APPENDIX F

CHESTER HILL BUILDING RECYCLING OPERATIONS

AIR QUALITY IMPACT ASSESMENT

ACOUSTICS AND AIR

REPORT NO. 17386
VERSION A

APRIL 2018

PREPARED FOR

BUILDING RECYCLING OPERATIONS
191 MILLER ROAD
CHESTER HILL NSW

WILKINSON MURRAY

DOCUMENT CONTROL

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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 pollutant. 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 micrometers. 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 EXECTUIVE SUMMARY

Wilkinson Murray have conducted an Air quality impact assessment to support the S75W application by BRO to modify the existing approval MP 06_0052 for the site located at 191 Miller Road Chester Hill.

The S75W seeks approval to:

- Upgrade the site to include hardstands and a partial enclosure for all future operations;
- Establish a daily processing limit of approximately 910 tonnes; and
- Increase the annual processing limit of the site to 250,000 tonnes per annum of building and demolition waste.

Modelling was conducted to assess operational dust impacts. With appropriate mitigation the project is expected to comply with all appropriate air quality objectives.

The mitigation measures required to minimise dust generation include construction of a hardstand area and a partial enclosure for operations, mist sprays, dust extraction systems and use of hoppers and bays to store materials. These are assumed to be implemented as part of the development.

Additionally, it has been assumed dust management strategies will be implemented to further minimise dust levels including temporary covering of stockpiles, sweeping of hardstand areas to keep them free of visible dust, water spraying for stockpiles, screens, conveyor circuits and during unloading/ loading of trucks when there is visible dust.

2 INTRODUCTION

Building Recycling Operations Pty Ltd (BRO) operate a building waste recycling centre at 191 Miller Road Chester Hill. The facility operates under an existing approval (MP 06_0052) and Environment Protection Licence (EPL 20421). The facility is currently approved to process 100,000 tonnes of building and demolition waste per year.

BRO is proposing to construct a new enclosure to contain future operations and improve environmental controls. The main intent of this proposal is to bring the operations at the site into compliance with the current approval and licence conditions.

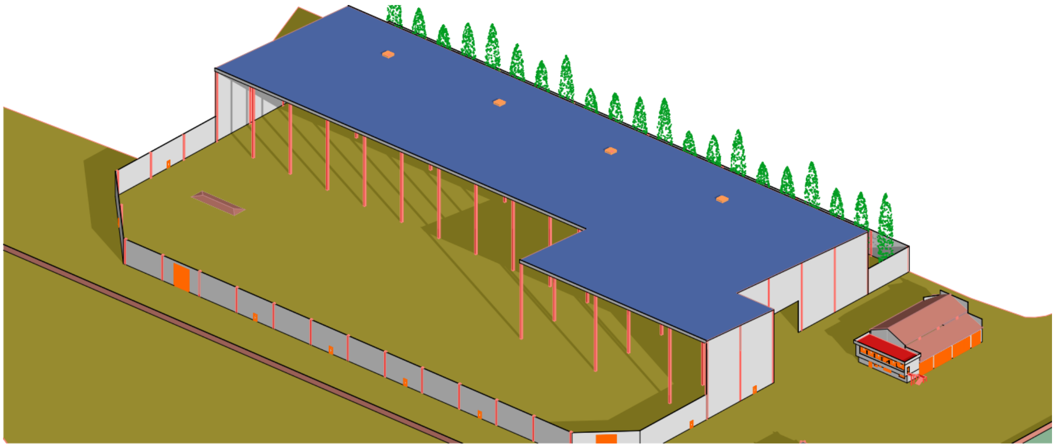
This assessment is written to support a section 75W application to modify the existing approval. The S75W seeks approval to:

- Upgrade the site to include hardstands and a partial enclosure for all future operations (building and perimeter barriers);
- Establish a daily processing limit of approximately 910 tonnes; and
- Increase the annual processing limit of the site to 250,000 tonnes per annum of building and demolition waste.

Figure 2-1 below depicts the proposed enclosure.

Wilkinson Murray Pty Ltd (WM) has been commissioned to assess potential off-site air quality impacts from the proposed development. A qualitative risk assessment and quantitative impact assessment of the potential air quality impacts from the operations under the proposed development was also undertaken.

Figure 2-1 Proposed Enclosure (Building and perimeter barriers)



2.1 Assessment requirements

This an air quality impact assessment has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal and addresses the Secretary Environmental Assessment Requirements (SEARs) (ref: MP 06_0052 MOD 3) for the Proposal. Table 2-1 provides a summary of the SEARs which are relevant to this report and the section where they have been addressed in this report.

Table 2-1 SEARs (MP 06_0052 MOD 3) Compliance Table (Air Quality)

EARs	Where Addressed
Air quality and Odour, including a quantitative assessment of potential air quality and odour impacts for all phases of the proposal in accordance with the relevant Environment Protection Authority guidelines	4.12

3 SITE DESCRIPTION

The site is located on Miller Road, Chester Hill. The site is bordered to the West by Miller Road and to the North by the T3 train line. The land use surrounding the site is predominantly industrial, with the nearest and most potentially affected residences located:

- approximately 120m to the north of the site, across the train line on Waldron Road;
- approximately 150m to the East on Orchard Road; and
- approximately 380m to the Southwest at the intersection of Miller Road and Bilolea Street.

Figure 3-1 below shows the site layout and the relative location of the nearest residential and non-residential receivers. Table 3-1 gives the address of the closest receivers and their approximate distance to the site. Table 3-2 identifies the nearby industrial receivers and the current tenants.

The northern part of the site is tenanted by a separate business, GQM Logistics, a Container hire, storage and sales firm. The two businesses, BRO and GQM Logistics, are separated by a concrete driveway with a concrete divide to separate entering and exiting traffic.

The BRO site is currently surrounded by shipping containers, emplaced to act as noise barriers. These containers will be removed as part of the development and replace by concrete barriers.

The site is located on an area of relatively flat terrain. The terrain rises gently towards the North and the East beyond the site.

The site is currently unpaved aside from the drive-way separating BRO with GQM Logistics.

Table 3-1 Residential Receivers and distances

Receiver	Address	Approximate distance to site (m)
R1	153-155 Waldron Road	110
R2	151 Waldron Road	115
R3	147 Waldron Road	130
R4	280 Miller Road	385
R5	116 Orchard Road	135
R6	14 Hughes Places	130
R7	2 Hughes Place	130
R8	11 Goodstate Place	135
R9	7 Goodstate Place	160
R10	259 Wellington Road	170
R11	1 Biloela Street	390

Table 3-2 Non-residential industrial receivers

Receiver	Name
R12	KU Chester Hill Children's centre
R13	QGM Logistics
R14	173 Orchard Industrial Estate
R15	Integrated Packaging
R16	Display and Rack

Figure 3-1 Site Overview

4 PROPOSED DEVELOPMENT

4.1 Project overview

Since BRO has taken ownership of the facility in 2016, it was found that the facility has a number of non-compliances in relation to the consent conditions in terms of environmental and amenity performance.

A Section 75W (S75W) application is to be submitted to address the legacy compliance issues. The S75W will seek approval to:

- staged upgrade of the site including the erection of an enclosure for the sorting of materials;
- establishment of a daily processing limit of approximately 910 tonnes; and
- increase in the annual processing limit from 100,000 tonnes per annum to 250,000 tonnes per annum.

The key element of the proposed development is the creation of continuous hardstand areas and the construction of an enclosure work site. In addition to this, the site will implement systems to convert the facility into a state of the art purpose built facility including a superior screening process and modern dust suppression systems.

The project involves the removal of large quantities of potentially Asbestos Contaminated Materials (ACM) known as the legacy stock pile and clearing the site for a large, continuous concrete slab. The construction of an enclosed facility will follow. The facility will be 200m long and broken down into 14 separate bays with each bay spanning 12.5 meters in width. The new facility will provide a stream-lined layout of the site that will be more environmentally responsible and compliant.

The two distinct phases of the project are:

- Phase 1 – Removal of Legacy stock pile, site establishment works for all phases of the project;
- Phase 2 – Operations will be ceased whilst hardstand and enclosure are constructed. Operations to recommence after new processing equipment is in place and commissioned.

Figure 4-1, Figure 4-2 and Figure 4-3 below show the footprint and elevations of the proposed enclosed site. Entry to the enclosed site is located on Miller road and the exit is located on the North-West edge with trucks driving down the existing driveway.

The proposed development will include a 3m wall around the entire building foot print and will include an 8m high enclosed section covering approximately half of the building footprint.

All operations, including stockpiling, screening and dumping will occur behind the wall. Screening, picking and pre-sorting and sorting will occur under the covered section along the southern wall of the development. Truck deliveries, and excess stockpiling will occur in the uncovered section on the northern side of the development.

Figure 4-1 Footprint of proposed enclosure

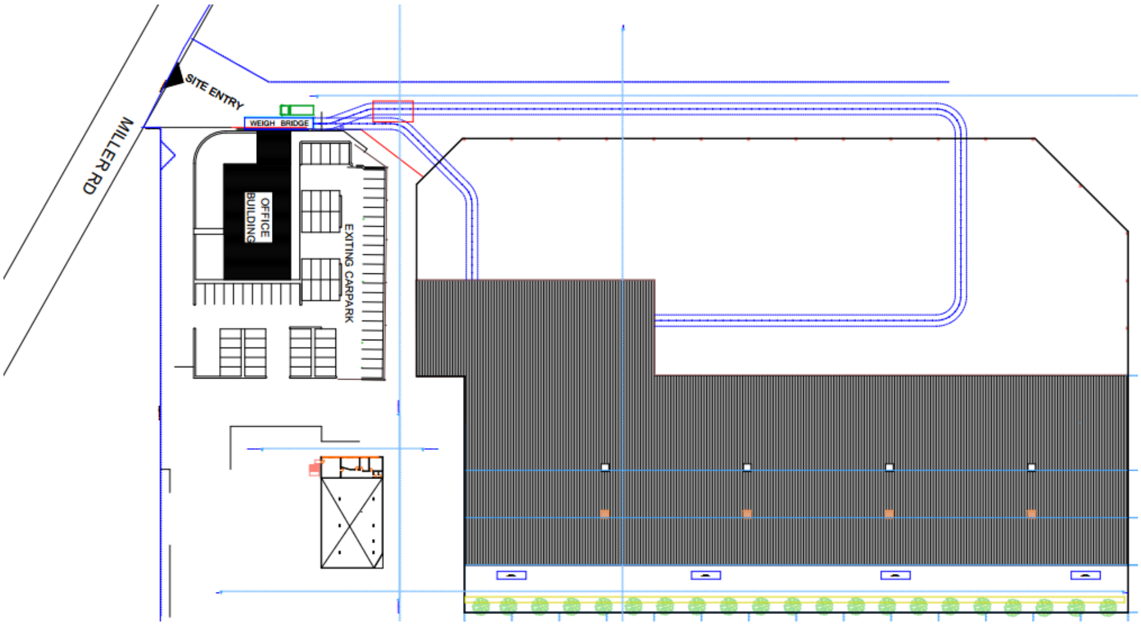


Figure 4-2 North Elevation

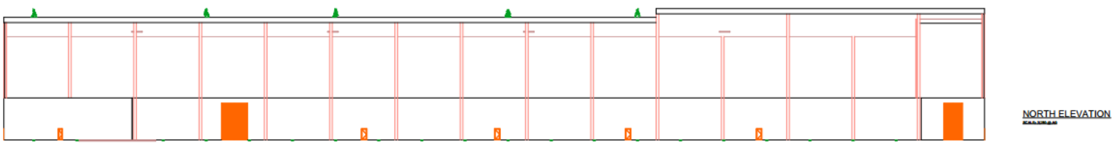
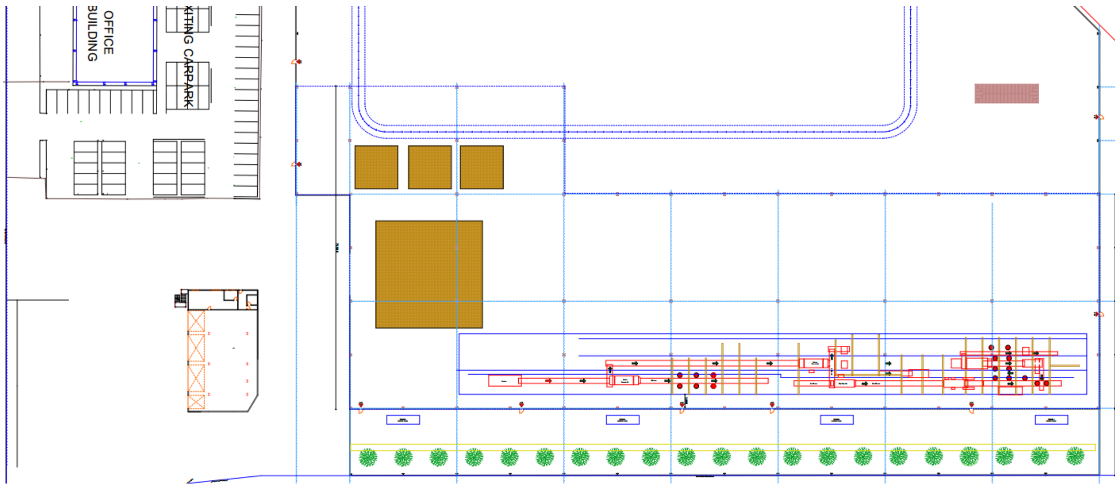


Figure 4-3 Site layout including processing equipment



The following equipment is proposed to be used to sort and screen the incoming material:

- 4 over band magnets to remove ferrous materials;
- 5 screens including 2 waste screens, a rotary screen and 2 flip flow screens;
- 3 sifters including a zig zag sifter and 2 wind sifters; and
- 2 manual picking stations.

The process can be described by the following 12 steps:

1. Trucks unload waste into designated areas and staff conduct preliminary checks for contaminated materials e.g asbestos;
2. Transfer of Material to Pre-Sort using two excavators;
3. A pre-sort is conducted to remove oversize objects. the pre-sorted material is loaded into a dosing bunker;
4. Primary Screening and Sorting to separate the material in 0-220mm and >220mm. The >220mm fraction is fed to manual picking station to sort items for either recovery or disposal;
5. Separation of Ferrous Metals from 0 to 220mm using overband magnet;
6. Secondary Screening using a second waste screen and two flip flow screens to separate materials into 4 fractions: 0 - 10mm, 10 - 20mm, 20 - 70mm and 70 -220m;
7. Recovery of Fines 0 – 10mm fraction;
8. Separation of Ferrous Materials from 10 to 20mm fraction using overband magnet;
9. Aggregate Decontamination of the 10 to 20mm using rotary screen, zig zag wind sifter and optical sorter;
10. Aggregate Decontamination of the 20 to 70mm using an overband magnet and wind sifter;
11. Sorting and decontamination of the 70 to 220mm using an overbelt magnet, wind sifter, manual sorting station, optical scanner and NIR scanner; and
12. All product is transported to bunkers prior to being loaded into trucks for sale or disposal.

The plant is equipped with dust extraction points for the manual sorting stations and transition points of materials, that will generate excessive dust. The extracted air and exhaust air from the wind sifters is filtered through a bag house before being vented to atmosphere.

Additionally, dust suppression misting system in use at various points along the process flow and the entry and exit points of the building to minimise dust emissions on the site.

5 AIR QUALITY IMPACT ASSESMENT

5.1 Introduction

This section assesses potential air quality impacts from operation of the proposed facility. Potential sources of airborne dust and appropriate mitigation measures are described in the following sections.

5.2 Dust Monitoring

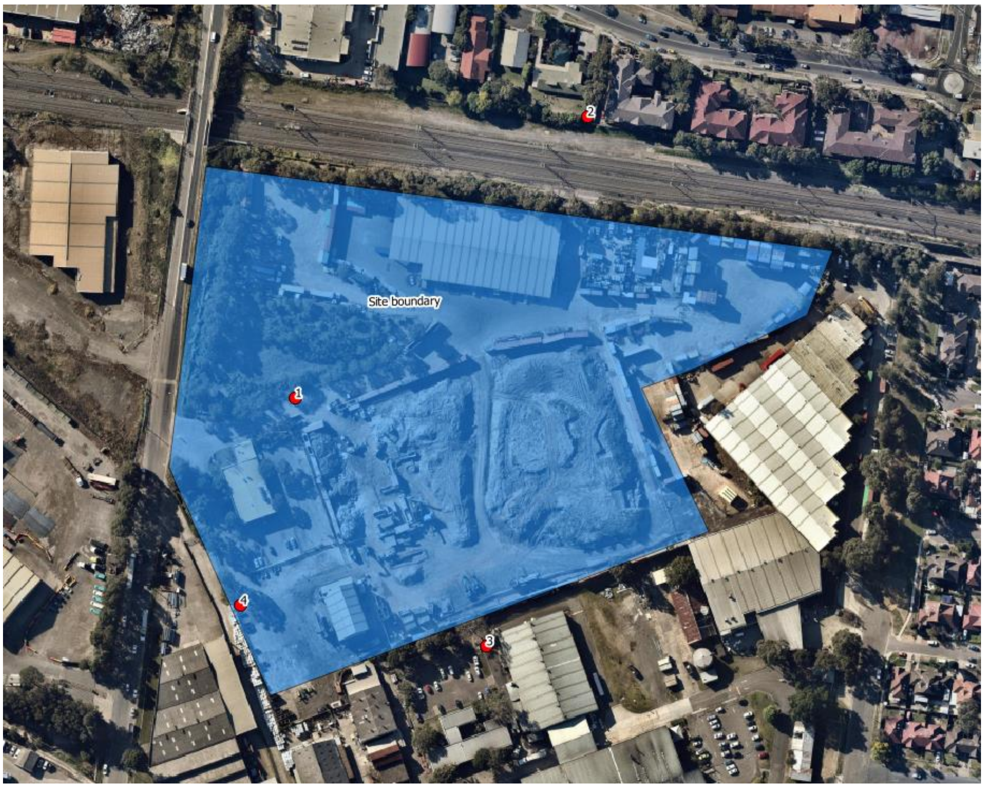
5.2.1 EPL Air Quality Requirements

The site currently operates under licence EPL 20421, issued by the NSW EPA. In accordance with the EPL, four dust deposition gauges are used to monitor dust emissions from the site. The locations of the gauges, as prescribed by the EPL, are presented in Table 5-1 and shown on Figure 5-1.

Table 5-1 Dust deposition monitoring locations

EPA Identification	Type of Monitoring Point	Location Description
1	Dust Gauge – Point 1	At the common boundary between the premises and Unit 8, 191 Miller Road
2	Dust Gauge – Point 2	At the South Eastern corner of KU Chester Hill Children's Centre in 157-159 Waldron Road
3	Dust Gauge – Point 3	Near the North-Western corner of the warehouse in 149 Orchard Road
4	Dust Gauge – Point 4	At the common Boundary between the premises and 195 Miller Road (Display and Rack)

Figure 5-1 Location of Dust Deposition



Section O3 of the EPL detail measures require to be taken to control dust, namely:

- All operations and activities occurring at the premises must be carried out in a manner that will prevent the emission of dust from the premises.
- All areas must be maintained, at all times, in a condition which effectively minimises the emission of wind-blown or traffic-generated dust.
- The licensee must ensure that no material, including sediment or oil, is tracked from the premises.
- Trucks entering and leaving the premises that are carrying loads must be covered at all times except during loading and unloading.
- The licensee must maintain a weather station to monitor onsite weather conditions including but not limited to rainfall and wind strength and direction. Weather information is to be used to inform reactive dust management
- The licensee must manage dust in accordance with the "*Air Pollution Control Management Plan*", prepared by Pollution Control Consultancy and Design and dated April 2017
- A copy of all records required by the *Air Pollution Control Management Plan* must be produced to any authorised officer of the EPA who asks to see them.
- A copy of the *Air Pollution Control Management Plan* must be kept at the Premises at all times. It must be available for inspection by any employee or agent of the licensee working at the Premises.

5.3 Risk Assessment

The following section summarises the proposed development and qualitatively assess the risk of air quality impacts.

The proposed development would process building and demolition waste as well as ferrous and non-ferrous materials. The facility will process inert matter, such as metals, concrete, bricks, tiles rubber and wood with an expected throughput of 250,000 tonnes per annum.

Air quality, and specifically dust, are a potential impact on the neighbouring premises as a result of the proposed operation.

The following site operations have the potential to generate air quality impacts from the site:

- Vehicles entering and leaving the site;
- Vehicles, including trucks and heavy machinery moving around the site on paved surfaces;
- Trucks dumping waste material;
- Excavators and loaders dumping material into trucks;
- Waste material on conveyors;
- Screens operating;
- Loading dumping material into screen and conveyor system hopper;
- Shredder operating; and
- Wind erosion off hardstand areas and/or stockpiles.

The building waste to be accepted typically contains a high percentage of dusty materials. Visible dust that is generated should be controlled using attended water sprays.

A review of the proposed site activities has not identified any activities with the potential to generate odours. Materials dumped onto the tipping floor of the processing building would be inspected. If any loads are found to contain any prohibited materials, such as putrescible waste, it would immediately be loaded back into the delivering vehicle and rejected from the site.

5.4 Air Quality Assessment Criteria

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (January, 2017).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.

5.5 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.

5.6 NSW EPA 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 5-2 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 5-2 Impact assessment criteria – dust and particulate matter

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	Total	30 µg/m³
	24-hour	Total	50 µg/m³
Deposited dust (DD)	Annual	Total	4 g/m²/month
	Annual	Incremental	2 g/m²/month

5.7 Existing dust deposition monitoring

Existing dust deposition data for the site in 2017 is presented in Table 5-3.

Table 5-3 Dust deposition gauge data, 2017

EPA identification	1	2	3	4
January	3.0	0.6	2.9	1.0
February	3.8	1.4	2.1	8.8
March	3.3	1.4	0.6	3.8
April	3.8	1.5	1.0	4.8
May	1.2	1.9	2.0	2.3
June	1.5	0.9	1.3	2.1
July	6.3	1.7	3.0	3.1
August	0.5	1.6	4.0	0.2
September	5.0	1.8	4.2	3.6
October	10.7	2.0	5.6	11.5
Average	**3.9**	**1.5**	**2.7**	**4.1**

The two monitoring locations located within the site boundary, locations 1 and 4, have an average dust deposition of 3.9 and 4.1 g/m^2/month. Locations 1, 3 and 4 have exceeded 4g/m^2/month in at least one individual month. The dust deposition data indicates the site current emits significant dust from the site.

5.8 Existing Meteorology

5.8.1 Temperature Humidity and Rainfall

Average monthly values for temperature, humidity, and rainfall over the period 2012 to 2016 are presented in Table 5-4.

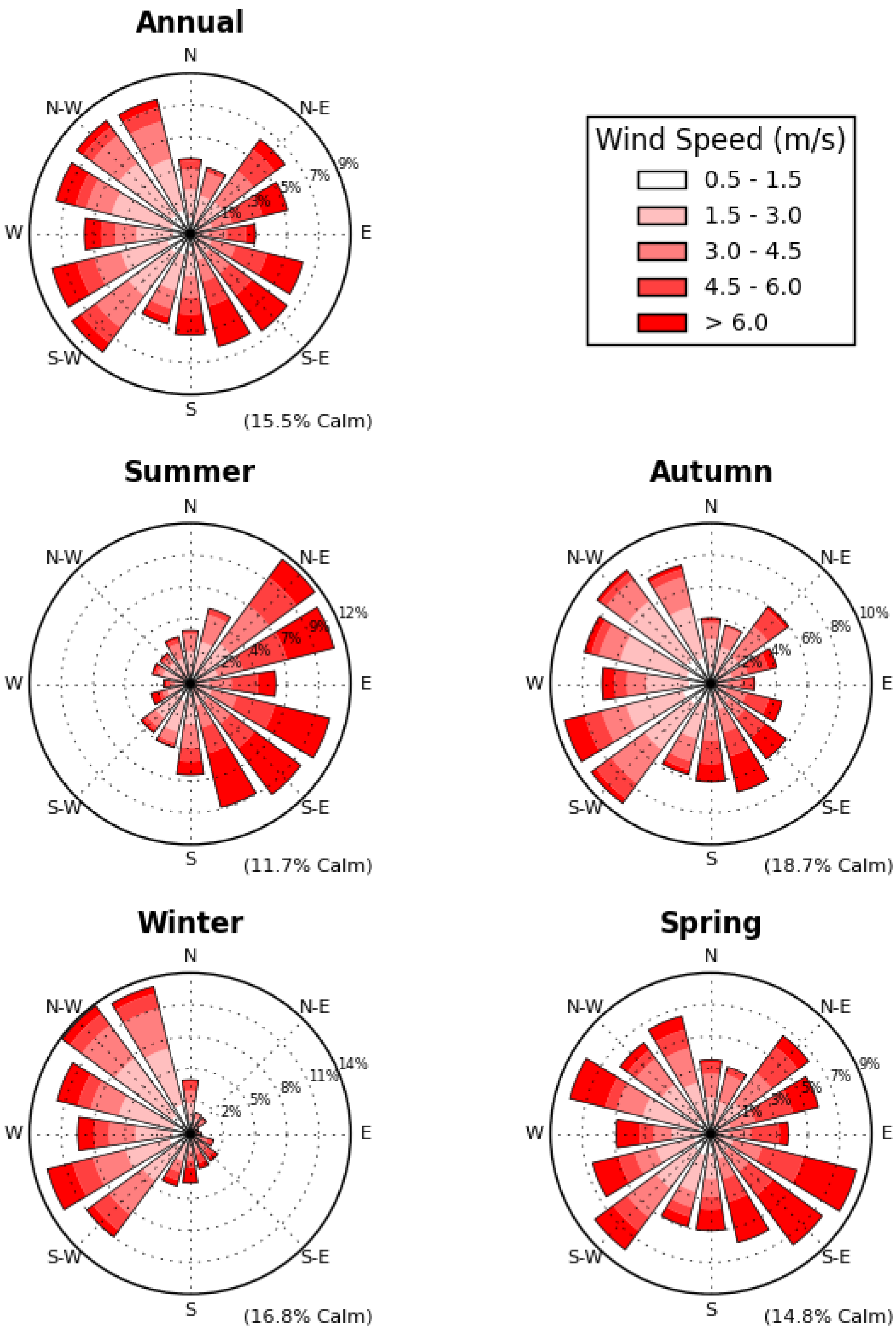
Long-term climate statistics are presented in Table 5-4. Temperature data recorded at the Bankstown Airport AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 23.2°C. July is the coolest month with a mean daily minimum temperature of 6.1°C. March is the wettest month with an average rainfall of 98 mm falling over 8 days. There are on average 84 rain days per year, delivering 875 mm of rain.

Table 5-4 Climate Averages for Bankstown Airport AWS 2012-2016

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
						9am Mean Observations							
Temp (°C)	21.3	21	19.6	16.9	13.5	10.7	9.6	11.1	14.5	17.4	18.4	20.6	16.2
Hum (%)	75	79	79	77	80	79	76	70	65	65	70	70	74
						3pm Mean Observations							
Temp (°C)	26.8	26.3	24.8	22.4	19.2	16.5	15.9	17.4	19.6	22.1	23.4	25.9	21.7
Hum (%)	52	54	55	52	57	55	50	45	45	46	50	49	51
						Daily Minimum and Maximum Temperatures							
Min (°C)	17.7	17.8	16.2	13	9.9	7.5	6.1	6.8	9.4	12.1	14.3	16.4	12.3
Max (°C)	28.5	28	26.4	23.7	20.4	17.4	16.9	18.8	21.4	23.9	25.6	27.5	23.2
						Rainfall							
Rain (mm)	95.8	96.5	98	76.6	69.9	77.2	55.7	50.7	46.4	58.3	73.2	75.9	875
Rain (days)	8	8.1	8.4	7	6.4	7	5.6	5.7	6.1	6.8	7.3	7.5	83.9

Windrose plots showing the distributions of wind direction and wind speeds at the Bankstown Airport AWS between 2012 and 2016 are presented in Figure 5-2.

Figure 5-2 Windroses - Bankstown Airport AWS 2012-2016



5.9 Local Ambient Air Quality

Air Quality monitoring data from the Office of Environment and Heritage (OEH) air quality monitoring site at Chullora has been used to characterise the ambient air quality in the area surrounding the project site. The OEH's Chullora site is located approximately 4.7 kilometres east of the project site, as shown in Figure 5-3.

Figure 5-3 OEH Air Quality Monitoring Site - Chullora

Table 5-5 presents a summary of the ambient concentrations of PM_{10} as measured at the OEH monitoring station in Chullora between 2012 and 2016. The data show that no exceedances of the 24-hour average goals for PM_{10} were measured during 2014. However during 2012 ,2013, 2015 and 2016, a number of exceedances of the 24-hour average goals for PM_{10} were recorded. All annual average concentrations of PM_{10} were below the goal.

Table 5-5 PM_{10} Monitoring Results – Chullora

Year	24-hour Average (goal = 50 µg/m³)			Annual Average (goal = 25 µg/m³)
	Minimum	Maximum	Exceedances	
2012	5.2	52.4	1	18.1
2013	5.7	69.4	4	18.3
2014	4.4	40	0	18.1
2015	4.4	64.6	1	17.5
2016	6.3	63.5	1	18.1

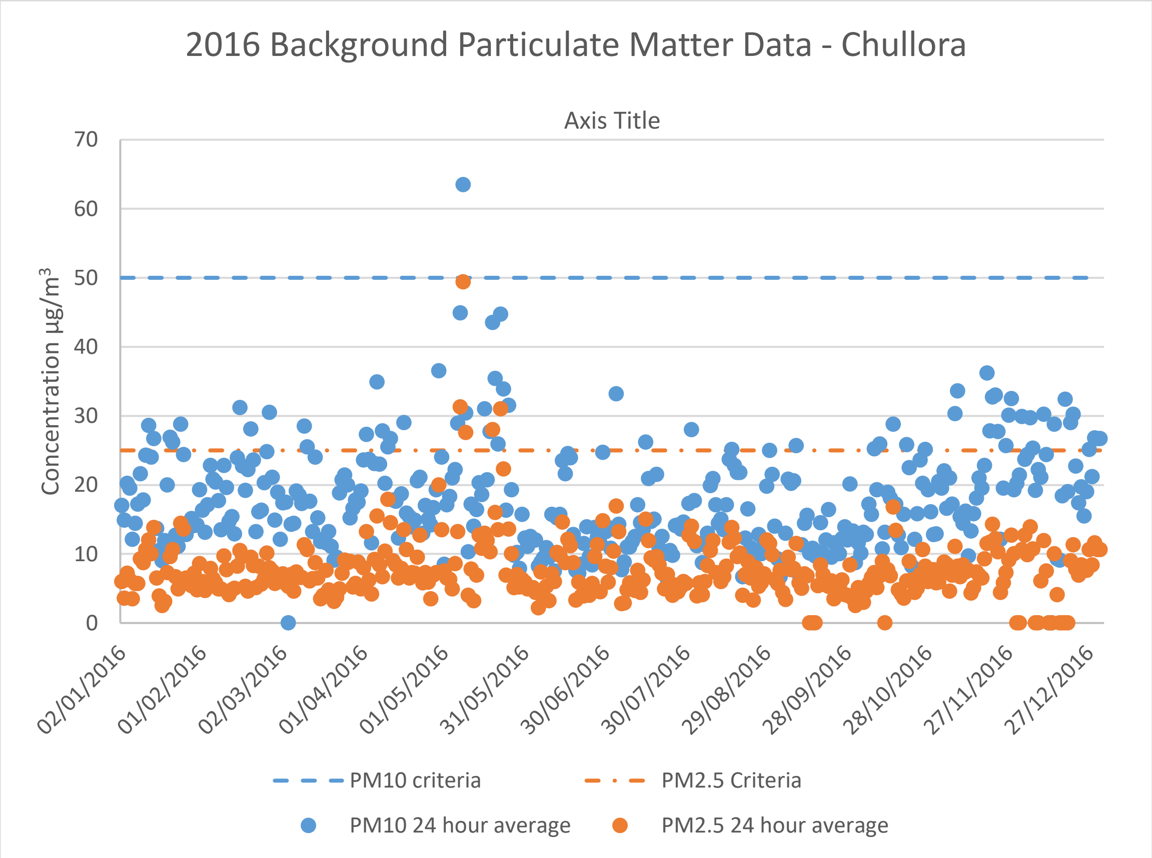
Table 5-6 presents a summary of the ambient concentrations of $PM_{2.5}$ as measured at the OEH monitoring station in Chullora between 2012 and 2016. The data show that no exceedances of the 24-hour average goals for $PM_{2.5}$ were measured during 2012 or 2014. During 2013, 2015 and 2016, a number of exceedances of the 24-hour average goals for $PM_{2.5}$ were recorded. Annual average concentrations of $PM_{2.5}$ were below the advisory goal during 2012 but on or above the goal for all other years.

Table 5-6 Existing Ambient $PM_{2.5}$ Concentrations

Year	24-hour Average (goal = 25 µg/m³)			Annual Average (goal = 8 µg/m³)
	Minimum	Maximum	Exceedances	
2012	0.3	23.4	0	6.0
2013	3.1	49.1	3	8.4
2014	2.8	23.1	0	9.0
2015	1.9	37.2	1	8.0
2016	2.2	49.4	5	8.0

Figure 5-4 shows the distribution of PM_{10} and $PM_{2.5}$ concentrations during 2016.

Figure 5-4 24-hour Average PM_{10} and $PM_{2.5}$ Concentrations - 2016



The majority of exceedances of the 24-hour average goals for PM_{10} and $PM_{2.5}$ during 2016, as shown in Figure 5-4, were caused by bushfire reduction burning in the Greater Sydney Metropolitan Region during between May.

The highest 24-hour average concentrations of PM_{10} and $PM_{2.5}$ during 2012 that were considered to not be affected by reduction burning, were 36.5 µg/m³ and 20 µg/m³, respectively. These values are considered to be more representative of the existing ambient air quality in the area, and will therefore be used further in the assessment as typical ambient levels.

The dust deposition data available for the site was deemed not representative of an ambient level due to existing impact from the site, additionally there is no readily available site-specific TSP data. The Chullora monitoring site does not measure these components; however estimates of the background levels for the site are required to assess the impacts per the criteria presented in Section 5.6.

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).

Applying this relationship with the 2016 annual average PM_{10} concentration of 18.1 µg/m^3 at the Chullora monitoring station estimates an annual average TSP concentration of 45.3 µg/m^3.

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 2.0 g/m^2/month for the area surrounding the project.

A summary of the assumed background particulate levels are:

- TSP - 45.3 µg/m^3 annual average;
- PM_{10} - 18.1 µg/m^3 annual average;
- PM_{10} - 36.5 µg/m^3 (24 hour);
- PM_{10} - 20 µg/m^3 (24 hour); and
- Dust deposition - 2.0 g/m^2/month.

5.10 Dispersion Modelling

Dispersion Modelling was conducted using regulatory approved meteorological and dispersion modelling tools.

5.10.1 TAPM

No meteorological observation data of the required quality is available for the site. The Bankstown Airport AWS is located approximately 3.7 kilometres south west of the Project site. Therefore, site-specific meteorological data was generated through the use of 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 TAPM model included assimilation of data collected at the Bankstown Airport AWS during the year 2016. This modelling year was chosen based on a long term meteorological analysis (see Appendix A).

5.10.2 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.

5.10.3 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 was selected by the Victorian EPA to replace AUSPLUME from 1 January 2014.

5.11 Estimated Dust and Particulate Emissions

As presented in Section 5.5, the potential air pollutants associated with the Project are dust and particulate matter. Potential sources of dust generation are:

- Vehicles entering and leaving the site;
- Vehicles, including trucks and heavy machinery moving around the site on paved surfaces;
- Trucks dumping waste material;
- Excavators and loaders dumping material into trucks;
- Waste material on conveyors;
- Screens operating;
- Loading dumping material into screen and conveyor system hopper;
- Shredder operating; and
- Wind erosion off hardstand areas and/or stockpiles.

Taking into account any control measures described above in Section 4.1 including dust extraction, misting sprays and watering where necessary, the total estimated emissions from the site are given below in Table 5-7. The full emissions inventory is included in Appendix B.

Table 5-7 Dust Emissions from site

Source	Emissions (kg/annum)
	TSP
Entire Site	3924

5.11.1 Particle Size Distribution

The Section above presents the total estimated mass of dust emitted throughout the year. However, to estimate the emissions of the specific pollutants identified for this study, information regarding the speciation of the dust is required.

The distribution of particle size within has been based on the *'US EPA AP42'* emission factors where available. Where specific species emission rates are unavailable for a given emission source, the speciation of the dust has been derived from measurements published by the NSW State Pollution Control Commission (SPCC) (SPCC, 1986). These measurements were taken around mines in the Hunter Valley, NSW; and are considered appropriate for this assessment. The distribution of particle size within the Total Suspended Particulates (TSP) is:

- $PM_{2.5}$ is 5.0% of TSP;
- $PM_{2.5-10}$ is 24.8% of TSP; and,
- PM_{10-30} is 70.1% of TSP.

Based on the particle size distribution and the total emitted mass of dust, the daily estimated emission rates for the pollutants of interest are presented in Table 5-8. The full emissions inventory is included in Appendix B.

Table 5-8 Dust and Particulate Emissions

Source	Emissions (kg/day)		
	TSP	**PM_{10}**	**$PM_{2.5}$**
Entire Site	6.55	3.70	0.51

5.11.2 Source Locations and Characteristics

Due to the semi enclosed nature of the dust generating activities, the source has been modelled as a single volume source, the size of the shed. The large volume source is centred over the shed. This approach is considered to be conservative.

The location of the volume source is shown in Figure 5-5. The location of the source, in MGA56 coordinates, and the relevant volume source parameters are presented in Table 5-9.

Table 5-9 Source Parameter

Source	MGA56 Coordinates		Release Height	Length of side	Initial Lateral Dimension	Initial Vertical Dimension
	Latitude	longitude				
Partial Enclosure	314583m	6248846 m	2 m	125 m	29.7m	5.58

Figure 5-5 Source Locations

5.12 Assessment of Impacts

5.12.1 Predicted Ground Level Concentrations at Sensitive Receptors

The predicted incremental ground level concentrations of the identified air pollutants at sensitive receptors, due to the operation of the Project, are presented below. Also presented are the total ground level concentrations of pollutants, based upon the existing ambient air quality presented in Section 5.9.

The predicted incremental and total ground level concentrations of dust and particulate matter are presented in Table 5-10. A contour plot of the incremental 24-hour average PM_{10} concentrations is shown in Figure 5-6. A contour plot of the incremental dust deposition is shown in Figure 5-7

Table 5-10 Predicted Dust and Particulate Matter Impacts at Receptors

Receptor	TSP		PM_{10}				Dust Deposition	
	Annual Average		24-hour Average		Annual Average		Annual Average	
	Increment	Total*	Increment	Total*	Increment	Total*	Increment	Total*
Criteria	90 µg/m³		50 µg/m³		25 µg/m³		2 g/m²/month	4 g/m²/month
R1	12.0	57.3	4.5	41.0	0.5	18.6	0.2	2.2
R2	10.1	55.4	3.8	40.3	0.5	18.6	0.2	2.2
R3	8.3	53.6	3.1	39.6	0.5	18.6	0.2	2.2
R4	1.4	46.7	0.6	37.1	0.1	18.2	0.0	2.0
R5	6.8	52.1	2.8	39.3	0.5	18.6	0.2	2.2
R6	7.0	52.3	2.8	39.3	0.5	18.6	0.2	2.2
R7	7.4	52.7	2.9	39.4	0.5	18.6	0.2	2.2
R8	7.4	52.7	2.8	39.3	0.5	18.6	0.2	2.2
R9	6.8	52.1	2.8	39.3	0.5	18.6	0.2	2.2
R10	6.7	52.0	2.6	39.1	0.5	18.6	0.2	2.2
R11	1.4	46.7	0.6	37.1	0.1	18.2	0.0	2.0
R12	10.6	55.9	4.1	40.6	0.5	18.6	0.2	2.2
R13	28.5	73.8	10.6	47.1	2.5	20.6	1.0	3.0
R14	10.5	55.8	4.2	40.7	0.7	18.8	0.3	2.3
R15	20.8	66.1	7.8	44.3	1.8	19.9	0.7	2.7
R16	37.4	82.7	13.4	49.9	2.6	20.7	1.0	3.0

* Total impacts include background concentrations.

Figure 5-6 Ground Level Concentration Contours – 24-hour Average PM_{10}

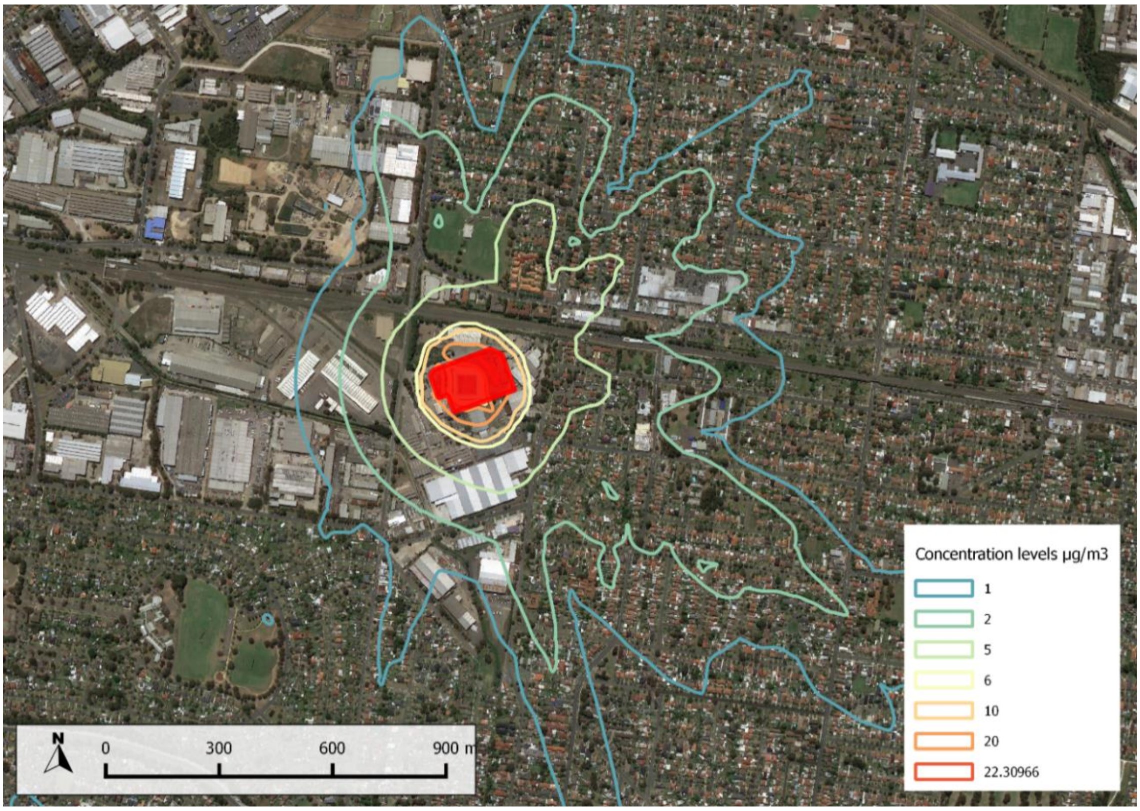
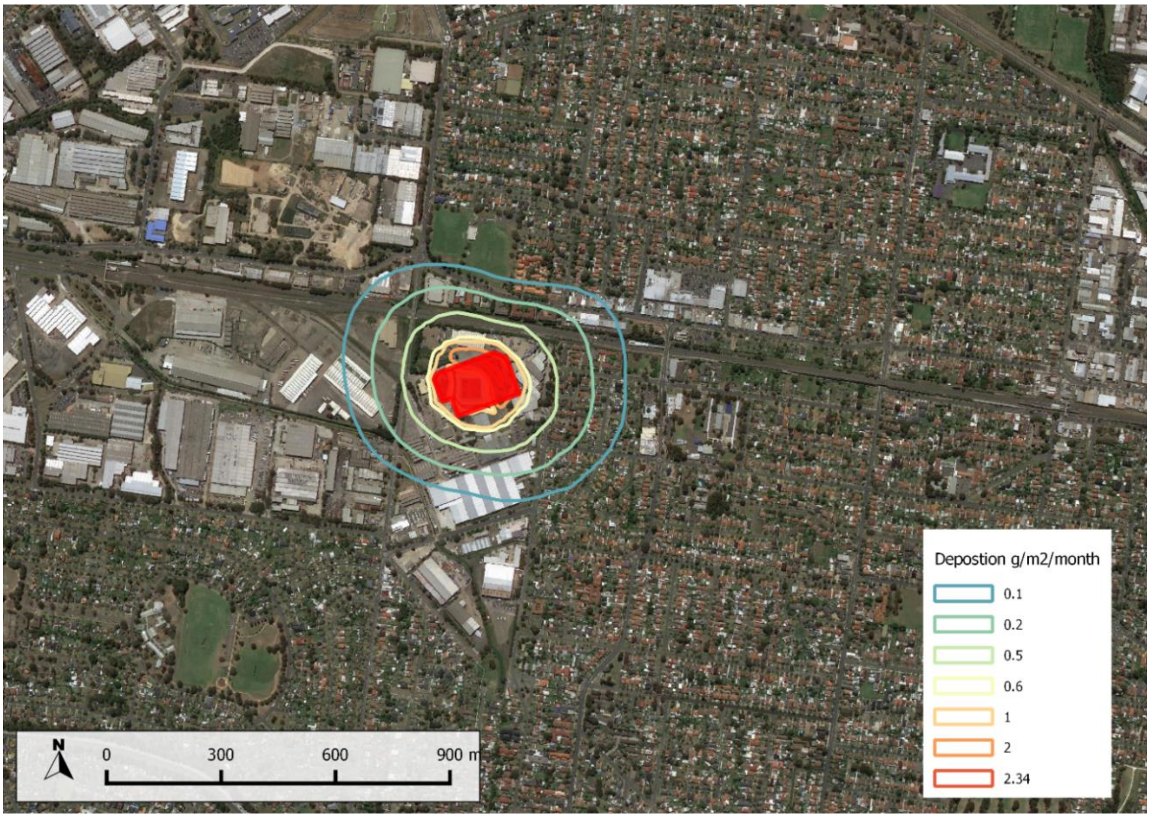


Figure 5-7 Ground Level Incremental Dust Deposition - g/m2/month Annual Average



Review of Table 5-10 indicates that the total impact on 24-hour average PM_{10} concentrations, calculated conservatively in accordance with the Approved Methods, comply with the impact assessment criterion of 50 µg/m^3 at all sensitive receivers. The predicted incremental and total levels of TSP and deposited dust comply with the impact assessment criteria at all sensitive receivers. Table 5-11 presents the dispersion modelling results for $PM_{2.5}$ at discrete receptors. Review of Table 5-11 indicates that the Project is unlikely to generate additional exceedances of the 24-hour average goal for $PM_{2.5}$ at any sensitive residential receptors.

Table 5-11 Predicted $PM_{2.5}$ Impacts at Discrete Receptors

Receptor	PM2.5			
	24-hour Average		Annual Average	
	Increment	Total*	Increment	Total*
Goal	**25 µg/m3**		**8 µg/m3**	
R1	0.7	20.7	0.1	8.1
R2	0.7	20.7	0.1	8.1
R3	0.6	20.6	0.1	8.1
R4	0.1	20.1	0.0	8.0
R5	0.7	20.7	0.0	8.0
R6	0.7	20.7	0.1	8.1
R7	0.6	20.6	0.1	8.1
R8	0.6	20.6	0.1	8.1
R9	0.6	20.6	0.1	8.1
R10	0.6	20.6	0.1	8.1
R11	0.1	20.1	0.0	8.0
R12	0.8	20.8	0.1	8.1
R13	2.5	22.5	0.6	8.6
R14	0.8	20.8	0.1	8.1
R15	2.0	22.0	0.5	8.5
R16	2.8	22.8	0.5	8.5

* Total impacts include background concentrations.

The predicted levels show that the annual average will be exceeded despite only a minor contribution from the project. The worst case $PM_{2.5}$ annual average concentration at surrounding receptors due to the project was 0.63µg/m^3. This represents approximately 8% of the $PM_{2.5}$ criteria and is considered an acceptable contribution to the airshed.

5.13 Dust Management

5.13.1 Dust Mitigation

The following dust controls will be implemented to significantly improve dust emissions compared to the current site:

- Creation of continuous hardstands to reduce uncover areas and emissions from vehicle movements;
- Construction of a semi enclosure to reduce wind erosion and reduce dispersion of emitted dust;
- Mist sprays;
- Dust extraction system; and
- Use of hoppers and bays to store materials;

The following dust management strategies will be implemented to further minimise dust:

- Where applicable, stockpiles to be temporarily covered or sprayed with water to keep dust to a minimum;
- Hardstand area to be kept free of visible dust by sweeping;
- Water should be used to control dust from screens and conveyor circuit where there is visible dust;
- Water spraying will be conducted during the unloading/loading of trucks, if visual dust is generated.

If mitigation methods are not effective, the following additional actions will be employed:

- Increase water sprays;
- Stop activity;
- Secure with a cover;
- Clearing of hardstand/road surface; and
- Reduce or modify activities.

If visual monitoring indicates that the air quality objectives are being exceeded:

- Identify the activities that were occurring at the time of the exceedances.
- Determine the activities that were most likely contributing to the exceedances.
- Review site works and environmental controls in place for this activity.
- Implement an agreed alternative to more adequately control dust generation.

5.13.2 Complaints

The Site Manager will maintain a complaint register. Any complaints will be investigated. Complaints will receive a verbal response as soon as possible.

5.13.3 Monitoring

All staff will conduct constant visual monitoring. The Site Manager will note non-conformances as they occur.

All plant operated by the site operator will be well maintained and comply with the EPA emission standards.

Dust deposition monitoring will continue to be conducted as per the existing licence.

5.13.4 Roles & Responsibilities

The Site Manager will ensure the following equipment and controls are in place:

- Dust mitigation equipment is available and operating at the frequency, times and location specified;
- Provide direction to equipment operators concerning speed of operation(s) and duration of watering;
- Staff and sub-contractors to be inducted and made aware of the air quality / dust suppression techniques used on site; and
- Follow up on all dust complaints.

6 CONCLUSION

Wilkinson Murray have conducted an Air quality impact assessment to support the S75W application by BRO to modify the existing approval MP 06_0052 for the site located at 191 Miller Road Chester Hill.

The S75W seeks approval to:

- Upgrade the site to include hardstands and a partial enclosure for all future operations;
- Establish a daily processing limit of approximately 910 tonnes; and
- Increase the annual processing limit of the site to 250,000 tonnes per annum of building and demolition waste.

A quantitative air quality assessment has been conducted for the site including dispersion modelling using AERMOD and TAPM. Air Quality criteria were developed based on the *'approved methods for the modelling and assessment of air pollutants in NSW'* for TSP, PM_{10}, $PM_{2.5}$ and deposited dust.

An emissions inventory for the site was developed assuming the following mitigations measures were in place. Construction of hardstands and a partial enclosure for operations, mist sprays, dust extraction systems and use of hoppers and bays to store materials.

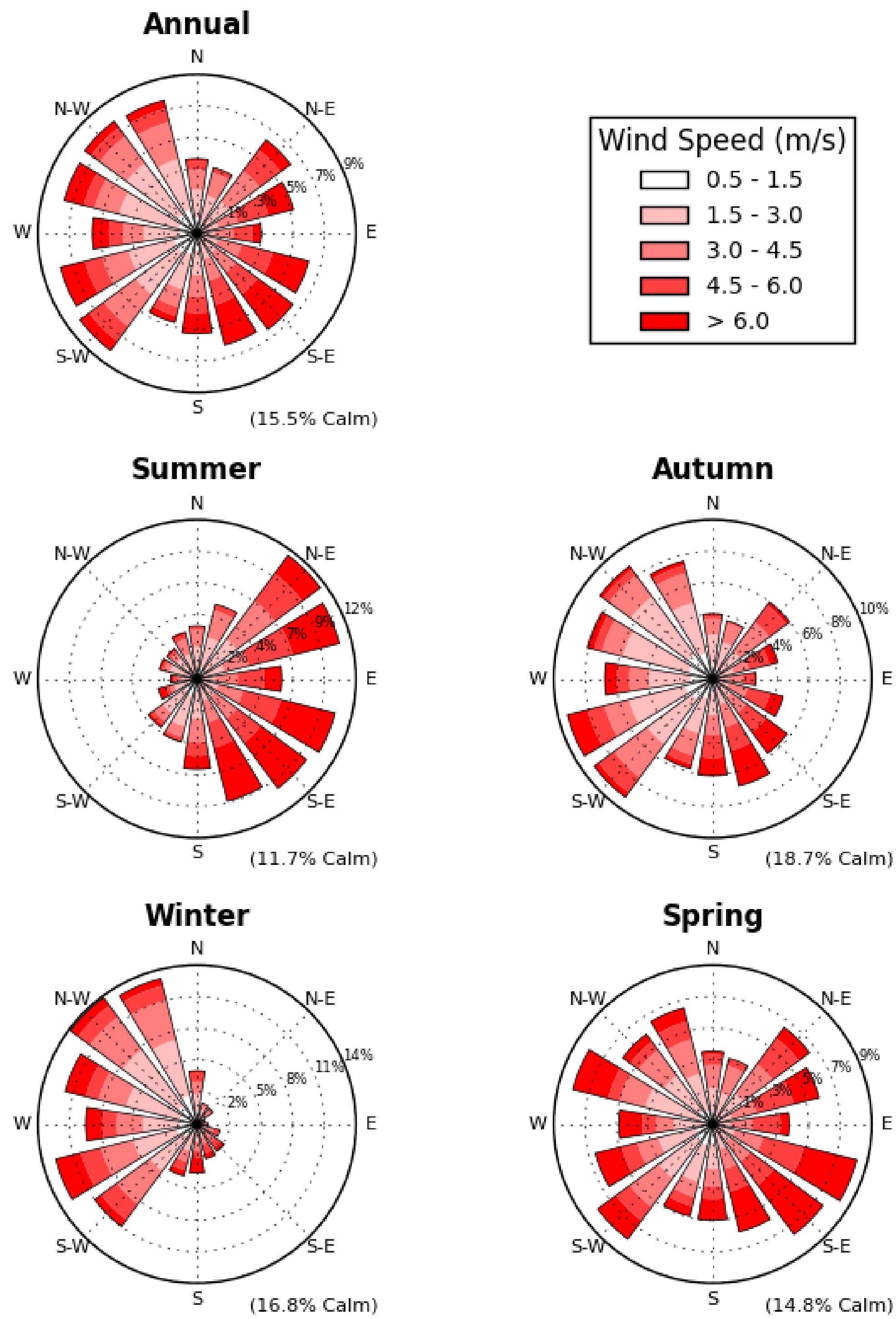
Additionally, is has been assumed that the following dust management strategies will be implemented to further minimise dust; stockpiles to be temporarily covered or sprayed with water to keep dust to a minimum, hardstand areas will be kept free of visible dust by sweeping, water spraying will occur for screens, conveyor circuits and during unloading/ loading of trucks where there is visible dust. It is recommended that the site have a dust management plan. The aims of the dust management plan is to minimise dust to nearby neighbours by ensuring there is no significant visible dust leaving the site.

The modelling showed that the project would comply with all relevant criteria for the assessed pollutants.

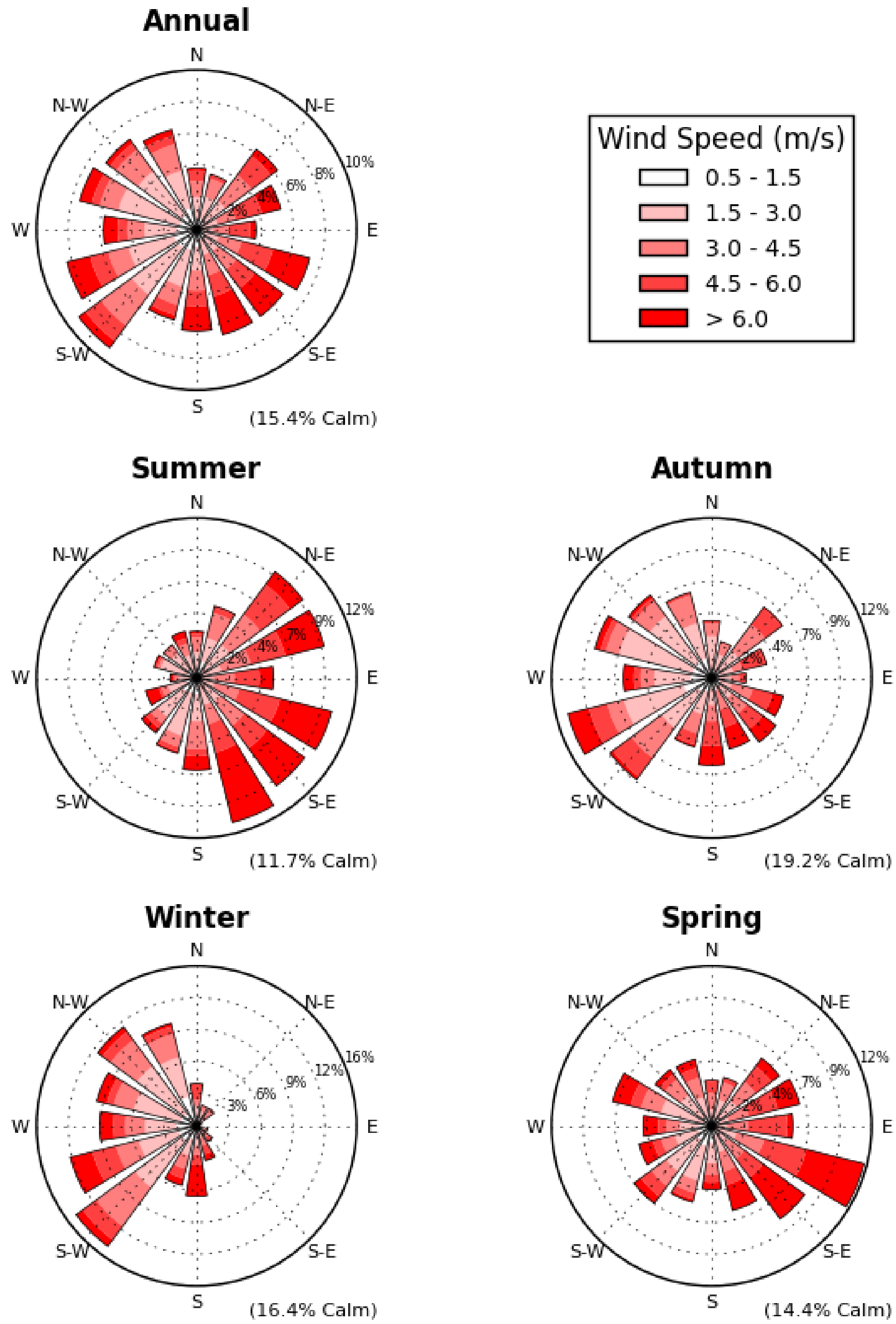
APPENDIX A

Long Term Weather Assessment

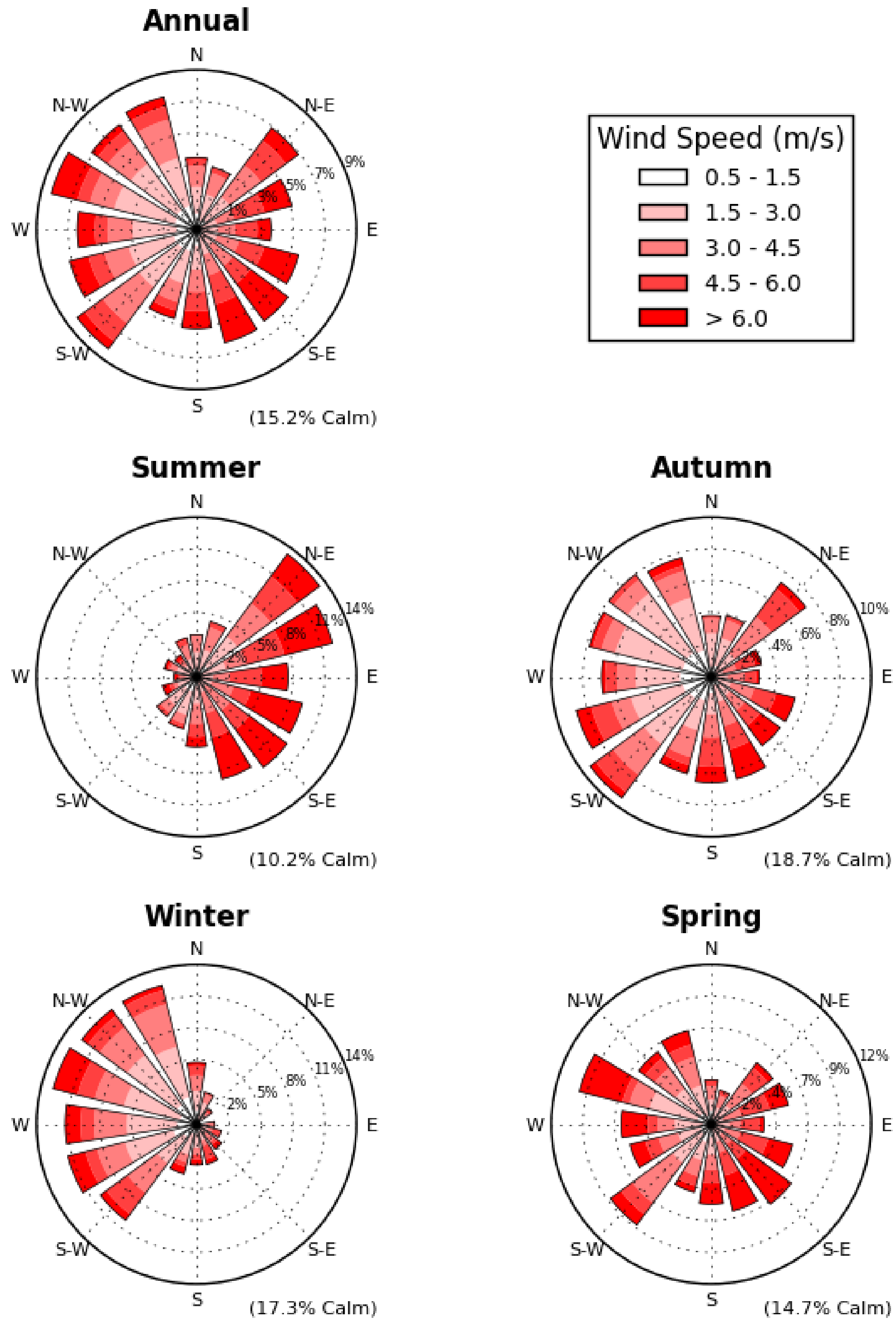
Windroses 2012 – 2016 Bankstown AWS



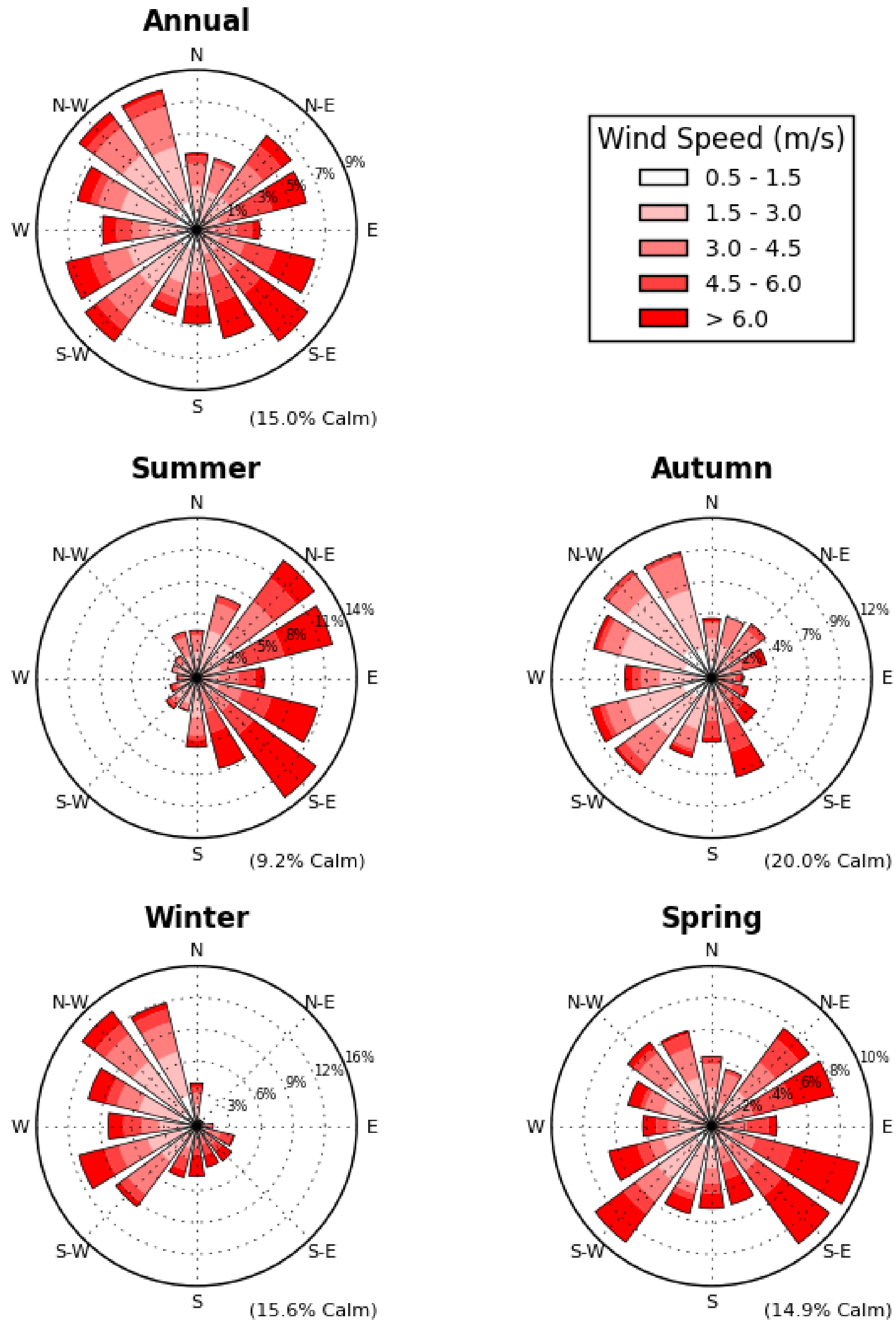
Windroses 2012 Bankstown AWS



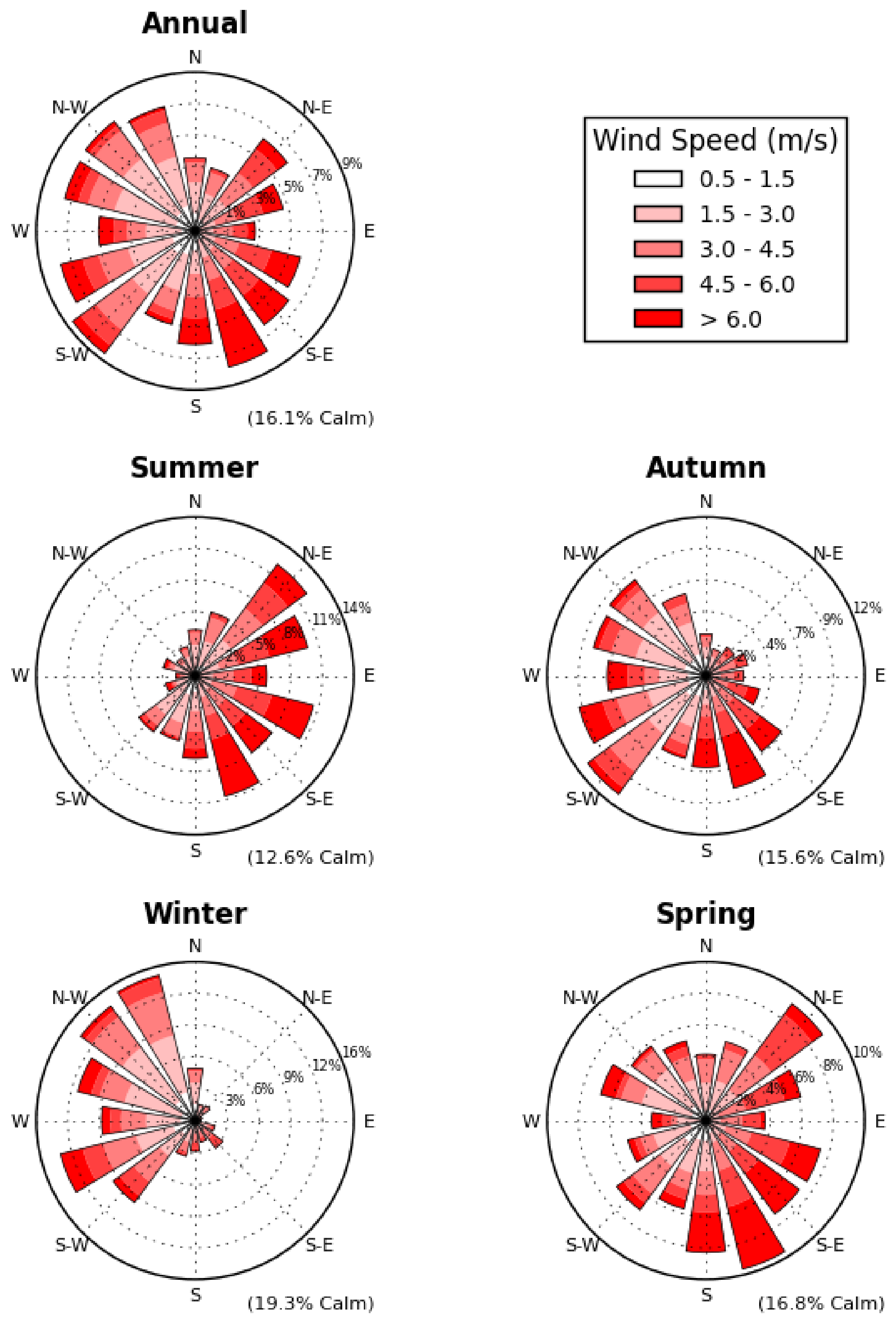
Windroses 2013 Bankstown AWS



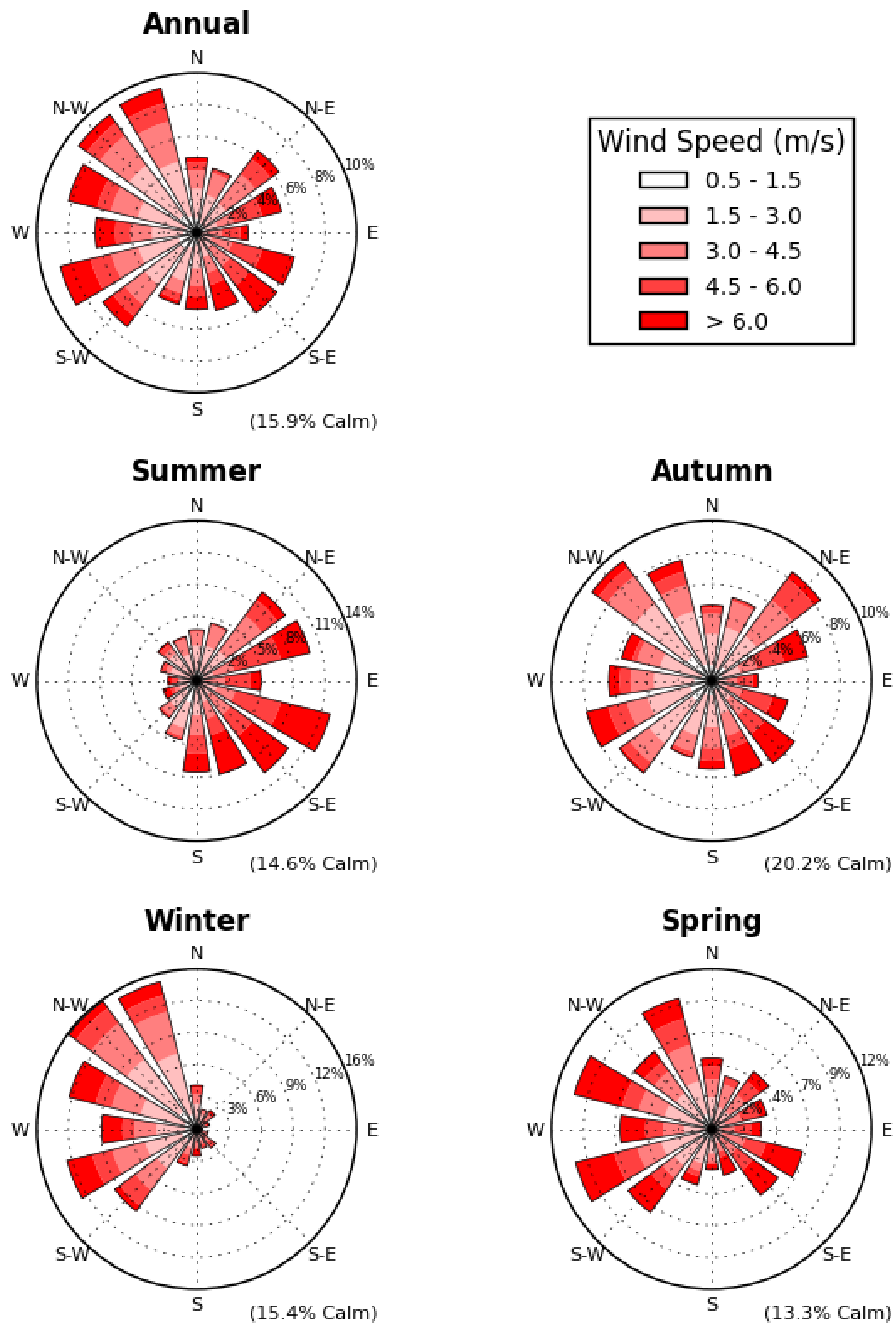
Windroses 2014 Bankstown AWS



Windroses 2015 Bankstown AWS



Windroses 2016 Bankstown AWS



APPENDIX B

Emissions Inventory

Particulate Emission Factor Equations

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 BOM dataset. A reduced windspeed has been used for operations occurring inside the covered area.

Vehicles on Paved Roads

Particulate emissions from vehicles moving on the hardstand have been estimated using US EPA emission factor equations (US EPA, 1985 and updates) for vehicles on sealed roads as follows:

$$E[kg/VKT] = k \times SL^{0.91} \times W^{1.02}$$

Where:

$K = 3.23$ for TSP, 0.62 for PM_{10} and 0.15 for $PM_{2.5}$

SL = silt content [%]

W = average weight (tons)

Wind erosion

Particulate emission factors for wind erosion, taken from US EPA emission factor equations (US EPA, 1985 and updates), are 0.1 kg/ha/h for TSP, 0.05 kg/ha/h for PM_{10}, and 0.0075 kg/ha/h for $PM_{2.5}$.

Emission source	Emission rate g/s TSP	Emission rate g/s PM10	Emission rate g/s PM2.5	Parameter 1	Value	Parameter 2	Value	Parameter 3	Value	Parameter 4	Value
Dumping into pre-sorting stockpile	1.74E-03	7.32E-04	8.80E-05	throughput (tpa)	250000	windspeed	2	Moisture content	10		
Loading processed materials into trucks	1.74E-03	7.32E-04	8.80E-05	throughput (tpa)	250000	windspeed	2	Moisture content	10		
Loading into feed hopper	2.87E-04	1.21E-04	1.45E-05	throughput (tpa)	250000	windspeed	0.5	Moisture content	10		
Screening and sifting	7.93E-02	3.33E-02	4.00E-03	throughput (tpa)	250000	windspeed	0.5	Moisture content	10		
Material transfer within site	1.74E-03	7.32E-04	8.80E-05	throughput (tpa)	250000	Windspeed	2	Moisture content	10		
Main conveyor circuit	2.87E-04	1.21E-04	1.45E-05	throughput (tpa)	250000	Windspeed	0.5	Moisture content	10		
Conveyors Between Screens	2.87E-04	1.21E-04	1.45E-05	throughput (tpa)	250000	Windspeed	0.5	Moisture content	10		
Conveyors – sorted product	2.87E-04	1.21E-04	1.45E-05	throughput (tpa)	250000	Windspeed	0.5	Moisture content	10		
Paved Haul roads In	2.59E-01	4.97E-02	1.20E-02	length (km)	0.2	silt loading	7	vehicle mass	21	vehicle movements(/hr)	11
Paved Haul roads Out	5.96E-02	1.14E-02	2.77E-03	length (km)	0.25	silt loading	7	vehicle mass	4	vehicle movements(/hr)	11
wind erosion - all stockpiles	9.78E-02	4.89E-02	5.88E-03	area (ha)	1.25	emission factor	0.4	rain days>0.25	108		
Total g/s	**5.24E-01**	**1.56E-01**	**2.62E-02**								