Hume Food Organics and Garden Organics Facility

Air Quality Impact Assessment

Transport Canberra and City Services

27 October 2023

→ **The Power of Commitment**

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GHD Pty Ltd | ABN 39 008 488 373

133 Castlereagh Street, Level 15

Sydney, New South Wales 2000, Australia

T 61-2-9239 7100 | **F** 9239 7199 | **E** sydmail@ghd.com | **ghd.com**

Abbreviations and meanings

Abbreviation	Meaning
AAWTF	Awaba Alternative Waste Treatment Facility
ACT	Australian Capital Territory
AQI	Air Quality Index
AQIA	Air quality impact assessment
AQMS	Air quality monitoring station
AWS	Automatic weather station
BoM	Bureau of Meteorology
EIS	Environmental impact statement
EPA	Environment Protection Authority
FO	Food Organics
FOGO	Food organics and garden organics
GHD	GHD Pty Ltd
Go	Garden Organics
HRRE	Hume Resource Recovery Estate
H_2S	Hydrogen sulfide
LGA	Local government area
LHRRP	Lucas Heights Resource Recovery Park
MLRMC	Mugga Lane Resource Management Centre
MRF	Materials recovery facility
NO_2	Nitrogen dioxide
NSW	New South Wales
OER	Odour emission rate
OU	Odour units
$PM_{2.5}$	Particulate matter of diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter of diameter less than or equal to 10 microns
POEO	Protection of the Environment Operations
SLR	SLR Consulting Australia
SOER	Specific odour emission rate
SO_2	Sulfur dioxide
SWMC	Summerhill Waste Management Centre
tpa	Tonnes per annum
TSP	Total suspended particles

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1. Introduction

1.1 Overview

The Australian Capital Territory (ACT) Government is working to reduce waste to landfill and increase resource recovery. The strategic direction for the management of waste in the Territory is set out in the 'ACT Waste Management Strategy 2011-25' (ACT Government, 2010). The strategy commits the ACT Government to minimise organic waste going to landfill and recovering organic waste resources. It also sets a target of increasing the rate of resource recovery to over 90 percent by 2025, with no recoverable waste sent to landfill.

The Federal Government also has a target of halving the amount of organic waste sent to landfill for disposal by 2030, as set out in the 'National Waste Policy Action Plan' (Australian Government, 2019)

A waste feasibility study was established in mid-2015 to identify a pathway towards achieving the ACTs waste management targets and examine options to drive better resource recovery. In 2018, the ACT Government released the final recommendations from the study as the 'Waste Feasibility Study: Roadmap and Recommendations Discussion Paper' (ACT Government, 2018). Key recommendations from this were to identify a site and establish an organics progressing facility to process food organics and garden organics (FOGO) and the implementation of a kerbside FOGO collection.

The 'ACT Climate Change Strategy 2019 to 2025' (ACT Governmemnt, 2019) also identifies FOGO collection for all households and the investigation of organic waste processing as key priorities. An opt-in FOGO collection pilot is currently underway in the ACT (Belconnen), which has so far diverted more than 480 tonnes of material from landfill (ACT Parliamentary Counsel, 2022).

There is currently no processing facility within the ACT that can accept and process FOGO material. ACT NoWaste is therefore proposing to develop a new FOGO facility (the 'proposal') in Hume to strengthen the Territory's circular economy and help meet Territory and Federal Government landfill diversion and resource recovery targets.

The proposal is defined as the construction and operation of a new FOGO facility with the capacity to receive up to 70,000 tonnes per year of FOGO for in-vessel composting.

1.1.1 Approval and assessment requirements

This report has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact statement (EIS) for the proposal. The EIS supports the application for approval of the proposal and to address the requirements provided by the ACT Department of Environment, Planning and Sustainable Development Directorate dated 7 June 2022.

The proposal is subject to approval by the planning and land authority within the Environment, Planning and Sustainability Development Directorate.

1.2 Purpose of this report

Transport Canberra and City Services has engaged GHD to conduct an air quality assessment for the proposed FOGO facility to be constructed within the Hume Resource Recovery Estate (HRRE) on Block 5, Section 26 Hume, off John Corey Road.

An air quality assessment is required for construction and operation of the project to determine any potential impacts on the nearby sensitive receptors and identify the need for any specific mitigation measures. Odour is identified as the key issue about air quality from the proposal.

1.3 Scope and limitations

This report documents the assessment of potential air quality impacts associated with the construction and operation of the FOGO facility and potential impacts on nearby sensitive receptors. This assessment has been undertaken in accordance with the *Technical framework for assessment and management of odour from stationary sources* (NSW Department of Environment and Conservation, 2006) (the Technical Framework) and the *Approved* *methods for the modelling and assessment of air pollutants in NSW* (NSW EPA, 2016) (the Approved Methods). The scope of works included:

- Review available ambient air quality, odour data, complaint data and reports in the local area including Mugga Lane Resource Management Centre (MLRMC).
- Undertake a site visit to gain an appreciation of the proposal site including other sources of odour in the area, the topography and sensitive receptors.
- Undertake a literature review of similar existing or proposed FOGO facilities, including odour assessments and predicted odour contours (publicly available).
- Preparation of an odour inventory of proposed operations based on provided source/process odour emission rate data, general biofilter odour emission guarantees, flow rates, activity type.
- Preparation of a meteorological model of the proposal site, using the nearby Bureau of Meteorology (BoM) weather stations (Tuggeranong and Canberra Airport) to improve the accuracy of the model.
- Prepare an odour dispersion model of the proposal, using assumed odour emission rates, discharge parameters (e.g. flow rates) and local meteorology.
- Predict 99th percentile odour concentrations at nearby sensitive receptors and in a grid surrounding the proposal site (contours).
- Discuss predicted odour concentrations and how they compare with the NSW EPA odour criteria and the *ACT Separation Distance Guidelines for Air Emissions November 2018.*
- Quantitatively assess the potential for cumulative odour impacts, most critically relating for the potential of interacting odour impacts from the MLRMC, including:
  - Review operational information for the MLRMC.
  - Review emission data, previous reports, previous modelling assessments.
  - Develop an odour emission inventory for the MLRMC, based on previous assessments if available, or based on publicly available odour sampling data from similar facilities.
  - Conduct dispersion modelling for the following scenarios:
    - impact of the MLRMC only; and
    - the cumulative impact with the proposed FOGO facility.
  - The scope of work does not include quantitative impact assessment for sources other than the MLRMC including other proposed sources in the region.
- Qualitatively describe the effect of emissions from traffic during construction and operation of the facility and equipment.
- Qualitatively discuss the potential for changed odour impacts associated with climate change, based on the findings of the climate change risk assessment.
- Prepare a standalone air quality report outlining the methodology and findings of the assessment (including odour contours).

This report has been prepared by GHD for Transport Canberra and City Services and may only be used and relied on by Transport Canberra and City Services for the purpose agreed between GHD and Transport Canberra and City Services as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Transport Canberra and City Services arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.4 Assumptions

The following assumptions apply to the assessment:

– Modelling was undertaken assuming the worst-case odour emissions occur 24 hours a day which is highly conservative.
– A meteorological model has been prepared using data from the BoM Tuggeranong and Canberra Airport AWS which have been assumed to be representative of the project site.
– The assessment has been carried out for normal operating conditions and does not consider changed odour risk associated with any modifications to the facility or upset scenarios.
– Odour emissions inventory is based on design assumptions including building and ventilation system air flow. Changes in the ventilation design may influence the predicted odour concentrations.
– The model includes a scenario with the stack height the same as the building height, which is not ideal for dispersion and wake effects. Additional modelling should be undertaken during detailed design if this option is chosen, or if any other stack discharge parameters are changed including stack diameter, location and velocity.
– Cumulative assessment has been undertaken based on assumptions about the MLRMC layout, odour concentrations and operations. No source odour sampling was provided and this was undertaken using representative odour data. Based on odour sampling survey results, it has been assumed the MLRMC does not impact the nearby sensitive receptors.

2. Legislative context

2.1 Assessment criteria

2.1.1 Scoping Document

The planning and land authority (the Authority) within the Environment, Planning and Sustainable Development Directorate has identified the matters that are to be addressed by an EIS in the relation to the development proposal. The EIS must conform to the identified requirements. The requirements relevant to air quality and climate change are provided in Table 2.1 as well as where they have been addressed.

Table 2.1 Scoping document requirements

Requirement	Where addressed
Provide an air quality and odour impact assessment completed by a suitably qualified environmental consultant which considers the air discharges from the facility and their impact on the surrounding environment. The assessment must take into consideration cumulative impacts from surrounding land uses. The assessment must be carried out in accordance with the NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.	This report
The assessment must consider dust impacts on the surrounding developments.	Section 6
The air quality and odour assessment must identify suitable mitigation measures.	Section 9
The assessment must include an Air Quality Management Plan which describes proposed mitigation and monitoring of air quality impacts and preventative controls such as maintenance measures and process management.	Section 9
Provide evidence showing net emissions from the operation of the facility.	Section 7.2
Provide quantitative estimates of the Scope 1 and 2 greenhouse gas emissions that will be generates by the proposed development during operation.	Greenhouse gas report

2.1.2 Odour assessment criteria

As specific guidelines for odour assessment are not specified for the ACT, the Technical Framework (NSW Department of Environment and Conservation, 2006) and the Approved Methods (NSW EPA, 2016) have been used for this odour assessment.

For a Level 3 odour assessment, the Technical Framework outlines recommended assessment objectives based on the type of facility being assessed (new, existing, upgrading/expanding). Level 3 odour impact assessments use at least one year of hourly average site-representative meteorological data and, where available, an odour-emissions model. Development of an odour emissions model has been completed in accordance with the Approved Methods.

Comparison of the sites predicted performance against impact assessment criteria outlined in the Approved Methods is a valuable tool in understanding the spatial variation in potential off-site impacts, expected level of risk as well as providing a baseline for future modifications or future developments surrounding the source of odour. The odour criteria range from 2 odour units (OU) for densely populated areas up to 7 OU for single isolated residences and can be seen in Table 2.2.

Table 2.2 Odour assessment criteria

Population of affected community	Odour performance criteria (OU) (nose response odour certainty units at 99th percentile[1])
Single Residence (≤ ~2)	7
~ 10	6
~ 30	5
~ 125	4

Population of affected community	Odour performance criteria (OU) (nose response odour certainty units at 99th percentile[1])
~ 500	3
Urban (≥~2,000)	2

Note 1: This is a prediction of the odour level that may occur 1% of the time, or one hour in one hundred. Odour performance criteria are designed to be precautionary, so that impacts on sensitive receivers can be minimised

The criteria assumes that 7 OU at the 99th percentile would be acceptable to the average person, but as the number of exposed people increases there is a chance that sensitive individuals would be encountered. The criteria of 2 OU at the 99th percentile is considered to be acceptable for large populations (more than 2,000 people).

The criteria have also been specified at an averaging time of nominally 1 second. The choice of short averaging time recognises that the human nose has a response time of less than 1 second so that modelling of odour impact should allow for the short-term concentration fluctuations in an odour plume due to turbulence.

As the CALPUFF dispersion model (used in this assessment) cannot predict concentrations for a 1 second average, a ratio between the 1 second peak concentration and 60 minute average concentration has been applied in accordance with Section 6.6 of the Approved Methods. This is known as the peak to mean ratio (P/M60). P/M60 is a function of source type, stability category and range (that is, near or far field), and values are tabulated in the Approved Methods.

2.1.3 Project odour criteria

There are three main areas of concern near the proposal site:

– MacArthur suburb located approximately 2 km southwest of the proposal site.
– The developing suburb of Tralee located approximately 1.1 km southeast of the proposal site.
– The Hume industrial area located approximately 250 m south of the proposal site at the nearest point.

The most stringent criterion of 2 OU has been used to assess the suburbs due to the density of residences in these areas.

The Hume industrial area, in particular the facilities nearest to the proposal site, is not expected to be densely populated. These are large warehouse facilities and likely only have a small number of employees relative to the building footprints. Therefore the population of this area has been assumed to be not more than 500 people at any one time. The corresponding odour criterion is 3 OU.

Other sensitive receptors are isolated residences which have been assessed under the least stringent criterion of 7 OU. There is one commercial receptor, a pub, located approximately 1.4 km southwest of the proposal site. The number of people present at this location at any one time has been assumed to be not more than 500 people and as such the criterion at this location is 3 OU.

2.1.4 Dust assessment criteria

Dust assessment criteria for the project was taken from the National Environment Protection (Ambient Air Quality) Measure) (Air NEPM) (National Environment Protection Council, 2021). The adopted air quality assessment criteria are summarised in Table 2.3.

Table 2.3 Dust assessment criteria

Pollutant	Averaging period	Concentration (µg/m^3)
PM_{10}	24 hours	50
	Annual	25
$PM_{2.5}$	24 hours	25
	Annual	8
Total suspended particulates (TSP)	Annual	90

2.2 Separation distances

The Environment Protection Authority (EPA) in several states has specified separation distances between industrial land uses that emit odour or dust and sensitive land uses. These guidelines are published as one method of considering potential conflicts between incompatible land uses. These are recommendations only, and there is always opportunity for a proponent to demonstrate compliance with relevant legislative requirements through other methods. It is noted that separation distances are developed to minimise impacts that may occur when there are accidents, power failure, equipment failure (i.e. odour controls) or unusual meteorological conditions that may occur, as well as normal operation.

The *Separation distance guidelines for air emissions* (ACT Government, 2018) has been used for this assessment. The separation distances relevant to this project specified in this guideline are:

– 1000 m from composting works (for compost produced at a rate of >200 tonnes/year).
– 300 m from waste transfer stations (i.e. collection, consolidation, temporary storage, sorting or recovering refuse or used materials prior to transfer for disposal or use elsewhere).
– 300 m from materials recovery facilities (i.e. Collecting, dismantling, treating, processing, storing or recycling used or surplus materials).

The separation distance from composting works is based on outdoor composting, whereas composting and processing of the FOGO materials at this facility will be fully enclosed. Therefore the separation distances for waste transfer stations and materials recovery facilities are more appropriate.

All residential sensitive receptors are >1 km from the proposal site and as such the facility is compliant with the recommended separation distance. This does not include the industrial area to the south as industrial areas are not considered a sensitive area as per the separation distance guideline. However, the industrial area has been included as a sensitive receptor in the quantitative assessment as it is considered a workplace which will be impacted by odour emissions as per the Approved Methods.

Other regulations relating to air quality in the ACT include the *Environment Protection Act 1997* (ACT Parliamentary Counsel, 2021) and the *Environment Protection Regulation 2005* (ACT Parliamentary Counsel, 2022). These specify requirements for activities in the ACT to reduce environmental impacts. This facility falls under Class A Item 37 '*the operation of a facility that composts, or is intended to compost, more than 200t of animal waste, or 5000t of plant waste, per year.'* This indicates that an environmental authorisation is required.

3. Proposal description

The facility will be sized with at least 50,000 tpa of initial FOGO processing capacity available from commencement of operations, and the design of the facility is intended to enable processing of up to 70,000 tpa of FOGO waste.

It is expected that around 42,000 tonnes per annum (tpa) of municipal FOGO feedstock could be collected for processing from 2023.

The design of the facility is to:

– Accommodate weekly, monthly and seasonal variations in input quantities and characteristics.
– Incorporate modular elements to enable the capacity and operating parameters of the tunnel composting system to be cost-effectively expanded to achieve the design processing capacity of 70,000 tpa.
– Accommodate increased tonnages and/or a range of additional organic waste feedstocks (subject to relevant licence approval).

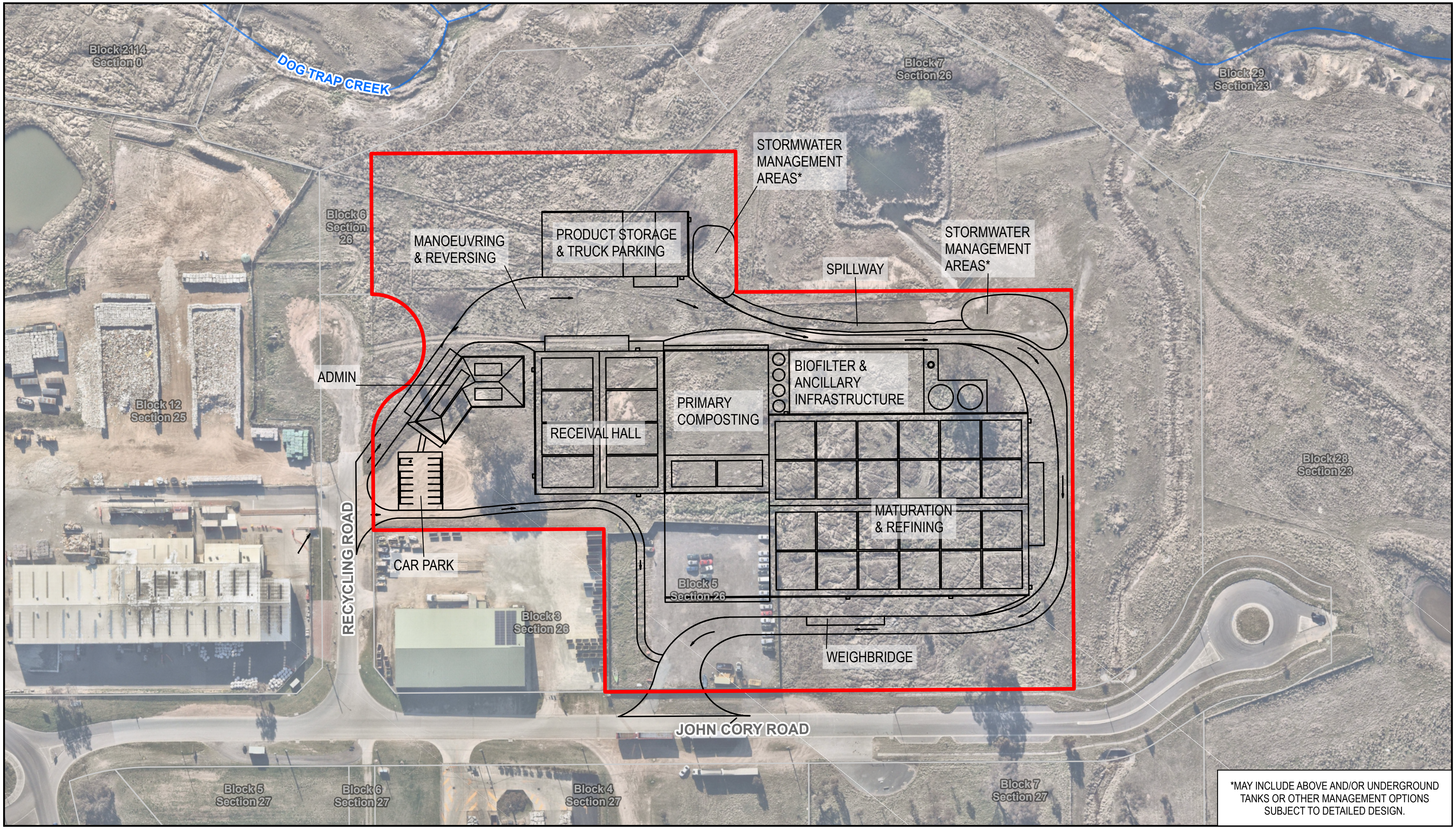
It is proposed that any spare capacity in the facility will be utilised for processing of a combination of commercial organic wastes, including food organic (FO) waste, and municipal garden organic (GO) waste from various sources. However, the primary focus will be processing of FOGO waste.

The tunnel composting plant incorporates an air quality management via extraction and biofiltration, and a high level of process monitoring and control of critical process parameters. This minimises the environmental impact of the operation and enables production of consistently high-quality recycled organic products.

The process comprises the following main elements:

– FOGO waste receival and decontamination.
– Shredding, mixing and moistening.
– Pasteurisation and composting in enclosed tunnels with forced aeration and moisture control.
– Enclosed maturation in static piles.
– Product refinement within the enclosed maturation building.
– Semi-enclosed and covered product storage on hardstand (under roof and enclosed on 3 sides).
– Residual waste management (materials removed during decontamination and product refinement).

Figure 3.1 below shows the indicative concept layout for the proposed composting facility, including a preliminary configuration and approximate area requirements to accommodate these operations (subject to detailed design and final vendor process selection).



Legend

- Proposal site
- Cadastre
- Proposal site layout
- Watercourses

Paper Size ISO A4

0 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Transport Canberra and City Services
Hume Food Organics and Garden Organics Facility
Air Quality Impact Assessment

Project No. 12540460
Revision No. 0
Date 17/10/2023

Indicative concept layout

FIGURE 3.1

\\ghdnet\ghd\AU\Canberra\Projects\23\12540460\GIS\Maps\Deliverables\FOGO_PSI.aprx
Print date: 17 Oct 2023 - 15:29

Data source: Imagery - Nearmap: extracted 17/10/2023; DEM - ACT Government, 2015; Roads, Cadastre - ACTmapi, 2022; Watercourses - NSWSS, 2022. Created by: pfernandes

The concept layout is based on a fully enclosed two-stage tunnel composting of 28 days active composting residence time process comprising:

– pasteurisation, achieved after a nominal 14 days in-tunnel.
– production of a composted product after a further 14 days in-tunnel.

The final processing sequence, process duration and methodology will be subject to detailed design and vendor process selection. The composted product would be screened following active maturation and then undergo final maturation and storage in order to meet stability requirements as necessary. The composting and screening process is to meet the requirements for a Mature Composted Soil Conditioner under AS4454-2012 as a minimum and notwithstanding these minimum requirements the soil conditioner shall be suitable for the intended local markets.

A semi-enclosed finished product storage area will allow for additional storage for the refined composted products. This area will be under a roof and enclosed on 3 sides.

More details on the proposal description relevant to odour are provided in Section 7.2.

4. Methodology

4.1 General

This AQIA of the construction and operation of the project was completed in accordance with EPA and contemporary guidance to assess air quality impacts from the project. A qualitative assessment has been completed to assess the impact during construction of the project. Atmospheric dispersion modelling was undertaken to evaluate the potential worst-case impacts from the project under routine operations and inform recommendations of appropriate mitigation measures to minimise any potential impacts.

4.1.1 Pollutants of interest

Air quality may be impacted by a number of pollutants, each of which has different emission sources and effects on human health, amenity and the environment.

Based on a review of the construction methodology and operational activities, dust and particulate matter was identified as the pollutant most likely to impact nearby sensitive receptors during construction of the project.

During operation of the project, odour was identified as the pollutant most likely to impact nearby sensitive receptors. Dispersion of odour has been modelled and assessed for operation of the project.

Combustion emissions from traffic and equipment would occur during both construction and operation of the project. However, these emissions are expected to be negligible in comparison with those from the high traffic volume already present on the Monaro Highway adjacent to the proposal site. Therefore combustion emissions have not been further assessed in this report.

4.2 Modelling methodology

4.2.1 Dispersion model selection

CALPUFF was found to be the most appropriate dispersion modelling software to use for this project due to the distance and topography between the meteorological observations and sensitive receptors, and the proposal site. As well as this, the high frequency of calm conditions (wind speeds less than 0.5 metres per second) cannot be accurately accounted for using AUSPLUME and therefore CALPUFF is required.

CALPUFF is an advanced non-steady-state, Gaussian puff dispersion model that uses a three dimensional spatially varying wind field that is capable of accounting for complex terrain features and varying wind fields.

4.2.2 Emission inventory development

The three key odour-emitting elements of the facility are the biofilter, incoming trucks delivering fresh FOGO waste, and the semi-enclosed storage of composted product.

Emission rates used in odour assessments for the Summerhill Waste Management Centre (SWMC) (AECOM, 2021) (ERM, 2022), the Lucas Heights Resource Recovery Park (LHRRP) (GHD, 2021) (Ektimo, 2014) and the Awaba Alternative Waste Treatment Facility (AAWTF) (GHD, 2016) were reviewed in development of this emissions inventory. The sources used in each of these assessments were compared with those for this project to ensure relevance. Where multiple relevant emission rates were found (e.g. varying emission rates for a similar source in each of the assessments), the maximum was used.

For the trucks and product storage assessments, emission rates were based on sampling of fresh and 3-week old green waste at the SWMC. The SWMC performs similar FOGO processing as expected at the Hume FOGO, however as this sampling was of the input and output products themselves the differences between the processing facilities is not expected to impact these measurements.

The emission rates used for the MLRMC were sourced from the LHRRP assessment based on sampling completed at this facility. Standard landfill operations and green waste processing have been assumed at both facilities. This includes emissions from the landfill (overnight, morning and afternoon), the leachate pond, and the green waste processing area.

4.2.3 Representative year

A representative year was chosen from the last five years based on the average annual wind speed, wind direction, temperature and relative humidity recorded at the BoM Tuggeranong AWS. A review of the Southern Oscillation Index (SOI) for the past ten years was also undertaken to ensure the chosen representative year was not drier or wetter than normal. This review is shown in A-2-2. The review resulted in the selection of the 2017 calendar year (01/01/2017 – 01/01/2018) as the representative year for modelling purposes.

4.2.4 Meteorological modelling

Local meteorology including long term wind speed and direction, as well as atmospheric stability, influence how air pollutants are dispersed into the local environment.

Site specific meteorological data used to drive the dispersion model was generated by use of TAPM and CALMET meteorological models to produce a three-dimensional wind field which also accounts for local variations in the terrain. Prognostic TAPM data were used as an ‘initial guess field’ for the CALMET meteorological model as well as surface observations from the two nearby BoM AWS (Tuggeranong and Canberra Airport).

Details of the procedure undertaken to produce the site-specific meteorology are provided in Appendix A.

4.2.5 Dispersion modelling

Predicted air quality impacts were modelled in accordance with the Approved Methods using an approved computer software model CALPUFF.

CALPUFF model settings were selected with consideration to the recommendations provided in the *Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia* (Barclay and Scire; Atmospheric Studies Group, 2011).

For this assessment, the CALPUFF dispersion model was used to predict ground-level concentrations from the project. The CALPUFF dispersion model utilised a meteorological dataset of one year in duration. The grid size used in the CALPUFF model was equivalent to the CALMET domain (use of CALMET further discussed in Appendix A). The same grid resolution of 200 metres used for the CALMET model was used in CALPUFF.

The source properties and emission rates utilised in the dispersion modelling are detailed in Section 7.2.

Building wake effects from proposed on site buildings and large structures were included through use of the Building Profile Input Program (BPIP) PRIME algorithm. The dispersion model accounted for wake effects from the waste receival hall, the composting hall and tunnels and the maturation hall.

The dispersion model was configured to predict odour concentration at identified sensitive receptor locations and for a sampling grid centred on the proposal site. Impacts at and beyond the site boundary were calculated using the sampling grid.

5. Environmental setting

5.1 Proposal location

The facility will be located within the current bounds of the Hume Resource Recovery Estate (HRRE) on Block 5, Section 26 Hume, off John Corey Road, shown in Figure 5.1.

The layout is based on a two-stage tunnel composting process comprising 28 days' residence time, with pasteurisation achieved after 14 days and production of a composted product after 28 days (meeting the requirements of AS4454-2012). The composted product will undergo final maturation in an enclosed building with odour control.

The enclosed maturation area of the facility will allow for active management and temporary storage of approximately 2 – 4 weeks' production of fresh compost exiting the tunnel composting process. During this period, and within this building, products can be further refined to meet customer requirements.

A semi-enclosed, covered finished product storage area will allow for a nominal 25 days' storage for the refined products, subject to detailed design.

Legend

- Proposal site
- Cadastre
- Watercourses

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Transport Canberra and City Services
Hume Food Organics and Garden Organics Facility
Air Quality Impact Assessment

Project No. **12540460**
Revision No. **0**
Date **16/08/2023**

Proposal location

FIGURE 5.1

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Print date: 30 Aug 2023 - 14:42

Data source: Metromap Tile Service: ,Light Gray Base: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS,Light Gray Reference: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS extracted 30/08/2023; DEM - ACT Government, 2015; Roads, Cadastre - ACTmapi, 2022; Watercourses - NSWSS, 2022. Created by: pfernandes

5.2 Sensitive receptors

Sensitive receivers are defined based on the type of occupancy and the activities performed in the land use. Sensitive receivers could include both existing and proposed:

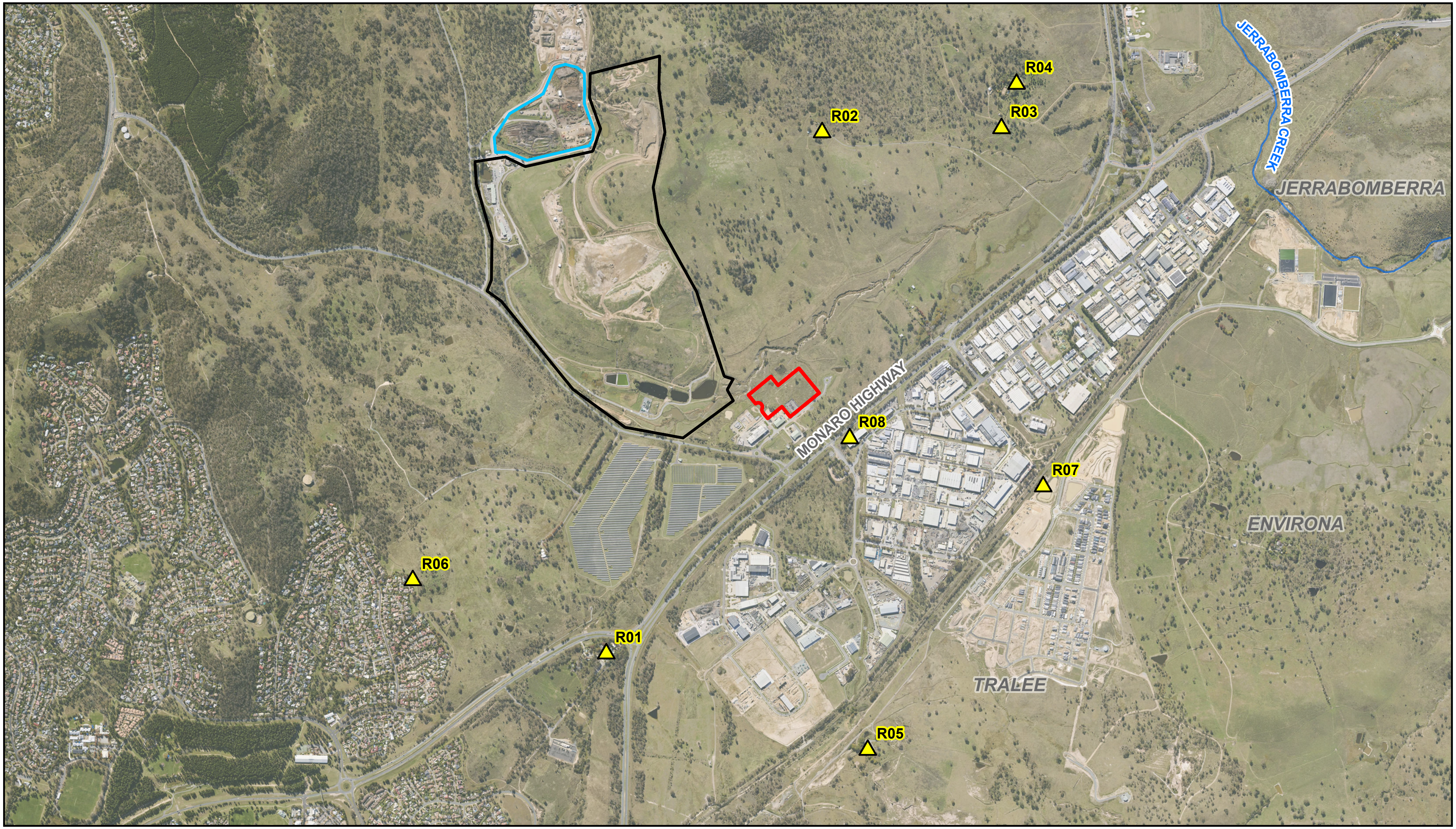
- Residences.
- Educational institutes.
- Hospitals and medical facilities.
- Places of worship.
- Commercial or industrial premises.
- Passive recreational areas such as parks and reserves.
- Active recreational areas such as sporting fields, golf courses. Note that these recreational areas are only considered sensitive when they are in use or occupied.

The nearest existing residential area is the suburb of MacArthur, located approximately 2 km southwest of the proposal site. The developing suburb of Tralee is located approximately 1.1 km southeast of the proposal site. Isolated sensitive receptors located nearer to the proposal site are described in Table 5.1 and shown in Figure 5.2.

Table 5.1 Sensitive receptors within 2 km of the proposal site

ID	Receptor Type	Address	Easting (m E)	Northing (m S)	Distance and direction from site
R01	Commercial	Rose Cottage Canberra, corner of Isabella Dr and Monaro Hwy	694648.43	6079835.47	1.4 km SW
R02	Residence	Jerrabomberra, 2620	695689.61	6082349.87	1.15 km NE
R03	Residence	10171 Monaro Hwy, Hume	696554.92	6082369.50	1.6 km NE
R04	Residence	Woden Homestead, 10225 Monaro Hwy, Hume	696627.56	6082583.61	1.65 km NE
R05	Residence	Tralee, 2620	695909.64	6079370.38	1.55 km S
R06	Residential area	MacArthur	693721.19	6080206.95	2 km SW
R07	Residential area	Tralee	696709.53	6080562.93	1.1 km SE
R08	Industrial area	Hume industrial area	695824.83	6080872.12	0.25 km S

The Mugga Lane Solar Park is located 300 m west of the proposal site however this is not considered a sensitive receptor as it is not regularly populated and therefore would not be impacted by odour.



Legend

- Proposal site
- Landfill
- Green waste facility
- Watercourses
- Sensitive receptors

Paper Size ISO A4

0 0.25 0.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Transport Canberra and City Services
Hume Food Organics and Garden Organics Facility
Air Quality Impact Assessment

Project No. **12540460**
Revision No. **0**
Date **16/08/2023**

Sensitive receptors

FIGURE 5.2

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Print date: 30 Aug 2023 - 14:40

Data source: Metromap Tile Service: extracted 30/08/2023; DEM - ACT Government, 2015; Roads, Cadastre - ACTmapi, 2022; Watercourses - NSWSS, 2022.
Created by: pfernandes

5.3 Background air quality

An assessment of the total impact, which includes the proposal impact as well as the background concentrations, is required.

5.3.1 Background ACT air quality monitoring data

Ambient air quality monitoring is undertaken in the ACT to support both the National Environment Protection Measures and Air Quality Index (AQI) to better communicate the ambient air quality to the ACT Community. The nearest station to the proposal site is the Monash AQMS which is located approximately 5.8 km west of the proposal site. This stations records concentrations of NO_2, CO, O_3, PM_{10} and $PM_{2.5}$. A summary of this data for the last five years is presented in Table 5.2.

Table 5.2 Summary of available background air quality data recorded by the Monash AQMS for 2017-2021

Pollutant	Averaging period	Recorded background concentration by year				
		2017	2018	2019	2020	2021
NO_2	Maximum 1 hour (ppm)	0.04	0.04	0.08	0.12	0.04
	Annual average (ppm)	0.005	0.004	0.005	0.004	0.003
CO	Maximum 8 hour (ppm)	0.7	0.7	4.8	4.9	0.6
	Annual average (ppm)	0.23	0.21	0.21	0.30	0.11
O_3	Maximum 8 hour (ppm)	0.05	0.05	0.11	0.09	0.04
	Annual average (ppm)	0.02	0.02	0.02	0.02	0.02
PM_{10}	Maximum 24 hour (µg/m^3)	-	-	310.8	1215.8	38.7
	Maximum 24 hour (below assessment criteria) (µg/m^3)	-	-	49.9	50.0	38.7
	Annual average (µg/m^3)	-	-	19.0	29.2	10.5
$PM_{2.5}$	Maximum 24 hour (µg/m^3)	37.0	39.2	296.4	1296.3	95.3
	Maximum 24 hour (below assessment criteria) (µg/m^3)	25.0	25.0	25.0	25.0	25.0
	Annual average (µg/m^3)	8.1	7.4	14.2	25.1	7.1
"-" indicates data not available						

5.3.2 Mugga Lane Resource Management Centre monitoring

Four rounds of ambient odour field surveys at the MLRMC were undertaken by SLR Consulting Australia (SLR) in 2021 and 2022, commissioned by ACT NoWaste, to assess the intensity of odours in the area surrounding the landfill, the green waste processing facility and the nearby Hume Materials Recycling Facility (MRF). In addition, infield gas and odour measurements at the landfill were performed to quantify the effectiveness of the tarpaulin covers being used as daily covers.

The odour surveys revealed that the odour intensities observed beyond the MLRMC boundary were at most 'strong'. Stronger odours (ranging from 'strong' to 'extremely strong') were observed within the MLMRC and MRF boundaries. The surveys also indicated that odours arising from the MRF have a relatively low plume extent while odours from green waste processing facility have the largest.

Table 5.3 Ambient odour field survey results - maximum odour intensities recorded across three sampling days

Sampling date	Landfill		MRF		Green waste processing facility		Sampling report
	Within boundary	Outside of boundary*	Within boundary	Outside of boundary*	Within boundary	Outside of boundary*	
May 2021	Very strong	Distinct	Strong	Distinct	Very strong	Distinct	(SLR Consulting Australia, 2021a)

Sampling date	Landfill		MRF		Green waste processing facility		Sampling report
	Within boundary	Outside of boundary*	Within boundary	Outside of boundary*	Within boundary	Outside of boundary*	
December 2021	Extremely strong	Strong	Strong	Distinct	Extremely strong	Strong	(SLR Consulting Australia, 2021b)
February 2022	Extremely strong	Distinct	Strong	Distinct	Very strong	Strong	(SLR Consulting Australia, 2022a)
May 2022	Extremely strong	Distinct	Strong	Distinct	Extremely strong	Distinct	(SLR Consulting Australia, 2022b)
* Note: 'Outside of boundary' does not indicate at a receptor location, these surveys were generally on roads around the facilities.							

No perceptible odours were detected in the residential areas of Macarthur, Fadden or Chisholm or at any residential receptors. The maximum odour intensity observed at an industrial receptor across all surveys was 'Distinct'.

Based on this, the green waste processing facility and the landfill have been identified as the most significant sources of odour emissions from the MLRMC, with minimal impacts from the MRF.

5.3.3 Complaint history

A total of nine complaints regarding odour detected in suburbs around the MLRMC were recorded in 2020, however the precise cause of odour was not identified. Due to the climatic conditions at the time of each complaint, it was unlikely that the Mugga Lane landfill was the cause of the odour.

No additional odour complaints have been provided for this assessment.

A number of articles in *The Canberra Times* document odour complaints from the Tuggeranong area to the west of the proposal site. The source of the odour was believed to be from the MLRMC, although this was not confirmed. The articles were published between 2015-2017, as presented in Table 5.4.

Table 5.4 Odour complaint history – The Canberra Times

Article title	Article date	Odour complaint location
Liberals question if 'sniff test' as good as it gets for Mugga Lane tip	09/12/2015	Fadden
Smell lingering over Tuggeranong suburbs causes frustration among local residents	12/01/2016	Tuggeranong
Tuggeranong residents still find Mugga Lane tip smell on the nose	25/06/2016	Tuggeranong
ACT government urges people to call Access Canberra to report Mugga Lane tip smell	02/07/2016	Tuggeranong
Complaints peter out over Tuggeranong 'tip stink' although residents say smell persists	24/04/2017	Tuggeranong

Inspections of the proposal site were undertaken by EPA officers after complaints were received in late 2015 and early 2016 (Legislative Assembly, 2016). No abnormal odour levels were observed at the proposal site or at the location of the complainant.

5.4 Climate and meteorology

The local climate and meteorology (weather) within the study area is of critical importance when assessing the potential for air quality impacts at sensitive receptors.

The meteorological environment relevant to a project site is best understood through review of data collected from long-running monitoring weather stations, most commonly operated by the Bureau of Meteorology (BoM) as well as state authorities and in some instances private entities. Simulation of the meteorological environment (modelling) is a useful tool in understanding the environment where suitable meteorological observations are not available.

5.4.1 Available observations

The BoM operates a network of automatic weather stations (AWS) across Australia. A BoM AWS typically measures critical meteorological parameters including wind speed, wind direction, temperature, relative humidity, and pressure, with some stations also measuring cloud coverage. The nearest AWS to the project is the BoM AWS located in Tuggeranong, approximately 5.8 km west of the proposal site.

5.4.1.1 Temperature

Figure 5.3 shows monthly mean temperature statistics for data measured at BoM Tuggeranong AWS for the period 2017 through 2021. The 50th percentile monthly maximum and minimum temperatures are used to show the typical temperature range for each month of the year, as well as the average monthly maximum and minimum temperatures. These are shown along with the monthly average temperature.

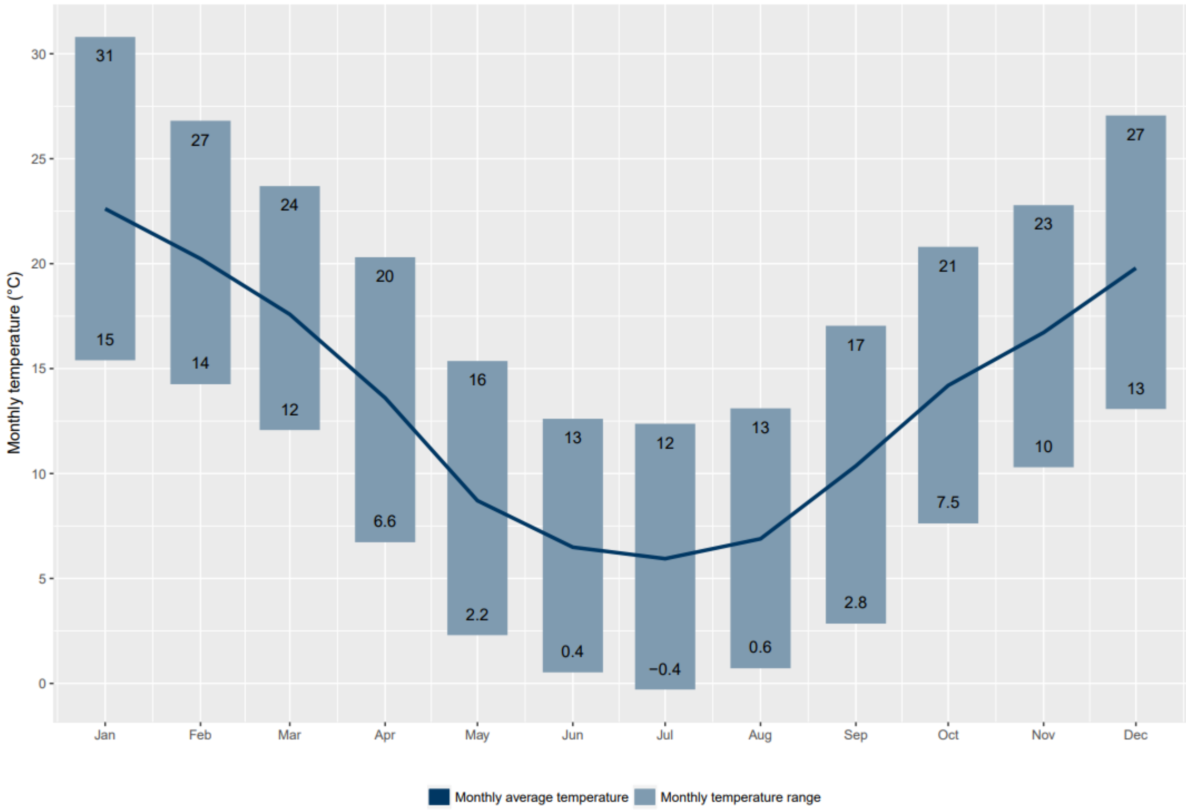

Figure 5.3 Monthly climate temperature statistics from BoM Tuggeranong (2017-2021)

5.4.1.2 Rainfall

Figure 5.4 shows monthly rainfall statistics for data measured at BoM Tuggeranong AWS for the period 2017 through 2021. The statistics shown include average monthly rainfall amount (mm) and average number of days per month where rainfall is greater than 0.25 mm.

The data shows that the number of rain days and the total rainfall amounts are greater during the spring and summer months.

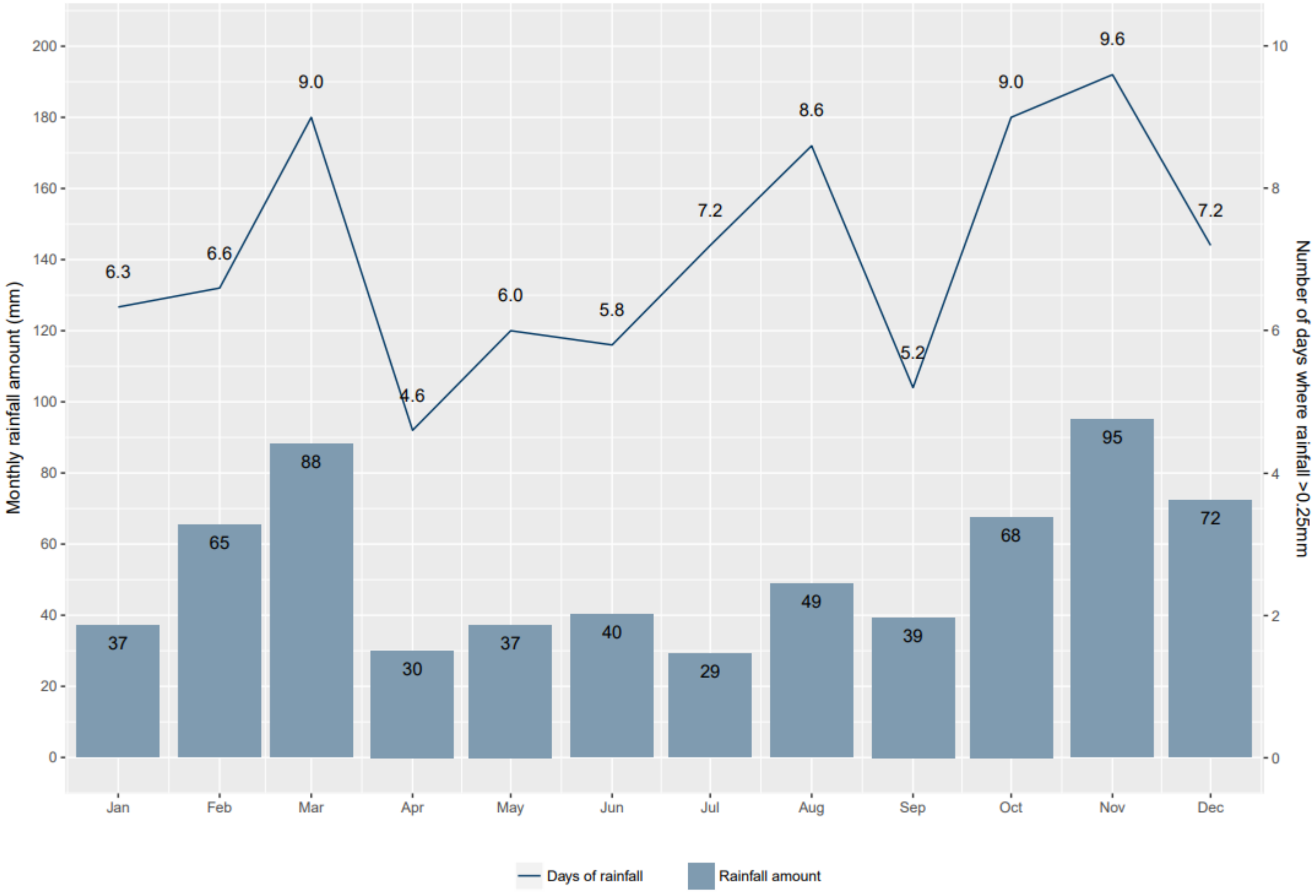

Figure 5.4 Average monthly rainfall collected from BoM Tuggeranong (2017-2021)

5.4.1.3 Wind

Figure 5.5 shows the average annual wind rose and Figure 5.6 shows the average seasonal wind roses, both measured at BoM Tuggeranong AWS for the period 2017 through 2021. Figure 5.5 shows the following features:

- The predominant annual average wind direction is from the northwest.
- The average wind speed measured was 2.4 metres per second.
- Calm conditions (wind speeds less than 0.5 m/s) occurred 21.5% of the time. Calm conditions are often associated with poor odour dispersion.
- High wind speeds (winds greater than 5 m/s which are often attributed to dust lift off) mostly occur from the northwest and south.

Figure 5.6 extends these observations, showing that:

- The winds from the northwest mainly occur during spring and winter.
- Autumn has a slightly lower average wind speed than the other seasons.
- Summer has the smallest proportion of calm conditions.

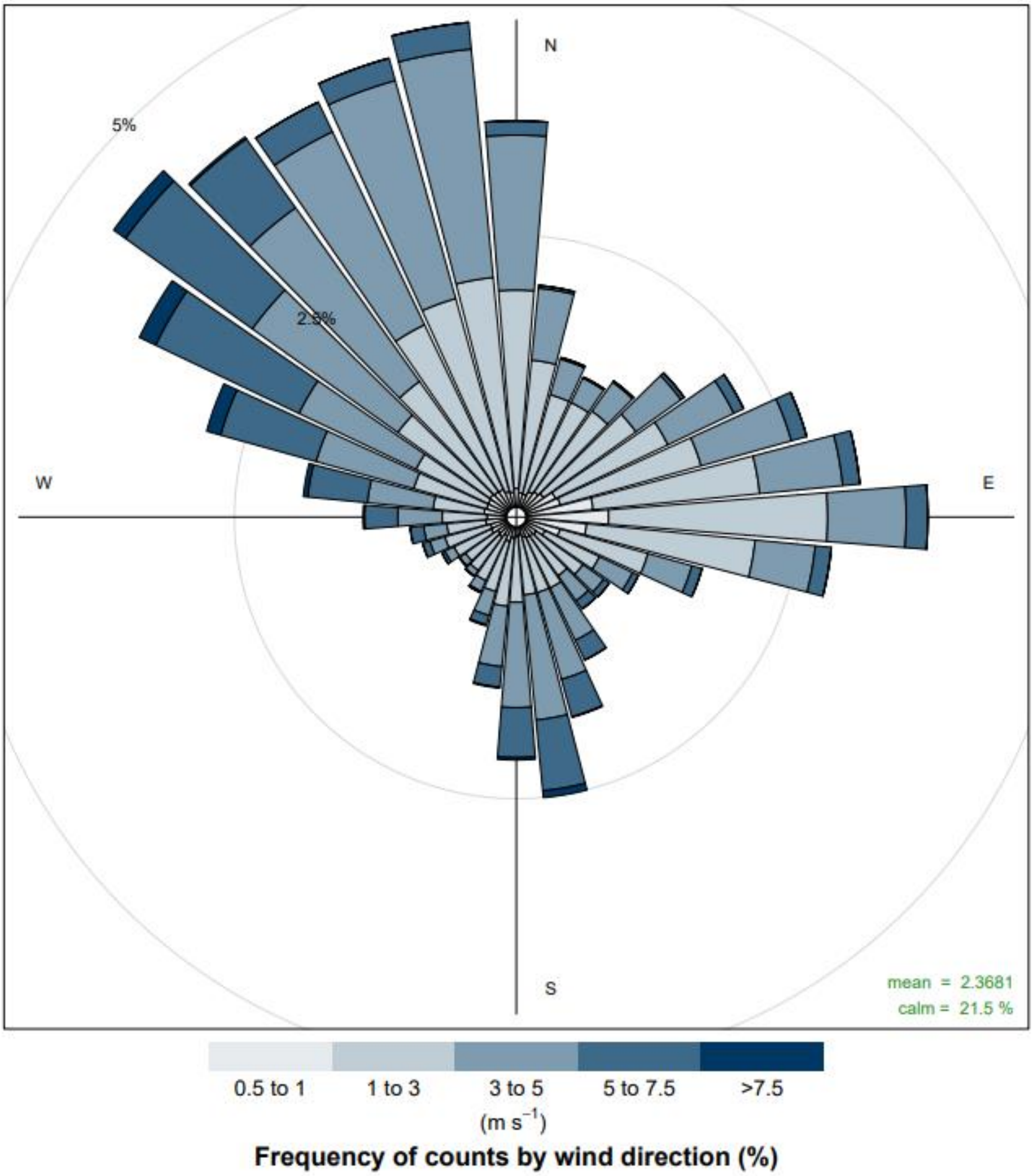

Figure 5.5 ***Annual average wind rose collected from BoM Tuggeranong (2017-2021)***

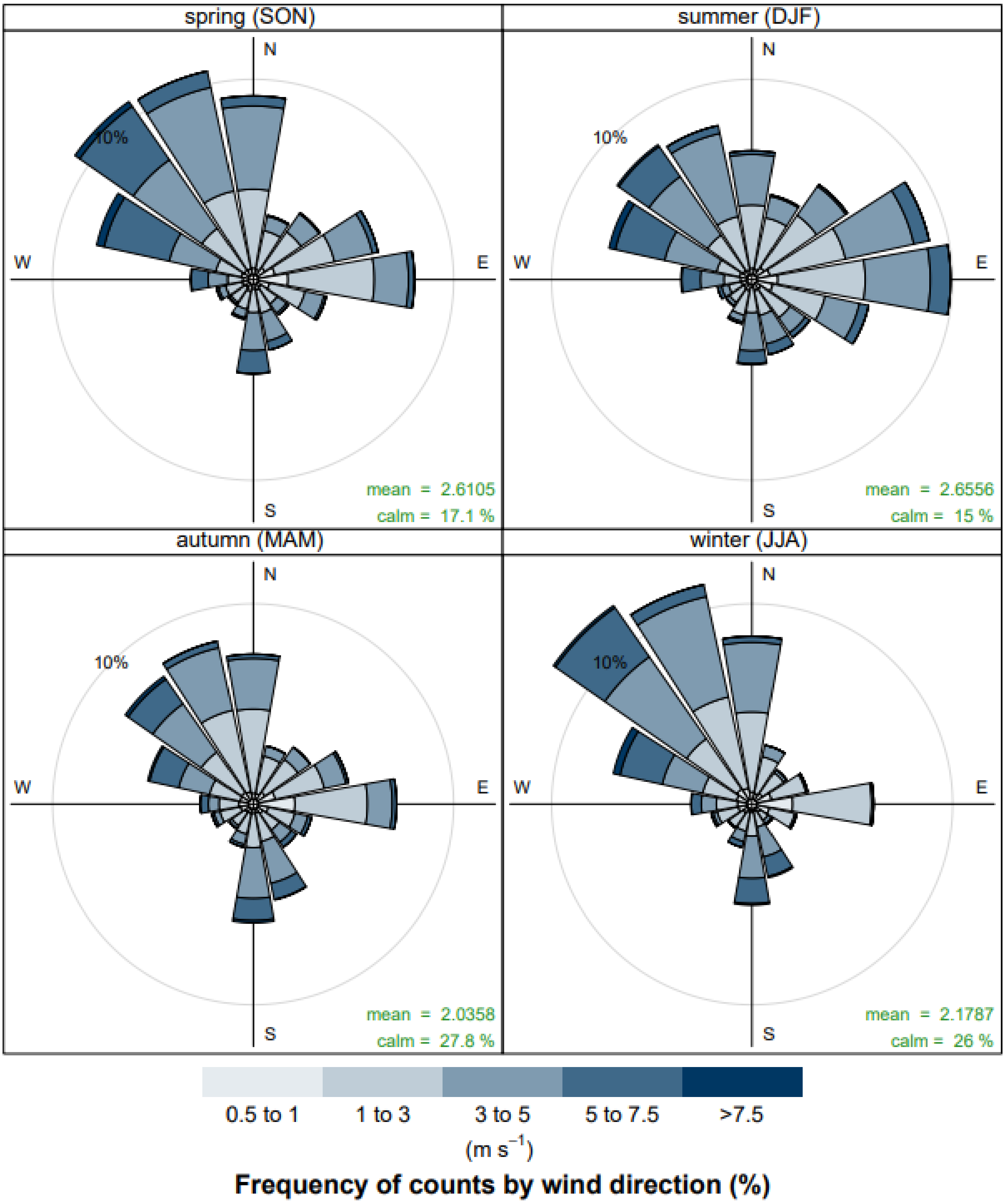

Figure 5.6 Average seasonal wind roses collected from BoM Tuggeranong (2017-2021)

5.5 Nearby facilities

The land use around the facility is mainly industrial and rural operations. Facilities near the proposal site which may also be a source of odour include:

- Boral asphalt plant.
- Hume asphalt plant.
- Capital asphalt plant.
- Dry waste facility.

- MLRMC.
- Green waste processing facility.

As the odours emitted from these facilities is of a different character to that from the FOGO facility, no cumulative impacts are anticipated.

6. Construction assessment

6.1 Construction overview

Expected construction activities are outlines in the main body of the EIS which includes the following:

- Site preparation including clearing of the site and grading.
- Construction of entry/exit and service roads and line marking.
- Installation of perimeter/boundary security fencing and gates.
- Creation of detention and sedimentation dams/basins.
- Bulk earthworks for site shaping and surface water drainage and detention ponds.
- Detailed excavation for lift and stair raft pads.
- Pouring concrete foundation slab, footings, hardstand and suspended slabs for the main buildings.
- Construction of pavement areas for car park and access roads and new proposal site entrance.
- Installation of steel truss framework for structures.
- Erection of pre-cast concrete panels for external and internal partition walls and metal roof for site buildings.
- Installation of processing equipment.
- Installation of firewater tanks.
- Construction of weighbridges and weighbridge office.
- Installation of fencing and signage.

6.2 Construction emissions

The generation of dust and particulate matter are the primary pollutants during the construction phase of the project. A risk-based assessment in accordance with IAQM guidance was undertaken to assess potential particulate impacts during the construction of the project.

Construction works has been divided into three activity groups that have potential to cause significant dust emissions. These activities are earthworks, construction and track-out noting that no demolition works are proposed and therefore demolition was not included as an activity group.

To identify the risk of dust impact from each construction activity, the size and scale of each activity must be determined as well as the sensitivity of the surrounding environment.

Size and scale

The size and scale of the activities are determined by not only the physical size of the project but other factors that are likely to increase or decrease the amount of dust created during each construction activity. Table 6.1 outlines these factors for each activity and the resulting size and scale descriptor as defined by the IAQM Guidance.

Table 6.1 Size and scale of construction activities

Activity	Description	Size and scale descriptor
Earthworks	– Total site area (that could require earthworks) is > 10,000 m^2 – 5-10 heavy vehicles in use at peak times	Large
Construction	– Total building volume of < 25,000 m^3 – Materials with low potential for dust release	Small
Track-out	– 1-500 heavy duty vehicle outwards movements in any one day – Unpaved road length of 50-100 m	Medium

Sensitivity

The sensitivity of the surrounding environment is determined by the number of high risk, medium risk and low risk receptors within a certain proximity of the construction footprint. High sensitivity receptors include dwellings, educational institutions, and medical facilities. Medium sensitivity receptors include commercial, and industrial premises. Low sensitivity receptors include farmland, recreational parklands, and other public spaces. The sensitivity is determined for three areas of concern, these are:

– Sensitivities of people to dust soiling effects.
– Sensitivities of people to the health effects of PM_{10}.
– Sensitivities of receptors to ecological effects.

The sensitivities for each area for all construction activities are outlined in Table 6.2.

Table 6.2 Sensitivity of areas of concern for all construction activities

Activity	Description	Sensitivity
Sensitivities of people to dust soiling effects	– Six high sensitivity receptors (R02-R07) greater than 350 m from any construction activity – One medium sensitivity receptor (R08) greater than 100 m from any construction activity and one medium sensitivity receptor (R01) greater than 350 m from any construction activity	Low
Sensitivities of people to the health effects of PM_{10}\	– An annual background PM_{10} concentration of 10.5 µg/m^3 was recorded from the Monash AQMS for the 2021 calendar year. – Six high sensitivity receptors (R02-R07) greater than 200 m from any construction activity. – One medium sensitivity receptor (R08) greater than 100 m from any construction activity and one medium sensitivity receptor (R01) greater than 350 m from any construction activity.	Low
Sensitivities of receptors to ecological effects.	– No high or medium sensitive ecological features within 50 m of the construction activity.	Low

Risk summary

The risk matrix uses the sensitivity and scale to determine the risk of dust impacts on the surrounding receptors. Table 6.3 outlines the risk levels determined for the construction of the project.

The risk identified during earthworks and track-out construction activities was **Low Risk** while the risk identified during construction activities was **Negligible Risk** for all sensitivity types.

Proposed specific mitigation measures and residual impacts are provided in Section 9.1 to further minimise the risk of dust impacts at receptor locations during construction works.

Table 6.3 Risk matrix for dust impacts during construction

Impact	Risk		
	Earthworks	Construction	Track-out
Dust soiling	Low risk	Negligible risk	Low risk
Human health	Low risk	Negligible risk	Low risk
Ecological	Low risk	Negligible risk	Low risk

7. Operational assessment

7.1 Operational overview

The facility will be sized with at least 50,000 tpa of initial processing capacity available from commencement of operations, and the design of the facility is intended to enable processing of up to 70,000 tpa of FOGO waste. It is expected that around 42,000 tpa of municipal FOGO feedstock could be collected for processing from 2023, and the facility will have an initial processing capacity of at least 50,000 tpa at commencement of operations.

The facility must be able to accommodate weekly, monthly and seasonal variations in input quantities and characteristics. The design of the facility shall incorporate modular elements to enable the capacity and operating parameters of the tunnel composting system to be cost-effectively expanded in future to achieve the design processing capacity of 70,000 tpa, to accommodate increased tonnages and/or a range of additional organic waste feedstocks, if required, subject to relevant approvals.

It is proposed that any spare capacity in the facility will be utilised for processing of a combination of commercial organic wastes, including FO waste, and municipal GO waste from various sources. However, the primary focus will be processing of FOGO waste.

The composting plant incorporates a tunnel composting process with air quality management via extraction and biofiltration, and a high level of process monitoring and control of critical process parameters. This minimises the environmental impact of the operation and enables production of consistently high-quality recycled organic products.

The process comprises the following main elements:

– FOGO waste receival and decontamination.
– Shredding, mixing and moistening.
– Pasteurisation and composting in enclosed tunnels with forced aeration.
– Enclosed maturation in static piles (on hardstand).
– Product refinement.
– Residual waste management (materials removed during decontamination and product refinement).

An indicative proposal site layout, including approximate footprint sizes, is shown in Figure 3.1 in Section 3.

7.2 Operational emissions

Enclosed waste facilities with a ventilation system that maintains negative pressure with all process air being treated by odour control is considered best practice in the industry.

The facility will be totally enclosed and kept under negative pressure with opening roller doors for truck access in and out of the waste receival area. All process air would be treated by biofilters prior to discharge in the environment. The three main sources of odour from the project are therefore the biofilter, the semi-enclosed covered matured compost product stockpiles, and incoming trucks delivering FOGO waste.

Due to the high moisture content of FOGO and as the receivals and composting facility is enclosed, particulate emissions from activities inside the building would be minimal. Matured compost will undergo screening and blending within the maturation and refining building which is also enclosed.

Activities outside the process buildings includes product storage only. These stockpiles, when in use, will be managed via controlled application of water for dust suppression when required such as on windy days.

Climate change may increase the frequency of extreme weather events which would impact composting process if it were not enclosed. The enclosed facility is considered best practice for the management of odour and potential extreme events due to climate change.

7.2.1 Waste receival doorway

As the building is maintained under negative pressure, it would be unlikely there would be any fugitive odour emissions from the waste receival hall doorway. GHD has undertaken a review of recent odour audits of the Veolia Clyde Waste Transfer Terminal and Banksmeadow Waste Transfer Terminal which are conducted regularly by The Odour Unit. These audits include smoke testing to determine the effectiveness of the forced air extraction system, including around the truck entry point into the building. Key findings by The Odour Unit include:

– "The smoke released at this point initially rose gradually moving towards the truck entrance before rising to the roof and moving slowly towards the extraction system. Visible smoke extraction at the overhead capture points was evident during the smoke testing at this point. Any smoke that continued towards the truck entrance was drawn back into the building" (Clyde Waste Transfer Terminal - TOU, June 2021).
– No smoke was found to be emanating from the sealed breezeways around the perimeter of the BTT Facility building; The released smoke was found to be well-contained with the BTT Facility building enclosure, suggesting that odour release at ground level is minimal; and the released smoke was found to gradually dissipate over time. This indicates that there is a very good level of air exchange turnover within the BTT Facility building enclosure. (Banksmeadow Waste Transfer Terminal – TOU, April 2019).

Based on these audits, GHD can conclude that odours are unlikely to escape from the entry door of the facility with a well operating air extraction system. The entry door should not therefore be included as an odour source under routine operations, however management measures including audits are recommended as per Section 9.

In addition to the air extraction system, rapid close roller doors would be installed to further mitigate odour impacts.

7.2.2 Odour control system

The odour control system is described in more detail on the Design Brief (GHD, 2022). Fresh air would be drawn into the building by a number of fans so there is opportunity to conduct regular and emergency maintenance activities while the other fan(s) remain in operation. Air extracted from the receival hall will be used to aerate the tunnels and some will also be used to cool spent air extracted from the composting tunnels before it is introduced to the odour treatment system.

The proposed odour control system will likely consist of a number of wet scrubbers and biofilter with an area of up to 1,300 m^2. The proposed system would be fitted with monitoring equipment capable of measuring air flow and moisture content going into the biofilter.

The biofilter will process all air from the receival hall, the primary composting tunnels and hallway, and the maturation building. Three air volume changes per hour have been assumed for these buildings, leading to an overall air volume change rate of 410,000 m^3/hour. However, as air from the waste receival hall is reused in the composting tunnels and hallway, the overall air pumped through the biofilter has been estimated as 345,000 m^3/hour as shown in Table 7.1. The location of the biofilter is seen in Figure 3.1 in Section 3.

Table 7.1 Extraction rate calculations for biofilter

Building	Footprint (m^2)	Height (m)	Volume (m^3)	Air volume changes per hour	Extraction rate (m^3/hr)	Air through the biofilter (m^3/hour)
Waste receival hall	2,700	12	32,200	3	96,620	32,430
Primary composting tunnels	3,200	5	16,160	3	48,480	48,480
Composting tunnel hallway	580	9	5,240	3	15,700	15,700
Maturation building	6,900	12	82,800	3	248,330	248,330
				Total:	409,140	344,950

For this stage of the project, a number of biofilter configurations were assessed in order to determine the most appropriate for the proposal site in terms of odour impact on the surrounding environment. These are summarised as:

– Typical rectangular open biofilter that emits treated air with low velocity near to ground.
– Stack arrangement – treated air from the biofilter is captured and discharged from a stack above the building roofline with increased velocity compared to the open biofilter. A stack helps disperse the air into atmosphere and reduces ground level odours.

7.2.3 Odour emission inventory

GHD has undertaken a review of similar FOGO composting facilities and assessments in order to identify representative odour emission rates for assessing the proposed facility. As discussed above, all odorous air from the building would be treated by the odour control system, which would have an emissions guarantee from the supplier.

As described in Section 4.2.2, emission rates for the semi-enclosed product storage and incoming trucks were sourced from sampling completed at the SWMC, a facility which undertakes similar FOGO processing (AECOM, 2021).

The semi-enclosed product storage will have an assumed footprint size of 2000 m^2 and an odour emission rate of 0.63 $OUv/m^2/s$.

An estimated two trucks per hour delivering FOGO waste has been assessed, with an odour emission rate of 8.79 $OUv/m^2/s$. Vehicle emissions of other pollutants were considered negligible and have not been further assessed.

The emission rates used for modelling the biofilters at the LHRRP, AAWTF and SWMC were based on an output odour concentration of 250 OU/m^3, 300 OU/m^3 and 500 OU/m^3 respectively (GHD, 2021; GHD, 2016; ERM, 2021). The maximum odour emission rate from biofilters is generally 1000 OU/m^3 as per Table 3.176 from the *JRC Policy for Science Report* (Brinkmann et al., 2016). Based on these values, the odour emission rate from the biofilter has been estimated as 500 OU/m^3.

The odour emission sources and emission rate calculations are presented in Table 7.2. A peak to mean (P/M60) scaling factor of 2.5 has been used to scale up the odour emission rate used in modelling, to account for the estimation of short or peak odour concentrations on a time scale of one second or less (refer Table 6.1 of the Approved Methods, (NSW EPA, 2016)). The P/M60 factor used for the biofilter varied between 2.3 and 2.5 depending on the atmospheric stability class to increase the accuracy in estimated emissions from this main source.

Table 7.2 Modelled source parameters

Source		Flow rate (m^3/s)	Concentration (OU)	OER ($OU.m^3/s$)	SOER (OU.m/s)	Modelled SOER (OU.m/s)*	Operating hours
Biofilter	Primary composting tunnels	13.5	500	18570	9.1	22.6	24 hours a day
	Composting tunnel hallway	4.4	500	2180	1.7	4.2	24 hour a day
	Maturation building	69.0	500	34490	16.8	42.1	24 hours a day
Source		**Surface area (m^2)**	**SOER (OU.m/s)**	**OER ($OU.m^3/s$)**		**Modelled SOER (OU.m/s)***	**Operating hours**
Semi-enclosed product storage		2000	0.63	3133		1.6	24 hours a day
Incoming trucks		81	8.79	712		22.0	Working hours only: 7am-6pm

Source	Flow rate (m^3/s)	Concentration (OU)	OER ($OU.m^3/s$)	SOER (OU.m/s)	Modelled SOER (OU.m/s)*	Operating hours
*includes the P/M60 factor of 2.5						

7.3 Dispersion modelling

Odour dispersion modelling results for the typical open biofilter and the stack options are presented below.

7.3.1 Ground level biofilter

The results of the odour modelling and assessment at the sensitive receptors are provided below in Table 7.3. All results are the 1 second 99th percentile peak odour concentration as per the Technical Framework.

The results show that predicted odour from the FOGO facility is exceeds the criteria at two assessed sensitive receptors:

– Tralee suburb with an exceedance of 0.9 OU above the criteria

– the Hume industrial area with a significant exceedance of 61 OU. This is likely due to the proximity of the industrial area to the facility and most likely to occur during cool calm conditions which occur 13.2% of the time. Predicted odour levels above the criteria traverse most of the industrial area.

Table 7.3 Predicted odour concentration from the FOGO facility (with ground level biofilter) at sensitive receptors

Sensitive receptor		Predicted odour concentration (OU)	Odour assessment criteria (OU)
R01	Commercial	2.5	3
R02	Residence	4.5	7
R03	Residence	1.9	7
R04	Residence	1.7	7
R05	Residence	1.4	7
R06	McArthur suburb	1.5	2
R07	Tralee suburb	**2.9**	2
R08	Hume industrial area	**64**	3

A contour plot for the predicted 1 second 99th percentile odour concentration is shown in Figure 7.1. The predicted plume dispersion extends in all directions evenly, most likely due to the high frequency of calm wind conditions.

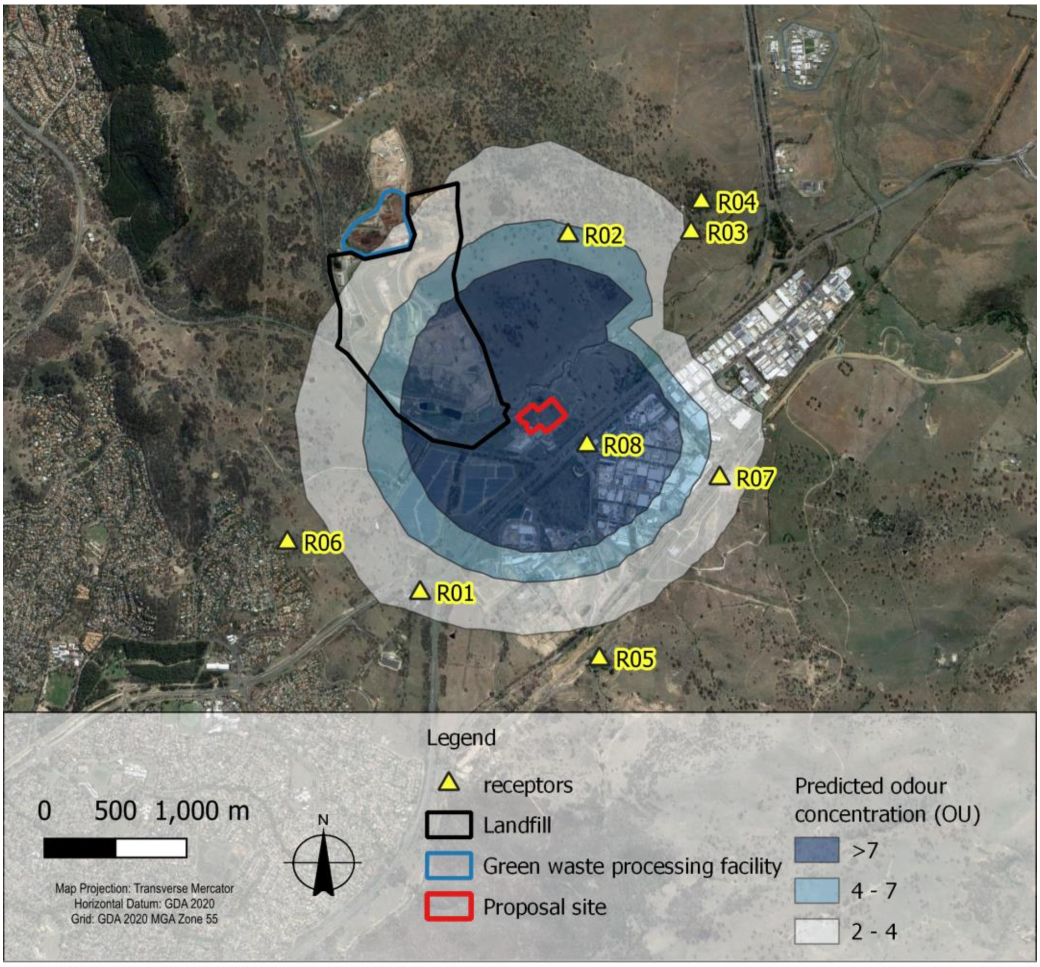

Figure 7.1 Predicted peak odour concentration (OU) from the FOGO facility (with ground level biofilter) (1 second 99th percentile)

Due to the significant exceedance of the criteria at the Hume industrial area, mitigation measures are required. The biofilter is the main source driving the overall odour impacts, the contributions from the semi-enclosed storage area and truck delivery are almost negligible. Therefore, mitigation strategies focus on the biofilter.

The large impacts from the biofilter are likely due to the high air flow from the buildings, therefore impacts were estimated when the overall air flow was reduced from 3 air changes per hour to 2 and 1 air changes per hour. The resulting impacts are shown in Table 7.4.

Table 7.4 Predicted odour concentration (OU) from the ground level biofilter at sensitive receptors from varying air flows

Receptor ID	Criteria (OU)	Predicted concentration (OU)		
		3 air changes per hour ($345,000\ m^3/hr$)	2 air changes per hour ($230,000\ m^3/hr$)	1 air change per hour ($115,000\ m^3/hr$)
R01	3	2.4	1.6	0.8
R02	7	4.4	2.9	1.5
R03	7	1.9	1.3	0.6
R04	7	1.6	1.1	0.5
R05	7	1.4	0.9	0.5
R06	2	1.5	1.0	0.5
R07	2	**2.8**	1.9	0.9
R08	3	**62**	**41**	**21**

While the impacts at all receptors are reduced by the reduced air flow, predicted concentrations at the industrial area still significantly exceed the criterion at this receptor. Therefore, another mitigation strategy is required.

7.3.2 Biofilter stack

As impacts from the ground level biofilter exceed the criterion, a stack may be considered to aid in the dispersion and dilution of odour to reduce impacts at the receptors.

Dispersion is improved by increasing exit velocity and stack height. Exit velocity from the stack is determined by the stack diameter and air flow. A stack diameter of 2.5 m has been considered which corresponds to an exit velocity of 19.5 m/s (based on 3 air changes per hour). We note that other stack diameters and velocities may also be appropriate however additional assessment may be needed to demonstrate this.

For effective dispersion and odour reduction, a stack height of at least 3 m taller than any other structure within a 20 m radius of the stack is recommended (EPA Victoria, 2021). The receival and maturation halls have an assumed roof height of 12 m, therefore a stack of 15 m in height is recommended. However due to potential visual impacts and height restrictions, stack heights of 12 and 13 m have also been assessed.

The modelled stack parameters, based on the 1, 2 and 3 air changes per hour, are summarised in Table 7.5. These parameters have been used to gain an understanding of the potential odour impacts with a stack, however are subject to change with detailed design.

Table 7.5 Stack parameters

Parameter	3 air changes per hour (345,000 m^3/hr)	2 air changes per hour (230,000 m^3/hr)	1 air change per hour (115,000 m^3/hr)
Stack diameter (m)	2.5	2.5	2.5
Temperature (K)	290	290	290
Exit velocity (m/s)	19.5	13.0	6.5

7.3.2.1 Stack option 1: 15 m height

A 15 m stack is the preferred option as this allows some clearance above the roofline for better dispersion and reduced, although some, building wake effects. Predicted impacts from the biofilter stack of 15 m are presented in Table 7.6.

Table 7.6 Predicted odour concentration (OU) from the biofilter stack of 15 m at sensitive receptors from varying air flows

Receptor ID	Criteria (OU)	Predicted concentration (OU)		
		3 air changes per hour (345,000 m^3/hr)	2 air changes per hour (230,000 m^3/hr)	1 air change per hour (115,000 m^3/hr)
R01	3	0.3	0.2	0.2
R02	7	1.0	0.7	0.5
R03	7	0.5	0.5	0.3
R04	7	0.5	0.5	0.3
R05	7	0.2	0.2	0.1
R06	2	0.5	0.4	0.2
R07	2	0.5	0.4	0.2
R08	3	2.0	1.8	1.2

No exceedances of the criteria are predicted. Maximum impacts are predicted for the 3 air changes per hour scenario despite the increased exit velocity, therefore this scenario has been used for the overall FOGO facility assessment and the cumulative assessment.

Results for the FOGO facility (i.e. including the semi-enclosed stockpiles and delivery trucks) are presented in Table 7.7 and Figure 7.2.

Table 7.7 Predicted odour concentration from the FOGO facility (with biofilter stack of 15 m) at sensitive receptors

Sensitive receptor		Predicted odour concentration (OU)	Odour concentration criteria (OU)
R01	Commercial	0.3	3
R02	Residence	1.0	7
R03	Residence	0.5	7
R04	Residence	0.6	7
R05	Residence	0.2	7
R06	McArthur suburb	0.5	2
R07	Tralee suburb	0.8	2
R08	Hume industrial area	2.1	3

No exceedances are predicted at any of the sensitive receptors.

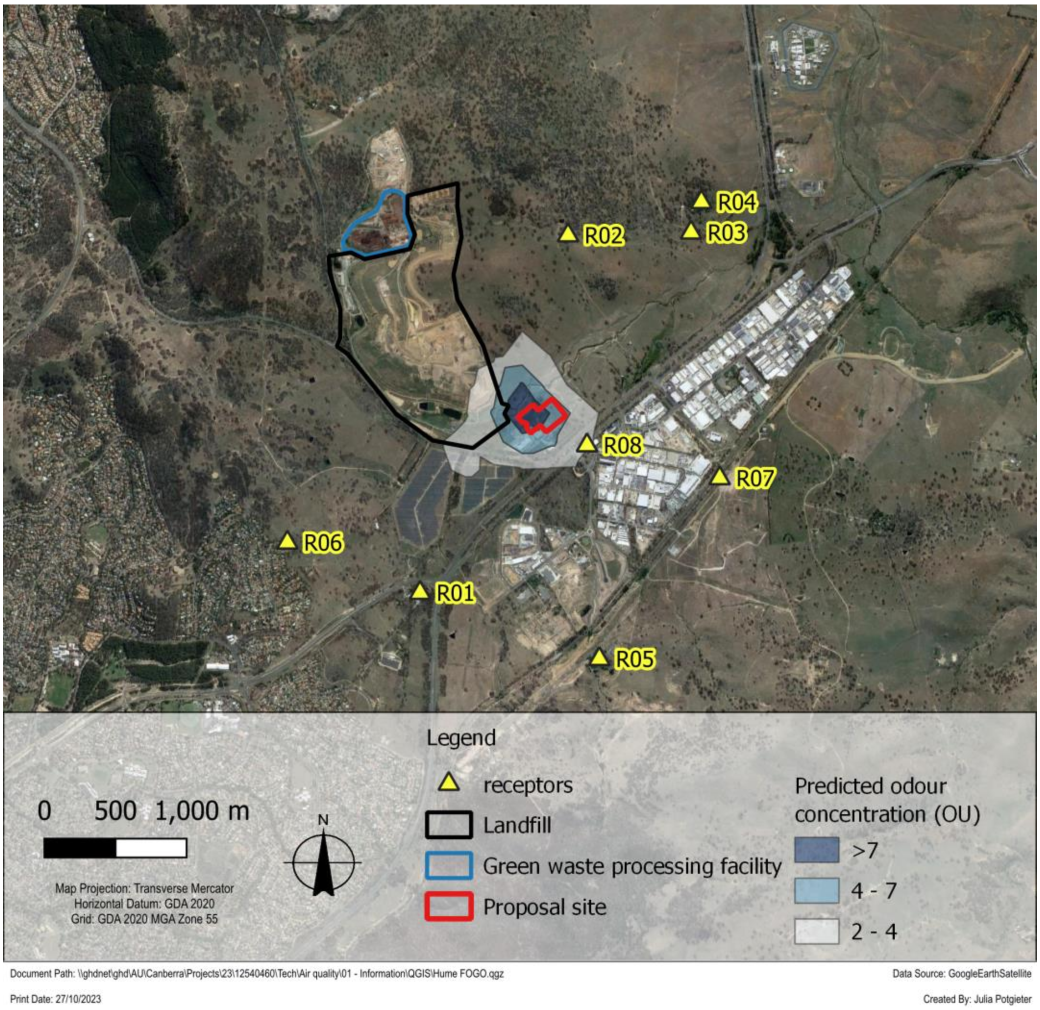

Figure 7.2 Predicted peak odour concentration (OU) from the FOGO facility (with biofilter stack of 15 m) (1 second 99th percentile)

7.3.2.2 Stack option 2: 13 m height

Predicted impacts from the biofilter stack of 13 m are presented in Table 7.8.

Table 7.8 Predicted odour concentration (OU) from the biofilter stack of 13 m at sensitive receptors from varying air flows

Receptor ID	Criteria (OU)	Predicted concentration (OU)		
		3 air changes per hour (345,000 m^3/hr)	2 air changes per hour (230,000 m^3/hr)	1 air change per hour (115,000 m^3/hr)
R01	3	0.3	0.2	0.2
R02	7	1.0	0.8	0.5
R03	7	0.6	0.5	0.4
R04	7	0.6	0.5	0.3
R05	7	0.2	0.2	0.1
R06	2	0.5	0.4	0.2
R07	2	0.5	0.4	0.2
R08	3	2.2	1.9	1.2

No exceedances of the criteria are predicted. Maximum impacts are predicted for the 3 air changes per hour scenario despite the increased exit velocity, therefore this scenario has been used for the overall FOGO facility assessment.

Results for the FOGO facility (i.e. including the semi-enclosed stockpiles and delivery trucks) are presented in Table 7.9 and Figure 7.3.

Table 7.9 Predicted odour concentration from the FOGO facility (with biofilter stack of 13 m) at sensitive receptors

Sensitive receptor		Predicted odour concentration (OU)	Odour concentration criteria (OU)
R01	Commercial	0.3	3
R02	Residence	1.0	7
R03	Residence	0.6	7
R04	Residence	0.6	7
R05	Residence	0.3	7
R06	McArthur suburb	0.5	2
R07	Tralee suburb	0.5	2
R08	Hume industrial area	2.2	3

No exceedances are predicted at any of the sensitive receptors.

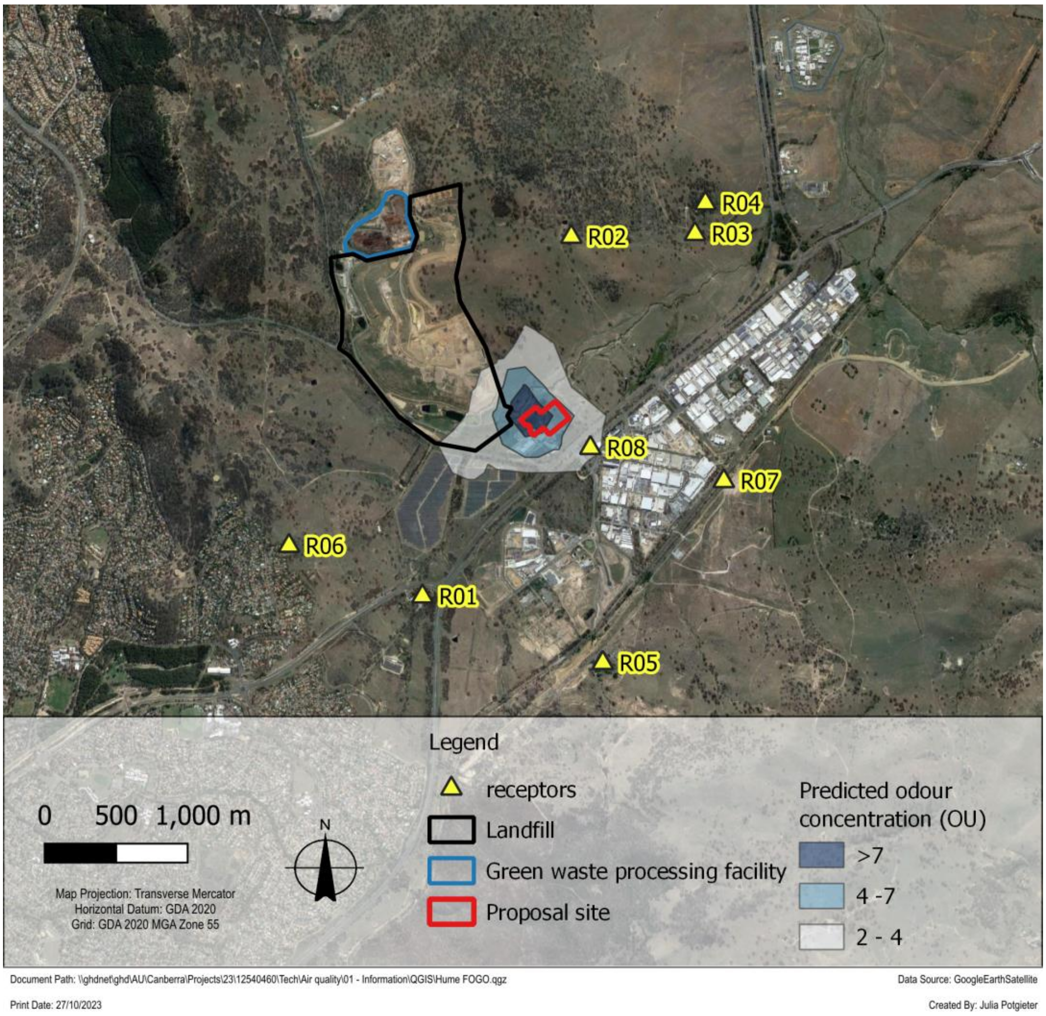

Figure 7.3 Predicted peak odour concentration (OU) from the FOGO facility (with biofilter stack of 13 m) (1 second 99th percentile)

7.3.2.3 Stack option 3: 12 m height

Predicted impacts from the biofilter stack of 12 m are presented in Table 7.10.

Table 7.10 Predicted odour concentration (OU) from the biofilter stack of 12 m at sensitive receptors from varying air flows

Receptor ID	Criteria (OU)	Predicted concentration (OU)		
		3 air changes per hour (345,000 m^3/hr)	2 air changes per hour (230,000 m^3/hr)	1 air change per hour (115,000 m^3/hr)
R01	3	0.3	0.3	0.2
R02	7	1.0	0.8	0.5
R03	7	0.6	0.5	0.4
R04	7	0.6	0.5	0.3
R05	7	0.2	0.2	0.1
R06	2	0.5	0.4	0.2
R07	2	0.5	0.4	0.2
R08	3	2.2	1.9	1.2

No exceedances of the criteria are predicted. Maximum impacts are predicted for the 3 air changes per hour scenario despite the increased exit velocity, therefore this scenario has been used for the overall FOGO facility assessment.

Results for the FOGO facility (i.e. including the semi-enclosed stockpiles and delivery trucks) are presented in Table 7.11 and Figure 7.4.

Table 7.11 Predicted odour concentration from the FOGO facility (with biofilter stack of 12 m) at sensitive receptors

Sensitive receptor		Predicted odour concentration (OU)	Odour concentration criteria (OU)
R01	Commercial	0.3	3
R02	Residence	1.0	7
R03	Residence	0.6	7
R04	Residence	0.6	7
R05	Residence	0.3	7
R06	McArthur suburb	0.5	2
R07	Tralee suburb	0.5	2
R08	Hume industrial area	2.3	3

No exceedances are predicted at any of the sensitive receptors.

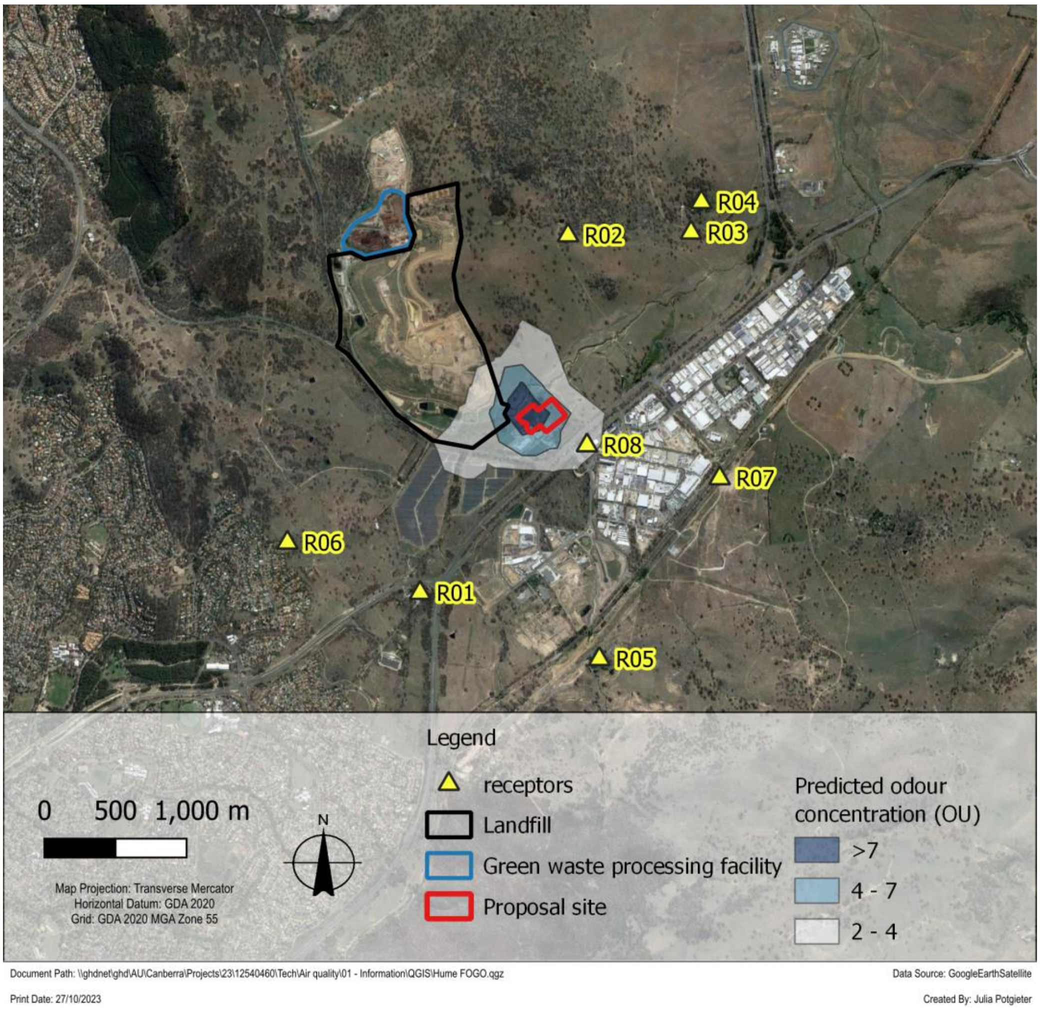

Figure 7.4 Predicted peak odour concentration (OU) from the FOGO facility (with biofilter stack of 12 m) (1 second 99th percentile)

8. Cumulative impacts

Cumulative impacts from the MLRMC are expected, particularly from the landfill and the green waste facility.

Odour contour plots for the predicted 1 second 99th percentile odour concentration due to the landfill and green waste facility are presented in Figure 8.1 and Figure 8.2 respectively.

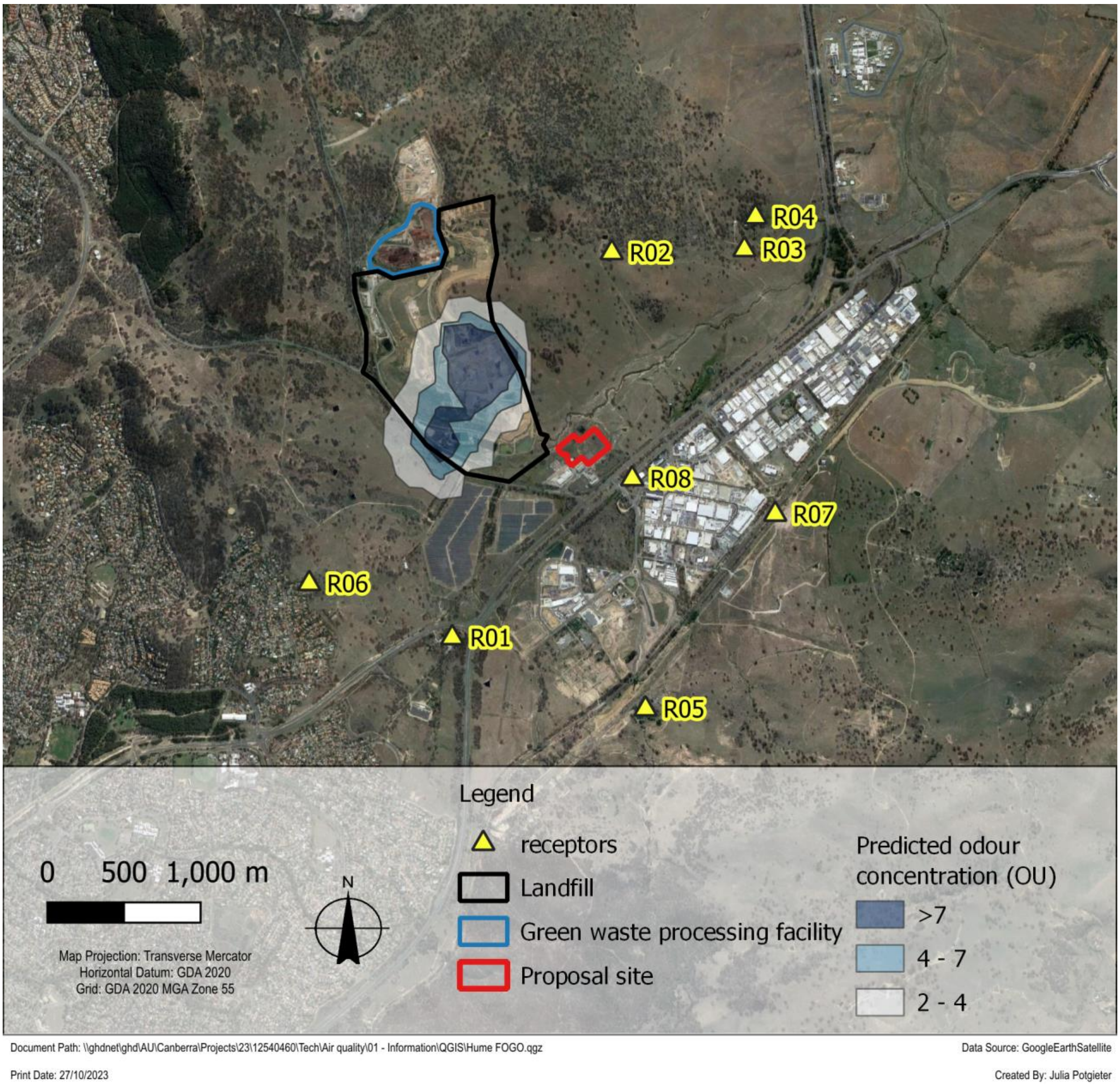

Figure 8.1 Predicted peak odour concentration (OU) from the landfill (1 second 99th percentile)

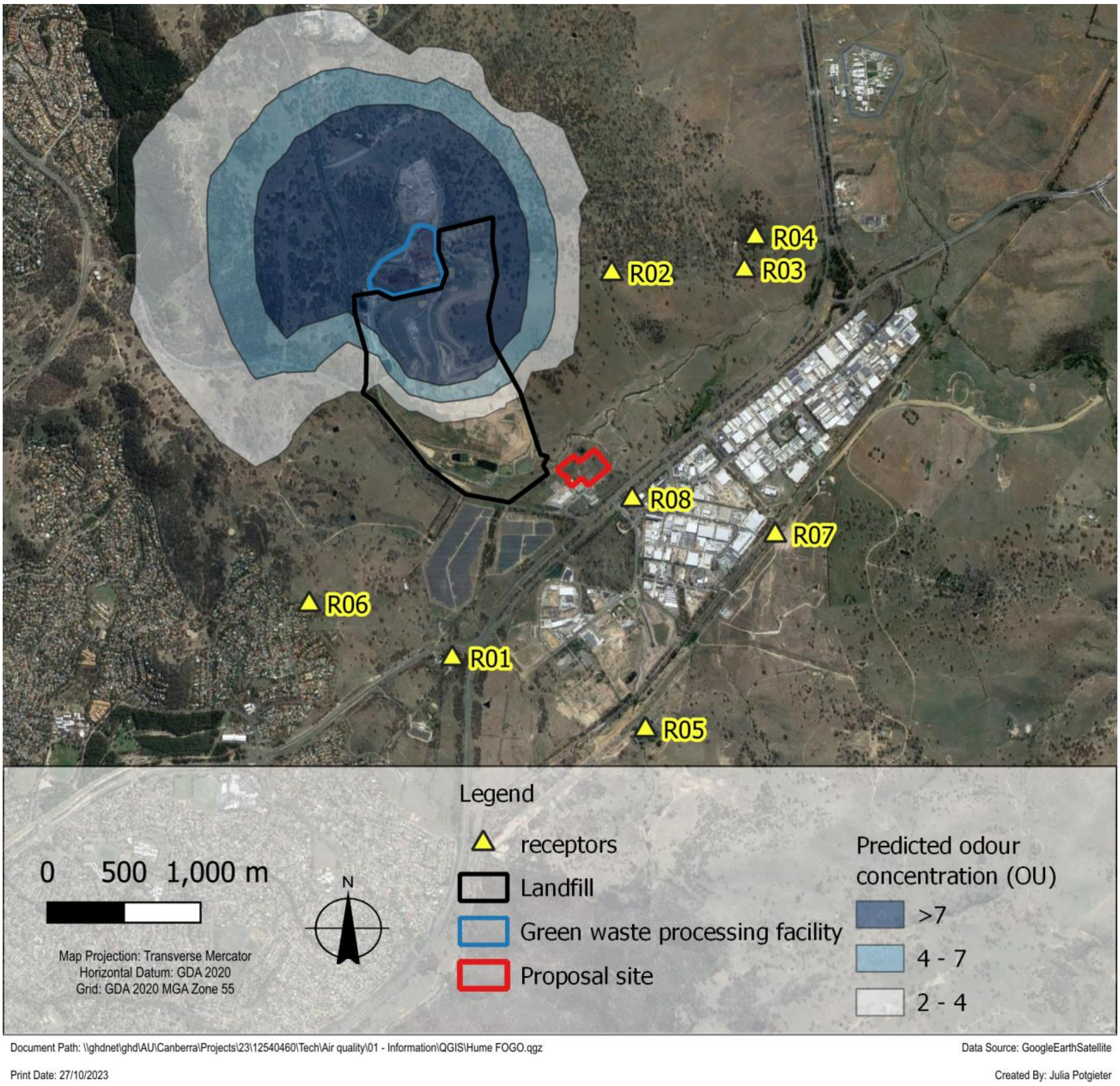

Figure 8.2 Predicted peak odour concentration (OU) from green waste facility (1 second 99th percentile)

The results of the cumulative (both the MLRMC and the FOGO facility) odour modelling and assessment at the sensitive receptors are provided below in Table 8.1. All results are the 1 second 99th percentile peak odour concentration as per the Approved Methods.

Emissions from the biofilter used in the cumulative assessment are based on the recommended stack parameters and maximum air flow:

– Emissions via a stack of 15 m in height and 2.5 m in diameter.
– 3 air changes per hour.

However this is subject to change with detailed design.

The results indicate that predicted odour from the cumulative impacts of the FOGO facility and the MLRMC is below criteria at all sensitive receptors.

Table 8.1 Predicted odour concentration from the FOGO facility and the MLRMC at sensitive receptors

Sensitive receptor		Predicted odour concentration (OU)	Odour concentration criteria (OU)
R01	Commercial	0.6	3

Sensitive receptor		Predicted odour concentration (OU)	Odour concentration criteria (OU)
R02	Residence	1.3	7
R03	Residence	0.8	7
R04	Residence	0.8	7
R05	Residence	0.5	7
R06	McArthur suburb	1.3	2
R07	Tralee suburb	0.7	2
R08	Hume industrial area	2.3	3

No exceedances of the criteria at the sensitive receptors are predicted. A contour plot for the predicted 1 second 99th percentile odour concentration is shown in Figure 8.3.

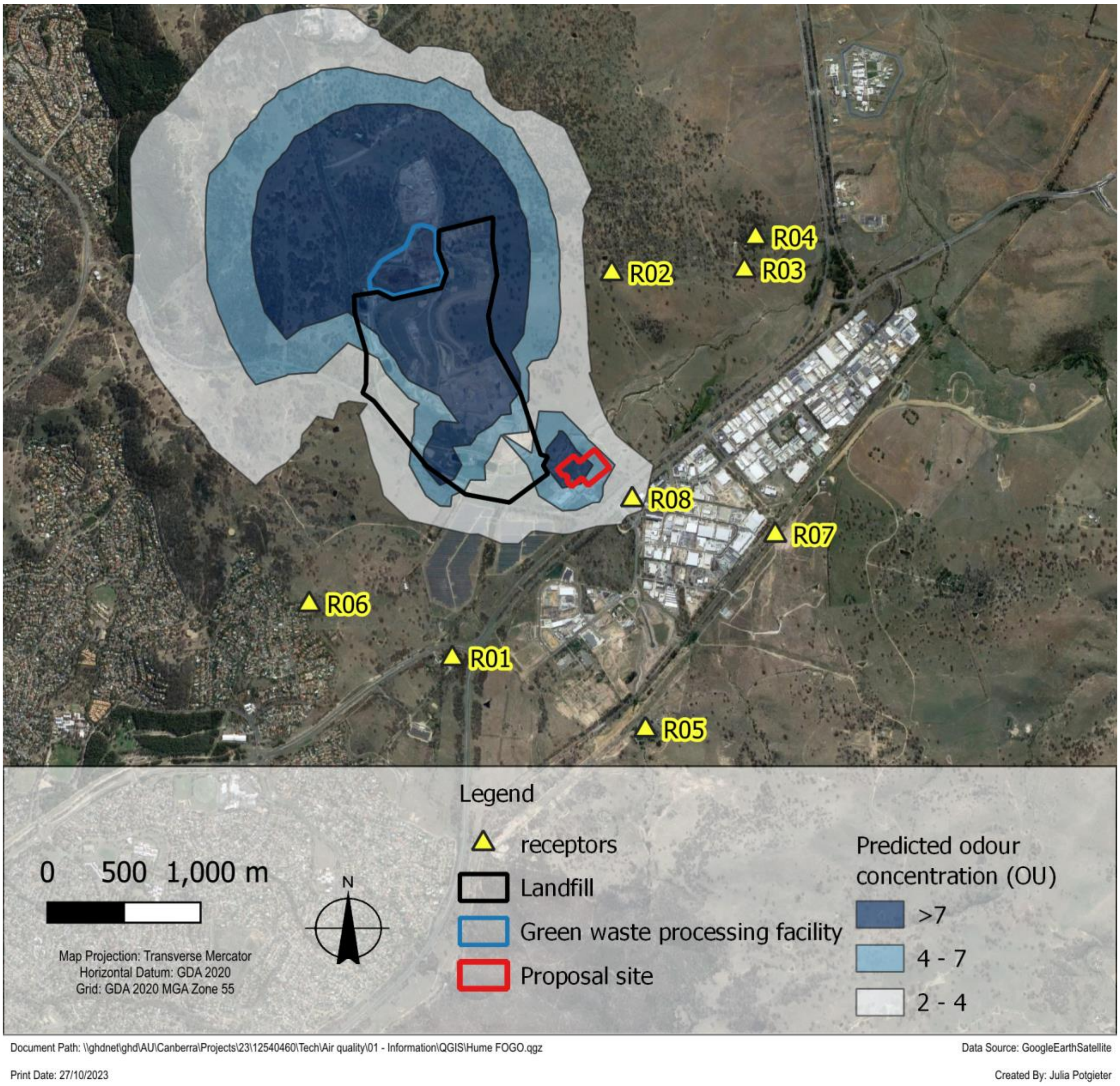

Figure 8.3 ***Predicted peak odour concentration (OU) from both the FOGO facility and the MLRMC (1 second 99th percentile)***

9. Air quality management plan

9.1 Construction

General air quality mitigation and management measure for construction of the project are provided below:

– Prepare a dust control protocol that forms part of the Construction Environmental Management Plan (CEMP) to detail management measures, a method for recording dust complaints and monitoring requirements.
– On days with forecast and actual high winds (i.e. over 10 m/s) reduce work effort accordingly if wind blown dust is observed to be leaving the proposal site boundary.
– Plant and equipment should be maintained in good condition to minimise ignition risk, spills and air emissions that may cause nuisance.
– Dust suppression should be undertaken as required using water sprays, water extension agents, soil stabilising polymers or other media on:
    - Unpaved work areas subject to traffic or wind,
    - During the loading and unloading of dust generating materials,
    - Unpaved access tracks,
    - Stockpiles.
– If the works are creating levels of dust which may significantly impact on residential amenity, the works should be modified or stopped until the dust hazard is reduced to an acceptable level.
– On days with high background dust levels (due to fire or offsite dust events for example), increase dust mitigation in the form of watering or reduce dusty construction activities.
– Construction vehicles with potential for loss of loads (such as dust or litter) should be covered when using public roads.

9.2 Operation

General odour mitigation and management measures are outlined below:

– Establish 24 hour emergency maintenance agreements with equipment manufacturers to limit the impact of equipment failures.
– Set up an onsite meteorological station to inform operational activities and identify odour sources in the event of a complaint.
– Maintain biofilter as per manufacturer specifications and perform regular testing to confirm it is performing correctly.
– Monitor the oxygen levels inside the composting tunnels to ensure optimum levels are maintained. Maintain and clear air spigots after material is removed from the tunnels. .
– Monitor the moisture content inside the composting tunnels and adjust the fan speed accordingly to maintain optimum air flow.
– Maintain and clean air spigots after the compost materials is removed from the maturation hall to ensure optimum aeration.
– If the works are emitting odour concentrations which may significantly impact the nearby receptors, the works should be modified or stopped until the odour hazard is reduced to an acceptable level.
– Odour audits, including smoke testing at the waste receival doorway, should be undertaken annually.

As there may be semi-enclosed product storage, dust may be a concern on windy days. This will be managed via controlled application of water for dust suppression when required.

10. Conclusion

An air quality impact assessment has been undertaken to determine the impacts from the construction and operation of the proposed FOGO facility located within the Hume Resource Recovery Estate. The main pollutants of concern were dust during the construction stage and odour during the operational stage of the project.

A qualitative assessment was undertaken to estimate the impacts of dust emissions for the construction stage in accordance with the *Guidance on the assessment of dust from demolition and construction* (Institute of Air Quality Management, 2014). This assessment took into account the dust emission magnitude and the receptor sensitivity for demolition, earthworks, construction and track-out. No demolition would be required as the proposal site is already cleared. Emissions from earthworks and track-out were identified as low risk, and negligible risk for construction due to the small-scale operations required and the distance to the nearest receptors.

Dispersion modelling was undertaken to estimate the impacts of odour emissions for the operational stage in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016). The biofilter was first assessed as a ground level area source, the results of which indicated that predicted impacts would significantly exceed the criterion at the nearby industrial area even when reducing the air flow to a third of the estimated value. Therefore, a stack was considered to aid in the dispersion and dilution of odour emissions. Three stacks of 15 m, 13 m and 12 m in height were assessed. Predicted impacts from all assessed stack configurations complied with the criteria at all sensitive receptors. The minimum recommended stack height for effective dispersion is 3 m above the nearby buildings; therefore the 15 m stack is the recommended option. However, further assessment can be undertaken during detailed design to refine the assumed stack parameters.

Cumulative impacts from the existing Mugga Lane Resource Management Centre (MLRMC) and the FOGO facility (assuming biofilter emissions were via a 15 m stack) were also assessed. Emission sources from the MLRMC included the landfill, leachate pond and green waste processing. Emission rates were estimated based on sampling at a similar facility (GHD, 2021). Predicted concentrations comply with the criteria specified in the Approved Methods at all sensitive receptors.

Management and mitigation measures are identified for construction and operation of the facility to manage emissions of dust and odour respectively.

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Appendix A

Meteorological modelling methodology

A-1 Overview

Local meteorology, including long term wind speed and direction as well as atmospheric stability, can influence how pollutants are dispersed into the local environment.

This appendix outlines the methodology used to synthesise site-representative meteorology for the project. The meteorology is used in CALPUFF to drive the dispersion model.

A-2 Methodology

The meteorology modelling methodology is summarised below:

– Selection of a model period.
– Development of coarsely gridded prognostic meteorological data set using The Air Pollution Model (TAPM).
– Development of fine gridded meteorological data set which takes in account local terrain features using the CALMET diagnostic meteorological model.
– Verification of model performance using data measured at BoM meteorological stations.
– Extraction of predicted meteorological parameters from the CALMET model.

A-2-1 Nearby BoM station review

The nearest BoM station is the Tuggeranong AWS (ID: 70339). It is located approximately 5.8 km west of the site. This station began operation in January 1996 and collects all desired meteorological parameters except for cloud data.

A-2-2 Representative year selection

A representative year was chosen for modelling purposes based on review of Southern Oscillation Index (SOI) for the past 10 years and an analysis of BoM data recorded at the Tuggeranong AWS for the last five calendar years (01/01/2017 – 31/12/2021).

The SOI indicates the intensity of El Nino or La Nina events in the Pacific Ocean. A value of less than -7 often indicates El Nino episodes typically accompanied by sustained warming of the central and eastern tropical Pacific Ocean, a decrease in the strength of the Pacific Trade Winds, and a reduction in winter and spring rainfall over much of eastern Australia and the Top End. A value greater than 7 often indicates La Nina episodes, typically associated with stronger Pacific Trade Winds and warmer sea temperatures to the north of Australia. Waters in the central and eastern tropical Pacific Ocean become cooler during this time. Together these give an increased probability that eastern and northern Australia will be wetter than normal.

The SOI for the past 10 years is shown in Figure A.1.

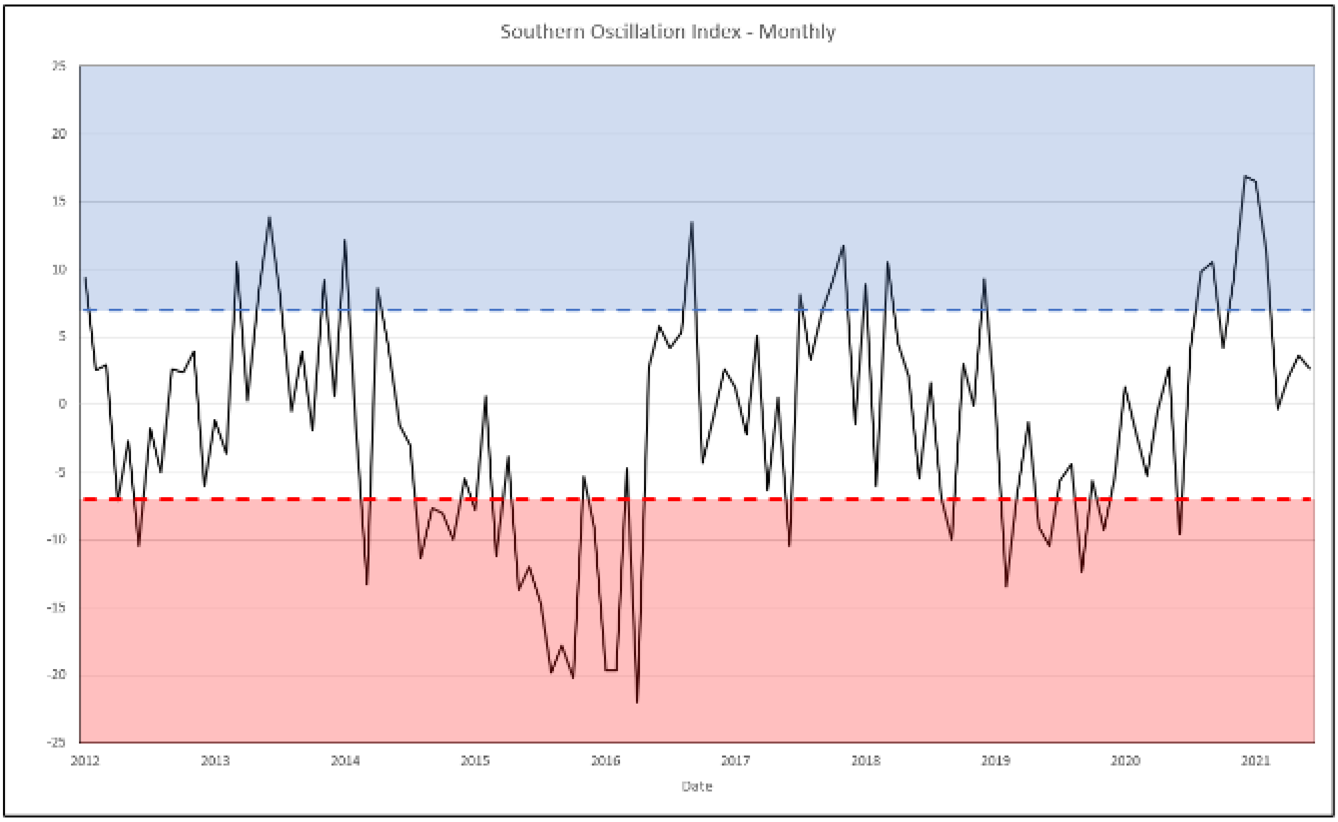


Figure A.1 Southern Oscillation Index for last 10 years (2012-2021)

Probability density function plots of Tuggeranong AWS data (2017-2021) for temperature, relative humidity, wind direction and wind speed are provided in Figures A.2 to A.5 respectively.

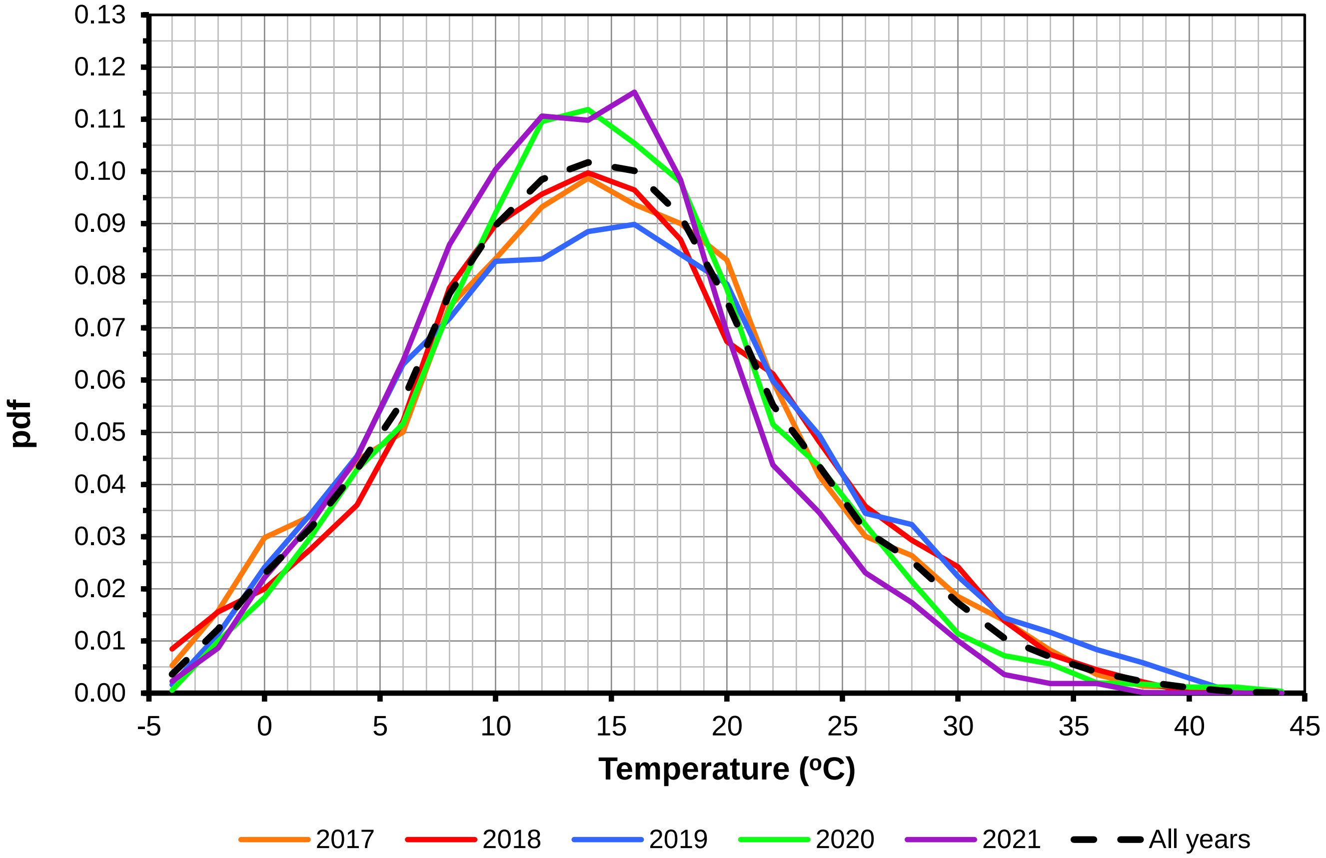


Figure A.2 *Temperature plot (Tuggeranong AWS, 2017-2021)*

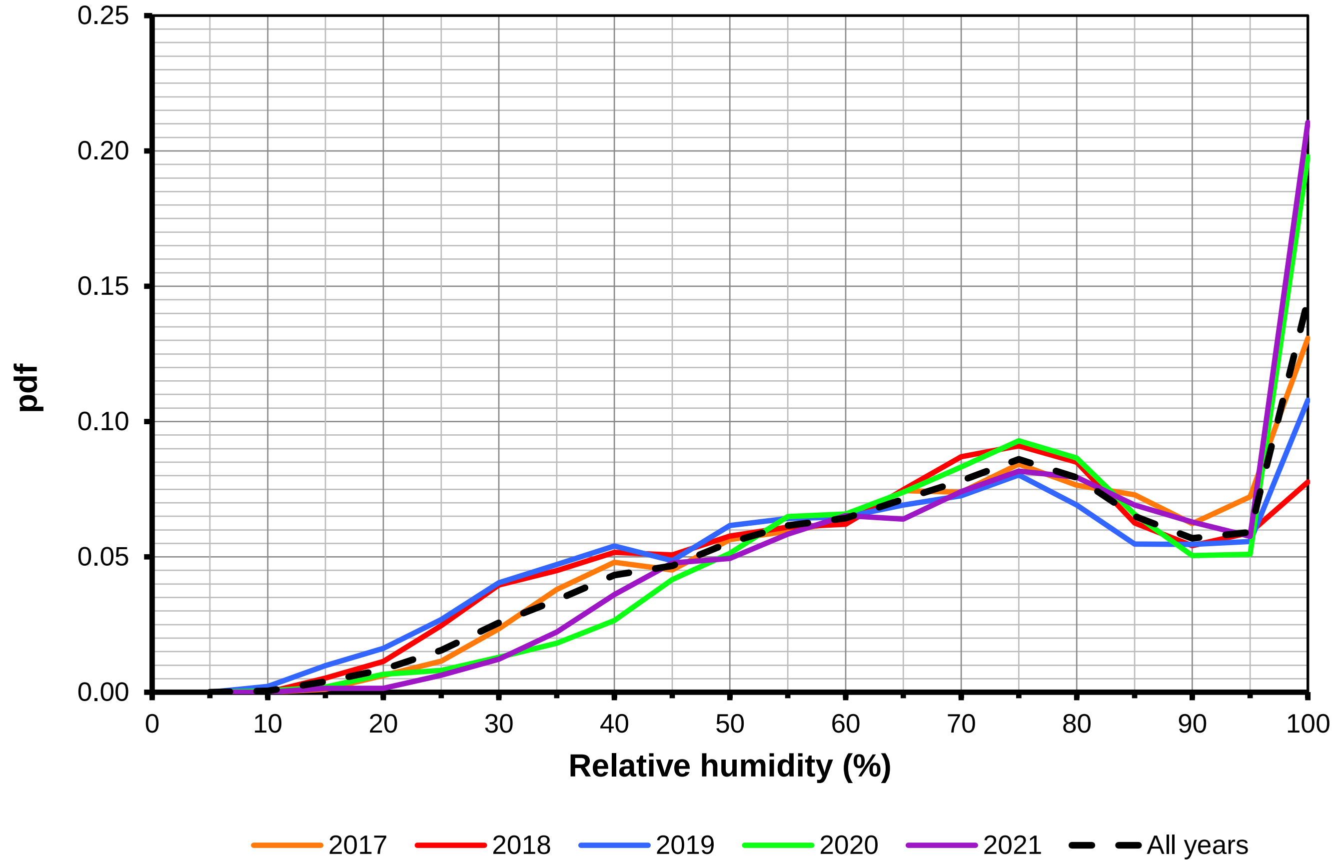


Figure A.3 *Relative humidity plot (Tuggeranong AWS, 2017-2021)*

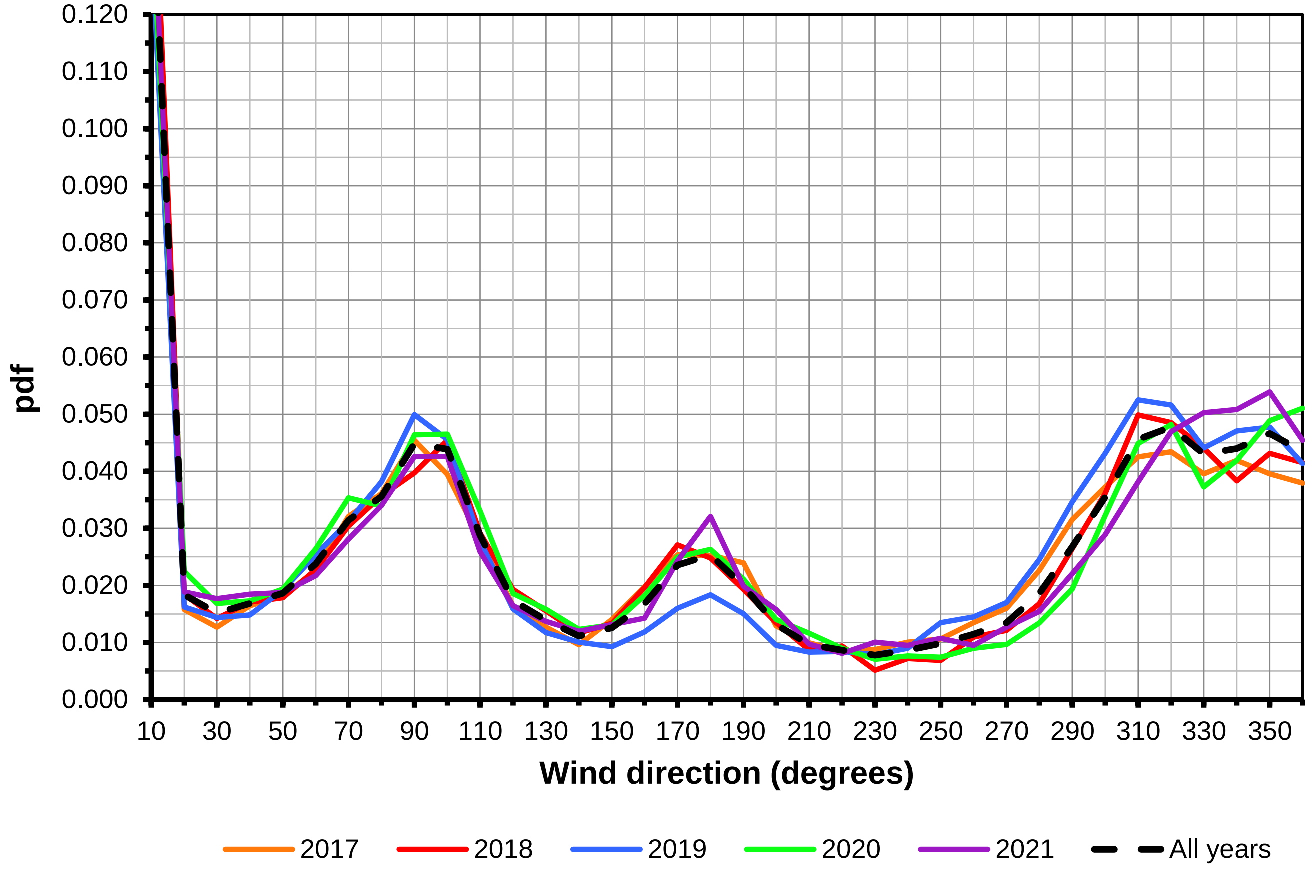


Figure A.4 *Wind direction plot (Tuggeranong AWS, 2017-2021)*

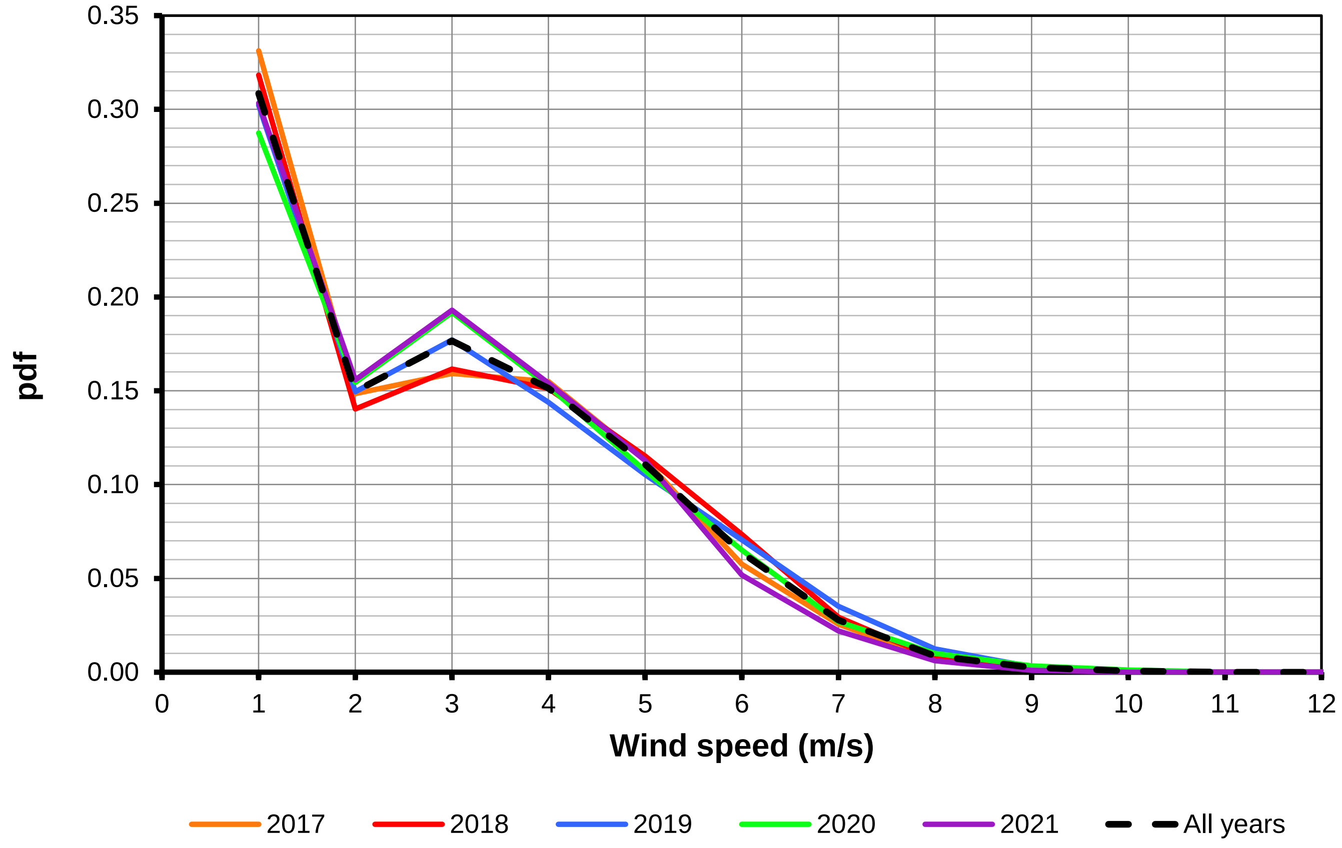


Figure A.5 *Wind speed plot (Tuggeranong AWS, 2017-2021)*

Based on the review of SOI data and meteorological conditions recorded at Goulburn Airport AWS, the representative year selected for modelling purposes was 01 January 2017 through 01 January 2018.

The parameters for the prognostics TAPM are summarised in Table A.1.

Table A.1 TAPM parameters

Parameter	Value
Modelled period	01 January 2017 to 31 December 2021
Domain centre	UT zone 55S Easting: 695267 m Northing: 6081399 m
Domain grid spacing	1.2 x 1.2 km
Domain size	30 x 30 km
Number of vertical levels	25

A-3 CALMET modelling

CALMET (Version 7) was used to resolve the wind field around the subject site to 200 metres spatial resolution. The application of CALMET for this purpose is an approved modelling approach in NSW as per the Approved Methods with model guidance documentation provided.

Upon completion of the TAPM runs, a CALMET simulation was set up to run for the model period using the three dimensional gridded data output from TAPM as an initial guess field. This approach is consistent with guidance documentation.

CALMET was run using the ‘Hybrid’ mode (i.e. surface observational data from the BoM Tuggeranong AWS and the BoM Canberra Airport AWS were included in the model). A varying radius of influence was used (LVARY=T) to incorporate both stations.

All model settings were selected based on the recommendations provided in the Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia (J Barclay and J Scire, Atmospheric Studies Group TRC Environmental Corporation, 2011) except for MDISP which the default value was used.

The centre of the CALMET domain was located at UTM Zone 56 coordinates 695 kilometres east and 6081 kilometres north. The CALMET domain extended 22 kilometres to the east and north.

The CALMET domain consisted of 110 grids in both the east and north directions, with a grid resolution of 0.2 kilometre.

The CALMET model parameters are summarised in Table A.2. The TERRAD value was selected based on inspection of the terrain elevations in the vicinity of the subject site.

Terrain and land use data used for the CALMET modelling are presented in Figures A.6 and A.7 respectively.

Table A.2 Summary of CALMET model parameters

Parameter	Value
Modelled period	1 January 2017 to 31 December 2017
Mode	Hybrid (NOOBS = 1)
UTM zone	56
Domain origin (southwest corner)	Easting: 695 km Northing: 6081 km

Parameter	Value
Domain size	110 x 110 at 0.2 km resolution (22.0 km x 22.0 km)
Number of vertical levels	11
Vertical levels (m)	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000,
CALMET settings for hybrid mode Settings selected in accordance with (OEH, 2011)	TERRAD = 11 km
Initial guess field	TAPM .m3d file used as an initial guess field for CALMET
Surface data	N/A
Upper air data	No site specific upper air data is used. Upper air data is included within the TAPM .m3d initial guess field.
Land use and terrain data	Land use data was manually developed through assessment of aerial imagery to accurately reflect the land use in the area. High-resolution terrain data was sourced from the STRM 1-second (~30 m) database.

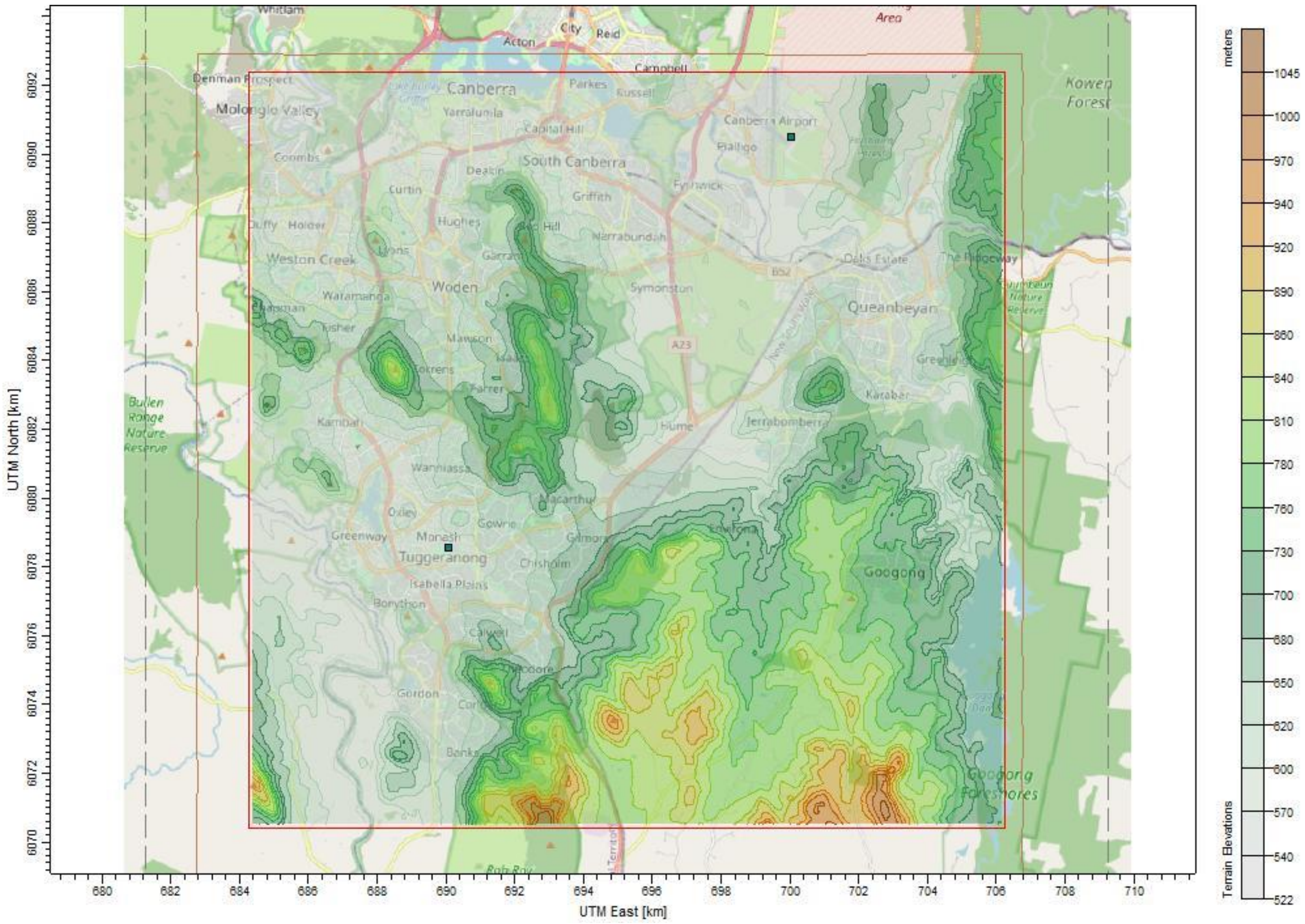


Figure A.6 Terrain data used for CALMET modelling

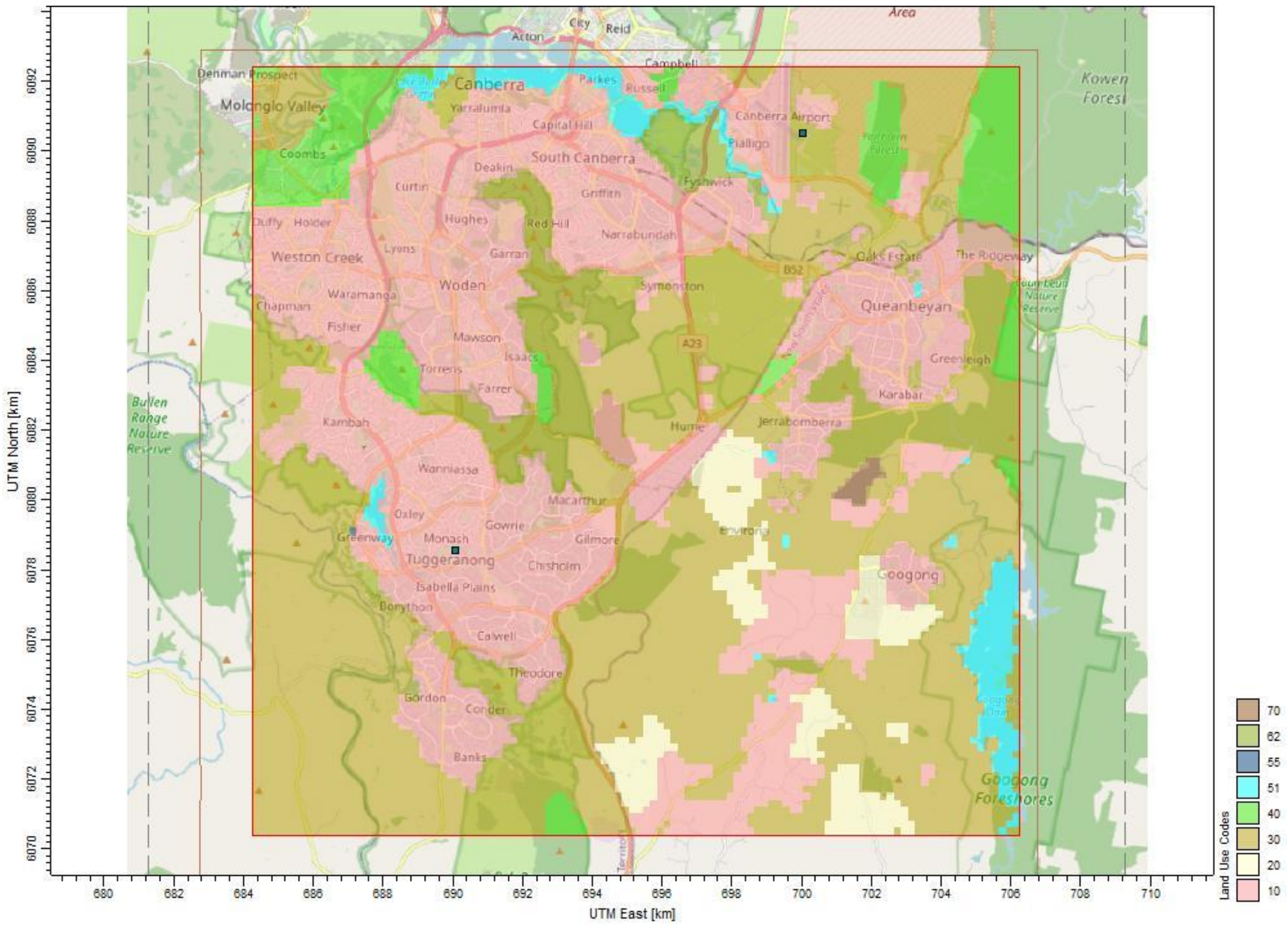


Figure A.7 ***Land use data for CALMET modelling***

The local meteorology largely determines the pattern of off-site air quality impact on receptors (houses, businesses and industry). The effect of wind on dispersion patterns can be examined using the wind and stability class distributions at the site from the dataset that is produced by CALMET. The winds at the site are most readily displayed by means of wind rose plots, giving the distribution of winds and the wind speeds from these directions.

The features of particular interest in this assessment are (i) the dominant wind directions and (ii) the relative incidence of stable light wind conditions that yield minimal mixing (defines peak impacts from ground-based sources).

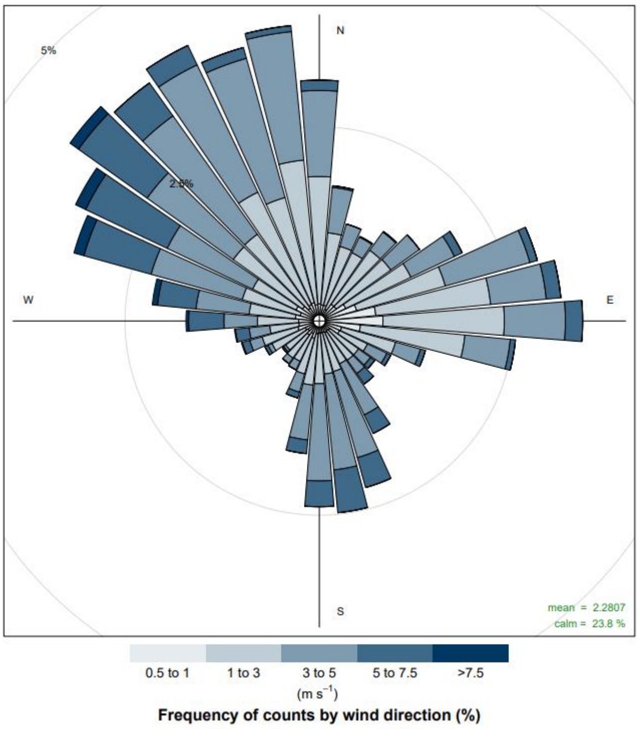
A-4 Model verification

Verification of the meteorological model performance was carried out by comparing the model outputs to BoM observations and onsite observations as shown in Table A.3.

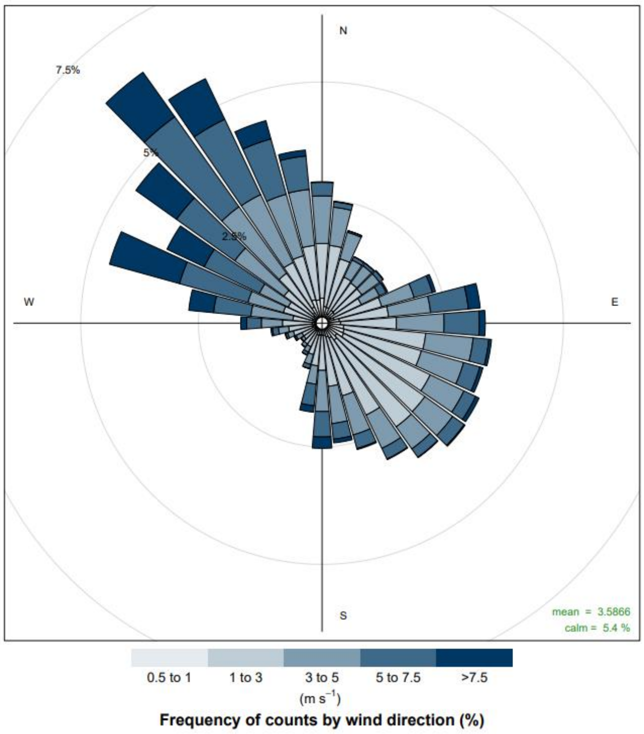
BoM data was sourced for the same time period as that of the CALMET model period (01/01/2017-01/01/2018) for verification. Onsite meteorological data was only available from September 2017 therefore the average wind rose for September 2017 to May 2022 is presented.

Table A.3 Model verification - wind rose comparison

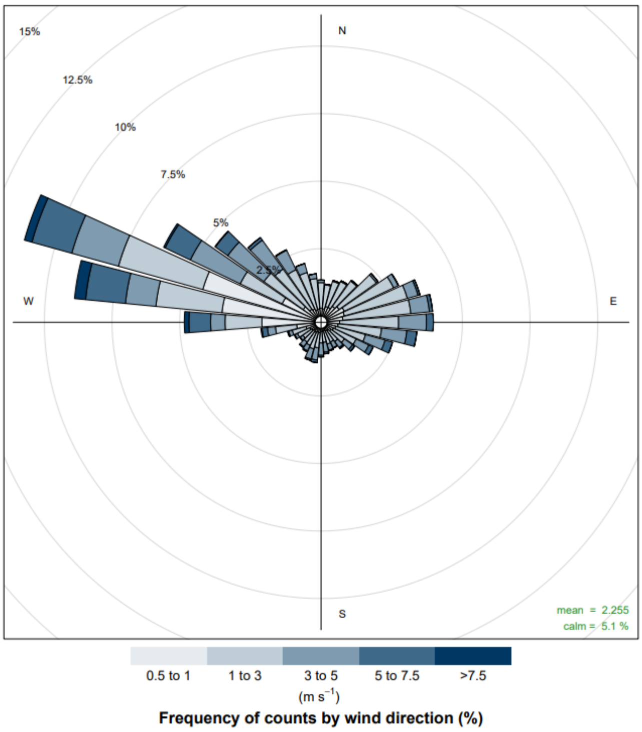
BoM Tuggeranong AWS (2017)



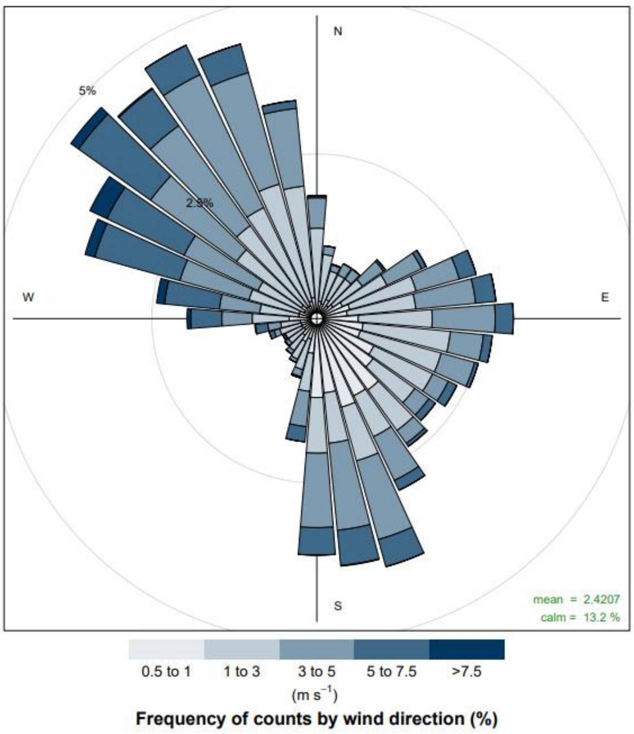
BoM Canberra Airport AWS (2017)



Onsite meteorology (09/2017 – 05/2022)



CALMET model output (2017)



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