Mainstream Recycling Pty. Ltd.

Waste Recycling Facility – 6 Sleigh Place, Wetherill Park NSW

Odour Assessment

Document Control

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1. INTRODUCTION

Airlabs Environmental Pty Ltd (Airlabs) have been commissioned by Mr. Andrew Wild from Wild Environment Pty Ltd (Wild Environment) on behalf of Mainstream Recycling Pty Ltd (Mainstream Recycling) to undertake odour dispersion modelling to predict odour impacts from the waste recycling facility located at 6 Sleigh Place, Wetherill Park, NSW (hereafter 'the facility').

Mainstream Recycling operate an approved waste transfer station / recycling facility at 6 Sleigh Place, Wetherill Park, NSW and its operations are currently licensed by the NSW- Environment Protection Authority (NSW-EPA), under the licence number EPL 20694.

As per EPL 20694, the facility is approved to undertake the following scheduled activities:

- Waste processing (non-thermal treatment)
- Waste storage – other types of waste.

As per information provided to Airlabs, the proponent of the facility is lodging a Development Application (DA) with the Fairfield City Council (the Council) seeking consent to increase the handling capacity of the facility from the existing 29,500 tonnes per annum (tpa) to 65,000 tpa to accommodate the increase in waste to be processed on site.

Consequently, an odour impact assessment is needed to assess the off-site odour impacts associated with increase in the volumes of waste accepted and processed at the facility. This forms the objective of this odour impact assessment prepared by Airlabs (OCT21134.1)

This odour assessment predicts modelled odour concentrations from the facility when the waste handling and treatment capacity increases to 65,000 tpa. The proponent is also seeking consent to keep the roller doors open during the operational hours of the facility. As-such, the odour assessment also investigates the potential impacts from keeping the doors open.

To effectively manage odours generated from the operations, Airlabs have been advised of the following improvements proposed by the proponent:

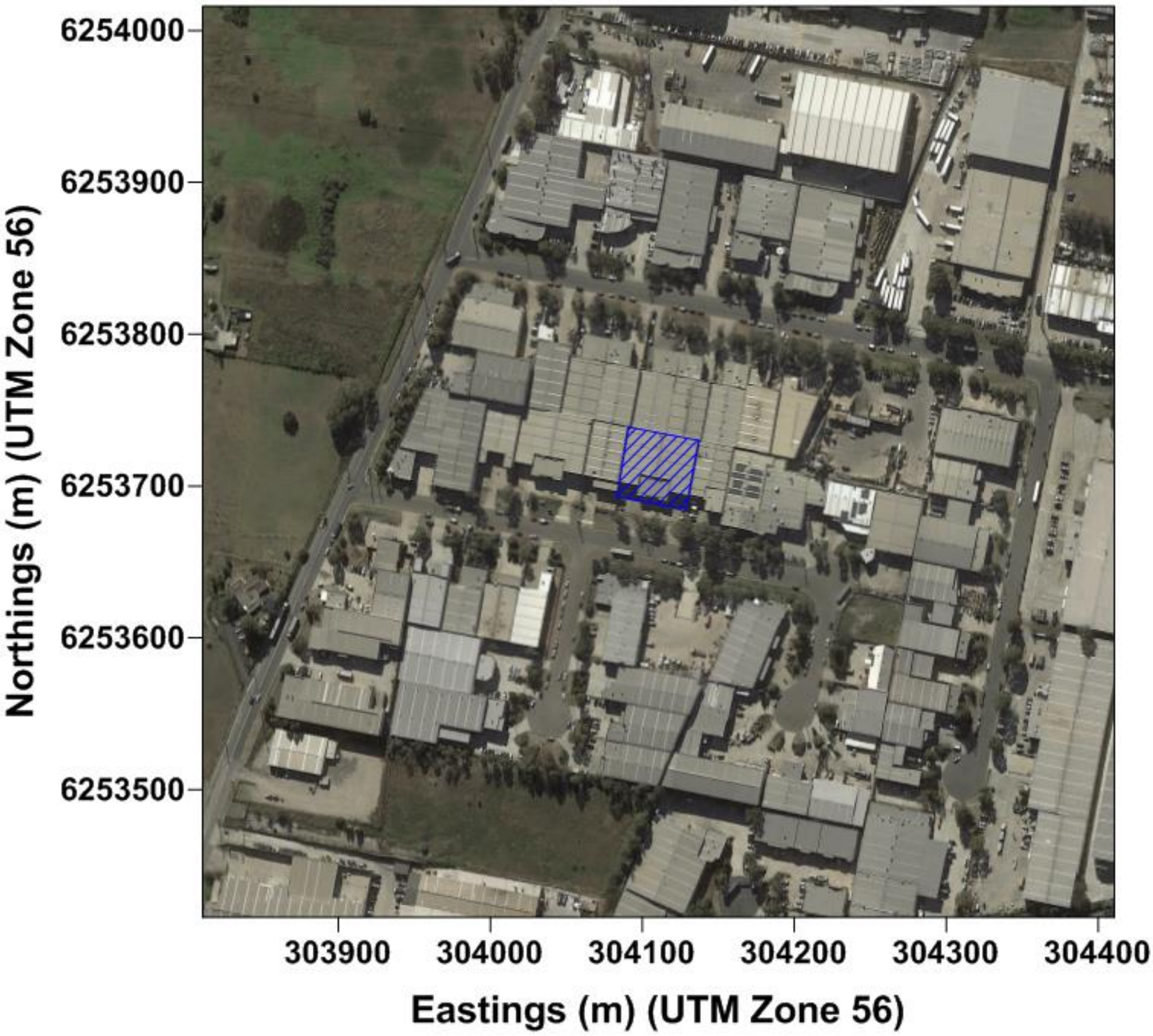
- All potential odours generated from the operational activities would be captured and passed through a scrubbing system (activated carbon unit) before venting into the atmosphere, thereby minimising the potential for any fugitive odours to leak from the facility.
- The stack exit velocity would be maintained at a minimum of 15 m/sec at all times during the operational hours, which will allow for better odour dispersion.

The odour assessment has been undertaken in accordance with the following guideline documents:

- Technical framework - Assessment and management of odour from stationary sources in NSW, NSW-EPA, November 2006
- Approved Methods for Modelling and Assessment of Air Pollutants in NSW, NSW-EPA, January 2017

The location of the facility (blue outlined) located at 6 Sleigh Place in Wetherill park, NSW is presented in **Figure 1**.

Figure 1: Location of the Mainstream Recycling Facility (shown in blue)



2. AIM OF THE ASSESSMENT

The aim of this odour assessment is to model the odour emissions from the facility during the proposed waste handling and treating capacity of 65,000 tpa; predict the odour concentrations; compare the predicted odour concentrations with the relevant odour assessment criteria to determine compliance.

3. ASSESSMENT APPROACH

The odour assessment has been undertaken in accordance with the NSW EPA published *Technical framework: Assessment and management of odour from stationary sources in NSW,* November 2006 (hereafter 'the Odour Technical Framework')

To predict odour impacts from the facility, dispersion modelling was undertaken as per the NSW EPA published *Approved Methods for Modelling and Assessment of Air Pollutants in NSW*, January 2017 (hereafter 'the Approved Methods'). Specific tasks that have been undertaken include:

- Identification of the study area and surrounding environment.
- Determination of relevant odour assessment criteria.
- Development of a 3-D meteorological model.
- Determination of odour emission rates.
- Modelling of the odour emissions and predicting.
- Comparing predicted odour concentrations with assessment criteria to determine compliance.

4. REGULATORY FRAMEWORK

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration which produces an olfactory response or sensation (PAE Holmes, 2009). That theoretical minimum concentration is referred to as the "odour threshold "and is also referred to as one (1) Odour Unit (OU). Therefore, an odour concentration of less than 1 OU would theoretically mean that there wouldn't be any odours perceived. Typically, the levels at which an odour is perceived to be a nuisance can range from 2 OU to 10 OU, depending on several factors, commonly referred to as the FIDOL factors. These factors determine whether an odour will result in a complaint or not. The FIDOL factors include:

- the **F**requency of the exposure;
- the **I**ntensity of the odour;
- the **D**uration of the odour episodes;
- the **O**ffensiveness of the odour; and
- the **L**ocation of the source.

The odour assessment criterion specified in the Odour Technical Framework is adopted within the Approved Methods. As per the Approved Methods, the assessment criterion is applicable at the nearest existing or likely future off-site sensitive receptors and is to be reported as the 99th percentile peak (1-second average) incremental (predicted impact due to the modelled sources alone) odour concentration.

It is noted that the criterion is designed, considering, the range in sensitivities to odours within the community, and also provide additional protection for individuals with a heightened response to odours. As-such, the assessment criterion is directly linked to the population densities as shown in **Table 1** and is established through the below formula:

$$Impact\ assessment\ criterion\ (Odour\ Units) = \frac{log10\ (population) - 4.5}{-0.6}$$

The facility is located in an industrial land use setting – *IN1 General Industrial*. As per the Approved Methods, the assessment criterion of 2.0 OU is applicable at the nearest existing or likely future off-site sensitive receptors and is to be reported as the 99th percentile peak (1-second average) incremental (predicted impact due to the modelled sources alone) odour concentration. The 99th percentile implies that the assessment criteria can be exceeded only for 1% of the entire year (i.e. 87 hours of the 8760 hours in a year).

Dispersion models typically predict concentrations valid for averaging periods of 1-hour or longer. As such, in order to determine peak (1-second) average concentrations, peak to mean factors (referred to as peak (1-second) to mean (1-hour) ratios) are applied to account for the odour fluctuation between the 1-second nose response time and the mean odour concentrations predicted over a 1-hour averaging period. The peak to mean ratio is dependent on the type of sources (e.g. point, area, volume etc.), distance to the receptor and the atmospheric stability.

For this odour assessment, a peak to mean ratio of 2.3 was used to convert mean 1-hour average concentration to the peak 1-second concentration.

Table 1: Impact Assessment Criteria – Complex Mixtures of Odorous Air Pollutants

Population of Affected Community	Impact Assessment Criteria (Odour Units – 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

5. PROPOSAL SPECIFICS

As noted earlier, the proposal is seeking consent to increase in the capacity of waste intake from 29,950 tpa to 65,000 tpa. Specific details as provided to Airlabs by Wild Environment are detailed below:

- 65,000 tpa of gross pollution trap waste, street sweeper waste and stormwater drainage systems waste including oily water waste (known as J120 in NSW) would be accepted by the facility.
- This will involve 35 trucks per day entering and leaving.
- Waste will be received 24 hours per day, 7 days per week (inclusive of public holidays).
- Waste removal from site will increase to four (4) per week from the current two (2) per week.
- Truck and drivers' cars will be parked off site.
- The roller doors will be left open during the working periods.

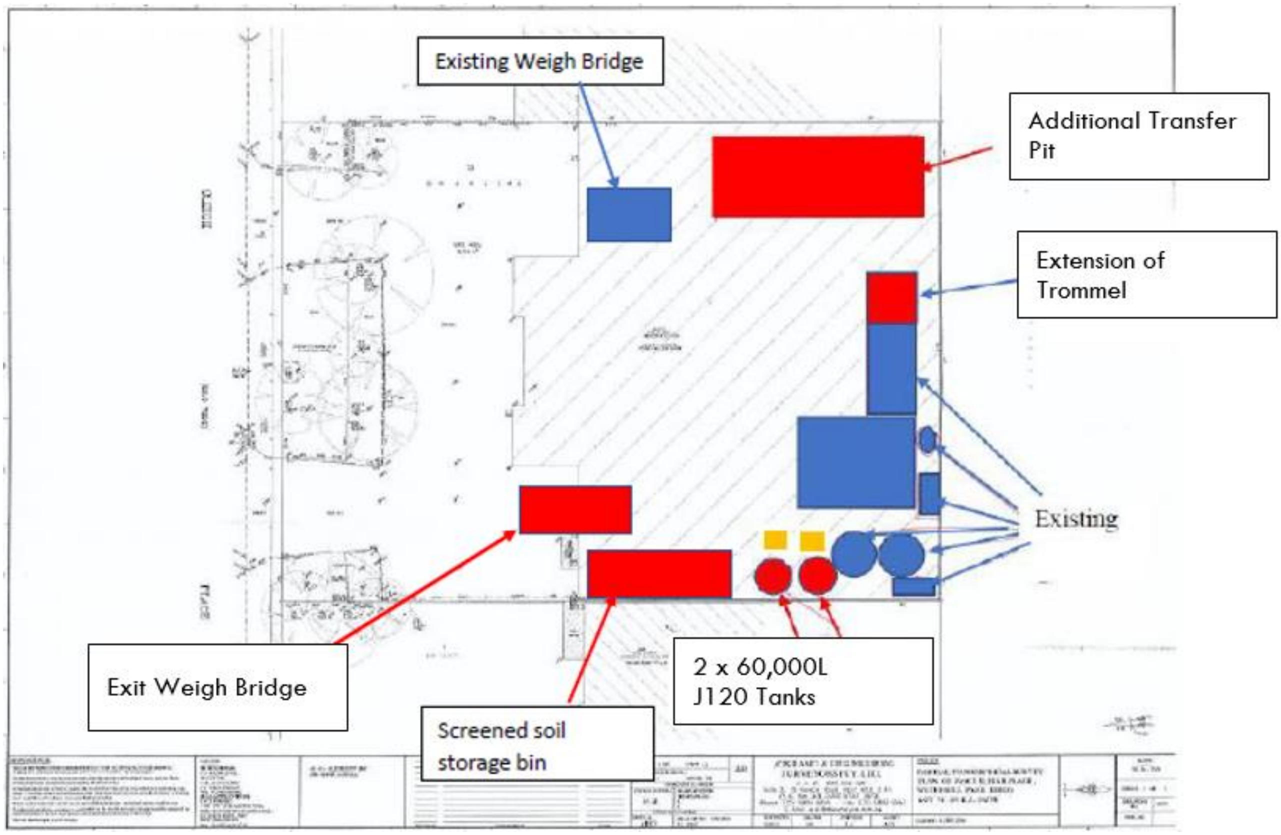
A layout of the existing facility with the proposed modifications is presented in **Figure 2**.

Airlabs have been informed by Wild Environment that all the odours generated from the various operations at the facility would be captured and passed through an activated carbon system before venting off the building through a 0.5m diameter stack, with a cross sectional area of 0.2 m^2 and maintaining a minimum exit velocity of 15 m/sec at all times.

As-such, Airlabs have been advised that there would be no fugitive odours generated during the operational activities at the facility as it would be constantly under negative pressure and the odours would pass through an activated carbon system before venting off the stack. This maintenance of the facility under negative pressure during operational hours allows for the roller doors to be open.

Therefore, for the odour assessment, it has been assumed that all the odours generated would be vented through the stack, that there would be no fugitive odours and that the rollers doors would be kept open at all times during the operational hours.

Figure 2: Overview of the Existing Facility



Source: Pacific Environmental Australia, 2018

6. METEOROLOGICAL MODELLING

6.1 Assessment Methodology

Meteorological mechanisms govern the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere. The local meteorology at the site plays a significant role in understanding the pollutant transport and dispersion mechanisms, and in order to adequately characterise the local meteorological conditions, information is needed on key parameters such as prevailing wind regime, mixing depth, atmospheric stability, ambient temperatures, rainfall and relative humidity. The following sections outline the methodology for characterising the meteorological conditions at the proposed facility.

Mainstream Recycling does not operate or manage a weather station at the facility. Due to non-availability of on-site meteorological data, reference was drawn to data from the nearest site-representative meteorological monitoring station, which is the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Horsley Park Equestrian Centre (Station No: 067119), which is approximately 3 km from the proposed facility.

As per the Approved Methods, in the absence of site-specific data for a Level 2 impact assessment, at least one year of site-representative data must be used and this data should be corelated against longer-duration site-representative meteorological database of at least five (5) years to be deemed acceptable.

As-such, in accordance with the Approved Methods, five (5) years of meteorological data recorded at the BoM Moss Vale AWS between 2013-2017 was collected and processed. The 2017 calendar year was selected based on analysis of five (5) years of trends in data recorded at the AWS.

Additional details of the selection of meteorological modelling year is presented in **Appendix A.**

Meteorological modelling for the 2017 calendar year was conducted using a combination of 'The Air Pollution Model (TAPM) (Version 4) and CALMET meteorological models. Analysis of the CALMET generated meteorological data at the proposed facility site location was undertaken to demonstrate that the meteorological data used in the dispersion model adequately describes the patterns expected at the site.

6.2 TAPM

For this modelling assessment, the meteorological model 'The Air Pollution Model (TAPM) (Version 4.0.5)' was used to generate the prognostic output. TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a prognostic model which is used to predict three-dimensional meteorological data and air pollution concentrations. TAPM allows users to generate synthetic observations by referencing in-built databases (e.g. terrain information, synoptic scale meteorological observations, vegetation and soil type etc.) which are subsequently used in generating site-specific hourly meteorological data (Hurley P.J., 2008).

Hourly meteorological observations from BoM AWS (Bureau of meteorology Automatic weather station) Horsley Park Equestrian Centre (067119) were assimilated in TAPM. The Horsley Park AWS is located approximately 3 km southwest of the Mainstream Recycling facility.

Technical details of the model equations, parameterisations and numerical methods are described in the Hurley (2008). Details of the TAPM configuration for this project are outlined in **Table 2**.

Table 2: TAPM Model Configuration

Parameter	Value
Year of Analysis	2013 to 2017 (01/01/2013 to 31/12/2017)
Grid Centre Coordinates (latitude, Longitude) (degree)	-33deg 49.5min, 150deg 52min
Number of grids (spacing)	4 (30km, 10km, 3km, 1km)
Grid dimensions (nx, ny, nz)	25, 25, 25
Data assimilation	BoM Horsley Park (067119)

6.2 CALMET

CALMET (version 6.4.0) was used to derive higher resolution meteorological fields at 200 m resolution over a 10 km x 10 km modelling domain centred over the facility. CALMET was run for the 2017 calendar year in no-observations mode (NOOBS = 2) with prognostic output from TAPM used as an input to the CALMET model.

The CALMET model settings were in general accordance with the NSW - Environment Protection Agency (NSW-EPA) (formerly Office of Environment and Heritage – OEH) '*Generic Guidance and Optimum Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, Australia*' (OEH, 2011).

Configuration of the CALMET model is specified in **Table 3**.

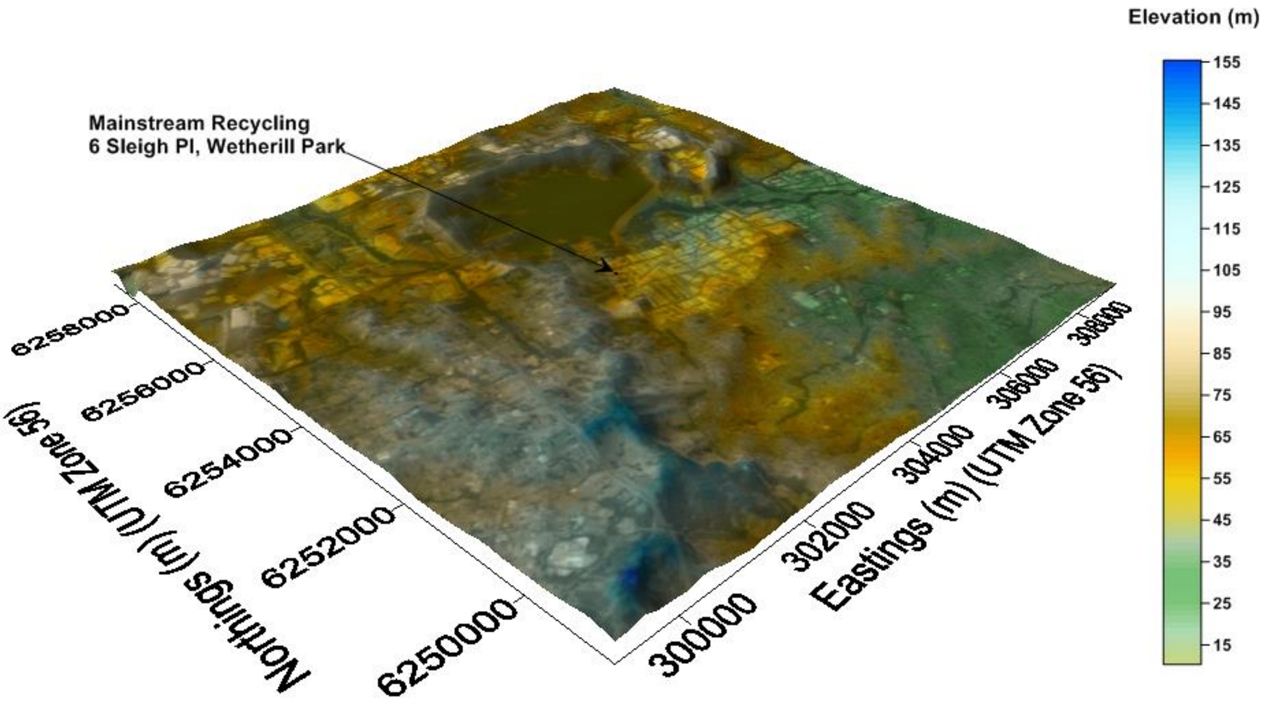
Table 3: CALMET - Model Configuration

Parameter	Value
Year of Analysis	2017
No. X Grid Cells (NX), No. Y Grid Cells (NY)	51, 51
Grid spacing (DGRIDKM) (km)	0.2
XORIGIN (km), YORIGIN (km)	299.007, 6248.609
No. of Vertical Levels	10
Meteorological Data Option	NOOBS = 2
Upper Air and Surface Data	TAPM generated MM4/MM5/3D
Geophysical Datasets	USGS GLCC (land use) & SRTM 1- arc second terrain

The Geophysical dataset for CALMET contain terrain and land use information for the modelling domain. For this assessment, the terrain for the CALMET grid was extracted from 1- arc second (30m) spaced elevation data obtained via NASA's Shuttle Radar Topography Mission (SRTM) in 2000 (Downloaded from USGS website). The land use or land cover data for the modelling domain was based on the USGS Global Land Cover Classification (USGS GLCC). The geotechnical parameters for the land use classification were adopted from the default CALMET corresponding land use categories.

Terrain features surrounding the facility is shown in **Figure 3** through a 3-D topography map.

Figure 3: Terrain Surrounding the Mainstream Recycling Facility



6.3 Modelled Meteorology

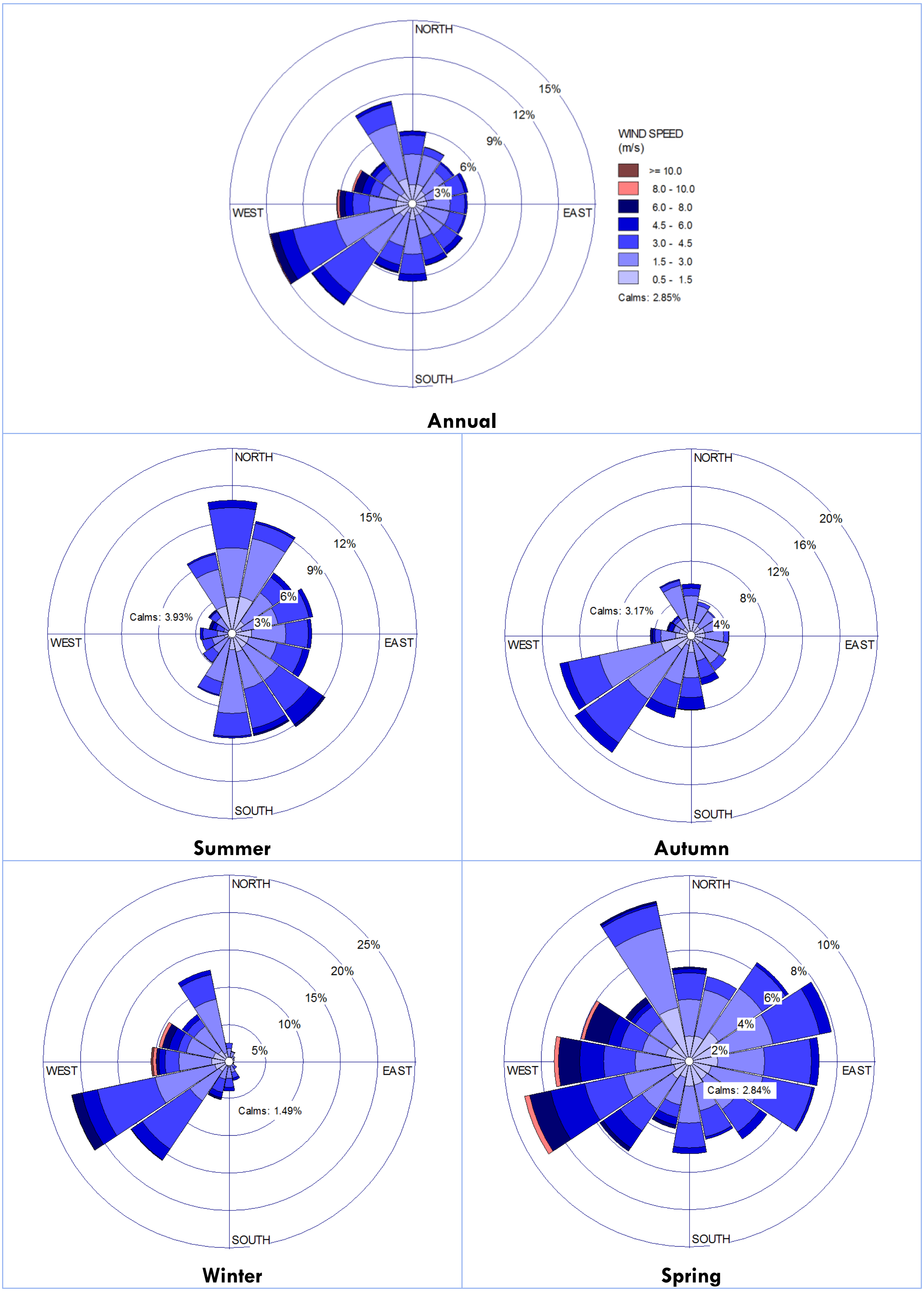
Hourly wind speeds and direction for calendar year 2017 were extracted from the CALMET output at the centre of the modelling domain (at the location of the facility) and are visually presented in the form of wind roses in **Figure 4**.

Annual wind roses show winds predominantly from the southwest sectors and to a lesser extent from the north-westerly direction. The average wind speed for the 2017 dataset was 2.6 m/sec.

Seasonal variation in the wind profile generated for the 2017 calendar year is clearly evident from the wind roses presented in **Figure 4**.

Calm conditions (wind speeds <0.5 m/sec) are expected to occur for less than 3% of the entire 2017 calendar year.

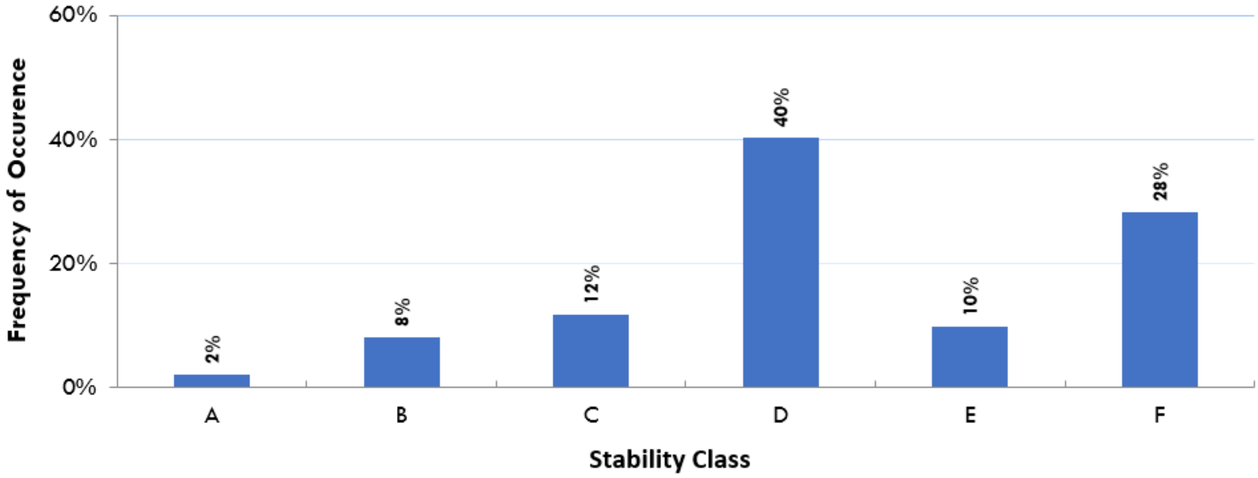
Figure 4: CALMET Generated Wind Rose for 2017 at the Mainstream Recycling Facility



Stability of the atmosphere is determined by a combination of horizontal turbulence caused by the wind and vertical turbulence caused by the solar heating of the ground surface. Stability cannot be measured directly; instead, it must be inferred from available data, either measured or numerically simulated. The Pasquill-Gifford scale defines stability on a scale from A to G, with stability class A being the least stable, occurring during strong daytime sun and stability class G being the most stable condition, occurring during low wind speeds at night. For any given wind speed, the stability category may be characterised by two or three categories depending on the time of day and the amount of cloud present. In meteorological models such as CALMET, the stability classes F and G are combined.

A summary of the numerically simulated hourly stability class data using CALMET for 2017 is presented in **Figure 5**. A higher frequency (40%) of stability class D and stability class F (28%) are predicted indicating that the dominant conditions are moderately to very stable, with very little lateral and vertical diffusion.

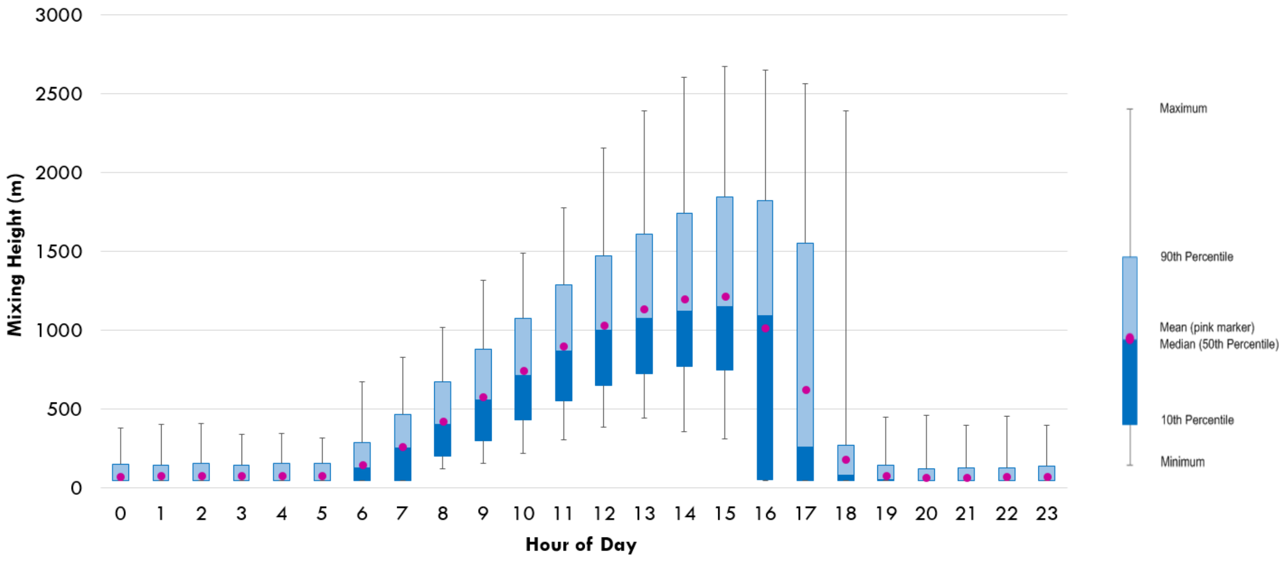
Figure 5: CALMET Predicted Frequency of Stability Class – 2017



The mixing height quantifies the vertical height of mixing in the atmosphere and is a modelled parameter that cannot be measured directly. The mixing height decreases in the late afternoon, particularly after sunset, due to the change from surface heating from the sun to a net heat loss overnight. Low mixing heights typically translate to stagnant air with little vertical motion, while high mixing heights allow vertical mixing and good dispersion of pollutants. CALMET simulated hourly mixing height data for the year 2017 is shown in **Figure 6**.

The data presented in **Figure 6** shows the mixing height as a function of the hour of the day at the centre of the facility. The graph represents the typical growth of the boundary layer, whereby the mixing height is generally lowest during the night and into the early morning and highest during the late afternoon.

Figure 6: CALMET Predicted Diurnal Variation in Mixing Height – 2017



7. DISPERSION MODELLING

7.1 CALPUFF Configuration

Dispersion modelling was undertaken using the CALPUFF model v.6.42 utilising meteorological wind fields generated through CALMET for the year 2017. A 5 km by 5 km computational grid centred over the facility was sufficient to capture the impacts of odour emissions on the local surroundings. Gridded receptors were sampled at 20 m resolution over the area of interest surrounding facility (circa. 1 km x 1 km). General run control parameters and technical options that were selected are presented in **Table 4**. Defaults were used for other options.

Table 4: CALPUFF Model Configuration

Parameter	Value
CALPUFF version	6.42
Year modelled	2017
No. X Grid Cells (NX), No. Y Grid Cells (NY)	51, 51
XORIGIN (km), YORIGIN (km)	299.007, 6248.609
No. of vertical levels	10
Computational Grid spacing (DGRIDKM)	200 m
Sampling Grid spacing	20 m
Method used to compute dispersion coefficient (MDISP)	3
Computational grid size	5 km x 5 km
Wet deposition	False
Dry deposition	False

7.2 Modelled Odour Emission Rates

At the time of undertaking the odour assessment, Airlabs were advised by Pacific Environmental of an odour survey (odour monitoring) assessment conducted at the facility in April 2018.

The odour monitoring report[1] prepared by Stephenson Environmental Management Australia in April 2018 (SEMA, 2018) presented an inventory of odour concentrations generated from the existing operations at the facility.

According to SEMA 2018, odour monitoring was undertaken above the receivals and solids settling pit, at the recovered fines storage, at the east access doorway and from one of the two roof vents (western roof vent). All the sampling was conducted on the 22nd March 2018. At the time of conducting the odour monitoring, the facility's production rates were in the order of 20,000 tpa.

To estimate odour emission rates for this proposal, reference was drawn to the measured odour concentrations presented in SEMA 2018.

The maximum measured odour concentrations from the monitoring program were considered for this assessment. The highest measured odour concentration was 49 odour units (OU), which was measured at the roof vent.

The odour concentrations for this proposal were estimated by scaling the maximum measured odour concentration across all the sources from the monitoring campaign with the waste treatment capacity during the time of sampling (20,000 tpa) and the proposed waste intake capacity of 65,000 tpa.

As-such, the odour concentrations estimated for the receiving and processing of waste up to 65,000 tpa is 159 OU.

As noted in **Section 5**, it is understood that all odours generated from the operational activities at the facility would be captured and passed through an activated carbon system before passing through a 0.5m diameter stack with a minimum exit velocity of 15 m/sec. As-such, no fugitive odours / leakage of odours are expected from the operational activities.

Odour emission rates were estimated from the aforementioned scaled odour concentrations and the corresponding volumetric flow rate (calculated from the cross-sectional area and the minimum exit velocity to be achieved). As there would be no leakage of odours due to the facility being maintained under negative pressure, fugitive odour emissions were not determined for operations.

The estimated odour emission rate for the facility while operating at 65,000 tpa is 469 OU.m^3/sec. This estimate of the odour emission rate considers all the odours generated from the facility including the liquid tanks and any fugitive odours, which would be captured and passed through the exhaust stack before discharging into the atmosphere.

For the modelling, it has been assumed that the stack designed to vent all the odours from the facility (which include odours from the liquid tanks and any fugitive odours) would be operating 24 hours, 365 days of the year.

The stack parameters to be used in the odour dispersion modelling are summarised in **Table 5**.

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[1] *Odour Monitoring Assessment, Mainstream Recycling Pty. Ltd., 6 Sleigh Place, Wetherill Park, NSW*, Report issued by Stephenson Environmental Management Australia, Project No: 5943/S24944/18, Date of issue: 27 April 2018

Table 5: Stack Parameters

Parameter	Value
Stack exit velocity	15 m/s
Stack exit temperature	295 degree Kelvin
Stack exit diameter	0.5 m
Stack height above ground	12 m (4 m above roof)

7.3 Modelled Sensitive Receptors

Sensitive receptors located in close proximity of the facility were identified and included in the dispersion model to assess off site odour impacts from the operations.

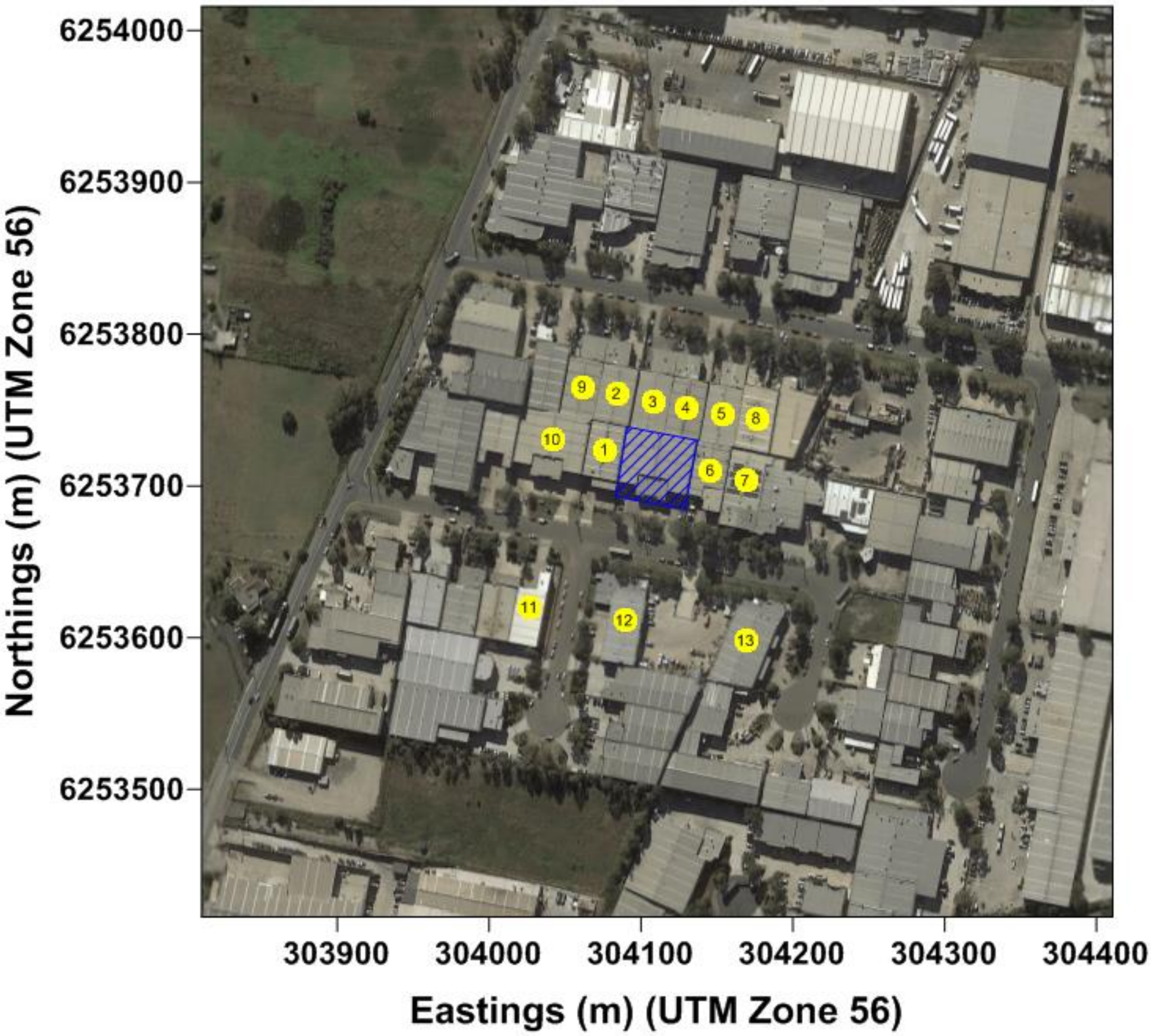
Modelled odour concentrations were predicted at the identified sensitive receptors and compared with the assessment criterion of 2 OU to determine compliance.

Details of the identified sensitive receptors are tabulated in **Table 6** and illustrated in **Figure 7**.

Table 6: Modelled Sensitive Receptors

Receptor ID	Easting (m)	Northing (m)	Type
R1	304077	6253724	Industrial
R2	304084	6253761	Industrial
R3	304108	6253755	Industrial
R4	304130	6253751	Industrial
R5	304154	6253747	Industrial
R6	304146	6253710	Industrial
R7	304169	6253703	Industrial
R8	304176	6253744	Industrial
R9	304062	6253765	Industrial
R10	304042	6253730	Industrial
R11	304027	6253620	Industrial
R12	304089	6253611	Industrial
R13	304169	6253598	Industrial

Figure 7: Modelled Sensitive Receptors



8. DISPERSION MODELLING RESULTS

The 99th percentile peak (1-second) average odour concentrations predicted at the identified sensitive receptors are presented in **Table 7**.

Dispersion modelling results suggests compliance of the 2 OU criteria at all identified sensitive receptors for operations. The maximum model predicted odour concentration was 0.45 OU, predicted at receptor R3. Odour concentration isopleths are presented in **Figure 8**.

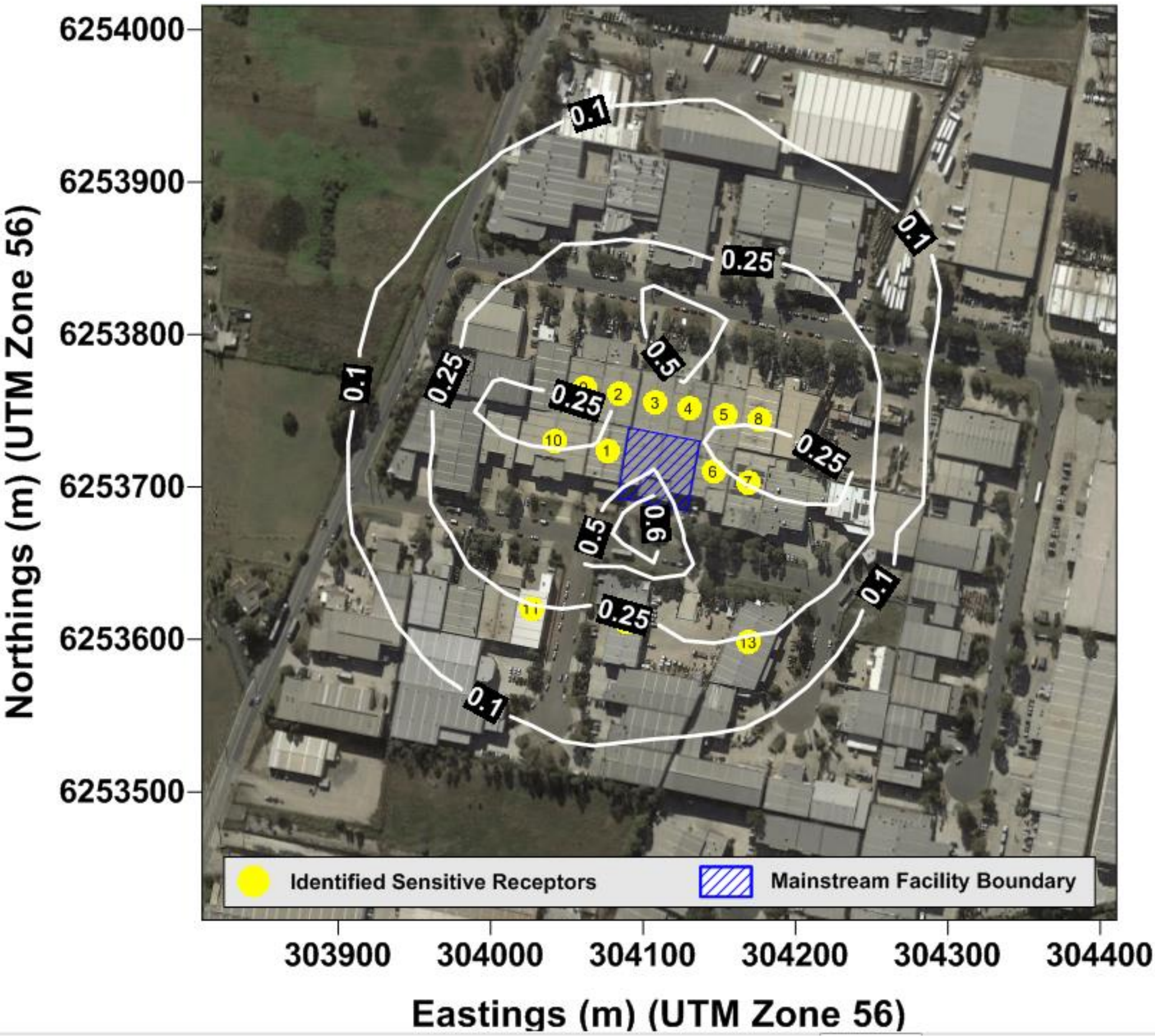
Modelling suggests that the higher stack exit velocity of 15 m/sec will significantly improve the dispersion of odours emanating from the facility's operations and will not adversely impact the surrounding receptors. Furthermore, the odours captured by the exhaust system would be treated through an activated carbon before venting into the atmosphere.

It has been assumed in the dispersion model that the exhaust system will be sufficient enough to maintain negative pressure inside the facility at all times during the operational hours and that any odour emanating from the facility will be discharged to the atmosphere only through the exhaust stack. Hence, any potential release of fugitive odours whilst the roller doors being open have not been modelled.

Table 7: Odour Dispersion Modelling Results

Receptor ID	Assessment Criteria (OU)	Model Predicted Odour Concentration (99th percentile, 1-sec average, OU)
R1	2 OU	0.31
R2		0.28
R3		0.45
R4		0.35
R5		0.28
R6		0.26
R7		0.25
R8		0.25
R9		0.26
R10		0.24
R11		0.25
R12		0.19
R13		0.24

Figure 8: Predicted 99th Percentile Peak (1-second) Odour Concentrations (Assessment Criteria: 2 OU)



9. CONCLUSION

Airlabs were commissioned by Wild Environment on behalf of Mainstream Recycling to conduct an odour assessment of their operations. The facility, whose operations are licensed by the NSW-EPA (EPL No: 20694), is an approved waste recycling facility which accepts and treats gross pollution trap waste and stormwater drainage system waste including oily water waste.

The facility current accepts and treats up to 29,950 tpa. A DA is being lodged with the Fairfield City Council seeking consent to increase the handling capacity of the facility from the existing 29,500 tonnes per annum (tpa) to 65,000 tpa along with the installation of additional machinery to accommodate the increase in waste to be processed on site. The proponent is also seeking consent to keep the roller doors open during the operational hours of the facility.

Subsequently, an odour assessment is needed to support the DA to inform the regulatory authorities on the expected odour impacts from the proposal and the potential effects resulting from keeping the roller doors open.

The odour assessment has been undertaken in accordance with the following guideline documents:

- Technical framework - Assessment and management of odour from stationary sources in NSW, NSW-EPA, November 2006
- Approved Methods for Modelling and Assessment of Air Pollutants in NSW, NSW-EPA, January 2017

To assess the odour impacts from the proposal, odour dispersion modelling has been undertaken using the CALPUFF dispersion model. Odour emission rates for the facility were estimated based on referencing site specific odour monitoring data available from a survey conducted in 2018.

The odour concentrations for the facility were estimated by scaling the maximum measured odour concentration across all the sources from the monitoring campaign with the waste treatment capacity during the time of sampling (20,000 tpa) and the proposed waste intake capacity for the facility (65,000 tpa).

Airlabs have been advised by Wild Environment that to improve the performance of odour management, all potential odours generated from the operational activities would be captured and passed through a scrubbing system (activated carbon unit) before passing through a 0.5m diameter stack with a minimum exit velocity of 15 m/sec. As-such, no fugitive odours / leakage of odours are expected from the operational activities at the facility.

Modelling shows that predicted impacts from the facility comply with the odour assessment of 2 OU.

Compliance is mainly attributed to the negligible odour generation potential of the existing and proposed waste types, design changes proposed by the proponent, which comprise maintaining a negative pressure system during operational hours and capturing all the potential odours (including the liquid tanks and any fugitive odours) and treating them through an activated carbon system before discharging into the atmosphere through an exhaust stack which will maintain a minimum exit velocity of 15 m/sec at all times. Modelling suggests that the higher stack exit velocity of 15 m/sec will significantly improve the dispersion of odours emanating from the facility's operations. Maintaining a negative pressure environment, minimises the potential for fugitive odours leaking from the facility and therefore provides the opportunity to operate with the roller doors open.

In conclusion, the modelling shows that design measures proposed by the proponent will achieve compliance with the odour assessment criteria, when the operations are increased to 65,000 tpa. The design changes also allow the proponent to operate the facility by keeping the roller doors open during the operational hours.

10. REFERENCES

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APPENDIX A

Selection of the Meteorological Year

Analysis of the meteorological data recorded at the site-representative location – BoM AWS (Bureau of meteorology Automatic weather station) Horsley Park Equestrian Centre (AWS No: 067119) over a five (5) year period between 2013-2017 has been undertaken.

The following charts have been produced to compare the one-year site-representative data (2017) with five (5) year observations and to support the selection of the 2017 meteorological modelling year.

- Interannual (2013-2017) wind roses – BoM Horsley Park Equestrian Centre AWS.
- Interannual (2013-2017) mean maximum and mean minimum temperature profiles – BoM Horsley Park Equestrian Centre AWS
- Interannual (2013-2017) wind speed frequency distribution chart – BoM Horsley Park Equestrian Centre AWS.
- Interannual (2013-2017) percentage of calms – BoM Horsley Park Equestrian Centre AWS.

The interannual analysis presented in **Figure A.1** through **Figure A.4** shows that there is minimal inter-annual variation in the winds measured across this period. Therefore, the 2017 calendar year is considered site representative and was assimilated in TAPM. The prognostic output from TAPM was then used as an input to the CALMET model to derive higher resolution meteorological fields.

Figure A.1: Inter-Annual Wind Roses – BoM Horsley Park Equestrian Centre AWS – 2013 to 2017

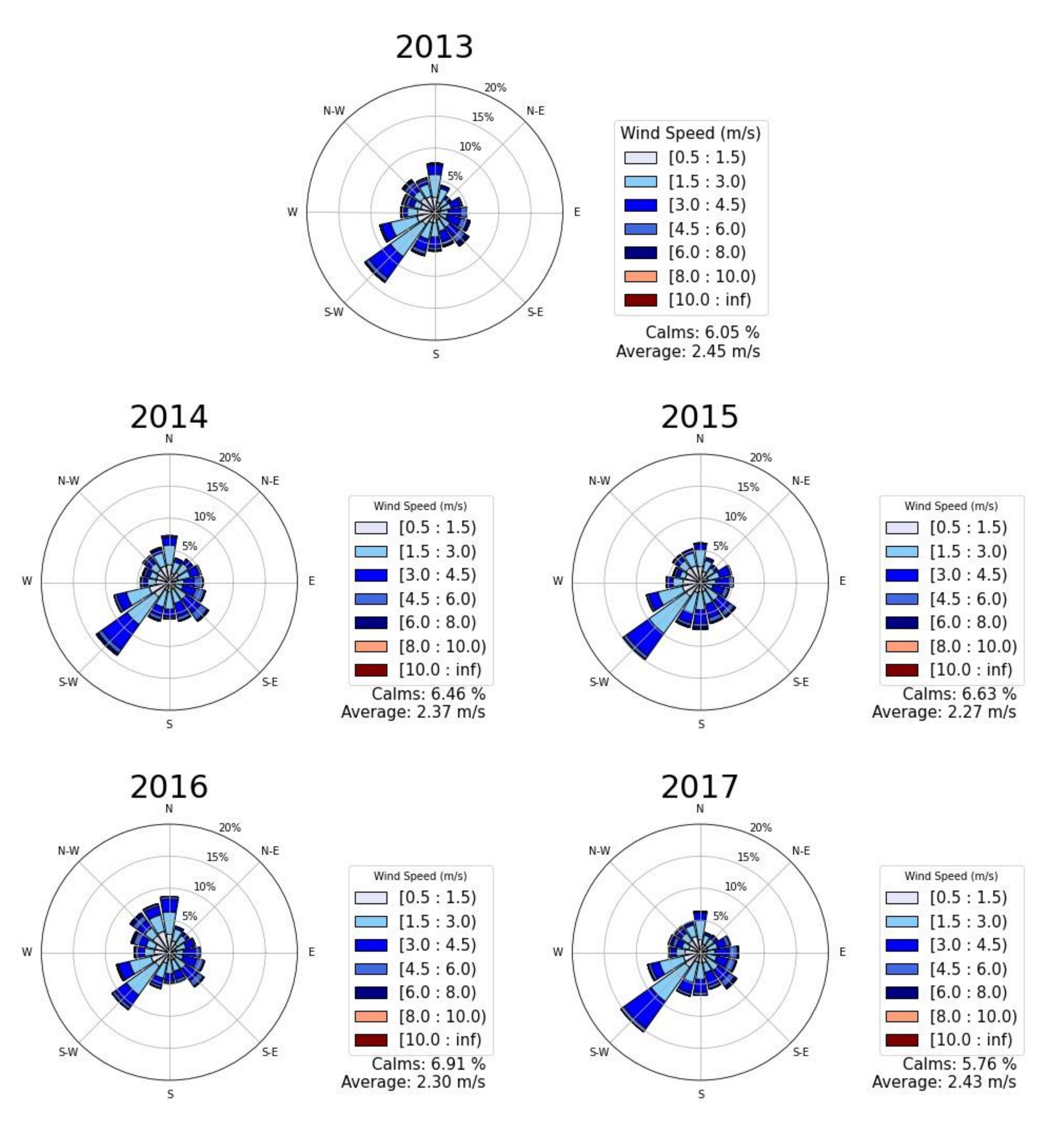

Figure A.2: Inter-Annual Mean Maximum (top) and Mean Minimum (bottom) Temperature Profiles – BoM Horsley Park Equestrian Centre AWS – 2013 to 2017

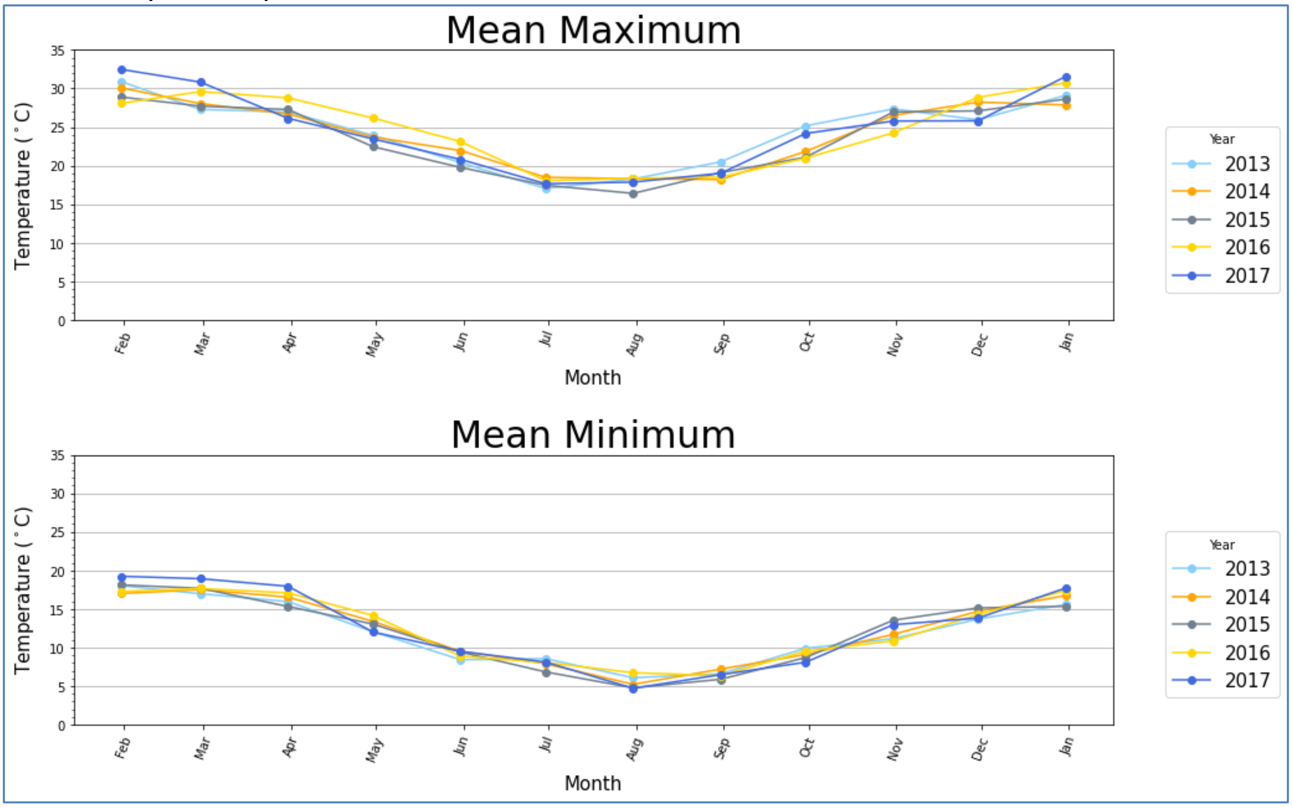

Figure A.3: Inter-Annual Wind Speed Frequency – BoM Horsley Park Equestrian Centre AWS – 2013 to 2017

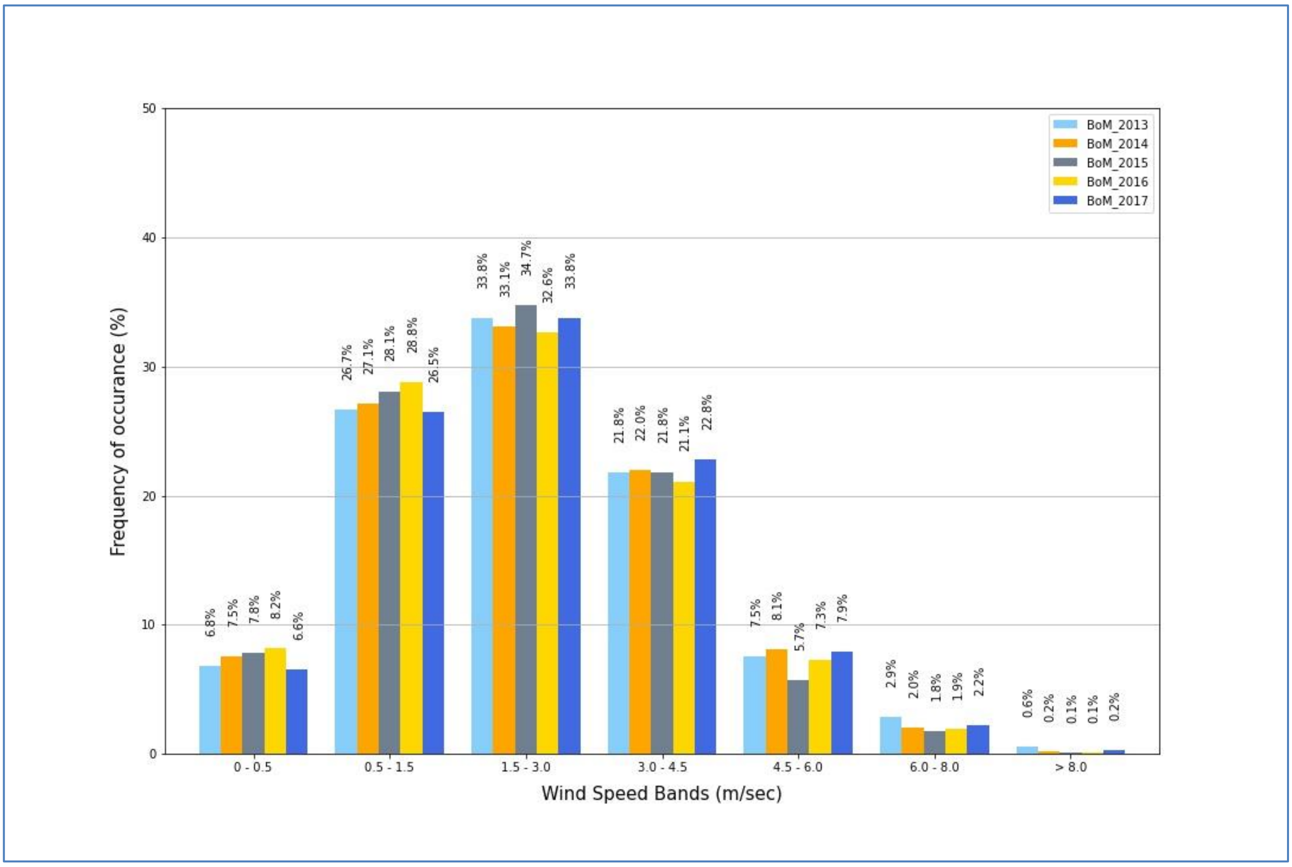

Figure A.4: Inter-Annual Calms Percentage – BoM Horsley Park Equestrian Centre AWS – 2013 to 2017