



memorandum

TO Christchurch City Council FROM [REDACTED]
DATE 24 January 2024
RE Living Earth Odour Monitoring: 9th December 2023 to 5th January 2024 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 9th of December 2023 and the 5th of January 2024.

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, P, and R 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, D and Q are in the residential zone, while Site L is in the general industrial zone.



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:

- ∴ 18th of December 2023;
- ∴ 19th of December 2023; and
- ∴ 20th of December 2023.

3.1 18th December 2023

██████████ were the PDP odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 17 °C, and east-north-easterly to easterly winds ranging from 7.3 to 7.8 m/s as a 10-minute average. The scouts started at Site A, then walked a loop, finishing back at Site A. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (yellow dots) and key scouting locations are shown in **Figure 2**.



Figure 2: 18th December 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: 18th December 2023 - Odour Scouting Summary

Site	Time	Observations
A	13:37	Very weak (1) odours of an indeterminate character detected.
C	13:38	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 78% of the time. Very weak (1) odours of an indeterminate character were detected 21% of the time. Weak (2) compost odour was detected 1% of the time (1 out of the 120 total observations).</p> <p>The odour was assessed to be neither offensive nor objectionable.</p>
B	13:55	No odour (0) to intermittent very weak (1) odours of an indeterminate character detected.
D	13:57	Weak (2) solvent odours detected.
O	13:59	Very weak (1) odours of an indeterminate character to intermittent weak (2) lolly odour detected.
Q	14:03	Very weak (1) odours of an indeterminate character detected.
R	14:06	No odour (0) detected.
Q to J	14:10	No odour (0) detected.
I	14:20	No odour (0) detected.
H	14:24	No odour (0) to intermittent very weak (1) odours of an indeterminate character detected.
G	14:26	No odour (0) detected.
G to F	14:27	Intermittent weak (2) compost odour detected.
F	14:29	Very weak (1) odours of an indeterminate character detected.
E	14:32	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 71% of the time. Very weak (1) odours of an indeterminate character were detected 27% of the time. Weak (1) compost odour was detected 2% of the time.</p> <p>The odour was assessed to be neither offensive nor objectionable.</p>
P	14:47	No odour (0) detected.
D	14:49	No odour (0) detected.
O	14:52	No odour (0) detected.
A	14:53	No odour (0) detected.

Intermittent weak compost odour was detected in the residential area, at Site C and Site E. This odour was not assessed to be 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 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 19th December 2023

██████████ were the odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 16 °C and easterly winds ranging from 6.8 to 8.2 m/s as a 10-minute average. The scouts started at Site C, before walking the boundary of the residential zone, from Site Q to Site E. The scouts then walked a loop around the industrial zone, before ending at Site O. The objective was to take odour observations downwind of the LE Site. The odour scout route (yellow dots) and key scouting locations are shown in **Figure 3**.



Figure 3: 19th December 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: 19th December 2023 - Odour Scouting Summary

Site	Time	Observations
C	14:03	FIDOL assessment completed. No odour (0) was detected 31% of the time. Very weak (1) odours of an indeterminate character were detected 37% of the time. Weak (2) compost odour was detected 33% of the time. The odour was assessed to be neither offensive nor objectionable.
O	14:19	No odour (0) detected.
Q	14:23	Intermittent very weak (1) odours of an indeterminate character detected.
O	14:25	Intermittent weak (2) compost odour detected.
D	14:29	FIDOL assessment completed. No odour (0) was detected 38% of the time. Very weak (1) odours of an indeterminate character were detected 43% of the time. Weak (2) compost odour was detected 20% of the time. The odour was assessed to be neither offensive nor objectionable.
E	14:46	Very weak (1) odours of an indeterminate character detected.
F	14:49	Very weak (1) odours of an indeterminate character detected.
G	14:52	Weak (2) to distinct (3) compost odour detected.
H	14:54	Very weak (1) odours of an indeterminate character detected.
I	14:59	Intermittent very weak (1) odours of an indeterminate character detected.
J	15:01	No odour (0) detected.
K	15:04	Very weak (1) odours of an indeterminate character detected.
L	15:07	Weak (2) to distinct (3) compost odour detected.
D	15:12	Very weak (1) odours of an indeterminate character detected.
O	15:15	Very weak (1) odours of an indeterminate character detected.

Intermittent weak compost odour was detected in the residential area at sites C, O, and D. This odour was assessed to be neither offensive nor objectionable.

The compost odour detected in the industrial area was not considered 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, oversized stockpiles, and screened fines. The odour did not match PDP’s experience with the odour from the processing hall or associated biofilter.

3.3 20th December 2023

██████████ were the odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 19 °C and east-north-easterly winds ranging from 2.8 to 4 m/s as a 10-minute average. The scouts started at Site A, before separately walking boundary of the residential zone. One scout then walked up Dyers Road toward the LE site, before returning and ending at Site A. The other scouted Maces Rd towards Bromley Rd. The objective was to take odour observations downwind of the LE Site. The odour scout route (yellow dots) and key scouting locations are shown in **Figure 4**.



Figure 4: 20th December 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 3: 20th December 2023 - Odour Scouting Summary

Site	Time	Observations
Scout 1		
A	13:14	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 52% of the time. Very weak (1) odours of indeterminate character were detected 33% of the time. Weak (2) compost odour was detected 15% of the time.</p> <p>The odour was assessed to be neither offensive nor objectionable.</p>

Table 3: 20th December 2023 - Odour Scouting Summary

Site	Time	Observations
A to C	13:27	Weak (2) to intermittently distinct (3) compost odour.
O	13:31	No odour (0) to very weak (1) odours of an indeterminate character detected.
D	13:35	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 48% of the time. Very weak (1) odours of an indeterminate character were detected 37% of the time. Weak (2) compost was detected 15% of the time.</p> <p>The odour was assessed to be neither offensive nor objectionable.</p>
O	13:50	No odour (0)
Q	13:57	No odour (0)
O	14:00	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 48% of the time. Very weak (1) odours of an indeterminate character were detected 28%. Weak (2) compost odour was detected 20% of the time. Distinct (3) compost odour was detected 3% of the time.</p> <p>The odour was determined to be offensive or objectionable.</p>
C	14:15	Intermittent weak (2) to distinct (3) compost.
Scout 2		
C	13:37	<p>FIDOL assessment completed.</p> <p>No odour (0) was detected 30% of the time. Very weak (1) odours of an indeterminate character were detected 25% of the time. Weak (2) compost odour was detected 40% of the time. Distinct (3) compost odour was detected 5% of the time.</p> <p>The odour was determined to be offensive or objectionable.</p>
B	13:30	Weak (2) cut grass odour detected.
P	13:38	<p>FIDOL assessment detected.</p> <p>No odour (0) was detected 58%. Very weak (1) odours of an indeterminate character were detected 23% of the time. Weak (2) floral odour was detected 2% of the time. Weak (2) compost odour was detected 15% of the time. Distinct (3) compost odour was detected 2% of the time.</p> <p>The odour was determined to be offensive or objectionable.</p>
E	13:53	Intermittent weak (2) to distinct (3) marine and grass odours detected.
E to F	13:56	Intermittent weak (2) and distinct (3) compost odour detected.
F	14:00	Constant weak (2) to distinct (3) compost odours detected.
F to G	14:01	Intermittent weak (2) to distinct (3) compost odours detected.

Table 3: 20th December 2023 - Odour Scouting Summary

Site	Time	Observations
G	14:03	Constant weak (2) to distinct (3) compost odours detected.
H	14:05	Constant weak (2) to distinct (3) compost odours detected.
H to F		Constant Weak (2) to distinct (3) compost odour detected. Strong (4) compost odour was detected for ~20 seconds between G and F.
F to E		No odour (0) detected.
E to D		Intermittent weak (2) compost odour detected.
D to B		Intermittent weak (2) compost to distinct (3) compost odour detected.
C	14:19	Constant weak (2) compost odour detected.

Compost odour was detected throughout the residential area. Distinct compost odour was detected in the residential area at Sites C, O, P, and between D and B.

As the meteorological conditions on this day were stable, it is assumed that the 10-minute observations are generally representative of the odour conditions experienced over the course of the entire day. The compost odour in the residential area was assessed to be offensive and objectionable at several locations.

Distinct (3) odour has rarely been detected at site C in 2023, indicating that the odour was penetrating further into the residential zone than generally observed during scouting in 2023. Living Earth advised that three screens were operating on the day and trucks were active, removing material from the site. PDP understand that this was occurring with the object of clearing the site of compost as part of transitioning to the interim solution. This elevated level of activity on the site may have been a contributor to the level of odour detected.

The compost odour detected in the industrial area was not considered 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, oversized 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 three occasions between 9th December 2023 and 5th January 2024. Plots of the raw results from each 10-minute assessment, summarised by monitoring location, are appended to this memorandum.

PDP understand that Living Earth were in the process of clearing material from the site during the scouting period. This was expected to initially increase the risk of offensive odour from the site due to increased handling of material, with the intent of reducing the risk of offensive odour by removing the material stored outdoors.

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:

- ∴ 18th December 2023

Intermittent weak compost odour was detected in the residential area, at Site C and Site E. This odour was not assessed to be offensive or objectionable. The odour detected in the industrial area was not considered offensive or objectionable for an industrial area.

∴ 19th December 2023

Intermittent weak compost odour was detected in the residential area at sites C, O, and D. This odour was assessed to be neither offensive nor objectionable. The compost odour detected in the industrial area was not considered offensive or objectionable for an industrial area.

∴ 20th December 2023

Distinct compost odour was detected in the residential area at Sites C, O, P, and between D and B. This odour was assessed to be offensive or objectionable. These elevated levels of odour in the residential area may have been caused by increased handling and screening at the site while material was being removed during the transition to the new site operation.

On odour scouting days where compost odour was detected, 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.

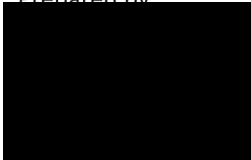
5.0 Limitations

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.

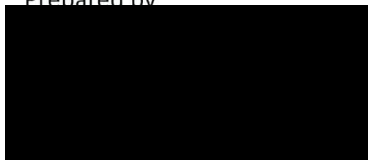
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Prepared by



Air Quality Engineer

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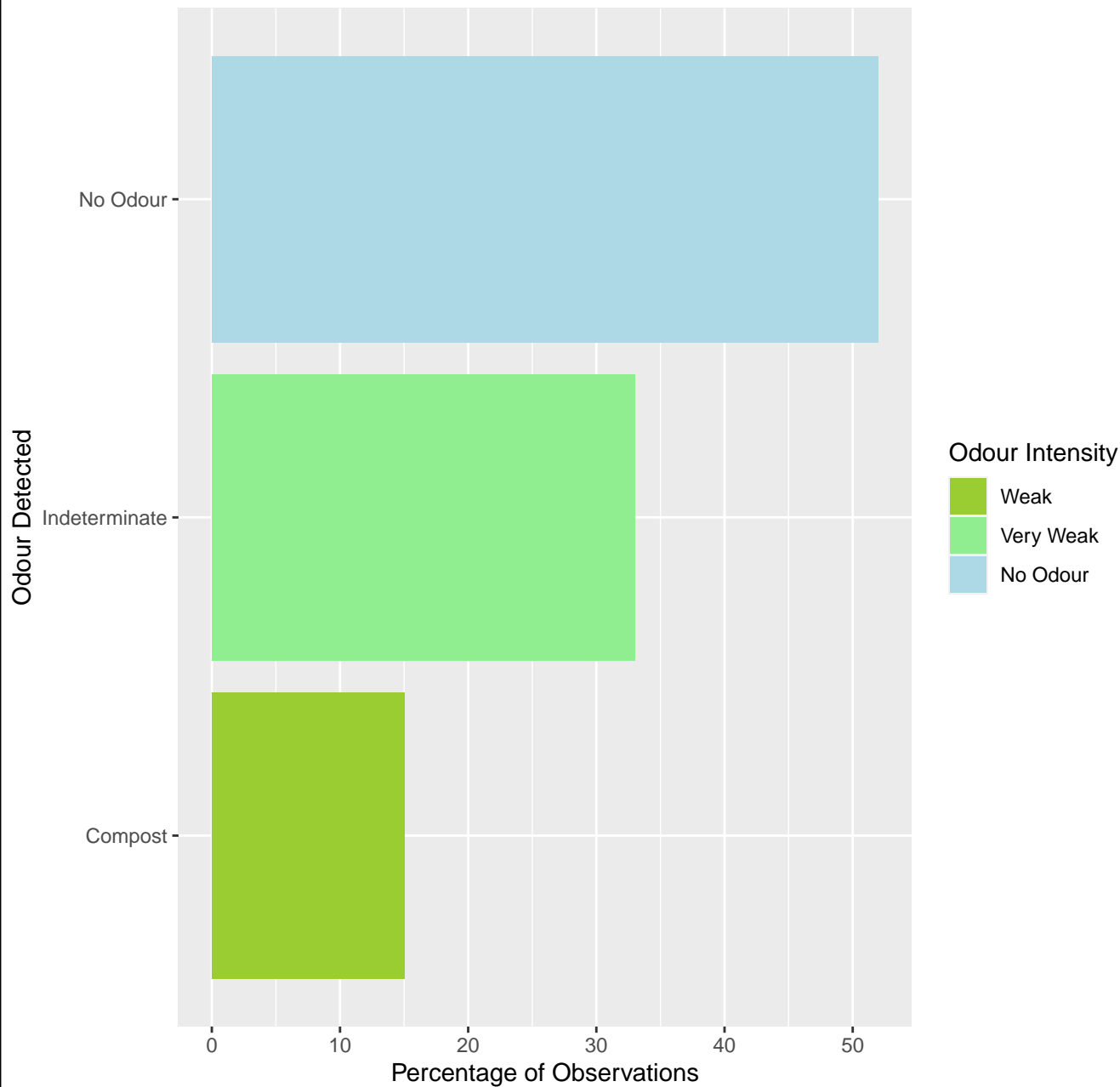
Senior Environmental Engineer

Approved by

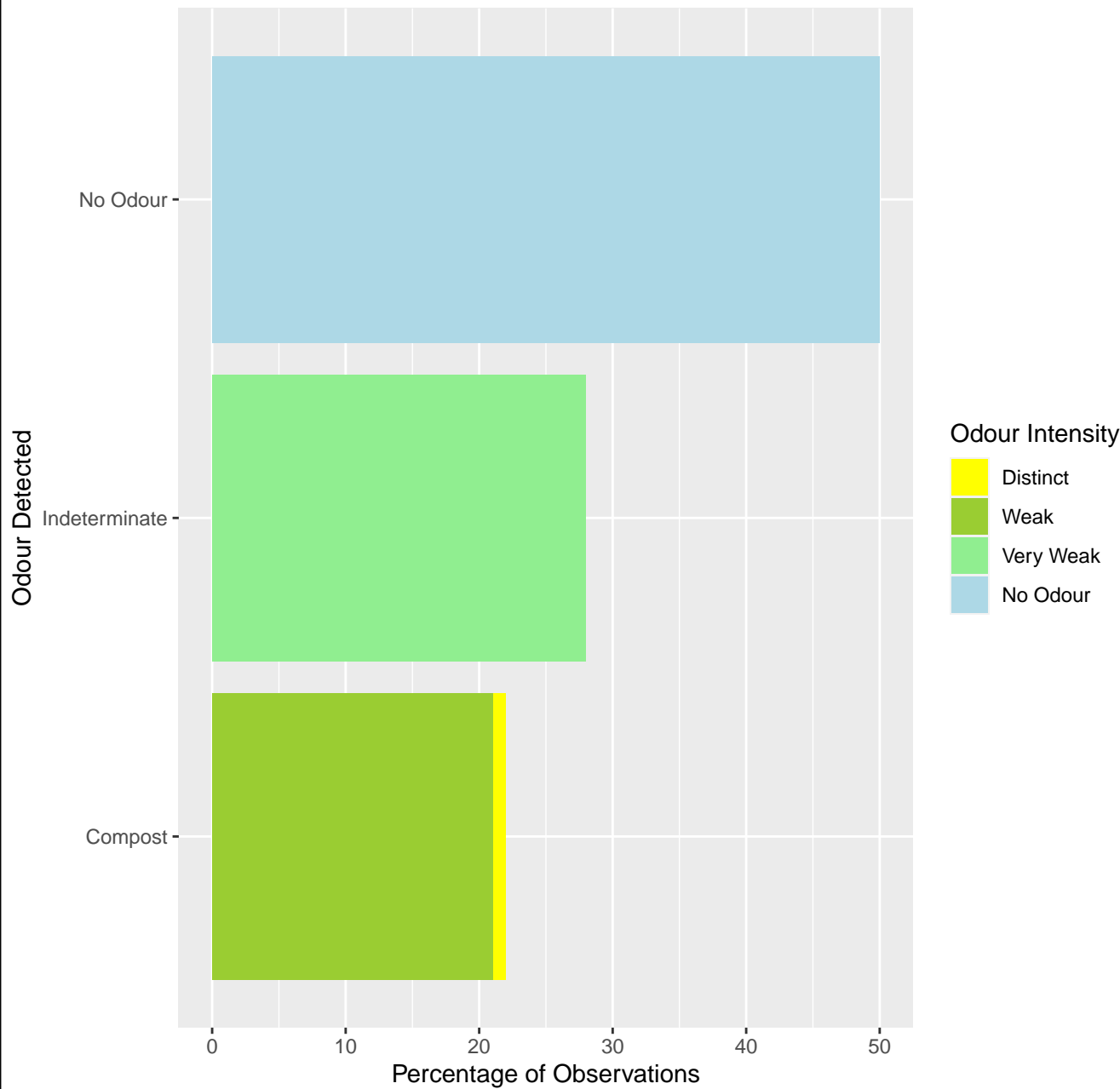


Group Director

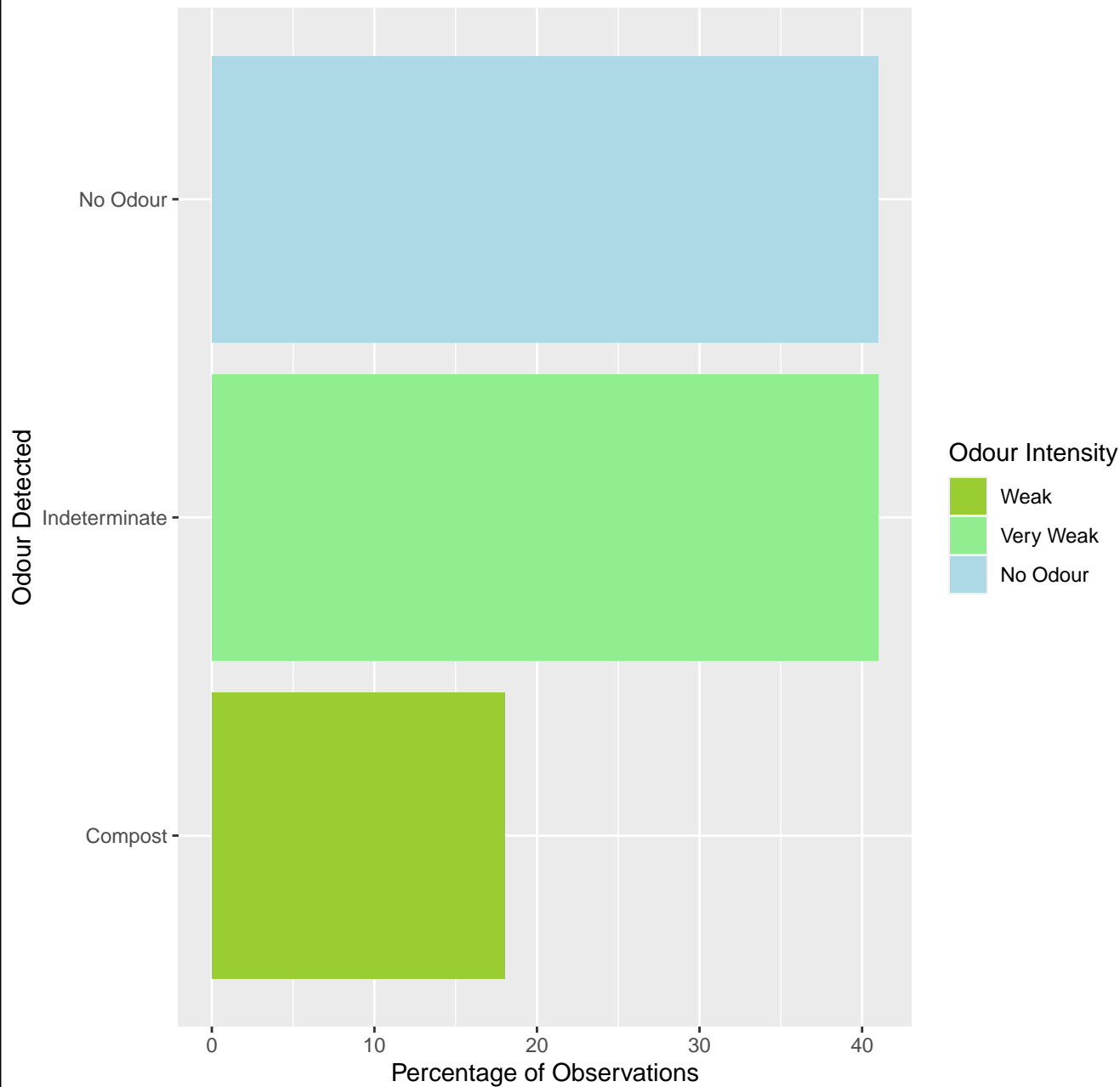
Site A : Summary of Odours Detected at Site



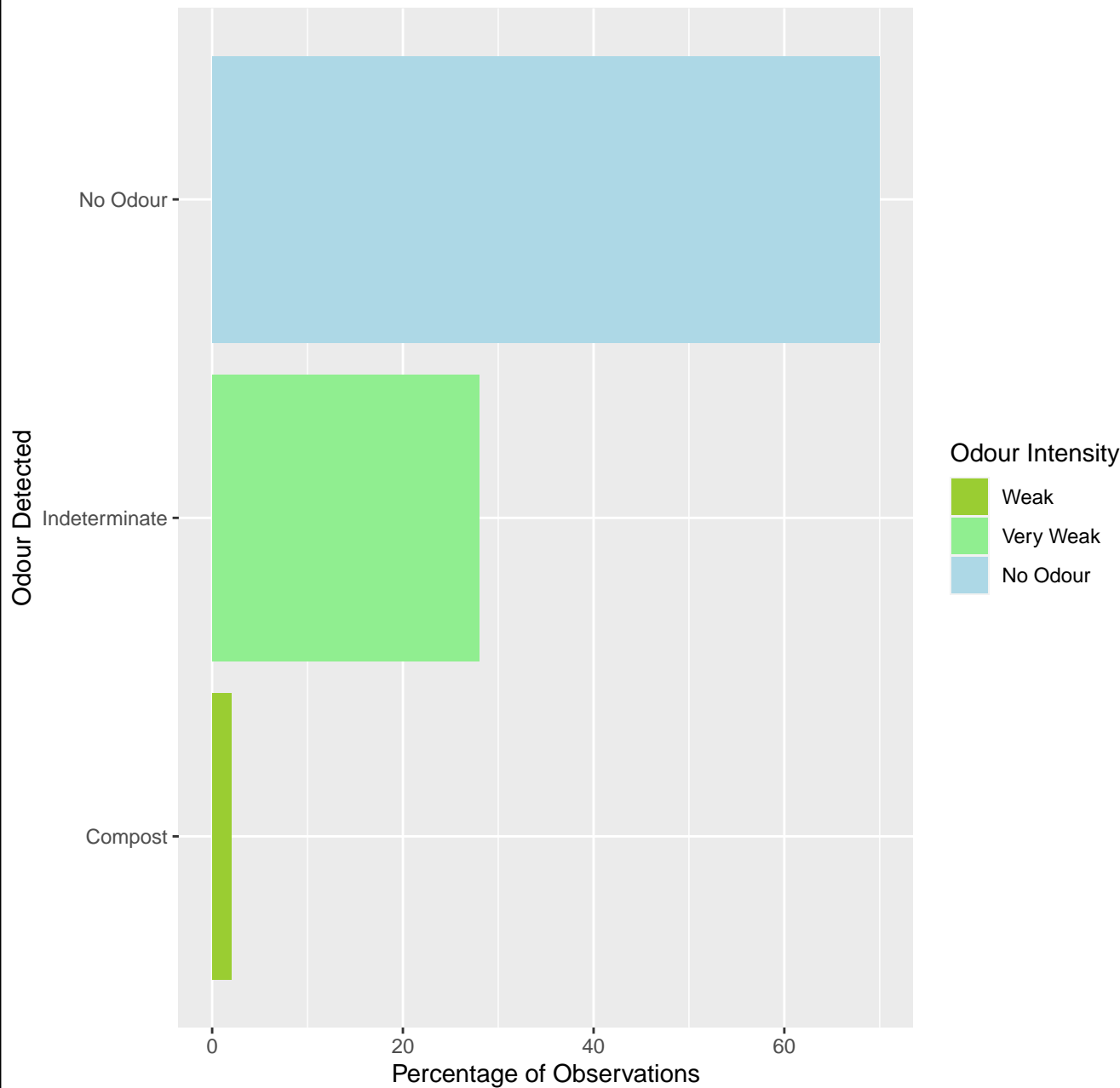
Site C : Summary of Odours Detected at Site



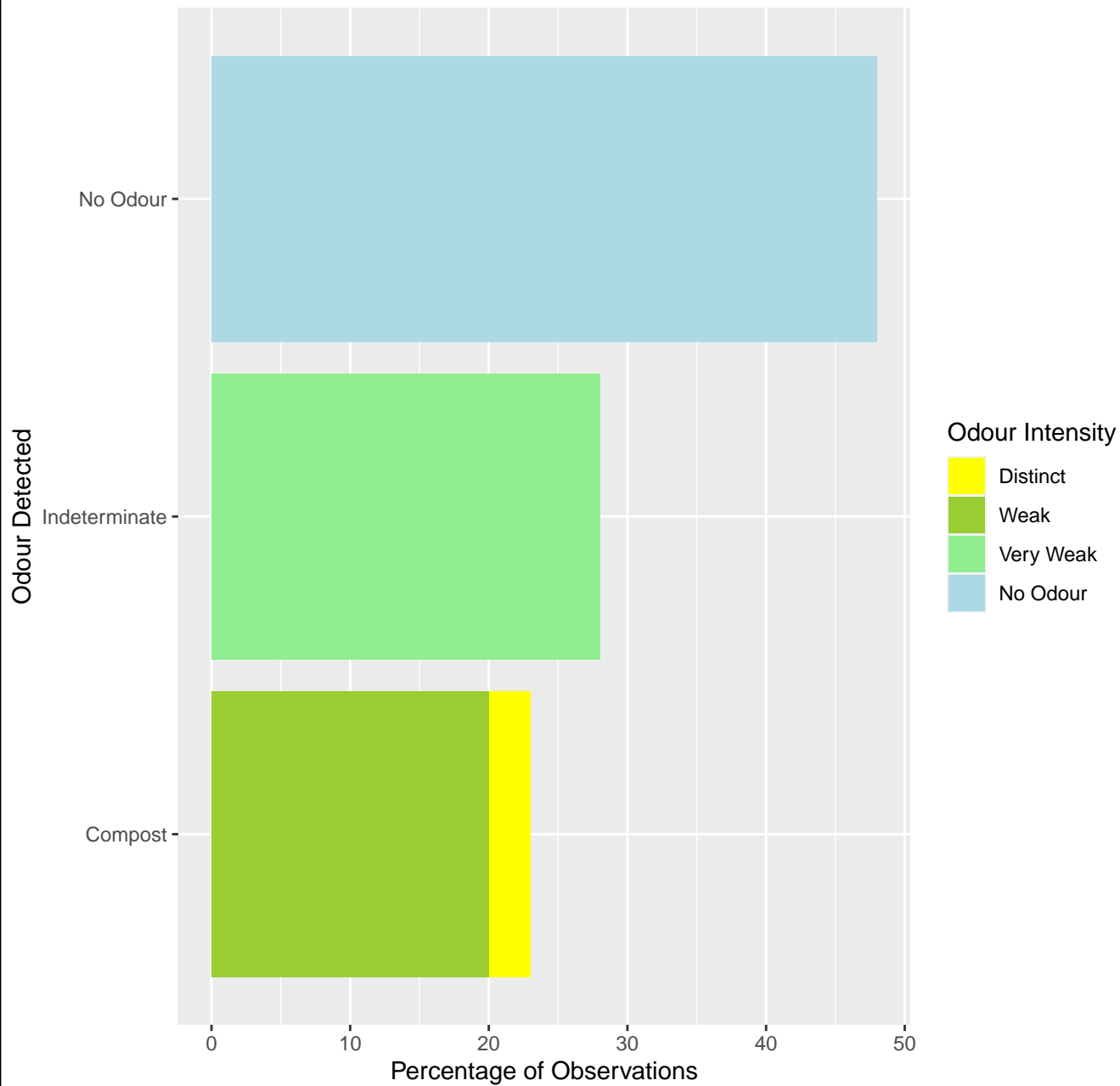
Site D : Summary of Odours Detected at Site



Site E : Summary of Odours Detected at Site



Site O : Summary of Odours Detected at Site



Site P : Summary of Odours Detected at Site

