ACOUSTICS AND AIR

BORG ST MARYS

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 20216-AQ
VERSION A

OCTOBER 2020

PREPARED FOR

BORG MANUFACTURING PTY LTD
2 WELLA WAY
SOMERSBY NSW 2250

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	7 September 2020	Nic Hall	John Wassermann
A	Final	14 October 2020	Nic Hall	John Wassermann

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GLOSSARY OF AIR QUALITY TERMS

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H_2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO_2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NO_x) – A criteria air polluant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometres. PM2.5 is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.

1 INTRODUCTION

Borg Manufacturing Pty Ltd is proposing to increase the throughput/volume of the existing resource recovery and recycling facility at 25 Dunheved Circuit, St Marys, Lot 143 in DP 1013185.

The Proposal was declared to be a State Significant Development (SSD-10474). The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal have been issued and set out the environmental assessment requirements for the project.

Wilkinson Murray Pty Limited has been engaged by Borg Manufacturing to prepare an Air Quality Impact Assessment (AQIA) for inclusion in the Environmental Impact Statement (EIS) relative to the project.

The proposal is for the increase of throughput/volume of waste to the existing Resource Recovery Facility at 25 Dunheved Circuit. The site currently has approval for the sorting and processing of 18,000 tonnes of waste per annum (DA01/1034 Penrith Council). It is proposed to increase this throughput to 150,000 tonnes per annum, consisting of 110,000 tonnes wood/timber waste and 30,000 tonnes of plasterboard. As a result of processing the timber materials, a minor amount of waste metals (approx.10,000 tonnes) will also be collected on site and transferred elsewhere for processing.

This AQIA presents the findings of the assessment of potential operational air quality impacts associated with the proposed development. The assessment has been conducted in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016).

1.1 Secretary's Environmental Assessment Requirements

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) (SSD 10474) for the Proposal, issued by NSW Department of Planning and Environment.

Table 1-1 provides a summary of the relevant SEARs which relate to air quality, and where these have been addressed in this report.

Table 1-1 SEARs

SEARs	Where addressed
A quantitative assessment of the potential air quality, dust and odour impacts of the development in accordance with relevant Environment Protection Authority guidelines	Sections 3 through 7
The details of buildings and air handling systems and strong justification for any material handling, processing or stockpiling external to buildings	Section 6
Details of proposed mitigation, management and monitoring measures	Section 8

The waste materials handled by the Proposal comprise wood/timber, plasterboard and metals. These materials are not considered odorous. Accordingly, the risk of odour impacts from the Proposal is negligible and odour impacts have not been discussed any further in this report.

2 PROJECT DESCRIPTION

2.1 Site Location

The site is identified as 25 Dunheved Circuit, St Marys, being Lot 143 in DP 7013185. The site is an irregular shaped battle-axe lot with an area of 6,140 m^2 and is zoned IN1 General Industrial. The land is predominantly flat, with vegetation on the site, all areas of the site are hardstand.

The lot contains:

- a 3,455 m^2 waste process cladding with a ridge;
- a site office and amenities;
- two inground 20 m weighbridges;
- external areas sealed with concrete hardstand; and
- water tanks.

The site location is shown in Figure 2-1.

Figure 2-1 Site location

2.2 Surrounding Land Use and Sensitive Receptors

The land use immediately surrounding the site is industrial. The nearest sensitive receptors are residents located in the nearby suburbs of Werrington County, North St Marys, Ropes Crossing and Central Precinct and the Dunheved Golf Course. Discrete receptors have been identified in these suburbs for assessment purposes, as shown in Figure 2-2 and identified in Table 2-1.

Industrial land uses surrounding the site are not identified as sensitive receptors for the purposes of this assessment, however the predicted air quality impacts at these locations have been presented by way of the contour plots in Appendix A.

Figure 2-2 Sensitive Receptors

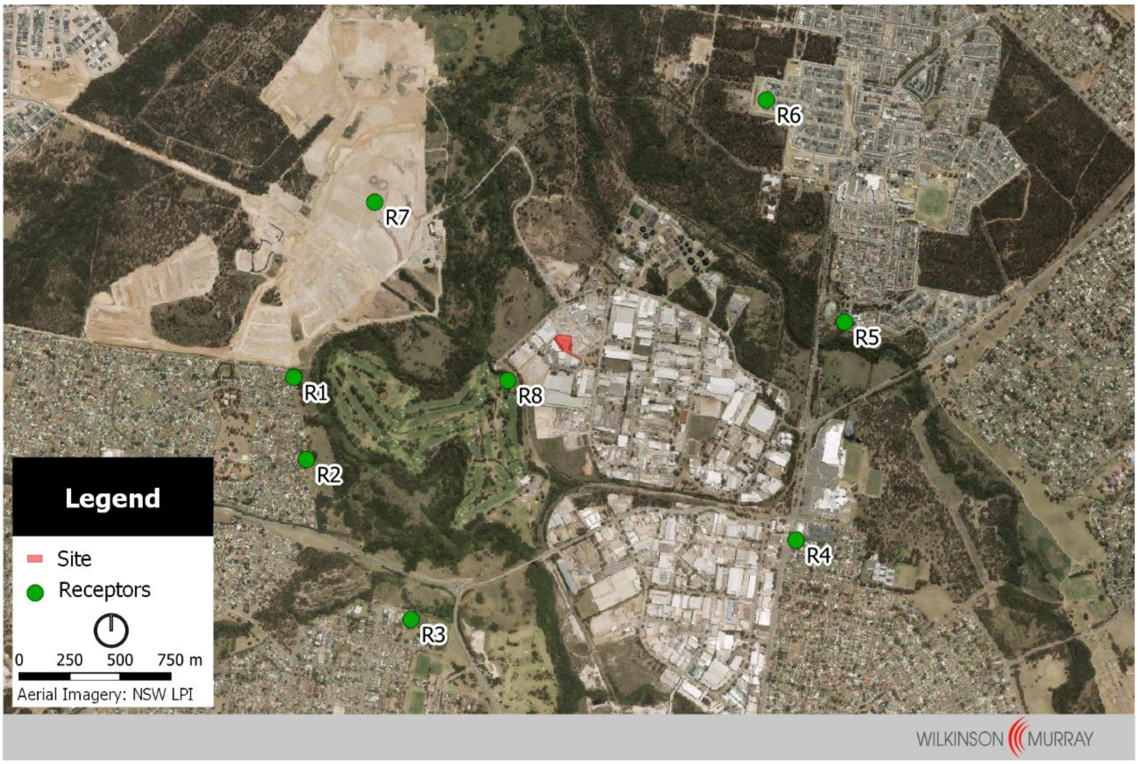


Table 2-1 Discrete Receptors

Receptor	Address	Distance (m)
R1	21 Hartog Drive, Werrington County	1,290
R2	12 Poole Street, Werrington County	1,390
R3	66 Reid Street, Werrington	1,500
R4	199 Forrester Road, North St Marys	1,375
R5	12 Townsend Crescent, Ropes Crossing	1,245
R6	50 Rafter Parade, Ropes Crossing	1,430
R7	St Marys ADI Site Central Precinct	825
R8	Dunheved Golf Course	280

2.3 Project Description

2.3.1 Proposal Overview

The proposal is for the increase of throughput/volume of waste to the existing Resource Recovery Facility at 25 Dunheved Circuit. The site currently has approval for the sorting and processing of 18,000 tonnes of waste per annum (DA01/1034 Penrith Council). It is proposed to increase this throughput to 150,000 tonnes per annum, consisting of 110,000 tonnes wood/timber waste and 30,000 tonnes of plasterboard. As a result of processing the timber materials, a minor amount of waste metals (10,000 tonnes) will be collected on site and transferred elsewhere for processing. No physical works are proposed to the existing site or buildings.

Processing of timber and wood and plasterboard waste will happen inside the existing building by way of compaction and shredding/grinding. The majority of the processed wood waste will be transferred to the Borg Manufacturing site in Oberon, NSW to be used in the manufacture of particle board and MDF products, or to be used as a non-standard fuel in heat plant. The typical types of wood waste include clean pallets, particle board & MDF, LOSP & T2 pine and laminated MDF with coatings, along with other urban and raw wood materials deemed suitable. These waste materials will come from a number of sources including Borg Panels customers, framing and truss builders, freight companies, waste facilities and other timber companies.

Plasterboard will be minimised and grinded, with paper removed during the grinding process. The gypsum generated by processing will be used for agricultural soil conditioning or re-used in plasterboard production.

Waste metals recovered during the timber processing will be manually sorted and separated, and then taken off-site to other waste facilities to be processed or disposed of.

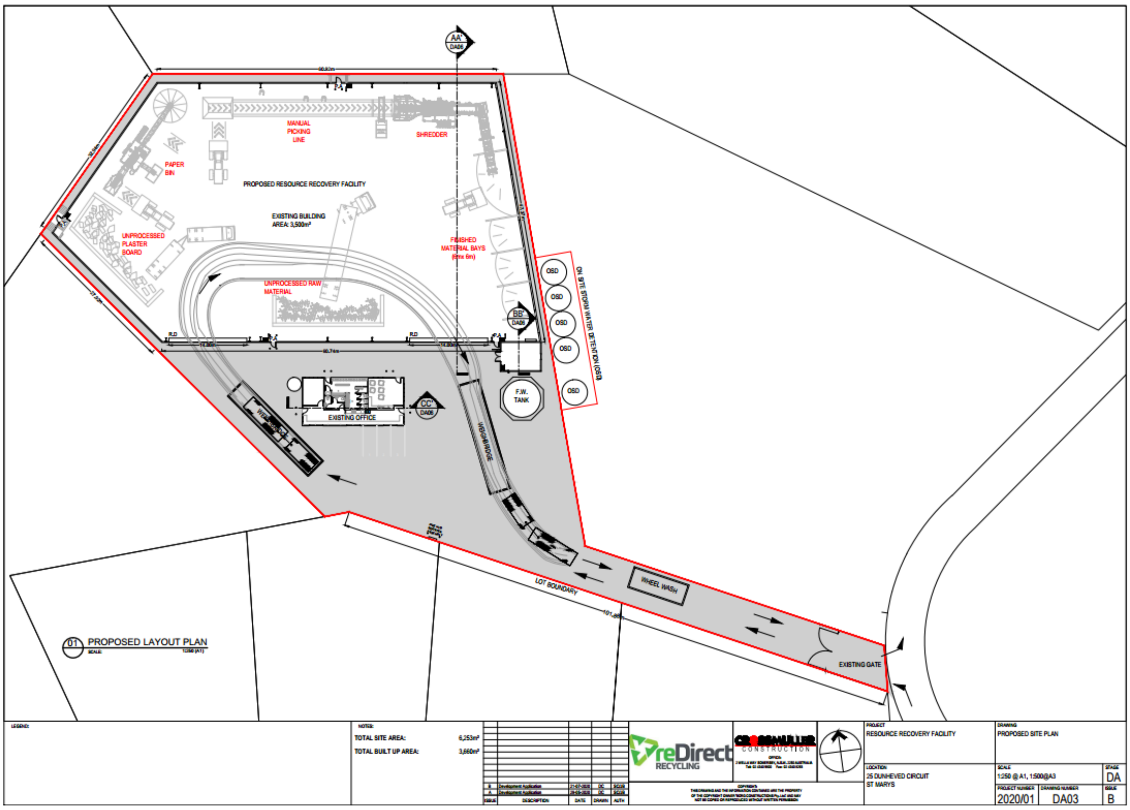
All RRF activities (storage and processing) will be undertaken inside the existing building on 25 Dunheved Circuit.

reDirect is proposing to increase the throughput of waste from 18,000 tpa to process up to 150,000 tpa of materials within the existing resource recovery facility. The majority of the processed material will be re-used in the manufacture of engineered timber products, mainly particle board. Detailed below are the amounts of material proposed to be recovered on the site.

- 110,000 tonnes of Urban and Natural Wood wastes (MDF off-cuts, raw wood offcuts, clean pallets, LOSP pine, engineered wood products, particleboard, some laminated MDF with paint).
- 30,000 tonnes of plasterboard waste, primarily offcuts and de-construction materials from construction sites.
- Minor amounts <10,000 tonnes of ferrous and non-ferrous metals. This will be made up of steel, and steel components removed from the processing of pallets i.e. nails, strapping etc. waste metals will be sorted and dispatched off-site. Some metal independent of the recovered materials will also be brought to be site.

The key components of the Proposal are shown in Figure 2-3.

Figure 2-3 Site plan showing proposed site layout



It is noted that there are no new facilities proposed for this development.

2.3.2 Hours of Operation

It is proposed to operate the facility 24 hours a day, 7 days a week including processing, waste delivery and collection. This is consistent with the previous approval on-site under SSD-8200.

A modern waste recycling facility needs to be able to receive, process and despatch 24 hours per day, although for the majority of times, it can be expected that most operations would be carried out in daytime hours.

There will be up to 10 staff employed onsite in processing, stockpiling, receiving, dispatch and office related work.

3 AIR QUALITY CRITERIA

3.1 Introduction

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods) 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.

3.2 Pollutants of Interest

Potential air pollutants associated with the Project comprise dust and particulate matter. Specifically, the following pollutants are identified:

- Total Suspended Particulates (TSP);
- Particulate Matter (PM_{10} and $PM_{2.5}$); and,
- Deposited Dust.

3.3 Impact Assessment Criteria

The EPA Approved Methods specifies air quality assessment criteria for assessing impacts from dust generating activities. These criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (NEPC, 1998).

Table 3-1 summarises the air quality goals for dust and particulate matter that are relevant to this study. The air quality goals relate to the total concentrations of dust and particulate matter in the air and not just that from the project. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 3-1 Impact Assessment Criteria – Dust and Particulate Matter

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited dust (DD)	Annual	Total	4 g/m²/month
	Annual	Incremental	2 g/m²/month

4 EXISTING ENVIRONMENT

4.1 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, and are key inputs into dispersion models. The following sub-sections discuss the local meteorology near the Proposal site and identify a representative set of meteorological data for use in the dispersion modelling to be undertaken for this assessment.

4.1.1 Long Term Climate

Long term meteorological data for the area surrounding the site is available from the Penrith Lakes AWS operated by the Bureau of Meteorology (BoM). The Penrith Lakes AWS is located approximately 8.5 km west of the Site and records observations of a number of meteorological data include wind speed, wind direction, temperature, humidity and rainfall.

Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Penrith Lakes AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 31.2°C. July is the coolest month with a mean daily minimum temperature of 5.3°C. February is the wettest month with an average rainfall of 123 mm falling over 8 days. There are, on average, 71 rain days per year, delivering 705 mm of rain.

Table 4-1 Climate Averages for Penrith Lakes AWS

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temp (°C)	22.3	21.7	19.7	17.6	13.8	10.5	9.6	11.7	15.8	18.5	19.6	21.4	16.8
Hum (%)	73	79	80	76	81	85	83	72	64	60	68	69	74
3pm Mean Observations													
Temp (°C)	29.0	27.7	26.1	23.3	19.8	17.1	16.6	18.6	21.7	23.7	25.3	27.6	23.0
Hum (%)	47	53	52	49	52	55	50	41	40	41	46	45	48
Daily Minimum and Maximum Temperatures													
Min (°C)	18.7	18.5	16.8	13.2	9.2	7.0	5.3	6.1	9.3	12.2	15.0	17.1	12.4
Max (°C)	31.2	29.7	27.6	24.7	21.2	18.2	18.0	19.9	23.3	25.9	27.6	29.8	24.8
Rainfall													
Rain (mm)	93.6	122.6	79.0	46.9	35.9	48.8	30.6	29.8	32.7	54.8	80.4	60.8	705.4
Rain (days)	7.5	7.7	8.1	5.4	4.1	5.7	4.0	3.3	4.6	5.5	7.7	7.0	70.6

4.1.2 Wind

Wind data from Penrith Lakes AWS has been incorporated into the dispersion modelling for this assessment.

Figure 4-1 to Figure 4-6 present annual and seasonal "wind rose" plots for the Penrith Lakes AWS for the period 2015 to 2019, inclusive. The plots show similar patterns of wind speed and wind direction over the five-year period, with south-westerly winds being prevalent throughout the year. Wind speed and wind direction during 2018 are generally representative of the five-year period and have therefore been adopted for modelling purposes.

Figure 4-1 Penrith Lakes AWS Wind Roses, 2015

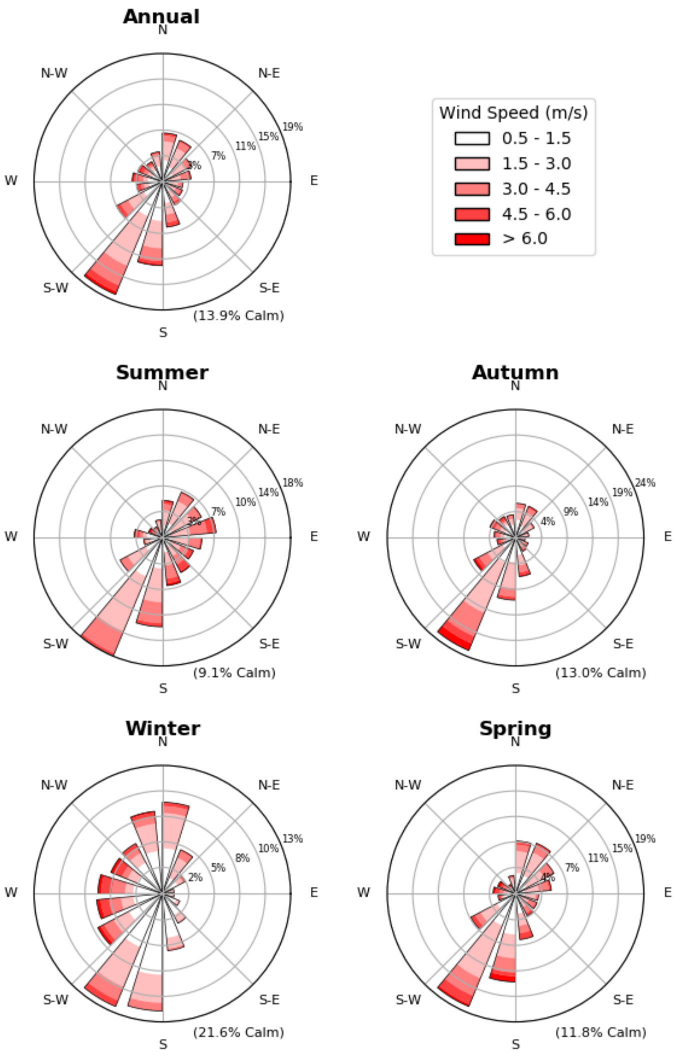


Figure 4-2 Penrith Lakes AWS Wind Roses, 2016

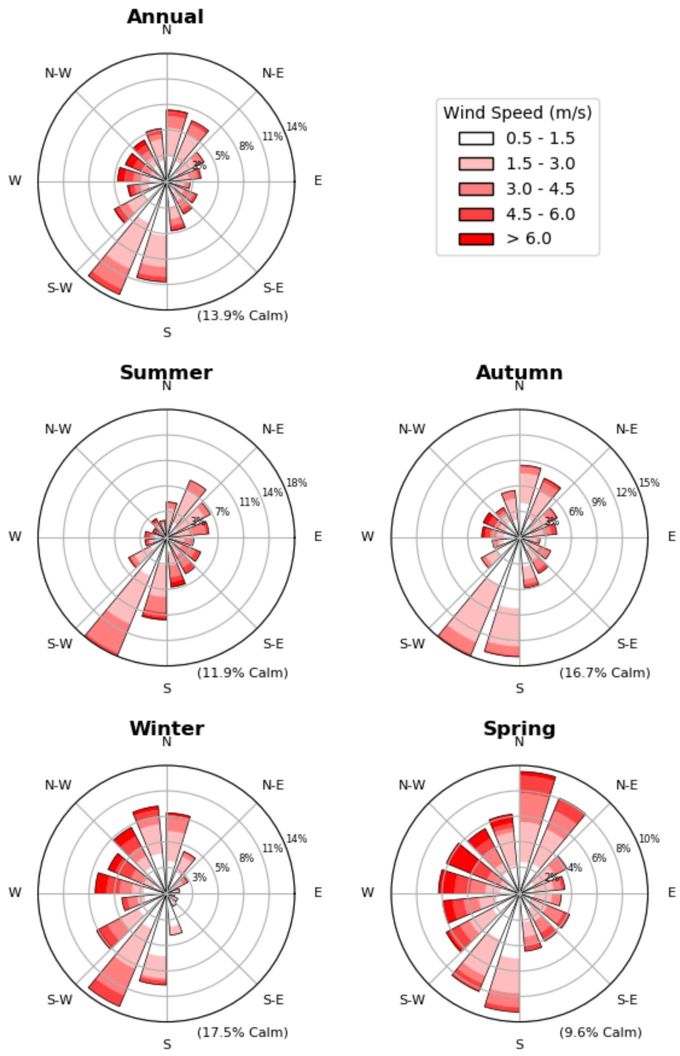


Figure 4-3 Penrith Lakes AWS Wind Roses, 2017

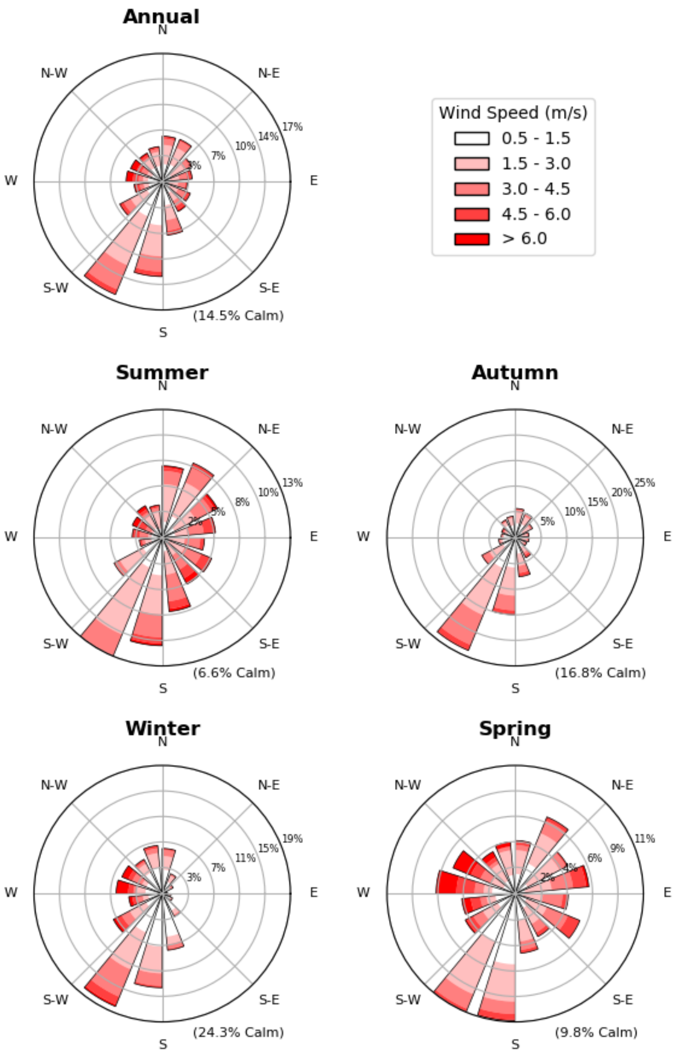


Figure 4-4 Penrith Lakes AWS Wind Roses, 2018

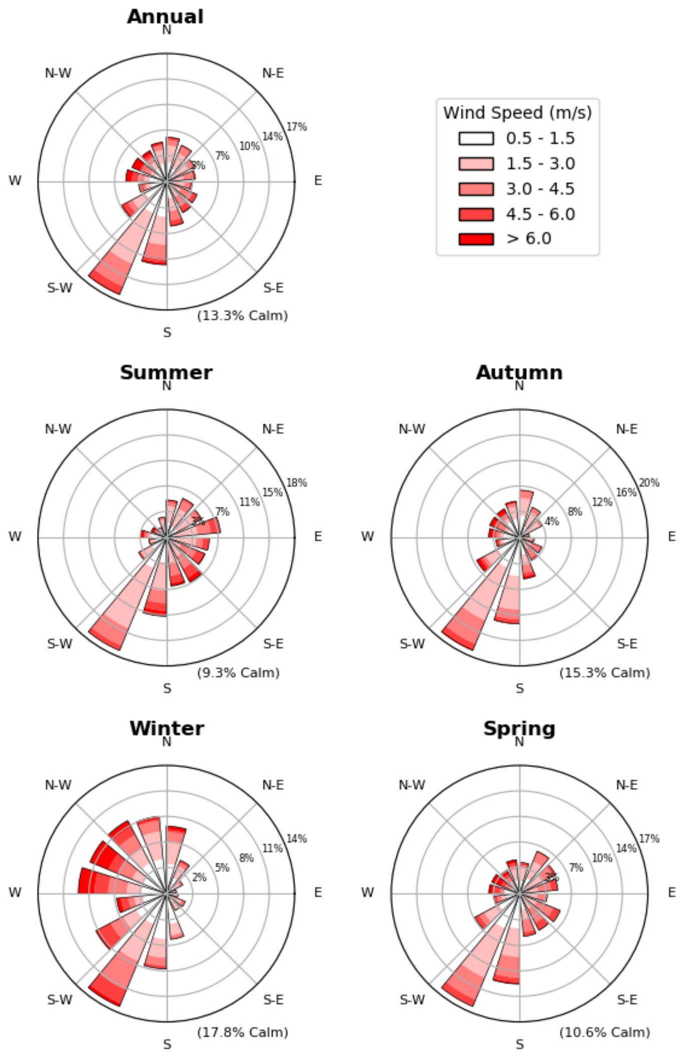


Figure 4-5 Penrith Lakes AWS Wind Roses, 2019

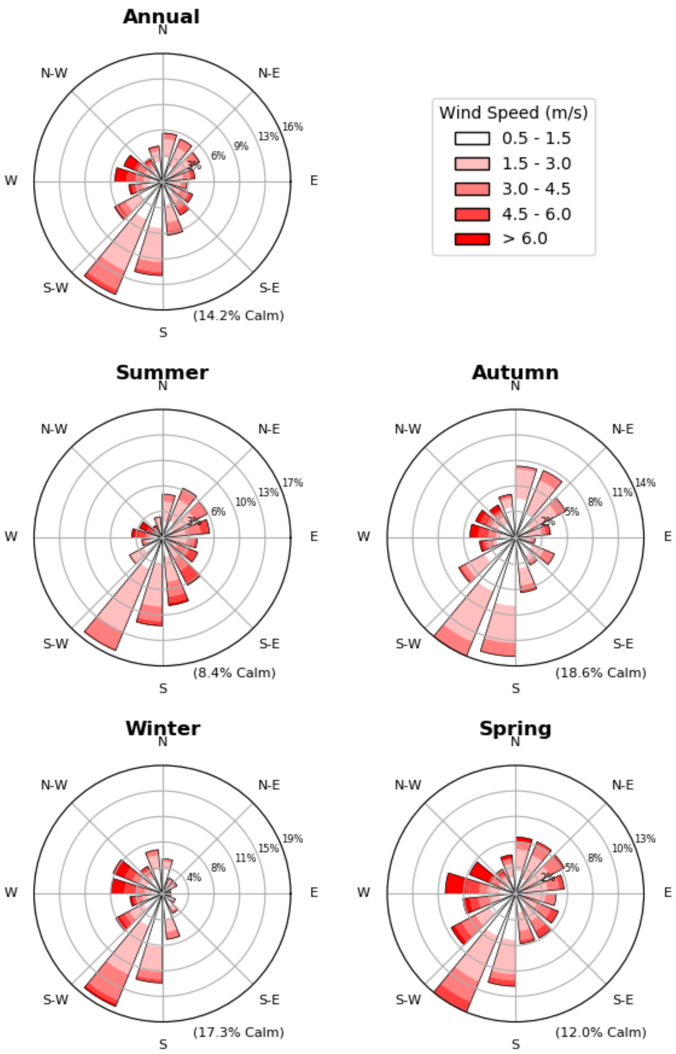
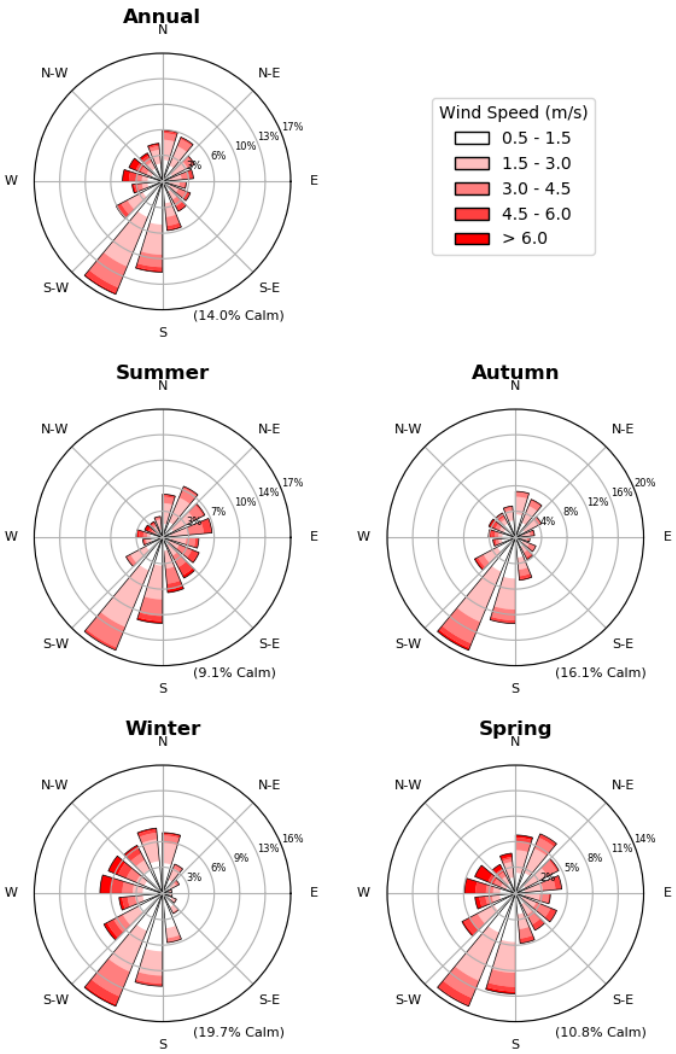


Figure 4-6 Penrith Lakes AWS Wind Roses, 2015-2019



4.2 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 Department of Planning Industry and Environment (DPIE) operates a network of air quality monitoring stations (AQMS) across NSW. The nearest DPIE AQMS is located approximately 6 kilometres south of the Proposal site, at St Marys.

A summary of the ambient air quality monitoring data collected at the St Marys AQMS during the modelling year (2018) is presented in Table 4-2.

Table 4-2 Ambient air quality monitoring results – St Marys AQMS, 2018

Statistic	$PM_{2.5}$	PM_{10}
24-hour average, max	80.5	100.5
24-hour average, max complying [a]	23.2	47.6
24-hour average, 99th percentile	24.3	41.0
24-hour average, 95th percentile	13.3	33.9
24-hour average exceedances	3	2
Annual average	7.8	19.4

a. highest value less than the EPA impact assessment criterion

It is noted that ambient PM_{10} and $PM_{2.5}$ concentrations during 2018 were elevated. As noted in the *NSW Annual Air Quality Statement 2018*, particle pollution was elevated in 2018 due to "*… more frequent exceptional events, such as dust storms, bushfires and hazard reduction burns.*"

There are no readily available site specific Total Suspended Particulates (TSP) and deposited dust monitoring data. The St Marys AQMS does not measure these components; however, estimates of the background levels for the area are required to assess the impacts of the Proposal on TSP and deposited dust.

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 2018 annual average PM_{10} concentration of 19.4 µg/m3 at the St Marys AQMS estimates an annual average TSP concentration of 48.5 µg/m3.

To estimate annual average dust deposition levels, a similar process to the method used to estimate TSP concentrations is applied. This approach assumes that a TSP concentration of 90µg/m3 will have an equivalent dust deposition value of 4 g/m^2/month; and indicates a background annual average dust deposition of 2.16 g/m^2/month for the area surrounding the project.

Table 4-3 summarises the background air quality adopted for assessment purposes.

Table 4-3 Background Air Quality Adopted for Assessment

Pollutant	Averaging Period	Adopted Background Concentration/Level
PM_{10}	24-hour	47.6 µg/m^3
	Annual	19.4 µg/m^3
$PM_{2.5}$	24-hour	23.2 µg/m^3
	Annual	7.8 µg/m^3
TSP	Annual	48.5 µg/m^3
Deposited Dust	Annual	2.16 g/m^2/month

5 DISPERSION MODELLING

5.1 Meteorological Modelling

5.1.1 TAPM

No meteorological observation data is available for the site. 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).

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 33.91° S, 151.19° 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 Penrith Lakes AWS during 2018.

5.1.2 AERMET

The TAPM results, including predictions of wind speed, wind direction, temperature, humidity, cloud cover, solar radiation, and rainfall, were used as inputs to AERMET – AERMOD's meteorological pre-processor. AERMET uses the TAPM data, along with land use data, to calculate mixing heights and velocity scaling parameters.

5.2 Dispersion Modelling

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.

AERMOD is accepted by NSW EPA for use in air quality impact assessments.

6 EMISSIONS TO AIR

The following section presents the estimated emissions of air pollutants associated with the operation of the Proposal.

6.1 Operational Air Emissions

Dust emissions during operation of the Proposal have been estimated based on information provided by the client, using emission factors sourced from both locally developed and US EPA developed documentation.

The significant sources of dust/particulate emissions associated with the operation of the Proposal are identified as:

- Loading/unloading of material;
- Processing (grinding/crushing and screening) material;
- Truck movements on paved roads; and,
- Diesel exhaust from mobile plant.

No material handling, processing or stockpiling would occur outside the building. Therefore, wind blown dust emissions would be negligible. A control factor of 70% has been applied to all sources located inside the building.

The estimated dust emissions associated with the operation of the Proposal are presented in Table 6-1. A detailed emissions inventory is provided in Appendix B.

Table 6-1 Estimated operational dust emissions

Source/Activity	Annual Emissions (kg/year)		
	$PM_{2.5}$	PM_{10}	TSP
Loaded trucks entering site	3.5	14.6	76.2
Unloaded trucks leaving site	0.8	3.4	17.7
Raw material dumped to stockpile	3.4	22.3	47.1
Load material into crusher	3.4	22.3	47.1
Processing material	2.3	12.2	121.5
Screening material	1.1	16.7	562.5
Unload processed material to stockpile	3.4	22.3	47.1
Load processed material to truck	3.4	22.3	47.1
Empty trucks entering site	1.2	4.8	24.8
Loaded trucks leaving site	2.5	10.4	54.4
Exhaust Emissions	84.5	87.3	87.3
Total	**109.4**	**238.4**	**1132.7**

7 ASSESSMENT OF IMPACTS

This section presents the dispersion modelling results and discussed the likely off-site air quality impacts associated with the operation of the Proposal.

7.1 Particulate matter ($PM_{2.5}$ and PM_{10}) and TSP

Table 7-1 presents the dispersion modelling results for particulate matter and TSP at sensitive receptors.

Table 7-1 Predicted TSP and particulate matter impacts at sensitive receptors

Receptor	$PM_{2.5}$				PM_{10}				TSP	
	24-hour		Annual		24-hour		Annual		Annual	
	Increment	Increment	Increment	Total	Increment	Total	Increment	Total	Increment	Total
Goal	**25 µg/m³**		**8 µg/m³**		**50 µg/m³**		**25 µg/m³**		**90 µg/m³**	
R1	0.1	23.3	<0.1	7.8	0.2	47.8	<0.1	19.4	0.1	48.6
R2	0.2	23.4	<0.1	7.8	0.3	47.9	<0.1	19.4	0.1	48.6
R3	0.1	23.3	<0.1	7.8	0.3	47.9	<0.1	19.4	0.1	48.6
R4	<0.1	23.2	<0.1	7.8	0.1	47.7	<0.1	19.4	<0.1	48.5
R5	0.1	23.3	<0.1	7.8	0.1	47.7	<0.1	19.4	<0.1	48.5
R6	0.1	23.3	<0.1	7.8	0.2	47.8	<0.1	19.4	<0.1	48.5
R7	0.1	23.3	<0.1	7.8	0.2	47.8	<0.1	19.4	0.1	48.6
R8	1.4	24.6	0.2	8.0	3.0	**50.6**	0.4	19.8	1.3	49.8

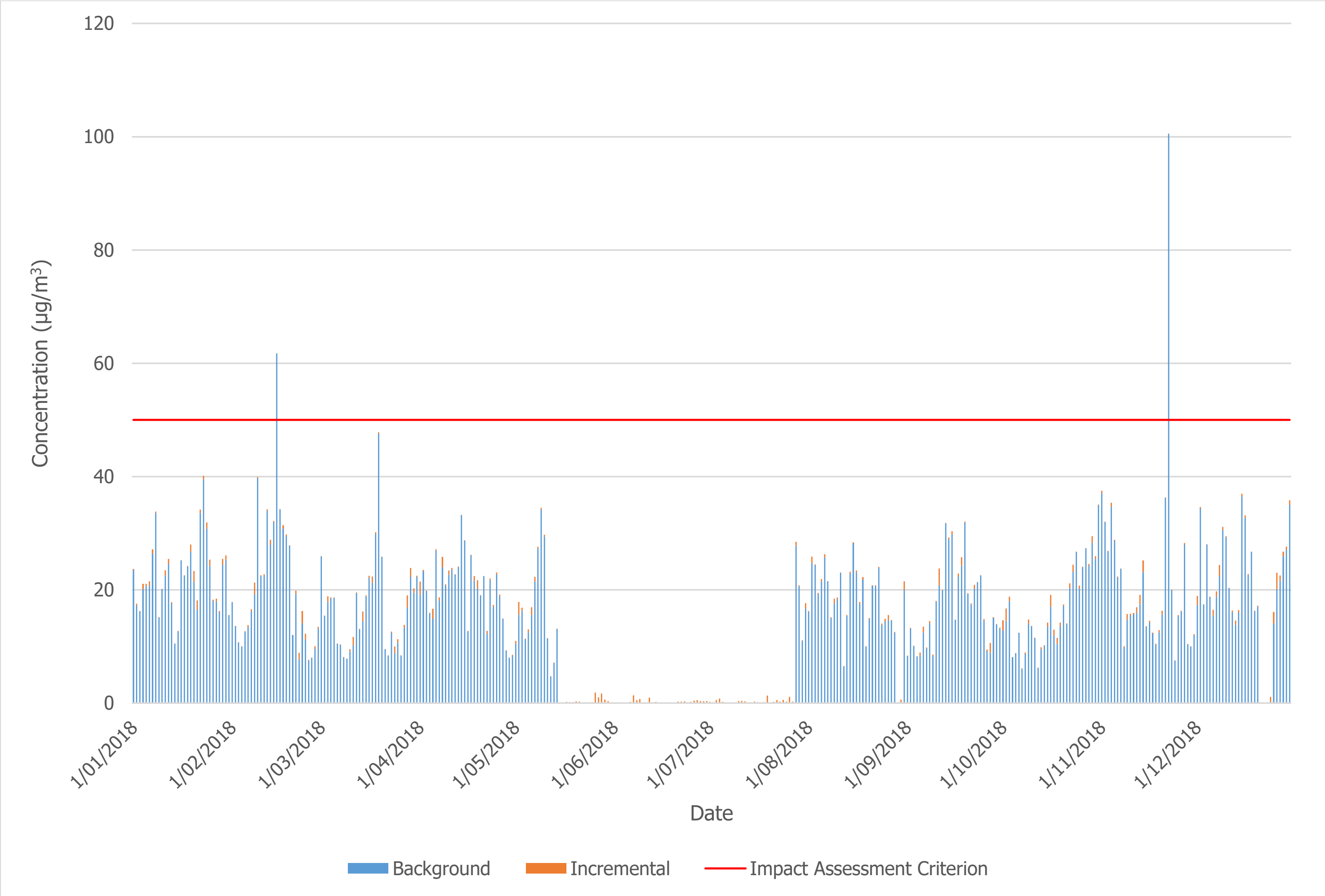
The results indicate compliance with the impact assessment criteria at all receptors except at R8 (Dunheved Golf Couse) where the 100^{th} percentile 24-hour average PM_{10} concentration exceeds the criterion.

To further investigate the potential air quality impacts at R8, a contemporaneous assessment of 24-hour average PM_{10} concentrations has been conducted. The contemporaneous assessment involves adding the existing background concentration, as observed at the St Marys AQMS, to the predicted incremental concentration for each day of the simulation.

Figure 7-1 presents the results of the contemporaneous assessment of 24-hour average PM_{10} concentrations at R8. The contemporaneous assessment shows that the contribution of the Proposal to total PM_{10} concentrations is very low, and that the Proposal does not result in additional exceedances of the impact assessment criterion. Therefore, in accordance with the Approved Methods, no further mitigation of PM_{10} emissions from the Proposal is warranted. Figure 7-1 also shows a period in 2018 where the St Marys AQMS did no record ambient PM_{10} levels. noting the trends through the remainder of 2018 where ambient PM_{10} concentrations are recorded, the period of missing data is considered unlikely to influence the outcome of the assessment presented herein.

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

Figure 7-1 Contemporaneous 24-hour average PM_{10} assessment, R8



7.2 Deposited Dust

The predicted levels of deposited dust at sensitive receptors are presented in Table 7-2.

Table 7-2 Predicted deposited dust impacts at sensitive receptors

Receptor	Deposited Dust	
	Annual	
	Increment	Total
Goal	**2 g/m²/month**	**4 g/m²/month**
R1	<0.01	2.16
R2	<0.01	2.16
R3	<0.01	2.16
R4	<0.01	2.16
R5	<0.01	2.16
R6	<0.01	2.16
R7	<0.01	2.16
R8	0.02	2.18

The results in Table 7-2 indicate compliance with the impact assessment criteria for deposited dust.

8 DUST MITIGATION AND MANAGEMENT

Air quality impacts associated with the operation of the Proposal are predicted to comply with relevant impact assessment criteria. Notwithstanding, in an effort to minimise air quality impacts associated with the Proposal, the following mitigation measures should be implemented where reasonable and feasible:

- engines of vehicles and plant to be switched off when not it use
- vehicles and plant to be fitted with pollution reduction devices where practicable
- vehicles and plant to be maintained in accordance with manufacturer's specifications
- reduce drop heights when handling dusty material
- dampen excessively dusty material during handling
- trafficable areas to be swept/cleaned regularly
- vehicles restricted to designated routes
- on-site speed limits enforced
- vehicle loads to be covered when travelling off-site.

9 CONCLUSION

Borg Manufacturing Pty Ltd is proposing to increase the throughput/volume of the existing resource recovery and recycling facility at 25 Dunheved Circuit, St Marys, Lot 143 in DP 1013185.

The Proposal was declared to be a State Significant Development (SSD-10474). The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal have been issued and set out the environmental assessment requirements for the project.

Wilkinson Murray Pty Limited has been engaged by Borg Manufacturing to prepare an Air Quality Impact Assessment (AQIA) for inclusion in the Environmental Impact Statement (EIS) relative to the project.

Potential dust impacts associated with the operation of the Proposal have been assessed in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016).

Quantitative assessments of potential dust impacts from the operation of the Proposal have been conducted, based on TAPM meteorological simulations and the AERMOD dispersion modelling system.

The results of the dispersion modelling indicate that dust and particulate matter concentrations due to the operation of the Proposal would comply with the established criteria at all sensitive receptors.

Several measures have been identified to further reduce air quality impacts associated with the operation of the Proposal.

APPENDIX A

CONTOUR PLOTS

Figure A-1 Contour Plot: Incremental 24-hour $PM_{2.5}$

Figure A-2 Contour Plot: Incremental Annual $PM_{2.5}$

Figure A-3 Contour Plot: Incremental 24-hour PM_{10}

Figure A-4 Contour Plot: Incremental Annual PM_{10}

APPENDIX B

EMISSION INVENTORY

A.1 Particulate Emission Factor Equations

Paved Roads

TSP emissions from vehicles on paved roads are a function of the mass of the vehicles and the amount of silt loading on the road. The following US EPA emission factor (US EPA, 1985 and updates) is used to calculated emissions from paved roads:

$$E[g/VKT] = k \times (sL)^{0.91}(W)^{1.02}$$

Where:

k = 3.23 for TSP

sL = road surface silt loading [g/m^2]

W = average vehicle weight [tons]

Loading / unloading / transferring material

Each tonne of material handles will generate quantities of particulate matter that will depend on the wind speed and the moisture content of the material according to the US EPA emission factor (US EPA, 1985 and updates) shown below:

$$E[kg/t] = k \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2.0}\right)^{1.4}} \right)$$

Where:

k = 0.74 for TSP, 0.35 for PM_{10} and 0.053 for $PM_{2.5}$

U = wind speed [ms^{-1}]

M = moisture content [%]

The wind speed is taken as the average wind speed from the TAPM dataset.

Crushing and screening

Particulate emission factors for crushing and screening concrete have been taken from the US EPA (US EPA, 1985 and updates) and are summarised below:

Activity	Emission Factor [kg/t]		
	TSP	**PM_{10}**	**$PM_{2.5}$**
Tertiary crushing (controlled)	0.0006	0.00027	0.00005
Screening (controlled)	0.0011	0.00037	0.000025

Table B-1 Emission Inventory, $PM_{2.5}$

Activity	Total Emission [kg/year]	Intensity	Units	Emission Factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Control [%]
Loaded trucks entering site	3.5	700	VKT/y	0.005053956	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Unloaded trucks leaving site	0.8	500	VKT/y	0.00164804	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Raw material dumped to stockpile	3.4	150000	t/year	7.49179E-05	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load material into crusher	3.4	150000	t/year	7.49179E-05	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Processing material	2.3	150000	t/year	0.00005	kg/t									70%
Screen material	1.1	150000	t/year	0.000025	kg/t									70%
Unload processed material to stockpile	3.4	150000	t/year	7.49179E-05	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load processed material to truck	3.4	150000	t/year	7.49179E-05	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Empty trucks entering site	1.2	700	VKT/y	0.00164804	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Loaded trucks leaving site	2.5	500	VKT/day	0.005053956	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Exhaust Emissions	84.5													70%
Total	**109.4**													

Table B-2 Emission Inventory, PM_{10}

Activity	Total Emission [kg/year]	Intensity	Units	Emission Factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Control [%]
Loaded trucks entering site	14.6	700	VKT/y	0.020889685	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Unloaded trucks leaving site	3.4	500	VKT/y	0.006811899	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Raw material dumped to stockpile	22.3	150000	t/year	0.000494741	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load material into crusher	22.3	150000	t/year	0.000494741	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Processing material	12.2	150000	t/year	0.00027	kg/t									70%
Screen material	16.7	150000	t/year	0.00037	kg/t									70%
Unload processed material to stockpile	22.3	150000	t/year	0.000494741	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load processed material to truck	22.3	150000	t/year	0.000494741	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Empty trucks entering site	4.8	700	VKT/y	0.006811899	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Loaded trucks leaving site	10.4	500	VKT/day	0.020889685	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Exhaust Emissions	87.3													70%
Total	238.4													

Table B-3 Emission Inventory, TSP

Activity	Total Emission [kg/year]	Intensity	Units	Emission Factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Control [%]
Loaded trucks entering site	76.2	700	VKT/y	0.108828521	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Unloaded trucks leaving site	17.7	500	VKT/y	0.035487798	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Raw material dumped to stockpile	47.1	150000	t/year	0.001046023	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load material into crusher	47.1	150000	t/year	0.001046023	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Processing material	121.5	150000	t/year	0.0027	kg/t									70%
Screen material	562.5	150000	t/year	0.0125	kg/t									70%
Unload processed material to stockpile	47.1	150000	t/year	0.001046023	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Load processed material to truck	47.1	150000	t/year	0.001046023	kg/t	2	wind speed [m/s]	2	moisture content [%]					70%
Empty trucks entering site	24.8	700	VKT/y	0.035487798	kg/VKT	15	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Loaded trucks leaving site	54.4	500	VKT/day	0.108828521	kg/VKT	45	vehicle mass [t]	0.6	silt loading [g/m^2]					0%
Exhaust Emissions	87.3													70%
Total	1132.7													