



OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

March 15 – March 29, 2024

Former Electra Site, Statielei 111 Mortsel

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1 Introduction

This letter report contains a brief description of the Electrical Resistance Heating (ERH) remediation system operations performed at the former Electra Site at Statielei 105 – 113 in Mortsel. The time period addressed in this report is from March 15 to March 29, 2024. **Figure 1** contains a site map displaying the locations of the thermal treatment area, electrodes, temperature monitoring points (TMPs) and other pertinent Site features.

2 System Operation Activities

The weeks of the reporting period involve week 12 and 13 of 2024. During this period the site was visited 6 times.

In the reporting period the following works were performed:

- Due to the remediation goals being met, the following electrodes were disconnected:
 - SL105 and 107: M04, L04, K04, J04, J03, K03, L03, M03, N03, P03, Q03, R02, Q02, P02, N02, M02, L02 and K02
 - SL113: D12, D13, E11, E12, F10, F11, F12, G10, G11, H09, H10, H11, J09, J10, J11, K11, C12, C13 and M10.
 - The rest of the electrodes are still connected due to the concentrations and unexpected compounds in the soil vapour.
- Performed vapor measurements (together with TEC).
- Replaced thermal protection and motor P05; installed a new EPDM impeller on P05.
- Installed a cooling pipe for the KO pump in the basement.
- Removed concrete leftover of drillings, sealed holes with foam.
- Installed extra acoustic screens around SC fan.
- Removed pallets and cardboard boxes for Veerle.
- General checks and equipment maintenance
 - General data collection and inspections
 - Amp surveys
 - PID measurements
 - Relative humidity measurements
 - Step & Touch
 - Drained the condensate in the VGAC vessels, influent hose blowers
 - Replaced filters bags SC
 - Drained cooling water from SC.
 - Checked electricity and water meters.

3 ERH Application Summary

The ERH system operational parameters from the current reporting period are presented in **Table 1** below.

Table 1. ERH System Parameters

ERH System Parameters	Estimated	Up to March 29th	Percentage of total
Operation Time (days)	137 ¹	129 ³	94%
Cumulative Energy Applied (MWh)	3.800 ²	2.676	70%

Total energy for ERH and auxiliary Equipment was ca. 2.676 MWh. Energy applied for ERH up to March 29th was ca. 2.588 MWh.

The contractual remediation target has been met on March 18: the ERH treatment time was 118 days. The global electricity consumption up to March 18 was ca. 2.500 – 2.600 MWh.

¹ Extra days for higher concentrations in soil not included.

² Extra energy for higher concentrations in soil not included.

³ This is with regard to the days that ERH was not active. Including those days would give an operation time of 140 days.



4 Temperature Monitoring

During the reporting period of March 15 to 29, 2024 the site average subsurface temperature slightly decreased (approximately 1 °C). This decrease is due to the disconnection of the electrodes as mentioned in Section 2, and is expected to decrease over the following period.

During this reporting period we found out that the RTDs in TMP N04 were not installed at the right depth. The temperature sensors were ca. 1,5 meter too high, so the most shallow sensor was installed above the ERH treatment area. On March 27 we lowered the temperature sensors to the right depth, what resulted in a much higher temperature for the shallow RTD in TMP N04.

The highest individual temperature measurement within the treatment volume is 104,1 °C at TMP K10 at 7,5 meters below ground surface (bgs). Subsurface temperatures at different depths per TMP location and over time are presented in **Figure 2**. The highest site average measured during this period was at 96,7 °C on the 20th of March.

In total 4 shallow RTD's are installed near utilities (Statielei 109 front and Statielei 113 back) to measure the temperature close to the utilities. The average temperature at the utility RTDs is 47,5 °C, the maximum temperature is 50,6 °C in RTD T4 (SL 113 back). It stands out that, with the disconnection of electrodes the temperature in the RTDs will decrease.

5 Vapor Recovery

During the reporting period the vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was maintained between 20 - 85 mbar, with an average of ca. 50 mbar. All pipe and field piezometer pressure measurements show negative values, indicating the system is working sufficiently to maintain negative pressure. The vapor flow rate, as measured after the vapor recovery blower, averaged circa 930 m³/hour. During the last three days of this reporting period, the flowrate was increased to average 1.340 m³/hour.

Vapor monitoring

During every site visit HMVT performs PID vapor measurements of the ambient air and the extracted soil vapor. The most recent PID measurement for chlorinated volatile organic compounds (CVOC), collected on March 29th, was 4,3 ppm. The PID measurements of the extracted soil vapor are stable on a level of 4 - 8 ppm and appear to decrease slowly.

From the 7th of March, the soil vapour has been measured at several locations (electrodes), which showed that at the disconnected electrodes low PID values were measured. However, in the source-zone in SL109 and SL111, still elevated PID values were measured, which varied in their percentage of VOCs (see also Section 8. Mass removal). The disconnected electrode locations also showed low values when sampling with Dräger tubes (per 2/a 2-250 ppm range).

These results were already presented during the meetings, but for completion are delivered together with this report: 'HMVT Resultaten TH dragermetingen 15-3-2024 kaart' and 'HMVT Resultaten PID metingen 07032024-02042024'. TEC performed measurements with the VaporSafe and took samples for laboratory analyses. These results will be reported by TEC.

6 Vapor treatment

The extracted soil vapors are treated with granular activated carbon (GAC). The emission limit, as defined in the tender document, for PCE and TCE is 100 mg/m³ if total mass is higher than 2.000 g/hr. The client wants to limit the emissions to zero.



Two Mach4X vessels, containing respectively 18 and 10 m³ of vapor GAC, are currently connected and functioning as vapor treatment. HMVT performs PID vapor measurements of the influent and effluent of the GAC vessels on a regular base. During the reporting period, the PID reading of the effluent of the first GAC filter was 0,2 ppm. The PID reading of the effluent of the second GAC filter was 0,0 ppm. TEC will periodically take vapor samples from the influent and effluent of each vessel for analyses in the laboratory.

The activated carbon vessels had a relatively low adsorption rate. A lot of attention was spent on condensation in the VGAC vessels. Measures were taken to decrease the humidity level of the vapor stream (extra cooling and insulation of tubing). Measurements showed that relative humidity complies to the requirement as obliged, namely < 50% (at a temperature of ca. 28 - 36 °C). HMVT also made a memo about relative humidity in the soil vapor. Condensation will probably take place on the cold vessel wall, but not in the middle of the filter. During this reporting period the activated carbon filters were drained frequently. The amount of condensate was low (5-10 l per visit).

7 Condensate and water treatment

During the reporting period 160 m³ of water was recovered via condensed water by the vapor recovery system. A total of 2.174 m³ of condensate has been produced since the start-up of the ERH system.

The condensate produced from the steam condensers is collected and treated in 2 liquid granular activated carbon vessels, before being discharged to the sewer. The discharge limit for PCE and TCE is 10 µg/l. TEC will periodically take samples from the water treatment system. From the samples of the 19th of February, no contaminants were detected in the effluent. No new analysis results have been obtained by HMVT since then.

8 Mass removal (by PID)

The mass removal calculation is based on the PID measurements in the influent of GAC1. We use a 10,6 eV bulb, so the correction factor for PCE is 0,57. During the reporting period, the total mass removed from the subsurface was approximately 7 kg (based on PCE), 1 kg less than the previous reporting period. The total mass recovered from the subsurface since the start of the project is circa 380 kg (**Figure 3.**)

Recently it has been discovered that a significant part of the extracted soil vapour contains different compounds such as aldehydes, alcohols and ketones. The quantity (level) of these compounds fluctuates per influent measurement. For this reason the PID value on the influent side is not representable for just PCE.

When reviewing the 6 laboratory result from January 12 to March 14, the average VOCl percentage was 66% ± 13%. However, it also stands out that the percentage of VOCl's in the total is decreasing. For comparison, it was 86% in the sample of the January 12, while having decreased to 55% on March 14.

9 Health & Safety

During the reporting period no mentionable affairs regarding health and safety occurred.

Step & Touch

The highest measured voltage (step and touch) during the reporting period was negligible at <100 mV.

Ambient air monitoring

During the reporting period, no presence of CVOC in daily ambient air monitoring was measured (PID). TEC will provide the measurement data from the VaporSafe.

10 Settlement measurements

The settlement measurements are being monitored on a weekly basis by buro Teugels. The results of the measurements can be found in table 2, displayed in meters. Settlement is expressed in mm. The measuring points can be found in the map below.

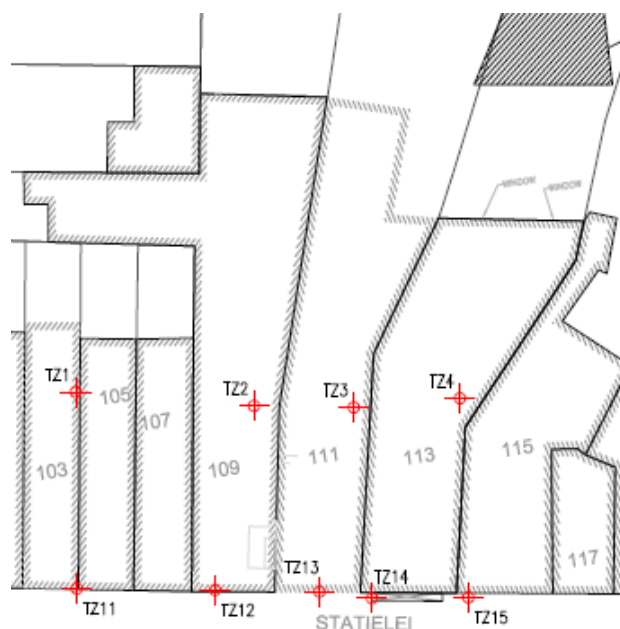


Table 2. Results settlement measurements

	dossier nr.:	#		
	werf:	Wesrosan - Mortel Statielei		
	datum:	#		
	Operator:	K.J. - S.B.		

ZETTINGSMETING																					
Nr. pt	19/04/23	Δ	TOT Δ	06/02/24	Δ	TOT Δ	20/02/24	Δ	TOT Δ	27/02/24	Δ	TOT Δ	05/03/24	Δ	TOT Δ	20/03/24	Δ	TOT Δ	26/03/24	Δ	TOT Δ
TZ1	5,705			5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2
TZ2	8,780			8,776	-1	-4	8,776	0	-4	8,777	1	-3	8,776	-1	-4	8,776	0	-4	8,776	0	-4
TZ3	12,178			12,175	-1	-3	12,175	0	-3	12,176	1	-2	12,176	0	-2	12,176	0	-2	12,175	-1	-3
TZ4	9,256			9,255	0	-1	9,254	-1	-2	9,255	1	-1	9,255	0	-1	9,255	0	-1	9,254	-1	-2
TZ11	5,211			5,209	0	-2	5,209	0	-2	5,210	1	-1	5,210	0	-1	5,209	-1	-2	5,209	0	-2
TZ12	8,150			8,145	-1	-5	8,145	0	-5	8,146	1	-4	8,146	0	-4	8,146	0	-4	8,146	0	-4
TZ13	11,095			11,095	0	0	11,095	0	0	11,096	1	1	11,096	0	1	11,095	-1	0	11,095	0	0
TZ14	8,922			8,923	0	1	8,923	0	1	8,924	1	2	8,924	0	2	8,924	0	2	8,924	0	2
TZ15	3,971			3,970	0	-1	3,970	0	-1	3,971	1	0	3,970	-1	-1	3,971	1	0	3,971	0	0

OPMERKINGEN	
Ref.meting:	19/04/23
Δ	: verschil t.o.v. vorige meting
TOT Δ	: verschil t.o.v. ref.meting

Limited settlements (2 – 4 mm) have been measured in buildings Statielei 103, 109 and 111. There appears to be little development in terms of settlement. According to stability engineer Herman Peiffer, settlements over 6 mm can pose a potential problem.

11 Further remarks

The results of the second soil and groundwater sampling round were discussed on March 18. All soil and groundwater samples meet the remediation goals. For this reason HMVT has achieved the contractual remediation targets on March 18.

However, since the soil vapour still shows significant concentrations of VOCs and other previously undiscovered compounds, OVAM has chosen to continue the remediation until further notice. Part of the thermal treatment zone has been shut off on March 20, see Section 2.



12 Planned Activities

Planned activities for the following two weeks (14 and 15) involve:

- Regular monitoring and maintenance activities.
- Soil vapour sampling activities for individual VR wells (together with TEC).

Figures

1. Site plan
2. Average Temperature vs. Time (by TMP)
3. Cumulative Mass Removed vs. Time



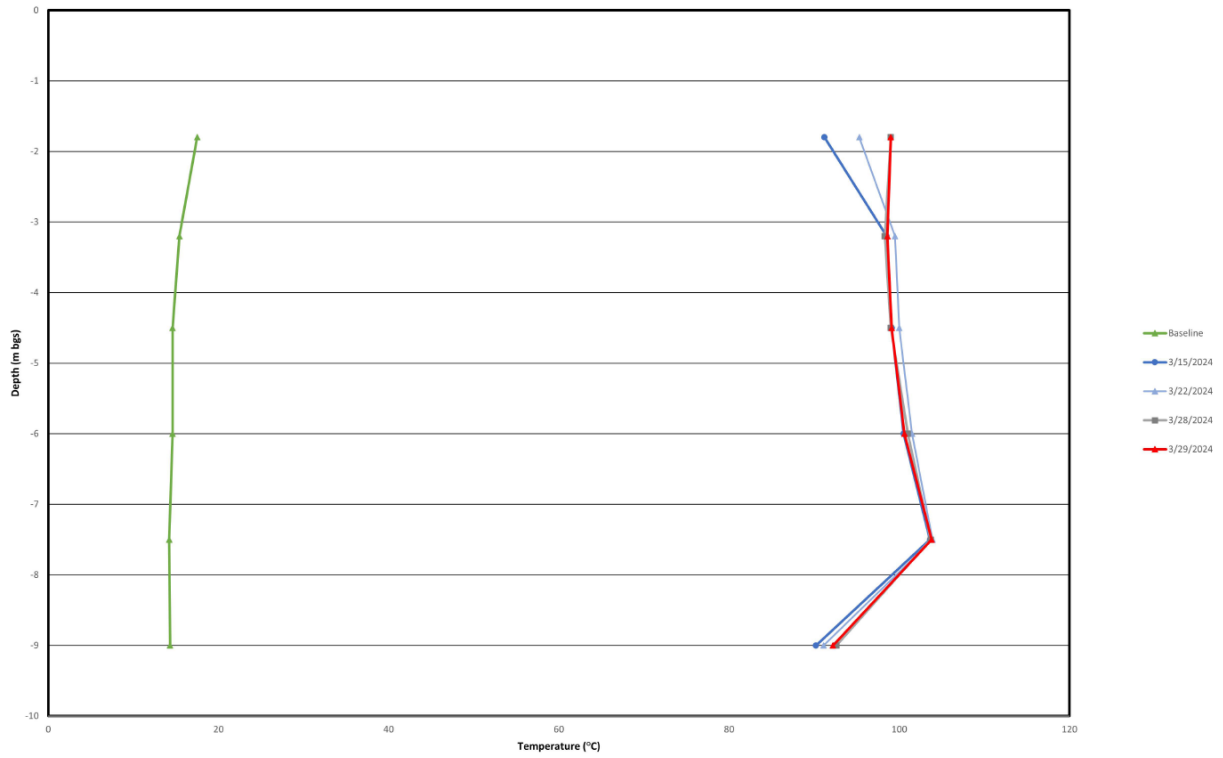
Figure 1: Site plan

The as built site plan is attached separately

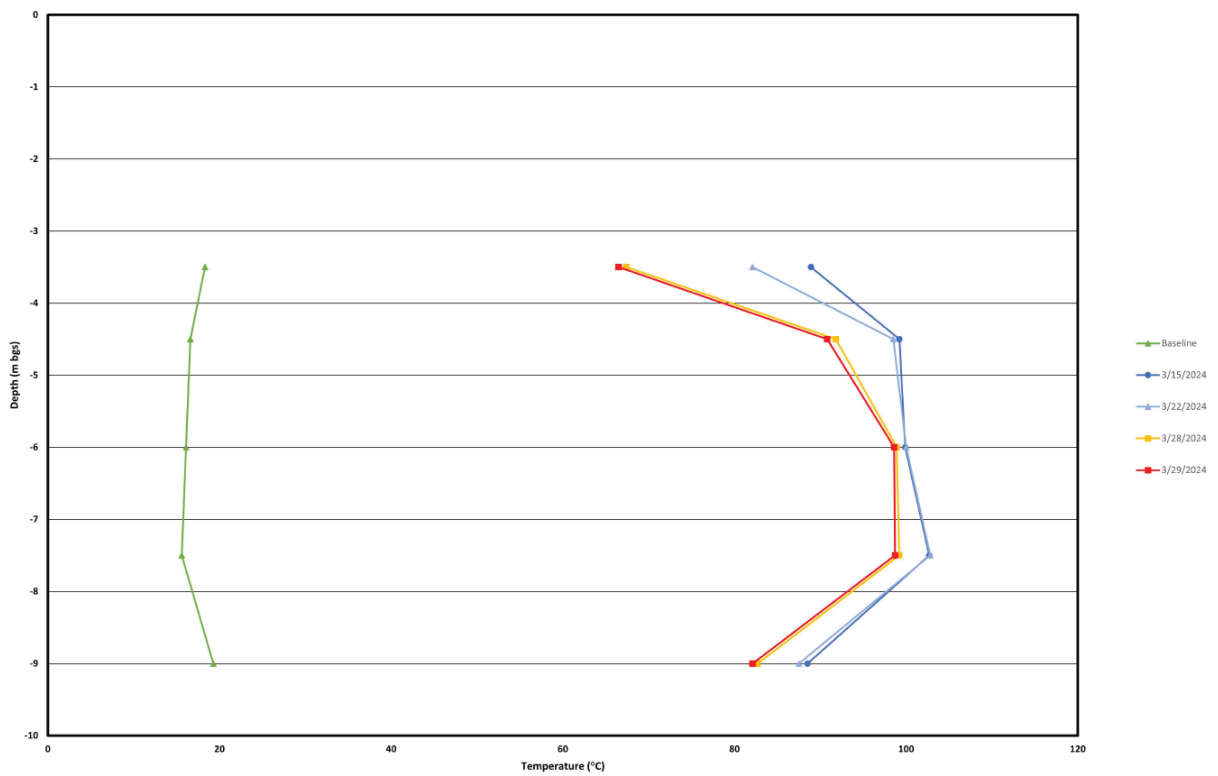


Figure 2. Average Temperature vs. Time (By TMP)

TMP C10 - Mortsel

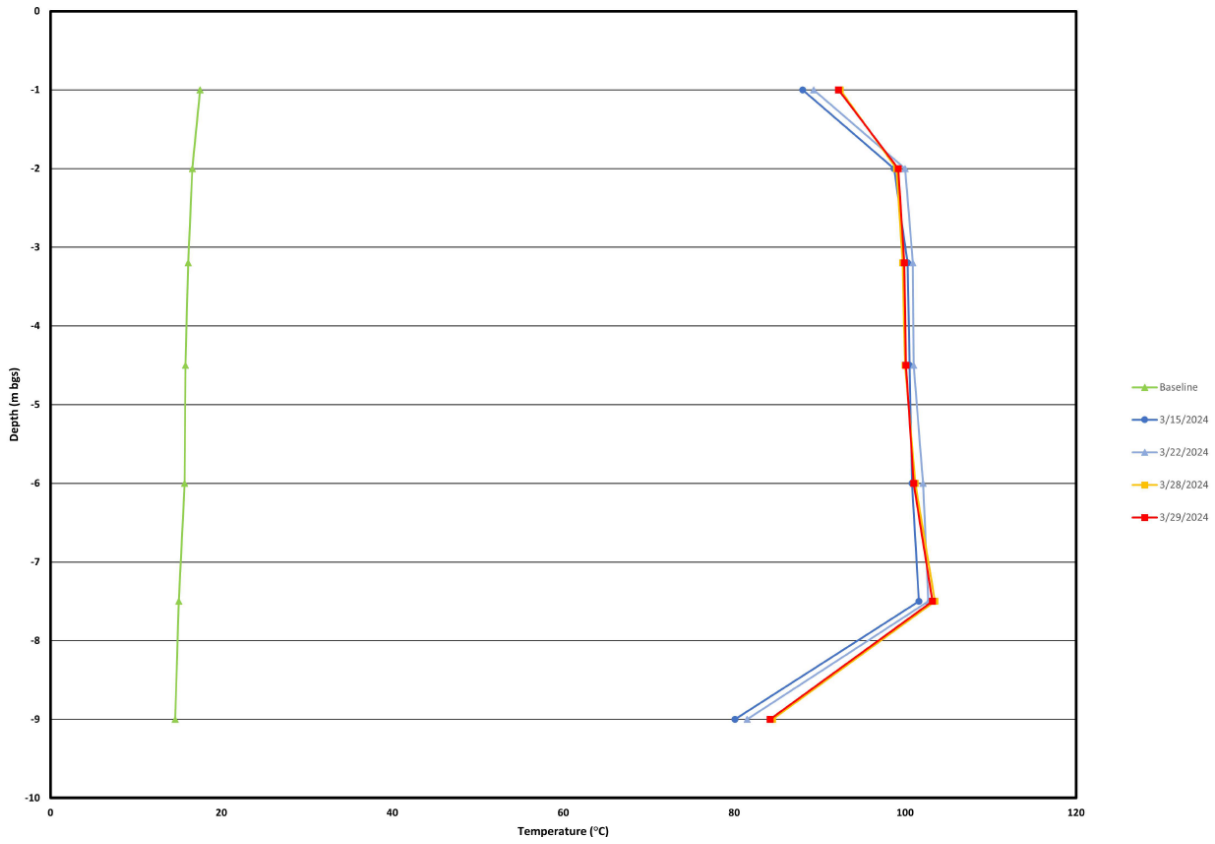


TMP-D12 - Mortsel

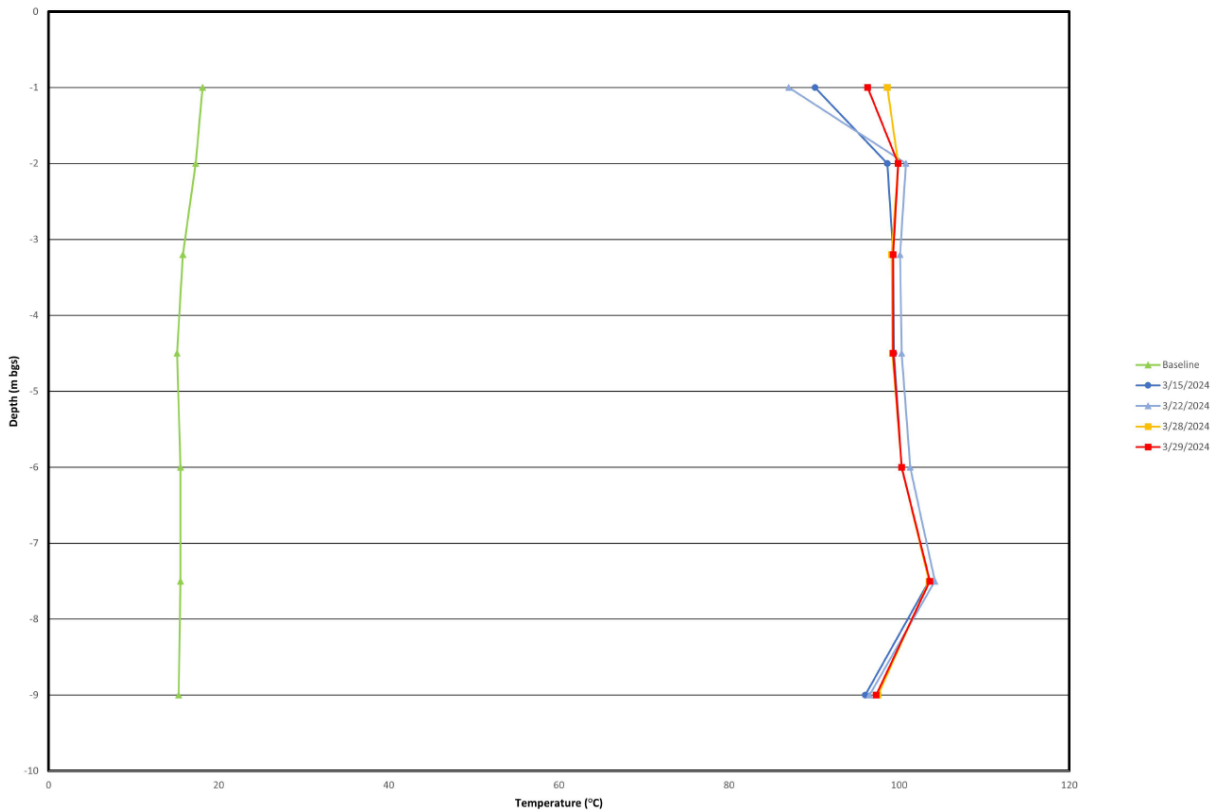




TMP-E05 - Mortsel

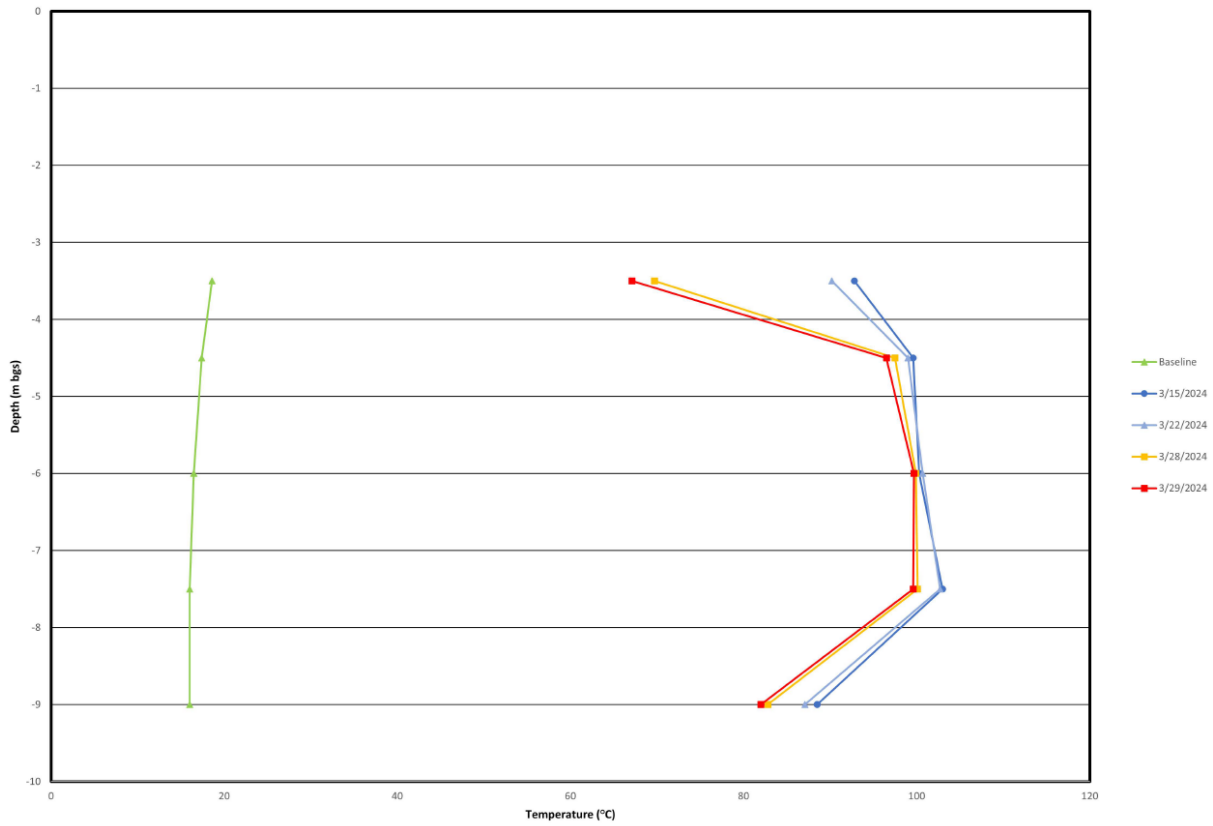


TMP F08 - Mortsel

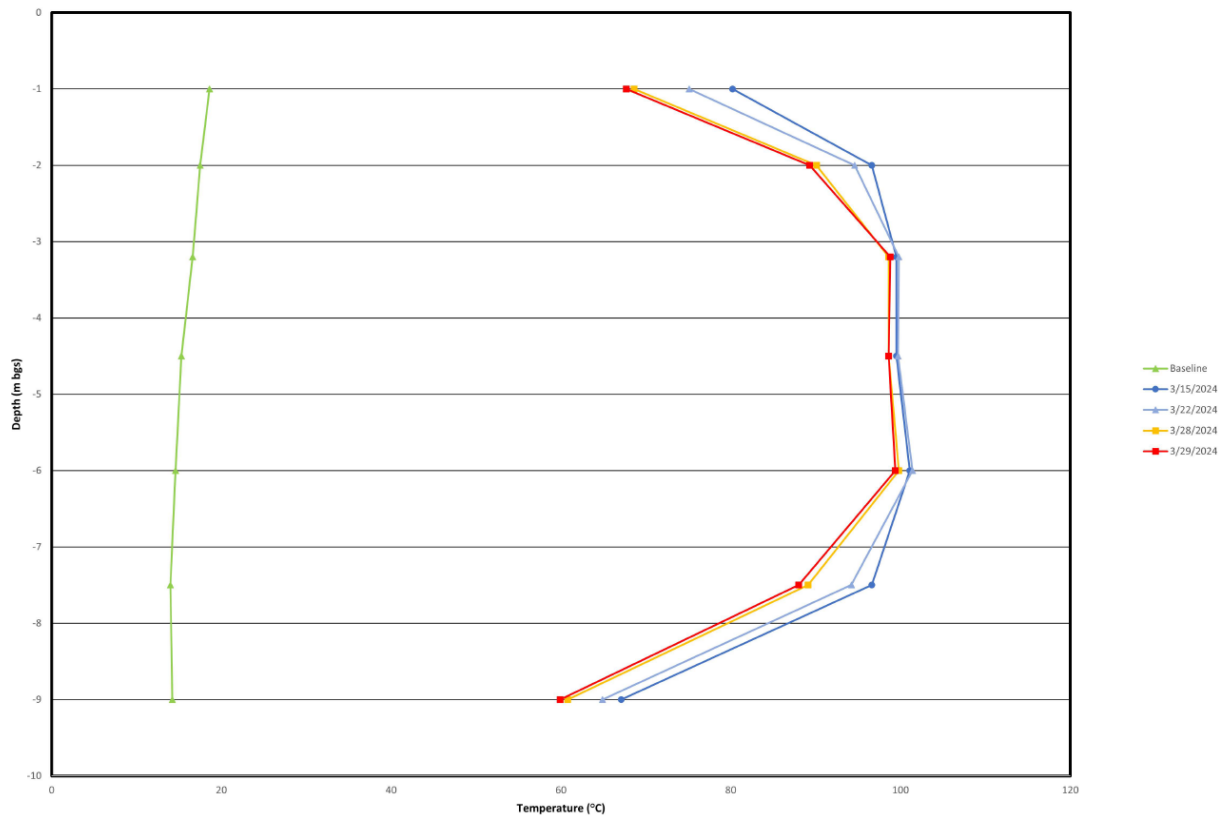




TMP H10 - Mortsel

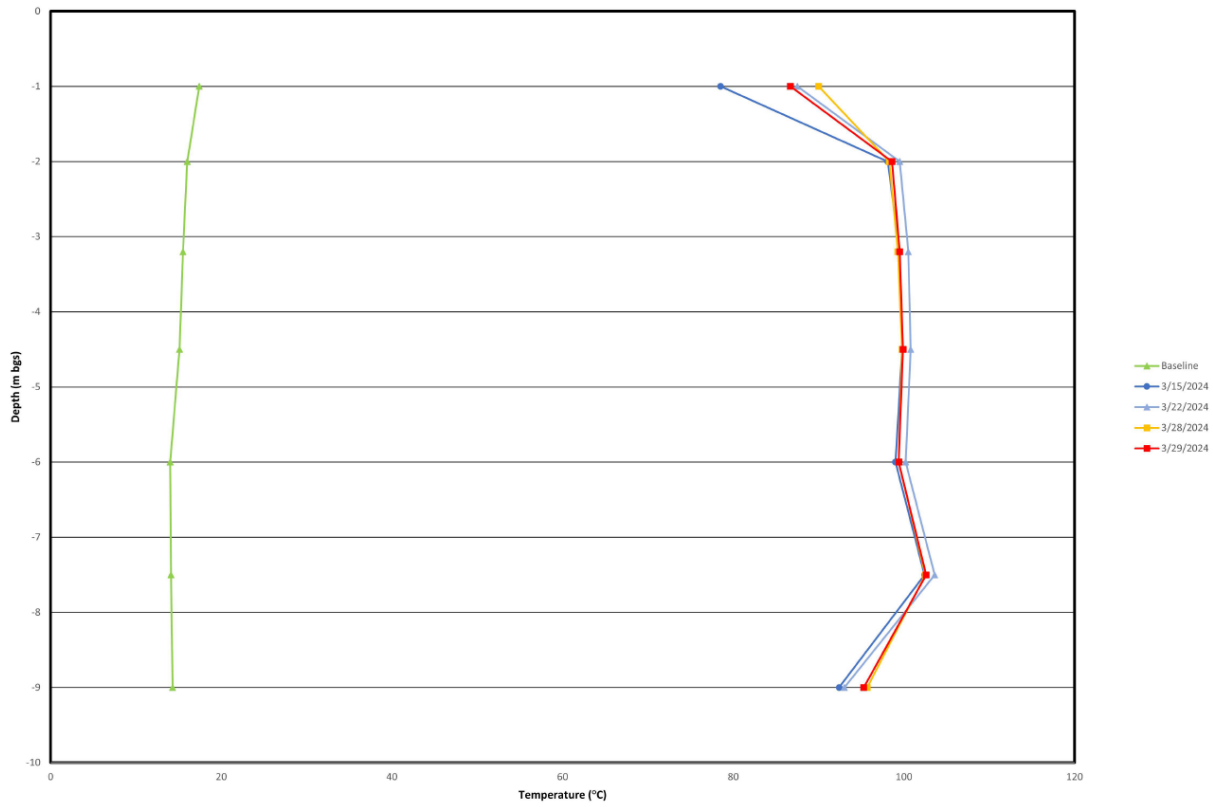


TMP J03 - Mortsel

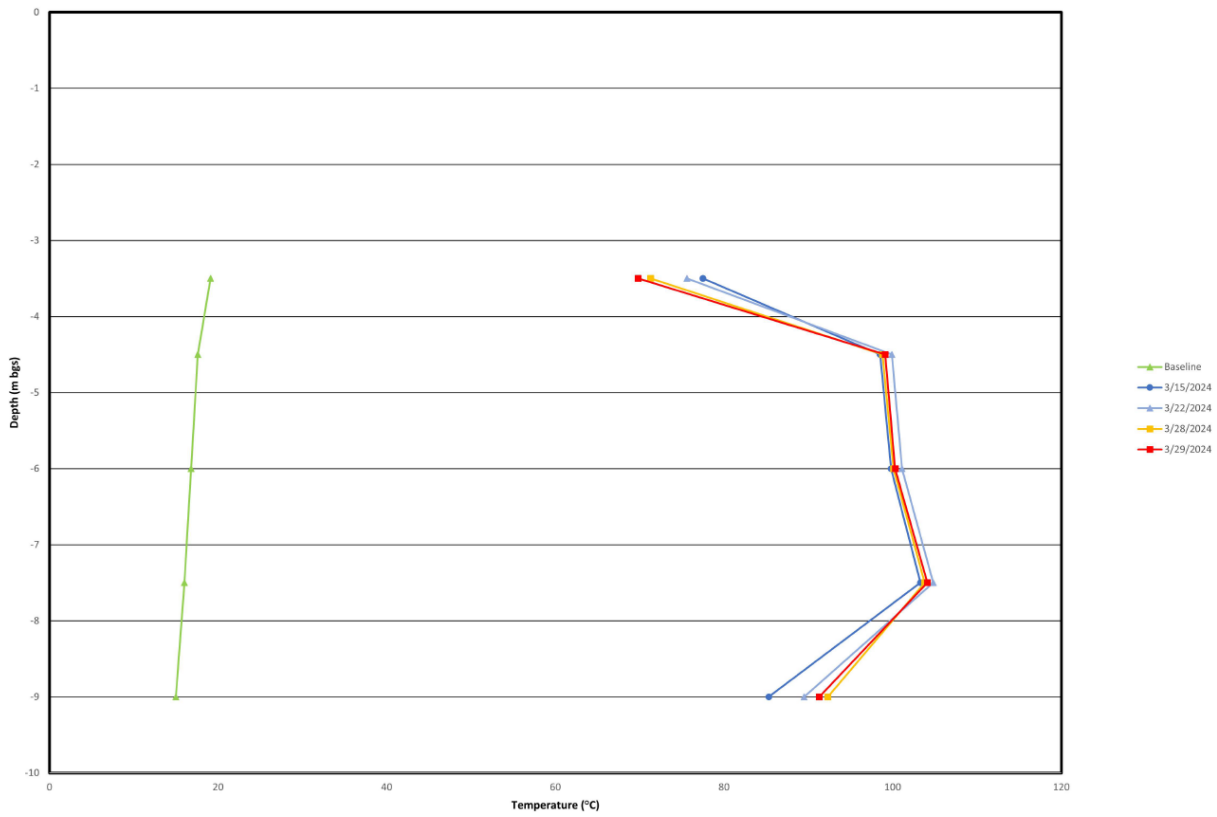




TMP K06 - Mortsel

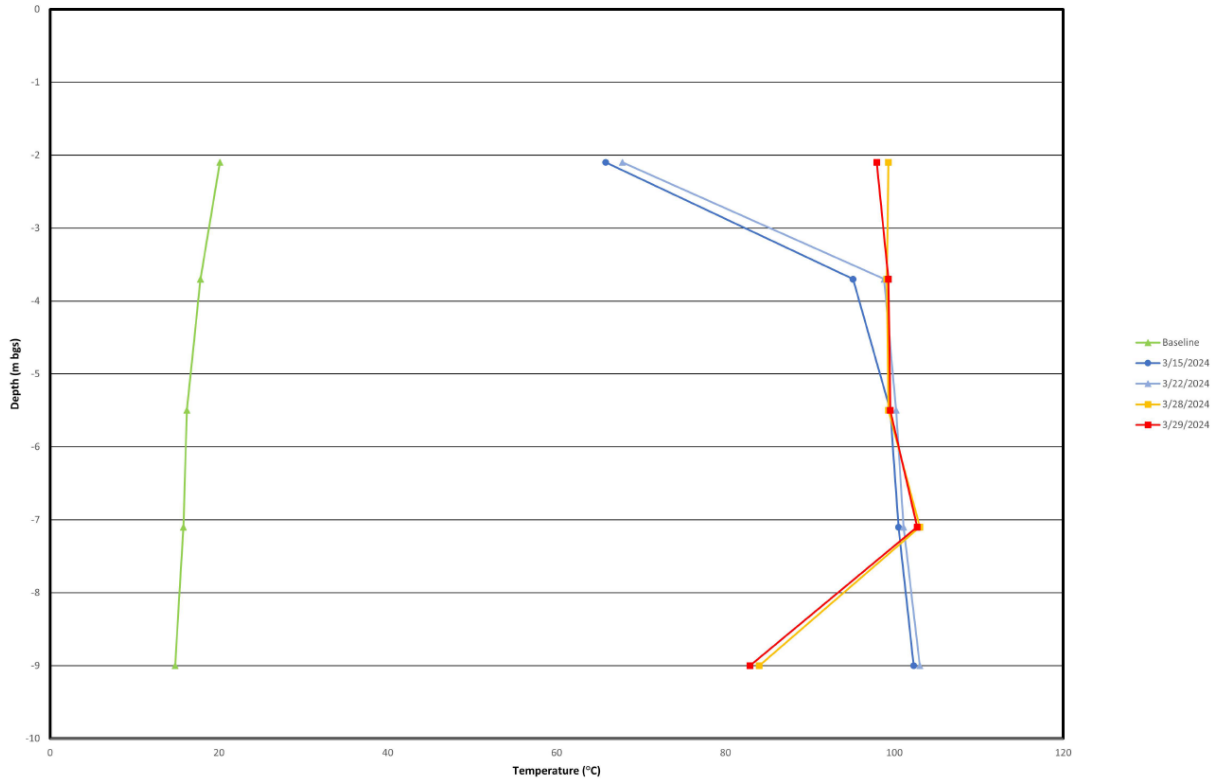


TMP K10 - Mortsel





TMP N04 - Mortsel



Mortsel TMP Average Temperature over Time

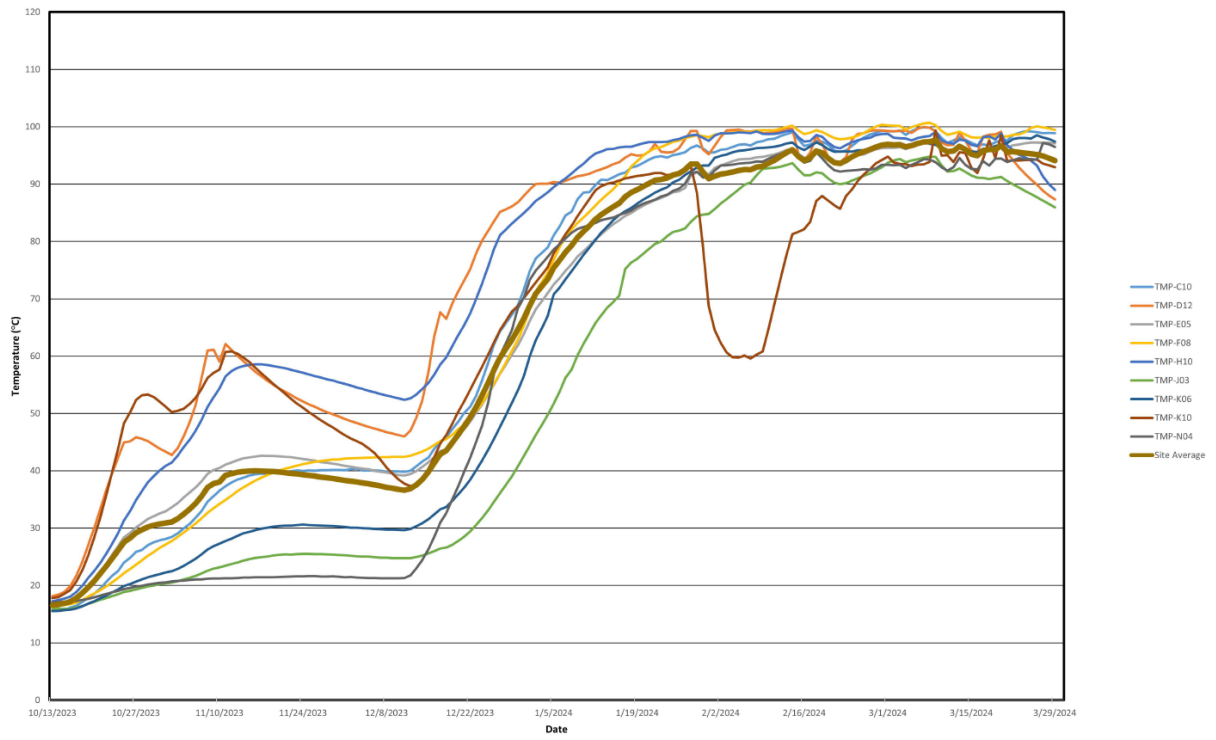




Figure 3. Cumulative Mass Removed vs. Time

