



# memorandum

TO Christchurch City Council FROM [REDACTED]  
DATE 11 December 2023  
RE Living Earth Odour Monitoring: 14<sup>th</sup> October 2023 to 10<sup>th</sup> November 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 14<sup>th</sup> of October 2023 and the 10<sup>th</sup> of November 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, 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/Character<sup>1</sup>; 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.

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<sup>1</sup> "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:

- ∴ 18<sup>th</sup> of October 2023;
- ∴ 19<sup>th</sup> of October 2023;
- ∴ 25<sup>th</sup> October 2023;
- ∴ 30<sup>th</sup> October 2023;
- ∴ 3<sup>rd</sup> November 2023;
- ∴ 7<sup>th</sup> November 2023;

#### 3.1 18<sup>th</sup> October 2023

████████████████████ were the PDP odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 14 °C and easterly to east-north-easterly winds ranging from 4.8 m/s to 5.1 m/s as a 10-minute average. The scouts started at Site A, then walked through the residential area finishing back at Site A. Following this, the scouts drove to the Living Earth facility and completed a site walkover around the compost windrows. 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: 18<sup>th</sup> October 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: 18<sup>th</sup> October 2023 - Odour Scouting Summary

Site	Time	Observations
A	15:00	Intermittent weak (2) compost odour detected.
C	15:10	<b>FIDOL assessment completed.</b> No odour (0) was detected 67% of the time. Very weak (1) odours of an indeterminate character were detected 27% of the time. Weak (1) compost odour was detected 5% of the time. Weak (1) solvent odour, with a negative hedonic tone, was detected 1% of the time. <b>Odour was assessed to be not offensive or objectionable.</b>
B	15:25	Intermittent weak (2) cut grass and compost odour detected.
D	15:28	<b>FIDOL assessment completed.</b> No odour (0) was detected 47.5% of the time. Very weak (1) odours of an indeterminate character were detected 27.5% percent of the time. Weak (2) compost odour was detected 12.5% of the time. Distinct (3) compost odour was detected 9.5% of the time. Weak (3) paint/solvent odour, with a negative hedonic tone, was detected 2.5% of the time. Weak (3) cut grass odour, with a positive hedonic tone, was detected less than 1% of the time. <b>Odour was assessed to be offensive and objectionable.</b>

**Table 1: 18<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
P	15:42	No odour (0) to distinct (3) compost odour detected.
E	15:50	Continuous distinct (3) compost odour detected.
E to D	15:52	Continuous weak (2) solvent odour detected.
D	15:54	Intermittent very weak (1) odour of an indeterminate character detected.
O	15:56	No odour (0) detected.
C	15:58	No odour (0) detected.
A	16:00	Intermittent weak (2) compost odour detected.

Weak compost odour was detected in the residential area at Site C but was not considered offensive or objectionable.

The intensity and frequency of the compost odour at Site D was assessed to be offensive and objectionable. The compost odour was observed to come in waves, oscillating between no odour (0), and distinct (3) odour. This oscillating odour was observed while walking through Sites P and E.

The scouts visited the site and observed the odour sources on the site:

- ∴ The biofilter had a damp barky odour, very different from the odour observed offsite.
- ∴ 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.
- ∴ The odour at the south-western boundary of the site did not fluctuate significantly. Therefore, the ‘oscillation’ observed in the residential area was likely the result of atmospheric turbulence instead of variation caused by a pattern of site activity.

**3.2 19<sup>th</sup> October 2023**

████████████████████ were the PDP odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 14 °C, and easterly winds ranging from 4.6 to 5.1 m/s as a 10-minute average. The scouts started at Site C, then walked a loop, finishing back at Site C. 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 3**.



**Figure 3: 19<sup>th</sup> October 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: 19<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
C	13:45	No odour (0) detected.
C to O		Intermittent very weak (1) indeterminate odour.
O	13:49	No odour (0) detected.
Q	13:52	No odour (0) detected.
O	13:54	Intermittent weak (2) compost odour detected.
O to D		Intermittent weak (2) compost odour detected.
D	13:59	No odour (0) detected.
P	13:59	<b>FIDOL assessment completed.</b> No odour (0) was detected 73% of the time. Very weak (1) odours of indeterminate character were detected 19% of the time. Weak (2) compost odour was detected 8% of the time. <b>Odour was assessed to be not offensive or objectionable.</b>
E	14:16	No odour (0) detected.
E to F		Intermittent weak (2) compost odour detected.

**Table 2: 19<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
F	14:20	Intermittent weak (2) compost odour detected.
G	14:22	Weak (2) to distinct (3) compost odour detected.
H	14:24	Intermittent weak (2) to distinct (3) rubbish odour detected.
H to I		Intermittent weak (2) solvent/paint odour detected.
I	14:29	No odour (0) detected.
J	14:31	No odour (0) detected.
J to K		Intermittent weak (2) solvent odour detected.
K	14:34	No odour (0) detected.
K to L		Intermittent weak (2) compost odour detected.
L	14:37	Intermittent weak (2) solvent odour and compost odour detected.
D	14:38	<b>FIDOL assessment completed.</b> No odour (0) was detected 81% of the time. Very weak (1) odours of indeterminate character were detected 18% of the time. Weak (2) compost odour was detected 2% of the time.  <b>Odour was assessed to be not offensive or objectionable.</b>
O	14:54	No odour (0) detected.
C	14:55	No odour (0) detected.

Intermittent weak compost odour was detected in the residential area, at Sites O, D, and P. 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.

**3.3 25<sup>th</sup> October 2023**

██████████ were the odour scouts. The scouts were present for approximately 1 hour. The weather was clear, with an average temperature of 17 °C and easterly winds ranging from 5 to 6 m/s as a 10-minute average. The scouts started at Site O, 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 4**.





**Figure 4: 25<sup>th</sup> October 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: 25<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
O	15:11	<b>FIDOL assessment completed.</b> No odour (0) was detected 62% of the time. Very weak (1) odours of indeterminate character were detected 36% of the time. Weak (2) compost odour was detected 2% of the time. <b>Odour was assessed to be not offensive or objectionable.</b>
Q	15:28	No odour (0) detected.
O	15:30	Very weak (1) intermittent odours of an indeterminate character detected.
D	15:34	No odour (0) detected.
E	15:37	No odour (0) detected.
F to G	15:42	Continuous very weak (1) odours of an indeterminate character to weak (2) compost odour detected.
G to H	15:44	Constant very weak (1) odours of an indeterminate character to weak (2) compost odour detected.
H to I	15:48	Very weak odours of an indeterminate character detected.

**Table 3: 25<sup>th</sup> October 2023 - Odour Scouting Summary**

I to J	15:52	No odour (0) to very weak (1) odours of an indeterminate character detected.
J to K	15:56	Continuous very weak (1) odours of an indeterminate character detected.
K to L	15:59	Very weak (1) odours of an indeterminate character and weak (2) compost and solvent odours detected.
D	16:03	No odour (0) detected.
O	16:06	No odour (0) detected.

Very intermittent, weak (2) compost odour was detected at Site O in the residential area. The odour was not considered to be offensive or 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.

**3.4 30<sup>th</sup> October 2023**

██████████ was the odour scout. The scout was present for approximately 1 hour. The weather was clear, with an average temperature of 16 °C and easterly winds ranging from 6.9 to 8 m/s as a 10-minute average. The scout started at Site O, 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 5**.



Figure 5: 30th October 2023 - Odour Scout Route

Table 4: 30<sup>th</sup> October 2023 - Odour Scouting Summary

Site	Time	Observations
O	13:24	Very weak (1) odours of an indeterminate character detected.
D	13:26	<b>FIDOL assessment completed.</b> No odour (0) was detected 80% of the time. Very weak (1) odours of an indeterminate character were detected 20% of the time. <b>Odour was assessed to be not offensive or objectionable.</b>
E	13:41	No odour (0) to very weak (1) odours of an indeterminate character were detected.
F	13:46	Continuous weak (2) to distinct (3) compost odour detected.
G	13:48	Very weak (1) odours of an indeterminate character to weak (2) compost odour detected.
H	13:49	No odour (0) to very weak (1) odours of an indeterminate character detected.

**Table 4: 30<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
I	13:53	Very weak (1) odours of an indeterminate character detected.
J	13:56	No odour (0) detected.
K	15:00	No odour (0) detected.
L	15:02	No odour (0) detected.
D	14:05	No odour (0) detected.
O	14:08	No odour (0) detected.
Q	14:10	No odour (0) detected.
O	14:13	No odour (0) detected.

No compost odour was detected in the residential area. 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, oversize stockpiles and screened fines. The odour did not match PDP’s experience with the odour from the processing hall or associated biofilter.

**3.1 3<sup>rd</sup> November 2023**

██████████ was the odour scout. The scout was present for approximately 1 hour. The weather was overcast and drizzling, with an average temperature of 13 °C and easterly winds ranging from 3.6 to 4 m/s as a 10-minute average. The scout started at Site O, 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 6**.



Figure 6: 3rd November 2023 - Odour Scout Route

Table 5: 30<sup>th</sup> October 2023 - Odour Scouting Summary

Site	Time	Observations
O	13:06	No odour (0) detected.
D	13:09	No odour (0) detected.
E	13:13	No odour (0) to very weak (1) odours of an indeterminate character detected.
F	13:18	No odour (0) detected.
G	13:20	No odour (0) detected.
H	13:22	No odour (0) to weak (2) solvent odour detected.

**Table 5: 30<sup>th</sup> October 2023 - Odour Scouting Summary**

Site	Time	Observations
I	13:25	No odour (0) detected.
J	13:28	No odour (0) detected.
K	13:31	No odour (0) detected.
L	13:35	No odour (0) detected.
D	13:38	No odour (0) detected.

No compost odour was detected in the residential or industrial area. 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, oversize stockpiles and screened fines. The odour did not match PDP’s experience with the odour from the processing hall or associated biofilter.

**3.1 7<sup>th</sup> November 2023**

[REDACTED] was the PDP odour scout. The scout was present for approximately 40 minutes. The weather was clear, with an average temperature of 14 °C, and east-north-easterly to easterly winds ranging from 4.4 to 5.2 m/s as a 10-minute average. The scout started at Site C, then walked a loop, finishing back at Site C. 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 6**.



**Figure 7: 7<sup>th</sup> November 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 6: 7<sup>th</sup> November 2023 - Odour Scouting Summary**

Site	Time	Observations
C to O	14:35	Intermittent very weak (1) indeterminate odour detected.
O to Q	14:39	Intermittent very weak (1) indeterminate odour detected.
Q to O	14:42	Intermittent very weak (1) indeterminate odour detected.
O to D	14:44	Intermittent very weak (1) indeterminate odour detected.
D to E	14:47	Intermittent very weak (1) indeterminate odour detected.
E to F	14:50	Very weak (1) indeterminate odour to weak (2) compost odour detected.
F to G	14:53	Intermittent weak (2) to distinct (3) compost odour detected.
G to H	14:55	Intermittent weak (2) to distinct (3) compost odour detected.
H to I	14:57	Intermittent very weak (1) indeterminate odour detected.
I to J	15:00	No odour (0) detected.
J to K	15:03	Intermittent very weak (1) indeterminate odour detected.
K to L	15:06	Intermittent weak (2) compost odour detected.
L to D	15:11	No odour (0) detected.
D to O	15:12	No odour (0) detected.
O to C	15:14	No odour (0) detected.
C	15:16	No odour (0) detected.

No compost odour was detected in the residential area. 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, 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 six occasions between 14<sup>th</sup> October and 10<sup>th</sup> November 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:

- ∴ 18<sup>th</sup> October 2023

Distinct (3) compost odour was detected between Sites D, P, and E. The odour detected in the residential area was assessed to be **offensive and objectionable**.

∴ 19<sup>th</sup> October 2023

Intermittent weak compost odour was detected in the residential area, at Sites O, D, and P. This odour was not assessed to be offensive or objectionable.

∴ 25<sup>th</sup> October 2023

Very intermittent weak (2) compost odour was detected at Site O in the residential area. The odour was not assessed to be offensive or objectionable. The compost odour detected in the industrial area was not considered offensive or objectionable for an industrial area.

∴ 30<sup>th</sup> October 2023

No compost odour was detected in the residential area. The compost odour detected in the industrial area was not assessed offensive or objectionable for an industrial area.

∴ 3<sup>rd</sup> November 2023

No compost odour was detected in either the residential or industrial area.

∴ 7<sup>th</sup> November 2023

No compost odour was detected in the residential area. The compost odour detected in the industrial area was not considered offensive or objectionable for an industrial area.

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.

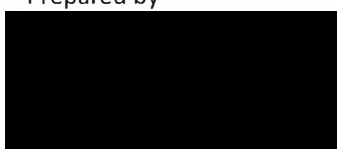
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Prepared by



Air Quality Engineer

Prepared by



Air Quality Scientist

Reviewed by



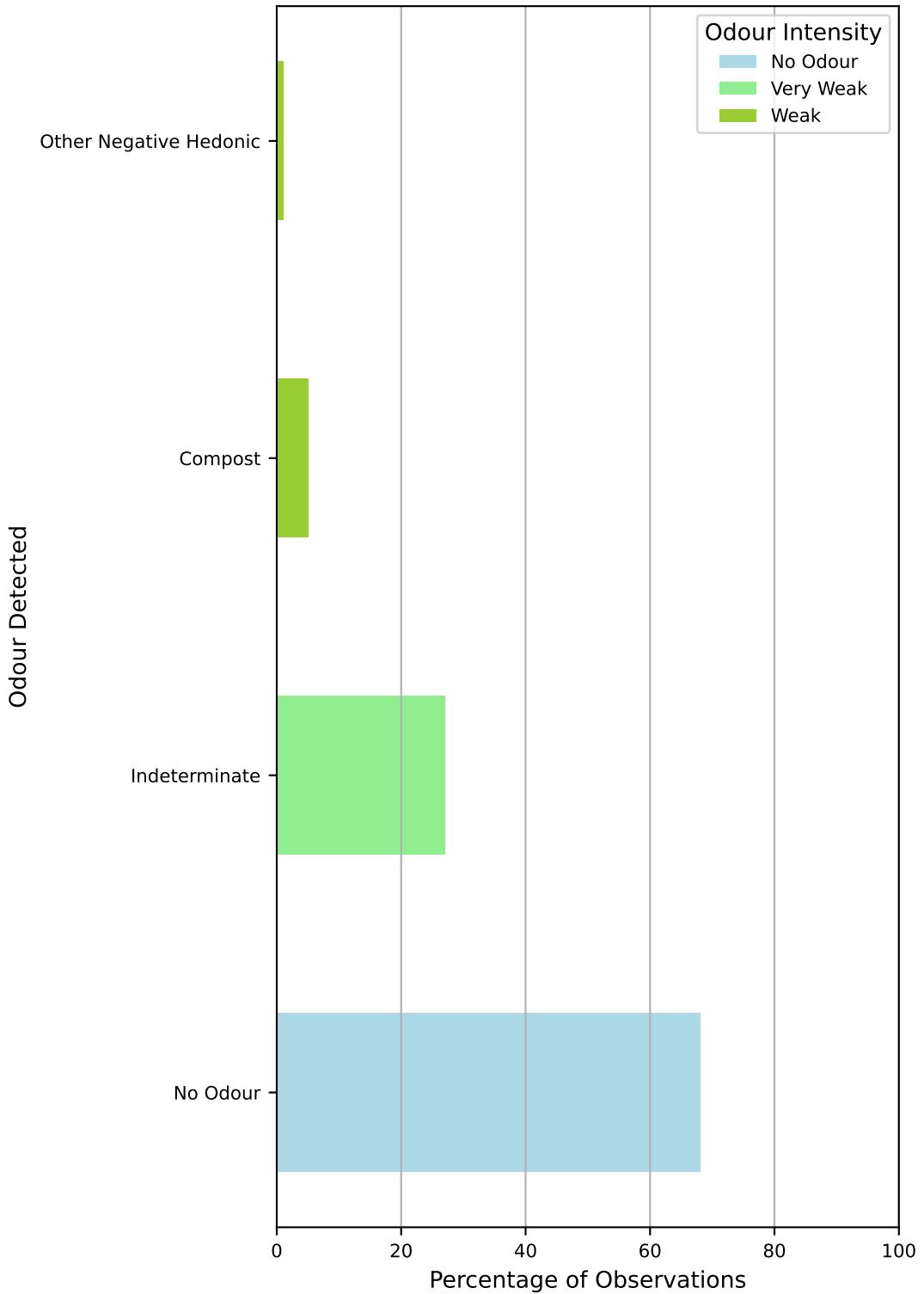
Senior Environmental Engineer

Approved by

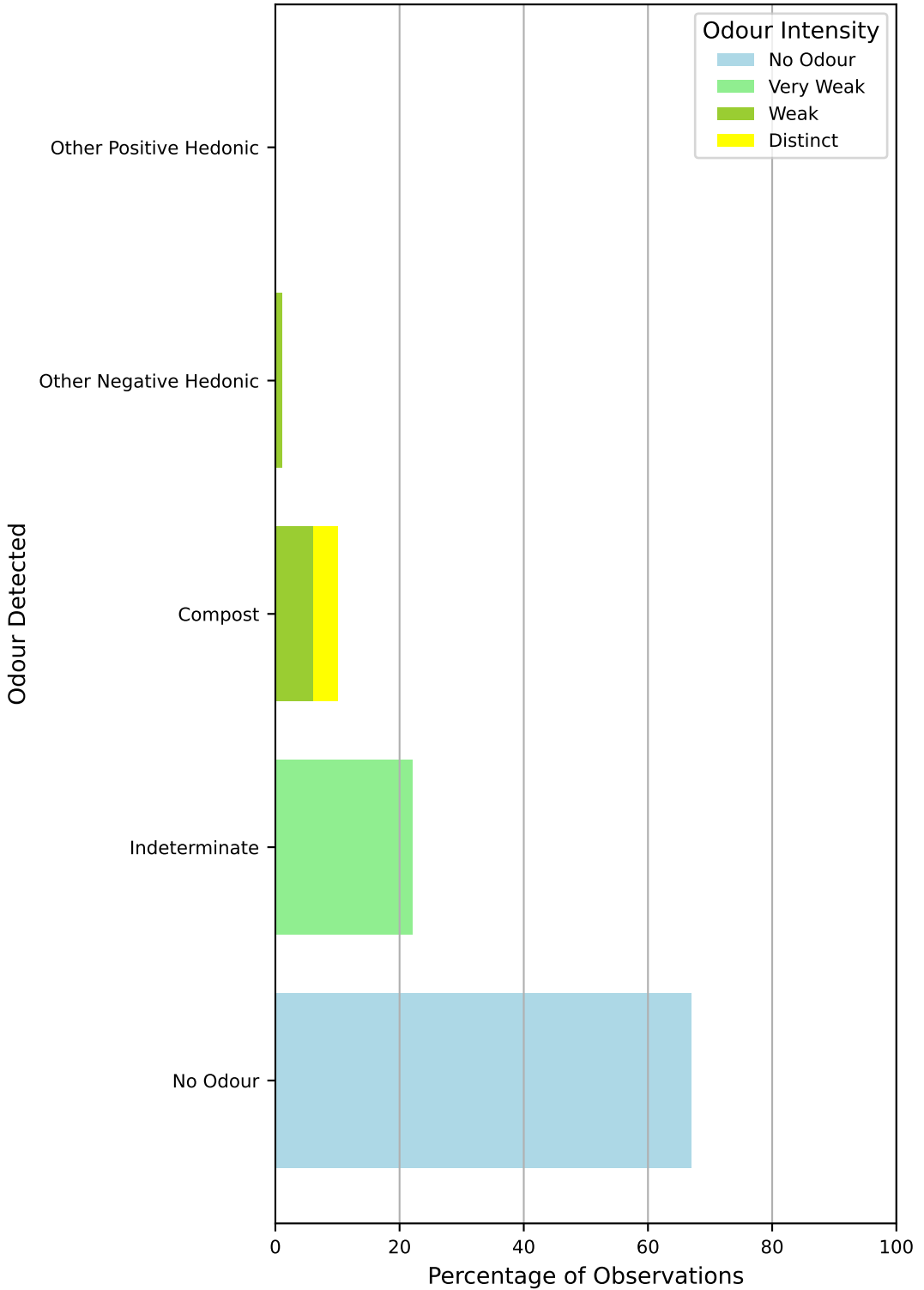


Group Director

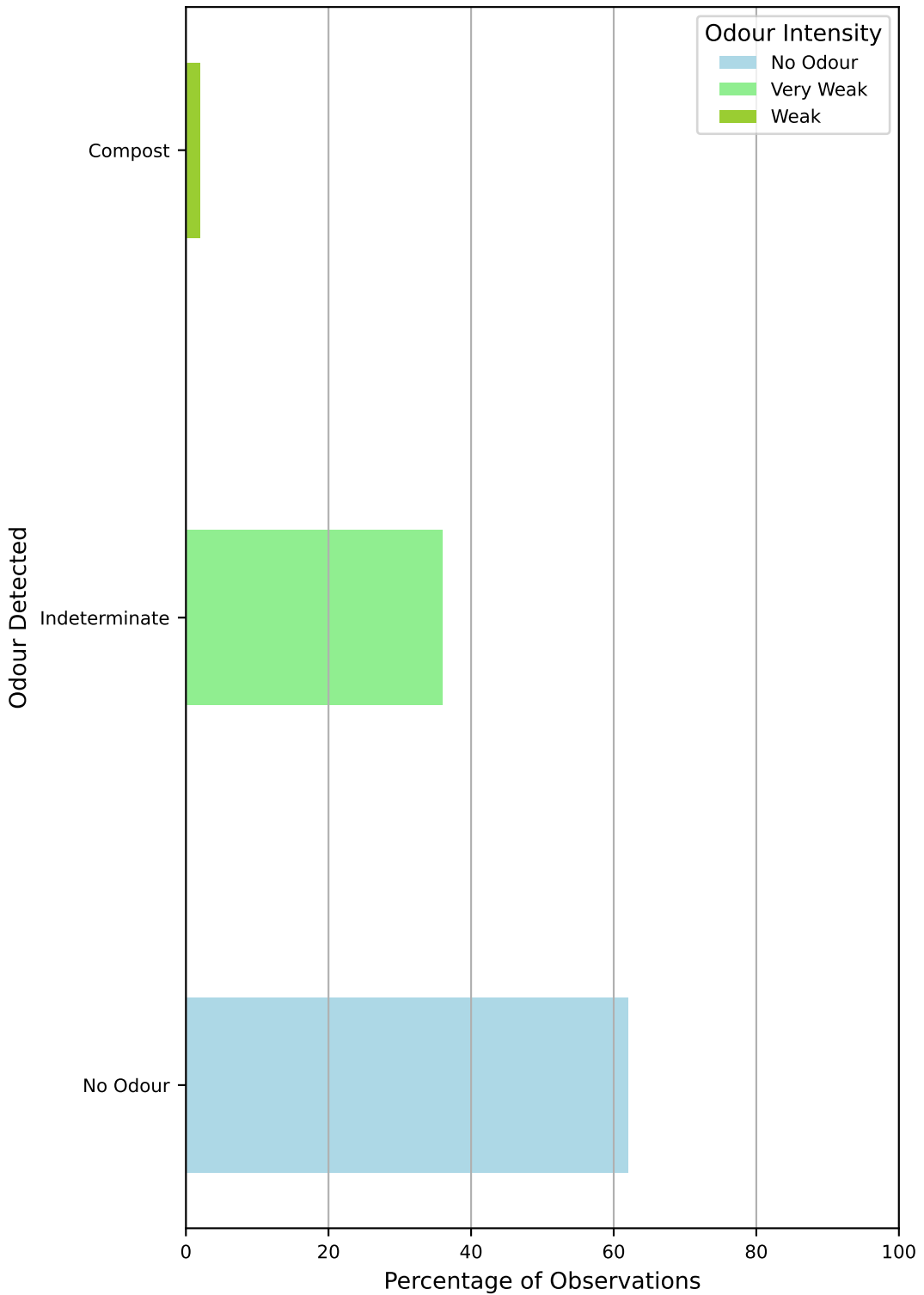
# Site C



# Site D



# Site O



# Site P

