



Ravensworth Composting Facility | State Significant Development | Modification 3

SUBMISSIONS REPORT

Prepared for Bettergrow Pty Ltd (Bettergrow) | 23 July 2026





Ravensthorpe Composting Facility

STATE SIGNIFICANT DEVELOPMENT | MODIFICATION 3 | SUBMISSIONS REPORT

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23 July 2026

PR425

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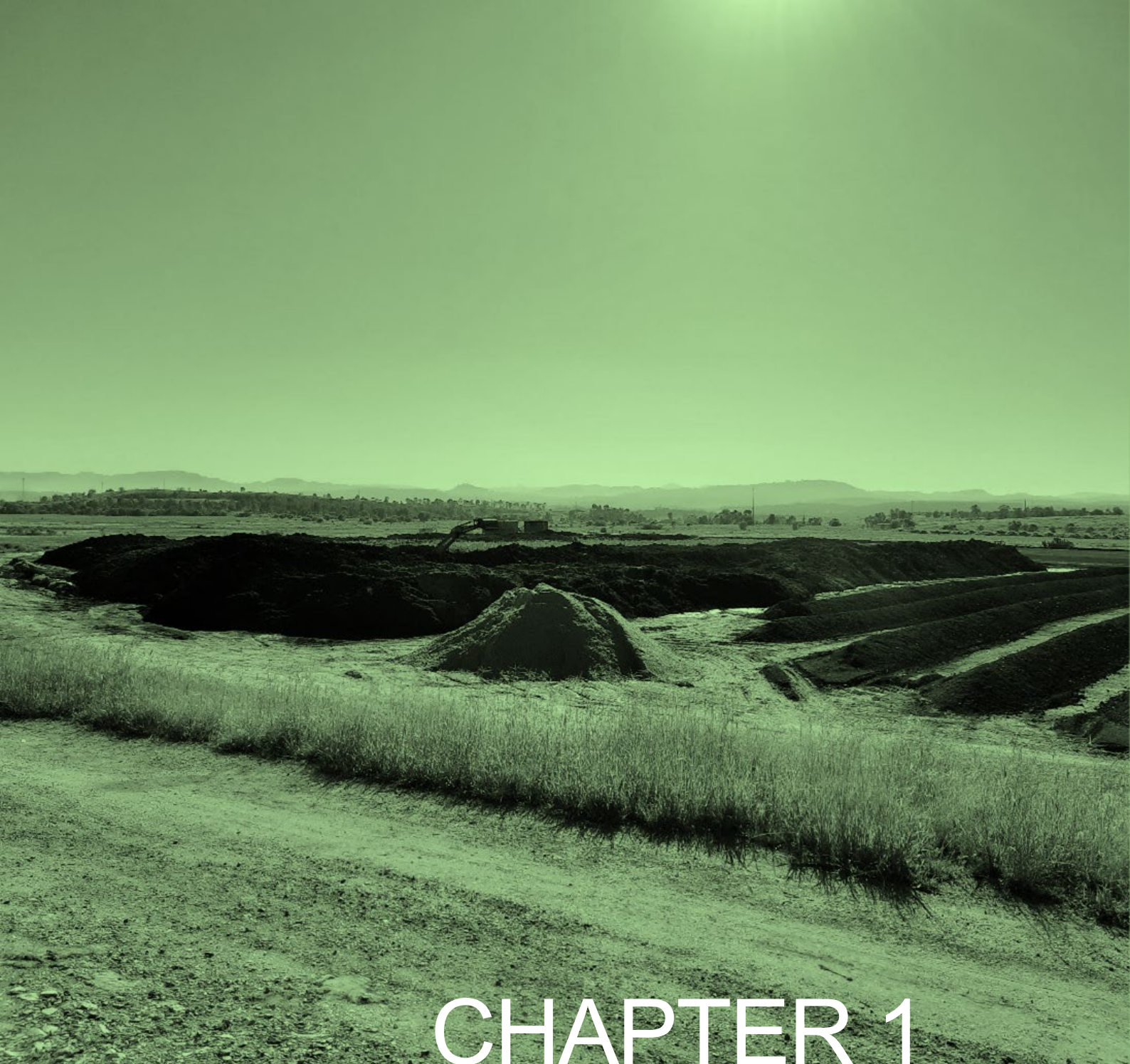
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CHAPTER 1

INTRODUCTION

1 INTRODUCTION

1.1 Overview

Bettergrow Pty Ltd (Bettergrow) operates the Ravensworth Composting Facility (the 'facility') at 74 Lemington Road, Ravensworth (the 'site'), in the Singleton local government area (LGA), New South Wales (NSW). The facility processes biosolids, garden organics and other organic recovered material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses.

The site is situated on a rehabilitated capped open cut mining void within the Ravensworth Operations open cut mining complex, approximately 6 kilometres (km) north-west of Camberwell and approximately 20 km north-west of Singleton. AGL Macquarie Pty Ltd (AGL) owns the land on which the facility is located.

The facility originally commenced operation under a development consent granted by Singleton Council (Council) on 25 November 2016 (DA140/2016). This consent was modified on two occasions, to facilitate an increase in organic material received and processed on-site and the transfer of compost products to additional AGL sites, and allow compost material from the site to be sold to third parties in the region.

On 31 August 2022, a State significant development (SSD) application (SSD-9418) was approved by the (then) Minister for Planning under Section 4.38 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to expand the existing facility to receive and process up to 200,000 tonnes per annum (tpa) of organic recovered material, extend the compost processing and blending areas pad, undertake water drainage and leachate works, and install associated infrastructure.

Modification 1 to SSD-9418 (SSD-9418-MOD-1) was approved on 6 December 2023, to allow for the removal of the site weighbridge and receipt and processing of additional waste streams that would require a general or site-specific resource recovery order to be granted and an exemption issued by the EPA.

Modification 2 to SSD-9418 (SSD-9418-MOD-2) was approved on 16 June 2026, to permit the receipt and processing of decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, receipt and blending of Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials, and installation of a 65,000 litre (L) above ground diesel storage tank.

Bettergrow is now seeking approval to modify consent SSD-9418 under Section 4.55(2) of the EP&A Act to increase the processing capacity of the facility from 200,000 to 250,000 tpa, receive and process raw FOGO recovered material at the facility, and install a weighbridge. This will be the third modification (Modification 3) to the development consent.

This report provides a response to submissions received on the proposed modification.

1.2 The proposed modification

The proposed modification is described in Chapter 3 of the Modification Report and seeks to:

- increase the processing capacity of the facility from 200,000 to 250,000 tpa;
- receive and process raw FOGO recovered material at the facility;
- employ three additional staff;
- install a site weighbridge; and

- allow up to 5 additional light vehicles and 14 additional heavy vehicles to access the site per day.

The scope of the proposed modification is hereafter referred to as ‘the project’.

1.3 Approval process

The *Ravensthorpe Composting Facility State significant development Modification 3 Modification Report* (Modification Report) (Element Environment, 2025a) was prepared for the proposed modification by Element Environment Pty Limited (Element) on behalf of Bettergrow.

The Modification Report was prepared in accordance with Section 4.55(3) of the EP&A Act and submitted to the NSW Department of Planning, Housing and Infrastructure (DPHI).

DPHI subsequently published the Modification Report on the NSW Government’s Major Projects website (Major Projects website) between 7 and 20 May 2026 and notified relevant government agencies with an invitation to review.

Submissions were received from five government agencies and the community.

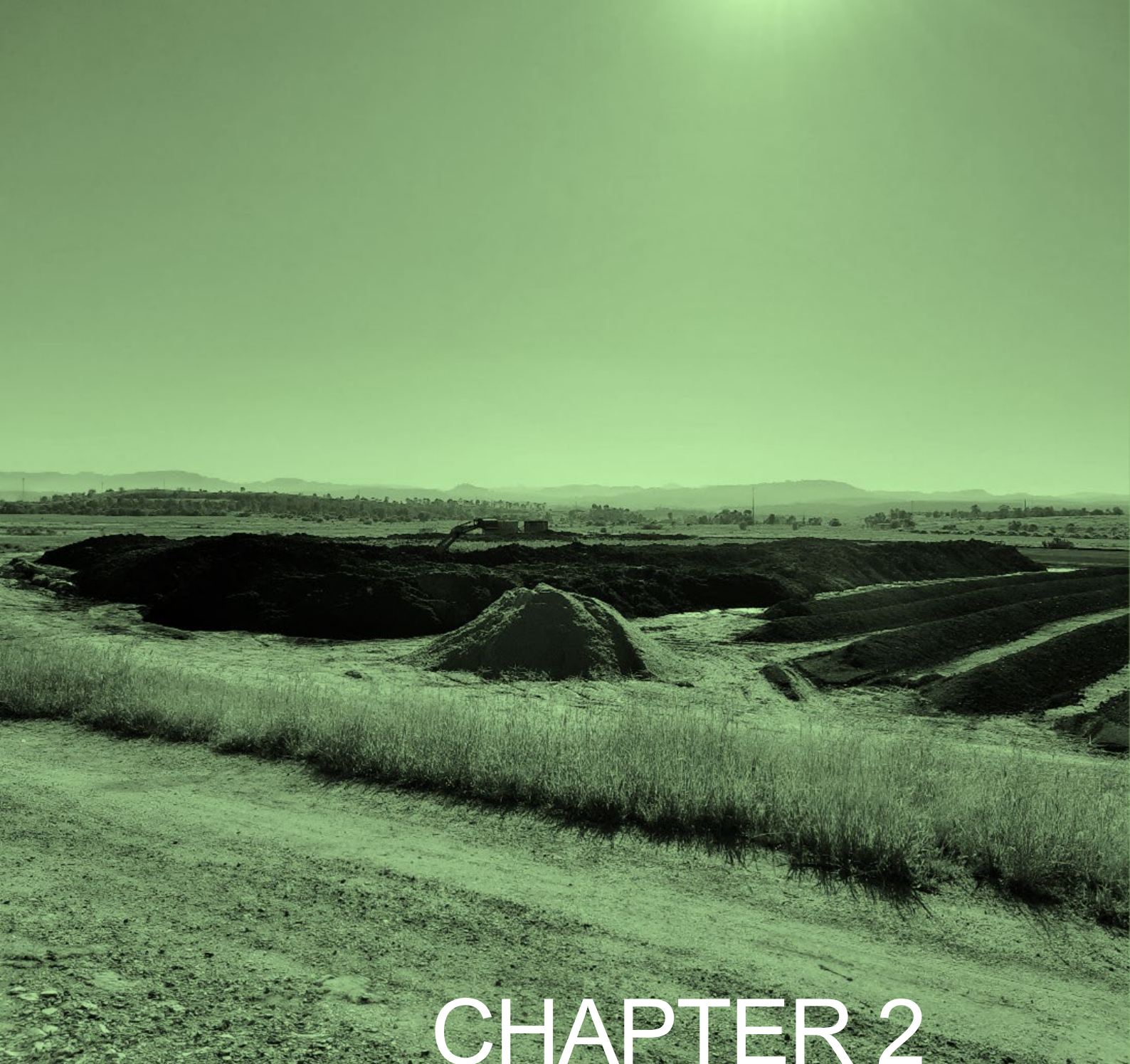
DPHI requested that a Response to Submissions Report (Submissions Report) be prepared for the proposed modification.

1.4 Document purpose and structure

This report provides a considered response to the comments and issues raised by government agencies and the community during the public exhibition of the Modification Report, in accordance with Section 4.15(1)(d) of the EP&A Act. It has been prepared in accordance with the *State significant development guidelines - preparing a submissions report* (DPHI, 2026).

This report has been structured as follows:

- Section 1 – Project background information, project description and report structure;
- Section 2 – Analysis of submissions received;
- Section 3 – Response to agency submissions;
- Section 4 – Response to public submissions;
- Section 5 – Updated project justification; and
- Section 6 – References.



CHAPTER 2

ANALYSIS OF SUBMISSIONS

2 ANALYSIS OF SUBMISSIONS

2.1 Overview of submissions

Submissions received during exhibition of the Modification Report are available to view on the Major Projects website at:

<https://www.planningportal.nsw.gov.au/major-projects/projects/modification-3-ravensworth-composting-facility-throughput-increase-and-receival-fogo-municipal-and-ci-sources>.

A total of five submissions were received from the following government agencies:

- DPHI;
- NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group;
- Heritage NSW;
- NSW Environment Protection Authority (NSW EPA); and
- Transport for NSW.

No comments were received from the local council (Singleton Council). It is noted that submissions provided by DCCEEW Water Group and Transport for NSW did not raise any comments in relation to the modification application.

Three community submissions were received, including:

- one submission in support of the modification from Chatswood, NSW;
- one submission objecting to the modification from Beecroft, NSW; and
- a submission from Loop Organics Pty Ltd (Loop Organics), a composting facility situated near the facility.

2.2 Summary of submissions

A submissions register is provided in Appendix A, which summarises all submissions received and where the matters raised in those submissions have been addressed.

A summary of the number of comments, recommendations, objections and support is provided in Table 2.1.

Table 2.1 Overview of submissions

Position	Community	Government agency	Total
Comment	15	0	15
Recommendation	0	24	24
Objection	1	0	1
Support	1	0	1

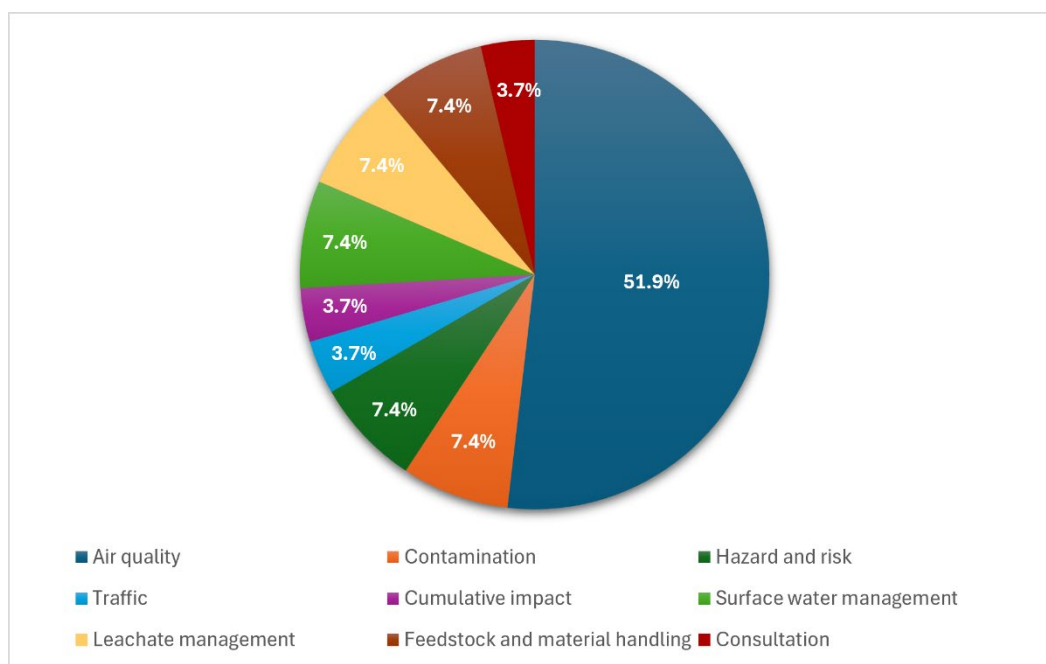
2.3 Summary of matters raised

The key themes of the matters raised in the submissions are summarised in Table 2.2 and visually represented in Figure 2.1. Some submissions commented on multiple themes. The themes have been grouped into categories as shown in Table 2.2, in descending order of quantity of comments.

Table 2.2 Key submission categories

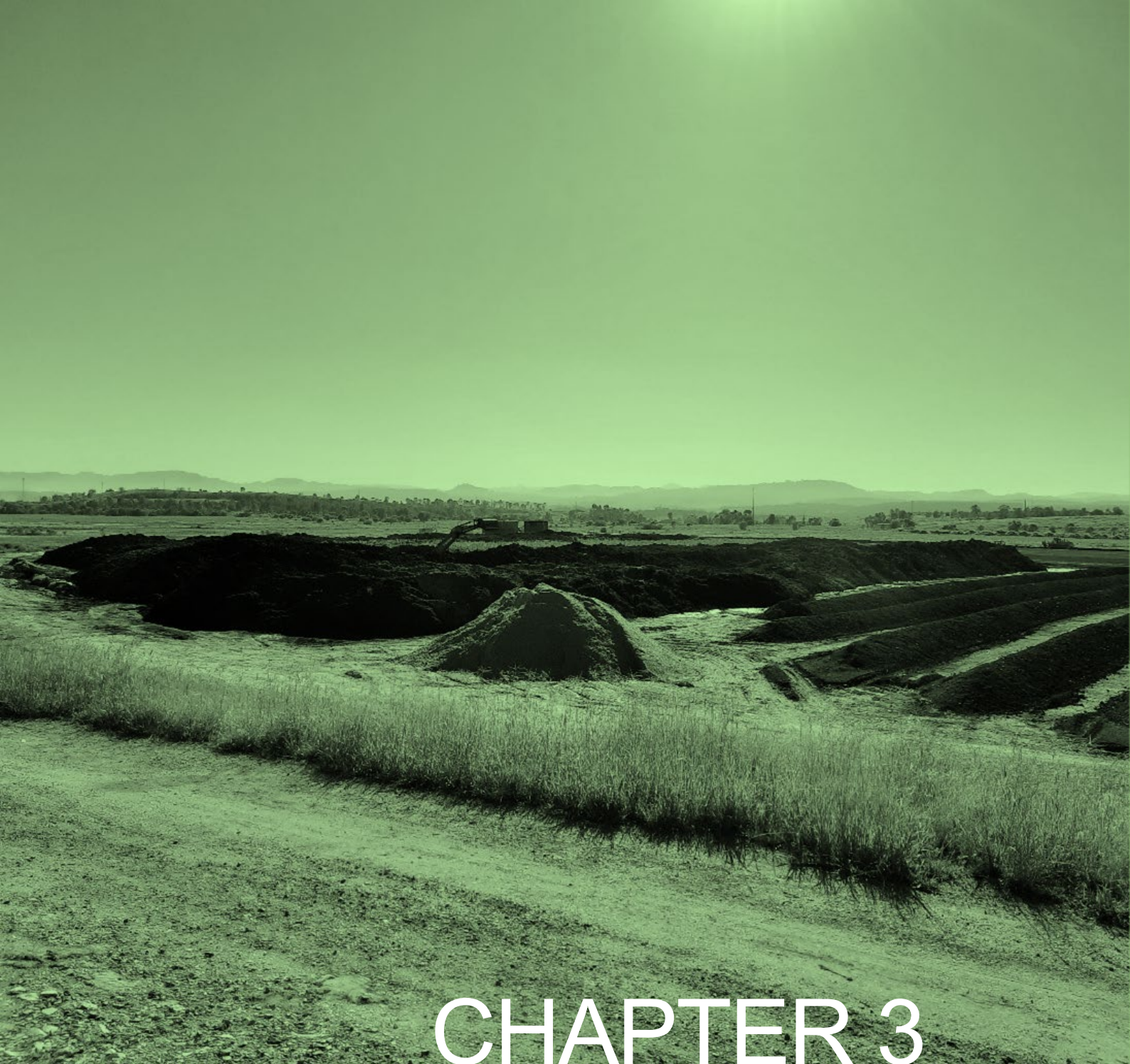
Category	Sub-category	Total comments or recommendations
The economic, environmental and social impacts of the project	Air quality	18
	Surface water	4
	Contamination	2
	Hazard and risk	2
	Leachate management	2
	Traffic	1
	Cumulative impact	1
The project (e.g. the site, the project area, the physical layout and design, key uses and activities, timing)	Feedstock and material handling	8
Procedural matters (e.g. level or quality of engagement, compliance with the SEARs, identification of relevant statutory requirements)	Consultation	1

Figure 2.1 Key submission themes



Each individual government agency submission is addressed in Chapter 3, while public submissions are addressed in Chapter 4.

Table 2.2 indicates that the key themes of the submissions include potential odour, feedstock and material handling and surface water impacts. Submissions also provided comments or recommendations on contamination risk, other hazards and risks, leachate generation, potential traffic and cumulative impacts, and consultation undertaken for the modification.



CHAPTER 3

RESPONSE TO AGENCY
SUBMISSIONS

3 RESPONSE TO AGENCY SUBMISSIONS

The government agency submissions are addressed in this chapter. **Bold** text is an exact reproduction of the submissions received, while normal text is Bettergrow's response to submissions.

As the majority of the submissions relate to air quality, Todoroski Air Sciences, who prepared the *Air Quality Impact and Greenhouse Gas Assessment, Bettergrow Ravensworth Composting Facility, Modification 3* (AQIA) (Todoroski Air Sciences, 2025) for the proposed modification (refer to Appendix C of the Modification Report), prepared the responses to air quality submissions. Responses from Todoroski Air Sciences are provided in Appendix B, and included in the relevant air quality sections below.

3.1 NSW EPA

3.1.1 Air quality

Odour emission rates

Issue:

Adopted odour emission rates are unclear.

Section 5.5 of the AQIA states that odour emission rates for the modelled odour sources were estimated based on site specific sampling conducted at the Bettergrow Ravensworth composting facility (the facility), as well as an additional facility that receives raw FOGO material. The data was then supplemented with literature values based on a review of studies from comparable operations. The AQIA states that the maximum odour levels for each week (week 0-8) were used to estimate the source odour emission rate (SOER) over the duration of the composting process.

Figure 5-6 indicates a maximum SOER for FOGO recovered material of ~7.4 OUV/m²/s, however, table 5-5 specifies that the SOER applied in the assessment was 1.8 OUV/m²/s, which represents an inconsistency between figure 5-6 and the data used for modelling.

The SOER applied to the raw FOGO material appears to be consistent with the two odour flux samples taken as part of the Odour Report. However, FOGO waste can be highly variable depending on the particular waste stream. Therefore, the adopted SOER for raw FOGO material should be representative of a reasonable worst case. The EPA notes that the modelled FOGO SOER requires further clarification, to demonstrate its suitability for assessment purposes.

Recommendation:

The EPA recommends that DPHI requests the Applicant amend the assessment to ensure that the adopted Source Odour Emission Rate (SOER) for Food Organics and Garden Organics (i.e. at week 0) is representative of a reasonable worst case scenario.

Bettergrow response:

The odour measurement data reviewed in the AQIA included data collected from the facility, Valoriza (a facility that receives and processes raw FOGO recovered material from kerbside collections and commercial sources), and other studies and locations, as stated in Section 6.2.3 of the Modification Report. The Valoriza material is considered comparable to the raw FOGO recovered material proposed to be received and processed at the facility.

The reviewed datasets show variability in odour emissions across the different composting stages, as described in Section 6.2.3 of the Modification Report. This variability is normal and expected and is likely to reflect differences in material composition, climatic conditions, composting conditions and sampling methodology. Notwithstanding the variability, the key factor is that the data show a consistent trend of decreasing odour emissions as the composting material matures.

The data also indicate that the measured odour emissions from the Ravensworth and Valoriza samples are generally lower than some of the other FOGO datasets reviewed, as shown in Figure 6.1 of the Modification Report. This is relevant, as some of the higher odour results appear to relate to FOGO recovered material containing significantly more malodorous inputs, such as grease trap waste. Such material is not proposed to be accepted at the facility and is therefore not considered representative of the proposed operations.

The source odour emission rate (SOER) of 1.8 odour unit volume per metre squared per second (OUV/m²/s) adopted in the modelling for raw FOGO recovered material is the average of the odour sampling results from Valoriza. For large sites that have material present at all stages, and are far away from receivers, any potential odour received at a receiver will be relatively homogeneous and consistent with the average odour of the material on the site. Hence the average value is appropriate for the project, as the sensitive receivers in Camberwell, approximately 6 km from the site, would not be able to distinguish any odour from one part of the site from another part of the site. This value is therefore considered representative of the type of material likely to be received at the facility, while still providing a valid value for this site considering any variability in the odour emissions from raw FOGO recovered material.

For the remaining composting stages, the adopted emission rates were derived using the observed relationship between odour emissions and compost maturity across the reviewed datasets. This approach is considered to provide a reasonable worst case representation of the operation of the project. It appropriately accounts for variability in composting material and operating conditions, while avoiding the use of unrepresentative high-end values that would likely overstate the actual odour emissions from the project.

Odorous activities

Issue:

Odorous activities associated with FOGO composting do not appear to have been considered in the AQIA.

The AQIA modelled the composting processing and blending area of the facility as a total area source (187,000 m²). The source odour emission rate (SOER) was then applied over this area based on the age of the material as shown in table 5-5. The EPA note that this assumption may represent the odour potential of the facility under standard conditions, however, activities with a higher odour potential do not appear to be considered, as outlined below:

- ***Shredding and blending:*** Based on table 1.2 of the Modification Report, part of the mobile plant at the facility includes a shredder. Shredding and blending activities can cause increased levels of odour due to the release of trapped gases. The odour associated with shredding / blending does not appear to have been considered in the AQIA.
- ***Windrow turning:*** Although a necessary part of the composting process, windrow turning can cause a temporary increase in odour emissions. The odour associated with windrow turning does not appear to have been considered in the AQIA.
- ***Non-ideal conditions:*** Windrows are required to be maintained under specific environmental conditions (e.g. moisture and temperature) to prevent anaerobic

conditions from developing. Moisture from rain events can fill pore spaces, potentially contributing to anaerobic conditions and increased odour levels. The Modification Report notes that during the composting process, temperature and moisture levels for each windrow are monitored and adjusted as needed, however it is unclear how excessive moisture levels are controlled during the composting process, particularly during prolonged wet periods. Therefore, it is unclear if current mitigation measures are sufficient to minimise offsite odour impacts, given the significant changes to feedstocks and receipt capacity proposed.

- **Additional areas:** Figure 5-4 of the AQIA shows the composting, processing and blending area of the facility which was modelled as part of the assessment. However, it appears that there are additional piles located to the north of the composting, processing and blending area, that are within the boundary of the facility. Additional compost piles do not appear to have been considered in the assessment.
- **Leachate dams:** The SOER adopted for the leachate dams is 1 OUV/m²/s, which appears to be based on site-specific sampling conducted during 2018. The EPA notes that the sampling conducted may be representative of the operations of the facility at the time when sampling was conducted i.e. a receipt of up to 76,000 tonnes per annum (tpa) of biosolids and garden organics. However, under the proposal, the facility intends to accept 250,000 tonnes per annum, including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The EPA notes that the leachate dams are regarded as a significant source of odour for the site, therefore, a small increase in the SOER may result in a significant increase in the odour potential for the facility. The EPA advises that the adopted SOER for the leachate dams should be appropriate regarding the proposed volume and type of feedstock received at the facility.

Recommendation:

The EPA recommends that DPHI requests the Applicant considers all potential odour sources, including (but not limited to) those outlined above as part of the odour dispersion modelling, as described below:

- **Odour source identification – the AQIA should be revised to include the following odour sources, or appropriate justification for their exclusion:**
 - Shredding and blending activities,
 - Windrow turning activities,
 - Additional areas must be considered (i.e. piles located to the north of the composting, processing and blending area),
 - Leachate dams: The SOER for leachate dams must reflect the proposed volume and type of feedstock to be received at the facility.
- **The AQIA should be amended to clearly describe how odour emissions will be managed and mitigated under a range of operating scenarios, including:**
 - Non-ideal conditions (i.e. prolonged wet weather).

Bettergrow response:

The odour modelling presented in the AQIA focused on the following key odour sources identified for the project, as described in Section 5.4 of the AQIA and Section 6.2.6 of the Modification Report:

- the composting processing and blending area, which includes the compost windrows, receipt and blending of the input material streams and storage of mature compost; and
- the leachate control dam.

These sources are generally continuous and have the greatest potential to contribute to off-site odour impacts. Other operational activities, such as shredding and blending, and windrow turning,

are short term, transient activities that occur intermittently during daytime operational activities, and atmospheric dispersion conditions are typically more favourable and the potential for odour impacts is reduced.

Shredding, blending and windrow turning activities can result in a short term increase in odour emissions as additional material surface area is temporarily exposed to air. However, the available test data indicate that odour levels return to normal relatively quickly, typically within one to two hours. These activities can also assist in reducing longer term odour potential through the beneficial effects of oxygenation, homogenisation and moisture redistribution within the composting material, as described in Section 6.2.6 of the Modification Report.

As these activities are undertaken during daytime hours, when dispersion conditions are generally better than during the evening and overnight periods, any short term increase in odour emissions is expected to have a limited potential to result in off-site odour impacts. As such, explicitly modelling such short term activities at times of good dispersion is unwarranted and would not materially affect the assessment conclusions.

The additional piles to the north of the composting area identified by the EPA in Figure 5.4 of the AQIA are not raw material or active composting material. These piles comprise temporary storage of finished product material, which is generally benign in odour terms compared with the raw and active composting materials assessed in the AQIA. The odour character associated with this material would be expected to be earthy or soil-like and is not considered likely to be offensive or out of place within the surrounding setting, which includes extractive industry and agricultural land uses where soil disturbance and exposed earthen materials are common.

The odour emissions for the leachate control dam were based on the emission rates used in a previous odour study for the site (Advanced Environmental Dynamics, 2019). Based on previous experience, a SOER of 1 OUV/m²/s for a leachate control dam at this type of facility is highly conservative and represents a poorly maintained or upset, high odour pond condition. Other studies for composting facilities, including facilities accepting FOGO material (ERM, 2013), reported a leachate dam odour emission rate of 0.33 OUV/m²/s. This is comparable to other facilities focused on green waste (GHD, 2015; TOU, 2010), which reported a leachate dam odour emission rate of 0.26 to 0.3 OUV/m²/s. These odour emission rates are considered more typical of expected leachate dam conditions at a composting facility. Therefore, under typical conditions, leachate dam emissions rates are significantly lower. As such, the modelled leachate dam emission rate provides a reasonable worst case representation for the project without relying on an unreasonably high or unrepresentative value.

With the implementation of suitable management measures to maintain aerobic conditions within the leachate control dam (i.e. aeration), odour emission rates of the dam would be much lower than assumed in the modelling.

Mitigation and management measures currently implemented at the facility to minimise odour emissions, as outlined in the *Air Quality Management Plan* (Air Quality Management Plan) (Todoroski Air Sciences, 2023), include:

- All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation. Where this is not possible, odorous wastes will be covered temporarily with green waste or saw dust.
- Homogeneous mixing will be undertaken.
- Compost materials will be watered to a moisture content such as not to create an anaerobic environment.
- Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver.

The AQIA recommended that these measures continue to be applied to minimise odour impacts (refer to Section 7 of the AQIA and Section 6.2.6 of the Modification Report). It is understood that

the Air Quality Management Plan is currently being updated to consider the recently approved SSD-9418-MOD-2 (refer to Section 1.1).

The existing *Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling* (Composting Management Plan) (Bettergrow, 2025c) for the facility also outline procedures for managing temperature, moisture content and carbon-to-nitrogen ratio during the composting process to minimise odour emissions (refer to Table 1.2 and Section 6.2.6 of the Modification Report).

During non-ideal operating conditions, such as prolonged wet weather, the appropriate management response would be determined based on the condition of the material and the operational circumstances at the time. This may include turning material to assist moisture loss and aeration, mixing wetter material with drier material to improve a moisture balance, and ensuring ponds are aerated. These measures provide practical operational controls to manage odour generation during periods when odour potential may otherwise increase.

In the unlikely event that excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the existing management plans (which are in the process of being updated to consider the recently approved SSD-9418-MOD-2), Bettergrow will temporarily cease the receipt of all material and new composting activities, until the cause of the odour issue has been identified and addressed. This additional measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue. The investigation would consider the likely cause of the excessive odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

Overall, the adopted modelling approach is considered to provide a reasonable worst case assessment of odour impacts from the project. It focuses on the continuous and material odour sources with the greatest potential to influence off-site impacts, adopts conservative but reasonably representative emission rates, and accounts for the site's existing operational controls, without applying assumptions that would unreasonably overstate likely odour emissions.

Sensitive receivers

Issue:

Sensitive receptors do not appear to have been assessed appropriately.

Section 2 of the AQIA states that the nearest privately-owned residential receptors to the facility are located in the vicinity of Camberwell (~6km from the premises). It is also stated that there are other receptors located closer to the premises (along Hebden Road and Lemington Road) which are said to be between approximately 2 and 5 km from the site. The AQIA notes that these residences are on mining land (owned by Glencore and Yancoal) and are subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore are not considered as sensitive receptors for this assessment.

However, a sensitive receptor is defined in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) as “a location where people are likely to work or reside”. The EPA notes that all sensitive receptors “i.e. locations where people are likely to work or reside” should be considered in an AQIA to ensure that potential impacts from a proposed activity are well understood and appropriately addressed/mitigated where necessary. The AQIA should clearly outline all potential off site sensitive receptors, which would include residences on mine owned land

and industrial receptors, to ensure that impacts from the proposal are understood and appropriately managed.

Recommendation:

The EPA recommends that DPHI request the Applicant amend the AQIA to consider all sensitive receptors as defined by the Approved Methods to ensure that the impacts of the facility's operations are appropriately considered and addressed.

Bettergrow response:

The definition of a sensitive receiver per the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) (NSW EPA, 2022) includes 'a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area.' While this definition may capture a broad range of land uses, its application must be considered within the context of land use zoning and compatibility.

As outlined in Section 3.1.2 of the AQIA, a clear distinction is made in the AQIA between residential and other highly sensitive receivers, which forms the basis for the assessment, and industrial and mining land uses, which are inherently compatible with higher-emitting activities and are not reasonably assessable against residential criteria.

Applying residential-level criteria to all locations where people may be present, irrespective of zoning, would be inconsistent with NSW planning principles and the intent of the Approved Methods. It would remove the distinction between industrial and residential land uses and impose unreasonable constraints on established industrial precincts.

The receivers along Hebden Road and Lemington Road are located on mine-owned land, subject to existing mining-related environmental impacts, likely to be uninhabited and situated within a predominantly industrial/resource extraction setting. In particular, the nearest receiver is an uninhabited industrial equipment warehouse on mine-owned land. Accordingly, these receivers are not considered representative of sensitive receivers for compliance assessment in the AQIA.

The predicted incremental 99th percentile average odour concentrations for the project at the nearest sensitive receivers are shown in Figure 6.2 of the Modification Report, and the predicted cumulative 99th percentile average odour concentrations for the project at the nearest sensitive receivers are shown in Figure 6.3 of the Modification Report. These figures have been updated and reproduced in Figure 3.1 and Figure 3.2 below to show the predicted incremental and cumulative 99th percentile average odour concentrations for the project at the nearest industrial, commercial, mine-owned and privately-owned receivers.

As noted in Section 6.2.2 of the Modification Report, the NSW criteria for acceptable levels of odour outlined in the Approved Methods range from 2 to 7 Odour Unit (OU), with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated residential rural areas. The applicable NSW EPA impact assessment criterion at the identified industrial and commercial receiver locations is 7 OU, reflecting the relatively small exposed population and the absence of a permanent more sensitive residential population at these locations.

The modelling results indicate that incremental and cumulative odour levels during operation of the project would be well below the most stringent NSW EPA impact assessment criterion of 2 OU at the majority of the nearest sensitive receiver locations, including all of the nearest mine-owned and privately-owned receivers (refer to Figure 3.1 and Figure 3.2).

Incremental and cumulative odour levels at nearby industrial receivers and commercial receivers would also generally be below 2 OU. Only one industrial receiver, the Loop Organics facility, and one mine-owned receiver, the uninhabited warehouse along Hebden Road, would experience odour levels greater than 2 OU. However incremental and cumulative odour levels at these two

receivers would be less than 6 OU, which is below the relevant NSW EPA impact assessment criterion of 7 OU.

As such, the project is not expected to result in any unacceptable odour impacts, as described in Section 6.2.6 of the Modification Report.

As described in Section 6.2.6 of the Modification Report, these results are based on the conservative assumptions that the entire processing pads area would act as an odour source in addition to the leachate control dam (refer to Figure 5-4 of the AQIA), and that the maximum odour emission rates established from an analysis of site-specific and other odour monitoring data would apply to the project. In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles, and odour emission rates measured at the facility are much lower. The cumulative results are also based on the conservative assumption that the entire composting and blending area of the Loop Organics facility (including currently unused areas), in addition to its leachate dam, would act as an odour source (refer to Figure 5-5 of the AQIA). Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

The AQIA approach is therefore considered to be consistent with the intent of the Approved Methods, and provides adequate information to assess potential impacts at sensitive and non-sensitive receivers.

Figure 3.1
Predicted incremental 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 3
Submissions Report

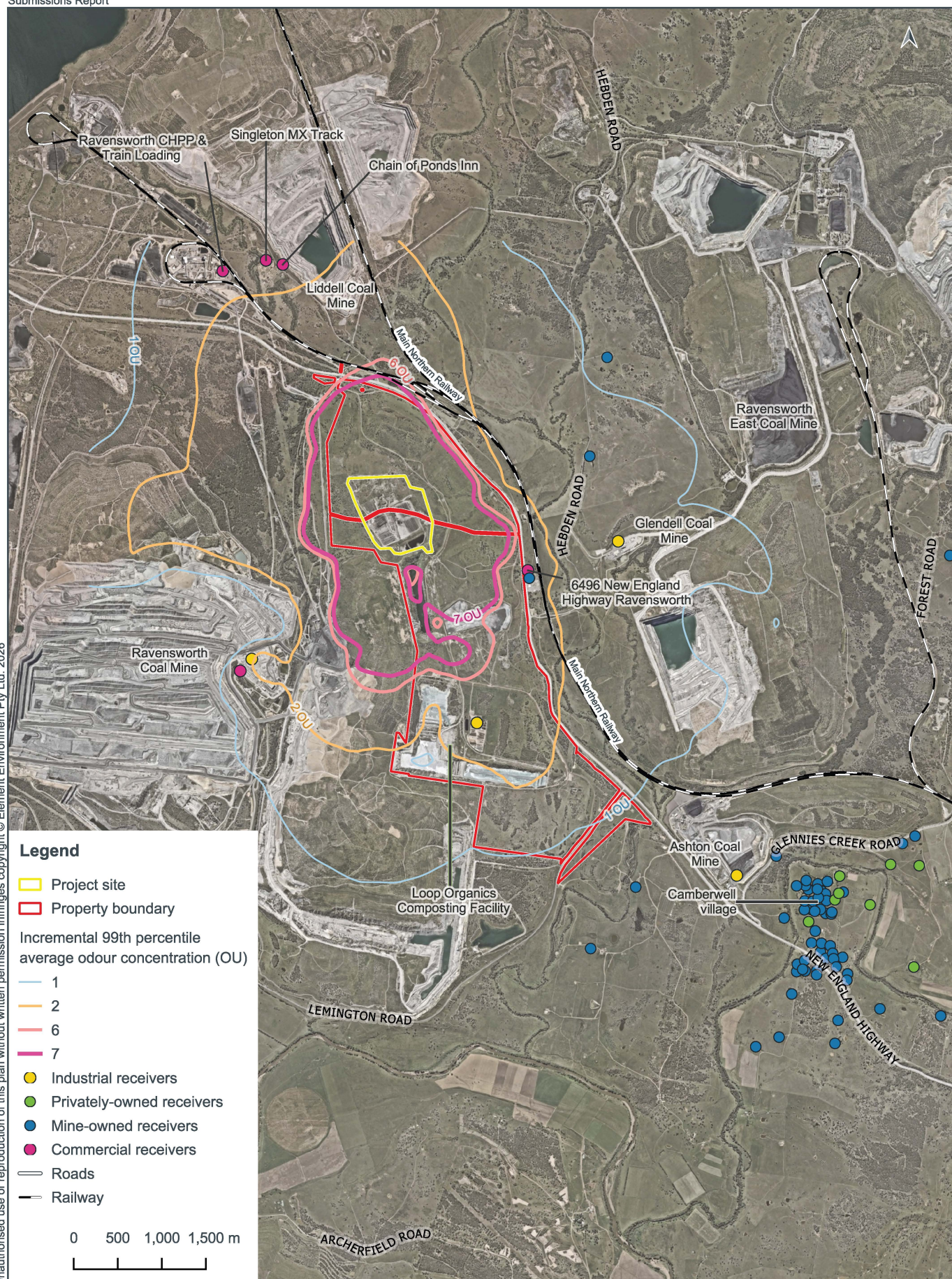
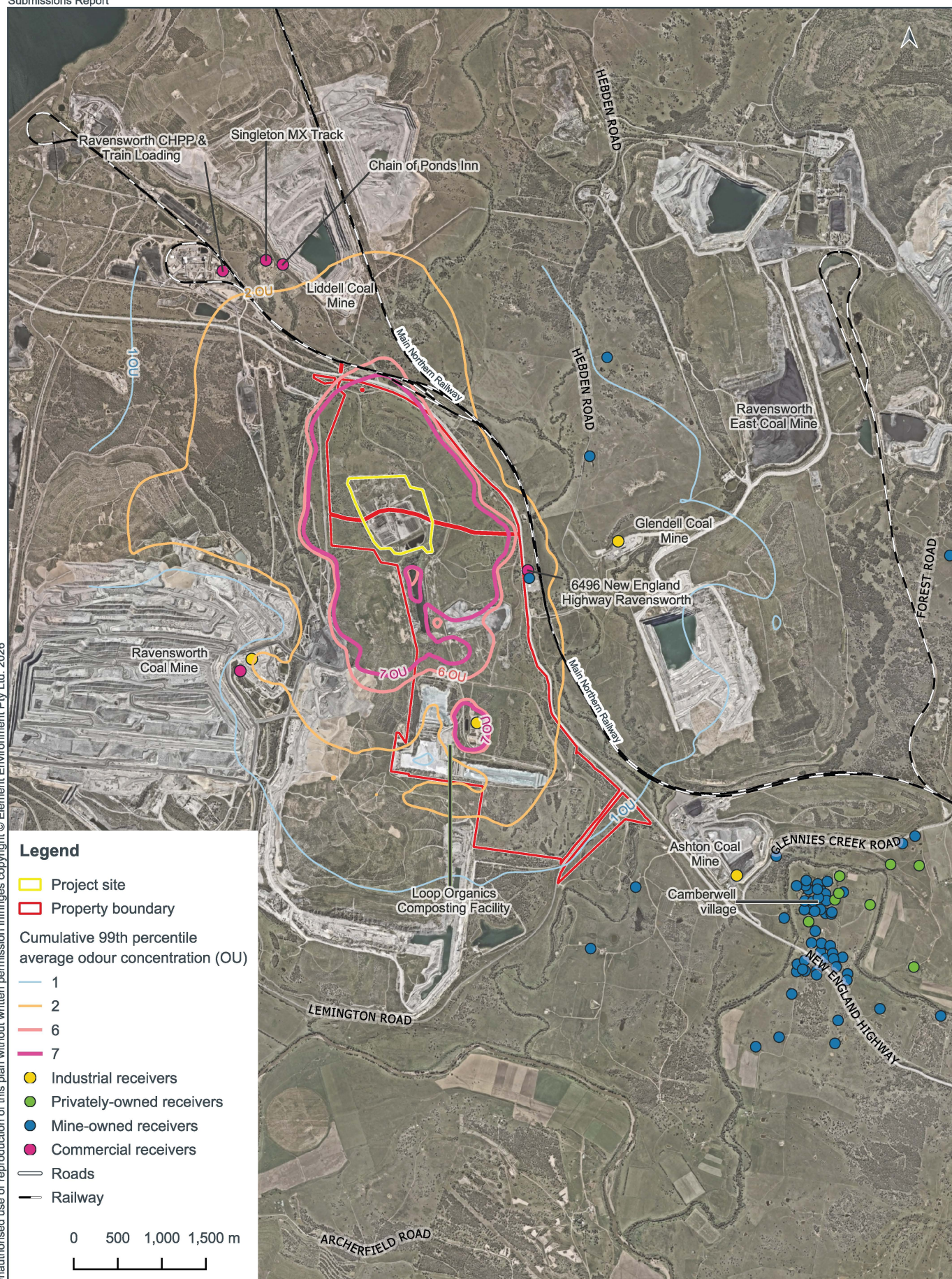


Figure 3.2
Predicted cumulative 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 3
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Cumulative odour assessment

Issue:

The cumulative odour assessment does not appear to be reasonable worst case.

Table 5-2 of the AQIA has outlined that the approximate area for the Composting Processing & Blending Area of the Loop Organics facility is 71,500 m². The specific odour emission rate (SOER) for the Loop Organics facility was based on site-specific monitoring conducted at the Bettergrow Ravensworth facility in 2019. The site-specific measurements returned an average SOER of 0.034 OUV/m²/s based on the testing conducted, which is similar to that of fresh greenwaste (0.027 OUV/m²/s). However, under the Environment Protection Licence of Loop Organics (EPL 20892), the facility is able to accept General Solid Waste (putrescible) i.e. food waste as defined in Composting in Schedule 1 of the POEO Act. The assumed SOER of 0.034 for the Loop Organics facility is therefore not considered to be consistent with the waste that may be received at the site.

The EPA considers that the assessment should ensure the cumulative odour assessment is representative of the types of waste which are accepted by Loop Organics.

Recommendation:

The EPA recommends that DPHI request the Applicant amends the cumulative odour assessment to consider representative types of waste which are accepted by Loop Organics (including the receipt and composting of FOGO waste).

Bettergrow response:

As noted in the AQIA, there is limited publicly available information regarding the operation of the nearby Loop Organics composting facility, other than its reported annual composting rate of 55,000 tpa and satellite imagery of the site. In the absence of more detailed information, the AQIA conservatively assumed all relevant operational areas within the Loop Organics facility visible in aerial imagery, to be potential odour sources.

The AQIA adopted the modelling assumptions for Loop Organics used in the previous assessment for the Bettergrow facility (Advanced Environmental Dynamics, 2019). It is understood that these assumptions were not objected to at the time and, in the absence of more detailed or updated information, they are considered reasonable for the purposes of the current assessment.

Loop Organics has recently received approval from Council to increase their facility's processing capacity from 55,000 tpa to 95,000 tpa (DA 8.2016.173.8). As the development application for this proposal was lodged after this modification application, the details of the development application could not be considered in the AQIA. Bettergrow has contacted Loop Organics on several occasions to request further details about the planned expansion, however no information has been received from Loop Organics at the time of writing.

Without specific information on the existing and proposed process activities, material types, operational practices, active composting areas, emission controls and odour emission rates at Loop Organics, any alternative assumptions would be speculative and inconsistent with those for approved projects in the planning system. On this basis, the adopted approach is considered appropriate for assessing potential cumulative odour impacts associated with the project.

Mitigation and management measures

Issue:

Additional controls do not appear to have been considered in the assessment.

Under Appendix B of the Modification Report, the mitigation and management measures for the project remain the same as the existing approved development. The EPA note that under the proposal, the facility would accept an additional 50,000 tonnes of waste per annum (increasing the processing capacity of the facility from 200,000 to 250,000 tpa), including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The odour potential of the proposal is therefore significantly greater than that of the current operation however it does not appear that additional odour controls have been considered. Open composting systems, such as turned windrows are generally suitable where feedstocks are lower risk, and where sites have sufficient separation from sensitive receivers. However, as processing volumes increase, or where higher risk feedstocks are accepted (such as FOGO), additional controls are usually required.

Although the facility is located a significant distance from sensitive receptors, the risk of potential odour impacts is not completely removed, therefore additional controls should be further considered.

The EPA note that the Loop Organics facility, (located immediately to the south of the Bettergrow facility) accepts FOGO waste. Although the Loop Organics facility is significantly smaller than that of the proposal (accepting a maximum of 55,000 tonnes per annum), the following mitigation measures are included in their environment protection licence:

- Geofabric covers are used with Category 3 food organics material,
- Category 3 food organics material must be covered at the end of each operational day until the material is stabilised.

The EPA note that Loop Organics facility also utilise a sorting shed, which has not been considered as part of the proposal.

The EPA consider that to maintain consistency with other FOGO composting facilities and to minimise odour impacts associated with the proposal, the Applicant must consider additional mitigation measures to reduce the risk of offsite odour impacts. The EPA recommends that all reasonably practicable measures to minimise or control odour from the facility must be considered.

Recommendation:

The EPA recommends that DPHI require the Applicant to consider all additional reasonably practicable mitigation measures to reduce the risk of offsite odour impacts from the proposal.

Bettergrow response:

The AQIA dispersion modelling results indicate that the predicted incremental and cumulative odour levels during operation of the project would be well below the most stringent NSW EPA impact assessment criterion of 2 OU at the nearest sensitive residential receivers in Camberwell, as stated in Section 6.2.6 of the Modification Report and shown in Figure 6.2 and Figure 6.3 of the Modification Report. This report further indicates that incremental and cumulative odour levels at nearby industrial receivers and commercial receivers would also generally be below 2 OU (refer to responses above). Only one industrial receiver, the Loop Organics facility, and one mine-owned receiver, the uninhabited warehouse along Hebden Road, would experience odour levels greater than 2 OU. However incremental and cumulative odour levels at these two receivers would be less than 6 OU, which is below the relevant NSW EPA impact assessment criterion of 7 OU.

On this basis, even allowing for reasonable variation in odour emission rates between individual product streams, composting conditions or operating scenarios, the potential for unacceptable odour impacts at sensitive receivers is considered very low. The assessment therefore indicates

that the proposed operation can be managed with the existing mitigation and management measures, without the need for additional enclosure or treatment systems.

It is not considered reasonable or proportionate to require further controls where the predicted odour impacts are already well below the relevant assessment criterion at all sensitive receivers, and where substantial separation distances provide a significant additional buffer.

Nevertheless, in the unlikely event that excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the existing management plans (which are in the process of being updated to consider the recently approved SSD-9418-MOD-2), Bettergrow will temporarily cease the receipt of all material and new composting activities, until the cause of the odour issue has been identified and addressed. This additional measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue. The investigation would consider the likely cause of the excessive odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

Despite multiple requests, Loop Organics has not provided Bettergrow with the basic operating parameters or odour emission rate data for its proposed future activities. The nature of its operations, process configuration, material handling practices and actual odour emissions are therefore unknown. While the Loop Organics facility may be smaller in scale, this does not necessarily mean that it has lower odour emissions or a lower potential for off-site odour impacts.

It is therefore not appropriate to rely on a direct comparison between the project and the Loop Organics operation when determining the need for additional controls. The requirement for odour mitigation should be based on the specific characteristics of the project, including the proposed activities, adopted odour emission rates, modelling results, receiver separation distances and site-specific operational controls.

The project is a substantial distance away from sensitive receivers, and the modelling demonstrates that the predicted odour impacts are well within the relevant assessment criterion. Accordingly, the existing and proposed odour mitigation and management measures are considered appropriate and proportionate to the level of risk identified for the project, and further controls are not considered warranted.

Issue:

The AQIA does not appear to have identified engineering contingencies that could be implemented should odour impacts occur under the proposal.

The AQIA and the Modification Report (Appendix B) provides a list of the existing and proposed mitigation measures. Mitigation measures nominated for odour include:

- **All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation.**
- **Compost materials will be watered to a moisture content such as not to create an anaerobic environment.**
- **Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver.**

The EPA notes that the nominated measures outlined in Appendix B of the Modification report are the same as the existing modified development (Modification 1) controls. It is also noted that Appendix B does not explicitly identify engineering contingencies or additional operational contingencies that could be implemented should odour impacts occur once operational.

To ensure the risk of odour impacts has been appropriately communicated, the EPA considers that the Applicant should nominate specific contingencies measures that could be implemented should odour impacts occur once operational. In nominating contingencies consideration could be given, but not necessarily limited to:

- enclosing part of the facility,
- covering of odorous material with geofabric materials,
- implementation of end of pipe engineering controls for reducing odorous emissions, and
- ceasing receipt of highly odorous material (including FOGO).

Where the Applicant can nominate specific engineering contingencies that could be implemented at the planning stage, the overall risk of odour impacts is reduced. Per the NSW Odour Technical Framework, it is important that the Applicant considers what options are available to control odour for new and modified activities during the assessment/planning stages of a proposal. Section 6.2 of the NSW Odour Technical Framework states the proposal must include any additional feasible mitigation measures that could be implemented if the facility emits offensive odour after it is operational. The proponent should therefore identify measures beyond the proposed operations which could be implemented should odour impacts occur after plant modifications have taken place.

Recommendation:

The EPA recommends that DPHI request the Applicant investigates and outlines additional odour control options that could be applied, should odour impacts occur once proposed operations have been implemented.

Bettergrow response:

The modelling predictions presented in the AQIA indicate that the potential for off-site odour impacts associated with the project is very low. On this basis, no further routine odour controls are considered warranted beyond the existing operational mitigation and management measures outlined in the Operational Environmental Management Plan (OEMP) (Bettergrow, 2024) and Composting Management Plan.

In the unlikely event that excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the existing management plans (which are in the process of being updated to consider the recently approved SSD-9418-MOD-2), Bettergrow will temporarily cease the receipt of all material and new composting activities, until the cause of the odour issue has been identified and addressed. This additional measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue. The investigation would consider the likely cause of the excessive odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

If the investigation identifies that further engineering or process controls are required to enable the continued acceptance and processing of FOGO recovered material at the site without causing unacceptable odour impacts, then such appropriate measures will be implemented. Any additional controls would be developed having regard to the identified cause of the odour issue, the effectiveness of existing management measures, and the need to maintain acceptable odour outcomes at surrounding receivers.

Once the cause of the odour issue has been addressed, acceptance of the relevant material stream could recommence in a controlled manner, subject to appropriate operational checks and ongoing monitoring. This contingency approach is considered proportionate to the low odour risk predicted by the AQIA, while providing a clear and practical response mechanism should unexpected odour issues arise.

3.1.2 Feedstock and material handling

Resource recovery orders and exemptions

Issue:

The applicable resource recovery orders and exemptions for raw FOGO recovered materials should be clarified.

Section 3.4 of the Modification Report states that raw FOGO material will be received and processed at the premises in accordance with 'The Compost Order 2016' issued by the EPA. However the facility also receives biosolids, which in Table 3.1, are proposed to be blended into the compost. This is not in compliance with the Compost Order 2016. If the feedstocks of raw FOGO and biosolids are proposed to be mixed, the compost produced would need to be supplied under the 'Biosolids Order 2014' or a specific resource recovery exemption for that compost material.

The EPA understands that the Applicant currently holds "The Bettergrow Compost Order 2025" and the "The Bettergrow Compost exemption 2025", which specifically allow for the composting of 'any combination of biosolids, spent bleaching clay, paper crumble, mulch, garden organics, food waste manure, paunch, recovered plasterboard and Bayswater mine water" and expires on 11 June 2027. The raw FOGO received on-site could be composted under either:

- the general Compost Order 2016 if the feedstocks to composting are limited to the allowed inputs under this general order (i.e. any combination of mulch, garden organics, food waste, manure and paunch); or
- the specific order and exemption 'The Bettergrow compost order 2025' which permits additional inputs to composting as noted above.

Recommendation:

The EPA recommends that DPHI request the Applicant clarifies the applicable resource recovery orders and exemptions the composting operations at the facility will receive and process waste streams under.

Bettergrow response:

All organic material will be received and composted at the facility under 'The Bettergrow Compost Order 2025' (or as in force from time to time). Bettergrow will apply to amend the 'The Bettergrow Compost Exemption 2025', in consultation with the NSW EPA, to allow ENM and VENM to be blended with the final compost product.

Finished compost from the facility would be applied to land as a soil amendment under 'The Bettergrow Compost Exemption 2025' (or as in force from time to time).

Material quantities

Issue:

Material quantities in the Modification Report are not consistent with individual waste classification types and don't clearly identify materials that will be composted or materials that will be blended.

Table 3.1 of the Modification Report outlines the proposed annual throughputs of different types of materials that will be received and processed at the premises per year. The EPA notes that waste types such as Excavated Natural Materials (ENM) and Virgin Excavated Natural Materials (VENM) have been combined into the same throughput stream. ENM and VENM are different waste classes. By combining them into one line with a combined total of 15,000 tonnes per annum, this will make distinguishing one from another difficult. VENM and ENM are both identified as received 'ready for blending' (column 4 of Table 3.1). The EPA assumes these will be blended with the final compost produced on site. A similar term is used for other received materials which should be 'blended and composted' so it is not clear about the intended processing for some of the received materials. It is not clear whether they will go through a composting process, as defined by the compost orders, or if the materials are to be blended at the end of the full process.

The EPA notes that 'Animal waste (manure)' is listed as 'raw – for blending' in Table 3.1. Manure should be added at the start of the composting process as per the Compost Orders and receive the full composting treatment, not simply added to the final compost.

The 'Recycled water from Bayswater Power Station' is listed as 'raw – for blending and compost maintenance'. The 'Bettergrow Compost Order 2025' allows the use of 'Bayswater mine water' as an input to the composting process. This is defined as 'water extracted from Void 4 within Environment Protection Licence 2652 and used as an alternative moisture source for composting'.

It is not clear if these two references refer to the same liquid. If this is not the same liquid, it presents a potential source of pathogen contamination of the compost if it is used after pasteurisation stage. If it is a different water source, it should also be assessed for potential chemical contamination before it is permitted for use in any stage of the generation of compost.

Recommendation:

The EPA recommends that DPHI request the Applicant to amend the Modification Report to:

- Clearly identify each waste type separately,
- Clearly identify the material types proposed to be processed via 'composting' as defined in the 'Compost Order 2016' or the 'Bettergrow Compost Order 2025', and note if they require pasteurisation,
- Clearly identify which materials will be blended after composting is completed,
- Outline how these proposed material handling procedures will meet each resource recovery order, and
- Clarify if the source of water referenced in the assessment is the same as that specified within 'Bettergrow Compost Order 2025.'

Bettergrow response:

Table 3.1 of the Modification Report provides a summary of the different types of recovered organic material that would be received and processed at the facility. This table has been updated and reproduced as Table 3.1 below (with changes shown in **bold**) to:

- list VENM and ENM as separate streams of organic material;
- update the description of certain types of organic material, to reflect the relevant resource recovery order;
- provide additional detailed information on the proposed material handling processes, including which materials would be composted (and be subject to pasteurisation, as described below), and which materials would be blended after composting is completed; and
- specify the resource recovery order that would apply to the material.

All material placed into the windrows for composting would be subject to pasteurisation in accordance with the requirements of *AS 4454-2012 Composts, soil conditioners and mulches* (AS 4554-2012) (Standards Australia, 2012) and *Certification Assurance Procedure CA-05 – Biosecure transport and Treatment of Host Plant Material Destined for Recycling or Waste* (NSW Department of Primary Industries, 2017), as described in Section 1.3.5 of the Modification Report. AS 4554-2012 requires compost material to be subjected to pasteurisation temperatures above 55 °C for at least three consecutive days, as described in Section 1.3.5 of the Modification Report.

The proposed material handling procedures would comply with 'The Bettergrow Composting Order 2025' (or as in force from time to time), where applicable, by ensuring that:

- each material is correctly classified and recorded on receipt;
- only eligible input materials are accepted;
- raw organic feedstocks for composting are processed through the process detailed in the *Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling* (Composting Management Plan) (Bettergrow, 2025c);
- materials intended for blending are kept separate from raw composting feedstocks;
- VENM, ENM and other non-composting materials are tracked as separate streams;
- finished products are only supplied once applicable processing, sampling and testing requirements have been satisfied; and
- records are maintained to demonstrate compliance with each relevant order and exemption.

Table 3.1 Proposed feedstock and material handling

Type of organic material	Waste classification ¹	Description	State of material received	Material handling procedures	Existing tonnage (tpa)	Proposed tonnage (tpa)
FOGO	General solid waste (putrescible)	Food waste and garden waste (as defined in Schedule 1 of the <i>NSW Protection of Environment Operations Act 1997</i> (POEO Act))	Raw	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	0	105,000
VENM	N/A	VENM (as defined in Schedule 1 of the POEO Act)	Raw	Blended with final compost product	0	7,500
ENM	General solid waste (non-putrescible)	ENM (as defined in 'The Bettergrow Compost Order 2025')	Raw	Blended with final compost product	0	7,500

Type of organic material	Waste classification ¹	Description	State of material received	Material handling procedures	Existing tonnage (tpa)	Proposed tonnage (tpa)
Garden organics	General solid waste (non-putrescible)	Garden waste (as defined in Schedule 1 of the POEO Act)	Mulched and screened	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	110,000	57,500
Biosolids	General solid waste (non-putrescible)	Biosolids (as defined in 'The Bettergrow Compost Order 2025')	Dewatered	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	25,000	42,500
Paper crumble	General solid waste (non-putrescible)	Paper crumble for composting (as defined as General or Specific Exempted Waste)	Shredded	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	10,000	0
Urban wood residue	General solid waste (non-putrescible)	Urban wood residues for composting (as defined in 'The Bettergrow Compost Order 2025')	Shredded	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	2,500	2,500
Natural organic fibrous material	General solid waste (non-putrescible)	Natural organic fibrous composting material (as defined in Schedule 1 of the POEO Act)	Shredded	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow	2,500	2,500

Type of organic material	Waste classification ¹	Description	State of material received	Material handling procedures	Existing tonnage (tpa)	Proposed tonnage (tpa)
				Compost Order 2025'		
Bayswater Mine water	Liquid waste	Wastewater from Bayswater Mine (as defined in 'The Bettergrow Compost Order 2025'	Raw	Blended with other organic recovered material upon receipt for the purpose of composting in accordance with 'The Bettergrow Compost Order 2025'	25,000	15,000
Animal waste (manure)	General solid waste (non-putrescible)	Animal waste (as defined in Schedule 1 of the POEO Act)	Raw	Blended with other organic recovered material upon receipt and composted (and pasteurised) in accordance with 'The Bettergrow Compost Order 2025'	5,000	10,000
Hydro-excavated drilling mud	General solid waste (non-putrescible)	Drill mud process water (as defined in 'The Treated Drill Mud Order 2014')	Raw	Blended with other organic recovered material upon receipt for the purpose of composting, in accordance with 'The Bettergrow Compost Order 2025', and dust suppression.	20,000	0
Total					200,000	250,000

1: In accordance with the Waste Classification Guidelines.

3.1.3 Surface water

Surface water management controls

Issue:

Further clarification is required for surface water management controls.

The EPA notes that in the SWIA several potential risks to surface water quality and contamination were identified at the premises. Figure 5-1 of the SWIA shows the outline of the clean water drainage alignment with a number of potential contamination risks, as follows:

- Northern stockpiled area with material stored hydraulically up-gradient of the clean water drainage alignment,

- Eastern clean water drainage line appears discontinuous with access tracks and internal roads visible crossing the line with no segregation evident,
- Chemical spills or leak risks from the refuelling diesel tank and fill location.

The EPA notes that whilst the SWIA recommends SWIA management and mitigation actions for the clean water diversion infrastructure and leachate management systems, it is not clear what measures the Applicant is proposing to implement as part of this modification. As a result, the EPA considers that additional clarification on measures to reduce the risk of contamination of the clean water diversions should be provided.

Recommendation:

The EPA recommends that DPHI requests the Applicant provide:

- Clarification of how the contamination risks above have been addressed.
- Clarification of the outcome of the inspection recommended by the SWIA to check the integrity and operational effectiveness of the clean water diversion infrastructure at the premises, and any rectification action identified.
- An updated Site Plan with surface water and leachate management features detailed showing how surface water and leachate will be managed to prevent contamination in the proposed expansion of composting operations.

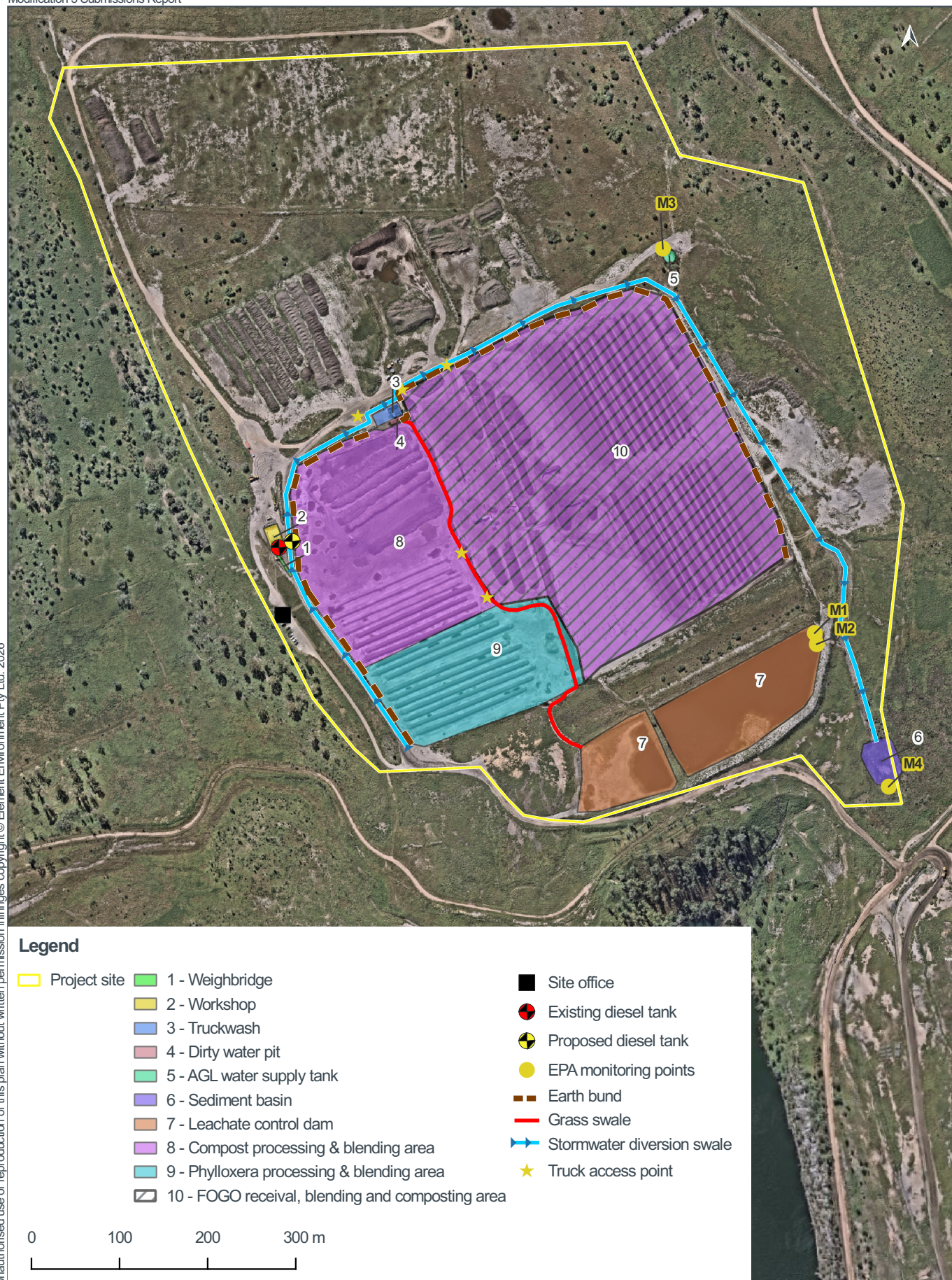
Bettergrow response:

Updated site plan

Figure 1.5 of the Modification Report, on which Figure 5-1 of the Surface Water Impact Assessment (SWIA) (Appendix D of the Modification Report) is based, has been updated and reproduced as Figure 3.3 below, to provide more detailed information about the existing surface water and leachate management controls at the site to minimise potential contamination risks at the facility.

Figure 3.3
Updated site layout

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Contamination risks

The northern stockpile area (refer to Figure 3.3) is a self-bunded (earthen bund) temporary storage area for finished AGL compost product awaiting collection. Rainfall within this area, including during periods of heavy rainfall, dissipates naturally through seepage loss (rainwater infiltrates the compost stockpile into the underlying ground) and evaporation (rainwater evaporates from the surface of the stockpile). There is no runoff from this area into the clean water drainage system.

Diversion bunds are in place along the processing pad perimeter to exclude minor upstream catchment flows from entering the processing pads, as described in Section 1.3.5 of the Modification Report. Grassed swales are also in place along the processing pad perimeter to collect and convey clean stormwater runoff towards the sediment basin, reduce flow velocities and promote evaporation and infiltration, as shown in Figure 3.3. All water, including rainfall, that falls onto the pad is collected and managed as leachate, with the pad graded to convey leachate to the leachate dam.

The eastern clean water drainage line is discontinuous in three locations to allow delivery trucks and plant to access the processing pad for operational purposes, as shown in Figure 3.3. The grass swale that conveys wastewater from the truck wash to the leachate dam, is also discontinuous in two locations to enable operational vehicles and plant to travel between the eastern and western processing pads, as shown in Figure 3.3. Culverts have been installed beneath these access points on the processing pad to maintain flow within this swale.

The on-site diesel tanks are double-walled self-bunded tanks installed in accordance with AS 1692-2006 *Steel tanks for flammable and combustible liquids* (Standards Australia, 2006) and AS 1657-2013 *Fixed platforms, walkways, stairways and ladders - Design, construction and installation* (Standards Australia, 2013), as described in *Ravensworth Composting Facility State significant development Modification 2 Modification Report* (Element Environment, 2025b). The outer wall of the double-walled tanks provides an extra layer of protection, capturing any leaks or spills and reducing the risk of environmental contamination. Drip trays are also used during refuelling to capture and contain any potential drips, leaks or spills. In addition, the potential for spills and leaks and associated contamination risk to occur is minimised through the spill prevention, containment and management measures outlined in the *Site Emergency Plan* (Bettergrow, 2025a).

As outlined in Section 1.5.1 of the Modification Report, the most recent independent environmental audit undertaken at the facility in August and September 2024 for the period 24 January 2023 to 21 August 2024 (KPMG, 2024) noted:

- The site presented well during the inspection with no evidence of pollutants observed to be escaping the boundaries.
- Chemical storage was well managed, with the storage areas clean and tidy, bunding and spill kits provided and no evidence of spills or leaks occurring.

The facility's OEMP and its associated sub-plans, including the Surface and Groundwater Management Plan, will be reviewed and updated to reflect the expanded operation and consider any additional contaminants, as required by condition C8(d) of development consent SSD-9418 (subject to approval of this modification application) (refer to Section 6.3.4 of the Modification Report). This will include review of the existing surface water monitoring program with regard to the analytical suite for sampling and actions, and action trigger levels for additional contaminants of potential concern, if any are identified.

Potential contaminants of concern associated with the site's current operations are also identified in Condition M2 of the facility's Environment Protection Licence (EPL), EPL 7654. Subject to approval of the proposed modification, the NSW EPA will review the licence and amend the list

of potential contaminants of concern, as necessary, to reflect the modified operations and associated environmental risks.

Surface water and leachate management infrastructure inspections

The clean water diversion infrastructure and leachate dam are inspected monthly by the Site Coordinator to assess their integrity and operational effectiveness. Inspection findings are documented in the Workplace and Environmental Inspection Checklist. Where rectification works are required, they are undertaken as soon as reasonably practicable.

As stated in Section 6.3.4 of the Modification Report, potential impacts on surface water quality during construction and operation of the project are expected to be minimal with the implementation of:

- the existing erosion, sedimentation and contamination mitigation and management measures; and
- the existing monitoring and maintenance measures outlined in the Surface and Groundwater Management Plan to ensure the integrity of the existing stormwater and leachate management infrastructure and prevent cross-contamination.

As such, there is not considered to be any requirement for additional surface water mitigation or management measures.

3.1.4 Leachate management

Issue:

Further clarification is required for leachate management controls.

The EPA notes that the Modification Report does not appear to provide sufficient detail on measures to minimise the generate of leachate. The EPA considers that with the increase in volume of material processing, there is potential for increased leachate generation. It is not clear if existing management controls are appropriate to manage the potential increase in leachate volume or if additional controls would be required.

Recommendation:

The EPA recommends that DPHI request the Applicant clarify the proposed measures to minimise the volume of leachate, and any additional measures required to manage increased risks of leachate generation.

Bettergrow response:

As stated in Section 6.3.3 of the Modification Report, the facility currently operates as a closed-loop water management system, whereby leachate generated on the processing pads and wastewater generated by the truck wash are captured in the onsite leachate control dam and reused for moisture conditioning during the composting process, as the composting process is a net user of water.

The site water balance assessment for the proposed site operations is presented in Section 4.5 of the SWIA and Section 6.3.3 of the Modification Report. As stated in Section 6.3.4 of the Modification Report, the updated site water balance indicates that the project would not result in a net increase of leachate generated, and that the facility would continue to be a net user of water, under average climate conditions.

Leachate generation at the facility is currently minimised through:

- operating the existing best management practice closed-loop water management system;
- frequently turning windrows to ensure they remain aerobic and pasteurisation is achieved;

- monitoring the moisture content of compost windrows;
- diverting clean water away from the processing pad;
- constructing compost windrows parallel with the stormwater flows, to minimise the transport of leachate and gross solids to the leachate dams.
- carrying out monthly Workplace and Environmental Inspections to identify any maintenance or rectification works required; and
- aerating the leachate dam, as required, in response to contaminants of potential concern identified through routine quarterly characterisation sampling in accordance with EPL 7654 for the facility.

As discussed in Section 1.3.5 of the Modification Report, the leachate control dam has enough storage capacity (50.2 megalitres (ML)) to capture all runoff up to the 1% (1 in 100-year) Annual Exceedance Probability (AEP) 24-hour rainfall event. In the exceedingly rare event that the leachate control dam overflows during rainfall less frequent than the 1% AEP 24-hour rainfall event, leachate water can flow via a spillway into the 2 ML lower sediment basin. In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has in excess of 40 metres (m) depth of available airspace above its normal operating level (i.e. over 500 ML). As such, the risk of exceeding the on-site leachate storage capacity is considered unlikely, and no additional measures are required.

3.2 DPHI

3.2.1 Feedstock and material handling

Issue:

Provide detailed justification that the site is suitable to accommodate the proposed 25% increase in throughput, with consideration of the range of potential processing times and the maximum storage capacity for incoming waste and finished product.

Bettergrow response:

Table 3.2 presents the calculations used to determine the total capacity of the processing pads. Further explanation of these calculations is provided below.

Table 3.2 Calculations to determine total capacity of processing pads

	Eastern pad	Western pad
Surveyed processing pad area	114,350 m ²	87,800 m ²
Total area used for unloading and stockpiling	0 m ²	25,000 m ²
Total area available for windrows	114,350 m ²	62,800 m ²
Windrow area ((width + an additional 2 m to allow for equipment and vehicle access) x length of windrow)	1,050 m ²	910 m ²
Maximum number of windrows on processing pad (total area available for windrows / windrow area)	109	69
Maximum capacity of processing pad (windrow volume (m ³) (width x height x length) x maximum number of windrows)	245,250 m ³	134,550 m ³
Total capacity (maximum capacity of processing pad (in m ³) x 1.5)	367,875 t	201,825 t

The total surveyed area of each processing pad is shown in the 2017 leachate barrier certification presented in Appendix D.

When initially formed, each compost windrow is approximately 5 m wide and 3 m high. Windrows on the eastern processing pad would be approximately 150 m long, while those on the western processing pad would be approximately 130 m long. Based on these dimensions, the eastern pad

has an estimated capacity of approximately 245,250 cubic metres (m³), and the western pad has an estimated capacity of approximately 134,550 m³.

The combined capacity of both processing pads is therefore approximately 569,700 t, which provides sufficient capacity to accommodate an increase of approximately 184% in the current facility throughput (200,000 tpa). This allows for approximately 2 m of spacing between windrows for vehicle and equipment access, as well as an area of approximately 25,000 square metres (m²) on the western processing pad for unloading and stockpiling activities. As the volume of the composting material decreases by approximately 50-60% during the composting process due to natural shrinkage, this capacity estimate is considered conservative, with additional operational capacity expected to become available over time.

The processing time from initial formation of the windrows until completion of the composting process is approximately 10 to 12 weeks. The available processing capacity of the processing pads would be routinely monitored to ensure sufficient space is available for the incorporation and composting of incoming organic material. Organic material would only be accepted where adequate processing capacity exists, ensuring that the volume of material received does not exceed the operational capacity of the composting pads.

As such, the site is considered to be suitable for the proposed increase in throughput.

Issue:

Clarify the sources of FOGO material proposed to be received.

Bettergrow response:

FOGO recovered material proposed to be received at the facility would be sourced from municipal waste collections within the Newcastle, Port Stephens and Central Coast LGAs.

Issue:

Clarify the maximum quantity of FOGO material to be stockpiled at the site prior to processing.

Bettergrow response:

Upon arrival at the site, FOGO recovered material would immediately be incorporated into a windrow comprising of biosolids and other approved organic material. In the unlikely event that FOGO recovered material cannot be incorporated into a windrow immediately upon arrival, it would be covered with green waste or mature compost, to minimise potential odour emissions. Alternatively, an odour neutralising agent, such as BioActive, could be applied to manage potential odour emissions until the material can be incorporated into a windrow.

In the unlikely event that temporary stockpiling is required, up to 100 t of FOGO recovered material may be stockpiled on-site per day, however, all material would be incorporated into a windrow on the day of its arrival on-site.

Issue:

Show on plans where the inspection/stockpile areas for FOGO material are proposed.

Bettergrow response:

As described in sections 1.3.5 and 3.7 of the Modification Report, trucks delivering FOGO material would tip their loads onto the hardstand pad (the compost processing and blending area as shown in Figure 1.3 of the Modification Report), to be inspected. FOGO material would typically be received, blended and composted within the eastern pad of the compost processing and blending area, as shown in the updated site layout in Figure 3.3.

Issue:

Detail the composting process(es) for FOGO material. Consider including process flow diagrams.

Bettergrow response:

The existing composting process is described in Section 1.3.5 of the Modification Report, and a flow diagram for this process is presented in Section 3.5 of the facility's OEMP. This flow diagram is currently being updated as part of the revision of the OEMP to reflect changes to operational processes resulting from the recent approval of Modification 2 to SSD-9418 (SSD-9418-MOD-2), as required by condition C8(d) of development consent SSD-9418. The updated OEMP will be submitted to DPHI for approval.

An indicative flow diagram for the composting process for decontaminated and pasteurised FOGO and/or food recovered material (that will be received and processed at the facility under Modification 2), as well as raw FOGO recovered material (proposed under this modification), is presented in Figure 3.4.

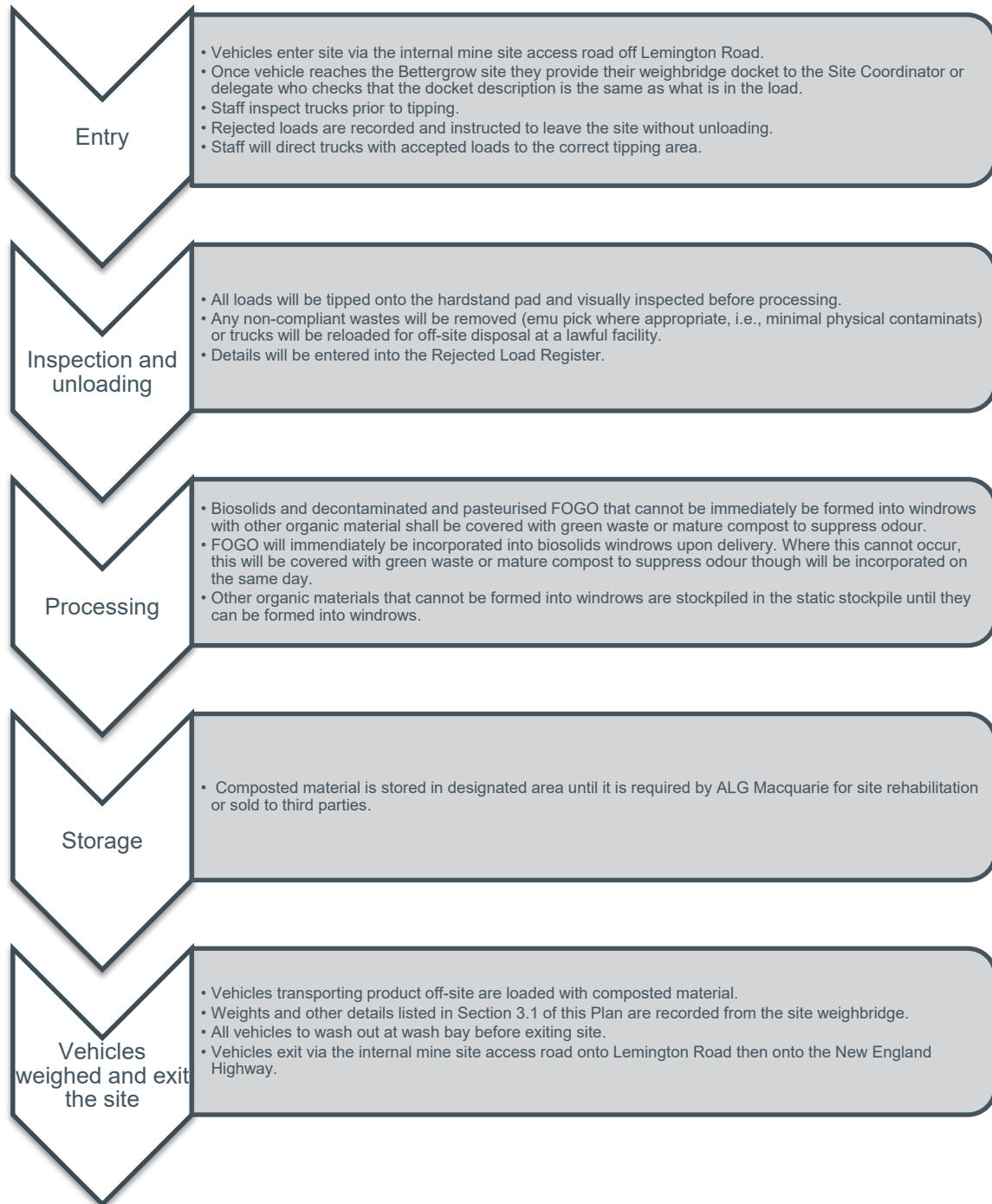
Upon arrival at the site, FOGO recovered material would be unloaded onto the process hardstand and immediately incorporated into a windrow comprising of biosolids and other approved organic material. In the unlikely event that FOGO recovered material cannot be incorporated into a windrow immediately upon arrival, it would be covered with green waste or mature compost, to minimise potential odour emissions. Alternatively, an odour neutralising agent, such as BioActive, could be applied to manage potential odour emissions until the material can be incorporated into a windrow.

The following current management practices will continue to be implemented during the composting of raw FOGO recovered material:

- Compost windrows are constructed to run parallel with the stormwater flows in order to minimise the transport of leachate and gross solids to the leachate dam.
- Windrows are frequently turned with a specialised windrow turner to ensure they remain aerobic and that pasteurisation of all products is achieved. On windy days water is sprayed over the compost to prevent dust generation during the turning of the windrows.
- The moisture content of the windrows is monitored and adjusted as required to maintain a moisture content of 45 – 50% weight by weight (w/w) during composting.
- The temperature of the windrows is monitored weekly at a minimum to create a temperature profile. The internal temperature of the windrows needs to reach a minimum temperature of 55 degrees Celsius (°C) which is maintained for at least three consecutive days before each turn to achieve pasteurisation. Compost windrows may reach temperatures higher than 55°C during the initial phase of composting. When windrows reach internal temperatures greater than 62°C, the windrow is turned to dissipate heat and to provide oxygen which is essential for maintaining aerobic conditions.
- The composting process generally takes up to 8 weeks after which maturation will occur.
- Compost is dried to a moisture content of approximately 35% w/w or less.

The finished compost material would be screened and potentially blended with VENM or ENM to create the required final product.

Figure 3.4 Indicative flow diagram for the processing of FOGO recovered material



Issue:

Detail the decontamination processes that would be in place either on-site or off-site to ensure the suitability of FOGO waste received from municipal collection or from mixed commercial and industrial sources for composting, noting that the existing site process is to return contaminated loads to the supplier.

Bettergrow response:

FOGO recovered material received at the facility would undergo several stages of physical contaminant removal prior to arrival at the site and during on-site processing, including:

- Off-site pre-processing: Prior to delivery at the facility, FOGO recovered material would undergo decontamination, sorting and shredding at a waste transfer facility. This process includes the manual removal of large-sized contaminants, such as food containers, plastic bottles and plastic bags, as well as smaller-sized contaminants, such as plastic or metal fragments.
- Initial receipt inspection: The facility's existing Waste Management Plan (Bettergrow, 2024b) outlines further procedures that are currently implemented, and will continue to be implemented for the project, to identify physical contaminants in incoming loads. Upon arrival, each load would be visually inspected for remaining physical contaminants. Loads containing excessive contamination may be rejected and returned to the transfer station for further sorting and contaminant removal. If no contaminants are identified, the truck would proceed to the load receipt hardstand area.
- Unloading inspection: As the FOGO recovered material is unloaded onto the receipt hardstand area, it would be inspected by suitably trained personnel to identify any hazardous or non-conforming waste, including physical contaminants and asbestos. Where hazardous contaminants or non-conforming waste is identified, the truck would be reloaded and returned to the supplier.
- Processing inspection: The organic material would also be routinely inspected during blending of the material and after the maturation process, to identify and remove any physical contaminants.

This multi-stage decontamination process minimises the presence of physical contaminants in incoming feedstock and the final compost product, as stated in sections 1.3.5 and 6.6 of the Modification Report.

3.2.2 Air quality

Issue:

The Modification Report and Air Quality Impact Assessment have characterised only occupied residential receivers as sensitive receivers. The Approved Methods for the Modelling and Assessment of Air Pollutants in NSW defines sensitive receptors as a location where people are likely to work or reside. Under this definition, several sensitive receivers would fall within or very near to the 2-odour unit contour provided with odour modelling, including the commercial premises at 6496 New England Highway Ravensworth, Ravensworth Operations' coal mine, Chain of Ponds Inn historic site, Singleton MX Track, Ravensworth coal washery and several railway loading and unloading facilities. The assessment should consider impacts on these and any other potential sensitive receivers.

Bettergrow response:

As discussed in Section 3.1.1, the definition of a sensitive receiver in the Approved Methods captures a broad range of land uses. However, the application of the odour assessment criteria

should be considered in the context of the zoning, compatibility and actual use of the land surrounding the project, as described previously.

The predicted incremental and cumulative 99th percentile average odour concentrations for the project at the additional commercial premises identified by DPHI, as well as other industrial and mine-owned receivers, are shown in Figure 3.1 and Figure 3.2. The modelling results indicate that the predicted odour levels at these receivers would generally be less than the most stringent NSW EPA criterion of 2 OU, as discussed in Section 3.1.1. Only one industrial receiver, the Loop Organics facility, and one mine-owned receiver, the uninhabited warehouse along Hebden Road, would experience odour levels greater than 2 OU. However incremental and cumulative odour levels at these two receivers would be less than 6 OU, which is below the relevant NSW EPA impact assessment criterion for these receivers of 7 OU (refer to Section 3.1.1).

Issue:

Historical odour sampling from the leachate dam prior to receipt of putrescible wastes may not be representative of the leachate odour profile relevant to proposed waste storage and processing and its adequacy for use in the Air Quality Impact Assessment should be reconsidered.

Bettergrow response:

As discussed in Section 3.1.1, the SOER adopted for the leachate dam is considered conservative and appropriate for assessing maximum odour emission rates for the purposes of the assessment.

The adopted SOER is higher than odour emission rates measured for leachate dams at other comparable composting facilities, where reported values are typically less than half the level applied in the modelling. On this basis, the adopted SOER is expected to overestimate the likely odour emissions from the leachate dam under any normal operating conditions.

Accordingly, the adopted SOER is considered suitably conservative and appropriate for assessing potential odour impacts from this facility.

Issue:

The cumulative odour assessment for the modification must be updated to reflect Loop Organics Pty Ltd's proposed processing rate increase at its 74 Lemington Road outdoor composting facility to 95,000 tonnes per annum.

Bettergrow response:

As discussed in Section 3.1.1, there is insufficient publicly available information to further refine the cumulative odour assessment for the nearby Loop Organics facility. Information has been requested from Loop Organics to better understand its existing and proposed operational practices, material types, active composting areas, emission controls and odour emission rates. However, despite repeated requests, no information has been received from Loop Organics at the time of writing to enable a more detailed or refined assessment of its current operations or proposed expansion.

In the absence of this information, any alternative assumptions would be speculative and inconsistent with those for approved projects in the planning system used in the AQIA, as described in Section 3.1.1. Such speculation would not necessarily improve the reliability of the assessment, and may not provide a sound basis for evaluating cumulative odour impacts.

The AQIA modelling has been based on the conservative assumption that the entire composting and blending area of the Loop Organics facility, in addition to its leachate dam, would act as an odour source (refer to Figure 5-5 of the AQIA), as described in Section 6.2.6 of the Modification Report. In practice, some of the processing pads area is used for vehicle access and spacing

between windrow piles. As such, actual odour emissions for the Loop Organics facility are expected to be less than predicted.

The AQIA therefore adopted the best available information and previously accepted assumptions for the Loop Organics facility. This is considered an appropriate and reasonable approach in these circumstances.

Issue:

Noting the significant potential for odour generation from both outdoor processing and storage of FOGO and the increased processing rate, include details of all reasonable and feasible mitigation measures to minimise odour generation and demonstrate that adopted measures are adequate to manage odour impacts from the site.

Bettergrow response:

As discussed in Section 3.1.1, the AQIA demonstrates that the potential for off-site odour impacts associated with the project is very low. The assessment indicates that the predicted odour levels are well within the applicable criteria, and that the existing and proposed odour mitigation and management measures are appropriate for the level of risk identified.

It is not considered reasonable or proportionate to require further controls where the predicted odour impacts are already well below the relevant assessment criterion at all sensitive receivers, and where substantial separation distances provide a significant additional buffer.

Nevertheless, in the unlikely event that excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the existing management plans (which are in the process of being updated to consider the recently approved SSD-9418-MOD-2), Bettergrow will temporarily cease the receipt of all material and new composting activities, until the cause of the odour issue has been identified and addressed. This additional measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue. The investigation would consider the likely cause of the excessive odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

In the unlikely event that odour generation increases to a level that cannot be adequately managed through standard operational controls, Bettergrow would temporarily cease the receipt of all material and new composting activities, and investigate the cause of the odour, as described in Section 3.1.1. This measure would directly address the primary potential source of elevated odour generation and would allow time for the cause of the issue to be investigated and rectified.

3.2.3 Surface water

Issue:

The table of Mitigation and Management measures in Appendix B of the Modification Report retains a previous commitment to line the leachate dams with recompacted overburden/clay. Confirm whether this measure is in place and detail its adequacy for preventing exfiltration of leachate or contaminants, and whether additional lining may be required to account for increased throughput and altered contaminant loadings that will result from end-to-end FOGO processing.

Bettergrow response:

The leachate control dam was constructed under geotechnical supervision and incorporates a liner consisting of recompacted clay with an in-situ permeability of less than 1×10^{-9} metres per second (m/s), designed to resist chemical degradation from a wide range of aggressive chemicals (including typical chemical compounds found in FOGO material) and maintain long term structural integrity. This liner was certified by geotechnical engineers to confirm that it satisfies NSW EPA requirements outlined in the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (NSW EPA, 2004) (refer to Appendix D).

As stated in Section 6.3.3 of the Modification Report, the facility currently operates a closed-loop water management system, whereby leachate captured in the onsite leachate control dam is reused for moisture conditioning during the composting process, as the composting process is a net user of water. As such, leachate is contained within the leachate control dam only for a limited time.

The updated site water balance prepared for the project (refer to Section 6.3.3 of the Modification Report) indicates that, under average climate conditions, the facility would remain a net user of water. Accordingly, the project would not result in a net increase of leachate generated, as stated in Section 6.3.4 of the Modification Report.

The leachate control dam has enough storage capacity (50.2 ML) to capture all runoff up to the 1% (1 in 100-year) AEP 24-hour rainfall event, as discussed in Section 1.3.5 of the Modification Report. In the exceedingly rare event that the leachate control dam overflows during rainfall less frequent than the 1% AEP 24-hour rainfall event, leachate water can flow via a spillway into the 2 ML lower sediment basin. In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has in excess of 40 m depth of available airspace above its normal operating level (i.e. over 500 ML). As such, the risk of exceeding the on-site leachate storage capacity is considered unlikely, even during extended wet weather events.

Bettergrow will continue to operate the facility in accordance with EPL 7654 issued by the NSW EPA under Section 55 of the POEO Act. This includes quarterly leachate characterisation sampling for contaminants of potential concern listed in EPL 7654. Aeration of the leachate control dam is undertaken, as required, based on the results of the routine quarterly characterisation sampling.

It should also be noted that the SWIA (refer to Appendix D of the Modification Report) did not identify any deficiencies in the current leachate management strategy.

As such, additional lining is not required to account for the increased throughput and altered contaminant loadings due to the project.

Issue:

The Surface Water Impact Assessment made recommendations that have not been addressed in the modification, including a review of the existing surface water monitoring regime in respect to contaminants of potential concern in leachate and a review of the effectiveness of clean water diversion infrastructure. Provide detail on how these recommendations will be addressed.

Bettergrow response:

The facility's OEMP and its associated sub-plans, including the Surface and Groundwater Management Plan, will be reviewed and updated to reflect the expanded operation and consider any additional contaminants, as required by condition C8(d) of development consent SSD-9418 (subject to approval of this modification application) (refer to Section 6.3.4 of the Modification Report). This will include review of the existing surface water monitoring program with regard to

the analytical suite for sampling and actions, and action trigger levels for additional contaminants of potential concern, if any are identified.

Potential contaminants of concern associated with the site's current operations are also identified in Condition M2 of EPL 7654. Subject to approval of the proposed modification, the NSW EPA will review the licence and amend the list of potential contaminants of concern, as necessary, to reflect the modified operations and associated environmental risks.

Issue:

The Surface Water Impact Assessment noted a commitment from the Applicant to upgrade clean water diversion infrastructure. Provide detail on the status and outcomes of this upgrade.

Bettergrow response:

The existing control 'Upgrade to the clean water diversion to ensure separation from process areas' specified in Table 5-1 of the SWIA was included in error. This control is based on a previous update of the Surface and Groundwater Management Plan in the OEMP in 2024 (dated 27 August 2024), in accordance with SSD-9418 condition C8(b), following an environmental incident in which an earthen fissure developed in the western section of the leachate dam. As an interim management measure, the facility implemented additional leachate management controls, including the establishment of diversion swales to direct leachate from the western processing pad to the eastern processing pad, and subsequently into the operational eastern leachate control dam, until rectification works were completed. No clean water diversion infrastructure upgrades are required at present.

3.3 Heritage NSW

3.3.1 Consultation

Issue:

Heritage NSW notes that the modification does not involve any physical or ground-disturbing works and that the proposed changes are largely administrative in nature.

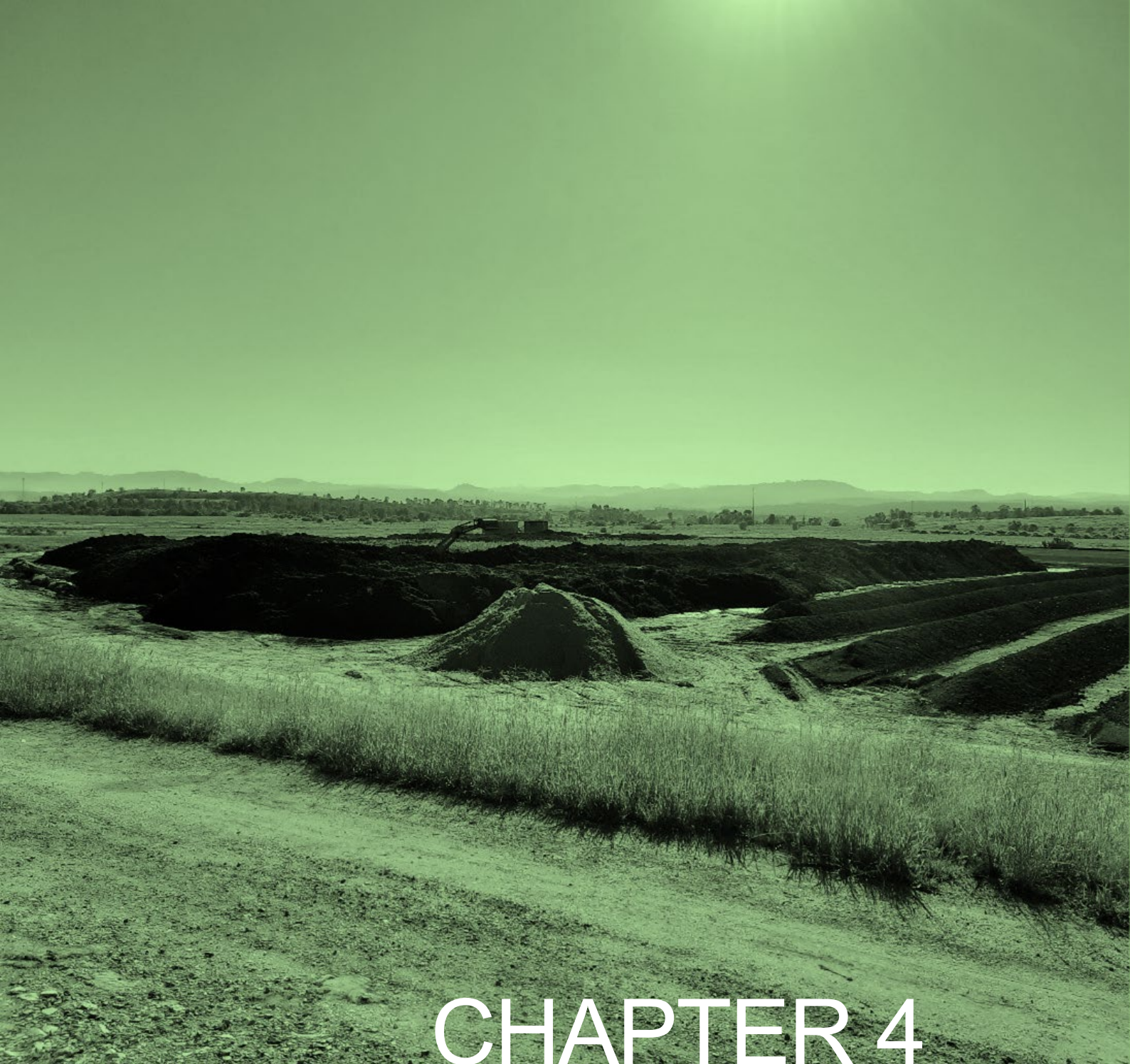
The subject site is not listed on the State Heritage Register (SHR), nor is it in the immediate vicinity of any SHR items. Further, the site does not contain any known historical relics. Heritage NSW have no further comment on the EIS. As there are local items in the vicinity of the subject site, advice should be sought from the relevant local council.

Bettergrow response:

The modification application has been referred to Council, however no response has been received.

As noted in Section 2.2.5 of the Modification Report, the nearest registered heritage item is a former public school along Hebden Road, Ravensworth, approximately 1.4 km south-east of the site, listed as a local heritage item under the Singleton Local Environmental Plan (LEP) (Item ID I42). Recent satellite imagery indicates that the school has been demolished, with only the foundations and some external walls remaining.

The project is not expected to result in any impacts on known or previously unidentified historic heritage items, as it would not involve any excavation of undisturbed land, extension of the development footprint or changes to operational activities. As such, no changes are expected to potential historic heritage impacts from the approved development, as stated in Section 6.6 of the Modification Report.



CHAPTER 4

RESPONSE TO PUBLIC
SUBMISSIONS

4 RESPONSE TO PUBLIC SUBMISSIONS

The public submissions are addressed in this chapter. **Bold** text is an exact reproduction of the submissions received, while normal text is Bettergrow's response to submissions.

4.1 Air quality

Odour emissions

Issue:

FOGO and C&I organic streams possess a significantly higher putrescible content compared to standard green waste or previously approved streams. This leads to a rapid generation of volatile organic compounds (VOCs) and anaerobic conditions if not meticulously managed.

- **Inadequate Processing Infrastructure: Open windrow composting, or partially enclosed receival, is wholly inadequate for high-volume FOGO processing. The increase in throughput necessitates fully enclosed receival halls operating under strict negative pressure, coupled with biofiltration systems designed specifically for the peak ammonia and hydrogen sulphide loads typical of FOGO decomposition.**
- **Meteorological Vulnerability: The Hunter Valley experiences distinct inversion layers and prevailing wind conditions that can trap and transport odours over considerable distances. An increase in putrescible mass without corresponding upgrades to active, enclosed aeration infrastructure will inevitably result in unacceptable odour impacts on surrounding receptors.**

Bettergrow response:

While FOGO and commercial and industrial organic recovered material can have a higher putrescible content than green waste, this has been directly accounted for in the odour assessment in the AQIA. Odour emission rates were adopted from a wide range of data sources, including published information, site-specific and site representative monitoring data, with conservative assumptions applied in the dispersion modelling, as described in Section 3.1.1.

The assessment also accounts for local meteorological conditions, including calm and stable conditions that can influence odour dispersion. The assertion that the project would inevitably result in unacceptable odour impacts is not supported by the assessment results.

The modelling results indicate that incremental and cumulative odour levels during operation of the project would be well below the most stringent EPA criterion of 2 OU at the nearest sensitive receivers in Camberwell, as described in Section 6.2.6 of the Modification Report. These results are based on the conservative assumptions that the entire processing pads area would act as an odour source, and that the maximum odour emission rates established from an analysis of site-specific and other odour monitoring data would apply to the project. In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles, and odour emission rates measured at the facility are much lower. Odour levels during operation of the project are therefore expected to be lower than the predicted incremental odour levels. As such, unacceptable odour impacts at residential receptors are not expected.

Potential odour risks associated with receival, handling and processing of more putrescible organic material at the facility would be managed through the implementation of the existing mitigation and management measures outlined in Appendix C.

Issue:

The Specific Odour Emission Rate (SOER) odour used for the site modelling is not representative of the proposed or current site processing conditions or the range of products which are proposed to be processed by Bettergrow.

Bettergrow response:

As discussed in Section 3.1.1, the SOERs adopted in the AQIA were selected based on a wide range of available odour emissions data, including published data for other facilities, site-specific sampling data available for the project and site representative data of material proposed to be accepted at the site.

This provides a reasonable and conservative basis for representing the range of materials and processing activities proposed for the site. It accounts for the inherent variability in odour emissions between material types, composting stages and operating conditions, while also giving appropriate weight to data that are most representative of the proposed operation.

The adopted SOERs are therefore considered to represent reasonable worst case emission rates for the assessment. They are sufficiently conservative to account for expected variability in material composition and processing conditions, without relying on unrepresentatively high values that would overstate actual odour emissions from the project.

Issue:

According to the Bettergrow Modification 3 Report, wastes which will be composted on site include biosolids (for processing and storage), animal waste (paunch), food waste, including commercial food waste, garden organics, paper crumble and natural organic fibrous material. However, the actual combination of these materials and their relative contribution to odour is not detailed in the odour study report.

Bettergrow response:

The adopted odour emission rates in the AQIA represent the full range of proposed composting feedstocks and processing activities at the facility, and appropriately accounts for variations in material composition over time. This is appropriate for this site due to its large size and distance from sensitive receivers (approximately 6 km).

The AQIA considers the overall odour-generating potential of the operation rather than individual waste streams or composting piles, as any short term variability would not be discernible at the nearest sensitive receivers due to the substantial separation distance. Accordingly, separately modelling individual waste streams would not materially influence the assessment outcomes or the predicted off-site odour impacts.

Issue:

Data used in the odour study includes:

- **Historical site data from their Advanced Environmental Dynamics, 2019 report, where only biosolids and garden organics were composted on site,**
- **Data from a facility which uses tunnel processing (Valoriza facility in Dandenong, Vic) to process FOGO- not open windrow composting (Ektimo, 2025)**
- **Literature data for FOGO processing but not data for other organic wastes (Todoroski Air Sciences, 2025a and 2025b).**

Data used in the Bettergrow Odour Modelling report needs further consideration including using updated site-specific data and relevant SOER data for all sources of waste proposed to be processed on site.

Bettergrow response:

The AQIA uses odour emission data from a range of relevant sources, including published data, data from other composting facilities, and site-specific or site-representative sampling data. This dataset includes odour emission information for the key odorous materials and processing activities proposed for the site, including mixed organic materials, biosolids and composting operations, and therefore provides an appropriate basis for characterising the likely odour emissions associated with the proposed operations.

The adopted approach recognises that odour emissions from composting activities can vary depending on material composition, composting stage, moisture content, aeration, management practices and sampling conditions. Accordingly, the use of multiple datasets provides a more balanced and representative basis for selecting SOERs than reliance on a single dataset.

As such, the SOERs adopted in the AQIA are based on relevant available data and provide a reasonable worst case representation of the proposed operations, while accounting for expected variability in material composition, composting stage and operating conditions.

Furthermore, odour sampling of the current operations alone would not fully characterise the project, as some of the proposed material streams and processing arrangements are not yet in place. Consequently, the AQIA considers published data and representative data from comparable facilities, such as Valoriza, to appropriately characterise the proposed operations.

This approach is consistent with previous air quality impact assessments for composting facilities and is considered appropriate for the project.

Issue:

SOER data should also include site specific odour emissions data for the leachate dam, which has not been previously measured at the Bettergrow facility.

Bettergrow response:

A conservative SOER of 1 OUV/m²/s was adopted for the facility's leachate control dam, as shown in Section 6.2.3 of the Modification Report and Table 5-5 of the AQIA. This emission rate is higher than values typically reported for well-managed leachate dams at comparable composting facilities and is therefore considered conservative for the purposes of the assessment. The adopted emission rate thereby provides an appropriate allowance for potential higher-than-normal odour emissions from the leachate dam, including periods where pond conditions may be less favourable.

On this basis, the AQIA is considered to have adequately and conservatively assessed the potential odour contribution from the leachate control dam.

Cumulative impacts

Issue:

A conservative estimate has been made of cumulative odour emissions data using estimates of Loop Organics' odour emission. This estimate does not account for the proposed expansion of the Loop Organics facility from 55,000 tonnes to 95,000 tonnes.

Bettergrow response:

The cumulative odour assessment has been prepared based on the information publicly available at the time of assessment. As discussed in Section 3.1.1, information has been requested from Loop Organics to better understand its existing and proposed operational practices, material types, active composting areas, emission controls and odour emission rates. However, despite

repeated requests, no information has been received from Loop Organics at the time of writing to enable a more detailed or refined assessment of its current operations or proposed expansion.

In the absence of detailed information on the Loop Organics, the cumulative modelling has adopted a conservative representation of the Loop Organics operations. This is considered appropriate, as any further refinement would require speculative assumptions that may not improve the reliability of the assessment.

Odour emissions from composting activities are primarily influenced by the exposed odorous surface area, the nature and condition of the material, and the stage of composting, rather than throughput alone. The modelling has therefore assumed that the relevant exposed operational areas at Loop Organics comprise composting odour sources. This is likely to overestimate the actual odour contribution from Loop Organics, as it assumes the maximum potential use of those areas for odour-generating composting activities.

On this basis, the cumulative assessment is considered conservative and appropriate for assessing potential cumulative odour impacts associated with the project.

Mitigation and management measures

Issue:

The mitigation measures proposed in the Modification 3 Report are the same as those proposed in the Modification 2 reports. However, Modification 2 is not approved or operational, so it is not appropriate to state that there is expected to be a minimal change in odour from Modification 2 to Modification 3, without having fully measured the impacts of Modification 2.

Bettergrow response:

This comment appears to be based on an incorrect assumption regarding the basis of the odour assessment.

The odour assessment does not rely on Modification 2 being approved or operational, nor does it rely on measured odour outcomes from Modification 2. The odour assessment for Modification 3, being the project, has been undertaken using dispersion modelling of the proposed Modification 3 operations. The modelling includes the relevant odour sources, adopted odour emission rates and proposed mitigation and management measures.

The conclusion that Modification 3 would not result in unacceptable odour impacts is based on the predicted odour modelling outcomes for the Modification 3 operations. The modelling indicates that odour levels during operation of the project would be well below the most stringent NSW EPA impact assessment criterion of 2 OU at the nearest sensitive receivers in Camberwell. These results are based on the conservative assumptions that the entire processing pads area would act as an odour source, and that the maximum odour emission rates established from an analysis of site-specific and other odour monitoring data would apply to the project, as outlined in Section 6.2.6 of the Modification Report. In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles, and odour emission rates measured at the facility are much lower. Odour levels during operation of the project are therefore expected to be lower than the predicted incremental odour levels.

The proposed mitigation and management measures are therefore considered appropriate for the Modification 3 operations. Based on the predicted odour impacts, no additional mitigation measures are considered warranted.

Nevertheless, in the unlikely event that excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the existing management plans (which are in the process of being updated to consider the recently approved

SSD-9418-MOD-2), Bettergrow will temporarily cease the receipt of all material and new composting activities, until the cause of the odour issue has been identified and addressed. This additional measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue. The investigation would consider the likely cause of the excessive odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

Issue:

Mitigation measures should also consider circumstances where the leachate dam generates excessive odour such as when aerobic conditions are not maintained.

Bettergrow response:

A conservative SOER value of 1 OUV/m²/s was adopted for the facility's leachate control dam, as shown in Section 6.2.3 of the Modification Report and Table 5-5 of the AQIA. This emission rate is higher than values typically reported for well-managed leachate dams at comparable composting facilities and is therefore considered conservative for the purposes of the assessment. The adopted emission rate thereby provides an appropriate allowance for potential higher-than-normal odour emissions from the leachate dam, including periods where pond conditions may be less favourable.

On this basis, the potential for elevated odour from the leachate dam has been appropriately considered in the assessment, and no additional mitigation measures are considered warranted. Nevertheless, as described above, an additional measure will be implemented, to prevent any potential worst case odour impacts.

4.2 Contamination

Issue:

Municipal FOGO and C&I streams notoriously suffer from high physical contamination rates, primarily soft plastics, hard plastics, and glass.

- **Compost Quality and End-Use:** Given that the primary end-use for this compost is the rehabilitation of the AGL Macquarie void lands, introducing highly contaminated feedstocks risks permanently polluting the rehabilitation site with microplastics and glass shards.
- **Decontamination Shortfalls:** The modification must not be approved without the implementation of advanced, multi-stage mechanical separation infrastructure (such as air classifiers, trommels, and optical sorters) on the front-end receipt and back-end refinement processes. Standard visual inspection and basic screening are entirely insufficient for municipal FOGO.

Bettergrow response:

FOGO recovered material received at the facility would undergo decontamination, sorting and shredding at a waste transfer facility prior to receipt at the facility, as described in Section 3.1.2. The facility also implements additional procedures upon receipt and processing of the organic recovered material on-site to identify and remove any remaining physical contaminants, as described in Section 3.1.2.

With the implementation of these measures, there would be negligible changes to potential waste management impacts from the approved development, as noted in Section 6.6 of the Modification Report.

Issue:

Biosecurity and Spillage: Increased transport of wet, putrescible FOGO increases the risk of road spillage and leachate leakage from haulage vehicles, requiring stringent transport protocols that have not been adequately detailed.

Bettergrow response:

As a waste transporter and receiver, Bettergrow is required to comply with Section 70 of the Protection of the Environment Operations (Waste) Regulation 2014, to ensure that waste is transported in a manner that protects human health and the environment. This includes transporting waste in covered vehicles that are constructed and maintained to prevent waste from spilling, leaking or otherwise escaping during transport. Accordingly, vehicles transporting waste typically include sealed steel bodies, compression chambers, leak-resistant tailgates, leachate sumps or reservoirs and enclosed loading systems.

In addition, spill prevention and management measures for the road transport of organic recovered material to and from the facility are outlined in the following existing management plans and procedure:

- *Pollution Incident Response Management Plan* (Bettergrow, 2024c), included as Appendix G in the OEMP;
- Emergency Procedure – Spill Management for Truck Drivers, included as Appendix H – Biosecurity Protocol Documents in the OEMP; and
- *Transport Management Plan for Part A & Part B of CA-05 Biosecure Transport of Host Plant Material Bettergrow Ravensworth Compost Facility* (Bettergrow, 2023).

These plans and procedure will continue to be implemented during operation of the project. As such, the potential for spills and leaks and associated contamination impacts to occur during operation of the project, is expected to be minimal.

4.3 Hazard and risk

Fire risk

Issue:

The exothermic nature of composting, combined with larger required stockpile volumes to accommodate increased throughput, severely escalates the risk of spontaneous combustion. High-volume FOGO processing requires strict mass balance and residence time controls. The proponent must demonstrate that pile heights, spacing for emergency vehicle access, and active temperature monitoring systems meet the latest Fire and Rescue NSW guidelines for organic waste facilities.

Bettergrow response:

According to Section 3 of the *Fire safety guideline – Fire safety in waste facilities* (Fire and Rescue NSW, 2020), the guideline does not apply to ‘any waste facility, or areas of, that are being used for composting, including in-vessel, green waste and anaerobic digestion’. However, the guideline notes that fire safety requirements still apply to waste facilities not covered by this guideline.

Therefore, the facility currently implements the spontaneous combustion prevention and management measures specified in Section 7 of the Composting Management Plan. These

measures have been developed in accordance with relevant industry literature and guidance, and include:

- physical turning of windrows or stockpiles to minimising anaerobic and dry pockets;
- maintaining a relatively high (50%) and stable moisture content due to the addition of fresh material daily;
- maintaining a small surface area to the stockpile volume and restricting air flow; and
- visual inspections to detect possible problems such as hot spots.

In the unlikely event that spontaneous combustion does occur, staff will implement the Emergency Procedure 1 – Fire management, outlined in Appendix 2 of the Composting Management Plan.

These measures and procedures will continue to be implemented during operation of the project. As such, there would be negligible changes to potential fire risks from the approved development, as stated in Section 6.6 of the Modification Report.

General

Issue:

While the diversion of organic waste from landfill is a critical component of NSW's circular economy targets, the proposed increase in throughput and the expanded receipt of Food Organics and Garden Organics (FOGO) alongside Commercial and Industrial (C&I) waste streams present significant, unmitigated risks. Transitioning a facility to handle larger volumes of highly putrescible waste fundamentally changes its risk profile. The modification should be rejected unless a comprehensive overhaul of the facility's environmental controls is mandated.

Bettergrow response:

The proposed modification has been assessed in accordance with the requirements of Section 4.55 the EP&A Act, which involved:

- undertaking an environmental risk analysis prior to the preparation of the modification report, to identify the key potential environmental impacts associated with the project (refer to Section 6.1 of the Modification Report);
- consultation with government agencies (including DPHI, NSW EPA, Council, Transport for NSW, Subsidence Advisory NSW and Warrumbungle Local Aboriginal Land Council) and potentially impacted sensitive receivers, to identify any potential environmental impacts that were not identified during the risk analysis (refer to Section 2.1 and Chapter 5 of the Modification Report); and
- undertaking detailed technical studies for key issues identified for the project during the preparation of the Modification Report (refer to Appendices C to F of the Modification Report).

All issues raised by the relevant stakeholders are outlined in Chapter 5 of the Modification Report, including where issues have been addressed in the report. The Modification Report concluded that only minor impacts would occur during construction and operation of the project, which can be addressed through the implementation of the management and mitigation measures outlined in the existing management plans for the facility (refer to Section 7 of the Modification Report). Overall, it was concluded that the development as proposed to be modified, would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

In addition, the modification has been publicly exhibited to invite any submissions from other government agencies (including DCCEEW and Heritage NSW), as well as the wider community, to identify any potential issues that have not been identified. These issues have been addressed in this Submissions Report.

The Modification Report and this Submissions Report confirms that the proposed modification would result in only minor impacts, and that the development as proposed to be modified would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

4.4 Leachate management

Issue:

The biological degradation of food waste generates a substantially higher volume of leachate with severely elevated Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and nutrient loads (particularly nitrogen and phosphorus) compared to green waste.

- **System Capacity:** The existing leachate and stormwater management infrastructure must be scrutinized. A mere increase in throughput calculations is insufficient; the facility must demonstrate that the existing basin liners, retention times, and aeration capacities are engineered to handle the concentrated chemical profile of FOGO leachate, particularly during extended wet weather events.
- **Spill and Runoff Risk:** Any failure in the containment system risks catastrophic contamination of local surface water and groundwater systems in the surrounding Ravensworth environment.

Response:

The leachate control dam was constructed under geotechnical supervision and incorporates a compacted impermeable liner designed to resist chemical degradation from a wide range of aggressive chemicals (including typical chemical compounds found in FOGO material) and maintain long term structural integrity. This liner was certified by geotechnical engineers to confirm that it satisfies NSW EPA requirements outlined in the *Environmental Guidelines for Composting and Related Organics Processing Facilities* (NSW EPA, 2004) (refer to Appendix D).

As stated in Section 6.3.3 of the Modification Report, the facility currently operates a closed-loop water management system, whereby leachate captured in the onsite leachate control dam is reused for moisture conditioning during the composting process, as the composting process is a net user of water. As such, leachate is contained within the leachate control dam only for a limited time.

The updated site water balance prepared for the project (refer to Section 6.3.3 of the Modification Report) indicates that, under average climate conditions, the facility would remain a net user of water. Accordingly, the project would not result in a net increase of leachate generated, as stated in Section 6.3.4 of the Modification Report.

The leachate control dam has enough storage capacity (50.2 ML) to capture all runoff up to the 1% (1 in 100-year) AEP 24-hour rainfall event, as discussed in Section 1.3.5 of the Modification Report. In the exceedingly rare event that the leachate control dam overflows during rainfall less frequent than the 1% AEP 24-hour rainfall event, leachate water can flow via a spillway into the 2 ML lower sediment basin. In the exceedingly rare event that the lower basin fills, water can overflow into the former Void 4 south-west of the lower basin, which has in excess of 40 m depth of available airspace above its normal operating level (i.e. over 500 ML). As such, the risk of exceeding the on-site leachate storage capacity is considered unlikely, even during extended wet weather events.

Bettergrow will continue to operate the facility in accordance with EPL 7654 issued by the NSW EPA under Section 55 of the POEO Act. This includes quarterly leachate characterisation sampling for contaminants of potential concern listed in EPL 7654. Aeration of the leachate control

dam is undertaken, as required, based on the results of the routine quarterly characterisation sampling.

It should also be noted that the SWIA (refer to Appendix D of the Modification Report) did not identify any deficiencies in the current leachate management strategy.

4.5 Traffic

Issue:

Increasing the facility's throughput will require a proportional, if not exponential, increase in heavy vehicle movements along Lemington Road and the New England Highway.

Bettergrow response:

The project would generate up to an additional 8 light vehicle movements and 2 heavy vehicle movements per day during construction (including inbound and outbound movements) and up to an additional 10 light vehicle movements and 28 heavy vehicle movements per day during operation (including inbound and outbound movements), as outlined in Section 6.5 of the Modification Report.

The main transportation route during construction and operation would be the New England Highway, which carries approximately 13,915 vehicles per day, and Lemington Road.

Light vehicle movements would mainly occur during the morning and afternoon peak periods, due to staff travelling to and from the facility, whereas heavy vehicle movements would be spread out over the work day (7:00 am to 6:00 pm during construction and 6:00 am to 6:00 pm during operation).

The project would generate up to five additional vehicle movements (one heavy vehicle and four light vehicle movements) during the morning and afternoon peak periods during construction, and up to eight additional vehicle movements (three heavy vehicle and five light vehicle movements) during the morning and afternoon peak periods during operation. These additional vehicle movements would comprise less than 1% of the existing 1,000 to 1,200 vehicles travelling through the New England Highway/Lemington Road intersection during the peak periods. In addition, traffic modelling indicates that the project would have a minimal impact on the intersection with no deterioration in average delay, level of service or queue length. As such, the project is expected to result in minimal impacts on the performance of the New England Highway/Lemington Road intersection and the local road network as well as road safety during operation.

Additionally, Transport for NSW was consulted for Modification 3 and had no requirements for the proposed development, as it is considered there will be no significant impact on the nearby classified (State) road network.

4.6 Cumulative impact

Issue:

Cumulative Impact: The regional road network is already heavily burdened by mining and industrial traffic. The addition of constant, heavy waste-haulage vehicles poses an increased risk to road safety, accelerates the degradation of road surfaces, and increases diesel particulate emissions.

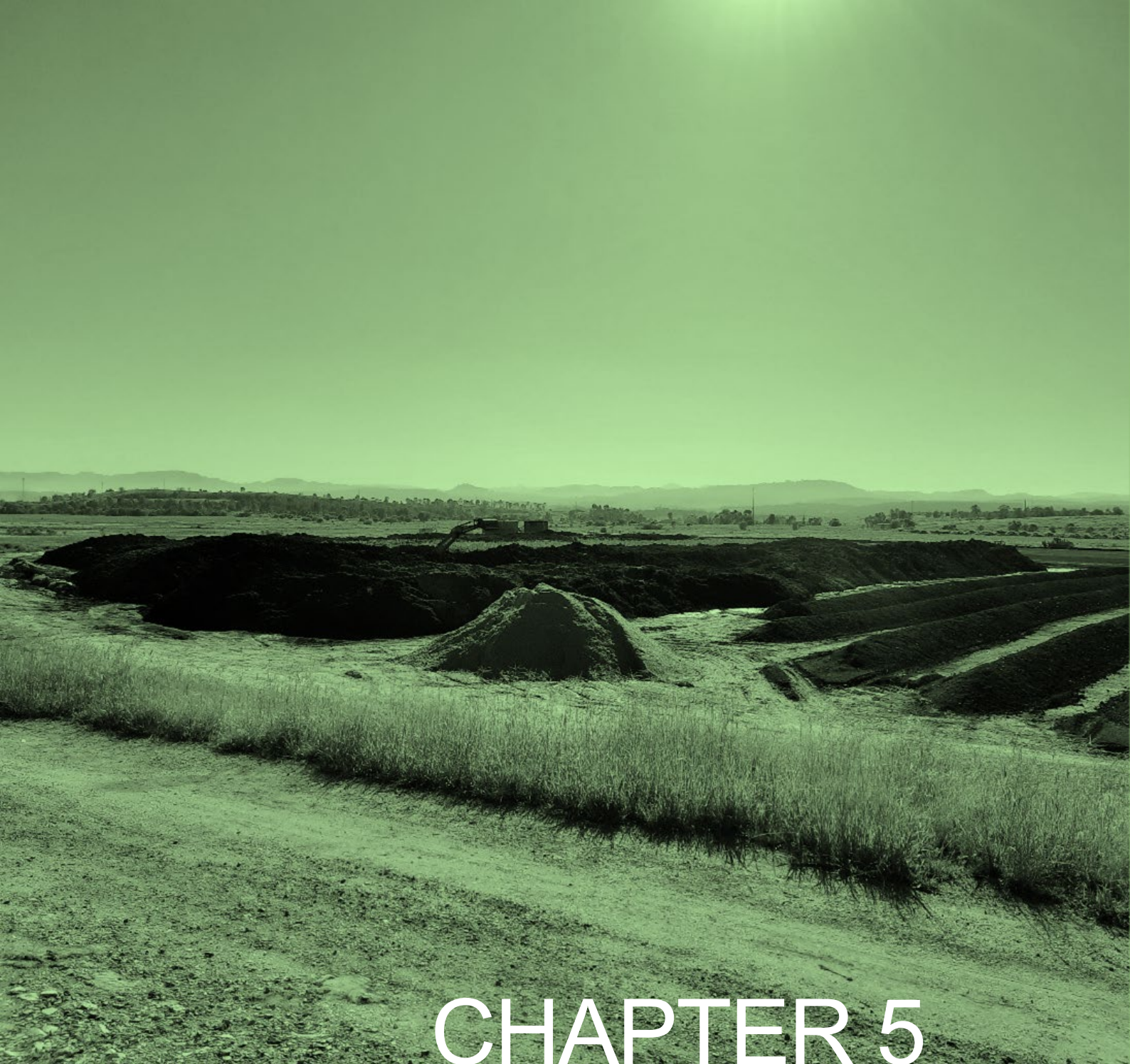
Bettergrow response:

As discussed in Section 4.5, the project is expected to result in a minor increase in heavy and light vehicle movements during operation (less than 1% of the existing traffic generated). As such,

the project is expected to result in minimal impacts on road safety and the condition of the surrounding road network.

Particulate emissions during construction due to heavy vehicle movements would be minor, temporary and short term, and is not likely to result in any air quality impacts at nearby sensitive receivers, based on the scale of the activities, duration of construction and the distance to sensitive receivers, as discussed in Section 6.2.6 of the Modification Report.

The predicted incremental particulate emissions during operation of the project, due to the use of heavy vehicles, loading/unloading of FOGO recovered material and other operational processes, are presented in Figure 6.5 to Figure 6.10 of the Modification Report. At Camberwell, the predicted incremental dust levels attributable to the project would be less than 0.5 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) for 24-hour average PM_{10} , less than 0.1 $\text{g}/\text{m}^2/\text{month}$ for dust deposition levels and less than 0.1 $\mu\text{g}/\text{m}^3$ for the other dust metrics, as described in Section 6.2.6 of the Modification Report. These levels are negligible and would not be discernible relative to the existing background dust levels experienced at Camberwell (refer to Section 6.2.5 of the Modification Report), and would not exceed the relevant NSW EPA air quality assessment criteria.



CHAPTER 5

UPDATED PROJECT
JUSTIFICATION

5 UPDATED PROJECT JUSTIFICATION

The facility originally commenced operation under development consent DA140/2016 granted by Council under Part 4 of the EP&A Act on 25 November 2016. This development consent was subsequently modified on two separate occasions (refer to Section 1.1).

On 31 August 2022, development consent SSD-9418 was granted by a delegate of the (then) Minister for Planning under Section 4.38 of the EP&A Act, to expand the existing facility to process up to 200,000 tpa of organic recovered material, including water drainage and leachate works, extension of the compost processing and blending areas pad and associated infrastructure.

Development consent SSD-9418 has previously been modified under Section 4.55(1A) of the EP&A Act on two occasions (refer to Section 1.1). The latest modification (Modification 2) approved on 16 June 2026, enables the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material, receipt and blending of VENM and ENM with organic recovered materials, as well as the installation of a 65,000 L above ground diesel storage tank.

Bettergrow is now seeking approval to modify consent SSD-9418 under Section 4.55(2) of the EP&A Act (Modification 3) to allow:

- an increase in the receipt and processing capacity of the facility from 200,000 tpa to 250,000 tpa;
- receipt and processing of raw FOGO recovered material at the facility;
- installation of a site weighbridge;
- employment of three additional staff; and
- up to five additional light vehicles and 14 additional heavy vehicles to access the site per day.

Prior to the preparation of the Modification Report, DPHI was consulted regarding the most appropriate planning approval pathway for the modification. DPHI confirmed that the modification application should be submitted and assessed under Section 4.55(2) of the EP&A Act, as the development (as modified) would be substantially the same development as the development for which consent was originally granted.

Consultation was also undertaken with the government agencies, adjoining landowners and the wider community. Feedback provided by these stakeholders has been addressed in Chapter 5 of the Modification Report and this Submissions Report.

The modification has been assessed in accordance with the requirements of Section 4.55 of the EP&A Act and has been shown to be consistent with the relevant local, State and Commonwealth government statutory planning instruments and strategic plans and policies.

The proposed modified operations would provide enhanced social and economic benefits by increasing the region's processing capacity to recycle FOGO recovered material, thereby reducing the amount of organic waste going to landfill and contributing to the conservation of natural resources, which is consistent with the principles of a circular economy and environmentally sustainable development.

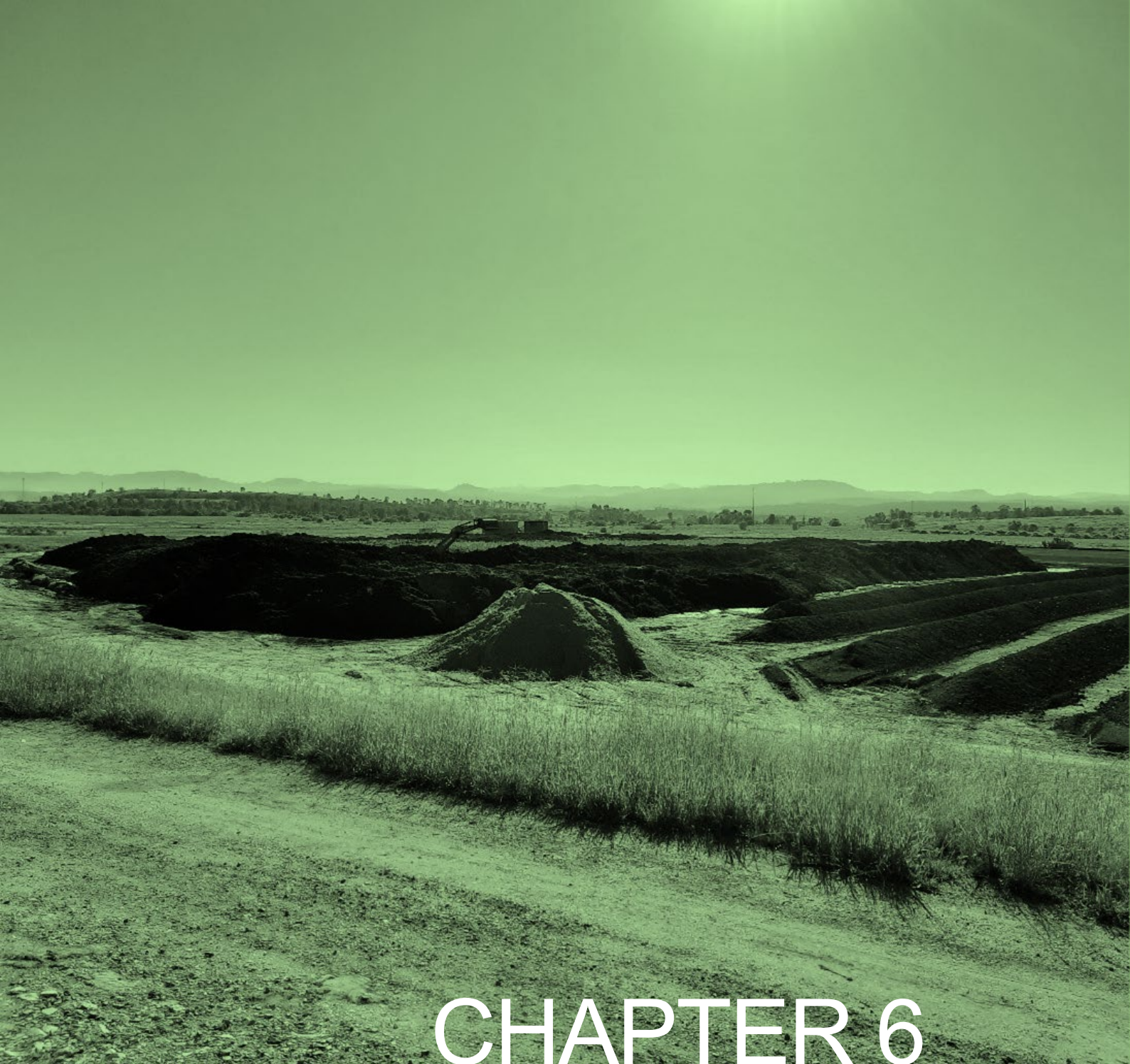
It has been demonstrated throughout the Modification Report and this Submissions Report that the modified development would remain substantially the same as the development for which consent was originally granted, and would result in only minor impacts. These impacts can be addressed through the implementation of the existing mitigation and management measures, as summarised in Appendix C. However, one additional measure has been proposed to minimise any potential worst case scenario odour impacts.

The existing environmental management plans (including the OEMP and its associated sub-plans, and the Composting Management Plan) will be reviewed and updated in accordance with

the modified consent, subject to approval of this modification application, to ensure they remain fit for purpose, as required by as required by condition C8(d) of development consent SSD-9418.

Overall, the development, as proposed to be modified, would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

Given the need for the modification, the suitability of the site and lack of environmental impacts, the modification is considered to be justified and in the public interest and therefore appropriate for approval under Section 4.55(2) of the EP&A Act.



CHAPTER 6

REFERENCES

6 REFERENCES

Advanced Environmental Dynamics (2019), Appendix G – Greenspot Ravensworth Greenhouse gas, odour, and dust Assessments.

Bettergrow (2023), Transport Management Plan for Part A & Part B of CA-05 Biosecure Transport of Host Plant Material Bettergrow Ravensworth Compost Facility (Version 1.0, dated 23 June 2023).

Bettergrow (2024a), Operational Environmental Management Plan – Bettergrow Ravensworth Composting Facility (Version 4, dated 1 October 2024).

Bettergrow (2024b), Waste Management Plan – Bettergrow Ravensworth Composting Facility (Version 2, dated 26 July 2024).

Bettergrow (2024c), Pollution Incident Response Management Plan – Bettergrow Pty Ltd EPL 7654, 74 Lemington Road, Ravensworth, NSW (Rev no 11, dated 27 September 2024).

Bettergrow (2025a), Site Emergency Plan (Version 1.0, dated 4 August 2025).

Bettergrow (2025b), Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling (Version 12, dated 7 August 2025).

Bettergrow (2025c), Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling (Version 12, dated 7 August 2025).

Element Environment (2025a), Ravensworth Composting Facility State significant development Modification 3 Modification Report. Prepared for Bettergrow Ptd Ltd.

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ERM (2013), Resource Recovery Facility – Gerogery, Odour Impact Assessment, prepared for Baker & McKenzie by ERM, August 2013.

Fire and Rescue NSW (2020), Fire safety guideline – Fire safety in waste facilities.

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NSW Department of Primary Industries (2017), Certification Assurance Procedure CA-05 – Biosecure transport and Treatment of Host Plant Material Destined for Recycling or Waste, version 2.0.

NSW Environment Protection Authority (2004), Environmental Guidelines for Composting and Related Organics Processing Facilities.

NSW Environment Protection Authority (2022), Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, NSW Environment Protection Authority, August 2022.

Senversa (2024), Surface and Groundwater Management Plan – Ravensworth Composting Facility, 74 Lemington Road, Ravensworth, NSW (Version 3, dated 1 October 2024).

Standards Australia (2006), AS 1692-2006 Steel tanks for flammable and combustible liquids (Reconfirmed 2016).

Standards Australia (2012), AS 4454-2012 Composts, soil conditioners and mulches.

Standards Australia (2013), AS 1657-2013 Fixed platforms, walkways, stairways and ladders - Design, construction and installation.

Todoroski Air Sciences (2023), Air Quality Management Plan – Bettergrow Nutrient Recycling Facility, Ravensworth, prepared for Bettergrow Pty Ltd by Todoroski Air Sciences. 2023.

Todoroski Air Sciences (2025), Air Quality Impact and Greenhouse Gas Assessment – Bettergrow Ravensworth Composting Facility Modification 3, prepared for Element Environment, dated 30 October 2025.

TOU (2010), Odour Impact Assessment of Proposed Composting Facility, Wooroloo Brook Farm, WA, prepared for Purearth by The Odour Unit, April 2010.



APPENDIX A

SUBMISSIONS REGISTER

A.1 Submissions register for government agency submissions

Table A.1 Government submissions

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
1.1	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Provide detailed justification that the site is suitable to accommodate the proposed 25% increase in throughput, with consideration of the range of potential processing times and the maximum storage capacity for incoming waste and finished product.	Section 3.2.1
1.2	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Clarify the sources of FOGO material proposed to be received.	Section 3.2.1
1.3	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Clarify the maximum quantity of FOGO material to be stockpiled at the site prior to processing.	Section 3.2.1
1.4	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Show on plans where the inspection/stockpile areas for FOGO material are proposed.	Section 3.2.1
1.5	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Detail the composting process(es) for FOGO material. Consider including process flow diagrams.	Section 3.2.1
1.6	DPHI	The economic environmental and social impacts of the project	Feedstock and material handling	Detail the decontamination processes that would be in place either on-site or off-site to ensure the suitability of FOGO waste received from municipal collection or from mixed commercial and industrial sources for composting, noting that the existing site process is to return contaminated loads to the supplier.	Section 3.2.1
1.7	DPHI	The economic environmental and social impacts of the project	Air quality	The Modification Report and Air Quality Impact Assessment have characterised only occupied residential receivers as sensitive receivers. The Approved Methods for the Modelling and Assessment of Air Pollutants in NSW defines sensitive receptors as a location where people are likely to work or reside. Under this definition, several sensitive receivers would fall within or very	Section 3.2.2

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				near to the 2-odour unit contour provided with odour modelling, including the commercial premises at 6496 New England Highway Ravensworth, Ravensworth Operations' coal mine, Chain of Ponds Inn historic site, Singleton MX Track, Ravensworth coal washery and several railway loading and unloading facilities. The assessment should consider impacts on these and any other potential sensitive receivers.	
1.8	DPHI	The economic environmental and social impacts of the project	Air quality	Historical odour sampling from the leachate dam prior to receipt of putrescible wastes may not be representative of the leachate odour profile relevant to proposed waste storage and processing and its adequacy for use in the Air Quality Impact Assessment should be reconsidered.	Section 3.2.2
1.9	DPHI	The economic environmental and social impacts of the project	Air quality	The cumulative odour assessment for the modification must be updated to reflect Loop Organics Pty Ltd's proposed processing rate increase at its 74 Lemington Road outdoor composting facility to 95,000 tonnes per annum.	Section 3.2.2
1.10	DPHI	The economic environmental and social impacts of the project	Air quality	Noting the significant potential for odour generation from both outdoor processing and storage of FOGO and the increased processing rate, include details of all reasonable and feasible mitigation measures to minimise odour generation and demonstrate that adopted measures are adequate to manage odour impacts from the site.	Section 3.2.2
1.11	DPHI	The economic environmental and social impacts of the project	Surface water	The table of Mitigation and Management measures in Appendix B of the Modification Report retains a previous commitment to line the leachate dams with recompacted overburden/clay. Confirm whether this measure is in place and detail its adequacy for preventing exfiltration of leachate or contaminants, and whether additional lining may be required to account for increased throughput and altered contaminant loadings that will result from end-to-end FOGO processing.	Section 3.2.3
1.12	DPHI	The economic environmental and social impacts of the project	Surface water	The Surface Water Impact Assessment made recommendations that have not been addressed in the modification, including a review of the existing surface water monitoring regime in respect to contaminants of potential concern in leachate and a review of the effectiveness of clean water diversion infrastructure. Provide detail on how these recommendations will be addressed.	Section 3.2.3
1.13	DPHI	The economic environmental and social impacts of the project	Surface water	The Surface Water Impact Assessment noted a commitment from the Applicant to upgrade clean water diversion infrastructure. Provide detail on the status and outcomes of this upgrade.	Section 3.2.3
2.1	NSW EPA	The economic environmental and	Air quality	Adopted odour emission rates are unclear. Section 5.5 of the AQIA states that odour emission rates for the modelled odour sources were estimated based on site specific sampling conducted at the Bettergrow Ravensworth composting	Section 3.1.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
		social impacts of the project		facility (the facility), as well as an additional facility that receives raw FOGO material. The data was then supplemented with literature values based on a review of studies from comparable operations. The AQIA states that the maximum odour levels for each week (week 0-8) were used to estimate the source odour emission rate (SOER) over the duration of the composting process. Figure 5-6 indicates a maximum SOER for FOGO recovered material of ~7.4 OUV/m²/s, however, table 5-5 specifies that the SOER applied in the assessment was 1.8 OUV/m²/s, which represents an inconsistency between figure 5-6 and the data used for modelling. The SOER applied to the raw FOGO material appears to be consistent with the two odour flux samples taken as part of the Odour Report. However, FOGO waste can be highly variable depending on the particular waste stream. Therefore, the adopted SOER for raw FOGO material should be representative of a reasonable worst case. The EPA notes that the modelled FOGO SOER requires further clarification, to demonstrate its suitability for assessment purposes. <u>Recommendation:</u> The EPA recommends that DPHI requests the Applicant amend the assessment to ensure that the adopted Source Odour Emission Rate (SOER) for Food Organics and Garden Organics (i.e. at week 0) is representative of a reasonable worst case scenario.	
2.2	NSW EPA	The economic environmental and social impacts of the project	Air quality	Odorous activities associated with FOGO composting do not appear to have been considered in the AQIA. The AQIA modelled the composting processing and blending area of the facility as a total area source (187,000 m²). The source odour emission rate (SOER) was then applied over this area based on the age of the material as shown in table 5-5. The EPA note that this assumption may represent the odour potential of the facility under standard conditions, however, activities with a higher odour potential do not appear to be considered, as outlined below: ▪ Shredding and blending: Based on table 1.2 of the Modification Report, part of the mobile plant at the facility includes a shredder. Shredding and blending activities can cause increased levels of odour due to the release of trapped gases. The odour associated with shredding / blending does not appear to have been considered in the AQIA. ▪ Windrow turning: Although a necessary part of the composting process, windrow turning can cause a temporary increase in odour emissions. The odour associated with windrow turning does not appear to have been considered in the AQIA. ▪ Non-ideal conditions: Windrows are required to be maintained under specific environmental conditions (e.g. moisture and temperature) to prevent anaerobic conditions from developing. Moisture from rain events can fill pore spaces, potentially contributing to anerobic conditions and increased odour levels. The Modification Report notes that during the composting process, temperature and moisture levels for each windrow are monitored and adjusted as	Section 3.1.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				needed, however it is unclear how excessive moisture levels are controlled during the composting process, particularly during prolonged wet periods. Therefore, it is unclear if current mitigation measures are sufficient to minimise offsite odour impacts, given the significant changes to feedstocks and receival capacity proposed. ▪ Additional areas: Figure 5-4 of the AQIA shows the composting, processing and blending area of the facility which was modelled as part of the assessment. However, it appears that there are additional piles located to the north of the composting, processing and blending area, that are within the boundary of the facility. Additional compost piles do not appear to have been considered in the assessment. ▪ Leachate dams: The SOER adopted for the leachate dams is 1 OUV/m²/s, which appears to be based on site-specific sampling conducted during 2018. The EPA notes that the sampling conducted may be representative of the operations of the facility at the time when sampling was conducted i.e. a receival of up to 76,000 tonnes per annum (tpa) of biosolids and garden organics. However, under the proposal, the facility intends to accept 250,000 tonnes per annum, including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The EPA notes that the leachate dams are regarded as a significant source of odour for the site, therefore, a small increase in the SOER may result in a significant increase in the odour potential for the facility. The EPA advises that the adopted SOER for the leachate dams should be appropriate regarding the proposed volume and type of feedstock received at the facility. <u>Recommendation:</u> The EPA recommends that DPHI requests the Applicant considers all potential odour sources, including (but not limited to) those outlined above as part of the odour dispersion modelling, as described below: ▪ Odour source identification – the AQIA should be revised to include the following odour sources, or appropriate justification for their exclusion: - Shredding and blending activities, - Windrow turning activities, - Additional areas must be considered (i.e. piles located to the north of the composting, processing and blending area), - Leachate dams: The SOER for leachate dams must reflect the proposed volume and type of feedstock to be received at the facility. ▪ The AQIA should be amended to clearly describe how odour emissions will be managed and mitigated under a range of operating scenarios, including: - Non-ideal conditions (i.e. prolonged wet weather).	

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
2.3	NSW EPA	The economic environmental and social impacts of the project	Air quality	Additional controls do not appear to have been considered in the assessment. Under Appendix B of the Modification Report, the mitigation and management measures for the project remain the same as the existing approved development. The EPA note that under the proposal, the facility would accept an additional 50,000 tonnes of waste per annum (increasing the processing capacity of the facility from 200,000 to 250,000 tpa), including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The odour potential of the proposal is therefore significantly greater than that of the current operation however it does not appear that additional odour controls have been considered. Open composting systems, such as turned windrows are generally suitable where feedstocks are lower risk, and where sites have sufficient separation from sensitive receivers. However, as processing volumes increase, or where higher risk feedstocks are accepted (such as FOGO), additional controls are usually required. Although the facility is located a significant distance from sensitive receptors, the risk of potential odour impacts is not completely removed, therefore additional controls should be further considered. The EPA note that the Loop Organics facility, (located immediately to the south of the Bettergrow facility) accepts FOGO waste. Although the Loop Organics facility is significantly smaller than that of the proposal (accepting a maximum of 55,000 tonnes per annum), the following mitigation measures are included in their environment protection licence: ▪ Geofabric covers are used with Category 3 food organics material, ▪ Category 3 food organics material must be covered at the end of each operational day until the material is stabilised. The EPA note that Loop Organics facility also utilise a sorting shed, which has not been considered as part of the proposal. The EPA consider that to maintain consistency with other FOGO composting facilities and to minimise odour impacts associated with the proposal, the Applicant must consider additional mitigation measures to reduce the risk of offsite odour impacts. The EPA recommends that all reasonably practicable measures to minimise or control odour from the facility must be considered. <u>Recommendation:</u> The EPA recommends that DPHI require the Applicant to consider all additional reasonably practicable mitigation measures to reduce the risk of offsite odour impacts from the proposal.	Section 3.1.1
2.4	NSW EPA	The economic environmental and	Air quality	The cumulative odour assessment does not appear to be reasonable worst case. Table 5-2 of the AQIA has outlined that the approximate area for the Composting Processing & Blending Area of the Loop Organics facility is 71,500 m². The specific odour emission rate	Section 3.1.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
		social impacts of the project		(SOER) for the Loop Organics facility was based on site-specific monitoring conducted at the Bettergrow Ravensworth facility in 2019. The site-specific measurements returned an average SOER of 0.034 OUV/m²/s based on the testing conducted, which is similar to that of fresh greenwaste (0.027 OUV/m²/s). However, under the Environment Protection Licence of Loop Organics (EPL 20892), the facility is able to accept General Solid Waste (putrescible) i.e. food waste as defined in Composting in Schedule 1 of the POEO Act. The assumed SOER of 0.034 for the Loop Organics facility is therefore not considered to be consistent with the waste that may be received at the site. The EPA considers that the assessment should ensure the cumulative odour assessment is representative of the types of waste which are accepted by Loop Organics. <u>Recommendation:</u> The EPA recommends that DPHI request the Applicant amends the cumulative odour assessment to consider representative types of waste which are accepted by Loop Organics (including the receipt and composting of FOGO waste).	
2.5	NSW EPA	The economic environmental and social impacts of the project	Air quality	Sensitive receptors do not appear to have been assessed appropriately. Section 2 of the AQIA states that the nearest privately-owned residential receptors to the facility are located in the vicinity of Camberwell (~6km from the premises). It is also stated that there are other receptors located closer to the premises (along Hebden Road and Lemington Road) which are said to be between approximately 2 and 5 km from the site. The AQIA notes that these residences are on mining land (owned by Glencore and Yancoal) and are subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore are not considered as sensitive receptors for this assessment. However, a sensitive receptor is defined in the <i>Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales</i> (Approved Methods) as “a location where people are likely to work or reside”. The EPA notes that all sensitive receptors “i.e. locations where people are likely to work or reside” should be considered in an AQIA to ensure that potential impacts from a proposed activity are well understood and appropriately addressed/mitigated where necessary. The AQIA should clearly outline all potential off site sensitive receptors, which would include residences on mine owned land and industrial receptors, to ensure that impacts from the proposal are understood and appropriately managed. <u>Recommendation:</u> The EPA recommends that DPHI request the Applicant amend the AQIA to consider all sensitive receptors as defined by the Approved Methods to ensure that the impacts of the facility’s operations are appropriately considered and addressed.	Section 3.1.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
2.6	NSW EPA	The economic environmental and social impacts of the project	Air quality	The AQIA does not appear to have identified engineering contingencies that could be implemented should odour impacts occur under the proposal. The AQIA and the Modification Report (Appendix B) provides a list of the existing and proposed mitigation measures. Mitigation measures nominated for odour include: ▪ All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation. ▪ Compost materials will be watered to a moisture content such as not to create an anaerobic environment. ▪ Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver. The EPA notes that the nominated measures outlined in Appendix B of the Modification report are the same as the existing modified development (Modification 1) controls. It is also noted that Appendix B does not explicitly identify engineering contingencies or additional operational contingencies that could be implemented should odour impacts occur once operational. To ensure the risk of odour impacts has been appropriately communicated, the EPA considers that the Applicant should nominate specific contingencies measures that could be implemented should odour impacts occur once operational. In nominating contingencies consideration could be given, but not necessarily limited to: ▪ enclosing part of the facility, ▪ covering of odorous material with geofabric materials, ▪ implementation of end of pipe engineering controls for reducing odorous emissions, and ▪ ceasing receipt of highly odorous material (including FOGO). Where the Applicant can nominate specific engineering contingencies that could be implemented at the planning stage, the overall risk of odour impacts is reduced. Per the NSW Odour Technical Framework, it is important that the Applicant considers what options are available to control odour for new and modified activities during the assessment/planning stages of a proposal. Section 6.2 of the NSW Odour Technical Framework states the proposal must include any additional feasible mitigation measures that could be implemented if the facility emits offensive odour after it is operational. The proponent should therefore identify measures beyond the proposed operations which could be implemented should odour impacts occur after plant modifications have taken place. <u>Recommendation:</u>	Section 3.1.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				The EPA recommends that DPHI request the Applicant investigate and outline additional odour control options that could be applied, should odour impacts occur once proposed operations have been implemented.	
2.7	NSW EPA	The project	Feedstock and material handling	The applicable resource recovery orders and exemptions for raw FOGO recovered materials should be clarified. Section 3.4 of the Modification Report states that raw FOGO material will be received and processed at the premises in accordance with 'The Compost Order 2016' issued by the EPA. However the facility also receives biosolids, which in Table 3.1, are proposed to be blended into the compost. This is not in compliance with the Compost Order 2016. If the feedstocks of raw FOGO and biosolids are proposed to be mixed, the compost produced would need to be supplied under the 'Biosolids Order 2014' or a specific resource recovery exemption for that compost material. The EPA understands that the Applicant currently holds "The Bettergrow Compost Order 2025" and the "The Bettergrow Compost exemption 2025", which specifically allow for the composting of 'any combination of biosolids, spent bleaching clay, paper crumble, mulch, garden organics, food waste manure, paunch, recovered plasterboard and Bayswater mine water' and expires on 11 June 2027. The raw FOGO received on-site could be composted under either: - the general Compost Order 2016 if the feedstocks to composting are limited to the allowed inputs under this general order (i.e. any combination of mulch, garden organics, food waste, manure and paunch); or - the specific order and exemption 'The Bettergrow compost order 2025' which permits additional inputs to composting as noted above. <u>Recommendation:</u> The EPA recommends that DPHI request the Applicant clarify the applicable resource recovery orders and exemptions the composting operations at the facility will receive and process waste streams under.	Section 3.1.2
2.8	NSW EPA	The project	Feedstock and material handling	Material quantities in the Modification Report are not consistent with individual waste classification types and don't clearly identify materials that will be composted or materials that will be blended. Table 3.1 of the Modification Report outlines the proposed annual throughputs of different types of materials that will be received and processed at the premises per year. The EPA notes that waste types such as Excavated Natural Materials (ENM) and Virgin Excavated Natural Materials (VENM) have been combined into the same throughput stream. ENM and VENM are different waste classes. By combining them into one line with a combined total of 15,000 tonnes per annum, this will make distinguishing one from another difficult. VENM and ENM are both identified	Section 3.1.2

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				as received 'ready for blending' (column 4 of Table 3.1). The EPA assumes these will be blended with the final compost produced on site. A similar term is used for other received materials which should be 'blended and composted' so it is not clear about the intended processing for some of the received materials. It is not clear whether they will go through a composting process, as defined by the compost orders, or if the materials are to be blended at the end of the full process. The EPA notes that 'Animal waste (manure)' is listed as 'raw – for blending' in Table 3.1. Manure should be added at the start of the composting process as per the Compost Orders and receive the full composting treatment, not simply added to the final compost. The 'Recycled water from Bayswater Power Station' is listed as 'raw – for blending and compost maintenance'. The 'Bettergrow Compost Order 2025' allows the use of 'Bayswater mine water' as an input to the composting process. This is defined as 'water extracted from Void 4 within Environment Protection Licence 2652 and used as an alternative moisture source for composting'. It is not clear if these two references refer to the same liquid. If this is not the same liquid, it presents a potential source of pathogen contamination of the compost if it is used after pasteurisation stage. If it is a different water source, it should also be assessed for potential chemical contamination before it is permitted for use in any stage of the generation of compost. <u>Recommendation:</u> The EPA recommends that DPHI request the Applicant to amend the Modification Report to: ▪ Clearly identify each waste type separately, ▪ Clearly identify the material types proposed to be processed via 'composting' as defined in the 'Compost Order 2016' or the 'Bettergrow Compost Order 2025', and note if they require pasteurisation, ▪ Clearly identify which materials will be blended after composting is completed, ▪ Outline how these proposed material handling procedures will meet each resource recovery order, and ▪ Clarify if the source of water referenced in the assessment is the same as that specified within 'Bettergrow Compost Order 2025.'	
2.9	NSW EPA	The economic environmental and social impacts of the project	Surface water	Further clarification is required for surface water management controls. The EPA notes that in the SWIA several potential risks to surface water quality and contamination were identified at the premises. Figure 5-1 of the SWIA shows the outline of the clean water drainage alignment with a number of potential contamination risks, as follows: ▪ Northern stockpiled area with material stored hydraulically up-gradient of the clean water drainage alignment,	Section 3.1.3

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				▪ Eastern clean water drainage line appears discontinuous with access tracks and internal roads visible crossing the line with no segregation evident, ▪ Chemical spills or leak risks from the refuelling diesel tank and fill location. The EPA notes that whilst the SWIA recommends SWIA management and mitigation actions for the clean water diversion infrastructure and leachate management systems, it is not clear what measures the Applicant is proposing to implement as part of this modification. As a result, the EPA considers that additional clarification on measures to reduce the risk of contamination of the clean water diversions should be provided. <u>Recommendation:</u> The EPA recommends that DPHI requests the Applicant provide: ▪ Clarification of how the contamination risks above have been addressed. ▪ Clarification of the outcome of the inspection recommended by the SWIA to check the integrity and operational effectiveness of the clean water diversion infrastructure at the premises, and any rectification action identified. ▪ An updated Site Plan with surface water and leachate management features detailed showing how surface water and leachate will be managed to prevent contamination in the proposed expansion of composting operations.	
2.10	NSW EPA	The economic environmental and social impacts of the project	Leachate management	Further clarification is required for leachate management controls. The EPA notes that the Modification Report does not appear to provide sufficient detail on measures to minimise the generate of leachate. The EPA considers that with the increase in volume of material processing, there is potential for increased leachate generation. It is not clear if existing management controls are appropriate to manage the potential increase in leachate volume or if additional controls would be required. <u>Recommendation:</u> The EPA recommends that DPHI request the Applicant clarify the proposed measures to minimise the volume of leachate, and any additional measures required to manage increased risks of leachate generation.	Section 3.1.4
3.1	Heritage NSW	Procedural matters (e.g. level or quality of engagement, compliance with the SEARs, identification of	Consultation	As there are local items are in the vicinity of the subject site, advice should be sought from the relevant local council.	Section 3.3.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
		relevant statutory requirements)			
4.1	DCCEEW Water Group	The economic environmental and social impacts of the project	N/A	The Modification Report has been reviewed by NSW DCCEEW Water Group, and all requirements have been adequately addressed by the proponent, therefore NSW DCCEEW Water Group has no further comments.	Noted. No response is required.
5.1	Transport for NSW	The economic environmental and social impacts of the project	Traffic	New England Highway (HW09) is a classified (State) road and Lemington Road is a local road. Council is the roads authority for both roads and all other public roads in the area, in accordance with Section 7 of the Roads Act 1993. Transport for NSW has reviewed the information provided and has no requirements for the proposed development, as it is considered there will be no significant impact on the nearby classified (State) road network.	Noted. No response is required.

A.2 Submissions register for community submissions

Table A.2 Community submissions

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
1.1	Submitter 1	The project	Objection	Formally object to the proposed Modification 3 for the Ravensworth Composting Facility (SSD-9418).	Objection to the proposed modification is acknowledged. No response is required.
1.2	Submitter 1	The economic environmental and social impacts of the project	Hazard and risk	While the diversion of organic waste from landfill is a critical component of NSW's circular economy targets, the proposed increase in throughput and the expanded receipt of Food Organics and Garden Organics (FOGO) alongside Commercial and Industrial (C&I) waste streams present significant, unmitigated risks.	Section 4.3

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				Transitioning a facility to handle larger volumes of highly putrescible waste fundamentally changes its risk profile. The modification should be rejected unless a comprehensive overhaul of the facility's environmental controls is mandated.	
1.3	Submitter 1	The economic environmental and social impacts of the project	Air quality	FOGO and C&I organic streams possess a significantly higher putrescible content compared to standard green waste or previously approved streams. This leads to a rapid generation of volatile organic compounds (VOCs) and anaerobic conditions if not meticulously managed. ▪ Inadequate Processing Infrastructure: Open windrow composting, or partially enclosed receival, is wholly inadequate for high-volume FOGO processing. The increase in throughput necessitates fully enclosed receival halls operating under strict negative pressure, coupled with biofiltration systems designed specifically for the peak ammonia and hydrogen sulphide loads typical of FOGO decomposition. ▪ Meteorological Vulnerability: The Hunter Valley experiences distinct inversion layers and prevailing wind conditions that can trap and transport odours over considerable distances. An increase in putrescible mass without corresponding upgrades to active, enclosed aeration infrastructure will inevitably result in unacceptable odour impacts on surrounding receptors.	Section 4.1
1.4	Submitter 1	The economic environmental and social impacts of the project	Leachate management	The biological degradation of food waste generates a substantially higher volume of leachate with severely elevated Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and nutrient loads (particularly nitrogen and phosphorus) compared to green waste. ▪ System Capacity: The existing leachate and stormwater management infrastructure must be scrutinized. A mere increase in throughput calculations is insufficient; the facility must demonstrate that the existing basin liners, retention times, and aeration capacities are engineered to handle the concentrated chemical profile of FOGO leachate, particularly during extended wet weather events. ▪ Spill and Runoff Risk: Any failure in the containment system risks catastrophic contamination of local surface water and groundwater systems in the surrounding Ravensworth environment.	Section 4.4
1.5	Submitter 1	The economic environmental and social impacts of the project	Contamination	Municipal FOGO and C&I streams notoriously suffer from high physical contamination rates, primarily soft plastics, hard plastics, and glass. ▪ Compost Quality and End-Use: Given that the primary end-use for this compost is the rehabilitation of the AGL Macquarie void lands, introducing highly contaminated feedstocks risks permanently polluting the rehabilitation site with microplastics and glass shards. ▪ Decontamination Shortfalls: The modification must not be approved without the implementation of advanced, multi-stage mechanical separation infrastructure (such as air classifiers, trommels, and optical sorters) on the front-end receival and back-end refinement	Section 4.2

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
				processes. Standard visual inspection and basic screening are entirely insufficient for municipal FOGO.	
1.6	Submitter 1	The economic environmental and social impacts of the project	Traffic	Increasing the facility's throughput will require a proportional, if not exponential, increase in heavy vehicle movements along Lemington Road and the New England Highway.	Section 4.5
1.7	Submitter 1	The economic environmental and social impacts of the project	Cumulative impact	Cumulative Impact: The regional road network is already heavily burdened by mining and industrial traffic. The addition of constant, heavy waste-haulage vehicles poses an increased risk to road safety, accelerates the degradation of road surfaces, and increases diesel particulate emissions.	Section 4.6
1.8	Submitter 1	The economic environmental and social impacts of the project	Contamination	Biosecurity and Spillage: Increased transport of wet, putrescible FOGO increases the risk of road spillage and leachate leakage from haulage vehicles, requiring stringent transport protocols that have not been adequately detailed.	Section 4.2
1.9	Submitter 1	The economic environmental and social impacts of the project	Hazard and risk	The exothermic nature of composting, combined with larger required stockpile volumes to accommodate increased throughput, severely escalates the risk of spontaneous combustion. High-volume FOGO processing requires strict mass balance and residence time controls. The proponent must demonstrate that pile heights, spacing for emergency vehicle access, and active temperature monitoring systems meet the latest Fire and Rescue NSW guidelines for organic waste facilities.	Section 4.3
2.1	Submitter 2	The project	Support	The submitter supports the project.	Support for the proposed modification is acknowledged. No response is required.
3.1	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	The Specific Odour Emission Rate (SOER) odour used for the site modelling is not representative of the proposed or current site processing conditions or the range of products which are proposed to be processed by Bettergrow.	Section 4.1
3.2	Loop Organics Pty Ltd	The economic environmental and	Air quality	According to the Bettergrow Modification 3 Report, wastes which will be composted on site include biosolids (for processing and storage), animal waste (paunch), food waste, including commercial food waste, garden organics, paper crumble and natural organic fibrous material.	Section 4.1

No	Submitter	Category	Sub-category	Submission	Where addressed in report / response
		social impacts of the project		However, the actual combination of these materials and their relative contribution to odour is not detailed in the odour study report.	
3.3	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	Data used in the odour study includes: - Historical site data from their Advanced Environmental Dynamics, 2019 report, where only biosolids and garden organics were composted on site, - Data from a facility which uses tunnel processing (Valoriza facility in Dandenong, Vic) to process FOGO- not open windrow composting (Ektimo, 2025) - Literature data for FOGO processing but not data for other organic wastes (Todoroski Air Sciences, 2025a and 2025b). Data used in the Bettergrow Odour Modelling report needs further consideration including using updated site-specific data and relevant SOER data for all sources of waste proposed to be processed on site.	Section 4.1
3.4	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	SOER data should also include site specific odour emissions data for the leachate dam, which has not been previously measured at the Bettergrow facility.	Section 4.1
3.5	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	A conservative estimate has been made of cumulative odour emissions data using estimates of Loop Organics' odour emission. This estimate does not account for the proposed expansion of the Loop Organics facility from 55,000 tonnes to 95,000 tonnes.	Section 4.1
3.6	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	The mitigation measures proposed in the Modification 3 Report are the same as those proposed in the Modification 2 reports. However, Modification 2 is not approved or operational, so it is not appropriate to state that there is expected to be a minimal change in odour from Modification 2 to Modification 3, without having fully measured the impacts of Modification 2.	Section 4.1
3.7	Loop Organics Pty Ltd	The economic environmental and social impacts of the project	Air quality	Mitigation measures should also consider circumstances where the leachate dam generates excessive odour such as when aerobic conditions are not maintained.	Section 4.1



APPENDIX B

TODOROSKI AIR SCIENCES
RESPONSES

23 July 2026

Amna Robinson
Senior Environmental Consultant
Element Environment
Via email: amna@elementenvironment.com.au

RE: Response to Submissions – Bettergrow Ravensworth Composting Facility Modification 3

Dear Amna,

The following outlines additional information and clarification to address requests for further information relating to the *Air Quality Impact and Greenhouse Gas Assessment, Bettergrow Ravensworth Composting Facility, Modification 3* (the AQIA) (**Todoroski Air Sciences, 2025**).

Submissions addressed include those from the New South Wales (NSW) Environmental Protection Authority (EPA), the Department of Planning, Housing and Infrastructure (DPHI), Loop Organics and the general public.

Each of the key comments is shown in grey italics and is followed by our response to the comment.

NSW EPA

1. Adopted odour emission rates are unclear

Section 5.5 of the AQIA states that odour emission rates for the modelled odour sources were estimated based on site specific sampling conducted at the Bettergrow Ravensworth composting facility (the facility), as well as an additional facility that receives raw FOGO material. The data was then supplemented with literature values based on a review of studies from comparable operations. The AQIA states that the maximum odour levels for each week (week 0-8) were used to estimate the source odour emission rate (SOER) over the duration of the composting process. Figure 5-6 indicates a maximum SOER for FOGO recovered material of ~7.4 OUV/m²/s, however, table 5-5 specifies that the SOER applied in the assessment was 1.8 OUV/m²/s, which represents an inconsistency between figure 5-6 and the data used for modelling.

The SOER applied to the raw FOGO material appears to be consistent with the two odour flux samples taken as part of the Odour Report. However, FOGO waste can be highly variable depending on the particular waste stream. Therefore, the adopted SOER for raw FOGO material should be representative of a reasonable worst case. The EPA notes that the modelled FOGO SOER requires further clarification, to demonstrate its suitability for assessment purposes.

Recommendation

The EPA recommends that DPHI requests the Applicant amend the assessment to ensure that the adopted Source Odour Emission Rate (SOER) for Food Organics and Garden Organics (i.e. at week 0) is representative of a reasonable worst case scenario.

The odour measurement data reviewed in the AQIA included data from other studies and locations, as well as data collected from the Ravensworth facility, being the Project site, and Valoriza – a facility that receives and processes raw FOGO material from kerbside collections and commercial sources. The Valoriza material is considered comparable to the raw FOGO material proposed to be received and processed at the facility.

The reviewed datasets show variability in odour emissions across the different composting stages. This variability is normal and expected and is likely to reflect differences in material composition, climatic conditions, composting conditions and sampling methodology. Notwithstanding the variability, the key factor is that the data show a consistent trend of decreasing odour emissions as the composting material matures.

The data also indicate that the measured odour emissions from the Ravensworth and Valoriza samples are generally lower than some of the other FOGO datasets reviewed. This is relevant, as some of the higher odour results appear to relate to FOGO material containing significantly more malodorous inputs, such as grease trap waste. Such material is not proposed to be accepted at the facility and is therefore not considered representative of the proposed operations.

There is no inconsistency; the SOER of 1.8 odour unit volume per metre squared per second (OUV/m²/s) adopted in the modelling for raw FOGO material is the average of the odour sampling results from Valoriza. For large sites that have material present at all stages, and are far away from receptors, any potential odour received at a receptor will be relatively homogeneous and consistent with the average odour of the material on the site. Hence the average value is appropriate in this case where a receptor could not possibly distinguish any odour from one part of the site vs. another at the distances involved. This value is thus considered representative of the type of material likely to be received at the facility, while still providing a valid value for this site considering any variability in the odour emissions from raw FOGO material.

For the remaining composting stages, the adopted emission rates were derived using the observed relationship between odour emissions and compost maturity across the reviewed datasets. This approach is considered to provide a reasonable worst-case representation of the proposed operation. It appropriately accounts for variability in composting material and operating conditions, while avoiding the use of unrepresentative high-end values that would likely overstate the actual odour emissions from the Project.

2. Odorous activities associated with FOGO composting do not appear to have been considered in the AQIA

The AQIA modelled the composting processing and blending area of the facility as a total area source (187,000 m²). The source odour emission rate (SOER) was then applied over this area based on the age of the material as shown in table 5-5. The EPA note that this assumption may represent the odour potential of the facility under standard conditions, however, activities with a higher odour potential do not appear to be considered, as outlined below:

- *Shredding and blending: Based on table 1.2 of the Modification Report, part of the mobile plant at the facility includes a shredder. Shredding and blending activities can cause increased levels of odour due to the release of trapped gases. The odour associated with shredding / blending does not appear to have been considered in the AQIA.*

- *Windrow turning: Although a necessary part of the composting process, windrow turning can cause a temporary increase in odour emissions. The odour associated with windrow turning does not appear to have been considered in the AQIA.*
- *Non-ideal conditions: Windrows are required to be maintained under specific environmental conditions (e.g. moisture and temperature) to prevent anaerobic conditions from developing. Moisture from rain events can fill pore spaces, potentially contributing to anaerobic conditions and increased odour levels. The Modification Report notes that during the composting process, temperature and moisture levels for each windrow are monitored and adjusted as needed, however it is unclear how excessive moisture levels are controlled during the composting process, particularly during prolonged wet periods. Therefore, it is unclear if current mitigation measures are sufficient to minimise offsite odour impacts, given the significant changes to feedstocks and receival capacity proposed.*
- *Additional areas: Figure 5-4 of the AQIA shows the composting, processing and blending area of the facility which was modelled as part of the assessment. However, it appears that there are additional piles located to the north of the composting, processing and blending area, that are within the boundary of the facility. Additional compost piles do not appear to have been considered in the assessment.*
- *Leachate dams: The SOER adopted for the leachate dams is 1 OUV/m²/s, which appears to be based on site-specific sampling conducted during 2018. The EPA notes that the sampling conducted may be representative of the operations of the facility at the time when sampling was conducted i.e. a receival of up to 76,000 tonnes per annum (tpa) of biosolids and garden organics. However, under the proposal, the facility intends to accept 250,000 tonnes per annum, including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The EPA notes that the leachate dams are regarded as a significant source of odour for the site, therefore, a small increase in the SOER may result in a significant increase in the odour potential for the facility. The EPA advises that the adopted SOER for the leachate dams should be appropriate regarding the proposed volume and type of feedstock received at the facility.*

Recommendation

The EPA recommends that DPHI requests the Applicant considers all potential odour sources, including (but not limited to) those outlined above as part of the odour dispersion modelling, as described below:

- ***Odour source identification – the AQIA should be revised to include the following odour sources, or appropriate justification for their exclusion:***
 - *Shredding and blending activities,*
 - *Windrow turning activities,*
 - *Additional areas must be considered (i.e. piles located to the north of the composting, processing and blending area),*
 - *Leachate dams: The SOER for leachate dams must reflect the proposed volume and type of feedstock to be received at the facility.*
- ***The AQIA should be amended to clearly describe how odour emissions will be managed and mitigated under a range of operating scenarios, including:***
 - *Non-ideal conditions (i.e. prolonged wet weather).*

The odour modelling presented in the AQIA focused on the key odour sources associated with the Project. These sources are generally continuous and have the greatest potential to contribute to off-site odour impacts. Other operational activities, such as shredding and blending, and windrow turning, are short term, transient activities that occur intermittently during the main daytime operational period, when atmospheric dispersion conditions are typically more favourable and the potential for odour impacts is reduced.

Shredding, blending and windrow turning activities can result in a short-term increase in odour emissions as additional material surface area is temporarily exposed to air. However, the available test data indicate that odour levels return to normal relatively quickly, typically within one to two hours. These activities can also assist in reducing longer-term odour potential through the beneficial effects of oxygenation, homogenisation and moisture redistribution within the composting material.

As these activities are undertaken during daytime hours, when dispersion conditions are generally better than during the evening and overnight periods, any short-term increase in odour emissions is expected to have a limited potential to result in off-site odour impacts. Given the very low results, explicitly modelling such short-term activities at times of good dispersion is unwarranted and would not materially affect the assessment conclusions.

The additional piles to the north of the composting area identified by the EPA in Figure 5.4 of the AQIA are not raw material or active composting material. These piles comprise temporary storage of finished product material, which is generally benign in odour terms compared with the raw and active composting materials assessed in the AQIA. The odour character associated with this material would be expected to be earthy or soil-like and is not considered likely to be offensive or out of place within the surrounding setting, which includes extractive industry and agricultural land uses where soil disturbance and exposed earthen materials are common.

The odour emissions for the leachate pond were based on the emission rates used in a previous odour study for the site (**Advanced Environmental Dynamics [AED], 2019**). Based on our experience, a SOER of 1 OUV/m²/s for a leachate pond at this type of facility is highly conservative and represents a poorly maintained or upset, high odour pond condition. Other studies for composting facilities, including facilities accepting FOGO material such as (**ERM (2013)**), reported a leachate pond odour emission rate of 0.33 OUV/m²/s. This is comparable to other facilities focused on greenwaste such as **GHD (2015) & TOU (2010)** which reported a pond odour emission rate of 0.26-0.3 OUV/m²/s. These odour emission rates are considered more typical of expected pond conditions at a composting facility. Therefore, under typical conditions, pond emissions rates are significantly lower. The modelled leachate pond emission rate already provides a reasonable worst-case representation for the Project without relying on an unreasonably high or unrepresentative value.

With suitable management measures to maintain aerobic conditions within the pond, odour emissions from this source would be expected to be managed toward much lower values than assumed in the modelling.

The AQIA refers to the existing mitigation and management measures for odour outlined in the Air Quality Management Plan (**Todoroski Air Sciences, 2023**). It is understood that this is currently being updated to include the recent modification at the site (Modification 2 to development consent SSD-9418). Bettergrow also has a Compost Management Plan that includes procedures for managing temperature, moisture content and carbon-to-nitrogen ratio, all of which can influence odour generation if not appropriately controlled.

Management measures in the site's Air Quality Management Plan includes the following:

- ✦ All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation. Where this is not possible, odorous wastes will be covered temporarily with green waste or saw dust.
- ✦ Homogeneous mixing will be undertaken.

- ✦ Compost materials will be watered to a moisture content such as not to create an anaerobic environment.
- ✦ Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver.

During non-ideal operating conditions, such as prolonged wet weather, the appropriate management response would be determined based on the condition of the material and the operational circumstances at the time. This may include turning material to assist moisture loss and aeration, or mixing wetter material with drier material to improve a moisture balance. Ensuring ponds are aerated is also relevant. These measures provide practical operational controls to manage odour generation during periods when odour potential may otherwise increase.

Overall, the adopted modelling approach is considered to provide a reasonable worst-case assessment of odour impacts from the Project. It focuses on the continuous and material odour sources with the greatest potential to influence off-site impacts, adopts conservative but reasonably representative emission rates, and accounts for the site's existing operational controls, without applying assumptions that would unreasonably overstate likely odour emissions.

3. Additional controls do not appear to have been considered in the assessment

Under Appendix B of the Modification Report, the mitigation and management measures for the project remain the same as the existing approved development. The EPA note that under the proposal, the facility would accept an additional 50,000 tonnes of waste per annum (increasing the processing capacity of the facility from 200,000 to 250,000 tpa), including ~100,000 tonnes of FOGO waste, 42,500 tonnes of biosolids and 10,000 tonnes of manure. The odour potential of the proposal is therefore significantly greater than that of the current operation however it does not appear that additional odour controls have been considered. Open composting systems, such as turned windrows are generally suitable where feedstocks are lower risk, and where sites have sufficient separation from sensitive receivers. However, as processing volumes increase, or where higher risk feedstocks are accepted (such as FOGO), additional controls are usually required. Although the facility is located a significant distance from sensitive receptors, the risk of potential odour impacts is not completely removed, therefore additional controls should be further considered.

The EPA note that the Loop Organics facility, (located immediately to the south of the Bettergrow facility) accepts FOGO waste. Although the Loop Organics facility is significantly smaller than that of the proposal (accepting a maximum of 55,000 tonnes per annum), the following mitigation measures are included in their environment protection licence:

- *Geofabric covers are used with Category 3 food organics material,*
- *Category 3 food organics material must be covered at the end of each operational day until the material is stabilised.*

The EPA note that Loop Organics facility also utilise a sorting shed, which has not been considered as part of the proposal.

The EPA consider that to maintain consistency with other FOGO composting facilities and to minimise odour impacts associated with the proposal, the Applicant must consider additional mitigation measures to reduce the risk of offsite odour impacts. The EPA recommends that all reasonably practicable measures to minimise or control odour from the facility must be considered.

Recommendation

The EPA recommends that DPHI require the Applicant to consider all additional reasonably practicable mitigation measures to reduce the risk of offsite odour impacts from the proposal.

The results of the AQIA indicate that the predicted 7 Odour Unit (OU) criterion contour due to the Project remains more than 5 kilometres (km) away from the nearest sensitive receptor, and 0.4 km from the nearest non-sensitive receptor location, being a mine-owned receptor that is a mining equipment warehouse. This demonstrates a substantial separation between the predicted extent of odour impacts and any sensitive receptor location.

On this basis, even allowing for reasonable variation in odour emission rates between individual product streams, composting conditions or operating scenarios, the potential for unacceptable odour impacts at sensitive receptors is considered very low. The assessment therefore indicates that the proposed operation can be managed with the controls already identified, without the need for additional enclosure or treatment systems.

It is not considered reasonable or proportionate to require further controls where the predicted odour impacts are already well below the relevant assessment criterion at all sensitive receptors, and where substantial separation distances provide a significant additional buffer.

Reference has been made to the Loop Organics operation. However, despite multiple requests, Loop Organics has not provided Bettergrow with basic operating parameters or odour emission rate data for its proposed future activities. The nature of its operations, process configuration, material handling practices and actual odour emissions are therefore unknown. While the Loop Organics facility may be smaller in scale, this does not necessarily mean that it has lower odour emissions or a lower potential for off-site odour impacts.

It is therefore not appropriate to rely on a direct comparison between the Project and the Loop Organics operation when determining the need for additional controls. The requirement for odour mitigation should be based on the specific characteristics of the Project, including the proposed activities, adopted odour emission rates, modelling results, receptor separation distances and site-specific operational controls.

The Project is located at a substantial distance from sensitive receptors, and the modelling demonstrates that the predicted odour impacts are well within the relevant assessment criterion. Accordingly, the existing and proposed odour management measures are considered appropriate and proportionate to the level of risk identified for the Project, and further controls are not considered warranted.

4. The cumulative odour assessment does not appear to be reasonable worst case

Table 5-2 of the AQIA has outlined that the approximate area for the Composting Processing & Blending Area of the Loop Organics facility is 71,500 m². The specific odour emission rate (SOER) for the Loop Organics facility was based on site-specific monitoring conducted at the Bettergrow Ravensworth facility in 2019. The site-specific measurements returned an average SOER of 0.034 OUV/m²/s based on the testing conducted, which is similar to that of fresh greenwaste (0.027 OUV/m²/s). However, under the Environment Protection Licence of Loop Organics (EPL 20892), the facility is able to accept General Solid Waste (putrescible) i.e. food waste as defined in Composting in Schedule 1 of the POEO Act. The assumed SOER of 0.034 for the Loop Organics facility is therefore not considered to be consistent with the waste that may be received at the site. The EPA considers that the assessment should ensure the cumulative odour assessment is representative of the types of waste which are accepted by Loop Organics.

Recommendation

The EPA recommends that DPHI request the Applicant amends the cumulative odour assessment to consider representative types of waste which are accepted by Loop Organics (including the receipt and composting of FOGO waste).

As noted in the AQIA, there is limited publicly available information regarding the operation of the nearby Loop Organics composting facility, other than its reported annual composting rate of 55,000 tonnes per annum (tpa) and satellite imagery of the site. In the absence of more detailed information, the AQIA conservatively assumed all relevant operational areas visible in aerial/ satellite imagery to be potential odour sources.

The AQIA adopted the modelling assumptions for Loop Organics used in the previous assessment for the Bettergrow facility (AED, 2019). It is understood that these assumptions were not objected to at the time and, in the absence of more detailed or updated information, they are considered reasonable for the purposes of the current assessment.

Loop Organics has recently received approval from Singleton Council to increase their facility's processing capacity from 55,000 tpa to 95,000 tpa (DA 8.2016.173.8). Bettergrow has requested further details regarding the planned expansion of the Loop Organics facility on several occasions; however, no information was forthcoming, and none has since been provided. Without specific information on the actual process activities, material types, operational practices, active composting areas, emission controls and odour emission rates at Loop Organics, any alternative assumptions would be speculative and inconsistent with those for approved operation in the planning system. On this basis, the adopted approach is considered appropriate for assessing potential cumulative odour impacts associated with the Project.

5. Sensitive receptors do not appear to have been assessed appropriately

Section 2 of the AQIA states that the nearest privately-owned residential receptors to the facility are located in the vicinity of Camberwell (~6km from the premises). It is also stated that there are other receptors located closer to the premises (along Hebden Road and Lemington Road) which are said to be between approximately 2 and 5 km from the site. The AQIA notes that these residences are on mining land (owned by Glencore and Yancoal) and are subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore are not considered as sensitive receptors for this assessment.

However, a sensitive receptor is defined in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) as “a location where people are likely to work or reside”. The EPA notes that all sensitive receptors “i.e. locations where people are likely to work or reside” should be considered in an AQIA to ensure that potential impacts from a proposed activity are well understood and appropriately addressed/mitigated where necessary. The AQIA should clearly outline all potential off site sensitive receptors, which would include residences on mine owned land and industrial receptors, to ensure that impacts from the proposal are understood and appropriately managed.

Recommendation

The EPA recommends that DPHI request the Applicant amend the AQIA to consider all sensitive receptors as defined by the Approved Methods to ensure that the impacts of the facility’s operations are appropriately considered and addressed.

The definition of a sensitive receptor per the Approved Methods (**NSW EPA, 2022**) is acknowledged and includes “a location where people are likely to work or reside; **this may** include a dwelling, school, hospital, office or public recreational area.” (Emphasis added show this definition may, or equally may not include such receptors).

While this definition may capture a broad range of land uses, its application must be considered within the context of land-use zoning and compatibility.

As outlined in Section 3.1.2 of the AQIA, a clear distinction is made in the AQIA between residential and other highly sensitive receptors, which forms the basis for the assessment, and industrial and mining land uses, which are inherently compatible with higher-emitting activities and are not reasonably assessable against residential criteria.

Applying residential-level criteria to all locations where people may be present, irrespective of zoning, would be inconsistent with NSW planning principles and the intent of the Approved Methods. It would remove the distinction between industrial and residential land uses and impose unreasonable constraints on established industrial precincts.

The receptors along Hebden Road and Lemington Road are located on mine-owned land, subject to existing mining-related environmental impacts, likely to be uninhabited and situated within a predominantly industrial/resource extraction setting. Accordingly, these receptors are not considered representative of sensitive receptors for compliance assessment, which is appropriately undertaken at privately-owned residential locations (e.g. Camberwell). The nearest receptor is uninhabited and is an industrial equipment warehouse on mine owned land. It is not a sensitive receptor and is not assessed as such.

The potential incremental odour impacts from the Project at the industrial and commercial receptors, the nearest mine-owned receptors and privately-owned receptors are shown in **Figure 1**. The potential cumulative odour impacts from the Project and the nearby Loop Organics facility at the receptors are shown

in **Figure 2**. We note that the modelling is based on conservative assumptions with the maximum area emitting odour and would overestimate the likely actual impact.

As noted in Section 3.1.1 of the AQIA, the NSW criteria for acceptable levels of odour outlined in the EPA Approved Methods range from 2 to 7 Odour Unit (OU), with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated residential rural areas. The applicable NSW EPA impact assessment criterion at the industrial and commercial receptor locations is 7 OU, reflecting the relatively small, exposed population and the absence of a permanent residential population at these locations.

The modelling predictions show no material odour impact from the Project at the majority of these locations, including all of the nearest mine-owned receptors and privately-owned receptors (i.e. below the most stringent EPA impact assessment criterion of 2 OU).

For all of the industrial and commercial receptors, the predicted levels are below 7 OU. The uninhabited warehouse at 6496 New England Highway and the Loop Organics facility are predicted to experience odour concentrations greater than 2 OU; however, remain below 6 OU. As the predicted odour concentrations at both locations remain below the applicable 7 OU criterion, along with the other industrial and commercial receptors the Project is not expected to result in an unacceptable odour impact.

The modelling therefore demonstrates that the Project would not result in any unacceptable odour impacts at any of the sensitive receivers.

The AQIA approach is consistent with the intent of the Approved Methods, and provides adequate information to assess potential impacts at any sensitive or non-sensitive receptor.

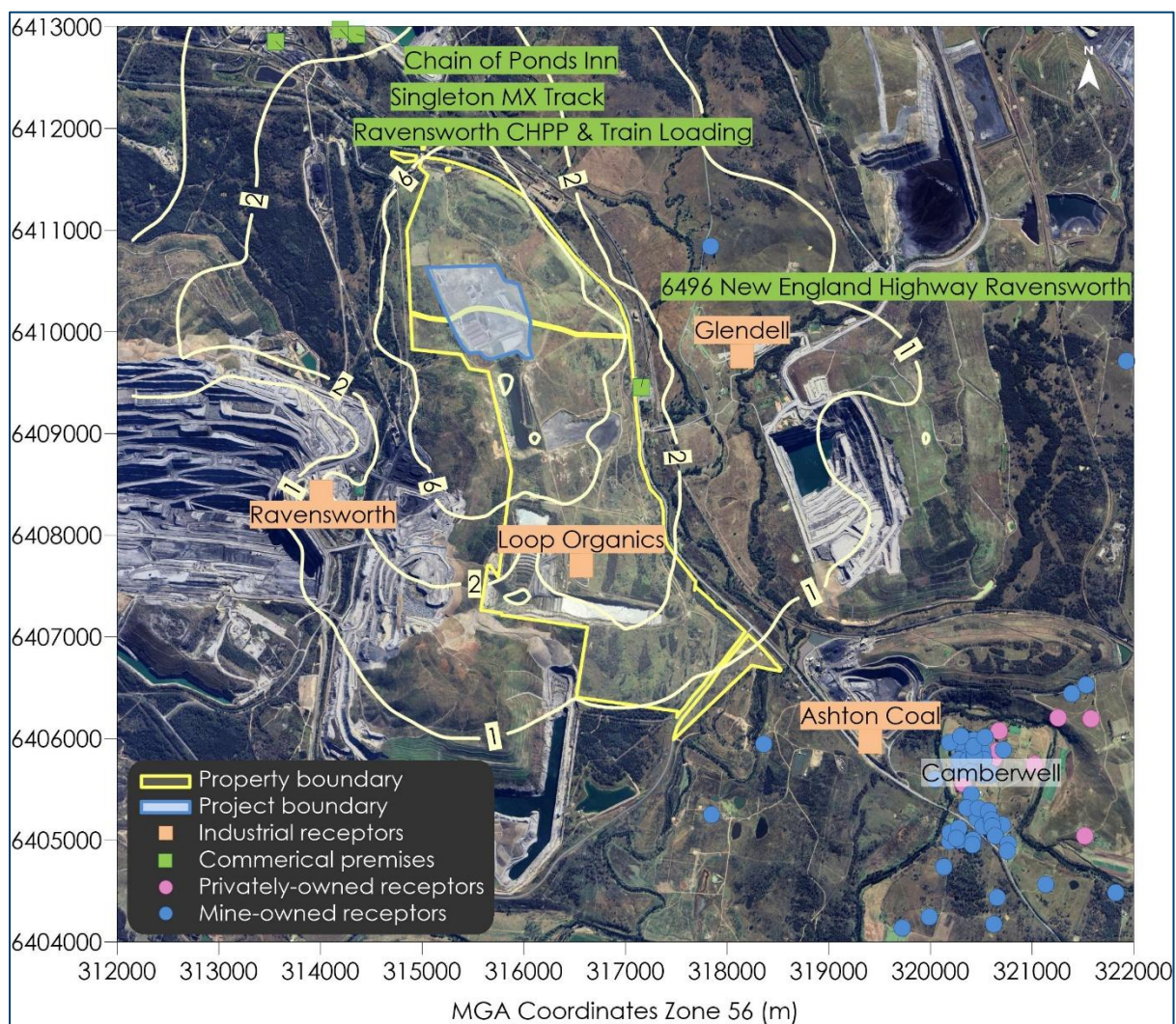


Figure 1: Predicted 99th percentile nose-response average odour concentration – Incremental impact

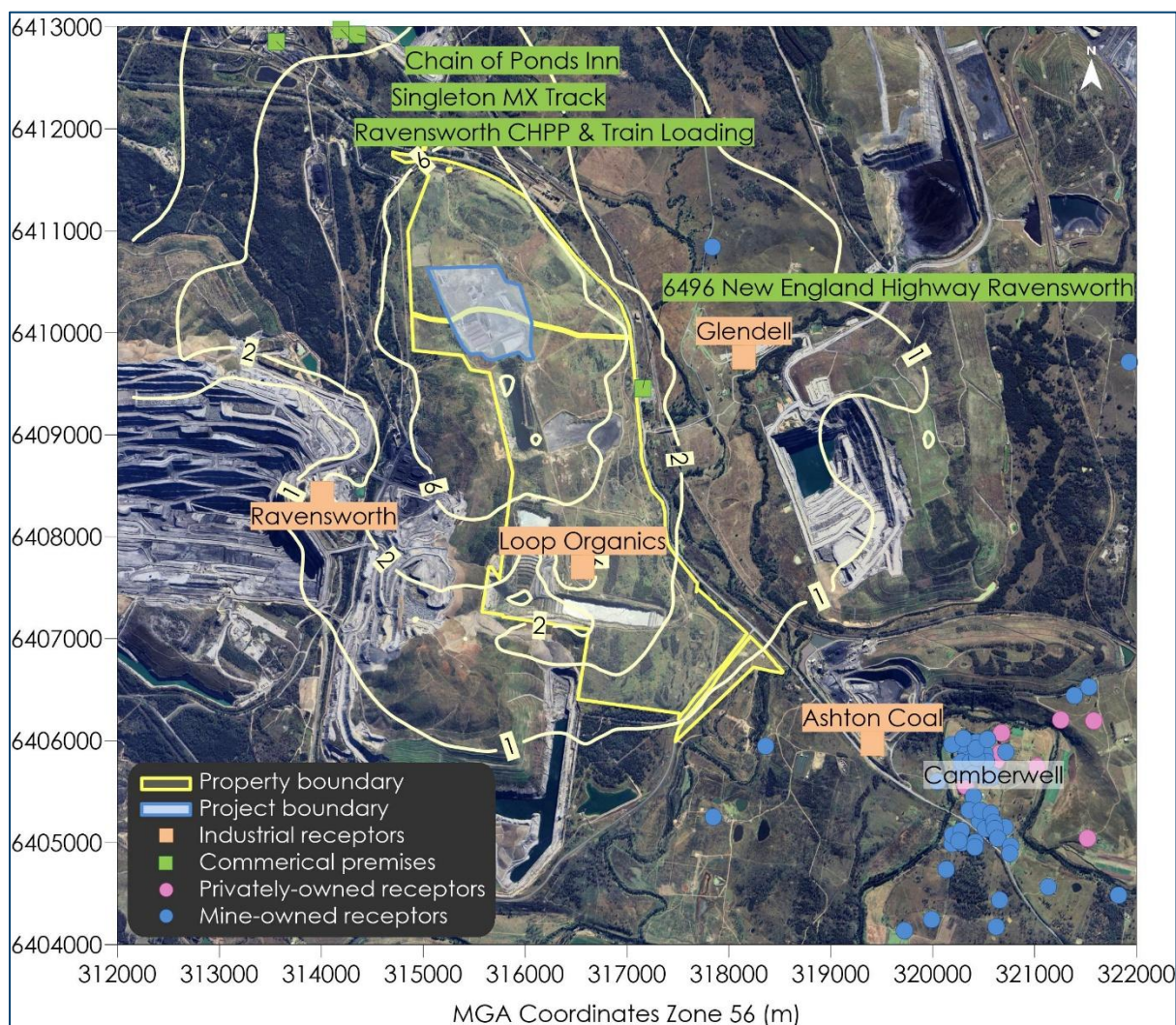


Figure 2: Predicted 99th percentile nose-response average odour concentration – Cumulative impact

6. The AQIA does not appear to have identified engineering contingencies that could be implemented should odour impacts occur under the proposal

The AQIA and the Modification Report (Appendix B) provides a list of the existing and proposed mitigation measures. Mitigation measures nominated for odour include:

- All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation.
- Compost materials will be watered to a moisture content such as not to create an anaerobic environment.
- Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver.

The EPA notes that the nominated measures outlined in Appendix B of the Modification report are the same as the existing modified development (Modification 1) controls. It is also noted that Appendix B does not explicitly identify engineering contingencies or additional operational contingencies that could be implemented should odour impacts occur once operational.

To ensure the risk of odour impacts has been appropriately communicated, the EPA considers that the Applicant should nominate specific contingencies measures that could be implemented should odour impacts occur once operational. In nominating contingencies consideration could be given, but not necessarily limited to:

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- enclosing part of the facility,
 - covering of odorous material with geofabric materials,
 - implementation of end of pipe engineering controls for reducing odorous emissions, and
 - ceasing receipt of highly odorous material (including FOGO).

Where the Applicant can nominate specific engineering contingencies that could be implemented at the planning stage, the overall risk of odour impacts is reduced. Per the NSW Odour Technical Framework, it is important that the Applicant considers what options are available to control odour for new and modified activities during the assessment/planning stages of a proposal. Section 6.2 of the NSW Odour Technical Framework states the proposal must include any additional feasible mitigation measures that could be implemented if the facility emits offensive odour after it is operational. The proponent should therefore identify measures beyond the proposed operations which could be implemented should odour impacts occur after plant modifications have taken place.

Recommendation

The EPA recommends that DPHI request the Applicant investigates and outlines additional odour control options that could be applied, should odour impacts occur once proposed operations have been implemented.

The modelling predictions presented in the AQIA indicate that the potential for off-site odour impacts associated with the Project is very low. On this basis, no further routine odour controls are considered warranted beyond the existing operational management measures outlined in the Operational Environmental Management Plan (OEMP) (Bettergrow, 2024).

In the unlikely event that excessive odour is generated by the Project and cannot be adequately managed through standard site controls set out in the management plans and the soon to be updated management plans for this modification, the most practicable and effective additional contingency measure would be to temporarily cease the receipt of all material and any new composting activity, until the cause of the odour issue has been identified and addressed. This measure would directly target the primary potential source of elevated odour generation and would provide the facility with time to investigate and rectify the issue.

The investigation would consider the likely cause of the elevated odour, including whether it was associated with the characteristics of the material received, the condition of material on-site, composting management practices, weather conditions, or other external or incidental factors. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.

If the investigation identifies that further engineering or process controls are required to enable the continued acceptance and processing of FOGO material at the site without causing unacceptable odour impacts, then appropriate such measures would be implemented. Any additional controls would be developed having regard to the identified cause of the odour issue, the effectiveness of existing management measures, and the need to maintain acceptable odour outcomes at surrounding receptors.

Once the cause of the odour issue has been addressed, acceptance of the relevant material stream could recommence in a controlled manner, subject to appropriate operational checks and ongoing monitoring. This contingency approach is considered proportionate to the low odour risk predicted by the AQIA, while providing a clear and practical response mechanism should unexpected odour issues arise.

DPHI

The Modification Report and Air Quality Impact Assessment have characterised only occupied residential receivers as sensitive receivers. The Approved Methods for the Modelling and Assessment of Air Pollutants in NSW defines sensitive receptors as a location where people are likely to work or reside. Under this definition, several sensitive receivers would fall within or very near to the 2-odour unit contour provided with odour modelling, including the commercial premises at 6496 New England Highway Ravensworth, Ravensworth Operations' coal mine, Chain of Ponds Inn historic site, Singleton MX Track, Ravensworth coal washery and several railway loading and unloading facilities. The assessment should consider impacts on these and any other potential sensitive receivers.

As discussed in an earlier response, the definition of a sensitive receptor in the Approved Methods (**NSW EPA, 2022**) captures a broad range of land uses. However, the application of the odour assessment criteria should be considered in the context of the zoning, compatibility and actual use of the land surrounding the Project, as outlined previously.

The commercial premises, including railway loading and unloading facilities, identified in the vicinity of the Project are shown in **Figure 1**, with the predicted incremental odour impact contours overlaid. The modelling indicates that the predicted incremental odour concentrations at each of these premises are less than 7 OU.

The 7 OU criterion is appropriate for these non-sensitive receptor locations. The Approved Methods apply population-dependent odour criteria, with lower criteria, such as 2 OU, being applicable to more densely populated areas where a larger number of people may be exposed. By contrast, the identified commercial/ industrial premises are discrete locations with relatively low occupancy compared with residential areas or other more densely populated sensitive land uses.

Historical odour sampling from the leachate dam prior to receipt of putrescible wastes may not be representative of the leachate odour profile relevant to proposed waste storage and processing and its adequacy for use in the Air Quality Impact Assessment should be reconsidered.

As discussed in an earlier response, the SOER adopted for the leachate dam is considered conservative and appropriate for assessing maximum odour emission rates for the purposes of the assessment.

The adopted emission rate is higher than odour emission rates measured for leachate ponds at other comparable composting facilities, where reported values are typically less than half the level applied in the modelling. On this basis, the adopted SOER is expected to overestimate the likely odour emissions from the leachate dam under any normal operating conditions.

Accordingly, the adopted SOER is considered suitably conservative and appropriate for assessing potential odour impacts from this source.

The cumulative odour assessment for the modification must be updated to reflect Loop Organics Pty Ltd's proposed processing rate increase at its 74 Lemington Road outdoor composting facility to 95,000 tonnes per annum.

As discussed in an earlier response to similar EPA issues, there is insufficient publicly available information to further refine the cumulative odour assessment for the nearby Loop Organics facility. Information has been requested from Loop Organics to better understand its operations, process areas, material types, odour

controls and potential odour emission rates; however, despite repeated requests over a relatively long time this information has not been provided.

In the absence of this information, any further refinement of the cumulative assessment would require speculative assumptions regarding the nature, extent and intensity of odour-generating activities at the Loop Organics site. Such assumptions would differ from those used in this modelling and in previous modelling for projects which are approved in the planning system. Such speculation would not necessarily improve the reliability of the assessment and may not provide a sound basis for evaluating cumulative odour impacts.

The AQIA modelling has been based on the conservative assumption that the entire composting and blending area of the Loop Organics facility, in addition to its leachate dam, would act as an odour source (refer to Figure 5-5 of the AQIA). In practice, some of the processing pads area is used for vehicle access and spacing between windrow piles. As such, actual odour emissions for the Loop Organics facility are expected to be less than predicted.

The AQIA therefore adopted the best available information and previously accepted assumptions for the Loop Organics facility. This is considered an appropriate and reasonable approach in these circumstances.

Noting the significant potential for odour generation from both outdoor processing and storage of FOGO and the increased processing rate, include details of all reasonable and feasible mitigation measures to minimise odour generation and demonstrate that adopted measures are adequate to manage odour impacts from the site.

As discussed in earlier responses on similar topics raised by the EPA, the AQIA demonstrates that the potential for off-site odour impacts associated with the Project is very low. The assessment indicates that the predicted odour levels are well within the applicable criteria, and that the existing and proposed odour mitigation and management measures are appropriate for the level of risk identified.

In the unlikely event that odour generation increases to a level that cannot be adequately managed through standard operational controls, a suitable contingency measure would be to temporarily cease the receipt of all material and any new composting activity. This measure would directly address the primary potential source of elevated odour generation and would allow time for the cause of the issue to be investigated and rectified.

The investigation would consider factors such as the characteristics of the material received, the condition of material on-site, composting management practices, moisture content, aeration, weather conditions and any other relevant operational or external factors. Depending on the findings, appropriate corrective actions may include changes to material acceptance procedures, additional mixing or turning, moisture adjustment, blending with less odorous material, temporary covering, or other practical operational controls.

If the investigation identifies that additional engineering or process controls are required to continue accepting and processing highly odorous material without causing unacceptable odour impacts, then those controls would be investigated and implemented as appropriate. This provides a clear and proportionate contingency framework, while recognising that the AQIA indicates a low risk of odour impacts under the proposed operating conditions.

Loop Organics

1. The Specific Odour Emission Rate (SOER) odour used for the site modelling is not representative of the proposed or current site processing conditions or the range of products which are proposed to be processed by Bettergrow

The SOER adopted for the assessment was selected based on a wide range of available odour emissions data, including published data for other facilities, site-specific sampling data available for the Project and site representative data of material proposed to be accepted at the site.

This provides a reasonable and conservative basis for representing the range of materials and processing activities proposed for the site. It accounts for the inherent variability in odour emissions between material types, composting stages and operating conditions, while also giving appropriate weight to data that are most representative of the proposed operation.

The adopted SOERs are therefore considered to represent reasonable worst-case emission rates for the assessment. They are sufficiently conservative to account for expected variability in material composition and processing conditions, without relying on unrepresentatively high values that would overstate actual odour emissions from the Project.

2. According to Bettergrow Modification 3 Report, wastes which will be composted on site include biosolids (for processing and storage), animal waste (paunch), food waste, including commercial food waste, garden organics, paper crumble and natural organic fibrous material. However, the actual combination of these materials and their relative contribution to odour is not detailed in the odour study report.

The AQIA does not rely on modelling each individual waste stream separately. The adopted odour emission rates represent all materials and processing activities proposed for the facility, including the full range of composting feedstocks identified in the AQIA. This is appropriate for this site because it is large and receptors are far away.

While the exact composition of material within individual composting piles may vary over time, this variability is appropriately accounted for in the adopted emission rates. The assessment focuses on the overall odour-generating potential of the proposed operation, rather than short-term variation within individual piles or material streams than cannot be discernible at any receptor in any case.

Given the separation distance to the nearest sensitive receptors, any minor variation in odour emissions from individual material streams or individual piles would not be discernible at those receptors. Accordingly, modelling each waste stream separately would not materially alter the assessment outcomes and is unnecessary for assessing the potential for off-site odour impacts.

3. Data used in the odour study includes:

- *Historical site data from their Advanced Environmental Dynamics, 2019 report, where only biosolids and garden organics were composted on site,*
- *Data from a facility which uses tunnel processing (Valoriza facility in Dandenong, Vic) to process FOGO-not open windrow composting (Ektimo, 2025)*
- *Literature data for FOGO processing but not data for other organic wastes (Todoroski Air Sciences, 2025a and 2025b).*

The AQIA uses odour emission data from a range of relevant sources, including published data, data from other composting facilities, and site-specific or site-representative sampling data. This provides a suitable basis for characterising the likely odour emissions associated with the proposed operations.

The adopted approach recognises that odour emissions from composting activities can vary depending on material composition, composting stage, moisture content, aeration, management practices and sampling conditions. By considering multiple datasets, the assessment provides a more balanced and representative basis for selecting odour emission rates than reliance on a single dataset.

This approach has been used in previous air quality impact assessments for composting facilities and is considered appropriate for the Project. The adopted emission rates are considered to provide a reasonable worst-case representation of the proposed operations.

4. We believe that the data used in the Bettergrow Odour Modelling report needs further consideration including using updated site-specific data and relevant SOER data for all sources of waste proposed to be processed on site.

The AQIA has been prepared using a combination of historical odour emission data, published literature data, and site-specific or site-representative data relevant to the Project. The dataset includes odour emission information for the key odorous materials and processing activities proposed for the site, including mixed organic materials, biosolids and composting operations.

The adopted SOERs are based on relevant available data and provide a reasonable worst-case representation of the proposed operations, while accounting for expected variability in material composition, composting stage and operating conditions.

Furthermore, odour sampling of the current operations alone would not fully characterise the proposed Project, as some of the proposed material streams and processing arrangements are not yet in place. Any assessment of the Project would need to draw on published data and representative data from comparable facilities, such as Valoriza, to appropriately characterise the proposed future operations.

5. SOER data should also include site specific odour emissions data for the leachate dam, which has not been previously measured at the Bettergrow Facility.

The leachate dam was included in the modelling using a conservative specific odour emission rate of 1 OUV/m²/s. This emission rate is higher than values typically reported for well-managed leachate ponds at comparable composting facilities and is therefore considered conservative for the purposes of the assessment.

The adopted emission rate provides an appropriate allowance for potential higher-than-normal odour emissions from the leachate dam, including periods where pond conditions may be less favourable. On this basis, the AQIA is considered to have adequately and conservatively assessed the potential odour contribution from the leachate management areas.

6. A conservative estimate has been made of cumulative odour emissions data using estimates of Loop Organics' odour emission. This estimate does not account for the proposed expansion of the Loop Organics facility from 55,000 tonnes to 95,000 tonnes.

The cumulative odour assessment has been prepared based on the information available at the time of assessment. Repeated requests have been made to obtain additional site-specific odour emission data and

operational details for the Loop Organics facility; however, sufficient information has not been provided to enable a more detailed or refined assessment of its operations or proposed expansion.

In the absence of detailed information on the Loop Organics, the cumulative modelling has adopted a conservative representation of the Loop Organics operations. This is considered appropriate, as any further refinement would require speculative assumptions that may not improve the reliability of the assessment.

Odour emissions from composting activities are primarily influenced by the exposed odorous surface area, the nature and condition of the material, and the stage of composting, rather than throughput alone. The modelling has therefore assumed that the relevant exposed operational areas at Loop Organics comprise composting odour sources. This is likely to overestimate the actual odour contribution from Loop Organics, as it assumes the maximum potential use of those areas for odour-generating composting activities.

On this basis, the cumulative assessment is considered conservative and appropriate for assessing potential cumulative odour impacts associated with the Project.

7. Furthermore, the mitigation measures proposed in the Modification 3 Report are the same as those proposed in the Modification 2 reports. However, Modification 2 is not approved or operational, so it is not appropriate to state that there is expected to be a minimal change in odour from Modification 2 to Modification 3, without having fully measured the impacts of Modification 2.

This comment appears to be based on an incorrect assumption regarding the basis of the odour assessment.

The assessment does not rely on Modification 2 being approved or operational, nor does it rely on measured odour outcomes from Modification 2. The odour assessment for Modification 3, being the Project, has been undertaken using dispersion modelling of the proposed Modification 3 operations. The modelling includes the relevant odour sources, adopted odour emission rates and proposed mitigation and management measures.

The conclusion that Modification 3 would not result in unacceptable odour impacts is based on the predicted odour modelling outcomes for the Modification 3 operations. The modelling indicates that no sensitive receptors are located within the conservative 2 OU contour. In addition, the predicted 7 OU criterion contour remains several kilometres from the nearest sensitive receptors and does not extend to any locations where unacceptable odour impacts would be expected.

The proposed mitigation and management measures are therefore considered appropriate for the Modification 3 operations. Based on the predicted odour impacts, no additional mitigation measures are considered warranted.

8. Mitigation measures should also consider circumstances where the leachate dam generates excessive odour such as when aerobic conditions are not maintained.

As discussed in an earlier response, the leachate dam has been conservatively accounted for in the AQIA and the adopted SOER therefore already accounts for higher-than-normal leachate odour emissions. On this basis, the potential for elevated odour from the leachate dam has been appropriately considered in the assessment, and no additional mitigation measures are warranted.

General Public



1. Unacceptable Odour Emissions and Air Quality Impacts

FOGO and C&I organic streams possess a significantly higher putrescible content compared to standard green waste or previously approved streams. This leads to a rapid generation of volatile organic compounds (VOCs) and anaerobic conditions if not meticulously managed.

- **Inadequate Processing Infrastructure:** Open windrow composting, or partially enclosed receival, is wholly inadequate for high-volume FOGO processing. The increase in throughput necessitates fully enclosed receival halls operating under strict negative pressure, coupled with biofiltration systems designed specifically for the peak ammonia and hydrogen sulphide loads typical of FOGO decomposition.
- **Meteorological Vulnerability:** The Hunter Valley experiences distinct inversion layers and prevailing wind conditions that can trap and transport odours over considerable distances. An increase in putrescible mass without corresponding upgrades to active, enclosed aeration infrastructure will inevitably result in unacceptable odour impacts on surrounding receptors.

While FOGO and C&I organic streams can have a higher putrescible content than green waste, this has been directly accounted for in the odour assessment. Odour emission rates were adopted from a wide range of data sources, including published information, site-specific and site representative monitoring data, with conservative assumptions applied in the dispersion modelling.

The assessment also accounts for local meteorological conditions, including calm and stable conditions that can influence odour dispersion. The assertion that the Project would inevitably result in unacceptable odour impacts is not supported by the assessment results.

The relevant odour criterion is 7 OU, and the predicted 7 OU contour associated with the Project remains more than ~6km from the nearest residential receptor. Accordingly, the assessment demonstrates that unacceptable odour impacts at residential receptors are not expected.

Odour risks associated with receival, handling and processing of more putrescible organic material would also be managed through the proposed operational controls and management measures.

Please feel free to contact us if you would like to clarify any aspect of this report.

Yours faithfully,
Todoroski Air Sciences



Aleks Todoroski



Emilie Aragnou



References

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"Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments", prepared for Bettergrow Pty Ltd by Advanced Environmental Dynamics, August 2019.

ERM (2013)

"Resource Recovery Facility – Gerogery, Odour Impact Assessment", prepared for Baker & McKenzie by ERM, August 2013.

GHD (2015)

"Lucas Heights Resource Recovery Park Project Air Quality Assessment", prepared for SITA Australia by GHD, August 2015.

NSW EPA (2022)

"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", NSW Environment Protection Authority, August 2022.

Todoroski Air Sciences (2023)

"Air Quality Management Plan Bettergrow Nutrient Recycling Facility, Ravensworth", prepared for Bettergrow Pty Ltd by Todoroski Air Sciences. 2023.

Todoroski Air Sciences (2025)

"Air Quality Impact and Greenhouse Gas Assessment, Bettergrow Ravensworth Composting Facility, Modification 3", prepared by Todoroki Air Sciences, October 2025.

TOU (2010)

"Odour Impact Assessment of Proposed Composting Facility, Wooroloo Brook Farm, WA", prepared for Purearth by The Odour Unit, April 2010.





APPENDIX C

UPDATED MITIGATION AND
MANAGEMENT MEASURES

Updated mitigation and management measures

The updated mitigation and management measures for the project mainly remain the same as the existing modified development (Modification 2), apart from an additional measure that has been added to minimise potential worst case odour impacts, as shown in **bold** in Table B-1 below.

The existing environmental management plans (including the OEMP, Composting Management Plan and other sub-plans of the OEMP) will be reviewed and updated in accordance with the modified consent, subject to approval of the modification application, to ensure they remain fit for purpose, as required by condition C8(d) of development consent SSD-9418.

Table B-1 Mitigation and management measures

Issue	Mitigation or management measure
Air quality – odour emissions	- A revised Compost Management Plan is to be prepared prior to the development increasing operations at the site. - Staff will receive training on methods to reduce odour generation. - On-site dams, stormwater, and leachate to be suitably managed through separation of clean and leachate runoff, reuse, and sampling. - Only approved wastes will be accepted onsite. - Windrows will be managed in accordance with site operational procedure for windrow construction and maintenance. - All odorous wastes are to be mixed immediately with less odorous wastes to reduce odour generation. Where this is not possible odorous wastes will be covered temporarily with green waste or saw dust. - Homogeneous mixing will be undertaken. - Compost materials will be watered to a moisture content such as not to create an anaerobic environment. - Odour monitoring will be undertaken as required should an issue be identified at a sensitive receiver. If excessive odour is generated by the project and cannot be adequately managed through standard operational controls set out in the management plans, the receipt of highly odorous material and new composting activities will cease until the cause of the odour issue has been identified and addressed. Where a particular incoming material stream is identified as being unusually odorous or unsuitable for processing, that material may be rejected or not accepted in future.
Air quality – dust emissions	- Hardstand pads and the internal roadways will be regularly watered to suppress dust using site water carts. - Staff will undertake visual inspections of dust generation to ensure dust is not spreading beyond the site boundary. - Loads leaving the site will be required to be watered and tarped to prevent dust generation. - Windrows and stockpiles will be maintained by water cart and will have a minimum moisture content of 45 %, with increased watering to occur prior to adverse weather conditions. - During excessive wind conditions, loading activities will be reduced until more favourable conditions prevail. - Staff will receive training on methods to reduce dust generation.
Air quality – greenhouse gas emissions	- Whenever practicable, vehicles to leave site with full loads to reduce the number of traffic movements and diesel consumption. - All vehicles/plant and machinery will be turned off when not in use and regularly serviced in accordance with manufacturers specifications to ensure efficient operation. - The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate. - Recycled materials will be incorporated into the project where possible. - The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment. - All vehicles and machinery will be fitted with OEM exhaust systems to ensure exhaust emissions are within accepted standards.
Surface water and groundwater	- Surface and Groundwater Management Plan to be updated to include the expanded facility. - Limit fuels and chemicals stored onsite to a minimum.

Issue	Mitigation or management measure
	▪ All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains. ▪ Plant and equipment must be regularly inspected and serviced to limit risk of oil loss. ▪ Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment. ▪ Wash down areas must be appropriately constructed to capture and treat all wastewater, with collected solid material disposed off-site to a licensed facility. ▪ All staff to be appropriately trained in the spill response plan for the minimisation and management of unintended spills. ▪ A high standard of site housekeeping is to be maintained to limit risk of gross pollutants entering surface waters (i.e. construction waste, litter). ▪ All reasonable and practicable measures must be taken to prevent pollution of any existing waterways from silt or untreated leachate run-off, and oil or grease spills from any machinery. ▪ Wastewater for cleaning equipment must not be discharged or indirectly to any watercourses or stormwater systems. ▪ Exposed bare earth areas within the composting facility site must be minimised. Unused areas are to be revegetated. ▪ The facility must be designed to prevent surface water from mixing with the organics received and processed at the premises and the final products, process residuals and contaminated materials stored at the premises. This includes: - Drains and spillways. - Bunding. - Sediment controls during construction. ▪ Clean stormwater must be diverted around waste and leachate catchments through the installation of clean water catch drains and diversion bunds. ▪ Maintain surface gradient of the hardstand pad and orientation/geometry of windrows to minimise leachate generation and to ensure that leachate flows directly to the primary detention basin without mixing with compost organics ▪ Maintain all water related infrastructure, during construction and operation of expanded infrastructure, and operation, designed to maximise runoff and reduce infiltration including: - Low permeability base in the composting processing areas. - Bunding and arrangement of windrows. - Perimeter bunding and diversion drains. ▪ Procedures for testing, treatment, and discharge of leachate to be established and implemented, including monitoring anaerobic conditions. ▪ Undertake aeration of the leachate dam (increase oxygen) if required (i.e. if hydrogen sulphide, dissolved oxygen or pH levels are outside limits). ▪ Monitor water levels of the detention basin to ensure that the water levels do not drop below the anticipated use of water for composting and evaporation. ▪ Maintain integrity of hardstand pad by repairs to areas damaged by plant and machinery movements. ▪ Ensure drains and surface water gradients are free of excess vegetation and debris so that the flow of stormwater or leachate is not impeded, and the moisture / compaction levels achieved in embankment construction are maintained. ▪ Regular inspections of onsite infrastructure and structural integrity of drains, hardstand, and leachate dam. ▪ Repair and maintain any cracks observed in the base and side walls of the dam using clay, preferably bentonite or bentonite clay mixture. ▪ Waste to be accepted at the facility is to be in accordance with the EPA licence. Waste must be effectively vetted so prohibited wastes are not accepted at the facility. ▪ Waste is only to be received, stored, or processed in areas where the leachate barrier has been installed. ▪ Monitoring of pollutants must be undertaken as per EPL 7654. ▪ Leachate collection and storage facilities must be maintained to collect and impound all leachate in accordance with the design storm event. ▪ Leachate is not to be used for dust suppression on haul roads.

Issue	Mitigation or management measure
	- Leachate is to be recycled through moisture conditioning of compost, to drawdown on basin volumes and ensure the design capacity of the basin is maintained for future storm events. - Management of windrows and gradients to ensure no ponding or pooling occurs. - Depressions must be filled promptly by using screened or sieved overburden. - All water that has entered processing and storage areas and water that has been contaminated by leachate must be handled and treated in the same manner as leachate. - Leachate must be collected and stored in a lined basin capable of capturing the 1% AEP, 24-hour runoff event. The hardstand pad and basin liner shall be constructed recompacted overburden/clay with an in-situ permeability (K) of less than 1×10^{-9} m/s in accordance with Aurecon (2017). - The leachate dam must be designed in accordance with AS 3798-2007 – Guidelines on Earthworks for Commercial and Residential Developments. - Leachate basin is to be regularly desilted in order to maintain design storage capacity, without compromising basin liner integrity.
Traffic and access	The bulk of heavy vehicle movements will be scheduled to avoid the busy morning and afternoon peak hours.
Noise and Vibration	- All employees and contractors are to receive an environmental induction that will include: - Relevant licence and approval conditions. - Permissible hours of work. - Location of nearest sensitive receivers. - Construction employee parking areas. - Designated loading/unloading areas and procedures. - Site opening/closing times (including deliveries). - Environmental incident procedures.
Biodiversity	- The establishment of artificial wetlands in the north-western area of the lease area, where small depressions exist, is recommended. Use of a variety of water depths, and planting of native wetland species endemic to the Singleton region is encouraged. - Weeds present over the disturbed areas of the site should be controlled/eradicated where feasible.
Bushfire	- A minimum 4 m wide access road with 1 m shoulders, passing areas every 200 m to allow two-way passing of vehicles, and all-weather trafficable is to be provided. - A minimum 4 m wide unsealed all-weather trafficable road around the external perimeter of the compost mounds should be provided to prevent potential grass fires encroaching into the compost facility, or a fire from the compost facility spreading into surrounding grassed areas and properties. - A diesel or petrol-powered fire-fighting pump, with at least a 40 m long hose with steel nozzle, mounted on a mobile fire tanker unit should be provided. It should be able to pump out water and cart water from the water supply tank/dam, and fight any spot fires caused by ember attack, or self-combustion. - An Emergency and Evacuation Plan should be prepared, including details of the site Fire Warden, local NSW Rural Fire Service contact numbers, emergency muster point, fire-fighting appliance location, first aid kits, and emergency response procedures in the advent of a bush fire. - The NSW Rural Fire Service should also be notified of the development once approved so it can be added to their facility register, and details also provided of access and fire-fighting capacity onsite.
Visual	Existing trees within the site is to be retained to maintain the existing level of screening.
Aboriginal Heritage	- All relevant staff should be made aware of their statutory obligations for heritage under the <i>National Parks and Wildlife Act 1974</i> and the <i>Heritage Act 1977</i>. This is to be in the form of a heritage induction on site prior to works. - In the unlikely event that disturbed Aboriginal objects are identified during the development then they are to be collected and recorded in accordance with Heritage NSW guidelines and in consultation with the Registered Aboriginal Parties.

Issue	Mitigation or management measure
	▪ In the unlikely event that human skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area cordoned off. ▪ The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or are possible Aboriginal remains. ▪ If the remains are thought to be Aboriginal, Heritage NSW must be contacted via the Environment Line 131 555. ▪ A Heritage NSW officer will determine if the remains are Aboriginal or not. ▪ If the remains are identified as Aboriginal, a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.
Historic Heritage	▪ All relevant staff should be made aware of their statutory obligations for heritage under the <i>National Parks and Wildlife Act 1974</i> and the <i>Heritage Act 1977</i>. This is to be in the form of a heritage induction on site prior to works. ▪ In the unlikely event that disturbed objects are identified during the development then they are to be collected and recorded in accordance with Heritage NSW guidelines. ▪ In the unlikely event that human skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area cordoned off. ▪ The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene. ▪ If the remains are thought to be of heritage significance, Heritage NSW must be contacted via the Environment Line 131 555. ▪ A Heritage NSW officer will determine if the remains are of heritage significance.
Socio-economic	▪ Ongoing engagement will occur with key stakeholders during construction and operations.
Fire and Incident Management	▪ New storage structures on the site should be constructed to comply with Part E1 (deemed to satisfy provisions) and Part E2.3 (Special Hazards) of the BCA. ▪ A strict no smoking policy should be enforced on site when in proximity of any combustible materials. Smoking will only be permitted in clearly signposted areas. ▪ All water collection points should be checked regularly to ensure their ability to be accessed in an emergency. ▪ Fire extinguishers should be positioned at readily accessible points, including on mobile plant, so that their use in an emergency is not restricted. ▪ All firefighting plant and equipment should be regularly serviced in line with the manufacturer's recommendation. ▪ The temperature of all stockpiles and windrows should be monitored in accordance with established workplace procedures. If temperatures throughout the compost exceed 67 °C, then watering is to be initiated to dissipate heat. ▪ All stockpiles and windrows should be sufficiently moist. The moisture content of compost windrows must be kept above 40 % weight for weight to retard burning. ▪ In the event of a fire within a windrow, the affected stockpile/windrow must first be suppressed with either the use of water and/or dirt. The stockpile/windrow must then be pulled apart. However, if weather conditions are such that pulling apart the stockpile/windrow is likely to ignite other stockpile/windrows or spread the fire internally or externally, (eg dry with moderate/strong winds), the stockpile must not be broken up until conditions are suitable. ▪ In the event a fire cannot be extinguished using water or soil, the use of fire retardants should be considered (expert advice should be sought from Fire and Rescue NSW before taking action with retardants). ▪ Once the fire has been extinguished, affected areas should be monitored on a continual basis until materials have cooled. ▪ All fire water should be contained on site. ▪ All staff should be trained in the use of onsite firefighting appliances. ▪ Combustible materials should not be accumulated in areas close to exhausts or engines. ▪ Display emergency procedures and information in the site office or other visible location.

Issue	Mitigation or management measure
Hazard and Risk	▪ Conduct or participate in site emergency scenarios as required. ▪ Regularly identify and check all site fire extinguishers and firefighting equipment. ▪ All mobile plant and equipment should be fitted with fire extinguishers. ▪ An Emergency Response Plan should be prepared and implemented for the facility. ▪ All staff on site should be appropriately trained in the handling of dangerous goods. ▪ Flammable and combustible liquids will be stored in accordance with AS 1940-2004: The Storage and Handling of Flammable and Combustible Liquids.
Waste Management	▪ Plant and equipment should be regularly maintained in accordance with OEMP requirements. ▪ Ordering should be limited to only the required amount of materials. ▪ Materials should be segregated to maximise reuse and recycling. ▪ Routine checks should be undertaken of waste sorting and storage areas for cleanliness, hygiene and OH&S issues, and contaminated waste materials. ▪ Separate skips and recycling bins should be provided for effective waste segregation and recycling purposes. ▪ Training and awareness of the requirements of the WMP and specific waste management strategies should be undertaken. ▪ Contaminated waste should be managed, transported, and disposed of in accordance with licensing requirements. ▪ Off-site waste disposal should be transported and disposed of in accordance with licensing requirements. ▪ Assessment of suspicious potentially contaminated materials, hazardous materials and liquid wastes should be undertaken. ▪ Regular monitoring, inspection and reporting requirements should be undertaken, and findings implemented. ▪ All waste materials (not including compost) removed from the site should only be directed to a waste management facility or premises lawfully permitted to accept the materials. ▪ All waste will be: - stored wholly within the designated waste storage areas; and - loaded and unloaded within the designated loading and unloading areas. ▪ Subcontractors will be informed of site waste management procedures. ▪ All contractors and staff will receive a site specific environmental induction at the commencement of their employment at the development.



APPENDIX D

LEACHATE BARRIER CERTIFICATION

RCA ref 12825a-103/0

14 September 2017

BetterGrow
PO Box 945
WINDSOR 2756

Attention: John Vyse

Geotechnical Engineering

Engineering Geology

Environmental Engineering

Hydrogeology

Construction Materials Testing

Environmental Monitoring

Sound & Vibration

Occupational Hygiene

RAVENSWORTH LEACHATE BARRIER CERTIFICATION

1 INTRODUCTION

This report provides a certification of the leachate barrier that BetterGrow have constructed at a site at 74 Lemington Road, Ravensworth, NSW. The leachate barrier has been placed over the southern portion of the second section of the Stage 1 Pad areas over Void 3 at the Ravensworth site. The leachate barrier lies beneath the operating area that BetterGrow are using for preparation of a topsoil medium at the site by blending treated Sydney Water biosolids and green waste (see Survey plan attached to letter provided by Tony Mexon and Associates). The operating area being used for the receipt, blending and preparation is a large relatively level area overlying a relic tailings dam at the site. The works are subject to EPA Notice of Variation of Licence NO. 7654 with the variation relating to preparation of leachate barrier and lining of the operating area.

2 LEACHATE BARRIER APPROVAL CONDITIONS

EPA Notice of Variation of Licence NO. 7654 states that:

Clause O7.1 - Prior to receiving waste, the licensee must ensure that the waste receipt, handling, processing and storage surfaces in the southern portion of Stage 1 are constructed with a leachate barrier in accordance with minimum standards in the EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004.

Clauses O7.2 - The licensee must provide a Certified Quality Assurance report to the EPA for approval within four weeks of completion, that the leachate barrier on the working surfaces of the southern portion of Stage 1 at the premises has been installed and constructed in accordance with the EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004. The CQA report must be prepared by a suitably qualified expert or engineer.

The EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004 states that the liner is to comprise "a clay or modified soil liner consisting of at least 600 mm of recompacted clay with an in-situ permeability (k) of less than 10^{-7} m/s. Such liners should be placed in successive layers up to 300 mm uncompacted thickness."

3 SUMMARY OF WORKS AT THE SITE

Works at the site have been undertaken by:

Earthworks – JE & J Robinson Pty Ltd

Survey – Tony Mexon & Associates

Geotechnical Testing – RCA Australia

Works have comprised preparation of an operations area by placing and compacting a subbase of 300-400mm of site won overburden with 100-150mm gravel compacted over that as a wearing course. The 300-400mm of site won overburden was placed over an existing capping over the relic tailings dam that was investigated by JE & J Robinson Pty Ltd by test pitting and found to comprise a 400mm layer of overburden. The existing capping layer was subjected to rolling and compaction prior to the placement of the additional overburden layer as indicated in the attached letter from JE & J Robinson dated 8 September 2017.

RCA Australia has provided Level 2 compaction testing for BetterGrow during the compaction of the Stage 1 Pad area. As identified on the attached Site Layout Plan of the Void 3 Composting Pads the works are divided into a Southern Pad area and a Northern Pad area.

The attached letter from Tony Mexon & Associates (dated 8 September 2017) indicates that the average thickness of the layer of overburden that was compacted over the second section of the Stage 1 Pad areas was 378mm.

4 TEST RESULTS

4.1 DENSITY TESTING

The compaction testing results for the overburden subbase layer being placed within the Southern Pad area identified on the attached Site Layout plan. The test results are attached and cover tests over the period 7 July 2017 to 17 July 2017. Overburden was placed in two layers (Layer 1 and Final Layer). Density test results indicate density ratios in the range 99-100% for Layer 1 and 102.5-105.5% for the Final Layer.

4.2 OVERBURDEN TESTING

Overburden from the Ravensworth stockpile was tested by RCA (see attached results). The tested material has a PI of 15% with 37% gravel, 23% sand and 40% silt and clay.

4.3 PERMEABILITY TESTING

RCA Australia had sample of the overburden material tested for permeability (k) by Macquarie Geotech. Permeability was tested by method AS1289 6.7.3 on samples compacted to standard density ratio of 95%. The eight test results indicate permeability in the range 2.8×10^{-9} to 1.5×10^{-10} m/s.

5 CERTIFICATION

Based on the data provided RCA Australia consider that the overburden leachate barrier placed over the southern portion of the second section of the Stage 1 works satisfies conditions O7.1 and O7.2 of EPA Notice of Variation of Licence NO. 7654.

Yours faithfully

RCA AUSTRALIA



Mark Allman
Principal Geotechnical Engineer

ATTACHMENTS

Site Layout Plan

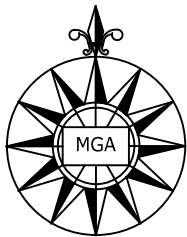
Density Reports 29-40

Overburden Quality of Material Report

Compaction and Permeability Test Results

Tony Mexon & Associates Letter (8/9/2017)

JE & J Robionson Letter (8/9/2017)



EASEMENT FOR ACCESS

PINK TOPPED PVC PIPE

EDGE OF BETTERGROW EPL

NORTHERN PAD

(27.27ha)

SOUTHERN PAD

(16.58ha)

LEACHATE DAM

EASEMENT FOR ACCESS

TO LEMINGTON ROAD

DEPTH MARKER VOLUMES	
DEPTH (M)	VOLUME (M ³)
0.4	1000
0.6	2100
0.8	3400
1.0	4900
1.2	6500
1.4	8000
1.6	9600
1.8	11200
2.0	12900
2.2	14500
2.3	15700

MONITORING POINTS			
POINT	EASTING	NORTHING	COMMENT
A.	315785.8	6410375.5	CENTRE OF WATER TANK
B.	315777.0	6409824.2	CENTRE OF SPILLWAY
C.	315779.3	6409811.6	STAR PICKET IN DAM WALL
D.	315746.8	6409817.2	DEPTH MARKER GUAGE
E.	316012.5	6409733.6	STAR PICKET NEAR BASIN OUTLET

SURVEYOR				CLIENT/OWNER	REVISION NOTES		TITLE
TONY MEXON & ASSOCIATES Registered Surveyors P.O. Box 917 Singleton, NSW 2330				BETTERGROW	13/6/2017 ORIGINAL	0	VOID 3 COMPOSTING PADS SITE LAYOUT
SURVEYORS REF.		SCALE	SHEET SIZE				
13-26		1:4000	A3				

Hilf Density Ratio Report

Client :	JE & J Robinson	Report Number:	12665 - 006
Address :	PO Box 786, Muswellbrook, NSW, 2333	Report Date :	10/07/2017
Project Name :	Compaction Control	Order Number :	
Project Number :	12665	Test Method :	AS1289.5.7.1
Location:	Ravensworth Ash Dam	Page 1 of 1	

Sample Number :	17-1554	17-1555	17-1556	17-1557
Test Number :	29	30	31	32
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	7/07/2017	7/07/2017	7/07/2017	7/07/2017
Date Tested :	7/07/2017	7/07/2017	7/07/2017	7/07/2017
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Hardstand Layer 1	Hardstand Layer 1	Hardstand Layer 1	Hardstand Layer 1
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	37.5	37.5	37.5
Oversize Wet (%) :	19	10	3	14
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.332	2.428	2.595	2.238
Field Moisture Content (%) :	16.3	13.0	15.2	11.1
Hilf MDR Number :	17-1554	17-1555	17-1556	17-1557
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	102.5	106.0	106.5	108.5
Field Wet Density (t/m ³) :	2.06	2.12	2.12	2.12
Optimum Moisture Content (%) :	15.9	12.2	14.3	10.2
Moisture Variation :	-0.3	-0.8	-0.9	-0.9
Peak Converted Wet Density (t/m ³) :	2.08	2.13	2.12	2.13
Hilf Density Ratio (%) :	99.0	99.5	100.0	99.5
Minimum Specification :	95%	95%	95%	95%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Gravelly CLAY	Sandy Gravelly CLAY	Gravelly CLAY	Sandy Gravelly CLAY
Remarks :	-			



Accredited for compliance with ISO/IEC 17025.

APPROVED SIGNATORY

Timothy Baker - Senior Soil Technician

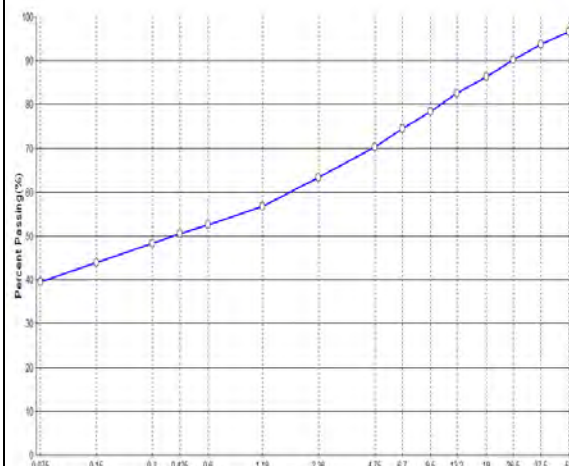
NATA Accreditation Number

9811 Singleton Lab Site Rec No. 14515

Document Code RF89-8

Quality of Materials Report

Client:	Better Grow	Report Number:	12825a - 002
Client Address:	PO Box 945 Windsor NSW 2756	Report Date:	30/06/2017
Job Number:	12825a	Order Number:	-
Project:	Ravensworth	Page 1 of 1	
Location:	Ravensworth ,	Sample Location	
Lab No:	17-1442	CWR Ravensworth Stockpile	
Date Sampled:	27/06/2017	Spec Description: -	
Date Tested:	28/06/2017	Lot Number: -	
Sampled By:	RCA Geotech	Spec Number: -	
Sample Method:	AS SUPPLIED		
Material Source:	-		
For Use As:	-		
Remarks:	-		

A.S. Sieve Sizes		Specification Minimum	Percent Passing	Specification Maximum
Test Method: AS 1289.3.6.1 (washed)				
	75.00 mm		100	
	53.00 mm		97	
	37.50 mm		94	
	26.50 mm		90	
	19.00 mm		86	
	13.2 mm		83	
	9.50 mm		78	
	6.7 mm		74	
	4.75 mm		70	
	2.36 mm		63	
	1.18 mm		57	
	0.600 mm		53	
	0.425 mm		50	
	0.300 mm		48	
	0.150 mm		44	
	0.075 mm		40	

Atterberg Tests	Test Method	Specification Minimum	Result	Specification Maximum
Liquid Limit (%)	AS1289.3.1.2		35	
Plastic Limit (%)	AS1289.3.2.1		20	
Plasticity Index	AS1289.3.3.1		15	
Linear Shrinkage (%)			-	
P.I. x % Passing 0.425 mm			-	

	Accredited for compliance with ISO/IEC 17025.	Approved Signatory	Form Number
		 Timothy Baker Senior Soil Technician NATA Accred No:9811	RP132-1

Hilf Density Ratio Report

Client :	JE & J Robinson	Report Number:	12665 - 007
Address :	PO Box 786, Muswellbrook, NSW, 2333	Report Date :	18/07/2017
Project Name :	Compaction Control	Order Number :	
Project Number :	12665	Test Method :	AS1289.5.7.1
Location:	Ravensworth Ash Dam	Page 1 of 2	

Sample Number :	17-1731	17-1732	17-1733	17-1734
Test Number :	33	34	35	36
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	17/07/2017	17/07/2017	17/07/2017	17/07/2017
Date Tested :	17/07/2017	17/07/2017	17/07/2017	17/07/2017
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Hardstand Final Layer	Hardstand Final Layer	Hardstand Final Layer	Hardstand Final Layer
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	19	19	19
Oversize Wet (%) :	1	6	7	5
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.240	2.261	2.263	2.261
Field Moisture Content (%) :	9.6	10.3	10.0	9.4
Hilf MDR Number :	17-1731	17-1732	17-1733	17-1734
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	69.5	70.5	69.5	71.0
Field Wet Density (t/m ³) :	2.03	2.03	2.00	2.03
Optimum Moisture Content (%) :	13.8	14.6	14.4	13.3
Moisture Variation :	4.4	4.4	4.5	4.0
Peak Converted Wet Density (t/m ³) :	1.93	1.95	1.94	1.94
Hilf Density Ratio (%) :	105.0	104.0	103.0	105.0
Minimum Specification :	95%	95%	95%	95%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL
Remarks :	-			



Accredited for compliance with ISO/IEC 17025.

APPROVED SIGNATORY

Timothy Baker - Senior Soil Technician
 NATA Accreditation Number
 9811 Singleton Lab Site Rec No. 14515

Document Code RF89-8

Hilf Density Ratio Report

Client :	JE & J Robinson	Report Number:	12665 - 007
Address :	PO Box 786, Muswellbrook, NSW, 2333	Report Date :	18/07/2017
Project Name :	Compaction Control	Order Number :	
Project Number :	12665	Test Method :	AS1289.5.7.1
Location:	Ravensworth Ash Dam	Page 2 of 2	

Sample Number :	17-1735	17-1736	17-1737	17-1738
Test Number :	37	38	39	40
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	17/07/2017	17/07/2017	17/07/2017	17/07/2017
Date Tested :	17/07/2017	17/07/2017	17/07/2017	17/07/2017
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Hardstand Final Layer	Hardstand Final Layer	Hardstand Final Layer	Hardstand Final Layer
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	19	19	19
Oversize Wet (%) :	6	7	6	6
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.261	2.241	2.264	2.261
Field Moisture Content (%) :	9.5	9.5	9.8	10.4
Hilf MDR Number :	17-1735	17-1736	17-1737	17-1738
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	69.5	69.0	69.0	70.0
Field Wet Density (t/m ³) :	2.06	2.02	2.08	2.02
Optimum Moisture Content (%) :	13.7	13.8	14.2	14.9
Moisture Variation :	4.3	4.4	4.5	4.4
Peak Converted Wet Density (t/m ³) :	1.96	1.97	1.98	1.98
Hilf Density Ratio (%) :	105.0	102.5	105.5	102.0
Minimum Specification :	95%	95%	95%	95%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL
Remarks :	-			



Accredited for compliance with ISO/IEC 17025.

APPROVED SIGNATORY

Timothy Baker - Senior Soil Technician
 NATA Accreditation Number
 9811 Singleton Lab Site Rec No. 14515

Document Code RF89-8

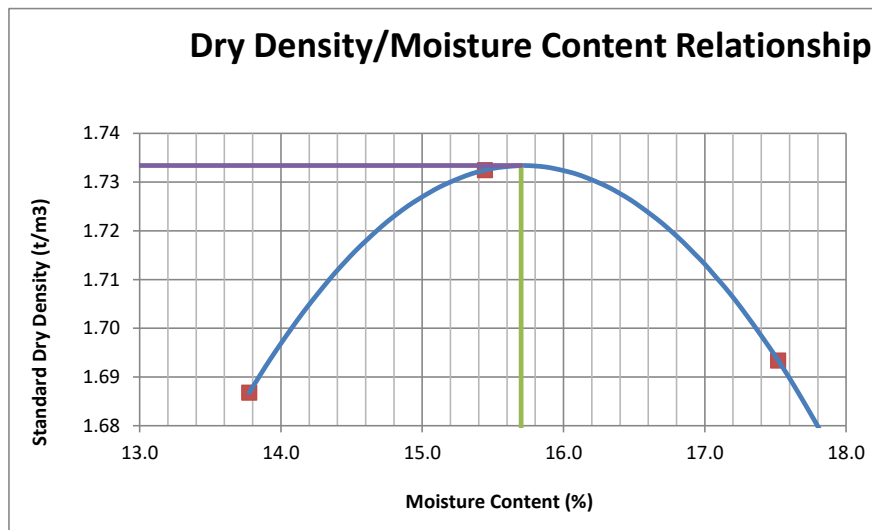
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 1
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20884-MDD
Job No:	S17017	Lab No:	S20884

Test Procedure: ☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling: Sampled by Client **Date Sampled:** 16/01/2017

Preparation: Prepared in accordance with the test method



Maximum Dry Density (t/m ³)	1.733
Optimum Moisture Content (%)	15.7
Percentage Oversize on 19mm sieve (%)	33
Percentage Oversize on 37.5mm sieve (%)	22



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Authorised Signatory:

Chris Lloyd

14/02/2017

Date:

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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 1
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20884-TP
Job No:	S17017	Lab No:	S20884

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m ³)	1.73	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	15.7	Back Pressure (kPa)	500
Placement Moisture Content (%)	15.7	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.64	Sample Height (mm)	50.0
Density Ratio (%)	95.0	Sample Diameter (mm)	50.0

PERMEABILITY $k_{(20)} =$ **1.8E-10 (m/sec)**

Comments

Permeant Used: Sydney tap water



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Authorised Signatory:

14/02/2017

Ian Goldschmidt

Date:



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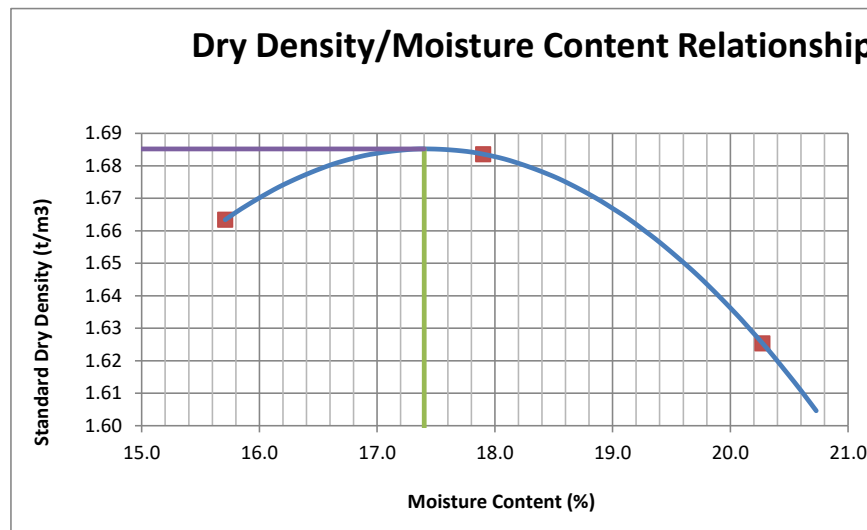
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 2
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20885-MDD
Job No:	S17017	Lab No:	S20885

Test Procedure:	☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
	☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling:	Sampled by Client	Date Sampled:	16/01/2017
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m³)	1.685
Optimum Moisture Content (%)	17.4
Percentage Oversize on 19mm sieve (%)	33
Percentage Oversize on 37.5mm sieve (%)	16



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Date:



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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 2
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20885-TP
Job No:	S17017	Lab No:	S20885

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m ³)	1.69	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	17.4	Back Pressure (kPa)	500
Placement Moisture Content (%)	17.4	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.61	Sample Height (mm)	50.0
Density Ratio (%)	95.0	Sample Diameter (mm)	50.0

PERMEABILITY **$k_{(20)} = 1.8E-10$ (m/sec)**

Comments

Permeant Used: Sydney tap water



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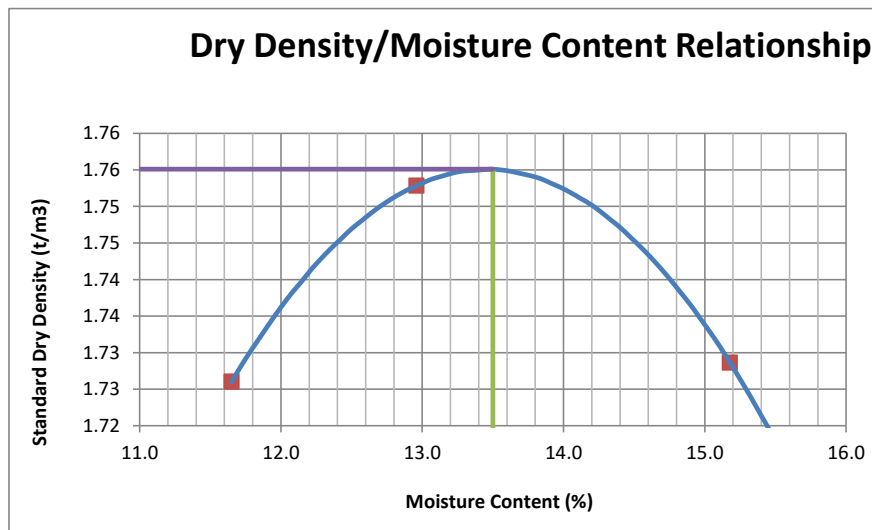
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 3
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20886-MDD
Job No:	S17017	Lab No:	S20886

Test Procedure: ☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling: Sampled by Client **Date Sampled:** 16/01/2017

Preparation: Prepared in accordance with the test method



Maximum Dry Density (t/m³)	1.755
Optimum Moisture Content (%)	13.5
Percentage Oversize on 19mm sieve (%)	32
Percentage Oversize on 37.5mm sieve (%)	18



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Authorised Signatory:

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Date:

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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 3
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20886-TP
Job No:	S17017	Lab No:	S20886

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
---------------------	---

Maximum Dry Density (t/m ³)	1.76	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	13.5	Back Pressure (kPa)	500
Placement Moisture Content (%)	13.5	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.67	Sample Height (mm)	53.0
Density Ratio (%)	95.0	Sample Diameter (mm)	50.2

PERMEABILITY **$k_{(20)} = 1.6E-09$ (m/sec)**

Comments

Permeant Used: Sydney tap water



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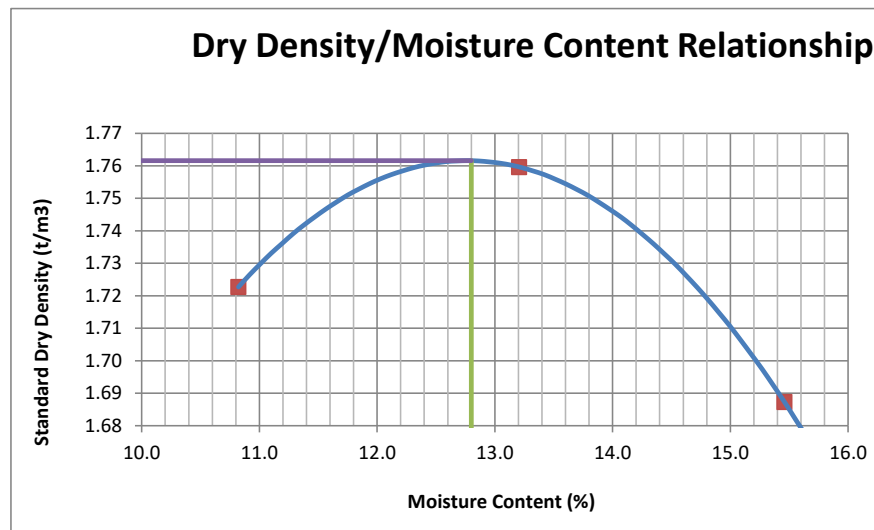
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 4
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20887-MDD
Job No:	S17017	Lab No:	S20887

Test Procedure: ☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling: Sampled by Client **Date Sampled:** 16/01/2017

Preparation: Prepared in accordance with the test method



Maximum Dry Density (t/m³)	1.762
Optimum Moisture Content (%)	12.8
Percentage Oversize on 19mm sieve (%)	17
Percentage Oversize on 37.5mm sieve (%)	10



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Chris Lloyd

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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 4
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20887-TP
Job No:	S17017	Lab No:	S20887

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
---------------------	---

Maximum Dry Density (t/m ³)	1.76	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	12.8	Back Pressure (kPa)	500
Placement Moisture Content (%)	12.8	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.67	Sample Height (mm)	52.7
Density Ratio (%)	95.0	Sample Diameter (mm)	50.3

PERMEABILITY $k_{(20)} =$ **2.0E-09 (m/sec)**

Comments

Permeant Used: Sydney tap water



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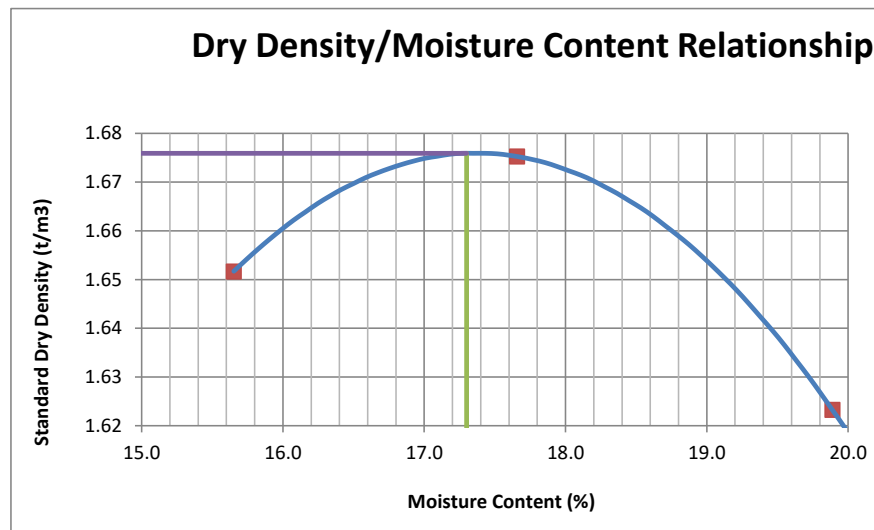
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 5
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20888-MDD
Job No:	S17017	Lab No:	S20888

Test Procedure:	☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
	☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling:	Sampled by Client	Date Sampled:	16/01/2017
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m³)	1.676
Optimum Moisture Content (%)	17.3
Percentage Oversize on 19mm sieve (%)	33
Percentage Oversize on 37.5mm sieve (%)	16



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Date:



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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 5
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20888-TP
Job No:	S17017	Lab No:	S20888

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m ³)	1.68	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	17.3	Back Pressure (kPa)	500
Placement Moisture Content (%)	17.3	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.60	Sample Height (mm)	50.4
Density Ratio (%)	95.0	Sample Diameter (mm)	51.2

PERMEABILITY $k_{(20)} =$ **2.1E-10 (m/sec)**

Comments

Permeant Used: Sydney tap water



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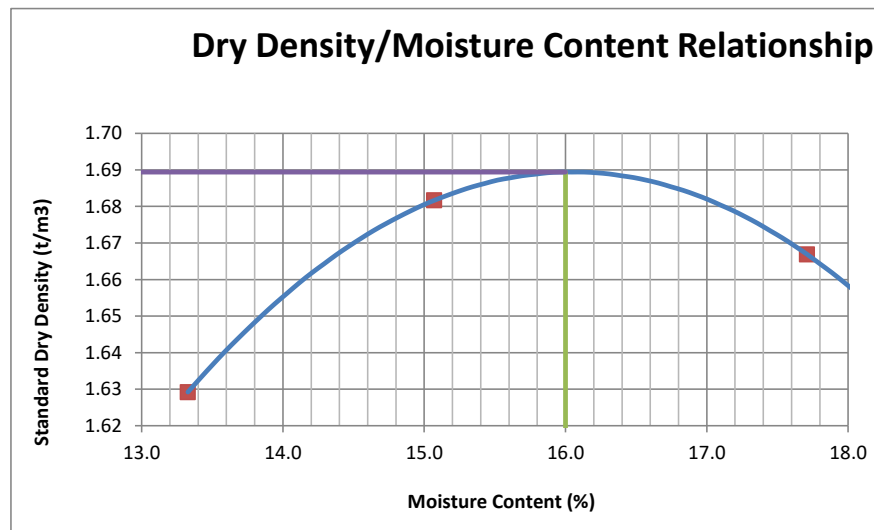
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Borrow Pit - Location 6
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey gravelly SAND
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20889-MDD
Job No:	S17017	Lab No:	S20889

Test Procedure: ☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling: Sampled by Client **Date Sampled:** 16/01/2017

Preparation: Prepared in accordance with the test method



Maximum Dry Density (t/m³)	1.689
Optimum Moisture Content (%)	16.0
Percentage Oversize on 19mm sieve (%)	19
Percentage Oversize on 37.5mm sieve (%)	8



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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Borrow Pit - Location 6
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey gravelly SAND
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20889-TP
Job No:	S17017	Lab No:	S20889

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m ³)	1.69	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	16.0	Back Pressure (kPa)	500
Placement Moisture Content (%)	16.0	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.61	Sample Height (mm)	52.2
Density Ratio (%)	95.0	Sample Diameter (mm)	50.2

PERMEABILITY $k_{(20)} =$ **1.5E-10 (m/sec)**

Comments

Permeant Used: Sydney tap water



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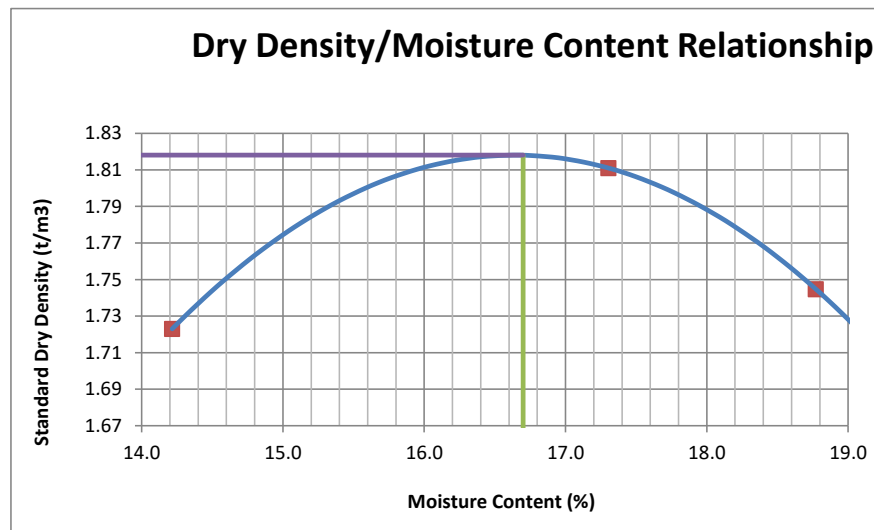
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Corner of Borrow Pit - Location 7
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20890-MDD
Job No:	S17017	Lab No:	S20890

Test Procedure:	☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
	☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling:	Sampled by Client	Date Sampled:	16/01/2017
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Preparation:	Prepared in accordance with the test method
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Maximum Dry Density (t/m³)	1.818
Optimum Moisture Content (%)	16.7
Percentage Oversize on 19mm sieve (%)	30
Percentage Oversize on 37.5mm sieve (%)	13



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Authorised Signatory:

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14/02/2017

Date:



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DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Corner of Borrow Pit - Location 7
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20890-TP
Job No:	S17017	Lab No:	S20890

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
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Preparation:	Prepared in accordance with the test method
---------------------	---

Maximum Dry Density (t/m ³)	1.82	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	16.7	Back Pressure (kPa)	500
Placement Moisture Content (%)	16.7	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.73	Sample Height (mm)	53.0
Density Ratio (%)	95.0	Sample Diameter (mm)	50.1

PERMEABILITY $k_{(20)} =$ **2.8E-09 (m/sec)**

Comments

Permeant Used: Sydney tap water



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

14/02/2017

Ian Goldschmidt

Date:



Macquarie Geotechnical
Unit 8/10
Bradford Street
Alexandria NSW 2015

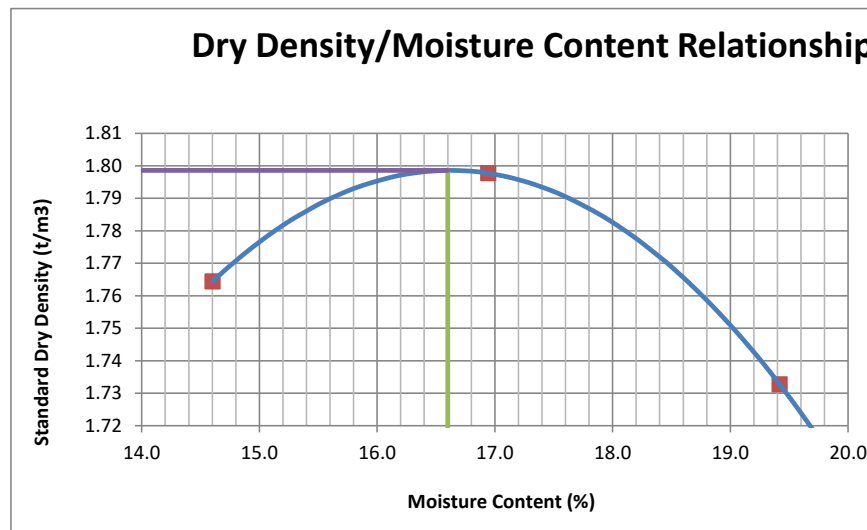
DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client:	RCA Australia	Source:	Corner of Borrow Pit - Location 8
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20891-MDD
Job No:	S17017	Lab No:	S20891

Test Procedure:	☒ AS1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard compactive effort
	☒ AS1289.2.1.1 Determination of the moisture content of a soil - Oven drying method (Standard method)

Sampling:	Sampled by Client	Date Sampled:	16/01/2017
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Preparation:	Prepared in accordance with the test method
---------------------	---



Maximum Dry Density (t/m³)	1.799
Optimum Moisture Content (%)	16.6
Percentage Oversize on 19mm sieve (%)	24
Percentage Oversize on 37.5mm sieve (%)	6



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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

14/02/2017

Date:



Macquarie Geotechnical
Unit 8/10
Bradford Street
Alexandria NSW 2015

DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER

Client:	RCA Australia	Source:	Corner of Borrow Pit - Location 8
Address:	PO Box 175/ 92 Hill Street, Carrington NSW 2294	Sample Description:	clayey sandy GRAVEL
Project:	Compaction Control Ravensworth Ash Dam (12665)	Report No:	S20891-TP
Job No:	S17017	Lab No:	S20891

Test Procedure:	☒ AS1289 6.7.3 DETERMINATION OF PERMEABILITY OF A SOIL - CONSTANT HEAD METHOD USING A FLEXIBLE WALL PERMEAMETER
	☒ AS1289 5.1.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using standard compactive effort
	☐ AS1289 5.2.1 Soil compaction and density tests - Determination of the dry density/moisture content relationship of a soil using modified compactive effort

Sampling:	Sampled by Client	Date Sampled:	16.1.17
------------------	-------------------	----------------------	---------

Preparation:	Prepared in accordance with the test method
---------------------	---

Maximum Dry Density (t/m ³)	1.80	Confining Pressure (kPa)	600
Optimum Moisture Content (%)	16.6	Back Pressure (kPa)	500
Placement Moisture Content (%)	16.6	Mean Effective Stress (kPa)	100
Moisture Ratio (%)	100.0	Material tested passing (mm)	4.75
Placement Dry Density (t/m ³)	1.71	Sample Height (mm)	51.3
Density Ratio (%)	95.0	Sample Diameter (mm)	49.9

PERMEABILITY $k_{(20)} =$ **7.4E-10 (m/sec)**

Comments

Permeant Used: Sydney tap water



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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

14/02/2017

Ian Goldschmidt

Date:



Macquarie Geotechnical
Unit 8/10
Bradford Street
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96 Castlereagh St, Singleton
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Singleton
NSW 2330

Phone 02 6571 2344
Fax 02 6571 2355
Mobile 0438 660 082
Email tony@tonymexon.com.au



**TONY MEXON
& ASSOCIATES**
REGISTERED SURVEYORS

ABN 11 885 739 260

8th September 2017

Ref: 14-32 Bettergrow 8-9-2017

John Vyse

Bettergrow

48 Industry Road

Vineyard NSW 2765

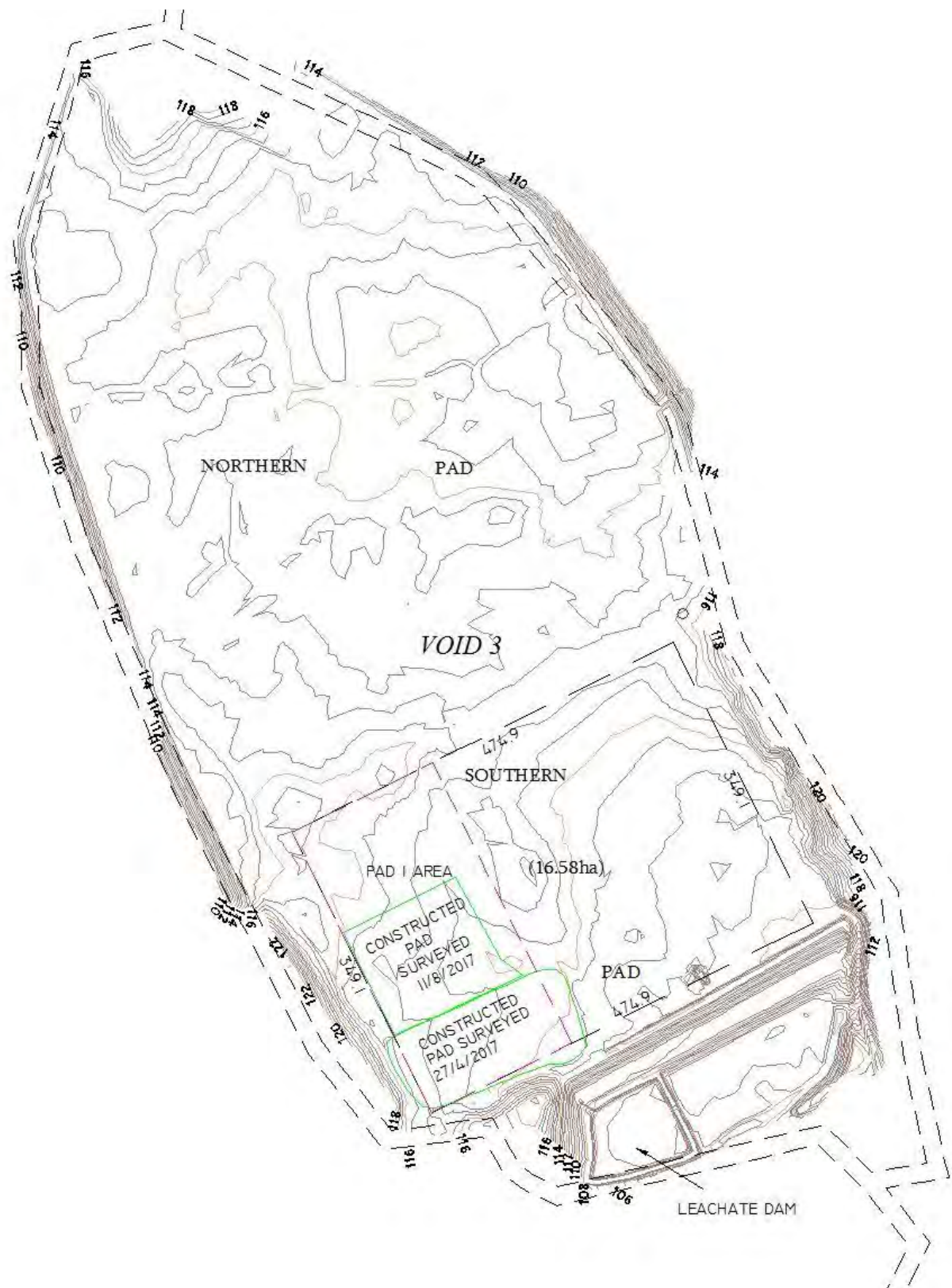
John,

On the 11th August 2017 we surveyed Pad 1 on your Ravensworth Void 3 site as constructed. Since the previous survey, the amount of fill placed over the existing capping is 7750m³ over a pad area of 20500m². This gives an average cover of 378mm over the existing ash capping material.

Regards,

Tony Mexon

B.Surv, Registered Surveyor, MIS





JE & J ROBINSON PTY LTD

PLANT HIRE—EARTHMOVING CONTRACTORS

LIME & GYPSUM SALES

ABN: 87 002 661 341

Phone: 02 6541 2198

Fax: 02 6541 2378

E-mail: Warren@robbos.net

8th September 2017

Mr John Vyse,
Organics Business Manager,
Bettergrow
PO Box 945
WINDSOR NSW 2756

Dear Mr Vyse,

RE: Capping layers at Void 3 area – RAVENSWORTH

I wish to confirm that our Company has undertaken a wide variety of earthworks projects in the Void 3 area at Ravensworth for many years on behalf of Macquarie Generation and now AGL.

We conducted digging of preliminary test pits in the capping layer already on site. It was determined that the existing layer of capping was 400mm thick and we confirm that it was subjected to rolling and compaction prior to the installation of the current fill layer.

The capping material that has now been laid down for Bettergrow has been subjected to and passed compaction and permeability testing and I confirm that the top layer exceeds 300mm depth in all areas.

Please refer to our Site Manager, Darren Kedwell should you require further information.

Yours faithfully,

JE & J ROBINSON PTY LTD

WARREN TREVOR

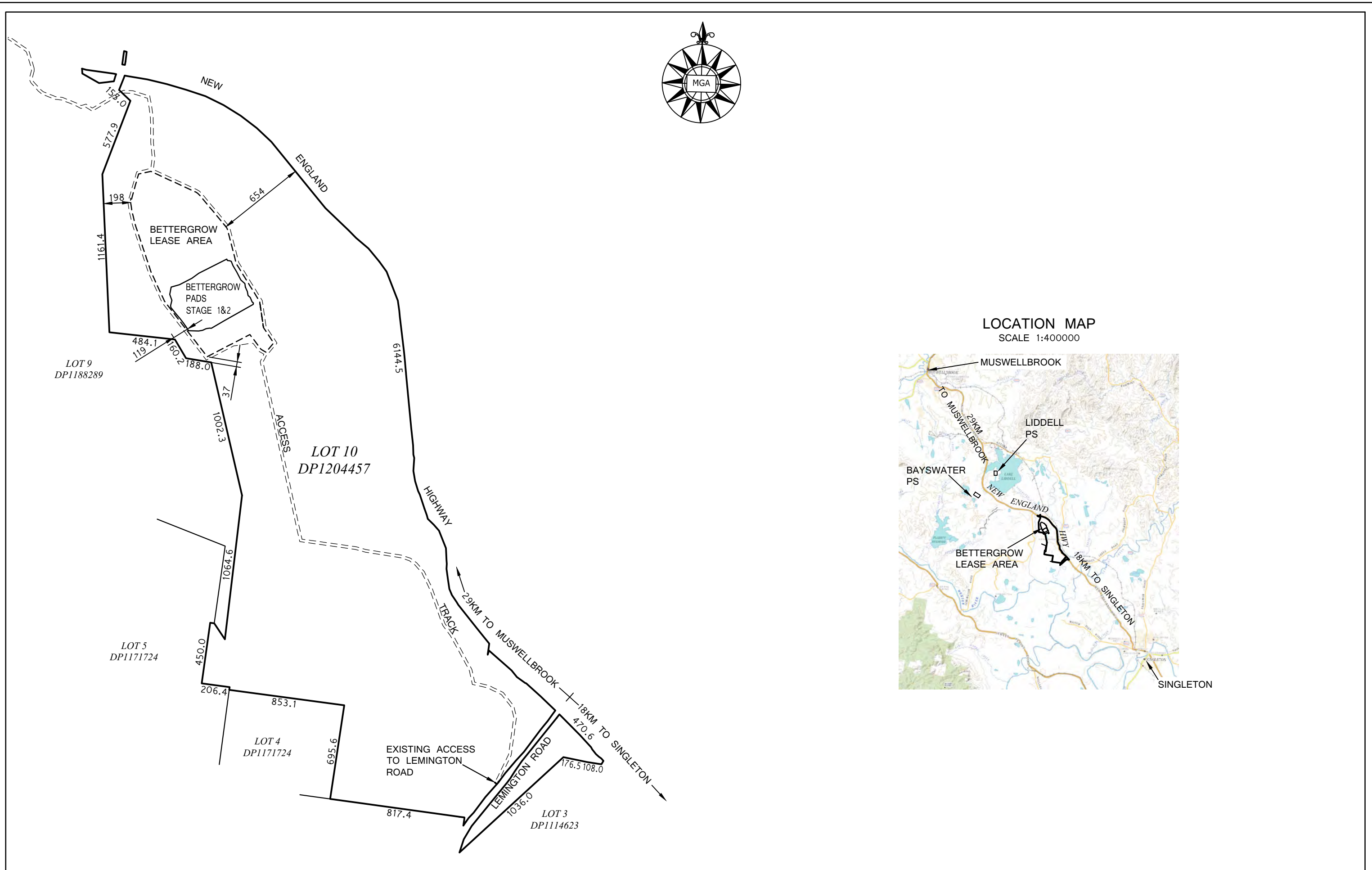
OFFICE MANAGER

POSTAL ADDRESS:

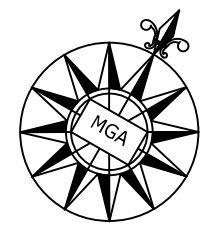
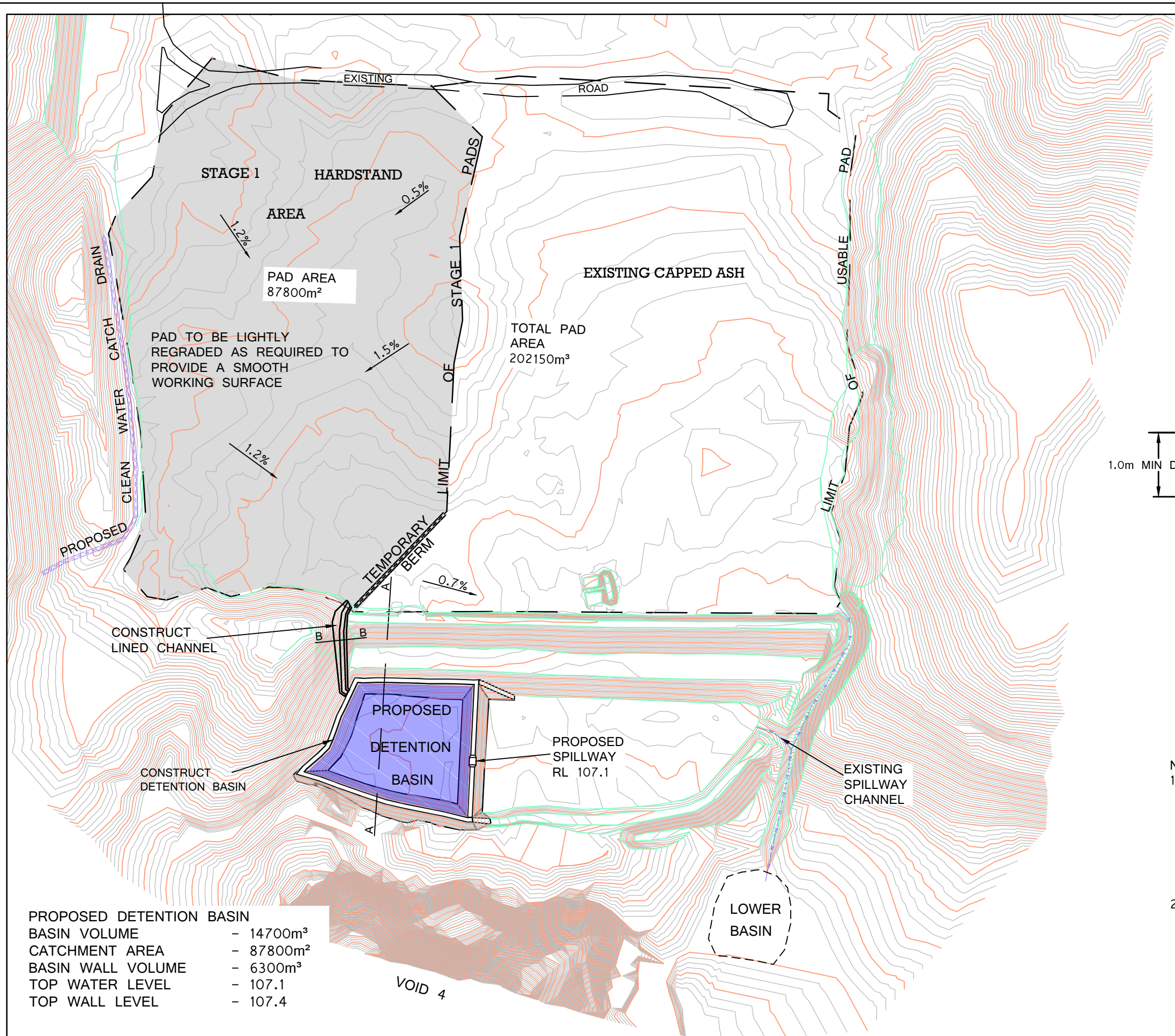
PO Box 786
MUSWELLBROOK NSW 2333

SITE ADDRESS:

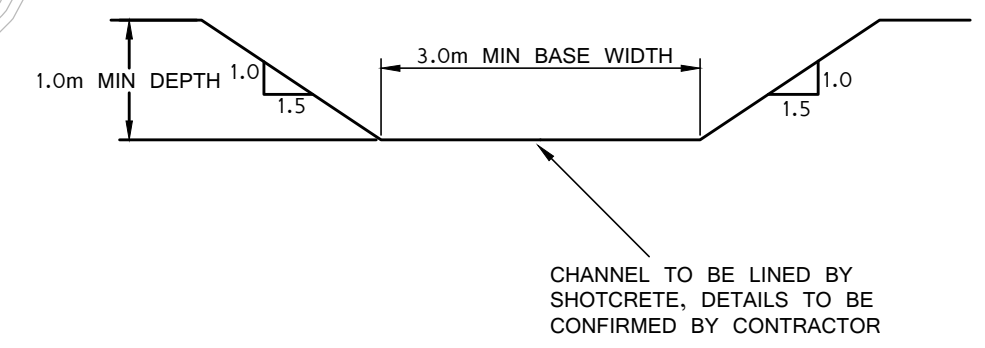
30 Wallarah Road
MUSWELLBROOK INDUSTRIAL ESTATE



 TONY MEXON & ASSOCIATES REGISTERED SURVEYORS	CLIENT/OWNER		DETAILS			REVISION NOTES		TITLE
	BETTERGROW		SURVEYORS REF.	SCALE	SHEET SIZE	18/7/2016 ORIGINAL	0	BETTERGROW RAVENSWORTH COMPOSTING FACILITY SHEET 1 OF 6 GENERAL ARRANGEMENT
			14-32	1:25000	A3			
			DATE OF SURVEY: 23 FEBRUARY 2016					



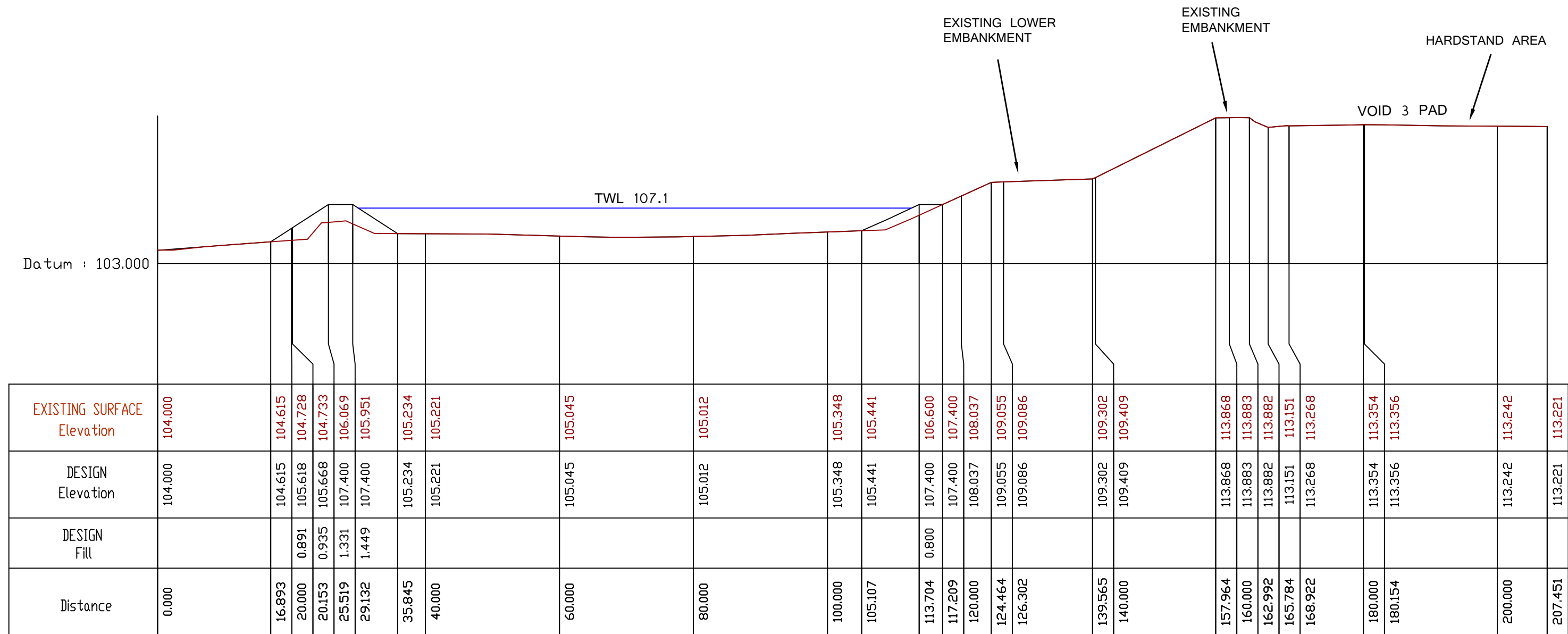
TYPICAL CHANNEL SECTION "B-B"

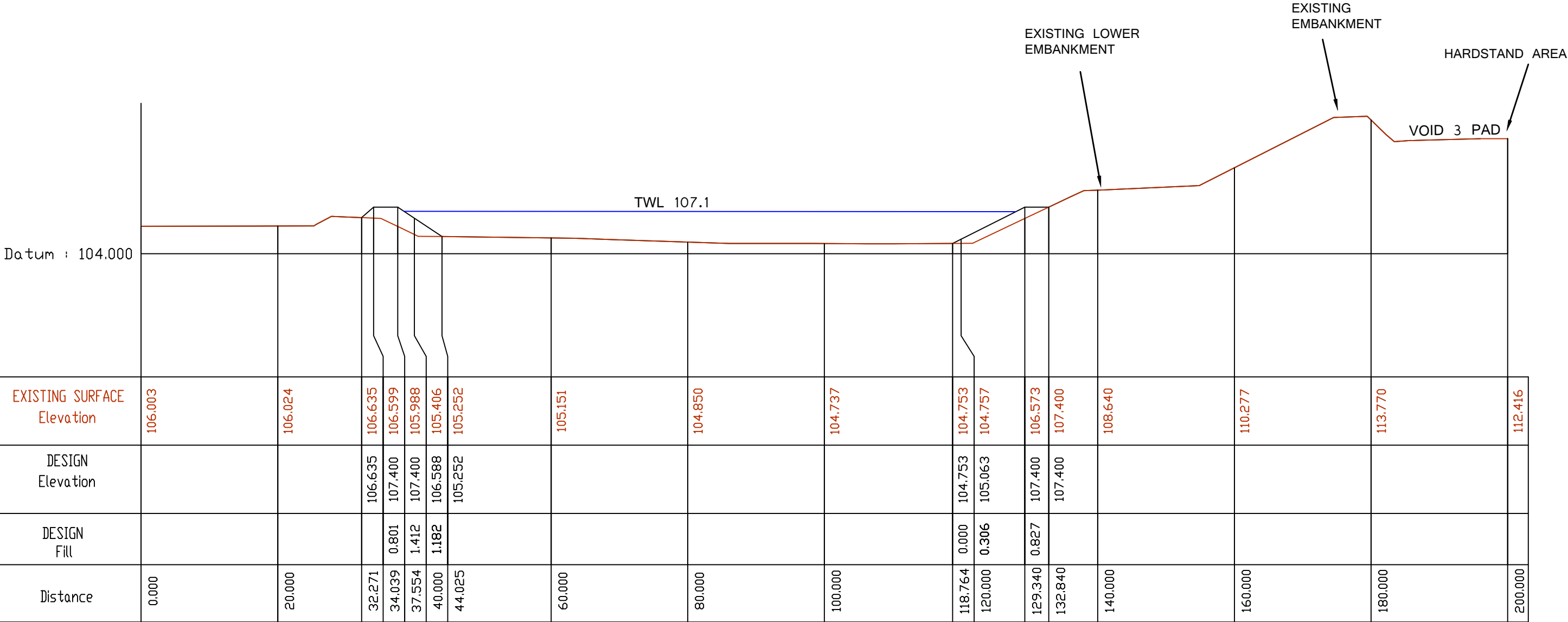


PROPOSED DETENTION BASIN	
BASIN VOLUME	- 14700m ³
CATCHMENT AREA	- 87800m ²
BASIN WALL VOLUME	- 6300m ³
TOP WATER LEVEL	- 107.1
TOP WALL LEVEL	- 107.4

- NOTES
1. THE DETAILS PROVIDED IN THIS PLAN ARE FOR THE PURPOSE OF DEMONSTRATING CRITERIA USED TO ASCERTAIN VARIOUS VOLUMES AND CAPACITIES. THIS PLAN IS NOT AN ENGINEERING DRAWING. ENGINEERING ADVICE SHOULD BE SOUGHT PRIOR TO USE OF THIS DRAWING FOR CONSTRUCTION.
 2. CONTOURS WITHIN THE PAD & PROPOSED DETENTION BASIN ARE DERIVED FROM ACCURATE SURVEY DATA. CONTOURS OVER EXTERNAL AREA INCLUDING THE LOWER BASIN, ARE DERIVED FROM LIDAR DATA AND IS NOT ACCURATE.

 TONY MEXON & ASSOCIATES REGISTERED SURVEYORS	CLIENT/OWNER	DETAILS			REVISION NOTES		TITLE
	BETTERGROW	SURVEYORS REF.	SCALE	SHEET SIZE	18/7/2016 ORIGINAL	0	BETTERGROW RAVENSWORTH COMPOSTING FACILITY SHEET 3 OF 6 STAGE 1 WORKS
		14-32	1:3000	A3			
		DATE OF SURVEY: 23 FEBRUARY 2016					





20 October 2023

Bettergrow
PO Box 945
WINDSOR NSW 2756

Geotechnical Engineering

Engineering Geology

Environmental Engineering

Hydrogeology

Construction Materials Testing

Environmental Monitoring

Sound & Vibration

Occupational Hygiene

RAVENSWORTH LEACHATE BARRIER CERTIFICATION

INTRODUCTION

This report provides a certification of the leachate barrier that Bettergrow has constructed at their site located at 74 Lemington Road, Ravensworth, NSW. The leachate barrier has been placed over the Stage 2 Pad area over a void at the Ravensworth site.

The leachate barrier lies beneath the operating area where Bettergrow operates an outdoor windrow composting facility by blending treated biosolids and green waste. The operating area being used for the delivery, blending and preparation is a large relatively level area overlying a relic tailings dam at the site. Some work was also done on the extension of the existing detention basin

LEACHATE BARRIER APPROVAL CONDITIONS

Prior to receiving waste, the licensee must ensure that the waste receipt, handling, processing and storage surfaces Stage 2 are constructed with a leachate barrier in accordance with minimum standards in the EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004.

The EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004 states that the liner is to comprise "a clay or modified soil liner consisting of at least 600 mm of recompacted clay with an in-situ permeability (k) of less than 10^{-7} m/s. Such liners should be placed in successive layers up to 300 mm uncompacted thickness."

SUMMARY OF WORKS AT THE SITE

Works at the site have been undertaken by:
Earthworks - Bettergrow

Geotechnical Testing – RCA Australia

RCA Australia has provided Level 2 compaction testing of the Stage 2 Pad area and the walls and floor of the detention Basin as identified on the attached Site Layout Plan

TEST RESULTS

The pad area compaction tests are attached and cover tests on the 28th of June 2023. The Gravelly CLAY was placed in two layers (Layer 1 and Final Layer). Density test results indicate density ratios in the range 98%-102% for Layer 1 and 98%-101.5% for the Final Layer. The detention basin tests are attached and cover tests on the 8th of September 2023. Density test results indicate density ratio in the range of 100%-105%

PERMEABILITY TESTING

RCA Australia had sample of the site won material tested for permeability (k) by Macquarie Geotech. Permeability was tested by method AS1289 6.7.3 on samples compacted to standard density ratio of 98%. The three test results indicate permeability's 5×10^{-10} , 1×10^{-9} and 1×10^{-9} m/s.

CERTIFICATION

Based on the data provided RCA Australia consider that the leachate barrier placed over the Stage 2 works and detention basin satisfies conditions of EPA's "Environmental Guidelines for Composting and Related Organics Processing Facilities" 2004.

Yours faithfully
RCA AUSTRALIA



Tim Baker
Laboratory Manager

ATTACHMENTS

Site Layout Plan

Compaction and Permeability Test Results

Hilf Density Ratio Report

Client :	Better Grow	Report Number:	16834 - 001
Address :	PO Box 945, Windsor, NSW, 2756	Report Date :	19/07/2023
Project Name :	Ravensworth Laydown Pad	Order Number :	
Project Number :	16834	Test Method :	AS1289.5.7.1
Location:	Ravensworth Mine , Singleton	Page 1 of 3	

Sample Number :	23-1723	23-1724	23-1725	23-1726
Test Number :	1	2	3	4
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date Time - Tested :	28/06/2023 7.30am	28/06/2023 7.36am	28/06/2023 7.45am	28/06/2023 7.53am
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Laydown Pad Top Layer	Laydown Pad Top Layer	Laydown Pad Top Layer	Laydown Pad Top Layer
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	19	19	19
Oversize Wet (%) :	18	15	15	12
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.502	2.501	2.481	2.501
Field Moisture Content (%) :	10.4	9.3	8.7	11.5
Hilf MDR Number :	23-1723	23-1724	23-1725	23-1726
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	76.5	76.0	74.5	79.0
Field Wet Density (t/m ³) :	2.15	2.10	2.09	2.08
Optimum Moisture Content (%) :	13.6	12.2	11.6	14.5
Moisture Variation :	3.2 % Dry	3.0 % Dry	3.0 % Dry	3.0 % Dry
Peak Converted Wet Density (t/m ³) :	2.12	2.12	2.11	2.13
Hilf Density Ratio (%) :	101.5	99.0	99.0	98.0
Minimum Specification :	98%	98%	98%	98%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL
Remarks :	-			



Accredited for compliance with ISO/IEC 17025 - Testing.

APPROVED SIGNATORY



Timothy Baker - Senior Soil Technician
NATA Accreditation Number
9811

Document Code RF89-9

Hilf Density Ratio Report

Client :	Better Grow	Report Number:	16834 - 001
Address :	PO Box 945, Windsor, NSW, 2756	Report Date :	19/07/2023
Project Name :	Ravensworth Laydown Pad	Order Number :	
Project Number :	16834	Test Method :	AS1289.5.7.1
Location:	Ravensworth Mine , Singleton	Page 2 of 3	

Sample Number :	23-1727	23-1728	23-1729	23-1730
Test Number :	5	6	7	8
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Date Time - Tested :	28/06/2023 7.59am	28/06/2023 8.11am	28/06/2023 8.17am	28/06/2023 8.24am
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Laydown Pad Top Layer	Laydown Pad Bottom Layer	Laydown Pad Bottom Layer	Laydown Pad Bottom Layer
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	19	19	19
Oversize Wet (%) :	15	19	15	16
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.501	2.490	2.499	2.499
Field Moisture Content (%) :	11.3	7.8	8.2	8.6
Hilf MDR Number :	23-1727	23-1728	23-1729	23-1730
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	78.5	61.0	61.5	62.5
Field Wet Density (t/m ³) :	2.08	2.02	2.08	2.24
Optimum Moisture Content (%) :	14.4	12.8	13.3	13.7
Moisture Variation :	3.1 % Dry	5.0 % Dry	5.1 % Dry	5.0 % Dry
Peak Converted Wet Density (t/m ³) :	2.13	2.06	2.09	2.20
Hilf Density Ratio (%) :	98.0	98.0	100.0	102.0
Minimum Specification :	98%	98%	98%	98%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL	Clayey GRAVEL
Remarks :	-			



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APPROVED SIGNATORY



Timothy Baker - Senior Soil Technician
NATA Accreditation Number
9811

Document Code RF89-9

Hilf Density Ratio Report

Client :	Better Grow	Report Number:	16834 - 001
Address :	PO Box 945, Windsor, NSW, 2756	Report Date :	19/07/2023
Project Name :	Ravensworth Laydown Pad	Order Number :	
Project Number :	16834	Test Method :	AS1289.5.7.1
Location:	Ravensworth Mine , Singleton	Page 3 of 3	

Sample Number :	23-1731	23-1732		
Test Number :	9	10		
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b		
Date Sampled :	28/06/2023	28/06/2023		
Date Time - Tested :	28/06/2023 8.30am	28/06/2023 8.43am		
Material Type :	General Fill	General Fill		
Material Source :	Site Won	Site Won		
Lot Number :				
Sample Location :	Laydown Pad Bottom Layer	Laydown Pad Bottom Layer		
Test Depth (mm) :	300	300		
Layer Depth (mm) :	300	300		
Maximum Size (mm) :	19	19		
Oversize Wet (%) :	14	0		
Oversize Dry (%) :				
Oversize Density (t/m ³) :	2.501			
Field Moisture Content (%) :	8.0	9.2		
Hilf MDR Number :	23-1731	23-1732		
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1		
Compactive Effort :	Standard	Standard		
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1		
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1		
Moisture Ratio (%) :	61.5	64.5		
Field Wet Density (t/m ³) :	2.02	1.86		
Optimum Moisture Content (%) :	13.1	14.2		
Moisture Variation :	5.2 % Dry	5.3 % Dry		
Peak Converted Wet Density (t/m ³) :	2.03	1.86		
Hilf Density Ratio (%) :	99.5	100.0		
Minimum Specification :	98%	98%		
Moisture Specification :	N/A	N/A		
Site Selection :				
Soil Description :	Clayey GRAVEL	Silty CLAY		
Remarks :	-			



Accredited for compliance with ISO/IEC 17025 - Testing.

APPROVED SIGNATORY



Timothy Baker - Senior Soil Technician
NATA Accreditation Number
9811

Document Code RF89-9

Permeability of Soil - Constant Head Method Using a Flexible Wall Permeameter Report			
Client	RCA Australia	Source	Onsite Stockpile Location 1
Address	PO Box175/ 92 Hill Street, Carrington NSW 2294	Sample Description	Silty Sandy GRAVEL
Project	Compaction Control - Ravensworth Laydown pad (16834)	Report No	S89345-TP
Job No	S23407-1	Lab No	S89345
Test Procedure	AS 1289 6.7.3 Determination of permeability of soil-Constant head method using a flexible wall permeameter		
Sampling	Sampled by Client - results apply to the sample as received	Date Sampled	Unknown
Preparation	Prepared in accordance with the test method	Date Tested	5/10/2023
Test Details			
Specimen Type	Remoulded		
Remoulding Details	98% of SMDD at 100% of SOMC		
Tested Portion	-9.5 mm		
Permeant Type	Sydney Tap Water		
Specimen Details			
Percent Retained on 37.5 mm Sieve (%)	0		
Maximum Dry Density (t/m ³)	1.97		
Optimum Moisture Content (%)	9.9		
Test Moisture Content (%)	9.9		
Moisture Ratio (%)	100.0		
Test Dry Density (t/m ³)	1.93		
Density Ratio (%)	98.0		
Specimen Length (mm)	70.3		
Specimen Diameter (mm)	70.1		
Length to Diameter Ratio	1.0		
Test Data			
Confining Pressure (kPa)	550		
Back Pressure (kPa)	500		
Mean Effective Stress (kPa)	50		
Coefficient of Permeability k(20) (m/second)	1E-09		
Notes			
 Accredited for compliance with ISO/IEC 17025 - Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full. Results relate only to the samples tested. NATA Accredited Laboratory Number: 14874		Authorised Signatory:  Chris Lloyd	
		Macquarie Geotechnical 14 Carter St Lidcombe NSW 2141	

Permeability of Soil - Constant Head Method Using a Flexible Wall Permeameter Report			
Client	RCA Australia	Source	Onsite Stockpile Location 2
Address	PO Box175/ 92 Hill Street, Carrington NSW 2294	Sample Description	Sandy Clayey GRAVEL
Project	Compaction Control - Ravensworth Laydown pad (16834)	Report No	S89346-TP
Job No	S23407-1	Lab No	S89346
Test Procedure	AS 1289 6.7.3 Determination of permeability of soil-Constant head method using a flexible wall permeameter		
Sampling	Sampled by Client - results apply to the sample as received	Date Sampled	Unknown
Preparation	Prepared in accordance with the test method	Date Tested	5/10/2023
Test Details			
Specimen Type	Remoulded		
Remoulding Details	98% of SMDD at 100% of SOMC		
Tested Portion	-9.5 mm		
Permeant Type	Sydney Tap Water		
Specimen Details			
Percent Retained on 37.5 mm Sieve (%)	0		
Maximum Dry Density (t/m ³)	1.95		
Optimum Moisture Content (%)	11.1		
Test Moisture Content (%)	11.1		
Moisture Ratio (%)	100.0		
Test Dry Density (t/m ³)	1.91		
Density Ratio (%)	98.0		
Specimen Length (mm)	70.0		
Specimen Diameter (mm)	70.1		
Length to Diameter Ratio	1.0		
Test Data			
Confining Pressure (kPa)	550		
Back Pressure (kPa)	500		
Mean Effective Stress (kPa)	50		
Coefficient of Permeability k(20) (m/second)	5E-10		
Notes			
 Accredited for compliance with ISO/IEC 17025 - Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full. Results relate only to the samples tested. NATA Accredited Laboratory Number: 14874		Authorised Signatory:  Date: 6/10/2023 Chris Lloyd	
		Macquarie Geotechnical 14 Carter St Lidcombe NSW 2141	

Permeability of Soil - Constant Head Method Using a Flexible Wall Permeameter Report			
Client	RCA Australia	Source	Onsite Stockpile Location 3
Address	PO Box175/ 92 Hill Street, Carrington NSW 2294	Sample Description	Sandy Clayey GRAVEL
Project	Compaction Control - Ravensworth Laydown pad (16834)	Report No	S89347-TP
Job No	S23407-1	Lab No	S89347
Test Procedure	AS 1289 6.7.3 Determination of permeability of soil-Constant head method using a flexible wall permeameter		
Sampling	Sampled by Client - results apply to the sample as received	Date Sampled	Unknown
Preparation	Prepared in accordance with the test method	Date Tested	11/10/2023
Test Details			
Specimen Type	Remoulded		
Remoulding Details	98% of SMDD at 100% of SOMC		
Tested Portion	-9.5 mm		
Permeant Type	Sydney Tap Water		
Specimen Details			
Percent Retained on 37.5 mm Sieve (%)	0		
Maximum Dry Density (t/m ³)	1.97		
Optimum Moisture Content (%)	10.0		
Test Moisture Content (%)	10.0		
Moisture Ratio (%)	100.0		
Test Dry Density (t/m ³)	1.93		
Density Ratio (%)	98.0		
Specimen Length (mm)	70.1		
Specimen Diameter (mm)	70.1		
Length to Diameter Ratio	1.0		
Test Data			
Confining Pressure (kPa)	550		
Back Pressure (kPa)	500		
Mean Effective Stress (kPa)	50		
Coefficient of Permeability k(20) (m/second)	1E-09		
Notes			
 Accredited for compliance with ISO/IEC 17025 - Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full. Results relate only to the samples tested. NATA Accredited Laboratory Number: 14874		Authorised Signatory:  Chris Lloyd	
		Macquarie Geotechnical 14 Carter St Lidcombe NSW 2141	

Hilf Density Ratio Report

Client :	Better Grow	Report Number:	16834 - 002
Address :	PO Box 945, Windsor, NSW, 2756	Report Date :	20/09/2023
Project Name :	Ravensworth Laydown Pad	Order Number :	
Project Number :	16834	Test Method :	AS1289.5.7.1
Location:	Ravensworth Mine , Singleton	Page 1 of 2	

Sample Number :	23-2437	23-2438	23-2439	23-2440
Test Number :	11	12	13	14
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b
Date Sampled :	8/09/2023	8/09/2023	8/09/2023	8/09/2023
Date Time - Tested :	8/09/2023 10.30am	8/09/2023 10.37am	8/09/2023 10.45am	8/09/2023 10.53am
Material Type :	General Fill	General Fill	General Fill	General Fill
Material Source :	Site Won	Site Won	Site Won	Site Won
Lot Number :				
Sample Location :	Western Corner of Dam Basin Floor Final Layer	Southern Corner of Dam Basin Floor Final Layer	Southern End of Dam Wall Dam Wall Final Layer	Eastern Corner of Dam Basin Floor Final Layer
Test Depth (mm) :	300	300	300	300
Layer Depth (mm) :	300	300	300	300
Maximum Size (mm) :	19	19	19	19
Oversize Wet (%) :	0	0	0	0
Oversize Dry (%) :				
Oversize Density (t/m ³) :				
Field Moisture Content (%) :	9.1	9.4	9.2	9.1
Hilf MDR Number :	23-2437	23-2438	23-2439	23-2440
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1	AS 1289.5.7.1
Compactive Effort :	Standard	Standard	Standard	Standard
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1	AS 1289.5.8.1
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1	AS 1289.2.1.1
Moisture Ratio (%) :	67.0	65.5	68.5	66.0
Field Wet Density (t/m ³) :	2.03	2.00	1.93	1.96
Optimum Moisture Content (%) :	13.6	14.4	13.5	13.8
Moisture Variation :	4.6 % Dry	5.0 % Dry	4.4 % Dry	4.8 % Dry
Peak Converted Wet Density (t/m ³) :	1.94	1.93	1.93	1.92
Hilf Density Ratio (%) :	105.0	104.0	100.0	102.0
Minimum Specification :	98%	98%	98%	98%
Moisture Specification :	N/A	N/A	N/A	N/A
Site Selection :				
Soil Description :	Sandy Silty CLAY	Sandy Silty CLAY	Sandy Silty CLAY	Sandy Silty CLAY
Remarks :	-			



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APPROVED SIGNATORY



Timothy Baker - Senior Soil Technician
NATA Accreditation Number
9811

Document Code RF89-9

Hilf Density Ratio Report

Client :	Better Grow	Report Number:	16834 - 002
Address :	PO Box 945, Windsor, NSW, 2756	Report Date :	20/09/2023
Project Name :	Ravensworth Laydown Pad	Order Number :	
Project Number :	16834	Test Method :	AS1289.5.7.1
Location:	Ravensworth Mine , Singleton	Page 2 of 2	

Sample Number :	23-2441	23-2442		
Test Number :	15	16		
Sampling Method :	AS 1289.1.2.1-6.4b	AS 1289.1.2.1-6.4b		
Date Sampled :	8/09/2023	8/09/2023		
Date Time - Tested :	8/09/2023 11.07am	8/09/2023 11.22am		
Material Type :	General Fill	General Fill		
Material Source :	Site Won	Site Won		
Lot Number :				
Sample Location :	Eastern End of Dam Wall Dam Wall Final Layer	Northern Corner of Dam Basin Floor Final Layer		
Test Depth (mm) :	300	300		
Layer Depth (mm) :	300	300		
Maximum Size (mm) :	19	19		
Oversize Wet (%) :	0	0		
Oversize Dry (%) :				
Oversize Density (t/m ³) :				
Field Moisture Content (%) :	9.1	9.2		
Hilf MDR Number :	23-2441	23-2442		
Hilf MDR Method :	AS 1289.5.7.1	AS 1289.5.7.1		
Compactive Effort :	Standard	Standard		
Field Density Method :	AS 1289.5.8.1	AS 1289.5.8.1		
Moisture Method :	AS 1289.2.1.1	AS 1289.2.1.1		
Moisture Ratio (%) :	64.0	64.5		
Field Wet Density (t/m ³) :	1.96	2.00		
Optimum Moisture Content (%) :	14.2	14.2		
Moisture Variation :	5.2 % Dry	5.1 % Dry		
Peak Converted Wet Density (t/m ³) :	1.94	1.92		
Hilf Density Ratio (%) :	101.0	104.0		
Minimum Specification :	98%	98%		
Moisture Specification :	N/A	N/A		
Site Selection :				
Soil Description :	Sandy Silty CLAY	Sandy Silty CLAY		
Remarks :	-			



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Timothy Baker - Senior Soil Technician
NATA Accreditation Number
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Document Code RF89-9



FIGURE 4: EXISTING APPROVED OPERATIONS DA 140/2016

LOCATION:	RAVENSWORTH	DATUM: GDA94
JOB NO.:	PR 141357	PROJECTION: MGA Zone 56
PURPOSE: PLANNING		Data Sources: RPS, Client Land and Property 2017
Technician: andrea.stevkova	Date: 9/09/2019	

CLIENT: BETTERGROW

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
Unit 2A, 45 Fitzroy Street, Carrington, NSW, Australia, 2294 PO Box 120, Carrington, NSW, 2294
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