HANCOCK GALILEE PTY LTD

Kevin's Corner Project | Supplementary Environmental Impact Statement

G

Revised Air Quality and Greenhouse Gas Assessment — Supplementary Report





Report

Kevin's Corner Coal Mine Project Air Quality and Greenhouse Gas Assessment - Supplementary Report

3 OCTOBER 2012

Prepared for

Hancock Galilee Pty Ltd

Hancock House
355 Queen Street
Brisbane
Qld 4000

42626920

URS

Project Manager:

Rob Storrs
Principal Environmental Scientist

Principal-In-Charge:

Chris Pigott
Senior Principal

Author:

Stuart Bennett
Senior Associate Environmental Scientist

Reviewer:

Chris Taylor
Senior Associate Environmental Scientist

URS Australia Pty Ltd

Level 17, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia

T: 61 7 3243 2111
F: 61 7 3243 2199

Date:	**3 October 2012**
Reference:	42626920/001/006/3
Status:	Final C

Document delivery

URS Australia provides this document in either printed format, electronic format or both. URS considers the printed version to be binding. The electronic format is provided for the client's convenience and URS requests that the client ensures the integrity of this electronic information is maintained. Storage of this electronic information should at a minimum comply with the requirements of the Commonwealth Electronic Transactions Act (ETA) 2000.

Where an electronic only version is provided to the client, a signed hard copy of this document is held on file by URS and a copy will be provided if requested.

Table of Contents

Table of Contents

Tables

Table of Contents

Figures

Table of Contents

Appendices

Abbreviations

Abbreviation	Definition
ACARP	Australian Coal Association Research Program
ACIRL	Australian Coal Industry Research Laboratories
ACIRP	Australian Coal Industry Research Program
AGO	Australian Greenhouse Office
AHD	Australian Height Datum
AN	Ammonium Nitrate
ANFO	Ammonium Nitrate Fuel Oil
AS/NZS	Australian Standard/New Zealand Standard
BFS	Bank Feasibility Study
BOM	Bureau of Meteorology
CHPP	Coal Handling and Preparation Plant
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2-e	Carbon Dioxide Equivalent
CRD	Connors River Dam
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Department of Climate Change
DCCEE	Department of Climate Change and Energy Efficiency
DEEDI	Department of Employment, Economic Development and Innovation
EETM	Emissions Estimation Technique Manual
EIS	Environmental Impact Statement
EF	Emission factors
EHP	Department of Environment and Heritage Protection
EPA	Queensland Environmental Protection Authority
EPP (Air)	Environmental Protection (Air) Policy 2008
FEL	Front End Loaders
FMZ	Fuel Management Zone
GHG	Greenhouse Gas
HANFO	Heavy Ammonium Nitrate Fuel Oil
HGPL	Hancock Galilee Pty Ltd

Abbreviations

Abbreviation	Definition
IPCC	Intergovernmental Panel for Climate Change
JORC	Joint Ore Reserves Committee
LOM	Life of mine
NCAS	National Carbon Accounting System
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO	Nitric Oxide
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NPI	National Pollutant Inventory
NSW	New South Wales
PM_{10}	Particulate matter less than 10 µm
$PM_{2.5}$	Particulate matter less than 2.5 µm
QGN	Queensland Guidance Note
ROM	Run-of-mine
SEIS	Supplementary Environmental Impact Statement
STEL	Short Term Exposure Limit
SO_2	Sulphur Dioxide
TAPM	The Air Pollution Model
TEOM	Tapered Element Oscillating Microbalance
TSF	Tailings storage facility
TSP	Total Suspended Particulates
URS	URS Australia
US EPA	United States Environmental Protection Agency
Unit	**Definition**
%	Percentage
±	Plus or minus
°C	Degrees Celsius

Abbreviations

Abbreviation	Definition
°E	Degrees East
°S	Degrees South
μg/m^3	Micrograms per cubic metre
μm	Micrometre
bcm	Bank cubic metre
g/KW-hr	Grams per kilowatt hour
g/m^2/month	Grams per square metre per month
ha	Hectares
kg/h	Kilograms per hour
kg/l	Kilograms per litre
kg/KW-hr	Kilograms per kilowatt hour
kg/year	Kilograms per year
km	Kilometre
kWh	Kilowatt hour
KW-hr/litre	Kilowatt hour per litre
KW/litre	Kilowatts per litre
lb/hp-hr	Pounds per horse power hour
Litres/year	Litres per year
m	Metre
m/s	Meters per second
m^2	Square metre
m^3	Cubic metre
MJ/kg	Megajoules per kilogram
MJ/l	Megajoules per litre
mm	Millimetre
Mt	Million tonnes
Mtpa	Million tonnes per annum
t	Tonne

Abbreviations

Abbreviation	Definition
VKT	Vehicle kilometres travelled

Executive Summary

A Supplementary Impact Assessment of Air Quality and Greenhouse Gas Emissions from the Kevin's Corner Coal Mine project was undertaken. This was in response to the requirement to update the EIS with supplementary data and comments received from regulatory and non-regulatory stakeholders on the Environmental Impact Statement (EIS).

Key Changes

The key changes to the air quality model, which are collectively called the 'Model Refinements,' relate to:

- Sample data relating to the moisture content of overburden and coal which were used to develop a conceptual model of moisture content;
- The application of additional mitigation; and
- The use of more realistic emissions factors in the determination of emissions generation.

Key Issues

The key issues raised by regulatory and non-regulatory stakeholders for which have been addressed are:

- The potential human health impact of non-particulate blasting emissions;
- The source of power generation;
- The source of water for dust suppression; and
- The requirement to assess Greenhouse Gas emissions from the clearance of vegetation.

Background Datasets

Site specific monitoring data for the Project site were not available when dust impacts were predicted in the supplementary impact assessment. Therefore, the background concentrations applied were estimated, based on monitoring data from another coal mine in Queensland. To determine a site specific air quality baseline and whether the estimated background concentrations were representative of local air quality, monitoring of particulate matter and dust deposition was undertaken for 12 months at the Project site. These monitored datasets indicate that the background concentrations used in the supplementary assessment are a conservative representation of air quality in the project locality and region.

Model Refinements

The Model Refinements reduced dust generation in the Kevin's Corner emissions inventory by 48 to 53% for each assessment year. The main source contributors to this change were the reduction in grader speed, the reduction in the operational drop height of draglines and the increase in moisture content of overburden material dumped by trucks.

Impacts from the Kevin's Corner Coal Mine

Results have been presented for the Kevin's Corner Coal Mine Project with the inclusion of the Model Refinements. These include the impacts at four new sensitive receptors, which were identified after the completion of the EIS. Two of these receptors were homesteads and two ecologically sensitive areas. Results for the Kevin's Corner Coal Mine indicate that an exceedence of the 24-hour average PM_{10} EPP (Air) objective may occur at the Forrester Homestead in year 5. No exceedences of the

EPP (Air) or Department of Environment and Heritage Protection objectives for Total Suspended Particulate (TSP), $PM_{2.5}$ or rates of dust deposition were predicted for the life of the mine. Emissions of $PM_{2.5}$ from the combustion of diesel for power generation and transport, which were not included in the modelling were assessed. It was determined that they would contribute up to an additional 19% to the $PM_{2.5}$ generated from mining activities. However, it was shown that an exceedence of the $PM_{2.5}$ objectives was unlikely because mining emissions produce less than half of the concentration allowed under the EPP (Air).

Issues Raised by Statutory and Non-Statutory Consultees

Non-particulate Blasting Emissions

Non-particulate (oxides of nitrogen, carbon monoxide and sulphur dioxide) emissions from blasting were assessed and it was determined that all the sensitive receptors are located outside the range of impact for both routine and upset blasting conditions. A Fume Management Zone will be operated around the pits where emissions from blasting will be carefully managed in compliance with industry best practice.

Power Generation

The Kevin's Corner Coal Mine project has entered into a supply of infrastructure and services agreement with Powerlink Queensland for permanent electricity supply. Therefore, there will not be an on-site power generation facility.

Water Supply for Dust Suppression

HGPL has undertaken a supply and demand assessment of the water required on an annual basis for the Project. It was shown that the first five years of the Project, an off-site source of water for mine construction and operations, including dust mitigation, will not be required. HGPL is investigating a number of options for the supply of water to the project after five years.

Greenhouse Gas Emissions from Land Clearance

The updated Greenhouse Gas emissions inventory showed that with the inclusion of emissions from the clearance of vegetation from the land surface during construction increased the annual scope 1 emissions for the project by 5%. However, this represents <1% of the total emissions inventory for the life of the mine.

1 Introduction

There have been no changes to the Kevin’s Corner Coal Mine project description with the potential to impact on the emission of air pollutants since the modelling and quantification of emissions as reported in the EIS. Therefore, all updates to the quantification of emissions reported in this Supplementary Environmental Impact Statement (SEIS) report are as a result of atmospheric dispersion model refinements (‘Model Refinements’).

The key Model Refinements common to both projects are described in Section 1.1.

1.1 Model Refinements

1.1.1 Availability of Additional Moisture Content Data

For the development of the SEIS Refined Model, additional data relating to the moisture content of overburden and coal became available. A conceptual model of moisture content was, therefore, developed.

1.1.1.1 Moisture Content Conceptual Models

The moisture content variability of both the overburden/interburden (material on top of or between the product coal seams) and the product coal material has an impact on the potential dust emissions released from open cut mining activities. Relatively lower moisture content increases the potential for material to be disaggregated into finer particles, once disturbed through activities such as stockpiling via dragline handling and transfer to trucks. Consequently, finer particles have the potential to be transported by wind further from the source before deposition occurs, thus increasing the likelihood of impacting sensitive receptors external to the site. Relatively higher moisture content will lower the potential for finer particles to be released to the atmosphere as material remains better aggregated. Any release of particulates to the atmosphere would be more likely to deposit within a shorter distance from the emissions source, given the particulate would have a relatively higher mass, thereby reducing the potential impact to far field sensitive receptors.

1.1.1.2 Overburden Moisture Content

Overburden and product moisture contents were evaluated and, where necessary, refined within the SEIS assessment. The refinements were made based on the release of the Alpha Bank Feasibility Study (BFS) Design Criteria Coal Handling and Preparation Plant (CHPP) ‘BFS Criteria Report’ (Hancock Coal, 2010).

The overburden material consists of two primary layers, being weathered material on top of sandstone bedrock. Borehole data obtained from the site were used to develop a conceptual model for estimating the overburden moisture content. The moisture content of each overburden layer was determined through the analysis of available project data. The moisture content data within the conceptual model were found to be consistent with the moisture content data obtained from the borehole samples. Details on how the overburden moisture conceptual model was refined are provided in Section 3.1.1.

1.1.1.3 Product Moisture Content

Previous revisions of the EIS assumed a highly conservative air dried basis for moisture content. However, the moisture content data provided by the Alpha BFS document reports that the coal has a relatively high level of both air dry and total product moisture. The tests undertaken on raw coal samples were in accordance with industry best practice codes and ensured consistency throughout all coal testing procedures. The results of these tests were considered to provide more realistic product moisture contents, given that they represented ‘as received’ figures from the coal samples.

Input of the overburden and product moisture data to the refined dust emission inventory had the effect of reducing the overall dust generation total attributed to mining activities, and thus lower peak and average particulate matter concentrations at sensitive receptors. Further details on the derivation of product moisture contents and their application within the Refined Model are provided in Section 3.1.1.

1.1.2 Adoption of Revised Dust Mitigation Methods

1.1.2.1 Revision of Emissions Factors

For Front End Loading (FEL) of trucks, the very high moisture content of overburden at the Kevin’s Corner Coal Mine would significantly reduce particulate emissions from this source. Mitigation has therefore been included in the model to represent this more realistically. This principle has also been applied to the mitigation of emissions from truck dumping of overburden.

Additionally for the Kevin’s Corner Coal Mine Project, the emissions inventory has been reduced for all activities within the CHPP. These revisions are described in more detail in Section 3.1.2.1.

1.1.2.2 Dragline Drop Heights

A dragline is used to remove and transfer overburden material to facilitate the open cut mining process and negates the need for using trucks to transport material over disaggregated surfaces. Dust is released throughout the dragline operating process as the material is disturbed through the transfer of material from origin to stockpile. The height from which the material is dropped has a direct influence on the generated dust emissions. A higher drop height would result in the release of relatively higher volumes of dust, given the larger distance it would travel before reaching the ground. As a consequence, the generated dust would have the potential to travel further distances from the source and to increase in concentration. The SEIS assesses the dust generation from the release of material from the dragline, in accordance with the Hancock Galilee Pty Ltd (HGPL) proposed operational dragline procedures. The revised drop height is now 6 m, reduced from 15 m stipulated in the EIS. This reduction in drop height results in a lower predicted particulate matter generation from dragline activities, and contributes to a lower overall dust generation total from mining.

Details on the assessment of dust emissions relating to the dragline drop height are provided in Section 3.2.

The new dust mitigation methods adopted in the SEIS model are shown in Section 3.1.2.

1.1.3 Adjustments to the Kevin’s Corner Coal Mine Project SEIS Model

An adjustment was made to the predicted emissions associated with graders operating on both overburden material and haul roads. Graders were identified as a major source of PM_{10} within the EIS inventory, however it was established that the mean grader speed used in the EIS was overly conservative leading to an overestimation of emissions from this source. This grader speed has been corrected in the refined model and is further described in Section 3.1.

Project Datasets

2.1 Pollutants

The key projected emissions from the Project site are Total Suspended Particulate (TSP) (ambient and deposited), Particulate Matter less than 10 microns in diameter (PM_{10}), Particulate Matter less than 2.5 microns in diameter ($PM_{2.5}$). In the absence of Project site specific monitoring data, estimates of background ambient concentrations from the Ensham coal mine were applied in the EIS and supplementary impact assessment. Site specific sampling data were used to represent dust deposition. The adoption of these datasets represents the inclusion of the highest or most conservative concentrations available which are considered representative of the Project site and region.

2.2 Meteorology

Section A.1.1, Appendix A of Volume 2, Appendix O of the EIS describes the process whereby the most representative meteorological data is selected based on the proximity to the site, the similarity of the local terrain and rates of data completion. For this reason the data from Emerald Airport (170 km east of the project site) was chosen above Longreach (250 km west of the project site) for incorporation into TAPM. However, it should be noted that the modelling of dust was not based on data from the Emerald station. The data used for the modelling of upper air and for the region are from TAPM. The surface observations from Emerald were only used to nudge the modelled TAPM data to make it more representative of local conditions. In practice, this nudging process only makes a small difference to the meteorological data field produced by TAPM.

2.3 Baseline Monitoring

A baseline dust monitoring programme is in place on and around the Project site. The objective of this programme is to collect sufficient air quality data to adequately describe baseline conditions prior to the commencement of mining activities. The baseline monitoring programme is a joint exercise for both the Alpha and Kevin's Corner projects and consists of three ambient Tapered Element Oscillating Microbalance (TEOM) dust monitors installed to measure PM_{10} and 8 dust deposition gauges installed to measure dust deposition. The TEOM meets all Australian standards and US EPA federal equivalent methods for PM_{10} monitoring. All TEOM stations are connected to a data logging system linked with a 3G modem for remote data collection. The data is recorded remotely and collected from the data loggers on a daily basis and presented online. All data samples are logged at 10 minute intervals and stored online. Deposited dust is measured with dust deposition gauges which are operated to Australian/New Zealand Standard AS/NZS 3580.10.1.2003.

Presented in Table 2-1 are the locations of the TEOMs, dust gauges and meteorological monitors for the two project sites. It should be noted that for location 12, named the Alpha Accommodation Village, monitoring is actually being undertaken at the Alpha Exploration Camp in advance of construction of the Accommodation Village and is not a sensitive receptor location.

Where practical and where potentially significant dust impacts are expected, the monitoring of dust deposition will be undertaken at the human health and ecological receptors identified in the SEIS during construction and operation of the Project.

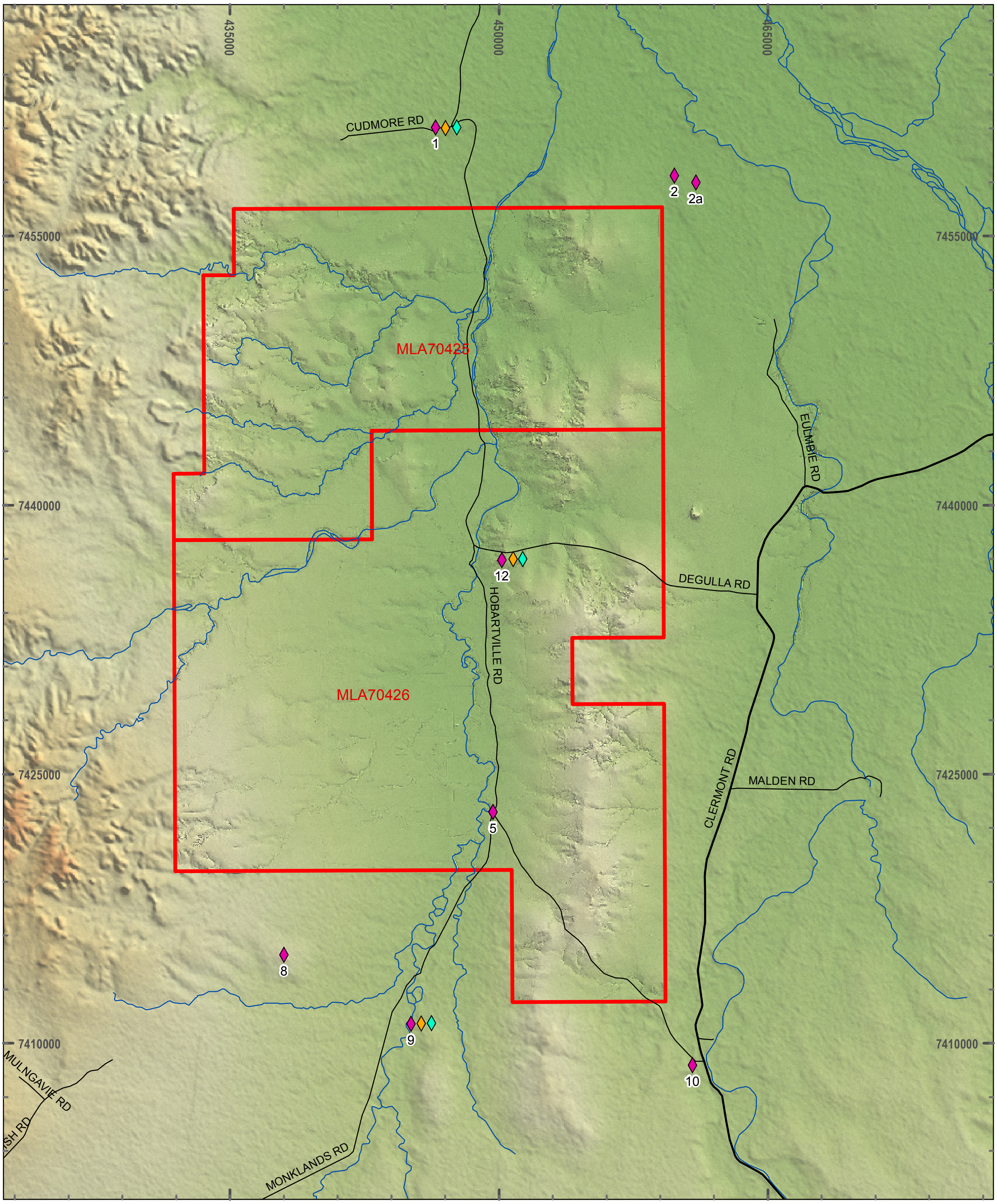
The Project sensitive receptor locations are discussed in Section 3.4.

Table 2-1 provides a summary of the frequency for baseline monitoring of PM_{10} and dust deposition.

2 Project Datasets

Table 2-1 Baseline Air Quality Monitoring Frequency

ID	Description	PM_{10} and meteorology	Dust Deposition
1	Forrester Homestead	Continuous	Monthly
2	Surbiton Station	-	Monthly
2a	Surbiton Station (Elsie House)	-	Monthly
5	Hobartville Homestead	-	Monthly
8	Kia Ora Homestead	-	Monthly
9	Monklands Homestead	Continuous	Monthly
10	Mentmore Homestead	-	Monthly
12	Alpha Exploration Camp	Continuous	Monthly



0 1.75 3.5 7 Km

Scale 1:300,000 (A4)
Datum: GDA 94, MGA Zone55

Dust Deposition Gauge (DDG)
Automatic Weather Station
TEOM
Drainage
Road
MLA Boundary

Source: Bing Maps © 2009 Microsoft Corporation and its data suppliers. ESRI ArcGIS Online 2011, © Mapinfo Australia Pty Ltd and PSMA Australia Ltd., © Commonwealth of Australia (Geoscience Australia) 2006, © The State of Queensland (Department of Environment & Resource Management) 2010, © The State of Queensland (Department of Mines and Energy) 2010, © Hancock Coal Supplied Data 2011.

Whilst every care is taken by URS to ensure the accuracy of the digital data, URS makes no representation or warranties about its accuracy, reliability, completeness, suitability for any particular purpose and disclaims all responsibility and liability (including without limitation, liability in negligence) for any expenses, losses, damages (including indirect or consequential damage) and costs which may be incurred as a result of data being inaccurate in any way for any reason. Electronic files are provided for information only. The data in these files is not controlled or subject to automatic updates for users outside of URS.

N W E S

HANCOCK GALILEE PTY LTD
Kevin's Corner Project
Supplementary Environmental Impact Statement

BACKGROUND MONITORING LOCATIONS

URS

KEVIN'S CORNER COAL MINE PROJECT

Figure: **2-1**

File No: **42626920-g-2010.mxd** Drawn: **XL** Approved: **SB** Date: **30-08-2012** Rev. **C** A4

2.4 Forrester Ambient Monitoring Station

The Forrester Homestead TEOM (Location 1 in Figure 2-1) is the closest continuous PM_{10} sampler to the Kevin's Corner project site. Meteorological parameters are also measured at the TEOM including wind speed, wind direction, rainfall, ambient temperature, relative humidity and solar radiation.

2.4.1 Data Completion

A weekly data check is undertaken to ensure maximum data capture rates are maintained. The validated database is created by flagging data affected by instrument faults, calibrations and other maintenance activities. Zero values represent a stable operating condition and non-zero values an unstable operating condition. All values representing an unstable operating condition are crossed checked against the data and removed from the data base.

The installation of the TEOMs occurred in June 2011. To date approximately 12 months of PM_{10} data have been collected as part of the baseline monitoring program.

The percentage data capture at each of the ambient PM_{10} monitoring sites has been determined. The rate is based on the percentage capture of 1 hour averages between the 1st July 2011 and 30th June 2012.

Table 2-2 shows the data percentage PM_{10} capture rate at each site.

Table 2-2 Percentage data Capture Rates

PM_{10} Data	Start date	End date	% completion
Forrester Homestead	01/07/2011	30/06/2012	74.6
Monklands Homestead	01/07/2011	30/06/2012	84.5
Alpha Exploration Camp	01/07/2011	30/06/2012	95.9
Recommended data capture rate 90%			

The data capture rate for the Forrester and Monklands TEOMs did not meet the recommended of rate of 90%, therefore, these data should be used as indicative of background at the Project site.

Installation of the dust deposition gauges occurred in November/December 2011 and to date 5 months of dust deposition data have been collected.

2.4.2 Data Validation

2.4.2.1 Background PM_{10} Concentrations

In the EIS, the estimated background PM_{10} concentration from the Ensham Coal Mine EIS was used in the absence of site specific monitoring data. This concentration was the highest and most conservative estimate available that was considered representative of the project locality and region. In order to compare TEOM monitoring data against the estimated background concentration, 24-hour average background PM_{10} concentrations for each of the three ambient monitoring stations were determined.

2 Project Datasets

Presented in Table 2-3 is a comparison between the TEOM monitored background results and the estimate used in the EIS.

Table 2-3 Monitored PM_{10} concentrations

Site	Start date	End date	PM_{10} concentration ($\mu g/m^3$)*
Forrester Homestead	01/07/2011	30/06/2012	18.1
Monklands Homestead	01/07/2011	30/06/2012	22.4
Alpha Accommodation Village	01/07/2011	30/06/2012	20.0
EIS estimated background concentration 27 $\mu g/m^3$			

* 70th percentile of 24-hour averages

The Forrester Homestead, Monklands Homestead and Alpha Accommodation Village TEOM monitoring results are below the estimated background concentration of 27$\mu g/m^3$. This suggests that the estimated background concentration used for the EIS study was a conservative representation of background PM_{10} for the project locality and region.

2.4.2.2 Background Dust Deposition Rates

To date six months of dust deposition data have been collected as part of the background air quality monitoring program. In accordance with Australian Standard AS/NZS 3580.10.1:2003 the recommended sampling period is 30 ± 2days. However this timeframe was not always achievable due to site access, bottle brakeage and overflow issues. In total there were five changeover periods from November 2011 to June 2012.

Table 2-4 shows the sampling period for each of the sites.

Table 2-4 Dust Deposition Gauge Collection Periods

Site	Sampling Period				
	1	2	3	4	5
Alpha Exploration Camp	23/11/2011-22/01/2012	20/01/2012-22/02/2012	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Hobartville Homestead	23/11/2011-22/01/2012	22/01/0212-22/02/2012	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Monklands Homestead	23/11/2011-22/01/2012	22/01/0212-22/02/2012	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012

2 Project Datasets

Site	Sampling Period				
	1	2	3	4	5
KiaOra Homestead	23/11/2011-22/01/2012	--	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Mentmore Homestead	13/12/2011-22/01/2012	22/01/0212-22/02/2012	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Surbiton Station	--	13/01/2011-21/02/2012	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Surbiton Station (Elsie House)	--	13/01/2011-21/02/2012	--	20/04/2012-22/05/2012	22/05/2012-18/06/2012
Forrester Homestead	--	--	22/02/2012-20/04/2012	20/04/2012-22/05/2012	22/05/2012-18/06/2012

--no data was available to site access issues, bottle breakages and overflows

An estimate of the background rate of dust deposition in the EIS was obtained from historical Hancock sampling data. Daily deposition rate monitoring results at the Project site were derived from the monthly total insoluble solids content from sampling at the locations described in Section 2.2.

Presented in Table 2-5 is a comparison between the dust deposition monitoring results and the background estimate originally used in the EIS.

2 Project Datasets

Table 2-5 Monitored dust deposition rates (mg/m^2/day)

Site	Sampling Period				
	1	**2**	**3**	**4**	**5**
Alpha Exploration Camp	13.3	6.1	1.7	9.4	3.7
Hobartville Homestead	15.0	16.1	10.0	18.6	3.7
Monklands Homestead	6.7	19.4	5.0	6.3	3.7
KiaOra Homestead	15.0	--	6.7	9.4	3.6
Mentmore Homestead	27.5	35.5	6.7	9.4	3.7
Surbiton Station	--	25.7	10.0	15.7	11.1
Surbiton Station (Elsie House)	--	45.7	--	15.7	7.4
Forrester Homestead	--	--	11.7	21.9	66.7
EIS estimated background deposition rate 68 mg/m^2/day					

-- No data was available due to site access issues, bottle breakages and overflows

The daily dust deposition rate recorded at each site for each period was below the estimated background rate of 68 mg/m^2/day and the Project goal of 140 mg/m^2/day applied in the EIS[1]. Therefore, these data indicate that the estimated background rate used in the EIS was a conservative representation of dust deposition in the project locality and region.

Kevin's Corner Coal Project Inventory

3.1 Updated PM_{10} Emissions Inventory

The PM_{10} emissions inventory contained within the Kevin's Corner Project EIS Air Quality Section (Volume 1, Section 13, 2011) was updated to reflect revised moisture content data for overburden material and product coal. In addition, the inventory was updated to adhere to the revised dust mitigation measures, including the proposed dragline drop height.

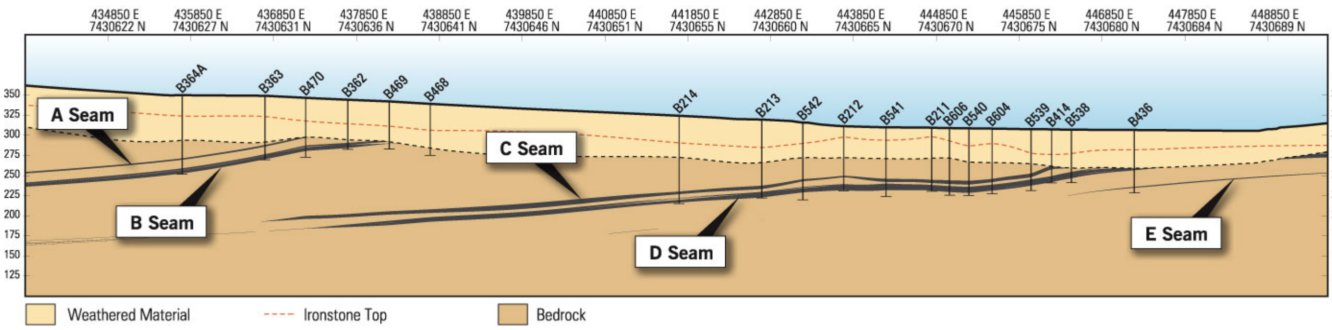
Further to the above, an amendment was made to the predicted emissions associated with graders operating on both overburden material and haul roads. Graders were identified as a major source of PM_{10} within the EIS inventory, however it was established that the mean grader speed used (20 km/h) was overly conservative. This resulted in an overestimation of vehicle kilometres travelled, as well as an elevated particulate matter emission factor, which is dependent upon mean speed. HGPL confirmed that an average speed of 5 km/h was more representative of the grader mean speed, assuming a 10 hour working day for each day of the assessed year. The updated inventory provided within this section applies the revised grader mean speed, and thus a revised PM_{10} contribution.

3.1.1 Moisture Content Conceptual Model

In the updated inventory, the moisture contents of overburden and product coal were revised on the release of the Alpha Bank Feasibility Study (BFS) Design Criteria Coal Handling and Preparation Plant (CHPP) 'BFS Criteria Report' (Hancock Coal, 2010). The document shows that the coal is a lower rank bituminous thermal coal with a relatively high level of both air dry and total product moisture. A series of sized coal samples for each main seam section (C, DU and DL) were tested for moisture by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), as described in the Alpha BFS Design Criteria Report. These tests were developed for the Australian Coal Industry and have been proven to provide accurate estimates of product moisture for higher rank thermal and coking coals from existing operations. Estimates of Run of Mine (ROM) or plant feed moisture were based on work from another Australia Coal Industry Research Program (ACIRP) study on in-situ moisture.

To estimate overburden moisture content, a simple conceptual model of the pit geology was developed on the basis of a review of available borehole data. A typical cross section is shown in Figure 3-1.

Figure 3-1 Typical mine cross section



The key assumptions are as follows:

- There are two layers, being tertiary weathered material and Bandanna formation sandstone bedrock;
- The tertiary layer has a constant depth of 50 m along the profile of the pit;
- The depth of sandstone is 25 m in year 5 and 125 m in year 30; and
- There is a linear progress through the cross section over time.

Although the mine plan indicates that progress through the pit depends on specific location, these assumptions are considered to provide a reasonable estimate of the relative proportions of overburden coming from each of the layers in any given year.

Moisture content data from available site data (see Figure 3-2) were analysed to determine the moisture content in each of the layers. Moisture content data from the Alpha test pit were found to be consistent with this data set. An average of all data points in each layer would introduce an unintentional bias because samples are not regularly distributed with depth. To alleviate this, data were placed into 10 m sample groups and the arithmetic mean moisture content was calculated for each group (shown as Average Data in Figure 3-2). The geometric mean of these data was calculated for each layer, resulting in moisture content estimates of 16.8% for the tertiary layer (assumed to be down to 270 m Australian Height Datum (AHD) in the test pit data) and 8.1% for the Bandanna Formation (assumed to be below 270 m AHD in the Alpha test pit data).

Following this, the depth of each layer to be handled in each year and the resulting annual average moisture content were calculated according to the assumptions above. The results are shown in Figure 3-3.

Figure 3-2 Moisture content depth

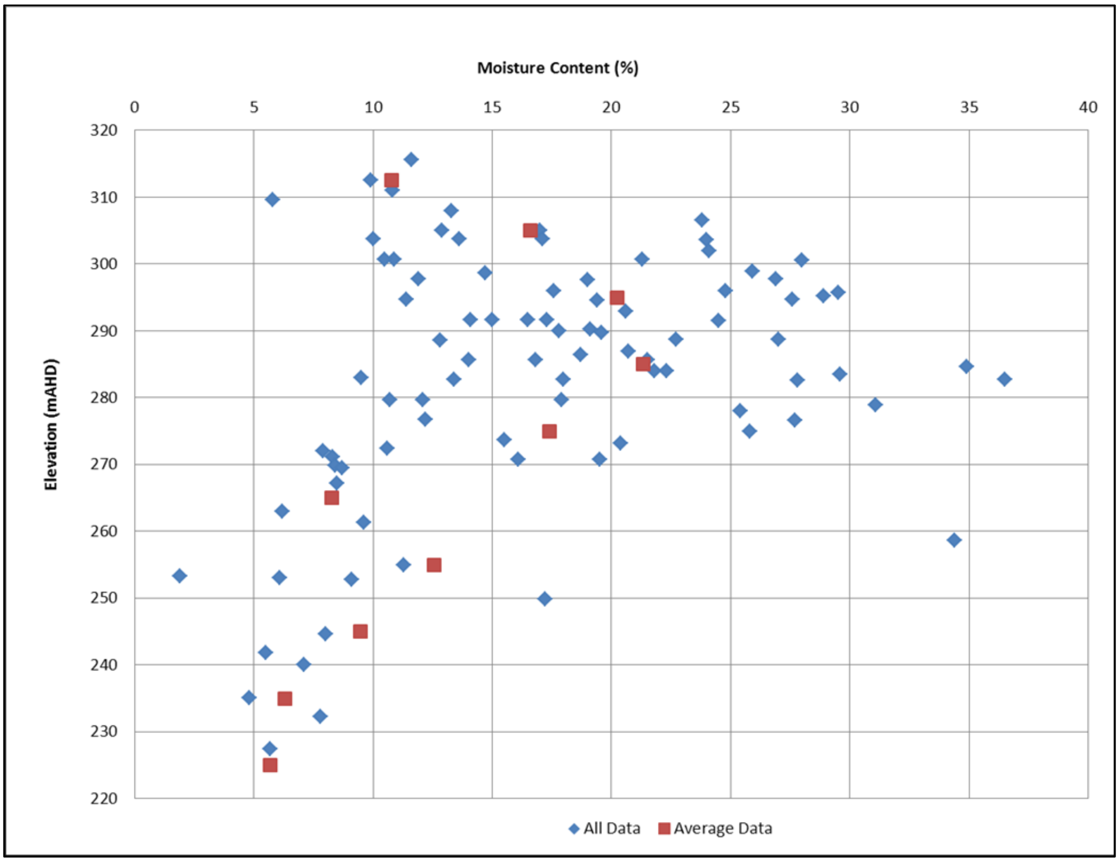
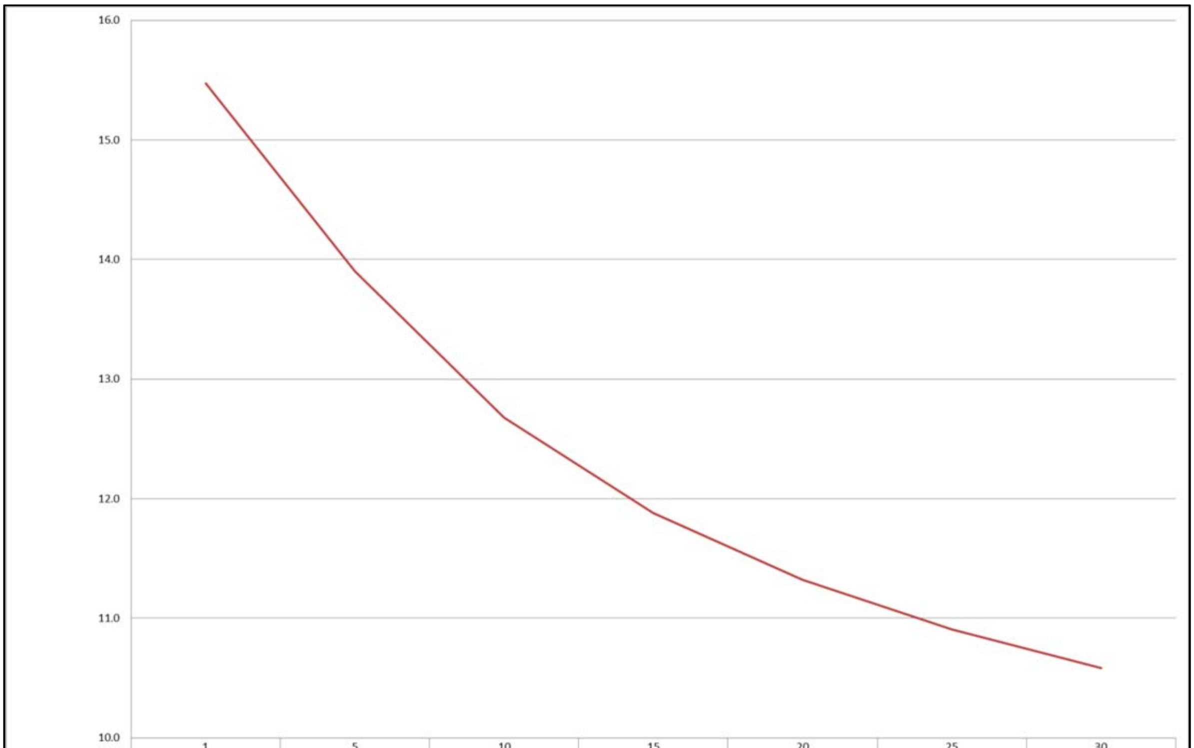


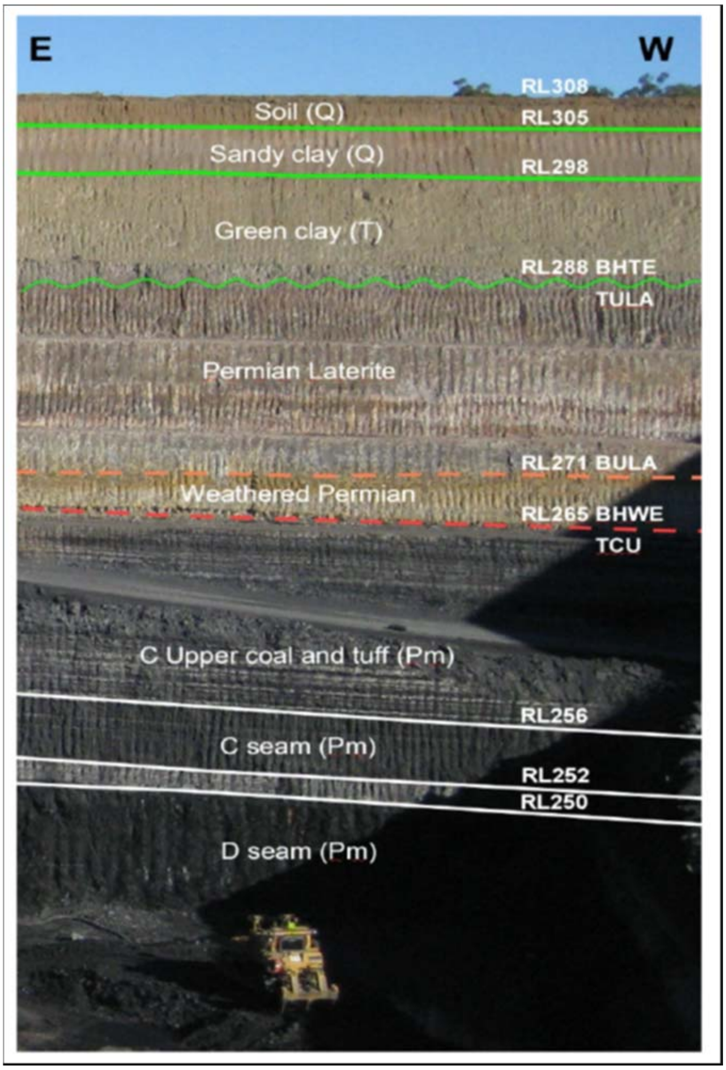
Figure 3-3 Calculated moisture content by year of operation



	1	5	10	15	20	25	30
Average MC %	15.5	13.9	12.7	11.9	11.3	10.9	10.6

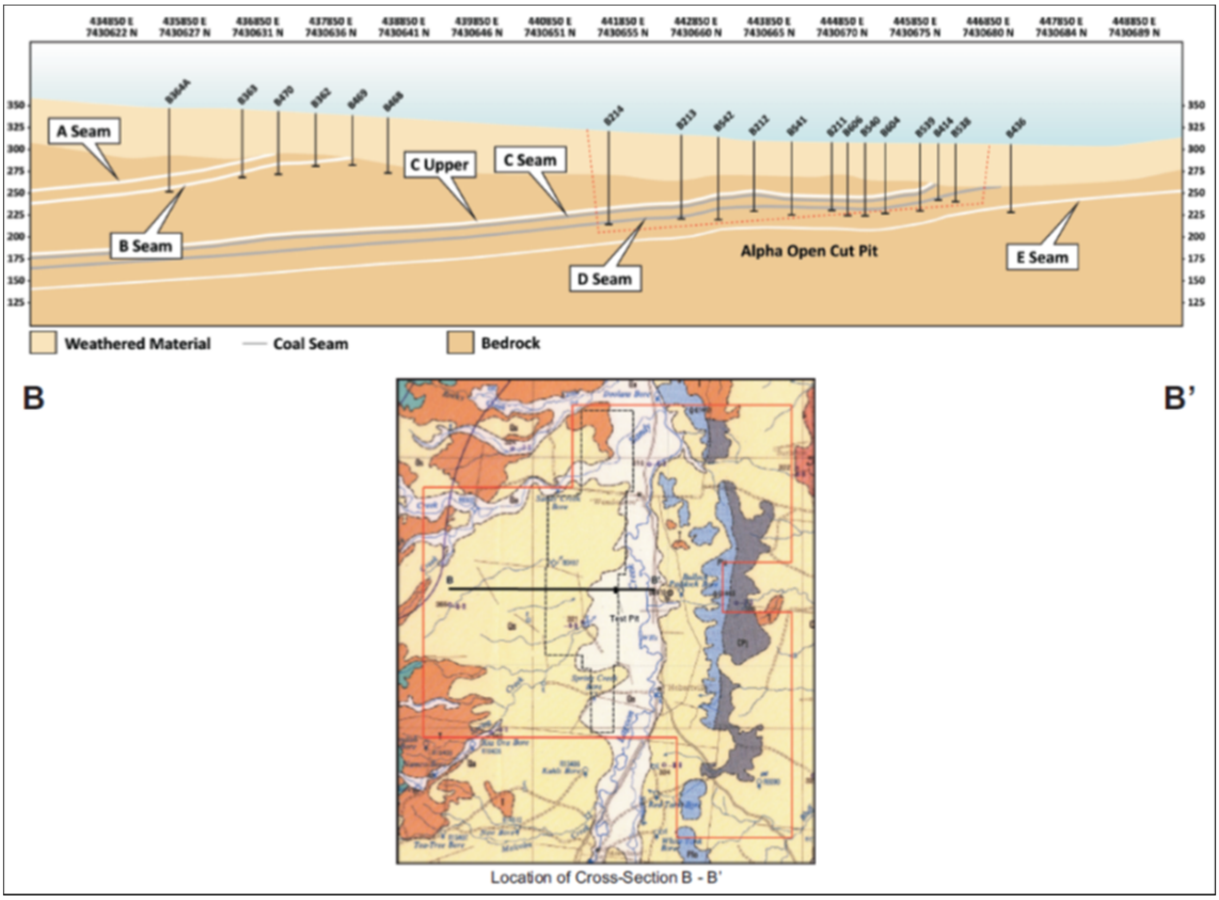
The moisture content information available from site data (see Figure 3-2) was found to be consistent with the observed moisture content from the Alpha test pit. In addition, the near surface layer of sandy clay within the Tertiary weathered strata (see Figure 3-4) is prevalent throughout the site, which acts as an aquiclude preventing the transmission of water. As such, low seasonal variation in moisture content below this upper layer would be expected. A geological cross section is presented in Figure 3-5, which spans a distance of approximately 14 km, demonstrates that there is little spatial variation in the depth of the Tertiary weathered material above the Permian strata. Therefore, it would be reasonably expected that the moisture content would not vary significantly both spatially and temporally. This supports the weighted average moisture content approach, as used for the updated inventory, providing the most appropriate representation of moisture content for each layer being removed, for each respective mining year.

Figure 3-4 Annotated photograph depicting main geological units within mine test pit[2]



[2] Hancock Prospecting Pty Ltd (February 2012) '*Summary of Groundwater level Data: Alpha Test Pit*' (Draft); JBT Consulting

Figure 3-5 Geological cross-section[3]



A summary of the overburden moisture contents applied in the updated inventory is presented in Table 3-1 and Table 3-2.

Table 3-1 Overburden moisture contents applied in inventory update

Layer	Year					
	1	**5**	**10**	**15**	**20**	**25**
Tertiary/Weathered Material (m) (moisture content 16.8%)	50	50	50	50	50	50
Bandanna/Sandstone (m) (moisture content 8.1%)	9	25	45	65	85	105
Weighted Average Moisture Content (%)	**15.5**	**13.9**	**12.7**	**11.9**	**11.3**	**10.9**

[3] Hancock prospecting Pty Ltd (October 2010) '*Alpha Coal Project Environmental Impact Statement*' – Figure 4-3

Table 3-2 ROM and product coal moisture contents applied in inventory update

Coal	Moisture Content (%)#	
	EIS (air dried basis)	Updated inventory* (as received basis)
Coal – in-situ	5	14
Coal – ROM	6.9	14
Coal – product	6.9	17.3
Miscellaneous	6.9	14

* From non-centrifugal moisture testing by CSIRO (product) and ACARP study on in-situ moisture (ROM) (Hancock Coal Pty Ltd (2010)).
# Moisture content in the EIS and SEIS was assumed to be on the highly conservative air dried basis. Information provided to URS has confirmed that the more realistic as received basis figures should be used for coal handling at the mine.

The effect of these changes in moisture contents to the PM_{10} emissions inventory is tabulated within Section 3.2. A sensitivity analysis of PM_{10} generation to moisture content is provided in Section 3.3.

3.1.2 Adoption of New Dust Mitigation Methods

3.1.2.1 US EPA AP42 Emission Factors

For Front End Loading (FEL) of trucks, under the National Pollutant Inventory (NPI) no effective mitigation is listed and so a control factor cannot be applied on this basis. However, the default NPI emission factor makes no allowance for moisture content and is based on research studies in the Hunter Valley, where the moisture content of overburden is significantly lower than that found in the Kevin's Corner Project area. The NPI Emissions Estimation Technique Manual (EETM) for Mining notes at in Section 1.1.1 that a moisture content of 1% would be plausible for the Hunter Valley. The US EPA AP42 (Section 13.2.4-3) emission factor equation for FEL of Trucks suggests that increasing moisture content by a factor of two results in a reduction in PM_{10} emissions of more than 60%. Although the calculated AP42 emission factor is considered in the NPI Manual to be unrealistically low for Australian (Hunter Valley) conditions, it is reasonable to assume that the very high moisture content of overburden at the Alpha Kevin's Corner Coal Mine would significantly reduce particulate emissions from this source. This principle has also been applied to the mitigation of emissions from truck dumping of overburden.

Additionally, the Alpha Kevin's Corner Coal Mine Project, the emissions inventory has been reduced for all activities within the CHPP as the material will be in the form of a 'slurry' with a moisture content in excess of the 15.7% threshold for dust generation described in the Hancock Prospecting Pty Ltd 'Dustiness Moisture Relationship Report' (ACIRL, 2010). These mitigation controls are summarised in Table 3-3.

3.1.2.2 Dragline drop height

The drag-line drop heights were reduced from 15 m to 6 m in the revised emissions inventory, which is a more realistic approach to the representation of emissions from this source based on proposed mining techniques. The dragline will be utilised from year 6 of the mining operations. A sensitivity analysis of the generation of dust to variations in dragline drop height is reported in Section 3.3.

3.1.2.3 CHPP activities moisture contents

The emissions inventory was reduced for all activities beyond the CHPP as the material will be in the form of a 'slurry' with a moisture content in excess of the 15.7% threshold for dust generation described in the Hancock Prospecting Pty Ltd 'Dustiness Moisture Relationship Report' (ACIRL, 2010). No significant dust emissions are, therefore, predicted from these sources.

All revised and updated mitigation controls are summarised in Table 3-3.

Table 3-3 Summary of revised moisture contents and updated mitigation measures within the PM_{10} emissions inventory

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
Additional data	Overburden and In-Pit	FEL of coal trucks Dozers	Increase to product and overburden moisture contents based on information from Alpha BFS and test pit borehole sampling.	Coal moisture contents available from Alpha BFS Design Criteria. Additional overburden moisture content data from test pit sampling. A single average for overburden moisture for the whole profile is applied unique to each year, depending on the proportion of material in each layer.
	ROM Activities	Truck dumping at ROM FEL at ROM Dozer hours (coal at ROM)		
	CHPP Activities	FEL at CHPP Dozer hours (coal at CHPP) CHPP conveyor transfer points		
Additional mitigation	Overburden & In Pit	Drilling	99% control applied to total emission and 70% to the remainder	Drills to be fitted with hydraulic dust control curtains, water sprays (70% control) and dust cyclones (99% control).
		Dragline	Changed drop height from 15m to 6 m	6 m is considered a more realistic estimate of drop height
		FEL of overburden into trucks	50% control for PM_{10}	No specific controls are proposed in Table 4 of the NPI EETM for mining for FEL of overburden into trucks. However, the USEPA AP42 (Section 13.2.4-3) emission factor takes

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
				account of moisture content. Although this emission factor is considered in the NPI Manual to be unrealistically low for Australian conditions, it is reasonable to assume that the very high moisture content of overburden at the Kevin's Corner Coal Mine would significantly reduce particulate emissions from this source. Calculations using the USEPA equation indicate that an increase in moisture content by a factor of 2 would be expected to result in a 62% reduction in emissions of PM_{10}, so a 50% control factor is applied.
		Truck dumping at overburden dumps	50% control for PM_{10}	USEPA AP42 uses the same equation as for truck loading, therefore, the same rationale as for FEL of overburden into trucks applies. NPI allows a 70% control for water sprays, confirming the relevance of moisture content for this dust source.
	ROM Activities	Truck dumping at ROM	50% control for PM_{10}	NPI control factor for water sprays
	ROM to CHPP Conveyor	Miscellaneous transfer points	70% control for PM_{10}	Partial enclosure and moisture will be lower than CPP conveyor
	CHPP Activities	CHPP Processing	98% inventory reduction for PM_{10}	Coal (<50mm) during processing/washing is mostly in slurry form with a high total moisture content and are therefore almost entirely removed as a source.
		Loading stockpiles	98% inventory reduction for PM_{10}	Loading stockpiles is by stacking equipment and can generate fines if drop heights are not managed. However, the material will be wet and dust sprays will be in operation which allowed for 50% control in NPI.
		Miscellaneous transfer points	90% inventory reduction for PM_{10}	The transfer points in the CHPP are partially enclosed, have water sprays and transfer material with total moistures between 17 and 23%. The

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
				material is so wet this amounts to the same as using water sprays in the NPI.
		Wind erosion from stockpiles	70% inventory reduction for PM_{10}	Product stockpiles are built for minimum exposure to prevailing winds with low batter angles to minimise wind erosion.
Adjustments to EIS	Tailings Dams	Tailings Dams	Area reduced to 10% of EIS	Estimated from aerial photography of tailings dams for other projects.

3.2 Changes to the PM_{10} Emissions Inventory

Subsequent to the updates applied to the emissions inventory, as described in Section 3.1, the revised PM_{10} emissions inventory is presented in Table 3-4. For comparison, the original EIS inventory is presented in Table 3-5. For the first five years of operation of the mine, processing will be undertaken in pit. Draglines will be used to remove pit material after five years of operation of the mine. The change in PM_{10} for each activity, between the original and revised inventories, was calculated as a function of the original total PM_{10} inventory, as presented in Table 3-6.

Table 3-4 Revised PM_{10} emissions inventory (kg/annum)

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Disturbance and Rehabilitation	92,562	3,797	8,204	14,139
Drilling and Blasting	31	37	17	27
Dragline Operation	-	-	108,839	122,717
FEL of Overburden into Trucks	1,256	2,422	923	2,778
Transport of Overburden to dumps	82,204	128,627	70,690	153,167
Truck Dumping at Overburden Dumps	133,930	221,735	68,025	180,975
FEL of coal trucks	64,012	93,684	83,677	172,827
Dozers	17,655	15,994	19,069	24,774
Graders	7,756	7,756	4,654	6,205
Wind Erosion from Pits	70,284	82,881	38,400	37,932
Wind Erosion from Overburden Stockpiles	107,971	107,971	107,971	107,971
Processing	6,788	11,097	-	-
Truck Dumping at ROM	5,827	8,313	9,257	19,120
Dozer - Coal at ROM (total)	17,978	17,978	17,978	17,978

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Coal Conveyors	172	128	128	128
Conveyor Transfer Points	347	5,597	7,666	7,635
Coal Processing	112	740	1,119	1,367
Loading of Coal Stockpiles	8	90	116	115
Misc Transfer Points	66	768	987	981
Wind Erosion from Stockpiles	924	924	924	924
Transport of Coal to ROM	10,463	20,574	30,975	82,089
Transport of Rejects to Dumps	1,471	17,653	23,772	24,264
Wind Erosion from Tailings Storage Facility	5,606	5,606	5,606	5,606
Total (kg/a)	**627,423**	**754,375**	**608,997**	**983,719**

- For the first five years of operation of the mine, processing will be undertaken in pit. Draglines will be used to remove pit material after five years of operation of the mine.

Table 3-5 Original submitted EIS PM_{10} emissions inventory (kg/annum)

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Disturbance and Rehabilitation	92,562	3,797	8,204	14,139
Drilling and Blasting	5,994	7,632	3,166	4,981
Dragline Operation	-	-	268,111	294,442
FEL of Overburden into Trucks	12,243	20,269	6,218	16,543
Transport of Overburden to dumps	115,425	174,802	91,692	193,509
Truck Dumping at Overburden Dumps	267,861	443,471	136,051	361,951
FEL of coal trucks	64,012	93,684	83,677	172,827
Dozers	86,055	66,932	64,200	73,761
Graders	243,236	243,236	145,942	194,589
Wind Erosion from Pits	70,284	82,881	38,400	37,932
Wind Erosion from Overburden Stockpiles	107,971	107,971	107,971	107,971
Processing	7,339	11,999	-	-
Truck Dumping at ROM	11,653	16,625	18,515	38,240
Dozer - Coal at ROM (total)	48,408	48,408	48,408	48,408
Coal Conveyors	172	128	128	128

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Conveyor Transfer Points	1,400	30,317	43,200	43,069
Coal Processing	5,601	37,025	55,935	68,375
Loading of Coal Stockpiles	678	7,879	10,126	10,067
Misc Transfer Points	1,934	22,465	28,873	28,705
Wind Erosion from Stockpiles	3,082	3,082	3,082	3,082
Transport of Coal to ROM	14,692	27,960	40,178	103,710
Transport of Rejects to Dumps	2,065	23,990	30,834	30,655
Wind Erosion from Tailings Storage Facility	56,064	56,064	56,064	56,064
Total (kg/a)	**1,218,731**	**1,530,615**	**1,288,973**	**1,903,148**

- For the first five years of operation of the mine, processing will be undertaken in pit. Draglines will be used to remove pit material after five years of operation of the mine.

Table 3-6 Change in PM_{10} inventory per activity (kg/annum) and expressed as a percentage change relative to original EIS PM_{10} inventory total (%)

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Disturbance and Rehabilitation	-	-	-	-
Drilling and Blasting	-5,963 **(-0.5%)**	-7,595 **(-0.5%)**	-3,149 **(-0.2%)**	-4,954 **(-0.3%)**
Dragline Operation	-	-	-159,272 **(-12.4%)**	-171,725 **(-9.0%)**
FEL of Overburden into Trucks	-10,987 **(-0.9%)**	-17,847 **(-1.2%)**	-5,295 **(-0.4%)**	-13,765 **(-0.7%)**
Transport of Overburden to dumps	-33,221 **(-2.7%)**	-46,175 **(-3.0%)**	-21,002 **(-1.6%)**	-40,342 **(-2.1%)**
Truck Dumping at Overburden Dumps	-133,931 **(-11.0%)**	-221,736 **(-14.5%)**	-68,026 **(-5.3%)**	-180,976 **(-9.5%)**
FEL of coal trucks	-	-	-	-
Dozers	-68,400 **(-5.6%)**	-50,938 **(-3.3%)**	-45,131 **(-3.5%)**	-48,987 **(-2.6%)**
Graders	-235,480 **(-19.3%)**	-235,480 **(-15.4%)**	-141,288 **(-11.0%)**	-188,384 **(-9.9%)**
Wind Erosion from Pits	0 **(0%)**	0 **(0%)**	0 **(0%)**	0 **(0%)**
Wind Erosion from Overburden Stockpiles	0 **(0%)**	0 **(0%)**	0 **(0%)**	0 **(0%)**
Processing	-551 **(-0.1%)**	-902 **(-0.1%)**	-	-
Truck Dumping at ROM	-5,826 **(-0.5%)**	-8,312 **(0.5%)**	-9,258 **(-0.7%)**	-19,120 **(-1.0%)**
Dozer - Coal at ROM (total)	-30,430 **(-2.5%)**	-30,430 **(-2.0%)**	-30,430 **(-2.4%)**	-30,430 **(-1.6%)**
Coal Conveyors	-	-	-	-
Conveyor Transfer Points	-1,053 **(-0.1%)**	-24,720 **(-1.6%)**	-35,534 **(-2.8%)**	-35,434 **(-1.9%)**

Activity	Year 1 PM_{10}	Year 5 PM_{10}	Year 15 PM_{10}	Year 25 PM_{10}
Coal Processing	-5,489 **(-0.5%)**	-36,285 **(-2.4%)**	-54,816 **(-4.3%)**	-67,008 **(-3.5%)**
Loading of Coal Stockpiles	-670 **(-0.1%)**	-7,789 **(-0.5%)**	-10,010 **(-0.8%)**	-9,952 **(-0.5%)**
Misc Transfer Points	-1,868 **(-0.2%)**	-21,697 **(-1.4%)**	-27,886 **(-2.2%)**	-27,724 **(-1.5%)**
Wind Erosion from Stockpiles	-2,158 **(-0.2%)**	-2,158 **(-0.1%)**	-2,158 **(-0.2%)**	-2,158 **(-0.1%)**
Transport of Coal to ROM	-4,229 **(-0.4%)**	-7,386 **(-0.5%)**	-9,203 **(-0.7%)**	-21,621 **(-1.1%)**
Transport of Rejects to Dumps	-594 **(-0.1%)**	-6,337 **(-0.4%)**	-7,062 **(-0.6%)**	-6,391 **(-0.3%)**
Wind Erosion from Tailings Storage Facility	-50,458 **(-4.1%)**	-50,458 **(-3.3%)**	-50,458 **(-3.9%)**	-50,458 **(-2.7%)**
Total change (kg/annum)	**-591,308 (-48.5%)**	**-776,245 (-50.7%)**	**-679,978 (-52.8%)**	**-919,429 (-48.3%)**

- For the first five years of operation of the mine, processing will be undertaken in pit. Draglines will be used to remove pit material after five years of operation of the mine.

3.3 Sensitivity of the Emissions Inventory to New Data-Sets

The worst case conditions for the handling of material via dragline, and for overburden and product moisture content were considered with respect to emissions of particulate matter and compared to the updated inventory equivalent conditions. This enabled a sensitivity analysis to be undertaken comparing the total PM_{10} generation in years 15 and 25 of mining activities, for the following two scenarios:

1. **Modelled conditions** - Dragline drop height of 6 m (in accordance with proposed mining technique), weighted average overburden moisture content, and ROM / product coal moisture as determined from the respective ACARP and CSIRO research.
2. **Worst case conditions** – Dragline drop height of 15 m (maximum possible drop height commensurate to proposed technique), worst case moisture content conditions of overburden material and ROM / product coal.

3.3.1 Dragline drop height

The sensitivity of predicted PM_{10} generation to a change in dragline drop height from 6m (modelled) to 15 m (worst case) for year 15 and year 25 is presented in Table 3-7.

Table 3-7 Sensitivity of PM_{10} generation to dragline drop height

Year	Source	PM_{10} generation (kg) at dragline height (m)		% difference
		6 m	15 m	
15	Dragline	108,839	206,700	+90%
	Total inventory	**750,285**	**848,146**	**+13%**
25	Dragline	122,717	233,058	+90%
	Total inventory	**1,172,103**	**1,282,444**	**+9%**

A 90% reduction in PM_{10} generation from the dragline source is predicted for a reduction in drop height from 15 m to 6 m, for both assessment years. With respect to the total PM_{10} generation from all sources, this would represent an increase of 13% and 9% in years 15 and 25 respectively. These figures assume that the dragline drop height would be maintained at 15 m for the entire year of operation, which would be considered unrealistic given HGPL proposed operational procedures relating to drop heights as follows:

"*All draglines will be uncovering coal using the standard "extended bridge" method, which requires the dragline to extend its dumping reach by building a "bridge" towards the spoil side. Most of this bridge material comes from the key cut near the high-wall. The key material will not be hoisted any higher than is required to clear the previously dumped area at the bridge end. Once the bridge is finished, the dragline will move on to the bridge and proceed to dig the remainder of the block and dump it to the final spoil pile. No high hoisting will be undertaken in order to reduce the hoisting time.*

Hoisting material up is costly and time consuming, hence all efficient dragline operations try to minimise over-hoisting. This ensures that dragline drop heights are as low as possible. HGPL will operate its draglines so that the drop height does not exceed 6 m in order to minimise cycle time and maximise dragline production."

In the event that the drop height is increased above 6 m, it would be reasonable to expect that it would not be maintained at an excess height for extended periods throughout an operational year. In this case, a total inventory increase in PM_{10} of well below 13% (year 15) and 9% (year 25) would be anticipated.

3.3.2 Overburden moisture content

The sensitivity of predicted PM_{10} generation to a change in overburden moisture content from a modelled value of 11.9% (year 15) / 10.9% (year 25) to 8.1% (worst case for all years) for year 15 and year 25 are demonstrated in Table 3-8.

Table 3-8 Sensitivity of PM_{10} generation to overburden moisture content

Year	Source	PM_{10} generation (kg) at moisture content (%)		% difference
		11.9% (yr 15) 10.9% (yr 25)	8.1% (all years)	
15	Dragline	108,839	122,152	+12%
	FEL of Overburden into Trucks	923	1,582	+71%
	Dozers	19,069	32,675	+71%
	Total inventory (1 year)	**750,285**	**793,219**	**+6%**
25	Dragline	122,717	134,419	+10%
	FEL of Overburden into Trucks	2,778	4,210	+52%
	Dozers	24,774	37,541	+52%
	Total inventory (1 year)	**1,172,103**	**1,221,927**	**+4%**

An increase in PM_{10} generation would be predicted from all relevant sources with lower overburden moisture content. In year 15, the use of the dragline, FEL, and dozers would be expected to increase PM_{10} generation by 12% and 71% respectively, for a lower moisture content (8.1%). In year 25, a lower moisture content is predicted to result in a 10% (dragline) and 52% (FEL and dozers) increase. However, a reduction in overburden moisture is predicted to result in a relatively low increase in total PM_{10} generation, with a 6% increase in year 15 and 4% in year 25.

3.3.3 Product moisture content

The sensitivity of predicted PM_{10} generation to the change in product moisture content for year 15 and year 25 are presented in Table 3-9.

Table 3-9 Sensitivity of PM_{10} generation to product moisture content

Year	Source	PM_{10} generation (kg) at moisture content (%)		% difference
		In-situ coal moisture 14%, ROM coal moisture 14%, Product coal moisture 17.3%	In-situ coal moisture 5.9%, ROM coal moisture 6.9%, Product coal moisture 6.9%	
15	Dozer hours - Coal at ROM	17,978	48,408	+169%
	Loading stockpiles	116	203	+75%
	Misc Transfer Points (Conveyors)	7,666	22,020	+187%
	Misc Transfer Points (Coal handling)	987	2,887	+193%
	Total inventory	**750,285**	**797,057**	**+6%**
25	Dozer hours - Coal at ROM	17,978	48,408	+169%
	Loading stockpiles	115	201	+75%
	Misc Transfer Points (Conveyors)	7,635	21,928	+179%
	Misc Transfer Points (Coal handling)	981	2,871	+193%
	Total inventory	**1,172,103**	**1,218,803**	**+4%**

The lower moisture contents are representative of the air dried figures, which are considered conservative values and thus represent worst case moisture conditions. The updated inventory moisture contents provide 'as received' figures based on CSIRO testing (product) and the ACARP study (ROM), considered to provide a more realistic representation of the coal moisture content at source. The 'as received' values and air dried values correspond to those presented in Figure 5.6.3_1 of the '*Resource Estimate & Geological Report*' undertaken by Salva Resources (May 2010). Furthermore, the laboratory analyses used in classifying these moisture content values were undertaken in accordance with the JORC Code (2004). This ensures that consistency is maintained through all coal testing procedures.

It is evident from Table 3-9 that sources of PM_{10} specific to the handling of product coal would be predicted to generate relatively more PM_{10} in both year 15 and year 25, given a lower moisture content. The total PM_{10} generated from all activities is predicted to be higher by 6% (year 15) and 4% (year 25), using the highly conservative moisture contents. The sampling data indicate that it is unlikely that such additional dust will be generated.

3.4 Assessment Locations

The assessment locations identified include sensitive receptors which have been selected to test the environmental value of human health and well-being and gazetted protected places in the study area. In total, 12 sensitive receptors were identified. Of these 12 sensitive receptors; two residential receptors and the Alpha Accommodation Village are located on MLA70426 (the adjoining Alpha Mine MLA, owned by Hancock Coal Pty Ltd); 9 residences are located off-site. The two gazetted protected places are located adjacent to the Kevin's Corner mining lease MLA70425.

The Hobartville and Wendouree Homestead receptors were initially identified as receptors 5 and 7. However, they lie within the boundary of MLA 70426 and will be acquired by that Proponent. Similarly, receptor 12 Alpha Accommodation Village will not be subject to the Project goals as emissions will be regulated under the Coal Mining Health and Safety Act 1999. Therefore, locations 5, 7 and 12 were not considered as sensitive receptors in the EIS.

The locations at which air quality has been assessed are as follows. All assessment locations are shown in Figure 3-6 and the human health and well-being receptors are shown in the contour plots in Section 4.

3.4.1 Human health and well-being sensitive receptors

Presented in Table 3-10 are the sensitive receptors for which the environmental value of human health and well-being is to be protected.

Table 3-10 Health and Well-being sensitive receptors

Location ID*	Description	X	Y
1	Forrester Homestead	446462	7460888
2	Surbiton Station	460936	7458001
3	Eulimbie Homestead	464135	7453631
4	Surbiton Homestead	461950	7440055
6	Burtle Homestead	464057	7429716
8	Kia Ora Homestead	437918	7414891
9	Monklands Homestead	445097	7411185
10	Mentmore Homestead	460780	7408727
11	Tressillian Homestead	462419	7416374

* IDs 5, 7 and 12 are not included because they were allocated to the Hobartville, Wendouree Homesteads and the Alpha Accommodation Village which are not sensitive receptors. Although assessed in the EIS, receptor 12 Alpha Accommodation Village was removed as a sensitive receptor in the Refined Model assessment as described. Location IDs 13 and 14 represent the Spring Creek Homestead and Glenn Innes Homestead sensitive receptors which are included in the Alpha SEIS and the Cumulative Impact Assessment (Appendix O).

3.4.2 Gazetted Protected Places

Presented in Table 3-11 are the designated protected places which have the potential to be impacted by air pollutant emissions from the Project.

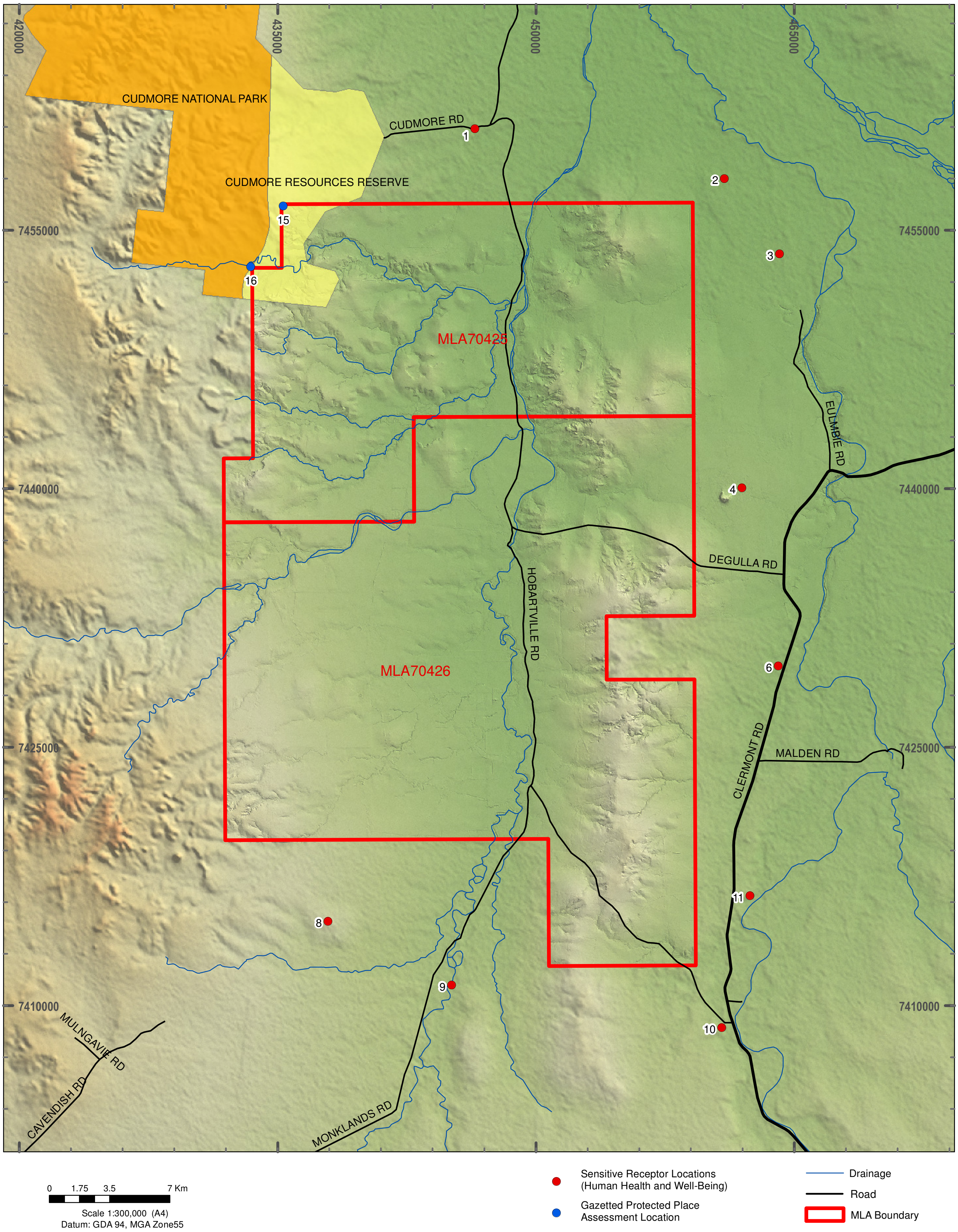
Table 3-11 Gazetted Protected Places

Location ID	Description	Designation	X	Y
15	Cudmore Resources Reserve	Category C protected place	435750	7456250
16	Cudmore National Park	Category A protected place	433750	7453250

The Cudmore National Park and Resources Reserve are gazetted protected places under the Nature Conservation Act 1992 and so air quality impacts are assessed under the EPP (Air).

The impacts of emissions of nitrogen oxides (NO_x), carbon monoxide (CO) and sulphur dioxide (SO_2) from blasting and the combustion of vehicle fuels are assessed qualitatively. However, ambient concentrations of particulate matter are not assessed because goals for the protection of the health and biodiversity of ecosystems are not prescribed in the EPP (Air).

There is no goal for the rate of dust deposition in the EPP (Air). Therefore, predictions at the modelled grid points shown in Table 3-11 are assessed against the EHP Project goal. These are the closest grid points to the sensitive receptor locations in the direction of the pits and are located just inside the Kevin's Corner MLA70425.



Source: Bing Maps © 2009 Microsoft Corporation and its data suppliers. ESRI ArcGIS Online 2011, © Mapinfo Australia Pty Ltd and PSMA Australia Ltd., © Commonwealth of Australia (Geoscience Australia) 2006, © The State of Queensland (Department of Environment & Resource Management) 2010, © The State of Queensland (Department of Mines and Energy) 2010, © Hancock Coal Supplied Data 2011.

HANCOCK GALILEE PTY LTD

Kevin's Corner Project
Supplementary Environmental Impact Statement

ASSESSMENT LOCATIONS

URS

KEVIN'S CORNER COAL MINE SEIS

Figure: **3-6**

File No: **42626920-g-2009.mxd** Drawn: **XL** Approved: **SB** Date: **03-10-2012** Rev. **E** A4

4

Air Quality Impacts

4.1 Kevin's Corner Coal Mine: Dispersion Modelling Results

Predicted concentrations from the atmospheric dispersion modelling were analysed at sensitive receptor locations and protected places in the locality of the Project described in Section 3.4. These are supplemented with gridded regional predictions presented through the use of contour plots.

The revised dispersion modelling results account for the updates to the emissions inventory, as discussed in Section 3.1. This section presents the results associated with year 5 and year 25 of mining which is consistent with the years reported in the EIS. The methodology employed and associated limitations are unchanged from the EIS.

4.1.1 Particulate Matter as PM_{10}

A summary of fifth highest predicted 24-hour average ground-level concentration of PM_{10} for each assessed receptor is presented in Table 4-1.

Table 4-1 Predicted 5th highest 24-hour average ground level concentration of PM_{10} ($\mu g.m^{-3}$)

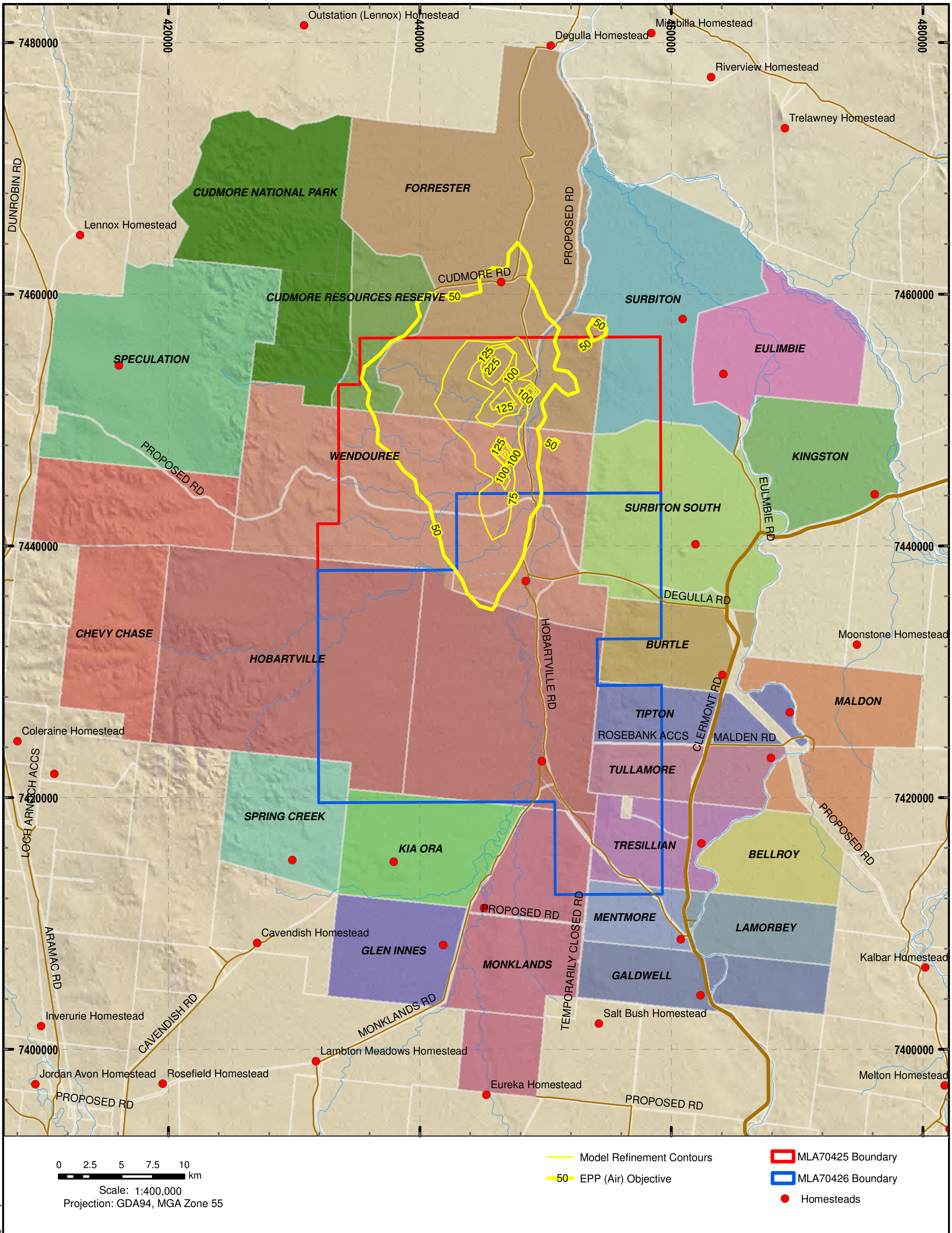
Receptor	Year 5			Year 25		
	Project	Total[1]	% of EPP (Air)	Project	Total[1]	% of EPP (Air)
1	26	53	106%	11	38	77%
2	2	29	59%	2	29	58%
3	1	28	57%	1	28	57%
4	1	28	57%	2	29	58%
6	1	28	56%	1	28	55%
8	5	32	64%	9	36	72%
9	4	31	62%	6	33	65%
10	1	28	55%	1	28	56%
11	1	28	55%	1	28	56%
Project Goal	**50**		100%	**50**		100%

[1] Includes background concentration estimated at 27 $\mu g.m^{-3}$.

The table shows an exceedance of the Project goal at Receptor 1 during Year 5 by 6%. The same receptor predicted a 24% exceedence within the EIS (Volume 1, Section 14, 2011), thus the updated mitigation measures and model refinements applied within the revised inventory would be expected to reduce the level of exceedence. The predicted concentrations at the remaining receptors are under the Project goal, as they were reported in the EIS. In year 25, it is predicted that the Project will be compliant at all sensitive receptors.

Contour plots for year 5 and year 25 are presented in Figure 4-1 and Figure 4-2, respectively, and highlight the extent of the region predicted to exceed the Project goal of 50 µg.m^{-3}. For year 5 this exceedence contour extends to the north off the mining lease as well as to the south and onto the Alpha Coal Project mining lease. For year 25, this the exceedence footprint stretches further west. However, there are no sensitive receptors in this area.

Data currently being collected as part of the background air pollutant survey at the three TEOMs described in Section 2.2 indicate that the 27µg.m^{-3} background concentration applied in the EIS may be an overestimate. Therefore, if these background air pollutant survey data were used to represent background, no exceedence would be predicted at Receptor 1. A revised background dust concentration has however not been used as part of the Refined Model as 12 months of data was not available to assess at the time of the SEIS assessment.



N W E S

HANCOCK GALILEE PTY LTD

Kevin's Corner Project
Supplementary Environmental Impact Statement

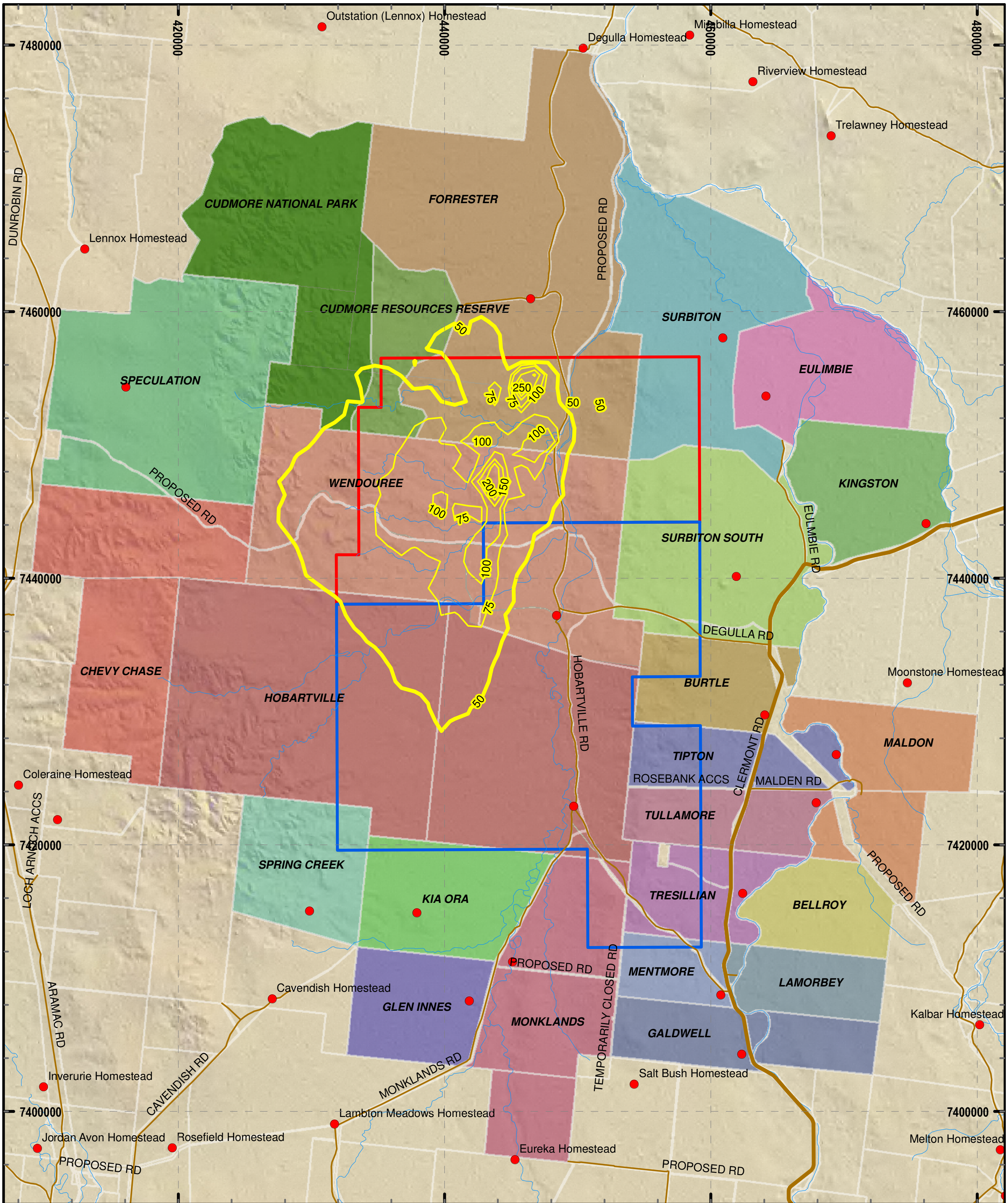
24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)
SEIS MODEL REFINEMENTS - YEAR 5

URS

KEVIN'S CORNER COAL MINE SEIS

Figure: **4-1**

File No: **42626920-g-2001.mxd** Drawn: **XL** Approved: **SB** Date: **04-10-2012** Rev. **C** A4



0 2.5 5 7.5 10 km

Scale: 1:400,000

Projection: GDA94, MGA Zone 55

Model Refinement Contours

50 EPP (Air) Objective

MLA70425 Boundary

MLA70426 Boundary

Homesteads

Source: Bing Maps © 2009 Microsoft Corporation and its data suppliers. ESRI ArcGIS Online 2011, © Mapinfo Australia Pty Ltd and PSMA Australia Ltd., © Commonwealth of Australia (Geoscience Australia) 2006, © The State of Queensland (Department of Environment & Resource Management) 2010, © The State of Queensland (Department of Mines and Energy) 2010, © Hancock Coal Supplied Data 2011.

N W E S

HANCOCK GALILEE PTY LTD

Kevin's Corner Project
Supplementary Environmental Impact Statement

**24-HOUR AVERAGE PM_{10} ($\mu g/m^3$)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF $27 \mu g/m^3$)
SEIS MODEL REFINEMENTS - YEAR 25**

URS

KEVIN'S CORNER COAL MINE SEIS

Figure: **4-2**

File No: **42626920-g-2002.mxd** Drawn: **XL** Approved: **SB** Date: **04-10-2012** Rev. **C** A4

4.1.2 Particulate Matter as $PM_{2.5}$

4.1.2.1 Emissions from Mining Activities

Table 4-2 shows the predicted maximum 24-hour average ground-level concentration of $PM_{2.5}$ at all receptor locations.

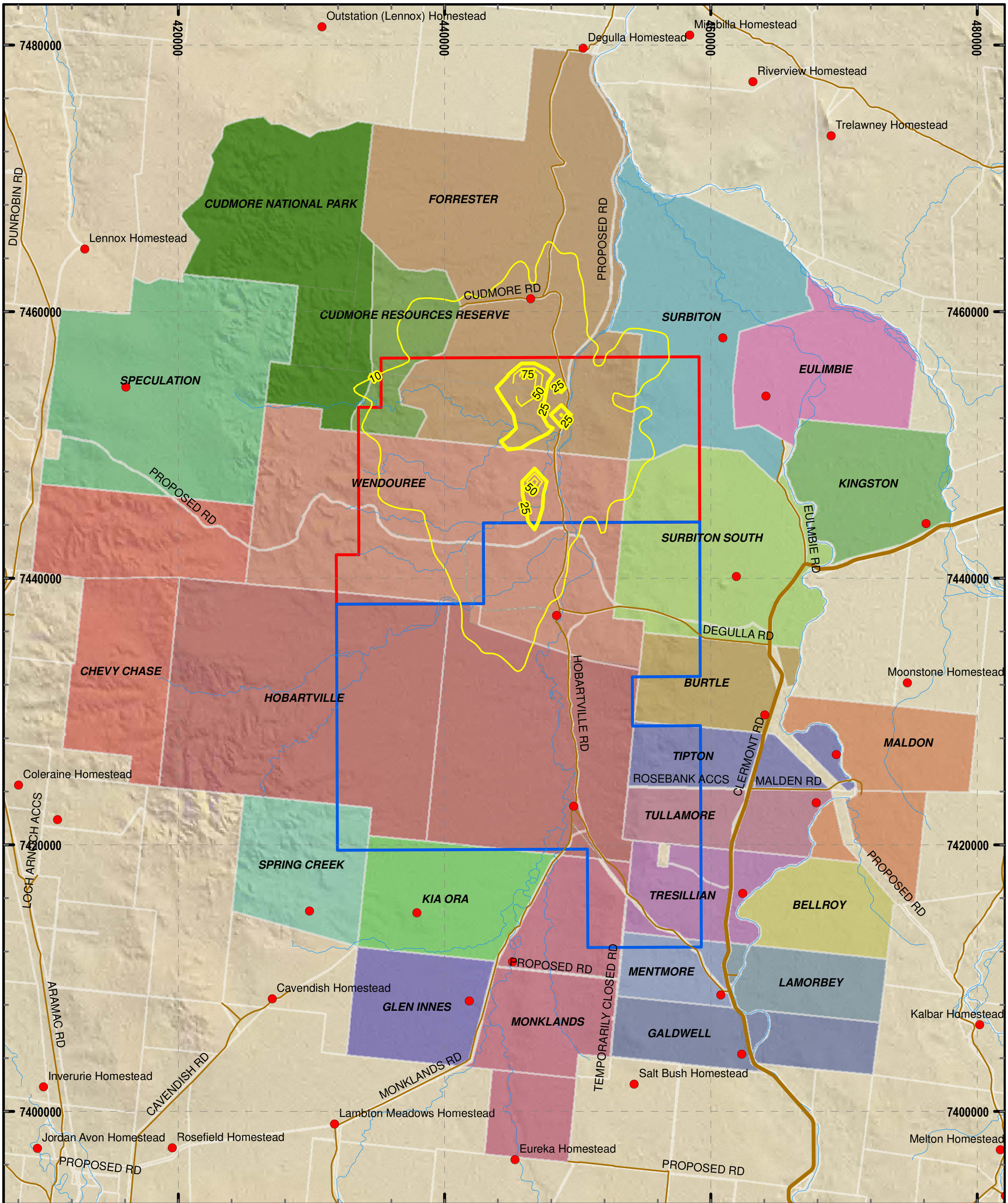
Table 4-2 Predicted maximum 24-hour average ground level concentration of $PM_{2.5}$ ($\mu g.m^{-3}$)

Receptor	Year 5			Year 25		
	Project	Total[1]	% of EPP (Air)	Project	Total[1]	% of EPP (Air)
1	5.9	11.3	45%	2.9	8.3	33%
2	1.2	6.6	27%	1.0	6.4	26%
3	0.5	5.9	24%	0.5	5.9	24%
4	1.4	6.8	27%	1.4	6.8	27%
6	0.6	6.0	24%	0.4	5.8	23%
8	1.1	6.5	26%	2.0	7.4	30%
9	1.3	6.7	27%	1.2	6.6	26%
10	0.3	5.7	23%	0.4	5.8	23%
11	0.4	5.8	23%	0.5	5.9	24%
Project Goal	**25**		100%	**25**		100%

[1] Includes background concentration estimated at 5.4 $\mu g.m^{-3}$.

Table 4-2 shows that no exceedences are predicted to occur at sensitive receptors for years 5 and 25. The highest prediction was made at Receptor 1 in year 5, which represents 45% of the Project goal. Background contribution is predicted to provide the dominant component of 24-hour average $PM_{2.5}$ concentrations.

The 24-hour average contour plots for Year 5 and Year 25, respectively, are presented on Figure 4-3 and Figure 4-4.



Source: Bing Maps © 2009 Microsoft Corporation and its data suppliers. ESRI ArcGIS Online 2011, © Mapinfo Australia Pty Ltd and PSMA Australia Ltd., © Commonwealth of Australia (Geoscience Australia) 2006, © The State of Queensland (Department of Environment & Resource Management) 2010, © The State of Queensland (Department of Mines and Energy) 2010, © Hancock Coal Supplied Data 2011.

N W E S

HANCOCK GALILEE PTY LTD

Kevin's Corner Project
Supplementary Environmental Impact Statement

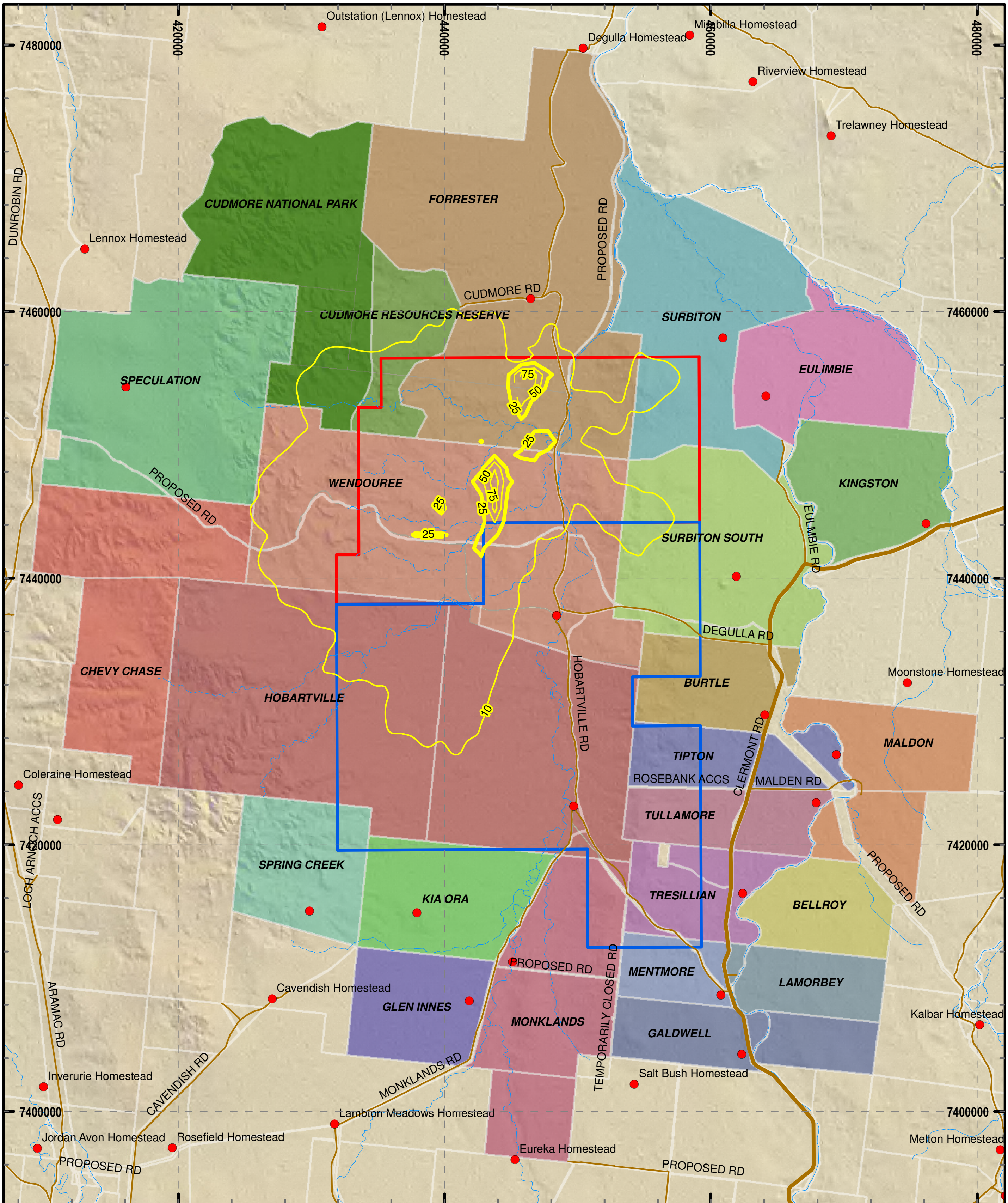
24-HOUR AVERAGE $PM_{2.5}$ ($\mu g/m^3$) (INCLUDING BACKGROUND CONTRIBUTION OF 5.4$\mu g/m^3$) SEIS MODEL REFINEMENTS - YEAR 5

URS

KEVIN'S CORNER COAL MINE SEIS

Figure: **4-3**

File No: **42626920-g-2003.mxd** Drawn: **XL** Approved: **SB** Date: **04-10-2012** Rev. **C** A4



0 2.5 5 7.5 10 km

Scale: 1:400,000

Projection: GDA94, MGA Zone 55

Model Refinement Contours

25 EPP (Air) Objective

MLA70425 Boundary

MLA70426 Boundary

Homesteads

Source: Bing Maps © 2009 Microsoft Corporation and its data suppliers. ESRI ArcGIS Online 2011, © Mapinfo Australia Pty Ltd and PSMA Australia Ltd., © Commonwealth of Australia (Geoscience Australia) 2006, © The State of Queensland (Department of Environment & Resource Management) 2010, © The State of Queensland (Department of Mines and Energy) 2010, © Hancock Coal Supplied Data 2011.

N W E S

HANCOCK GALILEE PTY LTD

Kevin's Corner Project

Supplementary Environmental Impact Statement

24-HOUR AVERAGE $PM_{2.5}$ (µg/m³) (INCLUDING BACKGROUND CONTRIBUTION OF 5.4µg/m³) SEIS MODEL REFINEMENTS - YEAR 25

URS

KEVIN'S CORNER COAL MINE SEIS

Figure: **4-4**

File No: **42626920-g-2004.mxd** Drawn: **XL** Approved: **SB** Date: **04-10-2012** Rev. **C** A4

The results for the annual average ground-level concentration of $PM_{2.5}$ are presented in Table 4-3.

Table 4-3 Predicted annual average ground level concentration of $PM_{2.5}$ ($\mu g.m^{-3}$)

Receptor	Year 5			Year 25		
	Project	Total[1]	% of EPP (Air)	Project	Total[1]	% of EPP (Air)
1	0.9	3.7	46%	0.4	3.2	40%
2	0.02	2.8	35%	0.02	2.8	35%
3	0.01	2.8	35%	0.01	2.8	35%
4	0.02	2.8	35%	0.02	2.8	35%
6	0.01	2.8	35%	0.01	2.8	35%
8	0.1	2.9	37%	0.2	3.0	38%
9	0.1	2.9	36%	0.1	2.9	36%
10	0.01	2.8	35%	0.01	2.8	35%
11	0.01	2.8	35%	0.01	2.8	35%
Project Goal	**8**		100%	**8**		100%

[1] Includes background concentration estimated at 2.8 $\mu g.m^{-3}$.

Table 4-3 shows that no exceedences of the Project goal for annual average $PM_{2.5}$ are predicted to occur at sensitive receptors for years 5 and 25. The highest prediction was made at Receptor 1 in year 5, which represents 46% of the Project goal. Background contribution is predicted to provide the dominant component of annual average $PM_{2.5}$ concentrations from the Kevin's Corner project.

4.1.2.2 Emissions from the Combustion of Vehicle Fuels

The annual generation of emissions of $PM_{2.5}$ from diesel fuels has been assessed by applying emission factors to the diesel usage for transport (Euro IV and Euro V) and energy use (US EPA AP-42 Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines) reported in the Section 14 of the Kevin's Corner EIS. The relative contribution of $PM_{2.5}$ generation from fuel combustion to that generated from mining operations has then been determined as a percentage to quantify the additional contribution to the total mine emissions inventory.

The calculations are summarised in Table 4-4 and Appendix B.

Table 4-4 Predicted annual average ground level concentration of $PM_{2.5}$ ($\mu g.m^{-3}$)

Calculation	Units	Year 5	Year 15	Year 25
Diesel usage for Transport (EIS inventory)	litres/year	20,472,788	7,641,177	15,276,730
Diesel usage for Energy (EIS inventory)	litres/year	3,709,152	5,346,243	5,269,621
$PM_{2.5}$ generated for Transport	kg/year	1,228	458	917
$PM_{2.5}$ generated for Energy	kg/year	15,645	22,550	22,227
Total generation of $PM_{2.5}$ from combustion	kg/year	16,873	23,008	23,143
Approximate total $PM_{2.5}$ for the mine	kg/year	**150,875**	**121,799**	**196,744**
Combustion $PM_{2.5}$ of total mine $PM_{2.5}$	%	**11**	**19**	**12**

Table 4-4 shows that $PM_{2.5}$ of an additional 11% in assessment year 5, 19% in year 15 and 12% in year 25 would be added to the emissions from general mining operations through the application of US EPA and Euro IV / V emission factors.

In consideration of the predicted concentrations of $PM_{2.5}$ reported in Section 4.1.2.1, which are all predicted to be under 50% of the Project goal for the 24-hour average and annual averaging periods, it is considered unlikely that additional $PM_{2.5}$ from the combustion of fuels would be the cause of additional exceedences of the Project goals.

4.1.3 Particulate Matter as TSP

Presented in Table 4-5 are the predicted annual average ground level concentrations of TSP for years 5 and 25.

Table 4-5 Predicted annual average ground level concentration of TSP ($\mu g.m^{-3}$)

Receptor	Year 5			Year 25		
	Project	Total[1]	% of EPP (Air)	Project	Total[1]	% of EPP (Air)
1	7.3	35.3	39%	3.0	31.0	34%
2	0.2	28.2	31%	0.2	28.2	31%
3	0.1	28.1	31%	0.1	28.1	31%
4	0.1	28.1	31%	0.1	28.1	31%
6	0.1	28.1	31%	0.1	28.1	31%
8	0.7	28.7	32%	1.3	29.3	33%
9	0.5	28.5	32%	0.6	28.6	32%
10	0.1	28.1	31%	0.1	28.1	31%
11	0.1	28.1	31%	0.1	28.1	31%
Project Goal	**90**		100%	**90**		100%

[1] Includes background concentration estimated at 28 $\mu g.m^{-3}$.

Table 4-5 shows that no exceedences of the Project goal for TSP are predicted to occur at sensitive receptors for years 5 and 25. Background contribution is predicted to provide the dominant component of total ambient TSP concentrations from the Kevin's Corner project.

4.1.4 Dust Deposition

Table 4-6 shows the predicted rates of dust deposition at the sensitive receptors and protected places in assessment years 5 and 25.

Table 4-6 Predicted dust deposition rate (mg/m^2/day)

Assessment Location	Year 5			Year 25		
	Project	Total[1]	% of EHP guideline	Project	Total[1]	% of EHP guideline
Sensitive Receptors						
1	6.5	74.5	53%	2.7	71.0	50%
2	0.3	68.3	49%	0.3	68.2	49%
3	0.1	68.1	49%	0.2	68.1	49%
4	0.1	68.1	49%	0.1	68.1	49%
6	0.03	68.0	49%	0.03	68.0	49%
8	0.3	68.3	49%	0.8	69.3	49%
9	0.6	68.6	49%	0.6	68.6	49%
10	0.1	68.1	49%	0.1	68.1	49%
11	0.1	68.1	49%	0.04	68.1	49%
Protected Places						
15	2.0	70.0	50%	2.6	70.6	50%
16	4.4	72.4	52%	3.6	71.6	51%
Project Goal	**140**		100%	**140**		100%

[1] Includes background concentration estimated at 68 mg/m^2/day.

Table 4-6 shows that no exceedences of the Project goal for dust deposition are predicted to occur at the sensitive receptors or protected places for years 5 and 25. Background contribution is predicted to be the dominant component of total dust deposition at the sensitive receptors from the Project.

At the Cudmore Resources Reserve, dust deposition rates predicted from Project emissions were 2.0 mg/m^2/day for year 5 and 2.6 mg/m^2/day for year 25. With the inclusion of estimated background, the total dust deposition rates are 50% of the Project goal in both assessment years. At the Cudmore Nature Reserve, the dust deposition rate predicted in year 5 from the Project was 4.4 mg/m^2/day for year 5 and 3.6 mg/m^2/day for year 25. With the inclusion of background, the total dust deposition rates are 52% and 51% of the Project goal respectively.

4.1.5 Blasting Emissions

Although combustion pollutants NO_x, CO and SO_2 from blasting for open cut mining may only contribute a small proportion of total emissions, the rapid release and high concentration that may be associated with such activities could pose a health risk should the resulting plume not dissipate rapidly and sufficiently before reaching human populations. Therefore, in its role as statutory consultee on the Kevin's Corner Coal Mine Project, Queensland Health has highlighted that these emissions have not been quantified in the EIS and the potential impact of their release on human health not properly assessed.

Emissions of particulate matter from blasting were assessed in the EIS using the average blast area, the number of expected blasts per year and an emission factor (kg/hour) from US EPA-AP42 volume 1, 5th edition Section 13.2.2. However, the scope of the assessment excluded non-particulate emissions from blasting associated with the combustion of Ammonia Nitrate Fuel Oil (ANFO), Heavy Ammonium Nitrate Fuel Oil (HANFO) and associated emulsion agents. Therefore, in response to the concerns from Queensland Health, this section reports on the assessment of NO_x, CO and SO_2 emissions from open cut pit blasting at the Kevin's Corner Coal Mine. The assessment scope covers those emissions which can be expected under 'normal' blast conditions where the explosive fuel is completely combusted and 'upset blasting conditions' which have the potential to produce clouds of visible noxious gas outside the standard blasting exclusion zone ('fume events'). These have the potential to impact upon human health during short periods of exposure. Table 4.1 of the Department of Employment, Economic Development and Innovation (DEEDI) Queensland Guidance Note 20 v3, indicates the length of potential exclusion distance downwind with several different wind conditions covering daytime stability classes. The table indicates that the largest blasts (fume category 5) with an initial plume of 500 ppm would require a downwind exclusion distance of 5,000 m to maintain a short term exposure limit (STEL) concentration of 5 ppm under worst case dispersion conditions[4].

4.1.5.1 Normal Blasting Conditions

In the assessment of air quality impacts 'screening' is a preliminary emissions dispersion assessment approach applied to determine whether a more detailed assessment is required. In this assessment, the US EPA screening dispersion model SCREEN3 was used to estimate worst-case ground level concentrations for non-particulate, gaseous emissions from blasting. A description of the SCREEN3 model and the methodology used to assess normal blast emissions is provided in Appendix A.

The emissions inventory was used to develop modeling scenarios to best represent normal blasting conditions. The emissions inventory is shown in Appendix A. The scenarios modelled in SCREEN3 were as follows:

- Northern Pit (single source) – a single blast from the Northern Pit
- Northern Pit (two sources) – two blasts from the Northern Pit
- Northern Pit (two sources) plus Central Pit (two sources) - two blasts from Northern Pit and two blasts from the Central Pit 2

Tables 4-7 to 4-9 show the predicted concentrations from SCREEN3 for NO_2, CO and SO_2:

Table 4-7 Carbon monoxide (excluding background)

Scenario	Distance to Pit (km)	8-hour average concentration ($\mu g.m^{-3}$)	% of standard
Northern Pit (single source)	7.0	500	4.4
Northern Pit (two sources)	7.0	600	5.5
Northern Pit (two sources) Central Pit (two sources)	7.0 12.0	800	7.3
EPP(Air) standard (8-hour average)		**11,000**	

[4] DEEDI (2011). Queensland Guidance Note QGN 20 v3 Management of oxides in nitrogen in open cut blasting

Table 4-8 Nitrogen dioxide (excluding background)

Scenario	Distance to Pit (km)	1-hour average concentration ($\mu g.m^{-3}$)	% of standard
Northern Pit (single source)	7.0	6.6	2.6
Northern Pit (two sources)	7.0	7.8	3.1
Northern Pit (two sources) Central Pit (two sources)	7.0 12.0	9.8	3.9
EPP(Air) objective		**250**	

Table 4-9 Sulphur dioxide (excluding background)

Scenario	Distance to Pit (km)	1-hour average concentration ($\mu g.m^{-3}$)	% of standard
Northern Pit (single source)	7.0	1.6	0.3
Northern Pit (two sources)	7.0	1.6	0.3
Northern Pit (two sources) Central Pit (two sources)	7.0 12.0	2.2	0.4
EPP(Air) objective		**570**	

Tables 4-7 to 4-9 show that all pollutants are predicted to be under the EPP (Air) objectives at the closest receptor excluding background concentrations. The results produced by SCREEN3 are inherently conservative in that they represent the peak hour concentration from the worst dispersion conditions in the year. The conditions under which the predictions were made were of a wind speed of 1 m/s under stable (class F) conditions. Note that these conditions only occur at night and blasting would only take place during the day.

Under these conditions, it would take approximately 2 hours for any pollutant to travel 7 km. By this time it is likely that the pollutant will be well mixed in the atmosphere which is represented in the concentrations predicted using SCREEN3. Exceedances at human receptors are considered to be highly unlikely under normal blasting conditions.

4.1.5.2 Upset Blasting Conditions

Fume events occur when a non-ideal explosive reaction generates a cloud of visible, toxic pollution which moves outside the standard blast exclusion zone. This cloud of visible pollution consists of NO_2, nitric oxide (NO), and CO which are harmful to human health. The standard blast exclusion zone is designed to provide protection from projections and blast overpressure.

It is difficult to quantitatively assess emissions during fume events due to the uncertainty in emissions factors. The rate of generation of NO_2, NO and CO during a fume event depends on a number of variables such as:

- Under or over fuelled Ammonium Nitrate (AN);
- Fuel AN mixture;
- Density of loaded explosives;
- Degree of confinement of explosives;

- Exposure of explosives to water;
- Ground conditions e.g. fissures, voids can result in explosives forming without critical diameter for an ideal explosive reaction causing fume; and
- Manufacture and specification of explosive ingredients including AN.

Therefore, the assessment of emissions during fume events has been undertaken qualitatively with a focus on the length of the potential downwind exclusion distance and the best practice management approaches recommended in the DEEDI guidance note QGN 20 v3.

Table 4-10 shows the distance of the most proximate sensitive receptors in the study to the nearest edge of the nearest pit.

Table 4-10 Distance of sensitive receptors to the nearest pit

Receptor	Distance of receptor to pit (m)
1. Forrester Homestead	7,000
2. Surbiton Station	12,000
3. Eullmbie Station	14,000
4. Surbiton Homestead	15,000
15. Cudmore Resources Reserve	12,000
16. Cudmore Nature Reserve	>12,000

The closest Receptor, 1, is located at a distance of 6,700 m. However, the modeling indicates that this exclusion zone will vary from 1,600 to 5,000 m depending on the meteorological conditions. A 500 m zone would only be required under worst-case conditions for the largest blasts.

Although this 5 ppm exclusion zone should not be used as a proxy for the protection of human health in the same way as the EPP (Air) NO_2 standard of 250 µg/m^3 is devised (as the STEL is an occupational exposure limit), it indicates that the sensitive receptors in the study are likely to lie outside the typical exclusion zone of the most intense blasts. The majority of the sensitive receptors are beyond 10,000 m.

The Cudmore Resources Reserve and Cudmore National Park are gazetted protected places under the Nature Conservation Act 1992 and so air quality impacts from the Project on the National Park and Resources Reserve are assessed under the EPP (Air). Both locations are 12,000 m from the nearest pit and are outside the blast exclusion zone. Therefore, these locations will not be impacted by emissions of NO_x, CO and SO_2 from blasting.

HGPL will operate a Fume Management Zone (FMZ) around the pits where emissions from blasting will be carefully managed in compliance with the best practice recommendations in guidance note QGN 20 v3. This will include the following preventative, management and incidence reporting measures:

- Adherence to best practice in the storage and preparation of explosives including minimization of water contamination and the use of a ratio of fuel oil to ANFO of 6%[5];

[5] Factors affecting ANFO fumes production by Rowland, J H Mainiero, R J.; 2000; p. 63-174. IN: Proceedings of the 26th Annual Conference on Explosives and Blasting Technique.- Anaheim, CA: International Society of Explosives Engineers;

- Adherence to best practice in the preparation of the blast site, including consideration of blast confinement and the presence of water;
- A pre-firing review including the definition of a FMZ for each blasting event;
- Consideration of the ideal conditions to prevent fume events such as the time of day and meteorology;
- Development of a monitoring plan for blasting events; and
- Incidence reporting, investigation of fume events and ongoing audit and review.

All controls put in place by HGPL for prevention and control of fume events will be vigorously applied and all HGPL personnel will ensure that these controls are firmly embedded and maintained for blasting operations.

4.1.6 Power Generation

The Kevin's Corner coal mine has entered into a supply of infrastructure and services agreement with Powerlink Queensland for permanent electricity supply. This is contracted for 30 months after financial closure for the Alpha Coal Mine project. Therefore, there will not be an on-site power generation facility. There will be temporary diesel generators used during the construction phase and emergency diesel generators available for use during power outages for critical mine safety equipment.

4.1.7 Water Supply for Dust Mitigation

HGPL has undertaken a supply and demand assessment of the water required on an annual basis for the Project which is described in the Off-Lease Assessment Report (SEIS Volume 2 Appendix I). The assessment shows that for the first five years of the Project, an off-site source of water for mine construction and operations, including dust mitigation, will not be required.

HGPL is investigating a number of options for the supply of water to the project after five years which include:

- A new pipeline to the Project site sourcing water from the Connors River Dam (CRD) under a SunWater contract lease, supply and transport agreement. The CRD and pipeline project would involve the construction and operation of the dam and associated water distribution infrastructure in Central Queensland;
- The secure of water from the Emerald Fairburn Dam in association with a dedicated water pipeline. The Emerald water pipeline would be sized to allow for the conveyance of however much water supply allocation can be secured in the near future;
- Use of existing farm dams which exist on the Kevin's Corner Project tenement;
- Flood water harvesting from the Belyando River in combination with a proposed off-stream dam storage;
- Surface evaporation protection for site water storages;
- Soils engineering compaction technology to provide earthworks stabilisation to reduce the use of water for soil;
- Dewatering of mining pits and underground mining areas to off-set the water needed for import to the site; and
- Use of Belt press filters in the CHPP which would reduce water demand in the CHPP by 50%.

Greenhouse Gas Impacts

5.1 Terms of Reference

Greenhouse Gas Emissions (GHG) from land clearance were not included in the Kevin's Corner EIS. To meet the Project's Terms of Reference, these emissions have now been calculated and the emissions inventory updated to show their relative contribution to the Project's total GHG emissions.

5.2 Calculation of Emissions from Land Clearance

Carbon emissions due to land clearing were calculated using the Department of Climate Change (DCC) FullCAM Modelling tool. FullCAM is a fully integrated carbon accounting model for estimating and predicting all biomass, litter and soil carbon pools in forest and agricultural systems. FullCAM is the model used to construct Australia's national greenhouse gas emissions account for the land use sector. It was developed under the National Carbon Accounting System (NCAS) at the Australian Greenhouse Office (AGO) to integrate data on land cover change, land use and management, climate, plant productivity, and soil carbon over time — to provide a dynamic account of the changing stock of carbon in Australia's land systems since 1970. Users of the model are able to determine project-based results on a similar basis to Australia's official recording of greenhouse gas emission trends for land use and land use change. The model incorporates a suite of verifiable component models, adapted for use at a fine spatial scale and temporal resolution for the Australian continent.

The model was used to produce an estimate of carbon emissions from land clearing at the initial phase of the project, which were subsequently averaged across the 29-year life of mine. It was assumed that vegetation growth at the project site had developed for 100 years and that all biomass removed during clearance would be converted to carbon dioxide.

Following the FullCAM modelling assessment land clearing emissions from the project site were compared against the Australian and Queensland 2009 annual GHG inventory emissions. This comparison showed that land clearing emissions from the project site contributed a small proportion to the state and national inventories. The annual average land clearance emissions accounts for 0.007% of the national 2009 annul greenhouse gas inventory and 0.02% of the Queensland inventory.

5.2.1 FullCAM Methodology

FullCAM integrates a range of models that simulate carbon cycles spatially to track the greenhouse gas (GHG) emissions and carbon stock changes (i.e. biomass, litter and soil) associated with land use and management. The model generates project-based results on a similar basis to Australia's official recording of greenhouse emissions trends for land use and land use change.

A multilayer, mixed system plot (forest and agriculture) was used, as recommended by the Department of Climate Change and Energy Efficiency (DCCEE) for deforestation modelling. Trees, crop species, and management information are contained on the FullCAM databases. A simple model was set up to measure the carbon mass of plants only, including above ground biomass and roots, from 1915 until mining activities commence in 2015. Based on the vegetation type options defined within FullCAM, tropical eucalyptus open woodlands were selected from the available native forest groups to represent the existing land use at the Project site.

5 Greenhouse Gas Impacts

Table 5-1 Kevins Corner FullCAM Model Inputs

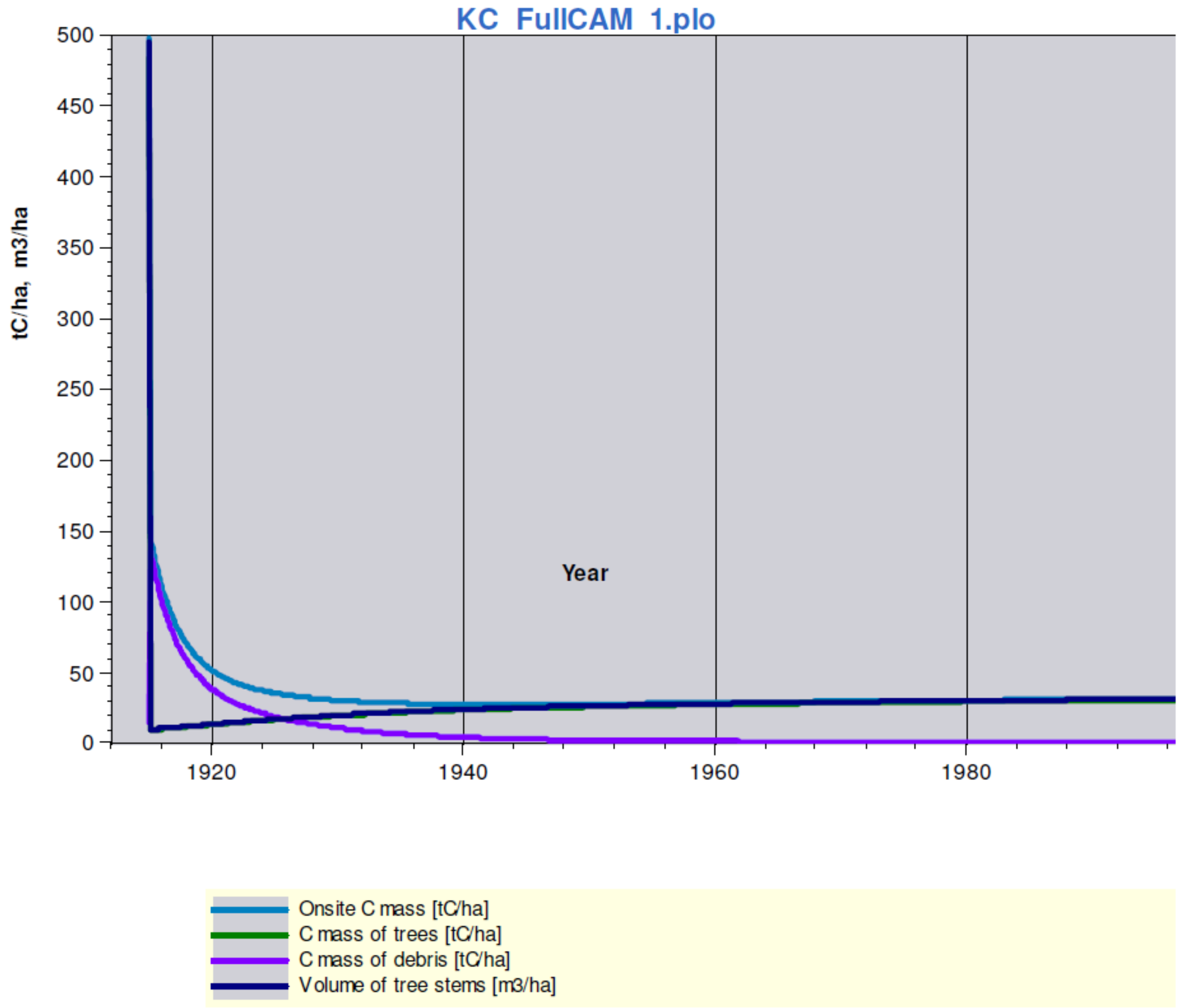
FullCAM input	Parameter	Description	Justification
Configuration	Plot	Multilayer mixed (forest and agriculture system)	Land use is mixed according to terrestrial ecology surveys which can be found in the ecology section of the EIS. It is also recommended by DCCEE
	Simulate	Carbon	Elemental carbon required to determine CO_2-e emission
	Tree Production	Tree yield formula	The tree yield formula is the most appropriate growth information to use for this plot
Timing	Simulation steps	Yearly	Yearly simulation steps were chosen to demonstrate one material movement from one pool to the next pool with each step simulating the same amount of time
	Start and End	1915-2015	Clearing initially mature vegetation on the site via a fire event at the commencement of the simulation (1915) The vegetation then naturally regenerates and grows over the 100 year period preceding the construction phase of the mine
Data Builder	Spatial data	445000 m (E), 7450000 m (N)	UTM location representative of the centre of the Project site
	Tree Species	Native Groups: Eucalyptus Open Woodland	The dominant woodland found at the Project site
Site	Maximum Above Ground Biomass	The above ground mass of the trees i.e. stems, branches, bark and leaves	By entering the maximum value of 764 tonnes of dry matter per hectare (tdm/ha) it presumes no impediment in the growth for the site and allows the vegetation to grow from a cleared state throughout the 100 year period
Events	1915 – Forest Fire 100% 2015 – Thin Clearing	Each simulation step consists of continuous processes punctuated by any events that occur during that step	Commencing with existing vegetation, then burning and allowing natural regeneration. In combination with default parameters, the plot simulation represented the growth based on the standard growth functions developed by DCCEE

5.2.2 FullCAM Results

The FullCAM simulation output plot, illustrated in Figure 5-2, presents the 100 year life cycle of the modelled vegetation. It indicates that by removing initially mature vegetation, at the commencement of the model simulation (1915) via a fire event, and allowing the vegetation to regenerate and grow over a 100 year period, it produces a total carbon content of 32.55 tC/ha in 2015. This elemental carbon emission factor was then converted to emissions of carbon dioxide equivalent (CO_2-e) by multiplying a standard factor.

An emission factor of 119tCO_2-e/ha per annum, obtained by applying the elemental conversion factor to the net carbon output, when multiplied with the amount of land to be cleared (4,364.5 ha), equates to 519,316 tCO_2-e released due to land clearing activities. The amount of land to be cleared from the project site includes the area to be disturbed within the mining lease and the proposed area to be disturbed for the off lease rail and road infrastructure.

Table 5-2 FullCAM output simulation plot



5.2.3 GHG Gas Emissions from the project

A summary of GHG scope 1 and scope 2 emissions are outlined below in Table 5-3 below. These are both direct and indirect emissions generated from the Project.

- Scope 1: Direct GHG emissions. Emissions released from a facility as a direct result of the activities of the facility. For example:
  - Emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.;
  - Emissions from on-site power generators; and
  - Coal Seam Gas (CSG) released to atmosphere.

Scope 2: Indirect GHG emissions. Scope 2 emissions are activities that generate electricity, heating, cooling or steam that is consumed by the facility but do not form part of the facility. They occur principally at electricity generators as a result of electricity consumption at another facility. They are recorded principally as a measure of what might happen to national emissions as a result of the consumption of electricity from facilities.

These emissions include the annual average emissions for the project and the total CO_2-e emissions over the 30-year project life (Volume 1, Section 14 GHG and Climate Change of the EIS). In terms of land clearing activities, the emission presented is representative of the CO_2-e over the life of the mine, although land clearing will be a one-time event occurring during the construction phase of the project.

5.2.4 Land Clearance Emissions to national and state GHG inventories

The National GHG Inventory (DCCEE, 2010b) is the latest available national account of Australia's GHG emissions. The National GHG Inventory (DCCEE, 2010b) has been prepared in accordance with the Revised 1996 and 2006 Intergovernmental Panel on Climate Change (IPCC) Objectives for National GHG inventories (IPCC, 2007). The IPCC guidance defines six sectors for reporting GHG emissions; these include:

- Energy Sector (including coal mining);
- Industrial Processes;
- Agriculture;
- Waste;
- Other; and
- Land Use, Land Use Change and Forestry

Table 5-3 below presents the total CO_2-e land clearance emissions contribution to Australia's and Queensland total project GHG emissions. Australia's net GHG emissions across all sectors totalled 565 million tonnes (Mt) CO_2-e in 2009, with the energy sector (including mining) emitting 417 Mt CO_2-e. Queensland total GHG emissions are 155 Mt with the energy sector contributing to 97 Mt based on the 2009 annual emissions. These values have been based on the National Greenhouse Gas Inventory 2009 and the State and Territory Greenhouse Gas Inventories 2009 (DCCEE, 2011).

Table 5-3 Comparison of annual land clearance emissions with Australia and Queensland annual GHG emissions (2009)

Source	% of Australian Mining Sector	% of Australian total	% of QLD Mining sector total	% of QLD total
Land clearance	0.004	0.003	0.01	0.02

When compared against the national and state inventories for GHG emissions it is evident that the project emissions from land clearing makes a relatively small contribution to both Australia's and Queensland's GHG emissions. Land clearance emissions represent less than 0.03% of the national GHG inventory, and represent less than 0.1% of the Queensland inventory.

The Queensland Government has proposed to reduce GHG emissions by 60% by 2050 based on 2000 levels, in accordance with the national target. This equates to a reduction of approximately 98 Mt CO_2-e.

The values generated from this modelling approach should be regarded as conservative as it is likely that the area of land cleared has been overestimated.

5.3 Updated GHG Emissions Inventory

Table 5-4 summarises the update GHG emissions inventory for the Kevin's Corner coal mine project.

Table 5-4 CO_2-e emissions summary

Scope	Source	Minimum Emissions (t CO2-e / yr)	Maximum Emissions (t CO2-e / yr)	Average Emissions (t CO2-e / yr)	Life of Mine Emissions (t CO2-e)
1	Fugitive emissions	75,360	320,468	270,032	7,830,936
1	Diesel combustion (transport)	19,804	55,238	33,506	971,679
1	Diesel combustion (stationary)	1,660	15,888	13,111	380,222
1	Explosives- Ammonium Nitrate Fuel Oil (ANFO)	0	57,030	3,824	110,891
1	Land clearance	-	-	17,907	519,316
1	**Total Annual Scope 1**	**96,824**	**448,624**	**338,380**	**9,813,004**
2	Purchased Electricity	525,399	2,024,881	1,699,164	49,275,743
Annual Scope 1 and 2		**637,074**	**2,392,332**	**2,037,544**	**59,088,787**

5 Greenhouse Gas Impacts

Table 5-4 shows that emissions from land clearance make a very small contribution to GHG emissions for the Project.

References

ACIRL (2010). Report: Dustiness Moisture Relationship Determination – Hancock Resources Pty Ltd. 2000-9307.

Bureau of Meteorology, Long term climate averages for Clermont Sirius St, Barcaldine and Emerald meteorological station, Available at www.bom.gov.au

C. Cowherd & D. Ono (2005) Proposed Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. http://www.epa.gov/ttn/chief/conference/ei15/session14/cowherd_pres.pdf last accessed 14/6/2012)

DCCEE (2011). Australian National Greenhouse Accounts. Quarterly Update of Australia's National Greenhouse Inventory. ISBN 978-1-922003-13-3 (print) 978-1-922003-14-0 (online)

DCCEE (2011). State and Territory Greenhouse Gas Inventories 2009 ISBN: 978-1-921299-45-2

DEEDI (2011). Queensland Guidance Note QGN 20 v3 Management of oxides in nitrogen in open cut blasting

European Commission Euro IV and V emission factors (http://ec.europa.eu/environment/air/transport/road.htm last accessed 14/6/2012)

IPCC (2006). IPPC Guidelines for National Greenhouse Gas Inventories (http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html last accessed 14/6/2012)

Hancock Coal Pty Ltd (2010). CHPP Bridging Study. Review of Product Moisture, Energy, Alternative Circuit Configurations, and Resource Yield Model. Prepared by Sedgman Ltd.

Hancock Coal Pty Ltd (2010). Alpha Coal Project. BFS Design Criteria. Coal Handling and Preparation Plant. HC-TSV-30000-RPT-00001_C

Hancock Coal Pty Ltd (2011) Air Quality Assessment for the Kevin's Corner EIS Project

Hurley, P. J. (2005), The Air Pollution Model (TAPM) Version 3, Part 1: Technical Description, CSIRO Atmospheric Research Technical Paper 71

JORC (2004) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. The JORC Code.

National Pollutant Inventory (NPI), 2001, Emission Estimation Technique Manual for Mining, Version 2.3, Available at: http://www.npi.gov.au/handbooks/approved_handbooks/mining.html

National Environmental Protection Council, National Environment Protection Measure for Ambient Air Quality, 1988, with amendment in 2003

NSW Department of Environment and Conservation, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, August 2005

Queensland Government, EHP, Queensland 2006 Air monitoring report, available online at http://www.EHP.qld.gov.au/environmental_management/air/air_quality_monitoring/air_quality_reports/index.html

Queensland Government, Environmental Protection (Air) Policy 2009, Office of the Queensland Parliamentary Counsel

6 References

Rowland and Mainiero, R J.(2000). Factors affecting ANFO fumes production by in: Proceedings of the 26th Annual Conference on Explosives and Blasting Technique.- Anaheim,CA: International Society of Explosives Engineers;

Salva Resources (2010) Resource Estimate and Geological Report

Sinclair Knight Merz (2005), Improvement of NPI Fugitive Particulate Matter Emission Estimation Techniques, May 2005

TRC Environmental Corporation, CALPUFF Version 6 Users' Instructions (Draft), Lowell, Massachusetts, USA, May 2006

USEPA AP-42 - Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume 1

USEPA AP-42 – Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines (http://www.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf last accessed 14/6/2012)

Victorian State Environment Protection Policy (Air Quality Management), 2001

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Hancock Galilee Pty Ltd and only those third parties who have been authorised in writing by URS to rely on this Report.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this Report.

It is prepared in accordance with the scope of work and for the purpose outlined in the agreed contract.

Where this Report indicates that information has been provided to URS by third parties, URS has made no independent verification of this information except as expressly stated in the Report. URS assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared between Monday 27th February and Tuesday 3rd October 2012 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This Report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This Report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Except as required by law, no third party may use or rely on this Report unless otherwise agreed by URS in writing. Where such agreement is provided, URS will provide a letter of reliance to the agreed third party in the form required by URS.

To the extent permitted by law, URS expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. URS does not admit that any action, liability or claim may exist or be available to any third party.

Except as specifically stated in this section, URS does not authorise the use of this Report by any third party.

It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Appendix A - Blasting Emissions Inventory

SCREEN3 is a single source Gaussian plume screening model which provides maximum ground-level concentrations for point, area, flare, and volume sources, as well as concentrations in the cavity zone, and concentrations due to inversion break-up and shoreline fumigation. It is commonly used in the field of air quality to determine if the regulatory standards set for the protection of human health have the potential to be exceeded.

Emissions Estimation

Emission rates of NO_x, CO and SO_2 from blasting were estimated using SCREEN3 and emission factors from the Australian National Pollutant Inventory (NPI) Emission Estimation Technique Manual (EETM) for Explosives Detonation and Firing Ranges. The emission factors applied in the screening assessment are shown below:

Uncontrolled Emission Factors for the Detonation of Explosives (Australian NPI) (kg/tonne)

Explosive	Carbon Monoxide (CO)	Nitrogen Oxides (NO_x)	Sulphur Dioxide (SO_2)
ANFO	34	8	1

The total amount of ANFO/HANFO mix (tonnes) required for each year of the life of the mine was derived from the total area being blasted. As each blast 'strip' was estimated by HCPL to measure 500 x 70 x 15m, the number of blasts required per year per pit was determined. The screening model emission rates in (g/s) for each pit were then derived from the product of the tonnes of explosive per pit and NPI emission factors for each species shown in Table A1.

In SCREEN3, emissions from blasting were represented as volume sources with the same dimensions as a single blasting 'strip' of 500 x 70 x 15 m.

Sensitive Receptors

As the most proximate receptor to any of the Project site, Forrester Homestead was selected as the receptor at which screening estimates would be made. The distance to the nearest point of the Northern Pit was estimated from the mine plans as 7 km. At its nearest point, Forrester Homestead was estimated to be 12 km from the Central Pit.

Modelling Scenarios

The impacts from blasting at Forrester Homestead were predicted in three increasingly conservative modelling scenarios to ensure that under the most extreme circumstances the Project Criteria are not likely to be exceeded. These scenarios were:

- One strip from the Northern Pit (most realistic);
- Two strips from the Northern Pit (conservative); and
- Two strips from the Northern Pit and two from the Central Pit (highly conservative).

Meteorology

To ensure predictions were made under the worst dispersion conditions, SCREEN3 was configured to predict concentrations in consideration of all wind speeds and stability classes. It was determined that the most conservative dispersion conditions were under stability class F with light wind speeds of 1 m/s in the direction of Forrester Homestead. Note that such conditions only occur at night and blasting will be undertaken during the day, when improved dispersion conditions will be experienced.

Appendix B - $PM_{2.5}$ emissions from the combustion of diesel

Table B1 presents how the emission factor for $PM_{2.5}$ from the combustion of diesel was derived and applied to obtain total $PM_{2.5}$ emissions associated with mining activities in years 5 and 25 of operation.

Table B1 Emissions criteria for $PM_{2.5}$ from diesel fuel combustion

Emissions criteria	Units	Value	Source
$PM_{2.5}$ emission factor for stationary engines	lb/hp-hr	0.0022	**The United States Environmental Protection Agency (AP-42)** http://www.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
	kg/KW-hr	0.0013376	
$PM_{2.5}$ emission factor for transport	g/KW-hr	0.02	**European Union (Emission factors for Euro IV and V for large goods vehicles)** http://ec.europa.eu/environment/air/transport/road.htm
	kg/KW-hr	0.00002	
Diesel usage stationary engines	KW-hr/litre	3	
Diesel usage: transport			
Heat content	MJ/kg	43	**United States Department of Energy**
Density	kg/litre	0.8	
Heat content	MJ/l	34.4	
Diesel use (100% load)	KW/l	9.6	
Diesel use (30% load)	KW-hr/litre	3.2	

Appendix B - PM2.5 emissions from the combustion of diesel

Table B2 Derivation of $PM_{2.5}$ diesel combustion emissions associated with mined ROM and product coal in years 5 and 25 of mine operation

Source	Units	Year 5	Year 15	Year 25
		2018	2022	2038
Explosives - Diesel	kL	778	667	940
Fuel Combustion for Transport - Diesel	kL	20,473	7641	15,277
Fuel Combustion for Energy - Diesel	kL	3,709	5346	5,270
Electricity Use	kWh	967,804,800	2,242,735,200	2,074,981,200
Fuel use for Transport - Diesel	kL/year	20,472,788	7,641,177	15,276,730
Fuel use for Energy - Diesel	kL/year	3,709,152	5,346,243	5,269,621
$PM_{2.5}$ generated for Transport - Diesel	kWh	61,418,363	22,923,532	45,830,190
$PM_{2.5}$ generated for Energy - Diesel	kWh	11,696,191	16,858,488	16,616,870
$PM_{2.5}$ generated for Transport - Diesel	kg/year	1,228	458	917
$PM_{2.5}$ generated for Energy - Diesel	kg/year	15,645	22,550	22,227
Total combustion $PM_{2.5}$	**kg/year**	**16,873**	**23,008**	**23,143**
Total PM_{10} for the mine	**kg/year**	**754,375**	**608,997**	**983,719**
Approx total $PM_{2.5}$ for the mine	**kg/year**	**150,875**	**121,799**	**196,744**
Combustion $PM_{2.5}$ of total mine $PM_{2.5}$	**%**	**11**	**19**	**12**

URS Australia Pty Ltd
Level 17, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001Australia

T: 61 7 3243 2111
F: 61 7 3243 2199

www.ap.urscorp.com