Attachment 12

Revised Air Quality Impact Assessment

A C O U S T I C S   A N D   A I R

WASTE AND RESOURCE MANAGEMENT FACILITY

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 15278-AQ
VERSION B

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PREPARED FOR

RESOURCECO
PO BOX 212
CONCORD NSW 2137

WILKINSON MURRAY

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50 YEARS 1962–2012

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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.

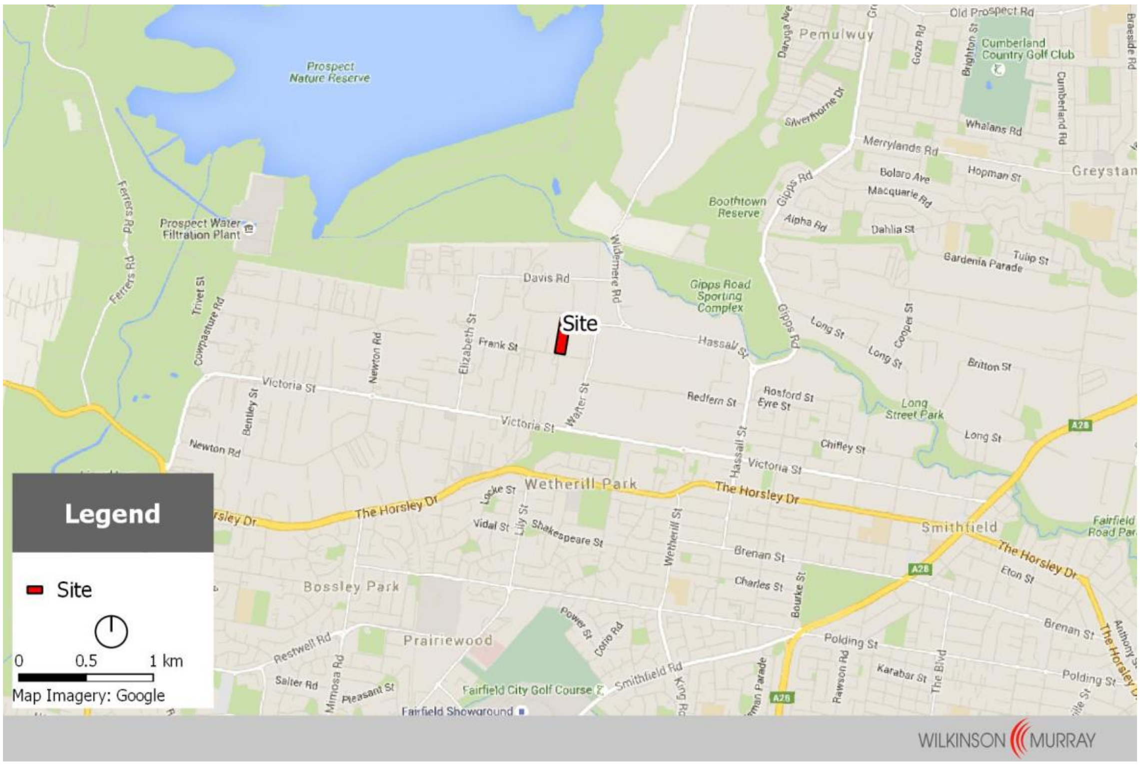
Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

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 INTRODUCTION

ResourceCo RRF Pty Ltd (ResourceCo) is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of a Waste and Resource Management Facility (the Project) at 35-37 Frank Street, Wetherill Park (the Site). The location of the Site is shown in Figure 1-1.

Figure 1-1 Site Location



The Project was declared to be a State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

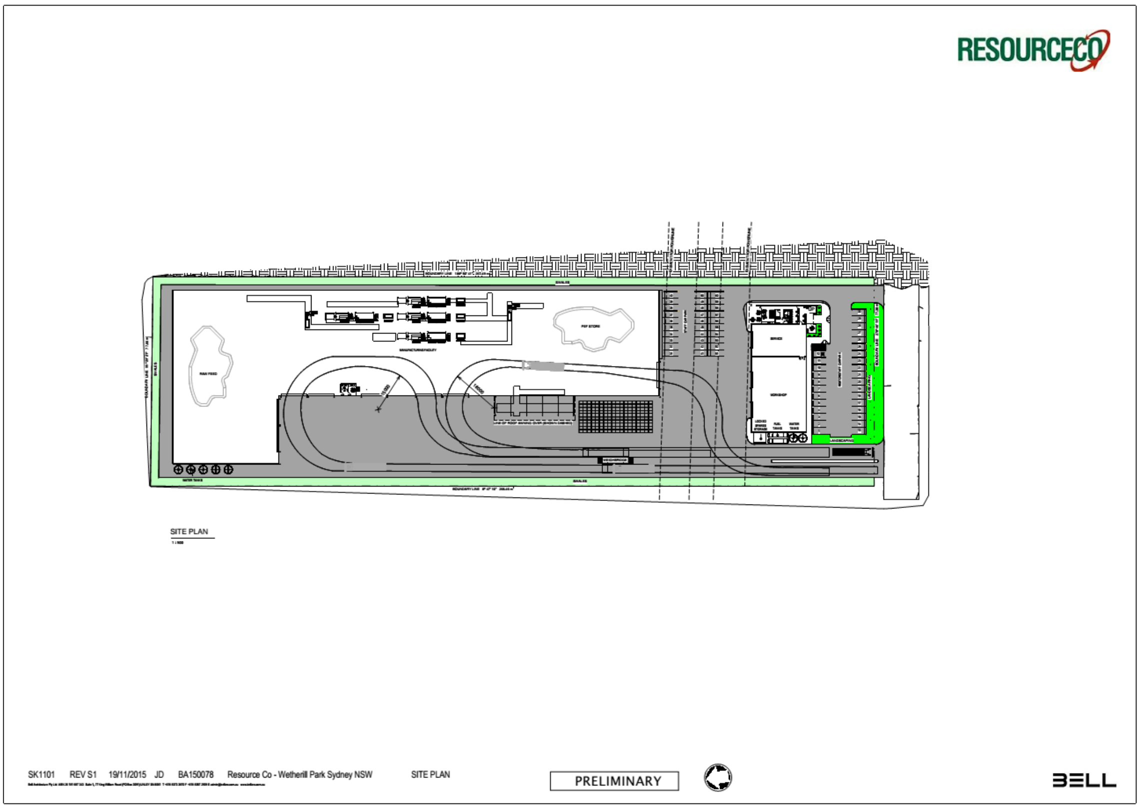
This Air Quality Impact Assessment (AQIA) has been prepared to address the relevant SEARs in relation to the preparation of the Environmental Impact Statement (EIS) for the project, and was conducted in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005).

2 AREA DESCRIPTION & PROPOSED OPERATION

2.1 The Site

The Site is located at on the northern side of Frank Street, to the west of the intersection with Redfern Street. The Site has an area of approximately 2.1 hectares. The site plan, as presented in Figure 2-1, shows car-parking, office and workshop facilities at the southern end of the Site, near Frank Street, and a large building covering the rear two thirds of the Site.

Figure 2-1 Site Plan



2.2 Surrounding Land Use and Sensitive Receptors

The land use immediately surrounding the Site is industrial. The nearest sensitive residential receptors are located in Wetherill Park, more than 700 metres away from the site. A number of residential receptor 'catchments' have been defined to identify receivers to the east, south-east, south and south-west. Table 2-1 presents each catchment, and identifies the most affected discrete residential receptor in each catchment, which will be used for the purposes of dispersion modelling and assessment of potential impacts.

The nearest industrial receptors, located adjacent to the site, are also identified in Table 2-1.

Table 2-1 Sensitive Receptors

Catchment / Receiver	Most Affected Receptor				
	Address	Easting (m)	Northing (m)	Distance from Site	Elevation (m)
R1	15 Maugham Crescent	306488	6252687	730	53
R2	54 Eyre Street	307879	6253087	1,410	32
R3	160 Chifley Street	307467	6252917	1,080	32
R4	6 Cobbett Street	306163	6252516	955	63
I1	39-41 Frank Street	306562	6253485	Boundary	52
I2	36-38 Frank Street	306464	6253375	Boundary	51
I3	27-33 Frank Street	306382	6253552	Boundary	48
I4	3A Davis Road	306497	6253749	Boundary	44

Figure 2-2 Sensitive Receptors

2.3 The Project

2.3.1 Overview

It is proposed to establish a Waste and Resource Management Facility on the Site which will process waster material to produce *Processed Engineering Fuel* (PEF) and other reusable commodities including aggregates, metal, timber and soil.

PEF is primarily a plastic-based material with high calorific value, derived from waste streams such as Construction and Demolition (C&D) waste, Commercial and Industrial (C&I) waste, and pre-processed Municipal Solid Waste (MSW). The proposed development would process dry, non-putrescible C&I and mixed C&D waste.

PEF is an alternative fuel used in energy intensive industrial to replace fossil fuels, such as coal and pet coke and is most commonly used in the cement manufacturing industry.

Recycling combustible waste into PEF provides the following benefits:

- Diverting waste from landfill;
- Conserving natural fossil fuels by replacement with sustainable green fuel;
- Reducing carbon emissions in cement manufacturing processes; and,
- Cost savings for industry through replacing fossil fuels with PEF.

The proposed facility has the capability to convert up to 250,000 tonnes of raw material per annum into approximately 150,000 tonnes of PEF and 75,000 tonnes of other reusable commodities. All raw materials are separated during processing and over 90% of the material is recycled.

2.3.2 Site Operations and Processes

C&D and C&I waste would be delivered to the site by customers, typically in medium rigid tip trucks. The average load size would be approximately 6 tonnes and up to 150 trucks would deliver to the site per day.

Materials dumped onto the tipping floor of the processing building and inspected. If the load is found to contain any prohibited materials, such as batteries or putrescible waste, it would immediately be loaded back into the delivering vehicle and rejected from the site. The approved waste materials are then moved to a stockpile. Prior to processing this material is pre-sorted through using an excavator where large metal items such as gas bottles are removed.

The waste is then loaded into the processing plant using an excavator and/or a front end loader. Based on the size and weight of the waste high calorific value products, such as plastics, paper, timber and textiles are separated from non-combustible products such as bricks, sand, concrete and glass.

The non-combustible products are quickly removed from the waste stream and are temporarily stockpiled in the building prior to being taken to other facilities for recycling into other products, such as road base.

The high calorific value products are then run through shredders to size the PEF to the specification of the end user. The sized material is then passed beneath another magnet to extract any ferrous metal liberated by the shredding process. This material is then stockpiled for loading on to outgoing trucks.

Approximately 25 semi-trailer loads of PEF would be shipped from the site per day. Additionally, approximately 25 large tip truck loads of other materials, primarily aggregates, would leave the site per day.

In addition to the heavy vehicle movements on the site, a number of mobile plant items would be operated within the processing building, as presented in Table 2-2. The sweeper and the forklift would also be operated outside the building.

Table 2-2 Mobile Plant

Item	Quantity
Bobcat	1
Excavator	3
Front end loader	2
Sweeper	1
Forklift	1

2.3.3 Dust Control

The processing building would feature a dust suppression sprinkler system, fitted to the ceiling, and would not have any form of mechanical ventilation. Rapid roller doors are proposed in all locations where regular access is required. For other doors, which only require access for maintenance, conventional doors are proposed however these will remain closed during normal operations. Based on the proposed number of truck movements any one of the roller doors used for access are likely to be open up to a total of 1/3 of the time during the day.

2.3.4 Operating Hours

The processing plant would operate in 2 shifts; from 5:00am to 10:30pm Monday to Friday, 6:00am to 5:00 pm Saturday, and 8:00am to 6:00pm Sunday as required.

Waste would be accepted between 5:00am and 5:00pm Monday to Saturday, and between 7:00am and 4:00pm Sunday.

Maintenance activities would occur as required outside these core hours and it is possible some deliveries from the site may occasionally occur.

2.3.5 Site Construction

The construction of the site would include a bulk earthworks phase of approximately three months. The earthworks would involve cut and fill on the site, and the importation of approximately 9,000 cubic metres of fill.

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* (DEC, 2005) 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 pollutants identified for this development with the potential to result in air quality impacts include odour and dust.

As presented in Section 2.3.2, putrescible waste is not accepted on the Site. However, it is foreseeable that a customer may deliver a load which contains some putrescible waste, and that it would spend a small amount of time on site before it is rejected and removed.

C&D and C&I waste contain a significant percentage of dusty materials, such as bricks, concrete and sand. The handling of these materials, and the shredding of combustible materials will produce dust and particulate matter.

3.3 Impact Assessment Criteria

3.3.1 Odour

NSW legislation prohibits emissions that cause offensive odour to occur at any off-site receptor. Offensive odour is evaluated in the field by authorised officers, who are obliged to consider the odour in the context of its receiving environment, frequency, duration, character and so on and to determine whether the odour would unreasonably interfere with the comfort and repose of the normal person. In this context, the concept of offensive odour is applied to operational facilities and relates to actual emissions in the air.

However, in the approval and planning process for proposed new operations or modifications to existing projects, no actual odour exists and it is necessary to consider hypothetical odour. In this context, odour concentrations are used and are defined in odour units. The number of odour units represents the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Thus by definition, odour less than one odour unit (1 OU), would not be detectable to most people.

The range of a person's ability to detect odour varies greatly in the population, as does their sensitivity to the type of odour. Therefore there can be a wide range of variability in the way odour response is interpreted.

It should be noted that odour refers to complex mixtures of odours, and not 'pure" odour arising from a single chemical. Odour from a single, known chemical very rarely occurs (when it does, it is best to consider that specific chemical in terms of its concentration in the air). In most situations, odour will be comprised of a cocktail of many substances that is referred to as a complex mixture of odorous pollutants, or more simply odour.

For developments with potential for odour it may be necessary to predict the likely odour impact that may arise. This is done by using air dispersion modelling which can calculate the level of dilution of odours emitted from the source at the point that it reaches surrounding receptors. This approach allows the air dispersion model to produce results in terms of odour units.

The NSW criteria for acceptable levels of odour range from 2 to 7 OU, with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated rural areas, as outlined below.

Table 3-1 presents the relevant impact assessment criteria for complex mixtures of odorous pollutants.

Table 3-1 Impact assessment criteria – complex mixtures of odorous pollutants

Population of affected community	Impact assessment criteria (OU)*
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

Note: * 99th percentile nose-response time.

The sensitive receivers identified in this assessment are located in an urban setting, and therefore an impact assessment criterion of 2.0 OU/m^3 has been adopted.

3.3.2 Dust and Particulate Matter

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 3-2 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 3-2 Impact assessment criteria – dust and particulate matter

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 $\mu g/m^3$
Particulate matter ≤10 µm (PM_{10})	Annual	Total	30 $\mu g/m^3$
	24-hour	Total	50 $\mu g/m^3$
Deposited dust (DD)	Annual	Total	4 g/m^2/month
	Annual	Incremental	2 g/m^2/month

There are currently no air quality goals for particulate matter ≤ 2.5 µm ($PM_{2.5}$) for projects within NSW. However, the National Environmental Protection Council (NEPC) has developed an advisory National Environmental Protection Measure (NEPM) for $PM_{2.5}$, as follows:

- A maximum 24 hour average concentration of 25 µg/m^3; and,
- An annual average concentration of 8 µg/m^3.

The above goals for $PM_{2.5}$ concentrations are considered advisory only.

4 EXISTING ENVIRONMENT

4.1 Local Climate

Long term meteorological data for the area surrounding the Site is available from the Bureau of Meteorology (BOM) operated Automatic Weather Station (AWS) at the Horsley Park Equestrian Centre. The Horsley Park Equestrian Centre AWS is located approximately 5 kilometres south west of the Site and records observations of a number of meteorological data including temperature, humidity, rainfall, wind speed and wind direction.

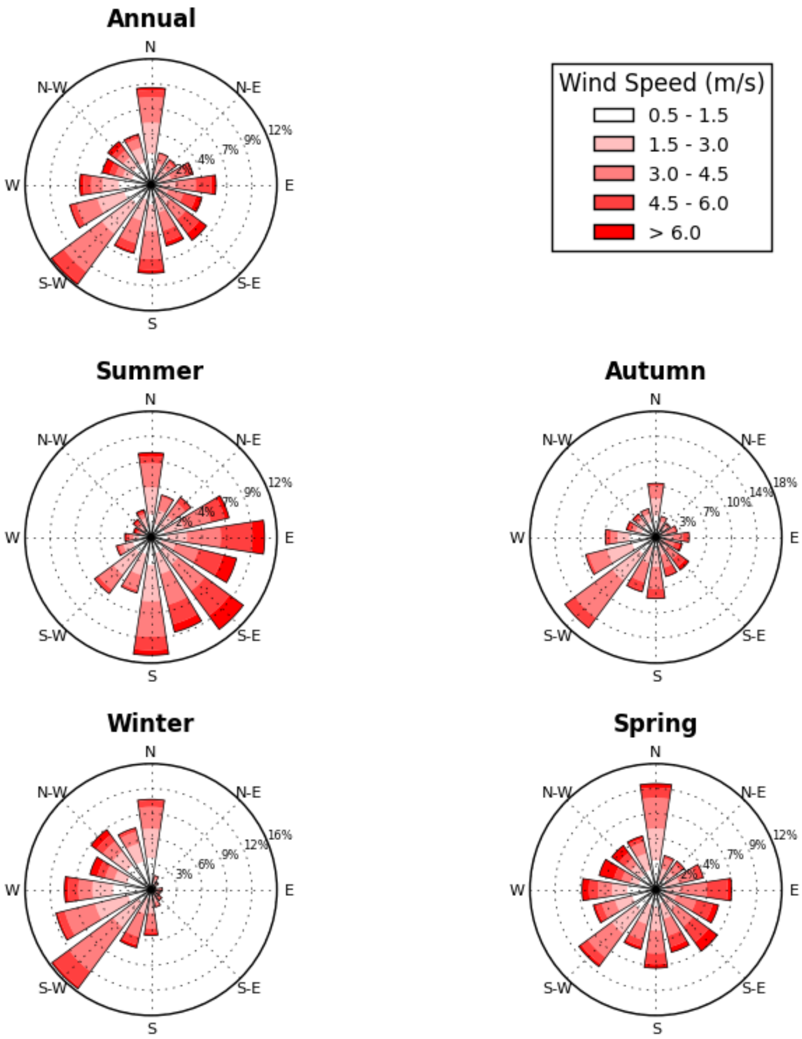
Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Horsley Park Equestrian Centre AWS indicates that January is the hottest month of the year, with a mean daily maximum temperature of 29.8°C. July is the coolest month with a mean daily minimum temperature of 5.8°C. February is the wettest month with an average rainfall of 112 mm falling over almost 8 days. There are on average 77 rain days per year, delivering 770 mm of rain.

Table 4-1 Long-term climate averages – Horsley Park Equestrian Centre AWS

Observation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temperature (°C)	22.0	21.5	19.4	17.5	13.8	11.1	10.3	12.0	15.6	18.1	19.2	20.9	16.8
Humidity (%)	73	77	81	76	77	80	78	70	65	61	70	71	73
3pm Mean Observations													
Temperature (°C)	28.2	27.1	25.3	22.2	19.2	16.6	16.1	17.8	20.8	22.5	24.2	26.5	22.2
Humidity (%)	49	53	54	53	52	55	50	42	42	45	50	48	49
Daily Minimum and Maximum Temperatures													
Minimum (°C)	17.7	17.8	15.9	12.8	9.0	7.1	5.8	6.5	9.4	11.6	14.4	16.1	12.0
Maximum (°C)	29.8	28.6	26.7	23.5	20.3	17.6	17.2	19.1	22.5	24.6	26.3	28.0	23.7
Rainfall													
Rainfall (mm)	71.1	111.7	74.3	81.8	48.7	65.4	38.3	38.6	34.9	57.5	82.9	65.1	770.2
Rain days	7.7	7.4	7.5	7.7	5.6	6.3	5.5	4.4	4.9	5.7	7.3	7.1	77.1

Windrose plots showing the distribution of wind direction and wind speed at the Horsley Park Equestrian Centre AWS between 2009 and 2014 are presented in Figure 4-1.

Figure 4-1 Windroses – Horsley Park Equestrian Centre AWS, 2009 – 2014



4.2 Local Ambient Air Quality

4.2.1 Odour

No significant sources of odour have been identified in the vicinity of sensitive receptors considered in this assessment.

4.2.2 Dust and Particulate Matter

Air Quality monitoring data from the Office of Environment and Heritage (OEH) air quality monitoring site at Prospect has been used to characterise the ambient air quality in the area surrounding the Site. The OEH's Prospect site is located approximately 5 kilometres north of the Site.

A summary of the PM_{10} monitoring results from 2012 to 2014 collected at the Prospect monitoring site is presented in Table 4-2

Table 4-2 PM_{10} Monitoring Results – Prospect

Year	Annual Average (µg/m3)	24 Hour Average (µg/m^3)	
		Maximum	90th Percentile
2012	17.2	38.7	26.4
2013	19.2	81.8	29.9
2014	17.6	44.3	25.6

Table 4-2 indicates that ambient PM_{10} concentrations in the area surrounding the Site are generally below recommended limit of 50 µg/m^3. Serious bushfires in the Blue Mountains during October 2013 resulted in a number of days where ambient PM_{10} concentrations were significantly elevated.

There are no readily available site specific TSP and deposited dust monitoring data. The Prospect monitoring site does not measure these components; however estimates of the background levels for the area are required to assess the impacts per the criteria presented in Section 3.3.2.

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 2012 annual average PM_{10} concentration of 17.2 µg/m3 at the Prospect monitoring station estimates an annual average TSP concentration of 43.0 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 1.91 g/m^2/month for the area surrounding the project.

The OEH monitoring site in Prospect began to record ambient concentrations of $PM_{2.5}$ in December 2014. Table 4-3 presents a summary of this data between December 2014 and 15 October 2015.

Table 4-3 $PM_{2.5}$ Monitoring Results – Prospect

Year	Annual Average (µg/m3)	24 Hour Average (µg/m^3)	
		Maximum	90th Percentile
2014/15	8.4	29.6	13.8

It should be noted that the annual average and maximum 24 hour average $PM_{2.5}$ concentrations measured at the Prospect OEH monitoring site exceed the NEPM advisory goals. There is one exceedance of the 24-hour average NEPM goal for $PM_{2.5}$ during 2015. This occurred during June, and is most likely the result of wood heaters being used in nearby residential areas.

For the purposes of assessing total $PM_{2.5}$ levels resulting from the Project, the second highest 24-hour average observation of 24.9 µg/m^3 will be used to represent the background level. This facilitate the identification of any additional exceedances of the NEPM goal.

5 DISPERSION MODELLING

5.1 Meteorological Modelling

5.1.1 TAPM

No meteorological observation data is available for the Site. The Horsley Park Equestrian Centre AWS is located approximately 5 kilometres south west of the 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 prognostic modelling domain was centred at 33.84° S, 150.91° E and involved four nesting grids of 30km, 10 km, 3 km and 1km with 25 grids in the lateral dimensions and 25 vertical levels.

The TAPM model included assimilation of data collected at the Horsley Park Equestrian Centre AWS during the year 2012. This modelling year was chosen based on a long term meteorological analysis (see Appendix A).

5.1.2 CALMET

The three dimensional prognostic wind field from the TAPM simulation was incorporated in a CALMET model as the initial guess wind field. CALMET was run using the 'No-Observations Approach' recommended by TRC (2011).

The CALMET domain was 6 x 6 km with a grid resolution of 0.15 km. Local land use and topographical data (SRTM 3) were used to produce realistic fine scale flow fields in the area surrounding the site.

5.2 Dispersion Modelling

CALPUFF is a non-steady state Gaussian puff dispersion model, developed for the US EPA and approved for use in DEC (2005). CALPUFF is considered an advanced dispersion model and is intended for use in situations where less advanced Gaussian plume models are not appropriate. CALPUFF is most often used in areas exhibiting one or more of the following features:

- Complex terrain;
- Recirculating coastal sea breezes;
- High frequency of calm winds; and,
- Buoyant line sources.

CALPUFF is also the preferred dispersion model for odour, and for this reason has been selected for this assessment.

5.2.1 Peak to Mean Ratios

To account for the time-averaging limitations of the dispersion model, peak-to-mean ratios have been incorporated into all odour flux rates in accordance with the Approved Methods. Peak-to-mean ratios for various source types, as prescribed by the Approved Methods, are presented in Table 5-1.

Table 5-1 Peak-to-mean ratios

Source type	Pasquill-Gifford stability class	P/M60	
		Near-field	Far-field
Area	A,B,C,D	2.5	2.3
	D,E	2.3	1.9
Line	A-F	6	6
Surface wake-free point	A,B,C	12	4
	D,E,F	25	7
Tall wake-free point	A,B,C	17	3
	D,E,F	35	6
Wake-affected point	A-F	2.3	2.3
Volume	A-F	2.3	2.3

Note: * Ratio of peak 1-second average concentrations to mean 1-hour average concentrations.

5.2.2 Building Wake Effects

All emissions associated with this development were modelled using volume sources, which are not affected by building wakes.

5.2.3 Dust Particle Size Distribution

Dust deposition is strongly influence by particle size. Therefore, the total dust emissions from the Site are separated into three fractions, based on particle size, as presented in Table 5-2. Each fraction is modelled as a separate species in CALPUFF, and the predicted ground level concentrations of $PM_{2.5}$, PM_{10}, TSP and dust deposition levels are calculated as combinations of the relevant fractions.

Table 5-2 Dust Particle Size Distribution

Particle Category	Size Range	Distribution (% of TSP)
Fine Particles (FP)	<2.5 μg	4.68%
Coarse Matter (CM)	2.5 – 10 μg	34.4%
Rest	10 – 30 μg	60.92

6 EMISSIONS TO AIR

6.1 Odour Emissions

No significant odour sources have been identified for the normal operations of the facility. However, it is foreseeable that a customer may deliver a load which contains some putrescible waste, and that it would spend a small amount of time on site before it is rejected and removed. The client has advised that a partial load of putrescible waste would spend no more than 1 – 2 hours on site.

A specific odour emission rate (SOER) of 3.65 $OU.m^3/s^2/s$ has been used to represent the likely odour emissions from putrescible waste on the tipping floor. This value is adopted from an assessment of putrescible waste in a resource recovery facility in Newcastle (PAE Holmes, 2011). It is assumed that a partial load of putrescible waste would cover no more than $100m^2$ of the tipping floor.

A summary of the estimate odour emissions from the tipping floor are presented in Table 6-1.

Table 6-1 Odour Emission Estimate

Source	SOER ($OU.m^3/m^2/s$)	Area (m^2)	Odour flux rate	Peak to mean ratio	Peak odour flux rate
Tipping Floor	3.65	100	365	2.3	840

6.2 Dust Emissions

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

6.2.1 Operational Dust Emissions

Dust would be generated during site operations due to the handling and processing of materials, and from truck movements on paved roads.

As presented in Section 2.3.2, the majority of the PEF production process involves separating the incoming waste, by size and weight, to extract materials with sufficient calorific value. Aggregate materials, such as bricks and concrete, are quickly removed and are therefore not handled as many times as the combustible materials which are included in PEF. Over the duration of the production process, aggregate materials are handled approximately 5 times, whereas combustible materials are handled approximately 10 times.

Since the PEF production takes place inside a building with dust suppression sprinklers, it is assumed that dust emissions are reduced by 50%. Although roadways would be kept clean, no reduction has been applied to the dust emissions from truck movements.

Total dust emissions from all significant dust generating activities during site operations are presented in Table 6-2. Detailed emission inventory and emission estimation calculations are presented in Appendix B.

Table 6-2 Estimated Annual Operational TSP Emissions

Activity	TSP Emissions (kg/year)
Truck movements on paved roads	2,480
Handling aggregate materials	16
Handling combustible/PEF materials	1
Shredding PEF materials	202
Total	**2,699**

The average daily operational TSP emissions from the site would be approximately 10.8 kg per day.

6.2.2 Construction Dust Emissions

The construction of the development would involve a bulk earthworks phase which would involve some cut and fill within the site, and the importation of approximately 9,000 cubic metres of fill material. The bulk earthworks phase would generate the highest dust emissions during construction, and is anticipated to last for approximately three months.

Table 6-3 Estimated Construction TSP Emissions

Activity	TSP Emissions (kg)
Material handling (excavators & loaders)	5.5
Dozers	260
Hauling (unsealed)	352
Wind erosion	55
Total	**673**

The average daily TSP emissions from the site during the bulk earthworks phase would be approximately 9.4 kg per day.

The estimated TSP emissions associated with the construction of the development are similar in magnitude, however slightly lower, that those for operations, and will only occur over a three month period. Accordingly, no further detailed assessment of construction dust emissions will be presented, since the impacts would be no greater than those during operations.

7 ASSESSMENT OF IMPACTS

The following section presents quantitative assessments of the potential odour and dust impacts on nearby sensitive receptors from the operation the project.

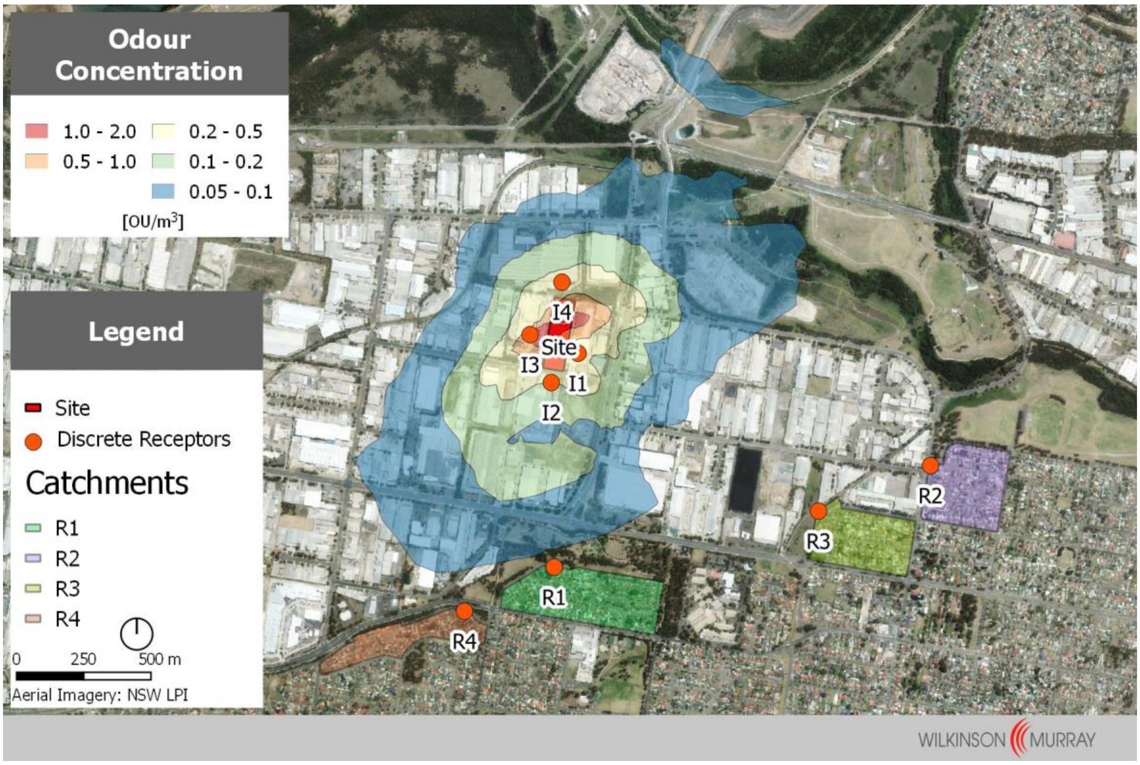
7.1 Assessment of Operational Odour Impacts

Based on dispersion modelling results, the predicted operational odour impacts on nearby receptors is presented numerically in Table 7-1 and graphically via contours in Figure 7-1.

Table 7-1 Predicted 99th percentile peak odour concentrations

Receptor	Predicted peak odour concentration (OU/m^3)	Impact assessment criterion (OU/m^3)	Complies? (Yes/ No)
R1	<0.1	2.0	Yes
R2	<0.1	2.0	Yes
R3	<0.1	2.0	Yes
R4	<0.1	2.0	Yes
I1	1.25	2.0	Yes
I2	0.20	2.0	Yes
I3	1.04	2.0	Yes
I4	0.28	2.0	Yes

Figure 7-1 Predicted 99th percentile peak odour concentrations



Review of Table 7-1 indicates that the predicted 99th percentile odour concentrations comply with the established criterion of 2.0 OU/m³.

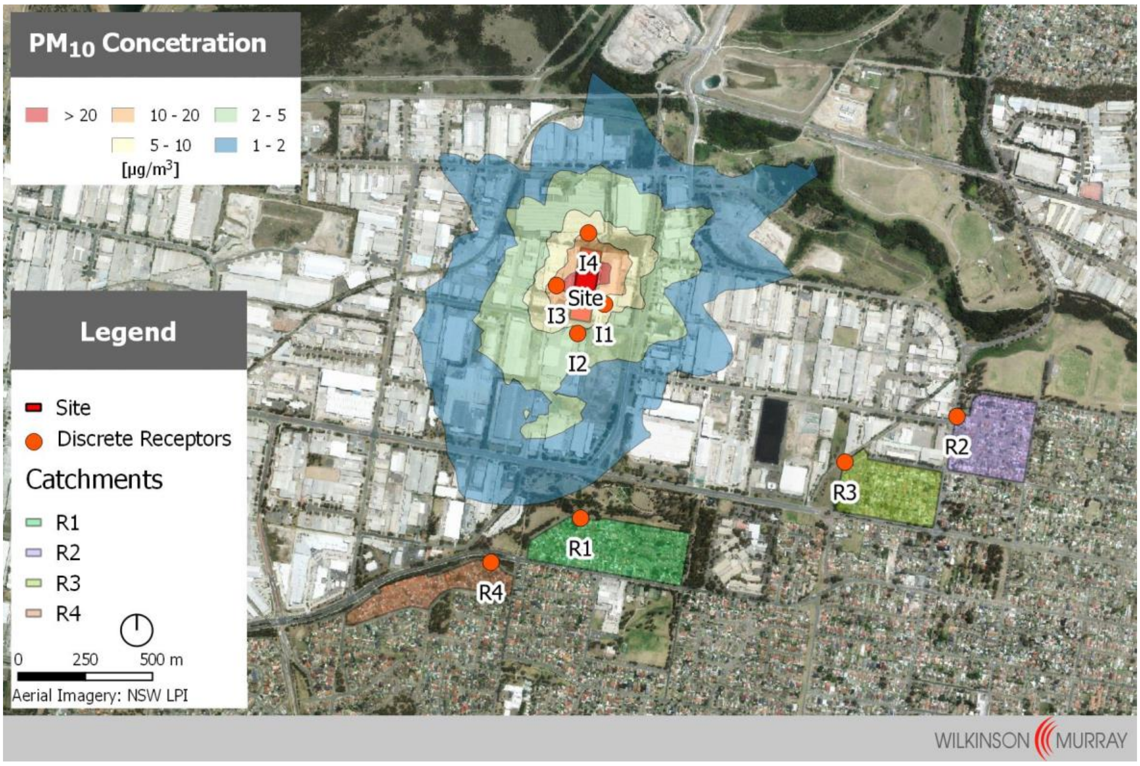
7.2 Assessment of Operational Dust Impacts

Table 7-2 presents the dispersion modelling results for criteria dust and particulate matter pollutants at sensitive receptors. A contour plot of the incremental 24 hour average PM_{10} concentrations is presented in Figure 7-2.

Table 7-2 Predicted Criteria Dust Impacts at Discrete Receptors

Receptor	TSP		PM_{10}				Dust Deposition	
	Annual Average		24-hour Average		Annual Average		Annual Average	
	Increment	Total	Increment	Total	Increment	Total	Increment	Total
Goal		**90 µg/m³**		**50 µg/m³**		**30 µg/m³**	**2 g/m²/month**	**4 g/m²/month**
R1	0.18	43.18	0.60	39.30	0.09	17.29	0.00	1.91
R2	0.03	43.03	0.18	38.88	0.02	17.22	0.00	1.91
R3	0.05	43.05	0.32	39.02	0.02	17.22	0.00	1.91
R4	0.15	43.15	0.54	39.24	0.08	17.28	0.00	1.91
I1	13.05	56.05	26.00	**64.70**	5.27	22.47	0.58	2.49
I2	1.67	44.67	4.34	43.04	0.73	17.93	0.07	1.98
I3	8.54	51.54	21.10	**59.80**	3.51	20.71	0.38	2.29
I4	2.43	45.43	7.87	46.57	1.02	18.22	0.11	2.02

Figure 7-2 Predicted Incremental 24-hour Average PM_{10} Concentration



Review of Table 7-2 demonstrates that dust and particulate matter emissions from the project have a negligible contribution to air quality at nearby sensitive residential receptors. The impact assessment criteria are met at all residential receptors for TSP, PM_{10} and deposited dust.

At the most affected industrial receptors, the predicted results in Table 7-2 indicate the potential for exceedances of the 24 hour average PM_{10} impact assessment criterion. Accordingly, a contemporaneous assessment of 24 hour average PM_{10} concentrations has been conducted for the most affected industrial receptor, I1.

The contemporaneous assessment of 24 hour average PM_{10} concentrations involves adding the existing background PM_{10} concentration, observed at the OEH monitoring site in Prospect, to the predicted incremental concentration for each day of the simulation period.

Figure 7-3 presents the results of the contemporaneous assessment of 24 hour average PM_{10} concentrations at I1. Based on the contemporaneous assessment, 24 hour PM_{10} impacts associated with the operation of the site comply with the impact assessment criterion.

Figure 7-3 Contemporaneous 24 hour Average PM_{10} Concentrations at Industrial Receptor I1

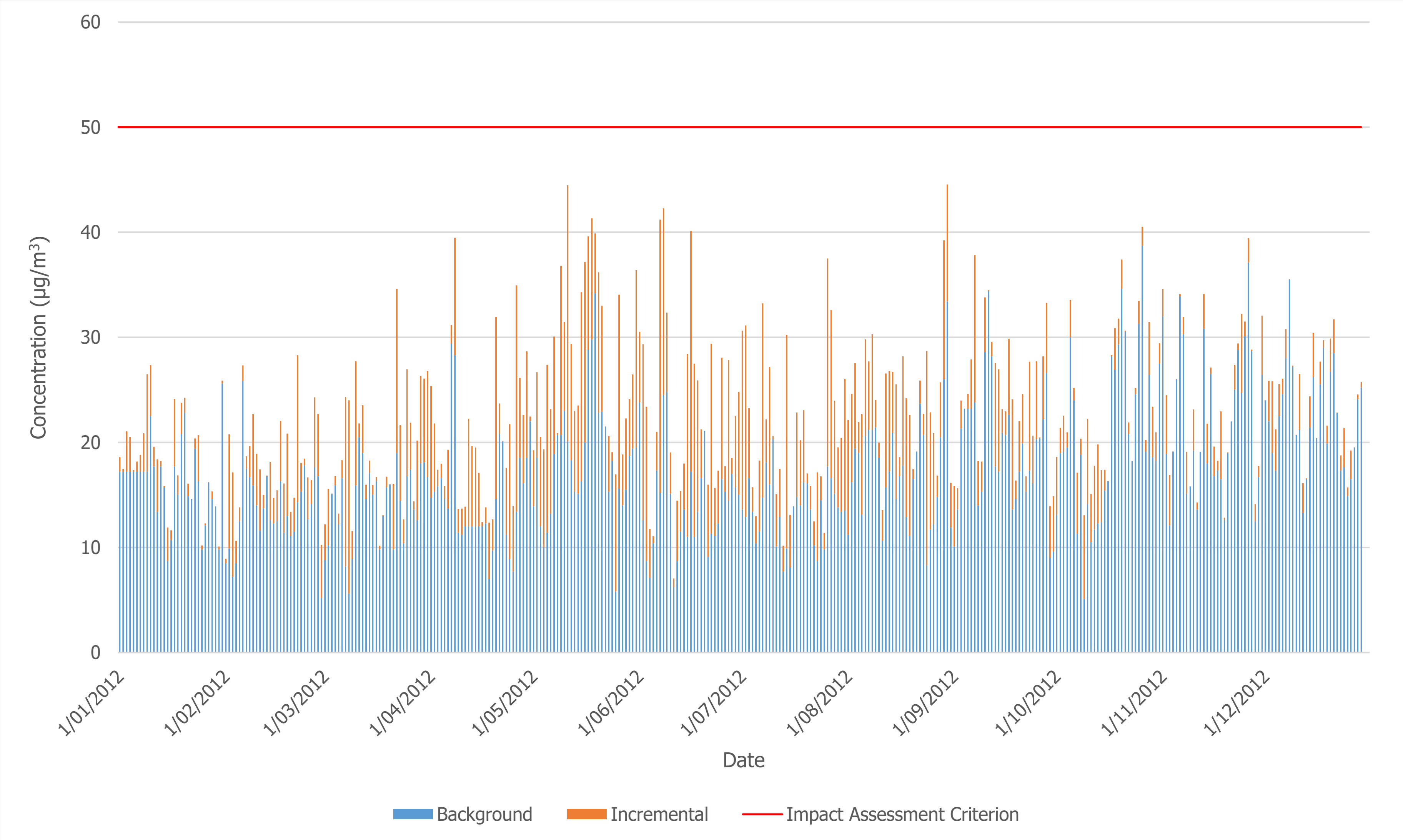


Table 7-3 presents the dispersion modelling results for $PM_{2.5}$ at discrete receptors. Review of Table 7-3 indicates that the Project is unlikely to generate additional exceedances of the 24-hour average NEPM goal for $PM_{2.5}$ at any sensitive residential receptors. The existing ambient annual average concentrations of $PM_{2.5}$ are slightly above the NEPM goal, and the Project has a negligible contribution to these concentrations at residential receptors.

Table 7-3 Predicted $PM_{2.5}$ Impacts at Discrete Receptors

Receptor	$PM_{2.5}$			
	24-hour Average		Annual Average	
	Increment	Total	Increment	Total
Goal	**25 µg/m³**		**8 µg/m³**	
R1	0.08	24.98	0.01	8.41
R2	0.02	24.92	0.00	8.40
R3	0.04	24.94	0.00	8.40
R4	0.07	24.97	0.01	8.41
I1	3.13	28.03	0.63	9.03
I2	0.52	25.42	0.09	8.49
I3	2.54	27.44	0.42	8.82
I4	0.95	25.85	0.12	8.52

8 BEST PRACTICE MANGEMENT

The preceding air quality impact assessment has demonstrated that the Project is expected to comply with relevant air quality criteria. Notwithstanding this, responsible developments should implement reasonable and feasible measures to reduce their burden on local and regional air quality. To this end, the following section presents a number of measures to reduce odour and dust emissions from the site.

8.1 Odour Management

Any incoming loads containing odorous materials will be identified immediately and rejected from the site. Additionally, the following odour management measures should be considered during the operation of the Project:

- Procedures for staff to report the presence of odours; and,
- Maintaining an odour complaints register which captures any complaints from off-site receptors.

8.2 Dust Management

8.2.1 Operational Dust Management

The main building will be fitted with dust suppression sprinklers and automatic roller doors. In addition, the following dust management measures should be considered during the operation of the Project:

- Engines of trucks and mobile plant to be switched off when not in use;
- Maintain and service plant in accordance with manufacturer's specifications;
- Sweep trafficable areas at least once daily;
- Limit vehicle speeds to 20 km/h;
- Cover vehicle loads if transporting material off-site; and,
- Reduce drop heights during loading and unloading of material.

8.2.2 Construction Dust Management

Potential construction dust mitigation measures which should be considered during the construction of the project are as follows:

- Engines of construction plant to be switched off when not in use;
- Maintain and service plant in accordance with manufacturer's specifications;
- Use of water carts and sprays to suppress any instances of visible dust leaving the site;
- Limit vehicle speeds to 20 km/h;
- Cover vehicle loads if transporting material off-site;
- Reduce drop heights during loading and unloading of fill material;

- Minimise area of exposed surfaces;
- Minimise amount of stockpiled materials;
- Where possible, apply barriers, covering or temporary rehabilitation;
- Rehabilitate completed sections as soon as practicable; and,
- Restrict construction activities during unfavourable weather conditions.

9 CONCLUSION

Wilkinson Murray has conducted an air quality impact assessment for the proposed Waste and Resource Management Facility at 35-37 Frank Street, Wetherill Park.

The assessment has been conducted in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005).

Quantitative assessments of potential odour and dust impacts from the operation of the Project has been conducted, based on TAPM meteorological simulations and the CALPUFF dispersion modelling system.

The results of the dispersion modelling indicate that odour concentrations at sensitive receptors due to the operation of the Project comply with the established criterion, and are likely to be undetectable.

Total ground level concentrations of criteria dust and particulate matter pollutants are predicted to comply with the impact assessment criteria at all sensitive receptors.

The existing ambient concentrations of $PM_{2.5}$ are slightly above the NEPM advisory goals, and the Project is predicted to have a negligible effect on these levels.

10 REFERENCES

NSW Department of Environment and Conservation (2005)

"Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", August 2005.

PAE Holmes (2011)

"Air Quality Impact Assessment – Proposed SITA Newcastle Resource Recovery Facility, Steel River", March 2011

SPCC (1983)

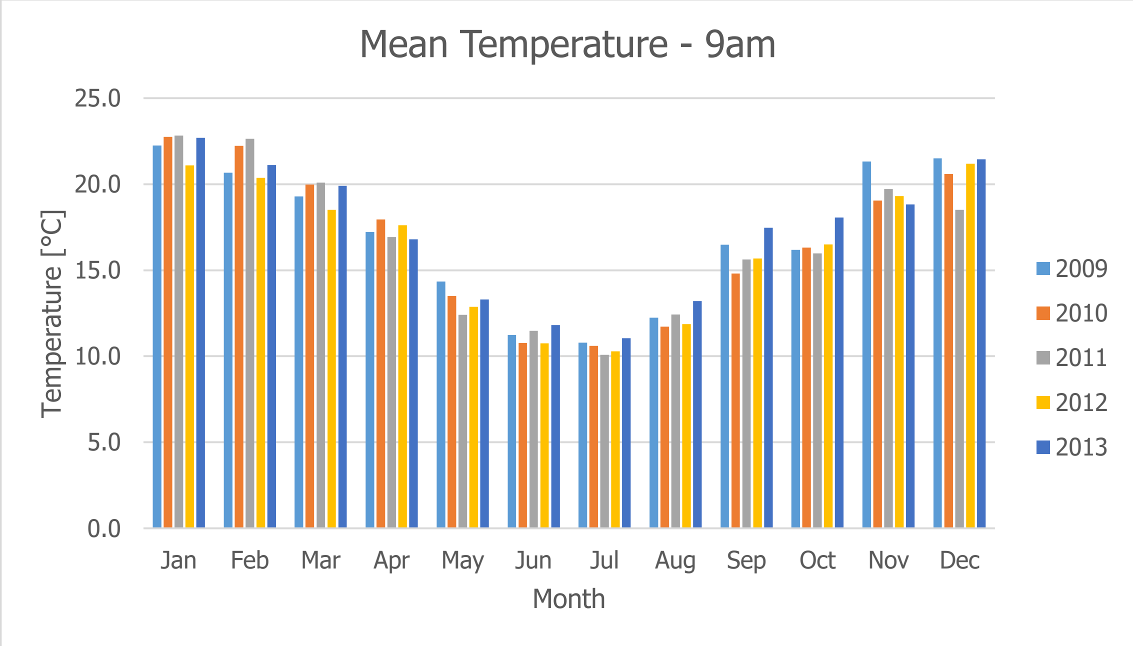
"Air Pollution from Coal Mining and Related Developments", State Pollution Control Commission.

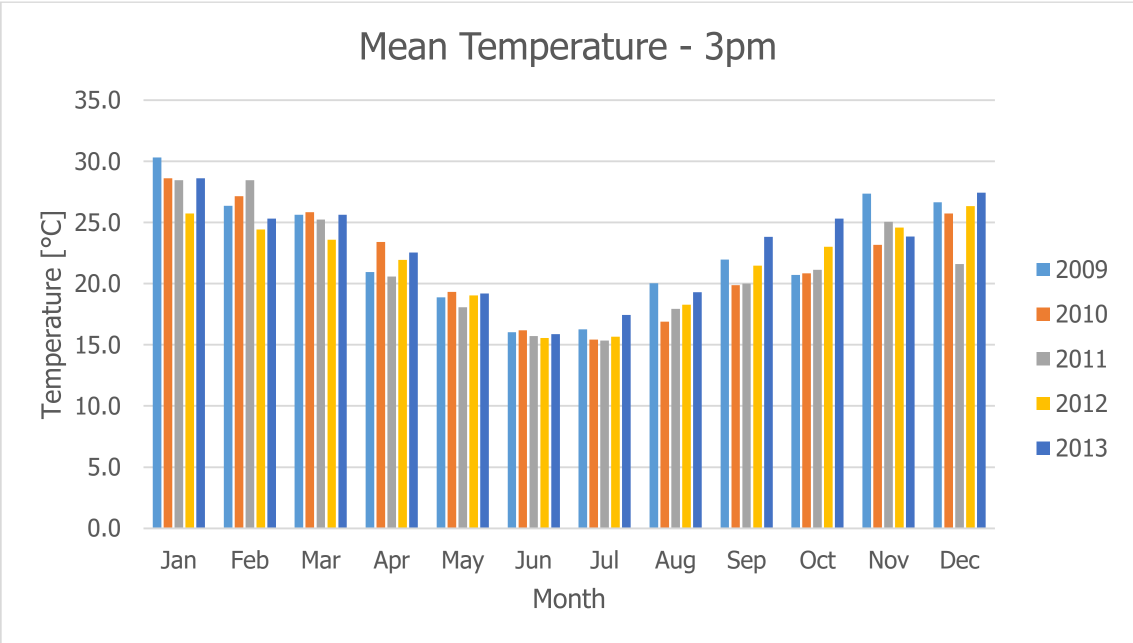
US EPA (1985 and updates)

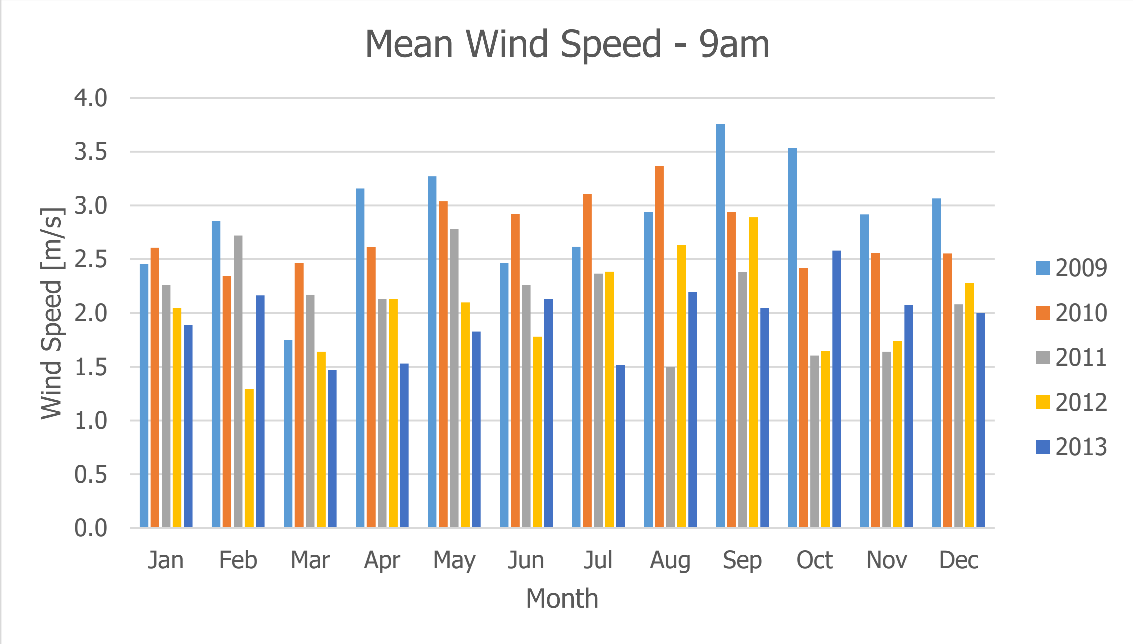
"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition, United States Environmental Protection Agency.

APPENDIX A

METEOROLOGICAL COMPARISON, HORSLEY PARK EQUESTRIAN CENTRE AWS: 2009 – 2014


Mean Temperature - 9am
25.0
20.0
15.0
10.0
5.0
0.0
Temperature [°C]
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2009
2010
2011
2012
2013


Mean Temperature - 3pm
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Temperature [°C]
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2009
2010
2011
2012
2013


Mean Wind Speed - 9am
Wind Speed [m/s]
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jan
Feb
Mar
Apr
May
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Month
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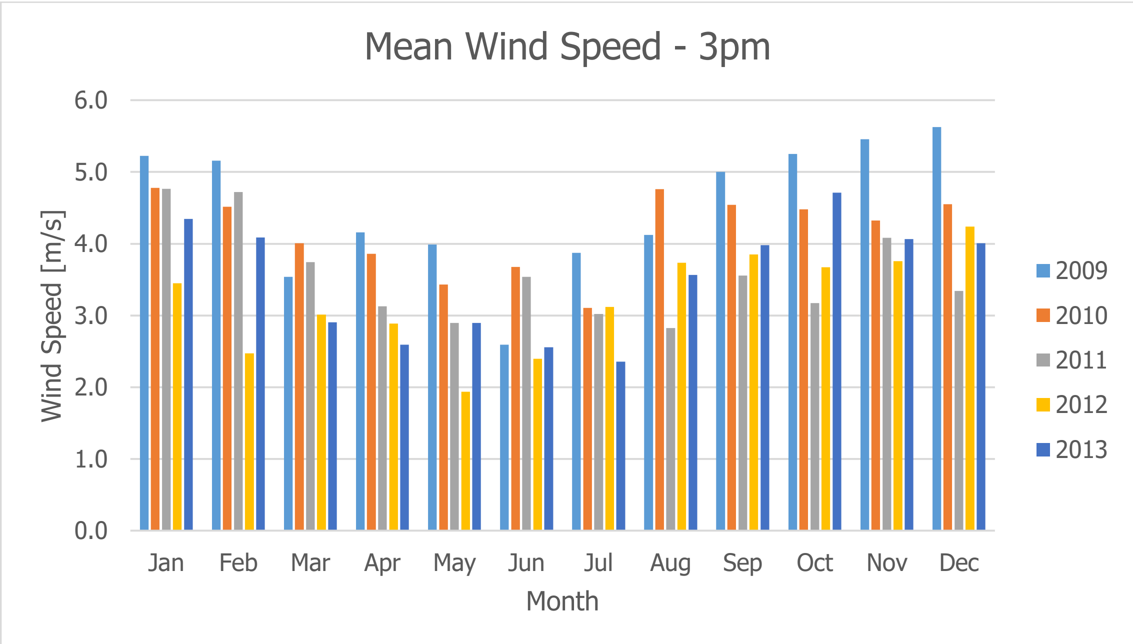
2013


Mean Wind Speed - 3pm
Wind Speed [m/s]
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
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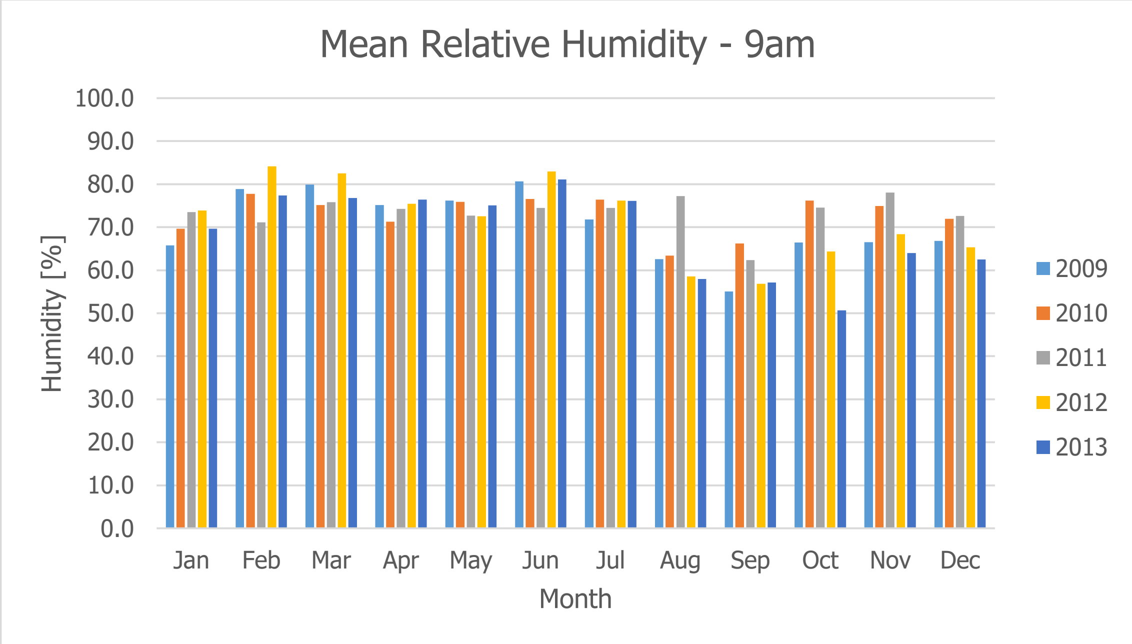
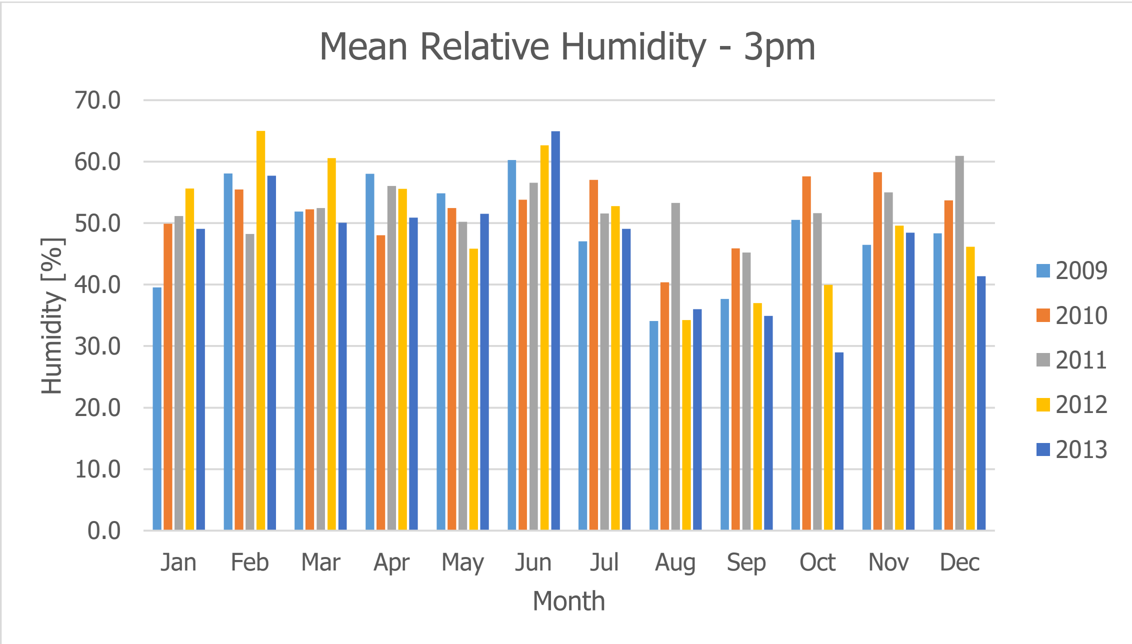
2013


Mean Relative Humidity - 9am
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Humidity [%]
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
2009
2010
2011
2012
2013


Mean Relative Humidity - 3pm
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Humidity [%]
Jan
Feb
Mar
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May
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Jul
Aug
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Oct
Nov
Dec
Month
2009
2010
2011
2012
2013

APPENDIX B

DUST EMISSIONS INVENTORY

B.1 Particulate Emission Factor Equations

Vehicles on 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:

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

Where:

k = 0.74 for TSP

U = wind speed [m/s]

M = moisture content [%]

A wind speed of 1 m/s is assumed as the activities are taking place inside a building with no forced ventilation.

Crushing

Particulate emission factors for crushing 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 (uncontrolled)	0.0027	0.0012	*
Screening (uncontrolled)	0.0125	0.0043	*

* No emissions data available

B.2 Emission Estimates

Table B-1 Summary of TSP Emissions

Activity	Total Emission [kg/year]	Intensity	Units	Emission Factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Control [%]
handling aggregate materials	15.9	75000	t	4.25E-04	kg/t	1	wind speed [m/s]	2	moisture content [%]					50
handling PEF materials	1.3	150000	t	1.69E-05	kg/t	1	wind speed [m/s]	20	moisture content [%]					50
crushing	202.5	150000	t	0.0027	kg/t									50
hauling - waste delivery	2194.6	15000	VKT/year	146.3070408	g/VKT	5	silt Loading [g/m^2]	10	ave vehicle mass [t]	150	vehicles	0.4	km per trip	0
hauling - Outgoing (PEF)	252.2	850	VKT/year	296.6988219	g/VKT	5	silt Loading [g/m^2]	20	ave vehicle mass [t]	25	vehicles	0.4	km per trip	0
hauling - Outgoing (other)	32.8	111	VKT/year	296.6988219	g/VKT	5	silt Loading [g/m^2]	20	ave vehicle mass [t]	25	vehicles	0.4	km per trip	0
Total	**2699**													