Appendix 19

Meadowbank Thermal Monitoring Report 2024

AGNICO EAGLE

MEADOWBANK PROJECT

Thermal Monitoring Report

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 6
March 2025

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	2020-03-31	All	All
2	2021-01-25	All	All
3	2022-03-11	All	All
4	2023-01-20	All	All
5	2024-02-23	All	All
6	2025-03-04	All	Thermal Performance of the TSF and RSF

INTRODUCTION

To observe the freeze back of the Tailings Storage Facility (TSF) and the Rockfill Storage Facilities (RSFs) at the Meadowbank Mine Project, a series of subsurface thermistors have been installed at strategic locations.

The purposes of the TSF thermistors are to monitor the talik temperatures underneath the TSF as freezing progresses and to monitor the freezing of the tailings. The purpose of the thermistors in the RSFs is to monitor the RSF temperature as freezing progresses. Appendix A of this report contains the updated data from each thermistor for 2024 as well as the location of the installed thermistors.

The thermistors data is reviewed periodically and as needed, and this will continue throughout the operational period as well as during closure. The results collected are to be used to compare the predicted thermal response of the facilities with the actual thermal response. This will allow adjustments to the Tailings Deposition Plan, the Waste Rock Management Plan, the Closure and Reclamation Plan (CRP), and the Final Closure and Reclamation Plan (FCRP).

INSTRUMENT SPECIFICATIONS

Each thermistor installed as part of the thermal monitoring plan must comply with the general specifications presented in Table 1.

Table 1: Thermistor Specifications

Items	Specifications
Accuracy	1 degree Celsius
Thermistor temperature range	-40 to 40 degrees Celsius
Method of cable termination	Amphenol connector and DAS direct connection
Cable termination enclosures	Weatherproof Animal resistant
Readout and data logger	Manual and DAS

THERMAL MONITORING OF THE TSF

The thermal monitoring program objective for the TSF is to provide the data required to validate the predictions of freeze back within the tailings and to support TSF cover and closure design. The goals of the TSF North Cell and South Cell cover systems and landforms are to ensure long-term landform physical stability, blend with current topography, ensure safe water quality for surface runoff and seepage, and control the dust level. If it is determined by monitoring during

operations that the tailings are freezing at lower rates than predicted, then mitigation procedures could be implemented if required.

An instrumentation plan for the TSF is planned to be developed to define the required instrumentation at closure once capping of the TSF is completed. The purpose of the performance monitoring system is to ensure that the cover performs as per its design intent and objectives.

The instruments installed in the North Cell TSF are located where tailings deposition was not planned to resume. No instruments are currently installed within the tailings of the South Cell, but it is planned to install some to support the final design of the TSF landform cover.

THERMAL PERFORMANCE OF THE TSF

The thermistors are indicating that freeze back is occurring within the North Cell TSF.

Instruments located near the pond of water of the North Cell are showing a portion of unfrozen tailings at depth with frozen tailings at surface (with a 4-5 m active layer) and a progression of the freezing front advancing at depth. This is represented by yellow dots on Figure 1 (NC-16-1, NC-16-2, NC17-3, NC-17-2, NC-17-8). Instruments located away from the water pond show that the tailings and its foundation are entirely frozen with an active layer depth of 4-5 m. This is represented by red and orange dots on Figure 1 (NC-17-1, NC17-4, NC-17-6, NC-17-7, NCIS-01 to NCIS-04).

Instruments installed below the capping show that the active layer is contained within the rockfill. This is represented by a green dot on Figure 1 (NC-17-5).

SWD-01 shows a stable unfrozen condition in the foundation below the frozen tailings and capping.

SWD-03 indicates the return to a talik condition in the South Cell near Saddle Dam 3.

The thermal prediction of the tailings freeze back made by Golder in 2008 indicated that for the more conservative scenario the entire tailings body would completely freeze back within a period of about 40 years after the end of operations with the freezing front advancing into the foundation beneath the tailings in the long term. The results are aligned with this modelling with most data showing a quicker freeze back than anticipated.

Further discussion on these results and how they support the long-term performance of the tailings closure landform will be presented in the design document to be submitted as part of the CRP and FCRP.

THERMAL MONITORING PLAN OF THE RSFS

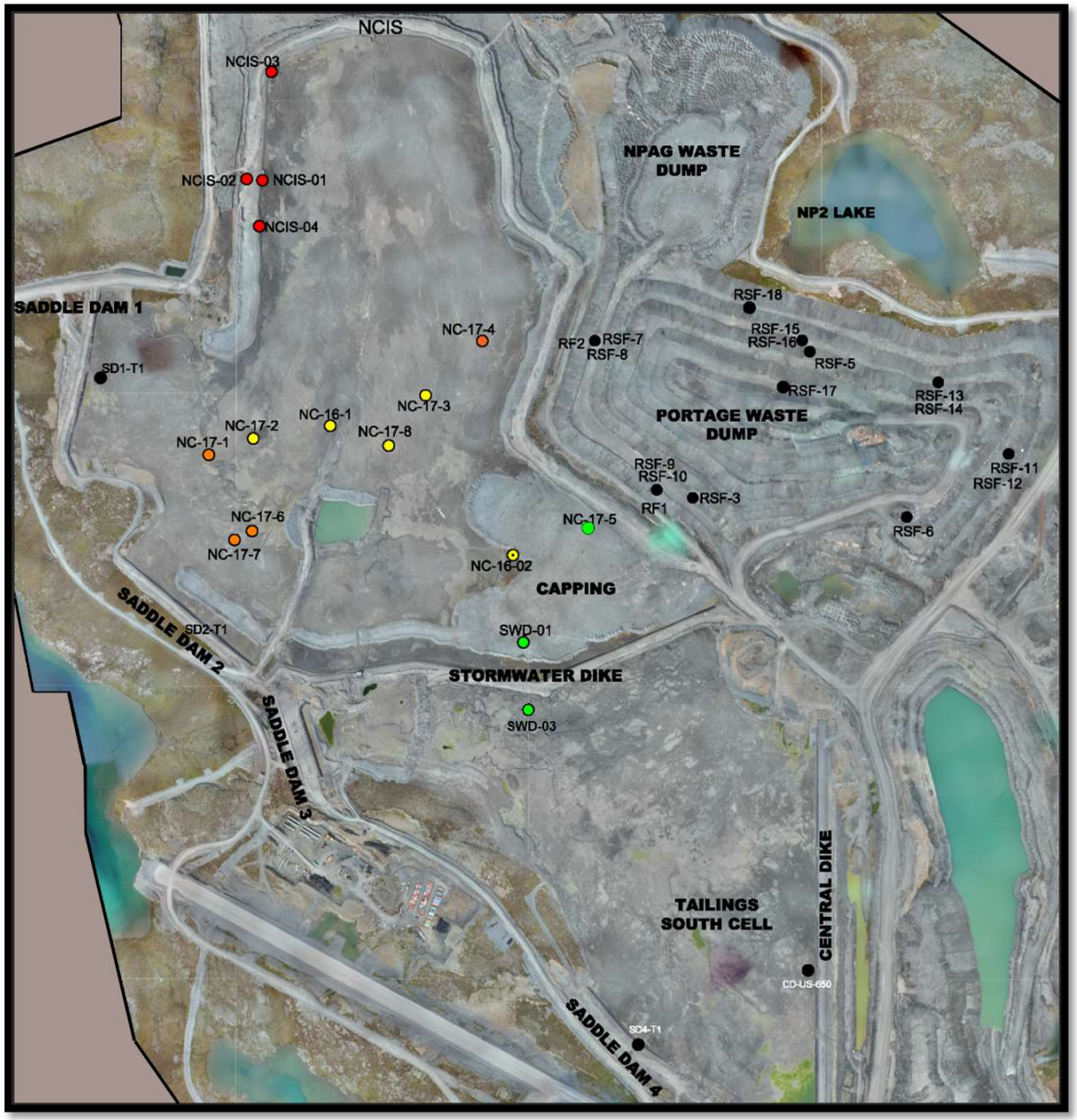
Thermistors are currently installed within the Portage RSF.

Additional thermistors may be installed within the Portage RSF and Vault RSF at closure, if required. The monitoring plan will be reviewed to define the required instrumentation and monitoring at closure.

THERMAL REGIME OF THE PORTAGE RSF

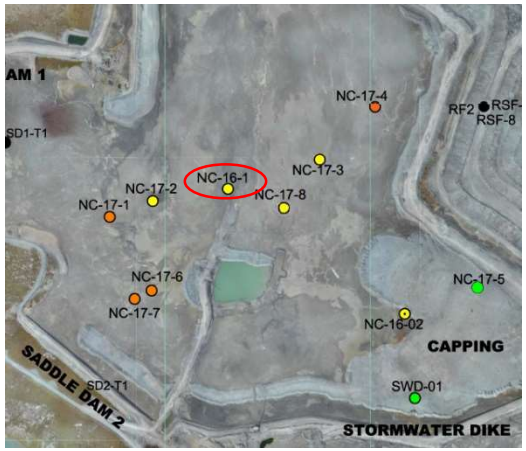
The Portage RSF thermal data for 2024 continues to follow the same trends as previous years. The thermal data indicates that the RSF is continuing to freeze back but has not yet reached a state of equilibrium. Based on thermistor data, the depth of the active layer is approximately 3 m. Work is ongoing for the final design of the top cover as part of the CRP and FCRP.

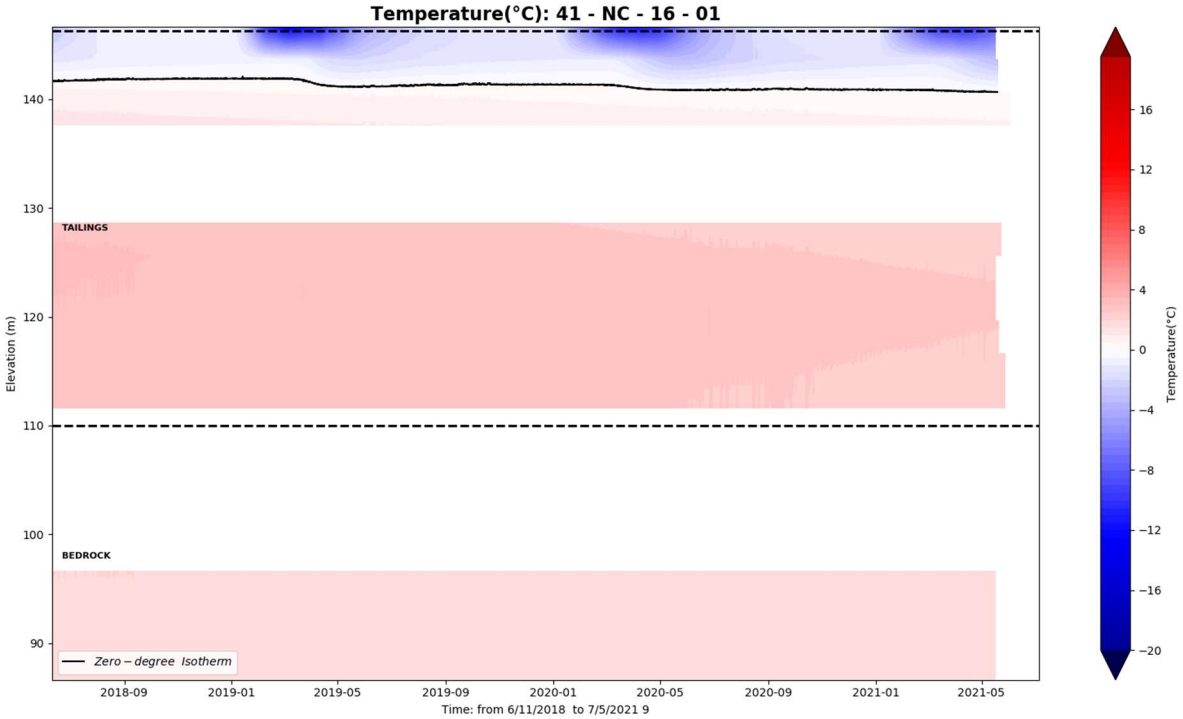
Note that data gaps in the graphs presented in this appendix are due to broken thermistor beads or communication issues. The gaps show as white areas.

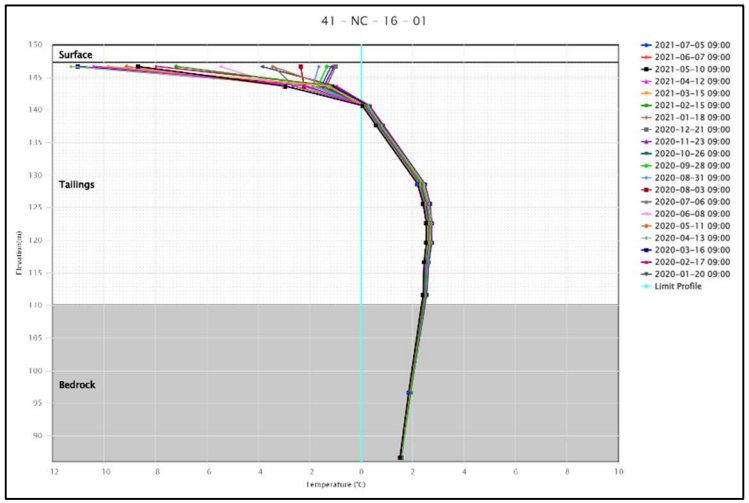


Name	Area	Easting (X)	Northing (Y)	Elevation (Z)	Azimuth	Dip	Installed	Active (Y) or (N)
NC-16-01	NC	**637562.77**	**7215849.33**	**147.63**	--	-90	2016	N
NC-16-02	NC	**637969.22**	**7215561.87**	**148.33**	--	-90	2016	Y
NC-17-1	NC	**637290.00**	**7215823.00**	**148.10**	--	-90	2017	Y
NC-17-2	NC	**637391.00**	**7215823.00**	**147.61**	--	-90	2017	Y
NC-17-3	NC	**637775.00**	**7215917.00**	**147.65**	--	-90	2017	Y
NC-17-4	NC	**637901.00**	**7216038.00**	**148.48**	--	-90	2017	Y
NC-17-5	NC	**638134.34**	**7215623.68**	**152.00**	--	-90	2017	Y
NC-17-6	NC	**637389.00**	**7215623.00**	**147.78**	--	-90	2017	Y
NC-17-7	NC	**637348.00**	**7215598.00**	**147.89**	--	-90	2017	Y
NC-17-8	NC	**637668.00**	**7215778.00**	**146.45**	--	-90	2017	Y
NCIS-01	NC	**637412.84**	**7216395.10**	**152.43**	--	-90	2018	Y
NCIS-02	NC	**637377.24**	**7216398.61**	**151.63**	--	-90	2018	Y
NCIS-03	NC	**637432.58**	**7216636.35**	**154.74**	--	-90	2018	Y
NCIS-04	NC	**637405.47**	**7216293.32**	**152.15**	--	-90	2018	Y
SWD-01	NC	**637992.60**	**7215368.00**	**148.43**	--	-90	2017	Y
SWD-03	SC	**638018.70**	**7215219.00**	**133.04**	--	-90	2017	Y
SD1-1	SD1	**637030.50**	**7215957.68**	**150.00**	94.00	Slope	2010	Y
SD2-1	SD2	**637290.00**	**7215420.00**	**150.00**	35.00	Slope	2012	Y
SD4-1	SD4	**638253.95**	**7214479.72**	**144.00**	31.00	Slope	2017	Y
CD-US 0+650	CD	**638626.00**	**7214639.00**	**126.40**	270.00	Slope	2014	Y
RSF-3	RSF	**638369.59**	**7215689.20**	**173.99**	--	-90	2013	Y
RSF-5	RSF	**638629.81**	**7216014.00**	**193.02**	--	-90	2013	N
RSF-6	RSF	**638845.40**	**7215647.00**	**197.79**	--	-90	2013	Y
RSF-7	RSF	**638153.00**	**7216039.00**	**173.50**	295.00	-55	2015	Y
RSF-8	RSF	**638156.00**	**7216038.00**	**173.85**	295.00	-70	2015	Y
RSF-9	RSF	**638290.00**	**7215707.00**	**171.26**	218.00	-55	2015	Y
RSF-10	RSF	**638293.00**	**7215711.00**	**171.70**	218.00	-70	2015	Y
RSF-11	RSF	**639071.00**	**7215787.00**	**193.13**	125.00	-55	2015	Y
RSF-12	RSF	**639066.00**	**7215791.00**	**193.51**	125.00	-70	2015	Y
RSF-13	RSF	**638916.00**	**7215943.00**	**191.69**	1.00	-55	2015	Y
RSF-14	RSF	**638917.00**	**7215939.00**	**191.81**	1.00	-80	2015	Y
RSF-15	RSF	**638612.00**	**7216038.00**	**192.10**	21.00	-55	2015	Y
RSF-16	RSF	**638610.00**	**7216033.00**	**192.39**	21.00	-70	2015	Y
RSF-17	RSF	**638570.44**	**7215935.40**	**233.18**	--	-90	2020	Y
RSF-18	RSF	**638485.25**	**7216121.50**	**172.61**	--	-90	2020	Y

NC-16-01

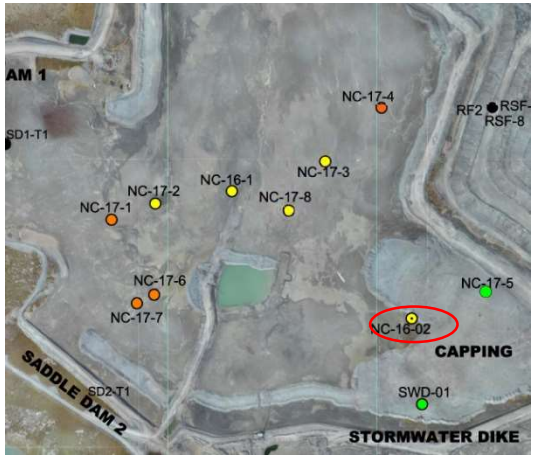


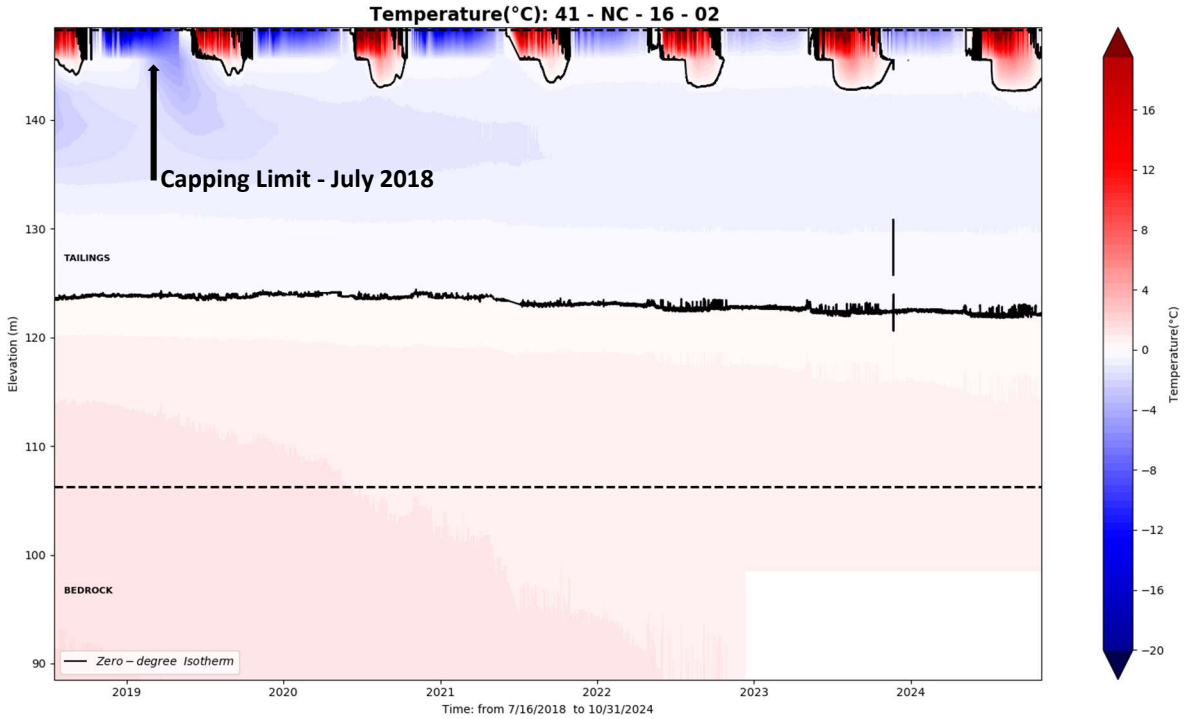


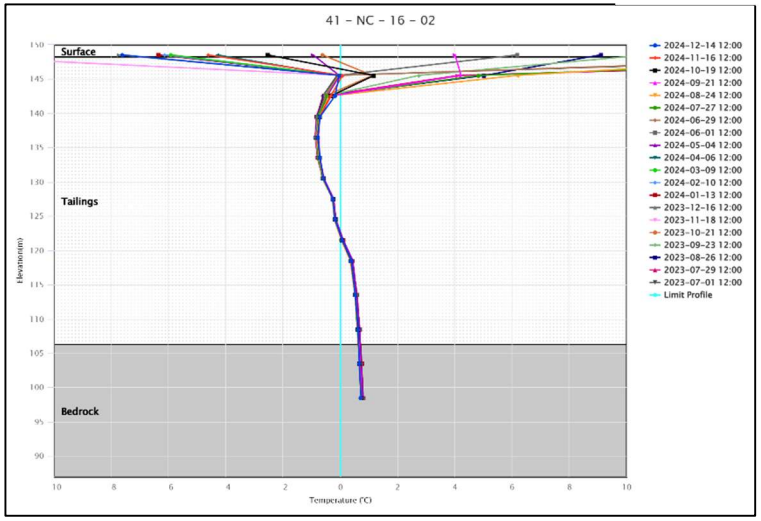


This instrument is broken and not sending anymore data, since July 2021.

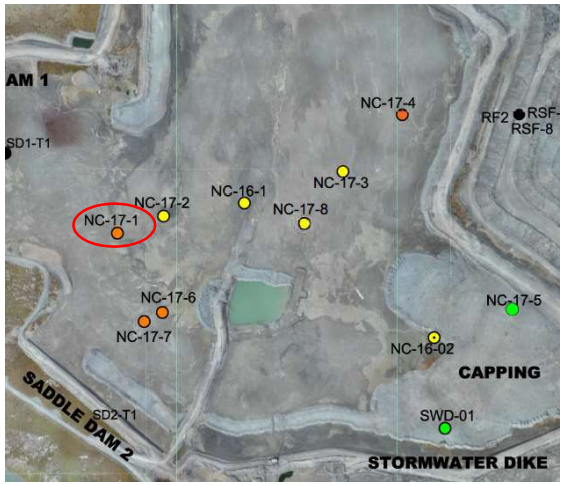
NC-16-02S

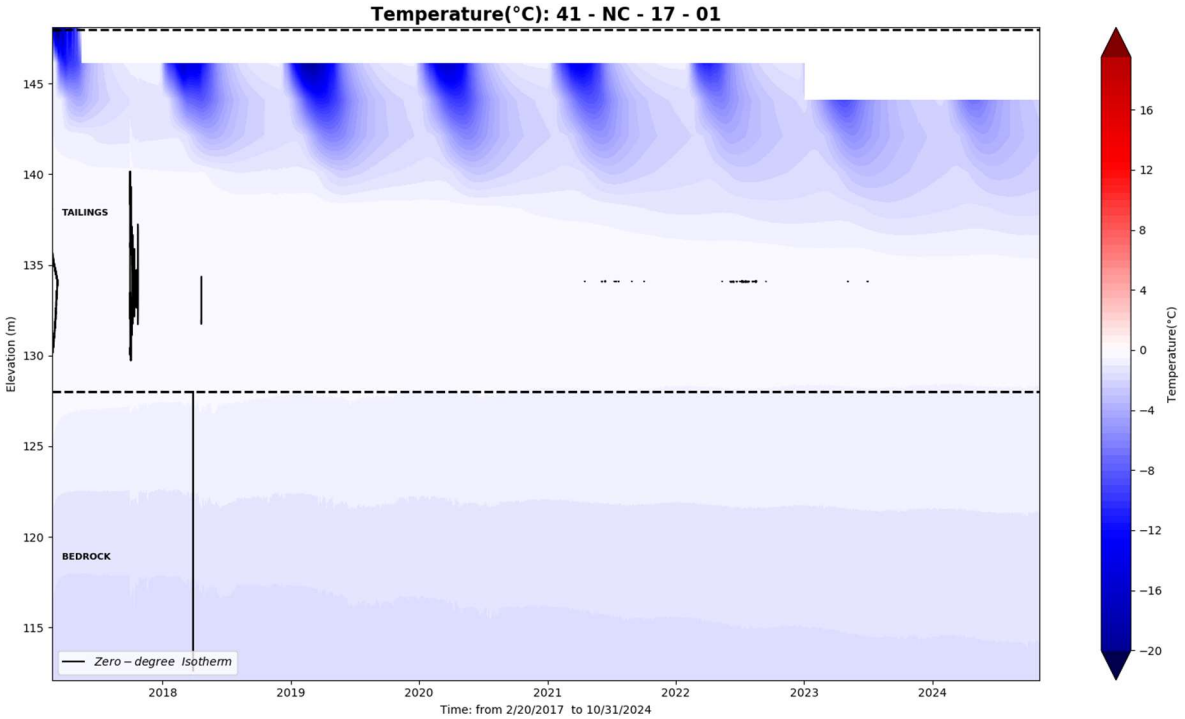

AM 1
NC-17-4
RF2
RSF-
RSF-8
SD1-T1
NC-17-3
NC-16-1
NC-17-2
NC-17-8
NC-17-1
NC-17-6
NC-17-5
NC-17-7
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

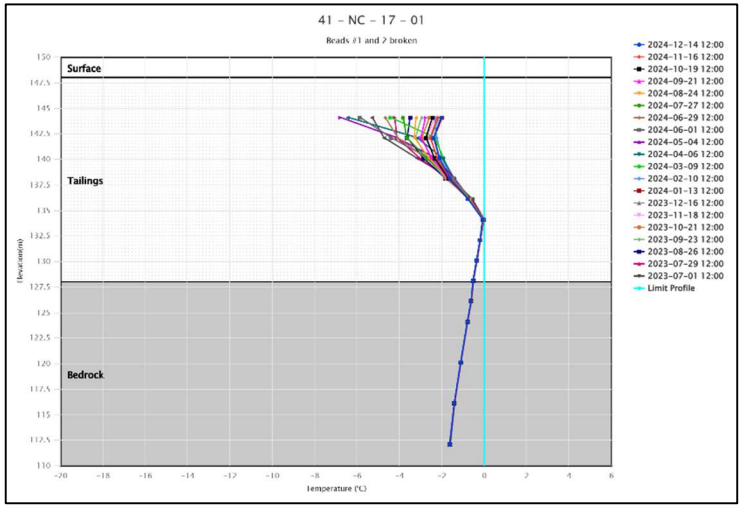

Temperature(°C): 41 - NC - 16 - 02
Capping Limit - July 2018
TAILINGS
BEDROCK
Zero – degree Isotherm
Elevation (m)
Temperature(°C)
Time: from 7/16/2018 to 10/31/2024


41 – NC – 16 – 02
Surface
Tailings
Bedrock
Limit Profile

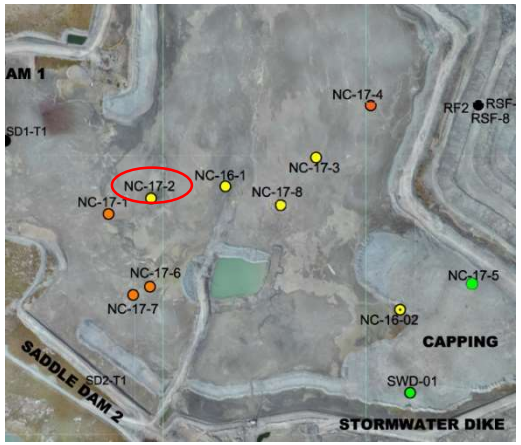
NC-17-01

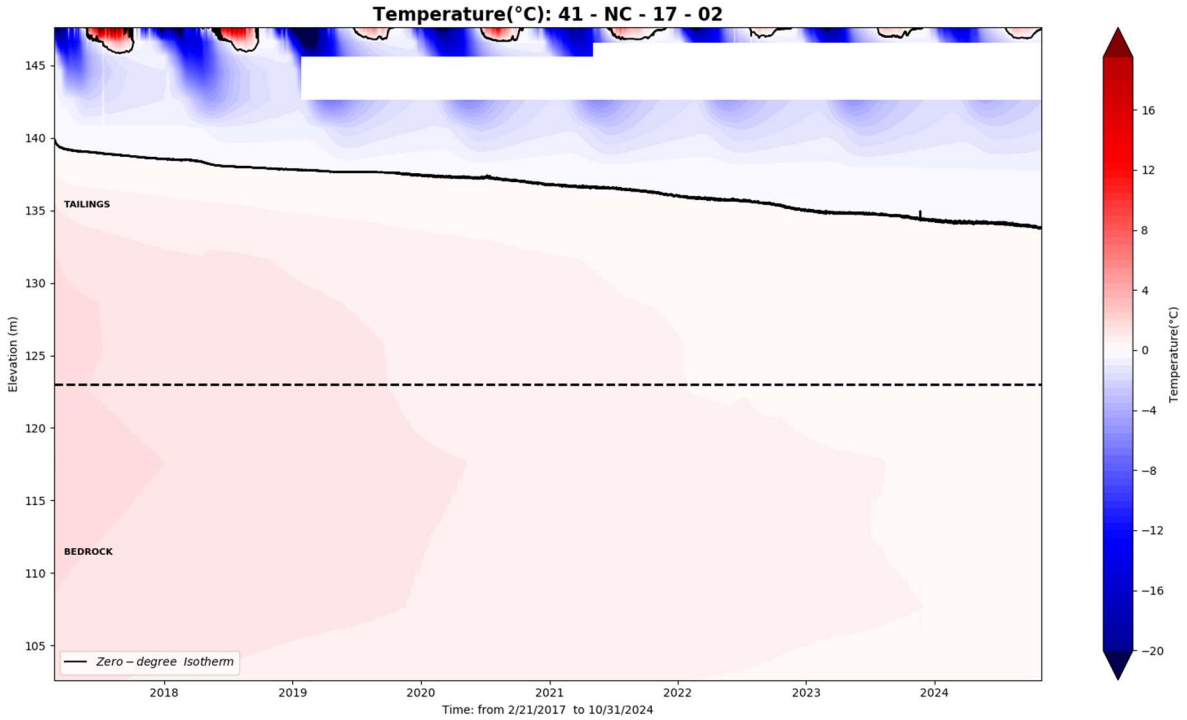

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-16-1
NC-17-3
NC-17-2
NC-17-1
NC-17-8
NC-17-6
NC-17-7
NC-17-5
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

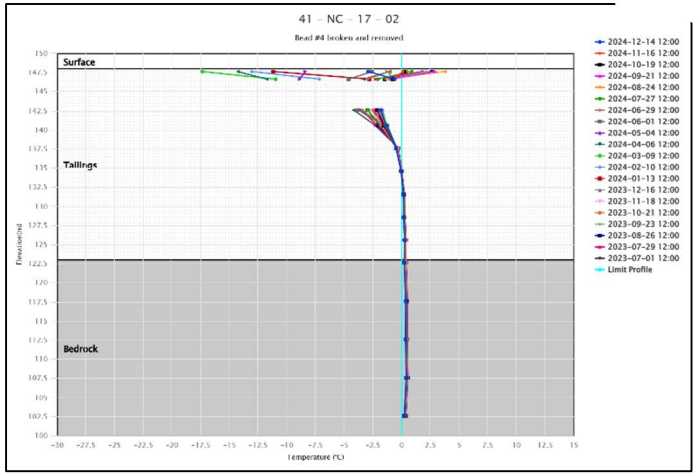

Temperature(°C): 41 - NC - 17 - 01
Elevation (m)
TAILINGS
BEDROCK
Zero – degree Isotherm
Time: from 2/20/2017 to 10/31/2024
Temperature(°C)


41 - NC - 17 - 01
Beads #1 and 2 broken
Surface
Tailings
Bedrock
Limit Profile

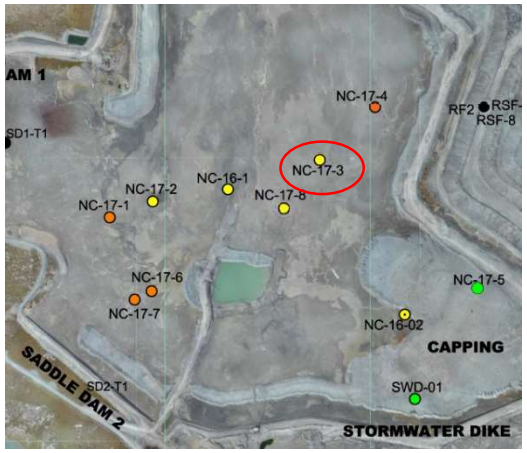
NC-17-02

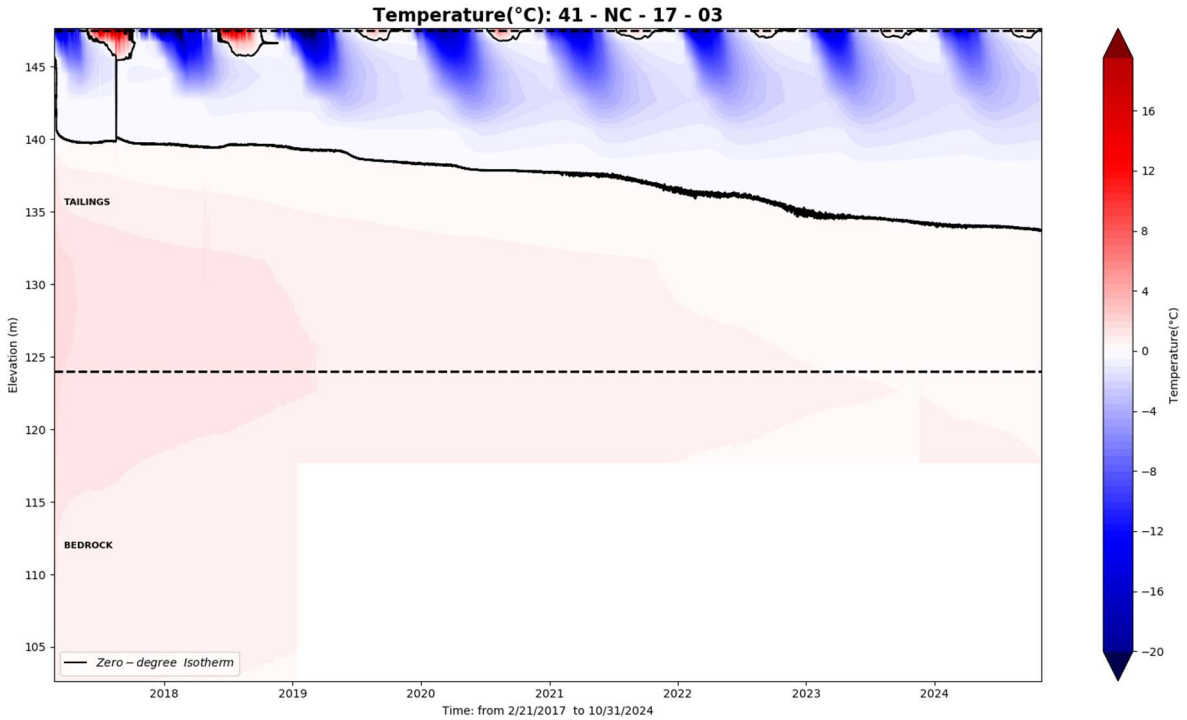

AM 1
NC-17-4
RF2
RSF-8
SD1-T1
NC-17-3
NC-16-1
NC-17-2
NC-17-8
NC-17-1
NC-17-6
NC-17-5
NC-17-7
NC-16-02
CAPPING
SD2-T1
SWD-01
SADDLE DAM 2
STORMWATER DIKE

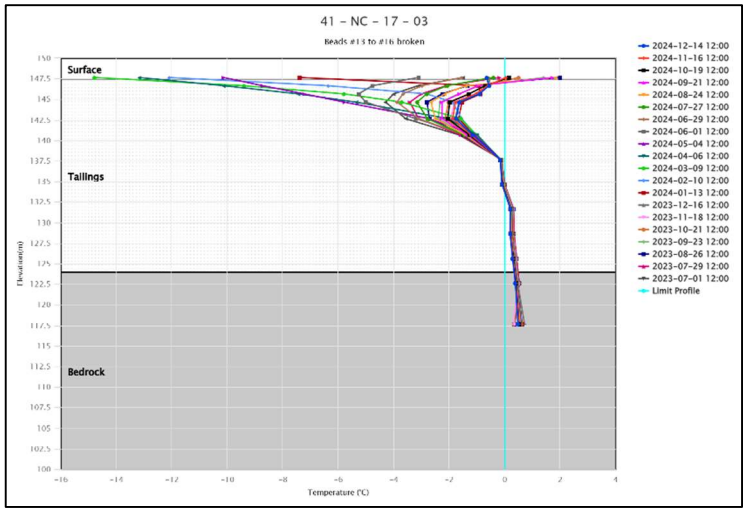

Temperature(°C): 41 - NC - 17 - 02
Elevation (m)
TAILINGS
BEDROCK
Zero – degree Isotherm
Time: from 2/21/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 02
Bead #4 broken and removed
Surface
Tailings
Bedrock
Elevation (m)
Temperature (°C)
Limit Profile

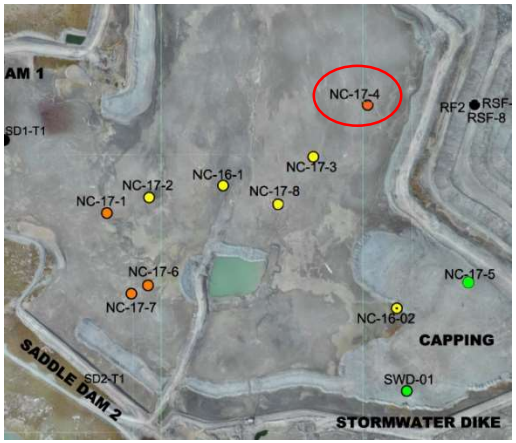
NC-17-03

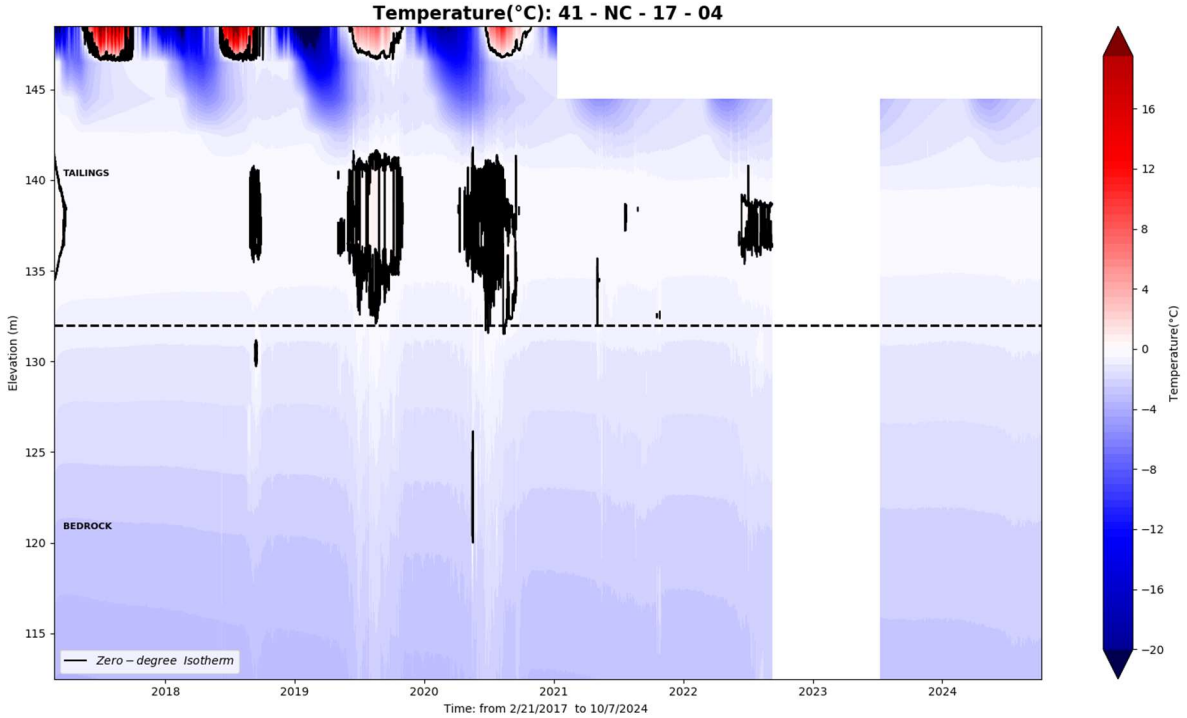

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-1
NC-17-8
NC-17-6
NC-17-7
NC-17-5
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

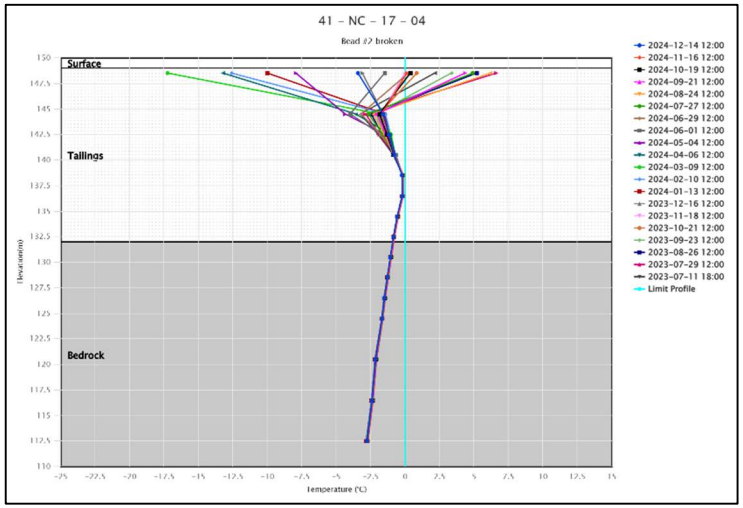

Temperature(°C): 41 - NC - 17 - 03
Elevation (m)
TAILINGS
BEDROCK
Zero – degree Isotherm
Time: from 2/21/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 03
Beads #13 to #16 broken
Surface
Tailings
Bedrock
Temperature (°C)
Limit Profile

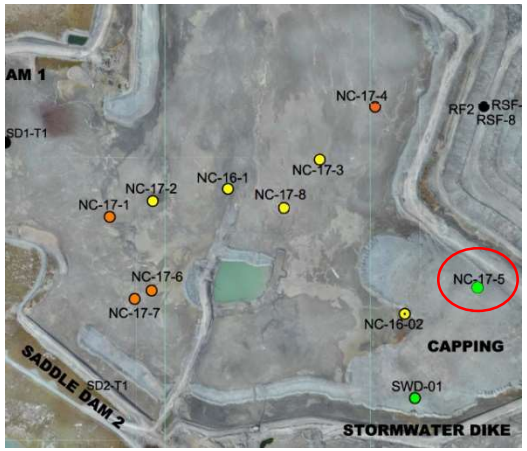
NC-17-04

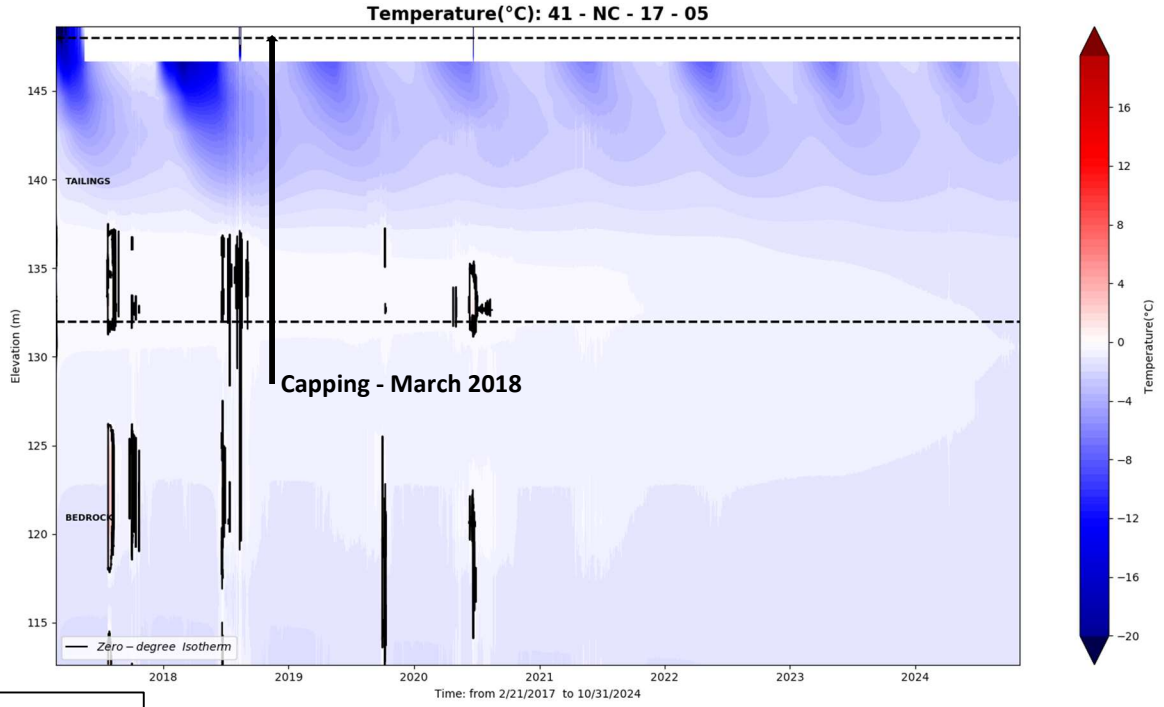

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-1
NC-17-8
NC-17-6
NC-17-7
NC-17-5
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

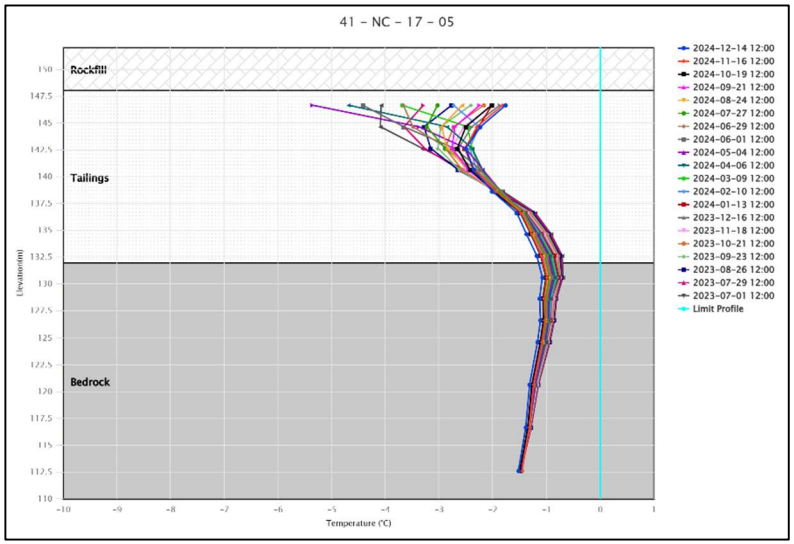

Temperature(°C): 41 - NC - 17 - 04
TAILINGS
BEDROCK
Zero – degree Isotherm
Elevation (m)
Time: from 2/21/2017 to 10/7/2024
Temperature(°C)


41 – NC – 17 – 04
Bead #2 broken
Surface
Tailings
Bedrock
Limit Profile

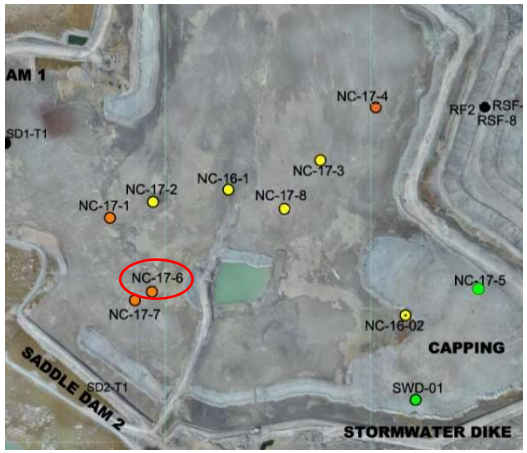
NC-17-05

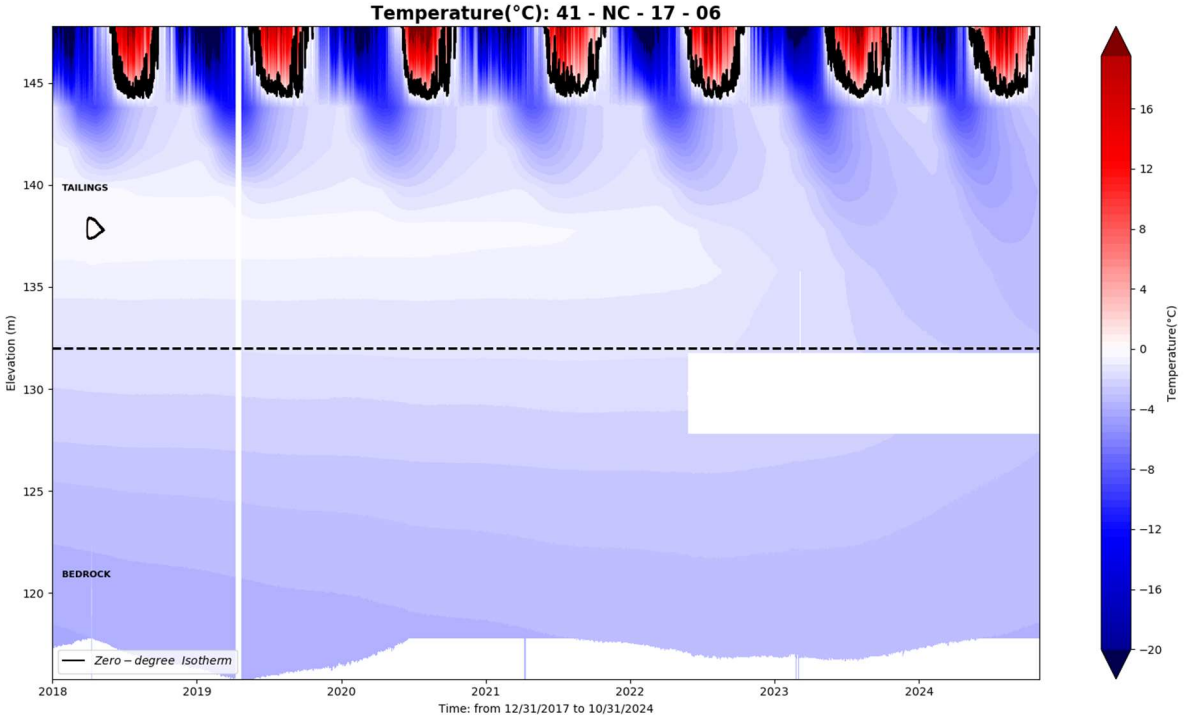

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-8
NC-17-1
NC-17-6
NC-17-5
NC-17-7
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

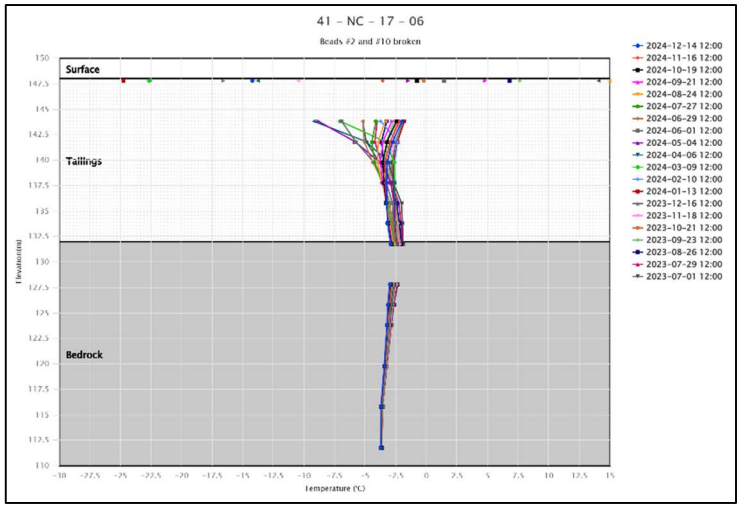

Temperature(°C): 41 - NC - 17 - 05
Elevation (m)
TAILINGS
BEDROCK
Capping - March 2018
Zero – degree Isotherm
Time: from 2/21/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 05
Rockfill
Tailings
Bedrock
Limit Profile
Temperature (°C)

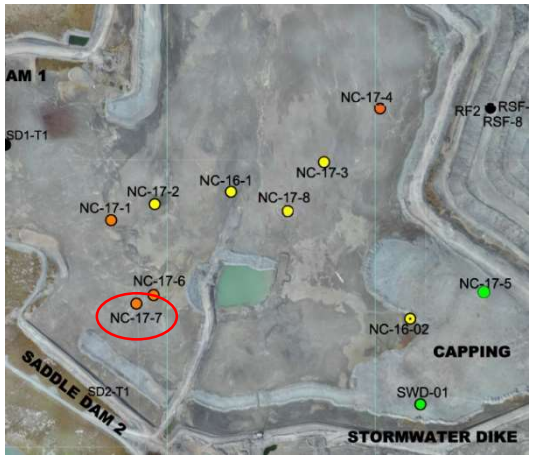
NC-17-06

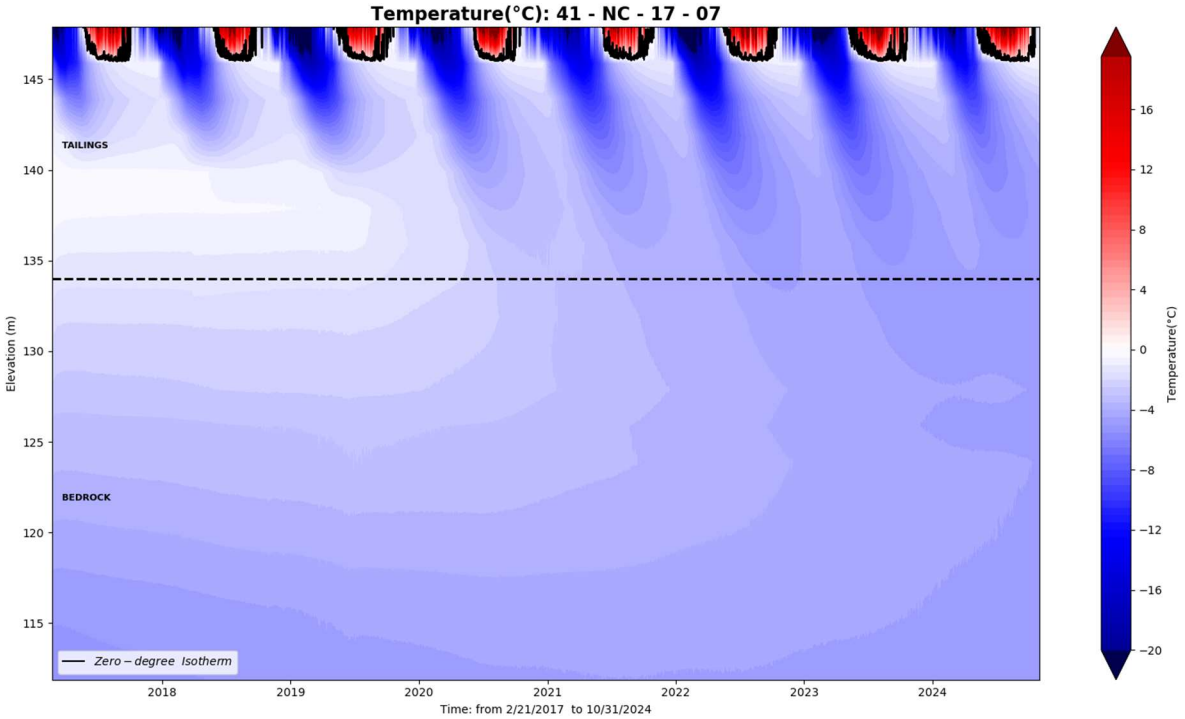

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-8
NC-17-1
NC-17-6
NC-17-5
NC-17-7
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

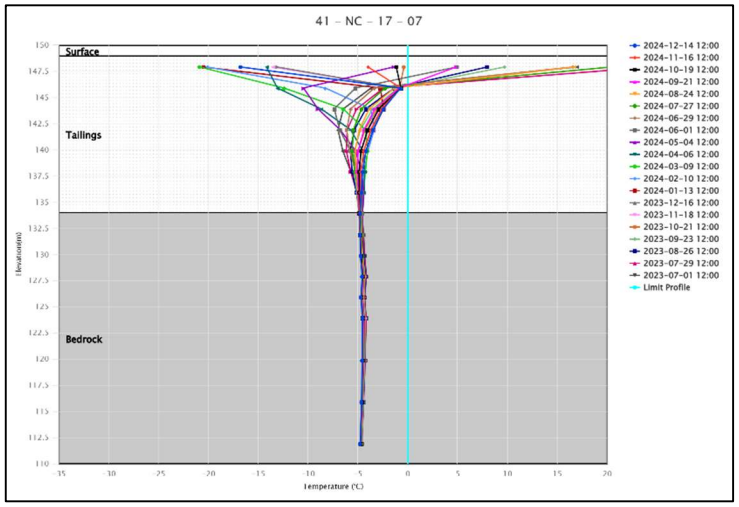

Temperature(°C): 41 - NC - 17 - 06
Elevation (m)
TAILINGS
BEDROCK
Zero – degree Isotherm
Time: from 12/31/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 06
Beads #2 and #10 broken
Surface
Tailings
Bedrock
Elevation (m)
Temperature (°C)

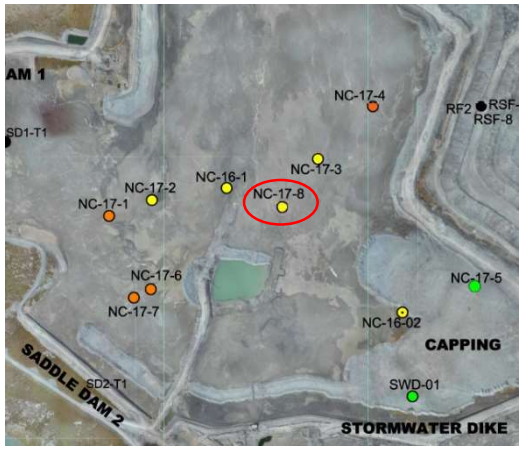
NC-17-07

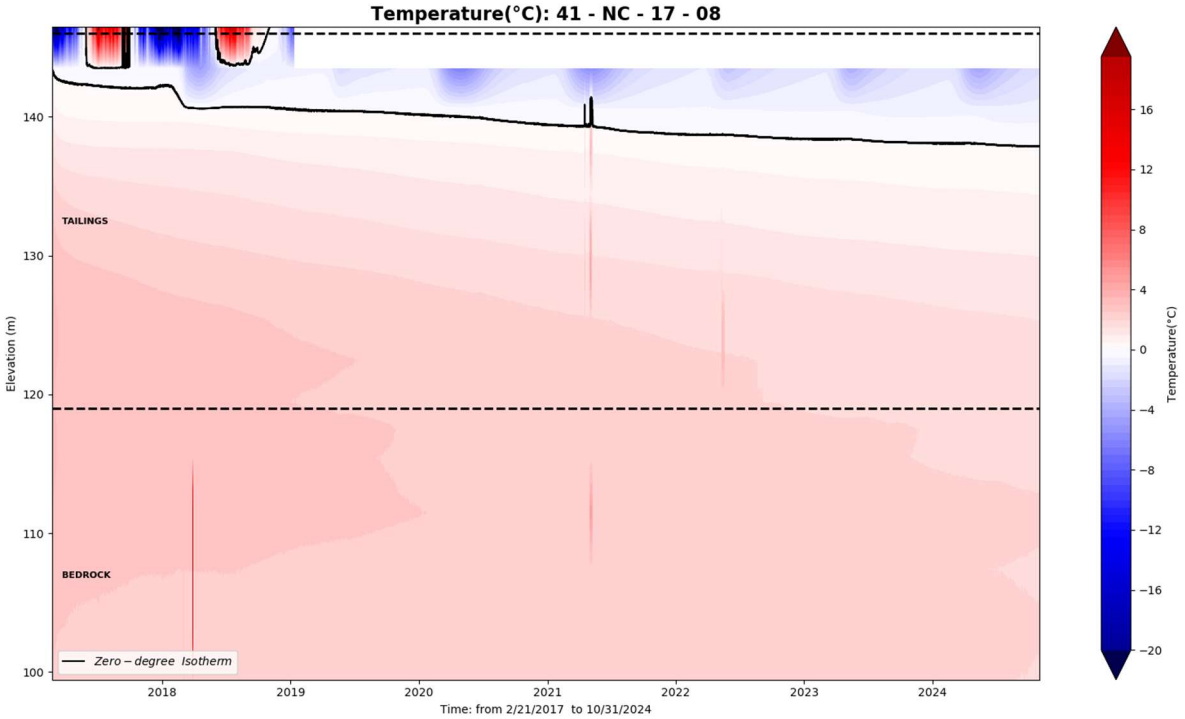

AM 1
SD1-T1
NC-17-4
RF2
RSF-
RSF-8
NC-16-1
NC-17-3
NC-17-2
NC-17-1
NC-17-8
NC-17-6
NC-17-7
NC-17-5
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

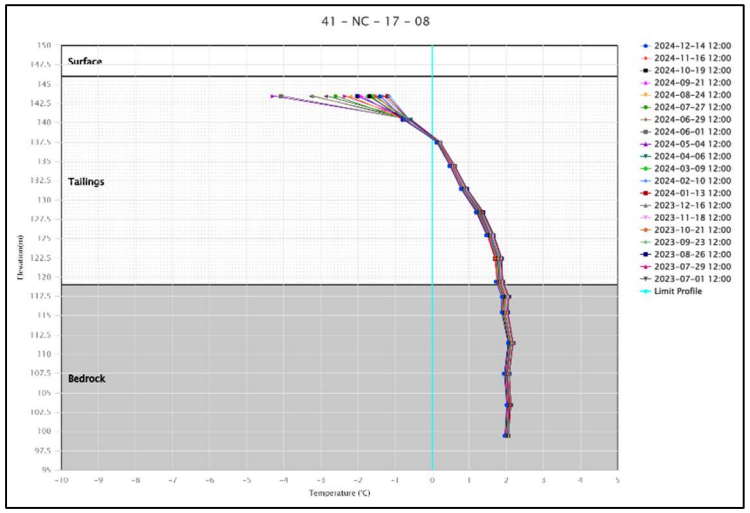

Temperature(°C): 41 - NC - 17 - 07
TAILINGS
BEDROCK
Zero – degree Isotherm
Elevation (m)
Time: from 2/21/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 07
Surface
Tailings
Bedrock
Elevation(m)
Temperature (°C)
Limit Profile

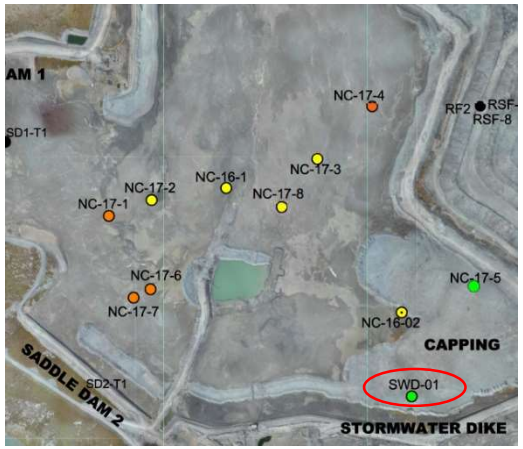
NC-17-08

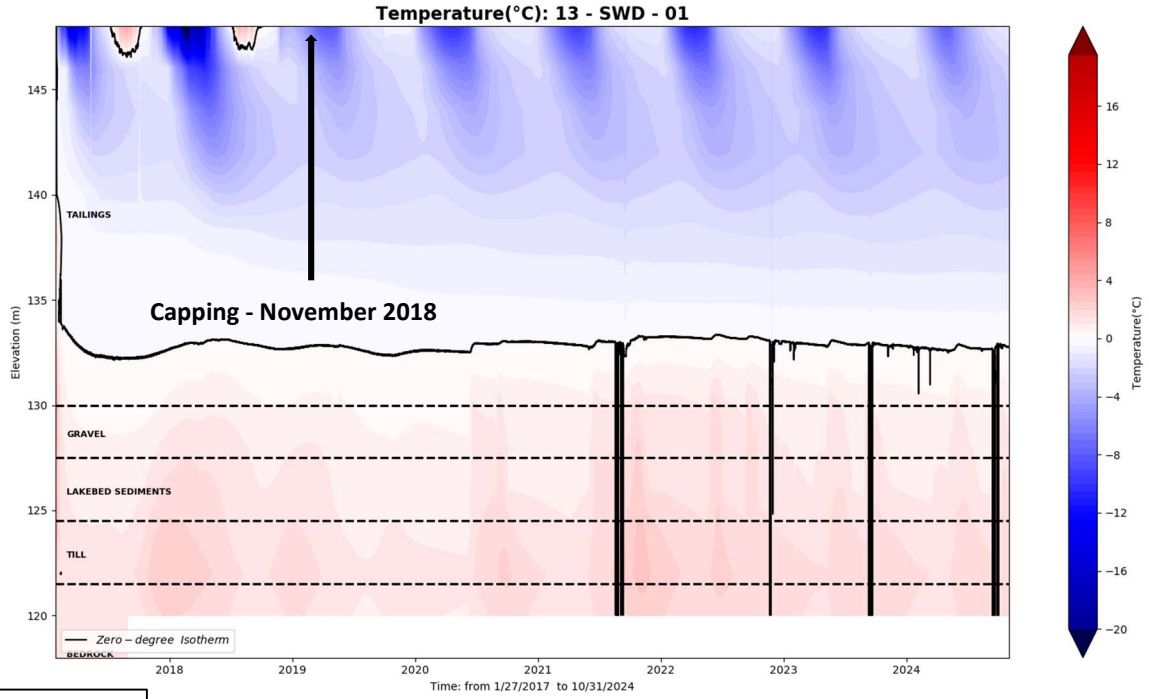

AM 1
SD1-T1
NC-17-4
RF2
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-1
NC-17-8
NC-17-6
NC-17-7
NC-17-5
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

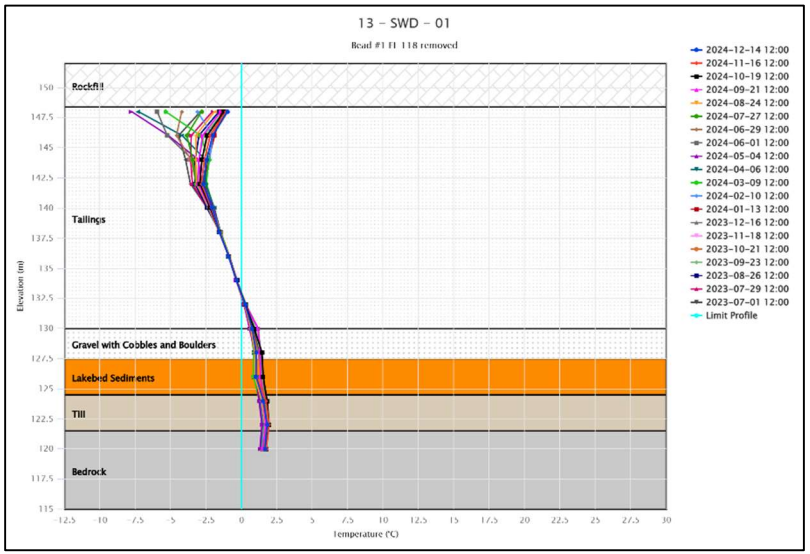

Temperature(°C): 41 - NC - 17 - 08
Elevation (m)
TAILINGS
BEDROCK
Zero – degree Isotherm
Time: from 2/21/2017 to 10/31/2024
Temperature(°C)


41 – NC – 17 – 08
Surface
Tailings
Bedrock
Limit Profile

SWD-01

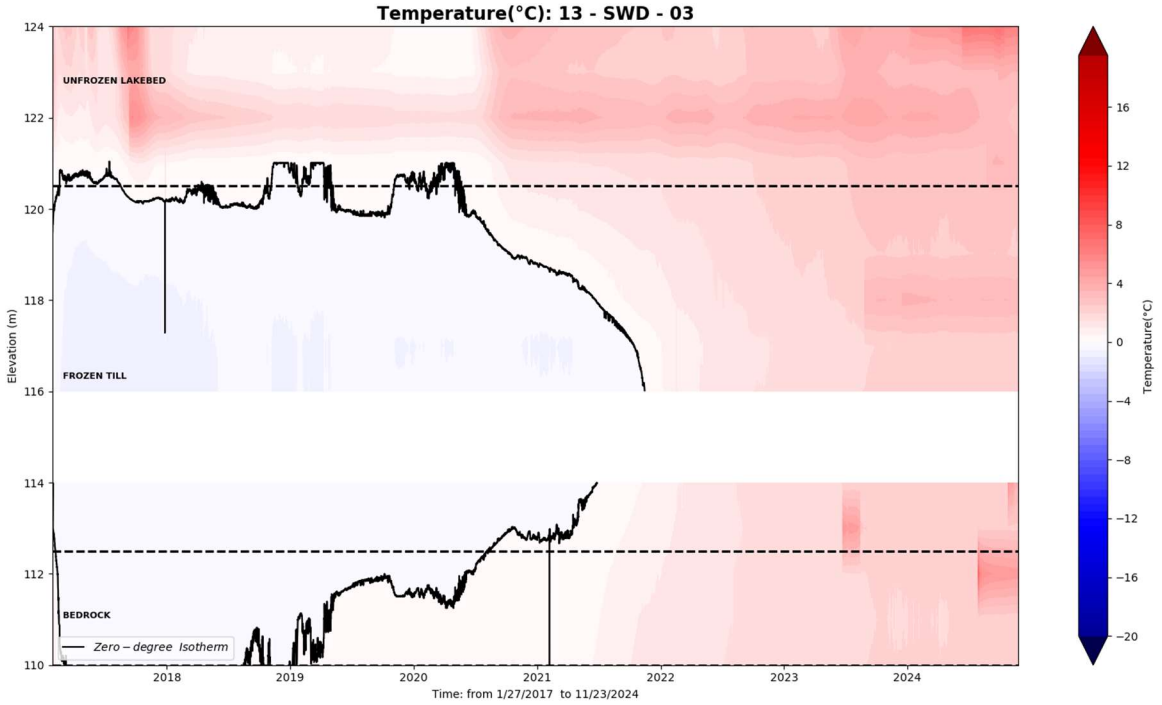

AM 1
SD1-T1
NC-17-4
RF2
RSF-8
NC-17-3
NC-16-1
NC-17-2
NC-17-8
NC-17-1
NC-17-6
NC-17-5
NC-17-7
NC-16-02
CAPPING
SADDLE DAM 2
SD2-T1
SWD-01
STORMWATER DIKE

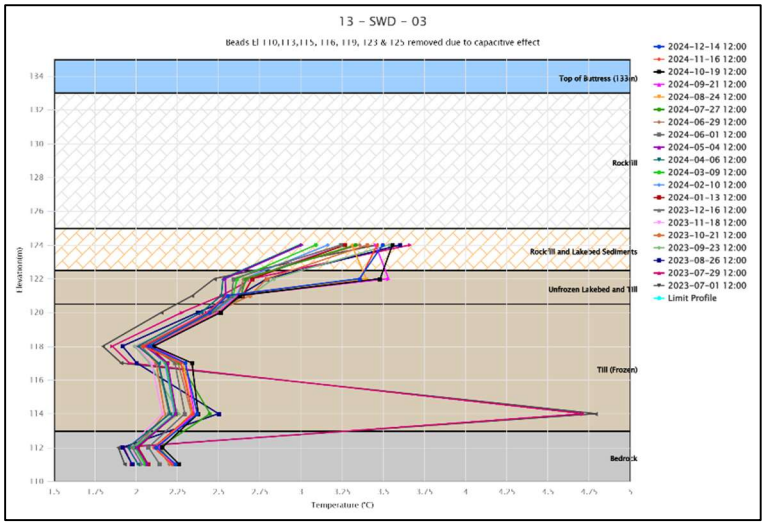

Temperature(°C): 13 - SWD - 01
Capping - November 2018
TAILINGS
GRAVEL
LAKEBED SEDIMENTS
TILL
BEDROCK
Zero – degree Isotherm
Elevation (m)
Time: from 1/27/2017 to 10/31/2024
Temperature(°C)


13 – SWD – 01
Bead #1 FI 118 removed
Rockfill
Tailings
Gravel with Cobbles and Boulders
Lakebed Sediments
Till
Bedrock
Elevation (m)
Temperature (°C)
Limit Profile

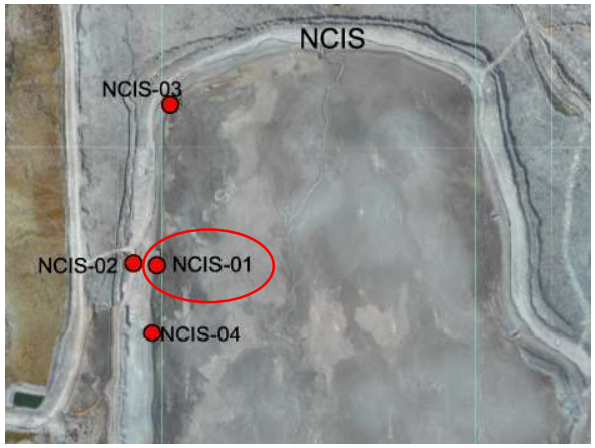
SWD-03

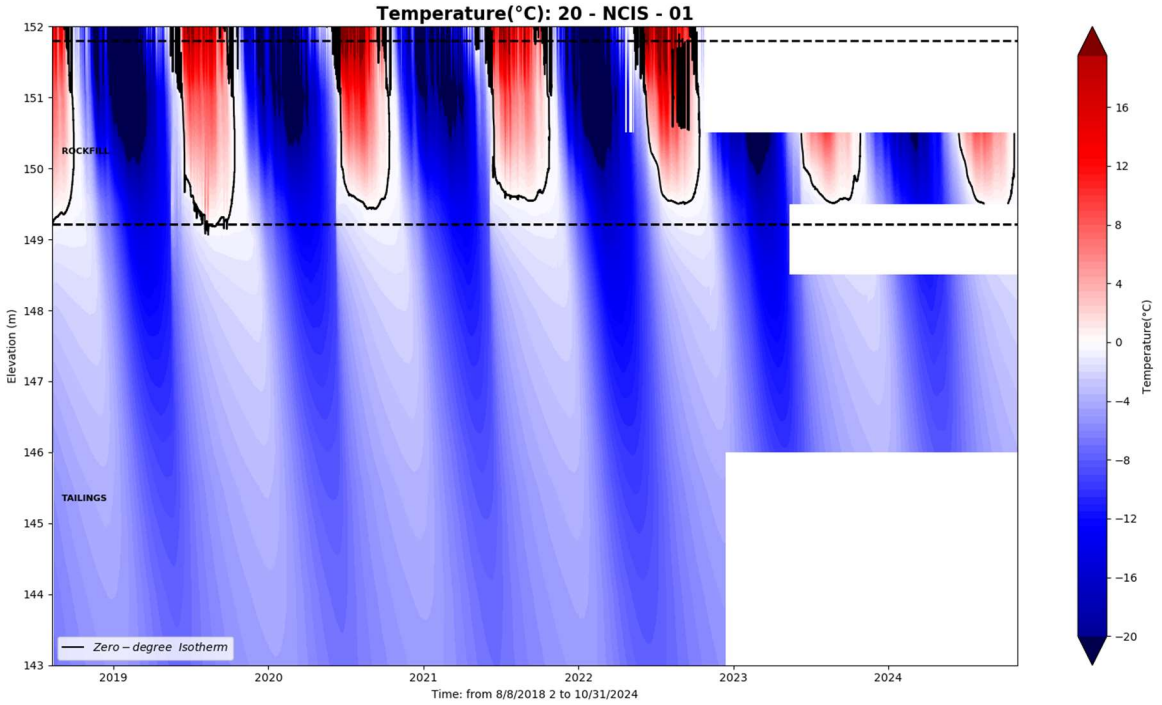

PORTAGE WASTE DUMP
NC-17-8
RSF-8
RSF-10
RSF-3
RF1
NC-17-5
NC-17-6
NC-17-7
NC-16-02
CAPPING
SWD-01
STORMWATER DIKE
SWD-03
SADDLE DAM 3

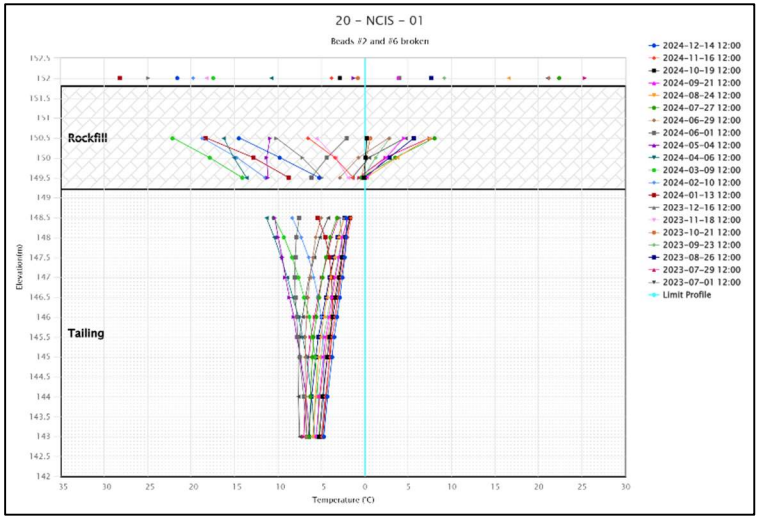

Temperature(°C): 13 - SWD - 03
UNFROZEN LAKEBED
FROZEN TILL
BEDROCK
Zero – degree Isotherm
Elevation (m)
Time: from 1/27/2017 to 11/23/2024
Temperature(°C)


13 – SWD – 03
Beads El 110,113,115, 116, 119, 123 & 125 removed due to capacitive effect
Top of Buttress (133m)
Rockfill
Rockfill and Lakebed Sediments
Unfrozen Lakebed and Till
Till (Frozen)
Bedrock
Limit Profile
Temperature (°C)

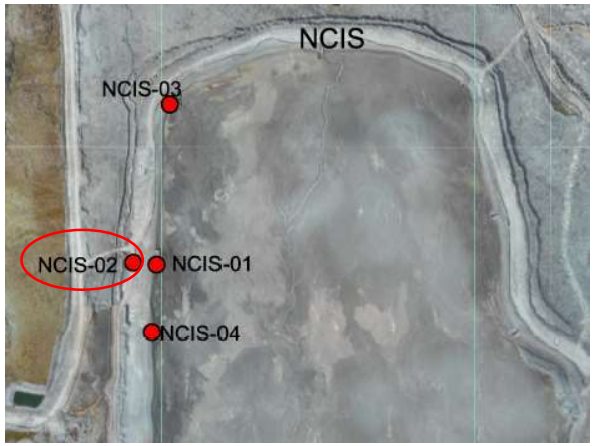
NCIS-01

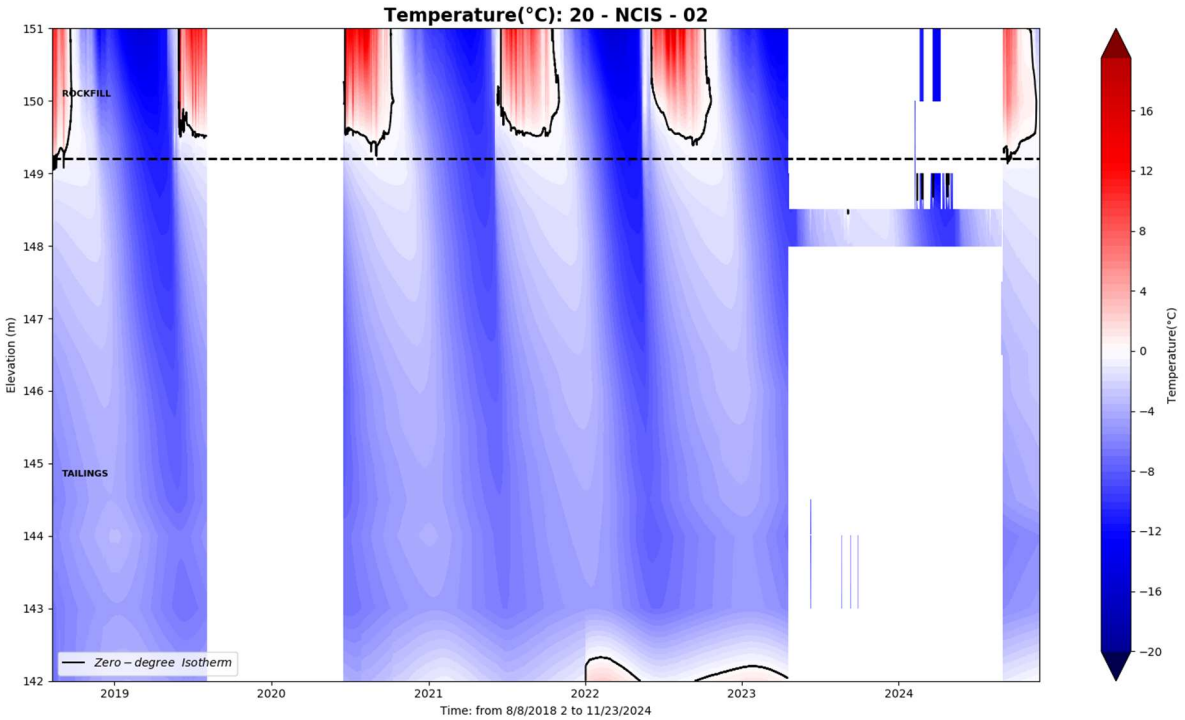

NCIS
NCIS-03
NCIS-02
NCIS-01
NCIS-04

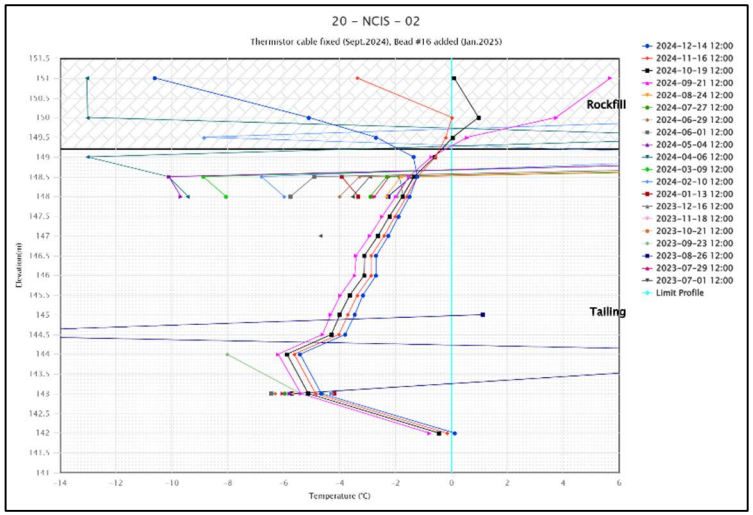

Temperature(°C): 20 - NCIS - 01
ROCKFILL
TAILINGS
Zero – degree Isotherm
Elevation (m)
Time: from 8/8/2018 2 to 10/31/2024
Temperature(°C)


20 – NCIS – 01
Beads #2 and #6 broken
Rockfill
Tailing
Elevation(m)
Temperature (°C)
Limit Profile

NCIS-02

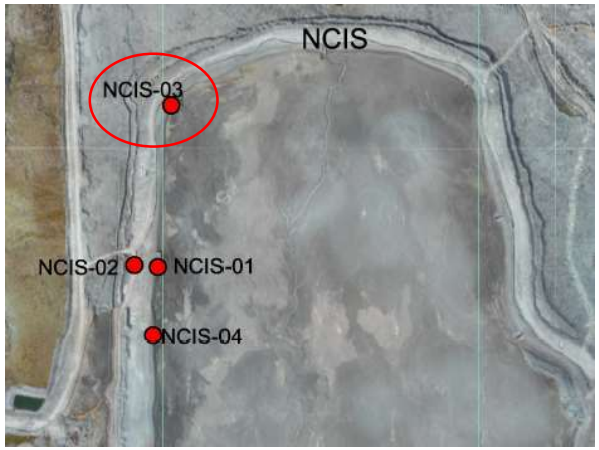


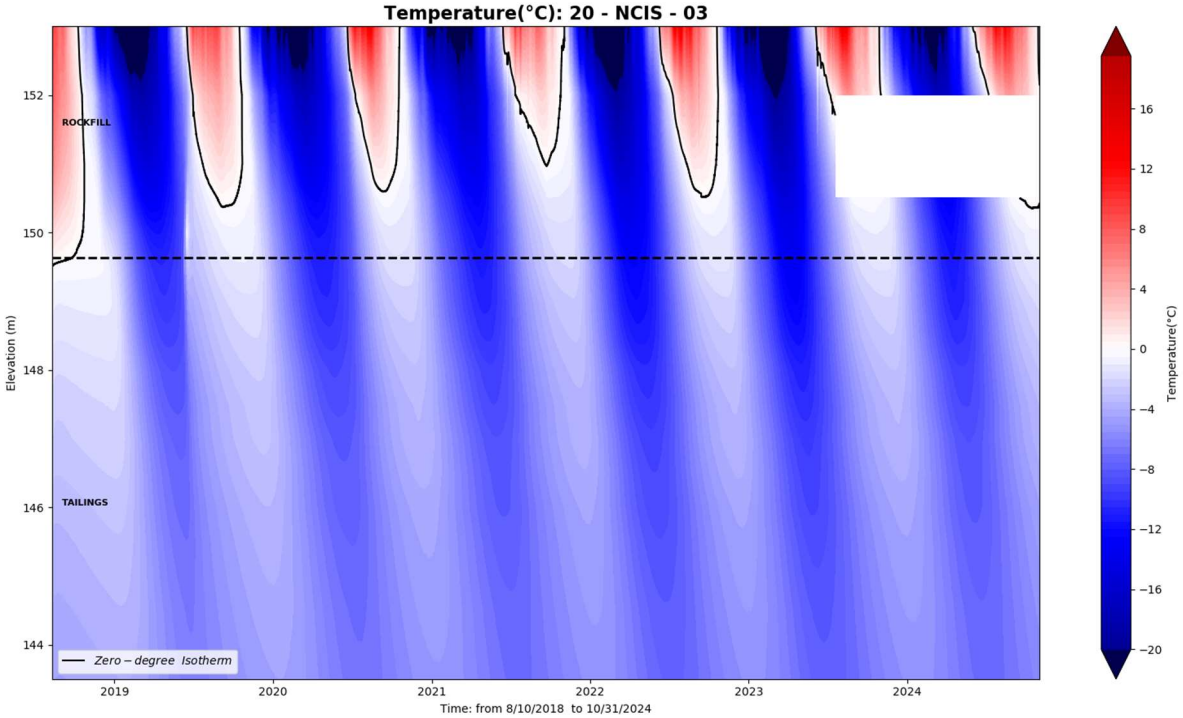


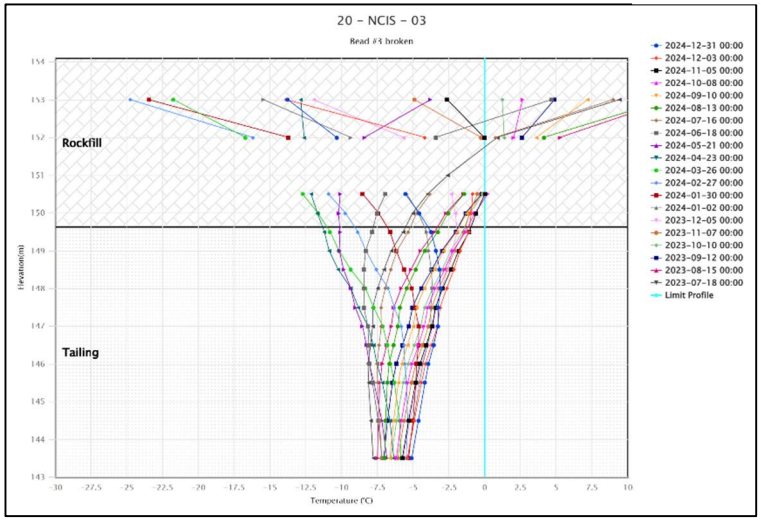


This instrument was fixed in September 2024.

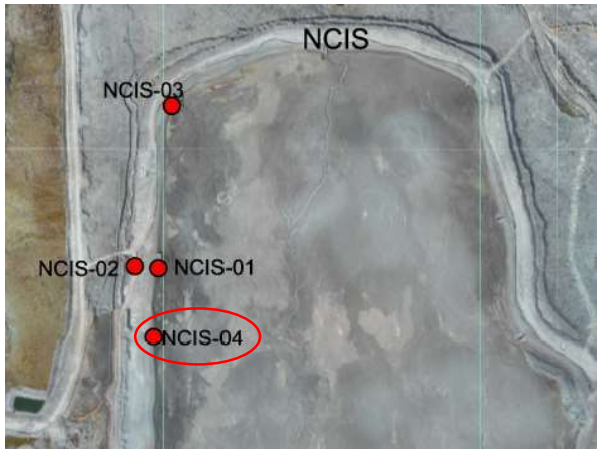
NCIS-03

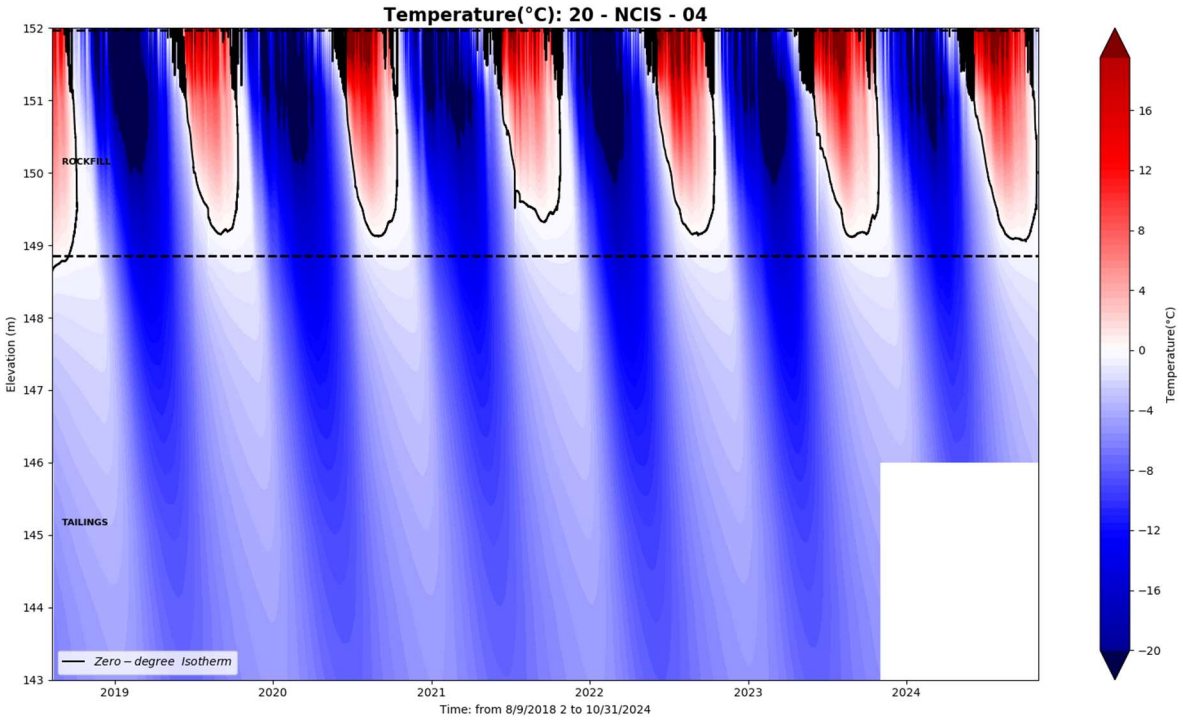

NCIS
NCIS-03
NCIS-02
NCIS-01
NCIS-04

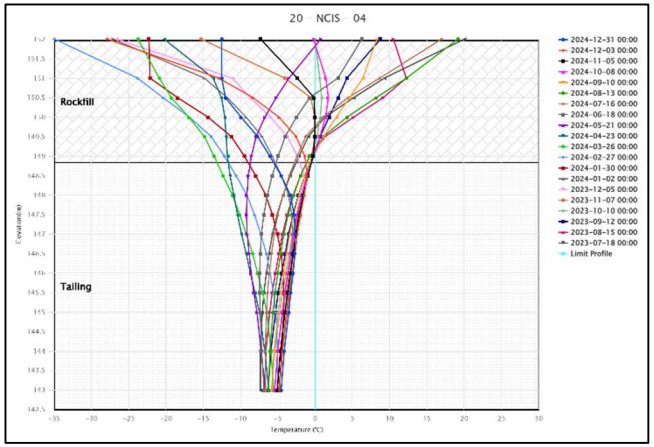

Temperature(°C): 20 - NCIS - 03
ROCKFILL
TAILINGS
Zero – degree Isotherm
Elevation (m)
Time: from 8/10/2018 to 10/31/2024
Temperature(°C)


20 – NCIS – 03
Read #3 broken
Rockfill
Tailing
Limit Profile

NCIS-04

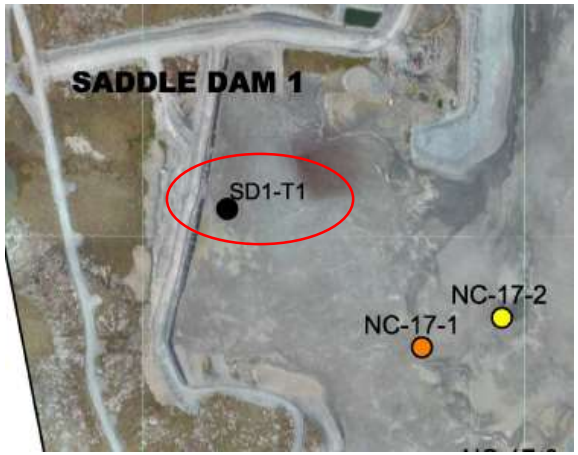

NCIS
NCIS-03
NCIS-02
NCIS-01
NCIS-04

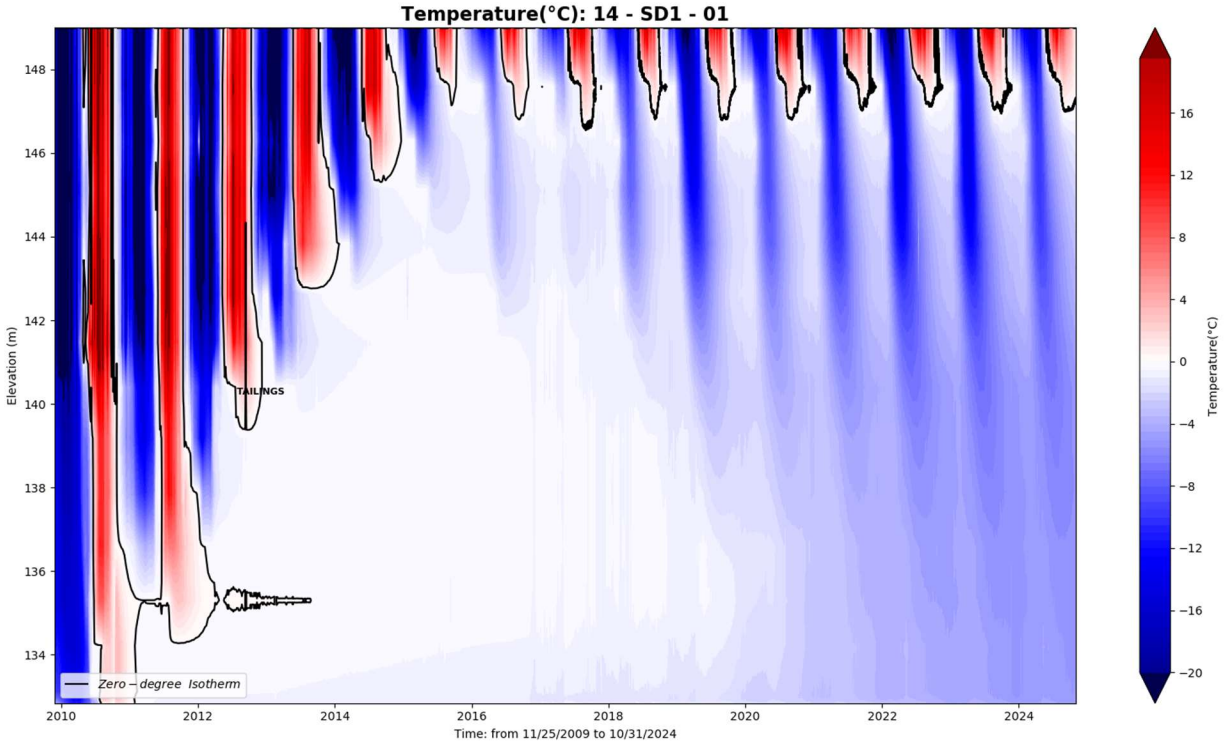

Temperature(°C): 20 - NCIS - 04
ROCKFILL
TAILINGS
Zero – degree Isotherm
Elevation (m)
Time: from 8/9/2018 2 to 10/31/2024
Temperature(°C)

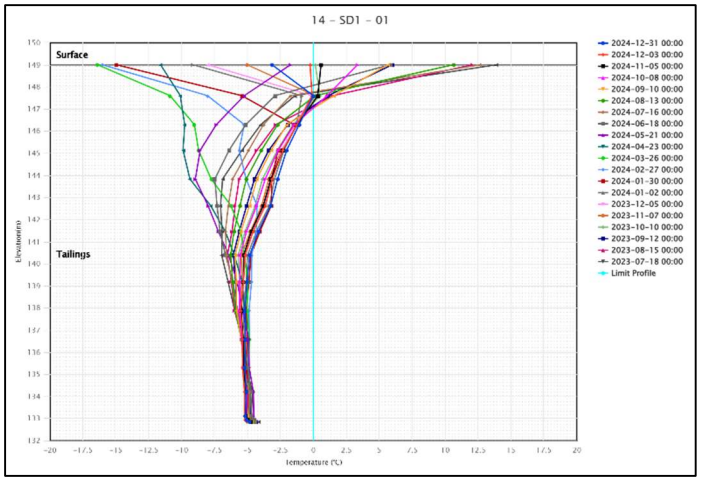

20 NCIS 04
Rockfill
Tailing
Limit Profile

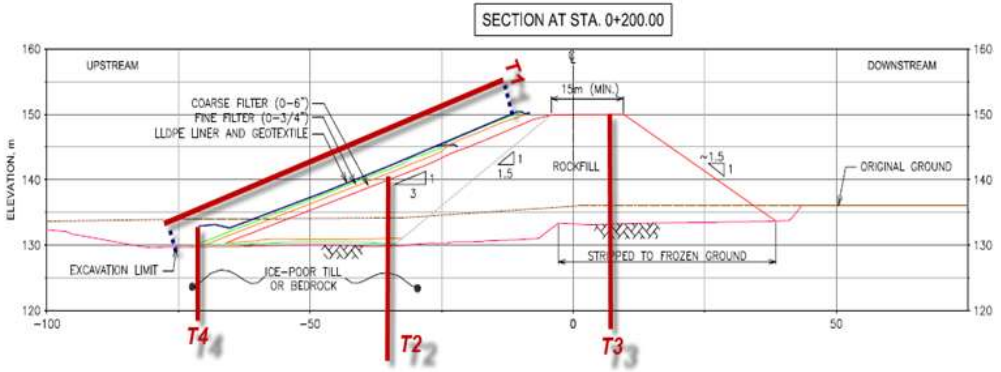
SD1-1

This instrument is along the liner.



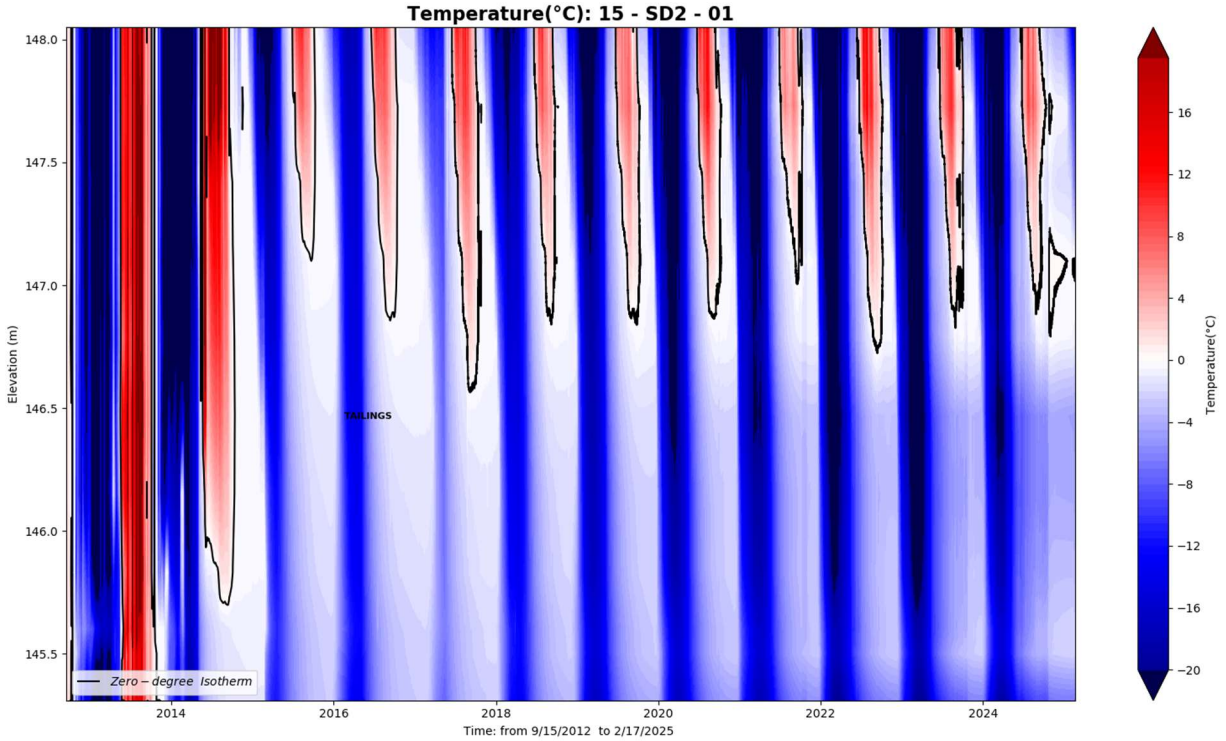


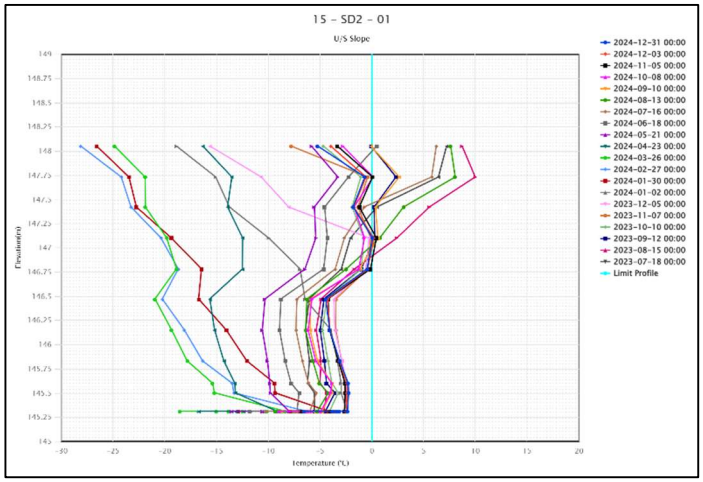


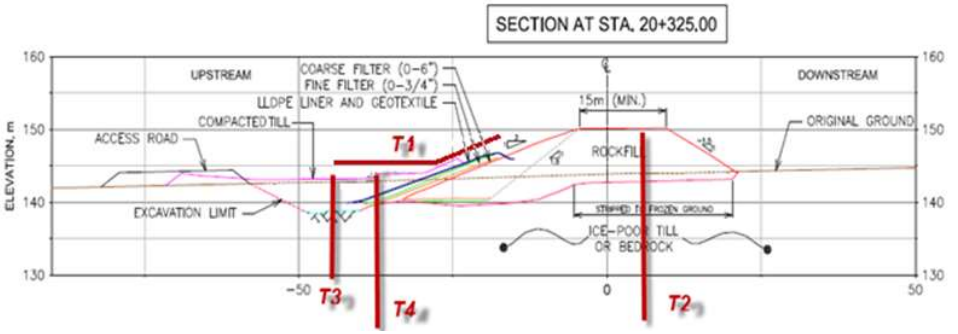


SD2-1

This instrument is along the liner.

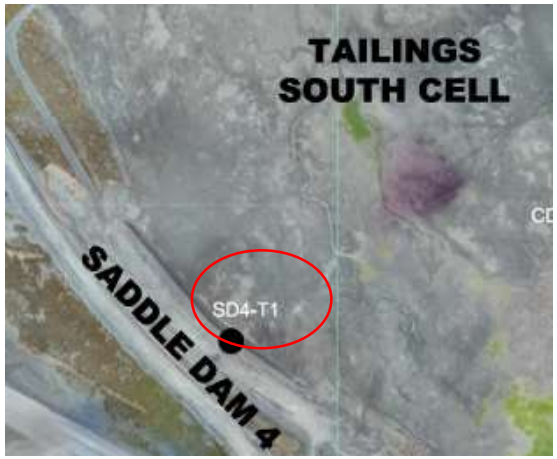


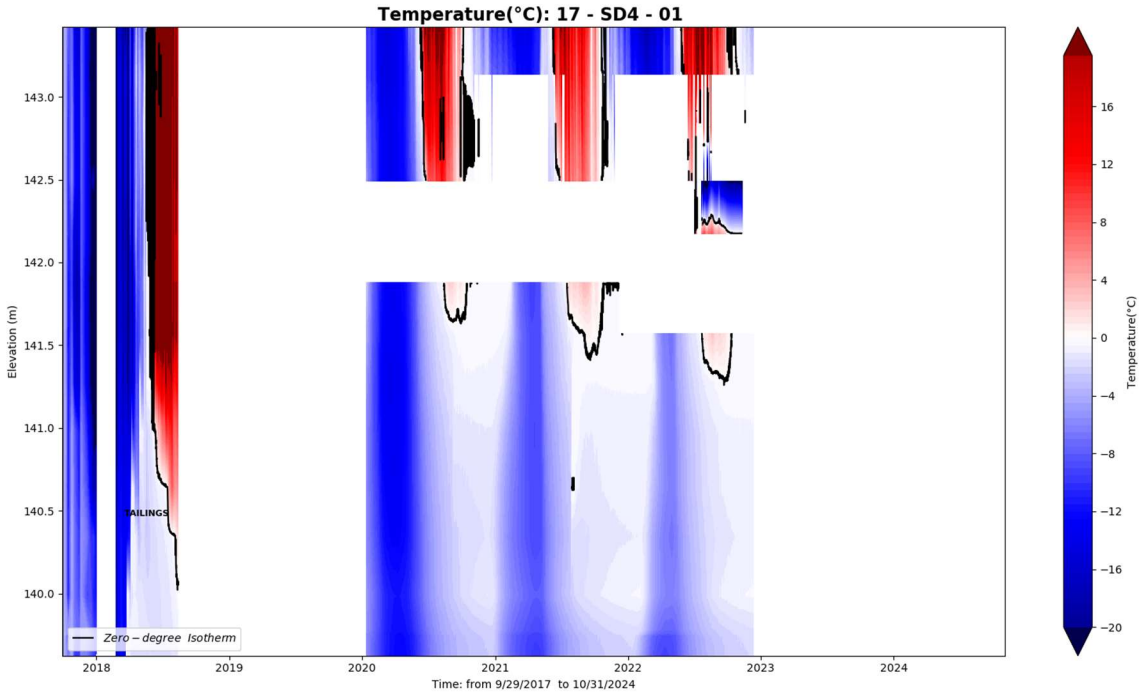


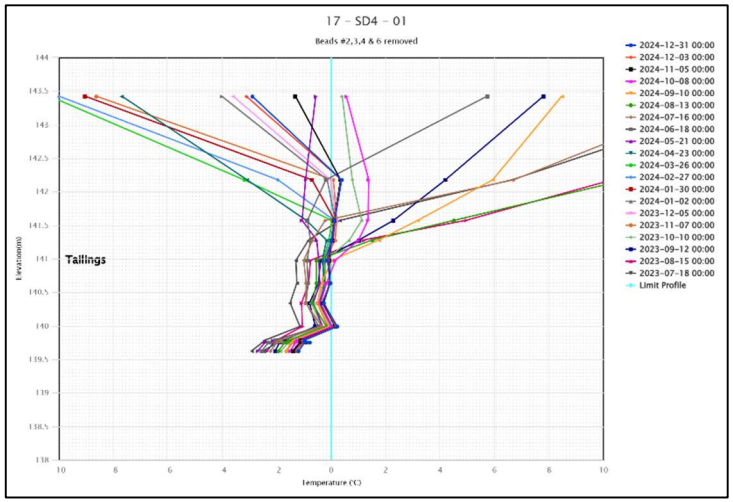


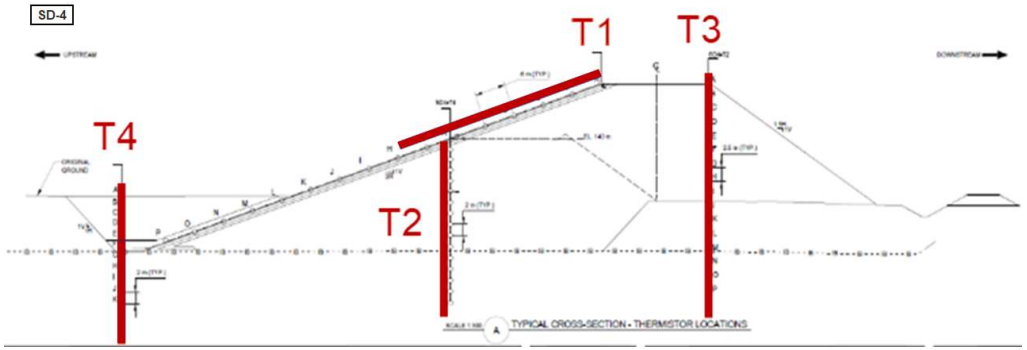
SD4-1

This instrument is along the liner. Note that some of the beads are no longer functioning properly, as seen on the graphs.



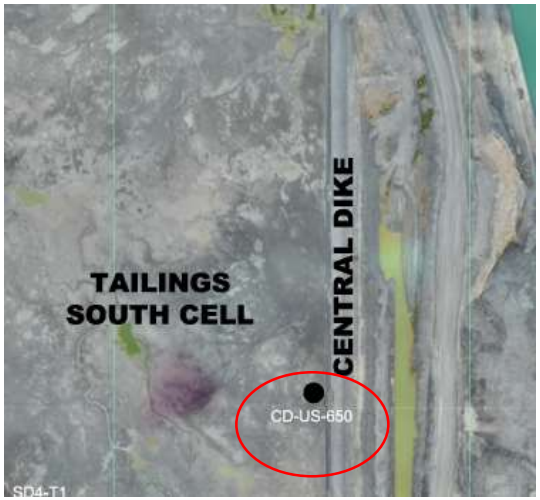


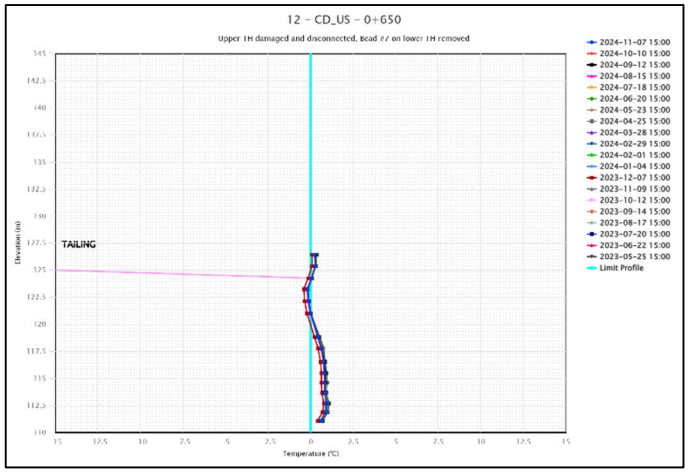


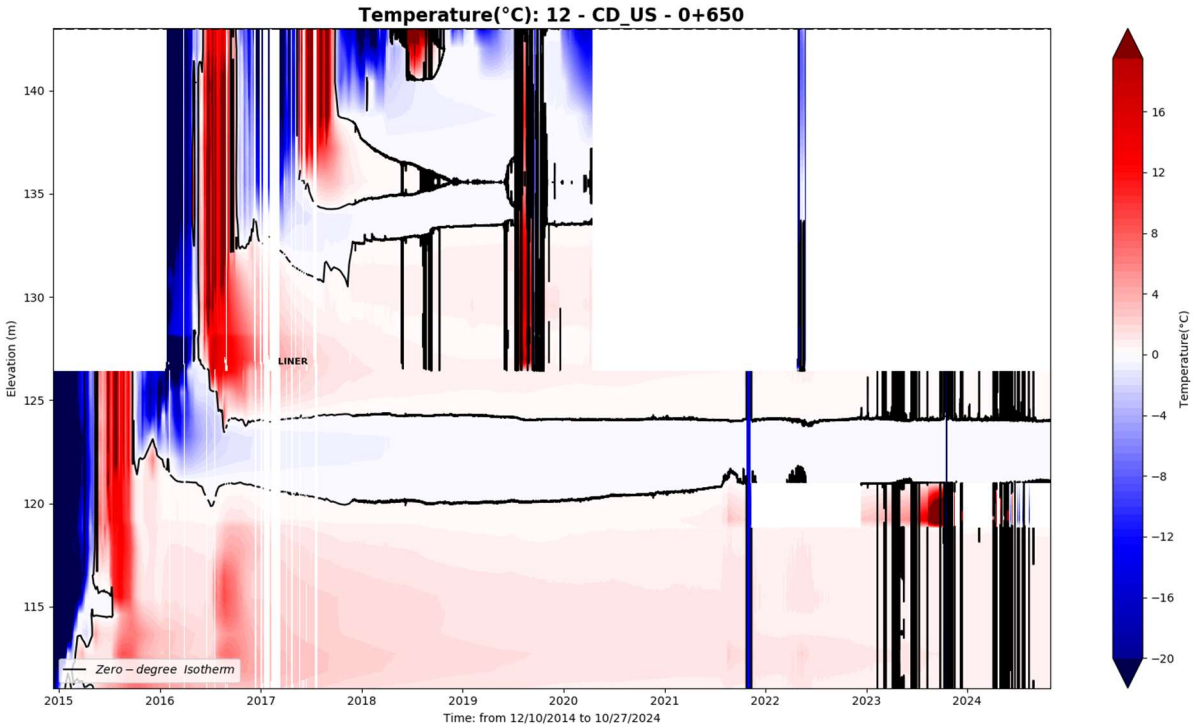


CD-US-0+650

This instrument is along the liner.

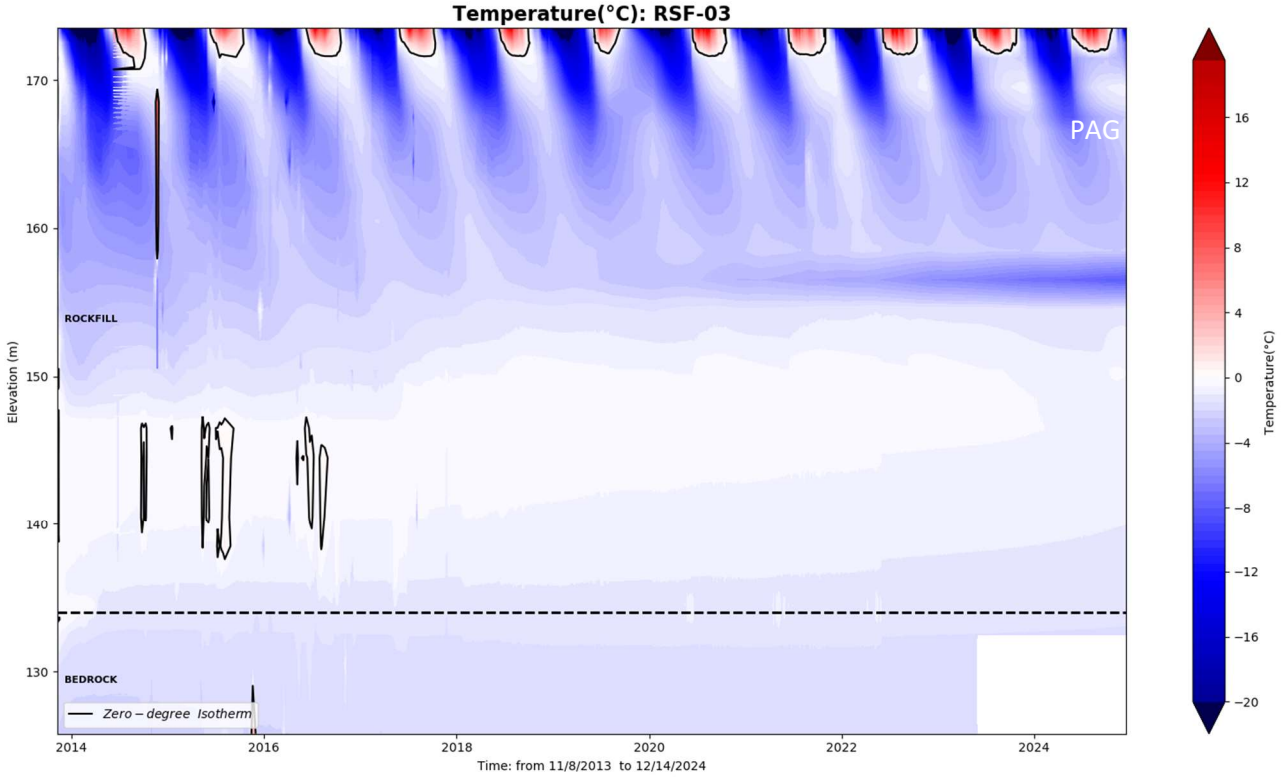






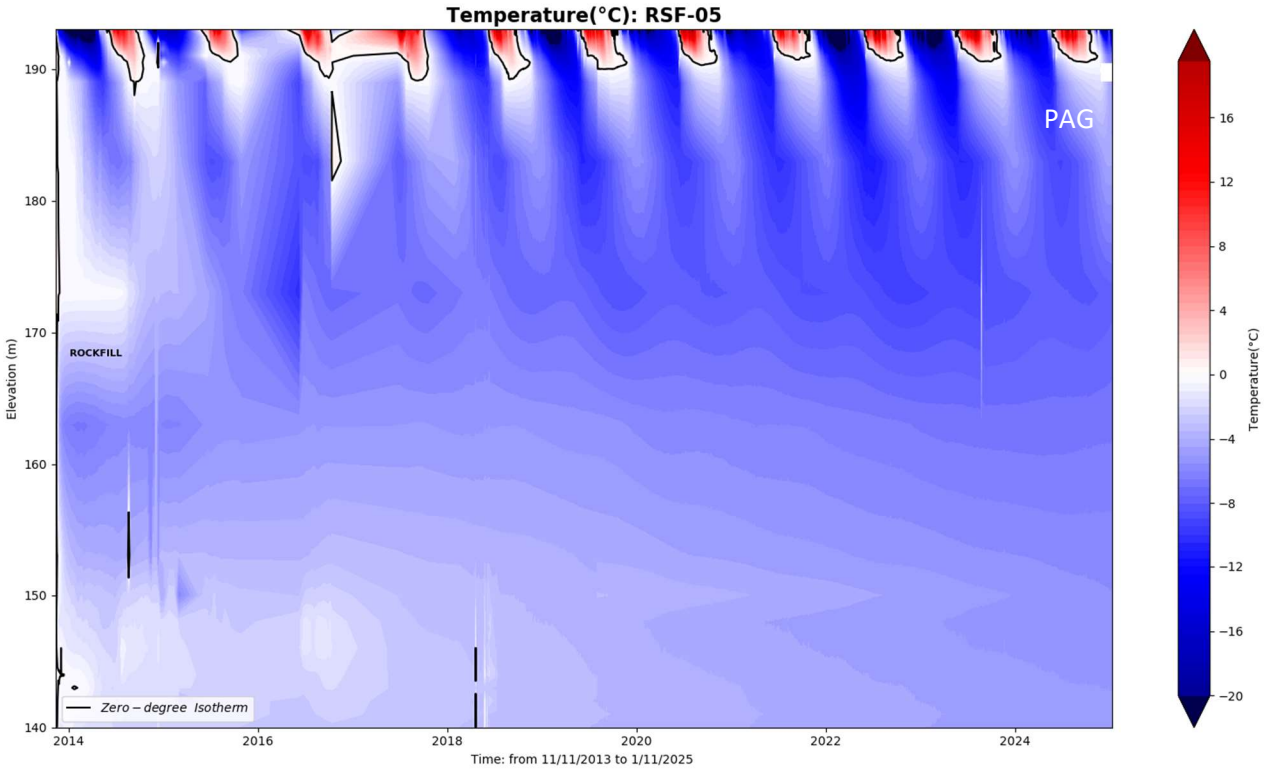
RSF-3


RSF-18
RSF-15
RSF-16
RF2
RSF-7
RSF-8
RSF-5
RSF-17
RSF-13
RSF-14
PORTAGE WASTE
DUMP
RSF-9
RSF-10
RSF-11
RSF-12
RSF-3
RF1
NC-17-5
RSF-6


Temperature(°C): RSF-03
PAG
ROCKFILL
BEDROCK
Zero – degree Isotherm
Elevation (m)
170
160
150
140
130
2014
2016
2018
2020
2022
2024
Time: from 11/8/2013 to 12/14/2024
Temperature(°C)
16
12
8
4
0
−4
−8
−12
−16
−20

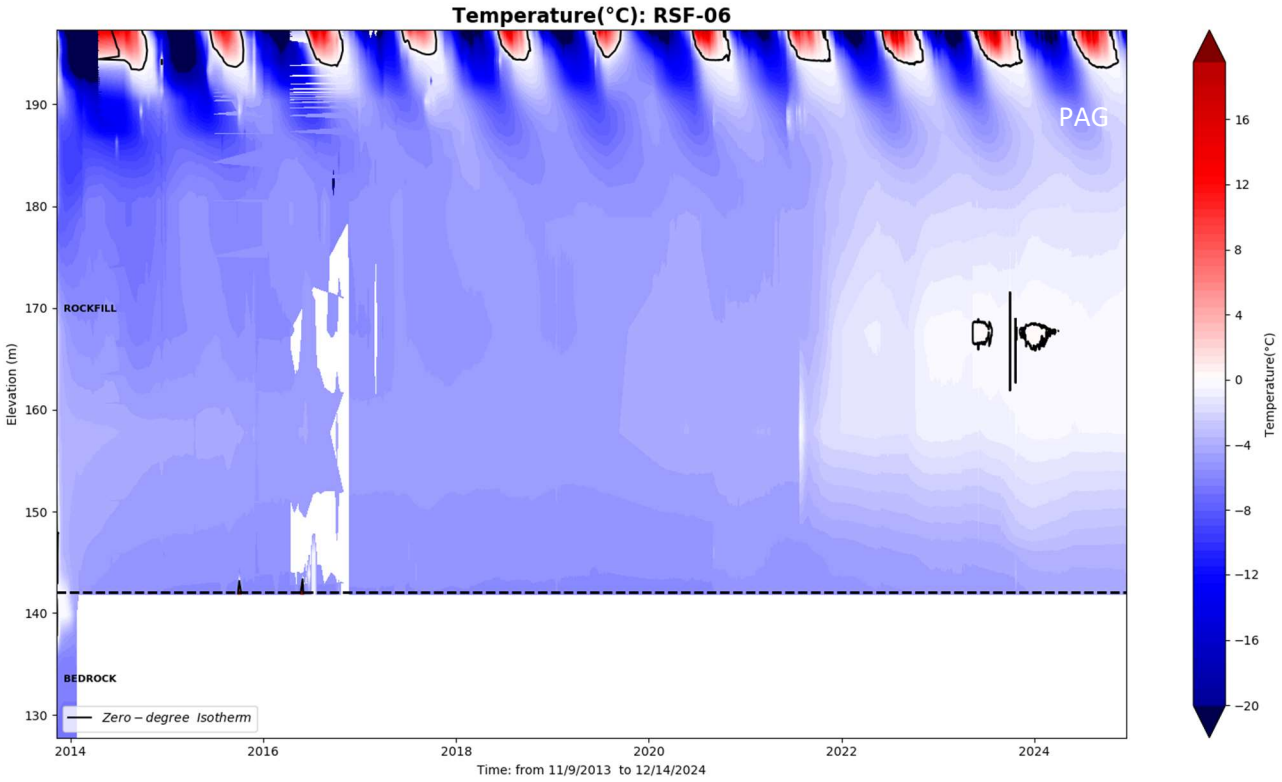
RSF-5


RSF-18
RSF-15
RSF-16
RF2
RSF-7
RSF-8
RSF-5
RSF-17
RSF-13
RSF-14
PORTAGE WASTE
DUMP
RSF-9
RSF-10
RSF-11
RSF-12
RSF-3
RF1
NC-17-5
RSF-6


Temperature(°C): RSF-05
PAG
ROCKFILL
Zero – degree Isotherm
Elevation (m)
190
180
170
160
150
140
2014
2016
2018
2020
2022
2024
Time: from 11/11/2013 to 1/11/2025
Temperature(°C)
16
12
8
4
0
−4
−8
−12
−16
−20

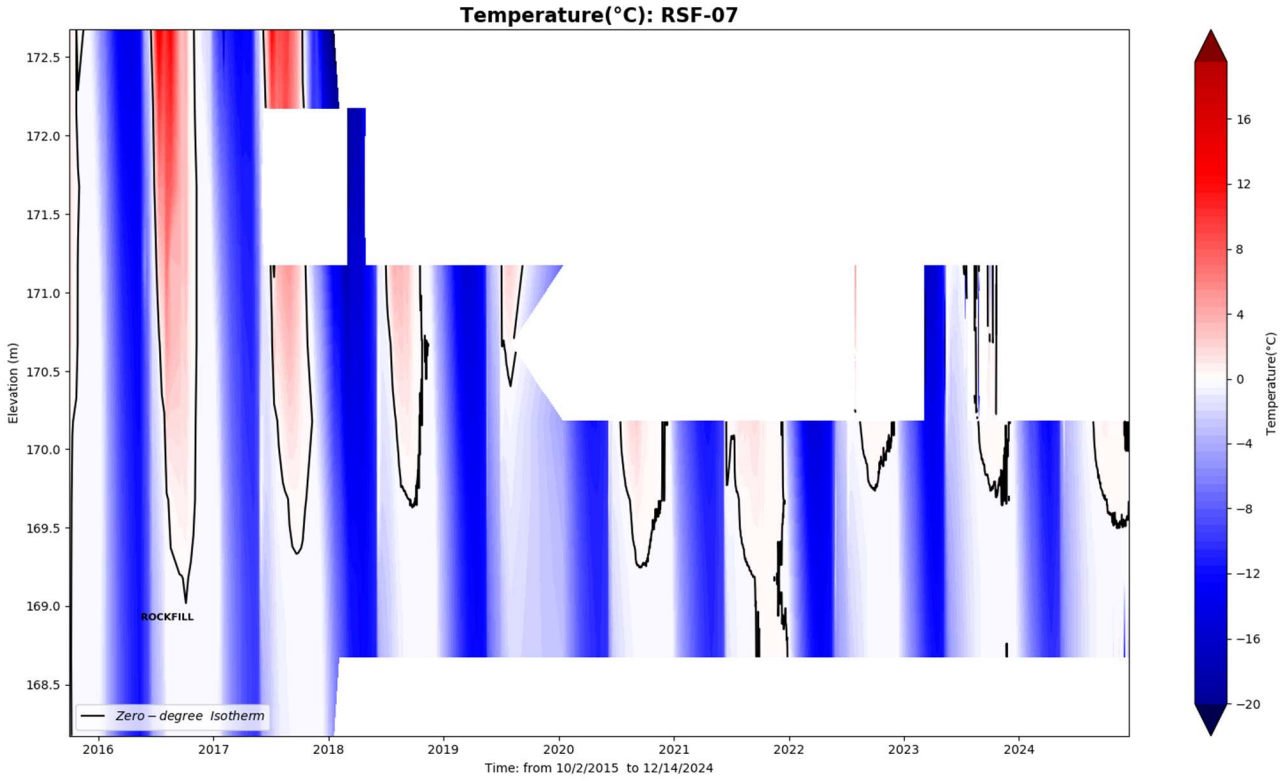
RSF-6


RSF-7
RSF-8
RSF-15
RSF-16
RSF-5
PORTAGE WASTE
DUMP
RSF-13
RSF-14
RSF-11
RSF-12
RSF-9
RSF-10
RSF-3
RF1
RSF-6
PING


Temperature(°C): RSF-06
PAG
ROCKFILL
BEDROCK
Zero – degree Isotherm
Elevation (m)
Time: from 11/9/2013 to 12/14/2024
Temperature(°C)

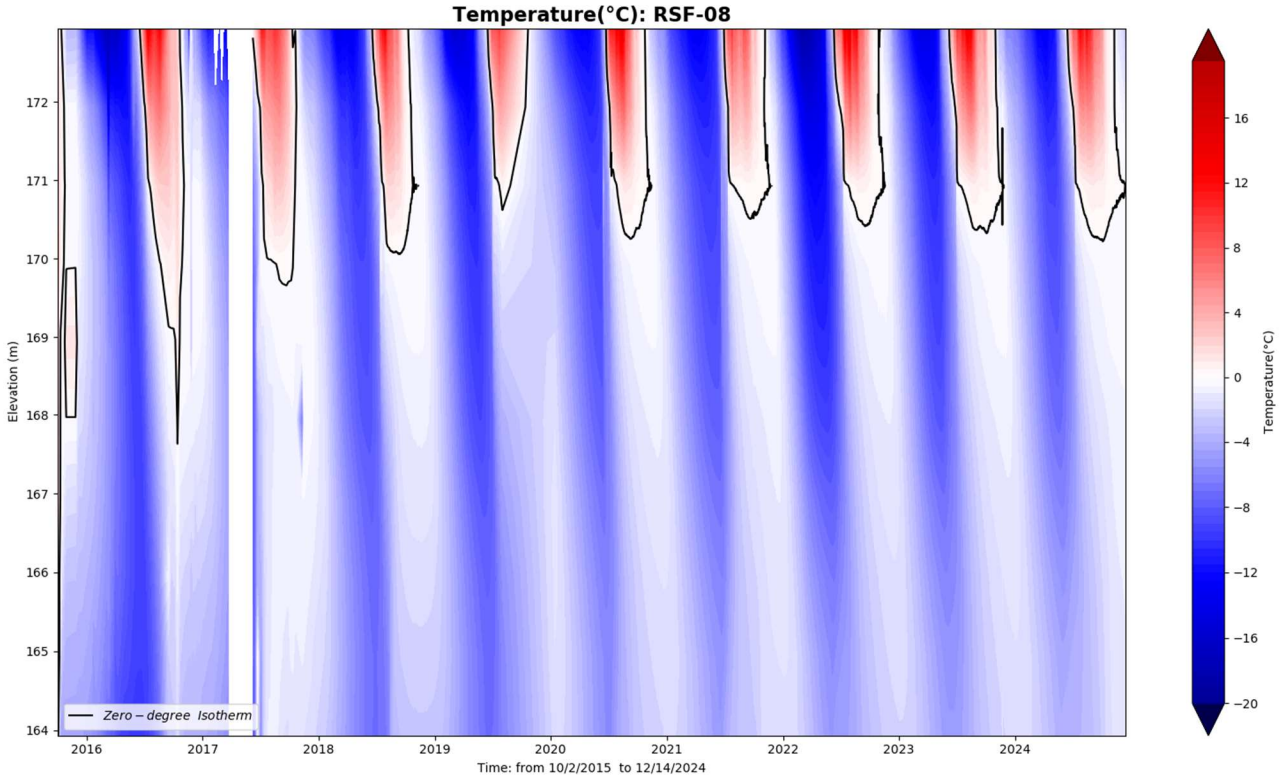
RSF-7

RSF-7 installed at a dip of -55°



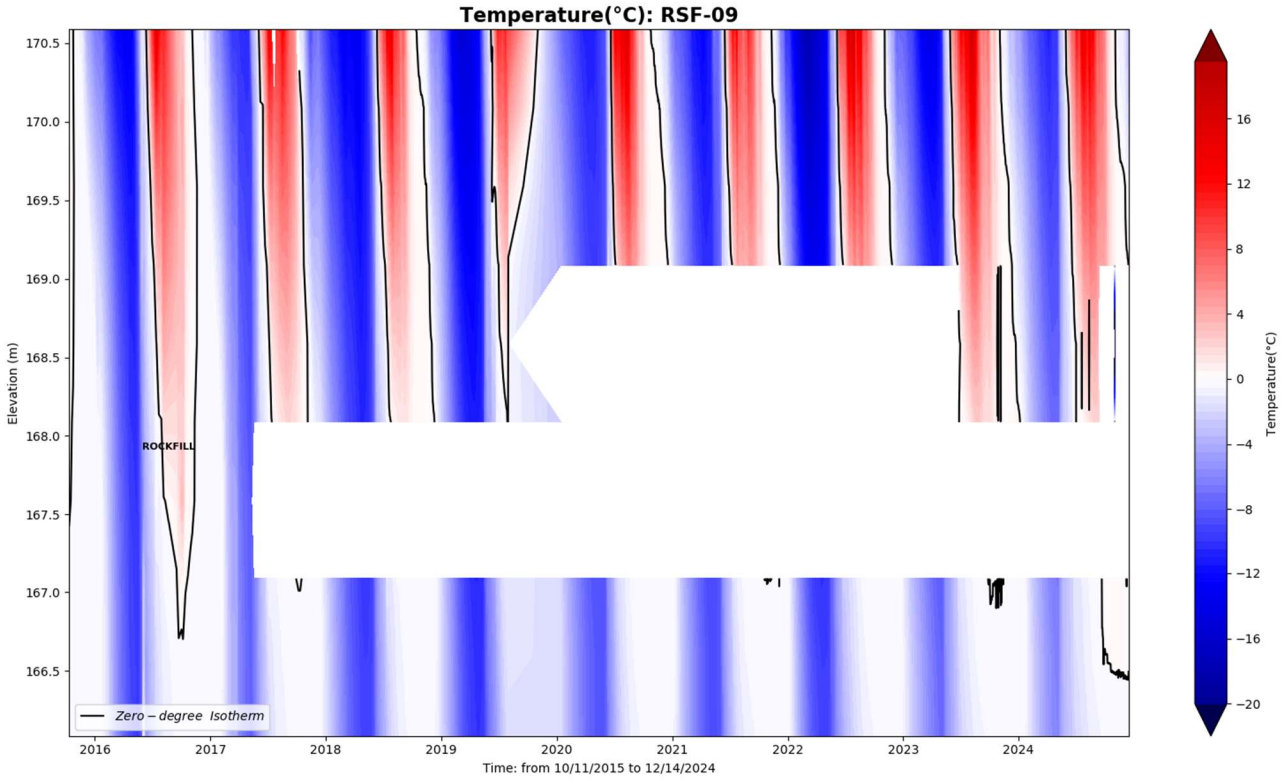
RSF-8

RSF-8 installed at a dip of -70°



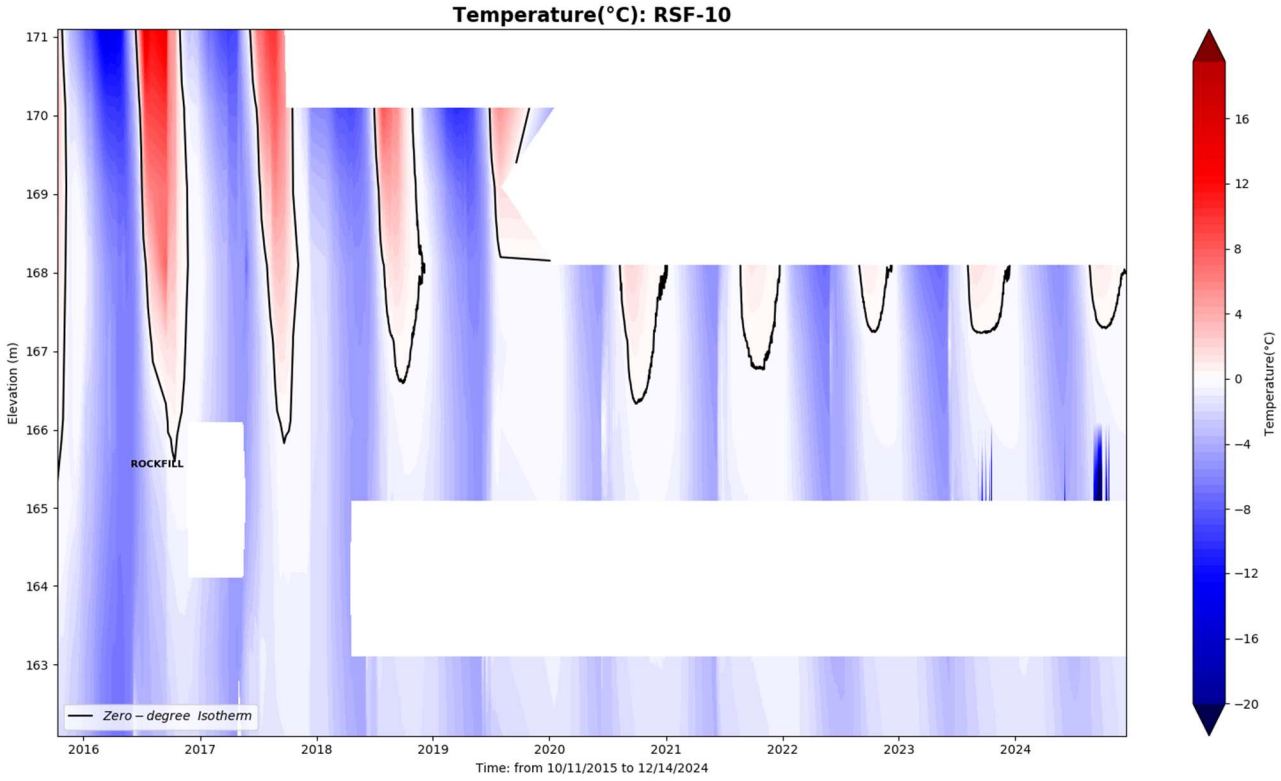
RSF-9

RSF-9 installed at a dip of -55°



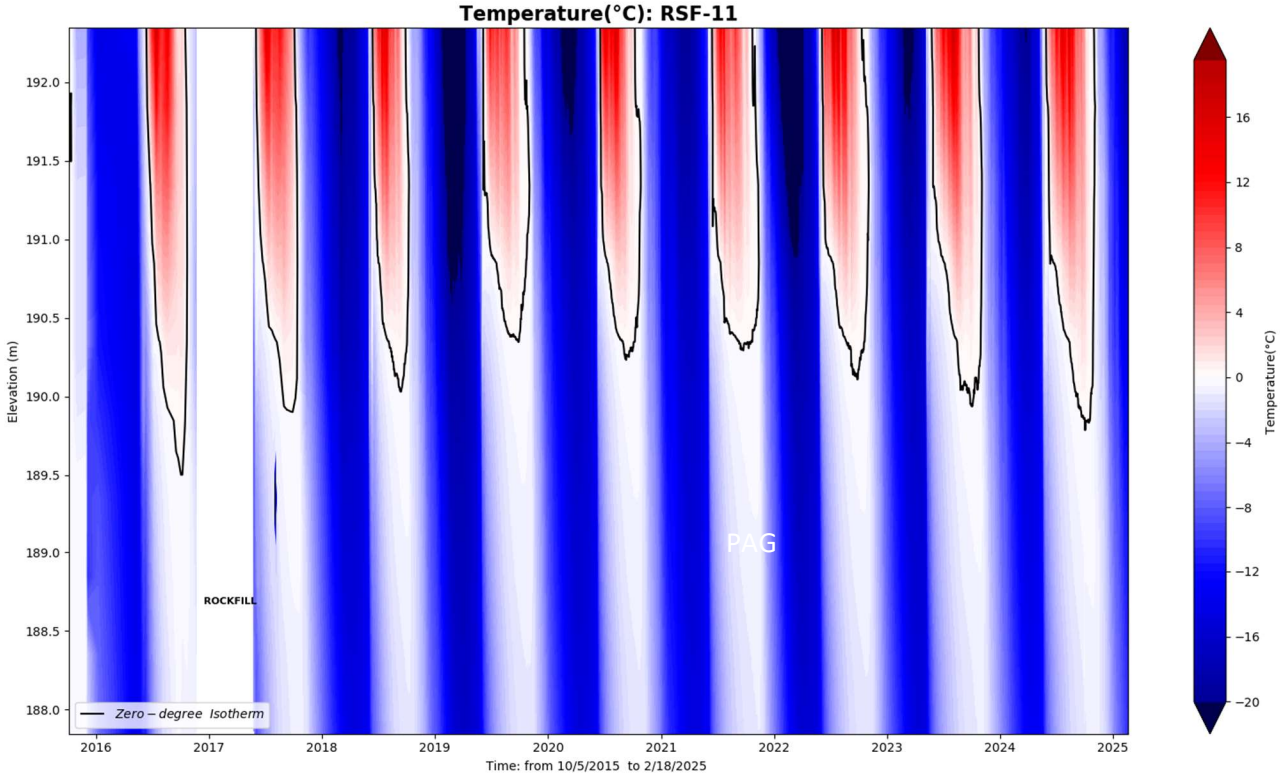
RSF-10

RSF-10 installed at a dip of -70°



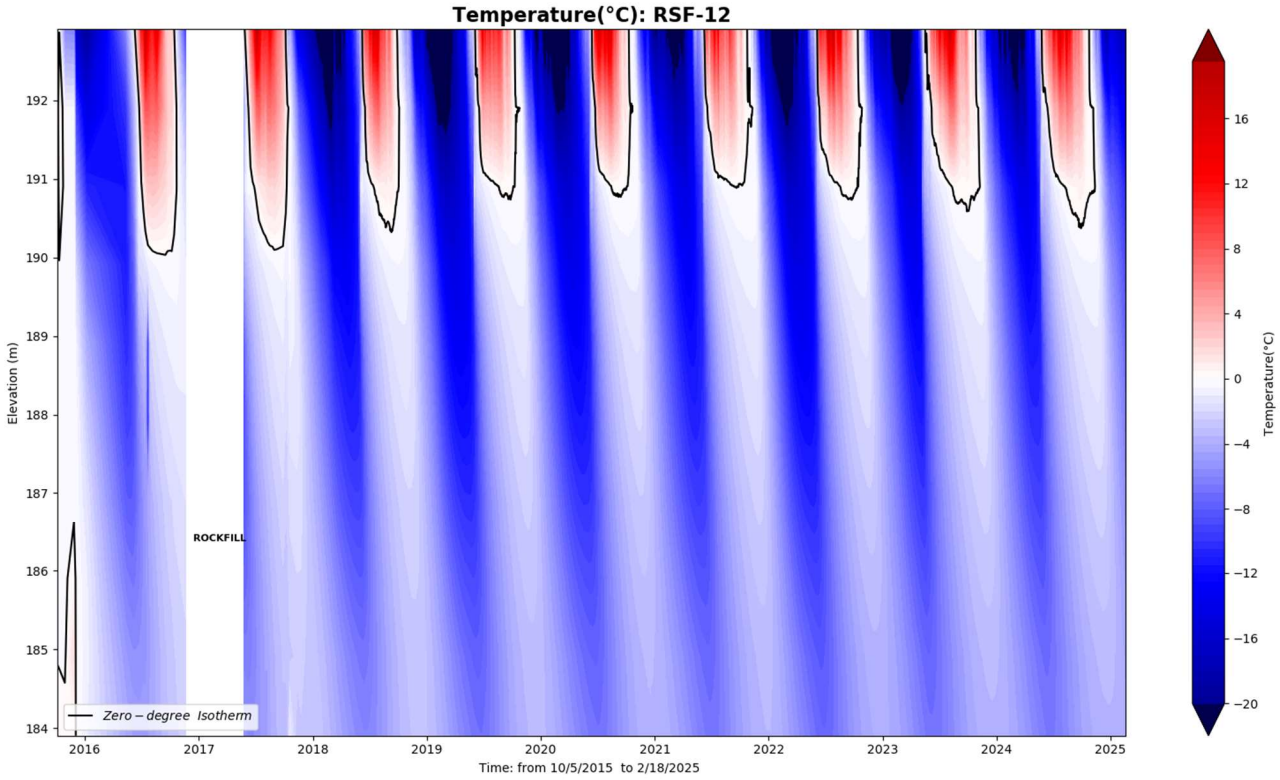
RSF-11

RSF-11 installed at a dip of -55°



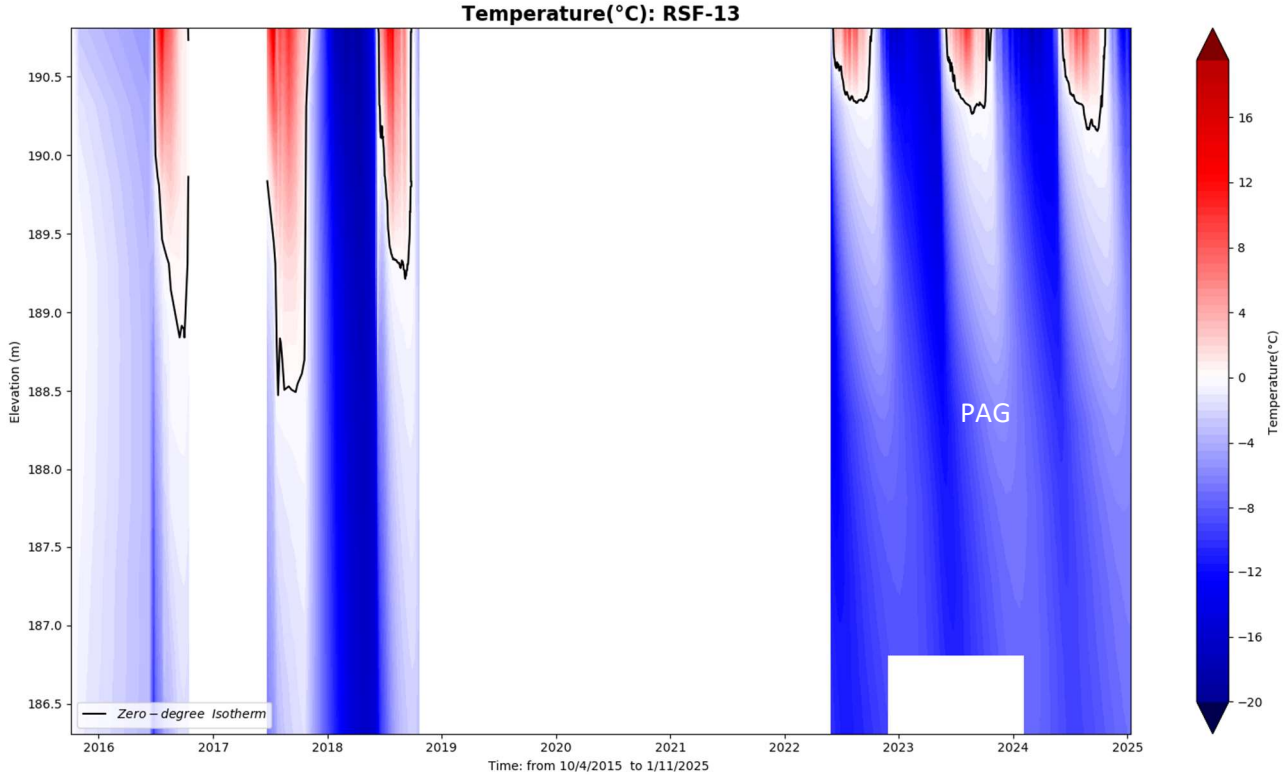
RSF-12

RSF-12 installed at a dip of -70°



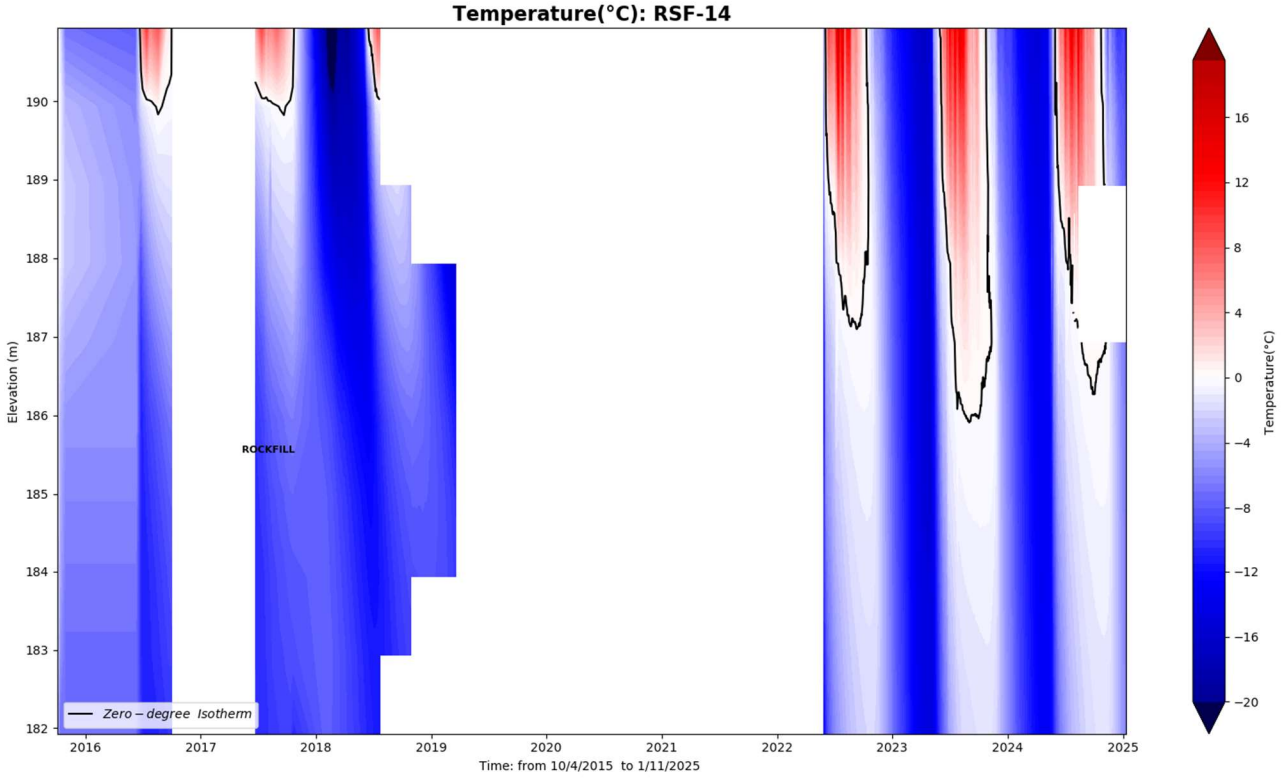
RSF-13


RSF-18
RSF-15
RSF-16
RF2
RSF-7
RSF-8
RSF-5
RSF-17
RSF-13
RSF-14
PORTAGE WASTE
DUMP
RSF-9
RSF-10
RSF-11
RSF-12
RSF-3
RF1
NC-17-5
RSF-6


Temperature(°C): RSF-13
Elevation (m)
190.5
190.0
189.5
189.0
188.5
188.0
187.5
187.0
186.5
PAG
Zero – degree Isotherm
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Time: from 10/4/2015 to 1/11/2025
Temperature(°C)
16
12
8
4
0
−4
−8
−12
−16
−20

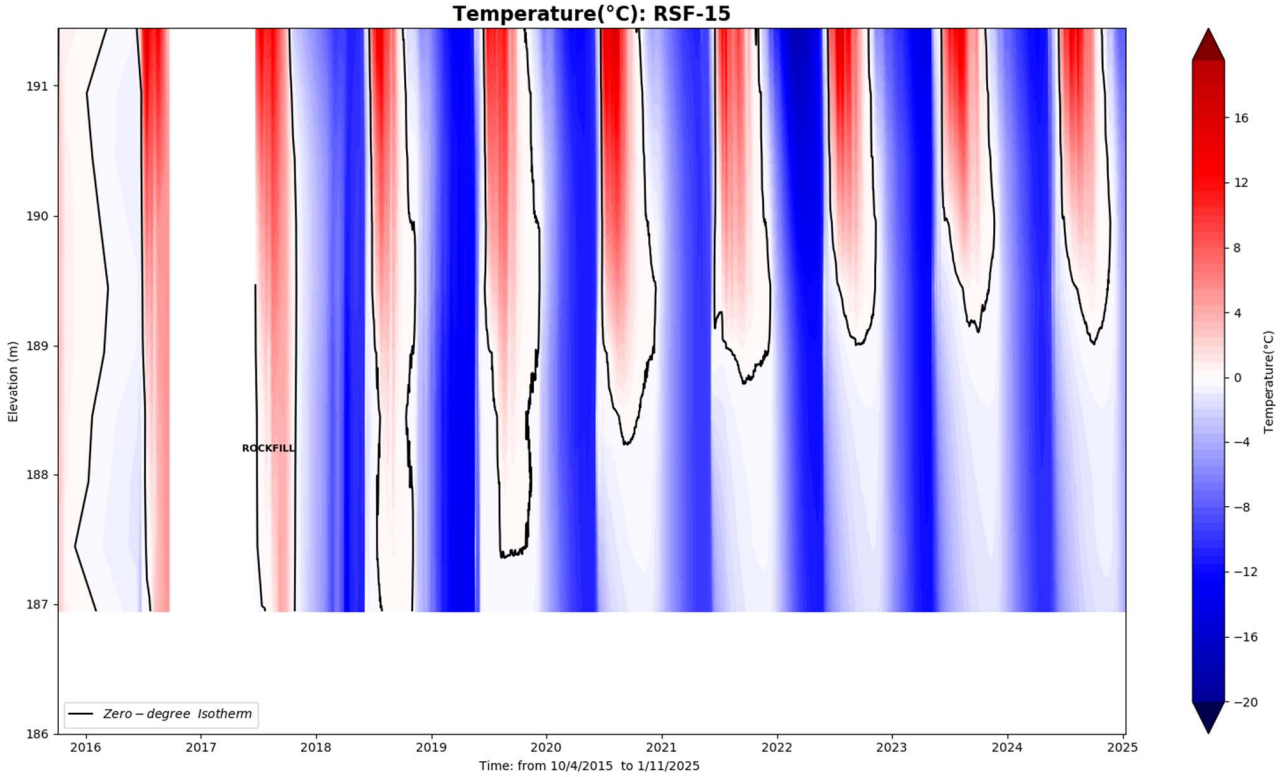
RSF-14


RSF-18
RSF-15
RSF-16
RF2
RSF-7
RSF-8
RSF-5
RSF-17
RSF-13
RSF-14
PORTAGE WASTE
DUMP
RSF-9
RSF-10
RSF-3
RF1
NC-17-5
RSF-6
RSF-11
RSF-12


Temperature(°C): RSF-14
Elevation (m)
190
189
188
187
186
185
184
183
182
ROCKFILL
Zero – degree Isotherm
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Time: from 10/4/2015 to 1/11/2025
16
12
8
4
0
−4
−8
−12
−16
−20
Temperature(°C)

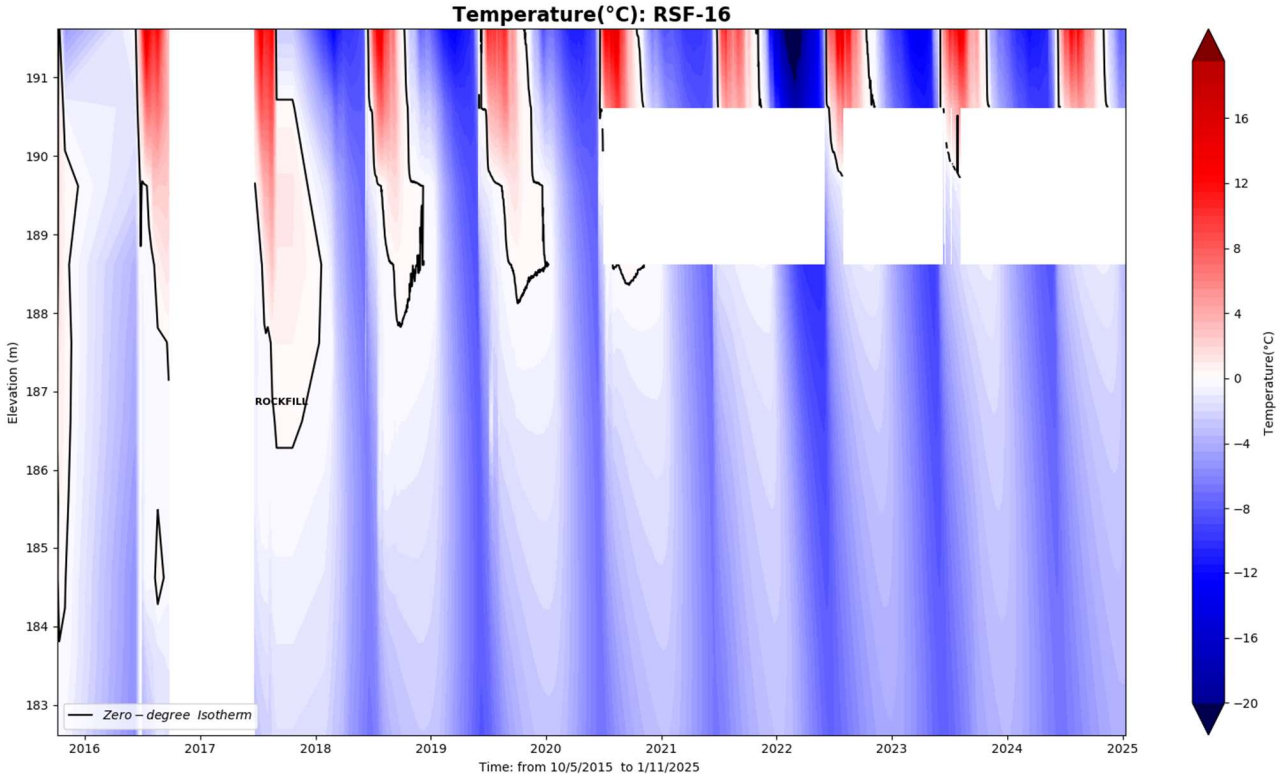
RSF-15

RSF-15 installed at a dip of -55°



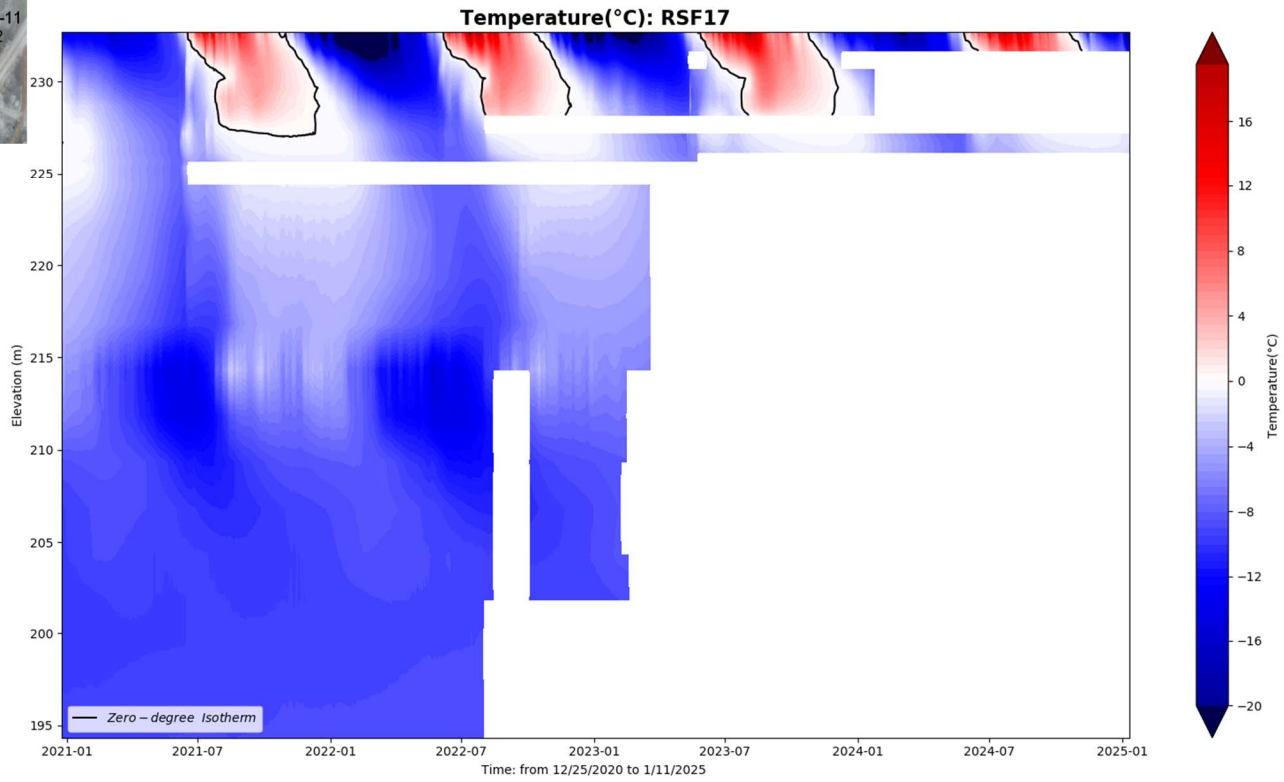
RSF-16

RSF-16 installed at a dip of -70°



RSF-17

RSF-17 installed at a dip of -90°



RSF-18

RSF-18 installed at a dip of -90°