





# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 1

UTM: 17W 563473 / 7911679

Latitude / Longitude: 71°17'56.513" N / 79°13'33.863" W

Date / Time Surveyed: 7-Aug-07 / 19:45



Figure 1: View upstream of crossing 1



Figure 2: View across crossing 1 from left bank



Figure 3: View downstream of crossing 1

### Watercourse Characteristics

Tributary Status:	4 <sup>th</sup> order trib of Mary R.
Channel Pattern:	braided, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	6.37
Wetted Width (m):	6.37
Depth Profile (25%, 50%, 75%; m):	0.01, 0.03, 0.01
Max. Depth (m):	0.03
Flow Regime:	ephemeral
Gradient (°):	1.5
<b>Upstream</b>	
Wetted / Bankfull Width (m):	9.15 / 9.15
Max. Depth (m):	0.06
<b>Downstream</b>	
Wetted / Bankfull Width (m):	16.50 / 16.50
Max. Depth (m):	0.01

### Notes

The Mary River is ~2 km downstream. There is a small, shallow lake ~500m downstream of the crossing. A dry stretch upstream of the crossing acts as a barrier.

## Crossing ID: 1A

UTM: 17W 563583 / 7911598

Latitude / Longitude: 71°17'53.795" N / 79°13'23.042" W

Date / Time Surveyed: 7-Aug-07 / 21:01



Figure 1: View upstream of crossing 1A



Figure 2: View across crossing 1A from left bank



Figure 3: View downstream of crossing 1A

### Watercourse Characteristics

Tributary Status:	4 <sup>th</sup> order trib of Mary R.
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	11.15
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	6
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water / 7.30
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

The Mary River is ~2 km downstream. There is a small, shallow lake ~500 m downstream of the crossing site.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 2

UTM: 563768 / 7911403

Latitude / Longitude: 71°17'47.329° N / 79°13'5.019° W

Date / Time Surveyed: 7-Aug-07 / 19:10

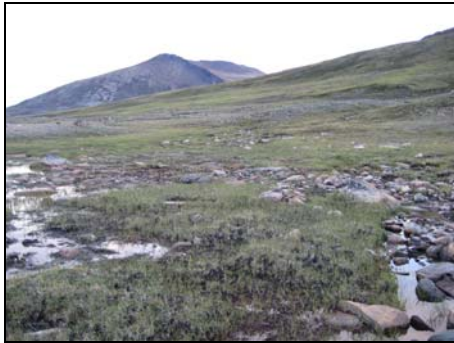


Figure 1: View upstream of crossing 2



Figure 2: View across crossing 2 from right bank



Figure 3: View downstream of crossing 2

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	braided, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	50.00
Wetted Width (m):	20.00
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	<0.05
Flow Regime:	ephemeral
Gradient (°):	2
<b>Upstream</b>	
Wetted / Bankfull Width (m):	20.00 / 50.00
Max. Depth (m):	<0.05
<b>Downstream</b>	
Wetted / Bankfull Width (m):	20.00 / 50.00
Max. Depth (m):	<0.05

### Notes

The Mary River is ~2.5 km downstream. There is a small lake ~1 km downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 3

UTM: 563824 / 7911323

Latitude / Longitude: 71°17'44.694° N / 79°12'59.626° W

Date / Time Surveyed: 7-Aug-07 / 20:16



Figure 1: View upstream of crossing 3



Figure 2: View across crossing 3 from right bank



Figure 3: View downstream of crossing 3

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	braided, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	45.00
Wetted Width (m):	22.50
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.1
Flow Regime:	intermittent
Gradient (°):	2
<b>Upstream</b>	
Wetted / Bankfull Width (m):	2.50 / 8.00
Max. Depth (m):	0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	20.00 – 25.00 / ~45.00
Max. Depth (m):	~0.10

### Notes

The Mary River is ~2.5 km downstream. There is a small lake ~1 km downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 4

UTM: 17W 563996 / 7911084

Latitude / Longitude: 71°17'36.820" N / 79°12'43.044" W

Date / Time Surveyed: 7-Aug-07 / 21:53



Figure 1: View upstream of crossing 4



Figure 2: View across crossing 4 from right bank



Figure 3: View downstream of crossing 4

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of Mary R.

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): 10.15  
Wetted Width (m): 10.15  
Depth Profile (25%, 50%, 75%; m): 0.01, 0.04, 0.07  
Max. Depth (m): 0.07  
Flow Regime: ephemeral  
Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): 0.34 / 0.34  
Max. Depth (m): 0.10

#### Downstream

Wetted / Bankfull Width (m): 15.92 / 23.18  
Max. Depth (m): 0.15

### Notes

The Mary River is ~3 km downstream. There is a small lake ~1.5 km downstream of the crossing site. Low water acts as a barrier between the lake and the crossing.

## Crossing ID: 5

UTM: 17W 564103 / 7910941

Latitude / Longitude: 71°17'32.104" N / 79°12'32.714" W

Date / Time Surveyed: 7-Aug-07 / 23:25



Figure 1: View upstream of crossing 5



Figure 2: View across crossing 5 from right bank



Figure 3: View downstream of crossing 5

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Mary R.

Channel Pattern: sinuous, braided

#### Crossing Site

Bankfull Width (m): 9.70  
Wetted Width (m): 9.70  
Depth Profile (25%, 50%, 75%; m): 0.01, 0.11, 0.13  
Max. Depth (m): 0.24  
Flow Regime: persistent  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 0.72 / 0.72  
Max. Depth (m): 0.10

#### Downstream

Wetted / Bankfull Width (m): 15.92 / 23.18  
Max. Depth (m): 0.15

### Notes

The Mary River is ~3 km downstream. There is a lake ~1.5 km downstream of the crossing site (same as Site 4). Low water acts as a barrier between the lake and the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 6

UTM: 17W 564627 / 7910549

Latitude / Longitude: 71°17'18.955" N / 79°11'41.221" W

Date / Time Surveyed: 7-Aug-07 / 22:38



Figure 1: View upstream of crossing 6



Figure 2: View across crossing 6 from left bank



Figure 3: View downstream of crossing 6

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Mary R.

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 8.50

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.50

Flow Regime: intermittent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): no water / 20.00

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): 0.35 / 1.00

Max. Depth (m): 0.05

### Notes

The Mary River is ~4 km downstream. There is a small lake ~3.5 km downstream of the crossing site. Low water levels over a cascade act as a barrier between the lake and the crossing.

## Crossing ID: 6A

UTM: 17W 564734 / 7910509

Latitude / Longitude: 71°17'17.562" N / 79°11'30.588" W

Date / Time Surveyed: 7-Aug-07 / 22:26



Figure 1: View upstream of crossing 6A



Figure 2: View across crossing 6A from left bank



Figure 3: View downstream of crossing 6A

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of Mary R.

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): 19.00

Wetted Width (m): 3.00

Depth Profile (25%, 50%, 75%; m): 0.05, 0.15, 0.08

Max. Depth (m): 0.20

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): 0.80 / N/M

Max. Depth (m): 0.55

#### Downstream

Wetted / Bankfull Width (m): 6.00 / 17.00

Max. Depth (m): 0.20

### Notes

The Mary River is ~4 km downstream. There is a small lake ~3.5 km downstream of the crossing site. A cascade acts as a partial barrier between the lake and the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 7

UTM: 17W 565501 / 7910060

Latitude / Longitude: 71°17'2.332" N / 79°10'14.876" W

Date / Time Surveyed: 7-Aug-07 / 23:10



Figure 1: View downstream of crossing 7, looking upstream



Figure 2: View downstream of crossing 7, across from right bank

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	25.00
Wetted Width (m):	0.80
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.25
Flow Regime:	intermittent – persistent
Gradient (°):	10
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	0.75 / 21.00
Max. Depth (m):	0.10

### Notes

The Mary River is ~5 km downstream. There is a large lake ~100 m downstream of the crossing site.

## Crossing ID: 8

UTM: 17W 565757 / 7909827

Latitude / Longitude: 71°16'54.565" N / 79°9'49.866" W

Date / Time Surveyed: 8-Aug-07 / 00:28



Figure 1: View upstream of crossing 8



Figure 2: View across crossing 8 from left bank



Figure 3: View downstream of crossing 8

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	nearly straight
<b>Crossing Site</b>	
Bankfull Width (m):	3.00
Wetted Width (m):	1.80
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.24
Flow Regime:	intermittent – persistent
Gradient (°):	8
<b>Upstream</b>	
Wetted / Bankfull Width (m):	1.80 / 2.80
Max. Depth (m):	0.05
<b>Downstream</b>	
Wetted / Bankfull Width (m):	1.30 / 3.30
Max. Depth (m):	0.25

### Notes

The Mary River is ~5.5 km downstream. There is a large lake ~100 m downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 9

UTM: 17W 565977 / 7909665

Latitude / Longitude: 71°16'49.123" N / 79°9'28.261" W

Date / Time Surveyed: 8-Aug-07 / 00:29



Figure 1: View upstream of crossing 9



Figure 2: View across crossing 9 from left bank



Figure 3: View downstream of crossing 9

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	26.70
Wetted Width (m):	11.10
Depth Profile (25%, 50%, 75%; m):	0.07, 0.03, 0.09
Max Depth (m):	0.21
Flow Regime:	persistent
Gradient (°):	8
<b>Upstream</b>	
Wetted / Bankfull Width (m):	17.00 / 18.30
Max. Depth (m):	0.18
<b>Downstream</b>	
Wetted / Bankfull Width (m):	0.78 / 0.78
Max. Depth (m):	0.39

### Notes

The Mary River is ~6 km downstream. There is a large lake ~200 m downstream of the crossing site. Falls upstream of the crossing act as a barrier.

## Crossing ID: 10

UTM: 17W 566717 / 7909224

Latitude / Longitude: 71°16'34.165" N / 79°8'15.293" W

Date / Time Surveyed: 8-Aug-07 / 01:50



Figure 1: View upstream of crossing 10



Figure 2: View across crossing 10 from left bank



Figure 3: View downstream of crossing 10

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Mary R.
Channel Pattern:	sinuous
<b>Crossing Site</b>	
Bankfull Width (m):	1.46
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	2
<b>Upstream</b>	
Wetted / Bankfull Width (m):	0.07 / 0.57
Max. Depth (m):	0.03
<b>Downstream</b>	
Wetted / Bankfull Width (m):	1.50 / 1.50
Max. Depth (m):	0.03

### Notes

The Mary River is ~7.5 km downstream. There is a large lake ~200 m downstream of the crossing site. Low water levels between the lake and the crossing act as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 11

UTM: 17W 567005 / 7908964

Latitude / Longitude: 71°16'25.491" N / 79°7' 47.178" W

Date / Time Surveyed: 8-Aug-07 / 01:03



Figure 1: View upstream of crossing 11



Figure 2: View across crossing 11 from left bank



Figure 3: View downstream of crossing 11

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Mary R.

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 13.60  
Wetted Width (m): 7.20  
Depth Profile (25%, 50%, 75%; m): 0.15, 0.12, 0.16  
Max. Depth (m): 0.20  
Flow Regime: persistent  
Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): 8.00 / 16.00  
Max. Depth (m): 0.45

#### Downstream

Wetted / Bankfull Width (m): 9.00 / 16.00  
Max. Depth (m): 0.15

### Notes

The Mary River is ~8 km downstream. There is a large lake ~200 m downstream of the crossing site.

## Crossing ID: 12

UTM: 17W 567121 / 7908861

Latitude / Longitude: 71°16'22.052" N / 79°7'35.850" W

Date / Time Surveyed: 8-Aug-07 / 01:38



Figure 1: View upstream of crossing 12



Figure 2: View across crossing 12 from right bank



Figure 3: View downstream of crossing 12

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Mary R.

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 13.70  
Wetted Width (m): 1.30  
Depth Profile (25%, 50%, 75%; m): N/M  
Max. Depth (m): 0.02  
Flow Regime: intermittent – persistent  
Gradient (°): 15

#### Upstream

Wetted / Bankfull Width (m): < 1.00  
Max. Depth (m): < .05

#### Downstream

Wetted / Bankfull Width (m): 1.00-1.50 / 10.00-15.00  
Max. Depth (m): < 0.20

### Notes

The Mary River is ~8 km downstream. There is a large lake ~200 m downstream of the crossing site. Low water levels and a steep gradient act as a barrier between the lake and the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 13

UTM: 17W 567389 / 7908618

Latitude / Longitude: 71°16'13.944" N / 79°7'9.699" W

Date / Time Surveyed: 8-Aug-07 / 02:04



Figure 1: View upstream of crossing 13



Figure 2: View across crossing 13 from right bank

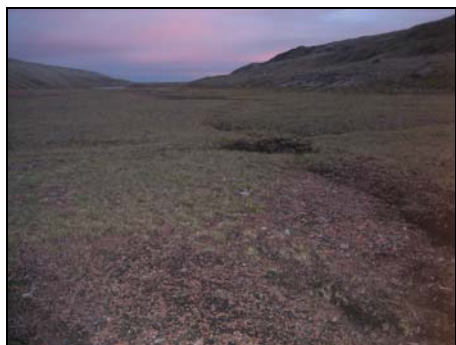


Figure 3: View downstream of crossing 13

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 14.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large, unnamed lake

Max. Depth (m): N/A

### Notes

The large, unnamed river (that eventually flows into Angajurjualuk Lake) is ~5 km downstream. There is a large, unnamed lake ~300 m downstream of the crossing site.

## Crossing ID: 14

UTM: 17W 567696 / 7908397

Latitude / Longitude: 71°16'6.506" N / 79°6'39.570" W

Date / Time Surveyed: 8-Aug-07 / 02:16



Figure 1: View upstream of crossing 14



Figure 2: View across crossing 14 from left bank



Figure 3: View downstream of crossing 14

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 9.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~300 m downstream of the crossing site. Cascades and no water act as barriers between the lake and the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 15A

UTM: 17W 568006 / 7908236

Latitude / Longitude: 71°16'0.999" N / 79°6'8.958" W

Date / Time Surveyed: 8-Aug-07 / 02:30



Figure 1: View upstream of crossing 15A



Figure 2: View across crossing 15A from right bank



Figure 3: View downstream of crossing 15A

### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of large river
Channel Pattern:	meandering, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	2.47
Wetted Width (m):	1.23
Depth Profile (25%, 50%, 75%; m):	0.01, 0.04, 0.02
Max. Depth (m):	0.07
Flow Regime:	ephemeral
Gradient (°):	N/M
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	1.00-2.00 / 2.00-3.00
Max. Depth (m):	< 0.10

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~0.5 km downstream of the crossing. A steep downstream cascade acts as a barrier.

## Crossing ID: 15B

UTM: 17W 568072 / 7908202

Latitude / Longitude: 71°15'59.836" N / 79°6'2.440" W

Date / Time Surveyed: 8-Aug-07 / 02:14



Figure 1: View upstream of crossing 15B



Figure 2: View across crossing 15B from left bank



Figure 3: View downstream of crossing 15B

### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of large river
Channel Pattern:	straight, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	undefined
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.01
Flow Regime:	ephemeral
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	9.80 / 9.80
Max. Depth (m):	0.15
<b>Downstream</b>	
Wetted / Bankfull Width (m):	3.48 / 7.81
Max. Depth (m):	under boulders

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~0.5 km downstream of the crossing. Low water levels downstream of the crossing site act as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 16

UTM: 17W 568247 / 7908113

Latitude / Longitude: 71°15'56.787" N / 79°5'45.155" W

Date / Time Surveyed: 8-Aug-07/ 02:46



Figure 1: View upstream of crossing 16



Figure 2: View across crossing 16 from left bank



Figure 3: View downstream of crossing 16

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): 6.30

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.12

Flow Regime: persistent

Gradient (°): 5

#### Upstream

Wetted / Bankfull Width (m): < 0.50 / < 6.00

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~0.5 km downstream of the crossing site. Barriers near the crossing site include water flowing through a boulder downstream, and low water upstream.

## Crossing ID: 16A

UTM: no waypoint available

Latitude / Longitude: N/A

Date / Time Surveyed: 8-Aug-07 / 03:01



Figure 1: View upstream of crossing 16A



Figure 2: View across crossing 16A from left bank



Figure 3: View downstream of crossing 16A

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 13.00

Wetted Width (m): 5.30

Depth Profile (25%, 50%, 75%; m): 0.08, 0.12, 0.17

Max. Depth (m): 0.17

Flow Regime: persistent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): 5.30 / 13.00

Max. Depth (m): 0.15

#### Downstream

Wetted / Bankfull Width (m): 5.30 / 13.00

Max. Depth (m): 0.15

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~0.6 km downstream of the crossing site. Falls ~200m upstream of the crossing act as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 16B

UTM: no waypoint available

Latitude / Longitude: N/A

Date / Time Surveyed: 8-Aug-07 / 03:17



Figure 1: View upstream of crossing 16B



Figure 2: View across crossing 16B from left bank



Figure 3: View downstream of crossing 16B

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 0.70

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.03

Flow Regime: persistent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): ~0.50 / ~0.70

Max. Depth (m): < 0.03

#### Downstream

Wetted / Bankfull Width (m): ~0.50 / ~0.70

Max. Depth (m): < 0.05

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~0.6 km downstream of the crossing site. Falls ~200 m upstream of the crossing act as a barrier (same as for Site 16A).

## Crossing ID: 17

UTM: 17W 568608 / 7907928

Latitude / Longitude: 71°15'50.452" N / 79°5'9.509" W

Date / Time Surveyed: 8-Aug-07 / 03:20



Figure 1: View upstream of crossing 17



Figure 2: View across crossing 17 from left bank



Figure 3: View downstream of crossing 17

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 0.50

Wetted Width (m): 0.40

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.24

Flow Regime: persistent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): ~0.40 / ~0.40

Max. Depth (m): < 0.20

#### Downstream

Wetted / Bankfull Width (m): ~0.40 / ~0.40

Max. Depth (m): < 0.40

### Notes

The large, unnamed river is ~5 km downstream. There is a large lake ~1 km downstream of the crossing site. Falls upstream of the crossing act as a barrier.



# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 18**

**UTM:** 17W 568765 / 7907848

**Latitude / Longitude:** 71°15'47.710" N / 79°4'54.007" W

**Date / Time Surveyed:** 8-Aug-07 / 03:44



**Figure 1:** View upstream of crossing 18



**Figure 2:** View across crossing 18 from left bank



**Figure 3:** View downstream of crossing 18

## Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of large river
Channel Pattern:	braided, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	17.00
Wetted Width (m):	10.50
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.05
Flow Regime:	ephemeral
Gradient (°):	2
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	no surface water
Max. Depth (m):	N/A

## Notes

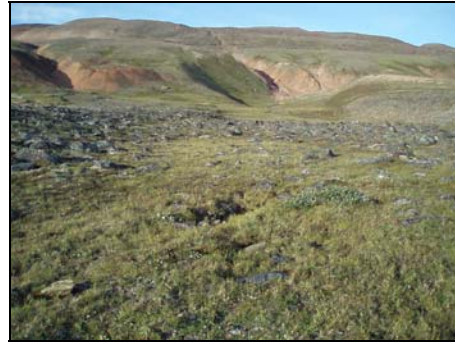
The large, unnamed river is ~4.5 km downstream. A dry stretch acts as a barrier between the crossing and downstream reaches.

**Crossing ID: 19**

**UTM:** 17W 568929 / 7907748

**Latitude / Longitude:** 71°15'44.316" N / 79°4'37.867" W

**Date / Time Surveyed:** 9-Aug-07 / 19:24



**Figure 1:** View upstream of crossing 19



**Figure 2:** View across crossing 19 from left bank



**Figure 3:** View downstream of crossing 19

## Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of large river
Channel Pattern:	undefined
<b>Crossing Site</b>	
Bankfull Width:	undefined
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	N/M
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

## Notes

The large, unnamed river is ~4.5 km downstream. A dry stretch acts as a barrier between the crossing and downstream reaches.

# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 20**

UTM: 17W 569015 / 7907692

Latitude / Longitude: 71°15'42.422" N / 79°4'29.416" W

Date / Time Surveyed: 8-Aug-07 / 04:37

**Figure 1:** View upstream of crossing 20**Figure 2:** View across crossing 20 from left bank**Figure 3:** View downstream of crossing 20**Watercourse Characteristics**Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: sinuous

**Crossing Site**

Bankfull Width (m): 2.36

Wetted Width (m): 2.06

Depth Profile (25%, 50%, 75%; m): 0.10, 0.07, 0.13

Max. Depth (m): 0.13

Flow Regime: persistent

Gradient (°): 1

**Upstream**

Wetted / Bankfull Width (m): 1.30 / 1.30

Max. Depth (m): 0.15

**Downstream**

Wetted / Bankfull Width (m): &gt; 2.00 / &gt; 2.00

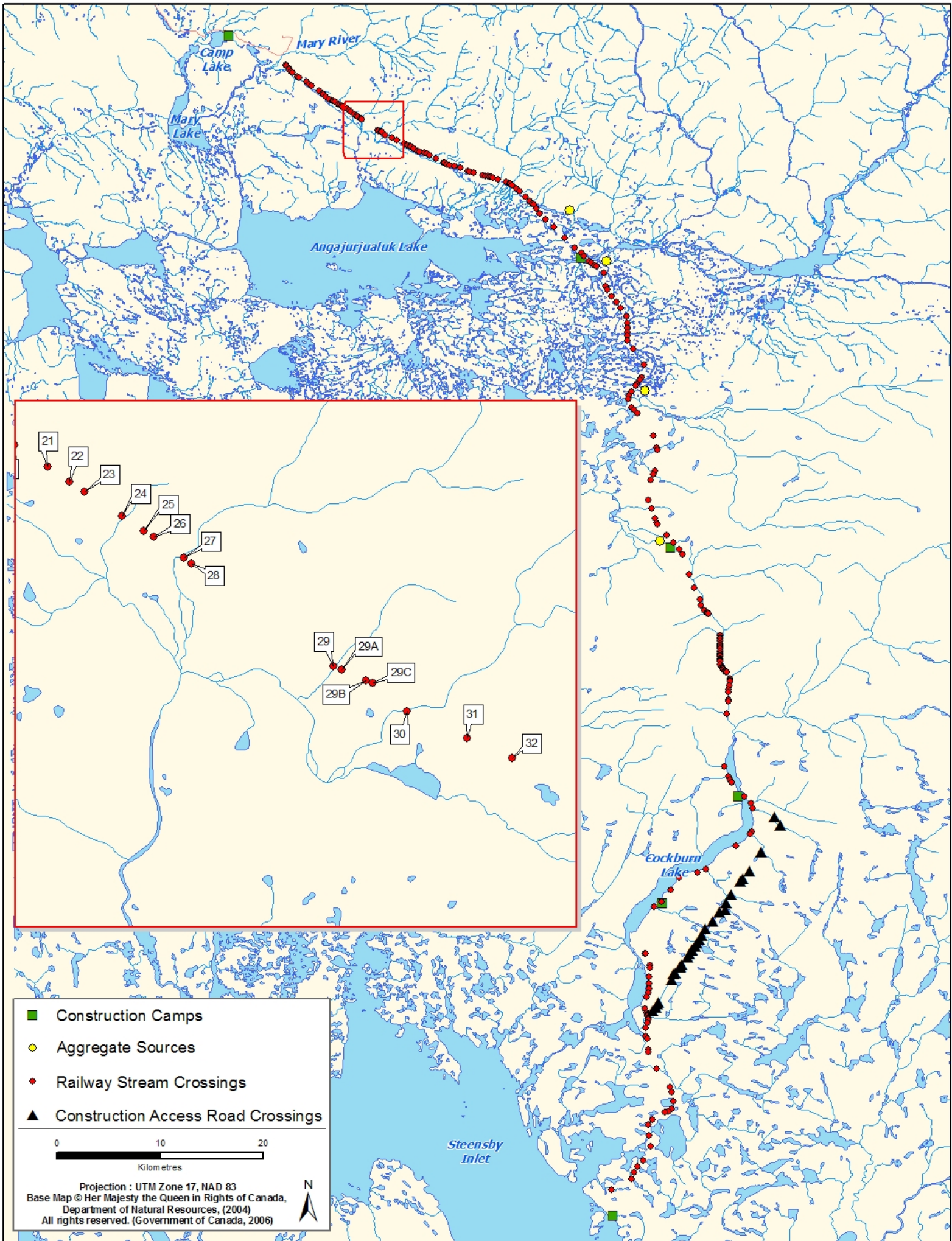
Max. Depth (m): &lt; 0.20

**Notes**

The large, unnamed river is ~4 km downstream.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 21

UTM: 17W 569365 / 7907464

Latitude / Longitude: 71°15'34.706" N / 79°3'55.026" W

Date / Time Surveyed: 8-Aug-07 / 05:06



Figure 1: View upstream of crossing 21



Figure 2: View across crossing 21 from left bank



Figure 3: View downstream of crossing 21

## Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

### Crossing Site

Bankfull Width (m): 1.40

Wetted Width (m): 0.90

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.18

Flow Regime: persistent

Gradient (°): 6

### Upstream

Wetted / Bankfull Width (m): < 1.00 / < 2.00

Max. Depth (m): < 0.20

### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

## Notes

The large, unnamed river is ~4 km downstream. Cascades downstream of the crossing act as a partial barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 22

UTM: 17W 569596 / 7907308

Latitude / Longitude: 71°15'29.435" N / 79°3'32.350" W

Date / Time Surveyed: 8-Aug-07 / 05:32

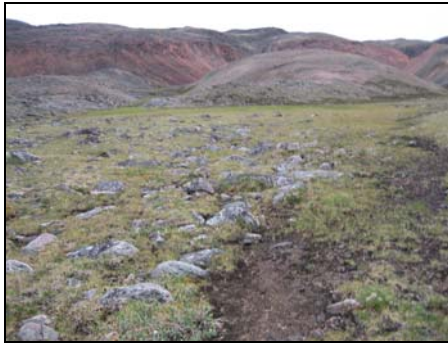


Figure 1: View upstream of crossing 22



Figure 2: View across crossing 22 from left bank



Figure 3: View downstream of crossing 22

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 2.20  
Wetted Width (m): no water  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): N/A  
Flow Regime: ephemeral  
Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

### Notes

The large, unnamed river is ~4 km downstream. There is a small lake ~0.5 km downstream of the crossing site. A dry stretch acts as a barrier between the lake and the crossing.

## Crossing ID: 22A

UTM: no waypoint available

Latitude / Longitude: N/A

Date / Time Surveyed: 8-Aug-07 / 05:39

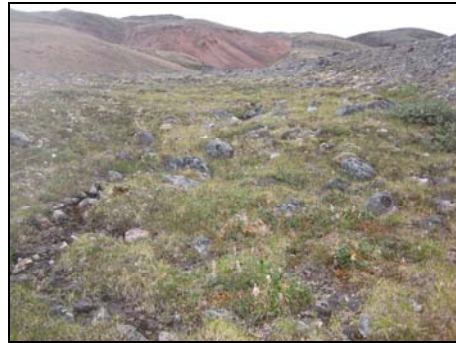


Figure 1: View upstream of crossing 22A

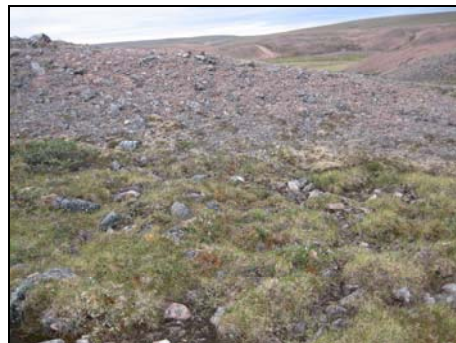


Figure 2: View across crossing 22A from left bank

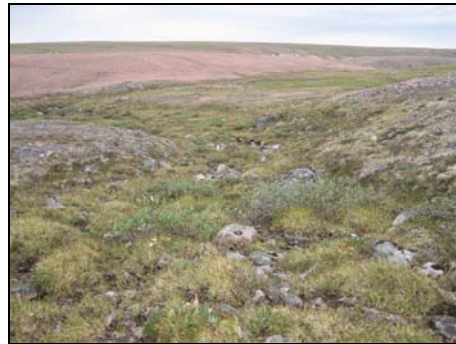


Figure 3: View downstream of crossing 22A

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 0.50  
Wetted Width (m): no water  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): N/A  
Flow Regime: ephemeral  
Gradient (°): 8

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): isolated pools  
Max. Depth (m): 0.15

### Notes

The large, unnamed river is ~4 km downstream. There is a small lake ~0.5 km downstream of the crossing site. A dry stretch acts as a barrier between the lake and the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 23

UTM: 17W 569752 / 7907206

Latitude / Longitude: 71°15'25.983" N / 79°3'17.028" W

Date / Time Surveyed: 8-Aug-07 / 05:49



Figure 1: View upstream of crossing 23



Figure 2: View across crossing 23 from left bank



Figure 3: View downstream of crossing 23

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: meandering

#### Crossing Site

Bankfull Width (m): 5.00

Wetted Width (m): 3.60

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: persistent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): 2.00 / 12.00

Max. Depth (m): 0.20

#### Downstream

Wetted / Bankfull Width (m): 0.50 / 1.00

Max. Depth (m): 0.35

### Notes

There is a large, unnamed river ~3 km downstream of the crossing site. A lack of fish suggests that there may be an unidentified barrier between the large river and the crossing.

## Crossing ID: 24

UTM: 17W 570144 / 7906949

Latitude / Longitude: 71°15'17.285" N / 79°2'38.534" W

Date / Time Surveyed: 8-Aug-07 / 20:12



Figure 1: View upstream of crossing 24



Figure 2: View across crossing 24 from left bank



Figure 3: View downstream of crossing 24

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: meandering

#### Crossing Site

Bankfull Width (m): 19.00

Wetted Width (m): 8.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.50

Flow Regime: persistent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): 5.00 / 7.00

Max. Depth (m): 0.50

#### Downstream

Wetted / Bankfull Width (m): 5.00 – 10.00 / ~20.0

Max. Depth (m): ~0.50

### Notes

There is a large, unnamed river ~3 km downstream of the crossing site. Cascades upstream and downstream of the crossing act as partial barriers.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 25

UTM: 17W 570372 / 7906798

Latitude / Longitude: 71°15'12.175" N / 79°2'16.155" W

Date / Time Surveyed: 8-Aug-07 / 20:31

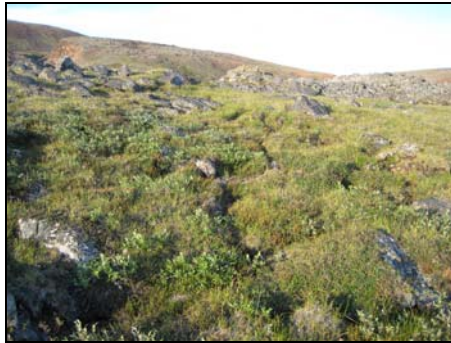


Figure 1: View upstream of crossing 25



Figure 2: View across crossing 25 from left bank



Figure 3: View downstream of crossing 25

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): very little water

Max. Depth (m): N/A

### Notes

The large river ~3 km downstream.

## Crossing ID: 26

UTM: 17W 570474 / 7906731

Latitude / Longitude: 71°15'9.909" N / 79°2'6.343" W

Date / Time Surveyed: 9-Aug-07 / 19:58



Figure 1: View upstream of crossing 26



Figure 2: View across crossing 26 from left bank



Figure 3: View downstream of crossing 26

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: sinuous, braided

#### Crossing Site

Bankfull Width (m): 14.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): 0.80 / 0.80

Max. Depth (m): 0.07

#### Downstream

Wetted / Bankfull Width (m): no water / 1.00

Max. Depth (m): N/A

### Notes

The large river ~2 km downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 27

UTM: 17W 570790 / 7906516

Latitude / Longitude: 71°15'2.640" N / 79°1'35.151" W

Date / Time Surveyed: 8-Aug-07 / 20:28



Figure 1: View upstream of crossing 27



Figure 2: View across crossing 27 from left bank



Figure 3: View downstream of crossing 27

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width: 14.80  
Wetted Width (m): 9.80  
Depth Profile (25%, 50%, 75%; m): 0.23, 0.30, 0.31  
Max. Depth (m): 0.34  
Flow Regime: persistent  
Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): 14.50 / 18.00  
Max. Depth (m): 0.34

#### Downstream

Wetted / Bankfull Width (m): 15.00 / 18.00  
Max. Depth (m): 0.30

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing. Cascades upstream of the crossing site act as a partial barrier.

## Crossing ID: 28

UTM: 17W 570872 / 7906452

Latitude / Longitude: 71°15'0.489" N / 79°1'27.137" W

Date / Time Surveyed: 8-Aug-07 / 21:48



Figure 1: View upstream of crossing 28



Figure 2: View across crossing 28 from left bank



Figure 3: View downstream of crossing 28

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): undefined  
Wetted Width (m): 2.60  
Depth Profile (25%, 50%, 75%; m): 0.02, 0.13, 0.08  
Max. Depth (m): 0.13  
Flow Regime: ephemeral  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): < 2.00 / undefined  
Max. Depth (m): < 0.15

#### Downstream

Wetted / Bankfull Width (m): 0.50 / 0.50  
Max. Depth (m): 0.10

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing. Cascades downstream of the crossing site act as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 29

UTM: 17W 572351 / 7905383

Latitude / Longitude: 71°14'24.431" N / 78°59'2.389" W

Date / Time Surveyed: 8-Aug-07 / 21:24



Figure 1: View upstream of crossing 29



Figure 2: View across crossing 29 from left bank



Figure 3: View downstream of crossing 29

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 1.90

Wetted Width (m): 1.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.12

Flow Regime: persistent

Gradient (°): 6

#### Upstream

Wetted / Bankfull Width (m): < 2.00 / < 2.00

Max. Depth (m): < 0.15

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.7 km downstream of the crossing. Downstream the stream flows underground, creating a barrier.

## Crossing ID: 29 A, B & C

UTM; Latitude / Longitude:

29a = 17W 572442 / 7905350; 71°14'23.268" N / 78°58'53.379" W

29b = 17W 572695 / 7905235; 71°14'19.286" N / 78°58'28.406" W

29c = 17W 572761 / 7905206; 71°14'18.279" N / 78°58'21.889" W

Date / Time Surveyed: 8-Aug-07 / 21:37-21:46



Figure 1: View across crossing 29A from right bank



Figure 2: View across crossing 29B from right bank



Figure 3: View across crossing 29C from right bank

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): dry or nearly dry

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): dry or nearly so

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): dry or nearly so

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~0.8 km downstream of the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 30

UTM: 17W 573122 / 7904914

Latitude / Longitude: 71°14'8.469" N / 78°57'46.694" W

Date / Time Surveyed: 8-Aug-07 / 22:08



Figure 1: View upstream of crossing 30

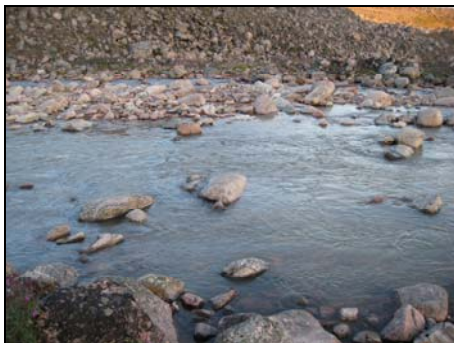


Figure 2: View across crossing 30 from left bank



Figure 3: View downstream of crossing 30

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 59.40

Wetted Width (m): 26.50

Depth Profile (25%, 50%, 75%; m): 0.52, 0.11, 0.25

Max. Depth (m): 0.52

Flow Regime: persistent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): 12.00 / 17.00

Max. Depth (m): < 0.50

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~1.0 km downstream of the crossing.

## Crossing ID: 31

UTM: 17W 573748 / 7904634

Latitude / Longitude: 71°13'58.754" N / 78°56'44.917" W

Date / Time Surveyed: 8-Aug-07 / 22:41



Figure 1: View upstream of crossing 31



Figure 2: View across crossing 31 from left bank



Figure 3: View downstream of crossing 31

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): 4.30

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): 0.09, 0.18, 0.06

Max. Depth (m): 0.18

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): < 1.50 / < 4.00

Max. Depth (m): < 0.20

#### Downstream

Wetted / Bankfull Width (m): under rocks / 8.25

Max. Depth (m): N/A

### Notes

There is a large lake (part of the large, unnamed river) ~0.7 km downstream of the crossing site. The stream flows underground between the lake and the crossing, creating a barrier.



# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 32**

UTM: 17W 574223 / 7904423

Latitude / Longitude: 71°13'51.426" N / 78°55'58.048" W

Date / Time Surveyed: 8-Aug-07 / 23:35

**Figure 1:** View upstream of crossing 32**Figure 2:** View across crossing 32 from left bank**Figure 3:** View downstream of crossing 32**Watercourse Characteristics**Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

**Crossing Site**

Bankfull Width (m): 17.90

Wetted Width (m): 3.00

Depth Profile (25%, 50%, 75%; m): 0.03, 0.39, 0.02

Max. Depth (m): 0.39

Flow Regime: persistent

Gradient (°): 3

**Upstream**

Wetted / Bankfull Width (m): 3.00 / 12.96

Max. Depth (m): 0.40

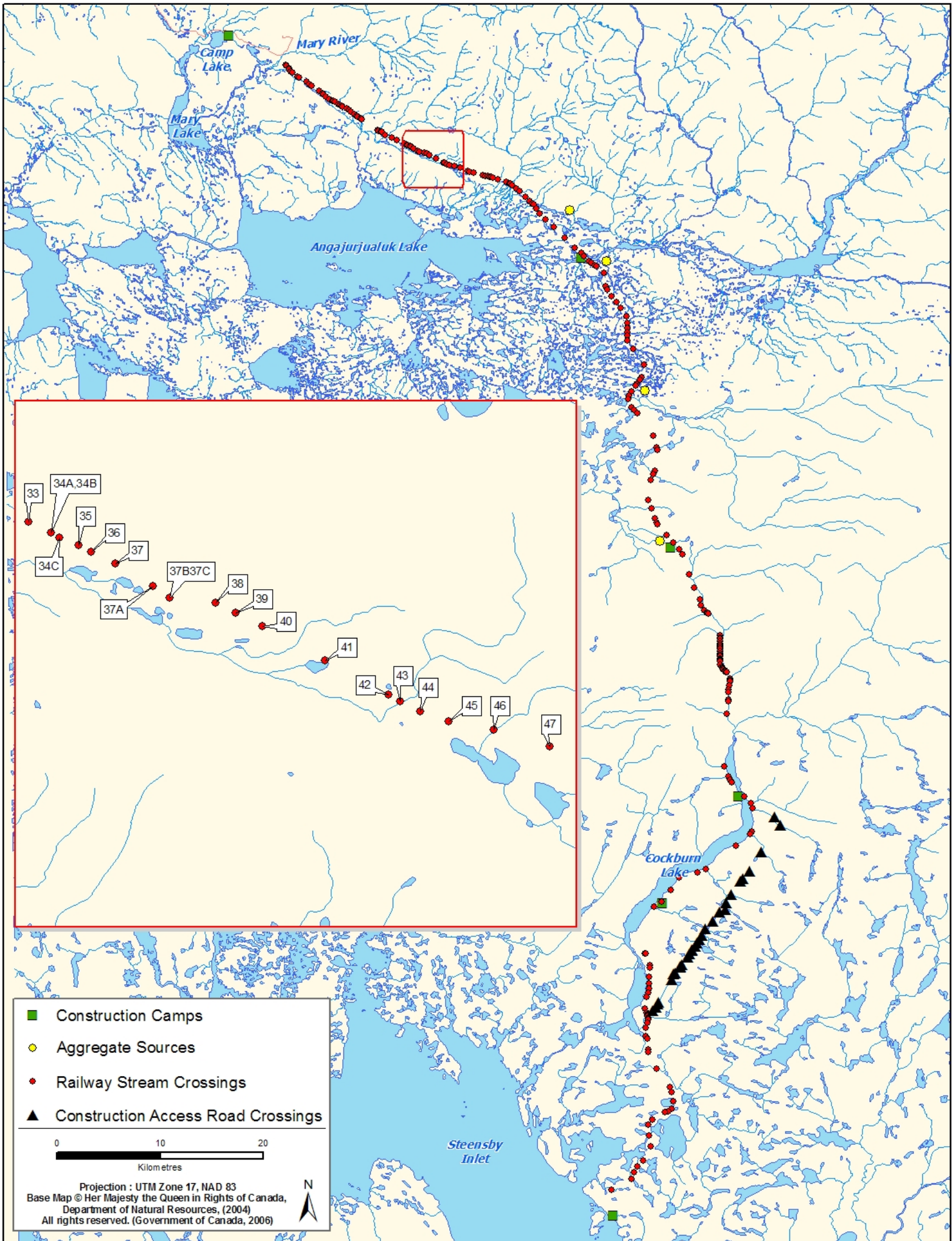
**Downstream**

Wetted / Bankfull Width (m): 3.00 / 20.30

Max. Depth (m): 0.20

**Notes**

The large, unnamed river is ~0.8 km downstream of the crossing. Cascades downstream of the crossing site act as a barrier.







# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 33****UTM:** 17W 574973 / 7904087**Latitude / Longitude:** 71°13'39.757" N / 78°54'44.074" W**Date / Time Surveyed:** 8-Aug-07 / 23:00

**Figure 1:** View upstream of crossing 33



**Figure 2:** View across crossing 33 from left bank



**Figure 3:** View downstream of crossing 33

## Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

**Crossing Site**

Bankfull Width (m): 1.00

Wetted Width (m): 0.70

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.19

Flow Regime: intermittent – persistent

Gradient (°): 8

**Upstream**

Wetted / Bankfull Width (m): < 0.50 / < 1.00

Max. Depth (m): < 0.15

**Downstream**

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

## Notes

The large, unnamed river is ~1 km downstream of the crossing. The stream flows underground between the lake and the crossing, creating a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 34A & B

UTM: 17W 575210 / 7903974

Latitude / Longitude: 71°13'35.848" N / 78°54'20.727" W

Date / Time Surveyed: 8-Aug-07 / 23:20



Figure 1: View across crossing 34A from left bank



Figure 2: View across crossing 34B from left bank

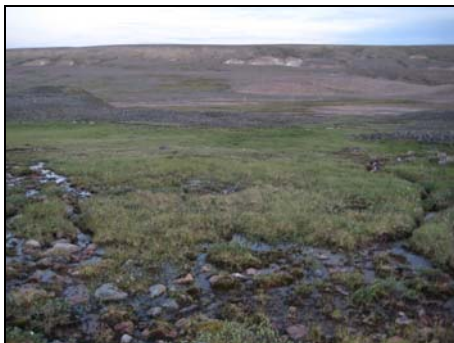


Figure 3: View downstream of crossing 34B

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 1.30

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: ephemeral

Gradient (°): 13

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.6 km downstream of the crossing. Barriers near the crossing include a steep drop ~50 m downstream, and no water upstream.

## Crossing ID: 34C

UTM: 17W 575295 / 7903923

Latitude / Longitude: 71°13'34.107" N / 78°54'12.391" W

Date / Time Surveyed: 8-Aug-07 / 23:28



Figure 1: View upstream of crossing 34C



Figure 2: View across crossing 34C from left bank



Figure 3: View downstream of crossing 34C

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 5.00

Wetted Width (m): 0.30

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.03

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.6 km downstream of the crossing. A steep drop acts as a barrier between the river and the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 35

UTM: 17W 575496 / 7903837

Latitude / Longitude: 71°13'31.108" N / 78°53'52.559" W

Date / Time Surveyed: 8-Aug-07 / 23:39



Figure 1: View upstream of crossing 35



Figure 2: View across crossing 35 from left bank



Figure 3: View downstream of crossing 35

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 1.80

Wetted Width (m): 0.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.19

Flow Regime: intermittent

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): 0.60 / 0.70

Max. Depth (m): 0.15

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.5 km downstream of the crossing. There is a small lake ~200 m downstream of the crossing. Cascades between the lake and the crossing act as a barrier.

## Crossing ID: 36

UTM: 17W 575630 / 7903773

Latitude / Longitude: 71°13'28.894" N / 78°53'39.362" W

Date / Time Surveyed: 8-Aug-07 / 23:52



Figure 1: View upstream of crossing 36



Figure 2: View across crossing 36 from left bank



Figure 3: View downstream of crossing 36

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 0.50

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral – intermittent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~0.5 km downstream of the crossing. There is a small lake ~200 m downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 37

UTM: 17W 575881 / 7903652

Latitude / Longitude: 71°13'24.709" N / 78°53'14.648" W

Date / Time Surveyed: 9-Aug-07 / 00:06



Figure 1: View upstream of crossing 37

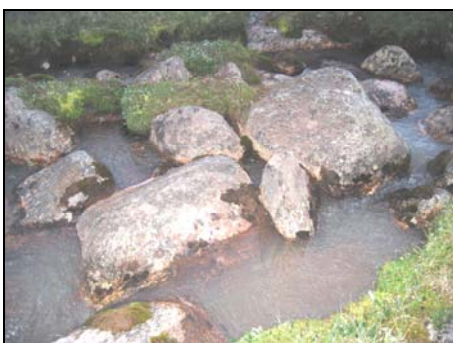


Figure 2: View across crossing 37 from left bank



Figure 3: View downstream of crossing 37

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 4.00

Wetted Width (m): 3.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.30

Flow Regime: persistent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): < 3.00 / < 4.00

Max. Depth (m): < 0.30

#### Downstream

Wetted / Bankfull Width (m): 3.00 / 4.00

Max. Depth (m): 0.35

### Notes

There is a small lake ~300 m downstream of the crossing site. The large, unnamed river is ~0.6 km downstream of the crossing. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 37A

UTM: 17W 576272 / 7903411

Latitude / Longitude: 71°13'16.493" N / 78°52'36.340" W

Date / Time Surveyed: 9-Aug-07 / 00:27



Figure 1: View upstream of crossing 37A



Figure 2: View across crossing 37A from right bank



Figure 3: View downstream of crossing 37A

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width: N/M

Wetted Width (m): nearly dry

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

There is a small lake ~100 m downstream of the crossing site. The large, unnamed river is ~0.8 km downstream of the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 37B & C

UTM: 17W 576452 / 7903288

Latitude / Longitude: 71°13'12.322" N / 78°52'18.750" W

Date / Time Surveyed: 9-Aug-07 / 00:40



Figure 1: View across crossing 37B from left bank

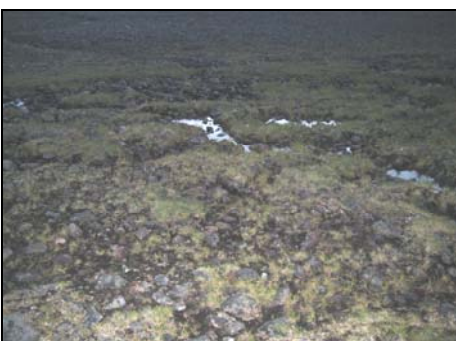


Figure 2: View across crossing 37C from right bank



Figure 3: View downstream of crossing 37B

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 22.90

Wetted Width (m): 5.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.5 km downstream of the crossing. There is a small lake ~200 m downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 38

UTM: 17W 576932 / 7903240

Latitude / Longitude: 71°13'10.227" N / 78°51'30.862" W

Date / Time Surveyed: 9-Aug 07 / 00:57

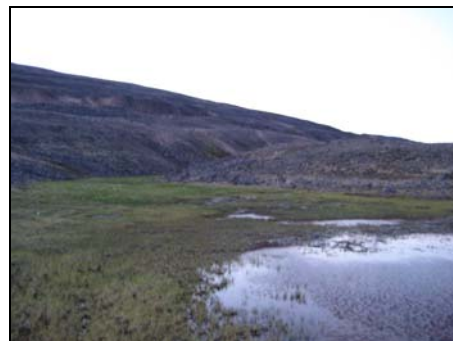


Figure 1: View upstream of crossing 38



Figure 2: View across crossing 38 from left bank

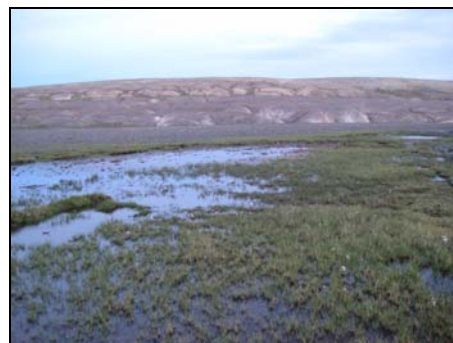


Figure 3: View downstream of crossing 38

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): 54.90

Wetted Width (m): 50.30

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.8 km downstream of the crossing. There is a small lake ~0.5 km downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 39

UTM: 17W 577142 / 7903135

Latitude / Longitude: 71°13'6.600" N / 78°51'10.210" W

Date / Time Surveyed: 9-Aug-07 / 01:06



Figure 1: View upstream of crossing 39



Figure 2: View across crossing 39 from left bank



Figure 3: View downstream of crossing 39

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 2.00

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.45

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): < 1.50 / < 2.00

Max. Depth (m): < 0.50

#### Downstream

Wetted / Bankfull Width (m): 1.50-2.50 / 2.00-4.00

Max. Depth (m): 0.50-0.75

### Notes

The large, unnamed river is ~0.8 km downstream of the crossing. There is a small lake ~0.5 km downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 40

UTM: 17W 577416 / 7902996

Latitude / Longitude: 71°13'1.803" N / 78°50'43.275" W

Date / Time Surveyed: 9-Aug-07 / 01:29

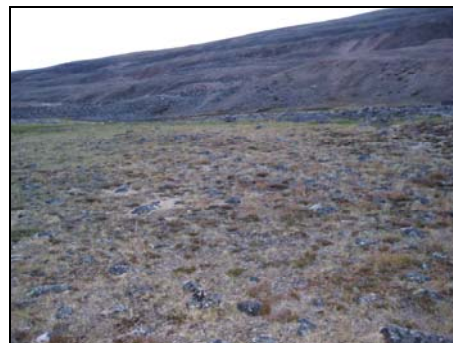


Figure 1: View upstream of crossing 40



Figure 2: View across crossing 40 from left bank



Figure 3: View downstream of crossing 40

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): 27.40

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~0.7 km downstream of the crossing. There is a small lake ~200 m downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 41

UTM: 17W 578075 / 7902638

Latitude / Longitude: 71°12'49.495" N / 78°49'38.593" W

Date / Time Surveyed: 9-Aug-07 / 01:33



Figure 1: View upstream of crossing 41



Figure 2: View across crossing 41 from right bank



Figure 3: View downstream of crossing 41

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): N/M (MSC)

Wetted Width (m): 7.30

Depth Profile (25%, 50%, 75%; m): 0.13, 0.25, 0.23

Max. Depth (m): 0.25

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.30

#### Downstream

Wetted / Bankfull Width (m): small, unnamed lake

Max. Depth (m): N/A

### Notes

There is a small lake immediately downstream of the crossing.  
The large, unnamed river is ~0.6 km downstream of the crossing.  
Cascades upstream of the crossing act as partial barriers.

## Crossing ID: 42

UTM: 17W 578733 / 7902277

Latitude / Longitude: 71°12'37.086" N / 78°48'34.045" W

Date / Time Surveyed: 9-Aug-07 / 01:48



Figure 1: View upstream of crossing 42



Figure 2: View across crossing 42 from left bank



Figure 3: View downstream of crossing 42

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 0.70

Wetted Width (m): 0.70

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: intermittent – ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): < 0.50 / < 0.50

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): 0.50-1.00 / 0.50-1.00

Max. Depth (m): 0.10-0.20

### Notes

The large, unnamed river is ~0.4 km downstream of the crossing.  
A stretch of low water downstream of the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 43

UTM: 17W 578855 / 7902210

Latitude / Longitude: 71°12'34.782" N / 78°48'22.080" W

Date / Time Surveyed: 9-Aug-07 / 01:55



Figure 1: View upstream of crossing 43



Figure 2: View across crossing 43 from left bank



Figure 3: View downstream of crossing 43

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 0.95

Wetted Width (m): 0.95

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.28

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): ~1.00 / ~1.00

Max. Depth (m): < 0.40

#### Downstream

Wetted / Bankfull Width (m): ~1.00 / ~1.00

Max. Depth (m): < 0.50

### Notes

The large, unnamed river is ~0.4 km downstream of the crossing.

## Crossing ID: 44

UTM: 17W 579065 / 7902100

Latitude / Longitude: 71°12'30.989" N / 78°48'1.467" W

Date / Time Surveyed: 9-Aug-07 / 02:17



Figure 1: View upstream of crossing 44



Figure 2: View across crossing 44 from right bank



Figure 3: View downstream of crossing 44

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 1.00

Wetted Width (m): 1.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M (under boulders)

Flow Regime: intermittent

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~0.4 km downstream of the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 45

UTM: 17W 579361 / 7901995

Latitude / Longitude: 71°12'27.254" N / 78°47'32.233" W

Date / Time Surveyed: 9-Aug-07 / 02:30



Figure 1: View upstream of crossing 45



Figure 2: View across crossing 45 from right bank

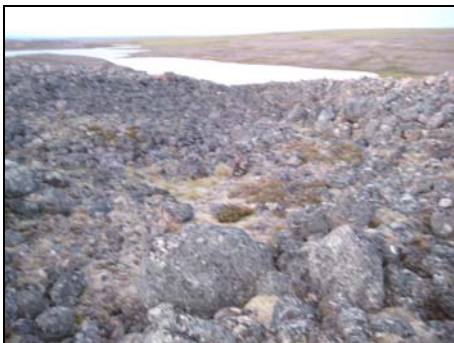


Figure 3: View downstream of crossing 45

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width: undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 5

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

There is a large lake (part of the large, downstream river) ~300 m downstream of the crossing site.

## Crossing ID: 46

UTM: 17W 579831 / 7901915

Latitude / Longitude: 71°12'24.119" N / 78°46'45.502" W

Date / Time Surveyed: 9-Aug-07 / 02:30



Figure 1: View upstream of crossing 46



Figure 2: View across crossing 46 from left bank



Figure 3: View downstream of crossing 46

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 1.60

Depth Profile (25%, 50%, 75%; m): 0.16, 0.49, 0.28

Max. Depth (m): 0.49

Flow Regime: persistent

Gradient (°): N/A

#### Upstream

Wetted / Bankfull Width (m): 3.80 / 4.00

Max. Depth (m): 0.18

#### Downstream

Wetted / Bankfull Width (m): 3.70 / >5.00

Max. Depth (m): 0.32

### Notes

There is a large lake (part of the large, downstream river) ~300 m downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 47**

UTM: 17W 580423 / 7901736

Latitude / Longitude: 71°12'17.642" N / 78°45'46.937" W

Date / Time Surveyed: 9-Aug-07 / 03:30



Figure 1: View upstream of crossing 47



Figure 2: View across crossing 47 from right bank



Figure 3: View downstream of crossing 47

**Watercourse Characteristics**

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

**Crossing Site**

Bankfull Width (m): 23.60

Wetted Width (m): undefined (under rocks)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 2

**Upstream**

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

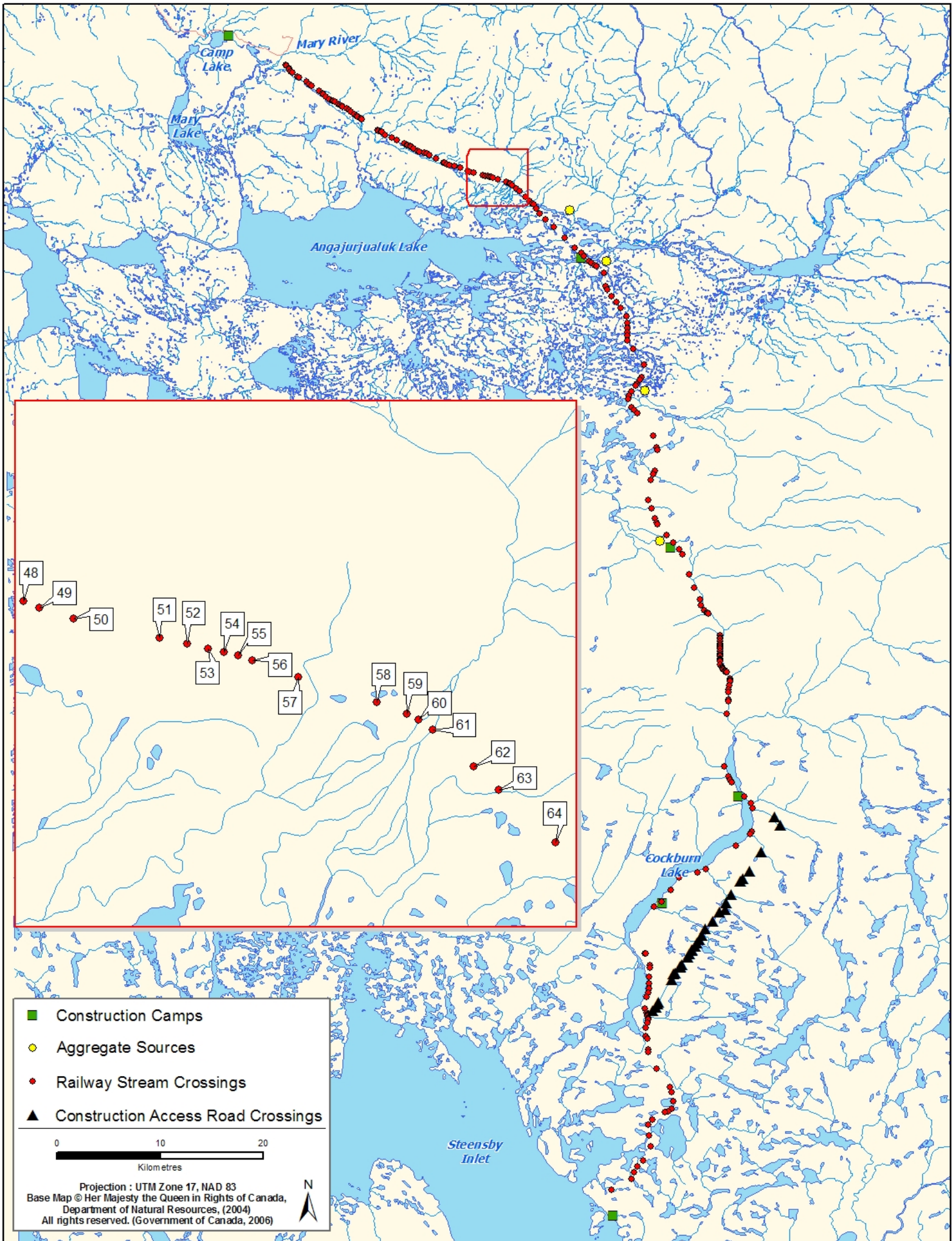
**Downstream**

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

**Notes**

There is a large lake (part of the large, downstream river) ~500 m downstream of the crossing site. The stream flows underground downstream between the lake and the crossing, creating a barrier.







# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 48

UTM: 17W 581148 / 7901425

Latitude / Longitude: 71°12'6.743" N / 78°44'35.571" W

Date / Time Surveyed: 9-Aug-07 / 03:05



Figure 1: View upstream of crossing 48



Figure 2: View across crossing 48 from right bank



Figure 3: View downstream of crossing 48

## Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

### Crossing Site

Bankfull Width (m): 3.00

Wetted Width (m): 2.20

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.15

Flow Regime: persistent

Gradient (°): 4

### Upstream

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

### Downstream

Wetted / Bankfull Width (m): 1.50 / 2.00

Max. Depth (m): 0.15

## Notes

There is a small lake ~300 m downstream and a large lake (part of the large, downstream river) ~900 m downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 49

UTM: 17W 581313 / 7901354

Latitude / Longitude: 71°12'4.254" N / 78°44'19.333" W

Date / Time Surveyed: 9-Aug-07 / 03:24



Figure 1: View upstream of crossing 49



Figure 2: View across crossing 49 from right bank



Figure 3: View downstream of crossing 49

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): 2.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 5

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

There is a small lake ~300 m downstream and a large lake (part of the large, downstream river) ~900 m downstream of the crossing site.

## Crossing ID: 50

UTM: 17W 581664 / 7901241

Latitude / Longitude: 71°12'0.186" N / 78°43'44.652" W

Date / Time Surveyed: 9-Aug-07 / 03:37



Figure 1: View upstream of crossing 50



Figure 2: View across crossing 50 from left bank



Figure 3: View downstream of crossing 50

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width: undefined

Wetted Width (m): water under boulders

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

### Notes

There is a small lake (part of the large, downstream river) 1 km downstream of the crossing site. The stream flows under boulders between the lake and the crossing, creating a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 51

UTM: 17W 582566 / 7901042

Latitude / Longitude: 71°11'52.669" N / 78°42'15.200" W

Date / Time Surveyed: 9-Aug-07 / 04:16



Figure 1: View upstream of crossing 51



Figure 2: View across crossing 51 from right bank

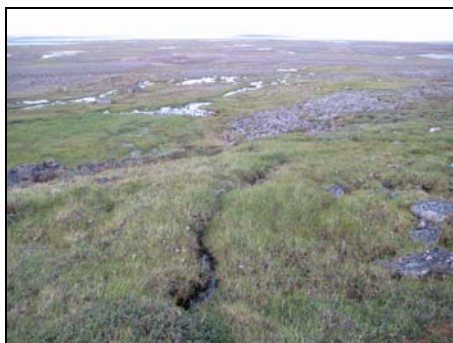


Figure 3: View downstream of crossing 51

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 25.60

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing.

## Crossing ID: 52

UTM: 17W 582851 / 7900979

Latitude / Longitude: 71°11'50.288" N / 78°41'46.940" W

Date / Time Surveyed: 9-Aug-07 / 04:32



Figure 1: View upstream of crossing 52



Figure 2: View across crossing 52 from right bank

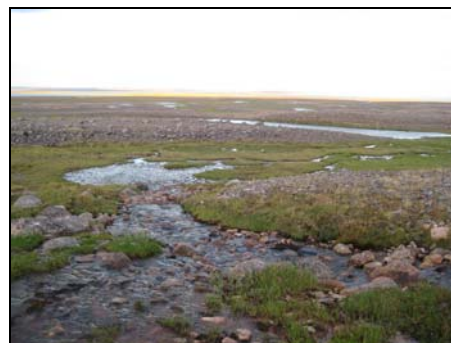


Figure 3: View downstream of crossing 52

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): 12.00

Wetted Width (m): 14.00

Depth Profile (25%, 50%, 75%; m): N/M

Max Depth (m): 0.11

Flow Regime: intermittent – persistent

Gradient (°): 15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): 2.20 / 3.00

Max. Depth (m): 0.26

### Notes

The large, unnamed river is ~2 km downstream of the crossing. The steep gradient upstream of the crossing is a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 53

UTM: 17W 583070 / 7900930

Latitude / Longitude: 71°11'48.438" N / 78°41'25.229" W

Date / Time Surveyed: 9-Aug-07 / 04:04



Figure 1: View upstream of crossing 53



Figure 2: View across crossing 53 from right bank

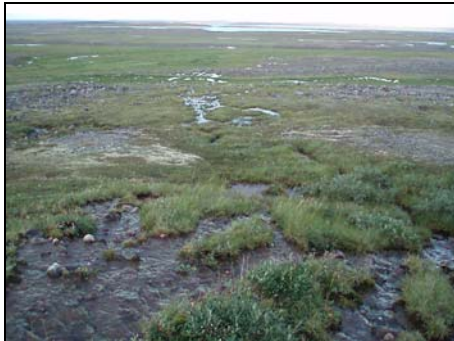


Figure 3: View downstream of crossing 53

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): N/M (MSC)  
Wetted Width (m): 2.00  
Depth Profile (25%, 50%, 75%; m): 0.07, 0.02, 0.03  
Max. Depth (m): 0.07  
Flow Regime: persistent  
Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): < 2.00 / MSC  
Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): N/M  
Max. Depth (m): N/M

### Notes

The large, unnamed river is ~3 km downstream of the crossing. A cascade and low water between the downstream river and the crossing act as barriers.

## Crossing ID: 54

UTM: 17W 583242 / 7900892

Latitude / Longitude: 71°11'47.001" N / 78°41'8.176" W

Date / Time Surveyed: 9-Aug-07 / 04:55



Figure 1: View upstream of crossing 54



Figure 2: View across crossing 54 from left bank



Figure 3: View downstream of crossing 54

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): N/M (MSC)  
Wetted Width (m): 2.50  
Depth Profile (25%, 50%, 75%; m): 0.11, 0.08, 0.05  
Max. Depth (m): 0.11  
Flow Regime: persistent  
Gradient (°): 10

#### Upstream

Wetted / Bankfull Width (m): 2.00 / 2.00  
Max. Depth (m): 0.10

#### Downstream

Wetted / Bankfull Width (m): 1.10 / 1.10  
Max. Depth (m): 0.20

### Notes

The large, unnamed river is ~3 km downstream of the crossing. Cascades act as a barrier between the downstream river and the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 55

UTM: 17W 583387 / 7900856

Latitude / Longitude: 71°11'45.661" N / 78°40'53.816" W

Date / Time Surveyed: 9-Aug-07 / 05:15



Figure 1: View upstream of crossing 55



Figure 2: View across crossing 55 from left bank



Figure 3: View downstream of crossing 55

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~3 km downstream of the crossing. A cascade and low water between the downstream river and the crossing act as barriers.

## Crossing ID: 56

UTM: 17W 583535 / 7900806

Latitude / Longitude: 71°11'43.865" N / 78°40'39.210" W

Date / Time Surveyed: 9-Aug-07 / 05:02



Figure 1: View upstream of crossing 56



Figure 2: View across crossing 56 from right bank



Figure 3: View downstream of crossing 56

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 1.80

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): 1.00-2.00 / 1.50-2.50

Max. Depth (m): 0.10-0.20

#### Downstream

Wetted / Bankfull Width (m): 1.00-2.00 / 1.50-2.50

Max. Depth (m): 0.10-0.20

### Notes

The large, unnamed river is ~3 km downstream of the crossing. A cascade and low water between the downstream river and the crossing act as barriers.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 57

UTM: 17W 584019 / 7900636

Latitude / Longitude: 71°11'37.781" N / 78°39'51.474" W

Date / Time Surveyed: 10-Aug-07 / 00:01



Figure 1: View upstream of crossing 57



Figure 2: View across crossing 57 from right bank



Figure 3: View downstream of crossing 57

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): N/M (MSC)

Wetted Width (m): 1.10

Depth Profile (25%, 50%, 75%; m): 0.17, 0.07, 0.17

Max. Depth (m): 0.30

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 2.20 / 2.20

Max. Depth (m): 0.23

#### Downstream

Wetted / Bankfull Width (m): 1.00-1.50 / MSC

Max. Depth (m): 0.30-0.50

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing.

## Crossing ID: 58

UTM: 17W 584838 / 7900369

Latitude / Longitude: 71°11'28.146" N / 78°38'30.638" W

Date / Time Surveyed: 9-Aug-07 / 23:15



Figure 1: View upstream of crossing 58



Figure 2: View across crossing 58 from right bank



Figure 3: View downstream of crossing 58

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): 17.00

Wetted Width (m): 2.30

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.11

Flow Regime: intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): >100.00 / >100.00

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): 1.20 / 7.00

Max. Depth (m): under rocks

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing. There is a small lake ~300 m downstream of the crossing. Boulders and low water downstream of the crossing site could potentially be a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 59

UTM: 17W 585145 / 7900251

Latitude / Longitude: 71°11'23.954" N / 78°38'0.412" W

Date / Time Surveyed: 9-Aug-07 / 23:25



Figure 1: View upstream of crossing 59



Figure 2: View across crossing 59 from right bank



Figure 3: View downstream of crossing 59

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): 57.60

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: intermittent – ephemeral

Gradient (°):

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing. There is a small lake ~ 300 m downstream of the crossing. Low water downstream of the crossing acts as a partial barrier.

## Crossing ID: 60

UTM: 17W 585271 / 7900183

Latitude / Longitude: 71°11'21.602" N / 78°37'48.084" W

Date / Time Surveyed: 9-Aug-07 / 23:50



Figure 1: View upstream of crossing 60



Figure 2: View across crossing 60 from left bank



Figure 3: View downstream of crossing 60

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 5.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~1.5 km downstream of the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 61

UTM: 17W 585420 / 7900082

Latitude / Longitude: 71°11'18.156" N / 78°37'33.588" W

Date / Time Surveyed: 10-Aug-07 / 00:00



Figure 1: View upstream of crossing 61



Figure 2: View across crossing 61 from right bank



Figure 3: View downstream of crossing 61

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 35.70

Wetted Width (m): 27.40

Depth Profile (25%, 50%, 75%; m): 0.22, 0.29, 0.45

Max. Depth (m): 0.52

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 22.80 / 25.50

Max. Depth (m): 0.42

#### Downstream

Wetted / Bankfull Width (m): > 25.00 / > 30.00

Max. Depth (m): 0.50-1.00

### Notes

Angajurjualuk Lake is ~8 km downstream of the crossing. Cascades downstream of the crossing act as a partial barrier.

## Crossing ID: 62

UTM: 17W 585843 / 7899702

Latitude / Longitude: 71°11'5.364" N / 78°36'52.810" W

Date / Time Surveyed: 10-Aug-07 / 00:40



Figure 1: View upstream of crossing 62



Figure 2: View across crossing 62 from right bank



Figure 3: View downstream of crossing 62

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large lake

Channel Pattern: braided, flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 6.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.15

Flow Regime: intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): under rocks

Max. Depth (m): N/A

### Notes

Large, unnamed lake is ~4 km downstream of the crossing. Low water downstream of the crossing acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 63

UTM: 17W 586109 / 7899455

Latitude / Longitude: 71°10'57.060" N / 78°36'27.207" W

Date / Time Surveyed: 10-Aug-07 / 00:33



Figure 1: View upstream of crossing 63



Figure 2: View across crossing 63 from left bank



Figure 3: View downstream of crossing 63

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large lake

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 8.80  
Wetted Width (m): nearly dry  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): N/A  
Flow Regime: ephemeral  
Gradient (°): 0.50

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): 0.90 / many channels  
Max. Depth (m): 0.29

### Notes

Large, unnamed lake is ~4 km downstream of the crossing.

## Crossing ID: 64

UTM: 17W 586704 / 7898904

Latitude / Longitude: 71°10'38.529" N / 78°35'29.951" W

Date / Time Surveyed: 10-Aug-07 / 00:57



Figure 1: View upstream of crossing 64



Figure 2: View across crossing 64 from left bank



Figure 3: View downstream of crossing 64

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined  
Wetted Width (m): undefined  
Depth Profile (25%, 50%, 75%; m): 0.01, 0.05, 0.01  
Max. Depth (m): 0.10  
Flow Regime: intermittent  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): N/M  
Max. Depth (m): N/M

#### Downstream

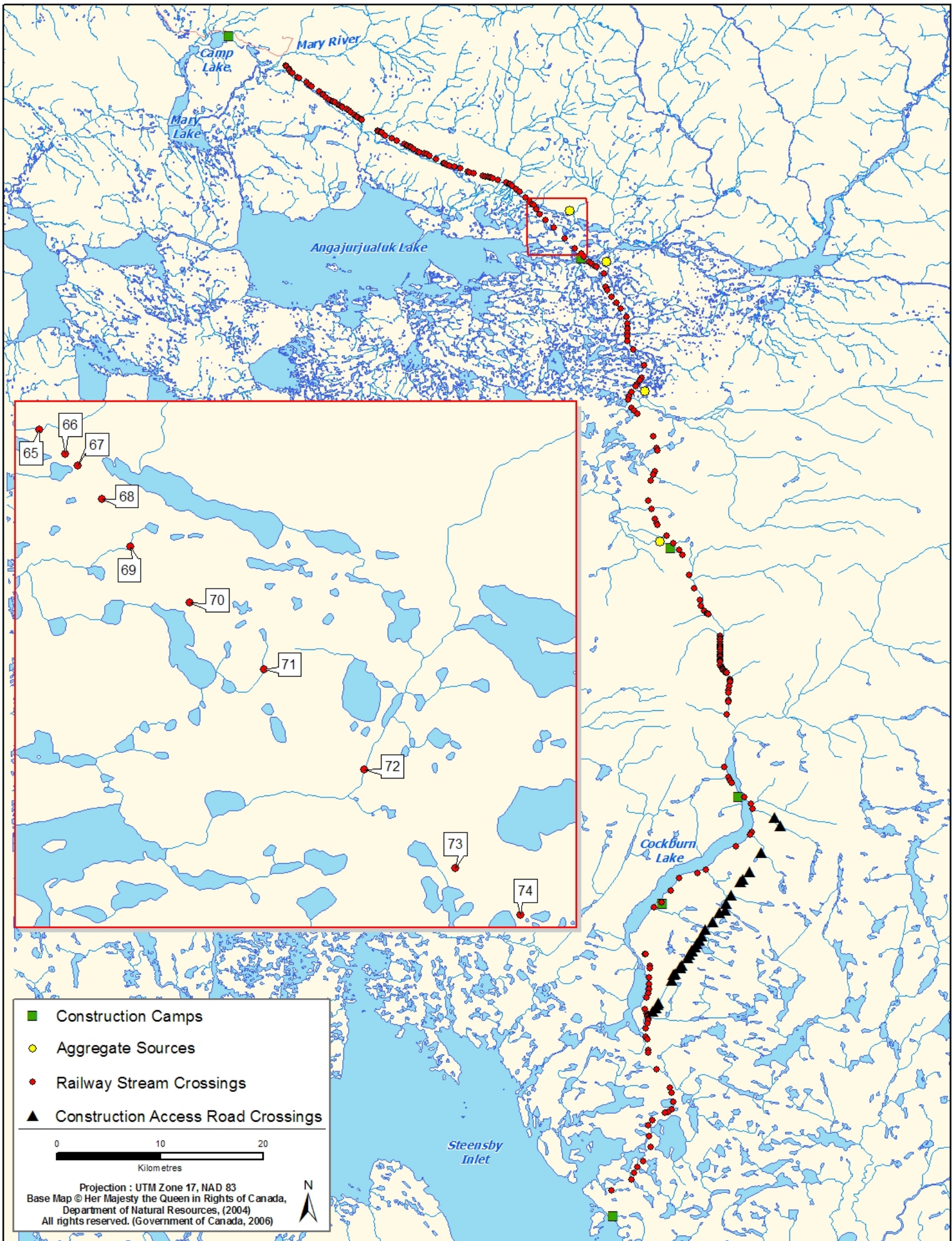
Wetted / Bankfull Width (m): N/M  
Max. Depth (m): < 0.10

### Notes

There is a very small lake 0.5 km downstream of the crossing site and a large, unnamed lake ~3 km further downstream. Low water between the lake and the crossing acts as a barrier.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 65

UTM: 17W 587092 / 7898544

Latitude / Longitude: 71°10'26.420" N / 78°34'52.634" W

Date / Time Surveyed: 10-Aug-07 / 01:30



Figure 1: View upstream of crossing 65



Figure 2: View across crossing 65 from left bank



Figure 3: View downstream of crossing 65

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): N/M (MSC)

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.65

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 8.00 / 12.70

Max. Depth (m): 0.10

#### Downstream

Wetted / Bankfull Width (m): > 0.50 / > 0.50

Max. Depth (m): 0.50-1.00

### Notes

There is a small lake 400 m downstream of the crossing site and a large, unnamed lake ~3.5 km further downstream.

## Crossing ID: 66

UTM: 17W 587366 / 7898291

Latitude / Longitude: 71°10'17.907" N / 78°34'26.284" W

Date / Time Surveyed: 10-Aug-07 / 01:10



Figure 1: View upstream of crossing 66



Figure 2: View across crossing 66 from right bank



Figure 3: View downstream of crossing 66

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large lake

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): N/A (under rocks)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 2.5

#### Upstream

Wetted / Bankfull Width (m): isolated ponds

Max. Depth (m): 0.40

#### Downstream

Wetted / Bankfull Width (m): isolated ponds

Max. Depth (m): 0.50

### Notes

There is a small lake ~200 m downstream of the crossing site and a large, unnamed lake ~3.5 km further downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 67

UTM: 17W 587493 / 7898166

Latitude / Longitude: 71°10'13.744" N / 78°34'14.100" W

Date / Time Surveyed: 10-Aug-07 / 01:30



Figure 1: View upstream of crossing 67



Figure 2: View across crossing 67 from left bank



Figure 3: View downstream of crossing 67

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large lake

Channel Pattern: sinuous to meandering

#### Crossing Site

Bankfull Width (m): 9.00

Wetted Width (m): 8.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.35

Flow Regime: intermittent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): isolated ponds

Max. Depth (m): 0.25

#### Downstream

Wetted / Bankfull Width (m): 18.2 / 37.3

Max. Depth (m): 0.35

### Notes

There is a small lake ~100 m downstream of the crossing site and a large, unnamed lake ~3.5 km further downstream. Low water levels downstream of the crossing act as a barrier.

## Crossing ID: 68

UTM: 17W 587745 / 7897818

Latitude / Longitude: 71°10'2.163" N / 78°33'50.341" W

Date / Time Surveyed: 10-Aug-07 / 01:55



Figure 1: View upstream of crossing 68



Figure 2: View across crossing 68 from left bank

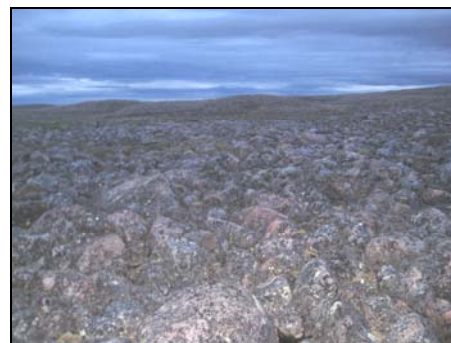


Figure 3: View downstream of crossing 68

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large lake

Channel Pattern: sinuous to meandering

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed lake is ~1.7 km downstream

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 69

UTM: 17W 588048 / 7897323

Latitude / Longitude: 71°9'45.806" N / 78°33'22.089" W /

Date / Time Surveyed: 10-Aug-07 / 02:15



Figure 1: View upstream of crossing 69

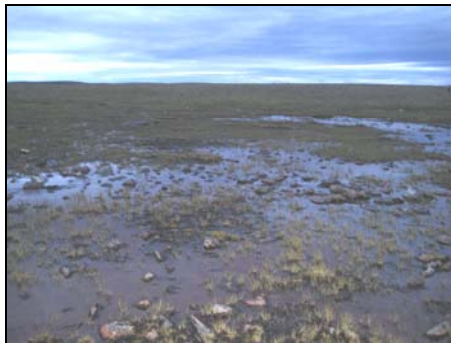


Figure 2: View across crossing 69 from left bank

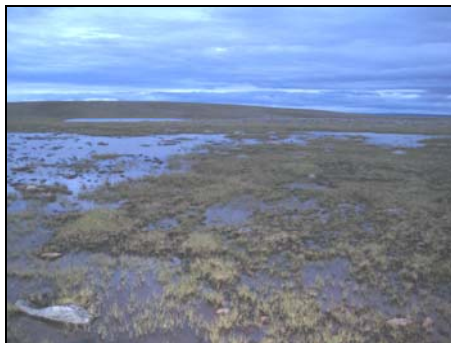


Figure 3: View downstream of crossing 69

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 23.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.03

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

### Notes

There is a small lake ~0.6 km downstream of the crossing site and a large, unnamed lake ~1.5 km further downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 70

UTM: 17W 588668 / 7896737

Latitude / Longitude: 71°9'26.098" N / 78°32'22.588" W /

Date / Time Surveyed: 10-Aug-07 / 02:18



Figure 1: View upstream of crossing 70



Figure 2: View across crossing 70



Figure 3: View downstream of crossing 70

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of small lake

Channel Pattern: braided, flooded terrestrial

#### Crossing Site

Bankfull Width (m): N/M (MSC)

Wetted Width (m): undefined

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

### Notes

There is a large lake ~100 m downstream of the crossing site. Low water levels between the lake and the crossing act as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 71

UTM: 17W 589438 / 7896038

Latitude / Longitude: 71°9'2.543" N / 78°31'8.620" W

Date / Time Surveyed: 10-Aug-07 / 02:37



Figure 1: View upstream of crossing 71



Figure 2: View across crossing 71 from right bank



Figure 3: View downstream of crossing 71

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.05

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

### Notes

Small lake ~0.8 km downstream and large, unnamed lake ~1 km downstream. Low water downstream of the crossing acts as a barrier.

## Crossing ID: 72

UTM: 17W 590489 / 7894987

Latitude / Longitude: 71°8'27.253" N / 78°29'28.139" W

Date / Time Surveyed: 10-Aug-07 / 03:10



Figure 1: View upstream of crossing 72



Figure 2: View across crossing 72 from left bank

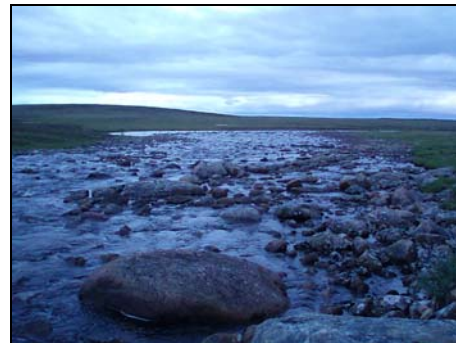


Figure 3: View downstream of crossing 72

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Angajurjua Lake

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 21.90

Wetted Width (m): 21.90

Depth Profile (25%, 50%, 75%; m): 0.21, 0.20, 0.42

Max. Depth (m): 0.42

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 15.00-20.00 / > 20.00

Max. Depth (m): 0.25-0.50

#### Downstream

Wetted / Bankfull Width (m): > 20.00 / > 20.00

Max. Depth (m): > 0.50

### Notes

Angajurjua Lake is ~2 km downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 73

UTM: 17W 591440 / 7893960

Latitude / Longitude: 71°7'52.858" N / 78°27'57.622" W

Date / Time Surveyed: 10-Aug-07 / 03:05



Figure 1: View upstream of crossing 73



Figure 2: View across crossing 73 from left bank



Figure 3: View downstream of crossing 73

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Ravn R.

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

The Ravn River is ~1 km downstream. There is a small lake ~200 m downstream of the crossing site. Low water levels between the lake and the crossing act as a barrier.

## Crossing ID: 74

UTM: 17W 592117 / 7893473

Latitude / Longitude: 71°7'36.237" N / 78°26'52.213" W

Date / Time Surveyed: 10-Aug-07 / 03:20



Figure 1: View upstream of crossing 74



Figure 2: View across crossing 74 from right bank



Figure 3: View downstream of crossing 74

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Ravn R.

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 2.00

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.03

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): Ravn River

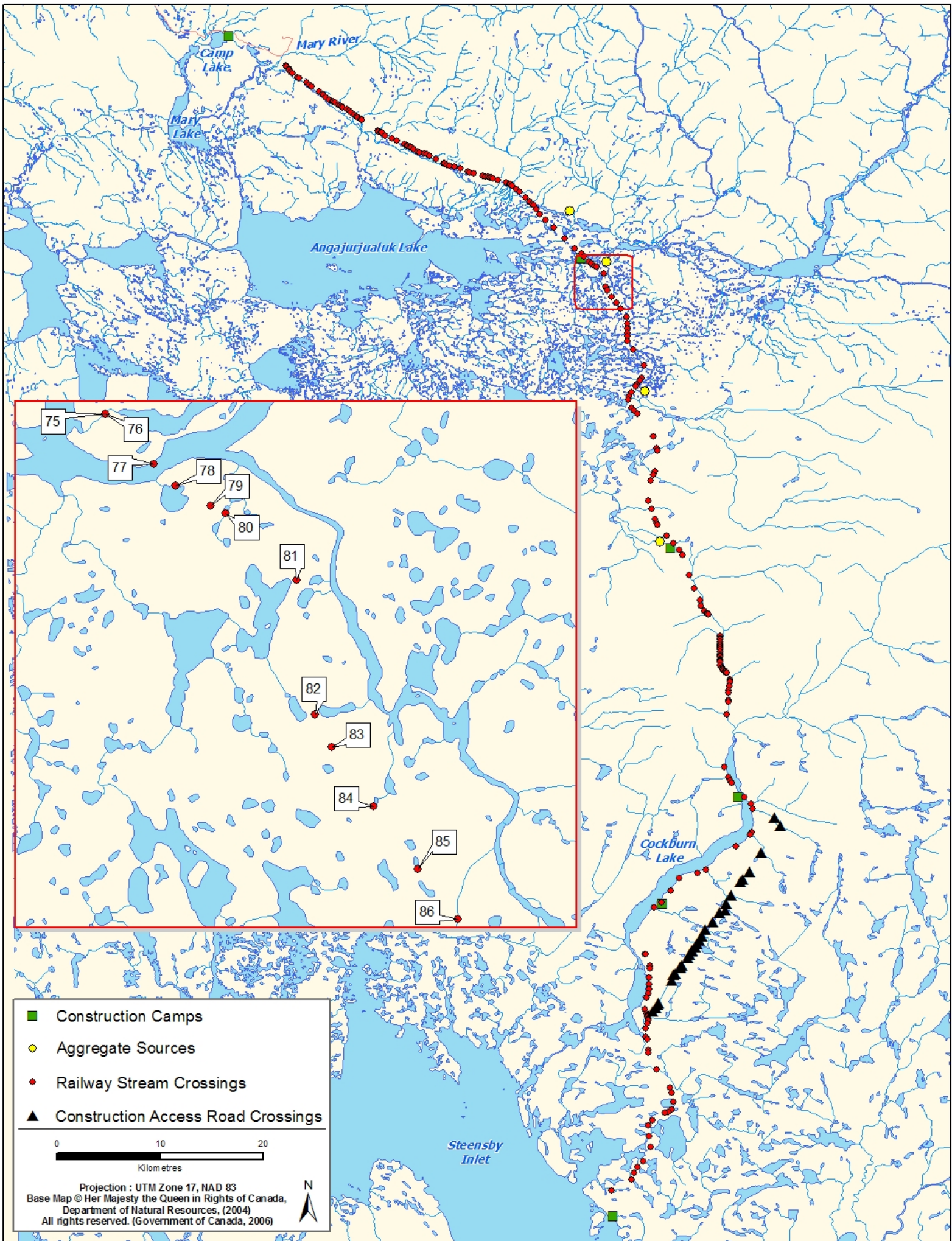
Max. Depth (m): N/A

### Notes

The Ravn River is ~100 m downstream of the crossing site. There is a steep drop between the Ravn River and the crossing that acts as a barrier.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 75 & 76

UTM: 17W 592377 / 7893222

Latitude / Longitude: 71°7'27.789" N / 78°26'27.371" W

Date / Time Surveyed: 10-Aug-07 / 03:35

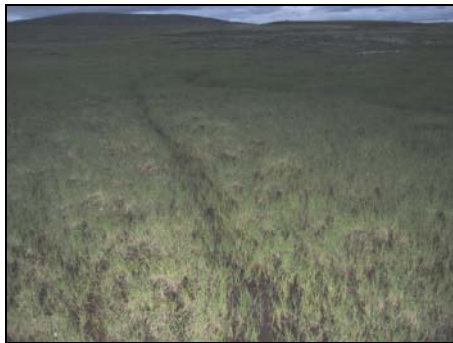


Figure 1: View upstream of crossings 75 & 76



Figure 2: View across crossings 75 & 76 from left bank



Figure 3: View downstream of crossings 75 & 76

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Ravn R.

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

Low water levels downstream of the crossing site act as a barrier between crossing and Ravn River, which is ~0.5 km downstream.

## Crossing ID: 77

UTM: 17W 592860 / 7892727

Latitude / Longitude: 71°7'11.167" N / 78°25'41.358" W

Date / Time Surveyed: 10-Aug-07 / 03:45



Figure 1: View upstream of crossings 77



Figure 2: View across crossing 77 from right bank



Figure 3: View downstream of crossings 77

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Angajurjualuk L.

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 171.00

Wetted Width (m): 126.20

Depth Profile (25%, 50%, 75%; m): too fast to measure

Max. Depth (m): too fast to measure

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): > 100.00 / > 150.00

Max. Depth (m): too fast to measure

#### Downstream

Wetted / Bankfull Width (m): > 100.00 / > 150.00

Max. Depth (m): too fast to measure

### Notes

This site is the Ravn River.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 78

UTM: 17W 593078 / 7892513

Latitude / Longitude: 71°7'3.967" N / 78°25'20.558" W

Date / Time Surveyed: 10-Aug -07 / 04:00



Figure 1: View across crossing 78 from right bank



Figure 2: View downstream of crossing 78

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Ravn R.

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): 0.50 – 1.00

### Notes

There is a small lake immediately downstream of the crossing site, which is ~100 m upstream of the Ravn River.

## Crossing ID: 79

UTM: 17W 593429 / 7892306

Latitude / Longitude: 71°6'56.810" N / 78°24'46.491" W

Date / Time Surveyed: 10-Aug-07 / 04:10



Figure 1: View downstream of crossing 79

### Watercourse Characteristics

Tributary Status: not a tributary

Channel Pattern: no channel

#### Crossing Site

Bankfull Width (m): never any water

Wetted Width (m): N/A

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: none

Gradient (°): N/A

#### Upstream

Wetted / Bankfull Width (m): N/A

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/A

Max. Depth (m): N/A

### Notes

This crossing is not likely wet at any point during the year, so this should not actually be considered a crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 80

UTM: 17W 593575 / 7892235

Latitude / Longitude: 71°6'54.319" N / 78°24'32.259" W

Date / Time Surveyed: 10-Aug-07 / 04:20



Figure 1: View upstream of crossing 80



Figure 2: View across crossing 80 from left bank



Figure 3: View downstream of crossing 80

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Ravn R.

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

The Ravn River is ~0.5 km downstream. There is a small lake ~100 m downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 81

UTM: 17W 594279 / 7891573

Latitude / Longitude: 71°6'31.997" N / 78°23'25.016" W

Date / Time Surveyed: 10-Aug-07 / 04:22

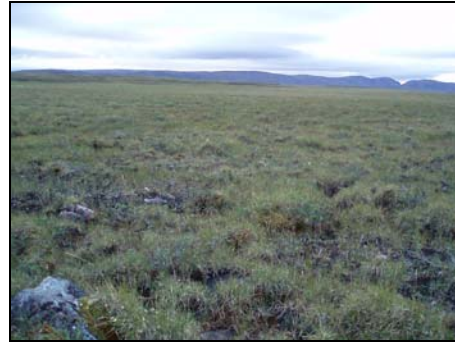


Figure 1: View upstream of crossing 81



Figure 2: View across crossing 81



Figure 3: View downstream of crossing 81

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of small lake

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined (MSC)

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 0.5

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

The Ravn River is ~3 km downstream of the crossing. There is a small lake ~100 m downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 82

UTM: 17W 594461 / 7890237

Latitude / Longitude: 71°5'48.666" N / 78°23'12.645" W

Date / Time Surveyed: 10-Aug-07 / 04:40

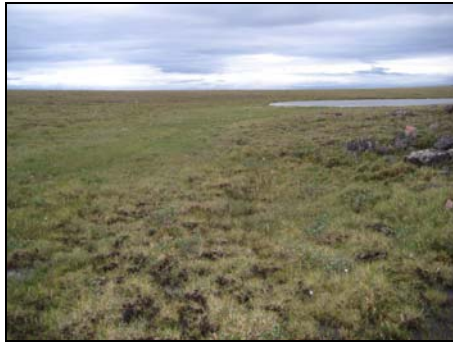


Figure 1: View upstream of crossing 82



Figure 2: View across crossing 82 from left bank

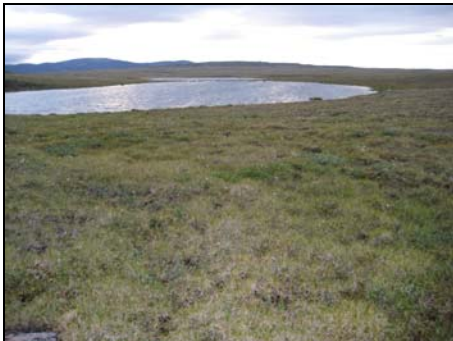


Figure 3: View downstream of crossing 82

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): pond

Max. Depth (m): N/A

### Notes

Large, unnamed river is ~0.5 km downstream.

## Crossing ID: 83

UTM: 17W 594631 / 7889909

Latitude / Longitude: 71°5'37.852" N / 78°22'57.148" W

Date / Time Surveyed: 10-Aug-07 / 04:50



Figure 1: View upstream of crossing 83



Figure 2: View across crossing 83 from right bank

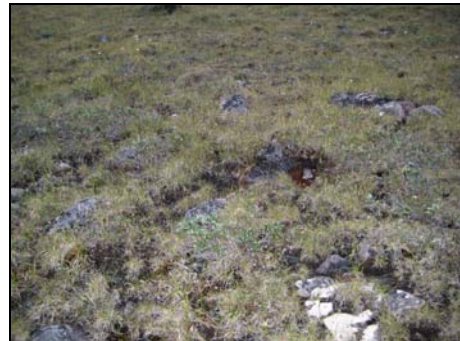


Figure 3: View downstream of crossing 83

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

Large, unnamed river is ~0.5 km downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 84

UTM: 17W 595046 / 7889321

Latitude / Longitude: 71°5'18.313" N / 78°22'18.418" W

Date / Time Surveyed: 11-Aug-07 / 03:45



Figure 1: View upstream of crossing 84



Figure 2: View across crossing 84 from right bank

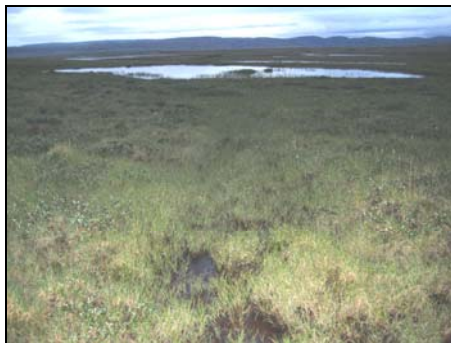


Figure 3: View downstream of crossing 84

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.15

Flow Regime: ephemeral

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): pond

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~1 km downstream. Low water downstream of the crossing acts as a barrier.

## Crossing ID: 85

UTM: 17W 595486 / 7888698

Latitude / Longitude: 71°4'57.608" N / 78°21'37.377" W

Date / Time Surveyed: 11-Aug-07 / 04:00



Figure 1: View upstream of crossing 85



Figure 2: View across crossing 85 from right bank



Figure 3: View downstream of crossing 85

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°):

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): pond

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~1.5 km downstream. Low water downstream of the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 86****UTM:** 17W 595881 / 7888203**Latitude / Longitude:** 71°4'41.090" N / 78°21'0.274" W**Date / Time Surveyed:** 11-Aug-07 / 04:08

**Figure 1:** View upstream of crossing 86



**Figure 2:** View across crossing 86 from left bank



**Figure 3:** View downstream of crossing 86

## Watercourse Characteristics

**Tributary Status:** 1<sup>st</sup> order trib of large river

**Channel Pattern:** flooded terrestrial

**Crossing Site**

**Bankfull Width (m):** undefined

**Wetted Width (m):** 1.50

**Depth Profile (25%, 50%, 75%; m):** N/M

**Max. Depth (m):** 0.05

**Flow Regime:** ephemeral

**Gradient (°):** N/M

**Upstream**

**Wetted / Bankfull Width (m):** undefined

**Max. Depth (m):** < 0.10

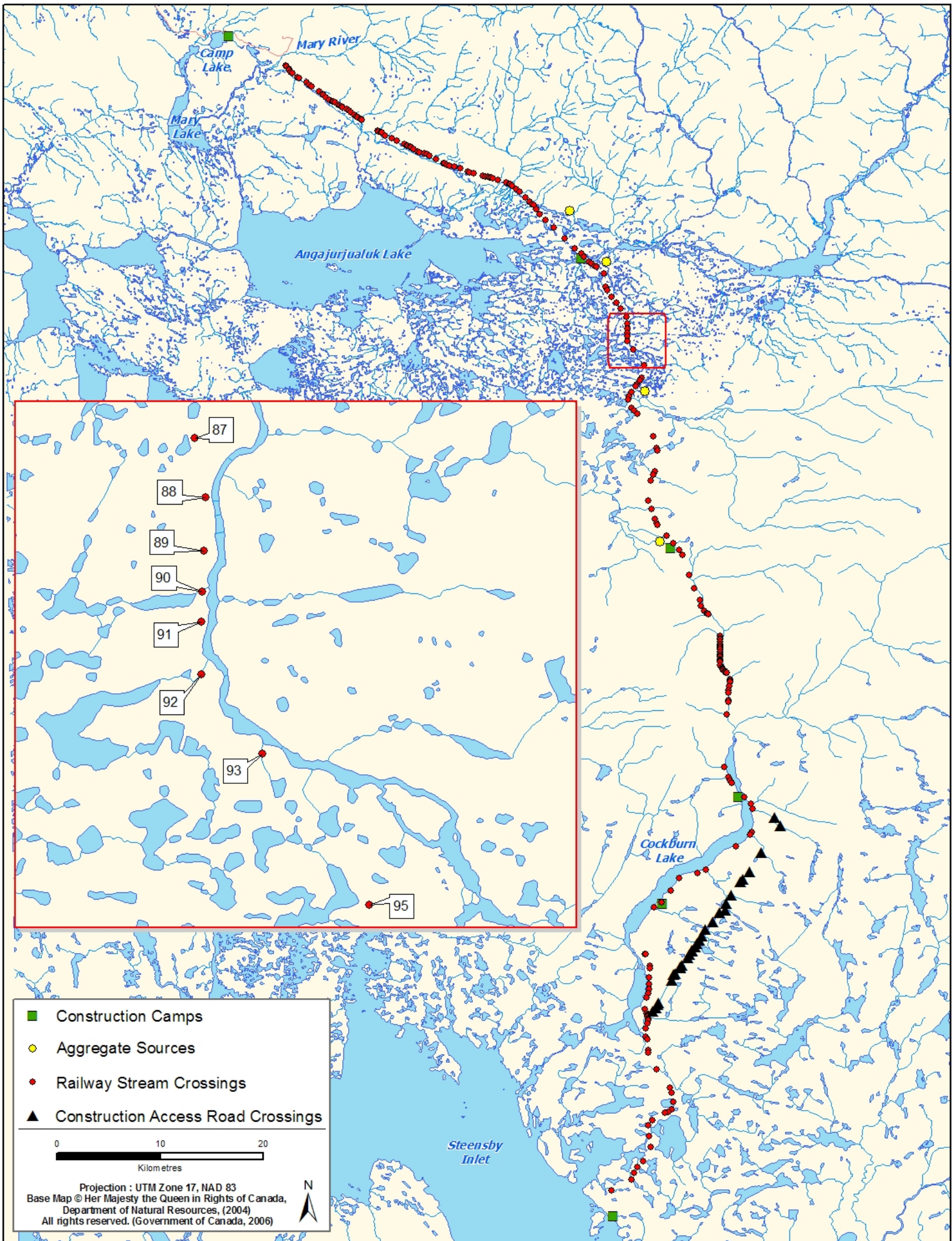
**Downstream**

**Wetted / Bankfull Width (m):** undefined

**Max. Depth (m):** < 0.10

## Notes

The large, unnamed river is ~1 km downstream. Low water downstream of the crossing acts as a barrier.







# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 87****UTM:** 17W 596485 / 7887328**Latitude / Longitude:** 71°4'12.022" N / 78°20'4.089" W**Date / Time Surveyed:** 11-Aug-07 / 04:20

**Figure 1:** View upstream of crossing 87



**Figure 2:** View across crossing 87 from right bank



**Figure 3:** View downstream of crossing 87

## Watercourse Characteristics

**Tributary Status:** 1<sup>st</sup> order trib of large river

**Channel Pattern:** undefined

**Crossing Site**

**Bankfull Width (m):** undefined

**Wetted Width (m):** no water

**Depth Profile (25%, 50%, 75%; m):** N/A

**Max. Depth (m):** N/A

**Flow Regime:** ephemeral

**Gradient (°):** N/M

**Upstream**

**Wetted / Bankfull Width (m):** no water

**Max. Depth (m):** N/A

**Downstream**

**Wetted / Bankfull Width (m):** undefined

**Max. Depth (m):** < 0.05

## Notes

The large, unnamed river is ~1 km downstream. Low water downstream of the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 88

UTM: 17W 596594 / 7886739

Latitude / Longitude: 71°3'52.876" N / 78°19'55.842" W

Date / Time Surveyed: 11-Aug-07 / 04:30



Figure 1: View upstream of crossing 88



Figure 2: View across crossing 88 from left bank

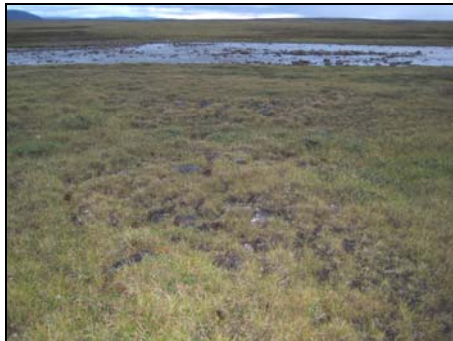


Figure 3: View downstream of crossing 88

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

Large, unnamed river is ~50 m downstream of crossing.

## Crossing ID: 89

UTM: 17W 596576 / 7886207

Latitude / Longitude: 71°3'35.748" N / 78°19'59.956" W

Date / Time Surveyed: 11-Aug-07 / 04:40



Figure 1: View upstream of crossing 89



Figure 2: View across crossing 89 from left bank



Figure 3: View downstream of crossing 89

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

Large, unnamed river is ~100 m downstream of crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 90

UTM: 17W 596561 / 7885802

Latitude / Longitude: 71°3'22.711" N / 78°20'3.216" W

Date / Time Surveyed: 11-Aug-07 / 04:50

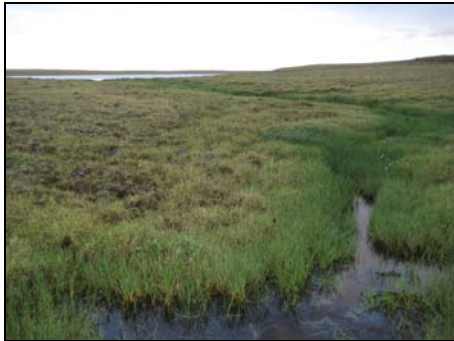


Figure 1: View upstream of crossing 90



Figure 2: View across crossing 90 from left bank



Figure 3: View downstream of crossing 90

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 2.00

Wetted Width (m): 0.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.43

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream of crossing.

## Crossing ID: 91

UTM: 17W 596551 / 7885501

Latitude / Longitude: 71°3'13.020" N / 78°20'5.524" W

Date / Time Surveyed: 11-Aug-07 / 04:42



Figure 1: View upstream of crossing 91



Figure 2: View across crossing 91 from left bank



Figure 3: View downstream of crossing 91

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream of crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 92

UTM: 17W 596551 / 7884977

Latitude / Longitude: 71°2'56.125" N / 78°20'7.813" W

Date / Time Surveyed: 11-Aug-07 / 04:10



Figure 1: View upstream of crossing 92



Figure 2: View across crossing 92 from left bank



Figure 3: View downstream of crossing 92

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 0.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.31

Flow Regime: intermittent – persistent

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): 0.80 / undefined

Max. Depth (m): 0.30

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

There is a large, unnamed river ~100 m downstream of the crossing site, and a large pond upstream of it.

## Crossing ID: 93

UTM: 17W 597159 / 7884187

Latitude / Longitude: 71°2'29.787" N / 78°19'10.962" W

Date / Time Surveyed: 11-Aug-07 / 3:45



Figure 1: View upstream of crossing 93



Figure 2: View across crossing 93



Figure 3: View downstream of crossing 93

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: isolated pools

#### Crossing Site

Bankfull Width (m): undefined (IP)

Wetted Width (m): ~ 0.50

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.15

Flow Regime: ephemeral

Gradient (°): 0.5

#### Upstream

Wetted / Bankfull Width (m): isolated pools

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream of crossing.

# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 95****UTM:** 17W 598223 / 7882688**Latitude / Longitude:** 71°1'39.929" N / 78°17'32.092" W**Date / Time Surveyed:** 11-Aug-07 / 05:05

**Figure 1:** View upstream of crossing 95



**Figure 2:** View across crossing 95 from left bank



**Figure 3:** View downstream of crossing 95

**Watercourse Characteristics**

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

**Crossing Site**

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.04

Flow Regime: ephemeral

Gradient (°): N/M

**Upstream**

Wetted / Bankfull Width (m): flooded terrestrial

Max. Depth (m): N/M

**Downstream**

Wetted / Bankfull Width (m): 0.15 / undefined

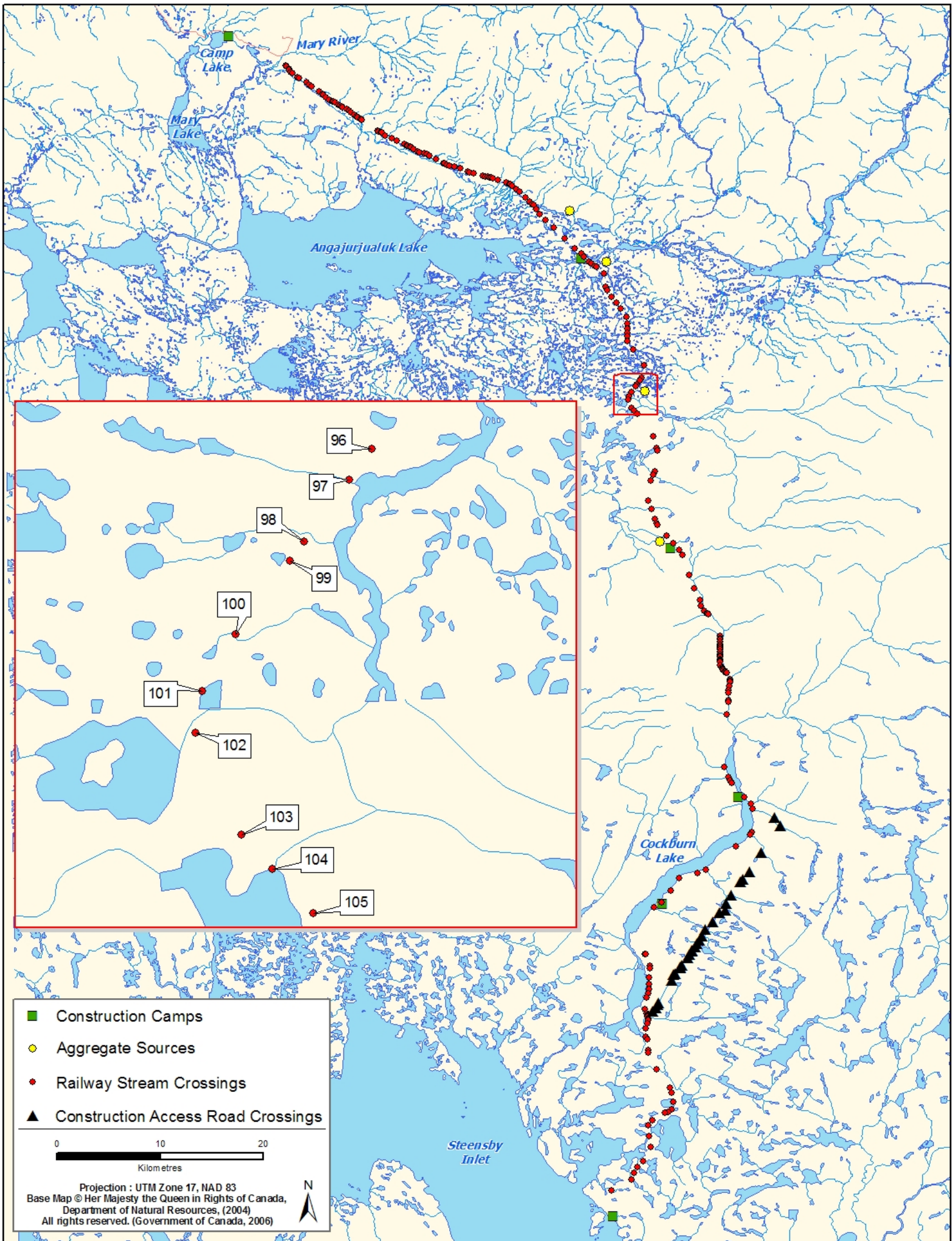
Max. Depth (m): 0.03

**Notes**

There are several lakes downstream between the crossing and the large, unnamed river. Low water between the lake and the crossing acts as a barrier.



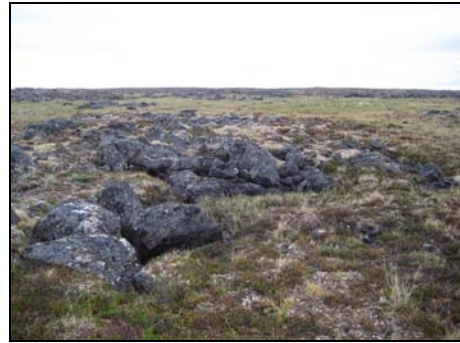




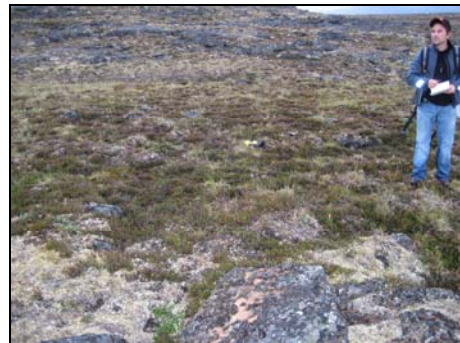




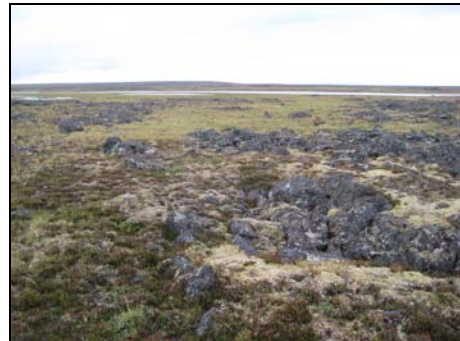
# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 96****UTM:** 17W 597961 / 7881471**Latitude / Longitude:** 71°1'1.067" N / 78°18'3.433" W**Date / Time Surveyed:** 11-Aug-07 / 05:15

**Figure 1:** View upstream of crossing 96



**Figure 2:** View across crossing 96 from right bank



**Figure 3:** View downstream of crossing 96

## Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

**Crossing Site**

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

**Upstream**

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

**Downstream**

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

## Notes

The large, unnamed river is ~200 m downstream of crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 97

UTM: 17W 597790 / 7881239

Latitude / Longitude: 71°0'53.832" N / 78°18'21.393" W

Date / Time Surveyed: 11-Aug-07 / 05:20



Figure 1: View upstream of crossing 97

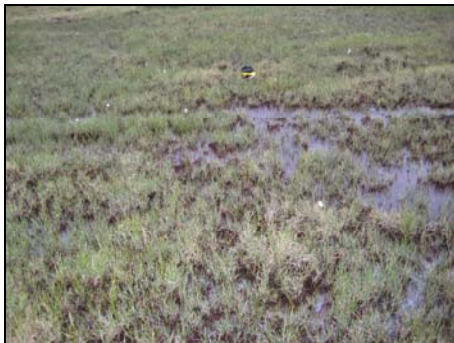


Figure 2: View across crossing 97 from left bank

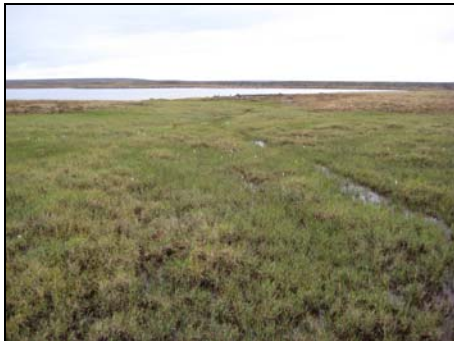


Figure 3: View downstream of crossing 97

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 20.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): ~0.05

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream of crossing. Low water between the river and the crossing acts as a barrier.

## Crossing ID: 98

UTM: 17W 597451 / 7880777

Latitude / Longitude: 71°0'39.422" N / 78°18'56.997" W

Date / Time Surveyed: 11-Aug-07 / 05:30

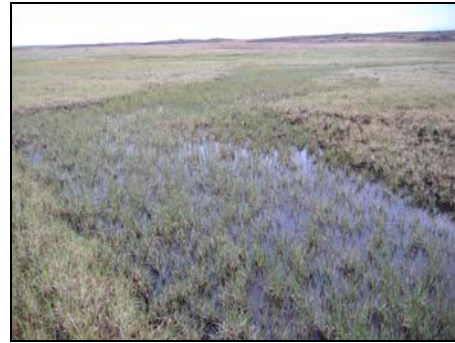


Figure 1: View upstream of crossing 98



Figure 2: View across crossing 98 from left bank



Figure 3: View downstream of crossing 98

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral – intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~200 m downstream of crossing. Low water upstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 99

UTM: 17W 597346 / 7880635

Latitude / Longitude: 71°0'34.993" N / 78°19'8.016" W

Date / Time Surveyed: 11-Aug-07 / 05:40



Figure 1: View upstream of crossing 99



Figure 2: View across crossing 99 from left bank

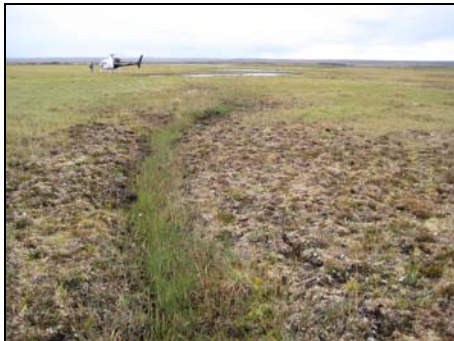


Figure 3: View downstream of crossing 99

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 0.45  
Wetted Width (m): no water  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): N/A  
Flow Regime: ephemeral  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): pond  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): N/M  
Max. Depth (m): N/M

### Notes

The large, unnamed river is ~400 m downstream of crossing.

## Crossing ID: 100

UTM: 17W 596938 / 7880079

Latitude / Longitude: 71°0'17.647" N / 78°19'50.841" W

Date / Time Surveyed: 11-Aug-07 / 05:30



Figure 1: View upstream of crossing 100



Figure 2: View across crossing 100 from left bank



Figure 3: View downstream of crossing 100

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined  
Wetted Width (m): undefined (FT)  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): 0.15  
Flow Regime: persistent – intermittent  
Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): isolated pools  
Max. Depth (m): ~0.15

### Notes

The large, unnamed river is ~1.1 k m downstream of crossing. There is no water upstream of the crossing site, which acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 101

UTM: 17W 596688 / 7879658

Latitude / Longitude: 71°0'4.428" N / 78°20'17.421" W

Date / Time Surveyed: 11-Aug-07 / 22:01



Figure 1: View upstream of crossing 101



Figure 2: View across crossing 101 from left bank



Figure 3: View downstream of crossing 101

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): pond

Max. Depth (m): N/A

### Notes

A large, unnamed river is ~1.5 km downstream of crossing. There is a small lake/pond immediately downstream of the crossing site.

## Crossing ID: 102

UTM: 17W 596638 / 7879339

Latitude / Longitude: 70°59'54.213" N / 78°20'23.757" W

Date / Time Surveyed: 11-Aug-07 / 22:11



Figure 1: View upstream of crossing 102



Figure 2: View across crossing 102 from left bank



Figure 3: View downstream of crossing 102

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: meandering

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): 2.30

Depth Profile (25%, 50%, 75%; m): 0.05, 0.18, 0.07

Max. Depth (m): 0.18

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 2.30 / flooded terrestrial

Max. Depth (m): ~ 1.00

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~1.5 km downstream of crossing. There is a small lake immediately downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 103

UTM: 17W 596985 / 7878575

Latitude / Longitude: 70°59'29.086" N / 78°19'52.750" W

Date / Time Surveyed: 11-Aug-07 / 22:03



Figure 1: View upstream of crossing 103

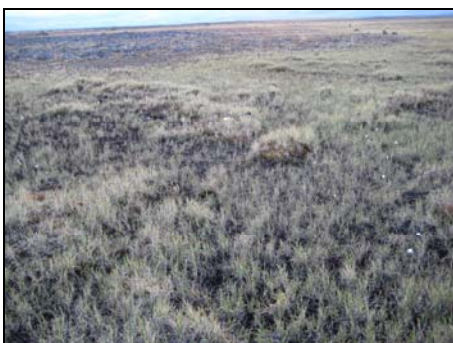


Figure 2: View across crossing 103 from right bank



Figure 3: View downstream of crossing 103

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

A large, unnamed lake is ~200 m downstream.

## Crossing ID: 104

UTM: 17W 597216 / 7878322

Latitude / Longitude: 70°59'20.600" N / 78°19'31.004" W

Date / Time Surveyed: 11-Aug-07 / 22:10



Figure 1: View upstream of crossing 104



Figure 2: View across crossing 104 from right bank



Figure 3: View downstream of crossing 104

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 1.70

Wetted Width (m): 1.20

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.04

Flow Regime: intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): large pond

Max. Depth (m): < 1.00

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

A large, unnamed river is ~0.8 km downstream. A small lake is ~200 m downstream from crossing. Low water downstream of the crossing acts as a partial barrier.

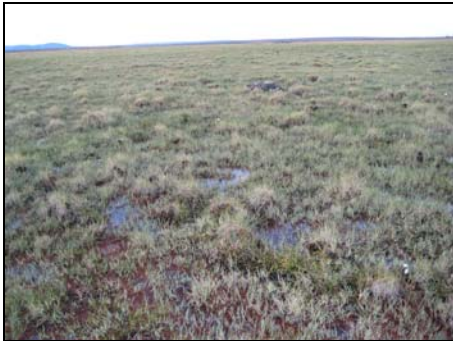
# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 105**

UTM: 17W 597522 / 7877988

Latitude / Longitude: 70°59'9.395" N / 78°19'2.201" W

Date / Time Surveyed: 11-Aug-07 / 22:23

**Figure 1:** View upstream of crossing 105**Figure 2:** View across crossing 105 from right bank**Figure 3:** View downstream of crossing 105**Watercourse Characteristics**Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: flooded terrestrial

**Crossing Site**

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

**Upstream**

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

**Downstream**

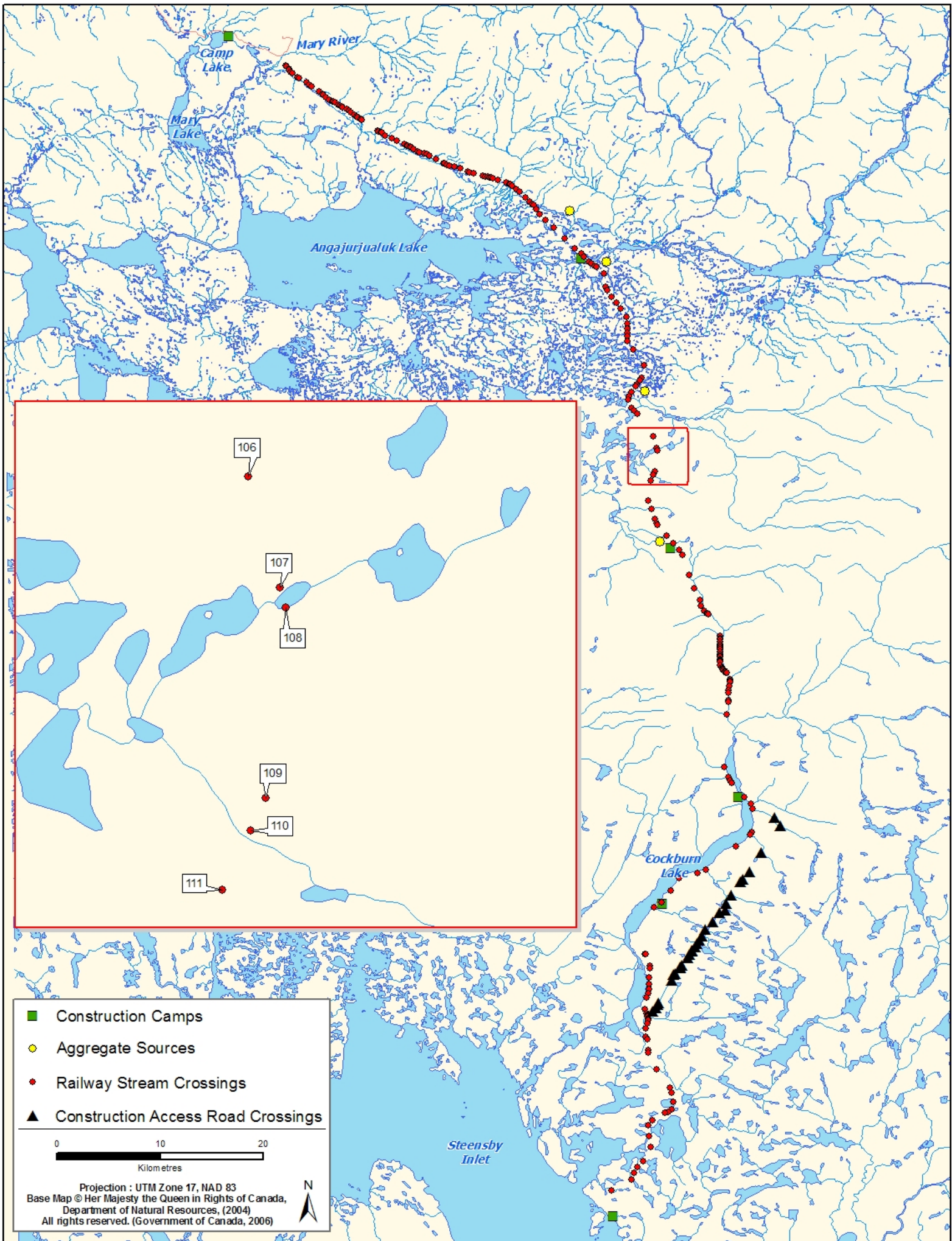
Wetted / Bankfull Width (m): lake/pond

Max. Depth (m): N/A

**Notes**

The large, unnamed lake/pond is ~100 m downstream. Low water downstream of the crossing site acts as a barrier.





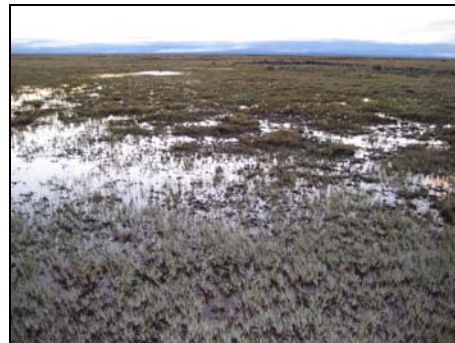




# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 106****UTM:** 17W 599076 / 7875790**Latitude / Longitude:** 70°57'56.289" N / 78°16'38.296" W**Date / Time Surveyed:** 11-Aug-07 / 23:10

**Figure 1:** View upstream of crossing 106



**Figure 2:** View across crossing 106 from right bank



**Figure 3:** View downstream of crossing 106

## Watercourse Characteristics

**Tributary Status:** 3<sup>rd</sup> order trib of large lake

**Channel Pattern:** flooded terrestrial

**Crossing Site**

**Bankfull Width (m):** undefined

**Wetted Width (m):** undefined (FT)

**Depth Profile (25%, 50%, 75%; m):** N/A

**Max. Depth (m):** N/M

**Flow Regime:** ephemeral

**Gradient (°):** 1

**Upstream**

**Wetted / Bankfull Width (m):** no water

**Max. Depth (m):** N/A

**Downstream**

**Wetted / Bankfull Width (m):** N/M

**Max. Depth (m):** N/M

## Notes

The large, unnamed lake is ~4 km downstream. Low water downstream of the crossing site acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 107

UTM: 17W 599410 / 7874632

Latitude / Longitude: 70°57'18.468" N / 78°16'10.457" W

Date / Time Surveyed: 11-Aug-07 / 23:25



Figure 1: View upstream of crossing 107



Figure 2: View across crossing 107 from left bank



Figure 3: View downstream of crossing 107

### Watercourse Characteristics

Tributary Status: 4<sup>th</sup> order trib of large lake

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): 36.60

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): isolated pond

Max. Depth (m): < 1.00

#### Downstream

Wetted / Bankfull Width (m): isolated pond

Max. Depth (m): < 1.00

### Notes

A small lake is ~1.5 km downstream and a large, unnamed lake is ~6 km downstream.

## Crossing ID: 108

UTM: 17W 599471 / 7874418

Latitude / Longitude: 70°57'11.480" N / 78°16'5.387" W

Date / Time Surveyed: 11-Aug-07 / 23:25



Figure 1: View upstream of crossing 108



Figure 2: View across crossing 108 from left bank



Figure 3: View downstream of crossing 108

### Watercourse Characteristics

Tributary Status: 4<sup>th</sup> order trib of large lake

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): 14.20

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.20

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): ~300.00 (lake/pond)

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): ~200.00 (lake/pond)

Max. Depth (m): N/A

### Notes

A small lake is ~1.5 km downstream and the large, unnamed lake is ~6 km downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 109

UTM: 17W 599262 / 7872425

Latitude / Longitude: 70°56'7.525" N / 78°16'34.869" W

Date / Time Surveyed: 11-Aug-07 / 23:25



Figure 1: View upstream of crossing 109



Figure 2: View across crossing 109 from left bank



Figure 3: View downstream of crossing 109

### Watercourse Characteristics

Tributary Status: 4<sup>th</sup> order trib of large lake

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 12.00

Wetted Width (m): 6.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.15

Flow Regime: intermittent – persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 8.00 / 12.00

Max. Depth (m): 0.10

#### Downstream

Wetted / Bankfull Width (m): 5.00-7.00 / > 10.00

Max. Depth (m): 0.10-0.30

### Notes

There is a small lake ~2 km downstream and a large, unnamed lake ~10 km downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 110

UTM: 17W 599099 / 7872088

Latitude / Longitude: 70°55'56.896" N / 78°16'52.439" W

Date / Time Surveyed: 11-Aug-07 / 23:40



Figure 1: View upstream of crossing 110



Figure 2: View across crossing 110 from left bank



Figure 3: View downstream of crossing 110

### Watercourse Characteristics

Tributary Status: 4<sup>th</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): N/M

### Notes

There is a small lake ~2 km downstream and a large, unnamed lake ~10 km downstream. Low water downstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 111**

UTM: 17W 598802 / 7871473

Latitude / Longitude: 70°55'37.496" N / 78°17'24.444" W

Date / Time Surveyed: 11-Aug-07 / 23:54

**Figure 1:** View upstream of crossing 111**Figure 2:** View across crossing 111 from left bank**Figure 3:** View downstream of crossing 111**Watercourse Characteristics**Tributary Status: 4<sup>th</sup> order trib of large lake

Channel Pattern: undefined

**Crossing Site**

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

**Upstream**

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

**Downstream**

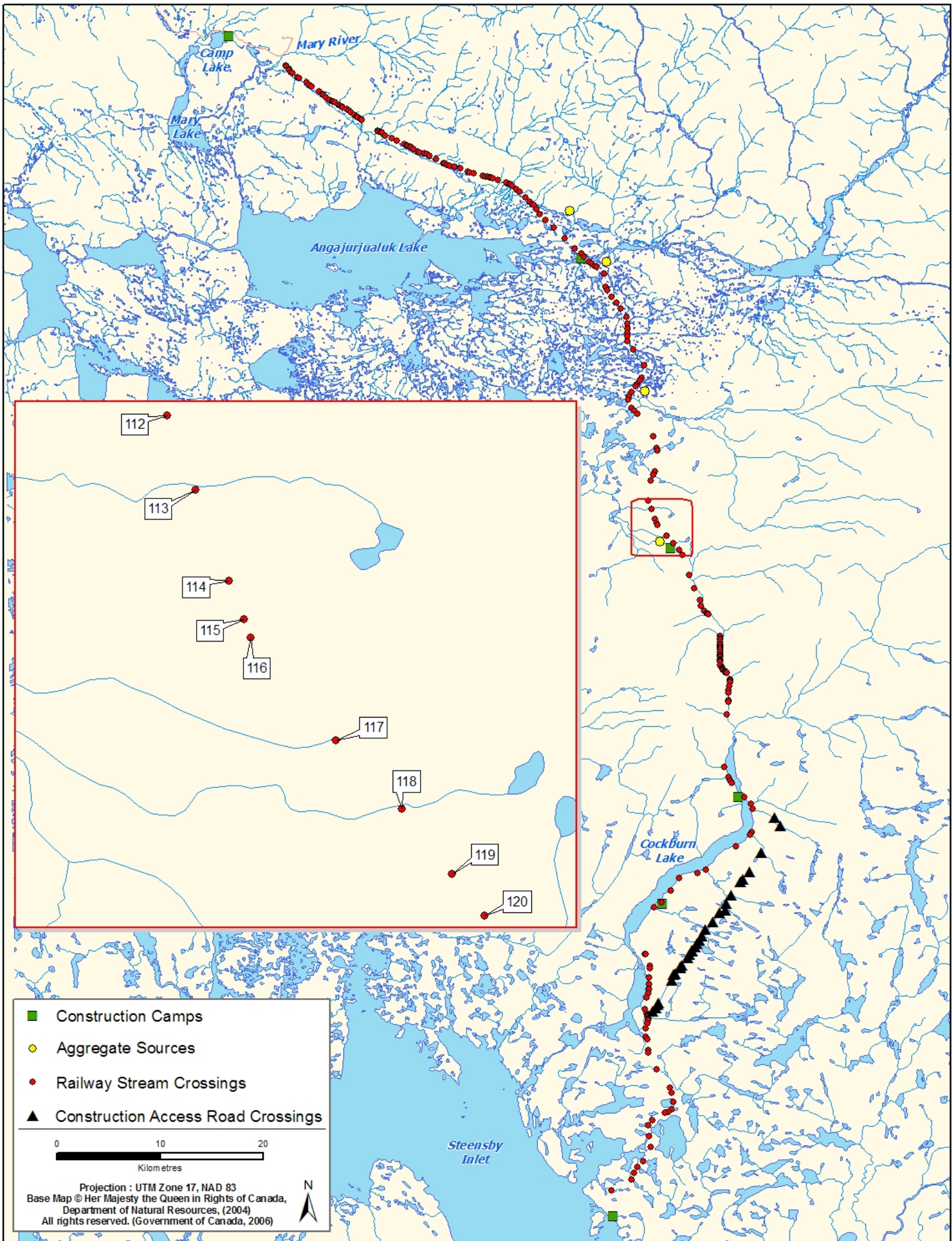
Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

**Notes**

There is a small lake ~1.5 km downstream and a large, unnamed lake ~10 km downstream.







# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 112****UTM:** 17W 598586 / 7869549**Latitude / Longitude:** 70°54'35.772" N / 78°17'54.202" W**Date / Time Surveyed:** 12-Aug-07 / 00:30

**Figure 1:** View upstream of crossing 112



**Figure 2:** View across crossing 112 from left bank



**Figure 3:** View downstream of crossing 112

## Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

**Crossing Site**

Bankfull Width (m): 5.00

Wetted Width (m): 2.10

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.22

Flow Regime: persistent

Gradient (°): 1

**Upstream**

Wetted / Bankfull Width (m): ~2.00 / > 4.00

Max. Depth (m): < 0.30

**Downstream**

Wetted / Bankfull Width (m): > 2.00 / > 4.00

Max. Depth (m): < 0.50

## Notes

The large, unnamed river is ~2.5 km downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 113

UTM: 17W 598881 / 7868768

Latitude / Longitude: 70°54'10.165" N / 78°17'28.580" W

Date / Time Surveyed: 12-Aug-07 / 00:20



Figure 1: View north of crossing 113



Figure 2: View east of crossing 113



Figure 3: View south of crossing 113

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 0.5

#### Upstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~2.5 km downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 114

UTM: 17W 599238 / 7867821

Latitude / Longitude: 70°53'39.116" N / 78°16'57.606" W

Date / Time Surveyed: 12-Aug-07 / 00:40



Figure 1: View upstream of crossing 114



Figure 2: View across crossing 114 from right bank

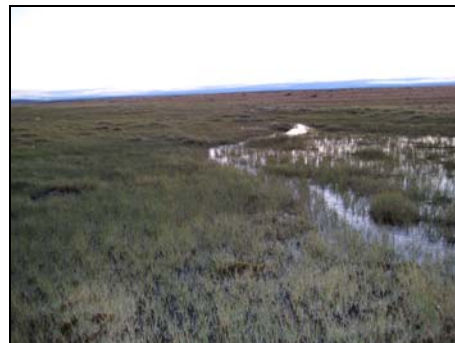


Figure 3: View downstream of crossing 114

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 14.0

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.05

Flow Regime: intermittent – ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): < 0.05

### Notes

The large, unnamed river is ~3 km downstream. Low water downstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 115

UTM: 17W 599391 / 7867415

Latitude / Longitude: 70°53'25.805" N / 78°16'44.340" W

Date / Time Surveyed: 12-Aug-07 / 00:45



Figure 1: View upstream of crossing 115



Figure 2: View across crossing 115 from right bank



Figure 3: View downstream of crossing 115

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~3 km downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 116

UTM: 17W 599465 / 7867227

Latitude / Longitude: 70°53'19.636" N / 78°16'37.889" W

Date / Time Surveyed: 12-Aug-07 / 00:50



Figure 1: View upstream of crossing 116



Figure 2: View across crossing 116 from right bank



Figure 3: View downstream of crossing 116

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~3.5 km downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 117

UTM: 17W 600353 / 7866153

Latitude / Longitude: 70°52'43.716" N / 78°15'15.293" W

Date / Time Surveyed: 12-Aug-07 / 00:35



Figure 1: View upstream of crossing 117

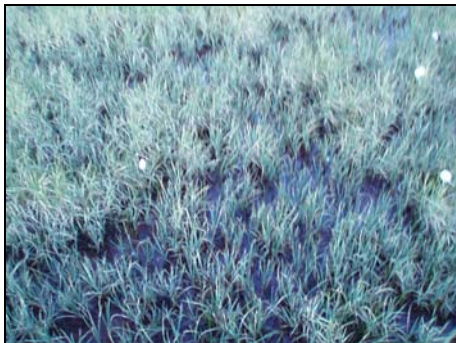


Figure 2: View across crossing 117 from left bank



Figure 3: View downstream of crossing 117

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 0.5

#### Upstream

Wetted / Bankfull Width (m): pond

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): undefined (FT)

Max. Depth (m): N/M

### Notes

The large, unnamed river is ~4.5 km downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 118

UTM: 17W 601043 / 7865435

Latitude / Longitude: 70°52'19.555" N / 78°14'10.649" W

Date / Time Surveyed: 12-Aug-07 / 01:01



Figure 1: View upstream of crossing 118

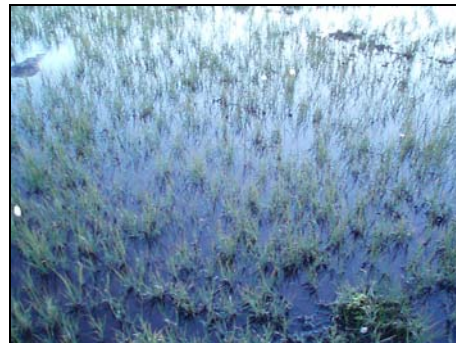


Figure 2: View across crossing 118 from right bank



Figure 3: View downstream of crossing 118

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): undefined (FT)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 50.00 (pond)

Max. Depth (m): < 1.00

#### Downstream

Wetted / Bankfull Width (m): 200.00 (pond)

Max. Depth (m): < 1.00

### Notes

The large, unnamed river is ~4 km downstream. There is a small, unnamed pond immediately downstream of the crossing. Low water downstream of the crossing site acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 119

UTM: 17W 601567 / 7864757

Latitude / Longitude: 70°51'56.923" N / 78°13'22.184" W

Date / Time Surveyed: 12-Aug-07 / 01:10



Figure 1: View upstream of crossing 119



Figure 2: View across crossing 119 from left bank



Figure 3: View downstream of crossing 119

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~2 km downstream.

## Crossing ID: 120

UTM: 17W 601901 / 7864318

Latitude / Longitude: 70°51'42.275" N / 78°12'51.339" W

Date / Time Surveyed: 12-Aug-07 / 01:20

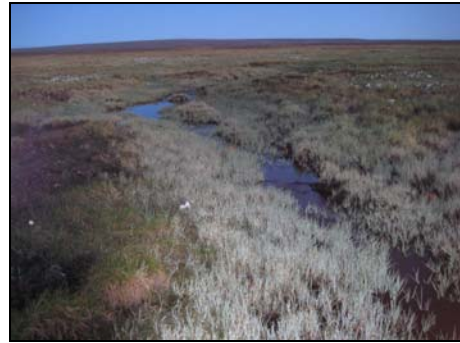


Figure 1: View upstream of crossing 120



Figure 2: View across crossing 120 from right bank



Figure 3: View downstream of crossing 120

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous, flooded terrestrial

#### Crossing Site

Bankfull Width (m): 5.00

Wetted Width (m): 1.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.09

Flow Regime: intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): N/M

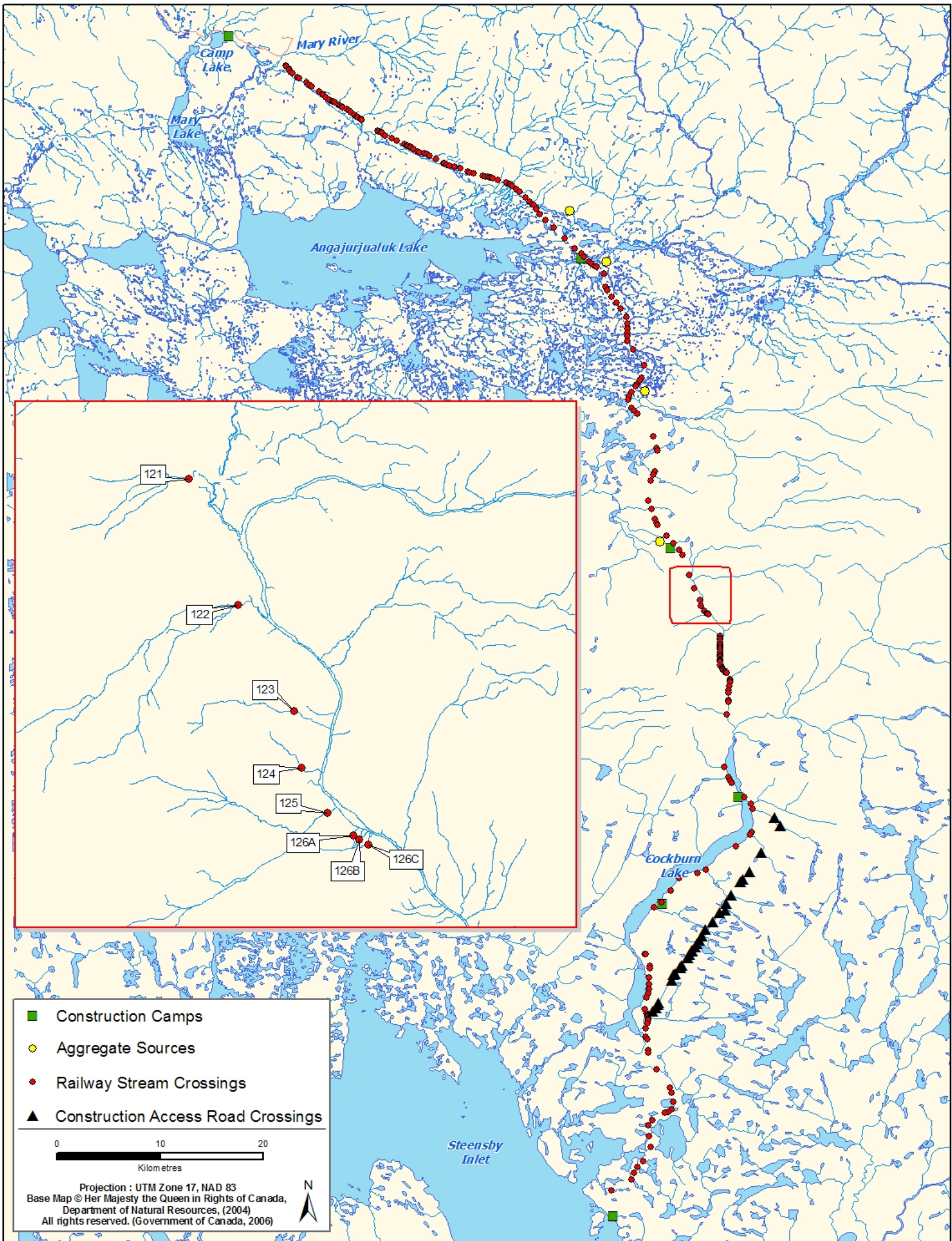
Max. Depth (m): N/M

### Notes

The large, unnamed river is ~1.5 km downstream. Low water downstream of the crossing site acts as a barrier.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 121

UTM: 17W 602535 / 7862393

Latitude / Longitude: 70°50'39.270" N / 78°11'57.779" W

Date / Time Surveyed: 12-Aug-07 / 01:55



Figure 1: View upstream of crossing 121

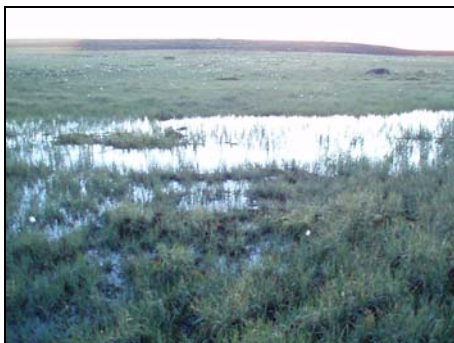


Figure 2: View across crossing 121 from right bank

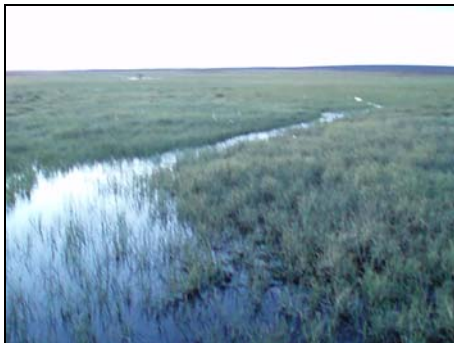


Figure 3: View downstream of crossing 121

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined  
Wetted Width (m): undefined (FT)  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): 0.05  
Flow Regime: intermittent – ephemeral  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined  
Max. Depth (m): ~0.05

#### Downstream

Wetted / Bankfull Width (m): undefined  
Max. Depth (m): ~0.05

### Notes

The large, unnamed river is ~400 m downstream.

## Crossing ID: 122

UTM: 17W 603047 / 7861074

Latitude / Longitude: 70°49'55.981" N / 78°11'13.521" W

Date / Time Surveyed: 12-Aug-07 / 01:54



Figure 1: View upstream of crossing 122



Figure 2: View across crossing 122 from left bank



Figure 3: View downstream of crossing 122

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined (boulder field)  
Wetted Width (m): undefined (under rocks)  
Depth Profile (25%, 50%, 75%; m): N/A  
Max Depth (m): N/A  
Flow Regime: intermittent  
Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): under rocks  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): 4.80 / flooded terrestrial  
Max. Depth (m): 0.15

### Notes

The large, unnamed river is ~400 m downstream. The stream flows under boulders downstream of the crossing site, creating a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 123

UTM: 17W 603631 / 7859970

Latitude / Longitude: 70°49'19.512" N / 78°10'21.272" W

Date / Time Surveyed: 21-Aug-07 / 02:10

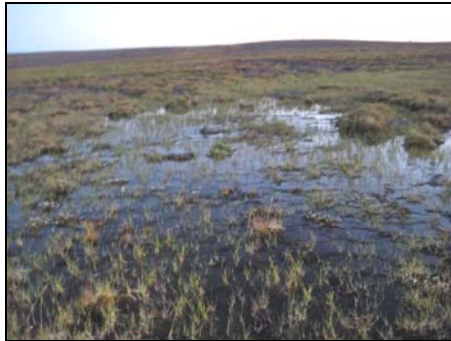


Figure 1: View upstream of crossing 123



Figure 2: View across crossing 123 from left bank



Figure 3: View downstream of crossing 123

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	undefined (FT)
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/M
Flow Regime:	intermittent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	undefined (FT)
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	undefined (FT)
Max. Depth (m):	N/M

### Notes

The large, unnamed river is ~600 m downstream. Low water between the river and the crossing site acts as a barrier.

## Crossing ID: 124

UTM: 17W 603710 / 7859376

Latitude / Longitude: 70°49'0.243" N / 78°10'16.243" W

Date / Time Surveyed: 12-Aug-07 / 02:25



Figure 1: View upstream of crossing 124



Figure 2: View across crossing 124 from left bank



Figure 3: View downstream of crossing 124

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	0.90
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.12
Flow Regime:	intermittent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

The large, unnamed river is ~300 m downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 125

UTM: 17W 603983 / 7858906

Latitude / Longitude: 70°48'44.679" N / 78°9'51.633" W

Date / Time Surveyed: 12-Aug-07 / 02:40



Figure 1: View upstream of crossing 125

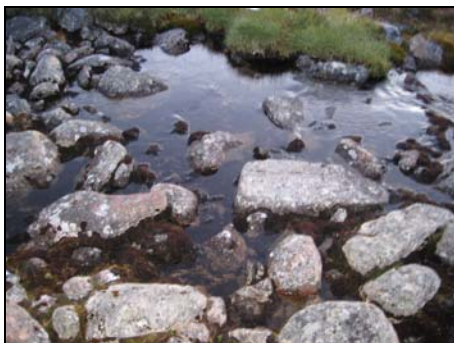


Figure 2: View across crossing 125 from left bank



Figure 3: View downstream of crossing 125

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 6.20

Wetted Width (m): 4.10

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.34

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): under rocks / 7.00

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream. The stream flows underground downstream of the crossing site, creating a barrier.

## Crossing ID: 126A

UTM: 17W 604250 / 7858671

Latitude / Longitude: 70°48'36.699" N / 78°9'26.541" W

Date / Time Surveyed: 12-Aug-07 / 02:55

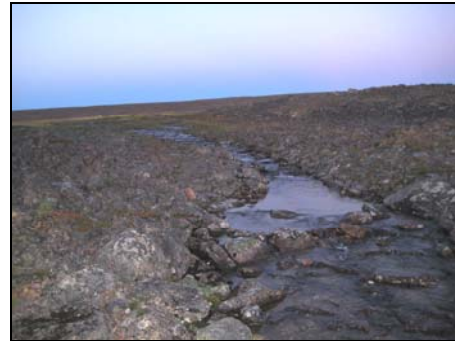


Figure 1: View upstream of crossing 126A



Figure 2: View across crossing 126A from left bank



Figure 3: View downstream of crossing 126A

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 8.20

Wetted Width (m): 5.50

Depth Profile (25%, 50%, 75%; m): 0.21, 0.33, 0.15

Max. Depth (m): 0.35

Flow Regime: persistent

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): 4.00-5.00 / > 6.00

Max. Depth (m): 0.30-0.40

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 126B

UTM: 17W 604315 / 7858630

Latitude / Longitude: 70°48'35.279" N / 78°9'20.359" W

Date / Time Surveyed: 12-Aug-07 / 03:10



Figure 1: View upstream of crossing 126B



Figure 2: View across crossing 126B from right bank



Figure 3: View downstream of crossing 126B

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided, straight

#### Crossing Site

Bankfull Width (m): 20.00

Wetted Width (m): 8.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.22

Flow Regime: persistent

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): 5.00-10.00 / >15.00

Max. Depth (m): 0.20-0.30

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.

A small cascade downstream of the crossing site acts as a partial barrier.

## Crossing ID: 126C

UTM: 17W 604408 / 7858576

Latitude / Longitude: 70°48'33.398" N / 78°9'11.493" W

Date / Time Surveyed: 12-Aug-07 / 03:25



Figure 1: View upstream of crossing 126C

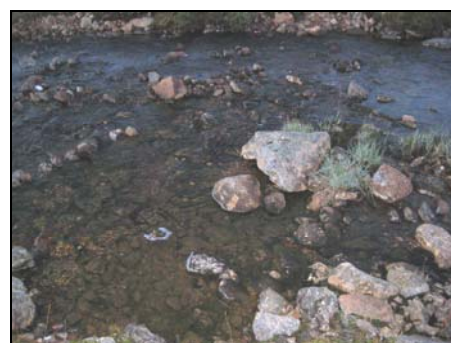


Figure 2: View across crossing 126C from right bank



Figure 3: View downstream of crossing 126C

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 9.50

Wetted Width (m): 9.00

Depth Profile (25%, 50%, 75%; m): 0.11, 0.05, 0.13

Max. Depth (m): 0.15

Flow Regime: persistent

Gradient (°): 2

#### Upstream

Wetted / Bankfull Width (m): 7.00-10.00 / >9.00

Max. Depth (m): 0.10-0.20

#### Downstream

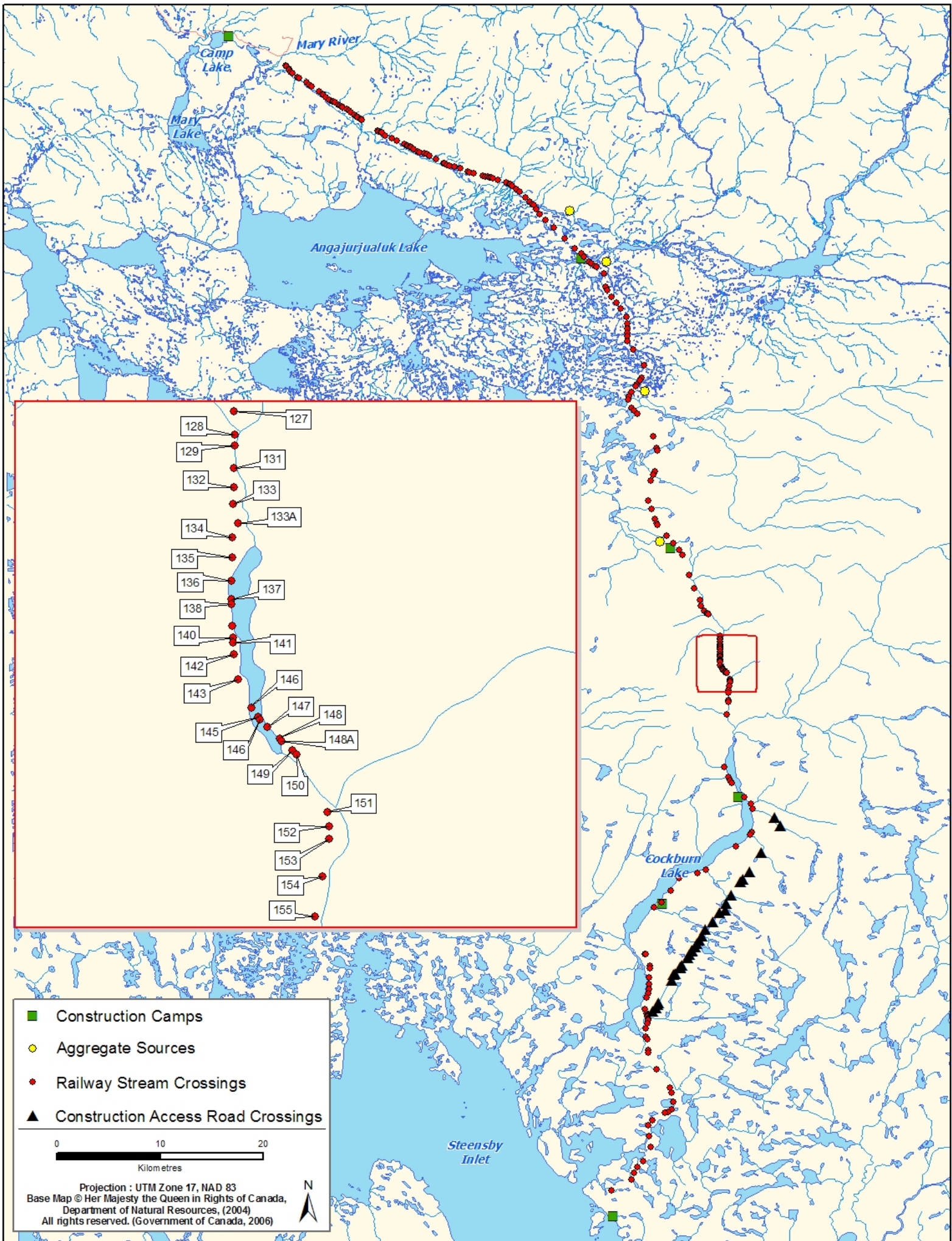
Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.









# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 127

UTM: 17W 605534 / 7856461

Latitude / Longitude: 70°47'23.499" N / 78°7'30.971" W

Date / Time Surveyed: 12-Aug-07 / 04:05



Figure 1: View upstream of crossing 127



Figure 2: View across crossing 127 from left bank



Figure 3: View downstream of crossing 127

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): 17.00  
Wetted Width (m): 10.20  
Depth Profile (25%, 50%, 75%; m): 0.15, 0.25, 0.30  
Max. Depth (m): 0.40  
Flow Regime: persistent  
Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): ~12.00 / 17.00  
Max. Depth (m): ~0.40

#### Downstream

Wetted / Bankfull Width (m): ~8.00 / 17.00  
Max. Depth (m): ~0.40

### Notes

The large, unnamed river is ~300 m downstream.

## Crossing ID: 128

UTM: 17W 605545 / 7856216

Latitude / Longitude: 70°47'15.584" N / 78°7'31.032" W

Date / Time Surveyed: 12-Aug-07 / 04:30



Figure 1: View upstream of crossing 128



Figure 2: View across crossing 128 from left bank



Figure 3: View downstream of crossing 128

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): N/M (MSC)  
Wetted Width (m): 1.00  
Depth Profile (25%, 50%, 75%; m): 0.10, 0.10, 0.15  
Max. Depth (m): 0.30  
Flow Regime: intermittent – persistent  
Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river  
Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream. Barriers near the crossing site include a small cascade downstream and the point upstream where the stream goes underground.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 129

UTM: 17W 605542 / 7856101

Latitude / Longitude: 70°47'11.881" N / 78°7'31.859" W

Date / Time Surveyed: 12-Aug-07 / 04:52



Figure 1: View upstream of crossing 129



Figure 2: View across crossing 129 from left bank



Figure 3: View downstream of crossing 129

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined (boulder field)

Wetted Width (m): undefined (under rocks)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): 6

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.

## Crossing ID: 130 & 131

UTM: 17W 605537 / 7855864

Latitude / Longitude: 70°47'4.248" N / 78°7'33.448" W

Date / Time Surveyed: 12-Aug-07 / 05:21



Figure 1: View upstream of crossings 130 & 131



Figure 2: View across crossings 130 & 131 from right bank



Figure 3: View downstream of crossings 130 & 131

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width: 0.70

Wetted Width (m): 0.50

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.19

Flow Regime: intermittent

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream. Low water between the river and the crossing site acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 132

UTM: 17W 605533 / 7855668

Latitude / Longitude: 70°46'57.936" N / 78°7'34.749" W

Date / Time Surveyed: 12-Aug-07 / 05:14



Figure 1: View upstream of crossing 132



Figure 2: View across crossing 132 from left bank



Figure 3: View downstream of crossing 132

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided, sinuous

#### Crossing Site

Bankfull Width (m): 12.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): >15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

There is a large, unnamed river ~300 m downstream.

## Crossing ID: 133

UTM: 17W 605529 / 7855489

Latitude / Longitude: 70°46'52.171" N / 78°7'35.971" W

Date / Time Surveyed: 12-Aug-07 / 05:02



Figure 1: View upstream of crossing 133



Figure 2: View across crossing 133 from right bank



Figure 3: View downstream of crossing 133

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 5.80

Wetted Width (m): 4.80

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.16

Flow Regime: intermittent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): 3.00-4.00 / > 4.00

Max. Depth (m): < 0.15

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

There is a large, unnamed river ~300 m downstream. Cascades between the river and the crossing site act as a partial barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 133A

UTM: 17W 605577 / 7855287

Latitude / Longitude: 70°46'45.586" N / 78°7'32.211" W

Date / Time Surveyed: 12-Aug-07 / 04:55



Figure 1: View upstream of crossing 133A



Figure 2: View across crossing 133A from left bank

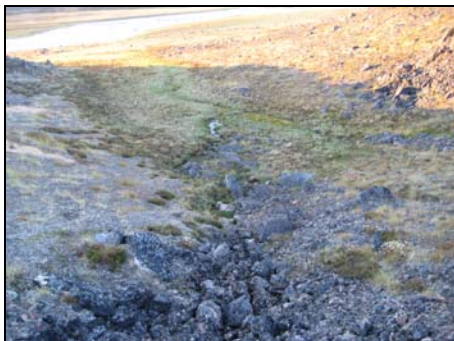


Figure 3: View downstream of crossing 133A

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): 0.50

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): >15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

There is a large, unnamed river ~300 m downstream.

## Crossing ID: 134

UTM: 17W 605521 / 7855138

Latitude / Longitude: 70°46'40.868" N / 78°7'38.382" W

Date / Time Surveyed: 12-Aug-07 / 04:50

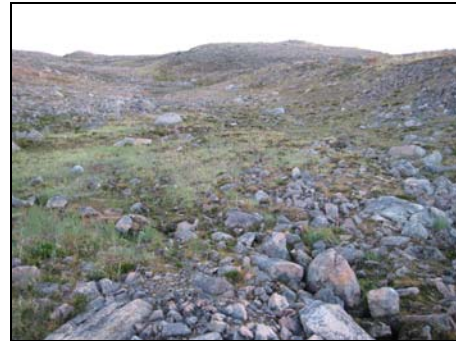


Figure 1: View upstream of crossing 134



Figure 2: View across crossing 134 from left bank



Figure 3: View downstream of crossing 134

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous to meandering

#### Crossing Site

Bankfull Width (m): 11.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 5

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

There is a large, unnamed river ~500 m downstream. There is a steep set of cascades between the river and the crossing site that would act as a barrier even if water were present.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 135

UTM: 17W 605517 / 7854932

Latitude / Longitude: 70°46'34.233" N / 78°7'39.728" W

Date / Time Surveyed: 12-Aug-07 / 04:45



Figure 1: View upstream of crossing 135



Figure 2: View across crossing 135 from right bank



Figure 3: View downstream of crossing 135

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous to meandering

#### Crossing Site

Bankfull Width (m):	20.00
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	8

#### Upstream

Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

#### Downstream

Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~200 m downstream. Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.

## Crossing ID: 136

UTM: 17W 605511 / 7854689

Latitude / Longitude: 70°46'26.408" N / 78°7'41.441" W

Date / Time Surveyed: 12-Aug-07 / 04:38



Figure 1: View upstream of crossing 136



Figure 2: View across crossing 136 from left bank

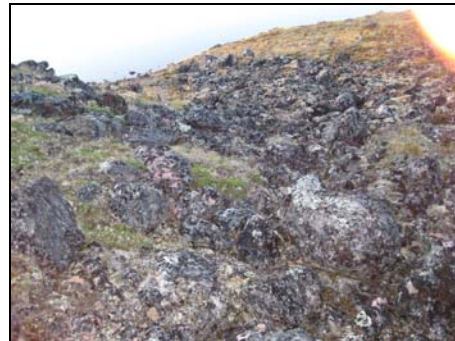


Figure 3: View downstream of crossing 136

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous

#### Crossing Site

Bankfull Width (m):	2.00
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	45

#### Upstream

Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

#### Downstream

Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~50 m downstream. Barriers near the crossing include a very steep gradient both upstream and downstream of the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 137

UTM: 17W 605508 / 7854493

Latitude / Longitude: 70°46'20.094" N / 78°7'42.643" W

Date / Time Surveyed: 12-Aug-07 / 04:31



Figure 1: View upstream of crossing 137



Figure 2: View across crossing 137 from right bank

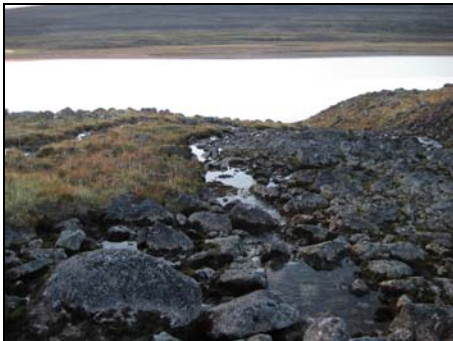


Figure 3: View downstream of crossing 137

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 6.00

Wetted Width (m): 6.00

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.08

Flow Regime: intermittent

Gradient (°): >15

#### Upstream

Wetted / Bankfull Width (m): N/A

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream.

Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.

## Crossing ID: 138

UTM: 17W 605509 / 7854445

Latitude / Longitude: 70°46'18.545" N / 78°7'42.767" W

Date / Time Surveyed: 12-Aug-07 / 04:28



Figure 1: View upstream of crossing 138



Figure 2: View across crossing 138 from right bank

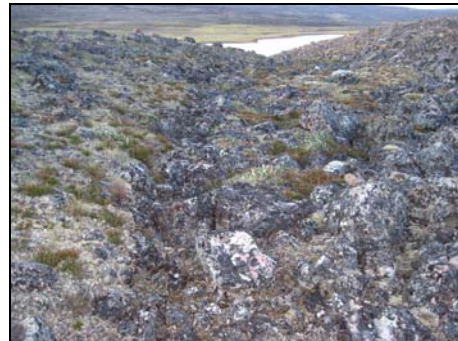


Figure 3: View downstream of crossing 138

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 1.50

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 10-15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.

Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 139

UTM: 17W 605519 / 7854217

Latitude / Longitude: 70°46'11.179" N / 78°7'42.845" W

Date / Time Surveyed: 12-Aug-07 / 04:23

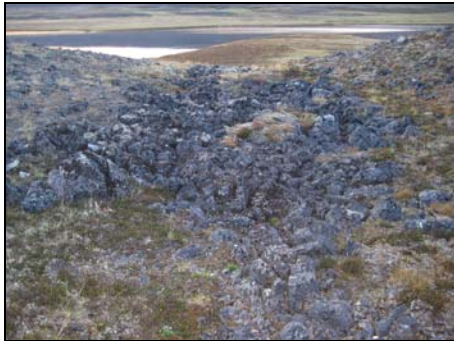


Figure 1: View upstream of crossing 139



Figure 2: View across crossing 139 from right bank



Figure 3: View downstream of crossing 139

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 2.50

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream. Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.

## Crossing ID: 140

UTM: 17W 605524 / 7854093

Latitude / Longitude: 70°46'7.174" N / 78°7'42.931" W

Date / Time Surveyed: 12-Aug-07 / 04:20



Figure 1: View upstream of crossing 140



Figure 2: View across crossing 140 from right bank



Figure 3: View downstream of crossing 140

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): 0.90

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): >15

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

A large, unnamed river is ~200 m downstream. Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 141

UTM: 17W 605526 / 7854046

Latitude / Longitude: 70°46'5.655" N / 78°7'42.953" W

Date / Time Surveyed: 12-Aug-07 / 04:15



Figure 1: View upstream of crossing 141



Figure 2: View across crossing 141 from left bank



Figure 3: View downstream of crossing 141

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): 4.00

Wetted Width (m): 4.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): nearly dry

Flow Regime: intermittent

Gradient (°): >15

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~200 m downstream. Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.

## Crossing ID: 142

UTM: 17W 605532 / 7853919

Latitude / Longitude: 70°46'1.552" N / 78°7'42.954" W

Date / Time Surveyed: 12-Aug-07 / 04:10



Figure 1: View upstream of crossing 142



Figure 2: View across crossing 142 from right bank

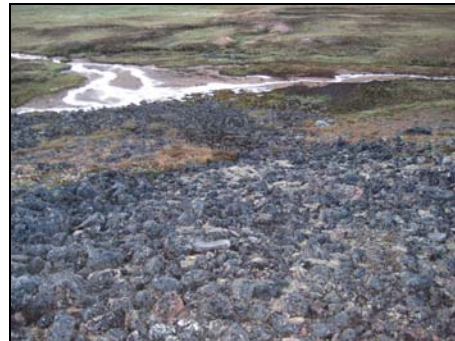


Figure 3: View downstream of crossing 142

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large river

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 12

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~300 m downstream. Barriers near the crossing include a steep gradient both upstream and downstream of the crossing.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 143

UTM: 17W 605581 / 7853657

Latitude / Longitude: 70°45'53.031" N / 78°7'39.376" W

Date / Time Surveyed: 12-Aug-07 / 04:05



Figure 1: View upstream of crossing 143



Figure 2: View across crossing 143 from right bank



Figure 3: View downstream of crossing 143

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: slightly meandering

#### Crossing Site

Bankfull Width (m): 1.50

Wetted Width (m): 0.80

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.06

Flow Regime: intermittent – persistent

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): < 1.00 / ~1.00

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~300 m downstream. Low water between the river and the crossing may act as a barrier.

## Crossing ID: 144

UTM: 17W 605717 / 7853363

Latitude / Longitude: 70°45'43.345" N / 78°7'27.441" W

Date / Time Surveyed: 12-Aug-07 / 22:15



Figure 1: View upstream of crossing 144



Figure 2: View across crossing 144 from left bank



Figure 3: View downstream of crossing 144

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: meandering

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): 5.60

Depth Profile (25%, 50%, 75%; m): 0.05 on average

Max. Depth (m): 0.10

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): 1.20 / undefined

Max. Depth (m): 0.50

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~100 m downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 145

UTM: 17W 605789 / 7853263

Latitude / Longitude: 70°45'40.011" N / 78°7'20.865" W

Date / Time Surveyed: 12-Aug-07 / 22:35



Figure 1: View upstream of crossing 145



Figure 2: View across crossing 145 from left bank

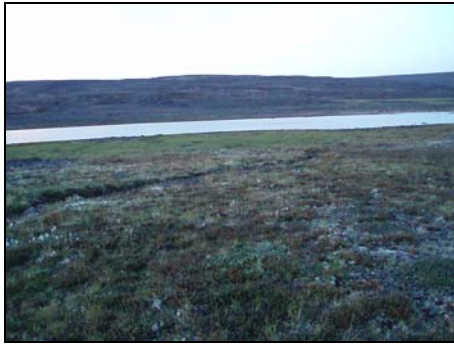


Figure 3: View downstream of crossing 145

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	11.40
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~100 m downstream.

## Crossing ID: 146

UTM: 17W 605809 / 7853239

Latitude / Longitude: 70°45'39.206" N / 78°7'19.021" W

Date / Time Surveyed: 12-Aug-07 / 22:40

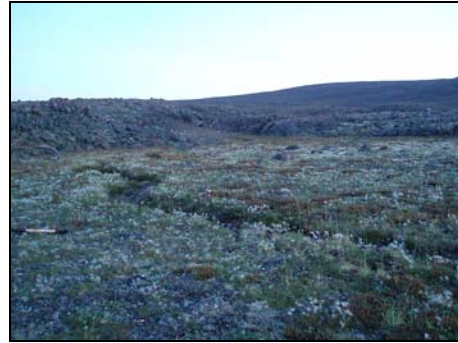


Figure 1: View upstream of crossing 146



Figure 2: View across crossing 146 from left bank

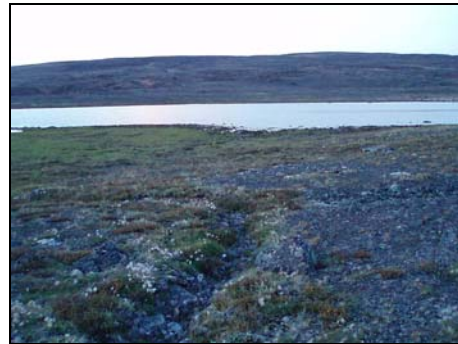


Figure 3: View downstream of crossing 146

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	Y-shaped
<b>Crossing Site</b>	
Bankfull Width (m):	0.50
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~100 m downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 147

UTM: 17W 605884 / 7853158

Latitude / Longitude: 70°45'36.480" N / 78°7'12.065" W

Date / Time Surveyed: 12-Aug-07 / 22:54



Figure 1: View upstream of crossing 147



Figure 2: View across crossing 147 from left bank



Figure 3: View downstream of crossing 147

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): ~4.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral – intermittent

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream.

## Crossing ID: 148

UTM: 17W 606017 / 7853036

Latitude / Longitude: 70°45'32.343" N / 78°6'59.630" W

Date / Time Surveyed: 12-Aug-07 / 23:08



Figure 1: View upstream of crossing 148



Figure 2: View across crossing 148 from left bank



Figure 3: View downstream of crossing 148

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): undefined (MSC)

Wetted Width (m): nearly dry

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): N/M

Flow Regime: ephemeral – intermittent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): nearly dry

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 148A

UTM: 17W 606029 / 7853015

Latitude / Longitude: 70°45'31.648" N / 78°6'58.555" W

Date / Time Surveyed: 12-Aug-07 / 23:20



Figure 1: View upstream of crossing 148 A



Figure 2: View across crossing 148 A from left bank



Figure 3: View downstream of crossing 148 A

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): N/M (MSC)

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: intermittent – persistent

Gradient (°): moderate

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream.

## Crossing ID: 149

UTM: 17W 606144 / 7852920

Latitude / Longitude: 70°45'28.409" N / 78°6'47.755" W

Date / Time Surveyed: 12-Aug-07 / 23:25



Figure 1: View upstream of crossing 149



Figure 2: View across crossing 149 from left bank



Figure 3: View downstream of crossing 149

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined (MSC)

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): moderate

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): large river

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~50 m downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 150

UTM: 17W 606194 / 7852876

Latitude / Longitude: 70°45'26.914" N / 78°6'43.072" W

Date / Time Surveyed: 12-Aug-07 / 23:44



Figure 1: View upstream of crossing 150

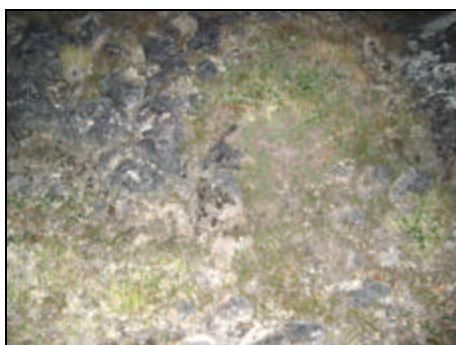


Figure 2: View across crossing 150 from left bank



Figure 3: View downstream of crossing 150

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	0.50
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	5
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~50 m downstream.

## Crossing ID: 151

UTM: 17W 606509 / 7852269

Latitude / Longitude: 70°45'6.861" N / 78°6'15.115" W

Date / Time Surveyed: 12-Aug-07 / 23:31



Figure 1: View upstream of crossing 151



Figure 2: View across crossing 151 from left bank



Figure 3: View downstream of crossing 151

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous to meandering
<b>Crossing Site</b>	
Bankfull Width (m):	2.50
Wetted Width (m):	2.00
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	N/M
Flow Regime:	ephemeral – intermittent
Gradient (°):	9
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

The large, unnamed river is ~500 m downstream. Low water between the river and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 152

UTM: 17W 606528 / 7852123

Latitude / Longitude: 70°45'2.125" N / 78°6'13.940" W

Date / Time Surveyed: 12-Aug-07 / 23:27



Figure 1: View upstream of crossing 152



Figure 2: View across crossing 152 from left bank



Figure 3: View downstream of crossing 152

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 8

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~500 m downstream.

## Crossing ID: 153

UTM: 17W 606531 / 7851992

Latitude / Longitude: 70°44'57.897" N / 78°6'14.258" W

Date / Time Surveyed: 12-Aug-07 / 23:21



Figure 1: View upstream of crossing 153



Figure 2: View across crossing 153 from right bank



Figure 3: View downstream of crossing 153

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: sinuous to meandering

#### Crossing Site

Bankfull Width (m): 2.40

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 7

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed river is ~600 m downstream.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 154

UTM: 17W 606463 / 7851596

Latitude / Longitude: 70°44'45.235" N / 78°6'22.749" W

Date / Time Surveyed: 12-Aug-07 / 23:13



Figure 1: View upstream of crossing 154



Figure 2: View across crossing 154 from left bank



Figure 3: View downstream of crossing 154

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous to meandering
<b>Crossing Site</b>	
Bankfull Width (m):	2.80
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral - intermittent
Gradient (°):	10
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~100 m downstream.

## Crossing ID: 155

UTM: 17W 606378 / 7851181

Latitude / Longitude: 70°44'31.987" N / 78°6'32.985" W

Date / Time Surveyed: 12-Aug-07 / 23:04

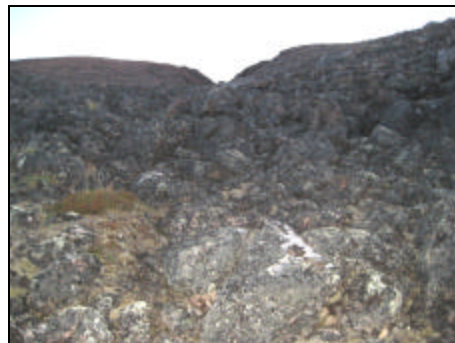


Figure 1: View upstream of crossing 155



Figure 2: View across crossing 155 from left bank



Figure 3: View downstream of crossing 155

### Watercourse Characteristics

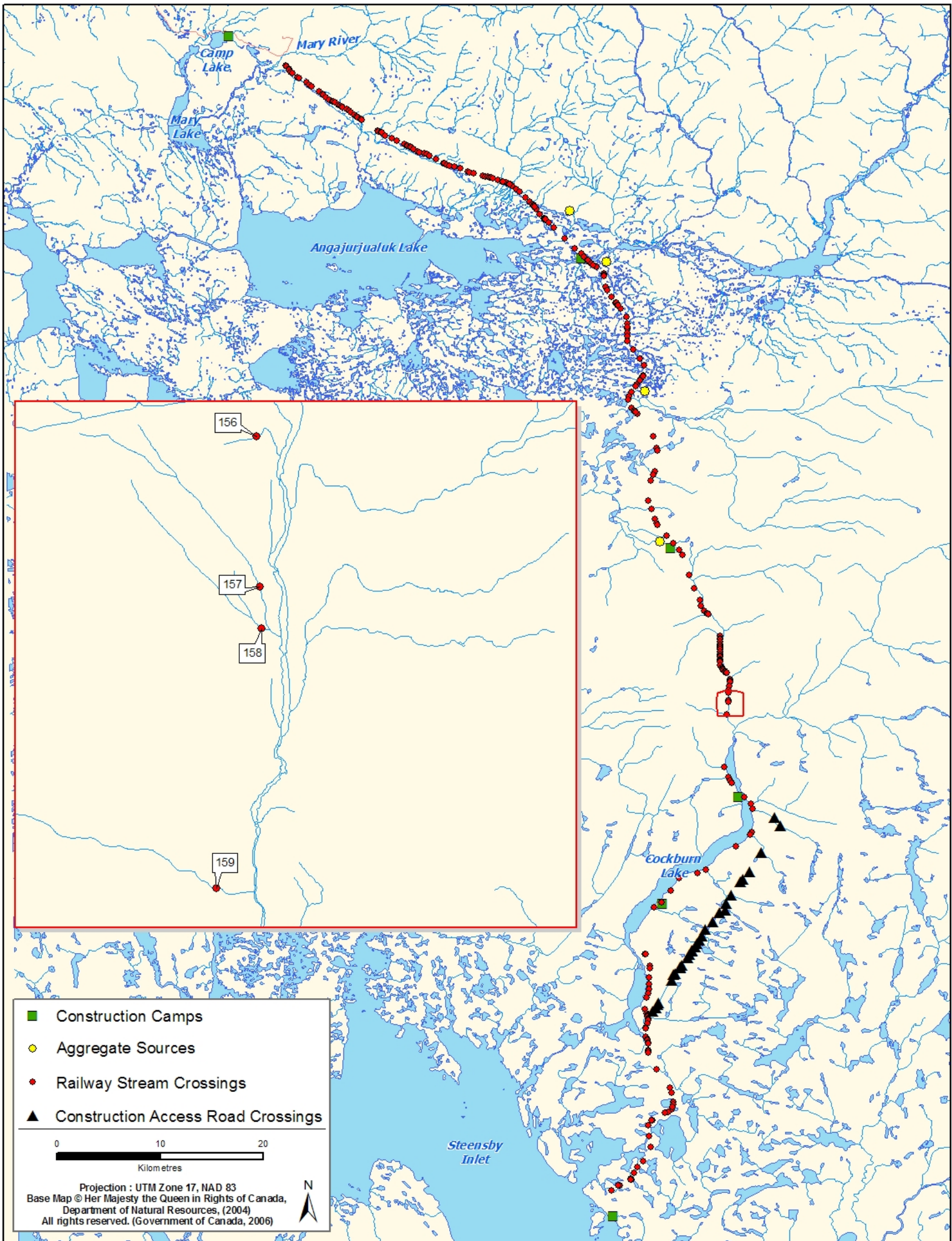
Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	0.80
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	30-40
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~50 m downstream. The steep gradient between the river and the crossing acts as a barrier.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 156

UTM: 17W 606363 / 7850947

Latitude / Longitude: 70°44'24.467" N / 78°6'35.540" W

Date / Time Surveyed: 12-Aug-07 / 22:57



Figure 1: View upstream of crossing 156



Figure 2: View across crossing 156 from left bank



Figure 3: View downstream of crossing 156

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	1.50
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	20-30
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~200 m downstream. The steep gradient between the river and the crossing acts as a barrier.

## Crossing ID: 157

UTM: 17W 606380 / 7850253

Latitude / Longitude: 70°44'2.067" N / 78°6'37.109" W

Date / Time Surveyed: 12-Aug-07 / 22:45



Figure 1: View upstream of crossing 157



Figure 2: View across crossing 157 from right bank

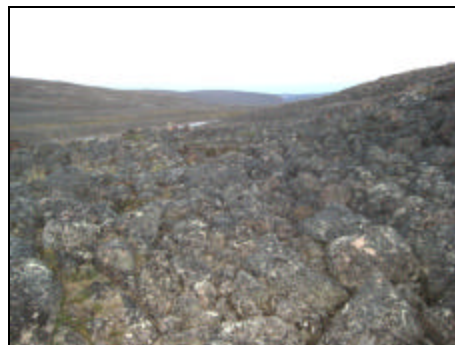


Figure 3: View downstream of crossing 157

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of large river
Channel Pattern:	undefined
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	12
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~300 m downstream. The steep gradient between the river and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 158

UTM: 17W 606385 / 7850060

Latitude / Longitude: 70°43'55.837" N / 78°6'37.519" W

Date / Time Surveyed: 12-Aug-07 / 22:40



Figure 1: View upstream of crossing 158



Figure 2: View across crossing 158 from left bank



Figure 3: View downstream of crossing 158

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	N/M
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~100 m downstream. The steep gradient between the river and the crossing acts as a barrier.

## Crossing ID: 159

UTM: 17W 606178 / 7848859

Latitude / Longitude: 70°43'17.437" N / 78°7'3.300" W

Date / Time Surveyed: 12-Aug-07 / 22:15



Figure 1: View upstream of crossing 159



Figure 2: View across crossing 159 from left bank



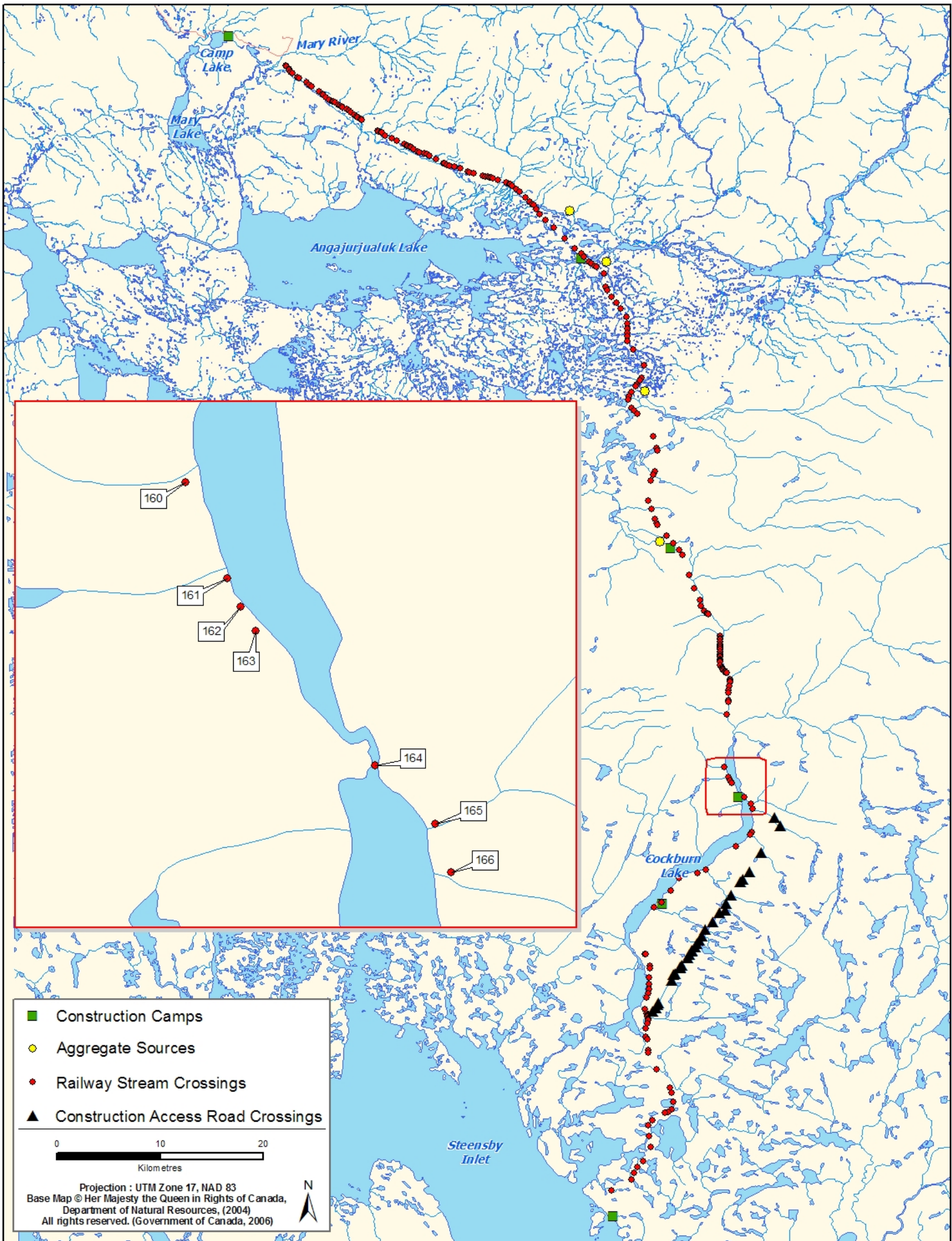
Figure 3: View downstream of crossing 159

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	sinuous to meandering
<b>Crossing Site</b>	
Bankfull Width (m):	8.00
Wetted Width (m):	7.50
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.28
Flow Regime:	persistent
Gradient (°):	15
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	large river
Max. Depth (m):	N/A

### Notes

The large, unnamed river is ~200 m downstream. Falls between the river and the crossing site act as barriers.







# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 160

UTM: 17W 605935 / 7843777

Latitude / Longitude: 70°40'33.971" N / 78°7'50.467" W

Date / Time Surveyed: 13-Aug-07 / 21:10



Figure 1: Aerial view of area near crossing 160



Figure 2: Another aerial view of area near crossing 160

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.20

Flow Regime: persistent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.20

#### Downstream

Wetted / Bankfull Width (m): Cockburn River/Lake

Max. Depth (m): N/A

### Notes

Cockburn River/Lake is ~200 m downstream. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

## Crossing ID: 161

UTM: 17W 606371 / 7842771

Latitude / Longitude: 70°40'0.872" N / 78°7'12.670" W

Date / Time Surveyed: 13-Aug-07 / 21:11



Figure 1: Aerial view of area near crossing 161



Figure 2: Another aerial view of area near crossing 161

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large river

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.10

Flow Regime: persistent – intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): Cockburn River/Lake

Max. Depth (m): N/A

### Notes

Cockburn River/Lake is ~100 m downstream. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 162

UTM: 17W 606508 / 7842476

Latitude / Longitude: 70°39'51.152" N / 78°7'0.703" W

Date / Time Surveyed: 13-Aug-07 / 21:12



Figure 1: Aerial view of area near crossing 162



Figure 2: Another aerial view of area near crossing 162

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.10
Flow Regime:	persistent – intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.10
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn River/Lake
Max. Depth (m):	N/A

### Notes

Cockburn River/Lake is ~200 m downstream. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

## Crossing ID: 163

UTM: 17W 606663 / 7842226

Latitude / Longitude: 70°39'42.855" N / 78°6'46.780" W

Date / Time Surveyed: 13-Aug-07 / 21:12



Figure 1: Aerial view of area near crossing 163



Figure 2: Another aerial view of area near crossing 163

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	straight, braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.10 - nearly dry
Flow Regime:	persistent – intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.10
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn River/Lake
Max. Depth (m):	N/A

### Notes

Cockburn River/Lake is ~200 m downstream. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 164

UTM: 17W 607916 / 7840822

Latitude / Longitude: 70°38'55.660" N / 78°4'51.458" W

Date / Time Surveyed: 13-Aug-07 / 03:59



Figure 1: View upstream of crossing 164

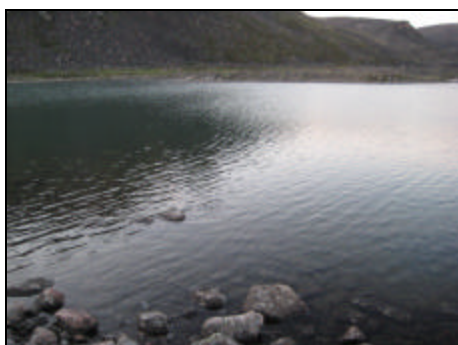


Figure 2: View across crossing 164 from left bank



Figure 3: View downstream of crossing 164

### Watercourse Characteristics

Tributary Status: Cockburn Lake

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 146.30

Wetted Width (m): 138.10

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): > 1.00

Flow Regime: persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

### Notes

This is the site where the proposed rail route will cross Cockburn Lake itself.

## Crossing ID: 165

UTM: 17W 608545 / 7840211

Latitude / Longitude: 70°38'34.984" N / 78°3'53.182" W

Date / Time Surveyed: 13-Aug-07 / 03:10



Figure 1: View upstream of crossing 165

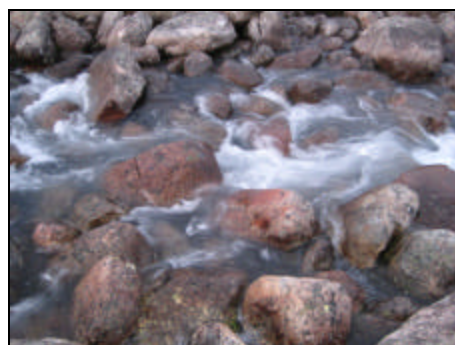


Figure 2: View across crossing 165 from left bank



Figure 3: View downstream of crossing 165

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: sinuous

#### Crossing Site

Bankfull Width (m): 8.00

Wetted Width (m): 7.00

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): ~0.40

Flow Regime: persistent

Gradient (°): 8-10

#### Upstream

Wetted / Bankfull Width (m): 4.00-8.00 / 5.00-10.00

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing. Cascades upstream and downstream of the crossing act as partial barriers.



# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 166****UTM:** 17W 608709 / 7839705**Latitude / Longitude:** 70°38'18.416" N / 78°3'39.625" W**Date / Time Surveyed:** 12-Aug-07 / 03:02

**Figure 1:** View upstream of crossing 166



**Figure 2:** View across crossing 166 from left bank



**Figure 3:** View downstream of crossing 166

## Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: sinuous

**Crossing Site**

Bankfull Width (m): 12.80

Wetted Width (m): 11.00

Depth Profile (25%, 50%, 75%; m): 0.40, 0.40, 0.60

Max. Depth (m): 0.75

Flow Regime: persistent

Gradient (°): 5-8

**Upstream**

Wetted / Bankfull Width (m): 5.00-10.00 / 10.00-15.00

Max. Depth (m): < 0.50

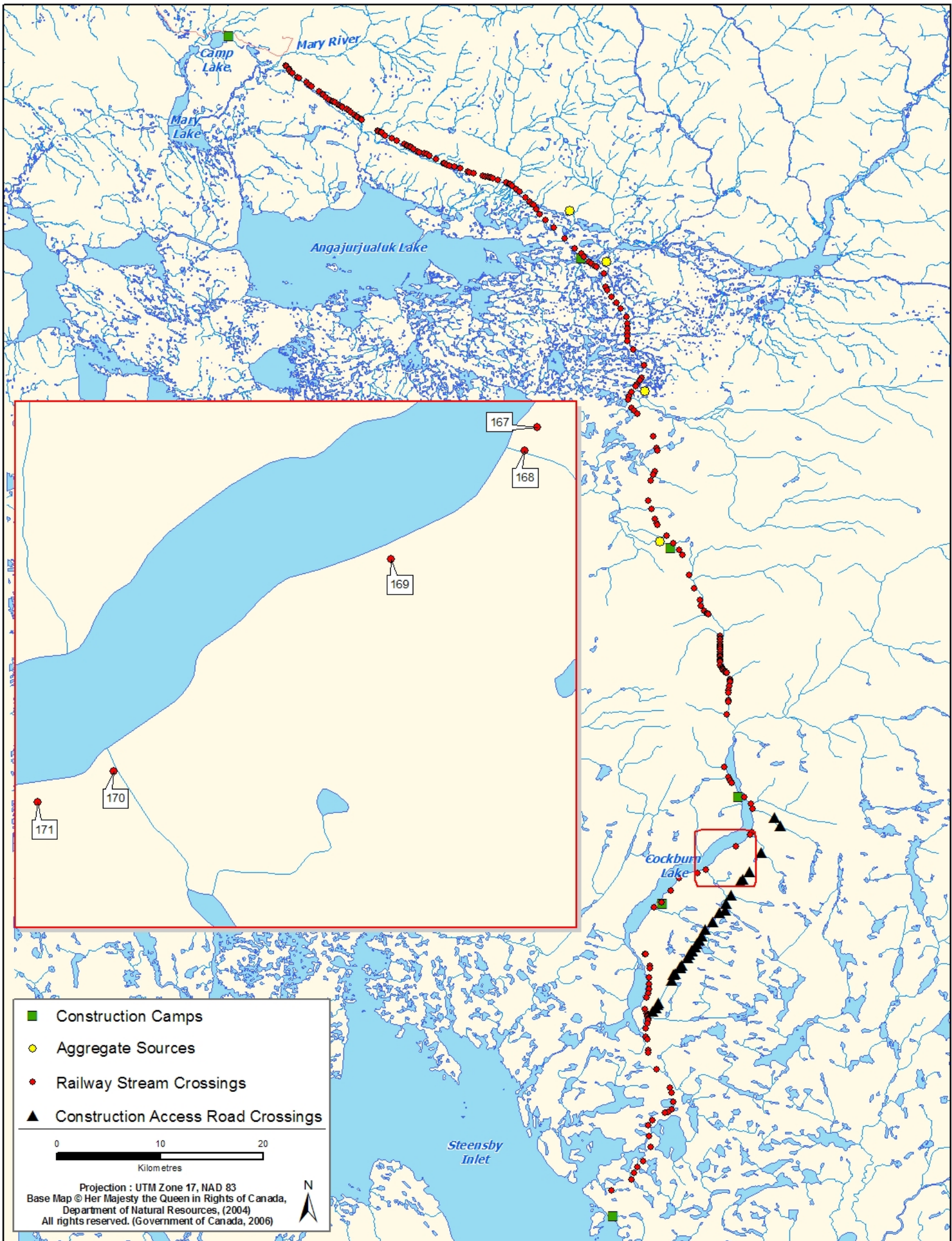
**Downstream**

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

## Notes

Cockburn Lake is located ~100 m downstream of the crossing. Cascades upstream and downstream of the crossing act as partial barriers.







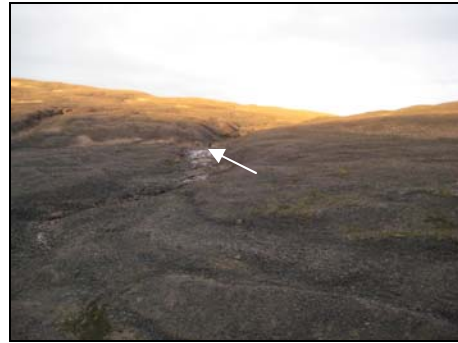
# Rail Alignment Watercourse Crossing Assessments

**Crossing ID:** 167

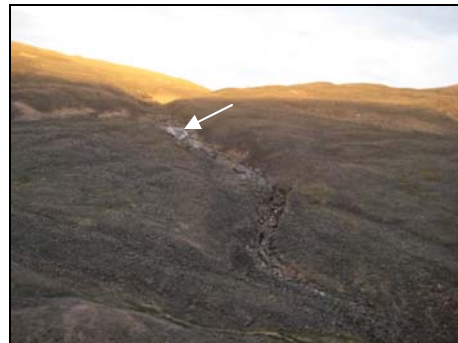
**UTM:** 17W 608594 / 7837414

**Latitude / Longitude:** 70°37'4.740" N / 78°4'1.559" W

**Date / Time Surveyed:** 13-Aug-07 / 21:30



**Figure 1:** Aerial view of area near crossing 167 (white arrow)



**Figure 2:** Another aerial view of area near crossing 167 (white arrow)

## Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	no water or nearly none
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

## Notes

Cockburn Lake is located ~100 m downstream of the crossing. The steep gradient and low water upstream and downstream of the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 168

UTM: 17W 608459 / 7837169

Latitude / Longitude: 70°36'57.052" N / 78°4'15.811" W

Date / Time Surveyed: 13-Aug-07 / 21:30



Figure 1: Aerial view of area near crossing 168 (white arrow)

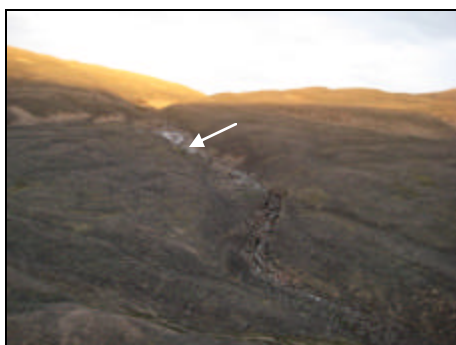


Figure 2: Another aerial view of area near crossing 168 (white arrow)

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.20
Flow Regime:	persistent - intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

## Crossing ID: 169

UTM: 17W 607062 / 7836041

Latitude / Longitude: 70°36'22.846" N / 78°6'36.619" W

Date / Time Surveyed: 13-Aug-07 / 21:32



Figure 1: Aerial view of area near crossing 169

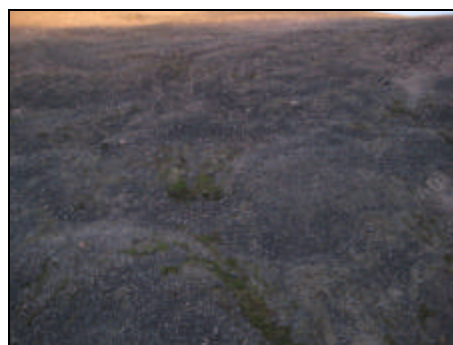


Figure 2: Another aerial view of area near crossing 169

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing. The steep gradient and low water upstream and downstream of the crossing acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 170

UTM: 17W 604171 / 7833818

Latitude / Longitude: 70°35'15.553" N / 78°11'27.092" W

Date / Time Surveyed: 13-Aug-07 / 21:34



Figure 1: Aerial view of area near crossing 170



Figure 2: Another aerial view of area near crossing 170

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	no water or nearly none
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.

## Crossing ID: 171

UTM: 17W 603373 / 7833494

Latitude / Longitude: 70°35'6.293" N / 78°12'45.888" W

Date / Time Surveyed: 13-Aug-07 / 21:34



Figure 1: Aerial view of area near crossing 171



Figure 2: Another aerial view of area near crossing 171

### Watercourse Characteristics

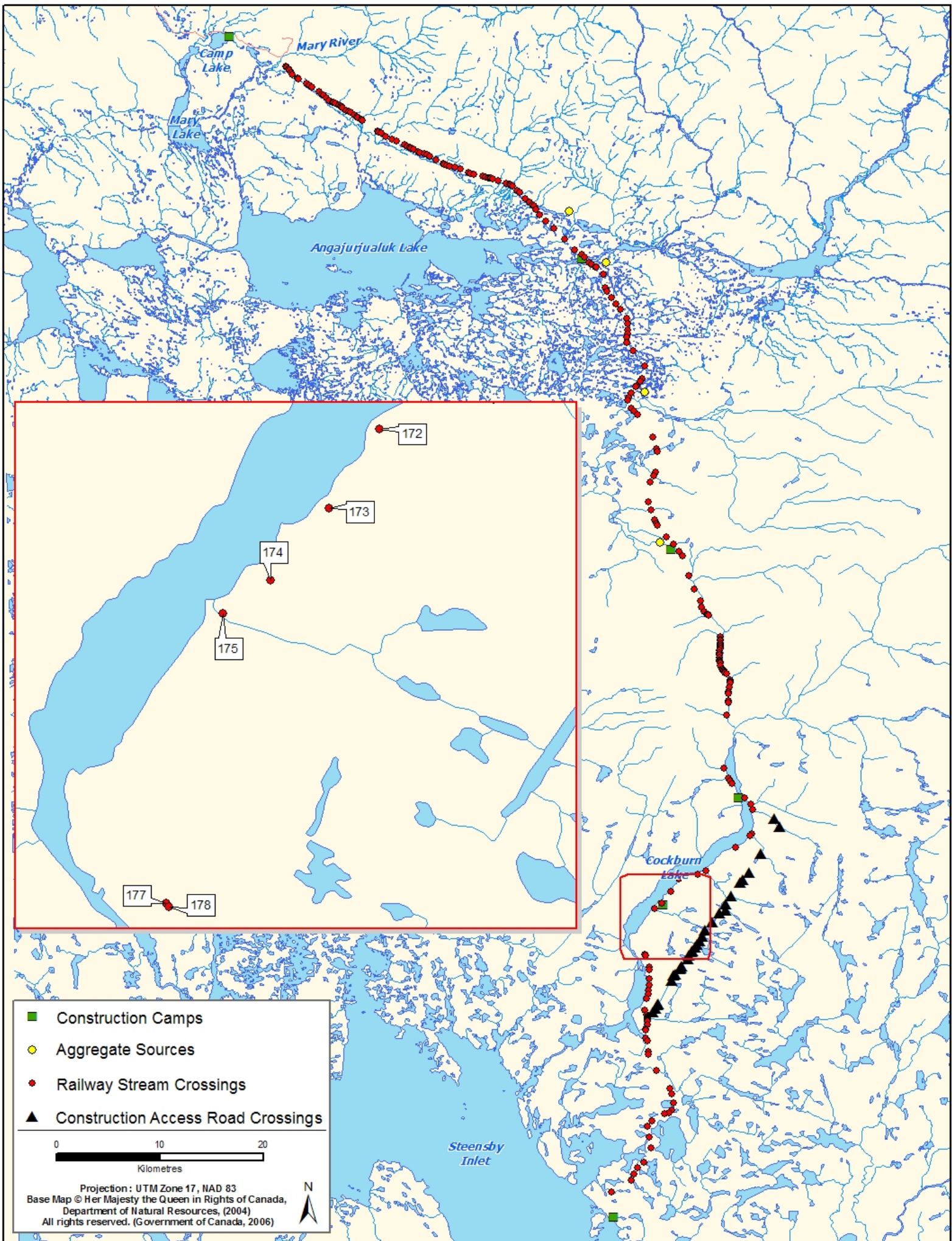
Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 172

UTM: 17W 601596 / 7833028

Latitude / Longitude: 70°34'53.876" N / 78°15'40.164" W

Date / Time Surveyed: 13-Aug-07 / 21:35



Figure 1: Aerial view of area near crossing 172



Figure 2: Another aerial view of area near crossing 172

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.

## Crossing ID: 173

UTM: 17W 600808 / 7831800

Latitude / Longitude: 70°34'15.422" N / 78°17'1.855" W

Date / Time Surveyed: 13-Aug-07 / 21:36



Figure 1: Aerial view of area near crossing 173

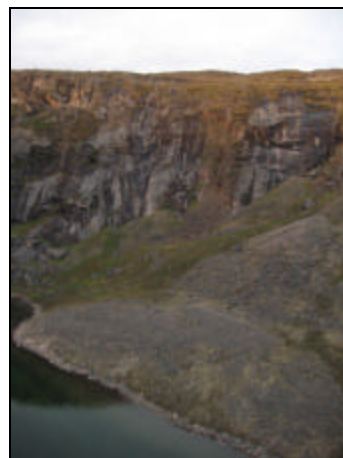


Figure 2: Another aerial view of area near crossing 173

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): no water or nearly none

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake

Max. Depth (m): N/A

### Notes

Cockburn Lake is located ~100 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 174

UTM: 17W 599902 / 7830688

Latitude / Longitude: 70°33'40.868" N / 78°18'34.385" W

Date / Time Surveyed: 13-Aug-07 / 21:37



Figure 1: Aerial view of area near crossing 174



Figure 2: Another aerial view of area near crossing 174

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight – slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.20
Flow Regime:	persistent
Gradient (°):	moderate - high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~300 m downstream of the crossing site.

## Crossing ID: 175

UTM: 17W 599167 / 7830161

Latitude / Longitude: 70°33'24.921" N / 78°19'47.791" W

Date / Time Surveyed: 13-Aug-07 / 21:37



Figure 1: Aerial view of area near crossing 175

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.20
Flow Regime:	persistent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~200 m downstream of the crossing site. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 177

UTM: 17W 598287 / 7825670

Latitude / Longitude: 70°31'1.348" N / 78°21'31.881" W

Date / Time Surveyed: 13-Aug-07 / 21:40



Figure 1: Aerial view of area near crossing 177 (white arrow)



Figure 2: Another aerial view of area near crossing 177 (white arrow)

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: braided

#### Crossing Site

Bankfull Width: N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.20

Flow Regime: intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.20

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.20

### Notes

Cockburn Lake is located ~1 km downstream of the crossing site.

## Crossing ID: 178

UTM: 17W 598325 / 7825610

Latitude / Longitude: 70°30'59.360" N / 78°21'28.462" W

Date / Time Surveyed: 13-Aug-07 / 21:40



Figure 1: Aerial view of area near crossing 178 (white arrow)



Figure 2: Another aerial view of area near crossing 178 (white arrow)

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: braided

#### Crossing Site

Bankfull Width: N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.20

Flow Regime: intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.20

#### Downstream

Wetted / Bankfull Width (m): N/M

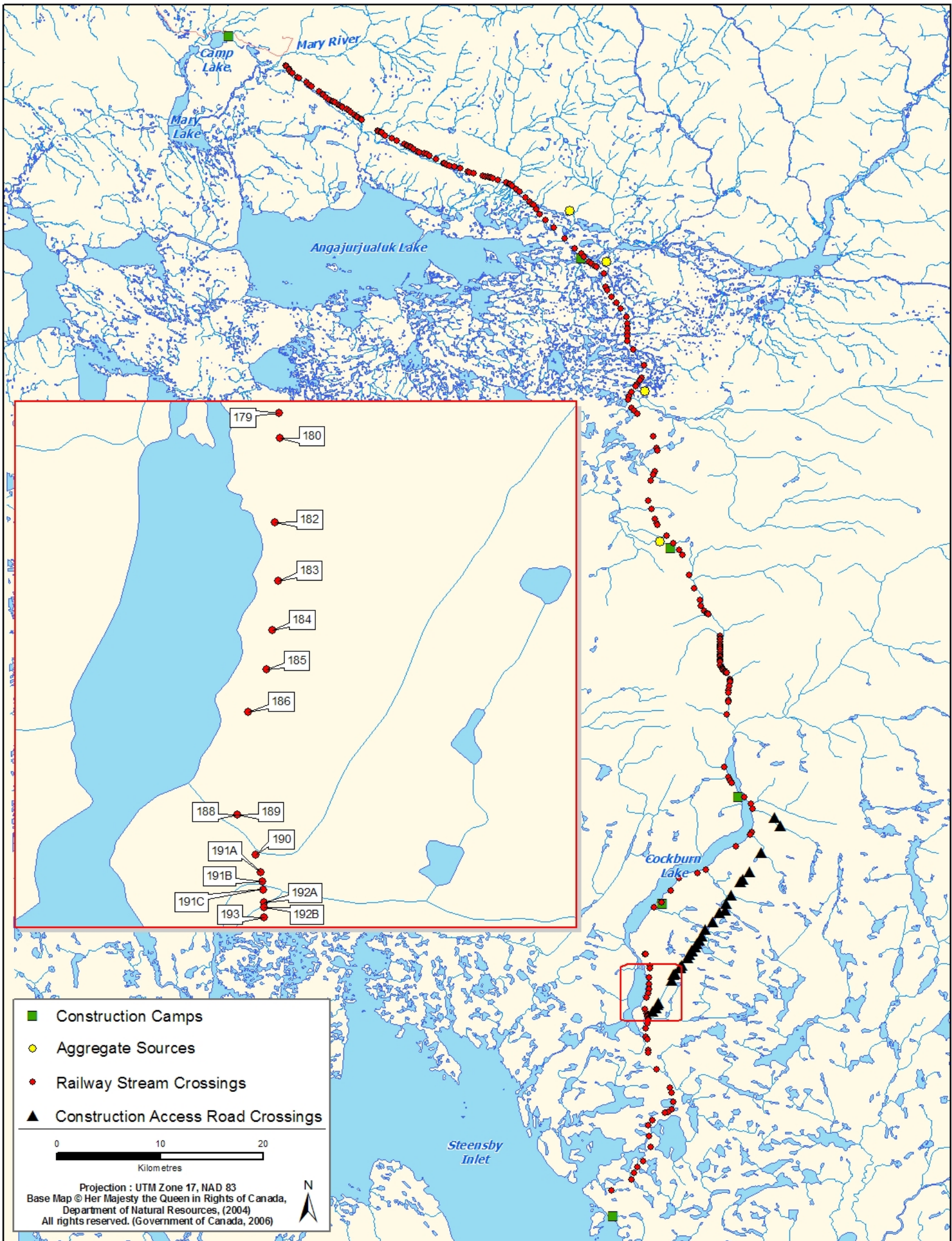
Max. Depth (m): < 0.20

### Notes

Cockburn Lake is located ~1 km downstream of the crossing site.











# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 179

UTM: 17W 598713 / 7824513

Latitude / Longitude: 70°30'23.441" N / 78°20'55.606" W

Date / Time Surveyed: 13-Aug-07 / 21:41



Figure 1: Aerial view of area near crossing 179

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: straight

#### Crossing Site

Bankfull Width: N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.10

Flow Regime: persistent – intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.10

### Notes

Cockburn Lake is located ~800 m downstream of the crossing site. Steep, shallow cascades between Cockburn Lake and the crossing act as barriers.

## Crossing ID: 180

UTM: 17W 598720 / 7824251

Latitude / Longitude: 70°30'14.983" N / 78°20'56.034" W

Date / Time Surveyed: 13-Aug-07 / 21:42



Figure 1: Aerial view of area near crossing 180

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: braided

#### Crossing Site

Bankfull Width: N/M

Wetted Width (m): N/M

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): < 0.10

Flow Regime: persistent – intermittent

Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): < 0.10

### Notes

Cockburn Lake is located ~800 m downstream of the crossing site.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 182

UTM: 17W 598665 / 7823373

Latitude / Longitude: 70°29'46.749" N / 78°21'5.041" W

Date / Time Surveyed: 13-Aug-07 / 21:42

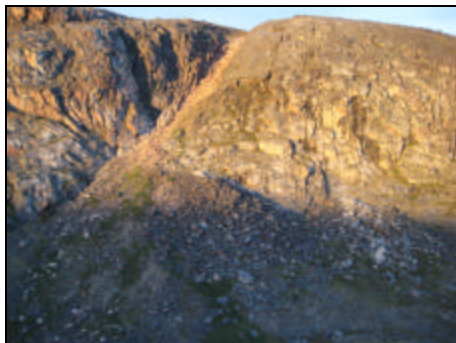


Figure 1: Aerial view of area near crossing 182

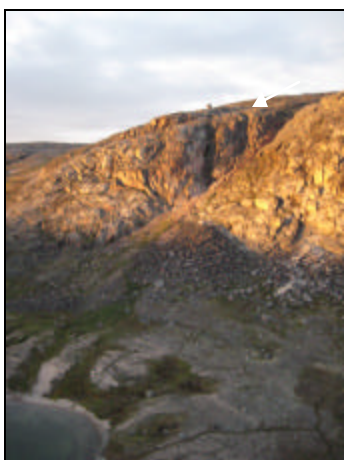


Figure 2: Another aerial view of area near crossing 182

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): N/M  
Wetted Width (m): no water or nearly none  
Depth Profile (25%, 50%, 75%; m): N/A  
Max. Depth (m): N/A  
Flow Regime: intermittent  
Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): no water  
Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake  
Max. Depth (m): N/A

### Notes

Cockburn Lake is located ~200 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.

## Crossing ID: 183

UTM: 17W 598703 / 7822764

Latitude / Longitude: 70°29'27.058" N / 78°21'3.936" W

Date / Time Surveyed: 13-Aug-07 / 21:43



Figure 1: Aerial view of area near crossing 183



Figure 2: Another aerial view of area near crossing 183

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of Cockburn

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): N/M  
Wetted Width (m): N/M  
Depth Profile (25%, 50%, 75%; m): N/M  
Max. Depth (m): < 0.10  
Flow Regime: persistent – intermittent  
Gradient (°): high

#### Upstream

Wetted / Bankfull Width (m): N/M  
Max. Depth (m): < 0.10

#### Downstream

Wetted / Bankfull Width (m): Cockburn Lake  
Max. Depth (m): N/A

### Notes

Cockburn Lake is located ~300 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 184

UTM: 17W 598641 / 7822251

Latitude / Longitude: 70°29'10.603" N / 78°21'12.075" W

Date / Time Surveyed: 13-Aug-07 / 21:43



Figure 1: Aerial view of area near crossing 184

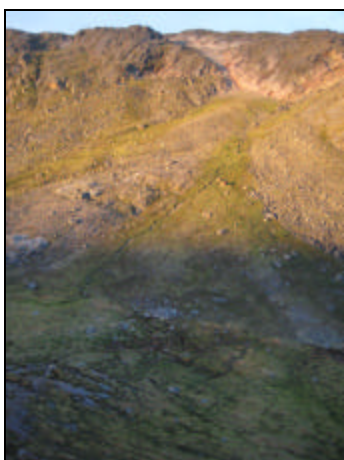


Figure 2: Another aerial view of area near crossing 184

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.10
Flow Regime:	persistent – intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.10
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~400 m downstream of the crossing site. The steep gradient downstream of the crossing acts as a barrier.

## Crossing ID: 185

UTM: 17W 598584 / 7821841

Latitude / Longitude: 70°28'57.462" N / 78°21'19.295" W

Date / Time Surveyed: 13-Aug-07 / 21:43



Figure 1: Aerial view of area near crossing 185

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	no water or nearly none
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	intermittent
Gradient (°):	high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~300 m downstream of the crossing site. The steep gradient and low water upstream and downstream of the crossing act as barriers.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 186

UTM: 17W 598393 / 7821396

Latitude / Longitude: 70°28'43.381" N / 78°21'39.581" W

Date / Time Surveyed: 13-Aug-07 / 21:44



Figure 1: Aerial view of area near crossing 186

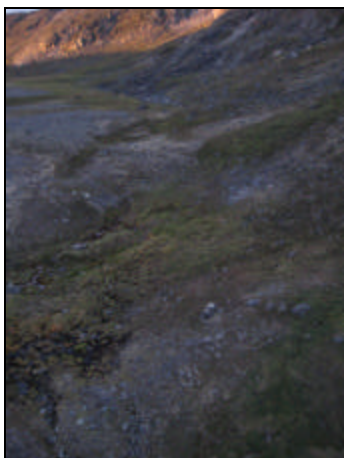


Figure 2: Another aerial view of area near crossing 186

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	< 0.20
Flow Regime:	persistent
Gradient (°):	moderate - high
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	< 0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	Cockburn Lake
Max. Depth (m):	N/A

### Notes

Cockburn Lake is located ~300 m downstream of the crossing site.

## Crossing ID: 188 & 189

UTM: 17W 598274 / 7820321

Latitude / Longitude: 70°28'8.883" N / 78°21'55.551" W

Date / Time Surveyed: 13-Aug-07 / 00:26

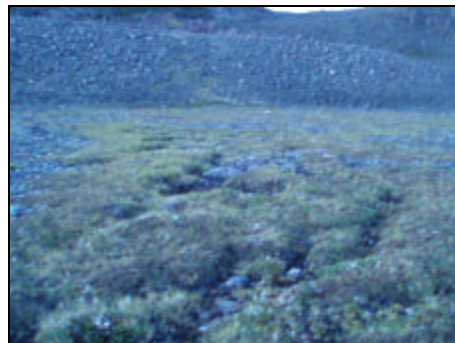


Figure 1: View upstream of crossings 188 & 189



Figure 2: View across crossings 188 & 189 from right bank



Figure 3: View downstream of crossing 188 & 189

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	1.40
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	isolated pools
Max. Depth (m):	N/M

### Notes

Cockburn Lake is located ~600 m downstream of the crossing. A dry stretch between Cockburn Lake and the crossing acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 190

UTM: 17W 598465 / 7819900

Latitude / Longitude: 70°27'55.040" N / 78°21'38.905" W

Date / Time Surveyed: 13-Aug-07 / 01:09



Figure 1: View upstream of crossing 190



Figure 2: View across crossing 190 from left bank



Figure 3: View downstream of crossing 190

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	4.60
Wetted Width (m):	4.60
Depth Profile (25%, 50%, 75%; m):	0.09, 0.20, 0.15
Max. Depth (m):	0.25
Flow Regime:	persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	4.60 / 4.60
Max. Depth (m):	0.25
<b>Downstream</b>	
Wetted / Bankfull Width (m):	5.00-7.00 / >100.00
Max. Depth (m):	0.15

### Notes

Cockburn Lake is ~1 km downstream of the crossing site.

## Crossing ID: 191A

UTM: 17W 598516 / 7819717

Latitude / Longitude: 70°27'49.067" N / 78°21'34.757" W

Date / Time Surveyed: 13-Aug-07 / 01:30



Figure 1: View upstream of crossing 191A



Figure 2: View across crossing 191A from right bank



Figure 3: View downstream of crossing 191A

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M (MSC)
Wetted Width (m):	13.30
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.25
Flow Regime:	persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	1.00 / 30.00
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M / >100.00
Max. Depth (m):	0.15

### Notes

Cockburn Lake is ~2 km downstream of the crossing site.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 191B

UTM: 17W 598534 / 7819622

Latitude / Longitude: 70°27'45.979" N / 78°21'33.420" W

Date / Time Surveyed: 13-Aug-07 / 01:50



Figure 1: View upstream of crossing 191B

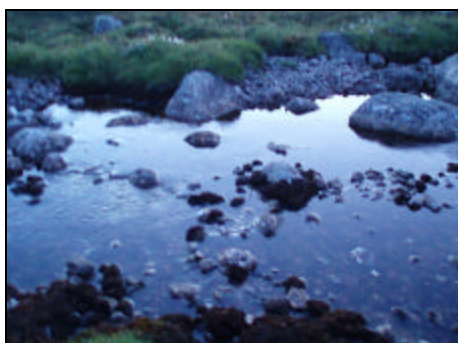


Figure 2: View across crossing 191B from right bank



Figure 3: View downstream of crossing 191B

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Cockburn
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	3.90
Wetted Width (m):	3.90
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.25
Flow Regime:	persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	~1.00 / ~30.00
Max. Depth (m):	~0.25
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M / >100.00
Max. Depth (m):	0.15

### Notes

Cockburn Lake is ~2 km downstream of the crossing site.

## Crossing ID: 191C

UTM: 17W 598546 / 7819533

Latitude / Longitude: 70°27'43.092" N / 78°21'32.637" W

Date / Time Surveyed: 13-Aug-07 / 01:56



Figure 1: View upstream of crossing 191C



Figure 2: View across crossing 191C from left bank



Figure 3: View downstream of crossing 191C

### Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M (MSC)
Wetted Width (m):	2.70
Depth Profile (25%, 50%, 75%; m):	0.05, 0.10, 0.05
Max. Depth (m):	0.15
Flow Regime:	intermittent – persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	< 2.00 / < 2.00
Max. Depth (m):	< 0.15
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

Cockburn Lake is ~2 km downstream of the crossing site.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 192A

UTM: 17W 598556 / 7819405

Latitude / Longitude: 70°27'38.950" N / 78°21'32.209" W

Date / Time Surveyed: 13-Aug-07 / 02:12



Figure 1: View upstream of crossing 192A



Figure 2: View across crossing 192A from left bank



Figure 3: View downstream of crossing 192A

### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of Cockburn
Channel Pattern:	sinuous
<b>Crossing Site</b>	
Bankfull Width (m):	22.90
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral – intermittent
Gradient (°):	2
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

Cockburn Lake is ~2 km downstream of the crossing site. A dry stretch between the crossing and Cockburn Lake acts as a barrier.

## Crossing ID: 192B

UTM: 17W 598556 / 7819348

Latitude / Longitude: 70°27'37.112" N / 78°21'32.448" W

Date / Time Surveyed: 13-Aug-07 / 02:05



Figure 1: View upstream of crossing 192B



Figure 2: View across crossing 192B from left bank



Figure 3: View downstream of crossing 192B

### Watercourse Characteristics

Tributary Status:	4 <sup>th</sup> order trib of Cockburn
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	5.00
Wetted Width (m):	5.00
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.20
Flow Regime:	persistent
Gradient (°):	3
<b>Upstream</b>	
Wetted / Bankfull Width (m):	< 5.00 / < 5.00
Max. Depth (m):	< 0.20
<b>Downstream</b>	
Wetted / Bankfull Width (m):	5.00-10.00 / 5.00-10.00
Max. Depth (m):	0.20-0.40

### Notes

Cockburn Lake is ~2 km downstream of the crossing site.

# Rail Alignment Watercourse Crossing Assessments

**Crossing ID: 193**

UTM: 17W 598554 / 7819244

Latitude / Longitude: 70°27'33.762" N / 78°21'33.076" W

Date / Time Surveyed: 13-Aug-07 / 01:53



Figure 1: View upstream of crossing 193



Figure 2: View across crossing 193 from right bank



Figure 3: View downstream of crossing 193

## Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of Cockburn

Channel Pattern: sinuous

**Crossing Site**

Bankfull Width(m): 15.50

Wetted Width (m): 11.90

Depth Profile (25%, 50%, 75%; m): 0.15, 0.05, 0.17

Max. Depth (m): 0.20

Flow Regime: persistent

Gradient (°): 5

**Upstream**

Wetted / Bankfull Width (m): 8.00-12.00 / > 10.00

Max. Depth (m): 0.15-0.30

**Downstream**

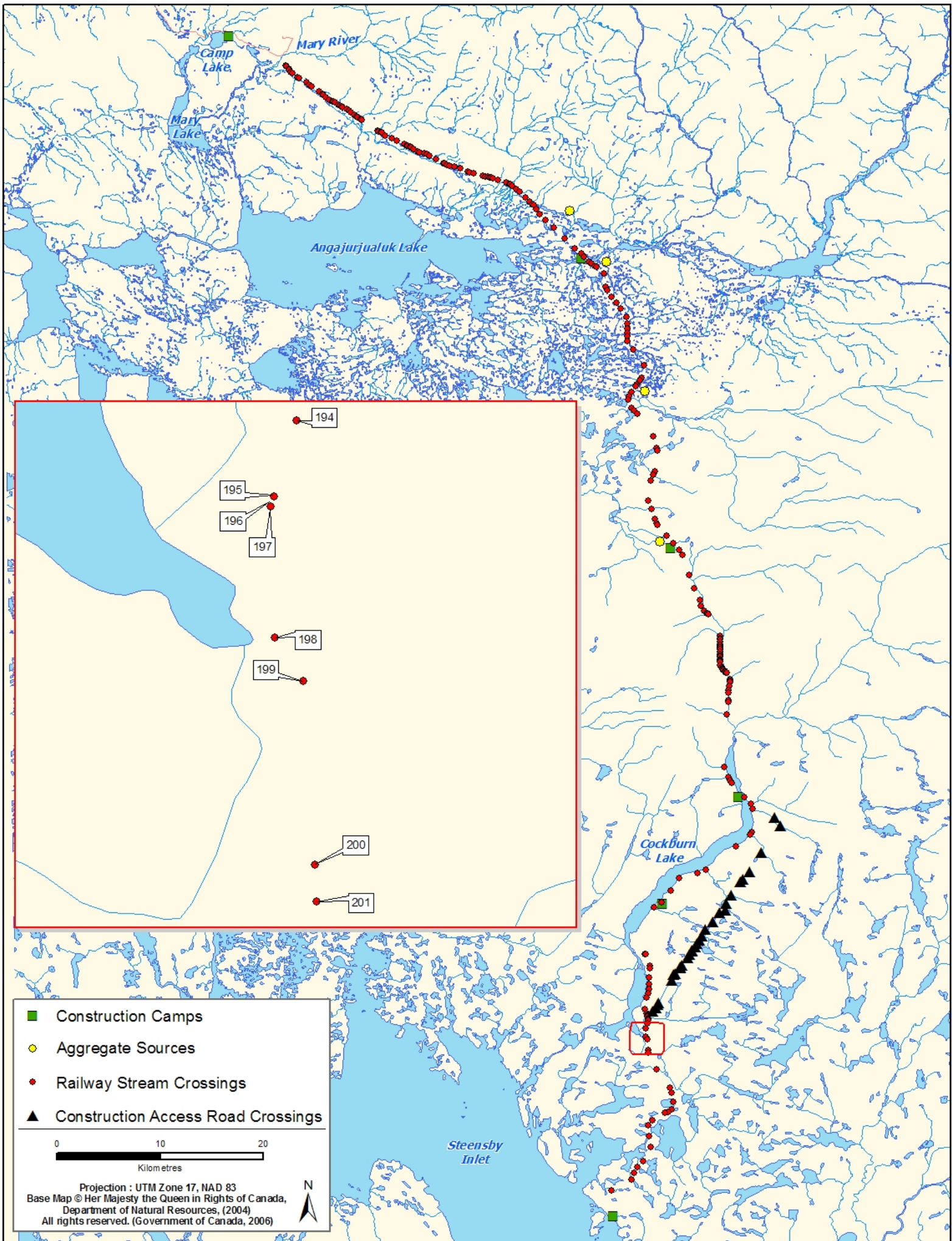
Wetted / Bankfull Width (m): 10.00-15.00 / >10.00

Max. Depth (m): 0.20-0.50

## Notes

Cockburn Lake is ~2 km downstream of the crossing site.









# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 194

UTM: 17W 598501 / 7818905

Latitude / Longitude: 70°27'22.905" N / 78°21'39.601" W

Date / Time Surveyed: 13-Aug-07 / 01:43



Figure 1: View upstream of crossing 194



Figure 2: View across crossing 194 from right bank



Figure 3: View downstream of crossing 194

## Watercourse Characteristics

Tributary Status:	2 <sup>nd</sup> order trib of Cockburn
Channel Pattern:	meandering
<b>Crossing Site</b>	
Bankfull Width (m):	5.00
Wetted Width (m):	4.80
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.08
Flow Regime:	persistent – intermittent
Gradient (°):	3
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

## Notes

Cockburn Lake is ~1.5 km downstream of the crossing site. Low water and steep stretch downstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 195

UTM: 17W 598370 / 7818460

Latitude / Longitude: 70°27'8.738" N / 78°21'54.078" W

Date / Time Surveyed: 13-Aug-07 / 01:35



Figure 1: View upstream of crossing 195



Figure 2: View across crossing 195 from right bank



Figure 3: View downstream of crossing 195

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	slightly meandering
<b>Crossing Site</b>	
Bankfull Width (m):	N/M
Wetted Width (m):	11.00
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	N/M
Flow Regime:	persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

Cockburn Lake is ~800 m downstream of the crossing site. Low water between the crossing site and the lake acts as a barrier.

## Crossing ID: 196 & 197

UTM: 17W 598352 / 7818400

Latitude / Longitude: 70°27'6.829" N / 78°21'56.062" W

Date / Time Surveyed: 13-Aug-07 / 01:27



Figure 1: View upstream of crossings 196 & 197

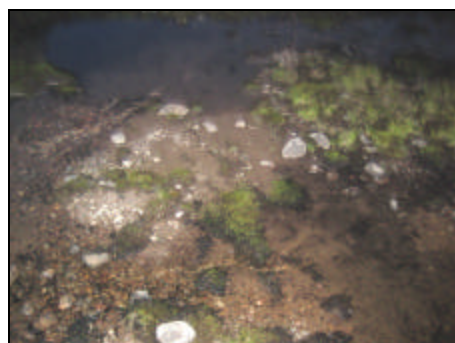


Figure 2: View across crossings 196 & 197 from left bank



Figure 3: View downstream of crossing 196 & 197

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	undefined (FT)
Wetted Width (m):	2.50
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.03
Flow Regime:	ephemeral – intermittent
Gradient (°):	4
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M

### Notes

Cockburn Lake is ~800 m downstream of the crossing site. A steep drop between the lake and the crossing site acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 198

UTM: 17W 598373 / 7817632

Latitude / Longitude: 70°26'42.034" N / 78°21'57.246" W

Date / Time Surveyed: 13-Aug-07 / 01:10



Figure 1: View upstream of crossing 198



Figure 2: View across crossing 198 from left bank



Figure 3: View downstream of crossing 198

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	sinuous
<b>Crossing Site</b>	
Bankfull Width (m):	0.40
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	N/A
Gradient (°):	10-12
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

### Notes

Cockburn Lake is ~400 m downstream of the crossing site. The steep gradient downstream of the crossing site acts as a barrier.

## Crossing ID: 199

UTM: 17W 598542 / 7817373

Latitude / Longitude: 70°26'33.446" N / 78°21'42.059" W

Date / Time Surveyed: 13-Aug-07 / 01:00



Figure 1: View upstream of crossing 199



Figure 2: View across crossing 199 from left bank



Figure 3: View downstream of crossing 199

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of Cockburn
Channel Pattern:	sinuous
<b>Crossing Site</b>	
Bankfull Width (m):	1.50
Wetted Width (m):	1.20
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.05
Flow Regime:	intermittent – persistent
Gradient (°):	11
<b>Upstream</b>	
Wetted / Bankfull Width (m):	< 2.00 / < 2.00
Max. Depth (m):	< 0.10
<b>Downstream</b>	
Wetted / Bankfull Width (m):	1.00-2.00 / 1.00-2.00
Max. Depth (m):	0.10-0.20

### Notes

A small, unnamed lake is ~100 m downstream and the Cockburn River is ~400 m downstream of the crossing site. Cascades between the lake and the crossing act as barriers.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 200

UTM: 17W 598611 / 7816294

Latitude / Longitude: 70°25'58.556" N / 78°21'39.928" W

Date / Time Surveyed: 13-Aug-07 / 00:44



Figure 1: View upstream of crossing 200

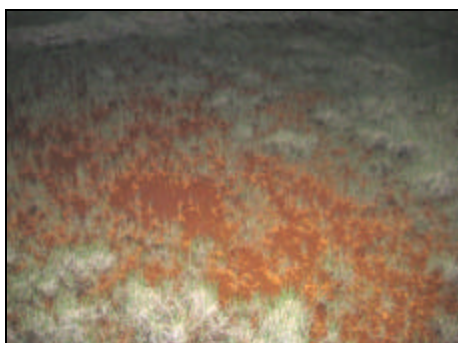


Figure 2: View across crossing 200 from right bank



Figure 3: View downstream of crossing 200

### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of large river
Channel Pattern:	flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	22.90
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	N/M
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	small lake/pond
Max. Depth (m):	N/M

### Notes

The unnamed river is ~1 km downstream. There is a small lake immediately downstream of the crossing. A dry stretch between the lake and the crossing site acts as a barrier.

## Crossing ID: 201

UTM: 17W 598620 / 7816078

Latitude / Longitude: 70°25'51.578" N / 78°21'39.965" W

Date / Time Surveyed: 13-Aug-07 / 00:38

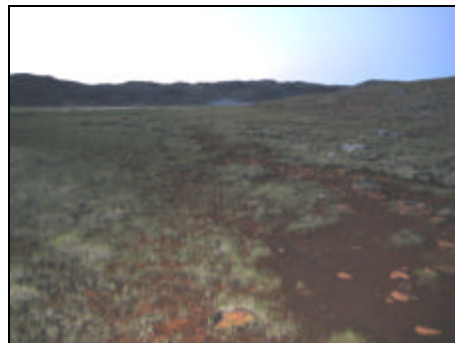


Figure 1: View upstream of crossing 201

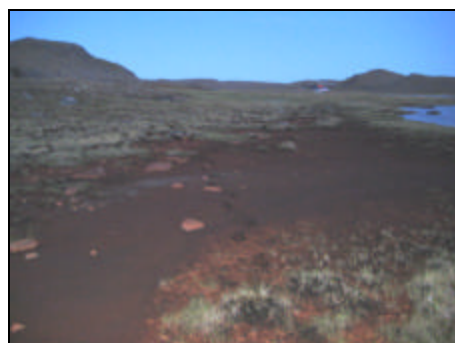


Figure 2: View across crossing 201 from left bank

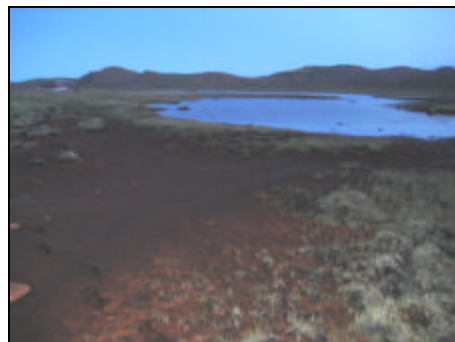


Figure 3: View downstream of crossing 201

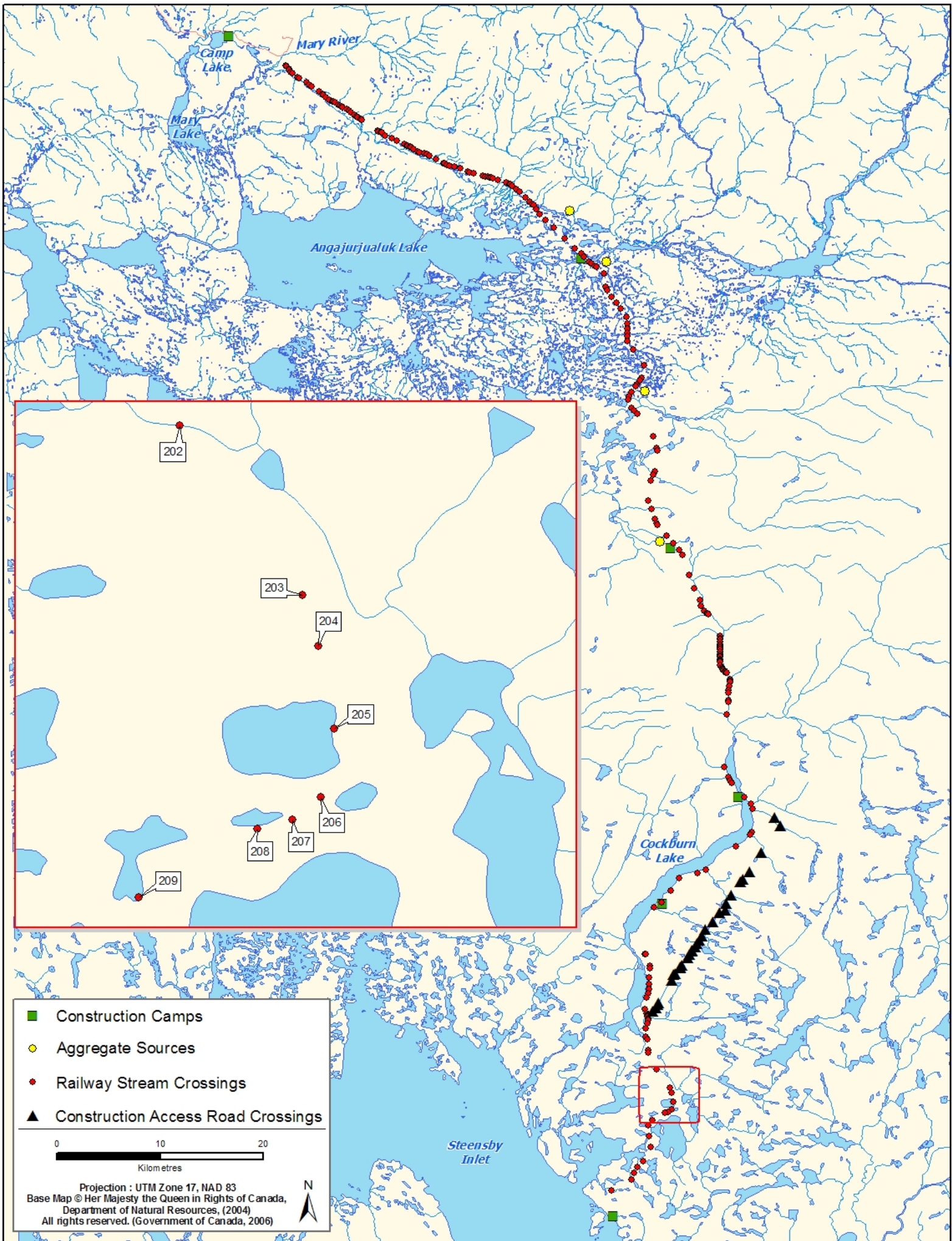
### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of large river
Channel Pattern:	braided, flooded terrestrial
<b>Crossing Site</b>	
Bankfull Width (m):	20.10
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	small lake/pond
Max. Depth (m):	N/M

### Notes

The unnamed river is ~1 km downstream. There is a small lake immediately downstream of the crossing. A dry stretch between the lake and the crossing site acts as a barrier.









# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 202

UTM: 17W 599383 / 7814505

Latitude / Longitude: 70°24'59.783" N / 78°20'33.182" W

Date / Time Surveyed: 13-Aug-07 / 22:10



Figure 1: View upstream of crossing 202



Figure 2: View across crossing 202 from right bank



Figure 3: View downstream of crossing 202

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large river
Channel Pattern:	braided
<b>Crossing Site</b>	
Bankfull Width (m):	N/M (MSC)
Wetted Width (m):	21.70
Depth Profile (25%, 50%, 75%; m):	ave. depth of 0.15
Max. Depth (m):	0.40
Flow Regime:	persistent
Gradient (°):	< 1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	small pond
Max. Depth (m):	< 2.00
<b>Downstream</b>	
Wetted / Bankfull Width (m):	4.0 / N/M
Max. Depth (m):	N/M

### Notes

The unnamed river is ~1 km downstream. There is a small lake immediately downstream of the crossing.

## Crossing ID: 203

UTM: 17W 600672 / 7812732

Latitude / Longitude: 70°24'0.784" N / 78°18'36.815" W

Date / Time Surveyed: 13-Aug-07 / 21:57



Figure 1: View upstream of crossing 203



Figure 2: View across crossing 203 from right bank



Figure 3: View downstream of crossing 203

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large lake
Channel Pattern:	flooded terrestrial (oily)
<b>Crossing Site</b>	
Bankfull Width (m):	undefined (FT)
Wetted Width (m):	N/M
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.05
Flow Regime:	ephemeral – persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	undefined
Max. Depth (m):	< 0.10
<b>Downstream</b>	
Wetted / Bankfull Width (m):	undefined
Max. Depth (m):	< 0.10

### Notes

The large, unnamed lake is ~1 km downstream. Low water downstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 204

UTM: 17W 600838 / 7812200

Latitude / Longitude: 70°23'43.392" N / 78°18'23.135" W

Date / Time Surveyed: 13-Aug-07 / 22:09



Figure 1: View upstream of crossing 204



Figure 2: View across crossing 204 from left bank

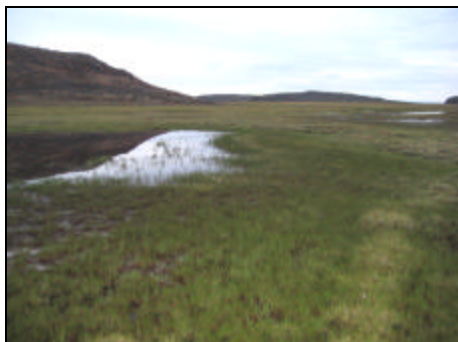


Figure 3: View downstream of crossing 204

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): 34.70

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.10

Flow Regime: ephemeral – persistent

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.15

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

There is a small lake downstream, and the large lake is ~500m downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 205

UTM: 17W 601003 / 7811332

Latitude / Longitude: 70°23'15.168" N / 78°18'10.989" W

Date / Time Surveyed: 13-Aug-07 / 22:36



Figure 1: View upstream of crossing 205



Figure 2: View across crossing 205 from right bank



Figure 3: View downstream of crossing 205

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large lake

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 1.00

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: intermittent

Gradient (°): 8

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small lake

Max. Depth (m): N/A

### Notes

The large, unnamed lake is ~1.5 km downstream. There is a lake immediately downstream of the crossing site. Low water between the lake and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 206

UTM: 17W 600856 / 7810619

Latitude / Longitude: 70°22'52.387" N / 78°18'28.131" W

Date / Time Surveyed: 13-Aug-07 / 22:24



Figure 1: View upstream of crossing 206



Figure 2: View across crossing 206 from left bank



Figure 3: View downstream of crossing 206

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of large lake

Channel Pattern: undefined

#### Crossing Site

Bankfull Width (m): N/M

Wetted Width (m): no water

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/A

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed lake is ~500 m downstream. There is also a lake immediately downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 207

UTM: 17W 600565 / 7810381

Latitude / Longitude: 70°22'45.128" N / 78°18'57.065" W

Date / Time Surveyed: 13-Aug-07 / 22:45



Figure 1: View upstream of crossing 207



Figure 2: View across crossing 207 from left bank



Figure 3: View downstream of crossing 207

### Watercourse Characteristics

Tributary Status: 3<sup>rd</sup> order trib of large lake

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): N/M (MSC)

Wetted Width (m): isolated pools

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): isolated pools

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

### Notes

The large, unnamed lake is ~500 m downstream. Low water between the lake and the crossing acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 208

UTM: 17W 600196 / 7810282

Latitude / Longitude: 70°22'42.460" N / 78°19'32.890" W

Date / Time Surveyed: 13-Aug-07 / 23:02



Figure 1: View upstream of crossing 208



Figure 2: View across crossing 208



Figure 3: View downstream of crossing 208

### Watercourse Characteristics

Tributary Status:	3 <sup>rd</sup> order trib of large lake
Channel Pattern:	undefined
<b>Crossing Site</b>	
Bankfull Width (m):	undefined
Wetted Width (m):	no water
Depth Profile(25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	N/M
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

### Notes

The lake is ~1 km downstream. There is a small lake ~100 m downstream of the crossing site. A dry stretch between the lake and the crossing acts as a barrier.

## Crossing ID: 209

UTM: 17W 598959 / 7809568

Latitude / Longitude: 70°22'21.180" N / 78°21'34.561" W

Date / Time Surveyed: 13-Aug-07 / 22:53



Figure 1: View upstream of crossing 209



Figure 2: View across crossing 209 from right bank

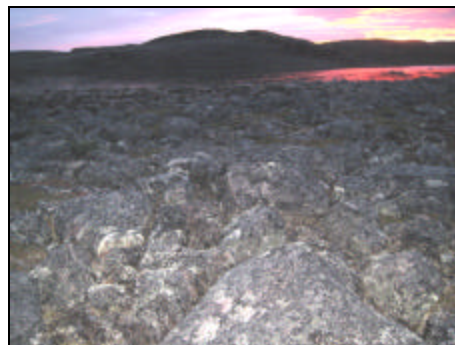


Figure 3: View downstream of crossing 209

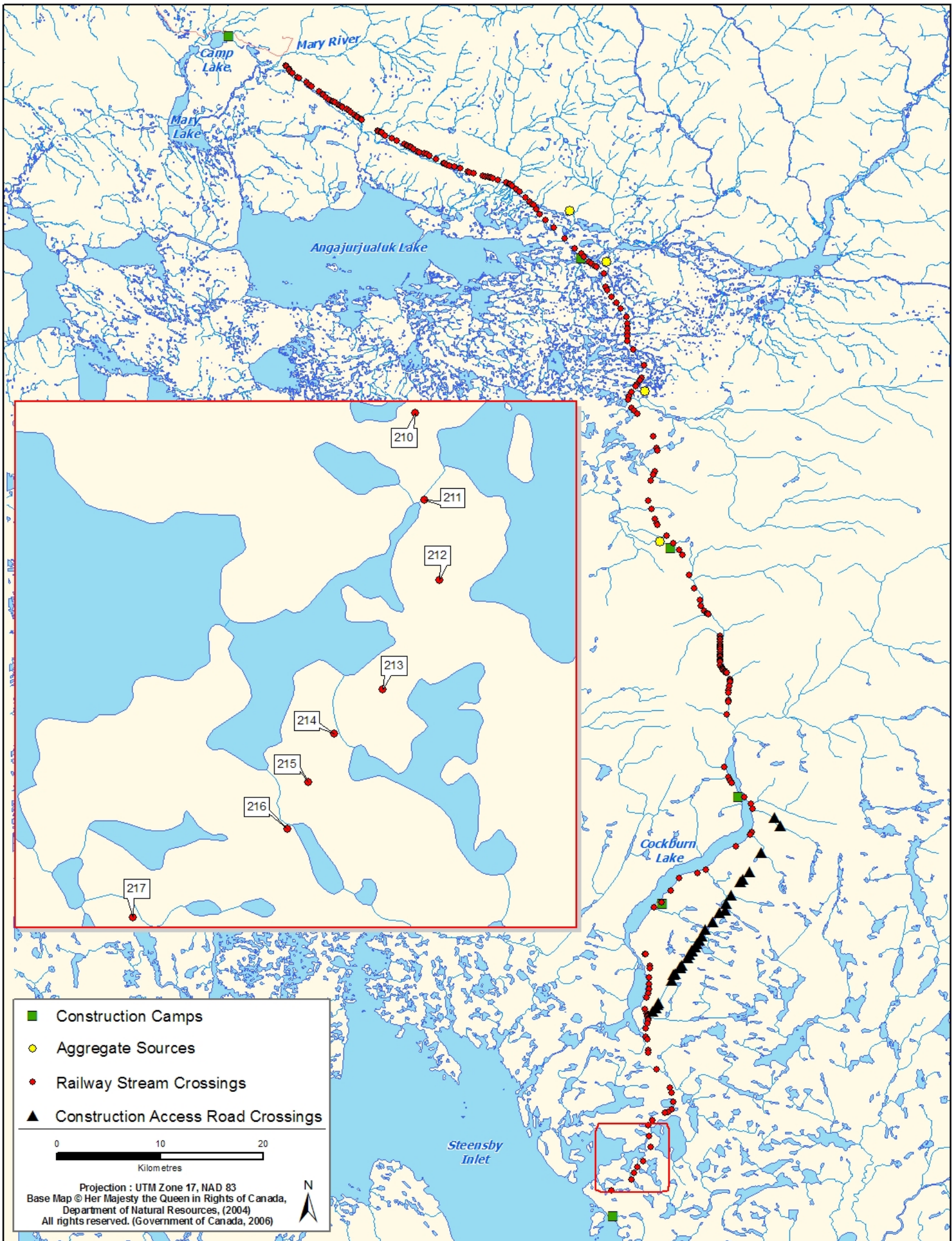
### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of large lake
Channel Pattern:	undefined
<b>Crossing Site</b>	
Bankfull Width (m):	undefined (rock field)
Wetted Width (m):	no water
Depth Profile (25%, 50%, 75%; m):	N/A
Max. Depth (m):	N/A
Flow Regime:	ephemeral
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	no water
Max. Depth (m):	N/A

### Notes

The lake is ~600 m downstream. A dry stretch between the lake and the crossing acts as a barrier.









# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 210

UTM: 17W 598552 / 7809073

Latitude / Longitude: 70°22'5.787" N / 78°22'15.657" W

Date / Time Surveyed: 13-Aug-07 / 23:09



Figure 1: View upstream of crossing 210



Figure 2: View across crossing 210 from right bank



Figure 3: View downstream of crossing 210

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of large lake

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): 0.30

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.02

Flow Regime: ephemeral – intermittent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): large lake

Max. Depth (m): N/A

### Notes

The large, unnamed lake is ~300 m downstream. Low water downstream of the crossing site acts as a barrier.

## Crossing ID: 211

UTM: 17W 598663 / 7807981

Latitude / Longitude: 70°21'30.419" N / 78°22'9.543" W

Date / Time Surveyed: 13-Aug-07 / 23:26



Figure 1: View upstream of crossing 211



Figure 2: View across crossing 211 from right bank



Figure 3: View downstream of crossing 211

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of inlet

Channel Pattern: straight

#### Crossing Site

Bankfull Width (m): undefined (no banks)

Wetted Width (m): 105.20

Depth Profile (25%, 50%, 75%; m): average depth 0.20

Max. Depth (m): ~0.50

Flow Regime: persistent

Gradient (°): 1.5

#### Upstream

Wetted / Bankfull Width (m): small unnamed lake

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): small unnamed lake

Max. Depth (m): N/A

### Notes

Steensby Inlet is ~1 km downstream. A small, unnamed lake is between the crossing and Steensby Inlet.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 212

UTM: 17W 598855 / 7806964

Latitude / Longitude: 70°20'57.356" N / 78°21'55.363" W

Date / Time Surveyed: 13-Aug-07 / 23:37



Figure 1: View upstream of crossing 212



Figure 2: View across crossing 212 from right bank



Figure 3: View downstream of crossing 212

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of inlet

Channel Pattern: flooded terrestrial

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): N/M (nearly dry)

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): N/M

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): small, unnamed lake

Max. Depth (m): N/A

### Notes

Steensby Inlet is ~800 m downstream. A small, unnamed lake is between the crossing and Steensby Inlet. Low water between the inlet and the crossing acts as a barrier.

## Crossing ID: 213

UTM: 17W 598138 / 7805588

Latitude / Longitude: 70°20'13.982" N / 78°23'9.733" W

Date / Time Surveyed: 13-Aug-07 / 23:51



Figure 1: View upstream of crossing 213



Figure 2: View across crossing 213 from right bank



Figure 3: View downstream of crossing 213

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of inlet

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): 0.50

Wetted Width (m): 0.10

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): 0.02

Flow Regime: intermittent – persistent

Gradient (°): 3

#### Upstream

Wetted / Bankfull Width (m): < 0.10 / < 0.50

Max. Depth (m): < 0.05

#### Downstream

Wetted / Bankfull Width (m): ~ 0.10 / ~0.50

Max. Depth (m): ~0.05

### Notes

Steensby Inlet is ~500 m downstream. Low water between the inlet and the crossing acts as a barrier.



# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 214

UTM: 17W 597527 / 7805030

Latitude / Longitude: 70°19' 56.833" N / 78°24' 10.528" W

Date / Time Surveyed: 14-Aug-07 / 00:05



Figure 1: View upstream of crossing 214

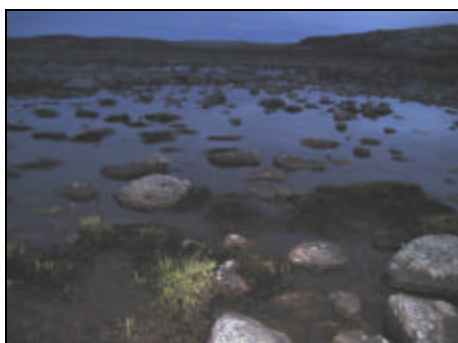


Figure 2: View across crossing 214 from right bank

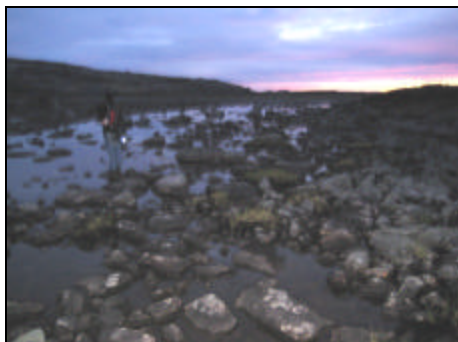


Figure 3: View downstream of crossing 214

### Watercourse Characteristics

Tributary Status: 1<sup>st</sup> order trib of inlet

Channel Pattern: pond

#### Crossing Site

Bankfull Width (m): undefined

Wetted Width (m): 107.90

Depth Profile (25%, 50%, 75%; m): N/M

Max. Depth (m): 0.34

Flow Regime: N/A

Gradient (°): 1

#### Upstream

Wetted / Bankfull Width (m): undefined

Max. Depth (m): N/M

#### Downstream

Wetted / Bankfull Width (m): N/M

Max. Depth (m): N/M

### Notes

Steensby Inlet is ~800 m downstream. There is a lake upstream of the crossing site.

## Crossing ID: 215

UTM: 17W 597201 / 7804426

Latitude / Longitude: 70°19' 37.803" N / 78°24' 44.201" W

Date / Time Surveyed: 13-Aug-07 / 23:50

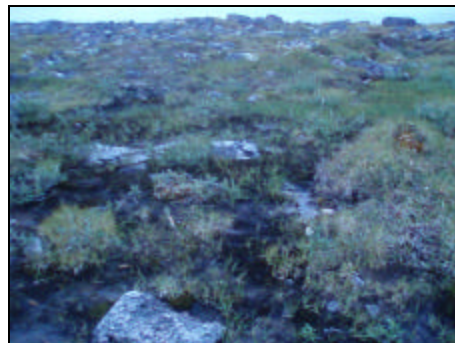


Figure 1: View upstream of crossing 215

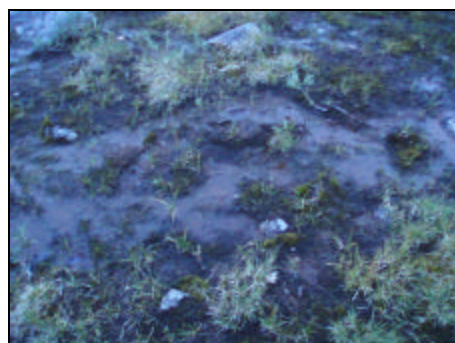


Figure 2: View across crossing 215 from right bank



Figure 3: View downstream of crossing 215

### Watercourse Characteristics

Tributary Status: 2<sup>nd</sup> order trib of inlet

Channel Pattern: braided

#### Crossing Site

Bankfull Width (m): undefined (FT)

Wetted Width (m): nearly dry

Depth Profile (25%, 50%, 75%; m): N/A

Max. Depth (m): N/M

Flow Regime: ephemeral

Gradient (°): 4

#### Upstream

Wetted / Bankfull Width (m): no water

Max. Depth (m): N/A

#### Downstream

Wetted / Bankfull Width (m): flooded terrestrial

Max. Depth (m): N/M

### Notes

Steensby Inlet is ~700 m downstream. There is a lake upstream of the crossing site. Low water upstream and downstream of the crossing site acts as a barrier.

# Rail Alignment Watercourse Crossing Assessments

## Crossing ID: 216

UTM: 17W 596936 / 7803830

Latitude / Longitude: 70°19'18.947" N / 78°25'11.986" W

Date / Time Surveyed: 14-Aug-07 / 00:14



Figure 1: View upstream of crossing 216



Figure 2: View across crossing 216 from right bank

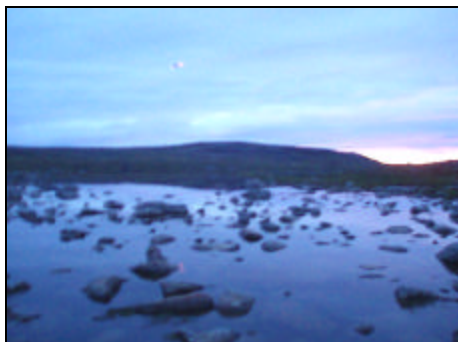


Figure 3: View downstream of crossing 216

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of inlet
Channel Pattern:	straight
<b>Crossing Site</b>	
Bankfull Width (m):	~20.00
Wetted Width (m):	14.60
Depth Profile (25%, 50%, 75%; m):	0.15, 0.20, 0.05
Max. Depth (m):	0.25
Flow Regime:	persistent
Gradient (°):	>1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	small unnamed lake
Max. Depth (m):	N/A
<b>Downstream</b>	
Wetted / Bankfull Width (m):	small unnamed lake
Max. Depth (m):	N/A

### Notes

Steensby Inlet is ~1 km downstream. There are lakes upstream and downstream of the crossing site.

## Crossing ID: 217

UTM: 17W 594998 / 7802718

Latitude / Longitude: 70°18'45.710" N / 78°28'21.871" W

Date / Time Surveyed: 14-Aug-07 / 00:33



Figure 1: View upstream of crossing 217



Figure 2: View across crossing 217 from right bank



Figure 3: View downstream of crossing 217

### Watercourse Characteristics

Tributary Status:	1 <sup>st</sup> order trib of inlet
Channel Pattern:	sinuous
<b>Crossing Site</b>	
Bankfull Width (m):	10.00
Wetted Width (m):	5.50
Depth Profile (25%, 50%, 75%; m):	N/M
Max. Depth (m):	0.10
Flow Regime:	persistent
Gradient (°):	1
<b>Upstream</b>	
Wetted / Bankfull Width (m):	N/M
Max. Depth (m):	N/M
<b>Downstream</b>	
Wetted / Bankfull Width (m):	small lake
Max. Depth (m):	N/A

### Notes

Steensby Inlet is ~1.5 km downstream. There are lakes upstream and downstream of the crossing site.