REPORT 10-7626-R1

Revision 0

# Air Quality Impact Assessment
# Materials Recycling Facility
# Chester Hill, NSW

PREPARED FOR

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24 FEBRUARY 2009

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# Air Quality Impact Assessment

# Materials Recycling Facility

# Chester Hill, NSW


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DOCUMENT CONTROL

| Reference | Status | Date | Prepared | Checked | Authorised |
|---|---|---|---|---|---|
| 10-7626-R1 | Revision 0 | 24 February 2009 | Martin Doyle | Scott Fishwick | Martin Doyle |
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## EXECUTIVE SUMMARY


No. 1 Demolition and Construction (NSW) Pty Ltd, a client of Moody and Doyle Pty Ltd are seeking approval for the construction and use of a portion of No. 191 Miller Road, Chester Hill, as a materials recycling facility for the processing of building demolition materials.

Heggies has been commissioned by Moody and Doyle Pty Ltd to undertake a detailed Air Quality Impact Assessment for a materials recycling facility, processing demolition waste.

The construction phase air quality impacts are considered to be insignificant given the scale and duration of the construction activities. Any potential emissions during construction are anticipated to be largely controllable through technical means including good site management, vehicle maintenance and applying appropriate dust mitigation measures where required.

General dust and particulate emissions from trucks (travelling on paved roads and unloading material), excavators, front end loaders, crusher and screen are assessed through atmospheric dispersion modelling. The results indicate that under worst case operations, the 24-hour $PM_{10}$ criterion of 50 µg/m$^3$, is not exceeded at the receptor locations. The annual average $PM_{10}$ criterion of 30 µg/m$^3$ is also not exceeded.

An assessment of the potential for dust deposition indicates that levels are significantly less than the project goal of 2 g/m$^2$/month.

It is noted that a worst-case assessment was conducted, in terms of modelled dust and particulate generation. As a result, all predictions in the assessment should be viewed as conservatively high, with levels expected to be significantly lower during normal operation of the facility.

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# 1 INTRODUCTION

No.1 Demolition and Excavation (NSW) Pty Ltd (hereafter, 'the Proponent'), a client of Moody and Doyle Pty Ltd (hereafter 'Moody and Doyle'), are seeking approval for the construction and operation of a materials recycling facility at 191 Miller Road, Chester Hill, NSW. Operations proposed for the site are to consist of general building demolition material recycling (sorting, processing and screening).

Previously, the Minister for Planning had granted approval for the use of the Chester Hill site as a materials recycling facility to CMA Corporation for the processing of ferrous and non-ferrous metals. The Director-General has advised that the current proposal for land use at Miller Road, Chester Hill would be considered through modification of the Minister for Planning's approval for the CMA Corporation operation.

Heggies Pty Ltd (hereafter 'Heggies') conducted an Air Quality Impact Assessment for the original application. Moody and Doyle have commissioned Heggies to undertake a revised air quality assessment taking into account the Proponent's proposed modifications to the previously approved operations.

The scope of this report is limited to an assessment of the air quality impacts during the construction and operation of the materials recycling facility. Suitable air quality management controls to protect local air quality have also been identified.

## 2 LOCAL SETTING AND PROJECT OVERVIEW

### 2.1 Local Setting

The proposed project is located at No.191 Miller Road Chester Hill, NSW - Lot 8 in Deposited Plan 1039882. It is located on the eastern side of Miller Road and is immediately south of the Main Southern Railway.

The location of the site with adjacent commercial and nearby residential properties is shown in **Figure 1**.

**Figure 1 Location of No.191 Miller Road, Chester Hill, NSW.**


Image Courtesy of Google Earth

### 2.2 Project Overview

In summary the development for which approval is currently sought comprises the following:

- removal of soil and concrete stockpiles;
- pouring of concrete in any areas of unsealed surface to form a continuous hard ground;
- existing stormwater management infrastructure upgrade as required;
- installation of a new electrical substation to service the proposed facility and future development of the site;
- installation of physical mitigation measures to prevent deleterious noise, dust and water emissions; and
- use of an existing two storey building as an administration headquarters;
- ancillary and visitor car parking in an existing sealed car park;
- line markings of new truck parking bays at the rear of the existing administration building.

The proposed operation involves the receipt and collection of building demolition materials comprising concrete, timber, bricks, tiles, rubber, metal etc. which are transported to site by way of trucks from building demolition sites. The following relates to on site operations:

- Materials are to be sorted and crushed through a crushing plant.
- The concrete and brick products are crushed and sorted into an end-product which comprises aggregate ranging from 30mm to 40mm in size and DGB roadbase.
- Timber and steel is sorted from the light waste. The steel goes to separate steel recyclers for future re-use and timber is mulched on site for use in gardens.
- Topsoil collected within the material is screened to filter any materials remaining from the recycling process. This is produced into top grade soil.
- Any non-recyclable material is taken to landfill.

Changes to the current Minister's approval (No. 06_0052) include the following:

- Change to up to 100,000 tonnes per annum (tpa) of ferrous and non-ferrous metals processing to up to 100,000 tonnes per annum (tpa) of concrete, inert and general solid waste, ferrous and non-ferrous metals, topsoil and green material processing. Typical quantities of materials to be processed on site include:
  - 20,000 tpa Metals
  - 20,000 tpa Concrete
  - 30,000 tpa Inert and general solid waste
  - 20,000 tpa Topsoil
  - 10,000 tpa Woodchip, green material

### 2.2.1 Proposed Plant and Equipment

A summary of the significant plant and equipment used during the proposed operational stage is given in **Table 1**.

**Table 1 Plant and Equipment**

| Machine | Function |
|---|---|
| Crusher | Crushing of Concrete and Brick to Aggregate and Roadbase material |
| Screener | Screening of Topsoil to remove unwanted material |
| 2 x Excavators (20 Tonne each) | Sorting and stockpiling of material |
| 2 x Rubber Wheel Loaders (12 Tonne each) | Movement of material about site |

### 2.2.2 Hours of Operation

During the operational phase, hours of operation will be:

- Monday to Friday (inclusive): 7am – 6pm.
- Saturday: 8am – 1pm.
- No work on Sundays or Public Holidays.

### 2.2.3 Transportation of Materials

Relevant to material transport:

- Transport of demolition materials to and from the site will be undertaken by the Proponent's own vehicles, contractor vehicles, and by the general public.

- The site is expected to be frequented by semi-trailers (light and medium rigids), trucks, trailers and 1 tonne Utes.
- An average of 40 - 50 deliveries per day is expected .

Once processed the majority of material will be transported to various locations throughout Sydney.

## 2.3 Nearest Residences

Residential areas, a nursing home, a fire station, industrial units, a childcare centre and three residential flat buildings, exist to the north of the site separated by the Main Southern Rail line. Residential properties exist to the east but are buffered somewhat by existing industrial premises immediately adjacent to the eastern site boundary. South and west of the site are zoned as industrial (Refer **Figure 1**).

Dispersion modelling can be used to predict pollutant concentrations at the nearest potentially affected sensitive receptors. Although much of the immediate surroundings are industrial in nature, sensitive residential and industrial receptors exist within the vicinity of the site.

The closest sensitive receivers exist approximately 150 m to the north of the site processing area and approximately 50 m from the site boundary. Residences to the east of the site are located approximately 170 m from the processing area of the site.

In addition to the nearby residential receptors, an industrial premises directly to the south of the site has been considered regarding the potential for dust generation at the site. Aperio Group Pty Ltd, at 149 Orchard Road, manufactures packaging products for the food and beverage industry and has expressed concern regarding the potential impact of dust on their manufacturing process.

A summary of the receptor locations assessed for air quality are given in **Table 2**.

**Table 2 Closest Sensitive Receptors**

| Receptor Location | Description | Easting (m) | Northing (m) |
|---|---|---|---|
| Waldron Road | 3 & 4 Storey Residential Units | 314648 | 6249023 |
| Goodstate Place | Residential Property | 314808 | 6248822 |
| Carpark of Aperio Group | Industrial Premises | 314544 | 6248730 |

The locations are presented in **Figure 2**.

## Figure 2 Sensitive Receptor Locations


Image Courtesy of Google Earth

# 3 AIR QUALITY ENVIRONMENT

The existing air quality in the vicinity of the site is that associated with an urban / industrial environment.

## 3.1 Criteria Applicable to Air Quality

### 3.1.1 Criteria Applicable to Particulate Matter

Emissions of particulate matter less than both 10 and 2.5 microns in aerodynamic diameter (referred to as $PM_{10}$ and $PM_{2.5}$ respectively) are considered important pollutants in terms of impact due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to $PM_{10}$ and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

One of the difficulties in dealing with air quality goals governing fine particles such as $PM_{10}$ is that the medical community has not been able to establish a threshold value below which there are no adverse health impacts.

The NSW Department of Environment and Climate Change (DECC) $PM_{10}$ impact assessment goals, as expressed in their document, "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*", 2005 (Approved Methods) are:

- 24-hour maximum of 50 µg/m$^3$.
- Annual average of 30 µg/m$^3$.

The 24-hour $PM_{10}$ reporting standard of 50 µg/m$^3$ is numerically identical to the equivalent National Environment Protection Measure (or NEPM) reporting standard except that the NEPM reporting standard allows for five exceedances per year. These NEPM goals were developed by the National Environmental Protection Council (NEPC) in 1998 to be achieved within 10 years of commencement.

In December 2000, NEPC initiated a review to determine whether a new ambient air quality standard for particulates 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) was needed in Australia, and the feasibility of developing such a standard. The review found that:

- There are health effects associated with fine particles.
- The health effects observed overseas are supported by Australian studies.
- Fine particle standards have been set in Canada and the USA, and an interim guideline proposed for New Zealand.

The review concluded that there was sufficient community concern regarding $PM_{2.5}$ to consider it an entity separate from $PM_{10}$. As such, in July 2003 a variation to the Ambient Air Quality National Environment Protection Measure (NEPM) was made to extend its coverage to $PM_{2.5}$. The NEPM reporting standards for $PM_{2.5}$ are:

- 24-hour maximum of 25 µg/m$^3$.
- Annual Average of 8 µg/m$^3$.

As there is little data available regarding $PM_{2.5}$ emission factors, $PM_{2.5}$ has not been quantitatively assessed within the report. In addition, given the nature of activities being undertaken at the site, $PM_{2.5}$ is not considered to be a significant issue.

### 3.1.2 Criteria Applicable to Total Suspended Particulate

The annual goal for Total Suspended Particulate (or TSP) is given as 90 $\mu g/m^3$ as recommended by the National Health and Medical Research Council (NHMRC) at their 92nd session in October 1981. It was developed before the more recent results of epidemiological studies suggested a relationship between health impacts and exposure to $PM_{10}$ concentrations.

It is noted that the $PM_{10}$ sub-set is typically 50% of total suspended particulate (TSP) mass in regions where road traffic is not the dominant particulate source (USEPA, 2001). This would be consistent with an annual average $PM_{10}$ goal of approximately 45 $\mu g/m^3$ (derived from 50% of the annual NHMRC goal of 90 $\mu g/m^3$). Thus, the historical NHMRC goal may be regarded as not as stringent as the newer $PM_{10}$ goal of 30 $\mu g/m^3$ expressed as an annual average.

Where road traffic is the dominant source of particulate pollution, (as may be the case in Chester Hill), the $PM_{10}$ sub-set of TSP may be even higher (up to 96% for diesel vehicle emissions, Watson et al, 2000).

Therefore, as the annual TSP goal is seen to be achieved if the annual $PM_{10}$ goal is satisfied, TSP has not been considered further in this report.

### 3.1.3 Nuisance Impacts of Fugitive Emissions

The preceding sections are concerned in large part with the health impacts of particulate matter. Nuisance impacts need also to be considered, mainly in relation to dust. In NSW, it is accepted practice that dust becomes a nuisance, in relation to its impact on residential areas, when annual average dust deposition levels exceed 4 $g/m^2$/month (inclusive of background dust levels).

**Table 3** presents the NSW DECC impact assessment goals for dust fallout, showing the allowable increase in dust deposition level over the ambient (background) level which would be acceptable so that dust nuisance could be avoided and the maximum allowable total dust level before loss of amenity is experienced.

**Table 3 DECC Goals for Allowable Dust Deposition**

| Averaging Period | Maximum Increase in Deposited Dust Level | Maximum Total Deposited Dust Level |
|---|---|---|
| Annual | 2 $g/m^2$/month | 4 $g/m^2$/month |

Source: Approved Methods, DECC 2005

As the ambient background dust deposition level cannot be determined for the subject site (refer **Section 3.2.2**) the maximum increase in deposited dust level will be the governing goal for the project.

## 3.2 Background Air Quality

### 3.2.1 $PM_{10}$

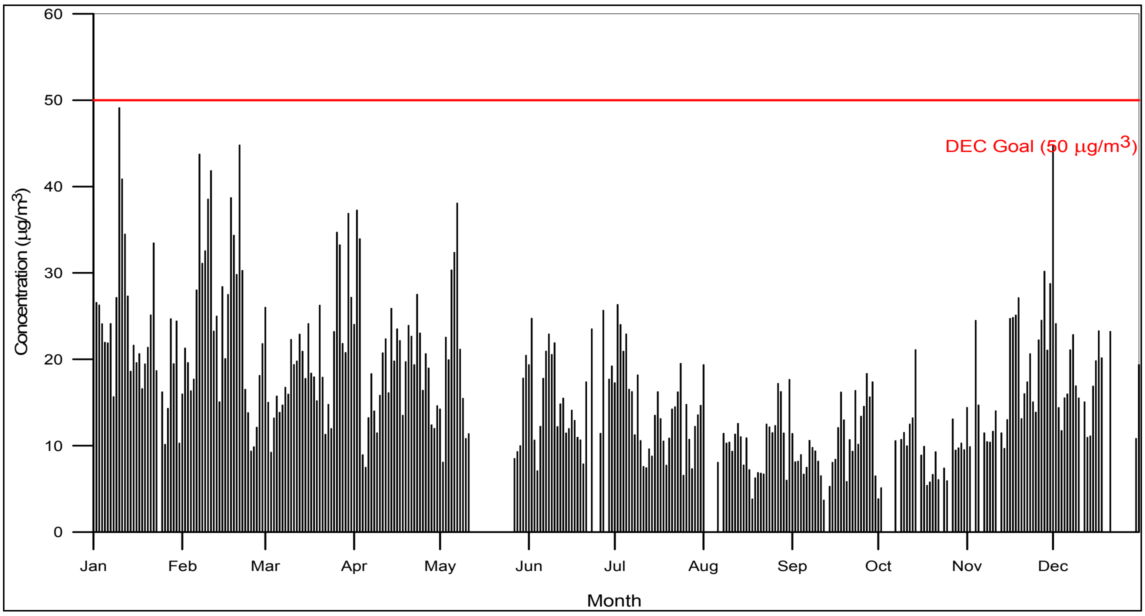
The closest NSW Department of Environment and Climate Change (DECC) air quality monitoring stations to the site are the Earlwood and St Marys air quality monitoring sites. Both monitoring stations assess ambient $PM_{10}$ concentrations using a Tapered Element Oscillating Microbalance (TEOM) instrument.

The Earlwood site is located within Beaman Park, Riverview Road, Earlwood, approximately 13.5 km east of the site. The St Marys site is located approximately 20 km to the northwest of the site. Both monitoring sites are located in residential areas.

Daily monitoring data are available from the DECC and can be used to determine background air quality for the region.

The 24 hour average $PM_{10}$ concentrations recorded at St Mary's for 2004 are presented in **Figure 3**.

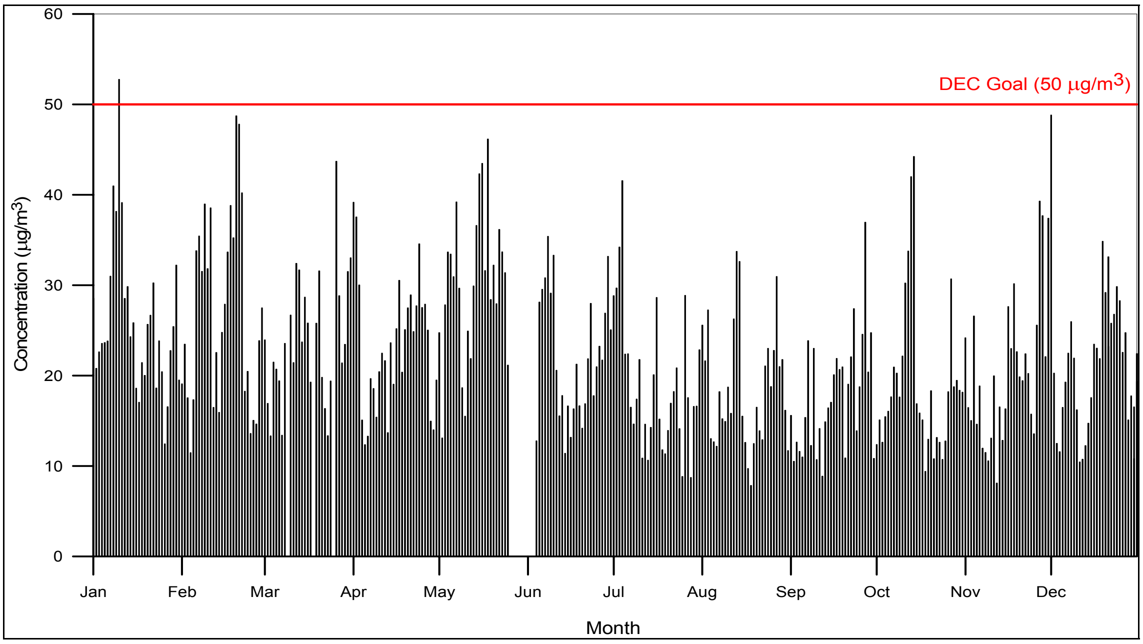
**Figure 3 24 hour Average $PM_{10}$ Concentration (µg/m³) St Mary's 2004**




The data for 2004 displayed indicate that the highest 24-hour average $PM_{10}$ concentration at the St Marys monitoring site was 49 µg/m³, recorded on 10 January 2004. The annual average $PM_{10}$ at St Marys for 2004 was 17 µg/m³.

The 24 hour average $PM_{10}$ concentrations recorded at Earlwood for the period 1 January 2004 to 31 December 2004 are presented in **Figure 4**.

**Figure 4   24 Hour Average $PM_{10}$ Concentration (µg/m³) Earlwood, 2004**




The results indicate that the highest 24-hour average $PM_{10}$ concentration recorded at the DECC's Earlwood monitoring site was 52 µg/m³, recorded on 10 January 2004. This is above the NSW DECC 24 hour average $PM_{10}$ goal of 50 µg/m³. The annual average $PM_{10}$ concentration recorded at Earlwood was 22 µg/m³.

For the purposes of establishing the existing air quality and in accordance with Section 5.1.1 of the DECC's Approved Methods, one year of continuous measurements recorded at Earlwood has been used to create a background file for use in the dispersion modelling.

The exceedance recorded on 10 January 2004 has been excluded from the data set and replaced with the annual average. This is in accordance with the DECC Approved Methods which states that where existing ambient air pollutant concentrations exceed the impact assessment criteria, it is appropriate to demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity.

### 3.2.2 Dust Deposition

Background dust deposition data is not available for the area surrounding the site. In the absence of background data, the NSW DECC criteria for incremental increase in dust deposition will be the governing criterion for this assessment (see **Section 3.1.3**).

## 3.3 Project Goals

In accordance with the DECC Approved Methods the following Air Quality Goals have been applied:

- A maximum 24-hour $PM_{10}$ concentration of 50 µg/m³.
- An annual average $PM_{10}$ concentration of 30 µg/m³.
- A maximum incremental increase in deposited dust of 2 g/m²/month.

# 4 AIR QUALITY IMPACTS

## 4.1 Construction

During dry conditions, the following construction related site activities have the potential to generate dust:

- Earthworks;
- Loading trucks;
- Wheel generated dust from construction traffic; and
- Wind Erosion from disturbed stockpiles / earth mounds.

In addition, diesel emissions from construction vehicles including excavators, front end loaders and trucks are expected during construction.

The construction phase of the proposed development is expected to be short lived and limited to earthworks involving the removal of a 1,980 $m^3$ mound of concrete and road base and a 550 $m^3$ mound of soil. These areas are clearly visible in the centre of the site as displayed in **Figure 1**.

Any areas of the site without a hardstand will be concreted and existing buildings may be upgraded as required. Noise walls will be constructed around the processing areas.

Any potential atmospheric emissions during construction are anticipated to be largely controllable through technical means including good site management / housekeeping, vehicle maintenance and applying appropriate dust mitigation measures where required.

Mitigation measures that can be implemented during the construction phase should dust become an issue include:

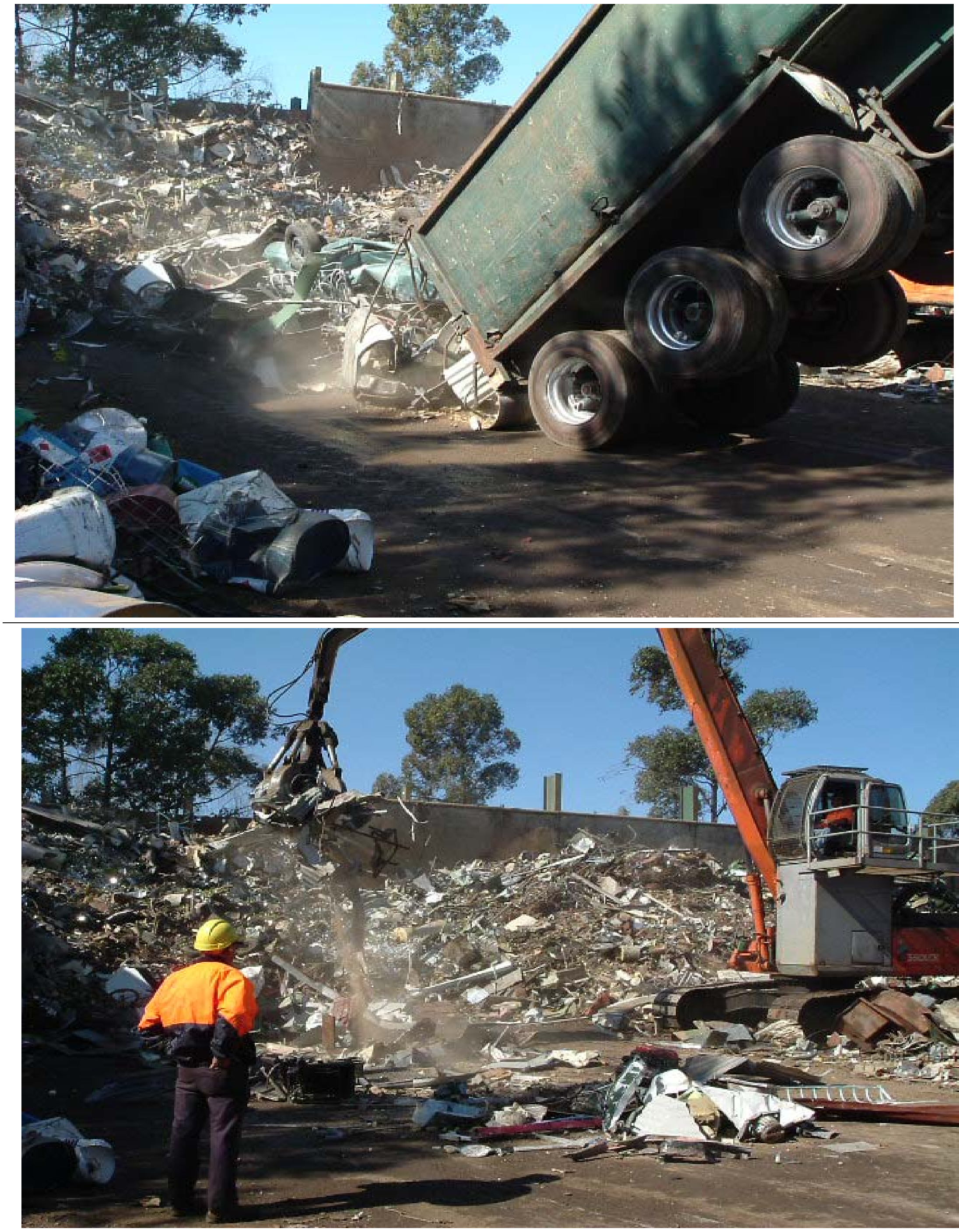
- Reducing the idling time of diesel vehicles on site;
- Ensuring trucks are maintained in accordance with manufacturer's specifications;
- Minimisation of exposed surfaces on soil and road base mounds;
- Regular watering of exposed surfaces;
- Any dirt tracked onto access routes should be cleaned as soon as practical;
- Ensure truck loads are covered and tailgates effectively sealed;
- Silt and other material should be removed from around erosion control structures to ensure deposits do not become a dust source; and
- Amending of dust-generating construction activities during adverse wind conditions.

Provided the mitigation measures detailed above are adhered to when required, air quality impacts associated with the construction activities at the site are not expected to adversely impact upon the surrounding environment.

## 4.2 Operation

Activities such as the dumping and management of demolition materials will have the potential to generate dust associated with the disturbance of soil and particles adhered to material brought onto site. **Figure 5** demonstrates dust generation from truck dumping and excavators working on scrap metal at a metal recycling facility.

**Figure 5 Truck Dumping and Excavator at Scrap Metal Recycling Facility**



Dust will also be generated by the on site crushing and screening of materials. Error! Not a valid bookmark self-reference. shows the dust generated by a mobile crushing plant at a concrete recycling facility where aggregate is the end product.

**Figure 6 Concrete Crushing Operations and Aggregate Storage at a Materials Processing Facility**

Additionally, dust may be generated by vehicles travelling on paved roads, with tyres acting to resuspend material on the road surface. The action of wind on the exposed surfaces of materials storage piles can also result in disturbance and suspension of dust and particulate matter into the ambient air.

# 5 ATMOSPHERIC DISPERSION MODELLING

Atmospheric dispersion modelling has been undertaken to assess the potential for dust and particulate generation from activities at the site. As discussed in **Section 4.2**, the main potential for dust generation is from the handling and processing of concrete and brick waste.

Where appropriate, modelling files used to assess air quality impacts for CMA Corporation proposed operations at Chester Hill have been updated and reprocessed to determine air quality impacts associated with the Proponent's proposed modifications to operations on site.

## 5.1 Methodology

The atmospheric dispersion modelling carried out for the site utilises the Ausplume Gaussian Plume Dispersion Model software developed by EPA Victoria, Version 6.0.

Ausplume is the approved dispersion model for use in the majority of applications in NSW. Default options specified in the Technical Users Manual (EPA Victoria, 2000) have been used, as per the DECC's Approved Methods document.

## 5.2 Dispersion Meteorology

### 5.2.1 Local Wind Conditions

The nearest Bureau of Meteorology (BoM) Automated Weather Station (AWS) is Bankstown Airport, located 4.6 km from the site. An analysis of wind data for 2001 to 2005 at Bankstown Airport indicates that winds from all directions are experienced at the site.

The strongest winds originate from the west to east-southeast. Wind roses for Bankstown Airport 2005 to 2001 are presented in **Appendix A**. The average wind speed recorded at Bankstown AWS is 3.8 m/s.

A meteorological input file using Bankstown 2004 data has been generated for input into the atmospheric dispersion model.

TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), is a prognostic model which may be used to predict three-dimensional meteorological data, with no local data inputs required.

The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations. TAPM is often used where insufficient on-site meteorological data is available. Parameters not recorded by the AWS (atmospheric stability class, mixing height and sigma theta) but required by the meteorological input file have been synthetically generated using TAPM.

The TAPM model also allows for the assimilation of wind observations to be optionally included in a model simulation. The wind speed and direction observations are used to realign the predicted solution towards the observation values.

For this assessment, TAPM was used to generate a complete 2004 meteorological data set for Bankstown Airport, incorporating observations recorded at the BoM AWS at the Airport. Continuous hourly observations for 2004 were used to generate an observation file for assimilation into the TAPM model.

Direct measurements of wind speed / direction and temperature from the Bankstown Airport AWS were combined with TAPM generated indirect measurements (mixing heights and sigma theta values) to produce the meteorological input file for the Ausplume dispersion modelling.

The season variation in wind behaviour for 2004 at Bankstown Airport is presented in **Appendix B**.

The seasonal wind roses indicate that:

- In summer the prevailing wind directions are from the southeast.
- In autumn the prevailing wind direction is from the west-southwest and south-southeast.
- In winter the prevailing wind direction is from the northwest, west-northwest and west-southwest.
- In spring the prevailing wind directions are from the southwest.

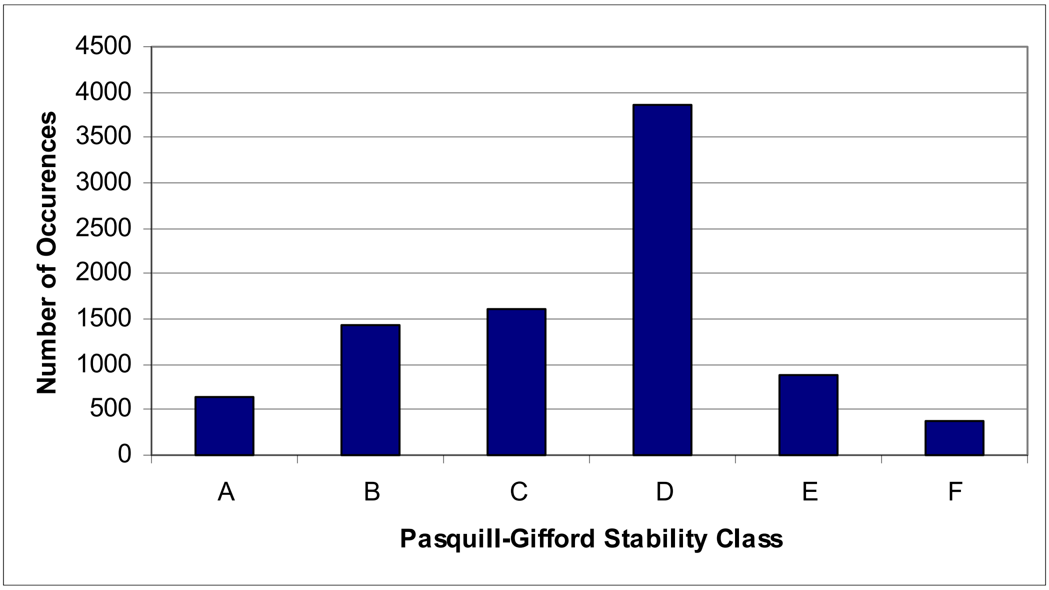
### 5.2.2 Atmospheric Stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Gifford assignment scheme identifies six Stability Classes, “A” to “F”, to categorise the degree of atmospheric stability. These classes indicate the characteristics of the prevailing meteorological conditions.

Stability Class “A” represents highly unstable conditions that are typically found during summer, categorised by strong winds and convective conditions. Conversely, Stability Class “F” relates to highly stable conditions, typically associated with clear skies, light winds and the presence of a temperature inversion. Classes “B” through to “E” represent conditions intermediate to these extremes.

The frequency of occurrence of each Stability Class for Bankstown Airport 2004 data is presented in **Figure 7**.

**Figure 7 Atmospheric Stability Class – Bankstown Airport 2004**



The results indicate a high frequency of conditions typical to Stability Class “D”, indicative of neutral conditions which will neither enhance nor impede atmospheric pollutant dispersion. A neutral atmosphere neither enhances nor inhibits mechanical turbulence and as a result, the vertical and lateral diffusion of a given atmospheric pollutant may be expected to be of a small to moderate scale.

**Appendix C** illustrates the seasonal variation in atmospheric stability class at Bankstown Airport for 2004. The frequency distribution of stability class varies relatively little with season, with Stability Class “D” dominating for all seasons.

## 5.3 Site Topography

Local topography plays an important role in atmospheric dispersion of pollutants by allowing or obstructing free movement of air masses. The topography of the area surrounding Chester Hill is characterised by flat terrain and is unlikely to significantly influence the dispersion of atmospheric pollutants. Accordingly a terrain file has not been incorporated into the dispersion model used for this assessment.

## 5.4 Modelling Scenarios

The modelling assessment is designed to determine the impact, in terms of dust and particulate matter, of worst case operation at the facility.

Activities such as the dumping and management of building demolition material will generate dust from soil, dirt and other contaminants that are received as part of the demolition material.

The following activities have been included in the particulate emissions inventory for the operational scenario.

- Trucks unloading demolition waste to the stockpiles areas (concrete, metals, topsoil, general solid waste, green material).
- Excavators managing stockpiles and loading crusher and screen.
- Wheel loaders managing stockpiles and loading crusher and screen
- Wind erosion from stockpiles.
- Trucks operating on paved road surfaces.
- Operation of crusher and screener machines.

Results of the modelling will be applied to determine appropriate dust mitigation strategies to limit any potential adverse impact and to achieve the relevant air quality impact assessment goals at adjacent sensitive receptors.

## 5.5 Emission Factors

The Australian Government Department of the Environment and Heritage have developed the National Pollution Inventory (NPI) which provides information on types and amounts of pollutants emitted into the community. The NPI was established under a National Environmental Protection Measure (NEPM) made by the National Environment Protection Council (NEPC) under Commonwealth, State and Territory legislation in 1998.

Over 3,000 facilities report annually to the NPI on the amount of pollution they emit and the NPI has produced a series of emission estimation techniques to aid a wide variety of industries in reporting. Facilities are required to report to the NPI if they process more than 10 tonnes of material or use a certain amount of energy.

Generic emission factors for wind erosion, truck dumping and excavators have been taken from emission rates published in the Emission Estimation Technique Manual for Mining (EETMM) for the following activities:

- Trucks unloading
- Excavators
- Wheel loaders (Front end loaders)
- Wind erosion
- Screen

Emission rates for particulate matter associated with vehicles operating on paved road surfaces, brake and tyre wear and direct exhaust emissions are based on equations drawn from the US EPA AP-42 Emissions Inventory (USEPA 1998). Fragmented stone, bricks and concrete will generally contain larger particle sizes than overburden from mining processes and therefore will be less likely to be dispersed. Emission factors for crushing operations have been taken from Chapter 11.19.2 of the AP-42 in preference to those given in the EETMM. The emission factor for Tertiary Crushing (controlled) has been used for TSP and $PM_{10}$. All emission factors are presented in **Table 4**.

**Table 4 Emission Estimation Factors**

| Activity | Total Particulate Emission Factor | $PM_{10}$ Emission Factor | Emission Factor Unit | Emission Factor Source |
|---|---|---|---|---|
| Trucks Unloading | 0.0003 | 0.0002 | kg/tonne | EETMM |
| Excavators | 0.0003 | 0.0002 | kg/tonne | EETMM |
| Front End Loader | 0.0003 | 0.0002 | kg/tonne | EETMM |
| Wind Erosion | 0.4 | 0.2 | kg/ha/hr | EETMM |
| Screen | 0.08 | 0.06 | kg/tonne | EETMM |
| Crusher | 0.0006 | 0.0003 | kg/tonne | AP-42 |
| 1t Ute Movements | 2.8 | 0.4 | g/VKT | AP-42 |
| 12t Truck Movements | 122.2 | 23.3 | g/VKT | AP-42 |
| 17t Truck Movements | 206.2 | 39.4 | g/VKT | AP-42 |
| 42t Truck Movements | 801.1 | 153.4 | g/VKT | AP-42 |

Note: Total Particulate Emission Factor is used to determine deposited dust

**Appendix D** provides details of the emission inventory for the modelling. The emission inventory has been derived to reflect the worst-case operation scenario for airborne emissions over a 24-hour period.

## 5.6 Assumptions

- Two 20 tonne excavators are assumed to operate continuously and concurrently, each handling and sorting 50% of the 100,000 tpa material.
- Two 12 tonne front end loaders are assumed to operate continuously and concurrently, each handling and sorting 50% of the 100,000 tpa material.
- Crusher is assumed to operate continuously, crushing 20,000 tpa of concrete.
- Screen is assumed to operate continuously, screening 20,000 tpa of soil.

- An average wheel generated dust emission factor has been calculated based on the assumption that 25% of the vehicle movements are undertaken by 1 tonne Utes, 25% by 12 tonne trucks, 25% by 17 tonne trucks and 25% by 42 tonne trucks (truck and dog).
- Wind erosion is assumed to occur when wind speeds exceed 5.4 m/s (USEPA 1985, NZ MFE 2001).
- Stockpiles are assumed to be 3 metres high.
- When calculating emission factors, an average wind speed was taken as 3.6 m/s (based on 2004 Bankstown Airport data) with a conservative moisture content of 1% applied for waste.

### 5.6.1 Emissions Controls

Emissions controls have been assumed to be implemented during the operation of the facility with control factors taken from Table 3 of the EETMM:

- 30% reduction in wind erosion from stockpiles due to wind breaks (noise attenuation walls around the processing and stockpile area)
- 30% reduction in emissions from crusher and screen due to wind breaks (noise attenuation walls around the processing)
- Further 50% reduction in emissions from the crusher due to water sprays.

## 5.7 Emissions Assessment

### 5.7.1 $PM_{10}$ Emissions

The results of the predicted maximum 24-hour $PM_{10}$ concentration (background plus increment) and the predicted maximum incremental concentration are presented in **Table 5**. As discussed in **Section 3.2.1** a variable background $PM_{10}$ file was included in the modelling.

**Table 5 Predicted $PM_{10}$ Concentrations (µg/m³)**

| Receptor | Maximum Predicted Concentration | Background Concentration | Incremental Concentration | DECC Goal |
|---|---|---|---|---|
| Waldron Road | 48.9 | 48.8 | 0.1 | 50 |
| Goodstate Place | 49.3 | 48.7 | 0.6 | 50 |
| Carpark of Aperio Group | 49.2 | 48.8 | 0.4 | 50 |
| | **Highest Incremental Concentration** | **Background Concentration** | **Total** | |
| Waldron Road | 1.9 | 12.4 | 14.3 | 50 |
| Goodstate Place | 0.8 | 22.0 | 22.8 | 50 |
| Carpark of Aperio Group | 8.9 | 17.8 | 26.7 | 50 |

The results indicate that under worst case operations, the 24-hour $PM_{10}$ criterion of 50 µg/m³, is not exceeded at the receptor locations, notwithstanding the high background concentrations included in the modelling. The maximum predicted increase in $PM_{10}$ concentration was 8.9 µg/m³, and occurred at the Aperio Group car park.

The results of the predicted annual average $PM_{10}$ concentration (background plus increment) are presented in **Table 6**.

**Table 6 Predicted Annual Average $PM_{10}$ Concentration (µg/m³)**

| | Annual Average Concentration | Background Concentration | Incremental Concentration | DECC Goal |
|---|---|---|---|---|
| Waldron Road | 22.4 | 22.0 | 0.4 | 30 |
| Goodstate Place | 22.4 | 22.0 | 0.4 | 30 |
| Carpark of Aperio Group | 22.9 | 22.0 | 0.9 | 30 |

The results presented in **Table 6** indicate that the annual average $PM_{10}$ criterion of 30 µg/m³ is also not exceeded. Concentration isopleths of the maximum predicted 24-hour $PM_{10}$ are presented in **Figure 8** The contours plots are included for presentation purposes and are not representative of concentrations at any one time. Rather, they provide an indication of the pollutant concentrations that could be potentially reached under the conditions modelled.

**Figure 8 Predicted Maximum 24-hour $PM_{10}$ Contour (50 µg/m³)**


## 5.8 Dust Deposition

**Table 7** shows the predicted Incremental Deposited Dust level at the identified receptors modelled.

**Table 7 Predicted Dust Deposition (g/m²/month)**

| Receptor | Annual Average Incremental Dust Deposition (g/m²/month) |
|---|---|
| Waldron Road | 0.1 |
| Goodstate Place | 0.1 |
| Carpark of Aperio Group | 0.3 |

The results indicate that under worst case operations the predicted dust deposition is significantly less than the project goal of 2 g/m$^2$/month.

Dust Deposition isopleths are presented in **Figure 9**.

**Figure 9 Dust Deposition Contours (1 and 2 g/m$^2$/month)**


## 5.9 Modelling Results Discussion

It is noted that a worst-case scenario was modelled, in terms of operational conditions. As a result, all predictions in the assessment should be viewed as conservatively high, with levels expected to be significantly lower than those modelled during normal operation of the facility.

It is therefore considered that there is an additional margin of safety in the modelling results presented to account for assumptions made with regard to ambient background concentrations meteorological inputs and particle emission rates used.

# 6 CONCLUSION

Heggies has been commissioned by Moody and Doyle to undertake a detailed Air Quality Impact Assessment for a materials recycling facility, processing demolition waste.

The construction phase air quality impacts are considered to be insignificant given the scale and duration of the construction activities. Any potential emissions during construction are anticipated to be largely controllable through technical means including good site management, vehicle maintenance and applying appropriate dust mitigation measures where required.

General dust and particulate emissions from trucks (travelling on paved roads and unloading material), excavators, front end loaders, crusher and screen are assessed through atmospheric dispersion modelling. The results indicate that under worst case operations, the 24-hour $PM_{10}$ criterion of 50 µg/m$^3$, is not exceeded at the receptor locations. The annual average $PM_{10}$ criterion of 30 µg/m$^3$ is also not exceeded.

An assessment of the potential for dust deposition indicates that levels are significantly less than the project goal of 2 g/m$^2$/month.

It is noted that a worst-case assessment was conducted, in terms of modelled dust and particulate matter generation. As a result, all predictions in the assessment should be viewed as conservatively high, with levels expected to be significantly lower during normal operation of the facility.

# 7 REFERENCES

This Air Quality Assessment has utilised the following references.


**Regarding Existing Air Quality**

- NSW DECC $PM_{10}$ data as measured by TEOM at the DECC's St Mary's and Earlwood monitoring sites, January 2004 – December 2004.

**Regarding Air Quality Goals**

- National Environmental Protection Council (NEPC), "*National Environmental Protection Measure for Ambient Air Quality*", 1998.
- National Health and Medical Research Council, 92nd Session, 1981.
- NSW Department of Environment and Climate Change (DECC), "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*", 2005.
- Watson, J. G., Chow, J. C. & Pace, T. G., Chapter 4: *Fugitive Dust Emissions* in Buonicore A. J. & Davis, W. T. (ed.), *Air Quality Engineering Manual*, 2000.

**Regarding Meteorology**

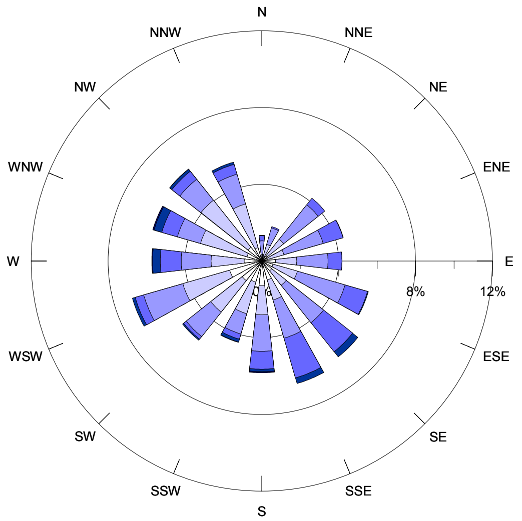
- Bureau of Meteorology Automatic Weather Station data for 2001 to 2005 at Bankstown Airport.

**Regarding Particulate Emission Factors**

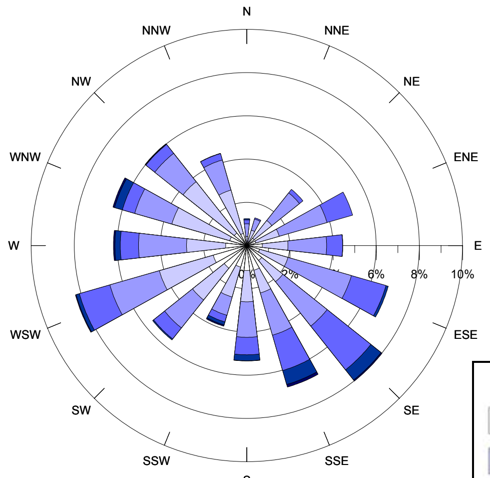
- Department of Environment and Heritage (DEH) "*Emission Estimation Technique Manual for Mining Version 2.3*", December 2001.
- NZ MFE (2001) New Zealand Ministry for the Environment "*Good practice guide for assessment and managing the environmental effects of dust emissions*"
- USEPA (1985) "*Compilation of Air Pollutant Emission Factors AP-42"* Fourth Edition United States Environmental Protection Authority.
- USEPA (1988) "*Compilation of Air Pollutant Emission Factors AP-42"* Fourth Edition United States Environmental Protection Authority.

# 8 GLOSSARY OF ACRONYMS AND SYMBOLS

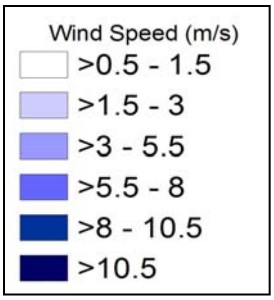
| | |
|---|---|
| AS | Australian Standard |
| AWS | Automatic Weather Station |
| BoM | Bureau of Meteorology |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DECC | NSW Department of the Environment and Climate Change |
| mg | Milligram (g x $10^{-3}$) |
| µg | Microgram (g x $10^{-6}$) |
| µm | Micrometre or micron (metre x $10^{-6}$) |
| $m^3$ | Cubic metre |
| NEPC | National Environment Protection Council |
| NHMRC | National Health and Medical Research Council |
| $PM_{10}$ | Particulate matter less than 10 microns in aerodynamic diameter |
| $PM_{2.5}$ | Particulate matter less than 2.5 microns in aerodynamic diameter |
| TAPM | "The Air Pollution Model" |
| TEOM | Tapered Element Oscillating Microbalance |
| TSP | Total Suspended Particulate |
| USEPA | United States Environmental Protection Agency |
| WHO | World Health Organisation |

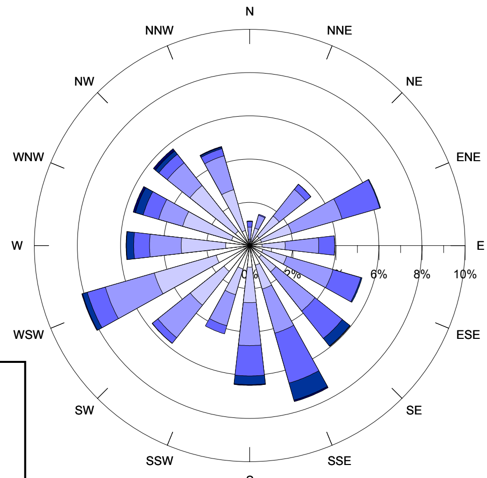



Bankstown 2005 Annual (Jan - September)
(Calms 20%)

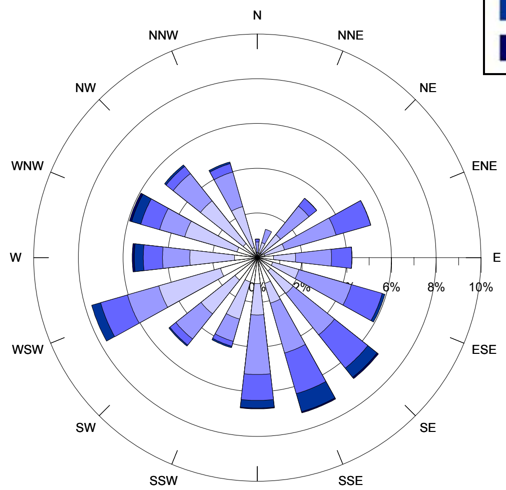



Bankstown 2004 Annual
(Calms 17%)

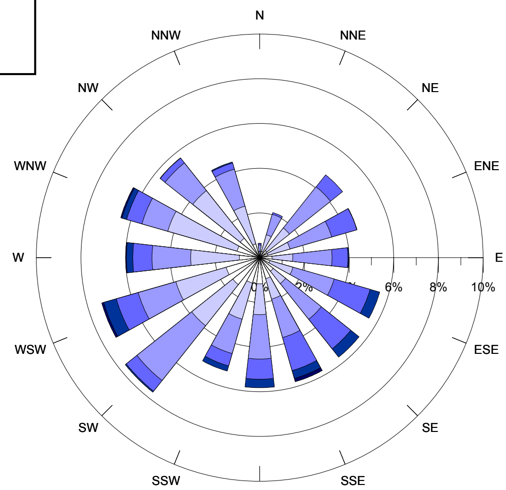



Bankstown 2003 Annual
(Calms 18%)




Bankstown 2002 Annual
Calms 20%)




Bankstown 2001 Annual
(Calms 18%)

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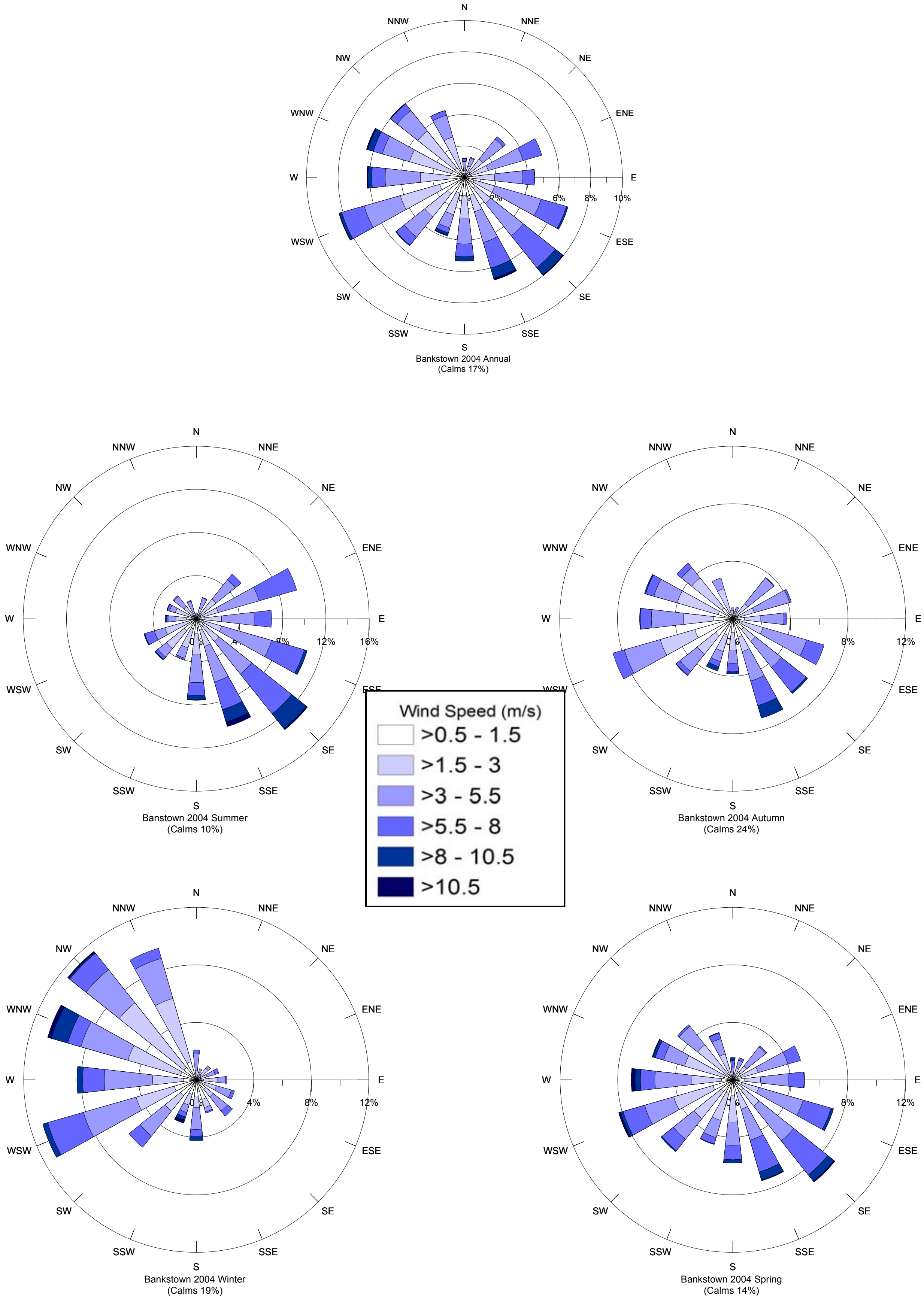
|---|---|---|---|---|
| RK | MD | 24/02/2009 | 10-7626 | 24/02/2009 |

**Appendix A: Bankstown Airport Wind Roses 2001-2005**

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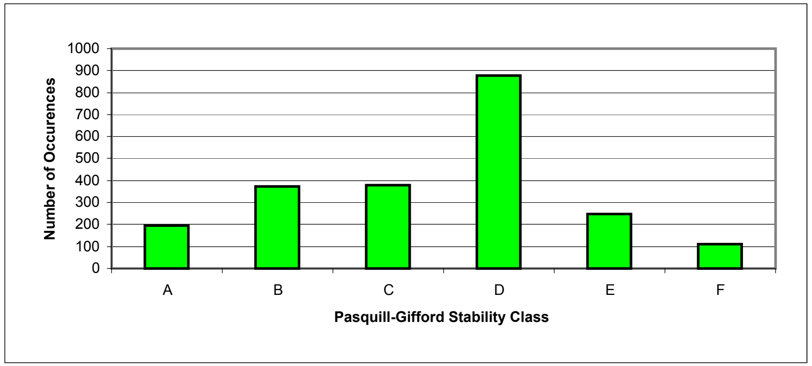
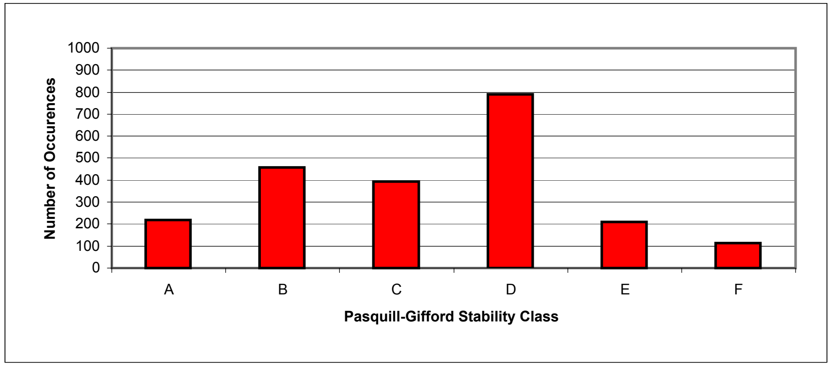
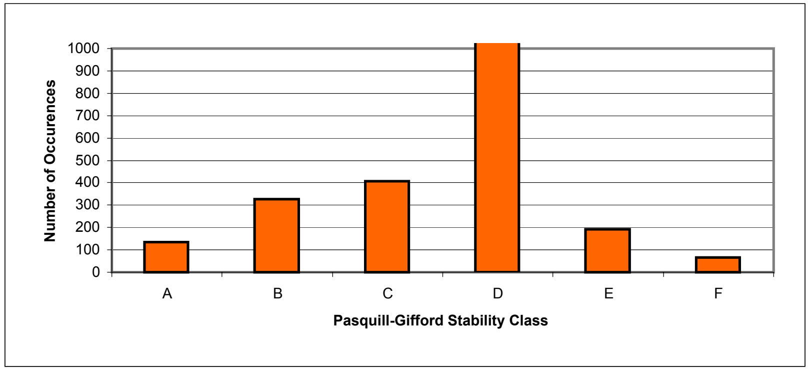
**Appendix B: BankstownAirport Wind Roses 2004**



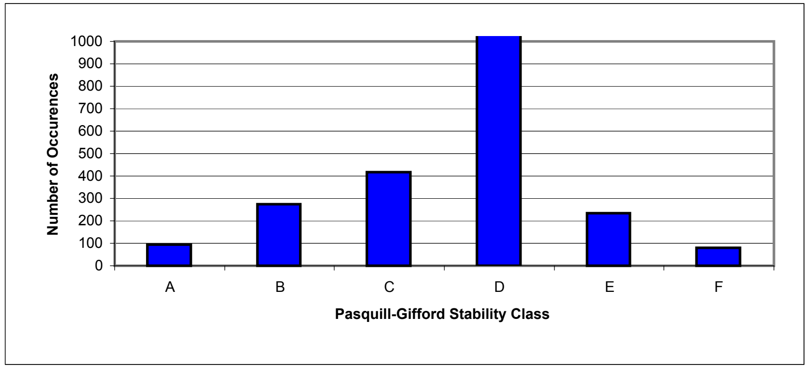

**Spring**




**Summer**




**Autumn**




**Winter**

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|---|---|---|---|---|
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Seasonal Stability Class Frequency Distribution for Bankstown Airport - 2004

| ***10-7626 No.1 Demolition Materials Recycling*** | **TSP Emission Factor** | **$PM_{10}$ Emission Factor** | **Emission Factor Units** | **Throughput (tonnes per hour)** | **Number of Hectares of stockpile** | **Average number of kilometres per return trip (per hour)** | **Working days available** | **Working hours per day** | **TSP Emission Rate (mg/s)** | **$PM_{10}$ Emission Rate (mg/s)** | **TSP Emission Flux ($mg/s/m^2$)** | **$PM_{10}$ Emission Flux ($mg/s/m^2$)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Processing Emissions** | | | | | | | | | | | | |
| Crusher - low moisture content ores | 0.0006 | 0.00027 | kg/t | 6 | n/a | n/a | 312 | 10 | 0.7 | 0.3 | n/a | n/a |
| Screen | 0.0800 | 0.0600 | kg/t | 6 | n/a | n/a | 312 | 10 | 49.9 | 37.4 | n/a | n/a |
| Trucks Unloading - demolition materials | 0.0003 | 0.0002 | kg/t | 32 | n/a | n/a | 312 | 10 | 2.9 | 1.4 | n/a | n/a |
| Excavators (2) | 0.0003 | 0.0002 | kg/t | 32 | n/a | n/a | 312 | 10 | 2.9 | 1.4 | n/a | n/a |
| Wheel Loader (2) | 0.0003 | 0.0002 | kg/t | 32 | n/a | n/a | 312 | 10 | 2.9 | 1.4 | n/a | n/a |
| **Wind Erosion** | | | | | | | | | | | | |
| Soil Stockpiles | 0.4 | 0.2 | kg/ha/hr | n/a | 0.5 | n/a | n/a | n/a | n/a | n/a | 0.008 | 0.003 |
| Aggregate Stockpiles | 0.4 | 0.2 | kg/ha/hr | n/a | 0.5 | n/a | n/a | n/a | n/a | n/a | 0.008 | 0.003 |
| **Emissions from Paved Roads** | | | | | | | | | | | | |
| Particulate Resuspension, Direct Emissions from Vehicle Exhaust, Brake and Tyre Wear (Truck and Dog - 25% operation) | 801.1 | 153.4 | g/VKT | n/a | n/a | 0.5 | 312 | 10 | 111.3 | 21.3 | n/a | n/a |
| Particulate Resuspension, Direct Emissions from Vehicle Exhaust, Brake and Tyre Wear (Medium-rigid semis - 25% operation) | 206.2 | 39.4 | g/VKT | n/a | n/a | 0.5 | 312 | 10 | 28.6 | 5.5 | n/a | n/a |
| Particulate Resuspension, Direct Emissions from Vehicle Exhaust, Brake and Tyre Wear (Small-rigid semis - 25 % operation) | 122.2 | 23.3 | g/VKT | n/a | n/a | 0.5 | 312 | 10 | 17.0 | 3.2 | n/a | n/a |
| Particulate Resuspension, Direct Emissions from Vehicle Exhaust, Brake and Tyre Wear (1t utes - 25% operation) | 2.8 | 0.4 | g/VKT | n/a | n/a | 0.5 | 312 | 10 | 0.4 | 0.1 | n/a | n/a |
| Average Particulate Resuspension, Direct Emissions from Vehicle Exhaust, Brake and Tyre Wear | 283.1 | 54.1 | g/VKT | n/a | n/a | 0.5 | 312 | 10 | 39.3 | 7.5 | n/a | n/a |

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|---|---|---|---|---|
| MD | RK | 24/02/2009 | | 01/05/2008 |

Appendix D - Emissions Inventory for Operations at Project Site

Quality System Quality Endorsed Company ISO 9001 Lic 3236 Standards Australia