RIVCOTT COTTON TRASH SOLUTION

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 17265-A
VERSION 1.0

DECEMBER 2024

PREPARED FOR

RIVCOTT LIMITED
50 CONARGO ROAD
CARRATHOOL NSW 2711

DOCUMENT CONTROL

Version	Notes	Status	Date	Prepared	Reviewed	Approved
0.1	-	Draft	20/12/2024	NH		NH
1.0	-	Final	22/12/2024	NH		NH

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1 INTRODUCTION

1.1 Background

RivCott is a company owned by local cotton farmers who collectively operate a cotton gin at 50 Conargo Road, Carrathool in the Murrumbidgee Local Government Area (LGA). The cotton gin operates under an existing development consent granted by Murrumbidgee Council (DA 161314) and an Environment Protection Licence (EPL) No. 20717. The development consent and the EPL permit the processing of up to 150,000 tonnes of raw cotton per year. The Cotton Gin has been in operation for 10 years.

The Riverina and surrounding area including Lachlan Valley is fast becoming one of the largest cotton producing regions in the southern hemisphere. Around 82,000 hectares of cotton area planted each year in the region. To decrease the cost for farmers to transport their cotton, a number of cotton gins have been developed in the region including the RivCott gin.

1.1.1 Cotton Ginning Process

The cotton ginning process commences at the farmers paddock where cotton fibre is harvested using purpose-built cotton harvesters which separate the fibre from the remainder of the cotton plant to create bales. Within the bales are cotton lint, seeds as well as sticks, stems, burrs and other foreign matter.

The bales are stored in the paddock covered in plastic until the farmer schedules transportation and ginning with the cotton gin.

The main goal of ginning is to separate the seed and lint from the cotton fibre. The first stage of the ginning process involves the measuring of the moisture content of the cotton which will determine the amount of heat that will be applied to the fibre. Cotton is capable of absorbing over 25 times its weight in water. The drying process is integral to produce useable lint for the manufacture of clothes and other products. Presently, RivCott utilises propane as a heat source to dry the cotton. Around 12 litres of propane is required to dry each bale converted to 83 kWh. Cotton must be ginned with a moisture level of 5%

The cotton fibre then makes its way through conditioners to remove cotton trash and foreign material before being sent to the gin stand where the seeds are removed. The cotton seed is sent to oil processing facilities to create cotton seed oil. The cotton lint is then sent to the bale press to create bales under high pressure for transportation to third party manufacturers which carry out the processes of carding, combing, spinning, dying and weaving to make clothes or other products.

At the end of the ginning process, 42% of each bale consists of lint, 49% is cotton seed and 9% is cotton trash which is mainly composed of cotton burrs (also known as cotton carpels or hulls), motes (cotton fibres attached with immature or broken seeds), sticks, leaf parts, and fine woody particles

1.2 Site Description

The subject site comprises around 104.51 (ha) of RU1 – Primary Production zoned land located at 50 Conargo Road in the Griffith LGA (see **Figure 1-1**) and is legally described as Lot 2 DP1265397

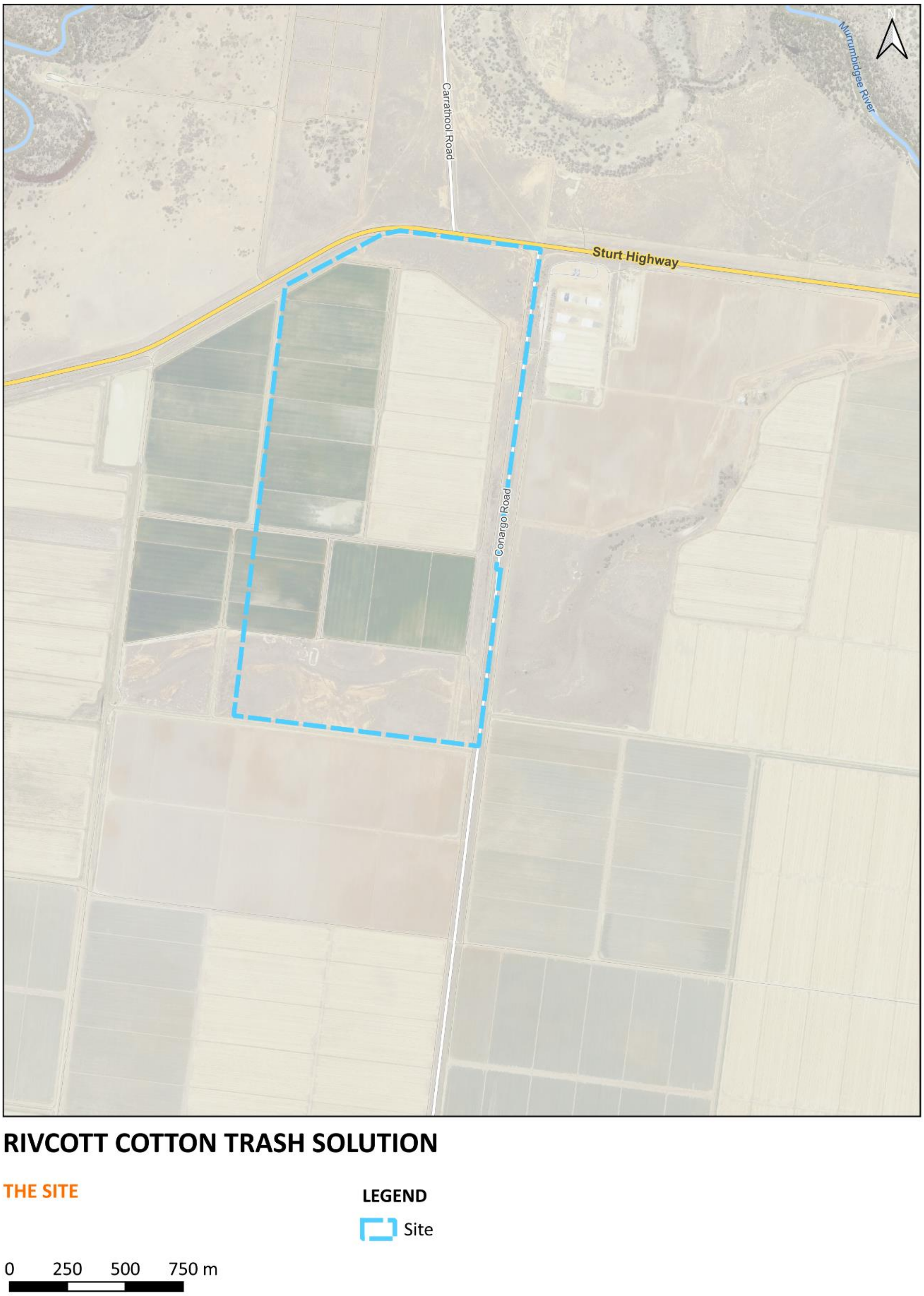
The subject site is bound by Conargo Road to the east and Sturt Highway to the north. The subject site presently contains the RivCott Cotton Gin which operates under DA 161314 and an Environment Protection Licence (EPL) No. 20717.

The site has a single formalised driveway from Conargo Road which connects to the Sturt Highway to the north via a channelised intersection designed for road trains.

The site contains the following improvements:

- Main cotton gin building
- Bail shed
- Cotton seed shed
- Workshop
- LPG gas tanks
- Weighbridge and office
- Car park
- Fire tanks, booster and pumps
- Landscaping areas
- Cotton bale storage areas
- Cotton trash storage areas
- Stormwater detention and conveyance system (the site operates as a closed system for water and is totally bunded.
- Noise barrier to the south and north of the cotton gin
- Truck parking and waiting areas
- Bulk diesel tank

Figure 1-1 The Site



Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.

1.3 Surrounding Land Uses

The site is located in a remote location in the Murrumbidgee Local Government Area on Conargo Road which connects to the Sturt Highway at an existing channelised intersection around 450 m from the site. Conargo Road is a bitumen sealed two lane road. The nearest residential receiver is located approximately 1.3 km to the north-west of the site. The predominant land use in the locality is broadacre and irrigated crop agriculture. Wormtech has a composting operation also on Conargo Road to the south of the site. The facility also operates under a Council development consent and an EPL and is permitted to receive around 90,000 tonnes per year of waste.

1.4 Environmental Protection Licence

EPL 20717 was issued by the EPA on 15 December 2015 and has been varied on two occasions. The EPL contains a processing limit of 150,000 tonnes of raw cotton per year. The EPL contains limits for discharge to air for Total Suspended Particles (TSP). A total of 37 monitoring locations are listed in the EPL.

The EPL also contains noise limits requiring the operations of the premises to not exceed an Leq (15 minute) noise emission criterion of 35dB(A).

The EPL also states under O4.1 that “there must be no incineration or burning of any waste at the premises.

1.5 Purpose of this Assessment

SoundIN Pty Ltd (SoundIN) has been engaged by RivCott, to prepare an Air Quality Impact Assessment (AQIA) for the Project. This AQIA has been prepared in general accordance with the NSW EPA’s *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2022) (the Approved Methods).

The construction of the Project would not generate significant dust emissions and there are no sensitive receptors within 350 metres of the Site. As suggested by the (UK) Institute of Air Quality management in the *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) assessment of construction dust impacts is not generally required when sensitive receptors are located more than 350 metres from the works. Therefore, this AQIA focusses on potential air quality impacts associated with the operation of the Project.

2 THE PROPOSAL

2.1 Gin Trash Problem

As discussed above, gin trash represents 9% of every cotton bale processed through the site. The RivCott EPL permits the processing of 150,000 tpy of cotton which equates to 13,500 tpy of cotton trash.

RivCott previously sent their cotton trash to the Wormtech composting facility. However, the facility began taking in food organic and garden organic (FOGO) waste and deceased poultry birds which does not leave any capacity to accept the cotton trash. Based on the existing approval being 150,000 tonnes of incoming cotton fibre, the gin produces 13,500 tonnes of cotton trash. The cotton trash is presently stored on site and used as a soil amendment. Storing the cotton trash in the paddocks is not considered to be a sustainable practice at the RivCott landholding for a number of reasons, including:

- The storing and decomposition of the cotton trash in paddocks creates greenhouse gas emissions.
- The cotton trash is considered a fuel load which could ignite in the paddock while being stored.
- The cotton trash also uses up space which could be used for the storage of cotton bales.

The EPA have issued an Order and Exemption for cotton gin trash which permits the land application of cotton gin trash within the confines of the controls in the Order. The use of the Order and Exemption to remove the cotton trash from the site is not feasible as farmers in the area have not required the use of it as a soil amendment and do not wish to pay the transportation costs to haul it to their paddocks.

RivCott has been searching for an alternative and sustainable method for the reuse of the cotton trash which could alleviate the above noted issues. The solution proposed in this application presented itself to RivCott through research and international best practices.

2.2 Gin Trash Solution

The Rivcott Gin presently utilises LPG to dry the cotton prior to ginning. Around 12 litres of LPG is required per bale which equates to 300 MJ of heat. The gin presently processing around 300,000 bales of cotton each year which requires 3.6 million litres of LPG. Each LPG tanker has a capacity of 40,000 litres and therefore around 90 truck movements are required each year to bring in LPG. The cost of LPG per litre in Australia as at 2 December 2024 was 1.17 AUD/L. Based on this cost ratio, RivCott must spend over $4 million per year to dry the cotton.

Cotton trash has substantial heat value equating to 16.6 MJ/kg. 46 kg of gin trash is produced per bale of cotton which equates to 764 MJ/ bale of heat value which surpasses the heat requirement to dry the lint produced from each bale.

Cotton gin trash therefore offers an optimal heat source to be used in the ginning process to eliminate the need to use LPG. Internationally, cotton gins in Greece incinerate gin trash to replace propane in the drying process. The incinerators used in Greece have only one chamber and are able to comply with EU EPA Standards.

RivCott is proposing to utilise three incinerators sourced from Canada referred to as a Triple Green Biomass Incinerator (TGBI) which is used for drying agricultural products and as a heat source for remote communities.

The thee TGBIs would be installed in a purpose-built extension to the southern end of the existing gin building. Gin trash would be transferred automatically to the TGBI in an enclosed environment.

3 AIR QUALITY CRITERIA

3.1 Introduction

This section identifies air pollutants relevant to this study and associated criteria. The criteria presented herein comprise impact assessment criteria for ground level concentrations (GLC) of pollutants and in-stack concentration limits.

3.2 Pollutants of Interest

The primary potential air pollutants associated with the operation of the Proposal are:

- Particulate matter ($PM_{2.5}$ and PM_{10})
- Sulfur dioxide (SO_2)
- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)

In addition to the air pollutants identified above, small amounts of polycyclic aromatic hydrocarbons (PAH) and dioxins and furans may be emitted during the combustion of gin trash. This is based on emissions factors for bagasse (sugar cane pulp) published in the National Pollutant Inventory (NPI) *Emission estimation technique manual for Combustion in Boilers* (NPI, 2011). The NPI does not provide emissions factors for the combustion of cotton gin trash. Of the fuels for which the NPI publishes emissions factors, bagasse is considered the most representative of gin trash.

3.3 Impact Assessment Criteria

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the "Approved Methods") (NSW EPA, 2022) sets out applicable impact assessment criteria for a number of air pollutants.

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the pollutants of interest in this study and the application air quality criteria for each pollutant.

3.3.1 Criteria Pollutants

Sulfur dioxide, nitrogen dioxide, particulate matter and carbon monoxide are among a group of air pollutants referred to as "criteria pollutants" in the Approved Methods. The impact assessment criteria for criteria pollutants relevant to the Proposal are presented in **Table 3-1**.

Table 3-1 Impact assessment criteria – criteria pollutants

Pollutant	Averaging Period	Criteria
Sulfur dioxide (SO_2)	1 hour	215 µg/m^3
	24 hours	57 µg/m^3
NO_2	1-hour	164 µg/m^3
	Annual	31 µg/m^3
Particulate matter ≤ 2.5 µm ($PM_{2.5}$)	24 hours	25 µg/m^3
	Annual	8 µg/m^3
Particulate matter ≤ 10 µm (PM_{10})	24 hours	50 µg/m^3
	Annual	25 µg/m^3
Total suspended particulates (TSP)	Annual	90 µg/m^3
Carbon Monoxide	15 minutes	100 mg/m^3
	1 hour	30 mg/m^3
	8 hours	10 mg/m^3

The criteria in **Table 3-1** are applied to the 100th percentile (i.e. maximum) dispersion modelling results and relate to the total concentrations of pollutants in the air, not just those emitted from a particular activity. Accordingly, some consideration must be given to the existing ambient concentrations of air pollutants. This is discussed in **Section 4.3**.

3.3.2 Toxic Pollutants

The impact assessment criteria for individual toxic pollutants relevant to the Proposal are presented in **Table 3-2**. These pollutants are assessed as the incremental impact at and beyond the boundary of the facility based on the 99.9th percentile of the dispersion modelling results.

Table 3-2 Impact assessment criteria – individual toxic pollutants

Pollutant	Averaging Period	Criteria (mg/m^3)
Dioxins and furans	1 hour	2.0×10^{-9}
Polycyclic aromatic hydrocarbon	1 hour	0.0004

3.4 Stack Limits

3.4.1 EPL #20717

The gin operates under EPL #20717, which includes stack emissions limits for the gin cyclones as presented in **Table 3-3**.

Table 3-3 Stack Limits – EPL #20717

Cyclone		Pollutant	100th percentile concentration limit (mg/m^3)
EPA ID	Description		
1	Unloading Fan: 1A-1	Total solid particles	50
2	Unloading Fan: 1A-2	Total solid particles	50
3	Unloading Fan: 1B-1	Total solid particles	50
4	Unloading Fan: 1B-2	Total solid particles	50
5	2nd Stage Pull: 2A-1	Total solid particles	40
6	2nd Stage Pull: 2A-2	Total solid particles	40
7	2nd Stage Pull: 2B-1	Total solid particles	40
8	2nd Stage Pull: 2B-2	Total solid particles	40
9	3rd Stage Pull: 3A-1	Total solid particles	20
10	3rd Stage Pull: 3A-2	Total solid particles	20
11	3rd Stage Pull: 3B-1	Total solid particles	20
12	3rd Stage Pull: 3B-2	Total solid particles	20
13	Overflow: A	Total solid particles	30
14	Feeder Dust	Total solid particles	50
15	Scavenger System	Total solid particles	10
16	Mote: LC1	Total solid particles	10
17	Mote: LC2-A	Total solid particles	10
18	Mote: LC2-B	Total solid particles	10
19	Mote: BC	Total solid particles	10
20	Mote: Trash	Total solid particles	10

Cyclone		Pollutant	100th percentile concentration limit (mg/m^3)
EPA ID	**Description**		
21	Mote: Pack BC	Total solid particles	10
22	Mote: Robber 1	Total solid particles	10
23	Mote: Robber 2	Total solid particles	10
24	Lint Cleaners: 3A	Total solid particles	45
25	Lint Cleaners: 4A	Total solid particles	45
26	Lint Cleaners: 5A	Total solid particles	45
27	Lint Cleaners: 3B	Total solid particles	45
28	Lint Cleaners: 4B	Total solid particles	45
29	Lint Cleaners: 5B	Total solid particles	45
30	Battery Condenser: B-1	Total solid particles	20
31	Battery Condenser: B-2	Total solid particles	20
32	Battery Condenser: B-3	Total solid particles	20
33	Battery Condenser: B-4	Total solid particles	20
34	Lint Cleaner Mote: A-1	Total solid particles	50
35	Lint Cleaner Mote: A-2	Total solid particles	50
36	Lint Cleaner Mote: B-1	Total solid particles	30
37	Lint Cleaner Mote: B-2	Total solid particles	30

3.4.2 Clean Air Regulation

The *Protection of the Environment Operations (Clean Air) Regulation 2022* (the Clean Air Regulation) defines maximum allowable in-stack concentrations to control impacts from industry on ambient air quality. The Regulation forms part of the *Protection of the Environment Operations Act 1997* (POEO Act).

The Clean Air Regulation sets out maximum permissible stack concentrations for a number of air pollutants, for various scheduled and non-scheduled activities. The relevant stack concentration limits for the Proposal, defined under the Clean Air Regulation as “general activities and plant” belonging to “Group 6”, are presented in **Table 3-4**.

Table 3-4 Stack Limits – Clean Air Regulation

Pollutant	Units of measure	100th percentile concentration limit
Solid particles	mg/m^3	50

4 EXISTING ENVIRONMENT

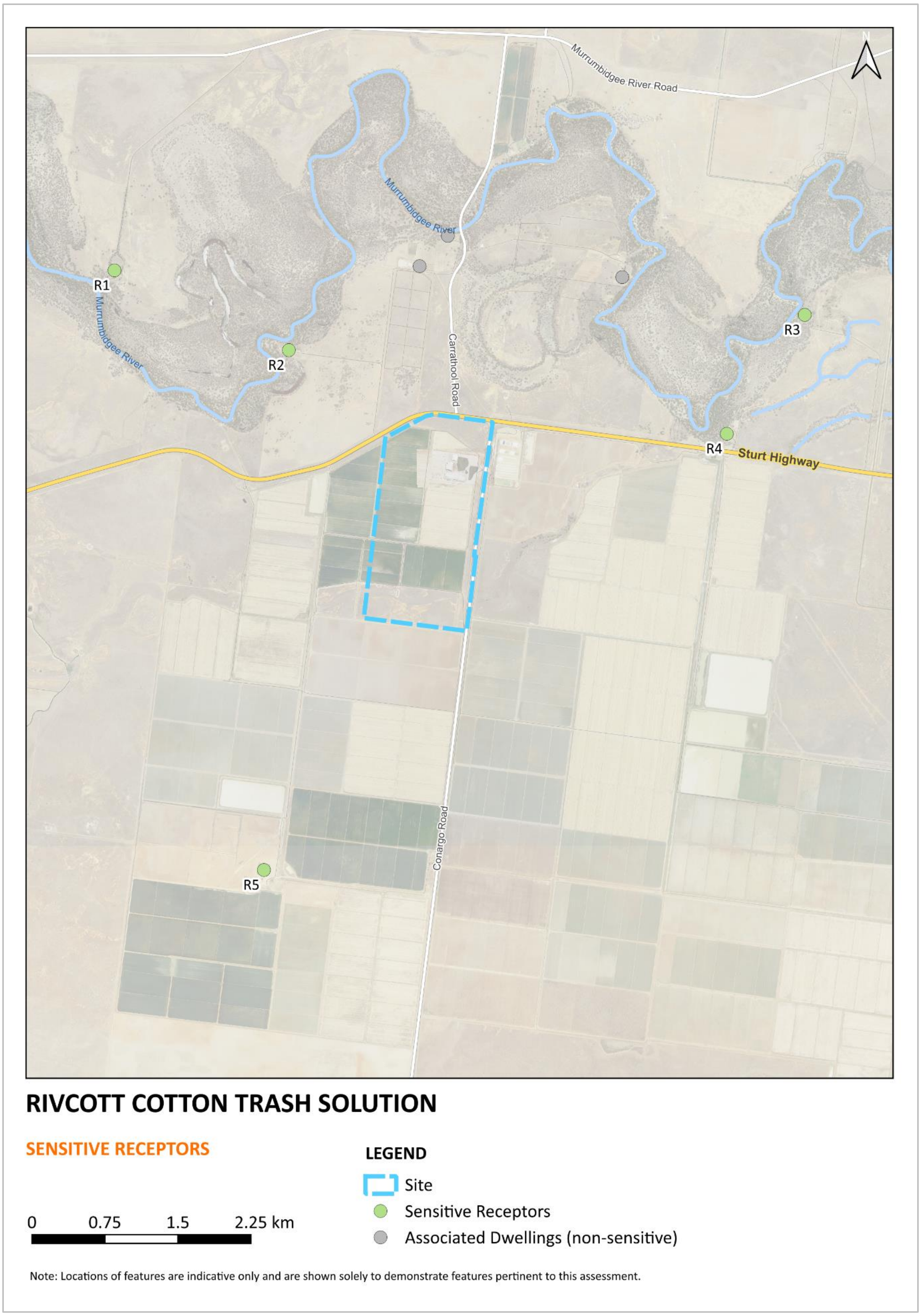
4.1 Sensitive Receptors

Several isolated rural dwellings comprise the nearest and most potentially affected sensitive receptors near the Site, which have been identified for assessment purposes. These receptors are identified in **Table 4-1** and shown in **Figure 4-1**. Several dwellings in the area are associated with RivCott (see **Figure 4-1)** and are not considered sensitive receptors for this assessment.

Table 4-1 Sensitive Receptors

Receptor ID	MGA55 Coordinates		Distance to site boundary (km)
	Easting (m)	Northing (m)	
R1	351,008	6,186,437	3.3
R2	352,799	6,185,618	1.3
R3	358,100	6,185,980	3.4
R4	357,299	6,184,758	2.4
R5	352,544	6,180,275	2.8

Figure 4-1 Sensitive Receptors



Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.

4.2 Local Meteorology

Meteorological conditions strongly influence air quality. Most significantly, wind speed, wind direction, temperature, relative humidity, and rainfall affect the dispersion of air pollutants. The following sub-sections discuss the local meteorology near the site.

4.2.1 Temperature, Humidity and Rainfall

Long term meteorological data for the area surrounding the site is available from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Griffith Airport. The Griffith Airport AWS is located approximately 65 kilometres north-east of the Site and records observations of several meteorological parameters including temperature, humidity, and rainfall.

Long-term climate statistics are presented in **Table 4-2**. Temperature data recorded at the Griffith Airport AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 33.3°C. July is the coolest month with a mean daily minimum temperature of 3.4°C. October is the wettest month with an average rainfall of 40 mm falling over 5 days. There are, on average, 49 rain days per year, delivering 411 mm of rain.

Table 4-2 Climate Averages for Griffith Airport AWS

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am mean temperature and humidity													
Temp(°C)	23.0	21.7	18.5	15.3	10.6	7.9	6.9	9.0	12.3	16.8	18.8	21.3	15.2
Hum(%)	49	58	60	66	78	87	88	79	70	56	56	49	66
3pm mean temperature and humidity													
Temp(°C)	30.6	30.2	27.0	22.8	18.2	14.3	13.3	15.5	18.9	22.8	26.0	28.6	22.4
Hum(%)	28	34	37	41	53	63	62	54	47	37	35	31	43
Daily minimum and maximum temperatures													
Min(°C)	17.4	17.5	14.4	10.3	6.7	4.3	3.4	3.8	5.8	9.2	12.8	15.3	10.1
Max(°C)	33.3	32.4	29.0	24.1	19.2	15.5	14.8	16.7	20.3	24.3	28.2	31.1	24.1
Rainfall													
Rain(mm)	36.8	28.0	35.4	29.6	36.1	35.1	32.4	34.9	32.7	39.9	36.6	32.9	410.6
Rain Days	3.3	2.6	2.9	3.3	4.2	4.9	5.5	5.5	4.6	4.6	3.7	3.5	48.6

4.2.2 Wind

As discussed in Section 5.1, a prognostic model has been used to develop site-specific meteorological data for dispersion modelling purposes. This prognostic model uses real observations of wind speed and wind direction to improve model performance. The BoM AWS at Hay Airport, which is located approximately 53 kilometres west of the Site has been used for this purpose.

Figure 4-2 to **Figure 4-7** present annual and seasonal “wind rose” plots for Hay Airport for the period 2019 to 2023, inclusive. On an annual basis, northerly and south westerly winds appear dominant. The south westerly winds are a feature of summer, spring and autumn. Wind speed and wind direction during 2021 are considered representative of the five-year period and have therefore been adopted for assessment purposes.

Figure 4-2 **Hay Airport AWS Wind Roses, 2019**

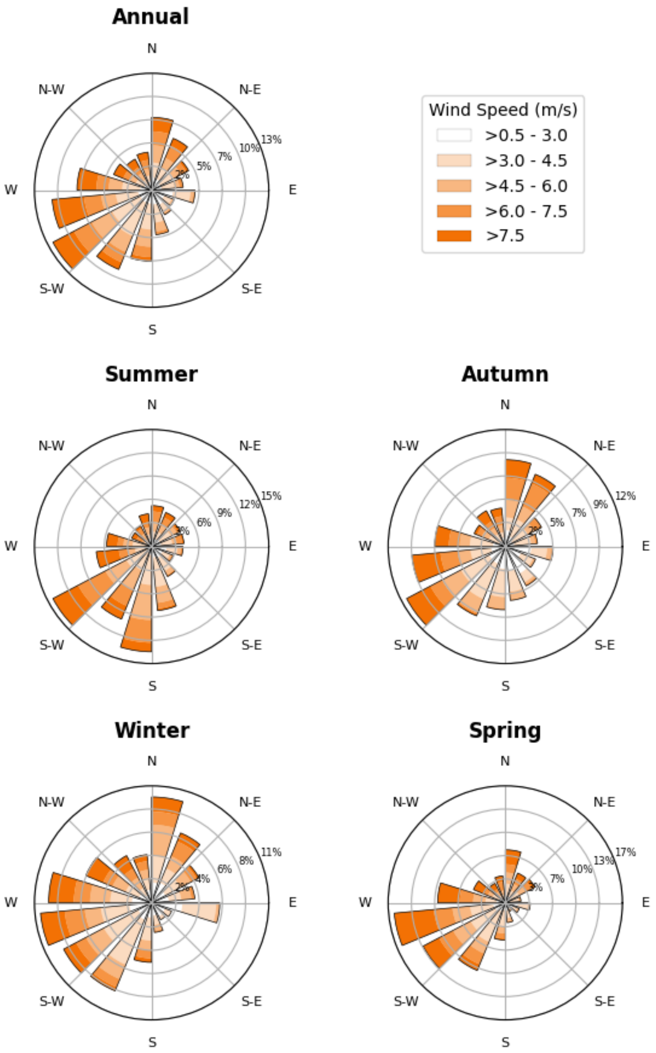


Figure 4-3 **Hay Airport AWS Wind Roses, 2020**

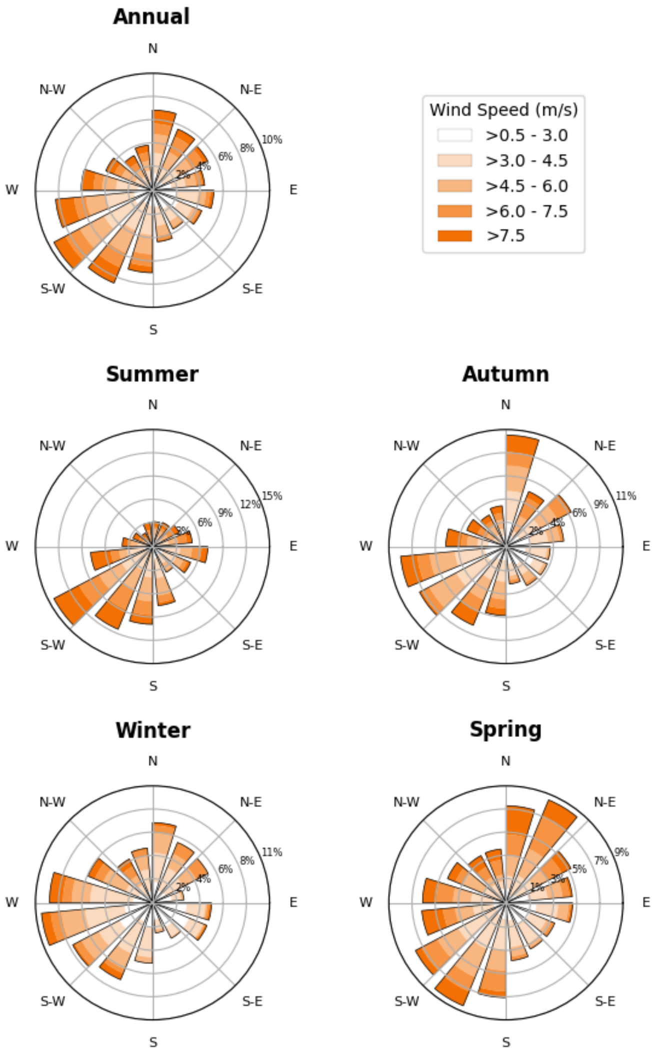


Figure 4-4 Hay Airport AWS Wind Roses, 2021

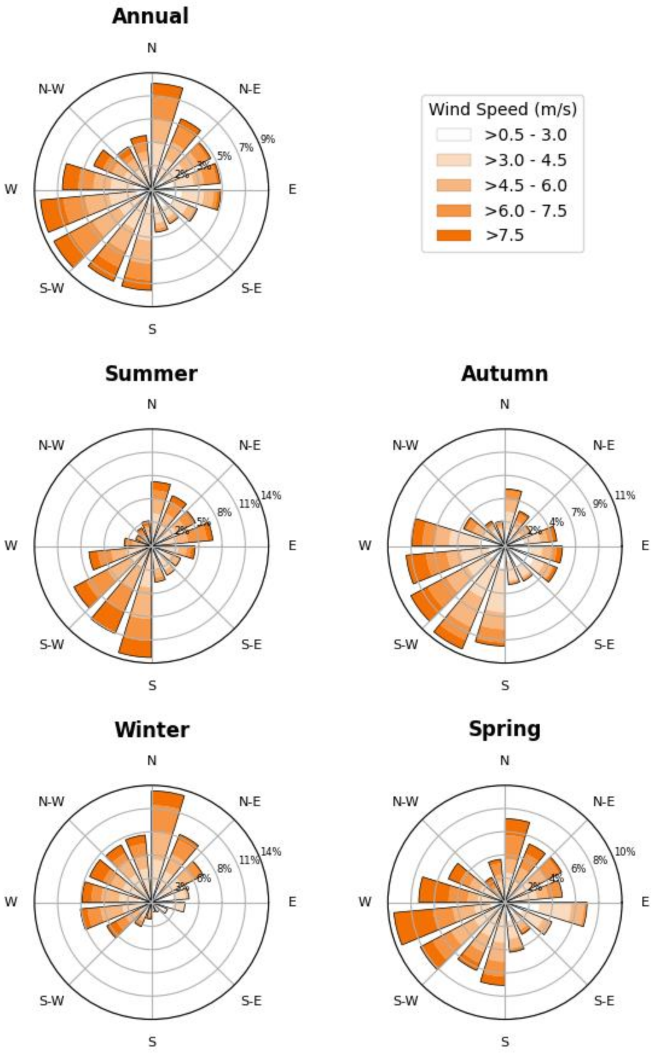


Figure 4-5 Hay Airport AWS Wind Roses, 2022

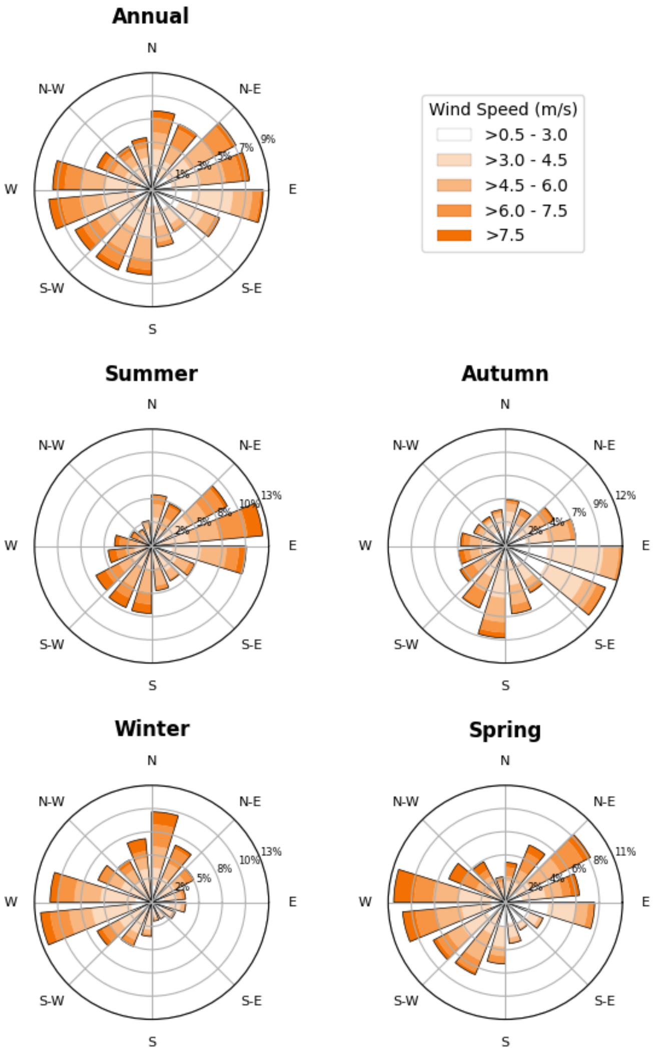
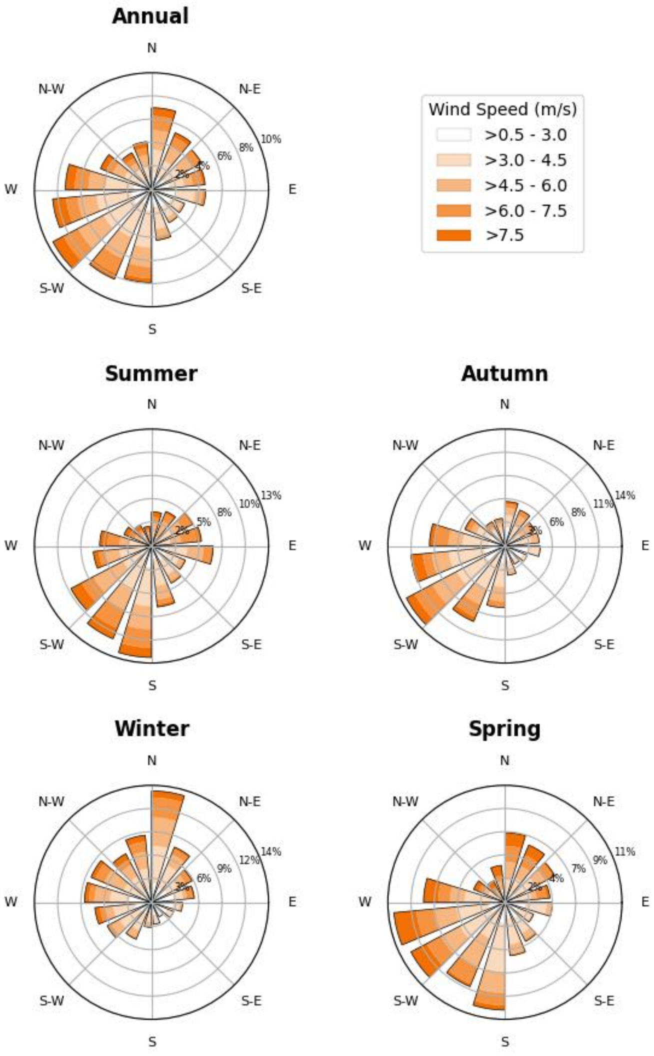


Figure 4-6 Hay Airport AWS Wind Roses, 2023



Annual

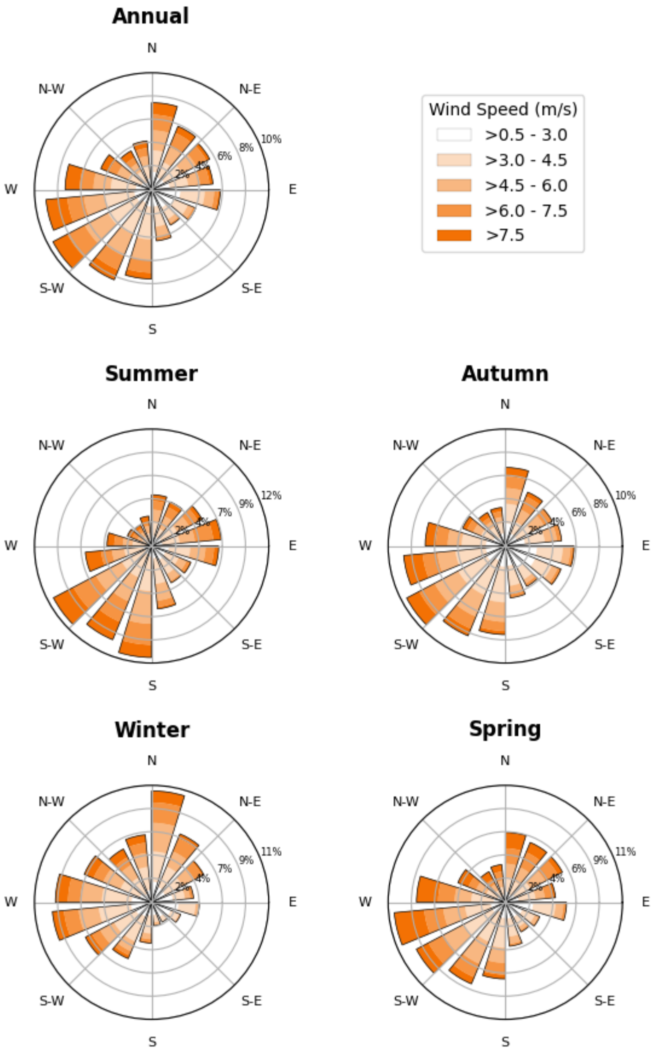
Summer

Autumn

Winter

Spring

Figure 4-7 Hay Airport AWS Wind Roses, 2019-2023



Annual

Summer

Autumn

Winter

Spring

4.3 Local Ambient Air Quality

No site-specific data are available to determine the existing concentrations of air pollutants at sensitive receptors near the Proposal. The NSW Government operates a network of air quality monitoring stations (AQMS) across NSW

The nearest AQMS is located approximately 190 kilometres south east of the Site, at Wagga Wagga North. The Wagga Wagga North AQM records $PM_{2.5}$ and PM_{10}, but does not record SO_2, NO_2, or CO. Goulburn AQMS, located approximately 400 kilometres east of the Site, records observations of NO_2. The nearest AQMS to the Site that records SO_2 and CO is located at Wollongong, approximately 500 kilometres east of the Site.

A summary of the ambient air quality monitoring data collected at the Wagga Wagga North, Goulburn and Wollongong AQMS during the modelling year (2021) is presented in **Table 4-3**.

Table 4-3 Existing Ambient Air Quality – 2021

Pollutant	AQMS	Concentration (µg/m³)			
		1-hour [1]	8-hour [1]	24-hour [1]	Annual
SO_2	Wollongong	60.1	n/a	17.2	n/a
NO_2	Goulburn	59.5	n/a	n/a	6.2
$PM_{2.5}$	Wagga Wagga North	n/a	n/a	25.4	6.3
PM_{10}	Wagga Wagga North	n/a	n/a	69.1	17.7
CO	Wollongong	1,379	804	n/a	n/a

1. Maximum values

There are no readily available site specific Total Suspended Particulates (TSP) data. NSW Government AQMS do not measure these components; however, estimates of the background levels for the area are required to assess the impacts of the Proposal on TSP.

Estimates of the annual average background TSP concentrations can be determined from a relationship between measured PM_{10} concentrations. This relationship assumes that 40% of the TSP is PM_{10} and was established as part of a review of ambient monitoring data collected by co-located TSP and PM_{10} monitors operated for reasonably long periods of time in the Hunter Valley (NSW Minerals Council, 2000). This approach to estimating ambient TSP concentrations in the absence of monitoring data is common throughout NSW and is generally accepted by NSW EPA.

Applying this relationship with the 2021 annual average PM_{10} concentration of 17.7 µg/m3 at the Wagga Wagga North AQMS estimates an annual average TSP concentration of 44.3 µg/m3.

$PM_{2.5}$ and PM_{10} impacts from the Proposal have been assessed using a “Level 2” assessment as defined in the Approved Methods. The Level 2 assessment involves adding contemporaneous background pollutant concentrations to dispersion modelling results. In instances where the ambient pollutant concentrations exceed the impact assessment criteria, as is the case for 24-hour $PM_{2.5}$ and PM_{10} at Wagga Wagga North, the Approved Methods requires a proposed development to not cause additional exceedances of the criteria.

5 DISPERSION MODELLING

5.1 Site Specific Meteorology

No meteorological observation data is available for the area near the Project. Therefore, site-specific meteorological data was generated using a prognostic model. The prognostic model used was The Air Pollution Model (TAPM), developed and distributed by the Commonwealth Scientific and industrial Research Organisation (CSIRO).

As discussed in Section 4.2.2, the 2021 calendar year was selected for meteorological (and dispersion) modelling as this was considered a representative year based on a review of data from the BoM monitoring station at Hay Airport AWS over the period 2019 – 2023.

5.1.1 TAPM

TAPM is an incompressible, non-hydrostatic, primitive equations prognostic model with a terrain-following vertical coordinate for three-dimensional simulations. It predicts the flows important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of large-scale meteorology provided by synoptic analyses. TAPM benefits from having access to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic scale meteorological analyses for various regions around the world.

The prognostic modelling domain was centred at 34.475° S, 145.408° E and involved four nesting grids of 30 km, 10 km, 3 km and 1km with 41 grids in the lateral dimensions and 25 vertical levels.

The TAPM model included assimilation of wind data collected at the Hay Airport AWS BoM Station during 2021.

5.1.2 AERMET

AERMET is the meteorological pre-processor in the AERMOD modelling system. AERMET accepts input data for local meteorology and land use and produces “surface” and “profile” files for AERMOD.

The TAPM results, including predictions of wind speed, wind direction, temperature, humidity, cloud cover, and rainfall, were used as inputs to AERMET. AERMET uses the TAPM data, along with land use data, to calculate mixing heights and velocity scaling parameters.

5.2 Regulatory Model

5.2.1 AERMOD

The dispersion model chosen for this assessment was AERMOD – the US EPA regulatory Gaussian plume air dispersion model. AERMOD is a steady state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts. It includes treatment of both surface and elevated sources, and both simple and complex terrain.

To account for terrain effects, 30 m resolution data from NASA's Shuttle Radar Topography Mission (SRTM) was imported into the AERMOD model.

5.2.2 NO_x Transformation

In most combustion sources, high-temperature chemical processes cause the nitrogen in the fuel air mixture to oxidise, creating various 'oxides of nitrogen' or NO_X. Nitric oxide (NO) makes up the majority of NO_X emissions from engines, with NO_2 typically making up 5-10% of the NO_X percentage.

After emission from the stack, NO is transformed to NO_2 through oxidation with atmospheric ozone.

For the purposes of this assessment, it is assumed that 100% of the NO_X emitted from the stacks (i.e. the cyclones) is transformed to NO_2. This is a very conservative assumption, which is supported by the Approved Methods, and would lead to the NO_2 impacts associated with the Proposal being overestimated by approximately 5-10 times.

5.2.3 Sub 1-hour Concentrations

Dispersion models typically predict ground level concentrations at time intervals of one hour or more. To predict sub 1-hour average concentrations, the following power-law, recommended by EPA Victoria (EPA Victoria, 1986), has been used:

$$C_{\tau_2} = C_{\tau_1}\left(\frac{\tau_1}{\tau_2}\right)^{0.2}$$

Where:

C_{τ_2} = concentration for averaging period 2

C_{τ_1} = concentration for averaging period 1

τ_1 = averaging period 1 (minutes)

τ_2 = averaging period 2 (minutes)

5.3 Emissions Estimates

A detailed emissions inventory for the Site was prepared in the original air quality impact assessment (AQIA) prepared by Pacific Environment Limited (PAL, 2014). The emissions inventory in the original AQIA identified all particulate emissions associated with ginning operations, including vehicle movements on haul roads, based on a maximum throughput in the gin of 50 bales per hour. Emissions factors developed by the Texas Commission on Environmental Quality (TECQ) were used to estimate particulate emissions from the gin. US EPA AP-42 (US EPA 1995) emission factors were used to estimate haul road emissions.

For this assessment, the detailed emissions inventory from the original AQIA has been updated and expanded as described in the following sub-sections.

5.3.1 Emissions Testing (2016)

Following the commissioning of the gin, emissions from the unloading and feeder dust cyclones were measured by AECOM (AECOM, 2016). The emissions monitoring found that the estimated emissions in the original AQIA for the unloading and feeder dust cyclones were 20 times and 4 times higher, respectively than the highest measured levels.

To account for the measured emissions being significantly lower than those estimated using emissions factors, the measured TSP emission rates from the unloading and feeder dust cyclones have been applied to those sources and all other ginning sources have been reduced by a factor of 4. The ratio of PM_{10} and $PM_{2.5}$ to total TSP emissions are unchanged from the TECQ emissions factors.

5.3.2 Increased Gin Capacity

The original emissions inventory was based on a maximum gin capacity of 50 bales per hour. The maximum capacity of the gin is now 100 bales per hour. Accordingly, particulate emissions associated with ginning and haulage have been doubled.

In combination with the increased capacity of the gin, the air flow rates through some of the cyclones have been increased.

5.3.3 TGBI Emissions

Pollutant emissions from the combustion of cotton gin trash in the TGBI have been estimated from manufacturer's data, supplemented by emission factors from the NPI.

During operations, the 3 TGBI would consume a total of 3,750 kg of gin trash per hour. The exhaust streams from the TGBI would be mixed with ambient air to produce approximately 84.5 cubic metres of heated air per second to be used in the ginning process. This heated air, which would contain the combustion products (i.e. air pollutants), would be sent to various stages of the ginning process in the proportions presented in **Table 5-1**.

Table 5-1 TGBI exhaust usage

Pollutant	Specific emission rate (g/kg fuel)
Unloading / 1st stage	31%
2nd stage	33%
3rd stage	36%

Measured specific emission rates (i.e. pollutant emissions per unit of fuel consumption) for the TGBI have been provided by Triple Green (DC, 2021) as summarised in **Table 5-2**. The emission rates in **Table 5-2** are based on wood chip waste. No emission rates for cotton gin trash are available.

Table 5-2 Manufacturer's emissions data, TGBI

Pollutant	Specific emission rate (g/kg fuel)	Total emission rate (g/s)
Particulate matter	0.522	0.544
NO_X	1.00	1.042
CO	9.72	10.125
SO_2	<0.036	0.038

For assessment purposes, it is assumed that all particulate matter emissions from the TGBI are in the $PM_{2.5}$ fraction. This is a conservative assumption and ensures that these emission are included in the assessment of $PM_{2.5}$, PM_{10} and TSP.

Although not provided in the manufacturer's emissions data for the TGBI, there is potential for a small amount of PAH and/or dioxins and furans to be released during the combustion of gin trash. NPI emissions factors for these pollutants released from uncontrolled bagasse boilers are presented in **Table 5-3** and have been adopted in this assessment.

Table 5-3 NPI emissions factors, uncontrolled bagasse boilers

Pollutant	Emission factor (g/kg fuel)	Emission rate (g/s)
PAH	5.0×10^{-4}	5.21×10^{-4}
Dioxins and furans	4.75×10^{-10}	4.94×10^{-10}

Table 5-4 presents the locations and exhaust conditions for the cyclones. The cyclone locations are shown in **Figure 5-1**.

Estimated particulate emissions from the cyclones, including those from ginning operations and the TGBI, are presented in **Table 5-5**.

Estimated emissions of $NO_{X,}$ CO, SO_2, PAH and dioxins and furans from the cyclones are presented in **Table 5-6**.

Estimated particulate emissions from haul road activities are presented in **Table 5-7**.

Table 5-4 Cyclone IDs, locations and stack conditions

Cyclone						Stack conditions						
Map ID [1]	EPL ID [2]	Description	Stage	Coordinates [3]		Air flow		Diameter		Height (m)	Exit velocity (m/s)	Exit temp (°C)
				X (m)	Y (m)	CFM [4]	m^3/s	in.	m			
1	1	Unloading Fan: 1A-1	Unloading / 1st stage	354,495	6,184,412	16,139	7.6	38	0.965	10	10.37	50.0
2	2	Unloading Fan: 1A-2		354,495	6,184,410	16,139	7.6	38	0.965	10	10.37	50.0
3	3	Unloading Fan: 1B-1		354,494	6,184,407	16,139	7.6	38	0.965	10	10.37	50.0
4	4	Unloading Fan: 1B-2		354,494	6,184,405	16,139	7.6	38	0.965	10	10.37	50.0
5	5	2nd Stage Pull: 2A-1	2nd stage	354,499	6,184,444	11,735	5.5	33	0.838	10	9.99	50.0
6	6	2nd Stage Pull: 2A-2		354,499	6,184,442	11,735	5.5	33	0.838	10	9.99	50.0
7	7	2nd Stage Pull: 2B-1		354,499	6,184,440	11,498	5.4	33	0.838	10	9.79	50.0
8	8	2nd Stage Pull: 2B-2		354,498	6,184,438	11,498	5.4	33	0.838	10	9.79	50.0
9	-	2nd Stage Pull: 2C-1		354,498	6,184,436	11,735	5.5	33	0.838	10	9.99	50.0
10	-	2nd Stage Pull: 2C-2		354,498	6,184,434	11,735	5.5	33	0.838	10	9.99	50.0
11	9	3rd Stage Pull: 3A-1	3rd stage	354,498	6,184,432	11,468	5.4	33	0.838	10	9.77	50.0
12	10	3rd Stage Pull: 3A-2		354,497	6,184,430	11,468	5.4	33	0.838	10	9.77	50.0
13	11	3rd Stage Pull: 3B-1		354,497	6,184,428	13,068	6.1	33	0.838	10	11.13	50.0
14	12	3rd Stage Pull: 3B-2		354,497	6,184,426	13,068	6.1	33	0.838	10	11.13	50.0
15	-	3rd Stage Pull: 3C-1		354,497	6,184,423	13,068	6.1	33	0.838	10	11.13	50.0
16	-	3rd Stage Pull: 3C-2		354,496	6,184,422	13,068	6.1	33	0.838	10	11.13	50.0

Cyclone						**Stack conditions**						
Map ID [1]	**EPL ID [2]**	**Description**	**Stage**	**Coordinates [3]**		**Air flow**		**Diameter**		**Height (m)**	**Exit velocity (m/s)**	**Exit temp (°C)**
				X (m)	**Y (m)**	**CFM [4]**	**m^3/s**	**in.**	**m**			
17	13	Overflow: A	Overflow	354,496	6,184,420	8,000	3.8	33	0.838	10	6.81	Ambient + 5
18	-	Overflow: B		354,496	6,184,417	8,000	3.8	33	0.838	10	6.81	Ambient + 5
19	14	Feeder Dust	Feeder dust	354,496	6,184,416	13,500	6.3	33	0.838	10	11.50	Ambient + 5
20	15	Scavenger System	Scavenger system	354,492	6,184,391	11,193	5.3	32	0.813	10	10.14	Ambient + 5
21	16	Mote: LC1	Mote cleaning	354,493	6,184,394	16,000	7.5	33	0.838	10	13.63	Ambient + 5
22	17	Mote: LC2-A		354,493	6,184,397	14,000	6.6	33	0.838	10	11.92	Ambient + 5
23	18	Mote: LC2-B		354,493	6,184,396	14,000	6.6	33	0.838	10	11.92	Ambient + 5
24	19	Mote: BC		354,494	6,184,403	11,500	5.4	33	0.838	10	9.79	Ambient + 5
25	20	Mote: Trash		354,494	6,184,401	16,000	7.5	33	0.838	10	13.63	Ambient + 5
26	21	Mote: Pack BC		354,493	6,184,399	11,500	5.4	33	0.838	10	9.79	Ambient + 5
27	22	Mote: Robber 1	Mote Robber	354,492	6,184,387	22,000	10.3	33	0.838	10	18.74	Ambient + 5
28	23	Mote: Robber 2		354,492	6,184,386	22,000	10.3	33	0.838	10	18.74	Ambient + 5
30	-	Lint Cleaners: 1A	A lint cleaners	354,493	6,184,441	13,500	6.3	33	0.838	10	11.50	Ambient + 5
31	-	Lint Cleaners: 2A		354,493	6,184,437	13,500	6.3	33	0.838	10	11.50	Ambient + 5
32	24	Lint Cleaners: 3A		354,492	6,184,433	13,500	6.3	33	0.838	10	11.50	Ambient + 5
33	25	Lint Cleaners: 4A		354,491	6,184,429	13,500	6.3	33	0.838	10	11.50	Ambient + 5
34	26	Lint Cleaners: 5A		354,491	6,184,425	13,500	6.3	33	0.838	10	11.50	Ambient + 5
35	-	Lint Cleaners: 1B	B lint cleaners	354,493	6,184,439	13,500	6.3	33	0.838	10	11.50	Ambient + 5

Cyclone						Stack conditions						
Map ID [1]	EPL ID [2]	Description	Stage	Coordinates [3]		Air flow		Diameter		Height (m)	Exit velocity (m/s)	Exit temp (°C)
				X (m)	Y (m)	CFM [4]	m^3/s	in.	m			
36	-	Lint Cleaners: 2B		354,492	6,184,435	13,500	6.3	33	0.838	10	11.50	Ambient + 5
37	27	Lint Cleaners: 3B		354,492	6,184,431	13,500	6.3	33	0.838	10	11.50	Ambient + 5
38	28	Lint Cleaners: 4B		354,491	6,184,427	13,500	6.3	33	0.838	10	11.50	Ambient + 5
39	29	Lint Cleaners: 5B		354,491	6,184,423	13,500	6.3	33	0.838	10	11.50	Ambient + 5
40	-	Battery Condenser: A-1	A battery condensers	354,494	6,184,452	41,300	19.4	33	0.838	10	35.17	Ambient + 5
41	-	Battery Condenser: A-2		354,494	6,184,449	41,300	19.4	33	0.838	10	35.17	Ambient + 5
42	-	Battery Condenser: A-3		354,496	6,184,452	41,300	19.4	33	0.838	10	35.17	Ambient + 5
43	-	Battery Condenser: A-4		354,496	6,184,449	41,300	19.4	33	0.838	10	35.17	Ambient + 5
44	30	Battery Condenser: B-1	B battery condensers	354,494	6,184,446	41,300	19.4	33	0.838	10	35.17	Ambient + 5
45	31	Battery Condenser: B-2		354,493	6,184,444	41,300	19.4	33	0.838	10	35.17	Ambient + 5
46	32	Battery Condenser: B-3		354,495	6,184,446	41,300	19.4	33	0.838	10	35.17	Ambient + 5
47	33	Battery Condenser: B-4		354,495	6,184,444	41,300	19.4	33	0.838	10	35.17	Ambient + 5
48	34	Lint Cleaner Mote: A-1	Lint cleaner motes	354,490	6,184,421	27,500	12.9	33	0.838	10	23.42	Ambient + 5
49	35	Lint Cleaner Mote: A-2		354,490	6,184,419	27,500	12.9	33	0.838	10	23.42	Ambient + 5
50	36	Lint Cleaner Mote: B-1		354,490	6,184,417	27,500	12.9	33	0.838	10	23.42	Ambient + 5
51	37	Lint Cleaner Mote: B-2		354,490	6,184,415	27,500	12.9	33	0.838	10	23.42	Ambient + 5

1. Map ID per **Figure 5-1**.
2. Per EPL #20717
3. UTM coordinates, MGA55.
4. Cubic feet per minute

Table 5-5 Cyclone emissions, particulate matter

Cyclone				Throughput	Ginning emissions (no TGBI)				TGBI emission rate (g/s)	Total Emission rate (g/s)		
Map ID [1]	EPL ID[2]	Description	Stage	Bales/hr	TCEQ emission factor (lb/bale)			Correction factor [3]				
					TSP	PM_{10}	$PM_{2.5}$		All [4]	TSP	PM_{10}	$PM_{2.5}$
1	1	Unloading Fan: 1A-1	Unloading / 1st stage	25	0.2960	0.1930	0.0152	1.0	0.0418	0.1358	0.1029	0.0465
2	2	Unloading Fan: 1A-2		25	0.2960	0.1930	0.0152	1.0	0.0418	0.1358	0.1029	0.0465
3	3	Unloading Fan: 1B-1		25	0.2960	0.1930	0.0152	1.0	0.0418	0.1358	0.1029	0.0465
4	4	Unloading Fan: 1B-2		25	0.2960	0.1930	0.0152	1.0	0.0418	0.1358	0.1029	0.0465
5	5	2nd Stage Pull: 2A-1	2nd stage	17	0.1290	0.0530	0.0027	4.0	0.0304	0.0996	0.0588	0.0319
6	6	2nd Stage Pull: 2A-2		17	0.1290	0.0530	0.0027	4.0	0.0304	0.0996	0.0588	0.0319
7	7	2nd Stage Pull: 2B-1		17	0.1290	0.0530	0.0027	4.0	0.0298	0.0990	0.0582	0.0313
8	8	2nd Stage Pull: 2B-2		17	0.1290	0.0530	0.0027	4.0	0.0298	0.0990	0.0582	0.0313
9	-	2nd Stage Pull: 2C-1		17	0.1290	0.0530	0.0027	4.0	0.0304	0.0996	0.0588	0.0319
10	-	2nd Stage Pull: 2C-2		17	0.1290	0.0530	0.0027	4.0	0.0304	0.0996	0.0588	0.0319
11	9	3rd Stage Pull: 3A-1	3rd stage	17	0.0520	0.0300	0.0026	4.0	0.0297	0.0576	0.0458	0.0311
12	10	3rd Stage Pull: 3A-2		17	0.0520	0.0300	0.0026	4.0	0.0297	0.0576	0.0458	0.0311
13	11	3rd Stage Pull: 3B-1		17	0.0520	0.0300	0.0026	4.0	0.0339	0.0618	0.0500	0.0353
14	12	3rd Stage Pull: 3B-2		17	0.0520	0.0300	0.0026	4.0	0.0339	0.0618	0.0500	0.0353
15	-	3rd Stage Pull: 3C-1		17	0.0520	0.0300	0.0026	4.0	0.0339	0.0618	0.0500	0.0353
16	-	3rd Stage Pull: 3C-2		17	0.0520	0.0300	0.0026	4.0	0.0339	0.0618	0.0500	0.0353
17	13	Overflow: A	Overflow	5	0.0630	0.0160	0.0011	4.0	-	0.0099	0.0025	0.0002

Cyclone				Throughput	Ginning emissions (no TGBI)				TGBI emission rate (g/s)	Total Emission rate (g/s)		
Map ID [1]	EPL ID[2]	Description	Stage	Bales/hr	TCEQ emission factor (lb/bale)			Correction factor [3]				
					TSP	PM$_{10}$	PM$_{2.5}$		All [4]	TSP	PM$_{10}$	PM$_{2.5}$
18	-	Overflow: B		5	0.0630	0.0160	0.0011	4.0	-	0.0099	0.0025	0.0002
19	14	Feeder Dust	Feeder dust	100	0.0430	0.0175	0.0010	1.0	-	0.1440	0.0586	0.0014
20	15	Scavenger System	Scavenger system	6	0.0430	0.0175	0.0010	4.0	-	0.0081	0.0033	0.0002
21	16	Mote: LC1	Mote cleaning	2	0.1050	0.0365	0.0020	4.0	-	0.0066	0.0023	0.0001
22	17	Mote: LC2-A		2	0.0430	0.0175	0.0010	4.0	-	0.0027	0.0011	0.0001
23	18	Mote: LC2-B		2	0.0430	0.0175	0.0010	4.0	-	0.0027	0.0011	0.0001
24	19	Mote: BC		2	0.0430	0.0175	0.0010	4.0	-	0.0027	0.0011	0.0001
25	20	Mote: Trash		2	0.0390	0.0080	0.0007	4.0	-	0.0025	0.0005	0.0000
26	21	Mote: Pack BC		2	0.0430	0.0175	0.0010	4.0	-	0.0027	0.0011	0.0001
27	22	Mote: Robber 1	Mote Robber	1	0.1110	0.0370	0.0028	4.0	-	0.0035	0.0012	0.0001
28	23	Mote: Robber 2		1	0.1110	0.0370	0.0028	4.0	-	0.0035	0.0012	0.0001
30	-	Lint Cleaners: 1A	A lint cleaners	20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
31	-	Lint Cleaners: 2A		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
32	24	Lint Cleaners: 3A		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
33	25	Lint Cleaners: 4A		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
34	26	Lint Cleaners: 5A		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
35	-	Lint Cleaners: 1B	B lint cleaners	20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
36	-	Lint Cleaners: 2B		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017

Cyclone				Throughput	Ginning emissions (no TGBI)				TGBI emission rate (g/s)	Total Emission rate (g/s)		
Map ID [1]	EPL ID[2]	Description	Stage	Bales/hr	TCEQ emission factor (lb/bale)			Correction factor [3]				
					TSP	PM_{10}	$PM_{2.5}$		All [4]	TSP	PM_{10}	$PM_{2.5}$
37	27	Lint Cleaners: 3B		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
38	28	Lint Cleaners: 4B		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
39	29	Lint Cleaners: 5B		20	0.1585	0.0421	0.0027	4.0	-	0.0999	0.0265	0.0017
40	-	Battery Condenser: A-1	A battery condensers	12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
41	-	Battery Condenser: A-2		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
42	-	Battery Condenser: A-3		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
43	-	Battery Condenser: A-4		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
44	30	Battery Condenser: B-1	B battery condensers	12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
45	31	Battery Condenser: B-2		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
46	32	Battery Condenser: B-3		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
47	33	Battery Condenser: B-4		12.5	0.0700	0.0165	0.0009	4.0	-	0.0276	0.0065	0.0004
48	34	Lint Cleaner Mote: A-1	Lint cleaner motes	1	0.1050	0.0365	0.0020	4.0	-	0.0033	0.0012	0.0001
49	35	Lint Cleaner Mote: A-2		1	0.1050	0.0365	0.0020	4.0	-	0.0033	0.0012	0.0001
50	36	Lint Cleaner Mote: B-1		1	0.0400	0.0020	0.0001	4.0	-	0.0013	0.0001	0.0000
51	37	Lint Cleaner Mote: B-2		1	0.0400	0.0020	0.0001	4.0	-	0.0013	0.0001	0.0000

1. Map ID per **Figure 5-1**.
2. Per EPL #20717
3. Correction factor to account for measured emissions from RivCott gin cyclones being significantly lower than TCEQ emission rates.
4. TGBI particulate emissions modelled as $PM_{2.5}$, PM_{10} and TSP.

Table 5-6 Cyclone emissions, other pollutants

Cyclone				Total Emission rate (g/s)				
Map ID [1]	EPL ID[2]	Description	Stage					
				NO$_X$	CO	SO$_2$	PAH	Dioxins & furans
1	1	Unloading Fan: 1A-1	Unloading / 1st stage	0.0802	0.7792	0.0029	4.008 x 10^{-5}	3.808 x 10^{-11}
2	2	Unloading Fan: 1A-2		0.0802	0.7792	0.0029	4.008 x 10^{-5}	3.808 x 10^{-11}
3	3	Unloading Fan: 1B-1		0.0802	0.7792	0.0029	4.008 x 10^{-5}	3.808 x 10^{-11}
4	4	Unloading Fan: 1B-2		0.0802	0.7792	0.0029	4.008 x 10^{-5}	3.808 x 10^{-11}
5	5	2nd Stage Pull: 2A-1	2nd stage	0.0583	0.5666	0.0021	2.915 x 10^{-5}	2.769 x 10^{-11}
6	6	2nd Stage Pull: 2A-2		0.0583	0.5666	0.0021	2.915 x 10^{-5}	2.769 x 10^{-11}
7	7	2nd Stage Pull: 2B-1		0.0571	0.5552	0.0021	2.856 x 10^{-5}	2.713 x 10^{-11}
8	8	2nd Stage Pull: 2B-2		0.0571	0.5552	0.0021	2.856 x 10^{-5}	2.713 x 10^{-11}
9	-	2nd Stage Pull: 2C-1		0.0583	0.5666	0.0021	2.915 x 10^{-5}	2.769 x 10^{-11}
10	-	2nd Stage Pull: 2C-2		0.0583	0.5666	0.0021	2.915 x 10^{-5}	2.769 x 10^{-11}
11	9	3rd Stage Pull: 3A-1	3rd stage	0.0570	0.5537	0.0021	2.848 x 10^{-5}	2.706 x 10^{-11}
12	10	3rd Stage Pull: 3A-2		0.0570	0.5537	0.0021	2.848 x 10^{-5}	2.706 x 10^{-11}
13	11	3rd Stage Pull: 3B-1		0.0649	0.6310	0.0023	3.246 x 10^{-5}	3.083 x 10^{-11}
14	12	3rd Stage Pull: 3B-2		0.0649	0.6310	0.0023	3.246 x 10^{-5}	3.083 x 10^{-11}
15	-	3rd Stage Pull: 3C-1		0.0649	0.6310	0.0023	3.246 x 10^{-}	3.083 x 10^{-11}
16	-	3rd Stage Pull: 3C-2		0.0649	0.6310	0.0023	3.246 x 10^{-}	3.083 x 10^{-11}

1. Map ID per **Figure 5-1**.
2. Per EPL #20717

Table 5-7 Haul road emissions

Activity	Emissions (kg/day)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Control	Description
TSP											
Module trucks	295.3	500	km/day	2.362	kg/VKT	35	vehicle mass [t]	5	silt content [%]	75%	Water cart
Bale trucks	35.5	56	km/day	2.536	kg/VKT	41	vehicle mass [t]	5	silt content [%]	75%	Water cart
Seed trucks	23.2	32	km/day	2.895	kg/VKT	55	vehicle mass [t]	5	silt content [%]	75%	Water cart
Total TSP	**353.9**										
PM_{10}											
Module trucks	75.9	500	km/day	0.607	kg/VKT	35	vehicle mass [t]	5	silt content [%]	75%	Water cart
Bale trucks	9.1	56	km/day	0.652	kg/VKT	41	vehicle mass [t]	5	silt content [%]	75%	Water cart
Seed trucks	6.0	32	km/day	0.744	kg/VKT	55	vehicle mass [t]	5	silt content [%]	75%	Water cart
Total PM_{10}	**90.9**										
$PM_{2.5}$											
Module trucks	7.6	500	km/day	0.061	kg/VKT	35	vehicle mass [t]	5	silt content [%]	75%	Water cart
Bale trucks	0.9	56	km/day	0.065	kg/VKT	41	vehicle mass [t]	5	silt content [%]	75%	Water cart
Seed trucks	0.6	32	km/day	0.074	kg/VKT	55	vehicle mass [t]	5	silt content [%]	75%	Water cart
Total $PM_{2.5}$	**9.1**										

Figure 5-1 Cyclone locations

RIVCOTT COTTON TRASH SOLUTION

CYCLONE LOCATIONS

LEGEND

● Cyclones

Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.

6 ASSESSMENT OF IMPACTS

6.1 Predicted GLC

The following section presents the predicted ground level concentrations (GLC) of air pollutants at nearby sensitive receptors.

It should be noted that the predicted GLC are based on the gin operated at its maximum capacity (100 bales per hour) for the entire simulation and that the cotton ginning season typically runs for only 5 months (May – September). Therefore, the dispersion modelling results presented herein will be reliable for averaging periods of 24-hours or less, but will significant overestimate annual average results

Contour plots of the predicted incremental GLC of 24-hour average PM_{10} and $PM_{2.5}$ and 1-hour average NO_2 are presented in Appendix A.

6.1.1 TSP

The predicted GLC of TSP at sensitive receptors are presented in **Table 6-1**. The results indicate that TSP impacts associated with the Proposal are predicted to comply with the impact assessment criterion at all receptors.

Table 6-1 Predicted TSP GLC at sensitive receptors (µg/m^3)

Receptor ID	**TSP, annual average**	
	Project only	Project + Background
Criterion	**-**	**90**
R1	1.1	45.4
R2	3.1	47.4
R3	1.1	45.4
R4	1.7	46.0
R5	0.8	45.1

6.1.2 PM_{10}

The predicted GLC of PM_{10} at sensitive receptors are presented in **Table 6-2**. The results indicate that PM_{10} impacts associated with the Proposal are predicted to comply with the impact assessment criterion at all receptors.

Table 6-2 Predicted PM_{10} GLC at sensitive receptors (µg/m^3)

Receptor ID	**PM_{10}, 24-hour average**			**PM_{10}, annual average**	
	Project only	Project + Background [1]	No. of additional exceedances due to Project	Project only	Project + Background
Criteria	**-**	**50**	**0**	**-**	**25**
R1	10.2	52.5	0	0.4	18.1
R2	22.5	52.9	0	1.0	18.7
R3	7.1	54.3	0	0.4	18.1
R4	9.8	52.8	0	0.6	18.3
R5	3.7	52.9	0	0.3	18.0

1. Based on Level 2 contemporaneous assessment.

6.1.3 $PM_{2.5}$

The predicted GLC of $PM_{2.5}$ at sensitive receptors are presented in **Table 6-3**. The results indicate that $PM_{2.5}$ impacts associated with the Proposal are predicted to comply with the impact assessment criterion at all receptors.

Table 6-3 Predicted $PM_{2.5}$ GLC at sensitive receptors (µg/m^3)

Receptor ID	$PM_{2.5}$, 24-hour average			$PM_{2.5}$, annual average	
	Project only	Project + Background [1]	No. of additional exceedances due to Project	Project only	Project + Background
Criteria	**-**	**25**	**0**	**-**	**8**
R1	2.6	24.8	0	0.1	17.8
R2	5.0	24.7	0	0.2	17.9
R3	1.5	24.6	0	0.1	17.8
R4	2.3	24.6	0	0.1	17.8
R5	1.1	24.6	0	0.1	17.8

1. Based on Level 2 contemporaneous assessment.

6.1.4 SO_2, NO_2, and CO

The predicted GLC of SO_2, NO_2 and CO at sensitive receptors are presented in **Table 6-4**. The results indicate that SO_2, NO_2 and CO impacts associated with the Proposal are predicted to comply with the impact assessment criterion at all receptors.

Table 6-4 Predicted SO_2, NO_2 and CO GLC at sensitive receptors (µg/m^3)

Receptor ID	**SO_2**				**NO_2**				**CO**					
	1-hour		**24-hours**		**1-hour**		**Annual**		**15-minutes**		**1-hour**		**8-hours**	
	Inc[1]	Tot[2]	Inc[1]	Tot[2]	Inc[1]	Tot[2]	Inc[1]	Tot[2]	Inc[1]	Tot[2]	Inc[1]	Tot[2]	Inc[1]	Tot[2]
Criteria	**-**	**215**	**-**	**57**	**-**	**164**	**-**	**31**	**-**	**100,000**	**-**	**30,000**	**-**	**10,000**
R1	0.7	60.8	0.1	17.3	19.3	78.8	0.1	6.3	247	2,067	187	1,566	58	862
R2	1.9	62.0	0.2	17.4	51.5	111.0	0.3	6.5	660	2,480	500	1,879	139	943
R3	0.5	60.6	0.1	17.3	14.8	74.3	0.1	6.3	190	2,009	144	1,523	50	854
R4	0.8	60.9	0.1	17.3	21.5	81.0	0.2	6.4	276	2,096	209	1,588	71	875
R5	0.4	60.5	0.1	17.3	11.7	71.2	0.1	6.3	149	1,969	113	1,492	32	836

1. Incremental (i.e. project only)
2. Total (i.e. project + background)

6.1.5 Toxic Pollutants

The predicted GLC of PAH and dioxins and furans at sensitive receptors, and at the most affected point beyond the site boundary, are presented in **Table 6-5**. The results indicate that the GLC of these pollutants are predicted to comply with the impact assessment criterion at all receptors.

Table 6-5 Predicted toxic pollutant GLC at sensitive receptors (mg/m^3)

Receptor ID	PAH, 1-hour 99.9th percentile	Dioxins & furans, 1-hour 99.9th percentile
Criteria	4.0×10^{-4}	2.0×10^{-9}
R1	6.788×10^{-6}	6.449×10^{-12}
R2	1.992×10^{-5}	1.893×10^{-11}
R3	5.664×10^{-6}	5.381×10^{-12}
R4	7.522×10^{-6}	7.146×10^{-12}
R5	4.607×10^{-6}	4.377×10^{-12}
Max off-site	7.411×10^{-5}	7.040×10^{-11}

6.2 Predicted Cyclone Stack Particle Concentrations

The predicted particulate concentrations in the cyclone stacks are presented in **Table 6-6**. The results indicate that the particulate concentrations in all cyclones are predicted to comply with the applicable limits.

Table 6-6 Predicted Cyclone Stack Concentrations (mg/m3)

Cyclone			Predicted Stack Particle Concentration	Stack Limit		Complies?
Map ID [1]	EPL ID[2]	Description		EPL #20717	Clean Air Reg	
1	1	Unloading Fan: 1A-1	21.2	50	50	Yes
2	2	Unloading Fan: 1A-2	21.2	50	50	Yes
3	3	Unloading Fan: 1B-1	21.2	50	50	Yes
4	4	Unloading Fan: 1B-2	21.2	50	50	Yes
5	5	2nd Stage Pull: 2A-1	21.4	40	50	Yes
6	6	2nd Stage Pull: 2A-2	21.4	40	50	Yes
7	7	2nd Stage Pull: 2B-1	21.7	40	50	Yes
8	8	2nd Stage Pull: 2B-2	21.7	40	50	Yes
9	-	2nd Stage Pull: 2C-1	21.4	-	50	Yes
10	-	2nd Stage Pull: 2C-2	21.4	-	50	Yes
11	9	3rd Stage Pull: 3A-1	12.6	20	50	Yes
12	10	3rd Stage Pull: 3A-2	12.6	20	50	Yes
13	11	3rd Stage Pull: 3B-1	11.9	20	50	Yes
14	12	3rd Stage Pull: 3B-2	11.9	20	50	Yes
15	-	3rd Stage Pull: 3C-1	11.9	-	50	Yes
16	-	3rd Stage Pull: 3C-2	11.9	-	50	Yes
17	13	Overflow: A	2.9	30	50	Yes
18	-	Overflow: B	2.9	-	50	Yes
19	14	Feeder Dust	25.2	50	50	Yes
20	15	Scavenger System	1.7	10	50	Yes
21	16	Mote: LC1	1.0	10	50	Yes
22	17	Mote: LC2-A	0.5	10	50	Yes
23	18	Mote: LC2-B	0.5	10	50	Yes
24	19	Mote: BC	0.6	10	50	Yes

Cyclone			**Predicted Stack Particle Concentration**	**Stack Limit**		**Complies?**
Map ID [1]	EPL ID[2]	Description		**EPL #20717**	**Clean Air Reg**	
25	20	Mote: Trash	0.4	10	50	Yes
26	21	Mote: Pack BC	0.6	10	50	Yes
27	22	Mote: Robber 1	0.4	10	50	Yes
28	23	Mote: Robber 2	0.4	10	50	Yes
30	-	Lint Cleaners: 1A	17.5	-	50	Yes
31	-	Lint Cleaners: 2A	17.5	-	50	Yes
32	24	Lint Cleaners: 3A	17.5	45	50	Yes
33	25	Lint Cleaners: 4A	17.5	45	50	Yes
34	26	Lint Cleaners: 5A	17.5	45	50	Yes
35	-	Lint Cleaners: 1B	17.5	-	50	Yes
36	-	Lint Cleaners: 2B	17.5	-	50	Yes
37	27	Lint Cleaners: 3B	17.5	45	50	Yes
38	28	Lint Cleaners: 4B	17.5	45	50	Yes
39	29	Lint Cleaners: 5B	17.5	45	50	Yes
40	-	Battery Condenser: A-1	1.6	-	50	Yes
41	-	Battery Condenser: A-2	1.6	-	50	Yes
42	-	Battery Condenser: A-3	1.6	-	50	Yes
43	-	Battery Condenser: A-4	1.6	-	50	Yes
44	30	Battery Condenser: B-1	1.6	20	50	Yes
45	31	Battery Condenser: B-2	1.6	20	50	Yes
46	32	Battery Condenser: B-3	1.6	20	50	Yes
47	33	Battery Condenser: B-4	1.6	20	50	Yes
48	34	Lint Cleaner Mote: A-1	0.3	50	50	Yes
49	35	Lint Cleaner Mote: A-2	0.3	50	50	Yes
50	36	Lint Cleaner Mote: B-1	0.1	30	50	Yes
51	37	Lint Cleaner Mote: B-2	0.1	30	50	Yes

1. Map ID per **Figure 5-1**.
2. Per EPL #20717

7 CONCLUSION

RivCott is proposing to utilise three TGBI to burn cotton gin trash to produce heat required in the ginning process.

SoundIN has been engaged by RivCott to prepare an Air Quality Impact Assessment for the Proposal.

Air quality impacts associated with the Proposal have been assessed in accordance with the Approved Methods.

The AERMOD dispersion model has been used to predict GLC of pollutants of interest at nearby sensitive receptor.

The modelling results indicate that air quality impacts associated with the operation of the Proposal comply with the relevant impact assessment criteria.

Predicted stack concentrations in the cyclones comply with the existing limits in EPL #20717 and the Clean Air Regulation.

8 REFERENCES

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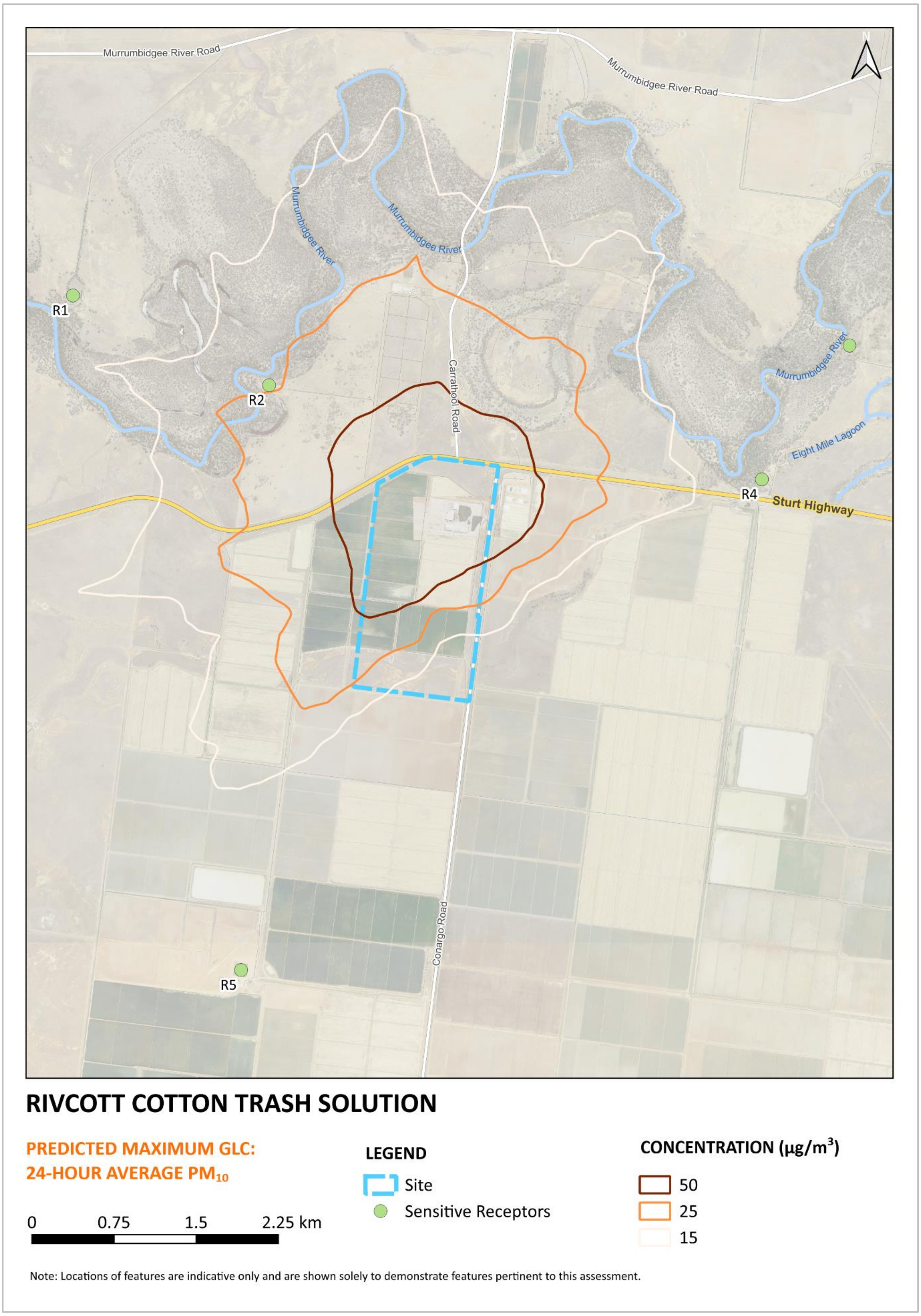
APPENDIX A

CONTOUR PLOTS

Figure A-1 Predicted incremental 24-hour average PM_{10} GLC

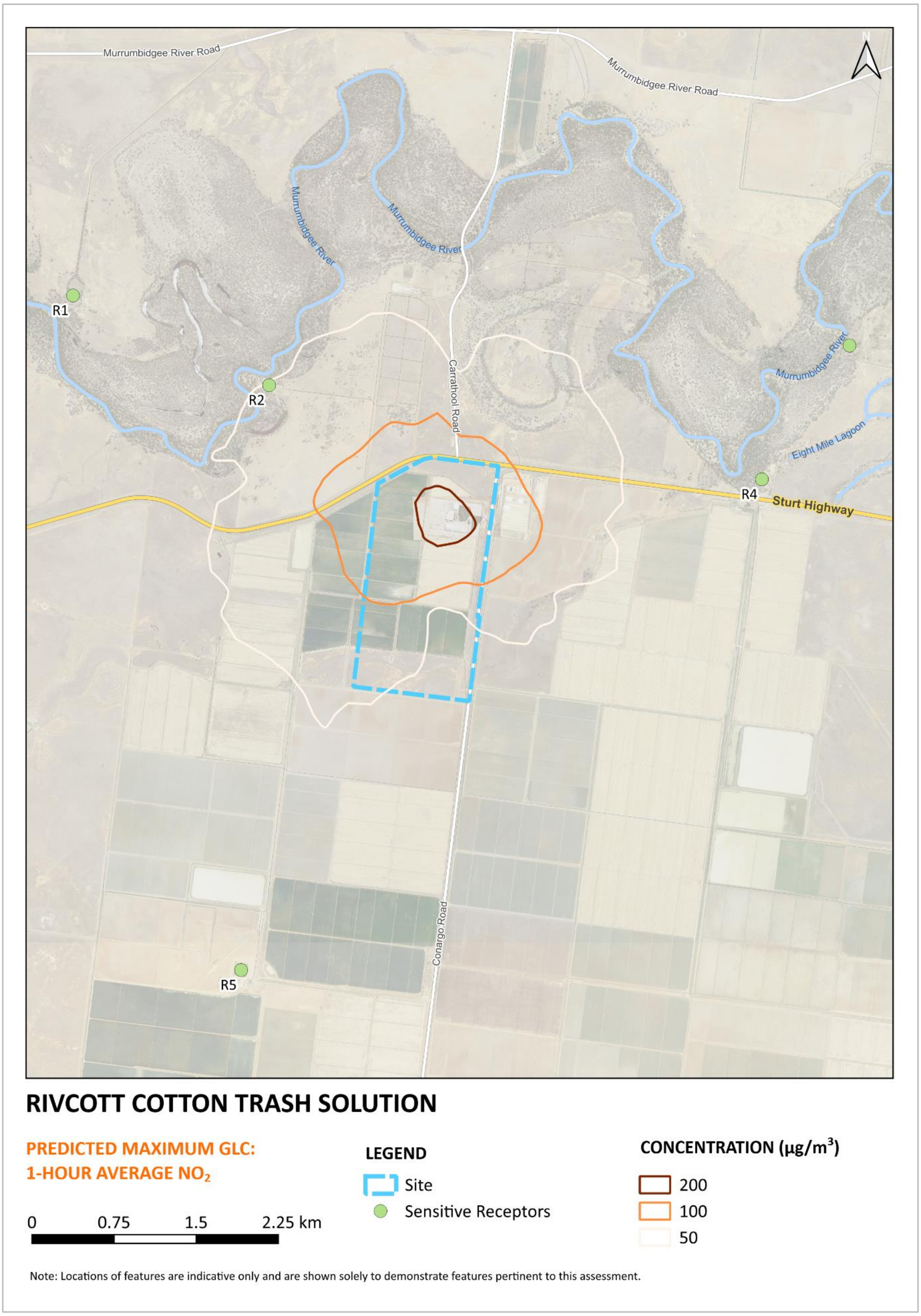


Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.

Figure A-2 Predicted incremental 24-hour average $PM_{2.5}$ GLC

Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.

Figure A-3 Predicted incremental 1-hour average NO_2 GLC



Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to this assessment.