



memorandum

TO Christchurch City Council FROM [REDACTED]
DATE 10/05/2023
RE Living Earth Odour Monitoring: 27th March 2023 to 9th April 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 of 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 of the period between the 27th March 2023 to 9th April 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.

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

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)

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:

- ∴ 1st April 2023; and
- ∴ 4th April 2023.

The period of the 27th of March 2023 to the 9th of April 2023 was characterised by wet and southerly conditions, limiting opportunities for odour observations.

3.1 1st April 2023

██████████ was the PDP odour scout. The scout was present for approximately 1 hour. The weather was clear, with a temperature of 18 °C and an easterly wind ranging from 3.5 m/s to 5.4 m/s as a 10-minute average. The scout started and finished at Site L. The object was to undertake odour monitoring across a full cross-section of the area downwind of the LE Site. The odour scout route (green dots) and key scouting locations are shown in **Figure 3**.



Figure 2: 1st April 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 1: 1st April 2023 - Odour Scouting Summary

Site	Time	Observations
L	14:13	No odour (0) detected.
D	14:15	No odour (0) detected.
D to P		Weak (2) sweet odour detected.
P	14:20	Intermittent, weak (2) manure odour detected. No compost odours detected.
P to E		Intermittent, weak (2) manure odour detected. No compost odours detected.
E	14:22	Intermittent, weak (2) manure odour detected. No compost odours detected.
E to F		No odour (0) detected.
F	14:31	No odour (0) detected.
G	14:33	No odour (0) detected.
G to H		Continuous, weak (2) compost odour detected.
H	14:38	Continuous, weak (2) to distinct (3) compost odour detected.
H to I		Intermittent, weak (2) compost odour detected.
J	14:49	Continuous, weak (2) to distinct (3) compost odour detected.
J to K		Continuous, distinct (3) paint/solvent odour detected.
K	14:55	No odour (0) detected.
K to L		Continuous, weak (2) compost odour detected.
L	15:03	No odour (0) detected.

Compost odour was not detected in the residential zone.

Distinct (3) compost odour was detected in the industrial zone along Dyers Rd, closest 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.

3.2 4th April 2023

██████████ was the PDP odour scout. The scout was present for approximately 1.5 hours. The weather was clear, with a temperature of 17 °C and easterly to north-easterly winds ranging from 3.9 m/s to 5.2 m/s as a 10-minute average. The scout started and finished at Site A (Oderings). The objective was to undertake odour monitoring in the residential area downwind of the LE Site. The odour scout route (blue dots) and key scouting locations are shown in **Figure 3**.

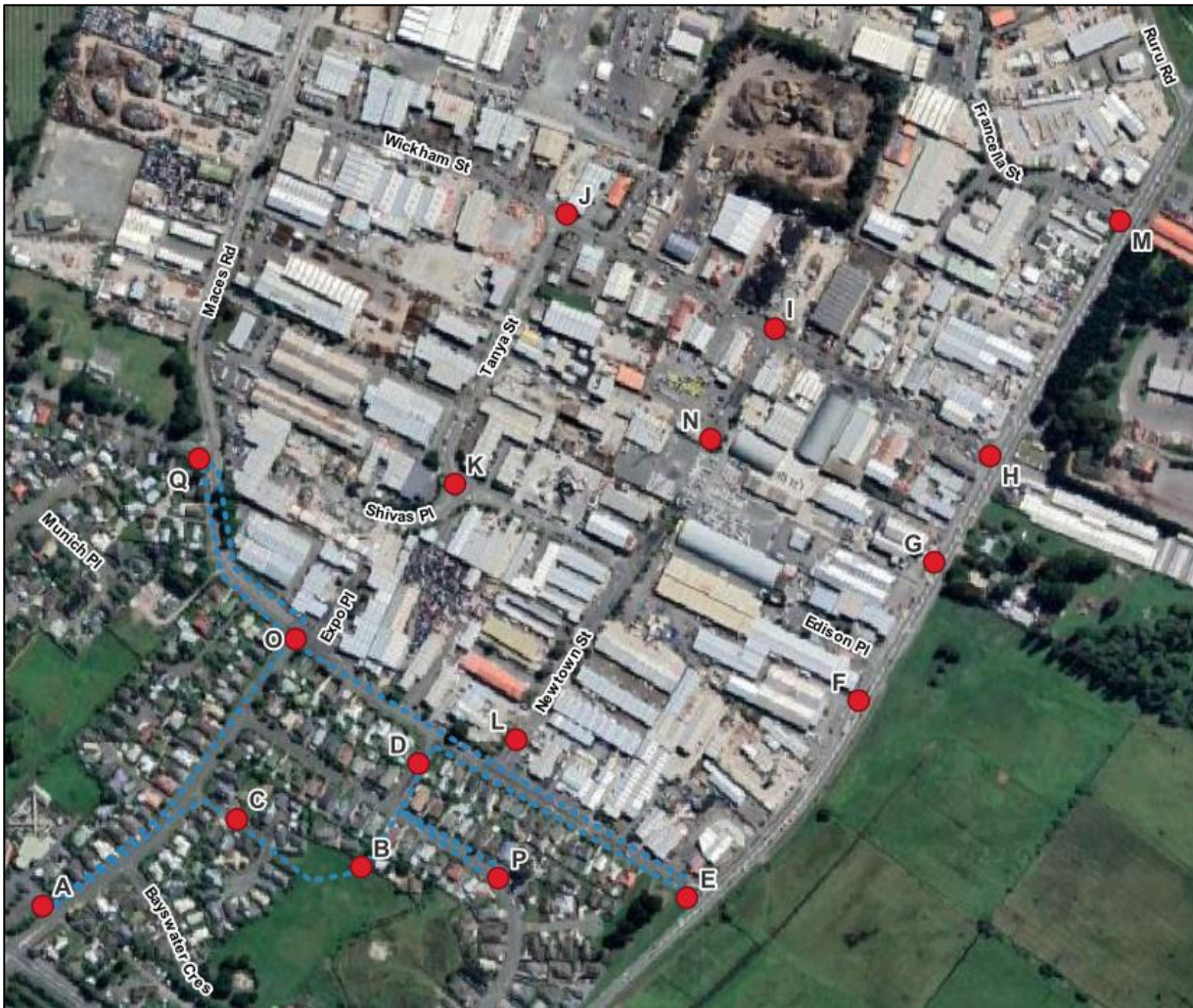


Figure 3: 4th April 2023 - Odour Scout Route

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: 4th April 2023 - Odour Scouting Summary

Site	Time	Observations
A	15:37	FIDOL assessment completed. No odour (0) was present 65% of the time. Very weak (1) odours of an indeterminate character were present 35% of the time. Odour assessed as not offensive or objectionable.
A to C	15:47	Intermittent weak (2) compost odour detected.

Table 2: 4th April 2023 - Odour Scouting Summary

Site	Time	Observations
C	15:49	FIDOL assessment completed. No odour (0) was present 70% of the time. Very weak (1) odours of an indeterminate character were present 27% of the time. Weak (2) compost odour was detected 3% of the time. Odour assessed as not offensive or objectionable.
C to B	15:59	Intermittent weak (2) unidentified putrid odour detected.
B to P	16:01	Intermittent weak (2) unidentified putrid odour and intermittent weak (2) compost odour detected.
P to B	16:04	No odour (0) to very weak indeterminate odour (1) detected.
B	16:07	FIDOL assessment completed. No odour (0) was present 72% of the time. Very weak (1) odours of an indeterminate character were present 17% of the time. Weak (2) compost odour was detected 12% of the time. Odour assessed as not offensive or objectionable.
B to D	16:17	No odour (0) to very weak indeterminate odour (1) detected.
D	16:18	FIDOL assessment completed. No odour (0) was present 18% of the time. Very weak (1) odours of an indeterminate character were present 15% of the time. Weak (2) compost odour was detected 67% of the time. Odour assessed as offensive and objectionable, if it were to continue.
D to L	16:28	Intermittent weak (2) compost odour detected.
L to E	16:30	Weak (2) paint odour detected near E.
E	16:35	FIDOL assessment completed. No odour (0) was present 93% of the time. Very weak (1) odours of an indeterminate character were present 7% of the time. Odour assessed as not offensive or objectionable.
E to L	16:45	No odour (0) detected.
L to O	16:47	Continuous weak compost odour (2) detected.
O	16:50	FIDOL assessment completed. Weak (2) compost odour was detected 18% of the time. Distinct (3) compost odour was detected 82% of the time. Odour assessed as offensive and objectionable, even for short periods.
O to Q	17:00	No odour (0) to weak compost odour (2) detected.
Q	17:03	FIDOL assessment completed. No odour (0) was present 82% of the time. Very weak (1) odours of an indeterminate character were present 8% of the time. Weak (2) compost odour was detected 10% of the time. Odour assessed as not offensive or objectionable.
Q to A	17:13	No odour (0) to weak compost odour (2) detected.

Nearly continuous weak (2) compost odour was detected at Site D. This odour would be considered offensive or objectionable if it continued for a substantial period of time. The windspeed and direction was consistently north-easterly from 14:20 into the evening.

Close to continuous distinct (3) compost odour was detected at Site O. This odour would be considered offensive or objectionable even if it only occurred for short periods of time.

Smelt-It reports at 16:52, 19:46 and 20:03 identified compost odours in the Bromley zone.

No abnormal activities were occurring at the LE site. PDP understand that the screens were not in operation.

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.

In summary, offensive or objectionable odours were detected along the residential-industrial boundary. Observations along the line formed by Sites Q, C, B, and A did not detect offensive odour, indicating the approximate boundary of the potentially offensive plume. Odours at Site D were weaker than at Q, indicating the centreline of the plume was closer to Site O.

4.0 Summary

PDP undertook odour scouting on two occasions between the 27th March 2023 and the 9th April 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:

- ∴ 1st April 2023

No compost odour in the residential zone. Some manure odours, associated with the farmland east of Dyers Road. PDP does not consider the odour detected during the scout was offensive or objectionable.

- ∴ 4th April 2023

Nearly continuous weak (2) and distinct (3) compost odours were detected in the residential zone. PDP considers the odour detected at Sites D and O during the scout was offensive and objectionable. Meteorological data and Smelt-It reports corroborate the potential for the odour to have occurred from approx. 14:20 into the evening.

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.

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.

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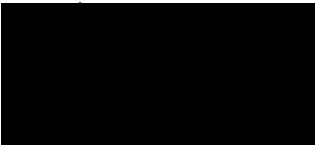
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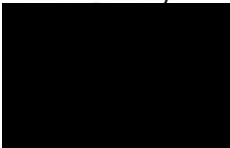
Senior Environmental Engineer

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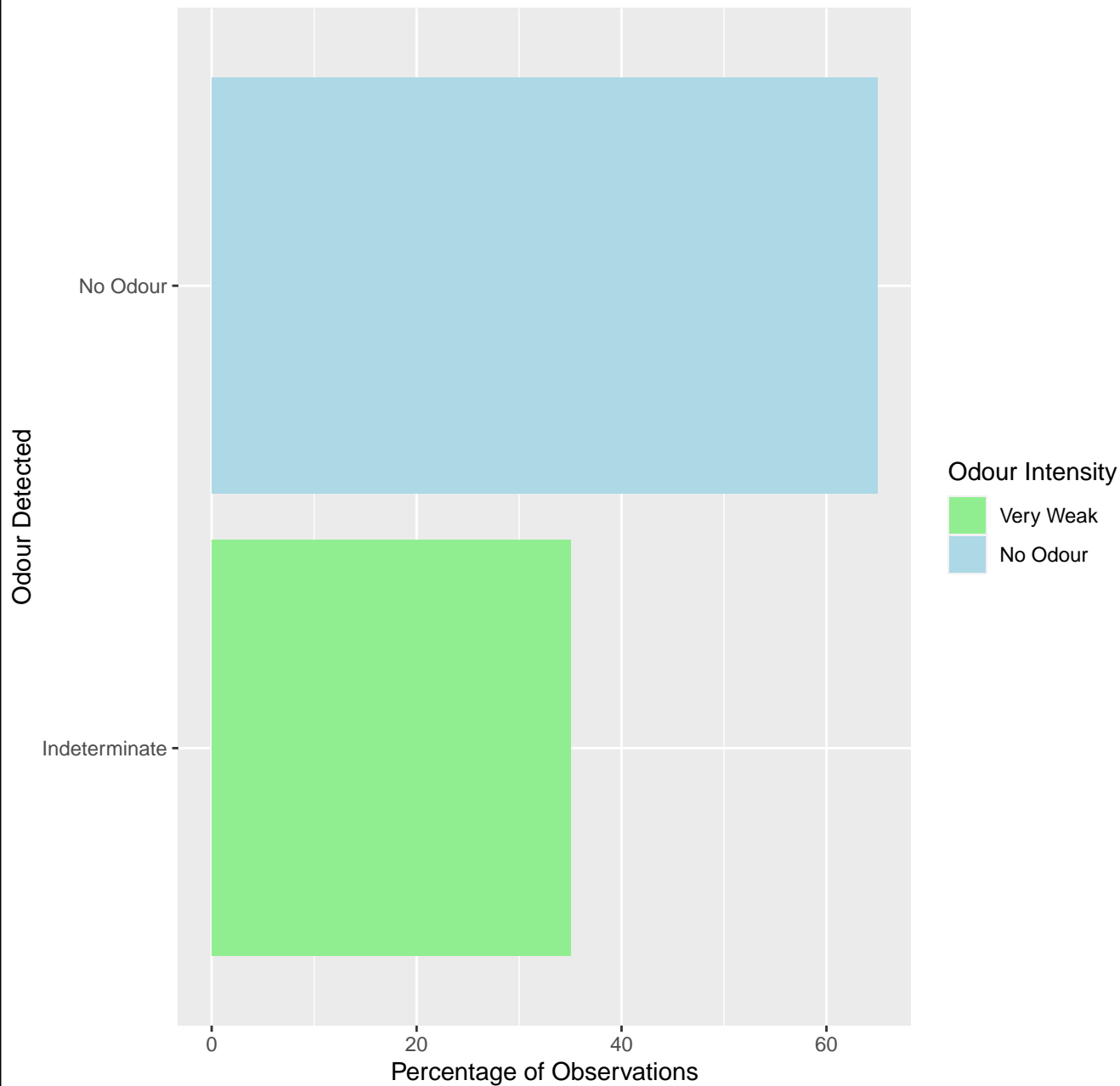
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Reviewed by

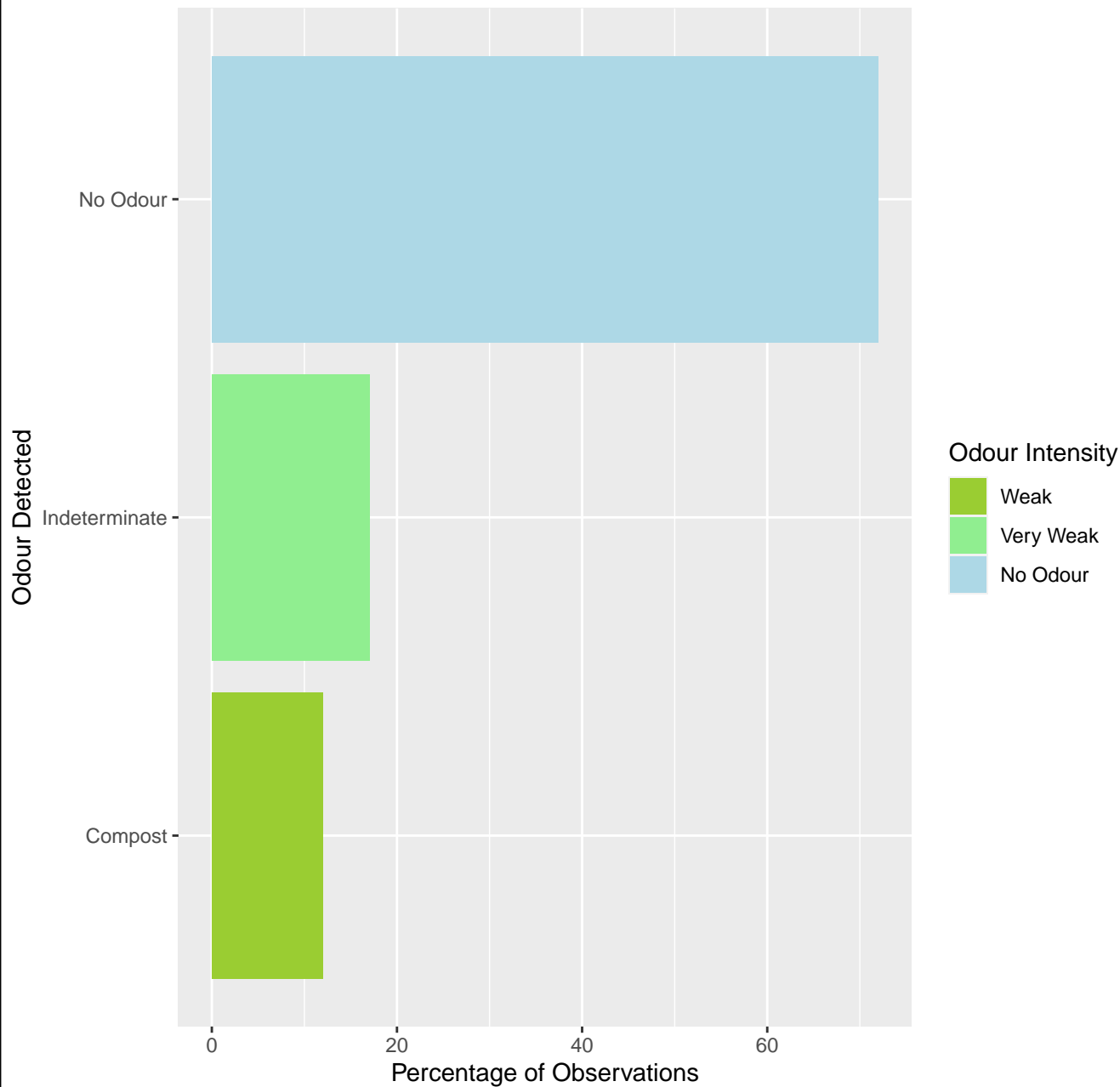


Technical Director

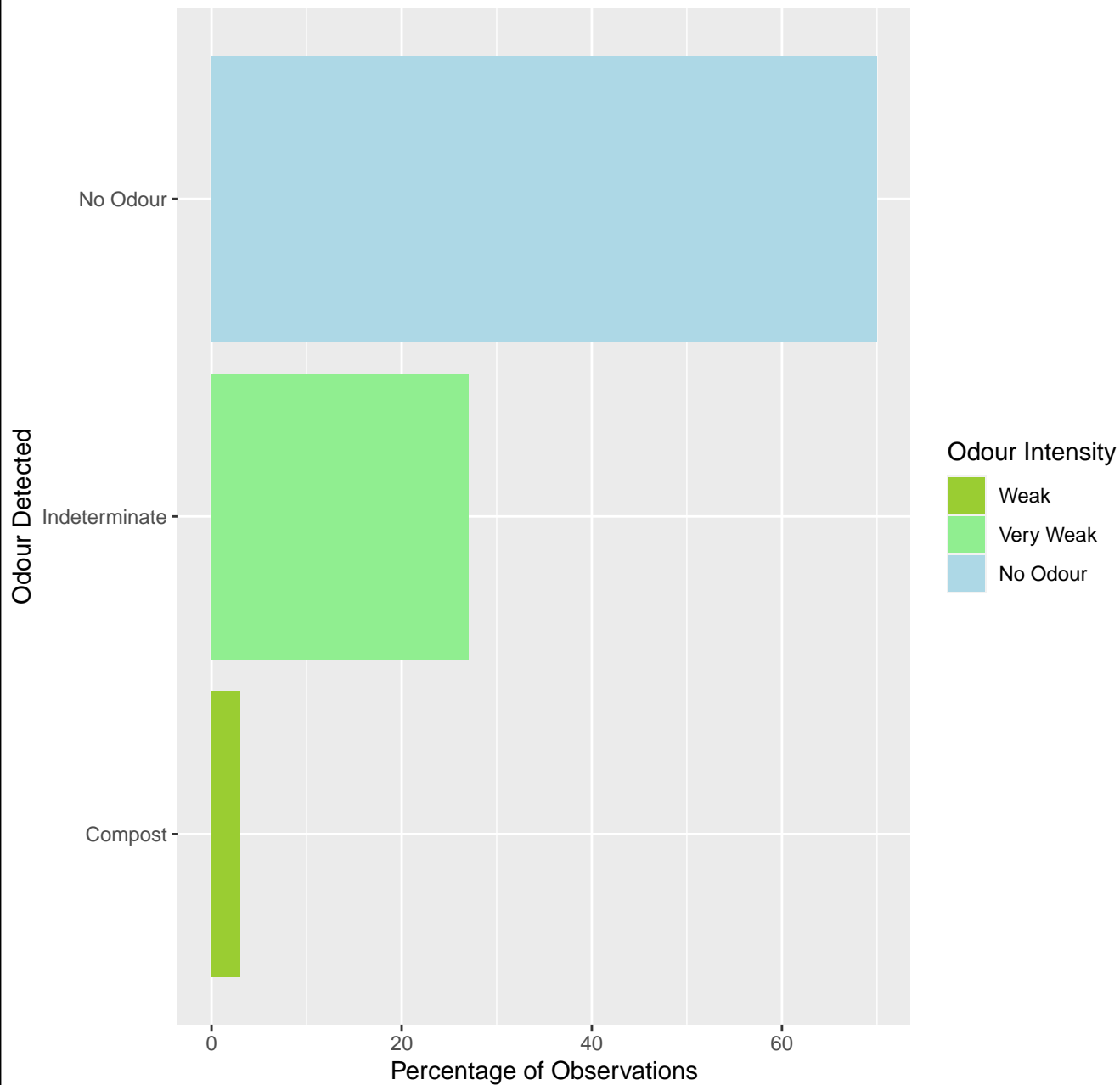
Site A : Summary of Odours Detected at Site



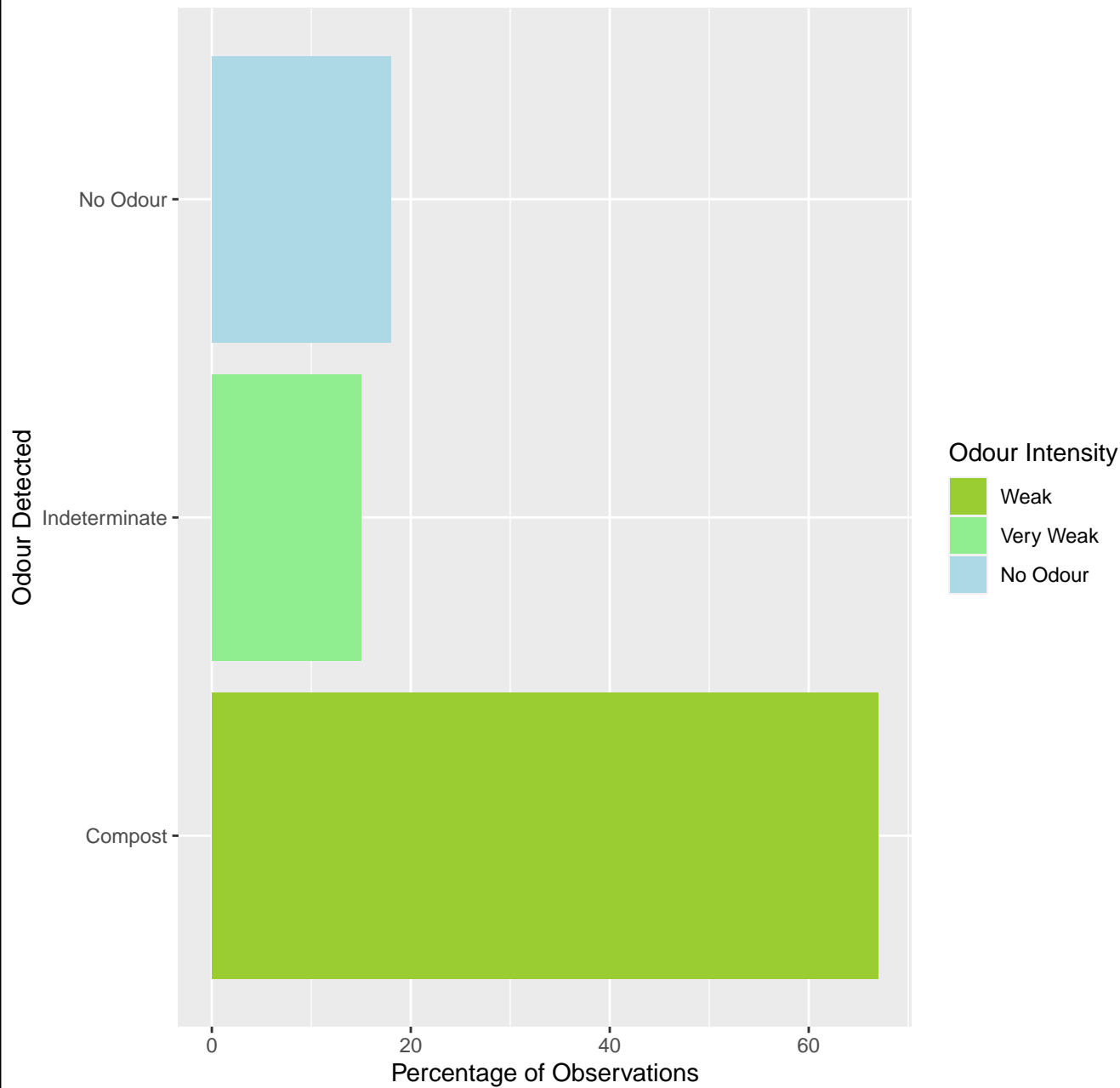
Site B : Summary of Odours Detected at Site



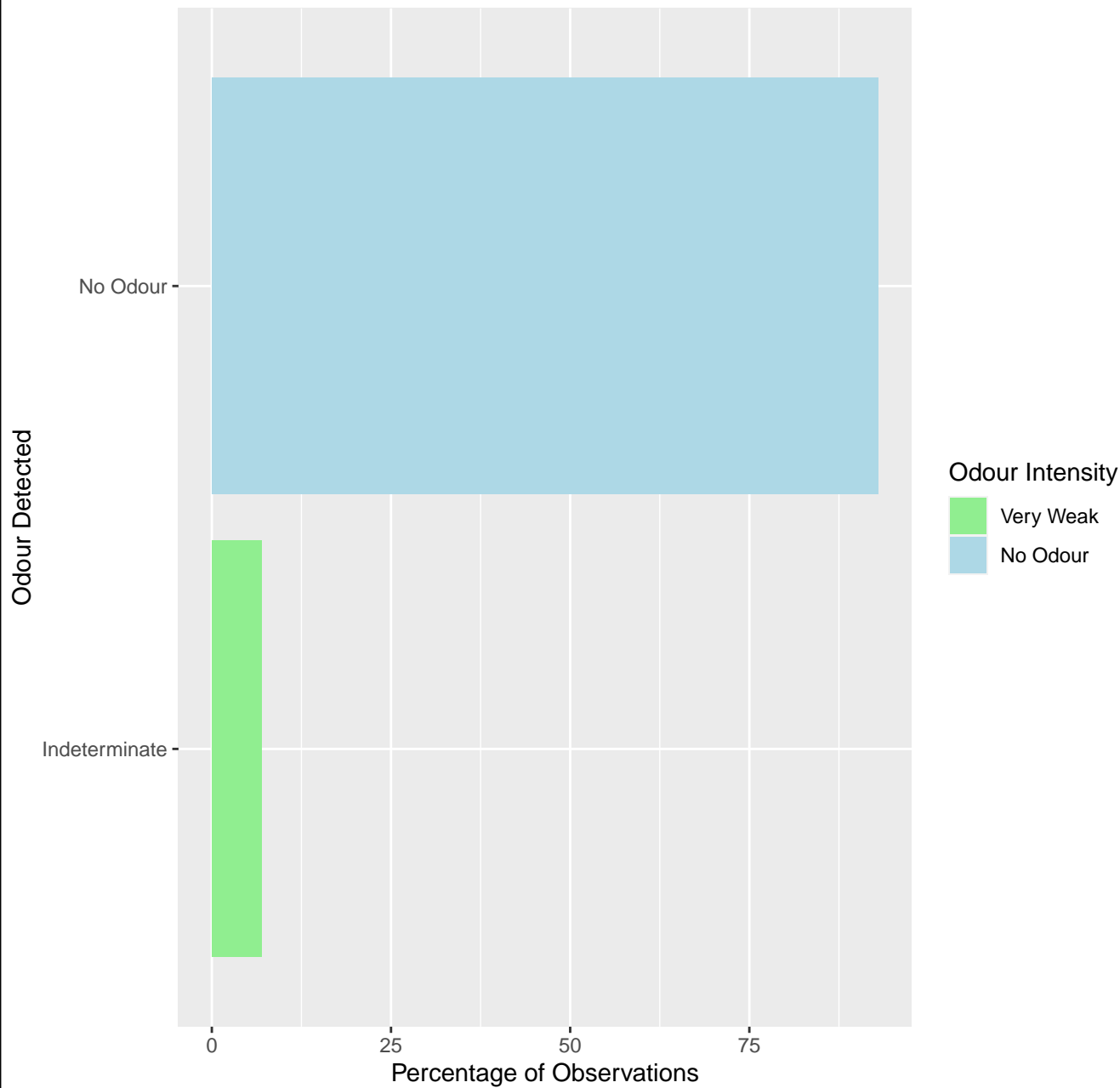
Site C : Summary of Odours Detected at Site



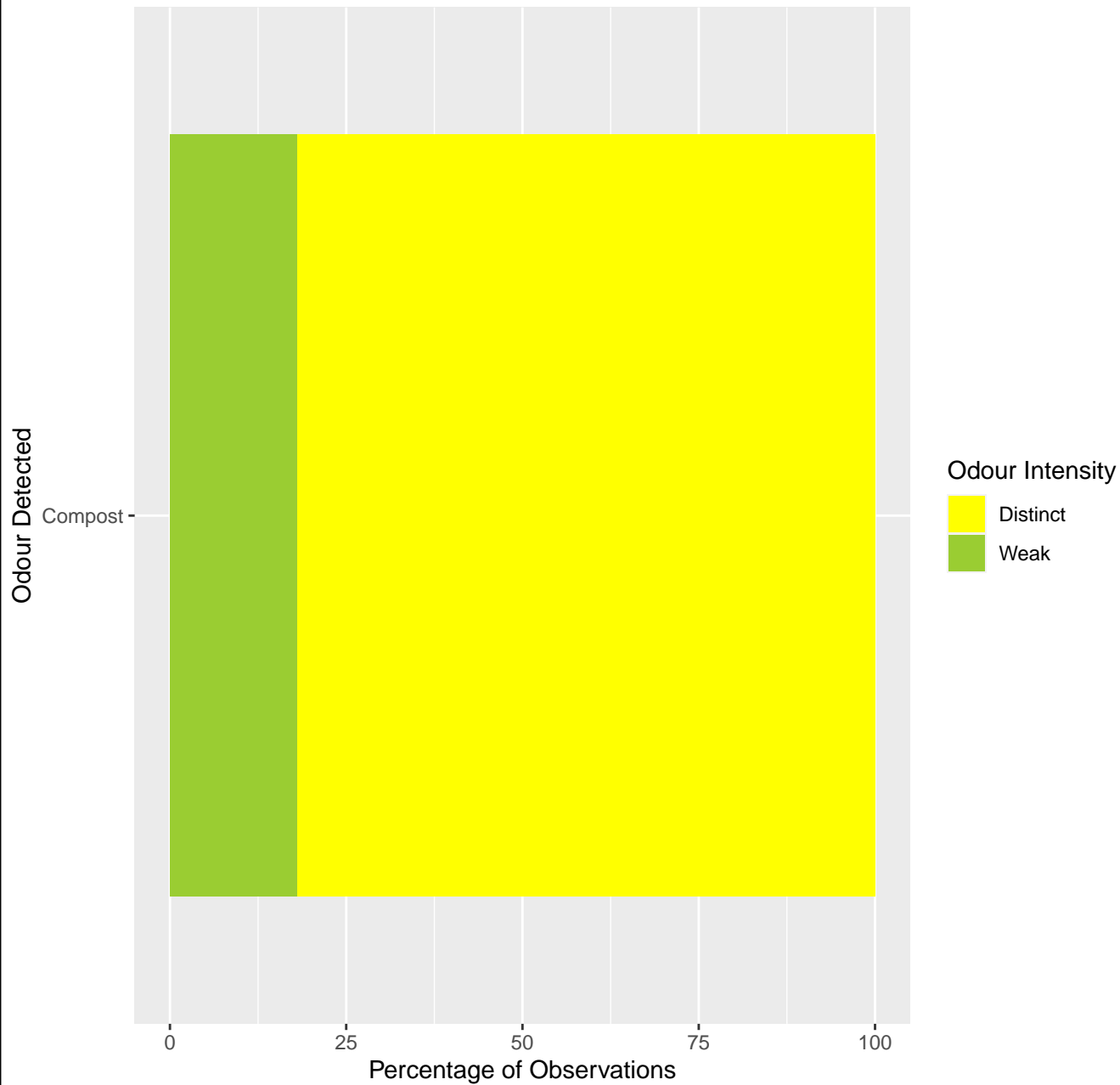
Site D : Summary of Odours Detected at Site



Site E : Summary of Odours Detected at Site



Site O : Summary of Odours Detected at Site



Site Q : Summary of Odours Detected at Site

