



Customer Focused. Planet Obsessed.

June 6, 2024

Luke LeMond
Site Manager
Solid Waste Program
State of Washington Dept. of Ecology
Central Regional Office
1250 West Alder St.
Union Gap, WA 98903-0009

Re: DTG Yakima – Agreed Order No. DE 21624 – Monthly Progress Letter – May

Dear Mr. LeMond:

In accordance with Section 7.3 of Agreed Order (AO) No. DE 21624, the following is a description of the actions taken during May 2024 to implement the requirements of this AO.

Activities:

On-site activities included weekly gas probe and every other week ambient monitoring. The once per month regulatory review meeting was also held on May 16, 2024 to assess conditions and the data. The data summary through May 2024 from Landfill Fire Control, Inc. (LFCI) is attached.

Ambient air and gas probe sampling results from the sampling performed March 26-28, 2024 were provided to Ecology on May 21, 2024.

A fire response/MTCA review meeting was held with Ecology and YHD on May 28, 2024 to discuss the data and monitoring conditions that would require additional site investigation.

The draft Limited Remedial Investigation (RI) Work Plan was submitted to Ecology on May 31, 2024.

Groundwater monitoring wells MW-5S and MW-6S were installed.

Deviations from Plans (if any):

None.

Deviations Description from the Scope of Work and Schedule:

None.



Customer Focused. Planet Obsessed.

All Data Received or Collected:

Ambient and gas probe data for gases and temperature were emailed, separately, to Ecology weekly after measurements were taken. Gas probe data was entered into the tracking spreadsheets and assessed by LFCI. The summary of the data has been included as an attachment.

Final air sampling laboratory data was provided and the emission assessment report is underway.

Deliverables for the Upcoming Month:

Deliverables will include:

- Final Emission Assessment Report
- Weekly ambient and gas probe data
- Groundwater well pump assemblies will be ordered
- June Progress Report

Please contact me to discuss any of the above items.

Respectfully,

A handwritten signature in blue ink, appearing to read "Ian Sutton".

Ian Sutton
Director of Engineering
DTG Recycle
isutton@dtgrecycle.com

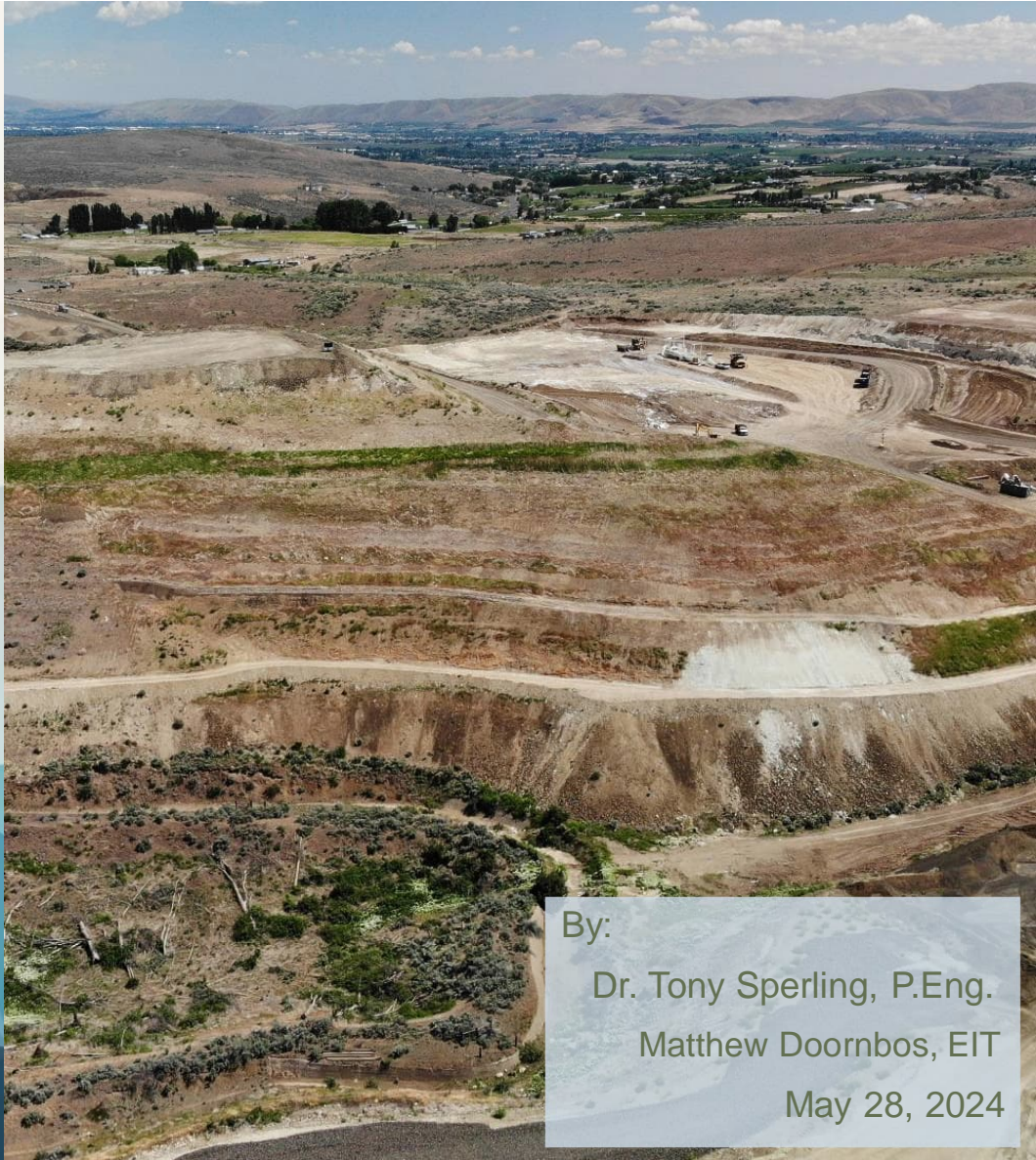
Enclosures: Focused Review of Trigger Levels – May 2024

cc: mbrady@parametrix.com
steven.newchurch@co.yakima.wa.us



DTG LPL Landfill fire investigations and mitigation

FOCUSED REVIEW OF TRIGGER LEVELS



By:
Dr. Tony Sperling, P.Eng.
Matthew Doornbos, EIT
May 28, 2024

Agenda

Typical Landfill Temperatures

Typical CO Landfill CO Concentrations

Monitoring Data Review

CO, Temp, O₂, VOC, H₂S, LEL, CH₄

Spatial Plot Analysis

Radiant Heat Flow

Combustion Gas Diffusion and Advective Flow

Overall Interpretation

Temperature Trigger Value

In landfills with no history of landfill fire, LFCI uses 170F as initial trigger of anomalous thermal activity as this flags temperatures above normal aerobic decomposition temperature.

Second state trigger is 220F, which indicates onset of exothermic thermal activity.

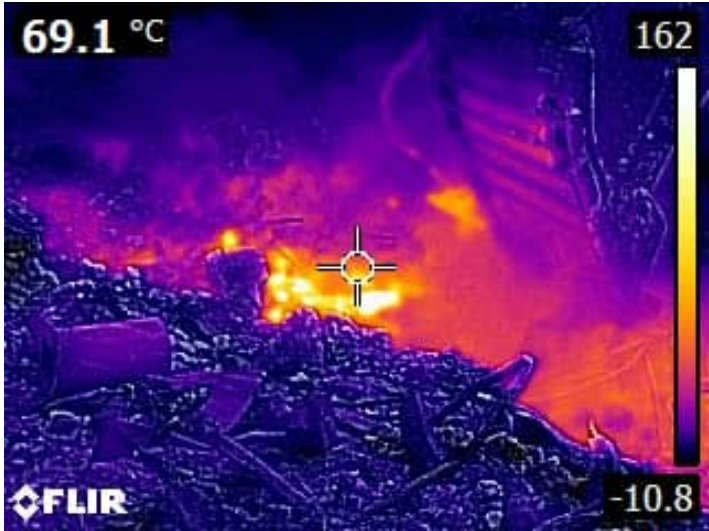
In assessing thermal response one must be mindful of heat flow due to convective and radiant heat distribution.

Gases will distribute heat unevenly due to gas migration through worm holes.

Table 2. LFCI Temperature Scale Identifying Key Temperature Ranges

Fahrenteit Deg F	Celcius Deg C		
1,832	1,000	Fire	
1,382	750		
932	500		
608	320		Upper Limit of Torrefaction (low temp. Pyrolysis)
601	316		Wood ignites spontaneously
500	260	Exothermic Decay of Wood	
400	204		
392	200		
392	200		Minimum temperature for Industrial Water Gas Shift Reaction (fast)
324	162		Melting point of EVOH Resin
300	149	Suspected Subsurface Exothermic Reaction in MSW	
290	143		
280	138		
270	132		Melting point of HDPE Liner (125 to 130C)
260	127		
250	121		
240	116		
230	110		
220	104		Trigger Temperature for Exothermic Chemical Activity (104C)
212	100		Boiling Point of Water
210	99	Heat Transfer and Exothermic Metal Oxidation	
200	93		
190	88		
180	82		
176	80		Maximum Biological Temperature per LFCI experience
175	79	Trigger for Elevated Temperatures in Gas Extraction Wells	
170	77	Aerobic Biological Decomposition	
167	75		Upper Limit of Aerobic Biologic Decomposition Temps.
165	74		Maximum temperature for methanogenesis
160	71		
150	66		
145	63	Temperature to which vaiance issued for running hot wells	
140	60	Anaerobic Biological Decomposition	
131	55		NSPS standard for maximum temperature in well
130	54		
120	49		
110	43		
100	38		
90	32		
80	27		
70	21		
60	16		

Raglan Mine Landfill Fire Suppression April - 2022

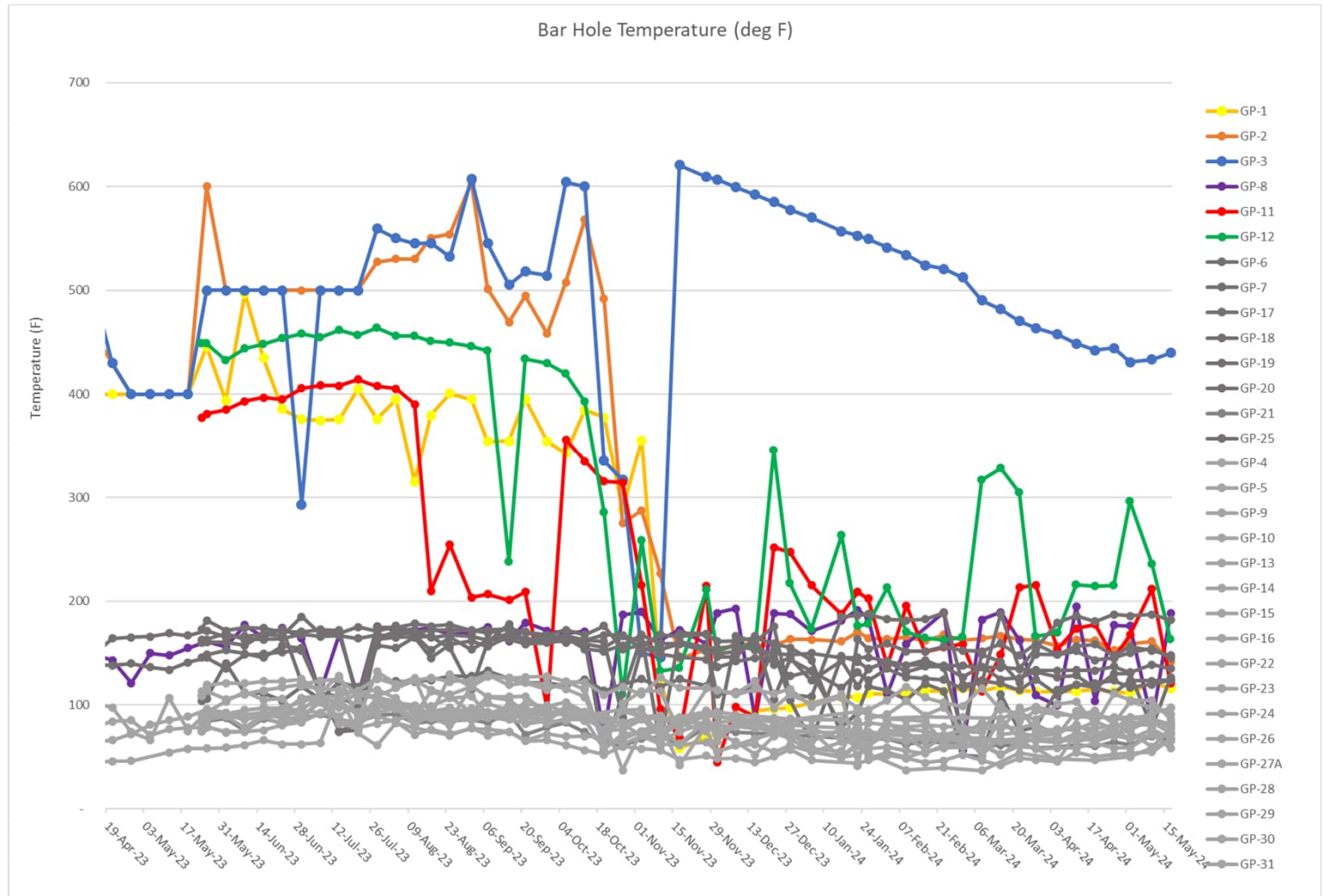


Barhole Temps

Affected near surface probes are GP-3 and GP-12.

GP-3 has highest temps, suggesting hottest portion of fire is near surface.

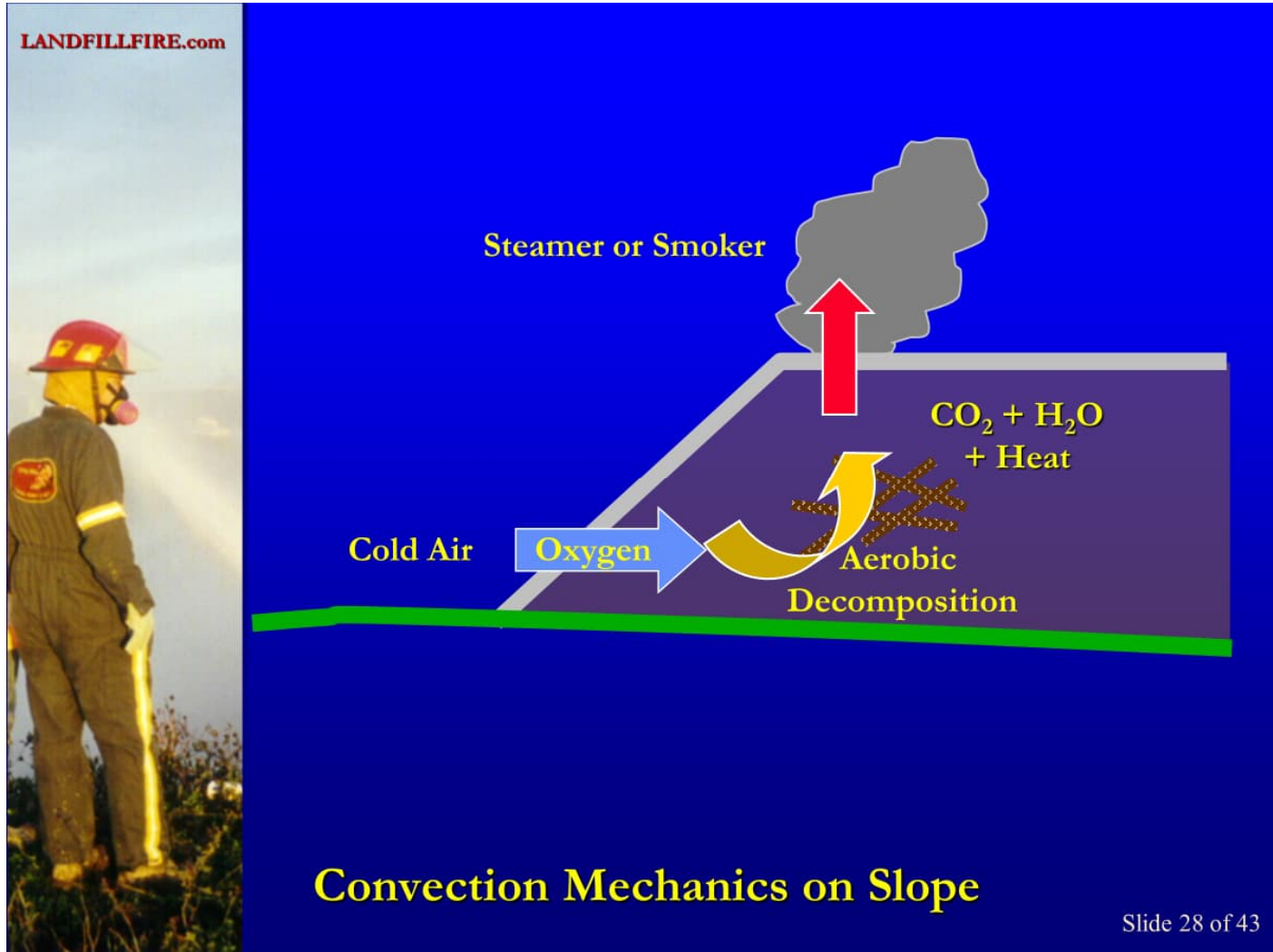
GP-12 is close to and above T-1, very close to fire.

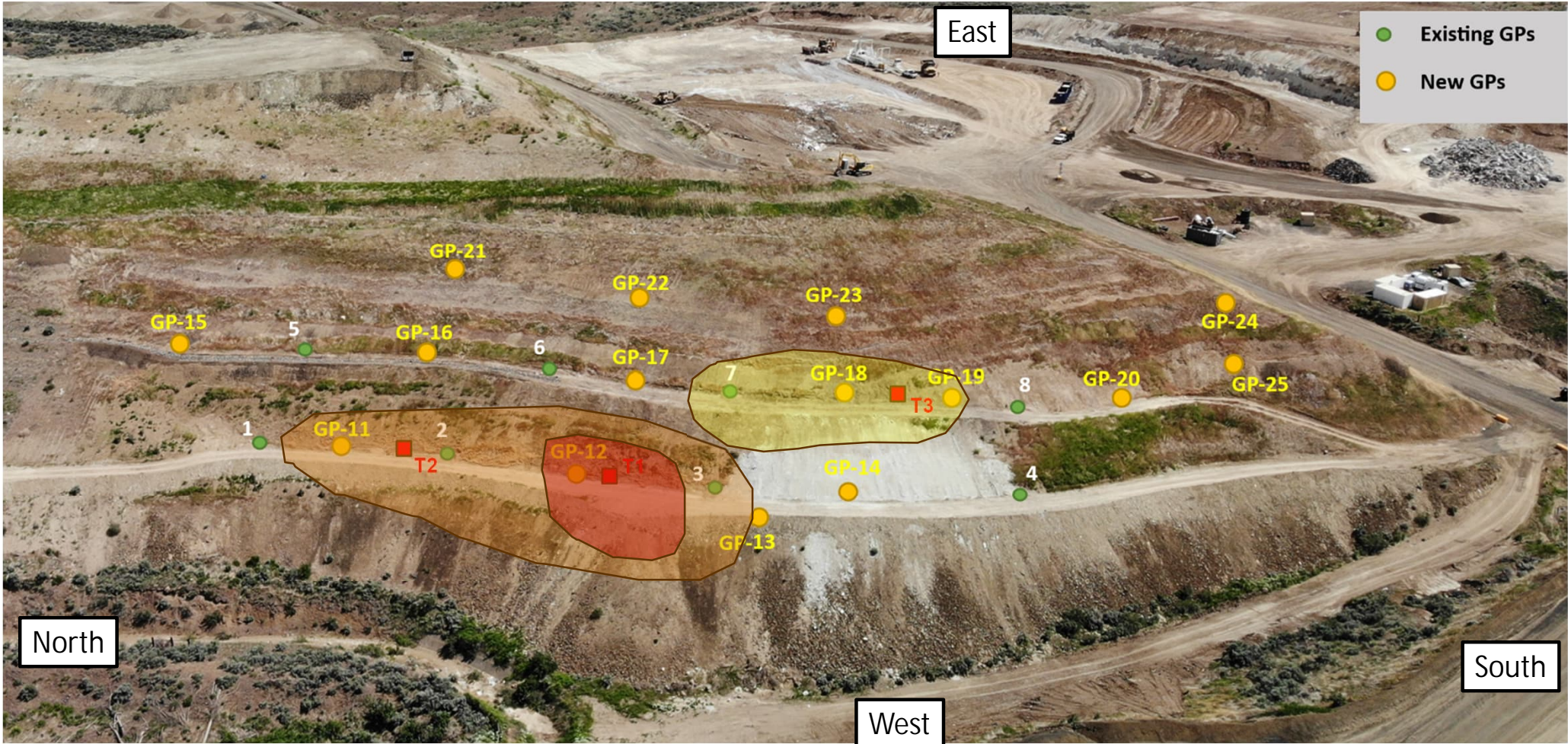


Convective Heat Distribution

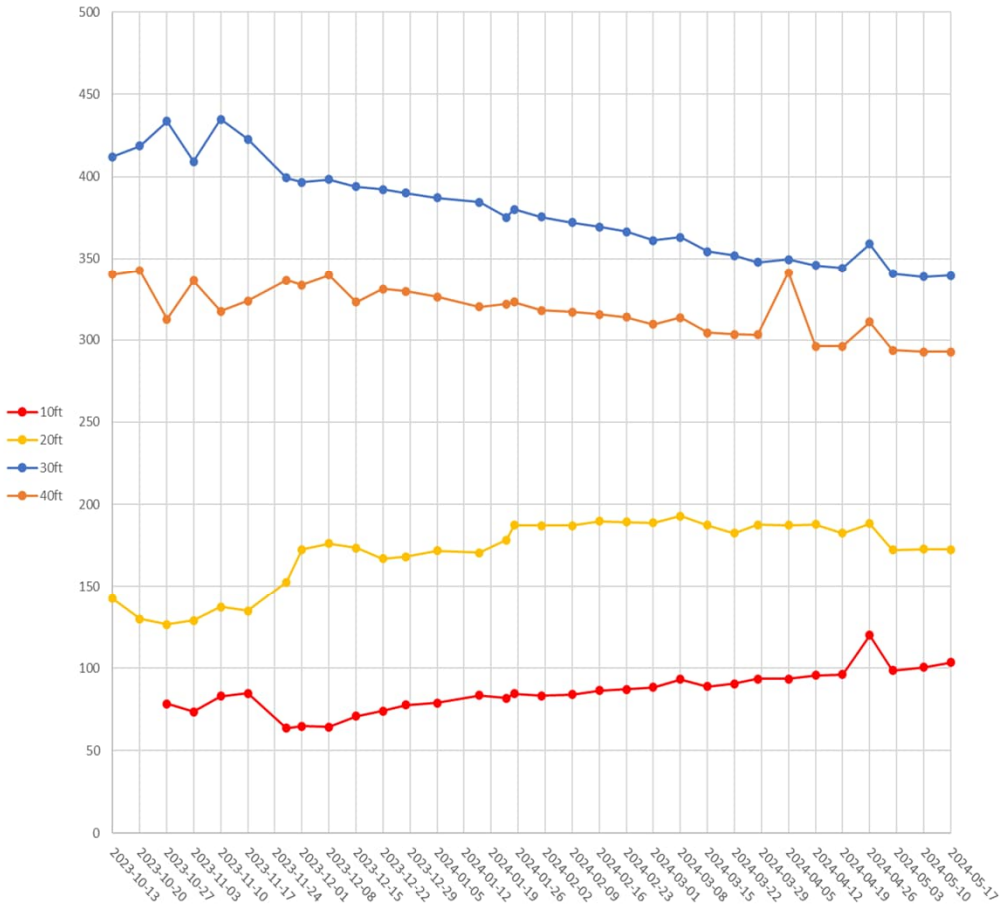
DTG situation is consistent with this model. Fire is occurring near T-1.

Convective gas flow is taking heat and gases upward and toward southwest, toward

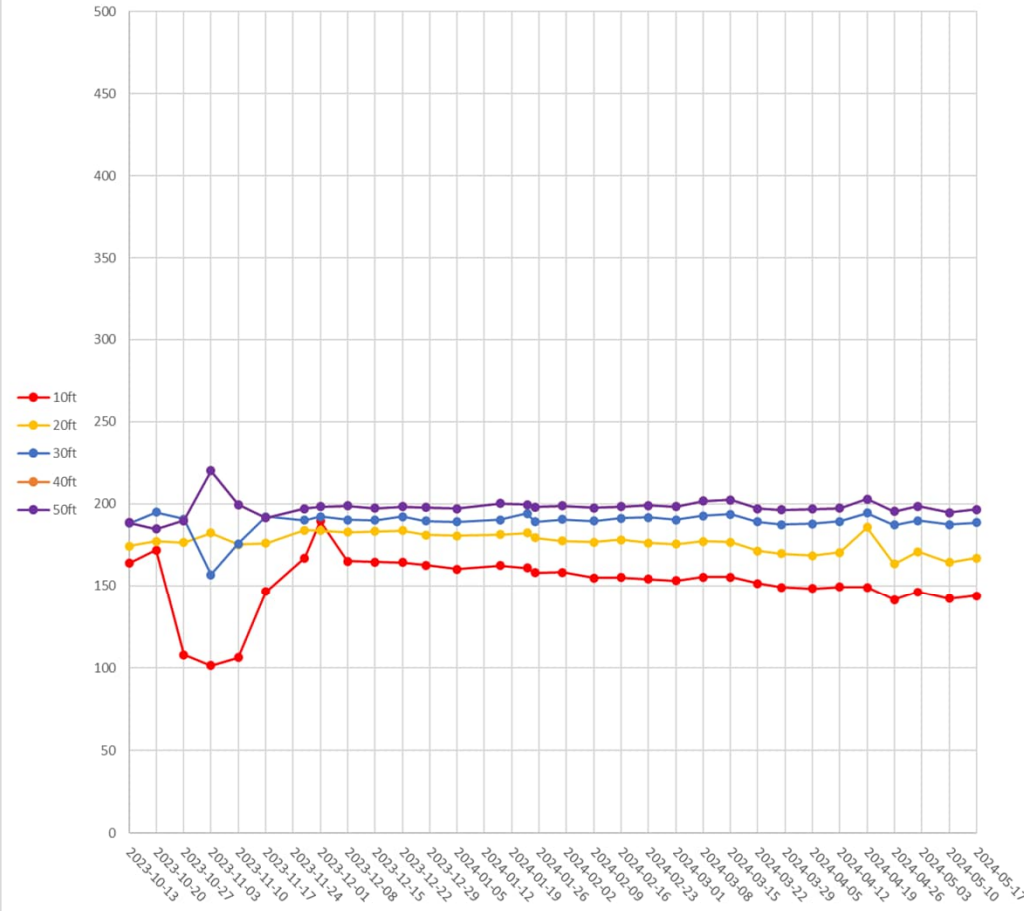




Thermistor 1



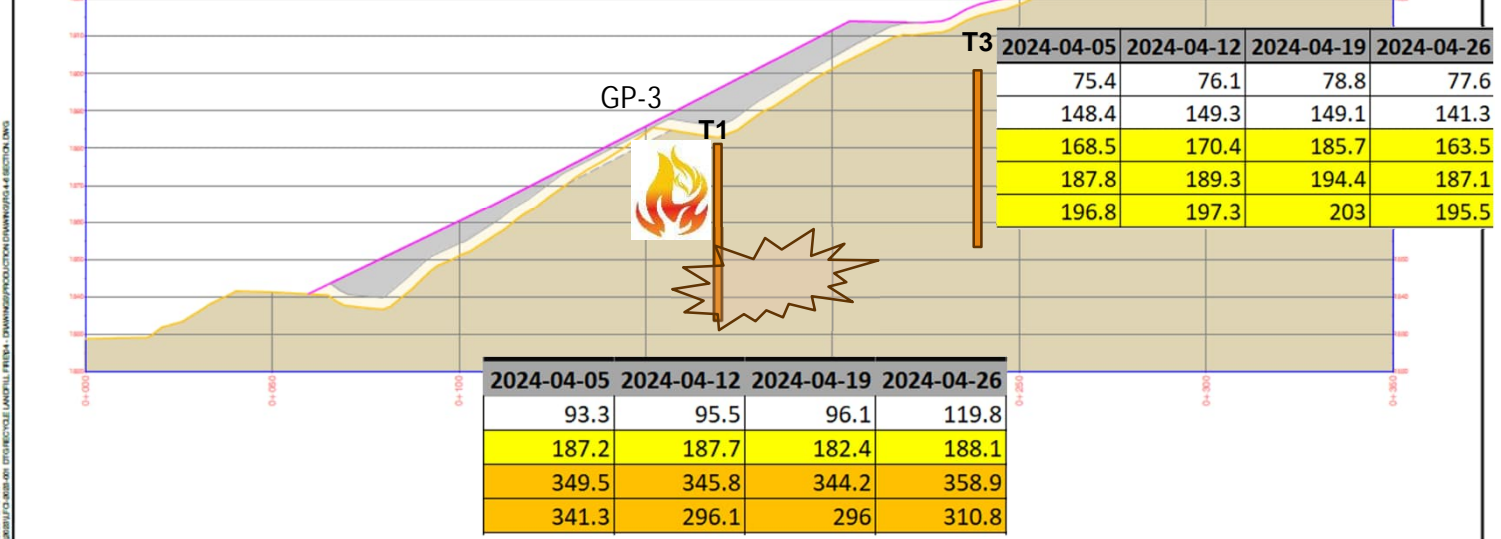
Thermistor 3



LEGEND:

- 2023-05-16 (E) PROFILE
- DESIGN SURGRADE PROFILE
- MINUS 12" SPOT ROCK
- 3" COMPACTED LOW PERMEABILITY (SL)
- EXISTING GROUND

23-Feb-24	01-Mar-24	08-Mar-24	15-Mar-24	22-Mar-24	28-Mar-24	05-Apr-24	12-Apr-24	19-Apr-24	26-Apr-24	02-May-24	10-May-24	17-May-24
TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)	TEMP (F)
113.3	115.7	113.7	117.5	113.9	112.7	112.7	113.4	114.7	113.0	111.4	121.6	115.6
167.8	162.8	164.2	166.7	163.3	162.5	156.6	162.9	162.0	152.7	159.2	161.2	141.8
520.6	512.4	490.5	482.0	470.6	463.7	457.7	448.8	442.3	444.6	431.2	433.6	439.8

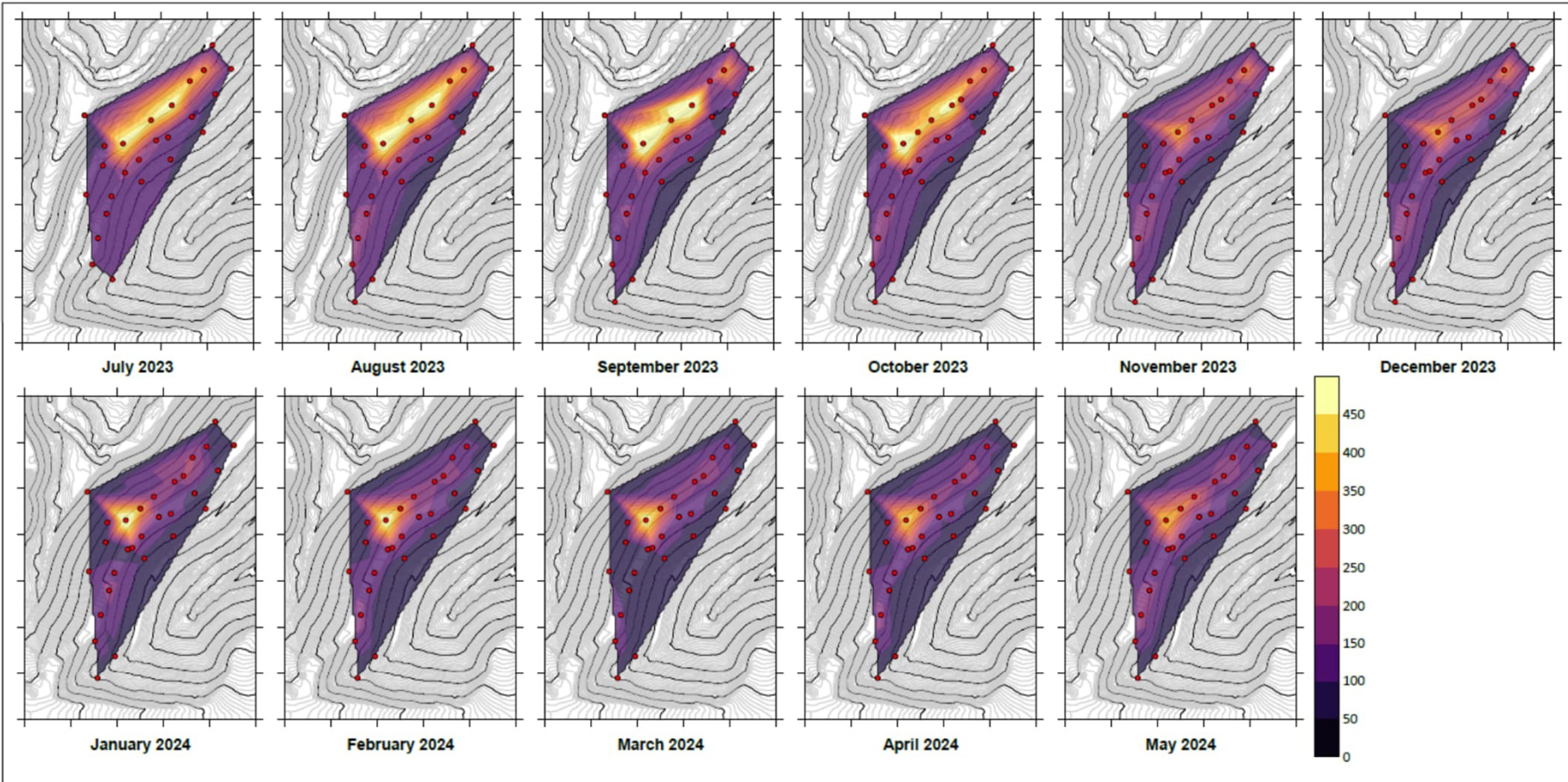


DATE GENERATED BY: AUSTIN, TRAVIS, 5/14/2023 12:15 PM
 C:\LANDFILL\PROJECTS\DTG\RECYCLE LANDFILL\FILE\4 - DRAWINGS\PRODUCTION\DRAWINGS\DTG-4-6 SECTION.DWG

<p>SPEARLING HANSEN ASSOCIATES</p> <p>Landfill Services Group • Landfill Design • Design & Construction Plans • Landfill Closure • Environmental Monitoring</p>	<p>#9 - 1205 Kalk Road East North Vancouver, B.C. V7J 1J9 Phone: (604) 940-7700</p>	<p>REUSE OF DOCUMENTS</p> <p>This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Spearling Hansen Associates.</p> <p>This drawing is not approved for construction unless it bears a signed and sealed engineer's stamp, affixed on or after the date of the last revision.</p>				<p>CLIENT:</p>	<p>DESIGN BY: T.SPEIRLING</p>	<p>SHA PROJECT # 2023-001</p>	<p>DTG RECYCLE LANDFILL FILE</p>		
		<p>DRAWN BY: A.TSANG</p>	<p>DATE CREATED: 5/14/2023</p>	<p>SECTION B-B'</p>							
<p>SEAL</p>		<p>NO. DATE REVISIONS</p>	<p>DRAWN CIVIL APPD</p>	<p>CHECKED BY: T.SPEIRLING</p>	<p>HORIZONTAL SCALE: 1" = 20'</p>	<p>APPROVED BY: -</p>	<p>VERTICAL SCALE: 1" = 20'</p>	<p>DRAWING NO. 2023-001-005</p>	<p>REV -</p>	<p>SHEET 005</p>	

ADJUST SCALE 90% FOR SHARP SHEET

Temp. Distribution



- Data taken from first monitoring event of each month
- Data was linearly interpolated between data points
- Datapoints (probe locations) represented in red
- Temperatures measured in Degrees Farenheit
- Contours are of existing ground at beginning of project, with design contours added for after addition of fill



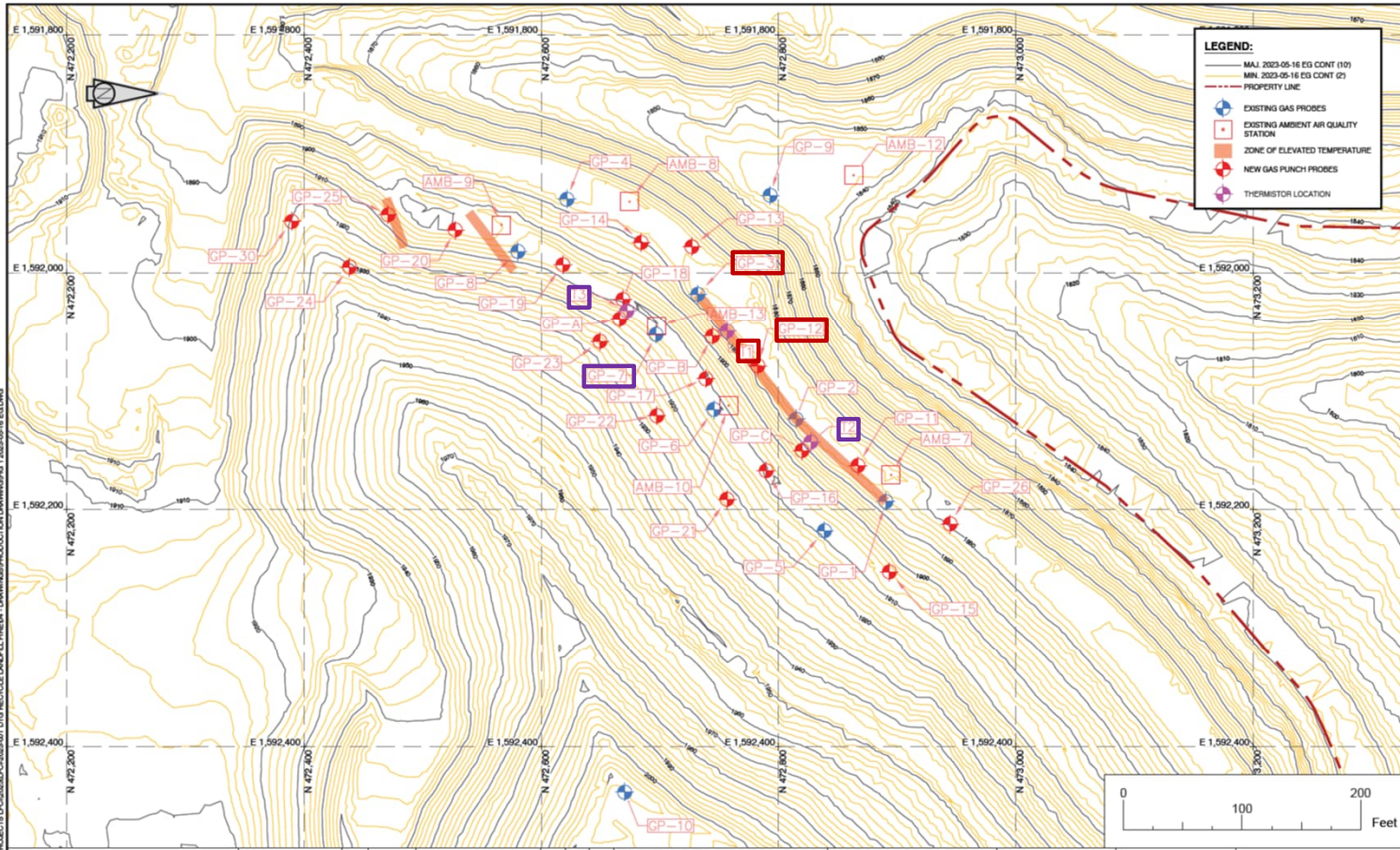
No.	DATE yr/m/day	REVISIONS	DRAWN	CHK'D	APP'D
1	2024/05/27	ISSUED FOR REVIEW	MD	TS	TS

REUSE OF DOCUMENTS
 This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Sperring Hansen Associates.
 This drawing is not intended for construction, and is only intended for reference and the purpose of landfill fire investigation.



DESIGN BY: T. SPERLING
 DRAWN BY: M. DOORBOS
 DATE CREATED: 2024/05/27
 SHA PROJECT # LFCI-2023-001

DTG RECYCLE LANDFILL FIRE		
MONTHLY MONITORING SUMMARY SPATIAL MAPS		
DRAWING NO.	REV	SHEET
LFCI-2023-001-05-TEMP	1	1



DTG 2023-05-16 EG CONT (01) - Recycle Recycle Recycle - 10/10/2023 10:16 AM
 X:\LANDFILL\RECYCLE\PROJECTS\2023-05-16 EG CONT (01) DTG RECYCLE LANDFILL.FXD - DRAWING\PRODUCTION\DRAWING\DTG 2023-05-16 EG CONT (01)


SPEARLING HANSEN ASSOCIATES
 Landfill Services Group
 • Landfill Design
 • Design & Operations Plans
 • Landfill Closure
 • Environmental Monitoring
 #8 - 1223 Keith Road East
 North Vancouver, B.C. V1J 1J3
 Phone: (604) 966-7723

NO.	DATE	REVISIONS	DRAWN	CHKD	APPR

REUSE OF DOCUMENTS

This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Sperling Hansen Associates.

This drawing is not approved for construction unless it bears a signed and dated engineer's stamp, affixed on or after the date of the last revision.

CLIENT:

DESIGN BY: T.SPERLING
 DRAWN BY: A.TSANG
 CHECKED BY: T.SPERLING
 APPROVED BY: --

SHA PROJECT #	2023-001	DTG RECYCLE LANDFILL FILE
DATE CREATED:	5/16/2023	EXISTING TOPOGRAPHY
HORIZONTAL SCALE:	1" = 7'	2023-05-16
VERTICAL SCALE:	1" = 7'	DRAWING NO.
ADJUST SCALE 50% FOR 34"X42" SHEET		REV
		SHEET
		2023-001-001
		--
		001

LFCI CO Assessment Scale

No Fire Indication	0 – 200
Possible Fire in Area	200 – 500
Potential Smouldering Nearby	500 – 750
Fire or Exothermic Reaction Likely	750 – 1000
Fire in Area	> 1000

Initial concern level for CO is 500 ppm.

Typically, when fire is occurring, fire centroid is above 10,000 ppm CO.

Due to subsurface dispersion of gases through worm holes and diffusive effects, CO interpretation needs to be carried out spatially.

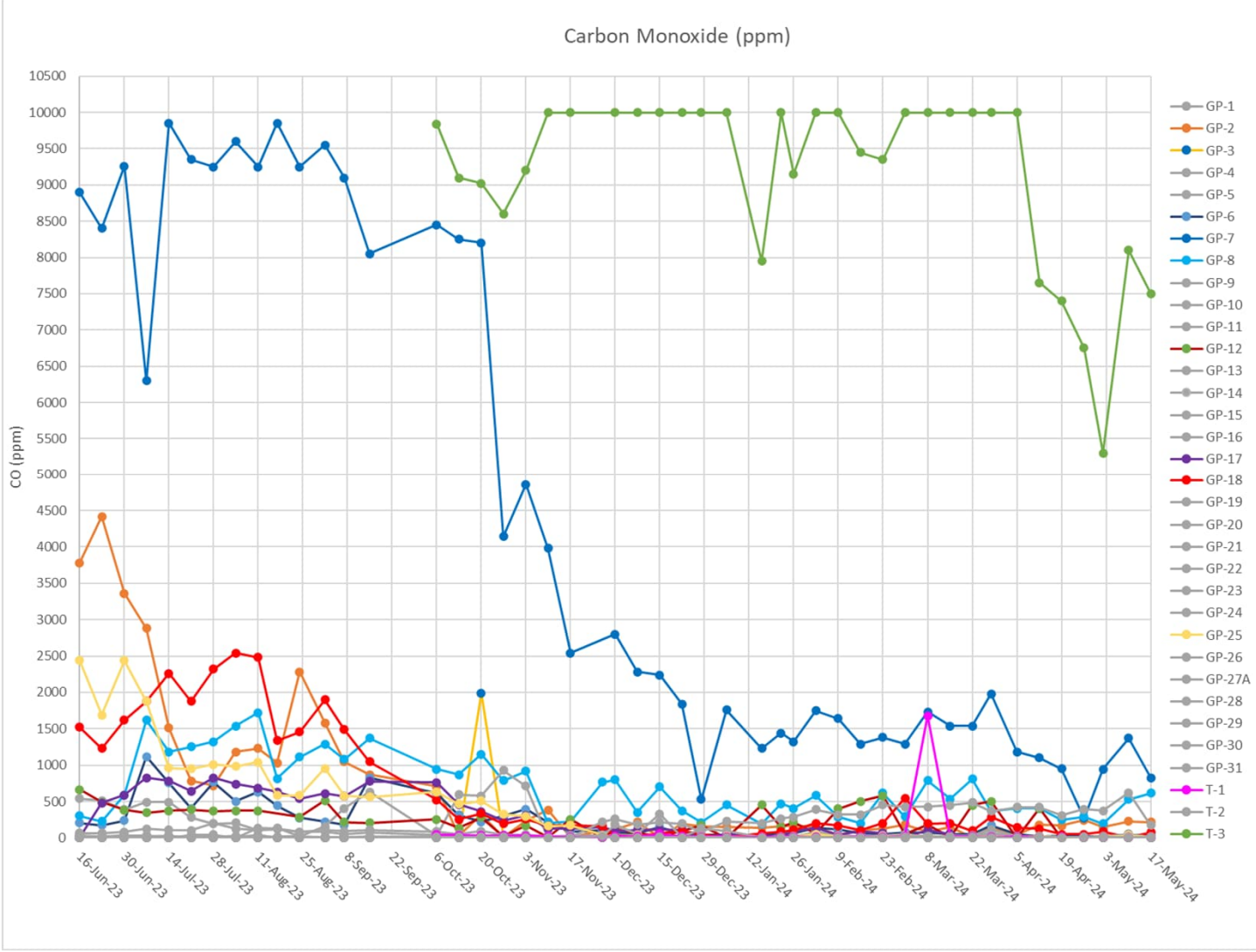
looking for decreasing overall trend and average

looking for shrinkage of centroid of high CO concentration

important to be mindful of cross-contamination issues

CO Concentrations

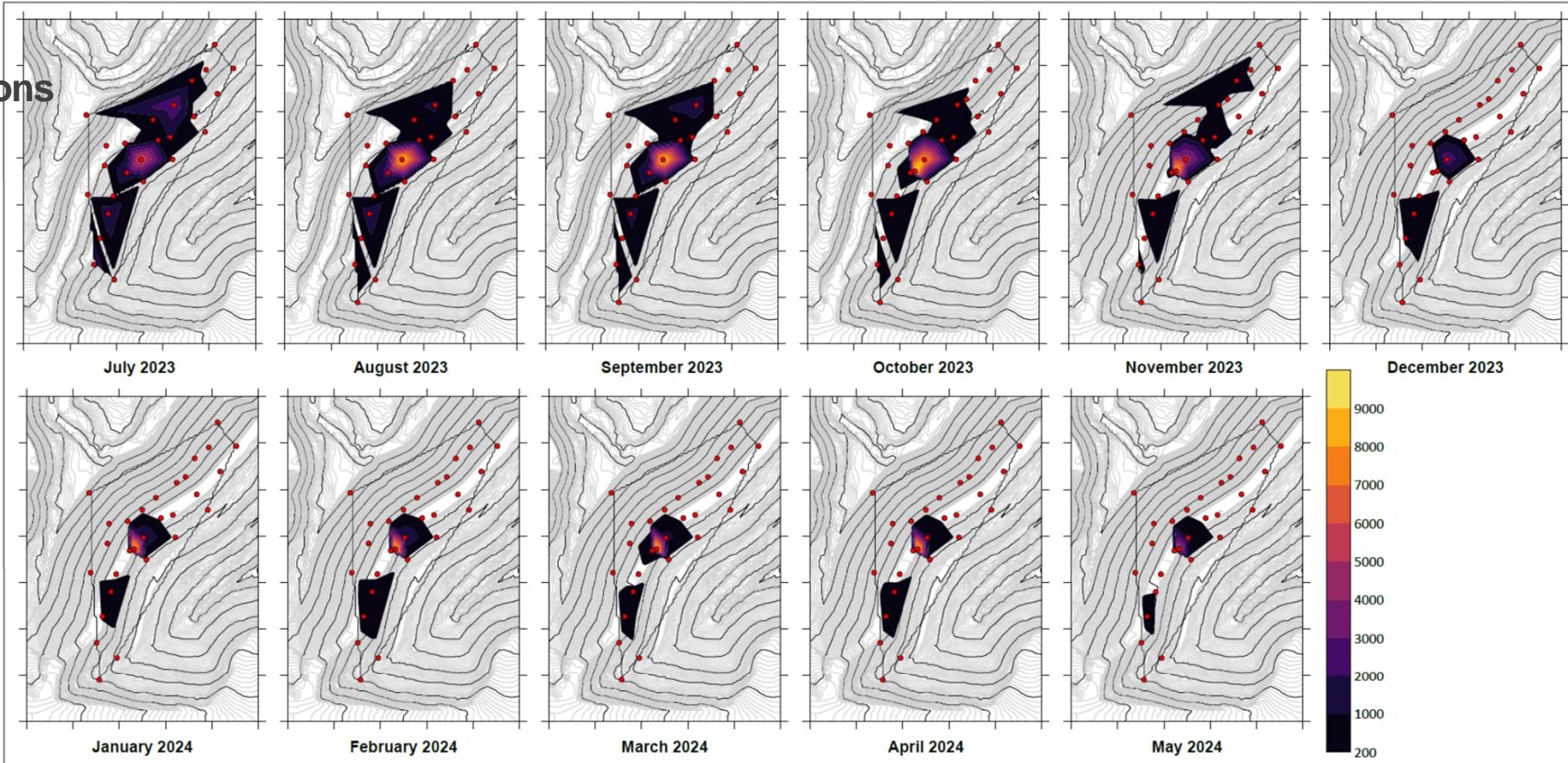
Highest CO concentrations have been in T-3, followed by GP-7.



CO Concentrations

Data indicates active smoulder in proximity to T-3 with convective pathway to GP-7.

Isolated centroid around T-3 would suggest that this may be primary smoulder zone generating the high CO levels.



- Data taken from first monitoring event of each month
- Data was linearly interpolated between data points
- Datapoints (probe locations) represented in red
- CO levels are measured in ppm
- Ground contours are of existing ground at beginning of project, with design contours added for after addition of fill



No.	DATE y/m/day	ISSUED FOR REVIEW	MD	TS	TS
1	2024/05/27	ISSUED FOR REVIEW			
		REVISIONS	DRAWN	CHK'D	APP'D

REUSE OF DOCUMENTS
 This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Sperring Hansen Associates.
 This drawing is not intended for construction, and is only intended for reference and the purpose of landfill fire investigation.



DESIGN BY:	T. SPERLING
DRAWN BY:	M. DOORBOS
DATE CREATED:	2024/05/27
SHA PROJECT #	LFCI-2023-001

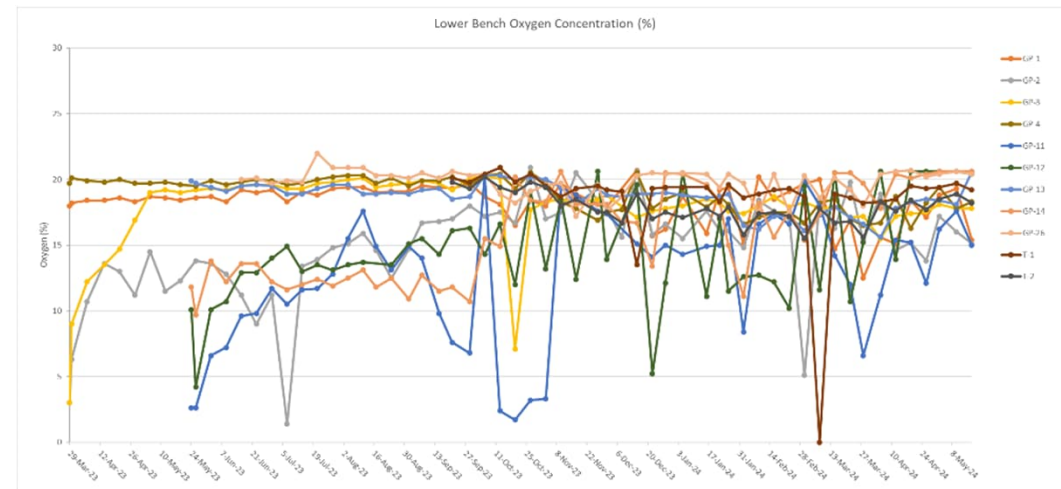
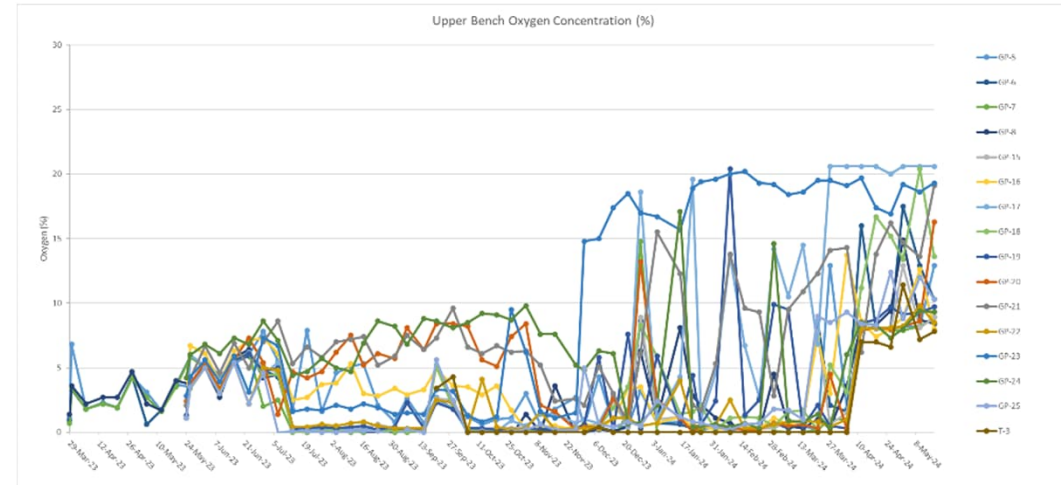
DTG RECYCLE LANDFILL FIRE		
MONTHLY MONITORING SUMMARY		
SPATIAL MAPS		
DRAWING NO.	REV	SHEET
LFCI-2023-001-05-CO	1	1



Both areas of landfill (upper and lower bench) are reading high oxygen in past three weeks. This may be due to the fire not consuming any more of the oxygen.

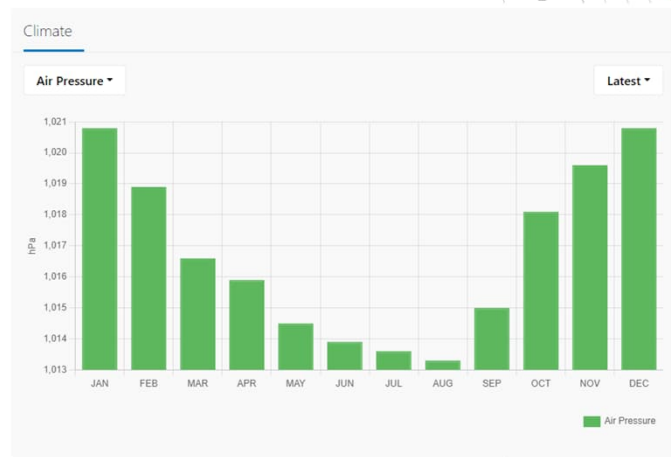
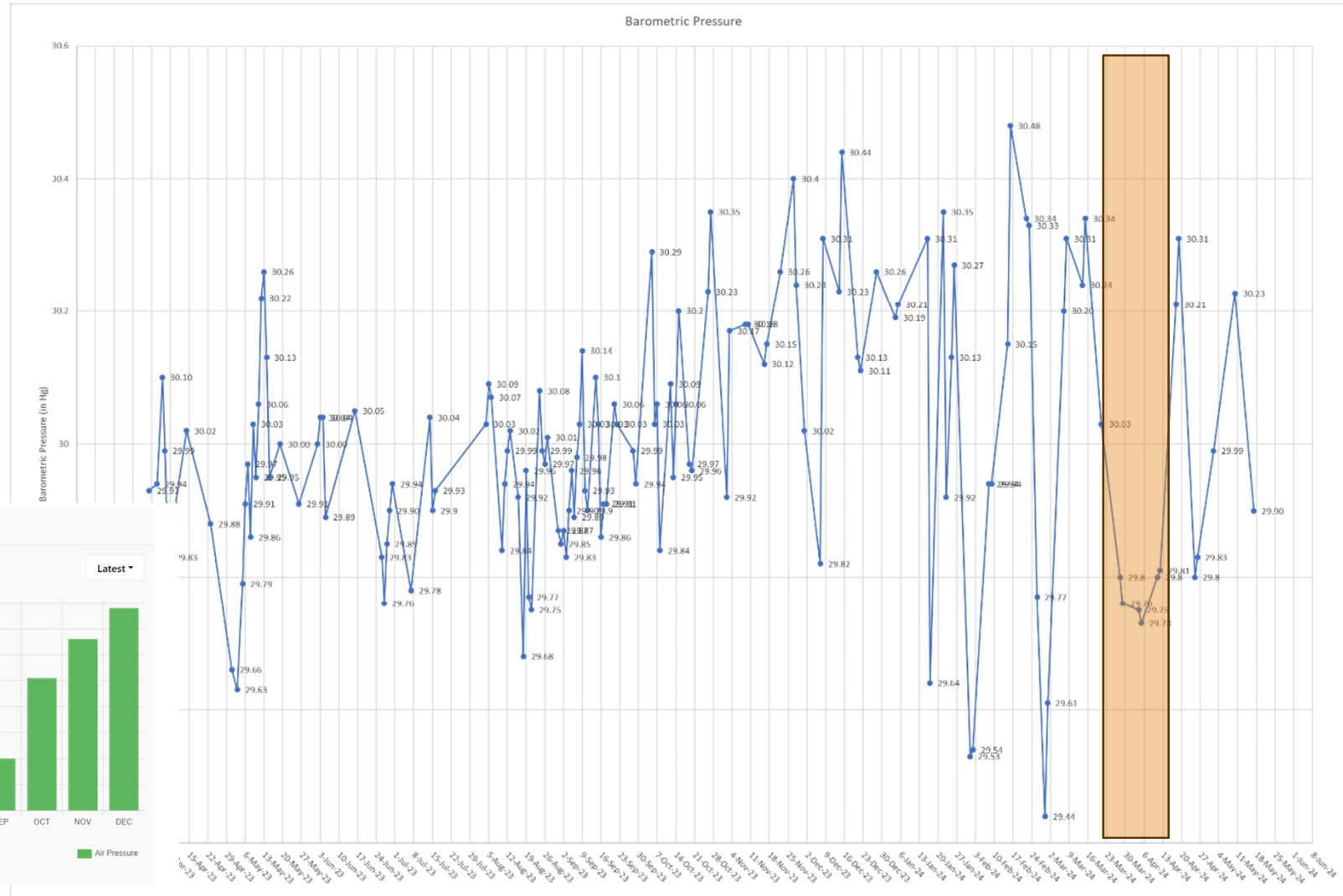
Oldest portion of Landfill is probably relatively inert and biologically inactive, producing very little methane. As a result, pore space is full of atmospheric air.

Some GPs susceptible to swings in pressure – LFCI believes this is causing the spikes.



Atmospheric Pressure

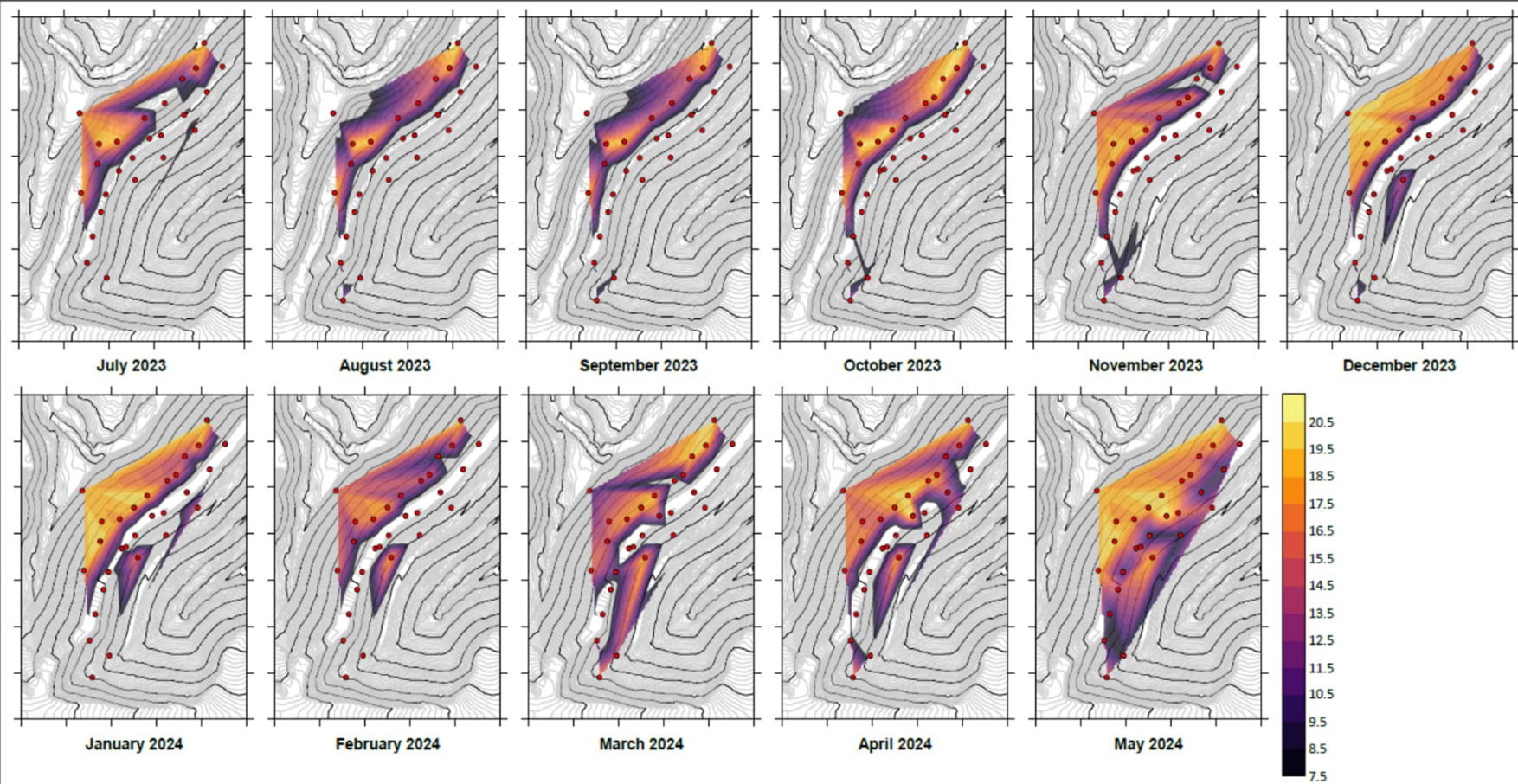
Large swings in pressure since Nov. 2023 have cycled atmospheric air into landfill, particularly in February and March, 2024.



Oxygen Concentrations

Shading of O2 on lower bench strongly impacted by GP-9 at toe.

O2 concentrations in upper bench have increased since March, 2024.



- Data taken from first monitoring event of each month
- Data was linearly interpolated between data points
- Datapoints (probe locations) represented in red
- O2 levels are measured in % composition
- Ground contours are of existing ground at beginning of project, with design contours added for after addition of fill



NO.	DATE	ISSUED FOR REVIEW	MD	TS	TS
1	2024/05/27	ISSUED FOR REVIEW			
NO.	DATE	REVISIONS	DRAWN	CHK'D	APP'D
	yr/m/day				

REUSE OF DOCUMENTS
 This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Sperring Hansen Associates.
 This drawing is not intended for construction, and is only intended for reference and the purpose of landfill fire investigation.

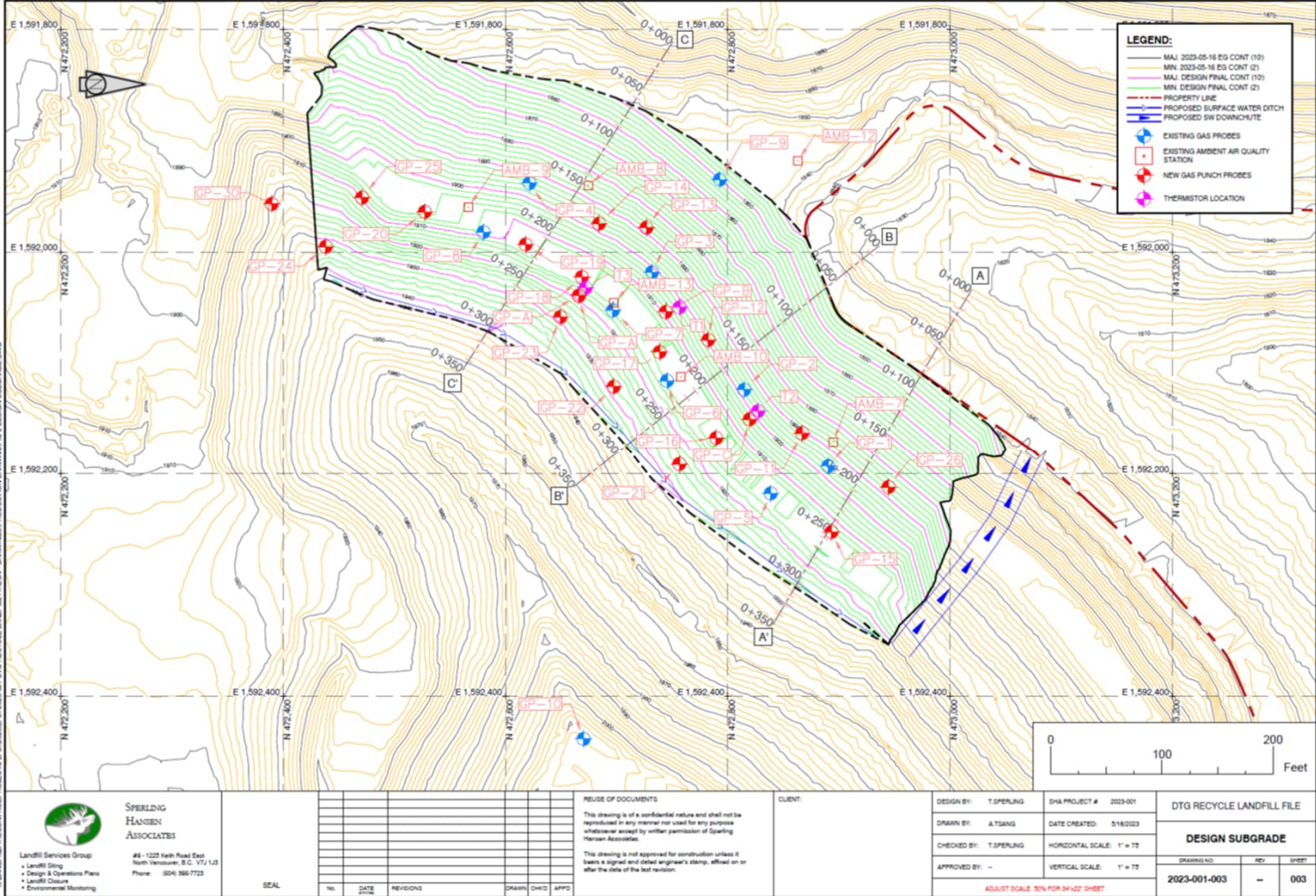


DESIGN BY:	T. SPERLING
DRAWN BY:	M. DOORNBOS
DATE CREATED:	2024/05/27
SHA PROJECT #	LFCI-2023-001

DTG RECYCLE LANDFILL FIRE		
MONTHLY MONITORING SUMMARY		
SPATIAL MAPS		
DRAWING NO.	REV	SHEET
LFCI-2023-001-05-02	1	1

Soil Cover Placement

Soil cover in excess of 3' was placed and compacted in area shown between Sept. and November, 2023.



DTP IDENTIFIED BY: Edwark Wagon Properties, LLC 10/20/2023. DATE: 10/20/2023. PROJECT: DTP RECYCLE LANDFILL AREA - DRAINAGE PRODUCTION DRAWING FOR DESIGN SUBGRADE 200G



**SPEARLING
HANSEN
ASSOCIATES**
 Landfill Services Group
 • Landfill Site
 • Design & Operations Plans
 • Landfill Closure
 • Environmental Monitoring
 #8 - 1225 Keith Road East
 North Vancouver, B.C. V7J 1J3
 Phone: (604) 986-7723

No.	DATE	REVISIONS	DRAWN	CHKD	APPD

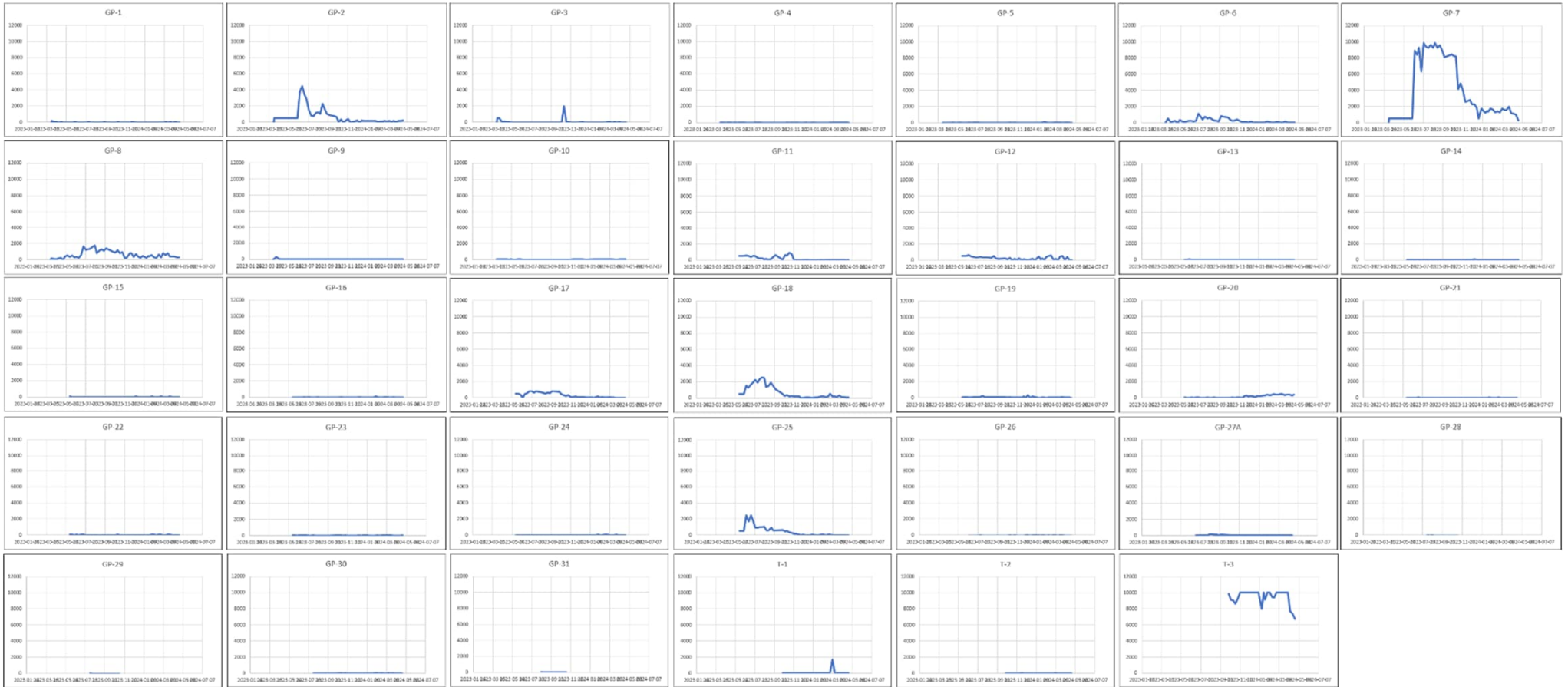
REUSE OF DOCUMENTS
 This drawing is of a confidential nature and shall not be reproduced in any manner nor used for any purpose whatsoever except by written permission of Sperling Hansen Associates.
 This drawing is not approved for construction unless it bears a signed and dated engineer's stamp, affixed on or after the date of the last revision.

CLIENT: _____
 DESIGN BY: T.SPEARLING
 DRAWN BY: A.TSANG
 CHECKED BY: T.SPEARLING
 APPROVED BY: _____

SHA PROJECT #	2023-001
DATE CREATED	5/16/2023
HORIZONTAL SCALE	1" = 75'
VERTICAL SCALE	1" = 75'
ADJUST SCALE 50% FOR 34"x22" SHEET	

DTP RECYCLE LANDFILL FILE		
DESIGN SUBGRADE		
DRAWING NO.	REV	SHEET
2023-001-003	--	003

CO Levels by Individual Wells

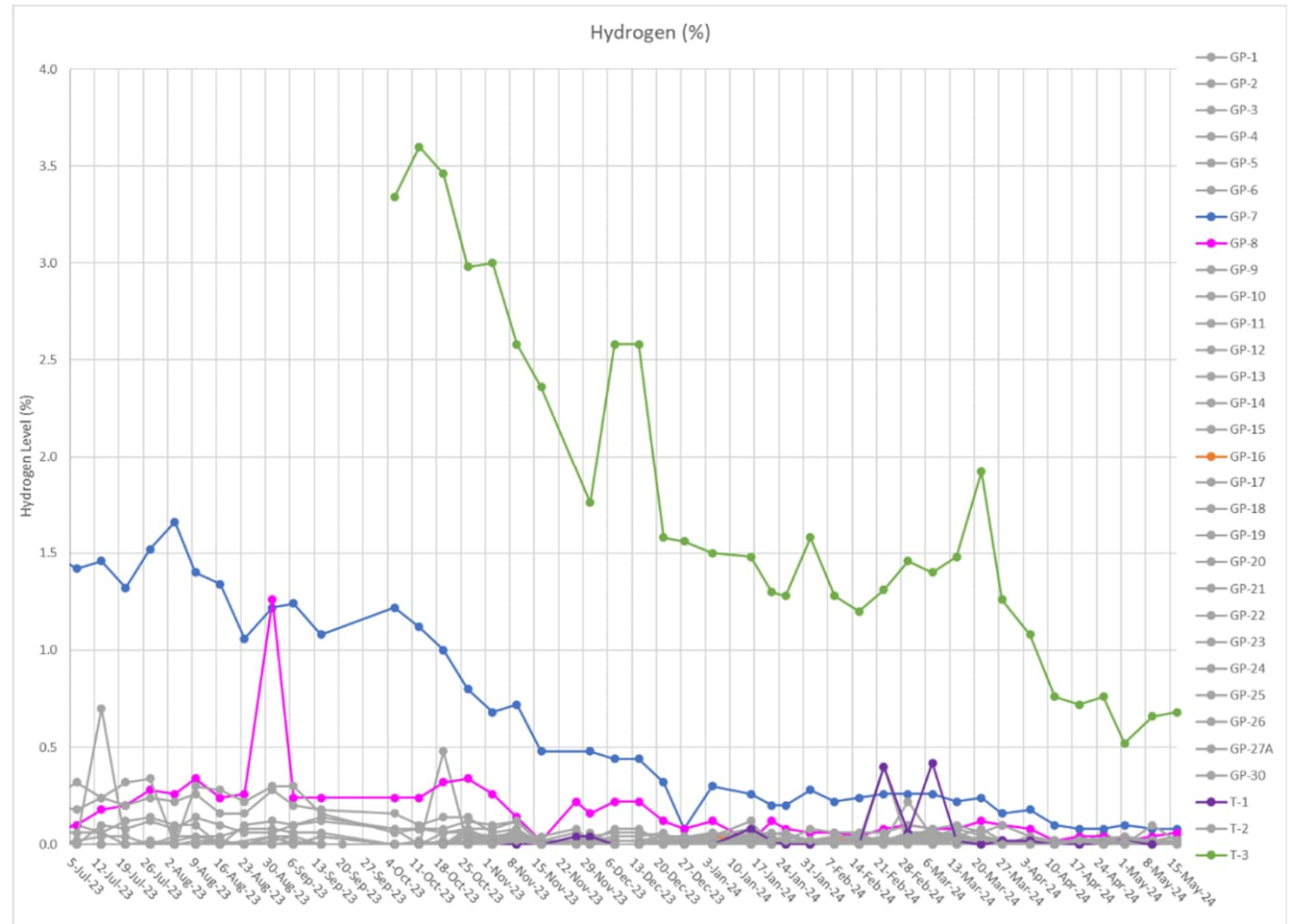


H₂

Hydrogen seems to be similar to the CO levels.

T-3 is trending downward, and has decreased significantly after cover was applied.

Even if H2 data is scrubbed from the CO data, GP-7 and T-3 remain high in CO. This month has shown very positive trends in H2 and CO



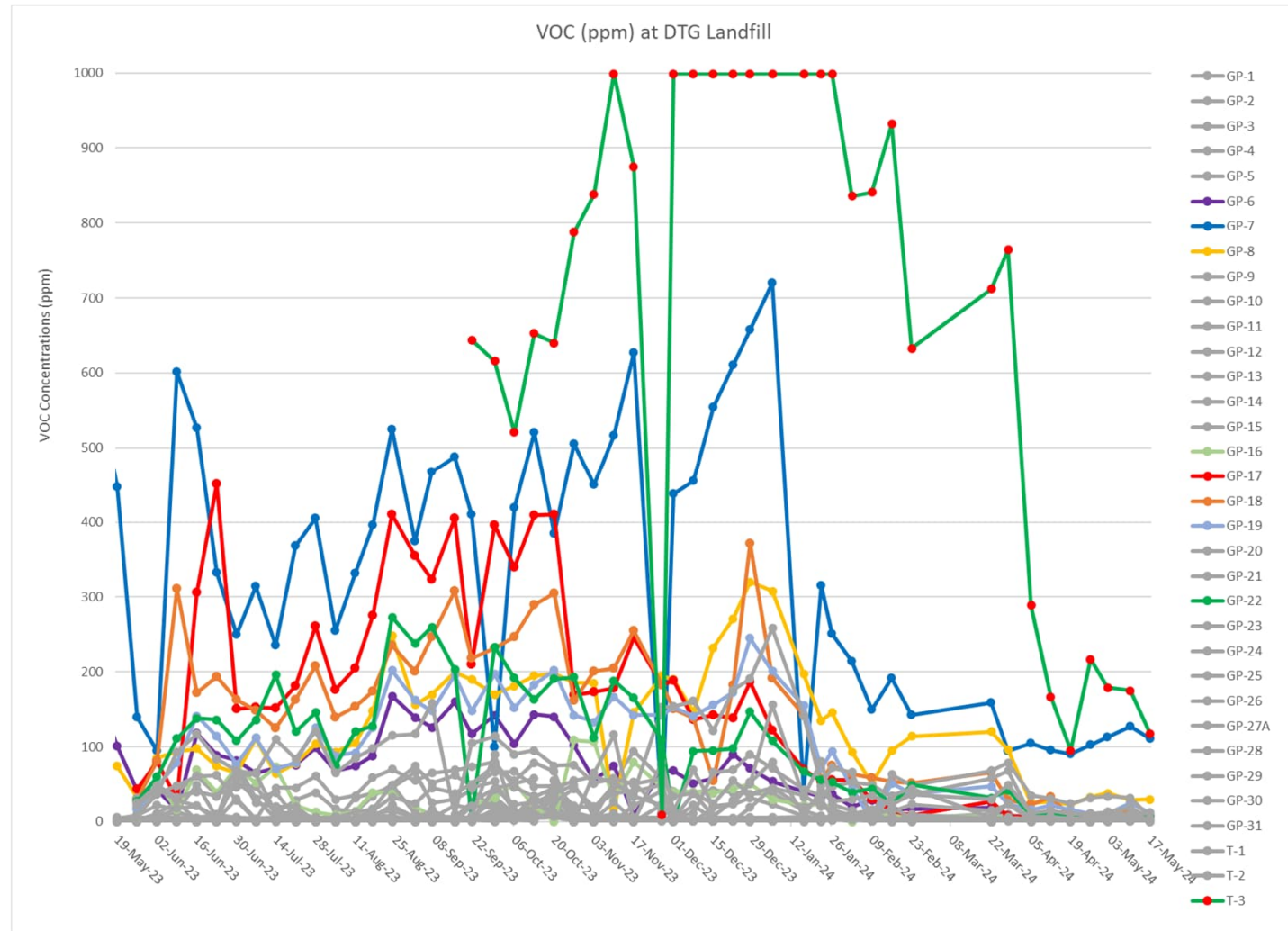
VOC's

T-3 has now decreased significantly to just over 200ppm.

Decreasing trend visible in all locations since January.

VOC concentrations are function of fire / smolder activity.

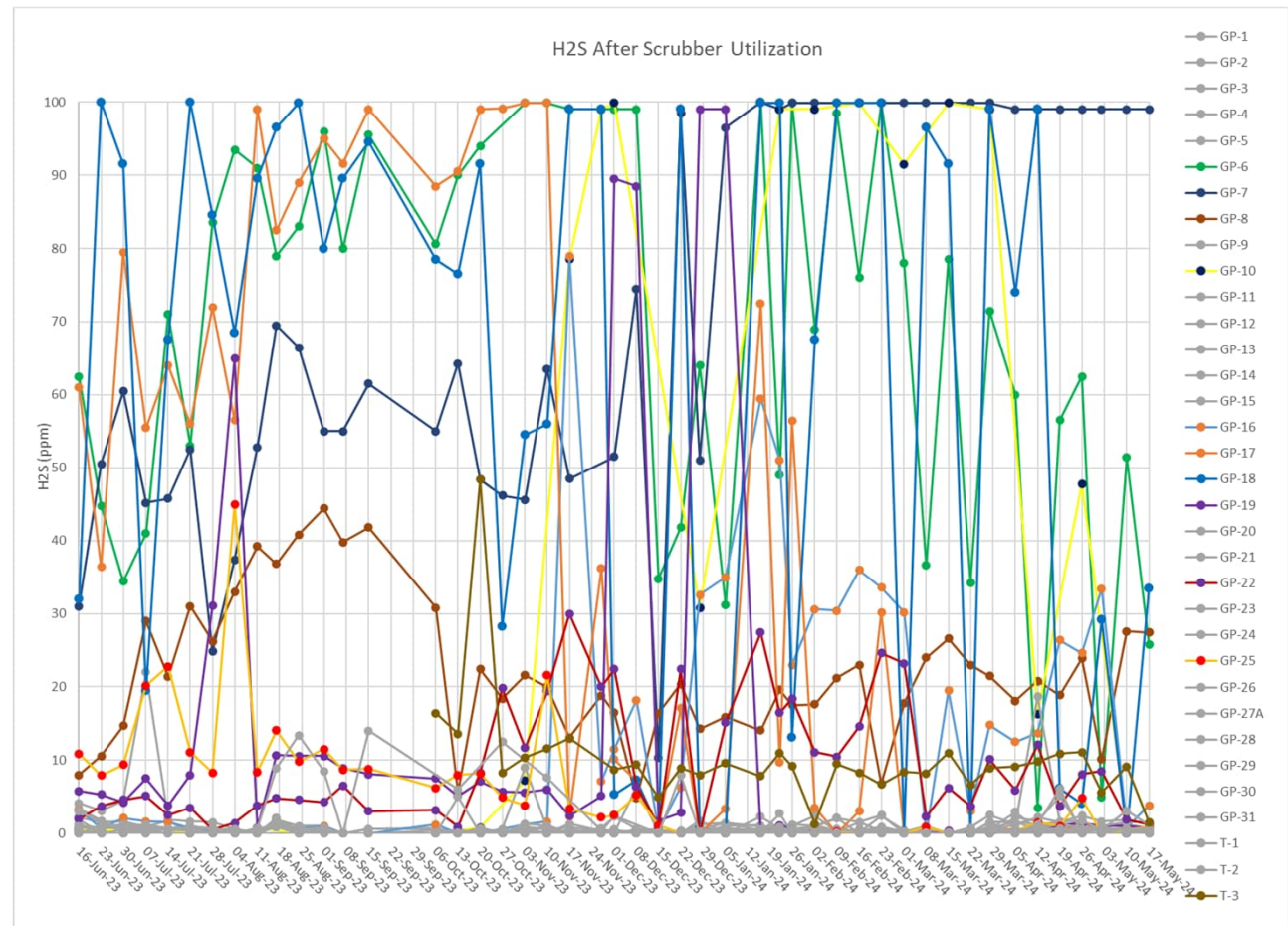
Intensity of combustion is decreasing as indicated by drops in CO, H₂, VOC.



H₂S

H₂S data continues to be noisy, likely affected by atmospheric pressure fluctuation.

Of note, GP-7 has remained high for past few months, and T-3 has remained stable around 10ppm.

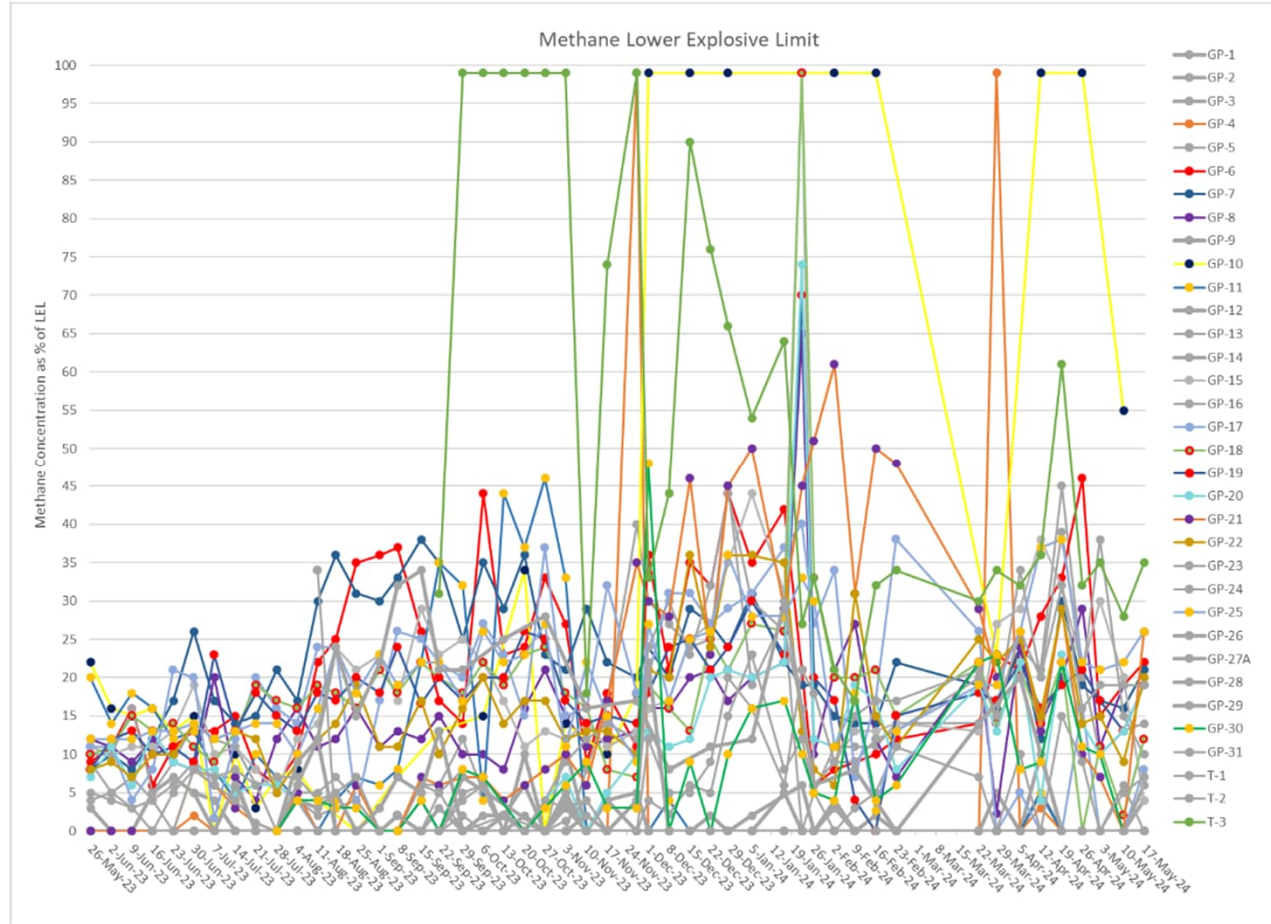


Lower Explosive Limit

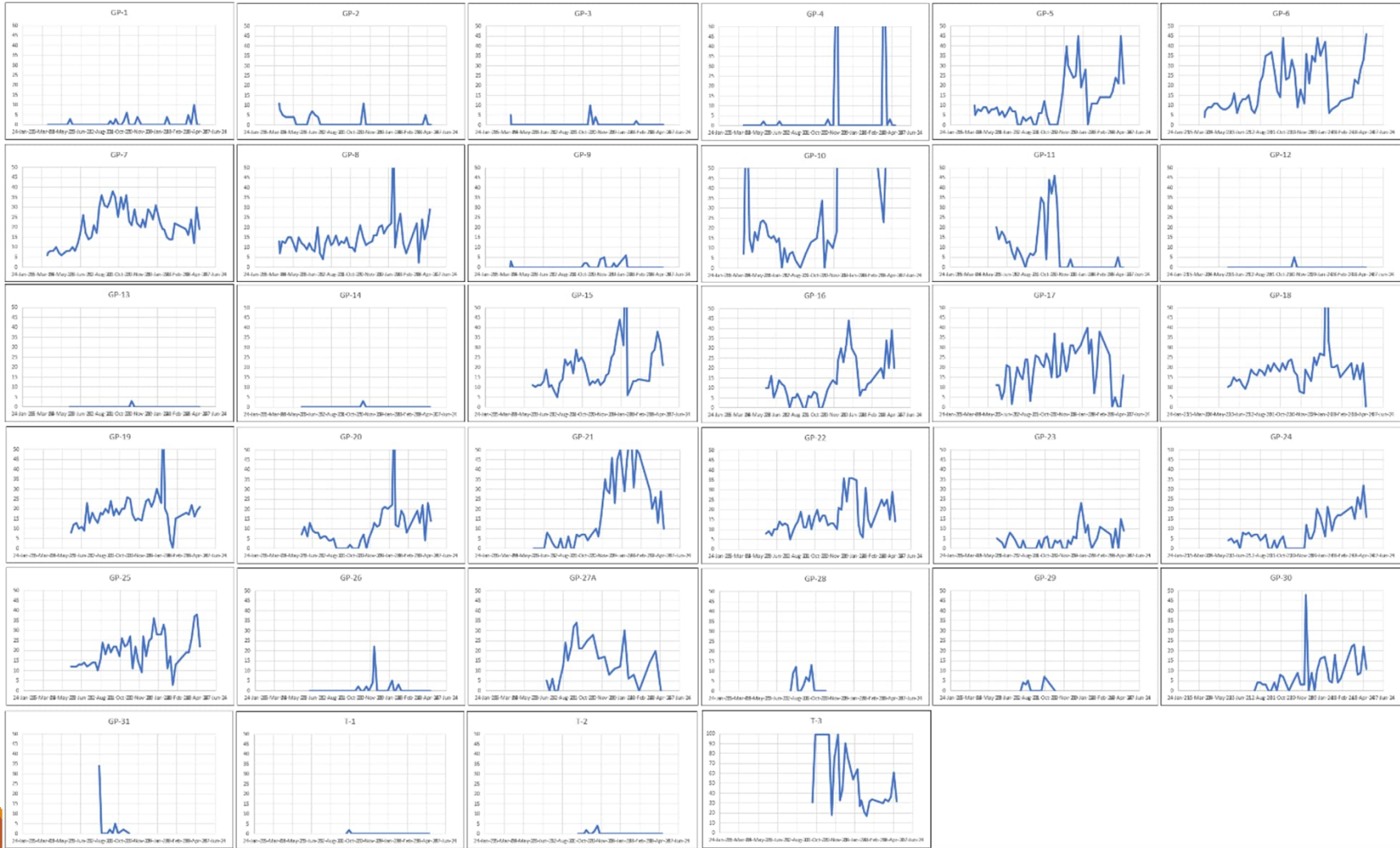
Many data points fluctuating wildly – methane composition is a better indicator of levels within the landfill.

Upward trend in methane is visible, with the data showing more even distribution.

GP-10 at top of landfill has highest methane. Youngest garbage at top of landfill produces most methane. Also, concentrations highest during stable low Pressure.



LEL for individual GP





● High Temp

□ High CO

▲ High H₂S

▼ High VOC

● Existing GPs
● New GPs



Fire Path



Data Interpretation

Suppression efforts are working. CO levels and temperatures have decreased dramatically since cover fill was placed. VOC's, H2 have also dropped, indicating less fire activity.

Temperatures have been on steady decline. Highest temps have been at GP-3, therefore, most active fire zone is actually shallower depth.

Centroid of fire is around GP-3 and T-1. Fire was burning along lower bench from T-1 spreading to north. Hot zone has shrunk over time.

Slight uptick in temperatures in T-1 and GP-3 this week, probably a function of increased O2.

In LFCI experience, CO has been best indicator of suppression at other landfill sites. CO levels in GP-7 and T-3 have dropped significantly in past month.

High O2 below lower bench road continues, has expanded to extent of monitoring - this is likely due to large atmospheric pressure swings and pervious waste mass allowing entry of ambient air.

Overall, it appears that the waste is smoldering underneath GP-3 and T-1 (elevated temperature) and a 'chimney' effect is occurring, causing higher CO and VOC's in T-3 and GP-7.

Trigger Levels

Triggers for action need to recognize this is an active fire that has been burning for more than a year.

Key metrics to watch are highest temperatures and CO levels, and whether those are trending downward.

Location of centroids and heat maps provide indication whether things are getting better or worse or if a new fire zone is developing.

Fixed number triggers at individual wells cannot be used without taking into account spatial distribution of nearby heat and gas sources (radiant heat, gas convection / diffusion).

LFCI's experience is that if fire starts in an area CO will spike to 10,000 ppm and a heat centroid will develop.

Gas concentrations and temperatures at this site are strongly influenced by atmospheric fluctuations. Long term trends indicate low pressure over summer months, which should result in improved conditions (less O₂ incursion).