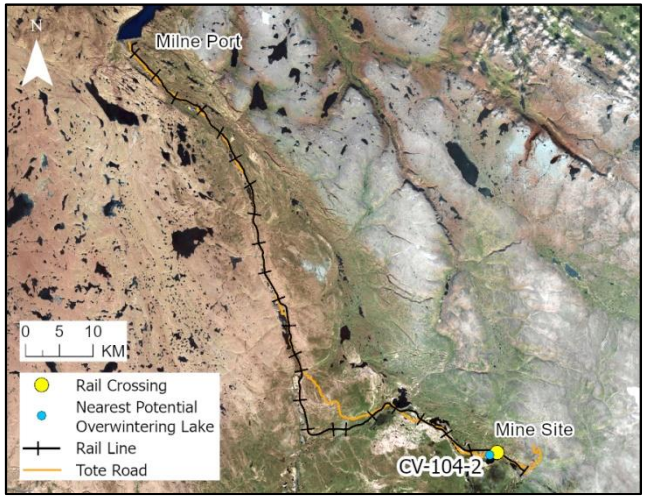
RAIL CV-104-2

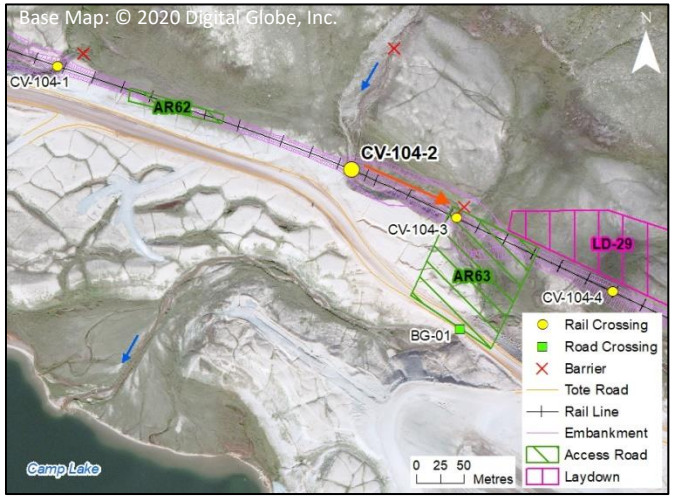
LOCATION AND CROSSING DESCRIPTION

Site ID:	CV-104-2	**Dates Surveyed:**	22-Jun-19; 19-Aug-19	**Waterbody Type:**	Stream
Project Interaction:	Diversion	**Centreline UTM Coordinates:**	17W 557881 E 7915094 N	**Culvert Length (m):**	N/A
Number of Barrels:	N/A	**Culvert Diameter/Span (mm):**	N/A	**Slope (%):**	N/A

GENERAL PHYSICAL CHARACTERISTICS

Flow Regime:	Seasonal	**Stream Order:**	2	**Drainage Basin Area (km²):**	0.357





SUMMARY

The rail alignment crosses an unnamed seasonal stream at CV-104-2, which flows into the stream crossed by the rail at CV-104-5 just upstream of the Tote Road crossing (BG-01) approximately 250 m downstream. The system drains southwest to Camp Lake another 530 m downstream from the Tote Road. This stream is shallow (<0.10 m) with moderate velocities and increasing gradient upstream from the centreline. Habitat is largely cascade/pool/riffle over cobble/gravel. Flow from this stream will be diverted to the stream crossing CV-104-3.

A steeper 50-m long reach with small vertical drops starting at 130 m upstream from the centreline may act as a barrier under low water levels, but fish were found upstream of this feature in spring and summer/fall 2019. There is a permanent barrier (an impassable vertical drop) approximately 3.5 km upstream from the rail centreline. There are no natural downstream barriers to fish movement, though high velocities have been observed at the outflow from the Tote Road culvert during periods of high water.

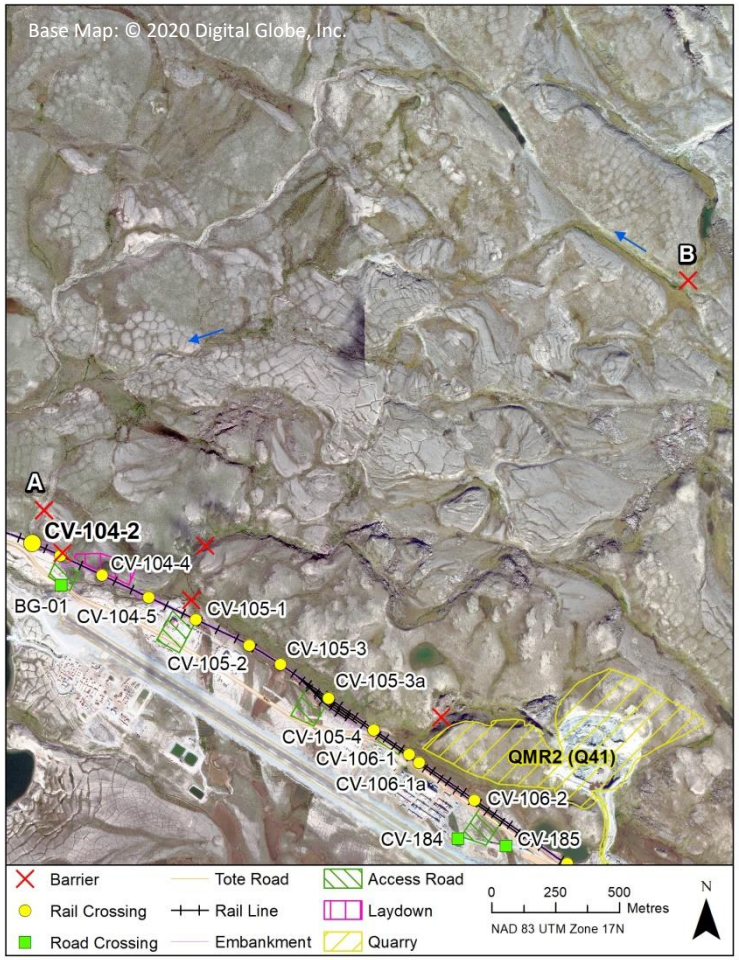
This stream provides open-water season rearing habitat for juvenile Arctic Char from Camp Lake upstream to the barrier. The stream does not provide overwintering or spawning habitat for char due to lack of flow and sufficient depth in winter.

Ninespine Stickleback have been captured at the confluence with Camp Lake downstream of this site, but have not been observed or captured upstream of the Tote Road where habitat is unsuitable for the species.

RAIL CV-104-2

BARRIERS

Upstream/ Downstream	UTM		Barrier Type			Height (m)	Gradient (°)	Description	Site Label
	Easting	Northing	1	2	3				
Downstream	NO BARRIERS								
Upstream	557926	7915221	VD	SHALL		0.3		Intermittent Barrier: When combined with low water, vertical drops may become barrier	A
Upstream	560456	7916125	VD			0.6		Permanent Barrier: >3.5 km upstream of crossing	B



A

A

B

RAIL CV-104-2

FISH HABITAT POTENTIAL

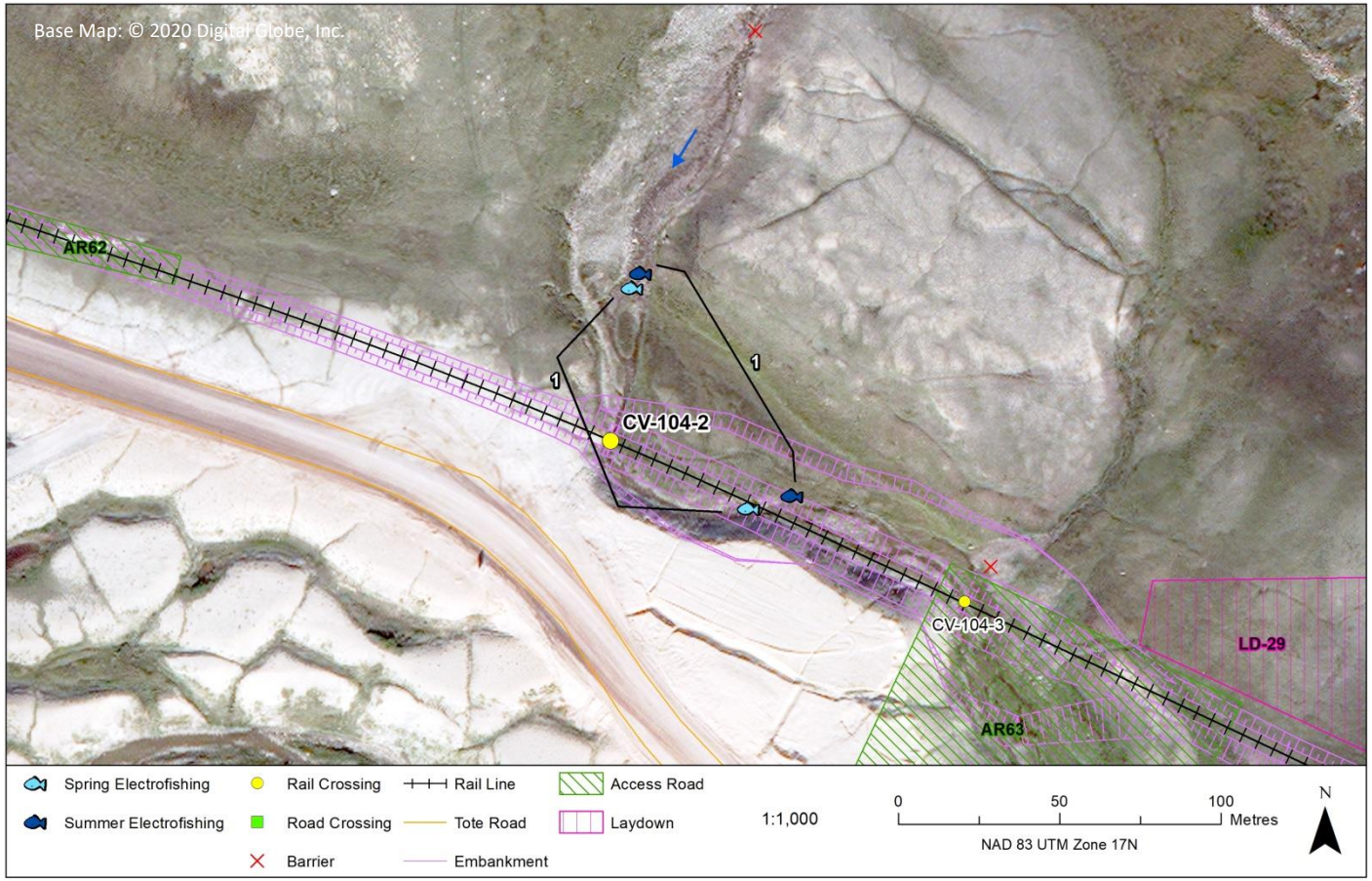
Nearest Potential Overwintering Habitat - ARCH: Camp Lake

Distance to Nearest Potential Overwintering Habitat - ARCH (km): ~0.80

Overwintering Habitat Upstream of Site - ARCH (Y/N): No

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

FISHING SITES



RAIL CV-104-2

FISHERIES DATA

Date: 22-Jun-19 **Temperature (°C):** 7.0 **Gear Used:** Backpack Electrofisher/Visual

Distance Fished (m): 112 **Duration Fished (seconds):** NR

Species	Season	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
ARCH	Spring	1	NR	7	0	-	55 – 100 (measured)
NNST	Spring	1	NR	0	0	-	-

Date: 19-Aug-19 **Temperature (°C):** 8.0 **Gear Used:** Backpack Electrofisher/Visual

Distance Fished (m): 105 **Duration Fished (seconds):** 481

Species	Season	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Length Range (mm)
ARCH	Summer/Fall	1	481	5	4	0.62	70 – 98 (measured)
NNST	Summer/Fall	1	481	0	0	-	-

COMMENTS

During spring, all fish were captured at or upstream from the rail centreline. During summer/fall, two fish were captured downstream and three upstream from the crossing centreline; four additional char were observed from 140 to 185 m upstream. Stickleback were not observed or captured in this stream in 2018 or 2019 and have not been captured in the stream crossed at CV-104-5 upstream of the Tote Road since monitoring began in 2006.

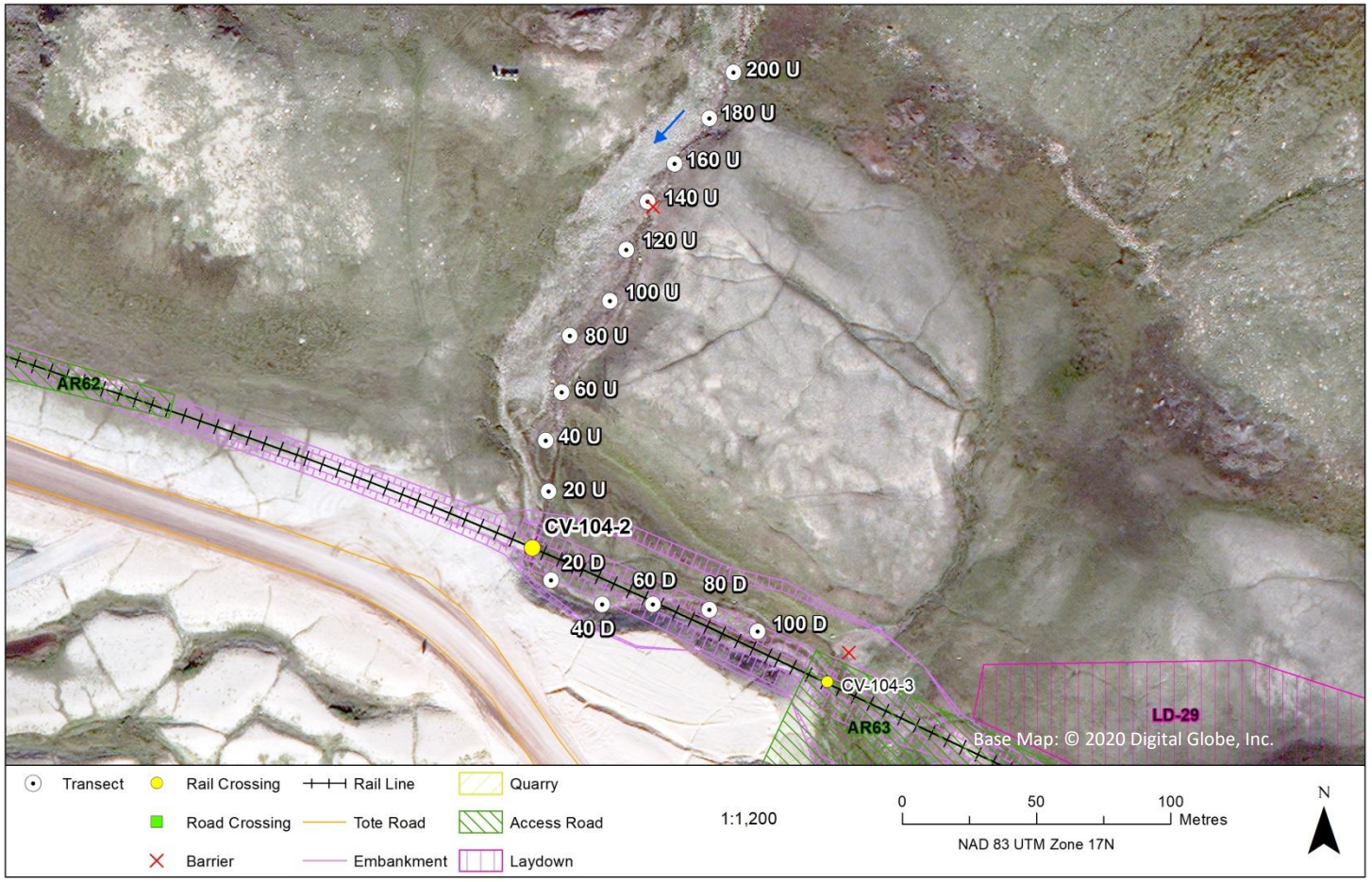
RAIL CV-104-2

GENERAL HABITAT CHARACTERISTICS

Channel Confinement: PC **Stream Morphology:** Meandering **Riparian Vegetation Type (%):** Grass 60, Willow 30, Other 10

Centreline	Height (m)	Stability	Materials (%)	Shape
LHB	0.20	Moderate	CGS 85, Mineral Soil 5, Organic 10	Sloping
RHB	0.40	Moderate	CGS 25, Mineral Soil 10, Organic 65	Vertical

HABITAT SURVEY SITES



RAIL CV-104-2

HYDROLOGY & HABITAT CHARACTERISTICS: 22-JUN-19

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

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	5.0	1.8	0.05	0.04	0.03	0.10	0.24	0.21	0.15	0.69
80D	7.4	5.1	0.07	0.04	0.03	0.07	0.11	0.39	0.28	0.39
60D	8.3	5.4	0.10	0.03	0.03	0.10	0.13	0.30	0.11	0.30
40D	4.6	3.1	0.03	0.07	0.07	0.07	0.00	0.12	0.04	0.32
20D	4.5	2.9	0.03	0.05	0.08	0.09	0.21	0.20	0.18	0.60
0 (Centreline)	5.4	3.1	0.03	0.09	0.07	0.09	0.19	0.17	0.44	0.44
20U	12.2	5.4	0.05	0.03	0.04	0.08	0.45	0.31	0.40	0.45
40U	12.5	7.0	0.05	0.06	0.02	0.06	0.38	0.30	0.28	0.38
60U	11.4	8.0	0.05	0.06	0.03	0.10	0.35	0.05	0.15	0.78
80U	28.5	13.0	0.02	0.06	0.05	0.15	0.15	0.10	0.34	0.34
100U	9.0	33.0	too shallow	0.05	0.05	0.07	too shallow	0.16	0.34	0.34

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Flat	Rapids	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	10	10	5	15	60	-	-	5	25	55	14	1
80D	75	10	-	10	5	-	-	5	40	45	9	1
60D	50	20	5	25	-	-	-	5	65	25	4	1
40D	60	10	-	30	-	-	-	10	30	35	15	-
20D	60	5	-	35	-	-	-	10	20	50	19	1
0 (Centreline)	55	20	5	10	10	-	-	10	30	40	20	-
20U	30	40	-	-	30	-	-	5	45	40	9	1
40U	25	25	-	-	50	-	-	5	15	60	24	1
60U	35	35	-	-	30	-	-	-	10	40	35	15
80U	10	50	-	-	40	-	-	-	15	65	15	5
100U	10	50	-	-	40	-	-	-	15	65	15	5

OTHER NOTES / OBSERVATIONS

Habitat in the stream is shallow riffle/cascade/pool with moderate velocities over mainly cobble/gravel substrate.

RAIL CV-104-2

HYDROLOGY & HABITAT CHARACTERISTICS: 19-AUG-19

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

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
100D	9.6	8.8	0.09	0.01	0.04	0.08	0.14	<0.01	0.14	0.52
80D	7.2	3.0	0.08	0.03	0.04	0.16	0.61	0.00	0.28	0.50
60D	3.3	2.8	0.05	0.01	0.05	0.20	0.31	too shallow	0.18	0.39
40D	3.2	2.4	0.05	0.05	0.05	0.06	0.26	0.38	0.31	0.54
20D	5.5	2.8	0.08	0.02	0.03	0.08	0.36	<0.01	0.18	0.52
0 (Centreline)	6.0	1.6	0.04	0.05	0.05	0.13	<0.01	0.36	0.11	0.92
20U	10.6	3.3	0.03	0.04	0.06	0.08	0.39	0.24	0.30	0.51
40U	18.5	5.6	0.06	0.03	0.03	0.25	0.08	0.16	0.28	0.43
60U	28.2	7.5	0.07	0.05	0.03	0.10	0.31	0.76	0.14	0.78
80U	29.3	11.2	0.02	0.08	0.02	0.18	0.15	0.46	0.22	0.47
100U	32.1	8.7	0.03	0.03	0.06	0.09	0.11	0.25	0.20	0.39

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Flat	Rapids	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	45	25	-	-	30	-	-	5	40	50	4	1
80D	40	35	-	-	25	-	-	5	40	51	4	-
60D	55	40	5	-	-	-	-	5	35	56	4	-
40D	80	20	-	-	-	-	-	-	10	85	5	-
20D	70	30	-	-	-	-	-	5	15	75	5	-
0 (Centreline)	60	30	-	-	10	-	-	5	35	50	10	-
20U	50	40	-	-	10	-	-	-	10	80	9	1
40U	55	35	-	-	10	-	-	10	30	50	5	5
60U	20	30	-	-	50	-	-	-	20	70	5	5
80U	15	40	-	-	45	-	-	-	10	80	9	1
100U	15	35	-	-	50	-	-	-	15	80	4	1

OTHER NOTES / OBSERVATIONS

Water levels, velocities, and habitat were similar between seasons.

RAIL CV-104-2

22-JUN-19

A

B

C

D

E

F

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

RAIL CV-104-2

22-JUN-19

A

B

C

D

E

F

Photos 2. Photos taken 40 m downstream (top) and 60 m downstream (bottom) in spring: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

RAIL CV-104-2

22-JUN-19

A

B

C

D

E

F

Photos 3. Photos taken 80 m downstream (top) and 100 m downstream (bottom) in spring: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

RAIL CV-104-2

22-JUN-19

A

B

C

D

E

F

Photos 4. Photos taken 20 m upstream (top) and 40 m upstream (bottom) in spring: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank).

RAIL CV-104-2

22-JUN-19

A

B

C

D

E

F

Photos 5. Photos taken 60 m upstream (top) and 80 m upstream (bottom) in spring: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

RAIL CV-104-2

22-JUN-19

A

B

C

Photos 6. Photos taken 100 m upstream (top) in spring: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank).

RAIL CV-104-2

19-AUG-19

A

B

C

D

E

F

Photos 7. Photos taken at the crossing centerline in summer/fall: (A) facing upstream; (B) facing downstream; (C) across (left bank looking at right bank); (D) diagonal from right bank above the centreline looking downstream; (E) across (right bank looking at left bank); and (F) diagonal from right bank below the centreline looking upstream.

RAIL CV-104-2

19-AUG-19

A

B

C

D

E

F

Photos 8. Photos taken 20 m downstream (top) and 40 downstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

RAIL CV-104-2

19-AUG-19

A

B

C

D

E

F

Photos 9. Photos taken 60 m downstream (top) and 80 downstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

RAIL CV-104-2

19-AUG-19

A

B

C

Photos 10. Photos taken 100 m downstream in summer/fall: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

RAIL CV-104-2

19-AUG-19

A

B

C

D

E

F

Photos 11. Photos taken 20 m upstream (top) and 40 m upstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

RAIL CV-104-2

19-AUG-19

A

B

C

D

E

F

Photos 12. Photos taken 60 m upstream (top) and 80 m upstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank).

RAIL CV-104-2

19-AUG-19

A

B

C

Photos 13. Photos taken 100 m upstream in summer/fall: (A) facing upstream; (B) facing downstream; and (C) across (left bank looking at right bank).

RAIL CV-104-2

HYDROLOGY & HABITAT CHARACTERISTICS: UPSTREAM SURVEY

Date: 19-Aug-19

Site	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Bankfull	Wetted	25%	50%	75%	Max	25%	50%	75%	Max
120U	30.4	10.7	0.01	0.06	0.07	0.10	0.00	0.29	0.16	0.62
140U	24.8	8.6	0.06	0.04	0.06	0.20	0.10	0.28	0.23	0.91
160U	18.8	2.9	0.10	0.20	0.05	0.34	0.10	0.02	0.42	1.13
180U	18.1	6.3	0.06	0.07	0.07	0.50	0.28	0.23	0.39	0.85
200U	14.6	6.4	0.06	0.08	0.08	0.17	0.05	0.48	<0.01	0.81

Site	Stream Morphology Composition (%)							Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Flat	Rapids	Fines	Gravel	Small Cobble	Large Cobble	Boulders
120U	15	40	-	-	45	-	-	10	10	75	4	1
140U	10	40	-	-	50	-	-	5	10	45	20	20
160U	10	30	10	-	50	-	-	5	10	35	25	25
180U	5	30	10	-	55	-	-	5	20	30	25	20
200U	10	35	-	-	55	-	-	5	20	40	20	15

OTHER NOTES / OBSERVATIONS

A survey was conducted in spring to document habitat changes up to 500 m upstream from the centreline. A detailed habitat survey was conducted from 100-200 m upstream in summer/fall.

The stream initially widens upstream from the rail where the intermittent barrier is located. Habitat at the permanent barrier is primarily cascade/pool over cobble/boulder.

RAIL CV-104-2

22-JUN-19: UPSTREAM SURVEY

A

B

C

D

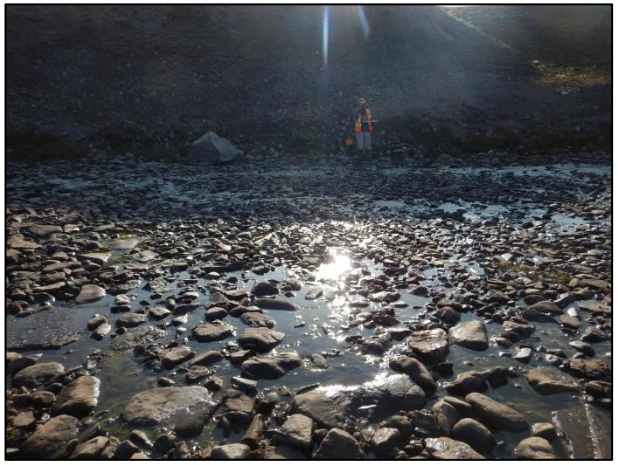
Photos 14. Photos taken 340 m upstream (top) and 400 m upstream (bottom) in summer/fall: (A,C) facing upstream; and (B,D) facing downstream.

RAIL CV-104-2

19-AUG-19: UPSTREAM SURVEY

A

B



C

D

E

F

Photos 15. Photos taken 120 m upstream (top) and 140 m upstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank). Note: all photos taken while standing at the transect centreline.

RAIL CV-104-2

19-AUG-19: UPSTREAM SURVEY

A

B

C

D

E

F

Photos 16. Photos taken 160 m upstream (top) and 180 m upstream (bottom) in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (left bank looking at right bank). Note: all photos taken while standing at the transect centreline.

RAIL CV-104-2

19-AUG-19: UPSTREAM SURVEY

A

B

C

Photos 17. Photos taken 200 m upstream in summer/fall: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank). Note: all photos taken while standing at the transect centreline.

RAIL CV-104-2

19-AUG-19: BARRIER SURVEY

A

B

C

D

E

F

Photos 18. Photos taken 20 m downstream (top) and 40 m downstream (bottom) from the barrier in summer/fall: (A,D) facing upstream; (B,E) facing downstream; and (C,F) across (right bank looking at left bank). Note: all photos taken while standing at the transect centreline.

RAIL CV-104-2

19-AUG-19: BARRIER SURVEY

A

B

C

Photos 19. Photos taken 60 m downstream from the barrier in summer/fall: (A) facing upstream; (B) facing downstream; and (C) across (right bank looking at left bank). Note: all photos taken while standing at the transect centreline.