



Ravensworth Composting Facility | State Significant Development | Modification 2

MODIFICATION REPORT

Prepared for Bettergrow Pty Ltd (Bettergrow) | 22 September 2025





Ravensthorpe Composting Facility

STATE SIGNIFICANT DEVELOPMENT | MODIFICATION 2 | MODIFICATION REPORT

Prepared for Bettergrow Pty Ltd (Bettergrow)
22 September 2025

PR426

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Date		22 September 2025

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Certification Page

Submission of a modification report prepared under Part 4 of the NSW *Environmental Planning and Assessment Act 1979*.

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In respect of	Ravensworth Composting Facility, State significant development consent (SSD-9418) – Modification 2	
Applicant name	Bettergrow Pty Ltd	
Responsible person/applicant	Zac Rowlandson	
Responsible person/applicant address	2 Wella Way, Somersby, NSW, 2250	
Proposed development	Modification 2 to Ravensworth Composting Facility State significant development consent (SSD-9418).	
Land to be developed	The site comprises Lot 10 in DP1204457, otherwise known as 74 Lemington Road, Ravensworth.	
Proposed development description	The proposed modification would allow for the receipt and processing of decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, the receipt and blending of Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials, and the installation of a 65,000 litre above ground diesel storage tank.	
Environmental assessment	This modification report addresses the requirements of Section 4.55 of the <i>NSW Environmental Planning & Assessment Act 1979</i> .	
Preparation	This modification report has been prepared by Element Environment Pty Ltd on behalf of Bettergrow Pty Ltd. In preparing the report, Element Environment has relied upon data, designs and plans and other information provided by Bettergrow Pty Ltd and other individuals and organisations referenced herein.	
Signature	 	
Name	Amna Robinson	Neville Hattingh
Date	22 September 2025	22 September 2025

EXECUTIVE SUMMARY

Introduction

Bettergrow Pty Ltd (Bettergrow) is seeking approval to modify development consent SSD-9418 for the Ravensworth Composting Facility (the 'facility') at 74 Lemington Road, Ravensworth, New South Wales (NSW) (the 'site'). 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.

Development consent SSD-9418 was previously modified (SSD-9418-MOD-1) on 6 December 2023 under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow for:

- 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 Environment Protection Authority (EPA), including spent bleaching clay, the organic fraction of street sweepings and plasterboard/gypsum.

This modification report supports an application by Bettergrow to modify consent SSD-9418 under Section 4.55(1A) of the EP&A Act. The proposed modification would be the second modification (Modification 2) to development consent SSD-9418.

Description of site and surrounds

The site is on part of Lot 10 DP1204457 in the Singleton local government area (LGA) in the Upper Hunter Valley region, and covers an area of approximately 57 hectares (ha). Nearby towns and urban centres include Camberwell, approximately 6 kilometres (km) to the south-east, Singleton, approximately 20 km to the south-east, and Muswellbrook, approximately 20 km to the north-west of the site.

The site is owned by AGL Macquarie Pty Ltd (AGL) and is within the Ravensworth Operations open cut mining complex, which comprises surface mining operations, coal processing plants and related infrastructure, and former mine sites that are currently being rehabilitated. The site is located on part of a capped and rehabilitated open cut mining void (Void 3) that has been filled with ash from the Bayswater Power Station.

Land within the site is zoned RU1 (Primary Production) under the Singleton Local Environmental Plan 2013 (Singleton LEP). The land surrounding the site is zoned RU1 (Primary Production) to the north, east, south and west, and SP2 (Infrastructure - Classified Road) and SP2 (Infrastructure - Rail Infrastructure) to the north, east and south-east.

The area surrounding the facility is dominated by coal mining and other heavy industrial activities, including power generation and related activities, and grazing pastures. Key land uses surrounding the site include:

- Bayswater Power Station and Lake Liddell to the north-west;
- Liddell Coal Mine to the north;
- Mt Owen Coal Mine to the north-east;
- Ravensworth Coal Mine to the west;
- Glendell Coal Mine, Ashton Coal Mine and Integra Coal Mine (production ceased in 2024) to the south-east;
- Loop Organics composting facility to the south;
- New England Highway to the east; and

- Main Northern Railway to the east.

Access to the facility is provided via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site.

The nearest sensitive receivers (private rural residential properties) for the facility are at Camberwell village, approximately 6 km away.

Modification overview

Modification 2 would allow:

- 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 to reduce fuel deliveries to the site.

The existing operations at the facility would remain virtually unchanged under the proposed transition to decontaminated and pasteurised FOGO and/or food recovered material. The infrastructure, material flow, composting technique, monitoring procedures and protocol and management practices would be consistent with the current operations.

No changes are required to the existing throughput of the facility, development footprint, site infrastructure, plant, equipment, vehicle movements, workforce or operating hours under this modification.

Impact assessment

The key potential environmental impact associated with the proposed modification relates to air quality (specifically odour emissions) and has been assessed via a detailed assessment by technical specialists. Other aspects are expected to be minimal, and have been assessed via a standard assessment.

Air quality

The main sources of odorous emissions from the project are the composting processing and blending area and leachate control dam. There is also the potential for cumulative odour impacts with the Loop Organics composting facility approximately 2 km south of the site.

Odour emission rates from the open air composting windrows and leachate dam are influenced by a number of factors, including the physical and chemical characteristics of the raw materials, microbiological activity, operational practices, environmental conditions and the use of additives. Specifically, high temperatures, excessive moisture and less frequent turning of the windrows are key contributors to unpleasant odours.

Dispersion modelling of the potential odour emissions during operation of the project indicates that odour levels, including cumulative odour levels in combination with the Loop Organics composting facility, would be well below the most stringent EPA impact assessment criteria at the nearest sensitive receivers in Camberwell. The project would result in a slight increase in odour levels close to the site, however, changes in odour levels at sensitive receivers in Camberwell are predicted to remain negligible due to their distance from the site.

These results are based on the conservative assumption that the entire processing pads area would act as an odour source and fresh material would be received and processed on-site. In practice, some of the processing pads area is used for vehicle access and spacing between

windrow piles. In addition, decontaminated and pasteurised FOGO and/or food recovered material is more likely to arrive on-site more than 24 hours after it was removed from the pasteurisation tunnels, with odour levels significantly reduced to existing odour levels on-site. Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

Existing mitigation or management measures related to odour emissions would continue to be implemented to minimise odour emissions from the project.

Justification and conclusion

The proposed modification has been assessed in accordance with the requirements of the EP&A Act and has been shown to be consistent with the relevant local, State and Commonwealth government planning instruments and policies, including the National Waste Policy: Less Waste, More Resources (Commonwealth of Australia, 2018), NSW Circular Economy Policy Statement (EPA, 2019) and NSW Waste and Sustainable Materials Strategy 2041 Stage 1:2021–2027 (NSW Department of Planning, Industry and Environment, 2021a).

The environmental impacts of the proposed modification have been assessed and found to be minimal, subject to the implementation of the existing mitigation and management measures.

The development (as modified) would provide critical waste management infrastructure to service the existing and future waste management needs of the Hunter region. The development would also assist the NSW Government in achieving its targets to halve the amount of organic waste sent to landfill and have an 80 per cent (%) average recovery rate from all waste streams by 2030.

The modification would be confined to already disturbed and operational areas of the site and would not involve extension of the development footprint or disturbance to native vegetation. Overall, the development, as proposed to be modified, would have significant environmental, social and economic benefits that far outweigh any residual environmental impacts.

The proposed modification is, therefore, considered to be justified and in the public interest and appropriate for approval under Section 4.55(1A) of the EP&A Act.

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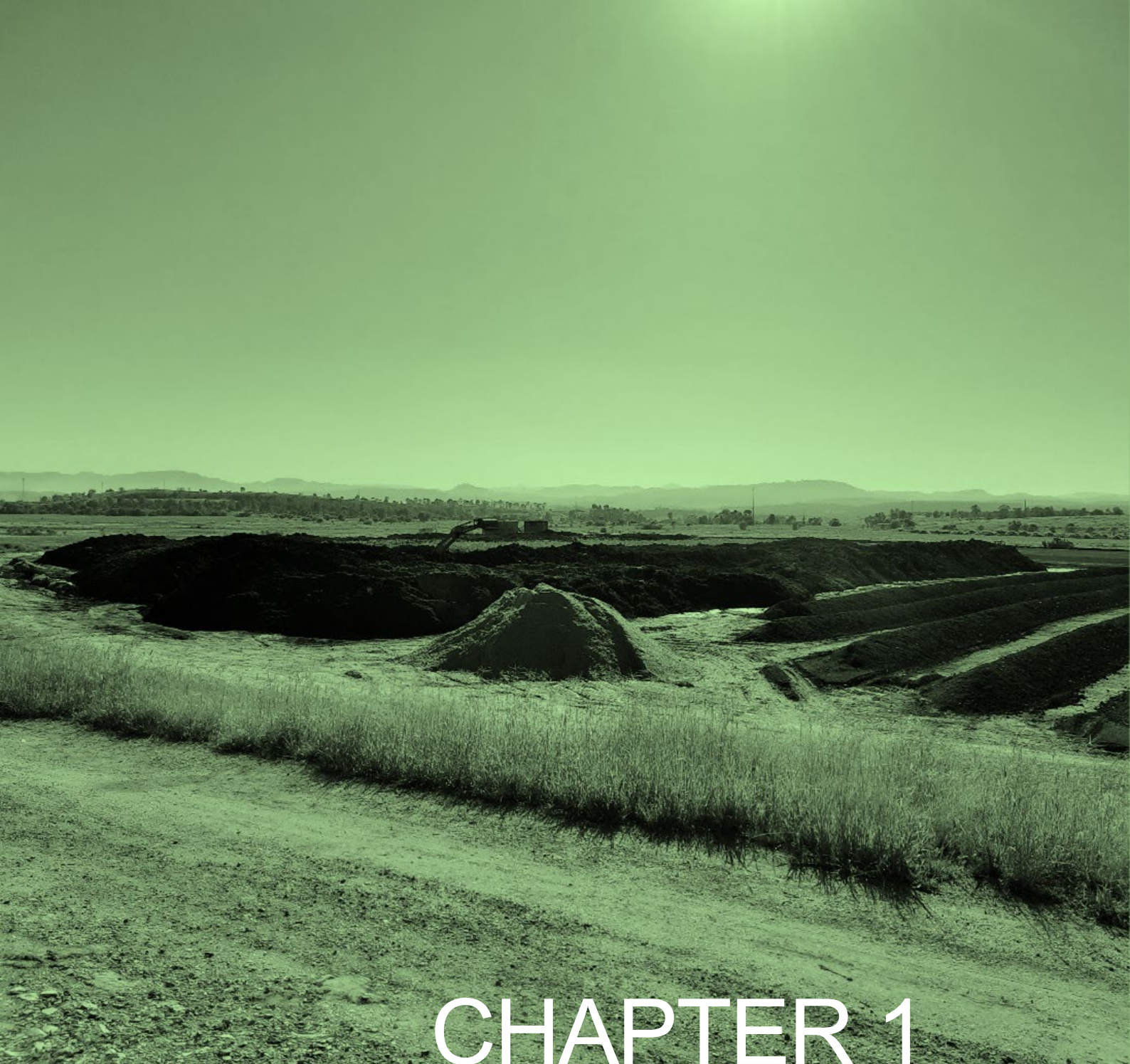
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ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Definition
AEP	Annual Exceedance Probability
AGL	AGL Macquarie Pty Ltd
AHIMS	Aboriginal Heritage Information Management System
am	Ante meridiem: before noon
ARI	Annual Recurrence Interval
AS	Australian Standard
BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BC SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
Bettergrow	Bettergrow Pty Ltd
BoM	Bureau of Meteorology
CCTV	Closed-circuit television
CLM Act	<i>NSW Contaminated Land Management Act 1997</i>
CO ₂ -e	Carbon dioxide-equivalent emissions
CSSI	Critical State significant infrastructure
DA	Development Application
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DECC	NSW Department of Environment and Climate Change
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
DPiE	NSW Department of Planning, Industry and Environment
Element	Element Environment Pty Ltd
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2021
EPA	NSW Environment Protection Authority
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental planning instrument
EPL	Environment protection licence
ESD	Ecologically sustainable development
FM Act	<i>NSW Fisheries Management Act 1994</i>
FOGO	Food Organics and Garden Organics
g/m ² /month	Grams per square meter per month
GDE	Groundwater Dependent Ecosystem
GJ/k	Gigajoule per kilolitre
ha	hectares
Heritage Act	<i>NSW Heritage Act 1977</i>
ICNG	Interim Construction Noise Guideline
ISO	International Organization for Standardization
kg CO ₂ -e/GJ	Kilograms of carbon dioxide equivalent per gigajoule
kL	Kilolitre
km	Kilometre

Abbreviation/Acronym	Definition
km ²	Square kilometre
km/h	Kilometres per hour
L	Litre
LEP	Local environmental plan
LGA	Local government area
m	Metre
m ²	Square metre
m ³	Cubic metre
m AHD	Metres Australian Height Datum
mbgl	Metres below ground level
ML	Megalitre
mm	Millimetre
MNES	Matter of national environmental significance
Mt	Million tonnes
mtpa	Million tonnes per annum
NPI	Noise Policy for Industry
NPW Act	<i>NSW National Parks & Wildlife Act 1974</i>
NSW	New South Wales
NSW DECCW	NSW Department of Environment, Climate Change and Water
OEMP	Operational Environmental Management Plan
OU	Odour Unit
OUV/m ² /s	Odour unit volume per square metres per second
PCT	Plant Community Type
PHA	Preliminary hazard analysis
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
pm	Post meridiem: after noon
PM _{2.5}	Particulate matter less than or equal to 2.5 micrometres in aerodynamic diameter
PM ₁₀	Particulate matter less than or equal to 10 micrometres in aerodynamic diameter
POEO Act	<i>NSW Protection of Environment Operations Act 1997</i>
Pty Ltd	Proprietary Limited
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
RFS	NSW Rural Fire Service
RNP	NSW Road Noise Policy
Roads Act	<i>NSW Roads Act 1993</i>
Rural Fires Act	<i>NSW Rural Fires Act 1997</i>
SEARs	Secretary's environmental assessment requirements
SEPP	State environmental planning policy
SOER	Specific odour emission rate
SSD	State significant development
SSI	State significant infrastructure
t	Tonne
t/m ³	Tonnes per cubic metre
TEC	Threatened ecological community
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021

Abbreviation/Acronym	Definition
tpa	Tonnes per annum
tpd	Tonnes per day
TSP	Total suspended particulates
µg/m ³	Micrograms per cubic metre
VENM	Virgin Excavated Natural Material
WARR Act	<i>NSW Waste Avoidance and Resource Recovery Act 2001</i>
WM Act	<i>NSW Water Management Act 2000</i>



CHAPTER 1

INTRODUCTION

1 INTRODUCTION

1.1 Overview

This modification report has been prepared by Element Environment Proprietary (Pty) Limited (Ltd) (Element) on behalf of Bettergrow Pty Ltd (Bettergrow) for submission to the New South Wales (NSW) Department of Planning, Housing and Infrastructure (DPHI) to accompany an application to modify the State significant development (SSD) consent SSD-9418 for the Ravensworth Composting Facility (the 'facility').

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. It is located at 74 Lemington Road, Ravensworth (the 'site'), on part of Lot 10 DP1204457, in the Singleton local government area (LGA). The site covers an area of approximately 57 hectares (ha). The regional and local context of the site is shown in Figure 1.1 and Figure 1.2, respectively.

Development consent SSD-9418 provided for the expansion of the existing facility to process up to 200,000 tonnes per annum (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 was previously modified (SSD-9418-MOD-1) under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 6 December 2023 to allow for:

- 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 Environment Protection Authority (EPA), including spent bleaching clay, the organic fraction of street sweepings and plasterboard/gypsum.

Bettergrow is now seeking approval to modify consent SSD-9418 pursuant to Section 4.55(1A) of the EP&A Act to allow:

- 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 to reduce fuel deliveries to the site.

No changes are required to the existing throughput of the facility, development footprint, site infrastructure, plant, equipment, vehicle movements, workforce or operating hours under this modification application.

The proposed modification will be the second modification (Modification 2) to development consent SSD-9418. It was confirmed with DPHI that the approval pathway and scope of environmental impact assessment as outlined in the Scoping Letter (Element Environment, 2025) is appropriate for the modification and that Secretary's environmental assessment requirements (SEARs) are not required for the modification.

This modification report has been prepared to address the requirements of Section 4.55(3) of the EP&A Act. The report has been prepared in accordance with the Department's *State significant development guidelines – preparing a modification report* (NSW Department of Planning and Environment (DPE), 2022a).

Figure 1.1
Regional context

Ravensworth Composting Facility SSD Modification 2
Environmental Impact Statement

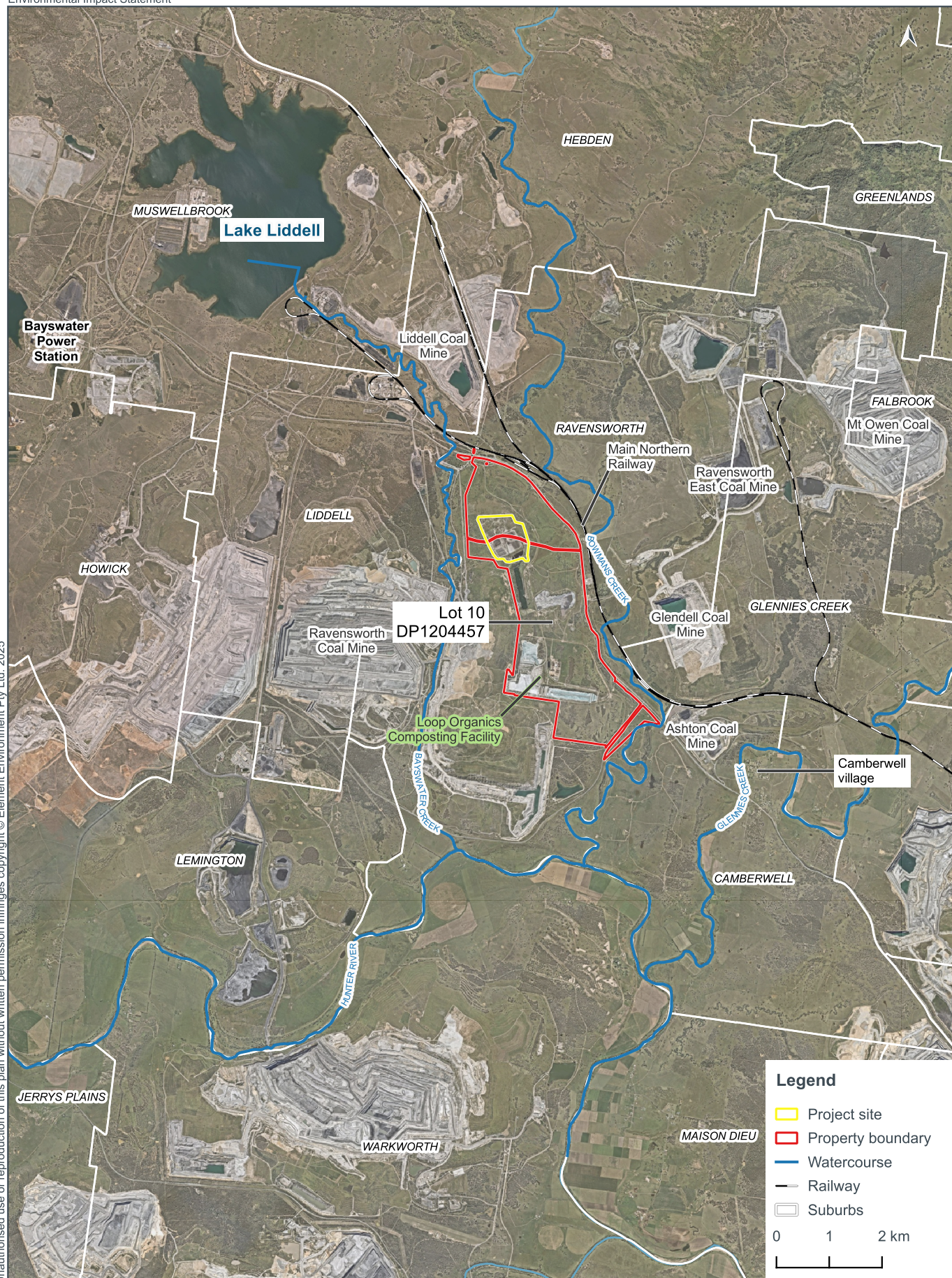
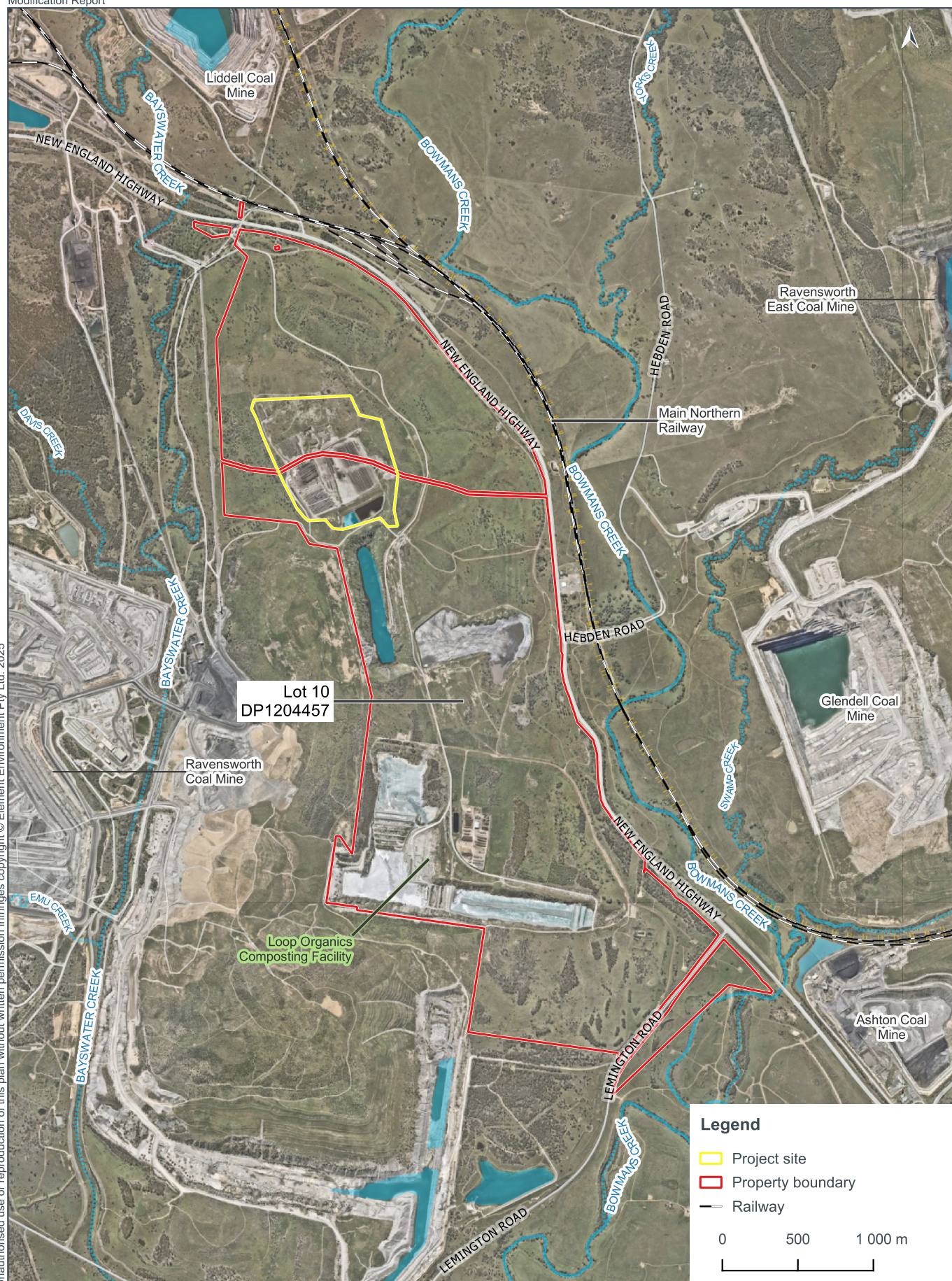


Figure 1.2
Local context

Ravensworth Composting Facility SSD Modification 2
Modification Report



1.2 The applicant

Bettergrow is the applicant for the modification application. The applicant's details are provided in Table 1.1.

Table 1.1 Applicant details

Item	Detail
Full name	Bettergrow Pty Ltd
Project contact	Zac Rowlandson, Chief Executive Officer
Postal address	2 Wella Way, Somersby, NSW, 2250
ABN	71 062 888 117

Bettergrow is a wholly owned subsidiary of the Borg Group. The company is a recognised pioneer in the organic recovery sector with operations spanning across various sites throughout NSW. It was first established in 1978, and over the course of the past 40 years has been at the forefront of an array of organic industries, including drilling slurries, biosolids, garden organics, food and grease trap waste.

The company is an Australian leader in the recovery and re-manufacture of organic residuals, waste and by-products to provide quality composts, fertilisers and bespoke soil rehabilitation products for beneficial use across a range of markets. It works with governments, communities and multi-national companies to progress the circular economy and preserve natural resources for a sustainable future.

Bettergrow also operates recycling facilities at:

- Bathurst, NSW – liquid wastes (existing operations), and forestry residues, biosolids, food organics, and garden organics; and
- Gulgong, NSW – farming enterprises.

1.3 The existing approved development

1.3.1 Related development

There is an extensive history of surface and underground coal mining operations in the Ravensworth area, with mining commencing as early as the 1950s at Liddell Colliery. Mining operations at the former Ravensworth South and Ravensworth No. 2 open cut mines, located immediately south of the facility, commenced in the early 1970's. Operations ceased at the Ravensworth No. 2 mine in 1993 and at the Ravensworth South mine in 2000.

The decommissioned Ravensworth No. 2 mine comprises five voids (referred to as Voids 1, 2, 3, 4 and 5) which are currently being rehabilitated by AGL Macquarie Pty Ltd (AGL), as the current owner of the mine. The voids are being filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated. Voids 1, 2 and 3 have been rehabilitated. The site is located on top of the former Void 3.

Void 4 is located approximately 100 metres (m) south of the leachate control dam on the site and is used as a water storage dam. It provides additional capacity for surface water runoff from the site during significant rainfall events.

The rehabilitation of Void 5 commenced in 2014 and is expected to be completed by 2032. Fly ash is pumped as a thick slurry from the Bayswater Power Station and deposited into Void 5. As a result of this process, water from the fly ash seeps from Void 5 into Void 4 and is pumped from

Void 4 back to the Bayswater Power Station for further re-use. Void 3 also seeps water into Void 4.

Rehabilitation works at Voids 1 to 5 are undertaken in accordance with the following development consents issued for the site in the 1980s and 1990s:

- Development Application (DA) 86/51 for the Ravensworth South mine, granted by the DPE on 16 December 1986;
- DA144/93, granted by Singleton Council (Council) on 8 December 1993 (as modified); and
- DA138/93, granted by Muswellbrook Shire Council on 13 December 1993 (as modified).

These development consents allow the use of composting material as part of the mine rehabilitation process, however, does not explicitly allow for the on-site processing of composting material.

1.3.2 Original development consent

The facility originally commenced operation under a development consent granted by Council on 25 November 2016 (DA140/2016). The application was assessed as integrated development (and not designated development) on the basis that the project was entirely ancillary to the existing rehabilitation works approved as part of the Bayswater Power Station and Ravensworth Operations open cut mining complex. The consent permitted the establishment and operation of on-site composting of 50,000 tpa of a mix of organic material, including garden organics, clean timber, biosolids, hydro excavation and drill slurry, paper pulp, fly ash, lime and manures, to facilitate the rehabilitation of the Ravensworth No. 2 mine and Ravensworth South mine.

On 19 April 2018, Council approved a modification to DA140/2016 under Section 4.55(2) of the EP&A Act to facilitate an increase in organic material received on site to 76,000 tpa, and the transfer of compost products to additional AGL sites, including the areas associated with the Liddell Power Station (which is now decommissioned). On 18 December 2018, Council approved a modification to DA140/2016 under Section 4.55(1A) of the EP&A Act to allow for the sale of compost material from the site to third parties in the region.

An SSD application (SSD-9418) to expand the existing composting facility was approved by the (then) Minister for Planning on 31 August 2022 under Section 4.38 of the EP&A Act to allow for:

- an increase in the receipt and processing of up to 200,000 tpa of recovered organic material;
- transfer of composted material to other AGL sites (e.g. Liddell Ash Dam and Baywater Power Station) for use in rehabilitation;
- expansion of the compost processing and blending areas pad;
- extension of the surface water drainage works to cover the additional pad area;
- expansion of the leachate control dam;
- installation of the following:
 - a single lane weighbridge (approximately 27.5 m long);
 - a dedicated trailer wash bay;
 - two 50,000 L recycled drill water storage tanks; and
 - a machinery shelter for the storage of tools and machinery for servicing.

1.3.3 Previous modification

The EPA advised Bettergrow on 15 May 2023 that a weighbridge is not required for premises that only have 'composting' as a scheduled activity listed on their Environment Protection Licence (EPL), as long as alternative methods to record waste received onto their premises are implemented.

A modification to SSD-9418 (SSD-9418-MOD-1) (hereafter referred to as 'Modification 1') under Section 4.55(1A) of the EP&A Act was approved on 6 December 2023 to allow for:

- 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, including spent bleaching clay, the organic fraction of street sweepings and plasterboard/gypsum.

Modification 1 allows greater flexibility to receive materials that have a beneficial re-use rather than send these materials direct to landfill.

Raw materials entering the site are weighed at the location of loading, either by loader scales or a weighbridge, prior to being delivered. No loads are accepted at the site without a weighbridge docket. Drivers with incoming material loads are required to supply details of the waste (including quantity, type, waste stream), vehicle, driver and supplier of the waste on their weighbridge docket.

Before the finished compost leaves the facility, it is weighed by scales fitted to front end loaders used on-site or by truck scales. All weighbridge/weigh dockets are maintained and recorded by Bettergrow. Outgoing dockets contain details of the waste (including quantity, type, waste stream), vehicle, driver and destination of the waste.

1.3.4 Environment Protection Licence

The site has been operating under EPL 7654 issued by the EPA since September 2000.

The EPL was last varied on 12 August 2024 (Notice number 1639204) to remove the Street Sweeping Composting Trial under Section E3 of the EPL and add the following wastes in Condition L3.1:

- the Downer organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time);
- the ReDirect organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); and
- paunch (as defined in 'The Bettergrow Compost Order 2023' or as in force from time to time).

1.3.5 Existing operation

Table 1.2 provides a summary of the existing site infrastructure and composting operation.

Table 1.2 Existing facility infrastructure and operation

Operational aspect	Detail
Existing site infrastructure	The following ancillary infrastructure support the operation of the facility, as shown in Figure 1.3: ▪ site office and staff amenities; ▪ site access and parking; ▪ mobile equipment, including green waste shredder, trommel/stardeck screen, excavator, front end loaders, windrow turners, water carts; ▪ workshop; ▪ load inspection bay; ▪ processing pads; ▪ truck wash; ▪ dirty water pit; ▪ surface water drainage infrastructure, including: - diversion bunds - drainage channels and spillway - 50.2 megalitre (ML) leachate control dam, consisting of a western and eastern dam

Operational aspect	Detail
	- 2 ML sediment ('lower') basin; ▪ water storage tanks, including: - 300,000 litre (L) AGL water storage tank - two 1,000 L potable water storage tanks; and ▪ 5,000 L diesel storage tank. The processing pads consist of compacted earth to achieve low permeability (1×10^{-9} metres per second (m/s)) to impede leachate generated from the composting process percolating through the capping layer into the subsoil and potentially groundwater. This ensures leachate is directed via a series of rock drains/channels to the leachate control dam.
Compost feedstock	Schedule 2, Condition A6 of development consent SSD-9418-MOD-1 permits the facility to process up to 200,000 tpa of organic material, inclusive of: a) urban wood residues for composting (as defined in 'The compost order 2016'); b) paper crumble for composting (defined as General or Specific Exempted Waste); c) wastewater from Bayswater Power Station; d) drilling mud process water (as defined in 'The Treated Drill Mud Order 2014'); e) natural organic fibrous composting material (as defined in Schedule 1 of the NSW <i>Protection of the Environment Operations Act 1997</i> (POEO Act)); f) biosolids (as defined in 'The Biosolids Order 2014'); g) garden waste (as defined in Schedule 1 of the POEO Act); h) animal waste (as defined in Schedule 1 of the POEO Act); and i) materials for the purpose of composting that are subject to a general or site specific resource recovery order and exemption as issued by the EPA from time to time. Schedule 2, Condition A7 of the development consent specifies that the facility is not permitted to receive or process food organic waste. Condition L3.1 of EPL 7654 permits the facility to receive up to 200,000 tpa of the following types of general solid waste (non-putrescible) and liquid waste: ▪ General solid waste (non-putrescible): - paunch (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - reDirect organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); - Downer organic fraction of street sweepings (as defined in 'The Bettergrow street sweepings compost order 2024' or as in force from time to time); - recovered plasterboard (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - spent bleaching clay (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - paper crumble (as defined in 'The Bettergrow compost order 2023' or as in force from time to time); - urban wood residues (as defined in 'The compost order 2016'); - natural organic fibrous material (as defined in Schedule 1 of the POEO Act); - coal ash which meets the conditions of 'The coal ash order 2014'; - biosolids categorised as unrestricted use, or restricted use 1, 2 or 3 in accordance with criteria in the Biosolids Guidelines (EPA, 2000). Contamination and stabilisation grades A, B and C only. Biosolids classified as 'Not Suitable For Use' (Grade E) are not to be accepted at the premises; and - garden waste (as defined in Schedule 1 of the POEO Act). ▪ Liquid waste: - Bayswater Mine Water (as defined in 'The Bettergrow compost order 2023' or as in force from time to time). The facility receives and processes organic recovered material from the following sources: ▪ kerbside green waste collection from residential households (garden organics only);

Operational aspect	Detail
	▪ Hunter Water and Sydney Water (biosolids); ▪ sawmills (wood residues); ▪ paper processors (paper crumble); ▪ infrastructure projects (drill muds); ▪ mines (raw water); ▪ food processors (organic fibrous material); and ▪ waste resource recovery facilities.
Composting process	The current operations involve the composting and blending of organic material, which is then used to create a final compost layer for rehabilitated land or agricultural uses. This involves the following processes: <i>Receival of organic material</i> ▪ Vehicles enter the site via the internal access road off Lemington Road. ▪ Drivers provide their weighbridge docket to the site coordinator or delegate who checks that the docket description is the same as what is in the load. In the unlikely event a load arrives at the facility without a weighbridge docket, the driver is instructed to attend a public weighbridge before returning to site and unloading. All delivery dockets are retained for record keeping. ▪ Staff inspect the trucks visually for any obvious contamination prior to tipping. ▪ Where contaminants are identified, the load is rejected and instructed to leave the site without unloading. Any rejected loads are recorded in the Rejected Loads Register, including truck and supply company details. The supplier is contacted and advised of the contaminated load. ▪ Where no contaminants are identified, the truck is instructed to proceed to the correct tipping area on the load receival hardstand area. <i>Inspection and unloading</i> ▪ Loads are tipped onto the hardstand pad and visually inspected by a staff member who has been appropriately trained in identifying any hazardous or non-conforming recovered material including physical contaminants and asbestos. ▪ If contaminants are found, the truck is reloaded and returned to the supplier. ▪ The supplier is contacted and advised of the contaminated load and the details of the rejected load are entered into the Rejected Loads Register. <i>Processing</i> ▪ Each material type is stockpiled in the designated tipping area until a sufficient volume of material has accumulated. It is then blended as instructed by the biosolids manager and placed into the windrows for pasteurisation and turning. ▪ Any contamination identified during the blending process is appropriately removed and isolated in a covered hook-lift bin. The hook-lift bin, when required, is transported to a suitably licensed landfill facility for disposal. ▪ Windrows are frequently turned with either a front-end loader, or a specialised windrow turner to ensure they remain aerobic and that pasteurisation of all products is achieved. Windrows may initially be covered with previously composted material to act as an odour filter, or an odour neutralising agent, such as BioActive, may be used to aid the process. On windy days, water is sprayed over the compost or biosolids to prevent dust generation during the turning of windrows. ▪ During the composting process, temperature and moisture levels for each windrow are monitored and adjusted as needed. The internal temperature of the windrows reaches a minimum of 55 degrees Celsius (°C) for a minimum of three days and is turned at least three times to create a stabilised product in accordance with <i>AS 4454-2012 Composts, soil conditioners and mulches</i> (Standards Australia, 2012) and the <i>Composting Management Plan, Including Management for CA-05 Biosecure Treatment of Phylloxera Host Plant Material for Recycling</i> (Composting Management Plan) (Bettergrow, 2025a). ▪ 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. ▪ Compost windrows are constructed so as to run parallel with the stormwater flows, in order to minimise the transport of leachate and gross solids to the leachate dams.

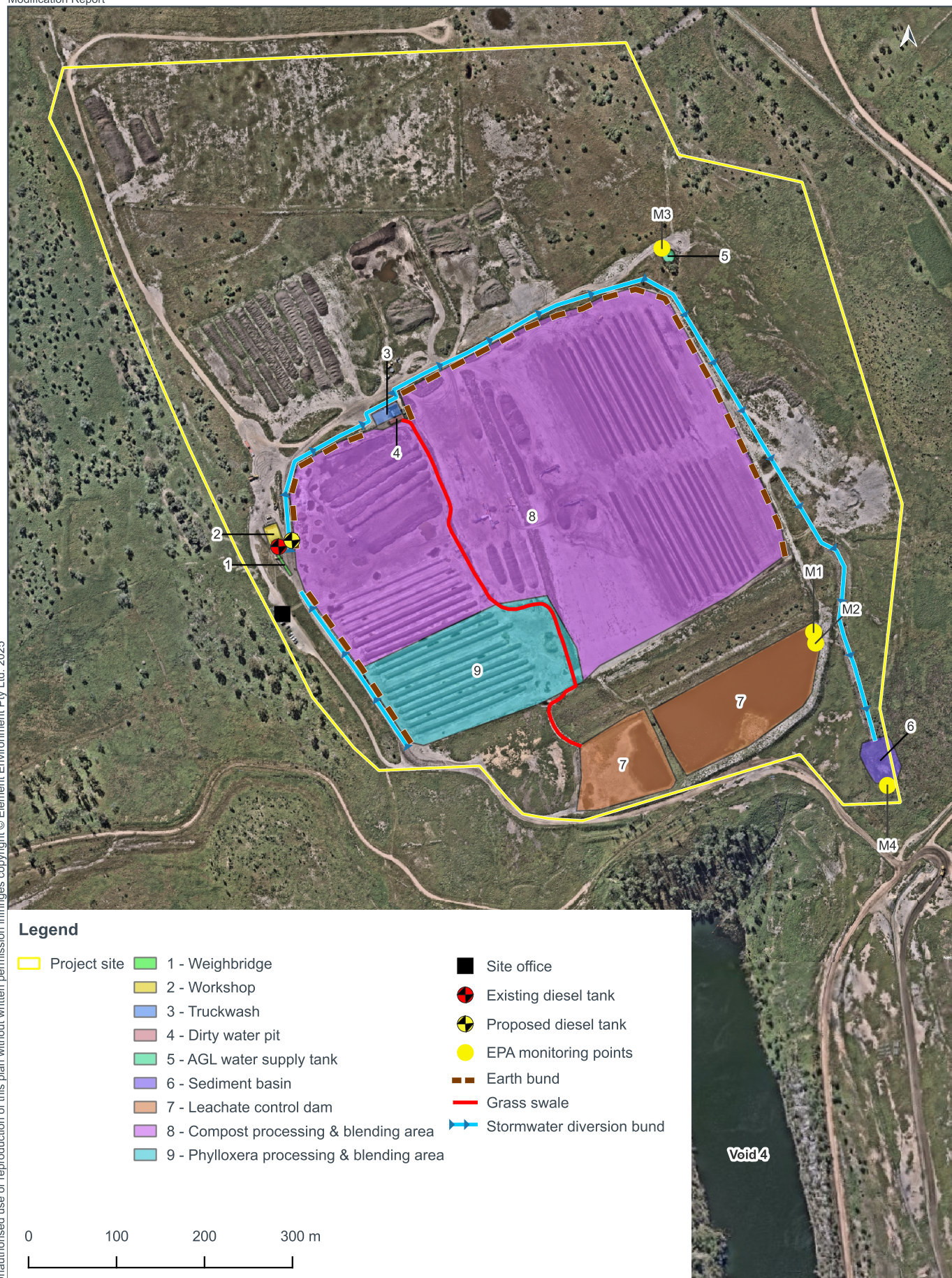
Operational aspect	Detail
	- Maturation occurs after approximately eight weeks. Compost must be dried to a moisture content of approximately 35 per cent (%) weight per weight (w/w) or less. The finished compost material is stored (and may be screened and blended with other ingredients) in a designated area to create the required final product. <i>Storage</i> - The final compost material is stockpiled in a designated area. The compost material is sampled and analysed at National Association of Testing Authorities (NATA) accredited laboratories to confirm the outputs produced meet the requirements set in the EPA's <i>Environmental Guidelines – Use and disposal of biosolids products</i> (EPA, 2000). The material is not released from site until the laboratory results are received to ensure the correct land application method is applied. - The final composted material is then loaded onto trucks using a front-end loader and transported to the relevant area for rehabilitation use or sold to third parties. <i>Loading and transfer of material off-site</i> - Vehicles transporting products off-site are loaded with the composted material. - Weights of material being transported off-site are recorded from the loader bucket electronic scales or truck electronic scales, together with other details, including material type, waste stream (where the material is a rejected load), date and time load is transported from the facility, vehicle registration number, drivers signature, contact details for receiver site, and EPL(s) for receiver sites, if applicable. - Vehicles are washed at the wash bay before exiting the site. - Vehicles exit via the internal access road into Lemington Road that connects to the New England Highway. - All loads that leave the site are tracked to the relevant customer or mine. - Composted material is received at the receiver site under the 'The Bettergrow compost exemption 2023' (or as in force from time to time) issued by the EPA. - All delivery dockets are retained for record keeping.
Stormwater management	Diversion bunds are in place around the processing pads to exclude minor upstream catchment flows from entering the processing pads. Diversion bunds along the western side of the site direct stormwater to surrounding land, and a diversion wall and channel direct stormwater from the eastern side of the site into the sediment ('lower') basin in the south-eastern corner of the site (refer to Figure 1.3). Rock structures and rip rap are provided to slow the velocity of stormwater flowing towards the lower 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 over 40 m of available airspace above its normal operating level (i.e. over 500 ML). There is no surface water discharge from the site into local drainage lines or watercourses. Any rainfall captured by the processing pads is considered to be leachate and managed as described below.
Leachate management	Leachate generated from organic material within the processing pads enters the leachate control dam via a shotcrete lined channel at the north-western corner of the dam. A concrete sedimentation fore-bay restricts gross solids entering the leachate control dam. The leachate control dam has enough storage capacity (50.2 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 lower basin. The facility operates within a closed water cycle, as the composting process is a net user of water. Water from the leachate control dam and Void 4 is used in the composting windrows to ensure optimal moisture conditions are maintained throughout the composting cycle. There is no direct discharge of leachate to surrounding drainage lines or watercourses.
Wastewater management	Wastewater from the truck wash is captured in the dirty water pit and channelled via swale drains to the leachate control dam.

Operational aspect	Detail
Utilities and services	
Electricity	No site infrastructure is connected to mains power. Electricity for the existing site office and staff amenities is provided by a mobile generator.
Water	The facility does not source any water from natural water bodies, watercourses or groundwater bores. There is no water supply (potable or raw) from a mains system available at the site. Water from the leachate control dam and Void 4 is used in the composting windrows to ensure optimal moisture conditions are maintained throughout the composting cycle. Water from Void 4 is also used for dust suppression and truck washing, and is accessed via an existing storage tank located in the north-eastern corner of the site (refer to Figure 1.3). This tank is filled remotely from the former Void 4 by operators at the Bayswater Power Station. There are no other demands on water from Void 4. Approximately 60.5 ML of water per year is used by the composting operation, including 57.1 kilolitres (kL) per day for dust suppression, 164.3 kL per day for compost moisture conditioning and 2.5 ML per year for truck washdown. Potable water for staff amenities is trucked to site and stored in two 1,000 L tanks.
Sewerage	There is no sewerage main available at the site. All liquid waste generated from staff amenities is removed by a licensed waste contractor and transported to a licensed facility when required.
Telecommunications	There are no fixed line telecommunication services available at the site. Staff use Ultra High Frequency (UHF) 2-way radios to communicate with each other on-site. Fourth-generation (4G) mobile phone services are available at the site from all the major service providers, however mobile phones are only allowed to be used in the office and staff amenities building.
Site access, traffic and parking	The site is accessed via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site (refer to Figure 1.2). There is a single designated entry/exit driveway along the southern boundary of the site and internal access roads through the site. The internal access road off Lemington Road is approximately 2 m wide to accommodate incoming and outgoing heavy vehicle movement. The road surface allows all-weather access, and surface water drainage is installed to divert stormwater away from the roadway onto suitable areas. Up to 54 heavy vehicles and 19 light vehicles access the site per day, generating up to 146 vehicle movements per day (73 movements in-bound and 73 movements outbound). A parking area for staff vehicles is provided adjacent to the site office. Trucks entering the site are unloaded directly on the pad area. Parking for trucks is available adjacent to the processing pads if trucks are required onsite for an extended period.
Hazardous substances and dangerous goods	Hazardous substances and dangerous goods are stored and used at the facility, including fuels, oils, lubricants and cleaning solvents. Diesel is stored in a 5,000 L above ground portable fuel tank on a bunded hardstand area next to the workshop. The facility consumes an estimated 168 kilolitres (kL) of diesel per year to operate plant and equipment on site and run a small generator that generates electricity for the site office. A tanker delivers diesel as required to the on-site storage tank. Various other chemical substances are consumed in minor quantities and stored within secure and/or bunded areas within the workshop and office building. Vehicles and machinery are refuelled off-site or at the diesel tank using a drip tray. Other maintenance of machinery on site takes place within designated bunded areas or hardstand areas using drip trays.
Site security	A security gate, fencing, closed-circuit television (CCTV) camera, and manned gate control building are located at the entrance to the internal access road off Lemington Road to control access to the site. All light and heavy vehicles require security clearance to access the site.
Hours of operation	The facility operates from Monday to Saturday from 6:00 am to 6:00 pm. No work is undertaken on Sundays or public holidays.

Operational aspect	Detail
	The current consent allows works outside of these hours in the following circumstances: ▪ works that are inaudible at the nearest sensitive receivers; ▪ for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or ▪ where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.
Workforce	Ten full time administrative and operational staff are employed at the facility.

Figure 1.3
Site layout

Ravensworth Composting Facility SSD Modification 2
Modification Report



1.4 Related modification application

Bettergrow is also in the process of applying to the DPHI to modify development consent SSD-9418 under Section 4.55(2) of the EP&A Act (Modification 3) to increase throughput at the facility.

Modification 3 would allow:

- a 50,000 tpa increase in the processing capacity of the facility, from 200,000 to 250,000 tpa;
- the receipt and processing of raw FOGO recovered material at the facility;
- the employment of three additional staff;
- installation of a site weighbridge; and
- up to 5 additional light vehicles and 14 additional heavy vehicles to access the site per day.

Modification 3 does not require an extension to the existing development footprint, clearing of native vegetation, bulk earthworks, or any changes to plant, equipment or operating hours.

Bettergrow submitted the Scoping Report for Modification 3 to the DPHI on 27 May 2025. Variation of the EPL to allow for the proposed modification will be sought in consultation with the EPA, subject to the approval of the modification application.

1.5 Environmental performance

Environmental audit

An independent environmental audit was undertaken for the facility in August and September 2024 for the period 24 January 2023 to 21 August 2024 (KPMG, 2024). The audit included a qualitative assessment of the predicted impacts associated with the development as described in the following documents, against the actual impacts observed by the auditor during the audit process:

- Greenspot Hunter Valley: EIS for 200,000 tpa Nutrient Recycling Facility – Ravensworth, NSW – SSD 9418 (SSD EIS) (RPS Australia East Pty Ltd (RPS), 2019a);
- Greenspot Hunter Valley Nutrient Recycling Facility Response to Submissions – SSD 9418 20 June 2022 (Submissions Report) (Space Urban, 2022a);
- Greenspot Hunter Valley Nutrient Recycling Facility Amended Report – 28 June 2022 (Space Urban, 2022b); and
- Statement of Environmental Effects – Ravensworth Nutrient Recycling Facility Modification of SSD9418 – MOD 1 (Modification 1 SEE) (Space Urban, 2023).

The audit demonstrated a strong environmental performance during the audit period. Three non-compliances were identified during the audit, however they were considered administrative in nature and have not been associated with any actual environmental impacts, and therefore no actions were assigned to them.

The audit report noted:

‘...the Bettergrow site operations and management teams are considered to have demonstrated a strong awareness of their environmental obligations, including OEMP requirements and relevant SSD-9418 conditions of approval, with the following key strengths noted:

- The site presented well during the inspection with no evidence of dust, sediments or other pollutants observed to be escaping the boundaries. Only minor issues were identified during the site inspection.
- The site induction contained a comprehensive summary of environmental requirements, including the conditions of approval and management plans.

- 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.
- Dust suppression was well managed via use of a dedicated water cart and a network of sprinklers to keep the compost windrows moist.
- Bettergrow management utilised an internal compliance tracking register to compile evidence against each condition of approval, making it readily available to the auditor.
- Bettergrow utilised a platform 'Safe by Choice' to store plant and equipment and employee competency information.'

Two minor issues were identified, which do not constitute non-compliances or opportunity for improvements:

- Moderate amounts of shredded plastic litter had collected within the swale drains on site. Routine housekeeping and maintenance activities are required on an ongoing basis to prevent litter from building up in swale drains. This was considered by the auditor to be a minor issue and a low risk.
- A moderate odour was observed when downwind of the compost stockpiles. Given the significant distance to the nearest receiver (approximately 6 km from the site), odour was not considered to present a major issue, nor would it meet the definition of an 'offensive odour' within the POEO Act. The auditor noted that the process of composting, whereby the materials are constantly being mixed and aerated is in itself a practical odour management strategy. This was considered by the auditor to be a minor issue and a low risk.

The auditor considered that all current environmental impacts at the time of the audit were less or equal to those anticipated within the relevant documents.

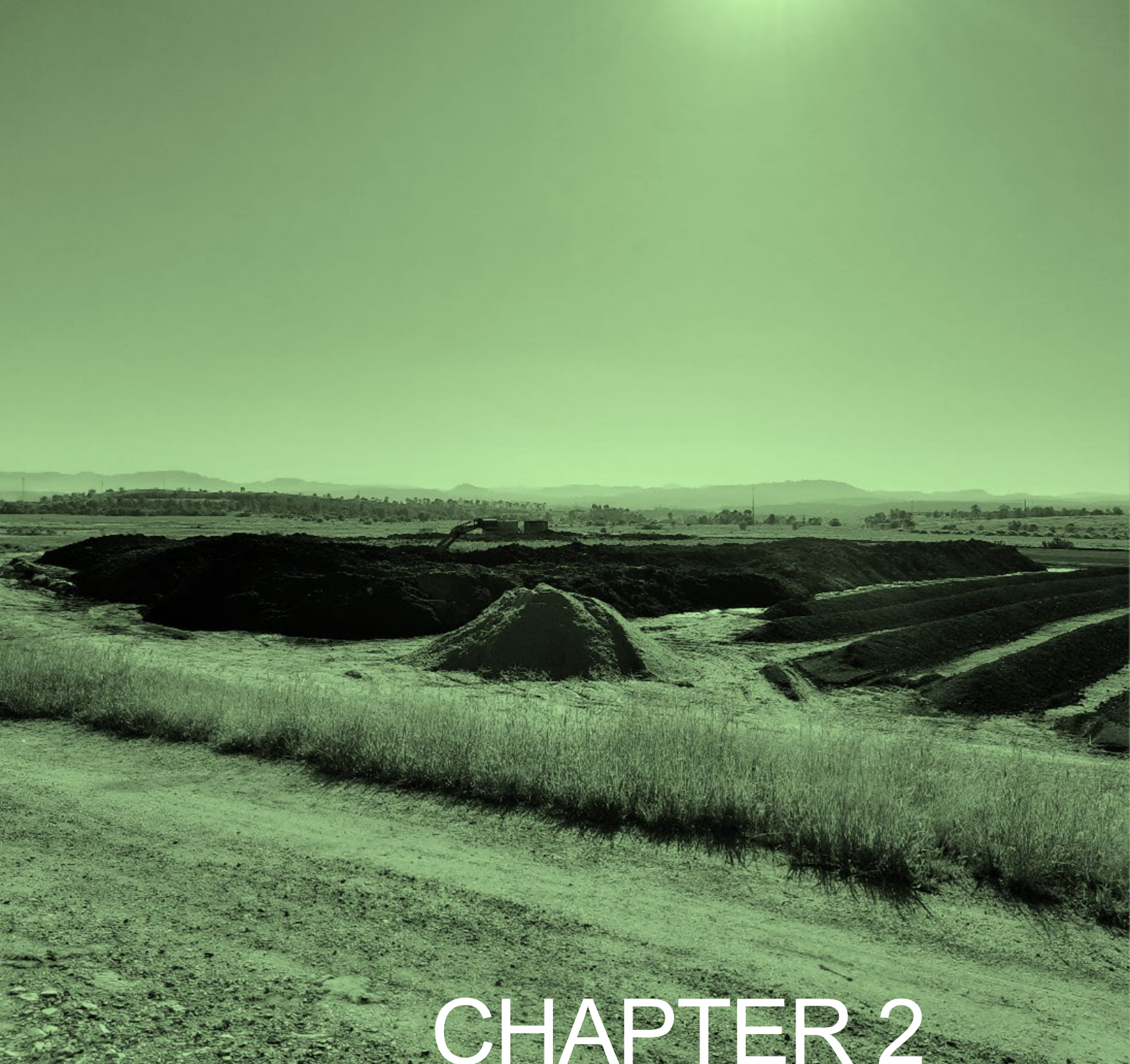
Compliance reporting

The first compliance report for the facility (the only compliance report to date) was published in October 2024 to report monitoring data.

There was nil discharge from the two discharge points (Points 2 and 4) during the reporting period. As data from the other two monitoring (characterisation) points (Points 1 and 3) were restricted to only three monitoring events, a discussion on water quality trends could not be performed yet.

Complaints register

A monthly Complaints Register is maintained for the facility and is available on the Bettergrow website (Bettergrow, 2025b). A review of the register indicates that no complaints have been received or recorded for the facility since January 2023 (when the Complaints Register was launched). This suggests that air emissions from the existing operations are not causing adverse impacts and that existing mitigation and management measures are effective.



CHAPTER 2

STRATEGIC CONTEXT

2 STRATEGIC CONTEXT

2.1 Key features of the site and surrounds

2.1.1 Site location

The site is at 74 Lemington Road, Ravensworth, on part of Lot 10 DP1204457 in the Singleton LGA, in the Upper Hunter Valley region. The site covers an area of approximately 57 ha.

The site is within the Ravensworth Operations open cut mining complex, which comprises surface mining operations, coal processing plants and related infrastructure, and former mine sites that are currently being rehabilitated. The site is located on part of a rehabilitated capped open cut mining void (Void 3) that has been filled with ash from the Bayswater Power Station.

Nearby towns and urban centres include Camberwell, approximately 6 km to the south-east, Singleton, approximately 20 km to the south-east, and Muswellbrook, approximately 20 km to the north-west of the site (refer to Figure 1.1).

Access to the facility is provided via an internal access road off Lemington Road, that connects to the New England Highway (A15) approximately 3.4 km south-east of the site.

The local context of the site, including local roads, nearby developments and natural features, are shown in Figure 1.2 and the existing site layout is shown in Figure 1.3.

2.1.2 Land use, ownership and zoning

The site is owned by AGL and the facility is operated by Bettergrow. Land within the site is zoned RU1 (Primary Production) under the Singleton Local Environmental Plan 2013 (Singleton LEP).

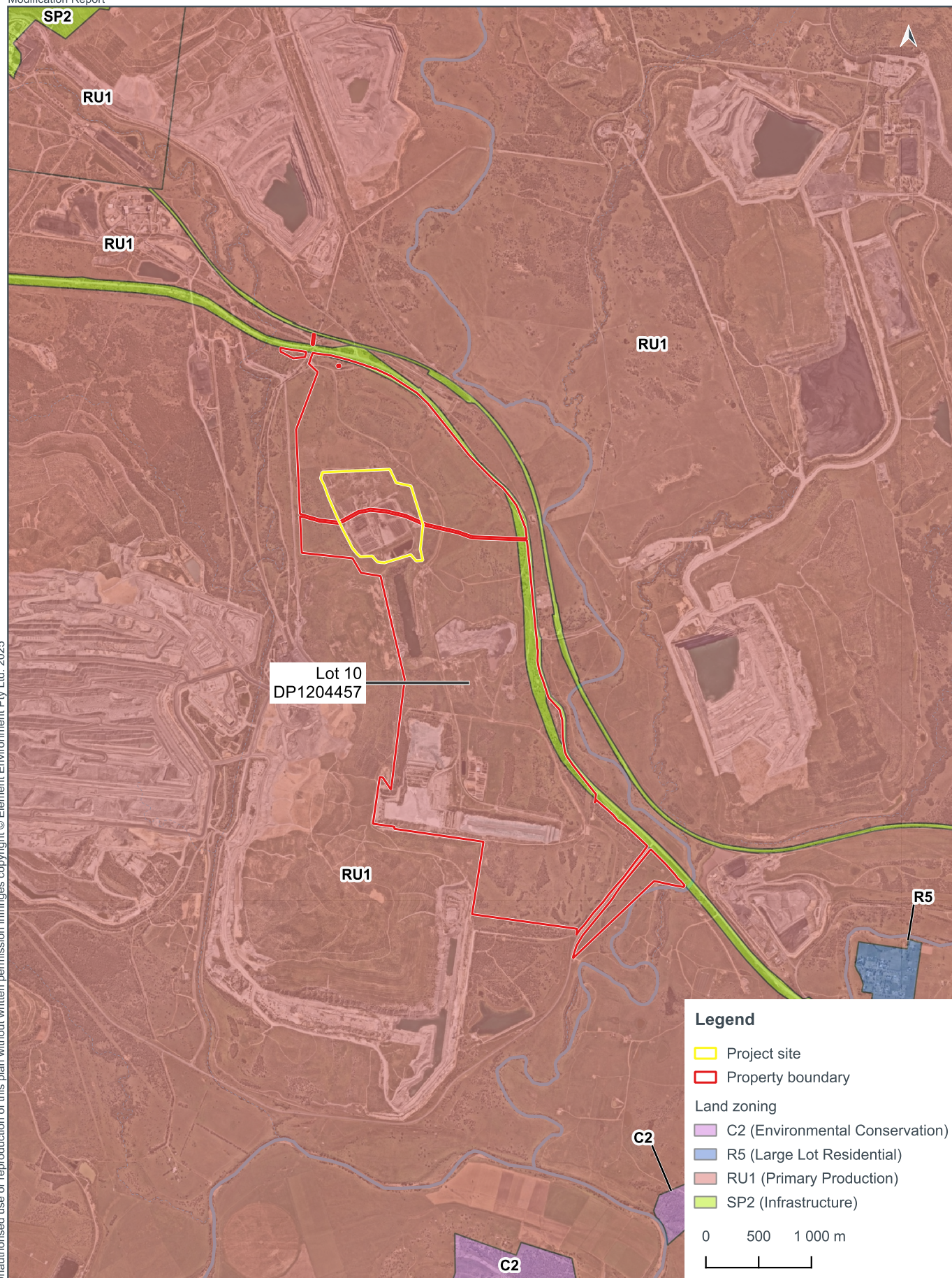
The area surrounding the facility is dominated by coal mining and other heavy industrial activities, including power generation and related activities, and grazing pastures. Key land uses surrounding the site (refer to Figure 1.1) include:

- Bayswater Power Station and Lake Liddell to the north-west;
- Liddell Coal Mine to the north;
- Mt Owen Coal Mine to the north-east;
- Ravensworth Coal Mine to the west;
- Glendell Coal Mine, Ashton Coal Mine and Integra Coal Mine (production ceased in 2024) to the south-east;
- Loop Organics composting facility to the south;
- New England Highway to the east; and
- Main Northern Railway to the east.

The land surrounding the site is zoned RU1 (Primary Production) to the north, east, south and west, and SP2 (Infrastructure - Classified Road) and SP2 (Infrastructure - Rail Infrastructure) to the north, east and south-east (refer to Figure 2.1).

Figure 2.1
Land zoning

Ravensworth Composting Facility SSD Modification 2
Modification Report



2.1.3 Sensitive receivers

The site is located within the Ravensworth Operations open cut mining complex characterised by mining operations, including blasting, drilling, excavation, hauling, crushing and grinding, and rehabilitation activities.

The nearest residences are along Hebden Road, approximately 2 km north-east of the site, and along Lemington Road, approximately 4.4 km south-east of the site. However, these residences are on mining land owned by Glencore Australia Pty Ltd (Glencore) and Yancoal Australia Pty Ltd, and subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore are not considered as sensitive receivers for the facility.

The nearest sensitive receivers (private rural residential properties) for the facility are at Camberwell village, approximately 6 km to the south-east of the site (refer to Figure 1.1).

2.2 Environmental setting

2.2.1 Topography, geology and soils

The landscape of the local area generally consists of undulating hills, ranging in elevation from 140 to 220 m Australian Height Datum (mAHD) and with slope gradients typically between 4% and 7%. The site is located on a ridge that runs in a north-south direction between Bayswater Creek in the west and Bowmans Creek in the east. Local relief within the site ranges from approximately 60 mAHD at the central southern end of the site to approximately 125 mAHD along the eastern border of the site (Kovac & Lawrie, 1991).

A review of the Camberwell 1:100 000 Geological Sheet 9133 (Roberts et al., 1991) indicates that the site is underlain by the Denham Formation within the Late Permian Wittingham Coal Measures, consisting of coal seams with interbedded sequences of claystone, tuff, siltstone, sandstone and conglomerate.

The Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac & Lawrie, 1991) indicates that the site and its surroundings are underlain by the Liddell soil landscape. This landscape is characterised by yellow soloths on slopes and yellow solodic soils on concave slopes. Earthy and siliceous sands occur on mid to lower slopes where the parent material is more sandy. Red soloths, red solodic soils and red podzolic soils may also occur. Limitations of this soil landscape include minor to severe sheet erosion with some minor rill erosion, low to high erodibility, high to very high erosion hazards, low to high soil salinity and low to moderate flood hazard (Kovac & Lawrie, 1991).

Previous open cut mining operations across the Ravensworth Operations open cut mining complex have significantly impacted soils within the area through soil removal, erosion and degradation. The site is located on the former Ravensworth Void 3 that has been filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated.

Acid sulfate soils

Acid sulfate soils generally occur in low lying areas in and around coastal swamps, estuaries, and other coastal water bodies. If these soils are disturbed or exposed to oxygen, they have the potential to oxidise over time, resulting in acidic water leaching from these soils and scalding vegetation or killing aquatic fauna. Acid sulfate soils can also react with concrete and steel infrastructure.

A review of the Singleton LEP did not identify any potential acid sulfate soils at the site. However, historical mining activities such as excavation and crushing of mineral deposits that accelerate the oxidation process may have resulted in the formation of acid sulfate soils within the vicinity.

Salinity

Saline soils occur naturally in many parts of Australia because of a combination of biophysical conditions, including climate, topography and geology (NSW Department of Environment and Climate Change (DECC), 2008). The erosion and transfer of saline sediments off-site has the potential to alter the water quality of receiving environments which in turn has the potential to impact upon flora and fauna that are sensitive to elevated levels of salinity.

A review of the DPHI eSPADE database (DPHI, 2025a), the Singleton LEP and spatial data from the Dryland Salinity National Assessment (Australian Bureau of Agricultural and Resource Economics and Sciences, 2016) did not identify any areas with risk of dryland salinity within or near the site. However, historical mining operations involving deep excavation and handling of mine wastes may have released salts into soil and groundwater, resulting in increased salinity within the vicinity.

Land and soil capability

The Land and Soil Capability Assessment Scheme (LSC Scheme) (Office of Environment and Heritage (OEH), 2012) classifies agricultural land based on its biophysical characteristics and subsequent limits they place on use of the land. The land and soil capability of land within the site has not been assessed as part of the LSC Scheme.

In addition to the LSC assessment scheme, the NSW government has mapped Biophysical Strategic Agricultural Land (BSAL) (OEH, 2013) and State significant agricultural land (SSAL) (in draft). The mapping of BSAL and SSAL is aimed at managing competing land uses and ensuring high value agricultural lands in NSW are preserved. BSAL is land with high quality soil and water resources capable of sustaining high levels of productivity. The biophysical attributes of SSAL represent the most capable, fertile and productive agricultural lands in the State, and can support a variety of agricultural industries operating successfully.

Draft SSAL mapping was released by the NSW Government in 2021 (NSW Department of Primary Industries (DPI), 2021). There are currently no specific requirements for the assessment of development projects in areas of draft SSAL, however the purpose was to understand the location, value and contribution to agricultural productivity in regional economics, and to assist with planning decisions on agricultural lands.

Neither BSAL nor SSAL has been mapped within the site (DPHI, 2025b; DPI, 2021).

2.2.2 Hydrology, flooding and water quality

Catchments, watercourses and drainage

The site is located within the lower portion of the Hunter River catchment. The Hunter River catchment is the largest coastal catchment in NSW, covering an area of approximately 21,500 square kilometres (km²), and plays a significant role in regional hydrology. The headwaters of the catchment are formed by runoff from the Barrington Tops and Coolah Tops National Parks in the north and the Goulburn River and Wollemi National Parks in the south. The Hunter River rises on the western slopes of the Mount Royal Range, part of the Great Dividing Range, east of Murrurundi, and flows generally south-west and then south-east for approximately 460 km before flowing into the Pacific Ocean at Newcastle.

There are no watercourses or drainage lines traversing the site. The nearest mapped drainage line (a tributary of Bowmans Creek) traverses the New England Highway approximately 620 m north-east of the site. Bayswater Creek, approximately 600 m to the west, is the nearest watercourse to the site. The creek is classified as a fifth order stream according to the Strahler stream ordering system (Strahler, 1957). Other nearby watercourses and waterbodies include Bowmans Creek, approximately 1.2 km to the east, the Hunter River, approximately 6 km to the south, and Lake Liddell, approximately 5.7 km to the north-west of the site. The site is well elevated at approximately 40 m higher than surrounding watercourses.

Bayswater Creek and Bowmans Creek flow in a southerly direction to discharge into the Hunter River. Both creeks are highly modified due to mining and power generation activities in the area and generally have low flows (median flow of less than 1 ML per day) (Fifteen50, 2019a). The Hunter River flows in a south-easterly direction to drain into the Tasman Sea (a marginal sea of the South Pacific Ocean) at Newcastle.

The Ravensworth Void 4 dam is located immediately south of the facility and receives stormwater from the surrounding land and seepage from Void 5. Fly ash from the Bayswater Power Station is currently pumped as a thick slurry into Void 5 as part of the approved rehabilitation of the Ravensworth No. 2 mine. Water from the fly ash seeps from Void 5 into Void 4 and is pumped from Void 4 back to the Bayswater Power Station for further re-use. Void 3, which has also been subject to filling with fly ash, also seeps water into Void 4.

As a result of the natural topography and modification from mining and power generation activities, only a small portion of the upstream catchment drains toward the site (Fifteen50, 2019a). The on-site surface water management system prevents minor upstream catchment flows from entering the processing pads. Diversion bunds along the western side of the site direct stormwater to surrounding land, and a diversion wall and channel direct stormwater from the eastern side of the site into the sediment ('lower') basin in the south-eastern corner of the site. Rock structures and rip rap are provided to slow the velocity of stormwater flowing towards the lower 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. hundreds of megalitres). There is no surface water discharge from the site into local drainage lines or watercourses.

Any rainfall captured by the processing pads is considered to be leachate and managed by the on-site leachate management system (refer to Section 1.3.5).

Water management

The site is located within the Jerrys Water Source regulated under the Water Sharing Plan (WSP) for the Hunter Unregulated and Alluvial Water Sources 2022.

In a letter to Bettergrow dated 26 July 2022, the (then) Department of Planning and Environment – Water confirmed that the Ravensworth composting facility does not require a water access licence to use the water from Void 4, as the source of the water is not groundwater, but tailings and ash dams, which are above the natural groundwater table.

Flooding

The site is well elevated at approximately 40 metres higher than surrounding watercourses (Fifteen50, 2019a). The site is located above the Probable Maximum Flood (PMF) event level (BMT, 2023) and is not identified as a flood planning area in the Singleton LEP (DPHI, 2025a).

Water quality

Both Bayswater Creek and Bowmans Creek are highly modified due to mining and power generation activities in the area, including discharges from Lake Liddell and Bayswater Power Station, and have elevated salinity levels (Fifteen50, 2019a).

WaterNSW data (WaterNSW, 2025) indicate that the average electrical conductivity (EC) measurement at Bayswater Creek in 2024 was 6,588 microsiemens per centimetre ($\mu\text{S}/\text{cm}$), with the average of all yearly averages (from the period 1999 to 2024) being 3,654 $\mu\text{S}/\text{cm}$. Bowmans Creek (Foy Brook Downstream Bowmans Creek Bridge Station No. 210130) is also saline with median EC measurements of 1,125 $\mu\text{S}/\text{cm}$ (for the period 1993 to 2026). These median EC values are well in excess of the ANZECC water quality trigger values for upland/lowland southeastern Australian streams (upland: 30-350 $\mu\text{S}/\text{cm}$; lowland: 125-220 $\mu\text{S}/\text{cm}$).

Water quality testing carried out by Bettergrow in 2018 indicated that the water within Void 4 is alkaline and brackish to saline, and has a low level of total suspended solids (Fifteen50, 2019a).

2.2.3 Groundwater

Groundwater occurrence, recharge and use

The facility is located within the Hunter subregion in the Northern Sydney Basin bioregion. Aquifers in the Hunter subregion can be broadly classed into three hydrogeological types: alluvial aquifers along major rivers and creek lines, coastal aquifers in the coastal area, and Triassic-Permian fractured (including porous) rock aquifers. The facility at Ravensworth is located above fractured and porous rock across the subregion, where the deeper, more extensive aquifer systems occur. The two main water bearing systems within and near the site are the Permian coal measures and the unconsolidated alluvial sediments associated with the Hunter River, Bayswater Creek and Bowmans Creek (Jacobs, 2022).

Groundwater recharge at the site primarily occurs as a result of rainfall infiltration at the subcrop/outcrop of the coal measures, across the alluvium, across deposited spoil and ash, and via lateral flow from the alluvium to the coal measures. The Whittingham Coal Measures are known to subcrop below the Hunter River alluvium, Bayswater Creek alluvium and Bowmans Creek alluvium. Coal seams are generally permeable horizontally, but vertical hydraulic connectivity is generally low (in the absence of subsidence induced cracking). The hydraulic connectivity between the Whittingham Coal Measures, the respective alluvium bodies and the surface waters is not precisely understood and/or varies along the river/creek lines (Jacobs, 2022).

Rainfall leakage below the existing site is conservatively estimated at 0.1 millimetres (mm) per day (mm/day), equivalent to a seepage rate of 10^{-9} metres per second (m/s). Across the site, this results in an annual leakage of less than 4 megalitres (ML). Rainfall seepage into Void 3 is contained and eventually moves into the lower Void 4, where it is captured and stored for reuse (Fifteen50, 2019a).

Groundwater extracted from aquifers in the Hunter subregion is used for a range of purposes, including domestic, stock, irrigation, town water supply and industrial purposes, with a proportion of water protected for the environment in all water sources (Commonwealth of Australia, 2019).

A review of available real time groundwater monitoring data maintained by WaterNSW identified nine groundwater bores within 2 km of the site, registered for monitoring, testing, dewatering, industrial, stock, domestic and irrigation purposes (WaterNSW, 2025). The nearest monitoring borehole (GW078054) is approximately 1.1 km east of the site. No new boreholes have been installed since the SSD EIS (RPS Australia East Pty Ltd, 2019a) (SSD EIS) was published.

Glencore and AGL also regularly monitor several other bores near the site and report on these annually (Fifteen50, 2019b).

The facility does not extract any water from groundwater bores.

Groundwater management

The site is located within the Sydney Basin-North Coast Groundwater Source regulated by the WSP for the North Coast Fractured and Porous Rock Groundwater Sources 2016.

Groundwater levels and water quality

Drilled depths of bores identified within 2 km of the site range between 6.2 and 300 metres below ground level (mbgl). Groundwater was intercepted at 43 mbgl at borehole GW080725, approximately 1.8 km to the east of the site. A water bearing zone between 11.4 and 12 mbgl, with a standing water level of 6.9 mbgl, was recorded for borehole GW078054, approximately 1 km to the south-east (WaterNSW, 2025).

In 2018, groundwater levels at the nearest Glencore and AGL monitoring bores were recorded at greater than 60 mbgl and between 16 and 31 mbgl, respectively (Fifteen50, 2019b).

The groundwater impact assessment (Fifteen50, 2019b) prepared for the SSD EIS confirmed depth to groundwater to be greater than 40 mbgl at the site.

Analysis of groundwater samples taken from the Glencore and AGL monitoring bores in 2018 indicated that the pH tended to range from neutral to alkaline (pH of 7.0 - 8.3) and electrical conductivity typically ranged between 4,550 and 9,670 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) (brackish to saline water) (Fifteen50, 2019b). Water of this quality is generally limited to industrial use, as salinity levels are greater than acceptable limits for stock and domestic consumption, and would be detrimental to crops and soils when used for irrigation.

Groundwater vulnerability

Groundwater vulnerability maps have been prepared by the DPHI for some catchments in NSW to indicate the vulnerability (or level of risk) of aquifers to contamination due to physical characteristics of the location, such as the depth to the water table and soil type. A groundwater vulnerability map has not been prepared for the Hunter River catchment in which the site is located. Given that the site and surrounding areas have historically been used for open cut and underground mining, groundwater in the area is not considered to be vulnerable.

2.2.4 Biodiversity

Native and non-native vegetation

Significant disturbance of the natural environment within and surrounding the site has occurred as a result of the long history of agricultural and mining activities in the area, and the site and its surrounding area were mostly cleared of vegetation prior to the construction of the facility.

Existing vegetation mostly consists of grassland and scattered shrubs or small trees in the north-western and north-eastern corners of the site and just north of the leachate control dam.

Vegetation mapping for the Upper Hunter region (NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), 2024a) does not identify any native vegetation within the site. Native plant community types (PCTs) identified near the site are described in Table 2.1.

Field surveys carried out in October 2018 as part of ecological investigations (Peak Land Management, 2018) for the SSD EIS confirmed vegetation within the site consists mostly of exotic weeds, with only two native species (unnamed) recorded in very low numbers.

Table 2.1 PCTs surrounding the site

Class	PCT	Description	Location
Western Slopes Grasslands	796	Derived grassland of the NSW South Western Slopes	Approximately 500 m to the west
Coastal Valley Grassy Woodlands	1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	Approximately 500 m to the west
Coastal Swamp Forests	1731	Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	Approximately 500 m to the west
Coastal Valley Grassy Woodlands	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Approximately 600 m to the north-east

Threatened ecological communities

Regional vegetation mapping (NSW DCCEEW, 2024a) does not identify any threatened ecological communities (TECs) within the site. Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS confirmed that there are no TECs or TEC habitat present within the site.

PCTs in the surrounding area may correspond with the following five TECs listed as endangered or critically endangered under the *NSW Biodiversity Conservation Act 2016* (BC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- PCT 796 may correspond with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, listed as critically endangered under the EPBC Act.
- PCT 1603 and PCT 1691 may correspond with the Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions TEC, listed as endangered under the BC Act.
- PCT 1603 and PCT 1691 may correspond with the Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions TEC, listed as endangered under the BC Act.
- PCT 1691 may also correspond with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions TEC, listed as critically endangered under the BC Act.
- PCT 1731 may correspond with the Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC, listed as endangered under the BC Act.

Threatened flora and fauna

No threatened flora or fauna species listed under the BC Act and/or EPBC Act have previously been recorded within the site (DPHI, 2025c; Peak Land Management, 2018).

Eight threatened flora species and 288 threatened fauna species, including 24 frog species, 183 bird species, 49 mammal species and 32 reptile species, listed under the BC Act and/or EPBC Act have been recorded within 10 km of the site (DPHI, 2025c).

Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS did not identify any suitable habitat for threatened species within the site.

Biodiversity values

No declared areas of outstanding biodiversity value have been identified within 10 km of the site. The site is not mapped as having biodiversity values in the Biodiversity Values Map and Threshold Tool (NSW DCCEEW, 2025b).

Aquatic habitat

Nearby watercourses include Bayswater Creek, approximately 600 m to the west, Bowmans Creek, approximately 1.2 km to the east, and the Hunter River, approximately 6 km to the south of the site.

Ecological investigations (Peak Land Management, 2018) undertaken for the SSD EIS identified ephemeral ponds/shallow standing water over small depressions adjacent to the north-eastern corner of the site, with some local and migratory waterbirds present.

Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined as ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide (NSW Department of Land and Water Conservation, 2002).

The GDE Atlas (Bureau of Meteorology (BoM), 2025a) does not identify any terrestrial or aquatic GDEs within the site. Low and high potential terrestrial GDEs are identified approximately 500 m to 600 m to the west, north and east of the site. A moderate potential aquatic GDE, Bowmans Creek, is identified approximately 1.2 km to the east of the site.

The WSP for the Hunter Unregulated and Alluvial Water Sources 2022 does not identify any high priority GDEs within or near the site.

Weeds, pests and pathogens

Weeds listed as Priority Weeds for the Hunter region under the *Biosecurity Act 2015* (Biosecurity Act) may occur within the site (Hunter Local Land Services, 2022a). Under the Biosecurity Act, Priority Weeds are weeds that have been determined as being of a high risk of causing significant negative impacts to agriculture, the environment, the community and the economy.

The Hunter region provides habitat for a range of commonly occurring pest species (Hunter Local Land Services, 2024). Exotic pests that may occur within the site include wild dogs, feral cats, European red fox, feral deers, feral horses, feral goats, feral pigs, and wild rabbits. No feral animals were observed during previous field surveys of the site (Peak Land Management, 2018).

Pathogens that have been recorded in the Hunter Interim Biogeographical Regionalisation for Australia (IBRA) subregion and have the potential to occur within the site include Myrtle rust (*Austropuccinia psidii*) and Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*) (Hunter Local Land Services, 2022a).

Matters of National Environmental Significance

A search was undertaken on 14 April 2025 for Matters of National Environmental Significance (MNES) listed under the EPBC Act that may occur within a 10 km radius of the site (refer to Section 4.1.1).

The following MNES may occur within 10 km of the site:

- 8 TECs, including:
 - Central Hunter Valley eucalypt forest and woodland (critically endangered);
 - Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (endangered);
 - Hunter Valley Weeping Myall (*Acacia pendula*) Woodland (critically endangered);
 - Lowland Rainforest of Subtropical Australia (critically endangered);
 - River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (critically endangered);
 - Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (endangered);
 - Warkworth Sands Woodland of the Hunter Valley (critically endangered); and
 - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).
- 49 threatened flora and fauna species, including 19 bird species, 2 frog species, 11 mammal species, 15 plant species and 2 reptile species; and
- 10 migratory species.

These matters are further discussed in Section 4.1.1.

2.2.5 Heritage

Non-Aboriginal heritage

A search of the World Heritage List, National Heritage List, Australian Heritage Database, NSW State Heritage Register, State Heritage Inventory, Section 170 Heritage and Conservation Registers and heritage schedule of the Singleton LEP on 14 April 2025 did not identify any registered heritage items within 1 km of the site.

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 LEP (Item ID I42). Recent satellite imagery indicates that the school has been demolished, with only the foundations and some external walls remaining.

Aboriginal heritage

The project is located within the Wanaruah Local Aboriginal Land Council (LALC) area.

Archaeological evidence suggests the Wonnarua (Wanaruah) People have occupied the Hunter Valley region for at least 35,000 years, however the majority of Aboriginal sites in the region are dated to the more recent Holocene period (less than 10,000 years ago). This may reflect Aboriginal occupation patterns but may also be influenced by the inaccessibility of potential coastal Pleistocene sites, which were inundated when sea levels rose and reached present levels approximately 6,000 years ago (RPS, 2019b).

Nearby watercourses and vegetation communities within and surrounding the site would have provided habitat for a variety of animals such as kangaroos, wallabies, possums, echidnas and birds, as well as potential food and raw material sources for Aboriginal people. However, the underlying geological formation would have provided few suitable raw stone materials for the manufacture of stone artefacts. While it is possible that mudstone could have been used in the production of lithic (stone-built) artefacts, it is likely that resources would have been procured from elsewhere (RPS, 2019b).

European settlement of the Hunter Valley commenced in 1820 as the region was pronounced open to free settlement. The site constituted farmland from 1824 until 1972, when coal mining in the Ravensworth area commenced at the Ravensworth No. 2 open cut mine.

Historical farming and mining activities included extensive land clearing, excavation, filling and levelling, resulting in a high level of successive disturbance at the site over the past 200 years (RPS, 2019b). The site formed part of the Ravensworth No. 2 open cut mine and has subsequently been filled in, capped and rehabilitated.

A search of the Aboriginal Heritage Information Management System (AHIMS) carried out in October 2018 as part of the Aboriginal Cultural Heritage Assessment (ACHA) (RPS, 2019b) prepared for the SSD EIS identified a large number of previously recorded Aboriginal sites in the Ravensworth Operations open cut mining complex, most of which have been partially or fully destroyed. No registered AHIMS sites were identified within the site. Aboriginal sites identified within the surrounding area included low-density surface artefact sites, art (pigment or engraved), grinding grooves, a modified tree, a massacre site, and potential archaeological deposits (PADs). The nearest AHIMS sites, a potential archaeological deposit (PAD) (Site ID 37-3-0591) and artefact (Site ID 37-3-0005), were identified over 300 m to the south-west and north-east of the site (respectively).

An updated search of the AHIMS on 15 April 2025 did not identify any additional registered Aboriginal sites near the facility.

The ACHA determined that the site has no archaeological, aesthetic or historic significance. It further concluded that the site has some cultural significance when considered as part of the wider cultural landscape, however, has no specific cultural values when viewed in isolation (RPS, 2019b).

2.2.6 Contamination

A review of the EPA, NSW Department of Primary Industries and Regional Development and Department of Defence public registers of contaminated sites was carried out on 17 April 2025 to assess the potential sources of contamination near the site. A number of potential current and former contaminant sources have been identified near the site and are summarised in Table 2.2.

There were no former gas works, sites listed on the EPA per- and polyfluoroalkyl substances (PFAS) investigation program, areas where unexploded ordinance is known to occur, liquid fuel facilities, or other waste management facilities listed in the National Waste Management Database, identified within 5 km of the site.

Table 2.2 Potential current and former contaminant sources

Item	Details
List of contaminated sites regulated by or notified to the EPA	There are no sites listed in the Contaminated Land Record of Notices within 5 km of the site. Two sites within 5 km of the site have been notified to the EPA under the <i>Contaminated Land Management Act 1997</i> (CLM Act): ▪ Ravensworth Operations Narama Mine, approximately 4 km south-west of the site; and ▪ Cumnock Colliery, approximately 4.5 km north-west of the site. Regulation under the CLM Act is not required for these premises.
Current EPA licensed activities	Six activities licensed under the POEO Act occur within 5 km of the site: ▪ coal works and mining for coal at the Ravensworth Operations open cut mining complex, off Lemington Road, Ravensworth (approximately 1 km south-west of the site), operated by Ravensworth Operations Pty Ltd, owned and operated by Glencore Coal (EPL No. 2652);

Item	Details
	- coal works and mining for coal at Liddell Coal Operations, Old New England Highway (approximately 1.8 km north of the site), operated by Liddell Coal Operations Pty Ltd, a wholly owned subsidiary of Glencore Coal (EPL No. 2094). Open cut coal mining including coal preparation plant and rail loading facilities ceased in November 2023. The mine site is now in the closure phase with closure activities consisting of bulk push, tailings dam capping, and landform rehabilitation. - composting at Loop Organics, 74 Lemington Road, Ravensworth (approximately 2 km south of the site), operated by Loop Organics Pty Ltd (EPL No. 20892); - coal works and mining for coal at Glendell Mine, Hebden Road, Ravensworth (approximately 2.5 km south-east of the site), operated by Glendell Tenements Pty Ltd on behalf of Glencore (EPL No. 12840); - dangerous goods production at Orica Australia Pty Ltd, New England Highway, Liddell (approximately 2.7 km north-west of the site), operated by Orica Australia Pty Ltd (EPL No. 1122). The facility is a dangerous good storage depot for ammonium nitrate, ammonium nitrate emulsion and diesel to support bulk explosives delivery to mines. This plant also manufactures emulsion phase; and - extractive activities, crushing, grinding or separating, coal works and mining for coal at Mount Owen Mine, Hebden Road, Ravensworth (approximately 3.8 km north-east of the site), operated by Mt Owen Pty Ltd on behalf of Glencore (EPL No. 4460).
Former licensed activities, now surrendered	Three former licensed activities, now surrendered under the POEO Act, occurred near the site: - coal works at Ravensworth Coal Terminal, Liddell Station Road, Ravensworth (approximately 2.5 km north of the site), operated by Ravensworth Coal Terminal Pty Ltd (EPL No. 5585); - coal works and mining for coal at Ravensworth East Mine, Hebden Road, Ravensworth (approximately 3.8 km east of the site), operated by Mt Owen Pty Ltd (EPL No. 10860); and - coal works and mining for coal at Cumnock No. 1 Colliery, off Old New England Highway (approximately 4.5 km north-west of the site), operated by Cumnock No. 1 Colliery Pty Ltd (EPL No. 37).

The site is located on top of the former Void 3 that has been filled with spoil and fly ash from the Bayswater Power Station, capped and rehabilitated. Previous contamination investigations carried out for the SSD EIS have not identified any known contamination at the site.

2.2.7 Hazards

Bushfire

Sections of the eastern, southern and western boundaries of the site are mapped as 'Vegetation Category 3' bushfire prone land, which presents a medium risk for bushfire, and its vegetation buffer (30 m) (DPHI, 2025a). The vegetation buffer represents areas that may be impacted by ember attack, radiant heat and/or flame contact during fires in adjacent bushfire prone land.

A Bushfire Risk Management Plan was developed in 2023 for the Singleton and Muswellbrook LGAs by the Hunter Valley Bushfire Management Committee (Hunter Valley Bushfire Management Committee, 2023). The plan identifies land areas and associated community assets within the Singleton and Muswellbrook regions at risk of bushfire and recommends measures to reduce these risks. The site is not located within any of the focus areas identified as having unacceptable high fire risk.

The bushfire season in the Singleton region predominantly occurs during the hotter months of the year, from October to March. The prevailing weather conditions typically associated with the

bushfire season are windy conditions accompanied by high day time temperatures and relative low humidity.

Hazardous substances and dangerous goods

Hazardous substances and dangerous goods stored and used at the facility are described in Section 1.3.5. The quantities of dangerous goods and hazardous substances that are stored and handled on site are below the threshold quantities listed in the *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* (Applying SEPP 33 Guidelines) (NSW Department of Planning (Department of Planning), 2011).

Vehicles and machinery are refuelled off-site or at the diesel tank using a drip tray. Other maintenance of machinery on site takes place within designated bunded areas or hardstand areas using drip trays.

Mine subsidence and ground settlement

Mine subsidence is a risk in areas which have been subject to underground coal mining as the land above can sink and fill the voided mine drifts, causing tilts and strains on the ground surface. In areas where coal extraction has taken place, subsidence generally occurs within a relatively short time after extraction.

The site is located within the Patrick Plains Mine Subsidence District in an area that has been subject to open cut and underground longwall mining as part of the Ravensworth Operations mining project.

The facility is located on the former Void 3 of the Ravensworth No. 2 open cut mine, which was filled in the early 2000's with fly ash (refer to Section 1.3.1).

The project is not likely to result in any changes to potential mine subsidence or ground settlement impacts from the existing development as:

- no new structures or buildings are proposed; and
- the proposed new double-walled self-bunded above ground diesel tank is constructed to comply with Australian Standards to contain any potential spills or leaks in the event of potential ground settlement or mine subsidence (refer to Section 3.6).

Consultation will be undertaken with Subsidence Advisory NSW to determine any conditions on the proposed modification in relation to potential mine subsidence damage.

2.3 Strategic policy context

The following strategic policies and plans have been considered in the assessment of the project, as they have not been considered previously for the approved development:

- National Waste Policy: Less Waste, More Resources (National Waste Policy) (Commonwealth of Australia, 2018);
- NSW Circular Economy Policy Statement (NSW Circular Economy Policy) (EPA, 2019);
- Net Zero Plan Stage 1: 2020–2030 (NSW Net Zero Plan) (NSW Department of Planning, Industry and Environment (DPIE), 2020);
- NSW Waste and Sustainable Materials Strategy 2041 Stage 1:2021–2027 (NSW Waste and Sustainable Materials Strategy) (DPIE, 2021a);
- Strategic Plan 2024–29 (EPA Strategic Plan) (EPA, 2024a);
- Waste Delivery Plan (EPA Waste Delivery Plan) (EPA, 2021);
- Hunter Regional Plan 2041 (Hunter Regional Plan) (DPE, 2022b);
- Regional Circular Materials Strategy Hunter and Central Coast 2022 – 2027 (Hunter and Central Coast Regional Circular Materials Strategy) (Hunter Joint Organisation, 2022); and

- Create Singleton 2032 – Community Strategic Plan 2022 – 2032 (Singleton Community Strategic Plan) (Singleton Council, 2022).

The project's consistency with the relevant objectives and planning priorities contained within the abovementioned strategic policies and plans is discussed in the following sections.

2.3.1 National Waste Policy

The National Waste Policy provides a national framework for waste management, recycling and resource recovery in Australia to 2030. It focuses on reducing waste disposal and treating waste as a valuable resource, aiming to deliver economic, environmental, and social benefits while transitioning towards a circular economy.

The overarching goal of the policy is to ensure all waste is managed in alignment with Australia's international commitments, safeguarding human health and the environment. The policy also aims to identify and mitigate long-term risks associated with waste to prevent intergenerational environmental impacts.

The policy outlines a nationally coordinated approach to waste management, guided by five key principles:

- waste avoidance – prioritising waste prevention, promoting efficient resource use, and designing products to minimise waste;
- enhanced resource recovery – improving collection systems, recycling processes, and the quality of recovered materials;
- increased use of recycled materials – stimulating demand and markets for recycled products;
- better management of material flows – ensuring waste is managed to benefit human health, the environment, and the economy; and
- improved data and innovation – enhancing information systems to drive innovation, guide investment, and support informed consumer choices.

The National Waste Policy is implemented through the National Waste Policy Action Plan 2024 (National Waste Policy Action Plan) (Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024a), which includes targets and priorities to guide Australia's investment and national efforts for waste management. The seven targets outlined in this plan include:

- Target 1: Ban the export of waste plastic, paper, glass and tyres, commencing in the second half of 2020;
- Target 2: Reduce the total waste generated in Australia by 10% per person by 2030;
- Target 3: 80% average recovery rate from all waste streams following the waste hierarchy by 2030;
- Target 4: Significantly increase the use of recycled content by governments and industry;
- Target 5: Continued phase out problematic and unnecessary plastics;
- Target 6: Halve the amount of organic waste sent to landfill for disposal by 2030; and
- Target 7: Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions.

The project supports the National Waste Policy objectives and Action Plan targets by:

- treating waste as a resource;
- reducing the amount of organic material sent to landfill and increasing the recovery of decontaminated and pasteurised FOGO and/or food recovered material;
- expanding industry capability and increasing the supply of recycled organic material (compost);
- generating economic, environmental, and social benefits by increasing industry capability while minimising environmental impacts;

- promoting sustainability and innovation; and
- protecting human health and the environment.

2.3.2 NSW Circular Economy Policy

The NSW Circular Economy Policy sets the ambition and approach for a circular economy in NSW, and provides principles to guide resource use and management. It provides a framework for implementing initiatives throughout the product life cycle, from design, manufacturing, and retail to end-of-life-disposal.

Key principles of a circular economy include:

- maximising resource value by extending the lifespan of products and materials; and
- optimising resource use to generate significant economic, social, and environmental benefits.

The NSW Circular Economy Policy outlines seven principles that will underpin NSW Government decision making and planning:

- sustainable management of all resources – replacing raw materials with recycled products;
- value resource productivity – minimising the inefficient use of virgin materials;
- design out waste and pollution – innovating product design for longevity, re-use, remanufacture and resource recovery, and increasing service offerings and remanufacture and repair activities;
- maintain the value of products and materials – increasing the reparability of products and the recyclability of materials to allow the preservation of value;
- innovate new solutions for resource efficiency – implement innovating technologies that increase resource efficiency and prioritise higher value re-use opportunities;
- create new circular economy jobs; and
- foster behaviour change through education and engagement of communities and businesses.

The project aligns with the following five focus areas that are outlined in the policy to guide government action:

- support innovation – by assisting businesses to develop innovative solutions to accelerate the transition to a circular economy;
- sustainable procurement – by supporting sustainable procurement practices by businesses and government which would, in turn, drive demand for recovered materials and reusable products;
- high quality, consistent recycling – by generating high quality recovered materials that can be used more easily for a greater range of purposes;
- mainstream product stewardship – by assisting producers to take responsibility for the management of the end of product life to improve environmental, economic and social outcomes; and
- circular design – by increasing the lifetime of organic materials and reducing their environmental impacts over their lifecycle.

2.3.3 NSW Net Zero Plan

The NSW Government is committed to achieving net zero emissions by 2050. In 2020, the NSW Government released the NSW Net Zero Plan, which sets out how we will reduce our emissions by 35% over the next decade, in order to reach net zero emissions by 2050. Plans for the second and third decades of the net zero path will be developed in the lead-up to the 2030s and 2040s respectively.

As part of the NSW Net Zero Plan, the NSW Government has committed to a target of net zero emissions from organic waste in landfill by 2030. Organic waste, such as food scraps and garden

trimmings, makes up about 40% of red-lidded kerbside bins. When sent to landfill, the decomposing material releases methane that may not be captured. However, when this waste is managed effectively through composting and recycling processes, methane emissions can be substantially reduced, soils can be regenerated to store carbon, and biogas can be created to generate electricity. A recent study by the EPA (EPA, 2024b) indicates that the collection, transport and processing of food waste into compost can reduce greenhouse gas emissions by up to 96% compared to landfilling it.

In order to deliver on its goal, the NSW Government has established world-leading landfill diversion policies to apply to the waste industry. In particular, it will:

- support local councils to provide communities with best-practice food and garden waste management infrastructure;
- ensure composts or other organic soils are of the highest quality for land application;
- facilitate the development of 'waste to energy' facilities in locations that have strong community support, provided those facilities meet strict environmental standards; and
- update regulatory settings to ensure residual emissions from the organic waste industry are offset.

The project supports these landfill diversion policies by expanding operations at the facility to include the processing of FOGO and/or food recovered material, thereby reducing the amount of FOGO and/or food waste that is sent to landfill and greenhouse gas emissions from landfill.

2.3.4 NSW Waste and Sustainable Materials Strategy

The NSW Waste and Sustainable Materials Strategy is informed and driven by the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). It aims to encourage waste reduction and recycling as NSW transitions to a circular economy (refer to Section 2.3.2). The strategy adopts the targets set in the National Waste Policy Action Plan (refer to Section 2.3.1), and reaffirms the NSW Government's commitment to the goal of net zero emissions from organic waste by 2030, as set out in the NSW Net Zero Plan (refer to Section 2.3.3).

The strategy further outlines the actions needed over the six years leading up to 2027 (the first phase of the strategy) to deliver on the long term objectives of the Circular Economy Policy, based on the following three focus areas:

- meeting future infrastructure and service needs by ensuring critical waste infrastructure is in place, with an emphasis on co-locating businesses in precincts that promote a circular economy;
- reducing carbon emissions by improving waste and materials management, including making materials more productive by improving their durability through design, reusing or repairing them, recycling and remanufacturing them or extracting their embodied energy, to reduce reliance on emissions-intensive virgin materials; and
- protecting the environment and public health by strengthening measures to manage waste pollution, including efforts to combat illegal dumping.

The project aligns with these focus areas by:

- expanding operations to include the processing of decontaminated and pasteurised FOGO and/or food recovered material, to ensure recovery and recycling infrastructure keep pace with demand;
- diverting more organic material from landfill, including FOGO and/or food material, and processing it into compost that is returned to local soils to sequester carbon, improve soil health, increase water retention and boost crop yields, and reduce carbon emissions; and
- increasing the supply of high quality recycled organic material while minimising environmental impacts.

The project represents a significant step in meeting future waste management needs while advancing NSW's transition to a circular economy.

2.3.5 EPA Strategic Plan

The EPA Strategic Plan describes how the EPA, as NSW's primary environmental regulator, will protect, restore and enhance the NSW environment and human health over the next five years and beyond.

The plan outlines three strategic choices about the environmental and human health outcomes the EPA will deliver:

- care for Country – land, water, air and community;
- drive climate action; and
- enable a safe circular economy.

The project supports the following outcomes of the strategic choices:

- Licensees respond to the challenges of climate change and collectively reduce their greenhouse gas emissions, helping to meet the targets in the NSW Net Zero Plan. By expanding operations to include the processing of FOGO and/or food recovered material, the project would allow more organic material to be diverted from landfill, resulting in reduced greenhouse gas emissions.
- The necessary systems, infrastructure and regulatory settings are incentivising the transition to a circular economy. The project would utilise the existing site infrastructure and systems to support increasing rates of recycling of organic material, including FOGO material, and supply of recycled organic material in the region.
- Potential harm associated with managing waste and recovered materials is minimised. The project would minimise potential environmental impacts associated with the processing of recovered materials as it does not involve extension of the existing development footprint, vegetation clearing or bulk earthworks, and is located far from sensitive receivers.
- Communities, industry and government are actively participating in the circular economy. The project would assist communities, industry and government to increase the recycling of organic material and the use of recycled organic products.

2.3.6 EPA Waste Delivery Plan

The EPA Waste Delivery Plan describes how the EPA will reduce the harmful impact of waste and drive behaviours that create a circular economy. It outlines how the EPA will work with communities, industries and government to achieve their strategic waste priorities and implement the NSW Waste and Sustainable Materials Strategy and NSW Plastics Action Plan (DPIE, 2021b).

The project aligns with the following initiatives of the plan:

- diverting organics from landfill – by expanding existing operations to include the processing of decontaminated and pasteurised FOGO and/or food recovered material to support the recent FOGO recycling mandates in NSW (refer to Section 2.4.1);
- leveraging government purchasing power to stimulate a local circular economy – by assisting the industrial sector to meet the increased demand for organic recycled material; and
- building on our success: business recycling – by supporting businesses to reduce the volume of organic material sent to landfill.

2.3.7 Hunter Regional Plan

The Hunter region is the leading regional economy in Australia, driven by the mining, energy, manufacturing and agricultural sectors. The Hunter Regional Plan is a 20-year land use plan to manage growth and change in the Hunter region. It seeks to streamline planning so that the Hunter can transition over time to an economy focussed on renewable energy and the circular economy.

The plan defines the region's long term vision and goals across areas such as economic diversification, environmental sustainability, and community wellbeing through nine objectives. Each objective is supported by performance outcomes, to guide planning decisions and assess whether local strategic plans and planning proposals are effectively contributing to the broader regional goals.

Objective 1 of the plan focuses on diversifying the Hunter's mining, energy, and industrial capacity and Objective 6 outlines the need to conserve heritage, landscapes, environmentally sensitive areas, waterways and drinking water catchments. The project supports performance outcome 5 (Circular economy industries and facilities area in appropriate sites) of Objective 1 and performance outcome 1 (Areas of high environmental value are protected to contribute to a sustainable region) of Objective 6, as it utilises a former mine site to expand organics recycling capability, thereby avoiding impacts on environmentally sensitive areas and receivers.

Objective 7 of the plan aims to reach net zero and increase resilience and sustainable infrastructure. The project supports Objective 5 of the plan (Places are designed to support the goal of net zero emissions by 2050 and opportunities for mitigation and adaptation to a changing climate and environment) of this objective as it reduces greenhouse gas emissions by diverting organic material from landfill, and is designed to be resilient to climate change.

2.3.8 Hunter and Central Coast Regional Circular Materials Strategy

The Hunter and Central Coast Regional Circular Materials Strategy represents the regional response of the Hunter and Central Coast region to the NSW Waste and Sustainable Materials Strategy. The strategy outlines a 20-year vision to transform the Hunter and Central Coast region into Australia's leading circular materials region, as well as an Implementation Plan to deliver the Strategic Direction objectives of the strategy over the next five years.

Four regional themes are identified in the strategy to align with the NSW Waste and Sustainable Materials Strategy themes and key priorities:

- collaboration – collaborating to solve regional problems for greatest positive impact;
- circularity – enabling and influencing the circular economy;
- resource recovery – improved infrastructure and operations for circular outcomes; and
- protect the environment – improved problem waste management and disaster resilience.

Each regional theme is associated with outcomes, success measures, strategic directions and key regional challenges.

The project aligns with the following strategic directions of the circularity and resource recovery themes:

- circularity:
 - support the adoption of upstream circular economy solutions to reduce consumer waste generation – by allowing a wider range of organic material to be diverted from landfill;
 - improve circular economy knowledge and embed principles into practice – by transforming organic recovered material into a valuable resource (compost), reducing greenhouse gas emissions and reducing reliance on manufactured chemical fertilizers;

- resource recovery:
 - investigate and implement solutions to increase resource recovery by improving infrastructure, operations and material quality – by extending existing operations to include the processing of FOGO and/or food recovered material; and
 - collaborate, conduct research and support programs to divert organic waste from landfill – by expanding industry capability in the Hunter region to divert a wider range of organic recovered material from landfill.

2.3.9 Singleton Community Strategic Plan

The Singleton Community Strategic Plan presents the community's long term vision, goals and strategic priorities for the Singleton LGA, and provides a guiding framework for Council's actions and policies. It identifies objectives for various aspects of community development, including people, places, the environment, the economy, and leadership, and strategies to achieve these objectives.

The project supports the following objectives of the strategy:

- our places are sustainable, adaptable and inclusive – by providing safe and well-maintained recycling infrastructure and promoting sustainable practices;
- our environments are valued, preserved, respected and enhanced in a sustainable way – by promoting efficient waste management, increasing reuse and recycling, and reducing risks from environmental pollution and disease; and
- our economy will demonstrate diversity, resilience and innovation – by supporting increased recycling of organic material by businesses as waste generation increases.

2.4 Need and alternatives

2.4.1 Need and justification

NSW is transitioning to a circular economy over the next 20 years, as outlined in the NSW Circular Economy Policy (refer to Section 2.3.2). This policy supports the broader Australian Government's commitment to reduce waste disposal and treat waste as a valuable resource, in order to deliver economic, environmental, and social benefits while transitioning towards a circular economy (Commonwealth of Australia, 2018) (refer to Section 2.3.1).

The NSW Waste and Sustainable Materials Strategy outlines the actions needed over the six years leading up to 2027 to deliver on the long term objectives of the NSW Circular Economy Policy (refer to Section 2.3.4). These actions are backed by \$356 million in funding to help deliver priority programs and policy reforms.

Waste targets that have been set for the State in the NSW Waste and Sustainable Materials Strategy include:

- reduce the total waste generated by 10% per person by 2030;
- have an 80% average recovery rate from all waste streams by 2030;
- significantly increase the use of recycled content by governments and industry; and
- halve the amount of organic waste sent to landfill by 2030.

To achieve these targets, the NSW government has passed legislation to mandate FOGO recycling in NSW (EPA, 2025a), including:

- Local councils will be required to provide all NSW households who receive a residual (red lid) waste collection service with a FOGO waste service by 1 July 2030.

- Relevant premises, including supermarkets, some institutions and hospitality businesses, will be required to have a source-separated food organics waste collection service in place, starting with the largest generators from 1 July 2026 and staggered to 2030, depending on how much waste they send to landfill each week.

Implementation of these mandates for all households in NSW is predicted to result in the diversion of almost 950,000 tonnes (t) of FOGO waste each year from landfill and into circular economy products like compost (EPA, 2025a). The NSW government is providing a suite of support programs for councils and businesses, including grant funding for infrastructure, education and guidance, to help communities transition to the FOGO mandates.

The Hunter Regional Plan forecasts an approximate 11% growth in the region's population by 2041. It is also estimated the Hunter region will be the leading regional economy in Australia by that time. A study into the current supply and demand drivers of organics recycling in NSW (EPA, 2020) indicates there is an increasing demand for recycled organics, mainly driven by the urban amenity market, which is influenced by urban and industrial development. The agriculture market is the second largest end-use market (with stronger demand in regional areas), and growth in this market is accelerating. Recycled organics also play a key role in the rehabilitation/remediation of degraded or marginal land. The study further shows that the urban amenity market is becoming increasingly discerning, with a strong demand for higher quality recycled organic products (EPA, 2020).

AGL has over 700 ha of land requiring progressive rehabilitation. The SSD EIS noted that the successful rehabilitation of the mine voids is dependent on creating a biologically active soil to enable the establishment of robust and diverse vegetation communities. The open cut mining operations have removed the topsoil and the remaining sub-soils have limited value as a plant growth medium. The organic material produced at the site is used to improve the soil across existing rehabilitated areas and new rehabilitation areas.

The project would have minimal environmental and social impact, as it does not involve an extension to the existing development footprint, clearing of native vegetation, bulk earthworks, or any changes to the existing site infrastructure, plant/equipment or operating hours.

The project is justified on the basis that it would align with circular economy government policies, plans and legislation, meet the increasing demand for recycled organic products and continue to support AGL's existing rehabilitation activities, while having minimal environmental and social impact.

2.4.2 Project alternatives

The alternatives considered by Bettergrow for the ongoing composting of organic material at the Ravensworth facility are outlined in the following sections.

Option 1 - Do nothing

The 'do nothing' option consists of the composting facility continuing operations under the existing approval. The facility would continue to receive and process the organic material as described in Section 1.3.5.

The 'do nothing' option is not considered feasible, as the ability of the composting facility to support the recycling of FOGO and/or food recovered material under the NSW government FOGO mandates (as described in Section 2.4.1), and support increasing population growth and development in the region (DPIE, 2022), would be severely constrained.

With the existing operation limited to the current feedstock, the site would lack the ability to significantly contribute to the FOGO recycling effort in the Hunter region. As a result, there would

be an increased reliance on waste disposal and alternative similar composting facilities located further away. This would increase the overall cost of waste management for relevant waste generators due to longer haulage distances or disposal costs, while also increasing greenhouse gas emissions and heavy vehicle traffic on roads.

The 'do nothing' option is therefore not considered appropriate due to the potential increased environmental, social and economic costs associated with an increased supply of FOGO waste in the region, and given the opportunity exists to process FOGO recovered material at the existing composting facility.

Option 2 – An alternative site

Moving the facility to an alternative site is not considered a viable option, as the existing site already comprises the infrastructure, space and plant and equipment to receive and process recovered organic material with minimal environmental and social impact.

Alternative sites have not been considered from a technical, capacity and environmental impact perspective, and would be inappropriate from an economic perspective, given:

- sunken costs in the existing site;
- capital expenditure required for a new site; and
- challenges of finding an appropriately zoned and located area for a new site near waste sources and transport infrastructure, with minimal environmental impacts and at an appropriate distance from sensitive receivers.

Option 3 – Receive and process FOGO and/or food recovered material

This option was considered most suitable as it involves the utilisation of existing disturbed land and infrastructure to receive and process a wider range of organic material with minimal additional environmental and social impacts. This option would also have positive flow on effects throughout the local and regional economy through the supply of a wider range and higher quality, of compost products to the agricultural, horticultural, mining and other industry sectors in the region.

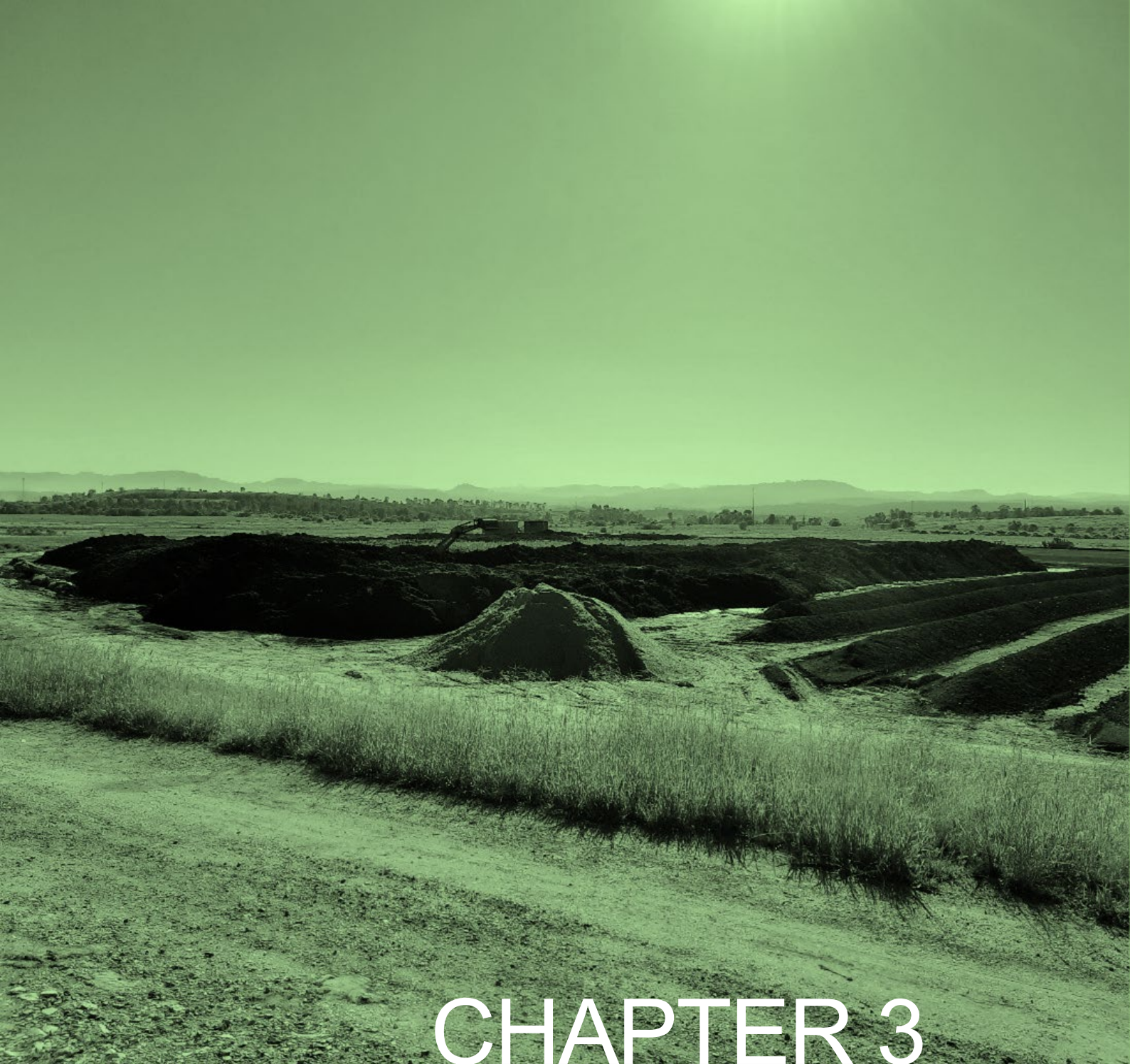
The processing of FOGO and/or food recovered material would further contribute to achieving targets for increased organics recycling and landfill diversion outlined in Australian and NSW government strategic policies and plans (refer to Section 2.3).

Option 3 was therefore selected as the preferred option as it would best meet the current and expected future demand for FOGO composting services in the region, and support government initiatives promoting sustainability and resource conservation.

The receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material within an enclosure was not considered as part of Option 3 for the following reasons:

- The site is located in a remote location within a mining complex, with the nearest sensitive receivers located approximately 6 km away from the site.
- Potential odour emissions, including cumulative odour emissions, from the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material are predicted to be well below the EPA criteria at the nearest sensitive receivers and would be further minimised with the implementation of the existing odour management and mitigation measures (refer to Section 6.2).
- There is adequate space available in the processing pads to receive and process a wider range of organic material.
- The installation of a product receipt and blending shelter is not a commercially viable option at the site, due to the high cost associated with installing an adequately sized structure for the facility.

- Other outdoor windrow FOGO composting facilities are currently operating in NSW without enclosures which supply high quality compost to the agricultural and mining sectors (Carbon Mate Pty Ltd, 2025; YLAD Living Soils, 2025; Worm Tech, 2025;).



CHAPTER 3

DESCRIPTION OF THE
MODIFICATION

3 DESCRIPTION OF THE MODIFICATION

3.1 Overview

Bettergrow is seeking approval to modify the SSD-9418 consent to:

- allow the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material;
- allow the receipt and blending of VENM and ENM with organic recovered materials; and
- install a 65,000 L above ground diesel storage tank to reduce fuel deliveries to the site.

No changes are required to the existing throughput of the facility (up to 200,000 tpa), development footprint, composting processes, site infrastructure, plant, equipment, vehicle movements, workforce or operating hours under this modification application.

3.2 Objective of the modification

The modification has the following objectives:

- assist the Australian and NSW governments to meet the waste reduction and resource recovery targets outlined in the National Waste Policy and NSW Waste and Sustainable Materials Strategy;
- support the current and expected future demand for recycled organic compost products driven by urban and industrial development;
- support economic development within the Hunter region;
- minimise environmental impacts by utilising the existing facility and site infrastructure; and
- operate the facility in full accordance with local and regional planning requirements and EPL considerations in an environmentally responsible and sustainable manner.

3.3 Pasteurised and decontaminated FOGO and/or food recovered material

The project would enable decontaminated and pasteurised FOGO and/or food recovered material to be received and processed at the facility.

Decontaminated and pasteurised FOGO and/or food recovered material is distinct from other organic recovered material, such as green waste and biosolids, as it is subject to the following controlled processing and pasteurisation prior to receipt at the facility:

- Decontamination: contaminants such as hazardous materials, metals, packaging materials and plastics are removed through a series of automated and manual processes, including removing visible contamination through a combination of manual sorting and the use of heavy machinery, and automated pre-sorting and shredding processes to remove non-organic material and reduce the size of bulky waste.
- Pasteurisation: the recovered material is loaded into enclosed tunnels with forced aeration, temperature, moisture and oxygen monitoring systems and subjected to high temperatures for a defined period of time (typically above 55 °C for at least 72 hours, as per Australian Standard (AS) 4454–2003: *Compost soil conditioners and mulches* (Standards Australia, 2003), to significantly reduce plant and animal pathogens and plant propagules (refer to Figure 3.1).

Figure 3.1 Decontaminated and pasteurised FOGO recovered material (Ektimo, 2025)



Key characteristics of the decontaminated and pasteurised material include:

- Pathogen free: pasteurisation eliminates harmful bacteria before the material arrives on-site (pathogenic microorganisms are usually destroyed during the open windrow composting process when the material reaches temperatures of above 55 °C due to microbial activity).
- Stabilised and partially matured: organic decomposition is well-advanced, reducing the risk of anaerobic breakdown, making the material more suitable for efficient windrow composting.
- Reduced odour: the material has a significantly reduced odour compared to green waste, raw food organics or biosolids 48 hours after pasteurisation.
- Low leachate generation: the moisture content of the material has been reduced (typically to 45–55%), and the material therefore has reduced propensity to generate leachate. Instead, it typically acts as a moisture-absorbing material rather than a leachate producer. Since the material has undergone pathogen reduction and volatile organic compound breakdown, any leachate produced would have a much lower odour intensity than that from untreated organic waste.
- Weed and pest suppression: high temperatures destroy viable weed seeds and insect larvae, unlike untreated green waste, which may still contain these contaminants (weeds and pests are usually destroyed during the open windrow composting process when the material reaches temperatures of above 55 °C due to microbial activity).
- Nutrient rich: the material retains valuable nutrients like nitrogen (N), phosphorus (P), and potassium (K), which will continue to be stabilised and mineralised during windrow maturation.
- Improved physical properties: the material is drier, more uniform, and has a stable structure, making it easier to aerate and manage in windrows.

The decontaminated and pasteurised FOGO and/or food recovered material is classified as general solid waste (non-putrescible) in accordance with the EPA's *Waste Classification Guidelines* (Waste Classification Guidelines) (EPA, 2014).

Bettergrow will submit an application to the EPA for a specific resource recovery order and exemption under the Protection of the Environment Operations (Waste) Regulation 2014, to permit the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material on-site (refer to Section 4.2.4). Resource recovery orders and exemptions have been developed by the EPA to ensure that "the use of waste must be genuine, fit-for-purpose, and cause no harm to the environment or human health".

The ratio/blend of materials used to make up the windrows to be composted will be provided by Bettergrow's Biosolids Manager. Careful consideration is given to each recipe based on the beneficial properties of the material in the compost blend. Section 3 (Process Overview) within the *Operational Environmental Management Plan* (OEMP) (Bettergrow, 2024) provides further detail on how the waste streams are integrated into the composting operation.

Based on the nature and composition of the new feedstock, review of the OEMP will be undertaken to ensure all management and mitigation measures remain fit for purpose.

3.4 VENM and ENM

The project seeks to allow the receipt and blending of VENM and ENM with organic recovered material at the facility, to improve the soil structure, nutrient content and moisture retention of the compost and offer a higher quality compost to customers.

VENM and ENM is classified as general solid waste (non-putrescible) in the Waste Classification Guidelines.

Schedule 1 of the POEO Act defines VENM as:

'natural material (such as clay, gravel, sand, soil or rock fines) —

(a) that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities, and

(b) that does not contain any sulfidic ores or soils or any other waste, and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.'

The EPA Excavated Natural Material Order 2014 defines ENM as:

'naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

(a) been excavated from the ground, and

(b) contains at least 98% (by weight) natural material, and

(c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, acid sulfate soils, potential acid sulfate soils or sulfidic ores.'

Only VENM and ENM that comply with the requirements of the POEO Act and Excavated Natural Material Order 2014 will be accepted for processing at the site.

3.5 Material quantities

The estimated annual throughputs of the different types of recovered organic material that would be received and processed at the facility are outlined in Table 3.1. No changes are proposed to the total throughput of the facility (200,000 tpa), as mentioned in Section 3.1.

Table 3.1 Estimated throughput of recovered organic material streams

Type of organic material	Waste classification	State of material received	Existing tonnage (tpa)	Proposed tonnage (tpa)
Decontaminated and pasteurised FOGO and/or food recovered material	General solid waste (non-putrescible) ¹	Shredded – for blending	0	70,000
VENM	VENM (as defined in Schedule 1 of the POEO Act)	Natural – for blending	0	7,500
ENM	ENM (as defined in 'The Excavated Natural Material Order 2014')	Excavated – for blending	0	7,500
Garden organics	Garden waste (as defined in Schedule 1 of the POEO Act)	Mulched and screened	110,000	50,000
Biosolids	Biosolids (as defined in 'The Biosolids Order 2014')	Dewatered – for blending	25,000	35,000
Paper crumble	Paper crumble for composting (defined as General or Specific Exempted Waste)	Shredded – for blending	10,000	0
Urban wood residue	Urban wood residues for composting (as defined in 'The compost order 2016')	Shredded – for blending	2,500	2,500
Natural organic fibrous material	Natural organic fibrous composting material (as defined in Schedule 1 of the POEO Act)	Shredded – for blending	2,500	2,500
Recycled water from Bayswater Power Station	Wastewater from Bayswater Power Station	Raw – for blending and compost maintenance	25,000	15,000
Animal waste (manure)	Animal waste (defined in Schedule 1 of the POEO Act)	Raw – for blending	5,000	10,000
Hydro-excavated drilling mud	Drill mud process water (as defined in 'The Treated Drill Mud Order 2014')	Raw – transfer only to another facility for processing	20,000	0

Type of organic material	Waste classification	State of material received	Existing tonnage (tpa)	Proposed tonnage (tpa)
Total			200,000	200,000

1: Bettergrow will submit an application to the EPA for a specific resource recovery order and exemption under the Protection of the Environment Operations (Waste) Regulation 2014.

3.6 Diesel tank

The project would install a 65,000 L above ground diesel storage tank next to the existing 5,000 L diesel tank to reduce fuel tank movements to and from the site (refer to Figure 1.3).

The double-walled self-bunded tank will be 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). The outer wall of the double-walled tank provides an extra layer of protection, capturing any leaks or spills and reducing the risk of environmental contamination.

Diesel fuel will continue to be stored and handled on-site in accordance with AS 1940:2017 *The storage and handling of flammable and combustible liquids* (AS 1940:2017) (Standards Australia, 2017), with appropriate separation from the site boundary and on-site protected places, and away from other flammable/combustible liquids/materials. Drip trays will continue to be used during refuelling to capture and contain any potential drips, leaks or spills.

3.7 EPL variation

Bettergrow holds EPL 7654 for the facility, issued under Section 55 of the POEO Act. The EPL was first issued in September 2000 and last modified on 12 August 2024 (Notice number 1639204) (refer to Section 1.3.4).

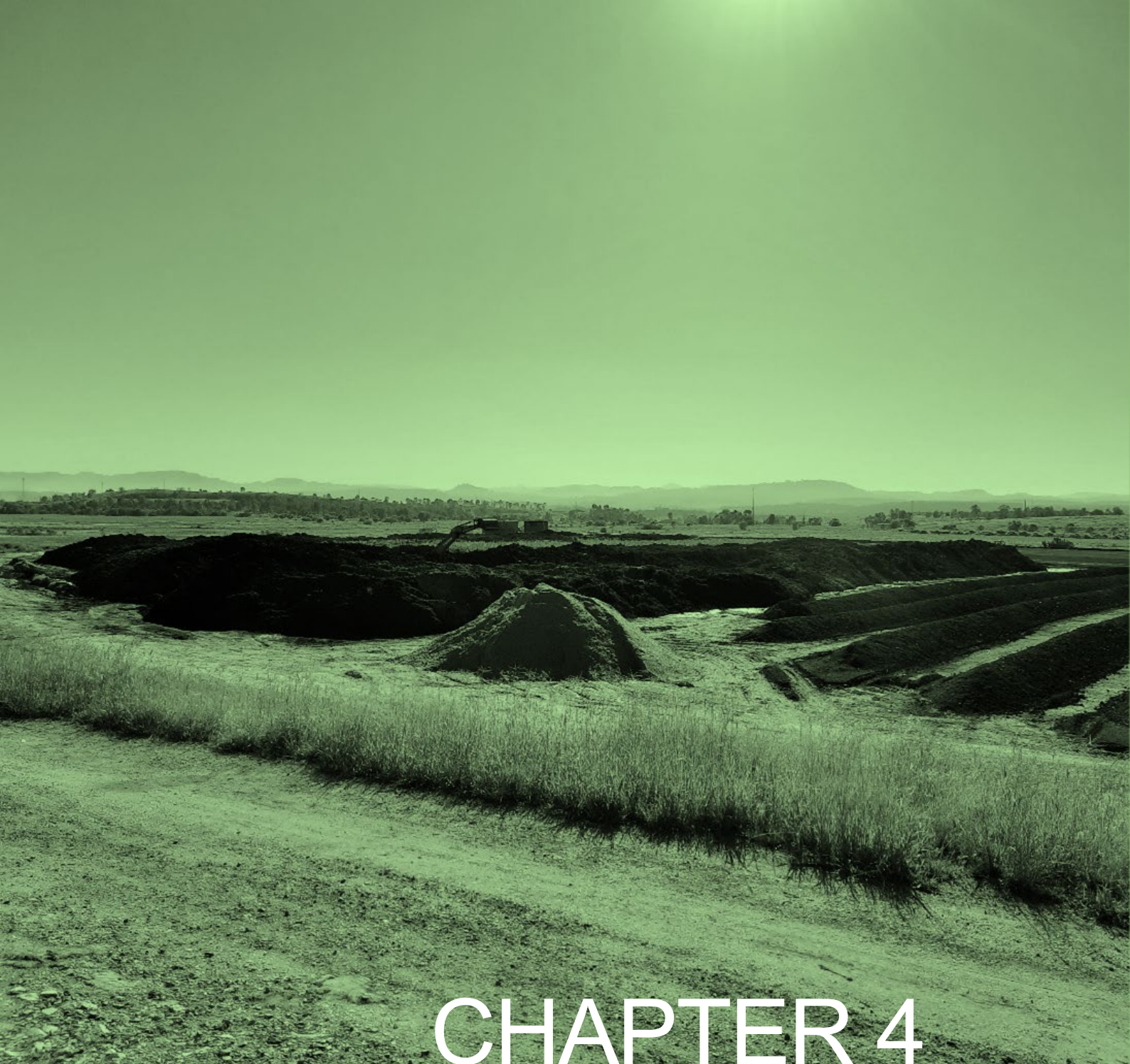
EPL 7654 authorises the carrying out of scheduled and fee-based activities at the premises, as summarised in Table 3.2.

Table 3.2 Scheduled activities authorised by EPL 7654

Scheduled activity	Fee based activity	Scale
Composting	Composting	>50000 T annual capacity to receive organics

Condition L3.1 of EPL 7654 specify the types of waste that may be received for composting at the site. Condition L3.2 states that the maximum amount of waste that may be received at the facility per year is 200,000 t.

Subject to the approval of this modification application, Bettergrow will request a variation to the EPL in consultation with the EPA, to include the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material, VENM and ENM.



CHAPTER 4

STATUTORY CONTEXT

4 STATUTORY CONTEXT

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary environmental legislation at the Federal level. The EPBC Act is administered by the Australian government DCCEEW, and provides a legal framework to protect and manage national and international important flora, fauna, ecological communities and heritage places, defined under the EPBC Act as MNES. The EPBC Act also confers jurisdiction over actions that have a significant impact on the environment where the actions affect, or are taken on, Commonwealth land.

An action that has, will have or is likely to have a significant impact on a MNES or Commonwealth land may not be undertaken without prior approval from the Australian Minister for the Environment and Water, as provided under Part 9 of the EPBC Act.

The protected matters search tool (PMST) is managed by the Australian government DCCEEW and is used to identify MNES within the proximity of a project. A search was undertaken on 14 April 2025 for MNES and Commonwealth land within a 10 km radius of the site. The results of the search are presented in Table 4.1.

Table 4.1 EPBC Act Protected Matters

Protected matter	Comments
MNES	
World heritage properties	There are no world heritage properties within 10 km of the project.
National heritage places	There are no national heritage places within 10 km of the project.
Wetlands of international importance (listed under the Ramsar Convention)	The site is between 50 km and 100 km from two wetlands of international importance (Hunter Estuary Wetlands). The project is not expected to result in any potential impacts on these wetlands (refer to Section 6.3).
Listed threatened species and ecological communities	Eight TECs may occur within 10 km of the site, namely: ▪ Central Hunter Valley eucalypt forest and woodland (critically endangered); ▪ Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (endangered); ▪ Hunter Valley Weeping Myall (<i>Acacia pendula</i>) Woodland (critically endangered); ▪ Lowland Rainforest of Subtropical Australia (critically endangered); ▪ River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (critically endangered); ▪ Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (endangered); ▪ Warkworth Sands Woodland of the Hunter Valley (critically endangered); and ▪ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).

Protected matter	Comments
	A total of 49 nationally listed threatened species, including 19 bird species, 2 frog species, 11 mammal species, 15 plant species and 2 reptile species, may occur within a 10 km radius of the site. The project does not involve the removal of native vegetation. The above-ground diesel tank would be installed on previously disturbed cleared land. The project is not likely to impact any nationally listed threatened species, populations, ecological communities or their habitat (refer to Section 6.3).
Migratory species protected under international agreements	The PMST lists a total of 10 migratory species that may occur within 10 km of the site. The project would not impact on potential habitat for marine bird species (refer to Section 6.3).
Commonwealth marine area	There are no Commonwealth marine areas in the vicinity of the project.
The Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park is not in the vicinity of the project.
Nuclear actions (including uranium)	There are no nuclear actions within the vicinity of the project.
A water resource, in relation to coal seam gas development and large coal mining development	This is not applicable to the project.
Commonwealth land	
Commonwealth land	The project is not located on Commonwealth land. There are two parcels of Commonwealth land (Australian Telecommunications Corporation [12615] and Telstra Corporation Limited [12614]) within 10 km of the project. The project is not expected to result in any potential impacts on this land.

The assessment of the project's impact on MNES and the environment of Commonwealth land, found that there is unlikely to be a significant impact on MNES or on Commonwealth land. Accordingly, the project has not been referred to the Australian government DCCEE under the EPBC Act.

4.1.2 Native Title Act 1993

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land and waters which derive from their traditional laws and customs. Native title may be recognised in places where Indigenous people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, an Indigenous Land Use Agreement or future act agreements.

A search of the National Native Title Tribunal registers, including the National Native Title Register, Register of Native Title Claims, Register of Indigenous Land Use Agreements and Native Title Application, Registration Decision and Determination records, was carried out on 14 April 2025.

No Native Title has been prescribed for the land on which the project is proposed and therefore no further approval is required under the NT Act.

4.1.3 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* provides a single national framework for the reporting and dissemination of information about the greenhouse gas emissions,

greenhouse gas projects, and energy use and production of corporations. It makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

The facility does not trigger any of the thresholds for reporting under the NGER Act (refer to Section 6.2.5).

4.2 NSW legislation

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of legislation governing the assessment and determination of development applications in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning and Public Spaces, statutory authorities and local councils.

Section 4.55 of the EP&A Act sets out the requirements for modifications to existing development consents. Bettergrow is seeking to modify the existing development consent under Section 4.55(1A) of the EP&A Act, which provides for modifications involving minimal environmental impact. A summary of how the project meets the criteria for a modification under Section 4.55(1A) is provided in Table 4.2.

Table 4.2 Section 4.55 (1A) modification requirements

Clause and requirements	Response/reference
(1A) Modifications involving minimal environmental impact: A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if—	
(a) it is satisfied that the proposed modification is of minimal environmental impact, and	The expected environmental impacts of the proposed modification are considered minimal (refer to Chapter 6).
(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and	The project is considered substantially and materially the same development as originally approved (and as modified) for the following reasons: ▪ The project would not materially change the nature and purpose of the approved facility as the facility already receives and processes a wide range of organic material. ▪ The project would not increase the approved or licenced volumes of organic recovered materials received or processed at the facility. ▪ The project is within the approved consent boundary and would be confined to an area previously disturbed and currently utilised by the facility operations. ▪ The project does not involve any changes to the approved plant and equipment, vehicle movements or hours of operation, and involves only a minor change to site infrastructure (installing of an additional above ground diesel tank). ▪ The project would not change any of the administrative or specific environmental conditions as described in Part A and Part B of the development consent, other than to change the type of organic material received and processed at the facility (conditions A6 and A7 in Part A).

Clause and requirements	Response/reference
	The environmental and social impacts associated with the project are expected to be minimal, and not significantly greater than those already approved (refer to Chapter 6). Therefore, the project would not be considered to result in a 'radical transformation' of the approved development.
(c) it has notified the application in accordance with – (i) the regulations, if the regulations so require, or (ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and	In accordance with Section 105 of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation), Section 4.55(1A) SSD modification applications are not required to be notified or advertised, but it is expected that it will be made publicly available on the Major Projects portal. The site has been operating under EPL 7654 issued by the EPA since September 2000. Subject to the approval of this modification application, Bettergrow will request a variation to the EPL in consultation with the EPA, to include the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material, VENM and ENM. DPHI will provide a copy of the modification application to the EPA.
(d) it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.	DPHI will need to consider any submissions received in relation to the proposed modification.
Subsections (1), (2) and (5) do not apply to such a modification.	
(3) In determining an application for modification of a consent under this section, the consent authority must take into consideration such of the matters referred to in section 4.15(1) as are of relevance to the development the subject of the application. The consent authority must also take into consideration the reasons given by the consent authority for the grant of consent that is sought to be modified.	The relevant matters for consideration are addressed in this table. The proposed modification will not alter or impact the reasons given by the consent authority for the granting of development consent 'SSD-9418'.
(4) The modification of a development consent in accordance with this section is taken not to be the granting of development consent under this Part, but a reference in this or any other Act to a development consent includes a reference to a development consent as so modified.	Noted.

Prior to the preparation of this modification report, DPHI was consulted regarding the most appropriate planning approval pathway for the proposed modification (refer to Section 5.1.1). DPHI confirmed that the modification application should be submitted and assessed under Section 4.55(1A) of the EP&A Act, as the development (as modified) will be substantially the same development as the development for which consent was originally granted and will result in minimal environmental impact. It was confirmed with DPHI that SEARs are not required for the modification.

Section 4.55(3) of the EP&A Act requires the consent authority to take into account those matters under Section 4.15(1) of the EP&A Act that are of relevance to the proposed modification. The relevant matters for consideration under Section 4.15(1) of the EP&A Act are addressed in Table 4.3.

Table 4.3 Section 4.15(1) evaluation

Section and requirement	Comment
4.15(1) Matters for consideration – general In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application: (a) the provisions of -	-
(i) any environmental planning instrument, and	All relevant environmental planning instruments are considered in Section 4.2.3.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and	There are no applicable draft instruments for consideration.
(iii) any development control plan, and	Section 2.10 of the SEPP (Planning Systems) 2021 (Planning Systems SEPP) states that development control plans (DCPs) do not apply to SSD. As such, it is not a mandatory requirement for the proposal to be assessed against the Singleton DCP 2014.
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and	There is no Voluntary Planning Agreement (VPA) or draft VPA that applies to the modification proposal or the site.
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),	Refer to Section 4.2.2.
(v) (Repealed)	-
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	Refer to Chapter 6.
(c) the suitability of the site for the development,	The suitability of the site as an organics composting facility was determined through approval of SSD-9418. As shown by the recent environmental audit and compliance report results (refer to Section 1.5), the existing approved operations have been performing in accordance with the requirements of SSD-9418 and EPL 7654. The results indicate that the site is highly suitable for the existing composting operation and that the operation is being managed appropriately. The site remains suitable for the proposed modification as: - no changes are required to the existing throughput of the facility, development footprint, composting processes, site infrastructure, plant, equipment, vehicle movements, workforce or operating hours; - the modification is unlikely to result in any adverse environmental impacts as the site is located in a highly disturbed environment in a mining complex, a significant distance (approximately 6

Section and requirement	Comment
	km) away from sensitive receivers (refer to Chapter 6); - any potential impacts can be adequately minimised and managed through the existing site-specific mitigation and management measures; and - the modified development is expected to maintain its high level of compliance.
(d) any submissions made in accordance with this Act or the regulations,	Bettergrow will respond to any government agency or public submissions received that DPHI requests a response to.
(e) the public interest.	The proposed modification is considered to be in the public interest, as discussed in Section 2.4.1.

4.2.2 Environmental Planning and Assessment Regulation 2021

Section 100(1) of the EP&A Regulation outlines the requirements for modification applications. Table 4.4 lists the relevant requirements and where they have been addressed in this report.

Table 4.4 Requirements of Section 100(1) of the EP&A Regulation

Clause requirement	Comments
(1) A modification application must contain the following information—	
(a) the name and address of the applicant,	Section 1.2
(b) a description of the development that will be carried out under the consent,	Section 1.3 and Chapter 3
(c) the address and folio identifier of the land on which the development will be carried out,	Section 2.1.1
(d) a description of the modification to the development consent, including the name, number and date of plans that have changed, to enable the consent authority to compare the development with the development originally approved,	Chapter 3
(e) whether the modification is intended to— (i) merely correct a minor error, misdescription or miscalculation, or (ii) have another effect specified in the modification application,	Section 4.2.1
(f) a description of the expected impacts of the modification,	Chapter 6
(g) an undertaking that the modified development will remain substantially the same as the development originally approved,	Section 4.2.1
(h) for a modification application that is accompanied by a biodiversity development assessment report—the biodiversity credits information,	N/A
(i) if the applicant is not the owner of the land—a statement that the owner consents to the making of the modification application,	Landowner's consent is required from AGL for the modification application.
(j) whether the modification application is being made to— (i) the Court under the Act, section 4.55, or (ii) the consent authority under the Act, section 4.56.	The application is being made to the consent authority under Section 4.55(1A) of the EP&A Act.

4.2.3 Environmental Planning Instruments

The relevant environmental planning instruments (EPIs) considered in relation to the proposed modification are summarised in Table 4.5.

Table 4.5 Relevant EPIs

SEPP	Overview
State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP)	Section 2.6 and Schedule 1 of the Planning Systems SEPP declare certain development to be SSD. The existing facility currently receives and processes up to 200,000 tpa of organic recovered material. The current development is classified as SSD under Part 4, Division 4.7 of the EP&A Act, in accordance with the categories and thresholds listed under clause 23(3) of Schedule 1 of the Planning Systems SEPP, being: ‘23 Waste and resource management facilities (3) Development for the purpose of resource recovery or recycling facilities that handle more than 100,000 tonnes per year of waste’ The proposed modification does not involve any changes to the approved volume of organic recovered material received and processed at the facility and remains appropriately characterised as SSD.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP)	Chapter 2 of the Biodiversity and Conservation SEPP aims to protect and preserve trees and other vegetation in non-rural areas of the State. Section 2.3 of the Biodiversity and Conservation SEPP identifies the land to which Chapter 2 of the SEPP applies. The Singleton LGA is not listed in Clause 2.3(a) and therefore the provisions of Chapter 2 of the SEPP do not apply to the modification. It is not proposed to clear any vegetation as part of the proposed modification.
State Environmental Planning Policy (Transport & Infrastructure) 2021 (TISEPP)	The TISEPP provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. It further specifies when consent is (and is not required) for infrastructure development when carried out in certain zones. The current development was deemed permissible with consent under clause 2.153(2)(a) of the TISEPP, as the development is considered a waste or resource management facility for the purposes of the Transport and Infrastructure SEPP, and is located on land zoned as RU1 (Primary Production), defined as a ‘prescribed zone’ under Section 2.152 of the TISEPP. The project would not change the classification of the development as a waste or resource management facility or the permissibility of the development under the TISEPP. Under Section 2.122 of the TISEPP, Council is required to provide written notice of development applications for certain traffic-generating developments listed in columns 2 and 3 of Schedule 3 of the TISEPP to Transport for NSW, and consider any response to the notice that is received from Transport for NSW within 21 days after the notice is given. The project is classified as traffic-generating development under Schedule 3 of the TISEPP, as it involves an increase in processing capacity at a resource management facility that has direct access to a road. The project would not result in an increase in traffic (refer to Section 6.3).
State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)	Chapter 3 of the Resilience and Hazards SEPP requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. Potentially hazardous or offensive development is defined by the Resilience and Hazards SEPP as development which poses a significant risk to, or which would have a significant adverse impact on, human health, life, existing or likely future development or the

SEPP	Overview
	biophysical environment, when all measures proposed to reduce or minimise its impacts have been implemented. The preliminary risk screenings conducted for the SSD EIS and Modification 1 Statement of Environmental Effects (SEE) (SpaceUrban, 2023) concluded that the proposed developments would not be classified as a potentially 'offensive' or 'hazardous' development in accordance with the SEPP 33 Guidelines. A Preliminary Hazard Assessment (PHA) was not required for the EIS or Modification 1 SEE under the Resilience and Hazards SEPP. The project would install a 65,000 L above ground self-bunded portable diesel tank adjacent to the existing 5,000 L diesel tank. No other changes to the existing storage, handling or management of hazardous substances or dangerous goods at the site are proposed. The project would not change the risk screening analysis of the existing development, as diesel on-site would be stored within a self-bunded tank and would not be stored with other flammable/combustible liquids/materials, and it is therefore not considered a potential hazardous substance under the SEPP 33 Guidelines (refer to Section 6.3). A PHA is not required to support the modification application under the Resilience and Hazards SEPP. Chapter 4 of the Resilience and Hazards SEPP aims to provide a State-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by considering contaminated land as part of the planning process. Under Section 4.6 of the Resilience and Hazards SEPP, a consent authority must not consent to the carrying out of development on land unless it has considered potential contamination issues. Waste storage and treatment is listed in Table 1 of <i>Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land</i> (Department of Urban Affairs and Planning, 1998) as an activity that may cause contamination. Despite this, there is no known contamination on the site and no duty to report contamination to the EPA under Section 60(3) of the CLM Act (refer to Section 2.2.6). The project is not expected to result in any additional contamination risks at the site (refer to Chapter 6). On the basis that the site has previously been found to be suitable for its current use, it is considered that the project is consistent with the requirements of the Resilience and Hazards SEPP and that it can be determined without further contamination assessment.
Singleton LEP	The site is zoned RU1 (Primary Production) under the Singleton LEP. Resource recovery facilities are not defined as 'permitted without consent' or 'permitted with consent' in land use zone RU1 (Primary Production), and is thereby considered prohibited development in this land use zone. However, the TISEPP prevails over the Singleton LEP where there is inconsistency between the two EPIs (refer to Section 2.7 of the TISEPP). The project would not change the permissibility of the development under the TISEPP, as discussed above.

4.2.4 Other NSW legislation

Approvals that were required for the approved development under other NSW legislation, in addition to the approval required under Part 4 of the EP&A Act, are summarised in Chapter 5 of the SSD EIS. These approvals are replicated in Table 4.6 below and any changes to the requirements resulting from the project are noted.

The only notable changes will be the requirement for:

- a variation to the existing EPL to include decontaminated and pasteurised FOGO and/or food recovered material, VENM and ENM as acceptable compost feedstock; and
- a specific resource recovery order and exemption under the POEO Regulation to permit the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material on-site.

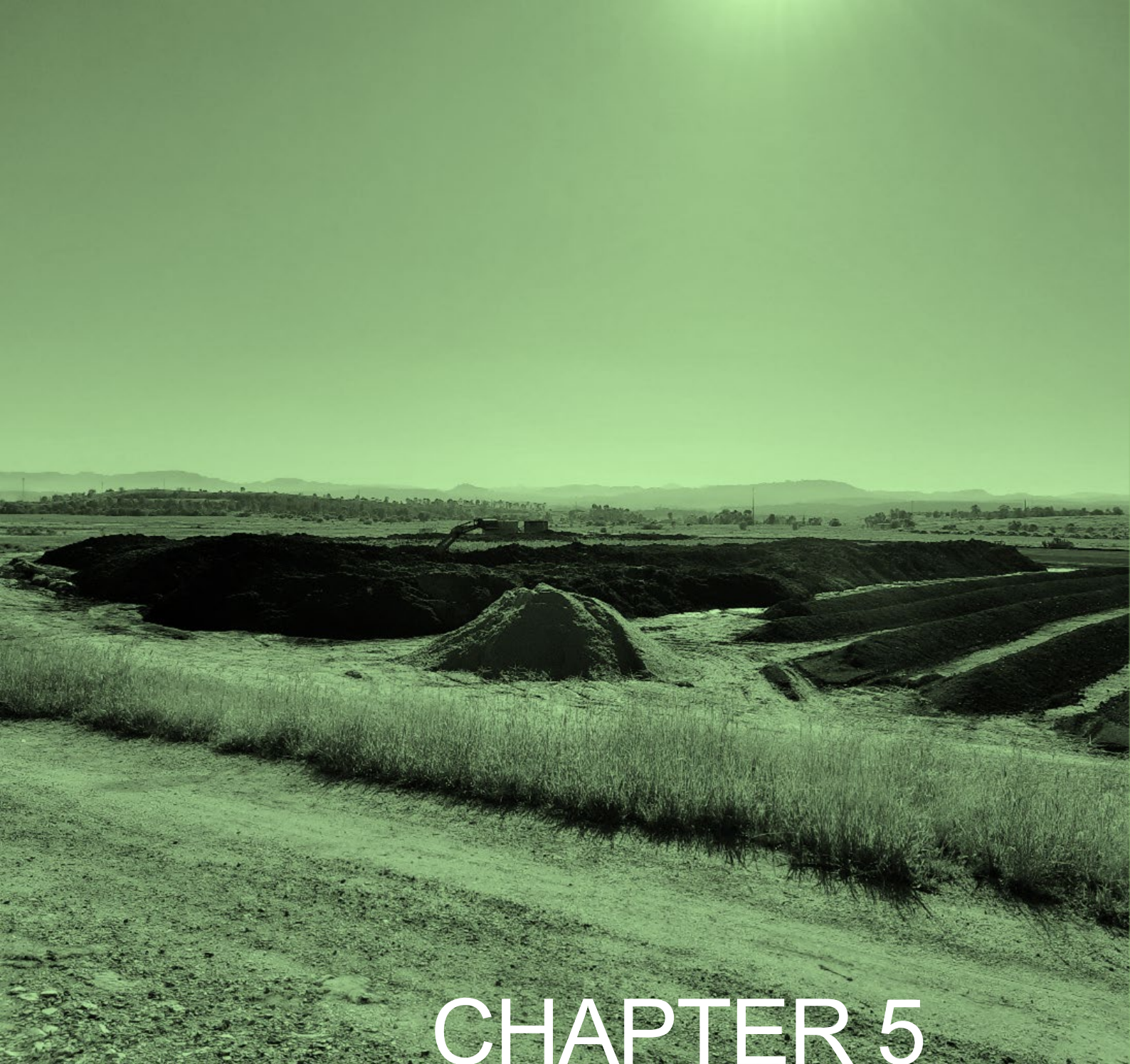
Bettergrow will submit an application to the EPA for a specific resource recovery order and exemption under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, to permit the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material on-site.

Schedule 1, Clause 9(1) of the POEO Act indicates that 'petroleum products storage', which would include diesel fuel storage, is a scheduled activity. The capacity to store more than 2,000 t of diesel requires an EPL under Part 3.2 of the POEO Act. The total on-site storage capacity of 59 t (based on 1,186 kL per tonne (KPMG, 2025)) would not trigger the requirement for an EPL under the POEO Act.

The Work Health and Safety Regulation 2017 (WHS Regulation) provides for the notification of Schedule 11 hazardous chemicals that are used, handled or stored above certain quantities. Where dangerous goods are used or stored in volumes greater than the manifest quantities specified in Schedule 11 of the WHS Regulation, Safework NSW must be notified, which includes the development and maintenance of an on-site manifest and lodgement of an emergency plan to Fire and Rescue NSW. The manifest contains essential information for emergency services of the types, quantities, and locations of hazardous chemicals at a workplace. The volume of diesel fuel storage does not exceed the manifest quantity for C1 combustible liquids (100,000 litres) specified in Schedule 11 of the WHS Regulation. Therefore, notification to Safework NSW is not required.

Table 4.6 Summary of other approvals

Legislation	Authorisation	Consent of approving authority	Change required for modification
POEO Act	EPL for the scheduled activity 'composting'	EPA	The project will require a variation to EPL 7654 to include the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material, VENM and ENM, subject to approval of the modification application.
Protection of the Environment Operations (Waste) Regulation 2014 (POEO Regulation)	Resource recovery order and exemption for decontaminated and pasteurised FOGO and/or food recovered material	EPA	The project will require a specific resource recovery order and exemption under the POEO Regulation to permit the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material on-site.



CHAPTER 5

COMMUNITY AND STAKEHOLDER ENGAGEMENT

5 COMMUNITY AND STAKEHOLDER ENGAGEMENT

5.1 Government agencies

Bettergrow and Element have consulted with DPHI, the EPA and Council in relation to the proposed modification, as discussed in the following sections. Consultation with Transport for NSW is not required as the proposed modification will not generate additional traffic or result in any additional traffic or transport related impacts.

5.1.1 DPHI

Bettergrow and Element held an online scoping meeting with the DPHI's Industry Assessments team on 10 April 2025, to inform the team about the proposed modification and confirm the approval pathway, scope of the impact assessment and consultation requirements.

At this meeting, it was agreed that:

- Element would progress Modification 2 as a Section 4.55(1A) modification application.
- The proposed scope of the environmental assessment, as outlined in the Scoping Letter, is acceptable to DPHI.
- The modification report will need to demonstrate that the modification will have a minimal impact on the environment, specifically in relation to potential air quality, leachate management and contamination impacts (refer to Sections 6.2 and 6.3).

Following the scoping meeting, DPHI officers confirmed in an email dated 29 April 2025 that the proposed modification would fall within the scope of a Section 4.55(1A) modification.

5.1.2 EPA

Bettergrow and Element held an online meeting with the EPA on 2 June 2025 to introduce the modified project and discuss the scope of the environmental assessment.

Issues raised by the EPA and sections where these have been addressed are summarised in Table 5.1.

Table 5.1 Issues raised by EPA

Issue	Section(s) where addressed
Relevant advice previously provided by the EPA on the SSD EIS and Submissions Report (Space Urban, 2022a) should be considered, including:	
▪ Describe odour mitigation and management measures.	Section 6.2 and Appendix C
▪ Benchmark odour mitigation and management measures against best practice (including the enclosure or covering of food waste composting).	Sections 2.4.2 and 6.2 and Appendix C
▪ Provide sample testing reports to verify emission rates from site sampling.	Section 6.2
▪ Consider cumulative odour impacts resulting from the neighbouring compost facility.	Section 6.2
▪ Assess the model generated meteorological data used in the dispersion assessment against longer term (minimum five years)	Section 6.2

Issue	Section(s) where addressed
meteorological data as required in the Approved Methods.	
The dust assessment should assess PM_{2.5} and correctly referenced the guideline.	Section 6.2
Detail the expected quantity of each waste type proposed to be accepted at the premises, including the state of the waste received (i.e. raw, screened, processed, pre-blended, partially composted etc.).	Section 3.5
The EPA generally requires any processing or composting of food wastes to be conducted within an enclosed space. If the applicant wishes to deviate from this standard, it will be required to provide justified alternatives that can demonstrate the same level of control gained by enclosing the operation.	Sections 2.4.2 and 6.2
Include the categorisation of the various organic wastes proposed to be accepted.	Sections 1.3.5, 3.3, 3.4 and 3.5
The key issues for the project are potential odour impacts, including cumulative odour impacts, and stormwater and leachate management.	Sections 6.2 and 6.3
Modelling and assessment of impacts should be undertaken in accordance with EPA approved methods.	Section 6.2

5.1.3 Council

Bettergrow and Element held an online meeting with a representative of Council's planning team on 28 August 2025, to inform the team about the proposed modification and obtain any feedback from Council on potential environmental risks.

Council requested that relevant advice previously provided by the Council on the SSD EIS and Submissions Report (Space Urban, 2022a) should be considered. These issues and the sections where they have been addressed are summarised in Table 5.2.

Table 5.2 Issues raised by Council

Issue	Section(s) where addressed
Clarification on the interaction between the existing and future approval requirements, including the management plans and controls that will be required.	Chapter 6
Potential impacts of the existing and proposed development on surrounding land uses, including future land use.	Sections 1.5 and 6.3
The surface and groundwater management plan should be updated to support the proposed development.	Section 6.3
Adequacy of existing stormwater and leachate management systems to manage leachate generated by the proposed development.	Sections 1.5 and 6.3
Prevention measures that will be implemented to prevent material/matter being tracked by vehicles from the site.	Sections 1.5 and 6.3
Prevention measures that will be implemented to prevent material entering the waterways and groundwater system.	Sections 1.5 and 6.3
Information is required regarding the use and management of the vehicle wash-down bay,	Section 1.5

Issue	Section(s) where addressed
including how the bay will be monitored to ensure all vehicles utilising it are minimising the risk of material being transported off site.	
Measures that will be implemented to prevent soil contamination, particularly from fuel and chemical storage areas, and materials brought into the facility.	Section 6.3
Structural integrity of the leachate and surface water containments, seepages and leakage.	Section 1.5
Adequacy of controls in water management plans to mitigate impacts of the proposed development.	Section 1.5 and Chapter 6
Potential cumulative odour impacts from a different array of material sources should be assessed and where required additional controls implemented.	Section 6.3
The existing management plans and controls should be updated with the new waste types.	Section 6.3
Further information is required on the management of residual wastes generated at the site, including expected contamination rates and management.	Section 6.3
More information on the decommissioning and rehabilitation of the site once operations cease. Council and the community should be consulted during these phases of the facility.	Section 3.13 and Chapter 7 of the SSD EIS
The existing facility is located within a Phylloxera Exclusion Zone, and Council notes that material imported into the facility can come from area that are Phylloxera infested, including the Sydney Basin. Council requires clarification on the current and future proposed controls for ensuring that the facility and its products will be Phylloxera free and will not pose any risk to the internationally recognised viticultural region of the Hunter Valley, including pathogen management and any adaptive management responses should Phylloxera be detected at the site.	Refer to the existing OEMP, Composting Management Plan and <i>Transport Management Plan for Part A & Part B of CA-05 Biosecure Transport of Host Plant Material Bettergrow Ravensworth Compost Facility</i> (Bettergrow, 2023)
Adequacy and effectiveness of existing controls to manage and mitigate potential cumulative dust impacts due to vehicle movements.	Sections 1.5 and 6.3
Adequacy or effectiveness of the existing controls, or the ability of these controls to manage and mitigate the potential impacts of the proposed development.	Section 1.5 and Chapter 6

5.2 Local community and stakeholders

Bettergrow undertook consultation with key stakeholders and the local community during preparation of the modification report. A project factsheet was mailed to surrounding mine operators and businesses, and residents in Camberwell. A total of 66 copies were distributed. The factsheet:

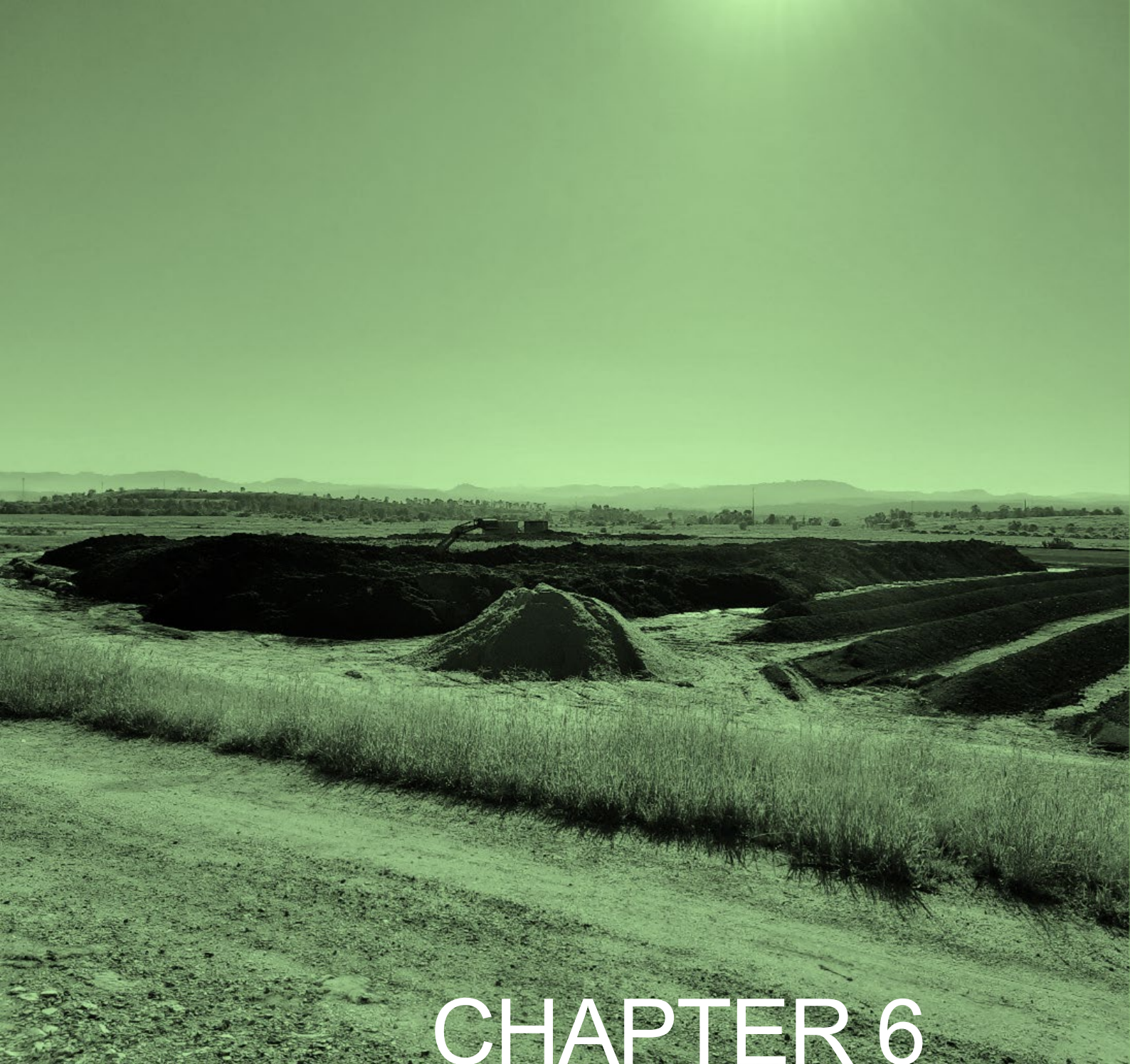
- identified the proponent;
- outlined the planning approval history for the facility and justification for the proposed modifications;
- summarised the proposed modifications for the facility (including Modification 3 described in Section 1.4);
- outlined the statutory planning process;

- invited feedback and provided contact details for feedback.

At the time of writing, no feedback on the letter has been received.

5.3 Landowner's consent

Landowner's consent is required from AGL for the modification application.



CHAPTER 6

ASSESSMENT OF IMPACTS

6 ASSESSMENT OF IMPACTS

6.1 Introduction

The key environmental issues associated with the approved development were assessed in detail in the SSD EIS.

As required by Section 4.55(3) of EP&A Act, DPHI is to take into account those matters listed under Section 4.15(1) of the EP&A Act (as relevant) when determining an application to modify an existing development consent.

Section 4.15(1)(b) of the EP&A Act requires the consent authority to consider the following:

‘The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.’

This chapter summarises the likely impacts of the project, including environmental impacts on both the natural and built environments, and social and economic impacts on the locality.

Environmental risks were analysed prior to the preparation of this modification report to identify the key potential environmental impacts associated with the project. Potential air quality impacts is considered to be the key issue associated with the project and is considered further via a detailed assessment provided in Section 6.2.

Low-risk environmental aspects were considered via a standard assessment and are summarised in Section 6.3.

6.2 Air quality

An assessment of potential dust, greenhouse gas and odour impacts of the approved development was provided in Appendix G and Section 9.1 of the SSD EIS.

6.2.1 Methodology

The potential impacts on air quality associated with operation of the project are assessed in the Air Quality Impact Assessment (Todoroski Air Sciences, 2025) provided in Appendix C. The findings of the report are summarised in this section.

The air quality impact assessment has been undertaken in accordance with the following guidelines:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA Approved Methods) (EPA, 2022b);
- *Technical framework – Assessment and management of odour from stationary sources in NSW* (NSW Department of Environment and Conservation (DEC), 2006); and
- *NSW Guide for Large Emitters* (NSW Guide for Large Emitters) (EPA, 2025b).

The assessment involved:

- reviewing publicly available air quality monitoring data, local topography and climate and meteorological data, to characterise the background air quality environment and identify the topographic features and climate and meteorological conditions that may influence air quality;
- identifying sensitive receivers for air quality in the surrounding area;
- identifying the main types and sources of air emissions during operation;
- estimating emission rates from each air emission source. Odour monitoring was undertaken at the Valoriza composting facility in Dandenong South, Victoria, to establish odour emission rates of the decontaminated and pasteurised FOGO and/or food recovered material (refer to the 'Odour assessment' section below);
- developing an air dispersion model using a combination of the CALPUFF modelling system and the Weather Research and Forecasting model (WRF) for a potential worst-case operating scenario to determine the extent and severity of potential air quality impacts. The 2017 calendar year was selected as the meteorological year for dispersion modelling based on an analysis of long term data trends in meteorological data recorded for the area;
- quantitatively analysing and assessing operational air quality with reference to measured background levels, including cumulative impacts;
- quantitatively estimating operational greenhouse gas emissions; and
- identifying management and mitigation measures required to avoid, minimise, and manage any potential air quality impacts during the project's construction and operation.

Dust emissions

The project is not expected to result in any noticeable changes in dust emissions as:

- the installation of the above ground fuel tank would involve only very minimal ground disturbance to level the ground surface;
- no changes are proposed to the existing approved and licenced volumes of organic material received and processed at the facility;
- decontaminated and pasteurised FOGO and/or food recovered material, VENM and EMN are not expected to generate more dust than the organic material currently accepted and processed at the site.

As such, dust emissions have not been considered further in the assessment. No changes are required to the existing dust mitigation and management measures outlined in the OEMP.

Odour assessment

The odour assessment is based on the following conservative assumptions:

- The entire processing pads area acts as an odour source. In practice, some of this area is used for vehicle access and spacing between windrows.
- A portion of the modelled composting processing and blending area comprises fresh (less than 24 hours old) decontaminated and pasteurised FOGO and/or food recovered material (when the odour levels are the highest, as discussed in Section 6.2.3). In practice, decontaminated and pasteurised FOGO and/or food recovered material is more likely to arrive on-site more than 24 hours after it was removed from the pasteurisation tunnels, with odour levels significantly reduced to existing odour levels on-site (refer to Section 6.2.3).

Odour emission rates for the modelled odour sources have been estimated based on site-specific odour monitoring at the facility and at another facility that receives and processes decontaminated and pasteurised FOGO and/or food recovered material.

Site-specific odour monitoring was undertaken at the facility in 2015 and 2018, at windrows containing garden organic material and biosolids at various maturation stages, as detailed in the *Greenhouse gas, odour and dust assessment* (Advanced Environmental Dynamics, 2019) of the SSD EIS. The recorded odour emission rates are considered representative of the current operations.

Additional odour monitoring was undertaken by Ektimo Pty Ltd (Ektimo) on 13 June and 6 August 2025 at the Valoriza composting facility in Dandenong South, Victoria, to obtain emission rates of decontaminated and pasteurised FOGO recovered material. The odour monitoring report (Ektimo, 2025) is provided in Appendix B of Appendix C.

The Valoriza facility receives and processes raw FOGO material from kerbside collections and commercial sources. Once the raw FOGO material is received, it undergoes decontamination which consists of picking, sorting and shredding the material to remove contaminants such as hazardous materials, metals, packaging materials and plastics, and blending the material into a more homogeneous mixture. The material is then stockpiled before it undergoes pasteurisation. Pasteurisation involves loading decontaminated material into sealed tunnels, where the material is held for approximately four weeks and aerated to support biological breakdown. Once the pasteurisation process has finished, the material is unloaded from the tunnels and formed into windrows.

Odour monitoring was conducted using an Isolation Flux Chamber (IFC) in accordance with Australian/New Zealand Standard (AS/NZS) 4323.4:2009 *Stationary source emissions - Area source sampling - Flux chamber technique* (Standards Australia, 2009) and the EPA Approved Methods. The IFC method is widely used for emission monitoring across a variety of applications and is commonly employed on surfaces such as soil, water bodies, landfills, compost piles, biosolids, wastewater treatment beds and industrial materials.

Odour monitoring included sampling of the following material:

- two samples of decontaminated FOGO recovered material (3 weeks old at the time of sampling);
- two samples of 1-day old (within 24 hours after removal from tunnel) pasteurised FOGO recovered material; and
- single samples of 2, 5 and 19-day old (2, 5 and 19 days after removal from tunnel) pasteurised FOGO recovered material (to identify any changes in the odour profile over time).

A detailed description of the monitoring methodology is provided in Section 2 of the odour monitoring report (refer to Appendix B of Appendix C). The results of the odour monitoring are summarised in Section 6.2.3.

Greenhouse gas assessment

Greenhouse gas is a collective term that describes a range of gasses that absorb or reradiate outgoing infrared radiation reflected from the Earth's surface that, in turn, influence the global temperatures. This is known as the greenhouse effect. A change in the mix of greenhouse gas can result in a cooling or heating of the current global temperatures. Human activities, including the combustion of carbon-based fuels, have and continue to increase the concentration of greenhouse gas in the atmosphere. This leads to greater absorption of infra-red radiation and an increase in atmospheric temperature.

Greenhouse gasses reported under the National Greenhouse and Energy Reporting Scheme include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Sulphur hexafluoride (SF₆)
- Perfluorocarbons (PFCs)
- Hydrofluorocarbons (HFCs).

Each greenhouse gas behaves differently in the atmosphere with respect to its ability to trap outgoing radiation and its residence time in the atmosphere. To achieve a common unit of measurement each greenhouse gas has been compared to the warming potential of carbon dioxide over a 100 year period. This provides a global warming potential for each greenhouse gas that can be applied to the estimated emissions of the project. The resulting aggregated emissions are referred to in terms of carbon dioxide-equivalent emissions (or CO₂-e).

To help differentiate between greenhouse gas emission sources, emissions are typically classified into the following scopes to help define ownership and the ability to control and influence different emissions sources:

- Scope 1 'direct' emissions include all direct greenhouse gas emissions from sources that are within the project's control boundary (e.g. combustion of fuels on-site, refrigerants);
- Scope 2 'indirect' emissions relate to energy produced outside the project's control boundary but are used in the project. This includes purchased electricity (from the grid), heat, cooling and steam; and
- Scope 3 'indirect' emissions are all emissions that occur as a result of the activities of the project, but occur from sources outside the project's control boundary. This includes upstream or downstream activities (e.g. emissions associated with the extraction and production of materials and the transportation of materials to site).

Although the project is not likely to result in additional greenhouse gas emissions from the new types of organic material that would be received and processed on-site, an updated greenhouse gas assessment has been completed to consider the most recent emission factors and greenhouse gas emission data for Australia.

The assessment focused on the 'modified business' scenario defined in the NSW Guide for Large Emitters that addresses overall sources and emissions associated with the existing operations and the project.

6.2.2 Assessment criteria

Odour

Impacts from odorous air emissions are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve "no odour". The detectability of an odour is a sensory property that refers to the theoretical

minimum concentration that produces an olfactory response or sensation. This point is called the odour threshold and defines one odour unit (OU). An odour goal of less than 1 OU would theoretically result in no odour impact being experienced.

The level at which an odour is perceived to be a nuisance depends on a combination of factors, including odour quality (individual compounds or mixtures of compounds), odour intensity (concentration of chemical or mix of chemicals), odour frequency, timing and duration (higher levels of short term emissions are likely to be more tolerable than long term emissions at the same level), population sensitivity, background level (that are likely to contribute to cumulative odour impacts), public expectation (e.g. background agricultural odours may not be considered offensive), source characteristics (point or diffuse sources) and health effects.

Odour assessment criteria are designed to take into account the range in sensitivities to odour within the community, and provide additional protection for individuals with a heightened response to odours. This can be done using a statistical approach which depends upon the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent criteria are necessary in these situations. Therefore, the odour assessment criteria allow for population size, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

The NSW criteria for acceptable levels of odour outlined in the EPA Approved Methods range from 2 to 7 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 EPA Approved Methods odour criteria are summarised in Table 6.1.

Table 6.1 Impact assessment criteria for complex mixtures of odorous air pollutants

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (≥ 2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ 2)	7.0

Places where people work, such as the surrounding industrial receivers (e.g. coal mining and composting operations), are not considered to have an equivalent amenity expectation relative to residential locations for the following reasons:

- Industrial receivers primarily have healthy adults present that are fit and capable to undertake work, whereas residential locations may have sensitive individuals present.
- In an industrial precinct, people are exposed to a range of industrial activities that may generate a range of various odours (or chemicals) and would therefore have less sensitivity to specific odours.
- A lower level of amenity is expected in an industrial precinct, due to the nature of the activities occurring within the precinct, and therefore a higher level of odour is generally more acceptable. Any reasonable expectation of comfort while visiting or working in an industrial area is greatly less than what would be expected in a residential home.
- Workers in an industrial precinct are mainly focussed on their work whereas residents in their homes have a greater focus on amenity and the surrounding environment.

For the above reasons, the EPA impact assessment criteria applied at residential receivers are not considered directly applicable to industrial receivers, and a less stringent odour criterion should apply to industrial receivers.

6.2.3 Odour monitoring results

The results of odour monitoring conducted of organic material received and processed at the facility as part of the SSD EIS (Advanced Environmental Dynamics, 2019) are provided in Table 6.2.

The one week old organic recovered material has the highest specific odour emission rate (SOER), followed by the freshly opened compost windrow and the finished compost product.

Table 6.2 Site-specific odour monitoring results (Advanced Environmental Dynamics, 2019)

Material type	SOER (OUV/m ² /s) ¹
Fresh green organic recovered material	0.027
One week old (3 part green organics and 1 part biosolids) organic recovered material	0.045
Five week old (3 part green organics and 1 part biosolids) organic recovered material	0.03
Freshly opened compost windrow	0.041
Finished compost product (3 part green organics and 1 part biosolids)	0.032

1: OUV/m²/s = Odour unit volume per square meter per second

The results of odour monitoring of decontaminated and pasteurised FOGO and/or food recovered material conducted for the project at the Valoriza composting facility are provided in Table 6.3. The SOER of samples taken of raw FOGO recovered material is provided for comparison purposes.

The odour monitoring results indicate variability in the odour emissions from the decontaminated and pasteurised FOGO material, with a clear trend of decreasing odour as the material ages.

The pasteurised FOGO recovered material removed from the tunnels within 24 hours has the highest SOER, followed by decontaminated FOGO recovered material and 2-day old (and older) pasteurised material. However, the SOER of the pasteurised FOGO recovered material decreases significantly 24 hours after it has been removed from the tunnels, as shown in Figure 6.1.

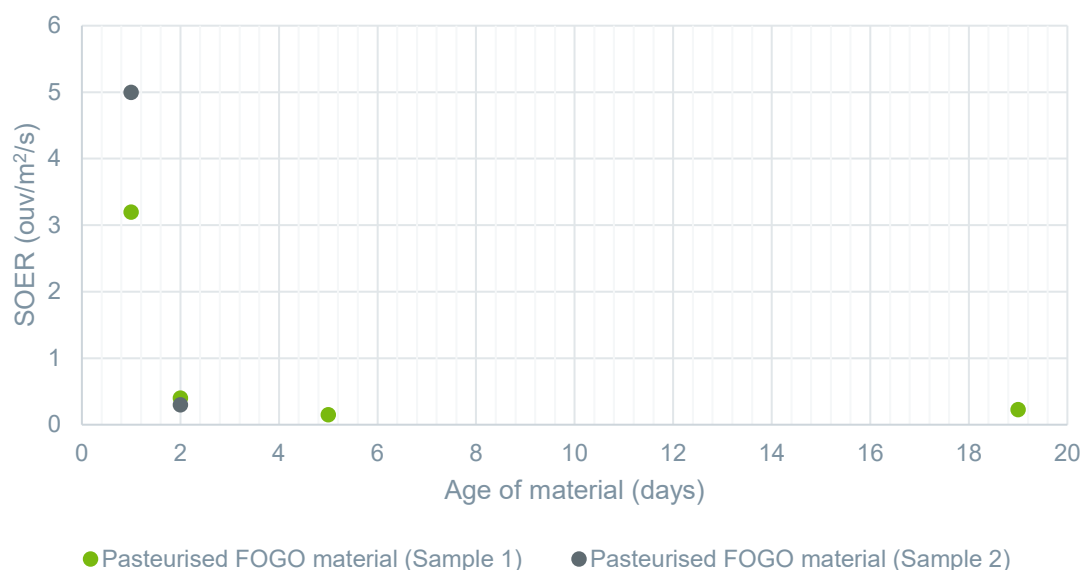
Compared with the existing organic material received and processed at the site, the decontaminated and pasteurised FOGO and/or food recovered material may generate some additional odour in the initial stages, however, odour levels are expected to decline rapidly to existing odour levels at the site as the material matures.

Table 6.3 Valoriza composting facility odour monitoring results

Material type	SOER (OUV/m ² /s) ¹	
	Sample 1	Sample 2
Raw FOGO recovered material	2.0	1.7
Decontaminated FOGO recovered material	0.6	0.4
1-day old decontaminated and pasteurised FOGO recovered material	3.2	5.0
2-day old decontaminated and pasteurised FOGO recovered material	0.4	0.3
5-day old decontaminated and pasteurised FOGO recovered material	0.15	N/A
19-day old decontaminated and pasteurised FOGO recovered material	0.23	N/A

1: OUV/m²/s = Odour unit volume per square meter per second

Figure 6.1 Change in pasteurised FOGO recovered material SOER over time



6.2.4 Existing environment

Sensitive receivers

Sensitive receivers in the surrounding area are described in Section 2.1.3.

Climate and meteorology

Meteorological conditions, particularly temperature, rainfall, relative humidity, wind speed and wind direction, determine the direction and rate at which air emissions disperse from a source.

Local climatic and meteorological conditions were identified using data from the nearest BoM weather monitoring station (with suitable available long term data) at Cessnock Airport (Site No. 061260), approximately 48 km south-west of the site (BoM, 2025b). The weather station has been operating since 1968.

The area is characterised by a temperate climate, with cool winters and warm and wet summers (BoM, 2025c).

Most of the annual rainfall occurs in the summer months, with the average rainfall ranging from 34.2 mm over 4.4 days in August to 98.7 mm over 8.1 days in February. The annual average rainfall is 738.4mm over 74.8 days.

January is the hottest month, with a mean maximum and minimum temperature of 30.4°C and 17.1°C respectively, while July is the coldest month, with a mean maximum and minimum temperature of 17.6°C and 4.2°C respectively (BoM, 2025b).

Relative humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9 am relative humidity ranges from 60% in October to 80% in March and June. Mean 3 pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds exhibit seasonal variations with lower wind speed records for 9 am and higher observations for 3 pm conditions. Mean 9 am wind speeds range from 8.7 kilometres per hour (km/h) in March to 14 km/h in September. Mean 3 pm wind speeds range from 14.2 km/h in May to 19.1 km/h in September.

Wind directions are generally evenly distributed ranging from the east-southeast to south-west on an annual basis with winds greatest from the north-west and north-northwest. During summer,

winds are predominantly from the east-southeast to south. During autumn, winds are mainly from the south-southwest, and in winter, winds from the north-west and north-northwest are most frequent. In spring, winds are predominantly from the north-west and east-southeast.

Ambient air quality

The main sources of air pollutants in the area are emissions from industrial and commercial operations and other anthropogenic sources such as wood heaters and motor vehicle exhausts.

A review of the National Pollutant Inventory (NPI) (DCCEEW, 2025a) identified the following facilities within 5 km that reported to the NPI during the 2023/2024 reporting year:

- Ravensworth Operations open cut mining complex, operated by Glencore Coal, at Lemington Road, Ravensworth, approximately 1 km west of the site.
- Orica Liddell Mining Services Plant, operated by Orica Australia Pty Ltd, at Pikes Gully Road, Liddell, approximately 1.2 km north-east of the site.
- Liddell Coal Operations, operated by Liddell Coal Operations Pty Ltd, at Old New England Highway, Ravensworth, approximately 1.8 km north of the site.
- Glendell Open Cut Mine, operated by Mt Owen Pty Ltd, at 246 Hebden Road, Ravensworth, approximately 3.8 km north-east of the site.

Emissions to air at the Ravensworth Operations open cut mining complex, Liddell Coal Operations and Glendell Open Cut Mine include carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur dioxide (SO₂), particulate matter (PM₁₀ (particulate matter with a diameter of 10 micrometers (µm) or less) and PM_{2.5} (particulate matter with a diameter of 2.5 µm or less)), and Volatile Organic Compounds (VOCs), among other substances. Emissions to air at the Orica Liddell Mining Services Plant include acetic acid (ethanoic acid), Cumen (1-methylethylbenzene) and VOCs.

Additional industrial and commercial activities may be present in the local area beyond those listed on the NPI database that could impact on air quality within the vicinity of the project. However, these activities would operate below the air quality thresholds specified for the relevant industry type and are not required to report under the NPI program.

Other sources of odour in the vicinity of the site include the Loop Organics composting facility at 74 Lemington Road, Ravensworth (approximately 2 km south of the site), operated by Loop Organics Pty Ltd (Loop Organics, 2025). This facility processes up to 55,000 tpa of food organics, garden organics, FOGO, biosolids, grease trap, organic fibrous material and paper crumble, and includes a composting and blending area and leachate dam.

The nearest air quality monitoring station to the project is located in Camberwell, approximately 6 km south-east of the project. Monitoring data suggest that air quality at this location is significantly impacted upon by surrounding mining operations (Advanced Environmental Dynamics, 2019). Exceedances of the ambient air criterion of 50 µg/m³ for the 24-hour average concentration of PM₁₀ is a frequent occurrence at the Camberwell monitoring station with between 4 and 87 exceedance days per year recorded during the 10-year period from 2014 to 2024. No exceedances were recorded in 2022. However, it is noted that the Camberwell monitoring station is a small community monitoring station which is not suitable for assessing performance against the National Environment Protection Measure (NEPM) standards (Advanced Environmental Dynamics, 2019).

Analysis of air quality data from 14 monitoring stations in the Upper Hunter region between 2011 and 2023 (NSW DCCEEW, 2024c) indicated the following:

- Hourly and annual nitrogen dioxide (NO₂) levels were below the NEPM benchmarks (8 parts per hundred million (pphm) and 1.5 pphm respectively) at the larger population centres of Merriwa, Muswellbrook and Singleton in all years.

- Hourly and daily SO₂ levels were generally below the NEPM benchmarks (10 pphm and 2 pphm respectively) at the larger population centres of Merriwa, Muswellbrook and Singleton in all years.
- Annual average PM₁₀ and PM_{2.5} levels increased at all monitoring stations throughout the region, compared to recent record low years, due to low rainfall levels, higher temperatures, drought and bushfire smoke.
- Annual average PM₁₀ levels were below the NEPM benchmark (25 µg/m³) at all stations, except one, in 2023, ranging between 14.2 µg/m³ and 32.5 µg/m³.

Annual average PM_{2.5} levels were below the NEPM benchmark (8 µg/m³) at all stations in 2023, ranging between 4.7 µg/m³ and 7.5 µg/m³. Smoke from domestic wood heaters contributed significantly to particle levels at larger population centres.

Odour emission rates

The main sources of odour emissions at the site include:

- composting processes, including the receipt and blending of the input material streams in the compost windrows, and storage of the final compost product; and
- the leachate control dam.

Odour emission rates for the project were established using a similar approach to that used in previous air quality assessments for the facility (Advanced Environmental Dynamics, 2019; Advanced Environmental Dynamics, 2022), with odour emission rates based on the average of the odour monitoring results applied to the modelled area source. This represents maturation of composting material and associated change in odour profile of the material over time.

The assessment was based on the worst-case assumption that a portion of the modelled composting processing and blending area comprises fresh (less than 24 hours old) decontaminated and pasteurised FOGO and/or food recovered material (when the odour levels are the highest, as discussed in Section 6.2.3).

The odour emission rates for the project adopted for the assessment are presented in Table 6.4. Comparable odour emission rates were applied to the Loop Organics composting facility. Odour emissions from these sources are assumed to remain at a constant rate during the modelling period.

Table 6.4 Odour emission rates for the project and Loop Organics composting facility

Facility	Odour source	SOER (OUV/m ² /s)
Ravensworth composting facility	1-day old decontaminated and pasteurised FOGO and/or food recovered material	4.1
	Composting processing and blending area	0.12
	Leachate dams	1 ¹
Loop Organics composting facility	Composting processing and blending area	0.034
	Leachate dams	1 ¹

1: Obtained from *Greenhouse gas, odour and dust assessment* (Advanced Environmental Dynamics, 2019).

Greenhouse gas emission scenarios and factors

The project would generate greenhouse gas emissions during composting activities and the operation of vehicles, plant and equipment on-site and off-site.

Estimated quantities of materials used to assess greenhouse gas emissions are summarised in Table 6.5. The composting tonnage reflects the currently approved limit (as the project is not proposing an increase in the quantity of material received and processed on-site), and the diesel

and petrol requirements are adopted from the greenhouse gas assessment undertaken for the SSD EIS (Advanced Environmental Dynamics, 2019) (as no increase in diesel or petrol consumption is anticipated).

Table 6.5 Estimated quantities of materials

Material	Quantity
Composting	200,000 t
Diesel	139 kL
Petrol	1.5 kL

Greenhouse gas emission factors outlined in the *Australian National Greenhouse Accounts Factors – For individuals and organisations estimating greenhouse gas emissions* (DCCEEW, 2024b) were applied in the assessment, as outlined in Table 6.6. As the site does not consume electricity, there are no Scope 2 emissions associated with the project.

Table 6.6 Greenhouse gas emission factors

Type	Energy content factor (Gigajoule per kilolitre (GJ/kL))	Emission factor			Units	Scope of emissions
		CO ₂	CH ₄	N ₂ O		
Composting	-	0.046	-	-	Tonnes of carbon dioxide equivalent per tonne of activity (t CO ₂ -e/t)	1
Diesel - stationary	38.6	69.9	0.1	0.2	Kilograms of carbon dioxide equivalent per gigajoule (kg CO ₂ -e/GJ)	1
		17.3	-	-	kg CO ₂ -e/GJ	3
Automotive gasoline/petrol		67.4	0.2	0.2	kg CO ₂ -e/GJ	1
		17.2	-	-	kg CO ₂ -e/GJ	3
Diesel - transport	34.2	69.9	0.07	0.4	kg CO ₂ -e/GJ	3

6.2.5 Potential impacts

Operation

Odour emissions

Potential odour impacts may result from odorous emissions from composting processes, including the receipt and blending of the input material streams in the compost windrows and storage of the final compost product, and the leachate control dam.

There is also the potential for cumulative odour impacts with the Loop Organics composting facility approximately 2 km south of the site.

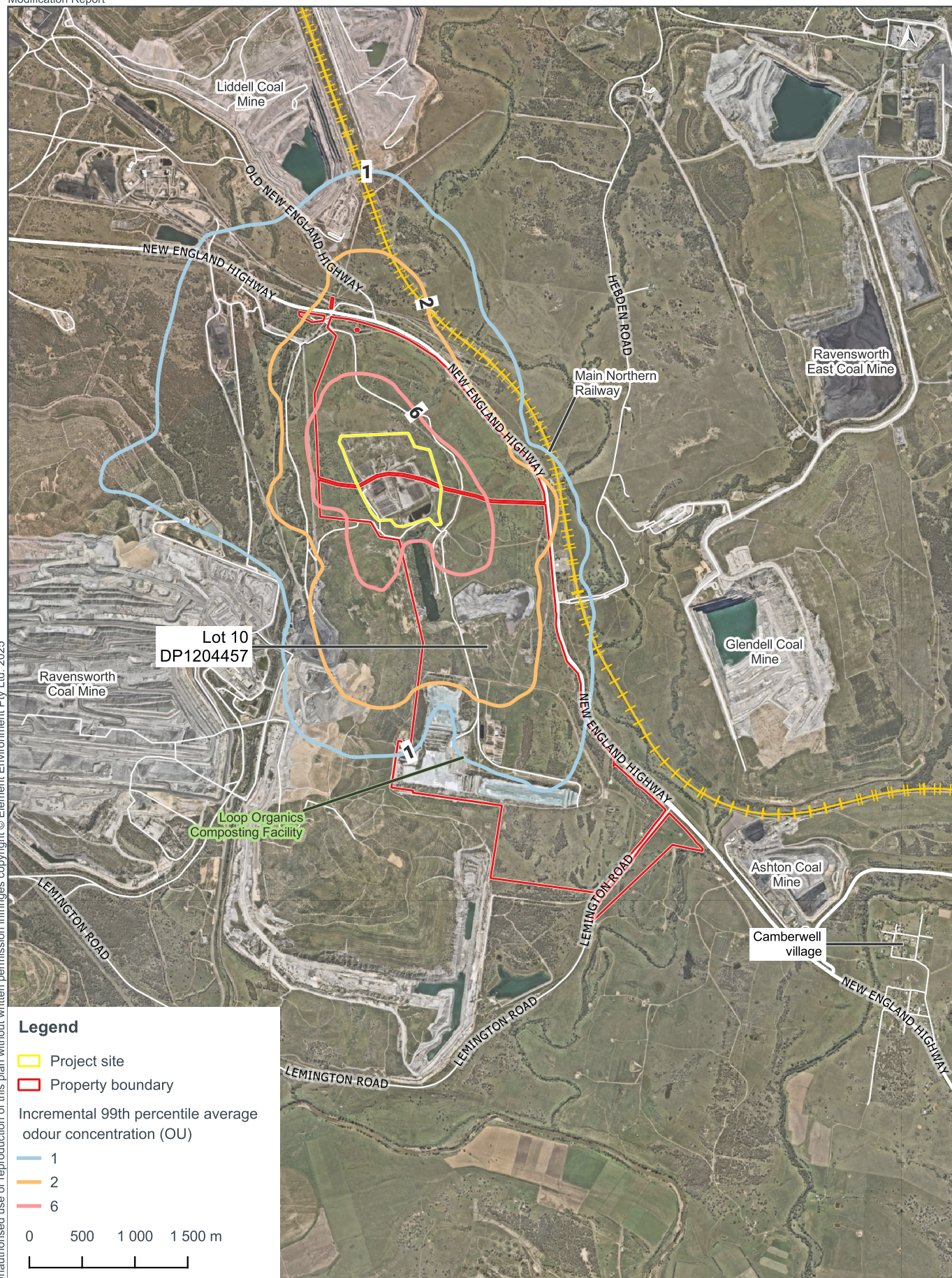
Factors influencing odour emission rates from the open air composting windrows and leachate dam include the physical and chemical characteristics of the raw materials (like carbon, nitrogen, moisture and volatile solids content and particle size), microbiological activity, operational practices (especially windrow turning frequency), environmental conditions (temperature, wind speed, atmospheric stability and humidity), and the use of additives. Specifically, high temperatures, excessive moisture and less frequent turning of the windrows are key contributors to unpleasant odours.

The predicted incremental maximum 99th percentile average odour concentrations for the project are presented in Figure 6.2.

The results indicate that odour levels during operation of the project would be well below the most stringent EPA impact assessment criterion of 2 OU at the nearest sensitive receivers in Camberwell. These results are based on the conservative assumption that the entire processing pads area would act as an odour source and fresh material would be received and processed on-site. In practice, some the processing pads area is used for vehicle access and spacing between windrow piles. In addition, decontaminated and pasteurised FOGO and/or food recovered material is more likely to arrive on-site more than 24 hours after it was removed from the pasteurisation tunnels, with odour levels significantly reduced to existing odour levels on-site. Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

Figure 6.2
Predicted incremental 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 2
Modification Report



The predicted cumulative maximum 99th percentile average odour concentrations for the project, operating in combination with the Loop Organics composting facility, are presented in Figure 6.3. The cumulative odour concentrations associated with the approved facility (as provided in the odour assessment for the Submissions Report) are presented for comparison purposes in Figure 6.4.

The results indicate that cumulative odour levels during operation of the project would remain well below the EPA criterion of 2 OU at sensitive receivers in Camberwell. The project would result in a slight increase in odour levels close to the site, however, changes in odour levels at sensitive receivers in Camberwell are predicted to remain negligible due to their distance from the site. These results are based on the conservative assumptions noted above, including that the entire composting and blending area of the Loop Organics facility would act as an odour source. Odour levels during operation of the project are therefore expected to be lower than the predicted odour levels.

Considering the results above, there is no requirement for additional operational air quality mitigation or management measures. The mitigation and management measures outlined in the Air Quality Management Plan for the facility (Bettergrow, 2024) will continue to be implemented during operation of the project.

Figure 6.3
Predicted cumulative 99th percentile average odour concentration contours

Ravensworth Composting Facility SSD Modification 2
Modification Report

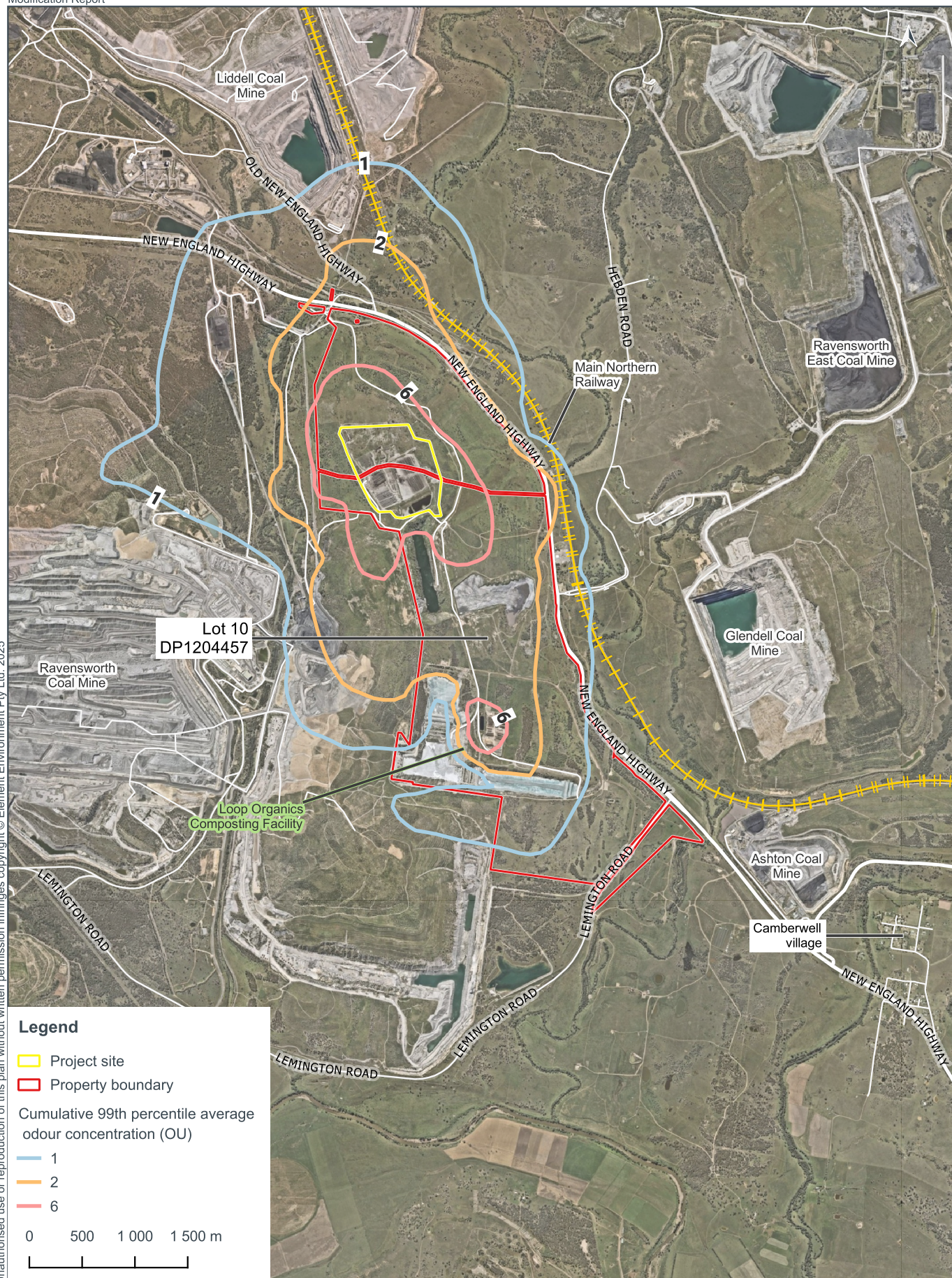
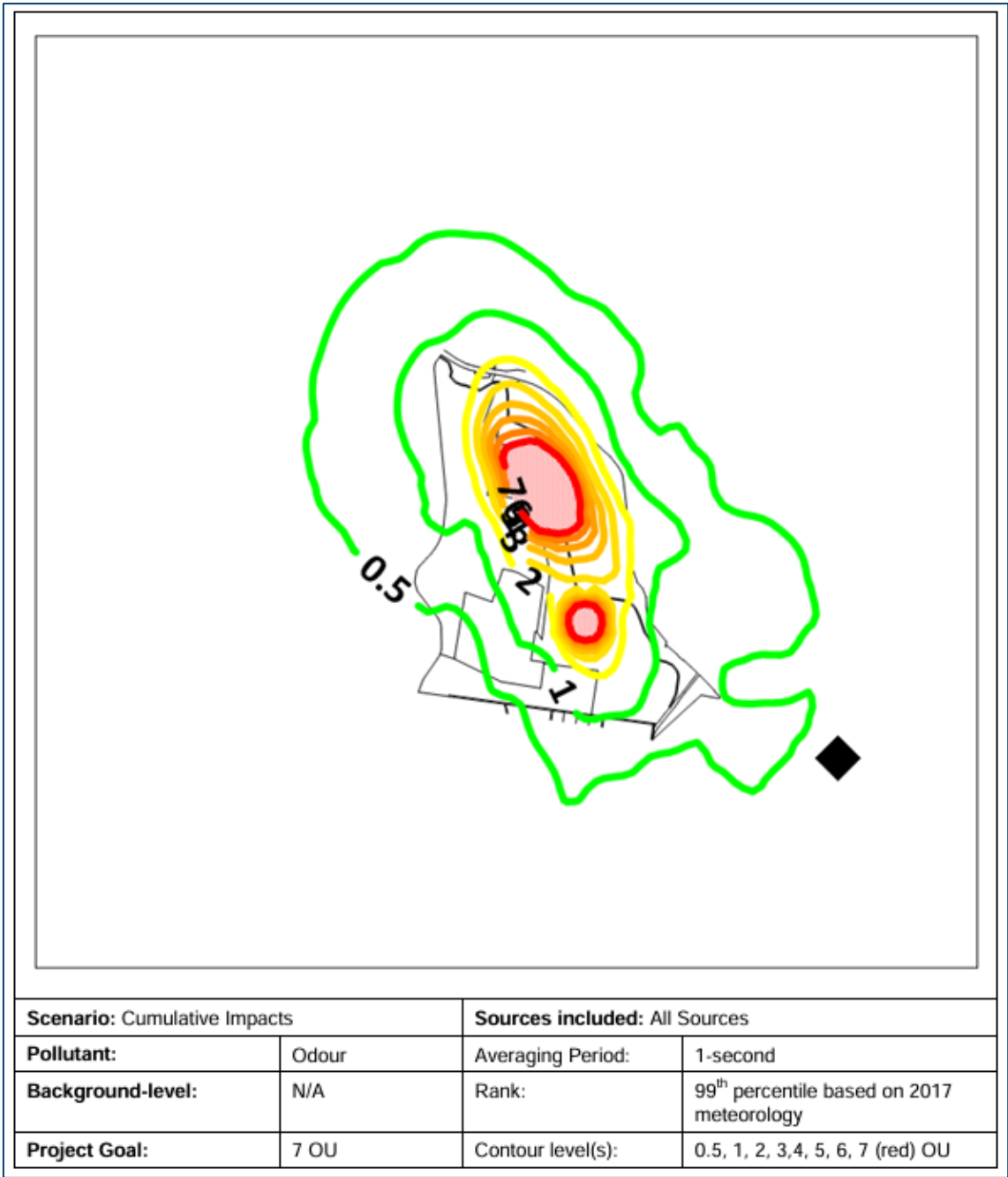


Figure 6.4 Cumulative 99th percentile average odour concentrations for the facility (Advanced Environmental Dynamics, 2022)



Greenhouse gas emissions

The estimated annual average Scope 1 and Scope 3 greenhouse gas emissions for the project are outlined in Table 6.7. There are no Scope 2 emissions associated with the project as the site does not consume electricity. The total estimated Scope 1 and Scope 3 annual average greenhouse gas emissions for the project is 11,477 t CO₂-e.

Table 6.7 Estimated annual average greenhouse gas emissions for the project

Scope of emissions	Description	Greenhouse gas source	Estimated annual average greenhouse gas emissions (t CO ₂ -e)
1	Direct greenhouse gas emissions associated with emissions generated on-site.	Emissions from organic recovered material during composting. Fossil fuel combustion during operation of diesel-powered vehicles, plant and equipment on-site.	9,580
3	Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities and waste disposal.	Emissions from organic material during production of food and garden material. Fossil fuel combustion during the transport of organic recovered material from suppliers to the site and the transport of the finished compost product from the site to customers.	94 1,803
Total			11,477

The estimated annual average Scope 1 greenhouse gas emissions for the project is 0.0096 million tonnes (Mt) CO₂e, which is approximately 0.0022% of the estimated annual Scope 1 greenhouse gas emissions for Australia (440.6 Mt CO₂-e) (DCCEEW, 2024c), and approximately 0.0086% of the estimated annual average greenhouse gas emissions for NSW (111.0 Mt CO₂e) (DCCEEW, 2025c). The project would therefore only make a very minimal contribution to total greenhouse gas emissions in NSW and Australia. Therefore, there are no changes required to the existing mitigation and management measures related to greenhouse gas emissions.

As the estimated Scope 1 emissions for the project are below 25,000 t CO₂-e, the preparation of a detailed greenhouse gas assessment and Climate Change Mitigation and Adaptation Plan is not required for the project, in accordance with the NSW Guide for Large Emitters.

6.3 Other environmental impacts

Other environmental matters that were assessed in the SSD EIS were subject to a desktop assessment to confirm that the proposed modification will not result in any significant changes to the impacts assessed in the original SSD application. The findings of the desktop assessment are summarised in Table 6.8.

Environmental matters that were not assessed in the EIS have not been considered in this report as they will not be impacted by the modification.

Table 6.8 Assessment of other environmental impacts

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
Hazards and risk – hazardous goods and substances		
The preliminary risk screening conducted for the SSD EIS concluded that the development is not classified as a potentially 'offensive' or 'hazardous' development in accordance with the SEPP 33 Guidelines. A PHA was not required for the EIS under the Resilience and Hazards SEPP.	- The modification would not change the risk screening analysis of the existing development, and a PHA is not required to support the modification application. - With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential hazards and risk of the approved development.	- The project would install a 65,000 L above ground self-bunded portable diesel tank adjacent to the existing 5,000 L diesel tank. No other changes to the existing storage, handling or management of hazardous substances or dangerous goods at the site are proposed. Diesel is classified as a combustible liquid (Class C1) by Australian Standard AS 1940:2017 for the purpose of storage and handling, but is not classified as a dangerous good by the Australian Dangerous Goods Code (National Transport Commission, 2014) for transport purposes, when transported on its own (i.e. not with flammable liquids). Diesel will continue to be transported, stored, handled and managed in accordance with the relevant regulations and industry standards, including AS 1940:2017. - The project would not change the risk screening analysis of the existing development, as diesel on-site would be stored within a self-bunded tank and would not be stored with other flammable/combustible liquids/materials (refer to Section 3.6), and is therefore not considered a potential hazardous substance under the SEPP 33 Guidelines. A PHA is not required to support the modification application. - There are no changes required to the existing mitigation and management measures related to hazardous goods and substances.
Hazards and risk – bushfire risk		
- The construction and operation of the expanded development have the potential to result in increased bushfire risks. - The development area is not mapped as bush fire prone land. Nevertheless, mitigation measures are proposed with respect to ensuring access, emergency evacuation and the supply of water.	- The modification would not introduce any additional bushfire risks. - With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential bushfire risks	- There are no changes expected to potential bushfire risks of the approved development (refer to 'Fire and incident management' below). - There are no changes required to the existing mitigation and management measures related to bushfire risk.

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
	from the approved development.	
Surface water and leachate		
▪ The expansion of the composting facility introduces a risk of additional volumes of leachate (and associated contaminant load) being generated and has the potential to impact the surrounding waterways of the Hunter catchment and groundwater aquifers through the discharge or infiltration of leachate. ▪ The overall risk of harm to the surface water environment is currently low and would continue to be low as it is adequately managed through existing pad and surface water management infrastructure which will be extended, including: - design and construction of the extended pad area with a low permeable base to prevent infiltration of leachate; - expansion of the leachate pond to capture runoff from the additional pad area; and - extension of the perimeter bund to divert clean water. ▪ There is no outside flood risk to the site and the area is not shown as flood prone land or within flood planning areas outlined in the Singleton LEP. ▪ The Surface and Groundwater Management Plan and other existing environmental management plans are to be updated to reflect the expanded operations and include trigger measures for investigating potential adverse surface water impacts, as well as measures to mitigate any identified exceedances.	▪ The modification would not involve any changes to the existing surface water and leachate management infrastructure on-site. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential surface water impacts from the approved development.	▪ There are no changes expected to potential surface water impacts of the approved development as: - the proposed new double-walled self-bunded above ground diesel tank is constructed to comply with Australian Standards to minimise any potential contamination risks (refer to Section 3.6); and - the project would not result in any changes to overland flows (including sediment loads) or potential flooding risks at the site. ▪ There are no changes expected to the volume of leachate generated during the composting process as: - no changes are proposed to the throughput of the facility; and - decontaminated and pasteurised FOGO and/or food recovered material has a reduced propensity to generate leachate (refer to Section 3.2). ▪ There are no changes required to the existing stormwater and leachate management infrastructure, or the existing surface water mitigation and management measures.
Groundwater		
▪ The proposed expansion increases the potential for groundwater pollution impacts associated with leachate infiltration to the groundwater aquifers beneath the site. ▪ The potential risk and impact are considered minor given the negligible volumes of rainfall seepage below the site, depth of groundwater and the groundwater is saline. In addition, groundwater beneath the site flows into Void 4	▪ The modification would not involve any changes to the existing surface water and leachate management infrastructure on-site. ▪ With the implementation of the mitigation and management measures	▪ There are no changes expected to potential groundwater quality impacts from the approved development as: - the proposed new double-walled self-bunded above ground diesel tank is constructed to comply with Australian Standards to minimise any potential contamination risks (refer to Section 3.6); and

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
immediately to the south, providing opportunity to capture and recycle water infiltrated throughout the site. ▪ Potential impacts to groundwater can be mitigated through a range of measures, including effective management of surface water. ▪ The facility will continue to be managed in accordance with the requirements of EPL 7654, including surface water monitoring requirements. ▪ The Surface and Groundwater Management Plan and other existing environmental management plans are to be updated to include expanded operations.	provided in the SSD EIS, there would be no change to potential groundwater impacts from the approved development.	- no changes are proposed to the existing leachate management infrastructure (refer to 'Surface water and leachate' section above). ▪ There are no changes required to the existing mitigation and management measures related to groundwater.
Traffic and access		
▪ The expansion of the facility would increase the quantity of organic material received and dispatched from the site, which would generate increased heavy vehicle and light vehicle movements. This has the potential to impact the surrounding road network. ▪ The worst-case traffic movements generated from the expanded operations would be up to 146 movements per day (73 in-bound and 73 out-bound), comprising 114 heavy vehicles (waste and fuel deliveries) and 32 light vehicle movements. ▪ The actual traffic movements would be less than 146, as many inbound trucks would also take out finished product for delivery to sites. ▪ Heavy vehicle movements would be distributed evenly throughout the day across the 12-hour operation period from 6 am to 6 pm. Light vehicle movements would be distributed evenly across the two hours at the start and end of the day (i.e. 6 am to 8 am and 3 pm to 5 pm). ▪ The expanded operations would result in up to 10 heavy vehicle movements per hour during the 12-hour operational period of the day. ▪ Construction traffic volumes would be low, peaking at an additional 10 movements per day. ▪ Traffic modelling concluded that the surrounding road network has adequate capacity to accommodate the traffic	▪ The modification would not introduce any additional traffic movements or changes to access. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential traffic impacts from the approved development.	▪ The project would result in a minor decrease in potential traffic impacts from the approved development, as it would reduce operational heavy vehicle movements (generated by refuelling trucks) due to the installation of a larger fuel tank (refer to Section 3.6). ▪ There are no changes required to the existing mitigation and management measures related to traffic and access.

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
movements without the need for any upgrades, and that there would be a negligible change to intersection delay, level of service and queue length across the key intersections. ▪ No impacts are expected on parking, access, or public or active transport. ▪ The development's traffic impacts would be minor and could be adequately managed through the Operational Traffic Management Plan. ▪ Bettergrow will, where possible, schedule its heavy vehicle movements to avoid the busy morning and afternoon peak hours. ▪ The movement of trucks into and out of the facility will be maximised through trucks entering and leaving with a full load where possible.		
Noise and vibration		
▪ The development has the potential to generate noise during construction and operational hours which could impact the amenity of the locality. ▪ The New England Highway and five operating mines surrounding the development already produce considerably more noise than would be emitted from the proposed compost facility expansion. ▪ Operational, construction and traffic noise levels would be well below the EPA's <i>Noise Policy for Industry</i> (EPA, 2017) project trigger levels (40 A-weight decibels (dBA) during the daytime and 35 dBA during the evening/night) for residential receivers, and noise criteria set out in EPA's <i>Interim Construction Noise Guidelines</i> (EPA, 2009) and <i>Road Noise Policy</i> (EPA, 2011). ▪ Vibration impacts were anticipated to be negligible during construction and operation activities. ▪ The noise and vibration generated by the expanded operations would have minimal to no impact on the nearest residential receivers to the site (in the village of Camberwell).	▪ The modification would not introduce any additional noise or vibration sources. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential noise and vibration impacts from the approved development.	▪ The project would result in a minor decrease in operational traffic noise impacts from the approved development, as it would reduce operational heavy vehicle movements (generated by refuelling trucks) due to the installation of a larger fuel tank (refer to Section 3.6). ▪ There are no changes expected to potential vibration or noise impacts (other than a reduction in operational traffic noise impacts) from the approved development as the project would not generate additional noise or vibration. ▪ There are no changes required to the existing mitigation and management measures related to noise and vibration.
Biodiversity and biosecurity		

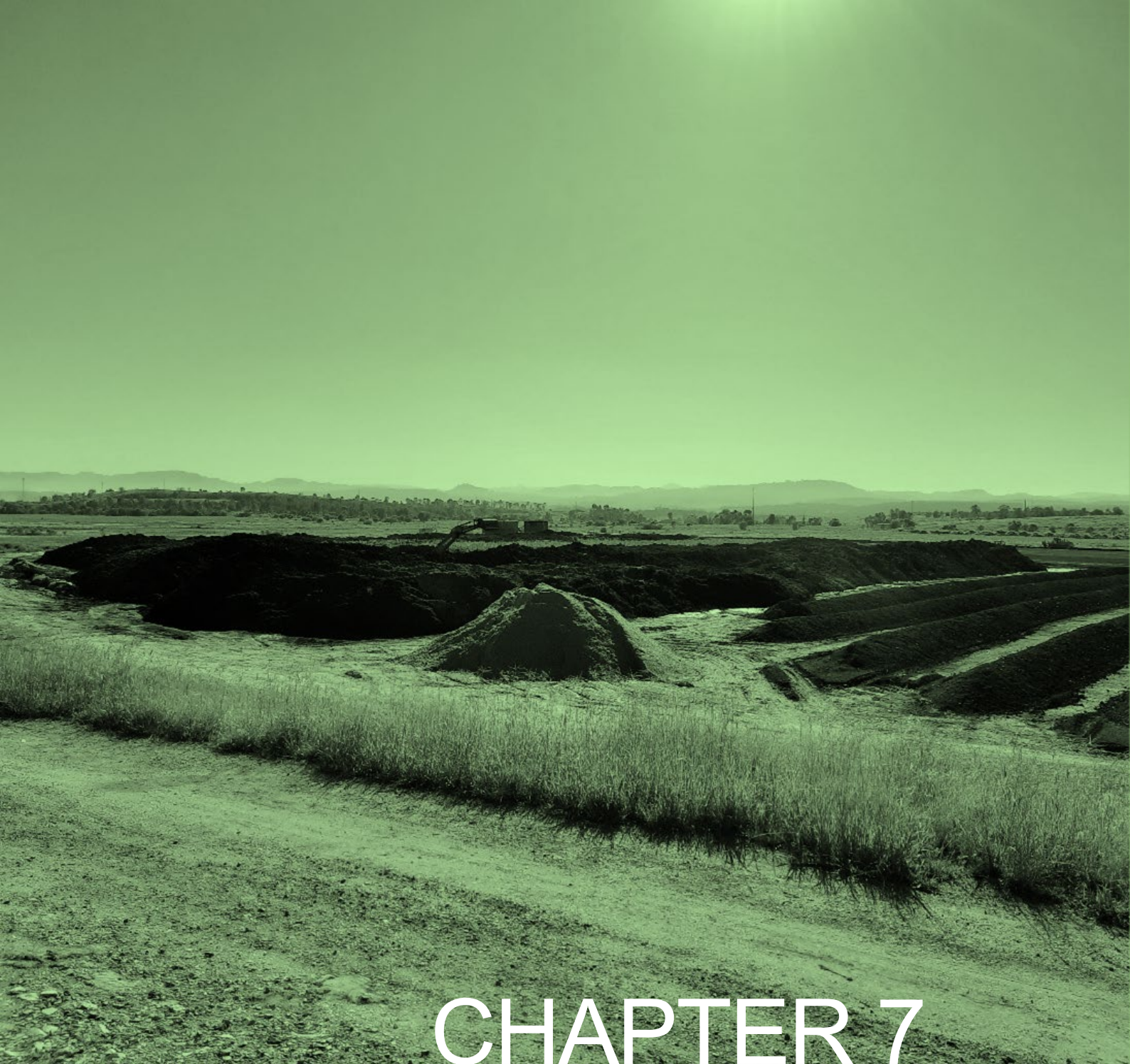
Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
▪ The construction and operation of the expanded development have the potential to result in biodiversity impacts and increased biosecurity and bushfire risks. ▪ Ecological investigations carried out in support of the proposed expansion have found there is no suitable habitat present at the site or immediate surrounds to support any threatened species, endangered ecological communities, critical habitat or endangered populations. ▪ The site is in a Phylloxera Exclusion Zone and there is the potential for material imported to the site to come from areas that are Phylloxera infested. ▪ The incoming material would not come from areas considered high risk for Phylloxera. ▪ Any presence of Phylloxera would be destroyed due to the temperatures achieved during the composting process. AS 4554-2012 requires compost material to be subjected to pasteurisation temperatures above 55 °C for at least three consecutive days. These requirements meet the heat treatment disinfection procedures outlined in the Australian National Phylloxera Management Protocol. ▪ The biosecurity risk posed by the development would be adequately managed through the composting processes required by AS 4554-2012.	▪ The modification would not introduce any additional impacts to biodiversity or additional biosecurity risks. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential biodiversity impacts or biosecurity risks from the approved development.	▪ There are no changes expected to potential biodiversity impacts or biosecurity risks from the approved development as the project does not involve any construction works, bulk earthworks or removal of native vegetation, or changes to vehicle movements or operational practices. ▪ There are no changes required to the existing mitigation and management measures related to biodiversity and biosecurity.
Visual		
▪ The development design has considered potential visual impacts on surrounding areas, including the distance to potentially affected areas and shielding provided by natural topographic features and the landforms associated with rehabilitated mining areas in the project area. ▪ The development does not require any site infrastructure that is elevated in nature, or visually intrusive during the day or night, or dominates the landscape. ▪ The existing and proposed operations would remain visually shielded by the surrounding vegetation and topography.	▪ The modification would not introduce any additional visual impacts. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential visual impacts from the approved development.	▪ There are no changes expected to potential visual impacts from the approved development as the project would not involve an extension to the development footprint, construction works or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to visual amenity.
Aboriginal heritage		

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
▪ The expanded operations may impact Aboriginal heritage values during construction and operation. ▪ No Aboriginal objects were identified in the project area and it is highly unlikely that Aboriginal objects would be uncovered as part of the proposed development. ▪ The proposed development would impact the cultural values of the project area by changing the land surface from disturbed land to a composting facility. However, given the project area is situated in a highly modified landscape and within an existing development, the impact is considered minor.	▪ The modification would not introduce any additional impacts to Aboriginal heritage values. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential Aboriginal heritage impacts from the approved development.	▪ There are no changes expected to potential Aboriginal heritage impacts from the approved development as the project would not involve any excavation, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to Aboriginal heritage.
Historic heritage		
▪ The expanded operations may impact historic heritage values during construction and operation. ▪ There are no heritage items identified in the project area and it is not anticipated that the expansion would have any impact on any items of historic heritage due to the highly disturbed nature of the site and the lack of any listed sites in the vicinity.	▪ The modification would not introduce any additional impacts to historic heritage values. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential historic heritage impacts from the approved development.	▪ There are no changes expected to potential historic heritage impacts from the approved development as the project would not involve any excavation, extension of the development footprint or changes to operational activities. ▪ There are no changes required to the existing mitigation and management measures related to historic heritage.
Socio-economic		
▪ Construction and operation of the proposed development may result in potential impacts to local amenity, including air quality (dust and odour), noise, traffic and visual impacts, unless appropriate design and mitigation measures are adopted. ▪ The potential for negative amenity impacts would be significantly reduced with the implementation of appropriate design features and environmental management controls guided by the Operational Environmental Management Plan.	▪ The modification would not introduce any additional socio-economic impacts. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential socio-economic impacts from the approved development.	▪ There are no changes expected to potential socio-economic impacts from the approved development as the project would not result in any additional traffic, access, noise and vibration or visual amenity impacts (refer to 'Traffic and access', 'Noise and vibration' and 'Visual amenity' sections above). ▪ The project would generate socio-economic benefits by supporting NSW's transitioning to a circular economy and meeting the increasing demand for recycled organic products, while having minimal environmental and social impact. ▪ There are no changes required to the existing mitigation and management measures related to socio-economic impacts.

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
▪ The expansion of the existing operation would benefit the existing rehabilitation activities across AGL lands. ▪ The development would assist the NSW Government in achieving an increased diversion of waste from landfill and increasing availability of recycled products through the provision of strategic infrastructure and processing capacity, thus having a positive impact on waste minimisation and resource recovery in the region. ▪ The proposed expansion would generate employment opportunities during construction and operation. ▪ The capital expenditure and associated economic spin-offs would contribute to and strengthen the local and regional economy.		
Fire and incident management		
▪ The main risk for waste combustion exists from spontaneous combustion due to the overheating of the composted materials. No stockpiles of timber or dry product will be stored on-site. ▪ Established fire management control measures, pollution incident response management plans and emergency procedures and protocols from Bettergrow's existing operations will be updated for the expanded development. This would ensure that the site has the appropriate checks and balances in place to safeguard the protection of life and the prevention of environmental harm, including air, water or land pollution.	▪ The modification would not introduce any additional fire risks or require any changes to accident, emergency or incident procedures. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential fire risks from, or accident, emergency, or incident procedures for, the approved development.	▪ There are no changes expected to potential fire risks or incident management of the approved development, as the project would not increase the volume of organic material stored on-site or introduce organic material that is more combustible than the material already approved to be received, stored and processed on-site. Also, the new double-walled self-bunded diesel tank would be installed, maintained and operated in accordance with the relevant Australian standards that minimise fire risk and incidents (refer to Section 3.6). ▪ There are no changes required to the existing mitigation and management measures related to fire and incident management.
Waste management		
▪ The development would accept up to 200,000 tpa of organic waste for processing. It would also generate operational waste including office waste, packaging waste and maintenance wastes. The inappropriate management of these wastes has the potential to result in impacts both on and off the site.	▪ The introduction of new waste streams and removal of the weighbridge has the potential to result in impacts on and off site if the waste is not appropriately managed.	▪ The introduction of new waste streams has the potential to result in impacts on-site and off-site if the waste is not appropriately managed. ▪ The modification is not expected to result in any additional waste management impacts as: - Additional waste streams brought on site would only be for the purpose of composting. Decontaminated and pasteurised FOGO

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
▪ The waste streams presently received at the facility will continue to be managed in accordance with the facility's existing management plans. ▪ Waste generated from construction and operation of the expanded facility will continue to be managed in accordance with the established waste hierarchy which underpins the objectives of the <i>Waste Avoidance and Resource Recovery Act 2001</i> to ensure that the diversion of waste from landfill is maximised. ▪ A Waste Monitoring Program and Waste Management Plan will be prepared and implemented, and updated as required, to ensure waste inputs and outputs are monitored and adequate waste management measures are in place for the development. ▪ The facility, once operational, would provide critical waste management infrastructure that would be able to service existing and future waste management needs and assist the NSW Government in achieving an increased diversion of waste from landfill through the provision of strategic infrastructure and processing capacity.	▪ The modification would result in minimal additional waste management impacts to the approved development as: - Additional waste streams brought on site would only be for the purpose of composting and would require a general or site-specific resource recovery order as well as an exemption issued by the EPA. - Only deliveries with weighbridge dockets will be allowed at the facility, and information on the quantity, type and source of waste, as well as the vehicle registration, driver signatures and the materials' origin will be collected. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential waste management impacts from the approved development.	and/or food material received on-site would require a general or site-specific resource recovery order and exemption issued by the EPA. Only VENM and ENM that comply with the requirements of the POEO Act and Excavated Natural Material Order 2014 will be accepted for processing at the site (refer to Section 3.4). - Only deliveries with weighbridge dockets will continue to be allowed at the facility, and information on the quantity, type and source of waste, as well as the vehicle registration, driver signatures and the materials' origin will be collected. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be negligible changes to potential waste management impacts from the approved development. ▪ There are no changes required to the existing mitigation and management measures related to waste management.
Cumulative impacts		

Matter and EIS summary	Impacts associated with Modification 1	Impacts associated with Modification 2
▪ The construction and operation of the expanded operations would make a minimal contribution to potential cumulative dust, noise, traffic, visual, surface water, leachate management and groundwater impacts. ▪ Potential cumulative impacts would be further reduced or avoided with the implementation of the mitigation and management measures provided in the SSD EIS.	▪ The modification would not introduce any additional cumulative impacts. ▪ With the implementation of the mitigation and management measures provided in the SSD EIS, there would be no change to potential cumulative impacts from the approved development	▪ The project would make only a minor contribution to cumulative odour impacts and greenhouse gas emissions (refer to Section 6.2). ▪ There are no changes required to the existing mitigation and management measures related to cumulative impacts.



CHAPTER 7

JUSTIFICATION OF MODIFIED
PROJECT

7 JUSTIFICATION OF MODIFIED PROJECT

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 1.3.2).

On 31 August 2022, development consent SSD-9418 was granted by a delegate of the Minister for Planning and Public Spaces 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.

The development consent has previously been modified under Section 4.55(1A) of the EP&A Act on one occasion (refer to Section 1.3.3). Bettergrow is now seeking approval to further modify the consent, pursuant to Section 4.55(1A) of the EP&A Act, to enable the following at the facility:

- receival and processing of decontaminated and pasteurised FOGO and/or food recovered material;
- receival and blending of VENM and ENM with organic recovered materials; and
- installation of a 65,000 L above ground diesel storage tank to reduce fuel deliveries to the site.

Prior to the preparation of this 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(1A) 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 and would result in minimal environmental impact.

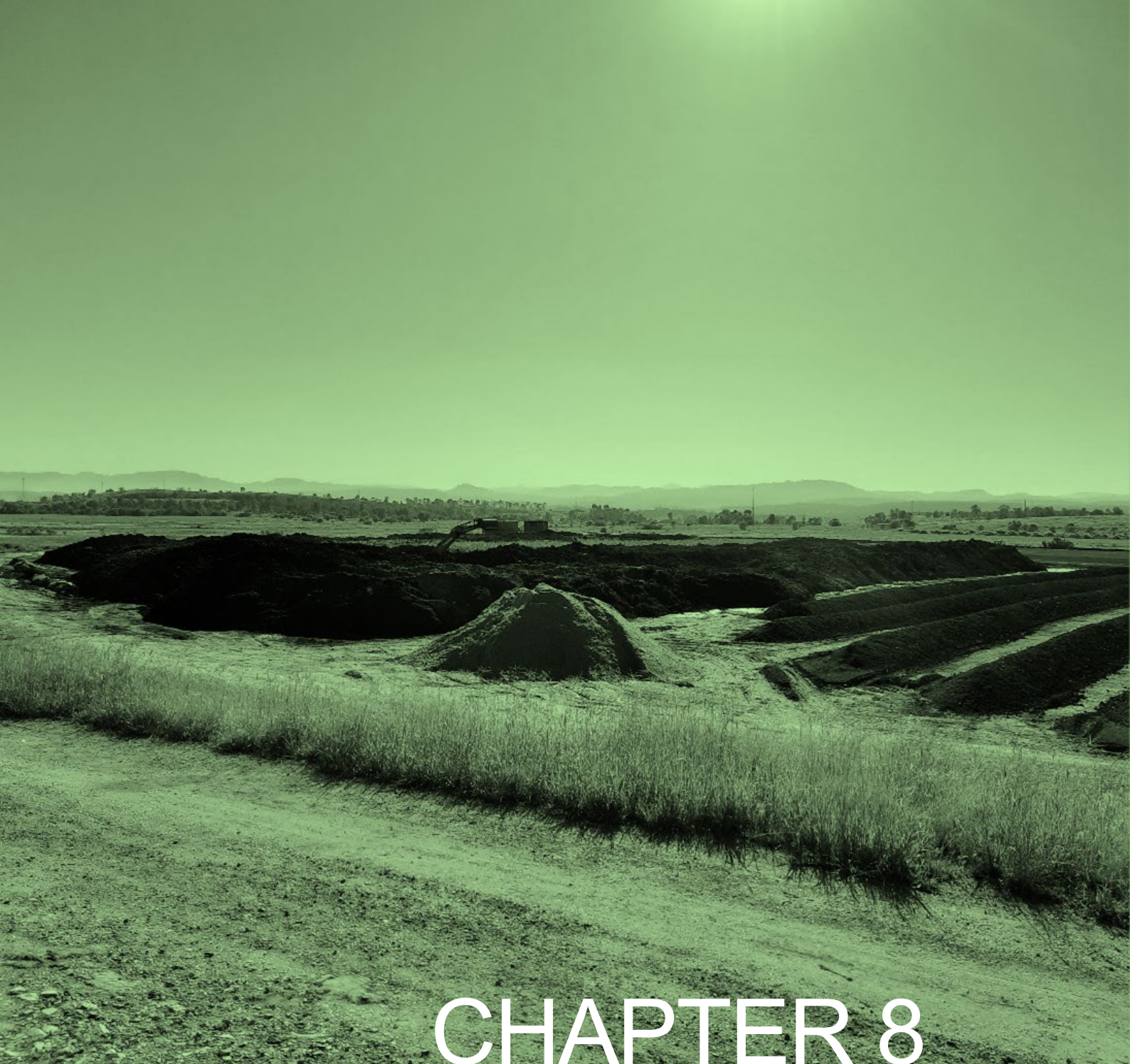
Consultation was also undertaken with the EPA, Council and adjoining landowners. Feedback provided by these stakeholders has been addressed in Chapter 5 of this report.

The modification has been assessed in accordance with the requirements of Section 4.55 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 will provide enhanced social and economic benefits by increasing the region's processing capacity to recycle FOGO and/or food 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 this report that minor impacts associated with the proposed modification can be addressed through the implementation of the existing management and mitigation measures. 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 project, 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(1A) of the EP&A Act.



CHAPTER 8

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8 REFERENCES

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APPENDIX A

UPDATED PROJECT DESCRIPTION

Updated project description

The modified development remains essentially the same as the existing approved development, with minor changes for each modification shown in **red** in the table below.

Element	Existing Development	Modification 1	Modification 2
Use	Resource recovery facility for composting and nutrient recycling	Resource recovery facility for composting and nutrient recycling	Resource recovery facility for composting and nutrient recycling
Processing capacity	Total up to 200,000tpa	Total up to 200,000tpa	Total up to 200,000tpa
Site area	Site and development footprint approximately 57ha in area.	Site and development footprint approximately 57ha in area.	Site and development footprint approximately 57ha in area.
Hours of operation	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.	6:00 am to 6:00 pm Monday to Saturday. No work on Sundays or Public Holidays.
Receival of waste	1 x weighbridge and 1 x load inspection bay	1 x weighbridge and 1 x load inspection bay	1 x load inspection bay
Site infrastructure	- Site access and parking; - Site office and staff amenities; - Processing pads; - Load inspection bay; - Surface water drainage, including: - diversion bunds - drainage channels and spillway 50.2 ML leachate control dam, consisting of a western and eastern dam 2 ML sediment ('lower') basin; - water storage tanks, including: 1 x 300,000 L AGL water storage tank 2 x 1,000 L potable water storage tanks; 1 x machinery shelter; 1 x truck wash; 1 x 27 m weighbridge; 1 x dirty water pit; and	- Site access and parking; - Site office and staff amenities; - Processing pads; - Load inspection bay; - Surface water drainage, including: - diversion bunds - drainage channels and spillway 50.2 ML leachate control dam, consisting of a western and eastern dam 2 ML sediment ('lower') basin; - water storage tanks, including: 1 x 300,000 L AGL water storage tank 2 x 1,000 L potable water storage tanks; 1 x machinery shelter; 1 x truck wash; 1 x Weighbridge; 1 x dirty water pit; and	- Site access and parking; - Site office and staff amenities; - Processing pads; - Load inspection bay; - Surface water drainage, including: - diversion bunds - drainage channels and spillway 50.2 ML leachate control dam, consisting of a western and eastern dam 2 ML sediment ('lower') basin; - water storage tanks, including: 1 x 300,000 L AGL water storage tank 2 x 1,000 L potable water storage tanks; 1 x machinery shelter; 1 x truck wash; 1 x dirty water pit; 1 x 5,000 L above ground diesel storage tank; and

Element	Existing Development	Modification 1	Modification 2
Permitted waste	1 x ,5000 L above ground diesel storage tank. - Urban wood residues for Composting (as defined in 'The compost order 2016'); - Paper Crumble for Composting (defined as General or Specific Exempted Waste); - Wastewater from Bayswater mine Void 4; - Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); - Natural organic fibrous Composting material (as defined in Schedule 1 of the POEO Act); - Biosolids; - Garden Waste (as defined in Schedule 1 of the POEO Act); and - Animal Waste (as defined in Schedule 1 of the POEO Act).	1 x 5,000 L above ground diesel storage tank. - Urban wood residues for Composting (as defined in 'The compost order 2016'); - Paper Crumble (as defined in the 'Bettergrow Compost Order 2023', or as in force from time to time); - Wastewater from Bayswater mine Void 4 (as defined in the 'Bettergrow Compost Order 2023, or as in force from time to time); - Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); - Natural organic fibrous Composting material (as defined in Schedule 1 of the POEO Act); - Biosolids (categorised as unrestricted use, or restricted use 1,2 or 3 in accordance with criteria in the EPA Biosolids Guidelines, 2000); - Garden Waste (as defined in Schedule 1 of the POEO Act); - Animal Waste (as defined in Schedule 1 of the POEO Act); and - Materials which are beneficial for compost production that are subject to a general or site-specific resource recovery order and exemption as issued by the EPA from time to time.	1 x 65,000 L above ground diesel tank. - Urban wood residues for Composting (as defined in 'The compost order 2016'); - Paper Crumble (as defined in the 'Bettergrow Compost Order 2023', or as in force from time to time); - Wastewater from Bayswater mine Void 4 (as defined in the 'Bettergrow Compost Order 2023, or as in force from time to time); - Drill mud process water (as defined in 'The Treated Drill Mud Order 2014'); - Natural organic fibrous Composting material (as defined in Schedule 1 of the POEO Act); - Biosolids (categorised as unrestricted use, or restricted use 1,2 or 3 in accordance with criteria in the EPA Biosolids Guidelines, 2000); - Garden Waste (as defined in Schedule 1 of the POEO Act); - Animal Waste (as defined in Schedule 1 of the POEO Act); - Materials which are beneficial for compost production that are subject to a general or site-specific resource recovery order and exemption as issued by the EPA from time to time; - VENM (as defined in Schedule 1 of the POEO Act); - ENM (as defined in the Excavated Natural Material Order 2014); and - Decontaminated and pasteurised FOGO and/or food recovered material, as defined in the relevant EPA resource recovery order and exemption.

Element	Existing Development	Modification 1	Modification 2
Waste sources	▪ Kerbside green waste collection from residential ▪ households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water), and ▪ Food processors (organic fibrous material).	▪ Kerbside green waste collection from residential households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water), ▪ Food processors (organic fibrous material), and ▪ Waste resource recovery facilities.	▪ Kerbside green waste collection from residential households (garden organics only), ▪ Hunter Water and Sydney Water (biosolids), ▪ Sawmills (wood residues), ▪ Paper processors (paper crumble), ▪ Infrastructure projects (drill muds), ▪ Mines (raw water), ▪ Food processors (organic fibrous material), and ▪ Waste resource recovery facilities.
Operational equipment	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.	▪ 1 x green waste shredder (if required); ▪ 1 x trommel or stardeck screen; ▪ 1 x 24 tonne excavator; ▪ 3 x 33 tonne front end loaders; ▪ 1 x top turn windrow turner; ▪ 2 x 15,000 litre water trucks; and ▪ 4 x light vehicles.
Traffic generation	Up to 146 movements per day	Up to 146 movements per day	Up to 146 movements per day
Workforce	Up to 15 operational jobs	Up to 15 operational jobs	Up to 15 operational jobs



APPENDIX B

UPDATED MITIGATION AND MANAGEMENT MEASURES TABLE

Updated mitigation and management measures

The mitigation and management measures for the project remain the same as the existing modified development (Modification 1), and are outlined in the table below.

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.
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. - 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).

Issue	Mitigation or management measure
	▪ 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. ▪ 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.

Issue	Mitigation or management measure
	- 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 1x10⁻⁹ 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 4m 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. - 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.

Issue	Mitigation or management measure
Historic Heritage	▪ If the remains are identified as Aboriginal, a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence. ▪ 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 67oC, 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. ▪ Conduct or participate in site emergency scenarios as required. ▪ Regularly identify and check all site fire extinguishers and firefighting equipment.
Hazard and Risk	▪ All mobile plant and equipment should be fitted with fire extinguishers. ▪ An Emergency Response Plan should be prepared and implemented for the facility.

Issue	Mitigation or management measure
	▪ 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 OEM 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 will be undertaken. ▪ Contaminated waste will 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.



APPENDIX C

AIR QUALITY IMPACT ASSESSMENT



TODOROSKI
AIR SCIENCES

AIR QUALITY IMPACT AND
GREENHOUSE GAS ASSESSMENT
BETTERGROW RAVENSWORTH
COMPOSTING FACILITY
MODIFICATION 2

Element Environment

23 September 2025

Job Number 25031860

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Air Quality Impact and Greenhouse Gas Assessment Bettergrow Ravensworth Composting Facility Modification 2

DOCUMENT CONTROL

Report Version	Prepared by	Reviewed by
FINAL - 002	PH	EA

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1 INTRODUCTION

Todoroski Air Sciences has prepared this report for Element Environment on behalf of Bettergrow Pty Ltd (the Proponent). It presents an assessment of the potential air quality impacts and greenhouse gas emissions associated with the proposed Modification 2 to the Ravensworth Composting Facility at Ravensworth, New South Wales (NSW) (hereafter referred to as the Project).

The Project seeks to allow the receipt and processing of decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered material, as well as the receipt and blending of Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) with organic recovered materials, at the facility.

This assessment has been prepared in general accordance with the NSW Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**) using a methodology based on a Level 2 / 3 Odour Impact Assessment as described in the *Technical Framework – Assessment and Management of Odour from Stationary Sources in NSW* (**NSW DEC, 2006**). The greenhouse gas (GHG) assessment has been prepared in general accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**).

This report comprises:

- ✦ A background to the Project and description of the proposed operations;
- ✦ A review of the existing meteorological and air quality environment surrounding the site;
- ✦ A description of the dispersion modelling approach and emission estimation used to assess potential air quality impacts;
- ✦ Presentation of the predicted results and discussion of the potential air quality impacts;
- ✦ A discussion on the proposed odour mitigation and management measures; and,
- ✦ An assessment of the potential greenhouse gas emissions associated with the Project.



2 PROJECT BACKGROUND

2.1 Local setting

The Project site is located at 74 Lemington Road, Ravensworth (Lot 10 DP1204457), approximately 6 kilometres (km) northwest of Camberwell.

The land use surrounding the Project site comprises of open cut and underground coal mining operations including Ravensworth, Glendell and Ashton and Mt Owen Complex. Loop Organics is a composting operation located within the same property boundary, approximately 2.5km to the south. The nearest privately-owned residential receptors to the Project are located in the vicinity of Camberwell.

There are also other receptors located closer to the Project site along Hebden Road and Lemington Road, between approximately 2 and 5 km from the site. However, these residences are on mining land owned by Glencore Australia Pty Ltd (Glencore) and Yancoal Australia Pty Ltd, and subject to noise, air quality, visual amenity, traffic and other environmental impacts from mining operations, and therefore not considered as sensitive receptors for this assessment.

Other industrial receptors, such as the neighbouring coal-mining operations and the composting facility, are not considered sensitive receptors for this assessment. These land uses do not warrant the same level of amenity as residential dwellings and, as industrial operations, are themselves potential sources of air emissions. This is discussed further in **Section 3.1.2**.

Figure 2-1 presents the location of the Project.

Figure 2-2 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project location. The area is characterised by undulating terrain, including depressions and elevations resulting from the open cut mining operations. Broader terrain features of the Hunter Valley Region are expected to influence the dispersion of air emissions at the Project.

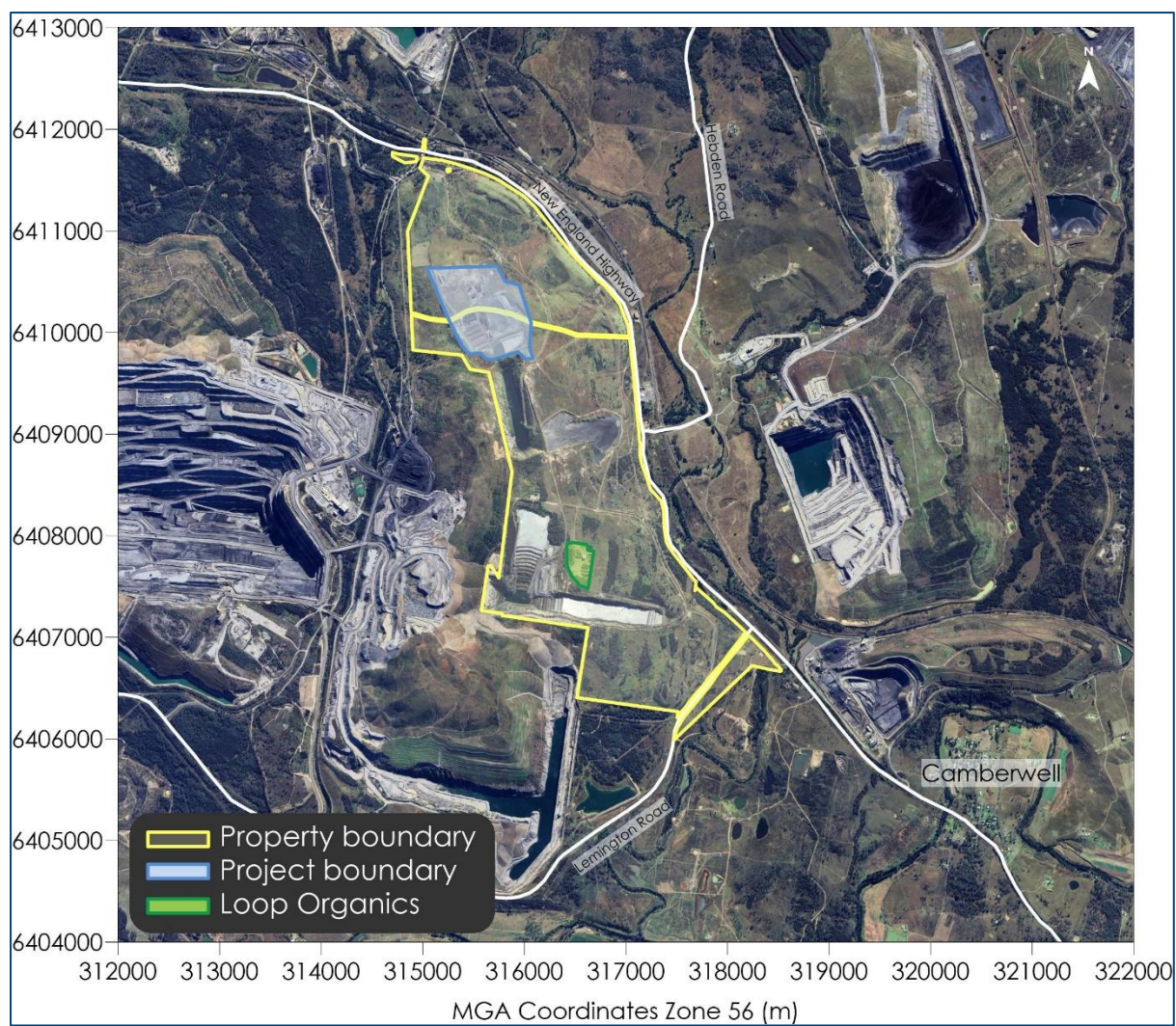


Figure 2-1: Project setting

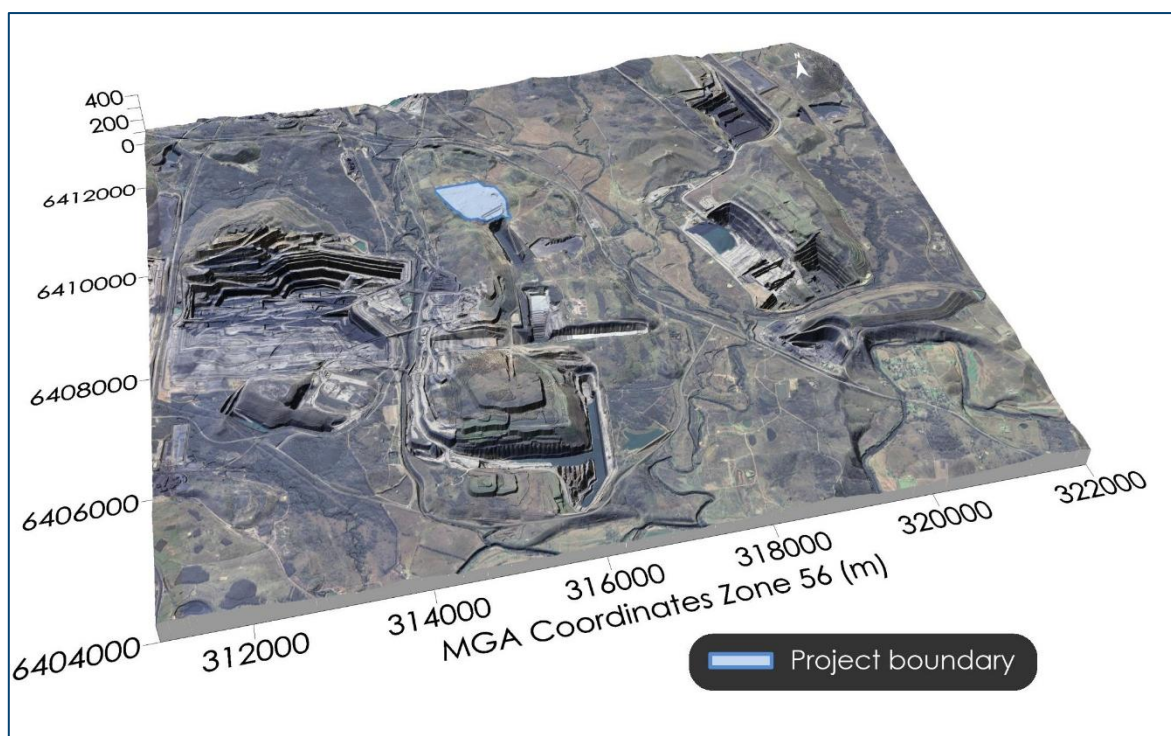


Figure 2-2: Topography in the vicinity of the Project location

2.2 Project description

2.2.1 Existing operations

The existing approved operations comprise of an outdoor organic recycling facility which composts approximately 200,000 tonnes per annum (tpa) of organic material. The facility processes biosolids, garden organics and other organic recovered materials in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses.

Odour impacts for the approved operation were assessed in the *Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments* (**Advanced Environmental Dynamics, 2019**) as part of the approved development's original State Significant Development application, and subsequently revised as part of the response to submissions in *Memorandum Greenspot Ravensworth Greenhouse Gas, Odour and Dust Assessments Update 2022* (**Advanced Environmental Dynamics, 2022**).

Operational activities generally include the receipt and processing of a range of organic recovered material, including shredded green waste from curb side green bins and biosolid waste from sewage treatment plants. The mixed waste is incorporated directly into windrows for a period of time to allow for pasteurisation to occur, where temperatures reach 55-65 degrees Celsius (°C) and destroy organic contaminants, seeds and parasites.

Hours of operation are from 6:00am to 6:00pm, Monday to Saturday, with no work undertaken on Sundays or public holidays.

2.2.2 Proposed operations

The Project seeks to allow the receipt and processing of decontaminated and pasteurised FOGO and/or food recovered material at the facility.

The Project also seeks to allow the receipt and blending of VENM and ENM with organic recovered material at the facility to improve the soil structure, nutrient content and moisture retention of the compost, and offer a higher quality compost to customers.

No changes are proposed to the existing development footprint, site infrastructure, equipment/plant, traffic generated by the facility, workforce, or approved recovered material volumes or operating hours. No road upgrades are required for the Project.

A description of the pre-treatment and characteristics of decontaminated and pasteurised FOGO and/or food recovered material that would be received at the facility is provided below.

FOGO and/or food recovered material would be subject to the following treatment prior to receipt at the facility:

- ✦ Decontamination: contaminants such as hazardous materials, metals, packaging materials and plastics are removed through automated and manual processes.
- ✦ Pasteurisation: the recovered material is subjected to high temperatures for a period of time (typically above 55°C for at least 72 hours (as per AS 4454–2012: Compost soil conditioners and mulches), to significantly reduce plant and animal pathogens and plant propagules.

The decontaminated and pasteurised FOGO and/or food recovered material is distinct from other organic recovered material, such as green waste and biosolids, as it is subject to controlled processing and pasteurisation prior to receipt at the facility.

Key characteristics of the decontaminated and pasteurised material that would be received at the facility include:

- ✦ Pathogen free: pasteurisation eliminates harmful bacteria such as *Salmonella* and *E. coli*, ensuring safe handling in the next composting stage.
- ✦ Stabilised and partially matured: organic decomposition is well-advanced, reducing the risk of anaerobic breakdown, making the material more suitable for efficient windrow composting.
- ✦ Reduced odour: after pasteurisation, the material has a significantly reduced odour compared to green waste, raw food organics or biosolids.
- ✦ Low leachate generation: the moisture content of the material has been reduced (typically to 45–55%), and the material therefore has reduced propensity to generate leachate. Instead, it typically acts as a moisture-absorbing material rather than a leachate producer. Since the material has undergone pathogen reduction and volatile organic compound breakdown, any leachate produced would have a much lower odour intensity than that from untreated organic waste.
- ✦ Weed and pest suppression: high temperatures destroy viable weed seeds and insect larvae, unlike untreated green waste, which may still contain these contaminants.
- ✦ Nutrient rich: the material retains valuable nutrients like nitrogen (N), phosphorus (P), and potassium (K), which will continue to be stabilised and mineralised during windrow maturation.



- ★ Improved physical properties: the material is drier, more uniform, and has a stable structure, making it easier to aerate and manage in windrows.

Overall, the decontaminated and pasteurised material is safer, more stable, and suited for further composting, ensuring a high-quality finished compost after windrow maturation.

VENM refers to natural material such as clay, gravel, sand, soil or rock fines that has been quarried or excavated from uncontaminated areas. It must not contain manufactured chemicals, industrial residues, sulfidic ores or soils or any other waste.

ENM refers to naturally occurring rock and soil (e.g. sandstone, shale, clay and soil) that is at least 98% natural material by weight. It excludes materials that qualifies as VENM or material that is processed, from hotspots, or that contains asbestos, acid sulfate soils (ASS/PASS), or sulfidic ores.

VENM and EMN would be blended with recovered organic material to enhance compost quality by improving soil structure, nutrient content and moisture retention.

The Project has the potential to generate particulate matter emissions during the unloading, loading and blending of VENM, ENM, and decontaminated and pasteurised FOGO and/or food-recovered material. However, there is no proposed change to the approved tonnages of material received or processed at the facility. A change in odour emissions due to the composting of these proposed materials can be expected. The Project is not anticipated to result in additional greenhouse gas emissions, as no changes to composting activities or additional equipment are proposed. Nevertheless, an updated greenhouse gas assessment has been completed as part of this assessment.



3 AIR QUALITY CRITERIA

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions from the Project and the applicable air quality criteria.

3.1 Odour

3.1.1 Introduction

In New South Wales, odour regulation sits within the framework of the Protection of the Environment Operations Act 1997 (POEO Act). Key provisions relevant to odour from premises include:

- ✦ Section 126 – prohibits the emission of an odour from premises that constitutes an offence under the Act.
- ✦ Section 128 – establishes offences for causing air pollution, which includes the emission of odour.
- ✦ Section 129 – enables regulatory authorities to take action where emissions (including odour) result in harm or unreasonable interference with amenity.

Importantly, there are currently no regulations in NSW prescribing generic point-source odour emission limits. Instead, odour is managed through the statutory prohibition on offensive odour under the POEO Act, supported by NSW EPA guidance such as the *Technical framework Assessment and management of odour from stationary sources in NSW* (NSW DEC, 2006) and *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2022).

As a result, odour assessment in the planning and approval process relies on the use of odour concentration criteria (expressed in odour units, OU) as a proxy measure, providing a consistent framework for predicting and managing the risk of odour impacts at sensitive receptors.

In this context, odour needs to be considered in two distinct ways. For operational facilities, offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character etc. and to determine whether the odour would interfere with the comfort and repose of the normal person unreasonably. The POEO Act defines the term *offensive odour* to mean an odour—

"(a) that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances—

(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations."



In this context, the concept of offensive odour is applied to operational facilities and relates to actual emissions in the air.

However, in the approval and planning process for proposed new operations or modifications to existing projects, no actual odour exists for assessment under the POEO Act. Accordingly, it is necessary to consider hypothetical odour and predictive odour concentration criteria (in odour units) to evaluate potential future impacts, ensuring statutory obligations are addressed in the absence of existing emissions.

The number of odour units represents the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Thus, by definition, odour less than an odour unit (1OU), would not be detectable to most people.

The range of a person's ability to detect odour varies greatly in the population, as does their sensitivity to the type of odour. The wide-ranging response in how any particular odour is perceived by any individual poses specific challenges in the assessment of odour impacts and the application of specific air quality goals related to odour. The *Technical Framework* (NSW DEC, 2006) sets out a framework specifically to deal with such issues.

It needs to be noted that the term "odour" refers to complex mixtures of odours, and not "pure" odour arising from a single chemical. Odour from a single, known chemical rarely occurs (when it does, it is best to consider that specific chemical in terms of its concentration in the air). In most situations odour will be comprised of a cocktail of many substances that is referred to as a complex mixture of odour, or more simply odour.

For activities with potential to release significant odour it may be necessary to predict the likely odour impact that may arise. This is done by using air dispersion modelling which can calculate the level of dilution of odours emitted from the source at the point that such odour reaches surrounding receptors. This approach allows the air dispersion model to produce results in terms of odour units.

The NSW criteria for acceptable levels of odour range from 2 to 7OU, with the more stringent 2OU criteria applicable to densely populated urban areas and the 7OU criteria applicable to sparsely populated rural areas, as outlined below.

3.1.2 Complex Mixtures of Odorous Air Pollutants

Table 3-1 presents the assessment criteria as outlined in the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2022). This criterion has been refined to take into account the population densities of specific areas and is based on a 99th percentile of dispersion model predictions calculated as 1-second averages (nose-response time).



**Table 3-1: Impact assessment criteria for complex mixtures of odorous air pollutants
(nose-response-time average, 99th percentile)**

Population of affected community	Impact assessment criteria for complex mixtures of odorous air pollutants (OU)
Urban (≥ 2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ 2)	7.0

Source: **NSW EPA, 2022**

The NSW odour goals are based on the risk of odour impact within the general population of a given area. In sparsely populated areas, the criteria assume there is a lower risk that some individuals within the community would find the odour unacceptable, hence higher criteria apply.

Peak-to-mean factors are applied to account for any odour fluctuation above and below the mean odour level of the 1-hour averaging time. The criteria in **Table 3-1** are compared with modelled results which include peaking factors to account for the time-averaging limitations of air dispersion models. The peak-to-mean factors developed by **Katestone Scientific Pty Ltd (1995, 1998)** for the NSW EPA are applied to convert the modelled (1-hour) averaging time to 1-second peak concentrations.

A summary of the peak-to-mean values is provided in **Table 3-2**.

Table 3-2: Peak-to-mean values

Source Type	Pasquill-Gifford stability class	Near field P/M 60*	Far field P/M 60*
Area	A, B, C, D	2.5	2.5
	E, F	2.3	1.9
Line	A-F	6	6
Surface point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A-F	2.3	2.3
Volume	A-F	2.3	2.3

*Ratio of peak 1-second average concentrations

Places where people work, such as the surrounding industrial receptors (e.g. coal-mining and composting operations), are not considered to have equivalent amenity expectation relative to residential locations for reasons including the following:

- ✦ Industrial receptors only have healthy adults present, fit and capable to partake in the work, whereas residential locations may have sensitive individuals present;
- ✦ The industrial receptors include a range of industrial activities where people are exposed to a range of various odours (or chemicals), and as such cannot be expected to have the same sensitivity;
- ✦ An existing industrial precinct can expect a lower level of amenity and this a higher level of odour and would be acceptable considering the nature of the activities occurring within this



area. For example, people visiting the industrial precinct, would be aware that industrial activities occur there. Consequently, they may encounter varying degrees of environmental effects, distinct from what one would expect in a residential area.

- ✦ Any reasonable expectation of comfort and repose whilst visiting or working in an industrial area is greatly less than what one would reasonably expect in one's own home.
- ✦ Workers are generally working and would be less focussed on things other than their work, unlike the case of residents in their home where a greater focus on their amenity and surroundings would be likely.

For reasons including the above, the NSW EPA impact assessment criteria applied at the residential receptors are not considered directly applicable at the industrial receptors and a less stringent odour criterion should be applied.

3.2 Particulate matter

Particulate matter consists of dust particles of varying size and composition. Air quality goals refer to measures of the total mass of all particles suspended in air defined as the Total Suspended Particulate matter (TSP).

The upper size range for TSP is nominally taken to be 30 micrometres (μm) as in practice particles larger than 30 to 50 μm will settle out of the atmosphere too quickly to be regarded as air pollutants. Two sub-classes of TSP are also included in the air quality goals, namely PM_{10} , particulate matter with equivalent aerodynamic diameters of 10 μm or less, and $\text{PM}_{2.5}$, particulate matter with equivalent aerodynamic diameters of 2.5 μm or less.

Particulate matter, typically in the upper size range, that settles from the atmosphere and deposits on surfaces is characterised as deposited dust. The deposition of dust on surfaces may be considered a nuisance and can adversely affect the amenity of an area by soiling property in the vicinity.

The Project is not expected to increase dust emissions as there is no proposed change to the approved tonnages of material received or processed at the facility. The decontaminated and pasteurised FOGO and/or food recovered material along with VENM and EMN are also not expected to generate more dust than the material currently accepted and processed at the site. Existing dust mitigation measures would continue to be applied for the Project. Accordingly, a specific assessment of particulate matter has not been undertaken as part of this assessment.



4 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and meteorology in the area surrounding the Project.

4.1 Local climate

Long-term climatic data from the Bureau of Meteorology (BoM) weather station at Cessnock Airport Automatic Weather Station (AWS) (Site No. 061260) were analysed to characterise the local climate in the proximity of the Project. The Cessnock Airport AWS weather station is located approximately 48 km southwest of the Project. The Cessnock Airport AWS weather station is the nearest BoM weather station with suitable available long-term data used to select the meteorological year for the dispersion modelling as outlined in **Appendix A**.

Table 4-1 and **Figure 4-1** present a summary of data from the Cessnock Airport AWS collected over an approximate 13 to 35-year period for various meteorological parameters. The data assists in characterising the local climatic conditions based on long-term meteorological parameters.

The data indicates that on average, January is the hottest month with a mean maximum temperature of 30.4°C and July is the coldest month with a mean minimum temperature of 4.2°C.

Rainfall levels are elevated in the summer months compared to the other seasons. The data show February is the wettest month with an average rainfall of 98.7 millimetres (mm) over 8.1 days, and August is the driest month with an average rainfall of 34.2mm over 4.4 days. The annual average rainfall is 738.4mm over 74.8 days.

Mean 9am relative humidity ranges from 60% in October to 80% in March and June. Mean 3pm relative humidity levels range from 42% in August and September to 55% in June.

Wind speeds exhibit seasonal variations with lower wind speed records for 9am and higher observations for 3pm conditions. Mean 9am wind speeds range from 8.7 kilometres per hour (km/h) in March to 14.0km/h in September. Mean 3pm wind speeds range from 14.2km/h in May to 19.1km/h in September.

Table 4-1: Monthly climate statistics summary – Cessnock Airport AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temp. (°C)	30.4	29.3	27.4	24.3	20.8	17.9	17.6	19.6	22.7	25.4	27.0	29.2	24.3
Mean min. temp. (°C)	17.1	16.9	15.0	10.8	7.5	5.7	4.2	4.6	7.1	9.9	13.1	15.2	10.6
Rainfall													
Rainfall (mm)	76.2	98.7	87.8	59.3	39.7	54.5	36.0	34.2	43.3	54.7	75.1	78.7	738.4
No. of rain days (≥1mm)	6.7	8.1	8.2	5.8	5.3	5.5	4.4	4.4	5.7	6.4	7.1	7.2	74.8
9am conditions													
Mean temp. (°C)	23.2	22.2	20.2	17.8	14.1	11.0	10.1	12.2	16.2	19.1	20.2	22.2	17.4
Mean R.H. (%)	68	76	80	76	79	80	76	69	63	60	65	65	71
Mean W.S. (km/h)	11.5	10.2	8.7	10.1	10.4	11.5	11.5	13.0	14.0	13.7	12.7	11.8	11.6
3pm conditions													
Mean temp. (°C)	28.7	27.3	25.7	23.0	19.6	16.8	16.4	18.6	21.2	23.4	25.0	27.3	22.8
Mean R.H. (%)	46	53	53	52	54	55	49	42	42	44	47	46	49
Mean W.S. (km/h)	18.5	17.3	15.7	14.6	14.2	15.1	15.3	17.3	19.1	18.7	18.6	18.3	16.9

Source: **BoM, 2025**

R.H. – Relative Humidity, W.S. – wind speed



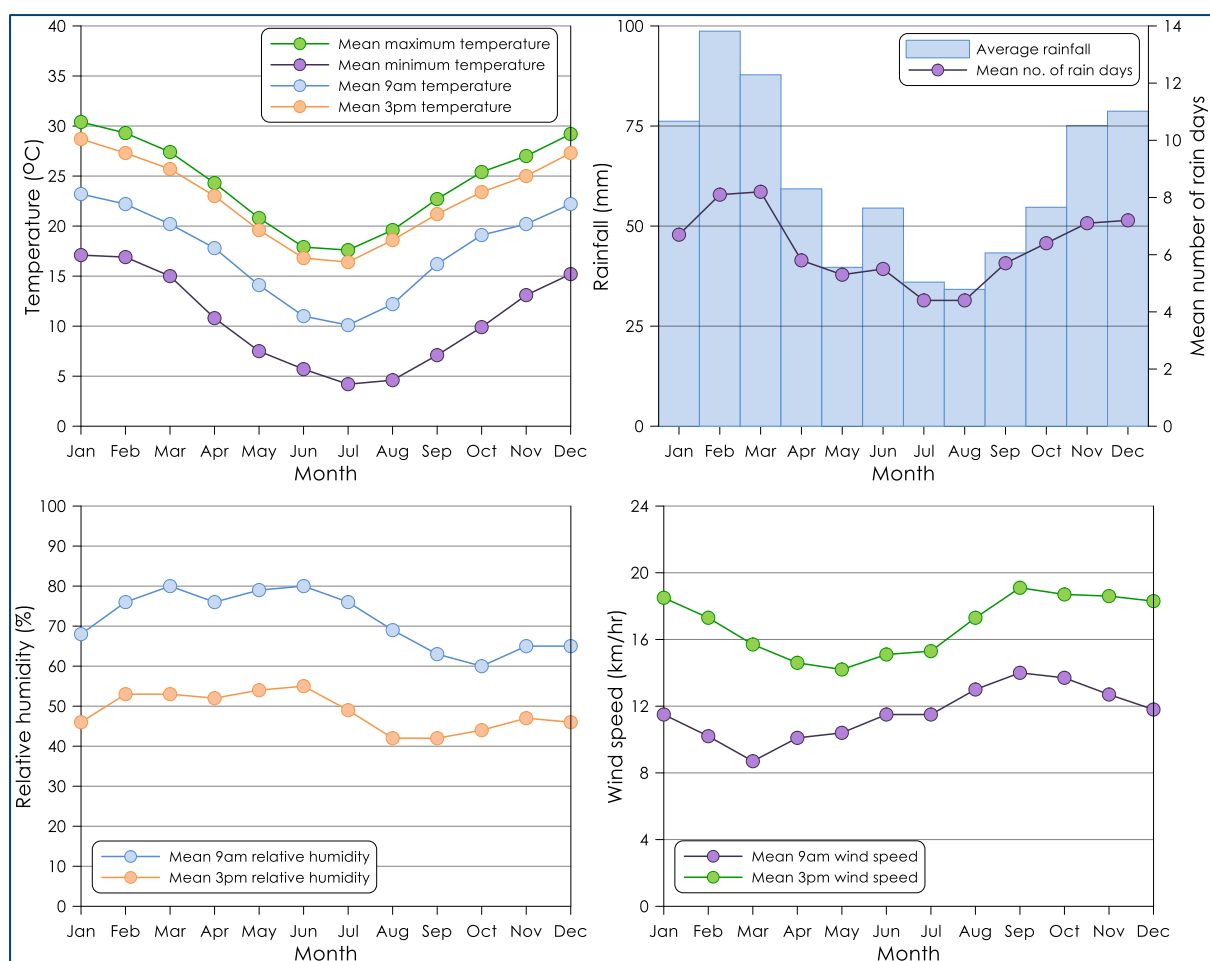


Figure 4-1: Monthly climate statistics summary – Cessnock Airport AWS

4.2 Local meteorological conditions

Annual and seasonal windroses for the Cessnock Airport AWS during the 2017 calendar period are presented in **Figure 4-2**.

The 2017 calendar year was selected as the meteorological year for the dispersion modelling based on an analysis of long-term data trends in meteorological data recorded for the area and wind patterns which reflect the patterns experienced in other years. Further detail is presented **Appendix A**.

Analysis of the windroses shows that the wind directions are generally evenly distributed ranging from the east-southeast to southwest on an annual basis with winds greatest from the northwest and north-northwest. During summer, winds from the east-southeast to south are most frequent. During autumn, winds are predominately from the south-southwest. In winter, winds from the northwest and north-northwest are most frequent. Spring windrose shows a similar distribution pattern as the annual windrose with winds from the northwest and east-southeast most frequent.

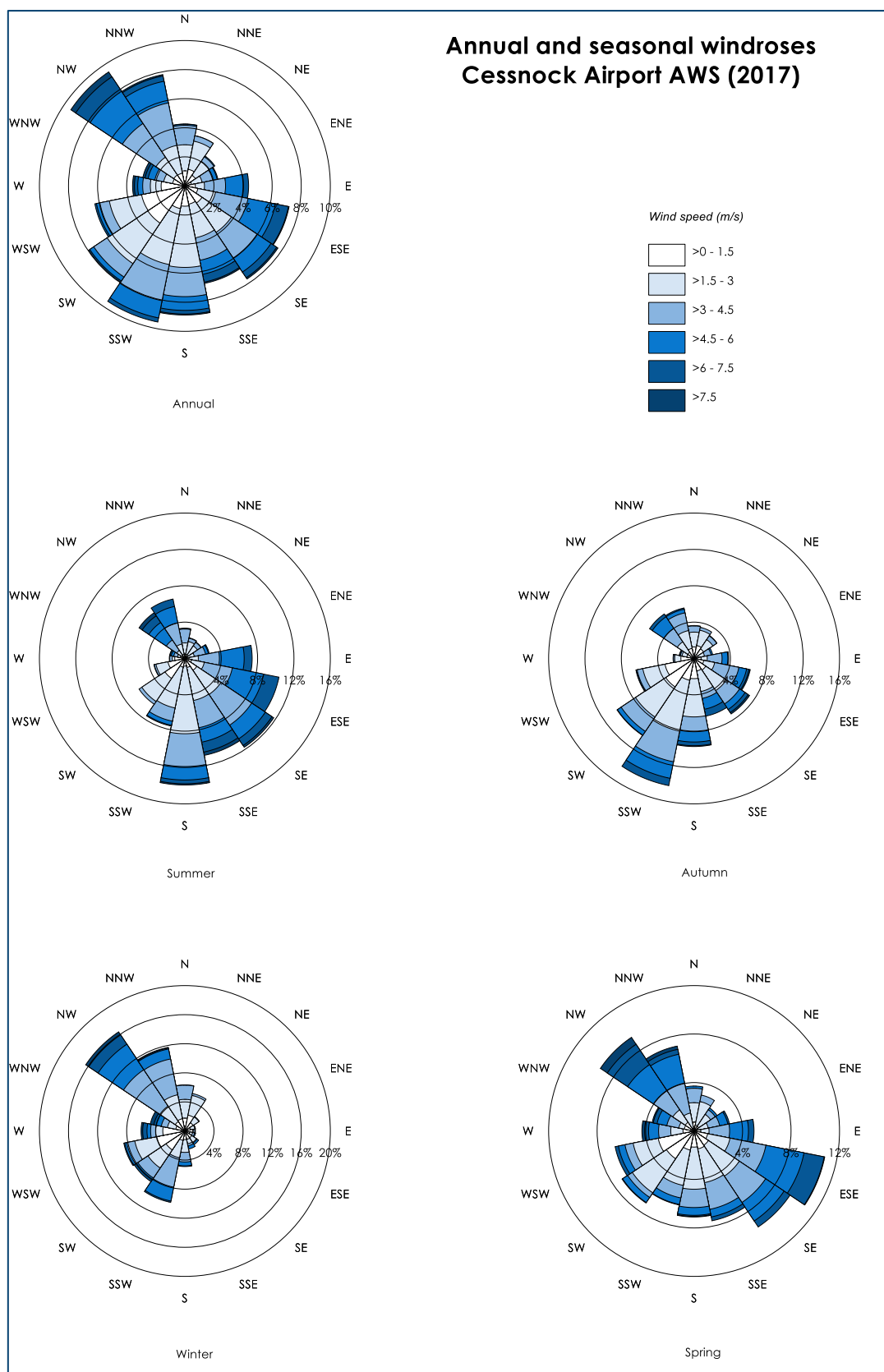


Figure 4-2: Annual and seasonal windroses – Cessnock Airport AWS (2017)

4.3 Odour complaints

A Complaints Register is maintained monthly and is available on the Bettergrow website¹. A review of the register indicates that no complaints have been received, or recorded, since January 2023. This suggests that air quality and odour from the operations are not causing adverse impacts and that existing mitigation and management measures are effective.

¹ <https://www.bettergrow.com.au/environmental/>



5 DISPERSION MODELLING APPROACH

The following sections are included to provide the reader with an understanding of the model and modelling approach applied for the assessment.

Modelling was undertaken using a combination of the CALPUFF Modelling System and the Weather Research and Forecasting model (WRF). The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST, and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets. WRF is a prognostic air model used to simulate meteorological data for input into CALMET.

The model was set up in general accordance with the NSW EPA *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'* (TRC Environmental Corporation, 2011).

5.1 Meteorological modelling

The meteorological modelling methodology applied a 'hybrid' approach which includes a combination of prognostic model data from WRF with surface observations.

The WRF model was applied to the available data to generate a three-dimensional upper air data file for use in CALMET. The centre of analysis for the WRF modelling used is 325000mE and 6406000mN. The simulation involved an outer grid of 750km with 15km grid spacing, with two nested grids with 3km and 1km grid spacing.

The CALMET domain was run on a 10 x 10km grid with a 0.1km grid resolution. The available meteorological data for January 2017 to December 2017 from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) monitoring stations at Camberwell and Singleton Northwest were included in the simulation.

The 2017 calendar year was selected as the modelling period based on an analysis of long-term meteorological data as outlined in **Appendix A**.

The seven critical parameters used in the CALMET modelling are presented in **Table 5-1**.

Table 5-1: Seven critical parameters used in CALMET

Parameter	Value
TERRAD	10
IEXTRP	-4
BIAS (NZ)	-1, -0.5, -0.25, 0, 0, 0, 0, 0, 0, 0, 0
R1 and R2	5, 5
RMAX1 and RMAX2	12, 12

5.2 Meteorological modelling evaluation

The outputs of the CALMET modelling are evaluated using visual analysis of the wind fields and extract data. **Figure 5-1** presents a visualisation of the wind field generated by CALMET for a single hour of the modelling period (i.e. example only). The wind fields follow the terrain well and indicate that the simulation produces realistic fine scale flow fields (such as terrain forced flows) in surrounding areas.

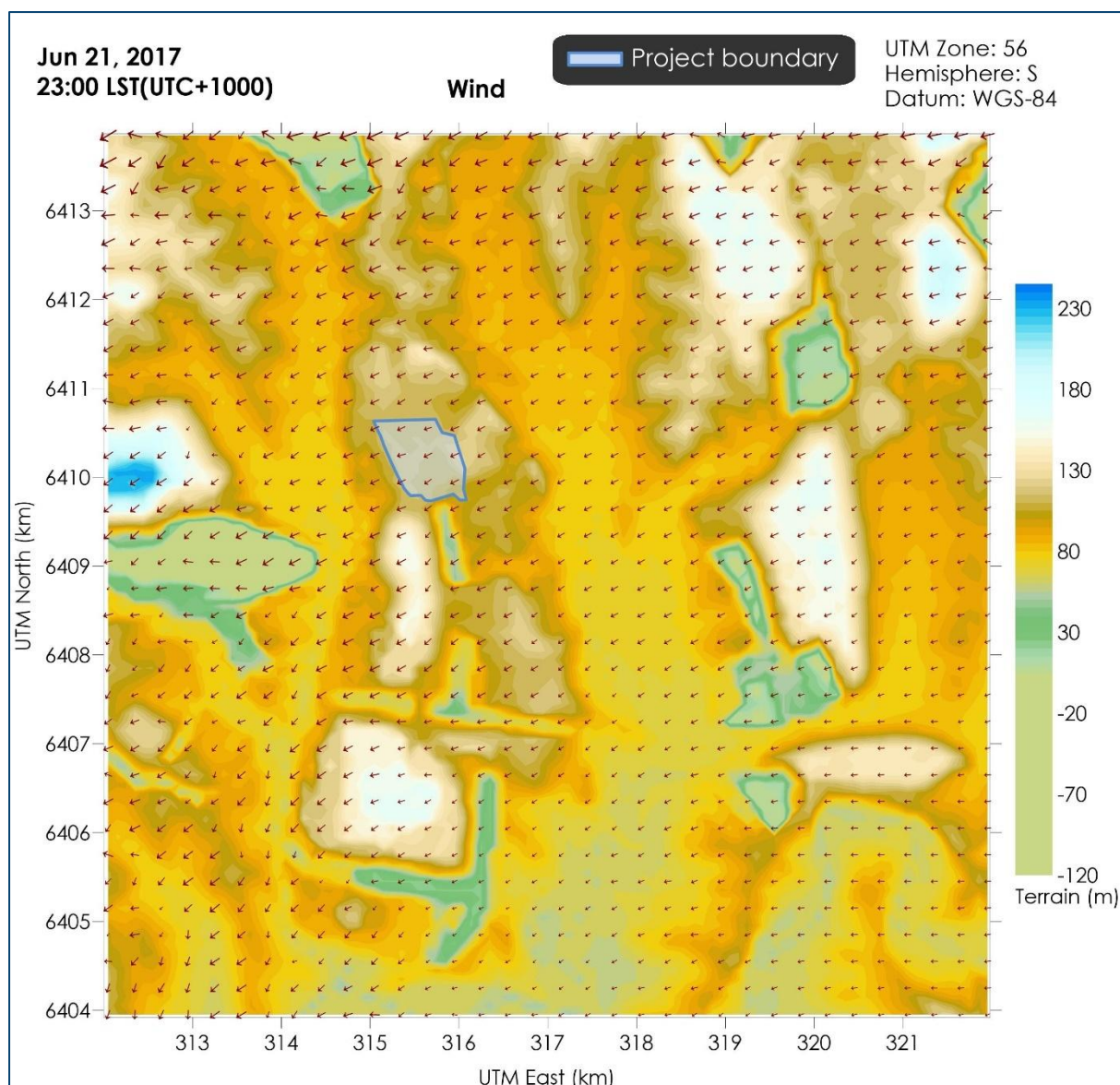


Figure 5-1: Representative 1-hour average snapshot of wind field for the Project

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 5-2** and **Figure 5-3**.

Figure 5-2 presents the annual and seasonal windroses from the CALMET data. Overall, the windroses generated in the CALMET modelling reflect the expected wind distribution patterns in the area as determined based on the available measured data and the expected terrain effects on the prevailing winds.

Figure 5-3 includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period for each modelled year and shows sensible trends considered to be representative of the area.

The annual temperature pattern exhibits a clear seasonal trend, with the highest temperatures occurring during the summer months and lowest temperatures observed in winter. The wind speed statistics shows a fairly even distribution of wind speeds. The mixing height trends follow expected patterns,

varying throughout the day due to changes in solar radiation and atmospheric stability. The stability classification indicates a high percentage of E and F-class periods combined, characterised by stable, calm conditions typically occurring at night.

In conclusion, the CALMET generated meteorological data are considered suitable for use in the air dispersion modelling for the Project.



Figure 5-2: Annual and seasonal windroses from CALMET (Cell ref 3862)

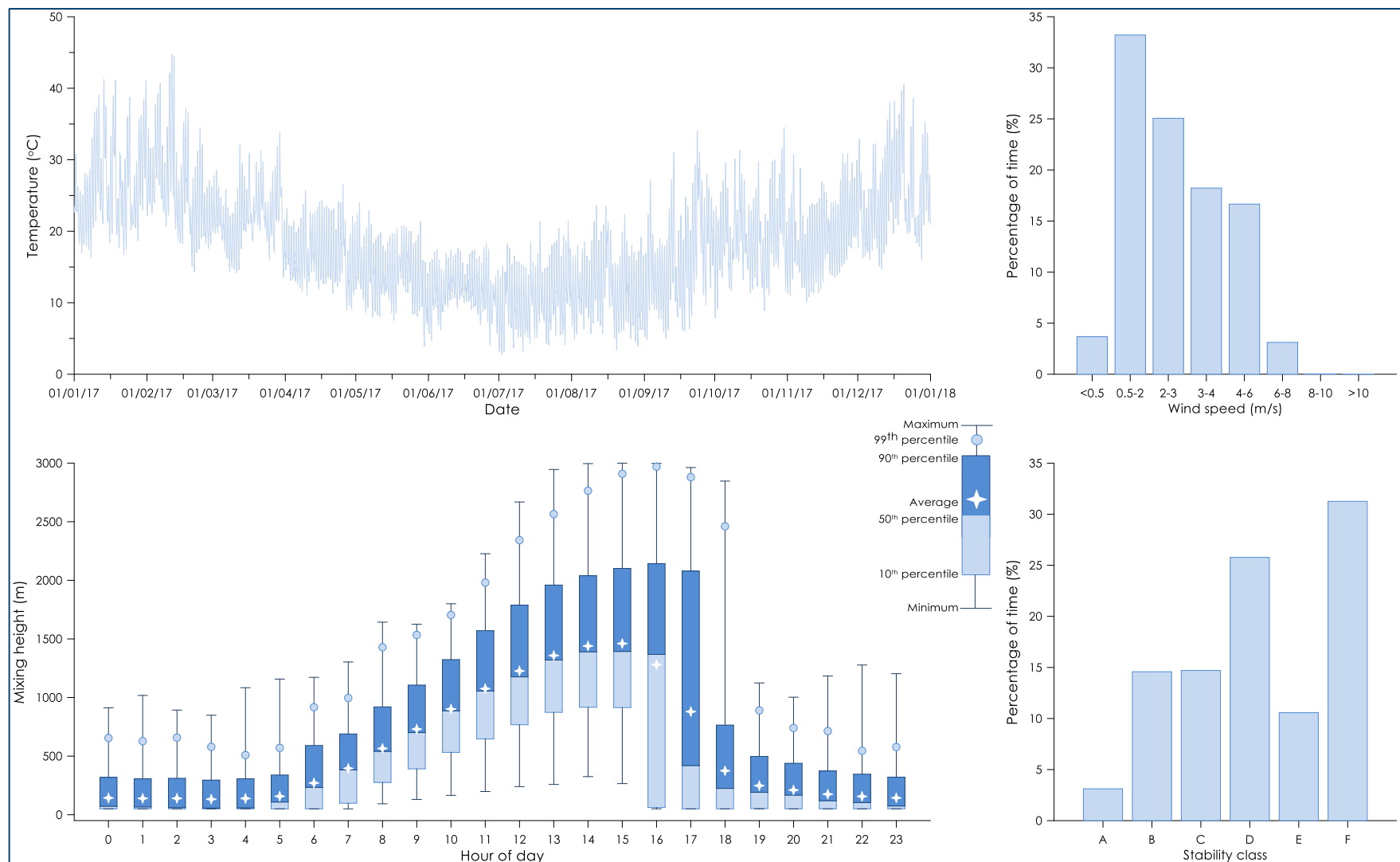


Figure 5-3: Meteorological analysis of CALMET (Cell REF 3862)



5.3 Dispersion modelling

The CALPUFF air dispersion model has been used to predict the potential odour levels in the ambient air in the wider area around the site.

Modelling of the key odour emission sources was conducted using the emissions rates and parameters outlined in the following section and utilising the meteorological data described in the previous section.

5.4 Modelled odour sources

Odour emissions from the Project would potentially arise from a range of sources with varying rates of odour emissions due to the nature and age of the composted material. The main sources of odour emissions for the Project modelled in this assessment are identified as:

- ✦ Composting processing and blending area - which includes the compost windrows, receival and blending of the input material streams and storage of mature compost; and,
- ✦ Leachate dams.

For the purpose of this assessment, the entire composting processing and blending area is assumed to act as an odour source. In practice, some of this area is used for vehicle access and spacing between windrow piles. This assumption provides a conservative estimate of potential odour from the source.

There is limited publicly available information on the operation of the nearby Loop Organics composting facility, aside from an annual composting rate of 55,000tpa and water quality monitoring data (published on the Loop Organics website). For the purpose of this assessment, the assumed odour sources have been identified using satellite imagery of the site with the entire areas assumed to act as odour sources, similar to the Project.

Figure 5-4 and **Figure 5-5** presents the location of the modelled odour emission sources for the Project and Loop Organics, respectively.

A summary of the approximate areas for the modelled odour sources are outlined in **Table 5-2**.

Table 5-2: Summary of the areas for modelled odour sources

Facility	Source	Approximate area (m ²)*
Project	Composting Processing & Blending Area	187,000
	Leachate Dams	28,000
Loop Organics	Composting Processing & Blending Area	71,500
	Leachate Dam	5,400

*values have been rounded

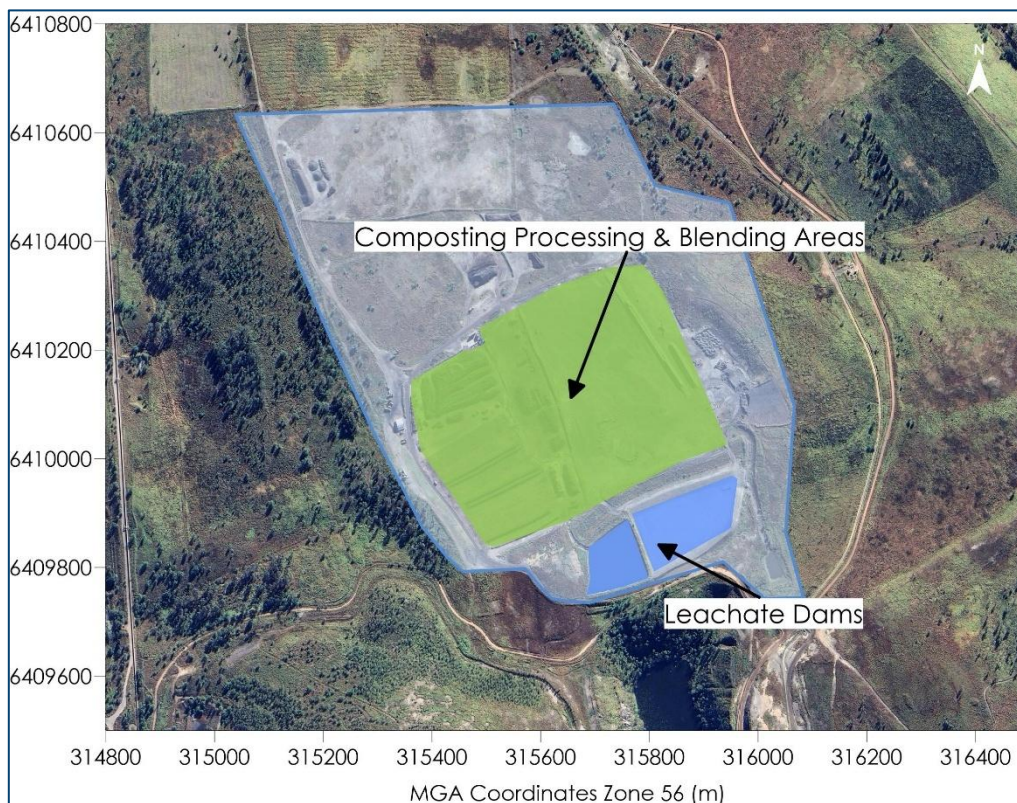


Figure 5-4: Modelled odour sources for the Project



Figure 5-5: Modelled odour sources for Loop Organics

5.5 Emission estimation

Odour emission rates for the modelled odour sources have been estimated based on site-specific odour sampling at the Ravensworth Composting Facility and at another facility that produces decontaminated and pasteurised FOGO.

Site-specific odour sampling was conducted as part of the original SSD application (**Advanced Environmental Dynamics, 2019**) and considered representative of the current operations. A summary of Specific Odour Emission Rates (SOER) taken at the Ravensworth Composting Facility and considered in the assessment is presented in **Table 5-3**.

Table 5-3: Summary of site-specific odour sampling

Source description	SOER (OUV/m ² /s)
Fresh green waste	0.027
One week old (3-part green organic (GO) and 1-part biosolids)	0.045
Five week old (3-part GO and 1-part biosolids)	0.03
Freshly opened compost windrow	0.041
Finished Product (3-part GO and 1-part biosolids)	0.032

Source: **Advanced Environmental Dynamics (2019)**

OUV/m²/s = odour unit volume per metre squared per second

Odour sampling of decontaminated and pasteurised FOGO material was conducted at the Valoriza Environment Australia (Valoriza) facility in Dandenong South, Victoria. This material is representative of the type proposed to be received at the Project site.

The Valoriza facility receives and processes raw FOGO material from kerbside collections and commercial sources. The material undergoes a decontamination and shredding process before being loaded into sealed pasteurisation tunnels for a period of approximately four weeks. Following pasteurisation, the material is unloaded from the tunnels and stockpiled for despatch.

Odour sampling was conducted by **Ektimo (2025)** using an isolation flux chamber in accordance with Australian Standard AS 4323.4 (2009) – Stationary Source Emissions, Method 4: Area source sampling – Flux chamber technique. Sampling was performed on a range of materials at Valoriza including raw FOGO material, decontaminated material, and decontaminated and pasteurised material at different maturation stages ranging from 1 day old to 19 days old to identify any variability. The results are summarised in **Table 5-4** the odour sampling report (**Ektimo, 2025**) is provided in **Appendix B**.

Table 5-4: Summary of odour sampling at Valoriza

Source description	Test 1 (OUV/m ² /s)	Test 2 (OUV/m ² /s)
Raw FOGO material	2.0	1.7
Decontaminated material	0.6	0.4
1 day old decontaminated and pasteurised material	3.2	5.0
2 day old decontaminated and pasteurised material	0.4	0.3
5 day old decontaminated and pasteurised material	0.15	-
19 day old decontaminated and pasteurised material	0.23	-

Source: **Ektimo (2025)**

The odour sampling results for the decontaminated and pasteurised material at varying ages are presented graphically in **Figure 5-6**.

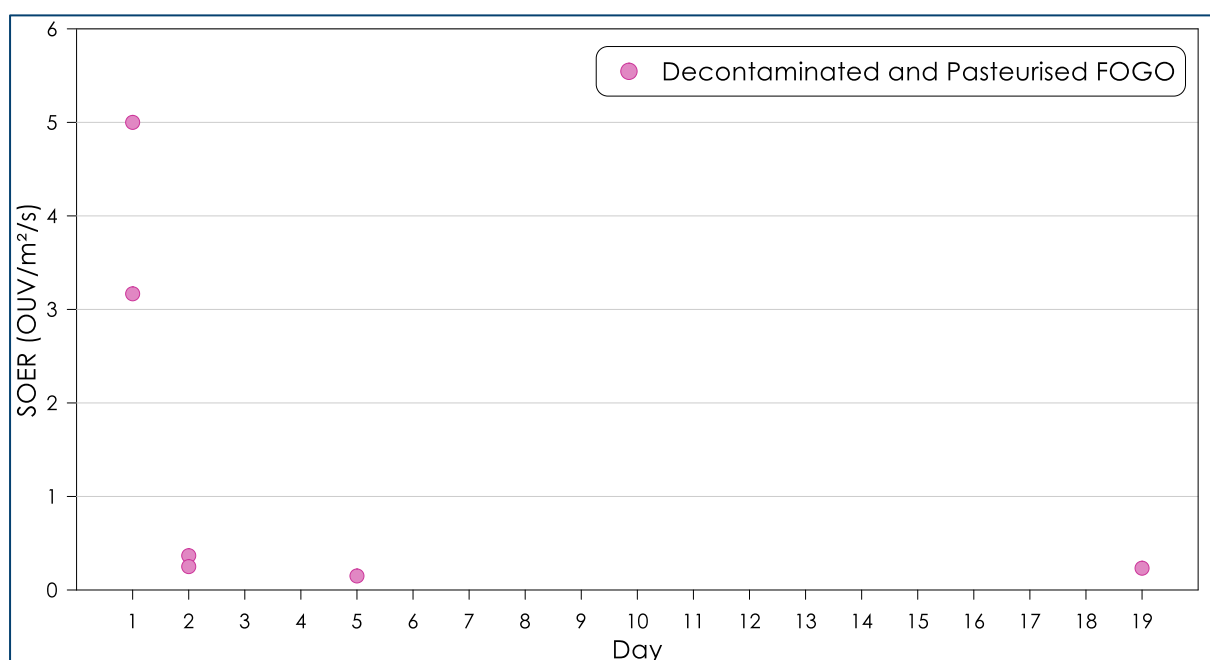


Figure 5-6: Odour sampling results for decontaminated and pasteurised FOGO material

The results in **Figure 5-6** show variability between the stages for the decontaminated and pasteurised FOGO material, with a clear trend of decreasing odour as the material ages. This trend is well known in composting, as odour reduces with decomposition. Compared with the existing sources at the Project site, the decontaminated and pasteurised FOGO material may generate some additional odour in the initial stages, however, levels are expected to decline rapidly to those emitted by current operations as the material matures.

A similar approach to that used in the previous assessments for the Ravensworth Composting Facility (**Advanced Environmental Dynamics, 2019 & 2022**) has been adopted, with odour emission rates based on the average of the sampling results (from **Table 5-3** and **Table 5-4**) applied to the modelled area source. This represents composting material over a range of ages.

For the assessment, a portion of the modelled Composting Processing and Blending area is assumed to comprise of one day old decontaminated and pasteurised FOGO material. In practice, decontaminated and pasteurised FOGO and/or food recovered material would only be accepted at the site once odour levels have dropped to current odour levels on-site, and would immediately be blended with other organic material and formed into windrows once received at the site. Furthermore, material arriving at the site are not likely to come straight out of tunnels as it will likely take a day or so to arrive at the site, from which point odour levels would have reduced significantly. This would result in a worst-case scenario and prediction of potential odour for the Project.

A summary of the odour emission rates for the Project is outlined in **Table 5-5**. Comparable odour emission rates were applied to Loop Organics. Odour emissions from these sources are assumed to remain at a constant rate for the modelling period.

Table 5-5: Odour emission rates for the Project

Facility	Source description	SOER (OUV/m ² /s)
Project	1 day old Decontaminated & Pasteurised FOGO and/or food recovered material	4.1
	Composting Processing & Blending Area	0.12
	Leachate Dams	1^
Loop Organics	Composting Processing & Blending Area	0.034
	Leachate Dam	1^

Source: ^Advanced Environmental Dynamics (2019)

5.6 Construction activity

There is no proposed construction activity, as the existing infrastructure will be used for the Project. As such, no air emissions are expected to be associated with construction.



6 DISPERSION MODELLING RESULTS

The spatial distribution of the dispersion modelling predictions for the Project is shown in **Figure 6-1** as an isopleth diagram showing the 99th percentile nose-response ground level odour concentrations. The results indicate that odour levels due to the Project will be below the most stringent NSW EPA impact assessment criterion of 2OU at the receptor locations in Camberwell.

Predicted cumulative impacts with Loop Organics are presented in **Figure 6-2**. These results also indicate that cumulative odour levels remain below the criterion of 2OU at receptor locations in Camberwell.

For comparison, the cumulative odour impacts associated with the approved Ravensworth Composting Facility are presented in **Figure 6-3 (Advanced Environmental Dynamics, 2022)**. The comparison indicates that the Project would result in a slight increase in odour impacts close to the Project site, however, impacts near the receptor locations in Camberwell would remain negligible due to their distance from the site.

The predicted odour impacts at the industrial receptors can be inferred from isopleth diagrams presented in **Figure 6-1** and in **Figure 6-2**. The level experienced at these locations are not greater than 2OU and is considered acceptable.

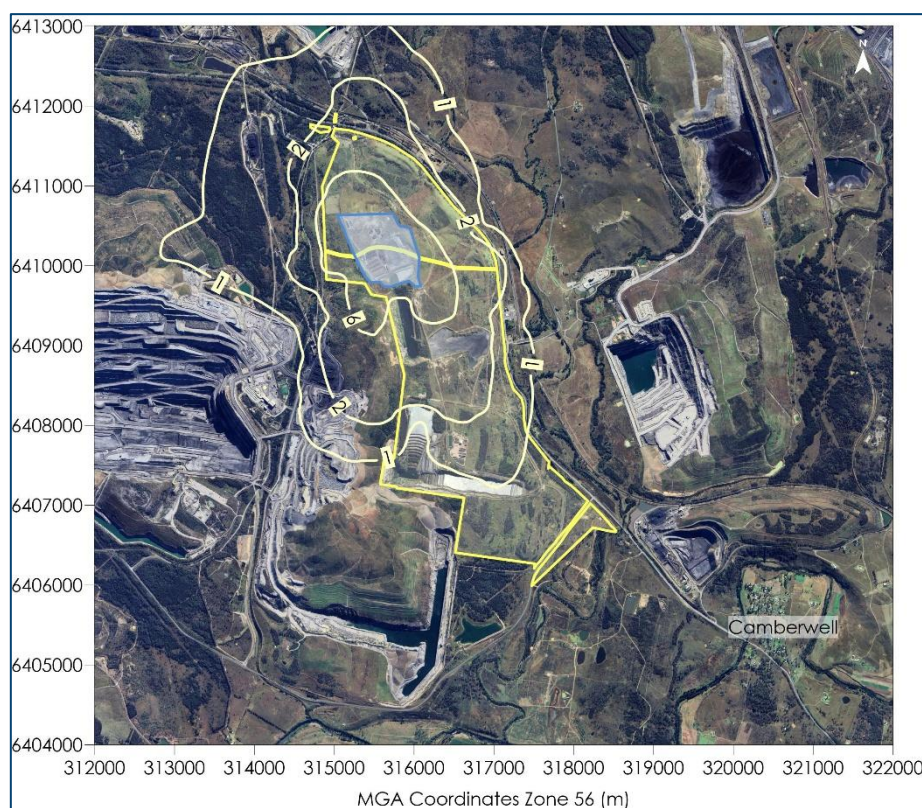


Figure 6-1: Predicted 99th percentile nose-response average odour concentration – Incremental impact

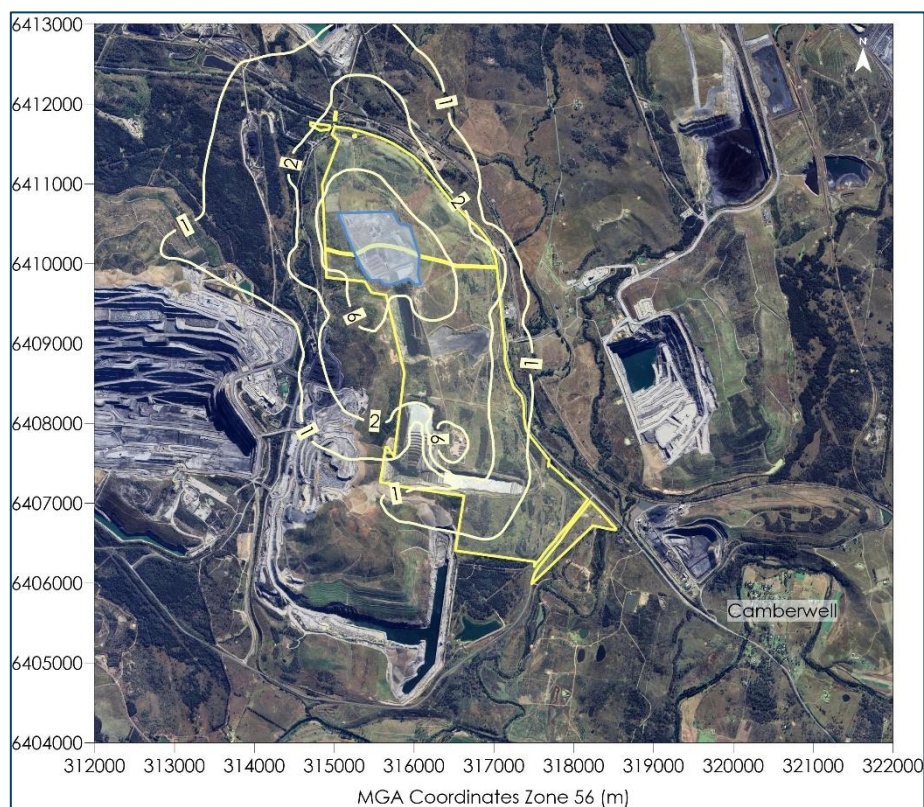
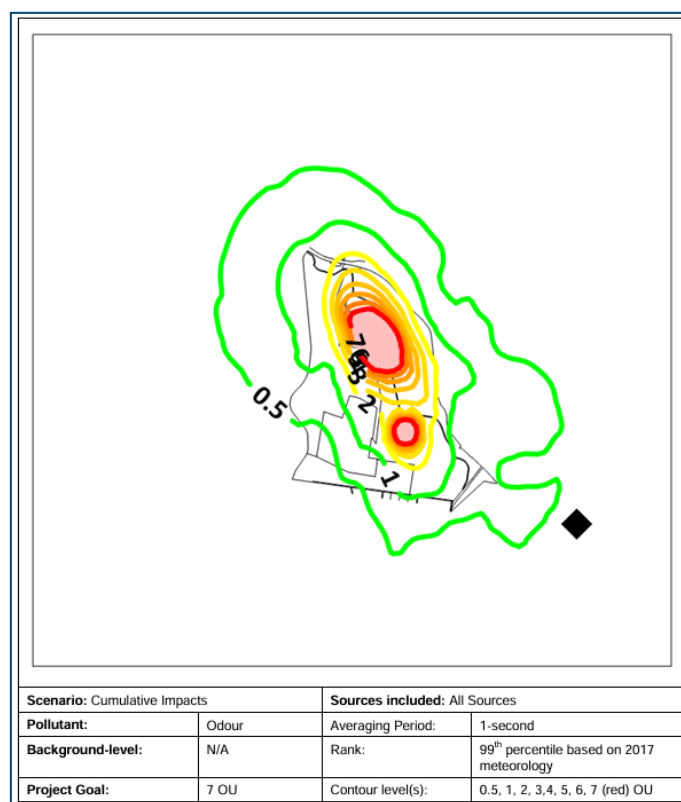


Figure 6-2: Predicted 99th percentile nose-response average odour concentration – Cumulative impact



Source: **Advanced Environmental Dynamics (2022)**

Figure 6-3: Predicted 99th percentile nose-response average odour concentrations for the approved operations

7 MITIGATION AND MANAGEMENT

The operations of the Project have the potential to result in a negligible change to odour levels at surrounding sensitive receptors. As such, there is no requirement for any additional operational odour mitigation or management measures.

Bettergrow currently implement a number of air quality control measures at the Ravensworth Composting Facility that are included within the site's Air Quality Management Plan (**Todoroski Air Sciences, 2023**). It is recommended that the existing air quality control measures continue to be applied to ensure any potential odour impacts are minimised.

7.1 Protection of the Environment Operations Act, 1997

The general obligations of the NSW *Protection of the Environment Operations Act, 1997* and the Regulations made under the Act (namely the NSW *Protection of the Environment Operations (Clean Air) Regulation, 2022*) would be followed for the Project.

The Project would operate in accordance with the relevant regulatory framework for air quality to ensure compliance with this legislation.



8 GREENHOUSE GAS ASSESSMENT

The activities associated with the Project will result in GHG emissions due to composting activities along with diesel and petrol consumption required to operate vehicles, plant and equipment at the site and the transport of material offsite.

As noted, the Project is not anticipated to result in additional greenhouse gas emissions, as no changes to composting activities or additional equipment are proposed. The previous GHG assessment for the approved operation (**Advanced Environmental Dynamics, 2019**) therefore remains relevant. The purpose of this assessment is to provide an updated evaluation of GHG emissions, reflecting the application of contemporary emission factors and assessment methodology.

This assessment focuses on the 'modified business' scenario, as defined in the *NSW Guide for Large Emitters* (**NSW EPA, 2025**), addressing overall sources and emissions associated with existing operations and including the implementation of the proposed modifications for the Project.

8.1 GHG emission scenario

Table 8-1 presents the estimated annual quantities of materials used to assess GHG emissions for the Project. The composting tonnage reflects the currently approved limit, with no additional material being proposed for the Project. Diesel and petrol requirements are adopted from the previous GHG assessment for the approved operation (**Advanced Environmental Dynamics, 2019**). As the approved tonnage remains unchanged, no increase in diesel or petrol consumption is anticipated.

Table 8-1: Estimated quantities of materials used to assess GHG emissions for the Project

Material	Quantity	Units
Composting	200,000	t
Diesel	139	kL
Petrol	1.5	kL

t = tonnes, kL = kilolitres

In terms of delivery of product material to customers, the Project would dispatch 200,000tpa using 32t road trucks, resulting in 6,250 trips. Assuming an average transport distance of 200km per return trip, this results in approximately 1,250,000km per year. Using an average truck fuel consumption rate of 53.1L/100km (**ABS, 2025**), this equates to 664kL/year of diesel required due to the vehicle movements from the Project.

The GHG emissions associated with the diesel usage are estimated in the following sections.

8.2 GHG emission factor

To quantify the amount of carbon dioxide equivalent (CO₂-e) material generated, emission factors for diesel use from the Australian *National Greenhouse Accounts Factors* (NGA Factors) document (**Cth DCCEW, 2024a**) were applied.

Table 8-2 summarises the emission factors applied.

Table 8-2: Summary of emission factor for diesel use

Type	Energy content factor (GJ/kL)	Emission factor			Units	Scope
		CO ₂	CH ₄	N ₂ O		
Composting	-	0.046	-	-	t CO ₂ -e/t	1
Diesel - Stationary	38.6	69.9	0.1	0.2	kg CO ₂ -e/GJ	1



Type	Energy content factor (GJ/kL)	Emission factor			Units	Scope
		CO ₂	CH ₄	N ₂ O		
		17.3	-	-		3
Automotive gasoline/petrol	34.2	67.4	0.2	0.2	kg CO ₂ -e/GJ	1
		17.2	-	-		3
Diesel – Transport	38.6	69.9	0.07	0.4	kg CO ₂ -e/GJ	3

Note: GJ/kL = gigajoule per kilolitre, CO₂ = carbon dioxide, CH₄ = methane, N₂O = nitrous oxide, t CO₂-e = tonnes of carbon dioxide equivalent, kg CO₂-e = kilograms of carbon dioxide equivalent

8.3 Estimated GHG emissions

The estimated annual average GHG emissions for the Project have been estimated based on quantity of materials and emission factors described in the previous sections.

A summary of the estimated annual average GHG emissions for the Project is presented in **Table 8-3**.

Table 8-3: Summary of estimated annual average GHG emissions

Activity	Scope	Estimated annual average GHG emissions (t CO ₂ -e)
Project	1	9,580
	3	94
Transport product offsite	3	1,803

The estimated annual average Scope 1 emissions for the Project is 9,580t CO₂-e (Scope 1) which is below the threshold of 25,000 t CO₂-e in accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**). The 25,000 t CO₂-e threshold is designed to identify projects with significant greenhouse gas emissions that require a more detailed climate change response, such as the preparation of a Climate Change Mitigation and Adaptation Plan (CCMAP). The CCMAP sets out how a project will avoid, reduce, substitute and offset emissions, and how it will adapt operations to align with NSW's legislated net zero targets

As the site does not consume electricity, there are no Scope 2 emissions associated with the Project.

The estimated annual GHG emissions for Australia in the 12-month period up to June 2024 was 440.6Mt CO₂-e (**Cth DCCEEW, 2024b**). In comparison, the estimated annual average GHG emissions for the Project is 0.0096 Mt CO₂-e (Scope 1). Therefore, the annual contribution of GHG emissions from the Project in comparison to the Australian GHG emissions for the 2024 period is estimated to be approximately 0.0022%.

At a state level, the estimated GHG emissions for NSW in the July 2021 to June 2022 period were 111.0Mt CO₂-e (**Cth DCCEEW, 2025**). The annual contribution of GHG emissions from the Project in comparison to the NSW GHG emissions for the 2022 period is estimated to be approximately 0.0086%.

Scope 3 emissions occur outside the Project's direct control and represent indirect impacts of its activities, as such have not been compared against state or national GHG inventories.

9 SUMMARY AND CONCLUSIONS

This report has examined the air quality impacts associated with the proposed modification to the Ravensworth Composting Facility located at Ravensworth, NSW.

Air dispersion modelling was used to predict the potential for off-site odour impacts in the surrounding area due to the operation of the Project with generally conservative assumptions.

The odour impact assessment indicates odour impacts due to the Project are below the applicable criterion at the receptor locations in Camberwell and would not lead to any unacceptable level of odour in the surrounding environment. Predicted odour impacts at industrial receptors are not greater than 2OU and is considered acceptable.

Nevertheless, the site would apply appropriate air quality management measures to ensure it minimises potential odour emissions from the site. Overall, the assessment demonstrates that even using conservative assumptions, the Project can operate without causing any significant air quality impact at current and future receptors in the surrounding environment.

The estimated annual average GHG emission for the Project is 0.0096 Mt CO₂-e (Scope 1), which is below the threshold of 25,000 t CO₂-e. GHG emissions from the Project are calculated to be approximately 0.0022% of the Australian GHG emissions for the period to June 2024 and approximately 0.0086% of the NSW GHG emissions for the 2022 period.

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Appendix A

Selection of Meteorological Year



Selection of meteorological year

A statistical analysis of the latest ten contiguous years of meteorological data from the Cessnock Airport AWS weather station is presented in **Table A-1**. The standard deviation of the nine years of meteorological data spanning 2015 to 2024 was analysed against the mean measured wind speed, wind direction, temperature and relative humidity.

The analysis indicates that the 2017 and 2019 datasets are closest to the mean for wind speed, the 2015 and 2017 datasets for wind direction, the 2015 dataset for temperature and the 2016 and 2017 datasets for relative humidity. On the basis of a score weighting analysis, 2017 was found to be most representative as it was calculated to have the lowest score.

Table A-1: Statistical analysis results for Cessnock Airport AWS

Year	Wind speed	Wind direction	Temperature	Relative humidity	Score
2015	1.0	0.2	0.1	0.4	3.3
2016	0.8	0.3	0.2	0.3	3.3
2017	0.7	0.2	0.2	0.3	3.0
2018	0.8	0.3	0.3	0.6	3.5
2019	0.7	0.2	0.2	0.8	3.2
2020	0.9	0.3	0.3	0.7	3.8
2021	1.0	0.3	0.2	0.5	3.7
2022	0.9	0.4	0.3	1.2	4.9
2023	1.5	0.3	0.4	0.4	4.8
2024	1.2	0.5	0.2	0.4	4.8

Figure B-1 shows the frequency distributions for wind speed, temperature, wind direction and relative humidity for the 2017 year compared with the mean of the 2015 to 2024 data set. The 2017 year data appear to be well aligned with the mean data for wind speed, wind direction and relative humidity.

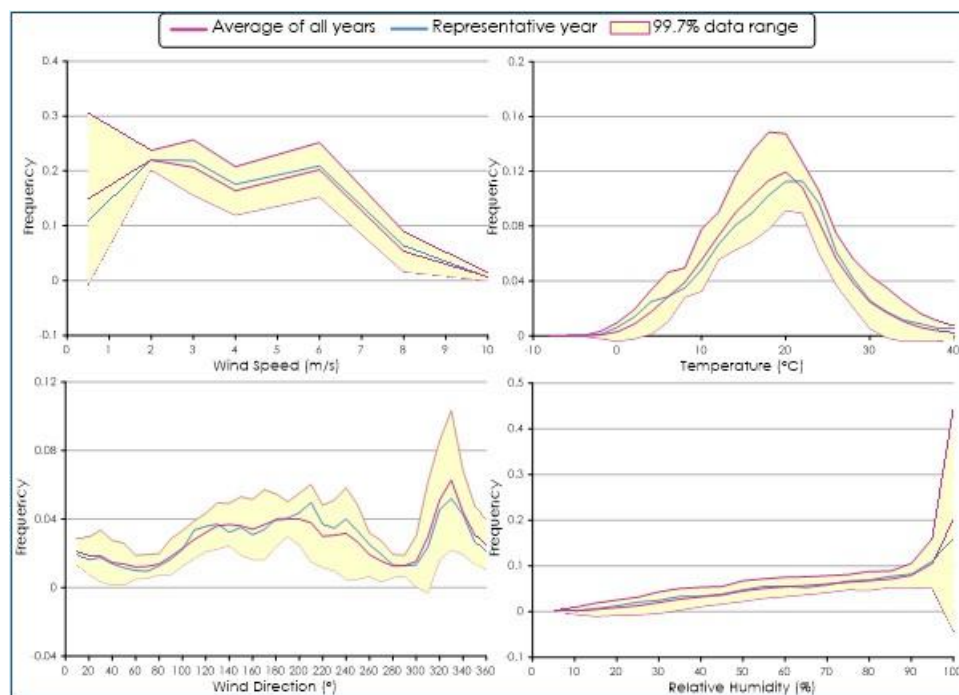


Figure A-1: Frequency distributions for wind speed, wind direction, temperature and relative humidity

Appendix B

Odour Sampling Report





Experts in air quality, odour and emission monitoring.

Modification 2 & Modification 3 of State Significant Development 9418 for Bettergrow Pty Ltd

Odour Emission Monitoring at Valoriza Dandenong

Report: R019297a

Element Environment Pty Ltd, Warriewood



Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, calibration, and inspection reports.

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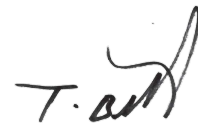
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Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to Test Methods section for full details of testing covered by NATA accreditation.

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1 Introduction

1.1 Background

Bettergrow Pty Ltd (Bettergrow) operate an organics recovery and composting facility at 74 Lemington Road, Ravensworth, NSW. The facility processes biosolids, garden organics and other recovered organic material in outdoor windrows to produce a compost product suitable for mine site rehabilitation and agricultural uses. Bettergrow hold a license to process 200,000 tonnes per annum, granted in 2022.

Bettergrow are currently seeking to expand their processing capacity to 250,000 tonnes per annum, alongside operational changes including the processing of decontaminated and pasteurised Food Organics and Garden Organics (FOGO) and/or food recovered materials. This expansion requires two modifications (Modification 2 and Modification 3) to State Significant Development (SSD) SSD-9418. To support this, Bettergrow engaged Element Environment Pty Ltd (Element Environment) to prepare the environmental assessment documentation for the modification applications. Relevant details of the modification applications are documented in the "Modification 2 - Scoping Letter" and "Modification 3 - Scoping Report" prepared by Element Environment.

To inform the modification reports for Modification 2 & Modification 3, an air quality assessment will be undertaken by Todoroski Air Sciences (Todoroski), including atmospheric dispersion modelling, to evaluate potential air quality impacts of the modifications. To inform this modelling, odour emission rates from the relevant waste types must be quantified. Since Bettergrow's current facility does not process decontaminated and pasteurised FOGO and/or food recovered material or raw FOGO recovered material, it was deemed appropriate to conduct odour monitoring at a composting facility that processes the material described above, which is located in the suburb of Dandenong South. The facility is owned and operated by Valoriza Environment Australia (Valoriza) located at 45/46 Villas Road, Dandenong South, Melbourne, VIC (Figure 1). Valoriza are licensed to process decontaminated and pasteurised FOGO and raw FOGO recovered material.

Element Environment engaged Ektimo to perform odour monitoring at Valoriza. The monitoring programme was conducted to obtain emission rates from sources comparable to those proposed for Bettergrow's expanded operations. Monitoring was undertaken on the 13th of June & the 6th of August 2025. The results of the monitoring programme will then be used as dispersion modelling inputs for the air quality assessments for the proposed modification applications. Please refer to 1.2 Monitoring Objective & Overview for a detailed breakdown of the monitoring sources and conditions.

Please note that the monitoring sources were selected based on a consultation with Element Environment and Todoroski, with an aim of monitoring the worst-case scenario for odour emissions generated by each waste type.

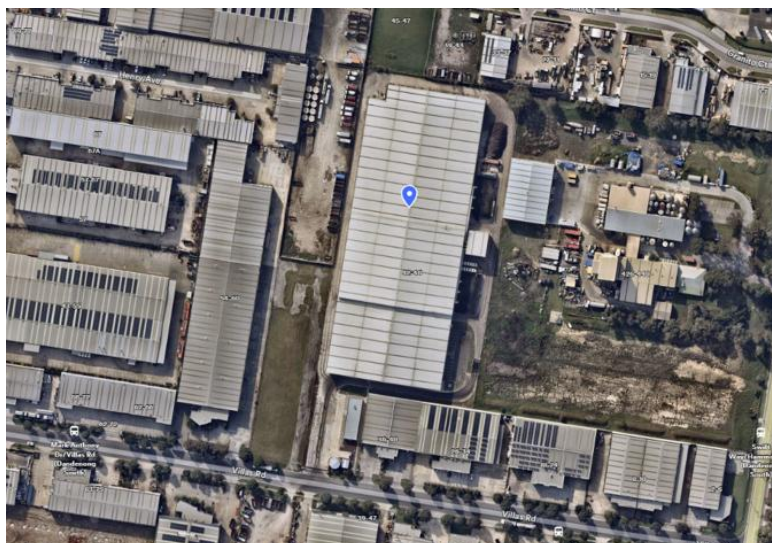


Figure 1: Valoriza Environment Australia - Dandenong composting facility

1.2 Monitoring Objective & Overview

The objective of the monitoring scope was to quantify emissions from three sources/waste material types that form part of Valoriza's operations.

Monitoring was performed as follows:

Section / Material	Age of Material	Monitoring Date	Monitoring Parameters*
Section 1 - Raw FOGO Material	Less than 1 day old	13 June 2025	-Odour (ou) -Flux Emission Rate (ou.m³/m²/min)
Section 2 - Decontaminated Material	Approx. 3 weeks old		
Section 3 - Pasteurised Material Windrow #2	Approx. 1 day old		
Section 3 - Pasteurised Material Windrow #3 (West)	Approx. 2 days old	06 August 2025	
Section 3 - Pasteurised Material Windrow #3 (East)	Approx. 2 days old		
Section 3 - Pasteurised Material Windrow #4	Approx. 5 days old		
Section 3 - Pasteurised Material Windrow #2	Approx. 19 days old		

*All concentrations are reported on a wet basis at STP.

Please note monitoring was conducted using an Isolation Flux Chamber (IFC) following AS4323.4 at the direction of Element Environment and Todoroski. Refer to Appendix A & Section 2 for further information and the application of the IFC methodology at each location during the monitoring event.

Monitoring images can be seen in Appendix A.

2 Monitoring Methodology - Isolation Flux Chamber (AS 4323.4)

Ektimo conducted emission monitoring using an isolation flux chamber based on NSW EPA (Environmental Protection Authority) regulatory requirements following Australian Standard AS 4323.4 (2009) – Stationary Source Emissions, Method 4: Area source sampling – Flux chamber technique.

The preface of AS4323.4 outlines that the flux chamber sampling technique may be “used for the determination of atmospheric contaminant emission rates from area sources, in particular, the determination of odour and hazardous air pollutants”.

Area sources include:

- Landfill surfaces (e.g. working face, soil/compost/synthetic cover, clay capped and revegetated) of various ages.
- Sewage treatment plant surfaces (e.g. inlet channels, primary sedimentation tanks,
- aeration tanks, activated sludge tanks, clarifiers, sludge lagoons, sludge drying beds,
- facultative lagoons, anaerobic lagoons and dissolved air flotation tanks).
- Composting surfaces (e.g. raw material stockpiles, compost windrows and final product stockpiles).
- Sub-surface contaminated groundwater sources (e.g. floating petroleum layer
- affecting surface emissions).
- Industrial sources (e.g. waste storage/disposal, sumps, surface spills, wastewater
- treatment plant surfaces and effluent disposal areas).
- Agricultural sources (e.g. feed lots, animal waste containments, crop preparation and
- residual crop treatment).
- Contaminated/remediation sites.

NSW EPA (Environmental Protection Authority) requires that emission to air monitoring for regulatory purposes be conducted following NSW EPA approved methods. These methods are outlined in the NSW EPA document “Approved methods for the sampling and analysis of air pollutants in NSW”.

The NSW EPA approved method (OM-8/Other Method 8) sites that AS4323.4 should be used to conduct odour sampling from diffuse sources. An excerpt from the *Approved methods for the sampling and analysis of air pollutants in NSW* document and associated link can be seen below in Figure 2.

Table 3 Other methods (OMs)

Method no.	Parameter measured	Method
OM-4	Total and hexavalent chromium emissions	California Air Resources Board Method 425 or USEPA SW-846 Test Method 0061
OM-5	'Fine' particulates (PM ₁₀₋₂ and/or PM _{2.5})	USEPA Method 201 or 201A or ISO 23210
OM-6	Polycyclic aromatic hydrocarbons (PAHs)	California Air Resources Board Method 429
OM-7	Odour sampling from point sources or odour analysis using dynamic olfactometry	AS 4323.3
OM-8	Odour sampling from diffuse sources	AS 4323.4
OM-9	'Coarse' particulates	Appendix 6: Other approved method 9
OM-10	Ammonia	ISO 21877
OM-11	Formaldehyde	USEPA Method 323 or USEPA Method 318 or USEPA SW-846 Test Method 0011 USEPA Compendium Method TO-5 or TO11A or NIOSH Method 2016 may be used when the source is comparable to ambient air conditions (<50°C, low moisture and low particulate concentrations).
OM-12	Isocyanates	USEPA Method 326 or USEPA Conditional Test Method 36
OM-13	Asbestos	ISO 10397

Figure 2: NSW EPA Approved Methods - Other Methods

Source: NSW EPA - [Approved methods for the sampling and analysis of air pollutants in NSW](#)

The Isolation Flux Chamber (IFC) methodology is widely used for emission monitoring across a variety of applications. It is commonly employed on surfaces such as soil, water bodies, landfills, compost piles, biosolids, wastewater treatment beds, and industrial materials.

The chamber functions by enclosing a defined surface area with a sealed structure, allowing emitted gases to accumulate in the chamber's headspace over a set period. Once an odourless air supply is connected, the equilibration phase begins—for a duration of 24 minutes, in accordance with AS4323.4. Following this phase, a sample is drawn into the designated sample media. Refer to Figure 3 for a schematic representation of the applied methodology.

AS4323.4 also highlights the assumption that for flux chamber measurements, the determined emission rate from within the chamber is representative of the total area source, both spatially and temporally.

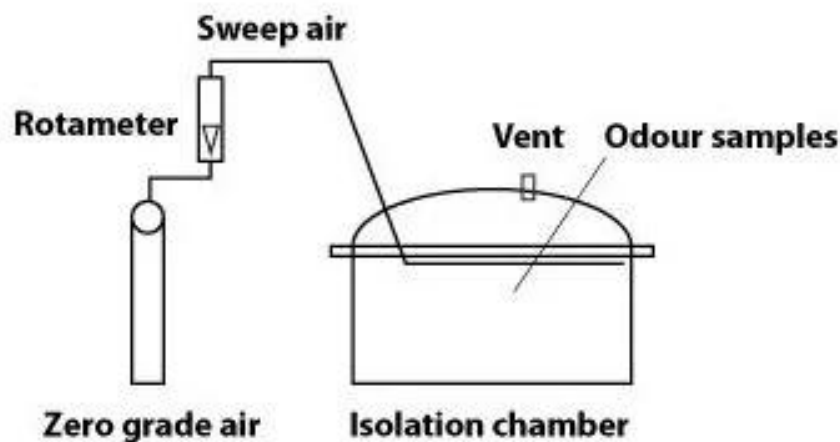


Figure 3: Isolation Flux Chamber diagram

3 Process Conditions

According to a Valoriza representative, the plant was operating as per normal operating conditions during both monitoring occasions. Commentary on the condition of each material monitored (as advised by Valoriza) is outlined below.

3.1.1 Section 1 - Raw FOGO Material

It was advised that the condition of the raw FOGO material monitored was representative of normal operations, and the material was approximately 1 day old. It was observed that the material surface was non-homogenous in nature and contained a combination of green waste, garden waste and food waste (Figure 4).



Figure 4: Raw FOGO material

3.1.2 Section 2 - Decontaminated Material

Once the Raw FOGO material is received, it undergoes decontamination which consists of picking, sorting and shredding the material. The decontamination process blends the waste material, resulting in a more homogeneous mixture. After decontamination the material is stockpiled before undergoing pasteurisation. According to the Valoriza representative, the decontaminated material sampled was approximately three weeks old and was the most recently processed batch. The condition of the material monitored can be seen in Figure 5 below.



Figure 5: Decontaminated material

3.1.3 Section 3 - Pasteurised Material - 1 Day Old

Pasteurisation involves loading decontaminated material into tunnels or sealed vessels, where the material is held for several weeks and aerated to support biological breakdown. Once the pasteurisation process has finished the material is removed from the tunnels/vessel and formed into windrows.

Based on information provided by Valoriza, Ektimo conducted monitoring on material windrow #2, which contained the entirety of Batch 20250528T04 from Tunnel 4. The material was monitored within 24 hours of its removal from the tunnel. This is likely to represent the worst-case emissions scenario for pasteurised material. Refer to Figure 6 for the condition of the pasteurised material.



Figure 6: Pasteurised material - 1 day old

3.1.1 Section 3 – Pasteurised Material – 2, 5 & 19 Days Old

Ektimo conducted monitoring on windrows of various ages to determine the impact of windrow age on odour emissions. Ektimo conducted monitoring on windrowed material that had aged/matured for 1 (discussed above), 2, 5 & 19 days. It was noted that sampling was not conducted on the same windrow for each age, however, based on consultation with Valoriza, the material composition in each windrow is expected to be homogenous and feed stocks do not vary. Monitoring on the windrows was conducted on the 13/06/2025 and the 06/08/2025.

For further information refer to Section 1.2.

Photos of monitored material at various ages can be seen in Figures 7-10 below.



Figure 7: Pasteurised material – 19 days old



Figure 8: Pasteurised material – 5 days old



Figure 9: Pasteurised material – 2 days old (Western bank)



Figure 10: Pasteurised material – 2 days old (Eastern bank)

4 Results Summary

Table 1 below summarises the results of the monitoring programme.

Duplicate samples were collected for all waste types to increase the robustness and repeatability of the measurement (sampling conducted on the 13/06/2025). Analysis of the monitoring programme conducted on 13/06/2025 indicates that pasteurised material exhibited the highest odour concentration of all waste types/process stages, followed by raw FOGO and decontaminated material.

Monitoring was carried out in an enclosed building, where notable temperature differentials between the sampling media and the ambient air created a high-moisture environment. These conditions resulted in condensation during monitoring, most prominently observed in Section 3.

Following a review of the monitoring conducted on the 13/06/2025, Element Environment and Todoroski initiated further investigation into the variation of odour emissions from older windrows, with the aim of characterising the material proposed for acceptance at the Bettergrow site.

Ektimo conducted further monitoring on three additional sampling locations, focusing on Section 3 and various aged windrows. Detailed findings, including site-specific observations and odour concentration measurements are presented in Section 5 of this report.

Single samples were collected on various aged windrows (06/08/2025). It should be noted that two samples were collected on the 2 day old windrow material, however, these samples are not considered duplicates as they were collected at different locations on the windrow. Two separate locations on the windrow were selected to capture potential spatial variation in windrow emissions.

Table 2 and Figure 11 summarise the change in odour concentration, flux emission rate, and temperature over various ages of the pasteurised material. A significant decrease in odour concentration and emissions is noted in the first 48 hours of aging.

Table 1: Results summary of the monitoring programme

Monitoring Parameters	13/06/2025 1018-1034		13/06/2025 0914-0930		13/06/2025 0813-0830	
	Section 1 - Raw/FOGO Material		Section 2 - Decontaminated Material		Section 3 - Pasteurised Material - 1 Day Old	
Surface description	Pre-processed food and green waste		Shredded green waste/compost		Earth-like grainy compost	
Odour concentration, ou	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
	3,300	2,700	940	710	5,100	7,800
Average odour concentration, ou	3,000		820		6,400	
Hedonic tone	very unpleasant		very unpleasant		very unpleasant	
Odour character	grass, rotten, green waste		grass, compost		grass,compost, rotten	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Flux Emission Rate, ou.m ³ /m ² /min	120	100	35	26	190	300
Average Flux Emission Rate, ou.m³/m²/min	110		31		240	

Monitoring Parameters	6/08/2025 1636-1644 Section 3 - Pasteurised Material - 2 Days Old (West)	6/08/2025 1645-1653 Section 3 - Pasteurised Material - 2 Days Old (East)	6/08/2025 1536-1544 Section 3 - Pasteurised Material - 5 Days Old	6/08/2025 1515-1523 Section 3 - Pasteurised Material - 19 Days Old
Surface description	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste	Shredded soil-like pile of green waste
Odour concentration, ou	410	590	240	360
Hedonic tone	very unpleasant	very unpleasant	mildly unpleasant	mildly unpleasant
Odour character	compost, green waste, fruity	compost, green waste, fruity	earthy, green waste	earthy, green waste
Flux Emission Rate, ou.m ³ /m ² /min	15	22	9	14

Table 2: Change in temperature, odour concentration and flux rate

Pasteurised Material Age	Temperature (°C)	Odour Concentration (ou)	Flux Emission Rate (ou.m ³ /m ² /min)
Approximately 1 Day Old	55	6400	240
Approximately 2 Days Old	72	500	19
Approximately 5 Days Old	57	240	9
Approximately 19 Days Old	25	360	14

Note - The values shown for concentration & emission rate of the Approximately 1 Day Old material represent the average of duplicate samples. The values shown for concentration, temperature & emission rate of the Approximately 2 Day Old material represent the average of two samples collected on the same windrow at the same age at different locations (West & East).

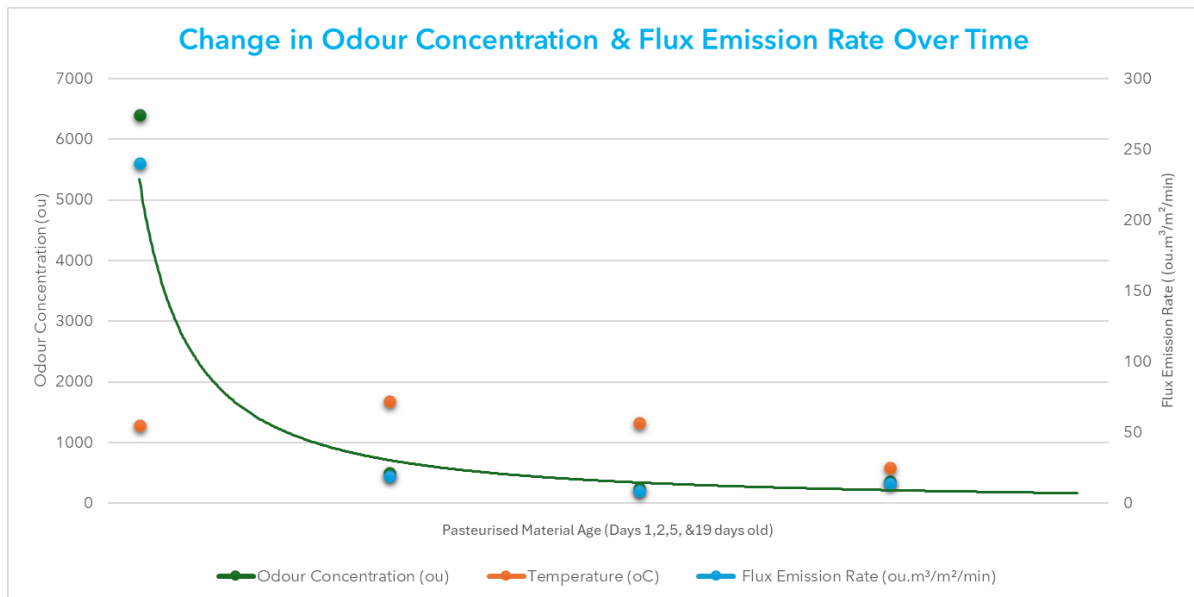


Figure 11: Change in temperature odour concentration and flux emission rate

Note - The values shown for concentration & emission rate of the Approximately 1 Day Old material represent the average of duplicate samples. The values shown for concentration, temperature & emission rate of the Approximately 2 Day Old material represent the average of two samples collected on the same windrow at the same age at different locations (West & East).

5 Results

5.1 Section 1 - Raw FOGO Material

Date	13/06/2025	Test Location	Section 1 - Raw FOGO Material
Report	R019031	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details		
GPS co-ordinates	38°2'4.08"S, 145°11'54.02"E	
Location Description	Stockpile of green waste and food waste	
Surface Description	Pre-processed food and green waste	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	Test 1	Test 2
Sampling time, hrs	1018 - 1026	1026 - 1034
Sample dilution	1	1
Concentration, ou	3300	2700
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, rotten, green waste	grass, rotten, green waste
Flux Emission Rate, ou.m ³ /m ² /min	120	100
Average concentration, ou	3000	
95% Confidence Interval	2600 - 3500	
Average Flux Emission Rate, ou.m ³ /m ² /min	110	
Flux Testing Parameters		
Equilibration time, hrs	0954 - 1018	
Sweep Rate @ STP, L/min	4.89	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	46	
Chamber temperature, °C	26	
Ambient temperature, °C	12	

5.2 Section 2 - Decontaminated Material

Date	13/06/2025	Test Location	Section 2 - Decontaminated Material
Report	R019031	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details		
GPS co-ordinates	38°2'0.13"S, 145°11'54.25"E	
Location Description	Stockpile of compost	
Surface Description	Shredded green waste/compost	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	Test 1	Test 2
Sampling time, hrs	0914 - 0922	0922 - 0930
Sample dilution	1	1
Concentration, ou	940	710
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, compost	grass, compost
Flux Emission Rate, ou.m³/m²/min	35	26
Average concentration, ou	820	
95% Confidence Interval	700 - 960	
Average Flux Emission Rate, ou.m³/m²/min	31	
Flux Testing Parameters		
Equilibration time, hrs	0850 - 0914	
Sweep Rate @ STP, L/min	4.86	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	43	
Chamber temperature, °C	18	
Ambient temperature, °C	13	

5.3 Section 3 - Pasteurised Material

5.3.1 Windrow #2 - 1 Day Old

Date	13/06/2025	Test Location	Section 3 - Pasteurised Material
Report	R019031	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		240425

Test Location Details		
GPS co-ordinates	38°1'58.49"S, 145°11'54.3"E	
Location Description	Stockpile of compost	
Surface Description	Earth-like grainy compost	
Area Classification	Industrial	
Sampling Method	AS4323.4 (Flux)	
Odour	Test 1	Test 2
Sampling time, hrs	0813 - 0821	0822 - 0830
Sample dilution	1	1
Concentration, ou	5100	7800
Hedonic tone	very unpleasant	very unpleasant
Odour character	grass, compost, rotten	grass, compost, rotten
Flux Emission Rate, ou.m ³ /m ² /min	190	300
Average concentration, ou	6400	
95% Confidence Interval	5500 - 7500	
Average Flux Emission Rate, ou.m ³ /m ² /min	240	
Flux Testing Parameters		
Equilibration time, hrs	0748 - 0812	
Sweep Rate @ STP, L/min	4.93	
Penetration Depth, mm	20	
Static Pressure, Pa	<2	
Surface temperature, °C	55	
Chamber temperature, °C	21	
Ambient temperature, °C	8	

5.3.2 Windrow #3 - 2 Days Old (West)

Date	6/08/2025	Test Location	Windrow #3 - 2 Days Old (West)
Report	R019297	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 14°11'55"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1636 - 1644
Sample dilution	1
Concentration, ou	410
Hedonic tone	very unpleasant
Odour character	compost, green waste, fruity
Flux Emission Rate, ou.m ³ /m ² /min	15
Flux Testing Parameters	
Equilibration time, hrs	1612 - 1636
Sweep Rate @ STP, L/min	4.62
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	69
Chamber temperature, °C	23
Ambient temperature, °C	21

5.3.3 Windrow #3 - 2 Days Old (East)

Date	6/08/2025	Test Location	Windrow #3 - 2 Days Old (East)
Report	R019297	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 14°11'55"E
Location Description	Middle-right section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1645 - 1653
Sample dilution	1
Concentration, ou	590
Hedonic tone	very unpleasant
Odour character	compost, green waste, fruity
Flux Emission Rate, ou.m ³ /m ² /min	22
Flux Testing Parameters	
Equilibration time, hrs	1621 - 1645
Sweep Rate @ STP, L/min	4.72
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	75
Chamber temperature, °C	27
Ambient temperature, °C	21

5.3.4 Windrow #4 - 5 Days Old

Date	6/08/2025	Test Location	Windrow #4 - 5 Days Old
Report	R019297	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 145°11'54"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1536 - 1544
Sample dilution	1
Concentration, ou	240
Hedonic tone	mildly unpleasant
Odour character	earthy, green waste
Flux Emission Rate, ou.m ³ /m ² /min	9
Flux Testing Parameters	
Equilibration time, hrs	1508 - 1532
Sweep Rate @ STP, L/min	4.74
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	57
Chamber temperature, °C	24
Ambient temperature, °C	19

5.3.5 Windrow #2 - 19 Days Old

Date	6/08/2025	Test Location	Windrow #2 - 19 Days Old
Report	R019297	Plant/Site	Valoriza Dandenong
Client	Element Environment		Dandenong South, VIC
Ektimo Staff	Han Ozupek & Mahdi Majd		

240425

Test Location Details	
GPS co-ordinates	38°2'1"S, 145°11'54"E
Location Description	Middle-left section of the windrow
Surface Description	Shredded soil-like pile of green waste
Area Classification	Industrial
Sampling Method	AS4323.4 (Flux)
Odour	
Sampling time, hrs	1515 - 1523
Sample dilution	1
Concentration, ou	360
Hedonic tone	mildly unpleasant
Odour character	earthy, green waste
Flux Emission Rate, ou.m ³ /m ² /min	14
Flux Testing Parameters	
Equilibration time, hrs	1451 - 1515
Sweep Rate @ STP, L/min	4.81
Penetration Depth, mm	20
Static Pressure, Pa	<2
Surface temperature, °C	25
Chamber temperature, °C	23
Ambient temperature, °C	19

6 Test Methods

All sampling and analysis were performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited	
				Sampling	Analysis
Area sources (equilibrium flux chamber)	AS 4323.4	NA	not specified	✓	NA
Odour	AS 4323.3	AS 4323.3	refer to results	✓	✓ [‡]
Odour characterisation	NA	direct observation	NA	NA	✗

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

[‡] Odour analysis conducted at the Ektimo VIC laboratory by forced choice olfactometry. Results were reported to Ektimo on:
13 June 2025 in report OV-01109
07 August 2025 in report OV-01124

7 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

Unless specifically noted, all samples were collected and handled in accordance with Ektimo's QA/QC standards.

8 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry basis (except moisture)
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
NA	Not applicable
NATA	National Association of Testing Authorities
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
Vic EPA	Victorian Environment Protection Authority
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range

9 Appendix A - Monitoring Images



Image 1: Raw FOGO material monitoring



Image 2: Decontaminated material monitoring



Image 3: Pasteurised material - 1-day old monitoring



Image 4: Pasteurised material - 2 Days Old (West) monitoring



Image 5: Pasteurised material - 2 Days Old (East) monitoring



Image 6: Pasteurised material – 5-day old monitoring



Image 7: Pasteurised material – 19-day old monitoring



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