Appendix 11 Air Quality Assessment

RENASCOR BAM PROJECT

Air Quality Assessment
Bolivar UPSG Processing Facility

Prepared for:

JBS&G

SLR Ref: 650.30016-R01
Version No: -v1.4
January 2024

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 1/ 89 Pirie Street
Adelaide SA 5000
T: +61 8 8998 0151
E: adelaide@slrconsulting.com   www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with JBS&G (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
650.30016-R01-v1.4	18 January 2024	J Meline	J A Cox	J Meline
650.30016-R01-v1.3	21 August 2023	J Meline	J A Cox	J Meline
650.30016-R01-v1.2	23 May 2023	J Meline	J A Cox	J Meline
650.30016-R01-v1.1	22 May 2023	J Meline	J A Cox	J Meline
650.30016-R01-v1.0	15 February 2023	J Meline	J Shepherd	J Meline

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

CONTENTS

APPENDICES

1 Introduction

As part of Renascor's Siviour battery anode material (BAM) project with mining and concentration of graphite ore on the Eyre Peninsula, Renascor is seeking approval for a facility to produce uncoated purified spherical graphite (UPSG) near Bolivar in South Australia.

The UPSG facility will refine and purify graphite concentrate, incorporating mechanical shaping and hybrid thermal-chemical purification processes and produce a micronised, spheronised and highly purified (greater than 99.95% carbon) graphite product graded by particle size. Graphite, when refined to purified spherical graphite (PSG), is an essential mineral resource in the manufacture of anodes for lithium-ion batteries, a sector which is projected to experience significant growth in the coming decades.

The UPSG facility is proposed as a two-stage development with Stage 2 effectively doubling the capacity of Stage 1.

SLR was engaged by JBS&G to prepare this air quality assessment for the approvals for the facility.

The air quality assessment was based on dispersion modelling with emissions included from the operations as for the full development of the site (Stage 2).

Full details on what is proposed for the facility are not included in this report. Some of the information regarding the production is commercial in confidence[1].

[1] Renascor considers that some of the information required to be provided to satisfy the EIS assessment requirements is commercially sensitive. Specific and detailed information that relates to equipment, reagents, wastewater treatment and by-products could be utilised by competitors or potential customers to Renascor's commercial disadvantage.

2 Description of Site Location and Operations

2.1 Site Location

The location proposed for the UPSG facility is on land owned by SA Water adjacent to the Bolivar wastewater treatment plant (WWTP) and nearby to the Waterloo Corner Interchange of the North-South Motorway as presented in **Figure 1**.

Figure 1 Site Location

2.2 Facility Operations

PSG is produced in a two-production step process consisting of:

- Mechanical shaping through a milling process for micronisation and spheronisation of the graphite concentrate to micronised (less than 50 microns) and spherical form.
- Purification with cleaning and concentration of the shaped graphite by a hybridised thermal-chemical caustic roast process and acid leach stages into a highly purified product suitable for the production of lithium-ion battery anodes.

Following the purification the PSG product will be dried and packaged for distribution.

The facility will receive flake graphite concentrate at a quality of approximately 95% carbon from the Siviour Graphite Mine by road transport. Packaged PSG products will be transported by road to Port Adelaide for export.

Waste products that cannot be reused in the process are neutralised through chemical precipitation and dried. Graphite fines produced through the micronisation/spheronisation process will either be a waste product or saleable by-product dependant on feasibility and demand for the product.

Key components of the UPSG facility include:

- Structures associated with mechanical processing:
  - industrial buildings
  - silos
  - truck loading and unloading facilities, access and egress
  - product bagging plant equipment, including pneumatic conveyance and feed hoppers
  - mechanical, hydraulic and pneumatic conveyance and feed structures for the purpose of moving graphite concentrate, partially and wholly processed UPSG, chemical reagents and process by-products within the plant
  - chemical storage equipment suitable for the storage of solid and liquid, caustic and acidic reagents including appropriate bunding/hardstand
  - mineral crushing and grinding machinery comprising mechanical micronisation and spheronisation circuits, associated feed hoppers, dust mitigation, collection and conveyance structures, subject to final engineering design.
- Equipment associated with chemical processing:
  - caustic roast kiln (electric or gas-fired) including dry reagent mixing, cooling equipment, lump-breaking and pulping equipment
  - leach tanks (caustic and acid), filtration structures and repulp tanks
  - reverse osmosis (RO) water treatment equipment, including demineralisation brine capture and discharge
  - caustic process water treatment and neutralisation
  - acid process water treatment and neutralisation
  - solid process by-product isolation, drying and containment
  - process monitoring equipment.

- In addition, the UPSG facility will include either:
  - electric kiln, steam production and drying machinery, subject to availability of natural gas connection, or
  - fuel burning equipment including kiln and boiler structures, natural gas connection, stack emission scrubbers (electrostatic precipitators), and associated emissions monitoring and combustion management equipment, or
  - a combination of electric and gas-fired equipment associated with kiln processes, steam production and drying machinery, subject to the outcomes of the DFS.

The micronisation and spheronisation process involves a number of mills connected in trains. All exhaust stacks for the processing building contain dust control. The transport of graphite around the facility is through a pneumatic pipe system. This system is enclosed and include a number of dust collectors as described below at venting points. Layouts of a mill train building is shown in **Figure 2** and **Figure 3**.

Figure 2 Mill Train Building Layout

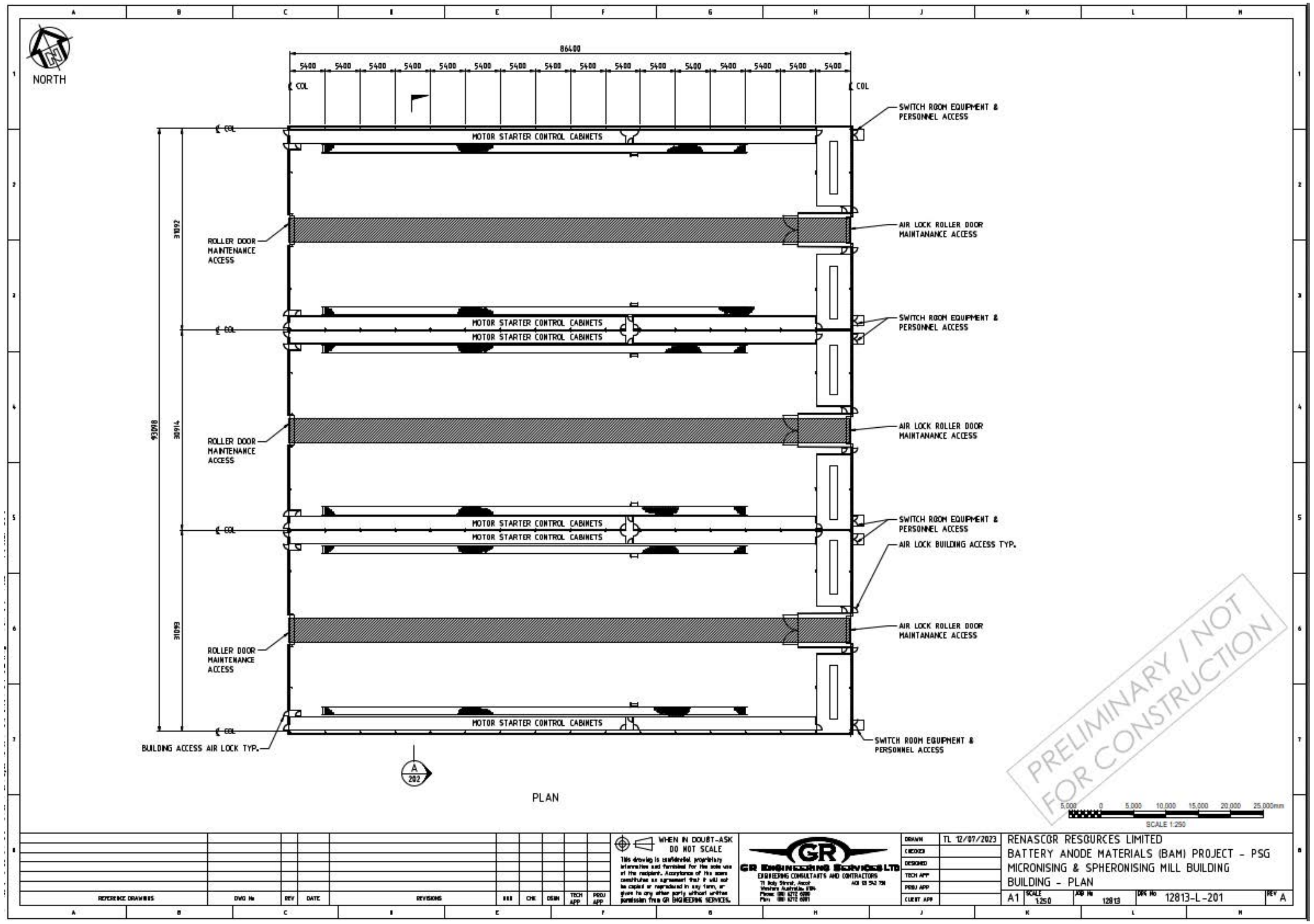
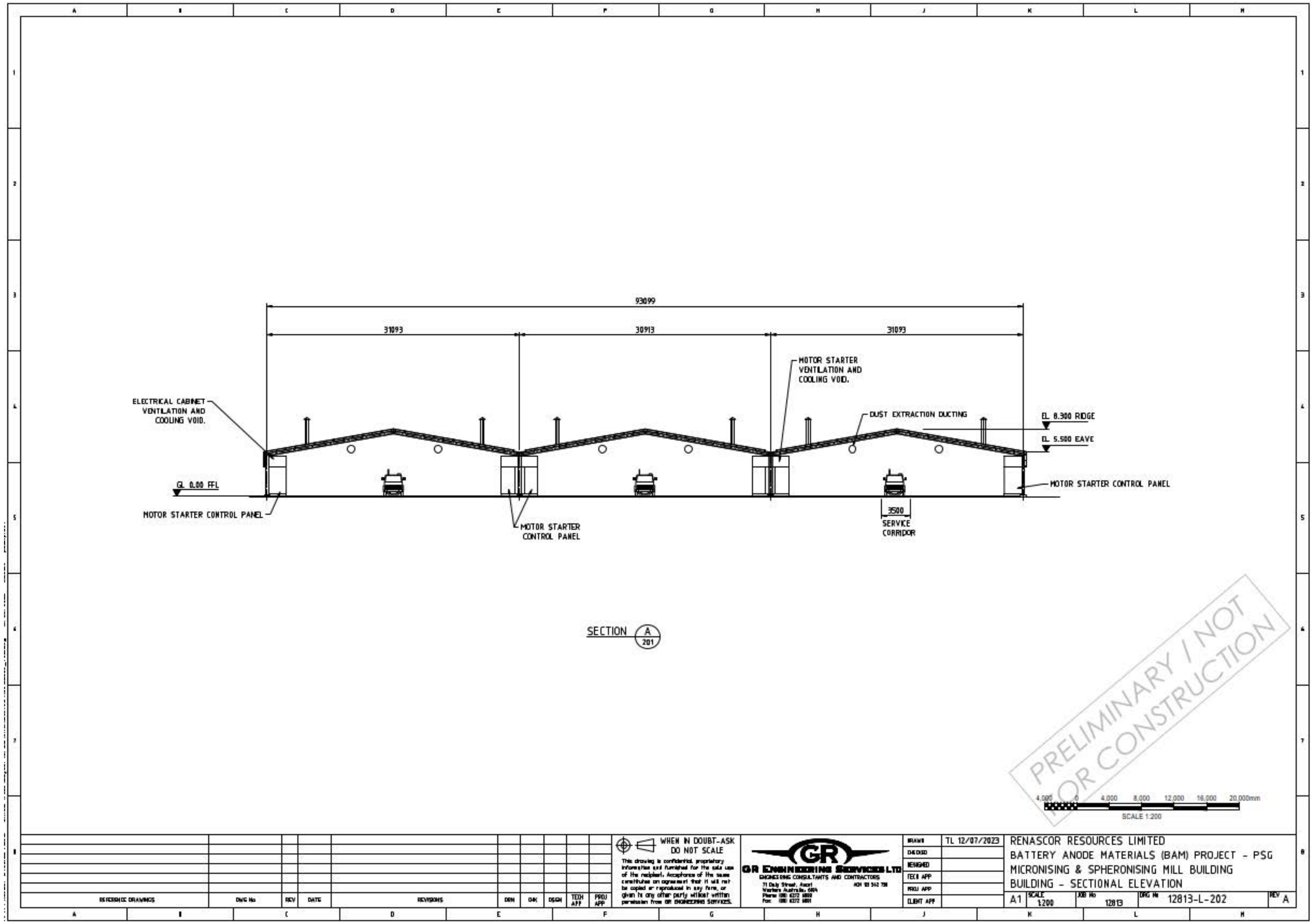


Figure 3 Mill Train Building Layout



2.3 Facility Air Emissions

A summary of the air emission sources included in the assessment, as identified from the project and process descriptions, are listed in **Table 1**.

The following pollutants were identified as emitted from the sources included in the assessment:

- Particulate matter as PM_{10} and $PM_{2.5}$ (equivalent aerodynamic diameters of 10 and 2.5 microns)
- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)
- Hydrogen sulfide (H_2S)

The potential for nuisance dust impacts from construction was also considered and is addressed in **Appendix C**. The potential for dust impacts from the facility construction was identified as low risk.

Table 1 Emission Sources

Stage 1	Stage 2
Micronisation A conservative number of stacks were modelled based on preliminary engineering design. Final number of stacks to be determined through detailed engineering. Separate dust collector for each stack. Emissions of particulate matter (PM_{10} and $PM_{2.5}$).	**Micronisation** Doubling of Stage 1 emission sources. Separate dust collector for each stack. Emissions of PM_{10} and $PM_{2.5}$.
Spheronisation A conservative number of stacks were modelled based on preliminary engineering design. Final number of stacks to be determined through detailed engineering. Separate dust collector for each stack. Emissions of PM_{10} and $PM_{2.5}$.	**Spheronisation** Doubling of Stage 1 emission sources. Separate dust collector for each stack. Emissions of PM_{10} and $PM_{2.5}$.
Mill train building ventilation exhaust Mill train building ventilation exhaust from dust collector. One ventilation point assumed for each two mill trains. A conservative number of emission points were modelled based on preliminary engineering design. Final number of vents to be determined through detailed engineering. Emissions of PM_{10} and $PM_{2.5}$.	**Mill train building ventilation exhaust** Doubling of Stage 1 emission sources. Emissions of PM_{10} and $PM_{2.5}$.
Rotary kiln stack 1 rotary kiln per stage. Emissions assuming gas fired kiln (as worst-case assumption of the kiln options). At the time of the assessment an electrically heated kiln was being considered as an option. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.	**Rotary kiln stack** 1 rotary kiln per stage. Emissions assuming gas fired kiln (as worst-case assumption of the kiln options). At the time of the assessment an electrically heated kiln was being considered as an option. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.
Rotary kiln dust collector/scrubber stack Emissions of PM_{10} and $PM_{2.5}$ from kiln of roasted product.	**Rotary kiln dust collector/scrubber stack** Emissions of PM_{10} and $PM_{2.5}$ from kiln of roasted product.
Alkaline gas scrubber stack 1 alkaline gas scrubber stack per stage. Emissions of residual H_2S from scrubber treatment.	**Alkaline gas scrubber stack** 1 alkaline gas scrubber stack per stage. Emissions of residual H_2S from scrubber treatment.
Spiral flash drier stack 1 flash drier per stage.	**Spiral flash drier stack** 1 flash drier per stage.

Stage 1	Stage 2
Emissions from stack from gas fired drier. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.	Emissions from stack from gas fired drier. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.
Steam boiler stack 1 boiler per stage. Emissions from stack from gas fired boiler. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.	**Steam boiler stack** 1 boiler per stage. Emissions from stack from gas fired boiler. Emissions of combustion gases: PM_{10}, $PM_{2.5}$, NO_2 and CO.
Pneumatic graphite transport system dust collectors A conservative number of emission points were modelled based on preliminary engineering design. Final number of vents to be determined through detailed engineering. Emissions of PM_{10} and $PM_{2.5}$.	**Pneumatic graphite transport system dust collectors** Doubling of Stage 1 emission sources. Emissions of PM_{10} and $PM_{2.5}$.

Considering the relatively low frequency of truck and vehicle movements[2] at the facility, particulate matter fugitive emissions from truck movements at site are deemed to be relatively insignificant and were therefore not included in the assessment.

2.1 Local Topography

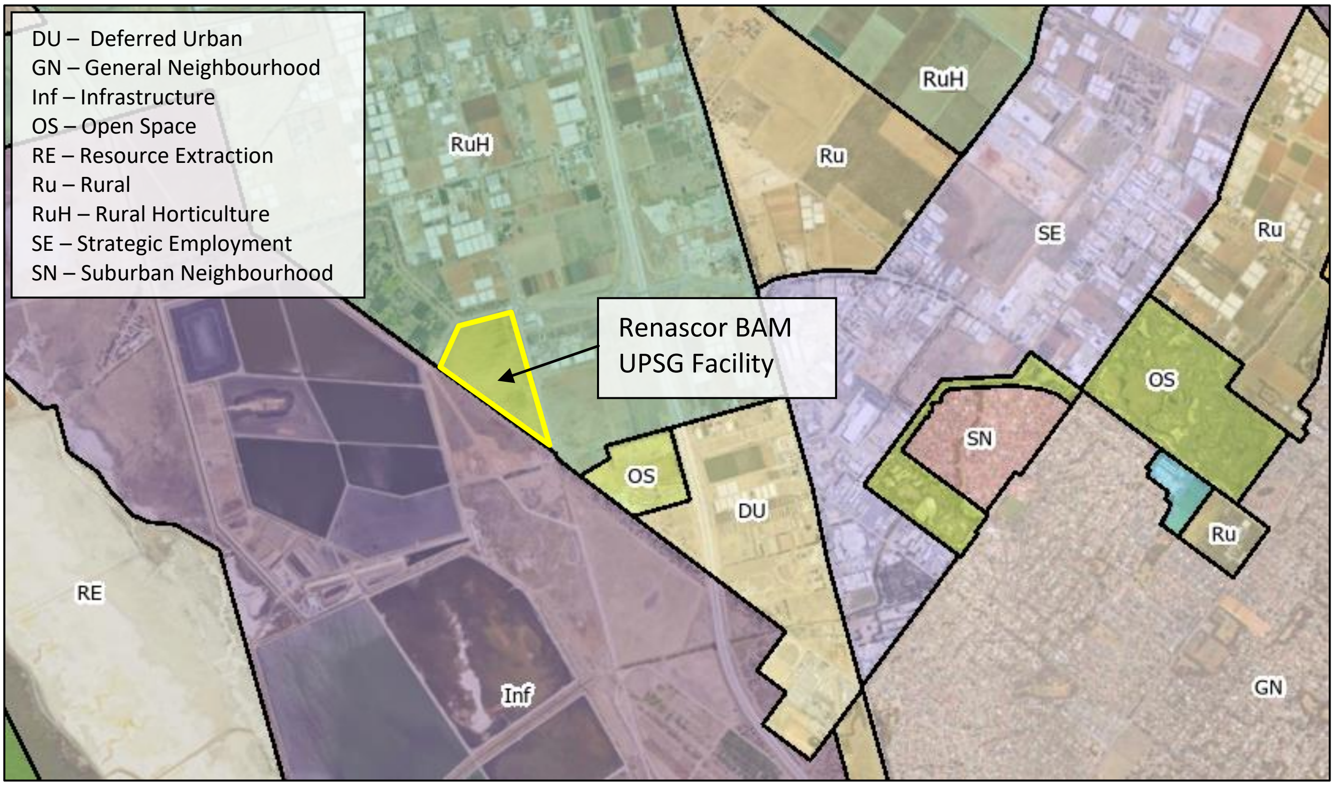
The land around the proposed facility location is essentially flat with a small rising gradient from the coastline towards inland. There are no significant terrain features in the vicinity with any potential to impact on the air quality situation as addressed in this assessment.

2.2 Land Use Zoning

The land use zoning in the area is presented in **Figure 4** and should to some extent be considered in the evaluation of the predicted air quality[3] impacts, at the nearest sensitive receptors.

[2] Less than one truck per hour.
[3] Mostly in relation to odour.

Figure 4 Land Use Zoning Surrounding the Project Location



Source: SA Property and Planning Atlas

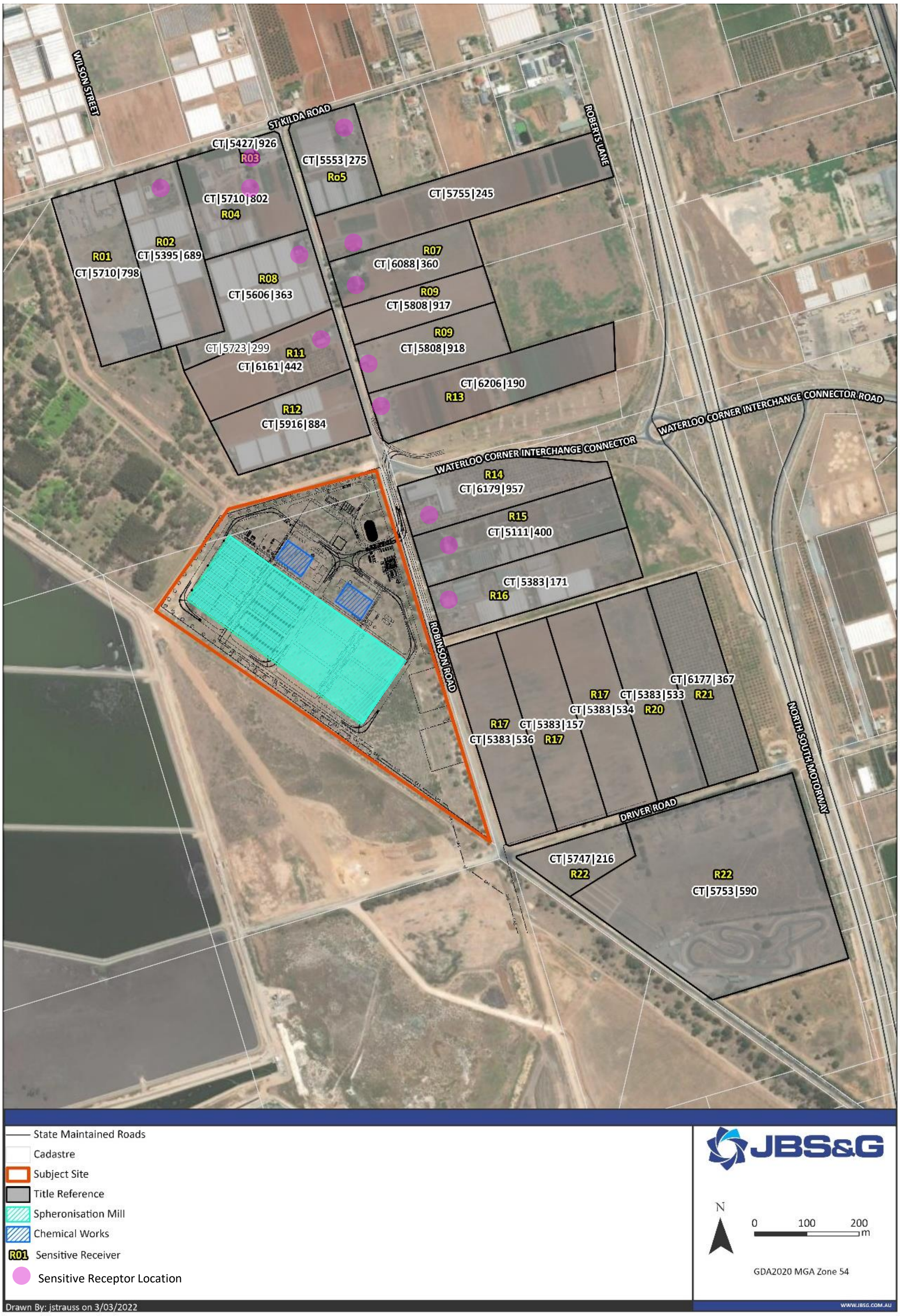
2.3 Sensitive Receptor Locations

The locations of the nearest sensitive receptors, identified as houses used as residences, by JBS&G and are presented in **Figure 5**.

The closest sensitive receptors (R14, R15 and R16) are located at a distance of approximately 120 m to the east of the facility activity-boundary of air emissions sources (purification plant[4]), included in the assessment.

[4] Rotary kiln, Alkaline gas scrubber, Spiral flash drier and Steam boiler

Figure 5 Sensitive Receptor Locations



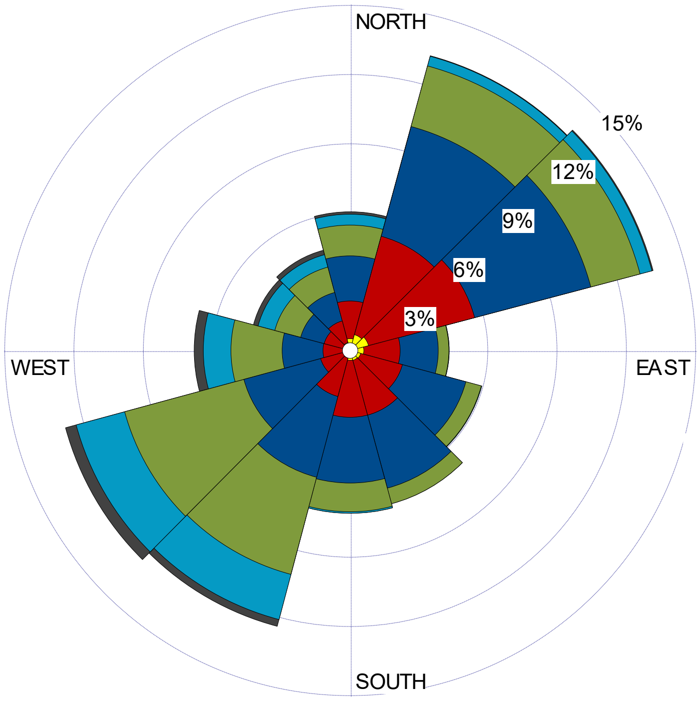
2.4 Local Meteorology - Wind Data

Wind data from the Bureau of Meteorology (BoM) Edinburgh automatic weather station (AWS) located approximately 5.5 km inland to the northeast of the proposed facility location is presented in **Figure 6** to **Figure 8**.

The prevailing wind directions in the area are southwesterly and northeasterly. Southwesterly winds are prevailing in summer months and afternoons and evenings (all year). Northeasterly winds are prevailing in winter months and nights and mornings (all year).

The closest sensitive receptors to the east of the facility on the other side of Robinson Road are in the prevailing downwind southwesterly wind direction. The wind speeds for this direction are however generally higher, which is favourable for dispersion.

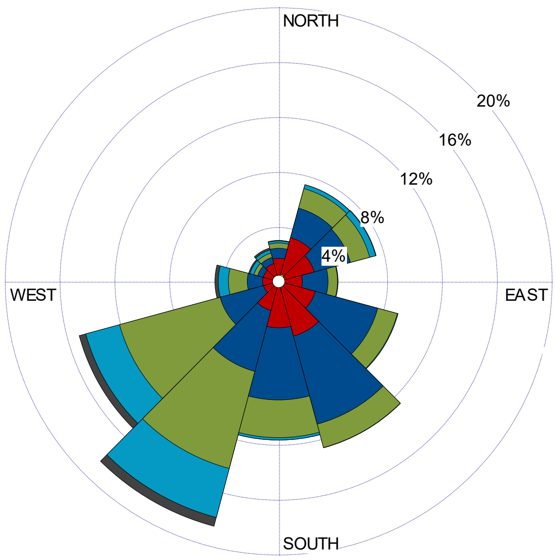
Figure 6 Annual Wind Rose



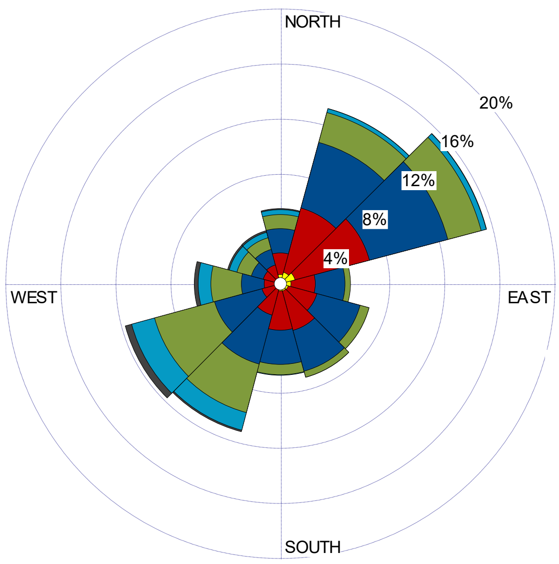
Location: Edinburgh BoM AWS	Data period: 2007 to 2021	Time period: All hours	Data type: Observation
Average wind speed: 4.5 m/s		Calm wind frequency: 1.7%	

Figure 7 Seasonal Wind Roses

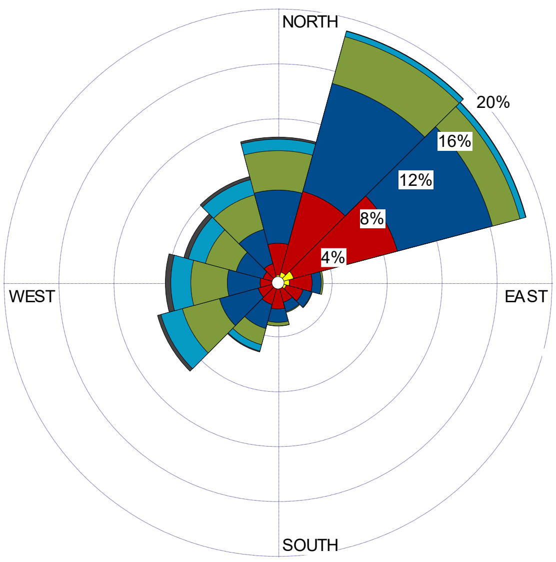
Summer:



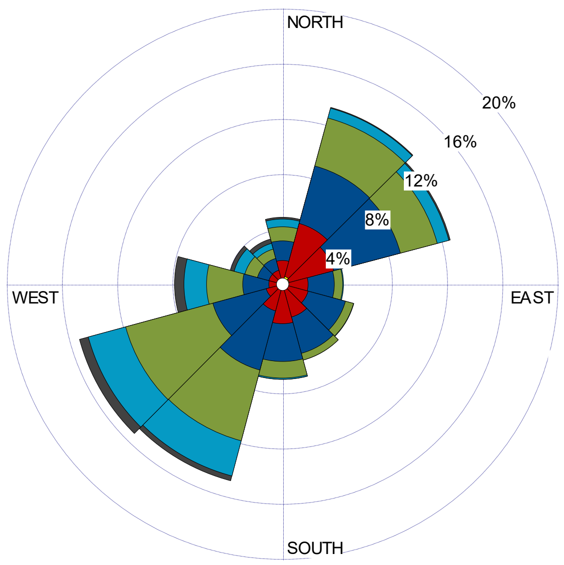
Autumn:



Winter:

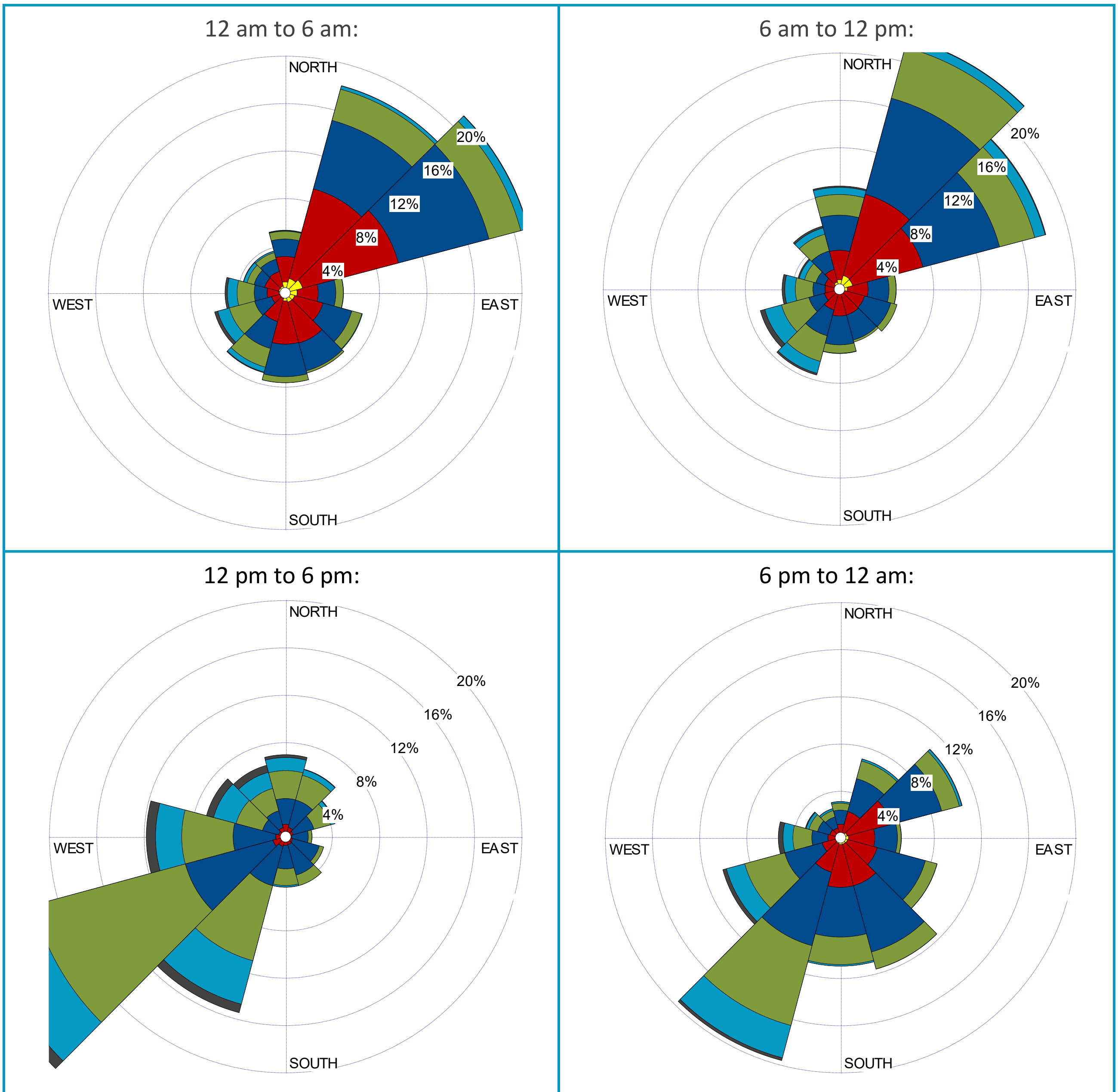


Spring:



Location: Edinburgh BoM AWS	**Data period:** 2007-2021	**Time period:** Seasonal	**Data type:** Observation
Average wind speed: Summer: 4.7 m/s Autumn: 4.1 m/s Winter: 4.2 m/s Spring: 7.9 m/s		**Calm wind frequency:** Summer: 1.1% Autumn: 2.4% Winter: 2.3% Spring: 1.1%	WIND SPEED (m/s) >= 10.80 8.00 - 10.80 5.30 - 8.00 3.00 - 5.30 1.50 - 3.00 0.50 - 1.50

Figure 8 Time of Day Wind Roses



Location: Edinburgh BoM AWS	**Data period:** 2007-2021	**Time period:** Time of day	**Data type:** Observation

Average wind speed:
12 am to 6 am: 3.5 m/s
6 am to 12 pm: 4.1 m/s
12 pm to 6 pm: 6.0 m/s
6 pm to 12 am: 4.3 m/s

Calm wind frequency:
12 am to 6 am: 2.9%
6 am to 12 pm: 2.2%
12 pm to 6 pm: 0.1%
6 pm to 12 am: 1.8%

WIND SPEED (m/s)
- >= 10.80
- 8.00 - 10.80
- 5.30 - 8.00
- 3.00 - 5.30
- 1.50 - 3.00
- 0.50 - 1.50

2.5 Existing Air Quality

2.5.1 Background Concentrations

The closest EPA ambient air quality monitoring stations are:

- North Haven (referred to as the North Western Adelaide – Le Fevre 2 station) approximately 9 km to the southwest of the project location and
- Elizabeth Downs (referred to as the Northern Adelaide – Elizabeth Downs station) approximately 12 km to the east northeast of the project location.

Of these two locations Elizabeth Downs is likely more representative of the project location. Le Fevre 2 arguably has more exposure to coastal conditions and industrial activities on Le Fevre peninsula.

A review of annual air quality data and statics for Elizabeth Downs for the years of data available was performed. The data is presented below and was used for selection of background concentrations for evaluation of the facility air emissions ground level concentrations against the Air EPP assessment criteria:

- PM_{10} data for 2008 to 2019 is presented in **Table 2**
- $PM_{2.5}$ data for 2016 to 2019 is presented in **Table 3**
- NO_2 data for 2002 to 2019 is presented in **Table 4**
- CO data for 2003 to 2016 is presented in **Table 5** and **Table 6.**

The air quality in Adelaide is generally good with only a few exceedances of Air EPP limits and air quality standards, mostly for PM_{10}.

It is noted that DATA SA does not have full data for any year after 2019 (only a few months for 2020 and 2021, and as such not included) available for download. CO monitoring is understood to have stopped in Elizabeth Downs in 2016 and is now only monitored by the EPA at the Adelaide CBD station location in South Australia.

The values selected for use as background concentrations are show in bold and summarised in **Table 7**.

Table 2 Elizabeth Downs PM_{10} 24 Hour Average Data 2008 to 2019

Year	Maximum 24 Hr Avg (µg/m³)	Number of Exceedances of Air EPP limit	90th Percentile 24 Hr Avg (µg/m³)	70th Percentile 24 Hr Avg (µg/m³)	Annual Average (µg/m³)	Data availability
2008	77.5	3	28.5	20.3	17.7	94%
2009	197.5	12	34.8	21.5	19.6	97%
2010	209.5	1	21.3	16.1	14.9	97%
2011	36.5	0	19.8	15.2	13.4	97%
2012	104.5	2	24.0	17.0	15.1	99%
2013	77.1	1	22.6	16.3	14.4	91%
2014	43.6	0	21.3	16.3	14.2	98%
2015	80.2	3	24.0	16.8	14.8	97%
2016	139.9	1	24.3	17.0	15.2	82%
2017	30.8	0	19.7	15.0	13.2	99%
2018	103.5	3	24.0	17.9	16.5	74%
2019	174.0	9	36.5	**22.5**	21.5	87%
2008-2019	209.5	35	25.1	17.4	15.8	79%

Source: (DATA SA, 2022)

Table 3 Elizabeth Downs $PM_{2.5}$ 24 Hour Average Data 2016 to 2019

Year	Maximum 24 Hr Avg (µg/m³)	Number of Exceedances of Air EPP limit	90th Percentile 24 Hr Avg (µg/m³)	70th Percentile 24 Hr Avg (µg/m³)	Annual Average (µg/m³)	Data availability
2016	13.9	0	7.2	5.3	4.5	99%
2017	16.2	0	9.8	**8.1**	**7.3**	85%
2018	15.8	0	9.1	7.2	6.4	73%
2019	33.0	1	8.3	6.5	6.1	98%
2016-2019	33.0	1	8.8	6.9	6.0	83%

Source: (DATA SA, 2022)

Table 4 Elizabeth Downs NO_2 1 Hour Average Data 2002 to 2019

Year	Maximum 1 Hr Avg (µg/m^3)	Number of Exceedances of Air EPP limit	90th Percentile 1 Hr Avg (µg/m^3)	70th Percentile 1 Hr Avg (µg/m^3)	Annual Average (µg/m^3)	Data availability
2002	82.1	0	24.6	10.3	9.4	94%
2003	87.6	0	19.8	7.9	7.6	97%
2004	75.3	0	21.3	9.6	8.9	95%
2005	78.0	0	20.5	8.6	8.3	95%
2006	87.2	0	20.5	10.3	8.9	89%
2007	80.0	0	18.5	8.2	7.1	94%
2008	63.6	0	18.5	8.2	7.4	93%
2009	57.5	0	18.5	8.2	6.8	97%
2010	71.8	0	20.5	8.2	8.3	95%
2011	63.6	0	18.5	8.2	7.0	95%
2012	55.4	0	16.4	6.2	6.2	93%
2013	116.6	0	18.5	7.9	7.6	95%
2014	175.5	0	19.8	8.9	8.7	95%
2015	57.5	0	20.5	8.2	8.3	95%
2016	51.3	0	14.4	6.2	5.6	81%
2017	71.8	0	20.5	10.3	9.1	75%
2018	65.7	0	18.5	10.3	8.6	84%
2019	61.6	0	16.4	**8.2**	**7.7**	91%
2002-2019	175.5	0	18.5	8.2	7.8	94%

Source: (DATA SA, 2022)

Table 5 Elizabeth Downs CO 1 Hour Average Data 2003 to 2016

Year	Maximum 1 Hr Avg (µg/m³)	Number of Exceedances of Air EPP limit	90th Percentile 1 Hr Avg (µg/m³)	70th Percentile 1 Hr Avg (µg/m³)	Annual Average (µg/m³)	Data availability
2003	3544	0	146	50	73	90%
2004	2621	0	112	35	57	96%
2005	2096	0	97	31	49	92%
2006	1762	0	112	25	38	86%
2007	1549	0	100	25	34	99%
2008	1562	0	75	25	40	96%
2009	1149	0	87	37	45	100%
2010	1924	0	87	37	44	98%
2011	1487	0	100	25	41	91%
2012	1737	0	75	25	30	94%
2013	1314	0	58	25	30	99%
2014	741	0	52	19	23	99%
2015	3223	0	50	25	27	97%
2016	825	0	50	12	21	99%
2003-2016	3544	0	85	**25**	39	95%

Source: (DATA SA, 2022)

Table 6 Elizabeth Downs CO 8 Hour Average Data 2003 to 2016

Year	Maximum 8 Hr Avg (µg/m³)	Number of Exceedances of Air EPP limit	90th Percentile 8 Hr Avg (µg/m³)	70th Percentile 8 Hr Avg (µg/m³)	Annual Average (µg/m³)	Data availability
2003	1758	0	181	63	73	92%
2004	1045	0	140	48	57	98%
2005	992	0	117	41	50	94%
2006	875	0	95	36	38	86%
2007	800	0	94	31	34	100%
2008	559	0	87	33	40	96%
2009	537	0	94	44	45	100%
2010	451	0	95	42	44	98%
2011	937	0	104	34	40	91%
2012	761	0	77	30	30	94%
2013	1254	0	65	26	30	99%
2014	284	0	56	23	23	99%
2015	1231	0	61	25	27	98%
2016	323	0	47	**22**	21	100%
2003-2016		0	91	34	39	96%

Source: (DATA SA, 2022)

A summary of the background concentrations applied in the assessment are presented in **Table 7.** These values were selected on conservative basis with a preference for a more recent year as to better reflect current conditions**.**

Table 7 Air Quality Data for Background Concentrations

Pollutant	Background Concentration	Averaging Time	Statistic	Monitoring Location	Percentile Year
PM_{10}	22.5 µg/m^3	24 hours	70th Percentile	Elizabeth Downs	2019
$PM_{2.5}$	8.1 µg/m^3	24 hours	70th Percentile		2017
	7.3 µg/m^3	12 months	Annual average		2017
NO_2	8.2 µg/m^3	1 hour	70th Percentile		2019
	7.7 µg/m^3	12 months	Annual average		2019
CO	25 µg/m^3	1 hour	70th Percentile		2003-2016
	22 µg/m^3	8 hours	70th Percentile		2016

Source: (DATA SA, 2022)

2.5.2 Odour

The facility is proposed to be located within a couple of hundred metres from the SA Water Bolivar WWTP sludge lagoons. Considering the scale of nearby the Bolivar WWTP sludge operations, it is expected that there will be odour from the WWTP present at times in the area surrounding the proposed facility. There are no significant odour emissions from the proposed facility apart from some low level H_2S emissions estimated for the alkaline scrubber stacks. No estimate on a potential background concentration of H_2S (as relating to odour) from the Bolivar WWTP sludge operations has been included. There is no data or assessment available on a potential background concentration of H_2S in the area.

3 Relevant Legislation, Policy and Guideline

The Environment Protection Act 1993 (EP Act) is the legislative foundation for regulating air quality in South Australia. Section 25 of the EP Act defines a General Environmental Duty to take all reasonable and practical steps to prevent or minimise environmental harm.

Environmental harm is defined under Section 5 of the EP Act as including harm, potential harm and environmental nuisance. Harm is further categorised as material or serious environmental harm, according to the nature and scale of its impacts.

From an air quality perspective, environmental harm is caused by air pollutants having toxic or adverse effects on human health or the environment. Effects may be long term (for example, chronic cardio-respiratory conditions) or short term (for example irritation of eyes and nose and triggering of asthma).

Environmental nuisance is often caused by odours or dust that interfere with the amenity of affected communities. Odours may be obnoxious, causing immediate discomfort. However, sometimes more pleasant odours can become unpleasant to people because they are exposed continuously. Dust may be visible as clouds and can deposit on surfaces, such as windowsills and doorsteps or cause soiling of clothes.

The General Environmental Duty is implemented through mandatory provisions of policies and environmental authorisations. In relation to air quality, the Environment Protection (Air Quality) Policy 2016 (Air EPP) incorporates a range of ground level concentrations, odour criteria and in-stack concentrations for assessing impacts of a wide range of air pollutants (SA EPA, 2016).

In addition to the Air EPP there are also the Ambient Air Quality Assessment guideline issued by the Environment Protection Authority South Australia (SA EPA) which provides general guidance on air quality assessment in South Australia (SA EPA, 2016).

As outlined in the Ambient Air Quality Assessment guideline, the EPA takes a risk-based approach to environmental protection. This is typically also reflected in air quality assessment requirements.

3.1.1 Air EPP Air Quality Assessment Criteria

For the evaluation of air quality impacts and assessment of compliance for the proposed PSG production facility, the predicted maximum ground level concentrations from the dispersion modelling were assessed against the Air EPP Schedule 2 ground level concentration assessment criteria as presented in **Table 8** at the nearest sensitive receptor locations, as presented in **Section 2.3**.

Predicted maximum ground level concentrations of PM_{10}, $PM_{2.5}$, NO_2 and CO were assessed cumulatively with background concentrations as selected in **Section 2.5**.

Table 8 Air EPP Ground Level Concentration Assessment Criteria

Pollutant	Classification	Averaging Time	Air EPP Maximum Ground Level Concentration (µg/m³)
PM_{10}	Toxicity	24 hours	50
$PM_{2.5}$	Toxicity	24 hours	25
		12 months	8
NO_2	Toxicity	1 hour	250
	Toxicity	12 months	60
CO	Toxicity	1 hour	31,240
	Toxicity	8 hours	11,250
H_2S	Odour	3 minutes	0.15
	Toxicity	3 minutes	510

Source: SA, 2016

3.1.2 Evaluation Distances

The Evaluation Distances for Effective Air Quality and Noise Management guideline provides recommendations on evaluation (separation) distances for air quality management across interfaces between activities with emissions and sensitive receptors (SA EPA, 2019).

The guideline evaluation distances for activities similar to the proposed activities with milling for the PSG production include:

- the evaluation distance of 300 m for crushing grinding or milling of chemical or rubber (non-odorous)
- the evaluation distance of 500 m for crushing, grinding or milling of rock, ores or minerals.

The evaluation distance for crushing, grinding or milling of rock, ores or minerals might seem relevant to consider, however from the activity description in the guideline it is understood that this evaluation distance is likely primarily intended for handling and processing of bulk materials. This is not the case for the PSG production which is an enclosed process for the handling and transport of the lightweight graphite material.

4 Assessment Methodology

An overview of the air quality impact assessment dispersion modelling methodology is provided in **Figure 9**. Details on each of the key aspects of the air quality assessment methodology are provided in the following sections.

Figure 9 Dispersion Modelling Assessment Methodology Overview

4.1 Dispersion Model and Meteorological Data

Dispersion modelling to predict the ground level concentrations of emissions to air from the facility was performed using the CALPUFF dispersion model. CALPUFF is widely used in Australia as a suitable dispersion model for a range of applications including assessments in complex meteorological/terrain settings, such as hilly terrain or near coastal areas with land/sea interactions on dispersion.

The meteorological data year for the assessment was selected based on a review of wind data for recent years (2007 to 2021) recorded at regional Bureau of Meteorology AWS including Edinburgh, Parafield and Outer Harbour, at distances of 5.5 to 10 km from the project site. The year 2020 was selected as the most average year with a conservative frequency of calms[5], which often can be indicator of poor dispersion conditions.

It is noted that the SA EPA has indicated a preference for the year 2009 for use in dispersion modelling. However, the year 2009 does not provide the most representative or conservative conditions for modelling in all locations. Data availability for 2009 compared to more recent years is also an emerging issue. A summary on the wind data statistics, wind roses, windspeed class frequencies, temperature and rainfall data for the selection of the meteorological data year is presented and plotted in **Appendix A**.

4.1.1 Processing of Meteorological Data

The dispersion modelling requires twelve months of hourly meteorological data. The Air Pollution Model (TAPM) was used to generate site-representative data for input into CALMET for further processing of the fine scale three-dimensional wind field data required for the CALPUFF dispersion model. CALMET was processed in two steps with an outer coarser grid as an intermediary step for preparing the inner CALMET fine resolution modelling domain.

- A description of TAPM is available in the model user manual (CSIRO, 2008).
- A description of the CALMET/CALPUFF model is available in the CALPUFF manual (SRC, 2011).

A summary of the meteorological model domain details is provided in **Table 9**. Evaluation of the processed meteorological data is provided in **Appendix B**.

[5] Low wind speeds <0.5 m/s. Near calms often reflect peak impact conditions for air quality assessments.

Table 9 TAPM and CALMET Modelling Domain Details

Model and Domain Settings	Details	Model and Domain Settings	Details	Model and Domain Settings	Details
TAPM		**CALMET Outer**		**CALMET Inner**	
5 nested grids	30 x 30 grid points	Domain size	25 km x 25 km	Domain size	12 km x 12 km
Grid point resolutions	30 km, 10 km, 3 km, 1 km	Receptor grid	500 m resolution	Receptor grid	100 m resolution
Domain origin centre point	E: 275,731 N: 6,151,946 Zone: 54S	Domain origin southwest corner	E: 263,231 N: 6,139,446 Zone: 54S	Domain origin southwest corner	E: 269,731 N: 6,145,946 Zone: 54S
Period	31/12/2019 to 01/01/2021	Period	01/01/2020 to 31/12/2020	Period	01/01/2020 to 31/12/2020
Modelled with wind assimilation data for Edinburgh, Parafield and Outer Harbour.		Initial guess field	3D output from TAPM	Initial guess field	CALMET outer

Further details on model settings can be provided as required.

4.1.2 Dispersion Model Configuration

A summary of the model details is provided in **Table 10**.

Table 10 CALPUFF Domain Details and Model Settings

Item	Details
Domain details	100 m resolution for 9 km by 9 km domain
Receptor details	100 m resolution for gridded receptors and sensitive receptor locations
Emissions data	Continuous emissions for all sources assumed as for 24/7 operations.
Stack/point sources	Due to the number of stack sources from the mill buildings included for the assessment, building wakes were not included in the dispersion modelling from these sources. The reason for this was the complications with the amount of BPIP input data required for entry for each model configuration file input. Also, the exhaust velocities from the two types of mill stacks were high (50.8 and 25.6 m/s) providing a low likelihood of building wake entrainment [a].

Further details on model settings can be provided as required.

[a] A review of the results showed this to be a reasonable assumption.

4.2 Emissions Estimation

Emission rates for the emission sources (see **Section 5**) were estimated based on emissions data and emissions factors as summarised in **Table 11**.

Table 11 Emissions Estimation Details

Emission source	Details
Micronisation	Micronisation mill PM_{10} and $PM_{2.5}$ emission rates calculated based on dust collector exhaust emission concentrations and fan rates.
Spheronisation	Spheronisation mill PM_{10} and $PM_{2.5}$ emission rates calculated based on dust collector exhaust emission concentrations and fan rates.
Mill train building ventilation exhaust	Mill train building exhaust ventilation PM_{10} and $PM_{2.5}$ emission rates calculated based on dust collector exhaust emission concentrations and building ventilation rates.
Rotary kiln stack	The rotary kiln combustion emission rates were estimated with emission factors based on the estimated gas consumption rate.
Rotary kiln dust collector stack/scrubber stack	PM_{10} and $PM_{2.5}$ emission rates were estimated based on the dust collector fan rate and the dust collector performance, as for other dust collectors proposed for the facility.
Alkaline gas scrubber stack	H_2S emission rate was estimated based on exhaust flow rate and concentration from test work data.
Spiral flash drier stack	The drier combustion emissions were estimated with emission factors based on the estimated gas consumption rate.
Steam boiler stack	The boiler combustion emissions were estimated with emission factors based on the estimated gas consumption rate.
Pneumatic graphite transport system dust collectors	PM_{10} and $PM_{2.5}$ emission rates from the graphite/product pipeline transport system calculated based on dust collector exhaust emission concentrations and information on the pneumatic system operation flowrates.

4.3 Air Quality Assessment Criteria

The dispersion modelling results were evaluated against the Air EPP air quality assessment criteria as presented in **Section 3.**

The potential for nuisance dust impacts was evaluated based on the PM_{10} dispersion modelling results, as presented in **Section 6,** showing a low level of PM_{10} impacts (a maximum incremental 24 hour average ground level concentration at the nearest sensitive receptor of 2.2 µg/m^3). The predicted low level incremental PM_{10} concentrations is indicative of a low risk of nuisance dust impacts[6].

To provide contingency and management of the operations without nuisance dust/particulate matter impacts an air quality management plan section was prepared as input for a site Environment Management Plan (included in **Appendix D**).

4.4 Air Quality Impacts from Construction

The potential for air quality impacts from the facility construction activities were reviewed using the Institute of Air Quality Management IAQM "Guidance on the Assessment of Dust from Demolition and Construction" developed in the United Kingdom by the (IAQM, 2014).

A summary of the assessment is provided in **Appendix C**. It was concluded that the risks associated with construction dust emissions is low with no specific concerns.

[6] Comparison against operational dust monitoring trigger levels in relation to nuisance dust risks (EPA Victoria, 2022).

5 Emissions Data

Emission rates used in the dispersion modelling were estimated based on emissions data and emission factors, as described in **Section 4.2,** and as summarised in **Table 12**.

Parameters for the stack sources used in the dispersion modelling are presented in **Table 13** and source parameters for the volume sources are presented in **Table 14**.

The building and the pneumatic graphite/product transport system dust collectors exhausts are emitted from wall mounted exhausts and were modelled as volume sources. The mill train building dust collectors were modelled with a separate source for each building. The pneumatic transport dust collectors were modelled represented by a single source for each stage located to the north of the mill train buildings[7].

All sources were modelled with continuous emissions as for continuous full production 24/7.

Table 12 Emissions Data, Emissions Factors and Emission Rates

Sources	Data and Emission Factors (per stack source)	Emission Rates (per source/stack) (g/s)	Comments
Micronisation mill stacks	Dust collector PM emission concentrations [a]: PM_{10}: 36 µg/m^3 $PM_{2.5}$: 17.8 µg/m^3 Exhaust flow rate: 5,750 m^3/hr [b]	PM_{10}: 0.000058 $PM_{2.5}$: 0.000028	Number of stacks commercial in confidence.
Spheronisation mill stacks	Dust collector PM emission concentrations [a]: PM_{10}: 36 µg/m^3 $PM_{2.5}$: 17.8 µg/m^3 Exhaust flow rate: 2,900 m3/hr [b]	PM_{10}: 0.000029 $PM_{2.5}$: 0.000014	Number of stacks commercial in confidence.
Rotary kiln stacks	Natural gas consumption rate: 0.407 T/hr [c] EF PM: 0.16 kg/T [d] EF NO_x: 3.68 kg/T [d] EF CO: 0.52 kg/T [d]	PM_{10}: 0.028 $PM_{2.5}$: 0.028 NO_2: 0.064 CO: 0.090	Total of 2 stacks. Assuming 10%[j] NO_x/NO_2 conversion
Rotary kiln dust collector stacks	Dust collector PM emission concentrations: PM_{10}: 50 µg/m^3 [h] $PM_{2.5}$: 25 µg/m^3 [h] Exhaust flow rate: 16,500 m^3/hr [f]	PM_{10}: 0.00023 $PM_{2.5}$: 0.00011	Total of 2 stacks.
Alkaline gas scrubber stacks	Scrubber H_2S concentration: 0.003 ppm [i] Exhaust flow rate: 700 m3/hr [f]	H_2S: 0.0000008	Total of 2 stacks.
Spiral flash drier stacks	Natural gas consumption rate: 0.248 T/hr [c] EF PM: 0.16 kg/T [d] EF NO_x: 0.155 kg/T [e] EF CO: 0.06 kg/T [e]	PM_{10}: 0.011 $PM_{2.5}$: 0.011 NO_2: 0.0011 CO: 0.0041	Total of 2 stacks. Assuming 10%[j] NO_x/NO_2 conversion
Steam boiler stacks	Natural gas consumption rate: 0.623 T/hr [c] EF PM: 0.16 kg/T [d] EF NO_x: 3.68 kg/T [d] EF CO: 0.52 kg/T [d]	PM_{10}: 0.018 $PM_{2.5}$: 0.018 NO_2: 0.042 CO: 0.060	Total of 2 stacks. Assuming 10%[j] NO_x/NO_2 conversion
Mill train building ventilation exhaust (2 train building)	Dust collector PM emission concentrations: PM_{10}: 50 µg/m^3 [f] $PM_{2.5}$: 25 µg/m^3 [f] Exhaust flow rate: 27,200 m^3/hr [f]	PM_{10}: 0.00038 $PM_{2.5}$: 0.00019	Number of vents commercial in confidence.

[7] The assumption to combine the emissions from these sources to a single source location was considered conservative considering the source locations in relation the nearest sensitive receptors.

Sources	Data and Emission Factors (per stack source)	Emission Rates (per source/stack) (g/s)	Comments
Mill train building ventilation exhaust	Dust collector PM emission concentrations: PM_{10}: 50 µg/m³ [f] $PM_{2.5}$: 25 µg/m³ [f] Exhaust flow rate: 40,800 m³/hr [f]	PM_{10}: 0.00057 $PM_{2.5}$: 0.00028	Modelled as volume sources
Pneumatic graphite transport system dust collectors	Dust collector PM emission concentrations: PM_{10}: 50 µg/m³ [h] $PM_{2.5}$: 25 µg/m³ [h] Exhaust flow rate: 800 m³/hr [g]	PM_{10}: 0.000011 $PM_{2.5}$: 0.0000056	Number of vents commercial in confidence.

[a] (Yilian, 2023)
[b] (Renascor, 2022a)
[c] (JBS&G, 2023a)
[d] (NPI, 2011) Table 20
[e] (NPI, 2002) Table 3
[f] (GRES, 2022)
[g] (JBS&G, 2023b)

[h] Assumption of performance same as for mill train building ventilation exhaust dust collector based on (JBS&G, 2023b)

[i] Kiln H_2S concentration determined from test work data <0.003 ppm (GRES, 2023)

[j] Emissions from combustion sources include nitrogen oxides (NO_x) as a mixture of nitric oxide (NO) and nitrogen dioxide (NO_2). The ratio depends on the combustion source, but is typically 5-10% NO_2 at point of source emission. Once emitted into the atmosphere, NO is oxidised to form NO_2. The rate at which this occurs is variable depending on ambient ozone and VOC concentrations as well as the rate of turbulent mixing of the plume with surrounding air and UV insolation. For this assessment, with the nearest sensitive receptors at a distance of less than 200 m from sources, 10% conversion of NO_x to NO_2 was assumed.

Table 13 Stack/Point Source Parameters

Source	Number of stacks	Stack Height (m)	Stack Diameter (m)	Exit Temperature (°C)	Exit Velocity (m/s)
Micronisation mill stacks – Stage 1&2	[a]	10	0.2	30	50.8
Spheronisation mill stacks – Stage 1&2	[a]	10	0.2	30	25.6
Rotary kiln stacks	2	21.6	0.7	450	22.3
Rotary kiln dust collector stacks	2	30.3	0.5	30	23.3
Alkaline gas scrubber stacks	2	15	0.175	30	8.1
Spiral flash drier stacks	2	23.2	1	96	14.3
Steam boiler stacks	2	16.7	0.2	100	57.3

[a] Number of stacks/production units commercial in confidence.

Table 14 Volume Source Parameters

Source	Number of Sources	Effective Height (m)	Sigma Y (m)	Sigma Z (m)
Mill train building dust collection exhausts	[a]	4.2	8	2
Pneumatic graphite transport system dust collectors	[a]	4.2	8	2

[a] Number of units commercial in confidence.

All building dust collector sources per stage modelled combined as 2 separate volume sources (one per stage)

Note: Volume source dimensions assumed based on mill train building dimensions

6 Results

The predicted results for the dispersion modelling at the sensitive receptors are presented below in **Table 15** to **Table 19** and plotted in **Figure 10** to **Figure 17**.

The results show that the proposed facility operations, as assessed, have low incremental impacts with good margins to the Air EPP assessment criteria for PM_{10}, $PM_{2.5}$, NO_2, CO and H_2S at the nearest sensitive receptors.

6.1 PM_{10}

Table 15 Results Sensitive Receptor Locations PM_{10} Ground Level Concentrations

Sensitive Receptor	Maximum Predicted Ground Level Concentrations (µg/m³)	
	PM_{10} 24 Hour Average Incremental	PM_{10} 24 Hour Average Cumulative (Including Background)
R2	0.7	23.2
R3	0.7	23.2
R4	0.8	23.3
R5	0.6	23.1
R6	0.8	23.3
R7	1.0	23.5
R8	0.9	23.4
R9	1.3	23.8
R11	1.0	23.5
R13	1.5	24.0
R14	1.6	24.1
R15	1.7	24.2
R16	2.2	24.7
Air EPP Criterion (µg/m³)	**NA**	**50**
Background Concentration (µg/m³)	**NA**	**22.5**

Figure 10 Maximum Predicted PM_{10} 24 Hour Average Ground Level Concentrations

Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Criterion (red):	50 µg/m³
Statistic:	Maximum
Background Concentration: 22.5 µg/m³	
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

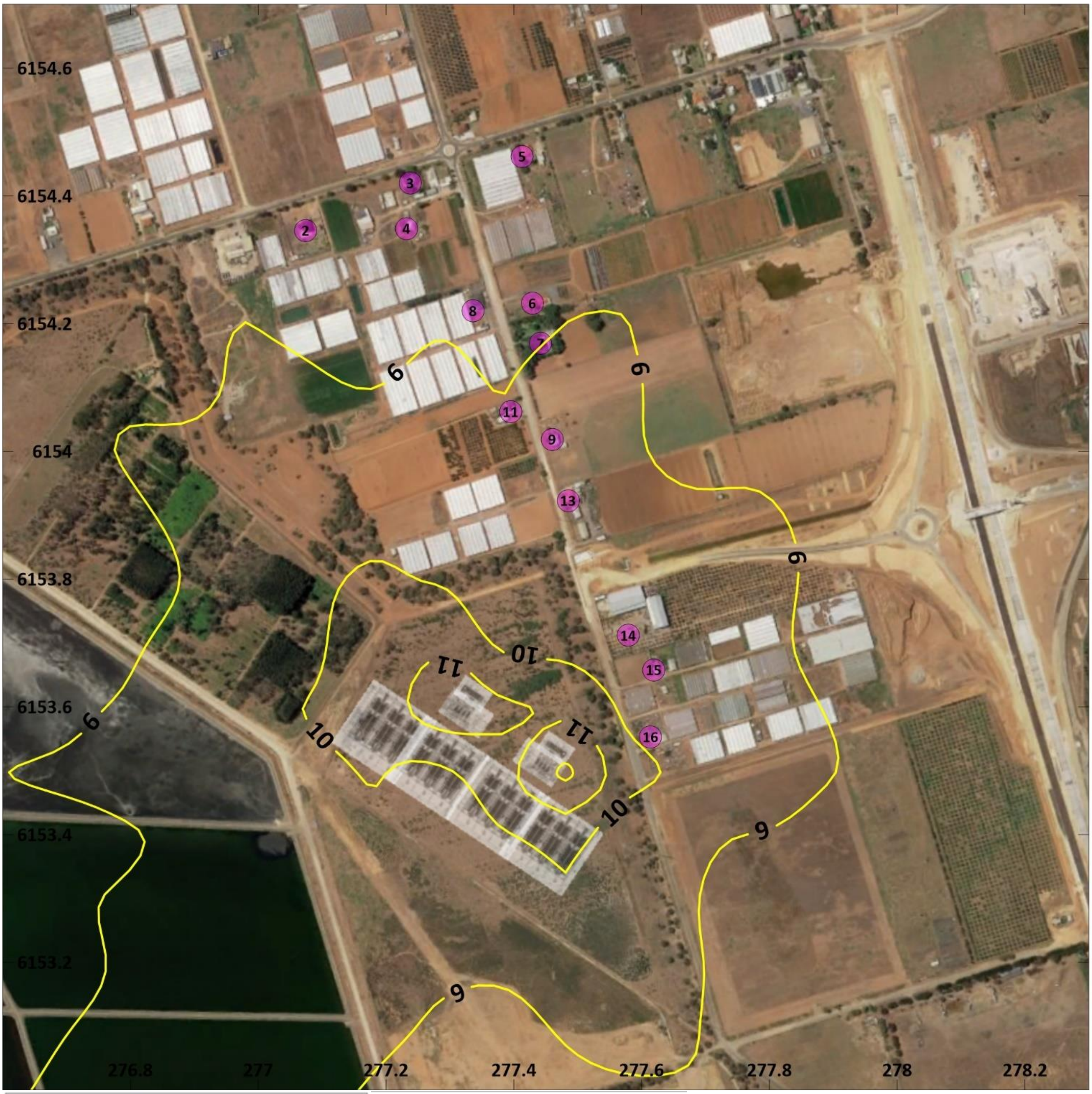
Pollutant: PM_{10} Avg Period: 24 hr Unit: µg/m³

6.2 $PM_{2.5}$

Table 16 Results Sensitive Receptor Location $PM_{2.5}$ Ground Level Concentrations

Sensitive Receptor	Maximum Predicted Ground Level Concentrations (µg/m³)			
	$PM_{2.5}$ 24 Hour Average		$PM_{2.5}$ Annual Average	
	Incremental	Cumulative (Including Background)	Incremental	Cumulative (Including Background)
R2	0.6	8.7	0.1	7.4
R3	0.6	8.7	0.1	7.4
R4	0.7	8.8	0.1	7.4
R5	0.5	8.6	0.1	7.4
R6	0.7	8.8	0.1	7.4
R7	0.8	8.9	0.1	7.4
R8	0.8	8.9	0.1	7.4
R9	1.2	9.3	0.1	7.4
R11	0.9	9.0	0.1	7.4
R13	1.3	9.4	0.2	7.5
R14	1.4	9.5	0.4	7.7
R15	1.5	9.6	0.3	7.6
R16	1.9	10.0	0.3	7.6
Air EPP Criterion (µg/m³)	**NA**	**25**	**NA**	**8**
Background Concentration (µg/m³)	**NA**	**8.1**	**NA**	**7.3**

Figure 11 Maximum Predicted $PM_{2.5}$ 24 Hour Average Ground Level Concentrations



Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Criterion (red):	25 µg/m³
Statistic:	Maximum
Background Concentration:	8.1 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: $PM_{2.5}$ Avg Period: 24 hr Unit: µg/m³

Figure 12 Predicted $PM_{2.5}$ Annual Average Ground Level Concentrations

Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Criterion (red):	8 µg/m³
Statistic:	Annual Average
Background Concentration:	7.3 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: $PM_{2.5}$ Avg Period: Annual Unit: µg/m³

6.3 NO_2

Table 17 Results Sensitive Receptor Location NO_2 Ground Level Concentrations

Sensitive Receptor	Maximum Predicted Ground Level Concentrations (µg/m³)			
	NO_2 1 Hour Average		NO_2 Annual Average	
	Incremental	Cumulative (Including Background)	Incremental	Cumulative (Including Background)
R2	2.4	10.6	0.1	7.8
R3	3.0	11.2	0.1	7.8
R4	3.1	11.3	0.1	7.8
R5	4.1	12.3	0.1	7.8
R6	5.2	13.4	0.1	7.8
R7	5.2	13.4	0.1	7.8
R8	4.7	12.9	0.1	7.8
R9	4.3	12.5	0.2	7.9
R11	4.9	13.1	0.2	7.9
R13	4.2	12.4	0.3	8.0
R14	4.4	12.6	0.5	8.2
R15	4.0	12.2	0.5	8.2
R16	5.3	13.5	0.4	8.1
Air EPP Criterion (µg/m³)	**NA**	**250**	**NA**	**60**
Background Concentration (µg/m³)	**NA**	**8.2**	**NA**	**7.7**

Figure 13 Maximum Predicted NO_2 1 Hour Average Ground Level Concentrations

Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

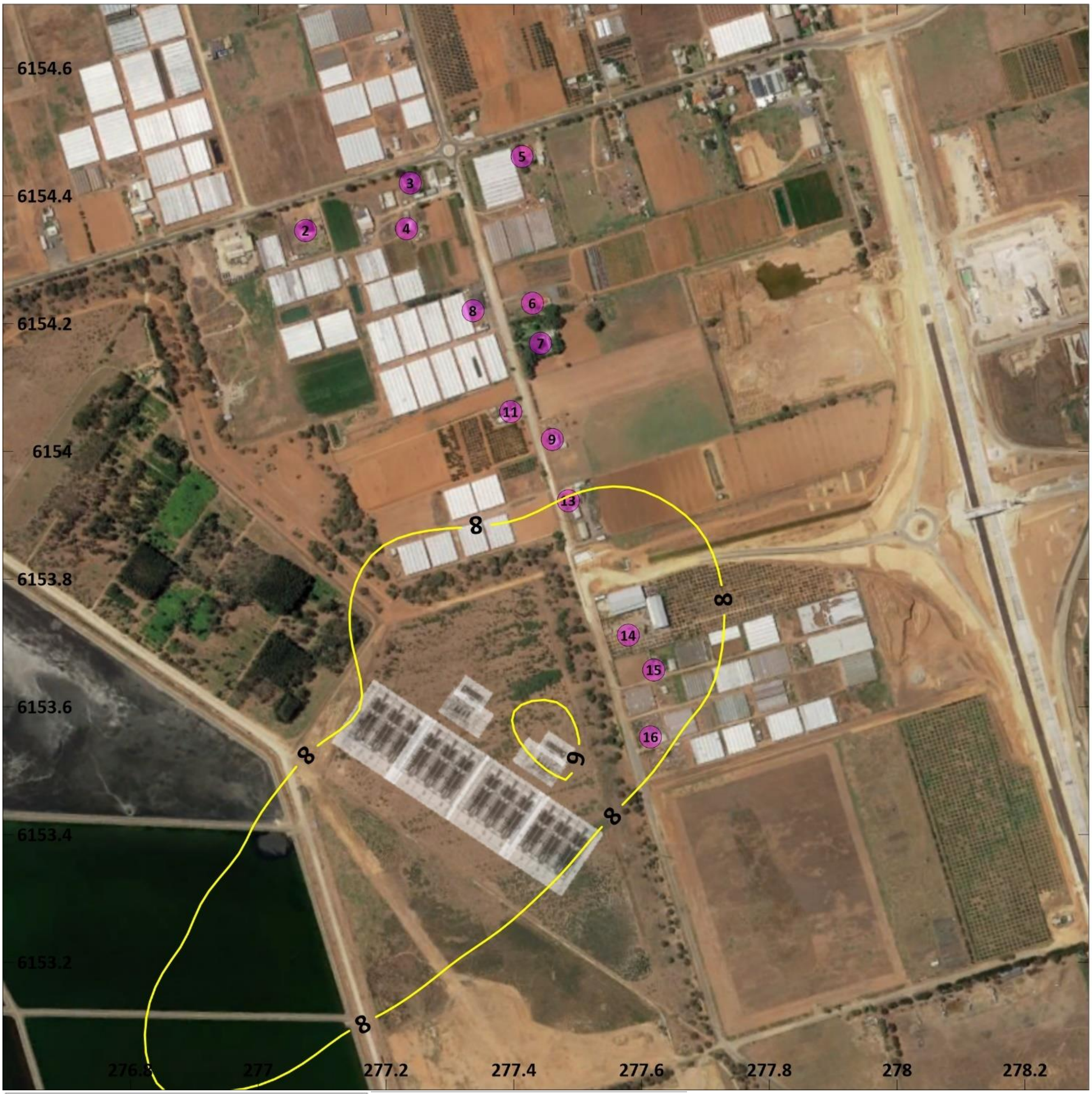
Air EPP Criterion (red):	250 µg/m³
Statistic:	Maximum
Background Concentration:	8.2 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: NO_2 Avg Period: 1 Hr Unit: µg/m³

Figure 14 Predicted NO_2 Annual Average Ground Level Concentrations



SLR
Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

Air EPP Criterion (red):	60 µg/m³
Statistic:	Annual Average
Background Concentration:	7.7 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: NO_2 Avg Period: Annual Unit: µg/m³

6.4 CO

Table 18 Results Sensitive Receptor Location CO Ground Level Concentrations

Sensitive Receptor	Maximum Predicted Ground Level Concentrations (µg/m³)			
	CO 1 Hour Average		CO 8 Hour Average	
	Incremental	Cumulative (Including Background)	Incremental	Cumulative (Including Background)
R2	4.4	29	3.1	25
R3	5.5	31	3.0	25
R4	5.8	31	3.3	25
R5	7.5	32	2.7	25
R6	9.5	35	3.3	25
R7	9.7	35	3.4	25
R8	8.7	34	3.5	25
R9	8.1	33	4.1	26
R11	9.2	34	4.0	26
R13	7.5	33	4.8	27
R14	7.1	32	5.3	27
R15	7.5	33	5.3	27
R16	8.9	34	6.3	28
Air EPP Criterion (µg/m³)	**NA**	**31,240**	**NA**	**11,250**
Background Concentration (µg/m³)	**NA**	**25**	**NA**	**22**

Figure 15 Maximum Predicted CO 1 Hour Average Ground Level Concentrations

SLR
Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Criterion (red):	31,240 µg/m³
Statistic:	Maximum
Background Concentration:	25 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: CO Avg Period: 1 Hr Unit: µg/m³

Figure 16 Maximum Predicted CO 8 Hour Average Ground Level Concentrations

Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Criterion (red):	11,250 µg/m³
Statistic:	Maximum
Background Concentration:	22 µg/m³
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: CO Avg Period: 8 Hr Unit: µg/m³

6.5 H_2S

Table 19 Results Sensitive Receptor Locations H_2S Ground Level Concentrations

Sensitive Receptor	Maximum Predicted Ground Level Concentrations (µg/m³)
	H_2S 3 Minute Average Incremental
R2	0.00011
R3	0.00011
R4	0.00011
R5	0.00009
R6	0.00012
R7	0.00014
R8	0.00012
R9	0.00020
R11	0.00015
R13	0.00024
R14	0.00027
R15	0.00029
R16	0.00040
Air EPP Criterion (µg/m³)	**Toxicity: 510** **Odour: 0.15**
Background Concentration (µg/m³)	**NA**

Figure 17 Maximum Predicted H_2S 3 Minute Average Ground Level Concentrations

SLR

Adelaide Office
Level 1/89 Pirie Street
Adelaide SA 5000
www.slrconsulting.com

The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

Air EPP Toxicity:	510 µg/m³
Air EPP Odour (red):	0.15 µg/m³
Statistic:	Maximum
Background Concentration:	NA
Date:	16/05/2023

Renascor UPSG Facility

Results Stage 1 & Stage 2

Pollutant: H_2S Avg Period: 3 min Unit: µg/m³

7 Conclusions

The air quality assessment of the Renascor BAM Bolivar UPSG processing facility demonstrates the following:

- The proposed facility operations, as assessed, are predicted to result in low incremental impacts with good margins to the Air EPP assessment criteria for PM_{10}, $PM_{2.5}$, NO_2, CO and H_2S at the nearest sensitive receptors.
- In relation to the results for PM_{10} and $PM_{2.5,}$ it is noted the dust collector performance (emission concentrations of PM_{10} and $PM_{2.5}$) as provided for the assessment is understood to be high (achieving low emission concentrations). Due to the number of sources included in the assessment, the dispersion modelling results can be considered to be strongly dependent on the dust collector performance as provided for the assessment.
- Considering the proximity to the Bolivar WWTP it is expected that there will be odour from the Bolivar WWTP sludge operations on occasion in the vicinity of the facility.

8 References

CSIRO. (2008). TAPM V4 User Manual, CSIRO Marine and Atmospheric Research Internal Report No. 5, October 2008 .

DATA SA. (2022, June). *South Australian Government Data Directory*. Retrieved from https://data.sa.gov.au/data/organization/environment-protection-authority-epa

EPA Victoria. (2022). *Guideline for Assessing and Minimising Air Pollution in Victoria, Publication 1961.*

GRES. (2022). *Spreadsheet: Environmental discharges.xlsx.*

GRES. (2023). *Email dated 2 May from GRES to SLR.*

IAQM. (2014). *Guidance on the Assessment of Dust from Demolition and Construction.*

JBS&G. (2023a). *Email communication from JBS&G, dated 23 January 2023.*

JBS&G. (2023b). *Email communication from JBS&G, dated 23 January 2023.*

JBS&G. (2023c). *Email communication from JBS&G, dated 7 February 2023.*

NPI. (2002). *EETM Timber and Wood Product Manufacturing V1.1.*

NPI. (2011). *EETM Combustion in Boilers V 3.6.*

Renascor. (2022a). *Email communication from Reanscor to JBS&G, dated 14 December 2022 .*

SA EPA. (2016). *Ambient Air Quality Assessment, August 2016 .*

SA EPA. (2019). *Evaluation distances for effective air quality and noise management.*

SRC. (2011). *CALPUFF Modelling System Version 6 User Instructions.*

Vic Gov. (2001). *Victorian Government Gazette. State Environment Protection Policy (Air Quality Managment). No. S 240 21 December 2001.* Victorian Government Printer.

Yilian. (2023). *Mill Noise and Dust Emissions Data.*

Appendix A:

Selection of Meteorological Data Year

2020 was selected as a representative and conservative assessment year considering BoM wind data from Edinburgh, Outer Harbour and Parafield. Additional data is presented below to provide comparison against long term conditions and the year 2009.

Long term annual average wind speed, frequency of calms and data availability for Edinburgh, Outer Harbour and Parafield are presented in **Table A-1**.

Long term and 2020 and 2009 wind roses for comparison for Edinburgh, Outer Harbour and Parafield are presented in **Figure A-1**.

Long term and 2020 and 2009 wind class frequency data for comparison for Edinburgh, Outer Harbour and Parafield are presented in **Figure A-2**.

Rainfall data comparing 2020 to long term conditions are plotted in **Figure A-3**.

Temperature data comparing 2020 to long term conditions are plotted in **Figure A-4**.

Table A-1 Annual Wind Data Statistics

BoM Station	Edinburgh			Outer Harbour			Parafield		
Year	Average Wind Speed	Calms	Data %	Average Wind Speed	Calms	Data %	Average Wind Speed	Calms	Data %
2007	4.61	1.32	99.61	5.64	0.14	99.92	4.32	3.39	99.71
2008	4.52	1.59	99.94	5.62	0.15	99.98	4.24	3.93	99.99
2009	4.6	1.67	99.12	5.74	0.19	98.05	4.32	4.13	99.94
2010	4.34	1.93	99.38	5.47	0.34	99.68	4.06	4.81	99.89
2011	4.21	1.64	98.66	5.39	0.25	98.78	3.99	4.74	99.81
2012	4.44	1.84	99.78	5.58	0.17	99.86	4.19	4.67	99.93
2013	4.59	1.32	99.97	5.7	0.3	100	4.35	3.42	99.99
2014	4.32	1.68	100	5.44	0.33	98.95	4.04	5.42	99.98
2015	4.29	2.31	99.98	5.45	0.25	97.26	4.05	5.8	99.97
2016	4.59	1.76	99.67	5.88	0.3	97.7	4.23	4.66	99.92
2017	4.28	2	99.95	5.46	0.51	100	3.99	6.4	99.97
2018	4.62	1.58	99.92	5.78	0.8	91.13	4.3	4.71	99.84
2019	4.57	2.01	100	5.69	0.23	96.26	4.17	5.66	99.98
2020 [a]	**4.46**	**1.94**	**99.99**	**5.77**	**0.35**	**95.82**	**4.17**	**6.09**	**99.91**
2021	4.43	1.55	99.53	5.76	0.37	97.64	4.13	5.31	99.98
Average all years	***4.46***	***1.74***	***99.7***	***5.62***	***0.31***	***98.07***	***4.17***	***4.88***	***99.92***

[a] Selected year

Figure A-1 Wind Rose Comparison of Years

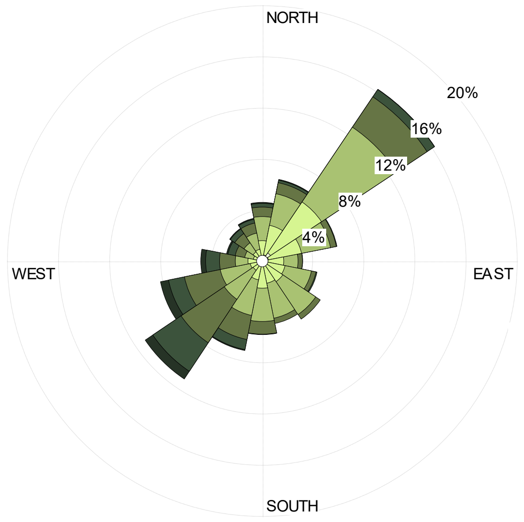
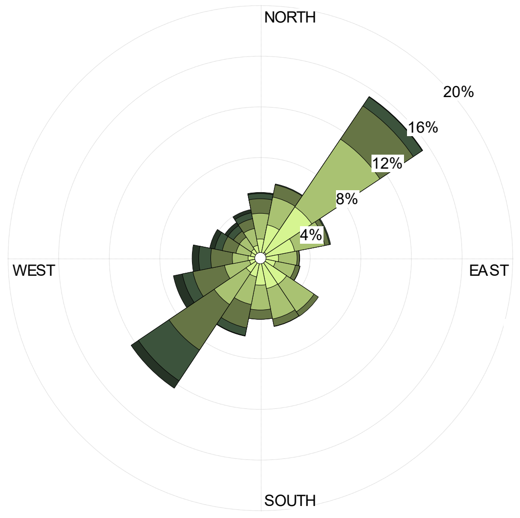
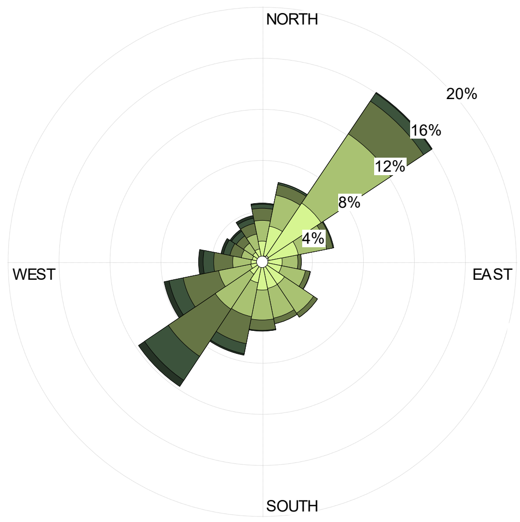
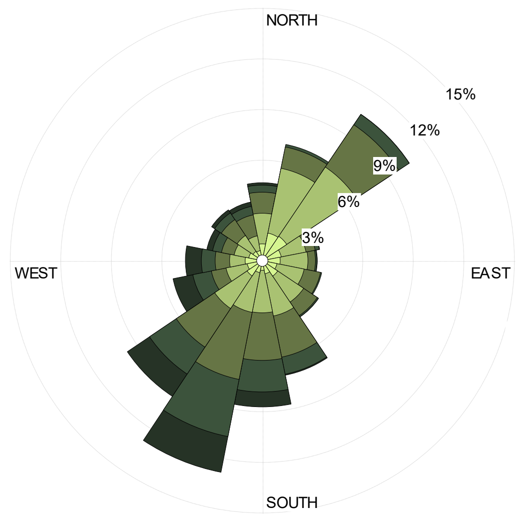
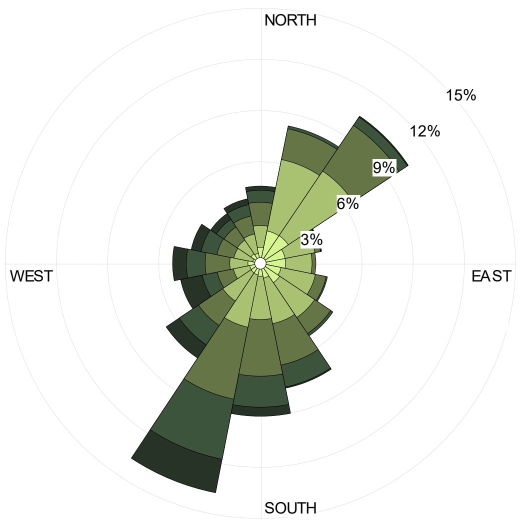
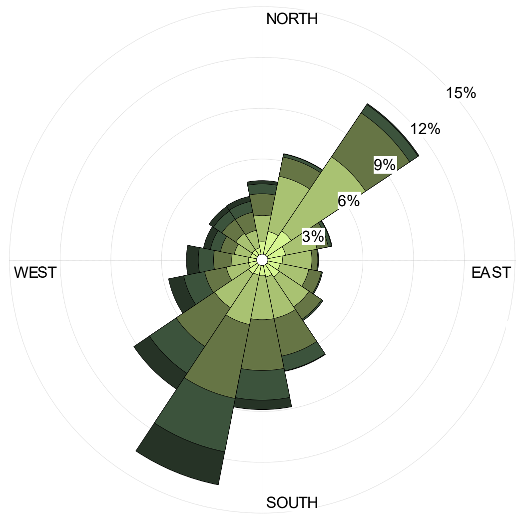
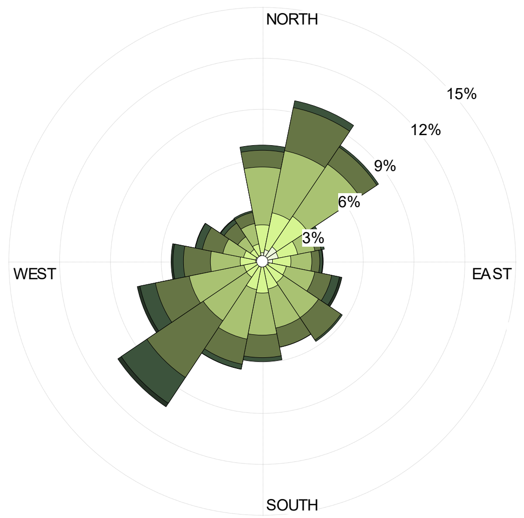
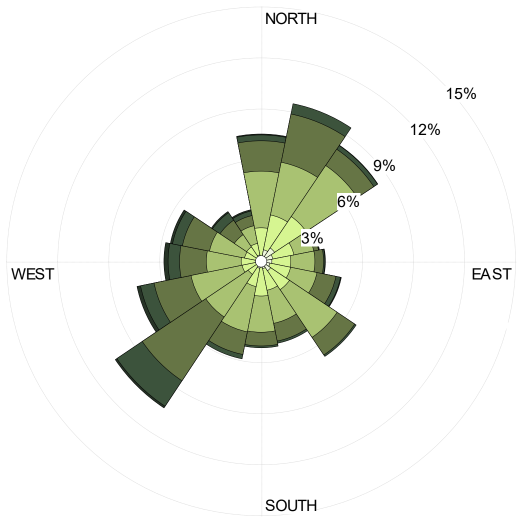
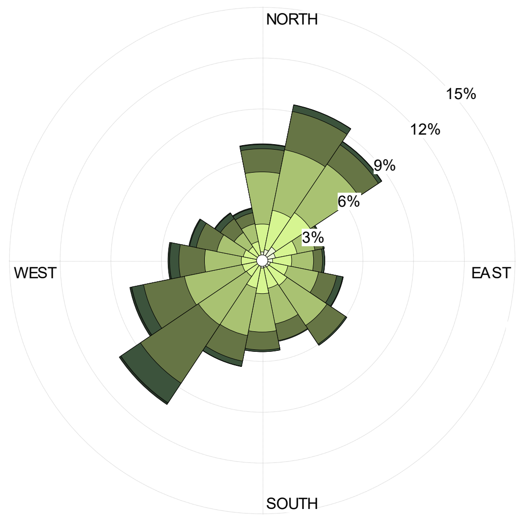
	Wind Rose for 2020	Wind Rose for 2009	Wind Rose for 2007 to 2021
Edinburgh			
Outer Harbour			
Parafield			

Figure A-2 Wind Class Frequency Comparison of Years

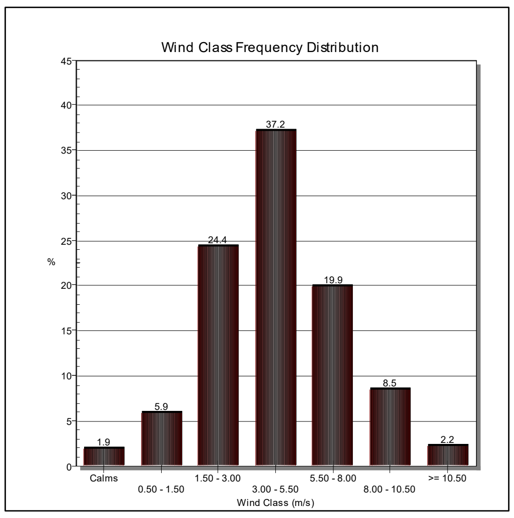
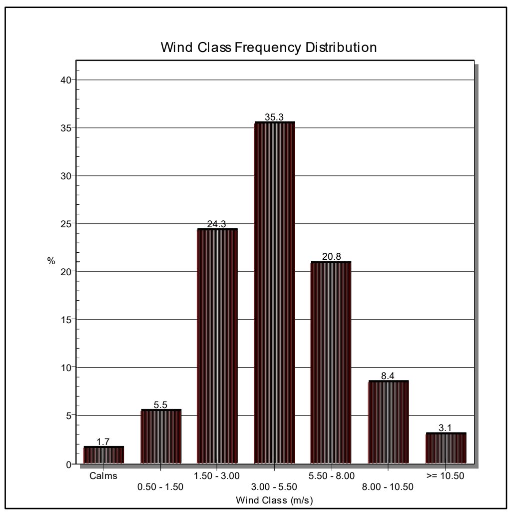
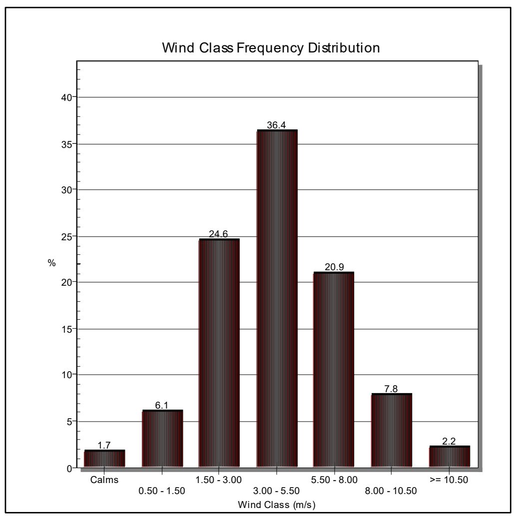
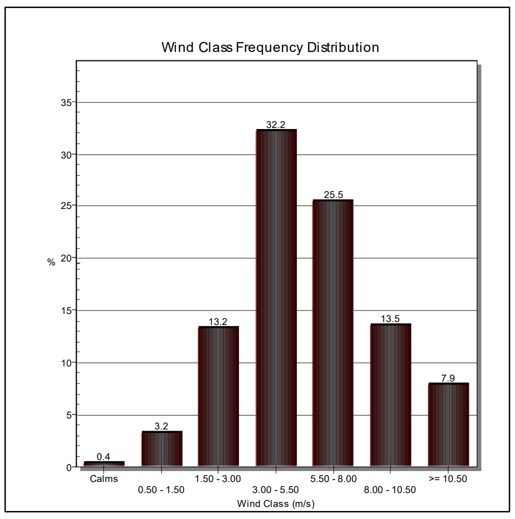
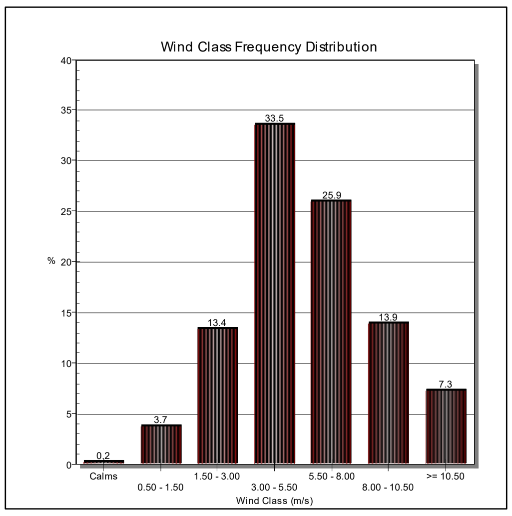
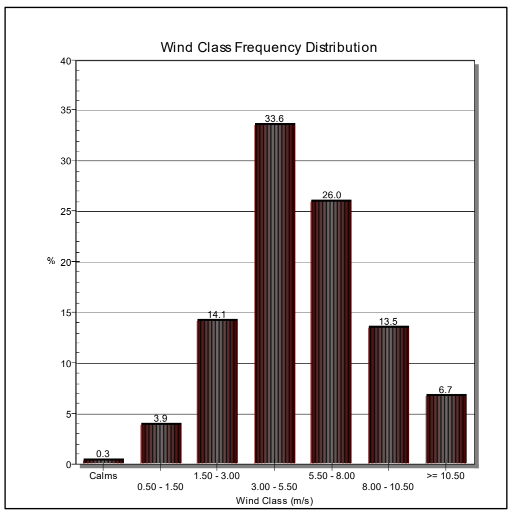
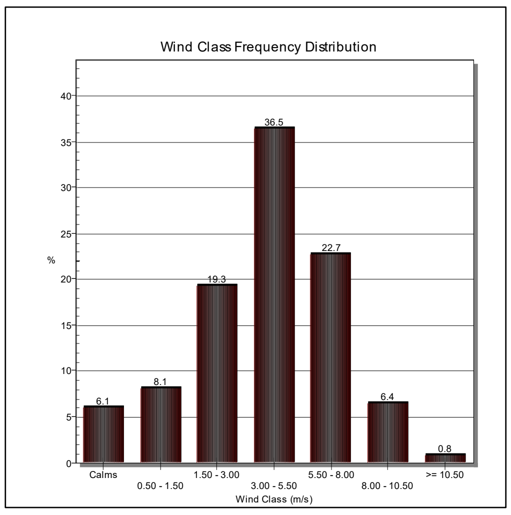
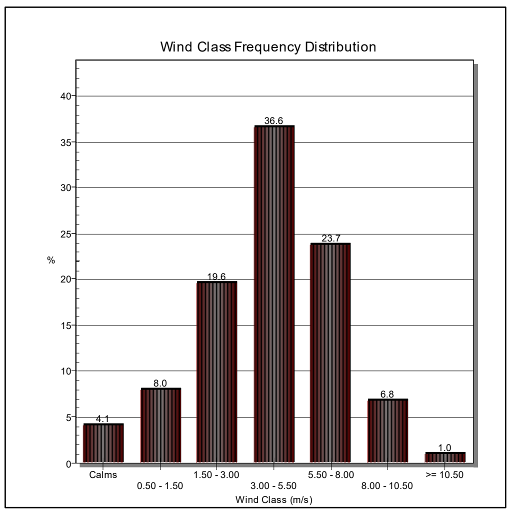
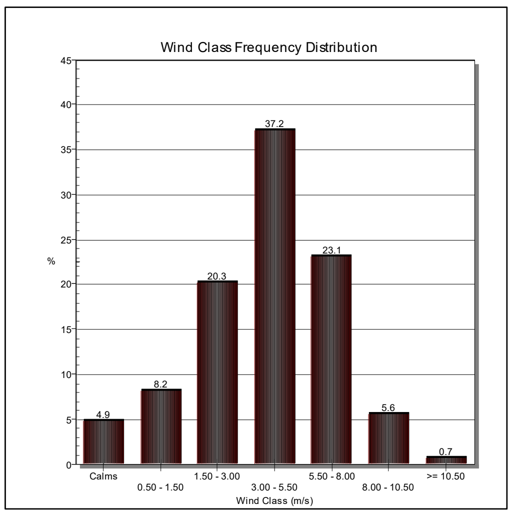
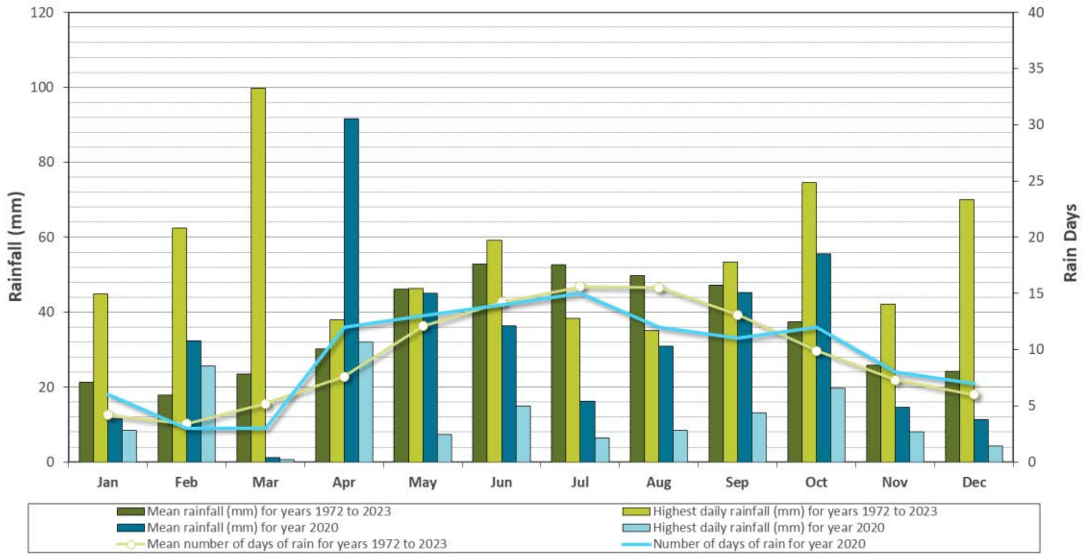
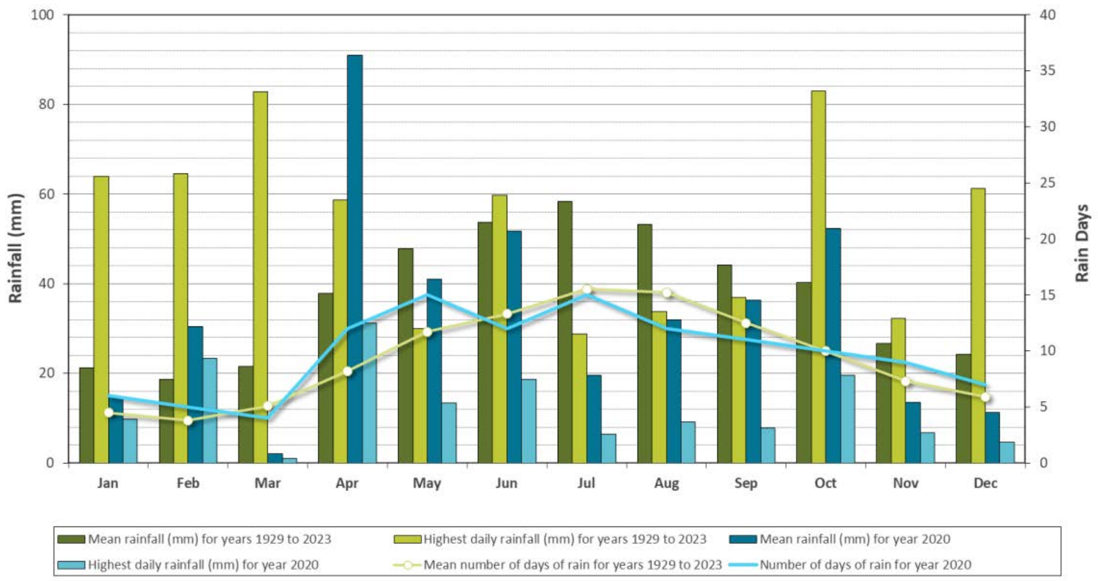
<table>
<tr><th></th><th>Wind Class Frequency for 2020</th><th>Wind Class Frequency for 2009</th><th>Wind Class Frequency 2007 to 2021</th></tr>
<tr><td>Edinburgh</td><td>
</td><td>
</td><td>
</td></tr>
<tr><td>Outer Harbour</td><td>
</td><td>
</td><td>
</td></tr>
<tr><td>Parafield</td><td>
</td><td>
</td><td>
</td></tr>
</table>

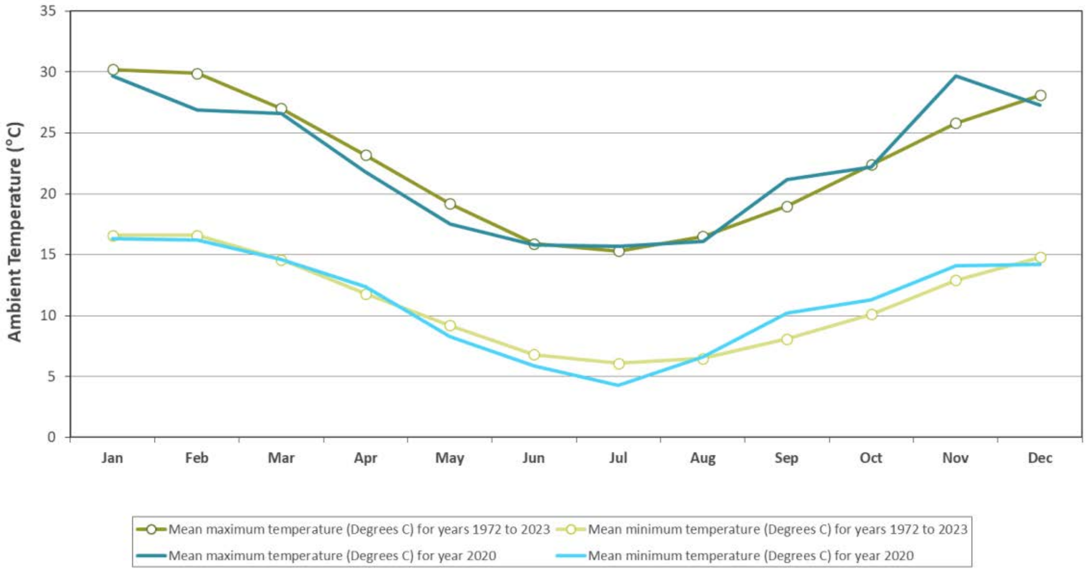
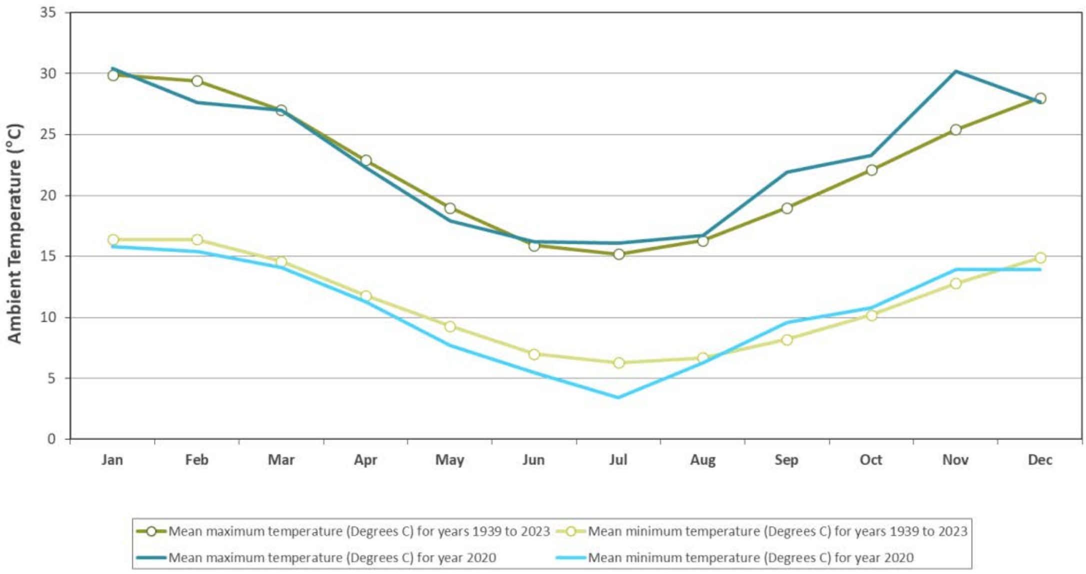
Figure A-3 Rainfall Data Comparison of Years

<table>
<tr><th></th><th>Rain Fall Data Comparison of 2020 to Long Term</th></tr>
<tr><td>Edinburgh</td><td>


</td></tr>
<tr><td>Parafield</td><td>


</td></tr>
<tr><td colspan="2">Source: BoM</td></tr>
</table>

Figure A-4 Temperature Data Comparison of Years

	Temperature Data Comparison of 2020 to Long Term
Edinburgh	
Parafield	
Source: BoM	

Appendix B:

Evaluation of Meteorological Data

Evaluation of Meteorological Data

The primary meteorological data parameters relevant for dispersion modelling are typically:

- wind (wind speed and direction)
- turbulence (atmospheric stability)
- mixing height (depth of turbulent layer)

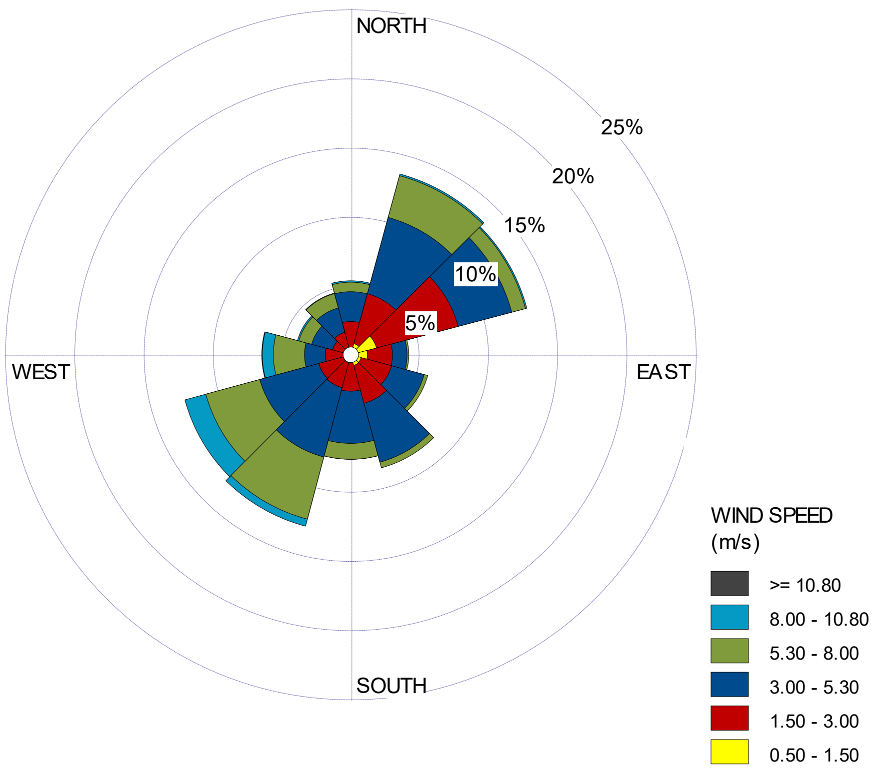
A review of the meteorological data used in the dispersion modelling for the above parameters is provided below.

Wind Speed and Wind Direction

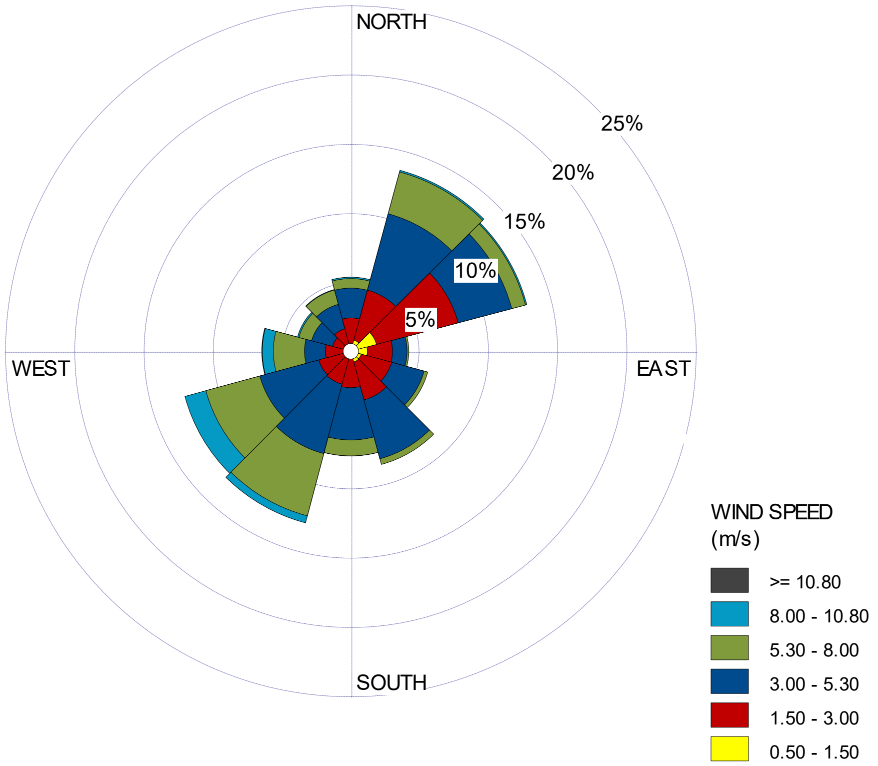
Wind roses show the frequency of occurrence of winds by direction and strength. The bars show the direction the wind is blowing from and the lengths show the frequency of winds from that direction. The bars also show the wind speed categories for each direction with the frequency represented by the size of each bar with the lightest wind speed category closest to the centre of the wind rose.

An annual wind rose for 2020 for the Renascor BAM project location is presented in **Figure B-1**. Seasonal and time of day wind roses are presented in **Figure B-2** and **Figure B-3**. The wind data compares well against the Edinburgh data (as presented in **Section 2.4**) with slightly lower wind speeds, as is typical for TAPM generated data, and conservative considering dispersion.

Figure B-1 Annual Wind Rose

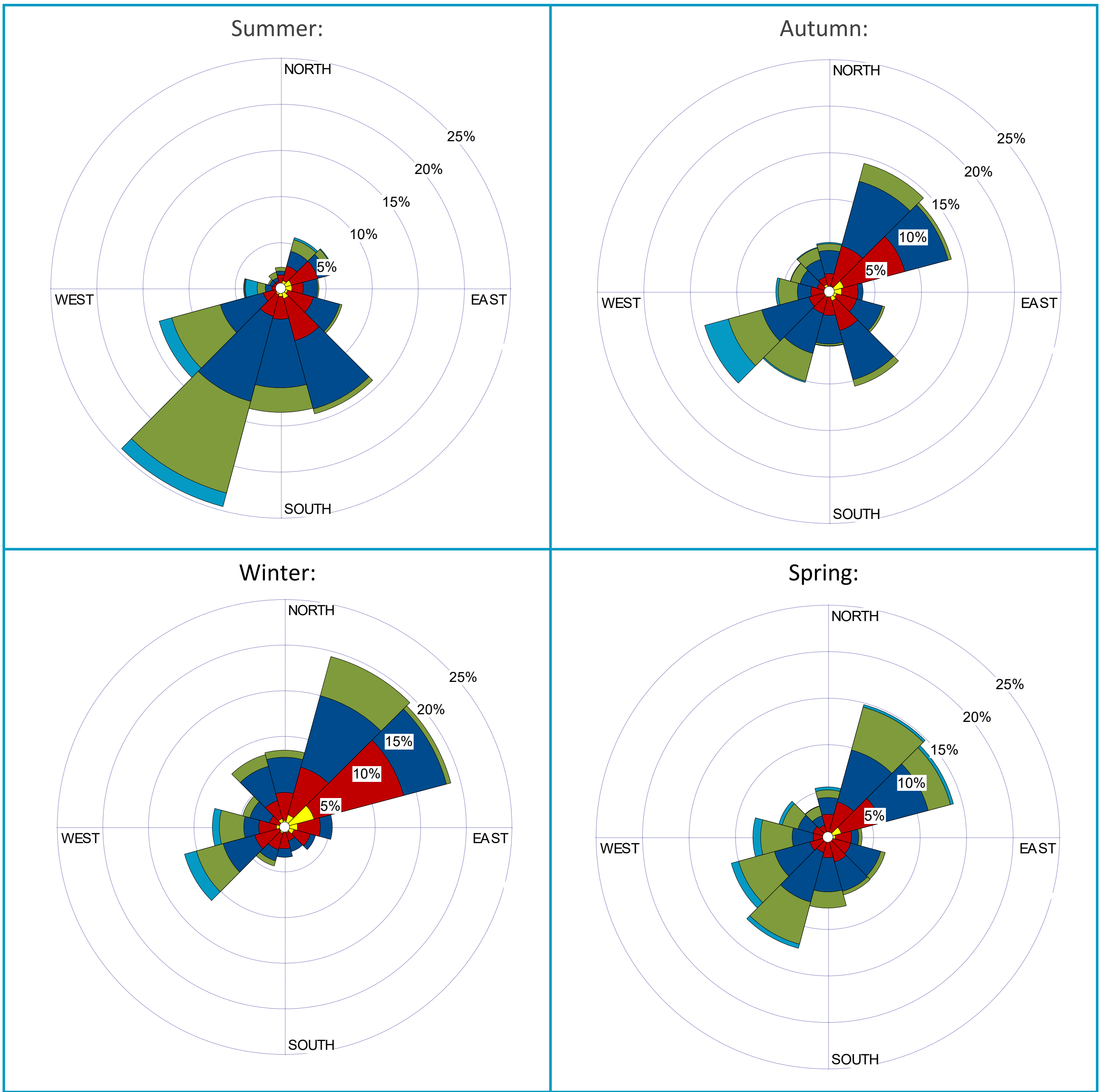


Location: Site (Waterloo Corner)	**Data period:** 2020	**Time period:** All hours	**Data type:** CALMET Extract



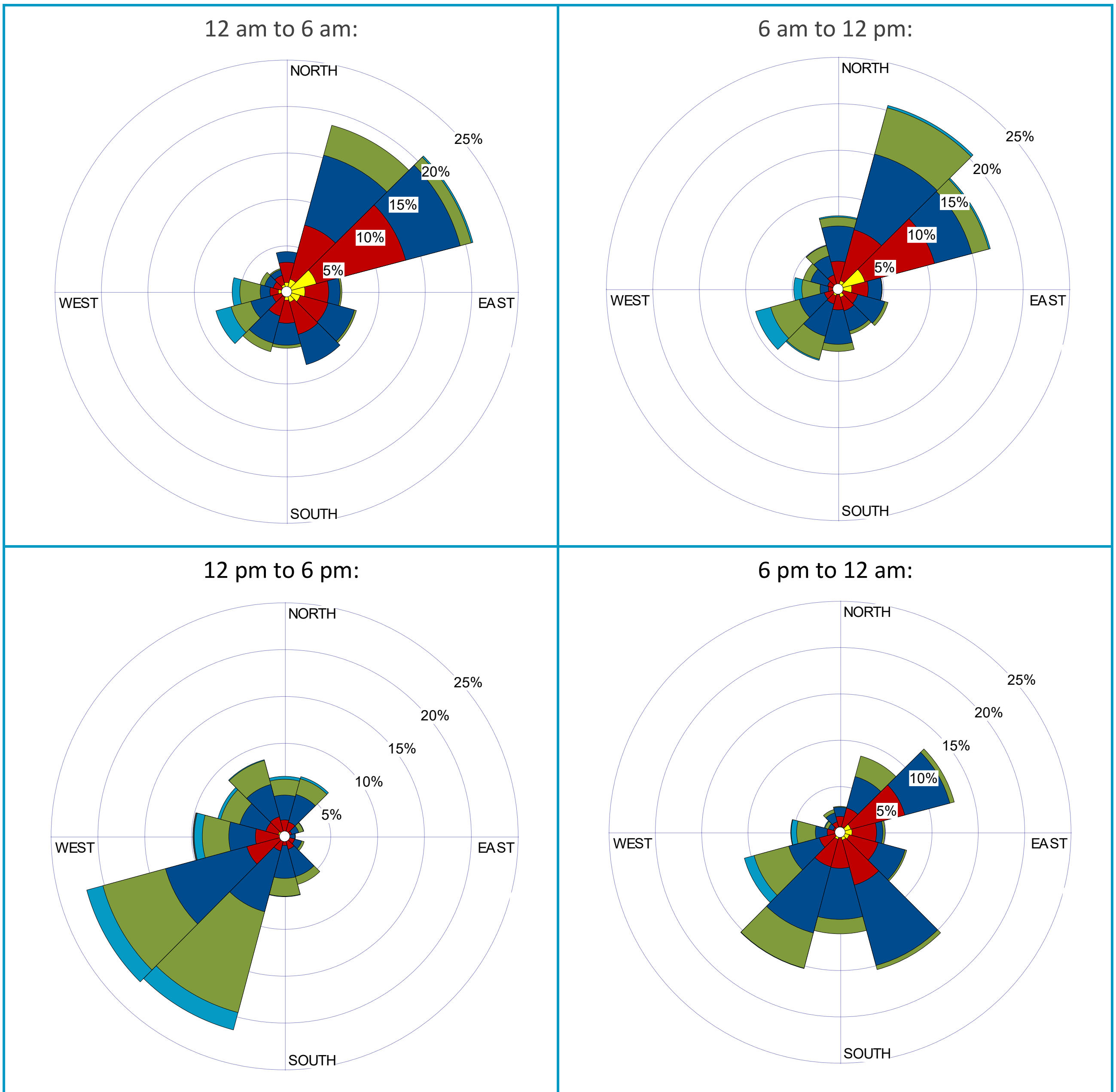
Average wind speed: 3.8 m/s	**Calm wind frequency:** 1.1%

Figure B-2 Seasonal Wind Roses



Location: Site (Waterloo Corner)	**Data period:** 2020	**Time period:** Seasonal	**Data type:** CALMET Extract
Average wind speed: Summer: 4.1 m/s Autumn: 3.7 m/s Winter: 3.3 m/s Spring: 4.1 m/s		**Calm wind frequency:** Summer: 1.3% Autumn: 1.0% Winter: 1.2% Spring: 1.0%	WIND SPEED (m/s) >= 10.80 8.00 - 10.80 5.30 - 8.00 3.00 - 5.30 1.50 - 3.00 0.50 - 1.50

Figure B-3 Time of Day Wind Roses



Location:	Data period:	Time period:	Data type:
Site (Waterloo Corner)	2020	Time of day	CALMET Extract

Average wind speed: 12 am to 6 am: 3.2 m/s 6 am to 12 pm: 3.7 m/s 12 pm to 6 pm: 4.7 m/s 6 pm to 12 am: 3.6 m/s	**Calm wind frequency:** 12 am to 6 am: 1.8% 6 am to 12 pm: 1.3% 12 pm to 6 pm: 0.3% 6 pm to 12 am: 1.1%

WIND SPEED (m/s)
- >= 10.80
- 8.00 - 10.80
- 5.30 - 8.00
- 3.00 - 5.30
- 1.50 - 3.00
- 0.50 - 1.50

Atmospheric Stability

Atmospheric stability refers to atmospheric turbulence and the tendency of the atmosphere to resist or enhance vertical motion. Depending on conditions the atmospheric stability can either inhibit or promote pollutant dispersion. The Pasquill-Gifford scheme provides six stability classes, A to F, to categorise the degree of atmospheric stability as follows:

A = Extremely unstable conditions

B = Moderately unstable conditions

C = Slightly unstable conditions

D = Neutral conditions

E = Slightly stable conditions

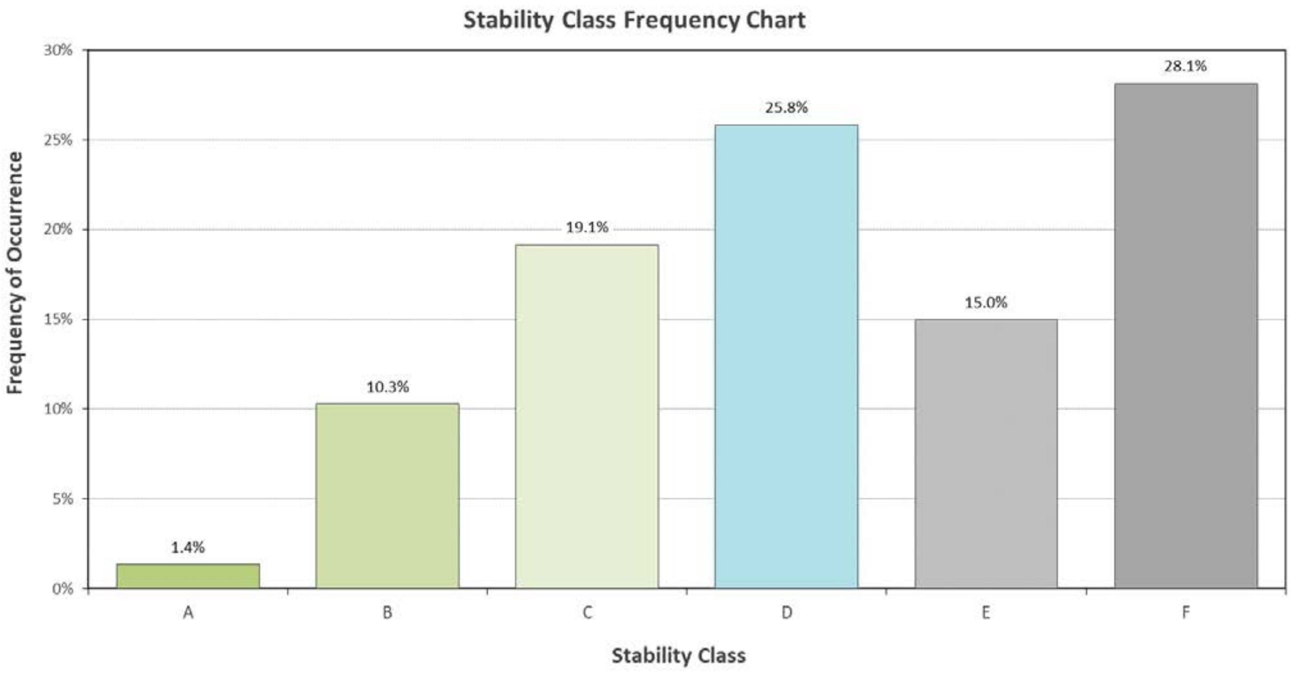
F = Moderately stable conditions

Unstable conditions are favourable for dispersion, while stable conditions are unfavourable for dispersion.

The dispersion modelling in CALPUFF used a more advanced atmospheric stability scheme (based on micro meteorology). Stability class data was extracted from the meteorological dispersion modelling data set for the meteorological data evaluation.

Stability class data for the Renascor BAM project location are presented in **Figure B-4**. The frequency of E and F class stability is as typical for inland settings. Given the near coastal location a higher a higher frequency of D class stability would typically have been expected. However, the higher frequency of F class stability should contribute with conservatism in the assessment.

Figure B-4 Distribution of Atmospheric Stability Classes



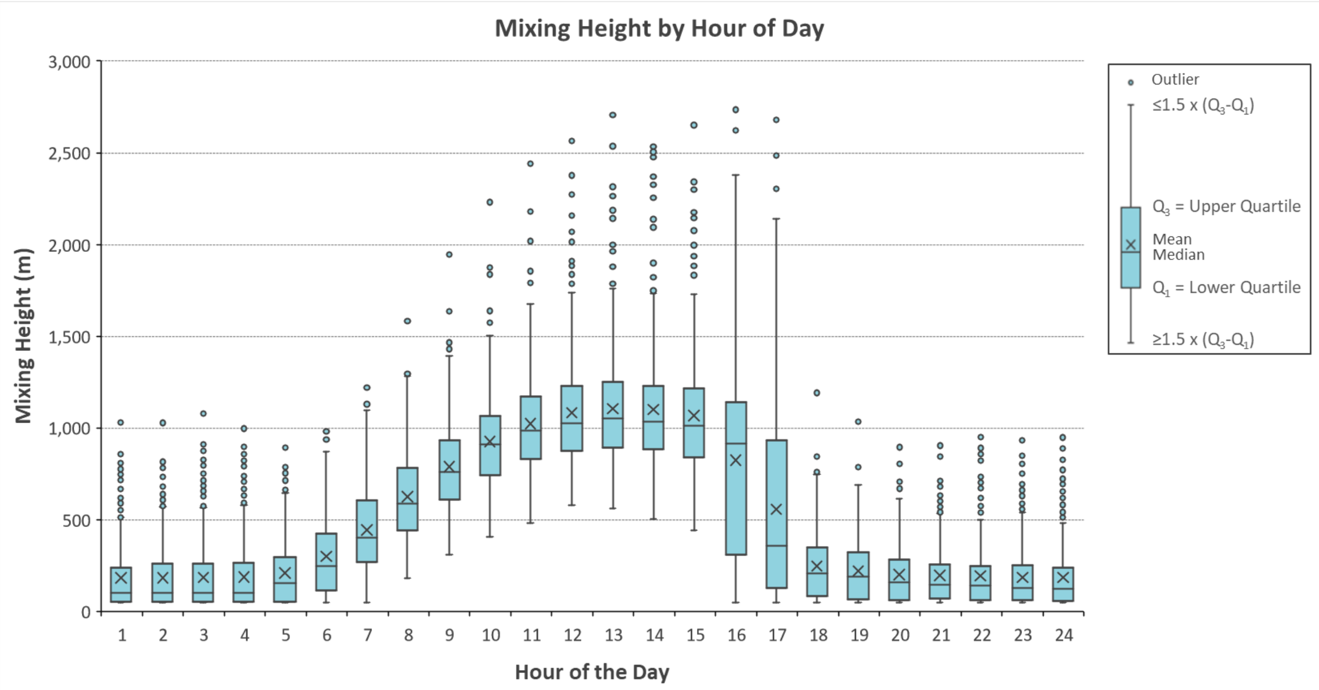
Mixing Height

The mixing height is the depth of the atmospheric mixing layer between ground level and an elevated temperature inversion. Depending on conditions, vertical dispersion is typically limited by the mixing height. This is an important parameter in dispersion modelling since the mixing height largely sets the vertical profile the dispersion can take place in.

Mixing heights have a diurnal variation in response to mixing from convection due to insolation and grow from sunrise to around midday. Followed by a decline until sunset when there typically is a rapid decline. If a plume penetrates through, or is released above, the mixing height the pollutants will be trapped aloft with no mixing to ground level (unless in specific conditions such as fumigation). Similarly, if a plume is trapped below a low mixing height (inversion layer) the vertical dispersion will be limited, and higher ground-level concentrations are likely to occur.

The profile of the diurnal mixing heights predicted at the project site is presented in **Figure B-5**.

Figure B-5 Distribution and Statistics of Mixing Heights



Appendix C:

IAQM Construction Dust Impact Assessment

1 Construction Dust Impact Assessment

1.1 Assessment Methodology of Construction for Dust Impacts

For review of potential air quality/dust impacts from the construction works of the facility, the IAQM *"Guidance on the Assessment of Dust from Demolition and Construction",* developed in the United Kingdom by the Institute of Air Quality Management (IAQM, 2014) was used for screening of assessment requirements.

The IAQM method uses a four-step process for assessing potential dust impacts from construction activities:

- **Step 1**: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2**: Assess risk of dust effects from activities based on:
  - the scale and nature of the works, which determines the potential dust emission magnitude; and
  - the sensitivity of the area surrounding dust-generating activities.
- **Step 3**: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4**: Assess significance of remaining activities after management measures have been considered.

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the Site, more than 50 m from the route used by construction vehicles on public roads, and more than 500 m from the Site entrance. This step is noted as having deliberately been chosen to be conservative and will require assessments for most projects.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and trackout (the movement of site material onto public roads by vehicles). The magnitudes are: *Large*; *Medium*; or *Small*, with suggested definitions for each category. The definitions given in the IAQM guidance for earthworks, construction activities and trackout, which are most relevant to this Development, are as follows:

Demolition (Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time):

- ***Large***: Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- ***Medium***: Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- ***Small***: Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks (Covers the processes of soil-stripping, ground-levelling, excavation and landscaping):

- ***Large***: Total site area greater than 10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t.
- ***Medium***: Total site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. silt), five to 10 heavy earth moving vehicles active at any one time, formation of bunds 4 m to 8 m in height, total material moved 20,000 t to 100,000 t.
- ***Small***: Total site area less than 2,500 m^2, soil type with large grain size (e.g. sand), less than five heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 t, earthworks during wetter months.

Construction (Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc):

- ***Large***: Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting.
- ***Medium***: Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching.
- ***Small***: Total building volume less than 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout (The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network):

- ***Large***: More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- ***Medium***: Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- ***Small***: Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table 1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table 1 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums, medium- and long-term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM_{10}.*	*Examples: Public footpaths, playing fields, parks and shopping street.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors.

Additional factors to consider when determining the sensitivity of the area include:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;

- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant, the season during which the works will take place;
- Any conclusions drawn from local topography;
- The duration of the potential impact (as a receptor may be willing to accept elevated dust levels for a known short duration, or may become more sensitive or less sensitive (acclimatised) over time for long-term impacts); and
- Any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table 2**. The sensitivity of the area should be derived for each of activity relevant to the project (i.e. construction and earthworks).

Table 2 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table 3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (i.e. an annual average of 25 µg/m^3 for PM_{10}) the IAQM method has been modified slightly.

a. This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

b. any history of dust generating activities in the area;

c. the likelihood of concurrent dust generating activity on nearby sites;

d. any pre-existing screening between the source and the receptors;

e. any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place;

f. any conclusions drawn from local topography;

g. duration of the potential impact; and

h. any known specific receptor sensitivities which go beyond the classifications given in this document.

Table 3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM_{10} conc.	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes: (a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.

(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table 4** (demolition), **Table 5** (earthworks and construction) and **Table 6** (trackout) to determine the risk category with no mitigation applied.

Table 4 Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 5 Risk Category from Earthworks and Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 6 Risk Category from Trackout Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the site is a low-, medium- or high-risk site.

Step 4 – Residual Impacts

Following Step 3, the residual impact is then determined after management measures have been considered.

1.2 Assessment

A summary of the IAQM assessment for the construction of the proposed facility is provided in **Table 7**.

Table 7 IAQM Assessment Summary

IAQM Assessment Step	Evaluation
Step 1	The closest sensitive receptors are located across Robinson Road at distances approximately between 50 m and 80 m from the site boundary of the Renascor BAM project site. However, most of the construction work at the site is understood to be undertaken away from the eastern site boundary.
Step 2	Scale of earth works: Large (Footprint of Stage 1 constructions approximately 69,000 m^2) Scale of construction works: Large (Footprint of Stage 1 buildings estimated to approximately 29,000 m^2) Potential for trackout: Small (Number of heavy vehicle movements/deliveries estimated to approximately 3 per day.) Receptor sensitivity: High Sensitivity potential in relation to dust soiling effects: Low Sensitivity potential in relation to potential dust health effects: Low Risk category from earthworks activities: Low risk Risk category from construction activities: Low risk Risk category from trackout activities: Low risk
Step 3	The risks associated with construction dust emissions are assessed as low. Common good dust management/mitigation practises should be applied for the construction and earthworks.
Step 4	No residual dust issues are expected for project construction activities based on implementation of good construction dust management/mitigation practises.

Appendix D:

Air Quality Management Plan Section for Site Environment Management Plan

AQMP Section for EMP

Introduction

This air quality management plan (AQMP) section has been prepared as input for the site environment management plan (EMP) for Renascor's Siviour battery anode material (BAM) project facility to produce uncoated purified spherical graphite (UPSG) near Bolivar in South Australia.

EPA License and/or Development Approval Requirements

<Section for summary of any EPA License and/or Development Approval requirements - To be included when available.>

Dust Management Plan Purpose and Objective

The purpose of the AQMP is to fulfil the facility EPA Licence and other approval requirements.

The objective of the plan is to manage the operations without particulate matter/dust air emissions causing nuisance complaints.

Responsibilities

The Operations Manager has the responsibility for the implementation of the AQMP, including:

- ensuring that all personnel and contractors conform with requirements of the AQMP
- ensuring that personnel on site are aware of their environmental responsibilities and obligations
- ensuring that dust control equipment is:
    - available for all relevant emission points,
    - functional, and
    - maintained to uphold performance
- responding to complaints, as per procedure
- reviewing and updating the AQMP as required.

Description of Operations and Particulate Matter/Dust Sources

Description of Production Activities

Purified spherical graphite (PSG) is produced in a two-production step process consisting of:

- Mechanical shaping through a milling process for micronisation and spheronisation of the graphite concentrate to micronised (less than 50 microns) and spherical form.
- Purification with cleaning and concentration of the shaped graphite by a hybridised thermal-chemical caustic roast process and acid leach stages into a highly purified product suitable for the production of lithium-ion battery anodes.

Following the purification the PSG product will be dried and packaged for distribution.

The facility will receive flake graphite concentrate at a quality of approximately 95% carbon from the Siviour Graphite Mine by road transport. Packaged PSG products will be transported by road to Port Adelaide for export.

Waste products that cannot be reused in the process are neutralised through chemical precipitation and dried. Graphite fines produced through the micronisation/spheronisation process will either be a waste product or saleable by-product dependant on feasibility and demand for the product.

Key components of the UPSG facility include:

- Structures associated with mechanical processing:
  - industrial buildings
  - silos
  - truck loading and unloading facilities, access and egress
  - product bagging plant equipment, including pneumatic conveyance and feed hoppers
  - mechanical, hydraulic and pneumatic conveyance and feed structures for the purpose of moving graphite concentrate, partially and wholly processed UPSG, chemical reagents and process by-products within the plant
  - chemical storage equipment suitable for the storage of solid and liquid, caustic and acidic reagents including appropriate bunding/hardstand
  - mineral crushing and grinding machinery comprising mechanical micronisation and spheronisation circuits, associated feed hoppers, dust mitigation, collection and conveyance structures, subject to final engineering design.
- Equipment associated with chemical processing:
  - caustic roast kiln (electric or gas-fired) including dry reagent mixing, cooling equipment, lump-breaking and pulping equipment
  - leach tanks (caustic and acid), filtration structures and repulp tanks
  - reverse osmosis (RO) water treatment equipment, including demineralisation brine capture and discharge
  - caustic process water treatment and neutralisation
  - acid process water treatment and neutralisation
  - solid process by-product isolation, drying and containment
  - process monitoring equipment.
- In addition, the UPSG facility will include either:
  - electric kiln, steam production and drying machinery, subject to availability of natural gas connection, or
  - fuel burning equipment including kiln and boiler structures, natural gas connection, stack emission scrubbers (electrostatic precipitators), and associated emissions monitoring and combustion management equipment, or
  - a combination of electric and gas-fired equipment associated with kiln processes, steam production and drying machinery, subject to the outcomes of the DFS.

Sources and Generation of Particulate Matter/Dust Emissions

The micronisation and spheronisation process involves a number of mills connected in trains. All mills are connected to exhaust stacks with two stage dust control. The mill train exhausts are the primary source of particulate matter emissions from the facility.

The transport of graphite around the facility is through a pneumatic pipe system. This system is enclosed and include dust collectors at venting and materials handling points.

Truck movements at site also has the potential to contribute to nuisance dust impacts. However, it was identified in the air quality impact assessment[8] that the low frequency of truck and vehicle movements at the facility was unlikely to contribute to nuisance dust impacts.

A list of the facility air emission sources is included in the Dust Management section.

Dust Management

Dust management is best achieved through a combination of:

- use of dust emission control units
- use of standard operation procedures and routine dust control methods adapted for the applications
- review of operation/production procedures to ensure optimal outcomes
- planning of production and maintenance activities to ensure that appropriate dust controls and mitigating actions are in place given potential breakdowns and maintenance schedules
- review of performance and dust management/control action effectiveness over time.

Induction and Training

As part of the site induction, all employees, contractors and visitors to site will be made aware of the following:

- why management, mitigation and control of air emissions are required
- the need to plan for maintenance schedules and production requirements
- the need to inform the Operations Manager failures of dust control units are observed
- that in situations with failure of dust control units, the affected mill/mills shall be taken off line until the dust control units are serviced.

Dust Management, Mitigations and Controls

Monitoring

As demonstrated in the air quality impact assessment[7] there is no ambient compliance or operational air quality monitoring required for the operations.

To review the performance of dust control units over time, it is recommended that the performance of mill dust control units are tested after commission and then reviewed/tested at an interval as required.

[8] SLR, Renascor BAM Project Air Quality Assessment Bolivar UPSG Processing Facility, January 2024

Dust Mitigation and Control Measures

Dust mitigation and particulate matter emission control measures for the sources for the operations are included below.

Sources	Emission Control	Mitigation and Control Measures
Micronisation and spheronisation mill stacks	Dust collector	Production scheduling to be planned to include regular service of dust control units. Production units to be taken offline when corresponding dust control unit performance is compromised/faulty. Maintenance as per equipment manufacturers specification and as required. Review/monitoring of dust control unit performance overtime.
Rotary kiln stacks dust collector	Dust collector	Maintenance as per equipment manufacturers specification and as required.
Alkaline gas scrubber stacks	Scrubber	Maintenance as per equipment manufacturers specification and as required.
Spiral flash drier stacks	No specific controls for management of particulate matter emissions	Maintenance as per equipment manufacturers specification and as required.
Steam boiler stacks	No specific controls for management of particulate matter emissions	Maintenance as per equipment manufacturers specification and as required.
Mill train building ventilation exhaust	Dust collector	Maintenance as per equipment manufacturers specification and as required.
Pneumatic graphite transport system dust collectors	Dust collector	Maintenance as per equipment manufacturers specification and as required.
Site vehicle and truck movements	NA	Maintenance and upkeep of onsite roadways to avoid silt build up and any potential spills of product.

Complaints Management

Well managed responses to complaints can play a significant role in managing potential nuisance.

Complaints Response Process

Upon receipt of a dust complaint, the following information shall be recorded:

1. The date and time of complaint.
2. The method by which the complaint was made (i.e. email, verbal, telephone, written) and who received the compliant.
3. Any personal details of the complainant which were provided by the complainant, or if no such details were provided, a note to that effect.
4. Whether the dust was visible (airborne) or deposited.
5. The location of the nuisance observation.
6. Wind speed and direction prior to, and at the time the complaint was received (from the site weather station).
7. Site activities at the time of (and recently preceding) the complaint.
8. The action taken by Renascor in relation to the complaint, including investigation and any follow up contact/correspondence with the complainant.
9. If no action was taken, the reason(s) why no action was taken.

The Operations Manager shall be informed immediately of any complaints received.

A complaints registry form is included in below.

Dust Complaints Registration Form

COMPLAINT RECEIPT	
Date and time of complaint.	
The method by which the complaint was made (i.e. verbal, telephone, written).	
Any personal details of the complainant which were provided by the complainant, or if no such details were provided, a note to that effect.	
Whether the dust was visible in the air (airborne) or deposited.	
The location of the nuisance observation.	
Any request by complainant for follow up correspondence.	
Complaint received by:	
INVESTIGATION AND FOLLOW UP	
Wind speed and direction prior to, and at the time the complaint was received.	
Site activities (incl potential maintenance issues) at the time of the complaint (and the period leading up to).	
The action taken by Renascor in relation to the complaint, including any follow up contact with the complainant.	
If no action was taken, the reason(s) why no action was taken.	

Complaints Validation Process

When the Operations Manager becomes aware of a complaint, the following will occur:

1. Review wind speed and wind direction at the time of the complaint and the period leading up to the time of the complaint.
2. The Operations Manager or other nominated and appropriately trained person will travel to the boundary and/or the complainant's location (if known) to inspect the situation. If visible particulate matter/dust is leaving the site, measures within the AQMP will be implemented to reduce emissions to an acceptable level.
3. If particulate matter/dust is not observed leaving the site, the Operations Manager will survey the area (from vantage point on site or drive around the local area to identify other sources).
4. The results of the two exercises above will be recorded in the complaint register.

Should Renascor be made aware of a complaint after the fact, this will be recorded and complaints validation may be limited to review of recorded wind conditions (direction and wind speed) and the operations at the time of the complaint.

Notifications

Any documented complaints will be made available to the EPA when requested and will be recorded within the electronic system.

Reporting

All employees and contractors are required to report generation of significant dust emissions (dust emissions with the potential to cause off-site nuisance) to the Operations Manager.

All dust complaints received shall be logged. This shall be completed within 24 hours of receiving the complaint and is considered internal reporting.

Review

The AQMP will be reviewed annually by the Operations Manager.

The effectiveness of the dust management, mitigations and controls will be evaluated considering:

- number of complaints received
- review of performance of dust emission controls
- dust management and control improvement opportunities to improve dust performance
- impacts on production in relation to dust performance.

Improvements as considered required will be implemented and the AQMP updated to capture changes.

Changes to a process at the site or inclusion of a new process that is relevant to dust management shall also prompt a review of the AQMP to update the plan as relevant. The EPA shall be notified of plan updates.

ASIA PACIFIC OFFICES

ADELAIDE
Level 1/89 Pirie Street
Adelaide SA 5000
Australia
T: +61 2 9427 8100

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS
Level 1 Suite 1.06
Boland’s Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
1/25 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
201 Victoria Street West
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203