



memorandum

TO Christchurch City Council FROM [REDACTED]
DATE 28 July 2023
RE Living Earth Odour Monitoring: 22nd May 2023 to 18th June 2023 Summary

1.0 Background

Living Earth Limited (Living Earth) operates an organics processing plant and composting facility located at 40 Metro Place, Bromley, Christchurch (the LE Site). Living Earth's air discharges are subject to the conditions attached to air discharge consent CRC080301.1 ("the consent") from Canterbury Regional Council (CRC) to discharge contaminants (odour and dust) to air.

Specifically, Condition 27 of the consent states that:

"The discharges to air shall not cause odour or dust which is offensive or objectionable beyond the boundary of the site on which this consent is exercised."

While Living Earth operates the composting facility, Christchurch City Council (CCC) holds the consent.

Pattle Delamore Partners Limited (PDP) has been providing assistance to CCC and Living Earth regarding the assessment and management of odour effects from the site. This has included regular odour scouting. The objectives of the odour scouting are to:

- ∴ Correlate the intensity and characters of observed odour (where possible) to:
 - Odour sources in the Bromley area.
 - Specific activities and/or sources on the LE Site.
 - Meteorological conditions.
 - Time of day.
- ∴ Undertake FIDOL assessments to determine if offensive or objectionable odours are present beyond the site boundary.
- ∴ Corroborate the content of community (i.e., Smelt-It) complaints.

This letter provides a summary of PDP's observations of off-site odour scouting for the period between the 22nd of May 2023 and the 18th of June 2023.

2.0 Summary of Methodology

Odour observations are made by PDP odour scouts. To ensure consistency between scouts, PDP ensures the following:

1. Scouts periodically undertake parallel odour assessments with each other in the field.
2. Scouts periodically visit the LE Site and familiarise themselves with the character of the odour from the various onsite sources.
3. Scouts undergo nose calibration via direct dilution olfactometry according to the requirements of AS/NZS 4323.3:2001 Section 9.7.2.

During an assessment, scouts walk at a comfortable pace through the area downwind of the LE Site, making note of odours detected. PDP has defined a series of observation points in the area where the scout makes more detailed observations, shown in **Figure 1**. The exact route and observation points visited in an assessment depend on the meteorological conditions (wind speed and direction) and the odour (if any) detected by the scout on the route.

Sites H and M are immediately downwind of the site, located along Dyers Road with sites G and F. Sites I, J, K, and N are located in the heavy industrial zone. Sites A, C, B, D, and P are located in the residential zone around Bayswater Reserve. Sites E, L, O and Q are located roughly along the residential-industrial boundary. In assessments, Sites E, O, and Q are used to represent the closest (to the LE Site) downwind edge of the residential zone. Site L is located in the general industrial zone - Site D is used as the closest (to the LE Site) downwind residential monitoring point in this area.



Figure 1: Odour Observation Locations

In key areas where odour is detected, or at known sensitive areas, a full 10-minute odour observation is taken. Where 10-minute observations are taken at a site, a FIDOL assessment is completed by the scout and a determination made as to whether the odour is offensive or objectionable.

Determinations made are necessarily the opinion of the odour scout at that time to the conditions they encounter. They are based upon observations in the field but may also include consideration of wider factors such as meteorological conditions and patterns of site activity when considering the potential for offensive or objectionable odour over longer time periods.

Each scout makes their determination with reference to other determinations made, both within PDP, and more widely amongst the air quality profession.

Summaries for each odour scout are included in Section 3.0. Detailed analysis of specific observations is included, where necessary. Results of all 10-minute odour observations, summarised by observation location, are appended to this memorandum.

This memorandum presents the results of the odour scouting undertaken. This report does not analyse odour trends across time.

2.1 FIDOL Analysis

As per Ministry for the Environment's Good Practice Guide for Assessing and Managing Odour (MfE GPG), odours were assessed against the FIDOL factors to determine if they are offensive or objectionable. The FIDOL factors are:

- ∴ Frequency;
- ∴ Intensity;
- ∴ Duration;
- ∴ Offensiveness/Character¹; and
- ∴ Location.

Odour intensity is reported on a scale of (0-6) as per the MfE's GPG Odour. PDP applies the following descriptions to each odour intensity to ensure consistency between scouts:

0. No Odour: No odour.
1. Very Weak: Odour detectable but character not recognisable.
2. Weak: Odour detectable and barely recognisable.
3. Distinct: Odour readily recognisable.
4. Strong: Odour is strong but not causing discomfort to assessor.
5. Very Strong: The odour causes some discomfort; assessor can remain in area but will consider leaving/altering breathing patterns.
6. Extremely Strong: The odour causes assessor to feel nauseous or compelled to leave the area.

¹ "It is preferable to refer to the character of an odour, rather than its 'offensiveness' to avoid confusion between the inherent characteristics of an odour (i.e., whether it is pleasant or unpleasant) and whether there is an 'objectionable or offensive' effect occurring as a result of exposure to odour." (MfE GPG Odour)

When determining whether odour is having an offensive or objectionable effect, odour scouts make their determination with respect to the FIDOL factors. No regulatory standard exists for the specific combination of FIDOL factors that do or do not constitute an offensive or objectionable odour. However, as a broad litmus test when making determinations at the Living Earth site, PDP scouts consider intermittently distinct (3) or continuous weak (2) odours of a negative hedonic tone (such as compost) to be offensive or objectionable in a residential zone.

Within a heavy industrial zone, there is a lower expectation of amenity as it pertains to odour.

Based on PDP's understanding, this approach is generally consistent with that used by other air quality professionals.

3.0 Results Summary

Result summaries for each odour scout are reported below. Results of all 10-minute odour observations, summarised by observation location, are appended to this memorandum.

Scouts were present in the Bromley area on the:

- ∴ 25th of May 2023;
- ∴ 1st of June 2023;
- ∴ 9th of June 2023;
- ∴ 15th of June 2023; and the,
- ∴ 16th of June 2023.

3.1 25th May 2023

██████ was the PDP odour scout. The scout was present for approximately 1 hour. The weather was clear, with an average temperature of 14 °C and east to east-south-easterly winds ranging from 3.5 m/s to 4.3 m/s as a 10-minute average. The scout started at Site A and finished at the LE site. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (blue dots) and key scouting locations are shown in **Figure 2**. The odour scout drove between Sites A and Q, between Sites Q and O, and between Site D and the LE site.



Figure 2: 25th May 2023 - Odour Scout Route

Results from the odour scout are shown below. Entries within **Table 1** that are highlighted blue denote locations within a residential zone and purple denotes locations within an industrial zone.

Table 1: 25th May 2023 - Odour Scouting Summary

Site	Time	Observations
A	11:35	No odour (0) detected.
Q	11:42	Intermittent, weak (2) compost odour detected. The compost odour was sharper, sweeter, and grassier than normal.
O	11:46	FIDOL assessment completed. No odour (0) was detected 33% of the time. Very weak (1) odours of an indeterminate character were detected 35% of the time. A weak (2) earthy/faecal odour with a negative hedonic tone was detected 3% of the time. An ‘upset biofilter’ odour was detected as weak (2) 25% of the time, with a single distinct (3) observation (2% of the time). The ‘upset biofilter’ odour had a character described as acidic, grassy, sharp and fermented.

Table 1: 25th May 2023 - Odour Scouting Summary

Site	Time	Observations
		Odour assessed as not offensive or objectionable.
D	12:00	Intermittent weak (2) solvent/hydrocarbon odour detected.
LE carpark	12:05	Continuous weak (2) to distinct (3) compost odour detected.
LE biofilter		The same acidic/grassy/sharp/fermented odour detected at O was detected.

Maintenance works were occurring on the biofilter during the odour scout. The odour produced due to this disruption was detected at Site O. The odour detected in the residential area was not considered offensive or objectionable.

The odour detected in the industrial area was not considered offensive or objectionable for an industrial area.

The character of the compost odour did not match PDP’s experience with the odour generated by the outdoor material. The odour at Site Q was sharper, sweeter, and grassier than normal. At Site O, the odour was more clearly different, with an acidic, grassy, sharp, and fermented character. This character matched the scout’s on-site observations at the biofilter on the day. The odour did not match PDP’s previous observations of the character of the biofilter under normal operating conditions.

3.2 1st June 2023

██████████ were the PDP odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 16 °C and north-easterly to east-south-easterly winds ranging from 2.2 m/s to 2.9 m/s as a 10-minute average. The scouts started near site L and finished near Site E. The objective was to undertake odour monitoring in the area downwind of the LE Site. The first odour scout’s route (blue dots), second odour scout’s route (orange dots) and key scouting locations are shown in **Figure 3**.



Figure 3: 1st June 2023 - Odour Scout Route

Results from the odour scout are shown below. Entries within **Table 2** that are highlighted blue denote locations within a residential zone and purple denotes locations within an industrial zone.

Table 2: 1st June 2023 - Odour Scouting Summary

Site	Time	Observations
Q	11:44	Weak (2) industrial solvent odour detected. Drove to L.
L	11:46	Continuous weak (2) industrial solvent odour detected.
L to D	11:47	No odour (0) detected.
D to B	11:49	Intermittent very weak (1) indeterminate odour detected.
B to P	11:52	Intermittent very weak (1) indeterminate odour detected.
P to E	11:54	Intermittent very weak (1) indeterminate odour detected.
E to D	11:58	Intermittent very weak (1) indeterminate odour detected.
D to O	12:09	Intermittent weak (2) solvent odour detected.

Table 2: 1st June 2023 - Odour Scouting Summary

Site	Time	Observations
O to Q	12:12	No odour (0) detected.
Q	12:15	FIDOL assessment completed. No odour (0) was detected 47% of the time. Very weak (1) odours of an indeterminate character were detected 45% of the time. Weak (2) compost odour was detected 5% of the time. Weak (2) 'upset biofilter' odour was detected 3% of the time. Odour assessed as not offensive or objectionable.
Q to L	12:25	No odour (0) detected.
Second Scout's Route		
L to K	11:47	Intermittent weak (2) industrial solvent odour detected
K	11:52	No odour (0) detected.
K to J	11:54	Very weak (1) indeterminate odour and weak (2) compost odour detected.
J	11:56	FIDOL assessment completed. No odour (0) was detected 10% of the time. Very weak (1) odours of an indeterminate character were detected 33% of the time. Weak (2) compost odour was detected 35% of the time. Weak (2) manure odour, with a negative hedonic tone, was detected 12% of the time. Distinct (3) 'upset biofilter' odour was detected 7% of the time. Distinct (3) compost odour was detected 3% of the time. Odour assessed as not offensive or objectionable.
I	12:10	Intermittent distinct (3) compost odour detected.
H	12:13	Intermittent weak (2) to distinct (3) compost odour detected.
M	12:17	Intermittent weak (2) to distinct (3) rubbish odour detected.
H	12:21	Intermittent weak (2) to distinct (3) compost odour detected.
G	12:23	Intermittent weak (2) to distinct (3) biofilter odour detected.
G to H	12:24	No odour (0) detected. Wind shifted to easterly.
F	12:26	Intermittent weak (2) to distinct (3) biofilter and compost odours detected. Wind shifted back to NE.
E	12:30	Grass cutting and spraying was occurring at Site E. Walked slightly west to avoid this odour. FIDOL assessment completed. No odour (0) was detected 10% of the time. Very weak (1) odours of an indeterminate character were detected 10% of the time. Weak (2) compost odour was detected 3% of the time. Weak (2) 'upset biofilter' odour was detected 50% of the time. Distinct (3) 'upset biofilter' odour was detected 22% of the time. A weak (2) sweet/candy odour, with a positive hedonic tone, was detected 5% of the time. Odour assessed as offensive and objectionable.

Table 2: 1st June 2023 - Odour Scouting Summary

Site	Time	Observations
E to D	12:32	Weak (2) 'upset biofilter' odour detected.
P	12:45	Intermittent weak (2) biofilter odour detected. Cut grass odour from mown lawn also detected.
E to D	12:50	Weak (2) 'upset biofilter' odour detected.

A wind shift occurred over the course of the odour scout. The wind was initially east-south-easterly, with odour detected at Site J. Over the course of the scout, the wind shifted to a north-easterly direction, becoming detected at Site E.

The weak compost and 'upset biofilter' odours detected at Site Q were not offensive or objectionable.

The 'upset biofilter' odour detected at Site E was offensive and objectionable.

The 'upset biofilter' odour detected matched PDP's experience with the odour from the biofilter while maintenance works were occurring, as detected on 25th May 2023.

The character of the compost odour matched PDP's experience with the odour generated by the outdoor material, namely the unscreened compost, oversize stockpiles and screened fines. The compost odour did not match PDP's experience with the odour from the processing hall or associated biofilter.

3.1 9th June 2023

██████ was the PDP odour scout. The scout was present for approximately 30 minutes. The weather was overcast, with a temperature of 9 °C and north-easterly winds with a windspeed of 2.1 m/s as a 10-minute average. The scout started and finished at Site O. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (purple dots) and key scouting locations are shown in **Figure 4**.



Figure 4: 9th June 2023 - Odour Scout Route

Results from the odour scout are shown below. Entries within **Table 3** that are highlighted blue denote locations within a residential zone and purple denotes locations within an industrial zone.

Table 3: 9 th June 2023 - Odour Scouting Summary		
Site	Time	Observations
O	14:31	Intermittent weak (2) compost odour detected.
Q	14:35	No odour (0) detected.
O	14:37	No odour (0) detected.
D	14:40	No odour (0) detected.
P	14:42	FIDOL assessment completed. No odour (0) was detected 72% of the time. Weak (2) compost odour was detected 8% of the time. A weak (2) sweet odour with a positive hedonic tone was detected 3% of the time. A woodsmoke odour, with a negative hedonic tone was detected as distinct (3) 2% of the time and weak (2) 15% of the time.

Table 3: 9th June 2023 - Odour Scouting Summary

Site	Time	Observations
		Odour assessed as not offensive or objectionable.
E	14:53	Intermittent weak (2) solvent odour detected.
E to D		Intermittent weak (2) solvent, cut grass, burnt rubber and compost odours detected.
D	14:56	No odour (0) detected.
O	14:59	No odour (0) detected.

Weak (2), intermittent compost odour was detected at several locations in the residential areas and was not offensive or objectionable. A number of other industrial odours were also detected along Maces Rd.

The character of the compost odour matched PDP's experience with the odour generated by the outdoor material, namely the unscreened compost, oversize stockpiles and screened fines. The odour did not match PDP's experience with the odour from the processing hall or associated biofilter.

3.2 15th June 2023

██████████ was the PDP odour scout. The scout was present for approximately 1 hour. The weather was clear, with an average temperature of 12 °C and east-northeast winds ranging from 5.3 m/s to 6.8 m/s as a 10-minute average. The scout started and finished near Site O. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (blue dots) and key scouting locations are shown in **Figure 5**.



Figure 5: 15th June 2023 - Odour Scout Route

Results from the odour scout are shown below. Entries within **Table 4** that are highlighted blue denote locations within a residential zone and purple denotes locations within an industrial zone.

Table 4: 15th June 2023 - Odour Scouting Summary

Site	Time	Observations
O	15:12	FIDOL assessment completed. No odour (0) was detected 57% of the time. Very weak (1) odours of an indeterminate character were detected 32% of the time. Weak (2) compost odour was detected 12% of the time. Odour assessed as not offensive or objectionable.
O to Q	15:22	No odour (0) detected.
Q to O	15:24	Very weak (1) indeterminate odour detected near O.
O to D	15:26	Intermittent weak (2) compost odour detected.

Table 4: 15th June 2023 - Odour Scouting Summary

Site	Time	Observations
D	15:30	FIDOL assessment completed. No odour (0) was detected 48% of the time. Very weak (1) odours of an indeterminate character were detected 30% of the time. Weak (2) compost odour was detected 22% of the time. Odour assessed as not offensive or objectionable.
D to E	15:40	Intermittent weak (2) compost odour detected.
E to F	15:43	Intermittent weak (2) to distinct (3) compost odour detected.
F to G	15:45	Continuous distinct (3) compost odour detected.
G to H	15:48	Continuous weak (2) compost odour detected.
H to I	15:51	Intermittent weak (2) industrial and intermittent weak (2) compost odours detected.
I to J	15:55	Intermittent weak (2) industrial odour detected.
J to K	15:59	No odour (0) detected.
K to L	16:02	Intermittent weak (2) compost odour detected on Newtown St. No odour (0) detected on Tanya St.
L to O	16:07	Intermittent very weak (1) indeterminate odour detected near L.

Intermittent weak (2) compost odour was detected at Sites O and D. This odour was not offensive or objectionable.

Distinct (3) compost odour was detected in the industrial zone along Dyers Rd, close to the LE site. Being in a heavy industrial zone, this odour was not offensive or objectionable for the location.

The character of the compost odour matched PDP's experience with the odour generated by the outdoor material, namely the unscreened compost, oversize stockpiles and screened fines. The odour did not match PDP's experience with the odour from the processing hall or associated biofilter.

3.3 16th June 2023

██████████ was the PDP odour scout. The scout was present for approximately 1 hour. The weather was clear, with an average temperature of 12 °C and east-northeasterly to easterly winds ranging from 6.1 m/s to 6.9 m/s as a 10-minute average. The scout started and finished near site O. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (blue dots) and key scouting locations are shown in **Figure 6**.



Figure 6: 16th June 2023 - Odour Scout Route

Results from the odour scout are shown below. Entries within Table 4 that are highlighted blue denote locations within a residential zone and purple denotes locations within an industrial zone.

Table 5: 16 th June 2023 - Odour Scouting Summary		
Site	Time	Observations
O	14:55	FIDOL assessment completed. No odour (0) was detected 42% of the time. Very weak (1) odours of an indeterminate character were detected 45% of the time. Weak (2) compost odour was detected 13% of the time. Odour assessed as not offensive or objectionable.
O to Q	15:05	No odour (0) detected.
Q to O	15:08	Intermittent weak (2) compost odour detected.
O to C	15:11	Intermittent weak (2) compost odour detected near O, no odour detected at Seascape Gardens.

Table 5: 16th June 2023 - Odour Scouting Summary

Site	Time	Observations
C to B	15:15	No odour (0) detected.
B to P	15:17	Intermittent weak (2) compost odour detected.
P to E	15:19	No odour (0) detected.
E to F	15:21	No odour (0) detected.
F to G	15:24	Continuous distinct (3) compost odour detected.
G to H	15:26	Continuous distinct (3) compost odour detected.
H to I	15:28	No odour (0) detected.
I to J	15:31	No odour (0) detected.
J to K	15:34	Intermittent weak (2) compost odour detected near K.
K to L	15:38	Continuous weak (2) compost odour detected on Tanya St, no odour (0) detected on Newtown St.
L to D	15:43	No odour (0) detected.
D to O	15:44	No odour (0) detected.

Intermittent, weak (2) compost odour was detected at and around Site O, and between sites B and P. This odour was not offensive or objectionable. Continuous distinct compost odour was detected from F to H. This odour was not offensive or objectionable for an industrial area.

The character of the compost odour matched PDP's experience with the odour generated by the outdoor material, namely the unscreened compost, oversize stockpiles and screened fines. The odour did not match PDP's experience with the odour from the processing hall or associated biofilter.

4.0 Summary

PDP undertook odour scouting on five occasions between 22nd May and 18th June 2023. Plots of the raw results from each 10-minute assessment, summarised by monitoring location are appended to this memorandum.

Typically, PDP considers that intermittent distinct (3) or continuous weak (2) odours of a negative hedonic tone (such as compost) are offensive or objectionable in a residential zone.

Based on PDP's observations:

- ∴ 25th May 2023

Compost odour was detected within the residential zone but was not offensive or objectionable. Compost odour in the industrial area was not offensive or objectionable. An acidic, grassy, sharp, fermented odour was also detected in the residential area and a visit to the site confirmed that this odour was originating from the biofilter due to works occurring on it. The frequency and intensity of this 'upset biofilter' odour was not considered offensive or objectionable in the residential or industrial areas.

- ∴ 1st June 2023

The same 'upset biofilter' odour detected on 25th May was detected at Site E within the residential zone, alongside compost odour. **These odours were considered offensive and objectionable.** Compost and 'upset biofilter' odour in the industrial area was not offensive or objectionable.

- ∴ 9th June 2023

Weak (2), intermittent compost odour was detected at several locations in the residential areas and was not offensive or objectionable. A number of other industrial odours were also detected along Maces Rd.

- ∴ 15th June 2023

Intermittent, weak (2) compost odour was detected at Sites O and D. This odour was not offensive or objectionable. The compost odour detected in the industrial area was not offensive or objectionable.

- ∴ 16th June 2023

Intermittent, weak (2) compost odour was detected at Site O. This odour was not offensive or objectionable. The compost odour detected in the industrial area was not offensive or objectionable.

Two odour characters, associated with the OPP were identified during the scouting:

- ∴ A 'compost' odour, which matched PDP's experience with the odour generated by the outdoor material, namely the unscreened compost, oversize stockpiles and screened fines; and,
- ∴ An 'upset biofilter' odour which coincided with the disruption to the normal operation of the biofilter.

The identified odours did not match PDP's experience with the odour from the processing hall or the associated biofilter, when operating normally.

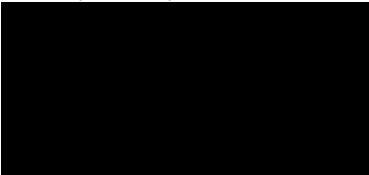
5.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Christchurch City Council and Living Earth. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This memorandum has been prepared by PDP on the specific instructions of Christchurch City Council for the limited purposes described in the memorandum. PDP accepts no liability if the memorandum is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

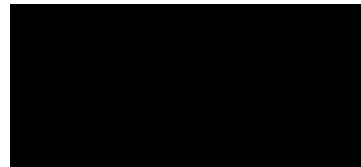
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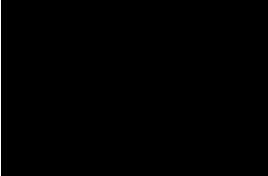
Senior Environmental Engineer

Prepared by



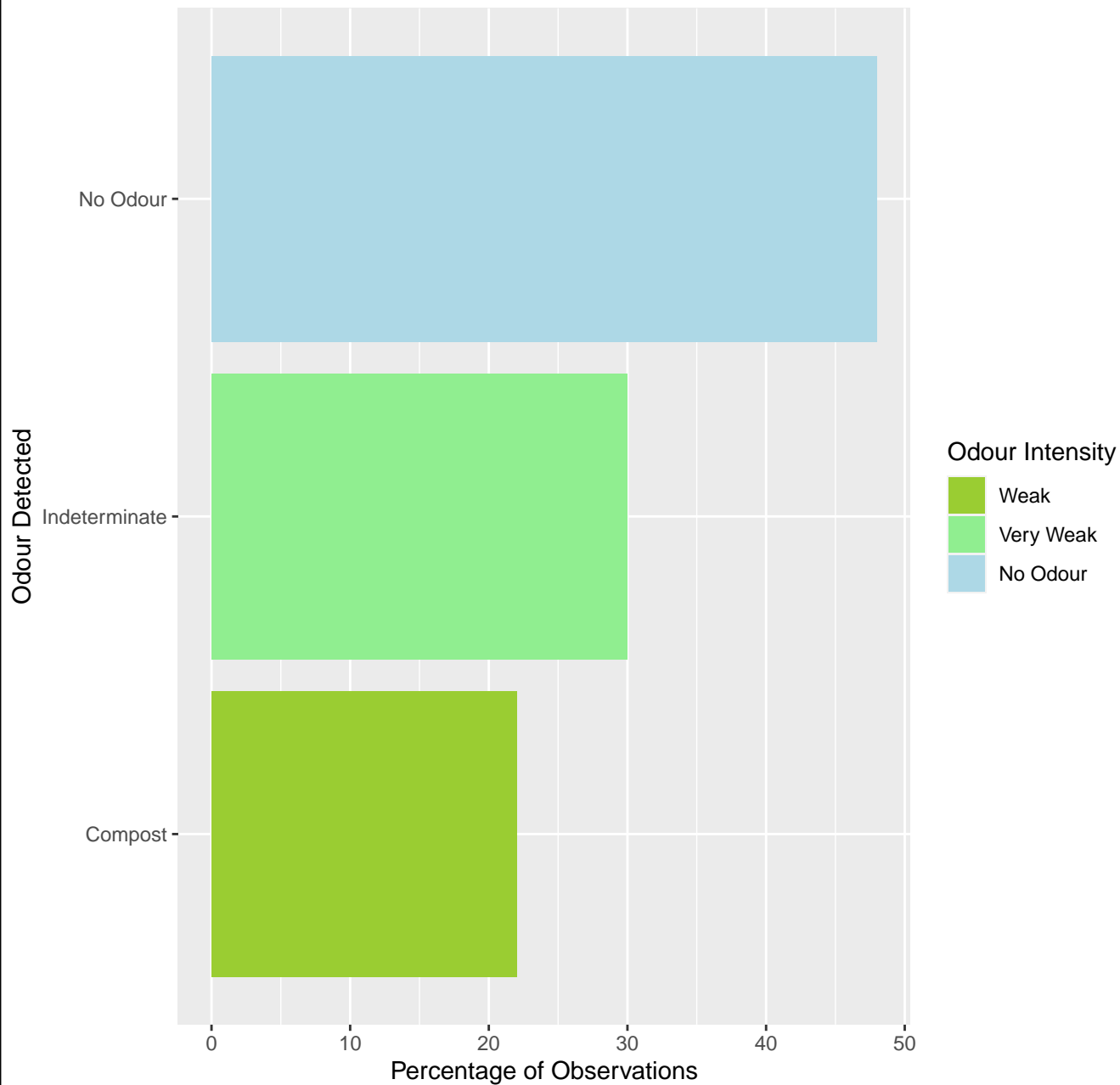
Air Quality Engineer

Reviewed by

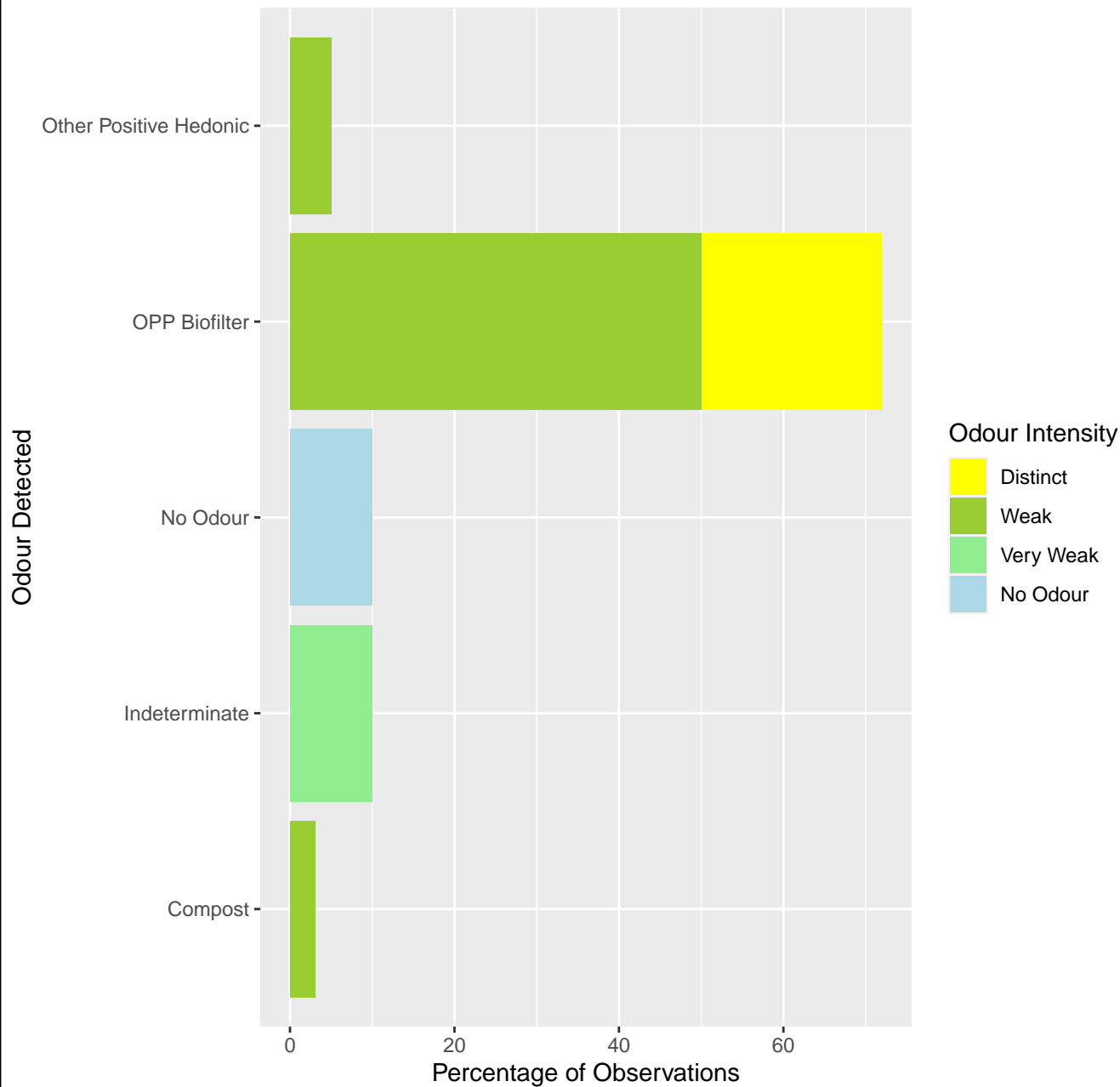


Technical Director

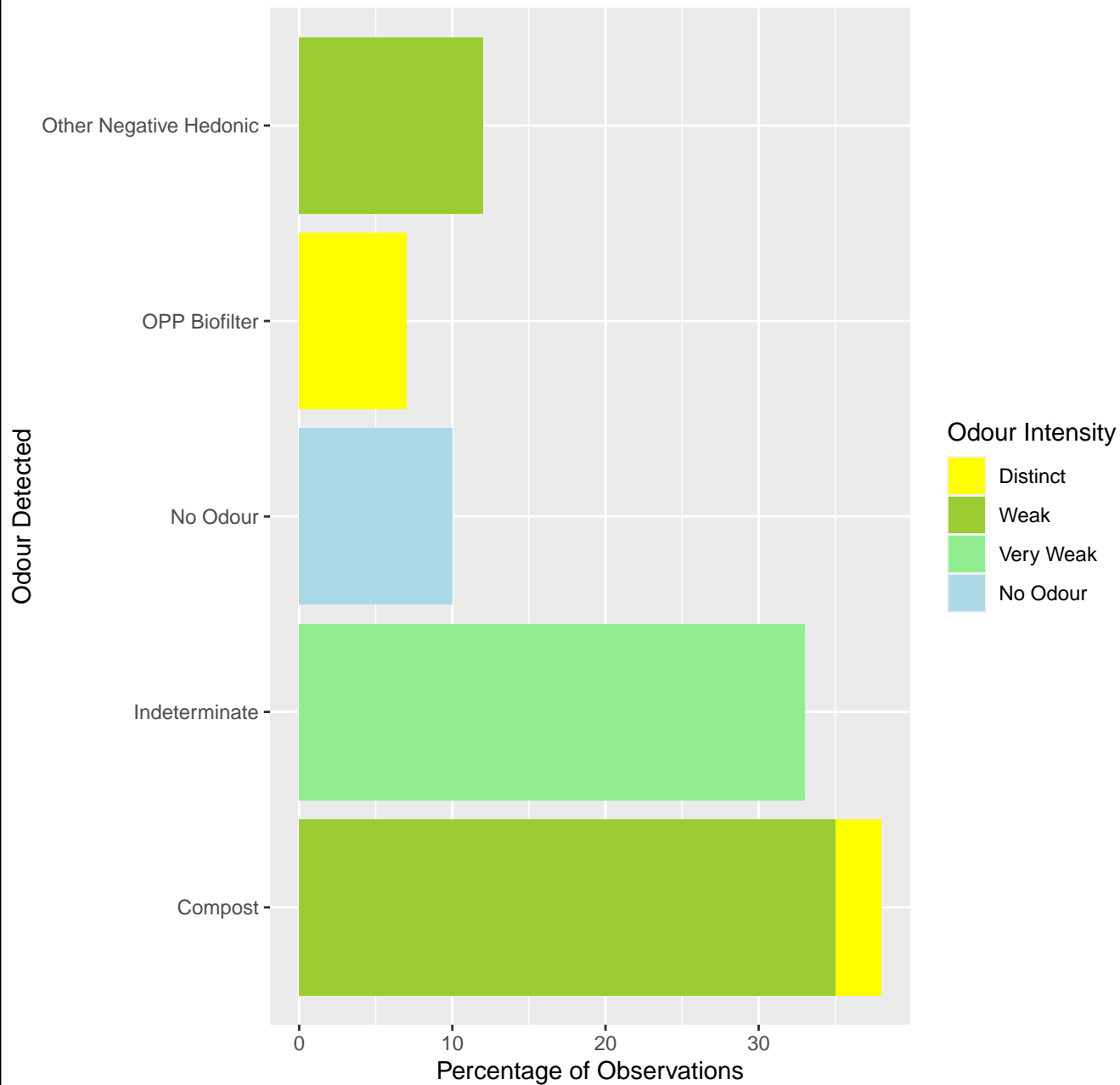
Site D : Summary of Odours Detected at Site



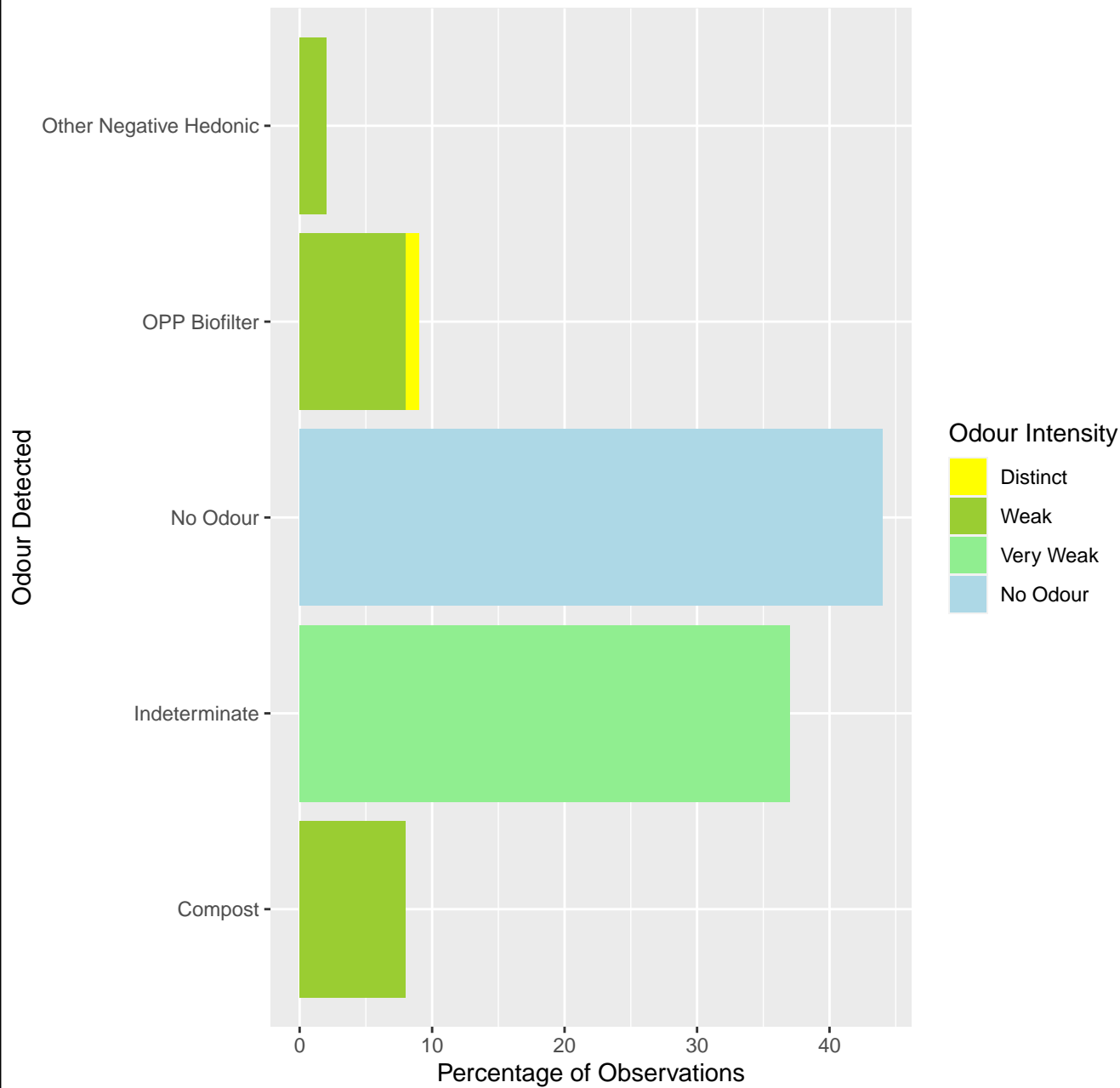
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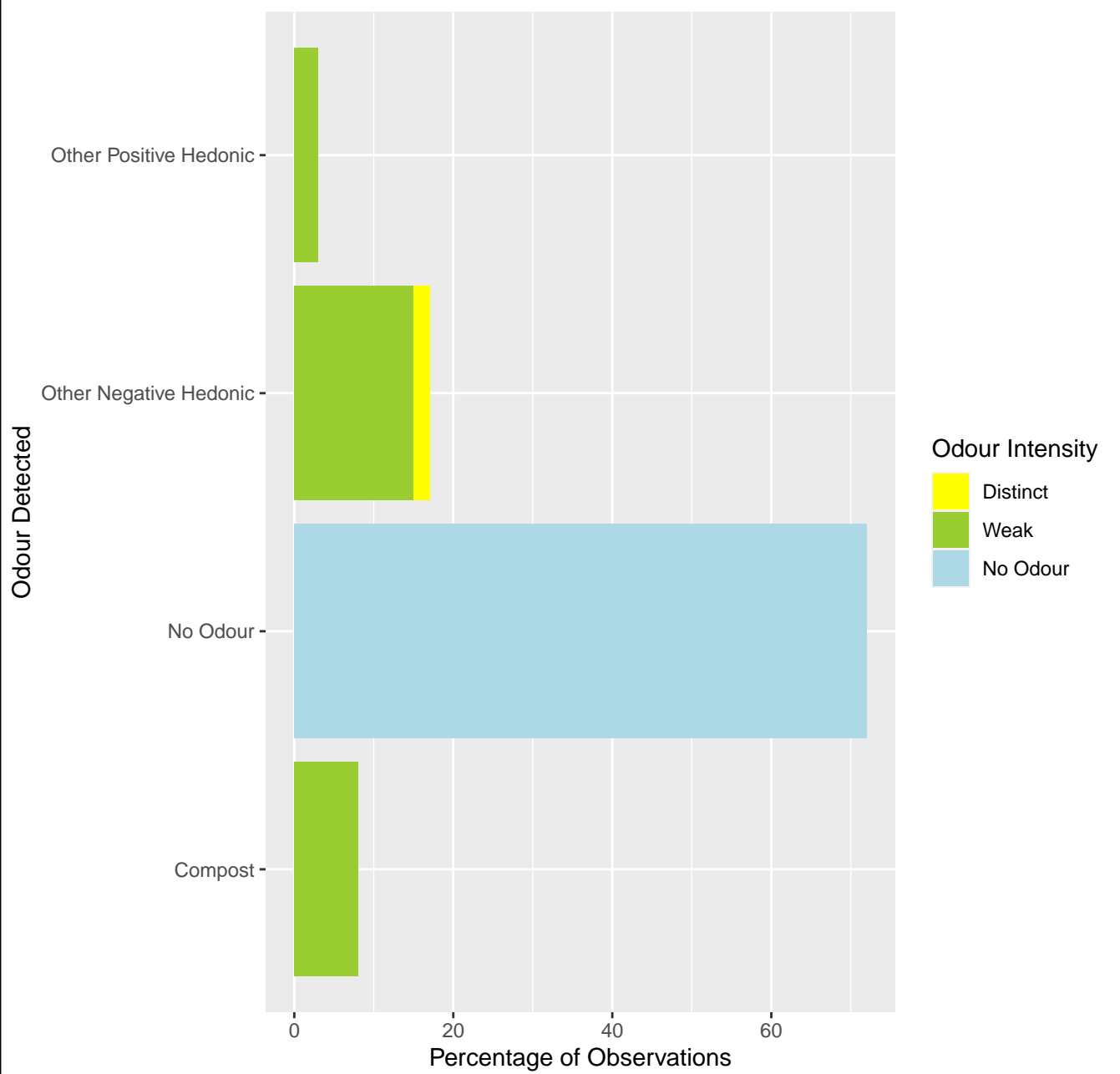
Site J : Summary of Odours Detected at Site



Site O : Summary of Odours Detected at Site



Site P : Summary of Odours Detected at Site



Site Q : Summary of Odours Detected at Site

