From: johnmulcahy@lowerchurchillproject.ca
To: stevegoulding@lowerchurchillproject.ca
Subject: Fw: Bidder 3
Date: Monday, July 6, 2015 8:01:47 AM
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1. Revised Pricing Schedule A2.1 - Option 1 - Diversion in 2016.pdf
3. Lower Churchill N&S Dams - OPTION 01 RIVER DIVERSION IN 2016 [30JUN15].pdf
4. Revised Estimated Trades Person Hours Schedule A2.7[1].docx
5. Revised Pricing Schedule A2.1 - Option 2 - Diversion in 2017.pdf
7. Lower Churchill N&S Dams - OPTION 02 RIVER DIVERSION IN 2017 [30JUN15].pdf
11. A17 Tech Contractor Response 30 Jun 2015[1].docx
12. Revised Execution Plan North and South Dams - 20150630[1].docx
13. Revised Staff Org Chart - 20150630(1).xlsx

John Mulcahy
Hydroelectric Construction Specialist
PROJECT DELIVERY TEAM
Lower Churchill Project
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You owe it to yourself, and your family, to make it home safely every day. What have you done today so that nobody gets hurt?

----- Forwarded by John Mulcahy/NLHydro on 07/06/2015 07:59 AM -----

From: Ken McClintock/NLHydro

To: John Mulcahy/NLHydro@NLHYDRO,

Date: 07/02/2015 08:22 AM

Subject: Bidder 3

1. Revised Pricing Schedule A2.1 - Option 1 - Diversion in 2016.pdf

3. Lower Churchill N&S Dams - OPTION 01 RIVER DIVERSION IN 2016 [30JUN15].pdf

4. Revised Estimated Trades Person Hours Schedule A2.7[1].docx

5. Revised Pricing Schedule A2.1 - Option 2 - Diversion in 2017.pdf

7. Lower Churchill N&S Dams - OPTION 02 RIVER DIVERSION IN 2017 [30JUN15].pdf

11. A17 Tech Contractor Response 30 Jun 2015[1].docx

12. Revised Execution Plan North and South Dams - 20150630[1].docx

13. Revised Staff Org Chart - 20150630(1).xlsx

Ken McClintock
Consultant
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You owe it to yourself, and your family, to make it home safely every day. What have you done today so that nobody gets hurt?

LOWER CHURCHILL PROJECT
MUSKRAT FALLS
CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS

SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2016

APPENDIX A2.1
Rev. B3

ISSUED FOR: BID DATE: 6 - Jun - 2015

BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM No	PRICE ITEM REFERENCE Exhibit 2 - ATT 1	WBS CODE CODE	WBS CODE SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE ($ CAN) F= (B+C+D+E)	TOTAL PRICE ($ CAN) G= A x F
	2	0000		INDIRECT COSTS									
1	2.1		0000.01	Mobilization	LS	1	28108.00	$ 2,030,888.91	$ 2,806,237.14	$ 24,162,873.95	$ -	$ 29,000,000.00	$ 29,000,000.00
2	2.2		0000.02	Site Installation	LS	1	61020.69	$ 6,611,291.94	$ 2,778,860.88	$ 11,109,847.18	$ -	$ 20,500,000.00	$ 20,500,000.00
3	2.3		0000.03	Management, Staff, employees and Consultants	LS	1	286750.00	$ 34,131,203.84	$ 4,009,751.56	$ 859,044.60	$ -	$ 39,000,000.00	$ 39,000,000.00
4	2.4		0000.04	Health and Safety, Environmental and Quality Requirements	LS	1	73546.48	$ 6,329,374.91	$ 121,300.77	$ 49,324.32	$ -	$ 6,500,000.00	$ 6,500,000.00
5	2.5		0000.05	Credit, Guarantee and Insurance	LS	1	0.00	$ -	$ 1,840,000.00	$ -	$ -	$ 1,840,000.00	$ 1,840,000.00
6	2.6		0000.06	Warranty, per Article 17 of the Agreement	LS	1	0.00	$ 225,000.00	$ -	$ 225,000.00	$ -	$ 450,000.00	$ 450,000.00
7	2.7		0000.07	Demobilization	LS	1	0.00	$ -	$ -	$ 250,000.00	$ -	$ 250,000.00	$ 250,000.00
				SUB-TOTAL INDIRECT COSTS									$ 97,540,000.00
	3	1100		GENERAL									
	3.1		1110	DEWATERING OF STRUCTURE AREAS									
8	3.1.1		1110.01	Dewatering of Structure Areas	LS	1	8179.00	$ 854,233.88	$ 389,418.13	$ 256,347.99	$ -	$ 1,500,000.00	$ 1,500,000.00
	3.2		1111	EXCAVATION OF EXISTING COFFERDAMS									
9	3.2.1		1111.01	Excavation of Existing Embankment cofferdams 1, 2 and 3, and Existing Ramps	m^3	177,000	0.05	$ 5.12	$ 0.10	$ 7.03	$ -	$ 12.25	$ 2,168,250.00
10	3.2.2		1111.02	Excavation of Downstream section of RCC riverside cofferdam	m^3	20,000	0.12	$ 13.17	$ 3.36	$ 14.47	$ -	$ 31.00	$ 620,000.00
	3.3		1112	PERMANENT ROADS AND PARKING AREA									
11	3.3.1		1112.01	Overburden Excavation	m^3	8,000	0.08	$ 8.57	$ -	$ 9.93	$ -	$ 18.50	$ 148,000.00
12	3.3.2		1112.02	Other Material or Rockfill	m^3	44,000	0.05	$ 5.08	$ -	$ 6.42	$ -	$ 11.50	$ 506,000.00
13	3.3.3		1112.03	Maintenance Grade 3 material	m^3	6,000	0.22	$ 24.98	$ 0.27	$ 28.75	$ -	$ 54.00	$ 324,000.00
14	3.3.6		1112.04	CSP culvert, dia. 900 mm	m	48	4.43	$ 481.94	$ 205.53	$ 162.53	$ -	$ 850.00	$ 40,800.00
15	3.3.7		1112.05	Guide Rails	m	400	2.60	$ 276.69	$ 115.47	$ 22.84	$ -	$ 415.00	$ 166,000.00
16	3.3.8		1112.06	Gate Type 1	unit	2	76.80	$ 8,362.27	$ 3,403.62	$ 1,234.12	$ -	$ 13,000.00	$ 26,000.00
	3.5		1114	DITCHES									
17	3.5.1		1114.01	Overburden Excavation	m^3	2,000	0.09	$ 8.73	$ -	$ 10.27	$ -	$ 19.00	$ 38,000.00
18	3.5.2		1114.02	Non-woven Geotextile, min 300 g/m^2	m^2	2,500	0.16	$ 15.81	$ 5.16	$ 3.54	$ -	$ 24.50	$ 61,250.00
19	3.5.3		1114.03	Rockfill Protection, 100 - 250 mm	m^3	1,000	0.35	$ 35.26	$ -	$ 22.74	$ -	$ 58.00	$ 58,000.00
	3.6		1115	SLOPE PROTECTION									
20	3.6.1		1115.01	Rockfill Protection, Zone 3E Material	m^3	2,500	0.12	$ 11.62	$ -	$ 12.88	$ -	$ 24.50	$ 61,250.00
21	3.6.2		1115.02	Non-woven Geotextile, min 530 g/m^2	m^2	4,500	0.04	$ 3.87	$ 3.52	$ 0.87	$ -	$ 8.25	$ 37,125.00
	3.7		1116	CHAIN LINK FENCES AND GATES									
22	3.7.1		1116.01	Chain Link Fence and Gates	m	720	2.90	$ 317.61	$ 67.99	$ 74.41	$ -	$ 460.00	$ 331,200.00
	3.8		1150	TEMPORARY UPSTREAM BRIDGE OVER SPILLWAY APPROACH CHANNEL									
23	3.8.1		1150.01	Engineering of Temporary Upstream Bridge	LS	1	0.00	$ 115,000.00	$ -	$ -	$ -	$ 115,000.00	$ 115,000.00
24	3.8.2		1150.02	Supply of Temporary Upstream Bridge	LS	1	373.10	$ 39,381.38	$ 1,946,918.35	$ 13,700.27	$ -	$ 2,000,000.00	$ 2,000,000.00
25	3.8.3		1150.03	Installation, removal and handover of Temporary Upstream Bridge	LS	1	18923.73	$ 2,026,189.06	$ 1,138,361.63	$ 1,335,449.31	$ -	$ 4,500,000.00	$ 4,500,000.00
				SUB-TOTAL GENERAL									$ 12,700,875.00
	4	2300		DAMS AND COFFERDAMS - GENERAL									
	4.1	2340	2341	UPSTREAM COFFERDAM									
				CIVIL WORK									
				Excavation									
26	4.1.1		2341.01	Overburden excavation	m^3	2,500	0.14	$ 14.83	$ -	$ 16.67	$ -	$ 31.50	$ 78,750.00
				Foundation Preparation in dry condition									
27	4.1.2		2341.02	Foundation Cleaning (water/air jets and Vacuum trucks)	m^2	1,200	0.90	$ 99.29	$ -	$ 15.71	$ -	$ 115.00	$ 138,000.00
28	4.1.3		2341.03	Rock Excavation including dental excavation and Scaling	m^3	500	0.79	$ 84.67	$ 24.58	$ 90.74	$ -	$ 200.00	$ 100,000.00
29	4.1.4		2341.04	Dental Concrete	m^3	800	1.92	$ 198.91	$ 480.52	$ 20.56	$ -	$ 700.00	$ 560,000.00
30	4.1.5		2341.05	Slush Grout	m^2	1,200	0.20	$ 21.11	$ 8.44	$ 0.95	$ -	$ 30.50	$ 36,600.00
31	4.1.6		2341.06	Dry Pack	m^3	6	50.00	$ 5,478.32	$ 1,274.56	$ 247.12	$ -	$ 7,000.00	$ 42,000.00
				Embankment Materials									
32	4.1.7		2341.07	Compacted Till - Zones 1 and 1C Materials	m^3	19,000	0.24	$ 24.84	$ -	$ 30.16	$ -	$ 55.00	$ 1,045,000.00
33	4.1.8		2341.08	Dumped Till - Zone 1A Material	m^3	134,000	0.13	$ 13.21	$ -	$ 21.79	$ -	$ 35.00	$ 4,690,000.00
34	4.1.9		2341.09	Compacted Granular - Zone 2A Material	m^3	20,700	0.28	$ 27.95	$ -	$ 30.05	$ -	$ 58.00	$ 1,200,600.00
35	4.1.10		2341.10	Compacted Granular - Zone 2C Material	m^3	8,700	0.28	$ 28.02	$ -	$ 29.98	$ -	$ 58.00	$ 504,600.00
36	4.1.11		2341.11	Dumped Granular - Zone 2E Material	m^3	26,300	0.17	$ 15.89	$ -	$ 25.11	$ -	$ 41.00	$ 1,078,300.00
37	4.1.12		2341.12	Dumped Rockfill- Zone 3 Material	m^3	143,000	0.06	$ 6.48	$ -	$ 8.02	$ -	$ 14.50	$ 2,073,500.00
38	4.1.13		2341.13	Dumped Large Blocks (300-1000 mm) - Zone 3 Class 1	m^3	37,000	0.08	$ 8.72	$ -	$ 12.28	$ -	$ 21.00	$ 777,000.00
39	4.1.14		2341.14	Dumped Large Blocks (≥1000 mm) - Zone 3 Class 2	m^3	65,000	0.17	$ 17.50	$ -	$ 25.50	$ -	$ 43.00	$ 2,795,000.00
40	4.1.15		2341.15	Dumped Large Blocks (≥1300 mm) - Zone 3 Class 3	m^3	15,000	0.20	$ 20.97	$ -	$ 34.03	$ -	$ 55.00	$ 825,000.00
41	4.1.16		2341.16	Compacted Crushed Stone - Zone 3A Material	m^3	10,950	0.32	$ 34.78	$ 0.28	$ 32.94	$ -	$ 68.00	$ 744,600.00
42	4.1.17		2341.17	Compacted Rockfill - Zone 3C Material	m^3	33,740	0.10	$ 11.06	$ -	$ 13.44	$ -	$ 24.50	$ 826,630.00
43	4.1.18		2341.18	Compacted Rockfill - Zone 3D Material	m^3	33,900	0.10	$ 11.06	$ -	$ 13.44	$ -	$ 24.50	$ 830,550.00
44	4.1.19		2341.19	Dumped Crushed Stone- Zone 3F Material	m^3	21,000	0.19	$ 20.34	$ 0.27	$ 24.88	$ -	$ 45.50	$ 955,500.00
				Investigation for Jet Grouted Cut-off Wall and Bedrock Grouting									
45	4.1.20		2341.20	Percussion Drill Holes in embankments, river sediments and bedrock	m	1,000	0.25	$ 32.20	$ -	$ 82.80	$ -	$ 115.00	$ 115,000.00
46	4.1.21		2341.21	Verification Core Drilling in jet grouting cut-off wall and bedrock	m	200	0.72	$ 93.00	$ 13.95	$ 358.05	$ -	$ 465.00	$ 93,000.00
47	4.1.22		2341.22	Core Diamond Drill Rig in Standby	hour	140	0.00	$ -	$ -	$ 150.00	$ -	$ 150.00	$ 21,000.00
				SUB-TOTAL UPSTREAM COFFERDAM									$ 19,530,630.00
	4.2	2340	2342	DOWNSTREAM COFFERDAM									
				CIVIL WORK									
				Excavation									
48	4.2.1		2342.01	Overburden excavation	m^3	500	0.15	$ 16.09	$ -	$ 16.16	$ -	$ 32.25	$ 16,125.00
				Foundation Preparation									
49	4.2.2		2342.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	1,250	0.90	$ 97.06	$ -	$ 17.94	$ -	$ 115.00	$ 143,750.00
50	4.2.3		2342.03	Rock excavation including dental excavation and scaling	m^3	500	0.80	$ 85.51	$ 24.35	$ 90.14	$ -	$ 200.00	$ 100,000.00
51	4.2.4		2342.04	Dental Concrete	m^3	200	1.92	$ 193.56	$ 466.61	$ 39.83	$ -	$ 700.00	$ 140,000.00
52	4.2.5		2342.05	Slush Grout	m^2	1,250	0.20	$ 21.11	$ 8.44	$ 0.95	$ -	$ 30.50	$ 38,125.00
53	4.2.6		2342.06	Dry Pack	m^3	6	50.00	$ 5,478.32	$ 1,274.56	$ 247.12	$ -	$ 7,000.00	$ 42,000.00
				Embankment Materials									
54	4.2.7		2342.07	Compacted Till - Zones 1 and 1C	m^3	2,000	0.23	$ 24.68	$ -	$ 30.32	$ -	$ 55.00	$ 110,000.00
55	4.2.8		2342.08	Compacted Granular - Zone 2C	m^3	2,500	0.28	$ 27.70	$ -	$ 32.30	$ -	$ 60.00	$ 150,000.00
56	4.2.9		2342.09	Compacted Rockfill - Zone 3C	m^3	4,600	0.12	$ 12.41	$ -	$ 13.59	$ -	$ 26.00	$ 119,600.00
57	4.2.10		2342.10	Compacted Rockfill - Zone 3D	m^3	2,000	0.12	$ 12.41	$ -	$ 13.59	$ -	$ 26.00	$ 52,000.00
				SUB-TOTAL DOWNSTREAM COFFERDAM									$ 911,600.00
	4.3	2340	2343	INTAKE CHANNEL COFFERDAM									
				CIVIL WORK									
				Excavation									
58	4.3.1		2343.01	Overburden excavation	m^3	8,800	0.06	$ 6.58	$ -	$ 7.92	$ -	$ 14.50	$ 127,600.00
				Foundation Preparation									
59	4.3.2		2343.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	1,700	0.90	$ 96.73	$ -	$ 18.27	$ -	$ 115.00	$ 195,500.00
60	4.3.3		2343.03	Rock excavation including dental excavation and scaling	m^3	700	0.78	$ 84.25	$ 24.70	$ 91.05	$ -	$ 200.00	$ 140,000.00
61	4.3.4		2343.04	Dental Concrete	m^3	250	1.90	$ 197.95	$ 482.45	$ 19.60	$ -	$ 700.00	$ 175,000.00
62	4.3.5		2343.05	Slush Grout	m^2	1,700	0.20	$ 21.17	$ 8.49	$ 0.83	$ -	$ 30.50	$ 51,850.00
63	4.3.6		2343.06	Dry Pack	m^3	9	50.00	$ 5,499.90	$ 1,283.69	$ 216.41	$ -	$ 7,000.00	$ 63,000.00
				Embankment Materials									
64	4.3.7		2343.07	Compacted Till - Zones 1 and 1C	m^3	6,300	0.29	$ 30.49	$ 2.02	$ 38.49	$ -	$ 71.00	$ 447,300.00
65	4.3.8		2343.08	Compacted Granular - Zone 2C	m^3	4,900	0.31	$ 35.17	$ 1.00	$ 49.33	$ -	$ 85.50	$ 418,950.00
66	4.3.9		2343.09	Compacted Rockfill - Zone 3C	m^3	5,200	0.19	$ 20.69	$ 2.02	$ 24.79	$ -	$ 47.50	$ 247,000.00
67	4.3.10		2343.10	Compacted Rockfill - Zone 3D	m^3	1,400	0.19	$ 20.69	$ 2.02	$ 24.79	$ -	$ 47.50	$ 66,500.00
				SUB-TOTAL INTAKE CHANNEL COFFERDAM									$ 1,932,700.00
	4.4		2330	SOUTH DAM									
				CIVIL WORK									
				Excavation									
68	4.4.1		2330.01	Overburden excavation	m^3	94,000	0.06	$ 6.41	$ -	$ 7.59	$ -	$ 14.00	$ 1,316,000.00
				Foundation Preparation									
69	4.4.2		2330.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	3,400	0.90	$ 103.97	$ -	$ 16.03	$ -	$ 120.00	$ 408,000.00
70	4.4.3		2330.03	Rock excavation including dental excavation and scaling	m^3	2,000	0.78	$ 85.12	$ 24.51	$ 90.36	$ -	$ 200.00	$ 400,000.00
71	4.4.4		2330.04	Dental Concrete	m^3	1,200	1.92	$ 203.98	$ 475.66	$ 20.36	$ -	$ 700.00	$ 840,000.00
72	4.4.5		2330.05	Slush Grout	m^2	3,400	0.20	$ 21.40	$ 8.29	$ 0.81	$ -	$ 30.50	$ 103,700.00
73	4.4.6		2330.06	Dry Pack	m^3	20	50.00	$ 5,541.23	$ 1,248.33	$ 210.45	$ -	$ 7,000.00	$ 140,000.00
74	4.4.7		2330.07	Drilling Holes for Grouting	m	1,200	0.70	$ 96.00	$ -	$ 24.00	$ -	$ 120.00	$ 144,000.00
75	4.4.8		2330.08	Dry cement incorported in the grout	kg	42,000	0.04	$ 3.69	$ 1.54	$ 0.92	$ -	$ 6.15	$ 258,300.00
76	4.4.9		2330.09	Cored Drill Check Holes	m	30	1.79	$ 482.55	$ -	$ 82.45	$ -	$ 565.00	$ 16,950.00
77	4.4.10		2330.10	Percussion Drilling Check holes	m	60	0.80	$ 92.00	$ -	$ 23.00	$ -	$ 115.00	$ 6,900.00
78	4.4.11		2330.11	Grouting - Successful connections	unit	250	2.93	$ 369.03	$ -	$ 30.97	$ -	$ 400.00	$ 100,000.00
79	4.4.12		2330.12	Water pressure test (Lugeon - 5 Stages)	hour	8	3.00	$ 412.50	$ -	$ 212.50	$ -	$ 625.00	$ 5,000.00
80	4.4.13		2330.13	Water test - Successful connections	unit	18	1.33	$ 181.50	$ -	$ 93.50	$ -	$ 275.00	$ 4,950.00
81	4.4.14		2330.14	Uplift gauges	m	20	2.40	$ 292.50	$ 210.60	$ 81.90	$ -	$ 585.00	$ 11,700.00

LOWER CHURCHILL PROJECT
MUSKRAT FALLS
CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS

SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2016

APPENDIX A2.1
Rev. B3

ISSUED FOR: BID DATE: 6 - Jun - 2015

BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM No	PRICE ITEM REFERENCE Exhibit 2 - ATT 1	WBS CODE CODE	WBS CODE SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE F= (B+C+D+E) ($ CAN)	TOTAL PRICE G= A x F ($ CAN)
82	4.4.15		2330.15	Thermistors (measure rock temperature in grout holes)	unit	1	48.00	$ -	$ 7,360.00	$ 4,140.00	$ -	$ 11,500.00	$ 11,500.00
				Embankment Materials									
83	4.4.16		2330.16	Compacted Till - Zones 1 and 1C	m^3	26,000	0.22	$ 23.98	$ -	$ 30.02	$ -	$ 54.00	$ 1,404,000.00
84	4.4.17		2330.17	Compacted Granular - Zone 2A	m^3	28,000	0.24	$ 24.49	$ -	$ 30.51	$ -	$ 55.00	$ 1,540,000.00
85	4.4.18		2330.18	Compacted Crushed Stone - Zone 3A	m^3	12,000	0.30	$ 33.08	$ 0.27	$ 32.64	$ -	$ 66.00	$ 792,000.00
86	4.4.19		2330.19	Compacted Crushed Stone - Zone 3B	m^3	16,000	0.30	$ 32.83	$ 0.27	$ 31.90	$ -	$ 65.00	$ 1,040,000.00
87	4.4.20		2330.20	Compacted Rockfill - Zone 3C	m^3	21,000	0.09	$ 10.24	$ -	$ 11.76	$ -	$ 22.00	$ 462,000.00
88	4.4.21		2330.21	Compacted Rockfill - Zone 3D	m^3	46,000	0.09	$ 10.24	$ -	$ 11.76	$ -	$ 22.00	$ 1,012,000.00
89	4.4.22		2330.22	Riprap - Zone 4	m^3	6,000	0.18	$ 20.46	$ -	$ 28.54	$ -	$ 49.00	$ 294,000.00
90	4.4.23		2330.23	Compacted Crushed Stone - Zone 5	m^3	310	0.32	$ 37.19	$ 0.28	$ 38.53	$ -	$ 76.00	$ 23,560.00
91	4.4.24		2330.24	Jersey Barrier	m	600	0.65	$ 74.31	$ 90.41	$ 25.29	$ -	$ 190.00	$ 114,000.00
				Geotechnical Instrumentation									
92	4.4.25		2330.25	V-Notch Weirs, excluding Shelters	unit	2	67.75	$ 7,584.94	$ 3,566.55	$ 348.52	$ -	$ 11,500.00	$ 23,000.00
93	4.4.26		2330.26	Shelters for V-Notch Weirs	unit	2	33.30	$ 3,831.62	$ 1,538.93	$ 254.46	$ -	$ 5,625.00	$ 11,250.00
94	4.4.27		2330.27	Survey Monuments at South Dam Crest	unit	3	5.33	$ 583.64	$ 340.89	$ 25.47	$ -	$ 950.00	$ 2,850.00
				SUB-TOTAL SOUTH DAM									**$ 10,485,660.00**
	4.5		2320	**NORTH DAM**									
				CIVIL WORK									
				Clearing									
95	4.5.1		2320.01	Clearing of the North Abutment	Ha	3	74.67	$ 20,218.82	$ -	$ 26,781.18	$ -	$ 47,000.00	$ 141,000.00
				Excavation									
96	4.5.2		2320.02	Overburden Excavation	m^3	72,000	0.08	$ 9.03	$ -	$ 10.97	$ -	$ 20.00	$ 1,440,000.00
				Foundation Preparation									
97	4.5.3		2320.03	Foundation Cleaning (water/air jets and vacuum)	m^2	13,500	1.50	$ 161.40	$ -	$ 28.60	$ -	$ 190.00	$ 2,565,000.00
98	4.5.4		2320.04	Rock Excavation including Dental Excavation and Scaling	m^3	6,000	1.01	$ 104.57	$ 23.48	$ 101.95	$ -	$ 230.00	$ 1,380,000.00
99	4.5.5		2320.05	Dental Concrete	m^3	4,000	1.92	$ 198.91	$ 480.52	$ 20.56	$ -	$ 700.00	$ 2,800,000.00
100	4.5.6		2320.06	Slush Grout	m^2	13,500	0.20	$ 21.11	$ 8.44	$ 0.95	$ -	$ 30.50	$ 411,750.00
101	4.5.7		2320.07	Dry Pack	m^3	70	50.00	$ 5,478.32	$ 1,274.56	$ 247.12	$ -	$ 7,000.00	$ 490,000.00
102	4.5.8		2320.08	Drilling Holes in RCC and Bedrock for Grouting	m	4,200	1.39	$ 220.00	$ -	$ 55.00	$ -	$ 275.00	$ 1,155,000.00
103	4.5.9		2320.09	Grouting - Successful Connections	unit	720	2.43	$ 331.96	$ 30.90	$ 37.15	$ -	$ 400.00	$ 288,000.00
104	4.5.10		2320.10	Dry Cement incorported in the grout	kg	126,000	0.01	$ 4.00	$ -	$ 0.71	$ -	$ 4.70	$ 592,200.00
105	4.5.11		2320.11	Cored Drill Check Holes	m	60	1.80	$ 268.00	$ -	$ 67.00	$ -	$ 335.00	$ 20,100.00
106	4.5.12		2320.12	Percussion Drilling Check Holes	m	120	1.40	$ 220.50	$ -	$ 24.50	$ -	$ 245.00	$ 29,400.00
107	4.5.13		2320.13	Water pressure test (lugeon - 5 Stages)	hour	15	3.20	$ 382.80	$ -	$ 197.20	$ -	$ 580.00	$ 8,700.00
108	4.5.14		2320.14	Water Pressure Test - Successful connections	unit	36	1.33	$ 161.70	$ -	$ 83.30	$ -	$ 245.00	$ 8,820.00
109	4.5.15		2320.15	Uplift gauges	m	60	1.80	$ 292.50	$ 210.60	$ 81.90	$ -	$ 585.00	$ 35,100.00
110	4.5.16		2320.16	Thermistor (measure temperature in grout holes)	unit	1	48.00	$ -	$ 7,360.00	$ 4,140.00	$ -	$ 11,500.00	$ 11,500.00
				Drainage Holes									
111	4.5.17		2320.17	Drilling Holes for Drainage in Foundation from Drainage Gallery, Φ76 mm	m	3,200	1.44	$ 278.80	$ -	$ 61.20	$ -	$ 340.00	$ 1,088,000.00
112	4.5.18		2320.18	PVC Caps for Drainage Holes	unit	125	0.00	$ -	$ 32.00	$ -	$ -	$ 32.00	$ 4,000.00
113	4.5.19		2320.19	Drilling Holes Upward for Drainage from Drainage Gallery into RCC, Φ76 mm	m	3,200	1.74	$ 388.56	$ 3.58	$ 72.86	$ -	$ 465.00	$ 1,488,000.00
				Instrumentation									
114	4.5.20		2320.20	Drilling Holes for piezometers	m	100	1.02	$ 115.94	$ 18.41	$ 15.65	$ -	$ 150.00	$ 15,000.00
115	4.5.21		2320.21	Vibrating Wire and Standpipe Piezometers TYPE - 1, excluding Cables	unit	8	34.00	$ 3,450.00	$ 2,300.00	$ -	$ -	$ 5,750.00	$ 46,000.00
116	4.5.22		2320.22	Vibrating Wire and Standpipe Piezometers TYPE - 2, excluding Cables	unit	2	34.00	$ 3,450.00	$ 2,300.00	$ -	$ -	$ 5,750.00	$ 11,500.00
117	4.5.23		2320.23	Instrument Cable including PVC Conduits and Pull Boxes	m	2,700	0.15	$ 20.13	$ -	$ 37.38	$ -	$ 57.50	$ 155,250.00
118	4.5.24		2320.24	Thermistors Cable in RCC	unit	8	25.00	$ 2,250.00	$ 2,250.00	$ -	$ -	$ 4,500.00	$ 36,000.00
119	4.5.25		2320.25	V-notch Weirs	unit	4	114.01	$ 12,521.95	$ 3,511.62	$ 1,466.43	$ -	$ 17,500.00	$ 70,000.00
120	4.5.26		2320.26	Vibrating Wire Weir Monitors.	unit	4	25.00	$ 1,437.50	$ -	$ 4,312.50	$ -	$ 5,750.00	$ 23,000.00
121	4.5.27		2320.27	Data logger, Terminal Box, Barometer Box including Grounding	LS	1	225.00	$ 11,400.00	$ 45,600.00	$ -	$ -	$ 57,000.00	$ 57,000.00
122	4.5.28		2320.28	Crest Survey Monuments	unit	4	6.80	$ 746.36	$ 340.51	$ 38.14	$ -	$ 1,125.00	$ 4,500.00
				Concrete and RCC operations									
123	4.5.29		2320.29	Roller Compacted Concrete (RCC)	m^3	210,000	1.59	$ 184.17	$ 116.09	$ 74.73	$ -	$ 375.00	$ 78,750,000.00
	4.5.29a			RCC Coarse Aggregates (Rate Only)	Tonne							$ 15.25	
	4.5.29b			RCC Fine Aggregates (Rate Only)	Tonne							$ 15.25	
124	4.5.30		2320.30	Conventional Vibrated Concrete (CVC) (Crest and Flip Bucket)	m^3	11,100	7.85	$ 902.63	$ 348.33	$ 249.04	$ -	$ 1,500.00	$ 16,650,000.00
125	4.5.31		2320.31	Facing Concrete	m^3	8,600	5.79	$ 604.55	$ 192.27	$ 203.18	$ -	$ 1,000.00	$ 8,600,000.00
126	4.5.32		2320.32	GERCC or GEVR - Formed Faces	m^3	4,650	4.36	$ 462.24	$ 124.71	$ 213.05	$ -	$ 800.00	$ 3,720,000.00
127	4.5.33		2320.33	Conventional Vibrated Concrete (North Abutment Crest Surface and Training Wall)	m^3	270	7.91	$ 853.80	$ 294.14	$ 152.06	$ -	$ 1,300.00	$ 351,000.00
128	4.5.34		2320.34	Increase or decrease in quantity of cement - Bid Mix (rate only)	Kg	N/A					$ -	$ 0.38	
129	4.5.35		2320.35	Increase or decrease in quantity of flyash - Bid Mix (rate only)	Kg	N/A					$ -	$ 0.38	
130	4.5.36		2320.36	Increase or decrease in quantity of cement - Source B (rate only)	Kg	N/A					$ -	$ -	
131	4.5.37		2320.37	Increase or decrease in quantity of flyash - Source B (rate only)	Kg	N/A					$ -	$ -	
132	4.5.38		2320.38	Air-entraining Admixture	litre	315,000	0.00	$ -	$ 1.30	$ -	$ -	$ 1.30	$ 409,500.00
133	4.5.39		2320.39	Retarder Admixture	litre	336,000	0.00	$ -	$ 1.75	$ -	$ -	$ 1.75	$ 588,000.00
134	4.5.40		2320.40	Precast Concrete	m^3	1,150	2.75	$ 286.85	$ 1,658.55	$ 104.60	$ -	$ 2,050.00	$ 2,357,500.00
135	4.5.41		2320.41	Gallery Floor CVC Concrete	m^3	275	15.30	$ 1,734.80	$ 346.20	$ 269.00	$ -	$ 2,350.00	$ 646,250.00
136	4.5.42		2320.42	Steel Reinforcement	kg	500,000	0.02	$ 4.76	$ 2.67	$ 0.37	$ -	$ 7.80	$ 3,900,000.00
137	4.5.43		2320.43	Steel Guardrails	kg	5,200	0.30	$ 34.47	$ 6.25	$ 2.03	$ -	$ 42.75	$ 222,300.00
138	4.5.44		2320.44	Waterstop	m	1,350	1.50	$ 168.85	$ 21.15	$ -	$ -	$ 190.00	$ 256,500.00
	4.6		2370	**NORTH DAM - Auxiliary Services**									
				ELECTRICAL WORK									
139	4.6.1		2370.01	Exothermic Connections.	unit	20	8.00	$ 862.50	$ 287.50	$ -	$ -	$ 1,150.00	$ 23,000.00
140	4.6.2		2370.02	Bare, Stranded, Medium Hard-Drawn Copper Conductor, size 500 kcmil	m	815	0.85	$ 92.00	$ 23.00	$ -	$ -	$ 115.00	$ 93,725.00
141	4.6.3		2370.03	Bare, Stranded, Medium Hard-Drawn Copper Conductor, size 4/0 AWG	m	16	0.80	$ 92.00	$ 23.00	$ -	$ -	$ 115.00	$ 1,840.00
142	4.6.4		2370.04	Embedded Copper Grounding Plates	unit	7	0.30	$ 34.50	$ 310.50	$ -	$ -	$ 345.00	$ 2,415.00
				SUB-TOTAL NORTH DAM									**$ 130,946,850.00**
	5	3100		**Powerhouse Channels**									
	5.1		3120.00	**Tailrace**									
				CIVIL WORK									
				Tailrace Rock Plug - Overburden Excavation									
143	5.1.1		3120.01	Overburden Excavation, excluding excavation of Cofferdam 3 - Dry Conditions	m^3	12,000	0.08	$ 8.60	$ -	$ 10.15	$ -	$ 18.75	$ 225,000.00
				Tailrace Rock Plug - Rock Excavation									
144	5.1.2		3120.02	Tailrace Rock Plug Excavation including access ramp to powerhouse -Dry Conditions	m^3	170,000	0.11	$ 16.25	$ 3.66	$ 16.84	$ -	$ 36.75	$ 6,247,500.00
145	5.1.3		3120.03	Tailrace Rock Plug - Underwater Excavation	m^3	34,000	0.40	$ 42.93	$ 22.17	$ 39.89	$ -	$ 105.00	$ 3,570,000.00
				Tailrace Rock Plug - Stabilization and Rock Surface Protection									
146	5.1.4		3120.04	Grouted Rock Bolts Type A	unit	70	19.20	$ 2,112.36	$ 1,033.12	$ 454.52	$ -	$ 3,600.00	$ 252,000.00
147	5.1.5		3120.05	Grouted Rock Bolts Type C	unit	20	35.20	$ 3,862.78	$ 1,909.30	$ 827.92	$ -	$ 6,600.00	$ 132,000.00
148	5.1.6		3120.06	Chain Link Wire Mesh - Installation	m^2	2,500	0.25	$ 27.36	$ 14.98	$ 5.92	$ -	$ 48.25	$ 120,625.00
149	5.1.7		3120.07	Chain Link Wire Mesh - Removal	m^2	20,300	0.05	$ 5.58	$ -	$ 1.92	$ -	$ 7.50	$ 152,250.00
150	5.1.8		3120.08	Existing Temporary Safety Fence - Removal	m	1,200	0.39	$ 43.17	$ -	$ 14.83	$ -	$ 58.00	$ 69,600.00
				SUB-TOTAL TAILRACE									**$ 10,768,975.00**
	6	1100		**Borrow Areas**									
	6.1		1117.00	**Borrowed Construction Material**									
151	6.1.1		1117.01	Overhaul of Borrowed Construction Material (rate only)	m3/km	N/A						$ 1.50	
ROW A	CALCULATED TOTAL OF LUMP SUM AND UNIT PRICE ITEMS (BASED ON APPROXIMATE QUANTITIES)									$			**284,817,290.00**
	7	1100		**Optional Pricing for Temporary Access Road and Quarry**									
	7.1		1113	**ACCESS ROAD TO LAYDOWN AREA C1, If required**									
152	7.1.1		1113.01	Other Material or Rockfill	m^3	28,000	0.05	$ 4.75	$ -	$ 6.50	$ -	$ 11.25	$ 315,000.00
153	7.1.2		1113.02	Maintenance Grade No 3	m^3	4,000	0.19	$ 17.52	$ 0.27	$ 18.21	$ -	$ 36.00	$ 144,000.00
	7.2		1118	**Quarry Q5**									
154	7.2.1		1118.01	Production of blasted rockfill from the quarry Q5	m^3	50,000	0.05	$ 2.90	$ 1.30	$ 2.00	$ -	$ 6.20	$ 310,000.00
	8	2300		**Optional Pricing for Temporary Access Road and Quarry**									
	8.1	2340	2341	**UPSTREAM COFFERDAM - Cut Off Wall**									
				Jet Grouting cut off wall, If required									
155	8.1.1		2341.23	Mobilization and demobilization	LS	1	2,342	$ 402,500.00	$ 39,000.00	$ 753,500.00	$ -	$ 1,195,000.00	$ 1,195,000.00
156	8.1.2		2341.24	Drilling Holes for Jet Grouting in embankment, river sediments and bedrock	m	9,600	0.56	$ 81.50	$ 5.20	$ 63.30	$ -	$ 150.00	$ 1,440,000.00
157	8.1.3		2341.25	Jet Grouted Cut-off wall	m^2	2,800	1.55	$ 200.00	$ 596.00	$ 354.00	$ -	$ 1,150.00	$ 3,220,000.00
				Bedrock Grouting beneath the Jet Grouted Cut-off Wall, if required									
158	8.1.4		2341.26	Drilling Holes for Grouting in embankment , jet grouting cut-off wall and bedrock, if required	m	1,300	0.05	$ 5.70	$ -	$ 17.05	$ -	$ 22.75	$ 29,575.00
159	8.1.5		2341.27	Dry cement incorported in the grout, if required	kg	11,000	0.03	$ 3.30	$ 1.25	$ 0.70	$ -	$ 5.25	$ 57,750.00
160	8.1.6		2341.28	Grouting - Succesful connections, if required	unit	60	2.50	$ 308.00	$ -	$ 462.00	$ -	$ 770.00	$ 46,200.00
				Additional Items Inserted by HJOC-Dragados as Requested by Nalcor									
161	9.1.1		2341.29	Levelling Concrete for RCC Including Formwork	m^3	1	1.87	$ 194.00	$ 495.00	$ 21.00	$ -	$ 710.00	$ 710.00

LOWER CHURCHILL PROJECT MUSKRAT FALLS CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS	SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2016	APPENDIX A2.1 Rev. B3
	ISSUED FOR: BID DATE: 6 - Jun - 2015	BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM		WBS CODE											
No	REFERENCE Exhibit 2 - ATT 1	CODE	SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE ($ CAN) F= (B+C+D+E)	TOTAL PRICE ($ CAN) G= A x F
162	9.1.2		2341.30	RCC Trial Sections	m^3	2,500	3.42	$ 390.00	$ 136.50	$ 103.50	$ -	$ 630.00	$ 1,575,000.00
				SUB-TOTAL OPTIONAL PRICING									$ 8,333,235.00

NOTES

Note 1 : If there has been an error in the calculation to establish the total of Column G (Total Price) or Column F (UNIT PRICE), then the figures of column A (Estimated Quantity of Units), column B (Man Hours), column C (Manpower), column D (Equipment) and column E (Profits) will prevail.

Note 2 : This Document is provided to the bidders in Native Excel File format. It is the bidders responsibility to verify cell formats and formulas.

Note 3 : Bidders shall not include any HST/GST from any source (whether from Bidder, subcontractor, vendors or suppliers) in the unit and lump sum prices in this Schedule of Price Breakdown. Bidders shall claim input tax credits on taxable supplies received from vendors, suppliers and subcontractors and thereof Bidders shall exclude HST/GST payable to the vendors, suppliers and subcontractors from the unit and lump sum prices in the Schedule. Bidders shall exclude HST/GST on the total listed in Row A.

Note 4: Items 152 to 160 are optional and will not be included in the total Bid price. However, Bidders shall provide price for each item as if they are included in the Scope. The work will be included in the contract, if required.

FOR THE LOWER CHURCHILL PROJECT - MUSKRAT FALLS

This Appendix forms part of the Proposal submitted by: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

Name of Bidder: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

Request For Proposal, Package No: CH0009

Signature:

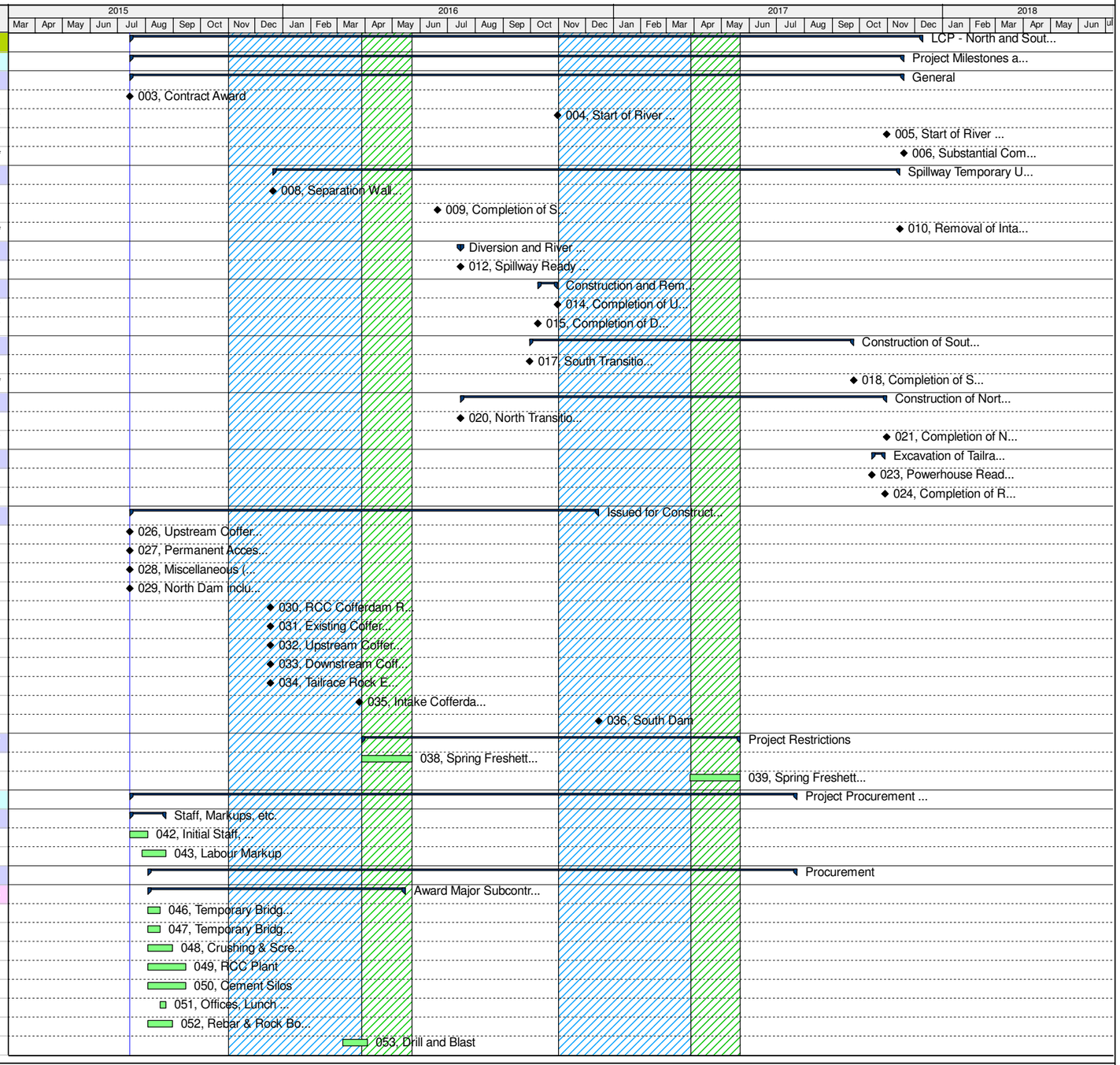
Date of Proposal: 30-JUN-2015

Project: *LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015*
Layout: *LCH-NS DAMS Layout [17JUN15] ALT1*
Filter: *TASK filter: All Activities*

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015		120.86w	15-Jul-15	10-Dec-17
Project Milestones and Restrictions		117.86w	15-Jul-15	19-Nov-17
General		117.86w	15-Jul-15	19-Nov-17
003	Contract Award	0.00w	15-Jul-15*	
004	Start of River Impoundment to Elev. 25.0m	0.00w		31-Oct-16*
005	Start of River Impoundment to Elev. 39.0m	0.00w		31-Oct-17*
006	Substantial Completion of the Work	0.00w		19-Nov-17*
Spillway Temporary Upstream Bridge and Access Ramps		94.57w	20-Dec-15	14-Nov-17
008	Separation Wall Completed	0.00w	20-Dec-15*	
009	Completion of Spillway Upstream Temporary Bridge	0.00w		19-Jun-16
010	Removal of Intake Cofferdam, Bridge and Access Ramps	0.00w		14-Nov-17*
Diversion and River Closure		0.00w	15-Jul-16	15-Jul-16
012	Spillway Ready for River Diversion	0.00w	15-Jul-16*	
Construction and Removal of Cofferdams		3.14w	09-Oct-16	31-Oct-16
014	Completion of Upstream Cofferdam to Elev. 26m	0.00w		31-Oct-16*
015	Completion of Downstream Cofferdam	0.00w		09-Oct-16*
Construction of South Dam		48.57w	30-Sep-16	24-Sep-17
017	South Transition Dam Completed	0.00w	30-Sep-16*	
018	Completion of South Dam	0.00w		24-Sep-17*
Construction of North Dam		64.86w	15-Jul-16	31-Oct-17
020	North Transition Dam Completed	0.00w	15-Jul-16*	
021	Completion of North Dam	0.00w		31-Oct-17*
Excavation of Tailrace Rock Plug		2.14w	15-Oct-17	29-Oct-17
023	Powerhouse Ready for Tailrace Impoundment	0.00w	15-Oct-17*	
024	Completion of Rock Plug Excavation	0.00w		29-Oct-17*
Issued for Construction Drawing Deliverables		72.29w	15-Jul-15	16-Dec-16
026	Upstream Cofferdam Starter Groins	0.00w	15-Jul-15*	
027	Permanent Access Roads	0.00w	15-Jul-15*	
028	Miscellaneous (Fence, Guide Rail, etc.)	0.00w	15-Jul-15*	
029	North Dam including Precast	0.00w	15-Jul-15*	
030	RCC Cofferdam Removal	0.00w	18-Dec-15*	
031	Existing Cofferdams Removal	0.00w	18-Dec-15*	
032	Upstream Cofferdam for North Dam	0.00w	18-Dec-15*	
033	Downstream Cofferdam for North dam	0.00w	18-Dec-15*	
034	Tailrace Rock Excavation	0.00w	18-Dec-15*	
035	Intake Cofferdam	0.00w	25-Mar-16*	
036	South Dam	0.00w	16-Dec-16*	
Project Restrictions		57.14w	28-Mar-16	21-May-17
038	Spring Freshette 2016 (Estimated)	8.00w	28-Mar-16*	22-May-16
039	Spring Freshette 2017 (Estimated)	8.00w	27-Mar-17*	21-May-17
Project Procurement & Mobilization		100.86w	15-Jul-15	23-Jul-17
Staff, Markups, etc.		5.71w	15-Jul-15	23-Aug-15
042	Initial Staff, Office, etc.	2.86w	15-Jul-15	03-Aug-15
043	Labour Markup	3.86w	28-Jul-15*	23-Aug-15
Procurement		98.00w	04-Aug-15	23-Jul-17
Award Major Subcontracts		38.86w	04-Aug-15	15-May-16
046	Temporary Bridge Supply	2.00w	04-Aug-15	17-Aug-15
047	Temporary Bridge Design	2.00w	04-Aug-15	17-Aug-15
048	Crushing & Screening	4.00w	04-Aug-15	31-Aug-15
049	RCC Plant	6.00w	04-Aug-15	14-Sep-15
050	Cement Silos	6.00w	04-Aug-15	14-Sep-15
051	Offices, Lunch rooms, etc	1.00w	17-Aug-15*	23-Aug-15
052	Rebar & Rock Bolts	4.00w	04-Aug-15*	31-Aug-15
053	Drill and Blast	4.00w	07-Mar-16*	03-Apr-16



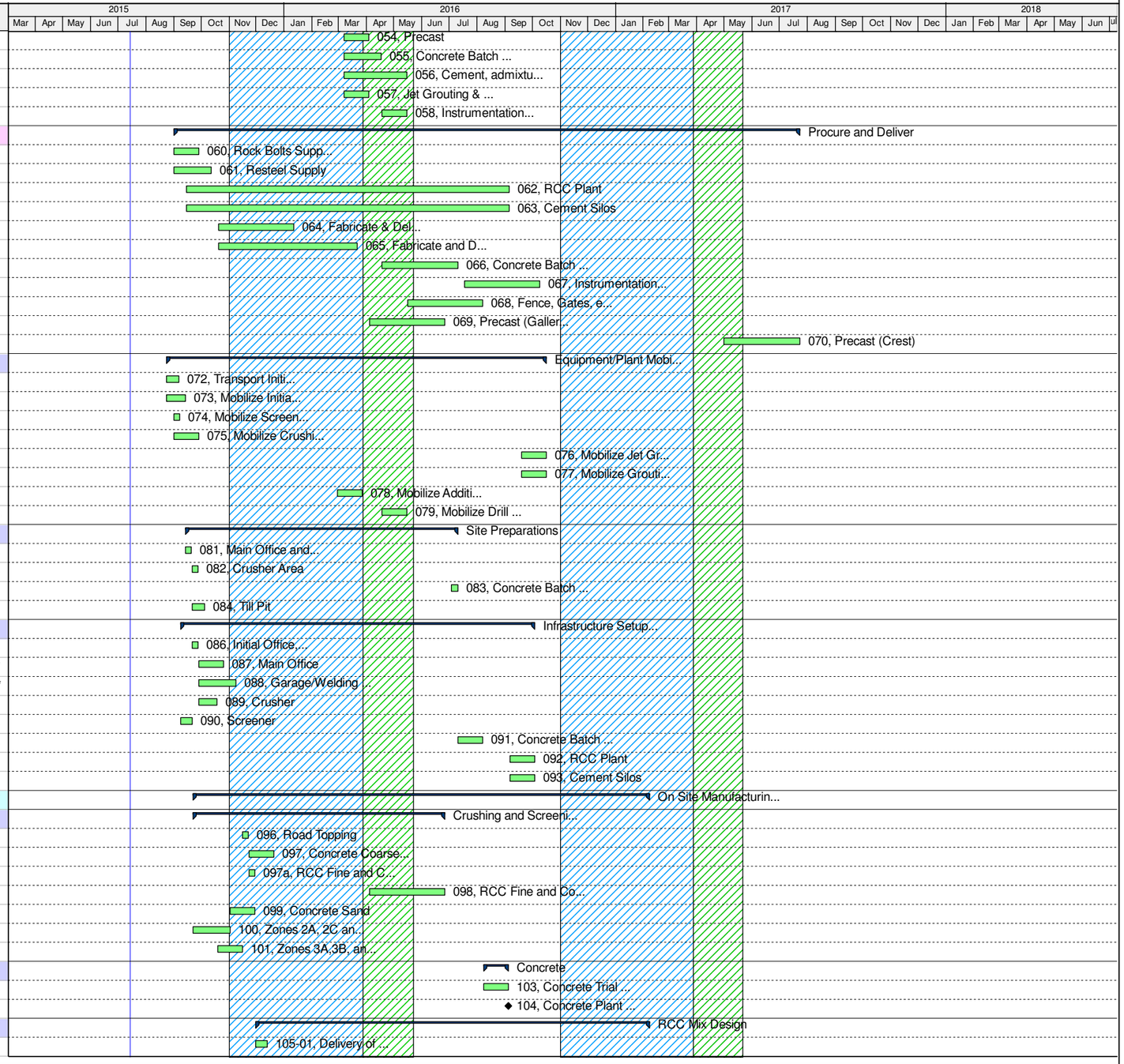
Remaining Level of Effort
Actual Level of Effort
Remaining Work
Critical Remaining Work
Milestone
Summary

Project: LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT1
Filter: TASK filter: All Activities

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
054	Precast	4.00w	07-Mar-16*	03-Apr-16
055	Concrete Batch Plant	6.00w	07-Mar-16*	17-Apr-16
056	Cement, admixtures, etc.	10.00w	07-Mar-16*	15-May-16
057	Jet Grouting & Grouting	4.00w	07-Mar-16*	03-Apr-16
058	Instrumentation, fence, etc.	4.00w	18-Apr-16*	15-May-16
Procure and Deliver		94.00w	01-Sep-15	23-Jul-17
060	Rock Bolts Supply	4.00w	01-Sep-15	28-Sep-15
061	Resteel Supply	6.00w	01-Sep-15	12-Oct-15
062	RCC Plant	49.00w	15-Sep-15	05-Sep-16
063	Cement Silos	49.00w	15-Sep-15	05-Sep-16
064	Fabricate & Deliver Steel Pier	10.00w	20-Oct-15	11-Jan-16
065	Fabricate and Deliver Bridge	20.00w	20-Oct-15	21-Mar-16
066	Concrete Batch Plant	12.00w	18-Apr-16	10-Jul-16
067	Instrumentation Supply	12.00w	18-Jul-16*	09-Oct-16
068	Fence, Gates, etc.Supply	12.00w	16-May-16	07-Aug-16
069	Precast (Gallery)	12.00w	04-Apr-16	26-Jun-16
070	Precast (Crest)	12.00w	01-May-17*	23-Jul-17
Equipment/Plant Mobilization		58.00w	24-Aug-15	16-Oct-16
072	Transport Initial Office, Lunchroom, Washroom, etc	2.00w	24-Aug-15	06-Sep-15
073	Mobilize Initial Equipment	3.00w	24-Aug-15	13-Sep-15
074	Mobilize Screening Plant	1.00w	01-Sep-15	07-Sep-15
075	Mobilize Crushing Plant	4.00w	01-Sep-15	28-Sep-15
076	Mobilize Jet Grouting Subcontractor	4.00w	19-Sep-16*	16-Oct-16
077	Mobilize Grouting Subcontractor	4.00w	19-Sep-16*	16-Oct-16
078	Mobilize Additional Equipment for 2016	4.00w	29-Feb-16*	27-Mar-16
079	Mobilize Drill and Blast Subcontractor	4.00w	18-Apr-16*	15-May-16
Site Preparations		41.00w	14-Sep-15	10-Jul-16
081	Main Office and Garage/Welding Shop	1.00w	14-Sep-15	20-Sep-15
082	Crusher Area	1.00w	21-Sep-15*	27-Sep-15
083	Concrete Batch Plant Area	1.00w	04-Jul-16*	10-Jul-16
084	Till Pit	2.00w	21-Sep-15*	04-Oct-15
Infrastructure Setup & Commission		54.00w	08-Sep-15	03-Oct-16
086	Initial Office, Lunchroom and Washroom	1.00w	21-Sep-15	27-Sep-15
087	Main Office	4.00w	28-Sep-15	25-Oct-15*
088	Garage/Welding Shop	6.00w	28-Sep-15	08-Nov-15*
089	Crusher	3.00w	28-Sep-15	18-Oct-15
090	Screener	2.00w	08-Sep-15	21-Sep-15
091	Concrete Batch Plant	4.00w	11-Jul-16	07-Aug-16
092	RCC Plant	4.00w	06-Sep-16	03-Oct-16
093	Cement Silos	4.00w	06-Sep-16	03-Oct-16
On Site Manufacturing		67.29w	22-Sep-15	07-Feb-17
Crushing and Screening		37.86w	22-Sep-15	26-Jun-16
096	Road Topping	1.00w	16-Nov-15*	22-Nov-15
097	Concrete Coarse Aggregates	4.00w	23-Nov-15*	20-Dec-15
097a	RCC Fine and Coarse Aggregates ((For Testing Purpose)	1.00w	23-Nov-15	29-Nov-15
098	RCC Fine and Coarse Aggregates	12.00w	04-Apr-16*	26-Jun-16
099	Concrete Sand	4.00w	02-Nov-15*	29-Nov-15
100	Zones 2A, 2C and 2E	6.00w	22-Sep-15	02-Nov-15
101	Zones 3A,3B, and 3F	4.00w	19-Oct-15	15-Nov-15
Concrete		4.00w	08-Aug-16	04-Sep-16
103	Concrete Trial Mixes	4.00w	08-Aug-16	04-Sep-16
104	Concrete Plant Ready for Production	0.00w		04-Sep-16
RCC Mix Design		57.43w	30-Nov-15	07-Feb-17
105-01	Delivery of Cement, Fly ash and Admixtures	2.00w	30-Nov-15	13-Dec-15



Remaining Level of Effort
Actual Level of Effort
Remaining Work
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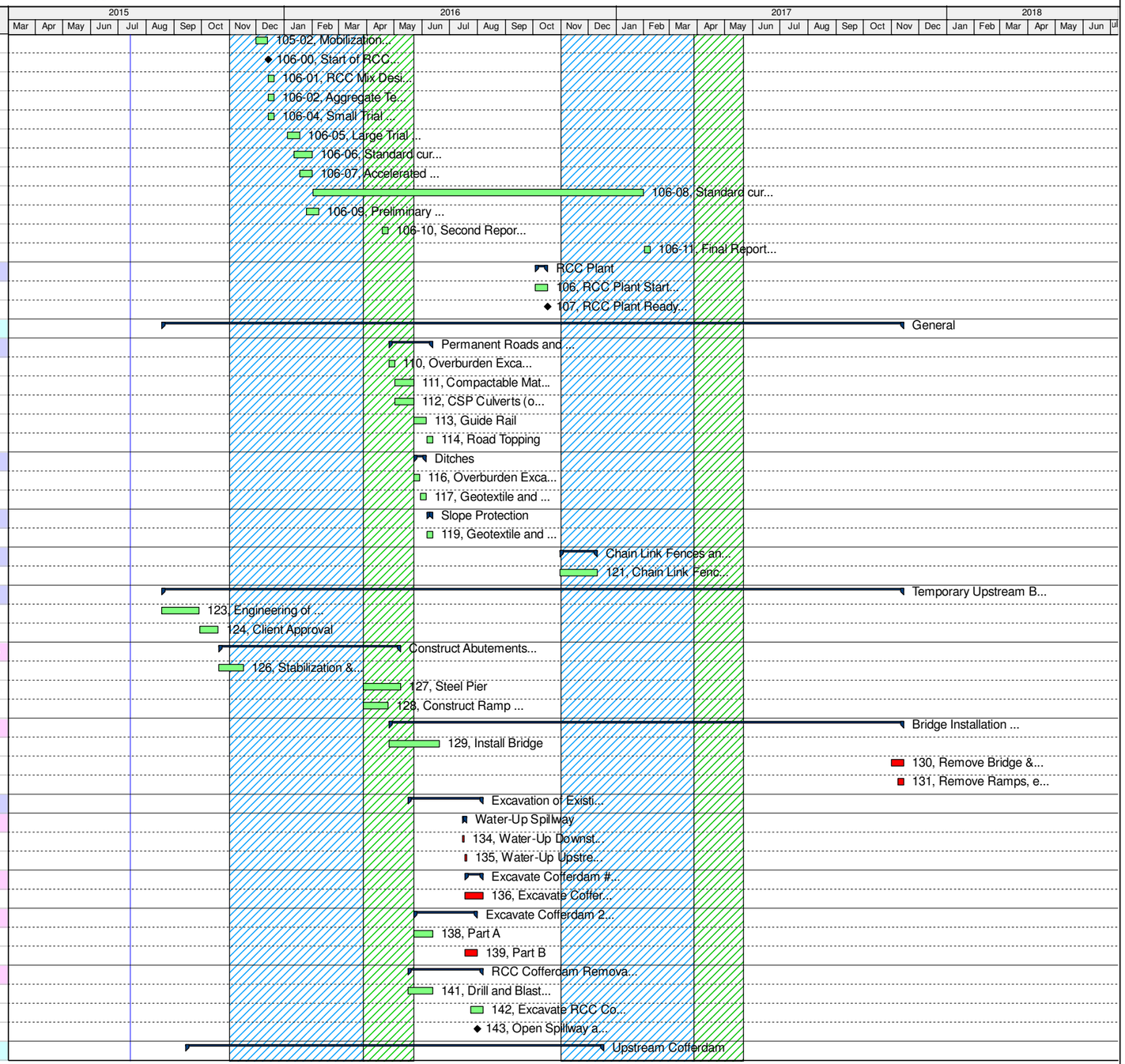
Milestone
Summary

Project: LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT1
Filter: TASK filter: All Activities

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
105-02	Mobilization of RCC Testing Equipment	2.00w	30-Nov-15	13-Dec-15
106-00	Start of RCC Mix Design	0.00w	14-Dec-15	
106-01	RCC Mix Design Program	1.00w	14-Dec-15	20-Dec-15
106-02	Aggregate Testing and Preparation to SSD	1.00w	14-Dec-15	20-Dec-15
106-04	Small Trial Batchs to Determine Water Demand and Dosage Rate of A	1.00w	14-Dec-15	20-Dec-15
106-05	Large Trial Batchs for Different Mixes	2.00w	04-Jan-16	17-Jan-16
106-06	Standard cure compressive strength tests up to 14 days	3.00w	11-Jan-16	31-Jan-16
106-07	Accelerated cure compressive strength tests at 14 days	2.00w	18-Jan-16	31-Jan-16
106-08	Standard cure compressive strength tests 28 to 365 days	49.43w	01-Feb-16	31-Jan-17
106-09	Preliminary Report (compressive tests up to 14 days)	2.00w	25-Jan-16	07-Feb-16
106-10	Second Report (compressive tests up to 91 days)	1.00w	18-Apr-16	24-Apr-16
106-11	Final Report (compressive tests up to 365 days)	1.00w	01-Feb-17	07-Feb-17
RCC Plant		2.00w	04-Oct-16	17-Oct-16
106	RCC Plant Start-Up	2.00w	04-Oct-16	17-Oct-16
107	RCC Plant Ready for Production	0.00w		17-Oct-16
General		112.29w	18-Aug-15	14-Nov-17
Permanent Roads and Parking Area		7.00w	25-Apr-16	12-Jun-16
110	Overburden Excavation	1.00w	25-Apr-16*	01-May-16
111	Compactable Material	3.00w	02-May-16	22-May-16
112	CSP Culverts (ongoing)	3.00w	02-May-16	22-May-16
113	Guide Rail	2.00w	23-May-16	05-Jun-16
114	Road Topping	1.00w	06-Jun-16	12-Jun-16
Ditches		2.00w	23-May-16	05-Jun-16
116	Overburden Excavation	1.00w	23-May-16*	29-May-16
117	Geotextile and Rockfill	1.00w	30-May-16	05-Jun-16
Slope Protection		1.00w	06-Jun-16	12-Jun-16
119	Geotextile and Rockfill	1.00w	06-Jun-16*	12-Jun-16
Chain Link Fences and Gates		6.00w	31-Oct-16	11-Dec-16
121	Chain Link Fence and gates	6.00w	31-Oct-16*	11-Dec-16
Temporary Upstream Bridge (S.S.)		112.29w	18-Aug-15	14-Nov-17
123	Engineering of Bridge, Piers, etc.	6.00w	18-Aug-15	28-Sep-15
124	Client Approval	3.00w	29-Sep-15	19-Oct-15
Construct Abutements and Pier		26.86w	20-Oct-15	08-May-16
126	Stabilization & Concrete	4.00w	20-Oct-15	16-Nov-15
127	Steel Pier	6.00w	28-Mar-16*	08-May-16
128	Construct Ramp South Side	4.00w	28-Mar-16*	24-Apr-16
Bridge Installation and Removal		78.43w	25-Apr-16	14-Nov-17
129	Install Bridge	8.00w	25-Apr-16	19-Jun-16
130	Remove Bridge & Pier	2.00w	01-Nov-17	14-Nov-17
131	Remove Ramps, etc.	1.00w	08-Nov-17	14-Nov-17
Excavation of Existing Cofferdams		12.00w	16-May-16	07-Aug-16
Water-Up Spillway		0.86w	15-Jul-16	20-Jul-16
134	Water-Up Downstream (if required)	0.43w	15-Jul-16	17-Jul-16
135	Water-Up Upstream	0.43w	18-Jul-16	20-Jul-16
Excavate Cofferdam #1		3.00w	18-Jul-16	07-Aug-16
136	Excavate Cofferdam #1	3.00w	18-Jul-16	07-Aug-16
Excavate Cofferdam 2 & 3		10.00w	23-May-16	31-Jul-16
138	Part A	3.00w	23-May-16	12-Jun-16
139	Part B	2.00w	18-Jul-16	31-Jul-16
RCC Cofferdam Removal		12.00w	16-May-16	07-Aug-16
141	Drill and Blast RCC	4.00w	16-May-16	12-Jun-16
142	Excavate RCC Cofferdam	2.00w	25-Jul-16	07-Aug-16
143	Open Spillway and Divert Water	0.00w		01-Aug-16
Upstream Cofferdam		64.00w	14-Sep-15	18-Dec-16



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Project: LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT1
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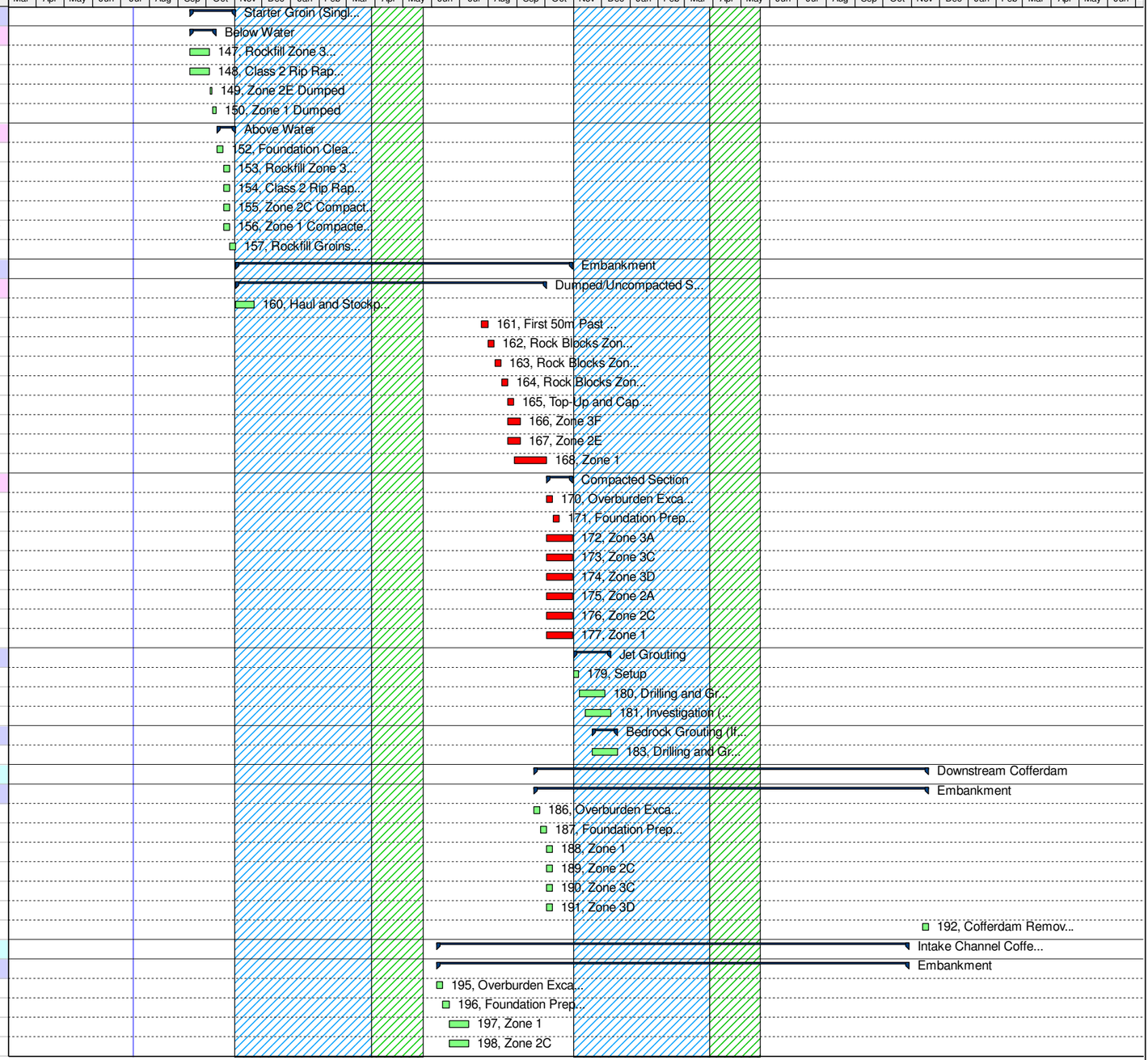
LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
Starter Groin (Single Shift)		7.14w	14-Sep-15	02-Nov-15
Below Water		4.14w	14-Sep-15	12-Oct-15
147	Rockfill Zone 3 Groins - Starter to Encase Till	3.00w	14-Sep-15	04-Oct-15
148	Class 2 Rip Rap Below WL	3.00w	14-Sep-15	04-Oct-15
149	Zone 2E Dumped	0.29w	06-Oct-15	07-Oct-15
150	Zone 1 Dumped	0.71w	08-Oct-15	12-Oct-15
Above Water		3.00w	13-Oct-15	02-Nov-15
152	Foundation Cleanup and Preparation	1.00w	13-Oct-15	19-Oct-15
153	Rockfill Zone 3 Groin - Above Water	1.00w	20-Oct-15	26-Oct-15
154	Class 2 Rip Rap Above WL	1.00w	20-Oct-15	26-Oct-15
155	Zone 2C Compacted	1.00w	20-Oct-15	26-Oct-15
156	Zone 1 Compacted	1.00w	20-Oct-15	26-Oct-15*
157	Rockfill Groins Zone 3 - Cap Starter/Ramp	1.00w	27-Oct-15	02-Nov-15
Embankment		50.14w	02-Nov-15	31-Oct-16
Dumped/Uncompacted Section		46.00w	02-Nov-15	02-Oct-16
160	Haul and Stockpile (1/2 Class 2 and Class 3)	3.00w	02-Nov-15*	22-Nov-15
161	First 50m Past Starter Groins	1.00w	25-Jul-16	31-Jul-16
162	Rock Blocks Zone 3 Class 1	1.00w	01-Aug-16	07-Aug-16
163	Rock Blocks Zone 3 Class 2	1.00w	08-Aug-16	14-Aug-16
164	Rock Blocks Zone 3 Class 3	1.00w	15-Aug-16	21-Aug-16
165	Top-Up and Cap Zone 3	1.00w	22-Aug-16	28-Aug-16
166	Zone 3F	2.00w	22-Aug-16	04-Sep-16
167	Zone 2E	2.00w	22-Aug-16	04-Sep-16
168	Zone 1	5.00w	29-Aug-16	02-Oct-16
Compacted Section		4.14w	03-Oct-16	31-Oct-16
170	Overburden Excavation - North Side	1.00w	03-Oct-16	09-Oct-16
171	Foundation Preparation - North Side	1.00w	10-Oct-16	16-Oct-16
172	Zone 3A	4.14w	03-Oct-16	31-Oct-16
173	Zone 3C	4.14w	03-Oct-16	31-Oct-16
174	Zone 3D	4.14w	03-Oct-16	31-Oct-16
175	Zone 2A	4.14w	03-Oct-16	31-Oct-16
176	Zone 2C	4.14w	03-Oct-16	31-Oct-16
177	Zone 1	4.14w	03-Oct-16	31-Oct-16
Jet Grouting		5.86w	01-Nov-16	11-Dec-16
179	Setup	0.86w	01-Nov-16	06-Nov-16
180	Drilling and Grouting	4.00w	07-Nov-16	04-Dec-16
181	Investigation (on going)	4.00w	14-Nov-16	11-Dec-16
Bedrock Grouting (If Required)		4.00w	21-Nov-16	18-Dec-16
183	Drilling and Grouting	4.00w	21-Nov-16	18-Dec-16
Downstream Cofferdam		58.14w	19-Sep-16	19-Nov-17
Embankment		58.14w	19-Sep-16	19-Nov-17
186	Overburden Excavation	1.00w	19-Sep-16	25-Sep-16
187	Foundation Preparation	1.00w	26-Sep-16	02-Oct-16
188	Zone 1	1.00w	03-Oct-16	09-Oct-16
189	Zone 2C	1.00w	03-Oct-16	09-Oct-16
190	Zone 3C	1.00w	03-Oct-16	09-Oct-16
191	Zone 3D	1.00w	03-Oct-16	09-Oct-16
192	Cofferdam Removal	1.00w	13-Nov-17	19-Nov-17
Intake Channel Cofferdam		70.14w	06-Jun-16	29-Oct-17
Embankment		70.14w	06-Jun-16	29-Oct-17
195	Overburden Excavation	1.00w	06-Jun-16*	12-Jun-16
196	Foundation Preparation	1.00w	13-Jun-16	19-Jun-16
197	Zone 1	3.00w	20-Jun-16	10-Jul-16
198	Zone 2C	3.00w	20-Jun-16	10-Jul-16



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Project: LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015
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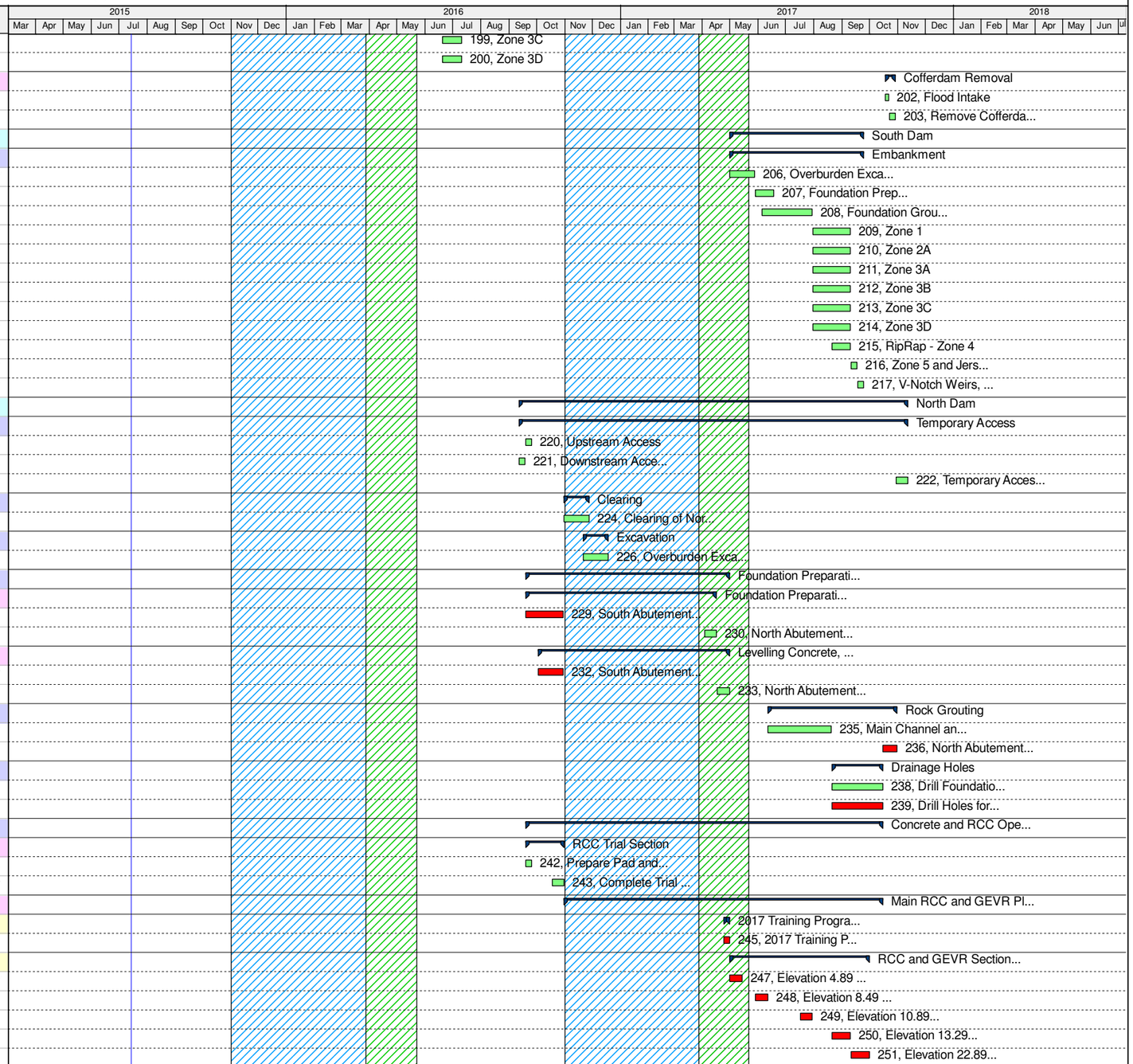
LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
199	Zone 3C	3.00w	20-Jun-16	10-Jul-16
200	Zone 3D	3.00w	20-Jun-16	10-Jul-16
Cofferdam Removal		1.71w	18-Oct-17	29-Oct-17
202	Flood Intake	0.71w	18-Oct-17	22-Oct-17
203	Remove Cofferdam	1.00w	23-Oct-17	29-Oct-17
South Dam		21.00w	01-May-17	24-Sep-17
Embankment		21.00w	01-May-17	24-Sep-17
206	Overburden Excavation	4.00w	01-May-17*	28-May-17
207	Foundation Preparation	3.00w	29-May-17	18-Jun-17
208	Foundation Grouting	8.00w	05-Jun-17	30-Jul-17
209	Zone 1	6.00w	31-Jul-17	10-Sep-17
210	Zone 2A	6.00w	31-Jul-17	10-Sep-17
211	Zone 3A	6.00w	31-Jul-17	10-Sep-17
212	Zone 3B	6.00w	31-Jul-17	10-Sep-17
213	Zone 3C	6.00w	31-Jul-17	10-Sep-17
214	Zone 3D	6.00w	31-Jul-17	10-Sep-17
215	RipRap - Zone 4	3.00w	21-Aug-17	10-Sep-17
216	Zone 5 and Jersey Barriers	1.00w	11-Sep-17	17-Sep-17
217	V-Notch Weirs, Survey Monuments, etc.	1.00w	18-Sep-17	24-Sep-17
North Dam		58.14w	12-Sep-16	12-Nov-17
Temporary Access		58.14w	12-Sep-16	12-Nov-17
220	Upstream Access	1.00w	19-Sep-16*	25-Sep-16
221	Downstream Access	1.00w	12-Sep-16	18-Sep-16
222	Temporary Access Removal	2.00w	30-Oct-17	12-Nov-17
Clearing		4.00w	31-Oct-16	27-Nov-16
224	Clearing of North Abutement	4.00w	31-Oct-16*	27-Nov-16
Excavation		4.00w	21-Nov-16	18-Dec-16
226	Overburden Excavation	4.00w	21-Nov-16	18-Dec-16
Foundation Preparation & levelling RCC/Concete		29.14w	19-Sep-16	30-Apr-17
Foundation Preparation		27.14w	19-Sep-16	16-Apr-17
229	South Abutement and Main Channel Area	6.00w	19-Sep-16	30-Oct-16
230	North Abutement Area	2.00w	03-Apr-17*	16-Apr-17
Levelling Concrete, etc.		27.14w	03-Oct-16	30-Apr-17
232	South Abutement and Main Channel Area	4.00w	03-Oct-16	30-Oct-16*
233	North Abutement Area	2.00w	17-Apr-17	30-Apr-17
Rock Grouting		20.29w	12-Jun-17	31-Oct-17
235	Main Channel and Abutements Area	10.00w	12-Jun-17	20-Aug-17
236	North Abutement Area (Part B/Last 50m)	2.29w	16-Oct-17	31-Oct-17
Drainage Holes		8.00w	21-Aug-17	15-Oct-17
238	Drill Foundation Holes	8.00w	21-Aug-17	15-Oct-17
239	Drill Holes for RCC Drainage to Gallery	8.00w	21-Aug-17	15-Oct-17
Concrete and RCC Operations		53.14w	19-Sep-16	15-Oct-17
RCC Trial Section		6.14w	19-Sep-16	31-Oct-16
242	Prepare Pad and Infrastructure	1.00w	19-Sep-16*	25-Sep-16
243	Complete Trial Section	2.00w	18-Oct-16	31-Oct-16*
Main RCC and GEVR Placement		47.14w	31-Oct-16	15-Oct-17
2017 Training Program		1.00w	24-Apr-17	30-Apr-17
245	2017 Training Program	1.00w	24-Apr-17*	30-Apr-17
RCC and GEVR Section 1		22.00w	01-May-17	01-Oct-17
247	Elevation 4.89 to 8.49	2.00w	01-May-17	14-May-17
248	Elevation 8.49 to 10.89	2.00w	29-May-17	11-Jun-17
249	Elevation 10.89 to 13.29	2.00w	17-Jul-17	30-Jul-17
250	Elevation 13.29 to 22.89	3.00w	21-Aug-17	10-Sep-17
251	Elevation 22.89 to 39.39	3.00w	11-Sep-17	01-Oct-17



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LOWER CHURCHILL - NORTH & SOUTH DAMS (PACKAGE CH-0009)
Dragados Canada, Inc. and **H.J.O' Connell Construction Limited**

O'CONNELL

DRAGADOS CANADA

Project: LCH0009-BL-A-R02 - B1/ LCP - North and South Dams Diversion 2016 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT1
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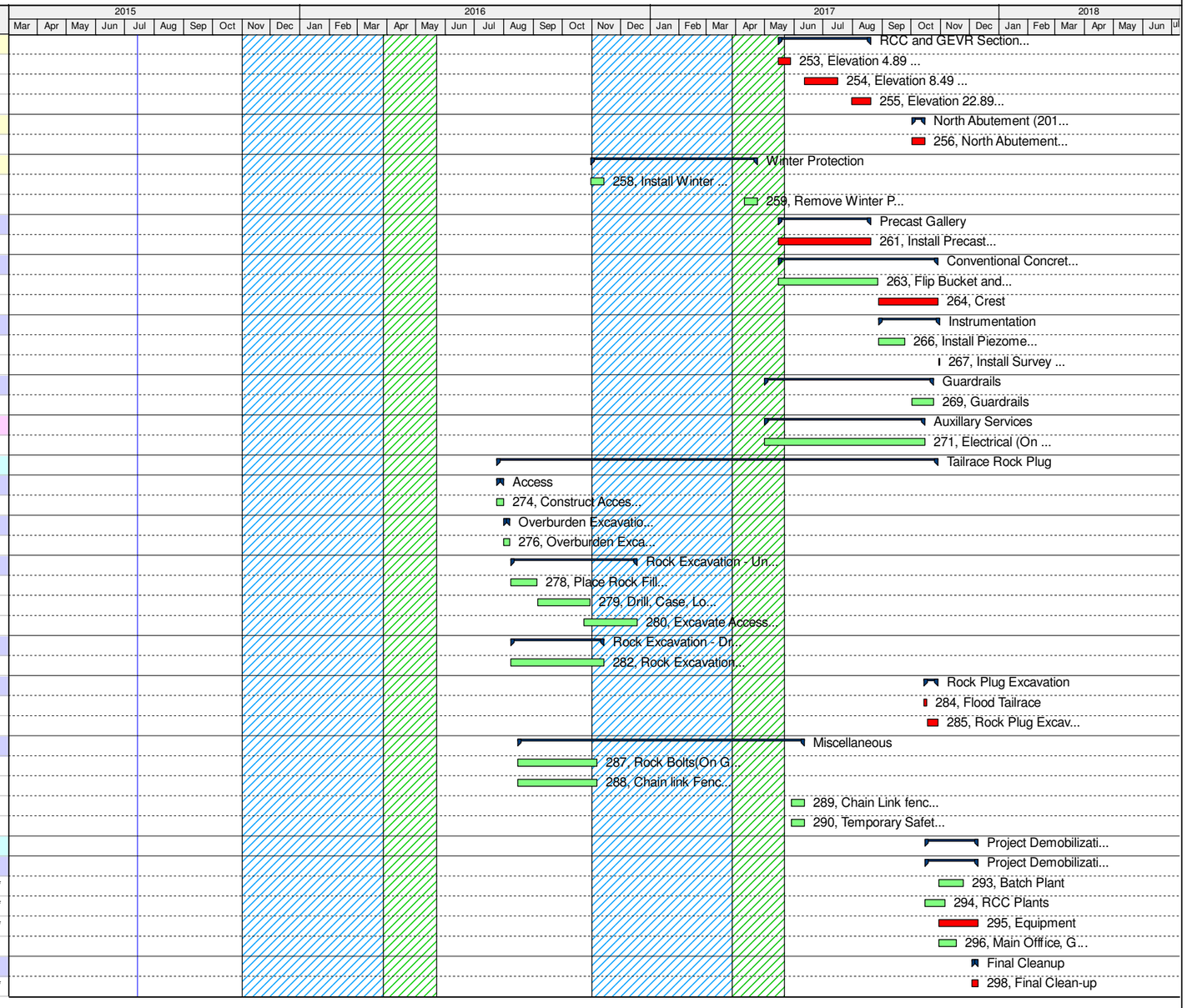
LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (I): RIVER DIVERSION IN 2016

Date: 30-Jun-15 **Time:** 14:23
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
	RCC and GEVR Section 2	14.00w	15-May-17	20-Aug-17
253	Elevation 4.89 to 8.49	2.00w	15-May-17	28-May-17
254	Elevation 8.49 to 22.89	5.00w	12-Jun-17	16-Jul-17
255	Elevation 22.89 to 36.39	3.00w	31-Jul-17	20-Aug-17
	North Abutement (2017)	2.00w	02-Oct-17	15-Oct-17
256	North Abutement (2017)	2.00w	02-Oct-17	15-Oct-17
	Winter Protection	22.14w	31-Oct-16	23-Apr-17
258	Install Winter Protection	2.00w	31-Oct-16	13-Nov-16
259	Remove Winter Protection	2.00w	10-Apr-17*	23-Apr-17
	Precast Gallery	14.00w	15-May-17	20-Aug-17
261	Install Precast Units - 2017	14.00w	15-May-17	20-Aug-17
	Conventional Concrete	24.00w	15-May-17	29-Oct-17
263	Flip Bucket and End Wall	15.00w	15-May-17	27-Aug-17
264	Crest	9.00w	28-Aug-17	29-Oct-17
	Instrumentation	9.29w	28-Aug-17	31-Oct-17
266	Install Piezometers, Weirs, etc.	4.00w	28-Aug-17	24-Sep-17
267	Install Survey Monuments	0.29w	30-Oct-17	31-Oct-17
	Guardrails	25.29w	01-May-17	24-Oct-17
269	Guardrails	3.29w	02-Oct-17	24-Oct-17
	Auxillary Services	24.00w	01-May-17	15-Oct-17
271	Electrical (On Going)	24.00w	01-May-17	15-Oct-17
Tailrace Rock Plug		63.14w	25-Jul-16	29-Oct-17
	Access	1.00w	25-Jul-16	31-Jul-16
274	Construct Access Road	1.00w	25-Jul-16	31-Jul-16
	Overburden Excavation	1.00w	01-Aug-16	07-Aug-16
276	Overburden Excavation	1.00w	01-Aug-16	07-Aug-16
	Rock Excavation - Underwater	19.00w	08-Aug-16	18-Dec-16
278	Place Rock Fill for Access	4.00w	08-Aug-16	04-Sep-16
279	Drill, Case, Load and Blast	8.00w	05-Sep-16	30-Oct-16
280	Excavate Access and Underwater Rock	8.00w	24-Oct-16	18-Dec-16
	Rock Excavation - Dry	14.00w	08-Aug-16	13-Nov-16
282	Rock Excavation to 30m Plug at Elevation 9	14.00w	08-Aug-16	13-Nov-16
	Rock Plug Excavation	2.14w	15-Oct-17	29-Oct-17
284	Flood Tailrace	0.43w	15-Oct-17	17-Oct-17
285	Rock Plug Excavation	1.71w	18-Oct-17	29-Oct-17
	Miscellaneous	40.14w	15-Aug-16	11-Jun-17
287	Rock Bolts(On Going)	12.00w	15-Aug-16	06-Nov-16
288	Chain link Fence Installation (On Going)	12.00w	15-Aug-16	06-Nov-16
289	Chain Link fence Removal	2.00w	29-May-17*	11-Jun-17
290	Temporary Safety Fence Removal	2.00w	29-May-17	11-Jun-17
Project Demobilization and Final Cleanup		8.00w	16-Oct-17	10-Dec-17
	Project Demobilization	8.00w	16-Oct-17	10-Dec-17
293	Batch Plant	3.71w	30-Oct-17	24-Nov-17*
294	RCC Plants	3.00w	16-Oct-17	05-Nov-17*
295	Equipment	6.00w	30-Oct-17	10-Dec-17*
296	Main Office, Garage, etc	2.71w	30-Oct-17	17-Nov-17
	Final Cleanup	1.00w	04-Dec-17	10-Dec-17
298	Final Clean-up	1.00w	04-Dec-17	10-Dec-17*



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APPENDIX A2.7

ESTIMATED TRADE PERSON-HOUR SCHEDULE

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

ESTIMATED TRADE PERSON-HOUR SCHEDULE

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Boilermakers	General Foreperson									
	Foreperson									
	Assistant Foreperson									
	Journeyperson									
	Helper									
	Apprentice - 3rd year									
	Apprentice - 2nd year									
	Apprentice - 1st year									
Bricklayers	Group 1 - General Foreperson									
	Group 1 - Foreperson									
	Journeyperson - Group 2									
	Journeyperson - Group 3									
	Journeyperson - Group 4									
	Apprentice - 1st 6 months									
	Apprentice - 2nd 6 months									
	Apprentice - 3rd 6 months									
	Apprentice - 4th 6 months									
	Apprentice - 5th 6 months									
	Apprentice - 6th 6 months									
	Apprentice - 7th 6 months									
	Apprentice - 8th 6 months									
Refractory	Group 1 – General Foreperson									
	Group 1 – Refractory Foreperson									
	Journeyperson - Group 5									
	Journeyperson - Group 6									
	Apprentice - 1st 1,200 hours									
	Apprentice - 2nd 1,200 hours									
	Apprentice - 3rd 1,200 hours									
	Apprentice - 4th 1,200 hours									

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Carpenters	General Foreperson	760		4,332	1,102	2,166				7,600
	Non-working Foreperson	2,271		12,944	3,406	6,360				22,710
	Working Foreperson									
	JourneyPerson, Carpenter, Welder, Scaffolder	10,665		60,790	15,997	29,863				106,650
	Apprentice – 1st									
	Apprentice – 2nd									
	Apprentice – 3rd									
	Apprentice – 4th	3,510		20,007	5,265	9,828				35,100
Electricians	General Foreperson									
	Non-working Foreperson									
	Working Foreperson	76.8		438	111	219				768
	Apprentice/JourneyPerson Electrician Welder/Welder	345.5		1,969	501	985				3,455
	Journeyperson									
	Apprentice - 1st year									
	Apprentice - 2nd year									
	Apprentice - 3rd year									
	Apprentice - 4th year	115		656	167	327				1,150
Labourers	General Foreperson	1,035		5,900	1,552	2,898				10,350
	Non-working Foreperson	2,484		14,155	3,725	6,957				26,542
	Working Foreperson	637		3,630	956	1,784				6,370
	Class 1	20,220		115,425	30,330	56,616				202,200
	Class 2	1,740		9,918	2,523	4,959				17,400
	Class 3									
	Class 4									
	Class 5									
	Class 6									
	Class 7	12.4		70	18	36				124
	Class 8	98.4		561	143	280				984
	Class 9									
	Class 10	1,816.8		10,356	2,634	5,178				18,168
	Class 11	3,192		18,194	4,629	9,097				31,920

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Insulators	General Foreperson									
	Foreperson									
	Working Foreperson									
	JourneyPerson Mechanic									
	Apprentice - 1st year									
	Apprentice - 2nd year									
	Apprentice - 3rd year									
	Apprentice - 4th year									
Hotel Employees and Restaurant Employees	Chef (General Foreperson)									
	1st Cook (Foreperson)									
	Baker, Meat Cutter & Foreperson									
	2nd Cook, Inventory Attendant, Service Attendant & Front Desk Attendant									
	3rd Cook, Baker's Helper & Bartender									
	Salad/Sandwich Person & Commissary									
	General Help									
	Foreperson									
	Camp Attendant Housekeeping									
	Security Crew Chief (General Foreperson)									
	Security Assistant Crew Chief (Foreperson)									
	Security Officer, Communications/Dispatch									
	Janitor									

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Electrical Line Workers	General Foreperson									
	Non-working Foreperson									
	Lead Lineperson									
	Utility Worker									
	Journey (Lineperson and/or Cable Splicer)									
	Apprentice - 1st year									
	Apprentice - 2nd year									
	Apprentice - 3rd year									
	Apprentice - 4th year									
Ironworkers - Structural	General Foreperson									
	Foreperson	75		428	109	213				750
	Connectors									
	Journeyperson	600		3,420	870	1,710				6,000
	Apprentice - 1st 1,000 hrs									
	Apprentice - 2nd 1,000 hrs									
	Apprentice - 3rd 1,000 hrs									
	Apprentice - 4th 1,000 hrs	200		1,140	290	570				2,000
Ironworkers - Rodman (Rebar)	General Foreperson									
	Foreperson									
	Journeyperson									
	Apprentice - 1st 1,000 hrs									
	Apprentice - 2nd 1,000 hrs									
	Apprentice - 3rd 1,000 hrs									
	Apprentice - 4th 1,000 hrs									

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Millwrights	General Foreperson									
	Non-working Foreperson									
	Working Foreperson	396		2,275	574	1,129				3,960
	Journeyperson Millwright – Welder Machinist									
	Apprentice 1st Year									
	Apprentice 2nd Year									
	Apprentice 3rd Year									
	Apprentice 4th Year									
Operating Engineers	General Foreperson	1,694		9,656	2,456	4,828				16,940
	Non-working Foreperson	5,970		34,029	8,657	17,014				59,700
	Operating Engineer – Group 1	7,915.5		45,118	11,478	22,559				79,155
	Operating Engineer – Group 2	9,784.5		55,772	14,187	27,886				97,845
	Operating Engineer – Group 3	2,555.5		14,566	3,716	7,283				25,555
	Operating Engineer – Group 4									
	Operating Engineer – Group 5	1,045		5,657	1,515	2,978				10,450
	Apprentice – 1st Period									
	Apprentice – 2nd Period									
	Apprentice – 3rd Period									
	Apprentice – 4th Period									
	Apprentice – 5th Period									
	Apprentice – 6th Period	8,739		49,812	12,672	24,906				87,390
	Clerical – Group 1									
	Clerical – Group 2									
	Clerical – Group 3									
Painters and Allied Trades	Painter/Glazier									
	Drywall Taper, Spray Painter, Sand Blaster, Vinyl Hangers, Fireproofers									
	Foreperson									
	General Foreperson									
	Apprentice - 1st year									
	Apprentice - 2nd year									

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

	Apprentice - 3rd year									
Trade Type	**Trade Classification**	**Number of LOA Person-Days**	**Travel KMs**	**Regular Time Person-Hours**	**Overtime (1.5x) Person-Hours**	**Overtime (2.0x) Person-Hours**	**Second Shift Person-Hours**	**Third Shift Person-Hours**	**Travel Time Hours**	**Total Person-Hours**
Plumbers and pipefitters	General Foreperson									
	Foreperson									
	Journeyperson									
	Welding Inspector									
	Apprentice – 1st year									
	Apprentice - 2nd year									
	Apprentice - 3rd year									
	Apprentice - 4th year									
Sheet Metal Workers	General Foreperson									
	Working Foreperson									
	Non-working Foreperson									
	Journeyperson									
	Apprentice - 2nd year									
	Apprentice - 3rd year									
	Apprentice - 4th year									
Teamsters	Group 1 (Single Axle)									
	Group 2 (Dual Axle/Tandem Axle)									
	Group 3 (Heavy Trucks & Warehouse)	13,877		79,096	20,815	38,855				138,765
	Group 4 (Emergency, Medical Technicians & First Mates)									
	Group 5 (Duty Nurse, Fire Prevention Officer, Captains & Engineers)									
	Group 6 (Tandem Axle)									
	Group 6 (Tandem Tandem Axle)	2,295								22,950

Appendix A2.7
Estimated Trade Person-Hour Schedule
Package Number: CH0009

Trade Type	Trade Classification	Number of LOA Person-Days	Travel KMs	Regular Time Person-Hours	Overtime (1.5x) Person-Hours	Overtime (2.0x) Person-Hours	Second Shift Person-Hours	Third Shift Person-Hours	Travel Time Hours	Total Person-Hours
Elevator Constructors	Mechanic									
	Mechanic in-charge (4 or more)									
	Mechanic in-charge (30 or more)									
	Probationary Helper I									
	Probationary Helper II									
	Helper I									
	Helper II									
	Improver Helper									

*LOA = Living Out Allowance.

LOWER CHURCHILL PROJECT MUSKRAT FALLS CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS	SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2017	APPENDIX A2.1 Rev. B3
	ISSUED FOR: BID DATE: 6 - Jun - 2015	BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM		WBS CODE												
No	REFERENCE Exhibit 2 - ATT 1	CODE	SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE| ($ CAN) F= (B+C+D+E)	TOTAL PRICE ($ CAN) G= A x F
	2	0000		INDIRECT COSTS									
1	2.1		0000.01	Mobilization	LS	1	28108.00	$ 2,062,375.09	$ 2,849,744.05	$ 25,087,880.86	$ -	$ 30,000,000.00	$ 30,000,000.00
2	2.2		0000.02	Site Installation	LS	1	61020.69	$ 6,759,270.52	$ 3,288,928.07	$ 12,076,801.41	$ -	$ 22,125,000.00	$ 22,125,000.00
3	2.3		0000.03	Management, Staff, employees and Consultants	LS	1	302400.00	$ 37,123,791.56	$ 4,279,072.47	$ 1,097,135.97	$ -	$ 42,500,000.00	$ 42,500,000.00
4	2.4		0000.04	Health and Safety, Environmental and Quality Requirements	LS	1	81166.48	$ 7,321,693.17	$ 126,761.87	$ 51,544.96	$ -	$ 7,500,000.00	$ 7,500,000.00
5	2.5		0000.05	Credit, Guarantee and Insurance	LS	1	0.00	$ -	$ 1,930,000.00	$ -	$ -	$ 1,930,000.00	$ 1,930,000.00
6	2.6		0000.06	Warranty, per Article 17 of the Agreement	LS	1	0.00	$ 225,000.00	$ -	$ 225,000.00	$ -	$ 450,000.00	$ 450,000.00
7	2.7		0000.07	Demobilization	LS	1	0.00	$ -	$ -	$ 250,000.00	$ -	$ 250,000.00	$ 250,000.00
				SUB-TOTAL INDIRECT COSTS									$ 104,755,000.00
	3	1100		GENERAL									
	3.1		1110	DEWATERING OF STRUCTURE AREAS									
8	3.1.1		1110.01	Dewatering of Structure Areas	LS	1	8179.00	$ 865,855.43	$ 382,409.95	$ 251,734.62	$ -	$ 1,500,000.00	$ 1,500,000.00
	3.2		1111	EXCAVATION OF EXISTING COFFERDAMS									
9	3.2.1		1111.01	Excavation of Existing Embankment cofferdams 1, 2 and 3, and Existing Ramps	m^3	177,000	0.05	$ 5.33	$ 0.10	$ 7.07	$ -	$ 12.50	$ 2,212,500.00
10	3.2.2		1111.02	Excavation of Downstream section of RCC riverside cofferdam	m^3	20,000	0.12	$ 13.72	$ 3.44	$ 14.83	$ -	$ 32.00	$ 640,000.00
	3.3		1112	PERMANENT ROADS AND PARKING AREA									
11	3.3.1		1112.01	Overburden Excavation	m^3	8,000	0.08	$ 8.76	$ -	$ 10.14	$ -	$ 18.90	$ 151,200.00
12	3.3.2		1112.02	Other Material or Rockfill	m^3	44,000	0.05	$ 5.21	$ -	$ 6.59	$ -	$ 11.80	$ 519,200.00
13	3.3.3		1112.03	Maintenance Grade 3 material	m^3	6,000	0.22	$ 25.53	$ 0.28	$ 29.39	$ -	$ 55.20	$ 331,200.00
14	3.3.6		1112.04	CSP culvert, dia. 900 mm	m	48	4.43	$ 493.28	$ 210.37	$ 166.35	$ -	$ 870.00	$ 41,760.00
15	3.3.7		1112.05	Guide Rails	m	400	2.60	$ 278.69	$ 116.30	$ 23.00	$ -	$ 418.00	$ 167,200.00
16	3.3.8		1112.06	Gate Type 1	unit	2	76.80	$ 8,362.27	$ 3,403.62	$ 1,234.12	$ -	$ 13,000.00	$ 26,000.00
	3.5		1114	DITCHES									
17	3.5.1		1114.01	Overburden Excavation	m^3	2,000	0.09	$ 8.73	$ -	$ 10.27	$ -	$ 19.00	$ 38,000.00
18	3.5.2		1114.02	Non-woven Geotextile, min 300 g/m^2	m^2	2,500	0.16	$ 16.13	$ 5.26	$ 3.61	$ -	$ 25.00	$ 62,500.00
19	3.5.3		1114.03	Rockfill Protection, 100 - 250 mm	m^3	1,000	0.35	$ 35.87	$ -	$ 23.13	$ -	$ 59.00	$ 59,000.00
	3.6		1115	SLOPE PROTECTION									
20	3.6.1		1115.01	Rockfill Protection, Zone 3E Material	m^3	2,500	0.12	$ 11.86	$ -	$ 13.14	$ -	$ 25.00	$ 62,500.00
21	3.6.2		1115.02	Non-woven Geotextile, min 530 g/m^2	m^2	4,500	0.04	$ 3.99	$ 3.62	$ 0.89	$ -	$ 8.50	$ 38,250.00
	3.7		1116	CHAIN LINK FENCES AND GATES									
22	3.7.1		1116.01	Chain Link Fence and Gates	m	720	2.90	$ 331.41	$ 68.56	$ 75.03	$ -	$ 475.00	$ 342,000.00
	3.8		1150	TEMPORARY UPSTREAM BRIDGE OVER SPILLWAY APPROACH CHANNEL									
23	3.8.1		1150.01	Engineering of Temporary Upstream Bridge	LS	1	0.00	$ 115,000.00	$ -	$ -	$ -	$ 115,000.00	$ 115,000.00
24	3.8.2		1150.02	Supply of Temporary Upstream Bridge	LS	1	373.10	$ 39,381.38	$ 1,946,918.35	$ 13,700.27	$ -	$ 2,000,000.00	$ 2,000,000.00
25	3.8.3		1150.03	Installation, removal and handover of Temporary Upstream Bridge	LS	1	18923.73	$ 2,026,189.06	$ 1,138,361.63	$ 1,335,449.31	$ -	$ 4,500,000.00	$ 4,500,000.00
				SUB-TOTAL GENERAL									$ 12,806,310.00
	4	2300		DAMS AND COFFERDAMS - GENERAL									
	4.1	2340	2341	UPSTREAM COFFERDAM									
				CIVIL WORK									
				Excavation									
26	4.1.1		2341.01	Overburden excavation	m^3	2,500	0.14	$ 15.71	$ -	$ 17.04	$ -	$ 32.75	$ 81,875.00
				Foundation Preparation in dry condition									
27	4.1.2		2341.02	Foundation Cleaning (water/air jets and Vacuum trucks)	m^2	1,200	0.90	$ 104.20	$ -	$ 15.80	$ -	$ 120.00	$ 144,000.00
28	4.1.3		2341.03	Rock Excavation including dental excavation and Scaling	m^3	500	0.79	$ 89.47	$ 24.63	$ 90.91	$ -	$ 205.00	$ 102,500.00
29	4.1.4		2341.04	Dental Concrete	m^3	800	1.92	$ 206.90	$ 482.46	$ 20.65	$ -	$ 710.00	$ 568,000.00
30	4.1.5		2341.05	Slush Grout	m^2	1,200	0.20	$ 22.39	$ 8.64	$ 0.97	$ -	$ 32.00	$ 38,400.00
31	4.1.6		2341.06	Dry Pack	m^3	6	50.00	$ 5,638.30	$ 1,266.21	$ 245.50	$ -	$ 7,150.00	$ 42,900.00
				Embankment Materials									
32	4.1.7		2341.07	Compacted Till - Zones 1 and 1C Materials	m^3	19,000	0.24	$ 26.16	$ -	$ 30.84	$ -	$ 57.00	$ 1,083,000.00
33	4.1.8		2341.08	Dumped Till - Zone 1A Material	m^3	134,000	0.13	$ 13.88	$ -	$ 22.12	$ -	$ 36.00	$ 4,824,000.00
34	4.1.9		2341.09	Compacted Granular - Zone 2A Material	m^3	20,700	0.28	$ 29.37	$ -	$ 30.63	$ -	$ 60.00	$ 1,242,000.00
35	4.1.10		2341.10	Compacted Granular - Zone 2C Material	m^3	8,700	0.28	$ 29.44	$ -	$ 30.56	$ -	$ 60.00	$ 522,000.00
36	4.1.11		2341.11	Dumped Granular - Zone 2E Material	m^3	26,300	0.17	$ 16.54	$ -	$ 25.46	$ -	$ 42.00	$ 1,104,600.00
37	4.1.12		2341.12	Dumped Rockfill- Zone 3 Material	m^3	143,000	0.06	$ 6.91	$ -	$ 8.09	$ -	$ 15.00	$ 2,145,000.00
38	4.1.13		2341.13	Dumped Large Blocks (300-1000 mm) - Zone 3 Class 1	m^3	37,000	0.08	$ 9.11	$ -	$ 12.39	$ -	$ 21.50	$ 795,500.00
39	4.1.14		2341.14	Dumped Large Blocks (≥1000 mm) - Zone 3 Class 2	m^3	65,000	0.17	$ 18.88	$ -	$ 26.12	$ -	$ 45.00	$ 2,925,000.00
40	4.1.15		2341.15	Dumped Large Blocks (≥1300 mm) - Zone 3 Class 3	m^3	15,000	0.20	$ 22.70	$ -	$ 34.55	$ -	$ 57.25	$ 858,750.00
41	4.1.16		2341.16	Compacted Crushed Stone - Zone 3A Material	m^3	10,950	0.32	$ 36.19	$ 0.28	$ 33.53	$ -	$ 70.00	$ 766,500.00
42	4.1.17		2341.17	Compacted Rockfill - Zone 3C Material	m^3	33,740	0.10	$ 11.74	$ -	$ 13.76	$ -	$ 25.50	$ 860,370.00
43	4.1.18		2341.18	Compacted Rockfill - Zone 3D Material	m^3	33,900	0.10	$ 11.74	$ -	$ 13.76	$ -	$ 25.50	$ 864,450.00
44	4.1.19		2341.19	Dumped Crushed Stone- Zone 3F Material	m^3	21,000	0.19	$ 20.94	$ 0.28	$ 25.28	$ -	$ 46.50	$ 976,500.00
				Investigation for Jet Grouted Cut-off Wall and Bedrock Grouting									
45	4.1.20		2341.20	Percussion Drill Holes in embankments, river sediments and bedrock	m	1,000	0.25	$ 33.60	$ -	$ 86.40	$ -	$ 120.00	$ 120,000.00
46	4.1.21		2341.21	Verification Core Drilling in jet grouting cut-off wall and bedrock	m	200	0.72	$ 95.00	$ 14.25	$ 365.75	$ -	$ 475.00	$ 95,000.00
47	4.1.22		2341.22	Core Diamond Drill Rig in Standby	hour	140	0.00	$ -	$ -	$ 155.00	$ -	$ 155.00	$ 21,700.00
				SUB-TOTAL UPSTREAM COFFERDAM									$ 20,182,045.00
	4.2	2340	2342	DOWNSTREAM COFFERDAM									
				CIVIL WORK									
				Excavation									
48	4.2.1		2342.01	Overburden excavation	m^3	500	0.15	$ 17.01	$ -	$ 16.49	$ -	$ 33.50	$ 16,750.00
				Foundation Preparation									
49	4.2.2		2342.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	1,250	0.90	$ 101.83	$ -	$ 18.17	$ -	$ 120.00	$ 150,000.00
50	4.2.3		2342.03	Rock excavation including dental excavation and scaling	m^3	500	0.80	$ 90.32	$ 24.39	$ 90.29	$ -	$ 205.00	$ 102,500.00
51	4.2.4		2342.04	Dental Concrete	m^3	200	1.92	$ 201.36	$ 468.63	$ 40.00	$ -	$ 710.00	$ 142,000.00
52	4.2.5		2342.05	Slush Grout	m^2	1,250	0.20	$ 22.39	$ 8.64	$ 0.97	$ -	$ 32.00	$ 40,000.00
53	4.2.6		2342.06	Dry Pack	m^3	6	50.00	$ 5,638.30	$ 1,266.21	$ 245.50	$ -	$ 7,150.00	$ 42,900.00
				Embankment Materials									
54	4.2.7		2342.07	Compacted Till - Zones 1 and 1C	m^3	2,000	0.23	$ 25.99	$ -	$ 31.01	$ -	$ 57.00	$ 114,000.00
55	4.2.8		2342.08	Compacted Granular - Zone 2C	m^3	2,500	0.28	$ 29.08	$ -	$ 32.92	$ -	$ 62.00	$ 155,000.00
56	4.2.9		2342.09	Compacted Rockfill - Zone 3C	m^3	4,600	0.12	$ 13.12	$ -	$ 13.88	$ -	$ 27.00	$ 124,200.00
57	4.2.10		2342.10	Compacted Rockfill - Zone 3D	m^3	2,000	0.12	$ 13.12	$ -	$ 13.88	$ -	$ 27.00	$ 54,000.00
				SUB-TOTAL DOWNSTREAM COFFERDAM									$ 941,350.00
	4.3	2340	2343	INTAKE CHANNEL COFFERDAM									
				CIVIL WORK									
				Excavation									
58	4.3.1		2343.01	Overburden excavation	m^3	8,800	0.06	$ 6.94	$ -	$ 8.06	$ -	$ 15.00	$ 132,000.00
				Foundation Preparation									
59	4.3.2		2343.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	1,700	0.90	$ 101.49	$ -	$ 18.51	$ -	$ 120.00	$ 204,000.00
60	4.3.3		2343.03	Rock excavation including dental excavation and scaling	m^3	700	0.78	$ 89.05	$ 24.74	$ 91.21	$ -	$ 205.00	$ 143,500.00
61	4.3.4		2343.04	Dental Concrete	m^3	250	1.90	$ 205.91	$ 484.41	$ 19.68	$ -	$ 710.00	$ 177,500.00
62	4.3.5		2343.05	Slush Grout	m^2	1,700	0.20	$ 22.45	$ 8.69	$ 0.85	$ -	$ 32.00	$ 54,400.00
63	4.3.6		2343.06	Dry Pack	m^3	9	50.00	$ 5,659.97	$ 1,275.08	$ 214.96	$ -	$ 7,150.00	$ 64,350.00
				Embankment Materials									
64	4.3.7		2343.07	Compacted Till - Zones 1 and 1C	m^3	6,300	0.29	$ 31.75	$ 2.05	$ 39.19	$ -	$ 73.00	$ 459,900.00
65	4.3.8		2343.08	Compacted Granular - Zone 2C	m^3	4,900	0.31	$ 36.62	$ 1.02	$ 50.36	$ -	$ 88.00	$ 431,200.00
66	4.3.9		2343.09	Compacted Rockfill - Zone 3C	m^3	5,200	0.19	$ 21.55	$ 2.07	$ 25.39	$ -	$ 49.00	$ 254,800.00
67	4.3.10		2343.10	Compacted Rockfill - Zone 3D	m^3	1,400	0.19	$ 21.55	$ 2.07	$ 25.39	$ -	$ 49.00	$ 68,600.00
				SUB-TOTAL INTAKE CHANNEL COFFERDAM									$ 1,990,250.00
	4.4		2330	SOUTH DAM									
				CIVIL WORK									
				Excavation									
68	4.4.1		2330.01	Overburden excavation	m^3	94,000	0.06	$ 7.02	$ -	$ 7.98	$ -	$ 15.00	$ 1,410,000.00
				Foundation Preparation									
69	4.4.2		2330.02	Foundation cleaning (water/ait jets and Vacuum trucks)	m^2	3,400	0.90	$ 104.54	$ -	$ 15.46	$ -	$ 120.00	$ 408,000.00
70	4.4.3		2330.03	Rock excavation including dental excavation and scaling	m^3	2,000	0.78	$ 90.73	$ 24.38	$ 89.88	$ -	$ 205.00	$ 410,000.00
71	4.4.4		2330.04	Dental Concrete	m^3	1,200	1.92	$ 213.05	$ 476.55	$ 20.39	$ -	$ 710.00	$ 852,000.00
72	4.4.5		2330.05	Slush Grout	m^2	3,400	0.20	$ 22.73	$ 8.44	$ 0.83	$ -	$ 32.00	$ 108,800.00
73	4.4.6		2330.06	Dry Pack	m^3	20	50.00	$ 5,709.01	$ 1,233.11	$ 207.88	$ -	$ 7,150.00	$ 143,000.00
74	4.4.7		2330.07	Drilling Holes for Grouting	m	1,200	0.70	$ 100.00	$ -	$ 25.00	$ -	$ 125.00	$ 150,000.00
75	4.4.8		2330.08	Dry cement incorported in the grout	kg	42,000	0.04	$ 3.90	$ 1.63	$ 0.98	$ -	$ 6.50	$ 273,000.00
76	4.4.9		2330.09	Cored Drill Check Holes	m	30	1.79	$ 495.48	$ -	$ 84.52	$ -	$ 580.00	$ 17,400.00
77	4.4.10		2330.10	Percussion Drilling Check holes	m	60	0.80	$ 96.80	$ -	$ 24.20	$ -	$ 121.00	$ 7,260.00
78	4.4.11		2330.11	Grouting - Successful connections	unit	250	2.93	$ 383.76	$ -	$ 31.24	$ -	$ 415.00	$ 103,750.00
79	4.4.12		2330.12	Water pressure test (Lugeon - 5 Stages)	hour	8	3.00	$ 425.70	$ -	$ 219.30	$ -	$ 645.00	$ 5,160.00
80	4.4.13		2330.13	Water test - Successful connections	unit	18	1.33	$ 191.40	$ -	$ 98.60	$ -	$ 290.00	$ 5,220.00
81	4.4.14		2330.14	Uplift gauges	m	20	2.40	$ 300.00	$ 216.00	$ 84.00	$ -	$ 600.00	$ 12,000.00

LOWER CHURCHILL PROJECT
MUSKRAT FALLS
CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS

SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2017

APPENDIX A2.1
Rev. B3

ISSUED FOR: BID DATE: 6 - Jun - 2015

BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM No	REFERENCE Exhibit 2 - ATT 1	WBS CODE CODE	WBS CODE SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE ($ CAN) F= (B+C+D+E)	TOTAL PRICE ($ CAN) G= A x F
82	4.4.15		2330.15	Thermistors (measure rock temperature in grout holes)	unit	1	48.00	$ -	$ 7,488.00	$ 4,212.00	$ -	$ 11,700.00	$ 11,700.00
				Embankment Materials									
83	4.4.16		2330.16	Compacted Till - Zones 1 and 1C	m^3	26,000	0.22	$ 25.34	$ -	$ 30.66	$ -	$ 56.00	$ 1,456,000.00
84	4.4.17		2330.17	Compacted Granular - Zone 2A	m^3	28,000	0.24	$ 25.86	$ -	$ 31.14	$ -	$ 57.00	$ 1,596,000.00
85	4.4.18		2330.18	Compacted Crushed Stone - Zone 3A	m^3	12,000	0.30	$ 35.02	$ 0.28	$ 33.70	$ -	$ 69.00	$ 828,000.00
86	4.4.19		2330.19	Compacted Crushed Stone - Zone 3B	m^3	16,000	0.30	$ 34.51	$ 0.28	$ 32.70	$ -	$ 67.50	$ 1,080,000.00
87	4.4.20		2330.20	Compacted Rockfill - Zone 3C	m^3	21,000	0.09	$ 10.94	$ -	$ 12.06	$ -	$ 23.00	$ 483,000.00
88	4.4.21		2330.21	Compacted Rockfill - Zone 3D	m^3	46,000	0.09	$ 10.94	$ -	$ 12.06	$ -	$ 23.00	$ 1,058,000.00
89	4.4.22		2330.22	Riprap - Zone 4	m^3	6,000	0.18	$ 21.79	$ -	$ 29.21	$ -	$ 51.00	$ 306,000.00
90	4.4.23		2330.23	Compacted Crushed Stone - Zone 5	m^3	310	0.32	$ 38.67	$ 0.28	$ 39.05	$ -	$ 78.00	$ 24,180.00
91	4.4.24		2330.24	Jersey Barrier	m	600	0.65	$ 80.11	$ 93.68	$ 26.20	$ -	$ 200.00	$ 120,000.00
				Geotechnical Instrumentation									
92	4.4.25		2330.25	V-Notch Weirs, excluding Shelters	unit	2	67.75	$ 8,025.75	$ 3,620.46	$ 353.79	$ -	$ 12,000.00	$ 24,000.00
93	4.4.26		2330.26	Shelters for V-Notch Weirs	unit	2	33.30	$ 4,069.85	$ 1,570.48	$ 259.67	$ -	$ 5,900.00	$ 11,800.00
94	4.4.27		2330.27	Survey Monuments at South Dam Crest	unit	3	5.33	$ 624.25	$ 349.63	$ 26.12	$ -	$ 1,000.00	$ 3,000.00
				SUB-TOTAL SOUTH DAM									**$ 10,907,270.00**
	4.5		2320	**NORTH DAM**									
				CIVIL WORK									
				Clearing									
95	4.5.1		2320.01	Clearing of the North Abutment	Ha	3	74.67	$ 20,808.36	$ -	$ 27,191.64	$ -	$ 48,000.00	$ 144,000.00
				Excavation									
96	4.5.2		2320.02	Overburden Excavation	m^3	72,000	0.08	$ 9.66	$ -	$ 11.34	$ -	$ 21.00	$ 1,512,000.00
				Foundation Preparation									
97	4.5.3		2320.03	Foundation Cleaning (water/air jets and vacuum)	m^2	13,500	1.50	$ 170.78	$ -	$ 29.22	$ -	$ 200.00	$ 2,700,000.00
98	4.5.4		2320.04	Rock Excavation including Dental Excavation and Scaling	m^3	6,000	1.01	$ 116.71	$ 24.95	$ 108.34	$ -	$ 250.00	$ 1,500,000.00
99	4.5.5		2320.05	Dental Concrete	m^3	4,000	1.92	$ 206.90	$ 482.46	$ 20.65	$ -	$ 710.00	$ 2,840,000.00
100	4.5.6		2320.06	Slush Grout	m^2	13,500	0.20	$ 22.39	$ 8.64	$ 0.97	$ -	$ 32.00	$ 432,000.00
101	4.5.7		2320.07	Dry Pack	m^3	70	50.00	$ 5,638.30	$ 1,266.21	$ 245.50	$ -	$ 7,150.00	$ 500,500.00
102	4.5.8		2320.08	Drilling Holes in RCC and Bedrock for Grouting	m	4,200	1.39	$ 228.00	$ -	$ 57.00	$ -	$ 285.00	$ 1,197,000.00
103	4.5.9		2320.09	Grouting - Successful Connections	unit	720	2.43	$ 346.35	$ 31.17	$ 37.48	$ -	$ 415.00	$ 298,800.00
104	4.5.10		2320.10	Dry Cement incorported in the grout	kg	126,000	0.01	$ 4.25	$ -	$ 0.75	$ -	$ 5.00	$ 630,000.00
105	4.5.11		2320.11	Cored Drill Check Holes	m	60	1.80	$ 276.00	$ -	$ 69.00	$ -	$ 345.00	$ 20,700.00
106	4.5.12		2320.12	Percussion Drilling Check Holes	m	120	1.40	$ 225.00	$ -	$ 25.00	$ -	$ 250.00	$ 30,000.00
107	4.5.13		2320.13	Water pressure test (lugeon - 5 Stages)	hour	15	3.20	$ 396.00	$ -	$ 204.00	$ -	$ 600.00	$ 9,000.00
108	4.5.14		2320.14	Water Pressure Test - Successful connections	unit	36	1.33	$ 165.00	$ -	$ 85.00	$ -	$ 250.00	$ 9,000.00
109	4.5.15		2320.15	Uplift gauges	m	60	1.80	$ 300.00	$ 216.00	$ 84.00	$ -	$ 600.00	$ 36,000.00
110	4.5.16		2320.16	Thermistor (measure temperature in grout holes)	unit	1	48.00	$ -	$ 7,488.00	$ 4,212.00	$ -	$ 11,700.00	$ 11,700.00
				Drainage Holes									
111	4.5.17		2320.17	Drilling Holes for Drainage in Foundation from Drainage Gallery, Φ76 mm	m	3,200	1.44	$ 287.00	$ -	$ 63.00	$ -	$ 350.00	$ 1,120,000.00
112	4.5.18		2320.18	PVC Caps for Drainage Holes	unit	125	0.00	$ -	$ 32.75	$ -	$ -	$ 32.75	$ 4,093.75
113	4.5.19		2320.19	Drilling Holes Upward for Drainage from Drainage Gallery into RCC, Φ76 mm	m	3,200	1.74	$ 396.99	$ 3.65	$ 74.36	$ -	$ 475.00	$ 1,520,000.00
				Instrumentation									
114	4.5.20		2320.20	Drilling Holes for piezometers	m	100	1.02	$ 124.80	$ 19.03	$ 16.17	$ -	$ 160.00	$ 16,000.00
115	4.5.21		2320.21	Vibrating Wire and Standpipe Piezometers TYPE - 1, excluding Cables	unit	8	34.00	$ 3,600.00	$ 2,400.00	$ -	$ -	$ 6,000.00	$ 48,000.00
116	4.5.22		2320.22	Vibrating Wire and Standpipe Piezometers TYPE - 2, excluding Cables	unit	2	34.00	$ 3,600.00	$ 2,400.00	$ -	$ -	$ 6,000.00	$ 12,000.00
117	4.5.23		2320.23	Instrument Cable including PVC Conduits and Pull Boxes	m	2,700	0.15	$ 20.48	$ -	$ 38.03	$ -	$ 58.50	$ 157,950.00
118	4.5.24		2320.24	Thermistors Cable in RCC	unit	8	25.00	$ 2,350.00	$ 2,350.00	$ -	$ -	$ 4,700.00	$ 37,600.00
119	4.5.25		2320.25	V-notch Weirs	unit	4	114.01	$ 13,392.87	$ 3,602.68	$ 1,504.46	$ -	$ 18,500.00	$ 74,000.00
120	4.5.26		2320.26	Vibrating Wire Weir Monitors.	unit	4	25.00	$ 1,500.00	$ -	$ 4,500.00	$ -	$ 6,000.00	$ 24,000.00
121	4.5.27		2320.27	Data logger, Terminal Box, Barometer Box including Grounding	LS	1	225.00	$ 12,000.00	$ 48,000.00	$ -	$ -	$ 60,000.00	$ 60,000.00
122	4.5.28		2320.28	Crest Survey Monuments	unit	4	6.80	$ 807.23	$ 353.21	$ 39.56	$ -	$ 1,200.00	$ 4,800.00
				Concrete and RCC operations									
123	4.5.29		2320.29	Roller Compacted Concrete (RCC)	m^3	210,000	1.59	$ 195.25	$ 118.48	$ 76.27	$ -	$ 390.00	$ 81,900,000.00
	4.5.29a			RCC Coarse Aggregates (Rate Only)	Tonne							$ 15.50	
	4.5.29b			RCC Fine Aggregates (Rate Only)	Tonne							$ 15.50	
124	4.5.30		2320.30	Conventional Vibrated Concrete (CVC) (Crest and Flip Bucket)	m^3	11,100	7.85	$ 943.64	$ 353.57	$ 252.78	$ -	$ 1,550.00	$ 17,205,000.00
125	4.5.31		2320.31	Facing Concrete	m^3	8,600	5.79	$ 643.80	$ 197.50	$ 208.71	$ -	$ 1,050.00	$ 9,030,000.00
126	4.5.32		2320.32	GERCC or GEVR - Formed Faces	m^3	4,650	4.36	$ 502.93	$ 128.15	$ 218.92	$ -	$ 850.00	$ 3,952,500.00
127	4.5.33		2320.33	Conventional Vibrated Concrete (North Abutment Crest Surface and Training Wall)	m^3	270	7.91	$ 896.36	$ 299.05	$ 154.60	$ -	$ 1,350.00	$ 364,500.00
128	4.5.34		2320.34	Increase or decrease in quantity of cement - Bid Mix (rate only)	Kg	N/A					$ -	$ 0.38	
129	4.5.35		2320.35	Increase or decrease in quantity of flyash - Bid Mix (rate only)	Kg	N/A					$ -	$ 0.38	
130	4.5.36		2320.36	Increase or decrease in quantity of cement - Source B (rate only)	Kg	N/A					$ -	$ -	
131	4.5.37		2320.37	Increase or decrease in quantity of flyash - Source B (rate only)	Kg	N/A					$ -	$ -	
132	4.5.38		2320.38	Air-entraining Admixture	litre	315,000	0.00	$ -	$ 1.30	$ -	$ -	$ 1.30	$ 409,500.00
133	4.5.39		2320.39	Retarder Admixture	litre	336,000	0.00	$ -	$ 1.75	$ -	$ -	$ 1.75	$ 588,000.00
134	4.5.40		2320.40	Precast Concrete	m^3	1,150	2.75	$ 286.85	$ 1,658.55	$ 104.60	$ -	$ 2,050.00	$ 2,357,500.00
135	4.5.41		2320.41	Gallery Floor CVC Concrete	m^3	275	15.30	$ 1,771.71	$ 353.57	$ 274.73	$ -	$ 2,400.00	$ 660,000.00
136	4.5.42		2320.42	Steel Reinforcement	kg	500,000	0.02	$ 4.92	$ 2.71	$ 0.38	$ -	$ 8.00	$ 4,000,000.00
137	4.5.43		2320.43	Steel Guardrails	kg	5,200	0.30	$ 36.57	$ 6.36	$ 2.07	$ -	$ 45.00	$ 234,000.00
138	4.5.44		2320.44	Waterstop	m	1,350	1.50	$ 178.56	$ 21.44	$ -	$ -	$ 200.00	$ 270,000.00
	4.6		2370	**NORTH DAM - Auxiliary Services**									
				ELECTRICAL WORK									
139	4.6.1		2370.01	Exothermic Connections.	unit	20	8.00	$ 881.25	$ 293.75	$ -	$ -	$ 1,175.00	$ 23,500.00
140	4.6.2		2370.02	Bare, Stranded, Medium Hard-Drawn Copper Conductor, size 500 kcmil	m	815	0.85	$ 92.00	$ 23.00	$ -	$ -	$ 115.00	$ 93,725.00
141	4.6.3		2370.03	Bare, Stranded, Medium Hard-Drawn Copper Conductor, size 4/0 AWG	m	16	0.80	$ 92.00	$ 23.00	$ -	$ -	$ 115.00	$ 1,840.00
142	4.6.4		2370.04	Embedded Copper Grounding Plates	unit	7	0.30	$ 35.00	$ 315.00	$ -	$ -	$ 350.00	$ 2,450.00
				SUB-TOTAL NORTH DAM									**$ 136,041,658.75**
	5	3100		**Powerhouse Channels**									
	5.1		3120.00	**Tailrace**									
				CIVIL WORK									
				Tailrace Rock Plug - Overburden Excavation									
143	5.1.1		3120.01	Overburden Excavation, excluding excavation of Cofferdam 3 - Dry Conditions	m^3	12,000	0.08	$ 9.12	$ -	$ 10.38	$ -	$ 19.50	$ 234,000.00
				Tailrace Rock Plug - Rock Excavation									
144	5.1.2		3120.02	Tailrace Rock Plug Excavation including access ramp to powerhouse -Dry Conditions	m^3	170,000	0.11	$ 16.77	$ 3.70	$ 17.03	$ -	$ 37.50	$ 6,375,000.00
145	5.1.3		3120.03	Tailrace Rock Plug - Underwater Excavation	m^3	34,000	0.40	$ 44.82	$ 22.57	$ 40.61	$ -	$ 108.00	$ 3,672,000.00
				Tailrace Rock Plug - Stabilization and Rock Surface Protection									
146	5.1.4		3120.04	Grouted Rock Bolts Type A	unit	70	19.20	$ 2,237.95	$ 1,050.08	$ 461.98	$ -	$ 3,750.00	$ 262,500.00
147	5.1.5		3120.05	Grouted Rock Bolts Type C	unit	20	35.20	$ 4,105.31	$ 1,949.39	$ 845.30	$ -	$ 6,900.00	$ 138,000.00
148	5.1.6		3120.06	Chain Link Wire Mesh - Installation	m^2	2,500	0.25	$ 28.79	$ 15.20	$ 6.01	$ -	$ 50.00	$ 125,000.00
149	5.1.7		3120.07	Chain Link Wire Mesh - Removal	m^2	20,300	0.05	$ 5.82	$ -	$ 1.93	$ -	$ 7.75	$ 157,325.00
150	5.1.8		3120.08	Existing Temporary Safety Fence - Removal	m	1,200	0.39	$ 45.04	$ -	$ 14.96	$ -	$ 60.00	$ 72,000.00
				SUB-TOTAL TAILRACE									**$ 11,035,825.00**
	6	1100		**Borrow Areas**									
	6.1		1117.00	**Borrowed Construction Material**									
151	6.1.1		1117.01	Overhaul of Borrowed Construction Material (rate only)	m3/km	N/A						$ 1.50	
ROW A	CALCULATED TOTAL OF LUMP SUM AND UNIT PRICE ITEMS (BASED ON APPROXIMATE QUANTITIES)											$	298,659,708.75
	7	1100		**Optional Pricing for Temporary Access Road and Quarry**									
	7.1		1113	**ACCESS ROAD TO LAYDOWN AREA C1, If required**									
152	7.1.1		1113.01	Other Material or Rockfill	m^3	28,000	0.05	$ 4.75	$ -	$ 6.50	$ -	$ 11.25	$ 315,000.00
153	7.1.2		1113.02	Maintenance Grade No 3	m^3	4,000	0.19	$ 17.52	$ 0.27	$ 18.21	$ -	$ 36.00	$ 144,000.00
	7.2		1118	**Quarry Q5**									
154	7.2.1		1118.01	Production of blasted rockfill from the quarry Q5	m^3	50,000	0.05	$ 3.00	$ 1.40	$ 2.10	$ -	$ 6.50	$ 325,000.00
	8	2300		**Optional Pricing for Temporary Access Road and Quarry**									
	8.1	2340	2341	**UPSTREAM COFFERDAM - Cut Off Wall**									
				Jet Grouting cut off wall, If required									
155	8.1.1		2341.23	Mobilization and demobilization	LS	1	2,342	$ 412,000.00	$ 46,500.00	$ 765,500.00	$ -	$ 1,224,000.00	$ 1,224,000.00
156	8.1.2		2341.24	Drilling Holes for Jet Grouting in embankment, river sediments and bedrock	m	9,600	0.56	$ 83.50	$ 5.35	$ 64.90	$ -	$ 153.75	$ 1,476,000.00
157	8.1.3		2341.25	Jet Grouted Cut-off wall	m^2	2,800	1.55	$ 207.00	$ 610.00	$ 363.00	$ -	$ 1,180.00	$ 3,304,000.00
				Bedrock Grouting beneath the Jet Grouted Cut-off Wall, if required									
158	8.1.4		2341.26	Drilling Holes for Grouting in embankment , jet grouting cut-off wall and bedrock, if required	m	1,300	0.05	$ 5.90	$ -	$ 17.60	$ -	$ 23.50	$ 30,550.00
159	8.1.5		2341.27	Dry cement incorported in the grout, if required	kg	11,000	0.03	$ 3.30	$ 1.25	$ 0.70	$ -	$ 5.25	$ 57,750.00
160	8.1.6		2341.28	Grouting - Succesful connections, if required	unit	60	2.50	$ 315.00	$ -	$ 475.00	$ -	$ 790.00	$ 47,400.00
				Additional Items Inserted by HJOC-Dragados as Requested by Nalcor									
161	9.1.1		2341.29	Levelling Concrete for RCC Including Formwork	m^3	1	1.87	$ 199.00	$ 504.00	$ 22.00	$ -	$ 725.00	$ 725.00

LOWER CHURCHILL PROJECT MUSKRAT FALLS CH0009 - CONSTRUCTION OF NORTH AND SOUTH DAMS	SCHEDULE OF PRICE BREAKDOWN - For River Diversion in 2017	APPENDIX A2.1 Rev. B3
	ISSUED FOR: BID DATE: 6 - Jun - 2015	BIDDER'S NAME: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

PRICE ITEM No	PRICE ITEM REFERENCE Exhibit 2 - ATT 1	WBS CODE CODE	WBS CODE SUBCODE	PRICE ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY A	MAN HOURS (AT SITE) PER UNIT	MANPOWER COST/UNIT ($ CAN) B	MATERIALS COST/UNIT ($ CAN) C	EQUIPMENT COST/UNIT ($ CAN) D	PROFIT COST/UNIT ($ CAN) E	UNIT PRICE ($ CAN) F= (B+C+D+E)	TOTAL PRICE ($ CAN) G= A x F
162	9.1.2		2341.30	RCC Trial Sections	m^3	2,500	3.42	$ 399.50	$ 144.50	$ 106.00	$ -	$ 650.00	$ 1,625,000.00
				SUB-TOTAL OPTIONAL PRICING									$ 8,549,425.00

NOTES

Note 1 : If there has been an error in the calculation to establish the total of Column G (Total Price) or Column F (UNIT PRICE), then the figures of column A (Estimated Quantity of Units), column B (Man Hours), column C (Manpower), column D (Equipment) and column E (Profits) will prevail.

Note 2 : This Document is provided to the bidders in Native Excel File format. It is the bidders responsibility to verify cell formats and formulas.

Note 3 : Bidders shall not include any HST/GST from any source (whether from Bidder, subcontractor, vendors or suppliers) in the unit and lump sum prices in this Schedule of Price Breakdown. Bidders shall claim input tax credits on taxable supplies received from vendors, suppliers and subcontractors and thereof Bidders shall exclude HST/GST payable to the vendors, suppliers and subcontractors from the unit and lump sum prices in the Schedule. Bidders shall exclude HST/GST on the total listed in Row A.

Note 4: Items 152 to 160 are optional and will not be included in the total Bid price. However, Bidders shall provide price for each item as if they are included in the Scope. The work will be included in the contract, if required.

FOR THE LOWER CHURCHILL PROJECT - MUSKRAT FALLS

This Appendix forms part of the Proposal submitted by: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

Name of Bidder: H.J. O'Connell Construction Ltd - Dragados Canada Inc Joint Venture

Request For Proposal, Package No: CH0009

Signature:

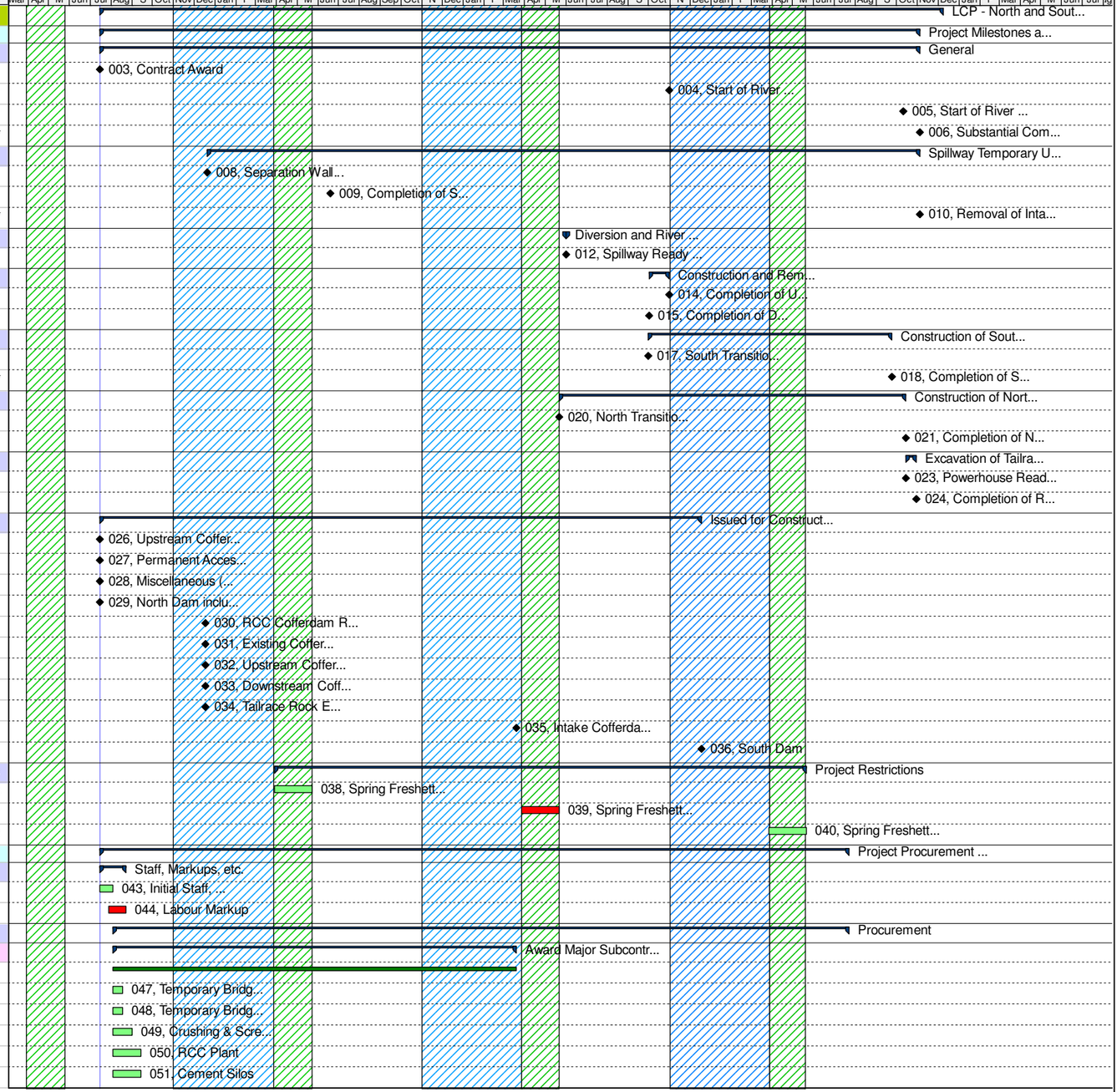
Date of Proposal: 30-JUN-2015

Project: LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT2
Filter: TASK filter: All Activities

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015		177.71w	15-Jul-15	09-Dec-18
Project Milestones and Restrictions		167.86w	15-Jul-15	04-Nov-18
General		167.86w	15-Jul-15	04-Nov-18
003	Contract Award	0.00w	15-Jul-15*	
004	Start of River Impoundment to Elev. 25.0m	0.00w		31-Oct-17*
005	Start of River Impoundment to Elev. 39.0m	0.00w		10-Oct-18*
006	Substantial Completion of the Work	0.00w		04-Nov-18*
Spillway Temporary Upstream Bridge and Access Ramps		145.29w	20-Dec-15	04-Nov-18
008	Separation Wall Completed	0.00w	20-Dec-15*	
009	Completion of Spillway Upstream Temporary Bridge	0.00w		19-Jun-16
010	Removal of Intake Cofferdam, Bridge and Access Ramps	0.00w		04-Nov-18*
Diversion and River Closure		0.00w	01-Jun-17	01-Jun-17
012	Spillway Ready for River Diversion	0.00w	01-Jun-17*	
Construction and Removal of Cofferdams		4.29w	01-Oct-17	31-Oct-17
014	Completion of Upstream Cofferdam to Elev. 26m	0.00w		31-Oct-17*
015	Completion of Downstream Cofferdam	0.00w		01-Oct-17*
Construction of South Dam		51.29w	30-Sep-17	23-Sep-18
017	South Transition Dam Completed	0.00w	30-Sep-17*	
018	Completion of South Dam	0.00w		23-Sep-18*
Construction of North Dam		73.00w	22-May-17	14-Oct-18
020	North Transition Dam Completed	0.00w	22-May-17*	
021	Completion of North Dam	0.00w		14-Oct-18*
Excavation of Tailrace Rock Plug		2.14w	15-Oct-18	29-Oct-18
023	Powerhouse Ready for Tailrace Impoundment	0.00w	15-Oct-18*	
024	Completion of Rock Plug Excavation	0.00w		29-Oct-18*
Issued for Construction Drawing Deliverables		121.71w	15-Jul-15	17-Dec-17
026	Upstream Cofferdam Starter Groins	0.00w	15-Jul-15*	
027	Permanent Access Roads	0.00w	15-Jul-15*	
028	Miscellaneous (Fence, Guide Rail, etc.)	0.00w	15-Jul-15*	
029	North Dam including Precast	0.00w	15-Jul-15*	
030	RCC Cofferdam Removal	0.00w	18-Dec-15*	
031	Existing Cofferdams Removal	0.00w	18-Dec-15*	
032	Upstream Cofferdam for North Dam	0.00w	18-Dec-15*	
033	Downstream Cofferdam for North dam	0.00w	18-Dec-15*	
034	Tailrace Rock Excavation	0.00w	18-Dec-15*	
035	Intake Cofferdam	0.00w	20-Mar-17*	
036	South Dam	0.00w	17-Dec-17*	
Project Restrictions		109.14w	28-Mar-16	20-May-18
038	Spring Freshette 2016 (Estimated)	8.00w	28-Mar-16*	22-May-16
039	Spring Freshette 2017 (Estimated)	8.00w	27-Mar-17*	21-May-17
040	Spring Freshette 2018 (Estimated)	8.00w	26-Mar-18*	20-May-18
Project Procurement & Mobilization		157.71w	15-Jul-15	22-Jul-18
Staff, Markups, etc.		5.71w	15-Jul-15	23-Aug-15
043	Initial Staff, Office, etc.	2.86w	15-Jul-15	03-Aug-15
044	Labour Markup	3.86w	28-Jul-15*	23-Aug-15
Procurement		154.85w	04-Aug-15	22-Jul-18
Award Major Subcontracts		84.85w	04-Aug-15	19-Mar-17
046	Award Major Subcontracts	126.72w	04-Aug-15	19-Mar-17
047	Temporary Bridge Supply	2.00w	04-Aug-15	17-Aug-15
048	Temporary Bridge Design	2.00w	04-Aug-15	17-Aug-15
049	Crushing & Screening	4.00w	04-Aug-15	31-Aug-15
050	RCC Plant	6.00w	04-Aug-15	14-Sep-15
051	Cement Silos	6.00w	04-Aug-15	14-Sep-15



Remaining Level of Effort
Actual Level of Effort
Remaining Work
Critical Remaining Work
Milestone
Summary

LOWER CHURCHILL - NORTH & SOUTH DAMS (PACKAGE CH-0009)
Dragados Canada, Inc. and **H.J.O' Connell Construction Limited**

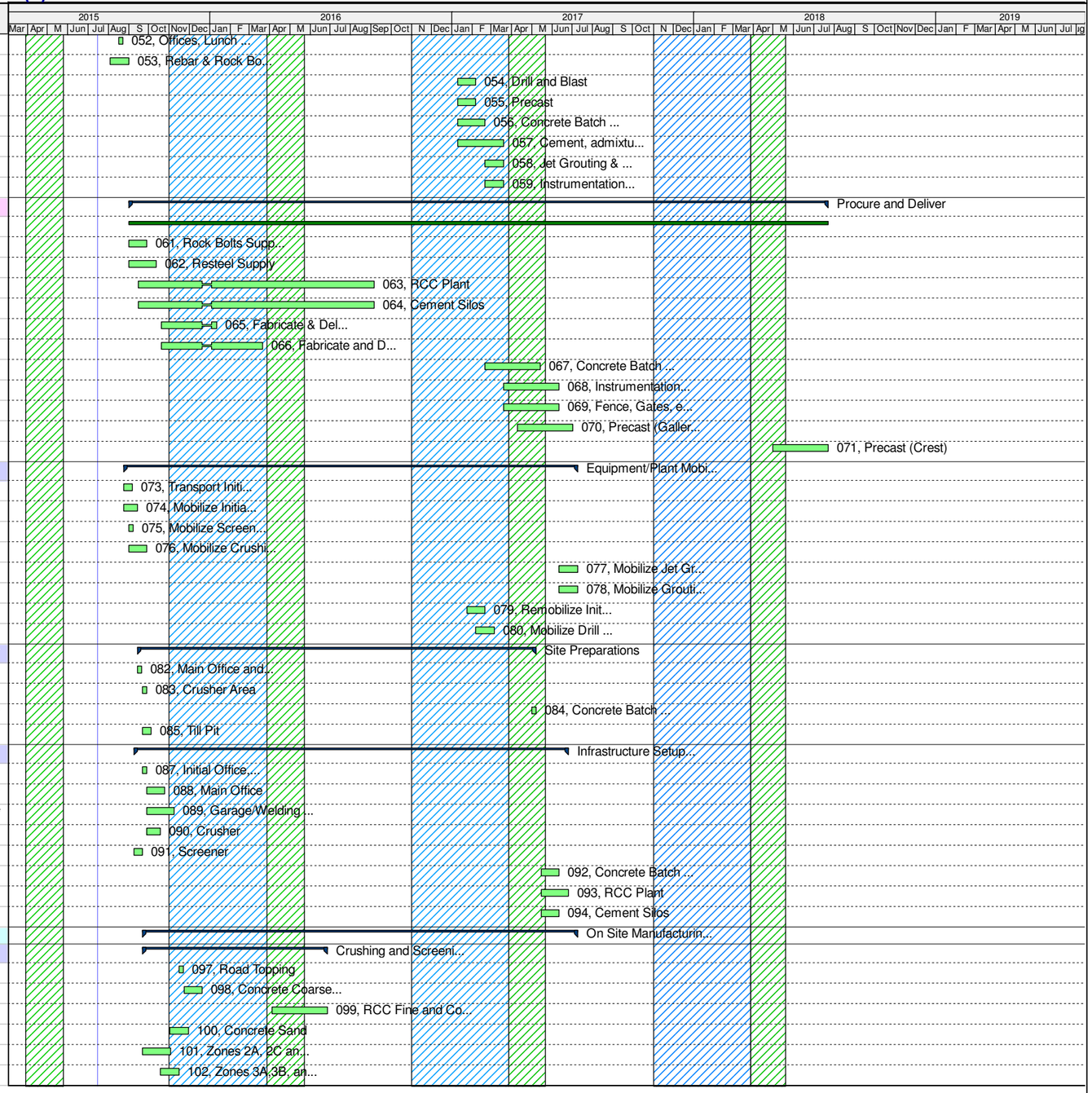
O'CONNELL
DRAGADOS CANADA

Project: *LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015*
Layout: *LCH-NS DAMS Layout [17JUN15] ALT2*
Filter: *TASK filter: All Activities*

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
052	Offices, Lunch rooms, etc	1.00w	17-Aug-15*	23-Aug-15
053	Rebar & Rock Bolts	4.00w	04-Aug-15*	31-Aug-15
054	Drill and Blast	4.00w	09-Jan-17*	05-Feb-17
055	Precast	4.00w	09-Jan-17*	05-Feb-17
056	Concrete Batch Plant	6.00w	09-Jan-17*	19-Feb-17
057	Cement, admixtures, etc.	10.00w	09-Jan-17*	19-Mar-17
058	Jet Grouting & Grouting	4.00w	20-Feb-17*	19-Mar-17
059	Instrumentation, fence, etc.	4.00w	20-Feb-17*	19-Mar-17
Procure and Deliver		150.85w	01-Sep-15	22-Jul-18
060	Procure and Deliver	225.28w	01-Sep-15	22-Jul-18
061	Rock Bolts Supply	4.00w	01-Sep-15	28-Sep-15
062	Resteel Supply	6.00w	01-Sep-15	12-Oct-15
063	RCC Plant	49.00w	15-Sep-15	05-Sep-16
064	Cement Silos	49.00w	15-Sep-15	05-Sep-16
065	Fabricate & Deliver Steel Pier	10.00w	20-Oct-15	11-Jan-16
066	Fabricate and Deliver Bridge	20.00w	20-Oct-15	21-Mar-16
067	Concrete Batch Plant	12.00w	20-Feb-17	14-May-17
068	Instrumentation Supply	12.00w	20-Mar-17	11-Jun-17
069	Fence, Gates, etc.Supply	12.00w	20-Mar-17	11-Jun-17
070	Precast (Gallery)	12.00w	10-Apr-17*	02-Jul-17
071	Precast (Crest)	12.00w	30-Apr-18*	22-Jul-18
Equipment/Plant Mobilization		93.14w	24-Aug-15	09-Jul-17
073	Transport Initial Office, Lunchroom, Washroom, etc	2.00w	24-Aug-15	06-Sep-15
074	Mobilize Initial Equipment	3.00w	24-Aug-15	13-Sep-15
075	Mobilize Screening Plant	1.00w	01-Sep-15	07-Sep-15
076	Mobilize Crushing Plant	4.00w	01-Sep-15	28-Sep-15
077	Mobilize Jet Grouting Subcontractor	4.00w	12-Jun-17*	09-Jul-17
078	Mobilize Grouting Subcontractor	4.00w	12-Jun-17*	09-Jul-17
079	Remobilize Initital Equipment and Additional Equipment for 2017	4.00w	23-Jan-17*	19-Feb-17
080	Mobilize Drill and Blast Subcontractor	4.00w	06-Feb-17	05-Mar-17
Site Preparations		81.14w	14-Sep-15	07-May-17
082	Main Office and Garage/Welding Shop	1.00w	14-Sep-15	20-Sep-15
083	Crusher Area	1.00w	21-Sep-15*	27-Sep-15
084	Concrete Batch Plant Area	1.00w	01-May-17*	07-May-17
085	Till Pit	2.00w	21-Sep-15*	04-Oct-15
Infrastructure Setup & Commission		89.00w	08-Sep-15	25-Jun-17
087	Initial Office, Lunchroom and Washroom	1.00w	21-Sep-15	27-Sep-15
088	Main Office	4.00w	28-Sep-15	25-Oct-15*
089	Garage/Welding Shop	6.00w	28-Sep-15	08-Nov-15*
090	Crusher	3.00w	28-Sep-15	18-Oct-15
091	Screener	2.00w	08-Sep-15	21-Sep-15
092	Concrete Batch Plant	4.00w	15-May-17	11-Jun-17
093	RCC Plant	6.00w	15-May-17*	25-Jun-17
094	Cement Silos	4.00w	15-May-17*	11-Jun-17
On Site Manufacturing		89.00w	22-Sep-15	09-Jul-17
Crushing and Screening		37.86w	22-Sep-15	26-Jun-16
097	Road Topping	1.00w	16-Nov-15*	22-Nov-15
098	Concrete Coarse Aggregates	4.00w	23-Nov-15*	20-Dec-15
099	RCC Fine and Coarse Aggregates	12.00w	04-Apr-16*	26-Jun-16
100	Concrete Sand	4.00w	02-Nov-15*	29-Nov-15
101	Zones 2A, 2C and 2E	6.00w	22-Sep-15	02-Nov-15
102	Zones 3A,3B, and 3F	4.00w	19-Oct-15	15-Nov-15



Remaining Level of Effort
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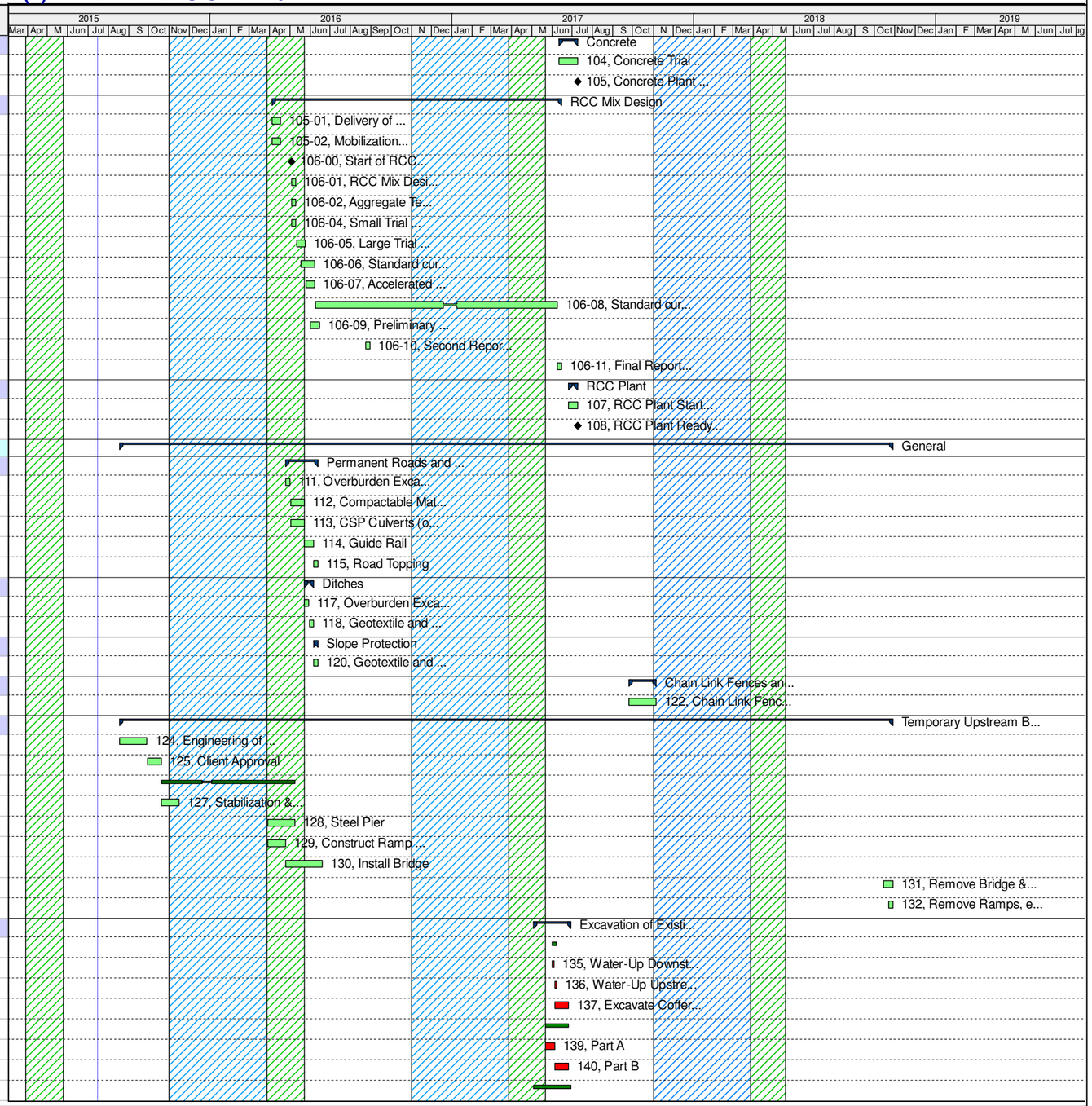
Milestone
Summary

Project: *LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015*
Layout: *LCH-NS DAMS Layout [17JUN15] ALT2*
Filter: *TASK filter: All Activities*

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
Concrete		4.00w	12-Jun-17	09-Jul-17
104	Concrete Trial Mixes	4.00w	12-Jun-17	09-Jul-17
105	Concrete Plant Ready for Production	0.00w		09-Jul-17
RCC Mix Design		59.71w	04-Apr-16	15-Jun-17
105-01	Delivery of Cement, Fly ash and Admixtures	2.00w	04-Apr-16	17-Apr-16
105-02	Mobilization of RCC Testing Equipment	2.00w	04-Apr-16	17-Apr-16
106-00	Start of RCC Mix Design	0.00w	04-May-16	
106-01	RCC Mix Design Program	1.00w	04-May-16	10-May-16
106-02	Aggregate Testing and Preparation to SSD	1.00w	04-May-16	10-May-16
106-04	Small Trial Batchs to Determine Water Demand and Dosage Rate of Admixtures	1.00w	04-May-16	10-May-16
106-05	Large Trial Batchs for Different Mixes	2.00w	11-May-16	24-May-16
106-06	Standard cure compressive strength tests up to 14 days	3.00w	18-May-16	07-Jun-16
106-07	Accelerated cure compressive strength tests at 14 days	2.00w	25-May-16	07-Jun-16
106-08	Standard cure compressive strength tests 28 to 365 days	49.43w	08-Jun-16	08-Jun-17
106-09	Preliminary Report (compressive tests up to 14 days)	2.00w	01-Jun-16	14-Jun-16
106-10	Second Report (compressive tests up to 91 days)	1.00w	24-Aug-16	30-Aug-16
106-11	Final Report (compressive tests up to 365 days)	1.00w	09-Jun-17	15-Jun-17
RCC Plant		2.00w	26-Jun-17	09-Jul-17
107	RCC Plant Start-Up	2.00w	26-Jun-17	09-Jul-17
108	RCC Plant Ready for Production	0.00w		09-Jul-17
General		162.00w	18-Aug-15	28-Oct-18
Permanent Roads and Parking Area		7.00w	25-Apr-16	12-Jun-16
111	Overburden Excavation	1.00w	25-Apr-16*	01-May-16
112	Compactable Material	3.00w	02-May-16	22-May-16
113	CSP Culverts (ongoing)	3.00w	02-May-16	22-May-16
114	Guide Rail	2.00w	23-May-16	05-Jun-16
115	Road Topping	1.00w	06-Jun-16	12-Jun-16
Ditches		2.00w	23-May-16	05-Jun-16
117	Overburden Excavation	1.00w	23-May-16*	29-May-16
118	Geotextile and Rockfill	1.00w	30-May-16	05-Jun-16
Slope Protection		1.00w	06-Jun-16	12-Jun-16
120	Geotextile and Rockfill	1.00w	06-Jun-16*	12-Jun-16
Chain Link Fences and Gates		6.00w	25-Sep-17	05-Nov-17
122	Chain Link Fence and gates	6.00w	25-Sep-17	05-Nov-17
Temporary Upstream Bridge (S.S.)		162.00w	18-Aug-15	28-Oct-18
124	Engineering of Bridge, Piers, etc.	6.00w	18-Aug-15	28-Sep-15
125	Client Approval	3.00w	29-Sep-15	19-Oct-15
126	Construct Abutements and Pier	26.86w	20-Oct-15	08-May-16
127	Stabilization & Concrete	4.00w	20-Oct-15	16-Nov-15
128	Steel Pier	6.00w	28-Mar-16*	08-May-16
129	Construct Ramp South Side	4.00w	28-Mar-16*	24-Apr-16
130	Install Bridge	8.00w	25-Apr-16	19-Jun-16*
131	Remove Bridge & Pier	2.00w	15-Oct-18	28-Oct-18
132	Remove Ramps, etc.	1.00w	22-Oct-18	28-Oct-18
Excavation of Existing Cofferdams		8.14w	04-May-17	29-Jun-17
134	Water-Up Spillway	1.00w	01-Jun-17	07-Jun-17
135	Water-Up Downstream (if required)	0.43w	01-Jun-17	03-Jun-17
136	Water-Up Upstream	0.43w	05-Jun-17	07-Jun-17
137	Excavate Cofferdam #1	3.00w	05-Jun-17	25-Jun-17
138	Excavate Cofferdam 2 & 3	5.00w	22-May-17	25-Jun-17
139	Part A	2.00w	22-May-17	04-Jun-17
140	Part B	3.00w	05-Jun-17	25-Jun-17
141	RCC Cofferdam Removal	8.14w	04-May-17	29-Jun-17



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Project: LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT2
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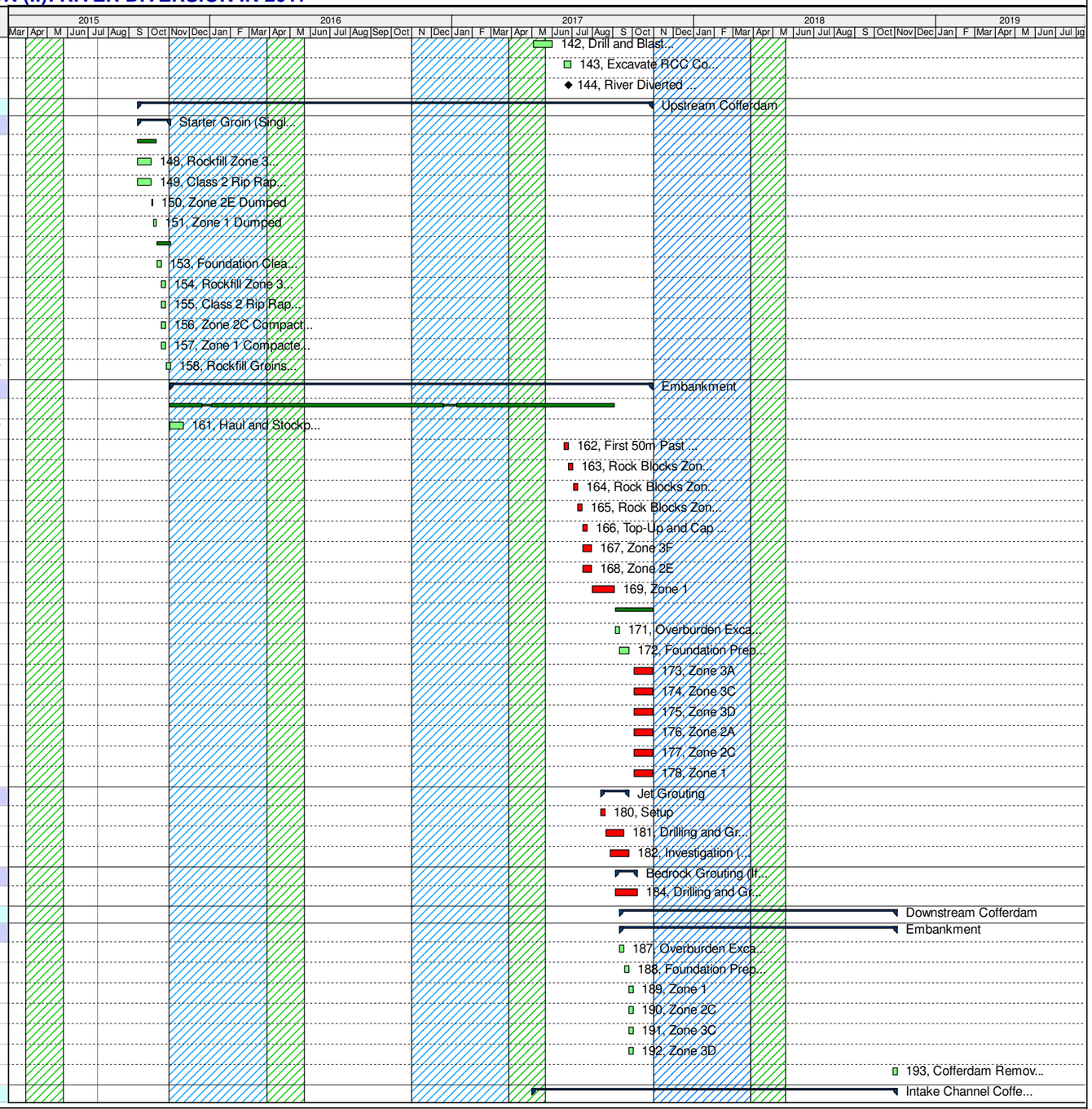
LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
142	Drill and Blast RCC	4.00w	04-May-17	01-Jun-17
143	Excavate RCC Cofferdam	1.57w	19-Jun-17	29-Jun-17
144	River Diverted Through Spillway	0.00w		25-Jun-17
Upstream Cofferdam		106.43w	14-Sep-15	31-Oct-17
Starter Groin (Single Shift)		7.14w	14-Sep-15	02-Nov-15
147	Below Water	4.14w	14-Sep-15	12-Oct-15
148	Rockfill Zone 3 Groins - Starter to Encase Till	3.00w	14-Sep-15	04-Oct-15
149	Class 2 Rip Rap Below WL	3.00w	14-Sep-15	04-Oct-15
150	Zone 2E Dumped	0.29w	06-Oct-15	07-Oct-15
151	Zone 1 Dumped	0.71w	08-Oct-15	12-Oct-15
152	Above Water	3.00w	13-Oct-15	02-Nov-15
153	Foundation Cleanup and Preparation	1.00w	13-Oct-15	19-Oct-15
154	Rockfill Zone 3 Groin - Above Water	1.00w	20-Oct-15	26-Oct-15
155	Class 2 Rip Rap Above WL	1.00w	20-Oct-15	26-Oct-15
156	Zone 2C Compacted	1.00w	20-Oct-15	26-Oct-15
157	Zone 1 Compacted	1.00w	20-Oct-15	26-Oct-15*
158	Rockfill Groins Zone 3 - Cap Starter/Ramp	1.00w	27-Oct-15	02-Nov-15*
Embankment		99.43w	02-Nov-15	31-Oct-17
160	Dumped/Uncompacted Section	91.14w	02-Nov-15	03-Sep-17
161	Haul and Stockpile (1/2 Class 2 and Class 3)	3.00w	02-Nov-15	22-Nov-15*
162	First 50m Past Starter Groins	1.00w	19-Jun-17	25-Jun-17
163	Rock Blocks Zone 3 Class 1	1.00w	26-Jun-17	02-Jul-17
164	Rock Blocks Zone 3 Class 2	1.00w	03-Jul-17	09-Jul-17
165	Rock Blocks Zone 3 Class 3	1.00w	10-Jul-17	16-Jul-17
166	Top-Up and Cap Zone 3	1.00w	17-Jul-17	23-Jul-17
167	Zone 3F	2.00w	17-Jul-17	30-Jul-17
168	Zone 2E	2.00w	17-Jul-17	30-Jul-17
169	Zone 1	5.00w	31-Jul-17	03-Sep-17
170	Compacted Section	8.29w	04-Sep-17	31-Oct-17
171	Overburden Excavation - North Side	1.00w	04-Sep-17*	10-Sep-17
172	Foundation Preparation - North Side	2.00w	11-Sep-17	24-Sep-17
173	Zone 3A	4.29w	02-Oct-17	31-Oct-17
174	Zone 3C	4.29w	02-Oct-17	31-Oct-17
175	Zone 3D	4.29w	02-Oct-17	31-Oct-17
176	Zone 2A	4.29w	02-Oct-17	31-Oct-17
177	Zone 2C	4.29w	02-Oct-17	31-Oct-17
178	Zone 1	4.29w	02-Oct-17	31-Oct-17
Jet Grouting		6.00w	14-Aug-17	24-Sep-17
180	Setup	1.00w	14-Aug-17	20-Aug-17
181	Drilling and Grouting	4.00w	21-Aug-17	17-Sep-17
182	Investigation (on going)	4.00w	28-Aug-17	24-Sep-17
Bedrock Grouting (If Required)		5.00w	04-Sep-17	08-Oct-17
184	Drilling and Grouting	5.00w	04-Sep-17	08-Oct-17
Downstream Cofferdam		60.00w	11-Sep-17	04-Nov-18
Embankment		60.00w	11-Sep-17	04-Nov-18
187	Overburden Excavation	1.00w	11-Sep-17*	17-Sep-17
188	Foundation Preparation	1.00w	18-Sep-17	24-Sep-17
189	Zone 1	1.00w	25-Sep-17	01-Oct-17
190	Zone 2C	1.00w	25-Sep-17	01-Oct-17
191	Zone 3C	1.00w	25-Sep-17	01-Oct-17
192	Zone 3D	1.00w	25-Sep-17	01-Oct-17
193	Cofferdam Removal	1.00w	29-Oct-18*	04-Nov-18
Intake Channel Cofferdam		79.00w	01-May-17	04-Nov-18



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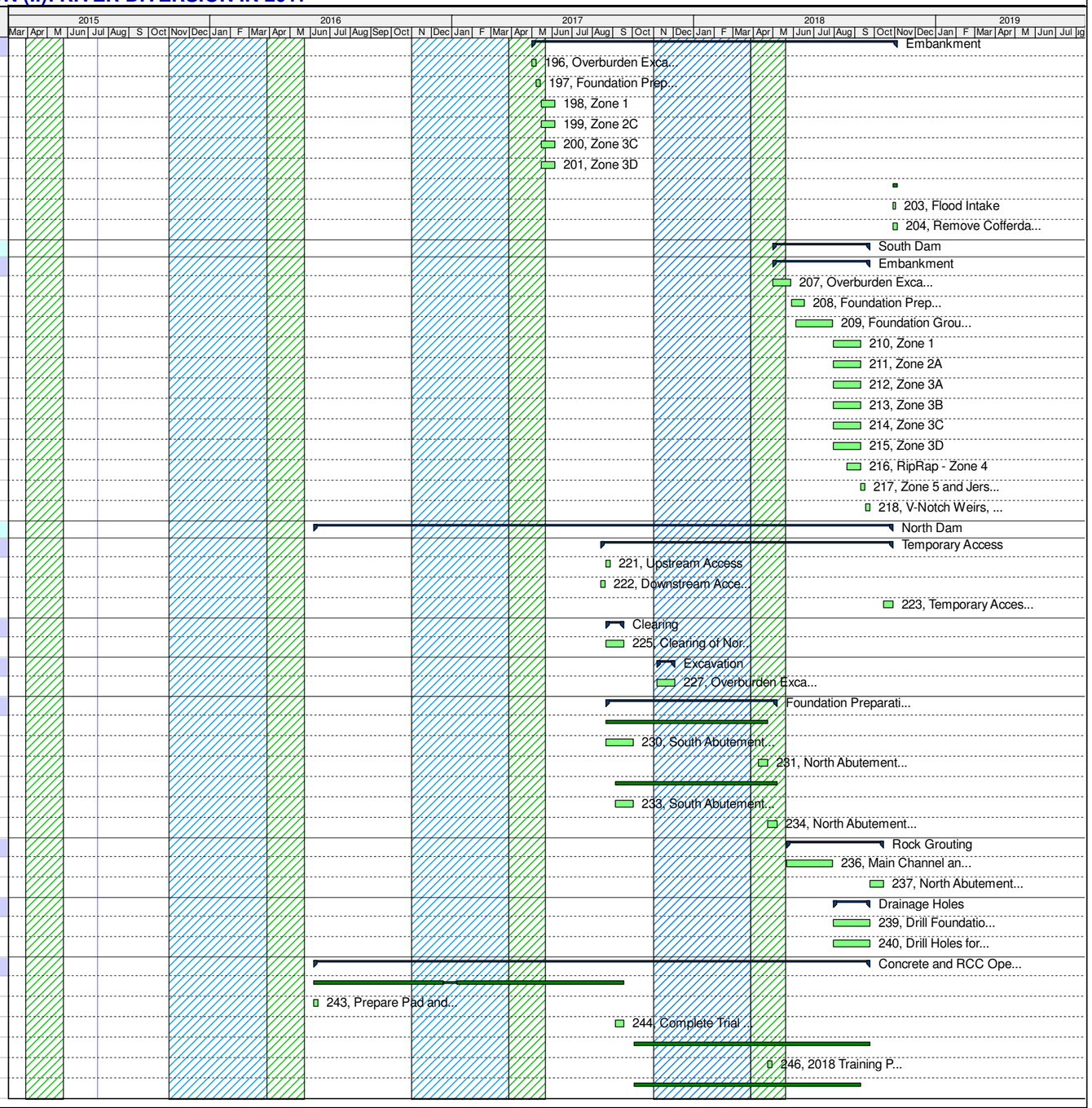
Project: LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015
Layout: LCH-NS DAMS Layout [17JUN15] ALT2
Filter: TASK filter: All Activities

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
Embankment		79.00w	01-May-17	04-Nov-18
196	Overburden Excavation	1.00w	01-May-17*	07-May-17
197	Foundation Preparation	1.00w	08-May-17	14-May-17
198	Zone 1	3.00w	15-May-17	04-Jun-17
199	Zone 2C	3.00w	15-May-17	04-Jun-17
200	Zone 3C	3.00w	15-May-17	04-Jun-17
201	Zone 3D	3.00w	15-May-17	04-Jun-17
202	Cofferdam Removal	1.00w	29-Oct-18	04-Nov-18
203	Flood Intake	0.57w	29-Oct-18	01-Nov-18
204	Remove Cofferdam	1.00w	29-Oct-18	04-Nov-18
South Dam		21.00w	30-Apr-18	23-Sep-18
Embankment		21.00w	30-Apr-18	23-Sep-18
207	Overburden Excavation	4.00w	30-Apr-18*	27-May-18
208	Foundation Preparation	3.00w	28-May-18	17-Jun-18
209	Foundation Grouting	8.00w	04-Jun-18	29-Jul-18
210	Zone 1	6.00w	30-Jul-18	09-Sep-18
211	Zone 2A	6.00w	30-Jul-18	09-Sep-18
212	Zone 3A	6.00w	30-Jul-18	09-Sep-18
213	Zone 3B	6.00w	30-Jul-18	09-Sep-18
214	Zone 3C	6.00w	30-Jul-18	09-Sep-18
215	Zone 3D	6.00w	30-Jul-18	09-Sep-18
216	RipRap - Zone 4	3.00w	20-Aug-18	09-Sep-18
217	Zone 5 and Jersey Barriers	1.00w	10-Sep-18	16-Sep-18
218	V-Notch Weirs, Survey Monuments, etc.	1.00w	17-Sep-18	23-Sep-18
North Dam		124.99w	06-Jun-16	28-Oct-18
Temporary Access		63.00w	14-Aug-17	28-Oct-18
221	Upstream Access	1.00w	21-Aug-17*	27-Aug-17
222	Downstream Access	1.00w	14-Aug-17	20-Aug-17
223	Temporary Access Removal	2.00w	15-Oct-18	28-Oct-18
Clearing		4.00w	21-Aug-17	17-Sep-17
225	Clearing of North Abutement	4.00w	21-Aug-17*	17-Sep-17
Excavation		4.00w	06-Nov-17	03-Dec-17
227	Overburden Excavation	4.00w	06-Nov-17*	03-Dec-17
Foundation Preparation & levelling RCC/Concete		37.00w	21-Aug-17	06-May-18
229	Foundation Preparation	35.00w	21-Aug-17	22-Apr-18
230	South Abutement and Main Channel Area	6.00w	21-Aug-17	01-Oct-17
231	North Abutement Area	2.00w	09-Apr-18*	22-Apr-18
232	Levelling Concrete,etc.	35.00w	04-Sep-17	06-May-18
233	South Abutement and Main Channel Area	4.00w	04-Sep-17	01-Oct-17
234	North Abutement Area	2.00w	23-Apr-18	06-May-18
Rock Grouting		21.00w	21-May-18	14-Oct-18
236	Main Channel and Abutements Area	10.00w	21-May-18	29-Jul-18
237	North Abutement Area (Part B/Last 50m)	3.00w	24-Sep-18	14-Oct-18
Drainage Holes		8.00w	30-Jul-18	23-Sep-18
239	Drill Foundation Holes	8.00w	30-Jul-18	23-Sep-18
240	Drill Holes for RCC Drainage to Gallery	8.00w	30-Jul-18	23-Sep-18
Concrete and RCC Operations		117.14w	06-Jun-16	23-Sep-18
242	RCC Trial Section	64.14w	06-Jun-16	17-Sep-17
243	Prepare Pad and Infrastructure	1.00w	06-Jun-16*	12-Jun-16
244	Complete Trial Section	2.00w	04-Sep-17*	17-Sep-17
245	Main RCC and GEVR Placement	51.00w	02-Oct-17	23-Sep-18
246	2018 Training Program	1.00w	23-Apr-18*	29-Apr-18
247	RCC and GEVR Section 1	49.00w	02-Oct-17	09-Sep-18



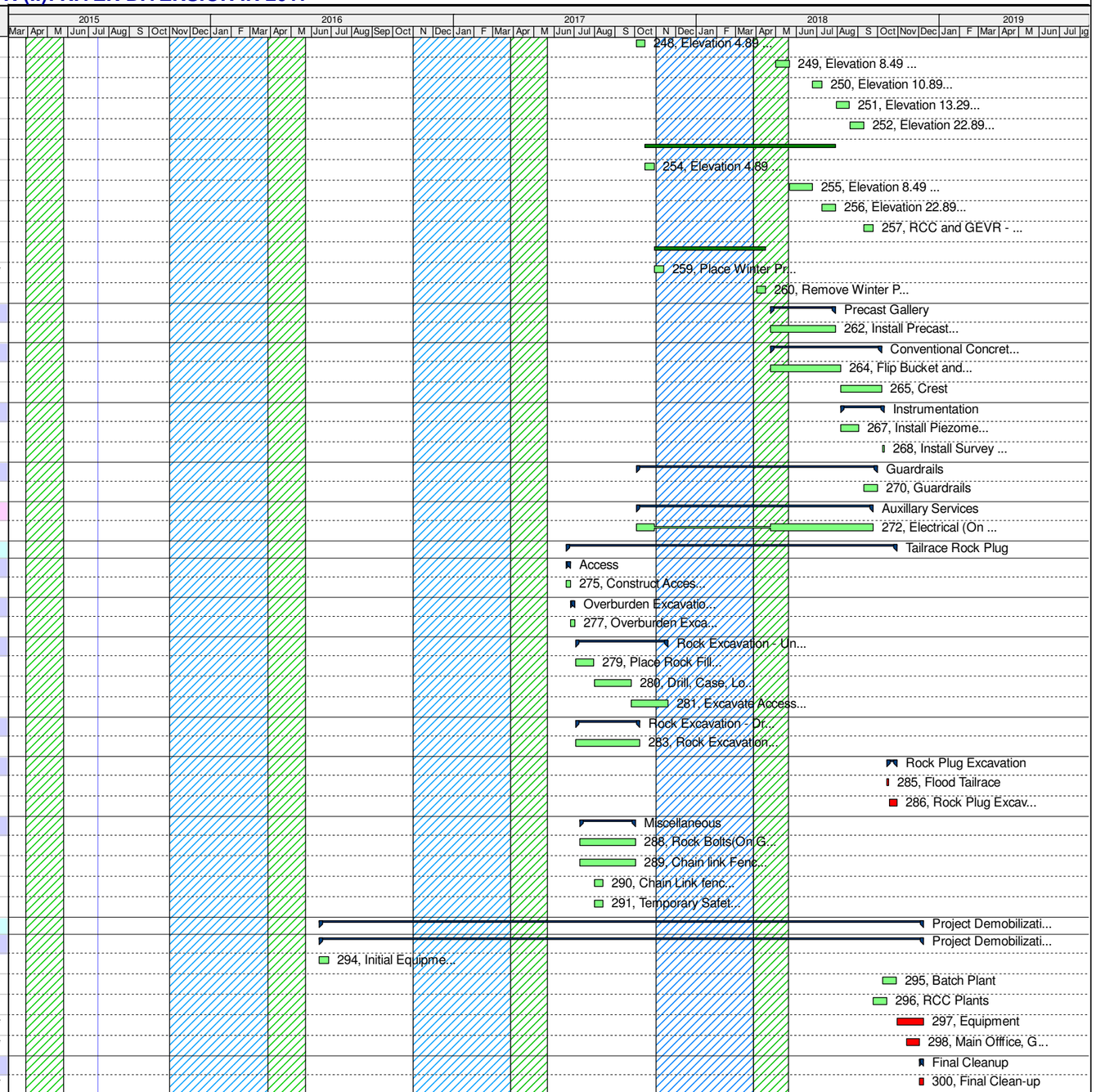
Remaining Level of Effort
Actual Level of Effort
Remaining Work
Critical Remaining Work
Milestone
Summary

Project: *LCH0009-BL-B-R02 - B1-1/ LCP - North and South Dams - Diversion 2017 - Award Date July 15, 2015*
Layout: *LCH-NS DAMS Layout [17JUN15] ALT2*
Filter: *TASK filter: All Activities*

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS
OPTION (II): RIVER DIVERSION IN 2017

Date: 30-Jun-15 **Time:** 14:18
Data Date: 15-Jul-15

Activity ID	Activity Name	Original Duration	Start	Finish
248	Elevation 4.89 to 8.49	2.00w	02-Oct-17	15-Oct-17
249	Elevation 8.49 to 10.89	3.00w	30-Apr-18*	20-May-18
250	Elevation 10.89 to 13.29	2.00w	25-Jun-18	08-Jul-18
251	Elevation 13.29 to 22.89	3.00w	30-Jul-18	19-Aug-18
252	Elevation 22.89 to 36.39	3.00w	20-Aug-18	09-Sep-18
253	RCC and GEVR Section 2	41.00w	16-Oct-17	29-Jul-18
254	Elevation 4.89 to 8.49	2.00w	16-Oct-17	29-Oct-17
255	Elevation 8.49 to 22.89	5.00w	21-May-18	24-Jun-18
256	Elevation 22.89 to 36.39	3.00w	09-Jul-18	29-Jul-18
257	RCC and GEVR - North Abutement (2017)	2.00w	10-Sep-18	23-Sep-18
258	Winter Protection	24.00w	30-Oct-17	15-Apr-18
259	Place Winter Protection	2.00w	30-Oct-17	12-Nov-17*
260	Remove Winter Protection	2.00w	02-Apr-18*	15-Apr-18
Precast Gallery		14.00w	23-Apr-18	29-Jul-18
262	Install Precast Units	14.00w	23-Apr-18*	29-Jul-18
Conventional Concrete		24.00w	23-Apr-18	07-Oct-18
264	Flip Bucket and End Wall	15.00w	23-Apr-18*	05-Aug-18
265	Crest	9.00w	06-Aug-18	07-Oct-18
Instrumentation		9.43w	06-Aug-18	10-Oct-18
267	Install Piezometers, Weirs, etc.	4.00w	06-Aug-18	02-Sep-18
268	Install Survey Monuments	0.43w	08-Oct-18	10-Oct-18
Guardrails		51.99w	02-Oct-17	30-Sep-18
270	Guardrails	3.00w	10-Sep-18	30-Sep-18
Auxillary Services		26.00w	02-Oct-17	23-Sep-18
272	Electrical (On Going)	26.00w	02-Oct-17	23-Sep-18
Tailrace Rock Plug		71.14w	19-Jun-17	29-Oct-18
Access		1.00w	19-Jun-17	25-Jun-17
275	Construct Access Road	1.00w	19-Jun-17	25-Jun-17
Overburden Excavation		1.00w	26-Jun-17	02-Jul-17
277	Overburden Excavation	1.00w	26-Jun-17	02-Jul-17
Rock Excavation - Underwater		20.00w	03-Jul-17	19-Nov-17
279	Place Rock Fill for Access	4.00w	03-Jul-17	30-Jul-17
280	Drill, Case, Load and Blast	8.00w	31-Jul-17	24-Sep-17
281	Excavate Access and Underwater Rock	8.00w	25-Sep-17	19-Nov-17
Rock Excavation - Dry		14.00w	03-Jul-17	08-Oct-17
283	Rock Excavation to 30m Plug at Elevation 9	14.00w	03-Jul-17	08-Oct-17
Rock Plug Excavation		2.14w	15-Oct-18	29-Oct-18
285	Flood Tailrace	0.43w	15-Oct-18	17-Oct-18
286	Rock Plug Excavation	1.71w	18-Oct-18	29-Oct-18
Miscellaneous		12.00w	10-Jul-17	01-Oct-17
288	Rock Bolts(On Going)	12.00w	10-Jul-17	01-Oct-17
289	Chain link Fence Installation (On Going)	12.00w	10-Jul-17	01-Oct-17
290	Chain Link fence Removal	2.00w	31-Jul-17*	13-Aug-17
291	Temporary Safety Fence Removal	2.00w	31-Jul-17	13-Aug-17
Project Demobilization and Final Cleanup		127.14w	13-Jun-16	09-Dec-18
Project Demobilization		127.14w	13-Jun-16	09-Dec-18
294	Initial Equipment	2.00w	13-Jun-16	26-Jun-16*
295	Batch Plant	3.00w	08-Oct-18	28-Oct-18*
296	RCC Plants	3.00w	24-Sep-18	14-Oct-18*
297	Equipment	5.86w	30-Oct-18	09-Dec-18*
298	Main Offfice, Garage, etc	2.86w	13-Nov-18*	02-Dec-18*
Final Cleanup		1.00w	03-Dec-18	09-Dec-18
300	Final Clean-up	1.00w	03-Dec-18	09-Dec-18*



Remaining Level of Effort
Actual Level of Effort
Remaining Work
Critical Remaining Work
Milestone
Summary

LOWER CHURCHILL - NORTH & SOUTH DAMS (PACKAGE CH-0009)
Dragados Canada, Inc. and **H.J.O' Connell Construction Limited**

APPENDIX A17

EXCEPTIONS

Category:
Category: **2. TECHNICAL**

Number	Reference	Description	Proposed Wording	Reason	Company Response May 29, 2015	O'Connell-Dragados Response June 30, 2015	Change in Price if exception is approved by Company	
							Increase	Decrease
1.	Civil Works Agreement	2.1 Design, Drawings and Specifications	Wording to be agreed with the Client	The Company is responsible for the design of all aspects of the permanent works. Detailed drawings and specifications will be provided to the Contractor in a timely manner to allow for planning as noted in the proposal schedule.	Agreed	No further action required.	NIL	NIL
2.	Civil Works Agreement	2.2 River Closure	Wording to be agreed with the Client	The water flow considered for the closure of the river is 2560 m3/s. According to Company study it will be at the end of May. Our proposal schedule is based on this premise.	Withdrawn by Bidder	No further action required.	NIL	NIL
3.	Exhibit 12	2.3 Company Supplied Power	Wording to be agreed with the Client	All temporary power is to be supplied by the Company for the Contractors use including but not limited to crushing and screening plants, CVC and RCC batch plants, lights, offices, etc. The use of generators would be additional to our proposal.	1. Company will only provide power at locations as specified in Exhibit 12, Section 2.1 (Electrical Power). Bidder is responsible for distribution beyond those points.	Agreed. No further action required.	NIL	NIL

3. (cont'd.)	Exhibit 12	2.3 Company Supplied Power	Wording to be agreed with the Client	All temporary power is to be supplied by the Company for the Contractors use including but not limited to crushing and screening plants, CVC and RCC batch plants, lights, offices, etc. The use of generators would be additional to our proposal.	2. Clarify this comment by providing the elements of additional cost included in "the use of generators".	Should the Company not be able to supply the construction power requirements for the Bidders facilities (at the distribution points indicated) and temporary generators are required, Bidder would expect to be compensated for the operation of these generators.	TBD	TBD
4.		2.4 Existing Conditions – Power Poles & Cables	Wording to be agreed with the Client	Company shall relocate poles and electrical cables on the tailrace rock plug at no cost to the Contractor and in a timely manner to allow excavation to proceed as per the proposal schedule.	Bidder to advise milestone requirement and associated date.	Bidder would need the poles and electrical cables relocated before August 8, 2016.	NIL	NIL
5.		2.5 Existing Conditions – Access Road Speed Limits	Wording to be agreed with the Client	Contractor has not considered speed limit reductions on the access roads beyond the existing posted limits.	Withdrawn by Bidder	No further action required.	NIL	NIL
6.		2.6 Existing Conditions - Escorts	Wording to be agreed with the Client	If escorts are required for deliveries to the site, they will be arranged and paid for by the Company. No costs have been included for escorts in our proposal.	Agreed	No further action required.	NIL	NIL
7.	Exhibit 12	2.7 Company Provided Laydown Areas	Wording to be agreed with the Client	We have assumed in our proposal that the existing transmission line right of way will be used for setup of the crushing/screening plant, concrete plants and aggregate stockpiles as required by the Contractor.	The Transmission Line ROW is not available for use by Contractor for any purpose.	Agreed. No further action required.	NIL	NIL

8.	Appendix A2.1	2.8 Temporary Upstream Bridge (A2.1 – Item 3.8.3)	Wording to be agreed with the Client	We have made provision to transport the Company purchased upstream temporary bridge within the Muskrat Falls Project site; no highway transport costs are considered in our proposal.	Agreed	No further action required.	NIL	NIL
9.	Appendix A2.1	2.9 RCC Cofferdam (A2.1 – Item 3.2.2)	Wording to be agreed with the Client	We have made no special provision for the verticality of the face of the remaining RCC Cofferdam upon completion of demolition activities.	Agreed See Item 15 below under Company Identified Items	Agreed. No further action required. Refer to response below in Item 15 of Company Identified Items.	NIL	NIL
10.	Specification	2.10 Vehicle Wash Stations	Wording to be agreed with the Client	We have not allowed for vehicle wash stations at site entrance/exit points as this has not been specified.	Withdrawn by Bidder	No further action required.	NIL	NIL
11.	Civil Works Agreement	2.11 Boulders	Wording to be agreed with the Client	We have not allowed for boulders in our price as the borehole logs do not indicate their presence. In the unlikely event that boulders are encountered in the jet grouting operation, then cost of removal, all associated extra costs, schedule delays and impacts, will be extra to our contract.	Understood. Any impacts will require substantiation in accordance with Agreement provisions	Agreed. No further action required.	NIL	NIL

12.	Civil Works Agreement	2.12 Waste Cement Bentonite Materials	Wording to be agreed with the Client	Disposal of dried cement bentonite waste material will be within the spoil disposal area, in a segregated pile. We have not allowed for additional treatment if required or disposal off-site. There is no requirement in the specifications for special treatment or disposal.	Agreed	No further action required.	NIL	NIL
13.	Exhibit 12	2.13 Sedimentation Ponds	Wording to be agreed with the Client	We have assumed that the existing Sedimentation Ponds are suitable for our dewatering requirements. Construction of additional Sedimentation Ponds or flocculation would be considered an extra to the Contract. No decommissioning costs are included for Company Sedimentation Ponds.	Agreed, with exception of jet grouting dewatering.	Agreed. No further action required.	NIL	NIL
14.	Appendix A2.1 and Exhibit 2 – Attachment 1	2.14 Dumped Rockfill Zone 3 (A2.1 – Item 4.1.12) & Dumped Large Blocks Zone 3 (A2.1 - Items 4.1.13 to 4.1.15 inclusive)	Wording to be agreed with the Client	We have assumed that measurement and payment for all Zone 3 materials, Dumped Rockfill and Dumped Large Blocks (i.e. Items 4.1.12 to 4.1.15 inclusive) is achieved by measured tonne from stockpile, not by in place survey as indicated in Exhibit 2. Payment will be by "over the scale" method of measurement.	Measurement of dumped rockfill Zone 3 and dumped large blocks, in water, will be measured from stockpile.	Agreed. No further action required.	NIL	NIL

15.	Specification	2.15 Aggregate Quality & Quantity	Wording to be agreed with the Client	We have assumed that there is sufficient quantity in the Company identified stockpiles and pits to produce the required aggregates. We have made no special provisions to address quality issues that may arise as a result of poor quality raw materials.	Agreed	No further action required.	NIL	NIL
16.	Appendix A2.1 and Exhibit 2 – Attachment 1	2.16 Approved Compactable Material	Wording to be agreed with the Client	We have assumed Approved Compactable Material is rockfill available from Company stockpiles.	Agreed	No further action required.	NIL	NIL
17.		2.17 Borrow Pits	Wording to be agreed with the Client	For borrow pit development, we have assumed all grubbing (if required) is pushed to the side rather than trucked to the Spoil Disposal site. This grubbing is leveled and spread during pit reclamation efforts which include sloping and leveling only, no hydroseeding has been included.	Agreed	No further action required.	NIL	NIL
18.		2.18 Material Availability	Wording to be agreed with the Client	We have assumed there is sufficient blasted rockfill for all permanent and temporary items, including those of the Contractor, such as, but not limited to, laydowns, roads, etc. Any blasting outside of the items in the Schedule of Price Breakdown is additional to our proposal.	~~Agreed~~ See Item 16 below under Company Identified Items	Refer to response below in Item 16 of Company Identified Items.	**Unit Rate Provided**	NIL

19.		2.19 Aggregate Production	Wording to be agreed with the Client	We have included provision to crush/screen aggregates for the quantities indicated in Appendix A2.1 Schedule of Price Breakdown, including provision for an additional 11% to the theoretical volume to account for losses, handling and provisions for fabrication in 2015. We have made no provision to process additional aggregates should the quantities increase beyond those listed in A2.1. Company should consider processing additional aggregates to avoid additional payment of processing plant mobilization & set-up.	Company no longer has a requirement to complete crushing activities in one season. Accordingly, Bidder is responsible for aggregate volume requirements.	Bidder assumes responsibility for aggregate volume requirements for the quantity of RCC identified in Schedule A2.1 Schedule of Prices. We maintain that there is no provision to crush aggregates for additions to the identified quantity of RCC aggregates. As previously stated, Company should consider processing additional aggregates to avoid additional payment of processing plant mobilization & set-up.	TBD	TBD
20.	Specification	2.20 Blasting	Wording to be agreed with the Client	Our methodology does not require the use of electronic detonators; therefore none have been included in our proposal. If their use is mandated, this would be additional to our proposal.	Company has not specified/mandated electronic detonators. Should electronic detonators be required to meet established regulations, they will be to Contractors account. See Item 17 below under Company Identified Items	Refer to response below in Item 17 of Company Identified Items.	**Included in Updated Proposal**	NIL

21.	Exhibit 2 – Attachment 1	2.21 Foundation Cleaning and Dental Concrete	Wording to be agreed with the Client	We have assumed a standard level of foundation cleaning for the North Dam. In order to enhance the schedule and ensure efficient operations, it is assumed the Company will approve the use of dental concrete to create a nominal level, safe base from which to start the RCC placement operations. Refer to provided photos in the Execution Plan for our expectations.	Company does not see value in the use of dental concrete for leveling purposes. Bidder should not make stated assumption without further discussion and agreement by Company. See Item 22 below.	Refer to response below in Item 22 of Company Identified Items.	TBD	TBD
22.	Exhibit 2 – Attachment 1	2.22 Dental Concrete	Wording to be agreed with the Client	Any leveling concrete required for the North Dam is measured and paid as Dental Concrete. We have not included for formwork for the dental concrete activity. If required, it will be will paid on a cost reimbursable basis.	Provide a unit rate (per M3) for Leveling Concrete, to be paid on the basis of actual measured quantities in place. The rate will include any associated formwork.	The unit rate ($/m3) for Leveling Concrete is provided in the Optional Price section of A2.1 Schedule of Prices as requested complete with a provision for formwork.	**Unit Rate Provided**	NIL

23.	Appendix A2.1	2.23 Rock Excavation (A2.1 – Items 4.1.3, 4.2.3, 4.3.3, 4.4.3 & 4.5.4)	Wording to be agreed with the Client	Since the quantity of dental excavation and handwork within these pay items is unknown and provisional, we have made a reasonable allowance in our pricing of this item for 10% of our cost submitted to apply to hand work and 90% to apply to machine work. In the event the value of hand work required will vary from the 10% allowed, we will require any variation to be adjusted on a time and material payment basis.	Company requires a single unit rate for dental excavation and handwork. No additional provisions for variability in hand/machine ratios will be considered.	Bidder maintains its original qualification with respect to variability in hand/machine ratios related to rock excavation identified.	TBD	TBD
24.	Specification	2.24 Contact Grouting	Wording to be agreed with the Client	We have not included for contact grouting for the grouting activities since the specification indicates it "may be required". If required, it will be additional to our proposal.	Agreed	No further action required.	NIL	NIL
25.	Appendix A2.1	2.25 RCC Formwork Costs	Wording to be agreed with the Client	In our proposal we have included ***all*** RCC formwork costs in Item 4.5.28 Roller Compacted Concrete (RCC).	Withdrawn by Bidder	No further action required.	NIL	NIL

26.	Specification	2.26 RCC Warm Joints	Wording to be agreed with the Client	We have assumed that in the specs., section 4.11.4 (page 51 of 79) in the Table 5 Joint Classifications, only the right part of the Table (the one for > 1500 m3) will apply for all layer volumes, > 1500 and < 1500 m3.	The exposure times indicated in Table 5 are indicative only (refer to clause 4.11.4.1 of specification section 03 37 23). The actual exposure times will be determined during the trials dependent on the actual mixes. No compensation will be made for variances from the exposure times assumed during the bid and those determined for the selected RCC product following RCC mix development.	Agreed. No further action required.	NIL	NIL
27.		2.27 Ammonia	Wording to be agreed with the Client	We have assumed that no special disposal (any Environmental regulation) is needed for the ammonia obtained when the cooling system is demobilized.	Bidder must comply with hazardous materials disposal requirements set out in the Project Wide Environmental Protection Plan. These requirements include the disposal of ammonia.	Agreed. Bidder has included the costs related to ammonia disposal in its updated proposal.	**Included in Updated Proposal**	NIL

Category: **3. QUALITY ASSURANCE**

Number	Reference	Description	Proposed Wording	Reason	Company Response May 29, 2015	O'Connell-Dragados Response	Change in Price if exception is approved by Company	
						June 30, 2015	Increase	Decrease
1.	Civil Works Agreement	3.1 Quality Control Testing	Wording to be agreed with the Client	We have assumed the Company will provide and operate an on-site laboratory thus we have not included costs related to independent third party Quality Control inspection and testing including, but not limited to, the following: • Compaction testing of all fills • Concrete testing • RCC testing	Company operates a materials laboratory on site and will perform QC activities to validate that concrete and aggregates conform to technical specifications, including fill compaction testing.	Agreed. No further action required.	NIL	NIL

Category: **4. COMPANY IDENTIFIED ITEMS**

Number	Reference	Description May 29, 2015	Description June 12, 2015	O'Connell-Dragados Response	Change in Price if exception is approved by Company	
					Increase	Decrease
1.	**General**	Provide confirmation of your proposed Project Team. Provide CV's for any key personnel not previously supplied.		See attached updated Organization Chart complete with CV's of key personnel that have been revised.	NIL	NIL
3.	**General**	Provide a unit rate (per M3) for RCC Trail Test Sections.		See updated A2.1 Schedule of Prices. The costs related to the RCC Trial Test Sections have been removed from the Direct Items for RCC and have been included in the Optional Price Section.	**Unit Rate Provided**	NIL
4.	**Bidder's Execution Plan**	Crane pad and any temporary works must be removed from area downstream of North Dam.		Agreed.	**Included in Updated Proposal**	NIL
5.	**General**	Provide a unit rate for using facing concrete instead of GERCC/GEVR, on upstream face of RCC, below water level.		Existing unit rate for the Facing Concrete in Schedule A2.1 is sufficient to replace GERCC/GEVR on the upstream face of the RCC below water level.	TBD	TBD
6.	**General**	Is the cost of installing a pre-cast concrete box culvert, below the North Dam, included in Bidder's proposal?		Our proposal does not include the cost of a pre-cast concrete box culvert below the North Dam. We have included dewatering/pumping costs to remove any accumulation of water between the downstream face of the North Dam and the downstream cofferdam to be constructed.	NIL	NIL
7.	**Bidder's Execution Plan**	Company confirms that the specification requirement for installation of bubble curtain remains. Please confirm compliance.		The bubble curtain is still included in our updated proposal.	NIL	NIL

8.	**Bidder's Execution Plan 34. NORTH DAM (2016)**	Company will only provide power at locations as specified in Exhibit 12, Section 2.1 (Electrical Power). Bidder is responsible for distribution beyond those points. See Item 3. Above.		Agreed.	NIL	NIL
9.	**Telecon June 5, 2015**		Jet Grouting is now considered Optional. All equipment, materials and operators will only be mobilized on an as-required basis. Please remove all Jet Grouting items from Schedule A2.1. and provide Optional pricing should this activity be necessary. In addition, identify the mobilization period required.	Agreed. The Jet Grouting items have been removed from the Direct Items in Schedule A2.1 and are now shown in the Optional Pricing section of A2.1.	**Unit Rate Provided**	NIL
10.	**Telecon June 5, 2015**		The (temporary) upper access road to C1 should now be proposed as an Option. The specification and quantities for the permanent roads and the temporary road have been changed and will be issued by June 11. The culvert specification has also changed. Appendix A2.1 to be updated to remove Class B and C materials. These will no longer be used based on updated road specification referred to above.	Agreed. The items related to the (temporary) upper access road to C1 have been removed from the Direct Items in Schedule A2.1 and are now shown in the Optional Pricing section of A2.1. Agreed. These changes have been accounted for in the updated proposal. Agreed. The Class A and B items have been removed from the updated proposal.	**Unit Rate Provided** **Included in Updated Proposal** **Included in Updated Proposal**	**Included in Updated Proposal** **Included in Updated Proposal** **Included in Updated Proposal**

11.	**Telecon June 5, 2015**		Company to provide Bidder with cement and fly ash rates to be utilized in Bidder's revised pricing. Company to propose a formula to be used for updating these rates post award and following confirmation of the mix design. Bidder to proceed with mix design activities after contract award, on an agreed basis of compensation.	Bidder has updated the cement and flyash supply price received from the Company. As requested, the cost of $380 per metric tonne is now included in the updated proposal. Bidder is prepared to proceed with the mix design activities after contract award. The cost for this is **not included** in the updated proposal but we estimate a Provisional Sum of $325,000 should be budgeted for these activities. Should we proceed with this approach, Bidder would request that full use of the on-site laboratory complete with any specialized test equipment be provided at no additional cost to the Bidder. If Company requires expanded or additional design / testing work beyond that described in the updated Execution Plan or if Bidder has to engage an offsite laboratory in the event Company does not have the specialized testing equipment required, adjustments to both the schedule and cost will have to be considered.	**Included in Updated Proposal** TBD	TBD TBD
12.	**Telecon June 5, 2015**		In event Laydown Area A cannot fulfill needs, provide optional pricing for drilling and blasting at Quarry 5 for up to 50,000 m3 of rock fill.	An optional price to drill and blast 50,000 m3 of rock fill at Quarry 5 is now included in the Optional Price section of A2.1. This price is for drill and blast activities only. Access roads, quarry development and reclamation efforts and loading, hauling and spreading/dumping costs are not included in this optional price.	**Unit Rate Provided**	NIL

13.	**Telecon June 5, 2015**		Although it is expected that the upstream cofferdam size has been reduced, no quantity adjustments need to be considered at this time. The successful Bidder will participate in post award value engineering discussions to review the upstream cofferdam as well as other structures.	Agreed. There is no adjustment in the updated proposal for a potential reduction in the quantities required for the upstream cofferdam. We look forward to participating in future value engineering discussions following award.	NIL	NIL
14.	**Telecon June 5, 2015**		WRT the delayed river closure option, Company suggested Bidder use two or more time windows during which Company can exercise its option to delay river closure by one season. Cost/schedule/execution impacts would then relate to these time windows. Company provided the schedule Milestone dates related to this scenario on June 5.	The Bidder's revised proposal price for the 2017 River Diversion Option is valid provided the Company notifies the Bidder of its intent to divert the river in June 2017 on or before February 28, 2016. This will allow the Bidder time to avoid mobilization of additional equipment originally intended to supplement the anticipated work program for 2016.		
15.	**Telecon June 5, 2015**		WRT Item 9 (see Technical category above) and the verticality of the face of the remaining RCC Cofferdam, Company must approve Bidder's means and methods related to demolition activities. This requirement is to verify that the integrity of the North Transition Dam closure wall will not be compromised.	Agreed.	NIL	NIL
16.	**General**		WRT Item 18 (see Technical category above) Company has reconsidered its previous response. Accordingly, Company clarifies that Stockpile A material cannot be used by Contractor for any purpose other than for Company structures/infrastructure covered in the Schedule of Price Breakdown.	Agreed.	NIL	NIL

17.	**Telecon June 5, 2015**		WRT Item 20 (see Technical category above) Company has identified that it has specified the use of electronic detonators for the removal of the underwater portion of the tailrace rock plug. See Section 3.7.7.2 of the Excavation Spec 31 23 00. Bidder must comply with this requirement.	Agreed. The cost for electronic detonators for the removal of the underwater portion of the tailrace rock plug is included in our updated proposal.	**Included in Updated Proposal**	NIL
18.	**Telecon June 5, 2015** (Bidder's Execution Plan)		Company confirmed that, due to the number of stakeholders involved in the approval process, it would not stop river flow to allow divers to disconnect the base of the pier of the (upstream) temporary bridge. In addition, the bridge abutment may have to be removed. Specifications require that all underwater temporary structures be removed and all temporary structures must be removed from the spillway channel. Bidder was requested to provide a sketch/drawing of the abutment and pier/pier footing details proposed to remain under water. Company to evaluate further.	Agreed. Bidder has included the costs related to removal of the structural steel support pier but has assumed the concrete abutments (that are outside the defined water passage) can remain in place. Should these abutments have to be removed, this would be an additional cost which can only be reasonably determined on site at that time. See above response. Bidder has included a conceptual sketch /drawing of the abutment and pier/pier footing that will remain for the review of the Company as requested. Scope & cost is subject to final approved design.	TBD TBD TBD	TBD TBD TBD

LOWER CHURCHILL PROJECT – MUSKRAT FALLS

PACKAGE CH0009 CONSTRUCTION OF NORTH AND SOUTH DAMS

CONSTRUCTION METHODOLOGY AND EXECUTION PLAN – ANNEX A13-1

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TABLE OF FIGURES

1. OVERVIEW

The following construction methodology, sequence, and procedures is intended to provide a summary of the primary construction activities and identify the main equipment, infrastructure setup, planning methods, work procedures, and project interfaces to be incorporated into the project. Specific items, including quality management, environmental protection and risk management, among others are further detailed in their respective sections of the Form of Tender and are not repeated in their entirety in this section. Various "backup" systems, redundancy measures, and risk management methods are also described in this section.

Figure 1: RCC Conveyors at La Breña II Dam, Spain

2. CLARIFICATIONS

During the preparation of this tender submittal certain assumptions and variations to the tender documents were made. These have been included within the submittal under Appendix A17 Exceptions. These clarifications form part of this submittal and modify various technical and commercial aspects.

Figure 2: Muskrat Falls Bulk Excavation Project

3. GENERAL CONSTRUCTION SCHEDULE

We have included our project tender schedule in Appendix A9 Schedule.

We have developed our preliminary schedule with extensive input from our construction and engineering teams. Our team will take a straightforward approach to keeping work on schedule and ensuring that our subcontractors stay on schedule. Our management approach is designed to avoid the necessity for schedule recovery from the start by maintaining progress and achieving milestones as planned.

The H.J. O'Connell Construction Limited (O'Connell) and Dragados Canada, Inc. (Dragados) team will apply stringent scheduling strategies and protocols from the outset that will ensure that we accurately identify key activities, monitor progress accurately and update the schedule on a routine basis. Our team will integrate input from all of our stakeholders to ensure that our schedule is complete and addresses the project's needs.

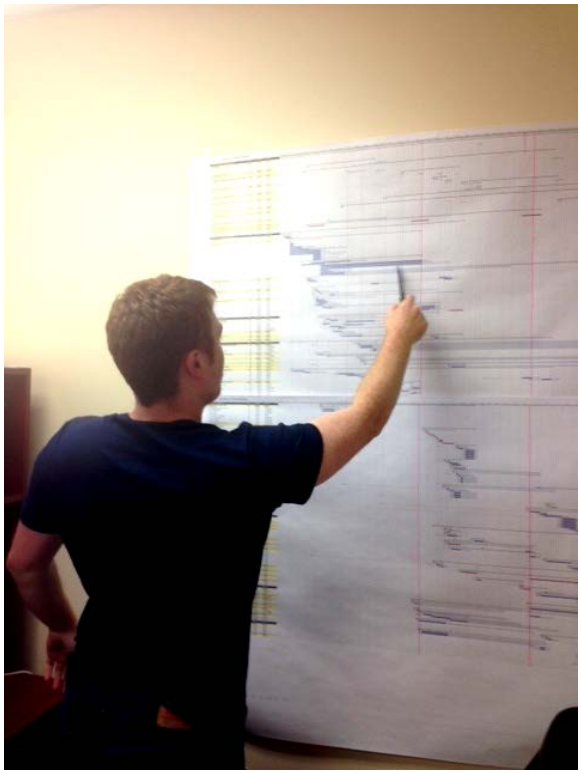

Figure 3: O'Connell-Dragados Team Member Discussing Schedule

The subcontractors will be incorporated into our schedule and specific schedule commitments and performance requirements will be reviewed and identified within our contracts. This builds schedule accountability into each subcontract as a contractual obligation.

The schedule submitted is *NOT* based entirely upon Exhibit 9 Work and Milestone Schedule but rather an adjusted schedule on the basis of the Construction Methodology. The noted changes are:

- M23 – Start of Foundation Preparation for North Dam
- M24 – Start of Placement of RCC

The new dates are:

- M23: 01-Aug-2016 versus 01-Jul-2016
- M24: 12-Sept-2016 versus 01-Aug-2016

These dates are achievable for our construction methodology. There is no affect on the overall completion date.

Our plan is to work a 14 day on and 7 day out rotation schedule with a single shift (10 hours per day) for the majority of the work in 2015. The crushing operation and support will be carried out on a separate 14 day on and 7 day out rotation schedule with two shifts per day and will include the necessary supervision to manage the additional shift. A 14 day on, 7 day out rotation on a double shift basis (20 hours per day) will be administered in 2016 and 2017. There will be multiple crews that will overlap for the crews that are out on turnaround to maintain continuous operation.

4. INITIAL PLANNING AND TEAM IMPLEMENTATION

Upon the award of the contract on January 15, 2015 the core of the project management team will be established and assigned to the project on a full time basis. The initial goals/activities by this group will include:

- Initial project planning
- Mobilization (equipment and materials) and infrastructure setup
- Procurement of major items
- Project systems and controls setup
- Hiring of other team/staff members
- Commercial orders (suppliers and subcontractors)

This group will include as a minimum the:

- Project Manager
- Deputy Project Manager/Construction Manager
- General Superintendent
- Maintenance Manager
- Safety Manager
- Quality Assurance Manager
- Business Manager
- Human Resources Manager
- Project Engineer
- Schedule Engineer
- Senior RCC Engineer

After initial planning activities are completed, this group shall also be responsible for the project implementation and mobilization phase and will put in place the measures and infrastructure required to execute the work in accordance with the schedule. They will initiate site hiring to complete the initial infrastructure installation.

The primary responsibilities of the group will be the establishment of:

- Company interface arrangement;

- Prepare project transition documents and meetings. This takes the tender information from the project estimate team to the project execution team;
- Draft, submit and have approved the Site Specific Safety Plan;
- Draft, submit and have approved the Site Specific Environment Plan;
- Draft, submit, and have approved the Site Specific Quality Plan (per ISO 9001 requirements). Begin preparation of project specific work plans, procedures, inspection requirements, verification forms, etc.;
- Set up and have approved the Project accounting system (both for internal and Company account requirements);
- Setup, submit, and have approved the drawing control, document control, and records system that is compliant with the Company's stipulations;
- Compile, submit, and have approved the project baseline construction schedule;
- Negotiate, finalize and prepare the necessary subcontracts and supplier purchase orders required for the initial stage and on-going work;
- Establishment of staffing schedule for other project team members;
- Establishment of the project reporting requirements, setting up and submitting for approvals the project reports, finalize the daily, weekly, and monthly report formats;
- Finalize the RCC batch plant equipment, setup, delivery details, operational aspects, and procedures and submit to be approved;
- Meet with the following:
    - Local Business to explain the project scope, supply requirements, and further identify business opportunities not identified during the time of tender
    - Aboriginal community/groups
    - Hiring Group
    - Union Groups

  Meetings would establish the contacts, proper channels for various activities, introduce the primary contacts within the project team and their respective responsibilities.

- Prepare the project "markup" package and work assignments, request and execute the markup meeting and complete any jurisdictional claims and final assignment. The markup package/presentation is to include a detailed description/scope of the work to be carried out to deliver the project;

- Human Resources to prepare skills requirements/list, then inventory availability from within the Aboriginal Community, local area, Labrador region and union locals; and
- Submit project bonding and insurance documents to the Company and other documents that may be required by Federal and Provincial authorities.

Within 4-6 weeks of contract award additional staff to round out the Project Team will be put in place and will include:

- Safety Advisors
- QC Engineers and Inspectors
- Field Engineers
- Maintenance Superintendents
- Maintenance Planners
- Superintendents
- Travel Coordinator
- Clerks

The complete project team will increase from those identified above to reflect the manpower histogram and Organization Chart in Appendix A1-8.1/8.2. A list of proposed staff for each position, complete with their alternates, is attached complete with resumes in Annex A1-9.

5. MOBILIZATION AND INFRASTRUCTURE SETUP

In April and May 2015 we plan to complete the following activities:

- Set up the office for 2015 (8 trailers in the Company Laydown) with required water and sewer systems. Power will be supplied by Owner.
- Setup a Maintenance Facility (i.e. Welding Shop) complete with all tooling. Sea cans will be setup for storage and warehouse requirements.
- Set up Maintenance lunchroom and washroom facilities.
- Mobilization of equipment and assembly of large equipment.
- Set up smaller site office complete with lunchroom, washroom and dryroom facilities.

Figure 4: Craft Dry Room Facility, Muskrat Falls, NL

A drawing of the Contractor's Temporary Infrastructure requirements is included in Annex A13-4.

In May and June 2016 we will mobilize the following additional items required for construction:

- Main Office and Lunch Rooms

  The main office setup will be expanded by 4 offices to accommodate the additional staff. Similarly, the extra lunch rooms, dry rooms and wash cars will be required for the additional craft

- RCC Batching Plants

  Two batching plants with two twin shaft mixers each will be set up in Area B to take advantage of the power supply available from the Company and to be in close proximity to the RCC aggregates. The plants will each have a capacity of 200 m^3 per hour of production each, and have a backup power system on standby. It will be a fully automated portable wet-mix batching establishment. An in-line aggregate storage bin with four (4) separate compartments for the various aggregates is included. Cement storage for type GU Cement and Flyash will also be provided.

  The following is a general list of equipment to be included in the batching plants:

  - Two Arcen twin shaft mixers, 3 m^3 each.
  - Aggregate storage bin with four compartments and 400 tonne capacity
  - Aggregate scales
  - Belt conveyor
  - Cement and fly ash storage silos
  - Cement and fly ash scales
  - Ice and water scales
  - Power panel
  - Prewiring
  - Aggregate handling system
  - Computerized batch control system
  - Dust collection system for mixers
  - Rotary screw air compressor
  - Admixture system
  - Modular control room
  - Water chiller
  - Generator (backup power) Trailer
  - 980 CAT Loader

A waterline will be established from the river to the plant. An ice flakes plant and a water heating plant will be added. These plants will be also setup in Area B.

Our proposal is based on utilizing power supplied by the Owner.

Figure 5: Concrete Plant (La Breña II Dam, Spain)

Refer to Annex A13-5 for a general arrangement of the RCC Plant setup, aggregate stockpiles, etc.

- Cement Silo Setup

  There will be six silos installed for cement and flyash storage. Each silo will hold 1000t for a total of 6000t. These will be set up on concrete foundations adjacent to the RCC Plant. The silos will be delivered in pieces and will take approximately one week to set up per silo. The setup crew will generally consist of:

  - 1 – Foreman
  - 1 – 80T Crane
  - 4 – Ironworkers
  - 2 – Labourers

Figure 6: 6 x 1000 t Silos at La Breña II Dam, Spain

- Conventional Concrete Plant Setup

  The concrete plant will consist of:

  - Concrete Plant for CVC (60m^3/hour)
  - Concrete heating for CVC
  - Water chilling plant for RCC

  The plant will be set up in the back end of Area B.

Again our proposal is based on utilizing power supplied by the Owner to operate the conventional concrete plant.

RCC batching plant specifications and layouts can be found in Annex A13-12.

6. EQUIPMENT RESOURCES

The equipment allocated for this project will be a combination of existing owned equipment, new purchased equipment and third party rental equipment.

Figure 7: Sherwood Pond Mine Development, Labrador City, NL

The table below is the anticipated type and quantity of equipment required for this project.

Table 1: Equipment Summary Table

Item	Description	Quantity
1	420 Backhoes	6
2	35t Excavators	6
3	45t Excavators	3

Item	Description	Quantity
4	75t/90t Excavators	4
5	120t Excavator	1
6	35t/40T Trucks	16
7	75T Off-highway Trucks	5
8	D5/D6 Size Dozer	5
9	D8 Size Dozer	5
10	Cat 980/988 Size Loader	6
11	140H Size Grader	1
12	10T/12T Compactors	6
13	Crushing Setup	1
14	Screening Plants	1
15	RCC Plants	2
16	Mobile Concrete Plant	1
17	Rock Drills	5
18	Clearing Harvestors	1
19	Welding Shop	1
20	Office Trailers	12
21	Lunch Rooms	6
22	Fuel Truck	2

Item	Description	Quantity
23	Welding Truck	1
24	Mechanic Truck	1
25	Pickups	50
26	Stadium Light Towers	5
27	Standard Light Towers	12
28	IT38 Tool Handler	1
29	48 Passenger Buses	5
30	40T Crane	1
31	80T Crane	1
32	120T Crane	1
33	Grout Plants	2
34	Creter Cranes/conveyors	2
35	Agitator Trucks	10

7. SURVEY AND SURVEY CONTROLS

Initial control point/monument information will be obtained from the Company's project control system. These points will be utilized to setup and maintain a project control system. The project control points will be maintained in AutoCAD in a project survey control drawing(s). Each project control point established will be cross referenced and checked back to two (2) independent setups at two (2) independent project control points. The Northing, Easting, elevation, and control information (type and description) will be provided to the Company. Project control setup will be carried out utilizing a total station arrangement providing the necessary accuracy and precision. Project control points and the Company project points would be marked and protected from construction activity damage. As part of the Quality Control requirements under the project procedures for "Survey" these points would be periodically checked to ensure conformance to the established/assigned data.

Figure 8: Surveyor at the Soldier's Pond Site, NL

After the project control is established we plan to complete a joint survey (Contractor/Company) of all excavation and fill areas to verify the current "original ground conditions". Should removal of materials occur on a cost plus basis or for any other reason, surveys will be completed at each stage to identify, as required, the associated quantities.

All layouts, drawings, modeling, control calculation, quantity work, as-builts, etc. will be performed using AutoCAD Civil 3D in conjunction with Terramodel software programs. Field survey would be carried out using a combination of GPS setup with Base Station, Total Stations,

and Standard Autolevels. Where applicable, lasers will be utilized to control excavation limits and in particular lift heights on dam structures (in conjunction with standard survey stakes and grades).

Calibration of all survey instrumentation and tools will be carried out in accordance with the Quality Control procedures. These procedures will take into account the manufacturers specifications and requirements, project requirements and requirements under the contract specifications. Calibration certifications, site check records and maintenance records will be maintained on site in accordance with the project document control requirements.

Survey control and verification will be the primary responsibility of the survey department including initial layout, “lines and level” checks, as-built final surveys, etc.

Calculations of co-ordinates and controls will be verified independently by a second person to ensure the location information provided in the field is correct.

8. ENVIRONMENTAL MANAGEMENT

The team will put in place measures to minimize impacts to the environment and adhere to the requirements of the contract documents and federal and provincial regulatory requirements. The following specific requirements will be addressed in project planning and or site procedure preparation to supplement our environmental program requirements:

Figure 9: Soldier's Pond Site, NL

- Silt fence
- Dewatering work areas
- Wildlife encounters
- Fueling/transfer procedure
- Spill procedures and on-site spill kits
- Site waste disposal procedures
- Excavation in water and placement of fills in water
- Borrow pit development
- Stripping and grading
- Aggregate management and crushing
- Batch plant operations

- Dust control

Figure 10: Trench with Rock Check Dam, Sandy Pond, Long Harbour site, NL

Typically all of the constructions activities executed on the project will have formal work procedures prepared covering all aspects of the work to be completed. Included in the procedures for each work element are environmental measures to be undertaken, the risks and required measures to mitigate. These are reviewed prior to work starting to determine the measures to be carried out before work commences. At the beginning of the project (and updated throughout the project as required) an environmental assessment is made and documented. The work activities are identified, permitting requirements, environmental risks documented and measures to mitigate are summarized. This will form a part of the project planning and execution information. Please refer to Appendix A6 Environmental Questionnaire for additional information

9. HEALTH AND SAFETY MANAGEMENT

While all of the principals of the Joint Venture have been consistent leaders in safety performance in their respective areas of endeavor throughout North America, the O'Connell Occupational Health and Safety Management System will direct the Health and Safety Program on the Lower Churchill Project. The OHS Management system that will be implemented at the Lower Churchill Project will meet and in most cases surpass all legislative and Company requirements and meet the criteria for COR Equivalency from the Newfoundland & Labrador Construction Safety Association.

The Joint Venture recognizes that the health and safety of its employees and the protection of the environment is as much a value in achieving corporate objectives as the productivity of its workforce and the quality of its work. With the belief that all incidents are preventable, the Company and management of the Joint Venture are committed to transferring their vision of Zero Harm to all workers at all levels of the organization. Through a cooperative attitude and the empowerment of workers to be pro-active safety leaders, the vision of an incident free workplace is seen as both a realistic and obtainable goal.

Using best management practices, senior management shall exercise leadership by establishing and realizing goals and objectives that achieve optimum health and safety results. Based on the principle that all undesired incidents can be prevented, the Joint Venture is committed to realizing an incident free workplace for its employees.

The Joint Venture Management Team has the responsibility for, and is committed to, providing a safe work environment where hazards are identified and controlled. Our goal of "zero incidents" is based on the following principles:

- Nothing is so urgent or important that we cannot take the time to do it safely.
- Safety is the first consideration in everything we do.
- Everyone has the right to a safe environment.
- Identification and mitigation of risk is everyone's responsibility.
- All incidents are preventable.
- All employees must be involved and supportive of the safety program.
- Working safely is a condition of employment.

The Joint Venture Health and Safety Program will manage the health and safety of all subcontractors in the same manner that we will manage our own system. All subcontractors will be held to the same standards of safety excellence that we expect from ourselves.

The Joint Venture recognizes that the prevention of accidents and incidents in the workplace is a responsibility that must be shared by both the Company and the workers. The establishment of an effective and functional Project Joint Occupational, Health and Safety (JOHS) Committee, will facilitate the promotion of a pro-active safety culture throughout the operation.

A senior manager and a representative selected by the committee members representing the workers will sit on the Project JOHS Committee. The Joint Venture itself will have in place an effective JOHS committee (separate from any project committee), the chairs of which, will sit on the "Project" JOHS Committee. Membership on the project JOHS Committee will also include representation from the Company if desired. All members of the Joint Occupational, Health and Safety Committee shall be appropriately trained as per applicable legislative requirements.

Figure 11: Pre-shift Meeting, Bulk Excavation Site, Muskrat Falls, NL

The Joint Venture will work cooperatively with the Project JOHS Committee. As a functioning entity, the committee shall be consulted and involved in all aspects of the development, implementation and maintenance of the Health and Safety Program.

Prior to working on the Lower Churchill Project all employees shall be required to attend and complete the comprehensive project orientation and induction training. At the time of hiring it

will be ascertained that all employees are appropriately trained to perform the tasks for which they are hired. In addition, all employees, staff and craft included, will undergo a medical examination complete with a drug and alcohol test prior to being approved for work on the Project.

We will evaluate the safety training and certifications of employees prior to and upon hiring and will coordinate the safety training for all employees either in-house or through external accredited training providers. We will maintain accurate training records and will require employees cleared through the applicable union halls to provide their necessary safety training certifications as a condition of employment.

Management and supervisors will receive the appropriate training to allow them to fulfill their responsibilities pursuant to legislative requirements.

The Joint Venture acknowledges its responsibility to ensure the health safety and welfare of the workers on the Lower Churchill Project. The Joint Venture believes that a healthy and safe workplace begins with a well-informed workforce who not only are aware of the hazards of their jobs and their workplace, but who also know how to control those hazards. The Joint Venture will develop, implement and maintain Safe Operating Procedures, designed to train and guide their workers in the safest possible methods to perform their specific duties. Safe Work Practices shall be included as part of the Safe Operating Procedures.

The Joint Venture recognizes a hazard as a condition, substance, behavior or practice with the potential to cause loss due to injury, illness or property damage. The ability to adequately recognize, evaluate and control these hazards strengthens a company's HSE management system. Work can be done safely even in the presence of significant hazards when the hazards have been systematically identified and evaluated and effective controls developed, implemented and maintained.

The Joint Venture will conduct job safety analysis (JSA) to evaluate all the tasks to determine the safest and most efficient way to complete the specific job. JSA's identify the hazards in each task of the job and determine control measures for those hazards.

The risk identification team will consist of supervisory personnel, workers immediately involved and familiar with the task, and a representative from the safety department. If necessary an expert in a particular field may be called upon to provide assistance. A Safety Task Analysis will

be conducted by supervisory personnel with their crews to review task related hazards and controls prior to the start of shift and when tasks are changed.

Before each shift the supervisors (including foremen) on the project participate in a cross-shift meeting to review the activities completed/ongoing from the previous shift and plan the upcoming shift. During the session (twice daily on double shift) issues related to safety are reviewed and identified to be communicated to the workers at the beginning of the shift. Prior to starting their shift, all employees will complete their "Stop and Think" and "Tailgate Meeting" and conduct a safety inspection of their workplace to identify any hazards that may pose a potential risk to their health and safety. Employees will take corrective action to control those hazards and reduce the risk to an acceptable level. Employees operating equipment shall conduct and document a pre-start inspection of their equipment or vehicle.

The Joint Venture's supervisory personnel shall conduct inspections of their workplaces as part of their daily responsibilities. Management inspections of the workplace shall be conducted on a weekly basis. A management inspection team shall consist of supervisory personnel and worker representatives from the trades' crafts working in that area.

In the event of an incident an effective Incident Investigation shall be conducted that will identify the root cause and recommend corrective action to prevent recurrences. The appropriate department/area manager will lead all major and serious incident investigations. Safety personnel will provide support to supervisors and line management for minor and serious incident investigations and participate on the senior management team for the investigation of major incidents or those with major potential. When an injury, incident or condition is serious, the supervisor will immediately notify a worker representative on the JOHS Committee and allow them the opportunity to participate in the investigation.

An Emergency Response Plan will be developed for the project to ensure effective control and response to a variety of emergency situations that may possibly occur. The Emergency Response Plan will be designed to ensure the most efficient and effective use of both the Joint Venture's and the Company's resources. A site emergency response team will be formed from amongst the employees who will receive regular training in current emergency response techniques, including first aid and initial fire fighting techniques. The emergency response procedures and protocols will be communicated to all employees and site visitors and will be posted in high traffic areas of all projects and sites.

In the event of an injury the safety department will be responsible for administering the disability management program for all project employees and shall implement a process of communication with the injured or ill worker during the initial stages of recovery and during the subsequent return to productive employment. The process shall be designed to assist workers to return to work at a pace and in a position, which is appropriate to their level of recovery. As part of their orientation workers will be made aware of the procedures to follow in the event they are injured on the job.

The Joint Venture will implement an effective communications system that will benefit all aspects of the project by allowing the free flow of health and safety information. The first exposure that new workers, contractors and visitors will have to the project will be their orientation training session. Through this method of instruction we will communicate to all personnel the information required to perform their duties in a safe and healthy manner.

Health and safety information will also be communicated to workers during safety meetings. These meetings could take the form of a pre-shift task assignment, a job safety analysis or a weekly "Tool Box "meeting. Tool Box topics will be developed and issued by the safety department. Workers will be encouraged to step forward and lead/participate in the weekly tool box meetings.

Health and Safety information that has to be communicated to employees in a timely manner will be communicated through a written safety memo, notice or alert, that will be forwarded to all supervisory staff to be included in their next safety meeting and will be posted on the health and safety notice boards. These notices will also be sent out electronically. Safety Notice Boards will be established at high traffic locations and lunchroom areas to further support safety communications initiatives. Safety banners, posters and signs will be placed in facilities and work areas to further communicate safety information to personnel. Universal hazard identification and warning signage will be utilized in the appropriate work areas to warn workers of potential hazards and communicate appropriate control measures.

All workers will be informed of the names of the members of the JOHS Committee. All committee members will be trained to communicate with workers in order to address their concerns and inform them of any relevant information that may help protect their health and safety. The minutes of all JOHS Committee meetings shall be posted on the safety notice boards.

The findings of formal safety inspections and ensuing recommendations or directives will be posted on the safety notice boards to inform the workforce of the identified hazards and subsequent controls.

As part of the Safety Orientation and ongoing training initiatives all project employees will be aware of their responsibilities and the procedures for reporting accidents and incidents. The findings of accident/incident investigations, including root causes and ensuing recommendations will be communicated to employees in a timely manner.

In the event of a serious incident, the Emergency Response Plan may be activated. Depending on the level of the emergency, external agencies may have to be contacted to provide assistance. All personnel will be trained in their roles and responsibilities, including who will be responsible for contacting any outside sources.

Our safety philosophy is based on the principles of ethical conduct, mutual trust and teamwork. To ensure continuous improvement of our safety program, we challenge, test and evaluate, as well as solicit input from site personnel to continually raise our standards of safety excellence. Documents and data containing information pertinent to the operation and performance of the health and safety program will be identified and controlled. The senior management team shall review the health and safety program on a regular basis to ensure its continued suitability, adequacy and effectiveness.

Please refer to Appendix A5 Health and Safety Questionnaire for additional information including a copy of the safety program that would, in conjunction with the Company's plan, form the basis of the program to be implemented.

10. QUALITY MANAGEMENT PROGRAM

The Joint Venture will implement and maintain a full Quality Assurance and Control Program in support of the Company provided laboratory testing facility and third party Quality Control.

Field inspection for activities such as concrete pours, rock bolting and grouting, foundation preparation and preparation and sign off of the necessary documentation will be carried out by staff Quality Control engineers.

Procedures, method statements, checklists, certifications and other documentation will be prepared for all necessary operation. Any testing records received from the Company's Quality Control lab will be integrated into the final as-built turnover documents prepared by our Quality Department.

Figure 12: RCC Density Measurement (Porce II Dam, Colombia)

For this project, the Quality Management System (QMS) currently employed by O'Connell will serve as the foundation for our program. Refer to Appendix A7 Quality Questionnaire (No Design) for additional details.

11. PROJECT CONTROLS

Following award the project team would immediately establish the project controls and the necessary interface with the Company's systems and requirements. Systems (along with report frequency, identification systems, filing methods, transfer and posting methods, electronic funds transfer for invoice payment, etc.) will cover:

- Cost and accounting
- Survey controls
- Documentation, drawings, correspondence may include:
    - job reports
- Report schedule
- Project numbering system
- Electronic transfer and posting system
    - QC records
    - QC inspector qualifications
    - Letters, correspondence, emails, faxes
    - Construction drawings
    - Shop drawings
    - Schedules
    - Mill and conformance certificates (cement, flyash, waterstop, additives, etc.)
    - Batch plant certification
    - Batch plant records/logs and tickets
    - Mix designs & trial batch records
    - Field inspection signoff records
    - Concrete pre concrete inspection checklist (sample in Annex A13-6)
    - Laboratory cylinder test report – compressive strength
    - Concrete field test reports
    - Concrete material(s) mill certificates
    - Grouting records
    - Survey as-builts
    - Equipment calibration certificates
    - Crane certifications and inspections
    - Rock bolt testing records

- Subcontractor protocols

It is intended to use current in-house accounting and cost control systems for the management of cost control and accounting systems. We would meet with the Company and identify the required reporting needs and format according to the requirements outlined in Exhibit 3 Civil Work – Coordination Procedures. With this information, we will to the extent possible, develop custom reporting formats, export formats, and summaries to meet the needs of the Company and permit electronic transfer and upload into the Company's systems where possible.

Costing and scheduling information would be tied to a common code/numbering and identification system (a work breakdown structure (WBS)). Utilizing the agreed WBS we will establish the costing protocols consistent with the Company's system for reporting and monitoring. Coding system and WBS would then be the basis for the financial accounting and job costing modules.

Change Orders will be issued for any Company or Contractor identified changes to the Issued for Construction drawings and specifications, changes in field conditions, etc. The Contractor will work with the Company to identify the cost and/or schedule impacts of the Change Request prior to the issuance of a Change Order.

Scheduling will be carried out using Primavera. Construction activities will be tracked based on the WBS utilizing the unique code assigned to each activity. Report and schedule structures will be summarized/presented at any detail level required.

With respect to documentation and correspondence control, all documents, drawings, procedures, etc. will be numbered as specified in the Joint Venture's QA procedures and adhere to any numbering system identified by the Company. Typically all documents will be recorded in an Excel database format.

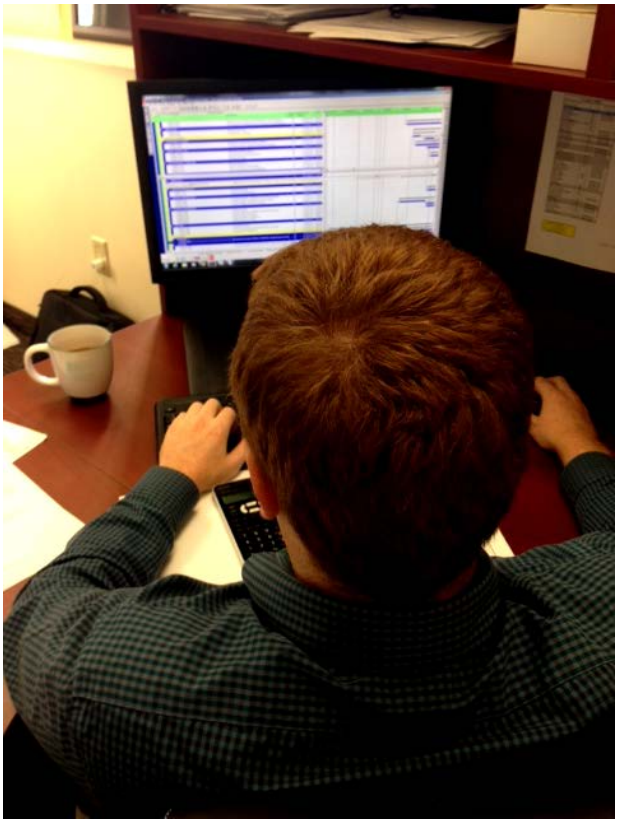

Figure 13: P6 Scheduling

All maintenance will be tracked and recorded by the company's "maintenance control system". All planned maintenance tasks will be scheduled at regular planned maintenance (PM's) intervals as per the manufacturer's recommendations and/or equipment specifications. All maintenance checks at defined intervals (as determined by equipment hour meeting meetings) will include a full checklist meeting or exceeding those recommended by the manufacturer.

12. QUANTITY MEASUREMENT AND PROGRESS ESTIMATES

Progress Estimates will be prepared monthly and agreed upon with the Company. Estimates will be prepared electronically using an approved progress form. The cutoff will be 25th of each calendar month. Review of each estimate will be completed within 15 days. All necessary documentation and backup will be submitted as required including:

- Invoices
- Payroll hours
- Subcontractor progress estimates/invoices
- Equipment hour records
- Accounting records and verifying backups
- Survey and quantity calculations

Figure 14: Haul Trucks being Loaded, Muskrat Falls, NL

Submittals for changes, additional work, or deletion per normal contract procedures

13. DAILY EXECUTION OF WORK, PLANNING AND COORDINATION

To ensure the work is planned, coordinated and executed in the most effective and safe manner the normal operational requirements of the Joint Venture include:

- Daily Cross Shift Meetings – This will bring together carryover information from the previous shift (i.e. what was completed and what remains outstanding). It also plans the requirements for work in the upcoming shift, safety, material and equipment needs and co-ordination, equipment maintenance planned and change-out and downtime, subcontractor requirements (support) and schedules;
- Internal Planning Weekly Meetings by Area/Discipline;
- Internal Weekly Schedules – Two and/or three week look-a-head, and rolling;
- Internal General Weekly Meetings – all areas (includes sub-contractors); and
- Coordination Meetings with other contractors (if required)

Figure 15: Encino Dam

The primary key to the successful integration of contractors and subcontractors is to ensure good communication and timely and accurate information flow between all parties. The Joint Venture will work with the Company to establish project procedures (and adhere to those in

place), meeting schedules, documentation processes, and other protocols to ensure effective communication and transfer of information, ultimately leading to successful collaboration and integration of all concerned as it pertains to the project work program.

During the course of the project work, weekly, monthly, or daily coordination meetings as required, will be held to review, discuss, and co-ordinate the work program and contractor interfacing. A correspondence and documentation protocol and contact list will be established, ensuring a mechanism is in place to control the flow of documents and ensure those required to have select information would receive it and that this information is properly files and easily retrievable.

Typically, prior to each phase of the work, critical component construction, and critical equipment lift/installation, a co-ordination planning session and/or meeting will occur involving all the required parties. The activities, work plans, scheduling, safety requirements, QA measures, contractor interfacing issues, etc. will be reviewed and understood by all before proceeding with the work.

Project scheduling will occur in an on-going manner. These will be updated on a weekly basis (or more often if needed) showing key dates, milestones, material delivery requirements, documentation requirements, methodologies and procedures, anticipated QA and QC requirements, specialty technicians or consultants, hold points, advanced testing and certification requirements, shop drawings, etc. and will be completed to ensure the requirements of all working on the project site are understood and accounted for.

14. MANPOWER SUMMARY

It is anticipated that there will be approximately 1,400,000 person hours of work associated with the execution of the project including administrative, craft, maintenance and subcontractor personnel. Onsite staff is expected to peak at around 75 persons while the craft/hourly (including subcontractors) is expected to peak at approximately 600 persons (including those on rotations).

The staffing and management for the Project will be secured for the most part from the full time experienced team currently available from the partner companies. The majority of this team are staff that currently resides in the province of Newfoundland & Labrador. The remainder will be relocated from existing operations elsewhere in Canada.

Figure 16: Equipment Working at the Muskrat Falls Site.

With respect to the hourly/craft positions, our proposal assumes that the majority of the necessary trade persons with the skills required for the various work components are available

in the Province of Newfoundland & Labrador through the associated union halls and will work under the Site Labour Agreement to be negotiated by the Company.

It is anticipated that all of the non-local persons will avail of the Company supplied camp accommodations.

15. WORK TO BE SUBCONTRACTED

The following is a list of the major work components that may be subcontracted during the project execution:

- Crushing of aggregate on site
- Rock drilling and blasting
- Conventional concrete supply
- Jet grouting
- Rock pressure grouting
- Precast concrete
- Tree clearing
- Tandem owner operators

Figure 17: Drill holes ready for Blasting at Muskrat Falls site

Subcontractors will be incorporated into the daily planning and work activities on the site. They will be required to operate under all health, safety, environment and labour agreement requirements.

Subcontractors will be evaluated on the basis of local and Aboriginal content, their ability to provide the necessary resources to satisfy the project schedule milestones, satisfy safety and quality standards established for the Project, commercial terms, etc. Subcontractors will be selected on the basis of overall best value for the Project.

16. EQUIPMENT MAINTENANCE SYSTEM

To optimize/maximize equipment availability, reduce downtime and minimize unplanned interruptions all equipment will be scheduled for regular preventative maintenance. Maintenance planning will be carried out on site and scheduling will be incorporated with project work planning to permit scheduling down time/change out.

All equipment (not including small tools) arriving on site will be included in the maintenance control system (MCS). All hours worked (meter hours) will be recorded daily and tracked by a Maintenance Planner at site.

Figure 18: Welding Facility at the Muskrat Falls site

Scheduled maintenance will be carried out at site and will be coordinated with the operations team to ensure minimal downtime. Coordination occurs formally on a daily basis in the job pre-shift meetings. Maintenance schedules are posted in advance to allow production crews to plan for this occurrence.

17. TEMPORARY FACILITIES – HEAT, LIGHT, COMPRESSED AIR, INDUSTRIAL WATER

A compressed air system will be provided in the Maintenance Facility.

Temporary heat is included in the Maintenance Facility and all offices, lunchrooms, washrooms will be heated.

Water supply for use during construction as required will be drawn by pump from the river or drilled wells.

Our proposal is based on utilizing power provided by the Company at no cost to the Contractor.

A layout of proposed laydown areas and waste disposal areas is included in Annex A13-5.

18. AGGREGRATE PROCESSING AND CRUSHING

Crushing and screening will utilize the services of an experienced subcontractor.

The crushing plant setup will consist of:

- 1 - Metso C140 Jaw Crusher
- 1 - Metso HP6 Cone Crusher
- 1 - Metso Barmac B9100SE VSI Crusher
- 1 – Incline screen
- 1 – Flat screen
- 1 – High frequency screen
- 1 – Flat screen with spray nozzles
- 1 – Washing screw

The plant will be fed with a Cat 775 off-highway truck and the material will be stockpiled with either a stacker or a Cat 988 size loader. We will utilize power from the Company for the crushing. Power generation by generators has not been included in our proposal but we have made allowance for backup diesel generators in the event of a power failure.

Figure 19: Aggregate Production for the La Breña II Dam

This plant will be set up in the transmission line right-of-way area. Rock from the stockpile in Area A will be utilized to make the laydown for the crushing plant. The initial crushing will produce product for the roads, etc. This will help establish some area from where the rock is currently stored and our intent is to store the RCC aggregates in this area as stockpiled rock is crushed and more area becomes available. If this is not possible, then the aggregates will have to be stockpiled in the transmission line corridor.

A power screening plant will be set up in GD8.

A crushing procedure will be prepared, including the environmental requirements related to the operation. Final testing of materials will be as carried out on site by the Company QC laboratory personnel.

19. TEMPORARY BRIDGE DESIGN AND INSTALLATION

The temporary bridge across the spillway approach channel will consist of one 80m span and one 20m (+/-) span as illustrated on the attached drawing in Annex A13-7. The 20m span may be a truss system or steel girder system.

The south access ramp for the temporary bridge will be constructed with rock fill from the existing rock stockpile. The material will be loaded with a 90t excavator in to 75T off-highway trucks and placed with a Cat D8 dozer. A 10t compactor will be utilized for compaction.

The south abutment will be established in an area of competent rock with minimal overbreak. This may require some realignment of the bridge. It will consist of a concrete retaining wall structure on the edge of the spillway channel. The area between the south abutment and the transition dam will be filled with rock fill. The existing bank in-situ rock will be structurally secured with rock bolts.

An intermediate pier will be established on the north edge of the spillway channel. This will consist of structurally securing the existing rock with rock bolts. A concrete foundation will be poured. A steel pier will be designed and fabricated off site which will be bolted to the concrete. When the bridge is eventually removed, the steel pier will be unbolted and removed. The concrete abutments and retaining wall will be installed outside of the limits of the spillway approach channel and therefore will remain in place.

Figure 20: Spillway Bridge, Long-Sault Rapids, ON (Algonquin Bridge)

We will require temporary closure of all gates to allow for calm water with no flow so that divers can be utilized to unbolt or cut the steel pier from its foundation. A crane will lift the steel from the water. Alternatively, the water could be lowered to elevation +10m to allow removal of the steel structure in the dry.

The existing RCC cofferdam will be utilized for the north abutment.

The bridge will utilize Mabey Universal panels or equivalent in a double-double reinforced configuration for the 80m span and single double configuration for the 20m span. The width will be 5m with a wooden deck. Concrete for the abutment and pier foundation will be obtained from a local supplier in Goose Bay or from the existing on-site concrete batch plant (if available).

The bridge will be assembled on rollers on the access ramp and pushed across the channel with a launching nose into position. It is imperative that the access ramp and bridge line up in a straight line to facilitate launching of the bridge.

The assembly crew will primarily consist of:

- 1 – 80T crane
- 1 – Cat 336 excavator

- 1 - Foreman
- 4 – Ironworkers
- 2 – Labourers

The bridge will have a 75T capacity, but will have the potential for higher capacities for future shorter spans.

The upstream spillway bridge will be removed in the same manner in which it was launched. A nose section will be installed and the bridge will be placed on rollers. The bridge will be pulled back on the south access ramp and dismantled. A section of this bridge will be utilized for temporary access across the powerhouse tailrace when the rock plug is removed. The final disassembly and storage will be done on site. There will be additional costs to the Company should the bridge have to be transported off of the project site.

During the dismantling of the bridge the steel section only of the intermediate pier will be removed as explained earlier.

Once the dismantling of the bridge is complete, the access ramp will be removed. The material will be excavated with 75t excavator and loaded into 40T articulated trucks. A 35t excavator will assist with machine cleaning. The material will be hauled and stockpiled adjacent to the South Dam for utilization in its construction.

20. PERMANENT ACCESS ROADS AND ACCESS ROAD TO LAYDOWN C1

Overburden material will be excavated with a 45t excavator. The material will be either cast to the side for reuse in covering the side slopes or loaded into 40T articulated trucks and hauled to disposal.

Figure 21: Site Roads at Muskrat Falls

Ditch excavation will be completed with a 35t excavator. The material will either be cast and spread or loaded into 40T articulated trucks and hauled to disposal.

Filter fabric will be placed with labourers with the assistance of a 35t excavator. The excavator will be utilized to place the rock fill protection. The rock fill for the protection will be selectively excavated from the existing rock stockpile.

Culvert locations will be excavated with a 35t excavator. The culvert will be placed with the 35t excavator and backfill will be completed with labourers with the assistance of a 35t excavator.

Guide rail posts will be excavated with a Cat 420 size backhoe. Posts will be placed and backfilled with labourers. Ironworkers will be utilized to install the guide rail, fence and gates.

We have based our proposal on the utilization of rock fill from the existing rock stockpile for the approved compactable material. There will be additional costs to the Company should the Company require something different.

The rock fill will be excavated from the stockpile with a 75t excavator and loaded in to 75T off-highway trucks. The material will be placed with a Cat D8 size dozer and compacted with a 10t compactor.

Class A, B and C material will be crushed from the existing rock stockpile with the crushing setup noted in section 18.

The materials will be loaded with Cat 980 size loader in to 40t articulated trucks. The material will be placed with a Cat D6 size dozer and Cat 140H grader. A 10t compactor and water truck will be utilized for compaction.

21. UPSTREAM & DOWNSTREAM COFFERDAM (2015)

Overburden material will be excavated with a 45t excavator and loaded into 40T articulated trucks. The area will be machine cleaned with a 35t excavator.

Prior to the placement of fills on in-situ rock, the foundation area under Zone 1 fills will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form, see sample in Annex A13-8.

Figure 22: Foundation Prep of Main Dam, Wuskwatim, MB

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

Rock fill from the existing rock stockpile will be utilized for the Zone 3 for the starter groins and ramps. The material will be loaded with a 75t or 90t excavator in to 75T off-highway trucks. The material will be hauled on the existing haul road in front of Cofferdam 1 and placed with a Cat D8 dozer. A 35t excavator will be utilized as support in the placement. A 10t compactor will be utilized for compaction, when required.

Till pit TD7 will be utilized for the material required for Zones 1 and 1C. The pit will be cleared, grubbed and any unsuitable material removed and relocated to the outside of the developed area. Perimeter ditches will be constructed in the pit for surface water management. Zone 1 products will not be screened at the source.

The material will be excavated with a 75t excavator and hauled to site with tandem trucks and temporarily stockpiled. The excavator will remove boulders during the loading process by casting them to the side. The material will be reloaded with a 45t excavator in to 40T articulated trucks and hauled to the placement area. The material will be placed with a D6 size dozer supported with a 35t excavator. A 10t compactor will be utilized for compaction.

Zones 2A and 2C will be loaded with a Cat 980 loader into tandems and hauled to site and stockpiled. The material will be reloaded with a Cat 980 loader into 40T articulated trucks and transported to the placement area. The material will be placed with a 35t excavator and/or small dozer and compacted with a 10t compactor. A water truck will assist compaction when required.

22. TEMPORARY STOCKPILE OF ZONE 3 CLASS 2 AND CLASS 1

Approximately 30,000m3 of zone 3 class 2 and 15,000m3 of zone 3 class 3 will be hauled in 2015 to the riverside area of the RCC cofferdam and stockpiled. The material will be loaded with a 90t excavator into 75T off-highway trucks. A 75T excavator will be used to stockpile the rock blocks.

23. EXISTING COFFERDAM REMOVAL

The existing cofferdam removal will commence with the excavation of Cofferdams 2 and 3. It is not anticipated that the spillway discharge area will have to be flooded with water prior to the removal of the cofferdams as the downstream water level is expected to be below that of the spillway discharge channel elevation. If this is not the case, the area will be flooded via pumping prior to the removal of Cofferdam 2.

The work will start with the removal of Cofferdam 2. The cofferdam will be excavated with a 120t excavator and loaded into 75T trucks. Material that can be salvaged will be stockpiled or moved to placement as in the case of the expansion of Area J; otherwise the material will be hauled to a disposal area. Initially it is anticipated that approximately two thirds of the material will be excavated, in order to create a haul road for the hauling of the RCC Cofferdam should it be necessary to do so. After the RCC Cofferdam has been removed, the remainder of Cofferdams 2 and 3 will be excavated. This will be accomplished with a 75t excavator and 40T articulated trucks. A 35t excavator will assist by machine cleaning the area.

After Cofferdam 2 is sufficiently removed, the spillway approach channel will be watered up via pumping. Once complete, the excavation of Cofferdam 1 will commence. The initial excavation will take Cofferdam 1 down to one meter of elevation above the river level at that time. This will be accomplished by utilizing a 90t excavator and 40T articulated trucks. Again, any material that can be salvaged will be stockpiled. The remainder will be hauled to disposal.

After the excavation is complete to one meter above the water, the remainder of the excavation will commence with the same crew. It is expected that all of the material from this excavation will have to be hauled to disposal.

24. RCC COFFERDAM REMOVAL

The existing RCC Cofferdam will be drilled and blasted. The plan is to drill the excavation with 90mm holes and blast with a powder factor of approximately 0.5 kg/m3. This will be done one row at a time.

The material will be excavated with a 120t excavator and loaded into 75T trucks and either hauled to disposal or it will remain until it can be utilized in the upstream cofferdam as Zone 3 material. In this case the material will be loaded with a 90t excavator into 40T articulated trucks and hauled to the upstream cofferdam.

Figure 23: RCC Cofferdam to be removed

Our proposal is based on being paid for removal and placement in the upstream cofferdam. Additionally, there is no consideration for facing concrete, surface smoothing, etc. for the vertical face of the remaining section of the existing RCC Cofferdam. This would be additional to the proposal.

25. TAILRACE ROCK EXCAVATION AND UNDERWATER EXCAVATION

The tailrace excavation will commence immediately after the removal of the existing cofferdams. The existing transmission line will have to be relocated by the Company prior to this date.

The excavation will start with the construction of a temporary access road. This will be completed with a 75t excavator, 40T articulated trucks and a Cat D8 dozer with the support of a 35t excavator for slopes. The road will be capped with rock fill from the existing rock stockpile.

Figure 24: Underwater Excavation, Wuskwatium Generating Station, MB

Utilizing the Bench Blast Survey Plan prepared for each bench/blast, holes will be surveyed/positioned and the drill depth for each hole provided. Line, buffer and production hole diameter requirements will be identified and each hole will be drilled to the required depth.

Bench Blast Survey Plan will be prepared in AutoCAD drawing format. It will identify;

- Bench location and co-ordinates
- Bench depth and grade requirement
- Pattern
- Line, buffer and production hole locations, spacing and burden
- Sub-drill requirement
- Wall step/benching if applicable

- Diameter for each hole type
- Area and volume

Hole verticality will be controlled with the drill boom monitoring system and hand levels with batter arrangement or templates. The drill speed will be monitored and adjusted, following a review of the blast results, as required to control drift.

Following the drilling operation on each bench, and prior to the loading of explosives, an as-drilled survey of hole locations will be carried out. Also, each individual hole will be measured to verify grade requirements. Holes below the specified grade will be filled with stemming material to bring the bottom to the specified elevation.

In conjunction with the Bench Blast Survey Plan the blast design will be prepared. The blast design will be detailed on a 'Blast Plan Notice" form, see Annex A13-9. This form will serve as the blast notification form and will contain the design information for each individual plan. The information will be transmitted to the Company's Representative prior to (minimum 24 hours) the commencement of loading of the blast. The proposal and notification will identify:

- Blast number
- Blast schedule – date and time
- Location, structure, bench, co-ordinates
- Blast volume
- Hole pattern, depth and diameter
- Firing sequence/layout
- Explosives type and quantities
- Explosive arrangement per hole type
- Monitoring device location and distance to the blast
- Max load per delay
- Collar requirements

Blasting in each area will initially be carried out conservatively on a trial basis using light loading. Initial results will be monitored to confirm original assumptions and or adjust the Master Blasting Plan.

Final Wall drilling will be carried in all rock areas indicated on the drawings, in channel areas, and as required by the Company's Representative.

Figure 25: Blast at Muskrat Falls, NL

Final wall drilling alignment will be controlled and located using GPS/total station survey. Each individual face will be clearly marked on the rock surface. In areas where the rock is not conducive to maintaining these marks, an offset line with wire can be utilized. Typically the line will be located on the neat line for all areas. The results will be monitored and procedures adjusted accordingly.

After each blast and material excavation/muck removal, the line drilling results will be evaluated. The methods and procedures will be adjusted/corrected as required (and documented) to address issues that may arise, including actual changes to the rock conditions and geology.

Perimeter holes will be drilled at 600mm spacing

Buffer Holes will generally be based on the following pattern:

- 75mm dia. holes with spacing 1500 mm centre to centre

Production Holes pattern will be based on:

- 90 - 100 mm dia. holes with spacing and overburden varying with bench height

Production blasts will vary in size with the optimum range from 1000 to 15,000 m3 (there will be blast smaller than this depending on location, bench height, etc.).

It is anticipated the bench heights will range from 2 - 10 meters depending on topography and excavation configuration.

Explosives will be loaded as per the particular blast design plan for the blast being prepared. The blasting crew will be supervised by a qualified foreman and experienced certified blaster (meeting all provincial and federal certification and training requirements). Holes will be properly stemmed after the explosives have been placed. Blast areas ready to fire will be secured and constantly monitored until the blast occurs.

Depending on the final blasting methodology designed and selection of the explosives supplier, the typical blasting products being considered for use on this project include:

- Packaged & bulk explosives:
  - fortel plus
  - senatel powersplit
  - booster sensitive emulsion
- Initiation products:
  - nonel handidet
  - pentex booster
- Detonating cord:
  - 18 grain, 25 grain and 400 grain

Electronic detonators will not be used.

Final loading design of the first and second line of buffer holes will be governed by best results attained in the early blasts. Production holes will use a cap sensitive booster in the toe and bulk emulsion in the column.

The Master Drill and Blast Plan will take into account the vibration limits identified in the contract documents. The firing sequence, powder factor, blast confinement and free faces will

be considered to provide the required vibration control. To monitor the vibrations at critical areas a seismograph will be used. The results will be recorded, forwarded to the Company's representative and accumulated results plotted and utilized to adjust subsequent blast operations throughout the project work.

Each day when a blast is scheduled, notification with the time(s) and location, will be posted on a "Blast Notification Board" in the campsite and in the camp cookhouse. The main gate security will be notified and requested to post the notification such that all personnel/visitors coming to site will be notified. A Blast Notification board will be erected at the main gate for this purpose.

After the "Authorization for Blasting" is completed, prior to each and every blast the area affected by the blast will be secured. All personnel will be removed from the area. The proper signal procedure will be followed prior to the blast and the "All Clear" given after the blast.

In addition, the area will be monitored to ensure no wildlife wanders into the blast zone.

The rock will be excavated with a 120t excavator and loaded in to 75T off-highway trucks. The initial material will be placed in the river in order to build a working platform from which to drill and case the underwater rock. The remainder of the rock will be hauled to stockpile.

The rock excavation will be drilled, blasted and excavated to elevation 9, including the existing ramp.

A 20m wide rock plug will be left at elevation 9 to protect the powerhouse. The plug will be drilled and capped.

The underwater excavation will be drilled and cased from the rock platform on a 3.0m x 3.0m pattern with a minimum of 2 metres of subdrill. The material will be loaded with a powder factor of approximately 2.0kg/m3 and blasted sequentially. Electronic detonators will not be used.

The rock, including the access pad, will be excavated with a 120t excavator and a 90t excavator in a long stick configuration. The material will be loaded in to 75T off-highway trucks and hauled to a stockpile area. The underwater profile will be mapped to ensure no high points remain and the desired elevation is achieved. An illustration of the tailrace rock removal scheme can be found in Annex A13-4.

26. TAILRACE PLUG REMOVAL

The tailrace plug will be predrilled in 2016. In 2017 the holes will be checked and either blown out or re-drilled as needed.

The plug will be loaded with a powder factor of approximately 1.2 kg/m3. Prior to blasting, the tailrace will be filled with water via pumping. Our blasting timing sequence does not require an air bubble curtain and none has been included in our proposal.

Figure 26: Downstream Rock Plug Removal, Wuskwatim Generating Station, MB

Once the plug is blasted, the material will be excavated with a 75t excavator assisted by a 90t excavator with a long stick configuration. The material will be loaded into 40T articulated trucks and hauled to a stockpile area.

27. ROCK BOLTS AND ROCKFALL NETTING

Rock bolts and netting will be installed in areas of excavation as directed/indicated by the Company's representative. Rock bolt holes will generally be installed as the excavation proceeds on each bench. A hydraulic drill will be used to drill holes and install the rock bolts as the excavation progresses and after the area is scaled and free of loose materials. Rock bolts will be 25 mm and 35 mm diameter hollow core mechanical anchors, fully grouted.

Figure 27: Rock Bolts being Installed, Muskrat Falls, NL

Rockfall netting will be pinned in place using a combination of mesh pins and the rock bolts. Access to install anchor pins and place rockfall netting will be achieved using appropriately sized manlifts (i.e. 60' to 120' JLG's).

28. UPSTREAM COFFERDAM

The upstream cofferdam will commence when the spring freshette allows the placement of rock in the river. This has been tentatively scheduled as May 23, 2016. However this date may change depending on the spring runoff conditions.

The work will commence with the upstream groin followed in a staggered manner with the downstream groin.

The initial placement will start with the rocks that have been stockpiled in 2015. The rocks will be loaded with a 90t excavator in to 75T articulated trucks. The smaller material will be placed with a Cat D8 dozer and the larger rocks will be placed with a 75t excavator.

The remainder of the material will be hauled across the upstream and downstream bridges. We will utilize two hauling fleets on a day and night basis. The rock will be loaded with a 90t excavator in to 40T articulated trucks and placed with either a Cat D8 or 75t excavator, see Annex A13-11.

Once river closure is obtained, the dumped filters 2E and 3F will be placed. The 2E will be hauled from granular pit GD8 in tandem dump trucks and stockpiled on site. The materials will then be loaded with a Cat 980 loader into 40T articulated trucks and hauled across both the upstream bridge and the downstream bridge. The material will be placed with a Cat D8 dozer supported with a 35t excavator.

Figure 28: Building River Closure, Wuskwatim, MB

Once the dumped filters are completed, the Zone 1 dumped material will commence. Till pit TD7 will be utilized for the material required for Zones 1. The pit will be cleared, grubbed and the unsuitable material removed and relocated to the outside of the developed area. Perimeter ditches will be utilized in the pit for surface water management. Zone 1 products will not be screened at the source.

The material will be excavated with a 75t excavator and hauled to site with tandem trucks and temporarily stockpiled. The excavator will remove boulders during the loading process by casting them to the side. The material will be reloaded with a 45t excavator into 40T articulated trucks and hauled to the placement area. The material will be placed with a D8 size dozer supported with a 35t excavator.

We will utilize a fleet placing on the downstream groin and another fleet placing on the upstream groin.

The downstream placement will try to establish a minimum seal all the way across the cofferdam so manageable water may be established as soon as possible, thus allowing the commencement of the foundation preparation activities.

The upstream placement will concentrate on getting the Zone 1 to grade so that the Jet Grouting (if required) can commence. A jet grouting specialist subcontractor will be utilized for the grouting.

Figure 29: Earthfill Dam construction, Mont Wright, QC.

After the grouting requirements are completed, the remainder of the upstream cofferdam will commence.

The Zone 1 material will be sourced from TD7 in the same manner as the Zone 1 dumped material. The material will also be hauled to the dam in the same manner as the Zone 1 material. Again, processing of the Zone 1 materials is not included in our proposal other than the removal of boulders with an excavator. The material will be placed with a Cat D6 dozer supported with a 35t excavator. A 10t compactor will be utilized for compaction. In the event of rain, the Zone 1 will be sealed with a smooth drum roller and placement stopped until the weather event has ceased.

Zones 2A and 2C will be processed in GD8 in 2015. The material will be loaded with a Cat 980 loader into tandem dump trucks and hauled to site and stockpiled. The material will be reloaded at site with a Cat 980 loader into 40T articulated trucks and hauled to the placement area. The material will be spread with a 35t excavator. A 10t compactor and water truck will be utilized for compaction.

Zone 3A will be loaded with a Cat 980 loader into 40T articulated trucks and hauled to the placement area. The material will be placed with a 35t excavator. A 10t compactor and water truck will be utilized for compaction.

Zones 3C and 3D rock fill will be taken from the existing rock stockpile at the site. The material will be loaded with a 75t excavator into 40T articulated trucks and hauled to the placement area. The material will be spread with a Cat D8 dozer assisted by a 35t excavator. The excavator will remove any oversize from the 3C and it will either be placed in the 3D zone or hauled away from the site.

29. DOWNSTREAM COFFERDAM

Figure 30: Earthfill Cofferdam Construction, Muskrat Falls, NL

The downstream cofferdam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

The downstream cofferdam will be removed in a similar manner as the intake cofferdam.

30. INTAKE COFFERDAM

The overburden material will be excavated with a 75t excavator and loaded into 40T articulated trucks and hauled to a disposal area.

Prior to the placement of fills on in-situ rock, the foundation area under Zones 1 will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form.

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

The remainder of the Intake Cofferdam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

The proposal is based on local water management only, utilizing small submersible pumps. The water will be pumped to the nearest existing sediment pond. The proposal does not include for any treatment, flocculation of the discharged water or construction of additional sediment ponds.

The Intake cofferdam will be removed with the same crew that removed the south access ramp. The material will be hauled to a disposal area.

31. RCC TRIAL SECTION

The purpose of this trial is to demonstrate effectiveness of all equipment, techniques and materials proposed. It will serve as a practice, training and orientation. The RCC mix designs will be determined by the Engineer. It will be completed on a prepared rock foundation in a location to be determined on site.

The formwork system utilized will be the same as the system to be used in the construction of the North Dam. Sample drawings are included in Annex A13-10. The upstream panels will be raised with a 40t crane located on the RCC and the downstream panels will be raised with an 80t crane located on the outside of the trial section.

The RCC will be hauled from the RCC Plant in 8m3 agitator trucks. It will be conveyed to the placement area with a Creter crane.

Figure 31: General View of the Test Section at Portugues Dam, PR, USA

The material will be spread with a Cat D5 dozer and compacted with a 12t compactor. Joints will be cut with a plate on a Cat 420 backhoe. Waterstop will be installed with carpenters and labourers will handle the water misting and curing.

Facing concrete will be placed with a pumper truck. Labourers will aid in placement and vibration.

Grout for GERCC will be made in a grout plant. The grout will be placed with a grout crew and vibrated in place after the RCC is placed.

32. RCC MIX DESIGN - TRIAL MIX PROGRAMME

1. Goal

The target RCC mix will be a mix with the better achievable properties for the concrete in its fresh and hardened state, within the limitations of the materials available.

The mixture proportions of the RCC have to be designed in order to obtain the required in-situ properties at the joints in the dam, rather than to obtain an unnecessary high compressive or tensile strength of the parent (unjointed) concrete. To achieve a good on-site overall concrete, it is essential to design an "RCC-friendly" mixture, that is, a "cohesive" RCC that does not segregate during transportation, dumping, spreading and compaction, and with enough excess of paste with respect to the compacted sand void ratio.

Our overall approach to the RCC mix design program will be to evaluate mixes that will enhance workability, allow for good cohesion, provide adequate strength gain over a longer period of time, provide low heat generation and permeability, allow for longer RCC maturity and better bonded lift joints to achieve the necessary design requirements for the project.

2. Mix designs

The RCC mic design program will develop mixes that will meet the design requirements for the project, have a high level of quality and take cost into consideration. We will target mixes that will embrace:

a) High cementitious content RCC mixes with
b) High flyash content on total cementitious, with the aim, among others, of attaining
c) High paste content, by having a Vpaste/Vmortar ratio at least 10% in excess of the compacted sand void ratio
d) Strength development at a slower rate. We will bracket our cement contents in the mix design program to target the long term strength requirements for the project and reduce the heat generated in the dam
e) A high level of workability: target Vebe consistency of 13 +/- 3 seconds
f) Better bonded lift joints. We will use setting time retarder to lengthen the joint maturity of each horizontal lift, minimizing costly joint preparation associated with

shorter joint maturities, and optimizing the RCC placement schedule. This also provides for a better monolithic structure

g) The retarder admixture also will have water reduction as a secondary effect, to further lower the W/(C+F) ratio, so that we may further reduce our cement content and heat being generated in the mix and the dam

h) High densities. We will optimize all of the materials to be used in the RCC mix designs to achieve the highest theoretical density possible and achieve the required in place densities in the dam

i) For the aggregates target combined curve we will use as a guideline one of the most used state of art of RCC mix design

3. Materials

According with the information we have at this stage, the materials more likely to be used are completely adequate for producing high quality RCC.

a) Cement: ASTM C150 Type I

b) Fly ash: ASTM C618 Class F

c) Admixtures: Set retarder ASTM C494 Type D, Air-entraining ASTM C233

d) Aggregates: The following aggregate types will be optimized to achieve the highest density possible and to assist in the workability of the overall mix:

- Group 1: 0 to 5 mm
- Group 2: 5 to 10 mm
- Group 3: 10 to 20 mm
- Group 4: 20 to 40 mm

4. Logistics

Our plan is to use the Nalcor's on-site laboratory to develop the RCC mix design program and perform all of the necessary testing for the mix design program.

If it is determined for any reason that the On-site laboratory is not suitable and/or not available for RCC testing , we will mitigate this by shipping test samples to an off-site laboratory in

Ontario well in advance to enable us to start in a timely manner with the RCC mix design program. In this scenario, additional costs will of course apply but can only be determined depending on the schedule and site conditions at that time.

5. Operating procedure

5.1.- Development of mix design program, which will include the testing to be performed for individual materials for RCC, trial batches to be performed and fresh and hardened property testing of the RCC

5.2.- Materials evaluation of each material type to be used in the RCC mix

5.3.- Aggregate testing for gradation, flat and elongated, specific gravity, fractured faces, loss to degradation, sand equivalent, voids content and maximum density

5.4.- Trial batching of RCC mix designs- In principle, we will bracket 3 different cementitious (cement+fly ash) contents and 3 different cement contents for each, to be trial batched for evaluation of a final mix. In total we shall have 9 different mixes which will show a wide spectrum of results. The final RCC mix design chosen could be one interpolated from among the above nine

5.5.- Fresh property testing of the RCC, which includes: Vebe, unit weight, moisture content, setting time and cylinder fabrication

5.6.- Harden property testing of RCC, which includes: Compressive strength testing performed on standard and accelerated cured cylinders

5.7.- Reports:

a) Preliminary Report. To be issued after conclusion of the laboratory Trial Mix Program, including the batching and testing phase with results of compressive strength tests up to 14 days. This Report will summarize the mix design program, including all testing performed for RCC and individual RCC materials.

Ideally, taking advantage of the results of the compressive strength tests on accelerated cured cylinders, a certain mix could be pre-selected as the recommended one, for its use in the Trial Demonstration Section.

b) Second Report. To be issued after gathering all the compressive strength tests up to 91 days. In this Second Report one specific mix will be recommended for its implementation at the Trial Demonstration Section.

c) Final Report. To be issued after gathering all the compressive strength test results up to 1 year. In this Final Report, and including the information available from the Trial Demonstration Section, the mix finally used at the Trial Demonstration Section will be either ratified or, on the contrary, somewhat refined in the parameters that would be deemed advisable. This shall take into account the long term compressive strength data and the behavior at full-scale of the mix recommended in the Second Report.

6. Schedule

6.1.- Start activity of RCC Mix Design: One month after crushing plant starts operating and suitable aggregates are available to start the Trial Mix Programe (TMP). For the purpose of this partial schedule, we call it Day 0

6.2.- Mobilization of specialized testing equipment: at least 2 weeks prior to start the TMP (Day 0)

6.3.- Shipment of cement, fly ash and admixtures: at least 2 weeks prior to start the TMP (Day 0)

6.4.- RCC Mix Design Program: 1 week, starting on Day 0

6.5.- Aggregate testing and preparation to SSD: 1 week, starting on Day 0

6.6.- Small trial batches to determine water demand and dosage rate of admixtures: 1 week, starting on Day 0

6.7.- Large trial batches for different mixes: 2 weeks, starting on Day 7 (including: Vebe, unit weight, moisture content, setting time and manufacture of cylinders)

6.8.-Standard cure compressive strength tests up to 14 days: 3 weeks, starting on Day 14

6.9.- Accelerated cure compressive strength tests at 14 days: 2 weeks, starting on Day 21

6.10.- Standard cure compressive strength tests 28 to 365 days: 1 year, starting on Day 35

6.11.- Preliminary Report (compressive tests up to 14 days): 2 weeks, starting on Day 28

6.12.- Second Report (compressive tests up to 91 days): 1 week, starting on Day 112

6.13.- Final Report (compressive tests up to 365 days): 1 week, starting on Day 386

7.Qualification

Our RCC mix design & testing program is based on our knowledge and experience gleaned on many other RCC dam projects which we believe is all-encompassing. Should Nalcor wish to make any modifications or improvements to the program we will gladly review and accommodate this. However should this entail additional time, costs and delay to the program we reserve the right to be compensated accordingly.

33. ADVANTAGE OF USING THE SPLIT-LEVEL PLACEMENT METHODOLOGY TO PERFORM THE NORTH DAM

In RCC dam construction there are five known methods of placement:

- Horizontal placement
- Slope-layer placement
- Split-level placement
- Block placement
- Non-continuous horizontal layer placement

The horizontal placement method, with layers of RCC being placed horizontally from one abutment to the other, is generally considered the simplest and preferred method, as long as the concrete plant has adequate capacity. This method is specified for the Muskrat Falls North Dam.

However, concurring that the above is true for most cases, there are particular occurrences where certain conditions can make the split-level placement method more advantageous. The O'Connell-Dragados Canada JV strongly believe that the Muskrat Falls North Dam is one of these cases in which the potential disadvantages of the split-level placement method (none of them existing in this case, as we will see), with respect to the horizontal placement method, are enormously overcome by the advantages that it can incorporate. For this reason, we will explain the logic behind our statement below.

The main two reasons to consider the horizontal placement method as the preeminent method are:

- the speed of construction; and
- the minimization of programmed cold joints.

In certain cases, the split-level construction method can improve the speed of construction, with very slight increment (or none) of the programmed cold joints (using a proper split-level approach), or a reduction of these joints. Besides this, more advantages can also be incorporated into the construction methodology such as:

I) better quality of the hot joints, and thus, of the monolithic structure;

II) less risk of occurrence of warm and non-programmed cold joints, which ultimately may lead to supposedly less total cold joints in the final structure;

III) taking advantage of good planning to avoid delays due to the mandatory stops which are impossible to avoid in the Horizontal Placement Method (i.e. placement of horizontal galleries and other obstacles in the dam body), reduction of the construction schedule; and lastly,

IV) a more economic dam; the cost of resources is less and we can build the dam with 2 – 10 hour shifts versus 2 - 12 hour shifts that will be required for the Horizontal Placement Method.

V) a safer work environment

It is extremely important to not mistake or assimilate the split-level placement method with the block placement method, implemented in RCC dams with concrete plants sized far below what is adequate. Also, it is important to mention that the split-level method can have different approaches, with greater or fewer programmed cold joints.

After some precedents around the world of the block placement method, the split-level method was introduced in the largest RCC dam in the world at the time, Beni Haroun in Algeria (2000) constructed by Dragados. Because of the shape of the valley, for a certain period the volume of the horizontal layers was very high and close to the limit of the capacity of the concrete plant. The dam was thus split into two halves with 14.4 m lifts (each of 48 layers of 0.3 m) placed alternatively on one or the other half of the dam. Therefore, for the stretch of the dam height in which this method was implemented, a cold joint in each half of the dam every 14.4 m was produced. But, for sure, many warm and non-programmed cold joints were avoided, with important savings in schedule and cost. This unquestionably improved the quality of the hot joints, deriving this from working within lower exposure times between consecutive layers.

All the plant and equipment at Beni Haroun was sized for a capacity of 500 m^3/h of RCC placement. It was considered impractical to increase this capacity for only the stretch of the dam height in which this would be necessary. Plus, the number of programmed cold joints introduced was negligible compared with the advantages encountered.

Additionally, this method has the great advantage that the formwork (or precast elements) for the horizontal galleries can be erected on one half of the dam while the RCC is placed in the other half, which means a further shortening of the placement schedule.

Figure 32: Split-level Placement Method Implemented at La Brena II Dam in Spain (2007-2008)

For the construction of what is currently the largest RCC dam in Europe, La Breña II in Spain (2007-2008), Dragados followed the same reasoning and the split-level method was implemented in a portion of the dam. In this case we used RCC ramps to move the mobile machinery from one half of the dam to the other at the end of each lift phase, but this may be avoided by using large cranes to move machinery.

In the case of Muskrat Falls, in principle it does not seem the reason to use the split-level method is the capacity of the plant and equipment; the required 400 m^3/h in the specifications

is well above what is normally used for RCC dams of similar volume. But, due to the "U" shape of the "valley" from the first layers of the dam and for a significant portion of the dam height, the volume of the layers is above 2000 m^3. Due to the plan shape of the layers, the formwork raising will also become a critical activity; especially on the downstream face since it has to be raised in full after every four layers.

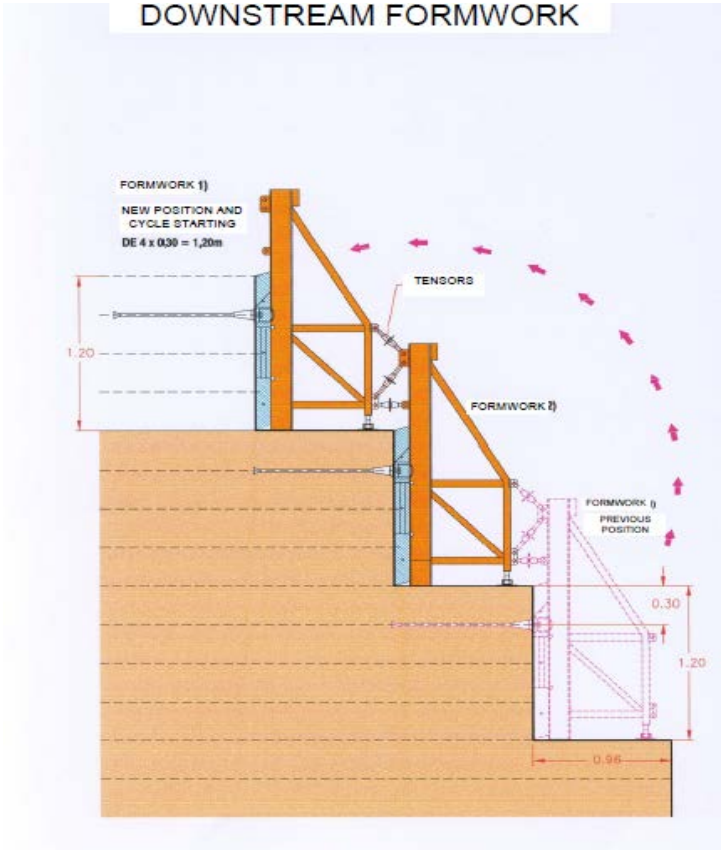

Figure 33: Dragados' Proprietary Formwork System for RCC Construction

Additionally, the length of transport for the trucks on the dam is significant, and due to the congestion of mobile machinery on the dam required for the different activities specific of the RCC, and for safety reasons, the placement output will be subject to slowdowns and hindrances. Thus, despite the high sizing of the concrete plant and conveyors, the operations on the dam will become an important bottle neck for the productions that could be obtained.

It seems a paradox, but the detailed study we have carried out, based on our experience in all sizes of RCC dams, reveals that notwithstanding the, in principle, oversized plant and equipment to be employed, there is a high risk of generating warm joints, which some or many of them could end up as cold joints for a significant part of the height of the dam using the horizontal placement method.

The resuming of RCC placement after a warm or cold joint is hindered by the fact that grout or mortar has to be placed in advance (but not too much in advance) of the RCC, which puts this first layer after the warm or cold joint in danger of not being covered by the second layer within the allowed time for the hot joint. This may lead to a "vicious circle" of working in a warm joint basis for several consecutive layers which is not acceptable.

Furthermore, the dam design includes four levels which are fitted with a horizontal stretch of gallery, the fourth being the access gallery at block 27, and as commented before the presence of horizontal galleries favors the split-level method. In fact, the split-level method approach we are proposing for Muskrat Falls North Dam is not a "balanced" one, with lifts of the same height at each half of the dam. We have arranged the lifts in each half of the dam based on the levels of the horizontal stretches of galleries in them, due to most of these levels are encountered only in one of the halves of the dam.

Because of the above, in this particular case the balance of programmed cold joins is favorable to the option of the split-level method, with a reduction of the number of them, as we show in detail:

- Cold joint at level 8.49: appears in full dam in both methods
- Cold joint at level 10.89: disappears in left half of dam for the split-level method
- Cold joint at level approx. 11.49: appears in left half of dam for the split level method, due to the winter stoppage
- Cold joint at level 13.29: disappears in left half of dam for the split-level method
- Cold joint at level 22.89: disappears in right half of dam for the split-level method
- Cold joint at level 36.39: appears in full dam in both methods

It is important to take into account that this schedule can be accomplished with only the following equipment:

- One concrete plant of 200 m^3/h, instead of two concrete plants for a total of 400 m^3/h

- Five concrete agitator trucks and one creter-crane/telebelt/concrete-placer type machine of 200' boom and 24'' width belt, instead a conveyor system of 400 m^3/h
- Machines for spreading, compaction and rest of operations on the dam sized for 200 m^3/h instead of 400 m^3/h

In our proposal, we have allowed for a complete spare system (i.e. RCC plant, agitator trucks and creter crane) to provide the specified redundancy. Additionally, this spare capacity can be brought into production where possible to improve schedule delivery.

The creter-crane type machine is a much more flexible, reliable and simpler solution than the conveyor system. The conveyor system requires much time to set-up once manageable water is achieved. This will affect the start of placement for RCC. This problem is eliminated with a Creter Crane and Agitator Trucks. In addition, if you lose a conveyor, you lose 100% of the production. It does not require erection and dismantling, whereas the conveyor system requires a complex installation process with several towers/masts to be erected. Lastly, the conveyor system requires reconfiguring to feed concrete to the upper part of the left abutment.

Figure 34: Creter-crane Type Machine, fed by Agitator Trucks, being used for RCC Dam Construction

There are advantages in the quality of the structure and somewhat in the schedule. Besides these advantages, there is also the potential for improving safety conditions. The erection, dismantling and reconfiguration of the conveyor system are very complex and involve certain safety risks. Additionally, with the creter-crane type machine, the dump trucks hauling RCC on the dam are avoided. In addition, there is also the advantage of the reduced cost of this alternative.

In conclusion, we propose to use the split-level placement method in this dam from the beginning. We are introducing the five advantages explained previously, including a slight reduction in the construction schedule. The schedule implementing this method involves a reduction of approximately only 11 days with respect to the schedule using the horizontal placement method, but it is important to stress that it is a more consistent schedule, something crucial for the Muskrat Falls Project as a whole, due to the lower risk of occurrence of warm and cold joints.

34. NORTH DAM (2016)

The clearing of the North Abutment will be done by an experienced subcontractor.

The overburden material in the North Abutment will be excavated with a 75t excavator and loaded into 40T articulated trucks and hauled to disposal. A 35t excavator will be utilized for machine cleaning.

A dewatering system utilizing two 8" 100hp submersible pumps with heat traced HDPE pipe will be installed for the management of water. A third pump will be purchased and installed for standby purposes. The water will be pumped to the sediment pond already constructed on the site. No treatment or flocculation of the water is included in our proposal. The proposal is based on the utilization of power supplied by the Company. One 350kw generator will be installed for standby and temporary outages only.

Figure 35: Foundation Clean-up (La Breña II Dam, Spain)

Foundation preparation activities will take place prior to the placement of any material on any of the dams or cofferdams. Foundation preparation includes dental excavation, foundation cleaning with water jets, air jets and hand tools, and treatments such as dental concrete and slush grout.

Dental excavation will be executed using a 35t excavator or smaller to remove any loose rock fragments, or isolated deposits of material that have collected due to the surficial geology. As

the effectiveness of mechanical excavation is reduced, foundation cleaning will take place using pressurized water, hand tools such as brooms and picks, 3 inch electric pumps and a small excavator with an air jet attachment. Fine materials and loose rock fragments will be removed to a reasonable standard during foundation cleaning.

Following the completion of foundation cleaning and once the foundation is dry with no standing water, dental concrete will be placed in the voids of the rock surface to provide a suitable surface on which till or roller compacted concrete materials can be effectively placed.

Figure 36: Dental Concreting of Uneven Foundation (Wuskwatim Generating Station, MB)

Formwork for the RCC will be a combination of fabricated on site and prefabricated (i.e. EFCO, Aluma, or Peri) systems and will be constructed of steel, wood or a combination of both. Forms shall be sufficiently rigid to prevent lateral or vertical distortion from the loading environment to which the forms will be subjected. All forms will be set to the design grades, lines and radii as shown on the Construction Drawings. Forms are to be anchored and firmly set over bearing areas to prevent displacement during concrete placement. Inspections are to be completed by the Project Engineer and/or the QC Engineer. Any correction of grade or alignment prior to, and at any time during concrete placement will be documented on the pour release checklist.

Figure 37: Downstream Formwork (La Breña II Dam, Spain)

Materials/forms intended for use in the work will be submitted for approval with the relevant data submittals.

The surfaces of all formwork to be in contact with concrete will be thoroughly cleaned and treated with Elsro #740 form release oil (or approved equal)before concrete placement. The form oil will be applied using a brush or hand sprayer to ensure forms have an even coating without excess or drip.

Forms will not be stripped until the required structural strength has been reached by the concrete and the governing strip period has been reached for the specific pour. Removal of forms will be done in a manner to avoid damaging or spalling of the concrete.

Ties will have a minimum of 100 mm setbacks and use a cone to provide neat, regular hole to be finished with rods being a minimum of 100 mm from the finished surface. All exposed finished edges/corners will be chamfered.

Curved formwork sections will be either site manufactured or prefabricated off site depending on the program schedule. All fabrication drawings (including rib layouts, bracing sections, etc.) will be prepared, stamped and submitted to the Company for review and approval.

All formwork will be detailed on form/lift drawings that will detail the form system, construction details, materials, tie system, spacing, special rigging, finish requirements, etc. In general, it is anticipated to erect steel strong backs (approximate height of 3.0 m) at required spacing. After the strongbacks are erected and braced to the exterior of the RCC structure's previous lift, panelized formwork is than installed in sections ranging in height from 600 to 1200 mm to facilitate the lift heights and to ease handling concerns. The steel strong backs will also be employed to erect temporary safety fencing for workers placing forms and during concrete placement operations.

Figure 38: Upstream Formwork (Portugues Dam, PR, USA)

Placement of concrete, finishing of vertical services and the erection and removal of the form systems will be supported on site by a 40 T Rough Terrain (RT) on the dam and an 80T crane on the upstream side in 2016

Prior to the placement of concrete on the prepared in-situ rock (i.e. surface that has been previously been cleaned, treated with slush grout and dental concrete placed where required), the foundation area will receive a final cleaning using gas / electric pumps (for wash water) and labourers with hand tools. Prepared foundation areas will be viewed and signed off on the

appropriate Foundation Inspection/Release form (refer to Appendix I) and just prior to the placement (any additional/touch up cleaning will be carried out at that time) of the concrete and will be signed off on the pre pour inspection checklist itself.

Figure 39: Concrete Plant and Conveyors at Enciso Dam, Spain, currently under construction

The RCC will be transported from the plant to the dam in agitator trucks to a creter crane where it will be conveyed to the dam for final placement. The material discharged from the creter crane will be spread with a Cat D5 dozer. Compaction will be achieved with a 12t compactor. There will be a placement crew that will work from the abutments towards the center where the feed from the swinger crane will be located. The material will be spread with Bulldozers D5 in layers of no more of 300mm after compaction.

The placement of RCC will continue on a day and night operation until the section as specified is completed.

Joints will be cut with a plate on a Cat 420 backhoe. Waterstop will be installed with carpenters and labourers will handle the water misting and curing.

Figure 40: Transverse Joint Cutting with Vibrating Plate (Portugues Dam-Test Section, PR, USA)

Facing concrete will be placed with a pumper truck. Labourers will aid in placement and vibration.

Grout for GERCC will be made in a grout plant. There will be two grout plants. The grout will be placed with a grout crew and vibrated in place after the RCC is placed.

Figure 41: Vibrating GERCC (Portugues Dam-Test Section, PR, USA)

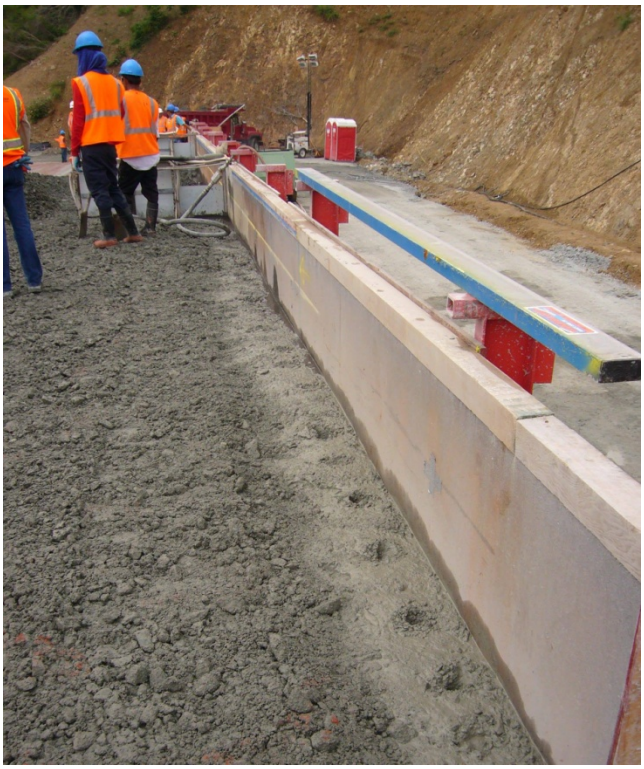

Figure 42: GERCC after Vibration (Portugues Dam-Test Section, PR, USA)

The gallery construction will be divided in two stages. The first stage will include the precast panel installation and the second stage will include the CIP reinforced concrete to form the gallery stairs, after the foundation drains have been drilled and the grout curtain has been completed.

The precast panels will be loaded with a 25T boom truck and transported to the placement area. The 80t crane will place the sections. These sections will be placed as required for construction.

Figure 43: Beni Haroun Gallery

Concrete will be worked thoroughly around tie bars, embedded fixtures, waterstop, along the edges of the formwork and into the angles and corners of the formwork to eliminate air voids and ensure homogeneous consolidation. To limit excessive loading from placing equipment near the edges of formwork, placement and consolidation by hand and small tools (i.e. Bomag walk-behind compactor, plate tamper, etc.) will be employed.

Any areas requiring additional vibration will be achieved using electric vibrators applied at the point of freshly deposited concrete. Vibration will be of sufficient duration and intensity to thoroughly consolidate concrete but not to cause segregation. Two vibrators (or more as required) plus a spare will be available for all pours.

Construction joints between blocks will be constructed, where required, in accordance with the details shown on the Construction Drawings. Construction Joints will be constructed as the RCC is placed, spread and compacted; by inserting the joint material into compacted full lift thickness RCC. The equipment to cut the RCC consists on a 420 backhoe with a plate and a roller compactor.

Durajoint Arctic Grade waterstop will be installed at the V1 joint locations with the bulb centered at the plastic joint. Waterstop will be continuous during installation and protected

from damage during on-going work. Ends will be cut square and joined (butt end splicing) using supplier approved Teflon coated thermostatically controlled splicing iron. Intersections that join two or more runs from different directions will be made with shop fabricated sections (i.e. "Y" or "+"). Around the waterstop, grout will be placed on the surface of the uncompacted RCC lift and permitted to soak into the layer. Consolidation using vibrators will ensure the Grout Enriched RCC is embedded thoroughly around the waterstop.

Where the waterstop terminates in rock it will be placed in a (neat) 300mm deep notch and filled with flowable non shrink grout.

Depending on the type of joint (cold/warm), the preparation requirements vary. Green cutting will be completed to expose concrete aggregate in order to provide a clean, rough, bonding surface on horizontal joints. Typically, concrete will be cleaned within 6 to 24 hours depending on temperature and concrete setting time. Initial cleanup after concrete has sufficiently hardened will include broom brushing and jet spray and the area will be flushed using a fire pump and hose. Debris will be gathered and disposed. An inspection of the joint and surface preparation checklist will be signed off on by the appropriate parties prior to the placement of fresh concrete.

Figure 44: Green Cutting with Water Blasting (Portugues Dam-Test Section, PR, USA)

A vacuum truck will be used to dry up ponded water during a joint cleanup. That joint will be performed with a high/low pressure water jetting or air/water jetting depending on the type of joint needed (cold/warm/).

Figure 45: Excess Water Removal with Vacuum Truck (Porce II Dam, Colombia)

Curing of concrete which will be exposed (upper part of the steps, upstream and downstream faces after forms removal…) will immediately follow finishing and after any excess moisture due to bleeding has evaporated. Curing may be carried out by wet curing or by means of a curing compound.

Concrete curing with wet curing will have a minimum (depending mix design requirements) seven (7) day humid cure in finished surface areas. Horizontal areas of the interface with future concrete shall be maintained until covered with concrete. Vertical finished surfaces will utilize a water based (dyed) curing compound. The pigmented curing compound will be applied by a hand sprayer to all exposed surfaces (Note: care will be taken to ensure curing compound is not sprayed on surfaces to receive future concrete). Humid cure will be achieved using soaker hoses, sprinklers, water, burlap, geotextile, and any combination therein to maintain constant moisture on concrete surfaces. Curing method used to be at the Concrete Superintendents discretion.

Figure 46: RCC Conveyors at La Breña II Dam, Spain

Concrete will be adequately protected from adverse weather conditions, including hot / cold temperatures, wind, rain, sleet, and snow. Concrete will be protected from direct sunlight for a period of three days.

The majority of the equipment will have its standby machine at the RCC worksite at all times.

Several environmental measures related to the concrete and batch plant operations will be included in the project procedures including:

- Dust control
- Reuse wash water
- Storage procedures for materials and additives, chemicals
- Wash out areas

Placement in 2016 is expected to stop on or about October 31, 2016. This will be weather dependent. The RCC will be covered with insulated tarpaulins. This will be covered with 0.5m of

sand. The sand will be covered with a polyethylene sheet that will be held in place with sand bags.

A dewatering crew of one foreman and labourer will monitor the dewatering over the winter shut down period.

35. NORTH DAM (2017)

The construction in the spring of 2017 will start with the removal of the winter protection. This is scheduled to be completed in April of 2017 to allow the placement of RCC to recommence on May 1, 2017. This will depend on the weather conditions at that time.

The RCC placement will continue in the same manner as in 2016. The exception is that the 80t crane originally located upstream of the RCC will be removed and replaced with a 120t crane. This crane will be located on the downstream side on the North Dam.

Drilling and grouting for the Curtain grouting will start once sufficient RCC has been placed. Most of the grouting will be done from the gallery with adequately dimensioned machinery. The North abutment (B32 to B38) will be done from top of the RCC. We will utilize the services of a grouting specialist for this work.

The construction of the Flip Bucket will start on or about May 29, 2017. Conventional wood forms will be utilized for sections 30 degrees and greater. The sections below this will utilize wooden panels in an open stepped configuration that will allow placement and finishing at the same time.

The construction of the crest concrete will be done in a similar manner as the flip bucket.

A specialist drilling subcontractor will be utilized for drilling the drainage holes from the drainage gallery to the crest.

Additional specifications, layouts and work plans related to the construction of the North Dam with creter cranes can be found in Annexes A13-13 and A13-14.

36. SOUTH DAM

The overburden material will be excavated with a 75t excavator and loaded in to 40T articulated trucks and hauled to a disposal area.

Prior to the placement of fills on in-situ rock, the foundation area under Zones 1 will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form.

Figure 47: Earthfill Dam Construction, Mont Wright, QC

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry

pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

Grouting will be completed with the assistance of a grouting specialist.

The remainder of the South Dam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

37. DEMOBILIZATION

Plant and equipment will be demobilized as it is no longer required for the project. Items will be carefully taken down in reverse order of setup and transported off site.

O'CONNELL
A DIVISION OF
BIRD CONSTRUCTION

CH0009 Construction of North and South Dams - Organization Chart

DRAGADOS CANADA