



14 April 2022

██████████
Branch Manager
Living Earth Limited
42 Metro Place,
Bromley,
CHRISTCHURCH 8062

Dear ██████████

LIVING EARTH ODOUR ASSESSMENT: CURRENT OPERATIONS, CONTROLS & EFFECTIVENESS

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.

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

Pattle Delamore Partners Limited (PDP) have been providing assistance to CCC and Living Earth regarding assessing the odour effects from the site.

PDP has been engaged by Living Earth to provide a summary of the current site operations, their relative contribution to the generation of odour onsite, and how the current controls are working. This information will be used to support and manage continued operations at the site.

This letter provides PDP's assessment of Living Earth's site operations, the odour risks these pose and the effectiveness of odour controls.

2.0 Key Personal Details

This assessment was undertaken by ██████████ ██████████ 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.

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

██████████ is a member of the Clean Air Society of Australia and New Zealand (CASANZ) and is a Certified Air Quality Professional (CAQP). Additionally, ██████████ 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.

3.0 Site Familiarity

██████████ has visited the site a number of times since January 2022 and has been undertaking proactive odour observations in the Bromley area on behalf of Living Earth and CCC. A site visit was undertaken on the 12th of April 2022 to assess current site odour sources and controls. At the time of the site visit, the screening plant was not operating.

4.0 Overview of Site Operations

Living Earth receive curb side organic (KSO) waste and green waste for processing from a number of sources which it processes into compost. The key site operations are summarised in the following sections.

4.1 In-Tunnel Composting

The fresh incoming material is mixed with oversize tailings and sawdust, ideally to achieve a 30:1 C/N ratio, before being shredded and placed in a tunnel to undergo an in-vessel composting process with forced air to maintain aerobic composting conditions. The air exhausted from the composting tunnels is treated via a biofilter prior to discharge. The tunnel process typically has a duration of 14 days before the immature compost is removed from the tunnels. A probiotic is now being added prior to the tunnel composting process to improve microbial activity in the composting process and reduce odour.

4.2 Screening

Fresh compost is taken straight from the composting tunnels and put through an undercover screening process to produce screened compost and oversize tailings. The fresh compost is hot and moist, and a proportion of the fines stick to the oversize material during the screening process. Air is extracted from the top of the screening building and directed through a biofilter.

Tailings are stored in piles prior to being blended with fresh incoming green waste and being reprocessed. These piles are not turned prior to being reprocessed.

4.3 Compost Maturation

The screened compost is stored in piles and transported offsite.

5.0 Potential Sources of Odour and Controls

Based on the description of the composting operation in the preceding section and using our on-site observations, PDP has identified five sources of odour (see also **Figure 1**):

1. The organics processing plant (OPP);
2. The tunnel composting and biofilter;
3. The operation of the screening plant;
4. Storage of oversize tailings; and,
5. Storage and loadout of compost.



Figure 1: Living Earth Odour Sources

The risks to offsite offensive and objectionable odours from each of these sources, and the controls in place to mitigate these risks, as discussed in the following sections.

5.1 Organics Processing Plant (OPP)

The OPP is where KSO and green waste is mixed with oversize tailings and sawdust (if required), shredded, sprayed with probiotic, and loaded into one of the eighteen composting tunnels. Living Earth's experience is that the use of a probiotic improves the composting process resulting in better product being produced with a reduction in associated odour.

Roller doors are opened when required to allow access for trucks dropping off waste, bringing in oversize tailings, and the transport of compost to the screening plant. Air is extracted to the biofilter from ducts within the OPP to minimise the escape of fugitive odours when all doors are shut. The main route for discharge of odour from the OPP is through the truck access roller doors. **Table 1** presents an assessment of the frequency of odour release from the OPP, the current controls in place to minimise odour, and an assessment of the effectiveness of the controls to minimise the generation of odour.

Table 1: Organics processing plant (OPP) odour generation potential

Frequency of odour release	<p>Only during operating hours</p> <p>Via roller doors when open to admit trucks or front-end loaders</p> <p>Minimal discharge of fugitive odours from building envelope</p>
Current controls	<p>Roller doors are kept closed when not in use</p> <p>Slight negative pressure maintained in OPP from air extraction</p> <p>SCADA control of tunnel airflow when tunnel door opened</p>
Effectiveness of controls	<p>Good</p>

Based on PDP’s observations, the current controls are working well to minimise the contribution of the OPP to the generation of on-site odour.

5.2 Tunnel Composting and Biofilter

The air exhausted from the composting tunnels is directed to a biofilter located adjacent to the OPP, for treatment prior to discharge into the atmosphere. Biofilters are regarded as best practice for the treatment of odours discharges from a wide range of sources such as rendering plants, fish factories, cooking odours and wastewater treatment plants. The exhaust from the biofilter has a sweet character which is recognisably different to the character of the compost odours (which is more bitter in character) observed offsite during odour scouting.

Table 2 presents an assessment of the frequency of odour release from the biofilter, the current controls in place to minimise odour, and an assessment of the effectiveness of the controls to minimise the generation of odour.

Table 2: Biofilter odour generation potential

Frequency of odour release	<p>Continuous (24/7)</p>
Current controls	<p>Use of probiotics in the composting operation</p> <p>Correctly designed to treat required air flowrates</p> <p>Correct biofilter operating conditions</p> <ul style="list-style-type: none"> ∴ Bed material fresh and replaced when necessary ∴ Bed material kept moist ∴ Monitoring of biofilter bed backpressure ∴ Monitoring of air parameters (Temp, pH, humidity) <p>Largest possible buffer distance to members of the public</p>
Effectiveness of controls	<p>Good – biofilter odour character not recognised offsite</p>

Based on PDP’s observations, the current controls are working well to minimise the contribution of the biofilter to the generation of on-site odour.

5.3 The Screening Plant

Fresh compost from the OPP is transported by front end loader to the screening plant for processing. The purpose of screening is twofold:

- ∴ Remove foreign objects such as stones and plastic; and,
- ∴ Separate the fine, compost product from the larger material that is discharged as tailings. These tailings are used back as an input.

Screening is undertaken undercover in an open fronted building with air being extracted from the top of the building and directed through a biofilter. The biofilter was observed to have vegetation growing on its surface indicating that it is potentially not operating in an optimal manner.

The screening process results in the release of dust in addition to odour, so a water mister blows across the open front of the building, primarily for dust control.

Discussions with Living Earth staff indicated that they view the screening plant as a larger source of odour than the OPP, biofilter or compost, but lower than that of the oversize tailings.

Table 3 presents an assessment of the frequency of odour release from the screening plant, the current controls in place to minimise odour, and an assessment of the effectiveness of the controls to minimise the generation of odour.

Table 3: Screening plant odour generation potential	
Frequency of odour release	When screening (4.00am until 11.00pm). Not on Sundays.
Current controls	Takes place in partially enclosed building Air above the drum screen extracted to a biofilter Water mister across entrance to the building for dust (and odour) Buffer distance to the south
Effectiveness of controls	Good but could be improved. – odour can escape from the open front of the screening enclosure and the biofilter should be assessed to ensure it is operating effectively.

Based on PDP’s observations and discussions with Living Earth staff, the current controls are to working reduce the contribution of the screening plant to the generation of on-site odour. The effectiveness of the controls are limited by the open front on the screening enclosure not being able to fully contain odours and direct them to the biofilter for treatment. Additionally, a visual inspection of the biofilter indicates that it may not be operating as effectively as it could be.

5.4 Tailings

Oversize material from the screening process is stored in piles at the northern end of the site prior to being blended with fresh incoming KSO and green waste and being reprocessed. Once placed these piles are not turned (to reoxygenate) prior to being reprocessed. Odour is released during the formation of these piles which decreases in intensity over time as the outer layer forms a mature layer. More intense odours are released when the piles are moved back into the OPP for blending with fresh KSO and green waste prior to composting.

As odour is discharged from the surface of the oversize tailings piles, the total odour discharge rate, and therefore the potential for offsite odour effects will decrease with decreasing volumes being stored.

Table 4 presents an assessment of the frequency of odour release from the oversize tailings, the current controls in place to minimise odour, and an assessment of the effectiveness of the controls to minimise the generation of odour.

Table 4: Tailings odour generation potential	
Frequency of odour release	Semi continuous Higher odour when forming piles Odour discharge reduces over a period of days after formation Higher odour discharge when removed for reprocessing
Current controls	Not turned after placement Located at the north end of the site resulting in the largest possible buffer distance to members of the public
Effectiveness of controls	Could be improved – odour is released semi continuously. Odour discharge related to the total volume (surface area) of the tailing piles.

Based on PDP’s observations, the current controls are having a limited impact on reducing the contribution of the tailings to the generation of on-site odour. The effectiveness of the controls is limited by the volume of oversize tailings that are currently being stored on site. Reducing the volume of tailings stored onsite will improve the effectiveness of the controls and significantly reduce the impact of this source of odour.

5.5 Compost Fines

The freshly screened compost is not fully mature, and the composting process will continue for several weeks before a stable material results. During this time the maturing compost requires a plentiful supply of oxygen to support the composting microbes. Failure to supply sufficient oxygen results in anaerobic conditions and the formation of offensive and objectionable odours when stored in a pile.

To mitigate this risk, the screened immature compost is stored in piles and regularly removed from site and spread to land.

Table 5 presents an assessment of the frequency of odour release from the immature compost, the current controls in place to minimise odour, and an assessment of the effectiveness of the controls to minimise the generation of odour.

Table 5: Compost odour generation potential	
Frequency of odour release	Semi continuous when onsite
Current controls	Removed from site as soon as possible to prevent anaerobic conditions and offensive or objectionable odours forming Regular loadout resulting in small volumes on-site at any one time Storage pile located at the northern most end of the site adjacent to the OPP resulting in the largest possible buffer distance to members of the public Trucks are covered before leaving site to minimise odour discharge from the truck themselves leaving site A mister is located adjacent to the compost pile to manage any dust produced which can also have a beneficial effect on odour discharges
Effectiveness of controls	Good – small volumes onsite for minimal time

Based on PDP's observations, the current controls are working well to minimise the contribution of the compost to the generation of on-site odour.

5.6 Site wide controls

In addition to the specific controls detailed above for each of the site odour sources, there are some additional controls that are applied across the site.

5.6.1 Portable Mistlers

Three portable mistlers have been located along the south western boundary of the operational portion of the site, primarily to provide mitigation against dust discharges, but the mistlers can also have a beneficial effect on odour discharges (see **Figure 2** and **Figure 4**).

5.6.2 Mister Lines

Mister lines are in place along the southern and southwestern boundary of the site to deliver a fine water/deodorant mist to provide mitigation of odour discharges from the site (see **Figure 3** and **Figure 4**).

5.6.3 Increased Buffer Distance

The change to the compost maturation process has resulted in a large reduction in the volume of 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 or objectionable odour (see **Figure 4**).



Figure 2: Portable mister



Figure 3: Misting line on southern boundary

6.0 Future Changes to Odour Controls

As described above, the major contributor to offsite odour is thought to be the storage of oversize tailings from the screening process.

It is estimated by Living Earth that there are currently 14,200 tonnes of oversize tailings stored on site. During the autumn and winter period, KSO and green waste supply to the site decreases. Living Earth plan to take advantage of this reduction to reprocess the tailings through the composting process and reduce the tonnage of tailings stored onsite to 3,000 tonnes, a reduction of nearly 80%.

As the discharge rate of odour from the storage of oversize tailing is proportional to the amount (surface area) being stored and length of storage, PDP anticipates that if the planned reduction in tailing volumes is achieved, the potential odour from the site will be significantly further reduced at the end of the winter period.



Figure 4: Mister lines, portable mister and buffer locations

7.0 Summary

PDP have assessed Living Earth’s composting operations during a site visit on the 12th of April and identified five sources of odour along with their potential relative contribution to onsite odour generation and how effective the current controls are. The five sources and the effectiveness of the current controls are:

- | | |
|---|--------------------------------------|
| ∴ The organics processing plant (OPP) | Good |
| ∴ The biofilter | Good |
| ∴ The operation of the screening plant | Good but could be improved |
| ∴ Storage of oversize tailings | Limited and could be improved |
| ∴ Storage and loadout of immature compost | Good |

Based on PDP’s observations, the current controls are generally working well to minimise the generation of onsite odour.

PDP's assessment is that the controls in place to minimise the generation of odour from the oversize tailings are having a limited effect. It would further improve the effectiveness of the odour mitigation if the volume of tailings being stored were to be reduced.

Living Earth plan to reduce the tonnage of tailings stored onsite over the winter period by nearly 80% which should reduce the potential discharge of odour from this source by a similar amount.

8.0 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.

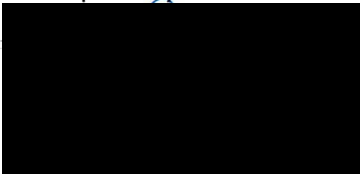
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Yours Faithfully

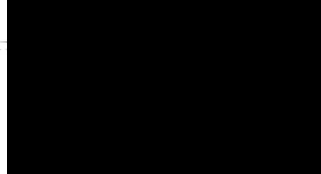
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