



# memorandum

TO Christchurch City Council FROM [REDACTED]  
DATE 28 September 2023  
RE Living Earth Odour Monitoring: 22<sup>nd</sup> July 2023 to 18<sup>th</sup> August 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 22<sup>nd</sup> of July 2023 and the 18<sup>th</sup> of August 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. Sites E, L, O and Q are located roughly along the residential-industrial boundary. In assessments, Sites E, O, and Q are considered to be in the residential zone; 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:

- ∴ 31<sup>st</sup> of July 2023;
- ∴ 1<sup>st</sup> of August 2023; and
- ∴ 18<sup>th</sup> August 2023.

### 3.1 31<sup>st</sup> July 2023

[REDACTED] were the PDP odour scouts. The scouts were present for approximately 90 minutes. The weather was clear, with an average temperature of 13 °C and east to east-south-easterly winds ranging from 1.8 m/s to 3 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 (orange dots) and key scouting locations are shown in Figure 2.



Figure 2: 31<sup>st</sup> July 2023 - Odour Scout Route

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

| Table 1: 31 <sup>st</sup> July 2023 - Odour Scouting Summary |       |  |
|--|-------|--|
| Site   | Time  | Observations   |
| A  | 14:10 | Intermittent, weak (2) cut grass odour detected.   |
| A to C   |       | Very intermittent weak (2) compost odour detected. Green bins were being emptied upwind on St Johns Street during this time. |
| C  | 14:15 | Intermittent very weak (1) indeterminate odour detected.   |
| B  | 14:19 | Intermittent very weak (1) indeterminate odour detected.   |

**Table 1: 31<sup>st</sup> July 2023 - Odour Scouting Summary**

| Site   | Time  | Observations   |
|--------|-------|--|
| D      | 14:20 | FIDOL assessment completed. No odour (0) was detected 30% of the time. Very weak (1) odour of an indeterminate character was detected 38% of the time. Weak (2) compost odour was detected 23% of the time. Weak faecal and solvent odours, with a negative hedonic tone were detected 8% of the time. Distinct (3) compost odour was detected 2% of the time (2 observations in 120 observations).<br><br><b>The odour was assessed to be offensive or objectionable, this is discussed further below.</b>          |
| O      | 14:37 | Intermittent weak (2) to distinct (3) compost odour detected.  |
| O to Q |       | Weak (2) compost odour initially detected, weakening to very weak (1).   |
| Q      | 14:43 | No odour (0) to very weak (1) indeterminate odour detected.  |
| R      | 14:50 | Very weak (1) indeterminate to intermittent weak (2) cut grass odour detected.   |
| Q to O |       | Intermittent very weak (1) indeterminate to distinct (3) compost odour detected.   |
| O      |       | Intermittent very weak (1) to weak (2) compost odour detected.   |
| O to D |       | Continuous weak (2) to distinct (3) compost odour detected.  |
| D      | 14:57 | Continuous distinct (3) compost odour detected.  |
| P      | 14:57 | FIDOL assessment completed. No odour (0) was detected 28% of the time. Very weak (1) odour of an indeterminate character was detected 23% of the time. Weak (2) compost odour was detected 23% of the time. Weak (2) solvent odour, with a negative hedonic tone was detected 3% of the time. Distinct (3) compost odour was detected 14% of the time. Distinct (3) solvent odour, with a negative hedonic tone, was detected 1% of the time.<br><br><b>The odour was assessed to be offensive or objectionable.</b> |
| E      | 15:12 | No odour (0) detected.   |
| E to F |       | Weak (2) to distinct (3) compost odour detected.   |
| F      | 15:20 | Weak (2) to distinct (3) compost odour detected.   |
| G      | 15:25 | No odour (0) to distinct (3) compost odour detected.   |
| H      | 15:30 | Wind began to swirl. Intermittent weak (2) cut grass odour detected.   |
| E      | 15:33 | Continuous distinct (3) solvent odour detected.  |
| L      | 15:36 | Intermittent weak (2) compost odour detected.  |
| O      | 15:38 | Intermittent weak (2) compost and woodsmoke odours detected.   |

Compost odours were detected in the residential zone. The compost odour reached a distinct (3) intensity in some locations.

### 3.1.1 Site D

A small amount of distinct (3) compost odour (2 observations in 120) was observed by the two scouts during the 10-minute observations at Site D (at 14:20). In isolation, this would not be sufficient to support an offensive or objectionable conclusion. Distinct (3) compost odour was observed at a higher frequency at 14:37 and 14:50 between Sites O and D during the remainder of the scout. These other observations showed that distinct (3) compost odours were present with a higher frequency in the area than the 10-minute observation at Site D would indicate. As such, the odour was assessed to be offensive or objectionable odour.

The odour observed 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. Negatively hedonic faecal and solvent odours were also present in the area.

### 3.2 1<sup>st</sup> August 2023

██████ was the PDP odour scout. The scout was present for approximately 30 minutes. The weather was clear, with an average temperature of 17 °C and north-westerly to north-north-westerly winds ranging from 8.4 m/s to 9.5 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 (orange dots) and key scouting locations are shown in **Figure 3**.



**Figure 3: 1<sup>st</sup> August 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: 1<sup>st</sup> August 2023 - Odour Scouting Summary**

| Site   | Time  | Observations  |
|--------|-------|---|
| O to D | 12:22 | No odour (0) detected.  |
| D to E | 12:25 | No odour (0) detected.  |
| E to F | 12:29 | Intermittent very weak (1) indeterminate odour detected near F. |
| F to G | 12:33 | No odour (0) detected.  |
| G to H | 12:34 | No odour (0) detected.  |
| H to I | 12:36 | No odour (0) detected.  |



**Table 2: 1<sup>st</sup> August 2023 - Odour Scouting Summary**

| Site   | Time  | Observations           |
|--------|-------|------------------------|
| I to J | 12:39 | No odour (0) detected. |
| J to K | 12:41 | No odour (0) detected. |
| K to L | 12:44 | No odour (0) detected. |
| L to D | 12:49 | No odour (0) detected. |
| D to O | 12:50 | No odour (0) detected. |

The weather forecast had predicted north-easterly winds, but north-westerly winds were observed while scouting. No compost odour was detected in the residential or industrial areas, likely due to the wind direction.

### 3.3 18<sup>th</sup> August 2023

██████████ was the PDP odour scout. The scout was present for approximately 1 hour. The weather was clear, with an average temperature of 11 °C and east-northeast winds ranging from 2.8 m/s to 3.1 m/s as a 10-minute average. The scout started and finished near Site A. The objective was to undertake odour monitoring in the area downwind of the LE Site. The odour scout route (orange dots) and key scouting locations are shown in **Figure 4**.



**Figure 4: 18<sup>th</sup> August 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: 18<sup>th</sup> August 2023 - Odour Scouting Summary**

| Site | Time  | Observations  |
|------|-------|---|
| A    | 13:48 | Intermittent very weak (1) odour detected.  |
| C    | 13:56 | FIDOL assessment completed. No odour (0) was detected 63% of the time. Very weak (1) odour of an indeterminate character was detected 22% of the time. Weak (2) compost odour was detected 8% percent of the time. Weak (2) burnt odour, with a negative hedonic tone, was detected 5% of the time. Distinct (3) compost odour was detected 2% of the time (10 seconds in 6 minutes).<br><br><b>The odour was assessed to be not offensive or objectionable, this is discussed below.</b> |

**Table 3: 18<sup>th</sup> August 2023 - Odour Scouting Summary**

| Site   | Time  | Observations   |
|--------|-------|--|
| B      | 14:08 | Distinct (3) cut grass odour detected.   |
| D      | 14:11 | FIDOL assessment completed. No odour (0) was detected 33% of the time. Very weak (1) odour of an indeterminate character was detected 25% of the time. Weak (2) compost odour was detected 25% of the time. Weak (2) solvent and manure odour, with a negative hedonic tone, was detected 10% of the time. Distinct (3) compost odour was detected 3% of the time. Distinct (3) solvent and manure odours, with a negative hedonic tone, were detected 3% of the time.<br><br><b>The odour was assessed to be offensive or objectionable, this is discussed below.</b> |
| P      | 14:25 | Very intermittent weak (2) to distinct (3) manure odour detected.  |
| E      | 14:28 | No odour (0) detected.   |
| E to D | 14:30 | Continuous weak (2) to distinct (3) compost odour detected.  |
| D      | 14:32 | Continuous weak (2) to distinct (3) compost odour detected.  |
| D to O | 14:33 | Intermittent weak (2) to distinct (3) compost odour detected.  |
| O      | 15:35 | Intermittent very weak (1) to weak (2) compost odour detected.   |
| O to Q | 14:36 | Intermittent very weak (1) to weak (2) compost odour detected.   |
| Q      | 14:38 | No odour (0) detected.   |
| R      | 14:42 | No odour (0) detected.   |
| R to Q |       | No odour (0) detected.   |
| Q to O |       | No odour (0) detected.   |
| O      | 14:49 | No odour (0) detected.   |
| O to D |       | Intermittent weak (2) to distinct (3) compost odour detected.  |
| D      | 14:50 | Intermittent weak (2) to distinct (3) compost odour detected.  |
| B      | 14:53 | Intermittent weak (2) to distinct (3) cut grass odour detected.  |
| C      | 14:55 | Intermittent weak (2) compost odour detected.  |
| C to A |       | Intermittent very weak (1) to weak (2) compost odour detected.   |
| A      |       | Intermittent weak (2) compost odour detected.  |

Three different odours were detected in the residential area during the scout - compost, solvent, and manure.

- ∴ 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.

- ∴ The specific source of the solvent odour was not investigated, however similar solvent odours have been observed from a number of industries in the industrial area previously.
- ∴ The manure odour had a rural character and matched odours previously observed from the paddocks across Dyers Rd towards the estuary.

### 3.3.1 Site C

A single observation of distinct (3) compost odour was made at Site C (during the 13:56 FIDOL assessment). The significant majority (63%) of the observations were of no odour (0), or a very weak (1) indeterminate odour (22%).

The 2% distinct (3) compost odour observed did not constitute an intermittent distinct (3) odour and was not offensive or objectionable. There was no evidence of a higher frequency or a longer duration of distinct (3) odour at Site C, as:

- ∴ A spot observation of odour at Site C, an hour later (14:55, towards the end of the odour scout), did not detect distinct (3) odour; and,
- ∴ The wind was progressively shifting over the course of the day, from northerly in the morning to south-easterly in the evening.

The observed compost odour, therefore, was assessed to be not offensive or objectionable.

### 3.3.2 Site D

Distinct (3) odours of compost (3%), and solvent and manure odours (combined 3%), were present at Site D during the 14:11 FIDOL assessment. Observations of no odour (0) only occurred 25% of the time.

In isolation, the 3% distinct (3) compost odour observed did not constitute an intermittent distinct (3) odour and was not offensive or objectionable. However, distinct (3) compost odour was observed at higher frequencies near Site D during the remainder of the scout (as per Table 3, observations between Sites E and O, between 14:30 and 14:50). As a result of the higher frequency of distinct (3) compost odour observed around Site D, the odour was assessed to be offensive or objectionable during the scout.

## 4.0 Summary

PDP undertook odour scouting on three occasions between 22<sup>nd</sup> July and 18<sup>th</sup> August 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:

∴ 31<sup>st</sup> July 2023

Offensive or objectionable compost odour was observed at Sites D and P, in the residential zone.

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

∴ 1<sup>st</sup> August 2023

The weather forecast had predicted north-easterly winds, but north-westerly winds were observed while scouting. No compost odour was detected in the residential or industrial areas, likely due to the wind direction.

∴ 18<sup>th</sup> August 2023

Offensive or objectionable compost odour was observed at Site D, in the residential zone. The single observation of distinct (3) odour at Site C did not reach the threshold of offensive or objectionable odour.

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



Senior Environmental Engineer

Prepared by



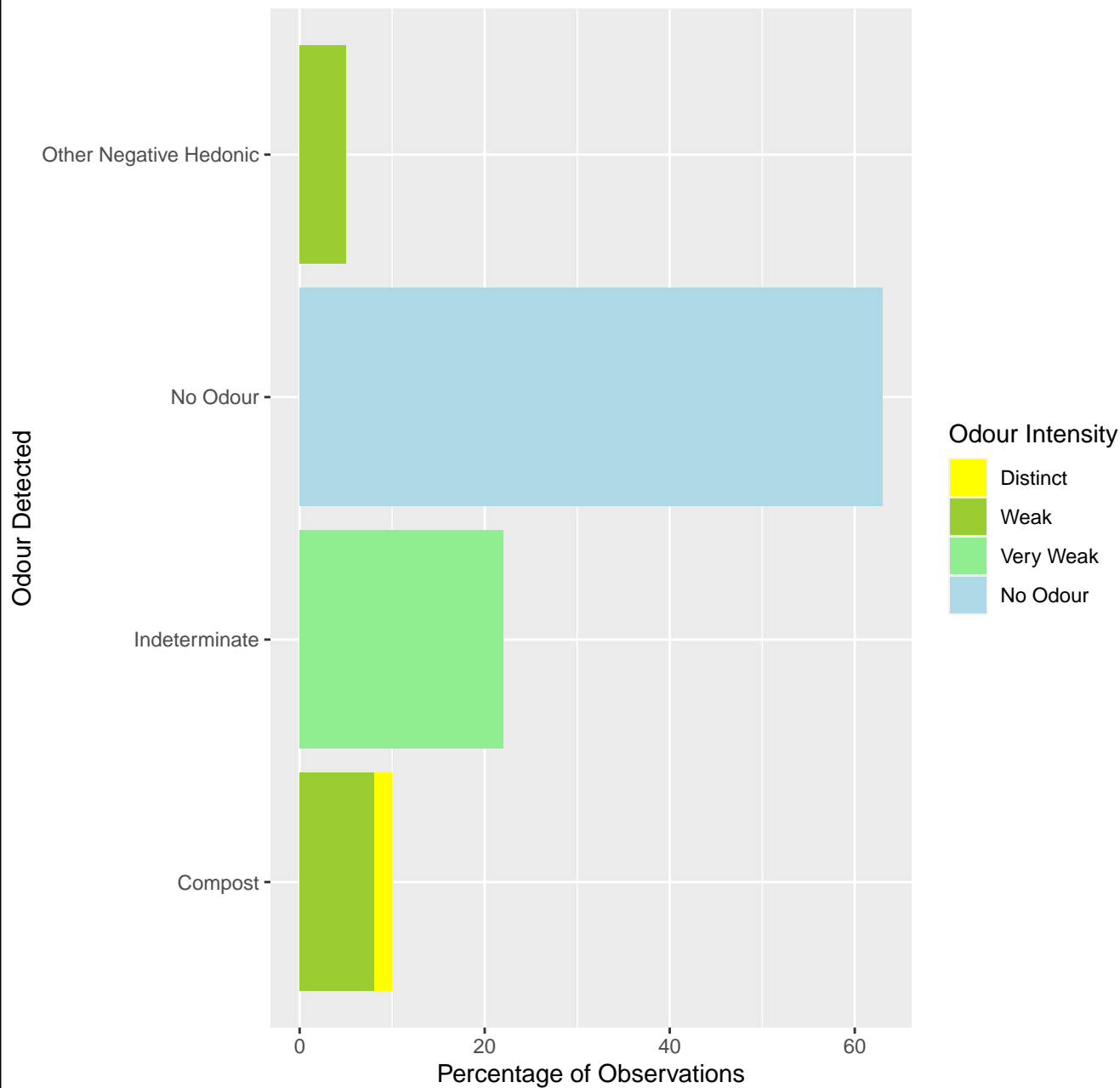
Air Quality Engineer

Reviewed by

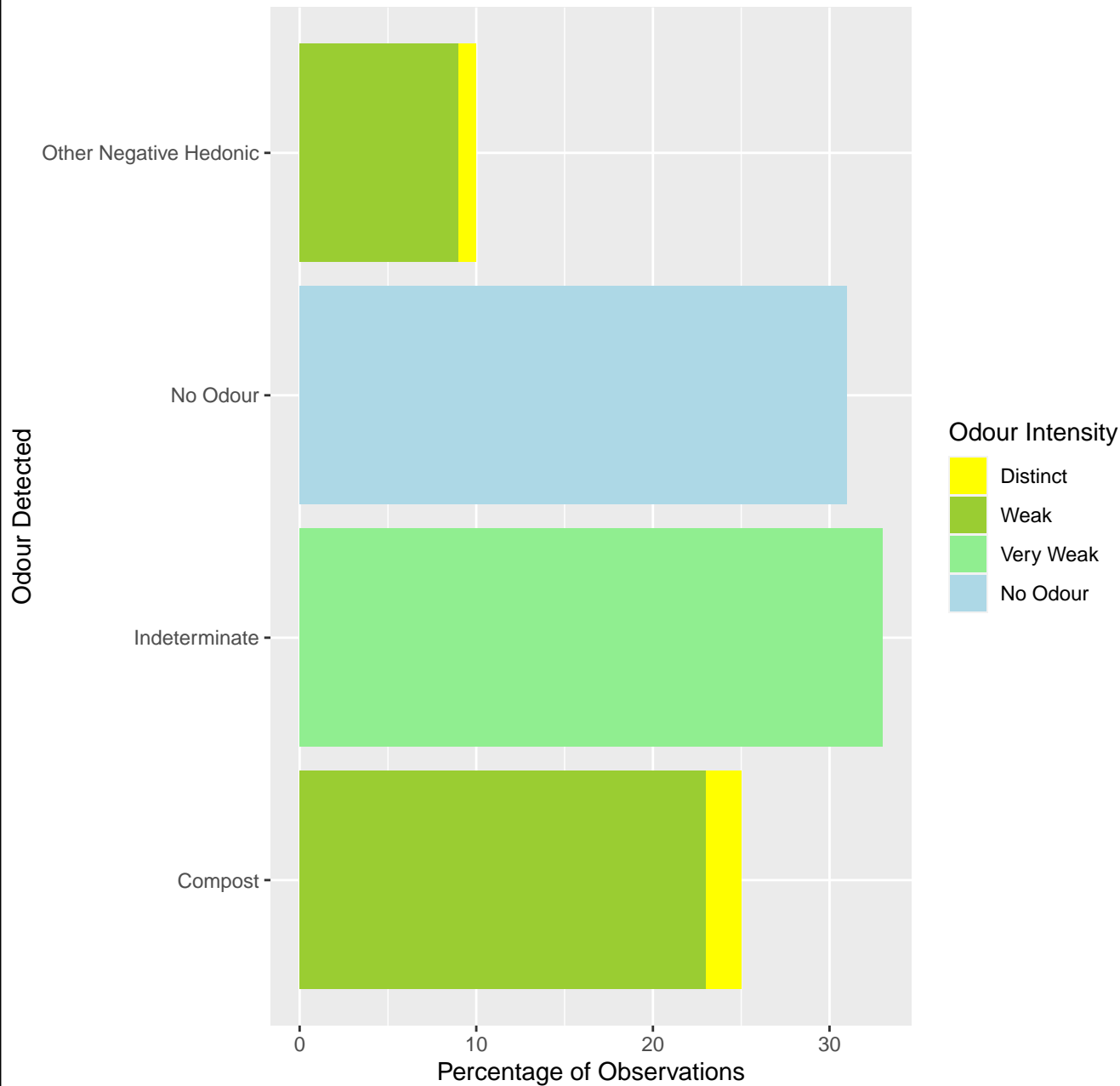


Technical Director

# Site C : Summary of Odours Detected at Site



# Site D : Summary of Odours Detected at Site





# Site P : Summary of Odours Detected at Site

