

**STATEMENT BY [REDACTED] FOR CHRISTCHURCH CITY
COUNCIL DATED 9 MARCH 2023**

1.0 PURPOSE OF STATEMENT

1.1 I am making this statement at the request of the Christchurch City Council (Council).

1.2 I am aware that notices of non-compliance (NONCs) were issued to Living Earth (LE) and/or the Council for 19th December 2022, on the 10th, 15th, 26th and 31st of January and on the 1st March 2023. Environment Canterbury (ECan) has issued infringement notices on Waste Management and on the Council for the events on the four January dates. Those on the Council are for breach of the resource consent and of an abatement notice. I have reviewed the notices and the circumstances of their issue.

1.3 The purpose of this statement is to give my expert opinion on:

- (a) whether there was an offensive and objectionable odour beyond the boundary of the site caused by the LE activity at the Organics Processing Plant (OPP) on the 10th, 15th, 26th and 31st of January;
- (b) whether there was anything happening on the site since December 2022 that might have caused increased odour;
- (c) whether the changes to site activity since ECan issued the NONCs could be reasonably expected to mitigate the odour, and whether any other changes should be made.

2.0 QUALIFICATIONS AND EXPERIENCE

2.1 My full name is [REDACTED].

2.2 I hold the qualifications of Bachelor of Mechanical Engineering from the University of Canterbury and PhD in Mechanical Engineering specialising in combustion, also from the University of Canterbury. I have been working in the areas of environmental management, energy projects and air quality since 2000.

2.3 I am a member of the Clean Air Society of Australia and New Zealand (CASANZ), am a Certified Air Quality Professional (CAQP), and have a 'calibrated' nose for the

purposes of assessing odour having been tested to, and meeting, the requirements of AS/NZS 4323.3:2001 Section 9.7.2.

- 2.4 I have been employed as a Technical Director of Environmental Management with PDP since December 2013. I provide technical advice on assessments of odour from wastewater treatment plants, wastewater irrigation odour assessments, odour from composting facilities, impacts of odour on food processing plants and discharges of odour to air from industrial plant. I have recently (January 2023) accepted a new role within PDP as the Group Director of PDP's water infrastructure business but continue to provide air quality advice to existing clients.
- 2.5 I have previously presented evidence on the potential effects of odour at a number of District, Regional and Environment Court hearings.
- 2.6 I have been advising the Council since January 2022 on:
- (a) My assessment of odour effects;
 - (b) Odour mitigation works;
 - (c) Operational changes that LE could make to mitigate the risk of odour;
 - (d) The merit of non-compliance notices issued by Environment Canterbury;
 - (e) Professional assessment of "chronic" odour;
 - (f) Assessment of "acute" odour.
- 2.7 I have also been providing consultancy services to LE regarding the identification of operational odour sources, assessment of the offsite effects of odour resulting from operations, and potential odour mitigation measures.
- 2.8 Although this is not a Council or Environment Court hearing, I can confirm I have read the Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023 and have complied with it in preparing this statement. My qualifications as an expert are set out above. I confirm that the issues addressed in this statement are within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my statement.

3.0 ODOUR ASSESSMENT METHODOLOGY SUMMARY

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

- **F** Frequency;
- **I** Intensity;
- **D** Duration;
- **O** Offensiveness/Character; and
- **L** Location.

3.2 Odour intensity is reported on a scale of (0-6) as per the MfE's GPG: Odour. As a short summary, PDP applies the following descriptions of each odour intensity:

0	No Odour	No odour.
1	Very Weak	Odour detectable but character not recognisable.
2	Weak	Odour detectable and character barely recognisable.
3	Distinct	Odour character 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 the area but will consider leaving or altering their breathing patterns.
6	Extremely Strong	The odour causes assessor to feel nauseous or compelled to leave the area.

3.3 The odour intensity scale and description presented above is generally consistent with those used by New Zealand air quality professionals.

4.0 NONC'S ISSUED TO LIVING EARTH

4.1 All NONCs (as per Paragraph 1.2) relate to Condition 27 or CRC080301.1 which 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."

4.2 Subsequently, ECan have issued four infringement notices to Waste Management NZ, one for each of the four NONCs in 2023 stating a breach of Condition 27 of their Resource Consent CRC080301.1.

4.3 ECan have also issued eight infringement notices to Christchurch City Council: one for each of the NONCs in January 2023 stating a breach of Condition 27 of their Resource Consent CRC080301.1, and one for each of the NONCs in January 2023 stating contravention of the abatement notice issued on 20th January 2021.

5.0 NONC ISSUED 4:24 PM ON TUESDAY THE 10TH JANUARY 2023

5.1 A NONC was issued to LE at 16:24 on Tuesday the 10th of January 2023.

5.2 The NONC stated that the purpose of the inspection was monitoring and not in response to a complaint.

5.3 The Odour Investigation Form (PE 233582) for the incident shows that a 10-minute assessment of odour was undertaken, starting at 14:35. The precise location is not clear however the figure below (drawn from the PE 233582 report) implies the location of the PE 233582 assessment was on Bayswater Crescent.



- 5.4 Odour intensities reported in the 10-minute assessment were 58% no odour (0), 17% very weak (1), 23% weak (2) and 2% distinct (3). Odour characters were all described as compost with the exception of a single very weak (1) coffee-like odour.
- 5.5 Odour characters were ascribed to very weak (1) intensity odours. Referring to Paragraph 3.2 above, PDP classify very weak (1) odours as odours that are detectable but do not possess a recognisable character. This highlights potential differences between how PDP and ECan assess odour intensity.
- 5.6 Odours identified by the compliance officer in their 360° assessment were as follows:
- (a) Site 1 - distinct (3) sea/marine.
 - (b) Site 2 - weak (2) sewer odour.
 - (c) Site 3 - No odour (0).
 - (d) Site 4 - Weak (2) rubbish.
 - (e) Site 5 - Weak (2) sweet.
 - (f) Site 6 - Weak (2) compost.

Observations at sites 4 and 6 identify the character of the odour to be that of the sources they are immediately downwind of. Sites 1, 2 and 3 establish the presence or lack thereof of upwind/crosswind odours to the LE site. The observation at Site 5 - a weak (2), sweet odour, is inconsistent with the character of the odours reported over the full 10-minute observation.

- 5.7 The compliance officer concluded “I did detect odour and consider it to be objectionable even in periods of short duration”. PDP would not typically consider 2% distinct (3) and 23% weak (2) odour over a short duration to be offensive or objectionable in a residential area. However, similar to Paragraph 5.5, ECan may also be categorising weak (2) and distinct (3) odour intensities differently and we would caution interpreting the odour intensities reported by ECan officers with the specific intensity criteria used by PDP (Paragraph 3.2).
- 5.8 No assessment was made by the compliance officer to establish as to whether the distinct (3) odour was present intermittently for a sustained period outside of the 10-minute assessment window.
- 5.9 It is unusual that a distinct (3) odour was observed in the residential area when only weak (2) odours were observed at the plant boundary. Typically, odour reduces in intensity with distance from the source.

5.10 LE report that ECan visited the site during their investigation and observed the odour from several sources on the site.

5.11 Two Smelt-It reports were generated on the day, summarised below.

Smelt-It Date	Time	Windspeeds ¹	Wind Directions ¹	Intensity	Character
10-Jan-2023	16:00	7.9 - 9 m/s	ENE	3 - acceptable	Sea/marine Meaty, Rancid, Dead Animal, decayed
	19:53	7.4 - 8.1 m/s	ENE	3 - objectionable	Sea/marine, Fishy Meaty, Rancid, Dead Animal, decayed

¹ As recorded at the NIWA Bromley Weather Station for the hour preceding the report.

5.12 Locations of the Smelt-It reports have not been made available by ECan on the basis of privacy. PDP are therefore unable to use wind data to assess the potential sources of the odour attributable to each complaint. Compost odours are not reported in the Smelt-It reports.

5.13 The wind conditions in the two hours preceding issuance of the NONC was a strong east north-easterly (between 57 and 67 degrees) with windspeeds ranging between 7.9 and 9.3 m/s. This is similar to the conditions of the two Smelt-It reports generated on the day.

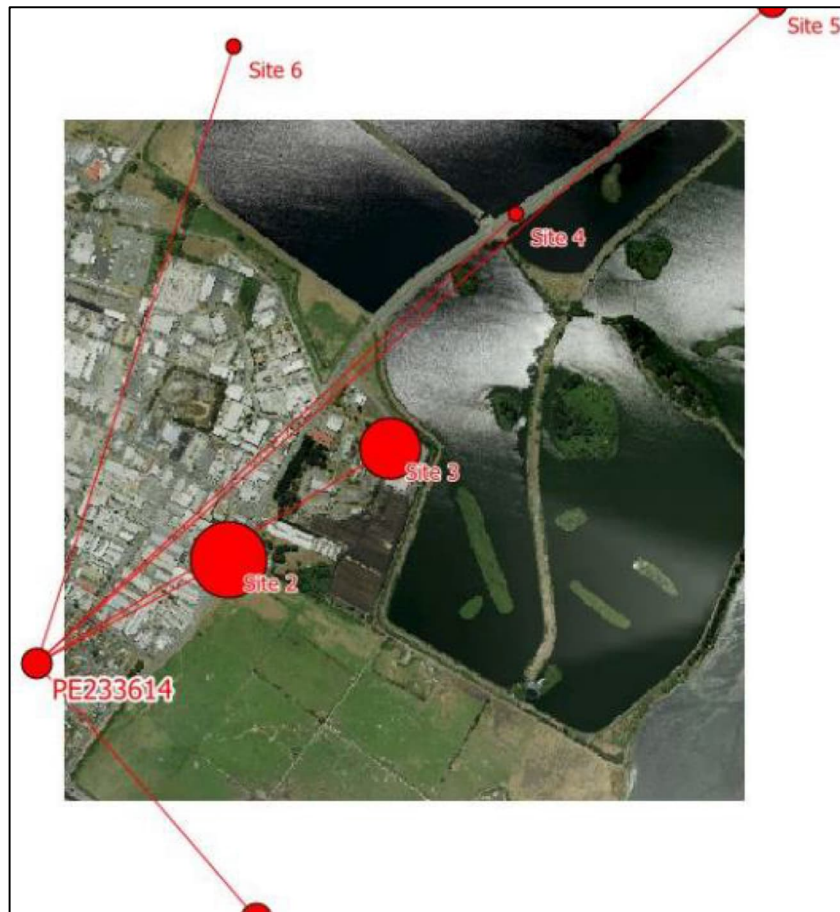
5.14 PDP does not have evidence that is directly contrary to ECan's conclusions on the day that there was a breach. A wider discussion of this NONC, and the others is included below in Section 10.0.

6.0 NONC ISSUED 12:18 PM ON SUNDAY THE 15TH JANUARY 2023

6.1 A NONC was issued to LE at 12:18 on Sunday the 15th of January 2023.

6.2 The NONC stated that the purpose of the inspection was in response to a complaint.

6.3 The Odour Investigation Form (PE 233614) for the incident shows that a 10-minute assessment of odour was undertaken, starting at 12:18 near Bayswater Reserve/Seascape Gardens.



- 6.4 Odour intensities reported in the 10-minute assessment were 68% no odour (0), 3% very weak (1), 10% weak (2), 13% distinct (3) and 5% strong (4) odour. The odour character for all observations included compost. Some observations also included silage and herbal/cut green grass character descriptions.
- 6.5 Odour characters were ascribed to very weak (1) intensity odours. Referring to Paragraph 3.2 above, PDP classify very weak (1) odours as odours that are detectable but do not possess a recognisable character. This again highlights potential differences between how PDP and ECan assess odour intensity.
- 6.6 Odours identified by the compliance officer in their 360° assessment were as follows:
- (a) Site 1 - weak (2) sea/marine/estuarine.
 - (b) Site 2 - very strong (5) compost, herbal and rubbish.
 - (c) Site 3 - Strong (4) compost and EcoDrop.
 - (d) Site 4 - No odour (0).
 - (e) Site 5 - Weak (2) sea/marine.
 - (f) Site 6 - No odour (0).

The 360° assessment shows a consistent trend of strong to very strong odours on and immediately downwind of the site, in comparison to the lower odour intensity at the residential area.

- 6.7 The very strong (5) odour intensity observed at the boundary and strong (4) intensity observed in the residential zone has not been observed by PDP staff during their proactive monitoring in the field. Strong (4) odours are occasionally observed by PDP staff close to the LE site boundary on Dyers Road but have not been observed at any significant downwind distance. Similar to Paragraph 6.5, ECan may be categorising strong (4) and very strong (5) odour intensities differently from the PDP assessment. Therefore, we would caution interpreting the odour intensities reported by ECan officers with the specific intensity criteria used by PDP (Paragraph 3.2).
- 6.8 The compliance officer concluded “I did detect odour and consider it to be objectionable even in periods of short duration”. PDP would consider the reported frequency of distinct (3) and strong (4) compost odours (as we interpret the intensity scale) in a residential area to be offensive or objectionable over a short duration. However, we note (as per Paragraphs 6.5 and 6.7) that ECan may be applying the intensity scale differently from the way it is applied by PDP.
- 6.9 LE have advised that the only activity at the site was one operator moving green waste into the Organics Processing Plant building. There were no other operational activities occurring such as the unloading of tunnels, screening of the fresh compost or trucks being loaded out.
- 6.10 Therefore, the only activities that could have been a source of odour onsite that PDP are aware of are the biofilter and fugitive emissions from the material stored on-site, namely the unscreened compost, and screened fines and tailings. This reduces the likelihood that a process upset was the cause of the high odour intensity (4 to 5) observed by the ECan beyond the boundary of the site.
- 6.11 Twelve Smelt-It reports were generated on the day; these are summarised below.

Smelt-It Date	Time	Windspeeds ¹	Wind Directions ¹	Intensity	Character
15-Jan-2023	09:55	5.4 - 5.9 m/s	NE - ENE	3 - objectionable	Meaty, Rancid, Dead Animal, decayed
	11:04	5.9 - 6.5 m/s	NE - ENE	6 - objectionable	Rubbish Compost, Silage, Herbal, cut grass Other
	11:12	5.9 - 6.5 m/s	NE - ENE	4 - objectionable	Compost, Silage, Herbal, cut grass Rubbish

11:15	5.9 - 6.5 m/s	NE - ENE	5 - objectionable	Rubbish Compost, Silage, Herbal, cut grass
11:15	5.9 - 6.5 m/s	NE - ENE	5 - objectionable	Compost, Silage, Herbal, cut grass Rubbish
14:05	7.9 - 8.4 m/s	ENE	6 - objectionable	Compost, Silage, Herbal, cut grass
14:23	7.9 - 8.6 m/s	ENE	6 - objectionable	Rubbish Compost, Silage, Herbal, cut grass Meaty, Rancid, Dead Animal, decayed Faecal, Sickening
14:23	7.9 - 8.6 m/s	ENE	6 - objectionable	Compost, Silage, Herbal, cut grass Rubbish
15:52	7.5 - 8.3 m/s	ENE	5 - objectionable	Compost, Silage, Herbal, cut grass
19:26	7.2 - 7.8 m/s	ENE	3 - objectionable	Meaty, Rancid, Dead Animal, decayed Sea/marine, Fishy
21:02	6.4 - 7.9 m/s	ENE	6 - objectionable	Rubbish Compost, Silage, Herbal, cut grass Meaty, Rancid, Dead Animal, decayed Sea/marine, Fishy Sewer odour Faecal, Sickening
21:04	6.4 - 7.9 m/s	ENE	5 - objectionable	Compost, Silage, Herbal, cut grass

¹ As recorded at the NIWA Bromley Weather Station for the hour preceding the report.

- 6.12 Locations of the Smelt-It reports have not been made available by ECan on the basis of privacy. PDP are therefore unable to use wind data to assess the potential sources of the odour attributable to each complaint. Compost is identified as an odour character in all but two reports.
- 6.13 The wind conditions in the hour preceding issuance of the NONC was a strong east north-easterly (between 61 and 65 degrees) with windspeeds ranging between 6.5 and 7.3 m/s. This is similar to the conditions when the Smelt-It reports were generated on the day.
- 6.14 Smelt-it complaints appear to corroborate the conclusions drawn by ECan. The odour intensity reported in the majority of the Smelt-It reports (5-6) has not been observed by PDP staff in the field. Strong (4) odours are occasionally observed by PDP staff in the field close to the LE site boundary on Dyers Road but have not been observed at any significant downwind distance. While not invalidating the detection of odour by the reporter, the intensities reported may not be consistent with the scale adopted by PDP (Paragraph 3.2 above).
- 6.15 Based upon PDP's understanding of site activities on the Sunday, unusually high intensity odours are unlikely to have been caused by a process upset.

6.16 PDP does not have evidence that is directly contrary to ECan's conclusions on the day that there was a breach. A wider discussion of this NONC, and the others is included below in Section 10.0.

7.0 NONC ISSUED 9:22 PM ON THURSDAY THE 26TH JANUARY 2023

7.1 A NONC was issued to LE at 21:22 on Thursday the 26th of January 2023.

7.2 The NONC itself does not indicate whether the purpose of the inspection was in response to a complaint or proactive monitoring however the Odour Complaint Investigation form stated that the investigation was in response to a complaint.

7.3 The NONC details state "Discharge of offensive or objectionable odour substantiated beyond property boundary contrary to consent conditions."

7.4 The Odour Complaint Investigation Form (PE 2333743) for the incident shows that a 10-minute assessment of odour was undertaken at 1 Glenbyre Place starting at 8:31pm. The Odour Complaint Investigation Form (PE 233778) for the incident shows that a 10-minute assessment of odour was undertaken. Odour intensities reported were 20% no odour (0), 2% very weak (1), 13% weak (2), 32% distinct (3) and 15% strong (4).

7.5 PDP note some peculiarities with the observations recorded on the investigation form¹.

(a) With the exception of the 4th minute, the same odour intensity and character is recorded for each observation within each minute. In PDP's experience odour intensity fluctuates on a sub minute frequency hence the requirement for 10 second observations over 10 minutes.

(b) An odour character is recorded against a very weak (1) odour intensity. Referring to Paragraph 3.2, PDP classify very weak odours as odours that are detectable but do not possess a recognisable character. This highlights potential differences between how PDP and ECan assess odour intensity.

¹ We note the investigation form recorded a NW wind direction, which would imply the area investigated was not downwind of Living Earth. PDP understand this to be a typo/error by ECan. The Bromley EWS (NIWA) recorded an easterly wind, placing the area investigated directly downwind of Living Earth. The compliance officer correctly did their assessment assuming Living Earth was upwind.

- (c) Odour intensities recorded during the 360° assessment at Trotters Powder Coatings (231 Dyers Road), Flo-Rite Drainage (247 Dyers Road) and the LE reception were recorded as 2, 4 and 3 respectively. In PDP’s experience it would be unusual, even in light winds, for the odour intensity not to decrease as you move downwind from the source to the observation point (1 – 1.5 km in this case). The observations are however not impossible as there is a time difference between the 10-minute assessment and the observations made in the 360° assessment during which conditions could have changed.
- (d) The compliance officer concluded “I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis”. No assessment was then made to establish whether the odour was present on a regular or frequent basis. PDP however note that (as per Paragraph 7.7), meteorological conditions were relatively consistent from at least 19:20 to 22:20 on that evening. Similarly, ECan could provide the assessment retrospectively using Bromley station meteorological data and site activity records.

7.6 The strong (4) odour intensity observed in the residential zone has not been observed by PDP staff during their proactive monitoring in the field. Strong (4) odours are occasionally observed by PDP staff close to the LE site boundary on Dyers Road but have not been observed at any significant downwind distance. While not invalidating the detection of odour by the compliance officer, the intensities reported may not be consistent with the scale adopted by PDP (Paragraph 3.2 above). We caution against interpreting the odour intensities reported by ECan officers with the specific intensity criteria used by PDP (Paragraph 3.2).

7.7 Fourteen Smelt-It reports were generated on the day; these are summarised below.

Smelt-It Date	Time	Windspeeds ¹	Wind		Intensity	Character
			Directions ¹			
26-Jan-2023	19:23	1.9 - 2.8 m/s	E - ESE		4 - objectionable	Compost, Silage, Herbal, cut grass
	19:29	1.9 - 2.8 m/s	E - ESE		3 - objectionable	Compost, Silage, Herbal, cut grass
	19:56	1.7 - 2.8 m/s	E - SE		5 - objectionable	Compost, Silage, Herbal, cut grass
	20:00	1.6 - 2.8 m/s	E - SE		6 - objectionable	Rubbish Compost, Silage, Herbal, cut grass
	20:01	1.6 - 2.8 m/s	E - SE		6 - objectionable	Compost, Silage, Herbal, cut grass
	20:02	1.6 - 2.8 m/s	E - SE		6 - objectionable	Compost, Silage, Herbal, cut grass
	20:11	1.6 - 2.8 m/s	E - SE		4 - objectionable	Compost, Silage, Herbal, cut grass

20:17	1.6 - 2.8 m/s	E - SE	6 - objectionable	Compost, Silage, Herbal, cut grass
20:22	1.6 - 2.8 m/s	E - SE	6 - objectionable	Compost, Silage, Herbal, cut grass Rubbish
20:31	1.6 - 2.5 m/s	E - SE	6 - objectionable	Compost, Silage, Herbal, cut grass
21:09	1.5 - 2.5 m/s	ESE - SE	3 - objectionable	Faecal, Sickening
21:31	1.1 - 2.5 m/s	E - SE	4 - objectionable	Compost, Silage, Herbal, cut grass Rubbish
21:41	1.1 - 2.3 m/s	E - ESE	6 - objectionable	Rubbish Compost, Silage, Herbal, cut grass
22:29	1.7 - 2.4 m/s	ESE - SE	3 - objectionable	Rubbish Compost, Silage, Herbal, cut grass Faecal, Sickening

¹ As recorded at the NIWA Bromley Weather Station for the hour preceding the report.

7.8 Locations of the Smelt-It reports have not been made available by ECan on the basis of privacy. PDP are therefore unable to use wind data to assess the potential sources of the odour attributable to each complaint.

7.9 The wind conditions in the hour preceding issuance of the NONC was a light E to SE direction (between 79 and 131 degrees) with windspeeds ranging between 1.6 m/s and 2.5 m/s. This is consistent with the conditions when the Smelt-It reports were generated. The wind direction also places Glenbyre Place downwind of Living Earth during ECan's investigation.

7.10 The odour intensity reported in the majority of the Smelt-It reports (6) has not been observed by PDP staff in the field. Strong (4) odours are occasionally observed by PDP staff close to the LE site boundary on Dyers Road but have not been observed at any significant downwind distance. While not invalidating the detection of odour by the reporter, the intensities reported may not be consistent with the scale adopted by PDP (Paragraph 3.2 above).

7.11 PDP does not have evidence that is directly contrary to ECan's conclusions on the day that there was a breach. A wider discussion of this NONC, and the others is included below in Section 10.0.

8.0 NONC ISSUED 4:42 PM ON TUESDAY THE 31ST JANUARY 2023

8.1 A NONC was issued to LE at 16:42 on Tuesday the 31st of January 2023.

8.2 The NONC indicates the inspection was in response to a complaint.

- 8.3 The NONC details states “Discharge of offensive or objectionable odour substantiated beyond property boundary contrary to consent conditions.”
- 8.4 The Odour Complaint Investigation Form (PE 233778) for the incident shows that a 10-minute assessment of odour was undertaken on Bayswater Crescent starting at 2:38pm.



- 8.5 Odour intensities reported in the 10-minute assessment were 70% no odour (0), 7% very weak (1), 15% weak (2) and 8% distinct (3) odour. Odour characters were all reported as compost.
- 8.6 Odour characters were ascribed to very weak (1) intensity odours. Referring to Paragraph 3.2 above, PDP classify very weak (1) odours as odours that are detectable but do not possess a recognisable character. This highlights potential differences between how PDP and ECan assess odour intensity.
- 8.7 Odours identified by the compliance officer in their 360° assessment were as follows:
- (g) Site 1 - distinct (3) sea/marine.
 - (h) Site 2 - distinct (3) sewer.

- (i) Site 3 - No odour (0).
- (j) Site 4 - strong (4) compost.
- (k) Site 5 - No odour (0).
- (l) Site 6 - weak (2) compost.

The odour intensity at Bayswater Crescent is generally consistent with the odour that PDP observed on Woburn Street in our proactive monitoring on the same day.

- 8.8 LE advised that during the afternoon (after 13:00 hrs):
- (a) Screened fine material was being removed from the site until 15:30; and,
 - (b) Screening occurred until 16:30.

- 8.9 Two Smelt-It reports were generated on the day; these are summarised below. Both reported odour profiles that included compost, and an intensity of 6. Windspeeds were from an ENE direction, with windspeeds of approximately 5 m/s.

Smelt-It Date	Time	Windspeeds ¹	Wind Directions ¹	Intensity	Character ²
31-Jan-2023	13:56	4.9 - 5.3 m/s	ENE	6 - objectionable	Compost, Silage, Herbal, cut grass Meaty, Rancid, Dead Animal, decayed Faecal, Sickening Other
	14:33	5 - 5.3 m/s	ENE	6 - objectionable	Compost, Silage, Herbal, cut grass

¹ As recorded at the NIWA Bromley Weather Station for the hour preceding the report.

- 8.10 Locations of the Smelt-It reports have not been made available by ECan on the basis of privacy. PDP are therefore unable to use wind data to assess the potential sources of the odour attributable to each complaint.
- 8.11 The wind conditions in the hour preceding issuance of the NONC was a moderate strong east-north-eastly (between 62 and 76 degrees) with windspeeds ranging between 5 and 5.3 m/s. These conditions are consistent with those under which the Smelt-it reports were generated.
- 8.12 The odour intensity reported in the Smelt-It reports (6) has not been observed by PDP staff in the field. PDP staff were present in the residential zone during the window in which the complaint was investigated by ECan staff and did not experience the same intensity. While not invalidating the detection of odour in the Smelt-It reports, the intensities reported may not be consistent with the scale adopted by PDP (Paragraph 3.2 above), nor with that used by ECan.

8.13 A PDP odour scout was present in the Bromley area during the window in which the complaint was investigated by ECan staff. A report of that 31st January proactive monitoring is appended to this report². Notable conclusions from this odour scout were:

- (a) The odour at the corner of St Johns Street and Maces Road was not considered offensive or objectionable.
- (b) Within the industrial area, along Newton and Tanya Street, intermittent distinct (3) compost odour was detected. This was not considered offensive or objectionable by the scout.
- (c) No notable compost odour was detected walking approximately 150 metres up Dyers Road from the Maces Road intersection. Weak (2) compost odour was first detected after this point.
- (d) The frequency and intensity of compost odour observed at Woburn/Newton Street, occurring over the period of the afternoon, would be considered offensive and objectionable.

8.14 Therefore, on the balance of the evidence, PDP consider the odour would have been offensive or objectionable at Woburn Street (beyond the boundary of the site) on the afternoon of the 31st January 2023.

9.0 SUMMARY OF PROACTIVE ODOUR SCOUTING UNDERTAKEN BY PDP IN EARLY JANUARY

9.1 PDP have been undertaking proactive odour scouting in the Bromley area on behalf of CCC and LE. While scouting, PDP have generally made odour observations at several key areas of interest, shown below. These represent the downwind boundary of the site (F, G, H and M), the residential-industrial boundary (E, L, O), the industrial zone (I, J, K, N) and the residential zone (A, C, B, D, P).

² Living Earth Odour Monitoring: 31st January Walkover Summary (2023) *Pattle Delamore Partners Ltd. (draft to CCC)*



9.2 PDP odour scouting has occurred when NE or ENE winds are forecast to occur. A summary of the scouting dates and conditions from October 2022 through to 31st January 2023 is included below.

Date	Approx. Start	Approx. End	Windspeeds ¹	Wind Directions ¹	Day
16 October	14:00	14:29	3.5 - 3.8 m/s	NE	Sunday
1 November	12:14	13:12	4.7 - 5.6 m/s	ENE	Tuesday
12 December	15:23	16:55	5.3 - 6.4 m/s	N	Monday
13 January	11:11	13:14	4.2 - 5.1 m/s	NE - ENE	Friday
16 January	14:32	16:49	6.6 - 8 m/s	ENE - E	Monday
18 January	15:55	17:08	6.6 - 7.4 m/s	E	Wednesday
20 January	10:16	14:53	2.8 - 5.2 m/s	NE - E	Friday
31 January	15:30	16:35	5.5 - 6.4 m/s	ENE	Tuesday

¹ As recorded at the NIWA Bromley Weather Station.

9.3 The following summary trends have been observed:

- (a) During the 16th October and 1st November 2022 scouts, no compost odour was detected in the residential zones. Compost odours from weak (2) to distinct (3) were detected in the industrial zone.
- (b) During the 12th December 2022 scout, weak (2) compost odours were detected at Woburn Street. Compost odours from weak (2) to distinct (3) were detected in the industrial zone.

(c) During the January 2023 scouting, weak (2) compost odours were detected (at least once) at all residential locations reported. Offensive or objectionable odour in the residential area was detected on the 31st January 2023. Compost odours, ranging from weak (2) to distinct (3) were consistently detected in the industrial zone. Strong (4) compost odours were detected on one occasion along Dyers Road.

9.4 PDP have visited the LE site on several occasions and determined that the character of the biofilter odour is different to the odour which can be recognised offsite. The character of the offsite odour is alike to the odour experienced immediately downwind of the on-site material piles, which are a combination of the unscreened compost, and screened tailings and fines piles.

10.0 COMPARISON OF NONCS TO FINDINGS OF PDP PROACTIVE ODOUR SCOUTING

10.1 The conditions during each NONC issued in January 2023 are summarised below.

NONC Date	Earliest Smelt-It Report	NONC Issued	Windspeeds ¹	Wind Directions ¹	Day
10 January	15:24	16:24	8.2 - 8.6 m/s	ENE	Tuesday
15 January	11:13	12:18	6.5 - 7.3 m/s	ENE	Sunday
26 January	19:27	20:31	1.6 - 2.8 m/s	E - SE	Thursday
31 January	14:01	16:38	5.0 - 5.3 m/s	ENE	Tuesday

¹ As recorded at the NIWA Bromley Weather Station.

10.2 The January 31st 2023 NONC was corroborated by PDP's proactive odour scouting on the day.

10.3 PDP were not present in the area on the 10th, 15th or 26th of January 2023 to corroborate the offensive or objectionable odour reported by ECan.

10.4 ECan officers appear to apply the odour intensity scale differently to PDP³ (as defined in Paragraph 3.2). Because of this, we have limited capability to critique the conclusions they draw in their FIDOL assessments on the basis of the odour intensities observed. If PDP were to interpret ECan's intensity observations according to PDP's odour intensity classification (Paragraph 3.2), we would conclude:

³ As observed in Paragraphs 5.5, 5.7, 6.5, 6.7, 7.5, 7.6 and 8.6.

- (a) On the 10th January 2023, as discussed in Paragraph 5.7, we would not consider the level of reported odour (according to PDP's intensity scale) to be offensive or objectionable in periods of short duration.
 - (b) On the 15th January 2023, as discussed in Paragraph 6.8, we would (according to PDP's intensity scale) consider the reported odour to be offensive or objectionable in periods of short duration.
- 10.5 The complaints on the 10th and 15th January 2023 occurred during ENE conditions with windspeeds greater than 5 m/s. PDP odour scouting identified offensive or objectionable odours in the residential zone near Bayswater Reserve during similar meteorological conditions on 31st January 2023.
- 10.6 Regarding the 10th January 2023 NONC, PDP considers that:
 - (a) The occurrence of a breach on the day is plausible, considering the meteorology on the day and the observations on the 31st January 2023.
 - (b) The FIDOL assessment by ECan did not (according to PDP's intensity scale) robustly support the conclusion of offensive or objectionable odour in periods of short duration; but,
 - (c) Considering the potential difference in application of the intensity scale between PDP and ECan (and point 10.6.a above), PDP cannot establish the odour was not offensive or objectionable, against the evidence of the compliance officer who was present for the assessment.
- 10.7 Regarding the 15th January 2023 NONC, considering the FIDOL assessment undertaken by ECan, the meteorology on the day and the observations on the 31st January 2023, the occurrence of a breach on the day is plausible.
- 10.8 Regarding the 26th January 2023 NONC, PDP considers that:
 - (a) The occurrence of a breach on the day is unusual (but not impossible), as it occurred further from the site and in a more easterly location than PDP understands complaints have historically come from.
 - (b) Several elements of the FIDOL assessment are peculiar as discussed in Paragraph 7.5.
 - (c) Elements of the assessment, needed to robustly support the conclusion of objectionable odour if it occurred on a regular or frequent basis, was not provided. No assessment was made to establish whether the odour was present in the area on a regular or frequent basis. This deficiency in the

assessment could be corrected by ECan retrospectively by analysing meteorological and site activity data.

- (d) PDP cannot establish the odour was not offensive or objectionable on the 26th January 2023, only that the observations are not consistent with our own observations of the area on other days.

11.0 ONSITE OPERATIONAL ACTIVITIES AND EFFECT ON OFFSITE ODOUR

11.1 In 2021 and 2022, prior to the expiration of the abatement notice period⁴, LE made significant changes to outdoor operations including:

- (a) Ceasing the onsite maturation of compost in windrows prior to screening;
- (b) Adding a probiotic to increase the in-vessel composting (IVC) process rate;
- (c) Screening immature compost straight from the IVC tunnels;
- (d) Promptly transporting immature screened compost offsite;
- (e) Reducing volumes of screened tailings stored prior to reprocessing; and,
- (f) Creating an enlarged buffer zone to the south and west between their operations and the site boundary.

11.2 Following the expiration of the abatement notice period, PDP understands that LE continued to reduce the amount of screened tailings stored on-site to approximately 1,200 – 1,500 tonnes.

11.3 PDP have previously (April 2022) assessed the potential onsite sources of odour from the post abatement operations to include⁵:

- (a) Fugitive emissions from the organics processing plant (OPP), namely the IVC tunnels and processing hall;
- (b) The biofilter, which processes ventilation air from the IVC tunnels and processing hall;
- (c) The operation of the main enclosed screening plant (with associated biofilter);
- (d) Storage of material onsite, including screened tailings and fines; and,
- (e) Handling of material onsite, including removal of fines from site.

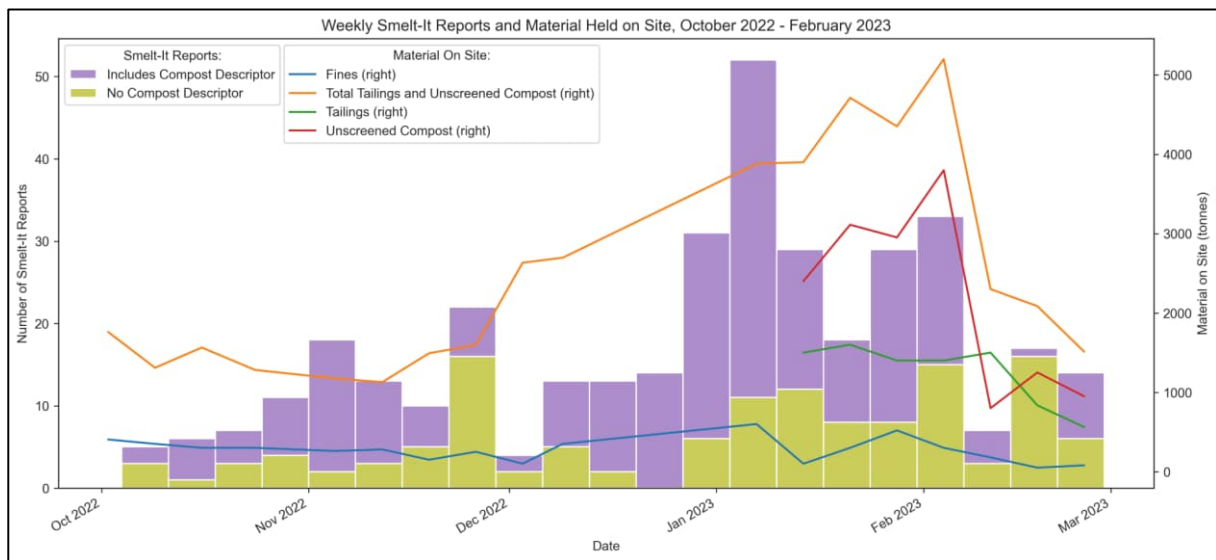
⁴ Living Earth Odour Assessment (14 February 2022) *PDP*

⁵ Living Earth Odour Assessment: Current Operations, Controls & Effectiveness (14 April 2022) *PDP*

- 11.4 Odours resulting from 11.3(a) and 11.3(b) have not been detected beyond the boundary of the site.
- 11.5 The character of odours resulting from 11.3(c), 11.3(d) and 11.3(e) are not able to be readily discriminated beyond the boundary of the site.
- 11.6 PDP understands that since late November, the site has been experiencing operational issues that are likely to have resulted in an increase in odour generated. Based on information received from LE, the issues can be summarised as follows:
- (a) A partial collapse of the floor of the biofilter; and
 - (b) A series of equipment failures on the main screen between the 27th of November 2022 and the 21st of January 2023.
- 11.7 Based on observations of the character and intensity of odour discharges from the biofilter by PDP staff during a site visit in January 2022, it appears that the biofilter itself continues to be effective in treating the odour from the composting tunnels.
- 11.8 PDP has been made aware that there is a plan in place to replace the OPP biofilter floor and media by early April. PDP is also aware that the floor of the screen biofilter was replaced in early February, with the filter media replaced at the same time.
- 11.9 In PDP's opinion the equipment failures on the main screen have had a more significant potential impact on offsite odour. The failures have resulted in two major changes to site operations:
- (a) The throughput of the mobile screening plant was not sufficient to keep up with the production from the OPP. This resulted in unscreened compost being stockpiled on the site, which could have turned anaerobic.
 - (b) Compost screening had to be carried out outdoors using the backup mobile screening plants. Odours from this process (potentially also heightened by the age of the unscreened compost piles) were not able to be captured and directed through the screen biofilter.
- 11.10 The increase in volumes onsite will increase the potential for offsite odour in two ways:
- (a) A larger surface area of material onsite will result in a greater odour discharge rate, requiring a greater distance of downwind dilution before the odour drops in intensity below levels where there is an off-site effect (offensive and objectionable); and,

(b) Unscreened compost is denser than screened tailings so will more quickly become anaerobic, potentially resulting in the release of more offensive and objectionable odours when disturbed (such as when being screened).

11.11 Information provided to PDP⁶, and shown in the figure below alongside a summary of the Smelt-It reports (February data as of yet not received), indicates that the material stored onsite increased from approximately 1,500 tonnes in October to November to a peak of 5,200 tonnes in the December to March period. The amount of fines stored onsite remained consistent. The split between tailings and unscreened compost was not reported to CCC prior to the week of the 16th January.



11.12 Unscreened compost primarily appears to be the cause of the increase in material onsite, as the increase in total tailings and unscreened compost coincides with the first failure of the main screen.

11.13 In PDP's opinion, the operational issues experienced by LE would have created additional sources of onsite odour and are a contributing factor to the increases in compost odour intensity detected offsite.

11.14 Volumes of kerbside organics (KSO) processed by the plant are highest during spring and summer. This increase in material throughput at the plant reduced composting times in the in-vessel composting tunnels from approx. 21 to approx. 14 days, which created a less mature and potentially more odorous compost.

11.15 The failure of the main screen was therefore exacerbated by the season in which it occurred in two ways:

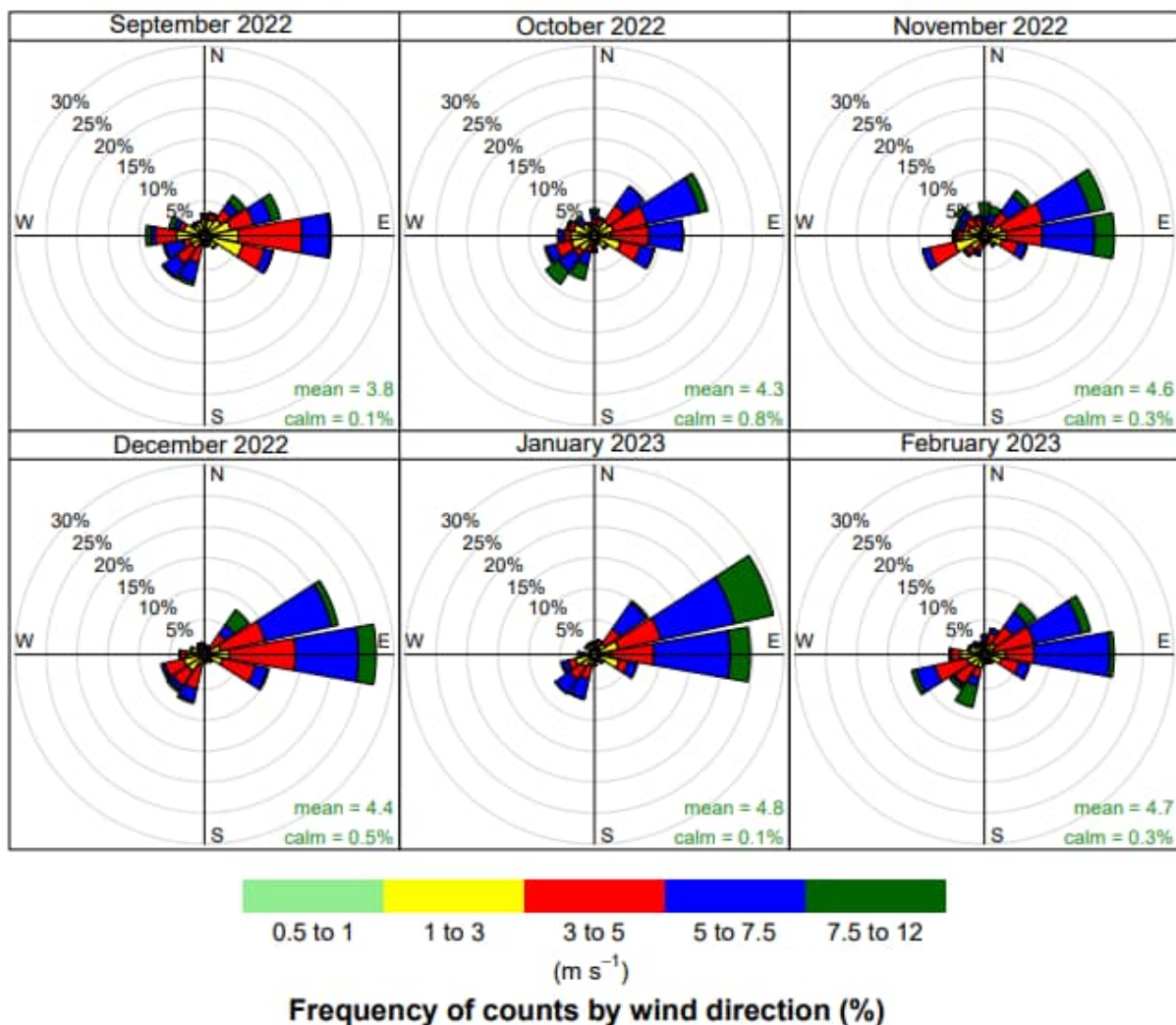
⁶ Weekly summaries of material held onsite, provided to CCC by Living Earth.

- (a) Greater throughput at the plant meant unscreened compost accrued faster on site than it would have in winter; and,
- (b) The compost produced was less mature and therefore more prone to produce odour.

12.0 METEOROLOGY AND THE EFFECT ON OFFSITE ODOUR

12.1 Another contributing factor to the increase in Smelt-It complaints seen in January is the frequency of north-easterly winds which carry odour from the LE site in the direction of the closest residential zone to the LE site (around Bayswater Reserve). Windroses for the complete months of September through February, sourced from NIWA’s Bromley weather station, are provided in the figure below.

Monthly windroses September 2022 – January 2023



- 12.2 The windroses show an increase in the frequency of ENE winds during December and January. This corresponds to wind directions most likely to carry odour towards the residential zone around Bayswater Reserve.
- 12.3 This increased frequency of ENE conditions will have exacerbated the effect of the changes in the processes on-site and is likely a contributing factor to the increase in Smelt-It complaints seen in January 2023.
- 12.4 A decrease in ENE conditions and increase in E and SW conditions in February is likely a contributing factor to the lower number of in Smelt-It complaints seen in February 2023.

13.0 SUMMARY

- 13.1 PDP has been undertaking proactive odour scouting in the Bromley area with the aim of being present and taking observations in as wide a range of meteorological conditions as possible.
- 13.2 ECan issued 4 NONCs during January. PDP's analysis and comparison to our proactive scouting in similar conditions indicates that ECan's observations of offensive or objectionable odours beyond the boundary are:
- (a) Plausible on the 10th January 2023, but not well supported by the investigating officer's report.
 - (b) Plausible on the 16th January 2023.
 - (c) Possible on the 26th January 2023 but inconsistent with our general observations of odour in the Bromley area.
 - (d) Corroborated by PDP odour observations on the 31st January 2023.
- 13.3 Proactive odour monitoring has observed an increase in odour intensity at the residential zone since mid-December.
- 13.4 PDP have considered several factors as the reason for this increase in odour, including:
- (a) Reduced composting times (and therefore compost maturity) due to spring/summer increases in KSO volumes (particularly grass clippings);
 - (b) The increased frequency of north-easterly winds in January;
 - (c) Damage to the floor of the biofilter treating process;

- (d) Outdoor screening as a result of equipment breakages;
- (e) Accumulation of unscreened compost (and tailings) on the site as a result of equipment breakages.

13.5 It is not possible to delineate the contribution made by each factor to the increased offsite odour observed in the odour monitoring, however several general statements can be made:

- (a) The damage to the biofilter had a minor effect.
- (b) The equipment failures on the main screen likely had significant impact on offsite odour, resulting in a larger volume of material being stored onsite and necessitating outdoor screening.
- (c) The increased volumes of KSO processed by the plant exacerbated the issues caused by the failures on the main screen.
- (d) The increased volume of material onsite and potential for unscreened compost to anaerobic while awaiting screening were likely more significant factors than the compost maturity.
- (e) Seasonal fluctuations in KSO volume and weather/meteorology are not factors that can be readily controlled by LE. Other elements of the site operation must therefore be adequately controlled in anticipation of these factors.

14.0 RECOMMENDATIONS

14.1 PDP understand that currently on the LE site:

- (a) The main screen is now operational and its biofilter has been running with new media since the 27th February 2023.
- (b) One mobile screen is currently operating to reduce volumes of unscreened compost more quickly. As of 7 March 2023, the backlog of unscreened material has been cleared. A second outdoor screen is on standby.
- (c) The biofilter for the OPP is due to have its media replaced and floor repaired in the coming months.
- (d) Some surplus tailings have been removed from the site.

14.2 PDP recommends the following work is considered:

- (a) Minimise the amount of tailings (oversize material) stored outside;

- (b) Eliminate the outside screening of compost by mobile plant;
- (c) Prevent the accumulation of unscreened compost if volumes are exceeding processing capacity. This may be by removing excess from the site.

14.3 More broadly PDP recommends CCC considers ways to enclose the material currently stored outside and ventilate this enclosure through a biofilter to treat odours. This would provide more operational flexibility (potentially allowing more material to be stored onsite without offsite odours becoming offensive and objectionable). Additionally, it would help protect the operation against impacts of the less controllable odour factors such as meteorology, KSO fluctuations and equipment malfunctions.



9 March 2023



memorandum

TO Christchurch City Council FROM [REDACTED]
DATE 10/03/2023
RE Living Earth Odour Monitoring: 31st January Walkover 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 and 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 on the 31st of January 2023.

2.0 Summary of Methodology

Odour scouting is undertaken by PDP odour scouts. To ensure consistency between scouts, PDP undertakes 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, these are 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.



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 and 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 and 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, in Section 4.0. Results of all 10-minute odour observations are appended to this memorandum.

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

2.1 FIDOL Analysis

As per Ministry for the Environment's (MfE) guidance, 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 Good Practice Guide for Assessing and Managing 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 and 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 and 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.

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)

3.0 Results Summary

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

3.1 31st January 2023

The weather was clear, with a temperature of 20 °C and a north-easterly wind ranging from 5.5 m/s to 6.3 m/s as a 10-minute average. [REDACTED] was the PDP odour scout. The scout started at Site D (Woburn Street) and finished at Bromley Road. Broadly, the object was to collect 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 2.



Figure 2: 31st January Odour Scout Route

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

The scout was present in the area for approximately an hour.

Table 1: 31 st January Odour Scouting Summary		
Site	Time	Observations
D	15:30	Crossed Woburn St to west side to gain separation from rose odour. FIDOL assessment completed. Odour over 10-minute window was not offensive and objectionable. The observed odour, if experienced over the whole afternoon, would have been offensive and objectionable, this is discussed further below.
Site L	15:38	Distinct (3) odour was detected, stopped and completed a FIDOL assessment. Odour not offensive or objectionable during assessment, proximity to residential area discussed below.
L to K		Along Newton St, odour similar to observations at Site L. Along Tanya St, less compost detected. Other industrial odours (solvent, cement) detected weakly (2).
K	15:53	FIDOL assessment completed. Compost odour weak (2) to distinct (3) for <10% of the assessment period. Other industrial odours (solvent, cement) present. Odour not offensive or objectionable during assessment.
K to L		Along Newton St, odour similar to observations at Site L. Along Tanya St, less compost detected. Other industrial odours (solvent, cement) detected.
L to E		No odour (0) detected along section of Maces Rd from L to E.
E to F		No odour (0) detected along section of Dyers Rd from E to F.
F	16:12	Very weak (1) odour detected at Site F. Weak (2) compost odours were identified just past Site F.
F to E		No odour (0) detected along section of Dyers Rd from F to E.
E to D		No odour (0) detected along majority of Maces Rd from E to D. Intermittent, weak (2) odours detected again circa L/D on Maces Rd.
O	16:25	FIDOL assessment completed. No distinct compost odour, weakly (2) detected compost odour approx. 20% of the assessment. Odour not offensive or objectionable during assessment.
O to Bromley Rd		No odour detected walking along Maces Rd from Site O to Bromley Rd.

Distinct compost odours were detected at Sites K, L and D. Distinct compost odours were not detected at Sites O, E and F. This indicates the odour ‘plume’ containing distinct odours was relatively narrow.

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 detailed assessment results for Sites L and D are provided in Section 4.0.

5.0 Detailed Results

5.1 31st January 2023 – Site L – FIDOL

Odours detected during the 10-minute assessment at Site L are summarised below in Figure 3.

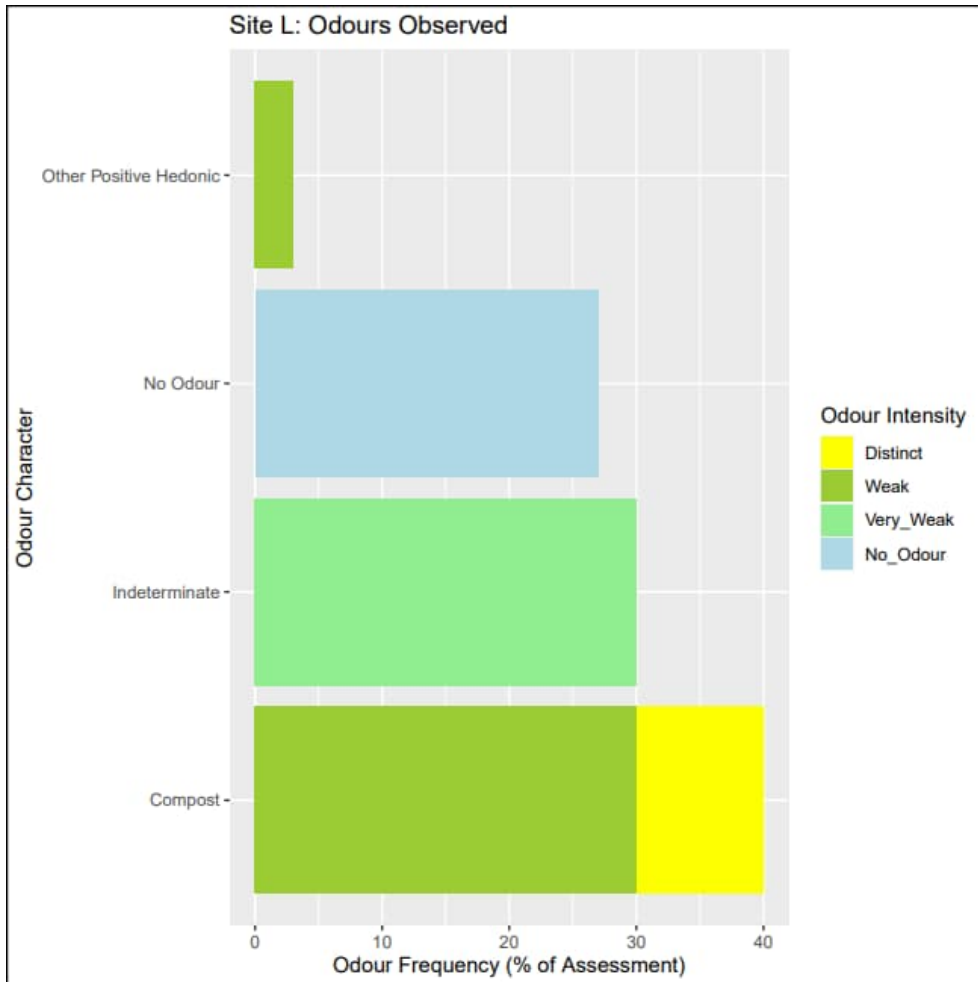


Figure 3: Site L Odours Observed, 31/01/2023 15:38

Site L, on Newton Street is near the edge of an industrial zone. The residential zone is just to south of Site L.

Over the course of the 10-minute observation at Site L, weak (2) compost odour was detected 30% of the time and distinct (3) compost was detected 10% of the time. Very weak (1) odours, where the character was not apparent, were detected 30% of the time.

The other odour with a positive hedonic tone was a weak (2) sweet odour.

The scout assessed the odour as being not offensive or objectionable for an industrial zone. The proximity of the residential zone to Site L has, however, been considered in the scout’s assessment of whether odour at Site D (on the same day) was offensive and objectionable as it indicates the frequency of distinct (3) odours in the area were, at times, higher than observed during the 10-minutes of observations at Site D.

5.3 31st January 2023 – Site D - FIDOL

Odours detected during the 10-minute assessment at Site D are summarised below in Figure 4.

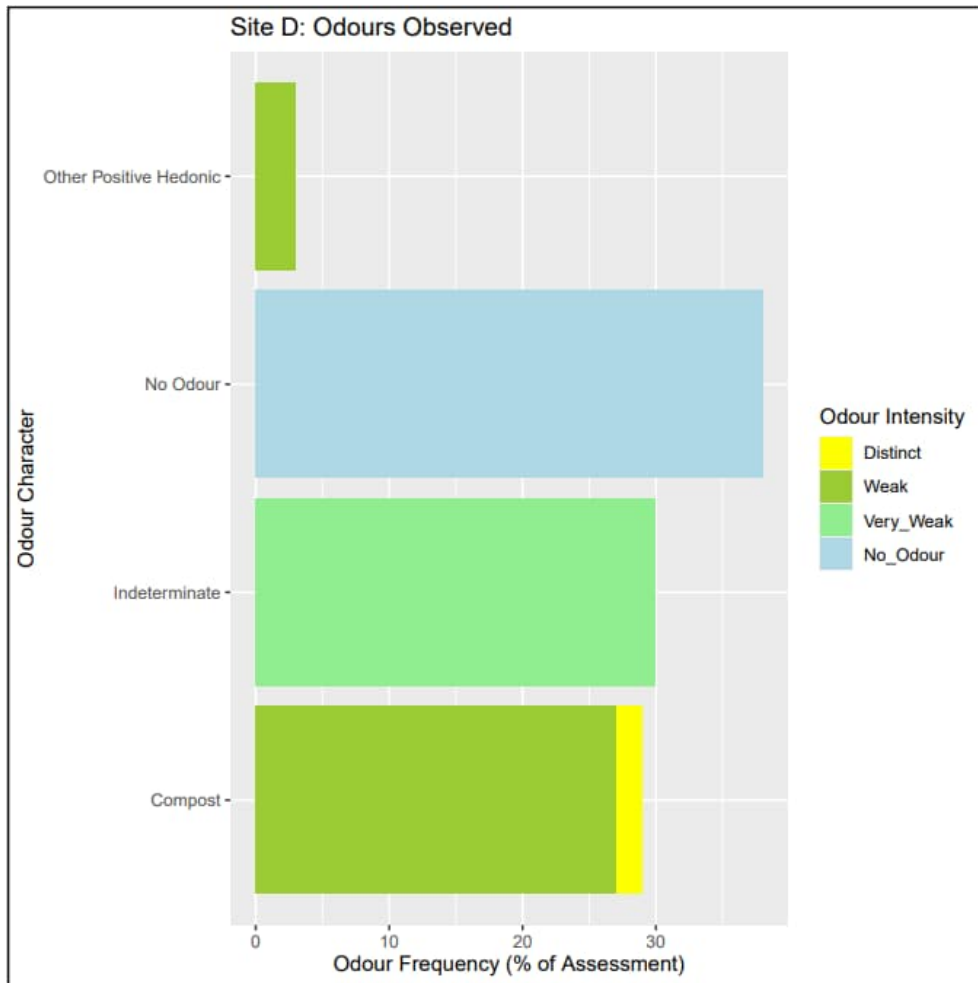


Figure 4: Site D Odours Observed, 31/01/2023 15:30

Site D, on Woburn Street, is within the residential zone.

Approximately 60% of the time, odour was detected. 29% of the time, the character of compost was recognisable in the odour (27% weak (2) and 2% distinct (3) odour).

The other positive hedonic odour recognised was a weak (2) floral odour.

Typically, intermittent distinct (3) or continuous weak (2) odours of a negative hedonic tone (such as compost) would be considered offensive and objectionable in a residential zone.

The odour observed at Site D (Woburn Street) was an intermittent weak (2) odour, not continuous. A single observation (10 seconds in 10 minutes) of distinct (3) compost odour was also observed, this is not sufficient to describe intermittent odour. In isolation, PDP do not consider this to meet the threshold of offensive or objectionable odour.

However, PDP consider the odour observed during the 10-minute observation window was likely reflective of the odour conditions present for the entire afternoon of the 31st of January. This is because:

1. The meteorological conditions (as measured at the Bromley AWS) were consistent over the afternoon; and,
2. The on-site activities at Living Earth did not change over the course of the afternoon.

North-east winds were stable, with a gradual increase in strength - approx. 5 m/s at 1 pm to approx. 6 m/s at 5 pm). Wind direction stayed within the ENE wind bracket. Therefore, dilution and mixing of generated odour would have been relatively consistent.

Living Earth advised that trucks were loading material to be removed from site until 15:35, and screening of fresh compost occurred on site until 16:30. Therefore site odour generation would have been relatively consistent².

Additionally, it is likely that the frequency of distinct odours at Site D was higher at times over the afternoon period than were observed in the approx. 10-minute monitoring period where PDP were present. This is because observations taken at Site L (a close to Site D), had a much higher proportion of distinct (3) odours in the time period immediately after the Site D observation.

Therefore, on the weight of evidence that distinct odours occurred intermittently in the residential zone over the afternoon in question, PDP consider the odour would have been offensive and objectionable at that location.

6.0 Summary

PDP undertook odour scouting on the 31st of January 2023. Plots of the raw results from each assessment are appended.

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

Based on PDP's observations:

- ∴ The odour at Site O (St Johns Street) was not considered offensive or objectionable.
- ∴ The odour within the industrial area (Sites K and L) was not considered offensive or objectionable.
- ∴ No notable odour (warranting a full 10-minute assessment) was detected moving along Maces Road from Woburn Street (Site D/L) towards the Dyers Road (Site E).
- ∴ No notable odour (warranting a full 10-minute assessment) was detected moving along Dyers Road (from Site E to Site F).
- ∴ The odour observed at Site D (Woburn Street) was intermittent weak (2) odour with a very intermittent (10 seconds in 10 minutes) distinct (3) compost odour.
 - In isolation of other information, PDP considers this observation does not represent an offensive or objectionable odour.
 - The plume containing distinct odours was relatively narrow, impacting near Woburn Street but not spreading as far as Dyers Road or St Johns Street. The odour levels at Site D/Site L would have been consistent over the course of the afternoon.

² As advised by Living Earth via email correspondence.

- The frequency of distinct odours at Site D was likely higher at times over the afternoon period than were observed in the approx. 10-minute monitoring period where PDP were present.
- On the weight of evidence that distinct odours occurred intermittently in the residential zone over the afternoon of the 31st of January, PDP consider the odour would have been offensive and objectionable.

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.

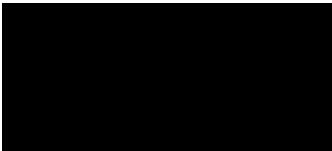
7.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Christchurch City Council and Living Earth, who provided details about site activities. 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.

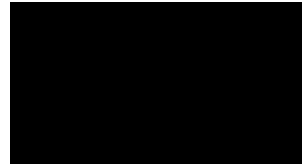
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Prepared by



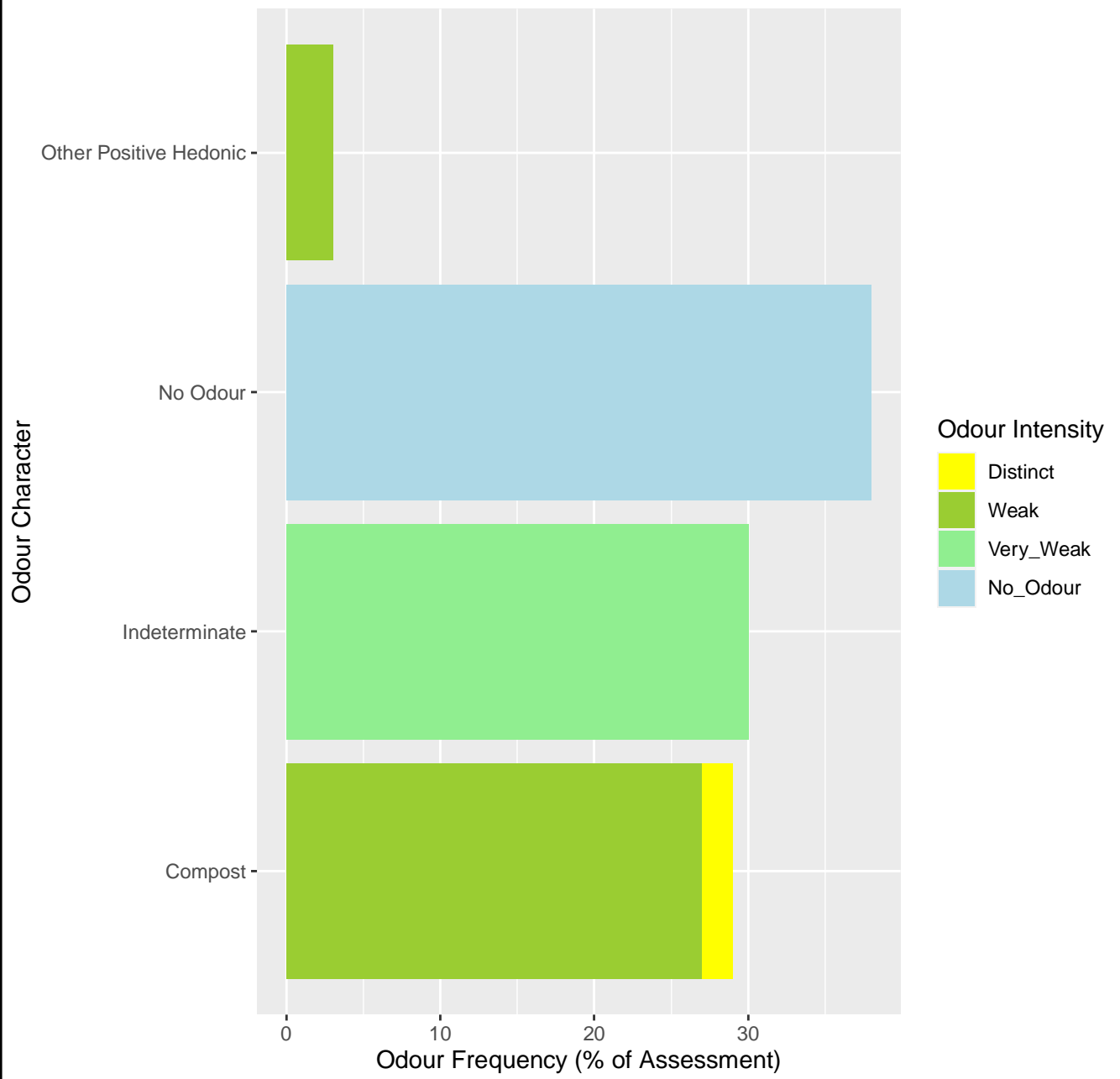
Senior Environmental Engineer

Reviewed by

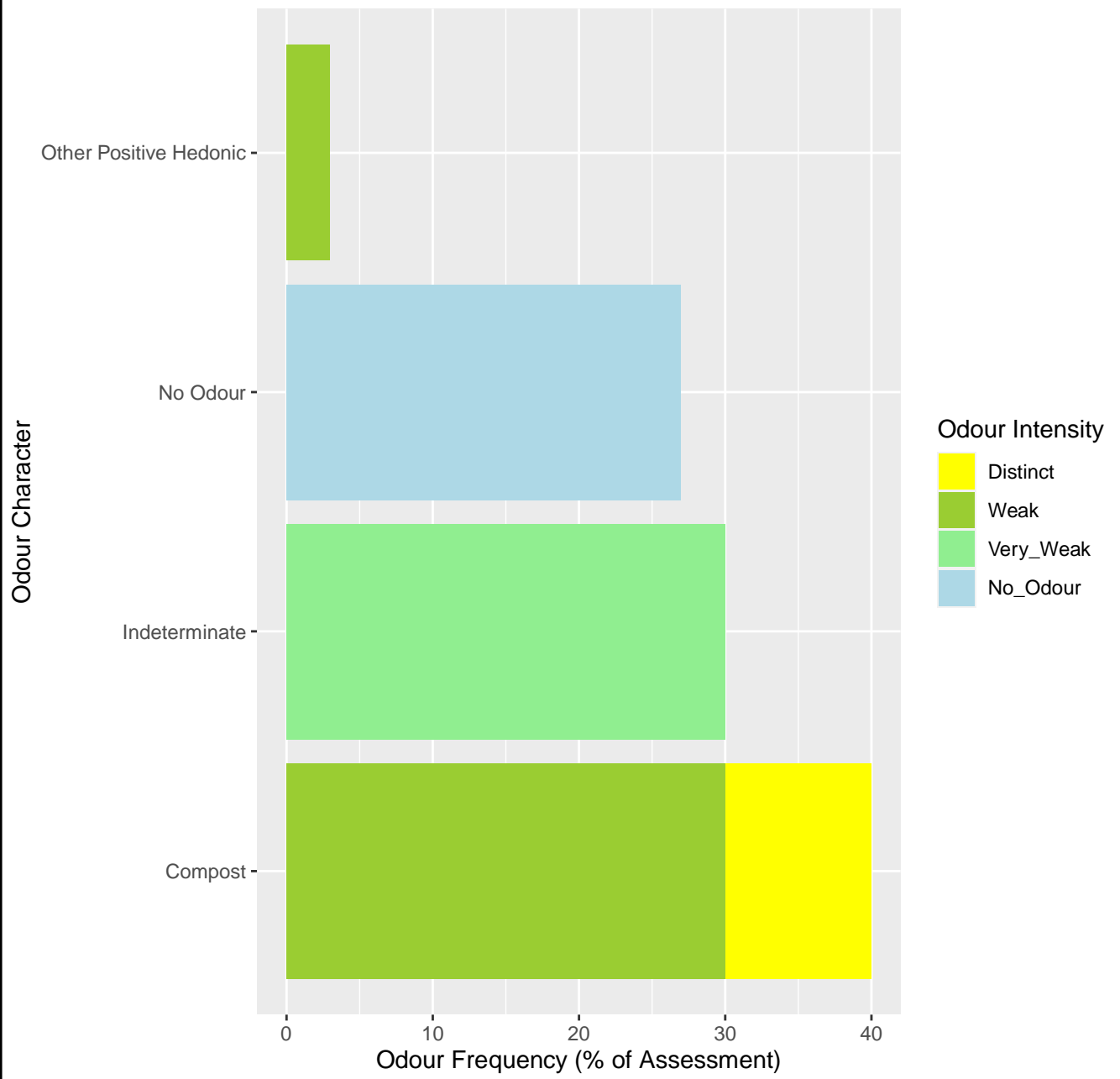


Technical Director

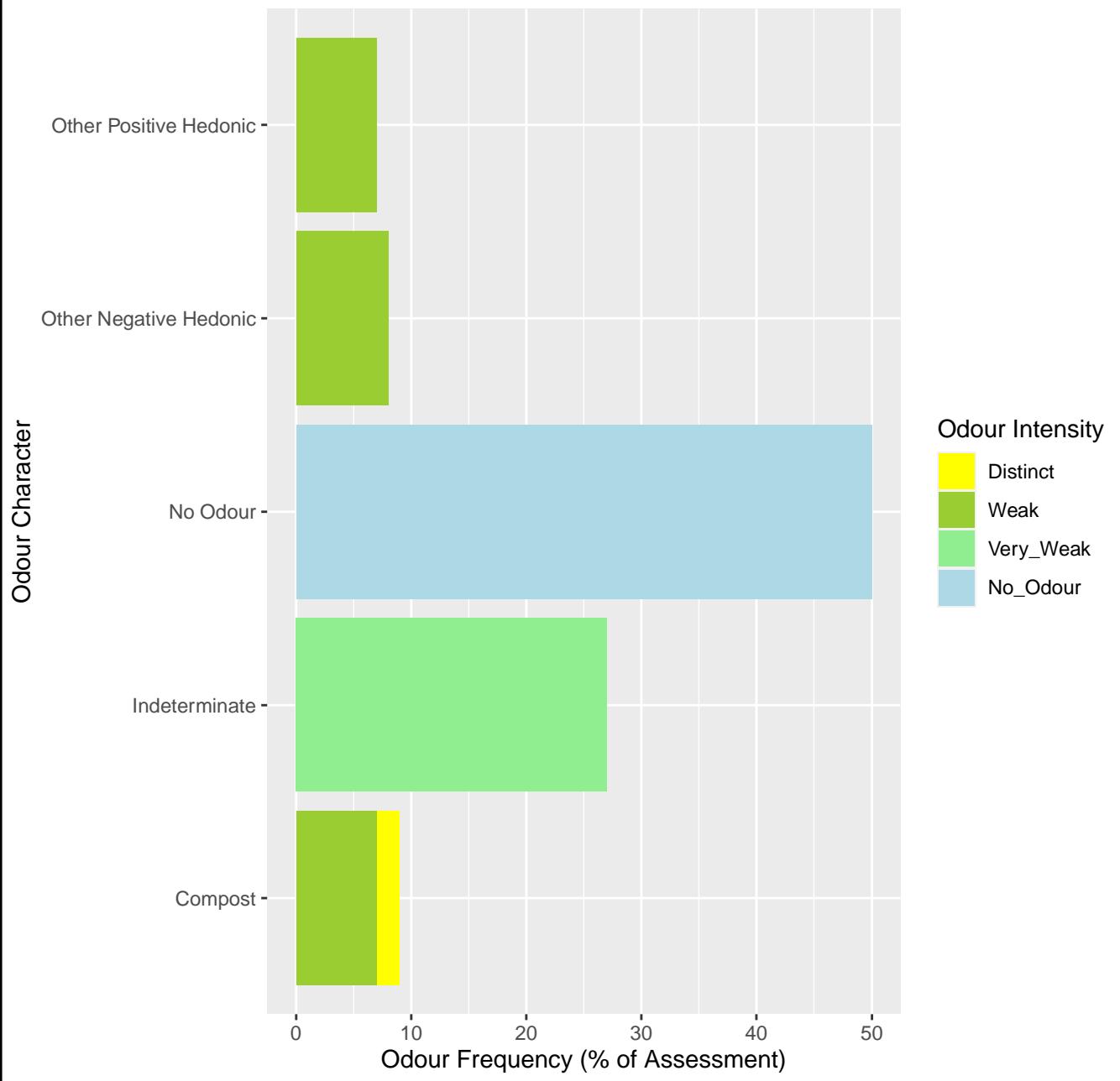
Site D: Odours Observed



Site L: Odours Observed



Site K: Odours Observed



Site O: Odours Observed

