

From: Carter, Paul
To: [Coffey, Bernard \(Clerk of the Executive Council\)](#)
Cc: [Quinlan, Krista](#)
Subject: FW: Daily Updates
Date: Thursday, February 9, 2017 4:46:35 PM
Attachments: [U-S Cofferdam Remediation Daily Dashboard 8-Feb-2017.pdf](#)

Update. Paul

From: PHarrington@lowerchurchillproject.ca [mailto:PHarrington@lowerchurchillproject.ca]
Sent: Thursday, February 09, 2017 1:17 PM
To: smarshall@nalcoreenergy.com; Nik Argirov (nik@argirovglobal.com); Krupski, Joseph (Joseph.Krupski@NRCan-RNCan.gc.ca); Parsons, Walter; Carter, Paul
Cc: StevePellerin@lowerchurchillproject.ca; JamesMeaney@lowerchurchillproject.ca; GBennett@nalcoreenergy.com
Subject: Fw: Daily Updates

FYI

Paul Harrington

Project Director (Consultant to LCMC)

PROJECT DELIVERY TEAM

Lower Churchill Project

t. 709 737-1907 c. 709 682-1460 f. 709 737-1985

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----- Forwarded by Paul Harrington/NLHydro on 02/09/2017 01:15 PM -----

From: Clyde McLean/LCP/NLHydro
To: Paul Harrington/NLHydro@NLHydro, Lance Clarke/NLHydro@NLHydro, Steve Pellerin/NLHydro@NLHYDRO, Brian Crawley/NLHydro@NLHydro, Ron Power/NLHydro@NLHydro, Gilbert Bennett/NLHydro@NLHydro, Karen O'Neill/NLHydro@NLHydro
Cc: Scott O'Brien/NLHydro@NLHYDRO, Robert Woolgar/NLHydro@NLHYDRO
Date: 02/09/2017 01:01 PM
Subject: Daily Updates

Good afternoon,

Updates for today are:

Upstream Cofferdam

Today grouting P192 and drilling P080.

8 of 13 primary holes completed in Sequence C & D

Seepage from upstream cofferdam 4.85 m³/min and from downstream cofferdam 1.95 m³/min. Seepage within acceptable limits.

Piezometers behaving within expected ranges

Monument surveys scheduled for Saturday

Gates/Impoundment

No ice build-up being observed upstream of gates

Gates exercised daily to break ice formation from gates on downstream side

Scheduled gate adjustments for today; lower gates 4 & 5 from 4.4 to 3.9m above sill. Expect water level increase of +/- 0.5m.

Water levels this morning at upstream cofferdam el. 17.8m, above upper falls el. 18.4m and downstream of Spillway el. 7.1m

Thanks

Clyde

Clyde McLean

Area Manager River Management/Habitat/Site Restoration


PROJECT DELIVERY TEAM

Lower Churchill Project

t. **709-733-4477** c. **709-691-4239**

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 <p>nalcor energy LOWER CHURCHILL PROJECT</p>	<p>Drilling and Grouting - Daily Dashboard U/S Cofferdam Remedial Works 8-February-2017</p>
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SUMMARY OF WORK

CURRENT PERIOD	FORECAST – NEXT PERIOD
Grouting: P-181, P-068, P-074 Drilling: P-192, P-074	Grouting: P-192, P-080, P-204 Drilling: P-080, P204
Total Number of Holes Drilled: 48 Total Number of Holes Grouted: 47	
Holes completed since previous report: 3	

WORK COMPLETED

SECTION A	Primary	Secondary	Tertiary
Total Number of Holes Planned:	11	10	.
Total Number of Holes Completed:	11	10	.
SECTION B	Primary	Secondary	Tertiary
Total Number of Holes Planned:	13	5	.
Total Number of Holes Completed:	13	5	.
SECTION C	Primary	Secondary	Tertiary
Total Number of Holes Planned:	7	.	.
Total Number of Holes Completed:	5	.	.
SECTION D	Primary	Secondary	Tertiary
Total Number of Holes Planned:	6	.	.
Total Number of Holes Completed:	3	.	.

TOTAL GROUT INJECTED (m³)

	Section A	Section B	Section C	Section D	Total
Total LMG:	53.3	54.2	7.6	5.9	121.0
Total Interface:	8.0	2.2	0.6	0.3	11.1
Total Bedrock:	9.7	2.7	4.3	2.8	19.5

SUMMARY OF WATER LEVELS

	Middle Pool	Downstream	Sta 0+380 U/S C/D	Sta 0+182 D/S C/D
7-Feb-2017	17.7 (15:30)	7.2 (16:00)	17.49 (22:30)	7.05 (22:30)
8-Feb-2017	17.6 (15:00)	7.1 (15:30)	17.70 (22:00)	6.82 (20:00)

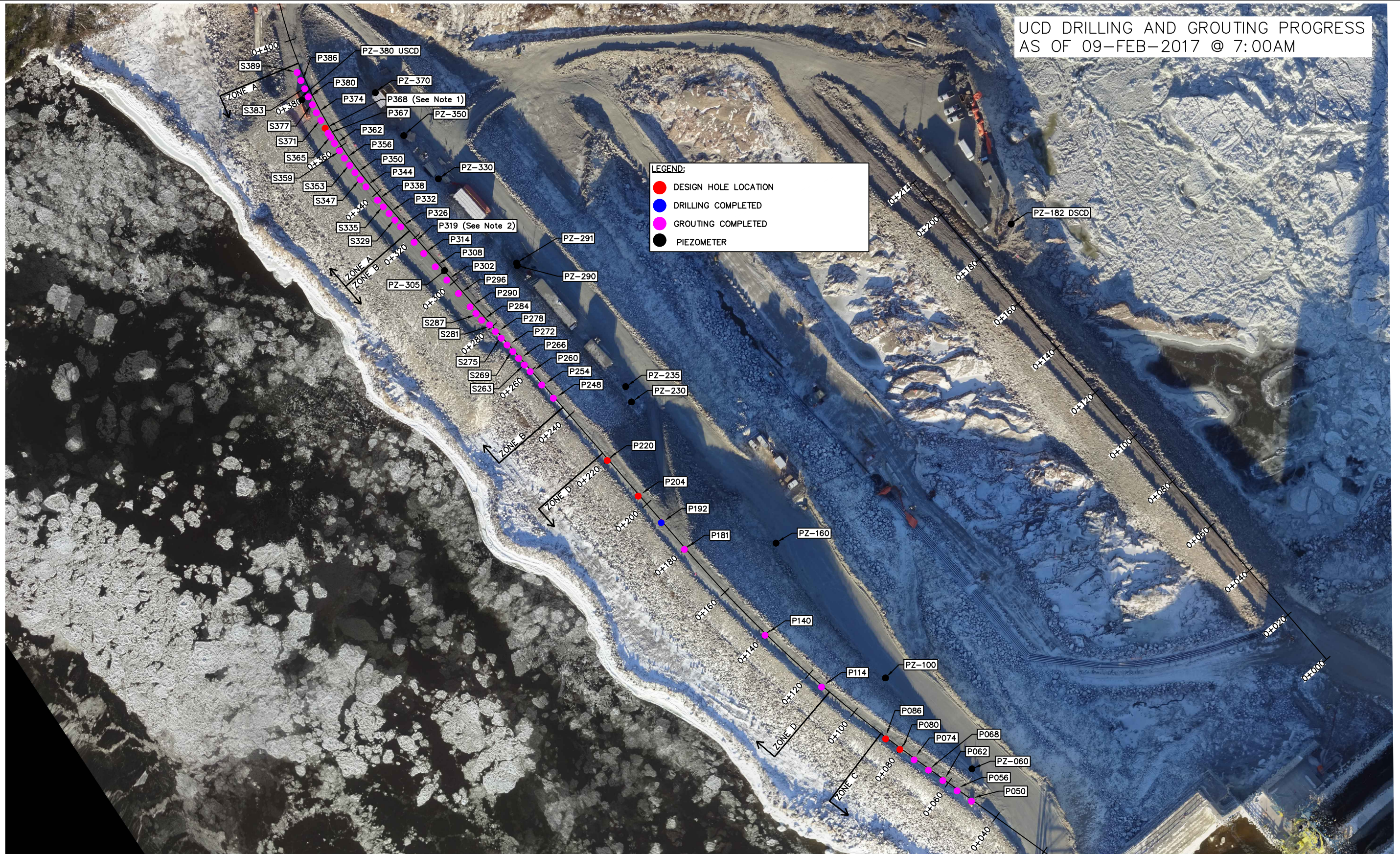
PIEZOMETERS

Date	Time	Sta 370	Sta 350	Sta 330	Sta 291	Sta 290	Sta 235	Sta. 230	Sta 160A	Sta 160B	Sta 100	Sta 060
8-Feb-2017	03:15	12.87	Dry	Dry	13.69	5.34	Dry	4.73	3.57	Dry	Dry	10.58
9-Feb-2017	04:00	13.05	Dry	Dry	13.69	5.34	Dry	4.76	3.58	Dry	Dry	10.66

ADDITIONAL INFORMATION

SEE ATTACHED PLAN, GROUTING PROFILES, WATER AND PIEZOMETER LEVELS, SCHEDULE, AND SUMMARIES

UCD DRILLING AND GROUTING PROGRESS
AS OF 09-FEB-2017 @ 7:00AM



LEGEND:

- DESIGN HOLE LOCATION
- DRILLING COMPLETED
- GROUTING COMPLETED
- PIEZOMETER

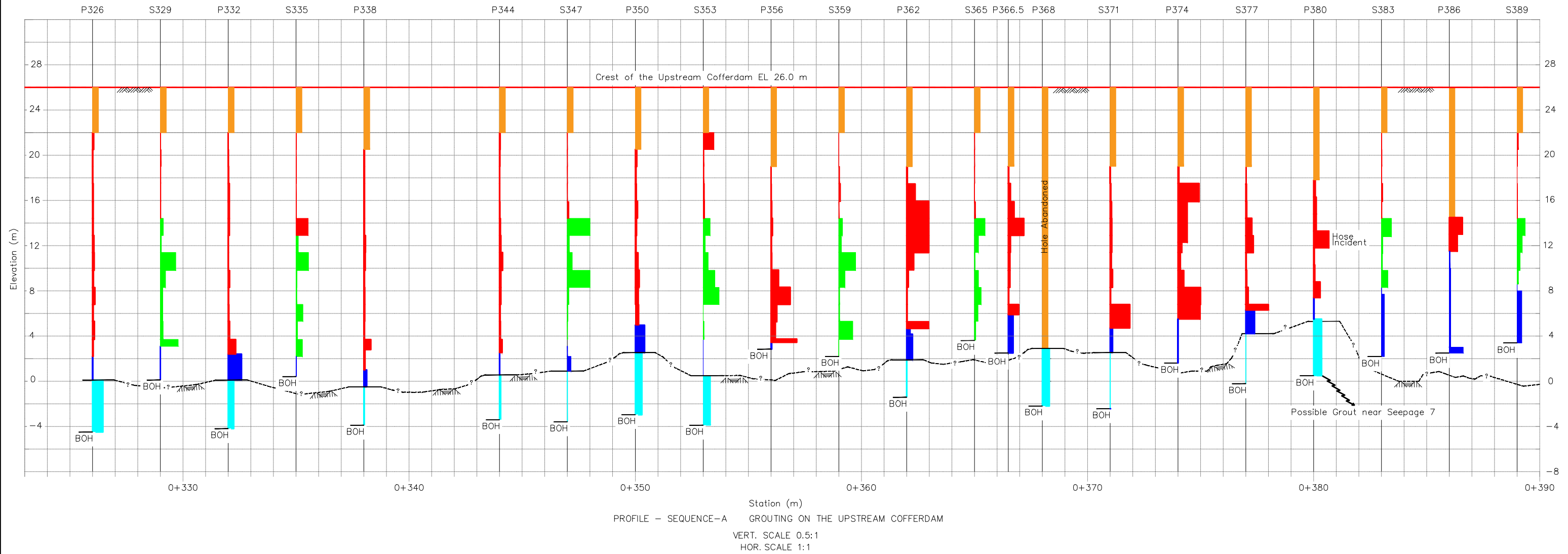
- NOTES:**
1. P368 has been rock grouted/backfilled and abandoned.
 2. P320 has been moved to station 0+319 (P319) to avoid destroying existing survey control at station 0+320



***** DATUM REFERENCE: ALL ELEVATIONS ARE IN METRES REFERENCED TO GEODETIC. COORDINATE REFERENCE: UTM 6° (UNIVERSAL TRANSVERSE MERCATOR) PROJECTION, NAD83, ZONE 20 CENTRAL MERIDIAN 63° 00' W LONGITUDE. *****

PROJECT		LOWER CHURCHILL PROJECT	
DRAWN	RS	TITLE	
CHECKED		MUSKRAT FALLS UPSTREAM COFFERDAM DRILLING & GROUTING PROGRESS	
DATE	09-FEB-2017	DOC No.	SKETCH
SCALE	NTS	Rev.	00

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	GROUT HOLE NUMBER																														Total	Unit													
	P326	T327.5	S329	T330.5	P332	T333.5	S335	T336.5	P338	T339.5	S341	T342.5	P344	T345.5	S347	T348.5	P350	T351.5	S353	T354.5	P356	T357.5	S359	T360.5	P362	T363.5	S365	P366.5	P368	T369.5			S371	T372.5	P374	T375.5	S377	T378.5	P380	T381.5	S383	T384.5	P386	T387.5	S389
Drill Date	13-01-17		25-01-17		11-01-17		26-01-17		11-01-17				10-01-17		27-01-17		09-01-17		29-01-17		08-01-17		31-01-17		07-01-17		01-02-17	05-01-17	21-12-16		06-01-17		31-12-16		03-01-17		20-12-16		02-02-17		16-12-16		03-02-17		
Grout Date	14-01-17		26-01-17		12-01-17		27-01-17		12-01-17				11-01-17		29-01-17		10-01-17		30-01-17		09-01-17		01-02-17		08-01-17		02-02-17	05-01-17	21-12-16		06-01-17		02-01-17		04-01-17		30-12-16		03-02-17		19-12-16		04-02-17		
Backfill	N/A		N/A		N/A		N/A		N/A				N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	N/A	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A
Compact	861		2737		1008		2964		1008				903		3764		1491		3907		3164		3270		6405		2230	2415	N/A		2548		6552		1890		2016		1456		1414		1313	53316	(L)
Interface	43		145		51		150		52				46		206		96		213		203		165		447		121	184			178		485		149		194		106		471		98	-	(L/m)
Bed Rock	11		1		1350		35		188				2		300		1015		1		21		683		N/A		720	N/A		240		10		820		47		742		855		974	8015	(L)	
Bed Rock	5		0		587		19		125				1		136		416		0		35		244				215		113		3		394		25		122		95		188	-	(L/m)		
Bed Rock	2100		N/A		1030		N/A		41				190		14		1620		1422		N/A		N/A		6		N/A	N/A	1600		10		0		1709		N/A		N/A		N/A		9742	(L)	
Bed Rock	457				240				12				48		3		295		323		N/A		N/A		2			N/A	1600		2		0		342							-	(L/m)		
Total	2972		2738		3388		2999		1237				1095		4078		4126		5330		3185		3270		7094		2230	3135	1600		2798		6562		2710		3772		2198		2269		2287	71073	(L)

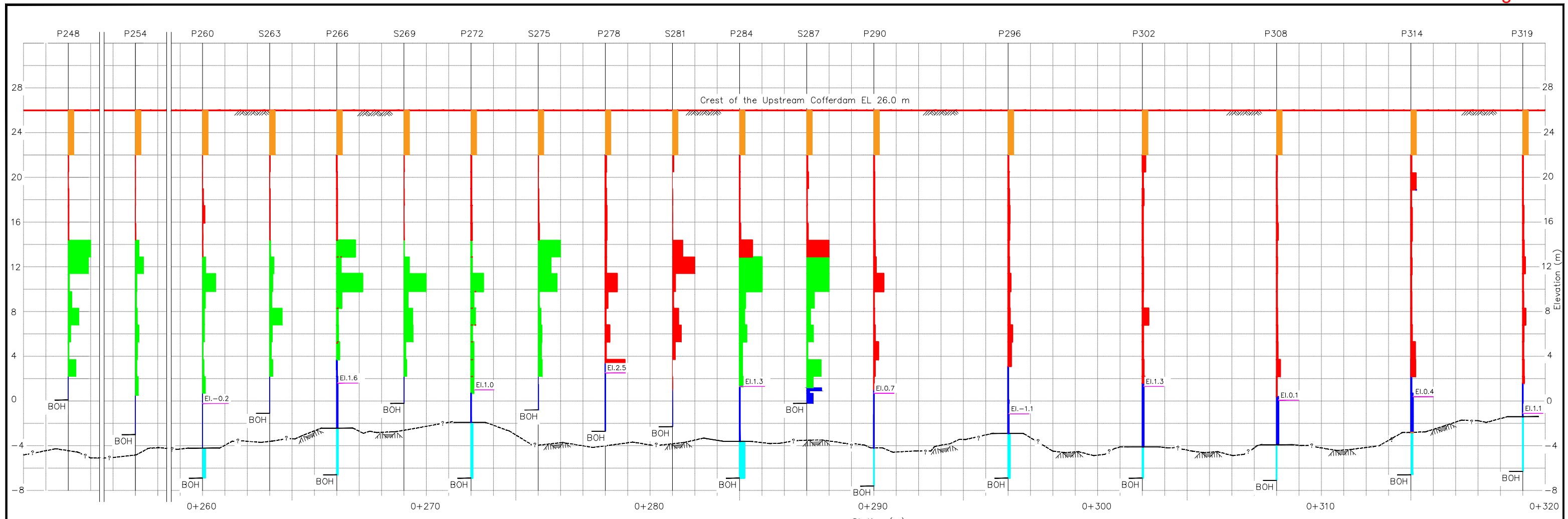
- LEGEND:**
- ACTUAL BEDROCK
 - ASSUMED BEDROCK
 - POSSIBLE GROUT SEEPAGE
 - BOTTOM OF HOLE
 - NATIVE TILL
 - BACKFILL
 - LMG: 1000 litres/m (Compact)
 - LMG: 1000 litres/m (Compact) (Injection pressure increased by 700 kpa)
 - HMG: 1000 litres/m (Interface)
 - HMG: 1000 litres/m (Bed Rock)

CONVERSION FACTORS
 HMG(br): 1bag/m=37L/bag
 HMG(i): 1bag/m=64L/bag

FOR INFORMATION ONLY

PROJECT		LOWER CHURCHILL PROJECT	
DRAWN		SB	
CHECKED			
DATE		04-FEB-2017	
SCALE		NTS	
DOC No.		04-FEB-2017-UCD-GROUT-LOG-A	
Rev.		00	

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PROFILE - SEQUENCE-B
 GROUTING ON THE UPSTREAM COFFERDAM
 VERT. SCALE 0.5:1
 HOR. SCALE 1:1

	GROUT HOLE NUMBER																																	Total	Unit																		
	P248	P254	P260	S263	P266	T267.5	S269	T270.5	P272	T273.5	S275	T276.5	P278	T279.5	S281	T282.5	P284	T285.5	S287	T288.5	P290	T291.5	S293	T294.5	P296	T297.5	S299	T300.5	P302	T303.5	S305	T306.5	P308			T309.5	S311	T312.5	P314	T315.5	S317	T318.5	P319	T320.5	S322								
Drill Date	03-02-17	02-02-17	24-01-17	31-01-17	23-01-17		30-01-17		21-01-17		29-01-17		18-01-17		25-01-17		20-01-17		27-01-17		19-01-17						17-01-17																										
Grout Date	04-02-17	03-02-17	24-01-17	01-02-17	24-01-17		01-02-17		22-01-17		30-01-17		19-01-17		26-01-17		21-01-17		28-01-17		20-01-17							18-01-17																									
Backfill	N/A	N/A	N/A	N/A	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A				
Compact	4904	1950	2282	2353	4130		3972		2240		5051		2149		3959		5761		7625		1624						1526																								54188	(L)	
	248	91	107	119	226		201		105		255		116		189		278		367		77						81																										
Interface	1	5	14	3	219		22		3		64		7		25		140		487		3						137																										
	0	1	3	1	35		9		1		21		1		8		29		348		1						23																										
Bed Rock	N/A	N/A	390	N/A	252		N/A		365		N/A		N/A		750		7		0		7						340																										
			145		60				72						224		0		224		0						85																										
Total	4905	1955	2686	2356	4601		3994		2608		5115		2156		3984		6651		8112		1634					2003																											

- ACTUAL BEDROCK
- ASSUMED BEDROCK
- ⚡ POSSIBLE GROUT SEEPAGE
- BOH BOTTOM OF HOLE
- El.X.X NATIVE TILL
- BACKFILL
- LMG: 1000 litres/m (Compact)
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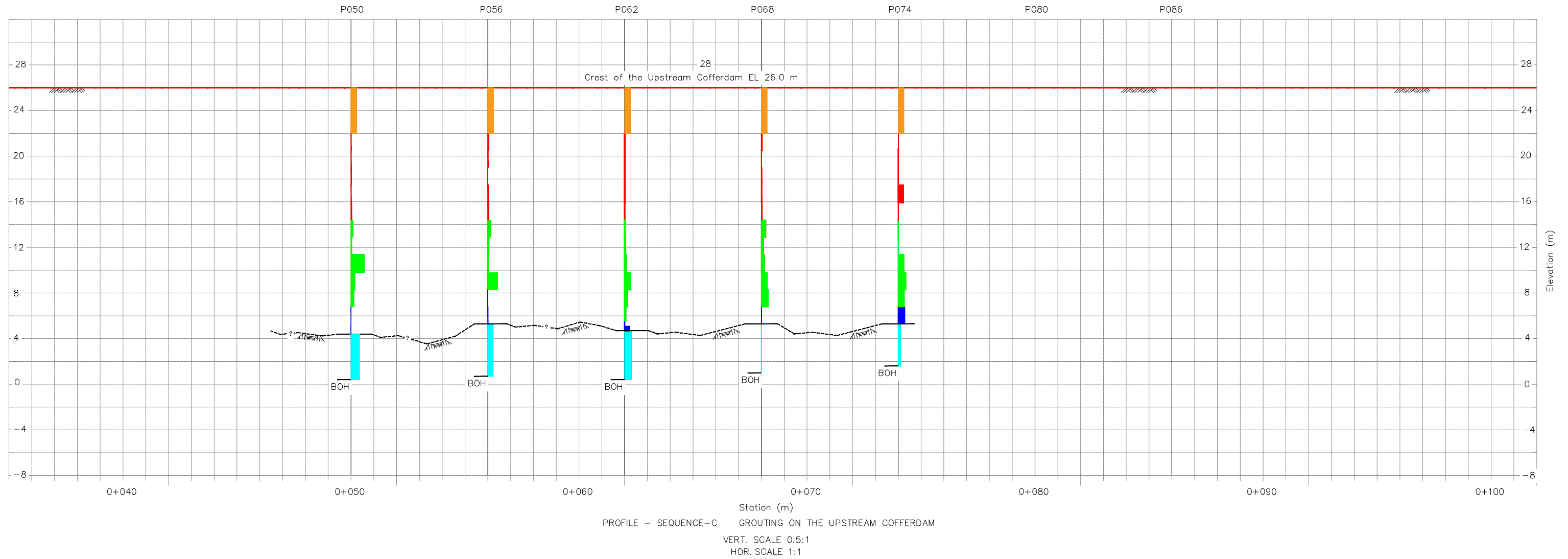
PROJECT		LOWER CHURCHILL PROJECT	
DRAWN	SB	TITLE	
CHECKED		MUSKRAT FALLS UPSTREAM COFFERDAM GROUTING LOG VOLUMES REPORT ZONE B	
DATE	04-FEB-2017	DOC No.	04-FEB-2017-UCD-GROUT-LOG-B
SCALE	NTS	Rev.	00

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2017.02.04/8:38am

FORMAT ANSI B (11x17)



	GROUT HOLE NUMBER																												Total	Unit	
	S047	T48.5	P050	T051.5	S053	T054.5	P056	T057.5	S059	T060.5	P062	T063.5	S065	T066.5	P068	T069.5	S071	T072.5	P074	T075.5	S077	T078.5	P080	T081.5	S083	T084.5	P086	T087.5			S089
Drill Date			04-02-17				05-02-17				06-02-17				07-02-17				08-02-17												
Grout Date			05-02-17				06-02-17				07-02-17				08-02-17				09-02-17												
Backfill			N/A				N/A				N/A				N/A				N/A												
Compact			1736				1235				1073				1742				1859											7645	(L)
Interface			114				90				65				115				122											-	(L/m)
Bed Rock			9				32				88				4				440											573	(L)
Bed Rock			4				10				96				2				289											-	(L/m)
Bed Rock			1500				1070				1305				1				380											4256	(L)
Bed Rock			375				234				306				0				104											-	(L/m)
Total			3245				2337				2466				1747				2679										12474	(L)	

- LEGEND:**
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 - ASSUMED BEDROCK
 - POSSIBLE GROUT SEEPAGE
 - BOTTOM OF HOLE
 - NATIVE TILL
 - BACKFILL
 - LMG: 1000 litres/m (Compact)
 - LMG: 1000 litres/m (Compact) (Injection pressure increased by 700kpa)
 - HMG: 1000 litres/m (Interface)
 - HMG: 1000 litres/m (Bed Rock)

CONVERSION FACTORS

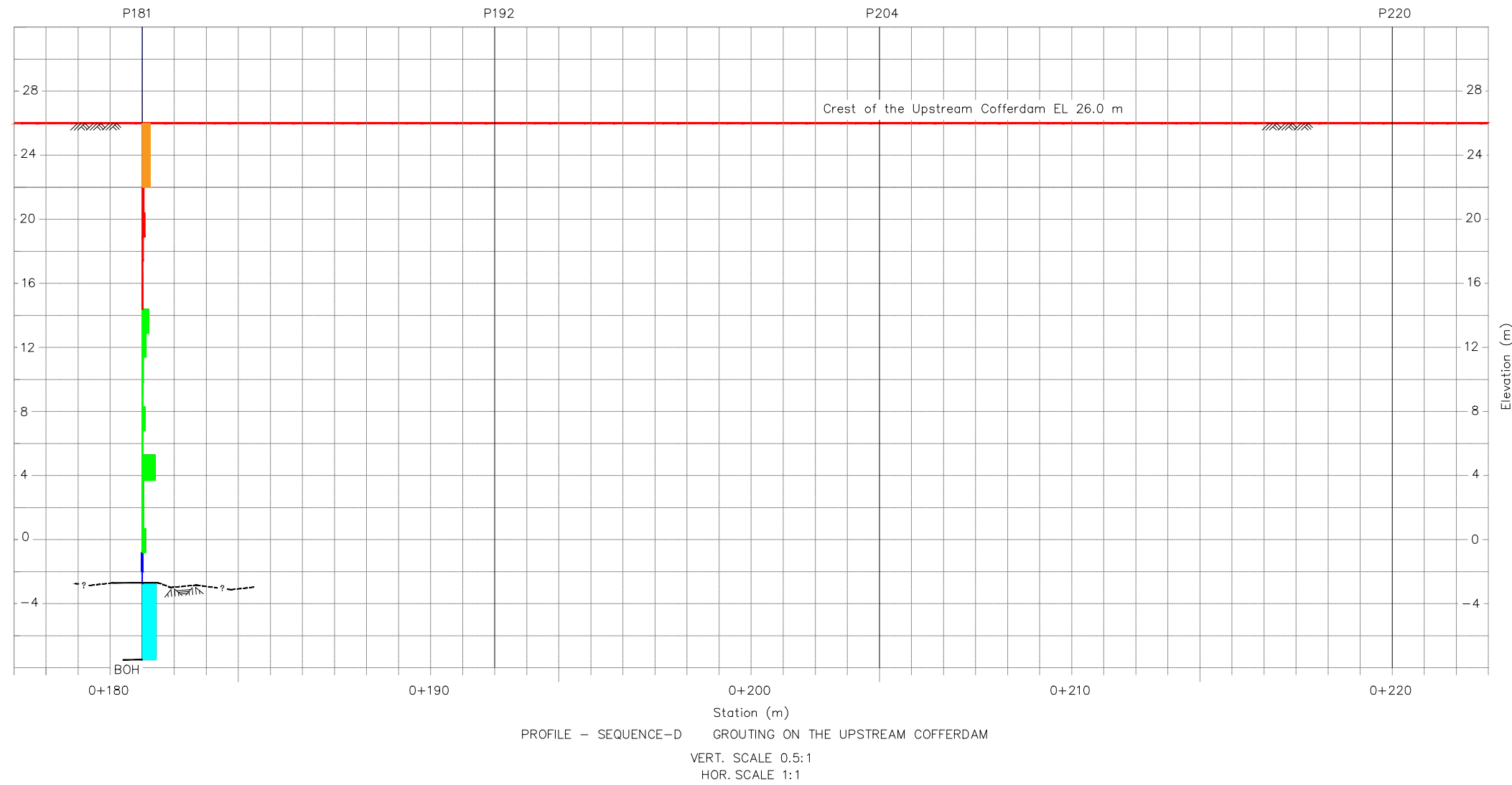
HMG(br): 1bag/m=37L/bag

HMG(i): 1bag/m=64L/bag

FOR INFORMATION ONLY

PROJECT		LOWER CHURCHILL PROJECT	
DRAWN	RS	TITLE	
CHECKED		MUSKRAT FALLS UPSTREAM COFFERDAM GROUTING LOG VOLUMES REPORT ZONE C	
DATE	09-FEB-2017	DOC No.	09-FEB-2017-UCD-GROUT-LOG-C
SCALE	NTS	Rev.	00

***** DATUM REFERENCE: ALL ELEVATIONS ARE IN METRES REFERENCED TO GEODETIC. COORDINATE REFERENCE: UTM 6° (UNIVERSAL TRANSVERSE MERCATOR) PROJECTION, NAD83, ZONE 20 CENTRAL MERIDIAN 65° 00' W LONGITUDE. *****



	GROUT HOLE NUMBER																		Total	Unit
	S	T	P181	T	S	T	P192	T	S	T	P204	T	S	T	P220	T	S			
Drill Date			07-02-17															xx		
Grout Date			08-02-17															xx		
Backfill			N/A															N/A		
Compact			2074															xx 2074 (L)		
Interface			91															xx - (L/m)		
Bed Rock			3															xx 3 (L)		
			2															xx - (L/m)		
			2100															xx 2100 (L)		
			438															xx - (L/m)		
Total			4177															xx 4177 (L)		

- LEGEND:**
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 - POSSIBLE GROUT SEEPAGE
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 - BACKFILL
 - LMG: 1000 litres/m (Compact)
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 - HMG: 1000 litres/m (Bed Rock)

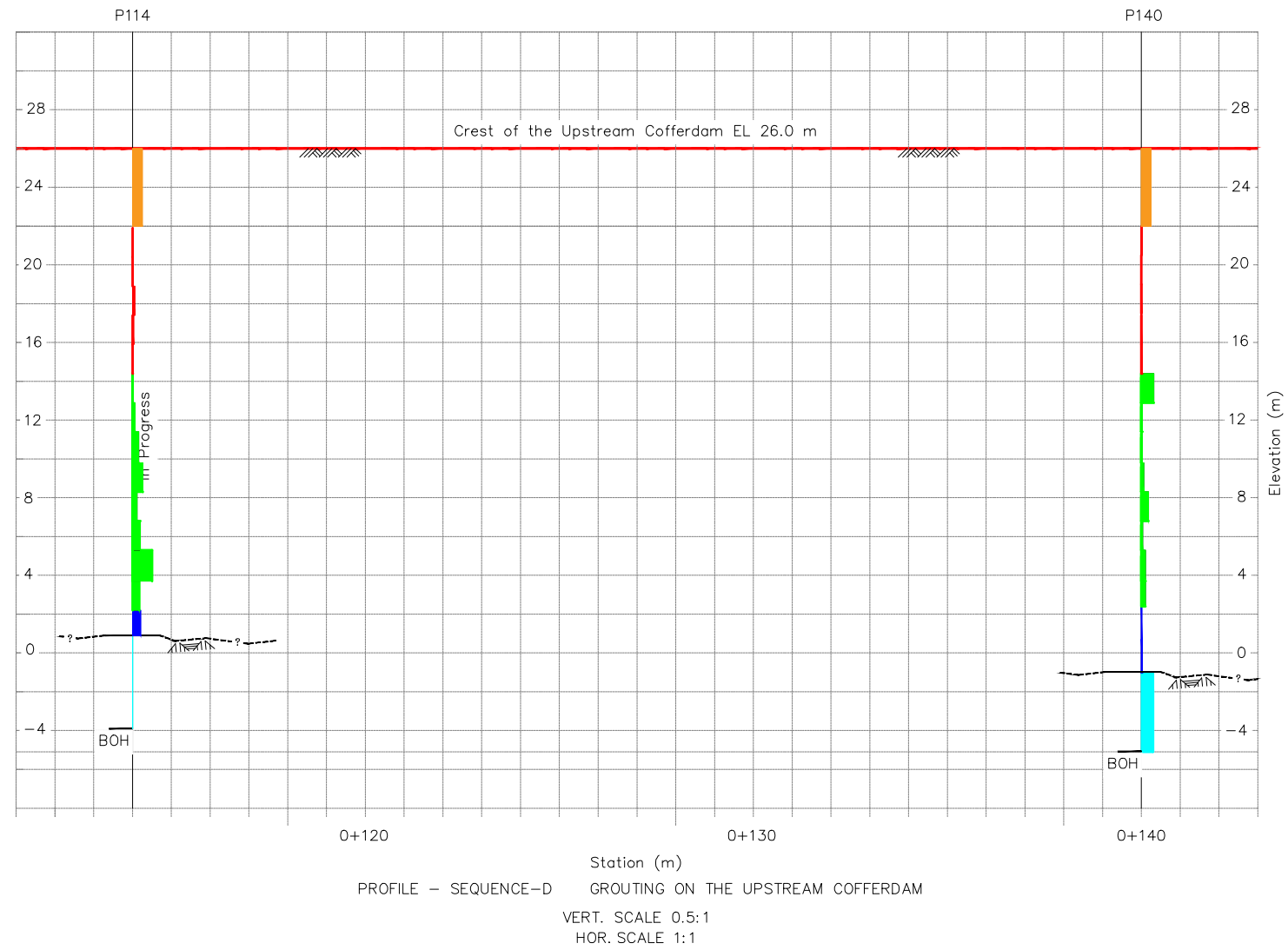
CONVERSION FACTORS

HMG(br): 1bag/m=37L/bag

HMG(i): 1bag/m=64L/bag

FOR INFORMATION ONLY

PROJECT		LOWER CHURCHILL PROJECT	
DRAWN	RS	TITLE	
CHECKED		MUSKRAT FALLS UPSTREAM COFFERDAM GROUTING LOG VOLUMES REPORT ZONE D (Sheet 1 of 2)	
DATE	09-FEB-2017	DOC No.	09-FEB-2017-UCD-GROUT-LOG-D
SCALE	NTS	Rev.	00



	GROUT HOLE NUMBER										Total	Unit
	S	T	P114				P140					
Drill Date			05-02-17				06-02-17					
Grout Date			05-02-17				07-02-17					
Backfill			N/A				N/A					
Compact			2434				1391				3825	(L)
Interface			123				71				-	(L/m)
Bed Rock			270				69				339	(L)
			208				21				-	(L/m)
			12				662				674	(L)
			3				161				-	(L/m)
Total			2716				2122				4838	(L)

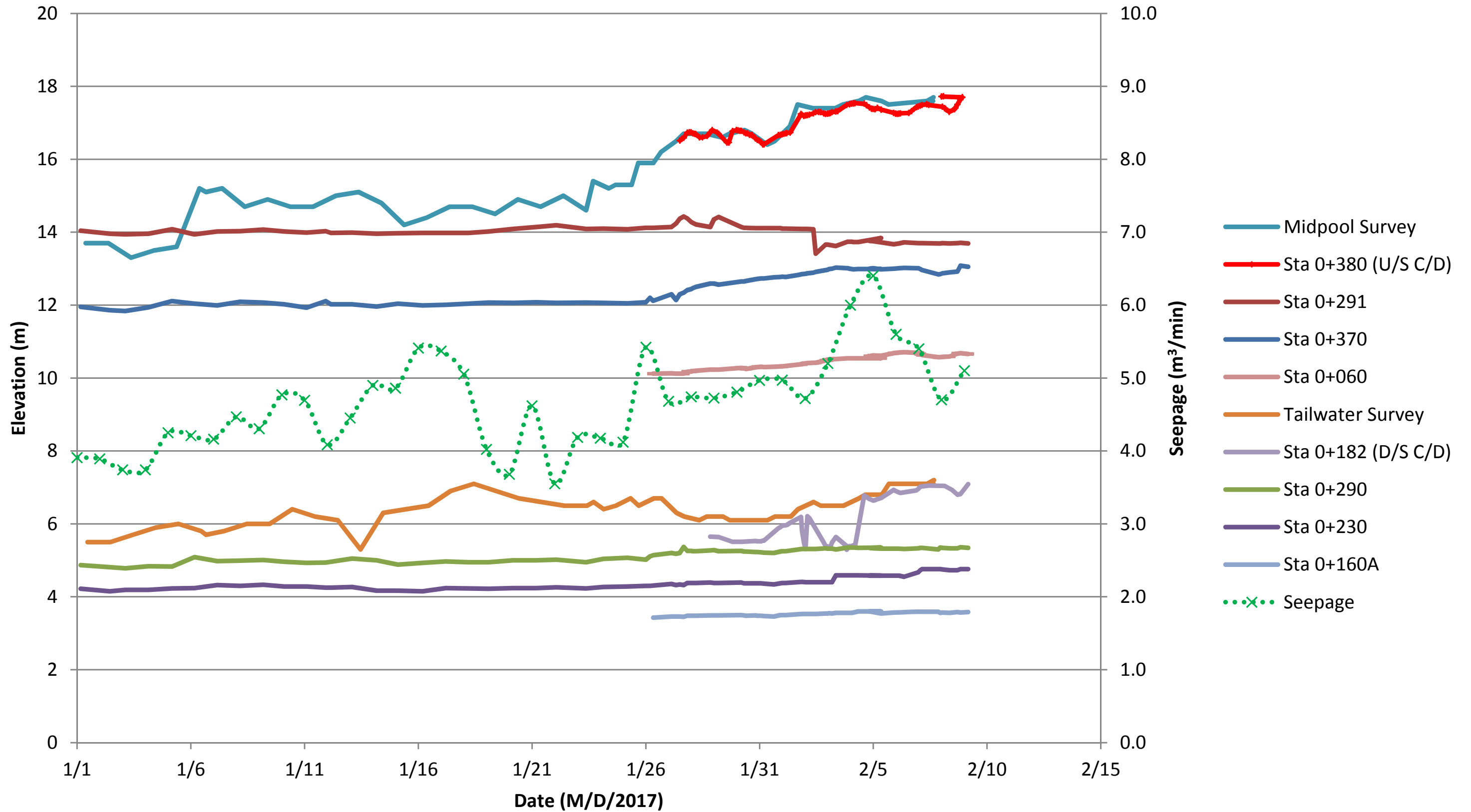
- LEGEND:**
- ACTUAL BEDROCK
 - ASSUMED BEDROCK
 - POSSIBLE GROUT SEEPAGE
 - BOTTOM OF HOLE
 - NATIVE TILL
 - BACKFILL
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 - LMG: 1000 litres/m (Compact) (Injection pressure increased by 700kpa)
 - HMG: 1000 litres/m (Interface)
 - HMG: 1000 litres/m (Bed Rock)

CONVERSION FACTORS
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 HMG(i): 1bag/m=64L/bag

FOR INFORMATION ONLY

		PROJECT	LOWER CHURCHILL PROJECT
DRAWN	RS	TITLE	MUSKRAT FALLS UPSTREAM COFFERDAM GROUTING LOG VOLUMES REPORT ZONE D (Sheet 2 of 2)
CHECKED			
DATE	07-FEB-2017		
SCALE	NTS	DOC No.	07-FEB-2017-UCD-GROUT-LOG-D
		Rev.	00

Water Level, Piezometer Readings and Seepage



Upstream Cofferdam: Drilling and Grouting Summary - Zone A

Sequence of completion		Borehole Number	Date of Completion		End of hole		Rock Contact		Rock Grout		Interface Grout		Low Mobility Grout Volume			Grouting Status	Remarks
Primary	Secondary		Drilling	Grout	Depth* (m)	Elev (m)	Depth* (m)	Elev (m)	Pressure (kPa)	Volume** (m³/m)	Pressure (kPa)	Volume (m³/m)	Total (m³)	Average (m³/m)	Max Stage (m³)		
	10	S-389	3-Feb-17	4-Feb-17	22.6	3.4	N/A	N/A	N/A	N/A	490	0.19	1.3	0.07	0.5	Complete	
1		P-386	17-Dec-16	19-Dec-16	23.6	2.5	N/E (Not encountered)		N/E	N/E	250	0.09	1.4	0.19	0.9	Complete	Borehole end in extra dense native till. Grouting Done. LMG pressure criteria meet
	9	S-383	2-Feb-17	3-Feb-17	23.8	2.2	19.8	6.2	N/A	N/A	500	0.12	1.5	0.07	0.7	Complete	
2		P-380	20-Dec-16 28-Dec-16 29-Dec-16	30-Dec-16	25.5	0.5	20.5	5.5	500	0.35	250	0.02	2.0	0.13	1.0	Complete	Grouting done. Extra dense native till resides on top of bedrock. Acoustic camera hole work done. Grouting to commence 29 Dec Commence grouting
	1	S-377	2-Jan-17	4-Jan-17	26.2	-0.2	21.8	4.2	480	0.00	250	0.4	1.9	0.15	0.5	Complete	Borehole end in bedrock. Acoustic camera completed. Grouting Done.
3		P-374	31-Dec-16	2-Jan-16	21.0	5.0	N/E		N/E	N/E	250	0	6.6	0.29	1.5	Complete	Borehole end in extra dense native till. Grouting Done. Large LMG volume take.
	2	S-371	6-Jan-17	6-Jan-17	28.4	-2.4	23.5	2.5	500	0.00	250	0.11	2.6	0.09	1.9	Complete	Drilled to depth of 93.3' feet. Relatively large LMG volume injected
4		P-368	21-Dec-16 28-Dec-16	N/C N/C	28.2 24.3	-2.2	23.2	2.8	500	0.28	Not done. Repeated in P366.5					Volume refusal with thick mix + anti-washout used for bedrock grouting. Hole redrilled to depth shown. Casing locked in bedrock. Hole to be abandoned. New hole to be drilled immediately adjacent, ie P366.5	
4a		P-366.5	5-Jan-17	5-Jan-17	23.5	2.5	Not done. Grouted in P368				250	0.22	2.4	0.13	1.1	Complete	Borehole end in extra dense native till. Between 38' and 43' closed by volume 1.5 m3
	8	S-365	1-Feb-17	2-Feb-17	22.4	3.6	N/A	N/A	N/A	N/A	N/A	N/A	2.2	0.08	0.7	Complete	
5		P-362	7-Jan-17	7-Jan-17	27.4	-1.4	22.9	3.1	500	0.00	250	0.24	6.4	0.35	1.5	Complete	
	7	S-359	31-Jan-17	31-Jan-17	23.8	2.2	N/A	N/A	N/A	N/A	N/A	N/A	3.3	0.12	1.1	Complete	
6		P-356	8-Jan-17	9-Jan-17	23.1	2.9	23.1	2.9	N/A	N/A	260	0.03	3.2	0.22	1.3	Complete	Rock not drilled due to problem with drill bit and attempt at extracting the bit failed.
	6	S-353	29-Jan-17	30-Jan-17	29.9	-3.9	24.2	1.8	500	0.32	280	0*	3.9	0.14	1.1	Complete	A problem was identified with the meter, interface volume injected cannot be confirmed
7		P-350	9-Jan-17	10-Jan-17	29.0	-3.0	23.5	2.5	500	0.30	260	0.42	1.5	0.06	0.3	Complete	
	5	S-347	27-Jan-17	29-Jan-17	29.6	-3.6	25.2	0.85	500	0.003	250	0.13	3.8	0.13	1.5	Complete	Maximum volume criteria was reached for two stages
8		P-344	10-Jan-17	11-Jan-17	29.4	-3.41	25.3	0.70	500	0.05	145	0.001	0.9	0.03	0.2	Complete	
10		P-338	12-Jan-17	13-Jan-17	29.9	-3.9	25.6	0.4	500	0.01	260	0.21	1.0	0.04	0.3	Complete	
	4	S-335	26-Jan-17	27-Jan-17	25.6	0.4	N/A	N/A	N/A	N/A		0.02	3.0	0.1	0.8	Complete	Drilling did not continue into rock per site instruction for secondary holes
9		P-332	11-Jan-17	11-Jan-17	30.2	-4.2	25.3	0.7	500	0.24		0.60	1.0	0.04	0.45	Complete	Drilling was undertaken over several days (08-11 Jan) using second drill rig.
	3	S-329	25-Jan-17	26-Jan-17	25.9	0.09	25.3	0.69	N/A	N/A	300	0	2.7	0.12	1.0	Complete	Drilling did not continue into rock per site instruction for secondary holes
11		P-326	13-Jan-17	13-Jan-17	30.5	-4.5	25.9	0.1	500	0.46	260	0.01	0.9	0.03	0.15	Complete	Notable grout take in bedrock.
11	10	No. of holes		Total Length Drilled		581.1											
100%	100%	% of Holes complete		* Assumed nominal crest level at El 26.00 m / ** 5 m stage length - typical													

Upstream Cofferdam: Drilling and Grouting Summary - Zone B

Sequence of completion		Borehole Number	Date of Completion		End of hole		Rock Contact		Rock Grout		Interface Grout		Low Mobility Grout Volume			Grouting Status	Remarks
Primary	Secondary		Drilling	Grout	Depth* (m)	Elev (m)	Depth* (m)	Elev (m)	Pressure (kPa)	Volume** (m³/m)	Pressure (kPa)	Volume (m³/m)	Total (m³)	Average (m³/m)	Max Stage (m³)		
3		P-319	14-Jan-17	16-Jan-17	32.2	-6.2	27.7	-1.7	500	0.02	270	0.001	0.9	0.03	0.20	Complete	A survey monument located at Sta 320 necessitated relocating the borehole to Sta 319.
4		P-314	17-Jan-17	17-Jan-17	32.6	-6.6	28.2	-2.2	500	0.10	250	0.06	1.5	0.05	0.35	Complete	
1		P-308	13-Jan-17	13-Jan-17	33.1	-7.1	29.9	-3.9	500	0.001	250	0.57	0.8	0.02	0.3	Complete	
2		P-302	14-Jan-17	15-Jan-17	33.2	-7.2	28.3	-2.3	500	0.04	110	0.06	1.5	0.05	0.4	Complete	
5		P-296	18-Jan-17	19-Jan-17	32.9	-6.9	28.3	-2.3	500	0.09	120	0.02	1.5	0.05	0.3	Complete	Pressure of interface grout to be verified.
7		P-290	18-Jan-17	20-Jan-17	33.6	-7.6	29.0	-3.0	500	0.002	107	0.001	1.6	0.05	0.7	Complete	Interface grouting completed twice for the same elevation range to ensure it was done.
	2	S-287	27-Jan-17	28-Jan-17	26.2	-0.2	N/A	N/A	N/A	N/A	250	0.36	7.6	0.24	1.5	Complete	Drilling did not continue to rock per site instruction, 3 stages reached maximum volume cutoff
8		P-284	20-Jan-17	22-Jan-17	32.9	-6.9	28.3	-2.3	500	0.22	140	0.03	5.8	0.19	1.5	Complete	2 stages reached maximum volume cutoff
	1	S-281	25-Jan-17	26-Jan-17	28.4	-2.4	N/A	N/A	N/A	N/A	280	0.007	4.0	0.12	1.5	Complete	Drilling did not continue to rock per site instruction, 1 stage reached maximum volume cutoff
6		P-278	18-Jan-17	19-Jan-17	28.7	-2.7	N/A	N/A	N/A	N/A	340	0.001	2.2	0.11	0.8	Complete	Drilling did not proceed into bedrock.
	3	S-275	29-Jan-17	30-Jan-17	26.8	-0.8	N/A	N/A	N/A	N/A	310	0.02	5.05	0.17	1.5	Complete	1 stage reached maximum volume cutoff
9		P-272	22-Jan-17	22-Jan-17	32.9	-6.9	28.0	-2.0	500	0.07	250	0.001	2.2	0.07	0.8	Complete	
	4	S-269	30-Jan-17	31-Jan-17	26.2	-0.2	N/A	N/A	N/A	N/A	271	0.009	4.0	0.13	1.5	Complete	
10		P-266	23-Jan-17	24-Jan-17	32.6	-6.6	28.0	-2.0	500	0.06	300	0.04	4.1	0.15	1.2	Complete	
	5	S-263	31-Jan-17	1-Feb-17	27.1	-1.1	N/A	N/A	N/A	N/A	368	0.001	2.4	0.08	0.9	Complete	
11		P-266	24-Jan-17	25-Jan-17	32.9	-6.9	29.0	-3.0	500	0.15	300	0.003	2.3	0.07	0.9	Complete	
12		P-254	1-Feb-17	2-Feb-17	29.0	-3.0	N/A	N/A	N/A	N/A	277	0.001	1.95	0.06	0.6	Complete	
13		P-248	3-Feb-17	4-Feb-17	25.9	0.1	N/A	N/A	N/A	N/A	250	0.001	4.9	0.16	1.5	Complete	
13	5	No. of holes	Total Length Drilled		547.2												
100%	100%	% of Holes complete		* Assumed nominal crest level at El 26.00 m / ** 5 m stage length - typical													

**Lower Churchill Project
Muskrat Falls
Upstream Cofferdam Remediation**

Upstream Cofferdam: Drilling and Grouting Summary - Zone D																	
Sequence of completion		Borehole Number	Date of Completion		End of hole		Rock Contact		Rock Grout		Interface Grout		Low Mobility Grout Volume			Grouting Status	Remarks
Primary	Secondary		Drilling	Grout	Depth* (m)	Elev (m)	Depth* (m)	Elev (m)	Pressure (kPa)	Volume** (m³/m)	Pressure (kPa)	Volume (m³/m)	Total (m³)	Average (m³/m)	Max Stage (m³)		
		P-220															
		P-204															
		P-192	9-Feb-17		31.1	-5.1	27.0	-1.0								In Progress	
3		P-181	7-Feb-17	8-Feb-17	33.5	-7.5	28.3	-2.3	500	0.43	250	0.002	2.07	0.06	0.6	Complete	Borehole moved from 0+180 to 0+181.
2		P-140	6-Feb-17	7-Feb-17	31.1	-5.1	27.0	-1.0	500	0.16	250	0.02	1.4	0.05	0.5	Complete	
1		P-114	4-Feb-17	5-Feb-17	29.9	-3.9	25.0	1.0	500	0.003	250	0.2	2.4	0.08	0.8	Complete	
3	0	No. of holes	Total Length Drilled		125.6												
50%	0%	% of Holes complete	* Assumed nominal crest level at El 26.00 m / ** 5 m stage length - typical														

Upstream Cofferdam: Drilling and Grouting Summary - Zone C																	
Sequence of completion		Borehole Number	Date of Completion		End of hole		Rock Contact		Rock Grout		Interface Grout		Low Mobility Grout Volume			Grouting Status	Remarks
Primary	Secondary		Drilling	Grout	Depth* (m)	Elev (m)	Depth* (m)	Elev (m)	Pressure (kPa)	Volume** (m³/m)	Pressure (kPa)	Volume (m³/m)	Total (m³)	Average (m³/m)	Max Stage (m³)		
		P-086															
		P-080															
5		P-074	8-Feb-17	9-Feb-17	24.4	1.6	19.8	6.2	500	0.10	259	0.3	1.86	0.08	0.5	Complete	
4		P-068	7-Feb-17	8-Feb-17	25.0	1.0	20.7	5.3	500	0.001	275	0.002	1.74	0.08	0.5	Complete	
3		P-062	6-Feb-17	7-Feb-17	25.6	0.4	21.3	4.7	500	0.31	255	0.1	1.07	0.04	0.4	Complete	
2		P-056	5-Feb-17	6-Feb-17	25.3	0.7	20.7	5.3	522	0.23	295	0.01	1.24	0.06	0.7	Complete	
1		P-050	4-Feb-17	5-Feb-17	25.6	0.4	21	5	500	0.38	300	0.004	1.7	0.07	0.9	Complete	
5	0	No. of holes	Total Length Drilled		125.9												
71%	0%	% of Holes complete	* Assumed nominal crest level at El 26.00 m / ** 5 m stage length - typical														