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# 10. AIR QUALITY

The South Galilee Coal Project (SGCP) seeks to maintain the existing environmental air quality values, such that ambient air quality levels at nearby sensitive receptors are conducive to human and environmental health and well-being.

This Section provides an assessment of the potential impacts on ambient air quality at the SGCP resulting from the construction and operation of the mine. The air quality assessment, undertaken on the SGCP area by Noise Mapping Australia Pty Ltd (NMA, 2011) (refer to **Appendix L—Air Quality Technical Report**), evaluates the local climatic conditions of the region and the existing environment in relation to particulate matter. Suitable mitigation and management measures to address potential impacts have been identified and are discussed.

Although there are no existing coal mines near the SGCP, there are several mines proposed to the north (e.g. Galilee Coal Project, Alpha Coal Project, Kevin's Corner Project and the Carmichael Coal Mine and Rail). These mines are currently in the process of obtaining the necessary approvals to permit operation. As part of the development of these mines, a railway line will be constructed to link the Galilee Basin to coal export terminal facilities. A number of rail lines have been proposed by other mining proponents and QR National. All of these proponents have indicated that third party access will be available and the SGCP proposal includes a railway spur to link to the common user railway lines. On June 6, 2012, the GVK-Hancock Coal rail alignment was approved by state government to allow third party access for the transportation of coal from the Galilee basin to the Abbot Point Coal Terminal (APCT).

## 10.1. LEGISLATION AND GUIDELINES

### 10.1.1. Environmental Protection (Air) Policy (2008)

The Queensland *Environmental Protection (Air) Policy 2008* (*EPP (Air)*) commenced on 1 January 2009. *The EPP (Air)* (Part 2, *Section* 5) aims to achieve the objective of the *Environmental Protection Act 1994 (EP Act)* in relation to Queensland's air environment. The objective of the *EP Act* is 'to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development, or ESD).

Specifically, the *EPP (Air)* addresses the environmental values to be enhanced or protected, namely:

a) the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems
b) the qualities of the air environment that are conducive to human health and well-being
c) the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property

d) the qualities of the air environment that are conducive to protecting agricultural use of the environment.

In order to meet the environmental values, Schedule 1 of the *EPP (Air)* nominates relevant air quality indicators and goals. Relevant air quality indicators from Schedule 1 are those dealing with particulates, as follows:

a) Total Suspended Particulate (TSP) 90 micrograms per cubic metre ($\mu g/m^3$) averaged over a year
b) particulate matter less than 2.5 micrometres ($\mu m$) in diameter ($PM_{2.5}$) 8 $\mu g/m^3$ averaged over one year
c) $PM_{2.5}$ 25 $\mu g/m^3$ averaged over 24 hours
d) particulate matter less than 10 $\mu m$ in diameter ($PM_{10}$) 50 $\mu g/m^3$ averaged over 24 hours, and no greater than five occurrences per year.

All these indicators are qualities of the air environment that are conducive to human health and well-being. The indicators apply at any sensitive or commercial place, such as residences, parks, gardens, schools, and shopping precincts.

### 10.1.2. EPA License and Permits – Guideline 8

Although the *EPP (Air)* 2008 is the primary reference for air quality criteria in Queensland, it does not address dust deposition. Dust deposition monitoring is the most common method used to measure dust levels in areas surrounding developments and is used as an indicator to undertake more detailed investigations. The sampling is conducted in accordance with Australian Standard *AS3580: Methods for Sampling and Analysis of Ambient Air – Method 10.1: Determination of Particulate Matter – Deposited Matter – Gravimetric Method*. Furthermore, mine licenses issued by the Department of Environment and Heritage Protection (DEHP) include a dust deposition limit.

The relevant guideline for the assessment of air quality in relation to the SGCP is the DEHP, 'Preparing an Environmental Management Overview Strategy (EMOS) for Non-standard Mining Projects'. This guideline requires that the release of dust or particulate matter or both resulting from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place. According to the guideline, the maximum permissible measured dust levels relevant to the proposed SGCP comprise:

a) Dust deposition of 120 milligrams per square metre per day ($mg/m^2/day$), averaged over one month
b) $PM_{10}$ of 150 $\mu g/m^3$ averaged over 24 hours, at a sensitive or commercial place downwind of the operational land.

The $PM_{10}$ criterion has been superseded by the more recent and more stringent *EPP (Air)* 2008 levels for $PM_{10}$.

### 10.1.3. National Environmental Protection Measure

The *National Environmental Protection Measure (Air) 2003* (*NEPM (Air)*) was developed by the National Environment Protection Council. The desired environmental outcome of the measure is to provide ambient air quality that allows for the adequate protection of human health and well-being (refer to **Table 10-1**). This goal is the same as that contained in the *EPP (Air)*.

**Table 10-1 *NEPM (Air)* Standards and Goal for $PM_{10}$**

| Pollutant | Averaging Period | Maximum Concentration | Goal Maximum Allowable Exceedances |
|---|---|---|---|
| Particles as $PM_{10}$ | 1 day | 50 µg/m$^3$ | 5 days a year |

### 10.1.4. Project Specific Air Quality Criteria

Air emissions from the SGCP comprise mainly particulate matter, also referred to as dust. Particulate matter for the SGCP will be described in three size categories:

- $PM_{2.5}$
- $PM_{10}$
- TSP.

In summary the applicable air quality criteria (from *NEPM (Air)*, *EPP (Air)* and EPA Guideline 8) are:

- dust concentration of $PM_{2.5}$ 25 µg/m$^3$ averaged over 24 hours
- dust concentration of $PM_{2.5}$ 8 µg/m$^3$ averaged over a year
- dust concentration of $PM_{10}$ of 50 µg/m$^3$ over a 24 hour averaging time and no more than 5 occurrences per annum
- total suspended particulates of 90 µg/m$^3$ averaged over a year
- dust deposition of 120 mg/m$^2$/day.

## 10.2. DESCRIPTION OF ENVIRONMENTAL VALUES

The SGCP is situated approximately 12 km south-west of the township of Alpha in a well-established grazing region. The area surrounding the site has undulating topography comprising of open farmlands and native scrublands.

The activities to be undertaken at the SGCP include the extraction, handling, processing and placement of soil, overburden, interburden and coal. These processes will result in the release of particulate matter into the atmosphere and have the potential to increase the ground level concentration of particles and deposition of particulate matter.

The DEHP monitors ambient air levels across Queensland and these levels are assessed to comply against the *NEPM (Air)* and the *EPP (Air)*. Due to the remote location of the SGCP there are no ambient air quality monitoring stations within the SGCP vicinity.

There are no major population centres close to the SGCP and potential emission sources on air quality are relatively low. Potential sources of particulate emissions from the existing surrounding environment primarily comprise:

- farming and grazing activities
- existing commercial activities
- traffic on unsealed roads
- smoke from grass/bush fires (permitted or otherwise)
- naturally occurring wind-blown dust.

### 10.2.1. Climate

The SGCP is situated between Emerald and Barcaldine. Both of these locations maintain a Bureau of Meteorology weather monitoring station. Barcaldine is a manual station with the weather records recorded twice daily. The closest Bureau of Meteorology continuous recording Automatic Weather Station (AWS) is located at Emerald.

Alpha is situated in central western Queensland, an inland tropical area. The region has a warm climate with two distinct seasons, a dry winter season and a wet summer season. Dry season temperatures average from 9 to 30 degrees Celsius (°C), while wet season temperatures range from around 18 to 35 °C. The region averages approximately 550 millimetres (mm) of rainfall each year, falling mostly between November and March. Typical climate data for the Alpha region is available in **Figure 10-1**.

During the wet summer season the soil moisture content increases and there is increased grass ground cover. This results in lower dust emissions from most activities, including from local roads and grazing lands. During the dry winter season the soil moisture content reduces (particularly at and close to the surface) and grass cover reduces. Dust emissions are more prevalent from most activities during this period. This is also the period when grass fires, including permitted fires are likely to occur. These fires release significant quantities of smoke into the lower atmosphere.

There is a dominant easterly component to the winds at Emerald. Any particulate or gaseous emissions from the SGCP are mostly likely to travel away from Alpha to the west, towards isolated rural residences.

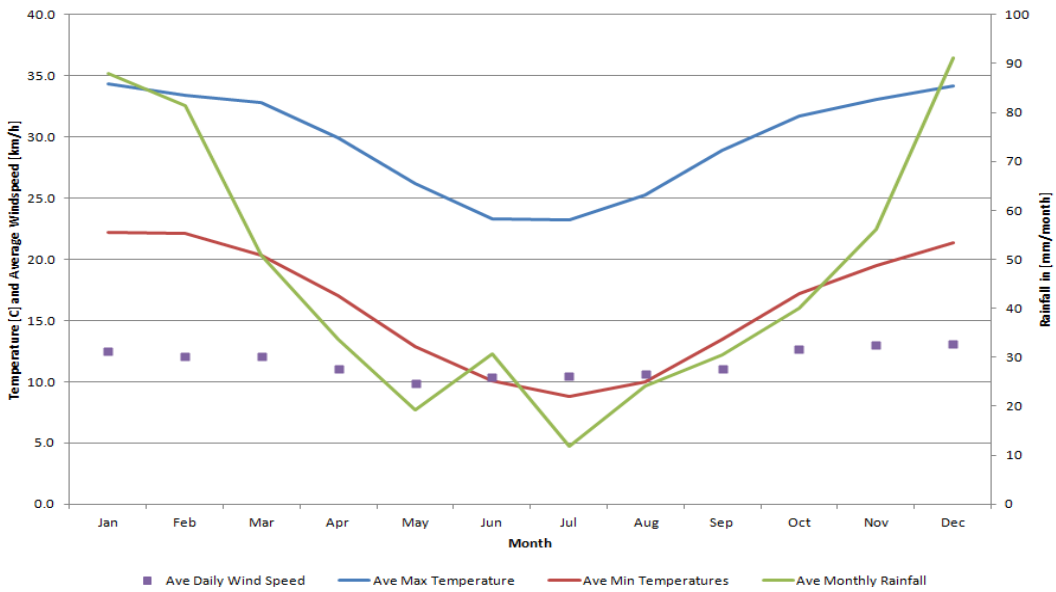



**Figure 10-1 Typical Climate Data for Alpha Township**

### 10.2.2. Sensitive Receptors

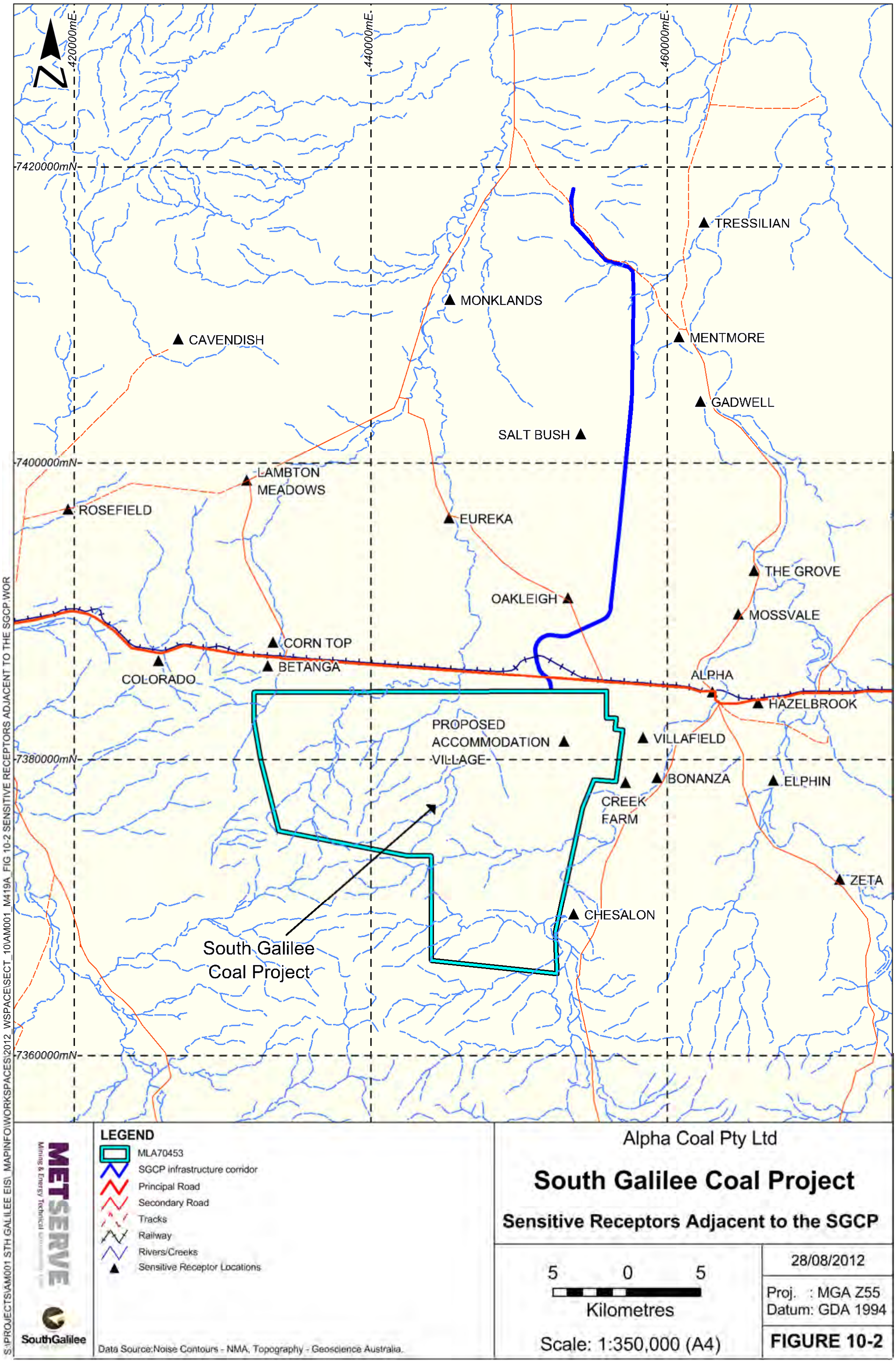
Eleven sensitive receptors have been identified within 19 km of the closest approach of the SGCP. The closest sensitive receptor is located within 1 km of the Mining Lease Application (MLA) 70453 boundary.

The sensitive receptors in the vicinity of the SGCP comprise the homesteads of grazing properties, the Alpha township and the proposed accommodation village located within MLA 70453. The closest sensitive receptors are shown on **Figure 10-2**. The locations and separation distances are displayed in **Table 10-2**.

The closest sensitive receptors to the proposed railway corridor are the Oakleigh Station Homestead, the Saltbush Station Homestead and the proposed accommodation village located within MLA 70453. Each has a separation distance of approximately 2 km from the proposed railway. The locations and separation distances are contained in **Table 10-2**.

**Table 10-2 Sensitive Receptors Adjacent to MLA 70453 and Infrastructure Corridor**

| Sensitive Receptor | Separation Distance (km) from Sensitive Receptor to: | | |
|---|---|---|---|
| | MLA 70453 | Surface Works | Railway Corridor |
| Alpha Township | 7 | 14 | 8 |
| Villafield Station Homestead | 1 | 9 | 6 |
| Bonanza Station Homestead | 2 | 10 | 9 |
| Creek Farm Station Homestead | 1 | 8 | 8 |
| Chesalon Station Homestead | 1 | 6 | 15 |
| Betanga Station Homestead | 2 | 12 | 18 |
| Corn Top Station Homestead | 3 | 12 | 18 |
| Oakleigh Station Homestead | 6 | 8 | 2 |
| Eureka Station Homestead | 12 | 14 | 11 |
| Saltbush Station Homestead | 17 | 19 | 2 |
| Proposed Accommodation Village | Within MLA 70453 | 3 | 2 |




Alpha Coal Pty Ltd

**South Galilee Coal Project**

**Sensitive Receptors Adjacent to the SGCP**

28/08/2012

5 0 5

Kilometres

Scale: 1:350,000 (A4)

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-2**

### 10.2.3. Background Levels of Particulate Matter and Dust Deposition

To effectively assess the potential air impacts of the SGCP it was important to measure and understand the existing air quality environment and current dust deposition levels at the surrounding sensitive receptors. Both short and long-term air quality/dust monitoring has been completed to fully understand the impacts to the air environment surrounding the SGCP. The full extent of the dust monitoring is detailed below.

#### *10.2.3.1. Ambient air quality/dust concentration monitoring*

Monitoring of the existing ambient dust concentration was undertaken at three locations:

- Alpha (east of the SGCP)
- Creek Farm Homestead (east of the SGCP)
- Oakleigh Station Homestead (north of the SGCP).

These properties were selected to represent potentially affected residences closest to the SGCP. Since easterly winds dominate, it was considered appropriate that dust concentration measurements be obtained both upwind and downwind of the SGCP location.

Monitoring was conducted over a period of seven days in July 2011. This time period was selected as a representative time period to reflect true and repeated conditions that are typically experienced in the area without influence from seasonal variations.

Two unattended automatic air quality loggers, one configured to record $PM_{10}$ concentrations and the other $PM_{2.5}$ concentrations, recorded air quality statistics at 15 minute intervals. The equipment was positioned near homesteads in the house compound at least 4 metres (m) from the dwellings. To convert from 15 minute intervals to 24 hour averaging, it was necessary to arithmetically average the 96, 15 minute measurements making up the 24 hours.

The particulate emission sources noted during the monitoring were typical of a rural grazing area. This includes:

- farming and grazing activities
- existing commercial activities
- unsealed roads
- smoke from grass and brush fires.

**Table 10-3** provides a summary of the ambient atmospheric dust concentrations at the three sensitive receptors.

**Table 10-3 Summary of Ambient Atmospheric Dust Concentrations**

| Date | Ambient Dust Concentrations–24 Hour Average | | | | | |
|---|---|---|---|---|---|---|
| | Alpha | | Creek Farm Homestead | | Oakleigh Homestead | |
| | $PM_{2.5}$ (ug/m³) | $PM_{10}$ (ug/m³) | $PM_{2.5}$ (ug/m³) | $PM_{10}$ (ug/m³) | $PM_{2.5}$ (ug/m³) | $PM_{10}$ (ug/m³) |
| 20 July 2011 | 7 (Note 1) | 18 (Note 1) | 1 (Note 1) | 13 (Note 1) | - | - |
| 21 July 2011 | 5 | 16 | 2 | 14 | 3 (Note 1) | 19 (Note 1) |
| 22 July 2011 | 4 | 14 | 1 | 13 | 4 | 9 |
| 23 July 2011 | 4 | 14 | 2 | 12 | 4 | 8 |
| 24 July 2011 | 5 | 15 | 2 | 15 | 4 | 8 |
| 25 July 2011 | 6 | 17 | 3 | 17 | 5 | 8 |
| 26 July 2011 | 7 | 18 | 4 | 15 | 7 | 10 |
| 27 July 2011 | - | - | 5 (Note 1) | 16 (Note 1) | 8 | 10 |
| 28 July 2011 | - | - | - | - | 4 (Note 1) | 4 (Note 1) |
| Median | 5 | 15 | 2 | 14 | 4 | 8 |
| Maximum | 7 | 18 | 4 | 17 | 8 | 10 |

Note 1: Averaging period less than 24 hours

#### *10.2.3.1.1. Alpha*

There appears to be a daily cycle in the monitored dust concentration levels that were recorded at Alpha, with the minimum dust levels (between 0 µg/m³ and 4 µg/m³ for $PM_{2.5}$ and between 9 µg/m³ and 15 µg/m³ for $PM_{10}$) occurring between 2 am and 6 am. Dust levels were found to be higher during the day, with both a morning and evening peak. This is most likely attributable to increases in dust producing activities (i.e. vehicular traffic, lawn mowing) in the vicinity of the monitor.

#### *10.2.3.1.2. Creek Farm Homestead*

There appears to be a daily cycle in the monitored dust concentrations that were recorded at the Creek Farm Homestead, with the minimum dust levels (between 0 µg/m³ and 4 µg/m³ for $PM_{2.5}$ and between 9 µg/m³ and 15 µg/m³ for $PM_{10}$) occurring between midnight and 6 am. Dust levels were found to be higher during the day with an evening peak. At or around 6 pm, a large number of short-term peaks of high dust concentration levels (higher than typical range) were found to occur. This is likely a result of increased incidences of dust generating activities (i.e. cars/machinery on unsealed roads, lawn mowing) in the vicinity of the monitor.

#### *10.2.3.1.3. Oakleigh Station Homestead*

Consistent with the results from Alpha and the Creek Farm Homestead, there was a recorded daily cycle in the monitored dust concentration levels at the Oakleigh Station Homestead. The minimum dust levels occurred between 2 am and 6 am and vary between 1 µg/m³ and 3 µg/m³ for $PM_{2.5}$ and between 2 µg/m³ and 10 µg/m³ for $PM_{10}$.

The dust levels are generally higher during the day with an evening peak. The $PM_{2.5}$ daily maximum typically occurs about 2 pm and is about 10 µg/$m^3$ higher than the minimums. The $PM_{10}$ daily maximum typically occurs about 6 pm and is also about 10 µg/$m^3$ higher than the minimums.

The monitoring at this site produced unusual results, as dust levels during the day appear to mostly comprise $PM_{2.5}$ particulates. These atypical results are likely to be due to fires that had been occurring at the time of monitoring.

#### *10.2.3.2. Dust deposition monitoring*

SGCP has commenced long-term dust deposition sampling at representative sensitive receptors locations surrounding the proposed mine, including:

- Alpha
- Betanga Station Homestead
- Chesalon Station Homestead
- Creek Farm Station Homesteads
- Oakleigh Station Homestead
- Saltbush Station Homestead
- Villafield Station Homestead.

The sampling results for September, October and November 2011 are contained in **Table 10-4**.

The results for four of the locations during the September period show an unusually high amount of soluble matter, most likely birds soiling the sample. Hence, the total insoluble solids are taken to be representative of dust fallout for all locations during September 2011.

The highest monthly dust deposition recording was at Oakleigh Station for the month of October. In this instance there was a high proportion of soluble matter and combustible matter suggesting an organic origin of the dust fallout. The ash component of the dust fallout has remained the most reliable indicator of dust fallout. Disregarding the unusually high reading for Oakleigh Station, the highest dust deposition (based on insoluble solids) is 45 mg/$m^2$/day.

**Table 10-4 Dust Deposition Sampling Results for September, October and November 2011**

| Location | Date | Total Solids (mg/m²/day) | Insoluble Solids (mg/m²/day) | Ash (mg/m²/day) | Soluble Matter (mg/m²/day) | Combustible Matter (mg/m²/day) |
|---|---|---|---|---|---|---|
| Alpha (House) | Sept 2011 | 121 | 28 | 22 | 93 | 6 |
| | Oct 2011 | 56 | 42 | 30 | 14 | 12 |
| | Nov 2011 | 83 | 45 | 5 | 38 | 40 |
| Oakleigh Station | Sept 2011 | 118 | 21 | 18 | 97 | 3 |
| | Oct 2011 | 165 | 90 | 31 | 75 | 59 |
| | Nov 2011 | 62 | 16 | 8 | 46 | 8 |
| Saltbush Station | Sept 2011 | 108 | 28 | 21 | 80 | 7 |
| | Oct 2011 | 50 | 38 | 30 | 12 | 8 |
| Villafield Station | Sept 2011 | 69 | 19 | 14 | 50 | 5 |
| | Oct 2011 | 38 | 26 | 15 | 12 | 11 |
| | Nov 2011 | 61 | 23 | 14 | 38 | 9 |
| Creek Farm Homestead | Sept 2011 | 21 | 13 | 11 | 8 | 2 |
| | Oct 2011 | 43 | 37 | 30 | 6 | 7 |
| Betanga Station | Oct 2011 | 49 | 29 | 21 | 20 | 8 |
| | Non 2011 | 48 | 29 | 18 | 19 | 11 |
| Chesalon Station | Oct 2011 | 58 | 41 | 30 | 14 | 12 |
| | Nov 2011 | 65 | 27 | 16 | 38 | 11 |

Note: Dust deposition not recorded at Betanga and Chesalon Stations in September 2011 or at Creek Farm and Saltbush Stations in November 2011 due to sampling problems.

## 10.3. AIR QUALITY MODELLING METHODOLOGY

Air quality modelling was used to predict and model the potential ground-level concentrations of pollutants and the rate of particulate and dust deposition and surrounding sensitive receptors resulting from the operational stage activities at the SGCP.

Emissions resulting from construction phase operations are relatively minor in comparison to emissions from the operational mine. The construction phase has not been modelled as the dust emissions are predicted to be substantially lower than the emissions modelled for an operational mine. Conservatively, the assessment of the operational mine applies for the construction phase.

The modelling adopted for the SGCP involves a sophisticated approach to identify the emissions for each hour over a two year period using meteorological data to refine the emission rates.

The modelling approach is comprised of three phases:

1. Preparation of meteorological data
2. Development of an emissions database
3. Air pollution modelling.

A more detailed description of the methods used for the air quality assessment and modelling limitations is available in **Appendix L—Air Quality Technical Report**.

### 10.3.1. Particulate Criteria

Particulate matter is characterized by its size. Particulate size ranges, specified in ambient air criteria are:

- total suspended particulate (TSP)
- particulate matter below 10 microns ($PM_{10}$)
- particulate matter below 2.5 microns ($PM_{2.5}$).

By definition, TSP includes both the $PM_{10}$ and $PM_{2.5}$ fractions, and $PM_{10}$ includes the $PM_{2.5}$ fraction. Under normal conditions, dust particles with aerodynamic diameters of more than $PM_{10}$ will typically fall out and be deposited onto the ground within several minutes of release.

The averaging period for ground level concentrations of pollutants are consistent with the relevant averaging periods for air quality indicators and goals in the *EPP (Air) 2008* and the NEPM Air.

The SGCP ToR (refer to **Appendix A—Final EIS ToR**) indicates that the modelling of $PM_{10}$ must be conducted for:

- 1 hour
- 24 hours
- annual averaging periods.

However, the 1-hour averaging time has not been used as there is no appropriate criterion for $PM_{10}$ 1-hour for the NEPM Air or *EPP (Air)*.

### 10.3.2. Preparation of Meteorological Data

Commonwealth Scientific and Industrial Research Organisation's (CSIRO) The Air Pollution Model (TAPM) was used to develop a detailed meteorological dataset for the SGCP. TAPM is highly regarded in the scientific community as a suitable tool to develop meteorological data sets for sites without site-specific meteorological observations.

The TAPM model uses larger scale synoptic meteorology data to predict the air flows important to local scale air pollution, such as sea breezes and terrain induced air flows. The TAPM used baseline meteorological information from a two year period, 2004 and 2005. These years were selected for modelling as Queensland was generally free from extreme weather events such as cyclones.

This 2 year period was then modelled by TAPM to produce a detailed meteorological data set representing 15 minute intervals over a two year period.

### 10.3.3. Project Emission Sources

#### *10.3.3.1. Construction Phase Emissions*

Particulate and dust emissions during the initial construction phase of the SGCP will result from the following activities:

- clearing of topsoil and vegetation
- excavation and transport of waste material
- blasting activities
- vehicle traffic on unpaved roads
- exhaust from vehicles and machinery.

Air emissions during the construction phase of the SGCP will be primarily dust related with some minor emissions of combustible pollutants.

#### *10.3.3.2. Operational Phase Emissions*

Particulate and dust emissions during the operational phase of the SGCP will result from the following activities:

- graders and dozers
- draglines
- trucks and shovels
- scrapers
- dumping and spreading of overburden and interburden
- conveying and dumping of ROM coal
- loading and unloading of stockpiles
- blasting
- transport of materials
- loading of trucks and trains.

No hazardous or toxic pollutants are expected to be released from the mining activities at the SGCP at sufficient quantities to be of concern to human or environmental health. Odour may occur from mining related activities, including the burning of fuel, equipment use or explosive usage however it is not expected to reach significant levels in the ambient air.

Further details of the operational modelling parameters and limitations can be found in **Appendix L—Air Quality Technical Report**.

#### *10.3.3.3. Other Gaseous and Odorous Compounds*

The combustion of diesel in mining machines will result in gaseous emissions of carbon dioxide ($CO_2$), nitrogen dioxide ($NO_2$) and sulphur dioxide ($SO_2$). Blasting also results in gaseous emissions.

In practice, the sources of gaseous emissions are widely dispersed and have low emission levels and a much localised impact. Thus the likelihood of exceeding environmental air quality limits beyond the SGCP MLA boundary is minimal. As a consequence it is not proposed to address the gaseous emissions in this assessment. However, the use of diesel fuels, along with release of methane from coal and other matters makes the SGCP a source of greenhouse gases. Greenhouse Gas Emissions are addressed in **Section 11—Greenhouse Gas Emissions**.

### 10.3.4. Development of an Emissions Database

An emissions database was developed to detail the predicted air emissions from the SGCP. The development of an accurate and representative emissions database has been based on the National Pollution Inventory (NPI) 'Emission Estimation Technique Manual for Mining Version 2.3' (NPI 2003) and the United States Environmental Protection Agency (US-EPA) AP-42 (2003) 5th Update.

To develop the database, the main mining activities and processes that produce or could produce dust emissions during the operation phase were identified. This information was then used to prepare process flowcharts for the handling of all overburden, interburden, coal and waste rock. An emission factor from the NPI 2003 was attributed to every handling point, handling activity and transport section within the flow charts. In addition, emissions for exposed surfaces were identified, sized and included in the database.

The emissions database provides an emission rate from every operation for each hour of the 2 year period and included the effects of dust emission controls due to rainfall and the operation of water trucks. Emissions for wind generated dusts have also been included with control only provided by rainfall.

The annual emission rates for the individual dust sources, excluding the pit retention factor and including dust controls, are shown in **Table 10-5**.

The total annual emission rates for the combined dust sources, excluding the pit retention factor and including dust controls are presented in **Table 10-6**.

**Table 10-5 Dust Emissions for Main Dust Activities in Tonnes Per Annum (excluding Pit Retention and including Dust Controls)**

| Sources | Location | Case 1 – Year 3 (Total Annual Tonnes/Annum) | | | Case 2 – Year 26 (Total Annual Tonnes/Annum) | | |
|---|---|---|---|---|---|---|---|
| | | $PM_{2.5}$ | $PM_{10}$ | TSP | $PM_{2.5}$ | $PM_{10}$ | TSP |
| Dragline | Northern pit | - | - | - | 46 | 367 | 847 |
| | Southern pit | 168 | 1,345 | 3,104 | 69 | 551 | 1,271 |
| Excavator (overburden) | Northern pit | 1.3 | 10 | 21 | 0.4 | 3 | 7 |
| | Southern pit | 0.3 | 3 | 5 | 0.6 | 5 | 11 |
| Excavator (coal) | Northern pit | 9.3 | 74 | 154 | 8.9 | 71 | 148 |
| | Southern pit | 21.6 | 173 | 360 | 13.4 | 107 | 223 |
| Dump truck (overburden) travelling | Northern pit | 10.7 | 85 | 387 | 8.8 | 70 | 318 |
| | Southern pit | 26.7 | 214 | 967 | 13.2 | 105 | 477 |
| | Spoil dumps & rehabilitation areas | 16.0 | 128 | 580 | 14.7 | 117 | 530 |
| Haul truck (coal) travelling | Northern pit | 8.0 | 64 | 288 | 5.5 | 44 | 199 |
| | Southern pit | 11.6 | 93 | 419 | 8.2 | 66 | 298 |
| | Haul road north | 11.8 | 94 | 428 | 13.1 | 105 | 475 |
| | Haul roads south | 16.0 | 128 | 579 | 16.0 | 128 | 580 |
| Conveyor | From underground to CHPP | 3.2 | 45 | 113 | 1.6 | 23 | 58 |
| | Transfer towers | 1.7 | 14 | 29 | 0.9 | 7 | 15 |
| Bulldozer (coal) | Northern pit | 11.9 | 95 | 298 | 21.4 | 171 | 537 |
| | Southern pit | 23.8 | 190 | 596 | 32.1 | 257 | 805 |
| | CHPP & Process area | 23.8 | 190 | 596 | 35.6 | 285 | 895 |
| Truck dumping coal | Northern dump station | 3.4 | 28 | 68 | 9.1 | 77 | 183 |
| | Southern dump station | 7.9 | 66 | 158 | 9.1 | 77 | 183 |
| Truck dumping overburden | Northern pit | 29.2 | 233 | 650 | 10.6 | 85 | 236 |
| | Southern pit | 26.0 | 207 | 577 | 16.0 | 127 | 355 |
| | Spoil dumps & rehabilitation areas | 9.7 | 78 | 217 | 17.7 | 141 | 394 |
| Drilling and Blasting | Northern pit | 0.2 | 1 | 3 | 0.1 | 1 | 2 |
| | Southern pit | 0.2 | 1 | 3 | 0.2 | 2 | 3 |
| Graders | Northern pit | 2.1 | 17 | 53 | 0.8 | 6 | 20 |
| | Southern pit | 3.1 | 25 | 76 | 1.2 | 10 | 30 |
| | Haul road north | 3.2 | 25 | 78 | 1.9 | 15 | 48 |
| | Haul roads south | 4.3 | 34 | 106 | 2.4 | 19 | 58 |

**Table 10-5 Dust Emissions for Main Dust Activities in Tonnes Per Annum (excluding Pit Retention and including Dust Controls) (cont)**

| Sources | Location | Case 1 – Year 3 (Total Annual Tonnes/Annum) | | | Case 2 – Year 26 (Total Annual Tonnes/Annum) | | |
|---|---|---|---|---|---|---|---|
| | | $PM_{2.5}$ | $PM_{10}$ | TSP | $PM_{2.5}$ | $PM_{10}$ | TSP |
| Loading stockpiles | CHPP & Process area | 9.6 | 77 | 181 | 15.6 | 124 | 293 |
| Unloading stockpiles | CHPP & Process area | 73.5 | 588 | 1,356 | 118.9 | 951 | 2,196 |
| Loading trains | CHPP & Process area | 0.4 | 4 | 8 | 0.7 | 6 | 13 |
| Vents from underground mining | Various locations | 5.0 | 28 | 40 | 8.5 | 47 | 68 |
| Bulldozer (Overburden) | Northern pit | 24.7 | 197 | 839 | 14.0 | 112 | 477 |
| | Southern Pit | 21.9 | 175 | 746 | 21.1 | 168 | 716 |
| | Spoil dumps & rehabilitation areas | 8.2 | 66 | 280 | 23.4 | 187 | 795 |
| Erosion | Northern pit | 13.2 | 105 | 211 | 8.8 | 70 | 140 |
| | Southern pit | 8.8 | 70 | 140 | 13.2 | 105 | 211 |
| | Spoil dumps & rehabilitation areas | 8.8 | 70 | 140 | 6.6 | 53 | 105 |
| | Process areas | 2.2 | 18 | 35 | 2.2 | 18 | 35 |
| | Haul roads north | 6.6 | 53 | 105 | 6.6 | 53 | 105 |
| | Haul roads south | 4.4 | 35 | 70 | 6.6 | 53 | 105 |
| Totals (Tonnes/Annum) | | 642 | 5146 | 15,064 | 625 | 4991 | 14,468 |

**Table 10-6 Dust Emission for Main Dust Sources in Tonnes Per Annum (excluding Pit Retention Factor and including Dust Controls)**

| Operation | Emission Type | Pit Retention Factor Applies | Case 1 (Tonnes/Annum) | | | Case 2 (Tonnes/Annum) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $PM_{2.5}$ | $PM_{10}$ | TSP | $PM_{2.5}$ | $PM_{10}$ | TSP |
| In pit sources combined | Coal and overburden | Y | 423 | 3,378 | 9,897 | 313 | 2,505 | 7,332 |
| Spoil dumps and regeneration areas | Overburden | N | 43 | 342 | 1,217 | 62 | 498 | 1,825 |
| Roads | Road base | N | 46 | 369 | 1,365 | 47 | 373 | 1,372 |
| CHPP, rail loader, dump stations | Coal | N | 121 | 971 | 2,403 | 191 | 1538 | 3,797 |
| Underground operations, vents, conveyor, transfer stations | Coal | N | 10 | 86 | 182 | 11 | 77 | 141 |

### 10.3.5. Air Pollution Modelling

Air quality impacts have been assessed via dispersion modelling for the construction phases of the SGCP.

CSIRO's TAPM was used to model the predicted meteorology to estimate the pollutant concentrations in the region surrounding the SGCP.

TAPM is designed to predict ground-level concentrations or dry deposition of pollutants emitted from one or more sources, which may comprise either stacks, area sources, volume sources, line sources or any combination of these.

#### *10.3.5.1. Modelling Cases*

Two modelling cases have been prepared for two mining stages of the SGCP. Both cases related to the maximum rate of handling overburden for the respective mining phases. A description of modelling Case 1 – Year 3 (2017) and Case 2 – Year 26 (2040) is provided in **Table 10-7**.

***Case 1 – Year 3 (2017)***

The first case, Year 3, is during the ramp-up phase of the mine when the projected waste rock extraction reaches a maximum at 55.3 Mbcm. The product coal for this year is expected to be approximately 9.7 Mtpa.

***Case 2 – Year 26 (2040)***

Case 2 assumes a fully developed mine with the projected waste rock reaching its local maximum of 37.7 million bank cubic metres (Mbcm). The product coal for this year is approximately 17.1 million tonnes per annum (Mtpa). The peak waste rock production is the 26$^{th}$ year of the mine's operation and is considered representative of the worst case emissions after the 20$^{th}$ year of operations.

#### *10.3.5.2. Railway Corridor Modelling*

The Proponent has proposed to connect the SGCP to a common user rail line linking the Galilee Basin to the Abbott Point Coal Terminal. It is beyond the scope of this assessment to address dust emissions for the entire rail line route; the modelling will address the proposed rail spur leading from the SGCP to the proposed common user rail line. The Proponent is committed to complying with Queensland Rail's (QR) Coal Dust Management Plan, which stipulates various dust control measures (i.e. spray-on coal dust suppressant) for the rail transport of coal.

Railway corridor modelling has been based in the current best emission methods and is conservatively based on current dust emissions.

Modelling has been undertaken for a 10 km length of the SGCP rail spur and the dust concentration has been calculated at setbacks between 100 m and 10 km west of the railway. Ausplume modelling has been run with the TAPM meteorological file developed for the SGCP. The proposed rail spur was modelled as a series of volume sources with a spacing of 50 m between each source as was recommended by the Ausplume manual.

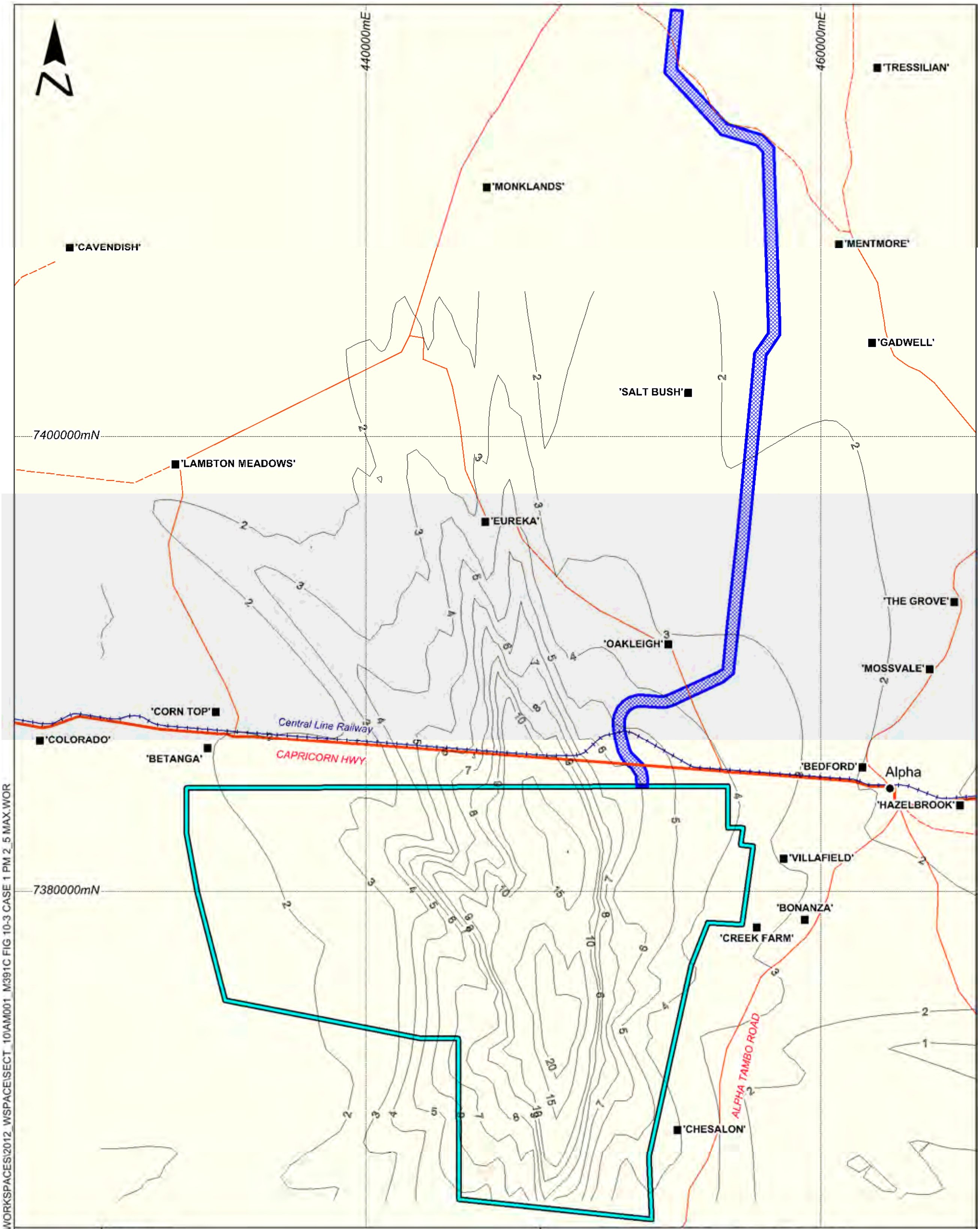
The proposed accommodation village has not been considered in the modelling as the speed of the train is close to zero and the dust emissions would be considerably lower in the vicinity of the rail loop.

**Table 10-7 Description of Modelling Case 1 – Year 3 (2017) and Case 2 – Year 26 (2040)**

| Item | Case 1 | Case 2 |
|---|---|---|
| Title | Development with one dragline (2017) and underground commencement | Two draglines and fully developed underground mine (2040) |
| Annual Product Coal (Mtpa) | 9.7 | 15.1 |
| Annual ROM Coal (Mtpa) | 7.35 Open-cut<br>3.04 Underground | 5.3 Open-cut<br>11.5 Underground |
| Waste rock (Mbcm) | 55 | 38 |
| In pit operations | • Dragline in north and southern pit<br>• Excavator on overburden<br>• Excavator on coal<br>• Dump trucks to overburden dump<br>• Haul trucks to ROM Bin (coal)<br>• Wind erosion. | • Dragline in north and southern pits<br>• Excavator on overburden<br>• Excavator on coal<br>• Dump trucks to overburden dump<br>• Haul trucks to ROM Bin (coal)<br>• Wind erosion. |
| Out of pit operations | • Dragline to waste rock emplacements<br>• Dump trucks to waste rock emplacements<br>• Haul trucks to ROM Bin (coal)<br>• Conveying (coal) from underground and ROM Bin to CHPP<br>• CHPP<br>• Rail loader<br>• Wind erosion<br>• Stockpiles. | • Dragline to waste rock emplacements<br>• Dump trucks to waste rock emplacements<br>• Haul trucks to ROM Bin (coal)<br>• Conveying (coal) from underground and ROM Bin to CHPP<br>• CHPP<br>• Rail loader<br>• Wind erosion<br>• Stockpiles. |
| Underground Mining | Vents (Ventilation fans) | Vents (Ventilation fans) |

## 10.4. MODELLING RESULTS

The calculated dust deposition and concentration contours (expressed in terms of μg/m$^3$) calculated from TAPM are illustrated in **Figure 10-3** to **Figure 10-14** inclusive.




S:\PROJECTS\AM001 STH GALILEE EIS_MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M391C FIG 10-3 CASE 1 PM 2_5 MAX.WOR

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**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- Elevation/Contours
- Homestead
- Population centre

Data Source: Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Case 1 - PM2.5 (24 Hour) Maximum

5 0 5

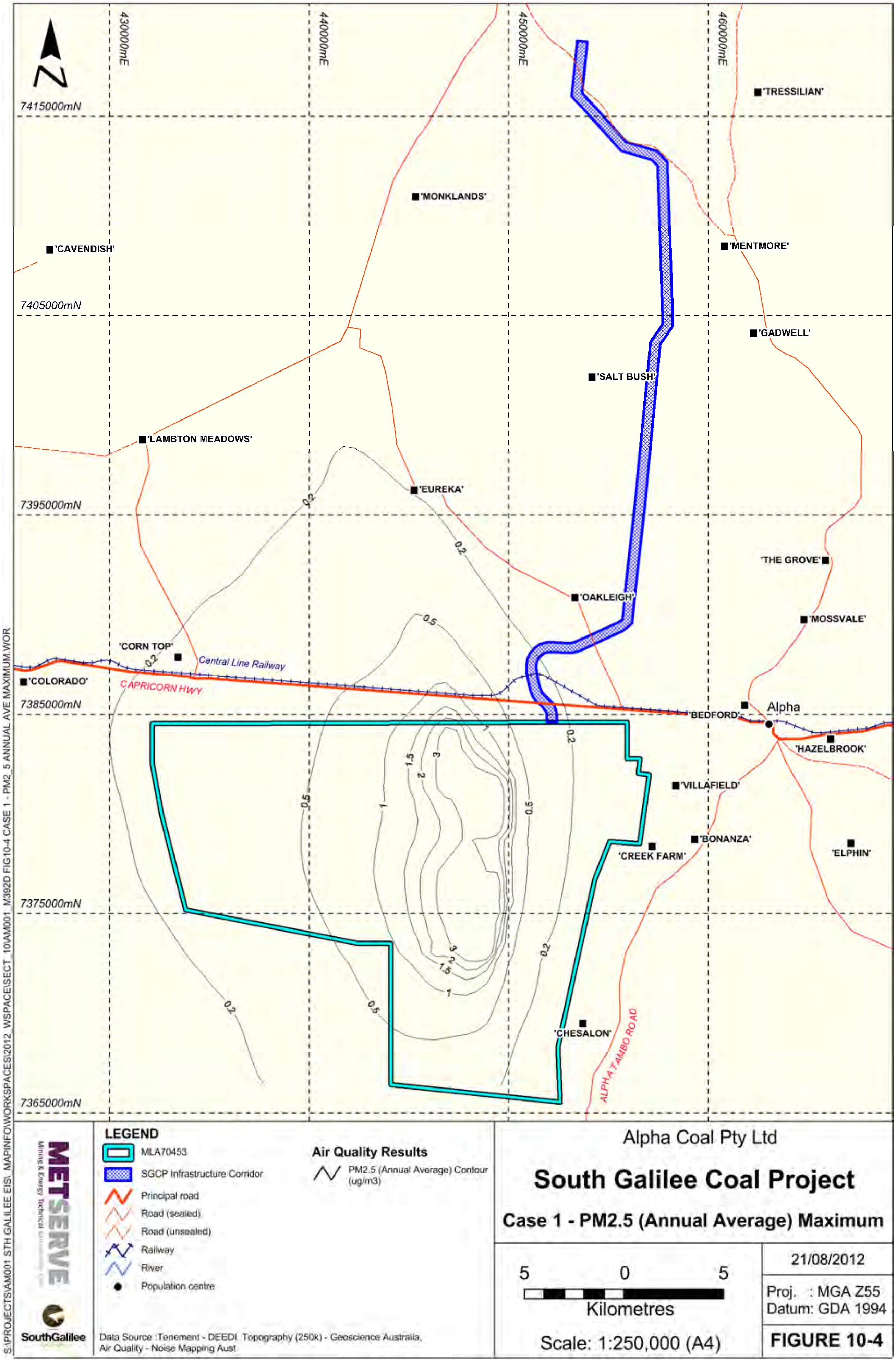
Kilometres

Scale: 1:250,000 (A4)

23/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-3**




S:\PROJECTS\AM001 STH GALILEE EIS_MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M392D FIG10-4 CASE 1 - PM2_5 ANNUAL AVE MAXIMUM.WOR

METSERVE Mining & Energy Technical Services

SouthGalilee

Data Source: Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

**South Galilee Coal Project**

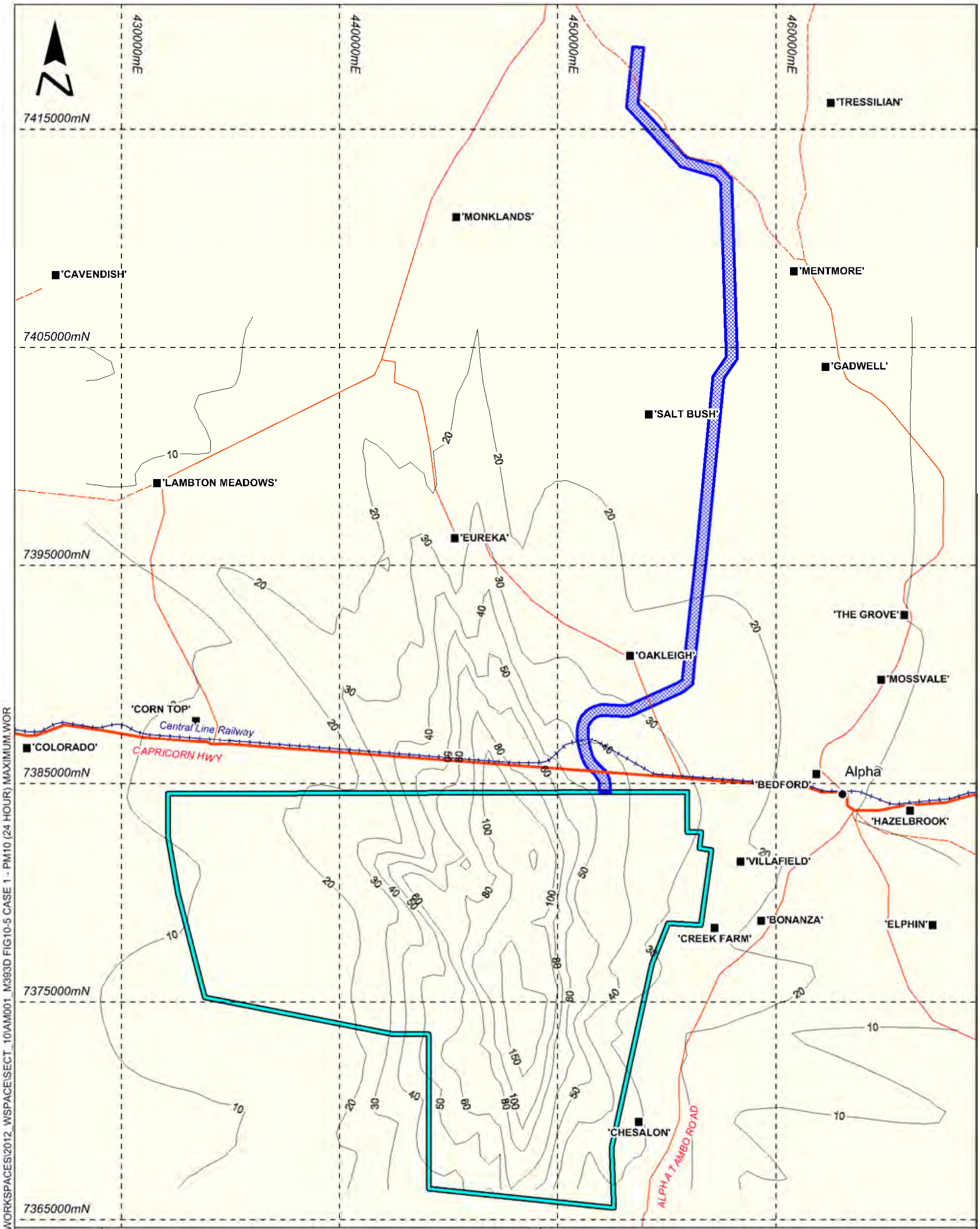
**Case 1 - PM2.5 (Annual Average) Maximum**

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-4**




S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFOWORKSPACES\2012_WSPACE\SECT_10\AM001_M393D FIG10-5 CASE 1 - PM10 (24 HOUR) MAXIMUM.WOR

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**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- PM2.5 (Annual Average) Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Case 1 - PM10 (24 hour) Maximum

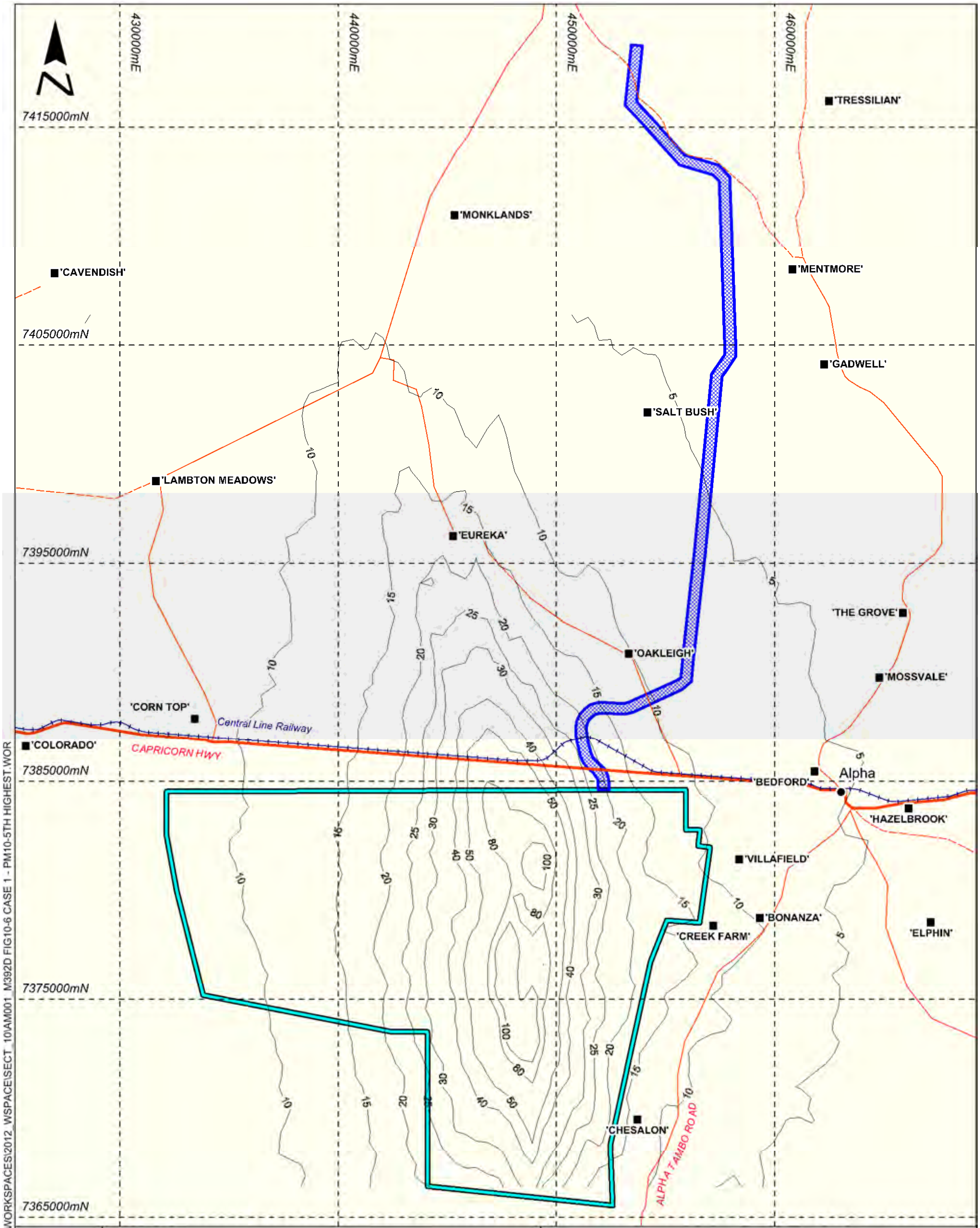
5 0 5
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-5**




S:\PROJECTS\AM001 STH GALILEE EIS_MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M392D FIG10-6 CASE 1 - PM10-5TH HIGHEST.WOR

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SouthGalilee

**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- PM10 (24 hour) 5th Highest Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

**South Galilee Coal Project**

**Case 1 - PM10 (24 hour) 5th Highest**

5 0 5

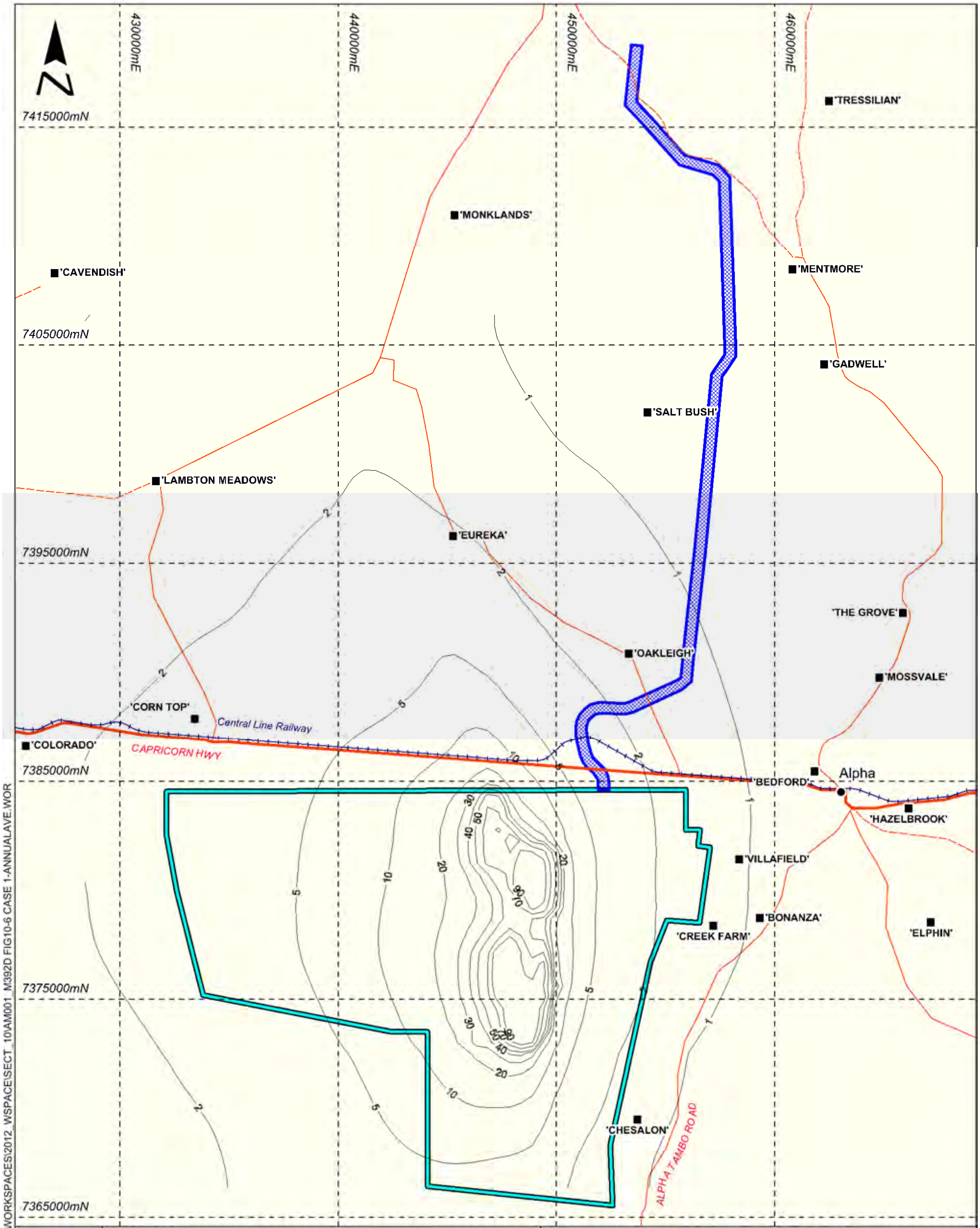
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-6**



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SouthGalilee

**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- TSP (Annual Average) Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

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# South Galilee Coal Project

## Case 1 - TSP (Annual Average)

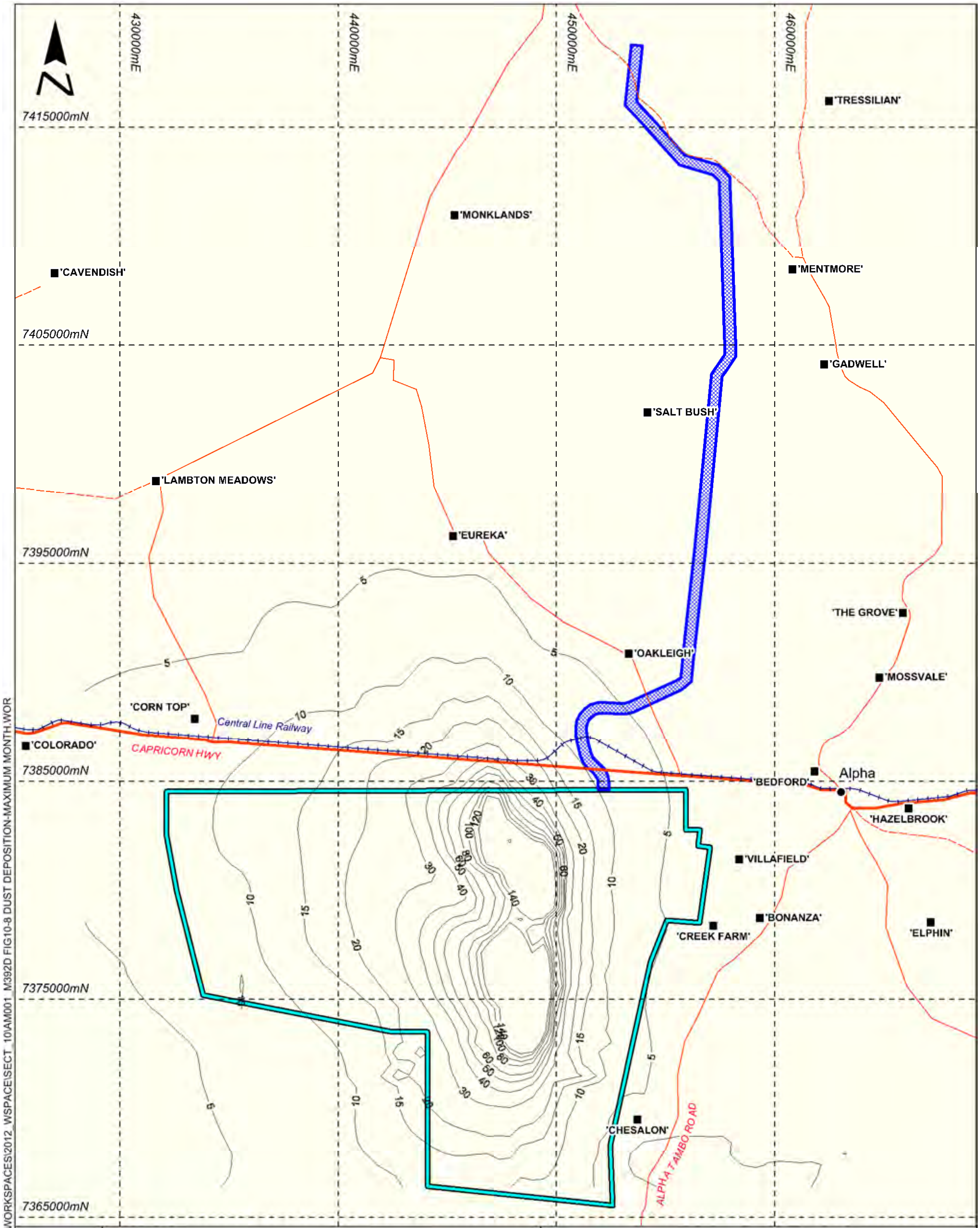
5 0 5
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-7**




S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M392D FIG10-8 DUST DEPOSITION-MAXIMUM MONTH.WOR

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**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- Dust deposition (Maximum Month) Contour (mg/m2/day)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia. Air Quality - Noise Mapping Aust

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# South Galilee Coal Project

## Case 1-Dust Deposition (Maximum Month)

5 0 5

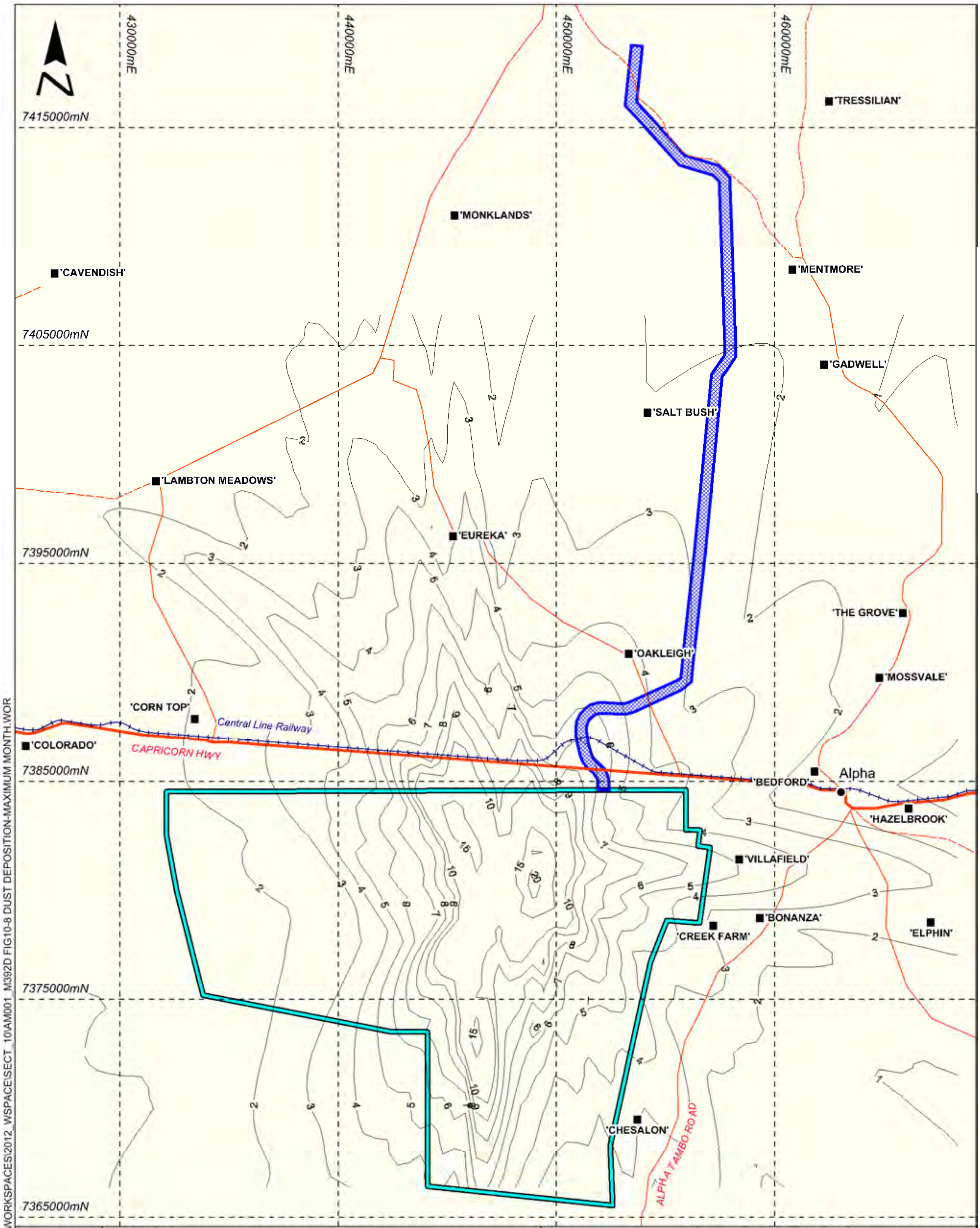
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-8**




## LEGEND

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

PM2.5 (24 hour) Maximum Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

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# South Galilee Coal Project

## Case 2 - PM2.5 (24 hour) Maximum

5 0 5

Kilometres

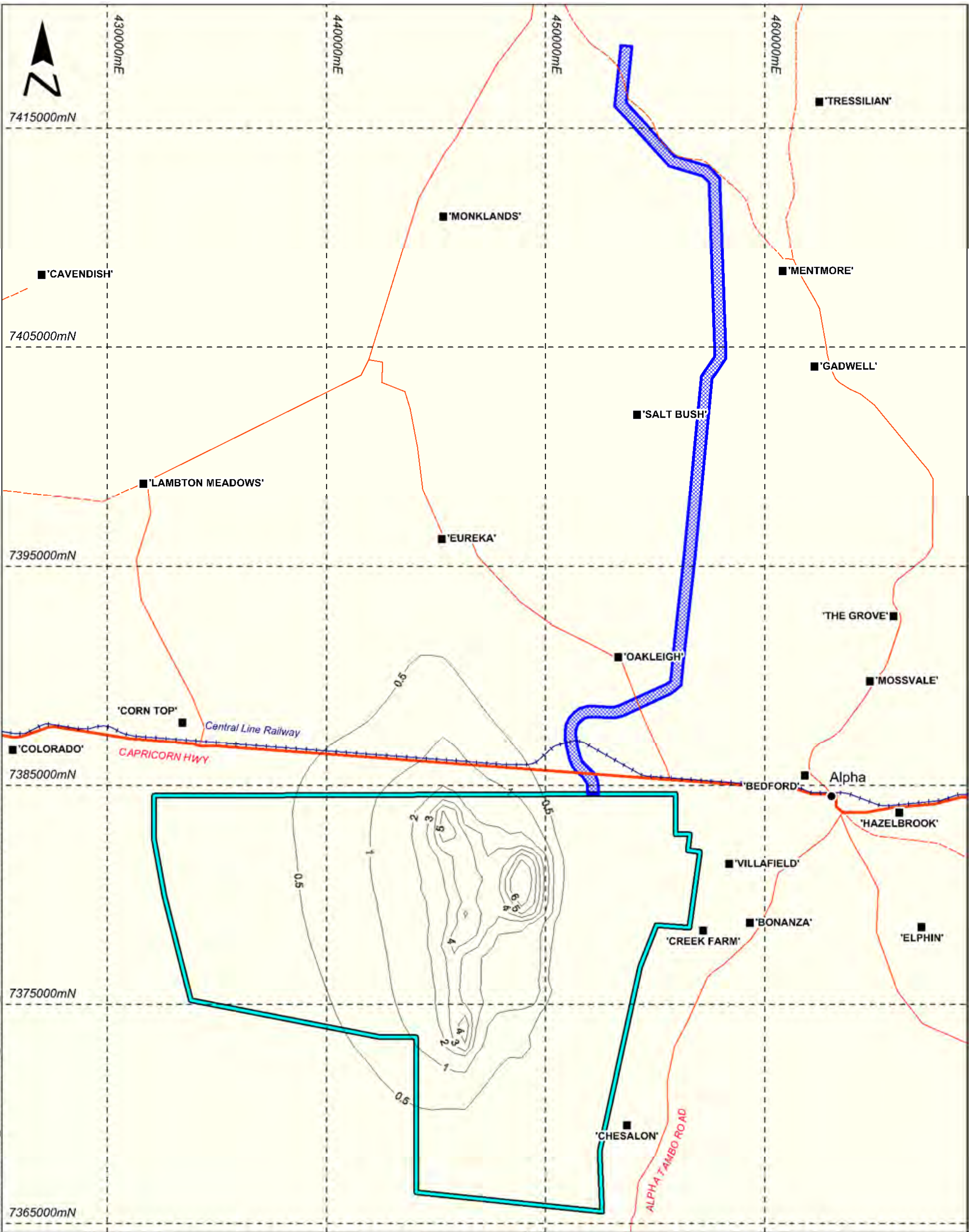
Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-9**

S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M392D FIG10-8 DUST DEPOSITION-MAXIMUM MONTH.WOR




S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFO\WORKSPACES\2012 WSPACE\SECT 10\AM001_M392D FIG10-10 CASE 2 PM 2_5 ANNUAL AVERAGE.WOR

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SouthGalilee

**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- PM2.5 (Annual Average) Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

## South Galilee Coal Project

### Case 2 - PM2.5 (Annual Average)

5 0 5

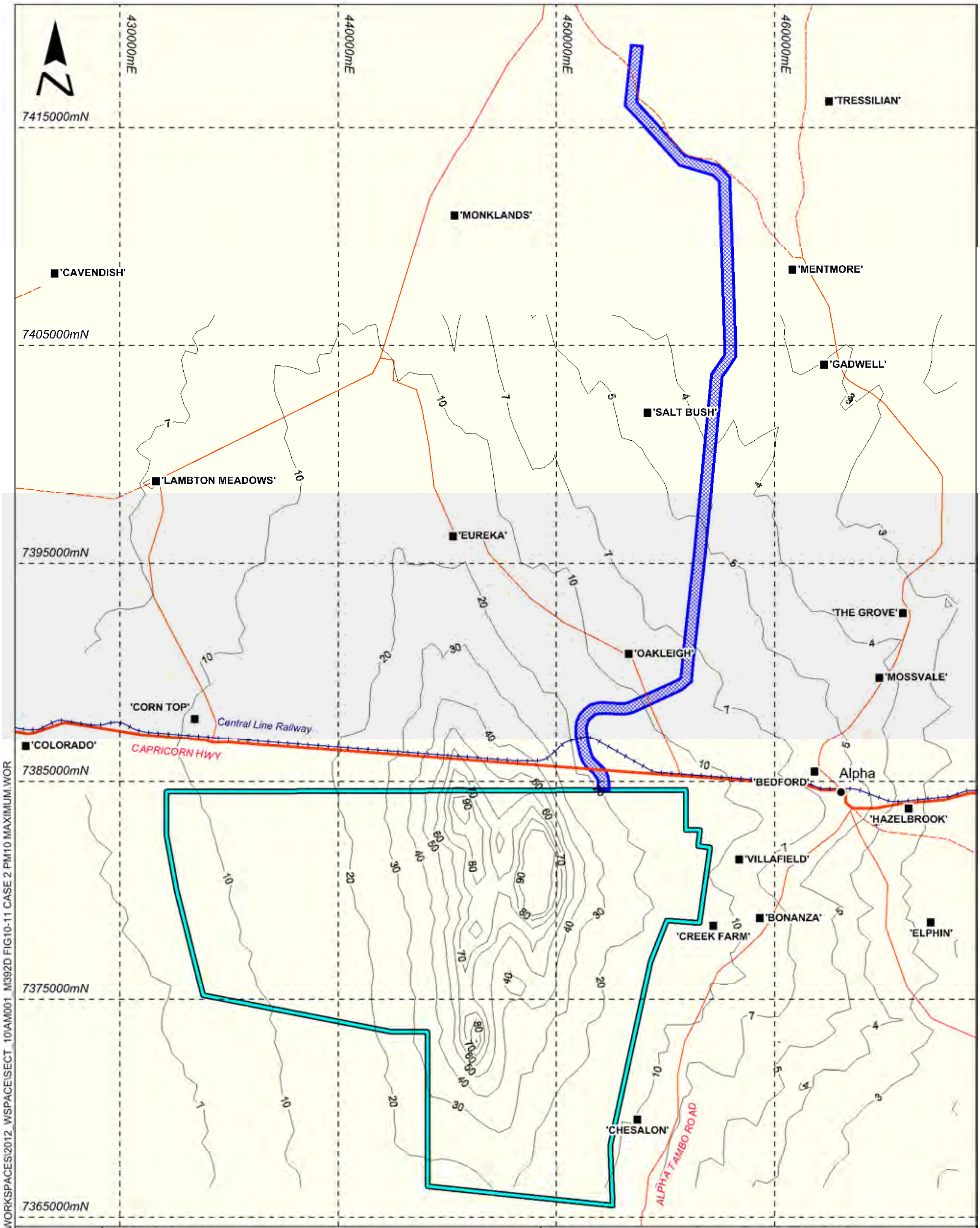
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-10**




S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFOWORKSPACES\2012 WSPACE\SECT 10\AM001 M392D FIG10-11 CASE 2 PM10 MAXIMUM.WOR

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SouthGalilee

**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- PM10 (24 hour) Maximum Contour (ug/m3)

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Case 2 - PM10 (24 hour) Maximum

5 0 5

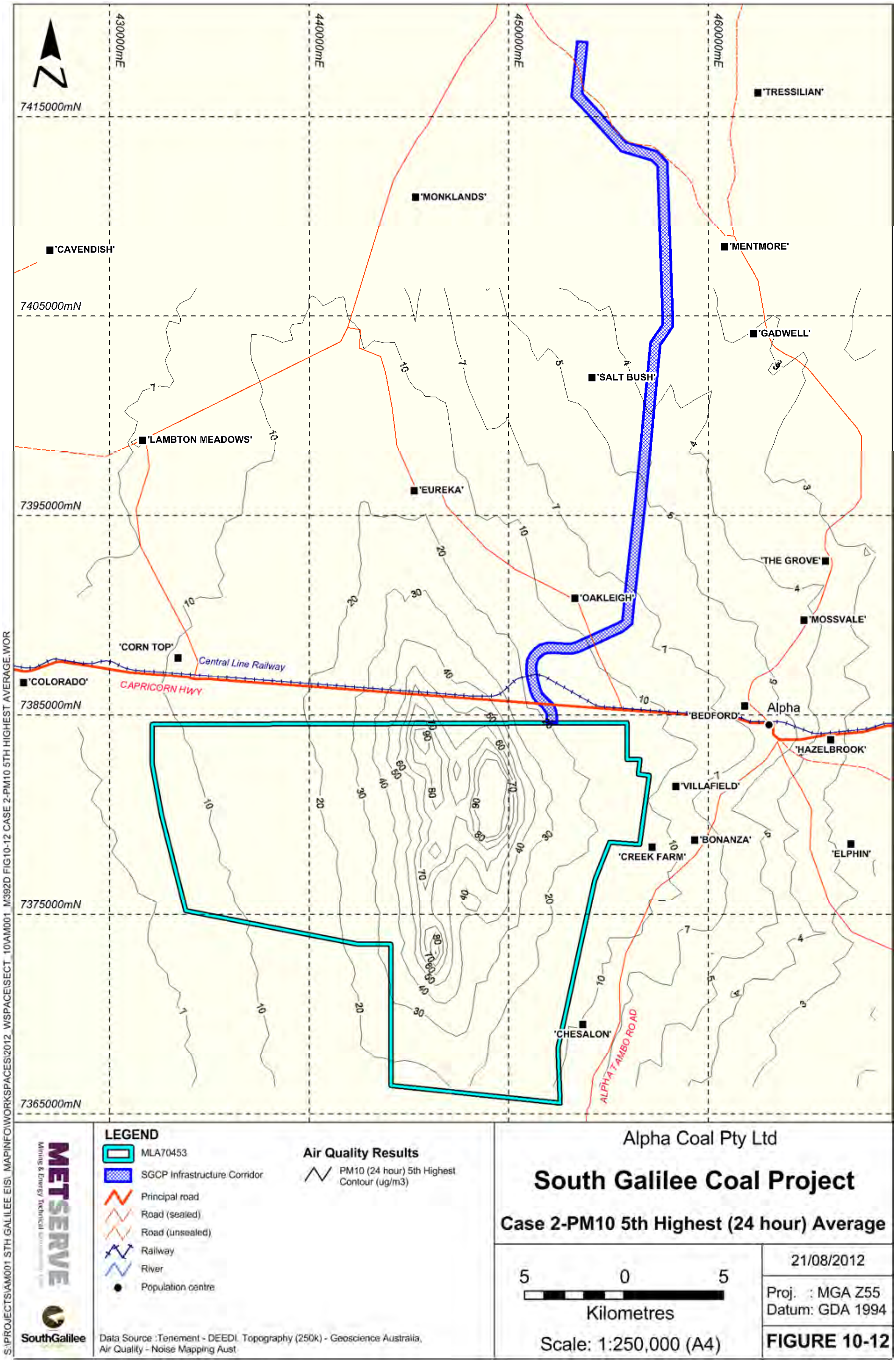
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-11**

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# South Galilee Coal Project

## Case 2-PM10 5th Highest (24 hour) Average

5 0 5

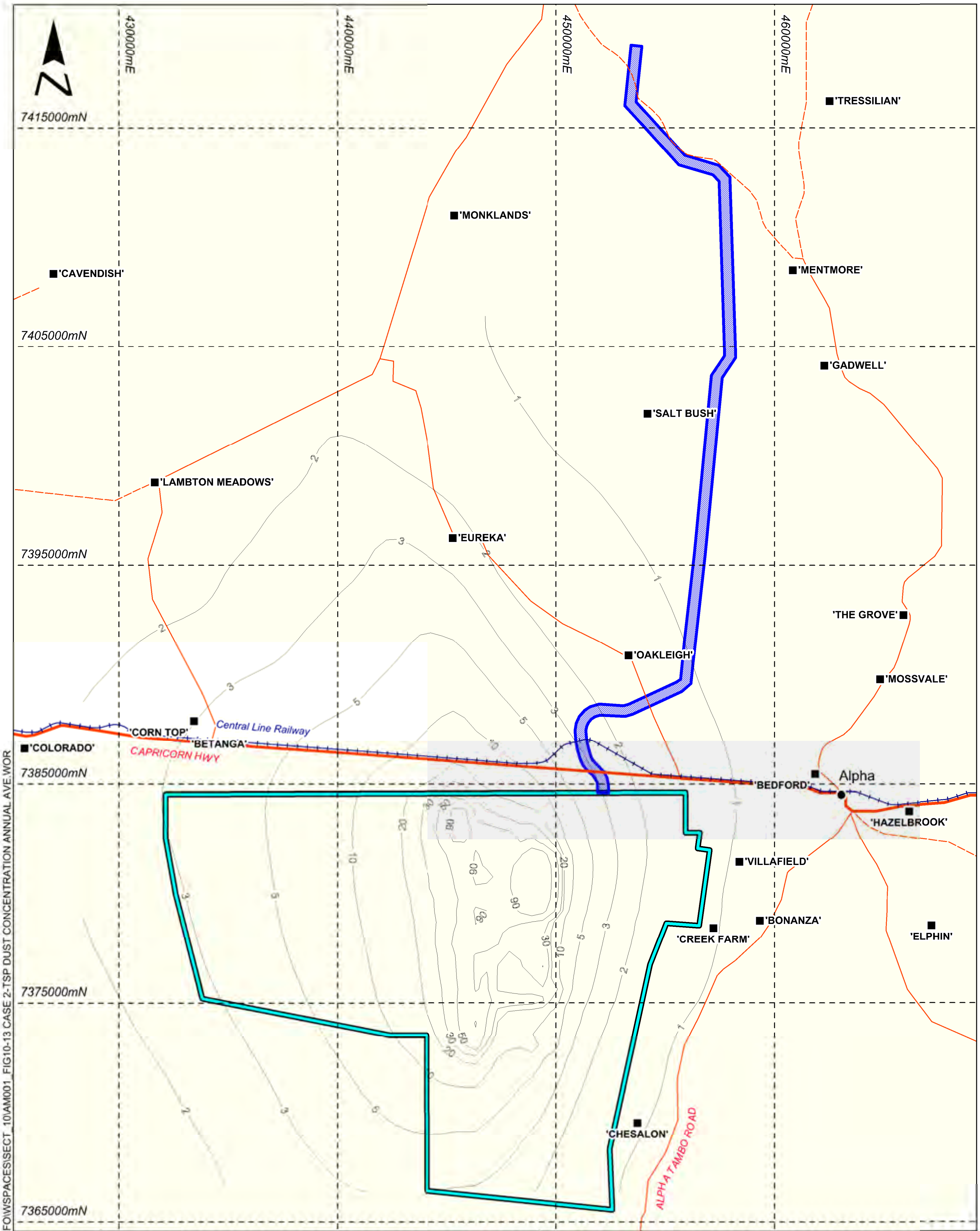
Kilometres

Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-12**




LEGEND

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- Homesteads
- Population centre

Air Quality Results

- TSP (Annua Average) Contour (ug/m3)

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SouthGalilee

Data Source: Tenement - DEEDI. Topography (250k) - Geoscience Australia.
Air Quality - Noise Mapping Aust

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# South Galilee Coal Project

## Case 2 - TSP Dust Concentration Annual Average

24/08/2012

5 0 5

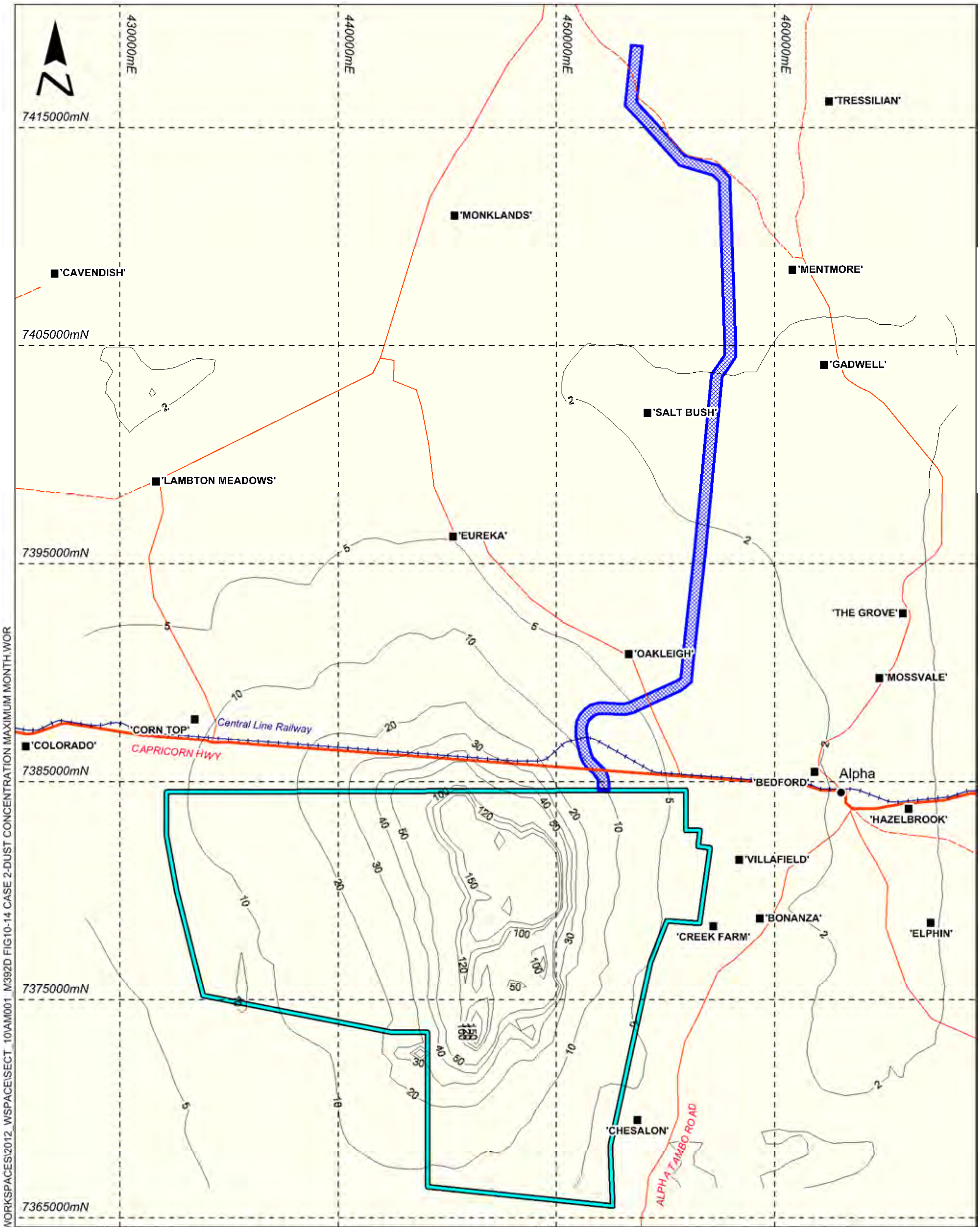
Kilometres

Scale: 1:250,000 (A4)

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-13**

S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFOWSPACES\SECT_10\AM001_FIG10-13 CASE 2-TSP DUST CONCENTRATION ANNUAL AVE.WOR






**LEGEND**

- MLA70453
- SGCP Infrastructure Corridor
- Principal road
- Road (sealed)
- Road (unsealed)
- Railway
- River
- Population centre

**Air Quality Results**

- Dust Deposition (Maximum Month) Contour (mg/m2/day)

METSERVE Mining & Energy Technical Services

SouthGalilee

Data Source :Tenement - DEEDI. Topography (250k) - Geoscience Australia, Air Quality - Noise Mapping Aust

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Case 2 - Dust Deposition Maximum Month

5 0 5
Kilometres
Scale: 1:250,000 (A4)

21/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 10-14**

### 10.4.1. Dust levels at Sensitive Receptors

The likely dust levels due to the operation of the mine at each nearby sensitive receptors have been determined and these are shown in **Table 10-8** for Case 1 – Year 3 (2017) and **Table 10-9** for Case 2 – Year 26 (2040).

Dust levels are largely within the nominated air quality goals, with the exception of $PM_{10}$ (24 hour maximum) at the accommodation village for both cases, and the Villafield Station Homestead in Case 2.

**Table 10-8 Predicted Dust Concentration and Dust Deposition for Sensitive Receptors (including assumed ambient levels) for Case 1 – Year 3 (2017)**

| Receptor | Calculated Dust Levels At Nearby Residences | | | | | |
|---|---|---|---|---|---|---|
| | PM2.5 (24 hour) (maximum) (µg/m³) | PM2.5 (annual average) (µg/m³) | PM10 (24 hour) (5th highest) (µg/m³) | PM10 (24 hour) (maximum) (µg/m³) | TSP (annual average) (µg/m³) | Dust Deposition (maximum month) (mg/m²/day) |
| **Limit** | **25** | **8** | **50** | **50** | **90** | **120** |
| ***Existing Ambient*** | ***8*** | ***5*** | ***18*** | ***18*** | ***25*** | ***45*** |
| Alpha Township | 10 | 5 | 24 | 33 | 25 | 47 |
| Villafield Station Homestead | 11 | 5 | 26 | 41 | 26 | 50 |
| Bonanza Station Homestead | 11 | 5 | 27 | 38 | 26 | 50 |
| Creek Farm Station Homestead | 11 | 5 | 31 | 41 | 27 | 50 |
| Chesalon Station Homestead | 12 | 5 | 32 | 50 | 27 | 50 |
| Betanga Station Homestead | 10 | 5 | 27 | 30 | 28 | 47 |
| Corn Top Station Homestead | 10 | 5 | 27 | 29 | 28 | 53 |
| Oakleigh Station Homestead | 11 | 5 | 29 | 43 | 27 | 50 |
| Eureka Station Homestead | 12 | 5 | 34 | 45 | 27 | 49 |
| Saltbrush Station Homestead | 10 | 5 | 33 | 24 | 26 | 49 |
| Proposed Accommodation Village | 14 | 5 | 38 | 58 (exceeds 50 for one 24 hour period) | 29 | 55 |

**Table 10-9 Predicted Dust Concentration and Dust Deposition for Sensitive Receptors (including assumed ambient levels) for Case 2 – Year 26 (2040)**

| Receptor | Calculated Dust Levels At Nearby Residences | | | | | |
|---|---|---|---|---|---|---|
| | PM2.5 (24 hour) (maximum) (µg/m³) | PM2.5 (annual average) (µg/m³) | PM10 (24 hour) (5th highest) (µg/m³) | PM10 (24 hour) (maximum) (µg/m³) | TSP (annual average) (µg/m³) | Dust Deposition (maximum month) (mg/m²/day) |
| **Limit** | **25** | **8** | **50** | **50** | **90** | **120** |
| ***Existing Ambient*** | ***8*** | ***5*** | ***18*** | ***18*** | ***25*** | ***45*** |
| Alpha Township | 10 | 5 | 25 | 33 | 25 | 48 |
| Villafield Station Homestead | 13 | 5 | 26 | 54 (exceeds 50 for one 24 hour period) | 26 | 49 |
| Bonanza Station Homestead | 11 | 5 | 26 | 40 | 26 | 49 |
| Creek Farm Station Homestead | 11 | 5 | 30 | 43 | 27 | 49 |
| Chesalon Station Homestead | 11 | 5 | 28 | 40 | 27 | 49 |
| Betanga Station Homestead | 10 | 5 | 29 | 33 | 28 | 55 |
| Corn Top Station Homestead | 10 | 5 | 29 | 33 | 28 | 55 |
| Oakleigh Station Homestead | 12 | 5 | 27 | 50 | 27 | 49 |
| Eureka Station Homestead | 12 | 5 | 36 | 48 | 27 | 50 |
| Saltbush Station Homestead | 10 | 5 | 23 | 36 | 26 | 47 |
| Proposed Accommodation Village | 16 | 5 | 43 | 78 (exceeds 50 for three 24 hour periods) | 29 | 55 |

## 10.4.2. Railway Modelling Results

The calculated ground level atmospheric dust concentrations at various setback distances from the railway are detailed in **Table 10-10**.

**Table 10-10 Calculated Dust Concentrations Levels at Various Setback Distances between the SGCP and Proposed Railway**

| Dust Index | Atmospheric Dust Concentration in (µg/m³) at various setback distances from Railway | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 100 m | 200 m | 300 m | 500 m | 1 km | 2 km | 5 km | 10 km |
| $PM_{2.5(24\ hour)}$ Maximum | 0.7 | 0.5 | 0.4 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 |
| $PM_{2.5(Annual\ Average)}$ | 0.5 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 |
| $PM_{10(24\ hour)}$ Maximum | 3.8 | 3.1 | 2.5 | 1.9 | 1.3 | 0.8 | 0.4 | 0.2 |
| $PM_{10(Annual\ Average)}$ | 2.9 | 2.1 | 1.6 | 1.0 | 0.6 | 0.3 | 0.1 | 0.0 |

The closest sensitive receptors to the proposed railway spur, (refer to **Table 10-2**), include the Oakleigh Station Homestead, the Saltbush Station Homestead and the proposed accommodation village located within MLA 70453.

The total dust exposure at the sensitive receptors within 2 km of the railway line and at the Alpha township is contained in **Table 10-11**. The proposed railway spur is expected to create a slight increase in the $PM_{10}$ (24 hour) dust exposure at Colorado Station and Saltbush Station Homesteads. However, the total dust level complies with the proposed exposure goals.

**Table 10-11 Calculated Dust Levels at Alpha and Sensitive Receptors within 2 km of the Railway Line**

| Sensitive Receptor | Calculated Dust levels at Nearby (within 2 km) Residences | | | | | |
|---|---|---|---|---|---|---|
| | PM2.5 (24 hour) (maximum) (µg/m³) | PM2.5 (annual average) (µg/m³) | PM10 (24 hour) (5th highest) (µg/m³) | PM10 (24 hour) (maximum) (µg/m³) | TSP (annual average) (µg/m³) | Dust Deposition (maximum month) (mg/m²/day) |
| **Limit** | **25** | **8** | **50** | **50** | **90** | **120** |
| **Existing Ambient** | **8** | **5** | **18** | **18** | **25** | **45** |
| **Case 1 – Year 3 (2017)** | | | | | | |
| Alpha Township | 10 | 5 | 24 | 33 | 25 | 47 |
| Oakleigh Station Homestead | 9 | 5 | 24 | 27 | 27 | 52 |
| Saltbrush Station Homestead | 10 | 5 | 25 | 37 | 26 | 47 |
| Proposed Accommodation Village | 14 | 5 | 38 | 58 (exceeds 50 for 1 24 hour period) | 29 | 55 |
| **Case 2 – Year 26 (2040)** | | | | | | |
| Alpha Township | 10 | 5 | 25 | 33 | 25 | 48 |
| Oakleigh Station Homestead | 9 | 5 | 26 | 27 | 27 | 50 |
| Saltbrush Station Homestead | 11 | 5 | 27 | 35 | 26 | 47 |
| Proposed Accommodation Village | 16 | 5 | 43 | 78 (exceeds 50 for 24 hour periods) | 29 | 55 |

## 10.5. AIR QUALITY IMPACTS

The predicted impacts from the modelling are specified in the sections below.

### 10.5.1. Case 1 – Year 3 (2017)

***$PM_{2.5}$***

The modelled $PM_{2.5}$ (24 hour maximum) and $PM_{2.5}$ (annual average) levels comply with the limits for $PM_{2.5}$ at all sensitive receptors.

***$PM_{10}$***

Dust contour modelling shows when adverse meteorological conditions persist for a minimum of 24 hours, elevated dust levels can surround the SGCP. Southerly winds lead to elevated dust levels to the north of the SGCP, specifically towards the Eureka Station Homestead. Westerly winds can result in a minor increase in dust levels to the east of the SGCP. The dust concentration levels at all sensitive receptors comply with the dust limits.

The maximum $PM_{10}$ (24 hour) concentration exceeds the 50 µg/m$^3$ limit at the accommodation village for one 24 hour period over the two year simulation period.

The dust level at Chesalon Station Homestead meets the limit of 50 ug/m$^3$ (including the assumed ambient level). All $PM_{10}$ (24 hour) dust levels comply with the dust limit.

***TSP***

TSP refers to the full size spectrum of suspended dust particles. The heavier fractions rarely travel significant distances, especially under meteorological conditions likely to lead to high downwind concentrations (low wind speed, wind direction remaining steady for a long period of time, neutral to stable atmosphere). Thus the increase in the annual average TSP is predicted to be very low and will be mostly associated with the lighter dust fractions (i.e. $PM_{10}$). The TSP (annual average) limit is met at all sensitive receptors.

***Dust Deposition***

The dust deposition (maximum month) contours show that most dust fall will occur west of the site above the underground mining area. The highest dust fallout occurs at the accommodation village and the maximum month is 55 mg/m$^2$/day (including the assumed background of 45 mg/m$^2$/day) compared with the 120 mg/m$^2$/day dust deposition limit. The dust fallout at all sensitive receptors complies with the dust deposition limit.

### 10.5.2. Case 2 – Year 26 (2040)

***$PM_{2.5}$***

Both the $PM_{2.5}$ (24 hour maximum) and $PM_{2.5}$ (annual average) limits for $PM_{2.5}$ are met at all sensitive receptors.

#### *$PM_{10}$*

As with Case 1, the dust contours, particularly the maximum $PM_{10}$ (24 hour) contours show that there are periods over the two year modelling simulation when adverse meteorological conditions persist for at least 24 hours leading to elevated dust levels some distance from the mining areas. It should be noted that the total dust emissions from the operation phase are similar for both Case 1 – Year 3 (2017) and Case 2 – Year 26 (2040). However with Case 2, there is greater activity in the northern parts of the SGCP and as a result the Case 2 off-site dust exposure is greater for those locations closer to the northern pits than the southern pits.

The most significant difference is the increase in the $PM_{10}$ (24 hour maximum) dust levels to the south of Alpha. The $PM_{10}$ (24 hour maximum) at Villafield increases from 41 µg/m$^3$ to 54 µg/m$^3$ between Case 1 and Case 2. This increase is due to more intensive activity in the northern pits. The $PM_{10}$ (24 hour) maximum at Chesalon decreases from 50 µg/m$^3$ to 40 µg/m$^3$ between Case 1 and Case 2. This reduction is due to less intensive activity in the southern pits and the westward progress in the southern open-cut mining area.

The maximum $PM_{10}$ (24 hour) concentration exceeds the 50 µg/m$^3$ limit at the accommodation village for three days per year. However, the $PM_{10}$ (24 hour) 5th highest level readily complies with the 50 µg/m$^3$ limit.

The $PM_{10}$ (24 hour maximum) concentration exceeds the limit at Villafield, however the $PM_{10}$ (24 hour) readily complies with the 50 µg/m$^3$ limit.

#### *TSP*

The TSP (annual average) limit is readily met at all sensitive receptors.

#### *Dust Deposition*

The dust deposition (maximum month) contours show that most dust fall will occur west of the site above the underground mining area. Dust deposition is highest at the accommodation village, Betanga and Corn Top Station Homesteads. At these locations the maximum month fallout is 55 mg/m$^2$/day (including the assumed background of 45 mg/m$^2$/day) although this is still significantly less than the 120 mg/m$^2$/day limit. The dust fallout at all sensitive receptors readily complies with the limits.

### 10.5.3. Cumulative Impacts

It is likely that mining activities at the SGCP will result in increased dust exposure for sensitive receptors north of the Project. The most noticeable impact is in terms of annual average exposures. The Eureka Station Homestead, located 14 km from the planned open-cut operation, is likely to experience an increase in the TSP (annual average) of 2 µg/m$^3$ and the overall exposure including a background of 25 µg/m$^3$ is 27 µg/m$^3$. If the nearby Galilee Coal Project exposure is of similar magnitude to the SGCP the total cumulative exposure would be still considerably below the limit of 90 µg/m$^3$.

The maximum (24 hour) dust levels are not cumulative; these are 'acute' exposures. For instance the highest dust levels at sensitive receptors to the north of the SGCP site require a southerly wind. Hence the reported maximum 'acute' dust exposure levels do not require further correction for other dust sources.

Generally the increase above existing ambient levels at all sensitive receptors is relatively low (i.e. an increase in dust exposure of less than 20 % and in many instances less than 10 % above the dust levels currently experienced in the area). This implies that the SGCP has minimal impact on the air sheds' ability to accept additional industrial (mining) operations.

### 10.5.4. Impacts Summary

Based on emissions modelling, the human health and ecological risks associated with emissions of dust and other emissions from the SGCP are expected to be low.

Although there is potential for air quality impacts associated with coal dust entrainment from train wagons, these emissions are anticipated to be minimal and do not warrant further assessment.

The potential for spontaneous combustion of stockpiled coal is considered small due to the low levels of sulphur and low inherent moisture. In the event of coal fires developing, there will be additional localised impacts on air quality due to the emission of smoke and gases. If there are instances of spontaneous combustion strategies such as smothering the fire by burial with waste rock will be used.

The SGCP is not expected to produce any odour that may be detrimental to the health and safety of employees, visitors or the general public. The risk of odour impacts during the construction and operation phases is considered to be low and therefore odour impacts have not been considered further.

It is anticipated that the SGCP may result in additional dust emissions at the Abbot Point Coal Terminal (APCT). The receipt and unloading of coal at the APCT requires direct environmental controls that are the responsibility of the terminal manager. The existing APCT environmental assessments and approvals have considered increases in coal handling at the port and incorporate appropriately scaled controls and mitigation measures. It is expected that the additional throughput associated with the SGCP will be incorporated in these proposed increases. Given that the dust emissions at the APCT will be addressed as part of a separate assessment process it is not considered appropriate to undertake detailed air assessments of the potential impacts of the SGCP on the APCT and its surrounds as part of this assessment process.

## 10.6. MITIGATION MEASURES

The environmental values of the air environment to be enhanced or protected are the qualities of the air environment that are conducive to suitability for the life, health and well-being of humans.

Although the overall impact of the SGCP on air quality is low, the mine will implement dust minimisation strategies, particularly during wind events.

A monthly report will be prepared to detail the monthly air quality monitoring results and the occurrence of any complaints.

Upon receiving a valid complaint in relation to dust nuisance, the complaint will be investigated and air quality mitigation measures must be implemented as soon as practicable if the complaints are substantiated. The SGCP will achieve and maintain the level of dust control which is outlined in the Environmental Authority. All monitoring and sampling techniques will be in compliance with the DEHP Air Quality Sampling Manual and applicable Australian Standards.

Measures proposed to avoid or minimise potential adverse air quality impacts associated with the SGCP are described below.

### 10.6.1. Long-term Dust Monitoring

Long-term dust monitoring is proposed to address the following issues:

- potential $PM_{10}$ (24 hour maximum) exceedance at the proposed accommodation village in Case 1
- potential $PM_{10}$ (24 hour maximum) exceedance at Villafield Station Homestead and the proposed accommodation village in Case 2
- future dust exposure levels from the Galilee Coal Project
- the effect of the tree zone on dust fallout.

The existing long-term real-time dust concentration monitoring network will be maintained by the Proponent to demonstrate seasonal variation of the air quality of the area. Two monitoring units have been installed at the Creek Farm Homestead and Alpha Township prior to the commencement of construction to provide details of the existing long-term dust levels from non-SGCP activities.

Dust monitoring results will be subjected to regular review to determine if the SGCP is causing an increase in dust concentrations above acceptable levels. Dust concentration data will include an analysis of the prevailing meteorological extraction rates and processes.

### 10.6.2. Meteorological Monitoring

Local meteorological data will be collected from a weather monitoring station installed by the SGCP at the Creek Farm Homestead. This station will be used to collect temperature, relative humidity, rainfall and wind speed data over the life of the SGCP.

### 10.6.3. Dust Deposition Monitoring

As described in **Section 10.2.3** seven dust deposition gauges have been installed at sensitive receptors surrounding the SGCP. Dust deposition (fallout) monitoring will continue to be undertaken at these locations over the life of the SGCP.

### 10.6.4. Dust Management Plan

A Dust Management Plan will be developed and implemented to mitigate adverse air quality impacts under worst case meteorological conditions.

Although many of these measures will be standard operating procedures for the mine, **Table 10-12** provides a summary of the control procedures to mitigate dust emissions.

**Table 10-12 Dust Mitigation Measures**

| Source | Mitigation Measure |
|---|---|
| Mining Areas | Disturb the minimum area necessary for mining and rehabilitate promptly. |
| Coal Handling Area | Use water sprays and water trucks to suppress dust in coal handling areas. |
| Stockpiles | Maintain water sprays on raw and product coal stockpile and transfer points.<br>Topsoil stockpiles will be sown with an appropriate plant mix and managed to ensure adequate ground cover is maintained. |
| Haul Roads | Maintain haul roads in good condition and use water trucks regularly to suppress dust. Investigate use of chemical suppressants if haul roads become too slippery. |
| Other Roads | Keep usage to a minimum and maintain in good condition. Use water trucks regularly to suppress dust. |
| Waste Rock Emplacements | Keep these areas moist, particularly if used by dump trucks. Keep the recently spread material moist to encourage crusting of surface. |
| Rail | Compliance with Queensland Rail's Coal Dust Management Plan. |