Photo 1. Iron Arm—Mouth of connecting stream IA-T01 (July 27, 2012)

Photo 2. Iron Arm—Connectiing stream IA-T01, general view (July 27, 2012)

Photo 3. Iron Arm—Mouth of connecting stream IA-T02 (July 27, 2012)

Photo 4. Iron Arm—Connecting stream IA-T02, general view (July 27, 2012)

Photo 5. Iron Arm—Mouth of connecting stream IA-T03 (July 28, 2012)

Photo 6. Iron Arm—Connecting stream IA-T03, general view (July 27, 2012)

Photo 7. Iron Arm—IA-T03 small chute acting as a fish barrier in segment S2 (July 27, 2012)

Photo 8. Iron Arm—Mouth of connecting stream IA-T04 (July 27, 2012)

Photo 9. Iron Arm—Bur-reed, VE-02 (July 27, 2012)

Photo 10. Iron Arm—Rush marsh, VE-03 (July 27, 2012)

Photo 11. Iron Arm—Bur-reed, VE-06 (July 28, 2012)

Photo 12. Iron Arm—Sedge marsh, VE-08 (July 28, 2012)

Photo 13. Iron Arm—Bur-reed, VE-09 (July 28, 2012)

Photo 14. Iron Arm—Sedge marsh, VE-10 (July 28, 2012)

Photo 15. Iron Arm—Bur-reed, VE-11 (July 28, 2012)

Photo 16. Iron Arm—Bur-reed, VE-12 (July 28, 2012)

Photo 17. Iron Arm—Sedge/rush marsh, VE-13 (July 28, 2012)

Photo 18. Iron Arm—Sedge marsh, VE-14 (July 28, 2012)

Photo 19. Iron Arm—Bur-reed, VE-15 (July 28, 2012)

Photo 20. Iron Arm—Brook trout potential spawning ground (July 28, 2012)

Photo 21. Bay 2—Bur-reed and sedge marsh, VE-02 (July 31, 2012)

Photo 22. Bay 2—Bur-reed, VE-03 (July 31, 2012)

Photo 23. Bay 2—Bur-reed and sedge/rush marsh, VE-04 (July 31, 2012)

Photo 24. Bay 2—Bur-reed, VE-05 (July 31, 2012)

Photo 25. Pond A, general view of the bank and high water mark (August 2, 2012)

Photo 26. Pond C, general view (August 1, 2012)

Photo 27. Lake E—Bur-reed, VE-01 (August 5, 2012)

Photo 28. Lake E—Connecting stream LE-T01 (August 5, 2012)

Photo 29. Lake E, brook trout potential spawning ground (August 5, 2012)

Photo 30. Lake E—Connecting stream LE-E05, segment S1 (August 5, 2012)

Photo 31. Lake E—Connecting stream LE-E05, segment S2 (August 5, 2012)

Photo 32. Lake E—Connecting stream LE-E05, segment S3 (August 5, 2012)

Photo 33. Lake F—Pond-lilies, VE-01 (August 8, 2012)

Photo 34. Lake F—Bur-reed, VE-02 (August 8, 2102)

Photo 35. CR01, general view (August 4, 2012)

Photo 36. CR02—AV-S1, general view (August 4, 2012)

Photo 37. CR02—AV-S2, general view (August 4, 2012)

Photo 38. CR02, water coming from the ground (August 4, 2012)

Photo 39. CR03—AM-S1 (July 31, 2012)

Photo 40. CR03—AM-S1 (July 31, 2012)

Photo 41. CR03—AV-S1, northern pike potential spawning ground (July 31, 2012)

Photo 42. CR03—AV-S1 (July 31, 2012)

Photo 43. CR20—AM-S1 (July 31, 2012)

Photo 44. CR20—AM-S2 (July 31, 2012)

Photo 45. CR20—AM-S3 (July 31, 2012)

Photo 46. CR20—AM-S4 (July 31, 2012)

Photo 47. CR20—AM-S5 (July 31, 2012)

Photo 48. CR20—AM-S5, beaver dam (July 31, 2012)

Photo 49. CR20—AV-S1 (July 31, 2012)

Photo 50. CR20—AV-S2 (July 31, 2012)

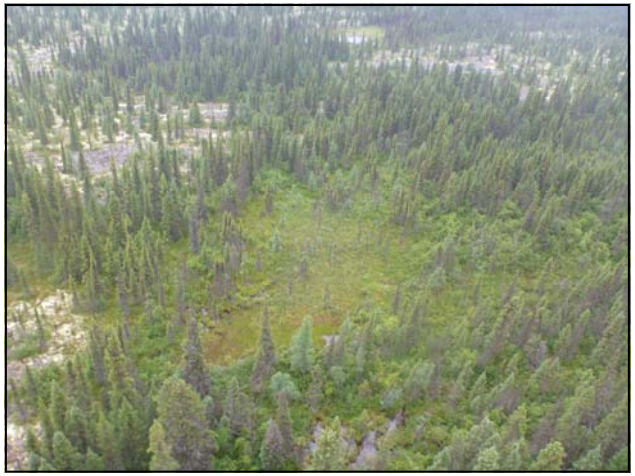

Photo 51. CR21—No stream found in the area of the new proposed road layout (July 31, 2012)

Photo 52. CR06—No stream found during field work (July 31, 2012)

Photo 53. CR07—AV-S1 (July 31, 2012)

Photo 54. CR07—AV-S2 (July 31, 2012)

Photo 55. CR07—AM-S1 (July 31, 2012)

Photo 56. CR07—AM-S2 (July 31, 2012)

Photo 57. CR10—AV-S1 (August 1, 2012)

Photo 58. CR10—AM-S1 (August 1, 2012)

Photo 59. CR10A—AM-S1 (August 1, 2012)

Photo 60. CR10A—AV-S1 (August 1, 2012)

Photo 61. CR10A—AV-S2 (August 1, 2012)

Photo 62. CR10B—AM-S1 (August 1, 2012)

Photo 63. CR10B—AV-S1 (August 1, 2012)

Photo 64. CR10B—AV-S2 (August 1, 2012)

Photo 65. CR12—AV-S1 (August 2, 2012)

Photo 66. CR12—AV-S2 (August 2, 2012)

Photo 67. CR12—AV-S3 (August 2, 2012)

Photo 68. CR12—AM-S1 (August 2, 2012)

Photo 69. CR12—AM-S2 (August 2, 2012)

Photo 70. CR12—AM-S3 (August 2, 2012)

Photo 71. CR14—AM-S1 (August 4, 2012)

Photo 72. CR14—AM-S2 (August 4, 2012)

Photo 73. CR14—AV-S1 (August 4, 2012)

Photo 74. CR14—AV-S2 (August 4, 2012)

Photo 75. CR15—AM-S1 (August 4, 2012)

Photo 76. CR15—AM-S2 (August 4, 2012)

Photo 77. CR15—AM-S3 (August 4, 2012)

Photo 78. CR15—AV-S1 (August 4, 2012)

Photo 79. CR15—AV-S2 (August 4, 2012)

Photo 80. CR15—AV-S3 (August 4, 2012)

Photo 81. CR16—AM-S1 (August 4, 2012)

Photo 82. CR16—AV-S1 (August 4, 2012)

Photo 83. CR16—AV-S2 (August 4, 2012)

Photo 84. CR17—AM-S1 (August 5, 2012)

Photo 85. CR17—AV-S1 (August 5, 2012)

Photo 86. CR17—AV-S2 (August 5, 2012)

Photo 87. CR23—AM-S1 (August 4, 2012)

Photo 88. CR23—AV-S1 (August 4, 2012)

Photo 89. CR23—AV-S2 (August 4, 2012)

Appendix E:
Connecting Streams Characteristics

Legend

Type of Riparian Vegetation

Md:	Mature deciduous
Mc:	Mature softwood
Arb:	Shrubby
Er:	Ericaceous
Herb:	Herbaceous
T:	Peatland

Substrate

L:	Silt and Clay
S:	Sand
V:	Gravel
C:	Cobble
G:	Rubble
B:	Boulder
R:	Bedrock
MO:	Organic Material/Muck

Aquatic Vegetation

E:	Emergent
S:	Submergent

Fish Species

BT:	Brook trout

E. Connecting Streams Characteristics

General characteristics										Shoreline					Stream bed											Fish habitat		
Stream ID	Segment ID	Date	Length (m)	Mean width (m)	Water depth (m)	Type of habitat (%)	Flow velocity (m/s)			High water line			Riparian vegetation		Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier	Shelter (rocs, debris, trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground
							Left	Center	Right	Height (m)	largeur (m)		Stream cover (%)	Type of vegetation[1]			L	S	V	C	G	B	R	MO			Type			
											Left	Right		Left	Right														
IA-T01	S1	2012-07-27	75	1.0	nd	100Run		0.4 - 0.3 - 0.3		2.0	2.0	2.5	30 overhanging; 40 overhead	80Arb; 5Mc; 5Herb	80Arb; 5Mc; 5Herb						5		95	Low	No	Partially underground	0	90	No
IA-T02	S1	2012-07-27	85	1.3	nd	90Run; 10Riffle	0.1 - 0.1	0.2 - 0.3 - 0.2	0.1 - 0.1	0.3	0.2	0.2	5 overhanging	55Herb; 30Er; 10Mc; 5Arb	55Herb; 30Er; 10Mc; 5Arb				50	25			25	Important	E&S - 5%	No	0	25	No
IA-T03	S1	2012-07-27	83	0.9	0.05 - 0.05	80Run; 15Riffle; 5Pool		0.2 - 0.2		0.3	0.5	1.0	10 overhanging; 10 overhead	50Er; 25Herb; 10Arb; 5Mc	50Er; 25Herb; 10Arb; 5Mc		40	5	40				15	Low	S - 15%	No	0	10	No
IA-T03	S2	2012-07-27	15	0.3	0.25	90Run; 10Fall		0.4		0.3	0	0	25 overhanging; 20 overhead	60Arb; 25Er; 10Herb; 5Mc	60Arb; 25Er; 10Herb; 5Mc		60			20			20	Low	No	0.30 m high fall	10	80	No
IA-T04	S1	2012-07-28	2	1.0	0.05	100Fall		0.4		0.15	0	0	5 overhanging	50Arb	50Arb					20	80			Important	No	1.3 m high fall	0	40	No
LE-T01	S1	2012-08-05	4	0.2	0.04	100Run		0.4		0.05	0.15	1.0	0	70Arb; 20Herb; 10Mc	90Herb; 10Mc				80	15	5			Important	No	Underground	0	0	No
LE-T05	S1	2012-08-05	37	1.5	0.26	60Flat; 40Run		0.8		0.2	4.0	2.0	30 overhead; 5 overhanging	65Herb; 25Er; 10Arb	65Herb; 25Er; 10Arb	10		80	10					Moderate	No	No	0	15	Yes; BT[4]
LE-T05	S2	2012-08-05	97	2.0	0.28 - 0.21	50Flat; 40Rapid; 10Eddy		1.1 - 0.6		0.3	2.0	4.0	40 overhanging; 20 overhead	45Arb; 30Herb; 25Er	45Arb; 30Herb; 25Er			5	40	35	20			Moderate	No	No	0	0	No
LE-T05	S3	2012-08-05	35	2.0	0.21 - 0.27	60Rapid; 30Run; 10Eddy		1.6 - 1.1		0.3	2.0	3.0	50 overhanging	60Arb; 20Er; 20Herb	65Arb; 20Herb; 15Er			10	60	15	15			Moderate	No	No	0	0	No
LF-T01	S1	2012-08-08	64	2.5	0.30 - 0.30	100Flat		0.1 - 0.1		0.3	2.0	2.0	0	80Er; 5Herb; 5Md; 5Mc; 5Arb	80Er; 5Herb; 5Md; 5Mc; 5Arb								100	Low	No	No	0	0	No
LF-T01	S2	2012-08-08	18	0.3	0.20	100Flat		0.2					50 overhead	50T; 40Er; 5Arb; 5Mc	50T; 40Er; 5Arb; 5Mc								100	Low	No	Underground	0	85	No
LF-E01	S1	2012-08-08	59	0.8	0.40 - 0.30	100Run		0.4 - 0.5		0.3	1.0	1.0	80 overhanging; 20 overhead	80Arb; 15Herb; 5Mc	80Arb; 15Herb; 5Mc				5	55	40			Important	No	No	5	70	No
PE-T01	S1	2012-08-10	51	5.0	0.24 - 0.26 - 0.32	60Rapid; 40Run		0.5 - 0.6 - 0.3		0.4	2.0	2.0	15 overhead; 10 overhanging	40Herb; 35Er; 25Arb	45Herb; 40Er; 15Arb				30	50	10		10	Moderate	E&S - 30%	No	5	10	No
PE-T01	S2	2012-08-10	312	55.0	-	100Pool		nd		0.3	2.0	2.0	10 overhead	100Herb	100Herb						30		70	Low	E&S 10%	No	15	0	No

Appendix F: Lacustrine Habitat Equivalent Units in Joyce Lake, Lake E and Lake F

Joyce Lake - Habitat Equivalent Units

Species	Littoral Zone						Non-littoral Zone			Total (m²)
	Coarse/No vegetation (bedrock-boulder-rubble)	Medium/No vegetation (gravel - cobble)	Fine/No vegetation (sand-silt-muck-clay)	Coarse/Vegetation (bedrock-boulder-rubble)	Medium/Vegetation (gravier - caillou)	Fine/Vegetation (sable-silt-M.O.-argile)	Coarse/Pelagic	Medium/Pelagic	Fine/Pelagic	
Pearl dace	0	0	36890	0	0	3288	0	0	59739	**99916**
Total (m²)	**0**	**0**	**36890**	**0**	**0**	**3288**	**0**	**0**	**59739**	**99916**

Lake E - Habitat Equivalent Units

Species	Littoral Zone						Non-littoral Zone			Total (m²)
	Coarse/No vegetation (bedrock-boulder-rubble)	Medium/No vegetation (gravel - cobble)	Fine/No vegetation (sand-silt-muck-clay)	Coarse/Vegetation (bedrock-boulder-rubble)	Medium/Vegetation (gravier - caillou)	Fine/Vegetation (sable-silt-M.O.-argile)	Coarse/Pelagic	Medium/Pelagic	Fine/Pelagic	
Broot trout	7768	8754	90773	0	1124	5132	0	0	11415	**124966**
Pearl dace	0	1141	94556	0	147	5346	0	0	28883	**130073**
Longnose sucker	2026	2283	6987	0	586	395	0	0	0	**12277**
White sucker	0	2283	31751	0	293	1785	0	0	23175	**59287**
Lake trout	8102	9131	105272	0	1172	5952	0	0	46005	**175634**
Mottled sculpin	2026	0	21012	0	0	1188	0	0	0	**24226**
Burbot	7423	8366	34986	0	1074	1978	0	0	11415	**65242**
Total (m²)	**8102**	**9131**	**105272**	**0**	**1172**	**5952**	**0**	**0**	**46005**	**175634**

Lake F - Habitat Equivalent Units

Species	Littoral Zone						Non-littoral Zone			Total (m^2)
	Coarse/No vegetation (bedrock-boulder-rubble)	Medium/No vegetation (gravel - cobble)	Fine/No vegetation (sand-silt-muck-clay)	Coarse/Vegetation (bedrock-boulder-rubble)	Medium/Vegetation (gravier - caillou)	Fine/Vegetation (sable-silt-M.O.-argile)	Coarse/Pelagic	Medium/Pelagic	Fine/Pelagic	
Brook trout	0	0	21428	0	0	5390	NA	NA	NA	**26818**
Longnose sucker	0	0	5035	0	0	1267	NA	NA	NA	**6302**
White sucker	0	0	6322	0	0	1590	NA	NA	NA	**7912**
Total (m^2)	**0**	**0**	**21428**	**0**	**0**	**5390**	**0**	**0**	**0**	**26818**

Appendix G:
Electrofishing Effort and Station Description

Legend

Stream ID

CR-00,	where CR identifies a stream crossing and 00 the crossing identification number
XX-T00,	where the first two letters identify the waterbody within which the stream discharges into and T00 is the stream identification number
PE:	Petitsikapau Lake
LE:	Lake E
HO:	Hollinger Lake

Station ID

PE-00,	where PE identifies the electrofisher and 00 is the station identification number

Fish Species

LC:	Lake chub
LNS:	Longnose sucker
WS:	White sucker
BT:	Brook trout
MS:	Mottled sculpin
B:	Burbot
TSS:	Threespine stickleback
INDE:	Not identified

Substrate

L:	Silt and Clay
S:	Sand
V:	Gravel
C:	Cobble
G:	Rubble
B:	Boulder
R:	Bedrock
MO:	Organic Material/Muck

Appendix G.1. Information on Electrofishing Effort and Number of Fish Caught in Streams

Stream ID	Station ID	Latitude (ddmmss.s)	Longitude (ddmmss.s)	Date	Water temp. (°C)	Station size			Fishing time (sec)	Fish caught							Notes
						Length (m)	Width (m)	Area (m^2)		LC	LNS	WS	BT	MS	B	INDE[1]	
PE-T01	PE-14	54 49 27.2	66 32 30.8	2012-08-10	10.0	50	2	100	694	1	15						3 fish observed
CR-03	PE-06	54 49 09.9	66 33 34.4	2012-08-08	14.0	25	1	25	340								No catch
CR-10A	PE-07	54 45 05.6	66 35 47.2	2012-08-08	8.5	30	1	30	507								No catch
CR-11	PE-08	54 44 01.1	66 35 55.6	2012-08-08	9.6	25	1	25	242								No catch
CR-12	PE-04	54 43 13.0	66 36 16.0	2012-08-07	nd	15	3	45	260								No catch
CR-14	PE-03	54 41 14.3	66 37 50.1	2012-08-07	15.0	60	2	120	690				2				
CR-15	PE-02	54 41 07.7	66 39 08.2	2012-08-07	nd	25	2	50	334	6	2		1				
CR-15	PE-11	54 41 40.4	66 39 23.0	2012-08-08	10.0	3	2	6	85	4							
CR-18	PE-01	54 38 15.7	66 39 25.1	2012-08-07	nd	60	2	120	729	5	4		6	4	1	1	1 TSS found dead
CR-20	PE-05	54 49 46.5	66 34 31.0	2012-08-08	nd	30	2	60	394								No catch
LE-T05	PE-09	54 52 36.2	66 29 59.8	2012-08-08	10.1	60	2	120	900		1		3	1			1 fish observed
HO-T02	PE-10	54 52 40.9	66 29 49.6	2012-08-08	nd	60	1	60	502			2					1 BT found dead

[1] Fish species not identified

Appendix G.2. Stream Characteristics in the Area of the Electrofishing Stations

Stream ID	Station ID	Mean water depth (m)	Flow pattern	Vegetation % cover	Substrate (%)								Mean flow velocity (m/s)
					MO	L	S	V	C	G	B	R	
PE-T01	PE-14	0.27	Rapid	10	10				30	50	10		0.47
CR-03	PE-06	0.66	Flat	15	5					60	30	5	0.70
CR-10A	PE-07	0.56	Not determined	40	100								0.10
CR-11	PE-08	0.75	Flat	75	100								0.20
CR-12	PE-04	0.68	Run - Flat	20				10	20	60	10		1.07
CR-14	PE-03	1.15	Flat	30	100								0.45
CR-15	PE-02	0.52	Rapid - Run	30			5	60	15	20			1.00
CR-15	PE-11	0.20	Pool	0									<0.01
CR-18	PE-01	0.32	Run - Flat	15		5	5		30	40	20		0.57
CR-20	PE-05	0.54	Run - Flat	30	20				20	40	20		0.53
LE-T05	PE-09	0.37	Riffle - Run - Eddy	40	5			70	20		5		0.40
HO-T02	PE-10	0.37	Flat	15	100								0.30

Appendix H:
Stream Crossings Characteristics

Crossing ID

CR-00, where CR identifies a stream crossing and 00 is the crossing identification number

Segment

AV: Downstream the crossing intercepts point

AM: Upstream the crossing intercepts point

Type of Riparian Vegetation

Md: Mature deciduous

Mc: Mature softwood

Arb: Shrubby

Er: Ericaceous

Herb: Herbaceous

T: Peatland

Substrate

L: Silt and Clay

S: Sand

V: Gravel

C: Cobble

G: Rubble

B: Boulder

R: Bedrock

MO: Organic Material/Muck

Aquatic Vegetation

E: Emergent

S: Submergent

Appendix H. Stream Crossings Characteristics

Crossing ID	Segment	Date	General characteristics								Shoreline					Stream bed												Fish habitat			Note
			Length (m)	Mean width (m)	Depth (m)	Type of habitat (%)	Flow velocity (m/s)			Pool		High water line			Riaprian vegetation			Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier	Shelter (rocs. debris. trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground	
							Left	Center	Right	n	Depth (m)	Height (m)	Width (m)		Stream cover (%)	Type of vegetation[1]		L	S	V	C	G	B	R	MO			Type				
													Left	Right		Left	Right														
CR-01	AV-01	2012-08-04	116	0.9	0.41 - 0.36	75Riffle; 10Run; 10Pool; 5Eddy		0.8 - 0.3		0		0.4	6	2	60Overhanging; 15Overhead	50Arb; 40Herb; 10Er	60Arb; 30Herb; 10Er					10		90	Moderate	E - 5%	Yes; underground	0	0	No	Thre is no connection upstream or downstream; only this segment.
CR-02	AV-S1	2012-08-04	67	1.5	0.26	100Flat		0.2		0		nd	nd	nd	40Submergent; 10Overhead	40T; 40Herb; 10Er	40T; 40Herb; 10Er							100	Low	E&S - 30%	Yes; underground	0	0	No	
CR-02	AV-S2	2012-08-04	98	10.5	nd	100Pool		nd		0		nd	nd	nd	25Submergent; 15Overhanging	80Herb; 10Er; 10Arb	80Herb; 15Arb; 5Er							100	Low	S - 10%	No	15	15	No	
CR-03	AM-S1	2012-07-31	215	25.0	0.25 - 0.23 - 0.16; 0.24 - 0.24 - 0.32; 0.18 - 0.09 - 0.39	100Flat	0.2 - 0.1 - 0.0	0.2 - 0.4 - 0.2	0.0 - 0.2 - 0.1	0		0.5	2	5	5Overhanging; 5Overhead	55Er; 15Herb; 5Arb	55Er; 5Herb; 25Arb			80	15	5				Moderate	E&S - 80%	No	50	10	Yes	Northern pike suitable spawning grounds
CR-03	AV-S1	2012-07-31	99	15.0	0.20 - 0.21; 0.22 - 0.36; 0.18 - 0.20	100Flat	0.2 - 0.2	0.4 - 0.3	0.1 - 0.2	0		0.5	2	10	5Overhanging;5Overhead; 5Submergent	60Arb; 30Er; 10Herb	60Arb; 30Er; 10Herb			30	60	10				Low	E&S - 70%	No	0	10	No	Small northern pike observed
CR-04	AM-S1	2012-07-31	97	3.0	nd	100Flat		0.1 - 0.1 - 0.0		1	1	0.2	2	2	0	100T	100T							100	Low	0	No	0	0	No	
CR-04	AV-S1	2012-07-31	44	3.0	nd	100Flat		nd		1	1	nd	nd	nd	0	100T	100T							100	Low	0	No	0	0	No	
CR-05	AM-S1	2012-07-31	62	2.0	0.17	80Flat; 20Run		0.1		1	0.6	0.3	5	5	95Overhanging; 5Overhead	50Arb; 30Er; 20Herb	50Arb; 30Herb; 20Er							100	Low	0	No	10	90	No	
CR-05	AM-S2	2012-07-31	116	1.5	0.16 - 0.19 - 0.07	60Flat; 40Run		0.4 - 0.1 - 0.4				0.5	2	3	70Overhanging; 30Overhead	60Arb; 30Herb; 10Er	60Arb; 30Herb; 10Er							100	Low	0	No	10	90	No	
CR-05	AV-S1	2012-07-31	86	1.0	0.33	60Flat; 40Run		0.2		0		0.4	3	2	95Overhanging; 5 Overhead	90Arb; 10Er	90Arb; 10Er							100	Low	0	No	0	0	No	
CR-05	AV-S2	2012-07-31	127	4.0	0.60 - 0.55	100Flat		0.2 - 0.1		1	nd	0.4	2	2	60Submergent; 10Overhead	50T; 30Herb; 20Er	50T; 30Herb; 20Er							100	Low	0	No	0	0	No	
CR-06	Intermittent; dry during field campaign																														
CR-07	AV-S1	2012-07-31	68	1.5	nd	100Flat		nd		0		0.2	1	1	50Overhead	50Er; 50Herb	50Er; 50Herb							100	Low	0	No	0	0	No	
CR-07	AV-S2	2012-07-31	118	1.0	0.28 - 0.27	80Flat; 20Run		0.2 - 0.1		0		0.3	2	1	5Overhanging; 5Overhead	50Herb; 40Arb; 10Er	50Herb; 40Arb; 10Er							100	Low	S - 10%	Yes; underground	0	20	No	
CR-07	AM-S1	2012-07-31	100	2.0	nd	100Flat		nd		0		0.3	1	2	20Overhead	50Er; 50Herb	50Er; 50Herb							100	Low	0	No	0	0	No	
CR-07	AM-S2	2012-07-31	131	10.0	nd	100Pool		nd		0		nd	nd	nd	15Overhead; 5Submergent	50T; 40Er; 10Herb	50T; 40Er; 10Herb						10		90	Low	S - 10%	No	0	0	No	
CR-08	AM-S1	2012-08-01	228	6.0	0.10 - 0.24; 0.29 - 0.21; 0.24 - 0.28	50Run; 30Rapid; 10Riffle; 10Eddy	0.4 - 0.9	0.9 - 1.2	0.4 - 0.8	0		0.6	2	6	30Overhanging	60Er; 40Arb	60Arb; 30Er; 10Herb				60	30	10			Moderate	0	No	5	30	No	
CR-08	AV-S1	2012-08-01	133	50.0	0.24 - 0.32	90Pool; 10Run		0.2 - 0.1		1	nd	0.5	10	5	5Overhead; 5Submergent	90Herb; 10Arb	90Herb; 10Arb					45	25		30	Low	0	No	0	0	No	
CR-09	Intermittent; dry during field campaign																														
CR-10	AV-S1	2012-08-01	204	6.0	nd	100Flat		0.1 - 0.1 - 0.0		0		0.4	2	1	10Submergent; 5Overhanging	45Herb; 35Er; 20Arb	45Herb; 35Er; 20Arb							100	nd	S - 80%	No	0	5	No	
CR-10	AM-S1	2012-08-01	340	6.0	nd	100Flat		0.1		0		0.3	1	2	15Submergent; 5Overhead; 5Overhanging	45Herb; 35Er; 20Arb	45Er; 35Arb; 20Herb						5		95	nd	S - 60%	No	0	0	No	
CR10A	AM-S1	2012-08-01	176	5.0	nd	100Pool		nd		0		nd	nd	nd	20Submergent	75Herb; 25Er	75Herb; 25Er							100	Low	E&S - 75%	No	0	0	No	
CR10A	AV-S1	2012-08-01	44	0.6	nd	100Flat		nd		0		nd	nd	nd	60Overhead; 10Overhanging; 5Submergent	30Herb; 25Er; 25Arb; 20Mc	30Herb; 25Er; 25Arb; 20Mc							100	Low	E&S -45%	No	0	0	No	
CR10A	AV-S2	2012-08-01	125	50.0	nd	100Pool		nd		0		nd	nd	nd	15Overhead; 15Submergent; 5Overhanging	45Er; 35Herb; 20Arb	50Er; 40Herb							100	Low	S - 25%	No	0	15	No	Brook trout observed.
CR-10B	AV-S1	2012-08-01	72	18.0	0.44 - 0.41 - 0.38; 0.53 - 0.33 - 0.48; 0.67 - 0.32 - 0.35	100Flat	0.1 - 0.1 - 0.0	0.2 - 0.1 - 0.1	0.0 - 0.1 - 0.0	0		0.3	0.5	0.5	30Overhead	45Er; 40Herb; 15Arb	45Er; 40Herb; 15Arb		60	5	5			30	Low	0	No	0	0	No	Several small northern pike observed
CR-10B	AV-S2	2012-08-01	75	5.0	0.26 - 0.34; 0.31 - 0.20; 0.16 - 0.19	45Rapid; 35Run; 15Riffle	0.4 - 1.1	0.8 - 1.0	0.4 - 0.8	1	0.85	0.5	0.5	1	20Overhanging; 15Overhead; 5Canopy	25Er; 15Herb; 15Arb; 15Mc	45Arb; 30Herb; 15Er; 10Mc			5	20	50	25		Moderate	S - 5%	No	0	5	No	
CR-10B	AM-S1	2012-08-01	232	8.0	0.49 - 0.32; 0.65 - 0.43; 0.50 - 0.22	90Flat; 10Run	0.1 - 0.4	0.1 - 0.4	0.0 - 0.3	0		0.4	0.0	0.5	5Overhead	45Er; 45Herb; 10Arb	50Herb; 30Er; 20Arb			5	60	15	15		5	Moderate	S - 30%	No	0	0	No	

Appendix H. Stream Crossings Characteristics

Crossing ID	Segment	Date	General characteristics									Shoreline						Stream bed														Fish habitat			Note
			Length (m)	Mean width (m)	Depth (m)	Type of habitat (%)	Flow velocity (m/s)			Pool		High water line			Riaprian vegetation			Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier								
										n	Depth (m)	Height (m)	Width (m)		Stream cover (%)	Type of vegetation[1]		L	S	V	C	G	B	R	MO			Type							
							Left	Center	Right				Left	Right		Left	Right													Shelter (rocs. debris. trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground	
CR-11	AM-S1	2012-08-03	148	2.0	0.36 - 0.62; 0.29 - 0.66; 0.35 - 0.65	80Run; 15Pool; 5Rapid	0.4 - 0.3	1.5 - 0.7	0.9 - 0.4	0		nd	nd	nd	20Overhead; 5Overhanging	40Er; 40Herb; 20Arb	50Herb; 50Er					10	40	50		Moderate	0	No				0	0	No	
CR-11	AM-S2	2012-08-03	131	1.0	0.69; 0.78; 0.72	90Flat; 10Rapid	0.4	0.6	0.4	0		nd	nd	nd	40Overhead	50Herb; 50Er	50Herb; 50Er				10	30	60			Low	0	No				5	10	No	
CR-11	AV-S1	2012-08-03	20	2.0	0.41; 0.41; 0.32	80Cascade; 10Pool; 10Eddy	1.3	0.9	0.9	0		nd	nd	nd	5Overhead	80Er; 20Herb	80Er; 20Herb					15	5	80		Moderate	0	No				0	5	No	
CR-11	AV-S2	2012-08-03	61	1.3	0.76; 0.82; 0.93	60Run; 40Flat	0.5	1.1	0.4	0		nd	nd	nd	5Overhead	60Herb; 40Er	60Herb; 40Er				10	80	10			Important	0	No				0	0	No	
CR-12	AV-S1	2012-08-02	32	2.5	0.34 - 0.24 - 0.22; 0.38 - 0.34 - 0.25; 0.37 - 0.38 - 0.16	60Run; 30Pool; 5Rapid; 5Eddy	0.3 - 0.2 - 1.2	0.8 - 0.8 - 1.0	0.5 - 0.2 - 0.8	0		0.3	5	5	15Overhanging; 15Overhead	60Arb; 40Herb	80Herb; 20Arb		5		60	30	5			Moderate	0	No				5	5	No	
CR-12	AV-S2	2012-08-02	93	3.0	0.36 - 0.43 - 0.45; 0.30 - 0.54 - 0.41; 0.18 - 0.38	50Flat; 30Run; 10Riffle; 10Eddy	0.5 - 0.0 - 0.1	0.6 - 0.5 - 0.5	0.3 - 0.1 - 0.2	0		0.4	3	2	60Overhanging; 5Overhead	70Arb; 20Herb; 10Er	60Arb; 25Er; 15Herb		10	30	50	5	5			Moderate	0	No				30	20	No	
CR-12	AV-S3	2012-08-02	93	2.0	0.55 - 0.23 - 0.22; 0.50 - 0.30 - 0.31; 0.24 - 0.36 - 0.20	65Rapid; 25Flat; 10Riffle	0.2 - 0.5 - 0.5	0.5 - 0.9 - 1.5	0.3 - 0.5 - 0.1	0		0.3	5	3	15Overhanging; 5Overhead	70Arb; 25Herb; 5Er	40Herb; 30Er; 30Arb				60	25	15			Important	0	No				5	25	No	
CR-12	AM-S1	2012-08-02	100	2.0	0.39 - 0.24 - 0.24; 0.48 - 0.31 - 0.37; 0.32 - 0.31 - 0.25	50Rapid; 30Flat; 15Run	0.1 - 0.4 - 0.1	0.7 - 0.6 - 0.7	0.2 - 0.1 - 0.1	0		0.3	2	4	15Overhanging; 5Couvertbas	60Arb; 30Er; 10Herb	60Er; 30Arb; 10Herb			5	30	50	15			Moderate	0	No				5	15	No	
CR-12	AM-S2	2012-08-02	122	3.0	0.17 - 0.35; 0.20 - 0.18; 0.24 - 0.21	40Rapid; 30Flat; 20Pool; 10Run	0.1 - 0.2	1.0 - 0.5	0.9 - 0.6	0					15Overhead; 15Overhanging; 5Canopy	45Herb; 40Er; 10Arb; 5Mc	60Er; 30Herb; 10Arb			5	30	50	10		5	Moderate	0	No				25	15	No	
CR-12	AM-S3	2012-08-02	62	4.0	0.26 - 0.13; 0.21 - 0.26; 0.31 - 0.29	40Flat; 40Run; 10Pool; 5Rapid;5Eddy	0.2 - 1.5	0.5 - 1.2	0.5 - 0.6	0		0.3	1	2	15Overhead; 5Overhanging	50Herb; 40Er; 5Arb; 5Mc	50Er; 40Herb; 5Arb; 5Mc				60	30	5		5	Moderate	0	No				15	25	No	
CR-13	AM-S1	2012-08-02	138	3.0	0.19 - 0.11; 0.36 - 0.32; 0.34 - 0.32	90Cascade; 5Rapid; 5Eddy	0.5 - 0.5	0.9 - 1.8	0.2 - 1.1	0		0.2	2	1	80Overhanging	100Arb	100Arb					5	10	80	5	Important	0	No				0	0	No	
CR-13	AM-S2	2012-08-02	99	4.0	0.29 ; 0.31; 0.29	50Cascade; 35Riffle; 15Eddy	0.6	1.6	0.2	0		nd	nd	nd	15Overhanging	100Arb	100Arb					10	80	10		Important	0	No				0	0	No	
CR-13	AV-S1	2012-08-02	35	4.0	0.14; 0.20; 0.10	70Cascade; 25Run; 5Riffle	0.8	1.8	0.9	0		nd	nd	nd	90Overhanging; 5Overhead	90Arb; 5Er; 5Herb	90Arb; 5Er; 5Herb				5	60	35			Important	0	No				15	60	No	
CR-13	AV-S2	2012-08-02	43	3.0	0.13; 0.26; 0.27	95Cascade; 5Riffle; 5Eddy	0.4	1.3	0.6	0		0.3	3	1	80Overhanging; 5Overhead	100Arb	100Arb				5	30	60	5		Important	0	No				0	0	No	
CR-13	AV-S3	2012-08-02	106	4.0	0.12; 0.14; 0.12	60Run; 25Rapid; 10Flat; 5Cascade	0.4	0.5	0.6	0		0.3	0	3	80Overhanging	90Arb; 5Er; 5Md	90Arb; 5Er; 5Md				5	60	30	5		Moderate	0	No				15	80	No	Brook trout observed
CR-14	AM-S1	2012-08-04	153	1.7	0.55 - 0.48	95Flat; 5Run		0.3 - 0.5		0		0.3	5	3	20Overhead; 5Overhanging	60Herb; 40Er	55Herb; 35Er; 10Arb				15	5			80	Important	E - 80%	No				15	5	No	
CR-14	AM-S2	2012-08-04	84	1.5	0.94 - 0.61 - 0.67	95Flat; 5Run		0.3 - 0.2 - 0.4		0		0.2	3	10	20Overhanging; 15Overhead	35Herb; 35Er; 30Arb	45Herb; 30Arb; 25Er								100	Low	E - 95%	No				0	50	No	
CR-14	AV-S1	2012-08-04	77	2.0	1.2	100Flat		0.2		0		0.3	2	3	60Submergent; 15Overhead	80Herb; 20Er	75Herb; 25Er								100	Low	E - 95%	No				15	0	No	
CR-14	AV-S2	2012-08-04	128	1.5	0.68	90Flat; 10Run		0.3		0		0.3	2	3	30Overhead; 15Submergent; 15Overhanging	80Herb; 15Er; 5Arb	70Herb; 20Er; 5Arb; 5Mc								100	Low	E - 85%	No				0	10	No	
CR-14	AV-S3	2012-08-04	47	1.0	0.36 - 0.29	50Flat; 30Run; 15Rapid; 5Cascade		1.3 - 1.3		0		0.2	3	2	25Submergent; 15Overhead; 15Overhanging; 5Canopy	65Herb; 20Er; 10Arb; 5Mc	70Herb; 15Er; 10Arb; 5Mc					5	5		90	Low	E - 80%	No				0	60	No	
CR-15	AM-S1	2012-08-04	102	3.0	0.23 - 0.31; 0.46 - 0.55; 0.23 - 0.45	70Flat; 20Rapid; 5Run; 5Riffle	0.3 - 0.2	1.2 - 0.9	0.8 - 0.0	2	0.41 - 0.51	0.3	1	1	15Overhead; 10Overhanging	70Herb; 20Er; 10Arb	70Herb; 20Er; 10Arb			20	20	60				Moderate	0	No				15	20	Yes	CR15-FR1; CR15-FR2; CR15-FR3; several juveniles of brook trout observed
CR-15	AM-S2	2012-08-04	73	2.5	0.33; 0.47 0.33	70Run; 20Flat; 5Riffle	0.2	1.3	0.2	0		0.3	0.5	0.5	25Overhead; 10Overhanging	70Herb; 20Er; 10Arb	50Er; 40Herb; 10Arb			10	60	30				Moderate	0	No				20	25	No	Fish observed
CR-15	AM-S3	2012-08-04	90	2.5	0.16 - 0.24; 0.36 - 0.27; 0.29 - 0.11	60Run; 30Cascade; 5Rapid; 5Eddy	0.7 - 0.8	1.3 - 1.6	1.2 - 1.5	0		0.3	1	2	25Overhanging; 10Overhead	60Arb; 30Er; 10Herb	45Arb; 40Er; 15Herb			15	60	25				Moderate	0	No				10	30	No	
CR-15	AV-S1	2012-08-04	41	3.0	0.26; 0.18; 0.20	60Flat; 20Run; 10Pool; 5Riffle; 5Eddy	0.5	0.6	0.6	1	0.95	0.25	0.5	2	15Overhead; 5Overhanging	80Herb; 15Arb; 5Er	80Herb; 15Arb; 5Er		5	50	30	15				Moderate	0	No				15	10	Yes	CR15-FR4; CR15-FR5
CR-15	AV-S2	2012-08-04	61	2.5	0.25 - 0.30; 0.38 - 0.40; 0.22 - 0.58	60Run; 30Flat; 5Pool; 5Eddy	0.8 - 0.1	1.3 - 0.8	0.5 - 0.4	0		0.3	1	1	15Overhanging; 15 Overhead	50Arb; 40Herb; 10Er	60Herb; 30Er; 10Arb		25	10	60	5				Moderate	0	No				0	0	Yes	CR15-FR6

Appendix H. Stream Crossings Characteristics

Crossing ID	Segment	Date	General characteristics									Shoreline					Stream bed												Fish habitat			Note
			Length (m)	Mean width (m)	Depth (m)	Type of habitat (%)	Flow velocity (m/s)			Pool		High water line			Riaprian vegetation		Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier		Shelter (rocs. debris. trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground	
							Left	Center	Right	n	Depth (m)	Height (m)	Width (m)		Stream cover (%)	Type of vegetation[1]	L	S	V	C	G	B	R	MO			Type				
													Left	Right		Left	Right														
CR-15	AV-S3	2012-08-04	67	2.5	0.36; 0.42; 0.33	60Flat; 25Run; 10Pool; 5Eddy	0.2	0.6	0.4	0		0.2	0.5	0.5	35Overhanging; 10Overhead	50Herb; 30Arb; 20Er	50Arb; 30Herb; 20Er		25	45	20				10	Moderate	0	No		25	25	Yes	Fish observed

Appendix H. Stream Crossings Characteristics

Crossing ID	Segment	Date	General characteristics								Shoreline						Stream bed												Fish habitat			Note
			Length (m)	Mean width (m)	Depth (m)	Type of habitat (%)	Flow velocity (m/s)			Pool		High water line			Riaprian vegetation			Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier	Shelter (rocs. debris. trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground	
										n	Depth (m)	Height (m)	Width (m)		Stream cover (%)	Type of vegetation[1]												Type			
							Left	Center	Right				Left	Right		Left	Right	L	S	V	C	G	B	R	MO							
CR-16	AM-S1	2012-08-04	35	0.8	0.17 - 0.60 - 0.51	80Riffle; 20Run		0.4 - 0.5 - 0.9		0		0.2	5	3	70Overhead; 10Overhanging	80Herb; 15Er; 5Arb	80Herb; 15Er; 5Arb							100	Low	0	Yes; underground	60	30	No	
CR-16	AV-S1	2012-08-04	101	0.5	0.34 - 0.81	90Riffle; 10Run		1.0 - 0.2		0		nd	nd	nd	90Overhead; 5Submergent	50Er; 45Herb; 5Arb	50Er; 45Herb; 5Arb							100	Low	0	No	50	40	No	
CR-16	AV-S2	2012-08-04	129	1.2	0.23	90Flat; 5Run; 5Pool		0.3		0		0.2	0.5	0.5	70Overhead; 10Submergent	50Herb; 30Er; 10Arb	50Herb; 30Er; 10Arb							100	Low	E - 30%	No	0	0	No	
CR-17	AM-S1	2012-08-05	268	21.0	0.51; 0.41; 0.44	100Flat	0.3	0.4	0.3	0		0.5	1	4	nd	nd	nd		90					10	Moderate	E - 60%	No	0	0	No	
CR-17	AV-S1	2012-08-05	86	15.0	0.65; 0.80; 0.75	90Flat; 10Rapid	0.7	0.8	0.7	0		nd	nd	nd	nd	nd	nd				30	70				Important	E - 5%	No	0	0	No	
CR-17	AV-S2	2012-08-05	217	10.0	0.59; 0.54; 0.35	80Rapid; 10Run; 10Flat	1.4	1.5	1.7	0		nd	nd	nd	nd	nd	nd			5	20	60	10	5		Important	0	No	0	0	No	
CR-18	AM-S1	2012-08-05	60	2.0	0.24 - 0.25; 0.44 - 0.37; 0.63 - 0.30	60Flat; 25Rapid; 10Run; 5Eddy	0.5 - 0.5	0.8 - 0.8	0.5 - 0.1	0		0.3	1	2	35Overhead; 20Overhanging	45Er; 40Herb; 15Arb	50Er; 40Herb; 10Arb		5		30	5			60	Moderate	E&S - 80%	No	10	30	No	
CR-18	AM-S2	2012-08-05	40	2.0	0.43 - 0.23; 0.49 - 0.41; 0.29 - 0.34	65Flat; 30Rapid; 5Run	0.5 - 0.4	1.1 - 1.2	0.4 - 0.4	0		0.5	nd	nd	20Overhanging; 15Overhead; 5Canopy	45Arb; 15Er; 40T	70T; 15Er; 15Arb				60		10		30	Moderate	E - 60%	No	5	15	No	
CR-18	AM-S3	2012-08-05	37	nd	0.50; 0.63; 0.52	85Flat; 15Riffle	0.4	0.5	0.3	0		0.3	nd	nd	40Overhead; 15Overhanging	65Er; 35Arb	60Er; 30Arb; 10Herb		30		60	10				Moderate	E&S - 20%	No	10	30	No	
CR-18	AM-S4	2012-08-05	60	2.0	0.71 - 0.32; 0.63 - 0.34; 0.33 - 0.48	70Flat; 25Rapid; 5Eddy	0.2 - 0.1	0.5 - 1.1	0.3 - 0.3	0		0.3	nd	nd	30Overhead; 5Overhanging	45Herb; 40Er; 15Arb	45Er; 45Herb; 10Arb				5		35		60	Moderate	E&S - 60%	No	10	30	No	
CR-18	AV-S1	2012-08-05	69	1.8	0.47; 0.37; 0.31	60Flat; 25Rapid; 10Pool; 5Run	0.7	0.6	0.4	0		0.4	1	1	15Overhead; 5Overhanging; 5Canopy	80Herb; 10Arb; 5Er; 5Md	75Herb; 15Er; 5Arb; 5Md		60		25	15				Moderate	E - 30%	No	15	0	No	
CR-18	AV-S2	2012-08-05	31	2.3	0.34; 0.52; 0.51	65Rapid; 20Flat; 15Eddy	0.3	1.3	0.1	0		0.5	1	2	15Overhead; 10Overhanging	60Arb; 30Herb; 10Er	60Er; 30Arb; 10Er				10	40	50			Low	0	No	0	15	No	
CR-18	AV-S3	2012-08-05	79	2.5	0.38 - 0.28; 0.29 - 0.35; 0.28 - 0.28	70Rapid; 10Riffle; 10Flat; 10Pool	0.4 - 0.3	1.5 - 0.7	0.3 - 0.2	0		0.4	4	1	85Overhanging; 5Overhead	90Arb; 5Er; 5Herb	90Arb; 10Herb		80		10	5	5			Moderate	E - 65%	No	10	15	No	
CR-18	AV-S4	2012-08-05	34	3.0	0.30; 0.53; 0.21	80Flat; 15Rapid; 5Pool	0.0	0.4	0.2	0		0.3	5	4	40Overhanging; 10Overhead	80Arb; 10Er; 10Herb	80Arb; 15Er; 5Herb		90			5		5		Low	E - 10%	No	10	25	No	
CR-18	AV-S5	2012-08-05	59	8.0	0.06; 0.18; 0.21	90Run;5Rapid; 5Eddy	0.4	1.2	0.9	0		0.3	2	1	nd	nd	nd				80	5			15	Moderate	0	No	0	0	No	
CR-19	Intermittent; few water pockets																															
CR-20	AM-S1	2012-07-31	45	6.0	0.08 - 0.14; 0.11 - 0.13; 0.09 - 0.10	65Run; 15Pool; 20Rapid	0.1 - 0.1	0.2 - 0.4	0.1 - 0.1	0		0.4	10	15	20Overhead; 10Overhanging	30Er; 25Arb; 45Herb	45Herb; 40Arb; 15Er				55	25	20			Low	E - 20%	No	25	5	No	
CR-20	AM-S2	2012-07-31	27	15.0	0.22; 0.56; 0.18	60Pool; 30Run; 10Eddy	0.0	0.2	0.0	1	0.89	0.32	5	4	10Overhead; 5Overhanging	50Herb; 45Er; 5Arb	55Er; 40Herb; 5Arb				30	60	10			Low	S - 15%	No	15	5	No	
CR-20	AM-S3	2012-07-31	39	5.0	0.25; 0.22; 0.11	80Run; 20Rapid	0.2	0.6	0.0	0		0.3	5	10	15Overhanging; 5Overhead	30Herb; 30Er; 10Arb	55Arb; 25Er; 20Herb				60	35	5			Moderate	E&S - 0%	No	0	20	No	
CR-20	AM-S4	2012-07-31	41	20.0	0.08 - 0.14; 0.04 - 0.10; 0.15 - 0.34	80Flat; 20Pool	0.2 - 0.1	0.1 - 0.1	0.2 - 0.1	0		0.4	nd	nd	5Overhanging; 5Overhead	50Arb; 50Er	50Arb; 50Er				50	25	25			Moderate	S - 35%	No	10	5	No	
CR-20	AM-S5	2012-07-31	44	3.0	0.07 - 0.03; 0.25 - 0.11; 0.26 - 0.05	95Flat; 5Run	0.0 - 0.0	0.1 - 0.3	0.0 - 0.0	0		0.3	10	10	15Overhead; 5Overhanging; 2Submergent	55Er; 25Herb; 20Arb	55Herb; 30Arb; 15Er				15	45	40			Moderate	S - 5%	Yes: beaver dam (h = 0.6 m)	0	15	No	Several small northern pike observed
CR-20	AV-S1	2012-07-31	222	35.0	0.14 - 0.15; 0.10 - 0.24; 0.21 - 0.17	70Pool; 25Flat; 5Run	0.1 - 0.1	0.1 - 0.1	0.1 - 0.1	1	0.63	nd	nd	nd	15Submergent; 5Overhead; 5Overhanging	55Er; 25Herb; 20Arb	55Er; 30Herb; 5Arb				5	70	25			Moderate	E&S - 5%	No	15	3	No	Fish observed
CR-20	AV-S2	2012-07-31	68	10.0	0.05 - 0.15 - 0.15; 0.19 - 0.11 - 0.18; 0.18 - 0.18 - 0.22	70Rapid; 30Run	0.2 - 0.6 - 0.5	0.2 - 0.7 - 0.5	0.2 - 0.4 - 0.4	0		0.3	5	15	15Overhanging; 10Overhead	55Er; 45Arb	45Er; 55Arb				45	45	10			Low	S - 5%	No	5	0	No	
CR-21	Intermittent; dry during field campaign																															

Appendix H. Stream Crossings Characteristics

Crossing ID	Segment	Date	General characteristics									Shoreline					Stream bed														Fish habitat			Note
			Length (m)	Mean width (m)	Depth (m)	Type of habitat (%)	Flow velocity (m/s)			Pool		High water line			Riaprian vegetation			Substrate (%)[2]								Substrate compaction	Aquatic vegetation[3]	Fish barrier		Shelter (rocs. debris. trees) (% coverage) recouvrement)	Sherlter (shrubs or branch)	Potential spawning ground	
							Left	Center	Right	n	Depth (m)	Height (m)	Width (m)		Stream cover (%)	Type of vegetation[1]		L	S	V	C	G	B	R	MO			Type				
													Left	Right		Left	Right															
CR-22	AM-S1	2012-08-03	163	2.5	0.27 - 0.33; 0.36 - 0.51; 0.15 - 0.35	95Cascade; 5Eddy	1.2 - 1.1	2.4 - 1.5	1.3 - 0.9	0		nd	nd	nd	80Overhanging	100Arb	100Arb					30	60	10		Important	0	No	0	0	No	
CR-22	AM-S2	2012-08-03	81	2.5	0.32; 0.61; 0.54	75Cascade; 15Rapid; 10Eddy	0.9	1.2	1.0	0		nd	nd	nd	60Overhanging; 15Canopy; 5Overhead	80Arb; 15Herb; 5Mc	80Arb; 15Herb; 5Mc					25	70	5		Important	0	No	0	0	No	
CR-22	AV-S1	2012-08-03	172	3.0	0.35; 0.48; 0.35	80Cascade; 10Rapid; 5Riffle; 5Eddy	1.2	1.5	1.7	0		nd	2	3	70Overhanging; 15Overhead	80Arb; 10Herb; 5Er; 5Mc	80Arb; 10Herb; 5Er; 5Mc					5	15	80		Important	0	No	0	0	No	
CR-22	AV-S1	2012-08-03	107	3.0	0.19; 0.15; 0.31	80Pool; 10Rapid; 5Riffle; 5Eddy	1.1	1.8	1.3	0		nd	3	1	60Overhanging; 20Overhead; 5Canopy	80Arb; 15Herb; 5Mc	80Arb; 15Herb; 5Mc					30	60	5	5	Important	0	No	0	0	No	
CR-23	AM-S1	2012-08-04	188	nd	nd	100Pool		nd		0		nd	nd	nd	10Overhead; 10Submergent	60Er; 25Herb; 15T	60Er; 25Herb; 15T					10			90	Moderate	E&S - 25%	No	0	0	No	
CR-23	AV-S1	2012-08-04	107	2.5	0.49; 0.51; 0.43	65Flat; 25Run; 10Rapid	0.4	0.7	0.3	0		nd	nd	nd	60Overhanging; 10Overhead	70Arb; 15Er; 15Herb	75Arb; 20Herb; 5Er					10	50	40		Moderate	E - 65%	No	0	45	No	
CR-23	AV-S2	2012-08-04	113	2.0	0.69	80Flat; 20Run		0.2		0		nd	nd	nd	85Overhanging; 10Overhead	75Arb; 15Herb; 10Er	75Arb; 15Er; 10Herb					10			90	Low	15%	No	0	45	No	Several old beaver dams. No fish barrier. Several young-of-the-year observed

[1] Type of riparian vegetation: Md: Mature deciduous; Mc: Mature softwood; Arb: Shruby; Er: Ericaceae; Herb: Herbaceous; T: Peatlanc

[2] Substrate: L: Silt and clay; S: Sand; V; Gravel; C; Cobble; G: Rubble; B : Boulder; R: Bedrock

[3] E: Emergent vegetation; S: Submergent vegetation

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Project Update for Joyce Lake Direct Shipping Iron Ore Project

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Final Report

October 31, 2014

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LIST OF FIGURES

1.0 INTRODUCTION / OVERVIEW

Labec Century (the Proponent) is proposing modifications to its Joyce Lake Direct Shipping Iron Ore Project (the Project) as a result of ongoing studies. The proposed modifications affect the following previous submissions to the Canadian Environmental Assessment Agency (CEA Agency) and the Newfoundland and Labrador Department of Environment and Conservation, Environmental Assessment Division (NLDOEC):

- Joyce Lake Direct Shipping Iron Ore Project – Project Description and Provincial Registration (November 5, 2012)
- Joyce Lake Direct Shipping Iron Ore Project – Supplemental Information Package (February 21, 2013)

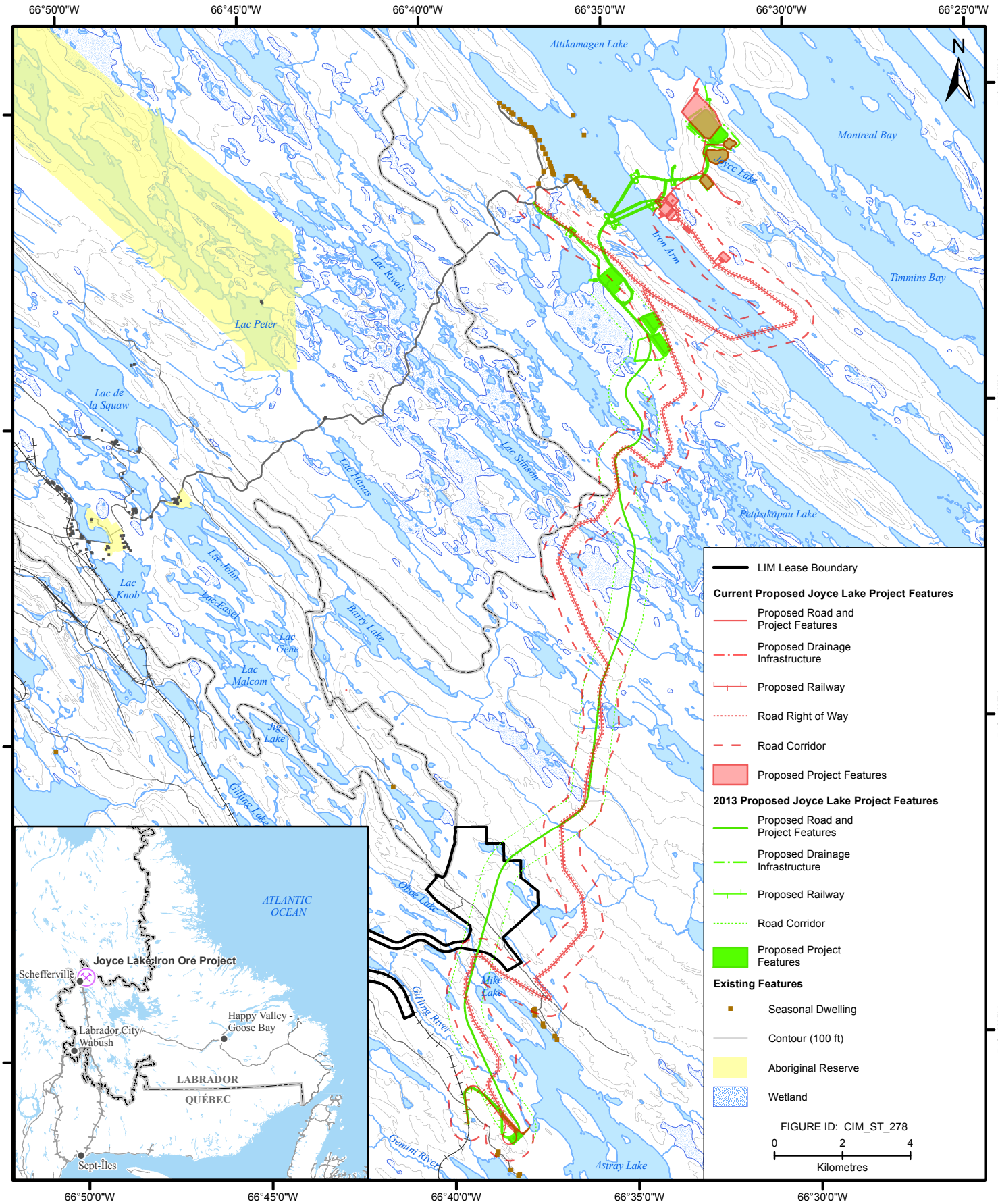
The current site plan as compared to the site plan presented in the Supplemental Information Package is presented in Figure 1-1.

The main proposed Project modifications include:

- Construction and operation of a rock causeway across Iron Arm for personnel and equipment access and haulage of product (lump and fine ore) across Iron Arm. This would replace the previously proposed ice bridges and barge landings;
- Use of only dry processing with anticipated 100% recovery (instead of both wet and dry processes) for iron ore processing. As a result, a tailings management facility will no longer be required; and
- Relocation of Project infrastructure to the north side (mine pit side) of Iron Arm.

The Project activities continue to meet the threshold for environmental assessment as per Section 15(a) of the Regulations Designating Physical Activities (*CEAA, 2012*) and the *Newfoundland and Labrador Environmental Assessment Regulation, 2003.*

The proposed Project changes represent a likely reduction in the potential environmental effects and physical footprint of the proposed Project. The existing environmental assessment guidelines developed for the Project by the CEA Agency and NLDOEC are broad enough in scope to address the proposed changes. As a result, revisions to guidelines issued for the Project are not likely to be required to address proposed modifications to the Project. A description of the Project modifications and a detailed concordance between new Project elements and the existing guidelines is presented below (Section 3.0).



CENTURY IRON MINES CORP.	FIGURE TITLE: **Proposed Joyce Lake Project: Site Plan Comparison**			Stassinu Stantec Limited Partnership
	CLIENT: **LABEC CENTURY IRON ORE INC.**			
CHECKED BY: **DF/CL**	FIGURE ID: **FIGURE 1-1**	PROJECT NUMBER: **121511139**	FIGURE SOURCES: Project features provided by BBA version 1 received 2014/10/15. Basemap information from NRCan CanVec database and Newfoundland and Labrador Department of Natural Resources.	

There have been no changes to the operational duration, labour force requirements, production rate, size of waste rock stockpiles, or transportation method. The accommodations facility will remain on site. As is typical, some refinements to infrastructure location will continue throughout the detailed design phase.

2.0 PROPOSED PROJECT MODIFICATIONS

The proposed modifications have been identified as a result of detailed alternatives analysis conducted throughout 2014. This alternatives analysis was conducted through a series of detailed studies on the Project components in question. Factors considered in the analysis included:

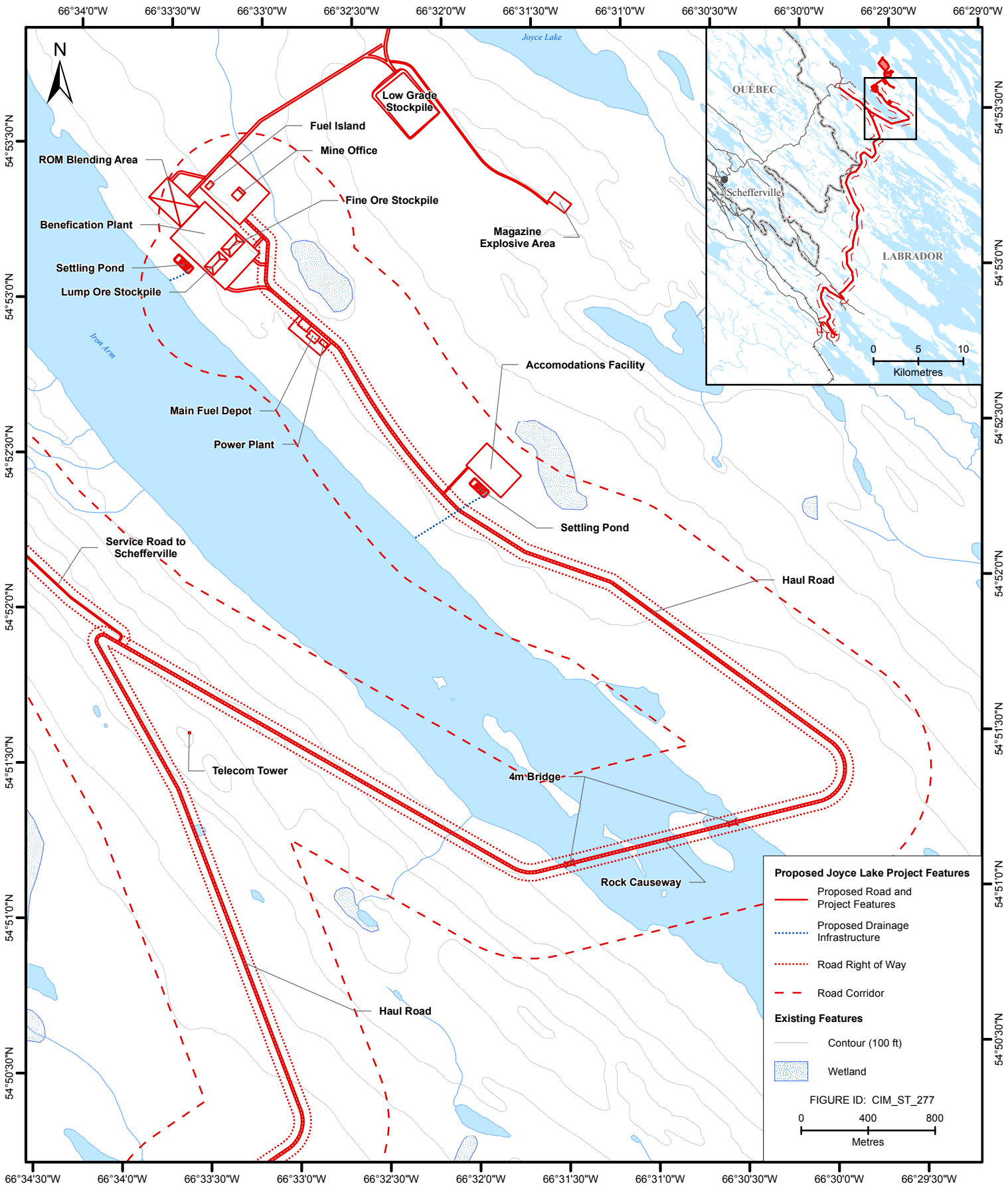
- Risks to both people and the environment;
- Community benefits and concerns;
- Project economics;
- Project schedule; and
- Long-term development potential of the area.

2.1 Construction and Operation of a Causeway across Iron Arm

A rock causeway (Figure 2-1) linking the open pit area to the mainland will be constructed across Iron Arm. This causeway will replace the previously proposed ice bridges, and will provide more flexibility in Project execution.

There are several potential benefits of using a causeway to cross Iron Arm rather than the previously proposed ice bridges:

- Safety improvements;
- Greater operational flexibility (i.e., all year operation);
- Better Project economics;
- The causeway can remain as an asset to the area;
- Local employees can be transported to work on a daily basis rather than live in the site camp; and
- Smaller stockpile footprints.



CENTURY IRON MINES CORP.

FIGURE TITLE:

Beneficiation Plant Area and Causeway

CLIENT:

LABEC CENTURY IRON ORE INC.

CHECKED BY:	FIGURE ID:	PROJECT NUMBER:	FIGURE SOURCES:
DF/CL	FIGURE 2-1	121511139	Project features provided by BBA version 1 received 2014/10/15. Basemap information from NRCan CanVec database and Newfoundland and Labrador Department of Natural Resources.

Stassinu Stantec Limited Partnership

2.2 Conducting only Dry Process for Iron Ore Processing and Removal of the Requirement for a Tailings Management Facility

The iron ore processing option to be implemented (Dry Process) will involve crushing and screening of run-of-mine ore to produce two iron ore "products":

- An **iron ore lump** product, between 6.3 mm and 31.5 mm in diameter (~ golf ball size); and
- An **iron ore sinter fines** product, less than 6.3 mm in diameter (~pea size).

Tailings will not be generated from the dry process and as a result a tailings management facility will no longer be required for the Project.

The benefits of using a dry process include:

- The footprint of the dry plant will be much smaller than wet and dry plants;
- Modular assembly of the dry plant, i.e. quick assembly and take down after the end of life-of-mine;
- Much lower power requirements, i.e. in the order of 600 to 800 percent, for the dry process compared to wet;
- Less noise and reduced SOx and NOx release; and
- No risks of spills and potential contamination related to the wet plant.

Mobile, self-contained, primary and secondary crushing units and a mobile screening unit will be used for ore crushing and screening on site to produce the lump and sinter fines ore products. No tailings will be generated as the process recovery will be 100% and water will not be used for iron ore processing on site. The only requirement for water on site is to control dust and for potable water requirements at the accommodations facility. The block flow diagram for the Dry Process is illustrated in Figure 2-2.

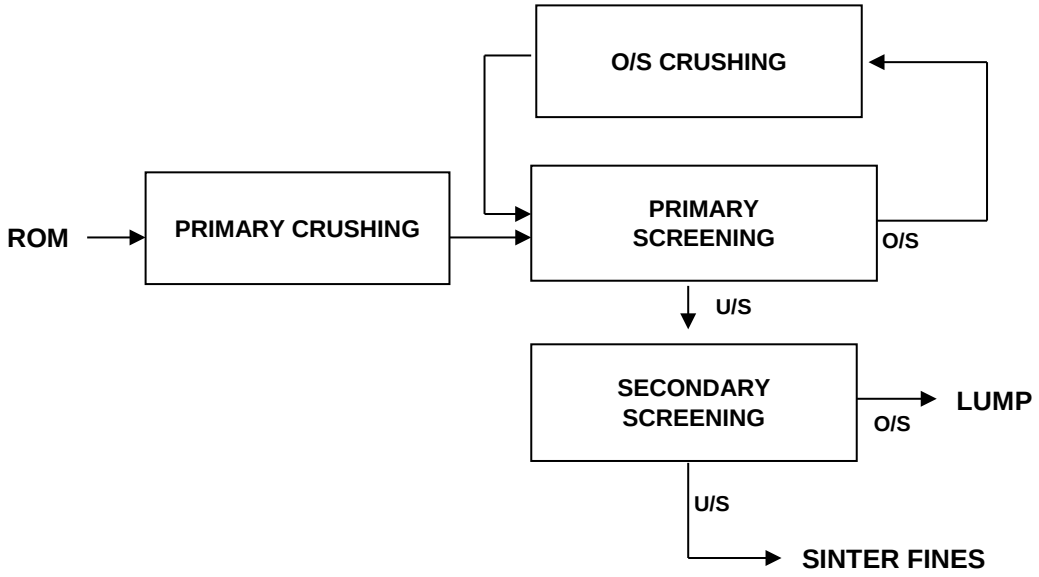


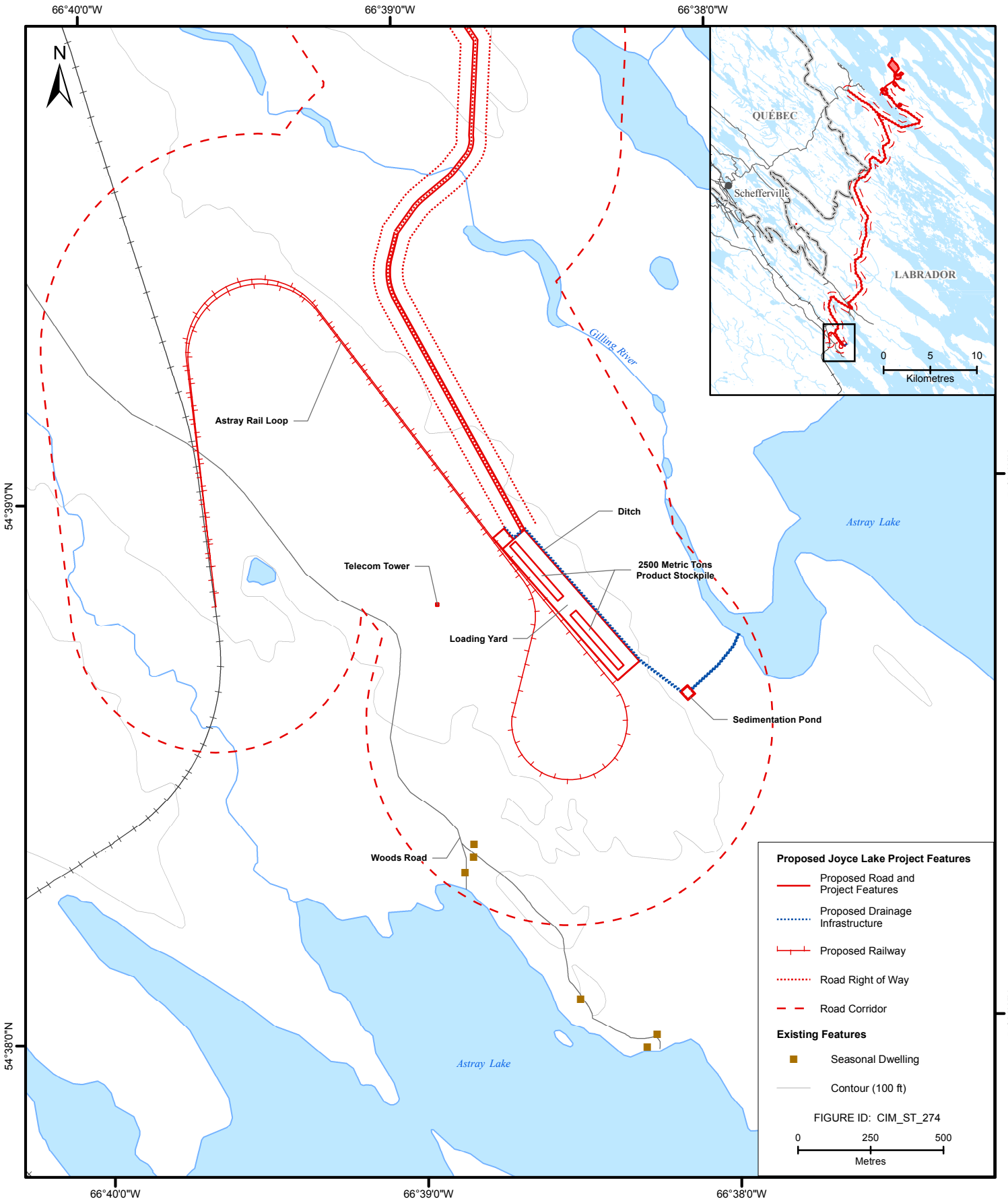
Figure 2-2 Block Flow Diagram

2.3 Relocation of Project Infrastructure to the North Side of Iron Arm

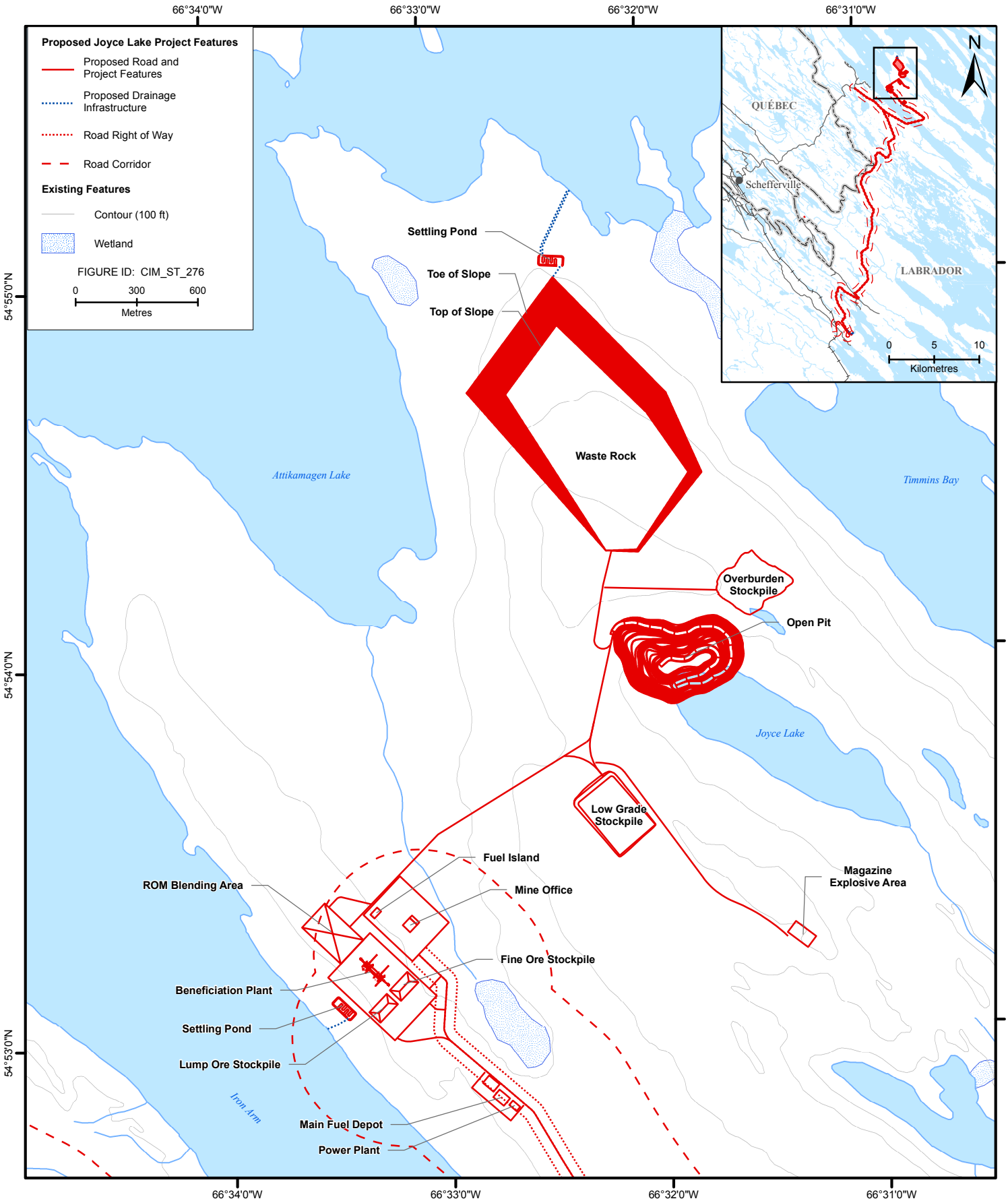
The proposed Project modifications include the relocation of the following Project components to the north side (mine side) of Iron Arm:

- run of mine ore stockpile;
- iron ore processing plant (dry processing unit);
- fines and lump ore stockpiles;
- accommodations facility; and
- mine office, maintenance shop, main fuel depot, and associated mine support facilities.

The proposed mine infrastructure is shown on Figure 2-3 and the proposed rail infrastructure is shown on Figure 2-4. There is no new Project infrastructure.



CENTURY IRON MINES CORP.	FIGURE TITLE: **Rail Infrastructure**			Stassinu Stantec Limited Partnership
	CLIENT: **LABEC CENTURY IRON ORE INC.**			
CHECKED BY: **DF/CL**	FIGURE ID: **FIGURE 2-4**	PROJECT NUMBER: **121511139**	FIGURE SOURCES: Project features provided by BBA version 1 received 2014/10/15. Basemap information from NRCan CanVec database and Newfoundland and Labrador Department of Natural Resources.	



CENTURY IRON MINES CORP.	FIGURE TITLE: **Mine Site and Associated Infrastructure**			Stassinu Stantec Limited Partnership
	CLIENT: **LABEC CENTURY IRON ORE INC.**			
CHECKED BY: **DF/CL**	FIGURE ID: **FIGURE 2-3**	PROJECT NUMBER: **121511139**	FIGURE SOURCES: Project features provided by BBA version 1 received 2014/10/15. Basemap information from NRCan CanVec database and Newfoundland and Labrador Department of Natural Resources.	

2.4 Summary of Project Infrastructure and Tonnage

Table 2-1 details the changes between the Project as outlined in the Registration (November 5, 2012), the Supplemental Project Information Package (February 21, 2013) and the current site plan. Table 2-2 shows the revised production schedule for the Project

Table 2.1 Summary of Project Infrastructure Footprint and Tonnage

Project Element	Registration Site Plan (November 5, 2012)	Registration Update Site Plan (February 21, 2013)	Current Site Plan (October 29, 2014)
Haulage Road (Beneficiation Plant to Rail Yard)	~26.6 km	~27.6 km	~40 km
Open Pit Area (m^2)	~164,716 m^2	~181,425m^2	~181,425m^2
Phase I DSO Tonnage	5,000,000 tonnes	6,000,000 tonnes	17,000,000 tonnes
Waste Rock Tonnage	5,050,000 tonnes	56,000,000 tonnes	47,600,000.00
Overburden Tonnage	2,900,000 tonnes	3,500,000 tonnes	4,500,000 tonnes
Tailings Management Facility (m^2)	500,000 m^2	250,000 m^2	0 m^2

Table 2.2 Estimated Production (By Year) of Iron Ore for the Joyce Lake Project

Product	Unit	Estimated Production by Year						
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Phase I Ore (DSO; 62% Fe)	tonne	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,000,000
Waste Rock	tonne	10,800,000	9,700,000	9,500,000	3,600,000	7,000,000	7,000,000	
Overburden	tonne	500,000	1,000,000	1,000,000	1,000,000	1,000,000		

Notes:
TBD - To be determined.

3.0 REGULATORY IMPLICATIONS AND COMMUNITY CONSULTATION

The proposed Project modifications described above are addressed in the Project-specific environmental assessment guidelines developed for the Project by the CEA Agency (March 2013) and NLDOEC (November 2013); hence, revisions to the guidelines are not anticipated for the proposed Project modifications. The environmental impact statement (EIS) being prepared for the Project will include a summary of changes that have been made to the Project since originally proposed, including the benefits of these changes to the environment, Aboriginal peoples, and other stakeholders.

Table 3-1 highlights sections in the CEA Agency and NLDOEC Guidelines that address the proposed changes/components.

Table 3.1 Summary CEA Agency and NLDOEC Guideline Provisions that Address Proposed Project Modifications

Project Component/ Activity	Description of proposed changed to project component/activity	Section(s) of CEA Agency Guidelines that address this component/activity	Section(s) of NLDEOC Guidelines that address this component/activity	Comments
Causeway and Haulage/Access Roads	Use of a causeway across Iron Arm (instead of ice bridges)	Sections 5.6, 6.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 15.1, 16.0	Sections 3.1.1, 4.4.4.1	The effects assessment will be conducted and mitigation measures will be developed as part of the EIS for the Project
Iron Ore Processing	Implementing Dry Process for iron ore processing (instead of both wet and dry processes)	Sections 6.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 15.1, 16.0	Sections 3.1.1, 4.4.4.1	The effects assessment will be conducted and mitigation measures will be developed as part of the EIS for the Project
Process Waste Management	Removal of the tailings management facility	Sections 6.0, 8.1, 15.1	Sections 3.1.1, 4.4.4.1	The tailings management facilities component will not be included in the effects assessment process in the EIS for the project

Labec Century will communicate the Project modifications to local communities and Aboriginal groups prior to the submission of the EIS. A summary of this consultation and any resulting modifications to the Project will be included in the EIS.