# 6. Air Quality

## 6.1 Air – Existing Environment

Potential sources of particulate emissions from the surrounding environment include:

- farming activities (in particular dust from cultivated areas);
- smoke; and
- the Blair Athol Mine.

Air pollutants other than dust, such as $SO_2$ and $NO_x$, are not considered relevant to this study, owing to their very low levels of emission and very localised impact.

Monitoring of 24 hour Total Suspended Particulate (TSP) matter using a high volume sampler was undertaken between May and September 1990 (Hollingsworth Dames and Moore, 1991) at residences surrounding the Clermont MLs, including Araluen, Glenmore and the Clermont Airport. Dust deposition monitoring was also conducted at Araluen, Crillee, Glenmore and the Clermont Airport between November 2003 and April 2004. A summary of the results of dust monitoring is presented in **Table 6-1**.

**Table 6-1 Summary of dust monitoring results**

| | Dust Deposition (mg/m²/day) | | | 24-hr TSP (µg/m³) | | |
|---|---|---|---|---|---|---|
| **Location** | **Minimum** | **Mean** | **Maximum** | **Minimum** | **Mean** | **Maximum** |
| Araluen | 10 | 26 | 60 | 8 | 22 | 61 |
| Crillee | 13 | 29 | 67 | ND | ND | ND |
| Airport | 13 | 25 | 67 | 9 | 19 | 39 |
| Glenmore | 10 | 32 | 70 | 11 | 46 | 112 |

ND = No data available

The dust deposition and TSP values listed in **Table 6-1** are consistent with levels typically encountered in the region with the particular climatic and land use characteristics of the region.

No information in relation to background concentrations of respirable particulates less than ten micrometres in diameter ($PM_{10}$) in the area surrounding the Clermont MLs is available. Therefore it is necessary to estimate background levels based on other information. The NSW Minerals Council (2000) reports that the ratio of $PM_{10}$ to TSP around Australian mines is typically 0.39. This ratio, when applied to a typical TSP background of 40 µg/m$^3$, yields a background $PM_{10}$ concentration of approximately 15 µg/m$^3$, which is consistent with expected levels in the region.

## 6.2 Air Quality Criteria and Legislation

### 6.2.1 $PM_{10}$ and TSP

The air quality goals as defined in the *Environmental Protection (Air) Policy 1997* (EPP (Air)) are relevant to the general ambient air quality in Queensland. The air quality goals set out in the EPP (Air) are designed to ensure various positive outcomes relating to such things as human health and/or biological integrity. The EPP (Air) goals are not presented as 'never-to-be-exceeded' standards. They may be interpreted as desirable levels that ought to be achieved in all but exceptional circumstances. The EPP (Air) goals for ambient $PM_{10}$, and total suspended particulates (TSP), are presented in **Table 6-2**.

**Table 6-2 EPP (Air) goals for ambient air concentrations of selected pollutants**

| Air Quality Indicator | Goal (σg/m$^3$) | Averaging Time | Relevance |
|---|---|---|---|
| Particulate ($PM_{10}$) | 150 | 24 Hours | Human Health |
| | 50 | Annual | Human Health |
| Total Suspended Particulate (TSP) | 90 | Annual | Human Health |

Reference also must be made to the National Environment Protection Measure (NEPM) for Ambient Air Quality. The goals set out in the NEPM are not applied in the same way as the EPP (Air) goals in Queensland, and are intended as monitoring-based goals in areas of substantial population. The National Environmental Protection Council (NEPC) has also outlined a guideline level for $PM_{10}$ in the NEPM for Ambient Air Quality. The NEPM guideline level for $PM_{10}$ is 50 µg/m$^3$ based on a 24-hour averaging period not to be exceeded more than 5 times per year. It is noted, however, that the NEPM goal is not intended to be used as a 'beyond the boundary' goal for individual emission sources. Hence, the assessment of impact in this EIS is based on the Queensland EPP (Air) goals.

### 6.2.2 Dust Deposition

Dust deposition in general tends to be a nuisance issue, but in some cases it can cause material damage, depending on the nature of the dust and the deposition surface. In many cases, such as car yards and other situations where vehicles or other equipment might be affected, increased cleaning requirements can give rise to significant cost imposts.

Coal dust is generally regarded as having a particularly high potential for nuisance effects owing to its dark colour. This makes the dust much more visible on many surfaces than typical crustal dust of lighter colouration. Recognising this, some authorities have recommended more stringent guidelines for coal dust deposition than for 'typical' dusts. However, setting robust criteria for all situations is difficult.

In Queensland, draft guidelines for dust deposition differentiating coal dust from lighter dusts were proposed informally some years ago by the then Department of Environment and Heritage (now the EPA). The draft guidelines were not formalised, but have been referred to as general guidance for the assessment of dust deposition impacts. The suggested coal dust guideline was 60 mg/m$^2$/day compared to 120 mg/m$^2$/day for 'normal' or light coloured dusts. Generally the deposited dust around coal mines is not strongly dominated by coal dust because of the dominance of emissions from overburden handling and haul roads and the 'normal' guideline of 120 mg/m$^2$/day is considered to be relevant to coal mines. Hence, for this assessment, the appropriate guideline for dust deposition is 120 mg/m$^2$/day.

## 6.3 Methodology

The prediction and assessment of dust impacts relies on:

- generation of required input meteorology for the ISC3 (Industrial Source Complex Version 3) model using the TAPM (The Air Pollution Model) model and CALMET model, as well as observation data. These models are briefly described below;
- estimation of emission rates based on accepted methods such as those developed by Environment Australia and the USEPA. Estimated emission rates are a required input for the ISC3 model;
- use of the ISC3 dispersion model to predict pollutant ground level concentrations; and
- comparison of predicted levels against the criteria presented in **Section 6.2.1**.

All mathematical models of airborne pollutant dispersion are simplifications of reality. For most practical purposes, models such as ISC3 provide useful and adequate indications of ground level concentrations. ISC3 is a Gaussian plume model with a specific component for open cut mines and is accepted by the EPA for the majority of regulatory applications. TAPM is a three dimensional meteorological and air pollution model developed by the CSIRO Division of Atmospheric Research.

The model predicts airflow important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of larger scale meteorology provided by synoptic analyses. Upper air data were generated over the study region using TAPM. The TAPM-generated data and observed meteorological data were entered into the CALMET diagnostic meteorological model. CALMET is a meteorological model that can provide the meteorological inputs required to run numerous dispersion models including ISC3. CALMET produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables for each hour of the modelling period. These fields can then be used to produce the meteorological files that are utilised in the ISC3 dispersion model, as was done for this study.

### 6.3.1 Methodology Limitations

Further information on the models used in this assessment and uncertainty in dispersion models is presented in **Appendix L1**.

The following factors should be considered when interpreting dust emission assessment:

- techniques for estimation of dust emission rates also contain potential sources of error;
- the estimated dust emission rates are based on an assumption that dust emission controls have been utilised on many of the dust emitting processes; and
- as outlined in **Appendix L1**, there are several potential sources of uncertainty in dispersion modelling assessments.

As such actual ground level concentrations may vary from those predicted in this assessment.

### 6.3.2 Input Meteorology

The meteorological data required to run TAPM are provided by CSIRO in the form of 6-hourly gridded three-dimensional data for the Australian region, derived from a combination of all sources of data (official weather stations, satellite imagery, aircraft, ships, etc.) that are utilised in routine global weather forecasting models. TAPM dynamically fits the gridded data for the selected region (in this case central Queensland) to a finer grid taking into account terrain, surface type and surface moisture conditions. TAPM produces detailed fields of hourly estimated temperature, winds, pressure, turbulence, cloud cover and humidity at various levels in the atmosphere as well as surface solar radiation and rainfall.

The CALMET model can be used to more easily generate an even finer grid of three-dimensional meteorology. It has the advantage of accepting output data from TAPM as well as additional data from local weather stations to improve the simulation of local conditions. For this study, CALMET was run with input from TAPM as well as data from the BAM.

Wind rose diagrams based on measurements at the BAM are presented in **Appendix L2**. The data illustrated by the wind roses consists of average annual (June 1996 – March 1998), summer, and winter data.

The general features of winds affecting plume dispersion are:

- there is no predominant wind direction during the night;
- winds during the afternoon are predominantly from the east to south-east;
- highest speeds occur with winds from the east;
- lowest speeds generally occur at night; and
- calm conditions occurred approximately 0.1% of the time during June 1996 – March 1998.

### 6.3.3 Emissions Estimation

Estimation of particulate emissions from activities at the Project involved the following general steps:

- key activities likely to generate airborne particulates were identified;
- for each operation the best available emission estimation techniques were obtained from various sources, including the National Pollutant Inventory (NPI) Emission Estimation Technique Manual

for Mining (Environment Australia, 2003) and USEPA's AP-42 Compilation of Air Pollutant Emission Factors (USEPA, 1998); and

- airborne particulate emissions were calculated from the operations data for each activity and the emission factors. Where necessary additional approximations were made based on best available information. The emissions used in modelling are given in **Section 6.3.5**.

Both normal and upset conditions were accommodated in the emissions estimation. At a coal mine the typical processes generating most dust emissions are not prone to the same sensitivity to technological failures (e.g., breakdown of scrubbers) as in industrial facilities. Rather, worst case emissions are generally associated with dry windy weather that raises dust from extensive exposed areas, the effects of which were incorporated into the estimation procedure.

### 6.3.4 Dust Emission Sources and Controls

Operations at the Project were characterised into the main dust generating activities in order to allow the estimation of dust emissions to be undertaken. A summary of particulate emissions from the main dust generating activities used as input into the ISC3 dispersion model is presented in **Table 6-3**.

The dust emission estimates outlined in **Table 6-3** included assumptions that dust emission controls have been utilised on many of the dust emitting processes. **Table 6-4** lists the specific controls assumed to be utilised to reduce dust emissions.

### 6.3.5 Dispersion Modelling Inputs

The dust emission sources outlined in **Table 6-3** were allocated to specific emission areas for input to the ISC3 dispersion model. A description of allocation of dust emission sources to modelling areas is presented in **Appendix L1**.

Emissions from the conveyor were considered to be minor relative to the other sources and were therefore not incorporated into the model. The conveyor is enclosed on its top and the predominantly windward side, and also enclosed on the opposite side for part of its length. Such design measures greatly reduce the potential for coal to be entrained by wind as it is being conveyed, and typically dust from conveyors of this design has only very localised significance, if any. However, the more substantial effects of loading and unloading of the conveyor at the BAM were included in the model.

## 6.4 Air – Potential Impacts

The modelling of dust impacts was based on Production Years 1 and 8, which were considered to represent different stages of the mine life with the potential for greater impacts than at other times. Production Year 1 is characterised by a high rate of overburden removal near the surface, and Year 8 has a high rate of overall activity and coal production associated with relatively high emission rates.

It should be noted that impacts are assessed only for sites outside the mine lease area, and in particular the most relevant locations are where people live or where there is other potentially sensitive land use. The contours inside the Clermont Mining Leases boundaries can indicate much higher impacts, but these are not of concern from a regulatory point of view.

**Table 6-3 Dust emissions**

| Operation | Units | Production Year 1 | | Production Year 8 | |
|---|---|---|---|---|---|
| | | TSP | $PM_{10}$ | TSP | $PM_{10}$ |
| Excavators/Shovels/Front-end loaders - loading trucks | kg/yr | 2,958,194 | 1,419,948 | 2,456,871 | 1,179,381 |
| Bulldozing | kg/yr | 332,918 | 98,098 | 332,918 | 98,098 |
| Trucks dumping | kg/yr | 1,417,610 | 508,398 | 1,166,244 | 420,268 |
| Drilling | kg/yr | 2,930 | 1,539 | 3,909 | 2,054 |
| Blasting | kg/yr | 10,406 | 5,411 | 12,219 | 6,354 |
| Wheel generated dust from unpaved roads (e.g.  haul roads) | kg/yr | 8,110,501 | 2,096,599 | 6,616,461 | 1,710,383 |
| Scrapers | kg/yr | 23,834 | 6,007 | 82,280 | 21,013 |
| Road grading | kg/yr | 15,740 | 11,594 | 15,740 | 11,594 |
| Loading stockpiles | kg/yr | 4,549 | 1,933 | 25,560 | 10,863 |
| Unloading from stockpiles | kg/yr | 34,120 | 14,785 | 191,702 | 83,071 |
| Loading to trains | kg/yr | 910 | 387 | 5,112 | 2,173 |
| Conveying miscellaneous and transfer points | kg/yr | 3,066 | 1,450 | 17,229 | 8,149 |
| Wind Erosion from active stockpiles and waste rock dumps | kg/yr | 1,424,798 | 712,399 | 3,736,126 | 1,868,063 |
| Coal Crushing | kg/yr | 125,106 | 104,941 | 702,908 | 589,610 |
| Vehicle Exhausts | kg/yr | 177,796 | 177,796 | 147,370 | 147,370 |
| **TOTAL** | tonnes/yr | 14,642 | 5,161 | 15,513 | 6,158 |

**Table 6-4 Dust Emission Controls**

| Emission Source | Control(s) Utilised | Control Efficiency Applied |
|---|---|---|
| Excavators/Shovels/Front-end loaders Loading trucks | No control available for truck loading [a] | 0% |
| Bulldozing | No control available for dozers [a] | 0% |
| Trucks dumping | No control utilised for unloading overburden, | 0% |
| | Water Sprays utilised for unloading coal | 70% |
| Drilling | Rubber curtain | 70% |
| Blasting | No control available for blasting [a] | 0% |
| Wheel Generated Dust from Haul Roads | Watering roads at >2L/$m^2$/hour | 75% |
| Scrapers | Average road wetting along scraper route of 2L/$m^2$/hour | 50% |
| Graders | No control utilised for graders | 0% |
| Loading Stockpiles | Water sprays utilised for loading stockpiles | 50% |
| Unloading from Stockpiles | Water sprays utilised for unloading stockpiles | 50% |
| Loading to Trains | No control utilised | 0% |
| Wind Erosion – Active Stockpiles | No control utilised for active dumps | 0% |
| Miscellaneous Transfer Points and Conveying: | | |
| From stockpile to dump hopper | Water Sprays | 50% |
| Bypass coal crushing station | Dust Seals | 50% |
| Transfer of crushed coal onto conveyor | No control utilised | 0% |
| Overland conveying of crushed coal | Partial enclosure of conveyor | 80% |
| Coal from conveyor to surge bin | Enclosed bin | 80% |
| Coal from surge bin to yard conveyors | No control utilised | 0% |
| Yard conveying of coal | No control utilised | 0% |
| Coal Crushing | Cyclone utilised, control efficiency incorporated in the emission factor for coal crushing | |
| Vehicle Exhausts | Current level of control utilised for vehicle types and fuel used | |

a – NPI EET Manual for Mining Version 2.3 (2001)

### 6.4.1 Regional

Predicted regional results of the dispersion modelling for the Project are presented as dust contour maps (**Figure 6-1**, **Figure 6-2**, **Figure 6-3** and **Figure 6-4**). The dust contours show the predicted increase in dust concentrations due to Project activities, and do not include the assumed background levels identified in **Section 6.1**.

**Figure 6-1** and **Figure 6-2** show the increase in short-term (24-hour) maximum levels of $PM_{10}$ and annual average and levels of $PM_{10}$ for Production Years 1 and 8. Annual average $PM_{10}$ concentration is the average of 8760 one hour concentrations (that is, 365 x 24-hour concentrations), whereas 24 hour $PM_{10}$ concentration is the maximum 24-hour midnight to midnight concentration occurring over a year. Therefore the 24-hour $PM_{10}$ predictions in particular indicate the potential impacts associated with adverse short-term weather conditions and associated emissions.

**Figure 6-3** and **Figure 6-4** show the increase in annual average TSP concentrations and dust deposition rates for Production Years 1 and 8.

### 6.4.2 Sensitive Receptors

The predicted dust concentrations at the nearest sensitive receptors to the Project are outlined in **Table 6-5** for the Production Year 1 modelling scenario and **Table 6-6** for Production Year 8. These predicted levels include the assumed background levels identified in **Section 6.1**.

**Table 6-5 Predicted Dust Concentrations and Deposition Rates at Nearby Sensitive Receptors (including background levels) – Production Year 1**

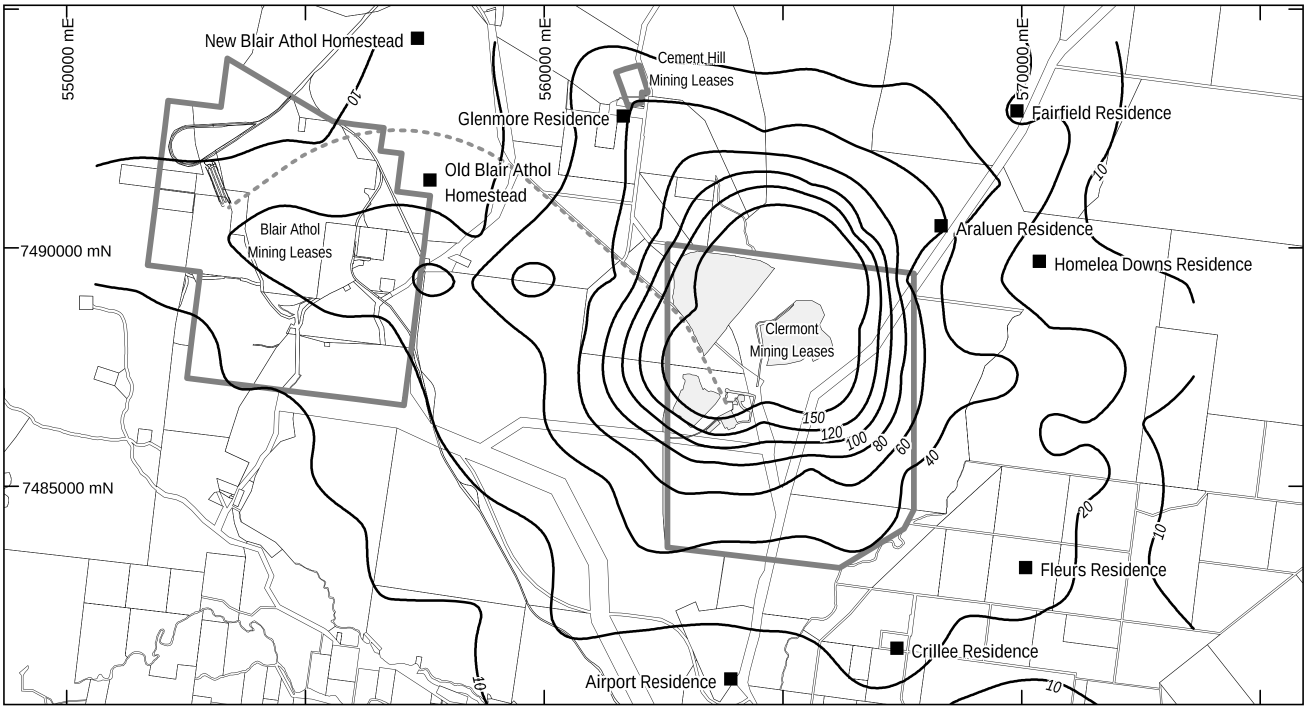
| Receptor | 24-hr $PM_{10}$ (µg/m³) | Annual $PM_{10}$ (µg/m³) | Annual TSP (µg/m³) | Annual Dust Deposition (mg/m²/day) |
|---|---|---|---|---|
| ***Guideline*** | ***150*** | ***50*** | ***90*** | ***120*** |
| Araluen Residence | 80.7 | 16.1 | 23.2 | 31.2 |
| Homelea Downs Residence [1, 2] | 29.3 | 15.4 | 29.4 | 29.3 |
| Fleurs Residence [1, 2] | 53.6 | 15.3 | 29.4 | 30.7 |
| Crillee Residence [1] | 43.8 | 15.8 | 29.9 | 35.1 |
| Airport Residence | 30.1 | 15.9 | 20.0 | 30.2 |
| Old Blair Athol Homestead [1, 2] | 33.1 | 15.9 | 30.1 | 34.5 |
| New Blair Athol Homestead [1, 2] | 29.1 | 15.7 | 29.8 | 31.9 |
| Glenmore Residence | 74.4 | 17.2 | 48.4 | 43.1 |

**Notes:**

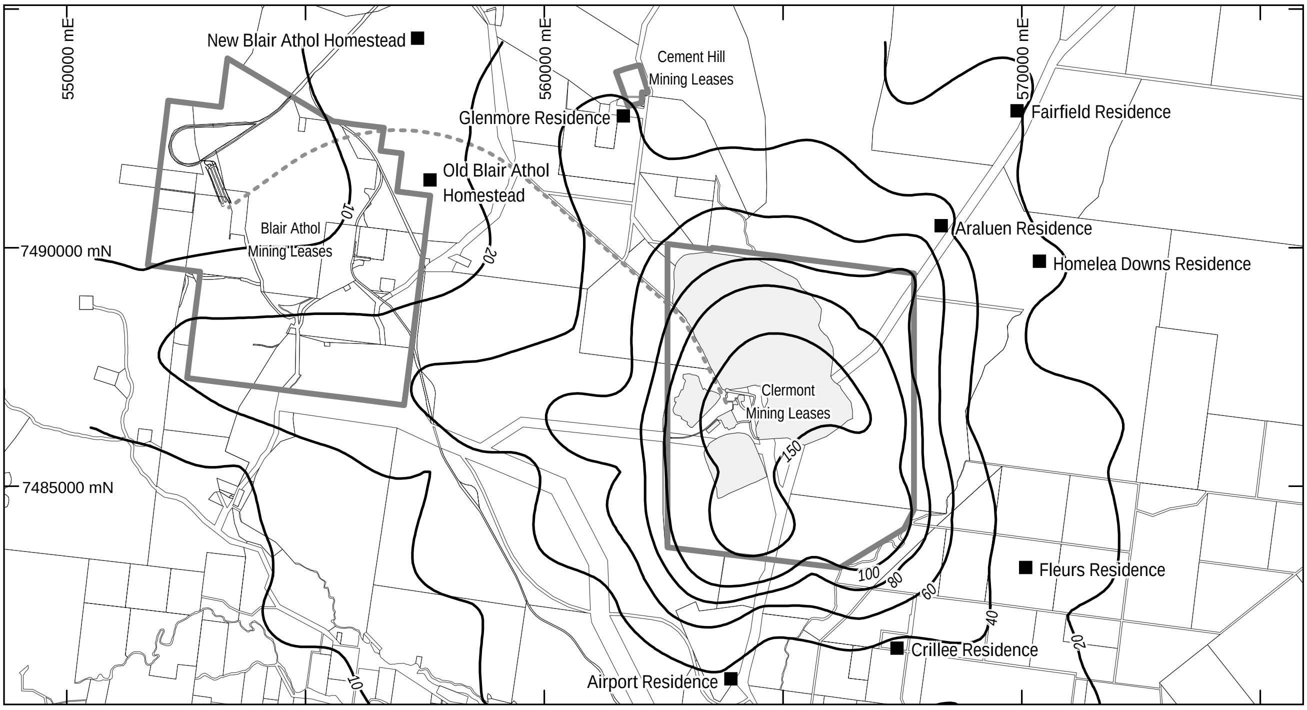
1 Sites with no baseline TSP data. Baseline TSP data for these sites was estimated as the mean of TSP concentrations at sites Airport, Glenmore and Araluen

2 Sites with no baseline deposited dust data. Baseline dust for these sites was estimated as the mean of deposited dust concentrations at sites Airport, Crillee, Glenmore and Fleurs.

*Increase in 24hr $PM_{10}$ Ground Level Concentrations ($\mu g/m^3$) Year 1 of Production*




*Increase in 24hr $PM_{10}$ Ground Level Concentrations ($\mu g/m^3$) Year 8 of Production*




■ Residence
Mining lease boundary
Property boundary
Mine footprint

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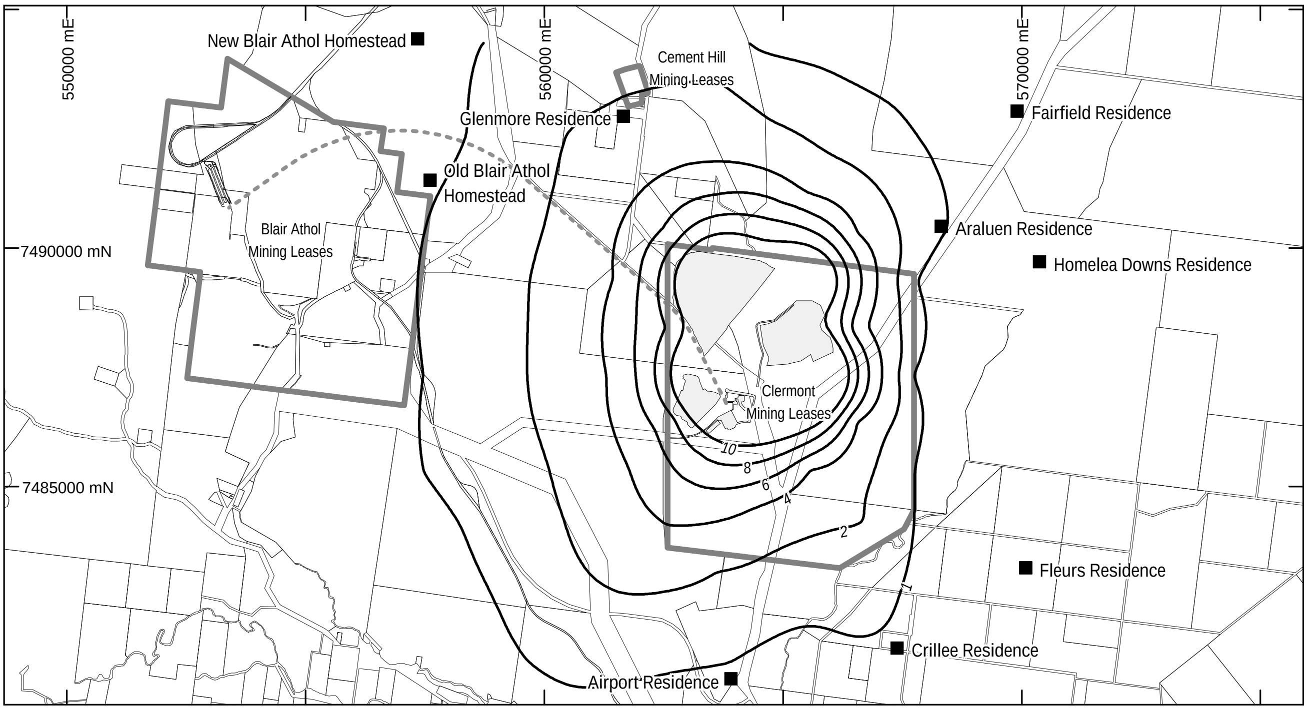
N

0 5000
metres
AMG zone 55, AGD84

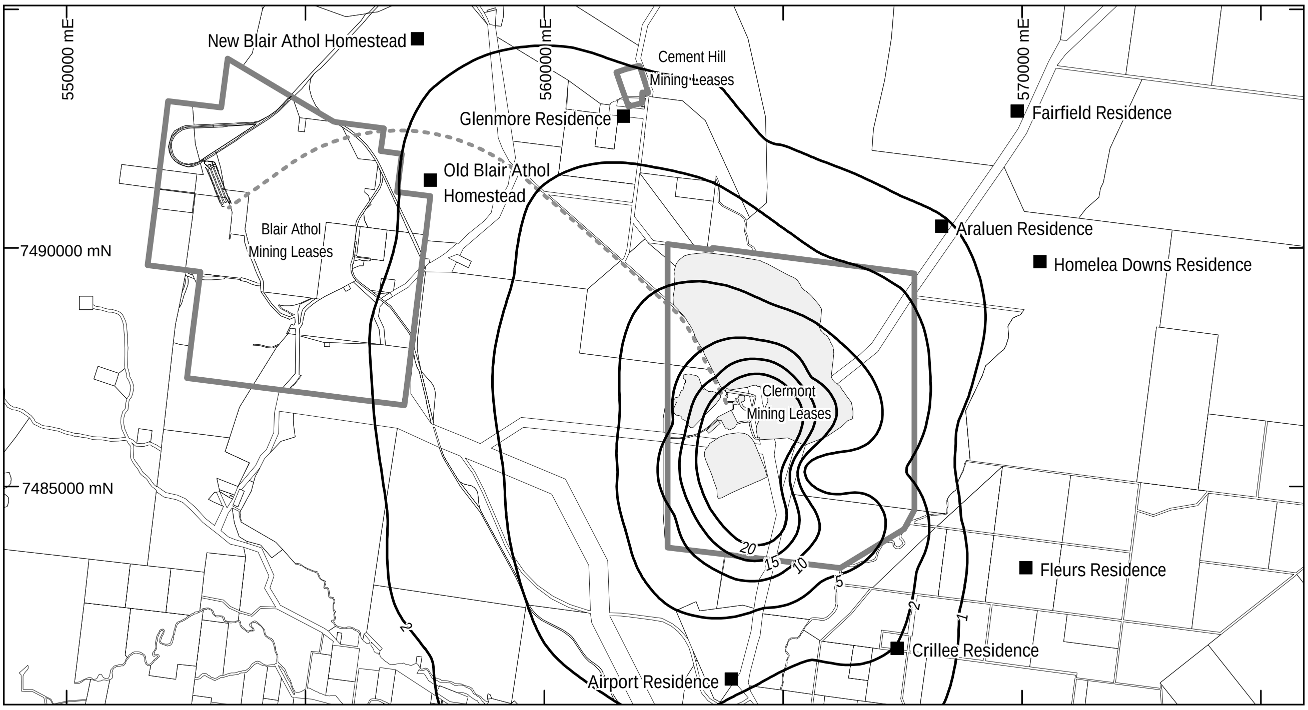
Figure 6-1

**Dust Contours - 24hr $PM_{10}$**

*Increase in Annual $PM_{10}$ Ground Level Concentrations ($\mu g/m^3$) Year 1 of Production*




*Increase in Annual $PM_{10}$ Ground Level Concentrations ($\mu g/m^3$) Year 8 of Production*




- Residence
- Mining lease boundary
- Property boundary
- Mine footprint

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0 5000

metres

AMG zone 55, AGD84

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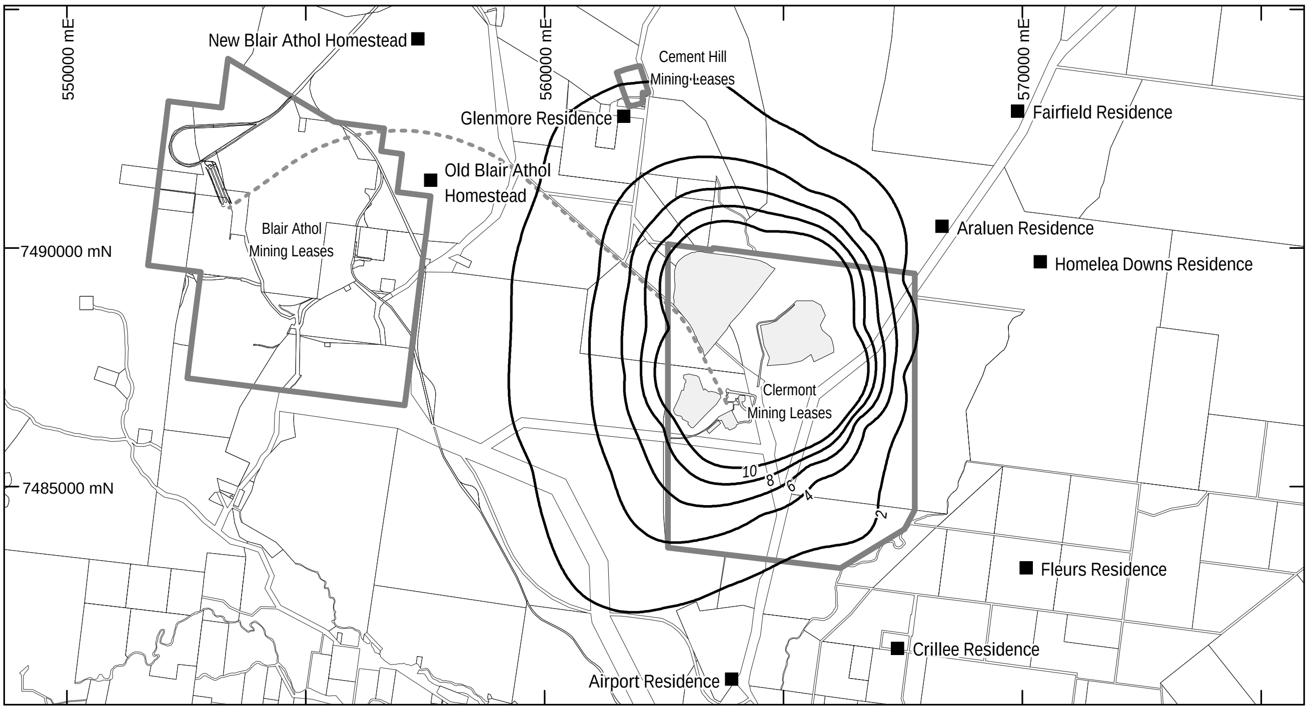
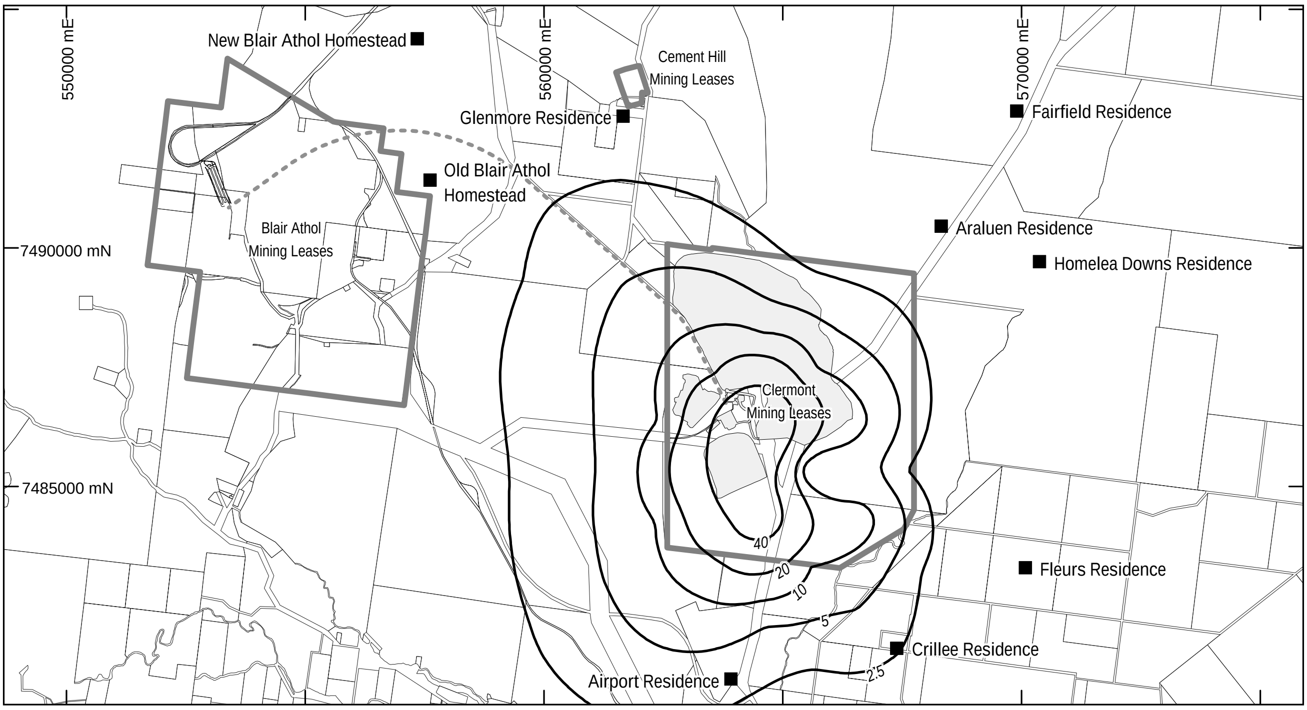
Figure 6-2

**Dust Contours - Annual $PM_{10}$**

*Increase in Annual TSP Ground Level Concentrations (µg/m³) Year 1 of Production*




*Increase in Annual TSP Ground Level Concentrations (µg/m³) Year 8 of Production*




- Residence
- Mining lease boundary
- Property boundary
- Mine footprint

N

0 5000

metres

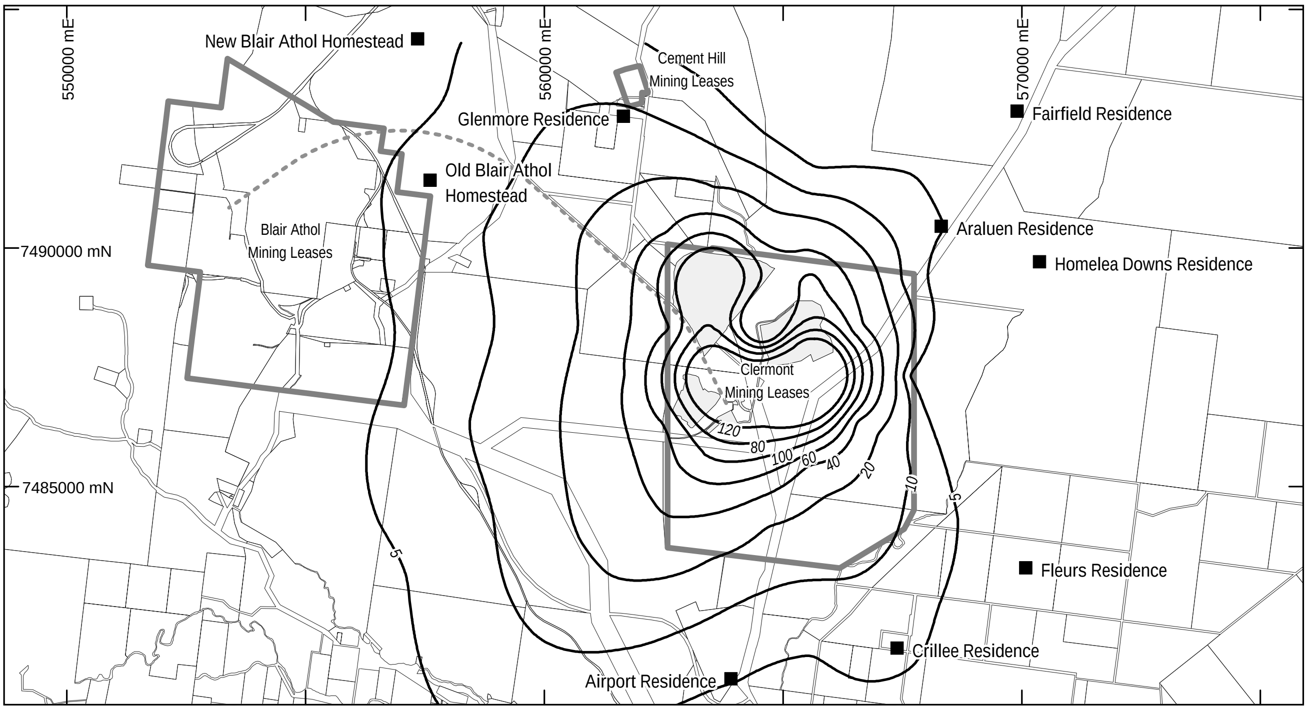
AMG zone 55, AGD84

Figure 6-3

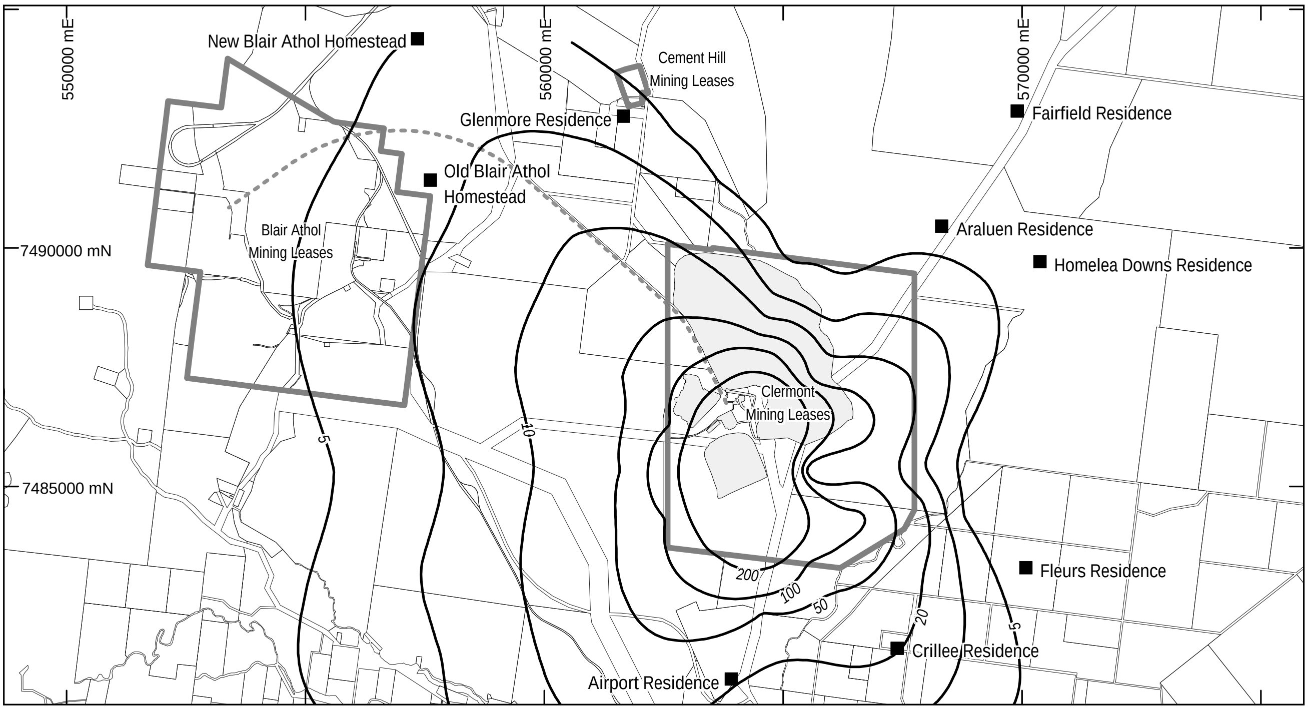
**Dust Contours - Annual TSP**

Q:\mapinfo\Plans\Clermont\2004EIS\Dust Contours\Annual TSP 2008 2016.wor

## *Increase in Annual Average Dust Deposition (mg/m² /day) Year 1 of Production*




## *Increase in Annual Average Dust Deposition (mg/m² /day) Year 8 of Production*




■ Residence

Mining lease boundary

Property boundary

Mine footprint

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metres

AMG zone 55, AGD84

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RIO TINTO COAL AUSTRALIA | clermont

Figure 6-4

**Dust Contours - Annual Deposited Dust**

**Table 6-6 Predicted Total Dust Concentrations and Deposition Rates at Nearby Sensitive Receptors (including background levels) – Production Year 8**

| Receptor | 24-hr $PM_{10}$ ($\mu g/m^3$) | Annual $PM_{10}$ ($\mu g/m^3$) | Annual TSP ($\mu g/m^3$) | Annual Dust Deposition ($mg/m^2/day$) |
|---|---|---|---|---|
| ***Guideline*** | ***150*** | ***50*** | ***90*** | ***120*** |
| Araluen Residence | 69.2 | 16.1 | 23.2 | 29.9 |
| Homelea Downs Residence [1, 2] | 43.8 | 15.6 | 29.7 | 31.2 |
| Fleurs Residence [1, 2] | 46.4 | 15.5 | 29.6 | 31 |
| Crillee Residence [1] | 48 | 16.9 | 31.6 | 49.5 |
| Airport Residence | 49.3 | 17.3 | 22.2 | 47.1 |
| Old Blair Athol Homestead [1, 2] | 33.3 | 16.2 | 30.4 | 36.3 |
| New Blair Athol Homestead [1, 2] | 31.7 | 15.8 | 29.9 | 33.2 |
| Glenmore Residence | 60.1 | 16.4 | 47.5 | 39.2 |

**Notes:**

1 Sites with no baseline TSP data. Baseline TSP data for these sites was estimated as the mean of TSP concentrations at sites Airport, Glenmore and Araluen

2 Sites with no baseline deposited dust data. Baseline dust for these sites was estimated as the mean of deposited dust concentrations at sites Airport, Crillee, Glenmore and Fleurs.

### 6.4.3 $PM_{10}$

Annual average levels of $PM_{10}$ at the nearest sensitive receptor (the Araluen residence) during Year 1 of Production (refer to **Table 6-5**) are predicted to be only 1.1 µg/m³ excluding background concentrations. Including the assumed background of about 15 µg/m³ yields a total concentration of approximately 16 µg/m³. While Araluen is the closest residence to the Project, meteorological conditions in the area result in higher concentrations being predicted at the Glenmore residence (2.2 µg/m³, or a total of 17.2 µg/m³). These levels are well below the EPP(Air) annual average guideline level for $PM_{10}$ of 50 µg/m³ (refer to **Section 6.2.1**).

Annual average levels of $PM_{10}$ for the Project during Year 8 of Production (refer to **Table 6-6**) also remain low with levels at the Araluen residence predicted to be 1.1 µg/m³ (16.1 µg/m³ with background). The highest predicted level of $PM_{10}$ in Year 8 of Production at a sensitive location is at the Airport residence (2.3 µg/m³, or 17.3 µg/m³ with background). These levels are well below the EPP(Air) annual average guideline level for $PM_{10}$ of 50 µg/m³ (refer to **Section 6.2.1**).

Predicted 24-hour concentrations of $PM_{10}$ in Production Years 1 and 8 are also well below the EPA guideline value of 150 µg/m³ (refer to **Table 6-5** and **Table 6-6**). The maximum predicted 24-hour level in Year 1 of Production is 65.7 µg/m³ (Araluen residence) and in Year 8 of Production is 54.2 µg/m³ (also at Araluen residence). With the inclusion of a 15 µg/m³ background level, these values reach approximately 80.7 µg/m³ and 69.2 µg/m³ respectively.

### 6.4.4 TSP

The maximum predicted increase in annual average concentrations of TSP at sensitive receptors in the first year of production and Year 8 of Production are 2.4 µg/m³ (Glenmore residence) and 3.2 µg/m³ (Airport residence) respectively. Adding the measured mean background TSP concentrations of 46 µg/m³ and 19 µg/m³ (refer to **Table 6-1**) yields estimates of 48.4 and 22.2 µg/m³ respectively. These concentrations are well within the EPP(Air) guideline concentration of 90 µg/m³.

### 6.4.5 Dust Deposition

As with the predicted concentrations of suspended particles, the predicted levels of deposited dust are also well within the guideline value of 120 mg/m²/day as an annual average. The highest predicted increase in levels due to the mine in Year 1 of Production and Year 8 of Production at sensitive locations are 11.1 mg/m²/day (Glenmore residence) and 22.1 mg/m²/day (Airport residence) respectively. Adding the assumed mean background levels (refer to **Table 6-1**) yields estimated total deposition rates of 43.1 and 47.1 mg/m²/day respectively.

### 6.4.6 Other Potential Impacts

Sulphur is a naturally occurring component of coal and commonly occurs as pyrite or iron disulphide ($FeS_2$). Exposure of pyrite to air and water forms sulphuric acid and iron hydroxide. The potential for this process to have a significant impact on corrosion of fences and other metallic surfaces depends on the rate of deposition of coal dust, the sulphur content of the coal and the rate of acid formation. The issue of corrosion associated with coal is most commonly associated with coal fired power stations and boilers, which emit $SO_2$ and $SO_3$ in gaseous form, which can then readily form sulphuric acid and cause corrosion. It is not an issue of any significance in relation to coal mines in Queensland.

Around the Project the only known concern about impacts on agricultural land use relates to opportunistic dryland cotton farming on the Homelea Downs property to the east of the mine site. Here the crop locations are rotated around the property. The potential for dust from coal mining to impact on cotton relates to the potential for dust to impact on the quality of the cotton for processing and on the productivity of the cotton plants, since heavy dust deposits can reduce photosynthetic activity and hence cotton yield. The predicted dust deposition rates on the Homelea Downs property are relatively low since the property is located on the predominantly upwind side of the mine. The predicted maximum impacts in Production Year 8 are about 35 $mg/m^2/day$ level near the western property boundary, when background is included. At this level of dust deposition, no detectable change in cotton productivity is likely, based on assessments of experimental data and extensive literature review (Doley, 2003). Cotton quality is also extremely unlikely to be compromised at these levels, which can occur naturally in this region. Most of the property is affected to a much lesser degree than its western extremity in Production Year 8, and so it is expected that the potential impact could be managed by appropriate selection of cropping areas away from this part of the property in critical years if considered necessary. However, the objective data suggest that this would not be necessary.

Considering the locations of residential sites and the proposed Site Construction Village and expected dust levels at those sites, no other significant effects of suspended or deposited dust, such as contamination of rainwater for drinking, are expected.

Results of coal quality testing of coal from the Clermont deposit indicate that dust from Clermont deposit coal can be extinguished at a lower moisture content compared to Blair Athol deposit coal. This means that not as much moisture is required to suppress dust from Clermont deposit coal compared to Blair Athol deposit coal. In terms of dust generation, the difference of the Clermont resource coal being loaded and transported on the existing railway, as opposed to the existing coal transported from the BAM, is that the Clermont deposit coal is likely to generate marginally less dust.

From a regional airshed perspective, there are no significant air quality issues relevant to the proposal apart from dust. Unlike an urban airshed, the region's air quality is not significantly affected by anthropogenic emissions of products of combustion or air toxics. Dust emissions from the proposed Clermont mine will not cause any significant change in regional air quality beyond a range of several kilometres, as indicated in the air quality assessment.

### 6.4.7 In-pit Crushing Option

The financial costs and benefits of in-pit crushing are being considered (see **Section 2.16.8**). In terms of the likely effects of this potential option on dust impacts, it is relevant that there would be less machine time for dozers, graders and haul road watering with the 12 fewer dump trucks needed for moving waste. From first principles, considering the reduced activity levels of significant dust generating sources and the retention of a significant fraction of the dust generated within the pit, it is evident that the dust impact associated with this option would be lower than that considered in this assessment. However, the quantitative reduction has not been modelled. Clearly, the dust levels predicted here would represent a very conservative basis for assessment of the in-pit option.

### 6.4.8 Air Quality Management Strategies

The principal air emissions from the proposed mine will be dust. Other emissions, such as products of combustion, will be relatively minor but will be managed by maintaining plant and machinery that give rise to such emissions in good working order to ensure that emissions are minimised. Greenhouse gases are addressed separately in **Section 6.5**.

An indication of the approach to managing dust emissions is provided in **Table 6-4**.

The principal controls will include the watering of haul roads, use of water sprays on coal when loading and unloading at transfer points, partial enclosure of the overland conveyor and surge bin, dust seals on the bypass coal crushing station, dust cyclone on the coal crusher, and dust curtains on drills. In addition to these specific controls, progressive rehabilitation will minimise the area of exposed unvegetated soil that forms a very significant wind-dependent dust source. Further, any dust-emitting activity that might give rise to an adverse short-term impact at a sensitive receptor will be managed if necessary to avoid activity when that location is downwind. Burning of cleared vegetation will be avoided when wind is blowing towards sensitive receptors. Topsoil stripping and replacement activities will be avoided when the wind speed is sufficient to carry visible dust to sensitive receptors. Any dust complaint will be investigated expeditiously and the complainant will be responded to.

### 6.4.9 Monitoring

Dust deposition monitoring will be carried out at Araluen, Crillee, the Airport and Glenmore residences for five years, following the commencement of construction, to confirm the modelling prediction that operations shall not result in a significant increase in dust levels. Monitoring will be carried out in accordance with "AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air. Method 10.1 Determination of particulate matter - Deposited Matter - Gravimetric method".

## 6.5 Greenhouse Gases

The Australian Greenhouse Office (AGO) is a federal government agency that manages the Australian greenhouse gas agenda, including the Greenhouse Challenge program. The Greenhouse Challenge guidelines (AGO, 2003) were used in the preparation of the greenhouse gas inventory for this study.

The following sources would contribute to direct and indirect greenhouse gas emissions from the Project:

- emissions from Coal Seams;
- generation and Consumption of Electricity;
- transport;
- explosive Detonation Emissions;
- spontaneous Combustion of Stockpile; and
- land Clearing.

**Table 6-7** provides a summary of greenhouse gas emissions from project activities. Note that $E_{CO_24e}$ is an abbreviation for 'emission of carbon dioxide equivalents'. The Production Years chosen for the analysis are the same as those used for the air quality assessment and provide a good indication of the range of annual emissions. Year 8 represents a high rate of emission associated with the high coal production rate.

The estimates in **Table 6-7** do not specify individual species of greenhouse gases. However, $CO_2$ is the principal emission from most of the individual sources identified in **Table 6-7** with the exception of methane from coal seams and oxides of nitrogen from explosives. Coal seam methane is expected to contribute almost half of $CO_2$-equivalent greenhouse gas emissions at full mine production.

The Proponent will:

- maintain an inventory of greenhouse gas emissions for the Project once construction starts;
- publicly report greenhouse emissions and progress on greenhouse mitigation measures; and
- maintain its membership of the Commonwealth Government Greenhouse Challenge Program.

**Table 6-7 Summary of Greenhouse Gas Emissions**

| Direct Emissions | $E_{CO_2 4e}$ Emissions (tonnes/yr) | |
|---|---|---|
| | **Production Year 1** | **Production Year 8** |
| Coal Seams | 38,692 | 217,390 |
| Transport - Diesel | 168,391 | 141,259 |
| Transport - Petrol | 72 | 72 |
| Explosives - ANFO | 903 | 607 |
| Explosives - Emulsion | 3,660 | 2,461 |
| Spontaneous Combustion | 12,553 | 12,553 |
| Land Clearing | 17,600 | 11,733 |
| Land Revegetation (carbon credit) | 0 | -227 |
| **Indirect Emissions** | | |
| Consumption of Electricity | 45,893 | 45,893 |
| **Total** | **287,764** | **431,741** |

Climate change and greenhouse gas issues are key components of Rio Tinto's commitment to sustainable development, and Rio Tinto implements a number of programs and actions to reduce or abate greenhouse gas emissions.

Through its industry associations, Rio Tinto has been participating in:

- Australian Coal Association Research Program (ACARP) - Support of projects investigating improved greenhouse gas reporting methodologies and assessment of the accuracy of emission factors for coal seam methane and spontaneous combustion. ACARP also supports clean coal technology research that has positive greenhouse gas emission implications. Rio Tinto annually contributes both financially and in-kind to ACARP's activities;
- Cooperative Research Centre for Coal in Sustainable Development (CCSD) - The CCSD is aimed at facilitating the development and use of sustainable coal based energy technologies. Rio Tinto provides funding for the CCSD; and
- The CO2 Cooperative Research Centre, which researches the capture of CO2 from industrial systems and its geological storage. Rio Tinto contributes funding through Rio Tinto Coal Australia to the CO2 Cooperative Research Centre.

Rio Tinto also participates in energy end use and greenhouse gas emissions efficiency initiatives including:

- The Rio Tinto Foundation for a Sustainable Minerals Industry (RTFSMI), which supports research and technical development that will assist the minerals industry to meet environmental challenges. Significant greenhouse gas related programs are undertaken by the RTFSMI;
- Carbon sequestration leadership forum – the forum aims to implement a cooperative approach to global carbon emissions; and
- Coal 21 – an organisation of Australian utilities and coal producers aiming to promote and facilitate the demonstration, commercialisation and early uptake of clean coal technologies in Australia. Rio Tinto Energy is a foundation member.