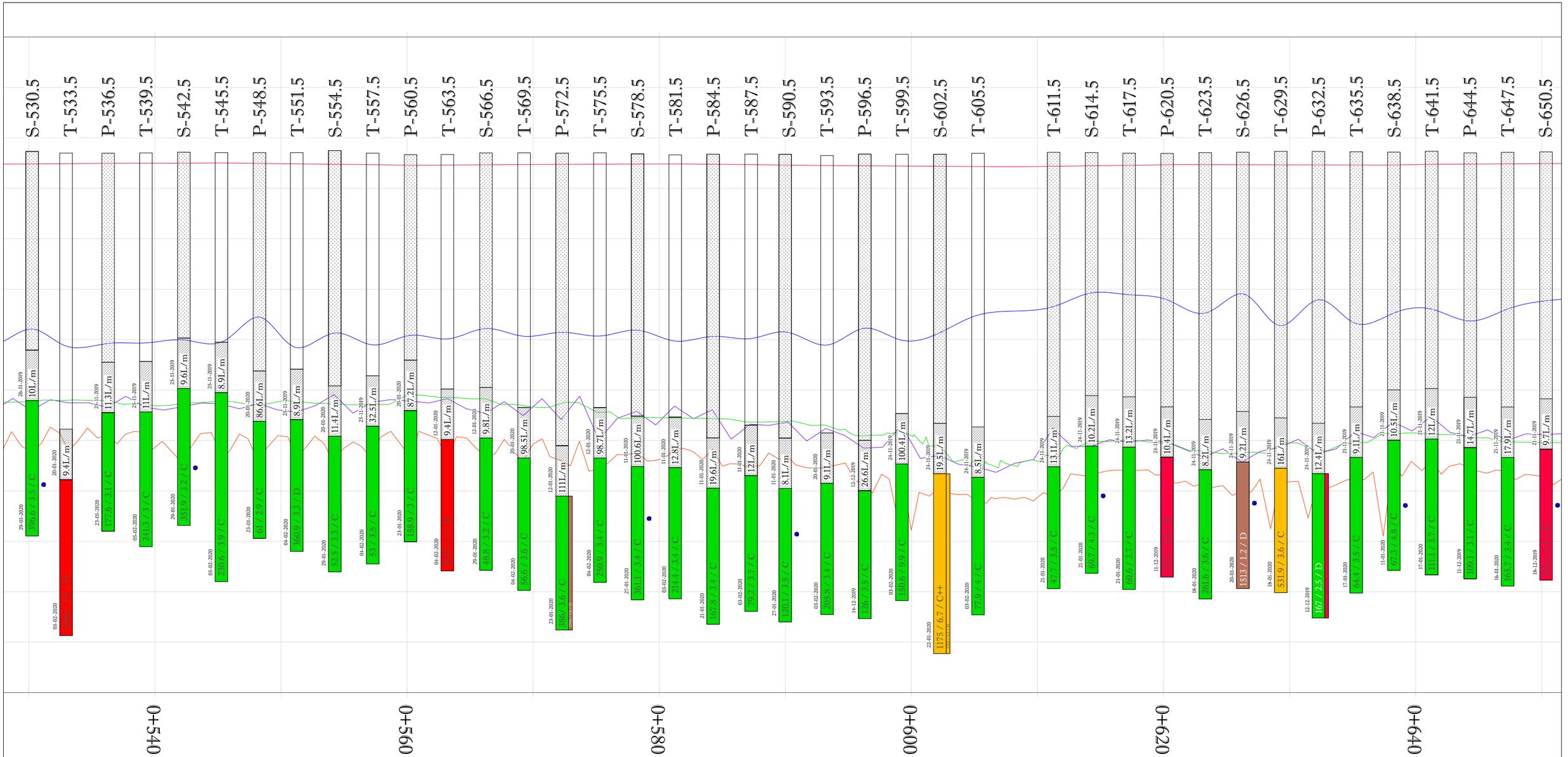
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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0 10 20 Meters

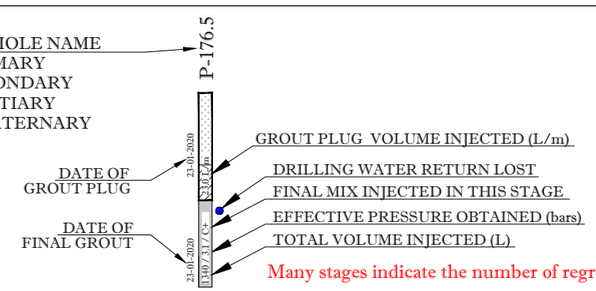
SCALE : 1:500 VERTICAL EXAGERATION: 2

KIVALLIQ CONTRACTORS GROUP LTD

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved

BOREHOLE NAME
P: PRIMARY
S: SECONDARY
T: TERTIARY
Q: QUATERNARY

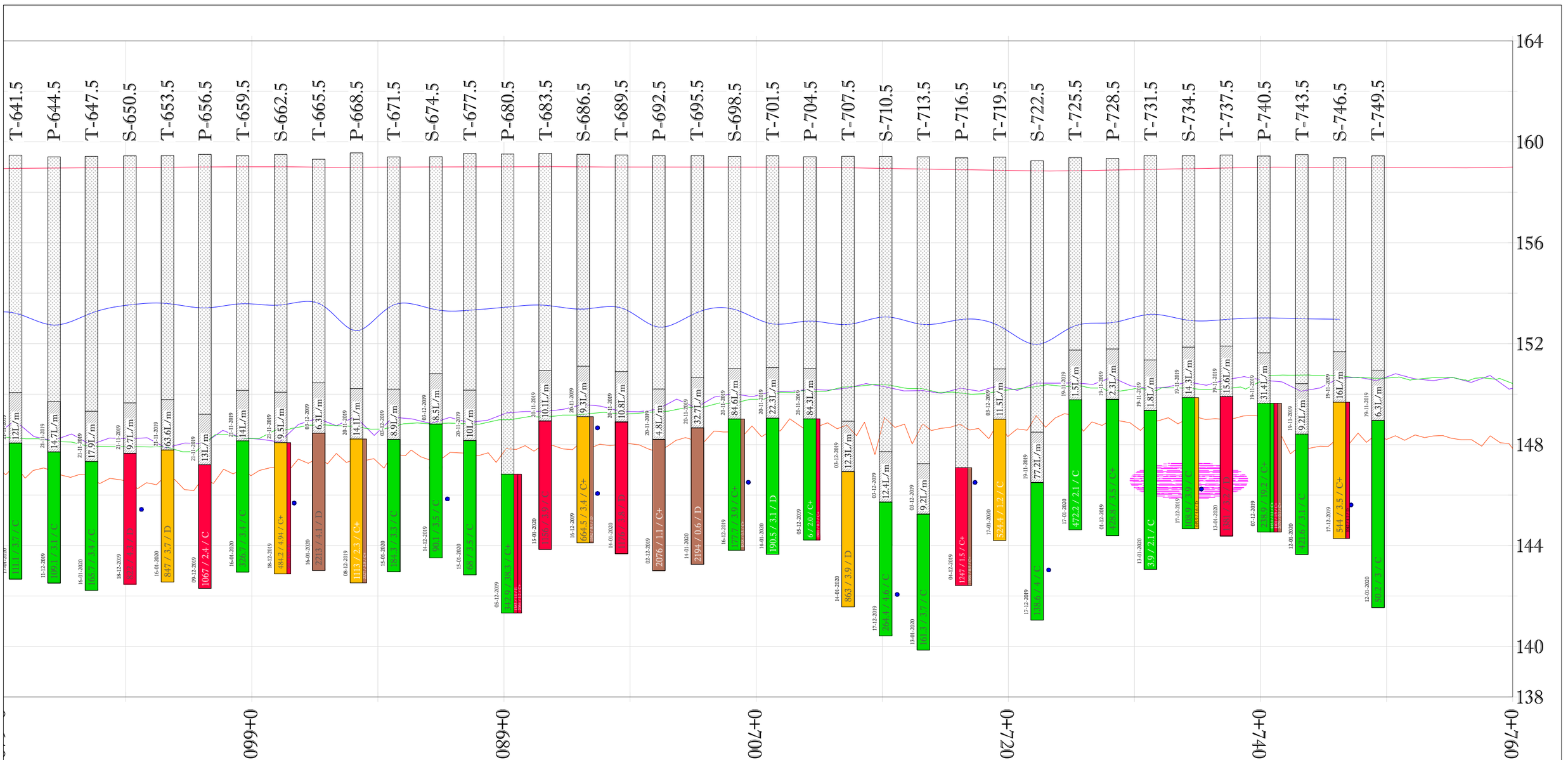


Many stages indicate the number of regrout

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION

PREPARED BY : MIKAËL LÉVESQUE
DATE : 20-02-2020
CON-FD-240-4

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



0 10 20 Meters

SCALE : 1:500 VERTICAL EXAGERATION: 2

KIVALLIQ CONTRACTORS GROUP LTD

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved

BOREHOLE NAME
P: PRIMARY
S: SECONDARY
T: TERTIARY
Q: QUATERNARY

P-176.5

DATE OF GROUT PLUG

DATE OF FINAL GROUT

GROUT PLUG VOLUME INJECTED (L/m)
DRILLING WATER RETURN LOST
FINAL MIX INJECTED IN THIS STAGE
EFFECTIVE PRESSURE OBTAINED (bars)
TOTAL VOLUME INJECTED (L)

Many stages indicate the number of regrout

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
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PREPARED BY : MIKAËL LÉVESQUE
DATE : 20-02-2020
CON-FD-240-5

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SNC·LAVALIN

WEEKLY REPORT

20200227-WR
Document number

2020/02/21 to 2020/02/27	669034	Sebastien Viau
Date	Project No.	Prepared by
Whale Tail Dike Remedial Drilling and Grouting Works		Agnico Eagle
Project		Client
SNC-Lavalin INC.	KCG (TCG)	
Consultant	Contractor	

MAIN ACTIVITIES

- This weekly report covers the activities from Feb 21st, 2020 to Feb 27th, 2020.
- QA representative missed the flight on Feb 21st so no QA representative on site from Feb 21st to Feb 24th, 2020.
- The main activities during this week were casing installation on the upstream blanket and downstream blanket (additional quaternary holes), bedrock drilling and grouting at the downstream blanket.
- AEM, TCG and SNC-Lavalin site personnel had construction meeting in the early morning of each day.
- Due to very low grout take in primary, secondary and tertiary holes in the West portion of the dike, grouting now starts with Mix B for the holes located in that section.
- All primary holes of the downstream blanket are now grouted and completed (except two exclusion zones P608.5 and P440.5 that will be grouted eventually).
- Grouted holes that have grout take less than 1000 L will now be immediately backfilled. Grouted holes with grout take over 1000 L will be left open to check grout level next day.
- SNC provided the list of the D/S blanket quaternary holes to be grouted. Sixteen (16) additional quaternary holes were asked by SNC and one by AEM for a total of Seventeen (17) quaternary holes at the D/S blanket.
- SNC will provide the locations of super primary holes (deeper holes) for U/S Blanket/curtain grouting.

GROUTING COMMITTEE RECOMMENDATIONS

- No additional recommendation from GC during this week.

CASING EXTENDED TO BEDROCK

- No casing were extended to bedrock during this week. A total of twenty two (22) casings were extended so far.

CASING PLUG

- No casing were plugged during this week.
- The only plug remained on the downstream blanket is T197.5 that will plugged after bedrock drilling (mud in the hole blocked the packer installation). The packer will be set half in the casing and half in the rock for the bedrock grouting. After bedrock grouting completed, the packer will be lift in the casing and the casing will be plugged.

CASING INSTALLATION

- Six (6) casings installed (night shift and day shift); four (4) at the downstream blanket (quaternary holes) and two (2) at the upstream blanket.
- Contractor was asked to prioritize the quaternary holes casing installation at the downstream blanket before installing the upstream casings.

Hole	Blanket (US or DS)	Survey bedrock depth (m)	Measured bedrock depth (m)	Casing Bottom depth (m)	Water depth (m)
Q-697,0	DS	9.45	9.96	10.26	9.1
Q-733,0	DS	8.89	9.81	10.11	9.07
Q-736,0	DS	8.9	9.73	10.03	8.87
Q-739,0	DS	8.9	10.2	10.5	5.0
S-745,0	US	8.4	8.8	9.1	5.0
T-748,0	US	8.5	8.88	9.2	5.0

BEDROCK DRILLING

- A total of thirty-two (32) holes had been drilled during this week for 5 m stage length between stations 176.5 and 377.5.
- No water loss was observed in all the holes drilled in bedrock this week.
- All holes drilled during this week stayed open to the bottom and no caving observed.
- So without water loss or caving, all holes were drilled in one 5 m long stage.
- All the holes washed clean after drilling for 5 min.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
T-377,5	16.9	-	-	No caving	No
T-371,5	18.2	-	-	No caving	No
T-365,5	22.3	-	-	No caving	No
T-353,5	19.9	-	-	No caving	No
T-347,5	18.4	-	-	No caving	No
T-341,5	17.9	-	-	No caving	No
T-329,5	16.4	-	-	No caving	No
T-323,5	15.7	-	-	No caving	No
T-317,5	15.0	-	-	No caving	No
T-311,5	13.9	-	-	No caving	No
T-305,5	13.6	-	-	No caving	No
T-299,5	13.2	-	-	No caving	No
T-293,5	14.1	-	-	No caving	No
T-287,5	13.9	-	-	No caving	No
T-281,5	14.4	-	-	No caving	No
T-275,5	14.5	-	-	No caving	No
T-269,5	14.4	-	-	No caving	No
S-266,5	14.5	-	-	No caving	No
S-254,5	14.8	-	-	No caving	No
P-248,5	14.5	-	-	No caving	No
S-242,5	14.3	-	-	No caving	No
P-236,5	14.5	-	-	No caving	No
S-230,5	14.2	-	-	No caving	No
P-224,5	14.6	-	-	No caving	No
S-218,5	15.8	-	-	No caving	No
P-212,5	15.1	-	-	No caving	No
S-206,5	15.7	-	-	No caving	No
P-200,5	15.3	-	-	No caving	No
S-194,5	15.0	-	-	No caving	No

P-188,5	13.9	-	-	No caving	No
S-182,5	12.8	-	-	No caving	No
P-176,5	13.4	-	-	No caving	No

BEDROCK GROUTING

- During this week, bedrock grouting was conducted for Primary, Secondary and Tertiary holes at the downstream blanket.
- A total of 151 holes, all at the downstream blanket, have been completed up to date.

1st Stage Grouting

- A total of twenty-nine (29) holes were grouted between station 176.5 and 437.5 during this week.
- All the holes grouted in 5 m stage length.
- All holes reached Pmax.
- Twenty-six (26) holes reached refusal at Pmax with Mix B, two (2) holes reached Pmax with Mix C without Celbex and one (1) hole reached Pmax with Mix D.
- Considering that all grout takes are below 1000 L, all holes were immediately backfilled at the end of pressure grouting process.
- In hole S-242,5 where almost 1000 L was grouted, grout level was measured 15 min after grouting. Grout was found at a depth of 9.0 m (in casing level) so the hole was backfilled.

Hole ID	Date	Grouting Length (m)	Closing Pressure (bar)	Closing Flowrate (l/min)	Volume Injected (L)	Mix	Comments
P-176,5	2020-02-26	5.8	3	0.2	508.7	420L mix B + 89 L Mix C	Backfilled after refusal
P-188,5	2020-02-26	5.8	2.94	0	403.5	Mix B	Backfilled after refusal
P-200,5	2020-02-25	5.28	2.93	0.5	40.5	Mix B	Backfilled after refusal
P-212,5	2020-02-25	4.95	3.15	1	62.4	Mix B	Backfilled after refusal
P-224,5	2020-02-25	5.3	2.98	0.2	63.3	Mix B	Backfilled after refusal
P-236,5	2020-02-25	5.35	2.95	0.4	53.9	Mix B	Backfilled after refusal
S-242,5	2020-02-27	5.16	3.45	0	988	450 L mix B + 480 L mix C + 58 L mix D	Backfilled after refusal
P-248,5	2020-02-25	5.23	3.21	0.8	66.7	Mix B	Backfilled after refusal
S-254,5	2020-02-27	5.50	2.97	0.5	50.9	Mix B	Backfilled after refusal
S-266,5	2020-02-25	5.28	2.3	0.9	46.1	Mix B	Backfilled after refusal
S-278,5	2020-02-25	5.3	2.26	0.3	51.7	Mix B	Backfilled after refusal
S-290,5	2020-02-24	5.45	3.1	0.7	69	Mix B	Backfilled after refusal
S-302,5	2020-02-24	5.28	2.8	0	46	Mix B	Backfilled after refusal
S-314,5	2020-02-24	5.35	2.9	1	58	Mix B	Backfilled after refusal
S-326,5	2020-02-24	5.58	3.1	0.5	56	Mix B	Backfilled after refusal
S-338,5	2020-02-24	5.39	4	0.3	64	Mix B	Backfilled after refusal
S-350,5	2020-02-24	4.92	3.1	0.1	64	Mix B	Backfilled after refusal
S-362,5	2020-02-23	4.7	3.3	0.4	76	Mix B	Backfilled after refusal
S-374,5	2020-02-23	5.01	2.9	0.1	76	Mix B	Backfilled after refusal
T-383,5	2020-02-23	5.36	3.1	0	74	Mix B	Backfilled after refusal
T-389,5	2020-02-23	5.38	3.3	0.1	100	Mix B	Backfilled after refusal
T-395,5	2020-02-23	5.08	3.3	0	97	Mix B	Backfilled after refusal
T-401,5	2020-02-23	5.14	3.4	0.2	631	400L mix B + 231 L Mix C	Backfilled after refusal
T-407,5	2020-02-22	5.1	3.4	0	133	Mix B	Backfilled after refusal
T-413,5	2020-02-22	5.25	3.5	0.2	68	Mix B	Backfilled after refusal
T-419,5	2020-02-22	5.12	3.1	0.1	76	Mix B	Backfilled after refusal
T-425,5	2020-02-22	5.09	3.2	1.2	40	Mix B	Backfilled after refusal
T-431,5	2020-02-22	5.27	3.4	0.9	42	Mix B	Backfilled after refusal
T-437,5	2020-02-22	5.5	3.4	1.1	47.76	Mix B	Backfilled after refusal

GROUT TESTING

- Grout tests were conducted for 1st batch as well as every 5 batches or whenever Mix changes. The Marsh values, specific gravity, bleeding and temperature values were checked for Mixes B and C.

Date	Hole ID	Mix	Specific Gravity	Marsh value (second)	Temperature (°C)	Bleeding (%)
2020-02-22	T-437.5	Mix B	1.72	51	27.0	2.0
	T-425.5	Mix B	1.72	48	24.0	---
	T-407.5	Mix B	1.73	49	24.5	2.0
2020-02-23	T-401.5	Mix B	1.70	54	26.0	2.0
	T-401.5	Mix C	1.76	64	25.0	---
	T-383.5	Mix B	1.71	48	21.0	2.0
2020-02-24	S-350.5	Mix B	1.72	51	19.5	2.0
	S-314.5	Mix B	1.72	54	18.0	---
	S-302.5	Mix B	1.73	55	18.5	2.0
2020-02-25	S-266.5	Mix B	1.72	57	24.0	2.0
	S-224.5	Mix B	1.68	45	23.0	2.0
2020-02-26	P-188.5	Mix B	1.71	52	27.5	2.4
	P-176.5	Mix B	1.72	55	24.0	---
2020-02-27	S-254.5	Mix B	1.72	46	23.5	2.0
	S-242.5	Mix C	1.75	65	22.0	1.0
	S-242.5	Mix D	1.81	---	21.0	---

- Marsh values for Mix B ranged mostly from 48 to 57s.
- The Specific Gravity and Bleed tests for Mix B shows very stable numbers with Specific Gravity ranged from 1.68 to 1.73 and Bleed from 2.0 to 2.4 %.
- Some fluctuation with Marsh value, possible issue with cement from different bulk bags, also some chunks found in the grout causing fluctuation in pressure and flow rate during grouting.
- KCG was advised to better control the screening and filling of 20 KG buckets.

HOLE DEPTH VERIFICATIONS

- TCG along with GHD and QA representative measured the depth of hole and water level for every hole prior to start rock grouting.

BOREHOLE INCLINATION CHECK

- KCG will submit RFI to relax the casing deviation from 0.5% to 2.0%

pH AND TURBIDITY RESPONSE

- No pH and Turbidity measures were taken this week.

LIST OF CHANGES ON SPECS, SITE INSTRUCTION, FIELD WORK AND DEVIATION LIST

Whale Tail Dike Remedial Grouting Sepecifications and Design Drawings Changes Tracking

Document	Revision	Date Issued	Subject
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PC	2019-10-03	Technical Specifications for Whale Tail Dike Remedial Drilling and Grouting Works Rev. PC was issued for AEM and Grouting Committee's (GC) review and comments. The document was the main topic of the discussion in the Grouting Committee Meeting No.3 held on Oct. 17th, 2019 in Montreal.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	PD	2019-10-28	As per discussions and recommendations from GC Meeting No.3, Technical and Specifications had been updated to Rev PD. Reference can be made to meeting minutes 669034-0000-30MC-0001 for details of the comments and recommendations to the designs.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PE	2019-11-27	Rev. PD had been updated to Rev PE based on recommendations presented in GC's letter Dated Oct. 25, 2019 and further discussions with AME engineers and site staff to implement the simplified approach and path forward proposed by the GC. Phased approach adopated starting with two rows of Blanket Grouting (Phase I) and based on the results of Blanket Grouting to decide the requirement of deepen the Upstream Blanket holes for Curtain Grouting (Phase II)
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	00	2020-01-10	Document Rev. PE had been updated based on comments on received and the discussions and recommendations from GC Meeting No.5 held on December 5, 2019.

Whale Tail Dike Remedial Grouting Site Instructions Changes Tracking

Document	Revision	Date Issued	Subject
SITE INSTRUCTIONS FOR DRILLING AND BLANKET GROUTING (Document Number: 669034-0000-40CA-0001 Rev. 00)	Rev 00	2019-11-19	A technical memo - Site Instructions for Drilling and Blanket Grouting Rev PB was issued on November 19, 2019. The objective of this document is to provide key instructions to the drilling and grouting of the Blanket Holes at the WTD foundation to allow work to start timely before Design Drawings and Specifications are ready and approved. The Site Instructions were prepared based on discussions and comments on Technical Specs Rev PD, Grouting Committee's Letter dated October 25, 2019 and in alignment with the objective of 40 to 50% seepage deduction with simplfied and phased project approach. This document may require update based on the progress and results of the field work.
	Rev 01	2020-01-08	The Site Instructions Rev 00 was updated to Rev 01 to incorporate: (1) modification of the Mix C+ by reducing the Calcium Chloride dosage (2)conditions for drilling and grouting the hole in two stages

Whale Tail Dike Remedial Grouting Fieldwork Instructions Changes Tracking

Document	Date Issued	Subject	Notes
Fieldwork Instruction No.1 (Email)	2019-12-03	Subject: 669034 - Rock Grouting on Grout Mix Change Procedures	This Fieldwork Instruction provide by email dated Dec. 03, 2019 on Subject: **Grout mix change procedures during the Blanket Hole Grouting and Regrouting** (prior to Open Throat Pump is available) based on the on site trial mix results and ground response on grout take and grouting pressure.
Fieldwork Instruction No.2 (FWI 001 Rev 00)	2019-12-07	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 00	This Fieldwork instruction applies to Grouting and Re-grouting of Primary Holes with the application of Celbex using Open Throat Pump as recommended by Grouting Committee (Meeting No. 5 on December 05 2019) that had been drilled per 5 m Stage. The site instruction will be updated as per the progress of the site construction.
Fieldwork Instruction No.3 (FWI 001 Rev. 01)	2019-12-09	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 01	The fieldwork instruction No.2 was updated to introduce Mix D

DEVIATION LIST FOR REMEDIAL GROUTING AT WHALE TAIL DIKE

Deviation #	Date Received	Date Responded	Status	Subject	Location/Address	Notes
001	2019-11-10		AEM will manage the situation	QC did not use centerlizer to monitor inclination	multiple locations	Daily Report - Contractor informed that they will use inclino meter without centerlizer as they did last winter but AEM will look if they can findout centerlizer for 4.6" casing.
002	2019-11-14		waiting for apparatus and	QC did not have Vicat apparatus and did not know how to use filtration	during Trial mix	Vicat apparatus received and fist vicat test performed on Dec 5, 2029
003	2019-12-06			inclination check in bedrock holes are not been checked. AEM said inclination check is not necessary in the rock hole during daily construction meeting on Dec 6, 2019 and captured on weekly		As per specs. "Deviation from vertical in the bedrock section of the hole shall not exceed 2% of drilled length."
004	2020-01-13			Drilling of tertiary holes prior to grouted secondary holes	T611.5, T617.5, T623.5, T629.5	Tertiary holes drilled while secondary holes S614.5 and S626.5 were not been grouted yet. As per spec. Tertiary holes shall be drilled in rock after secondary holes has been grouted and grout reached its final set
005	2020-01-12			Continuous drilling and grouting of tertiary holes	WTD Tertiary holes	Consective tertiary holes has been drilled and grouted (6 m distance). As per spec. minimum distance between two drilled holes in bedrock is
006	2020-02-13	2020-02-13	accepted	Use of Mix B in Tertiary Holes	WTD Tertiary holes	AEM and SNC agreed with the KCG proposal of using Mix B in Tertiary holes.

SAFE AND SAFETY REMARKS

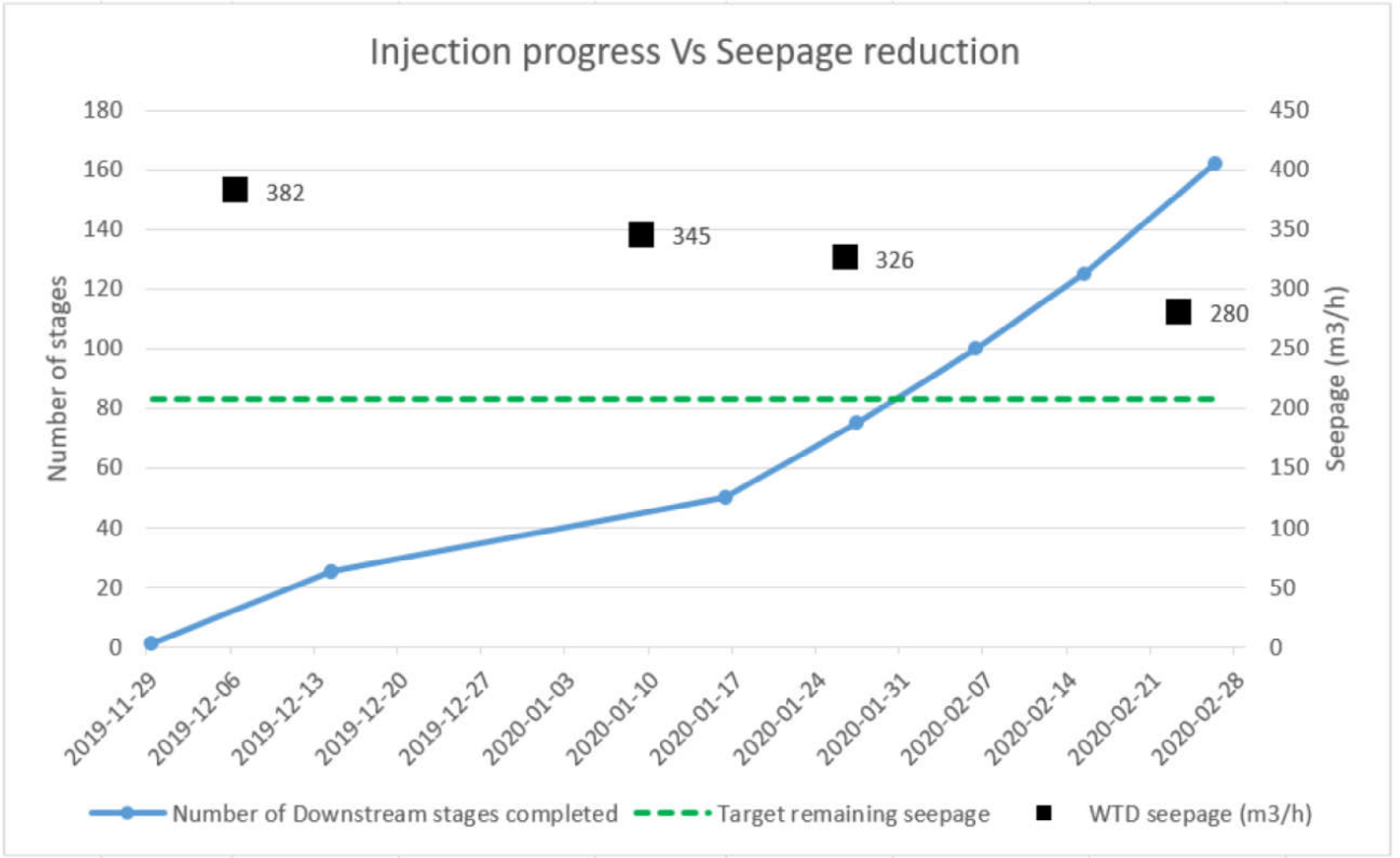
- Extreme cold weather conditions wear proper winter clothing.

Issued by :	*Sebastien Viau*	**28-02-2019**
	Signature	Date
Verified by :	*Tom Xue*	**28-02-2019**
	Signature	Date

APPENDICES

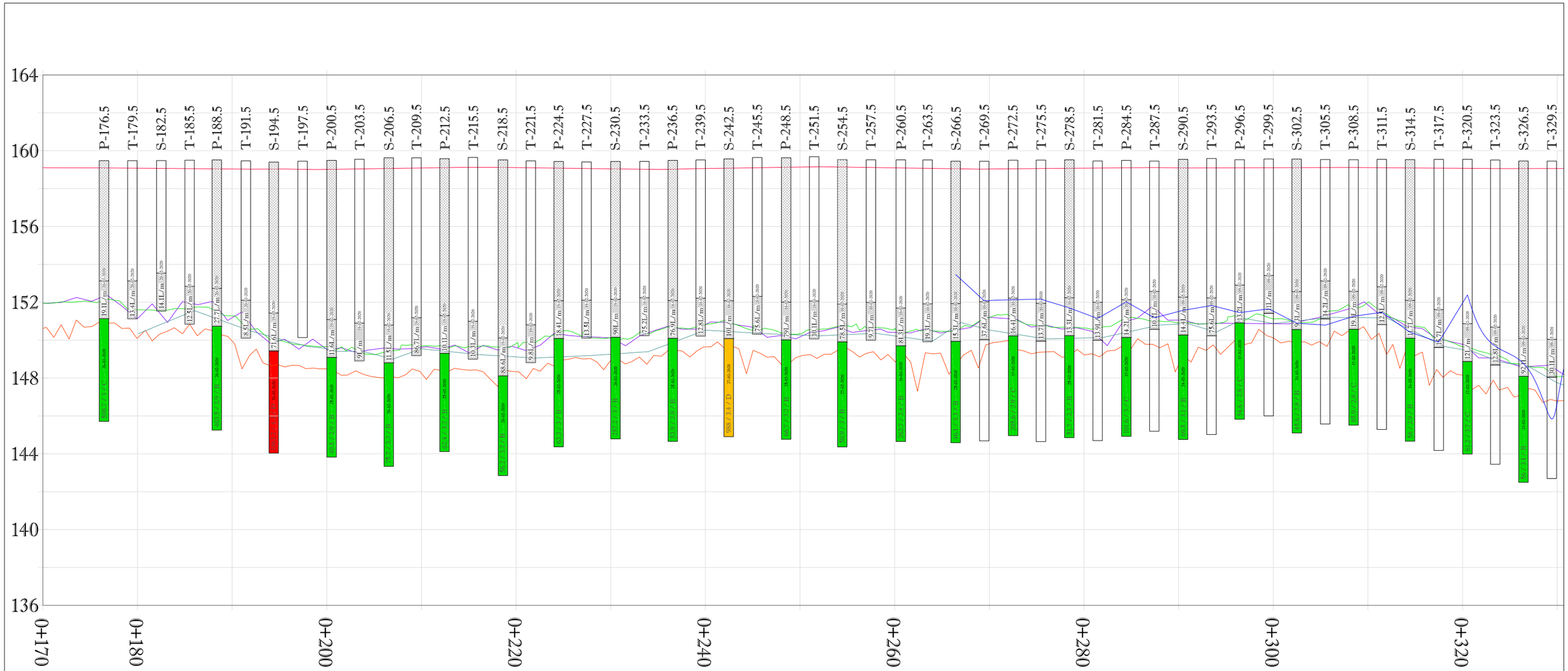
A1: AEM Seepage Report

A2: KGC As-Built Profile Progress


Injection progress Vs Seepage reduction
Number of stages
Seepage (m3/h)
180
160
140
120
100
80
60
40
20
0
450
400
350
300
250
200
150
100
50
0
382
345
326
280
2019-11-29
2019-12-06
2019-12-13
2019-12-20
2019-12-27
2020-01-03
2020-01-10
2020-01-17
2020-01-24
2020-01-31
2020-02-07
2020-02-14
2020-02-21
2020-02-28
Number of Downstream stages completed
Target remaining seepage
WTD seepage (m3/h)

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

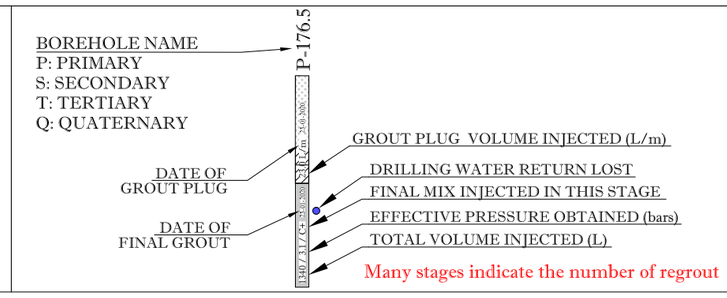


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



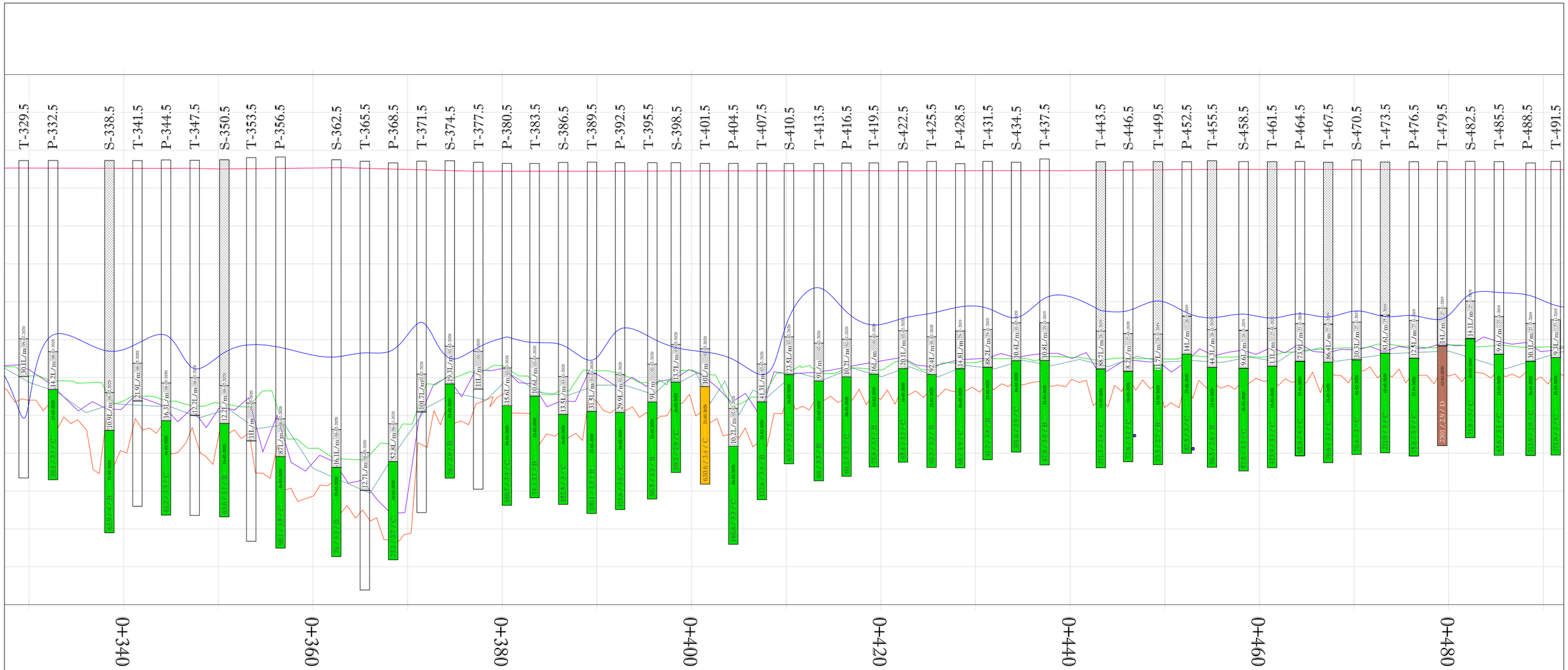
- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 01-03-2020
CON-FD-248-1

C:\Users\arpenteur\Dropbox (Groupe Gilbert)_arpentage meadowbank\02-B - CAD\11-811 - AMQ DIKES\WHALE TAIL DIKE\INJECTION\PHASE 2\WTD_DS INJECTION PHASE 2_ASBUILT.dwg

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

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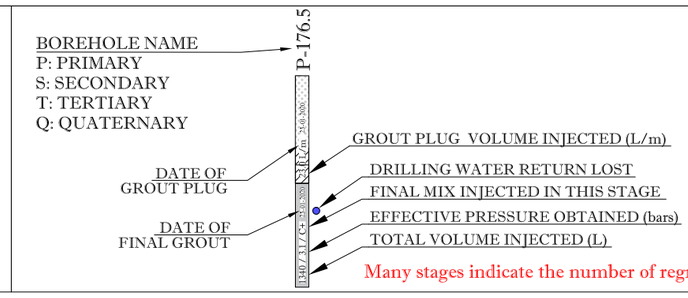

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- MEASURED WATER LEVEL
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- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 01-03-2020
CON-FD-248-2

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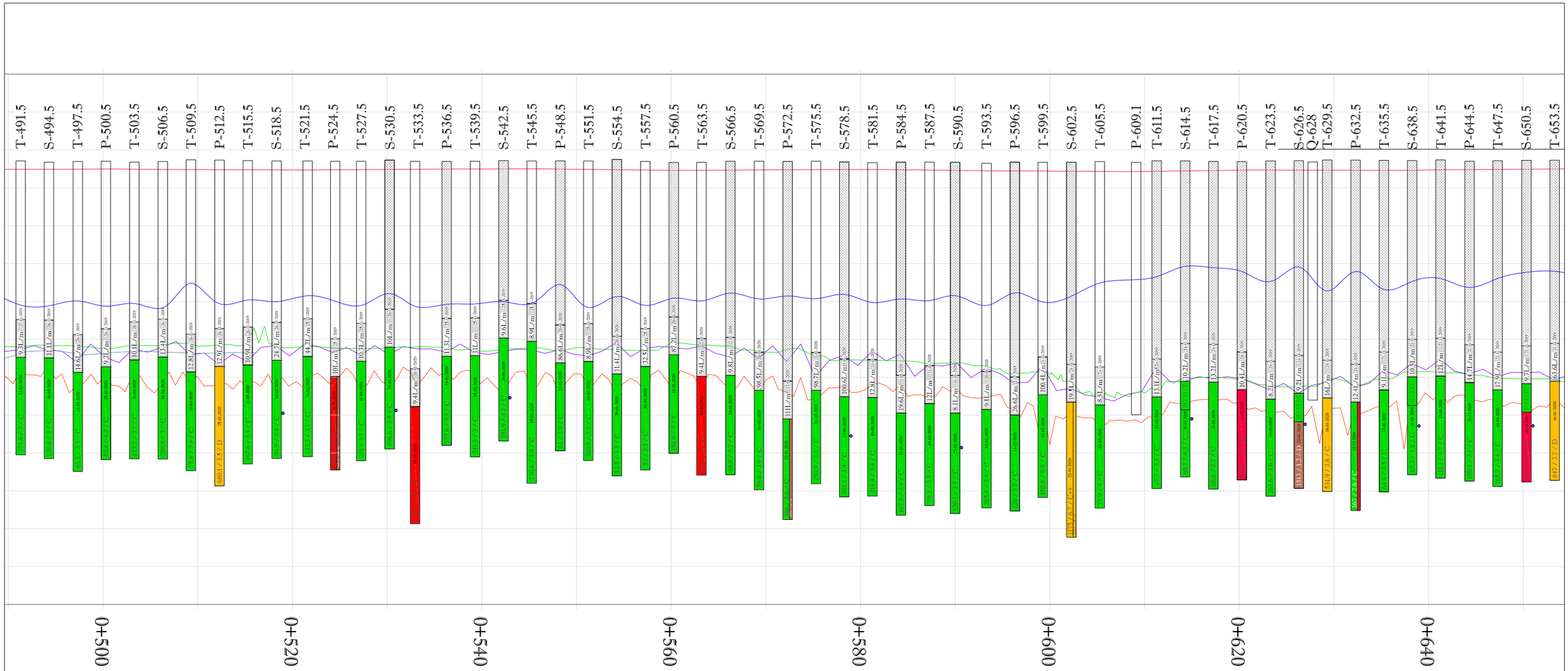
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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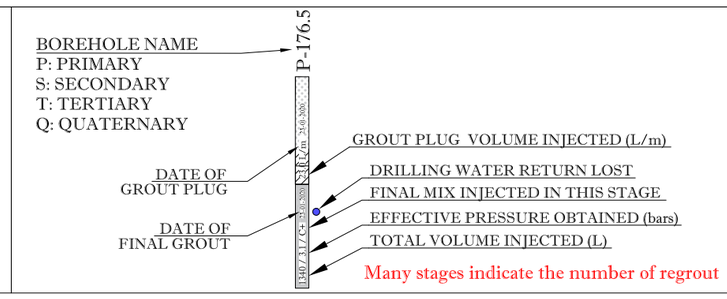

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PREPARED BY : FRANCIS PAULIN
DATE : 01-03-2020
CON-FD-248-3

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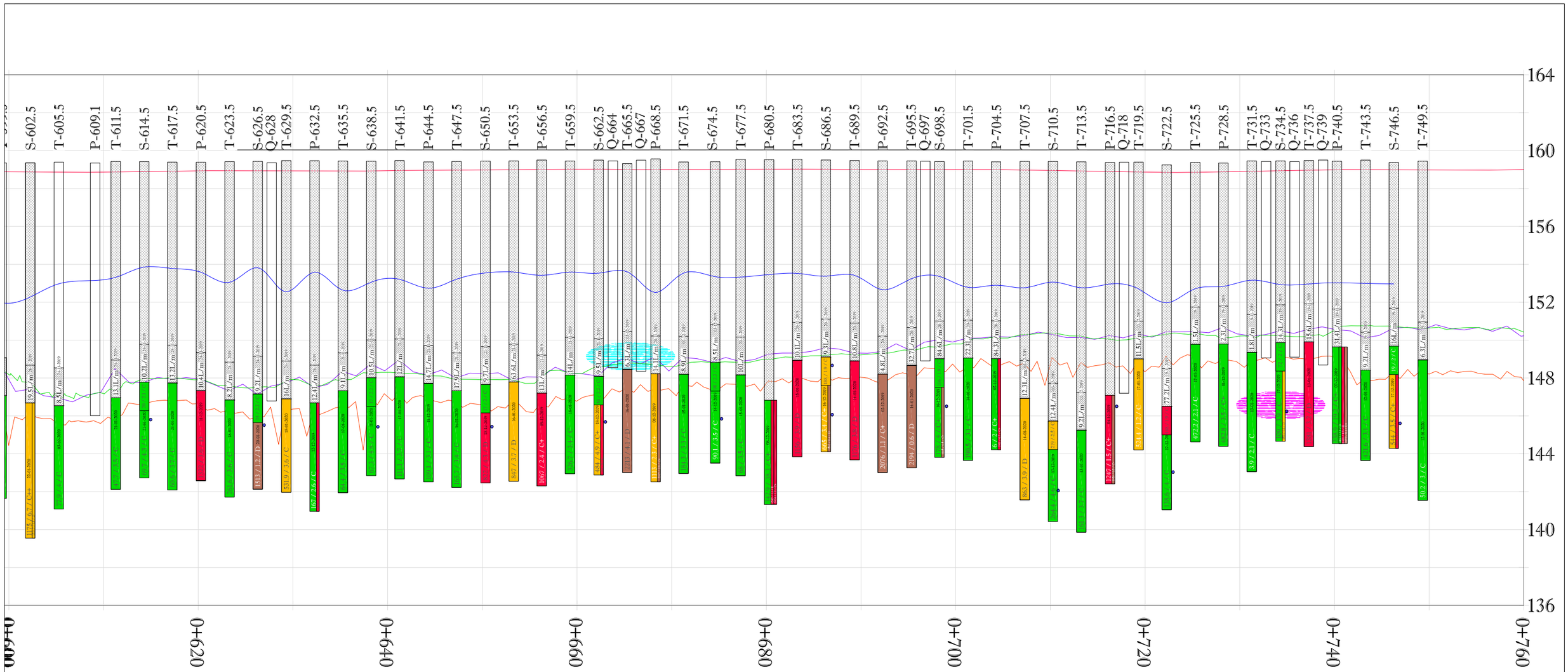
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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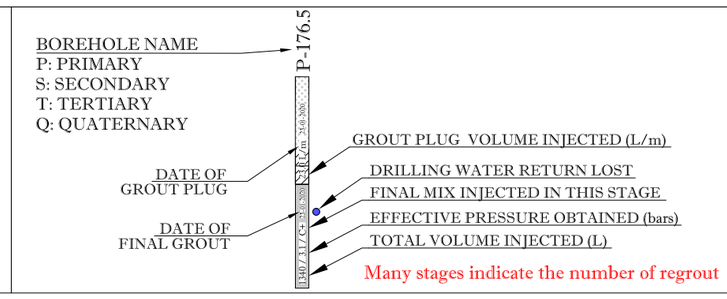

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PREPARED BY : FRANCIS PAULIN
DATE : 01-03-2020
CON-FD-248-4

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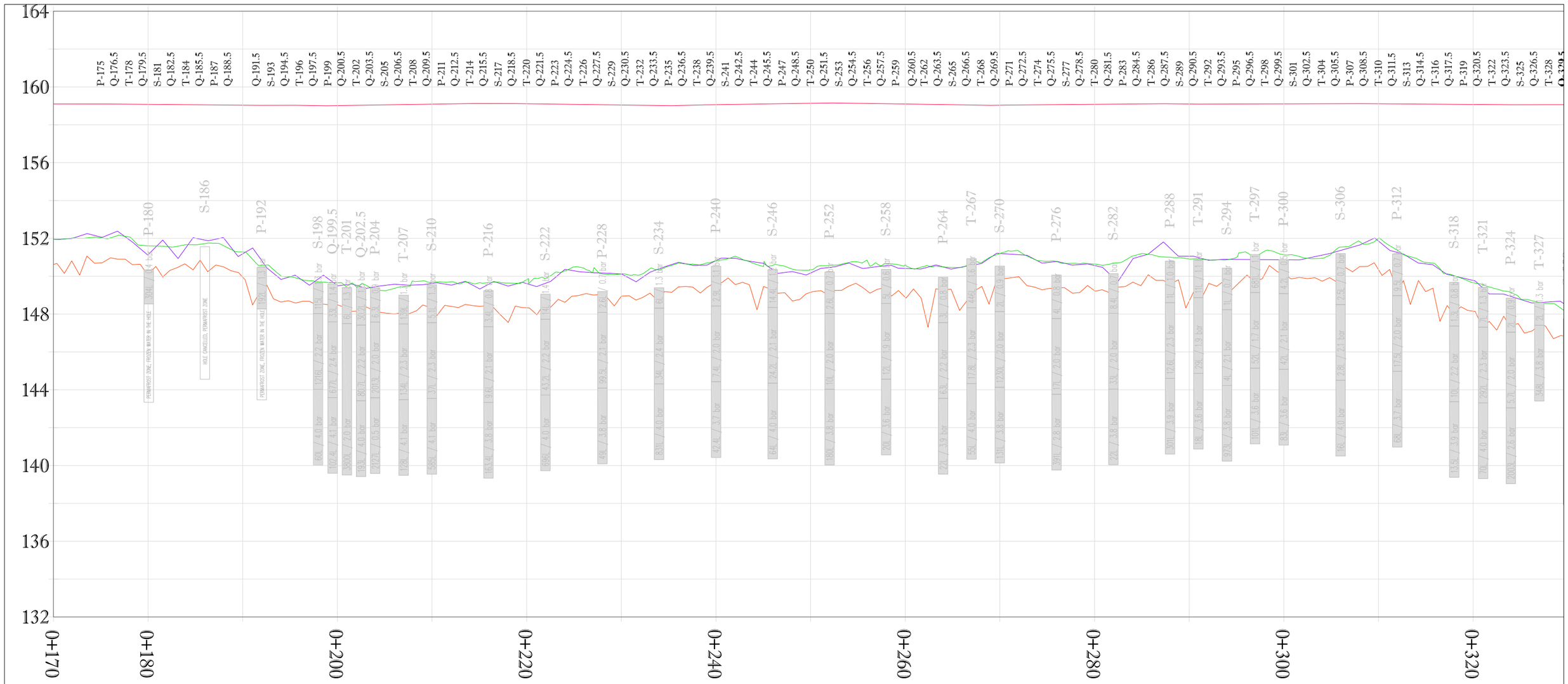
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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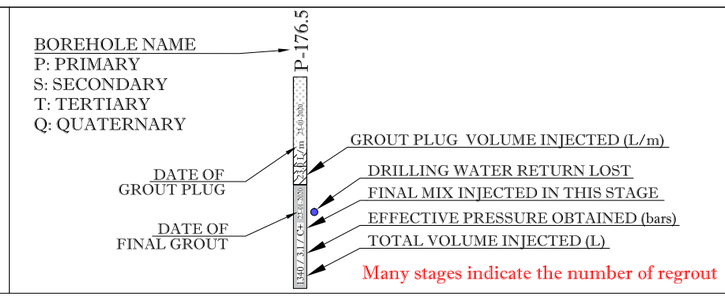

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BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 28-02-2020
CON-FD-245-1

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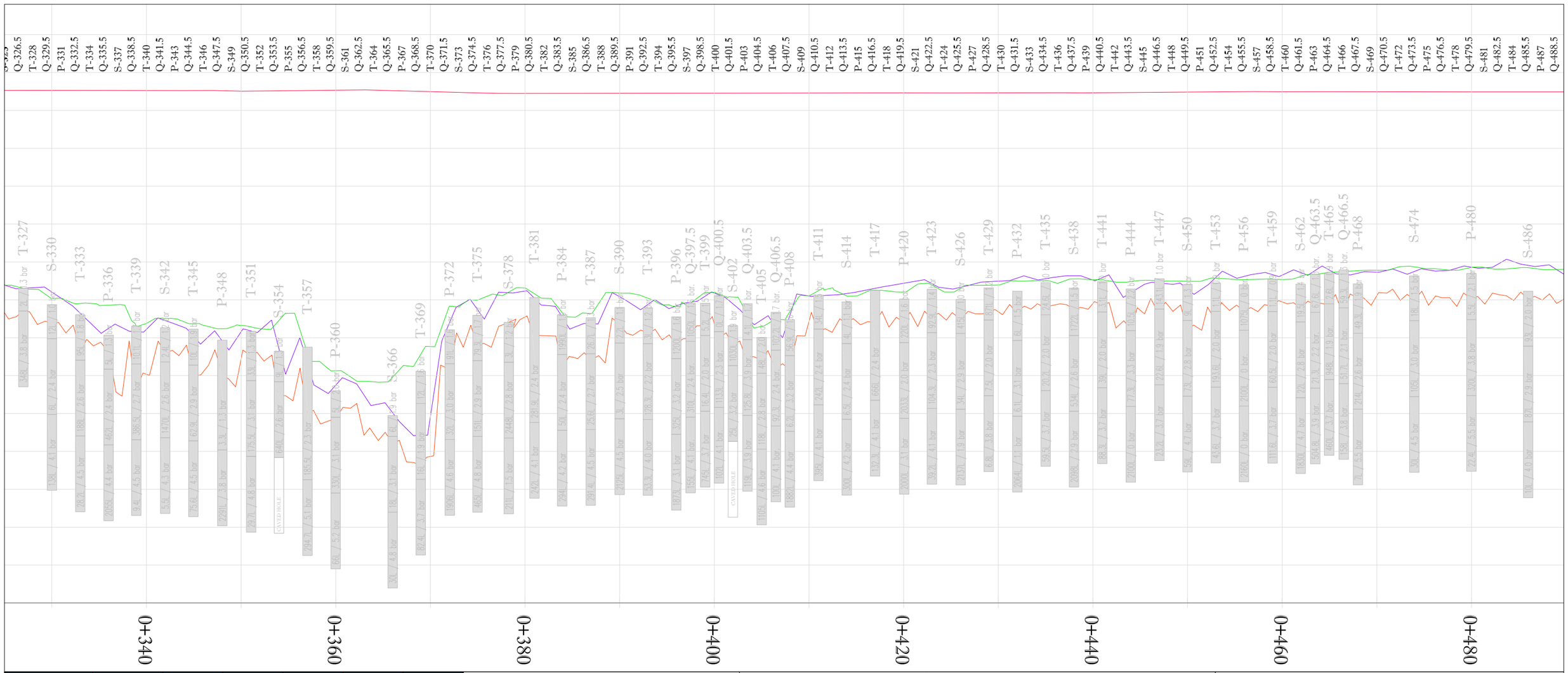
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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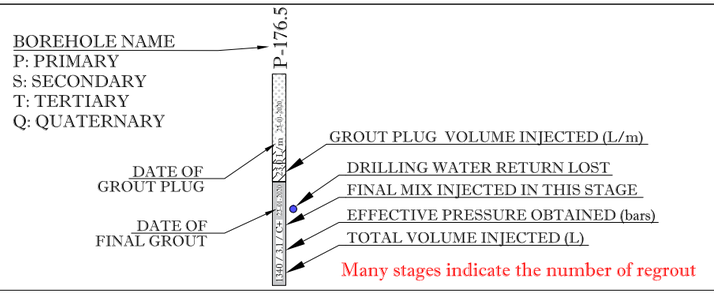

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PREPARED BY : FRANCIS PAULIN
DATE : 28-02-2020
CON-FD-245-2

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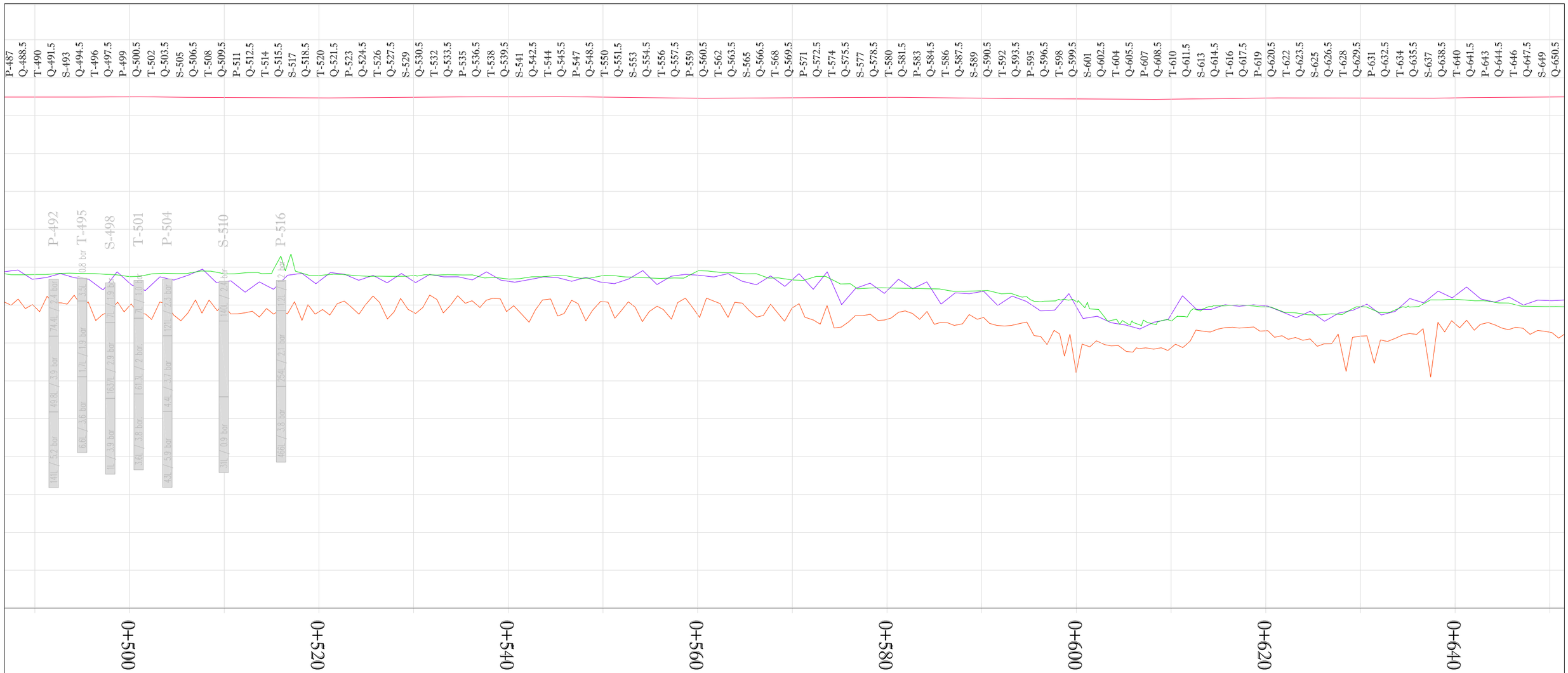
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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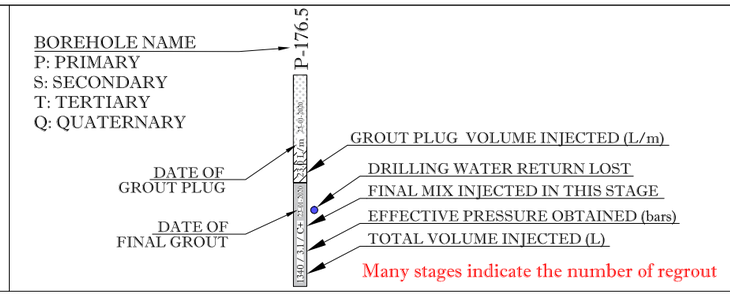

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PREPARED BY : FRANCIS PAULIN
DATE : 28-02-2020
CON-FD-245-3

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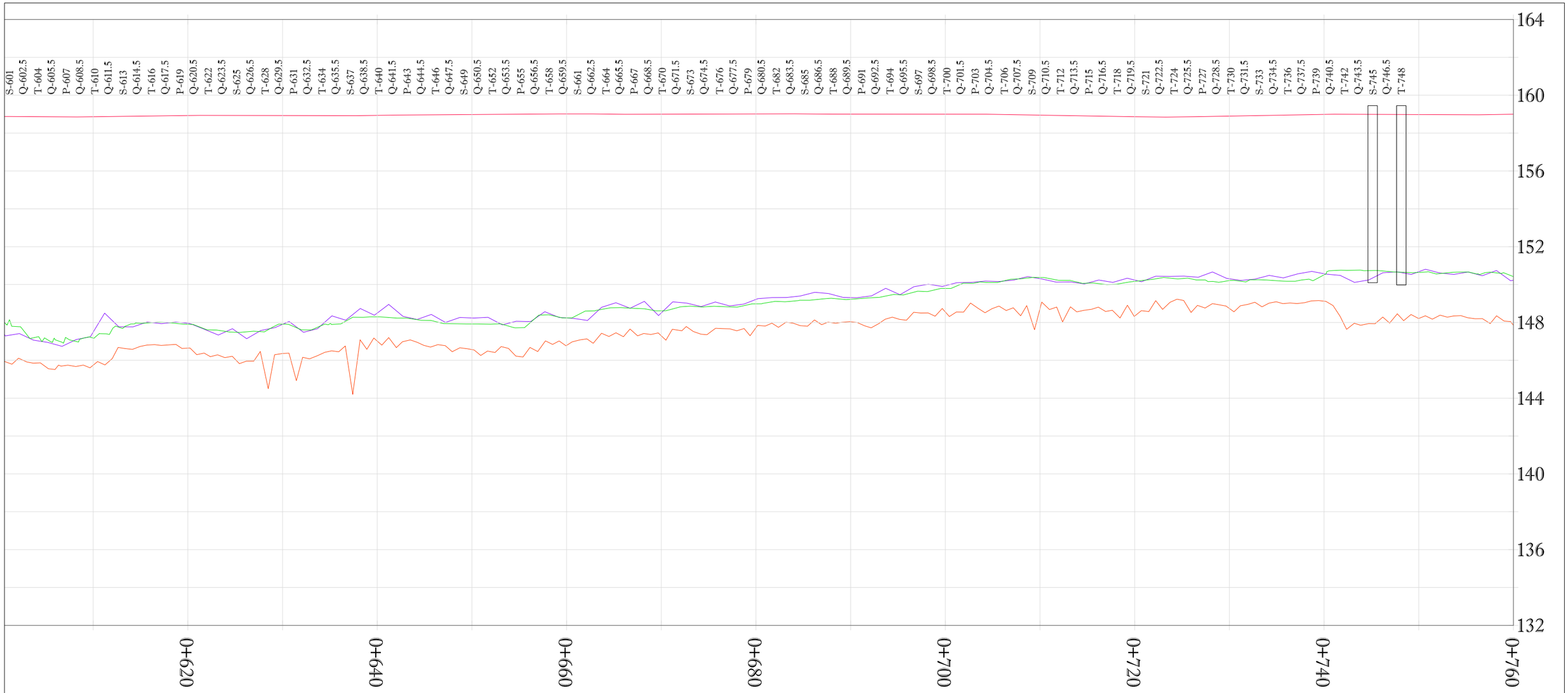
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
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Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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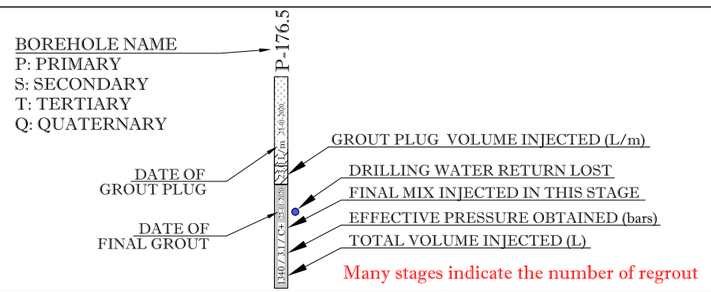

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PREPARED BY : FRANCIS PAULIN
DATE : 28-02-2020
CON-FD-245-4

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SNC·LAVALIN

WEEKLY REPORT

20200305-WR
Document number

2020/02/28 to 2020/03/05	669034	Sebastien Viau
Date	Project No.	Prepared by
Whale Tail Dike Remedial Drilling and Grouting Works		Agnico Eagle
Project		Client
SNC-Lavalin INC.	KCG (TCG)	
Consultant	Contractor	

MAIN ACTIVITIES

- This weekly report covers the activities from Feb 28th , 2020 to March 5th, 2020.
- The main activities during this week were casing installation on the upstream blanket and downstream blanket (additional quaternary holes), bedrock drilling and grouting at the downstream blanket. One casing was also plugged.
- AEM, TCG and SNC-Lavalin site personnel had construction meeting in the early morning of each day.
- Due to very low grout take in primary, secondary and tertiary holes in the West portion of the dike, grouting now starts with Mix B for the holes located in that section.
- All primary and secondary holes of the downstream blanket are now grouted and completed (except two exclusion zones P608.5 and P440.5 that will be grouted later).
- Grouted holes that have grout take less than 1000 L are immediately backfilled. Grouted holes with grout take over 1000 L will be left open to check grout level next day.
- SNC provided the list of the D/S blanket quaternary holes to be grouted. Sixteen (16) additional quaternary holes were asked by SNC and one by AEM for a total of Seventeen (17) quaternary holes at the D/S blanket. Installation of these additional casings is now completed.
- SNC will provide the locations of super primary holes (deeper holes) and strategy for U/S Blanket/curtain grouting to AEM which will be discussed on GC meeting on March 6th.

GROUTING COMMITTEE RECOMMENDATIONS

- No additional recommendation from GC during this week. Meeting with GC is planned for March 6th, 2020.

CASING EXTENDED TO BEDROCK

- No casing were extended to bedrock during this week. A total of twenty-two (22) casings were extended so far.

CASING PLUG

- Only casing T197.5 was plugged during this week.
- This casing has not been previously plugged because some mud was found in the hole during the initial casing plug attempt. It was then decided that the packer would be place half in bedrock and half in casing for bedrock injection after bedrock drilling.
- After the completion of the bedrock grouting in that hole, rods and packer were lift and packer was inflated in casing. The purpose was to plug the casing and to grout the upper portion of bedrock where portion of the packer was inflated. For this reason, high pressure was used. Casing uplift was attentively monitored.

CASING INSTALLATION

- Forty-three (43) casings installed (night shift and day shift); five (5) at the downstream blanket (4 quaternary and 1 primary) and thirty-eight (38) at the upstream blanket.
- Some water was coming out from hole Q-667 while casing drilling Q-664. It was observed while the Q-664 casing was not in bedrock yet (about 1 m above bedrock). The water was coming out when the rig was not drilling, and the water went away when drilling resumed.
- Water coming from T-700 while drilling T-691, S-694 T-697 and P-703.
- Water coming from T-703 while drilling T-700.
- Quaternary holes casing installation at the downstream blanket were prioritized before installing the upstream casings.

Hole	Blanket (US or DS)	Survey bedrock depth (m)	Measured bedrock depth (m)	Casing Bottom depth (m)	Water depth (m)
T-742	US	8.4	9.11	9.41	8.5
P-739	US	8.9	9.44	9.74	9.0
T-736	US	8.9	9.12	9.42	9.0
S-733	US	9.5	9.67	9.97	9.1
T-730	US	9.7	10.23	10.53	8.4
P-727	US	9.6	11.33	11.63	9.6
T-724	US	9.5	11.8	12.1	9.1
S-721	US	9.9	11.75	12.05	8.4
T-718	US	9.93	13.28	13.58	8.5
P-715	US	9.94	13.32	13.62	8.5
T-712	US	9.64	13.31	13.61	7.5
S-709	US	9.71	12.51	12.81	9.0
T-706	US	9.73	10.7	11	8.5
P-703	US	9.6	10.8	11.1	4.8
T-700	US	9.91	10.56	10.86	4.8
S-697	US	10.1	10.59	10.89	9.2
T-694	US	10.47	10.52	10.82	6.0
P-691	US	10.60	10.55	10.85	4.8
T-688	US	10.70	10.26	10.56	9.0
S-685	US	10.80	10.92	11.22	9.1
T-682	US	10.70	10.29	10.59	9.2
P-679	US	11.00	11.00	11.3	4.8
T-676	US	10.96	10.46	10.76	7.5
S-673	US	10.79	10.68	10.98	8.0
T-664	US	11.2	11.21	11.51	9.6
S-661	US	11.6	11.22	11.52	9.2
T-658	US	11.6	11.22	11.52	9.0
P-655	US	12.3	12.39	12.69	9.1
T-652	US	12.09	11.74	12.04	7.0
S-649	US	11.91	11.39	11.69	7.5
T-646	US	11.87	11.21	11.51	8.0
P-643	US	11.6	11.23	11.53	9.0
T-640	US	11.4	11.07	11.37	9.0
S-637	US	11.9	11.04	11.34	9.1
T-634	US	12.4	12.23	12.53	8.8
P-631	US	12.2	12.19	12.49	8.9
T-628	US	12.13	11.78	12.08	8.5
S-625	US	12.4	12.71	13.01	8.9
P-609,1	DS	11.83	12.72	13.02	9.0
Q-628	DS	11.6	12.07	12.37	9.13
Q-664	DS	10.4	10.35	10.65	10.35
Q-667	DS	10.5	10.56	10.86	9.02
Q-718	DS	9.4	11.61	11.91	10.6

BEDROCK DRILLING

- A total of seventeen (17) holes had been drilled during this week for 5 m stage length between stations 179.5 and 263.5.
- No water loss was observed in all the holes drilled in bedrock this week.
- All holes drilled during this week stayed open to the bottom and no caving observed.
- Without water loss or caving, all holes were drilled in one 5 m long stage.
- All the holes washed clean after drilling for 5 min.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
T-179,5	13.4	-	-	No caving	No
S-182,5	12.8	-	-	No caving	No
T-185,5	13.7	-	-	No caving	No
T-191,5	14.1	-	-	No caving	No
S-194,5	15.0	-	-	No caving	No
T-197,5	14.3	-	-	No caving	No
T-203,5	15.5	-	-	No caving	No
T-209,5	15.8	-	-	No caving	No
T-215,5	15.9	-	-	No caving	No
T-221,5	15.7	-	-	No caving	No
T-227,5	14.4	-	-	No caving	No
T-233,5	14.1	-	-	No caving	No
T-239,5	14.3	-	-	No caving	No
T-245,5	14.6	-	-	No caving	No
T-251,5	14.6	-	-	No caving	No
T-257,5	14.6	-	-	No caving	No
T-263,5	14.5	-	-	No caving	No

BEDROCK GROUTING

- During this week, bedrock grouting was conducted for Secondary and Tertiary holes at the downstream blanket.
- A total of 185 holes, all at the downstream blanket, have been completed up to date.

1st Stage Grouting

- A total of thirty-four (34) holes were grouted between station 182.5 and 377.5 during this week.
- All the holes grouted in 5 m stage length.
- All holes reached Pmax.
- The majority holes had very low to low grout take, except at S-194.5, T197.5, T221.5 and T293.5.
- Twenty-eight (28) holes reached refusal at Pmax with Mix B, three (3) holes reached Pmax with Mix C without Celbex and three (3) hole reached Pmax with Mix D.
- Rheomac quantity was doubled in holes S-194.5, T197.5, T221.5 and T293.5 in order to close holes.
- Grout level was measured later in the day or the day after in holes with grout take above 1000 L (S-194.5, T197.5, T221.5 and T293.5). Grout was found above bottom of casing, so the holes were backfilled except T197.5 where grout level will be measured later.
- All the other holes had grout takes below 1000 L, so they were immediately backfilled at the end of pressure grouting process.

Hole ID	Date	Grouting Length (m)	Closing Pressure (bar)	Closing Flowrate (l/min)	Volume Injected (L)	Mix	Comments
S-182,5	2020-02-29	5.21	2.96	0.1	112.2	Mix B	Backfilled after refusal
S-194,5	2020-02-28	5.4	4.34	1.6	**1863**	Mix B (460 L), Mix C (540 L), Mix D (800 L) and Mix D 2x Rheomac (63 L)	Grout level measured 2020-02-29. Hole backfilled

T-197,5	2020-03-05	5.16	4.01	2.4	**1742**	Mix B (400 L), Mix C (460 L), Mix D (640 L) and Mix D 2x Rheomac (242 L)	Grout level to be measured
T-203,5	2020-03-05	5.16	2.82	0	108	Mix B	Backfilled after refusal
S-206,5	2020-02-28	5.37	3.18	0.8	75.7	Mix B	Backfilled after refusal
T-209,5	2020-03-05	5.65	3.5	0	272	Mix B	Backfilled after refusal
T-215,5	2020-03-04	5.6	3.4	0	324	Mix B	Backfilled after refusal
S-218,5	2020-02-28	4.85	3.24	1.1	56	Mix B	Backfilled after refusal
T-221,5	2020-03-04	5.5	3.98	1.4	**1584**	Mix B (500 L), Mix C (400 L), Mix D (600 L) and Mix D 2x Rheomac (84 L)	Grout level measured 2020-03-04 after 4 hours. Hole backfilled
T-227,5	2020-03-04	5.1	2.9	0.7	64	Mix B	Backfilled after refusal
S-230,5	2020-02-28	4.9	3.05	0.1	257	Mix B	Backfilled after refusal
T-233,5	2020-03-04	5.2	3.1	0	688.3	Mix B (450 L) and Mix C (240 L)	Backfilled after refusal
T-239,5	2020-03-03	5.35	3.24	0.3	54.9	Mix B	Backfilled after refusal
T-245,5	2020-03-03	5.62	3.07	0.9	65.7	Mix B	Backfilled after refusal
T-251,5	2020-03-03	5.32	3.17	0.5	80.6	Mix B	Backfilled after refusal
T-257,5	2020-03-03	5.40	3.22	0.8	50.7	Mix B	Backfilled after refusal
T-263,5	2020-03-03	5.25	3.39	1.1	54.1	Mix B	Backfilled after refusal
T-269,5	2020-03-03	5.33	3.09	1	54.5	Mix B	Backfilled after refusal
T-275,5	2020-03-02	5.26	3.37	0.4	129.6	Mix B	Backfilled after refusal
T-281,5	2020-03-02	5.40	2.99	0.6	82	Mix B	Backfilled after refusal
T-287,5	2020-03-02	5.37	3.02	0.2	88.5	Mix B	Backfilled after refusal
T-293,5	2020-03-02	5.09	3.54	1.5	**1270**	500L mix B + 770 L Mix C	Grout level measured 2020-03-02 after 4 hours. Hole backfilled
T-299,5	2020-03-01	5.4	3.26	1	46	Mix B	Backfilled after refusal
T-305,5	2020-03-01	5.54	2.81	0.8	44.1	Mix B	Backfilled after refusal
T-311,5	2020-03-01	5.89	3.18	0.3	73.7	Mix B	Backfilled after refusal
T-317,5	2020-03-01	5.3	2.99	0.8	47.9	Mix B	Backfilled after refusal
T-323,5	2020-03-01	5.23	2.92	0.6	93.8	Mix B	Backfilled after refusal
T-329,5	2020-03-01	5.34	2.83	0.7	42.3	Mix B	Backfilled after refusal
T-341,5	2020-03-01	5.6	3.64	1.2	64.1	Mix B	Backfilled after refusal
T-347,5	2020-02-29	6.11	3.37	0.2	86.9	Mix B	Backfilled after refusal
T-353,5	2020-02-29	6.05	4.02	0.2	124.1	Mix B	Backfilled after refusal
T-365,5	2020-02-29	5.25	95.3	0.4	95.3	Mix B	Backfilled after refusal
T-371,5	2020-02-29	5.3	3.26	0	170.3	Mix B	Backfilled after refusal
T-377,5	2020-02-29	5.27	3.15	0	705.2	480L mix B + 225 L Mix C	Backfilled after refusal

GROUT TESTING

- Grout tests were conducted for 1st batch as well as every 5 batches or whenever Mix changes. The Marsh values, specific gravity, bleeding and temperature values were checked for Mixes B and C.

Date	Hole ID	Mix	Specific Gravity	Marsh value (second)	Temperature (°C)	Bleeding (%)
2020-02-28	S-230.5	Mix B	1.71	53	20.0	3
	S-206.5	Mix B	1.70	46	19.0	---
	S-194.5	Mix C	1.76	62	16.0	---
	S-194.5	Mix D	1.80	NA	17.0	---
	S-194.5	Mix D	1.79	NA	18.5	0
	S-194.5	Mix D	1.83	NA	15.5	---
2020-02-29	S-182.5	Mix B	1.73	57	20.5	3
	T-377.5	Mix B	1.70	49	17.0	---
	T-377.5	Mix C	1.78	NC	24.0	---

	T-353.5	Mix B	1.69	58	20.0	3
2020-03-01	T-341.5	Mix B	1.72	53	20.5	2
	T-317.5	Mix B	1.72	60	20.5	---
	T-299.5	Mix B	1.71	55	19.0	2
2020-03-02	T-293.5	Mix B	1.68	45	16.5	3
	T-293.5	Mix C	1.78	65	17.5	1.5
	T-293.5	Mix D	1.83	NA	16.0	---
	T-281.5	Mix B	1.73	49	14.0	2
2020-03-03	T-269.5	Mix B	1.70	47	14.5	2
	T-251.5	Mix B	1.71	49	16.0	2.5
2020-03-04	T-233.5	Mix B	1.72	50	14.5	2
	T-233.5	Mix C	1.77	100	16.0	1
	T-221.5	Mix C	1.79	72	17.5	---
	T-221.5	Mix D	1.82	NA	16.0	---
	T-221.5	Mix D	1.83	NA	17.0	---
	T-215.5	Mix B	1.68	48	17.5	---
2020-03-05	T-209.5	Mix B	1.73	53	23.5	2
	T-197.5	Mix B	1.70	48	20.0	-
	T-197.5	Mix C	1.79	NC	16.5	-
	T-197.5	Mix C	1.79	72	16.5	0
	T-197.5	Mix D	1.80	NA	17.0	-
	T-197.5	Mix D	1.83	NA	19.0	-

- Marsh values for Mix B ranged mostly from 45 to 60s.
- The Specific Gravity and Bleed tests for Mix B shows very stable numbers with Specific Gravity ranged from 1.68 to 1.73 and Bleed from 2.0 to 3.0 %.
- Water temperature was measured at 9.0 ^{o}C on 2020-03-05. Additional water heating was added.
- Some fluctuation with Marsh value, possible issue with cement from different bulk bags, also some chunks found in the grout causing fluctuation in pressure and flow rate during grouting.
- KCG was advised to better control the screening and filling of 20 KG buckets.
- On March 4th, it was found that grout recipes were not precisely followed by the batcher in the grout unit (less calcium chloride than required in Mixes B and C and more Rheomac in Mix D). Tests were done on March 5th to compare results (Specific gravity, Marsh value, and grout temperature) from the original recipes with results from the recipes they were using. No significant deviation was observed. It is important to note that results usually vary from one batch to another one even with the same recipe, so it is very hard to conclude the impact of the modified recipes. It was asked to follow the recipe more precisely for now on.

HOLE DEPTH VERIFICATIONS

- TCG along with GHD and QA representative measured the depth of hole and water level for every hole prior to start rock grouting.

BOREHOLE INCLINATION CHECK

- KCG will submit RFI to relax the casing deviation from 0.5% to 2.0%

pH AND TURBIDITY RESPONSE

- No pH and Turbidity measures were taken this week.

LIST OF CHANGES ON SPECS, SITE INSTRUCTION, FIELD WORK AND DEVIATION LIST

Whale Tail Dike Remedial Grouting Sepecifications and Design Drawings Changes Tracking

Document	Revision	Date Issued	Subject
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PC	2019-10-03	Technical Specifications for Whale Tail Dike Remedial Drilling and Grouting Works Rev. PC was issued for AEM and Grouting Committee's (GC) review and comments. The document was the main topic of the discussion in the Grouting Committee Meeting No.3 held on Oct. 17th, 2019 in Montreal.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	PD	2019-10-28	As per discussions and recommendations from GC Meeting No.3, Technical and Specifications had been updated to Rev PD. Reference can be made to meeting minutes 669034-0000-30MC-0001 for details of the comments and recommendations to the designs.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PE	2019-11-27	Rev. PD had been updated to Rev PE based on recommendations presented in GC's letter Dated Oct. 25, 2019 and further discussions with AME engineers and site staff to implement the simplified approach and path forward proposed by the GC. Phased approach adopated starting with two rows of Blanket Grouting (Phase I) and based on the results of Blanket Grouting to decide the requirement of deepen the Upstream Blanket holes for Curtain Grouting (Phase II)
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	00	2020-01-10	Document Rev. PE had been updated based on comments on received and the discussions and recommendations from GC Meeting No.5 held on December 5, 2019.

Whale Tail Dike Remedial Grouting Site Instructions Changes Tracking

Document	Revision	Date Issued	Subject
SITE INSTRUCTIONS FOR DRILLING AND BLANKET GROUTING (Document Number: 669034-0000-40CA-0001 Rev. 00)	Rev 00	2019-11-19	A technical memo - Site Instructions for Drilling and Blanket Grouting Rev PB was issued on November 19, 2019. The objective of this document is to provide key instructions to the drilling and grouting of the Blanket Holes at the WTD foundation to allow work to start timely before Design Drawings and Specifications are ready and approved. The Site Instructions were prepared based on discussions and comments on Technical Specs Rev PD, Grouting Committee's Letter dated October 25, 2019 and in alignment with the objective of 40 to 50% seepage deduction with simplfied and phased project approach. This document may require update based on the progress and results of the field work.
	Rev 01	2020-01-08	The Site Instructions Rev 00 was updated to Rev 01 to incorporate: (1) modification of the Mix C+ by reducing the Calcium Chloride dosage (2)conditions for drilling and grouting the hole in two stages

Whale Tail Dike Remedial Grouting Fieldwork Instructions Changes Tracking

Document	Date Issued	Subject	Notes
Fieldwork Instruction No.1 (Email)	2019-12-03	Subject: 669034 - Rock Grouting on Grout Mix Change Procedures	This Fieldwork Instruction provide by email dated Dec. 03, 2019 on Subject: **Grout mix change procedures during the Blanket Hole Grouting and Regrouting** (prior to Open Throat Pump is available) based on the on site trial mix results and ground response on grout take and grouting pressure.
Fieldwork Instruction No.2 (FWI 001 Rev 00)	2019-12-07	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 00	This Fieldwork instruction applies to Grouting and Re-grouting of Primary Holes with the application of Celbex using Open Throat Pump as recommended by Grouting Committee (Meeting No. 5 on December 05 2019) that had been drilled per 5 m Stage. The site instruction will be updated as per the progress of the site construction.
Fieldwork Instruction No.3 (FWI 001 Rev. 01)	2019-12-09	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 01	The fieldwork instruction No.2 was updated to introduce Mix D

DEVIATION LIST FOR REMEDIAL GROUTING AT WHALE TAIL DIKE

Deviation #	Date Received	Date Responded	Status	Subject	Location/Address	Notes
001	2019-11-10		AEM will manage the situation	QC did not use centerlizer to monitor inclination	multiple locations	Daily Report - Contractor informed that they will use inclino meter without centerlizer as they did last winter but AEM will look if they can findout centerlizer for 4.6" casing.
002	2019-11-14		waiting for apparatus and	QC did not have Vicat apparatus and did not know how to use filtration	during Trial mix	Vicat apparatus received and fist vicat test performed on Dec 5, 2029
003	2019-12-06			inclination check in bedrock holes are not been checked. AEM said inclination check is not necessary in the rock hole during daily construction meeting on Dec 6, 2019 and captured on weekly		As per specs. "Deviation from vertical in the bedrock section of the hole shall not exceed 2% of drilled length."
004	2020-01-13			Drilling of tertiary holes prior to grouted secondary holes	T611.5, T617.5, T623.5, T629.5	Tertiary holes drilled while secondary holes S614.5 and S626.5 were not been grouted yet. As per spec. Tertiary holes shall be drilled in rock after secondary holes has been grouted and grout reached its final set
005	2020-01-12			Continuous drilling and grouting of tertiary holes	WTD Tertiary holes	Consective tertiary holes has been drilled and grouted (6 m distance). As per spec. minimum distance between two drilled holes in bedrock is
006	2020-02-13	2020-02-13	accepted	Use of Mix B in Tertiary Holes	WTD Tertiary holes	AEM and SNC agreed with the KCG proposal of using Mix B in Tertiary holes.

SAFE AND SAFETY REMARKS

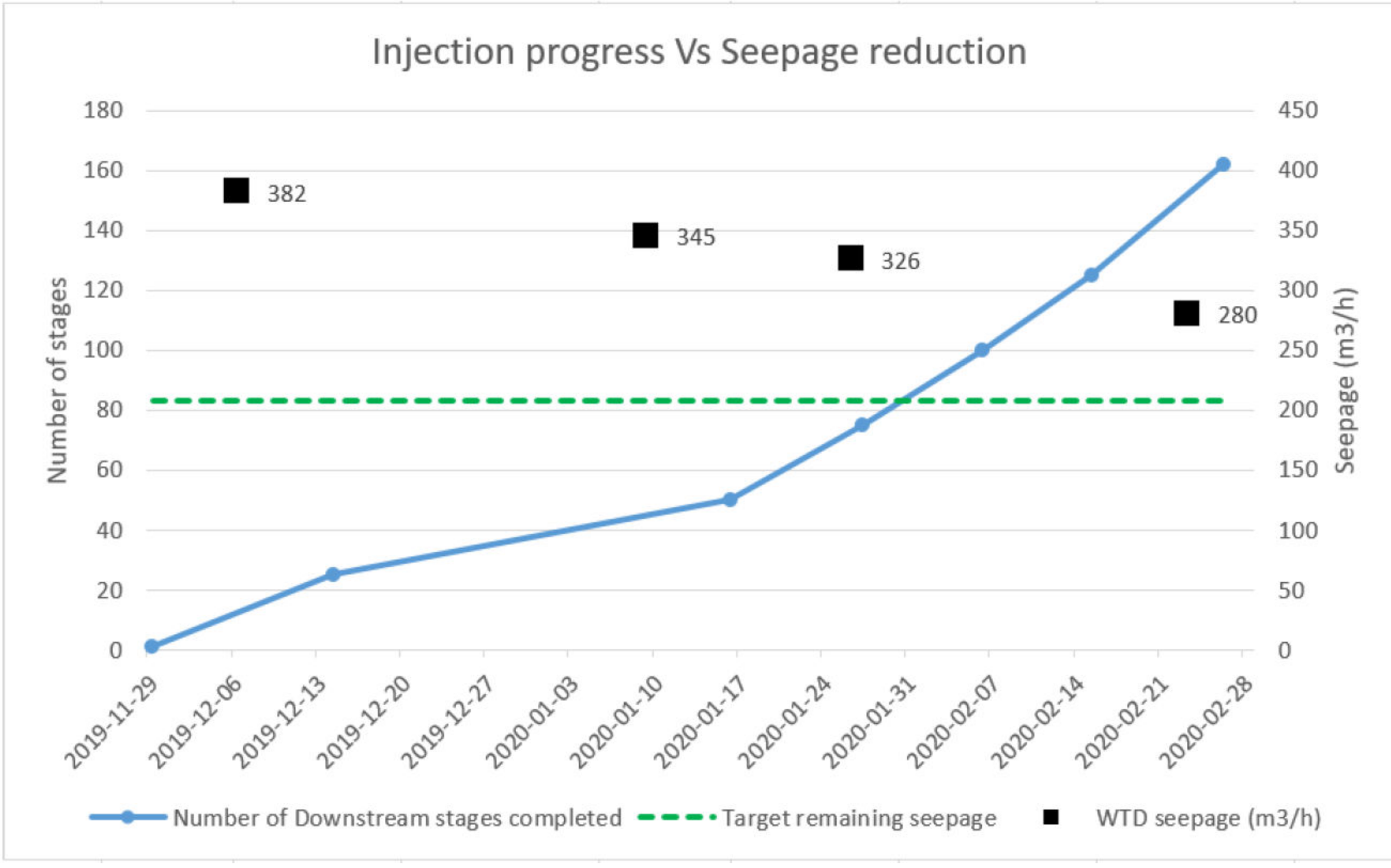
- Extreme cold weather conditions wear proper winter clothing.

Issued by :	*Sebastien Viau*	**05-03-2019**
	Signature	Date
Verified by :	*Tom Xue*	**05-03-2019**
	Signature	Date

APPENDICES

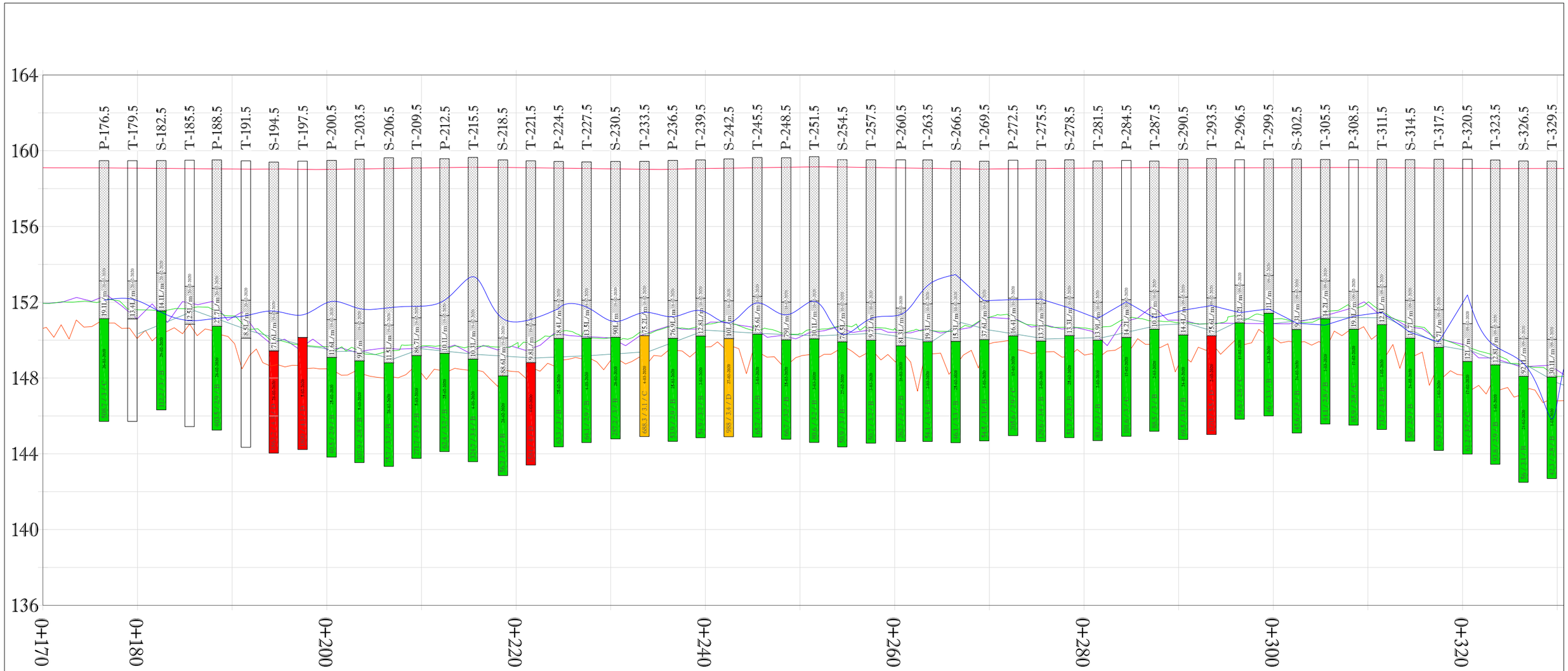
A1: AEM Seepage Report

A2: KGC As-Built Profile Progress


Injection progress Vs Seepage reduction
Number of stages
Seepage (m3/h)
180
160
140
120
100
80
60
40
20
0
450
400
350
300
250
200
150
100
50
0
382
345
326
280
2019-11-29
2019-12-06
2019-12-13
2019-12-20
2019-12-27
2020-01-03
2020-01-10
2020-01-17
2020-01-24
2020-01-31
2020-02-07
2020-02-14
2020-02-21
2020-02-28
Number of Downstream stages completed
Target remaining seepage
WTD seepage (m3/h)

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

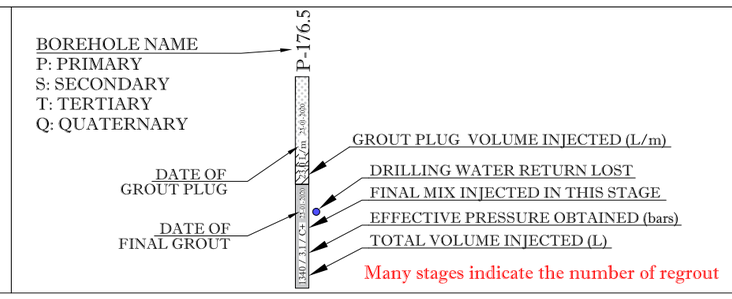


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-253-1

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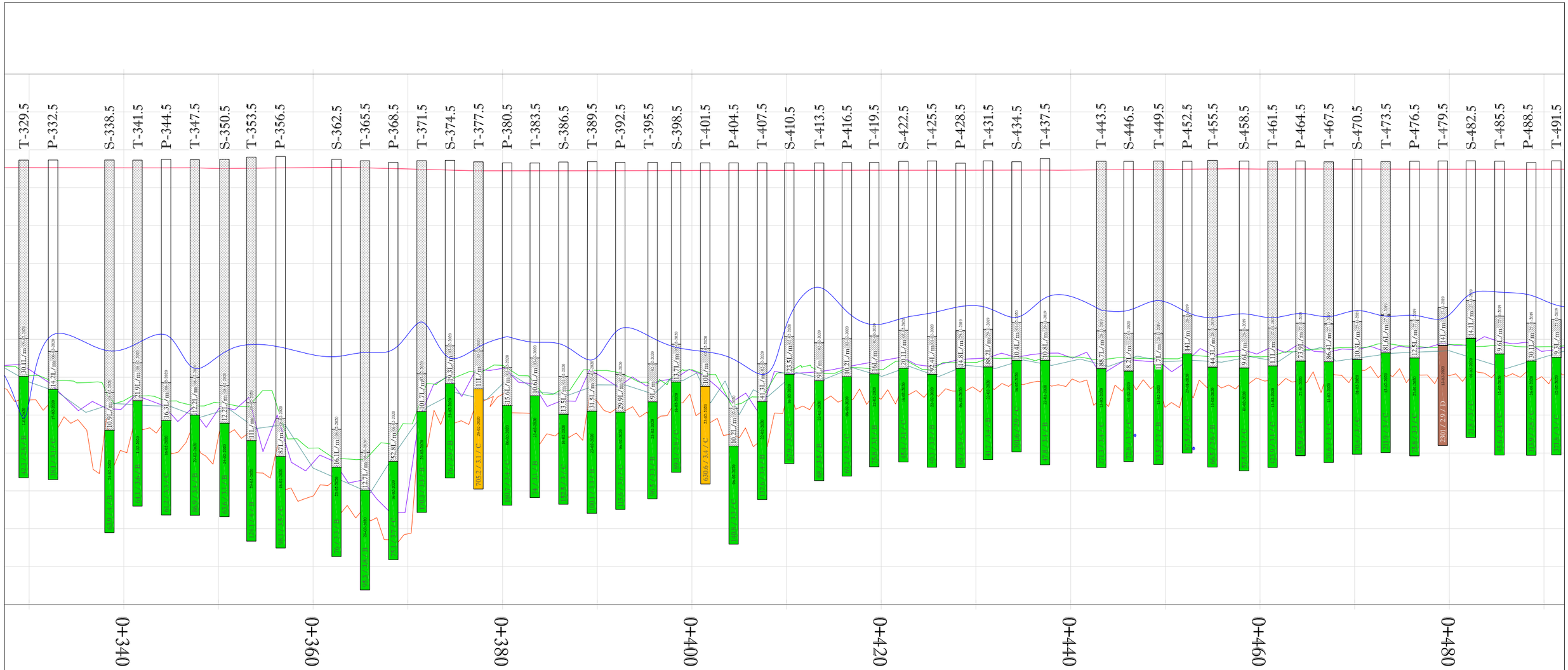
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



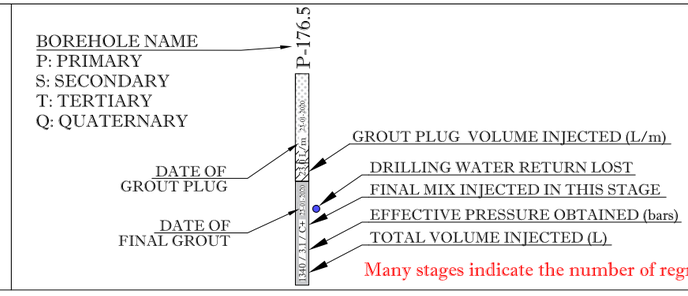
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-253-2

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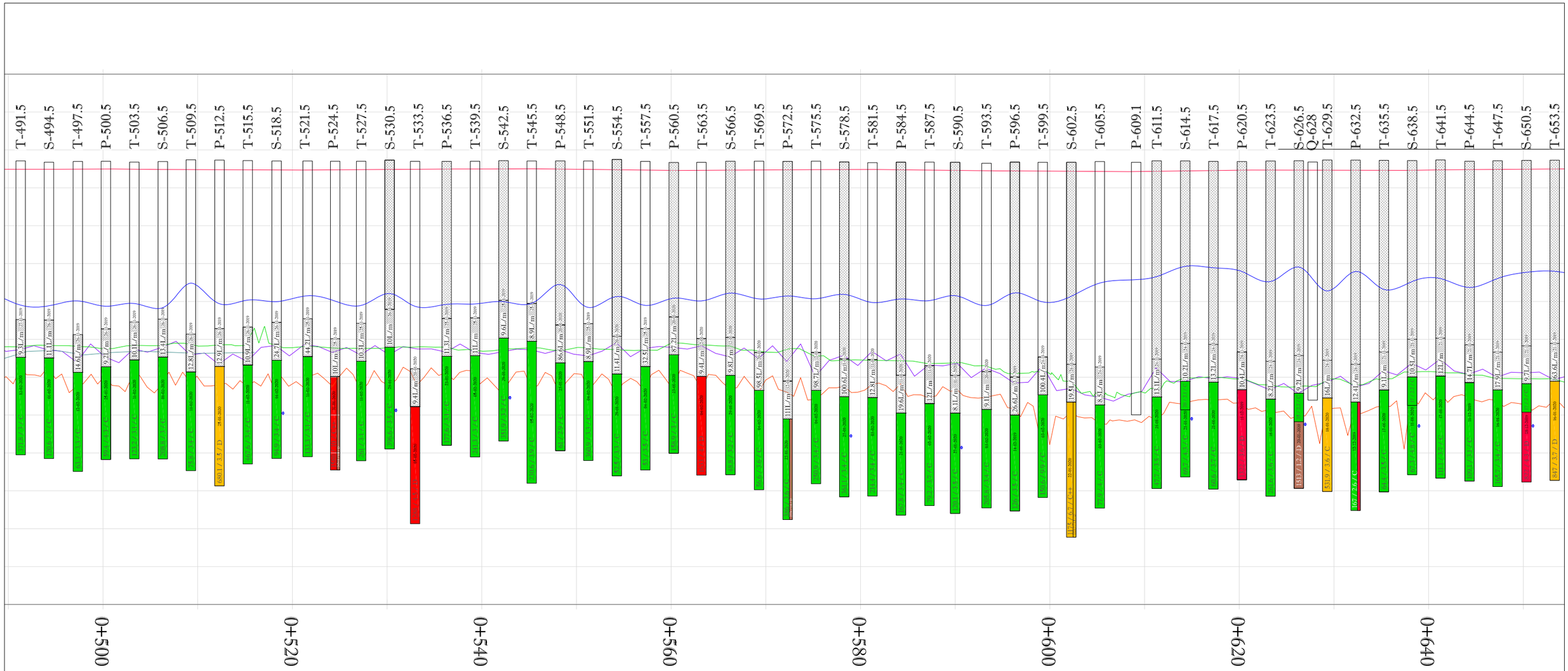
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



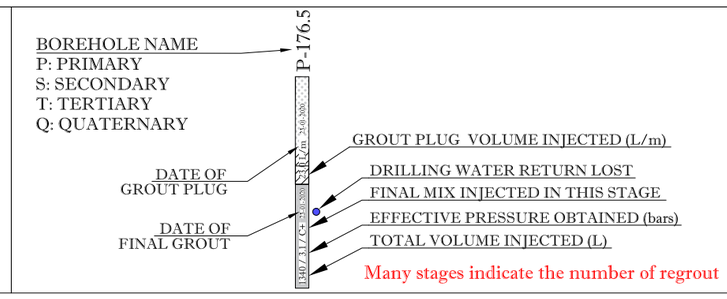
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-253-3

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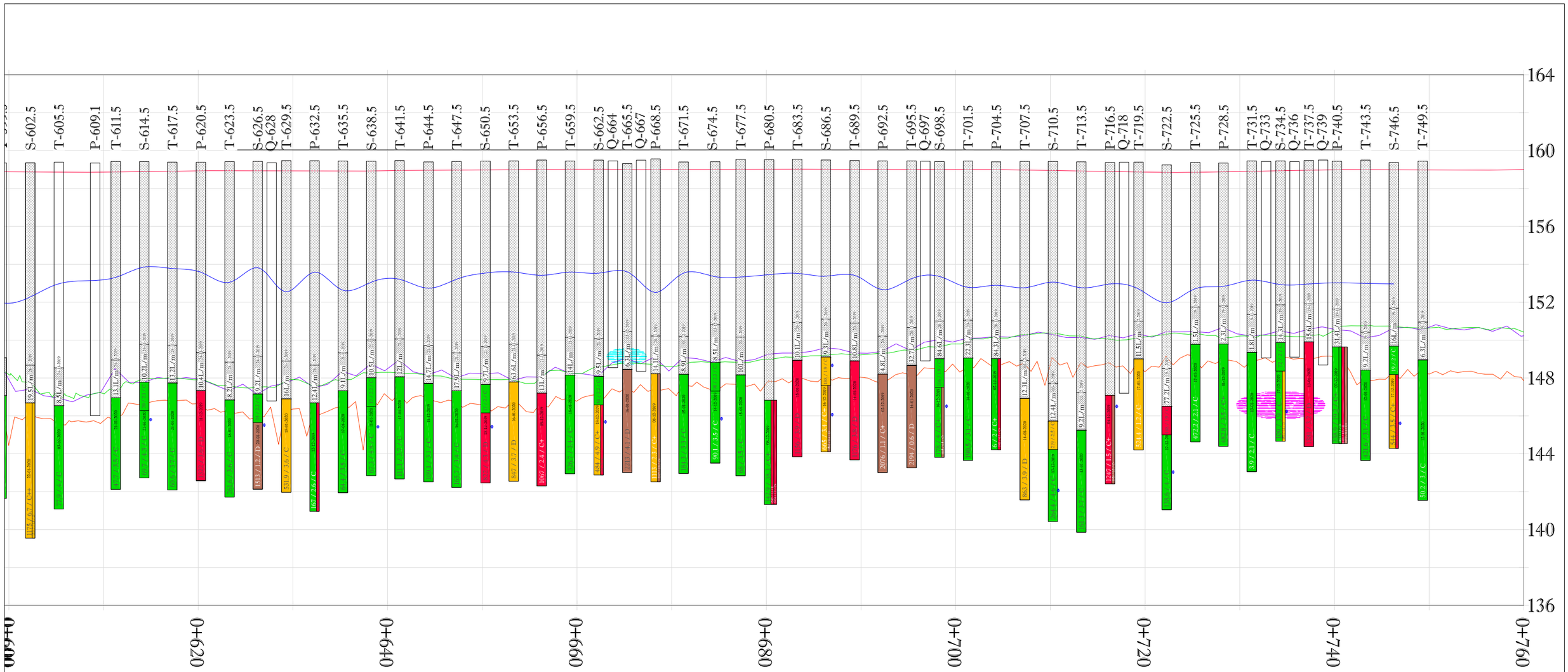
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

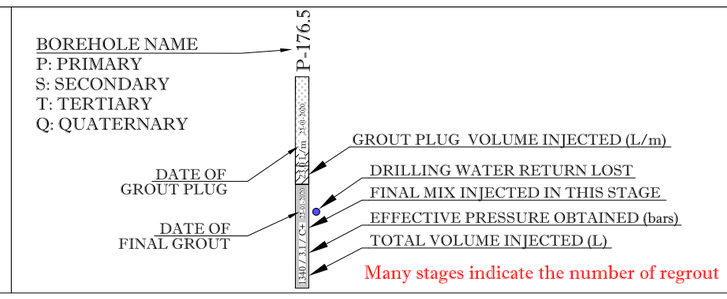


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-253-4

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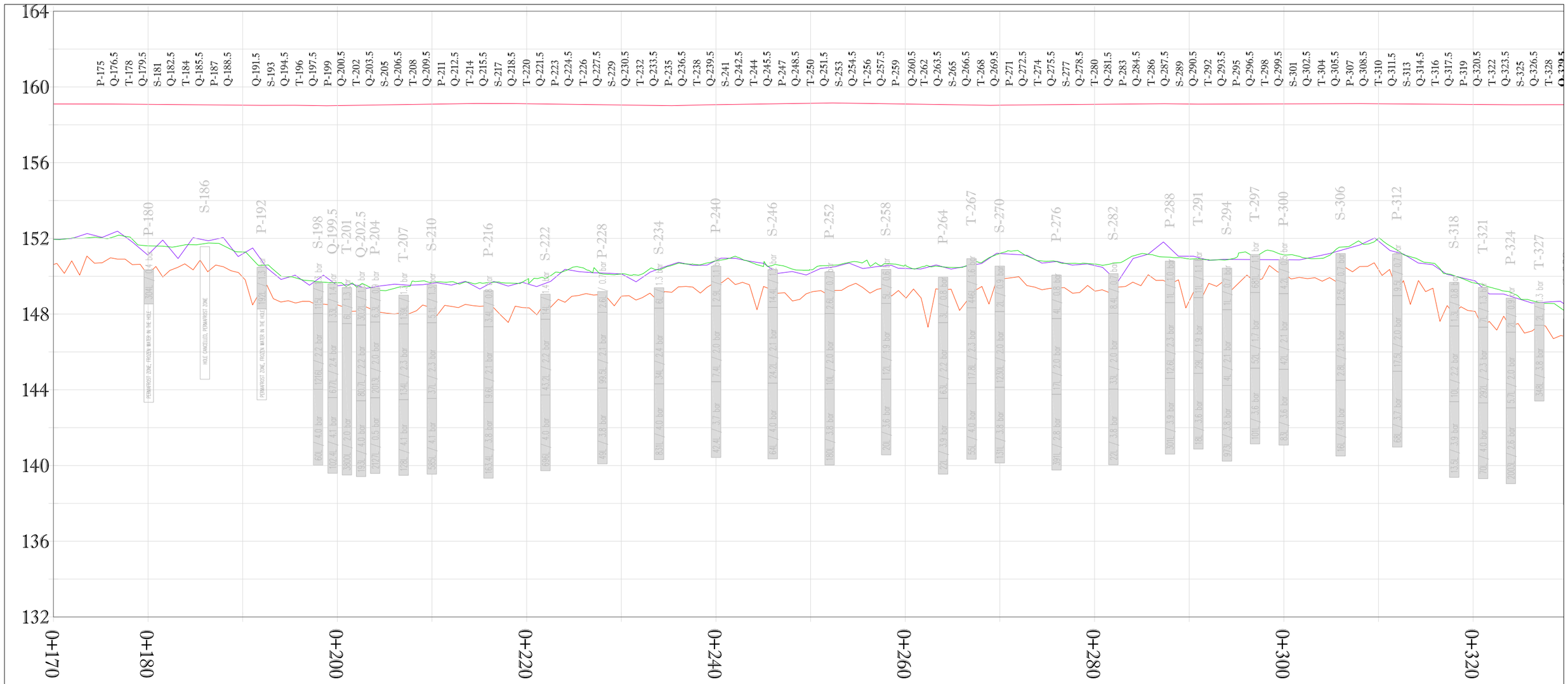
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
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VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
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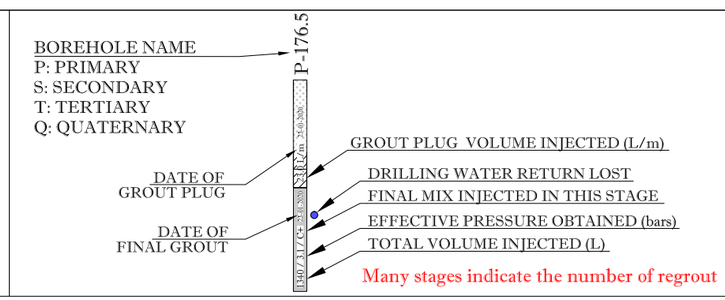

TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-254-1

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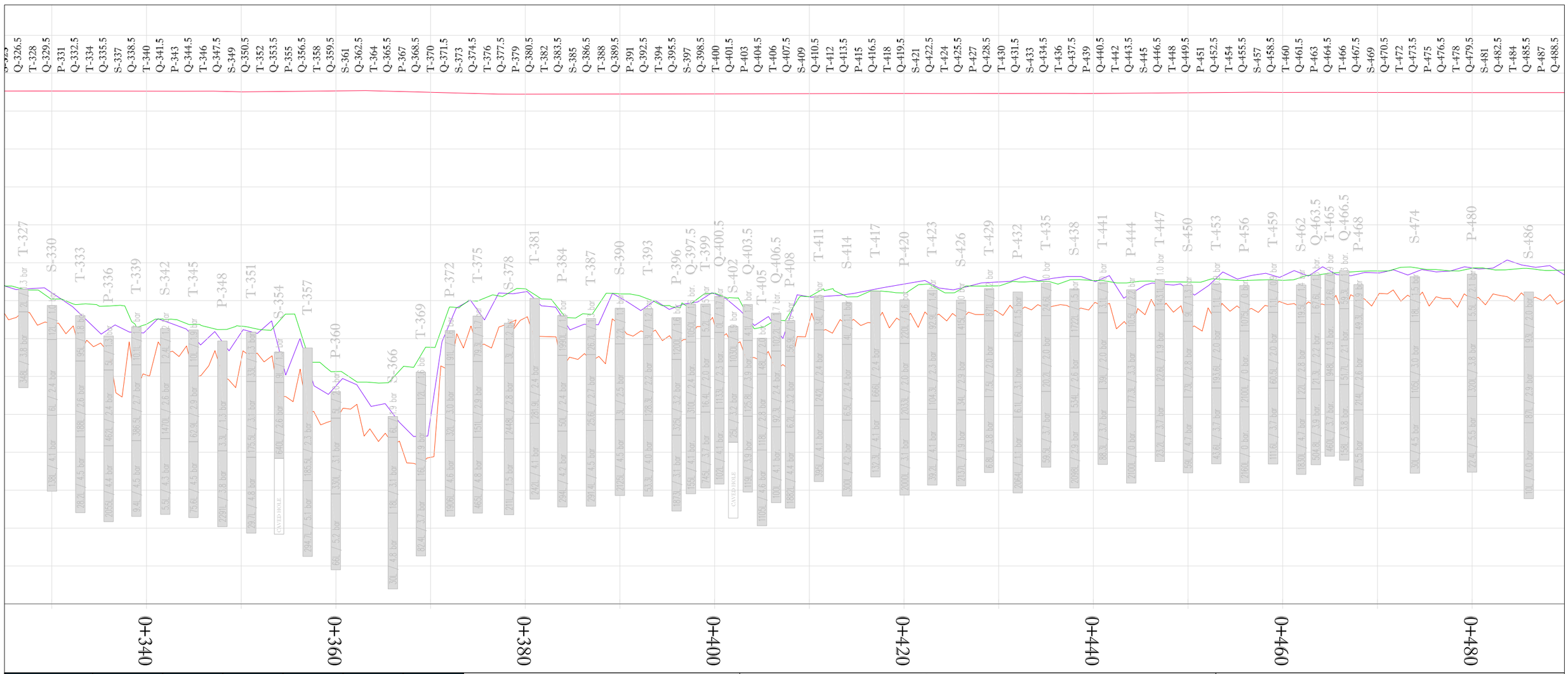
INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
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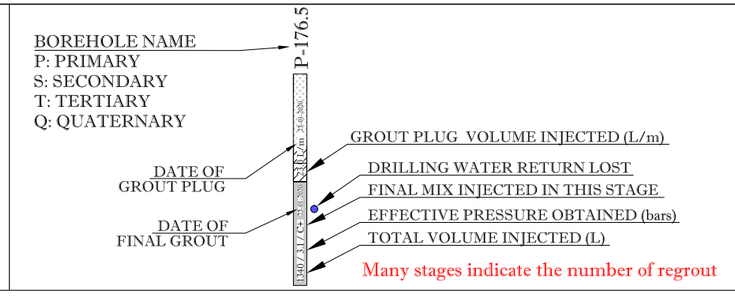

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- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-254-2

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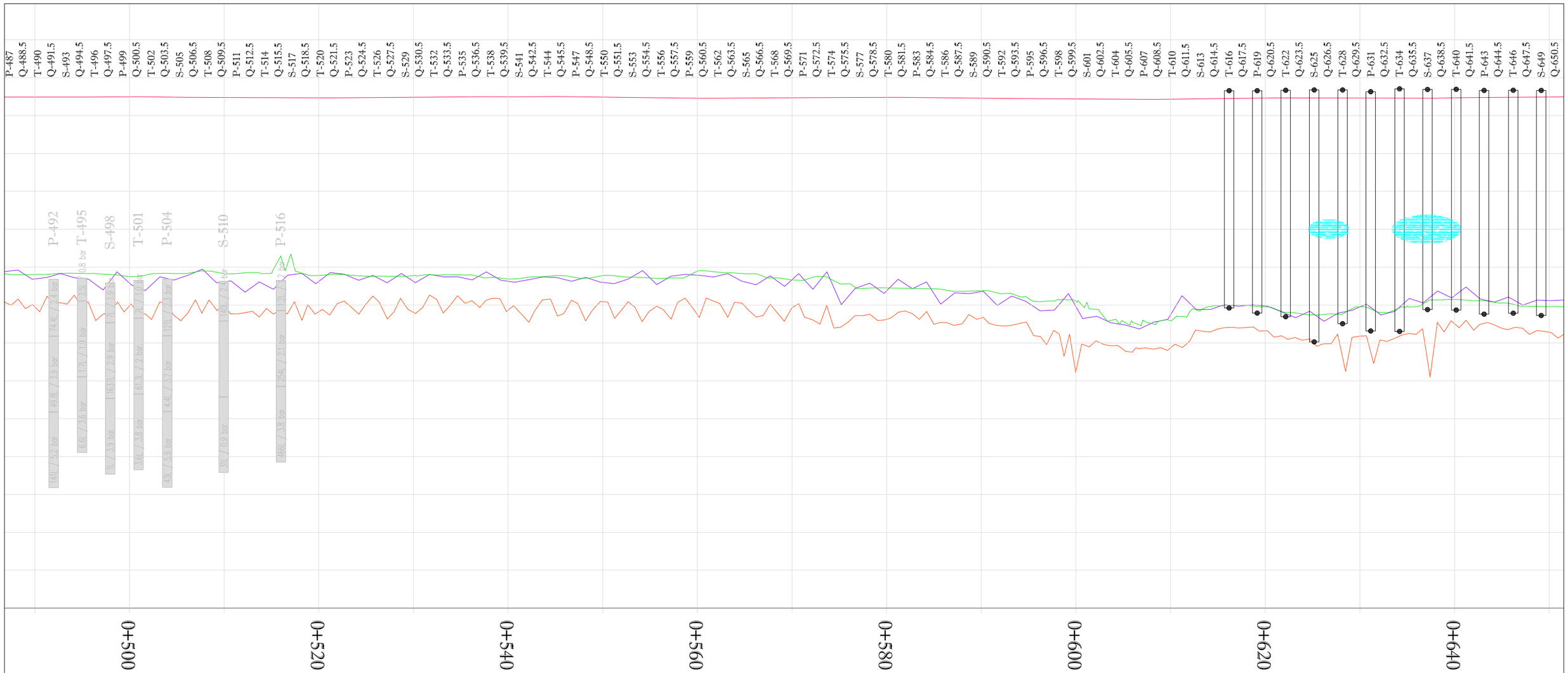
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
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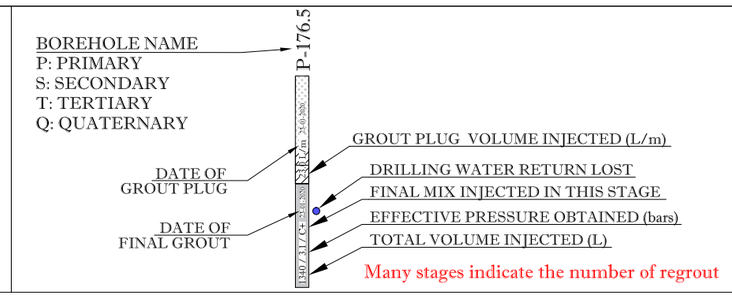

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- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-254-3

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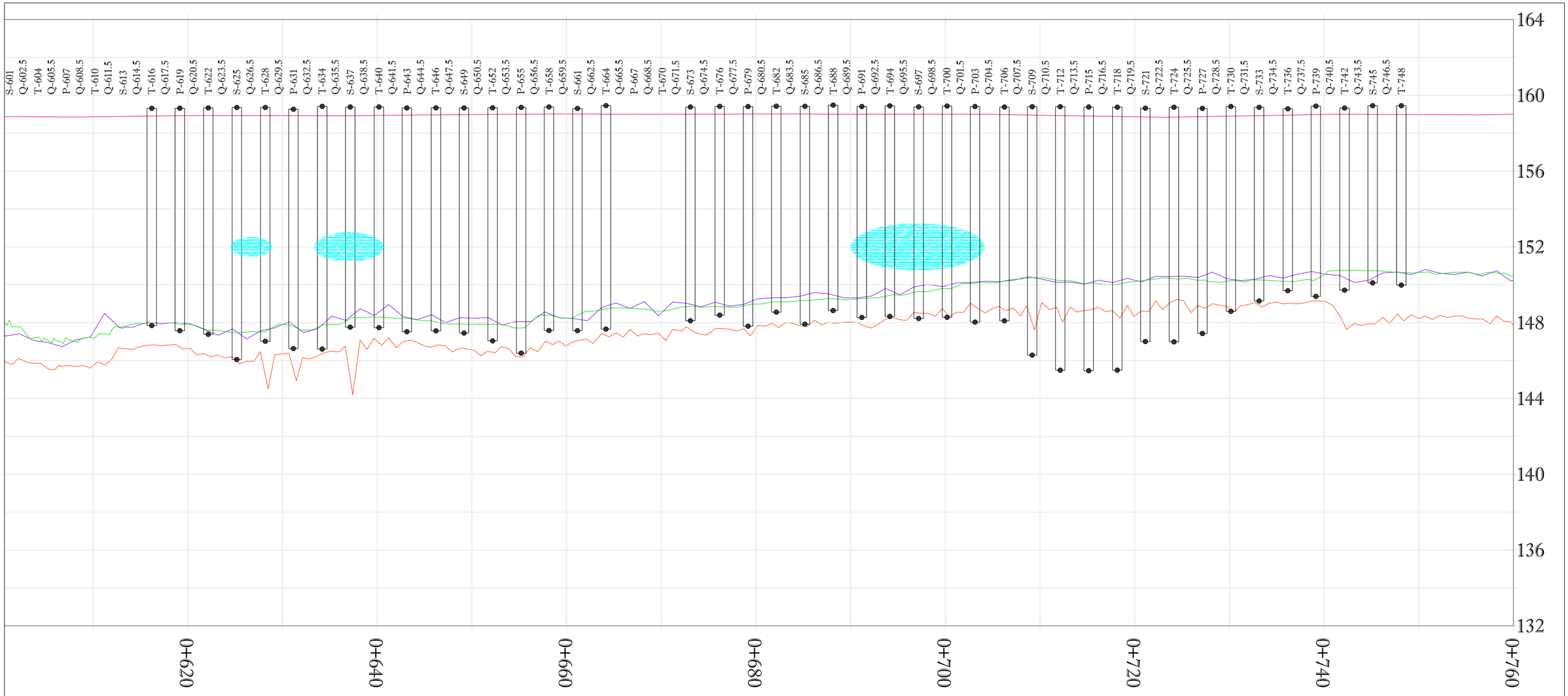
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

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VOL / P	HIGH	200 < > 400
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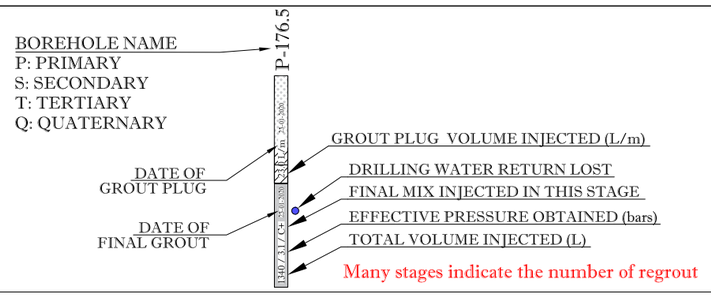

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PREPARED BY : FRANCIS PAULIN
DATE : 06-03-2020
CON-FD-254-4

SNC·LAVALIN

WEEKLY REPORT

20200312-WR
Document number

2020/03/06 to 2020/03/12	669034	Muhammad Saleem
Date	Project No.	Prepared by
Whale Tail Dike Remedial Drilling and Grouting Works		Agnico Eagle
Project		Client
SNC-Lavalin INC.	KCG (TCG)	
Consultant	Contractor	

MAIN ACTIVITIES

- This weekly report covers the activities from March 6th, 2020 to March 12th, 2020.
- The main activities during this week were casing installation on the upstream blanket and downstream blanket (additional quaternary holes), casing plug on upstream and downstream blanket, bedrock drilling and grouting at the downstream blanket (additional quaternary holes).
- AEM, TCG and SNC-Lavalin site personnel had construction meeting in the early morning of each day.
- All primary, secondary and tertiary holes of the downstream blanket have now been grouted and completed (except four holes in the exclusion zones).
- One hole in the exclusion zone (T359.5) has been cancelled due to instrumentation cables in the area, for two (2) holes (P440.5 and T335.5) KCG have not received the coordinate (need to be provided by AEM) and one (1) hole (P609.1) casing has been installed.
- Grouted holes that have grout take less than 1000 L are immediately backfilled. Grouted holes with grout take over 1000 L will be left open to check grout level next day.
- SNC provided the list of the D/S blanket quaternary holes to be grouted. Sixteen (16) additional quaternary holes were asked by SNC and one by AEM for a total of Seventeen (17) quaternary holes at the D/S blanket. Casing installation of these additional holes has now been completed.
- Seven (7) additional Quaternary holes for the downstream blanket between 0+176 and 0+224 have been added on March 12, 2020.
- In total twenty four (24) additional Quaternary holes been added for downstream blanket.

GROUTING COMMITTEE RECOMMENDATIONS

- Meeting with GC was held on March 6th, 2020. SNC proposed two (2) options for upstream blanket / curtain grouting strategy and path forward.
- Received recommendations from GC on March 10th, 2020. GC recommended to install grout curtain on the downstream side (which is not per original design).
- SNC provided respond to AEM on March 11th, 2020 to clarify some points.

CASING EXTENDED TO BEDROCK

- No casing was extended to bedrock during this week. A total of twenty two (22) casings were extended for the downstream blanket so far.

CASING INSTALLATION

Upstream Blanket

- Thirty one (31) casings installed (night shift and day shift); at the upstream blanket.
- Observed ice in some of the casings for upstream blanket while checking hole depth and water level prior to start casing plug. KCG cleaned the frozen casing with drill rig but some of the

casings frozen again near water surface. KCG will cleaned these casings when they are ready for plug.
- At T592, S589, T586, P583, T584 and S541 communication was observed between the casings during casing installation.
- In total eighty (80) casings have been installed.

Downstream Blanket
- Eleven (11) casings installed (night shift and day shift) for additional Quaternary holes at the downstream blanket.
- None of the casings observed communication between the casings.
- In total 213 casings have been installed with one hole (T449.5) missing casing installation report.
-

CASING PLUG

Downstream Blanket
- Fourteen (14) casing plugs grouted during this week and a total of 200 casings have been plugged so far using Mix C (water cement ratio 0.5, 2% calcium chloride).
- Only one (1) of the casing plugs (Q667) reached Vmax and the rest of the casing plug reached pressure refusal during this week.
- No casing plug was regrouted even if Vmax was reached.
- At Q682 about 0.45 m mud in the casing, KCG plugged this casing without cleaning and if at the time of grouting found not plugged properly, packer will be placed half in the casing and half in the hole.
-

	Casing Pluged				
Hole ID	Date	Grout Type	Grout Taken (L)	Pressure (Bar)	Comments
P-609,1	March 9, 2020	C	50.7	2.19	
Q-628	March 9, 2020	C	19.8	2.23	
Q-664	March 9, 2020	C	18.5	1.87	
Q-667	March 9, 2020	C	204.2	0.4	reached max volume
Q-682	March 8, 2020	C	16.4	2.03	about 0.45 m mud in the casing, KCG attempted to plug. If not successful during grouting will place packer half in the casing and half in the hole.
Q-685	March 8, 2020	C	26.5	1.99	
Q-688	March 8, 2020	C	20.4	1.95	
Q-691	March 8, 2020	C	17.9	1.9	
Q-694	March 8, 2020	C	16.4	2.03	
Q-697	March 8, 2020	C	23.5	1.92	
Q-718	March 8, 2020	C	18.9	1.98	
Q-733	March 8, 2020	C	19.6	1.98	
Q-736	March 8, 2020	C	25.5	1.86	
Q-739	March 8, 2020	C	24.3	1.88	

Upstream Blanket
- Thirty four (34) casing plugs grouted during this week and a total of thirty four (34) casings have been plugged so far using Mix C (water cement ratio 0.5, 2% calcium chloride until March 9 and from March 10 changed water cement ratio to 0.55 and calcium chloride to 1%).
- Eight (8) of the casing plugs reached Vmax and the rest of the casing plug reached pressure refusal.
- No casing plug was regrouted even if Vmax was reached.
- At T634, P631, T628 and S625, ice build-up along the casing at the water elevation (but holes were checked and found open to the bottom) and did not allow the packer to be pushed down, packer was placed and inflated above the water level and grouted without prefill.

Hole ID	Date	Grout Type	Grout taken (L)	Pressure (Bar)	Comments
T-748	March 10, 2020	C	20.2	2.12	
P-739	March 11, 2020	C	23.9	2.03	
T-736	March 11, 2020	C	33.3	1.72	
S-733	March 11, 2020	C	24.3	1.95	
T-730	March 11, 2020	C	17.6	1.97	
P-727	March 11, 2020	C	137.8	2.07	
T-724	March 11, 2020	C	201.1	0.52	ended at Vmax
S-721	March 11, 2020	C	200.1	0.57	ended at Vmax
T-718	March 11, 2020	C	18.7	2.31	
P-715	March 11, 2020	C	16.4	2.16	
T-712	March 11, 2020	C	57.5	2.25	
S-709	March 11, 2020	C	213	0.62	ended at Vmax
T-706	March 11, 2020	C	18.2	2.02	
P-703	March 11, 2020	C	185.6	0.42	ended at Vmax
T-700	March 11, 2020	C	181.3	0.25	ended at Vmax
S-697	March 12, 2020	C	181.2	0.84	ended at Vmax
T-694	March 12, 2020	C	38.8	1.94	
P-691	March 12, 2020	C	18.4	1.96	
T-688	March 12, 2020	C	18.6	1.92	
S-685	March 12, 2020	C	18.2	2.08	
T-682	March 12, 2020	C	18.9	2.04	
P-679	March 12, 2020	C	24.6	2.08	
T-676	March 12, 2020	C	179.9	0.4	ended at Vmax
S-673	March 12, 2020	C	16.5	2.31	
S-661	March 9, 2020	C	20.1	2.03	
T-652	March 9, 2020	C	18.3	2.16	
P-643	March 9, 2020	C	75.5	1,96	
T-640	March 9, 2020	C	59.9	1.79	
T-634	March 12, 2020	C	40.5	2.18	Packer placed above water level due to ice build up along casing
P-631	March 12, 2020	C	197.6	0.36	Packer placed above water level due to ice build up along casing Ended at Vmax
T-628	March 12, 2020	C	84.1	2.21	Packer placed above water level due to ice build up along casing
S-625	March 12, 2020	C	106.6	2.23	Packer placed above water level due to ice build up along casing

BEDROCK DRILLING

- A total of eleven (11) additional quaternary holes had been drilled during this week for 5 m stage length for downstream blanket.
- No water loss was observed in all the holes drilled in bedrock this week.

- All holes drilled during this week stayed open to the bottom except Q685 which was caved to 14 m below ground surface.
- All the holes washed clean after drilling for 6 min.
- No communication between the holes observed in any of the holes drilled during this week.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
Q-667	15.8	-	-	No caving	No
Q-682	15.4	-	-	No caving	No
Q-685	16.3	-	-	14	No
Q-688	15.5	-	-	No caving	No
Q-691	15.4	-	-	No caving	No
Q-694	14.9	-	-	No caving	No
Q-697	15.3	-	-	No caving	No
Q-718	16.6	-	-	No caving	No
Q-733	15.3	-	-	No caving	No
Q-736	14.8	-	-	No caving	No
Q-739	15.2	-	-	No caving	No

BEDROCK GROUTING

- During this week, bedrock grouting was conducted for Tertiary and additional Quaternary holes at the downstream blanket.
- A total of 194 holes, all at the downstream blanket, have been completed up to date.

1st Stage Grouting

- A total of nine (9) holes were grouted during this week.
- All the holes grouted in 5 m stage length.
- All holes reached Pmax.
- Six (6) holes reached refusal at Pmax with Mix B, three (3) holes reached Pmax with Mix C without Celbex.
- All the holes had grout takes below 1000 L, so they were immediately backfilled at the end of pressure grouting process.

	Interface grouting for 1.5 m/5 m stage									
Hole ID	Date	Grouting Length (m)	Calcualted Pmax (bar)	Closing Pressure (bar)	Closing Flowrate (l/min)	Volume Injected (L)	Mix	Comments	Depth of grout (m)	Empty Length after grouting (m)
T-179,5	2020-03-07	5.4	2.05	3.05	1	52.8	Mix B	Backfilled after refusal		
T-185,5	2020-03-07	5.39	3.06	2.82	1	53.4	Mix B	Backfilled after refusal		
T-191,5	2020-03-07	5.1	3.06	2.94	0	116.6	Mix C	Backfilled after refusal		
Q-685	2020-03-10	5.1	2.57	3.03	0	524.7	Mix B = 210 Mix C without celbex = 314.7	backfilled after refusal		
Q-691	2020-03-10	4.78	2.26	3.23	0.3	111.1	Mix B	backfilled after refusal		
Q-697	2020-03-10	5.1	2.31	3.17	0.1	223.4	Mix B	backfilled after refusal		
Q-718	2020-03-10	4.69	3.31	3.55	0.3	669.3	Mix B = 360 Mix C without celbex = 309.1	backfilled after refusal		
Q-733	2020-03-10	5.05	2.3	1.16	0.2	105.1	Mix B	backfilled after refusal		
Q-739	2020-03-10	4.7	2.32	3.5	0.3	76.2	Mix B	backfilled after refusal		

GROUT TESTING

- Grout tests were conducted for 1st batch as well as every 5 batches or whenever Mix changes. The Marsh values, specific gravity, bleeding and temperature values were checked for Mixes B and C.

Date	Hole ID	Mix	Specific Gravity	Marsh value (second)	Temperature (°C)	Bleeding (%)
2020-03-07	T191.5	Mix C	1.75	>100	18.0	1.0
	T185.5	Mix B	1.63	42	14.5	2.0
	T179.5	Mix B	1.67	55	28.0	2.0
2020-03-08	casing plug	Mix C	1.75	61	24	1.0
		Mix C	1.74	62	20	1.0
2020-03-09	casing plug	Mix C	1.78	65	23	1
		Mix C	1.66	42		
		Mix C	1.74	48	24	1
2020-03-10	casing plug	Mix C	1.75	52	15.7	1
		Mix C	1.73	>100	33	1
		Mix C	1.72	80	29.5	
2020-03-10	Q739	Mix B	1.65	39	28.5	2.0
	Q718	Mix B	1.68	57	26.3	
		Mix C	1.72	63	34.1	1.0
	Q691	Mix B	1.63	51	24.1	1.5
	Q685	Mix C	1.72	98	24.6	
		Mix C	1.69	56	29.5	1.0
2020-03-11	casing plug	Mix C	1.73	>100	33	1
		Mix C	1.72	80	29.5	
		Mix C	1.74	79	29.9	
		Mix C	1.73	70	28.3	1
2020-03-12	casing plug	Mix C	1.71	52	24.5	1
		Mix C	1.74	66	27	
		Mix C	1.7	56	26.5	1
		Mix C	1.71	65	26.9	

- Marsh values for Mix B ranged mostly from 40 to 55s and for Mix C widely ranged from 50 to 80s and some higher values of more than 80s also observed.
- The Specific Gravity and Bleed tests for Mix B shows very stable numbers with Specific Gravity ranged from 1.63 to 1.68 and Bleed from 1.5 to 2.0 %.
- The Specific Gravity and Bleed tests for Mix C also shows very stable numbers with Specific Gravity ranged from 1.70 to 1.80 and Bleed of 1%.
- Some fluctuation with Marsh value, possible issue with cement from different bulk bags, also some chunks found in the grout causing fluctuation in pressure and flow rate during grouting.
- KCG was advised to better control the screening and filling of 20 KG buckets.
- Due to some issues with cement and causing flash set of Mix C grout the water cement ratio of Mix C was modified from 0.5 to 0.55 and amount of calcium chloride changed from 2% to 1% on March 10th, 2020. The water cement ration will be adjusted back to original mix design if cement properties changed.

HOLE DEPTH VERIFICATIONS

- TCG along with GHD and QA representative measured the depth of hole and water level for every hole prior to start rock grouting.

BOREHOLE INCLINATION CHECK

- KCG will submit RFI to relax the casing deviation from 0.5% to 2.0%
- No casing inclination data received this week.

LIST OF CHANGES ON SPECS, SITE INSTRUCTION, FIELD WORK AND DEVIATION LIST

Whale Tail Dike Remedial Grouting Sepecifications and Design Drawings Changes Tracking

Document	Revision	Date Issued	Subject
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PC	2019-10-03	Technical Specifications for Whale Tail Dike Remedial Drilling and Grouting Works Rev. PC was issued for AEM and Grouting Committee's (GC) review and comments. The document was the main topic of the discussion in the Grouting Committee Meeting No.3 held on Oct. 17th, 2019 in Montreal.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	PD	2019-10-28	As per discussions and recommendations from GC Meeting No.3, Technical and Specifications had been updated to Rev PD. Reference can be made to meeting minutes 669034-0000-30MC-0001 for details of the comments and recommendations to the designs.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PE	2019-11-27	Rev. PD had been updated to Rev PE based on recommendations presented in GC's letter Dated Oct. 25, 2019 and further discussions with AME engineers and site staff to implement the simplified approach and path forward proposed by the GC. Phased approach adopated starting with two rows of Blanket Grouting (Phase I) and based on the results of Blanket Grouting to decide the requirement of deepen the Upstream Blanket holes for Curtain Grouting (Phase II)
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	00	2020-01-10	Document Rev. PE had been updated based on comments on received and the discussions and recommendations from GC Meeting No.5 held on December 5, 2019.

Whale Tail Dike Remedial Grouting Site Instructions Changes Tracking

Document	Revision	Date Issued	Subject
SITE INSTRUCTIONS FOR DRILLING AND BLANKET GROUTING (Document Number: 669034-0000-40CA-0001 Rev. 00)	Rev 00	2019-11-19	A technical memo - Site Instructions for Drilling and Blanket Grouting Rev PB was issued on November 19, 2019. The objective of this document is to provide key instructions to the drilling and grouting of the Blanket Holes at the WTD foundation to allow work to start timely before Design Drawings and Specifications are ready and approved. The Site Instructions were prepared based on discussions and comments on Technical Specs Rev PD, Grouting Committee's Letter dated October 25, 2019 and in alignment with the objective of 40 to 50% seepage deduction with simplfied and phased project approach. This document may require update based on the progress and results of the field work.
	Rev 01	2020-01-08	The Site Instructions Rev 00 was updated to Rev 01 to incorporate: (1) modification of the Mix C+ by reducing the Calcium Chloride dosage (2)conditions for drilling and grouting the hole in two stages

Whale Tail Dike Remedial Grouting Fieldwork Instructions Changes Tracking

Document	Date Issued	Subject	Notes
Fieldwork Instruction No.1 (Email)	2019-12-03	Subject: 669034 - Rock Grouting on Grout Mix Change Procedures	This Fieldwork Instruction provide by email dated Dec. 03, 2019 on Subject: **Grout mix change procedures during the Blanket Hole Grouting and Regrouting** (prior to Open Throat Pump is available) based on the on site trial mix results and ground response on grout take and grouting pressure.
Fieldwork Instruction No.2 (FWI 001 Rev 00)	2019-12-07	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 00	This Fieldwork instruction applies to Grouting and Re-grouting of Primary Holes with the application of Celbex using Open Throat Pump as recommended by Grouting Committee (Meeting No. 5 on December 05 2019) that had been drilled per 5 m Stage. The site instruction will be updated as per the progress of the site construction.
Fieldwork Instruction No.3 (FWI 001 Rev. 01)	2019-12-09	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 01	The fieldwork instruction No.2 was updated to introduce Mix D

DEVIATION LIST FOR REMEDIAL GROUTING AT WHALE TAIL DIKE

Deviation #	Date Received	Date Responded	Status	Subject	Location/Address	Notes
001	2019-11-10		AEM will manage the situation	QC did not use centerlizer to monitor inclination	multiple locations	Daily Report - Contractor informed that they will use inclino meter without centerlizer as they did last winter but AEM will look if they can findout centerlizer for 4.6" casing.
002	2019-11-14		waiting for apparatus and	QC did not have Vicat apparatus and did not know how to use filtration	during Trial mix	Vicat apparatus received and fist vicat test performed on Dec 5, 2029
003	2019-12-06			inclination check in bedrock holes are not been checked. AEM said inclination check is not necessary in the rock hole during daily construction meeting on Dec 6, 2019 and captured on weekly		As per specs. "Deviation from vertical in the bedrock section of the hole shall not exceed 2% of drilled length."
004	2020-01-13			Drilling of tertiary holes prior to grouted secondary holes	T611.5, T617.5, T623.5, T629.5	Tertiary holes drilled while secondary holes S614.5 and S626.5 were not been grouted yet. As per spec. Tertiary holes shall be drilled in rock after secondary holes has been grouted and grout reached its final set
005	2020-01-12			Continuous drilling and grouting of tertiary holes	WTD Tertiary holes	Consective tertiary holes has been drilled and grouted (6 m distance). As per spec. minimum distance between two drilled holes in bedrock is
006	2020-02-13	2020-02-13	accepted	Use of Mix B in Tertiary Holes	WTD Tertiary holes	AEM and SNC agreed with the KCG proposal of using Mix B in Tertiary holes.
007	2020-03-10			cahnge in Mix C	WTD injection	Changed water cement ratio to 0.55 and calcium chloride to 1% due to issues with cement quality.

SAFE AND SAFETY REMARKS

- Extreme cold weather conditions wear proper winter clothing.

Issued by :	*Muhammad Saleem*	**14-03-2020**	
	Signature	Date	
Verified by :	*Tom Xue*	**14-03-2020**	
	Signature	Date	

APPENDICES

A1: AEM Seepage Report

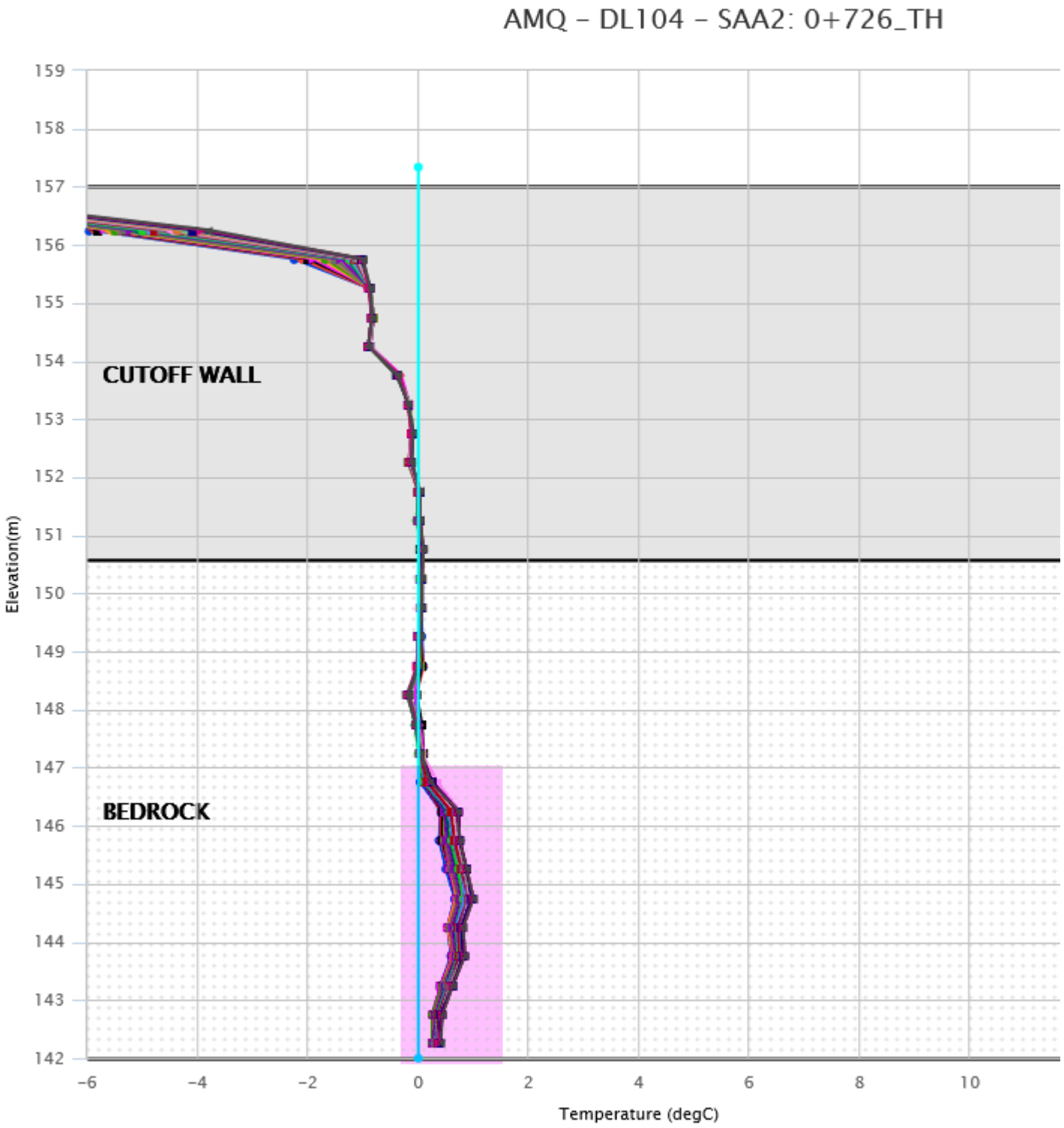
A2: KGC As-Built Profile Progress

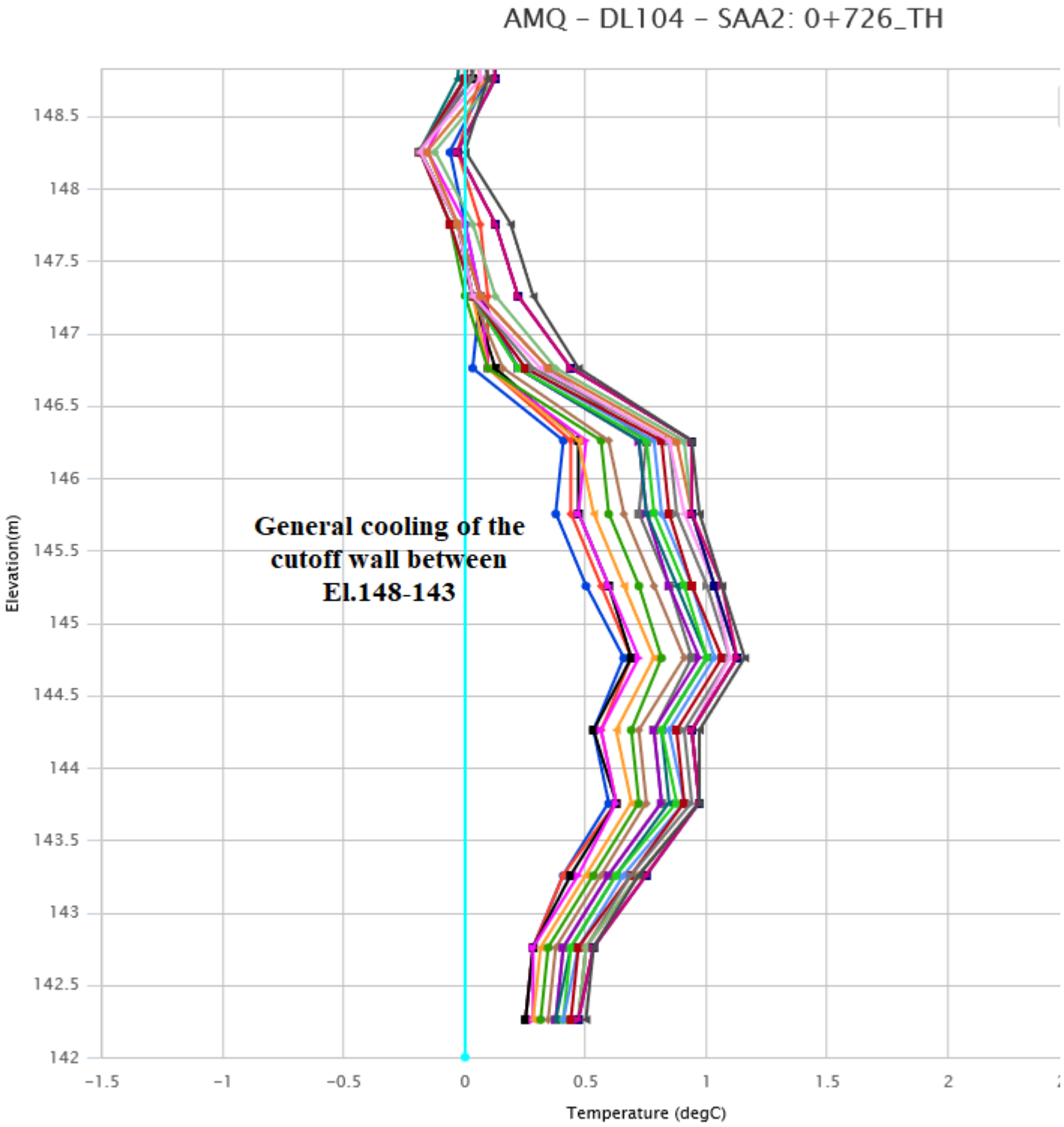
summary of the observations on the instrumentation for the last week on WTD.

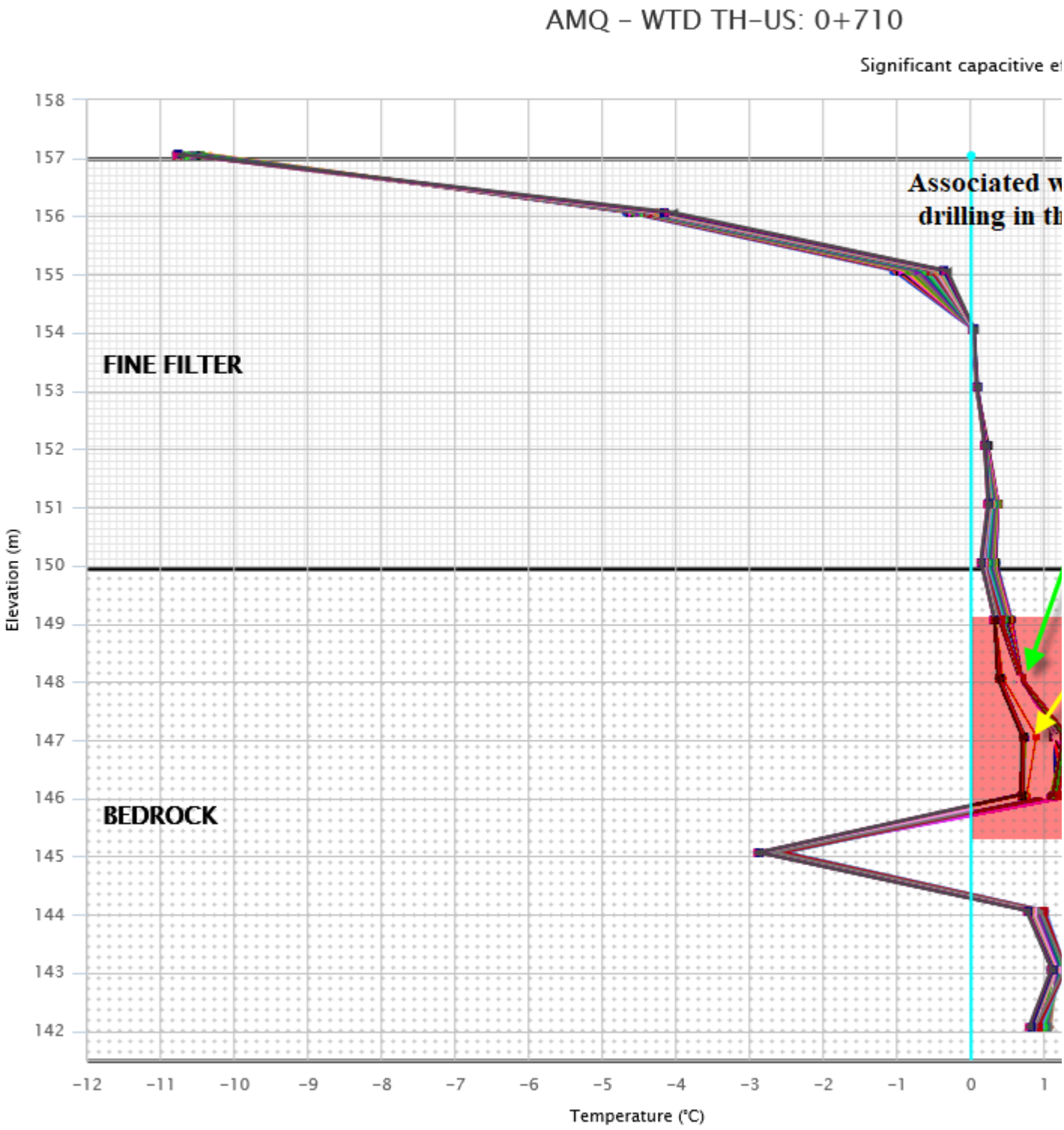
- **SAA-726:** general cooling trend within cutoff wall between 148-143 accelerated since March 3rd.
- **TH-710:** warming trend noted between 146-149 due to the injection of the quaternaries on the d/s and also with the drilling of the casings on the u/s line.
- **TH-675:** faster cooling between 149-151 also associated with quaternary casing drilling in the vicinity

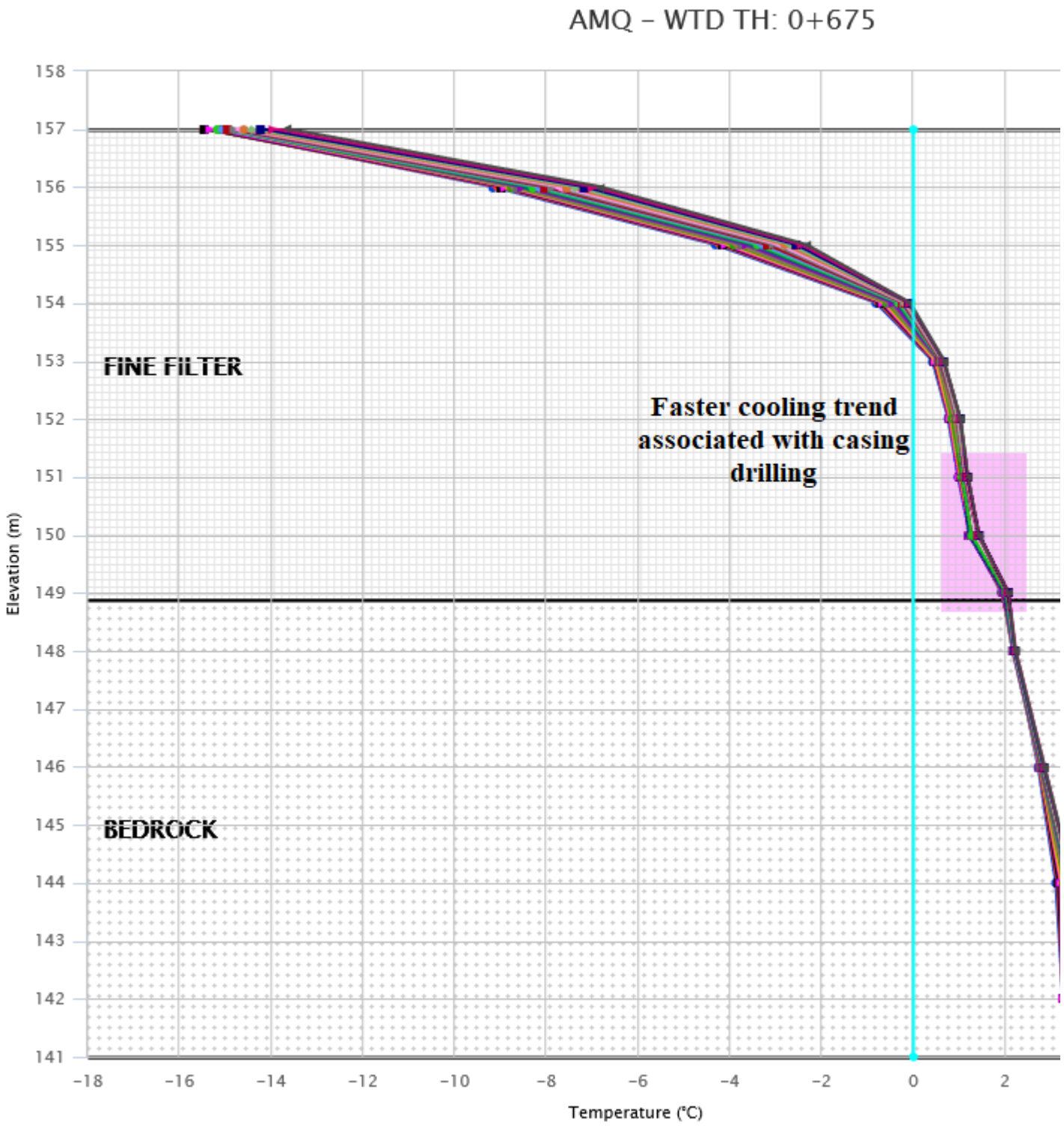
The seepage flow evaluation for the moment is still at 280m³\hr.

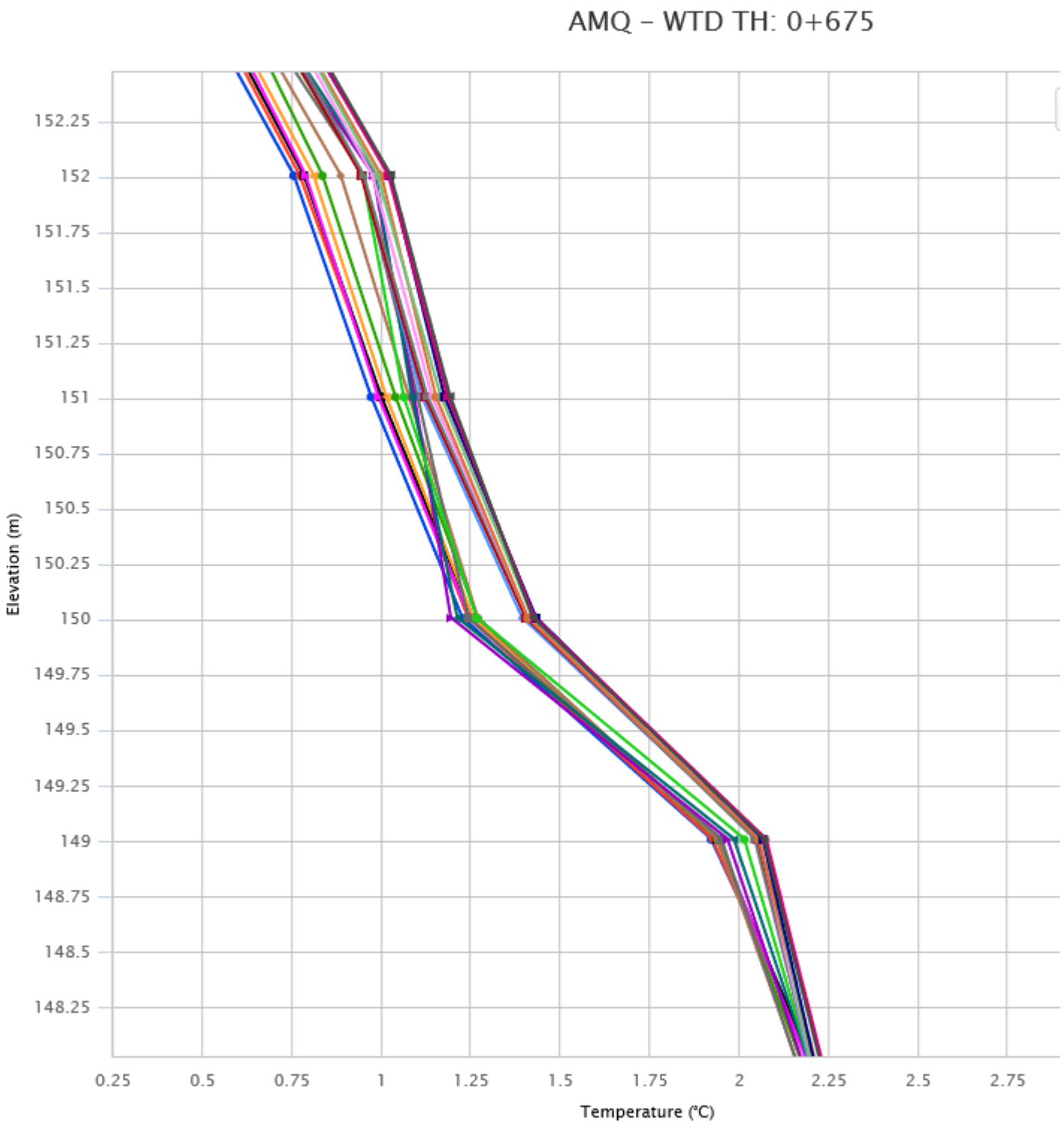
The V-Notch in the collection channel at the toe of the WTD (station 0+560) was reopened this week and the value is 43m³\hr which is exactly the same as the last reading available on Jan 21st 2020.


AMQ – DL104 – SAA2: 0+726_TH
CUTOFF WALL
BEDROCK
Elevation(m)
Temperature (degC)
159
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
143
142
−6
−4
−2
0
2
4
6
8
10


AMQ – DL104 – SAA2: 0+726_TH
General cooling of the cutoff wall between El.148-143
Elevation(m)
148.5
148
147.5
147
146.5
146
145.5
145
144.5
144
143.5
143
142.5
142
−1.5
−1
−0.5
0
0.5
1
1.5
2
Temperature (degC)

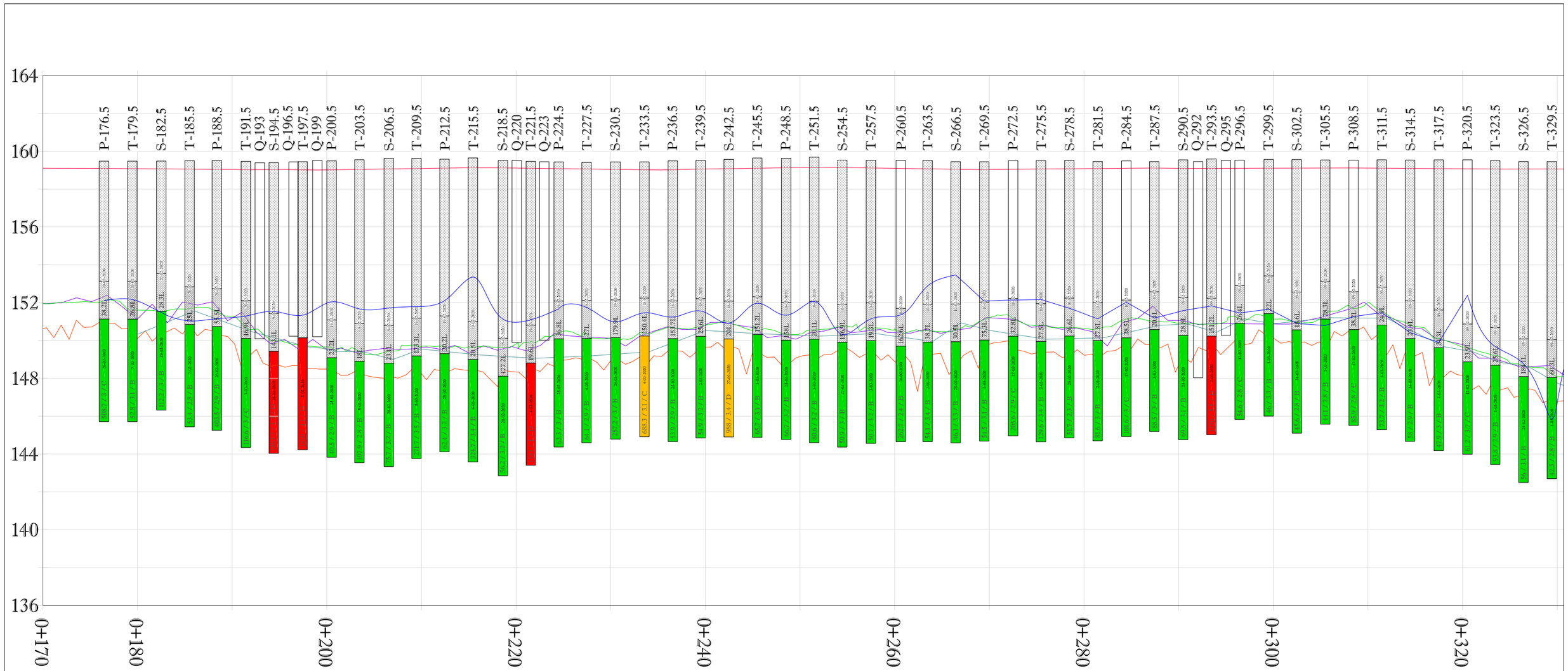

AMQ – WTD TH-US: 0+710
Significant capacitive e
Associated w
drilling in th
FINE FILTER
BEDROCK
Elevation (m)
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
143
142
−12
−11
−10
−9
−8
−7
−6
−5
−4
−3
−2
−1
0
1
Temperature (°C)


AMQ – WTD TH: 0+675
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
143
142
141
Elevation (m)
FINE FILTER
Faster cooling trend associated with casing drilling
BEDROCK
−18
−16
−14
−12
−10
−8
−6
−4
−2
0
2
Temperature (°C)


AMQ – WTD TH: 0+675
Elevation (m)
152.25
152
151.75
151.5
151.25
151
150.75
150.5
150.25
150
149.75
149.5
149.25
149
148.75
148.5
148.25
0.25
0.5
0.75
1
1.25
1.5
1.75
2
2.25
2.5
2.75
Temperature (°C)

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



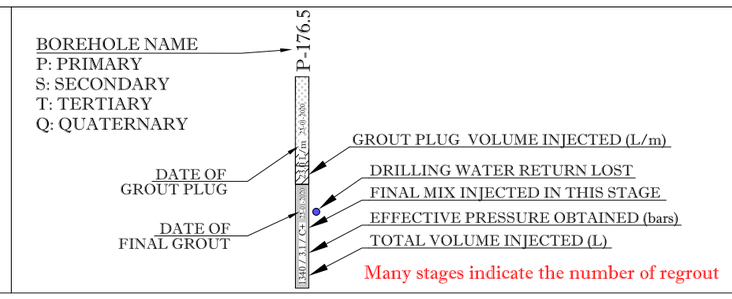
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



Many stages indicate the number of regrout

TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-281-1

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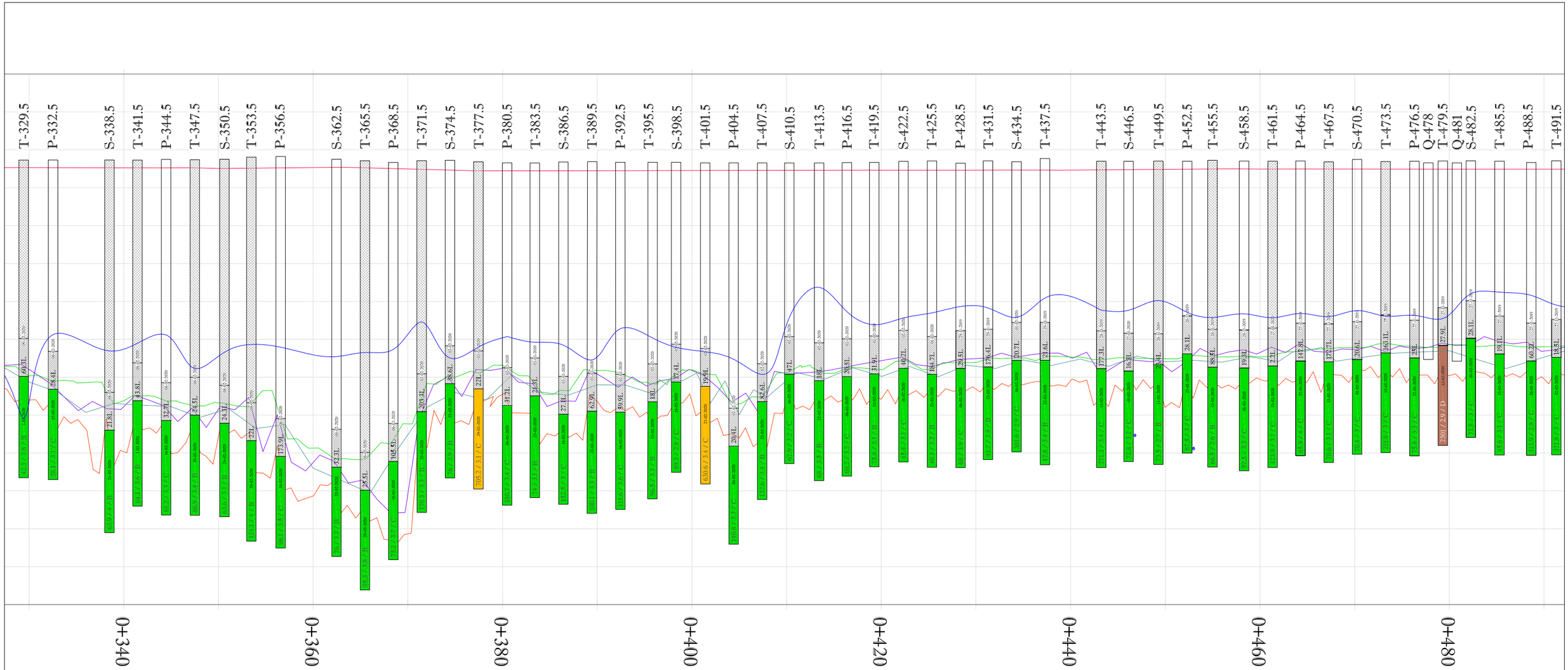
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
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VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

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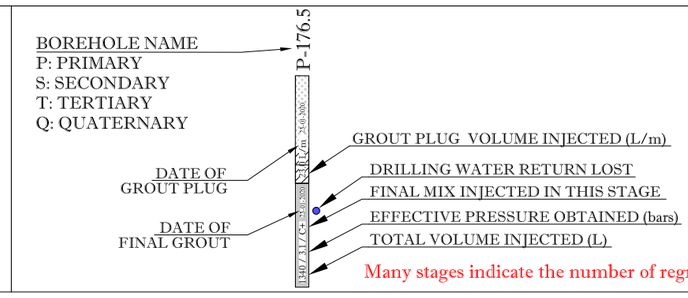

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-281-2

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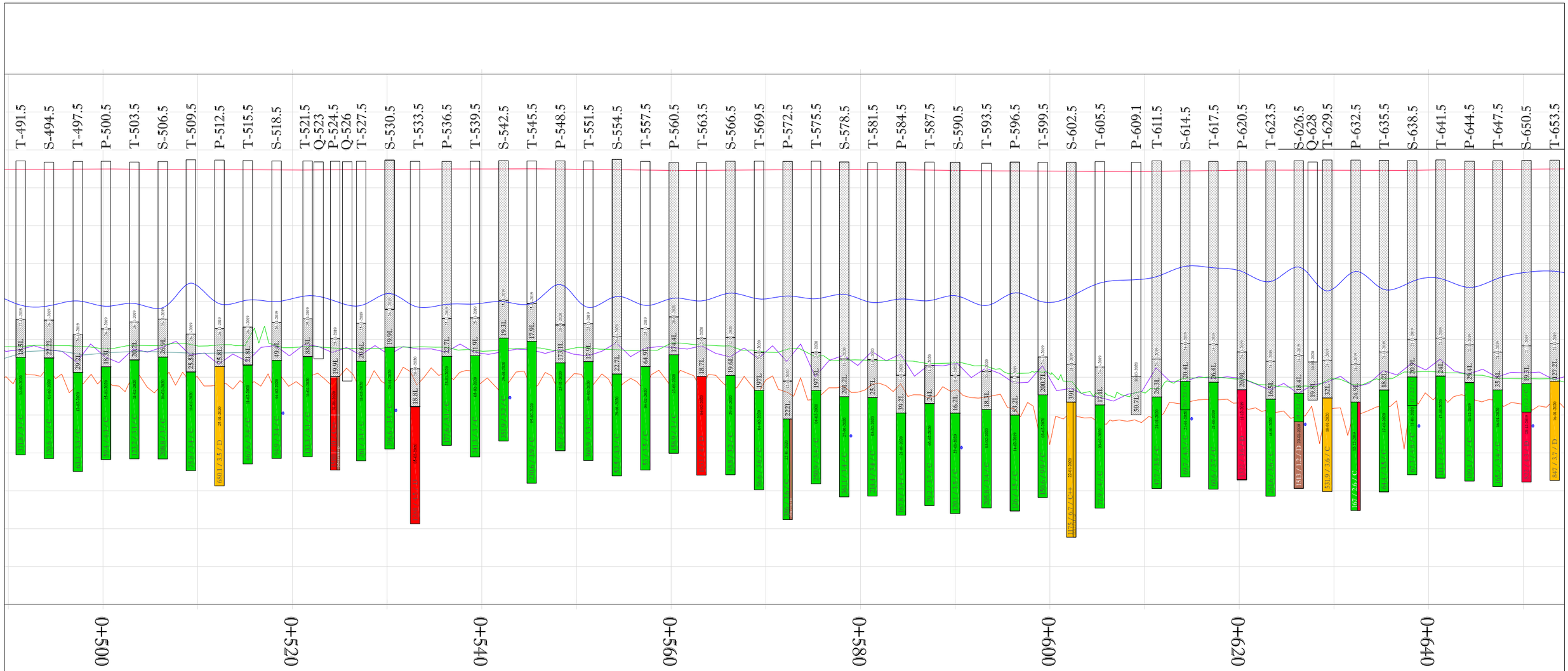
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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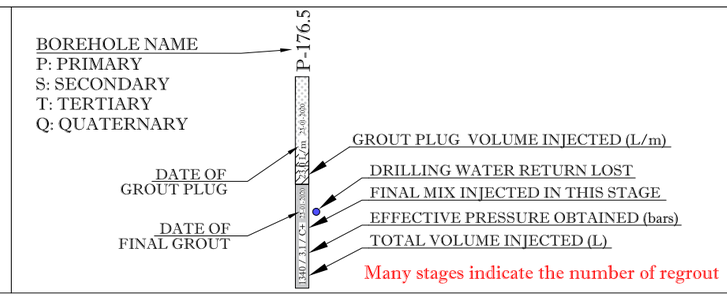

TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-281-3

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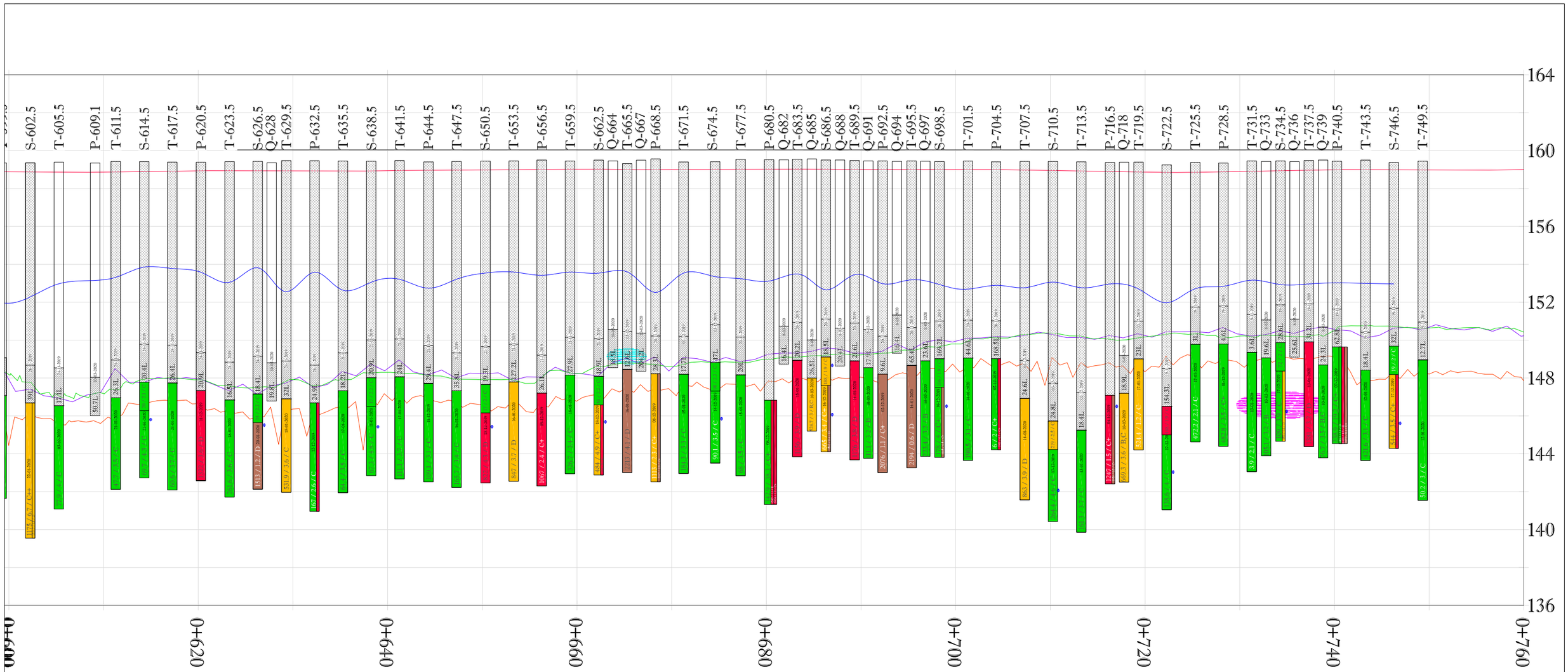
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



0 12 24 Meters

VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
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Calcium Chloride	(% by weight)	2	2	2	2	1
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Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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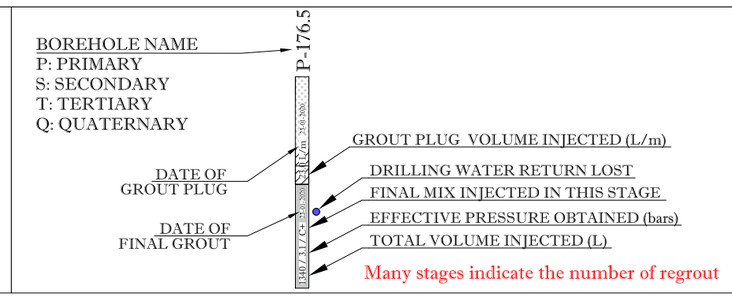

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-281-4

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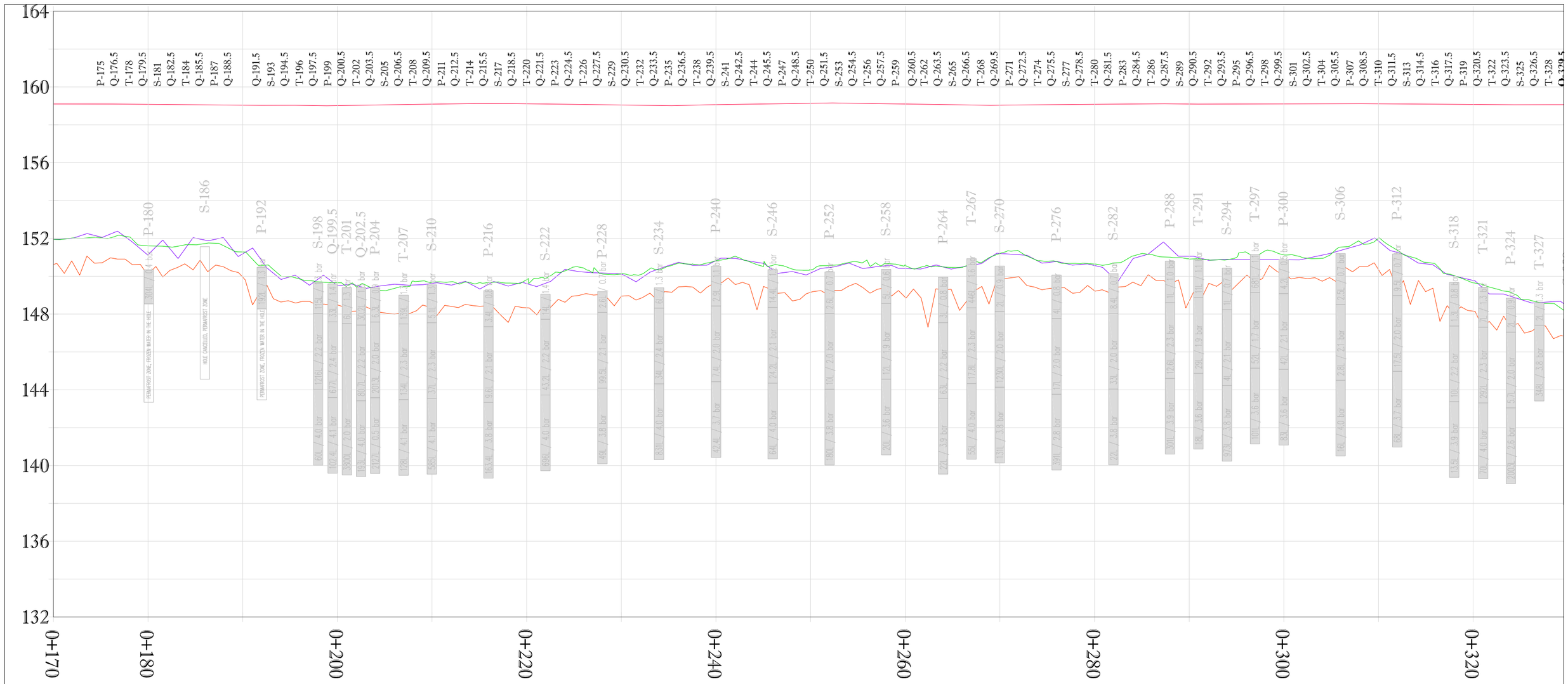
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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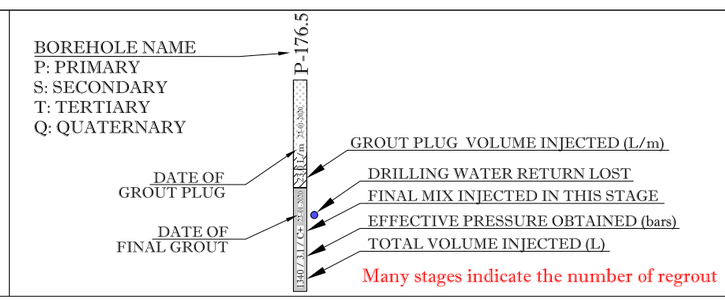

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-280-1

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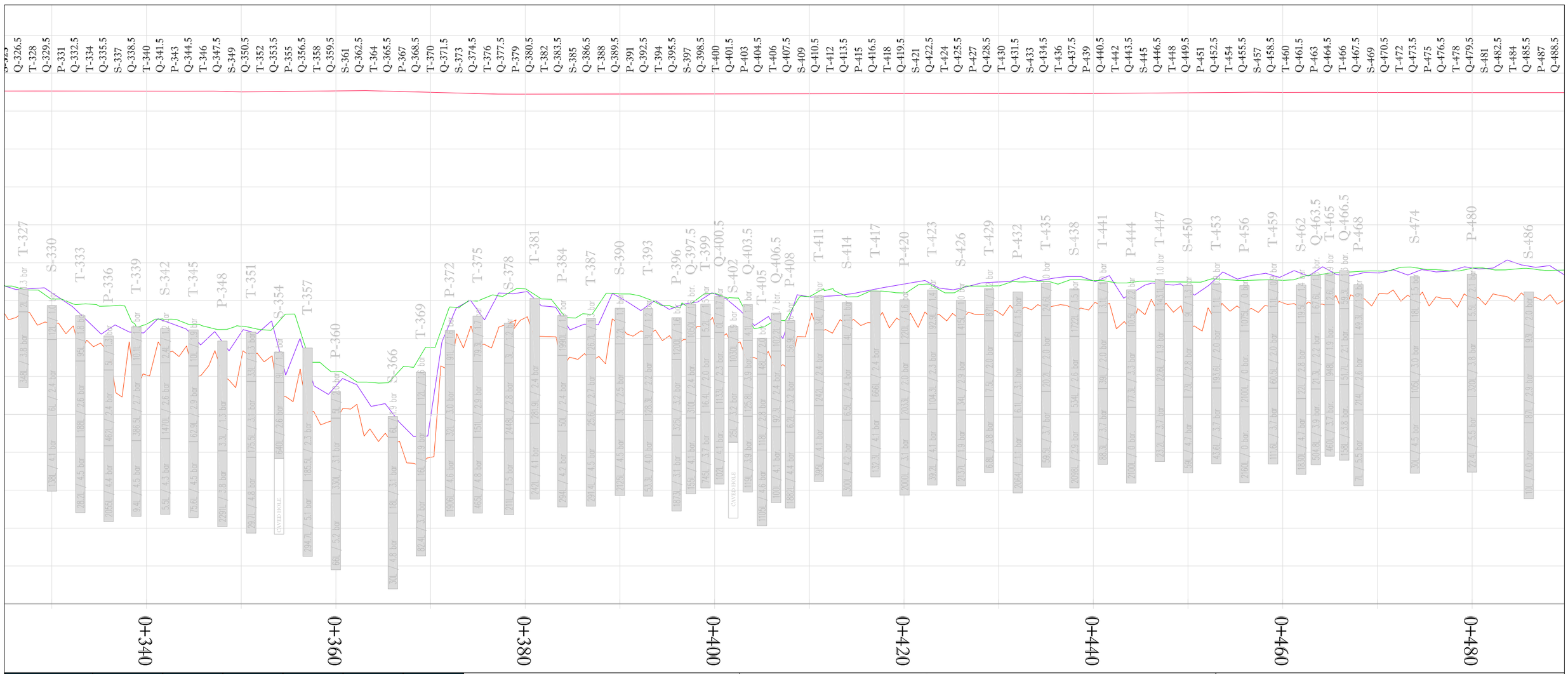
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

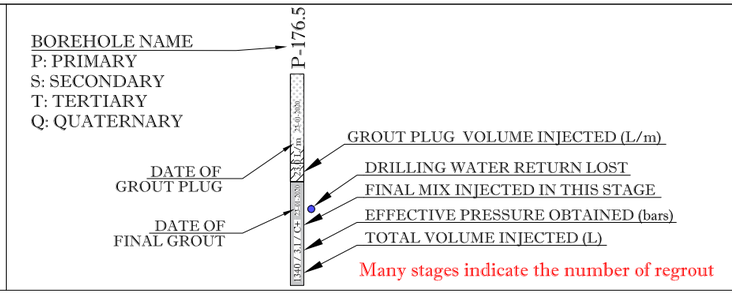


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-280-2

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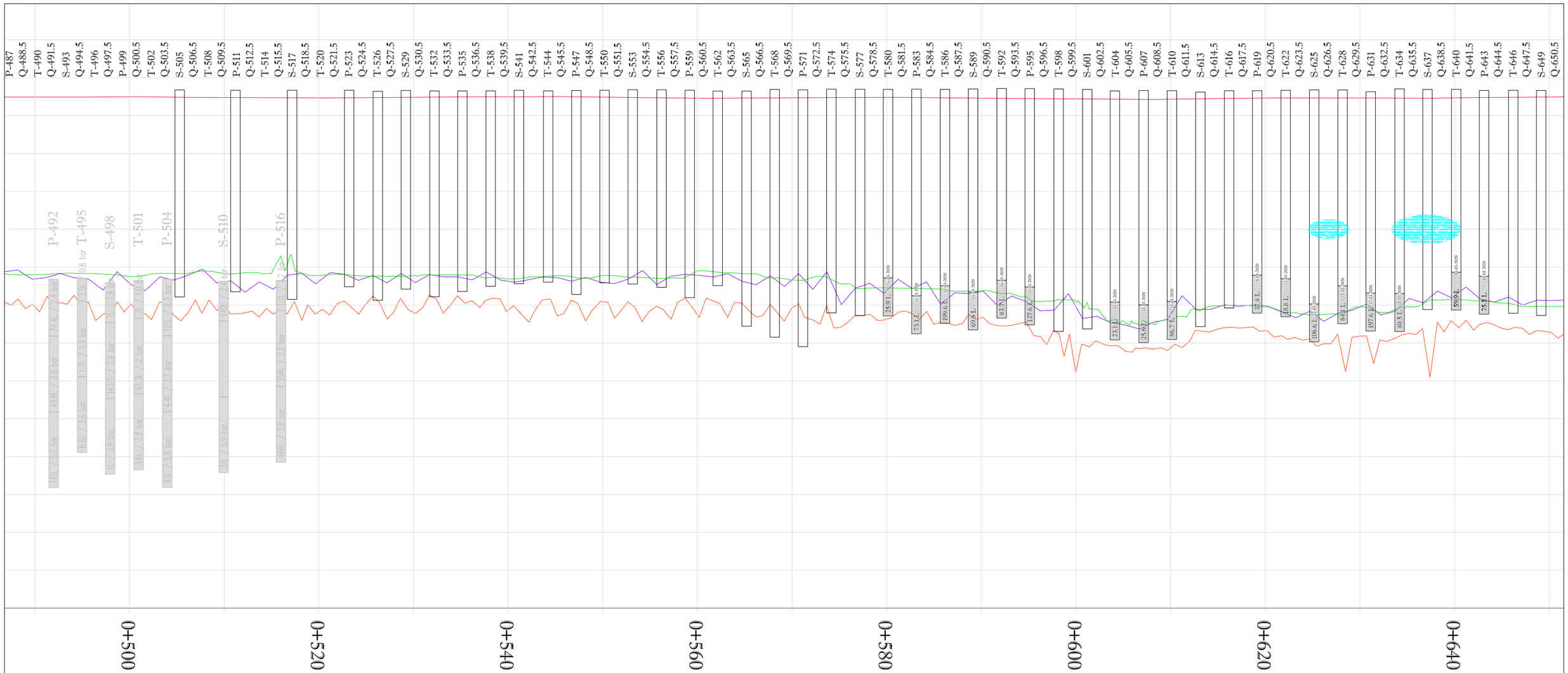
INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

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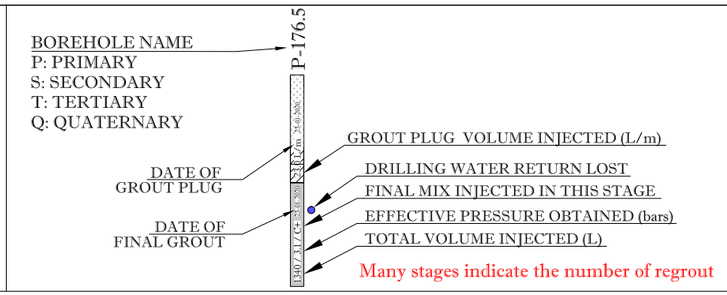

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- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-280-3

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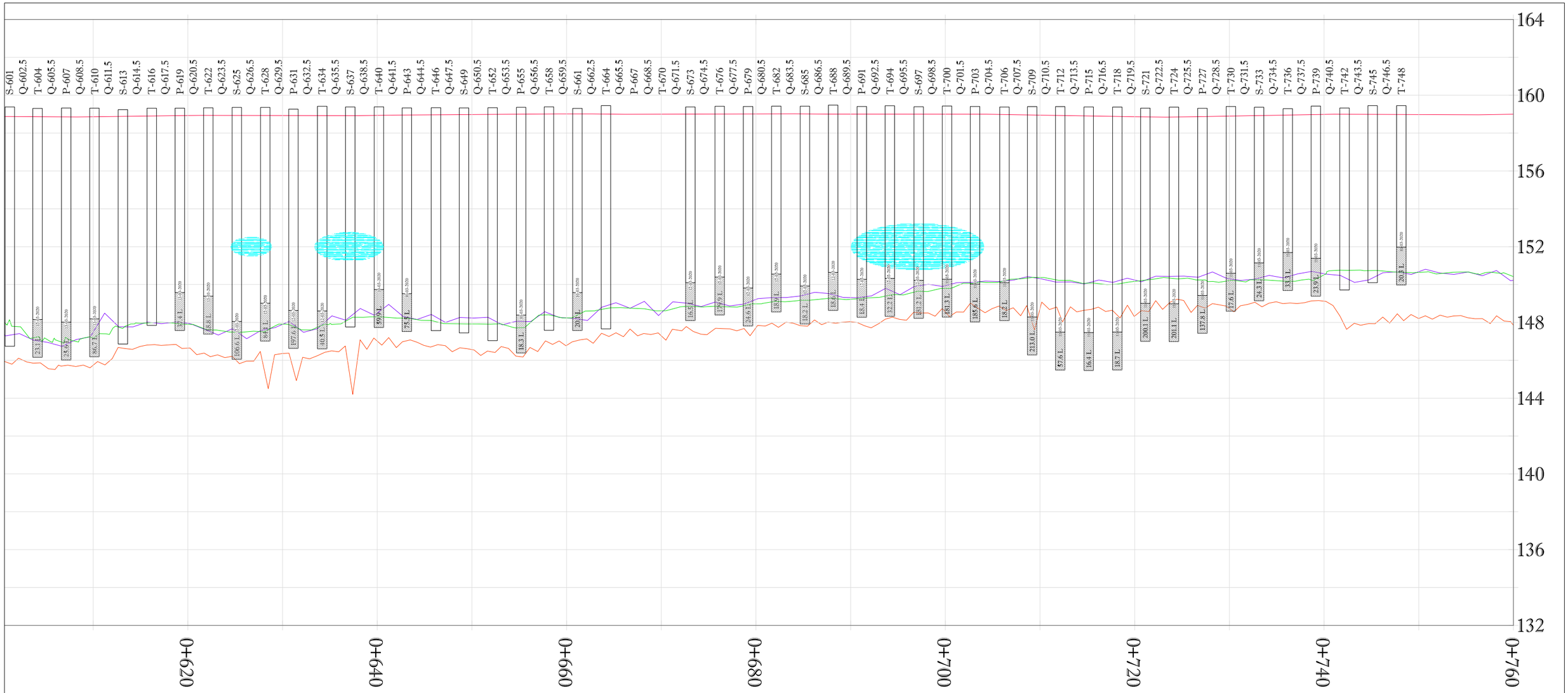
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

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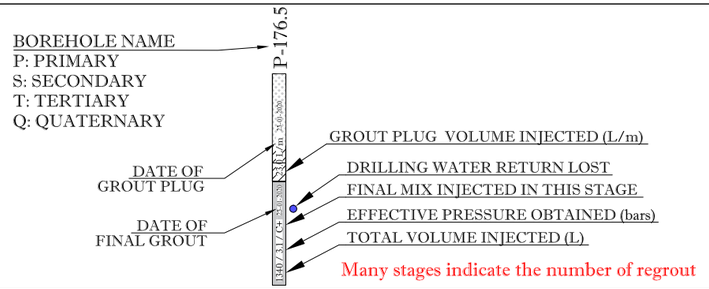

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- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-280-4

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SNC·LAVALIN

WEEKLY REPORT

20200319-WR
Document number

2020/03/13 to 2020/03/19	669034	Muhammad Saleem
Date	Project No.	Prepared by
Whale Tail Dike Remedial Drilling and Grouting Works		Agnico Eagle
Project		Client
SNC-Lavalin INC.	KCG (TCG)	
Consultant	Contractor	

MAIN ACTIVITIES

- This weekly report covers the activities from March 13th, 2020 to March 19th, 2020.
- The main activities during this week were casing plug on upstream and downstream blanket, bedrock drilling at the downstream blanket (additional quaternary holes).
- AEM, KCG and SNC-Lavalin site personnel had construction meeting in the early morning of each day.
- All primary, secondary and tertiary holes of the downstream blanket have now been grouted and completed (except three (3) holes in the exclusion zones (instrumentation areas) while one (1) hole in the exclusion zone has been cancelled.
- KCG received the coordinates for two (2) remaining (P440.5 and T335.5) casings in the exclusion zone. These casings will be installed when rig will be available. One hole in the exclusion zone (T359.5) had been cancelled due to instrumentation cables in the area.
- A total of twenty four (24) additional Quaternary holes been added for downstream blanket. Casings installation for all the additional holes had been completed and plugged.
- On March 13, 2020, no grouting between 9:30 AM and Noon due to water pump repair .
- On March 14, 2020, no grouting after 9:30 AM due to loader broke down and blizzard in the afternoon.
- On March 18, 2020, no grouting between 9 AM and Noon due to loader was not available at beginning and then some issue with injection unit.
- On March 19, 2020, as the Crew is worried about the current uncertain situation, KCG decided to do cleaning only (no drilling or grouting activity) to avoid any injury as the Crew cannot focus completely on job and they will have crew change tomorrow.
- On March 19, 2020, AEM conducted a meeting with all employees and announced that all employees going on time off will stay in isolation for fourteen (14) days prior to coming back to site.

GROUTING COMMITTEE RECOMMENDATIONS

- Meeting with GC was held on March 19th, 2020. To clarify some points from previous GC recommendations and to finalize the path forward for upstream and downstream blanket grouting and curtain grouting strategy.
- SNC, AEM and GC agreed to proceed with grouting primary and secondary holes for upstream blanket between Station 750 and 520 and grout tertiary holes based on the evaluation from grout take in primary and secondary holes.
- After both downstream and upstream blankets (GC called two rows short curtain) grouting completed, seepage data will be reviewed and if needed deeper grout curtain will be installed in targeted areas.

CASING EXTENDED TO BEDROCK

- No casing was extended to bedrock during this week. A total of twenty two (22) casings were extended for the downstream blanket so far.

CASING INSTALLATION

- No casing installed for upstream or downstream blanket during this week

CASING PLUG

Downstream Blanket

- Eleven (11) casing plugs grouted during this week using Mix C (water cement ratio 0.55, 1% calcium chloride) and a total of 211 casings have been plugged so far.
- Two (2) casings plugged (Q-199 and Q295) reached Vmax and the rest of the casing plug reached pressure refusal during this week.
- No casing plug was regrouted even if Vmax was reached.

	Casing Pluged				
Hole ID	Date	Grout Type	Grout Taken (L)	Pressure (Bar)	Comments
Q-193	March 17, 2020	C	24.9	2.05	
Q-197	March 17, 2020	C	19.1	2.16	
Q-199	March 17, 2020	C	143.3	0.25	Ended at Vmax
Q-220	March 17, 2020	C	20.7	2.12	
Q-223	March 17, 2020	C	48.2	1.73	
Q-292	March 17, 2020	C	23.4	1.95	
Q-295	March 17, 2020	C	149.6	0.25	Ended at Vmax
Q-478	March 17, 2020	C	55.4	1.78	
Q-481	March 17, 2020	C	21.1	2.08	
Q-523	March 16, 2020	C	20.2	1.98	
Q-526	March 16, 2020	C	23.1	2.2	

Upstream Blanket

- Forty two (42) casing plugs grouted during this week using Mix C (water cement ratio 0.55, 1% calcium chloride) from Stations 0+649 to 0+487.
- Seven (7) of the casing plugs reached Vmax and the rest of the casing plug reached pressure refusal.
- No casing plug was regrouted even if Vmax was reached.
- At fourteen (14) of the casings, ice build-up along the casing at the water elevation (but holes were checked and found open to the bottom) and did not allow the packer to be pushed down, packer was placed and inflated above the water level and grouted without prefill.

Hole ID	Casing Plug				
	Date	Grout Type	Grout taken (L)	Pressure (Bar)	Comments
S-649	March 18, 2020	C	87	1.99	Packer placed above water level due to ice build up along casing
T-646	March 18, 2020	C	191.3	0.82	ended at Vmax
S-637	March 18, 2020	C	98.5	2.11	Packer placed above water level due to ice build up along casing
T-622	March 13, 2020	C	18.8	2.23	
P-619	March 13, 2020	C	37.5	1.83	Packer placed above water level due to ice build up along casing
T-616	March 18, 2020	C	39.3	2.13	
S-613	March 18, 2020	C	5.8	2.82	Packer placed above water level due to ice build up along casing
T-610	March 13, 2020	C	86.7	2.17	Packer placed above water level due to ice build up along casing
P-607	March 13, 2020	C	25.6	2.09	
T-604	March 13, 2020	C	23	2.12	
S-601	March 18, 2020	C	22.3	2.18	
T-598	March 18, 2020	C	208.4	1.91	ended at Vmax
P-595	March 13, 2020	C	127.6	2.36	Packer placed above water level due to ice build up along casing
T-592	March 14, 2020	C	83.7	2.18	Packer placed above water level due to ice build up along casing
S-589	March 14, 2020	C	69.6	2.34	Packer placed above water level due to ice build up along casing
T-586	March 14, 2020	C	199.6	0.77	Packer placed above water level due to ice build up along casing Ended at Vmax
P-583	March 14, 2020	C	73.1	2.29	
T-580	March 14, 2020	C	25.9	1.96	
S-577	March 15, 2020	C	21.5	2.18	
T-574	March 15, 2020	C	24	2.09	
P-571	March 15, 2020	C	220.5	1.07	ended at Vmax
T-568	March 15, 2020	C	229.2	0.18	ended at Vmax
S-565	March 15, 2020	C	28	2.13	
T-562	March 15, 2020	C	51.7	2.08	Packer placed above water level due to ice build up along casing
P-559	March 15, 2020	C	55.1	2.13	Packer placed above water level due to ice build up along casing
T-556	March 15, 2020	C	171.5	0.24	ended at Vmax
S-553	March 15, 2020	C	25	1.97	
T-550	March 15, 2020	C	58	1.92	
P-547	March 15, 2020	C	20.8	2	
T-544	March 15, 2020	C	62.2	1.98	Packer placed above water level due to ice build up along casing
S-541	March 15, 2020	C	84.8	1.98	Packer placed above water level due to ice build up along casing
T-538	March 16, 2020	C	171	1.84	Packer placed above water level due to ice build up along casing Ended at Vmax
P-535	March 16, 2020	C	25.8	1.98	
T-532	March 16, 2020	C	23.5	2.07	
S-529	March 16, 2020	C	24.3	2	
T-526	March 16, 2020	C	60.5	1.8	
S-517	March 16, 2020	C	8.7	2	
P-511	March 16, 2020	C	37.5	1.8	
S-505	March 16, 2020	C	74.33	2.03	
P-499	March 17, 2020	C	17.4	2.29	
S-493	March 17, 2020	C	18.6	1.96	
P-487	March 17, 2020	C	30.6	2.29	

BEDROCK DRILLING

- One (1) additional quaternary hole and one (1) hole in the exclusion zone had been drilled during this week for 5 m stage length for downstream blanket.
- No water loss was observed in all the holes drilled in bedrock this week.
- All holes drilled during this week stayed open to the bottom.
- All the holes washed clean after drilling for 6 min.
- No communication between the holes observed in any of the holes drilled during this week.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
P-609.1	18.3	-	-	No caving	No
Q-628	17.6	-	-	No caving	No

BEDROCK GROUTING

- No bedrock grouting happened during this week, KCG was focusing on to complete the casing plugs for all casings installed.
- A total of 194 holes (including 6 additional Quaternary holes), all at the downstream blanket, have been completed up to date.

GROUT TESTING

- Grout tests were conducted for 1st batch as well as every 5 batches or whenever Mix changes. The Marsh values, specific gravity, bleeding and temperature values were checked for C.

Date	Hole ID	Mix	Specific Gravity	Marsh value (second)	Temperature (°C)	Bleeding (%)
2020-03-13	casing plug	Mix C	1.74	85	28.5	1
		Mix C	1.73	65	22.9	
2020-03-14	casing plug	Mix C	1.74	93	22.7	1
		Mix C	1.74	64	23	
2020-03-15	casing plug	Mix C	1.74	54	29.9	1
		Mix C	1.74	64	25.9	
		Mix C	1.72	65	28.7	1
2020-03-16	casing plug	Mix C	1.74	65	29.5	1
		Mix C	1.69	52	28.5	
		Mix C	1.72	77	29.5	1
2020-03-17	casing plug	Mix C	1.73	65	28.5	1
		Mix C	1.76	98	29.9	1
2020-03-18	casing plug	Mix C	1.72	72	27.9	1
		Mix C	1.71	80	27.5	1

- Marsh values for Mix C widely ranged from 52 to 80s and some higher values of more than 80s also observed.
- The Specific Gravity and Bleed tests for Mix C shows stable numbers with Specific Gravity ranged from 1.69 to 1.76 and Bleed of 1%.
- Some fluctuations with Marsh value, possible issue with cement from different bulk bags, also some chunks found in the grout causing fluctuation in pressure and flow rate during grouting.

- KCG was advised to better control the screening and filling of 20 KG buckets.
- Due to some issues with cement and causing flash set of Mix C grout the water cement ratio of Mix C was modified from 0.5 to 0.55 and amount of calcium chloride changed from 2% to 1% on March 10th, 2020. The water cement ration will be adjusted back to original mix design if cement properties changed.

HOLE DEPTH VERIFICATIONS

- KCG along with GHD and QA representative measured the depth of hole and water level for every hole prior to start rock grouting.

BOREHOLE INCLINATION CHECK

- Inclination check has been completed for 77 downstream blanket casings of the total 80 casings installed.
- Average deviation for downstream casings found 0.82% and the maximum value found is 2.38%.

LIST OF CHANGES ON SPECS, SITE INSTRUCTION, FIELD WORK AND DEVIATION LIST

Whale Tail Dike Remedial Grouting Sepecifications and Design Drawings Changes Tracking

Document	Revision	Date Issued	Subject
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PC	2019-10-03	Technical Specifications for Whale Tail Dike Remedial Drilling and Grouting Works Rev. PC was issued for AEM and Grouting Committee's (GC) review and comments. The document was the main topic of the discussion in the Grouting Committee Meeting No.3 held on Oct. 17th, 2019 in Montreal.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	PD	2019-10-28	As per discussions and recommendations from GC Meeting No.3, Technical and Specifications had been updated to Rev PD. Reference can be made to meeting minutes 669034-0000-30MC-0001 for details of the comments and recommendations to the designs.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PE	2019-11-27	Rev. PD had been updated to Rev PE based on recommendations presented in GC's letter Dated Oct. 25, 2019 and further discussions with AME engineers and site staff to implement the simplified approach and path forward proposed by the GC. Phased approach adopated starting with two rows of Blanket Grouting (Phase I) and based on the results of Blanket Grouting to decide the requirement of deepen the Upstream Blanket holes for Curtain Grouting (Phase II)
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	00	2020-01-10	Document Rev. PE had been updated based on comments on received and the discussions and recommendations from GC Meeting No.5 held on December 5, 2019.

Whale Tail Dike Remedial Grouting Site Instructions Changes Tracking

Document	Revision	Date Issued	Subject
SITE INSTRUCTIONS FOR DRILLING AND BLANKET GROUTING (Document Number: 669034-0000-40CA-0001 Rev. 00)	Rev 00	2019-11-19	A technical memo - Site Instructions for Drilling and Blanket Grouting Rev PB was issued on November 19, 2019. The objective of this document is to provide key instructions to the drilling and grouting of the Blanket Holes at the WTD foundation to allow work to start timely before Design Drawings and Specifications are ready and approved. The Site Instructions were prepared based on discussions and comments on Technical Specs Rev PD, Grouting Committee's Letter dated October 25, 2019 and in alignment with the objective of 40 to 50% seepage deduction with simplfied and phased project approach. This document may require update based on the progress and results of the field work.
	Rev 01	2020-01-08	The Site Instructions Rev 00 was updated to Rev 01 to incorporate: (1) modification of the Mix C+ by reducing the Calcium Chloride dosage (2)conditions for drilling and grouting the hole in two stages

Whale Tail Dike Remedial Grouting Fieldwork Instructions Changes Tracking

Document	Date Issued	Subject	Notes
Fieldwork Instruction No.1 (Email)	2019-12-03	Subject: 669034 - Rock Grouting on Grout Mix Change Procedures	This Fieldwork Instruction provide by email dated Dec. 03, 2019 on Subject: **Grout mix change procedures during the Blanket Hole Grouting and Regrouting** (prior to Open Throat Pump is available) based on the on site trial mix results and ground response on grout take and grouting pressure.
Fieldwork Instruction No.2 (FWI 001 Rev 00)	2019-12-07	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 00	This Fieldwork instruction applies to Grouting and Re-grouting of Primary Holes with the application of Celbex using Open Throat Pump as recommended by Grouting Committee (Meeting No. 5 on December 05 2019) that had been drilled per 5 m Stage. The site instruction will be updated as per the progress of the site construction.
Fieldwork Instruction No.3 (FWI 001 Rev. 01)	2019-12-09	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 01	The fieldwork instruction No.2 was updated to introduce Mix D

DEVIATION LIST FOR REMEDIAL GROUTING AT WHALE TAIL DIKE

Deviation #	Date Received	Date Responded	Status	Subject	Location/Address	Notes
001	2019-11-10		AEM will manage the situation	QC did not use centerlizer to monitor inclination	multiple locations	Daily Report - Contractor informed that they will use inclino meter without centerlizer as they did last winter but AEM will look if they can findout centerlizer for 4.6" casing.
002	2019-11-14		waiting for apparatus and	QC did not have Vicat apparatus and did not know how to use filtration	during Trial mix	Vicat apparatus received and fist vicat test performed on Dec 5, 2029
003	2019-12-06			inclination check in bedrock holes are not been checked. AEM said inclination check is not necessary in the rock hole during daily construction meeting on Dec 6, 2019 and captured on weekly		As per specs. "Deviation from vertical in the bedrock section of the hole shall not exceed 2% of drilled length."
004	2020-01-13			Drilling of tertiary holes prior to grouted secondary holes	T611.5, T617.5, T623.5, T629.5	Tertiary holes drilled while secondary holes S614.5 and S626.5 were not been grouted yet. As per spec. Tertiary holes shall be drilled in rock after secondary holes has been grouted and grout reached its final set
005	2020-01-12			Continuous drilling and grouting of tertiary holes	WTD Tertiary holes	Consective tertiary holes has been drilled and grouted (6 m distance). As per spec. minimum distance between two drilled holes in bedrock is
006	2020-02-13	2020-02-13	accepted	Use of Mix B in Tertiary Holes	WTD Tertiary holes	AEM and SNC agreed with the KCG proposal of using Mix B in Tertiary holes.
007	2020-03-10			cahnge in Mix C	WTD injection	Changed water cement ratio to 0.55 and calcium chloride to 1% due to issues with cement quality.

SAFE AND SAFETY REMARKS

- Extreme cold weather conditions wear proper winter clothing.

Issued by : *Muhammad Saleem* — Signature — **22-03-2020** — Date

Verified by : *Tom Xue* — Signature — **22-03-2020** — Date

APPENDICES

A1: AEM Seepage Report

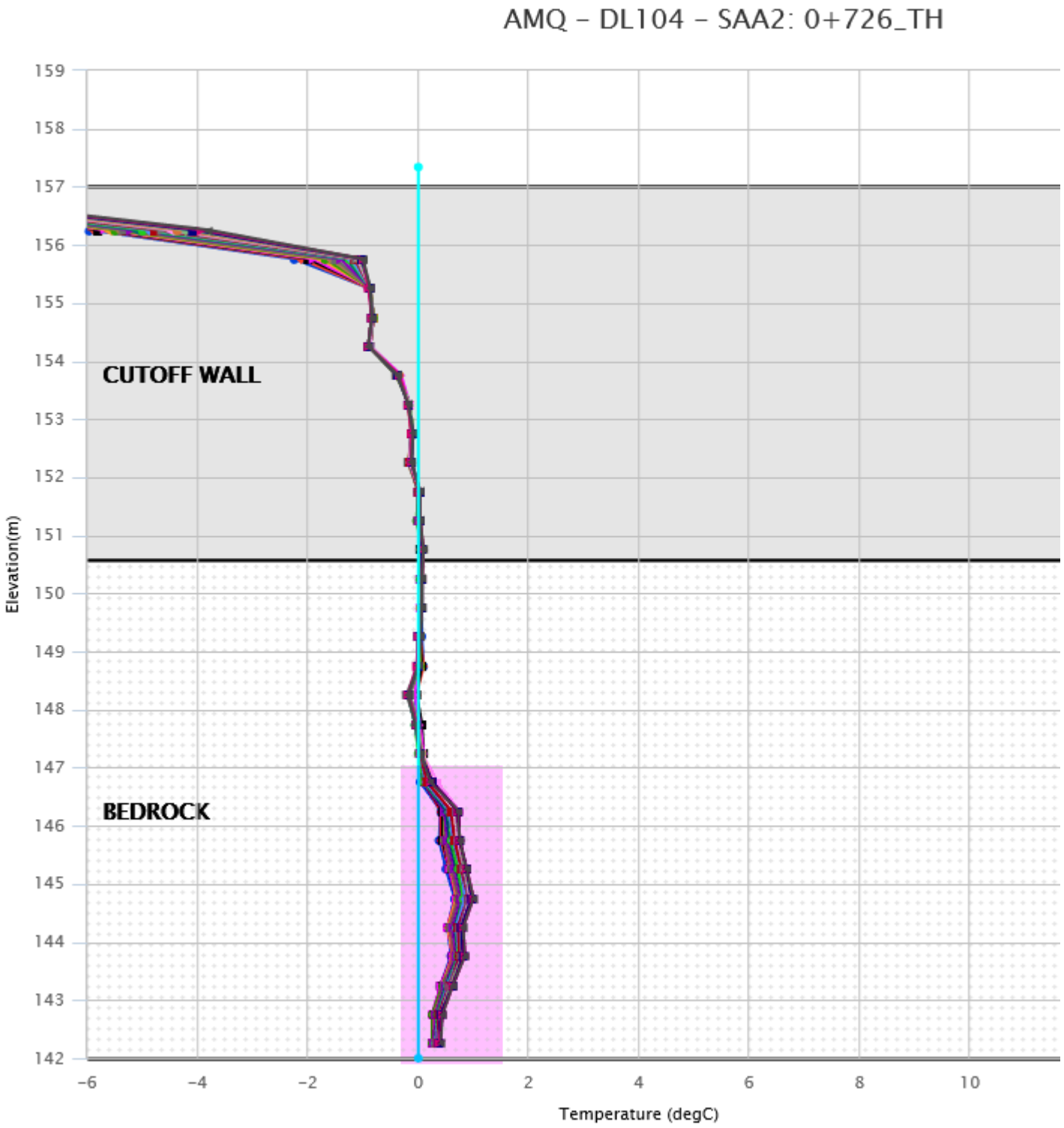
A2: KGC As-Built Profile Progress

summary of the observations on the instrumentation for the last week on WTD.

- **SAA-726:** general cooling trend within cutoff wall between 148-143 accelerated since March 3rd.
- **TH-710:** warming trend noted between 146-149 due to the injection of the quaternaries on the d/s and also with the drilling of the casings on the u/s line.
- **TH-675:** faster cooling between 149-151 also associated with quaternary casing drilling in the vicinity

The seepage flow evaluation for the moment is still at 280m³\hr.

The V-Notch in the collection channel at the toe of the WTD (station 0+560) was reopened this week and the value is 43m³\hr which is exactly the same as the last reading available on Jan 21st 2020.


AMQ – DL104 – SAA2: 0+726_TH
CUTOFF WALL
BEDROCK
Elevation(m)
Temperature (degC)
159
158
157
156
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154
153
152
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148
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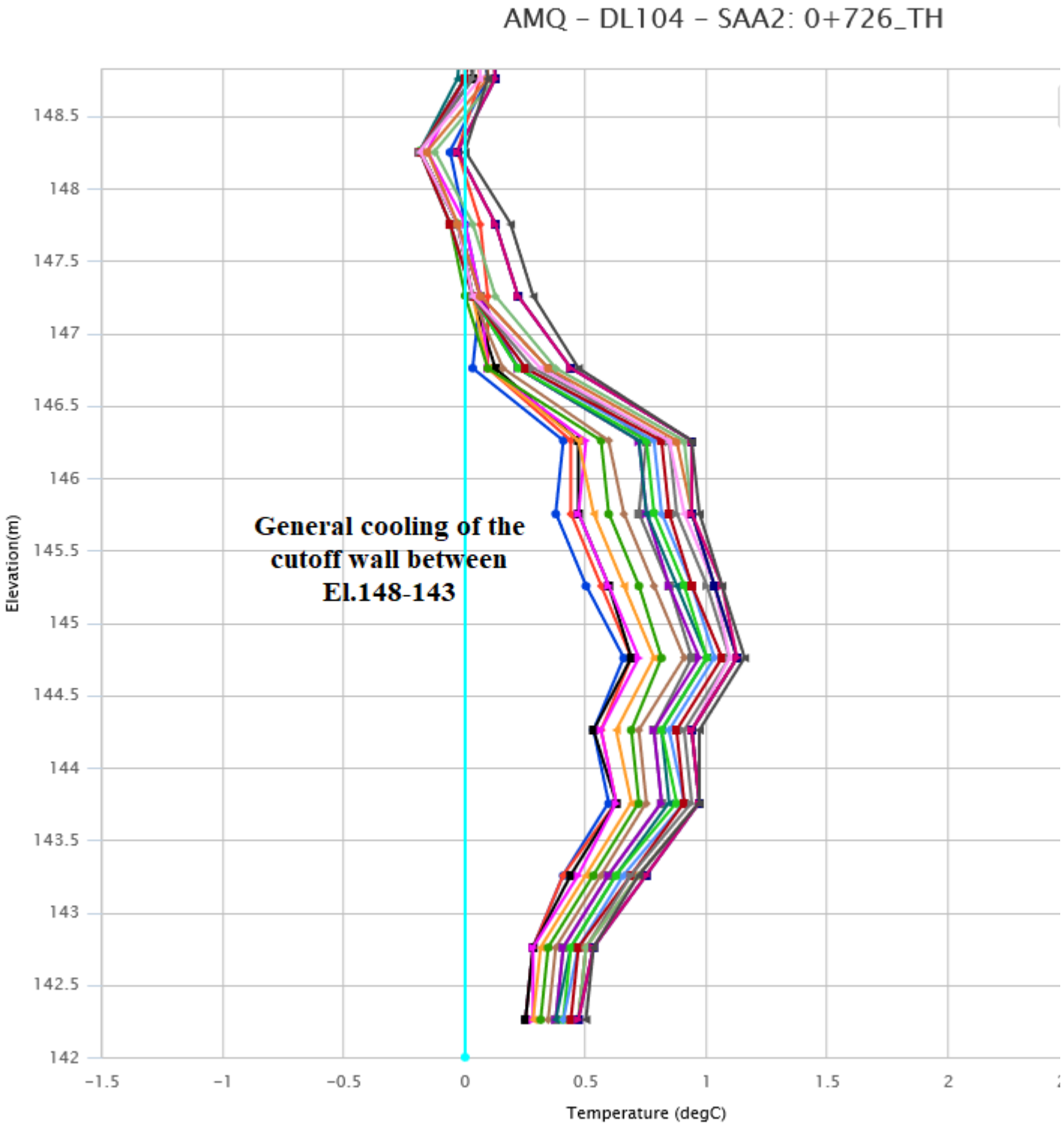
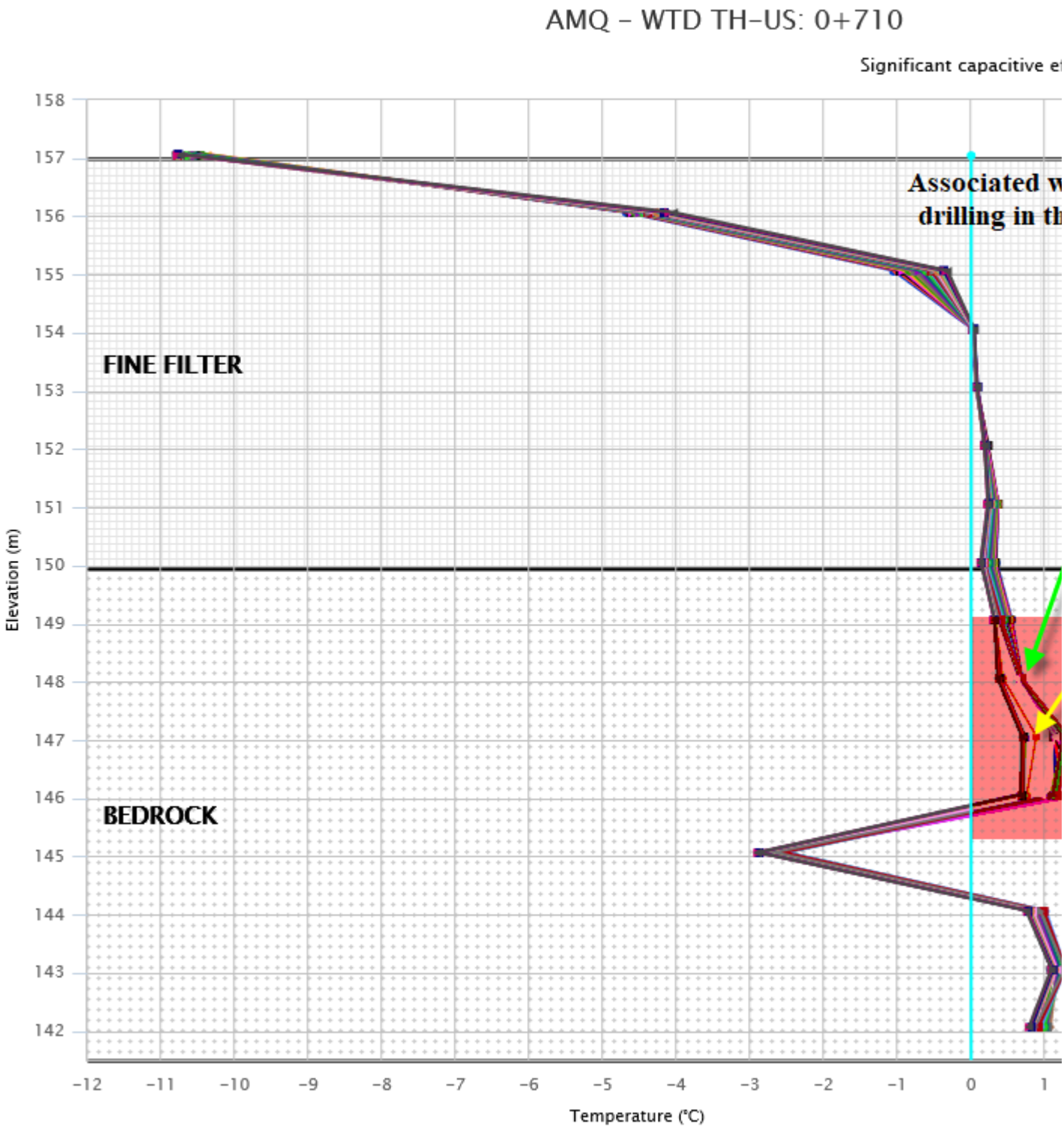
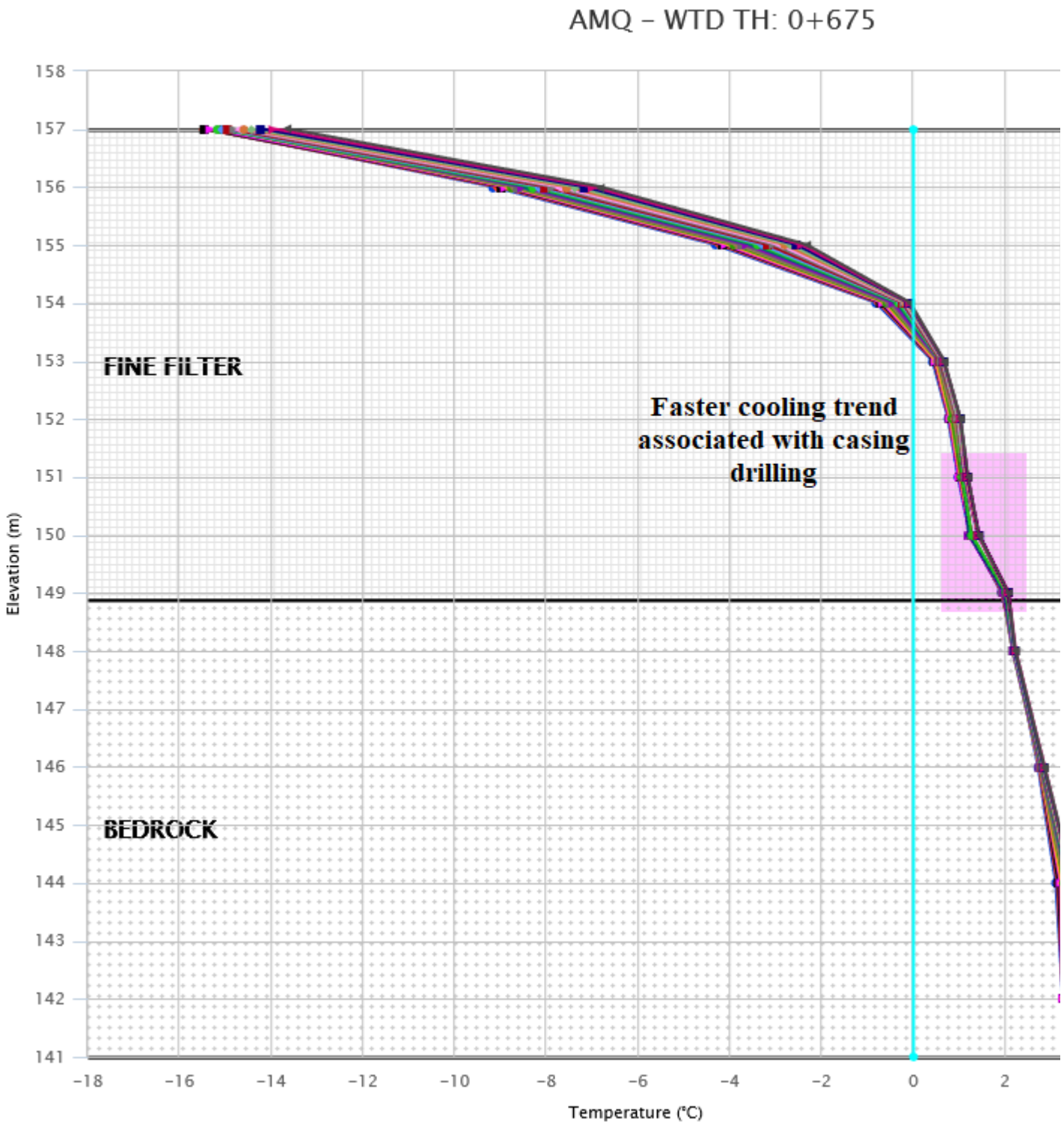
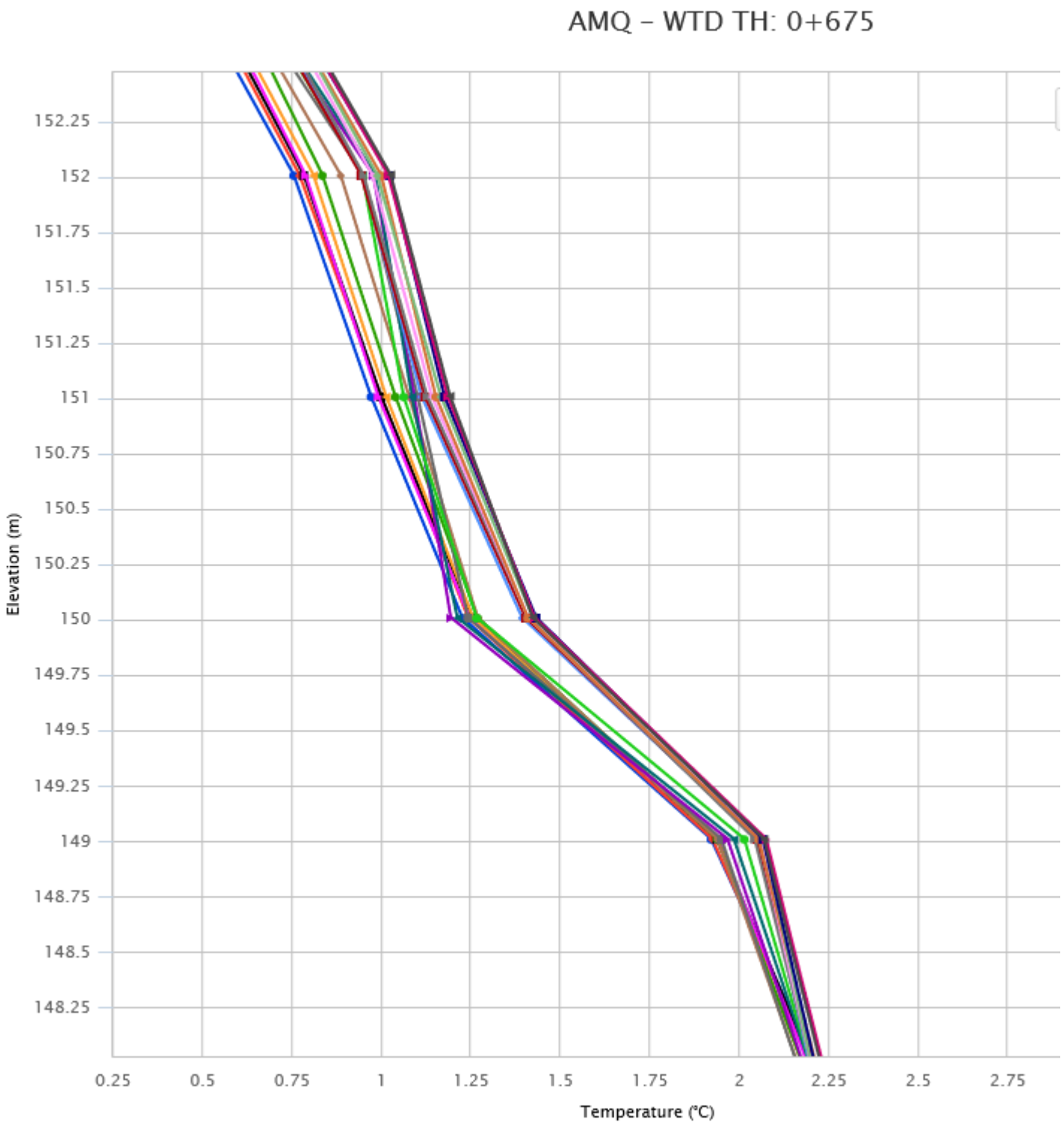
145
144
143
142
−6
−4
−2
0
2
4
6
8
10


AMQ – DL104 – SAA2: 0+726_TH
General cooling of the cutoff wall between El.148-143
Elevation(m)
148.5
148
147.5
147
146.5
146
145.5
145
144.5
144
143.5
143
142.5
142
−1.5
−1
−0.5
0
0.5
1
1.5
2
Temperature (degC)

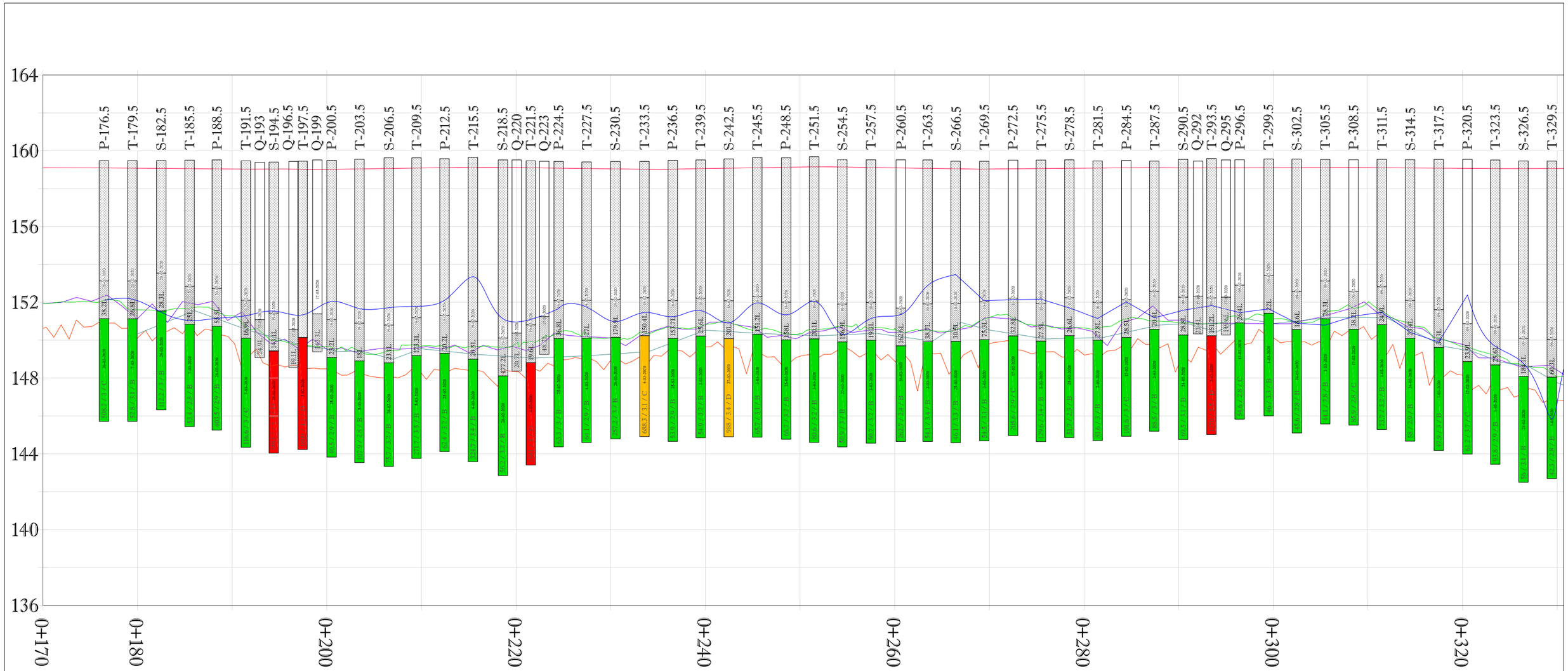

AMQ – WTD TH-US: 0+710
Significant capacitive e
Associated w
drilling in th
FINE FILTER
BEDROCK
Elevation (m)
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
143
142
−12
−11
−10
−9
−8
−7
−6
−5
−4
−3
−2
−1
0
1
Temperature (°C)


AMQ – WTD TH: 0+675
158
157
156
155
154
153
152
151
150
149
148
147
146
145
144
143
142
141
Elevation (m)
FINE FILTER
Faster cooling trend associated with casing drilling
BEDROCK
−18
−16
−14
−12
−10
−8
−6
−4
−2
0
2
Temperature (°C)


AMQ – WTD TH: 0+675
Elevation (m)
152.25
152
151.75
151.5
151.25
151
150.75
150.5
150.25
150
149.75
149.5
149.25
149
148.75
148.5
148.25
0.25
0.5
0.75
1
1.25
1.5
1.75
2
2.25
2.5
2.75
Temperature (°C)

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



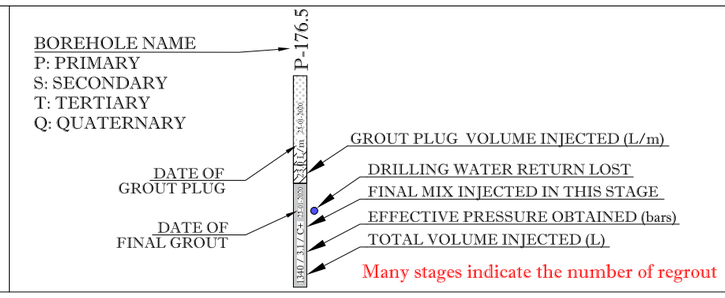
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



Many stages indicate the number of regrout

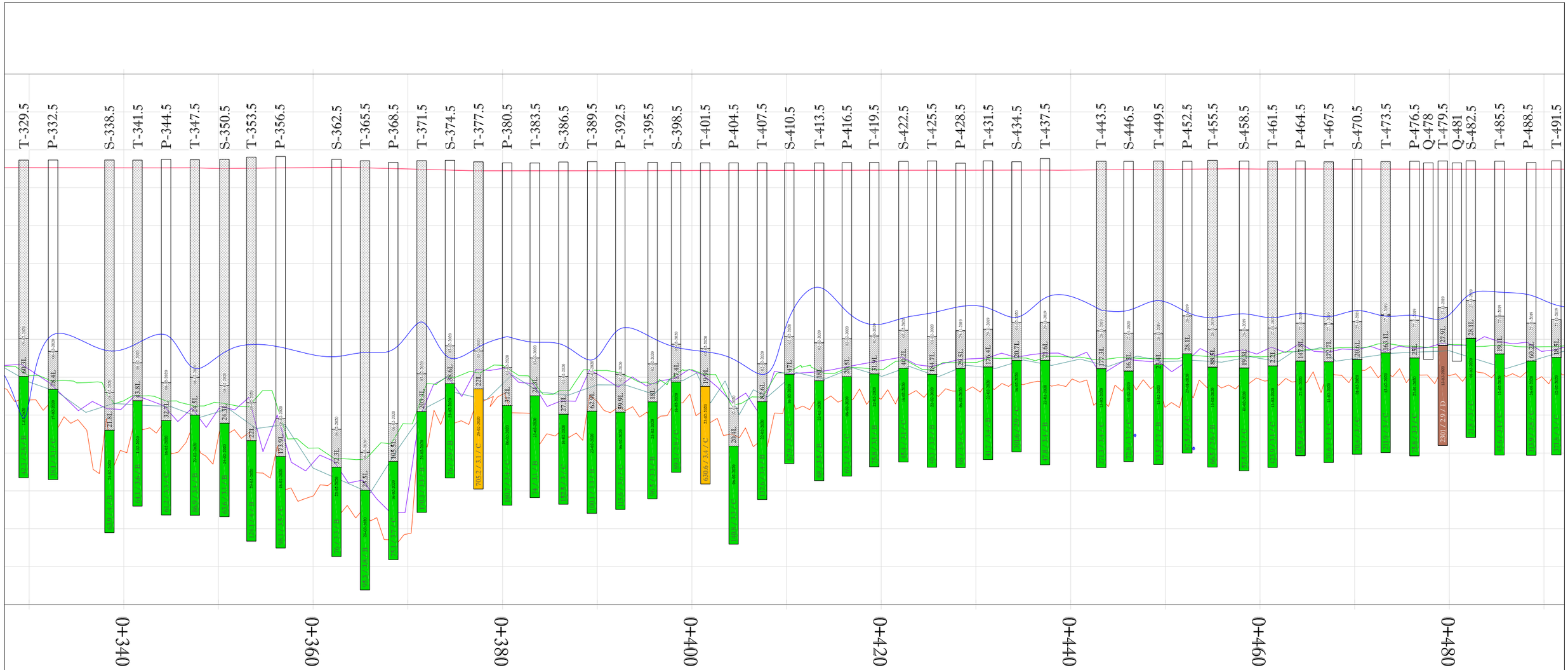
TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-291-1

C:\Users\arpenteur\Dropbox (Groupe Gilbert)_arpentage meadowbank\02-E - OFFICIAL DRAWING\11-811 - AMQ DIKES\CON-FD (AS BUILT)\CON-FD-291_WTD DS INJECTION PHASE 2 AS-BUILT_20032020.dwg

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



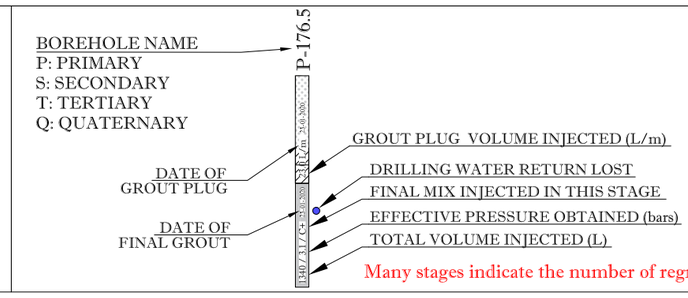
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



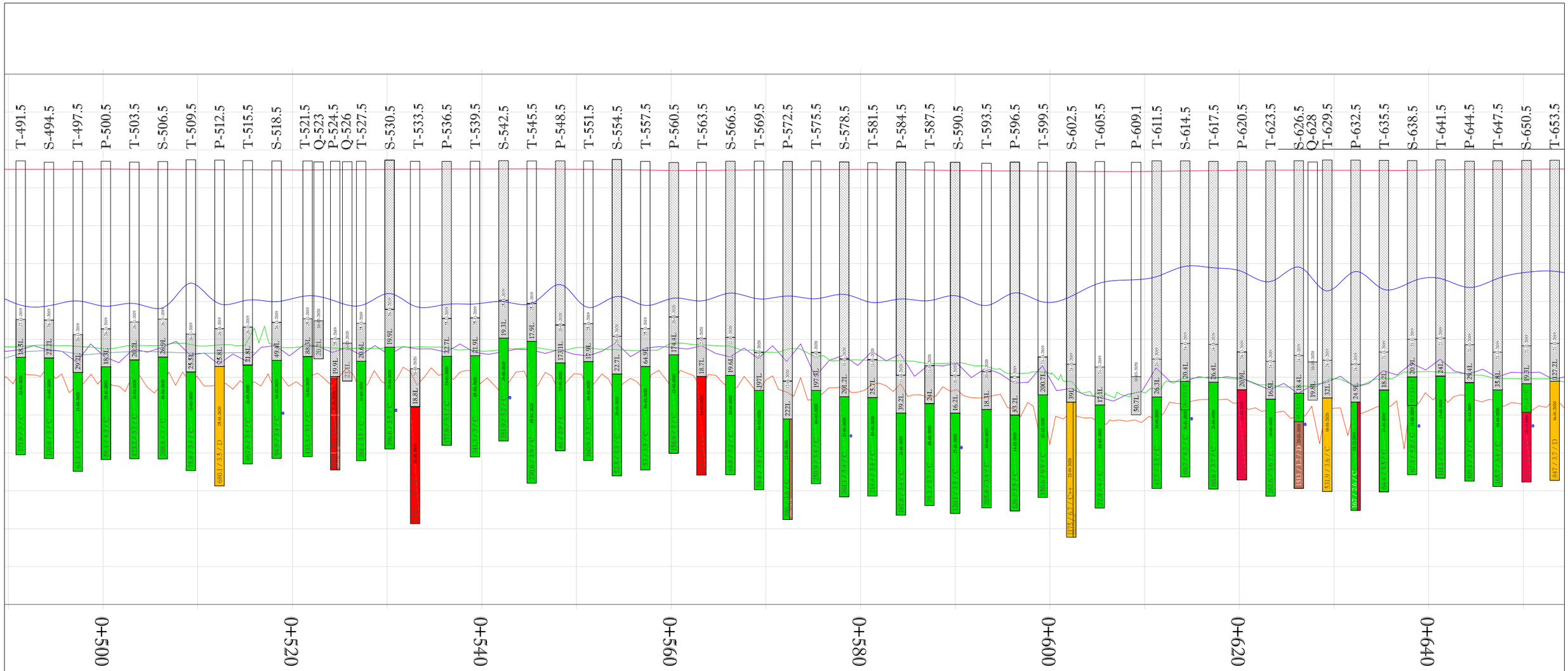
TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-291-2

C:\Users\arpenteur\Dropbox (Groupe Gilbert)_arpentage meadowbank\02-B – CAD\11-811 – AMQ DIKES\WHALE TAIL DIKE\INJECTION\PHASE 2\WTD_DS INJECTION PHASE 2_ASBUILT.dwg

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



0 12 24 Meters

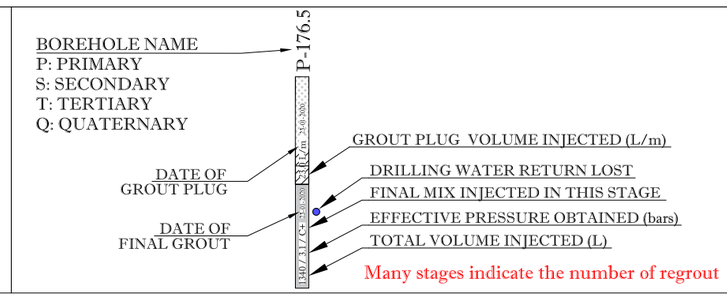
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-291-3

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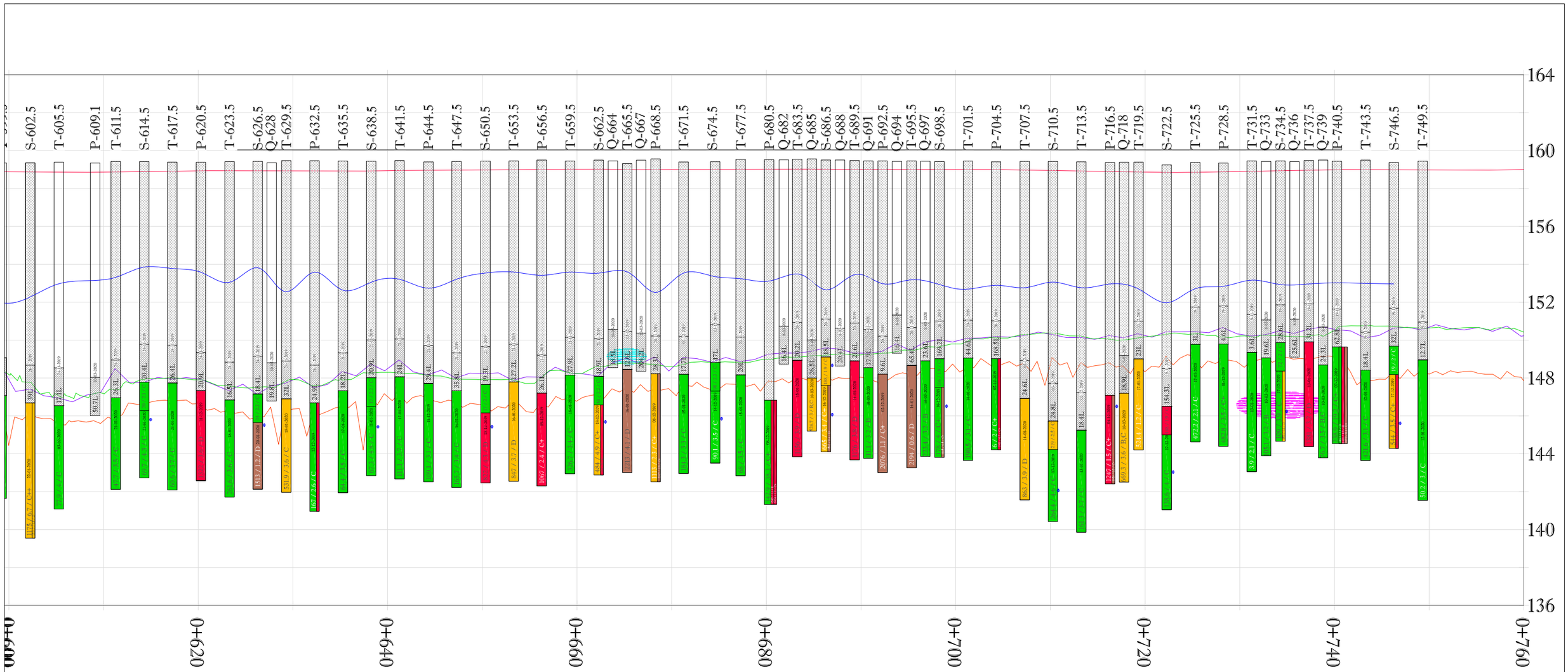
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



0 12 24 Meters

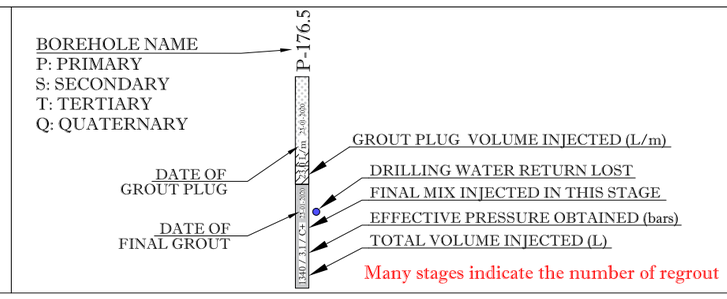
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-291-4

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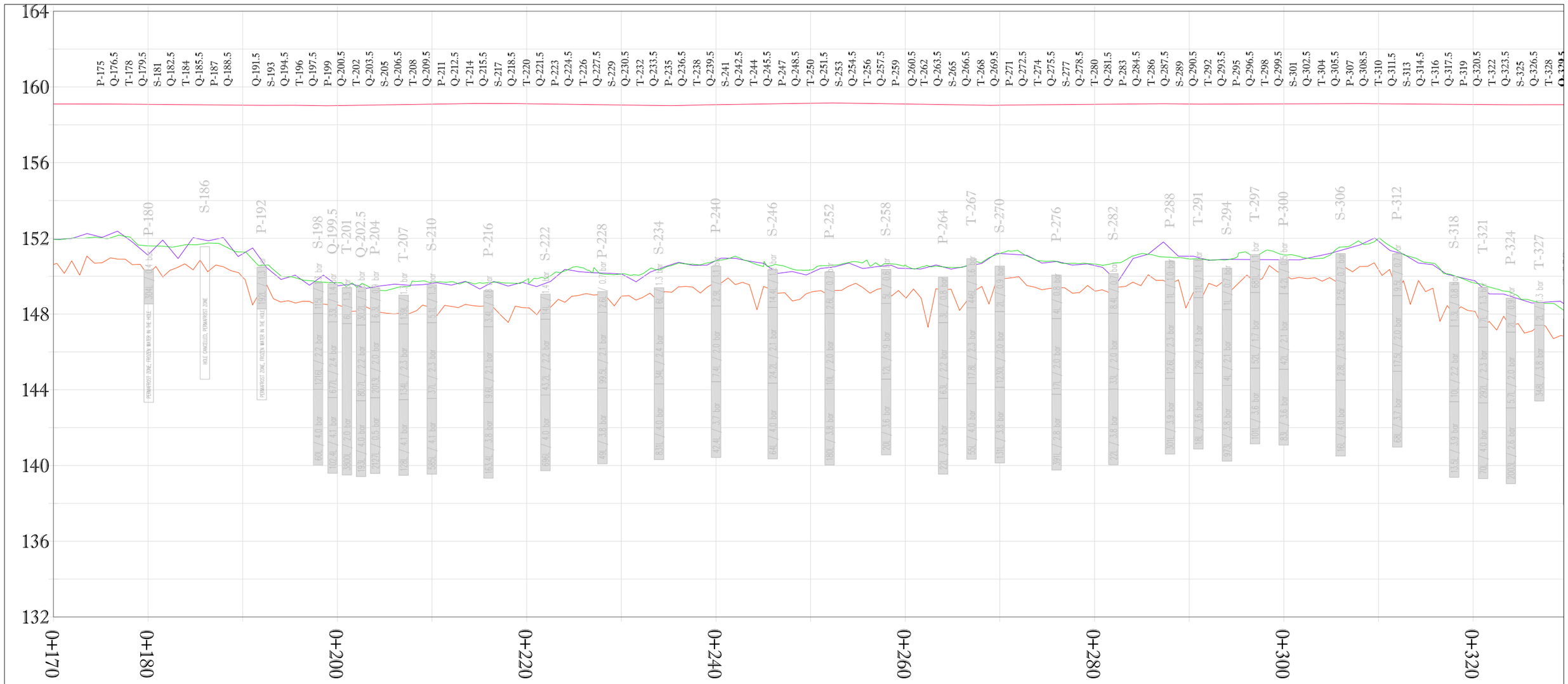
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

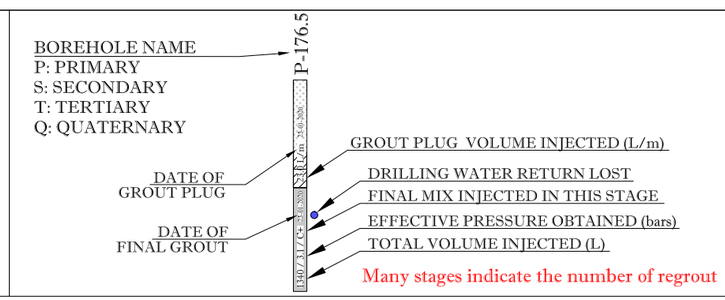


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved

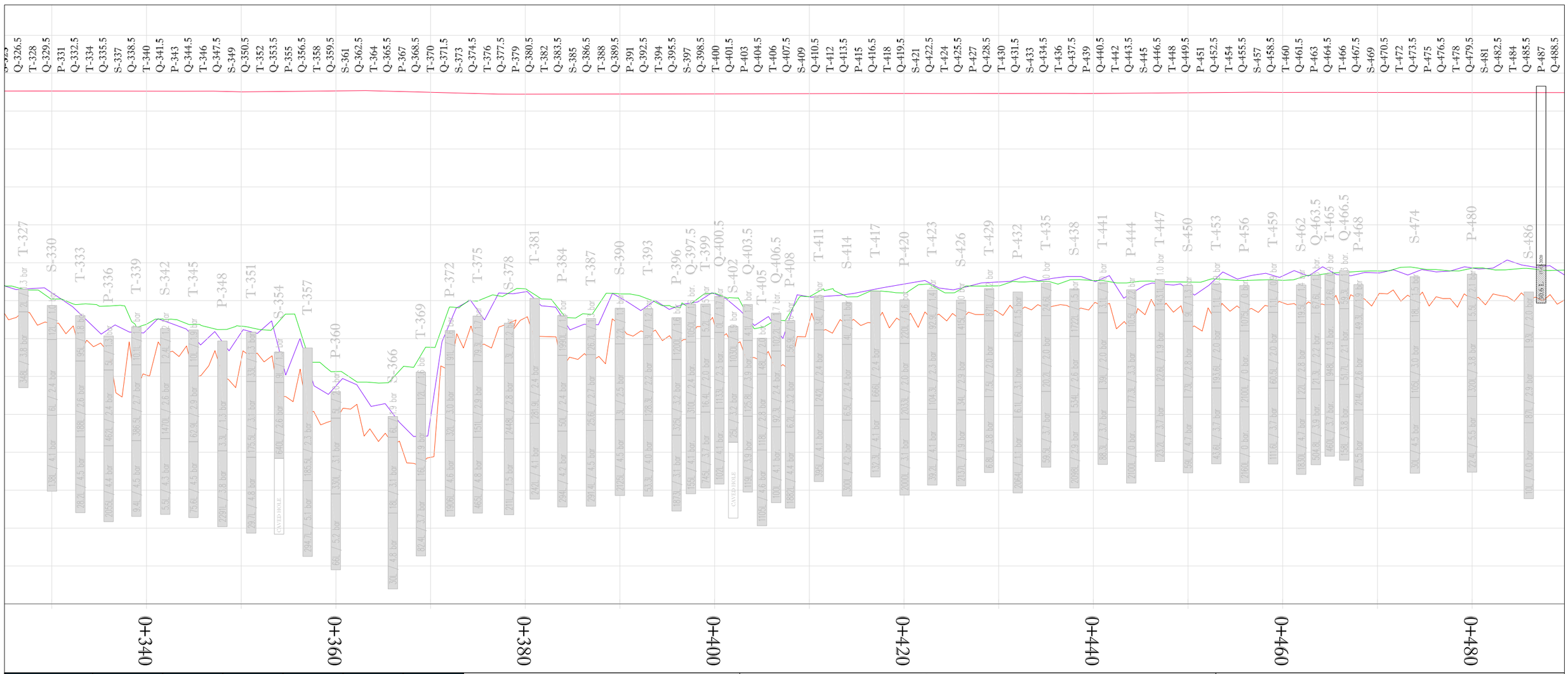


TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-290-1

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

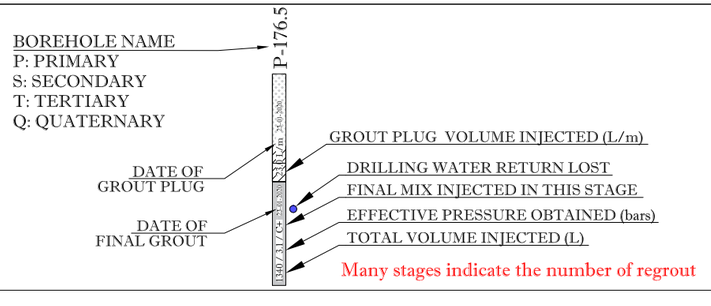


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 20-03-2020
CON-FD-290-2

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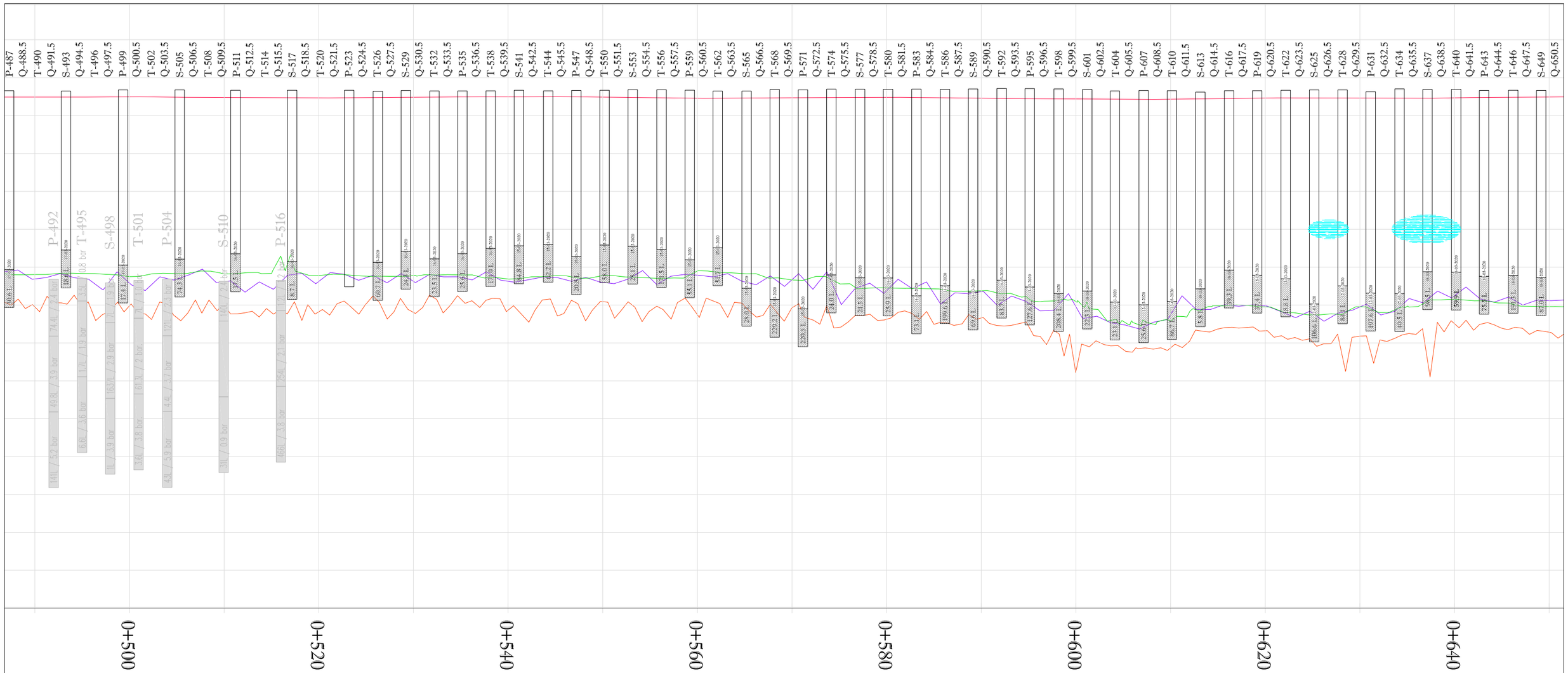
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
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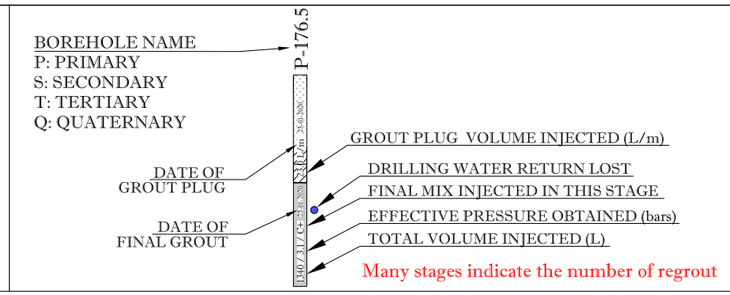


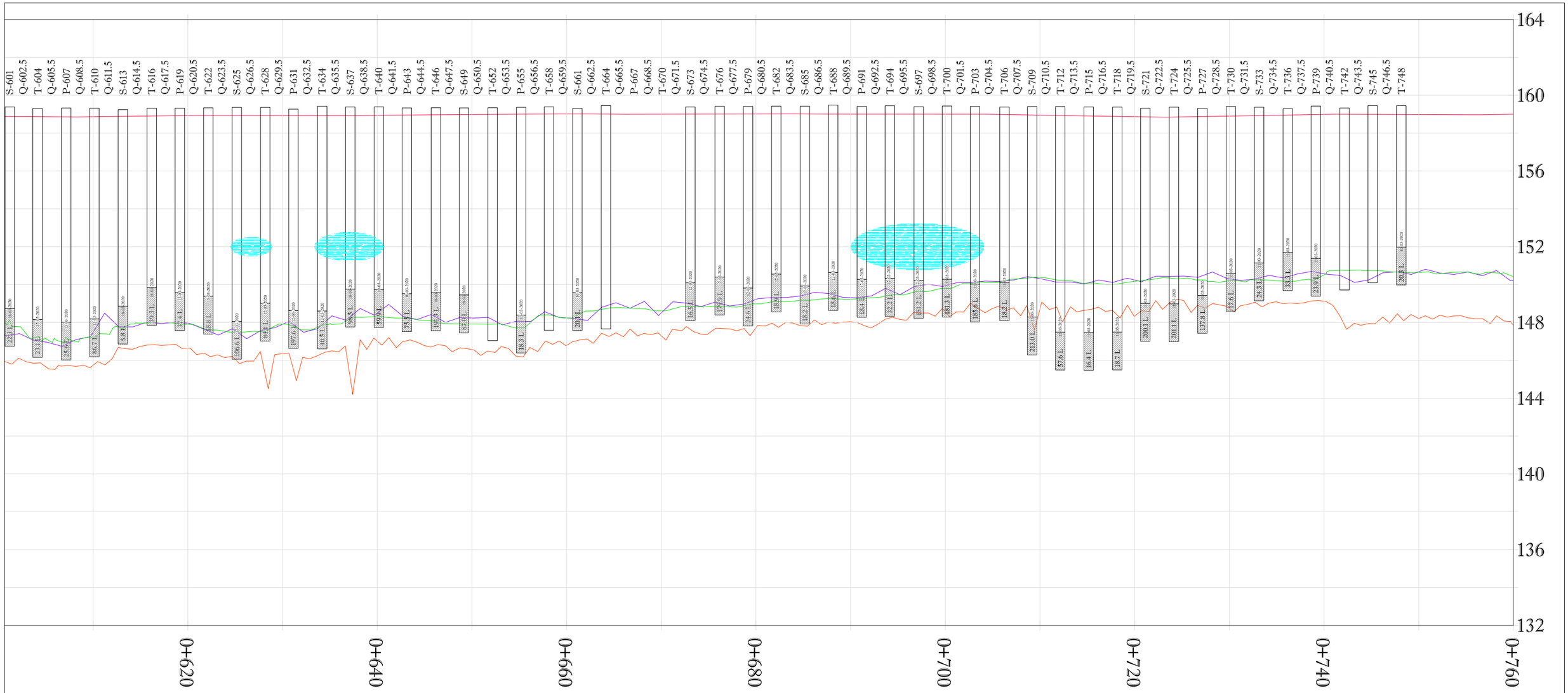
- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD

DATE : 20-03-2020
CON-FD-290-3

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
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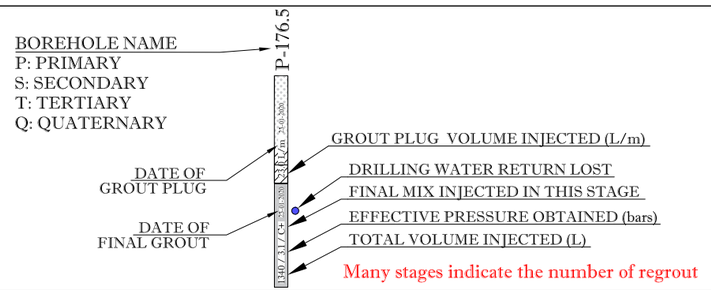

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : LOUIS-PIERRE COLLARD
DATE : 15-03-2020
CON-FD-280-4

SNC·LAVALIN

WEEKLY REPORT

20200325-WR
Document number

2020/03/20 to 2020/03/25	669034	Muhammad Saleem
Date	Project No.	Prepared by
Whale Tail Dike Remedial Drilling and Grouting Works		Agnico Eagle
Project		Client
SNC-Lavalin INC.	KCG (TCG)	
Consultant	Contractor	

MAIN ACTIVITIES

- This weekly report covers the activities from March 20th, 2020 to March 25th, 2020.
- This is the last weekly report due to the suspension of the grouting related activities by AEM.
- The main activities during this week were casing plug on upstream blanket, bedrock drilling at the downstream blanket (additional quaternary holes) and at the upstream blanket (Primary holes) and rock grouting for downstream additional Quaternary holes and upstream Primary holes.
- AEM, KCG and SNC-Lavalin site personnel had construction meeting in the early morning of each day.
- Attended AEM-SNC meeting on March 20, 2020 to discuss contingency plan, if SNC has to monitor the grouting program remotely due to possible travel restriction.
- All primary, secondary and tertiary holes of the downstream blanket had now been grouted and completed (except two (2) holes in the exclusion zones (instrumentation area) while one (1) hole in the exclusion zone had been cancelled).
- The two (2) casings pending to be installed in the exclusion zone (P440.5 and T335.5) will be decided later if AEM resume grouting operation after assessing the seepage during freshet season.
- A total of twenty four (24) additional Quaternary holes been added for downstream blanket. Casing installations for all the additional holes had been completed and plugged, sixteen (16) holes had been pressure grouted and one (1) hole (Q-478) was backfilled without pressure grouting after AEM decided to stop grouting operation.
- On March 22, 2020, bedrock grouting work interrupted upon pig shooting (pipe cleaning) to clear the area due to safety requirement. Work resumed after 2PM.
- On March 23, 2020, work stopped after completing grouting for one hole due to generator failure and work resumed after 1 PM.
- On March 25, 2020, AEM directed to stop all drilling and grouting activities and to backfill all the holes that had been drilled into rock but not been pressure grouted yet.

GROUTING COMMITTEE RECOMMENDATIONS

- On March 24, 2020, SNC Lavalin issued Addendum 01 of the Blanket Grouting Site Instruction Rev 01 for AEM review and comments. The Addendum includes changes in the upstream blanket grouting strategy and the recommended path forward from the Grouting Committee (Meeting No.8).

CASING EXTENDED TO BEDROCK

- No casing was extended to bedrock during this week. A total of twenty two (22) casings were extended for the downstream blanket so far.

CASING INSTALLATION

- No casing installed for upstream or downstream blanket during this week

CASING PLUG

Upstream Blanket

- Four (4) casing plugs grouted during this week using Mix C (water cement ratio 0.55, 1% calcium chloride) from Stations 0+745 to 0+658 for upstream blanket.
- Two (2) of the casing plugs reached Vmax and the rest of the casing plugs reached pressure refusal.
- No casing plug was regrouted even if Vmax was reached.

Hole ID	Casing Plug				
	Date	Grout Type	Grout taken (L)	Pressure (Bar)	Comments
S-745	March 21, 2020	C	152.8	1.1	Vmax
T-658	March 21, 2020	C	191.6	1.32	Vmax
T-664	March 21, 2020	C	29.7	1.94	
T-742	March 21, 2020	C	49.6	1.84	

BEDROCK DRILLING

Downstream Blanket

- Five (5) additional quaternary holes had been drilled during this week for 5 m stage length for downstream blanket.
- No water loss was observed in all the holes drilled in the bedrock this week.
- All holes drilled during this week stayed open to the bottom.
- All the holes washed clean after drilling for 6 min.
- No communication between the holes observed in any of the holes drilled during this week.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
Q-478	15.3	-	-	No caving	No
Q-481	15.2	-	-	No caving	No
Q-523	15.3	-	-	No caving	No
Q-526	16.4	-	-	No caving	No
Q-664	15.7	-	-	No caving	No

Upstream Blanket

- Six (6) Primary holes had been drilled during this week for 5 m stage length for upstream blanket.
- Water loss was observed in three (3) of the holes drilled in the bedrock this week.
- All holes drilled during this week stayed open to the bottom except one (1) hole (P-715) which was caved to 14.3 m from top of the ground and 4.1 m above the bottom of the hole drilled.
- All the holes washed clean after drilling for 6 min.
- No communication between the holes observed in any of the holes drilled during this week.

Hole	Total depth (m)	Water loss depth below ground level(m)	Water loss above bottom of the hole (m)	Caving depth (m)	Additional casing (m)
P-679	16.4	-	-	No caving	No
P-691	16.11	15.5	0.61	No caving	No
P-703	16.68	15.2	1.48	No caving	No
P-715	18.62	14.3	4.1	14.52	No
P-727	16.64	-	-	No caving	No
P-739	14.91	-	-	No caving	No

BEDROCK GROUTING

- During this week, bedrock grouting was conducted for additional quaternary holes and one primary hole in the exclusion zone at the downstream blanket and primary holes at upstream blanket.

Downstream Blanket

- A total of eleven (11) holes were grouted between Station 736 and 481 during this week.
- All the holes grouted in 5 m stage length.
- All holes reached refusal at Pmax with Mix B.
- All the holes had grout takes below 1000 L, so they were immediately backfilled at the end of pressure grouting process.
- A total of 205 holes (including 16 additional Quaternary holes) at the downstream blanket have been completed up to date.

	Interface grouting for 1.5 m/5 m stage									
Hole ID	Date	Grouting Length (m)	Calcualted Pmax (bar)	Closing Pressure (bar)	Closing Flowrate (l/min)	Volume Injected (L)	Mix	Comments	Depth of grout (m)	Empty Length after grouting (m)
Q-481	2020-03-23	4.6	3.06	3.03	0.2	220.8	Mix B	backfilled after refusal		
Q-523	2020-03-25	5.18	3.32	3.29	0	107.1	Mix B	backfilled after refusal		
Q-526	2020-03-23	5.08	3.32	3.35	0.1	55.5	Mix B	backfilled after refusal		
P-609,1	2020-03-23	5.33	3.55	3.36	0	90.2	Mix B	backfilled after refusal		
Q-628	2020-03-22	6.03	3.62	2.89	0	103.5	Mix B	backfilled after refusal		
Q-664	2020-03-25	5.05	3.2	3.2	0.2	116.4	Mix B	backfilled after refusal		
Q-667	2020-03-22	4.89	3.18	3.13	0.1	87.9	Mix B	backfilled after refusal		
Q-682	2020-03-22	4.43	3.2	2.95	0	512.1	Mix B	backfilled after refusal		
Q-688	2020-03-21	4.7	3.24	3.21	0	183.7	Mix B	backfilled after refusal		
Q-694	2020-03-21	5.25	3.11	3.21	0	146.2	Mix B	backfilled after refusal		
Q-736	2020-03-21	4.78	3.05	2.78	0.6	77.6	Mix B	backfilled after refusal		

Upstream Blanket

- A total of six (6) holes were grouted between Station 739 and 679 during this week.
- All the holes grouted in 5 m stage length except P715 which was grouted for 0.9 m stage length due to hole collapsed prior to grouting.
- Four (4) holes reached refusal at Pmax with Mix B, one (1) hole reached Pmax with Mix C without Celbex and one (1) hole ended at Vmax with Mix C without Celbex.
- Five (5) holes had grout takes below 1000 L, so they were immediately backfilled at the end of pressure grouting process.
- One (1) hole P-715 ended at Vmax and left open for 2nd stage drilling and grouting.
- Total of Six (6) holes all at the upstream blanket, have been completed up to date.

	grouting for 5 m stage									
Hole ID	Date	Grouting Length (m)	Calcualted Pmax (bar)	Closing Pressure (bar)	Closing Flowrate (l/min`	Volume Injected (L)	Mix Type	Comments	Depth of grout (m)	Empty Length after grouting (m)
P-679	2020-03-25	5.1	3.29	3.37	0.3	146	Mix B	backfilled after refusal		
P-691	2020-03-24	5.26	3.36	3.34	0.1	278.7	Mix B	backfilled after refusal		
P-703	2020-03-24	5.58	3.44	3.53	0	838	Mix B + Mix C	backfilled after refusal		
P-715	2020-03-24	0.9	2.2	1.05	1.05	627.8	Mix B + Mix C			
P-727	2020-03-24	5.01	3.39	3.56	0.3	94.7	Mix B	backfilled after refusal		
P-739	2020-03-23	5.17	3.17	3.13	0	392.5	Mix B	backfilled after refusal		

GROUT TESTING

- Grout tests were conducted for 1st batch as well as every 5 batches or whenever Mix changes. The Marsh values, specific gravity, bleeding and temperature values were checked for Mixes B and C.

Date	Grouting Type	Mix	Specific Gravity	Marsh value (second)	Temperature (°C)	Bleeding (%)
2020-03-21	casing plug	Mix C	1.71	50	20	1.5
		Mix C	1.73	77	22.2	1
	rock grout	Mix B	1.63	39	24.5	
2020-03-22	rock grout	Mix B	1.68	47	27.5	1.5
		Mix B	1.68	45	25.5	2
		Mix B	1.71	58	21.5	
2020-03-23	rock grout	Mix B	1.65	50	26	2
		Mix B	1.65	42	20	2
		Mix B	1.7	45	18.5	
2020-03-24	rock grout	Mix B	1.68	42	19.5	1.5
		Mix B	1.7	44	23.5	1.5
		Mix C	1.77	103	23	1
		Mix B	1.67	42	20.5	
		Mix C	1.76	63	22.5	
		Mix B	1.69	45	19	
2020-03-25	rock grout	Mix B	1.66	46	24.5	2
		Mix B	1.64	43	21.5	

- Marsh values for Mix C widely ranged from 52 to 80s and some higher values of more than 80s also observed while the Marsh Value for Mix B ranged from 39 to 50s and a single value (58s) higher than 50s was also observed
- The Specific Gravity and Bleed tests for Mix C shows stable numbers with Specific Gravity ranged from 1.71 to 1.77 and Bleed of 1% to 1.5%.
- The Specific Gravity and Bleed tests for Mix B also shows stable numbers with Specific Gravity ranged from 1.63 to 1.71 and Bleed of 1.5% to 2%.
- Some fluctuations with Marsh value, possible issue with cement from different bulk bags, also some chunks found in the grout causing fluctuation in pressure and flow rate during grouting.
- KCG was advised to better control the screening and filling of 20 KG buckets.
- Due to some issues with cement and causing flash set of Mix C grout the water cement ratio of Mix C was modified from 0.5 to 0.55 and amount of calcium chloride changed from 2% to 1% on March 10th, 2020.
- On March 21, 2020, Cement temperature was found at 44C in the afternoon, cement skid sent back to batching dorm and brought another skid of cement with temperature about 21C.

HOLE DEPTH VERIFICATIONS

- KCG along with GHD and QA representative measured the depth of hole and water level for every hole prior to start rock grouting.

BOREHOLE INCLINATION CHECK

- Inclination check has been completed for 77 upstream blanket casings of the total 80 casings installed.
- Average deviation for upstream casings found 0.82% and the maximum value found is 2.38%.

LIST OF CHANGES ON SPECS, SITE INSTRUCTION, FIELD WORK AND DEVIATION LIST

Whale Tail Dike Remedial Grouting Sepecifications and Design Drawings Changes Tracking

Document	Revision	Date Issued	Subject
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PC	2019-10-03	Technical Specifications for Whale Tail Dike Remedial Drilling and Grouting Works Rev. PC was issued for AEM and Grouting Committee's (GC) review and comments. The document was the main topic of the discussion in the Grouting Committee Meeting No.3 held on Oct. 17th, 2019 in Montreal.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	PD	2019-10-28	As per discussions and recommendations from GC Meeting No.3, Technical and Specifications had been updated to Rev PD. Reference can be made to meeting minutes 669034-0000-30MC-0001 for details of the comments and recommendations to the designs.
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION ROCK GROUTING Document Number: 611913-E531-40EF-0001	PE	2019-11-27	Rev. PD had been updated to Rev PE based on recommendations presented in GC's letter Dated Oct. 25, 2019 and further discussions with AME engineers and site staff to implement the simplified approach and path forward proposed by the GC. Phased approach adopated starting with two rows of Blanket Grouting (Phase I) and based on the results of Blanket Grouting to decide the requirement of deepen the Upstream Blanket holes for Curtain Grouting (Phase II)
TECHNICAL SPECIFICATIONS FOR THE WHALE TAIL DIKE FOUNDATION BLANKET GROUTING Document Number: 669034-0000-40EF-0001	00	2020-01-10	Document Rev. PE had been updated based on comments on received and the discussions and recommendations from GC Meeting No.5 held on December 5, 2019.

Whale Tail Dike Remedial Grouting Site Instructions Changes Tracking

Document	Revision	Date Issued	Subject
SITE INSTRUCTIONS FOR DRILLING AND BLANKET GROUTING (Document Number: 669034-0000-40CA-0001 Rev. 00)	Rev 00	2019-11-19	A technical memo - Site Instructions for Drilling and Blanket Grouting Rev PB was issued on November 19, 2019. The objective of this document is to provide key instructions to the drilling and grouting of the Blanket Holes at the WTD foundation to allow work to start timely before Design Drawings and Specifications are ready and approved. The Site Instructions were prepared based on discussions and comments on Technical Specs Rev PD, Grouting Committee's Letter dated October 25, 2019 and in alignment with the objective of 40 to 50% seepage deduction with simplfied and phased project approach. This document may require update based on the progress and results of the field work.
	Rev 01	2020-01-08	The Site Instructions Rev 00 was updated to Rev 01 to incorporate: (1) modification of the Mix C+ by reducing the Calcium Chloride dosage (2)conditions for drilling and grouting the hole in two stages
	Rev 01 Addendum 01	2020-03-24	The Addendum includes changes in the upstream blanket grouting strategy and the recommended pathforward from the Grouting Committee (Meeting No. 8)

Whale Tail Dike Remedial Grouting Fieldwork Instructions Changes Tracking

Document	Date Issued	Subject	Notes
Fieldwork Instruction No.1 (Email)	2019-12-03	Subject: 669034 - Rock Grouting on Grout Mix Change Procedures	This Fieldwork Instruction provide by email dated Dec. 03, 2019 on Subject: **Grout mix change procedures during the Blanket Hole Grouting and Regrouting** (prior to Open Throat Pump is available) based on the on site trial mix results and ground response on grout take and grouting pressure.
Fieldwork Instruction No.2 (FWI 001 Rev 00)	2019-12-07	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 00	This Fieldwork instruction applies to Grouting and Re-grouting of Primary Holes with the application of Celbex using Open Throat Pump as recommended by Grouting Committee (Meeting No. 5 on December 05 2019) that had been drilled per 5 m Stage. The site instruction will be updated as per the progress of the site construction.
Fieldwork Instruction No.3 (FWI 001 Rev. 01)	2019-12-09	FIELDWORK INSTRUCTION SHEET FWI-001 Document Number: 669034-2000-60NV-0001 Rev. 01	The fieldwork instruction No.2 was updated to introduce Mix D

Deviation List for Remedial Grouting At Whale Tail Dike

Deviation #	Date Received	Date Responded	Status	Subject	Location/Address	Notes
001	2019-11-10		AEM will manage the situation	QC did not use centerlizer to monitor inclination	multiple locations	Daily Report - Contractor informed that they will use inclino meter without centerlizer as they did last winter but AEM will look if they can findout centerlizer for 4.6" casing.
002	2019-11-14		waiting for apparatus and	QC did not have Vicat apparatus and did not know how to use filtration	during Trial mix	Vicat apparatus received and fist vicat test performed on Dec 5, 2029
003	2019-12-06			inclination check in bedrock holes are not been checked. AEM said inclination check is not necessary in the rock hole during daily construction meeting on Dec 6, 2019 and captured on weekly		As per specs. "Deviation from vertical in the bedrock section of the hole shall not exceed 2% of drilled length."
004	2020-01-13			Drilling of tertiary holes prior to grouted secondary holes	T611.5, T617.5, T623.5, T629.5	Tertiary holes drilled while secondary holes S614.5 and S626.5 were not been grouted yet. As per spec. Tertiary holes shall be drilled in rock after secondary holes has been grouted and grout reached its final set
005	2020-01-12			Continuous drilling and grouting of tertiary holes	WTD Tertiary holes	Consective tertiary holes has been drilled and grouted (6 m distance). As per spec. minimum distance between two drilled holes in bedrock is
006	2020-02-13	2020-02-13	accepted	Use of Mix B in Tertiary Holes	WTD Tertiary holes	AEM and SNC agreed with the KCG proposal of using Mix B in Tertiary holes.
007	2020-03-10			change in Mix C	WTD injection	Changed water cement ratio to 0.55 and calcium chloride to 1% due to issues with cement quality.

SAFE AND SAFETY REMARKS

- Extreme cold weather conditions wear proper winter clothing.

Issued by :	*Muhammad Saleem*	**27-03-2020**
	Signature	Date
Verified by :	*Tom Xue*	**27-03-2020**
	Signature	Date

APPENDICES

A1: AEM Seepage Report

A2: KGC As-Built Profile Progress

Did not received water seepage analysis report from AEM for this week but AEM confirmed that the water seepage on March 22, 2020 was 232 m3/hour.

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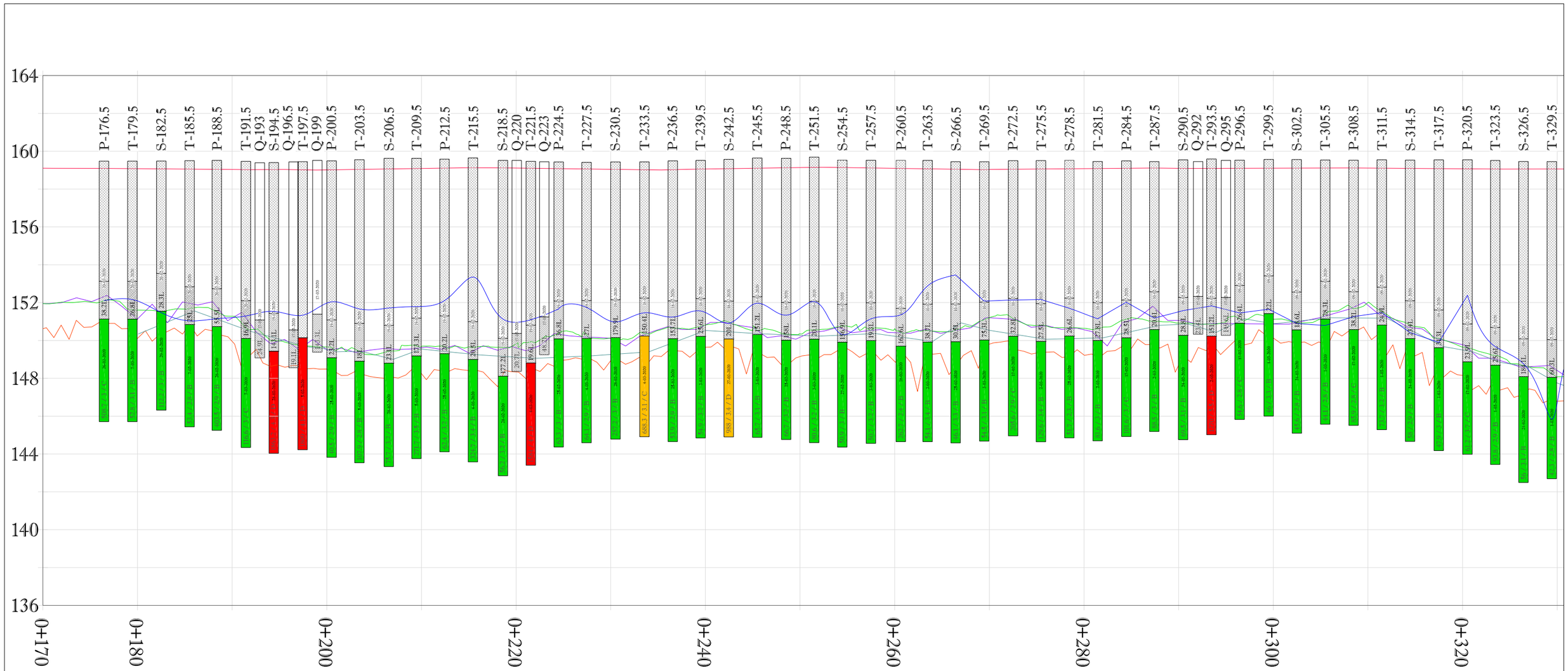
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



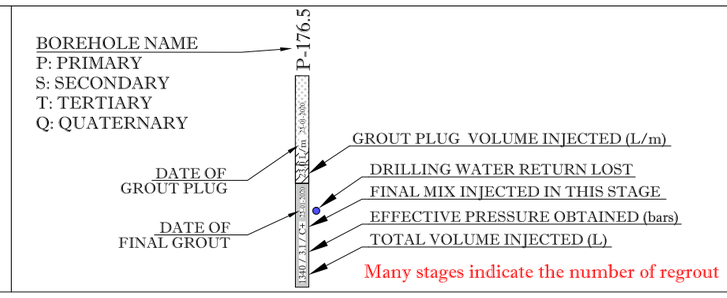
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 27-03-2020
CON-FD-302-1

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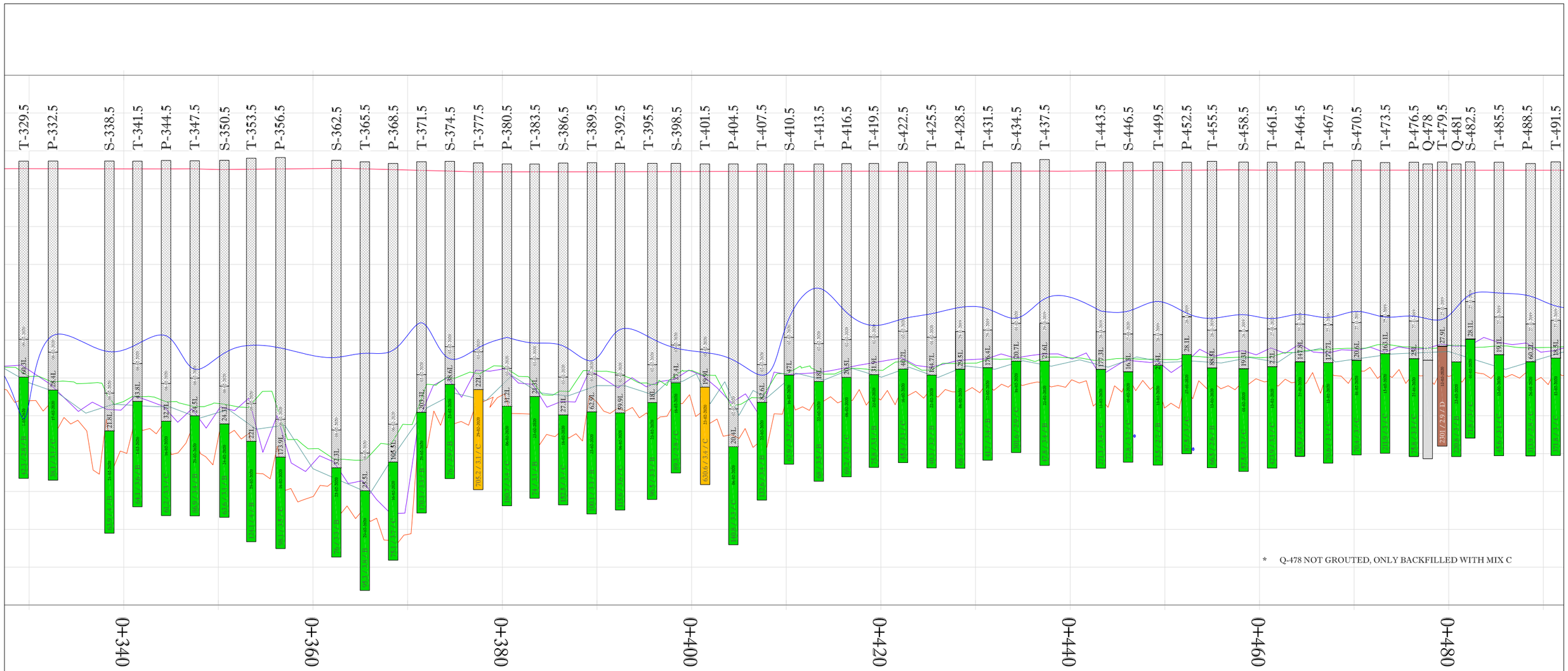
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
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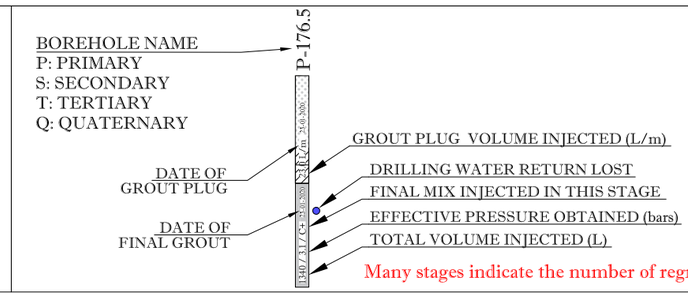

TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
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BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 27-03-2020
CON-FD-302-2

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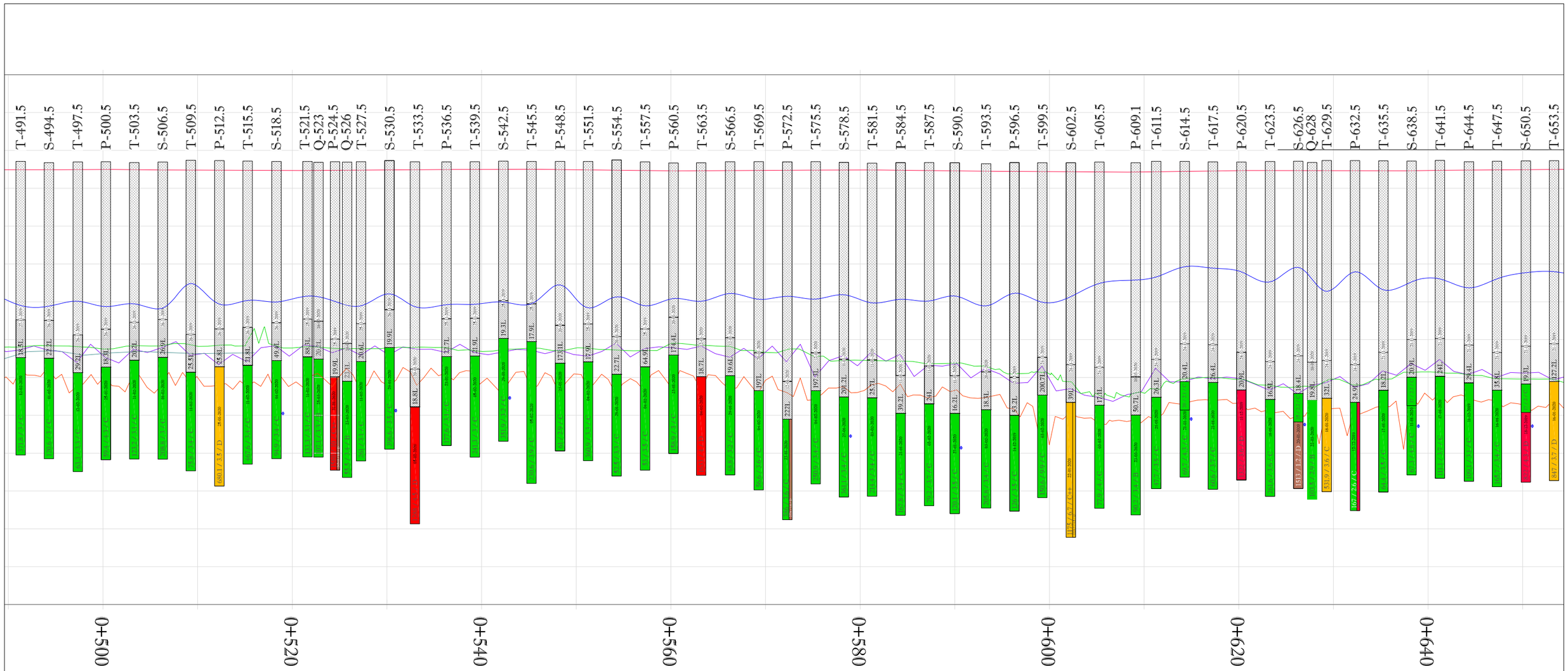
INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
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VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

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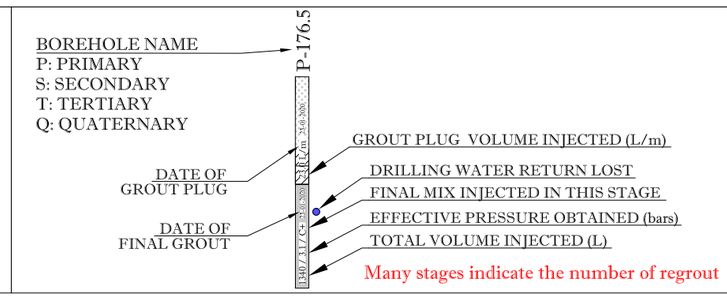

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PREPARED BY : FRANCIS PAULIN
DATE : 27-03-2020
CON-FD-302-3

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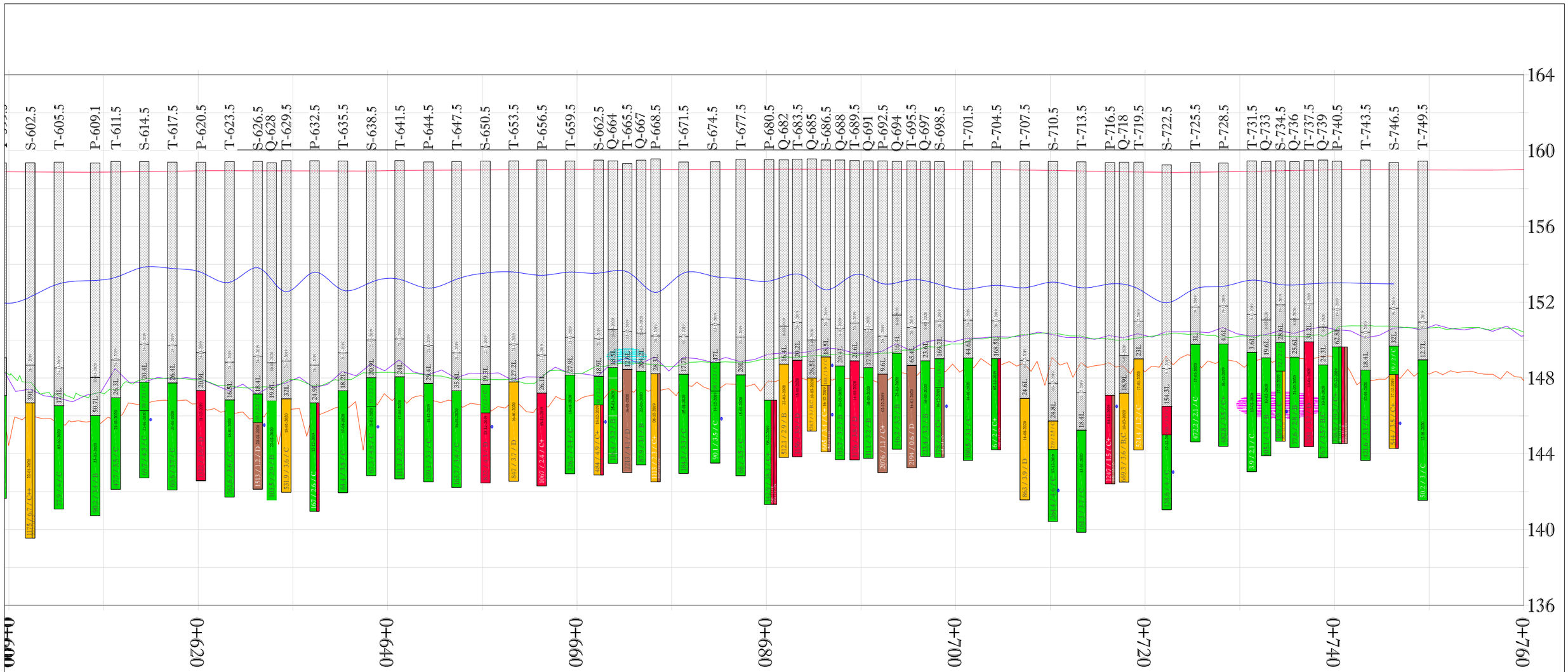
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION DOWNSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



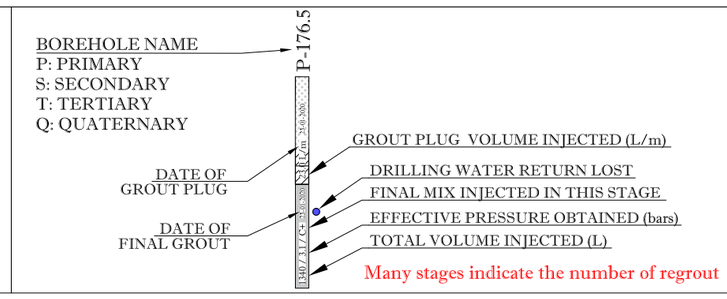
VERTICAL EXAGERATION : 2

Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



Many stages indicate the number of regrout

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 27-03-2020
CON-FD-302-4

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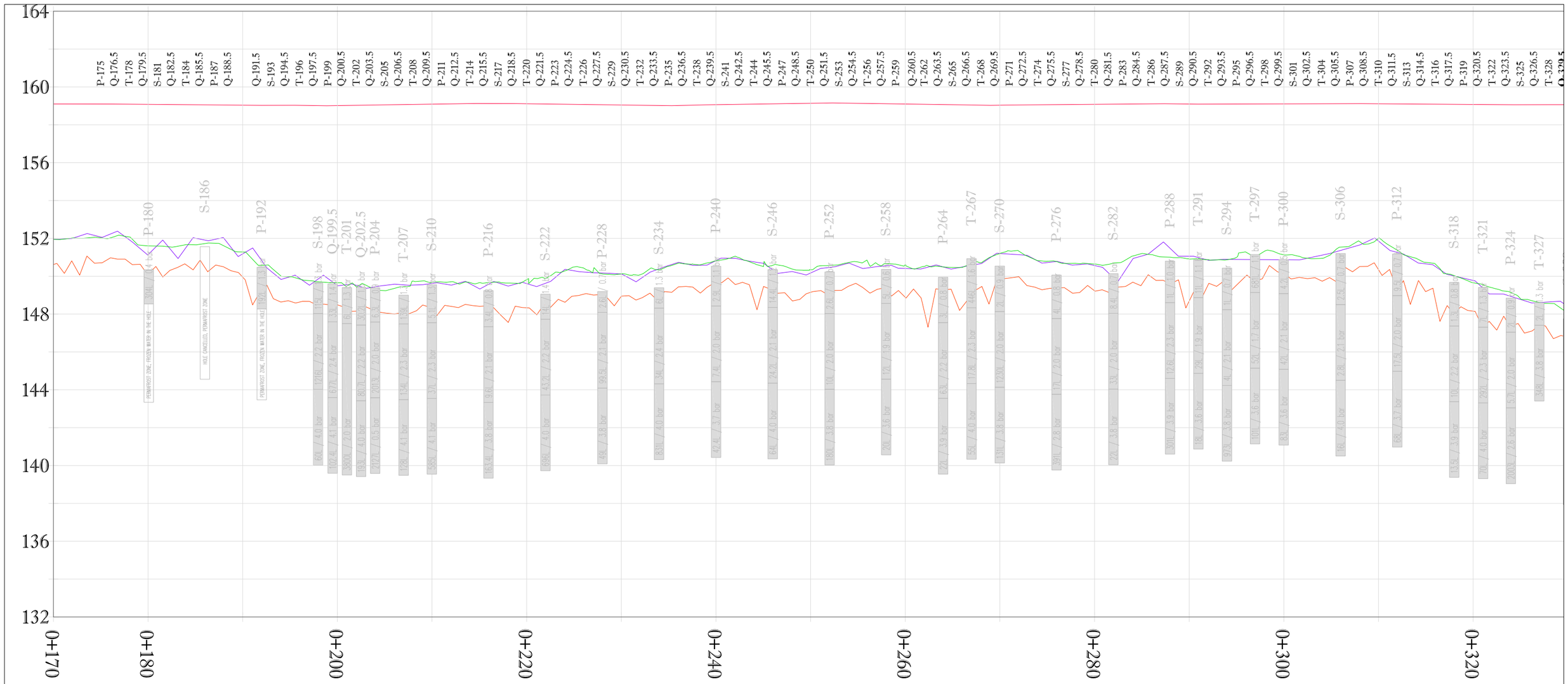
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

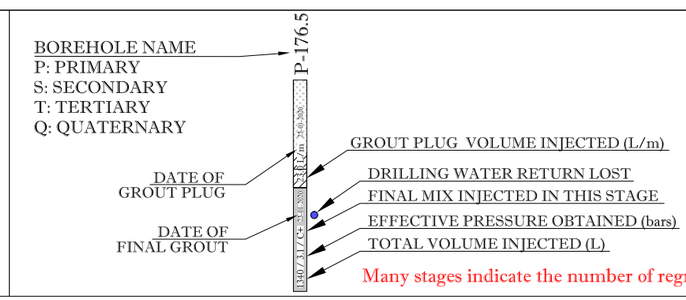


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



TOP DIKE AS-BUILT EL. 159.0
MEASURED WATER LEVEL
APPROVED BEDROCK SURVEY
BEDROCK ENCOUNTERED BY HENRY DRILLING
BOTTOM OF SECANT PILE ROCK SOCKET
GROUTING COMMUNICATION
CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 26-03-2020
CON-FD-303-1

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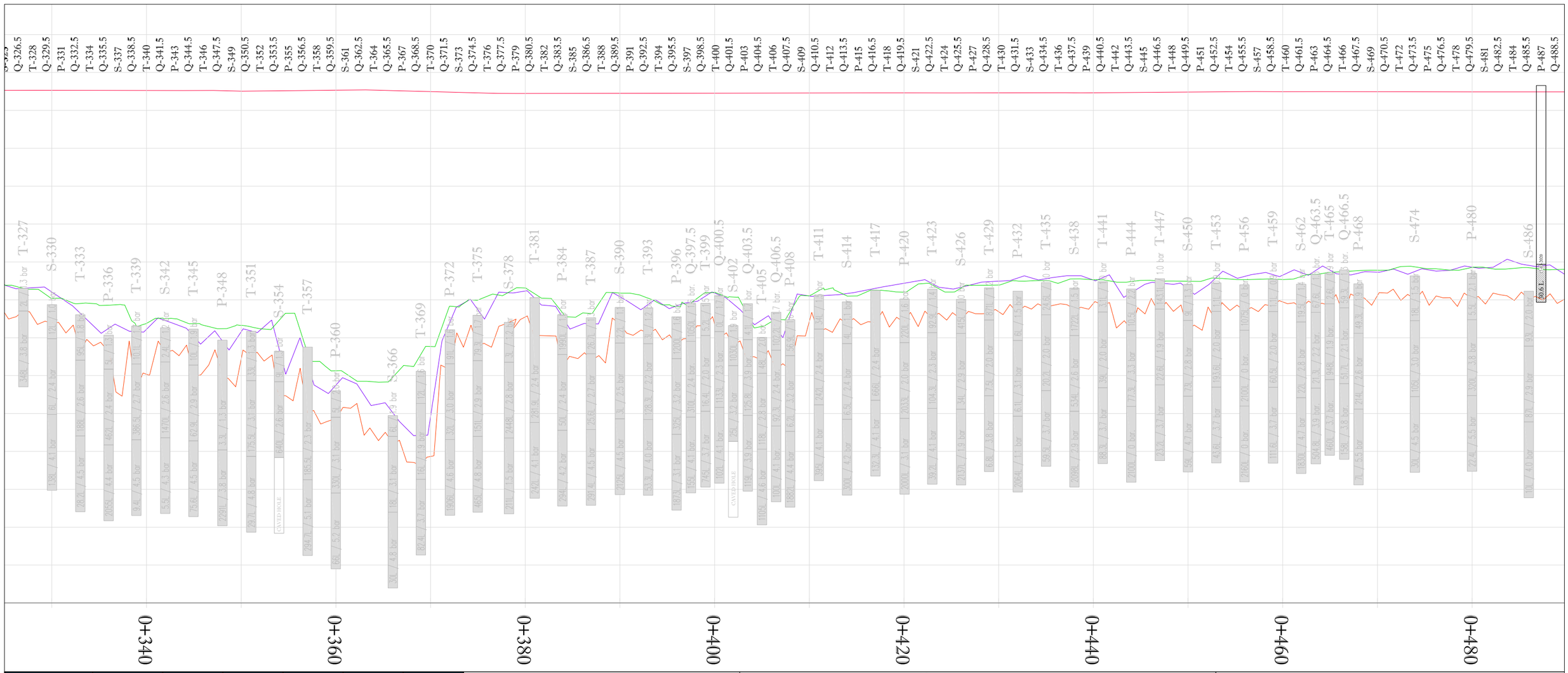
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811

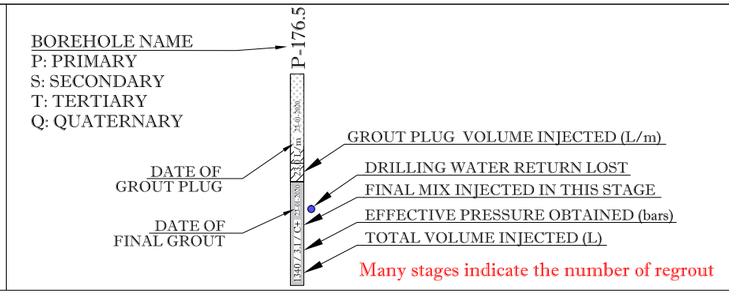


Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
Black numbers indicate > 80% of Pmax achieved



- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 26-03-2020
CON-FD-303-2

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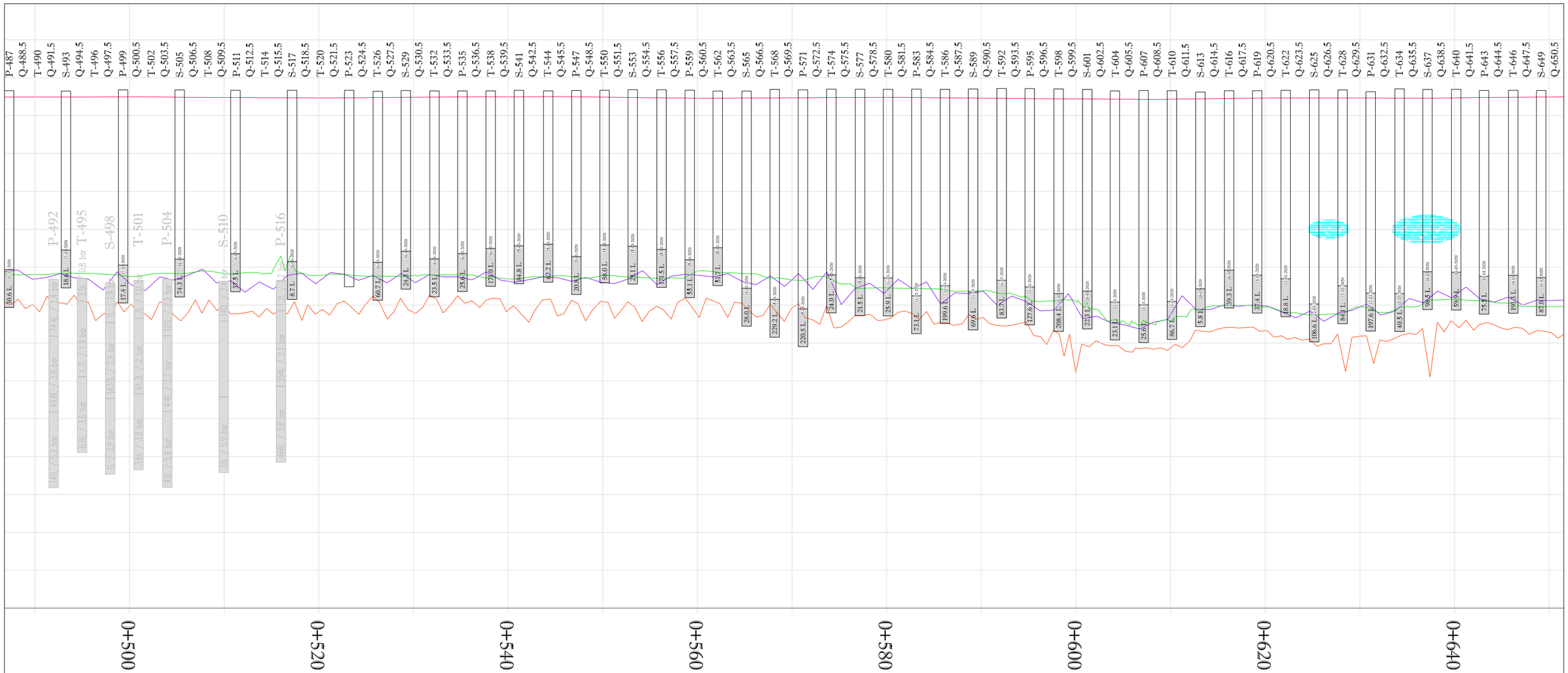
KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



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Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
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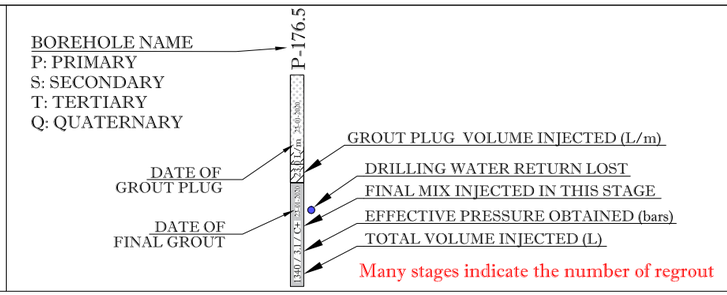
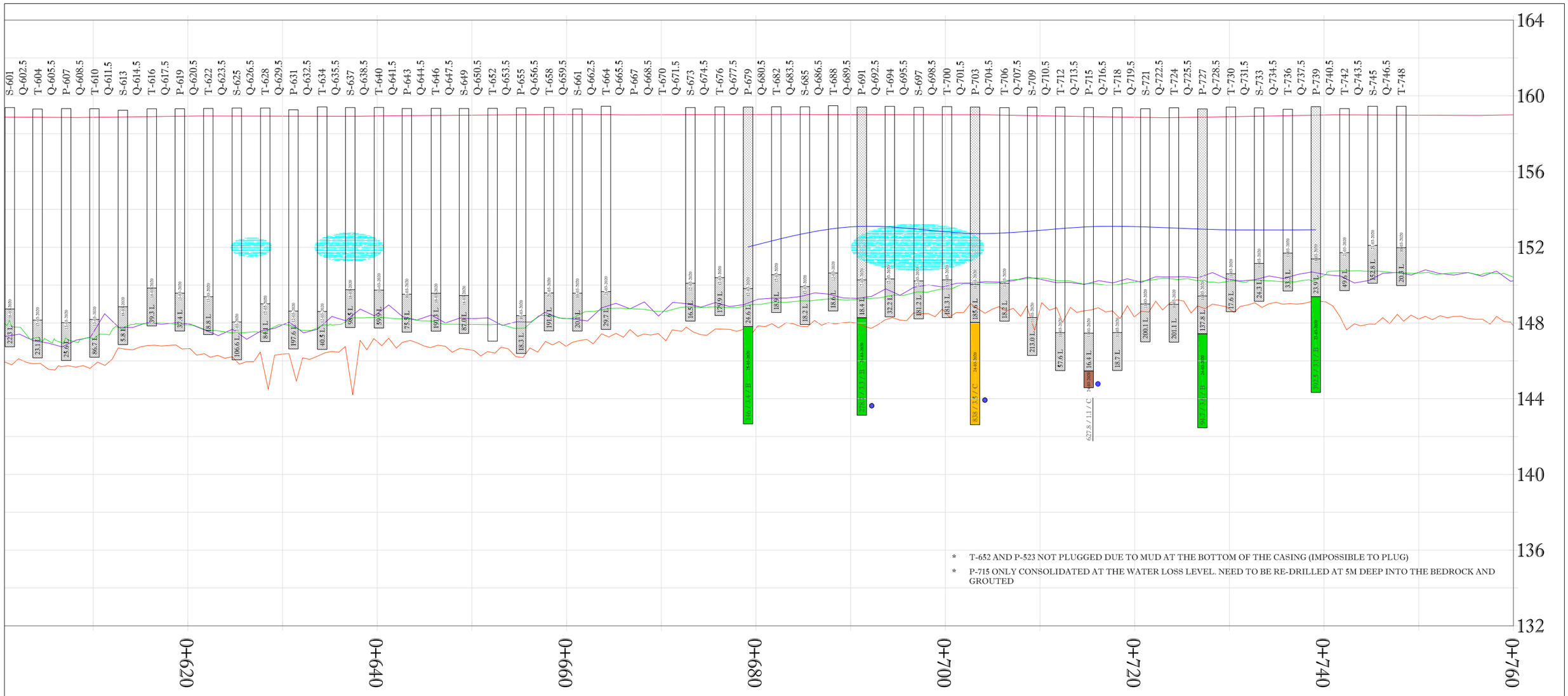


- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 26-03-2020
CON-FD-303-3

KIVALLIQ CONTRACTORS GROUP LTD

INJECTION UPSTREAM PHASE 2 - AS-BUILT
WHALE TAIL DIKE CONSTRUCTION - CONTRACT # 11-811



Ingredient	Unit	Mix B	Mix C	Mix C+	Mix C++	Mix D
Water	Litre	72	60	60	60	60
Cement Type III	kg	120	120	120	120	120
W:C ratio		0.6	0.5	0.5	0.5	0.5
Calcium Chloride	(% by weight)	2	2	2	2	1
	kg	2.4	2.4	2.4	2.4	1.2
Celbex	(% by weight)	-	-	0.2	0.3 to 2.0 [1]	-
	kg	-	-	0.24	0.36 to 2.4 [1]	-
Glenium 3030	ml	-	-	-	-	-
Rheomac 450	ml	-	-	-	-	500

[1] Celbex is added directly in the open throat pump. The quantity of Celbex is determined by the operator during the grouting procedure and modify depending the conditions observed on site.

		TAKE : L/m
VOL / P	LOW	< 100
VOL / P	M.HIGH	100 < > 200
VOL / P	HIGH	200 < > 400
VOL / P	V.HIGH	> 400

White numbers indicate > 80% of Pmax not achieved
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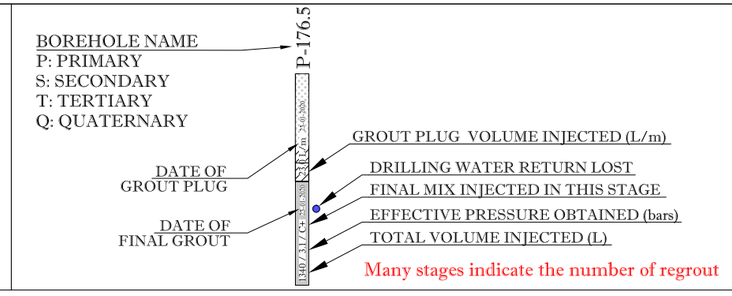

- TOP DIKE AS-BUILT EL. 159.0
- MEASURED WATER LEVEL
- APPROVED BEDROCK SURVEY
- BEDROCK ENCOUNTERED BY HENRY DRILLING
- BOTTOM OF SECANT PILE ROCK SOCKET
- GROUTING COMMUNICATION
- CASING COMMUNICATION

PREPARED BY : FRANCIS PAULIN
DATE : 26-03-2020
CON-FD-303-4

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Appendix C- 3: Weekly Meeting Minutes

SNC-LAVALIN INC.
195, The West Mall Street
Toronto, (Ontario)
Canada M9C 5K1
Tel: (416) 252-5315
Fax: (514) 231-5356

MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0001	**Ref. :**	669034-1100-30MC-0001-00
Prepared by :	Nina Quan	**Date :**	November 25th, 2019
Meeting date :	Thursday., Nov. 21st, 2019	**Time :**	10h00 to 10h45 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Frederick Bolduc (FB), Patrice Gagnon (PG), Pier-Eric MacDonald (PEM),Thomas Lepine (TL)	**SNC:** Nina Quan (NQ)	
Distribution :	All above + : Jesse Clark (JC)		

MINUTES

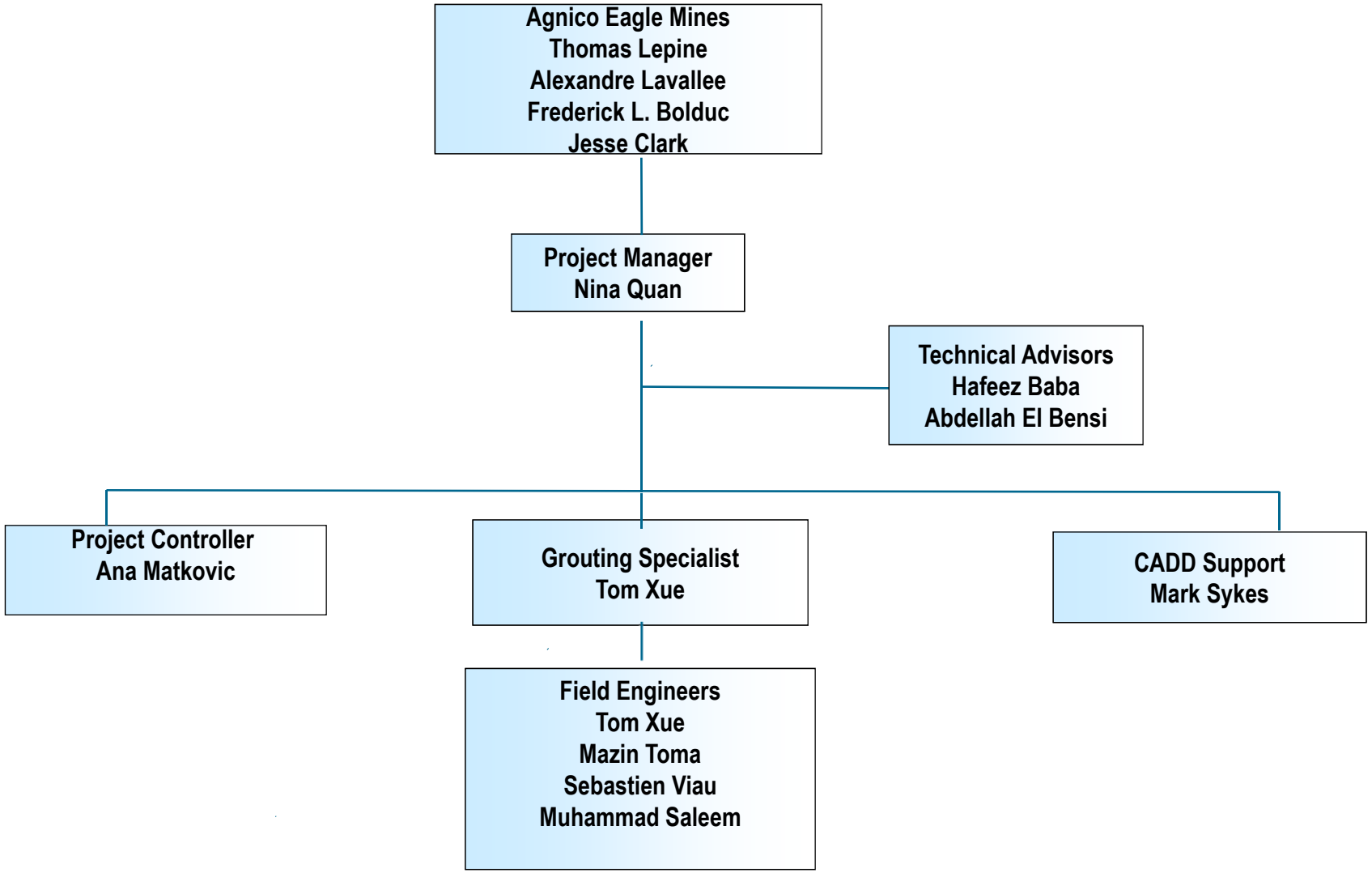
Point N°	Description	Action by	Date
1.0	**Grouting Committee Meeting**		
1.1	AEM decided to postpone the meeting to next week to give SNC more time to update the Technical Specification.	AEM	Nov 21
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date.	SNC	Nov 27
3.0	**Field Activities and QA Support for Grouting**		
3.1	AL: when we can start bedrock drilling and grout injection? PG: 42 BH more to install casing which will take about 4 days from now then drilling in the bedrock then injection (1week). If assuming 10 plugs per day,we are looking at about 17 days.	Info	
3.2	Bedrock drilling: 5m in bedrock as rule of thumb.	Info	
3.3	AEM: do we have drawings for bedrock drilling? SNC will submit drawings together with the Technical Specification.	Info	
3.4	Field Engineer rotation: Saleem is scheduled to come back to site for second rotation on December 4th and Jin-Dong is finishing his rotation on Dec 5th. Saleem will stay to December 20th which is the last day before the holidays.	Info	
3.5	AEM confirmed that January 10th is when everyone will be back on site.	Info	

Point N°	Description	Action by	Date
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February.	Info	
4.0	**Project Management**		
4.1	AEM has no comments on the field daily and weekly reports.	Info	
4.2	SNC will submit the first monthly report covering the period from beginning of the project to the end of November	SNC	Dec 5
5.0	**Miscellaneous**		
	SNC Organization Chart is attached		

Next meeting: Thursday, November 27th at 13:30-14:00

SNC·LAVALIN

REMEDIATION WORK FOR WHALE TAIL DIKE SEEPAGE



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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0002	**Ref. :**	669034-1100-30MC-0002-00
Prepared by :	Nina Quan	**Date :**	December 6, 2019
Meeting date :	Thursday., Nov. 28, 2019	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL),Thomas Lepine (TL)	**SNC:** Nina Quan (NQ), Tom Xue (TX)	
Distribution :	All above + : Jesse Clark (JC)), Frederick Bolduc (FB), Patrice Gagnon (PG), Pier-Eric MacDonald (PEM);Abdellah El.Bensi (AB), Muhammad Saleem (MS)		

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0001. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	A meeting with Grouting Committee is planned for either Dec 5th or Dec 6th. Details and confirmation will come soon. AEM suggested to give it some thoughts regarding the design of the blanket grouting – should we carry out a full extent of the blanket grouting? Is there away to optimize it to save time and cost	AEM	Nov 30
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date. Update: AEM will complete the review this weekend and send SNC their comments.	AEM	Nov 30
3.0	**Field Activities and QA Support for Grouting**		
3.4	Field Engineer rotation: Saleem is scheduled to come back to site for second rotation on December 4th and Jin-Dong is finishing his rotation on Dec 5th. Saleem will stay to December 20th which is the last day before the holidays.	Info	
3.5	AEM confirmed that January 10th is when everyone will be back on site.	Info	

Point N°	Description	Action by	Date
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February.	Info	
3.7	SNC brought up the concerns observed from some of the borehole drilled logs. A considerable amount of cement bentonite (CB) (0.25 to 2m) in four boreholes (T635.5, T722.5, P728.5 and T731.5) could not be cleaned as per TCG. Further investigation of the materials in the casing and cleaning of these boreholes are required. AEM (EoR) noticed the situation and provides some preliminary analysis of the possible reason for the CB blow back into casing. AEM agreed further investigations with sampling of the suspected CB materials and determining the property of the material.		
4.0	**Project Management**		
4.2	SNC will submit the first monthly report covering the period from beginning of the project to the end of November	SNC	Dec 9
5.0	**Miscellaneous**		

Next meeting: Friday, December 6th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0003	**Ref. :**	669034-1100-30MC-0003-00
Prepared by :	Nina Quan	**Date :**	December 11, 2019
Meeting date :	December 6, 2019	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Jesse Clark (JC), Pier-Eric MacDonald (PEM)	**SNC:**	Nina Quan (NQ), Tom Xue (TX), Abdellah El.Bensi (AEB), Muhammad Saleem (MS)
Distribution :	All above + :Frederick Bolduc (FB), Patrice Gagnon (PG), Thomas Lepine (TL)		

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0002. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	A meeting with Grouting Committee is planned for either Dec 5th or Dec 6th. Details and confirmation will come soon. AEM suggested to give it some thoughts regarding the design of the blanket grouting – should we carry out a full extent of the blanket grouting? Is there away to optimize it to save time and cost? Update: Grouting Committee Meeting was held on Thursday December 05. A memorandum will be prepared by the Committee to AEM sometimes next week.	Info	
1.2	AEM wanted to know if SNC agreed with the approach that the Committee proposed. SNC confirmed that we agreed with the Committee's recommendations to install open throat pump to use grout with higher percentage of Celbex. We also agreed with D/S blanket drill and grout in 1.5 m and 3.5 m stages using downstage method.	Info	
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date. Update: AEM will complete the review this weekend and send SNC their comments.		

Point N°	Description	Action by	Date
	Update: SNC received comments from AEM and the Committee on the Simplified Work Instructions as well as Technical Specifications. SNC will update the documents and Rev 00 will be issued in the coming days.	AEM	Dec 20
3.0	**Field Activities and QA Support for Grouting**		
3.4	Field Engineer rotation: Saleem is scheduled to come back to site for second rotation on December 4th and Jin-Dong is finishing his rotation on Dec 5th. Saleem will stay to December 20th which is the last day before the holidays break.	Info	
3.5	AEM confirmed that January 10th is the date when everyone will be back on site after the holidays break.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: AEM is going to have an internal meeting on this and will get back to SNC with more details.	Info	
3.7	SNC brought up the concerns observed from some of the borehole drilled logs. A considerable amount of cement bentonite (CB) (0.25 to 2m) in four boreholes (T635.5, T722.5, P728.5 and T731.5) could not be cleaned as per TCG. Further investigation of the materials in the casing and cleaning of these boreholes are required. AEM (EoR) noticed the situation and provides some preliminary analysis of the possible reason for the CB blow back into casing. AEM agreed further investigations with sampling of the suspected CB materials and determining the property of the material.	Info	
3.8	With regard to the open throat pump in operation, SNC will issue the fieldwork instruction for re-grouting and initial grouting of holes that had been drilled per 5 m stage.	SNC	Dec 6
4.0	**Project Management**		
4.2	SNC will submit the first monthly report covering the period from beginning of the project to the end of November.	SNC	Dec 13
5.0	**Miscellaneous**		

Next meeting: Thursday, December 12th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0004	**Ref. :**	669034-1100-30MC-0004-00
Prepared by :	Nina Quan	**Date :**	December 17, 2019
Meeting date :	December 12, 2019	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Frederick Bolduc (FB), Thomas Lepine (TL), Patrice Gargon (PG)	**SNC:** Nina Quan (NQ), Tom Xue (TX), Abdellah El.Bensi (AEB), Muhammad Saleem (MS)	
Distribution :	All above + : Jesse Clark (JC), Pier-Eric MacDonald (PEM)		

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0003. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	A meeting with Grouting Committee is planned for either Dec 5th or Dec 6th. Details and confirmation will come soon. AEM suggested to give it some thoughts regarding the design of the blanket grouting – should we carry out a full extent of the blanket grouting? Is there away to optimize it to save time and cost? Update: Grouting Committee Meeting was held on Thursday December 05. A memorandum will be prepared by the Committee to AEM sometimes next week. Update: No update on when the Memorandum from the Committee is available.	Info	
1.2	AEM wanted to know if SNC agreed with the approach that the Committee proposed. SNC confirmed that we agreed with the Committee's recommendations to install open throat pump to use grout with higher percentage of Celbex. We also agreed with D/S blanket drill and grout in 1.5 m and 3.5 m stages using downstage method. Update: AEM (TL) wondered if the two-stage bedrock grouting (1.5m and 3.5m) is applicable for all the boreholes or just Primary and Secondary holes. Can we go back to 5m bedrock grouting for tertiary holes? (post meeting reply) SNC: The Grouting Committee recommended to have two short stages for blanket grouting for all the holes. Based on the recent grouting data, very low grout take occurred in several holes	Info	

Point N°	Description	Action by	Date
	in the first 1.5 m stage. SNC think that it is acceptable to drill the blanket holes to 5m stage if bedrock conditions allow that is no water lost during drilling and no hole collapse.		
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date. Update: SNC received comments from AEM and the Committee on the Simplified Work Instructions as well as Technical Specifications. SNC will update the documents and Rev 00 will be issued in the coming days. Update: Technical Specifications and Drawings Rev 00 will be issued next week	AEM	Dec 20
3.0	**Field Activities and QA Support for Grouting**		
3.4	Field Engineer rotation: Saleem is scheduled to come back to site for second rotation on December 4th and Jin-Dong is finishing his rotation on Dec 5th. Saleem will stay to December 20th which is the last day before the holidays break.	Info	
3.5	AEM confirmed that January 10th is the date when everyone will be back on site after the holidays break.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: no update regarding when the QA field engineer night shift will begin. AEM will provide information when it becomes available.	AEM	
3.7	SNC brought up the concerns observed from some of the borehole drilled logs. A considerable amount of cement bentonite (CB) (0.25 to 2m) in four boreholes (T635.5, T722.5, P728.5 and T731.5) could not be cleaned as per TCG. Further investigation of the materials in the casing and cleaning of these boreholes are required. AEM (EoR) noticed the situation and provides some preliminary analysis of the possible reason for the CB blow back into casing. AEM agreed further investigations with sampling of the suspected CB materials and determining the property of the material.	Info	
3.8	With regard to the open throat pump in operation, SNC will issue the fieldwork instruction for re-grouting and initial grouting of holes that had been drilled per 5 m stage.	SNC	Completed
3.9	AEM would like to know the rationales to go with mix D when the grouting committee is not recommending it. (post meeting) SNC: The contractor proposed to use Mix D (with W/C =0.5, 2% of Calcium Chloride, and 500ml Rheomac UW 450 as per site trial) when no refusal with Mix C is obtained. SNC reviewed the		

Point N°	Description	Action by	Date
	product data sheet again and agreed to use Mix D as a trial. The data sheet show that the admixture has the major features of anti-washout, reduce segregation and bleeding, thixotropic action. Mix D had been injected in some holes and successfully close these holes during the trial period. It has been found that Mix D is more stable and controllable than Mix C with Celbex through Open Throat Pump.		
4.0	**Project Management**		
4.2	SNC will submit the first monthly report covering the period from beginning of the project to the end of November.	SNC	Dec 17
5.0	**Miscellaneous**		

Next meeting: Thursday, December 19th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0005	**Ref. :**	669034-1100-30MC-0005-00
Prepared by :	Nina Quan	**Date :**	January 06, 2020
Meeting date :	December 19 2019	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Frederick Bolduc (FB), Thomas Lepine (TL), Patrice Gargon (PG)	**SNC:** Nina Quan (NQ), Tom Xue (TX), Abdellah El. Bensi (AEB), Muhammad Saleem (MS)	
Distribution :	All above + : Jesse Clark (JC), Pier-Eric MacDonald (PEM)		

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0004. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	A meeting with Grouting Committee is planned for either Dec 5th or Dec 6th. Details and confirmation will come soon. AEM suggested to give it some thoughts regarding the design of the blanket grouting – should we carry out a full extent of the blanket grouting? Is there away to optimize it to save time and cost? Update: Grouting Committee Meeting was held on Thursday December 05. A memorandum will be prepared by the Committee to AEM sometimes next week. Update: No update on when the Memorandum from the Committee is available.	Info	
1.2	AEM wanted to know if SNC agreed with the approach that the Committee proposed. SNC confirmed that we agreed with the Committee's recommendations to install open throat pump to use grout with higher percentage of Celbex. We also agreed with D/S blanket drill and grout in 1.5 m and 3.5 m stages using downstage method. Update: AEM (TL) wondered if the two-stage bedrock grouting (1.5m and 3.5m) is applicable for all the boreholes or just Primary and Secondary holes. Can we go back to 5m bedrock grouting for tertiary holes? (post meeting reply) SNC: The Grouting Committee recommended to have two short stages for blanket grouting for all the holes. Based on the recent grouting data, very low grout take occurred in several holes	Info	

Point N°	Description	Action by	Date
	in the first 1.5 m stage. SNC think that it is acceptable to drill the blanket holes to 5m stage if bedrock conditions allow that is no water lost during drilling and no hole collapse.		
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date. Update: SNC received comments from AEM and the Committee on the Simplified Work Instructions as well as Technical Specifications. SNC will update the documents and Rev 00 will be issued in the coming days. Update: Technical Specifications and Drawings Rev 00 have been updated and currently pending for internal review.	SNC	Jan 6
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that January 10th is the date when everyone will be back on site after the holidays break. Saleem will return to site on January 10. SNC will confirm who will be taking the cross-shift with Saleem in January.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: no update regarding when the QA field engineer night shift will begin. AEM will provide information when it becomes available. The tentative date is last week of January or beginning of February	AEM	
3.7	SNC brought up the concerns observed from some of the borehole drilled logs. A considerable amount of cement bentonite (CB) (0.25 to 2m) in four boreholes (T635.5, T722.5, P728.5 and T731.5) could not be cleaned as per TCG. Further investigation of the materials in the casing and cleaning of these boreholes are required. AEM (EoR) noticed the situation and provides some preliminary analysis of the possible reason for the CB blow back into casing. AEM agreed further investigations with sampling of the suspected CB materials and determining the property of the material.	Info	
3.9	AEM would like to know the rationales to go with mix D when the grouting committee is not recommending it. (post meeting) SNC: The contractor proposed to use Mix D (with W/C =0.5, 2% of Calcium Chloride, and 500ml Rheomac UW 450 as per site trial) when no refusal with Mix C is obtained. SNC reviewed the product data sheet again and agreed to use Mix D as a trial. The data sheet show that the admixture has the major features of anti-washout, reduce segregation and bleeding, thixotropic action. Mix D had been injected in some holes and successfully close these holes during the		

Point N°	Description	Action by	Date
	trial period. It has been found that Mix D is more stable and controllable than Mix C with Celbex through Open Throat Pump.		
3.10	Discussion on KCG/TCG's observations (based on AEM emails on topic last 2 weeks observation dated 2:22pm Dec 19) : a) **Mix C + Celbex**: Grouting with Open throat pump is only used after the maximum volume of the stage is exceeded. The Pmax of 10 bar is used as a threshold to stop the grouting using open throat pump. When the packer is removed after Pmax is reached, it was noticed that the grout came up into the casing above the location of the packer because of the back pressure. This means that the pressure is transferred to the hole and rock. It is agreed to reduce the calcium chloride dosage to 1% or less when using Celbex to understand the interaction and compatibility between Celbex and Calcium Chloride. b) **1.5m and 3.5m Drilling and Grouting Stages**: The use of blanket drilling and grouting method in two stages is limited to 2 following cases: 1. Where the water loss is noticed in the first 1.5 m 2. If the hole may be collapsed due to field conditions. Otherwise, drilling and grouting of the blanket hole will be done in one stage of 5.0 m. *Site Instructions for Drilling and Blanket Grouting Memorandum* will be updated to incorporate these two modifications a and b..	Info TCG/SNC Info SNC	
4.0	**Project Management**		
4.2	SNC will submit the first monthly report covering the period from beginning of the project to the end of November.	SNC	Completed
5.0	**Miscellaneous**		

Next meeting: Thursday, January9th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0006	**Ref. :**	669034-1100-30MC-0006-00
Prepared by :	Nina Quan	**Date :**	January 16, 2020
Meeting date :	January 9, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Patrice Gargon (PG)	**SNC:** Nina Quan (NQ), Tom Xue (TX)	
Distribution :	All above + : Jesse Clark (JC), Pier-Eric MacDonald (PEM)), Frederick Bolduc (FB), Thomas Lepine (TL),	Abdellah El. Bensi (AEB), Muhammad Saleem (MS)	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0005. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Meeting No. 6 to be held on Monday January 13, 2020. SNC has started with the presentation preparation and will submit to AEM for review on Friday. Topics will be included in the presentation: a) Summarize the work in 2019 b) Key Issues and Mitigations (the use of Celbex, blanket holes in two stages, and grout mix) c) Topic for discussions (The use of Celbex in open throat pump, use of Mix D, drilling and grouting of blanket holes in two stages, grouting sequence of D/s and U/S blanket.)	SNC	Jan 10
1.3	AEM added that if drilling and grouting can be done at the targeted areas instead of carrying out the entire blanket? This will be discussed at the meeting.	Info	
2.0	**Technical Specifications and Constructions Drawings**		
2.1	SNC submitted the Site Instructions for Drilling and Blanket Grouting Memorandum on November 19th for AEM review and inputs. SNC will update the technical specification to Rev PE incorporating comments from AEM and Grouting Committee's recommendations. Revised Drawings will be submitted on the same date. Update: SNC received comments from AEM and the Committee on the Simplified Work Instructions as well as Technical Specifications. SNC will update the documents and Rev 00 will be issued in the coming days. Update: Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document	SNC	Jan 7

Point N°	Description	Action by	Date
	was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.		
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien Viau will be mobilizing to site on Monday January 20, 2020. Sebastien is the cross shift for Saleem who is scheduled for his turnaround on January 24 2020.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February.	AEM	
3.7	SNC brought up the concerns observed from some of the borehole drilled logs. A considerable amount of cement bentonite (CB) (0.25 to 2m) in four boreholes (T635.5, T722.5, P728.5 and T731.5) could not be cleaned as per TCG. Further investigation of the materials in the casing and cleaning of these boreholes are required. AEM (EoR) noticed the situation and provides some preliminary analysis of the possible reason for the CB blow back into casing. AEM agreed further investigations with sampling of the suspected CB materials and determining the property of the material.	Info	
3.9	AEM would like to know the rationales to go with mix D when the grouting committee is not recommending it. (post meeting) SNC: The contractor proposed to use Mix D (with W/C =0.5, 2% of Calcium Chloride, and 500ml Rheomac UW 450 as per site trial) when no refusal with Mix C is obtained. SNC reviewed the product data sheet again and agreed to use Mix D as a trial. The data sheet show that the admixture has the major features of anti-washout, reduce segregation and bleeding, thixotropic action. Mix D had been injected in some holes and successfully close these holes during the trial period. It has been found that Mix D is more stable and controllable than Mix C with Celbex through Open Throat Pump.		
3.10	Discussion on KCG/TCG's observations (based on AEM emails on topic last 2 weeks observation dated 2:22pm Dec 19) : a) **Mix C + Celbex**: Grouting with Open throat pump is only used after the maximum volume of the stage is exceeded. The Pmax of 10 bar is used as a threshold to stop the grouting using open throat pump. When the packer is removed after Pmax is reached, it was noticed that the grout came up into the casing above the location of the packer because of the back pressure. This means that the pressure is transferred to the hole and rock. It is agreed to reduce the calcium chloride dosage to 1% or less when using Celbex to understand the interaction and compatibility between Celbex and Calcium Chloride.	Info TCG/SNC Info	

Point N°	Description	Action by	Date
	b) **1.5m and 3.5m Drilling and Grouting Stages**: The use of blanket drilling and grouting method in two stages is limited to 2 following cases: 1. Where the water loss is noticed in the first 1.5 m 2. If the hole may be collapsed due to field conditions. Otherwise, drilling and grouting of the blanket hole will be done in one stage of 5.0 m. *Site Instructions for Drilling and Blanket Grouting Memorandum Rev 01* will be updated to incorporate these two modifications a and b..	SNC	
4.0	**Project Management**		
4.2	SNC submitted the first monthly report covering the period from beginning of the project to December 15, 2019.	SNC	Completed
5.0	**Miscellaneous**		

Next meeting: Thursday, January16th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0007	**Ref. :**	669034-1100-30MC-0007-00
Prepared by :	Nina Quan	**Date :**	January 16, 2020
Meeting date :	January 16, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL),	**SNC:**	Nina Quan (NQ), Tom Xue (TX), Abdellah El. Bensi (AEB), Muhammad Saleem (MS)
Distribution :	All above + : Jesse Clark (JC), Pier-Eric MacDonald (PEM)), Frederick Bolduc (FB), and Patrice Gargon (PG)		

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0006. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020.	GC	Jan 17
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien Viau will be mobilizing to site on Monday January 20, 2020. Sebastien is the cross shift for Saleem who is scheduled for his turnaround on January 24, 2020.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February.	AEM	
3.11	Tertiary Holes		
	In the Specs Section 5.2 - **Drilling for Blanket Holes in Bedrock**		

Point N°	Description	Action by	Date
	To minimize the chance of grout communication between adjacent drilled holes. The following requirements are included in the Specs: 6 - Minimum distance between two drilled holes in bedrock is 12 m. This distance may be increased by the Engineer if communication between adjacent holes occurs. 7 - Drilling of the rock section within 6 m of a grouted hole shall not be completed until the grout in the closest grouted hole reached its initial set time. KCG proposed to continue drilling and grouting **Tertiary Holes** in sequence from construction logistic and schedule perspective, which will result drilled hole spacing of only 6m. SNC has reviewed this proposed approach and have the following comments: • Drilling and grouting of Tertiary Holes in continuous sequencing may increase the chance of hole communications; • If a Primary or Secondary Holes been completed/grouted, the chance of grout communication of two adjacent Tertiary Holes will be less due to the existence of a grouted Primary or Secondary hole in between. • If communication occurs, packers shall be set in both holes to prevent grout loss from casing collar of the communicated hole and allow the two holes be grouted at the same time at required pressure. Grouting simultaneously two holes will be a challenge and may not achieve the required quality. • If AEM and Contractor choose to drill and grout the tertiary holes in a continuous sequence, SNC will accept it since both parties are aware about the issues/impacts associated with this execution procedure.	SNC	
4.0	**Project Management**		
4.2	January Monthly Report will be issued at the end of the month to cover the period from Dec 15 to end of January.	Info	
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, and 3. Fieldwork instruction.	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, January16th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0008	**Ref. :**	669034-1100-30MC-0008-00
Prepared by :	Nina Quan	**Date :**	January 27, 2020
Meeting date :	January 23, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL), Pier-Eric MacDonald (PEM)	**SNC:** Nina Quan (NQ), Muhammad Saleem (MS), Sebastien Viau (SV)	
Distribution :	All above + : Jesse Clark (JC),), Frederick Bolduc (FB), and Patrice Gargon (PG)	Tom Xue (TX), Abdellah El. Bensi (AEB),	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-0007. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020. Update: AEM received an email from the Grouting Committee instead of a Memorandum.	Info	
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien Viau arrived on site and had three days overlap with Saleem who will be on turnaround on Jan 24th.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February. Post meeting note: Possible start of night shift is Feb 21st, 2020.	AEM	Info
3.11	Tertiary Holes		

Point N°	Description	Action by	Date
	In the Specs Section 5.2 - **Drilling for Blanket Holes in Bedrock** To minimize the chance of grout communication between adjacent drilled holes. The following requirements are included in the Specs: 6 - Minimum distance between two drilled holes in bedrock is 12 m. This distance may be increased by the Engineer if communication between adjacent holes occurs. 7 - Drilling of the rock section within 6 m of a grouted hole shall not be completed until the grout in the closest grouted hole reached its initial set time. KCG proposed to continue drilling and grouting **Tertiary Holes** in sequence from construction logistic and schedule perspective, which will result drilled hole spacing of only 6m. SNC has reviewed this proposed approach and have the following comments: • Drilling and grouting of Tertiary Holes in continuous sequencing may increase the chance of hole communications; • If a Primary or Secondary Holes been completed/grouted, the chance of grout communication of two adjacent Tertiary Holes will be less due to the existence of a grouted Primary or Secondary hole in between. • If communication occurs, packers shall be set in both holes to prevent grout loss from casing collar of the communicated hole and allow the two holes be grouted at the same time at required pressure. Grouting simultaneously two holes will be a challenge and may not achieve the required quality. • If AEM and Contractor choose to drill and grout the tertiary holes in a continuous sequence, SNC will accept it since both parties are aware about the issues/impacts associated with this execution procedure.	Info	
4.0	**Project Management**		
4.2	January Monthly Report will be issued at the end of the month to cover the period from Dec 15 to end of January.	Info	
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, 3. Fieldwork instruction; 4. Deviation Table	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, January 30th at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0009	**Ref. :**	669034-1100-30MC-0009-00
Prepared by :	Nina Quan	**Date :**	February 5, 2020
Meeting date :	January 30, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Pier-Eric MacDonald (PEM)	**SNC:**	Nina Quan (NQ), Sebastien Viau (SV), Tom Xue (TX), Abdellah El. Bensi (AEB)
Distribution :	All above + : Alexandre Lavallée (AL), Thomas Lepine (TL), Jesse Clark (JC),), Frederick Bolduc (FB), and Patrice Gargon (PG)		Muhammad Saleem (MS),

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-000. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020. Update: still no Memorandum from the Grouting Committee.	Info	
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien Viau arrived on site and had three days overlap with Saleem who will be on turnaround on Jan 24th.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February. Post meeting note: Possible start of night shift is Feb 21st, 2020.	AEM	Info
3.11	Tertiary Holes		

Point N°	Description	Action by	Date
	In the Specs Section 5.2 - **Drilling for Blanket Holes in Bedrock** To minimize the chance of grout communication between adjacent drilled holes. The following requirements are included in the Specs: 6 - Minimum distance between two drilled holes in bedrock is 12 m. This distance may be increased by the Engineer if communication between adjacent holes occurs. 7 - Drilling of the rock section within 6 m of a grouted hole shall not be completed until the grout in the closest grouted hole reached its initial set time. KCG proposed to continue drilling and grouting **Tertiary Holes** in sequence from construction logistic and schedule perspective, which will result drilled hole spacing of only 6m. SNC has reviewed this proposed approach and have the following comments: • Drilling and grouting of Tertiary Holes in continuous sequencing may increase the chance of hole communications; • If a Primary or Secondary Holes been completed/grouted, the chance of grout communication of two adjacent Tertiary Holes will be less due to the existence of a grouted Primary or Secondary hole in between. • If communication occurs, packers shall be set in both holes to prevent grout loss from casing collar of the communicated hole and allow the two holes be grouted at the same time at required pressure. Grouting simultaneously two holes will be a challenge and may not achieve the required quality. • If AEM and Contractor choose to drill and grout the tertiary holes in a continuous sequence, SNC will accept it since both parties are aware about the issues/impacts associated with this execution procedure.	Info	
3.12	The rock section grouted this week showed a low grout take. Based on the thermistors rock temperature data, this area is interpreted as a potential seepage area and it was expected to show high grout take. May be the temperature anomalies is below the stage of 5 m length. All these grouting and temperature data will be gathered, analysed and used for the upstream blanket and upstream grout curtain, if any. SNC requested for a copy of the thermistor data and assessment. AEM offered to set up a link so that SNC can view data directly.	AEM	Feb 13
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
4.0	**Project Management**		
4.2	January Monthly Report will be issued at the end of the month to cover the period from Dec 15 to end of January.	Info	

Point N°	Description	Action by	Date
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, 3. Fieldwork instruction; 4. Deviation Table	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, February 13 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0010	**Ref. :**	669034-1100-30MC-0010-00
Prepared by :	Nina Quan	**Date :**	February 7, 2020
Meeting date :	February 6, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Frederick Bolduc (FB)	**SNC:**	Nina Quan (NQ), Sebastien Viau (SV), Tom Xue (TX), Abdellah El. Bensi (AEB)
Distribution :	All above + : Thomas Lepine (TL), Jesse Clark (JC),), Frederick Bolduc (FB), and Patrice Gargon (PG), Pier-Eric MacDonald (PEM)		Muhammad Saleem (MS),

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-009. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020. Update: still waiting for Memo from the Grouting Committee. Communications between AEM and Committee with further clarification and additional data. There will be another meeting in couple weeks to discuss about the downstream blanket remaining work and the upstream curtain grouting. SNC will review the existing grouting and thermistor data and provide inputs for the upcoming works.	SNC	Feb 27
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien will be on turnaround Friday (February 7) and Saleem will take over the cross shift.	Info	
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February.	AEM	Info

Point N°	Description	Action by	Date
	Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February. Post meeting note: Possible start of night shift is Feb 21st, 2020.		
3.11	Tertiary Holes		
	In the Specs Section 5.2 - **Drilling for Blanket Holes in Bedrock** To minimize the chance of grout communication between adjacent drilled holes. The following requirements are included in the Specs: 6 - Minimum distance between two drilled holes in bedrock is 12 m. This distance may be increased by the Engineer if communication between adjacent holes occurs. 7 - Drilling of the rock section within 6 m of a grouted hole shall not be completed until the grout in the closest grouted hole reached its initial set time. KCG proposed to continue drilling and grouting **Tertiary Holes** in sequence from construction logistic and schedule perspective, which will result drilled hole spacing of only 6m. SNC has reviewed this proposed approach and have the following comments: • Drilling and grouting of Tertiary Holes in continuous sequencing may increase the chance of hole communications; • If a Primary or Secondary Holes been completed/grouted, the chance of grout communication of two adjacent Tertiary Holes will be less due to the existence of a grouted Primary or Secondary hole in between. • If communication occurs, packers shall be set in both holes to prevent grout loss from casing collar of the communicated hole and allow the two holes be grouted at the same time at required pressure. Grouting simultaneously two holes will be a challenge and may not achieve the required quality. • If AEM and Contractor choose to drill and grout the tertiary holes in a continuous sequence, SNC will accept it since both parties are aware about the issues/impacts associated with this execution procedure.	Info	
3.12	The rock section grouted this week showed a low grout take. Based on the thermistors rock temperature data, this area is interpreted as a potential seepage area and it was expected to show high grout take. May be the temperature anomalies is below the stage of 5 m length. All these grouting and temperature data will be gathered, analysed and used for the upstream blanket and upstream grout curtain, if any. SNC requested for a copy of the thermistor data and assessment. AEM offered to set up a link so that SNC can view data directly. Update Feb 6: AEM will forward the thermistor data once the assessment is internally reviewed. SNC will recheck if we have access to AEM link to view thermistor data.	AEM	Feb 13

Point N°	Description	Action by	Date
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC.	AEM	February 12
4.0	**Project Management**		
4.2	January Monthly Report was issued covering the period from December 15 to end of January.	Info	
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, 3. Fieldwork instruction; 4. Deviation Table	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, February 13 at 13:30-14:00

SNC-LAVALIN INC.
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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0011	**Ref. :**	669034-1100-30MC-0011-00
Prepared by :	Nina Quan	**Date :**	February 16, 2020
Meeting date :	February 13, 2020	**Time :**	13h30 to 14h00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL), and Patrice Gargon (PG),	**SNC:** Nina Quan (NQ), Tom Xue (TX) and Muhammad Saleem (MS),	
Distribution :	All above + : Jesse Clark (JC),), Frederick Bolduc (FB), Pier-Eric MacDonald (PEM)	Sebastien Viau(SV), Abdellah El. Bensi (AEB)	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-010. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020. Update: still waiting for Memo from the Grouting Committee. Communications between AEM and Committee with further clarification and additional data. There will be another meeting in couple weeks to discuss about the downstream blanket remaining work and the upstream curtain grouting. SNC will review the existing grouting and thermistor data and provide inputs for the upcoming works. Update Feb 13: AEM forwarded SNC the email from GC. SNC replied with responses. In response to GC comments regarding having a QA manager for the grouting work, it is not in AEM's plan for the moment. Continue to carry out the work as currently is.	SNC	Feb 27
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	Sebastien will be on turnaround Friday (February 7) and Saleem will take over the cross shift.	Info	

Point N°	Description	Action by	Date
3.6	Currently, AEM does not have the information as to when there will be second field engineer required to be on site for the night shift grouting. It could be end of January or February. Update: a decision will be made on January 24 if night shift will be added. If night shift is added, mobilization of night shift will start around mid February. Post meeting note: Possible start of night shift is Feb 21st, 2020.	AEM	Info
3.11	Tertiary Holes		
	In the Specs Section 5.2 - **Drilling for Blanket Holes in Bedrock** To minimize the chance of grout communication between adjacent drilled holes. The following requirements are included in the Specs: 6 - Minimum distance between two drilled holes in bedrock is 12 m. This distance may be increased by the Engineer if communication between adjacent holes occurs. 7 - Drilling of the rock section within 6 m of a grouted hole shall not be completed until the grout in the closest grouted hole reached its initial set time. KCG proposed to continue drilling and grouting **Tertiary Holes** in sequence from construction logistic and schedule perspective, which will result drilled hole spacing of only 6m. SNC has reviewed this proposed approach and have the following comments: • Drilling and grouting of Tertiary Holes in continuous sequencing may increase the chance of hole communications; • If a Primary or Secondary Holes been completed/grouted, the chance of grout communication of two adjacent Tertiary Holes will be less due to the existence of a grouted Primary or Secondary hole in between. • If communication occurs, packers shall be set in both holes to prevent grout loss from casing collar of the communicated hole and allow the two holes be grouted at the same time at required pressure. Grouting simultaneously two holes will be a challenge and may not achieve the required quality. • If AEM and Contractor choose to drill and grout the tertiary holes in a continuous sequence, SNC will accept it since both parties are aware about the issues/impacts associated with this execution procedure.	Info	
3.12	The rock section grouted this week showed a low grout take. Based on the thermistors rock temperature data, this area is interpreted as a potential seepage area and it was expected to show high grout take. May be the temperature anomalies is below the stage of 5 m length. All these grouting and temperature data will be gathered, analysed and used for the upstream blanket and upstream grout curtain, if any. SNC requested for a copy of the thermistor data and assessment. AEM offered to set up a link so that SNC can view data directly.	AEM	On-going

Point N°	Description	Action by	Date
	Update Feb 6: AEM will forward the thermistor data once the assessment is internally reviewed. SNC will recheck if we have access to AEM link to view thermistor data. Update Feb 13: SNC still waiting for the thermistor data assessment		
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 13: SNC provided comments on KCG as-built profile progress (submitted on Feb 8) . These comments have yet been incorporated in the revised weekly report.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
4.0	**Project Management**		
4.2	January Monthly Report was issued covering the period from December 15 to end of January.	Info	
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, 3. Fieldwork instruction; 4. Deviation Table	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, February 20 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	00112	**Ref. :**	669034-1100-30MC-0012-00
Prepared by :	Nina Quan	**Date :**	February 25, 2020
Meeting date :	February 20, 2020	**Time :**	13h30 to 14h:30 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Pier-Eric MacDonald (PEM), Marion Habersetzer (MH)	**SNC:** Nina Quan (NQ), Tom Xue (TX), Abdellah El. Bensi (AEB) and Muhammad Saleem (MS),	
Distribution :	All above + : Jesse Clark (JC),), Frederick Bolduc (FB), Thomas Lepine (TL), and Patrice Gargon (PG),	Sebastien Viau(SV),	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-011. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Grouting Committee will issue a memorandum to address the topics mentioned during the meeting held on January 13, 2020. Update: still waiting for Memo from the Grouting Committee. Communications between AEM and Committee with further clarification and additional data. There will be another meeting in couple weeks to discuss about the downstream blanket remaining work and the upstream curtain grouting. SNC will review the existing grouting and thermistor data and provide inputs for the upcoming works. Update Feb 20: Comments received from GC on the weekly report week ending Feb 6.	SNC	Feb 27
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used	AEM	On-going

Point N°	Description	Action by	Date
	to define the potential seepage areas based on the reservoir water temperature.		
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 20: AEM will follow up with KCG regarding comments from GC and SNC on the as-built profile showing the drilling and grouting progress.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
3.17	Casing Drilling Deviation: The casing inclination control is not only to prevent hitting the existing cut-off wall but also to control the deviations in the bedrock drilling. For deep curtain holes this may change the design hole spacing if the deviation is too high. Up to now, the deviation is greater than 0.5% and AEM confirmed that the contractor could not do anything better than the range they have been sticking with (< 2%). Based on the site conditions, SNC agrees to revise the casing inclination to 2%.		
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.		
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the		

Point N°	Description	Action by	Date
	seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm.		
4.0	**Project Management**		
4.2	January Monthly Report was issued covering the period from December 15 to end of January.	Info	
4.3	On the weekly field work report, a summary changes tracking for the following will be included: 1. Technical Specifications, 2. Site Instruction Memorandum, 3. Fieldwork instruction; 4. Deviation Table	Info	
5.0	**Miscellaneous**		

Next meeting: Thursday, February 27 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	00112	**Ref. :**	669034-1100-30MC-0012-00
Prepared by :	Nina Quan	**Date :**	February 25, 2020
Meeting date :	February 20, 2020	**Time :**	13h30 to 14h:30 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Pier-Eric MacDonald (PEM), Jesse Clark (JC),),	**SNC:** Nina Quan (NQ), Hafeez Baba (HB), Tom Xue (TX), and Sebastien Viau (SV),	
Distribution :	All above + : Frederick Bolduc (FB), Thomas Lepine (TL), and Patrice Gargon (PG), Marion Habersetzer (MH)	Muhammad Saleem (MS) and Abdellah El. Bensi (AEB)	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-011. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	AEM is calling for another meeting (No.7) with the Grouting Committee first week of March. SNC will prepare the presentation with the following outline summarizing the grouting work progress: • Casing installation • Casing plug grouting • Rock drilling • Rock grouting • Downstream blanket data compilation • Upstream grouting proposed strategy	SNC	Mar 4
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that nightshift won't be added.	Info	
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used	AEM	On-going

Point N°	Description	Action by	Date
	to define the potential seepage areas based on the reservoir water temperature.		
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 20: AEM will follow up with KCG regarding comments from GC and SNC on the as-built profile showing the drilling and grouting progress.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
3.17	Casing Drilling Deviation: The casing inclination control is not only to prevent hitting the existing cut-off wall but also to control the deviations in the bedrock drilling. For deep curtain holes this may change the design hole spacing if the deviation is too high. Up to now, the deviation is greater than 0.5% and AEM confirmed that the contractor could not do anything better than the range they have been sticking with (< 2%). Based on the site conditions, SNC agrees to revise the casing inclination to 2%.	Info	
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.	Info	
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the		

Point N°	Description	Action by	Date
	seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm. *Update Feb 27*: SNC proposed all Primary holes in section from +600 to +750 to be deepened to implement curtain grouting: about10 m into the bedrock for Section from Station 0+700 to 0+750 and about 15 m from Station 0+600 to 0+700. The Deepened holes will be grouted in two to three stages. First stage is grouting the blanket using the same method as the downstream blanket, then after initial setting of injected grout come back to drill one or two more 5m stages and then grout upward (upstage grouting) provided bedrock conditions permit to advance the grout hole to full depth. SNC will prepare some preliminary sketch showing the planned sequence. AEM asked if it can be doable to go all the way to 15m instead of doing the blanket and then come back to do the other stages. It is more efficient that way for the contractors since time loss due to mob and demob? SNC: in term of quality, it will help with breaking up in stages and completing the blanket stage first. Going all the way may or may not feasible depending on the foundation bedrock conditions. If go all the way to 15 m, one possibility is you might lose the control of the hole due to hole collapse and may encounter some challenges with drilling due to lost water return and hole collapse. Grouting the blanket first while monitoring the seepage upon the completion we might find out that some holes may not need to go as deep, allowing a performance driven grouting program.		
3.20	AEM observed that two most western holes P181 for example encountered high grout take. Last year at this section grout take was not much and was interpreted as permafrost zone. Could this be the degradation of the permafrost? Should do some exploratory holes to find out? SNC: we also observed these two “relatively high take holes” compared with other low take holes in the West section (been grouted in 2018) of the alignment. We consider the current focus is to complete the downstream blanket, and to start upstream grouting at the critical zone as soon as possible to prepare for the freshet. When we have time, we can re-visit on this topic. Will keep this in mind.		
4.0	**Project Management**		
4.2	February Monthly Report will be issued next week.	SNC	Mar 6
5.0	**Miscellaneous**		

Point N°	Description	Action by	Date

Next meeting: Thursday, February 27 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	00114	**Ref. :**	669034-1100-30MC-0014-00
Prepared by :	Nina Quan	**Date :**	March 5, 2020
Meeting date :	March 5, 2020	**Time :**	13h30 to 14h:00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL),	**SNC:**	Nina Quan (NQ), Abdellah El. Bensi (AEB) and Sebastien Viau (SV)
Distribution :	All above + : Frederick Bolduc (FB), Thomas Lepine (TL), Patrice Gargon (PG), Marion Habersetzer (MH), Pier-Eric MacDonald (PEM), and Jesse Clark (JC),		Muhammad Saleem (MS) and Tom Xue (TX)

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-013. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	AEM is calling for another meeting (No.7) with the Grouting Committee first week of March. SNC will prepare the presentation with the following outline summarizing the grouting work progress: • Casing installation • Casing plug grouting • Rock drilling • Rock grouting • Downstream blanket data compilation • Upstream grouting proposed strategy Update Mar 5: SNC sent AEM draft presentation for review and comments. Based on the brief review of the presentation, AEM requested SNC to minimize background information as much as possible and focus the presentation on Upstream Grouting Strategy when presenting because of the time constraint and upstream strategy is the core of the meeting.	SNC	Done
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that nightshift won't be added.	Info	

Point N°	Description	Action by	Date
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used to define the potential seepage areas based on the reservoir water temperature.	AEM	On-going
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 20: AEM will follow up with KCG regarding comments from GC and SNC on the as-built profile showing the drilling and grouting progress.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
3.17	Casing Drilling Deviation: The casing inclination control is not only to prevent hitting the existing cut-off wall but also to control the deviations in the bedrock drilling. For deep curtain holes this may change the design hole spacing if the deviation is too high. Up to now, the deviation is greater than 0.5% and AEM confirmed that the contractor could not do anything better than the range they have been sticking with (< 2%). Based on the site conditions, SNC agrees to revise the casing inclination to 2%.	Info	
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.	Info	
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high		

Point N°	Description	Action by	Date
	grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm. *Update Feb 27*: SNC proposed all Primary holes in section from +600 to +750 to be deepened to implement curtain grouting: about10 m into the bedrock for Section from Station 0+700 to 0+750 and about 15 m from Station 0+600 to 0+700. The Deepened holes will be grouted in two to three stages. First stage is grouting the blanket using the same method as the downstream blanket, then after initial setting of injected grout come back to drill one or two more 5m stages and then grout upward (upstage grouting) provided bedrock conditions permit to advance the grout hole to full depth. SNC will prepare some preliminary sketch showing the planned sequence. AEM asked if it can be doable to go all the way to 15m instead of doing the blanket and then come back to do the other stages. It is more efficient that way for the contractors since time loss due to mob and demob? SNC: in term of quality, it will help with breaking up in stages and completing the blanket stage first. Going all the way may or may not feasible depending on the foundation bedrock conditions. If go all the way to 15 m, one possibility is you might lose the control of the hole due to hole collapse and may encounter some challenges with drilling due to lost water return and hole collapse. Grouting the blanket first while monitoring the seepage upon the completion we might find out that some holes may not need to go as deep, allowing a performance driven grouting program.		
3.20	AEM observed that two most western holes P181 for example encountered high grout take. Last year at this section grout take was not much and was interpreted as permafrost zone. Could this be the degradation of the permafrost? Should do some exploratory holes to find out? SNC: we also observed these two “relatively high take holes” compared with other low take holes in the West section (been grouted in 2018) of the alignment. We consider the current focus is to complete the downstream blanket, and to start upstream grouting at		

Point N°	Description	Action by	Date
	the critical zone as soon as possible to prepare for the freshet. When we have time, we can re-visit on this topic. Will keep this in mind.		
4.0	**Project Management**		
4.2	February Monthly Report will be issued next week.	SNC	Mar 6
5.0	**Miscellaneous**		

Next meeting: Thursday, March 12 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes Nº :	0015	**Ref. :**	669034-1100-30MC-001500
Prepared by :	Nina Quan	**Date :**	March 11, 2020
Meeting date :	March 11, 2020	**Time :**	15h30 to 16h:00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL), Patrice Gargon (PG), Marion Habersetzer (MH),	**SNC:** Nina Quan (NQ), Abdellah El. Bensi (AEB) and Muhammad Saleem (MS) and Tom Xue (TX)	
Distribution :	All above + : Frederick Bolduc (FB) Pier-Eric MacDonald (PEM) and Jesse Clark (JC)	Sebastien Viau (SV)	

MINUTES

Point Nº	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-014. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Update Mar 11: Meeting No.7 took place on Friday March 6. AEM forwarded to SNC the email received from Grouting Committee (GC) on Tuesday March10. In this email, the GC recommended path forward. SNC sent to AEM responses to those recommendations. One of the responses is that SNC needs clarification on the recommendations of downstream curtain after the completion of the upstream blanket grouting. AEM confirmed that it is also what AEM would like to know as well. AEM will set up a teleconference call with GC so that SNC and AEM can be clear on the rationales behind this recommendation. SNC emphasized that this meeting needs to take place ASAP because the strategy of upstream blanket grouting can be different if upstream curtain is still on the table.	AEM	Mar 12/13
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that nightshift won't be added.	Info	
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used	AEM	On-going

Point Nº	Description	Action by	Date
	to define the potential seepage areas based on the reservoir water temperature.		
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 20: AEM will follow up with KCG regarding comments from GC and SNC on the as-built profile showing the drilling and grouting progress.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
3.17	Casing Drilling Deviation: The casing inclination control is not only to prevent hitting the existing cut-off wall but also to control the deviations in the bedrock drilling. For deep curtain holes this may change the design hole spacing if the deviation is too high. Up to now, the deviation is greater than 0.5% and AEM confirmed that the contractor could not do anything better than the range they have been sticking with (< 2%). Based on the site conditions, SNC agrees to revise the casing inclination to 2%.	Info	
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.	Info	
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the		

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	seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm. *Update Feb 27*: SNC proposed all Primary holes in section from +600 to +750 to be deepened to implement curtain grouting: about10 m into the bedrock for Section from Station 0+700 to 0+750 and about 15 m from Station 0+600 to 0+700. The Deepened holes will be grouted in two to three stages. First stage is grouting the blanket using the same method as the downstream blanket, then after initial setting of injected grout come back to drill one or two more 5m stages and then grout upward (upstage grouting) provided bedrock conditions permit to advance the grout hole to full depth. SNC will prepare some preliminary sketch showing the planned sequence. AEM asked if it can be doable to go all the way to 15m instead of doing the blanket and then come back to do the other stages. It is more efficient that way for the contractors since time loss due to mob and demob? SNC: in term of quality, it will help with breaking up in stages and completing the blanket stage first. Going all the way may or may not feasible depending on the foundation bedrock conditions. If go all the way to 15 m, one possibility is you might lose the control of the hole due to hole collapse and may encounter some challenges with drilling due to lost water return and hole collapse. Grouting the blanket first while monitoring the seepage upon the completion we might find out that some holes may not need to go as deep, allowing a performance driven grouting program.		
3.20	AEM observed that two most western holes P181 for example encountered high grout take. Last year at this section grout take was not much and was interpreted as permafrost zone. Could this be the degradation of the permafrost? Should do some exploratory holes to find out? SNC: we also observed these two “relatively high take holes” compared with other low take holes in the West section (been grouted in 2018) of the alignment. We consider the current focus is to complete the downstream blanket, and to start upstream grouting at the critical zone as soon as possible to prepare for the freshet. When we have time, we can re-visit on this topic. Will keep this in mind. Update March 11: AEM requested SNC to send the list of proposed Quaternary holes for four of the boreholes on the west abutment that had high grout take. SNC can provide the suggested Quaternary holes but do not think that they need to be done now since the crew has moved to the east abutment already and the priority is upstream		

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	blanket grouting. Once complete the upstream blanket grouting and the crew is moving towards the west, then these holes can be carried out. However, AEM wanted to have these Quaternary holes to complete the downstream blanket therefore SNC will send AEM the list for these four Quaternary holes tomorrow – March 12.		
4.0	**Project Management**		
4.2	February Monthly Report will be issued next week.	SNC	Done
5.0	**Miscellaneous**		

Next meeting: Thursday, March 12 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0016	**Ref. :**	669034-1100-30MC-001600
Prepared by :	Abdellah El.Bensi	**Date :**	March 20, 2020
Meeting date :	March 19, 2020	**Time :**	13h30 to 14h:00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL), Marion Habersetzer (MH),	**SNC:** Abdellah El. Bensi (AEB) and Muhammad Saleem (MS) and Tom Xue (TX)	
Distribution :	All above + : Frederick Bolduc (FB) Pier-Eric MacDonald (PEM) and Jesse Clark (JC), Patrice Gargon (PG),	Nina Quan (NQ), Sebastien Viau (SV)	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-014. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Update Mar 11: Meeting No.7 took place on Friday March 6. AEM forwarded to SNC the email received from Grouting Committee (GC) on Tuesday March10. In this email, the GC recommended path forward. SNC sent to AEM responses to those recommendations. One of the responses is that SNC needs clarification on the recommendations of downstream curtain after the completion of the upstream blanket grouting. AEM confirmed that it is also what AEM would like to know as well. AEM will set up a teleconference call with GC so that SNC and AEM can be clear on the rationales behind this recommendation. SNC emphasized that this meeting needs to take place ASAP because the strategy of upstream blanket grouting can be different if upstream curtain is still on the table. SNC presented the strategy for the Dam section between 0+520 and 0+750. SNC strategy and Grouting Committee recommendations will be discussed this afternoon in order to reach a consensus about the steps forward.	Info	
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that nightshift won't be added.	Info	

Point N°	Description	Action by	Date
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used to define the potential seepage areas based on the reservoir water temperature.	AEM	On-going
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
3.14	RFI log: AEM prefers not to go with the template RFI log which SNC sent via email. The work will be continued via verbal discussion and email.	Info	
3.15	As mentioned in the Technical Specifications, the contractor is required to submit the As-Built drilling and grouting profile showing the work progress. AEM will check and forward the information to SNC. Update Feb 20: AEM will follow up with KCG regarding comments from GC and SNC on the as-built profile showing the drilling and grouting progress.	AEM	On-going
3.16	Tertiary holes: Although SNC agree with the GC's recommendation to set downstream Primary and Secondary holes as priority, we still need to consider that tertiary holes are necessary due to the large spacing between holes (6m) and the random distributions of the fractures in the bedrock. Example of T479.5 and the adjacent holes S482.5 and P 476.5. Another example is T461. AEM agreed to carry out all the Tertiary holes on downstream.	Info	
3.17	Casing Drilling Deviation: The casing inclination control is not only to prevent hitting the existing cut-off wall but also to control the deviations in the bedrock drilling. For deep curtain holes this may change the design hole spacing if the deviation is too high. Up to now, the deviation is greater than 0.5% and AEM confirmed that the contractor could not do anything better than the range they have been sticking with (< 2%). Based on the site conditions, SNC agrees to revise the casing inclination to 2%.	Info	
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.	Info	
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high		

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	grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm. *Update Feb 27*: SNC proposed all Primary holes in section from +600 to +750 to be deepened to implement curtain grouting: about10 m into the bedrock for Section from Station 0+700 to 0+750 and about 15 m from Station 0+600 to 0+700. The Deepened holes will be grouted in two to three stages. First stage is grouting the blanket using the same method as the downstream blanket, then after initial setting of injected grout come back to drill one or two more 5m stages and then grout upward (upstage grouting) provided bedrock conditions permit to advance the grout hole to full depth. SNC will prepare some preliminary sketch showing the planned sequence. AEM asked if it can be doable to go all the way to 15m instead of doing the blanket and then come back to do the other stages. It is more efficient that way for the contractors since time loss due to mob and demob? SNC: in term of quality, it will help with breaking up in stages and completing the blanket stage first. Going all the way may or may not feasible depending on the foundation bedrock conditions. If go all the way to 15 m, one possibility is you might lose the control of the hole due to hole collapse and may encounter some challenges with drilling due to lost water return and hole collapse. Grouting the blanket first while monitoring the seepage upon the completion we might find out that some holes may not need to go as deep, allowing a performance driven grouting program.		
3.20	AEM observed that two most western holes P181 for example encountered high grout take. Last year at this section grout take was not much and was interpreted as permafrost zone. Could this be the degradation of the permafrost? Should do some exploratory holes to find out? SNC: we also observed these two “relatively high take holes” compared with other low take holes in the West section (been grouted in 2018) of the alignment. We consider the current focus is to complete the downstream blanket, and to start upstream grouting at		

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	the critical zone as soon as possible to prepare for the freshet. When we have time, we can re-visit on this topic. Will keep this in mind. Update March 11: AEM requested SNC to send the list of proposed Quaternary holes for four of the boreholes on the west abutment that had high grout take. SNC can provide the suggested Quaternary holes but do not think that they need to be done now since the crew has moved to the east abutment already and the priority is upstream blanket grouting. Once complete the upstream blanket grouting and the crew is moving towards the west, then these holes can be carried out. However, AEM wanted to have these Quaternary holes to complete the downstream blanket therefore SNC will send AEM the list for these four Quaternary holes tomorrow – March 12. Update March 19: Casing of additional quaternary holes were installed and plugged.		
4.0	**Project Management**		
4.2	February Monthly Report will be issued next week.	SNC	Done
5.0	**Miscellaneous**		

Next meeting: Thursday, March 26 at 13:30-14:00

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MINUTES OF MEETING

Certifiée ISO 9001

Minutes N° :	0017	**Ref. :**	669034-1100-30MC-0017
Prepared by :	Nina Quan	**Date :**	March 27, 2020
Meeting date :	March 26, 2020	**Time :**	13h30 to 14h:00 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Weekly Coordination Meeting		
Presents :	**AEM:** Alexandre Lavallée (AL), Thomas Lepine (TL), Jesse Clark (JC),	**SNC:** Nina Quan (NQ), Sebastien Viau (SV) Muhammad Saleem (MS) and Tom Xue (TX)	
Distribution :	All above + : Frederick Bolduc (FB) Pier-Eric MacDonald (PEM),Patrice Gargon (PG), and Marion Habersetzer (MH),	Abdellah El. Bensi (AEB)	

MINUTES

Point N°	Description	Action by	Date
	Completed items are deleted and can be referred to in meeting 669034-11-30MC-016. New items are indicated in blue		
1.0	**Grouting Committee Meeting**		
1.1	Update Mar 11: Meeting No.7 took place on Friday March 6. AEM forwarded to SNC the email received from Grouting Committee (GC) on Tuesday March10. In this email, the GC recommended path forward. SNC sent to AEM responses to those recommendations. One of the responses is that SNC needs clarification on the recommendations of downstream curtain after the completion of the upstream blanket grouting. AEM confirmed that it is also what AEM would like to know as well. AEM will set up a teleconference call with GC so that SNC and AEM can be clear on the rationales behind this recommendation. SNC emphasized that this meeting needs to take place ASAP because the strategy of upstream blanket grouting can be different if upstream curtain is still on the table. SNC presented the strategy for the Dam section between 0+520 and 0+750. SNC strategy and Grouting Committee recommendations will be discussed this afternoon in order to reach a consensus about the steps forward. Update March 26: As per AEM's request, SNC issued an Addendum 01 to the Simplified Work Instruction Rev 01. This Addendum includes the changes in the upstream blanket grouting strategy and the recommended path forward from the Grouting Committee – Meeting No.8. AEM to get back to SNC with their comments. AEM is planning to call for a meeting with the Grouting Committee next week (March 30) to advise about suspension of the grouting work and to summarize the work completed thus far.	AEM	Week of March 30

Point N°	Description	Action by	Date
2.0	**Technical Specifications and Constructions Drawings**		
2.1	Technical Specifications and Drawings Rev 00 was issued on January 07 2020. Drawing No.3 was updated and the document was re-issued on January 10, 2020. In addition, Site Instructions Rev 01 was also updated and issued on January 08 2020.	SNC	Completed
3.0	**Field Activities and QA Support for Grouting**		
3.5	AEM confirmed that nightshift won't be added.	Info	
3.12	Thermistor data: Update Feb 20: SNC received VPN link to obtain the data directly from AEM. AEM shared preliminary discussion on the recent interpretation of the thermistor data. AEM confirmed that the data analysis provided to SNC on September is still valid and can be used to define the potential seepage areas based on the reservoir water temperature.	AEM	On-going
3.13	Recently, the casing plug is not filled with the grout prior to inflate the packer, hence the injected grout volume is very low. Good practice, as done before, is to fill the bottom of the casing to remove the residual water prior to inflate the packer and pressure grout the casing plug.	Info	
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Point N°	Description	Action by	Date
	Based on the site conditions, SNC agrees to revise the casing inclination to 2%.		
3.18	NCR: AEM proposed SNC to record any deviation on the RFI log instead of going through NCR procedure.	Info	
3.19	Upstream Grouting: SNC reviewed the field data and the following is preliminary suggestion: • Complete the downstream blanket grouting. Few quaternary holes will be added in the area where tertiary holes have high grout take. SNC will send AEM the list of required Quaternary holes along with their coordinates. • Casing installation can be carried out in the upstream at section +750 to 600. There are two possible options: a) Carry out blanket grouting at upstream with 5 m deep. After completing the upstream blanket, the seepage and thermistor data will be re-assessed to determine if upstream curtain is required. b) Carry out the upstream blanket grouting starting with some super primary holes. Super primary holes are primary holes that will be used to investigate the rock foundation and define the appropriate length of the grout curtain holes. AEM suggests having super primary holes for every other P-holes. This option needs further review to confirm. *Update Feb 27*: SNC proposed all Primary holes in section from +600 to +750 to be deepened to implement curtain grouting: about10 m into the bedrock for Section from Station 0+700 to 0+750 and about 15 m from Station 0+600 to 0+700. The Deepened holes will be grouted in two to three stages. First stage is grouting the blanket using the same method as the downstream blanket, then after initial setting of injected grout come back to drill one or two more 5m stages and then grout upward (upstage grouting) provided bedrock conditions permit to advance the grout hole to full depth. SNC will prepare some preliminary sketch showing the planned sequence. AEM asked if it can be doable to go all the way to 15m instead of doing the blanket and then come back to do the other stages. It is more efficient that way for the contractors since time loss due to mob and demob? SNC: in term of quality, it will help with breaking up in stages and completing the blanket stage first. Going all the way may or may not feasible depending on the foundation bedrock conditions. If go all the way to 15 m, one possibility is you might lose the control of the hole due to hole collapse and may encounter some challenges with drilling due to lost water return and hole collapse. Grouting the blanket first while monitoring the seepage upon the completion we might find out that some holes may not need to go as deep, allowing a performance driven grouting program.		

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3.20	AEM observed that two most western holes P181 for example encountered high grout take. Last year at this section grout take was not much and was interpreted as permafrost zone. Could this be the degradation of the permafrost? Should do some exploratory holes to find out? SNC: we also observed these two "relatively high take holes" compared with other low take holes in the West section (been grouted in 2018) of the alignment. We consider the current focus is to complete the downstream blanket, and to start upstream grouting at the critical zone as soon as possible to prepare for the freshet. When we have time, we can re-visit on this topic. Will keep this in mind. Update March 11: AEM requested SNC to send the list of proposed Quaternary holes for four of the boreholes on the west abutment that had high grout take. SNC can provide the suggested Quaternary holes but do not think that they need to be done now since the crew has moved to the east abutment already and the priority is upstream blanket grouting. Once complete the upstream blanket grouting and the crew is moving towards the west, then these holes can be carried out. However, AEM wanted to have these Quaternary holes to complete the downstream blanket therefore SNC will send AEM the list for these four Quaternary holes tomorrow – March 12. Update March 19: Casing of additional quaternary holes were installed and plugged.		
4.0	**Project Management**		
4.2	February Monthly Report will be issued next week.	SNC	Done
5.0	**Miscellaneous – Work Suspension**		
	AEM talked about the email sent to SNC on Wednesday March 25 to notify the suspension of the grouting work. AEM (TL) mentioned that the work is on hold and not cancel. SNC reiterated Mr. Michel Julien's question (Grouting Committee Meeting No.7) that the seepage estimation shows at the beginning of the program the seepage rate is 380 m^3/hr whereas 600 m^3/hr was reported, how reliable is this number? AEM (TL) replied that the seepage estimate is the inferred value and it is hard to say if the grouting work has an impact. There is uncertainty, i.e.: water frost penetration, different approaches used in the seepage estimation, smaller bathymetry vs broader bathymetry was applied etc. SNC (TX) commented that the reported seepage estimate is too optimistic. When the freshet comes, the South Pond/reservoir water level will be increased and which will result higher seepage. With regarding the suspension, SNC recommended to put cap on the boreholes where casings were installed for protection and safety purpose. SNC also recommended to proceed with as-built report preparation of the work completed thus far.		

Next meeting:

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MINUTES OF MEETING

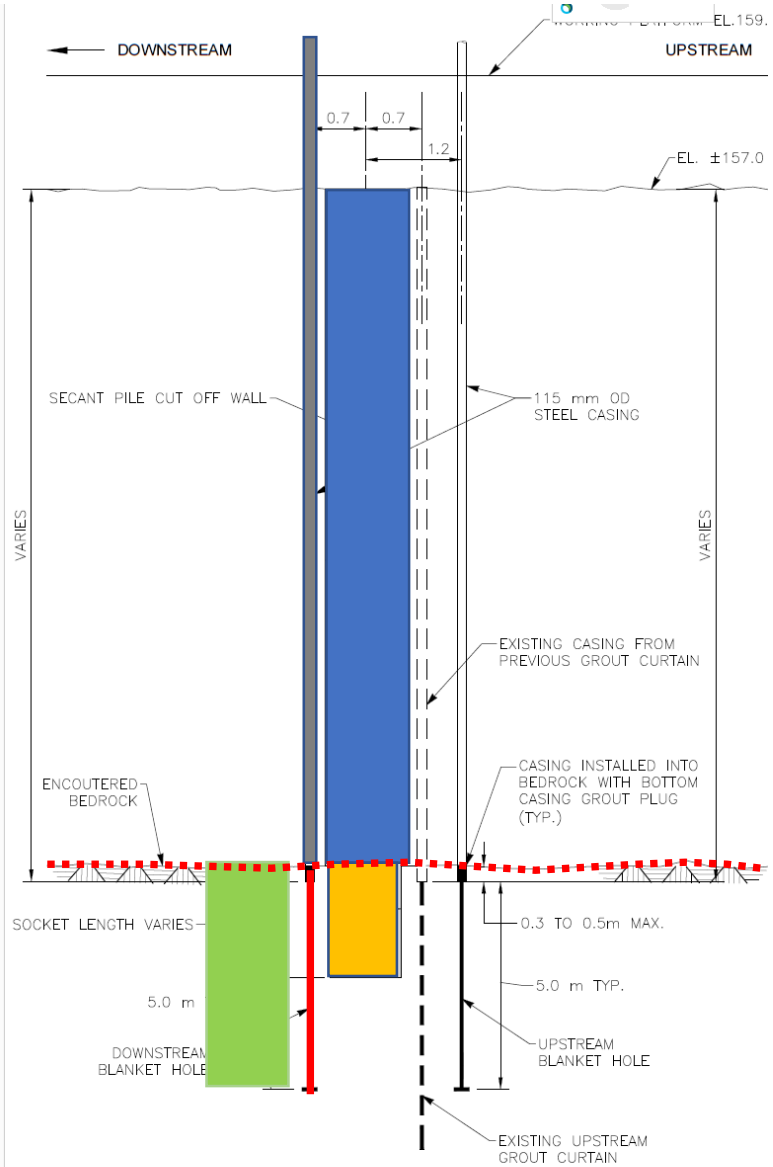
Certifiée ISO 9001

Minutes N° :	0001	**Ref. :**	669034-2000-30MC-0001-PB
Prepared by :	Nina Quan/Abdellah El Bensi	**Date :**	December 5th, 2019
Meeting date :	Monday December 2nd, 2019	**Time :**	10h00 to 10h45 EST
Location :	On-line meeting	**Project :**	669034 Remediation Work for Whale Tail Dike Seepage
Subject :	Update on Bedrock Injection – Discussion on learnings from the weekend		
Presents :	**AEM:** Alexandre Lavallée (AL), Jesse Clark (JC), Pier-Eric MacDonald (PEM), Pascal Lavoie,	**SNC:** Nina Quan (NQ), Tom Xue, Abdellah El Bensi (AEB), Jin-Dong Du (JDD), Muhammad Saleem (MS);	
Distribution :	All above + :, Frederick Bolduc (FB), Patrice Gagnon (PG), Thomas Lepine (TL,) Hafeez Baba (HB)		

MINUTES

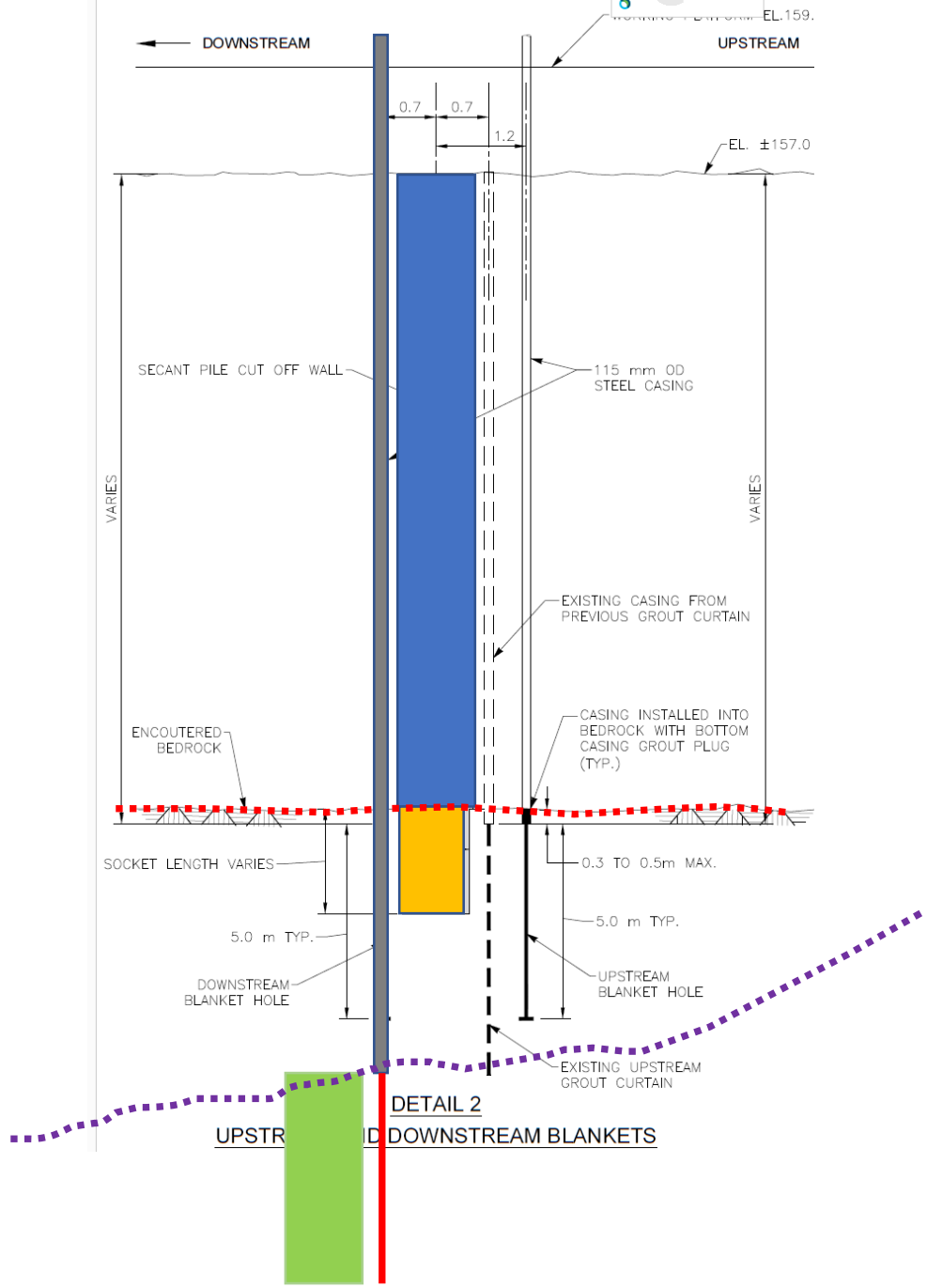
Point N°	Description	Action by	Date
1.0	**Discussion on the use of packer for the hole at 728.5 in which casing plug was not done**		
	Bedrock grouting is already done at this borehole.	Info	Done
2.0	**Discussion on whether there is a way to confirm if casing is properly sealed (whether it is grouted or not)**		
2.1	Using packer testing to decide if grout plug is required or not may not be practical and time consuming as mot of the holes may take water and we will need to do the grout plug after the water pressure test anyway. It may not save time and efforts at the end. If AEM and the contractor both agree to give it a try, SNC is okay with that. JDD confirmed that starting tomorrow, the casing plug will be carried out for all the remaining holes prior to bedrock grouting.	Info	
3.0	**Discussion on holes that never hit pressure refusal but refused on high grout take. The pump could not pump any thicker grout (pump was at 0.5 W:C, and 0.2% Cellbex)**		
3.1	1. Grout Take in Primary holes was expected especially in this location where the thermal analysis indicates potential high flow. 2. Capacity of the pumps must be assessed. Use of thicker mixes will depend on the equipment capacity to push it to the bottom of the hole. 3. Grout Mix C showed variation of physical proprieties from one test to the other, especially the marsh time which is normal with the application with Cellbex.	Info	
3.2	SNC suggested to return and re-grout Primary holes with high grout take to the refusal (Pmax) using thicker grout Mix. Grout Mixes D and		

Point N°	Description	Action by	Date
	E were developed during the field acceptance trial and should be used to complete the grouting in these holes provided that the equipment is able to pump them. The process of thicken the grout in the high grout take holes to get to the refusal is developed by SNC Design team and was communicated to the Engineer on site. This process will be updated based on data gathered from the rock grouting to respond to the different site conditions.	Info	
3.3	SNC will provide instruction for tomorrow grouting (re-grout the holes that didn't meet refusal). SNC proposed to try for thicker Mix. The worst case is to carry out ***two component injection***. ***Need to have a separate pump for this case***.	Info	
3.4	Line of Communication: SNC confirmed that the Engineer is the person on-site. Engineer will take all required decisions on site to keep the grouting work moving forward without delays. SNC design team will provide continuous support to the site on a timely manner.	Info	
3.5	SNC presented the figure showing the targeted area for blanket grouting for comparison between the anticipated rock surface and the competent bedrock. The objective is to show the risk of missing the targeted area to be treated if casing is advanced to much deeper to reach competent bedrock. AEM is aware of this situation and willing to take the risk since there are only about 10% of boreholes deeper than the anticipated bedrock surface and because of difficult grilling and grouting operations in soft foundation material and Cement Bentonite slurry. Figure is attached.	Info	



DETAIL 2

UPSTREAM AND DOWNSTREAM BLANKETS



DETAIL 2

UPSTR ID DOWNSTREAM BLANKETS

Appendix D

QC Data (KCG Reports)

D-1 Work Plan and Material Data Sheets

D-2 Downstream Casing Installation Report

D-3 Upstream Casing Installation Report

D-4 WTD Downstream Casing Deviation Table

D-5 WTD Upstream Casing Deviatin Table

D-6 GHD Daily Report

D-7 QC Grout Register

D-8 Contractor NCR

D-9 Rock Stage Data

D-10 Equipment Calibration Certificate

D-11 KGC Rock Drilling Report

D-1 Drilling and Grouting Work Plan and Material Data Sheets

KIVALLIQ CONTRACTORS GROUP LTD	Contract	Service	Type	Sequence	Revision
	11-811	CON	MET	021	0
	Client Number:				

DETAILED WORK PLAN

Title :	**Casing and bedrock drilling**		
Contract :	**REMEDIAL WORKS FOR WTD SEEPAGE**	Project N° :	**669034**

Rev.	***Section A Location :***
	▪ Whale Tail Dike

Rev.	***Section B References and appendix:***
	REFERENCE: ▪ Technical Specifications 669034-0000-40EF-0001, MEMORENDUM 669034-0000-40CA-0001

Rev.	***Section C Safety :***
	1 Personal protective equipment ▪ Security hard hat – Type II; CAN/CSA Z94.1-92 ▪ Safety boots - Class 2, Level 2; CAN/CSA Z195-02 ▪ Safety glasses; CAN/CSA Z94.3.1 ▪ High visibility Vest with reflective strips – CSA Class 2, Level2; ▪ Gloves are required for all tasks. Hand protection appropriate for the hazard and temperature must be worn. **2 Various** ▪ The detailed work plan will be presented to workers before the start of works. ▪ A JHA will be done for the specific risks and communicated to workers prior to the start of works. ▪ A radio communication standard shall be elaborated prior to works and included in the JHA mitigation measures. These information shall be repeated daily in the coordination meetings.

Rev.	***Section D Preparation :***
	1 Survey ▪ Before the works, implantation of drilling holes will be done ▪ Refer to the survey procedure for drilling casing installation o CON-MET-010

Rev.	***Section E Scope of work :***
	1 General This procedure is to explain the method for casing and bedrock drilling.

Rev.	***Section F – Work Plan :***
	1 Casing installation procedure ***1.1 General*** ▪ Drilling equipment is composed of drill DTH to install casing, with a 1150 cfm compressor and a welding machine to assemble casing sections. ▪ The casing dimension is 4,5" outside diameter and 4" inside diameter. ▪ The casing crew for each drill consist of one drill operator and one welder. ▪ Any person working on the casing installation will be adequately trained to use this equipment. ▪ Refer to CONT-MET-020 method - Steel casing installation for grouting. ***2.2 Method*** ▪ With a 'Down the hole' drill rig equipped with an eccentric system, introduce the drill rods and the steel pipes simultaneously using the drilling bit fixed on the down the hole hammer. ▪ Robit DTH-REC system will install 4,5" casing with an eccentric drill bit and a 3" DTH hammer. ▪ When the first casing length will be inserted in the FF material, a cable and a lock pin will be used to raise the second casing and the rod at the same time. ▪ The two rods will be tightened together (using core barrel and drill head) and the second casing will be installed and welded with the first one. ▪ When the hole will be completed, the casing will be sealed in the bedrock at 300mm below rock surface.

- Steel casings will be installed while drilling through FF material to bedrock foundation. The steel casings will be left in place.

2 Casing plugging after installation

2.1 General

- An injection unit will be used for casing plugging after casing drilling and deviation reading have been carried out.

2.2 Method

- To make sure the interface between steel casing and bedrock is sealed correctly, we will grout using low pressure with a maximum volume of 160 liters of mixed grout.
- The grout hose will be deepened in the bottom of casing to ensure that air and water are evacuated towards casing collar.
- Flow rate and pressure will be kept as low as possible during process to avoid casing movement.
- Mix C will be used for casing plugging.

3 Drilling grout holes in bedrock procedure

3.1 General

- A top hammer drill (Tamrock or equivalent) will be used to drill bedrock through the installed casing.
- Drilling sequence to follow will start with primary holes and then secondary and tertiary holes. Distances between primaries and secondaries will be of 12 meters and 6 meters will separate the tertiary holes.

3.2 Method

- Drilling rods of 3.6 m (12 feet) long and drilling bits of 90mm (3,5 inches) diameter are used for bedrock drilling.
- Holes will be drilled with water. Rod dope, grease or other lubricants on drill rods will not be used.
- Level will be used to measure depth of each holes. An inclinometer will be available on site to measure holes inclination in bedrock and an as-built can be provided on demand.
- The holes depth will be fixed by the client representative depending of the zone where we're located.
- After completion of drilling, the hole will be washed alternating jets of air and water to obtain a water return clear at the top of the hole.
- Holes casing will be protected against damage. Drilling plugs will be placed on the top of the casings.
- The drilling sequence will respect directives of the technical specifications about distances and delays imposed by adjacent grouted holes.
- If the driller encounters a major structure or very closely fractured ground or difficult drillings conditions accompanied with water loss, the bedrock drilling will be stopped. Drilling operations will restart after client's representative recommendations.
- A tempered drill shelter will be used during winter conditions to protect the equipment and avoid problems as much as possible during water drilling.

Rev.	***Section G – Quality Control:***
	1. General Quality Control, carried out by the Contractor will include: ▪ Providing as-built survey and QC data to the client's representative. ▪ Inclinometer to be used in every holes to measure deviation during casing drilling. ▪ Measurements of each holes will be carried out after completion of every casing. **2. Daily Quality Reporting** ▪ Daily record will follow the format and details specified in specifications. ▪ Casing deviation table will be presented and updated on a daily basis.

Rev.	***Section F Environment :***
	▪ Positioning of an emergency response kit on the work site. ▪ Before starting work, a visual inspection of the equipment will be done to detect any leak that could cause a spill. ▪ The environmental procedure in case of spill will be respected at all times following AEM recommendations. ▪ All workers will be sensitized to environmental measures for spills during the information session.

Rev.	***Section G Additional notes :***
	▪ This method may be modified and / or adapted to the actual conditions encountered with the approval of the owner's representative.

Section H Signatures :		
Prepared by : **Mikaël Côté**	*Signature :*	*Date:*

KIVALLIQ CONTRACTORS GROUP LTD	Contract	Service	Type	Sequence	Revision
	11-811	CON	MET	022	0
	Client Number:				

DETAILED WORK PLAN

Title :	**Grouting operations**		
Contract :	**REMEDIAL WORKS FOR WTD SEEPAGE**	Project N° :	**669034**

Rev.	***Section A Location :***
	▪ Whale Tail Dike

Rev.	***Section B References and appendix:***
	REFERENCE: ▪ Technical Specifications 669034-0000-40EF-0001, MÉMORENDUM 669034-0000-40CA-0001

Rev.	***Section C Safety :***
	1 Personal protective equipment ▪ Security hard hat – Type II; CAN/CSA Z94.1-92 ▪ Safety boots - Class 2, Level 2; CAN/CSA Z195-02 ▪ Safety glasses; CAN/CSA Z94.3.1 ▪ High visibility Vest with reflective strips – CSA Class 2, Level2; ▪ Gloves are required for all tasks. Hand protection appropriate for the hazard and temperature must be worn. Eye watching station. ▪ x **2 Various** ▪ The detailed work plan will be presented to workers before the start of works. ▪ A JHA will be done for the specific risks and communicated to workers prior to the start of works. ▪ A radio communication standard shall be elaborated prior to works and included in the JHA mitigation measures. These information shall be repeated daily in the coordination meetings.

Rev.	***Section D Preparation :***
	1 Survey ▪ Before the works, implantation of grouting holes will be done. ▪ Refer to the survey procedure for drilling pipe installation ▪ o CON-MET-010

Rev.	***Section E Scope of work :***
	1 General ▪ Grouting equipment set up. ▪ Grouting operations for downstream and upstream curtain.

Rev.	***Section F – Work Plan :***
	A. Grouting Operations **1 Method** ***1.1 General*** Each injection unit is made of two shelters (seacan A and B) assembled with the following: - Generator - Concrete plant (specs attached) - Water heater and water tank - Heat canon - Electric heating - Permeation grout monitor (specs attached) - Pipes, adaptors, packers and hoses (specs attached) Seacan A (mixing room) contains the generator, the water tank equipped with the water heater and all the required equipment for grout mixing. In particular a balance to validate the cement filled plastic bucket weight before the transfer into the batch plan and a flowmeter to measure the amount of water for the mix. Seacan B (control room) contains the control unit (permeation grout monitor), the heat canon and all pipes, packers and hoses required. The grouting team, in addition of a grouting specialist field supervisor, is made of three workers; the pump operator, the monitor operator and a labor. Owner's representative determined the mix frequency and the duration of the mixing process. The monitor operator must regularize the mixing pressure and the flow as asked by the engineer. The labor must prepare the hoses and put the packer into the hole.

Rev.	***Section F – Work Plan :***
	1.2 Method and steps ▪ The grouting will be completed in one single stage of 5 meters. ▪ Bedrock grouting will be done in 5m stages unless directed otherwise by the QC representative. ▪ After drilling the grout hole full depth, washing and cleaning the hole, the packer assembly will be lowered down to the right depth and the stage will be grouted until the first of these two values is reached; maximum grout volume for the stage or targeted pressure without absorption. ▪ Primary holes will be grouted using mix C. If no built-up pressure is observed after 2000 liters of grout pumped, grouting of the stage will stop and we will come back later with further instructions coming from the owner's representative. ▪ Secondaries and tertiaries will be conducted the same way following the right hole order. ▪ For high take stages, high density grout should be used if required by the owner's representative, using anti-washout admixture and/or sodium silicate gel pumped from a separate pump to conduct flash-set grout. ▪ To keep flow and pressure straight-line, the grout will run continuously into hoses controlled by the grout pump. Two pressure gauges are installed on the system. The first one is on the permeation grout monitor for real-time monitoring and the second one is right at the hole collar. ▪ Field trials have been carried out for headloss calculation in our grout lines for different mixes and the program in our permeation grout monitor will now show effective pressure. ▪ Flow and pressure are controlled by the monitor operator who just have open or close the valve installed on the return line. We can easily and securely controlled flow and pressure to avoid problems during grouting operations. ▪ Grouting will take place continuously until grout refusal occurs with specified grouting pressure or if maximum volume is reached for the stage. ▪ If communication occurs between different holes, a packer will be installed in the hole where it communicates to stop grout lost. The hole already started will continue as usual until refusal and then the grout lines will be installed on the second one.

Rev.	***Section G – Quality Control:***
	1. General Quality Control, carried out by the Contractor will include: ▪ Providing as-built survey and QC data to the owner's representative. ▪ Quality control tests and grouting records: parameters such as density, viscosity, cohesion, bleeding, material's temperature and initial setting time will be measured and recorded for each trial mix. ▪ Providing as-built grouting follow-up on a weekly basis with all the drilling and grouting information to the owner's representative. **2. Daily Quality Reporting** ▪ Daily record will follow the format and details specified in Design specs. A grouting report will be produced for each stage grouted. This report will include holes and stages number, stages length, grouting pressure, grouting flow, total volume injected and penetrability. ▪ Grouting reports, bedrock drilling reports, grout mixes QC reports and water testing reports will be e-mailed to the QA representative every morning on a daily basis (Appendix C, reports example).

Rev.	***Section F Environment :***
	▪ An emergency response kit (spill kit) will be on work site at all time. ▪ Before starting work, a visual inspection of the equipment will be done to detect any leak that could cause a spill. ▪ The environmental procedure in case of spill will be respected at all times following AEM recommendations. ▪ All workers will be sensitized to environmental measures for spills during the information session.

Rev.	***Section G Additional notes :***
	▪ This method may be modified and / or adapted to the actual conditions encountered with the approval of the owner representative.

Rev.	***Section H Signatures :***		
Prepared by : **Mikaël Côté**		*Signature :*	*Date:*

MASTER® BUILDERS SOLUTIONS

BASF We create chemistry

3	03 30 00	Cast-in-Place Concrete
	03 40 00	Precast Concrete
4	03 70 00	Mass Concrete
	04 05 16	Masonry Grouting

MasterGlenium® 3030

Full-Range Water-Reducing Admixture

Description

MasterGlenium 3030 ready-to-use full-range water-reducing admixture is a patented new generation of admixture based on polycarboxylate chemistry. MasterGlenium 3030 admixture is very effective in producing concretes with different levels of workability including applications that require the use of self-consolidating concrete (SCC). MasterGlenium 3030 admixture meets ASTM C 494/C 494M requirements for Type A, water-reducing, and Type F, high-range water-reducing, admixtures.

Applications

Recommended for use in:

- Concrete where high flowability, high-early and ultimate strengths and increased durability are needed
- Self-consolidating concrete
- Concrete where normal, mid-range, or high-range water-reduction is desired
- Concrete where normal setting times are required
- Strength-on-demand concrete, such as 4x4™ Concrete
- Pervious concrete
- Self-consolidating grout

Features

- Dosage flexibility for normal, mid- and high-range water reduction
- Reduced water content for a given slump
- Produces cohesive and non-segregating concrete mixture
- Increased compressive strength and flexural strength performance at all ages
- Providing faster setting times and strength development
- Enhanced finishability and pumpability

Benefits

- Providing economic benefits to the entire construction team through higher productivity and reduced variable costs

Performance Characteristics

The dosage flexibility of MasterGlenium 3030 admixture allows it to be used as a normal, mid-range and high-range water reducer.

Mixture Data: 600 lb/yd^3 of Type I cement (360 kg/m^3); slump, 8.5-9.25 in. (210-235 mm); non-air-entrained concrete; dosage rate adjusted to obtain 25-30% water reduction.

Setting Time

Mixture	Initial Set (h:min)	Difference (h:min)
Plain	4:24	–
Conventional high-range water-reducer	6:00	+ 1.36
MasterGlenium 3030 admixture	5:00	+0.36

Compressive Strength

	1 Day		7 Days	
Mixture	psi	MPa	psi	MPa
Plain	1700	12	4040	28
Conventional high-range water-reducer	3460	24	6380	44
MasterGlenium 3030 admixture	4120	28	7580	52

Slump Retention - in. (mm)

	Minutes		
Mixture	15	30	45
Plain	8.5 (215)	8.5 (215)	7.5 (200)
Conventional high-range water-reducer	8.5 (215)	4.25 (110)	3.5 (90)
MasterGlenium 3030 admixture	9.25 (235)	9.25 (235)	8.25 (210)

Rate of Hardening: MasterGlenium 3030 admixture is formulated to produce normal setting characteristics throughout its recommended dosage range. Setting time of concrete is influenced by the chemical and physical composition of the basic ingredients of the concrete, temperature of the concrete and ambient conditions. Trial mixtures should be made with actual job materials to determine the dosage required for a specified setting time and a given strength requirement.

Guidelines for Use

Dosage: MasterGlenium 3030 admixture has a recommended dosage range of up to 3 fl oz/cwt (195 mL/100 kg) for Type A applications, 3-6 fl oz/cwt (195-390 mL/100 kg) for mid-range use and up to 18 fl oz/cwt (1,170 mL/100 kg) for Type F applications. The dosage range is applicable to most mid- to high-range concrete mixtures using typical concrete ingredients. However, variations in job conditions and concrete materials, such as silica fume, may require dosages outside the recommended range. In such cases, contact your local sales representative.

Mixing: MasterGlenium 3030 admixture can be batched with the initial mixing water or as a delayed addition. However, optimum water reduction is generally obtained with a delayed addition.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterGlenium 3030 admixture will neither initiate nor promote corrosion of reinforcing steel embedded in concrete, prestressed concrete or of galvanized steel floor and roof systems. Neither calcium chloride nor other chloride-based ingredients are used in the manufacture of MasterGlenium 3030 admixture.

Compatibility: MasterGlenium 3030 admixture is compatible with most admixtures used in the production of quality concrete, including normal, mid-range and high-range water-reducing admixtures, air-entrainers, accelerators, retarders, extended set control admixtures, corrosion inhibitors, and shrinkage reducers.

Do not use MasterGlenium 3030 admixture with admixtures containing beta-naphthalene-sulfonate. Erratic behaviors in slump, slump flow, and pumpability may be experienced.

For directions on the proper evaluation of MasterGlenium 3030 admixture in specific applications, contact your local sales representative.

Storage and Handling

Storage Temperature: MasterGlenium 3030 admixture should be stored above freezing temperatures. If MasterGlenium 3030 admixture freezes, thaw at 45 °F (7 °C) or above and completely reconstitute by mild mechanical agitation. **Do not use pressurized air for agitation**.

Shelf Life: MasterGlenium 3030 admixture has a minimum shelf life of 12 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your local sales representative regarding suitability for use and dosage recommendations if the shelf life of MasterGlenium 3030 admixture has been exceeded.

Packaging

MasterGlenium 3030 admixture is supplied in 55 gal (208 L) drums, 275 gal (1040 L) totes and by bulk delivery.

Related Documents

Safety Data Sheets: MasterGlenium 3030 admixture

Additional Information

For additional information on MasterGlenium 3030 admixture or its use in developing concrete mixes with special performance characteristics, contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is the leading provider of solutions that improve placement, pumping, finishing, appearance and performance characteristics of specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets. For over 100 years we have offered reliable products and innovative technologies, and through the Master Builders Solutions brand, we are connected globally with experts from many fields to provide sustainable solutions for the construction industry.

Limited Warranty Notice

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is shipment to purchaser of product equal to the amount of product that fails to meet this warranty or refund of the original purchase price of product that fails to meet this warranty, at the sole option of BASF. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on BASF's present knowledge and experience. However, BASF assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. BASF reserves the right to make any changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

NSF Certified to NSF/ANSI 61

BASF Corporation
Admixture Systems
www.master-builders-solutions.basf.us

United States
23700 Chagrin Boulevard
Cleveland, Ohio 44122-5544
Tel: 800 628-9990 ■ Fax: 216 839-8821

Canada
1800 Clark Boulevard
Brampton, Ontario L6T 4M7
Tel: 800 387-5862 ■ Fax: 905 792-0651

Safety data sheet

1. Substance/preparation and company identification

MasterMatrix UW 450 also RHEOMAC UW 450

Use: Product for construction chemicals

Company:
BASF Australia Limited (ABN 62 008 437 867)
Level 12, 28 Freshwater Place Southbank
Victoria 3006, AUSTRALIA
Telephone: +61 3 8855-6600
Telefax number: +61 3 8855-6511

Emergency information:
BASF Emergency Advice Number: 1800 803 440 (24h) [within Australia]
BASF Emergency Advice Number: + 61 3 8855 6666 [outside Australia]

2. Hazard identification

No specific dangers known, if the regulations/notes for storage and handling are considered.

NON-HAZARDOUS SUBSTANCE, NON-DANGEROUS GOODS

3. Composition/information on ingredients

Chemical nature

Dispersion based on: cellulose ester, modified, in water

Hazardous ingredients

2-methylpentane-2,4-diol
Content (W/W): >= 1 % - <= 3 %
CAS Number: 107-41-5
Hazard symbol(s): Xi
R-phrase(s): 36/38

formaldehyde
Content (W/W): < 0.1 %
CAS Number: 50-00-0
Hazard symbol(s): T
R-phrase(s): 23/24/25, 34, 40, 43

The wording of the hazard symbols and R-phrases is specified in chapter 16 if dangerous ingredients are mentioned.

4. First-Aid Measures

General advice:
First aid personnel should pay attention to their own safety. Remove contaminated clothing.

If inhaled:
If difficulties occur after vapour/aerosol has been inhaled, remove to fresh air and seek medical attention.

On skin contact:
After contact with skin, wash immediately with plenty of water and soap. If irritation develops, seek medical attention.

On contact with eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

On ingestion:
Rinse mouth immediately and then drink plenty of water, seek medical attention. Do not induce vomiting unless told to by a poison control center or doctor.

Note to physician:
Symptoms: No significant symptoms are expected due to the non-classification of the product.
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Suitable extinguishing media:
foam, water spray, dry powder, carbon dioxide

Unsuitable extinguishing media for safety reasons:
water jet

Specific hazards:
carbon monoxide, carbon dioxide, harmful vapours, nitrogen oxides, fumes/smoke, carbon black

Special protective equipment:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

Sealed containers should be protected against heat as this results in pressure build-up. Keep containers cool by spraying with water if exposed to fire.

6. Accidental Release Measures

Personal precautions:
Use personal protective clothing. Do not breathe vapour/aerosol/spray mists. Sources of ignition should be kept well clear. Handle in accordance with good building materials hygiene and safety practice.

Environmental precautions:
Contain contaminated water/firefighting water. Do not discharge into drains/surface waters/groundwater.

Methods for cleaning up or taking up:
For small amounts: Pick up with inert absorbent material (e.g. sand, earth etc.). Dispose of contaminated material as prescribed.
For large amounts: Pump off product.

7. Handling and Storage

Handling

Avoid aerosol formation. Avoid inhalation of mists/vapours. Avoid skin contact. No special measures necessary provided product is used correctly.

Protection against fire and explosion:
No special precautions necessary.

Storage

Further information on storage conditions: Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Store protected against freezing. Protect from direct sunlight.

8. Exposure controls and personal protection

Components with workplace control parameters

2-methylpentane-2,4-diol, 107-41-5;
Peak limitation 121 mg/m3 ; 25 ppm (OEL (AU))

formaldehyde, 50-00-0;
CLV 0.3 ppm (ACGIHTLV)
TWA value 1.2 mg/m3 ; 1 ppm (OEL (AU))
STEL value 2.5 mg/m3 ; 2 ppm (OEL (AU))

Personal protective equipment

Respiratory protection:
Wear respiratory protection if ventilation is inadequate. Combination filter for gases/vapours of organic, inorganic, acid inorganic and alkaline compounds (e.g. EN 14387 Type ABEK).

Hand protection:
impermeable gloves
Synthetic rubber gloves
Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:
Safety glasses with side-shields (frame goggles) (e.g. EN 166)

Body protection:
light protective clothing

General safety and hygiene measures:
In order to prevent contamination while handling, closed working clothes and working gloves should be used. Handle in accordance with good building materials hygiene and safety practice. When using, do not eat, drink or smoke. Hands and/or face should be washed before breaks and at the end of the shift. At the end of the shift the skin should be cleaned and skin-care agents applied. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks).

9. Physical and Chemical Properties

Form:	liquid
Colour:	light yellow
Odour:	mild
pH value:	approx. 8.9 - 9.1
Information on: water	
Melting point:	0 °C
boiling temperature:	> 100 °C
Information on: water	
Boiling point:	100 °C
Flash point:	Non-flammable.
Explosion hazard:	not explosive

Information on: water	
Vapour pressure:	23.4 hPa (20 °C) Literature data.

Density:	approx. 1.19 - 1.23 g/cm3 (20 °C)
Solubility in water:	miscible (20 °C)
Miscibility with water:	 (20 °C) miscible in all proportions
Viscosity, dynamic:	approx. 3,000 - 6,000 mPa.s (20 °C)

Other Information:
If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Conditions to avoid:
See MSDS section 7 - Handling and storage.

Thermal decomposition:	No decomposition if stored and handled as prescribed/indicated.

Substances to avoid:
strong acids, strong bases, strong oxidizing agents

Corrosion to metals: No corrosive effect on metal.

Hazardous reactions:
The product is stable if stored and handled as prescribed/indicated.

No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological Information

Acute toxicity

Assessment of acute toxicity:
Virtually nontoxic after a single ingestion. The product has not been tested. The statement has been derived from products of a similar structure or composition.

(oral):No data available.

(by inhalation):No data available.

(dermal):No data available.

Irritation

Assessment of irritating effects:
Not irritating to eyes and skin. No irritation is expected under intended use and appropriate handling.

Sensitization

Assessment of sensitization:
After continuous contact with the skin, sensitization cannot be excluded.

Repeated dose toxicity

Assessment of repeated dose toxicity:
No reliable data was available concerning repeated dose toxicity.

Genetic toxicity

Assessment of mutagenicity:
The chemical structure does not suggest a specific alert for such an effect. The product has not been tested. The statement has been derived from the properties of the individual components.

Carcinogenicity

Assessment of carcinogenicity:
The chemical structure does not suggest a specific alert for such an effect.

Reproductive toxicity

Assessment of reproduction toxicity:
The chemical structure does not suggest such an effect. The product has not been tested. The statement has been derived from the properties of the individual components.

Developmental toxicity

Assessment of teratogenicity:
The chemical structure does not suggest such an effect. The product has not been tested. The statement has been derived from the properties of the individual components.

Other relevant toxicity information

Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

12. Ecological Information

Ecotoxicity

Assessment of aquatic toxicity:

At the present state of knowledge, no negative ecological effects are expected. There is a high probability that the product is not acutely harmful to aquatic organisms. The product has not been tested. The statement has been derived from products of a similar structure or composition.

Mobility

Assessment transport between environmental compartments:
No data available.

Persistence and degradability

Assessment biodegradation and elimination (H2O):
Inherently biodegradable. The insoluble fraction can be removed by mechanical means in suitable waste water treatment plants.

Bioaccumulation potential

Assessment bioaccumulation potential:
No data available concerning bioaccumulation.
Discharge into the environment must be avoided.

Additional information

Other ecotoxicological advice:
There is a high probability that the product is not acutely harmful to aquatic organisms. Do not discharge product into the environment without control. The product has not been tested. The statement has been derived from the properties of the individual components.

13. Disposal Considerations

Observe national and local legal requirements.
Residues should be disposed of in the same manner as the substance/product.

Contaminated packaging:
Contaminated packaging should be emptied as far as possible; then it can be passed on for recycling after being thoroughly cleaned.

14. Transport Information

Domestic transport:

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

15. Regulatory Information

Poisons Schedule: Not scheduled

Regulations of the European union (Labelling)

Directive 1999/45/EC ('Preparation Directive'):

The product does not require a hazard warning label in accordance with EC Directives.

Other regulations

If other regulatory information applies that is not already provided elsewhere in this safety data sheet, then it is described in this subsection.

Registration status:

AICS, AU	released / listed

16. Other Information

In addition to the information given in the safety data sheet we refer to the product specific 'Technical Information'.

Full text of hazard symbols and R-phrases if mentioned as hazardous components in chapter 3:

Xi	Irritant.
T	Toxic.
36/38	Irritating to eyes and skin.
23/24/25	Toxic by inhalation, in contact with skin and if swallowed.
34	Causes burns.
40	Limited evidence of a carcinogenic effect.
43	May cause sensitization by skin contact.

Vertical lines in the left hand margin indicate an amendment from the previous version.

The data contained in this safety data sheet are based on our current knowledge and experience and describe the product only with regard to safety requirements. The data do not describe the product's properties (product specification). Neither should any agreed property nor the suitability of the product for any specific purpose be deduced from the data contained in the safety data sheet. It is the responsibility of the recipient of the product to ensure any proprietary rights and existing laws and legislation are observed.

MASTER® BUILDERS SOLUTIONS | BASF We create chemistry

3 | 03 30 00 Cast-in-Place Concrete
03 40 00 Precast Concrete

MasterSet® FP 20

Accelerating Admixture

Description

MasterSet FP 20 admixture is a multi-component, non-chloride, water-reducing and accelerating admixture formulated to accelerate concrete setting time and increase early and ultimate strengths across a wide range of ambient temperatures (hot, mild, cold and subfreezing). MasterSet FP 20 admixture meets ASTM C 494/C 494M requirements for Type C, accelerating, and Type E, water-reducing and accelerating, admixtures.

Applications

Recommended for use in:

- Concrete being placed in subfreezing ambient conditions
- Reinforced, precast, pumped, flowable, lightweight or normal weight concrete and shotcrete (wet mix)
- Concrete placed on galvanized steel floor and roof systems
- Prestressed concrete
- Fast-track concrete construction
- Concrete subject to chloride ion limitations
- Self-consolidating concrete
- Pervious concrete
- 4x4™ Concrete

Features

- Accelerated setting time
- Especially effective for concrete placement at ambient temperatures as low as 20 °F (-7 °C)
- Superior workability
- Increased early and ultimate strengths
- Superior finishing characteristics for flatwork and cast surfaces

Benefits

- Earlier finishing of slabs – reduced labor costs
- Reduced in-place concrete costs
- Reduced or eliminated heating and protection time in cold weather
- Earlier stripping and reuse of forms

Performance Characteristics

Mixture Data

Type II cement, lb/yd^3 (kg/m^3)	600 (356)
Slump, in. (mm)	4 ± 1 (100 ± 25)
Air Content, %	Non-air-entrained concrete
Concrete Temperature	55 °F (12 °C)

Mild Weather

Setting Time: Ambient Temperature: 70 °F (21 °C)	Time of Set	
Mixture	**Initial Set (h:min)**	**Difference (h:min)**
Plain	4:30	REF
MasterSet FP 20 admixture @		
› 10 fl oz/cwt (650 mL/100 kg)	3:18	- 1:12

Cold Weather

Setting Time: Ambient Temperature: 50 °F (10 °C)

	Time of Set	
Mixture	**Initial Set (h:min)**	**Difference (h:min)**
Plain	5:48	REF
MasterSet FP 20 admixture @		
› 20 fl oz/cwt (1,300 mL/100 kg)	4:00	-1:48

Subfreezing Weather

Setting Time: Ambient Temperature: 30 °F (-1 °C)

	Time of Set	
Mixture	**Initial Set (h:min)**	**Difference (h:min)**
Plain	12:12	REF
MasterSet FP 20 admixture @		
› 60 fl oz/cwt (3,910 mL/100 kg)	3:54	- 8:18
› 90 fl oz/cwt (5,870 mL/100 kg)	2:24	- 9:48

Guidelines for Use

Dosage: The specific dosage of MasterSet FP 20 admixture for a given application is dependent on ambient and concrete temperatures, cement chemistry, concrete mixture proportions, the amount of set time acceleration needed and strength performance required. Listed below are the recommended dosage ranges for various weather applications.

Recommended Dosage for Mild and Cold Weather Applications: Use 5 - 60 fl oz/cwt (325 - 3,910 mL/100 kg) of cementitious material. As the dosage rate of MasterSet FP 20 admixture is increased, setting time is accelerated and early and ultimate strengths are increased.

Recommended Dosage for Subfreezing Weather Applications: Use 60 - 90 fl oz/cwt (3,910 - 5,870 mL /100 kg) of cementitious material to reduce the freezable water content of the mixture, to accelerate setting time and to provide early protection against freezing while the concrete is plastic in subfreezing temperatures.

Conservation of the heat generated by the concrete through the use of wind protection and/or insulation will permit placement in subfreezing ambient temperatures. See ACI 306.1, "Standard Specification for Cold Weather Concreting," and ACI 306 R, "Guide to Cold Weather Concreting" for recommended protection in cold weather.

Exposure to air movement, concrete surface to volume ratio, and mixture proportions affect performance under extreme cold weather conditions. Concrete containing MasterSet FP 20 admixture may reduce or eliminate the need for recognized protective measures and protection time required in cold or subfreezing weather concreting applications. Field evaluations of the concrete mixture selected for the project should be performed using local materials to determine: the optimum dosage rate of MasterSet FP 20 admixture required to achieve the desired setting time and strength performance, the minimum acceptable ambient and concrete temperatures for placement, and if the recognized protective measures and protection time required for cold and subfreezing weather concreting may be reduced or eliminated.

MasterKure ER 50 evaporation reducer is recommended to minimize evaporation of surface moisture. Concrete flatwork containing MasterSet FP 20 admixture that will be exposed to subfreezing weather conditions must be sealed to prevent the ingress of additional water to hardened concrete during curing. A surface sealer must be applied as soon as the concrete reaches initial set or finishing is complete.

Product Notes

Corrosivity – Non-Chloride, Non-Corrosive: MasterSet FP 20 admixture will neither initiate nor promote corrosion of reinforcing steel in concrete.

Compatibility: MasterSet FP 20 admixture can be used as a singular admixture or as a component in a BASF admixture system. When used with other admixtures, each admixture must be dispensed separately into the mixture.

In applications that require MasterSet FP 20 admixture dosages of 30 fl oz/cwt (1,950 mL/100 kg) or more, the use of a MasterGlenium® high-range water-reducing admixture is recommended to obtain increased water reduction and strength performance. **At such dosages, erratic slump behavior may be experienced when MasterSet FP 20 admixture is used in concrete mixtures that also contain naphthalene-based admixtures.**

Storage and Handling

Storage Temperature: MasterSet FP 20 admixture should be stored above freezing temperatures. If MasterSet FP 20 admixture freezes, thaw at 35 °F (2 °C) or above and completely reconstitute by mild mechanical agitation. **Do not use pressurized air for agitation.**

Shelf Life: MasterSet FP 20 admixture has a minimum shelf life of 12 months. Depending on storage conditions, the shelf life may be greater than stated. Please contact your local sales representative regarding suitability for use and dosage recommendations if the shelf life of MasterSet FP 20 admixture has been exceeded.

Packaging

MasterSet FP 20 admixture is supplied in 55 gal (208 L) drums, 275 gal (1040 L) totes and by bulk delivery.

Related Documents

Safety Data Sheets: MasterSet FP 20 admixture

Additional Information

For additional information on MasterSet FP 20 admixture or its use in developing a concrete mixture with special performance characteristics, contact your local sales representative.

The Admixture Systems business of BASF's Construction Chemicals division is the leading provider of solutions that improve placement, pumping, finishing, appearance and performance characteristics of specialty concrete used in the ready-mixed, precast, manufactured concrete products, underground construction and paving markets. For over 100 years we have offered reliable products and innovative technologies, and through the Master Builders Solutions brand, we are connected globally with experts from many fields to provide sustainable solutions for the construction industry.

Limited Warranty Notice

BASF warrants this product to be free from manufacturing defects and to meet the technical properties on the current Technical Data Guide, if used as directed within shelf life. Satisfactory results depend not only on quality products but also upon many factors beyond our control. BASF MAKES NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS. The sole and exclusive remedy of Purchaser for any claim concerning this product, including but not limited to, claims alleging breach of warranty, negligence, strict liability or otherwise, is shipment to purchaser of product equal to the amount of product that fails to meet this warranty or refund of the original purchase price of product that fails to meet this warranty, at the sole option of BASF. Any claims concerning this product must be received in writing within one (1) year from the date of shipment and any claims not presented within that period are waived by Purchaser. BASF WILL NOT BE RESPONSIBLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR PUNITIVE DAMAGES OF ANY KIND.

Purchaser must determine the suitability of the products for the intended use and assumes all risks and liabilities in connection therewith. This information and all further technical advice are based on BASF's present knowledge and experience. However, BASF assumes no liability for providing such information and advice including the extent to which such information and advice may relate to existing third party intellectual property rights, especially patent rights, nor shall any legal relationship be created by or arise from the provision of such information and advice. BASF reserves the right to make any changes according to technological progress or further developments. The Purchaser of the Product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with a full application of the product(s). Performance of the product described herein should be verified by testing and carried out by qualified experts.

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We create chemistry

Safety Data Sheet
KELCO-CRETE DG

1. Identification

Product identifier used on the label

KELCO-CRETE DG

Recommended use of the chemical and restriction on use
Recommended use*: for industrial use only

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
BASF Canada Inc.
100 Milverton Drive
Mississauga, ON L5R 4H1, CANADA

Telephone: +1 289 360-1300

Distributed By: Chemroy Canada Inc.
106 Summerlea Road
Brampton, ON
Canada L6T 4X3
Emergency Number: Terrapure 1-800-567-7455

Emergency telephone number

CANUTEC (reverse charges): (613) 996-6666
BASF HOTLINE: (800) 454-COPE (2673)

Other means of identification
Chemical family: No data available.

2. Hazards Identification

According to Hazardous Products Regulations (HPR) (SOR/2015-17)

Classification of the product

Combustible Dust Combustible Dust (1) Combustible Dust

Label elements

Signal Word:
Warning

Hazard Statement:

May form combustible dust concentration in air.

Hazards not otherwise classified

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition / Information on Ingredients

According to Hazardous Products Regulations (HPR) (SOR/2015-17)

No particular hazards known.

According to Controlled Products Regulations (CPR) (SOR/88-66)

Does not contain any hazardous ingredients.

4. First-Aid Measures

Description of first aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Keep patient calm, remove to fresh air.

If on skin:
Wash thoroughly with soap and water.

If in eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

If swallowed:
Rinse mouth and then drink plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms: No significant symptoms are expected due to the non-classification of the product.
Hazards: No hazard is expected under intended use and appropriate handling.

Indication of any immediate medical attention and special treatment needed

Note to physician
Treatment: Symptomatic treatment (decontamination, vital functions).

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
foam, water spray, dry powder, carbon dioxide

Unsuitable extinguishing media for safety reasons:
water jet

Special hazards arising from the substance or mixture
Hazards during fire-fighting:
carbon oxides

carbon dioxide, carbon monoxide, harmful vapours, nitrogen oxides, fumes/smoke, carbon black

Advice for fire-fighters
Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus.

Further information:
Dusty conditions may ignite explosively in the presence of an ignition source causing flash fire.

6. Accidental release measures

Further accidental release measures:
Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Avoid the formation and build-up of dust - danger of dust explosion. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition.

Personal precautions, protective equipment and emergency procedures
Do not breathe dust. Wear eye/face protection. Use personal protective clothing. Handle in accordance with good building materials hygiene and safety practice.

Environmental precautions
Contain contaminated water/firefighting water. Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up
Nonsparking tools should be used.

7. Handling and Storage

Precautions for safe handling
Avoid raising dust. Wear suitable protective clothing and eye/face protection. Avoid inhalation of dusts/mists/vapours. Breathing must be protected when large quantities are decanted without local exhaust ventilation.

Protection against fire and explosion:
Avoid dust formation. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate

precautions, such as electrical grounding and bonding, or inert atmospheres. Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids (2013 Edition) for safe handling.

Dust explosion class: Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1).

Conditions for safe storage, including any incompatibilities
No applicable information available.

Further information on storage conditions: Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Protect from direct sunlight.

8. Exposure Controls/Personal Protection

No occupational exposure limits known.

Advice on system design:
It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Personal protective equipment

Respiratory protection:
Wear respiratory protection if ventilation is inadequate.

Hand protection:
Chemical resistant protective gloves, Manufacturer's directions for use should be observed because of great diversity of types.

Eye protection:
Safety glasses with side-shields.

Body protection:
Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

General safety and hygiene measures:
Avoid inhalation of dusts. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Avoid exposure - obtain special instructions before use. Handle in accordance with good building materials hygiene and safety practice. When using, do not eat, drink or smoke. Hands and/or face should be washed before breaks and at the end of the shift. At the end of the shift the skin should be cleaned and skin-care agents applied. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks).

9. Physical and Chemical Properties

Form:	powder
Odour:	mild
Odour threshold:	not determined
Colour:	white to tan

pH value:	approx. 7 (1 %(m)) neutral
decomposition point:	approx. 448 K
---	
boiling temperature:	not applicable
Sublimation point:	No applicable information available.
Flash point:	not applicable
Flammability:	not highly flammable
Lower explosion limit:	For solids not relevant for classification and labelling.
Upper explosion limit:	For solids not relevant for classification and labelling.
Autoignition:	No applicable information available.
Vapour pressure:	not applicable
Density:	not determined
Relative density:	No applicable information available.
Bulk density:	not determined
Vapour density:	not applicable
Partitioning coefficient n-octanol/water (log Pow):	not applicable for mixtures
Self-ignition temperature:	351 °C
Thermal decomposition:	No decomposition if stored and handled as prescribed/indicated.
Viscosity, dynamic:	(20 °C) not applicable, the product is a solid
Viscosity, kinematic:	(20 °C) not applicable, the product is a solid
Solubility in water:	soluble, Forms a viscous solution.
Solubility (quantitative):	No applicable information available.
Solubility (qualitative):	No applicable information available.
Evaporation rate:	The product is a non-volatile solid.
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Oxidizing properties:
not determined

Dust explosivity characteristics:
Kst: 200 m.bar/s

Dust explosion class:
Dust explosion class 1 (Kst-value >0 up to 200 bar m s-1) (St 1)

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
Dust explosion hazard.

Conditions to avoid

See MSDS section 7 - Handling and storage.

Incompatible materials
strong acids, strong bases, strong oxidizing agents, strong reducing agents

Hazardous decomposition products

Decomposition products:
No hazardous decomposition products if stored and handled as prescribed/indicated.

Thermal decomposition:
No decomposition if stored and handled as prescribed/indicated.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity
Assessment of acute toxicity: Virtually nontoxic after a single ingestion. Virtually nontoxic by inhalation. Virtually nontoxic after a single skin contact. Based on available Data, the classification criteria are not met. The product has not been tested. The statement has been derived from the properties of the individual components.

Oral
No applicable information available.

Inhalation
No applicable information available.

Dermal
No applicable information available.

Assessment other acute effects
Assessment of STOT single:
The available information is not sufficient for evaluation.

Irritation / corrosion
Assessment of irritating effects: No irritation is expected under intended use and appropriate handling. Based on available Data, the classification criteria are not met.

Eye
Species: rabbit
Result: non-irritant

Sensitization
Assessment of sensitization: Skin sensitizing effects were not observed in animal studies.

Species: guinea pig
Result: Non-sensitizing.
Method: OECD Guideline 406

Aspiration Hazard
No aspiration hazard expected.

Chronic Toxicity/Effects

Repeated dose toxicity
Assessment of repeated dose toxicity: No reliable data was available concerning repeated dose toxicity. Based on available Data, the classification criteria are not met.

Genetic toxicity
Assessment of mutagenicity: The chemical structure does not suggest a specific alert for such an effect. Based on available Data, the classification criteria are not met.
Genetic toxicity in vitro: OECD Guideline 471 Ames-test S. typhimurium, E. coli:negative

Carcinogenicity
Assessment of carcinogenicity: The chemical structure does not suggest a specific alert for such an effect. Based on available Data, the classification criteria are not met.

Reproductive toxicity
Assessment of reproduction toxicity: The chemical structure does not suggest a specific alert for such an effect. Based on available Data, the classification criteria are not met.

Teratogenicity
Assessment of teratogenicity: The chemical structure does not suggest a specific alert for such an effect. Based on available Data, the classification criteria are not met.

Other Information
Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statements on toxicology have been derived from the properties of the individual components.

Symptoms of Exposure

No significant symptoms are expected due to the non-classification of the product.

12. Ecological Information

Toxicity

Aquatic toxicity
Assessment of aquatic toxicity:
Based on available Data, the classification criteria are not met. There is a high probability that the product is not acutely harmful to aquatic organisms.

Toxicity to fish
LC50 (96 h) > 100 mg/l, Oncorhynchus mykiss

Aquatic invertebrates
EC50 (48 h) > 100 mg/l, Daphnia magna (OECD Guideline 202, part 1)

Aquatic plants
EC50 (72 h) 100 mg/l, Scenedesmus subspicatus (OECD Guideline 201)

Microorganisms/Effect on activated sludge

Toxicity to microorganisms
OECD Guideline 209 activated sludge/EC50 (3 h): > 1,000 mg/l

Persistence and degradability

Assessment biodegradation and elimination (H2O)
Readily biodegradable (according to OECD criteria).

Elimination information

95 % (28 d) (OECD 301B; ISO 9439; 92/69/EEC, C.4-C) (aerobic) Readily biodegradable.

Bioaccumulative potential

Assessment bioaccumulation potential
Discharge into the environment must be avoided.

Mobility in soil

Assessment transport between environmental compartments
No data available.

Additional information

Other ecotoxicological advice:
Do not discharge product into the environment without control. The product has not been tested. The statements on ecotoxicology have been derived from the properties of the individual components.

13. Disposal considerations

Waste disposal of substance:
Dispose of in accordance with local authority regulations. Do not discharge into drains/surface waters/groundwater.

Container disposal:
Contaminated packaging should be emptied as far as possible; then it can be passed on for recycling after being thoroughly cleaned.

14. Transport Information

Land transport
TDG

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Federal Regulations

Registration status:
Chemical DSL, CA released / listed

THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

16. Other Information

SDS Prepared by:
BASF NA Product Regulations
SDS Prepared on: 2016/05/05

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

END OF DATA SHEET

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PQ Corporation is a privately held global enterprise operating in 20 countries, with annual revenues in excess of $500 million. PQ is a leading producer of silicate, zeolite, and other performance materials serving the detergent, pulp and paper, chemical, petroleum, catalyst, water treatment, construction, and beverage markets.

Potters Industries, PQ's wholly owned subsidiary, is a leading producer of engineered glass materials serving the highway safety, polymer additive, fine abrasive, and conductive product markets.

Bulletin 17-70

PQ® Liquid Sodium and Potassium Silicates - Storage and Handling

Liquid sodium and potassium silicates constitute two families of products, which range from moderately to strongly alkaline. Specific products within these families are usually defined by their silica-to-alkali "ratios" (i.e., SiO_2:Na_2O or SiO_2:K_2O weight ratios), in addition to other characteristics such as concentration, density, and viscosity.

PQ® liquid sodium silicates are aqueous solutions that range from pH 11.3 for 3.22 ratio products to pH 13.4 for 1.6 ratio solutions. PQ's potassium silicates range in pH from 11.3 for 2.5 ratio to 11.9 for 1.6 ratio.

HANDLING PRECAUTIONS

Because of their alkalinity, care should be exercised in working with sodium and potassium silicates. In addition, silicate that has dried will become glass-like, thereby presenting a cut hazard. A thorough knowledge regarding the proper handling procedures and safety precautions of the silicate products should be employed by all users. All persons involved in handling the products should familiarize themselves with the first-aid procedures in the event of skin and eye contact or ingestion.

This information, along with procedures for handling spills, is provided in Material Safety Data Sheets (MSDS) supplied by PQ Corporation. The user should keep copies of the MSDS on file. For additional MSDS, contact the PQ Customer Assistance Center at 800-944-7411 or visit www.pqcorp.com. For chemical emergencies, call Chemtrec at 800-424-9300.

Personal Protection. Personnel involved in unloading and/or handling liquid sodium and potassium silicates should utilize protective clothing and equipment to prevent accidental contact. This equipment generally consists of: hard hat, chemical goggles or face shield, alkali-resistant rubber gloves, safety footwear, and coveralls.

STORAGE ISSUES FOR LIQUID SILICATES

Storage Temperature. It is good practice to store liquid silicates at the lowest temperature needed to maintain a pumpable viscosity (i.e., 150-200 cP). Storage temperature will vary with each different product (see Figure 1). Higher temperatures may promote dehydration of the silicate, thus causing a surface skin to form. Tank agitation is necessary to prevent this gelatinous silicate skin from sinking to the bottom of the tank, building up on tank walls, plugging lines, or interfering with processes downstream. ***Liquid silicates should always be stored at a temperature below 140°F (60°C).*** For guidance on storage temperature for a particular product, contact PQ Technical Service at 610-651-4507.

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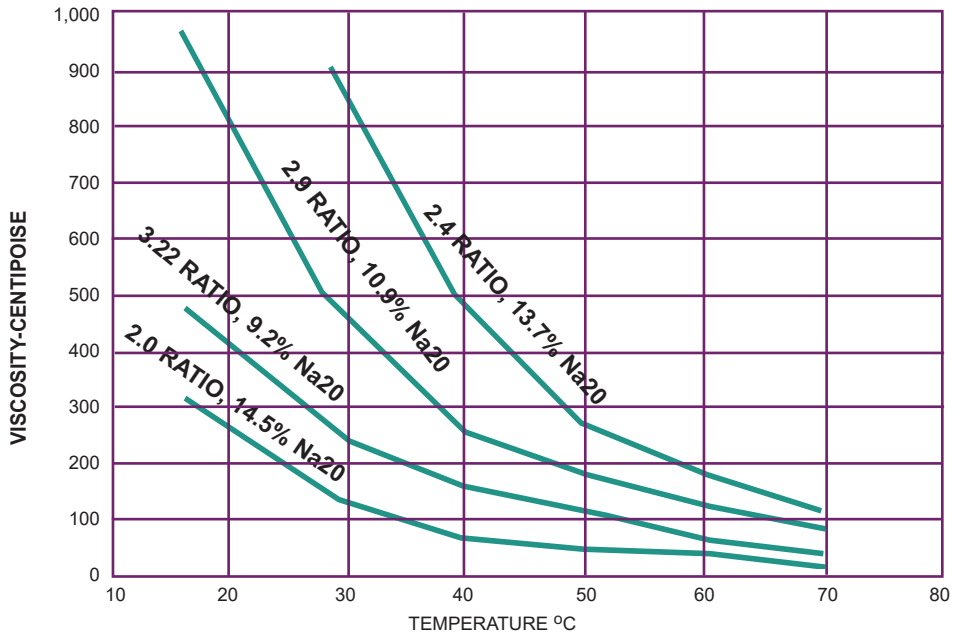
FIGURE 1—VISCOSITY OF SODIUM SILICATE AS A FUNCTION OF TEMPERATURE



Freezing. The freezing point of sodium and potassium silicate solutions is nearly the same as water, 32°F (0°C). If silicate cools to the freezing point, the water component of the solution begins to crystallize into ice, and this leaves the remaining portion of liquid over-saturated with respect to silica (SiO_2). As a result, the silica polymerizes into a gel. It may be possible to reconstitute frozen sodium silicate if it is thawed carefully and then mixed vigorously. It is significantly more difficult, however, to reconstitute frozen potassium silicate, and in most cases the product cannot be recovered.

The performance of a recovered product may not equal that of the original material. For more information on recovering frozen silicate, contact PQ Technical Service at 610-651-4507.

Minimizing the Accumulation of Storage Tank Sediment. It is the nature of sodium and potassium silicate liquid, regardless of the manufacturing method, to contain a small amount of suspended particles that can accumulate over time at the bottom of the storage tank. To minimize this accumulation of sediment, PQ recommends sloped-bottom or cone-bottom tanks. Recirculation of the liquid in the tank and prevention of silicate dehydration will also help. In addition, a maintenance schedule of inspection and tank cleaning is strongly recommended. If sediment is not controlled, tank capacity may be reduced, lines may become plugged, and soft gelatinous sediment may transform into a hard, persistent mass that can be costly to remove. If a routine maintenance program has not been implemented and removal of accumulated sediment becomes necessary, PQ can help identify the type of sediment that has collected and provide a list of professionals who can remove it. Although not hazardous, storage tank sediment is a regulated waste and should be disposed of in accordance with federal, state, and local regulations.

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TANK RECOMMENDATIONS FOR BULK STORAGE OF LIQUID SILICATES

Liquid silicates can be stored in either horizontal or vertical tanks constructed of carbon steel, stainless steel, fiberglass-reinforced plastic, or other suitable materials.

NOTE: Aluminum and brass tanks and fittings are not suitable for liquid silicate storage since they can be attacked by alkaline solutions.

Storage tanks and their supporting structures should be designed to contain liquid silicates with densities ranging from 1.31 to 1.68 g/cm^3 (82 to 105 lb/ft^3). Also, the tanks should meet all local code requirements and regulations. To reduce the accumulation of tank sediment, PQ recommends implementing one of the following:

- Use a tank with a cone bottom, and pipe the outlet line to come directly off the bottom.
- Use a tank with the bottom sloped to the outlet line.
- Install an agitator or tank recirculation system.

Commercial recirculation systems consist of a pump and piping installed several inches above the tank bottom. The pipe assembly may be circular with eductors at intervals around the circumference of the circle. Compressed air can be used as the motive force.

Tank Location. It is desirable to locate liquid silicate storage tanks in a heated building to minimize the possibility of the silicate freezing and to avoid pumping problems associated with increasing product viscosities due to cold weather.

For tanks located outside or in unheated buildings, provisions should be made for insulating the tank and/or for heating the contents with an external coil and low-pressure steam. This will prevent the liquid silicate from freezing and maintain a suitable viscosity for pumping (see Figure 1 for guidelines).

Heating Methods. When heating of the silicate becomes necessary, external heating is preferred. This may be provided by electrical heating tapes and/or blankets, or external steam plates (15 psig maximum steam pressure is recommended). Continuous agitation of the silicate is suggested to prevent localized over-heating and possible dehydration. Agitation can be accomplished by providing a recirculation loop between the storage tank and the day tank or the process equipment via a return bypass.

Internal heating is generally not advisable. It can cause localized dehydration of the silicate, resulting in a buildup of solid silicates on the heating surfaces. If internal heating is used, the silicate temperature should not exceed 140°F and continuous mixing of the contents is recommended. Internal surfaces should be inspected regularly for solids buildup. If buildup occurs, the tank should be emptied and the silicate buildup should be removed by dissolving it with steam and/or a dilute solution of caustic soda (NaOH).

NOTE: Do not heat fiberglass or plastic tanks. If heat is applied and there is no mixing, dehydration occurs and the resultant hard, dehydrated product cannot be cleaned by the usual methods without damaging the tanks.

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Tank Fittings. To ensure proper performance and facilitate maintenance, liquid silicate storage tanks should be fitted with the following:

- A 48-inch diameter manhole, with a hinged or bolted cover to permit access for inspection and cleaning.
- An appropriate liquid-level indicator. This can be a measuring stick calibrated to the tank's capacity per unit of liquid level, a sight glass, or a more complex liquid-level measuring instrument.
- A vent, properly sized for the tank volume and pumping rate.
- A silicate filling inlet line at the top of the tank.
- A silicate removal line at the bottom of the tank.
- An overflow line for spill control, to protect paint and insulation, and to ensure maximum liquid head space in the tank.
- A 20- to 24-inch bolted side port, with an alkaline-resistant gasket, near the bottom of the tank for cleaning and inspection.
- Ladders and platforms necessary to provide access to the top of the tank, valves, fittings, etc., which comply with OSHA requirements.
- It is good practice to use an overflow alarm system to prevent spills of the product.

Spill Containment. Provisions should be made to provide secondary containment of storage tanks and loading areas, if not required by local environmental regulations. This will avoid loss of product and/or environmental contamination due to spills or leakage.

Generally, the secondary containment should be sized to hold the contents of the largest storage tank plus 10% excess. All valves that penetrate the dike walls of the secondary containment should be closed and locked down when not in use.

Annual Inspection. New tanks should be washed and rinsed before filling to remove scale, grease, and dirt. Metal tanks should then be "painted" inside with a dilute silicate solution to prevent rust. Thereafter, they should be inspected periodically for structural defects, corrosion, and other potential hazards or contamination.

Tanks should be inspected externally for any signs of leaks. The tank vent and overflow lines should be inspected, and any blockage or buildup of material or debris removed. Insulated tanks should be inspected for rain intrusion. Check capping and flashing at the top of the tank, and make sure the rainwater drain line is clear. The insulation at the bottom of the tank should be checked for wicking or other signs of water intrusion that cause rust. External steam coils should be pressure tested annually.

The tank should be inspected internally for the accumulation of sediment and, if necessary, emptied and cleaned to remove the sediment.

PUMPS & PIPING

Pumps for handling liquid silicates are selected on the basis of the viscosity of the product(s) to be used, temperature conditions, required flow rates, and piping system characteristics.

Pumps should be equipped with casing drains to permit draining and washing when the need arises.

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Ordinary iron-pump bushings are satisfactory. Carbon-graphite bushings should not be used.

Positive Displacement Pumps. For flows less than 10 gpm, and for higher viscosity liquid silicates (above 400 cP), positive displacement pumps are preferred. They are self-priming and operate against a suction lift. (For higher flow rates, either positive displacement or centrifugal pumps are typically used).

A relief loop arrangement should be provided to relieve pressure if there is a blockage on the pump's delivery side, thus avoiding pump or piping damage and a possible unsafe condition. The stuffing box should be deeper than normal to allow maximum absorption of any silicate that might seep past the ring seal.

Centrifugal Pumps. These pumps can be used with low viscosity silicates (less than 400 cP). Higher viscosity products can cause slippage and cavitation of the material, resulting in elevated temperatures due to friction. This in turn may cause dehydration of the silicate and excessive wear of the pump. Centrifugal pumps of 1750 rpm are recommended, rather than 3500 rpm pumps.

Diaphragm Pumps. This type of pump has been used successfully to move silicate products. They are efficient when pressurized air lines are available.

Pump Relief Valve. A 2-inch Cash Standard Class D relief valve set at 15 psi should be installed in the pump discharge line to allow liquid to return to storage when it is not being pumped to a batching tank or to process. All piping suction discharge lines should be a 1/2 inch larger in diameter than the pump ports.

NOTE: It is suggested that you consult your pump supplier for additional information and assistance needed to select the proper type and size of pump for the silicate product(s) you process.

Piping. Liquid silicates can be handled in carbon-steel (black iron) or stainless-steel pipes. Brass, copper, or aluminum pipes should NOT be used.

The size of piping is determined based on the distance the silicate is pumped, the pumping rate, and its viscosity.

Tees should be installed in place of elbows at key locations to permit easy cleaning.

In order to minimize viscosity changes due to wide temperature variations, it may be desirable to insulate the piping.

Valves. Cast-iron or carbon-steel valves are suitable. "Teflon® "-coated plug valves, butterfly valves, and gate valves are preferred. Globe valves, which may stick more easily, are less desirable.

If lines are not kept completely full, steam or a warm alkaline solution should be used to purge valves when not in use.

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Meters. In-line meters are useful in maintaining accurate process control. Mass flow meters offer accurate readings, which are independent of changes in viscosity, temperature, or density.

Strainers. These are often employed to prevent contamination of mixtures or downstream equipment with large particles. Screens of 1/8 - to 1/4 -inch size are usually used, but actual selection will depend on pump clearances and/or tolerance of the process to particle size variation and amount of solids.

As a general rule, the screen area should be four times the cross-sectional area of the pipe. Basket or Y strainers are suggested. The following basket sizes are recommended, based on the flow rate:

Flow, gpm	Basket Size
18	1 ”
50	2 ”
140	3 ”
250	4 ”
550	6 ”

UNLOADING BULK SHIPMENTS

Bulk shipments of PQ liquid sodium and potassium silicates are generally shipped in tank trucks or railroad tank cars. The following suggestions are provided to facilitate safe and efficient unloading operations.

Personal Safety Precautions. Refer to “Handling Precautions” on page 1.

Pre-Shipment Planning. PQ customers, especially new customers, can expedite deliveries by providing the following information when placing their orders:

- Diameter of the inlet pipe and the type of fitting provided (i.e., threaded, quick-connect, etc.). Its diameter should be at least 3 inches.

- Distance from the inlet pipe to the location at which the tank or truck car will be unloaded. Normally, a tank truck is equipped with 40 feet of hose. The carrier may be notified if additional hose is required, and the customer will be charged for this service.

It is recommended that bulk liquid silicate storage tanks be located near the delivery point and, preferably, not far from the process point where it will be used.

The equipment and facilities that come in contact with the silicate when it is delivered should be clean and free of any contaminants to ensure the product’s integrity. Also, the customer should check storage tank levels prior to delivery to be certain there is sufficient tank capacity available to accept the quantity received.

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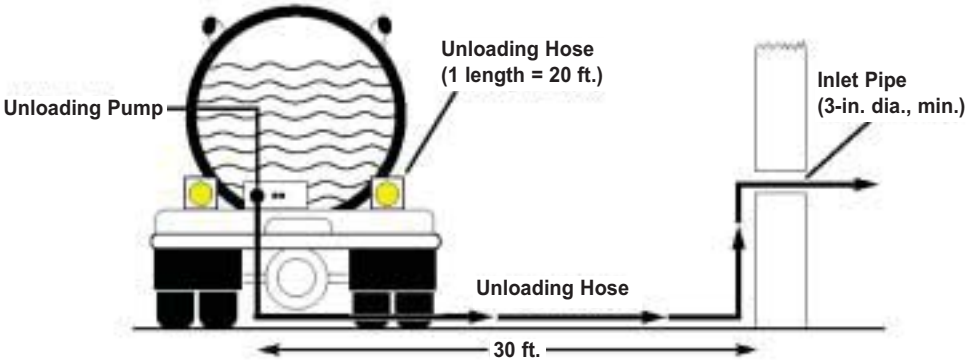
FIGURE 2—TYPICAL ARRANGEMENT FOR UNLOADING OF LIQUID SODIUM AND POTASSIUM SILICATES FROM A TANK TRUCK



TANK TRUCK UNLOADING

It is recommended that quality checks of the product be made before it is unloaded. Tank trucks should be positioned for unloading on a containment pad that provides sufficient capacity to contain the contents of the trailer in the event of an accidental spill.

Usually, 3-inch flexible hoses are used for unloading liquid silicates to minimize delivery time. These are supplied by the carrier and are provided with various sizes and types of fittings, including a quick-connect coupling.

Transfer from tank trucks is usually accomplished in one of the following ways:

Gravity – The material flows by gravity directly to storage or to a customer-supplied pumping station.

Truck-Mounted Pump – The pump transfers the silicate to the customer's storage tank.

Compressed Air – Pressurized air is supplied by the customer from a truck-mounted unit. Generally, when compressed air unloading is going to be used, the customer should advise the PQ sales or customer service representative at the time the order is placed. The fill line connection should be no more than 3 feet above ground level, and it should be threaded and capped to prevent entry of foreign material.

A typical arrangement for unloading tank trucks is shown in Figure 2.

TANK CAR UNLOADING

In addition to the precautions for handling liquid silicates as described on previous pages, the following DOT-required safety precautions should be followed with railroad tank cars:

- Be sure handbrake is set and wheels are blocked after the car is spotted.
- Place appropriate Federal Railway Administration (FRA) caution signs at each end of car warning that it is being unloaded or connected.
- Be sure derail attachments are in place at the ends of the siding.
- Goggles or face shields should be worn. Transfer of liquid silicate from tank cars to storage can be accomplished by the following means:

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Gravity or Pumping – These are the preferred methods.

When using either of these methods, it is important that the tank car shell be vented by opening the car's dome cover; or with domeless tank cars by opening the vacuum relief valve. Once vented, the car's outlet valve is opened and the contents are transferred.

The car interior should be inspected once unloading has been completed.

Compressed Air – This is the least desirable method for use with tank cars.

If this method is employed, however, an air-control assembly must be applied carefully, and the air pressure should never exceed 25 psi during unloading.

The sound of clear air through the discharge line signals the completion of the unloading process. After the air pressure has been released, the car interior should be inspected to ensure it is empty.

Figure 3 shows a typical arrangement for unloading a rail tank car.

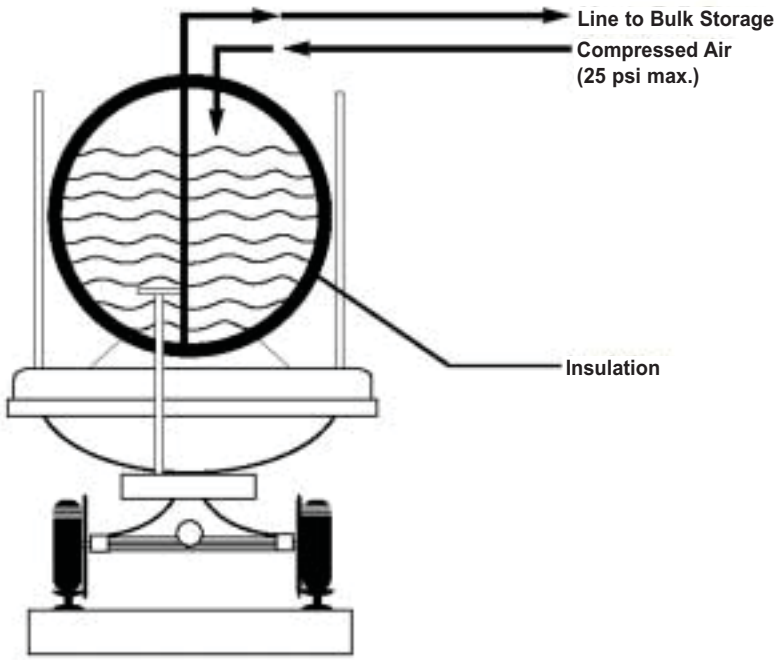
PERIODIC MAINTENANCE OF SILICATE STORAGE SYSTEMS

It is good practice to examine the equipment and facilities employed for unloading, storing, and distributing liquid silicates on a regular basis. This will ensure consistent product quality and trouble-free equipment operation.

PUMPS

- Check pumps, renew packing, and clean as required – including drive motors.
- Check water supply and drainage at packing gland (where water is used in the lantern ring) or over the gland.

FIGURE 3—TYPICAL ARRANGEMENT FOR UNLOADING LIQUID SODIUM OR POTASSIUM SILICATES FROM A TANK CAR WITH COMPRESSED AIR



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- Check operation of pressure relief valve on rotary positive displacement pumps.
- Check manual suction and discharge shut-off valves for good operation, including packing around stems. Renew as required.
- Check strainers.

CARE AND MAINTENANCE OF STUFFING BOX AND PUMP SHAFT

The stuffing box should be deeper than normal to allow for the maximum absorption of any silicates that might seep past the ring seal. Care should be used when installing the packing. This includes tightening the follower itself after the packing has been properly installed. Tightening the follower with either water or grease will promote good performance. The adjusting nuts on the follower should be taken up uniformly and finger-tight. Excessive tightening will squeeze the packing, increase the friction at the shaft contact surfaces, and accelerate wear with attendant leakage around the shaft. Progressive tightening will tend to aggravate wear on these surfaces.

It is good practice to drip water onto the motor shaft at the seal to dissolve any silicate which might seep through the seal and otherwise dry on the shaft, damaging the seal. Water can also be piped through the lantern ring with a 1/4 -inch copper tubing to a 1/4 -inch hole drilled in the gland just behind the gland flange, or to the outside in front of the flange. This should not be done under pressure because the water could then work its way back past the seal, into the silicate, and dilute it. A Teflon-type stuffing material should be used in the stuffing box.

VALVES

- Check all valves in the distribution system for good operation and proper closure.
- Check valve-stem packing and renew as required. Remove faulty valves and replace them.
- Check foot valve in tank on pump suction line, where used, in conjunction with cleaning.

STORAGE TANKS

- Check liquid-level indicators for performance.
- Check top manhole cover. Be sure it is properly in place at all times.
- Check air vent to determine that it is open to the atmosphere.
- Check the heating system where used. If submerged coils are used, clean them at the same time as the tank. Neglecting this operation contributes to buildup of silicate solids on the coils, resulting in poor heat transfer.
- Check thermostatic controls.
- Check for accumulation of sediment by surrounding the tank with a steel rod or a weighted tape measure.
- Schedule tank cleaning if needed. Remove sediment manually or by high-pressure water jet. Disposal of waste should be in compliance with federal, state, and local environmental requirements.

SAFETY DATA SHEET

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

Product Name	**N® Sodium Silicate Solution**
Alternative names	Sodium silicate solution (2.6<MR<=3.2)
CAS No.	1344-09-8
EINECS No.	215-687-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified use(s)	General purpose industrial chemical for use in a wide range of applications. Binding agent ; Corrosion inhibitor ; Dust binding agent ; Flame retardant or fire preventing agent ; Flotation agent ; Stabiliser ; Viscosity control agent
Uses advised against	None known.

1.3 Details of the supplier of the safety data sheet

Company Identification	PQ Corporation P.O. Box 840 Valley Forge PA 19482 USA
Telephone:	+1 610-651-4200
E-Mail (competent person)	sds.uk@pqcorp.com

1.4 Emergency telephone number

Emergency Phone No.	+1 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification	Skin Irrit. 2 Eye Irrit. 2
Hazards summary	Alkaline. Irritating to eyes and skin. Spilled material is slippery

2.2 Label elements

Hazard pictogram(s)

Signal word(s)	Warning
Hazard statement(s)	H315: Causes skin irritation. H319: Causes serious eye irritation.

Precautionary statement(s)	P262: Do not get in eyes, on skin, or on clothing. P280: Wear protective gloves/protective clothing/eye protection/face protection. P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
2.3 Other hazards	Dries to form glass film which can easily cut skin. Can etch glass if not promptly removed.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Regulation (EC) No. 1272/2008 (CLP)

Ingredient(s)	%W/W	CAS No.	EINECS No. / REACH Registration	Hazard symbol(s) and hazard statement(s)
Silicic acid, sodium salt	37.5	1344-09-8	215-687-4	H315 : Skin Irrit. 2 ; H319 : Eye Irrit. 2
Water	62.5	7732-18-5	231-791-2	

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Eye Contact	Irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 15 minutes. Obtain immediate medical attention.
Skin Contact	Wash affected skin with plenty of water. If symptoms develop, obtain medical attention.
Inhalation	Remove patient from exposure, keep warm and at rest. Obtain medical attention.
Ingestion	Do not induce vomiting. Wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain medical attention.
4.2 Most important symptoms and effects, both acute and delayed	Alkaline. Irritating to eyes and skin. The toxicity of sodium silicate is dependent on the silica to alkali ratio and on the pH.
4.3 Indication of any immediate medical attention and special treatment needed	Obtain immediate medical attention.

SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable Extinguishing Media	Compatible with all standard fire fighting techniques.
Unsuitable extinguishing Media	None known.
5.2 Special hazards arising from the substance or mixture	Not applicable. Aqueous solution. Non-combustible.
5.3 Advice for fire-fighters	None.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures	Wear suitable protective clothing. Wear eye/face protection.

6.2 Environmental precautions	Do not allow to enter drains, sewers or watercourses. Advise Authorities if spillage has entered water course or sewer or has contaminated soil or vegetation.
6.3 Methods and materials for containment and cleaning up	Caution - spillages may be slippery. Contain spillages with sand, earth or any suitable adsorbent material. Transfer to a container for disposal or recovery.
6.4 Reference to other sections	See Also Section 8.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling	Avoid contact with eyes, skin and clothing. Avoid generation of mist. Provide adequate ventilation. Emergency shower and eye wash facilities should be readily available. See Also Section 8
7.2 Conditions for safe storage, including any incompatibilities	Storage temperature 0-95º C. Loading temperature 45-95 º C. Do not allow material to freeze. Provide an adequate bund wall. Unsuitable containers: Aluminium See Also Section 10.
7.3 Specific end use(s)	See also Annex to the extended Safety Data Sheet.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

SUBSTANCE.	Occupational Exposure Limits
Silicic acid, sodium salt	No Occupational Exposure Limit assigned. An exposure limit of 2 mg/m3 (15 min TWA) is recommended by analogy with sodium hydroxide (UK EH40).

8.2 Exposure controls	Wear protective equipment to comply with good occupational hygiene practice. Do not eat, drink or smoke at the work place.
8.2.1 Appropriate engineering controls	Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions.
8.2.2 Personal Protection	
Respiratory protection	Respiratory protection not normally required. Advice on respiratory protective equipment is given in the HSE (Health and Safety Executive) publication HS(G)53.
Eye/face protection	Chemical goggles (EN 166).
Skin protection	Wear suitable protective clothing and gloves. Plastic or rubber gloves. For example EN374-3, level 6 breakthrough time (>480min). Wear suitable overalls.
8.2.3 Environmental Exposure Controls	The primary hazard of sodium silicate is the alkalinity. Avoid release to the environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Liquid. Almost colourless.
Odour	Odourless.
Odour Threshold (ppm)	Not applicable.
pH (Value)	Alkaline. 11-12
Freezing Point (°C)	Not applicable.
Melting Point (°C)	Not applicable.
Boiling Point (°C)	100
Flash Point (°C) [Closed cup]	Not applicable.

Evaporation rate	Not applicable.
Flammability (solid, gas)	Not applicable.
Explosive Limit Ranges	Not applicable.
Vapour Pressure (mm Hg)	Not applicable.
Vapour Density (Air=1)	No data.
Density (g/ml)	1.41 g/cm3 (20ºC), 42.0º Bé, 11.75 lbs/gal
Solubility (Water)	Soluble.
Solubility (Other)	No data.
Partition Coefficient	No data.
Auto Ignition Point (°C)	Not applicable.
Decomposition Temperature (°C)	Not applicable.
Viscosity (mPa. s)	Not applicable.
Explosive properties	Not applicable.
Oxidising Properties	Not applicable.
9.2 Other information	No data.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity	See Section: 10.3
10.2 Chemical stability	Stable.
10.3 Possibility of hazardous reactions	When arc welding vessels containing aqueous solutions of this material, take care to control any explosion risk from hydrogen evolved by electrolysis. Aqueous solutions will react with aluminium, zinc, tin and their alloys evolving hydrogen gas which can form an explosive mixture with air. Can react violently if in contact with acids. Can react with sugar residues to form carbon monoxide.
10.4 Conditions to avoid	See Section: 10.3
10.5 Incompatible materials	See Section: 10.3
10.6 Hazardous decomposition product(s)	None known.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Ingestion	All symptoms of acute toxicity are due to high alkalinity. Material will cause irritation. Oral LD50 (rat) 3400 mg/kg bw
Inhalation	Mist is irritant to the respiratory tract. All symptoms of acute toxicity are due to high alkalinity. Inhalation LC50 (rat) >2.06 g/m³
Skin Contact	Material will cause irritation. Dermal LD50 (rat) >5000 mg/kg bw
Eye Contact	Material will cause irritation.
Skin corrosion/irritation	Irritating to skin.
Serious eye damage/irritation	Irritating to eyes.
Sensitisation	Not sensitising.
Mutagenicity	No evidence of genotoxicity. In vitro/in vivo negative.
Carcinogenicity	No structural alerts. IARC, NTP, OSHA, ACGIH do not list this product as known or suspected carcinogen.
Reproductive toxicity	No evidence of reproductive toxicity or developmental toxicity.
STOT - single exposure	Not classified
STOT - repeated exposure	Not classified. NOAEL oral (rat) >159 mg/kg bw/d
Aspiration hazard	Not classified
Other information	

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity	Fish (Brachydanio rerio) LC50 (96 hour) 1108 mg/l Aquatic invertebrates: (Daphnia magna) EC50 (48 hour) 1700 mg/l

12.2 Persistence and degradability	Inorganic. Soluble silicates, upon dilution, rapidly depolymerise into molecular species indistinguishable from natural dissolved silica.
12.3 Bioaccumulative potential	Inorganic. The substance has no potential for bioaccumulation.
12.4 Mobility in soil	Not applicable.
12.5 Results of PBT and vPvB assessment	Not classified as PBT or vPvB.
12.6 Other adverse effects	The alkalinity of this material will have a local effect on ecosystems sensitive to changes in pH.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods	Dispose of this material and its container to hazardous or special waste collection point. Disposal should be in accordance with local, state or national legislation.

SECTION 14: TRANSPORT INFORMATION

14.1 UN number	Not classified according to the United Nations 'Recommendations on the Transport of Dangerous Goods'. Not classified as hazardous under DOT or US Transport Recommendations. International Maritime Dangerous Goods (IMDG) Code: Not classified as hazardous
14.2 Proper Shipping Name	Not applicable.
14.3 Transport hazard class(es)	Not applicable.
14.4 Packing group	Not applicable.
14.5 Environmental hazards	Not classified as a Marine Pollutant.
14.6 Special precautions for user	Unsuitable containers: Aluminium
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

TSCA Inventory Status: Reported/Included.
AICS Inventory Status: Reported/Included.
DSL/NDSL Inventory Status: Reported/Included. SARA TITLE III: Not an Extremely Hazardous Substance under §302. Not a Toxic Chemical under §313. Hazard Categories under §§311/312: Acute

German Water Hazard Classification VwVwS: Product ID number 1314, WGK class 1 (low hazard to water).
HMIS (Hazardous Material Information System) 2,0,0

15.2 Chemical Safety Assessment Information available on request.

SECTION 16: OTHER INFORMATION

Data referenced in this eSDS is from company-owned information and from data legitimately accessed by PQ Corporation through membership of Industry Consortia or other agreements. This includes data relating to toxicology, ecotoxicology, DNELs, PNECs and other information in this eSDS and its annex.

This SDS was last reviewed: 02/2015
The following sections contain revisions or new statements: All sections.

GHS Classification	Skin Irrit. 2 Eye Irrit. 2
Signal word(s)	Warning
Hazard pictogram(s)	
Hazard statement(s)	H315: Causes skin irritation. H319: Causes serious eye irritation.
Precautionary statement(s)	P262: Do not get in eyes, on skin, or on clothing. P280: Wear protective gloves/protective clothing/eye protection/face protection. P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

D-2 Downstream Casing Installation Report

Field Report

Day shift

Client: Groupe Gilbert - KCJ	Date: 02-11-19
Site: Amaruq	○ Excavation Bed Ver. ○ Sampling ○ Concrete ○ Reinforcing Steel ○ Compaction ○ Structural Steel ○ Asphalt ○ Vibration Monitoring
Project: Whale tail Bike	◉ Other: Borehole
Project No.: 11204932-B1	

I have: ☒ my JSEAs ☒ my PPE ☒ Proper training
I see: ☐ Unexpected Hazards I need: ☐ an S-RAF?

-19 °C

Field Results:

This is the first shift on the bike for all of us, so we take our time to make sure that we all understand how to do our job in a better way.

Today, we did 3 boreholes. In those 3, only one reach the bedrock and the others are at the maximum depth. P-728-5 (not sure if we really reach the bedrock).

Presence of water at the end of borehole.

Corrective actions to be taken:

Hugues Potvin

Site Representative: François Collard
From: Qamanirtuaq Sana
Project Manager: Daniel Pedneault, GHD

Inspector: Marissa Beauregard
Signature*:
Time on site (hrs): 12 h
Travel time (hrs):
Mileage (km):

* By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.

KIVALLIQ CONTRACTORS GROUP LTD

11811 - Casing Drilling Report

Employee: Maryska & Hugies

Drill #: TCG 5

Date: 02-11-19

Day ☒ Night ☐

Station	Survey Depth	Casing lenght (m)				Encounter bedrock (m)	Stick-up at level ground (0,4m)	Second cut (m)	Comments (ex; empty, boulders, ice, sand,etc.)
		1st	2nd	3rd	4th				
P-740.5	9.41	5.32	4.37	0.11	(-9.69)	not reach	0.43		water with presence of concrete (end)
P-728.5	9.43	5.30	4.37		(-9.67)	8.81	0.41	-0.12	water on the rock
P-704.5	9.98	5.32	4.37	0.70	(-9.69)	8.82	0.40		Rock really not competent

PAGE ____ OF ____

Borehole No.: P-728.5
Elevation:

Borehole Field Report

Client: Groupe Gilbert - KCJ
Project / Site: Amaruq - Whale Tail Dike
Project No.: 1204932-B1

Date start: 02-11-19
Date Finish:
Inspector: Hugues Potvin
Mariyska Beauregard

DIAMETER OF HOLE — OVERBURDEN:
BEDROCK: not sure
DEPTH OF HOLE: 9.11
WATER LEVEL: 8.81 DATE: 02-11-19
PROBE No.: TIME:

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

DRILLER: Bobby Gagné
DRILL: Sebastien Brassard TCG 5 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level		= 0.4m in the top							weather -19°C SUN
Rock fill									
1@2									
0-20 mm ↓									
8.81m Bedrock or blocs (see remarks)									@ the stations P-740.5 and P-704.5 we didn't reach the bedrock, so we supposed this is the same thing for this station
9.11m END OF BORE HOLE									
maximum depth = 9.43 m									

Remarks: The bedrock was supposed to be at 8.80m but between 8.81m and 9.11m we are on no competent bedrock or in blocs (!)

Checked By: DATE:

PAGE ____ OF ____

Borehole No.: P-704.5
Elevation: ____

Borehole Field Report

Client: Groupe Gilbert - KCT
Project / Site: Amaruq - Whale tail Bike
Project No.: 1120932-B1

Date start: 02-11-19
Date Finish: ____
Inspector: Hugues Potvin, Mashyaka Beauregard

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: ____
DEPTH OF HOLE: 9.98
WATER LEVEL: 8.82 DATE: 02-11-19
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ☐ RC Rock core

DRILLER: Bobby Gagné
DRILL: Sebastien Brassard TCG 5 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level									
Rock fill									
1@2m									
020 mm									
8.82m Blocs of Rock									
END OF BORE HOLE AT 9.98 m									

0.4m on the Top

Weather.
-19°C SUN

300 mm Rock really not competent.

At the beginning, we was sure it was the bedrock, but in the 300 mm it was too easy to be rock (bedrock).

Presence of water

Remarks: the bedrock was supposed to be at 8.92m. But we didn't reach the bedrock.

Checked By: ____ DATE: ____

PAGE _____ OF _____

Borehole No.: P-740.5
Elevation: _____

Borehole Field Report

Client: Groupe Gilbert - KCJ
Project / Site: Amaruq - Whale tail Like
Project No.: 1120932-B1

Date start: 02-11-19
Date Finish: _____
Inspector: Maryska Beauregard
Hugues Potvin

DIAMETER OF HOLE
OVERBURDEN: _____
BEDROCK: not Reach
DEPTH OF HOLE: 9.4
WATER LEVEL: 9.3 DATE: 02-11-19
PROBE No.: _____ TIME: _____

SAMPLE
☒ SS Split spoon
▨ ST Shelby tube
▯ RC Rock core

TESTS

DRILLER: Bobby Gagné
DRILL: Sebastien Brassard
TG 5 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
ground level			F	0.4m on the top					weather: -19°C SUN
Rockfill									
1@2m									
0-20mm									
5m									
Concrete + 0-20mm									There is a lot of concrete to meters 5 (from 9.4m (end of the hole) But in the middle the 0-20 was mixed with concrete (less concrete) And from 9.2 to 9.4 m the concrete is more dense.
9.2m									presence of
9.4m ↓ END OF BOREHOLE									At the maximum depth water (a little bit)

Remarks: the bedrock was supposed to be at 8.61 m but we didn't Reach it at the maximum depth.

Checked By: _____ DATE: _____

Field Report

Day shift

Client: Groupe Gilbert - KCS	**Date:** 03-11-19
Site: Amaruq	○ Excavation Bed Ver. ○ Sampling ○ Concrete ○ Reinforcing Steel ○ Compaction ○ Structural Steel ○ Asphalt ○ Vibration Monitoring ◉ Other: Borehole
Project: Whale tail Bike	
Project No.: 11204132-B1	

I have: ☒ my JSEAs ☒ my PPE ☒ Proper training
I see: ☐ Unexpected Hazards **I need:** ☐ an S-RAF?

°C

Field Results:

The Role T-731.5 will be completed tomorrow.

Corrective actions to be taken:

Marysia Beauregard

Site Representative: François Collard
From: Qamanittuaq Sana

Inspector: Hugues Fabin
Signature*:

Time on site (hrs): 12h
Travel time (hrs):
Mileage (km):

Project Manager: Daniel Pedneault, GHD

** By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.*

KIVALLIQ CONTRACTORS GROUP LTD

11811 - Casing Drilling Report

Employee: Hugues Poirier & Maryska Beauregard

Drill #: TC65 9928

Day ☐ Night ☐

Date: 03-11-19

Station	Survey Depth	Casing lenght (m)				Encounter bedrock (m)	Stick-up at level ground (0,4m)	Second cut (m)	Comments (ex; empty, boulders, ice, sand,etc.)
		1st	2nd	3rd	4th				
T-749,5	10.1	5,32	4,37	0.8		not reach	0.4		BR: 3,43 concrete 5m to end of borehole
S-746,5	10,21	5,32	4,37			8,94	0,35		BR: 8,36 water at 8,5m
T-743,5	10,56	5,31	4,37	1,46		9,65	0,45		BR: 8,30 water at 9,6m
T-737,5	9,56	5,32	4,35			8,88	0,4	-0,1	BR: 8,88 no water
S-734,5	9,52	5,32	4,37			8,89	0,4	-0,1	BR: 8,83 no water
T-731,5	9,66	5,31	4,29	0,50		not reach	0,4		BR: 8,96 To be completed

NB: T-731,5 will be completed tomorrow ⇒ information on this sheet.

	Borehole No.: S-7465 Elevation:	**Borehole Field Report**

Client: Groupe Gilbert - KCS
Project / Site: Amaruq - Whale tail Dike
Project No.: 1120-4932-B1
Date start: 03-10-19
Date Finish:
Inspector: Hugues Potvin, Maryjolla Beauregard

DIAMETER OF HOLE — OVERBURDEN: — BEDROCK: 8.94
DEPTH OF HOLE: 10.21
WATER LEVEL: 8.50 DATE:
PROBE No.: TIME:

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; [ ] RC Rock core

TESTS

DRILLER: Bobby Gagné
DRILL: Sebastien Broussard TCG 5 9928

	STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No. (Tests)	DESCRIPTION OF SAMPLES
	ground level		↑ 0.35m on the top							weather -26°C SUN
	Rockfill									
1@2	0-20 mm									
4.7m	concrete									
8.50m	WATER									The water begin to show up at 8.5 until the end of borehole.
8.94m	Bedrock |300 mm									
9.24m	end of bore hole									
	maximum depth = 10.21 m									

Remarks: The bedrock was supposed to be at 8.36m but it was at the depth of 8.94m.

Checked By: DATE:

PAGE ____ OF ____

Borehole No.: T-143.5
Elevation: ____

Borehole Field Report

Client: Groupe Gilbert - KCJ
Project / Site: Amaruq - Whale tail Pike
Project No.: 1120932-B1

Date start: 03-11-19
Date Finish: ____
Inspector: Hugues Potvin
Maryssa Beauregard

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 9.65
DEPTH OF HOLE: 10.08
WATER LEVEL: 9.5 DATE: ____
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

DRILLER: Bobby Gagné
DRILL: Sebastien Brassard TG95 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground surface		0.4m on the top							weather. -26°C SDN
Rockfill									
1.5@2m									
0-20mm									
WATER BEGIN AT 9.5m									
9.65m Bedrock with water									
		0.43m							The maximum depth was 10.56m
end of borehole at 10.08m									

Remarks: The bedrock was supposed to be at 8.30m and it was at the depth of 9.5m with a lot of water.

Checked By: ____ DATE: ____

PAGE ____ OF ____

	Borehole No.: T-749.5 Elevation:	**Borehole Field Report**

Client:	Groupe Gilbert - KCJ	Date start:	03-11-19
Project / Site:	Amaruq - Whale Tail Dike	Date Finish:	
Project No.:	11204932 - T31	Inspector:	Hugues Potvin Maryolla Beauregard.

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: not Reach

DEPTH OF HOLE: 10.1

WATER LEVEL: — DATE: ____

PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ◫ RC Rock core

TESTS

DRILLER: Bobby Gagné

DRILL: Sebastien Brassard, TCG 5 9928

	STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
	ground level		0.4m to the top						weather. -26°C sun
	Rock fill								
1@2	0-20mm ↓								
5m	Concrete								
9m	Concrete mixed								
10.1	end of Borehole								

Remarks: The bedrock was supposed to be at 8.43m but at the maximum depth of the borehole there is no bedrock.

Checked By: ____ DATE: ____

	Borehole No.: T 737.5 Elevation:	**Borehole Field Report**

Client: F. GILBERT, SANA	Date start: 2019-11-03
Project / Site: AMARUQ, WHALE TAIL DYKE	Date Finish: 2019-11-03
Project No.: 11204932	Inspector: HUGUES POIRIER

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 8.88 DEPTH OF HOLE: 9.18 m WATER LEVEL: X DATE: ____ PROBE No.: ____ TIME: ____	SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core	TESTS	DRILLER: SÉBASTIEN BRASSARD DRILL: ____

	STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
	ROCK FILL								NI ⊻ 0.4 m
1.473 m	0-20 mm								
	NB! PRESENCE OF SMALL AMOUNT OF CONCRETE AT 5 mm								
8.88 m	BEDROCK								NO WATER
9.18 m	END OF HOLE								

Remarks:

Checked By: ____ DATE: ____

	Borehole No.: 5734.5 Elevation:	**Borehole Field Report**

Client: F. GILBERT	Date start: 2019-11-03
Project / Site: AMARUQ, WHALE TAIL DIKE	Date Finish: 2019-11-03
Project No.: 11204932-B1	Inspector: HUGUES POTVIN

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 8.89

DEPTH OF HOLE: 9.19 m

WATER LEVEL: X DATE: ____

PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; [ ] RC Rock core

TESTS

DRILLER: SÉBASTIEN BRASSARD

DRILL: ____

	STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
	ROCK FILL								∏ 0.4 m
1 TO 2 M	0 - 20 mm								
5.0 m	0 - 20 mm + CONCRETE ↓								0 - 20 mm MIXED WITH CONCRETE 5.0 m TO 8.89 m
8.89 m	BEDROCK								
9.19 m	END OF HOLE								

Remarks: ____

Checked By: ____ DATE: ____

Field Report

Day shift

Client: Groupe Gilbert - KGS	**Date:** 04-11-19
Site: Amaruq	○ Excavation Bed Ver. ○ Sampling
Project: Whale tail Bike	○ Concrete ○ Reinforcing Steel
Project No.: 1120932-B1	○ Compaction ○ Structural Steel
	○ Asphalt ○ Vibration Monitoring
	◉ Other: Borehole

I have: ☐ my JSEAs ☒ my PPE ☐ Proper training
I see: ☐ Unexpected Hazards **I need:** ☐ an S-RAF?

○ ○ ○ ○ ◉ -16 °C

Field Results:

The bedrock of the holes wasn't really competent

Corrective actions to be taken:

Site Representative: François Collard
From: Qamanituaq Sana

Inspector: Hugues Potvin
Signature*:
Time on site (hrs): 12h
Travel time (hrs):
Mileage (km):

Project Manager: Daniel Pedneault, GHD

** By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.*

KIVALLIQ CONTRACTORS GROUP LTD

11811 - Casing Drilling Report

Employee: HUGUES POTVIN

Drill #:

Date: 2019-11-04

Day ☑ Night ☐

Station	Survey Depth	Casing lenght (m) 1st	2nd	3rd	4th	Encounter bedrock (m)	Stick-up at level ground (0,4m)	Second cut (m)	Comments (ex; empty, boulders, ice, sand,etc.)
T 725:5	9.35	5.31	4.29	[illegible]		NO	~~0.35~~ 0.75	—	BR; 8.78 AND ~~[illegible]~~ BEDROCK VERY WEAK NO WATER
S 722:5	9.20	5.31	4.29			NO	0.30	—	BR; 8.78 NO WATER
T 701:5	10.0	5.31	4.29	0.80		9.00	0.40	—	BR; 9.23 WATER AT 9.20 m
S 698:5	10.0	5.32	4.29	0.80		~~9.90~~	0.40	—	BR; 9.39 WATER (A LOT) AT 9.20 m BEDROCK VERY WEAK...
S 695:5	10.4	5.32	4.37	1.20		10.16	0.40	—	BR; 9.67 WATER (A LOT) AT 9.30 m

PAGE ____ OF ____

Borehole No.: T7315
Elevation:

Borehole Field Report

Client: E. GILBERT
Project / Site: AMARUQ/WHALE TAIL DYKE
Project No.: 1770493J-B1

Date start: 2019-11-03
Date Finish: 2019-11-04
Inspector: HUGUES POTVIN

DIAMETER OF HOLE
OVERBURDEN:
BEDROCK: NO
DEPTH OF HOLE: 9.66m
WATER LEVEL: 9.10 DATE: 2019-11-03
PROBE No.: TIME:

SS Split spoon
ST Shelby tube
RC Rock core

DRILLER: SÉBASTIEN BRASSARD
DRILL:

STRATIGRAPHY	Depth feet	Depth metres	SAMPLE State	SAMPLE Type and No.	SAMPLE Recup.	SAMPLE Blows 6" / 15cm or RQD	SAMPLE Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ROCK FILL									
~1.5m 0-30 mm									
~3.0m 0-30mm CONCRETE									
9.10m WATER (END OF HOLE)									PRESENCE OF WATER 9.10m AND DEEPER.
9.66m END OF HOLE									

Remarks: BEDROCK WAS EXPECTED AT 9.66m

Checked By: DATE:

	Borehole No.: T7515 Elevation:	**Borehole Field Report**

Client: F-GILBERT	Date start: 2019-11-04
Project / Site: AMARUQ, WHALE TAIL DYKE	Date Finish: 2019-11-04
Project No.: 11204932 B1	Inspector: HUGUES POTVIN

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: NW	☒ SS Split spoon	TESTS	DRILLER: JÉRÉMY + STÉPHANE
DEPTH OF HOLE: 9.35 m	▨ ST Shelby tube		DRILL: 2019-11-04
WATER LEVEL: ____ DATE: ____	▯ RC Rock core		2019-11-04
PROBE No.: ____ TIME: ____	SAMPLE		

STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
ROCK FILL								⊓ To 0.85m
1 AT 1.5 m — 0 - 20 mm ↓								
								NO WATER
9.35m — END OF HOLE								

Remarks: BEDROCK WAS EXPECTED AT 8.73m

Checked By: ____ DATE: ____

PAGE ____ OF ____

Borehole No.: S-6985
Elevation:

Borehole Field Report

Client: F. GILBERT
Project / Site: AMARUQ / ~~MINE~~ WHALE TAIL DIKE
Project No.: 1120493B-B1

Date start: 2019-11-04
Date Finish: 2019-11-04
Inspector: HUGUES POTVIN

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: ~~9.9~~
DEPTH OF HOLE: 10.0 m
WATER LEVEL: 9.90 m DATE: 2019-11-04
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: JEREMY
DRILL: ____

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
ROCKFILL									
~1.5 m									
0 - 20 mm									
									→ WATER (A LOT) AT 9.90 m →
9.90 m → WATER ▽ A LITTLE S MUST HAD AT THE END OF THE HOLE									
~9.90 m → BEDROCK (?) →									
10.0 m END OF HOLE									

Remarks: BEDROCK WAS EXPECTED AT 9.90 m
→ BEDROCK (IN SLATE) AND VERY SOFT À APPROXIMATELY 9.90 m

Checked By: ____ DATE: ____

PAGE ____ OF ____

GHD	Borehole No.: TG9515 Elevation:	**Borehole Field Report**

Client: F. GILBERT
Project / Site: AMARUQ, WHALE TAIL DYKE
Project No.: 112 04392 - B1

Date start: 2019-11-04
Date Finish: 2019-11-04
Inspector: HUGUES POTVIN

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 10.16m
DEPTH OF HOLE: 10.40m
WATER LEVEL: 9.30m DATE: 2019-11-04
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: JÉRÉMY
DRILL: ____

Depth (margin)	STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
	ROCKFILL								
1 TO 2 m	0-20mm								
~9.30m	▽ WATER								LOT OF WATER AT 9.30m
10.16m	BEDROCK ?								
10.40m	END OF HOLE								

Remarks: BEDROCK EXPECTED AT 9.67m

Checked By: ____ DATE: ____

Field Report

Night shift

Client: Groupe Gilbert - KCT	**Date:** 04-11-19
Site: Amaruq	○ Excavation Bed Ver. ○ Sampling
Project: WRole tail Bike	○ Concrete ○ Reinforcing Steel
Project No.: 11204932-B1	○ Compaction ○ Structural Steel
	○ Asphalt ○ Vibration Monitoring
	◉ Other: Borehole

I have: ☒ my JSEAs ☒ my PPE ☒ Proper training
I see: ☐ Unexpected Hazards **I need:** ☐ an S-RAF?

-20°C

Field Results:

At the beginning of the shift, the thermostat of the compresser wasn't working (Have been repaired).

We couldn't finish the Role P-680.5 because the welding ~~was~~ of the last casing wasn't

Corrective actions to be taken:

Site Representative: François Collard
From: Qamanittuaq Sana

Inspector: Maryska Beauregard
Signature*:
Time on site (hrs): 12h
Travel time (hrs):
Mileage (km):

Project Manager: Daniel Pedneault, GHD

** By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.*

thermostat compressseur

KIVALLIQ CONTRACTORS GROUP LTD

11811 - Casing Drilling Report

Employee: Mariyska Beauregard

Drill #: TG35 9928

Date: 4-11-19

Day ☐ Night ☒

Station	Survey Depth	Casing lenght (m)				Encounter bedrock (m)	Stick-up at level ground (0,4m)	Second cut (m)	Comments (ex; empty, boulders, ice, sand,etc.)
		1st	2nd	3rd	4th				
P-692.5	11.23	5.30	4,40	1,9		10.55	0,41	0,4	BR: 9.75 boulders of concret.
T-689.5	10.56	5,32	4,36	1,3		9.88	0,40	0,4	BR: 9.9
S-686.5	10.40	5,23	4,37	1,2		10.28	0,43	0,4	BR: 9.9 A lot of water in the end of borehole
T-683.5	10.60	5,22	4,29	1,1		10.30	0,46		BR: 10.0
P-680.5	10.8	5,21	4,32	1,27			0,40		BR: 10.1 not Drilish

PAGE ____ OF ____

GHD

Borehole No.: P-680.5
Elevation: ____

Borehole Field Report

Client: Groupe Gilbert - KCT
Project / Site: Amarua - Whale tail Bike
Project No.: 112041932-B1

Date start: 04-11-19
Date Finish: ____
Inspector: Marjska Beauregard

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 10,8
DEPTH OF HOLE: 10,8
WATER LEVEL: 9,5 DATE: ____
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

DRILLER: Bobby Gagné
DRILL: TC65 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level		= 0,4m to the top							
1@2m Rockfill									
0-20 mm									
9.5m Water									the water begin to show up at 9.5m and a lot of pressence until the end of borehole.
10.8 Bedrock and end of borehole									

Remarks: The bedrock was supposed to be at 10.1m but we reach it only at 10,5m, so the end of borehole (the maximum depth). We couldn't continue to have 0,3m in the bedrock.

Checked By: ____ DATE: ____

PAGE ____ OF ____

GHD

Borehole No.: T-683,5
Elevation: ____

Borehole Field Report

Client: Groupe Gilbert - KGT
Project / Site: Amaruq - Whale tail bike
Project No.: 11204932 - B1

Date start: 04-11-19
Date Finish: ____
Inspector: Maryska Beauregard

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 9.84
DEPTH OF HOLE: 10.6
WATER LEVEL: ____ DATE: ____
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

DRILLER: ____
DRILL: ____

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level									
1 @ 2m Rockfill									
0-20 mm									
7.6m Concrete mixed with 0-20mm									
10.3m Bedrock with water									
10.6m end of borehole									

Remarks: The bedrock was supposed to be at 10.0m and we reach it at 10.3m.

Checked By: ____ DATE: ____

PAGE ____ OF ____

Borehole No.: P-692.5
Elevation:

Borehole Field Report

Client: Groupe Gilbert - KCS
Project / Site: Amaruq - Whale Tail Site
Project No.: 1120493 2 - B1

Date start: 04-11-19
Date Finish:
Inspector: Maryska Beauregard

DIAMETER OF HOLE — OVERBURDEN:
BEDROCK: 10.55
DEPTH OF HOLE: 10.85
WATER LEVEL: 8.6 DATE:
PROBE No.: TIME:

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: Bobby Gagné
DRILL: TC6 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
ground level				0.4m on the top					
1@2 Rockfill 0-20mm									
7.5m Concrete									For the concrete, it was more a boulders.
8.6m Water									
10.55m Bedrock									
10.85 end of borehole 1300 mm									

Remarks:
The bedrock was supposed to be at 9.75 m but we reach it at level 10.55 meters. The water began to show up to 8.6m until the bedrock.

Checked By: DATE:

PAGE ____ OF ____

GHD

Borehole No.: T-6895
Elevation: ____

Borehole Field Report

Client: Groupe Gilbert - KCT
Project / Site: Amaruq - Whale tail
Project No.: ____

Date start: 04-11-19
Date Finish: ____
Inspector: Maryska Beauregard

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: 9.88
DEPTH OF HOLE: 10.18
WATER LEVEL: 5 DATE: ____
PROBE No.: ____ TIME: ____

☒ SS Split spoon
▨ ST Shelby tube
◫ RC Rock core

DRILLER: Bobby Gagné
DRILL: TC65 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level		0		0.4m to the top					
1@2 Rockfill 0-20mm ↓									
3.2m concrete mixed with 0-20 mm									
5m water ↓									
9.88m Bedrock									
10.18m end of borehole		300 mm							

Remarks: The bedrock was to be at 9.9m and we reach it at 9.88m.

Checked By: ____ DATE: ____

Borehole No.: S-686.5
Elevation:

Borehole Field Report

Client: Groupe Gilbert - BCJ
Project / Site: Amarrig - Whale tail Bike
Project No.: 12204932-B1

Date start: 04-11-19
Date Finish:
Inspector: Maryska Beauregard

DIAMETER OF HOLE — OVERBURDEN:
BEDROCK :
DEPTH OF HOLE:
WATER LEVEL: DATE:
PROBE No.: TIME:

☒ SS Split spoon
▨ ST Shelby tube
▯ RC Rock core

DRILLER: Bobby Gagné
DRILL: TC65 99928

STRATIGRAPHY	Depth feet	Depth metres	SAMPLE State	SAMPLE Type and No.	SAMPLE Recup.	SAMPLE Blows 6" / 15cm or RQD	SAMPLE Penetration index	TESTS Type and No.	DESCRIPTION OF SAMPLES
ground level			F	0.4m on the top					
1@2m Rockfill 0-20mm									
4.8m water									just a little bit of water but at this point we see a little each time we stop until 9.7m A lot (1:1)
5.2m Concrete									
0-20 mm mixed									
9.7m A lot of water									we find the bedrock at the maximum depth and we could only reach 0.1m in the bedrock
10.28m Bedrock									
10.40m end of borehole									

Remarks: The bedrock was supposed to be at 9m but we reach it at 10.28m and there is very a lot of water from 9.7m to 10.40m.

Checked By: DATE:

Field Report

Day Shift

Client: F-GILBERT KOJ	**Date:** 2019-11-05
Site: AMAKUK,	○ Excavation Bed Ver. ○ Sampling ○ Concrete ○ Reinforcing Steel ○ Compaction ○ Structural Steel ○ Asphalt ○ Vibration Monitoring ◉ Other: BUMP HOLE (DRILL)
Project: WHALE TAIL DYKE	
Project No.: 12-04932-B1	

I have: ☑ my JSEAs ☑ my PPE ☐ Proper training
I see: ☐ Unexpected Hazards **I need:** ☐ an S-RAF?

-18 °C

Field Results: → PUT MUD IN HOLE P-680-5 (NOT COMPLETED IN NIGHT SHIFT)
→ HOLES T-677-5 AND P644.5 COMPLETED.
→ HOLE T 647.5 NOT COMPLETED, BIT (HAMMER) FROZEN
+ (PRESENCE OF MUD IN HAMMER)
↳ MADE UNTIL APPROXIMATELY 9.30 m DEPTH

Corrective actions to be taken:

Site Representative: François Collard
From: Qamanittuaq Sana
Project Manager: Daniel Pedneault, GHD

Inspector: Hugues Poirier
Signature*: Hugues Poirier
Time on site (hrs): 12 h
Travel time (hrs):
Mileage (km):

** By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.*

KIVALLIQ CONTRACTORS GROUP LTD

11811 - Casing Drilling Report

Employee: Hughes Porvin

Drill #: TCGS 9928

Date: 2019-11-05

Day ☒ Night ☐

Station	Survey Depth	Casing lenght (m) 1st	2nd	3rd	4th	Encounter bedrock (m)	Stick-up at level ground (0,4m)	Second cut (m)	Comments (ex; empty, boulders, ice, sand,etc.)
T 677.5	11.0	5.31	4.31	1.76		~0	~~0.40~~	—	BR: 10.30 m, WE FINISH IN BLOC (WATER) OR ~~BEDROCK~~ DOS VERY WEAK BEDROCK
P 644.5	11.18	5.31	4.30	2.30		10.88	0.40	0.88	BR: 10.9 m, WATER AT 8.5 m
T 647.5	12.11	5.31	4.30	2.50					BR: 11.1 m

T 647.5 NOT FINISHED, BIT - HAMMER FROZEN (MUD, ETC...) MADE UNTIL ~ 9.3 m DEPTH

GHD

Borehole No.: T6775
Elevation:

Borehole Field Report

Client:	F. GILBERT	Date start:	2019-11-05
Project / Site:	AMARUQ, WHALE TAIL DYKE	Date Finish:	2019-11-05
Project No.:	11204932-B1	Inspector:	HUGUES PERRIN

DIAMETER OF HOLE — OVERBURDEN: ____ BEDROCK: —
DEPTH OF HOLE: 11.0
WATER LEVEL: 8.8 m DATE: 2019-11-05
PROBE No.: ____ TIME: ____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: STEPHANE + JEREMY
DRILL: TCG5 9928

STRATIGRAPHY	Depth (feet / metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
ROCKFILL								
1 TO 2 m — 0-20 mm								
8.8 m — (SEE REMARK) WATER								WATER AT 8.8 m NON ARTESIEN
10.0 m — BLOC OR VERY WEAK BEDROCK								FINISH IN BLOC OR VERY WEAK BEDROCK
11.0 m								

Remarks: BEDROCK EXPECTED AT 10.30 m
WE SEE WATER AFTER A STOP AND WE START COMPRESSOR

Checked By: ____ DATE: ____

PAGE _____ OF _____

Borehole No.: P 644-5
Elevation: _____

Borehole Field Report

Client: F. GILBERT
Project / Site: AMAPUQ, WHALE TAIL DYKE
Project No.: 11204932-B1

Date start: 2019-11-05
Date Finish: 2019-11-05
Inspector: HUGUES POTVIN

DIAMETER OF HOLE — OVERBURDEN: _____ BEDROCK: 10.88m
DEPTH OF HOLE: 11.18 m
WATER LEVEL: ~8.5m DATE: 2019-11-05
PROBE No.: _____ TIME: _____

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: JÉRÉMY
DRILL: TCG5 9928

STRATIGRAPHY	Depth feet	Depth metres	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
~~BEDROCK~~ BACKFILL									
~1.5m									
0-20 mm									
(SEE REMARK) WATER									WATER AT 8.5m NON ARTESIEN
~8.5m									
10.88m BEDROCK									
11.18m END OF HOLE									

Remarks: WE SEE WATER AFTER A STOP WHEN WE START COMPRESSOR

Checked By: _____ DATE: _____

PAGE ____ OF ____

GHD

Borehole No.: T647.5
Elevation:

Borehole Field Report

Client: F. GILBERT
Project / Site: AMARUQ, WHALE TAIL DYKE
Project No.: 11204932-B1
Date start: 2019-11-05
Date Finish:
Inspector: HUGUES POTVIN

DIAMETER OF HOLE OVERBURDEN: BEDROCK:
DEPTH OF HOLE:
WATER LEVEL: 8.60m DATE: 2019-11-05
PROBE No.: TIME:

SAMPLE: ☒ SS Split spoon; ▨ ST Shelby tube; ▯ RC Rock core

TESTS

DRILLER: Jeremy
DRILL: TCG5 99128

STRATIGRAPHY	Depth (feet)	Depth (metres)	State	Type and No.	Recup.	Blows 6" / 15cm or RQD	Penetration index	Type and No.	DESCRIPTION OF SAMPLES
~~BEDROCK~~ ROCKFILL									
≃ 2.0m — 0-20 mm									
≃ 8.60m — WATER ▽ (SEE REMARK)									~~WATER SEE~~ AT 8.60m
9.30m END OF THE DAY									MADE UNTIL ABOUT 9.30m

Remarks: WE SEE WATER AFTER A STOP AND A THE START OF THE COMPRESSOR.
HOLE NOT FINISHED, MADE UNTIL ABOUT 9.30m DEPTH (BIT-HAMMER FROZEN + MUD)

Checked By: DATE:

Field Report

Night shift

Client: Groupe Gilbert - KCS	**Date:** 5-11-19
Site: Amaruq	○ Excavation Bed Ver. ○ Concrete ○ Compaction ○ Asphalt ◉ Other: Borehole ○ Sampling ○ Reinforcing Steel ○ Structural Steel ○ Vibration Monitoring
Project: Whale tail Bike	
Project No.: 12204932-B1	

I have: ☒ my JSEAs ☒ my PPE ☒ Proper training
I see: ☐ Unexpected Hazards **I need:** ☐ an S-RAF?

-30 °C

Field Results:

We start by finish the hole T= 647,5 left by the team of the day shift (Mud in the hammer and bit frozen and they have no time to finish it).

Corrective actions to be taken:

Site Representative: François Collard
From: Qamanittuaq Sag

Inspector: Maryska Beauregard
Signature*:

Time on site (hrs): 12h
Travel time (hrs):
Mileage (km):

Project Manager: Daniel Rodrigue, GHD

** By signing this form I acknowledge that I have consulted the appropriate JSEA for the current project and I am in compliance with the JSEA procedures for this site at this time.*