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Lochard Energy

January 2023

Winton Energy Reserve 1 Facility

Air Quality Impact Assessment

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Winton Energy Reserve 1 Facility
Air Quality Impact Assessment

Lochard Energy

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	Name	Date	Signature
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Approved by:	Jeff Meynell	12 January 2023	

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We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Abbreviations

Air NEPM	National Environment Protection (Ambient Air Quality) Measure
AAQMS	Ambient Air Quality Monitoring Stations
AHD	Australian height datum
AQAC	Air quality assessment criterion
AQIA	Air Quality Impact Assessment
AWS	Automatic Weather Station
BAM	Beta attenuation monitor
BESS	Battery Energy Storage System
BoM	Bureau of Meteorology
BPIP	Building Profile Input Program
CO	Carbon Monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	Digital elevation model
EPA	Environment Protection Authority
ERS	Environment Reference Standard
GED	General environmental duty
GLCs	Ground level concentrations
GPG	Gas-fired power generation
LGA	Local government area
MGA	Map grid of Australia
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NH_3	Ammonia
NO	Nitrogen monoxide
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
O_3	Ozone
PM	Particulate Matters
$PM_{2.5}$	Particles with an aerodynamic diameter of 2.5 micrometres or less
PM_{10}	Particles with an aerodynamic diameter of 10 micrometres or less

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SCR	Selective catalytic reducer
SO_2	Sulphur dioxide
SRTM	Shuttle Radar Topography Mission
TAPM	The Air Pollution Model
TEOM	Tapered Element Oscillating Balance
TSP	Total Suspended Particulates
USEPA	United States Environment Protection Agency
VIC	Victoria
WSP	WSP Australia Proprietary Limited

Units

ºC	Degree Celsius
g/s	Grams per second
Ha	Hectare
km	kilometre
km/h	kilometre per hour
m	metre
Mg/Nm^3	Milligrams per normal cubic metres
m/s	Metres per second
mm	millimetres
MW	Megawatt
MWh	Megawatt-hours
ppb	Parts per billion
ppm	Part per million
$\mu g/m^3$	Microgram per cubic meter
µm	micrometre
%	Per cent

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Executive summary

Lochard Energy is proposing to develop an Energy Reserve 1 Facility (the project) at 386 Lee Road, Winton (subject site) comprising of:

- 200 megawatt (MW) / 400MWh Battery Energy Storage System (BESS)
- 200MW Gas-fired Power Generation (GPG) plant and adjoining transmission line

This technical report assesses the potential air quality impacts from operation of the project.

Relevant legislation for the project was reviewed and criteria assigned to each pollutant assessed.

Climate data collected at the Wangaratta Aero automatic weather station were analysed together with wind speed and wind direction data for the years 2017 to 2021.

Background air quality data collected at two ambient air quality monitoring stations (AAQMS) for 2017 to 2021 were analysed and adopted as background for this assessment. The AAQMS are:

- Alphington for NO_2 and CO data
- Albury for PM_{10} and $PM_{2.5}$

Ammonia (NH_3) is not monitored at any AAQMS in Victoria. As such incremental impacts only are assessed.

Thirty sensitive receptors in the vicinity of the subject site were identified and included in the model.

Site specific meteorological modelling files for the period 2017 to 2021 were generated using The Air Pollution Model (TAPM). AERMOD compatible meteorological files were generated using AERMET taking account of surface roughness, albedo, and Bowen Ration values around the subject site.

Air dispersion modelling using AERMOD was conducted for one operational scenario to assess potential air quality impacts from the project:

- continuous normal operating conditions (100% load)

The year showing the highest concentration for each pollutant and averaging period was used for assessing cumulative air quality impacts.

The following pollutants were modelled

- NO_x (as NO_2)
- CO
- particulate matter
- NH_3

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Contemporaneous background data were added to the predicted concentrations from the project to determine cumulative impacts. Incremental impacts for NH_3 were assessed only given no background data is available.

The modelling results indicate that under normal operating conditions at 100% load:

- the predicted 1-hour and annual average ground level concentrations of NO_2 are below their respective assessment criteria at all sensitive receptors assessed
- the predicted 8-hour rolling average ground level concentrations of CO is below its assessment criterion at all sensitive receptors assessed
- the predicted 24-hour and annual average ground level concentrations of PM_{10} is below its assessment criteria at all sensitive receptors assessed. This assumes all particulate matter is emitted in the form of PM_{10} only

- the predicted 24-hour and annual average ground level concentrations of $PM_{2.5}$ is below its assessment criteria at all sensitive receptors assessed. This assumes all particulate matter is emitted in the form of $PM_{2.5}$ only
- the predicted 1-hour, 24-hour, and annual average ground level concentrations of NH_3 (incremental only) is below its assessment criteria.

In summary, the air dispersion modelled demonstrated that emissions from the gas engines are low, below assessment criteria and contribute a much lower proportion of the total impact.

Management measures are recommended to ensure emissions are minimised from the facility. These are:

- low NO_x technology to be used
- the gas engines should be maintained in accordance with the manufacturers specifications with regular testing and scheduled regular maintenance
- NO_x and CO emissions from the gas engines to be regulated by in-stack emission limits
- periodic extractive monitoring to be undertaken to demonstrate compliance with in-stack limits
- a continuous on-line monitoring system to be installed on all four engine stacks
- a regular and documented maintenance and inspection program to be implemented for plant items.

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1 Introduction

1.1 Project context and overview

Lochard Energy (Iona Operations) Pty Ltd, an energy infrastructure company based in Australia, is seeking to develop the land for an energy hub at 386 Lee Road, Winton (the subject site). The proposed energy hub is known as Winton Energy Reserve 1 facility (the project).

The project will utilise hybrid technology with Li-Ion batteries and fast-start high-efficiency dual-fuel gas reciprocating engines and will comprise:

- A 200-megawatt (MW) Gas-Powered Generator (GPG) facility and adjoining ~200 metre (m) gas pipeline including metering station.
- A Battery Energy Storage System (BESS) facility. The BESS facility will supply and absorb 200MW real power with 400-megawatt-hour (MWh) energy storage capacity.
- A single electrical substation for both battery and GPG which then feeds into the local network.
- A ~3 kilometre (km) 220-kilovolt (kV) underground transmission line from the Glenrowan Terminal Station (GTS) to the subject site. The transmission line will cross the Hume Freeway and follow the existing AusNet easement northwest from the GTS. It will then head east within the road reserve of Lee Road before entering the subject site.

The project is located approximately 9 km north-east of Benalla and 175 km north-east of Melbourne within the Rural City of Benalla (Local Government Area). A concept layout plan for the project is provided in Figure 1.1..

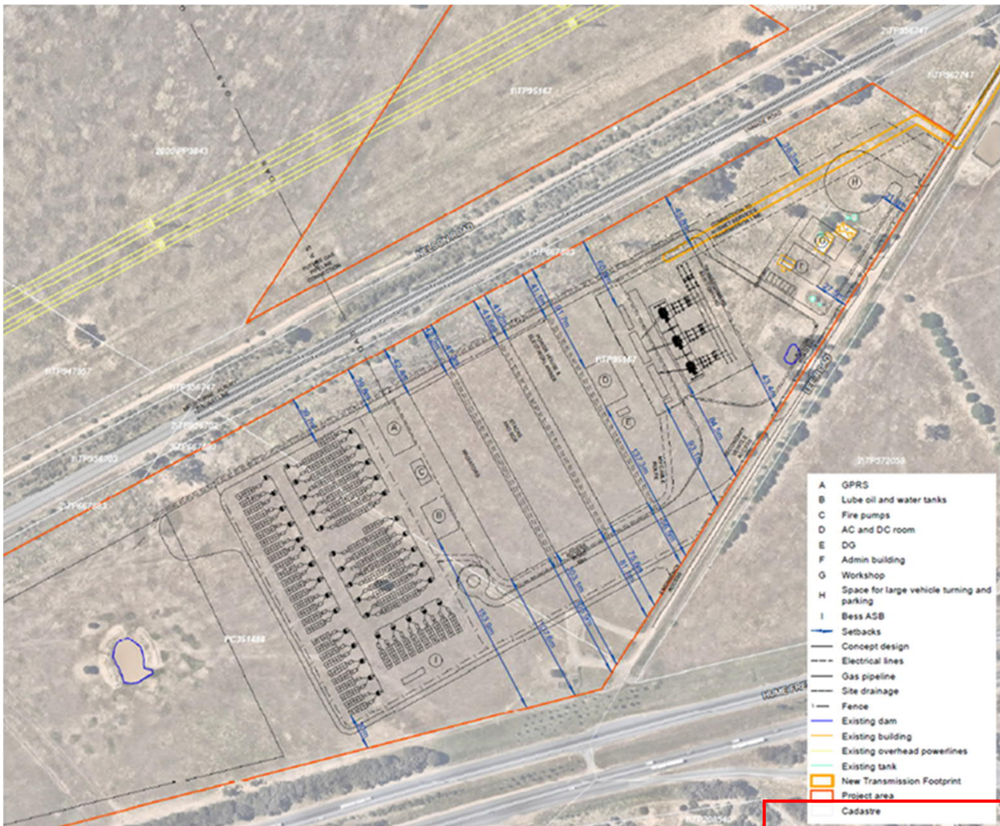

Figure 1.1 Concept layout plan

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1.2 Key features of the project

The project comprises the following key elements:

- A gas fired power generation (GPG) facility and adjoining gas pipeline including metering station to be agreed upon regarding the Basis of Design and operational parameters for the project. The GPG would operate as a peaking power plant which can quickly react to a sudden onset of energy demand.
- BESS facility: the BESS facility will be integrated with the broader site layout. It will supply and absorb 200MW of real power with 200 MWh energy storage capacity.

1.3 Local setting

The subject site is located in the township of Winton, approximately 9 kilometres (km) east of the township of Benalla and approximately 175 km north-east of Melbourne, within the Victoria's Ovens Murray Renewable Energy Zone.

The subject site has an irregular shape comprising of 40.4 hectares (Ha) of primarily vacant land. A farmhouse lies to the north-east corner of the subject site. There is an existing gas pipeline and power transmission within the subject site.

The subject site is intersected east-west by a rail reserve forming part of its northern boundary. The site is bound to the South by the Hume Freeway Road reserve, Lee Road to the east and agricultural land to the north-east. At its western extent, it is also cut in two places by the former road reserves of Winton township.

1.4 Objective

The objective of this report is to identify and assess through dispersion modelling the potential air quality impacts from the project during normal operations at 100% load.

1.5 Scope of works

The scope of works for assessing air quality impacts for the project are as follows:

- review all information provided by Lochard Energy and request further information where gaps exist
- identify the key emission sources and type of pollutant expected to be emitted during its operation
- describe and characterise the receiving environment (air quality, meteorology, topography) for the proposed site using publicly available information (e.g., Bureau of Meteorology [BoM], Environment Protection Authority [EPA], aerial imagery)
- review relevant legislation, guidelines and policies and establish appropriate design criteria for the Proposal
- identify the nearest sensitive receptors to the facility
- generate a pollutant emission inventory of pollutants generated during operation of the engines
- generate site-specific meteorological modelling files for 5 years using prognostic data generated by The Air Pollution Model (TAPM) supplemented with observational data collected at the Wangaratta Aero Automatic Weather Station (AWS)
- compute building downwash effects using the United States Environment Protection Agency (USEPA) Building Profile Input Program (BPIP)
- generate air dispersion modelling files for one model scenario
- predict ground level concentrations for the key pollutants modelled using AERMOD for one operational scenario at gridded and selected discrete sensitive receptors
- review the model outputs and compare with the assessment criteria for the Proposal
- prepare contour plots illustrating the extent of dispersal of each pollutant
- develop management measures, where relevant, to minimise impacts during operation

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1.6 Pollutants of interest

The following pollutants are expected to be generated during operation of the gas engines:

- oxides of nitrogen (NO_x)
- carbon monoxide (CO)
- particulate matter with:
  - an aerodynamic diameter of less than or equal to 10 micrometres in diameter (PM_{10})
  - an aerodynamic diameter of less than or equal to 2.5 micrometres in diameter ($PM_{2.5}$)
- ammonia (NH_3), due to slip from the selective catalytic reducers (SCRs)

The pollutants were modelled to predict pollutant ground level concentrations at discrete (sensitive) and gridded receptors.

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2 Legislative and policy context

This chapter describes the key Commonwealth and Victorian State legislative and policy context for the project in relation to air quality.

2.1 Commonwealth

2.1.1 *National Environment Protection Council Act 1994*

The National Environment Protection Council (NEPC) was established under the *National Environment Protection Council Act 1994* (NEPC Act). The primary functions of the NEPC are to:

- to prepare National Environment Protection Measures (NEPMs)
- to assess and report on the implementation and effectiveness of the NEPMs in each state and territory.

NEPMs are a special set of national objectives designed to assist in protecting or managing aspects of the environment e.g., air quality.

The NEPM relevant to air quality for the project is:

- *National Environment Protection (Ambient Air Quality) Measure 2021* (Air NEPM).

2.1.1.1 National Environment Protection (Ambient Air Quality) Measure 2021

Key pollutants commonly found in ambient air are nationally regulated under the National Environment Protection (Ambient Air Quality) Measure (Air NEPM).

The Air NEPM outlines standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. The national environment protection standards of this measure are presented Table 2.1.

These standards are not relevant to air emissions from individual sources, specific industries, or roadside locations. Air NEPM standards are intended to be applied at performance monitoring locations that represent air quality for a region or sub-region of 25,000 people or more. These performance monitoring stations are operated by the relevant environmental regulatory authority in each State and Territory.

Table 2.1 Air NEPM standards

Pollutant	Averaging period	Air quality standard[1, 2, 3]
Nitrogen dioxide	1 hour	0.08 ppm
	Annual	0.015 ppm
Carbon monoxide	8 hours	9.0 ppm
PM_{10}	24 hours	50 $\mu g/m^3$
	Annual	25 $\mu g/m^3$
$PM_{2.5}$	24 hours	25 $\mu g/m^3$
		20 $\mu g/m^3$
	Annual	8 $\mu g/m^3$
		7 $\mu g/m^3$

(1) Defined as a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed
(2) ppm – units of measurement for gaseous species expressed as parts per volume
(3) $\mu g/m^3$ – unit of measurement for particulate matter expressed as micrograms per cubic metre

2.2 State

2.2.1 Environment Protection Act 2017

The *Environment Protection Act 2017* (EP Act) is the current primary legislative instrument that governs protection of the environment in Victoria. The objective of the EP Act is to protect human health and the environment by reducing the harmful effects of pollution and waste.

The EP Act introduces a duty focused on harm prevention, known as the *general environmental duty* (GED). This duty requires a business (duty holders) to proactively manage the risks of harm to the environment together with addressing the impacts of pollution and waste after they have occurred.

Pursuant to the EP Act, the following relevant subordinate legislation and guidelines are:

- Environment Protection Regulations, 2021
- Environment Reference Standard, 2021
- Guideline for assessing and minimising air pollution in Victoria, 2021
- Recommended separation distances for industrial residual air emissions, 2013

2.2.2 Environment Protection Regulations 2021

Pursuant to the EP Act, the Environment Protection Regulations 2021 (EP Regulations) was developed jointly by the Environment Protection Authority (EPA) and the Department of Environment, Land, Water and Planning (DELWP) and aims to support the delivery of the new environment protection framework.

The objectives of the EP Regulations include, but are not limited to:

- imposing obligations in relation environmental protection, pollution incidents, contaminated land and waste
- providing for activities and other matters for the purpose of permissions (licences, permits and registrations)
- specifying matters in relation to litter, water, the atmosphere, land, noise, and vehicle emissions

Schedule 1 of the EP Regulations prescribes permission activities that require a development or operating licence.

2.2.3 Environment Reference Standard 2021

The Environment Reference Standard (ERS) is a legislative instrument made under the EP Act. The ERS is an environmental benchmark which '*brings together a collection of environmental value, indicators and objectives that describe environmental and human health outcomes to be achieved or maintained in the whole or in parts of Victoria*'. They are used to assess and report on changing environmental conditions in Victoria by providing a reference point that supports the GED for decision makers to consider whether a proposal or activity is consistent with the environmental values of the ERS. The ERS also allows the evaluation of potential impacts on human health and the environment that may result from a proposal or activity. The ERS is intended as a reference standard and is not a compliance standard for duty holders (businesses).

The ambient air quality indicators in the ERS cover criteria pollutants in Victoria, including NO_2, CO, PM_{10} and $PM_{2.5}$, likely to be emitted from the proposal. The ERS replaces the State Environment Protection (Ambient Air Quality) [EPA Victoria 2006] and the State Environment Protection Policy (Air Quality Management) [EPA Victoria 2001].

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Objectives for key air quality indicators relevant to the project are presented in Table 2.2.

Table 2.2 ERS objectives

Air quality indicator	Averaging period	Objectives	Maximum exceedances
Nitrogen dioxide	1 hour	0.12 ppm	1 day a year
	Annual	0.03 ppm	None
Carbon dioxide	8 hours	9.0 ppm	1 day a year
Particles as PM_{10}	24-hour	50 µg/m^3	None
	Annual	20 µg/m^3	None
Particles as $PM_{2.5}$	24-hour	25 µg/m^3	None
	Annual	8 µg/m^3	None

2.2.4 *Guideline for assessing and minimising air pollution in Victoria 2021*

The Guideline for assessing and minimising air pollution in Victoria, 2021 (EPA 2021a) provides a framework to assess and control risk associated with air pollution. The Guideline states: '*Emitters of pollution to air have a responsibility under the general environmental duty to apply controls to eliminate or minimise risks to human health or the environment, so far as reasonably practicable. This requires duty holders to understand their risks, implement controls and review performance of controls.*'

The guideline adopts a risk-based management approach that involves identifying hazards, assessing risk, implementing controls and checking controls.

The Guideline introduces air quality assessment criteria (AQAC) which are concentrations of air pollutants that provide a benchmark to understand potential risks. They are risk-based concentrations that help identify when or if an activity is likely to pose an unacceptable risk to human health and the environment.

For criteria pollutants including PM_{10} and $PM_{2.5}$, the objectives specified in the ERS are required to be adopted as AQACs. Table 2.3 presents the relevant AQACs adopted for the Proposal

Table 2.3 AQACs for relevant air quality indicators

Air quality indicator	Averaging period	AQAC (µg/m^3)	Reference
Ammonia	1-hour	3,200 µg/m^3	Air Pollution Guideline 2021, EPA Victoria
	24-hour	1,184 µg/m^3	
	Annual	70 µg/m^3	

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2.3 Project assessment criteria

A summary of the assessment criteria adopted for this project is presented in Table 2.4.

Table 2.4 Assessment criteria

Pollutant	Criterion	Averaging period	Source
NO_2	164 µg/m^3	1-hour	Air NEPM 2021
	30.8 µg/m^3	Annual	
CO	11,250 µg/m^3	8-hour	ERS 2021
PM_{10}	50 µg/m^3	24-hour	ERS 2021
	20 µg/m^3	Annual	
$PM_{2.5}$	25 µg/m^3	24-hour	
	8 µg/m^3	Annual	
NH_3	3,200 µg/m^3	1-hour	Air Pollution Guideline 2021, EPA Victoria
	1,184 µg/m^3	24-hour	
	70 µg/m^3	Annual	

It is noted that the Air NEPM 2021 introduced more stringent standards for NO_2 (1 hour and annual) which have not been incorporated into the ERS 2021 document. The NO_2 Air NEPM standards were adopted for this assessment.

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3 Existing environment

3.1 Local and regional setting

The facility is located approximately 1 km north-east of the town of Winton, in the north-eastern region of Victoria within the Benalla Local Government Area (LGA) and 170 km north-east of Melbourne. Land use in the area consists largely of agricultural usage and land dedicated to renewable energy infrastructure with a number of solar energy facilities operational to the east.

To the north lies vacant land and is bound by the Tottenham to Albury rail line and partly bound by Nelson Road, further north lies the Winton Wetlands. To the east is undeveloped vacant land and partly bound by Lee Road. Directly to the south lies the Hume Freeway beyond which is undeveloped vacant land, the Mokoan Rest Areas (190 metres [m] and 400 m respectively to the south-east), residential/farmhouses (590 m south and 910 m south-west) and the Winton Bushland Reserve To the west is undeveloped land and Seven Mile Creek (approximately 350 m).

3.2 Topography

The Site is generally higher in the south and lower in the west and north, with the surface elevation varying between 180 m Australian height datum (m AHD) in the south to 170 m AHD to the north and west.

3.3 Sensitive receptors and surrounding land uses

The Guideline for assessing and minimising air pollution in Victoria, 2021 (EPA 2021) describes a sensitive land use as:

'*a land use where it is plausible for humans to be exposed over durations greater than 24 hours, such as residential premises, education and childcare facilities, nursing homes, retirement villages, hospitals.*'

The nearest sensitive receptors to the facility were identified and are listed in Table 3.1 and presented Figure 3.1.

Table 3.1 Closest sensitive receptors to the subject site

Sensitive receptor ID	UTM co-ordinates (km)		Direction from Site	Distance from Site boundary (m)	Description of receptor
	Easting X (Km)	Northing Y (Km)			
R1	418864	5959397	South	785	Residential
R2	418784	5959360	South	810	Residential
R3	421927	5960738	East	1,520	Residential
R4	420954	5960875	East	1,295	Little Cedar – Farmhouse Goat Cheese
R5	421199	5960863	East	2,240	Residential
R6	418152	5958839	South	920	Residential
R7	417835	5958725	South-east	925	Residential
R8	417710	5958669	South-east	955	Residential
R9	417718	5958607	South-east	1,085	Residential
R10	417723	5958584	South-east	1,065	Residential
R11	417685	5958501	South-east	1,170	Residential

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Sensitive receptor ID	UTM co-ordinates (km)		Direction from Site	Distance from Site boundary (m)	Description of receptor
	Easting X (Km)	Northing Y (Km)			
R12	417715	5958463	South-east	1,185	Residential
R13	417587	5958718	South-east	925	Residential
R14	417519	5958707	South-east	950	Residential
R15	417480	5958696	South-east	960	Residential
R16	417381	5958643	South-east	1,025	Residential
R17	417265	5958566	South-east	1,140	Residential
R18	417555	5958487	South-east	1,175	Residential
R19	417449	5958516	South-east	1,225	Residential
R20	417431	5958459	South-east	1,150	Residential
R21	417388	5958438	South-east	1,230	Residential
R22	417338	5958432	South-east	1,285	Residential
R23	417426	5958323	South-east	1,375	Residential
R24	417473	5958231	South-east	1,425	Residential
R25	417506	5958114	South-east	1,540	Residential
R26	417763	5958157	South-east	1,455	Residential
R27	417605	5958040	South-east	1,630	Residential
R28	417889	5957953	South-east	1,775	Residential
R29	417680	5957874	South-east	1,865	Residential
R30	417738	5958385	South-east	1,195	Winton Primary School

Figure 3.1 Closest sensitive receptors to the Proposal

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Lochard Energy
Reserve 1 Facility: Winton

Figure 3-1
Sensitive Receptors

Legend

- Sensitive Receptors
- Mokoan Rest Area South Bound
- Mokoan Rest Ares Area North Bound
- Winton Bushland Reserve
- Winton Wetlands
- Education Complex
- Primary School
- Project Area
- Study Area
- Cadastre Boundaries

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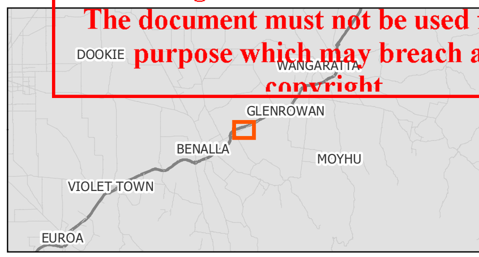

0 500 Meters

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:15,736 Date: 22/04/2022

Data sources: - DELWP, Geoscience Australia

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3.4 Climate and local meteorology

Meteorological conditions are important for determining the direction and rate at which air emissions from a source would disperse. Concentrations of pollutants within an airshed may build up during calm conditions (i.e., wind speeds of less than 0.5 metres per second [m/s]) and dispersion is poor whereas pollutants tend to disperse quickly during periods of strong winds, resulting in lower pollutant concentrations. The key meteorological requirements for an air quality assessment are typically hourly recorded of wind speed, wind direction, temperature, rainfall, and relative humidity. The following section discusses the climatic and meteorological conditions near the subject site.

3.4.1 Climatic conditions

The Bureau of Meteorology (BoM) collects meteorological data at automatic weather stations (AWS) across Australia and can be used for determining climatic statistics over standard periods, such as 30 years, known as climate normals.

There is one meteorological station near the subject site, located at Wangaratta Aero AWS (station number: 082138), located approximately 20 kilometres (km) to the north-east at an elevation of 153 metres (m). The AWS commenced operation in 1987 and remains operational.

Climatic statistical data recorded by BoM at Wangaratta Aero AWS is presented in Table 3.2.

The local climate at Wangaratta Aero AWS is characterised by:

- an average maximum temperature of 32.0ºC in January
- an average minimum temperature of 2.6ºC in July
- an annual average rainfall of 604.8 millimetres (mm) and average rainy days of 75.1
- an average maximum 9am relative humidity of 93% in July
- an average minimum 3pm relative humidity of 28% in January

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Table 3.2 Summary of climate statistics at Wangaratta Aero AWS

PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN[1]
Daily mean temperature (1987 to 2022)[2]													
Max (ºC)	32.1	31.0	27.6	22.6	17.4	14.0	13.0	14.5	17.6	21.6	25.9	29.3	22.2
Min (ºC)	14.3	13.8	10.8	6.9	4.3	2.8	2.6	2.9	4.5	6.4	9.5	11.8	7.6
Rainfall (1987 to 2022)[2]													
Mean rainfall (mm)	45.0	42.8	40.4	38.2	56.4	64.9	64.2	56.6	53.6	47.7	50.0	44.2	604.8
Mean days of rain (≥1mm)	4.3	3.6	3.8	4.5	6.7	8.9	10.3	9.3	7.4	6.0	5.3	5.0	75.1
Mean 9 am conditions (1987 to 2010)													
Temperature (ºC)	21.5	20.0	16.8	13.6	9.1	5.5	5.2	5.6	7.0	8.9	8.7	11.5	105.1
Relative humidity (%)	54	61	67	74	90	92	93	88	79	67	62	54	73
Wind speed (km/hr)	9.8	7.7	6.9	6.3	5.0	5.5	5.6	7.6	9.0	9.9	9.9	10.7	7.8
Mean 3 pm conditions (1987 to 2010)													
Temperature (ºC)	29.9	29.1	26.2	21.5	16.8	13.3	12.2	13.5	16.4	20.0	24.0	27.2	20.8
Relative humidity (%)	28	32	33	42	56	67	67	61	55	46	38	30	46

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Wind speed (km/hr)	16.6	14.0	14.1	12.9	10.6	10.6	11.7	13.8	16.3	16.1	16.4	17.3	14.2

(1) ANN: Annual

(2) Data accessed on 21 February 2022

3.5 Typical wind conditions

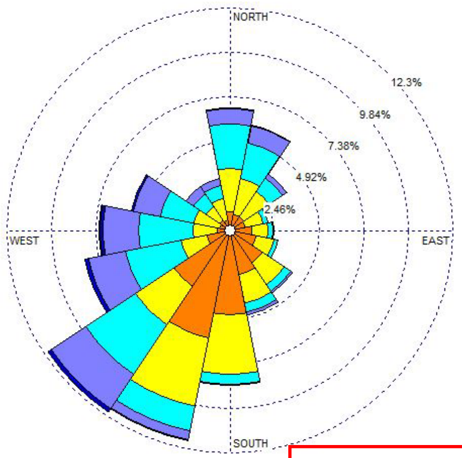
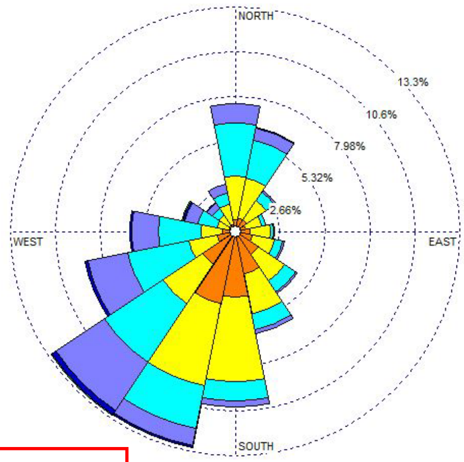
Wind speed and wind direction can influence the dispersion of air pollutants from the subject site. Adverse impacts can occur from any direction from an emission source. They are, however, more likely to occur downwind of the prevailing wind direction and in proximity to the subject site.

The online climatic data recorded at the BoM Wangaratta Aero AWS only provides 9am and 3pm data which is not detailed enough to characterise the local wind conditions. As such, more detailed meteorological data i.e., hourly data is required. Hourly wind speed and wind direction recorded at the Wangaratta Aero AWS for the period 2017 to 2021 were analysed. Figure 3.2 presents the annual and seasonal wind roses for the Wangaratta Aero AWS illustrating the frequency of strength and direction of wind flows.

The wind roses indicate the typical wind fields at Wangaratta Aero AWS are:

- most frequently from the south-west and south south-west followed by the south and west south-east during spring with a calm wind frequency of 8.1% (wind speeds of less than 0.5 m/s) and an average wind speed of 3.0 m/s
- most frequently from the south-west and south south-west followed by the south during summer with a calm wind frequency of 5.5% (wind speeds of less than 0.5 m/s) and an average wind speed of 3.3 m/s
- predominately from the south south-west and south-west followed by the south during autumn with a calm wind frequency of 5.5% (wind speeds of less than 0.5 m/s) and an average wind speed of 3.3 m/s
- most frequently from the north and south south-west followed by the south-west and west with a calm wind frequency of 14.6% and an average wind speed of 2.4 m/s
- a range of wind directions with south south-westerly followed by southerly and then northerly predominating over the five years with a calm wind frequency of 10.3% and an average wind speed of 2.8 m/s.

Overall, the Wangaratta Aero AWS experiences mainly south-westerly and northerly winds likely to be influenced by the higher elevations in the Warby-Ovens National Park which run north-south approximately 4 km to the west of Wangaratta.

Spring	Summer
	

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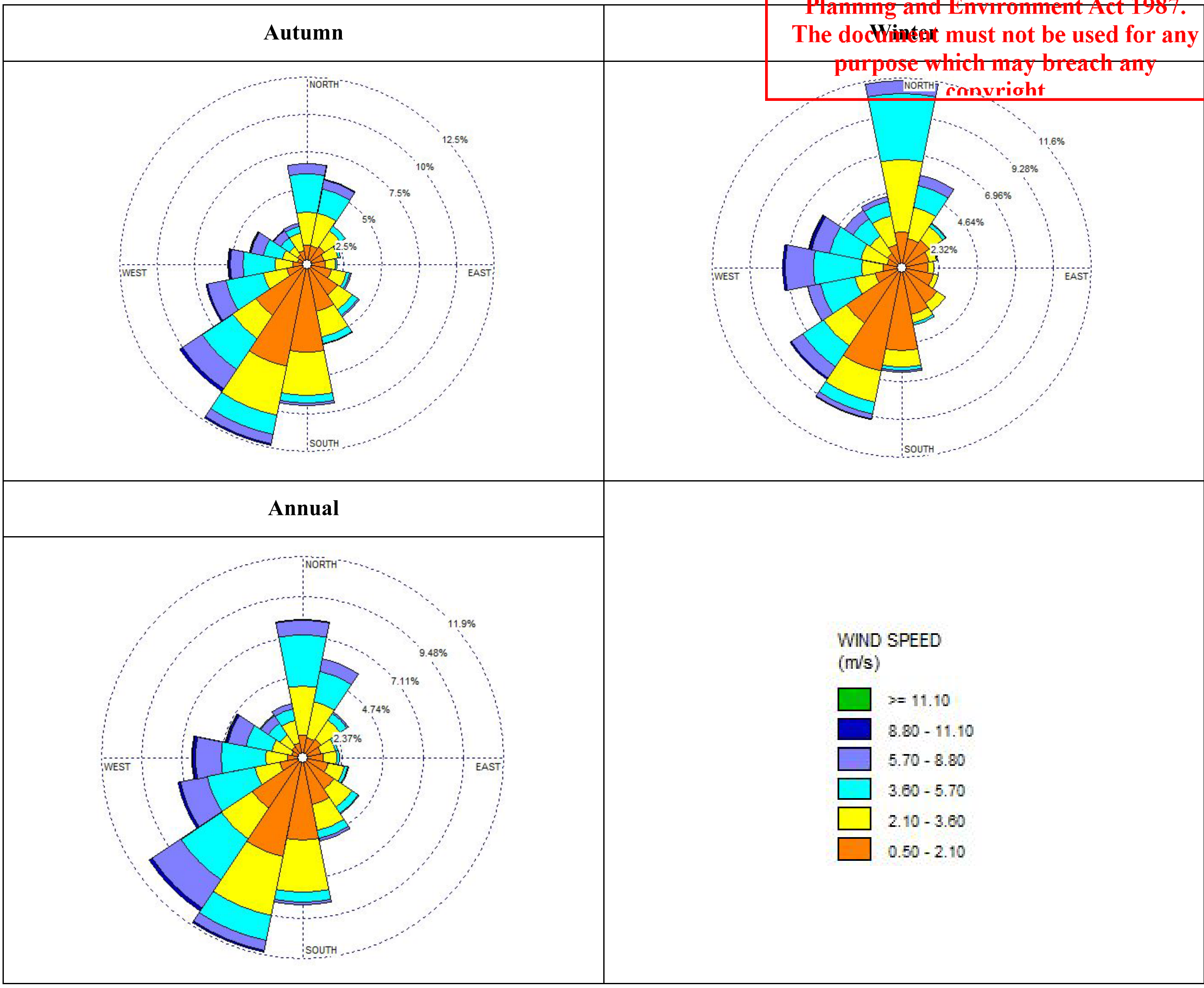

Figure 3.2 Annual and seasonal wind roses at Wangaratta Aero AWS for the period 2017 to 2021

3.6 Local air quality

To comply with the requirement of the Air NEPM, state EPA's have established ambient air quality monitoring networks across their states or territories to conduct long-term ambient air monitoring of key pollutants.

There are no ambient air quality monitoring stations that measures NO_2, CO, PM_{10} or $PM_{2.5}$ in a rural environment in Victoria. In this absence, background ambient air quality monitoring data is sourced from the nearest or most representative AAQMS. As such, the ambient air quality data adopted as background concentrations for this project are expected to be higher than actual concentrations at the site.

The nearest ambient air quality monitoring station (AAQMS) to the project is located at Jelbart Park in Albury, approximately 85 km to the north-east of the project in New South Wales. This performance monitoring station continuously measures PM_{10}, $PM_{2.5}$, ozone (O_3), and meteorological parameters. PM_{10} and $PM_{2.5}$ for the years 2017 to 2021 were adopted as background concentrations for the Proposal.

Alphington AAQMS is considered a representative of an urban environment that continuously measures NO_2 and CO, together with PM_{10}, $PM_{2.5}$, O_3, sulphur dioxide (SO_2) and meteorological parameters. It a performance monitoring station located approximately 170 km to the south-east of the subject site. NO_2 and CO concentrations for the years 2017 to 2021 were adopted as background concentrations for this Proposal. Preference was made to use PM_{10} and $PM_{2.5}$ collected at the Albury AAQMS given its regional location and expected lower concentrations.

A summary of the two AAQMS is presented in Table 3.3.

Table 3.3 Summary of AAQMS

AAQMS	Distance and direction to Proposal	Monitoring parameter used as background	NEPM compliance	Years analysed
Albury, NSW	85 km north-east	PM_{10}, $PM_{2.5}$	Yes	2017 to 2021
Alphington, VIC	170 km south-east	NO_2, CO	Yes	2017 to 2021[1]

(1) For 2021, data is only available from 1 January to 24 May 2021

3.6.1 NO_2

NO_2 monitoring at the Alphington AAQMS was conducted using a direct reading chemiluminescence technique for the years 2017 to 2021.

The NO_2 1-hour and annual average concentrations measured at the Alphington AAQMS over the period 2017 to 2021 are presented in Table 3.4 and illustrated in Figure 3.3. The monitoring data indicates that:

- the 1-hour and annual average NO_2 concentrations are compliant with their respective Air NEPM standards for the the years 2017 to 2021
- the maximum 1-hour and annual average NO_2 concentrations occur in 2017

Table 3.4 NO_2 concentrations at Alphington AAQMS for 2017 to 2021 (24 May)

Year	% Data availability	Annual average (ppb)	Maximum 1-hour average concentration (ppb)
2017	90.6	9.7	57
2018	94	9.6	50
2019	91.8	9.0	42
2020	92	8.2	52
2021	94.8	7.8[1]	36[1]
Air NEPM Standard		***15***	***80***

(1) Incomplete dataset. Data only available for the period 1 January to 24 May 2021

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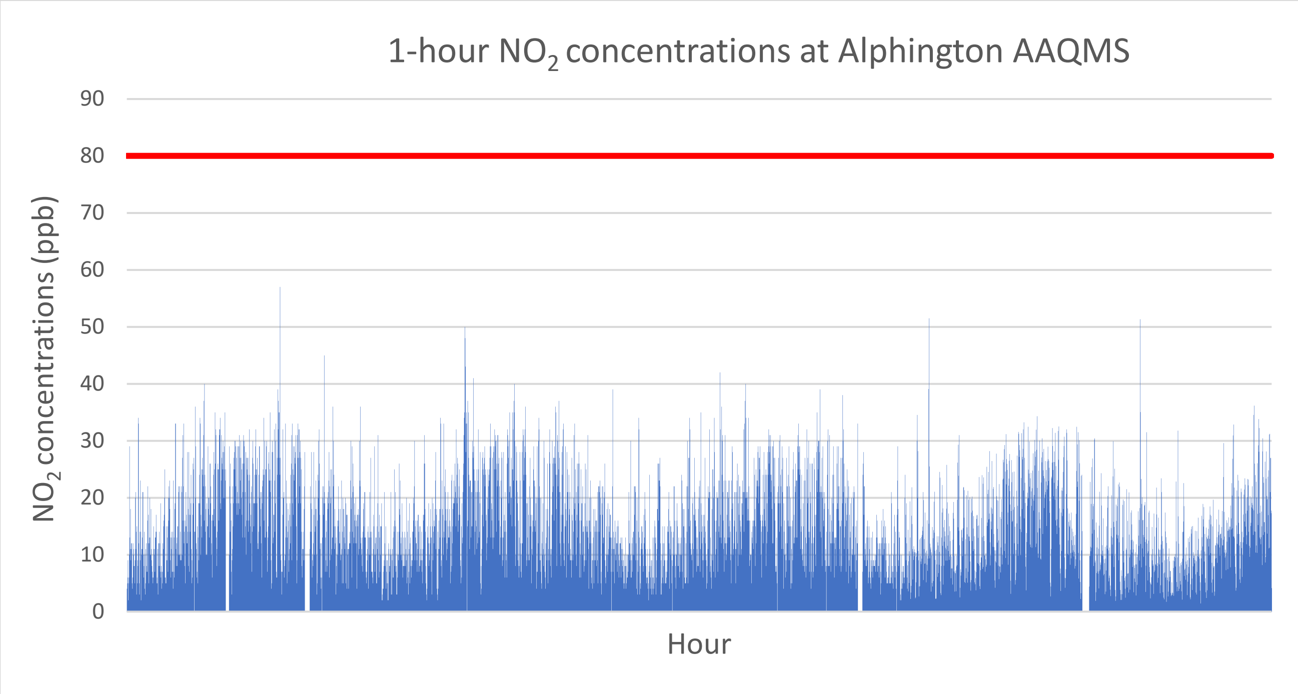

Figure 3.3 Hourly NO_2 concentrations at Alphington AAQMS for 2017 to 2021 (24 May 2021)

3.6.2 CO

CO monitoring at the Alphington AAMQS was carried out using the direct reading infrared analyser for the years 2017 to 2021.

The CO 8-hour average concentration measured at the Alphington AAQMS over the period 2017 to 2021 are presented in Table 3.5and illustrated in Figure 3.4. The monitoring data indicates that:

- the 8-hour average CO concentration is compliant with its respective Air NEPM standard for the years 2017 to 2021
- the maximum 8-hour average CO concentration occurs in 2020

Table 3.5 8-hour CO concentrations at Alphington AAQMS for 2017 to 2021 (24 May 2021)

Year	% Data availability	Maximum 8-hour average concentration (ppm)
2017	93.3	1.57
2018	93.6	1.76
2019	92.1	1.33
2020	86.8	3.87
2021	82.2[1]	1.13[1]
Air NEPM standard		***9***

(1) Data available for the period 1 January to 24 May 2021

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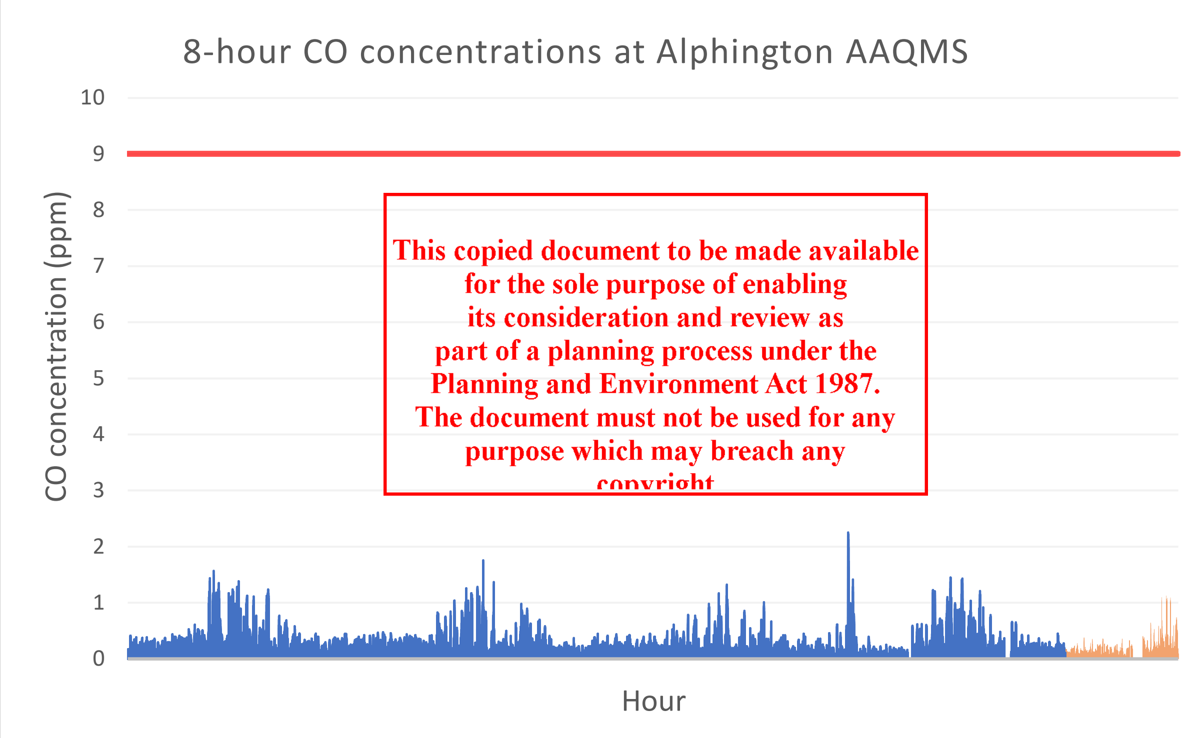

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Figure 3.4 8-hour CO concentrations at Alphington AAQMS for 2017 to 2021 (24 May 2021)

3.6.3 PM_{10}

PM_{10} monitoring at the Albury AAQMS was conducted using the Tapered Element Oscillating Instrument (TEOM) for the period 2017 to 2021.

24-hour and annual average PM_{10} concentrations measured at the Albury AAQMS over the period 2017 to 2021 are presented in Table 3.6 and Figure 3.5.

The monitoring dates indicates that:

— except for 2017, there were exceedances of the 24-hour PM_{10} Air NEPM standard for all years with 2019 recording 24 exceedances

— the highest 24-hour concentration of 298.3 µg/m^3 was recorded in 2020

— multiple exceedances of the 24-hour Air NEPM standard in 2019 and 2020 was due to widespread bushfires in Queensland, NSW, and Victoria from October 2019 to February 2020

— the annual average PM_{10} concentrations exceeded the Air NEPM standard in 2018, 2019 and 2020 due to bushfire smoke. The highest concentration of 24.9 µg/m^3 was recorded in 2019

Table 3.6 24-hour and annual average PM_{10} concentrations at Albury AAQMS for 2017 to 2021

Year	% Data availability	Annual average (µg/m^3)	Maximum 24-hour average (µg/m^3)	No of exceedances[1]
2017	97.5	17.4	48.8	0
2018	95.6	**21.2**	**107.8**	8
2019	98.6	**24.9**	**222.4**	24
2020	98.1	**21.1**	**298.3**	18
2021	98.6	15.4	**52.3**	1

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Year	% Data availability	Annual average ($\mu g/m^3$)	Maximum 24-hour average ($\mu g/m^3$)	No of exceedances[1]
Air NEPM standard		***20***	***50***	

(1) Exceedances highlighted in bold

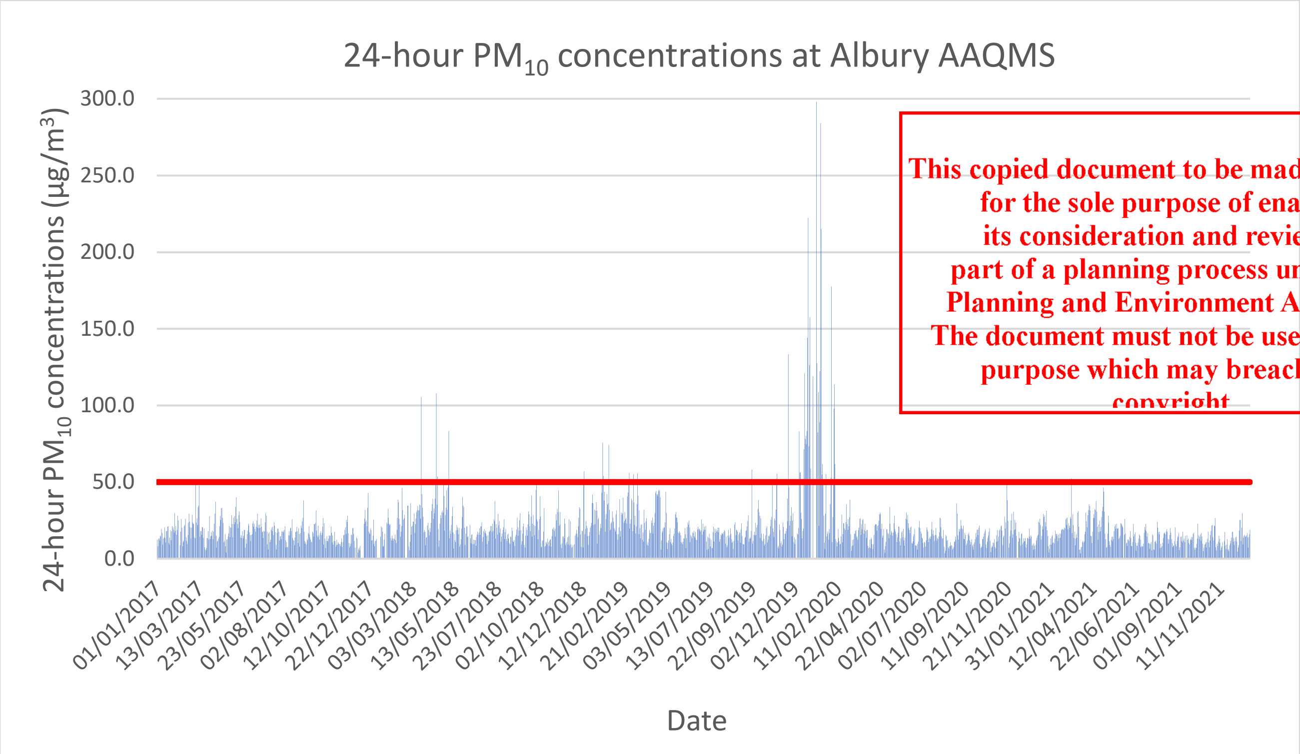

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Figure 3.5 24-hour PM_{10} concentrations at Albury AAQMS for 2017 to 2021

3.6.4 $PM_{2.5}$

$PM_{2.5}$ monitoring at the Albury AAQMS was conducted using the Beta Attenuation Method (BAM) for the period 2017 to 2021.

24-hour and annual average $PM_{2.5}$ concentrations measured at the Albury AAQMS over the period 2017 to 2021 are presented in Table 3.7 and Figure 3.6.

The monitoring dates indicates that:

- except for 2017 and 2020, there were exceedances of the 24-hour $PM_{2.5}$ Air NEPM standard for all years with 2019 recording 18 exceedances
- the highest 24-hour concentration of 275.2 $\mu g/m^3$ was recorded in 2020
- multiple exceedances of the 24-hour Air NEPM standard in 2019 and 2020 was due to widespread bushfires in NSW from October 2020 to February 2021
- the annual average $PM_{2.5}$ concentrations exceeded the Air NEPM standard in 2019 and 2020 due to bushfire smoke. The highest concentration of 11.6 $\mu g/m^3$ was recorded in 2019

Table 3.7 24-hour and annual average $PM_{2.5}$ concentrations at Albury AAQMS for 2017 to 2021

Year	% Data availability	Annual average ($\mu g/m^3$)	Maximum 24-hour average ($\mu g/m^3$)	No of exceedances[1]
2017	85.2	7.3	18.7	0

Year	% Data availability	Annual average (µg/m³)	Maximum 24-hour average (µg/m³)	No of exceedances[1]
2018	96.2	7.3	**30.4**	2
2019	99.2	**10.1**	**167.1**	18
2020	92.6	**11.6**	**275.2**	16
2021	94.2	7.3	24.6	0
Air NEPM standard		***8***	***25***	

(1) Exceedances in bold

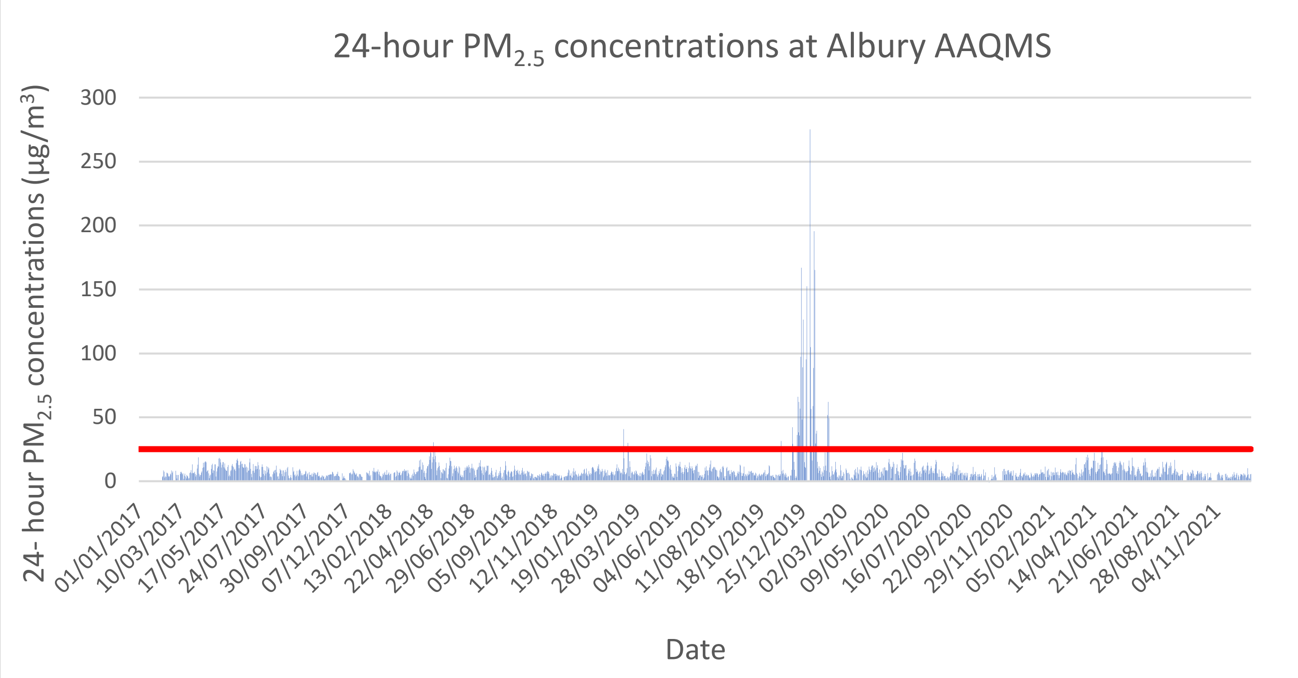

Figure 3.6 24-hour $PM_{2.5}$ concentrations at Albury AAQMS for 2017 to 2021

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4 Impact assessment

4.1 Assessment approach

The assessment methodology was conducted with consideration to the EPA Victoria draft *Guidance Notes for Using the Regulatory Air Pollution Model AERMOD in Victoria*, Publication 1551, October 2013 (EPA Victoria 2013a). EPA Victoria has adopted the US EPA regulatory dispersion model, AERMOD, as the approved regulatory air dispersion model for impact assessments in Victoria. As such, the following modelling approach was conducted for the assessment of air quality impacts associated with the operation of the Proposal:

— using TAPM and AERMET to develop meteorological input files for AERMOD.

— using AERMOD to predict GLCs for air emissions generated from the project operation.

— comparing cumulative concentrations against assessment criteria.

4.2 Model configuration

4.2.1 Meteorological modelling

Meteorological data files were developed in accordance with draft EPA Publication 1550 'Guidelines for Input Meteorological Data AERMOD', October 2013 (EPA Victoria 2013b).

The simulation of air quality impacts from the subject site requires the use of representative hourly meteorological data spanning five calendar years for surface and upper air observations. The closest BoM station where surface observations are available is located at the Wangaratta Aero AWS approximately 20 km north-east of the site. There is no BoM station within 5 km of the subject site. As such, site-specific surface and upper meteorological data was developed using the Commonwealth Scientific and Industrial Research Organisation (CSIRO) meteorological and prognostic air pollution model, The Air Pollution Model (TAPM).

4.2.1.1 The Air Pollution Model (TAPM)

The meteorological component of TAPM is an incompressible, optionally non-hydrostatic, primitive equation model with a terrain-following vertical co-ordinate for three dimensional simulations. The model is connected to '*databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature and synoptic –scale meteorological analysis for various regions around the world*'. Updated terrain and land use data together with other default dataset were used to generate synthetic meteorological files for the period 1 January 2017 to 31 December 2021.

TAPM was run adopting the setup prescribed by EPA publication 1550 and used the following parameters:

— Outer grid resolution of 30 km with nesting grids 10 km, 3 km, 1 km and 0.3 km.

— Grid centre of 36º30' S, 146º6' E (MGA Zone 55H 419224 m E, 5960320 m S).

— 41 by 41 horizontal grid points.

— 25 vertical levels (10 m, 25 m, 50 m, 100 m, 150 m, 200 m, 250 m, 300 m, 400m, 500 m, 600 m, 750 m, 1000 m, 1250 m, 1500 m, 1750 m, 2000 m, 2500 m, 3000 m, 3500 m, 4000 m, 5000 m, 6000 m, 7000 m, and 8000 m).

— 9-Second terrain height database.

— National Dynamic Land Cover Dataset 2.1.

— Synoptic analysis data for the period 1 January 2017 to 31 December 2021.

— TAPM default databases for soil type and leaf area index.

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TAPM's output was exported as a surface and upper air station file at MGA Zone 55H 419224 m E, 5960320 m S for incorporation into AERMET.

Wind rose plots were prepared from the TAPM output for the years 2017 to 2021 and are presented in Appendix A. The predominant wind directions are east south-easterly, west south-westerly and westerly which differ from the prevailing south-westerly winds recorded at Wangaratta Aero AWS. This may be due to a lack of influence from nearly topographic features. The average annual wind speeds are slightly higher at the subject site than at Wangaratta Aero AWS with lower calm conditions.

4.2.1.2 AERMET

To construct site-specific surface file for AERMET, the following TAPM-generated parameters extracted at the subject site location (MGA Zone 55H 419224 m E, 5960320 m S) were used in accordance with the requirements of the EPA publication 1550:

- wind speed at 10 m
- wind direction at 10 m
- screen level temperature (i.e., 2 m)
- screen level relative humidity (i.e., 2 m)
- net radiation
- mixing height.

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In the absence of a TAPM output for some surface meteorological parameters, measured data were adopted at the nearest AWS station. Station pressure and precipitation data from the nearest AWS station at Wangaratta Aero, and cloud cover at the Moorabbin/Melbourne Airport station, the nearest AWS station that collects cloud data, were used.

Table 4.1 presents surface roughness, albedo and Bowen Ratio values used in AERMET for generating AERMOD compatible surface meteorological files.

Upper air data extracted from TAPM was reconfigured to provide a profile file in AERMOD compatible format.

Table 4.1 Surface roughness, albedo and Bowen Ratio values used in AERMET

Parameter	**Season**	**Sector**
		0º – 360º
Surface roughness	Summer	0.41
	Autumn	0.41
	Winter	0.01
	Spring	0.05
Albedo	Summer	0.18
	Autumn	0.18
	Winter	0.2
	Spring	0.18
Bowen Ratio	Summer	0.8
	Autumn	1
	Winter	1

	Spring	0.4

4.2.2 Dispersion modelling

4.2.2.1 Air dispersion model

Atmospheric dispersion modelling mathematically simulates the transport and fate of pollutants emitted from a source into the atmosphere. Sophisticated software with algorithms that incorporate source quantification, surface contours and topography, as well as meteorology can reliably predict the downwind concentrations of these pollutants.

AERMOD is a new generation air dispersion model designed for short-range dispersion of airborne pollutants in steady state plumes that uses hourly sequential meteorological files with pre-processors to generate flow and stability regimes for each hour. The model produces output maps of GLCs, as a function of plume spread, which facilitated visual interpretation of key pollutant concentration isopleths. The model enables, through its statistical output, direct comparisons with national ambient air quality standards for compliance testing.

Air dispersion modelling was undertaken using the latest version of EPA regulatory model AERMOD (Version 19191) in Victoria, in accordance with the requirements of the EPA Publication 1551 (EPA Victoria 2013b).

4.2.2.2 Modelled receptors

The AERMOD receptor grid was a uniform cartesian grid measuring 25 km by 25 km (25 square km) with a grid spacing of 50 m centred at 419750 m E and 5959800 m S. The sensitive receptors identified in section 3.3 were also included in the model The grid is illustrated in Figure 4.1.

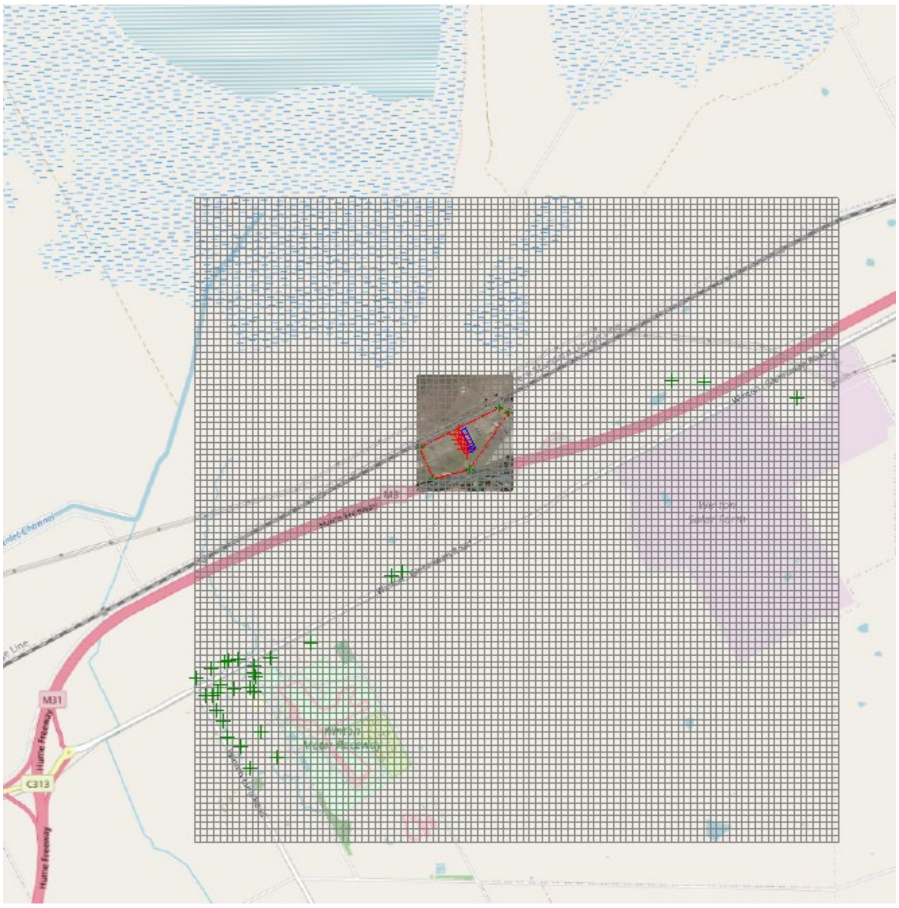

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Figure 4.1 Receptor grid

4.3 Emission estimation

The 200 MW gas fired power generation plant was based on the following configuration:

— 20 x 10MW gas engines with selective catalytic reducer aggregated into 4 stacks i.e., 5 x 10 MW gas engines through which emissions would be discharged through one stack.

4.3.1 Model scenario

Dispersion modelling of the following air emissions were based on continuous normal operating conditions (100% load):

— NO_x as NO_2

— CO

— Particulate matter

— NH_3

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4.3.2 Emission sources

The gas fired power generation plant would comprise of 4 identical point sources (stacks) each discharging emissions from 5 x 10MW gas engines.

4.3.3 Emission inventory

The stack source emission parameters and associated emissions data for the modelled scenario is presented in Table 4.2. The emissions data is based on worst case emissions from gas engines with SCRs operating under normal conditions for each of the modelled years (2017 to 2021).

Table 4.2 Modelled source emission parameters

Stack parameter	Stack 1	Stack 2	Stack 3	Stack 4
Location (Eastings, Northings, m)	419276 E, 5960467 N	419311 E, 5960486 N	419358 E, 5960337 N	419358 E, 5960318 N
Height (m, agl)	25	25	25	25
Diameter (m)	2.5	2.5	2.5	2.5
Temperature (°C)	357	357	357	357
Efflux velocity (m/s)	32	32	32	32
Volumetric flow (m^3/min, actual)	9,500	9,500	9,500	9,500
Pollutant	**Emission concentration (mg/Nm^3)**		**Emission rate (g/s)**	
NO_x (as NO_2)	50		3.3	
CO	538		35	
NH_3	7.6		0.49	
Particulate matter	16.0		1.04	

4.3.4 Building downwash

The AERMOD dispersion model accounts for the effects of building downwash of pollutants i.e., the enhanced turbulent mixing of pollutants in the lee of buildings, which can result in high concentrations in the wake of buildings. The buildings listed in Table 4.3 were included in the dispersion model.

Table 4.3 Building dimensions

Building name	Dimensions (m)
Engine hall	170 x 35 x 15 (L x W x H)[1]
MV switchgear building	28 x 6.5 x 5 (L x W x H)
Auxiliary service building	20 x 4.5 x 5 (L x W x H)
Workshop building	20 x 35 x 5 (L x W x H)
Administration building	20x 35 x 5 (L x W x H)

(1) L x W x H – Length by width by height

4.3.5 Treatment of terrain and land use data

To represent the influence of terrain elevations in the dispersion of pollutants, a digital terrain elevation file was used in AERMOD, based on Shuttle Radar Topography Mission (SRTM) data with a resolution of 90 m.

4.4 Assumptions and limitations

- emissions from each gas engine were modelled to be representative of continuous operation under 100% load for each hour of the year. In practice, the engines would run from between 1,500 to 4,500 hours per year.
- emissions of NO_x were modelled as NO_2 i.e., all of the NO_x is converted to NO_2. This is a highly conservative approach.
- five years (2017 to 2021) of meteorological data were used to model emissions from the GPG plant with the year predicting worst-case emissions (i.e., highest predicted concentrations) presented in this report
- local ambient air quality data was not available for the subject site. Ambient air quality data collected at the Albury AAQMS (PM_{10} and $PM_{2.5}$ data) and the Alphington AAQMS (NO_2 and CO) were adopted as background. Given their urban locations, background data is expected to be conservatively high.
- Ammonia slip levels from the SCR process typically range from 2 to 10 ppm. For this assessment an ammonia emission level of 10 ppm was used
- only incremental NH_3 impacts were presented given there is no available background data
- all particulate matter was assumed to be emitted as only PM_{10} and as only $PM_{2.5}$
- limitations in dispersion modelling include the uncertainties relating to the precision and applicability of input data and the lack of observational data with which to validate the predicted concentrations.

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5 Dispersion modelling results

The maximum predicted incremental concentrations for NO_x (as NO_2), CO, particulate matter and NH_3 for averaging periods consistent with the assessment criteria were extracted at modelled sensitive receptors. Where appropriate, background data were added to incremental concentrations to compare cumulative concentrations with relevant assessment criteria

5.1 NO_x as NO_2

Table 5.1 presents the 1-hour average and annual average NO_x (as NO_2) ground level concentrations at the selected sensitive receptors. Contours plots of incremental NO_x (as NO_2) impacts are presented in Appendix B illustrating the extent of dispersal from the Proposal. The predicted 1-hour and annual cumulative (emissions from the project plus background concentration) ground level concentrations (GLCs) of NO_x (as NO_2) at all sensitive receptors assessed are below their respective project assessment criteria. The highest predicted cumulative NO_x (as NO_2) concentration of 51.4 µg/m^3 occurred at receptor R1, located to the south of the facility of which 26.8 µg/m^3 (16% of the criterion) was due to emissions from the project.

Table 5.1 Predicted 1-hour and annual average NO_x (as NO_2) ground level concentrations

Receptor ID	1-hour average concentration (µg/m³)			Annual average concentration (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
R1	26.8	24.6	51.4	0.32	20.0	20.3
R2	20.3	24.6	44.9	0.30	20.0	20.3
R3	6.0	18.5	24.5	0.16	20.0	20.2
R4	6.9	22.6	29.5	0.22	20.0	20.2
R5	6.9	22.6	29.5	0.20	20.0	20.2
R6	8.1	6.2	14.3	0.19	20.0	20.2
R7	7.5	6.2	13.7	0.17	20.0	20.2
R8	7.2	20.5	27.7	0.16	20.0	20.2
R9	7.4	14.4	21.8	0.16	20.0	20.2
R10	7.5	14.4	21.9	0.16	20.0	20.2
R11	7.6	14.4	22.0	0.16	20.0	20.2
R12	7.9	14.4	22.3	0.16	20.0	20.2
R13	7.6	34.9	42.5	0.15	20.0	20.2
R14	7.6	34.9	42.5	0.15	20.0	20.2
R15	7.6	34.9	42.5	0.15	20.0	20.2
R16	7.5	34.9	42.4	0.14	20.0	20.1
R17	7.4	34.9	42.3	0.14	20.0	20.1
R18	7.1	14.4	21.5	0.15	20.0	20.2
R19	7.1	34.9	42.0	0.15	20.0	20.2

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Receptor ID	1-hour average concentration (µg/m³)			Annual average concentration (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
R20	7.1	32.8	39.9	0.14	20.0	20.1
R21	7.1	32.8	39.9	0.14	20.0	20.1
R22	7.1	32.8	39.9	0.14	20.0	20.1
R23	7.1	14.4	21.4	0.14	20.0	20.1
R24	7.6	14.4	22.0	0.15	20.0	20.2
R25	8.0	14.4	22.4	0.15	20.0	20.2
R26	8.6	14.4	23.0	0.15	20.0	20.2
R27	8.3	14.4	22.7	0.15	20.0	20.2
R28	8.6	14.4	23.0	0.15	20.0	20.2
R29	8.5	14.4	22.9	0.15	20.0	20.2
Winton Primary School	8.3	14.4	22.7	0.16	20.0	20.2
Assessment criteria			***164***			***30.8***

5.2 CO

Table 5.2 presents the 8-hour rolling average CO ground level concentrations at the selected sensitive receptors. Contours plots of incremental CO impacts are presented in Appendix B illustrating the extent of dispersal from the Proposal. The results indicate that the predicted cumulative 8-hour CO concentrations are below the assessment criterion of 11,250 µg/m³ at all sensitive receptor locations assessed. The highest predicted cumulative 8-hour average CO concentration of 241 µg/m³ occurred at receptor R26, with the background comprising 200 µg/m³ of the total. The highest predicted incremental 8-hour CO concentration of 88.7 µg/m³ occurred at receptor R1, less than 1% of the assessment criterion.

Table 5.2 Predicted 8-hour average CO ground level concentrations

Receptor ID	8-hour average CO concentrations (µg/m³)		
	Incremental	Background	Cumulative
R1	88.7	141	229
R2	87.9	141	230
R3	33.2	141	174
R4	50.5	93.8	144
R5	49.8	93.8	144
R6	41.0	200	241
R7	36.6	200	237
R8	34.7	200	235
R9	35.6	200	236

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Receptor ID	8-hour average CO concentrations (µg/m³)		
	Incremental	**Background**	**Cumulative**
R10	36.0	200	236
R11	36.0	200	236
R12	37.0	200	237
R13	32.2	200	232
R14	30.9	200	231
R15	30.5	200	231
R16	29.5	200	230
R17	28.5	200	229
R18	33.7	200	234
R19	31.6	200	232
R20	31.7	200	232
R21	31.2	200	231
R22	30.4	200	230
R23	32.8	200	233
R24	34.4	200	234
R25	35.8	200	236
R26	39.6	200	240
R27	37.8	200	238
R28	39.4	200	239
R29	38.8	200	239
Winton Primary School	38.6	200	239
Assessment criteria			***11,250***

5.3 Particulate matter

5.3.1 PM_{10}

Table 5.3 presents the 24-hour and annual average PM_{10} ground level concentrations at the selected sensitive receptors. Contours plots of incremental PM_{10} impacts are presented in Appendix B illustrating the extent of dispersal from the Proposal. The results show the 24-hour and annual average PM_{10} cumulative concentrations are below their respective assessment criteria at all sensitive receptor locations. The highest predicted 24-hour cumulative PM_{10} concentration of 22.8 µg/m³ occurs at receptor R4 where the contribution from the facility is 0.59 µg/m³, 1% of the assessment criterion of 50 µg/m³. The highest predicted 24-hour PM_{10} concentration from the facility only (1.2 µg/m³) occurs at receptor R1, comprising less than 3% of the assessment criterion. The highest predicted annual average cumulative PM_{10} concentration of 15.5 µg/m³ occurs at the majority of receptors assessed with the background comprising the majority (15.4 µg/m³) of the total.

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Table 5.3 Predicted 24-hour and annual average PM_{10} ground level concentrations

Receptor ID	24-hour average concentrations (µg/m³)			Annual average concentrations (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
R1	1.2	11.9	13.1	0.10	15.4	15.5
R2	1.0	11.9	12.9	0.10	15.4	15.5
R3	0.37	10.9	11.3	0.05	15.4	15.5
R4	0.59	22.2	22.8	0.07	15.4	15.5
R5	0.47	7.7	8.2	0.06	15.4	15.5
R6	0.35	20.2	20.6	0.06	15.4	15.5
R7	0.35	17.4	17.8	0.05	15.4	15.5
R8	0.36	17.0	17.4	0.05	15.4	15.5
R9	0.36	17.0	17.4	0.05	15.4	15.5
R10	0.36	17.0	17.4	0.05	15.4	15.5
R11	0.37	17.0	17.4	0.05	15.4	15.5
R12	0.36	17.0	17.4	0.05	15.4	15.5
R13	0.34	17.0	17.3	0.05	15.4	15.5
R14	0.33	17.0	17.3	0.05	15.4	15.5
R15	0.33	17.0	17.3	0.05	15.4	15.5
R16	0.33	17.0	17.3	0.04	15.4	15.4
R17	0.33	17.0	17.3	0.04	15.4	15.4
R18	0.38	17.0	17.4	0.05	15.4	15.5
R19	0.37	17.0	17.4	0.05	15.4	15.5
R20	0.38	17.0	17.4	0.05	15.4	15.5
R21	0.38	17.0	17.4	0.04	15.4	15.4
R22	0.38	17.0	17.4	0.04	15.4	15.4
R23	0.40	17.0	17.4	0.05	15.4	15.5
R24	0.39	17.0	17.4	0.05	15.4	15.5
R25	0.38	17.0	17.4	0.05	15.4	15.5
R26	0.34	5.8	6.1	0.05	15.4	15.5
R27	0.34	17.0	17.3	0.05	15.4	15.5
R28	0.34	5.8	6.1	0.05	15.4	15.5
R29	0.33	5.8	6.1	0.05	15.4	15.5

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Receptor ID	24-hour average concentrations (µg/m³)			Annual average concentrations (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
Winton Primary School	0.37	17.0	17.4	0.05	15.4	15.5
Assessment criteria			*50*			*25*

5.3.2 $PM_{2.5}$

Table 5.4 presents the 24-hour and annual average $PM_{2.5}$ ground level concentrations at the selected sensitive receptors. Contours plots of incremental $PM_{2.5}$ impacts are presented in Appendix B illustrating the extent of dispersal from the Proposal. The results show the 24-hour and annual average $PM_{2.5}$ concentrations are below their respective assessment criteria at all sensitive receptor locations. The highest predicted 24-hour cumulative $PM_{2.5}$ concentration of 10.3 µg/m³ occurs at receptor R7 where the contribution from the facility is 0.35 µg/m³, less than 2% of the assessment criterion of 25 µg/m³. The highest predicted 24-hour $PM_{2.5}$ concentration from the facility only (1.2 µg/m³) occurs at receptor R1, comprising approximately 5% of the assessment criterion. The highest predicted annual average cumulative $PM_{2.5}$ concentration of 7.4 µg/m³ occurs at most of the sensitive receptors assessed with the background comprising the majority (7.3 µg/m³) of the total.

Table 5.4 Predicted particulate matter ground level concentrations $PM_{2.5}$

Receptor ID	24-hour average concentrations (µg/m³)			Annual average concentrations (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
R1	1.2	6.6	7.8	0.10	7.3	7.4
R2	1.0	6.6	7.6	0.10	7.3	7.4
R3	0.37	4.8	5.2	0.05	7.3	7.4
R4	0.59	6.1	6.7	0.07	7.3	7.4
R5	0.47	6.6	7.1	0.06	7.3	7.4
R6	0.35	9.2	9.6	0.06	7.3	7.4
R7	0.35	9.9	10.3	0.05	7.3	7.4
R8	0.36	4.3	4.7	0.05	7.3	7.4
R9	0.36	4.3	4.7	0.05	7.3	7.4
R10	0.36	4.3	4.7	0.05	7.3	7.4
R11	0.37	4.3	4.7	0.05	7.3	7.4
R12	0.36	4.3	4.7	0.05	7.3	7.4
R13	0.34	4.3	4.6	0.05	7.3	7.4
R14	0.33	4.3	4.6	0.05	7.3	7.4
R15	0.33	4.3	4.6	0.05	7.3	7.4
R16	0.33	4.3	4.6	0.04	7.3	7.3
R17	0.33	4.3	4.6	0.04	7.3	7.3
R18	0.38	4.3	4.7	0.05	7.3	7.4

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Receptor ID	24-hour average concentrations (µg/m³)			Annual average concentrations (µg/m³)		
	Incremental	Background	Cumulative	Incremental	Background	Cumulative
R19	0.37	4.3	4.7	0.05	7.3	7.4
R20	0.38	4.3	4.7	0.05	7.3	7.3
R21	0.38	4.3	4.7	0.04	7.3	7.3
R22	0.38	4.3	4.7	0.04	7.3	7.3
R23	0.40	4.2	4.6	0.05	7.3	7.4
R24	0.39	4.3	4.7	0.05	7.3	7.4
R25	0.38	4.3	4.7	0.05	7.3	7.4
R26	0.34	4.2	4.5	0.05	7.3	7.4
R27	0.34	4.3	4.6	0.05	7.3	7.4
R28	0.34	4.2	4.5	0.05	7.3	7.4
R29	0.33	4.2	4.5	0.05	7.3	7.4
Winton Primary School	0.37	4.3	4.7	0.05	7.3	7.4
Assessment criteria			***25***			***8***

5.4 Ammonia

Table 5.5 presents the incremental 1-hour, 24-hour and annual average NH_3 ground level concentrations at the selected sensitive receptors. Contours plots of incremental NH_3 impacts are presented in Appendix B illustrating the extent of dispersal from the Proposal. The Victorian EPA does not monitor for NH_3 at any of its AAQMS. Consequently, incremental NH_3 impacts are presented only. The results indicate the predicted 1-hour, 24-hour and annual average concentrations from the facility are much lower than their respective assessment criteria at all sensitive receptors assessed. The highest predicted 1-hour, 8-hour and annual average NH_3 ground level concentrations occur at receptor R1 and are less than 1% of their respective assessment criteria.

Table 5.5 Predicted 1-hour, 24-hour, and annual average ammonia concentrations

Receptor ID	Maximum incremental average concentrations (µg/m³)		
	1-hour	24-hour	Annual
R1	4.0	0.57	0.05
R2	3.0	0.47	0.04
R3	0.9	0.18	0.02
R4	1.0	0.28	0.03
R5	1.0	0.22	0.03
R6	1.2	0.17	0.03
R7	1.1	0.17	0.03

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Receptor ID	Maximum incremental average concentrations (µg/m³)		
	1-hour	24-hour	Annual
R8	1.1	0.17	0.02
R9	1.1	0.17	0.02
R10	1.1	0.17	0.02
R11	1.1	0.17	0.02
R12	1.2	0.17	0.02
R13	1.1	0.16	0.02
R14	1.1	0.16	0.02
R15	1.1	0.15	0.02
R16	1.1	0.15	0.02
R17	1.1	0.16	0.02
R18	1.1	0.18	0.02
R19	1.1	0.18	0.02
R20	1.1	0.18	0.02
R21	1.1	0.18	0.02
R22	1.1	0.18	0.02
R23	1.1	0.19	0.02
R24	1.1	0.19	0.02
R25	1.2	0.18	0.02
R26	1.3	0.16	0.02
R27	1.2	0.17	0.02
R28	1.3	0.16	0.02
R29	1.3	0.16	0.02
Winton Primary School	1.2	0.18	0.02
Assessment criteria	***3,200***	***1,181***	***70***

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6 Management measures

The following management measures are proposed for efficient operation of the gas engines:

- low NO_x technology to be used
- the gas engines should be maintained in accordance with the manufacturers specifications with regular testing and scheduled regular maintenance
- NO_x and CO emissions from the gas engines to be regulated by in-stack emission limits
- periodic extractive monitoring to be undertaken to demonstrate compliance with in-stack limits
- a continuous on-line monitoring system to be installed on all four engine stacks
- a regular and documented maintenance and inspection program to be implemented for plant items.

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7 Conclusion

An operational air quality impact assessment was prepared in support of a Planning Permit for the Energy Reserve 1 Facility in Winton, Victoria.

Air dispersion modelling using AERMOD was conducted for one operational scenario to assess potential air quality impacts from the Proposal:

- continuous normal operating conditions (100% load)

The following pollutants were modelled

- NO_x (as NO_2)
- CO
- particulate matter
- NH_3

Contemporaneous (i.e., the same time period) background data were added to the predicted concentrations from the project to determine cumulative impacts. Incremental impacts for NH_3 were assessed only given no background data is available.

The modelling results indicate that under normal operating conditions at 100% load:

- the predicted 1-hour and annual average ground level concentrations of NO_2 are below their respective assessment criteria at all sensitive receptors assessed
- the predicted 8-hour rolling average ground level concentrations of CO is below its assessment criterion at all sensitive receptors assessed
- the predicted 24-hour and annual average ground level concentrations of PM_{10} is below its assessment criteria at all sensitive receptors assessed. This assumes all particulate matter is emitted in the form of PM_{10} only
- the predicted 24-hour and annual average ground level concentrations of $PM_{2.5}$ is below its assessment criteria at all sensitive receptors assessed. This assumes all particulate matter is emitted in the form of $PM_{2.5}$ only
- the predicted 1-hour, 24-hour, and annual average ground level concentrations of NH_3 (incremental only) is below its assessment criteria.

In summary, the air dispersion modelled demonstrated that emissions from the gas engines are low, below assessment criteria and contribute a much lower proportion of the total impact.

Management measures detailed in section 6 are recommended to ensure emissions are minimised from the facility.

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Bibliography

- Air NEPM. National Environment Protection (Ambient Air Quality) Measure 2021
- EPA Victoria (2013a). Construction of input meteorological data files for EPA Victoria's regulatory air pollution model (AERMOD). Environment Protection Authority of Victoria.
- EPA Victoria (2013b). Guidance notes for using the regulatory air pollution model AERMOD in Victoria. Environment Protection Authority of Victoria.
- EPA Victoria (2013c). Recommended separation distances for industrial residual air emissions. Environment Protection Authority of Victoria
- EP Act 2017. Environment Protection Act 2017
- EP Regs 2021. Environment Protection Regulations 2021
- EPA Victoria (2021b). Environment Reference Standard 2021
- EPA Victoria (2021c). Guide for assessing and minimising air pollution in Victoria, 2021
- NEPC (2003). National Environment Protection Council Act 1994
- EPA Victoria 2001. State Environment Protection Policy (Air Quality Management) 2001
- EPA Victoria 2016. State Environment Protection (Ambient Air Quality) 2016

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Appendix A

TAPM wind rose plots

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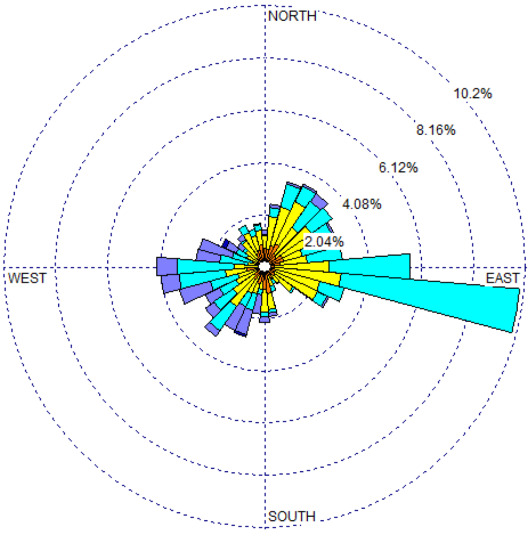
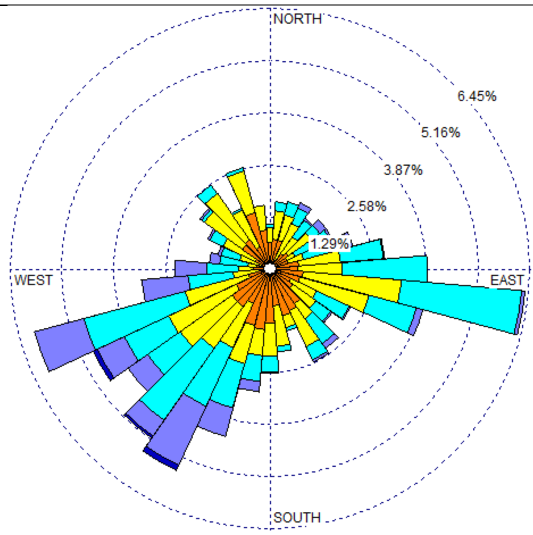
2017

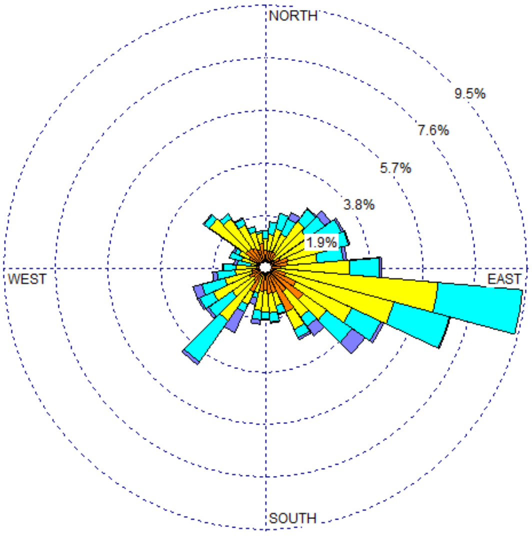
Spring



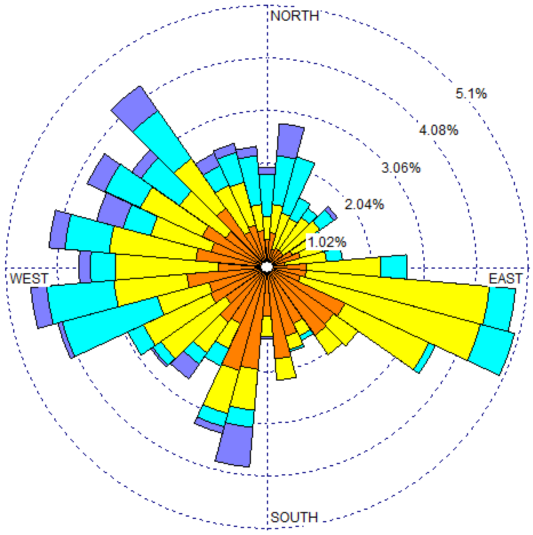
Summer



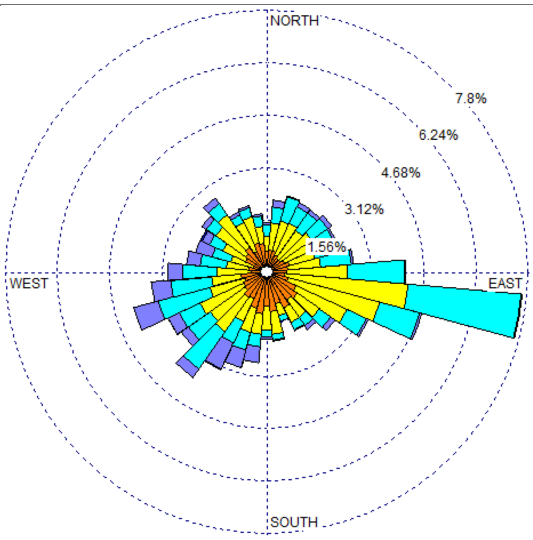
Autumn



Winter



Annual



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Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.52	0.32
Summer	3.25	0.46
Autumn	2.98	0.68
Winter	2.74	0.50
Annual	3.12	0.49

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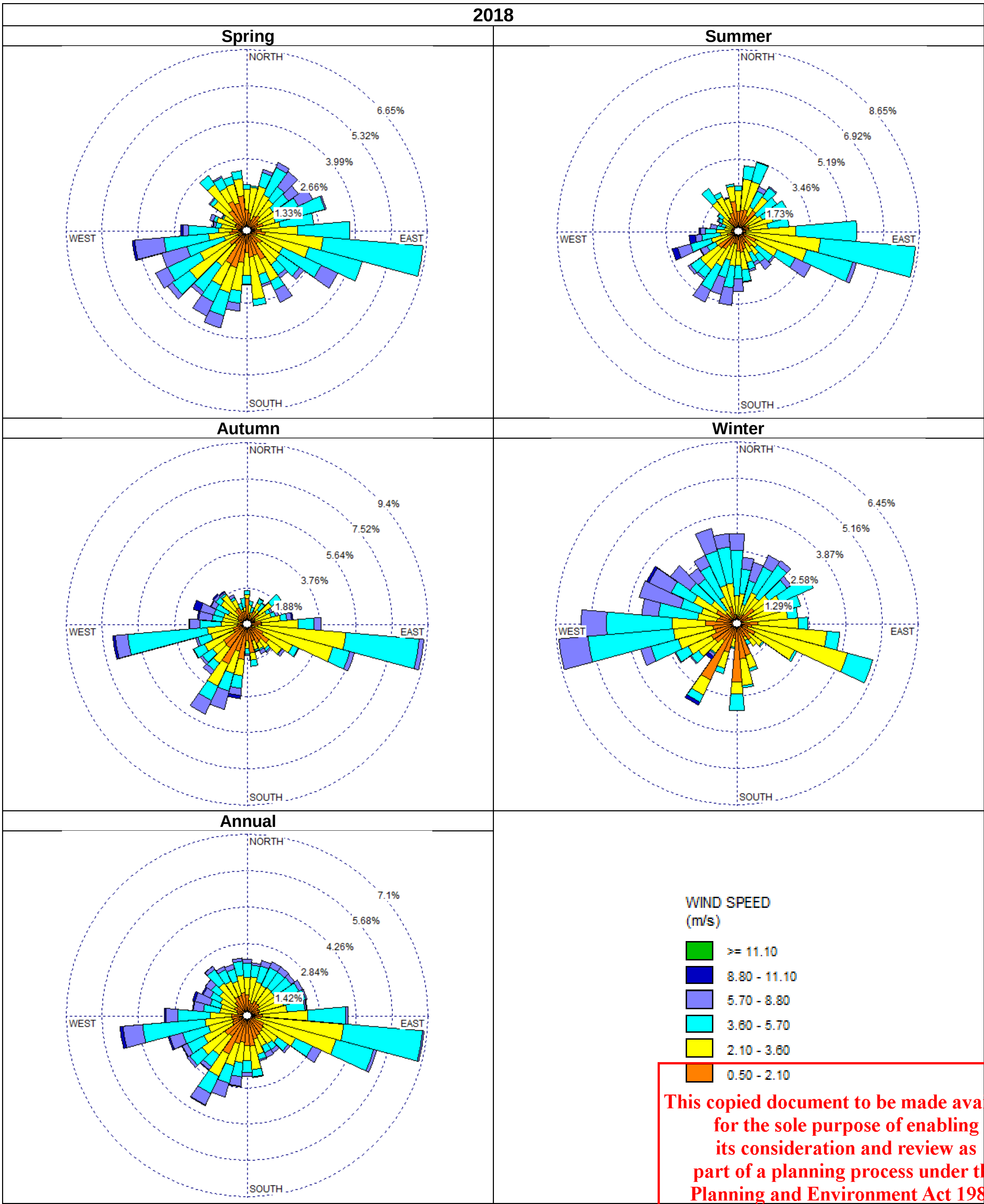

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Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.28	0.78
Summer	3.29	0.19
Autumn	3.10	0.59
Winter	3.37	0.59
Annual	3.26	0.54

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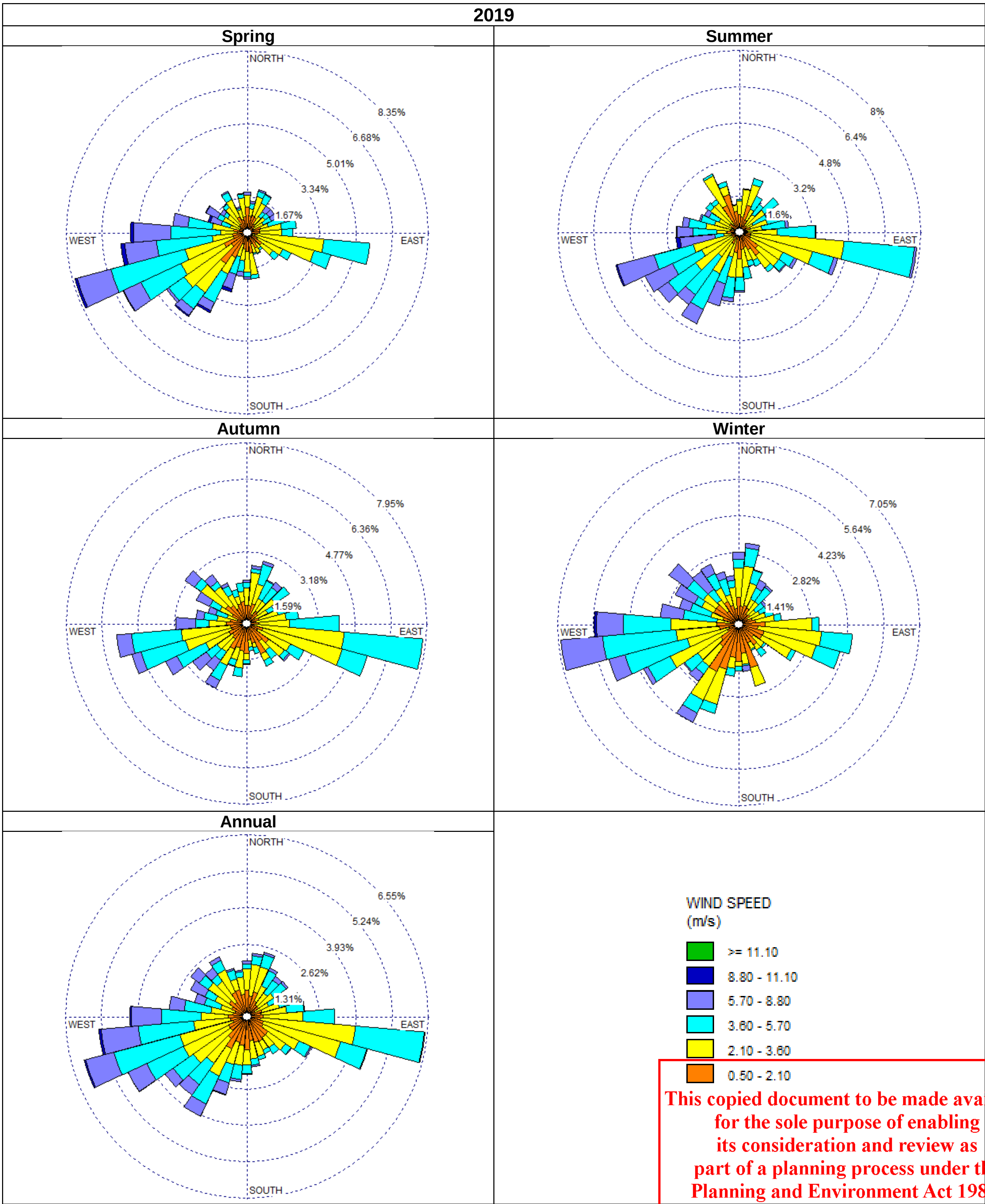

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Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.38	0.60
Summer	3.34	0.56
Autumn	3.10	0.45
Winter	3.11	0.54
Annual	3.23	0.54

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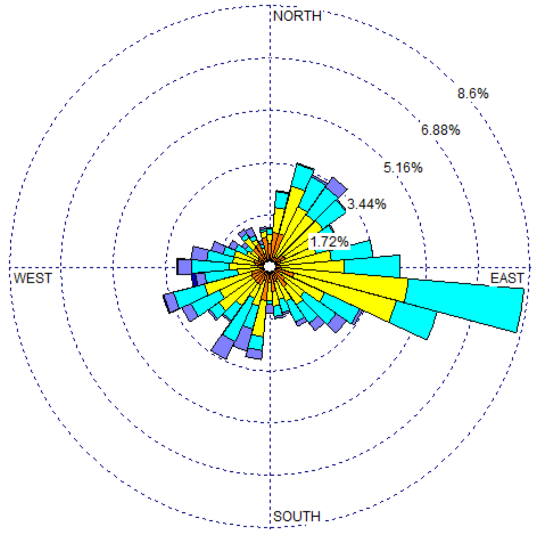
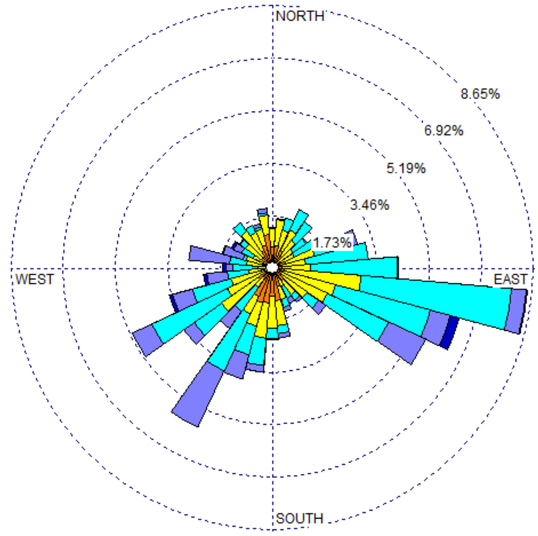
2020

Spring



Summer



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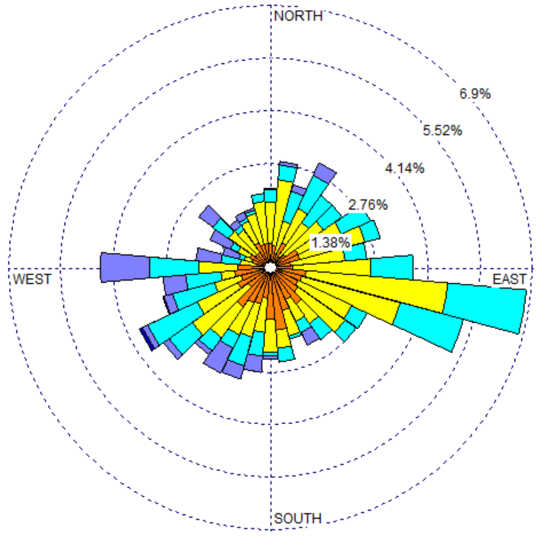

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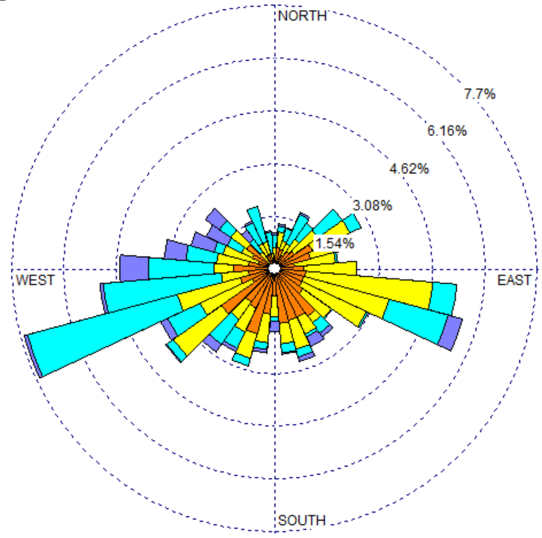

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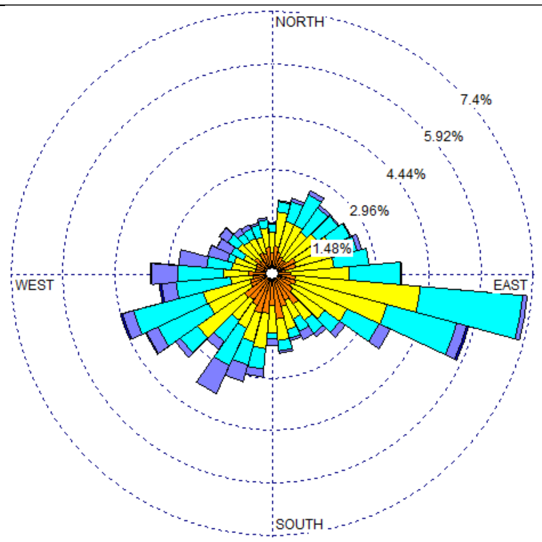

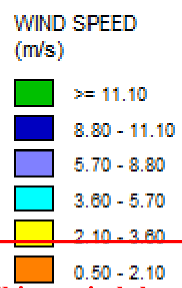

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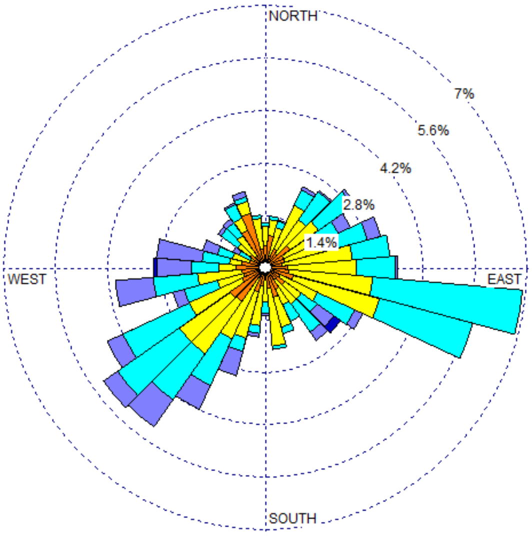
Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.27	0.50
Summer	3.72	0.18
Autumn	3.03	0.68
Winter	2.95	0.50
Annual	3.24	0.47

2021

Spring



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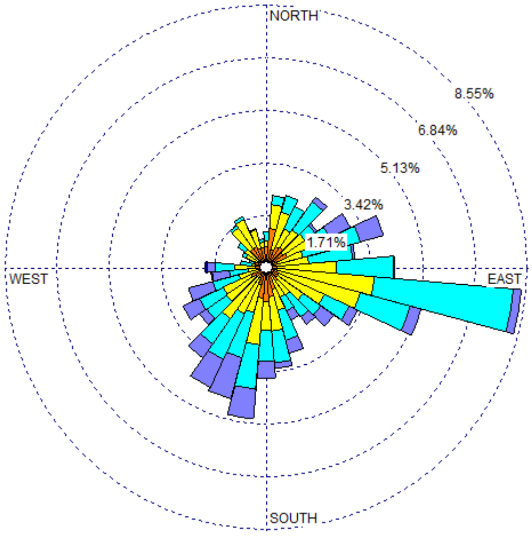
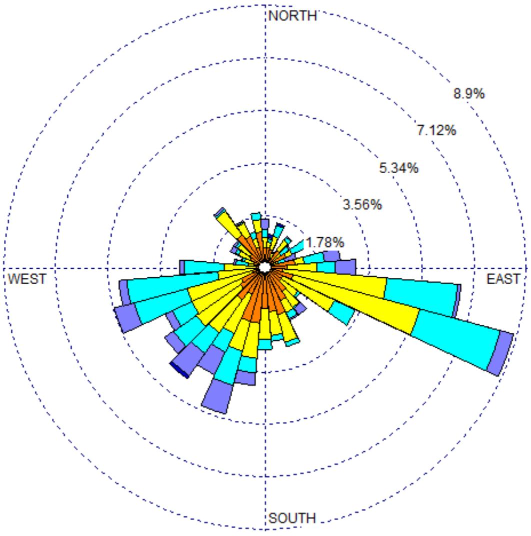
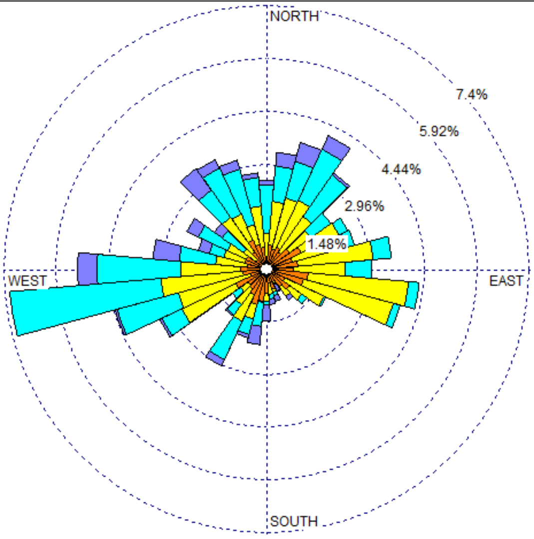


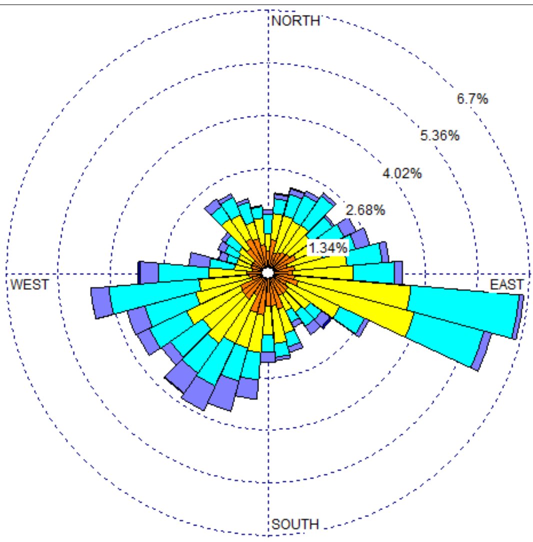
Autumn



Winter



Annual



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Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.36	0.46
Summer	3.51	0.37
Autumn	3.09	0.59
Winter	3.18	0.23
Annual	3.28	0.41

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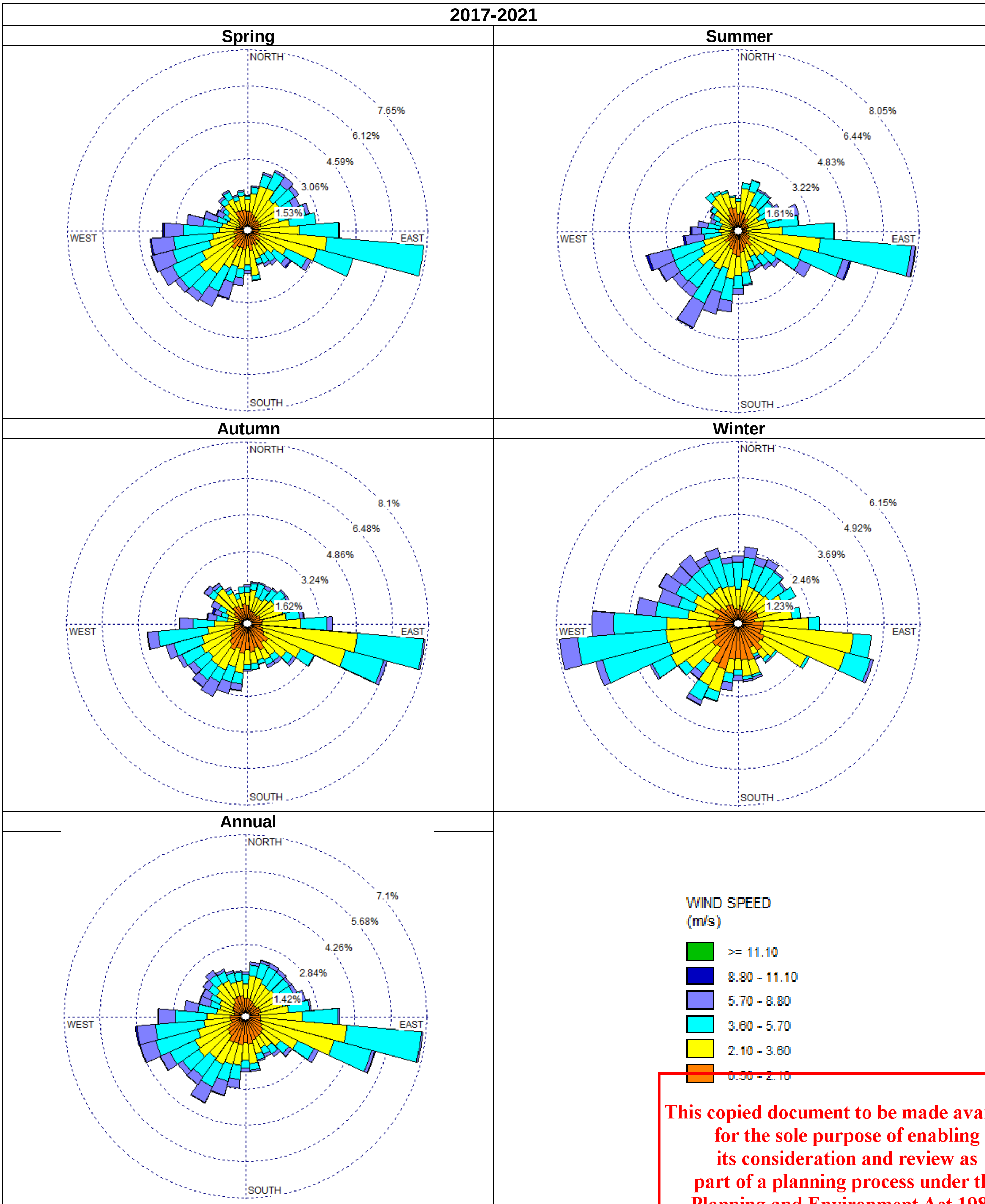

Averaging Period	Average Wind Speed (m/s)	Calm Winds Frequency (%)
Spring	3.36	0.53
Summer	3.42	0.35
Autumn	3.06	0.60
Winter	3.07	0.47
Annual	3.23	0.49

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Appendix B

Contour plots

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-1
Predicted 1-hour Average NO_2 Concentrations ($\mu g/m^3$)

Legend

- Predicted 1-hour Average NO_2 Concentrations ($\mu g/m^3$)
- Project Area
- Study Area
- Cadastre Boundaries

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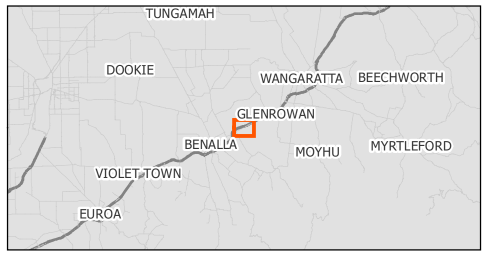

0 500 Meters

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:20,000 Date: 9/05/2022

Data sources: - DELWP, Geoscience Australia

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-2
Predicted Annual Average NO_2 Concentrations ($\mu g/m^3$)

Legend

- Predicted Annual Average NO_2 Concentrations ($\mu g/m^3$)
- Project Area
- Study Area
- Cadastre Boundaries

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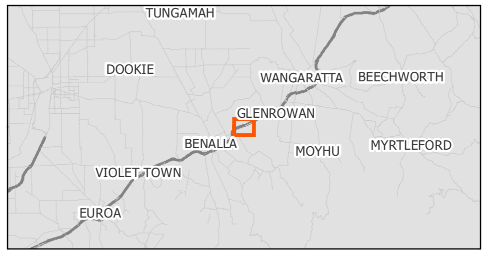

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-3
Predicted 8-hour Average CO Concentrations (μg/m^3)

Legend

- Predicted 8-hour Average CO Concentrations (μg/m^3)
- Project Area
- Study Area
- Cadastre Boundaries

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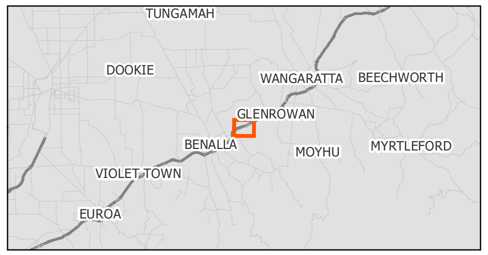

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-4
Predicted 24-hour Average Particulate Matter Concentrations (μg/m³)

Legend

- Predicted 24-hour Average Particulate Matter Concentrations (μg/m³)
- Project Area
- Study Area
- Cadastre Boundaries

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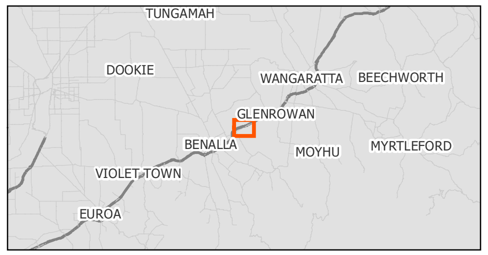

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-5
Predicted Annual Average Particulate Matter Concentrations (μg/m^3)

Legend

- Predicted Annual Average Particulate Matter Concentrations (μg/m^3)
- Project Area
- Study Area
- Cadastre Boundaries

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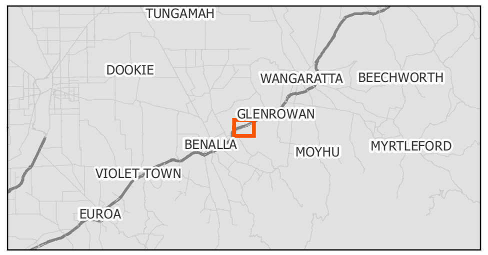

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-6
Predicted 1-hour Average NH_3 Concentrations ($\mu g/m^3$)

Legend

- Predicted 1-hour Average NH_3 Concentrations ($\mu g/m^3$)
- Project Area
- Study Area
- Cadastre Boundaries

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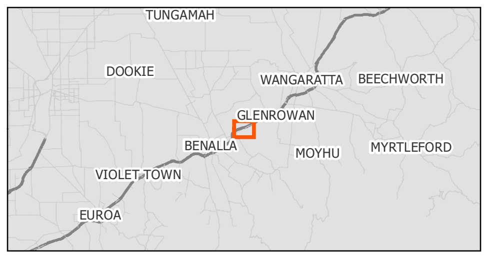

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-7
Predicted 24-hour Average NH_3 Concentrations (µg/m^3)

Legend

- Predicted 24-hour Average NH_3 Concentrations (µg/m^3)
- Project
- Study Area
- Cadastre Boundaries

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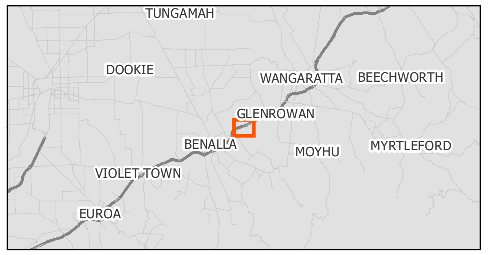

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Lochard Energy
Reserve 1 Facility: Winton

Figure A-8
Predicted Annual Average NH_3 Concentrations ($\mu g/m^3$)

Legend

- Predicted Annual Average NH_3 Concentrations ($\mu g/m^3$)
- Project Area
- Study Area
- Cadastre Boundaries

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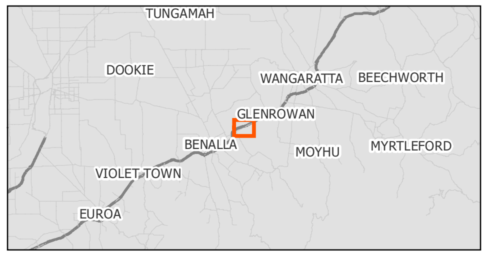

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