 95%; Pool – 5%
Substrate Composition:	Cobble – 70%; Boulders – 20%; Gravel – 5%; Sand – 5%
Stream Cover:	Boulders – 20%
Riparian Vegetation:	Arctic cotton, moss, willows, and grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a medium-sized waterbody consisting largely of riffle habitat with cobble substrate. The banks have moderate-high erosion potential and boulders are the only significant available cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Site is upstream of Camp Lake and has suitable habitat for juvenile char to rear or take refuge from larger char in the lake. It is unlikely spawning occurs in this tributary since water levels are relatively low during the fall, however it cannot be ruled out completely. Several small char were captured during fisheries investigations of this creek. The habitat is less suitable for sticklebacks.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-01
Site: DS
UTM: 17W 557924 7914921
Dates Surveyed: 23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1.5˚

Hydrology

	Spr	Sum
Bankfull Width (m):	24.00	24.00
Wetted Width (m):	18.40	23.77
Riffle-Crest Depth (m):	0.20	0.30
Pool Depth (m):	0.10	NA
D_{95} (m):	0.57	0.57
Point Velocities (m/s)		
Pool:	0.13	NA
Riffle:	1.34	1.00
Culvert:	2.93	2.67

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 15% pool, 5% cascade (spring); 100% riffle (summer)

Substrate Composition: 60% cobble, 20% sand, 15% gravel, 5% boulder

Stream Cover: 10% lg cobble, 5% boulders, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses and moss

Barriers Present (Y/N): Y
Location: Culvert prevents US access by some ARCH

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	64.0	14.1
TDS (g/l):	0.04	0.09
DO (mg/l)	13.69	12.02
%DO:	103.7	NM
Water Temp (˚C):	3.5	6.6

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - L
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across the left and right channels (c) from the habitat assessment downstream of BG-01 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across the left and right channels (c) from the habitat assessment downstream of BG-01 during summer 2008.

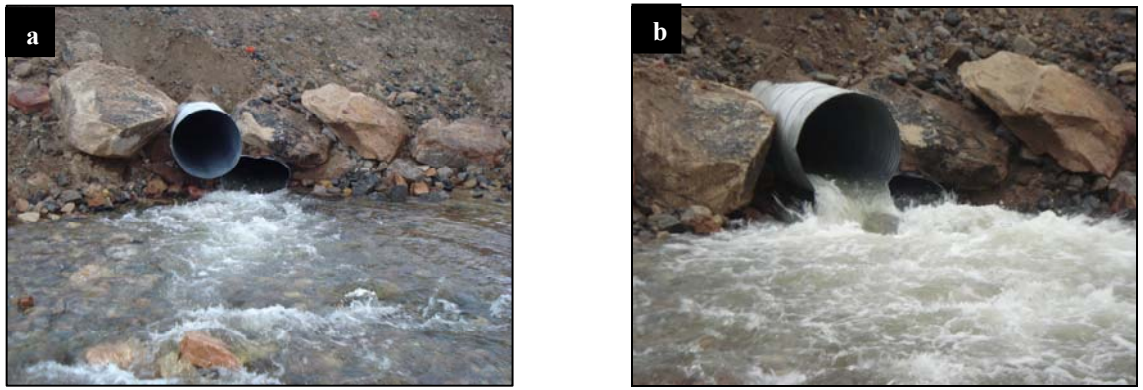

Figure 3.View from the downstream end of the culverts at crossing BG-01 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-01	**UTM:**	17W 558020 7914937
Site:	US	**Dates Surveyed:**	23-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2˚

Hydrology

	Spr	Sum
Bankfull Width (m):	25.60	25.60
Wetted Width (m):	4.00	25.60
Riffle-Crest Depth (m):	0.15	0.22
Pool Depth (m):	0.35	1.05
D_{95} (m):	0.29	0.29
Point Velocities (m/s)		
Riffle:	0.79	0.68
Pool:	0.06	0.06
Run:	NA	0.19

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool (spring); 50% run, 30% pool, 20% riffle (summer)

Substrate Composition: 90% cobble, 10% gravel

Stream Cover: 25% UC banks, 20% lg cobble, 5% deep pools

Aquatic Vegetation: Periphyton,

Riparian Vegetation: Grasses, willows & moss

Barriers Present (Y/N): Y
Location: Partial culvert barrier

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	0.20/0.12	Flooded
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	64.0	13.6
TDS (g/l):	0.04	0.09
DO (mg/l)	13.70	11.97
%DO:	103.0	NM
Water Temp (˚C):	3.3	6.5

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - L NNST - N	ARCH - L NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of BG-01 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of BG-01 during summer 2008.

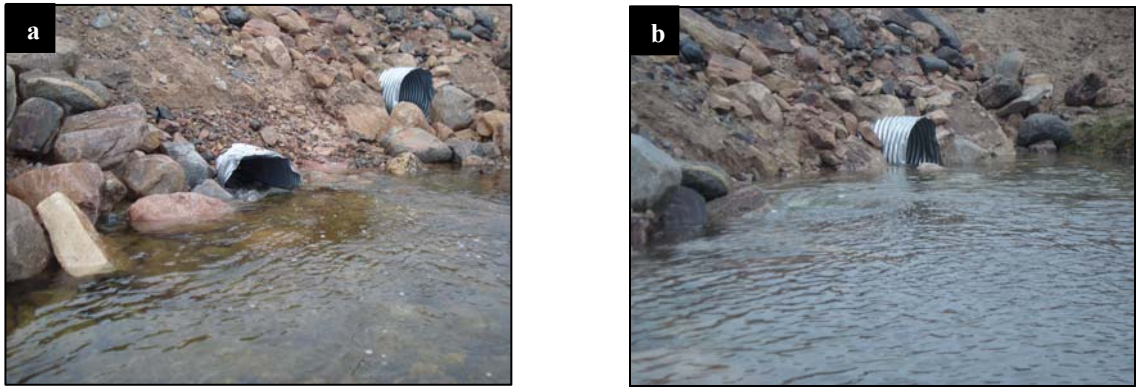

Figure 3. View from the upstream end of the culverts at crossing BG-01 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-01
Site: DS

UTM / Chainage: 17W 557991 7914919 / 99 + 672
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1.5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	23.76	23.76
Wetted Width (m):	17.37	10.10
Riffle Depths (m):	0.11, 0.22, -	0.05, 0.14, 0.12
Pool Depth (m):	0.17	0.14
Culvert Depth (m):	0.20	0.15
Maximum Depth (m):	~ 1.00	0.75
Point Velocities (m/s)		
Riffles:	0.44, 0.53	0.14, 0.67, 0.55
Pool:	0.06	0.00
Culvert:	2.24	2.08

Stream/Riparian Habitat

Channel Morphology: 60% riffle, 40% pool

Substrate Composition: 45% sm. cobble, 30% lg. cobble, 10% sand, 10% gravel, 5% boulder

Stream Cover: 35% lg. cobble/ boulder, 10% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss, & willow

Barriers Present (Y/N): Y
Location: Perched culvert prevents US access by YOY ARCH

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.20	Undef-0.20
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	88	237
pH:	8.26	8.34
Water Temp (˚C):	12.1	6.7

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - L
Migration:	ARCH - L NNST - N	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-01 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at BG-01 during late August, 2009.

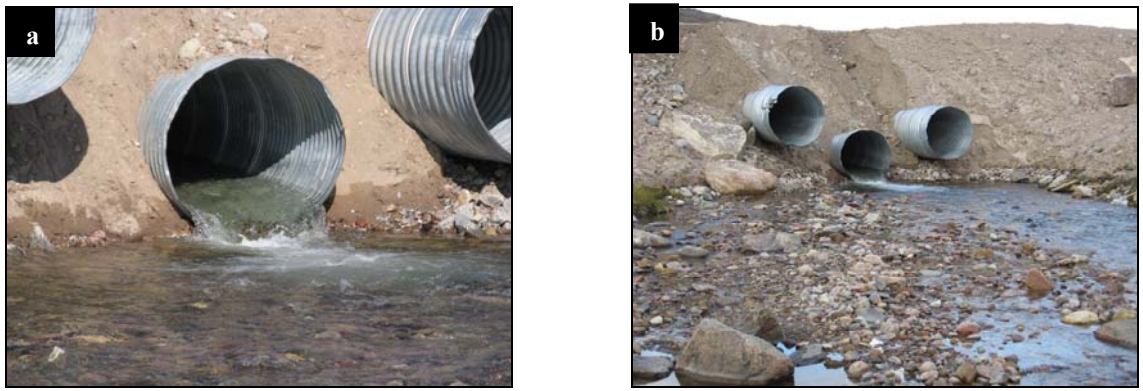

Figure 3.View from the downstream end of the culverts at crossing BG-01 during early July (a) and late August (b), 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-01	**UTM:**	17W 558020 7914937
Site:	US	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2˚

Hydrology

	Spring	Fall
Bankfull Width (m):	23.76	23.76
Wetted Width (m):	6.40	6.40
Riffle Depth (m):	0.20	0.04
Pool Depth (m):	0.42	0.55
Run Depth (m):	0.60	0.23
Culvert Depth (m):	-	0.30
Maximum Depth (m):	0.75	0.55
Point Velocities (m/s)		
Riffle:	0.65	0.90
Pool:	0.02	0.05
Run:	0.16	0.23
Culvert:	-	0.74

Stream/Riparian Habitat

Channel Morphology: 40% riffle, 40% run 20% pool

Substrate Composition: 50% lg. cobble, 45% sm. cobble, 5% gravel

Stream Cover: 30% under-cut banks, 50% lg. cobble, 20% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows & moss

Barriers Present (Y/N): Y

Location: Perched culvert barrier DS

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.15-0.30	0.15-0.30
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	82	-
pH:	8.28	-
Water Temp (˚C):	12.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - L
Migration:	ARCH - L NNST - N	ARCH - M NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-01 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-01 during late August, 2009.

Figure 3. View from the upstream end of the culverts at crossing BG-01 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-186
Site: DS

UTM / Chainage: 17W 560753 7913507 / 102 + 812
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Confined

Channel Gradient: 1.5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	7.90	7.90
Wetted Width (m):	4.70	4.60
Riffle Depths (m):	0.08, 0.07	0.04, 0.08
Pool Depth (m):	0.25	0.08
Centre Culvert Depth (m):	0.31	0.25
Maximum Depth (m):	0.31	0.25
Point Velocities (m/s)		
Riffles:	0.42;0.44	0.44, 0.73
Pool:	0.00	0.01
Centre Culvert:	0.13	0.55

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 15% pool, 5% cascade

Substrate Composition: 55% sm. cobble, 29% lg. cobble, 10% gravel, 5% sand, 1% boulder

Stream Cover: 30% lg. cobble/ boulder, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, moss, & willow

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10-0.20	0.10-0.20
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	143	210
pH:	8.35	8.32
Water Temp (˚C):	13.6	7.5

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-186 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-186 during late August, 2009.

Figure 3.View from the downstream end of the culverts at crossing CV-186 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-186
Site: US

UTM / Chainage: 17W 560753 7913507 / 102 + 812
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1.5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	4.00	4.00
Wetted Width (m):	3.80	3.20
Riffle Depths (m):	0.09, 0.10	0.09, 0.10
Pool Depth (m):	0.12	0.15
Centre Culvert Depth (m):	0.13	0.17
Maximum Depth (m):	0.15	0.17
Point Velocities (m/s)		
Riffles:	0.44, 0.23	0.26, 0.62
Pool:	0.03	0.01
Centre Culvert:	0.82	1.03

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 10% cascade, 10% pool

Substrate Composition: 60% sm. cobble, 30% lg. cobble, 5% gravel, 5% sand

Stream Cover: 30% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows & moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.05-0.30	0.05-0.30
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	144	-
pH:	8.37	-
Water Temp (˚C):	13.7	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-186 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-186 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing pool habitat and existing culvert.

Figure 2: Upstream view from proposed crossing showing riffle-pool habitat.

Figure 3: View across CV-187.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-187

UTM: 17W 0562392 / 7912843

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.126 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	5.7 m
Wetted Width:	4.0 m
Riffle-Crest Depth:	0.02 m
Pool Depth:	0.38 m
Residual Pool Depth:	0.36 m
Bankfull Depth:	0.62 m
Bank Height:	0.60 m
D_{95}:	0.95 m
D:	<0.001 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	0.5^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	Low-Moderate
Erosion Potential:	Moderate
Undercut Banks:	None

Mesohabitat Composition:	Pool – 80%; Riffle – 20%
Substrate Composition:	Cobble – 70%; Gravel – 10%; Boulders – 10%; Silt/organic – 10%
Stream Cover:	Boulders – 10%; Instream Vegetation – 15%
Riparian Vegetation:	Small plants, willows, and grasses
Aquatic Vegetation:	Algae, submerged grasses
Unique Features:	Fuel drum culvert at crossing
Summary:	This is a small-sized waterbody consisting largely of pool habitat with cobble substrate. The banks have moderate erosion potential and there is a variety of available cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Abundant pools with some larger substrates represent ideal habitat for juvenile char. Several young char were captured during fisheries investigations There is probably little use by adult char or by sticklebacks.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-187
Site: DS

UTM / Chainage: 17W 560957 7913414 / 103 + 078
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	13.71	13.71
Wetted Width (m):	10.97	10.97
Pool Depth (m):	0.30	0.20
Left Culvert Depth (m):	0.26	0.25
Maximum Depth (m):	0.40	0.30
Point Velocities (m/s)		
Pool:	0.00	0.00
Left Culvert:	0.01	0.03

Stream/Riparian Habitat

Channel Morphology: 100% pool

Substrate Composition: 80% sand, 10% gravel, 5% sm. cobble, 5% lg. cobble

Stream Cover: 5% lg. cobble, 40% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10-0.20	0.15-0.25
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	160	268
pH:	8.56	8.34
Water Temp (˚C):	15.3	7.1

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - H NNST - L
Migration:	ARCH - L NNST - L	ARCH - L NNST - L

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-187 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-187 during late August, 2009.

Figure 3. View from the downstream end of the culverts at crossing CV-187 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-187
Site: US

UTM / Chainage: 17W 560957 7913414 / 103 + 078
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	10.97	10.97
Wetted Width (m):	9.14	4.30
Pool Depth (m):	0.14	0.22
Left Culvert Depth (m):	0.04	0.06
Maximum Depth (m):	0.25	0.25
Point Velocities (m/s)		
Pool:	0.01	0.00
Left Culvert:	0.25	0.48

Stream/Riparian Habitat

Channel Morphology: 99% pool, 1% riffle

Substrate Composition: 49% lg. cobble, 45% sm. cobble, 5% sand/silt, 1% boulder

Stream Cover: 50% lg cobble/ boulder

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	165	-
pH:	8.56	-
Water Temp (˚C):	15.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - L NNST - L	ARCH - L NNST - L
Migration:	ARCH - L NNST - L	ARCH - L NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-187 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-187 during late August, 2009.

APPENDIX 8-2. DETAILED FISHERIES DATA COLLECTED FROM WATERBODIES ALONG THE MILNE INLET TOTE ROAD, 2006-2010.

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Table A8-2.1. Detailed fisheries catch/observation data collected during Tote Road surveys, 2006-2010.. ..... A8-2_1

Table A8-2.1. Detailed fisheries catch/observation data collected during Tote Road surveys, 2006-2010.

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-183	0.145	07-Aug-06	MT	119.2	-	None	0	0.00	-	-
		07-Aug-06	EF	-	510	ARCH	1	0.12	-	-
		02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	259	None	0	0.00	-	-
CV-181	0.583	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	168	None	0	0.00	-	-
CV-176	2.638	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	288	None	0	0.00	-	-
CV-173	4.430	02-Jul-09	OB	-	-	None	0	-	-	-
CV-170	5.267	02-Jul-09	OB	-	-	ARCH[4]	2	-	-	-
		26-Aug-09	EF	-	357	None	0	0.00	-	-
CV-167	5.960	02-Jul-09	OB	-	-	None	0	-	-	-
CV-166	6.056	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	366	None	0	0.00	-	-
CV-159	8.407	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	300	None	0	0.00	-	-
CV-157	8.960	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	300	None	0	0.00	-	-
CV-156	9.223	07-Aug-06	OB	-	-	None	0	-	-	-
CV-154	9.570	02-Jul-09	OB	-	-	None	0	-	-	-
		26-Aug-09	EF	-	324	None	0	0.00	-	-
CV-153	10.218	02-Jul-09	OB	-	-	None	0	-	-	-
CV-152	10.280	02-Jul-09	OB	-	-	None	0	-	-	-
CV-151	10.460	02-Jul-09	OB	-	-	None	0	-	-	-
CV-146	11.348	07-Aug-06	OB	-	-	None	0	-	-	-
CV-129	15.650	24-Jun-08	EF	-	541	ARCH	4	0.44	160	83-203
		23-Jul-08	EF	-	540	ARCH	1	0.11	98	-
		02-Jul-09	OB	-	-	ARCH	2	-	-	-
		26-Aug-09	EF	-	582	ARCH	3	0.31	131	95-163
		06-Aug-10	EF	-	420	ARCH	9	1.29	135	94-187
		06-Aug-10	EF	-	420	NNST	1	0.14	42	-

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-128	17.486	07-Aug-06	MT	117.0	-	ARCH	1	0.01	84	-
		07-Aug-06	EF	-	655	None	0	0.00	-	-
		02-Jul-09	OB	-	-	ARCH	1	-	-	-
		27-Aug-09	OB	-	-	ARCH	1	-	-	-
CV-125	20.447	02-Jul-09	OB	-	-	None	0	-	-	-
CV-120	23.515	02-Jul-09	OB	-	-	None	0	-	-	-
CV-119	24.264	02-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-
CV-115	27.686	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	403	None	0	0.00	-	-
CV-114	29.647	07-Aug-06	EF	-	170	ARCH	1	0.35	63	-
		03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	487	ARCH	4	0.49	75	55-108
		06-Aug-10	EF	-	480	ARCH	8	1.00	70	55-97
CV-113	30.655	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-
CV-112	31.450	03-Jul-09	OB	-	-	ARCH	Several	-	-	-
		27-Aug-09	OB	-	-	ARCH	Several	-	-	-
		27-Aug-09	EF	-	260	None	0	0.00	-	-
		06-Aug-10	EF	-	420	ARCH	6	0.86	65	55-83
		10-Aug-10	EF	-	390	ARCH	16	2.46	58	40-83
CV-111	31.990	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	462	ARCH	9	1.17	78	53-114
CV-202	32.825	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-
CV-106	33.170	03-Jul-09	OB	-	-	ARCH	1	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-
CV-104	33.794	07-Aug-06	EF	-	345	ARCH	3	0.52	-	-
		03-Jul-09	OB	-	-	ARCH	Many	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-203	34.153	23-Jun-08	OB			NM - Not fish bearing				
		03-Jul-09	OB	-	-	None	0	-	-	-
CV-102	36.028	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	335	ARCH	4	0.72	46	45-48
CV-099	37.840	07-Aug-06	MT	229.4	-	ARCH	19	0.08	97	68-122
		24-Jun-08	EF	-	558	ARCH	10	1.08	137	126-148
		22-Jul-08	EF	-	990	ARCH	16	0.97	83	64-129
		03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	368	ARCH	12	1.96	103	90-145
		06-Aug-10	OB	-	-	ARCH	1	-	-	80
CV-095	41.100	07-Aug-06	OB	-	-	None	0	-	-	-
CV-094	41.613	24-Jun-08	EF	-	720	ARCH[5]	3	0.25	141	130-151
		23-Jul-08	EF	-	600	ARCH[5]	2	0.20	122	119-125
		03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	OB	-	-	None	0	-	-	-
CV-093	42.216	07-Aug-06	OB	-	-	None	0	-	-	-
CV-092	42.949	07-Aug-06	OB	-	-	None	0	-	-	-
CV-087	46.223	07-Aug-06	OB	-	-	None	0	-	-	-
CV-086	46.300	03-Jul-09	OB	-	-	None	0	-	-	-
CV-082	49.655	03-Jul-09	OB	-	-	None	0	-	-	-
CV-079	50.600	27-Jul-08	EF	-	1380	ARCH	48	2.09	93	38-158
		03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	OB	-	-	ARCH	Many	-	-	90-150
CV-207	50.762	08-Sep-08	EF	-	772	ARCH	2	0.16	132	131-133
CV-078	51.171	07-Aug-06	MT	113.0		ARCH	20	0.18	114	80-150
		03-Jul-09	OB	-	-	ARCH	Many	-	-	-
		27-Aug-09	OB	-	-	ARCH	Many	-	-	90-200
		05-Aug-10	EF	-	600	ARCH	27	2.70	97	63-143
CV-076	53.028	03-Jul-09	OB	-	-	ARCH	Many	-	-	-
		27-Aug-09	OB	-	-	ARCH	Many	-	-	50-70

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-072	53.878	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	614	ARCH	10	0.98	77	63-105
CV-060	58.856	07-Aug-06	MT	112.1	-	ARCH	25	0.22	100	75-120
		03-Jul-09	OB	-	-	ARCH	Many	-	-	-
		27-Aug-09	OB	-	-	ARCH	Many	-	-	60-100
CV-059	59.960	03-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	384	ARCH	4	0.63	84	80-87
CV-058	60.523	04-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	326	ARCH	3	0.55	92	85-100
CV-057	60.712	07-Aug-06	MT	111.4	-	ARCH	10	0.09	118	95-135
		04-Jul-09	OB	-	-	None	0	-	-	-
		27-Aug-09	EF	-	316	ARCH	3	0.57	99	70-120
CV-055	61.904	07-Aug-06	OB	-	-	None	0	-	-	-
BG-50	62.804	08-Aug-06	MT	95.8	-	ARCH	1	0.01	114	-
		24-Jun-08	EF	-	518	ARCH	6	0.69	149	95-178
		23-Jul-08	EF	-	540	ARCH	4	0.44	93	71-107
		23-Jul-08	EF	-	540	NNST	3	0.33	52	51-53
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	617	ARCH	18	1.75	153	74-280
		05-Aug-10	EF		480	ARCH	4	0.50	133	101-160
CV-049	63.302	08-Aug-06	MT	95.1	-	None	0	0.00	-	-
		04-Jul-09	OB	-	-	ARCH	2	-	-	-
		28-Aug-09	OB	-	-	ARCH	Several	-	-	-
CV-048	64.312	04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	348	None	0	0.00	-	-
CV-046	66.490	04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	273	None	0	0.00	-	-

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-040	72.263	08-Aug-06	MT	94.6	-	None	0	0.00	-	-
		24-Jun-08	EF	-	415	None	0	0.00	-	-
		23-Jul-08	EF	-	340	None	0	0.00	-	-
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	OB	-	-	None	0	-	-	-
		05-Aug-10	OB	-	-	None	0	-	-	-
CV-030	77.506	04-Jul-09	OB	-	-	ARCH	1	-	-	-
		04-Jul-09	OB	-	-	NNST	1	-	-	-
		28-Aug-09	OB	-	-	None	0	-	-	-
BG-32	78.161	04-Jul-09	OB	-	-	ARCH	1	-	-	-
		28-Aug-09	OB	-	-	ARCH	Many	-	-	50-60
		05-Aug-10	OB	-	-	ARCH	Many	-	-	50-150
		05-Aug-10	OB	-	-	NNST	Several	-	-	50-60
CV-217	79.915	08-Aug-06	MT	186.0	-	NNST	1	0.01	50	-
		04-Jul-09	OB	-	-	ARCH	Many	-	-	
		28-Aug-09	OB	-	-	ARCH	Many	-	-	YOY-300
		06-Aug-10	EF	-	420	ARCH	24	3.43	72	55-141
		06-Aug-10	EF	-	420	NNST	7	1.00	49	38-60
CV-216	80.646	08-Aug-06	OB	-	-	None	0	-	-	-
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	OB	-	-	ARCH	Many	-	-	50-70
BG-31	82.076	05-Aug-10	OB	-	-	ARCH	3	-	-	80-100
BG-30	84.636	05-Aug-10	OB	-	-	None	0	-	-	-
BG-29	84.805	04-Jul-09	OB	-	-	ARCH	Several	-	-	-
		04-Jul-09	OB	-	-	NNST	Several	-	-	-
		28-Aug-09	OB	-	-	ARCH	Many	-	-	-
BG-28	86.263	08-Aug-06	OB	-	-	None	0	-	-	-

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
BG-27	86.609	08-Aug-06	OB	-	-	None	0	-	-	-
		04-Jul-09	OB	-	-	ARCH	1	-	-	-
		28-Aug-09	EF	-	290	ARCH	2	0.41	73	72-73
		06-Aug-10	EF	-	600	ARCH	20	2.00	71	55-106
		10-Aug-10	EF	-	480	ARCH	11	1.38	71	49-97
BG-24	87.710	08-Aug-06	MT	90.3	-	ARCH	15	0.17	109	93-138
		23-Jun-08	EF	-	727	ARCH	12	0.99	101	78-145
		23-Jul-08	EF	-	960	ARCH	32	2.00	94	50-378
		04-Jul-09	OB	-	-	ARCH	Many	-	-	-
		28-Aug-09	EF	-	642	ARCH	38	3.55	110	75-185
BG-17	90.167	10-Aug-06	MT	43.8	-	ARCH	3	0.07	111	90-137
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	591	ARCH	21	2.13	114	46-179
		28-Aug-09	EF	-	591	NNST	2	0.20	67	61-72
BG-16	90.218	10-Aug-06	OB	-	-	None	0	-	-	-
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	OB	-	-	None	0	-	-	-
BG-04	94.148	04-Jul-09	OB	-	-	ARCH	Many	-	-	-
		28-Aug-09	OB	-	-	None	0	-	-	-
CV-001	94.728	30-Aug-09	OB	-	-	ARCH	Several	-	-	50-100
		30-Aug-09	OB	-	-	NNST	Many	-	-	YOY
		05-Aug-10	OB	-	-	ARCH	Several	-	-	50-100
		05-Aug-10	OB	-	-	NNST	Many	-	-	YOY
CV-223	97.155	27-Jul-06	MT	19.3	-	None	0	0.00	-	-
		27-Jul-06	EF	-	1125	ARCH	5 to 10	-	-	-
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	380	ARCH	22	3.47	145	95-232
CV-224	97.758	27-Jul-06	OB	-	-	ARCH	>10	-	-	-
		04-Jul-09	OB	-	-	ARCH	Many	-	-	-
		28-Aug-09	OB	-	-	ARCH	Many	-	-	50-60

Table A8-2.1. - Continued -

Crossing ID	Road Chainage (km)	Date	Gear[1]	Duration[2]		Species	Total Caught / Observed	CPUE[3]	Fork Length (mm)	
				dec.hrs	sec				Mean	Range
CV-225	98.989	28-Jul-06	EF	-	755	ARCH	11	0.87	51	36-123
		23-Jun-08	EF	-	527	ARCH	8	0.91	85	75-90
		23-Jun-08	EF	-	527	NNST	1	0.11	-	-
		23-Jul-08	EF	-	720	ARCH	33	2.75	90	45-145
		04-Jul-09	OB	-	-	None	0	-	-	-
		28-Aug-09	EF	-	681	ARCH	98	8.63	121	47-181
		06-Aug-10	EF	-	540	ARCH	87	9.67	-	52-177
BG-01	99.672	27-Jul-06	MT	161.4	-	ARCH	4	0.02	103	90-117
		27-Jul-06	EF	-	495	ARCH	4	0.48	135	84-158
		23-Jun-08	EF	-	661	ARCH	13	1.18	88	70-127
		23-Jul-08	EF	-	650	ARCH	16	1.48	107	70-139
		04-Jul-09	OB	-	-	ARCH	Many	-	-	-
		28-Aug-09	EF	-	528	ARCH	55	6.25	147	71-227
		28-Aug-09	EF	-	528	NNST	2	0.23	53	45-61
		06-Aug-10	EF	-	480	ARCH	317	39.63	-	50-209
		06-Aug-10	EF	-	480	NNST	1	0.13	-	-
CV-186	102.812	04-Jul-09	OB	-	-	ARCH	Many	-	-	-
		28-Aug-09	OB	-	-	ARCH	Many	-	-	-
CV-187	103.078	28-Jul-06	MT	139.1	-	ARCH	2	0.01	114	112-115
		28-Jul-06	EF	-	660	ARCH	5	0.45	94	75-110
		04-Jul-09	OB	-	-	ARCH	2	-	-	-
		28-Aug-09	OB	-	-	ARCH	2	-	-	100-150
		05-Aug-10	OB	-	-	ARCH	3	-	-	100-150

1 - EF = electrofishing, MT = minnow traps, OB = observational surveys
2 - Duration described as decimal hours for minnow trap sets and seconds for backpack electrofishing
3 - Catch-per-unit-effort (CPUE) calculated as #fish/hour of minnowtrapping or #fish/minute of electrofishing
4 - Arctic char recorded in CV-170 were all captured/observed ~300m downstream, below a probable barrier
5 - Arctic char recorded in CV-094 were all captured/observed downstream of the falls at 30 m DS from the crossing