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MT/snb
Ref: 191318_Let7_EPA_Rev1
14 August 2020

ATTN: Lesley Corkill
Unit Head Regulatory Operations Metro - West
NSW EPA
Locked Bag 5022
PARRAMATTA NSW 2150
Email: info@epa.nsw.gov.au

Dear Lesley,

Re: Development Application DA20/0262 – 344 Park Road Wallacia – Further Information Required

This letter is in response to the letter (Ref: DOC20/394450-47) from NSW EPA requesting further information regarding the Air Quality Impact Assessment (AQIA) undertaken for the proposed resource recovery facility at 344 Park Road, Wallacia NSW 2745.

Each of the four (4) requests are answered categorically below.

Request

1. *The emissions inventory provided in Table 6-4 of the AQIA does not provide clear or sufficient information for the EPA to check the calculations applied. The applicant needs to provide a full inventory that enables the EPA to re-calculate each emission rate. This should include for each line item a clear identification of the applied emission factor, reduction factor, rate, units and any other data required for the calculation of both the daily and annual emission rate.*

Response

The emissions inventory in Table 6-4 has been updated to display the requested information and enable re-calculation of emission rates. Each item displays the source name, applied emission factor, units, applied reduction factor and emission rate pre- and post-reduction factor. This is shown for both daily and annual emission rates entered into the model.

Request

The AQIA has not provided adequate information and justification regarding its selection of the meteorological year used in the model. The comparative review of meteorology was limited to wind run and temperature only.

The review must comply with the requirements outlined in section 9.4.2 of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2016), and provide the data detailed in the EPA's Environmental Assessment Requirements dated 21 May 2018 (SEARS). Where a parameter is not particularly relevant to the meteorology, model used or modelling scenario, a brief discussion justifying how it was selected is sufficient.

The EPA's SEARS outlined that the EIS should provide and analyse site representative data on the following meteorological parameters:

- *a) temperature and humidity*
- *b) rainfall, evaporation and cloud cover*
- *c) wind speed and direction*
- *d) atmospheric stability class*
- *e) mixing height (the height that emissions will be ultimately mixed in the atmosphere)*
- *f) katabatic air drainage*
- *g) air re-circulation.*

Response

The representative meteorological year of 2015 was selected based on the complete data sets for temperature, wind (and as at the most recent revision of the AQIA, rainfall) available from the nearest BoM AWS at Badgerys Creek. Meteorological data was compared with parameters from the five (5) years preceding 2020 (2015-2019). 2015 was selected due to the completeness of available data, however all preceding years showed reasonably similar results with little variation between selected parameters.

The completeness of data for 2015 and lack of significant variation between years informed the decision to select 2015 as the representative year and obtain meteorological data from Lakes Environmental for the dispersion modelling software AERMET. The Lakes Environmental meteorological data was site specific for coordinates 33.877 S, 150.677 E (344 Park Road, Wallacia NSW 2745) and utilised the converted Weather Research and Forecasting (WRF) model to create a compatible AERMET input for modelling.

Additional meteorological parameters have been included as requested in the SEARS, and used to describe the site and the representative year of 2015. These are as follows:

- a) Temperature and humidity is described in Section 4.3;
- b) Rainfall, evaporation and cloud cover is described in Section 4.4;
- c) Wind speed and direction is described in Section 4.5;
- d) Atmospheric stability class is described in Section 4.6;
- e) Mixing height is described in Section 4.1.3;
- f) Katabatic air drainage is described in Section 4.7; and
- g) Air re-circulation is described in Section 4.8.

Request

2. *The EPA notes that the 'All Seasons' wind rose in Figure 4-1 of the AQIA has a high proportion of south west winds, however this does not seem to fit the trends for the individual seasons. In the justification of the meteorology data requested above, include a discussion of this matter.*

Response

Wind roses in Figure 4-1 have been updated to be consistent with the seasonal trends from the referenced station.

Request

3. *The AQIA states that a Construction Environmental Management Plan (CEMP) will be prepared, which will include an air quality control procedure. No similar statement was made regarding an Operational Environmental Management Plan (OEMP). Clarification should be provided regarding the preparation and implementation of an appropriate OEMP which includes a dust management control procedure.*

Response

The EMP/OEMP will include appropriate controls and dust mitigation measures outlined in the AQIA..

An updated AQIA (Ref: 191318_AQIA_Rev2) has been prepared to address the above requests and is attached to this letter (Attachment 1).

Yours faithfully,
for Benbow Environmental

Matthew Taylor
Environmental Scientist

Kate Barker
Environmental Scientist

ATTACHMENTS

Attachment 1: Air Quality Impact Assessment (Ref: 191318_AQIA_Rev2)

AIR QUALITY IMPACT ASSESSMENT
PREPARED FOR
344 PARK ROAD, WALLACIA NSW 2745

Prepared for:	Greenfields Resource Recovery Facility Ellie Barikhan, Site Owner Carlo Ranieri, Carlo Ranieri and Associates Pty Ltd
Prepared by:	Matthew Taylor, Environmental Scientist Kate Barker, Environmental Scientist R T Benbow, Principal Consultant
Report No:	191318_AQIA_Rev2 August 2020 (Released: 14 August 2020)

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DOCUMENT CONTROL

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Matthew Taylor	Environmental Scientist		14 August 2020

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Approved by:	Position:	Signature:	Date:
R T Benbow	Principal Consultant		14 August 2020

DOCUMENT REVISION RECORD

Revision	Date	Description	Checked	Approved
1	24-4-2020	Rev 1	E Hansma	R T Benbow
2	14-8-2020	Rev 2	E Hansma	R T Benbow

DOCUMENT DISTRIBUTION

Revision	Issue Date	Issued To	Issued By
1	24-4-2020	Greenfields Resource Recovery Facility	Benbow Environmental
2	14-8-2020	Greenfields Resource Recovery Facility	Benbow Environmental

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EXECUTIVE SUMMARY

This report presents an Air Quality Impact Assessment (AQIA) for the site located at 344 Park Road, Wallacia NSW 2745. The assessment is in support of an Environmental Impact Statement (EIS) being undertaken for the installation and operation of a resource recovery facility on site.

The facility would receive and process up to 95,000 per annum of C&D and C&I waste. The assessment determines the predicted dust and particulate matter contribution from the proposed site operations. The assessment does not include an assessment of odour impacts, as no odour is expected to be generated from the proposed development.

This AQIA has been prepared in accordance with the NSW EPA guidelines *"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales"* (2016) (AMMAAP), using background data which is then combined with the predicted levels resulting from the proposed operations to assess the cumulative air quality impacts.

This AQIA has been assessed using emission factors adopted from the National Pollutant Inventory's *Emission Estimation Technique Manual for Mining* (2012) and the *Emission Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals* (2014.

The air dispersion model AERMOD was used for the prediction of off-site dust impacts associated with the air emissions from the operations.

Annual TSP, PM_{10} and $PM_{2.5}$ emissions at all receptors are predicted to comply with the *Approved Methods* criterion.

The maximum predicted impacts for 24 hour averaging periods for PM_{10} and $PM_{2.5}$ exceeded the relevant criteria. The background concentrations for PM_{10} and $PM_{2.5}$ for 24-hour averaging periods are considered elevated, with levels of at 24.96 µg/m^3 and 62.42 µg/m^3 respectively in comparison to the *Approved Methods* criteria of 25 µg/m^3 and 50 µg/m^3.

In cases of elevated background concentrations, the NSW EPA requires a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities.

Contemporaneous addition of the predicted daily increments of PM_{10} and $PM_{2.5}$ with daily measured background levels for 2015 showed no additional exceedances due to proposed site activities.

With the proposed site activities and dust controls in place, it is considered that emissions to air from the site's operation are unlikely to cause harm to health or the environment.

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1. INTRODUCTION

This report presents an Air Quality Impact Assessment (AQIA) for the site located at 344 Park Road, Wallacia NSW 2745. The assessment is in support of an Environmental Impact Statement (EIS) being undertaken for the installation and operation of a resource recovery facility on site.

The facility would receive and process up to 95,000 per annum of C&D and C&I waste. The assessment determines the predicted dust and particulate matter contribution from the proposed site operations. The assessment does not include an assessment of odour impacts, as no odour is expected to be generated from the proposed development.

This AQIA has been prepared in accordance with the NSW EPA guidelines *"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales"* (2016) (AMMAAP), using background data which is then combined with the predicted levels resulting from the proposed operations to assess the cumulative air quality impacts.

This AQIA uses existing air quality data to establish the background levels of dust and particulates. This background data is then combined with the predicted levels resulting from the proposed operations of the resource recovery facility to assess the cumulative air quality impacts.

2. PROPOSED DEVELOPMENT

2.1 SITE LOCATION

The subject site is located at 344 Park Road, Wallacia NSW 2745 (legally known as Lot 5 DP 655046) in the Penrith City Council Local Government Area. The proposed development is located towards the north eastern section of the site.

The site is bounded by Park Road on its northern side, which connects Luddenham and Wallacia.

The site is approximately 200,730 m^2 in area. However, only approximately 50,000 m^2, or 25%, of the site will be used for the proposed development.

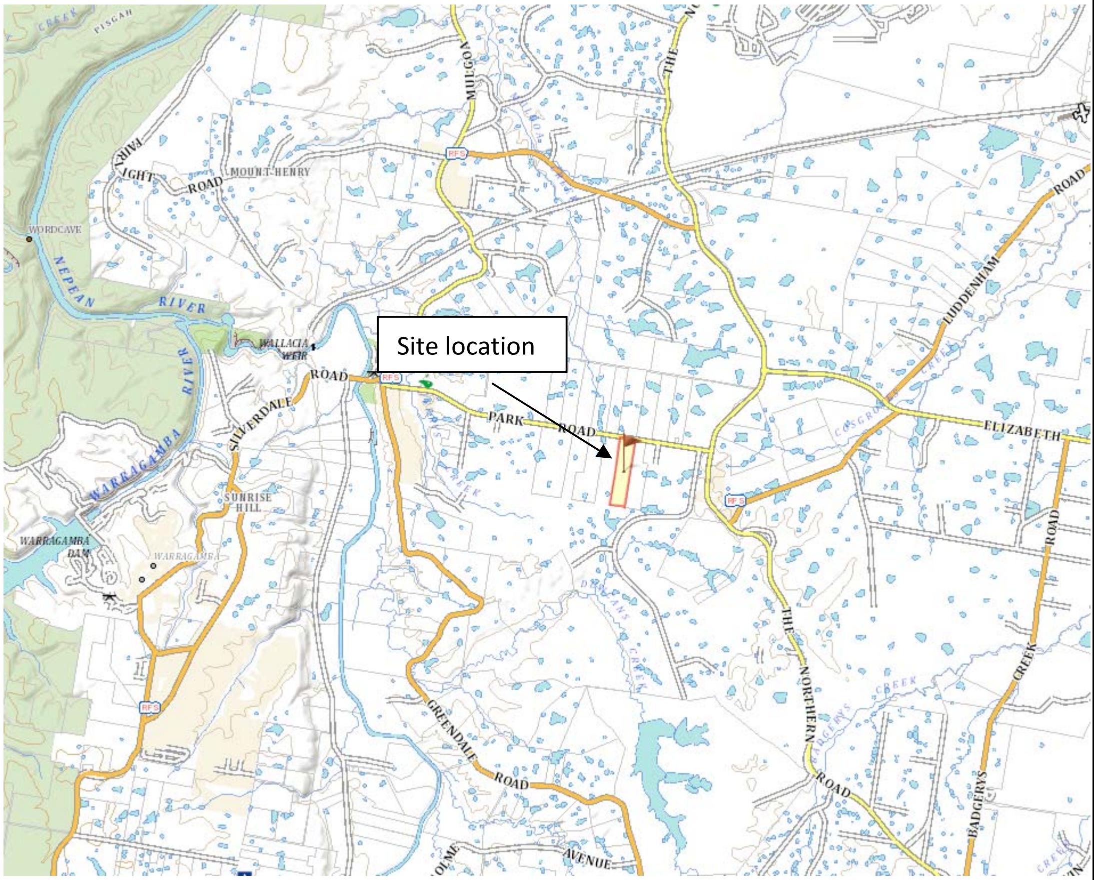
The location of the subject site as an aerial view is shown in Figure 2-1 and its location in a local context is shown in Figure 2-2.

Figure 2-1: Aerial view of the site

Source: SIX Maps 2019

↑N	LEGEND: Site boundary	Benbow Environmental 25-27 Sherwood Street Northmead NSW 2152

Figure 2-2: Site location in a local context



Source: Six Maps 2019

↑N

Benbow Environmental
25-27 Sherwood Road
Northmead NSW 2152

2.2 LAND USE

The current land zoning for the site is RU1 – Primary Production under the Penrith Local Environmental Plan (LEP) 2010, as displayed in Figure 2-4.

Surrounding land zoning to the north, east and west is also RU1 – Primary Production. To the south of the site, the existing land zoning is RU4 – Primary Production Small Lots. The potential usage for these land zones enable similar developments and allow synergies between businesses.

Surrounding land use zoning showing the location of the site is shown in Figure 2-3.

Figure 2-3: Surrounding land use zoning

Source: https://www.planningportal.nsw.gov.au

Legend:

B1	Neighbourhood Centre	R2	Low Density Residential
B2	Local Centre	R3	Medium Density Residential
B3	Commercial Core	R4	High Density Residential
B4	Mixed Use	R5	Large Lot Residential
B5	Business Development	RE1	Public Recreation
B6	Enterprise Corridor	RE2	Private Recreation
E1	National Parks and Nature Reserves	RU1	Primary Production
E2	Environmental Conservation	RU2	Rural Landscape
E3	Environmental Management	RU4	Primary Production Small Lots
IN1	General Industrial	SP1	Special Activities
IN2	Light Industrial	SP2	Infrastructure
IN3	Heavy Industrial	W1	Natural Waterways
R1	General Residential	WSP	SEPP Western Sydney Parklands

2.3 Hours of Operations

The hours of operation are dependent upon the incoming waste haulage. The proposed hours of operation are 24 hours, 7 days a week.

2.4 Proposed Development Description

The proposed development is for the establishment and operation of a resource recovery facility that would accept, process and store construction and demolition (C&D) and commercial and industrial (C&I) waste.

The facility would receive and process up to 95,000 per annum of C&D and C&I waste. No other waste would be accepted. Material accepted on site will be made up of the following waste streams:

- Construction & Demolition
  - Wood
  - Gyprock – plaster board
  - Concrete
  - Brick
  - Aggregates, roadbase or ballast
  - Asphalt
  - Steel

- Commercial & Industrial
  - Paper and cardboard
  - Plastic
  - Steel
  - Aluminium
  - Wood

Processes on site that may impact the air quality are:

- Incoming and outgoing truck deliveries;
- Storage of waste materials;
- Sorting and screening of waste materials; and,
- Blending and crushing waste materials.

Due to the nature of materials handled and stored at the facility, odour will not be released from the site. As such, dust is the major issue regarding the sites air quality.

2.5 Nearest Sensitive Receptors

Table 2-1 lists the location of representative potentially affected receptors that are considered in this assessment. The locations are shown in Table 2-1 and Figure 2-4.

The air quality guidelines protect the health of the residential community and consider the need to protect the health of children, the elderly, and the infirm. These guidelines are not applicable to workers on industrial premises; however, it can be informative to include industrial receptors in air quality dispersion models to gain a better understanding of the air quality impacts of the proposed site activities on adjacent businesses.

Table 2-1: Table of nearest receptors

Receptor ID	Address	Direction from Site	Lot and DP	Approximate distance to proposed development	Easting	Northing	Type of receiver
R1	334 Park Road Wallacia	W	Lot 1 DP1145597	120 m	285021.638	6249439.302	Residential
R2	322 Park Road Wallacia	W	Lot 1 DP1145716	225 m	284933.078	6249512.917	Residential
R3	323-341 Park Road Wallacia	NW	Lot 8 DP666928	170 m	285037.927	6249646.635	Residential
R4	343-351 Park Road Wallacia	NNW	Lot 71 DP594632	175 m	285134.703	6249714.806	Residential
R5	353-361 Park Road Wallacia	N	Lot 72 DP594632	220 m	285292.865	6249747.295	Residential
R6	363 Park Road Luddenham	NE	Lot 6 DP651102	200 m	285481.825	6249581.294	Residential
R7	364 Park Road Luddenham	E	Lot 4 DP653236	115 m	285403.646	6249481.174	Residential
R8	386 Park Road Luddenham	E	Lot 1 DP557920	245 m	285485.226	6249150.151	Residential
R9	384 Park Road Luddenham	E	Lot 2 DP557920	275 m	285490.185	6248944.237	Residential
R10	45 Willowdene Avenue Luddenham	S	Lot 3 DP248069	565 m	285042.472	6248548.515	Residential
R11	115 Willowdene Avenue Luddenham	SW	Lot 4 DP248069	720 m	284827.59	6248489.29	Residential
R12	288A Park Road Wallacia	WSW	Lot 1 DP1195400	610 m	284516.692	6249018.95	Residential
R13	32 Willowdene Avenue Luddenham	SE	Lot 32 DP771596	865 m	285871.683	6248638.714	School
R14	288A Park Road Wallacia	W	Lot 1 DP1195400	445 m	284654.005	6249225.993	Industrial
R15	380 Park Road Luddenham	E	Lot 1 DP215057	185 m	285441.875	6249297.194	Industrial

Note: distances measured from the boundaries of the site development area

Figure 2-4: Aerial of nearest receptors

Source: SIX Maps 2020

↑N Not to scale	LEGEND: Receptor: + R1 Development border: Site border:	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

3. AIR QUALITY CRITERIA AND GUIDELINES

3.1 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) applies the following definitions relating to air pollution:

> *'**"Air pollution"** means the emission into the air of any air impurity.*
>
> *While "air impurity" includes smoke, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, mists odours, and radioactive substances'*

The following sections of this Act have most relevance to the site:

- *Section 124 Operation of Plant - other than domestic plant*

  The occupier of any premises who operates any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure:

  (a) to maintain the plant in an efficient condition, or

  (b) to operate the plant in a proper and efficient manner.

- *Section 126 Dealing with Materials*

  (1) The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupiers failure to deal with those materials in a proper and efficient manner.

  (2) In this section:

  ***deal** with materials means process, handle, move, store or dispose of the materials.*

  ***Materials** includes raw materials, materials in the process of manufacture, manufactured materials, by-products or waste materials.*

- *Section 128 Standards of air impurities not to be exceeded*

  (1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:

  (a) The standard of concentration and the rate, or

  (b) The standard of concentration or the rate.

Prescribed by the regulations in respect of any such activity or any such plant.

(2) Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

- *Section 129 Standards of air impurities not to be exceeded*

(1) The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour form the premises to which the licence applies.

(2) It is a defence in proceedings against a person for an offence against this section if the person establishes that:

(a) The emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of the licence directed at minimising the odour, or

(b) The only persons affected by the odour were persons engaged in the management or operation of the premises.

(3) A person who contravenes this section is guilty of an offence.

The proposed development is required to comply with this Act.

3.2 PROTECTION OF ENVIRONMENT OPERATIONS (CLEAN AIR) REGULATION 2010

In accordance with Part 5 of the *Protection of the Environment Operations (Clean Air) Regulation 2010* (herein referred to as the Clean Air Regulation), the proposed waste recycling facility would belong to Group 6 (Standards for scheduled premises) as the activity is to be "*commenced to be carried on, or to operate, on or after 1 September 2005 as a result of an environment protection licence granted under the* Protection of the Environment Operations Act 1997 *pursuant to an application made on or after 1 September 2005".*

Schedule 4 of the Clean Air Regulation provides standards of concentration for scheduled premises general activities and plant, any crushing, grinding, separating or materials handling activity:

Solid Particles (total) = 20 mg/m^3

The facility would be required to meet the above standard of concentration.

3.3 ADOPTED CRITERIA & NSW ENVIRONMENT PROTECTION AUTHORITY GUIDELINES

The *Approved Methods* (EPA 2016) provides guidance on methodology and thresholds that are to be used for the air impact assessment of a proposed development. This air impact assessment has been conducted in accordance with this guideline. Assessable pollutants (along with their corresponding limits) are summarised in Table 3-1. These criteria are applied at the nearest existing or likely future off-site sensitive receptor.

Table 3-1: Applicable Particulate Criteria at Sensitive Receptors from the NSW EPA Modelling Guidelines (*Approved Methods* 2016)

Pollutant	Averaging Period	Percentile	Concentration $\mu g/m^3$
Total Suspended Particulates (TSP)	Annual	100^{th}	90
PM_{10}	24 Hours	100^{th}	50
	Annual	100^{th}	25
$PM_{2.5}$	24 Hours	100^{th}	25
	Annual	100^{th}	8

4. METEOROLOGY AND LOCAL AIR QUALITY

The meteorological data used in the modelling of this assessment was no-observation prognostic meteorological data. A prognostic meteorological data file was created by Lakes Environmental with WRF and AERMET using a representative year. The representative year is selected based on the evaluation of weather monitoring stations for their proximity to the site, completeness of data, and similarity of topography to the subject site.

Referenced and relevant meteorological parameters are detailed in this section.

4.1.1 Selecting a Representative Meteorological Year

The weather monitoring station operated by the Bureau of Meteorology nearest to the subject site with monthly climate statistics and graphs for all available years for temperature, daily wind run and rainfall is the Badgerys Creek AWS (Station No. 067108. This monitoring station is located approximately 5.3 km south-east of the subject site and was considered to be the most appropriate source of data for determining the representative year due to its proximity to the site, completeness of data, and similar topography to the subject site. Table 4-1 summarises the long-term data for temperature, wind and rainfall at the referenced AWS.

Long term averages from Badgerys Creek AWS meteorological data (see Section 4.2) was compared to each of the date the five (5) years preceding 2020 (2015-2019) (Attachment 1). The meteorological year of 2015 was selected as a representative year due to similarity to long term trends and the completeness of available data, however all preceding years showed reasonably similar results with little variation between selected parameters.

Additional meteorological parameters such atmospheric stability, mixing height and katabatic flow relative to the site are described in the below sections.

A 2015 prognostic meteorological data file was created by Lakes Environmental using the MMIF. This data set was used as input into AERMOD as AERMOD- Ready Surface & Profile.

4.1.2 MMIF and AERMET

Data files created by Lakes Environmental was output using the US EPA's Mesoscale Model Interface Program (MMIF).

Execution of MMIF was done according to the recommendations found in the EPA's Guidance on the Use of the Mesoscale Model Interface Program (MMIF) for AERMOD Applications. The AERMOD-Ready files were generated by processing the AERMET-Ready data files output by MMIF through the most recent version of the US EPA's AERMET meteorological pre-processor executable (Version 19191). This includes use of the MMIF-generated AERSURFACE output file for Stage 3 surface characteristics.

AERMET is a meteorological pre-processor that organises data and estimates the necessary boundary layer parameters for dispersion calculations in AERMOD.

4.1.3 AERMOD Parameters

The meteorological dataset obtained from Lakes Environmental and pre-processing by AERMET provides the necessary boundary layer parameters for dispersion calculations in AERMOD. Their inclusion within the AERMOD dispersion model are described below. As per the AERMOD technical guide, the following parameters relate to data input:

> ***Data flow in the AERMOD modelling system***
> *Surface characteristics in the form of albedo, surface roughness and Bowen ratio, plus standard meteorological observations (wind speed, wind direction, temperature, and cloud cover), are input to AERMET. AERMET then calculates the PBL parameters: friction velocity (u*), Monin-Obukhov length (L), convective velocity scale (w*), temperature scale (*), mixing height (z i), and surface heat flux (H) These parameters are then passed to the INTERFACE (which is within AERMOD) where similarity expressions (in conjunction with measurements) are used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (v , w), potential temperature gradient (d/dz), potential temperature ( ), and the horizontal Lagrangian time scale (TLy).*

Many of the meteorological parameters not available from BoM, such as site representative cloud cover, mixing height and surface heat flux, are considered within the Lakes Environmental AERMET/AERMOD interface.

4.2 CLIMATE

Long term climate data including temperature, wind run and rainfall was collected from the Badgerys Creek AWS. The AWS has monthly statistics from 1995-2020 for minimum temperature, maximum temperature and rainfall, and 2003-2020 for daily wind run. The monthly and annual statistics are summarised in Table 4-1.

Table 4-1: Long-term climate data from the Badgerys Creek AWS

Month	Mean Minimum Temperature (°C) 1995-2020	Mean Maximum Temperature (°C) 1995-2020	Daily Wind Run (km) 2003-2020	Mean Rainfall (mm) 1995-2020
January	17.3	30.3	215	75.1
February	17.2	28.9	205	108.8
March	15.3	26.8	191	84.1
April	11.5	24.1	185	46.8
May	7.6	20.8	185	36.8
June	5.6	17.8	198	59.2
July	4.1	17.5	204	24.8
August	4.7	19.2	227	34.7
September	7.7	22.6	241	34.9
October	10.5	24.9	224	52.1
November	13.5	26.6	227	67.6
December	15.5	28.7	218	53.6
Annual	10.9	24	210	680.2

4.2.1 Temperature and Humidity

Site representative temperature data for the most recent 5 years is displayed in Attachment 1. Long term minimum and maximum temperature statistics are displayed in Column 2 and 3 of Table 4-1. The mean minimum and maximum temperatures were lowest in July and highest in January.

Humidity data for the referenced AWS was only available for years 1995-2010; for these years, the mean annual humidity for 9am and 3pm was 75% and 50% respectively.

4.2.2 Rainfall, Evaporation and Cloud Cover

Rainfall data for the most recent 5 years is displayed in Attachment 1. Long term rainfall statistics are displayed in Column 5 of Table 4-1. Evaporation and cloud cover data relative to the site was unavailable. The mean rainfall was lowest in July and highest in February.

4.2.3 Wind Speed and Direction

Long term daily wind run statistics are displayed in Column 4 of Table 4-1. Wind rose plots and local wind trends relative to the site are described below. The daily wind run was equally lowest in April and May, and equally highest in August and November.

4.2.3.1 Wind Rose Plots

Wind rose plots show the direction from which the wind is coming with triangles known as "petals". The petals of the plots in summarise wind direction data into 8 compass directions i.e. north, north-east, east, south-east, etc.

The length of the triangles, or "petals", indicates the frequency that the wind blows from the direction presented. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of the six wind speed classes. Thus, the segments of a petal show what proportion of wind for a given direction falls into each class.

The proportion of time for which wind speed is equal to or less than 0.5 m/s, when speed is negligible, is referred to as calm hours or "calms". Calms are not shown on a wind rose as they have no direction, but they are noted under each wind rose as a temporal percentage.

The concentric circles in each wind rose are the axes that denote wind frequencies. In comparing the plots it should be noted that the axis varies between wind roses, although all wind roses are the same size. The frequencies shown in the first quadrant (top-left quarter) of each wind rose are stated beneath the wind rose.

4.2.3.2 Local Wind Trends

Seasonal wind rose plots for this site utilising Badgerys Creek AWS 2015 data have been included in Figure 4-1. Annual average wind speeds of 2.34 m/s and a calms frequency of 7.06% were estimated. Annual winds from the south-west were found to be dominant and were present for approximately 27% of the time.

The average summer wind speed was 2.35 m/s, with a calms frequency of 5.74%. South-west and easterly winds were found to be the most dominant at a frequency of approximately 18-19% each.

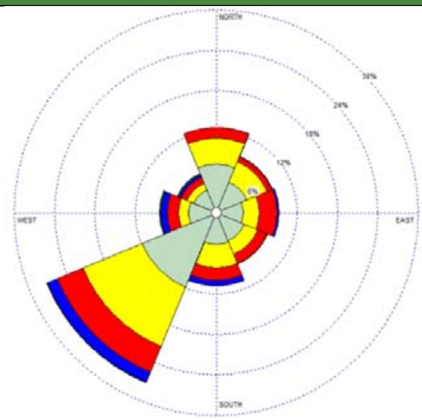
In autumn, dominant winds were blowing from the south-west (~33%). The average autumn wind speed was 2.47 m/s with a calms frequency of 6.88%.

The winter season data showed the prevalence of winds from the south-west, which accounted for ~35% of winds. Followed by winds from the north accounting for ~17% of wind directions. The average winter wind speed was determined to be 2.18 m/s with a calms frequency of 8.65%.

In the spring time, average wind speeds of 2.34 m/s with a frequency of calms of 6.92% were recorded. Winds from the south-west were most dominant and accounted for approximately 21%. Winds from the south were approximately 13% each. The rest of the wind directions were found to be present at frequencies less than 12%.

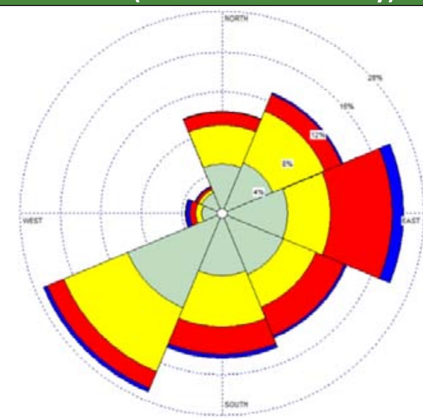
Figure 4-1: Wind Rose Plots for the Referenced Meteorological Station – BOM Badgerys Creek AWS ID 067108 (2015)

All Seasons



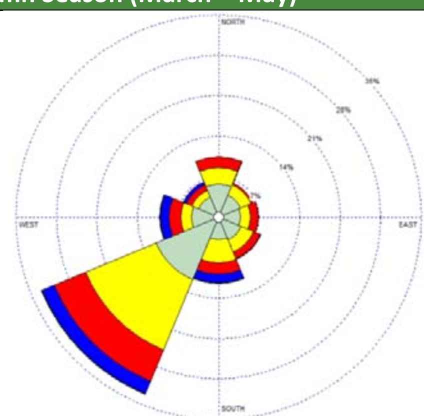
Average Wind Speed: 2.34 m/s
Calms Frequency: 7.06%
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Summer Season (December – February)



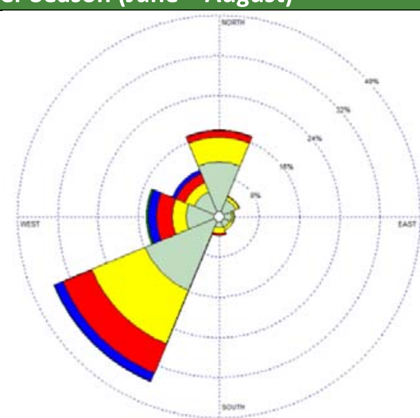
Average Wind Speed: 2.35 m/s
Calms Frequency: 5.74%
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Autumn Season (March – May)



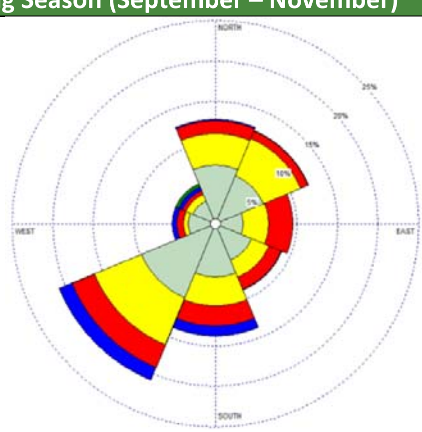
Average Wind Speed: 2.47 m/s
Calms Frequency: 6.88 %
Axis Frequencies: 7%, 14%, 21%, 28%, 35%

Winter Season (June – August)



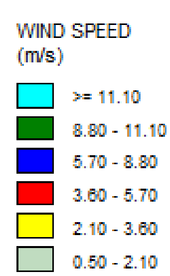
Average Wind Speed: 2.18 m/s
Calms Frequency: 8.65%
Axis Frequencies: 8%, 16%, 18%, 24%, 32%, 40%

Spring Season (September – November)



Average Wind Speed: 2.34m/s
Calms Frequency: 6.92%
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Legend



4.3 ATMOSPHERIC STABILITY CLASS

The "stability" of the atmosphere is a classification used to describe the structure of the atmosphere in terms of temperature, specifically, how temperature changes in the atmosphere with altitude. Classification is often done according to the Pasquill-Gifford classification system that consists of six stability class groups, shown in Table 4-2.

The class "A" describes an atmosphere where the air is well-mixed and there is little hindrance of dispersion into the atmosphere. At the other end of the scale is class "F", which describes conditions under which temperature inversions would occur, where winds are calm or absent and air close to the earth's surface cannot rise into the atmosphere due to the presence of warmer air layers above. The classes in between A and F indicate changing degrees of stability due to variations in temperature in the atmosphere.

Table 4-2: Pasquill-Gifford Stability Class System

Stability Class	Description
A	Extremely Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Slightly Stable
F	Very Stable

Table 4-3 and Table 4-4 present the statistical information related to the atmospheric stability class for the 2015 Badgerys Creek AWS meteorological data. There were 1.1% missing or incomplete data for this file which has been excluded.

Table 4-3: Wind Direction/Stability Class Frequency Distribution (Count) for Badgerys Creek AWS (2015 BoM data)

Frequency Distribution (Count)							
Direction (Blowing From)	Stability Class						
	A	B	C	D	E	F	Total
N	224	140	204	497	125	129	1319
NE	214	120	124	327	72	66	923
E	80	53	162	346	85	74	800
SE	81	140	204	497	125	129	1176
S	224	57	192	451	116	61	1101
SW	121	128	296	1379	311	180	2415
W	75	59	106	405	80	67	792
NW	50	21	87	298	52	69	577
Total	1069	718	1375	4200	966	775	9103

Table 4-4: Wind Direction/Stability Class Frequency Distribution (Percentage) for Badgerys Creek AWS (2015 BoM data)

Direction (Blowing From)	Frequency Distribution (Percentage %)						
	Stability Class						
	A	B	C	D	E	F	Total
N	2.5	1.5	2.2	5.5	1.4	1.4	14.5
NE	2.4	1.3	1.4	3.6	0.8	0.7	10.1
E	0.9	0.6	1.8	3.8	0.9	0.8	8.8
SE	0.9	1.5	2.2	5.5	1.4	1.4	12.9
S	2.5	0.6	2.1	5.0	1.3	0.7	12.1
SW	1.3	1.4	3.3	15.1	3.4	2.0	26.5
W	0.8	0.6	1.2	4.4	0.9	0.7	8.7
NW	0.5	0.2	1.0	3.3	0.6	0.8	6.3
Total	11.7	7.9	15.1	46.1	10.6	8.5	100.0

Stability class D is the most frequent with an occurrence of 46.1%. Stability classes A, B, and C, which offer the best dispersion conditions, occur with frequencies of 11.7%, 7.9% and 15.1% respectively.

Worst case dispersion conditions for emissions would occur during F-class stability conditions – generally associated with still/light winds and clear skies during the night time or early morning period (stable conditions). Analysis of the referenced site-specific meteorological data indicates the F-class dispersion conditions were present for approximately 8.5% of the time.

In addition to the above data, the wind speed frequency distribution across wind directions is shown in Table 4-5. There were 7.1% calms which will contribute to the stable conditions in E and F stability classes. The majority of wind speed lies between 0.5 – 3.6 m/s for 72.1% of the time. This is represented in the D stability class which is experienced 46.1% of the time, as shown in Table 4-4.

Table 4-5: Wind Direction/Speed Frequency Distribution (Percentage) for Badgerys Creek AWS (2015 BoM data)

Direction (Blowing From)	Frequency Distribution (Percentage %)							
	Wind speed (m/s)							
	<0.50	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	Total
N	-	7.2	3.8	1.5	0.1	0.0	0.0	12.6
NE	-	4.9	3.3	0.8	0.1	0.0	0.0	9.0
E	-	4.1	2.4	2.6	0.3	0.0	0.0	9.3
SE	-	4.5	2.1	1.5	0.1	0.0	0.0	8.2
S	-	4.7	3.4	1.9	0.8	0.0	0.0	10.8
SW	-	11.9	9.4	4.2	1.6	0.1	0.0	27.1
W	-	4.2	1.4	1.7	1.0	0.1	0.0	8.4
NW	-	3.6	1.1	0.9	0.5	0.1	0.0	6.3
Calms	7.1	-	-	-	-	-	-	7.1
Incomplete	1.1	-	-	-	-	-	-	1.1
Total	8.2	45.1	27.0	15.1	4.4	0.4	0.0	100.0

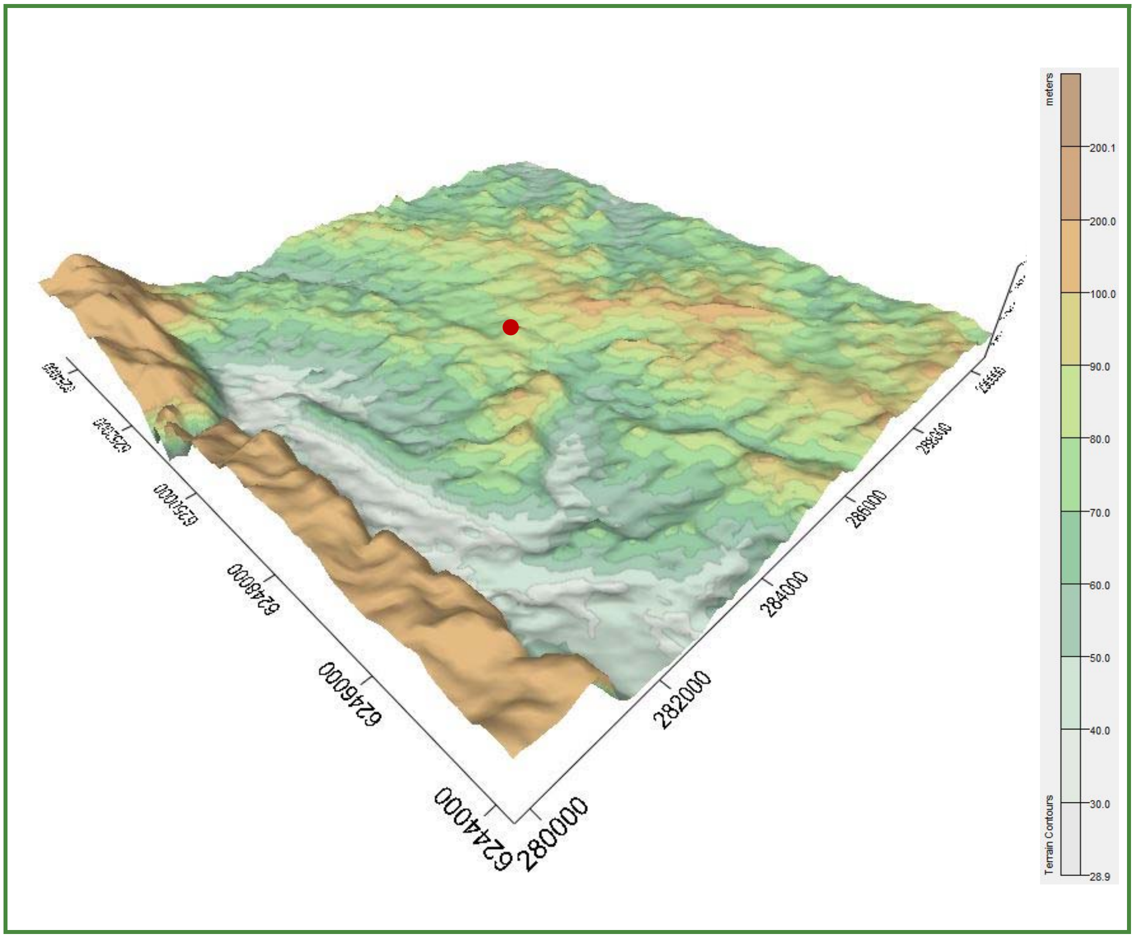
4.4 KATABATIC FLOW, TERRAIN AND STRUCTURAL EFFECTS ON DISPERSION

The meteorological condition known as katabatic flow (or katabatic drift) is often identified as the condition under which maximum environmental impacts from primarily ground-based sources are likely to occur. Katabatic flow is simply the movement of cold air down a slope, generally under stable atmospheric conditions. Under such circumstances, dispersion of airborne pollutants is generally slow and the associated impacts can reach their peak.

Katabatic flow is unlikely to affect emissions from the site's activities as the site is at a low elevation and is relatively flat.

Figure 4-2 shows the terrain with the z-axis (i.e. vertical axis) exaggerated by a factor of 10 (i.e. a given distance on the x-axis or y-axis appears three times as great on the z-axis) in order to provide a clearer description of the topography. A coloured scale bar shows elevations corresponding to the colours used in the figures. It should be noted that these figures are an approximation of the actual terrain, based on terrain information from NASA SRTM 1-arc second digital elevation models.

Figure 4-2: Local topography of site with a factor of 10 vertical exaggeration



4.5 AIR RE-CIRCULATION

Similar to katabatic flow, atmospheric circulation is affected by temperature and wind. Warm air closest to the equator flows towards the poles and east, and as it travels it is influenced by convection cells relative to latitude. The convection cell relative to the site is the Ferrel cell, which occupies the 30-60 degree latitude. Prevailing westerly winds within this cell distribute heat across the surface as denser, cooler air returns south at ground level.

Due to the site being at a low elevation and relatively flat, coupled with majority of the air stability percentage being "neutral-slightly unstable", particle dispersion from atmospheric movement can be considered relatively good and negative impacts from atmospheric re-circulation on emissions considered low.

4.6 LOCAL AIR QUALITY

No air quality measurements have been undertaken specifically for this project. Instead, the air quality data from a representative monitoring station was used to gain an understanding of what current pollutant levels may be around the site and to provide background air quality parameters for the assessment.

Background air quality parameters were obtained from the NSW EPA air quality monitoring station in Camden. This station is located approximately 18 km south of the subject site and is considered appropriately representative. Although Bringelly monitoring station is 9km from the subject site it does not have $PM_{2.5}$ data available. The relevant assessable pollutant parameters available from the monitoring station are $PM_{2.5}$ and PM_{10}. The relevant data is summarised in Table 4-6.

Table 4-6: Summary of 2015 Data for $PM_{2.5}$ and PM_{10} from Camden Air Quality Monitoring Station.

Pollutant	Averaging period	Concentration ($\mu g/m^3$)
$PM_{2.5}$	Maximum 24 hr average for 2015	24.96
	2nd highest 24 hr average for 2015	20.70
	3rd highest 24 hr average for 2015	17.96
	Annual average for 2015	6.44
PM_{10}	Maximum 24 hr average for 2015	**62.42**
	2nd highest 24 hr average for 2015	34.90
	3rd highest 24 hr average for 2015	32.66
	Annual average for 2015	14.06

Note: Average values are calculated from hourly data available on https://www.environment.nsw.gov.au/. Bold values exceed the *Approved Methods* criteria.

No ambient air quality data for Total Suspended Particulates (TSP) is available from the referenced monitoring station. Therefore, the worst-case particle size distribution data from the AP-42 Emissions Database provided by the U.S. Environmental Protection Agency (US EPA, 1995), a PM_{10}-to-TSP ratio of 0.51 was used to estimate the TSP background concentration level of 27.57 $\mu g/m^3$ for an annual averaging period.

A summary of the background air quality levels from the Camden air quality monitoring station adopted for this assessment is provided in Table 4-7.

Table 4-7: Adopted particulate matter background levels for assessment

Pollutant	Averaging period	Concentration ($\mu g/m^3$)
$PM_{2.5}$	24 hours	24.96
	Annual	6.44
PM_{10}	24 Hours	**62.42**
	Annual	14.06
Total Suspended Particulates (TSP)	Annual	27.57

Note: Bold values exceed the *Approved Methods* criteria.

The data collected from the Camden air quality monitoring station shows elevated 24-hour background levels of PM_{10} that are above the *Approved Methods* 24-hour average criterion of 50 $\mu g/m^3$. Although background levels of 24-hour $PM_{2.5}$ do not exceed, they are still considered high as the maximum average is only 0.04 $\mu g/m^3$ below the criteria. In cases of elevated background concentrations, the *Approved Methods* states:

> *In some locations, existing ambient air pollutant concentrations may exceed the impact assessment criteria from time to time. In such circumstances, a licensee must demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical.*

This has been addressed in the modelling results and discussion in Section 7 and Section 8.

5. AIR QUALITY IMPACTS

5.1 CONSTRUCTION

Construction activities have the potential to generate dust.

A Construction Environmental Management Plan (CEMP) is recommended to be prepared that documents the environmental aspects of the construction phase and establishes procedures to manage any potential impacts. It is recommended an Air Quality Control Procedure be presented in the CEMP which sets out the procedure for managing and monitoring air emissions during construction. The following is a summary of the control measures provided in the procedure. Local weather conditions should be taken into account in determining the level and suitability of controls required.

Control Measures

- Monitor local weather conditions and cease dust generating operations when conditions result in visible dust emissions, and implement mitigation measures or until weather conditions improve;
- Erection of wind breaks such as fences or vegetative buffers at the site boundary;
- Locate stockpiles away from drainage paths, easement, kerb, or road surface, and near existing wind breaks such as trees and fences;
- Dust suppression/wind breaks on stockpiles;
- Limit stockpile height to 5 m (maximum) and size;
- Vehicles leaving the site to be cleaned of dirt and other materials to avoid tracking onto public roads;
- Enforce appropriate speed limits for vehicles on site. Recommended speed limit is <15 km/hr;
- Cover all loads entering and leaving the site; and
- Inspect the site daily using a Site Dust Control Checklist to aid with the implementation of air quality control measures.

5.2 OPERATIONS

The proposed development will include the following dust generating activities:

- Incoming and outgoing truck deliveries;
- Storage of waste materials;
- Sorting and screening of waste materials; and
- Blending and crushing waste materials.

Control Measures

The following control measures will be implemented to reduce dust impacts:

- Dust emitting activities limited to inside the building; and
- Extensive water misting system.

6. AIR IMPACT ASSESSMENT

This section assesses the effects of potential emissions on the existing ambient air quality as a direct result of the proposal. The assessment methodology, modelling configurations, results and discussion of the potential impacts as well as any recommendations on mitigation measures are described in detail.

Wheel generated dust has not been considered as a significant source of emissions. The entire site is to be hardstand of compacted road base which releases minimal dust.

Odour emissions associated with the proposed development are considered negligible. Materials stored and the processes undertaken on site are not odour-generating, therefore odour does not warrant any further assessment.

6.1 EMISSION SOURCES

Emission sources for processes on site are confined to resource recovery activities. The main air emissions typical of a C&D/C&I recycling facility are dust and particulates ($PM_{2.5}$, PM_{10} and TSP).

6.1.1 Mitigation Measures

The air quality mitigation measures (for dust control) that are included in the air dispersion model and proposed development are:

- Dust generating activities including unloading, screening, crushing and sorting of materials are conducted within a building;
- Water misting system focused at local point of dust emissions, as well as applied throughout the entire inside plant;
- Water misting system in roof of outside storage and loading bunkers; and
- Water misting system on front end loaders.

6.2 ADOPTED EMISSION FACTORS

The emission factors used for this assessment were sourced from the following National Pollutant Inventory Emission Estimation Technique Manuals:

- NPI EETM for Mining (2012); and
- NPI EETM for Mining and Processing of Non-Metallic Minerals (2014) (crushed stone processing data) were utilised in this assessment to represent the sites activities.

The relevant NPI documents do not include data for estimating emission of $PM_{2.5}$. A summary of selected NPI factors is included in Table 6-1.

Table 6-1: Emission Factors

Reference (NPI EETM)	Site Source	PM_{10} Emission Factor (kg/tonne)	TSP Emission Factor (kg/tonne)
Mining and Processing of Non-Metallic Minerals	Unloading	0.000008	-
Mining	Sorting (Front End Loader)	0.00005	-
Mining	Sorting (Excavator)	0.012	0.025
Mining and Processing of Non-Metallic Minerals	Screening	0.0043	0.0125
Mining and Processing of Non-Metallic Minerals	Screening (fines)	0.036	0.15
Mining and Processing of Non-Metallic Minerals	Crushing	0.0012	0.0027
Mining and Processing of Non-Metallic Minerals	Truck loading crushed stone (Front End Loader)	0.00005	-
Mining	Conveyors	0.2 (kg/ha/hr)	0.4 (kg/ha/hr)
Mining and Processing of Non-Metallic Minerals	Conveyor drop (transfer point)	0.00055	0.0015
Mining	Stockpiles	0.2 (kg/ha/hr)	0.4 (kg/ha/hr)

The *Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emissions Factors* (2006) gives a ratio of 0.15 $PM_{2.5}/PM_{10}$ for 'Aggregate Handling and Storage Piles' which was used to estimate $PM_{2.5}$ emissions for from aggregate processing activities.

The US EPA AP-42 *Appendix B.2 Generalized Particle Size Distributions* (1996) data for 'Mechanically Generated Processed Ores and Non-metallic Minerals' gives a ratio of 0.35 $PM_{2.5}/PM_{10}$ which was used to estimate $PM_{2.5}$ emissions from fines processing activities.

In addition, where there is no TSP data available in the NPI a generic PM_{10} to TSP ratio of 0.51 has been assumed to estimate TSP emission factors, as materials are made up of a variety of products (bricks, concrete, timber, metal, glass).

6.2.1 Reduction Factors

Reduction factors for the facility have been based on the *Emission Estimation Technique Manual for Concrete Batching and Concrete Product Manufacturing* (NPI DEH, 1999) which are shown in Table 6-2.

Table 6-2: Reduction Factors for PM_{10} for Concrete Batching Activities from NPI EETM for Concrete Batching and Concrete Products

Control	Reduction Factor (Materials Handling)	Reduction Factor (Materials Storage)
Default	-	0.3
Wind Breaks	0.7	0.7
Water Sprays	0.5	0.5
Chemical Suppression	0.2	0.2
Enclosure (2-3 walls)	0.1	0.1
Covered Stockpiles	0.0	0.0
Enclosed	0.0	-

Reduction factors were applied to the NPI EETM emission factors from Table 6-2 depending on the emission reduction controls in place for each process, as outlined in Table 6-3.

Table 6-3: Emission Reduction Factors Applied to NPI EETM Emission Factors

Processes at Proposed Site	Control in Place	Reduction Factor Applied
Stockpiles	Water Sprays	0.5
Conveyor drop	Water Sprays	0.5
Front end loader	Water Sprays	0.5
Activities within a building	Enclosed by 2-3 walls Water Sprays	0.05 (0.1 × 0.5)

6.3 Source Configurations and Parameters

6.3.1 Assumptions and Emission Sources Modelled

The following assumptions were used in the model site activities.

- A total of 95,000 tonnes per annum of raw material processed was used to estimate emissions from the subject site;
- The maximum peak daily processing of 500 tonnes of materials was used to estimate emissions based on daily truck deliveries (~15/day);
- The breakdown of materials is assumed to be:
  - Waste to landfill 10%,
  - Light SRF 10&,
  - Plastic 8%,
  - Wood 15%,
  - Cardboard/paper 10%,

    - Metals 8%, and
    - Aggregates 39%;
- All sources were modelled for 24 hours per day, 7 days per week;
- All stockpiles released from 0 m; and
- All processing activities in the building are a combined source on the site;
- All doors on the building are assumed open with a release height of 6 m.

Each potential dust emitting process outside the building was allocated a separate source in the dispersion model, all activities within the building were calculated and then summed to be modelled as one combined source. Emission sources are detailed below in Table 6-4 and shown in Figure 6-1.

Table 6-4: Emission source inventory

Source Name	Source Type	Daily tonnage	Annual Tonnage	Source Area (m^2)	Release Height (m)	PM_{10} Emission Factor	TSP Emission Factor	Units	Calculated Emission Rates as per NPI EETM					Reduction Factor Applied	Emission rates after reduction factors applied (input into model)				
									Daily Emission Rate (g/s)		Annual Emission Rate (g/s)				Daily Emission Rate (g/s)		Annual Emission Rate (g/s)		
									$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP		$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP
Front-end Loader (4)	Volume	500	95000	4	3	0.00005	9.80E-05*	kg/t	4.34E-05	2.90E-05	2.26E-05	1.51E-04	2.96E-04	0.5	2.17E-05	1.45E-05	1.13E-05	7.53E-05	1.48E-04
60 mm Aggregate stockpile	Area	500	-	80	0	0.2	0.4	kg/ha/hr	2.78E-06	1.85E-05	2.78E-06	1.85E-05	3.70E-05	0.5	1.39E-06	9.26E-06	1.39E-06	9.26E-06	1.85E-05
32 mm Aggregate stockpile	Area	500	-	120	0	0.2	0.4	kg/ha/hr	4.16E-06	2.78E-05	4.16E-06	2.78E-05	5.56E-05	0.5	2.08E-06	1.39E-05	2.08E-06	1.39E-05	2.78E-05
16 mm Aggregate stockpile	Area	90	-	96	0	0.2	0.4	kg/ha/hr	7.78E-06	2.22E-05	7.78E-06	2.22E-05	8.88E-05	0.5	3.89E-06	1.11E-05	3.89E-06	1.11E-05	4.44E-05
-6 mm Aggregate stockpile	Area	40	-	64	0	0.2	0.4	kg/ha/hr	5.18E-06	1.48E-05	5.18E-06	1.48E-05	2.96E-05	0.5	2.59E-06	7.41E-06	2.59E-06	7.41E-06	1.48E-05
Conveyor drop to 60 mm	Volume	195	37050	1	4.5	0.00055	0.0015	kg/t	1.86E-04	1.24E-03	9.70E-05	6.46E-04	1.76E-03	0.5	9.31E-05	6.21E-04	4.85E-05	3.23E-04	8.81E-04
Conveyor drop to 32 mm	Volume	195	37050	1	4.5	0.00055	0.0015	kg/t	1.86E-04	1.24E-03	9.70E-05	6.46E-04	1.76E-03	0.5	9.31E-05	6.21E-04	4.85E-05	3.23E-04	8.81E-04
Conveyor drop to 16 mm	Volume	195	37050	1	4.5	0.00055	0.0015	kg/t	4.34E-04	1.24E-03	2.26E-04	6.46E-04	1.76E-03	0.5	2.17E-04	6.21E-04	1.13E-04	3.23E-04	8.81E-04
Conveyor drop to -6 mm	Volume	195	37050	1	4.5	0.00055	0.0015	kg/t	4.34E-04	1.24E-03	2.26E-04	6.46E-04	1.76E-03	0.5	2.17E-04	6.21E-04	1.13E-04	3.23E-04	8.81E-04
Building total	Volume	*See below*	*See below*	5800	6	-	-	-	6.94E-02	3.54E-01	3.57E-02	1.82E-01	4.96E-01	0.05 (0.1 × 0.5)	3.46E-03	1.76E-02	1.78E-03	9.06E-03	2.47E-02
Sources summed to create building total (note: the below calculated emission rates have not had reduction factors applied. Reduction factors are applied to the building total volume source above)																			
Truck unloading inside	*-*	*500*	*95000*	*-*	*-*	*0.000008*	*1.57E-05**	*kg/t*	*6.94E-06*	*4.63E-05*	*3.61E-06*	*2.41E-05*	*4.73E-05*	*-*	*6.94E-06*	*4.63E-05*	*3.61E-06*	*2.41E-05*	*4.73E-05*
Pre-sort stockpile	*-*	*-*	*-*	*125*	*-*	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	*-*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*
Excavator sorting	*-*	*500*	*95000*	*-*	*-*	*0.012*	*0.025*	*kg/t*	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*	*-*	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*
Internal storage area 1	*-*	*-*	*-*	*125*	*-*	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	*-*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*

Table 6-4: Emission source inventory

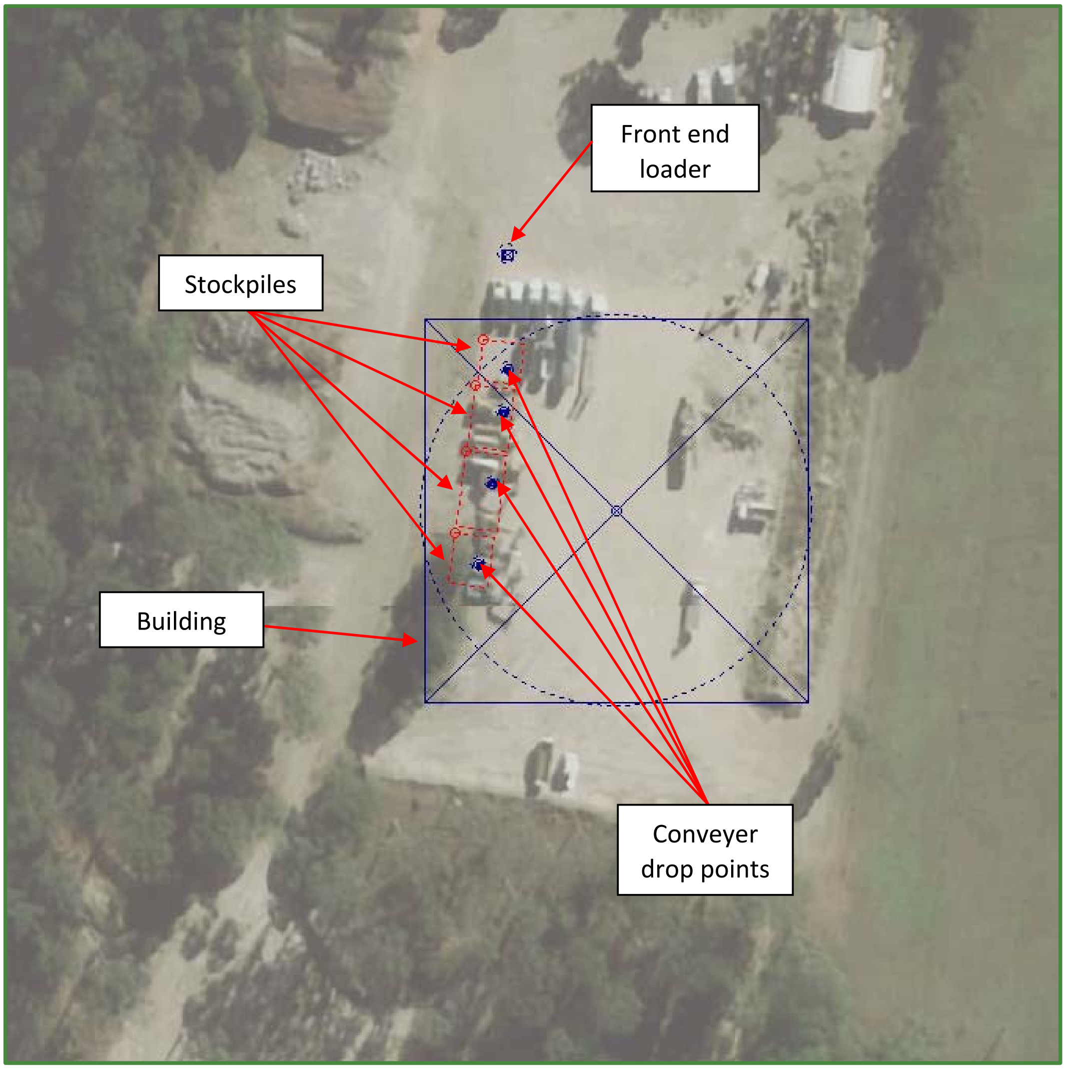
Source Name	Source Type	Daily tonnage	Annual Tonnage	Source Area (m^2)	Release Height (m)	PM_{10} Emission Factor	TSP Emission Factor	Units	Calculated Emission Rates as per NPI EETM					Reduction Factor Applied	Emission rates after reduction factors applied (input into model)				
									Daily Emission Rate (g/s)		Annual Emission Rate (g/s)				Daily Emission Rate (g/s)		Annual Emission Rate (g/s)		
									$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP		$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP
Internal storage area 2	-	-	-	*125*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	-	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*
Internal storage area 3	-	-	-	*125*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	-	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*
Internal storage area 4	-	-	-	*125*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	-	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*
Paper storage area	-	-	-	*125*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*	-	*4.34E-06*	*2.89E-05*	*4.34E-06*	*2.89E-05*	*5.79E-05*
Front end loader sorting	-	*500*	*95000*	-	-	*0.012*	*0.025*	*kg/t*	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*	-	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*
Shredder	-	*500*	*95000*	-	-	*0.0012*	*0.0027*	*kg/t*	*1.04E-03*	*6.94E-03*	*5.42E-04*	*3.61E-03*	*8.13E-03*	-	*1.04E-03*	*6.94E-03*	*5.42E-04*	*3.61E-03*	*8.13E-03*
Conveyor 1	-	-	-	*20*	-	*0.2*	*0.4*	*kg/ha/hr*	*6.94E-07*	*4.63E-06*	*6.94E-07*	*4.63E-06*	*9.26E-06*	-	*6.94E-07*	*4.63E-06*	*6.94E-07*	*4.63E-06*	*9.26E-06*
Mobile crusher	-	*195*	*37050*	-	-	*0.0012*	*0.0027*	*kg/t*	*4.06E-04*	*2.71E-03*	*2.11E-04*	*1.41E-03*	*3.17E-03*	-	*4.06E-04*	*2.71E-03*	*2.11E-04*	*1.41E-03*	*3.17E-03*
Waste screen (Under 60 over 250)	-	*480*	*91200*	-	-	*0.0043*	*0.0125*	*kg/t*	*3.58E-03*	*2.39E-02*	*1.87E-03*	*1.24E-02*	*3.61E-02*	-	*3.58E-03*	*2.39E-02*	*1.87E-03*	*1.24E-02*	*3.61E-02*
Conveyer 2	-	-	-	*12*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.17E-07*	*2.78E-06*	*4.17E-07*	*2.78E-06*	*5.56E-06*	-	*4.17E-07*	*2.78E-06*	*4.17E-07*	*2.78E-06*	*5.56E-06*
Picking station	-	-	-	*12*	-	*0.2*	*0.4*	*kg/ha/hr*	*4.17E-07*	*2.78E-06*	*4.17E-07*	*2.78E-06*	*5.56E-06*	-	*4.17E-07*	*2.78E-06*	*4.17E-07*	*2.78E-06*	*5.56E-06*
Conveyor 3	-	-	-	*8*	-	*0.2*	*0.4*	*kg/ha/hr*	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*	-	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*
Air separator	-	*100*	*19000*	-	-	*0.0043*	*0.0125*	*kg/t*	*7.47E-04*	*4.98E-03*	*3.89E-04*	*2.59E-03*	*7.53E-03*	-	*7.47E-04*	*4.98E-03*	*3.89E-04*	*2.59E-03*	*7.53E-03*
Conveyor 4	-	-	-	*20*	-	*0.2*	*0.4*	*kg/ha/hr*	*6.94E-07*	*4.63E-06*	*6.94E-07*	*4.63E-06*	*9.26E-06*	-	*6.94E-07*	*4.63E-06*	*6.94E-07*	*4.63E-06*	*9.26E-06*
Bounce separator	-	*100*	*19000*	-	-	*0.0043*	*0.0125*	*kg/t*	*7.47E-04*	*4.98E-03*	*1.49E-08*	*9.95E-08*	*7.53E-03*	-	*7.47E-04*	*4.98E-03*	*1.49E-08*	*9.95E-08*	*7.53E-03*
Heavy stockpile	-	-	-	*41.5*	-	*0.2*	*0.4*	*kg/ha/hr*	*1.43E-06*	*9.55E-06*	*1.43E-06*	*9.55E-06*	*1.91E-05*	-	*1.43E-06*	*9.55E-06*	*1.43E-06*	*9.55E-06*	*1.91E-05*
Light stockpile	-	-	-	*33.75*	-	*0.2*	*0.4*	*kg/ha/hr*	*1.17E-06*	*7.81E-06*	*1.17E-06*	*7.81E-06*	*1.56E-05*	-	*1.17E-06*	*7.81E-06*	*1.17E-06*	*7.81E-06*	*1.56E-05*
Front end loader to sorting or reprocessing	-	*500*	*95000*	-	-	*0.012*	*0.025*	*kg/t*	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*	-	*1.04E-02*	*6.94E-02*	*5.42E-03*	*3.61E-02*	*7.53E-02*

Table 6-4: Emission source inventory

Source Name	Source Type	Daily tonnage	Annual Tonnage	Source Area (m^2)	Release Height (m)	PM_{10} Emission Factor	TSP Emission Factor	Units	Calculated Emission Rates as per NPI EETM					Reduction Factor Applied	Emission rates after reduction factors applied (input into model)				
									Daily Emission Rate (g/s)		Annual Emission Rate (g/s)				Daily Emission Rate (g/s)		Annual Emission Rate (g/s)		
									$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP		$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	TSP
Conveyor to aggregates screen	-	-	-	*9*	-	*0.2*	*0.4*	*kg/ha/hr*	*3.13E-07*	*2.08E-06*	*3.13E-07*	*2.08E-06*	*4.17E-06*	-	*3.13E-07*	*2.08E-06*	*3.13E-07*	*2.08E-06*	*4.17E-06*
60-32 Aggregate screen	-	*195*	*37050*	-	-	*0.0043*	*0.0125*	*kg/t*	*1.46E-03*	*9.70E-03*	*7.58E-04*	*5.05E-03*	*1.47E-02*	-	*1.46E-03*	*9.70E-03*	*7.58E-04*	*5.05E-03*	*1.47E-02*
Conveyor out to 60 mm	-	-	-	*7*	-	*0.2*	*0.4*	*kg/ha/hr*	*2.43E-07*	*1.62E-06*	*2.43E-07*	*1.62E-06*	*3.24E-06*	-	*2.43E-07*	*1.62E-06*	*2.43E-07*	*1.62E-06*	*3.24E-06*
Conveyor to screen	-	-	-	*8*	-	*0.2*	*0.4*	*kg/ha/hr*	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*	-	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*
32-16 Aggregate screen	-	*195*	*37050*	-	-	*0.0043*	*0.0125*	*kg/t*	*1.46E-03*	*9.70E-03*	*7.58E-04*	*5.05E-03*	*1.47E-02*	-	*1.46E-03*	*9.70E-03*	*7.58E-04*	*5.05E-03*	*1.47E-02*
Conveyor out to 32 mm	-	-	-	*7*	-	*0.2*	*0.4*	*kg/ha/hr*	*2.43E-07*	*1.62E-06*	*2.43E-07*	*1.62E-06*	*3.24E-06*	-	*2.43E-07*	*1.62E-06*	*2.43E-07*	*1.62E-06*	*3.24E-06*
Conveyor to screen	-	-	-	*8*	-	*0.2*	*0.4*	*kg/ha/hr*	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*	-	*2.78E-07*	*1.85E-06*	*2.78E-07*	*1.85E-06*	*3.70E-06*
16-6 Aggregate screen	-	*195*	*37050*	-	-	*0.036*	*0.15*	*kg/t*	*2.84E-02*	*8.13E-02*	*1.48E-02*	*4.23E-02*	*1.76E-01*	-	*2.84E-02*	*8.13E-02*	*1.48E-02*	*4.23E-02*	*1.76E-01*
Conveyor out to 16 mm	-	-	-	*7*	-	*0.2*	*0.4*	*kg/ha/hr*	*5.67E-07*	*1.62E-06*	*5.67E-07*	*1.62E-06*	*3.24E-06*	-	*5.67E-07*	*1.62E-06*	*5.67E-07*	*1.62E-06*	*3.24E-06*
Conveyor across	-	-	-	*7*	-	*0.2*	*0.4*	*kg/ha/hr*	*5.67E-07*	*1.62E-06*	*5.67E-07*	*1.62E-06*	*3.24E-06*	-	*5.67E-07*	*1.62E-06*	*5.67E-07*	*1.62E-06*	*3.24E-06*
Conveyor out to -6 mm	-	*195*	*37050*	*8*	-	*0.2*	*0.4*	*kg/ha/hr*	*6.48E-07*	*1.85E-06*	*6.48E-07*	*1.85E-06*	*3.70E-06*	-	*6.48E-07*	*1.85E-06*	*6.48E-07*	*1.85E-06*	*3.70E-06*

*: where an NPI EETM TSP emission factor was not available, a generic PM_{10} to TSP ratio of 0.51 was adopted.

Figure 6-1: Arrangement of Modelled Sources



7. AIR IMPACT MODELLING

7.1 Dispersion Model

The new generation air dispersion model, AERMOD ver. 9.8.0, was used for the prediction of off-site impacts associated with the air emissions from the proposed operations. AERMOD uses air dispersion based on planetary boundary layer turbulence structure and scaling concepts. The AERMOD model replaced AUSPLUME as the air dispersion model accepted by the Victorian EPA in January 2014 and is a suitable model to use for this air assessment.

The model was used to estimate the concentration impacts on receptors for each hour of input meteorology. Terrain was assumed to be elevated.

7.1.1 Meteorological Data

Prognostic meteorological data for the year 2015 was obtained from Lakes Environmental as described in Sections 4.1.1 and 4.1.2. The profile and surface data files were input to AERMOD.

7.2 Air Impact Modelling Results

7.2.1 Maximum Impacts at Sensitive Receptors

Table 7-1 to Table 7-5 provide the results of the maximum modelled impacts for each identified receptor. Isopleths for each averaging period are provided in Figure 7-1 to Figure 7-5. Background concentrations that exceed the relevant *Approved Methods* criterion are marked with red text.

Table 7-1: TSP Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m³)	Background (µg/m³)	Cumulative Impact (µg/m³)	Criteria (µg/m³)
R1	0.31	27.57 µg/m³	27.88	90 µg/m³
R2	0.18		27.75	
R3	0.10		27.67	
R4	0.11		27.68	
R5	0.12		27.69	
R6	0.21		27.78	
R7	0.41		27.98	
R8	0.28		27.85	
R9	0.20		27.77	
R10	0.10		27.67	
R11	0.09		27.66	
R12	0.06		27.63	
R13	0.05		27.62	
R14	0.11		27.68	
R15	0.74		28.31	

Note: Complies / Non-compliance

Figure 7-1: TSP Annual Averaging Period Modelling Results

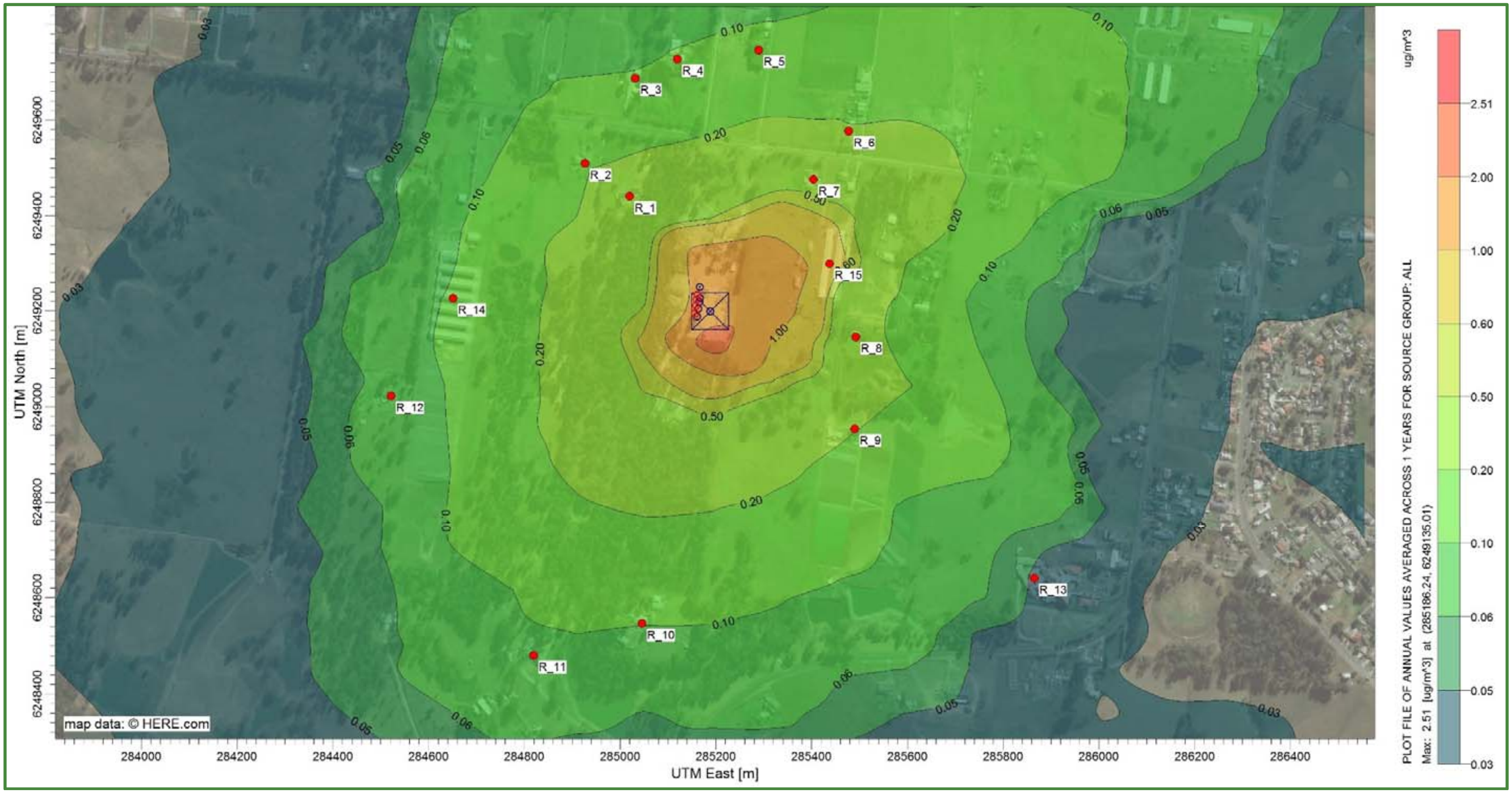


Table 7-2: PM_{10} Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m³)	Background (µg/m³)	Cumulative Impact (µg/m³)	Criteria (µg/m³)
R1	0.12	14.06 µg/m³	14.18	25 µg/m³
R2	0.07		14.13	
R3	0.04		14.10	
R4	0.04		14.10	
R5	0.04		14.10	
R6	0.08		14.14	
R7	0.15		14.21	
R8	0.10		14.16	
R9	0.08		14.14	
R10	0.04		14.10	
R11	0.03		14.09	
R12	0.02		14.08	
R13	0.02		14.08	
R14	0.04		14.10	
R15	0.27		14.33	

Note: Complies / Non-compliance

Figure 7-2: PM_{10} Annual Averaging Period Modelling Results

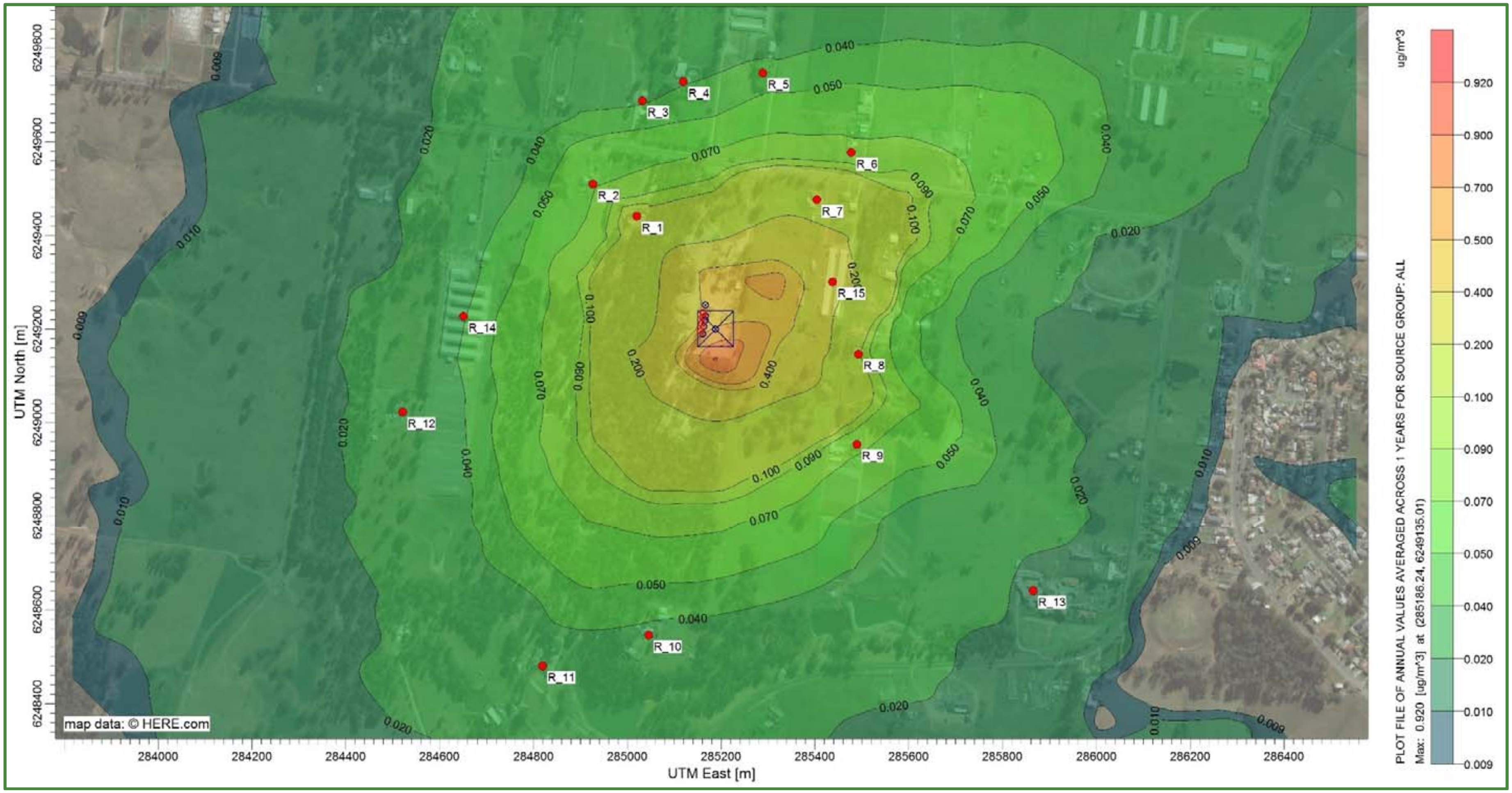


Table 7-3: $PM_{2.5}$ Annual Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m³)	Background (µg/m³)	Cumulative Impact (µg/m³)	Criteria (µg/m³)
R1	0.02	6.44 µg/m³	6.46	8 µg/m³
R2	0.01		6.45	
R3	0.01		6.45	
R4	0.01		6.45	
R5	0.01		6.45	
R6	0.02		6.46	
R7	0.03		6.47	
R8	0.02		6.46	
R9	0.02		6.46	
R10	0.01		6.45	
R11	0.01		6.45	
R12	0.00		6.44	
R13	0.00		6.44	
R14	0.01		6.45	
R15	0.06		6.50	

Note: Complies / Non-compliance

Figure 7-3: $PM_{2.5}$ Annual Averaging Period Modelling Results

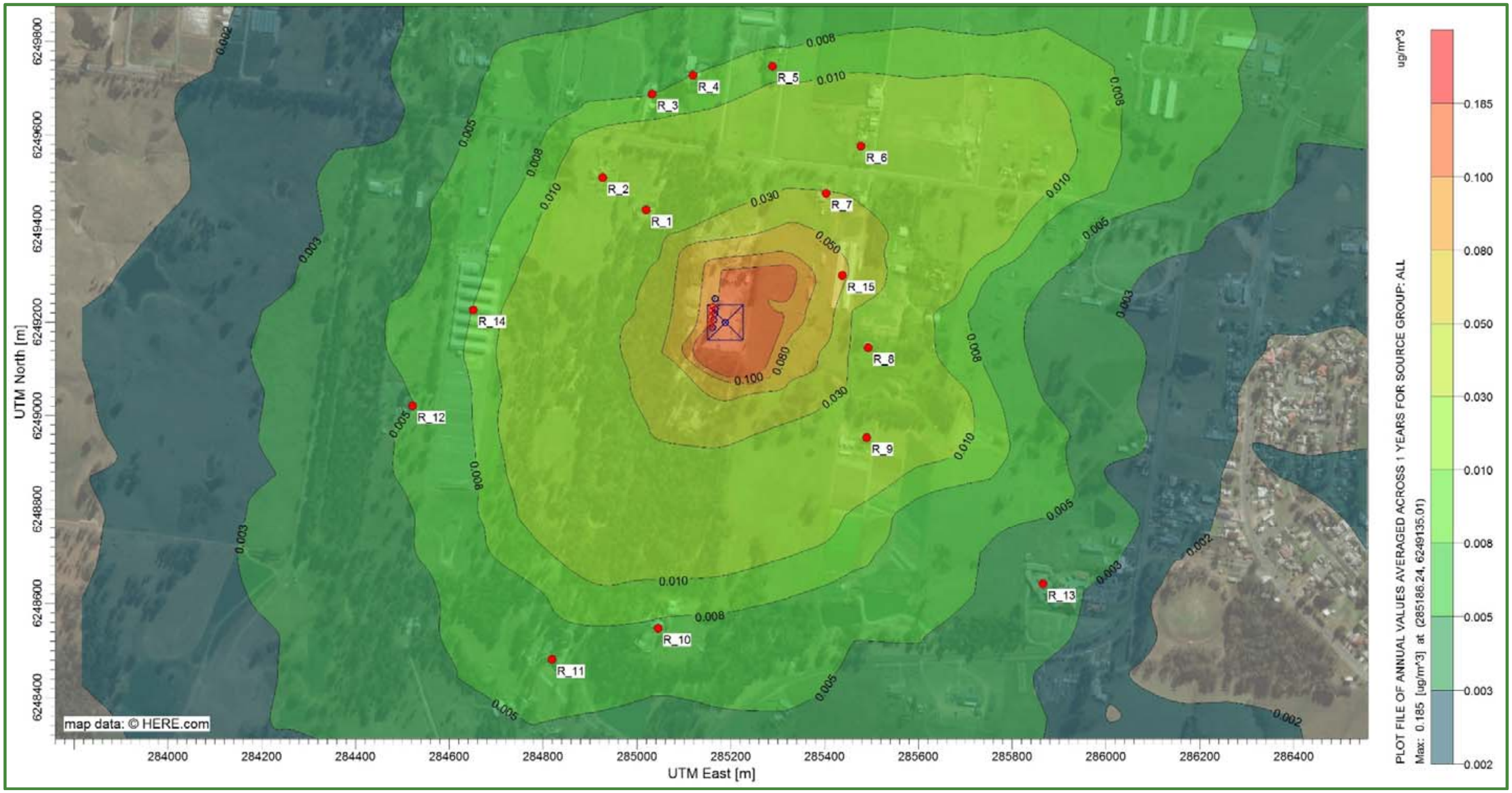


Table 7-4: PM_{10} 24 Hour Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m³)	Background (µg/m³)	Cumulative Impact (µg/m³)	Criteria (µg/m³)
R1	1.42	62.42 µg/m³	63.84	50 µg/m³
R2	0.96		63.38	
R3	0.56		62.98	
R4	0.61		63.03	
R5	0.80		63.22	
R6	1.17		63.59	
R7	1.85		64.27	
R8	1.75		64.17	
R9	1.18		63.60	
R10	0.61		63.03	
R11	0.63		63.05	
R12	0.59		63.01	
R13	0.40		62.82	
R14	0.64		63.06	
R15	2.62		65.04	

Note: Complies / Non-compliance

Figure 7-4: PM_{10} 24 Hour Averaging Period Modelling Results

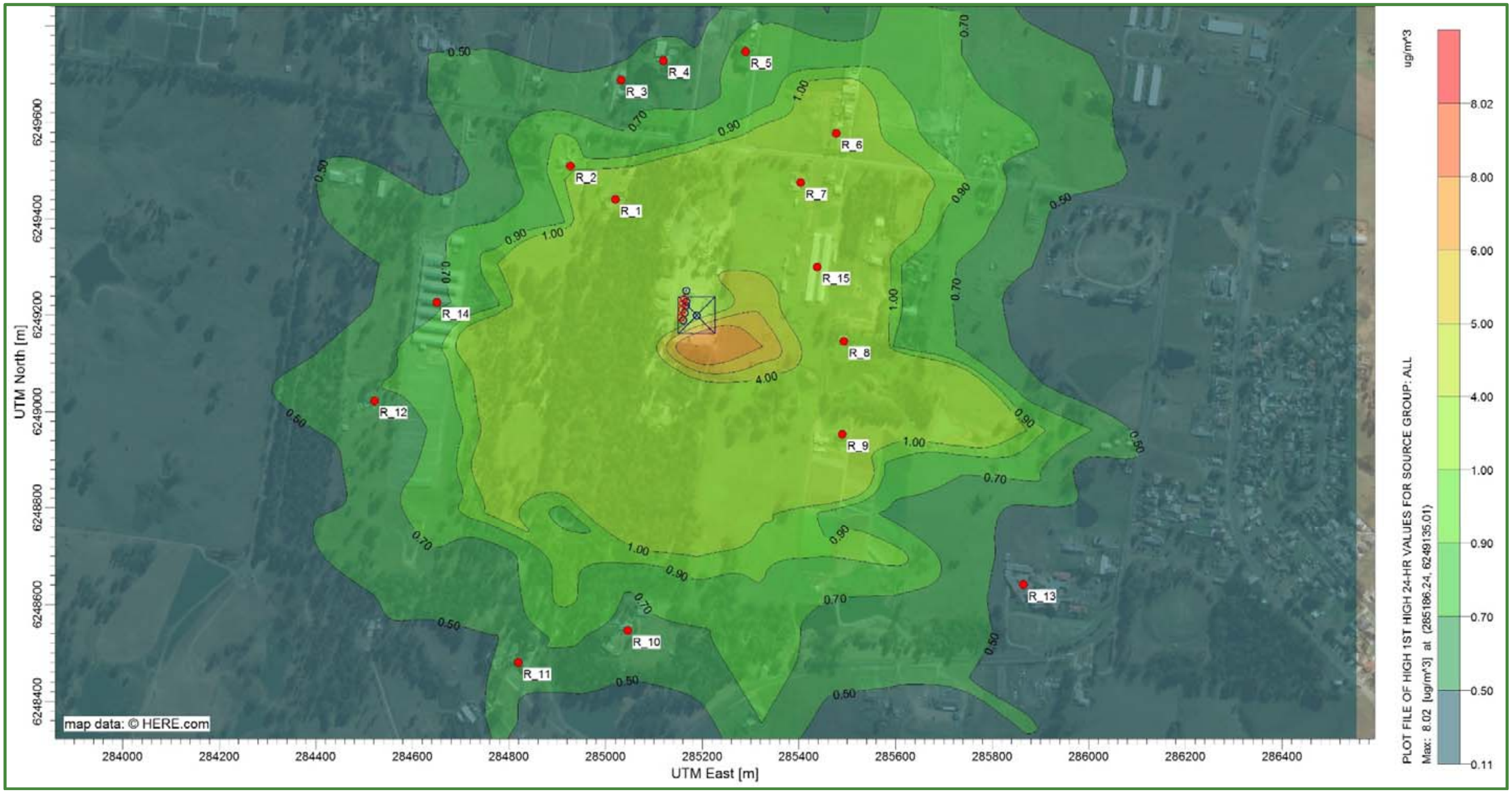
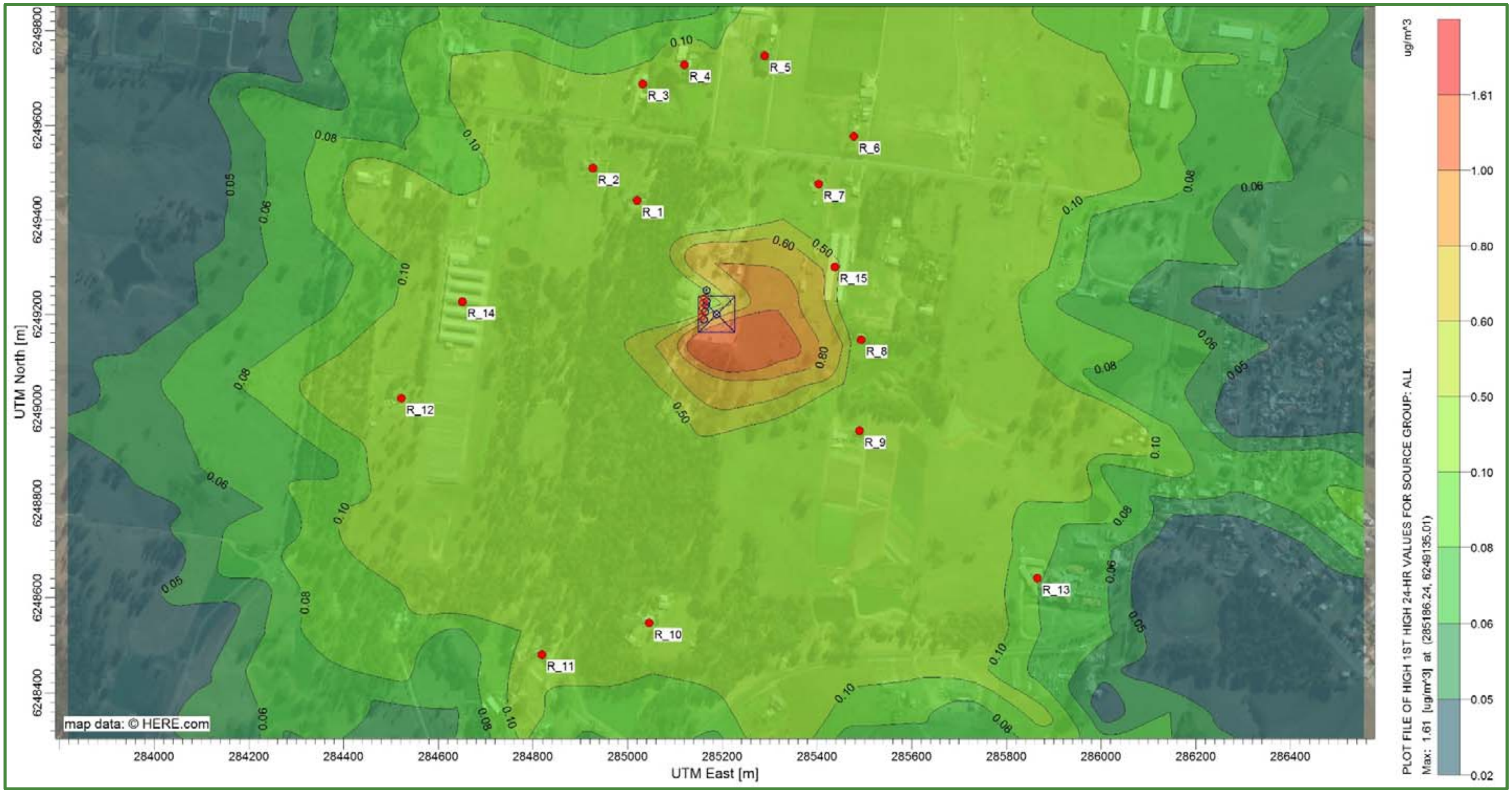


Table 7-5: $PM_{2.5}$ 24 Hour Averaging Period Modelling Results

Receptor ID	Incremental Impact (µg/m³)	Background (µg/m³)	Cumulative Impact (µg/m³)	Criteria (µg/m³)
R1	0.29	24.96 µg/m³	25.25	25 µg/m³
R2	0.20		25.16	
R3	0.11		25.07	
R4	0.12		25.08	
R5	0.16		25.12	
R6	0.24		25.20	
R7	0.38		25.34	
R8	0.36		25.32	
R9	0.24		25.20	
R10	0.12		25.08	
R11	0.13		25.09	
R12	0.12		25.08	
R13	0.08		25.04	
R14	0.13		25.09	
R15	0.53		25.49	

Note: Complies / Non-compliance

Figure 7-5: $PM_{2.5}$ 24 Hour Averaging Period Modelling Results



7.2.2 Predicted Days of Cumulative Exceedance

Due to the high background levels of PM_{10} and $PM_{2.5}$ at the site, the *Approved Methods* require a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities.

Table 7-6 and Table 7-7 summarise the contemporaneous impact and background of the top eight days of highest background concentrations and the top eight days of highest predicted increment for PM_{10} and $PM_{2.5}$ for the most highly impacted receptor (R15).

Table 7-6: Summary of Top Eight Days of Contemporaneous PM_{10} Impact and Background at Residential Receptor R15 (*Approved Methods* Criterion = 50 µg/m³)

Date	PM_{10} 24 Hour Average (µg/m³)			Date	PM_{10} 24 Hour Average (µg/m³)		
	Highest Background	Predicted Increment	Total		Background	Highest Predicted Increment	Total
06/05/2015	62.42	0.62	63.04	04/06/2015	12.90	2.62	15.52
26/11/2015	34.90	0.04	34.94	22/06/2015	11.00	2.62	13.62
07/10/2015	32.66	0.02	32.68	07/08/2015	8.69	2.30	10.99
22/08/2015	32.36	0.04	32.40	29/08/2015	9.66	2.27	11.93
27/11/2015	31.90	0.38	32.28	12/09/2015	14.84	2.17	17.01
21/08/2015	31.48	0.51	31.99	06/04/2015	9.08	2.13	11.21
05/05/2015	31.01	0.20	31.21	03/06/2015	10.49	2.00	12.49
17/10/2015	31.00	0.81	31.81	11/09/2015	15.01	1.97	16.98

✓Complies ✗ Non-compliance

Table 7-7: Summary of Top Eight Days of Contemporaneous $PM_{2.5}$ Impact and Background at Residential Receptor R15 (*Approved Methods* Criterion = 25 µg/m³)

Date	$PM_{2.5}$ 24 Hour Average (µg/m³)			Date	$PM_{2.5}$ 24 Hour Average (µg/m³)		
	Highest Background	Predicted Increment	Total		Background	Highest Predicted Increment	Total
22/08/2015	24.96	0.01	24.97	22/06/2015	7.73	0.53	8.26
21/08/2015	20.70	0.10	20.80	04/06/2015	8.07	0.52	8.59
10/10/2015	17.96	0.05	18.01	07/08/2015	6.46	0.46	6.92
07/06/2015	17.26	0.24	17.50	29/08/2015	9.57	0.45	10.02
05/07/2015	15.34	0.34	15.68	13/09/2015	9.73	0.43	10.16
08/06/2015	14.18	0.05	14.23	06/04/2015	9.08	0.43	9.51
17/10/2015	13.50	0.16	13.66	03/06/2015	5.82	0.41	6.23
20/08/2015	13.37	0.12	13.49	11/09/2015	5.80	0.40	6.20

✓Complies ✗ Non-compliance

8. DISCUSSION OF MODELLING RESULTS

Annual TSP, PM_{10} and $PM_{2.5}$ emissions at all receptors are predicted to comply with the *Approved Methods* criterion.

The maximum predicted impacts for 24 hour averaging periods for PM_{10} and $PM_{2.5}$ exceeded the relevant criteria. The background concentrations for PM_{10} and $PM_{2.5}$ for 24 hour averaging periods are considered elevated, with levels of at 24.96 µg/m^3 and 62.42 µg/m^3 respectively in comparison to the *Approved Methods* criteria of 25 µg/m^3 and 50 µg/m^3.

In cases of elevated background concentrations, the NSW EPA requires a demonstration that no additional exceedances of the impact assessment criteria will occur as a result of the proposed site activities.

Contemporaneous addition of the predicted daily increments of PM_{10} and $PM_{2.5}$ with daily measured background levels for 2015 showed no additional exceedances due to proposed site activities.

With the proposed site activities and dust controls in place, it is considered that emissions to air from the site's operation are unlikely to cause harm to health or the environment.

9. STATEMENT OF POTENTIAL AIR QUALITY IMPACTS

Annual TSP, PM_{10} and $PM_{2.5}$ emissions at all receptors are predicted to comply with the *Approved Methods* criterion.

The maximum predicted impacts for 24 hour averaging periods for PM_{10} and $PM_{2.5}$ exceeded the relevant criteria. The background concentrations for PM_{10} and $PM_{2.5}$ for 24 hour averaging periods are considered elevated, with levels of at 24.96 $\mu g/m^3$ and 62.42 $\mu g/m^3$ respectively in comparison to the *Approved Methods* criteria of 25 $\mu g/m^3$ and 50 $\mu g/m^3$.

However, contemporaneous addition of the predicted daily increments of PM_{10} and $PM_{2.5}$ with daily measured background levels for 2015 showed no additional exceedances due to proposed site activities.

Therefore, the *Approved Methods* criteria are satisfied at all residential receptors for all particulate air pollutants modelled.

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10. REFERENCES

ACT Government. (2014). *Draft Seperation Distance Guidelines for Air Emissions: Environment Protection Authority.* Retrieved 2018, from https://www.environment.act.gov.au/__data/assets/pdf_file/0004/657211/EPA-Separation-Distance-Guidelines-for-Air-Emissions_ACCESS.pdf

Environment Protection Authority (2016) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. Sydney.

Ferraris, C., Hackley, V., and Avilés, A (2004) *Measurement of Particle Size Distribution in Portland Cement Powder: Analysis of ASTM Round Robin Studies.* Cement, Concrete and Aggregates. Vol. 26, No. 2, 2004, pp. 1-11.

Guo, L., Ma, S., Zhao, D., Tong, J., Chen, D., Ma, Y., et al. (2018). Interception Effect of Vegetative Environment Buffers on Pollutant Emission from Mechanical Ventilated Poultry Houses. *2018 ASABE Annual International Meeting. American Society of Agricultural and Biological Engineers*, 1.

Malone, G. et al. . (2006). Efficacy of vegetative environmental buffers to capture emissions from tunnel ventilated poultry houses', in Proceedings: workshop on agricultural air quality. *State of the Science, Potomac, Maryland*, 875–878.

NSW legislation (1997) *Protection of the Environment Operations Act*. *No 156.* Available at: https://www.legislation.nsw.gov.au/#/view/act/1997/156/whole (Accessed: 29 August 2017).

National Pollutant Inventory (1999) *Emission Estimation Technique Manual for Concrete Batching and Concrete Product Manufacturing.* Available at: http://www.npi.gov.au/resource/emission-estimation-technique-manual-concrete-batching-and-concrete-product-manufacturing (Accessed: 27 August 2017).

National Pollutant Inventory (2012) *Emission Estimation Technique Manual for Mining*

National Pollutant Inventory (2014) *Emission Estimation Technique Manual for Mining* and Processing of Non-Metallic Minerals (2014)

United States Environmental Protection Agency (1995) *AP 42, Fifth Edition Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*. Available at: https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissionfactors (Accessed: 11 August 2017).

11. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

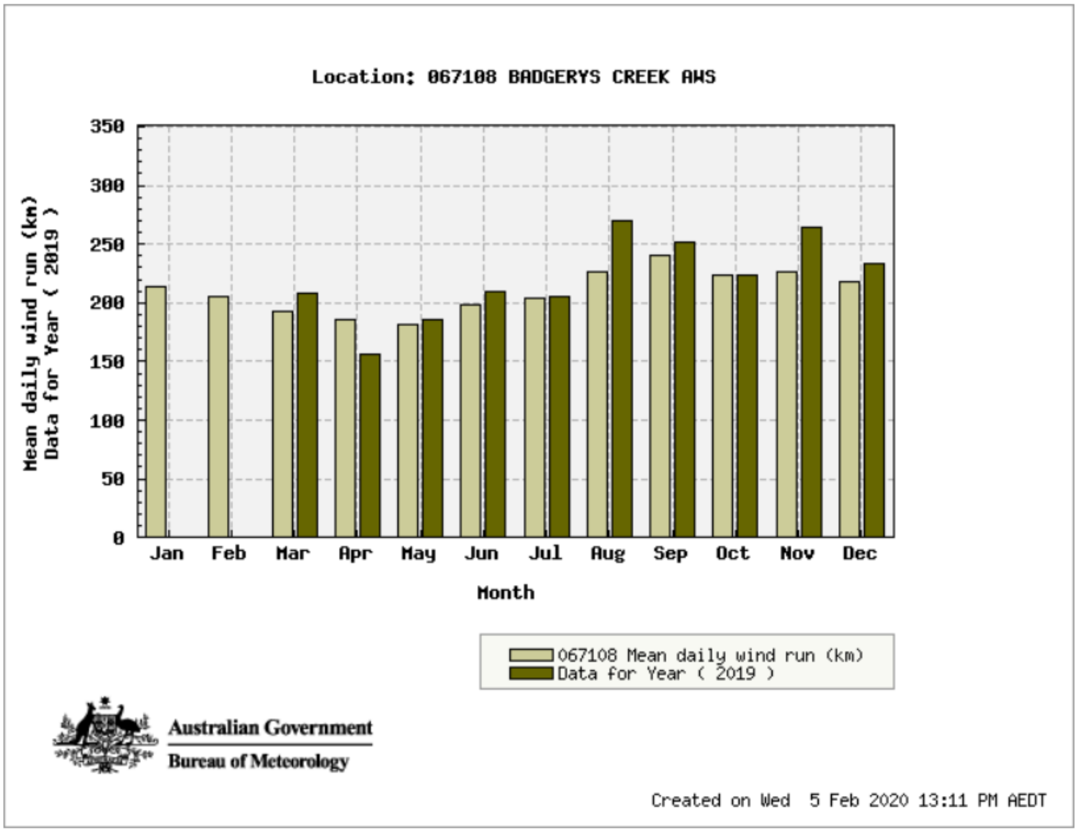
This report has been prepared solely for the use of Greenfields Resource Recovery Facility and as per our agreement for providing environmental services. Only Greenfields Resource Recovery Facility is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

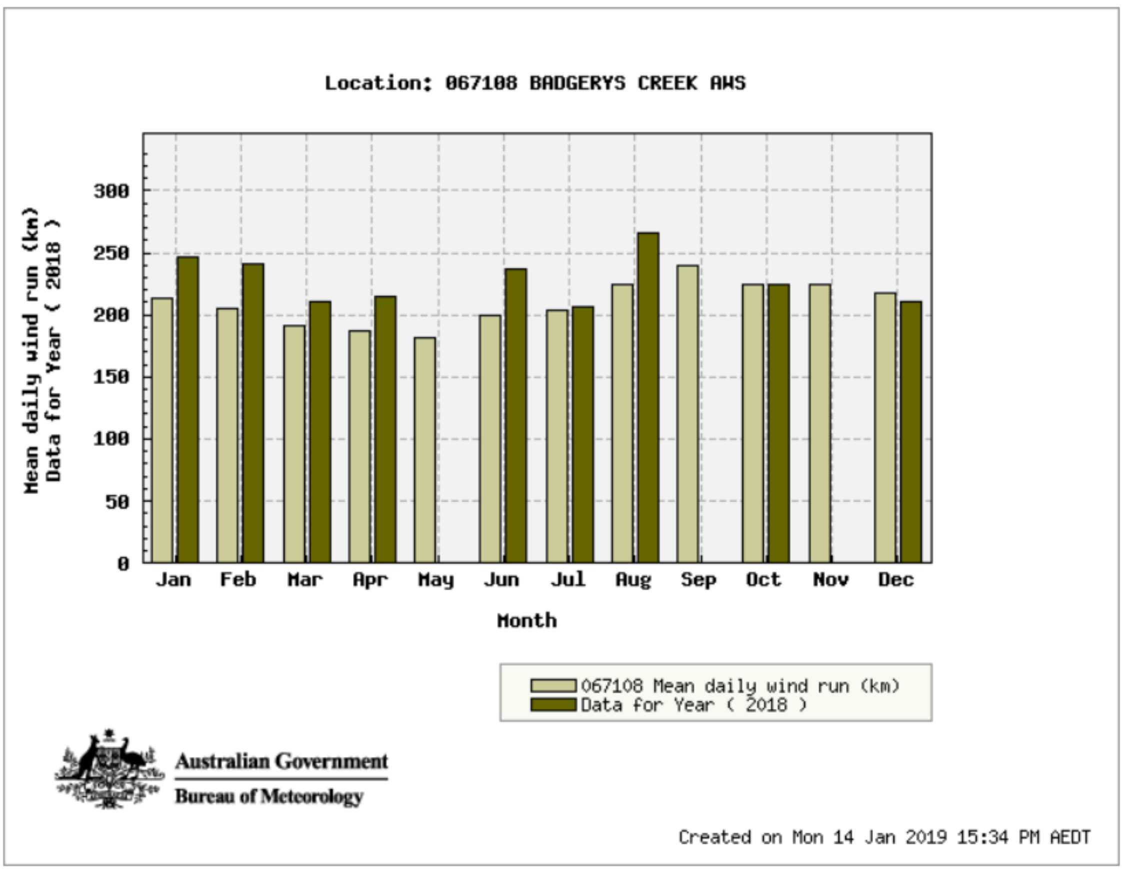
Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Greenfields Resource Recovery Facility for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Long-term Climate Statistics for the Referenced Meteorological Station – Badgerys Creek, Bureau of Meteorology


Location: 067108 BADGERYS CREEK AWS
Mean daily wind run (km)
Data for Year (2019)
350
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
067108 Mean daily wind run (km)
Data for Year (2019)
Australian Government
Bureau of Meteorology
Created on Wed 5 Feb 2020 13:11 PM AEDT


Location: 067108 BADGERYS CREEK AWS
Mean daily wind run (km)
Data for Year (2018)
300
250
200
150
100
50
0
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Mar
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Month
067108 Mean daily wind run (km)
Data for Year (2018)
Australian Government
Bureau of Meteorology
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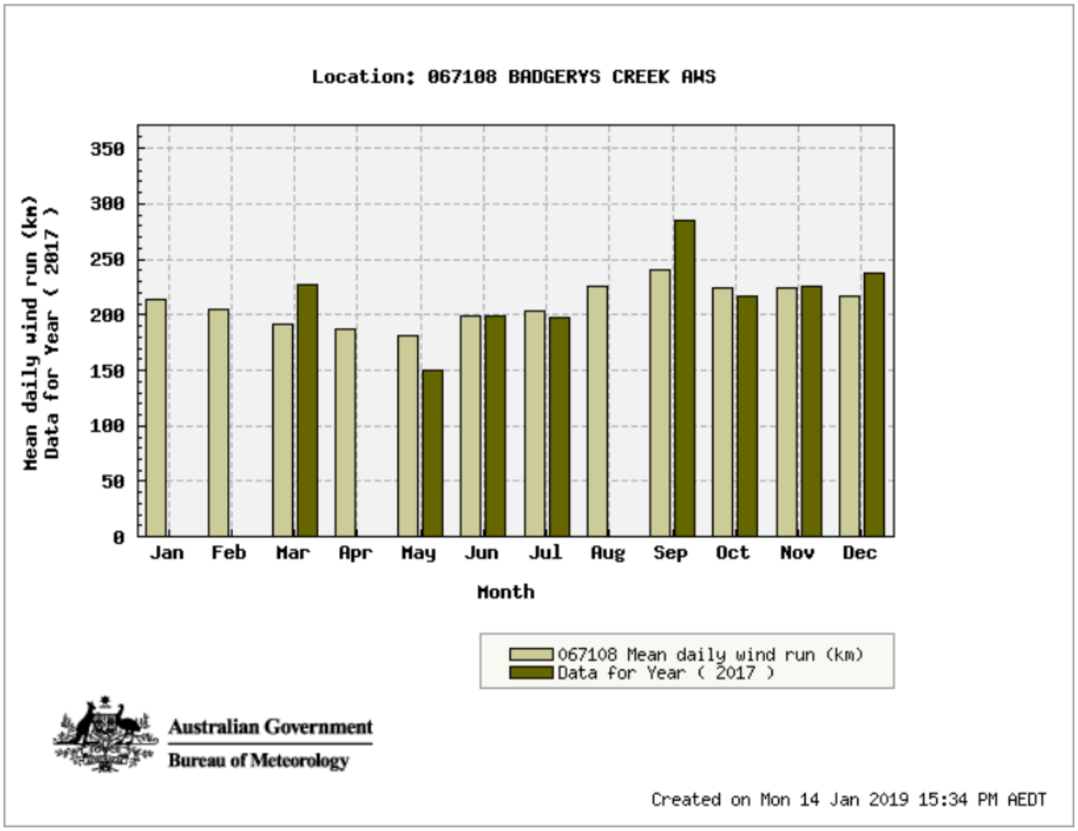
Location: 067108 BADGERYS CREEK AWS
Mean daily wind run (km)
Data for Year (2017)
350
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
067108 Mean daily wind run (km)
Data for Year (2017)
Australian Government
Bureau of Meteorology
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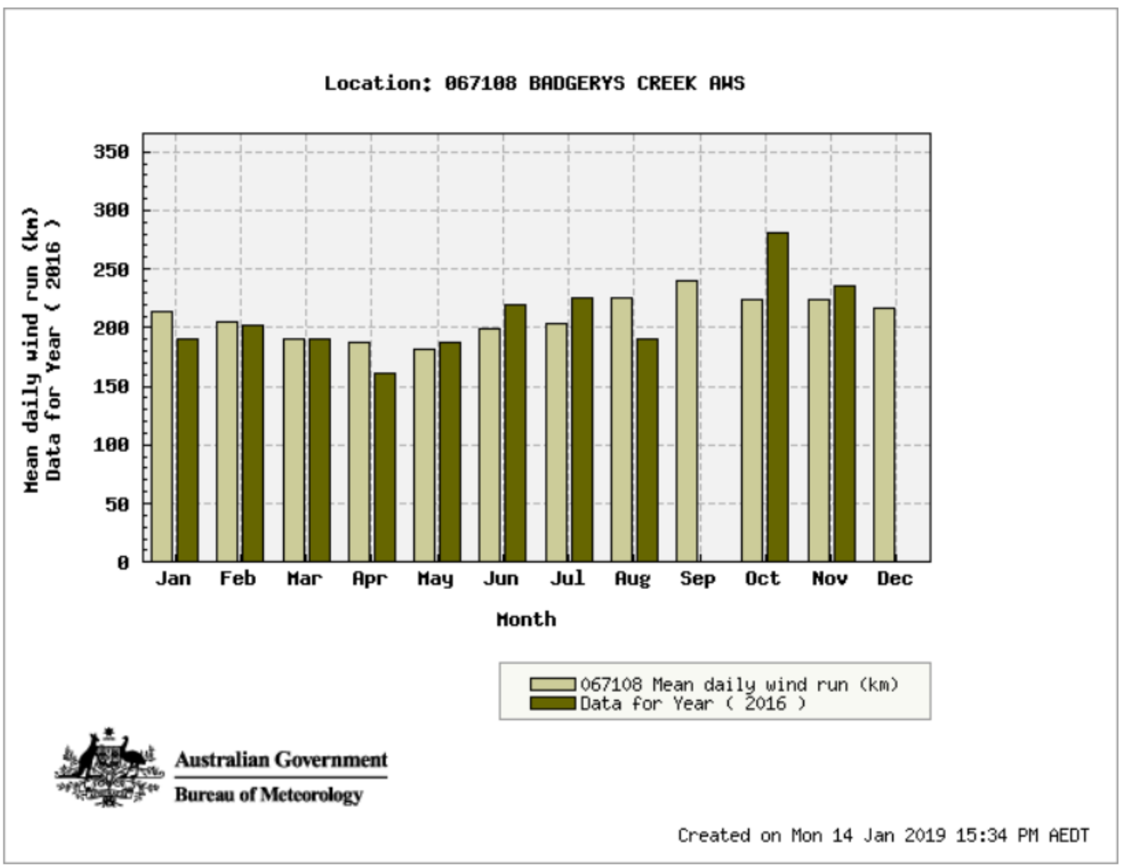
Location: 067108 BADGERYS CREEK AWS
Mean daily wind run (km)
Data for Year (2016)
350
300
250
200
150
100
50
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Jan
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May
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Jul
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Month
067108 Mean daily wind run (km)
Data for Year (2016)
Australian Government
Bureau of Meteorology
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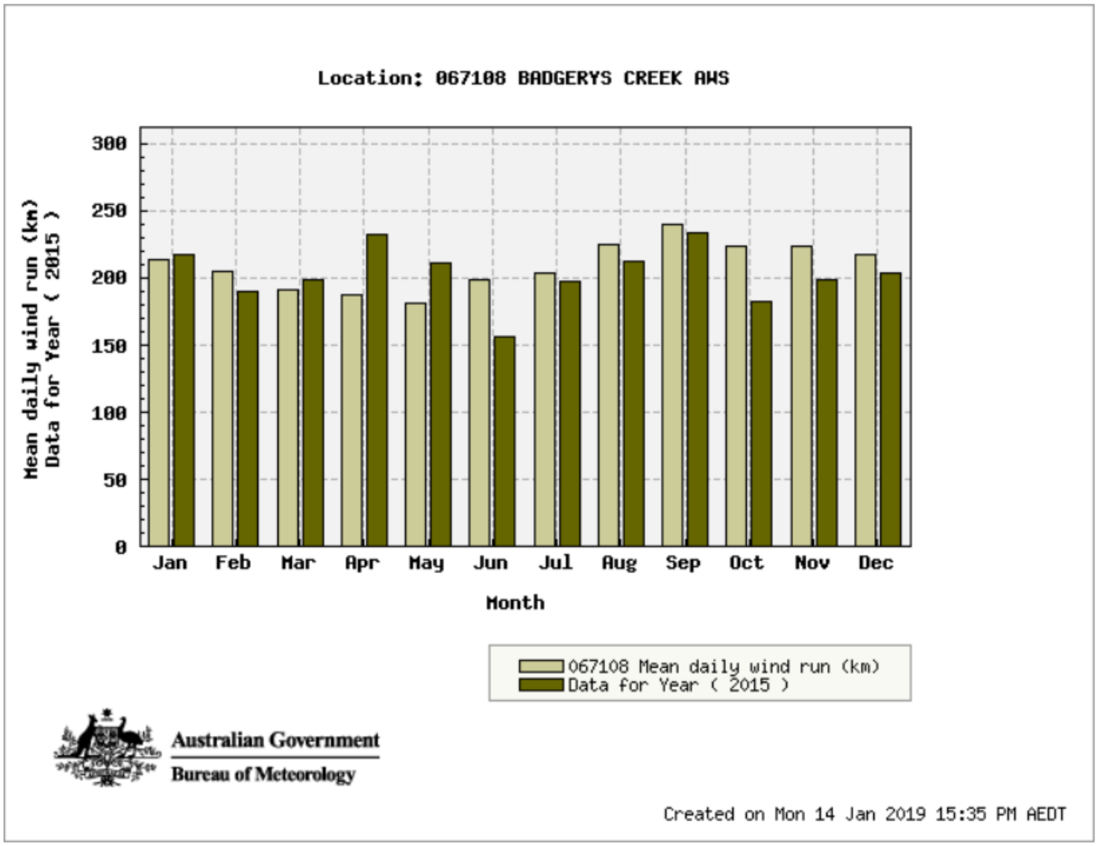
Location: 067108 BADGERYS CREEK AWS
Mean daily wind run (km)
Data for Year (2015)
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
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Nov
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Month
067108 Mean daily wind run (km)
Data for Year (2015)
Australian Government
Bureau of Meteorology
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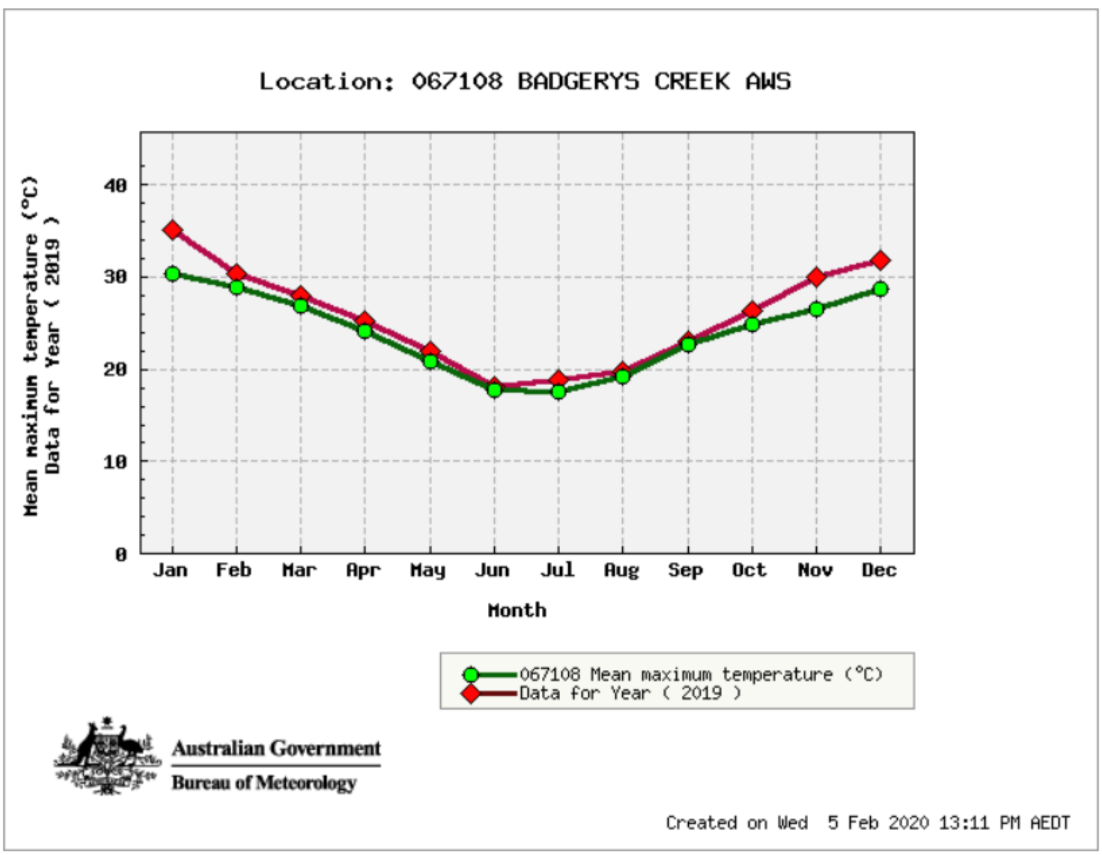
Location: 067108 BADGERYS CREEK AWS
Mean maximum temperature (°C)
Data for Year (2019)
40
30
20
10
0
Jan
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May
Jun
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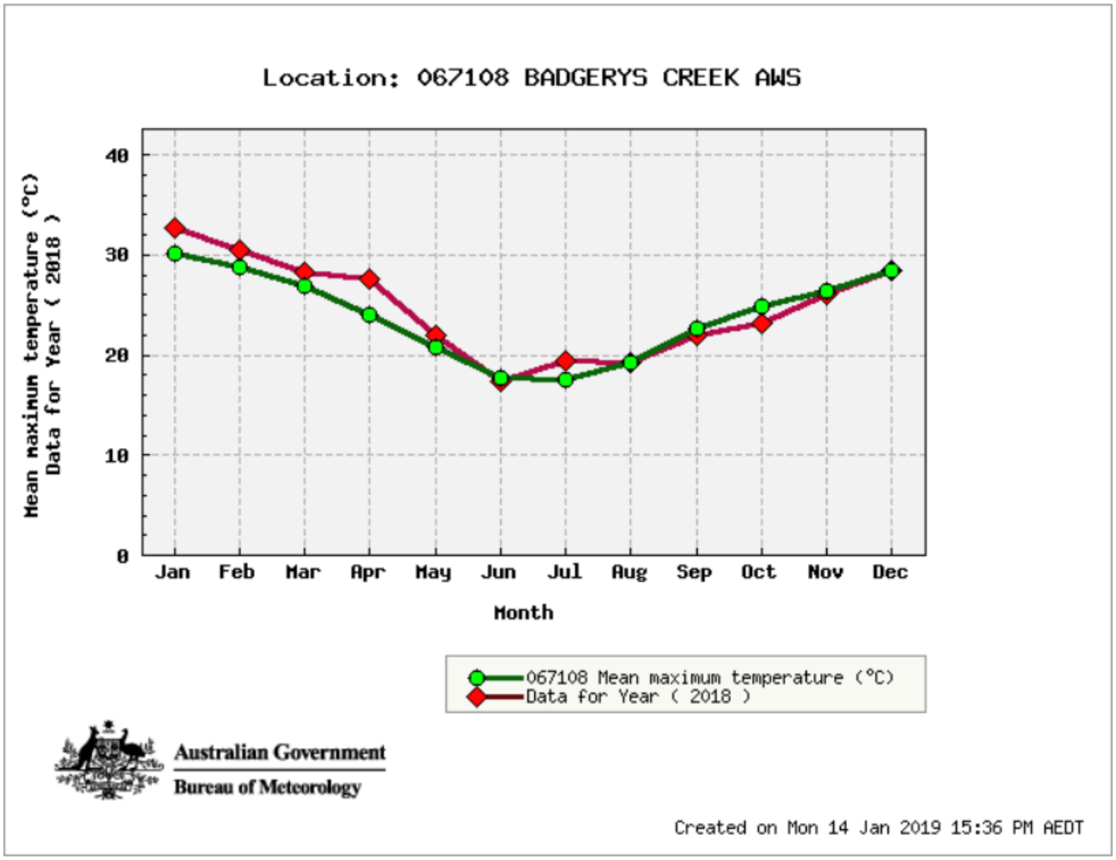
Month
067108 Mean maximum temperature (°C)
Data for Year (2019)
Australian Government
Bureau of Meteorology
Created on Wed 5 Feb 2020 13:11 PM AEDT



Location: 067108 BADGERYS CREEK AWS
Mean maximum temperature (°C)
Data for Year (2018)
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
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Month
067108 Mean maximum temperature (°C)
Data for Year (2018)
Australian Government
Bureau of Meteorology
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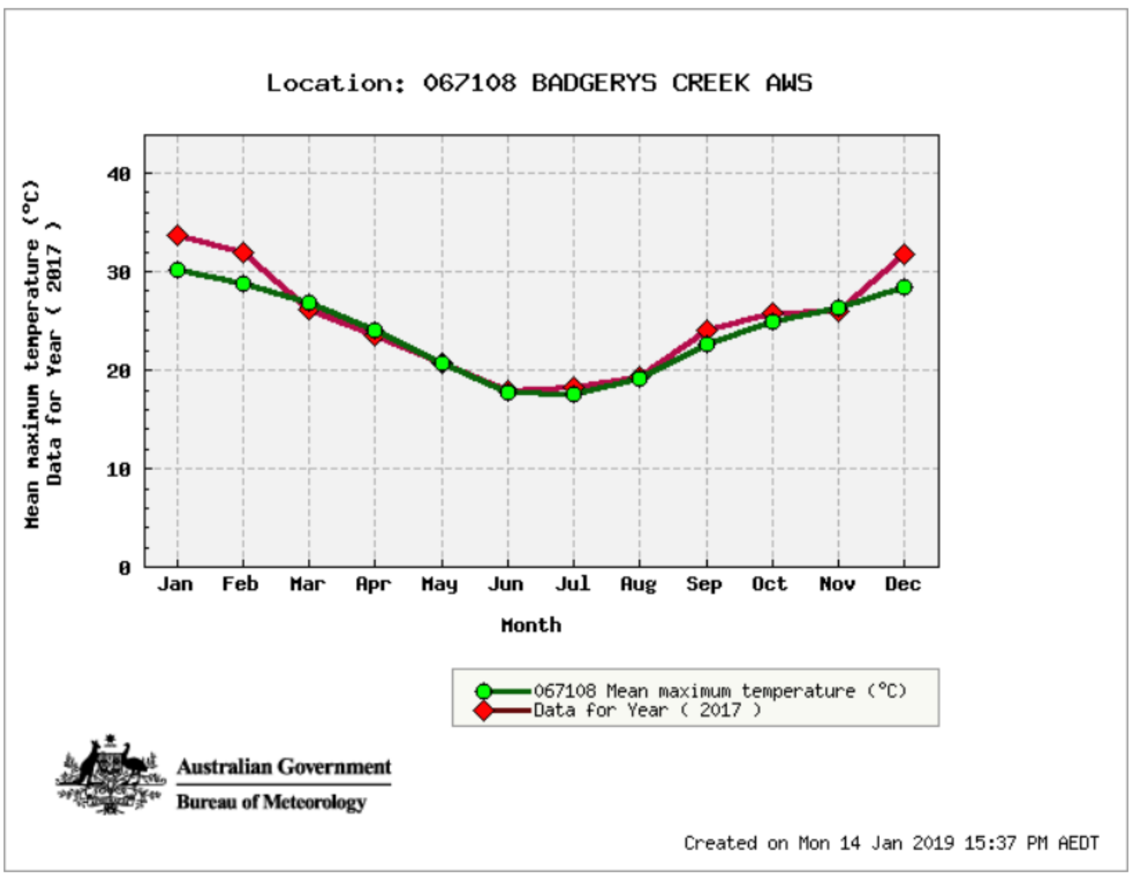

Location: 067108 BADGERYS CREEK AWS
Mean maximum temperature (°C)
Data for Year (2017)
40
30
20
10
0
Jan
Feb
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Jun
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Month
067108 Mean maximum temperature (°C)
Data for Year (2017)
Australian Government
Bureau of Meteorology
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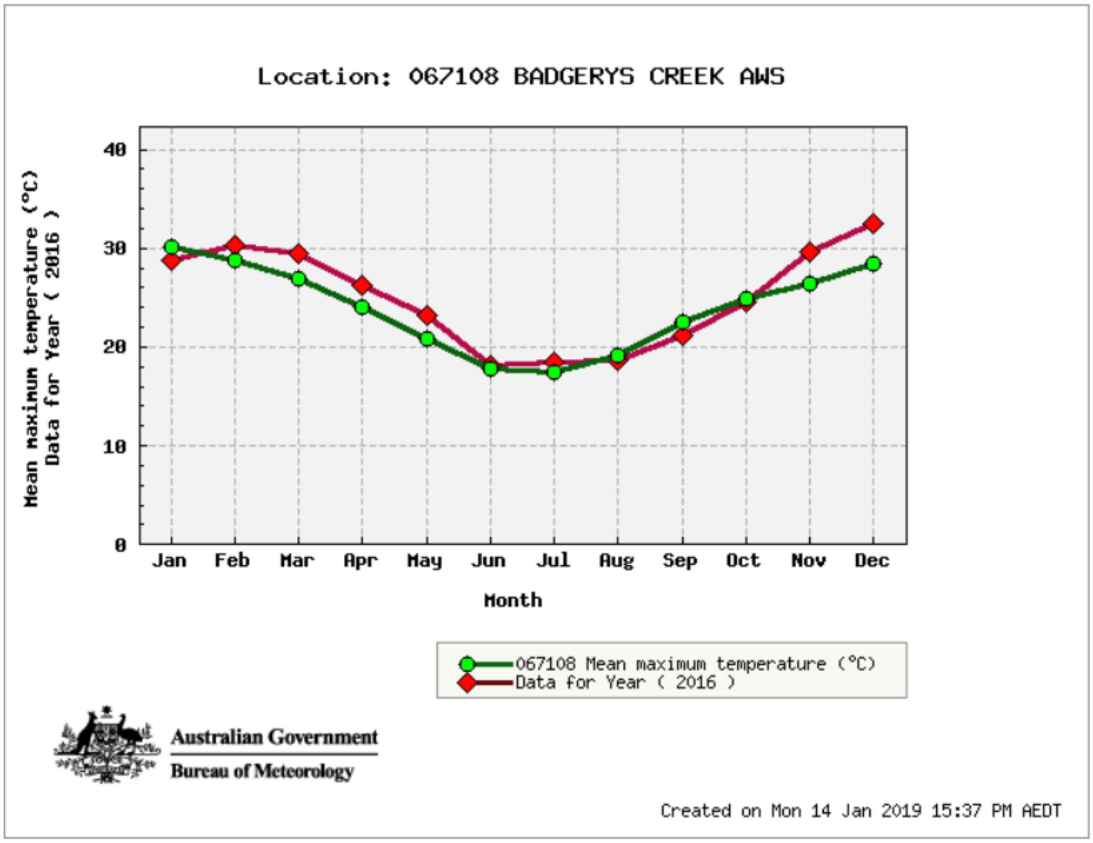

Location: 067108 BADGERYS CREEK AWS
Mean maximum temperature (°C)
Data for Year (2016)
40
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Month
067108 Mean maximum temperature (°C)
Data for Year (2016)
Australian Government
Bureau of Meteorology
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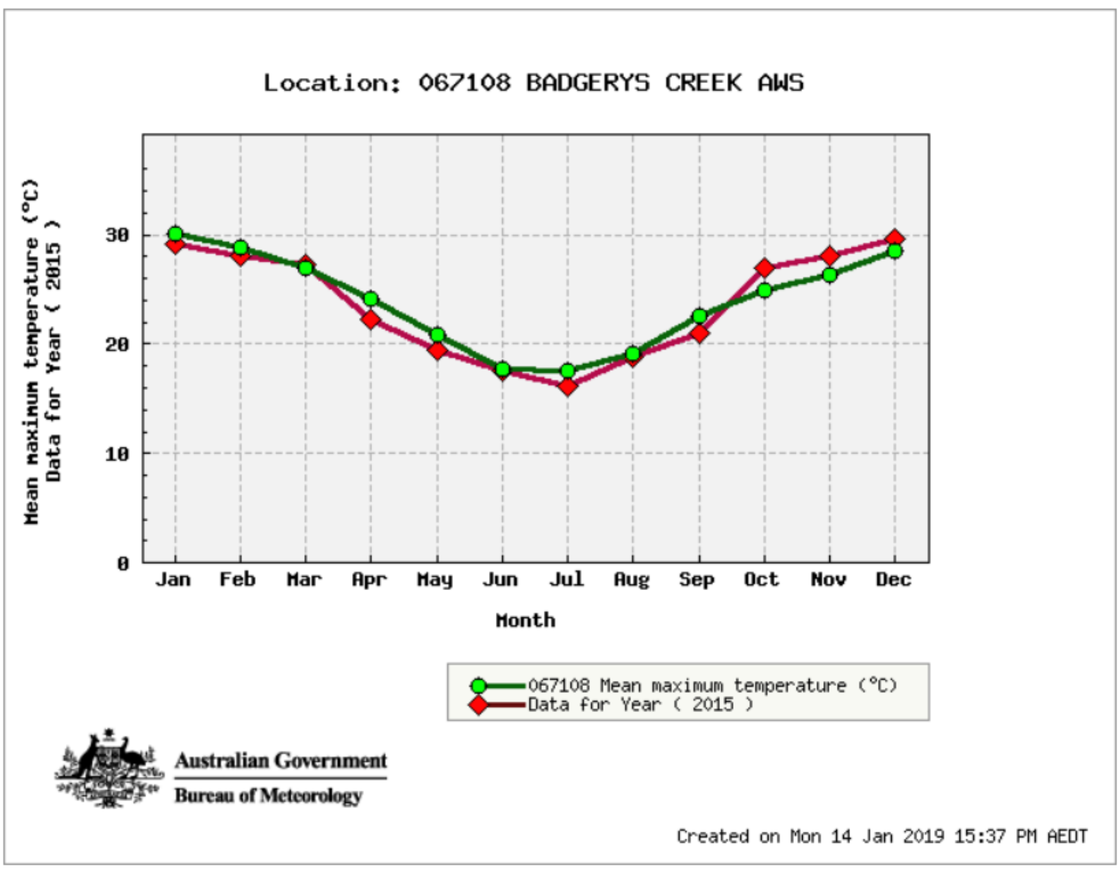

Location: 067108 BADGERYS CREEK AWS
Mean maximum temperature (°C)
Data for Year (2015)
30
20
10
0
Jan
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Month
067108 Mean maximum temperature (°C)
Data for Year (2015)
Australian Government
Bureau of Meteorology
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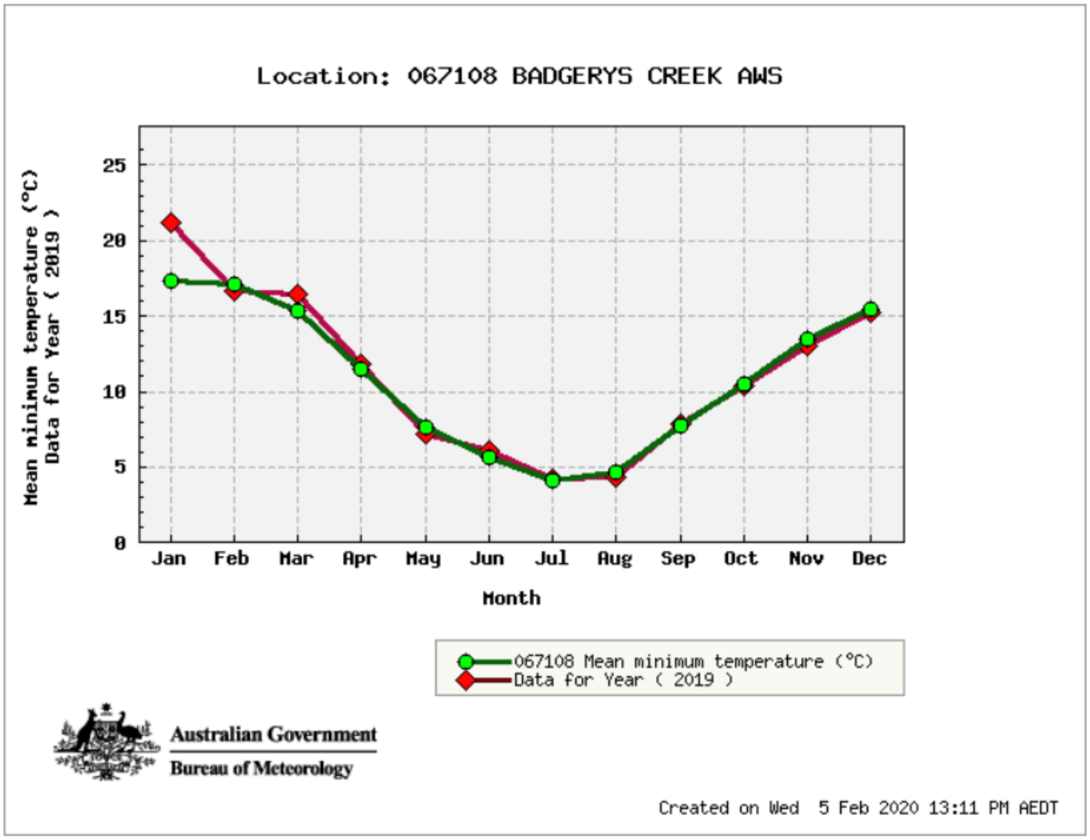
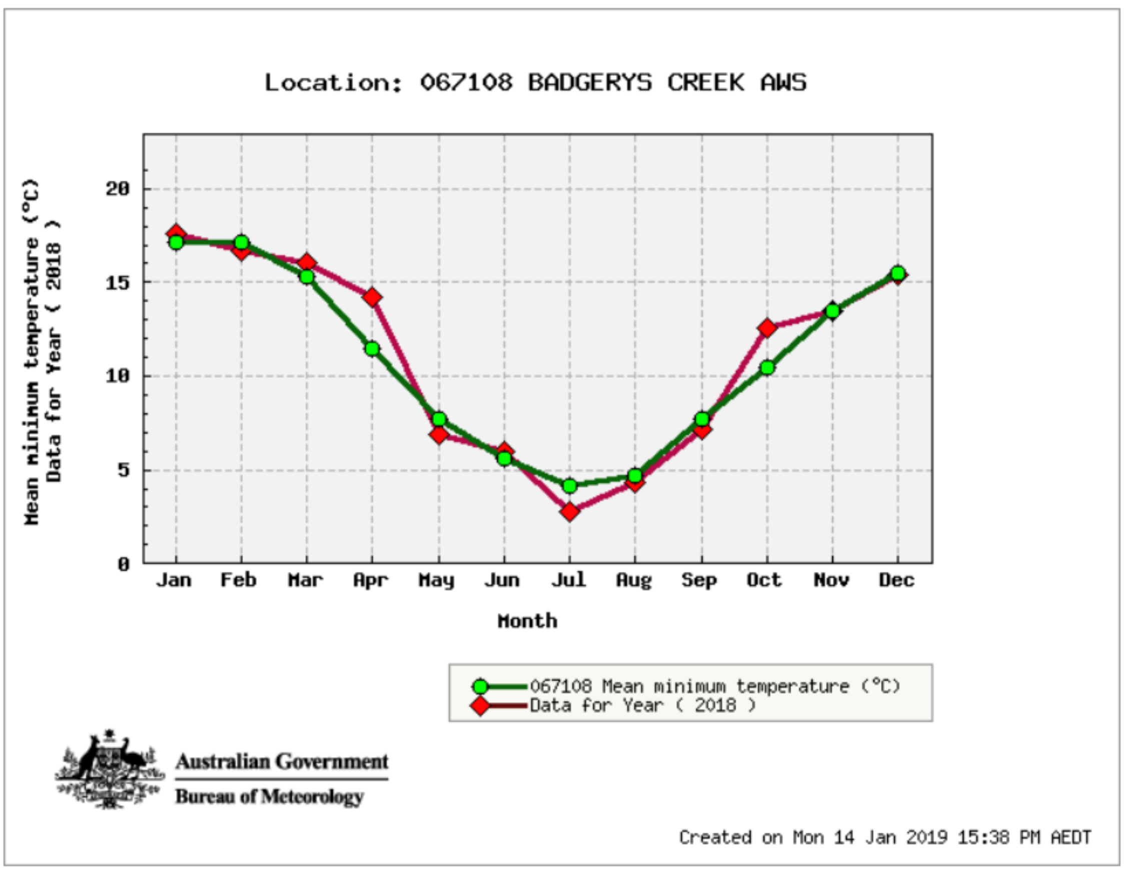


Location: 067108 BADGERYS CREEK AWS
Mean minimum temperature (°C)
Data for Year (2019)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month
067108 Mean minimum temperature (°C)
Data for Year (2019)
Australian Government
Bureau of Meteorology
Created on Wed 5 Feb 2020 13:11 PM AEDT



Location: 067108 BADGERYS CREEK AWS
Mean minimum temperature (°C)
Data for Year (2018)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month
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Data for Year (2018)
Australian Government
Bureau of Meteorology
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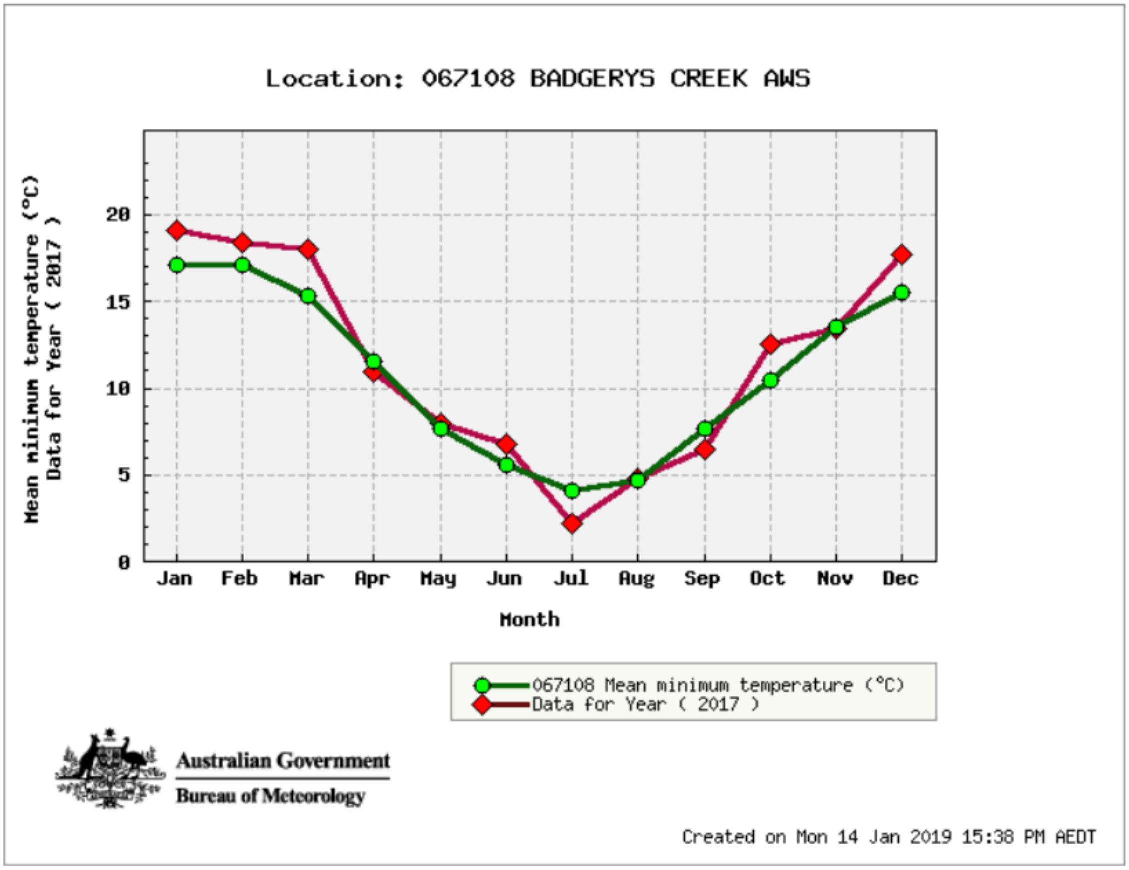
Location: 067108 BADGERYS CREEK AWS
Mean minimum temperature (°C)
Data for Year (2017)
20
15
10
5
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May
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Month
067108 Mean minimum temperature (°C)
Data for Year (2017)
Australian Government
Bureau of Meteorology
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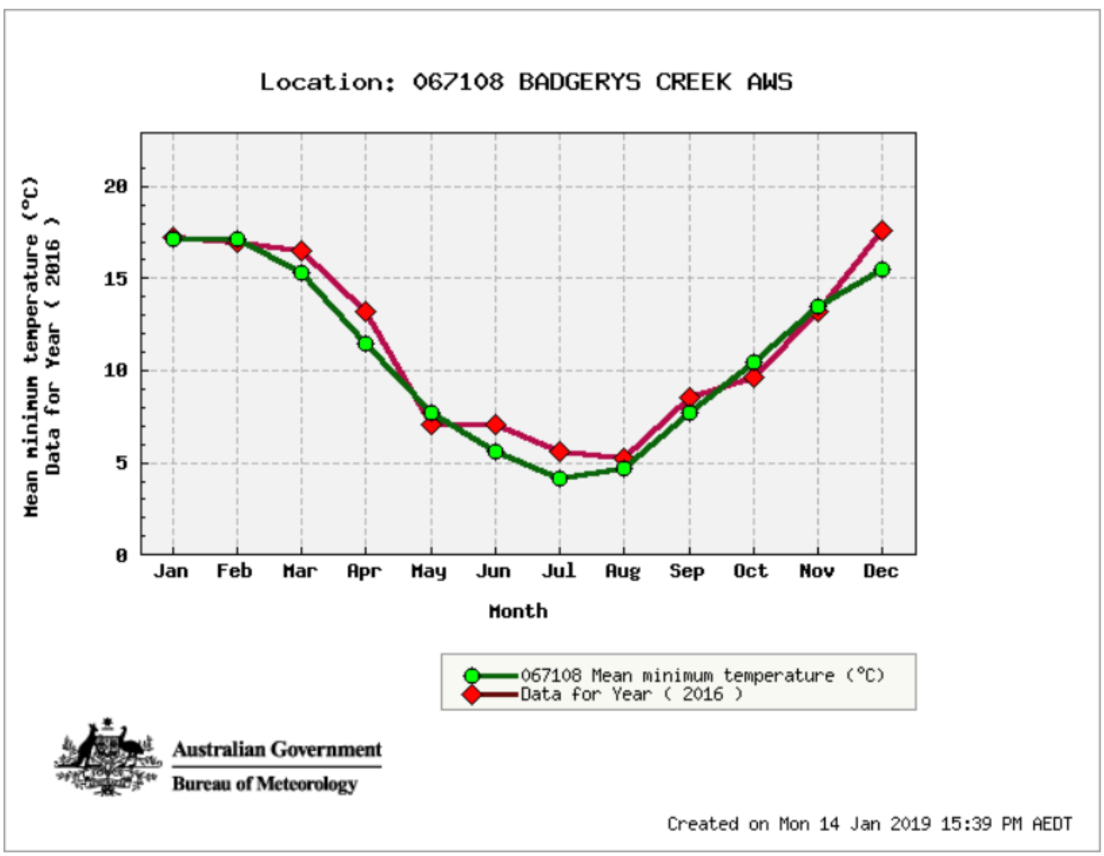
Location: 067108 BADGERYS CREEK AWS
Mean minimum temperature (°C)
Data for Year (2016)
20
15
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Month
067108 Mean minimum temperature (°C)
Data for Year (2016)
Australian Government
Bureau of Meteorology
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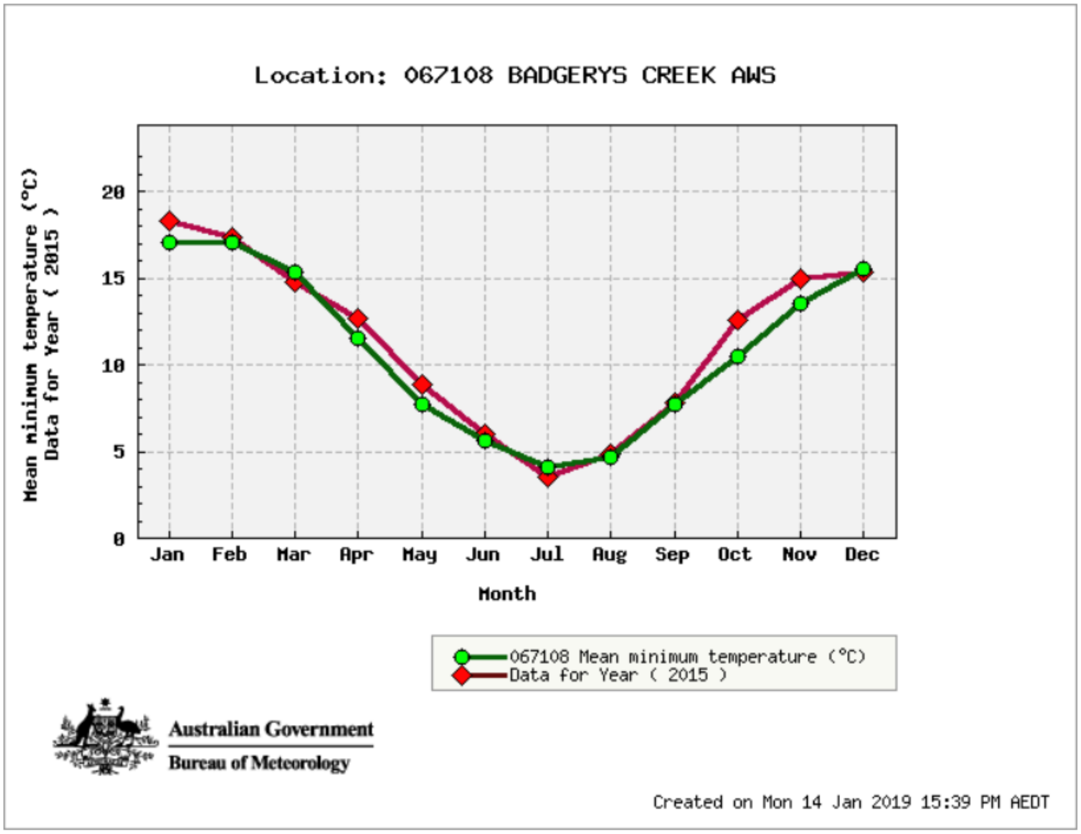
Location: 067108 BADGERYS CREEK AWS
Mean minimum temperature (°C)
Data for Year (2015)
20
15
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0
Jan
Feb
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Jul
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Month
067108 Mean minimum temperature (°C)
Data for Year (2015)
Australian Government
Bureau of Meteorology
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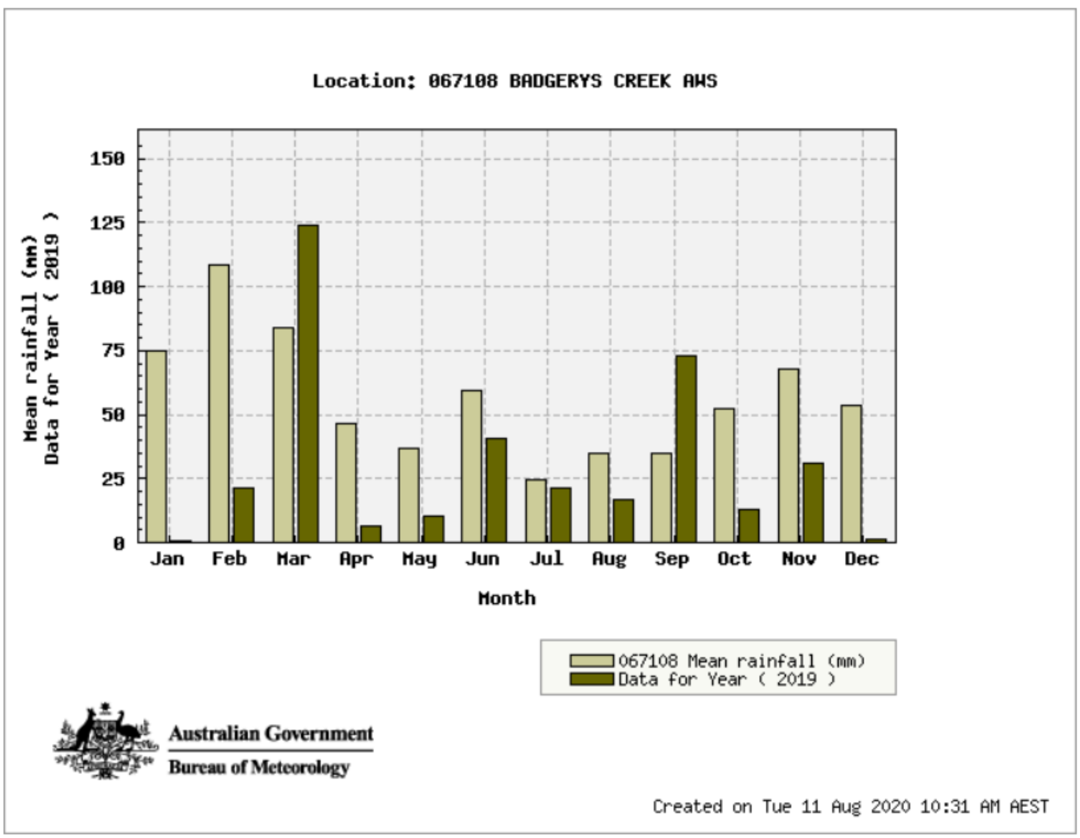
Location: 067108 BADGERYS CREEK AWS
Mean rainfall (mm)
Data for Year (2019)
150
125
100
75
50
25
0
Jan
Feb
Mar
Apr
May
Jun
Jul
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Oct
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Dec
Month
067108 Mean rainfall (mm)
Data for Year (2019)
Australian Government
Bureau of Meteorology
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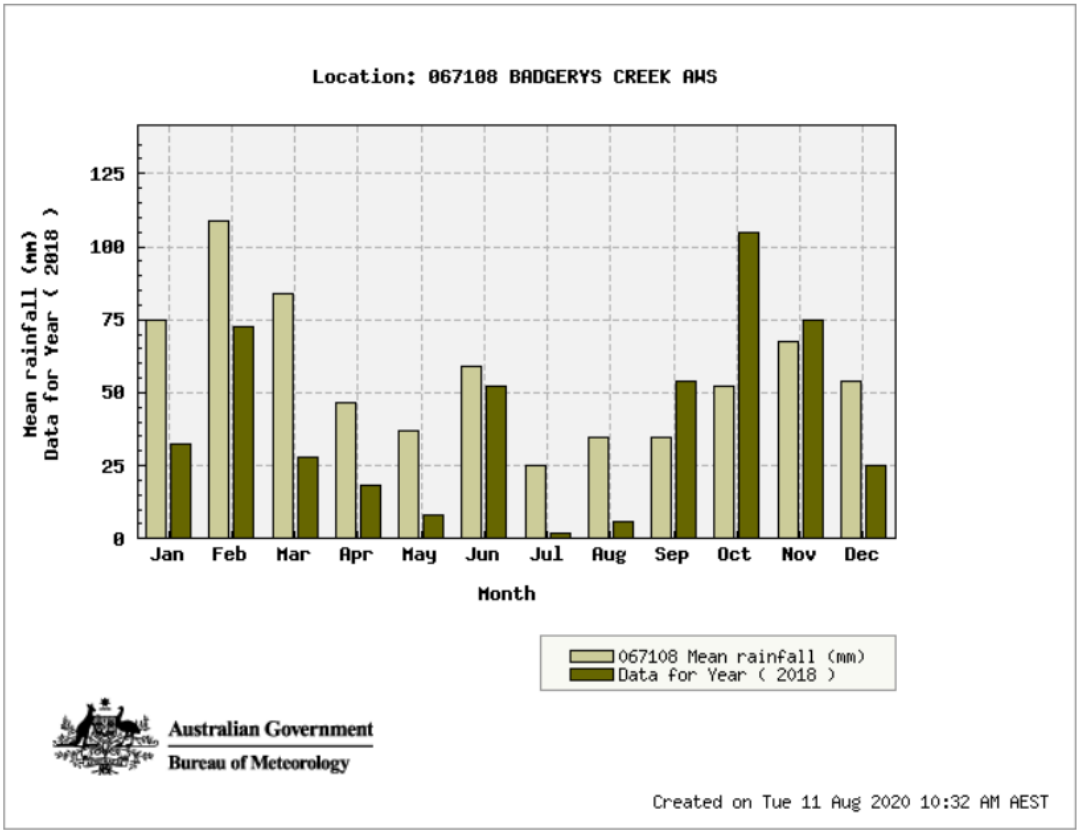
Location: 067108 BADGERYS CREEK AWS
Mean rainfall (mm)
Data for Year (2018)
125
100
75
50
25
0
Jan
Feb
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Apr
May
Jun
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Month
067108 Mean rainfall (mm)
Data for Year (2018)
Australian Government
Bureau of Meteorology
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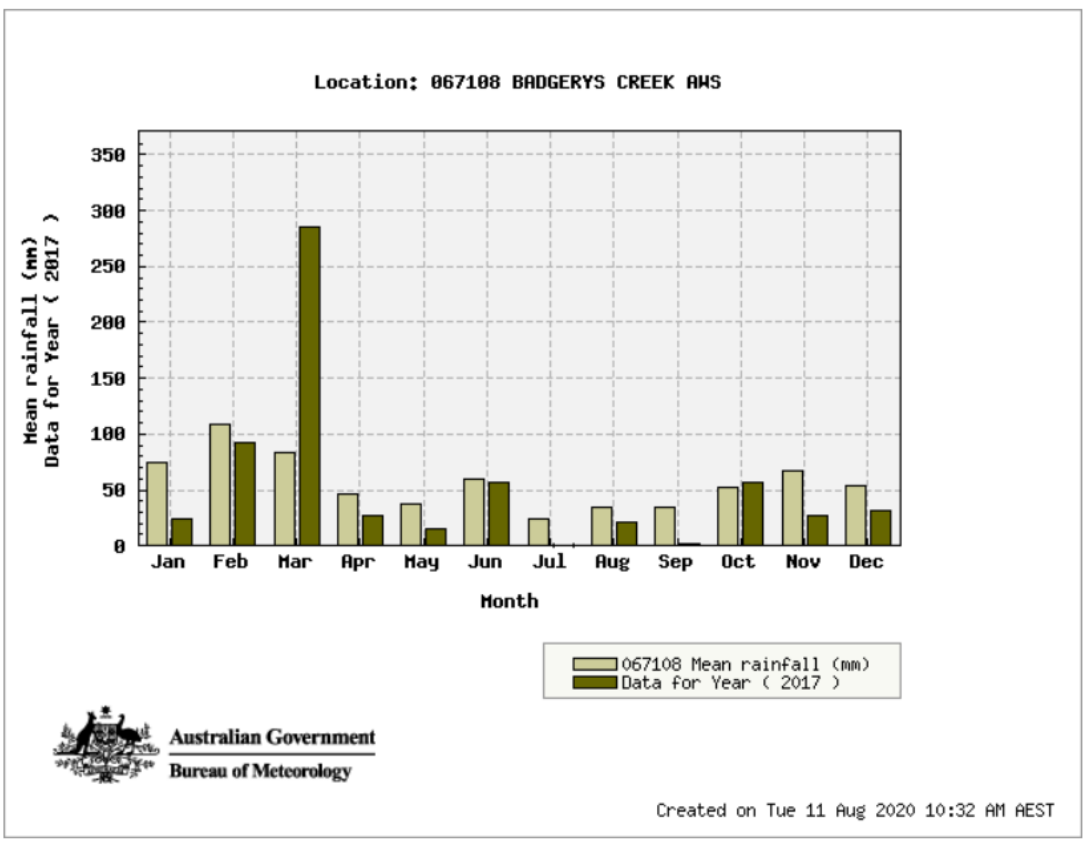
Location: 067108 BADGERYS CREEK AWS
Mean rainfall (mm)
Data for Year (2017)
350
300
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100
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Jan
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067108 Mean rainfall (mm)
Data for Year (2017)
Australian Government
Bureau of Meteorology
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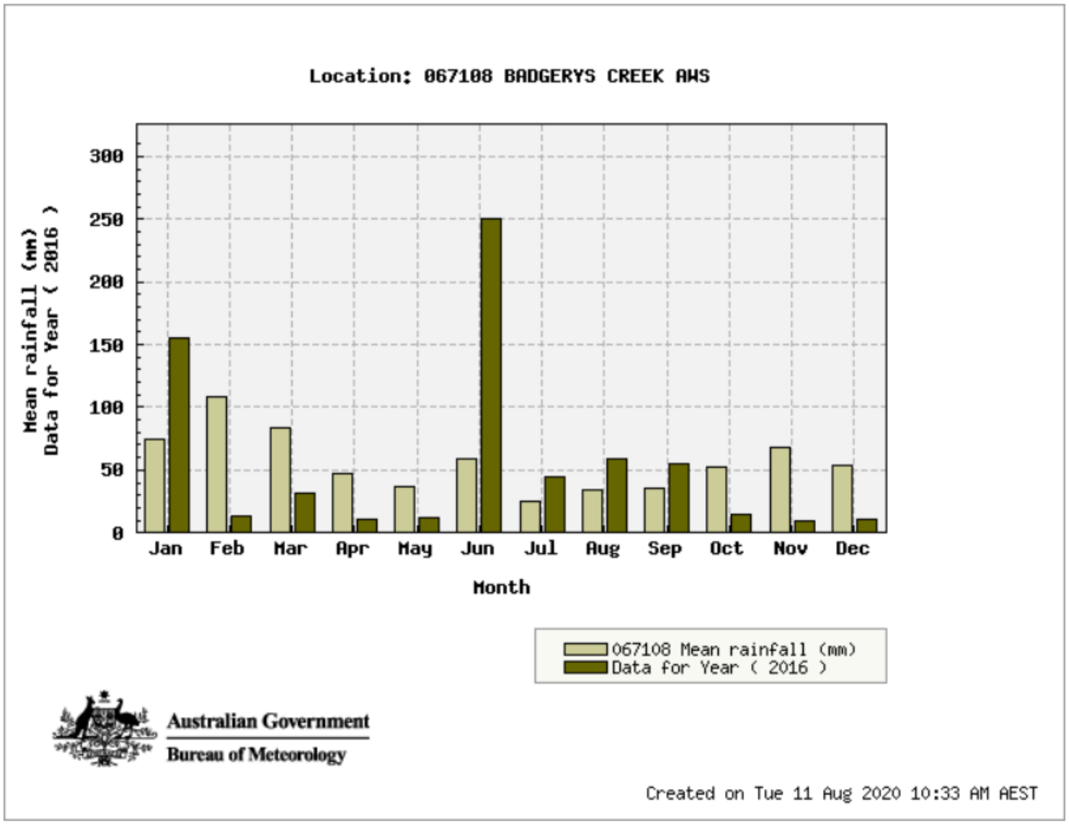
Location: 067108 BADGERYS CREEK AWS
Mean rainfall (mm)
Data for Year (2016)
300
250
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Jan
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Month
067108 Mean rainfall (mm)
Data for Year (2016)
Australian Government
Bureau of Meteorology
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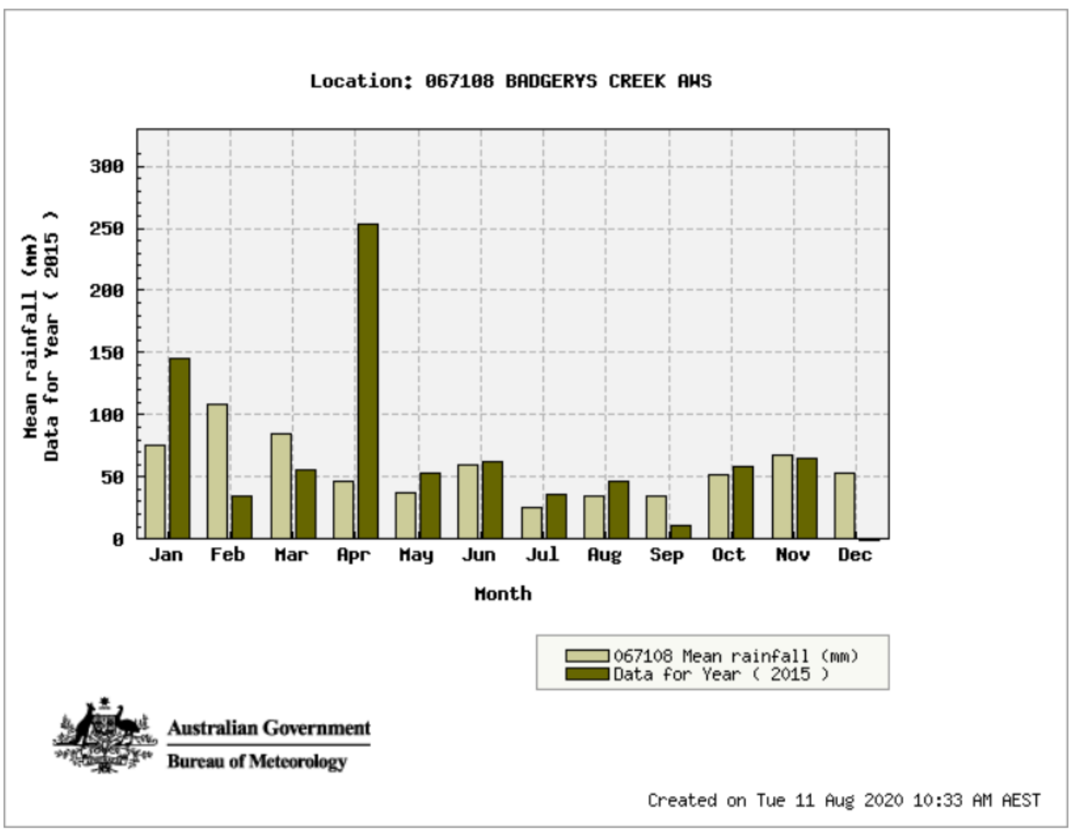
Location: 067108 BADGERYS CREEK AWS
Mean rainfall (mm)
Data for Year (2015)
300
250
200
150
100
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Jan
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Mar
Apr
May
Jun
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Aug
Sep
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Nov
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Month
067108 Mean rainfall (mm)
Data for Year (2015)
Australian Government
Bureau of Meteorology
Created on Tue 11 Aug 2020 10:33 AM AEST