

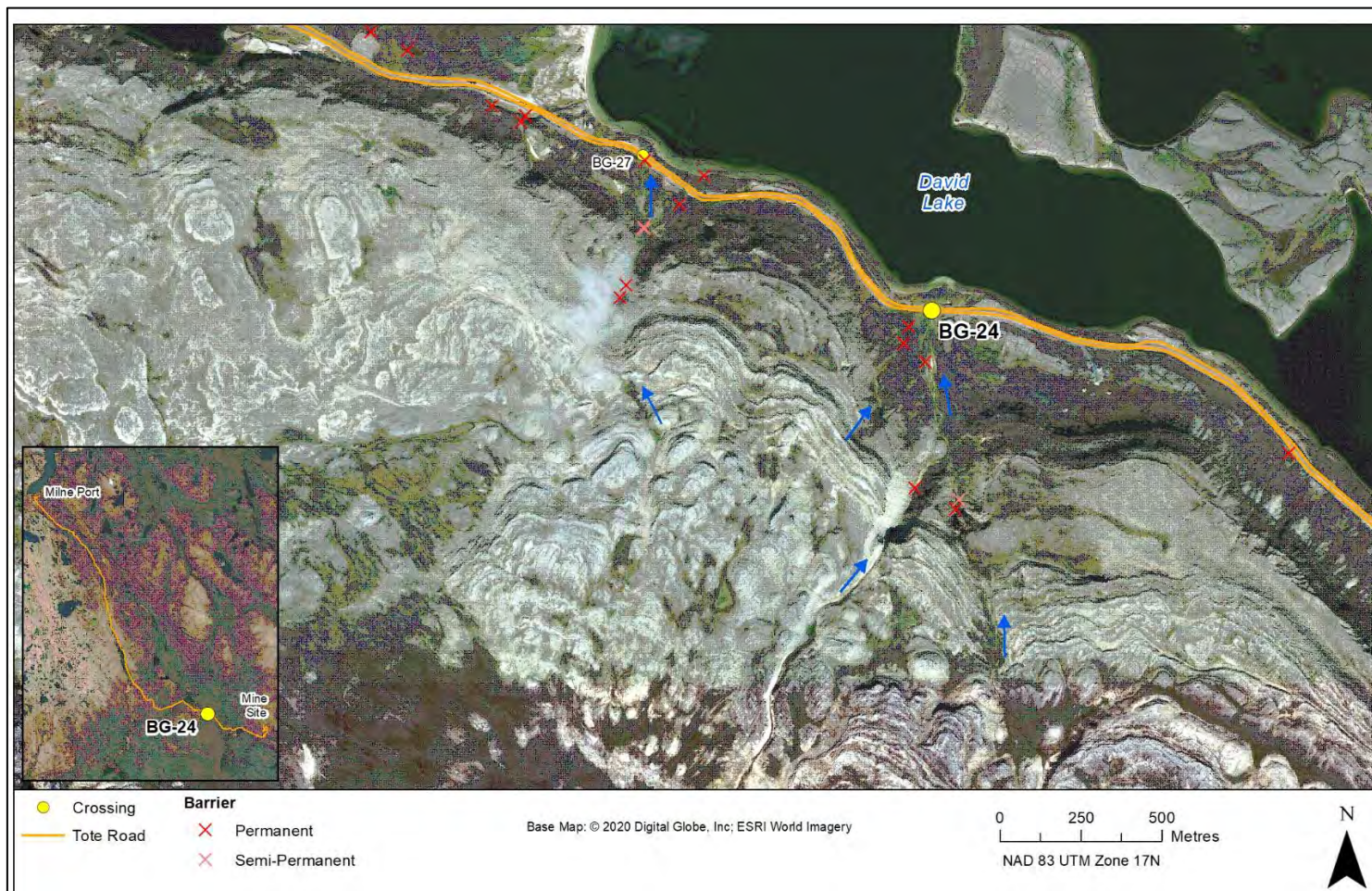
# TOTE ROAD BG-24

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-24	Dates Surveyed:	5-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 548766 E 7918878 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 3



BAFFINLAND IRON MINES  
MARY RIVER PROJECT

 **North/South Consultants Inc.**  
Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - POTENTIAL

# TOTE ROAD BG-24

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-24 that flows 110 m north into David Lake. Although a bathymetric survey has not been conducted, David Lake is believed to be of sufficient depth to support overwintering of both species.

Detailed habitat data were collected in the crossing area in spring 2023. Wetted widths over the surveyed area ranged from 3.7-7.2 m downstream and 17.0-63.3 m upstream of the crossing. High spring freshet flows typically back-up against the upstream side of the road embankment creating a large, wetted area. By summer/fall, the wetted area is reduced to the natural stream channel. The stream was relatively deep downstream in spring 2023 with maximum depths exceeding 1.0 m. Upstream depths were moderate, ranging from 0.25-0.35 m. Measured maximum velocities were high, typically >1.00 m/s and approaching 2.00 m/s upstream from the road. Stream morphology was largely run/riffle downstream and riffle upstream of the crossing. Substrates were mainly fines/gravel/cobble downstream and cobble upstream.

One large juvenile char was captured downstream of the crossing in spring 2023. Char are frequently abundant downstream and upstream of the road in this stream. The low catch rates in spring 2023 and presence of a larger individual are likely the result of sampling during very high flows and low water temperatures (i.e., fish may not have moved into the area by the time of the survey due to low water temperatures and/or high flows). Juvenile char use habitat in the stream for rearing and there is potential for adult use in the deeper pools near David Lake. There is no char spawning or overwintering habitat in the stream.

Ninespine Stickleback have never been captured in this stream but are known to occur in other tributaries to David Lake (e.g., BG-17). Habitat in this stream is likely unsuitable for the species.

# TOTE ROAD BG-24

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	P	N	P	P

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	5-Jul-23	2.0	50	142	1	0	0.42	153
	NNST					0	0	0.00	-
Upstream	ARCH			50	103	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

In spring 2023, a single large juvenile char was captured downstream of BG-24. Stickleback have never been captured in this stream but are known to be present in other parts of the watershed.

# TOTE ROAD BG-24

## HYDROLOGY CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	10.1	5.2	-	-	-	>1.0	-	-	-	0.60
60D	16.0	7.2	-	-	-	>1.5	-	-	-	~1.0
20D	11.5	3.7	-	-	-	>1.0	-	-	-	1.35
0 (Centreline)	UNDER TOTE ROAD									
20U	83.7	63.3	-	-	-	0.35	-	-	-	1.95
60U	54.2	17.0	-	-	-	0.30	-	-	-	1.96
100U	56.6	30.5	-	-	-	0.25	-	-	-	1.86

## OTHER NOTES / OBSERVATIONS

Wetted widths in spring 2023 over the surveyed area ranged from 3.7-7.2 m downstream and 17.0-63.3 m upstream of the crossing. The stream was relatively deep downstream with measured maximum depths exceeding 1.0 m. Upstream depths were moderate, ranging from 0.25-0.35 m. Measured maximum velocities at each transect were high, typically >1.00 m/s and approaching 2.00 m/s upstream from the road.

# TOTE ROAD BG-24

## HABITAT CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	10	5	5	80	-	-	-	10	20	60	10	-
60D	20	10	20	50	-	-	-	45	50	5	-	-
20D	30	10	20	40	-	-	-	5	40	50	5	-
0 (Centreline)	UNDER TOTE ROAD											
20U	70	10	5	15	-	-	-	10	20	50	30	-
60U	80	5	5	10	-	-	-	-	15	60	20	5
100U	85	-	5	10	-	-	-	5	15	70	10	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was largely run/riffle downstream and riffle upstream of the crossing. Substrates were mainly fines/gravel/cobble downstream and cobble upstream.

# TOTE ROAD BG-24

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

## TOTE ROAD BG-24

5-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

# TOTE ROAD BG-24

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-3. Photos taken 20 m upstream (top) and 60 m upstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

## TOTE ROAD BG-24

5-JUL-23



**A**



**B**



**C**

Photos 1-4. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

# TOTE ROAD BG-27

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-27	Date Surveyed:	5-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 547876 E 7919355 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 2



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Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - POTENTIAL

# TOTE ROAD BG-27

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-27 that flows northeast into David Lake 50 m downstream of the culvert. Although a bathymetric survey has not been conducted, David Lake is believed to be of sufficient depth to support overwintering of both species.

Detailed habitat data were collected in the crossing area in spring 2023. The stream at BG-27 is generally narrow, shallow, and relatively fast moving with an increasing gradient at and upstream of the culvert. Wetted widths in July 2023 ranged between 1.0 and 5.5 m. Measured maximum depths were shallow, typically < 0.20 m, with maximum velocities ranging between 0.94 – 1.17 m/s. Stream morphology was relatively uniform, comprised mostly of riffle-run areas with shallow pooling near the shore. Substrate was mostly large and small cobble, interspersed with smaller amounts of fines, gravel and boulders.

Ninespine Stickleback have never been captured or observed in this stream but are present in other tributaries of David Lake (e.g., BG-17). The relatively high natural flows likely restrict stickleback use to rearing in the lowermost reach at the outflow to David Lake.

Juvenile Arctic Char use habitat in the vicinity of the Tote Road crossing at BG-27 throughout the open-water period for rearing. There is no overwintering or spawning habitat for either species in this stream.

# TOTE ROAD BG-27

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	N
NNST	N	N	P	P

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	5-Jul-23	2.0	50	111	3	1	2.16	71-149
	NNST					0	0	0.00	-
Upstream	ARCH			50	123	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

A few char were captured/observed downstream of the crossing in spring 2023. Relatively high flows and cold water temperatures at the time of the survey likely limited fish movements upstream from David Lake.

# TOTE ROAD BG-27

## HYDROLOGY CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted      Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	STREAM REACHES DAVID LAKE									
60D										
20D	20.2	1.0	-	-	-	0.21	-	-	-	1.17
0 (Centreline)	UNDER TOTE ROAD									
20U	11.6	1.9	-	-	-	0.18	-	-	-	1.01
60U	12.4	5.5	-	-	-	0.16	-	-	-	0.94
100U	11.7	5.4	-	-	-	0.18	-	-	-	1.02

## OTHER NOTES / OBSERVATIONS

Wetted widths in July 2023 ranged between 1.0 and 5.5 m. Measured maximum depths were shallow, typically < 0.20 m, with maximum velocities at transects ranging between 0.94 – 1.17 m/s.

# TOTE ROAD BG-27

## HABITAT CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted      Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	STREAM REACHES DAVID LAKE											
60D												
20D	60	10	-	30	-	-	-	5	10	50	30	5
0 (Centreline)	UNDER TOTE ROAD											
20U	70	10	-	20	-	-	-	10	20	50	20	-
60U	70	10	-	20	-	-	-	5	15	50	20	5
100U	70	10	-	20	-	-	-	10	20	60	10	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was relatively uniform, comprised mostly of riffle-run areas with shallow pooling near the shore. Substrate was mostly large and small cobble, interspersed with smaller amounts of fines, gravel and boulders.

## TOTE ROAD BG-27

5-JUL-23



**A**



**B**



**C**

Photos 1-1. Photos taken 20 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

# TOTE ROAD BG-27

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-2. Photos taken 20 m upstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

## TOTE ROAD BG-27

5-JUL-23



**A**



**B**



**C**

Photos 1-3. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

# TOTE ROAD BG-29

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-29	Date Surveyed:	5-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 546229 E 7919877 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 3



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FISH HABITAT:

ARCTIC CHAR - YES  
NINESPINE STICKLEBACK - YES

# TOTE ROAD BG-29

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-29 that flows from a small lake 15 m to the east towards a larger river, 2.5 km north. This 4.7 km-long river flows northwest from David Lake to Muriel Lake. The small upstream lake has been surveyed for bathymetry and substrate and has sufficient depths to support overwintering for both species. Although bathymetric surveys have not been conducted, Muriel and David lakes are believed to be of sufficient depth to support overwintering of both species.

Detailed habitat data were collected the crossing area in in spring 2023. The stream at BG-29 had wetted widths ranging from 2.1 m downstream to 13.5 m upstream at the outlet from the lake. Maximum depths ranged from 0.32 m downstream to >1.0 m upstream. Measured maximum velocities increased in an upstream to downstream direction. Stream morphology was mainly riffle with some pools and runs downstream and shallow and deep pool upstream. Substrates were predominantly fines except for the farthest downstream transect (100 m downstream of the crossing), which was primarily composed of cobble.

Juvenile Arctic Char use habitat in the vicinity of the Tote Road crossing at BG-27 throughout the open-water period for rearing. There is no overwintering or spawning habitat for char in this stream, though there may be some adult char use of the most upstream areas near the lake.

Ninespine Stickleback have been captured in the lower reaches of this stream in previous years but are uncommon near the crossing where gradient and flows are higher. When present, stickleback can use habitat in this stream for rearing and potentially spawning. There is no overwintering habitat in the stream.

# TOTE ROAD BG-29

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	P	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	5-Jul-23	3.0	50	109	4	0	2.20	85 – 149
	NNST					0	0	0.00	-
Upstream	ARCH			50	97	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

In spring 2023, a few larger juvenile char were captured downstream from the road. Ninespine stickleback were not captured or observed during this survey but are known from this crossing in previous years. . No fish passage issues associated with the crossing were observed at the time of the survey.

# TOTE ROAD BG-29

## HYDROLOGY CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	6.4	2.1				0.32				0.68
60D	10.8	5.1				0.47				0.61
30D	17.0	8.4				>1.5				0.45
0 (Centreline)	UNDER TOTE ROAD									
20U	26.0	13.5				>1.0				~0.20
60U	UPSTREAM LAKE									
100U										

## OTHER NOTES / OBSERVATIONS

The stream at BG-29 had wetted widths ranging from 2.1 m downstream to 13.5 m upstream at the outlet from the lake. Maximum transect depths ranged from 0.32 downstream to >1.0 m upstream. Measured maximum velocities increased in an upstream to downstream direction.

# TOTE ROAD BG-29

## HABITAT CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	60	20	-	20	-	-	-	10	5	50	30	5
60D	20	20	10	50	-	-	-	100	-	-	-	-
30D	-	60	20	20	-	-	-	100	-	-	-	-
0 (Centreline)	UNDER TOTE ROAD											
20U	-	70	20	10	-	-	-	65	10	10	10	5
60U	UPSTREAM LAKE											
100U												

## OTHER NOTES / OBSERVATIONS

Stream morphology was mainly riffle with some pools and runs downstream and shallow and deep pool upstream. Substrates were predominantly fines except for the farthest downstream transect, which was primarily cobble.

# TOTE ROAD BG-29

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

## TOTE ROAD BG-29

5-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

## TOTE ROAD BG-29

5-JUL-23



**A**



**B**



**C**

Photos 1-3. Photos taken 20 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

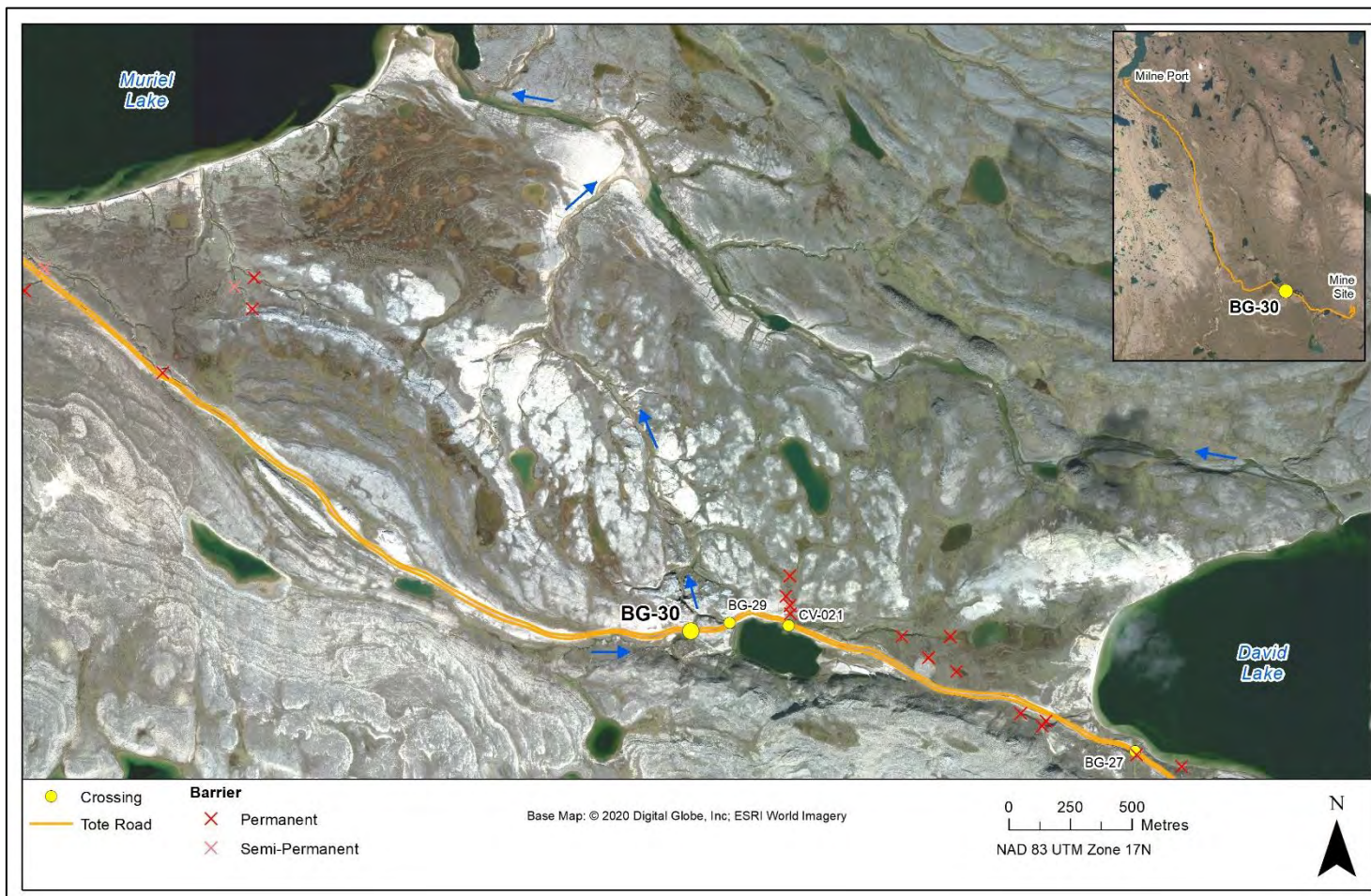
# TOTE ROAD BG-30

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-30	Date Surveyed:	5-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 546070 E 7919844 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 2



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FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

# TOTE ROAD BG-30

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-30 that flows 70 m north to the BG-29 stream system, sharing the same nearby potential overwintering lakes. This stream was part of the compensation plan for the original HADD authorization. A natural rockslide near the confluence with the BG-29 stream that had blocked fish access from overwintering areas and prevented fish use of available habitat upstream from the rockslide, was removed in 2010. The channel was remediated into a natural step-pool approach to the culvert, successfully restoring fish passage to the entire watershed.

In spring 2023, wetted widths downstream from the culvert ranged from 3.9-8.5 m with maximum depths of 0.19-0.45 m. A large pool is present immediately upstream of the road throughout the open-water period. In spring 2023, the pool had widths and depths ranging from 10.6-21.7 m and 0.31->1.0 m, respectively. Measured velocities were generally moderate throughout, typically <0.40 m/s. Stream morphology was mainly riffle/run/pool downstream and deep pool upstream of the crossing. Substrates were predominantly cobble/gravel downstream and fines upstream.

Juvenile Arctic Char use habitat in the vicinity of the Tote Road crossing at BG-30 throughout the open-water period for rearing. There is no overwintering or spawning habitat for char in this stream.

Ninespine Stickleback were not captured in spring 2023, but have been found downstream of the culvert closer to the confluence with the BG-29 stream, where gradient is lower and flows slower, during previous site surveys. Stickleback can use stream habitat for rearing and potential spawning, particularly in the upstream pool. There is no overwintering habitat for stickleback in this stream.

# TOTE ROAD BG-30

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	N
NNST	P	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	5-Jul-23	3.0	50	77	2	3	3.90	80 - 142
	NNST					0	0	0.00	-
Upstream	ARCH			50	69	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

A few juvenile char were captured downstream of the Tote Road in spring 2023. No stickleback were captured but the species has been noted downstream from this crossing in previous years. Some riprap from the road embankment had entered the stream at the downstream end of the culvert, blocking fish access at the time of the survey. This material was not present during the 2022 site survey.

# TOTE ROAD BG-30

## HYDROLOGY CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted      Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	12.1	8.5	-	-	-	0.45	-	-	-	0.42
60D	12.9	3.9	-	-	-	0.19	-	-	-	0.19
20D	10.3	6.4	-	-	-	0.22	-	-	-	0.93
0 (Centreline)	UNDER TOTE ROAD									
20U	19.3	17.8	-	-	-	>1.0	-	-	-	~0.20
60U	28.8	21.7	-	-	-	>1.0	-	-	-	~0.20
100U	17.3	10.6	-	-	-	0.31	-	-	-	0.43

## OTHER NOTES / OBSERVATIONS

In spring 2023, wetted widths downstream from the culvert ranged from 3.9-8.5 m with maximum depths of 0.19-0.45 m. Immediately upstream of the road, the stream becomes a large pool with widths and depths ranging from 10.6-21.7 m and 0.31->1.0 m, respectively. Measured velocities were generally moderate throughout, typically <0.40 m/s.

# TOTE ROAD BG-30

## HABITAT CHARACTERISTICS: 5-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted      Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	30	10	30	30	-	-	-	10	30	45	10	5
60D	60	20	-	20	-	-	-	10	20	45	20	5
20D	60	10	5	25	-	-	-	5	15	55	20	5
0 (Centreline)	UNDER TOTE ROAD											
20U	-	10	85	5	-	-	-	100	-	-	-	-
60U	-	10	85	5	-	-	-	100	-	-	-	-
100U	30	10	50	10	-	-	-	50	10	20	10	10

## OTHER NOTES / OBSERVATIONS

Stream morphology was mainly riffle/run/pool downstream and deep pool upstream. Substrates were predominantly cobble/gravel downstream and fines upstream.

# TOTE ROAD BG-30

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right on top, right bank looking at left bank on bottom).

## TOTE ROAD BG-30

5-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

# TOTE ROAD BG-30

5-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-3. Photos taken 20 m upstream (top) and 60 m upstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

## TOTE ROAD BG-30

5-JUL-23



**A**



**B**



**C**

Photos 1-4. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

# TOTE ROAD BG-32

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-32	Date Surveyed:	4-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 5407229 E 7921597 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 3+



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FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

# TOTE ROAD BG-32

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-32 that flows 300 m southeast to the large outflow river from Muriel Lake, 1.6 km to the northeast. In addition, there are three small lakes located 2-4 km upstream (north) of the road crossing that have sufficient depth to support overwintering of both species. Although a bathymetric survey has not been conducted, Muriel Lake is believed to be of sufficient depth to support overwintering of both species.

Detailed habitat data were collected in the crossing area in spring 2023. Wetted widths were typically >10.0 m throughout the surveyed area. The channel was consistently deep (>1.0 m), and the velocities were moderate to high, often exceeding 1.00 m/s. Stream morphology was mainly deep pool/run downstream and deep pool riffle/pool upstream. Substrates were predominantly fines throughout.

Juvenile Arctic Char were not captured in 2023 but are known to use habitat in the vicinity of the Tote Road crossing at BG-32 throughout the open-water period for rearing. There is no overwintering or spawning habitat for char in this stream, though depths may be sufficient for adult char feeding, particularly during spring.

A single, adult Ninespine Stickleback was captured in spring 2023. Stickleback use stream habitat in the vicinity of the crossing for rearing and potential spawning. There is no overwintering habitat for stickleback in this stream.

# TOTE ROAD BG-32

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	P	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	4-Jul-23	1.5	50	80	0	0	0.00	-
	NNST					1	0	0.47	64
Upstream	ARCH			50	46	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

A single Ninespine Stickleback was captured downstream of the crossing. No char were captured or observed. Low water temperatures and high flows during the survey period likely limited fish movements from overwintering habitat to the crossing area.

# TOTE ROAD BG-32

## HYDROLOGY CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	49.3	10.5	-	-	-	>1.00	-	-	-	0.35
60D	46.8	6.6	-	-	-	>1.00	-	-	-	0.48
20D	37.5	16.5	-	-	-	>1.00	-	-	-	1.11
0 (Centreline)	UNDER TOTE ROAD									
20U	44.4	10.2	-	-	-	>1.00	-	-	-	>1.0
60U	52.3	11.3	-	-	-	>1.25	-	-	-	0.97
100U	44.6	10.5	-	-	-	>1.20	-	-	-	~1.0

## OTHER NOTES / OBSERVATIONS

In spring 2023, wetted widths were typically >10.0 m throughout the surveyed area. The channel was consistently deep (>1.0 m), and velocities were moderate to high, often exceeding 1.00 m/s.

# TOTE ROAD BG-32

## HABITAT CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	10	20	50	20	-	-	-	100	-	-	-	-
60D	10	10	55	25	-	-	-	100	-	-	-	-
20D	5	10	75	10	-	-	-	50	20	30	-	-
0 (Centreline)	UNDER TOTE ROAD											
20U	30	20	30	20	-	-	-	70	20	10	-	-
60U	40	10	30	20	-	-	-	99	1	-	-	-
100U	30	20	30	20	-	-	-	100	-	-	-	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was mainly deep pool/run downstream and deep pool riffle/pool upstream. Substrates were predominantly fines throughout.

# TOTE ROAD BG-32

4-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

## TOTE ROAD BG-32

4-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

# TOTE ROAD BG-32

4-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-3. Photos taken 20 m upstream (top) and 60 m upstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

## TOTE ROAD BG-32

4-JUL-23



**A**



**B**



**C**

Photos 1-4. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

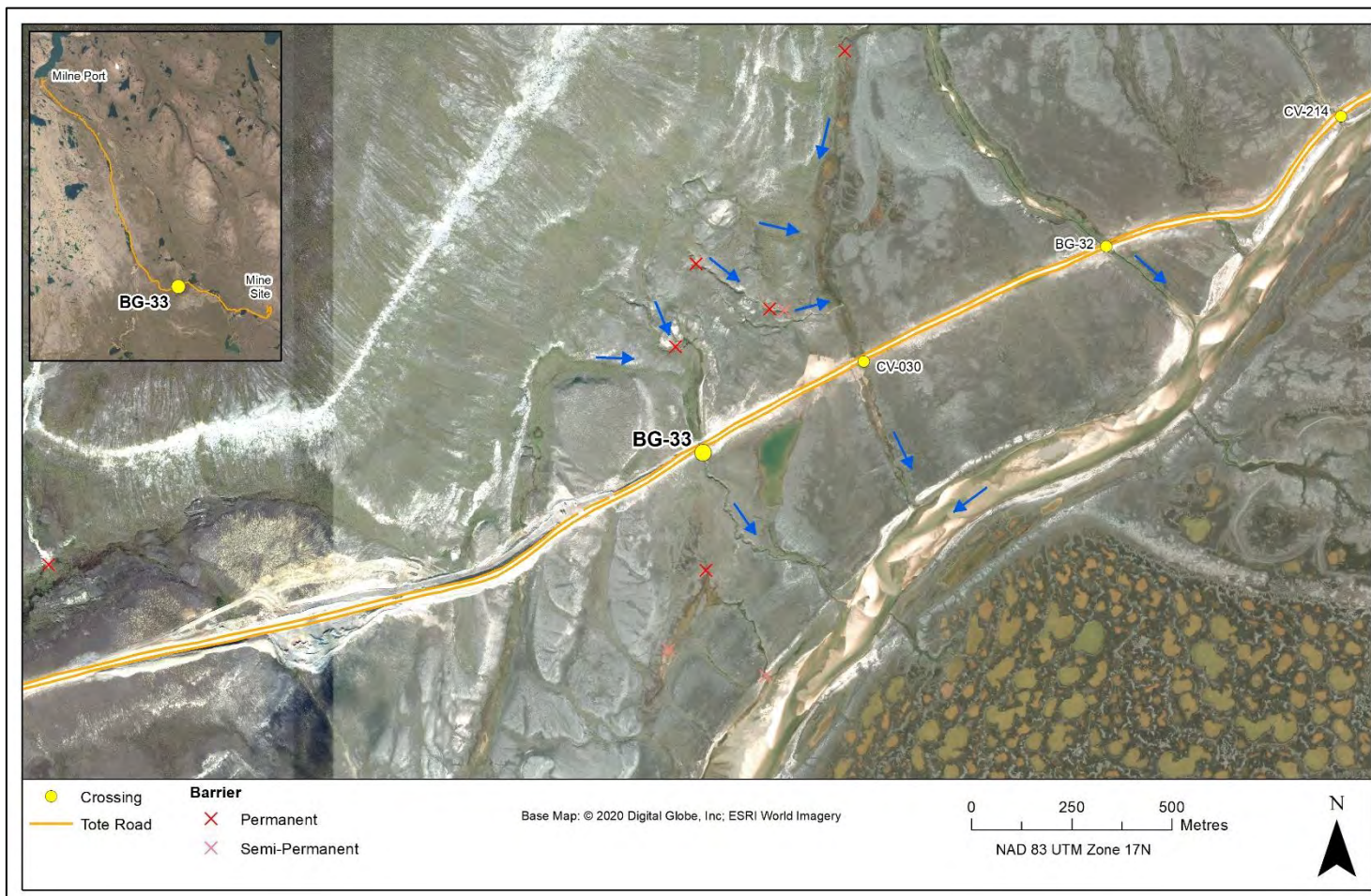
# TOTE ROAD BG-33

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-33	Date Surveyed:	4-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 539720 E 7921082 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 3+



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FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

# TOTE ROAD BG-33

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site BG-33 that flows 600 m southeast to the large outflow river from Muriel Lake, 2.7 km to the northeast. In addition, there are three small lakes located 2-4 km upstream (north) of the road crossing that have sufficient depth to support overwintering of both species. Although a bathymetric survey has not been conducted, Muriel Lake is believed to be of sufficient depth to support overwintering of both species.

Detailed habitat data were collected in the crossing area in spring 2023. Wetted widths were typically narrow ( $<3.5$  m) downstream from the road and wide upstream ( $>15.0$  m) where the stream ponds at the road embankment. Maximum depths ranged from 0.25-0.87 m. Velocities were generally moderate (0.40-0.80 m/s) but occasionally exceeded 1.00 m/s. Stream morphology was highly variable with riffles, pools and runs each dominant at different transects. Substrates were predominantly fines throughout except near the road where cobble was most abundant.

Two larger juvenile Arctic Char were captured downstream of the crossing in 2023. Char use habitat in the vicinity of the Tote Road crossing throughout the open-water period for rearing. There is no overwintering or spawning habitat for char in this stream.

A single, adult Ninespine Stickleback was captured in spring 2023. Stickleback use stream habitat in the vicinity of the crossing for rearing and potentially spawning. There is no overwintering habitat for stickleback in this stream.

# TOTE ROAD BG-33

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	N
NNST	P	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	4-Jul-23	3.0	50	110	2	0	1.09	115 - 263
	NNST					1	0	0.55	54
Upstream	ARCH			50	104	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

Small numbers of both species were captured in spring 2023 downstream of the road crossing. The slight perch on the downstream end of the culvert and the presence of road aggregate immediately upstream of the crossing may impede fish movements.

# TOTE ROAD BG-33

## HYDROLOGY CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	11.8	3.1	-	-	-	0.50	-	-	-	0.59
60D	8.0	1.3	-	-	-	0.25	-	-	-	0.72
20D	6.0	3.0	-	-	-	0.42	-	-	-	1.31
0 (Centreline)	UNDER TOTE ROAD									
20U	32.2	18.1	-	-	-	0.57	-	-	-	0.48
60U	36.8	25.2	-	-	-	0.30	-	-	-	0.01
100U	46.5	15.1	-	-	-	0.87	-	-	-	0.46

## OTHER NOTES / OBSERVATIONS

Wetted widths were typically narrow (<3.5 m) downstream from the road and wide upstream (>15.0 m) where the stream ponds at the road embankment. Maximum depths ranged from 0.25-0.87 m. Velocities were usually moderate (0.40-0.80 m/s) but occasionally exceeded 1.00 m/s.

# TOTE ROAD BG-33

## HABITAT CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	5	15	50	30	-	-	-	100	-	-	-	-
60D	50	10	20	20	-	-	-	50	50	-	-	-
20D	75	10	5	10	-	-	-	5	20	65	10	-
0 (Centreline)	UNDER TOTE ROAD											
20U	10	20	60	10	-	-	-	95	-	5	-	-
60U	-	30	60	5	-	-	5	90	-	5	5	-
100U	10	40	20	30	-	-	-	100	-	-	-	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was highly variable with riffles, pools and runs each dominant at different transects. Substrates were predominantly fines throughout except near the road where cobble was most abundant.

# TOTE ROAD BG-33

4-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

## TOTE ROAD BG-33

4-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

# TOTE ROAD BG-33

4-JUL-23



**A**



**B**



**C**



**D**



**E**



**F**

Photos 1-3. Photos taken 20 m upstream (top) and 60 m upstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

## TOTE ROAD BG-33

4-JUL-23



**A**



**B**



**C**

Photos 1-4. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

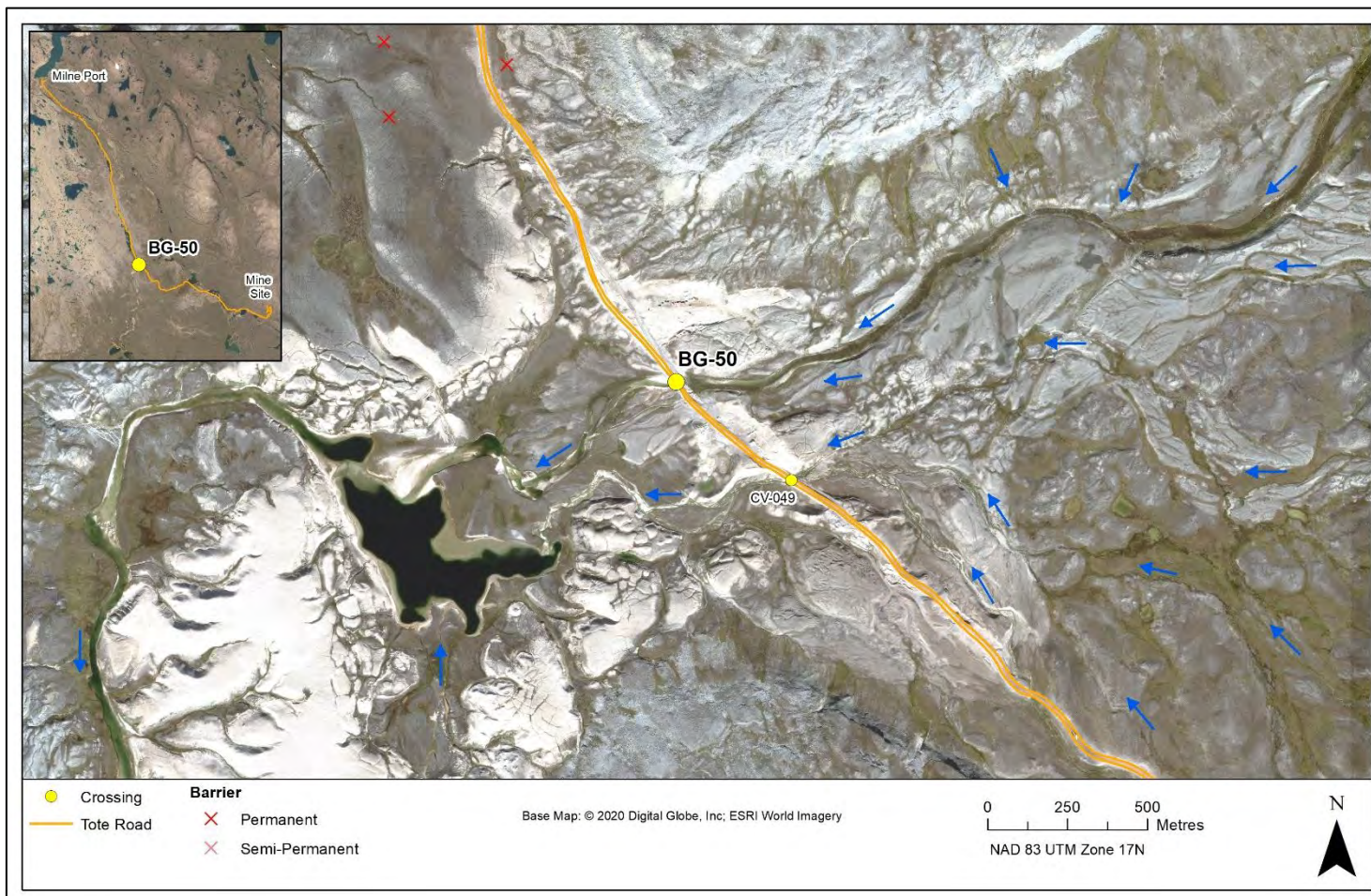
# TOTE ROAD BG-50

## LOCATION AND CROSSING DESCRIPTION

Site ID:	BG-50	Dates Surveyed:	4-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 529294 E 7926852 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 3+



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FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

# TOTE ROAD BG-50

## SITE SUMMARY

The Tote Road crosses a large, unnamed river at site BG-50 that flows 1.0 km west to a small lake. Although a bathymetric survey has not been conducted, the lake is suspected of being of sufficient depth to support overwintering based on shoreline surveys and review of available imagery. The road crossing is located at the upstream end of a mid-channel island and is separated into a bridge crossing on the larger north channel and a culvert crossing at the smaller south channel. The culverts are perched and impassable to fish but the bridge crossing does not affect fish passage.

Detailed habitat data were collected in the bridge channel in spring 2023. The river is wide with spring wetted widths in the north channel ranging from 47-75 m. Maximum depths and velocities could not be measured across the transects due to unsafe wading conditions but likely exceeded 2.0 m and 3.00 m/s, respectively. Stream morphology was primarily rapids and riffle. Substrate proportions could not be assessed due to the fast, deep water, but the photos indicate they were almost exclusively cobble/boulder throughout.

The river could not be fished in spring 2023 due to unsafe wading conditions. However, low water temperatures and high flows during the survey period likely limited fish movements from overwintering habitat to the crossing area. Both species have been captured in this river in previous surveys. Juvenile, and potentially adult, char can use habitat in the vicinity of the Tote Road crossing throughout the open-water period for rearing/feeding. There is no overwintering or spawning habitat for char in this river.

Stickleback use habitat in the slower-flowing areas of the stream along the banks in summer/fall for feeding. Spawning is unlikely given the lack of suitable habitat. Additional surveys of the area have shown some evidence of stickleback spawning in small, marshy tributaries of this river. There is no overwintering habitat for stickleback in this river.

# TOTE ROAD BG-50

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	N	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	4-Jul-23	2.0	N/A	N/A	0	0	0.00	-
	NNST					0	0	0.00	-
Upstream	ARCH			N/A	N/A	0	0	0.00	-
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

Flows were too high to safely electrofish in spring 2023. However, both species have been captured in the river in previous years. The river provides open-water rearing habitat for both species and potentially feeding habitat for adult char.

# TOTE ROAD BG-50

## HYDROLOGY CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted      Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	145	75	-	-	-	>2.0	-	-	-	>3.0
60D	125	65	-	-	-	>2.0	-	-	-	>3.0
20D	160	47	-	-	-	>2.0	-	-	-	>3.0
0 (Centreline)	UNDER TOTE ROAD									
20U	-	-	-	-	-	-	-	-	-	-
60U	-	-	-	-	-	-	-	-	-	-
100U	65.8	48.7	-	-	-	>2.0	-	-	-	>3.0

## OTHER NOTES / OBSERVATIONS

Wetted widths ranged from 47-75 m in spring 2023. Maximum depths and velocities could not be measured due to unsafe wading conditions but likely exceeded 2.0 m and 3.00 m/s, respectively.

# TOTE ROAD BG-50

## HABITAT CHARACTERISTICS: 4-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	20	1	19	10	-	50	-	-	-	-	-	-
60D	30	5	10	5	-	50	-	-	-	-	-	-
20D	30	5	10	5	-	50	-	-	-	-	-	-
0 (Centreline)	UNDER TOTE ROAD											
20U	-	-	-	-	-	-	-	-	-	-	-	-
60U	-	-	-	-	-	-	-	-	-	-	-	-
100U	20	5	10	5	-	60	-	-	-	-	-	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was primarily rapids and riffle. Substrates could not be directly observed due to the fast, deep water, appears to consist almost exclusively of cobble/boulder throughout based on site photographs.

# TOTE ROAD BG-50

4-JUL-23



**A**



**B**



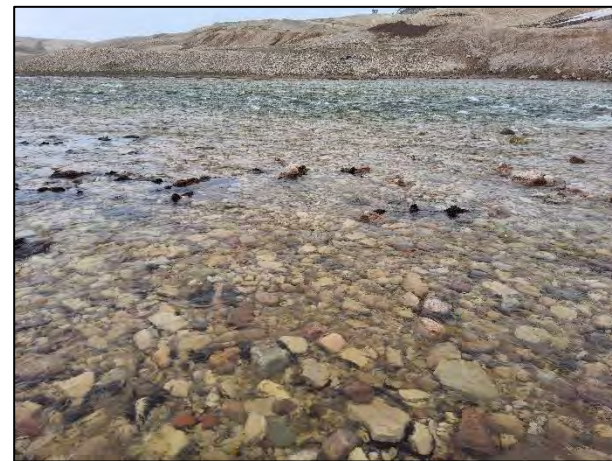
**C**



**D**



**E**



**F**

Photos 1-1. Photos taken 20 m downstream (top) and 60 m downstream (bottom) in spring 2023: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

# TOTE ROAD CV-216

5-JUL-23



**A**



**B**



**C**

Photos 1-2. Photos taken 100 m downstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

# TOTE ROAD CV-216

5-JUL-23



**A**



**B**



**C**

Photos 1-4. Photos taken 100 m upstream in spring 2023: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

# TOTE ROAD CV-001

## LOCATION AND CROSSING DESCRIPTION

Site ID:	CV-001	Dates Surveyed:	8-Jul-23	Waterbody Type:	Stream
Project Interaction:	Tote Road Culvert	UTM Coordinates:	17W 553544 E 7914897 N		

## GENERAL PHYSICAL CHARACTERISTICS

Flow Regime: Seasonal Stream Order: 2



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FISH HABITAT:

ARCTIC CHAR - YES  
NINESPINE STICKLEBACK - YES

# TOTE ROAD CV-001

## SITE SUMMARY

The Tote Road crosses a small, unnamed stream at site CV-001 that flows westward into an unnamed lake 1.5 km downstream of the culvert. This stream is a smaller branch of the stream crossed by the road at culvert site BG-04. The downstream lake has sufficient depth to support overwintering for both species.

Detailed habitat data were collected at this site in spring 2023. Wetted widths ranged between 0.9 and 19.7 m. Maximum depths at each transect were moderate, not exceeding 0.60 m and ranging from 0.27 – 0.52 m. Maximum velocities were variable, ranging between 0.10 and 1.40 m/s; velocities tended to be higher in more constricted areas of the stream. Stream morphology was typically riffle and run with isolated areas of pooling. The substrate was primarily composed of fines and gravel interspersed with small amounts of cobble.

Juvenile Arctic Char were captured in this stream in spring 2023 and were more abundant downstream than upstream of the culvert where flows are higher and there are greater proportions of cobble substrate. These spatial trends have been consistent across all years of monitoring. There is no char spawning or overwintering habitat in this stream.

Ninespine Stickleback have frequently been captured in this stream throughout the Tote Road monitoring program, particularly upstream of the culvert in marshy areas with wetted terrestrial vegetation. The species can use habitat in the vicinity of the Tote Road crossing at CV-001 for rearing/feeding and likely spawning. There is no overwintering habitat for stickleback in this stream.

# TOTE ROAD CV-001

## FISH HABITAT POTENTIAL

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	N
NNST	P	N	Y	Y

## FISHERIES DATA

Location	Species	Survey Date	Temperature (°C)	Distance Fished (m)	Effort (Seconds)	# Fish Captured	# Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
Downstream	ARCH	8-Jul-23	4.0	50	118	17	15	16.27	84-165
	NNST					1	0	0.51	84
Upstream	ARCH			50	169	0	1	0.36	~140
	NNST					0	0	0.00	-

## OTHER NOTES / OBSERVATIONS

Juvenile char were abundant downstream of the culvert and a single char was observed approximately 100 m upstream. Juvenile char use habitat in the stream for rearing during the open-water period. A single adult stickleback was captured downstream of the road.

# TOTE ROAD CV-001

## HYDROLOGY CHARACTERISTICS: 8-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	9.5	0.9	-	-	-	0.32	-	-	-	1.40
60D	14.0	5.1	-	-	-	0.30	-	-	-	0.41
20D	10.0	7.3	-	-	-	0.27	-	-	-	0.60
0 (Centreline)	UNDER TOTE ROAD									
20U	17.5	54.3	-	-	-	0.36	-	-	-	0.10
60U	60.7	11.3	-	-	-	0.52	-	-	-	0.80
100U	63.2	19.7	-	-	-	0.38	-	-	-	0.11

## OTHER NOTES / OBSERVATIONS

Wetted widths in spring 2023 ranged between 0.9 and 19.7 m. Measured maximum depths at each transect were moderate, not exceeding 0.60 m, and ranging from 0.27 – 0.52 m. Maximum velocities were variable, ranging between 0.10 and 1.40 m/s; velocities tended to be higher in more constricted areas of the stream

# TOTE ROAD CV-001

## HABITAT CHARACTERISTICS: 8-JUL-23

Wetted/Dry/Shallow (<0.02 m)/Unconnected Pools:      Wetted

Stage:    High

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Rapids	Flat	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	45	10	10	35	-	-	-	35	35	25	5	-
60D	30	15	5	50	-	-	-	70	29	1	-	-
20D	40	20	10	30	-	-	-	40	50	10	-	-
0 (Centreline)	UNDER TOTE ROAD											
20U	5	30	30	35	-	-	-	35	55	9	1	-
60U	30	20	10	40	-	-	-	25	70	4	1	-
100U	5	60	25	10	-	-	-	50	45	5	-	-

## OTHER NOTES / OBSERVATIONS

Stream morphology was typically riffle and run with isolated areas of pooling. The substrate was primarily composed of fines and gravel interspersed with small amounts of cobble.