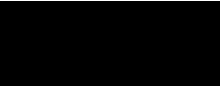




14 February 2022


Living Earth Limited
42 Metro Place,
Bromley,
CHRISTCHURCH 8062

Dear 

LIVING EARTH ODOUR ASSESSMENT

1.0 Background

Living Earth Limited (Living Earth) operates an organics processing plant and green waste composting facility located at 40 Metro Place, Bromley, Christchurch (shown in Figure 1) (the 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.

The issue of unidentified, offensive, chronic and acute odour in parts of Bromley has been a persistent and longstanding issue for the community¹.

On the 20th of January 2021, CCC was issued with an abatement notice in respect of the discharge of offensive or objectionable odour from the Site which has a compliance date of 31 January 2022.

Living Earth has made a number of changes to its operation to reduce the potential for offensive or objectionable odours to occur.

Pattle Delamore Partners Limited (PDP) has been engaged by Living Earth to undertake an assessment of odours from the Living Earth facility to determine compliance or otherwise with Condition 27 of the consent.

This letter provides a summary of the operational changes made and the odour scouting undertaken to assess odour discharges from the Living Earth site.

¹ Adaptive Management Plan – to address Bromley odour issues, CCC, 19 June 2020



2.0 Site operations

Living Earth receive greenwaste for processing from a number of sources. The fresh incoming material is mixed with screened process tailings and sawdust, ideally to achieve a 30% carbon, 70% nitrogen ratio, before being shredded and placed in a tunnel to undergo an in-vessel composting process with composting air being treated via a biofilter. The in-vessel process typically has a duration of 14 days before the compost is removed from the vessels for screening and maturation.

2.1 Old maturation process (pre abatement notice)

Previously, the fresh compost straight from the composting vessels was placed in windrows to complete the maturation process over an eight-week period. On average there was between 15,000 and 20,000 tonnes in windrows at any one time. The windrows were turned, as required, during daytime working hours to maintain oxygen and moisture within the windrow at appropriate levels to support the maturation process.

The windrows themselves were a low source of odour except when being turned which released odour, primarily during the first 2 weeks of turning.

Once the compost was mature, the windrows were screened to produce a screened mature compost product, and tailings (comprised of oversize, not fully composted material) which was stored in piles prior to being blended with fresh incoming material and being reprocessed.

2.2 Transition maturation process (now)

A key initiative Living Earth have taken to reduce the potential for nuisance odours from the site is the removal of all windrows from the outdoor area.

To enable this to be achieved, Living Earth has had to totally change the compost maturation process, with the screened fresh immature compost removed from site. In addition, Living Earth is continuing to turn and mature the existing windrows (which were onsite at the time of the abatement notice was served) before screening and removal offsite.

Naturally, the change in the operational philosophy has taken time to implement on the site with both the old windrow maturation process, and the new process screening the fresh immature compost, occurring in parallel.

While the remaining unscreened windrows required turning, the timing of the turning of the windrows was changed from occurring during the daytime to at night to reduce the potential for annoyance at odours released during the process. All windrows from the former maturation process have now all been screened and removed from site.

Fresh immature compost is now being taken straight from the composting vessels and put through an undercover screening process to produce screened immature compost and immature oversize tailings. The fresh compost is hot and moist, and a proportion of the fines stick to the oversize material during the screening process. This results in a lower yield of screened compost compared to that previously obtained when screening compost after the eight-week windrow maturation process (30% versus 50% previously achieved). This results in higher volumes of tailings being re-processed through the in-vessel composting process.

Immature oversize tailings are stored in piles prior to being blended with fresh incoming material and being reprocessed. These piles are not turned prior to being processed. A probiotic is now being added prior to the in-vessel composting process to improve microbial activity in the composting process and reduce odour.

The screened immature compost is transported offsite within days of production to mature.

The change to the compost maturation process has resulted in a large reduction in material being stored onsite. Windrows have been removed from the southern and western end of the site to create a buffer area between the operations and the site boundary downwind of the prevailing north easterly wind which will further reduce the potential for offsite offensive of objectionable odour (see **Figure 2**, **Figure 4** and **Figure 4**). Additionally, fog cannons have been placed along this boundary to provide mitigation against dust discharges from the operational portion of the Living Earth site.



Figure 1: Fence separating the operational area from the newly created southern buffer zone



Figure 2: Southern end of the Living Earth site with windrows removed



Figure 3: Current buffer area

The immature tailings are reused within days of production so do not require turning. The reduction in volumes and removal of the need to turn the windrows has resulted in a reduction in the nuisance odour generation potential at the Living Earth site.

2.3 Future maturation process

Living Earth's composting operation must process all green waste that is delivered to site on a daily basis. The existing capacity of the in-vessel composting tunnels constrain the composting operation by limiting the in-vessel composting duration and the volumes of tailings that can be blended with fresh green waste and reprocessed. CCC has a key meeting in March to decide whether they will increase the sites in-vessel composting capacity which would result in increased in-vessel composting durations, a reduction in tailing volumes being stored in pies, and a more mature compost product out of the tunnels with reduced odour.

All fresh immature compost from the vessels will continue to be screened immediately to separate the immature fines from the immature tailings.

The immature fines will be removed from site within days of being screened.

The immature oversize tailings will be stored in piles before being blended with fresh green waste, sprayed with a probiotic, and returned to the in-vessel composting tunnels.

2.4 Summary

The key changes that have been made to Living Earth's outside operations are summarised as follows:

- ∴ No new formation of unscreened compost windrows for maturation;
- ∴ Windrows removed from the southern and western end of the site to create a buffer area between operations and the site boundary;
- ∴ Fresh compost screened immediately into immature fines and tailings;
- ∴ The immature compost fines are removed from site within a couple of days; and
- ∴ Immature tailings are stored in piles (without being turned) until blended with fresh green waste and re-composted;

3.0 Assessment of odour

Under the Resource Management Act 1991 (RMA), the primary concern with odour is whether or not it is causing an effect that could be considered offensive or objectionable.

The framework against which odours are assessed to determine if an odour has an offensive or objectionable effect is known as the **FIDOL** factors.

- ∴ **Frequency** - How often the odour occurs e.g. per day, week, month
- ∴ **Intensity** - The strength of the odour
- ∴ **Duration** - The length of time people are exposed to the odour
- ∴ **Offensiveness** - The odour's pleasantness or unpleasantness
- ∴ **Location** - Where the odour is detected e.g. rural, industrial, urban

Different combinations of these factors can result in adverse effects. For example, offensive and objectionable odours can occur on a continuum from chronic (low intensity, long term) to acute (high intensity, short term) effects.

The Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Odour, and the FIDOL assessment framework, does not assume that odours will never be observed outside a site boundary, rather any odour which is observed should not cause an objectionable or offensive effect when considered in the context of the sensitivity of the surrounding land use and the expected level of air quality amenity.

In this particular situation, given the well-known and documented chronic and acute odour issues in parts of Bromley, the FIDOL assessments undertaken have focussed on the intensity, offensiveness (hedonic tone), and location of the odours observed, rather than frequency or duration, in determining whether the odours observed could be considered offensive or objectionable.

4.0 Odour assessment

4.1 Odour assessor details

The odour assessment was undertaken by [REDACTED] [REDACTED] is an experienced air quality professional with experience assessing odour from a range of sources including composting operations, landfills, waste transfer stations, wastewater treatment plants, irrigation of wastewater to land, food processing facilities and wood processing plants.

[REDACTED] has prepared and presented odour related expert witness evidence at both Regional and Environment Court hearings.

[REDACTED] is a member of the Clean Air Society of Australia and New Zealand (CASANZ) and has 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.

4.2 Methodology

Each odour assessment was carried out in accordance with Appendix 3 of the MfE Good Practice Guide for Assessing and Managing Odour². Each assessment period was 10 minutes in duration with observations taken every 10 seconds (60 in total).

Odour scouting was undertaken on two days downwind of the Living Earth site. The locations where assessments were made are given in **Figure 4** and **Figure 5** and the assessments themselves are summarised in **Table 1**.

4.3 Odour Scouting - 20 January 2020

Odour scouting downwind of the Living Earth site was undertaken on the afternoon the 20th of January 2022. At the time of the assessments, the site was operating normally with all activities described above in the transition maturation process being undertaken.

4.3.1 Assessment 1

The first odour assessment location was on the south side of Breezes Rd approximately 1.6 km from the boundary of the Living Earth site. The land immediately to the south of this odour scout location is being spread with immature compost from the Living Earth site. Trucks were observed depositing fresh compost further to the west so it was deduced that the compost adjacent to the odour scout location had been in situ for some time.

No odour was observed 20% of the time. The majority of the odours observed were cut grass (42%) and rubbish (30%). The remaining odours observed were musty/earthy/mouldy and compost which were determined to originate from aging compost in the adjacent paddock. The intensity of the odours detected were predominantly weak (just able to determine its character) (66%) and distinct (odour readily observable and the character is easily defined) (14%).

Based on consideration of the FIDOL factors, none of the observed odours are assessed as being offensive or objectionable at this location.

² Good Practice Guide for Assessing and Managing Odour, Ministry for the Environment, 2016



Figure 4: Odour scout locations 20 January 2022



Figure 5: Odour scout locations 26 January 2022

Table 1: Odour Assessment Summary

	Location 1	Location 2	Location 3	Location 4	Location 5
Date	20 Jan 2020	20 Jan 2020	26 Jan 2020	26 Jan 2020	26 Jan 2020
Time	3.22 pm	4.00pm	4.06pm	4.25pm	4.45pm
Wind direction	SW	SW	NE	NE	NE
Wind speed (m/s)	2-3	1-2	1-3	1-3	1-3
Temperature (°C)	20	20	18	18	18
Rain	None	None	None	None	None
Cloud cover (Octa No.)	0 (clear sky)	0 (clear sky)	0 (clear sky)	2 (mostly sunny)	6 (mostly cloudy)
Character Description					
No Odour	20%	48%	35%		100%
Herbal, green, cut grass	42%		28%		
Rubbish	30%			70%	
Musty, earthy, mouldy	7%				
Compost	2%	50%	37%		
Woody, resinous				30%	
Other - Biofilter		2%			
Intensity Descriptor					
No odour	20%	48%	35%		100%
Very weak					
Weak	66%		32%	22%	
Distinct	14%	35%	33%	75%	
Strong		17%		3%	
Very Strong					
Extremely strong					

4.3.2 Assessment 2

The second odour assessment location was on a track to the north of the Living Earth site. Walking down the track from west to east, odours from the waste transfer station, Living Earth’s operations, and Living Earth’s biofilter were all experienced in that order. It was noted that the transfer station odour had a slightly more unpleasant hedonic tone (-3) than the compost or biofilter odours (-1 to -2).

A location at the mid-point of the track, at the boundary of the Site, was selected to assess to odours coming from Living Earth’s operations.

No odour was observed 48% of the time. This was largely due to the funnelling effect of wind from the east down the tree lined track. The majority of the odours observed were compost (50%) and the biofilter (2%). The intensity of the odours detected were distinct (odour readily observable and the character is easily defined) (35%) and strong (strong intensity but is not at the point which causes discomfort to the assessor) (17%).

Based on consideration of the FIDOL factors, none of the observed odours are assessed as being offensive or objectionable at this location.

4.4 Odour Scouting - 26 January 2020

Odour scouting downwind of the Living Earth site was undertaken on the afternoon the 26th of January 2022. At the time of the assessments, the site was operating normally with all activities described above in the transition maturation process being undertaken.

4.4.1 Assessment 3

The third odour assessment location was on Dyers Rd approximately 380 metres from the nearest tailings piles on the Living Earth site.

No odour was observed 35% of the time. The majority of the odours observed were compost (37%) and cut grass from the adjacent paddock (28%). The intensity of the odours detected were predominantly weak (just able to determine its character) (32%) and distinct (odour readily observable and the character is easily defined) (33%). The weak odours were generally associated with the compost character and the distinct odours with the cut grass.

Based on consideration of the FIDOL factors, none of the observed odours are assessed as being offensive or objectionable at this location.

4.4.2 Assessment 4

The fourth odour assessment location was on Dyers Rd, close to the intersection with Wickham Street due west of Living Earth's operations.

As was expected from the wind direction, odour from Living Earth's operations were not observed at this location.

Odour was observed 100% of the time with the majority of the odours observed being rubbish from the waste transfer station (70%) and woody/resinous odours from the eucalyptus trees in the windbreak downwind of the waste transfer station (30%). The intensity of the odours detected ranged from weak (just able to determine its character) (22%) through distinct (odour readily observable and the character is easily defined) (75%) to strong (strong intensity but is not at the point which causes discomfort to the assessor) (3%).

The strong odours were associated with the rubbish character and the weak and distinct odours roughly evenly split between the rubbish and the woody/resinous odours. It was noted that the odour from the eucalyptus windbreak did appear to be masking the odours from the waste transfer station at times.

Based on consideration of the FIDOL factors, none of the observed odours are assessed as being offensive or objectionable at this location.

4.4.3 Assessment 5

The fifth odour assessment location was on Dyers Rd at the intersection with Maces Road approximately 720 meters downwind of the nearest tailings piles on the Living Earth site. This location was chosen as it was the closest residential site downwind of Living Earths operation.

No odour from either Living Earth's operations, or the waste transfer station, were observed at this location.

5.0 Summary

Since being served the abatement notice, Living Earth has made significant changes to its outdoor composting operations to reduce the potential for offensive or objectionable odours from its operation to be detected offsite.

The key changes that have occurred from an odour reduction point of view are:

- ∴ Ceasing the onsite maturation of compost in windrows prior to screening;
- ∴ Addition of a probiotic to increase the in-vessel composting process rate;
- ∴ Screening immature compost straight from the in-vessel tunnels;
- ∴ Immediate transport of immature screened compost offsite;
- ∴ Reduction in volumes of screened tailings stored prior to reprocessing; and
- ∴ Creation of an enlarged buffer zone to the south and west between their operations and the site boundary.

Based on the odour scouting assessments undertaken, it is PDP's opinion that Living Earth has been successful in eliminating a number of potential sources of odour on their site and reduced the potential for offensive or objectionable odours to occur beyond the boundary of their site.

6.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Living Earth Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Living Earth Limited for the limited purposes described in the report. PDP accepts no liability if the report 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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Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

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