HANCOCK PROSPECTING PTY LTD

Alpha Coal Project Environmental Impact Statement

Noise and Vibration

Report

Noise and Vibration Impact Assessment

Alpha Coal Project (Mine)

20 SEPTEMBER 2010

Prepared for

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Abbreviations

Abbreviation	Description
AARC	Australasian Resource Consultants
ANZEC	Australian and New Zealand Environment Council
CHPP	Coal Handling and Preparation Plant
CoP	Code of Practice
EMP	Environmental Management Plan
EPA	Environmental Protection Act 1994 (Queensland);
EPP(Noise)	Environmental Protection (Noise) Policy 2008
GHD	GHD Group Pty Ltd
Ha	Hectares
HCPL	Hancock Coal Pty Ltd
HPPL	Hancock Prospecting Pty Ltd
IPCC	In Pit Crusher Conveyor
km	Kilometres
km/h	Kilometres per hour
m	Metres
m/s	Metres per second
m^3	Cubic metres
MIA	Mine Industrial Area
MIC	Maximum Instantaneous Charge
ML	Mining Lease
MLA70126	Subject Mining Lease
mm/s	Millimetres per second
Mt	Megatonnes
Mtpa	Megatonnes per annum
NSW RTA	New South Wales Road Traffic Authority
OLC	Overland Conveyor
P	Pressure (Overpressure)
PFS	Pre Feasibility Study
PPV	Peak Particle Velocity
ROM	Run of Mine
STP	Sewerage Treatment Plant
T	Tonnes
TLO	Train Load Out
ToR	Terms of Reference
URS	URS Australia Pty Ltd
WHO	World Health Organisation

Executive Summary

URS Australia Pty Ltd (URS) has been commissioned by Hancock Prospecting Pty Ltd (HPPL) to undertake a noise and vibration impact assessment for the proposed Alpha Coal Project (Mine) (the Project), a 30 Mtpa thermal coal mine in the Galilee Basin of Queensland, Australia. The mine would be supported by privately owned and operated rail and port infrastructure facilities.

The Galilee Basin is a significant yet-to-be developed coal field, consisting of four principal seams of predominately thermal coal suitable for high-production open-cut mining. HPPL intends to apply for a mining lease (ML) to cover the most economic 30-year mine plan, with two of the four major coal seams targeted. Mining methods employing draglines, shovels and trucks would be used to expose these seams for the duration of the mine life. Additionally, an in pit crusher conveyor (IPCC) system is potentially viable. Truck and shovel mining methods and conveyors would be used to extract the coal and deliver it to the coal handling preparation plant (CHPP). At the Project site the coal would be mined, washed and conveyed to a train load-out (TLO) facility where it would be transported approximately 495 km to the east coast of Australia to the port facility of Abbot Point for export.

The potential for noise and vibration effects associated with the Project arise from the mine infrastructure construction phase, the 30-year mine operations, blasting, operational rail movements and off-site traffic.

The nearest potentially affected sensitive receptor locations have been identified, eight of which are located outside the HPPL mining lease boundary, while two existing receptors are located within the mining lease boundary closer to the proposed pit areas. Additionally, potential noise and vibration impacts at the location of an accommodation village proposed by HPPL, located within the mining lease boundary providing sleeping facilities for mine site contractors, has been assessed.

The predicted noise impacts from the proposed site on these locations have been assessed with consideration of the following relevant state legislation and guidelines:

- *Terms of Reference for an environmental impact statement, Alpha Coal Project* (Coordinator General, June 2009)
- *Environmental Protection Act 1994 (Queensland);*
- *Environmental Protection (Noise) Policy 2008;*
- *EPA Ecoaccess Guideline: Planning for Noise Control;*
- *EPA Ecoaccess Guideline: Noise and Vibration from Blasting;* and
- *EPA Ecoaccess Guideline: Assessment of Low Frequency Noise.*
- *Interest in Planning Schemes No. 3 (Queensland Transport) and Queensland Rail Code of Practice for Railway Noise Management* (November, 2007);
- *The Health Effects of Environmental Noise – other than hearing loss* (enHealth) Council, 2004); and
- *World Health Organisation Guidelines for Community Noise,* 1999.

As the mine would operate on a 24 hour, 7 days per week basis, an assessment of sleep disturbance for the nearest potentially affected noise sensitive receptors has been considered in this study.

While the Queensland *Environmental Protection (Noise) Policy 2008* does not include construction noise limits, construction activities have been assessed with consideration to the *Environmental Protection (Noise) Policy 2008* and the *World Health Organisation (WHO)* guideline for sleep protection.

The noise criteria have been conservatively established by adopting the lowest permissible noise limits to assess the proposed construction and operations with consideration to the above guidelines

and background noise monitoring results. Detailed results of noise measurements and the noise criteria applicable to the Project are presented in **Sections 3** and **4**. Daily noise logging plots are also provided in **Appendix F**.

Noise levels from the proposed construction and operation have been predicted using an acoustic computer model created in SoundPLAN Version 7.0. Details of the area's topography, receptor locations and sound power levels of the noise sources have been used in the noise model. Typical and 'worst-case' scenarios have been taken into consideration throughout the noise modelling. Detailed results of the predictive modelling are provided in **Sections 5.3** and **5.4**.

Noise modelling indicates that the proposed construction and operational mining activities would comply with the established noise criteria at the eight receptor locations outside the mining lease boundary without the requirement for any specific noise mitigation measures.

The two receptors within the mining lease boundary are expected to be adversely affected by operational noise from the mine site, the closer of the two considerably affected. This receptor is additionally expected to be adversely affected by noise during the construction phase and by overpressure effects resulting from the proposed blasting at the pits. At this location the potential for overpressure levels to exceed the recommended limits for human comfort and structural damage is also predicted. At all other receptor locations, with the adoption of suitable blasting controls, compliance with the relevant blasting noise and vibration control guidelines is predicted.

The predicted increase in off-site road traffic volume due to the proposed construction and operation is significant. While full compliance with the relevant road traffic noise criteria is predicted during all construction and operations stages, noticeably increased noise levels are likely to be perceived by the most affected receptors.

GHD has carried out an assessment of rail noise and vibration effects for the proposed 400 km rail line associated with the Project. A summary of the GHD report is provided in **Section 5.10.** No exceedance of the relevant rail noise criteria is predicted.

It is concluded that noise impacts from construction activities and operation of the proposed mine are not expected to significantly degrade the existing acoustic environment nor create undue annoyance to the receptors located outside the mining lease boundary. With regards to the two homesteads (receptors) within the mine lease boundary, the Proponent is discussing the Project's impacts with the affected properties. The discussions will include appropriate compensation arrangements to ensure the landholders' specific requirements are properly satisfied.

1

Introduction

URS Australia Pty Ltd (URS) has been commissioned by Hancock Prospecting Pty Ltd (HPPL) to undertake a construction and operations noise and vibration impact assessment for the proposed Alpha Coal Project (Mine) (the Project). This assessment has been prepared in accordance with the *Terms of Reference* (TOR) dated June 2009, the *Environmental Protection Act* (EPA)*1994* and the *Environmental Protection (Noise) Policy 2008.*

Noise and vibration impacts associated with the site's proposed construction and operations have been assessed in accordance with the relevant draft EPA Ecoaccess guidelines (*EPA Ecoaccess Guideline Planning for Noise Control, EPA Ecoaccess Guideline Noise and Vibration from Blasting* and *EPA Ecoaccess Guideline Assessment of Low Frequency Noise*). Off-site road traffic noise has been assessed against the *Department of Main Roads' Road Traffic Noise Management Code of Practice (CoP)* criteria.

Additionally, the following guidelines and standards have been considered:

- *AS1055.1 and AS1055.2, 1997 - Description and Measurement of Environment Noise;*
- *Interest in Planning Schemes No. 3 (Queensland Transport) and Queensland Rail Code of Practice for Railway Noise Management* (November, 2007);
- *AS 2187.2, 2006 – Explosives, Storage and Use, part 2, Use of Explosives;*
- *BS7385 Part 2*, 1993 - *Evaluation and Measurement for Vibration in Buildings, Guide to Damage Levels from Ground-borne Vibration;*
- *BS6472, 1992 - Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*;
- *The Health Effects of Environmental Noise – other than hearing loss* (enHealth) Council, 2004);
- *Australian/New Zealand Standard AS/NZS 2107-2000, Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*; and
- *World Health Organisation Guidelines for Community Noise,* 1999.

1.1 Scope of Assessment

The scope of this assessment is to:

- Provide a description of the existing acoustic environment and the proposed development;
- Establish project-specific noise criteria;
- Establish ground vibration and overpressure criteria for blasting;
- Predict potential noise, overpressure and ground vibration impacts by means of noise modelling and calculations;
- Assess predicted noise, overpressure and vibration levels against the established criteria;
- Provide a statement of potential impacts; and
- Report the findings of the assessment.

This assessment includes potential construction and operations noise and vibration impacts of the mine site and associated infrastructure, but does not include the operations of the proposed Alpha airport, railway or port facilities.

An independent study of the rail noise and vibration impact has been undertaken by GHD consultants. A summary of this is provided in **Section 5.10**. Potential noise and vibration impacts on terrestrial animals and avifauna are not included in this assessment. The findings of the potential impacts on fauna from the ecology assessment are addressed in **Section 5.11**.

2

Project and Site Description

2.1 Project Description

The Galilee Basin, located in Queensland, Australia, is a significant yet-to-be developed coal field, consisting of four principal seams (A-D) of thermal coal. The coal field is suitable for high-production open-cut mining, with the seams dipping gently from east to west and varying in thickness from 5 to 8 metres (m). The Project consists of a mineable resource of nearly four billion tonnes of thermal coal, with a large portion identified as export quality.

HPPL is proposing to develop the Project, a 30 million tonnes per annum (Mtpa) (product) open cut thermal coal mine to target the C and D Seams in the Upper Permian coal measures of the Galilee Basin. Approximately 1.2 billion tonnes of the identified resource is proposed to be mined initially using open-cut methods, with the potential for developing significant underground resources.

The coal mine would be supported by privately owned and operated rail and port infrastructure facilities. At the Project site the coal would be mined, washed and conveyed to a train load-out (TLO) facility where it would be transported approximately 495 kilometres (km) to the port facility at Abbot Point for export.

The Project construction is planned to commence in late 2011 and first coal would be produced in early 2014. The proposed mine life is 30 years. Coal mining and product tonnage will build up over a 4 year period and then be maintained at 30 Mtpa for the life of mine (LOM).

2.2 Site Location

The coal tenements held by HPPL (and other fully-owned subsidiaries) occupy an area of some 74,000 hectare (ha) and are located approximately 50 km north of the township of Alpha, 130 km south-west of Clermont and 360 km south-west of Mackay in Central Queensland, Australia.

Land use within and adjacent to the mine site is predominantly low intensity cattle grazing and the site and surrounding areas are relatively flat and vegetated.

2.3 Noise Sensitive Receptors

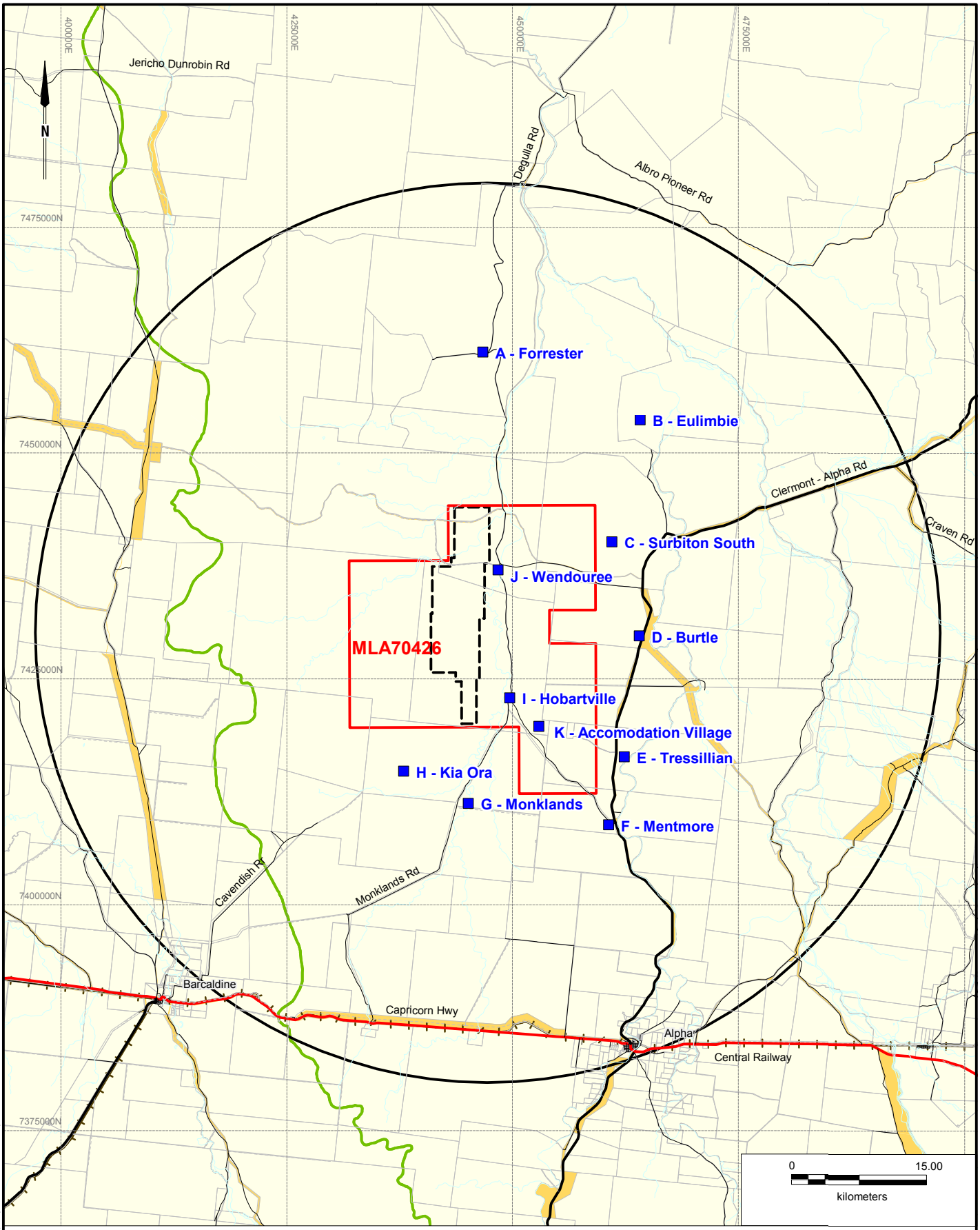
Two existing dwellings, Wendouree Station and Hobartville Homestead, are located within the mining lease boundary and a further eight dwellings located within 20 km of the site's boundary to the north, east and south have been identified by HPPL.

Table 2-1 sets out the nearest potentially affected noise sensitive receptor locations and their respective distances from the mining lease boundary and pit area boundary. A site location plan indicating the identified receptor locations is shown in **Figure 2-1**, while **Figure 2-2** shows the proposed site layout.

2 Project and Site Description

Table 2-1 Noise Sensitive Receptors

Receptor	Address	Approx. Distance from MLA70426 Mining Lease Boundary, (km)	Approx. Distance from Pit Area Boundary, (km)
A	Forrester Homestead	16.7	17.2
B	Eulimbie Homestead	9.4	16.2
C	Surbiton South Station	3.7	13.6
D	Burtle Station	4.6	17.3
E	Tressillian Homestead	4.2	16.7
F	Mentmore Homestead	5.4	18.4
G	Monklands Homestead	7.9	8.8
H	Kia Ora Homestead	4.6	8.2
I	Hobartville Homestead	Within MLA70426	3.7
J	Wendouree Station	Within MLA70426	1.2
K	HPPL Accommodation Village	Within MLA70426	6.4



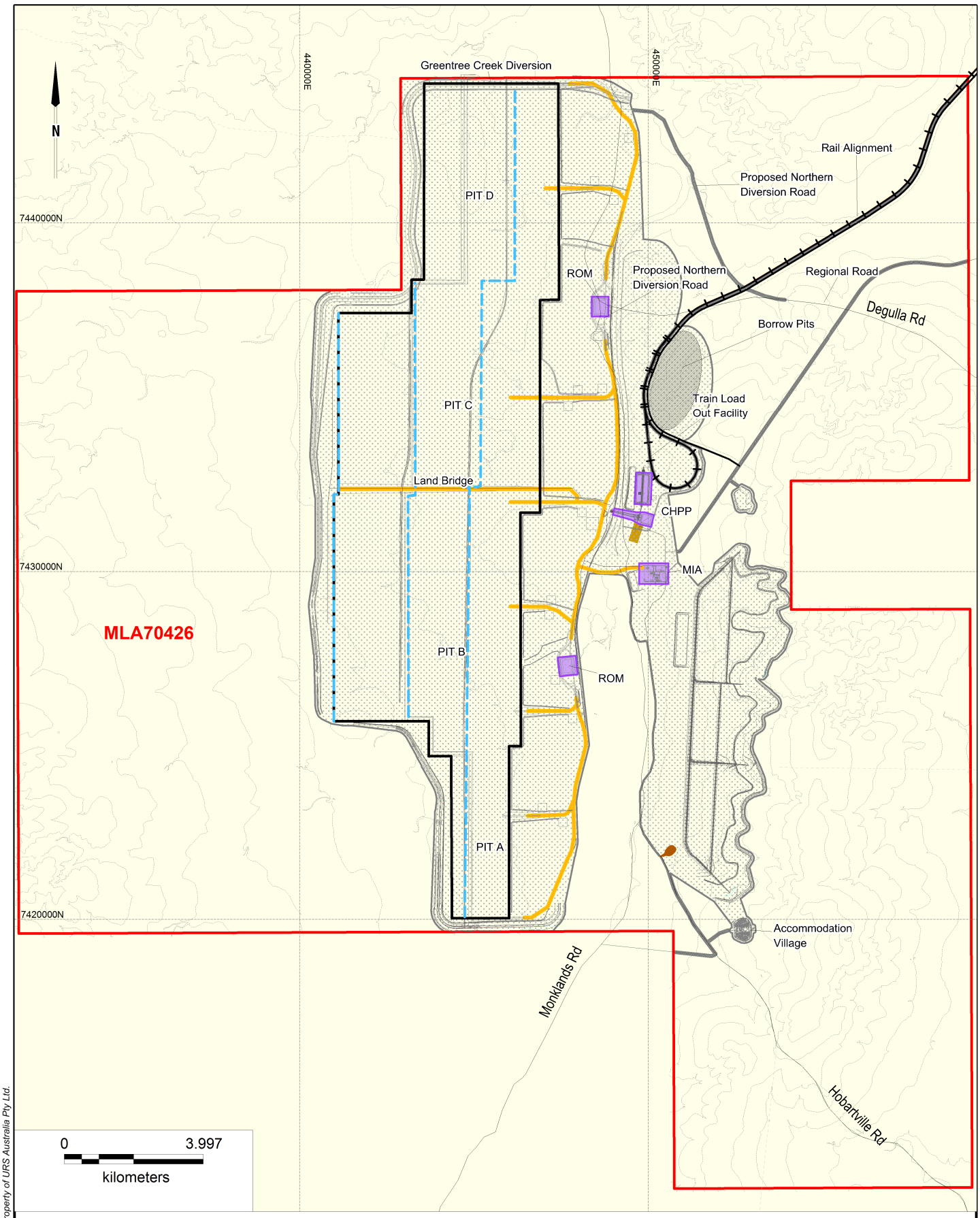
LEGEND:

Homesteads | Mining Lease | Catchment Boundaries | Stock Route | Pit Extent

Client	Project	Title
HANCOCK PROSPECTING PTY LTD	NOISE IMPACT ASSESSMENT ALPHA COAL PROJECT GENERAL INFORMATION	**NOISE SENSITIVE RECEPTORS**

URS

Drawn: AO	Approved: MM	Date: 22/09/2010	Figure: **2-1**
Job No: **42626580**	File No: 42626580-g-5012.wor		



LEGEND:

MINE-FACE OVER TIME | HAUL ROADS | PIT EXTENT | MINING LEASE (MLA70426) | DISTURBANCE AREA

Client	Project	Title
HANCOCK PROSPECTING PTY LTD	NOISE IMPACT ASSESSMENT ALPHA COAL PROJECT GENERAL INFORMATION	**PROJECT SITE- NOISE SOURCES**

URS

Drawn: AO	Approved: MM	Date: 22/09/2010	Figure: **2-2**
Job No: **42626580**	File No: 42626580-g-5011b.wor		**Rev:B**

3

Existing Acoustic Environment

3.1 Noise Measurement Methodology

Long-term unattended noise monitoring has been conducted by Australasian Resource Consultants (AARC) at the locations of the two dwellings within the mining lease boundary, namely Receptors I (Hobartville Homestead) and J (Wendouree Station) and at Receptor C (Surbiton South Station). The monitoring took place between 23 and 30 June 2010 at Receptors C and J and between 26 June and 3 July 2010 at Receptor I. It is understood that measurements were undertaken in general accordance with AS1055:1997 "*Acoustics – Description and Measurement of Environmental Noise*".

According to the AARC monitoring records, the equipment detailed in **Table 3-1** was used in the survey. These instruments comply with AS IEC 61672.1 – 2004 "*Electroacoustics – Sound level meters – Specifications*", and are understood to have valid and current calibration certificates traceable to a NATA certified laboratory.

Table 3-1 Equipment Used for Unattended Noise Monitoring Survey

Monitoring Location	Item	Make	Model	Serial No.
Wendouree Station (J)	Noise Logger	Acoustic Research Laboratories (ARL)	EL215	194510
Hobartville Homestead (I)	Noise Logger	Acoustic Research Laboratories (ARL)	EL215	194517
Location C (Surbiton South Station)	Noise Logger	Acoustic Research Laboratories (ARL)	EL215	194436

The noise loggers were set to statistically process and store the measured noise levels every 15 minutes for the whole monitoring period, with the measuring microphones set at 1.2 metres above ground level. The AARC monitoring records indicate that the noise loggers were calibrated before logging and the calibration was checked after logging using an acoustic calibrator. No significant discrepancies (greater than 0.2 dB) were reported in the pre and post measurement reference calibration tests.

When analysing measured long-term noise levels, it is usual practice to reference the meteorological data provided by the nearest Bureau of Meteorology (BOM) Automatic Weather Station (AWS) to the site. Hourly rainfall and wind data from the closest AWS station (Clermont AWS ID: 35124) has been analysed and no adverse weather conditions during the monitoring period were indicated. The Clermont station, however, is located some 110 km NNE of the on-site noise monitoring locations and therefore the BOM data cannot be considered to be representative of the subject site conditions. The trend of background noise during each monitoring period has been examined, and any noise monitoring periods considered to be affected by likely extraneous noise were excluded from the final data analysis.

3.2 Noise Measurement Results

For the purpose of this assessment, the following times of day are defined in Table 3-2:

Table 3-2 Time of Day

Time of Day	Time
Day	0700 – 1800
Evening	1800 – 2200
Night	2200 – 0700

The results of the long-term unattended noise monitoring are set out in **Table 3-3**, **Table 3-4** and summarised in **Table 3-5**. Any 15-minute period affected by likely adverse weather conditions or likely extraneous noise was excluded from calculation. Daily noise monitoring plots are provided in **Appendix F**.

During the monitoring period, the microphone of the noise logger at Receptor C fell to the ground, where it continued to measure until the end of the monitoring period. A review of the monitoring data indicated that this event most likely occurred at approximately 1945 on 26 June. On this basis, whilst the measured noise levels at Receptor C were found to be reasonably consistent with and following similar trends to those levels measured at the two locations within the mining lease boundary (I and J), the data obtained from Receptor C has been excluded from further analysis.

Given the very rural nature of the proposed mine site and far reaching surrounds, it is considered that the measured noise levels obtained from the monitoring locations within the mining lease boundary would be reasonably representative of the noise levels at the locations of Receptors A – H, the closest identified receptors outside the mining lease boundary. Additionally, it should be noted that given the relatively low background noise levels measured, the exclusion of the monitoring data at Receptor C would not be expected to result in the setting of any less stringent noise level criteria for the Project.

Table 3-3 Measured Noise Levels – Wendouree Station (J)

Date	Background Noise Level L_{A90} dB(A)			Ambient Noise Level L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wednesday 23 June 2010	-	26	26	-	32	27
Thursday, 24 June 2010	-	31	26	-	33	28
Friday, 25 June 2010	-	-	26	-	-	28
Saturday, 26 June 2010	28	26	26	43	30	27
Sunday, 27 June 2010	28	28	26	43	33	27
Monday, 28 June 2010	27	26	26	44	29	28
Tuesday, 29 June 2010	27	25	25	43	31	27
Representative Value	**27**	**26**	**26**	**43**	**31**	**27**

Notes: All measurements in periods showing "-" were considered to be affected by extraneous noise.

3 Existing Acoustic Environment

Table 3-4 Measured Noise Levels – Hobartville Homestead (I)

Date	Background Noise Level L_{A90} dB(A)			Ambient Noise Level L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Saturday, 26 June 2010	26	26	24*	43	29	28
Sunday, 27 June 2010	27	29	24	45	33	28
Monday, 28 June 2010	29	26	24*	43	31	29
Tuesday, 29 June 2010	26	27	24*	42	31	26
Wednesday, 30 June 2010	25	24	24*	41	29	27
Thursday, 01 July 2010	27	26	24*	39	30	25
Friday, 02 July 2010	26	24	24*	42	30	26
Representative Value	**26**	**26**	**25***	**42**	**31**	**27**

Notes: Measurements marked * are considered likely to have been affected by measurement noise floor of the EL215 instrument.

In accordance with the Ecoaccess guideline, the threshold background level is L_{A90} 25 dB(A). The RBL of L_{A90} 24 dB(A) was adjusted accordingly. (Refer to **Section 4.2**)

The daily noise logging results indicate the presence of significant durations of extraneous noise at both monitoring locations. As can be seen from the daily noise monitoring plots (**Appendix F**) this data has been excluded from analysis for the purposes of this assessment.

Rating Background Levels (RBL) for daytime, evening and night-time periods determined from the noise monitoring results for each measurement location are summarised in **Table 3-5**. The median maximum $L_{Aeq(1hour)}$ noise levels measured at each location are also shown.

The RBLs were in the 26 – 27 dB(A) range during the daytime, at 26 dB(A) during the evening and in the 24 – 26 dB(A) range during the night-time. These background noise levels are typical of those of a very rural environment with natural noise sources and minimal transportation. After the exclusion of the data contaminated by extraneous noise, the determined ambient L_{Aeq} levels were in the 42 – 43 dB(A) range during the daytime, at 31 dB(A) during the evening and at 27 dB(A) during the night-time.

Operational noise criteria based on the levels set out in **Table 3-5** are detailed in **Section 4.** For the further receptor locations where monitoring was not conducted the assessment criteria has been based the lowest daytime, evening and night-time noise monitoring results, effectively from the Hobartville Homestead location.

It is noted that in very rural areas such as the subject site, background noise levels are typically controlled by insect noise in the presence of neutral meteorological conditions (zero or very low wind speed and no precipitation).Somewhat higher background levels often occur in the summer months when insect activity is generally higher. In this respect it is considered that the Project noise criteria established within this assessment, which are based on monitoring undertaken in the cooler months of June and July, provide for a conservative assessment.

3 Existing Acoustic Environment

Table 3-5 Summary of Measured Noise Levels

Location	Rating Background Noise Level (RBL), L_{A90} dB(A)			Ambient Noise Level (AL) L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Wendouree Station (J)	27	26	26	43	31	27
Hobartville Homestead (I)	26	26	24*	42	31	27
Notes: Measurements marked * are considered likely to have been affected by measurement noise floor of the EL215 instrument.						

4

Project Acoustic Criteria

Due to the nature of the mining activities, it is noted that there may be some crossover between operations and construction activities. Assessment criteria for general construction and general operations are provided in **Sections 4.1** and **4.2** respectively.

Both construction and operations have the potential to cause sleep disturbance and to generate low frequency noise effects. Additionally blasting, the only activity considered likely to have the potential to result in ground vibration effects over significant distances and overpressure effects, is also proposed as both a construction and operations activity. Accordingly, criteria for the assessment of sleep disturbance, low frequency noise and noise and vibration from blasting are provided in **4.3, 4.4** and **4.5** respectively.

4.1 Construction Noise Criteria

In the absence of specific guidelines for the assessment of construction noise in Queensland, the potential construction noise impacts from the site have been assessed with consideration of the following documents:

- *Environmental Protection Act (1994)*;
- *Environmental Protection Regulation 2008*; and
- *Environmental Protection (Noise) Policy 2008.*

URS considers the Queensland *Environmental Protection (Noise) Policy 2008* [EPP(Noise)] to be most appropriate for the purpose of this assessment.

Environmental Protection (Noise) Policy 2008

The EPP(Noise) does not include construction noise limits. It does, however, provide acoustic quality objectives for the protection of amenity, human health and wellbeing, including sleep protection. Construction noise effects have been assessed against these criteria, which are set out in **Table 4-1**.

Table 4-1 Environmental Protection (Noise) Policy 2008 - Acoustic Quality Objectives

Sensitive Receptor	Time of Day	Acoustic quality objectives (measured at the receptor) dB(A)			Environmental Value
		$L_{Aeq,1hour}$	$L_{A10,1hour}$	$L_{A1,1hour}$	
Dwelling (external)	Daytime and Evening	50	55	65	Health & wellbeing
Dwelling (internal)	Daytime and Evening	35	40	45	Health & wellbeing
Dwelling (internal)	Night-time	30	35	40	Health & wellbeing in relation to the ability to sleep

It is noted that these criteria were developed for the protection of amenity and health and not for the control of construction noise, which is generally regarded as a temporary activity and therefore often afforded greater tolerance. WHO,1999 recommends for quality sleep, maximum indoor noise levels should not exceed 45 dB(A).

4.2 Operations Noise Criteria

The potential operational noise impacts of the site have been assessed in accordance with the provisions of the following documents:

- *Environmental Protection (Noise) Policy 2008;* and
- *EPA Ecoaccess Guideline: Planning for Noise Control.*

The *Ecoaccess Guideline: Planning for Noise Control* prescribes a process which takes account of:

— the control and prevention of background creep in the case of steady noise;
— the containment of variable noise levels and short term noise events; and
— the prevention of sleep disturbance.

Background Creep

To prevent background noise levels progressively increasing over time by establishing developments, the Planning for Noise Control guideline recommends outdoor background planning noise levels (RBL, min$L_{A90,1hour}$) not exceed daytime, evening and night-time periods for various land use. The land use surrounding the Project site fits the 'Purely Residential, Very Rural' land use classification described by the guideline. RBLs for this category are set out in **Table 4-2** whilst **Table 4-3** summarises the recommended adjustments to these levels that would control and prevent $L_{A90,1hour}$ background noise creep occurring.

Table 4-2 Recommended Outdoor Background Noise Planning Levels (in terms of min$L_{A90,1hour}$)

Receptor Area Dominant Land Use (description of neighbourhood)	Applicable Locations	Background Noise Level (RBL), min$L_{A90,1hour}$ (dBA)		
		Day	Evening	Night
Purely Residential, Very Rural	All Identified Receptors (Locations A-K)	35	30	25

Table 4-3 Adjustments to Recommended RBL to Prevent Background Creep

Existing Background Level at Receptor	Recommended $L_{A90,1hour}$ Maximum Noise Level Contribution from Alpha Coal Mine Activity
Existing Background Level > Recommended RBL	Existing Background – 10 dB(A)
Existing Background Level = Recommended RBL	Recommended RBL – 10 dB(A)
Existing Background Level = Recommended RBL – 1	Recommended RBL – 9 dB(A)
Existing Background Level = Recommended RBL – 2	Recommended RBL – 5 dB(A)
Existing Background Level = Recommended RBL – 3	Recommended RBL – 3 dB(A)
Existing Background Level = Recommended RBL – 4	Recommended RBL – 2 dB(A)
Existing Background Level = Recommended RBL – 5	Recommended RBL – 2 dB(A)
Existing Background Level ≤ Recommended RBL – 6	Existing Background + 5 dB(A)

The Ecoaccess guideline notes that it may not be possible to maintain background noise levels in very rural areas below 25 dB(A) as developments occur and in such cases a threshold background level of

25 dB(A) is to be used. The resultant background creep criteria applied for each receptor based on the noise monitoring results are set out in **Table 4-4**. The Hobartville location criteria, which are based on the lowest daytime, evening and night-time noise monitoring results, have been applied for receptor locations where no background noise monitoring was undertaken.

Table 4-4 Background Creep Criteria

Receptor	min$L_{A90,1hour}$ (dBA)		
	Day	Evening	Night
J (Wendouree Station)	32	28	25
I (Hobartville Homestead); A-H; and K (HPPL Accommodation Village)	31	28	25

Planning Noise Levels

The Ecoaccess guideline recommends the adoption of adjusted continuous L_{Aeq} noise criteria for planning purposes. The estimated maximum Planning Noise Levels (PNL) with respect to the day, evening and night-time periods as recommended by the Ecoaccess guideline for the applicable 'Very Rural Noise Area' category are set out in **Table 4-5**. Restricting emissions to these levels would help to protect against noise impacts such as speech interference, community annoyance and sleep disturbance. Where the existing noise level from specific noise sources is close to the maximum planning level, the noise from any new source(s) must be controlled to protect the amenity of the area. **Table 4-6** summarises the Ecoaccess guideline recommended adjustments to be applied to the recommended maximum PNLs where existing noise levels approach the maximum PNL.

Table 4-5 Recommended Maximum Values of Planning Noise Levels (PNL)

Noise Area Category	Description of Neighbourhood	Maximum Hourly Sound Pressure Level, $L_{Aeq,1hour}$ (PNL)		
		Day	Evening	Night
Z1	Very rural, purely residential. Less than 40 vehicles an hour	40	35	30

Table 4-6 Modifications to Recommended Maximum Planning Noise level (PNL) to Account for Existing Level of Specific Noise to Preserve Amenity

Total Existing Noise Level from Specific Sources (dB(A))	Maximum PNL for Noise from New Sources Alone (dB(A))
≥ PNL + 2	If existing noise levels is likely to decrease in future: PNL – 10 If existing noise levels is unlikely to decrease in future: Existing Level – 10
PNL + 1	PNL – 9
PNL	PNL – 8
PNL – 1	PNL – 6
PNL – 2	PNL – 4
PNL – 3	PNL – 3

Total Existing Noise Level from Specific Sources (dB(A))	Maximum PNL for Noise from New Sources Alone (dB(A))
PNL – 4	PNL – 2
PNL – 5	PNL – 2
PNL – 6	PNL – 1
< PNL – 6	PNL

Modifications to the PNLs have not been considered as existing specific noise sources have not been identified.

Specific Noise Levels

For the containment of short term emissions, the Ecoaccess guideline identifies Specific Noise Level (SNL) $L_{Aeq,1hour}$ criteria to be determined as follows:

- SNL = RBL + 3 dB(A) – k1 – k2

Where k1 and k2 are penalty adjustments to be applied for the presence of tonality and/or impulsiveness respectively. Penalty adjustments of 2 dB(A) apply where these characteristics are just detectable and adjustments of 5 dB(A) apply where they are clearly audible.

The resultant SNLs based on the noise monitoring results (with Hobartville Location results applied for all receptors where no monitoring was undertaken) are set out in **Table 4-7**. No penalties for impulsiveness or tonality have been applied as the noise sources under assessment are not considered to possess these characteristics.

Table 4-7 Specific Noise Level Criteria

Receptor	SNL $L_{Aeq,1hour}$ dB(A)		
	Day	Evening	Night
J (Wendouree Station)	30	29	29
I (Hobartville Homestead); A-H; and K (HPPL Accommodation Village)	29	29	28

In accordance with the Ecoaccess guideline, the SNL criteria are applied for the purposes of this assessment, as in this case, they are more stringent than the PNLs. Compliance with the SNL criteria will ensure the PNLs are readily achieved. A summary of operational noise criteria applicable to the Project is provided in **Table 4-8**.

Table 4-8 Summary of Operations Noise Design Criteria

Receptor	Daytime Criteria		Evening Criteria		Night Criteria	
	$L_{A90,1hour}$ dB(A)	$L_{Aeq,1hour}$ dB(A)	$L_{A90,1hour}$ dB(A)	$L_{Aeq,1hour}$ dB(A)	$L_{A90,1hour}$ dB(A)	$L_{Aeq,1hour}$ dB(A)
J (Wendouree Station)	32	30	28	29	25	29
I (Hobartville Homestead); A-H; and K (HPPL Accommodation Village)	31	29	28	29	25	28

4.3 Sleep Disturbance Criteria

Where there exists the possibility that instantaneous, short-duration, high-level noise events may occur during night-time hours (1000 – 0700), consideration should be given to the potential for the disturbance of sleep within residences and the accommodation village.

The Ecoaccess guideline makes reference to the World Health Organisation (WHO)'s *Guidelines for Community Noise (Berglund B, Lindvall T and Schwela D H 1999)* for sleep disturbance caused by noise impacts.

The WHO suggests that noise levels inside bedrooms should be limited to 45 dB(A) L_{Amax} and 30 dB(A) L_{Aeq}. In addition, the Australian/New Zealand Standard *AS/NZS 2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* recommends a satisfactory continuous noise level inside bedrooms of 30 dB(A) L_{Aeq}.

When considering internal noise levels from an external noise source, it is common practice to assume that windows are partially open to allow natural ventilation on warm nights. The noise reduction through partially opened windows is estimated to be 10 dB(A), as noted in the Ecoaccess guideline and specified in *AS 3671-1989: Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction*.

To achieve the internal noise levels described above and for the avoidance of sleep disturbance, the noise levels outside bedroom windows, should be limited to 40 dB L_{Aeq} and 55 dB(A) L_{Amax}.

As set out in **Section 4.1**, for the protection of sleep, the EPP (Noise) recommends that internal noise levels do not exceed 40 dB(A) $L_{A1,1hour}$. Assuming a 10 dB(A) reduction through a partially opened window, this is approximately equivalent to an external level of 50 dB(A) L_{A1} and therefore represents a more stringent requirement than proposed by the WHO.

For the purposes of this assessment, the more stringent 50 dB(A) L_{A1} sleep protection criterion is adopted.

4.4 Low Frequency Noise Criteria

The Queensland EPA's draft *Ecoaccess Guideline: Assessment of Low Frequency Noise* provides guidance for the assessment of low frequency noise impacts. The intent of the criteria is to assess annoyance and discomfort to persons at noise sensitive premises caused by low frequency noise with a frequency range from 10 Hz to 200 Hz. The guideline uses the G-weighting function to determine annoyance due to infrasound in the frequency range from 1 Hz to 20 Hz and low frequency noise

criterion for initial screening inside home environments in terms of Linear, A-weighted and one-third octave band sound pressure levels in the range 20 to 200 Hz.

Infrasound

The recommended infrasound (1 Hz to 20 Hz) draft guideline limits are:

- 85 dB(G) inside dwellings during the day, evening and night and inside classrooms and offices; and
- 90 dB(G) for occupied rooms in commercial enterprises.

Low Frequency Noise

With respect to low frequency noise, the draft guideline recommends that:

- in the case of noise sources emitting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB(Linear) to avoid complaints of low frequency noise annoyance; and
- if broad band $L_{LINeq} - L_{Aeq} > 15$ dB, a 1/3 octave frequency analysis should be carried out. This involves an analysis of 1/3 octave band levels in the 5 Hz to 200 Hz range and comparison with the respective 1/3 octave median hearing threshold levels for the best 10% of the older population (55-60 years old) to determine the degree of low frequency noise audibility.

The draft guideline additionally prescribes a process to determine annoyance due to tonality in low frequency noise whereby a noise is determined tonal should the sound pressure level in a particular 1/3 octave be 5 dB or more above the levels in the two neighbouring bands. To determine annoyance for tonal noise, the level in the 1/3 octave band(s) is compared to the hearing threshold level in the corresponding band(s). **Table 4-9** sets out acceptable exceedances of the 1/3 octave threshold levels for the avoidance of annoyance due to low frequency tonal noise.

Table 4-9 Annoyance due to Tonal Noise Threshold Criteria

Period	1/3 Octave Frequency Band			
	8 Hz – 63 Hz	80 Hz	100 Hz	>100 Hz and < 200 Hz
Day	5	10	15	17
Night	0	5	10	12

To establish annoyance for non-tonal noise in the frequency range 10 Hz to 160 Hz the draft guideline recommends the 1/3rd octave band spectra measured indoors is A-weighted and the resulting A-weighted values between 10-160 Hz are summed to yield the A-weighted noise level $L_{pA,LF}$.

Table 4-10 sets out acceptable indoor $L_{pA,LF}$ levels for various types of space as recommended by the guideline.

Table 4-10 Acceptable Indoor Criteria for Non-Tonal Noise

Type of Space	$L_{pA,LF}$ (dB(A))
Dwelling, evening and night	20
Dwelling, day	25
Classroom, office etc	30
Rooms with commercial enterprises	35

It is considered appropriate to apply a 3 dB increase to the levels set out in the table above in determining appropriate outdoor noise limits for the corresponding uses. This assumes a conservative 3 dB low frequency range attenuation through a façade with open windows.

4.5 Blasting Noise and Vibration Criteria

Section 440ZB of the Environmental Protection and Other Legislation Amendment Act (No. 2) 2008 (Part 2 Amendment of Environmental Protection Act 1994) provides the following criteria for the control of air blast overpressure and ground vibration:

"A person must not conduct blasting if—

(a) the airblast overpressure is more than 115 dB Z Peak for 4 out of any 5 consecutive blasts; or

(b) the airblast overpressure is more than 120 dB Z Peak for any blast; or

(c) the ground vibration is—

(i) for vibrations of more than 35 Hz—more than 25 mm a second ground vibration, peak particle velocity; or

(ii) for vibrations of no more than 35 Hz—more than 10 mm a second ground vibration, peak particle velocity."

The Act does not provide time controls for blasting, however, the Queensland EPA's *Ecoaccess Guideline: Noise and Vibration from Blasting* provides the following:

Noise Criteria

Blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then

(a) the airblast overpressure must be not more than 115 dB(linear) peak for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and

(b) the airblast overpressure must not exceed 120 dB(linear) peak for any blast.

Vibration Criteria

Blasting operations must be carried out in such a manner that if ground vibration should propagate to a noise-sensitive place:

(a) the ground-borne vibration must not exceed a peak particle velocity of 5 mm per second for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and

(b) the ground-borne vibration must not exceed a peak particle velocity of 10 mm per second for any blast.

Times of Blasting

Blasting should generally only be permitted during the hours of 9 am to 3 pm, Monday to Friday, and from 9 am to 1 pm on Saturdays. Blasting should not generally take place on Sundays or public holidays.

Blasting outside these recommended times should be approved only where:

(a) blasting during the preferred times is clearly impracticable (in such situations blasts should be limited in number and stricter airblast overpressure and ground vibration limits should apply); or

(b) There is no likelihood of persons in a noise-sensitive place being affected because of the remote location of the blast site.

Weather Effects

When a temperature inversion or a heavy low cloud cover is present, values of airblast overpressure would be higher than normal in surrounding areas. Accordingly, blasting should be avoided if predicted values of airblast overpressure in noise-sensitive places exceed acceptable levels. If this is not practicable, blasting should be scheduled to minimise noise annoyance. An appropriate period is generally between 11 am and 1 pm. Similarly, blasting should be avoided at times when strong winds are blowing from the blasting site towards noise sensitive places.

The ground vibration and overpressure limits set out in the Ecoaccess guideline are more stringent than those provided under Section 440ZB and on this basis have been adopted for the purposes of this assessment. However, while limiting blasting to between the times suggested by the Ecoaccess guideline is not considered practicable nor necessary, limiting the activity to less sensitive times of the day, is recommended where practicable. The following blasting time controls are considered appropriate for the purposes of this assessment:

Times of Blasting

- Blasting should only be permitted between 0700 -1800; and
- Preferably blasting should only be carried out between 0900 -1700.

A summary of the overpressure and ground vibration criteria adopted for the purposes of assessment is provided in **Table 4-11.**

Table 4-11 Summary of Blasting Overpressure and Ground Vibration Design Criteria

Airblast Overpressure and Vibration Parameter	Between 0700-1800 and Preferably between 0900-1700
Airblast Overpressure	115 dB(L) for 9 out of any 10 consecutive blasts regardless of interval between blasts. Any single blast must not exceed 120 dB(L).
Peak Particle Velocity	5 mm/s for 9 out of any 10 consecutive blasts regardless of interval between blasts. Any single blast must not exceed 10 mm/s.

4.6 Off-Site Road Traffic Noise Criteria

The Department of Traffic and Main Roads' (DTMR) Road Traffic Noise Management Code of Practice (CoP) criteria have been adopted for the purposes of this assessment. The CoP aims to protect sensitive receptors in the vicinity of new road projects, road upgrades and existing roads with no roadworks.

Table 4-12 sets out the applicable CoP criterion for existing residences nearby existing roads with no roadworks.

4 Project Acoustic Criteria

Table 4-12 Department of Main Roads' Road Traffic Noise Management Code of Practice (CoP) Criteria

Activity	Road traffic noise level within a 10 year horizon, $L_{A10(18hour)}$ dB(A)
Existing Residences	68

5

Assessment of Potential Noise Impacts

5.1 Calculation Method

Noise levels due to the proposed construction and the operation of the site at the identified noise sensitive receptor locations have been predicted using an acoustics computer model created in SoundPLAN Version 7.0. This program is used internationally and recognised by regulators and authorities throughout Australia.

The noise model was constructed to allow the prediction of cumulative noise levels from the site including the contribution of each noise source. The noise model takes into account:

- sound power levels of each source;
- receptor locations;
- screening effects due to topography;
- meteorological effects and attenuation due to distance; and
- ground and atmospheric absorption.

The noise calculations have been carried out using the L_{Aeq} descriptor to assess the operational and construction noise impacts.

The program allows the use of various noise prediction algorithms. To calculate noise emission levels under neutral and adverse meteorological conditions, the CONCAWE algorithm which is designed for industrial sites has been used.

The CONCAWE method was especially designed for the requirements of large industrial facilities such as petroleum and petrochemical complexes, and is now widely used for calculating noise emissions from all types of industrial facilities in Australia. CONCAWE provides calculation methods for predicting noise levels under the influence of wind and the stability of the atmosphere.

CONCAWE is implemented in SoundPLAN to calculate the sound pressure level at the receptor location taking into consideration the following:

- attenuation due to distance between the source and receptor;
- attenuation due to air absorption which is evaluated in accordance with ISO9613, ISO3891 or ANSI 126;
- ground attenuation considering hard or soft surfaces;
- correction due to sound refractions by wind and temperature gradients which is based on the Pasquil meteorological atmosphere categories (Pasquil Stability Class);
- correction due to wind speed and direction; and
- screening based on the Nordic General Prediction method.

The effects of meteorological conditions are explained in more detail in **Section 5.2** below.

5.2 Meteorological Conditions

Adverse meteorological conditions have the potential to increase noise levels at a receptor. Such phenomena generally occur during temperature inversions or where there is a wind gradient with wind direction from the source to the receptor. These meteorological effects typically increase noise levels by 5 to 10 dB, and even greater than 10 dB in extreme conditions.

Temperature inversions generally occur during the night-time and early morning periods, thus the most significant meteorological effect during the daytime period is wind.

The prevailing meteorological conditions for the site have been assessed using data extracted from the meteorological model, CALMET, for the year 2009. In addition to assessment of the annual data, consideration has been given to seasonal variations, with summer (December to February); autumn (March to May); winter (June to August); and spring (September to November) periods. Additionally the daytime (0700-1800); evening (1800-2200); and night-time (2200-0700) periods have been considered. Results of this analysis are presented graphically in the form of windroses and wind class frequency distributions in **Appendix B**. Further details of the meteorological analysis including CALMET modelling used for this assessment are provided in the Air Quality Impact Assessment (Section 13 of the EIS).

Based on analysis of the CALMET data, the prevailing meteorological conditions for the daytime and evening / night-time periods are summarised in **Table 5-1**. SoundPLAN modelling for adverse meteorological conditions has conservatively assumed moderate inversion (F-class stability category) conditions (3°C/100 m temperature inversion strength for all receptors) and 3 m/s windspeed, with all receptors downwind of the site.

Table 5-1 Prevailing Meteorological Conditions

Time of Day	Pasquil Stability Class	Wind Speed (m/s)	Wind Direction
Day (0700 – 1800)	B/C	3	ENE
Evening & Night (1800 – 0700)	F	3	E & ENE

5.3 Operations Noise

5.3.1 Sound Power Levels

Table 5-2 presents sound power levels (L_w) for the equipment identified as the primary on-site operations noise sources. Schedules of equipment have been compiled for the different stages of the project including fixed plant and mobile equipment associated with mine operation works. These schedules are based on Appendices 8C and 6A-14 of the Pre-Feasibility Study (PFS) report and updated accordingly with the “Staging Plan for CHPP” prepared by Thiess Sedgman Joint Venture, updated 16 June 2010.

Sound power levels in octave frequency bands for these sources have been obtained from the SoundPLAN technical library, Australian Standard AS2436:1981, British Standard BS5228 and data published in previous EIS studies. The references are listed as footnotes in each relevant table.

The major installed equipment and most of the minor equipment would operate between 10 to 20 hours per day. For the purposes of this assessment, all plant was assumed to operate 24 hours per day, 7 days a week. Minor equipment and on-site light vehicles were not considered in the assessment as they would have no material influence on the predicted noise levels.

Sound power levels for the Coal Handling and Preparation Plant (CHPP) have been calculated using details provided in Appendix 8C of the PFS. Each one of the CHPP’s four modules was modelled as two vertically aligned point sources with equivalent total sound energy for the module. The CHPP noise levels listed in **Table 5-2** below are resultant noise levels for each module. These noise levels were also compared with previous measurements undertaken in similar CHPP environments and coal wash plants. Octave band data for the CHPP was taken from data of other plants adjusted to account

for the size of equipment for this Project. Most of the noise producing equipment within the CHPP are pumps and drives; typical sound power levels of 90 dB(A) have been assumed for each of them. The dominant noise sources associated with the CHPP are the sizers and crushers which were modelled separately.

The sound power levels presented in the table have been applied in the SoundPLAN noise model. These levels do not consider any noise mitigation measures, such as acoustic enclosures, silencers, mufflers etc.

Equipment schedules vary for the different stages and operational scenarios assessed. Noise source quantities for individual stages are specified in **Section 5.3.2** of this report, while full details are provided in **Appendix C**.

Table 5-2 Sound Power Levels – Operational Equipment

Operations Noise Source		Estimated Overall Sound Power Level[1]	
		dB(Lin)	dB(A)
Mine Equipment Installed Major Equipment[2]	Marion 8750 Dragline	125	115
	P&H4100 XPB Shovel	117	113
	Liebherr R9800 Excavator	129	123
	Liebherr R9350BH Excavator	125	119
	CAT 994D Front End Loader	118	111
	CAT 797 RDT Haul truck	125	117
	CAT 793D RDT Haul truck	125	117
	CAT 789C Water truck	125	117
	CAT 785C RDT Haul truck	125	117
	Kress 200-II Coal haulers	121	121
	CAT D11T Dozer	121	109
	CAT D10T Dozer	121	109
	CAT 854K RT Dozer	127	121
	CAT 24M Grader	119	109
	Drill DR460	125	119
	Drill D45KS Blast hole	125	119
Mine Equipment Installed Minor equipment[3]	Pit Pump	107	108
	Lighting Plant (Electric Generator)	104	102
	Low Loader	100	99
	Telescopic Crane 50t/25t/160t	105	102
Mine Equipment Installed Minor equipment[4]	Pit Pump	118	108
	Lighting Plant (Electric Generator)	118	102
	Low Loader	119	99
	Telescopic Crane 50t/25t/160t	118	102
CHPP	Module 1	126	107
	Module 2	135	107
	Module 3	130	108

Operations Noise Source		Estimated Overall Sound Power Level[1]	
		dB(Lin)	dB(A)
	Module 4	130	107
Stockpiles	Crusher/Sizer	131	116
	Reclaimer	115	115
Train load out facilities	Sampling system / Washdown sump	115	118
Conveyors	CV202 – Southern ROM Overland	122	125
	CV201 – Northern ROM Overland	117	126
	CV121 – South ROM Collection	123	110
	CV101 – North ROM Collection	125	110
	CV301/341 – Raw coal handling	117	117
	CV801/802 – Product collection	129	112
	CV811/812 – Stockyard belt	125	118
	CV804/805 – TLO feed bin	119	114
	CV701/702 – Rejects collection	112	107
	CV703 – Rejects overland	130	125

Notes:
1. Based on British Standard BS5228
2. EIS for Caval Ridge Mine Project Construction and Operational Noise and Vibration Impact Assessment
3. EIS for Ensham Central Project Environmental Noise Assessment
4. Alpha Coal Bulk Sample Project Noise & Vibration Impact

5.3.2 Noise Modelling Scenarios

Potential noise impacts have been predicted separately for neutral and adverse meteorological conditions. Since the most sensitive period is the night time, the noise modelling results for neutral and adverse conditions are compared with the night-time criteria, with source-to-receptor wind.

Table 5-3 provides a summary of the meteorological scenarios considered which are based on the meteorological data presented in **Appendix B**.

Table 5-3 Meteorological Conditions Used in Noise Modelling

Met. Scenario (Evening and Night-time)	Meteorological Condition				
	Temperature (°C)	Relative Humidity (%)	Pasquil Stability Class	Wind Speed (m/s)	Wind Direction
A: Operation – Neutral Met Conditions	10	50	D	0	n/a
B: Operation – Adverse Met. Conditions	10	50	F	3	Source-to-receptor

The noise modelling has been conducted based on likely maximum operating conditions for installed and mobile equipment. In setting up the noise model, all sources were positioned according to the proposed site layout (

Figure 2-2) for the respective stages. In sensitivity tests, slight changes to the positioning of the sources were found not to significantly affect the results.

It has been assumed that the noise generating activities for each construction and operational stage occur simultaneously and all equipment identified for each scenario operates continuously.

Table 5-4 summarises the noise modelling scenarios, indicating the numbers of major and minor operations equipment units applied in the noise modelling. **Appendix C** provides a full detailed schedule of equipment applied in the noise modelling for each operations stage.

Table 5-4 Operation Noise - Modelling Scenarios

Scenario	Period	Description	Equipment			
			Mine Equipment		Fixed Plant	
			Major	Minor	CHPP	Conveyors
1	Day 1 – 2013	• Initial box cut excavations along the full strike length of the mine. • Product Coal by 2013: 3.8 Mt per year • No draglines at this stage	47 units	25 units	In Construction	
2	Oct 2013 – Sep 2014	• Box cut excavations • South dump station in operation. • Product Coal by 2014: 12 Mt per year	100 units	31 units	• CHPP Module 1 • South ROM dump station	• Southern ROM • Raw coal handling 1 • Product and reject collection • Stock yard 1 • TLO feed 1
3	Oct 2014 – Jul 2015	• Box cut excavations. • Product Coal by 2015: 18.1Mt per year	133 units	49 units	• CHPP Module 2	• Raw coal handling 2
4	Aug 2015 – Oct 2016	• First Dragline servicing northern ramp of Pit C and south of Pit D. • North dump station in operation. • Product Coal by 2016: 25 Mt per year	175 units	49 units	• CHPP Module 3 • North ROM dump station	• Northern ROM • Raw coal handling 3 • Stock yard 2 • TLO feed 2

Scenario	Period	Description	Equipment			
			Mine Equipment		Fixed Plant	
			Major	Minor	CHPP	Conveyors
5	2017 – 2018	• Dragline servicing Pits C and D, whilst truck-shovel fleets servicing Pits A and B. • Final box cut blocks completed. • Full production of 30Mt per year is reached. • Construction works finished, CHPP, services, TLO and reject systems are operational	200 units	55 units	• CHPP Module 4	
6	2018 – 2023	• Three draglines operating across all pits. • Production: 30 Mt per year.	208 units	55 units	• Fully operational	
7	2023 – 2033	• Eight draglines operating across all pits. • Maximum dragline depth in Pit D. • Truck-excavator fleet increases. • Production: 30Mt per year.	224 units	55 units	• Fully operational	
8	2033 – 2043	• Eight draglines operating across all pits. • Mine ceases production at the end of 2042. • Production: 30Mt per year.	277 units	55 units	• Fully operational	

5.3.3 Predicted Operational Noise Levels

A summary of the range of results of the noise modelling for each operational stage is presented in **Table 5-5**, whilst detailed results are provided in **Appendix D** (**Tables D3 to D10**).

5 Assessment of Potential Noise Impacts

Table 5-5 Summary of Predicted Operational Noise Levels for All Operational Stages

Receptor	Noise Level - L_{Aeq} [dB(A)]		Criterion, $L_{Aeq,1hour}$ [dB(A)]			Exceedance
	Neutral Weather	Adverse Weather	Daytime	Evening	Night-time	
A: Forrester Homestead	12 – 18	15 – 22	29	29	28	Nil
B: Eulimbie Homestead	6 – 9	9 – 12	29	29	28	Nil
C: Surbiton South Homestead	17 – 23	21 – 26	29	29	28	Nil
D: Burtle Station	16 – 21	20 – 25	29	29	28	Nil
E: Tresillian Homestead	10 – 16	13 – 19	29	29	28	Nil
F: Mentmore Homestead	2 – 10	5 – 14	29	29	28	Nil
G: Monklands Homestead	13 – 22	17 – 25	29	29	28	Nil
H: Kia Ora Homestead	14 – 23	18 – 26	29	29	28	Nil
I: Hobartville Homestead	35 – 42	39 – 47	29	29	28	Up to 18 dB(A) Daytime; Up to 18 dB(A) Evening; Up to 19 dB(A) Night-time
J: Wendouree Station	57 – 62	59 – 64	30	29	29	Up to 34 dB(A) Daytime; Up to 35 dB(A) Evening; Up to 35 dB(A) Night-time
K: HPPL Accommodation Village	23 – 30	27 – 34	29	29	28	Up to 5 dB(A) Daytime; Up to 5 dB(A) Evening; Up to 6 dB(A) Night-time

The noise levels predicted for each operational stage are within the established noise criteria at all the receptors located outside of the mining lease boundary (A-H), under all meteorological conditions. With reference to **Appendix D.1**, operational noise levels at these receptor locations are predicted to steadily increase from the commencement of operations, typically by 1-2 dB(A) each year from 2013 until full capacity production is reached by 2017. The highest noise levels predicted at the receptor locations outside the mining lease boundary of up to 25-26 dB(A) L_{Aeq} occur at locations C, D, G and H (Surbiton South Homestead, Burtle Station, Monklands Homestead, and Kia Ora Homestead) under adverse meteorological conditions.

Adverse meteorological conditions are expected for a significant amount of the time. In this respect, the data extracted from CALMET indicates the F-Class stability category (moderate strength inversion) for 47 % of the time and prevailing windspeed in the 2.1-3.6 m/s range (**Appendix B**). Therefore consideration to predicted levels for adverse meteorological conditions is appropriate. Under these conditions noise levels at the receptors may be expected to typically increase by up to 3-5 dB(A) when compared with neutral meteorological conditions.

Receptors A-H

With reference to the background noise monitoring data, general operational noise (with the exception of blasting) from the site would be generally expected to be barely audible or inaudible at all receptor locations outside the mining lease boundary during the day-time period. In low background noise conditions, occurring during the night-time period, the site operation may be audible externally at receptor locations A, C, D, E, G and H. (Forrester Homestead, Surbiton South Homestead, Burtle Station, Tresillian Homestead, Monklands Homestead, and Kia Ora Homestead), but as previously identified the predicted noise levels would be no higher than the measured ambient noise levels and would not exceed the criteria. Considering the attenuation afforded through the dwellings' external façades, operations noise from the mine would not be expected to be audible inside any of the identified dwellings located outside the mining lease boundary.

Specific noise mitigation measures to control general on-site operational noise, with respect to these receptors, are not considered necessary, beyond normal good practice.

Location J, Wendouree Station

The closest sensitive receptor (Location J, Wendouree Station) is predicted to be highly noise affected, with noise levels of up to 64 dB(A) L_{Aeq} predicted at this location under adverse meteorological conditions. This represents an exceedance of the night time limit by some 35 dB(A). It is expected that the measures required to mitigate an exceedance of this order would be impracticable.

In order to achieve a satisfactory level of amenity inside the dwelling and to achieve the sleep protection criterion, some 34 dB(A) noise reduction through the dwelling's external facades would be necessary. In this respect, it should be noted that the composite level of attenuation that may achieved through a dwelling's external facades is usually limited by the acoustic performance of its windows. In order to meet the internal noise standards at this location, it is expected that substantial upgrading of the dwelling's glazing would be necessary. Furthermore, as the dwelling's windows would be required to be kept closed, to achieve the criteria, the provision of air conditioning would additionally be required.

Notwithstanding this, due to the likely overpressure impacts from blasting, which are discussed in **Section 5.8**, any such upgrades to this dwelling to control the effects of operations noise would not be recommended.

Location I, Hobartville Homestead

Location I (Hobartville Homestead) is also predicted to be affected, with noise levels of up to 47 dB(A) L_{Aeq} predicted at this location under adverse meteorological conditions. This represents an exceedance of the night time limit by some 19 dB(A). Based on the predicted external L_{Aeq} noise level,

the internal noise limit for sleep protection would only be expected to be met with windows of the dwelling closed. Therefore, it is considered that while mitigating the external noise level exceedance at this location may not be practicable, meeting the sleep protection limit could be achieved with the adoption of air conditioning for the dwelling, to allow for windows to be kept closed.

Location K, HPPL Accommodation Village

The key amenity issue for the HPPL accommodation village is sleep protection as limited external activity is expected and its primary function is to provide sleeping facilities for mine workers between shifts. On this basis, only the internal noise criteria are considered appropriate for the assessment of the accommodation village.

External noise levels of up to 34 dB(A) L_{Aeq} are predicted at this location under adverse meteorological conditions and as such it would be expected that the internal noise criteria would be met with windows open. The accommodation will be air conditioned, allowing windows to be kept closed. Further measures, such as physical barriers through vegetation planting etc, will be considered by the Proponent during design of the accommodation village.

A predicted noise contour map for the mine at full production (Scenario 8, 2033-2043) under adverse night-time meteorological conditions is presented in **Appendix E**. It should be noted that these noise contours are indicative only due to interpolation within the calculation grid. The results of the point-to-point calculations presented in **Table 5-5** and **Appendix D.1** are more accurate than the noise contours.

5.4 Construction Noise

5.4.1 Sound Power Levels

Construction equipment has been nominated for the different stages of the construction works. Typical construction equipment expected on this site and noise levels are summarised in **Table 5-6**. The sound power levels of these items have been taken from British Standard BS 5228 and other similar projects.

Table 5-6 Sound Power Levels - Construction Noise Sources

Construction Noise Source		Sound Power Level	
		dB(Lin)	dB(A)
Cranes[1]	Crawler 400t	105	102
	Crawler 200t		
	Crawler 100t		
	Hydraulic 80t		
	Hydraulic 50t		
	Rough terrain 30t		
	Franna 20t		
Plant[1]	Welders	101	101
	Compressors	103	102
	Diesel electric generators	104	102

		Sound Power Level	
	Drill	125	119
Water Truck[2]	CAT 798C	125	117
Dozer[3]	CAT D11T/ D10T	121	109
	CAT 854K	127	121
Grader[3]	CAT 24M	119	109
Loader[3]	Face Loader - CAT 994D	118	111
	Low Loader	115	99

Notes:
1. Based on British Standard BS5228
2. EIS for Caval Ridge Mine Project Construction and Operational Noise and Vibration Impact Assessment
3. EIS for Ensham Central Project Environmental Noise Assessment

5.4.2 Noise Modelling Scenarios

Construction works would include four stages, over a duration of four years, to complete the CHPP, dump station ROM pads, overland conveyors (OLC) and product handling conveyors, stockyards, train load out (TLO) facility and mine services such as the sewerage treatment plant (STP), electrical substations, mine industrial area (MIA) and accommodation village.

The main construction activities would involve the following stages:

- Stage 1: Construction of South ROM, OLC South, TLO, CHPP Module 1, Thickener (Modules 1 and 2), Stockyard 1, MIA, Accommodation Village and Services;
- Stage 2: CPP Module 2 and Conveyors;
- Stage 3: North ROM, OLC North, CPP Module 3, Thickener (Modules 3 and 4), Stockyard 2; and
- Stage 4: CPP Module 4 and conveyors.

Table 5-7 summarises the major construction equipment units considered for each stage in the modelling scenarios.

Table 5-7 Construction Noise - Modelling Scenarios

Scenario	Period	Construction Equipment Requirement					
		Cranes	Plant	Water Truck	Dozer	Grader	Loader
1	May 2012 –Sep 2013	12 units	47 units	1 unit	4 units	2 units	2 units
2	Oct 2013 – Sep 2014	8 units	35 units	1 unit	4 units	2 units	2 units
3	Oct 2014 – Sep 2015	12 units	47 units	1 unit	4 units	2 units	2 units
4	Oct 2015 – Oct 2016	8 units	35 units	1 unit	4 units	2 units	2 units

5.4.3 Predicted Construction Noise Levels

The noise levels at each receptor location generated by the construction activities have been predicted by modelling of the noise sources listed in **Table 5-6**. The noise modelling has been carried

out considering neutral and adverse meteorological conditions. The results for the predicted noise levels during construction of the mine site are presented in **Appendix D.2, Tables D-11 to D-14** and summarised in **Table 5-8**

Table 5-8 Summary of Predicted Construction Noise Levels for All Construction Stages

Receptor	Noise Level - L_{Aeq} [dB(A)]		Criterion, $L_{Aeq,1hour}$ [dB(A)]			Exceedance
	Neutral Weather	Adverse Weather	Daytime	Evening	Night-time	
A: Forrester Homestead	<10	<10	50	45	40	Nil
B: Eulimbie Homestead	<10	<10	50	45	40	Nil
C: Surbiton South Homestead	<10	11	50	45	40	Nil
D: Burtle Station	<10	11	50	45	40	Nil
E: Tresillian Homestead	<10	<10	50	45	40	Nil
F: Mentmore Homestead	<10	<10	50	45	40	Nil
G: Monklands Homestead	<10	<10	50	45	40	Nil
H: Kia Ora Homestead	<10	<10	50	45	40	Nil
I: Hobartville Homestead	17-18	22-23	50	45	40	Nil
J: Wendouree Station	30-41	35-45	50	45	40	Up to 5 dB(A) Night-time*
K: HPPL Accommodation Village	10-11	14-15	50	45	40	Nil
Notes: * under adverse weather conditions						

The predicted construction noise levels indicate an exceedance of the EPP (Noise) night-time limit by up to 5 dB(A) under adverse weather conditions at Location J. No exceedance of the EPP (Noise) noise limits are predicted at any other location for the construction of the mine infrastructure during the day or night time periods.

It should be noted that the predicted noise levels presented in **Appendix D.2** result from a conservative noise modelling approach where it has been assumed that all equipment would operate continuously and simultaneously during the assessment period.

Specific physical construction noise mitigation measures are not considered necessary. However, adoption of noise management strategies implementing good industry practice is recommended to minimise noise emissions from the proposed construction works. Recommendations on construction noise management strategies are provided in **Section 6.1**. These will be incorporated into the construction phase Environmental Management Plan (EMP).

5.5 Borrow Pits

It is proposed to establish borrow pits within the mining lease to source approximately 2,300,000 m^3 of gravel materials over the life of the Project. The final location of the borrow pits is yet to be determined, however, an indicative location is shown in

Figure 2-2. It should be noted that it is not proposed to carry out any blasting within the borrow pits.

Approximately 164,500 m^3 of material will be sourced from the borrow pits during the construction phase, with a further 5,000 m^3 of material acquired from the footprint of the tailings dam.

It is anticipated that it would take no more than one month to source the 164,500 m^3 of material required during the construction phase.

During the one month construction phase period two dozers, two loaders and one tertiary crusher and screen would operate on a 24 hours per day, 7 days per week basis within the borrow pits area in addition to haul trucks for the transport of materials. During the operations phase, the same equipment schedule is anticipated, though operations would be sporadic.

Based on the indicative location of the borrow pits and published sound power levels for the identified equipment, it is predicted that during the operations phase, wholly compliant operational noise levels would be maintained at all receptor locations. While noise levels may be expected to rise by approximately 1 dB(A) at Receptor C, this is a barely noticeable difference that most people would find difficult to detect and noise levels would not be expected to increase at any other receptor location.

For the one month period of borrow pits activity during the construction phase, compliance with the construction noise criteria will be maintained. While the predicted noise levels will be expected to rise by up to approximately 3-5 dB(A) at the closest receptors outside the mining lease (Receptors C, D and E), with reference to the background noise monitoring data, the noise levels will be expected to be below exiting background noise and barely audible or inaudible at the identified receptors.

5.6 Sleep Disturbance

The predicted night-time period levels are significantly below 50 dB(A) L_{Amax} at receptor locations A-H. Therefore, the operation is not predicted to give rise to sleep disturbance at these locations.

As discussed in **Section 5.3.3**, the sleep protection criterion will not be readily achieved at Locations J and I with windows open. Substantial upgrading of the Wendouree Station's building envelope will be necessary to meet the sleep protection performance criterion. However, any such upgrade is not recommended, with consideration to the predicted blasting overpressure exceedance at this location.

Assuming a conservative noise reduction from outside to inside of 20 dB(A) through the external façades of the Hobartville Homestead's dwelling with windows closed, the internal noise criteria would be expected to be achieved. Provision of air conditioning however will be required to satisfy the internal noise criteria.

The sleep protection criterion is expected to be readily achieved within the HPPL Accommodation Village, which will be provided with air conditioning, allowing windows to be kept closed.

5.7 Low Frequency Noise

The Ecoaccess low frequency impact assessment process requires initial screening tests to determine whether predicted levels at receptor locations would exceed 50 dB(L) and whether linear levels would exceed A-weighted levels by 15 dB or more. In the case of an exceedance of these indicator limits further investigation is then required.

The mining equipment noise sources under assessment emit noise typically of a broadband nature and have not been known to generate the dominant low frequencies that the Ecoaccess guideline was

intended to address. Notwithstanding this SoundPLAN predictive noise modelling estimated the noise levels to be no more than 43 dB(L) at the receptor locations outside the mining lease boundary. Additionally, while linear noise levels of up to 58 dB(L), 73 dB(L) and 49 dB(L) are predicted at Locations I, J and K, no more than 15 dB difference between linear levels and A-weighted levels is predicted at these locations.

On this basis it is concluded that low frequency noise would not be at a level to cause annoyance to these residential receptors and compliance with the 20 dB $L_{pA,LF}$ criterion inside these dwellings is predicted. Accordingly, no adjustment to the A-weighted operational noise criteria is deemed necessary.

5.8 Blasting Noise and Vibration

Blasting would be carried out using ammonium nitrate/fuel oil (ANFO) explosive. The transportation, storage and use of explosives would be in accordance with the relevant Australian Standards (i.e. AS 2187 Explosives – storage, transport and use) and all state legislation (i.e. Explosive Act 1999). Over the 30 years, the average amount of ANFO used per annum is estimated to be approximately 82,000 t.

One 4-man blast crew has been allowed for per 15,000 tonnes of explosives per year. The maximum number of blast crews by 2033 is seventeen, including shot-firers. It has been assumed that the explosives supplier would operate the explosives depot and supply the explosives trucks and operators.

The first 15-20m of the tertiary truck-shovel overburden would be excavated while the rest of the tertiary and weathered Permian overburden would require some blasting to maintain excavation productivity. All fresh overburden and the inter-burden between the C and D seams require blasting. All blast holes would be confined and standard central Queensland strip mining blasting techniques would be used. Electronic initiation would be used to optimise blast performance and to limit the Maximum Instantaneous Charge (MIC) values.

The maximum range of MIC is 350 kg – 1,300 kg, while the likely range of MIC is 550 kg – 1,000 kg. No waste excavation blasting is anticipated beyond the pit areas.

Table 5-9 summarises the anticipated number of blasts as determined by the Proponent, which are also shown as graphs in **Figure 5-1** . The greatest number of blasts is predicted in 2017, with 533 blasts predicted for that year.

Table 5-9 Summary of Number of Anticipated Blasts

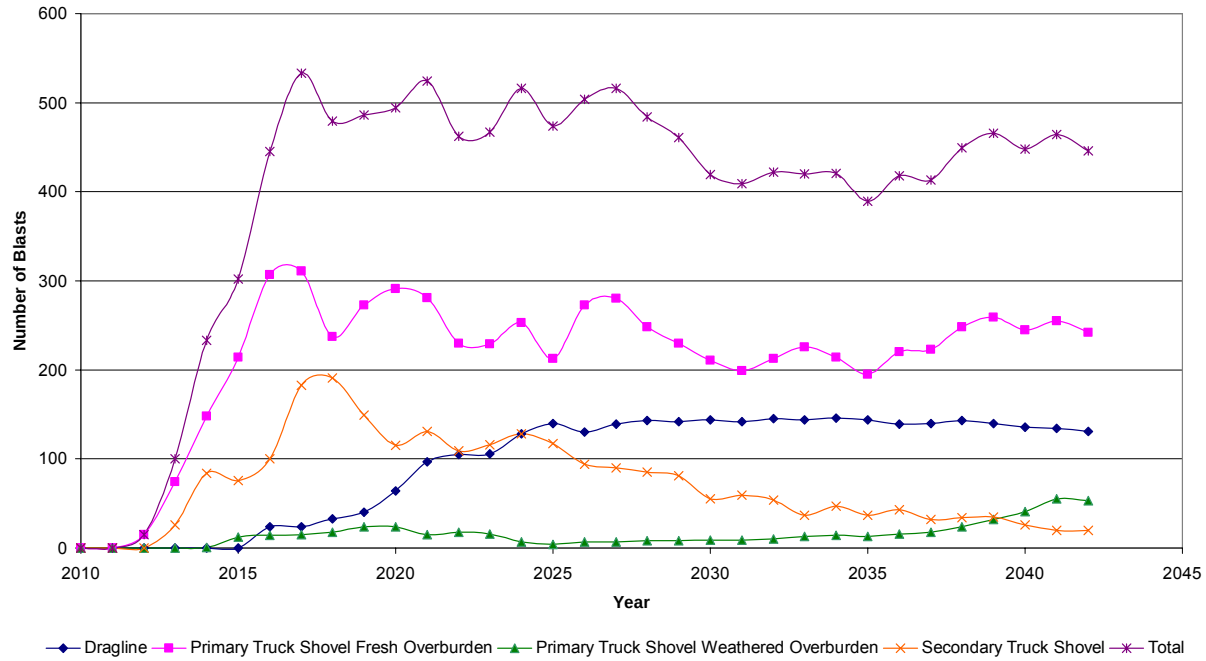
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DRE*	0	0	0	0	0	0	0	24	24	33	40	64
PTSFOB*	0	0	0	15	74	148	214	307	311	237	273	291
PTSWOB*	0	0	0	0	0	1	12	14	15	18	24	24
STS*	0	0	0	0	26	84	76	100	183	191	149	115
TOTAL	0	0	0	15	100	233	302	445	533	479	486	494
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
DRE*	97	105	106	128	140	130	139	143	142	144	142	145

5 Assessment of Potential Noise Impacts

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DRE*	0	0	0	0	0	0	0	24	24	33	40	64
PTSFOB*	281	230	229	253	213	273	280	248	230	211	199	213
PTSWOB*	15	18	16	7	4	7	7	8	8	9	9	10
STS*	131	109	116	128	117	94	90	85	81	55	59	54
TOTAL	524	462	467	516	474	504	516	484	461	419	409	422
	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Total All Yrs	
DRE	144	146	144	139	140	143	140	136	134	131	3,143	
PTSFOB	226	214	195	220	223	248	259	245	255	242	7,057	
PTSWOB	13	14	13	16	18	24	32	41	55	53	505	
STS	37	47	37	43	32	34	35	26	20	20	2,374	
TOTAL	420	421	389	418	413	449	466	448	464	446	13,079	

Notes: * DRE: Dragline; PTSFOB: Primary Truck Shovel Fresh Overburden; PTSWOB: Primary Truck Shovel Weathered Overburden; STS: Secondary Truck Shovel.

Figure 5-1 Proposed Yearly Blasts Over Life of Mine



Ground Vibration

The peak particle velocity (PPV) due to blast induced ground vibration experienced at the identified sensitive receptor locations would be dependent on the maximum charge per delay, the distance from the blast site and ground geology. For the purposes of assessment the PPV has been estimated by applying the following standard empirical formulae and site constants as set out in AS 2187.2,2006:

$$PPV = 1140\left(\frac{R}{Q^{1/2}}\right)^{-1.6}$$

- Where
  - R = distance between charge and point of measurement [m]; and
  - Q = maximum instantaneous charge (effective charge mass per delay) [kg].

In applying this method calculations indicate that blasts requiring up to the maximum 1300 kg MIC would not exceed the most stringent 5 mm/s ground vibration criterion (Ecoaccess criterion for 90 % of blasts) at the closest sensitive receptor location (Location J, Wendouree Station) based on minimum setback distance to the pit area.

At Location J, ground vibrations would be expected in the order of 4 mm/s, which would be expected to be easily noticeable, but considerably below accepted thresholds for structural damage to buildings.

For lower capacity MIC blasts and at greater setback distance the predicted magnitude of vibration reduces substantially. Due to the setback distances afforded to Location I (Hobartville Homestead) and Location K (HPPL Accommodation Village), for instance, for maximum capacity blasts PPV is predicted to not exceed 1 mm/s, while at the closest sensitive receptor locations beyond the mining lease boundary PPV is predicted to not exceed magnitudes in the order of 0.2 mm/s.

Therefore with respect to ground vibration, the proposed blasting schedule may be undertaken in full compliance with the established criteria, without risk of damage to the receptor properties or undue community annoyance.

The TOR states that information should be supplied on blasting which might cause ground vibration or fly rock on or adjacent to, the site with particular attention given to places of work, residence, recreation, worship and general amenity. Given the substantial setback distances to the identified receptors, flyrock impacts from blasting at these locations would not be expected.

5.8.1 Vibration Effects on Underground Pipelines

Standard DIN 4150.3-1999 recommends offset distances for buried pipelines constructed from various materials for the prevention of damage from vibration effects. Masonry or plastic pipes are most susceptible; for these pipeline types an offset distance of 510 m is recommended. There are no known buried pipelines within 510 m of the proposed blasting areas and therefore no adverse effects on pipelines due to blasting are expected.

5.8.2 Vibration Effects on Underground Communications Cabling

Optic fibre cables would supply communications to the site, and would likely enter the mine site along the Powerlink powerlines. It is understood that the cable network would not be sited within 500 m of the proposed blasting areas and therefore no adverse effects on communications networks due to blasting are expected.

5.8.3 Overpressure

Overpressure due to confined blasting experienced at sensitive receptor locations would be dependent on the maximum charge per delay, the distance from the blast site and ground geology. Additionally, air blast overpressure propagation can be increased under certain meteorological

conditions (with the occurrence of temperature inversions and/or source-to-receptor wind direction) and decreased with topographic shielding.

Overpressure (P) has been estimated by applying the following standard empirical formulae and site constants as set out in AS 2187.2,2006:

$$P = Ka\left(\frac{R}{Q^{1/3}}\right)^{a}$$

- Where
  - P = pressure [kilopascals];
  - R = distance from charge [m];
  - Q = explosive charge mass [kg];
  - Ka = site constant; and
  - a = site exponent.

For confined blasthole charges, a conservative site constant (k_a) value of 100 has been assumed with a site exponent (a) value of -1.45. The predicted levels disregard any meteorological and shielding effects.

Receptors A-H

Calculations indicate that blasts requiring up to the maximum 1300 kg MIC would not exceed the most stringent 115 dB(L) overpressure criterion (Ecoaccess criterion for 90 % of blasts) at any sensitive receptor location beyond the mining lease boundary based on minimum setback distance to the pit area. Of the identified receptors beyond the mining lease boundary, Location H (Kia Ora Homestead) is the closest to the pit area boundary at a setback distance of approximately 7 km. At this location overpressure levels of no more than 113 dB(L) are predicted.

Location J, Wendouree Station

Considering the range of MICs proposed, there is potential for exceedances of the overpressure criteria at the sensitive receptor locations within the mining lease. At Location J (Wendouree Station) overpressure levels in the 129 – 135 dB(L) range are predicted. The upper extent of this range exceeds the ANECC structural damage threshold criterion and therefore the efficacy of control measures to mitigate this exceedance, beyond acquisition of the property would be expected to present a significant challenge.

Location I, Hobartville Homestead

At Location I (Hobartville Homestead), the use of lower capacity blasts, not exceeding MIC 350 kg, would not be expected to result in an exceedance of the 115 dB(L) limit, whereas maximum capacity 1,300 kg MIC blasts are predicted to just exceed the 120 dB(L) limit. On this basis, it is expected that overpressure effects may be mitigated at through blasting controls at the Hobartville location.

Location K, HPPL Accommodation Village

At Location K (HPPL Accommodation Village), overpressure levels are predicted to be lower than 114 dB(L) and therefore the criteria are expected to be readily achieved at this location.

The predictions detailed above are based on site constants which are generally regarded to provide conservative results and hence the predicted levels should only be used as a guide. It is recommended that calculations are revised and predictions refined on the availability of site specific constants and once the exact locations for blasting are known. Blast monitoring should be undertaken to assess compliance, determine the site constants and confirm the predictions.

Blasting carried out within the recommended hours (0900 – 1700) would not be expected to be affected by the presence of temperature inversions as these generally occur during the night-time and early morning period. Source-to-receptor wind direction may be expected to give rise to increased noise levels at the receptors and should be considered when planning blasting.

Provided blasting is properly managed, the proposed blasting program can be carried out to meet the overpressure criteria at all but the Wendouree Station receptor locations. Reducing the MIC capacity and increasing distance is the most effective way of reducing blasting impacts. Recommendations on the management of overpressure from blasting are provided in **Section 6.2.** These would be provided to the blasting contractor for consideration and incorporated into a blasting Environmental Management Plan (EMP).

5.9 Off-Site Traffic Noise

The potential off-site traffic noise impact associated with the proposed operations and construction of Alpha Coal Mine has been assessed based on traffic volume predictions undertaken for the development. The increases in traffic volumes for each road section have been estimated for trips to and from the site. The following route sections were identified:

- A: Alpha to Alpha Coal Mine site, via Clermont-Alpha Road;
- B: Clermont to Alpha Coal Mine site, via Clermont-Alpha Road;
- C: East of Alpha to Alpha, via Capricorn Highway; and
- D: West of Alpha to Alpha, via Capricorn Highway.

The changes in traffic volumes would alter the noise emission from roadways, increasing the $L_{A10(18hour)}$, which is an average of the L_{A10} traffic noise levels produced between 0600 and 0000 hours (18 hours). The level of noise emission increase depends on the increase rate of the annual average daily traffic (AADT). These AADT figures and predicted traffic volumes due to mine construction and operation were obtained from the Pre-Feasibility Study, based on equipment and construction materials, truck-load quantities, waste transport, personnel movements and consumable deliveries. The accuracy of these figures is dependant on preliminary predictions on traffic volumes and therefore a conservative approach has been taken.

5.9.1 Calculation of Road Traffic Noise (CoRTN)

Calculations were undertaken following the CoRTN (U.K. Department of Transport) prediction method for the following existing and predicted conditions for the peak years during construction and operation:

Table 5-10 Baseline Road Traffic Parameters

Road	Year 2009		Construction Year 2013		Operation Year 2041	
	AADT	% Heavy Vehicle	AADT	% Heavy Vehicle	AADT	% Heavy Vehicle
A: Clermont-Alpha Road (Between Alpha and Hobartville Road)	83	27	659 [1]	13	1213 [2]	11
B: Clermont-Alpha Road (Between Hobartville Road and Clermont)	83	27	366 [1]	9	694 [2]	13

Notes:
1. Includes predicted traffic volume during the busiest year of construction works (2013), plus existing traffic incremented by 50% for 2013.
2. Includes predicted traffic volume during the busiest year of operations (2041), plus existing traffic incremented by 300% for 2041.

Table 5-11 provides a summary of the calculated $L_{A10(18hour)}$ road traffic noise levels for the subject road sections at the affected sensitive receptor locations.

Table 5-11 Predicted Road Traffic Noise Results

Sensitive Receptor	Route	Setback (from Clermont-Alpha Rd)	Existing Traffic Noise $L_{A10(18hours)}$ yr 2009	Predicted Road Noise dB(A)		Relative Increase in Noise Level (dB)	
				Construction yr 2013	Operation yr 2041	Construction yr 2013	Operation yr 2041
Mentmore Homestead	A	500 m	23	31	33	8	10
Tressillian Homestead	B	600 m	23	27	30	4	7
Burtle South	B	200 m	27	31	34	4	7

The ongoing operations of the mine would generate significantly more traffic than the construction phase of the Project. The increase in operations traffic would be due principally to personnel transport, from Alpha town or Clermont to the mine site and Alpha airport to the accommodation village.

The predicted traffic volumes generated by the Project represent a significant increase when compared with the existing level of traffic. While full compliance with the 68 dB(A) $L_{A10(18hour)}$ CoP criterion is expected to be readily achieved without the requirement for any specific mitigation, a perceived increase in road traffic noise experienced by the identified receptors is considered likely.

The Mentmore Homestead (Location E) is predicted to be the most affected of the identified receptors, with a relative increase in $L_{A10(18hour)}$ noise levels by some 8 dB during peak mine construction and by some 10 dB during peak mine operation. Increases of this order represent an effective perceived doubling in subjective loudness. Noise management strategies to minimise the noise from the off-site

road traffic associated with the proposed mine construction and operations have been provided in **Section 6.1** of this report.

5.10 Review of Rail Noise and Vibration Impact Assessment

HPPL proposes to construct a standard gauge, 495 km long railway line for the purposes of transporting processed coal from the Alpha coal mine site to the proposed Port of Abbot Point. The rail line would be designed to enable the export of 60 Mtpa of quality thermal coal to overseas markets.

GHD has undertaken an assessment of the potential noise and vibration impacts resulting from the construction and operation of the proposed Alpha Rail Corridor Project (*Report for Alpha Rail Project – Noise Assessment, August 2010 (Revision 0)*). This Section provides a summary of the report.

5.10.1 Assessment Criteria

Railway Noise

The GHD report considers the provisions of the *Environmental Protection Act 1994* and the *Environmental Protection (Noise) Policy 2008*, whilst it assesses operations rail noise against Planning Levels proposed by the Queensland Rail's *Code of Practice for Railway Noise Managemen*t (Ver 2, 2007); those being:

- 65 dB(A) $L_{Aeq,\ 24hr}$; and
- 87 dB(A) L_{Amax}.

Construction Noise

The assessment does not consider construction noise limits, but applies the time restrictions set out under *Section 440K – Building Work* of the Queensland *Environmental Protection Act 1994*. Under this regulation, no audible noise is permitted between:

- 1830 – 0630 Monday to Saturday; or
- Sundays and public holidays.

Vibration

The assessment recognises the levels of vibration for human perception set out in DIN 4150 Part 2, whilst it establishes human comfort criteria based on *BS 6472 – 1992, "Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*". Structural vibration criteria are based on *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures*.

Blasting

Controls for potential blasting are based on the Australian and New Zealand Environment Council (ANZEC) guideline - *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (1990).

5.10.2 Rail Noise

The assessment identifies two rural area receptors within 500 m of the proposed rail alignment – Receptor 1 at a setback distance of 113 m from the proposed track and Receptor 2 at a setback distance of 260 m.

GHD undertook rail noise modelling to assess potential noise impacts on the identified receptors using the environmental noise prediction model CadnaA, employing the Nordic Rail Traffic Noise Prediction Method (Kilde 1984).

The modelling assessment was based on peak production volumes of coal of 60 Mtpa, being transported by GE ES44DC diesel locomotive trains. In order to transport this volume of coal, based on 24,000 tonne payloads, 14 train trips (7 each way) per day were assumed.

The following assumptions were made with regards to the modelled rail movements and configuration:

- Based on standard coal wagons each of 106 tonne capacity, about 234 wagons would be needed to be attached to each locomotive 3-unit set to carry the proposed 24,000 tonnes of coal per train, resulting in a total length of 4 km;
- The expected coal train movements per day for peak production and transportation in 2016 (train movements spread out evenly over a 24-hour period) are 7 on the Up track and 7 on the Down track; and
- The design speed was assumed to be 80 km/h.

The following assumptions were made with regard to the model configuration:

- A general ground absorption coefficient of 0.5 was used throughout the model;
- Atmospheric conditions of 20 °C and 70 % humidity were used;
- Meteorological effects were disregarded; and
- A source sound power level of 94 dB(A) per linear metre was assumed, based on United Group rail noise measurement data, adapted to the Nordic train input data.

The GHD assessment reports rail noise at both receptors would be lower than the 65 dB(A) $L_{Aeq,24hrs}$, which implies that the Code of Practice noise target would be met with the corridor in operation.

As the GHD assessment did not consider the sensitive receptor locations relevant to this assessment, URS has undertaken additional noise modelling using the details and assumptions considered in the GHD assessment to predict potential rail noise emission levels at the receptors given in **Table 2-1**. URS noise modelling predicted consistent rail noise levels at the receptors as those documented by GHD. The resultant rail noise levels at the receptors are presented in **Table 5-12**.

It is noted that meteorological effects have not been considered by GHD. In this regard, it is noted that the occurrence of source-to-receptor wind directions and/or the presence of a temperature inversion would have the potential to provide an exceedance of the $L_{Aeq,24hr}$ Planning Level criteria at the identified receptor locations.

Table 5-12 URS Rail Noise Modelling Results

Receptor	Noise Levels - L_{Aeq} dB(A)		Rail CoP $L_{Aeq,24hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	24	28	65	Nil
B: Eulimbie Homestead	46	51	65	Nil
C: Surbiton South Homestead	38	43	65	Nil
D: Burtle Station	26	30	65	Nil
E: Tresillian Homestead	16	19	65	Nil
F: Mentmore Homestead	10	14	65	Nil
G: Monklands Homestead	22	25	65	Nil
H: Kia Ora Homestead	23	26	65	Nil
I: Hobartville Homestead	42	47	65	Nil
J: Wendouree Station	62	65	65	Nil
K: Site Accommodation Village	30	35	65	Nil

The results presented in **Table 5-12** show that of the receptors outside the mining lease boundary (A – H), the most impacted by rail noise would be the closest to the rail line, Receptor B (Eulimbie Homestead), which sets back from the rail line by some 1,600 m and from the mine site by some 16 km. Rail noise criterion would be satisfied at all the receptor locations.

Rail noise at Wendouree Station (Receptor J), which is located within the mining lease boundary, may marginally exceed the criterion under adverse meteorological conditions.

The GHD rail noise predictions indicate the train noise L_{Amax} levels being approximately 15 dB(A) higher that the $L_{Aeq.}$ Based on this margin it would be expected that L_{Amax} noise criterion of 87 dB(A) would be achieved.

Sleep Disturbance

While the GHD and URS assessments predict compliant L_{Amax} noise levels at the sensitive receptors locations, it is noted that for some receptors, these levels are high enough potentially to give rise to sleep disturbance based on the recommendation of the WHO, 1999 and the EPP (Noise), 2008.

5.10.3 Rail Vibration

Given the nearest sensitive receptor is over 100 m from the rail corridor, it is highly unlikely there would be any adverse community reaction due to operations vibration impacts. URS concurs with this opinion. The GHD assessment additionally notes that '*recent vibration testing of coal trains in the Hunter Valley have indicated there is low probability of adverse comment for human comfort for receptors located more than 40 metres from the rail line*'.

5.10.4 Construction Phase

In the absence of detailed design information, the GHD report takes the reasonable approach of considering likely construction activities and equipment schedules for the construction phase. Based

on a number of reference documents and the GHD internal database, an indicative list of construction equipment/plant and corresponding sound power levels is provided in Table 5-1 of the report (refer EIS Volume 6, Appendix G). The sound power levels presented are generally consistent with the observations of URS.

Construction noise at the sensitive receptors was calculated based on distance loss from the source to the receptor. The GHD report notes that '*the calculations do not take into consideration the mitigating or enhancing effects of terrain, screening or meteorological conditions, therefore providing a measure of conservatism'*. In this regard, it is noted that while disregarding terrain and screening effects would provide conservatism, neglecting to consider meteorological effects which may serve to enhance noise propagation may in fact result in the under prediction of received noise levels.

The magnitude of noise impacts associated with construction would be dependent upon a number of factors including the current construction activities, existing local noise sources, intervening terrain and weather conditions. Also received noise levels would fluctuate due to the movements of the mobile machinery and that the machinery is likely to produce lower sound power levels for much of the time, when not operating at maximum capacity. It notes that it is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time and that certain types of construction machinery would be present on site for only brief periods during construction.

The predicted construction noise levels for each item of plant has been calculated at varying setback distances with results shown in Table 5-2 of the GHD report, and predicted levels at the identified receptor locations provided in Table 5-3. However, predictions for scenarios involving more than one plant item are not provided. Two plant items generating equal sound power levels, operating in the same area simultaneously would be expected to typically give rise to a 3 dB(A) increase compared to one plant item working alone.

Received noise levels at the closest receptor for single plant items are predicted to be in the range of 47-65 dB(A), with impact piling resulting in noise levels of up to 84 dB(A).

As previously noted, the assessment applies no numerical construction noise limits. Based on the predicted noise levels provided in Table 5-2 of the GHD report, URS considers that without consideration to piling activities, exceedances of the EPP(Noise) daytime guideline noise level of 50 dB(A) $L_{Aeq,1hr}$ may be likely to occur at receptor locations within approximately 500 m of the rail line. Additionally, URS considers that piling activities may have the potential for exceedance of the daytime guideline level at receptor locations within approximately 3 km of the rail line. Notwithstanding this, as previously noted, the EPP(Noise) criteria were developed for the protection of amenity and health and not for the control of construction noise, which is generally regarded as a temporary activity and therefore often afforded greater tolerance.

As stated in the GHD report, URS recognises that the construction of the rail track is transient in nature and noise impacts would reduce as the rail construction progresses along the route away from receptors.

5.10.5 Construction Vibration

The GHD report predicts ground vibration levels associated with various items of construction plant based on levels provided by the NSW RTA Environmental Noise Management Manual and concludes that the majority of construction activities along the rail corridor are not expected to produce perceptible levels of vibration due to the distance from the receptors. Pile driving may produce

vibration levels which are barely noticeable to receptors at approximately 110 metres. URS concurs with these assumptions.

5.10.6 Construction Blasting

The GHD assessment notes that blasting may potentially be required for excavations of sections of the rail corridor where hydraulic excavators with hammer attachments are ineffective. It recommends that blasting should only occur between 0900 to 1700 Monday to Friday and 0900 to 1300 Saturday.

The report notes that a MIC of greater than 100 kg should not be required and a charge of 50 kg or less is likely to be appropriate. Estimates of air blast overpressure and ground vibration due to potential blasting are provided based on blasts in the MIC range of 10-100 kg. These are consistent with URS predictions. The report correctly identifies that overpressure, as opposed to ground vibration, is likely to be the limiting factor with respect to the distance from sensitive receptors over which blasting can occur. The report notes that blasting at distances to receptors of less than 800 m would be restricted by the MIC. URS notes that with reference to Table 5-5 and Figure 5-1 of the report and URS in-house predictions, at 800 m compliance with the 120 dB(L) limit would only be achieved for MICs of no more than approximately 50 kg. Further, in the event that the upper range of MIC considered (up to 100 kg) is necessary, blasting would be likely to be restricted for distances to receptors of less than approximately 1 km.

URS concurs with the recommended construction blasting mitigation measures set out in Section 5.4.4 of the GHD report.

5.11 Impacts on Fauna

Volume 2, Section 9 of the Environmental Impact Statement (EIS) describes the environmental values identified onsite, in terms of terrestrial flora and fauna, amphibians, reptiles, birds and mammals for the Project. In relation to the potential noise and vibration impacts upon these ecological values, the findings of the ecology assessment are as follows:

- An increase in noise, vibration and dust associated with the construction and operations phases of the Project may lead to the displacement of native species from their current home ranges;
- The increase in noise and vibration emissions which would result from construction and operations activities may discourage the Southern Squatter Pigeon (*Geophaps scripta scripta*) and Little Pied Bat (*Chalinolobus picatus*) from utilising the immediate area. These impacts may also affect insect abundance, water quality and reproductive behaviour.
- Indirect impacts upon breeding and feeding activities due to noise and vibration disturbance are also possible.
- While no literature on the effects of blasting on tree roosting bat species was found, it is probable that some concussive impacts would occur in nearby roost trees which may lead to short-term displacement of bats from the affected areas. Therefore, the blasting process could potentially impact the Little Pied Bat (*Chalinolobus picatus*) via increased predation, if blasting occurred when avian predators – both raptors and owls – were active; and
- While the effects of blasting and vibration on cave-dwelling bat species are poorly understood, the observations of one study found the noise and vibration from blasting had no apparent impact upon the observed colony.

With reference to noise and vibration, the ecological assessment recommends the following management strategies for species of conservational significance:

- Consider undertaking blasting in intensive bursts (over days or weeks rather than every day) so that prolonged impacts upon the Little Pied Bat (*Chalinolobus picatus*) and other potentially vibration and / or noise-sensitive species are minimised.
- If blasting does need to occur on a daily basis, restrict blasting to one or two periods of short duration during the day and avoid periods when avian predators are most active (i.e. when bats are likely to fly out of their roost sites and could be opportunistically attacked).
  - Where possible, consider using earth banks and / or noise barriers to baffle blasting.
  - Where possible, consider using plant machinery (scraper, D10 bulldozer etc) instead of blasting.

5.12 Summary of Potential Noise and Vibration Impacts

The following provides a summary of the outcomes of the assessment of potential noise impacts:

- Operation:
  - Noise levels generated by the proposed operations are predicted to be within the established noise limits at all receptor locations outside the mining lease boundary under all meteorological conditions. The existing receptors within the mining lease boundary are expected to be affected. Exceedances of the night-time criteria by up to 35 dB(A) and 19 dB(A) are anticipated at Wedouree Station (Receptor J) and Hobartville Homestead (Receptor I) respectively.
- Construction Noise:
  - While no specific limits exist for the control of construction noise, the EPP (Noise) night-time acoustic quality objective is predicted to be exceeded by up to 5 dB(A) at the Wendouree Station (Receptor J) location during the construction stages. No other exceedances of the EPP (Noise) values are predicted during the daytime, evening or night periods throughout the construction stages.
- Sleep Disturbance:
  - Predicted noise levels are within the sleep disturbance noise limit for all receptors beyond the mining lease boundary. Noise levels that could give rise to sleep disturbance are predicted at the Wendouree Station (Receptor J) and Hobartville Homestead (Receptor I) locations. Additionally rail traffic during the night-time period has potential to cause sleep disturbance at the Eulimbie Homestead location (Receptor B) and potentially at the Surbiton South Homestead (Receptor C) location.
- Low Frequency Noise:
  - The proposed operation assessed using the Ecoaccess guideline indicates that low frequency noise would not be at a level to cause annoyance to the closest residential receptors.
- Blasting:
  - The Wendouree Station receptor (Receptor J) is predicted to be adversely affected by high overpressure levels from blasting. Overpressure levels of up to 135 dB(L) are predicted, which exceeds the ANECC structural damage threshold criterion. Beyond acquisition of the property, mitigation measures to reduce overpressure effects at this location are considered impracticable. It is expected that overpressure effects may be mitigated through blasting practice controls at the Hobartville Homestead (Receptor I) and Accommodation Village

(Receptor K) locations. No overpressure exceedances are anticipated beyond the mining lease boundary and the ground vibration criteria is expected to be met at all sensitive receptor locations.

- Off-Site Traffic Noise;
  - Full compliance with the DTMR Road Traffic Noise Management CoP criteria is predicted for all construction and operational stages. Due to the relative increase in vehicle volumes, however, noticeably increased noise levels are likely to be perceived by the most affected receptors.
- Rail Noise:
  - URS concurs with the general findings of the rail noise and vibration assessment carried out by GHD. Full compliance with the Queensland Rail's CoP is predicted at all identified receptors.

6

Noise Mitigation Measures

6.1 Construction and Operations Noise

Specific physical construction and operations noise mitigation measures are not considered necessary. While the proposed activities have limited potential for impact on the local ambient noise environment, the following noise management strategies can be applied, which would further reduce the potential for noise issues during the proposed construction and operations periods:

- Where practicable carrying out all construction works using noisiest equipment or plant items within the day-time period;
- Scheduling construction to minimise multiple use of the noisiest equipment or plant items where practicable;
- Strategic positioning of plant items and maintenance work areas to reduce the noise emission to noise sensitive receptors, where possible;
- Ensuring machinery engine covers are closed, equipment is well maintained and silencers/mufflers are used, including routine maintenance for major items of construction equipment that are significant contributors to construction noise levels;
- Awareness training for staff and contractors in environmental noise issues including:
  - Minimising the use of horn signals and maintaining to a low volume. Alternative methods of communication should be considered;
  - Avoiding any unnecessary noise when carrying out manual operations and when operating plant; and
  - Switching off any equipment not in use for extended periods during construction work;
- Restricting heavy vehicle entry to site and departure from site to the nominated construction hours;
- Community consultation with local residents and building owners to assist in the alleviation of community concerns. Previous experience on similar projects has demonstrated that affected noise sensitive receptors may be willing to endure higher construction noise levels for a shorter duration if they have been provided with sufficient warning in the place of intermittent but extended periods of construction noise at lower levels; and
- Maintaining a suitable complaints register. Should noise complaints be received, undertake noise monitoring at the locations concerned. Reasonable and feasible measures would need to be implemented to reduce noise impacts.

6.2 Blasting

It is recommended that prior to commencement of blasting on site a Blasting Management Plan (BMP) be prepared which should include a monitoring program. This should be made available to the relevant authority as required.

Prior to any blasting, it is recommended that building condition surveys at all potentially impacted dwellings (sensitive receptors) are carried out and repeated at completion of works.

It is recommended that the following are considered and documented in the BMP:

- Restricted blasting times (between 0900-1700 recommended);
- Blast design including direction and detonation and designing the detonation sequence with delays between holes so that the blast waves from individual holes do not arrive simultaneously at a residence;
- Avoiding blasting during adverse weather conditions;

- Orientation of the blast face and directing energy away from sensitive sites;
- Maximum Instantaneous Charge;
- Dimensions of the blast – spacing between holes, distance from the free face to the first row of holes, distance between rows of holes; and
- Type and depth of stemming.

If required, overpressure noise and ground vibration levels due to blasting may be reduced by:

- Reducing the MIC by using delays, reduced hole diameter and/or deck loading;
- Changing the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination;
- Exercising strict control over spacing and orienting of all blast drill holes;
- Using minimum practicable sub-drilling which gives satisfactory toe conditions; and
- Using alternative rock breaking techniques where practicable.

6.3 Off-Site Road Traffic

Specific noise mitigation measures are not considered necessary to control off-site road noise. However, the following noise management strategies can be applied, which would further reduce the potential for noise issues during the proposed construction and operations periods:

- Ensuring all road going heavy vehicles are properly maintained;
- Restricting heavy vehicles' entry to site and departure from site to the nominated construction hours;
- Awareness training for staff and contractors in environmental noise issues including:
  - Minimising the use of horn signals and maintaining to a low volume; and
  - Avoiding any unnecessary vehicle noise such as that caused by the application of engine brakes in the vicinity of homestead locations.
- Community consultation with local residents and building owners to assist in the alleviation of community concerns; and
- Maintaining a suitable complaints register. Should noise complaints be received, investigate at the locations concerned.

7

Conclusions

Hancock Prospecting Pty Ltd (HPPL) proposes to develop the Alpha Coal Project, a 47,000 ha, 30 Mtpa thermal coal mine in the Galilee Basin of Queensland, Australia.

The Project construction is planned to commence in late 2011 with first coal to be produced in 2013. The initial mine life is 30 years, mining approximately 1.1 billion tonnes of the 3.9 billion tonne resource. Coal mining and product tonnage would build up over a 5 year period and then be maintained at 30 Mtpa for the life of the Project.

The mine would be supported by privately owned and operated rail and port infrastructure facilities. At the site the coal would be mined, washed and conveyed to a train load-out facility where it would be transported approximately 495 km to the east coast.

URS Australia Pty Ltd (URS) has completed a noise impact assessment for the proposed coal mine project, considering the mine construction and operational stages. The assessment of rail noise impact is beyond the scope of this assessment, however, the findings of the rail noise assessment prepared by GHD have been reviewed and incorporated into this assessment.

The nearest potentially affected noise sensitive receptor locations have been identified, eight of which are located outside the HPPL mining lease boundary, while two existing receptors are located closer to the proposed pit areas, within the mining lease boundary.

The assessment of potential noise impacts of the proposed construction and operations of the mine, on surrounding noise sensitive receptor locations, has been carried out in accordance with relevant Queensland EPA and WHO noise guidelines. Throughout the assessment, 'worst-case' construction and operations conditions have been considered, assuming for each construction and operations stage that all plant equipment is continuously and simultaneously operational on a 24 hour per day, 7 days per week basis.

Noise modelling indicates that the proposed construction and operations mining activities would comply with the established noise limit criteria at the eight receptor locations outside the mining lease boundary without the requirement for any specific noise mitigation measures.

The two receptors within the mining lease boundary are expected to be adversely affected by operations noise from the mine site, the closer of the two considerably affected. This receptor is additionally expected to be adversely affected by noise during the construction phase and by overpressure effects resulting from the proposed blasting at the pits. At this location, based on a conservative assessment, overpressure levels exceeding the recommended limits for human comfort and structural damage are predicted. At all other receptor locations, with the adoption of suitable blasting controls, compliance with the relevant blasting noise and vibration control guidelines is predicted.

The predicted increase in off-site road traffic volume due to the proposed construction and operations is significant. While full compliance with the relevant road traffic noise criteria is predicted during all construction and operations stages, noticeably increased noise levels are likely to be perceived by the most affected receptors.

It is concluded that noise impacts from construction activities and operation of the proposed mine are not expected to significantly degrade the existing acoustic environment nor create undue annoyance to the receptors located outside the mining lease boundary, though the closest receptors to the pits are expected to be affected. Beyond acquisition of the property, mitigation of the effects at the closest receptor location is not considered to be practicable.

7 Conclusions

It is recommended that a number of good practice construction and operations noise control measures are adopted to minimise noise emissions from the mine site.

The predicted noise levels should be verified periodically during the mine's development, and in the unlikely event of any significant discrepancies from this assessment, there is scope to provide additional noise control measures.

A complaints register shall be implemented and maintained to record complaints and ensure investigation and response.

8

References

- Terms of Reference for an environmental impact statement, Alpha Coal Project (Coordinator General, June 2009)
- Environment Protection Act 1994 (Queensland);
- Environmental Protection and Other Legislation Amendment Act (No. 2) 2008 (Queensland);
- Environment Protection (Noise) Policy 2008 (Queensland);
- Ecoaccess Guideline: Planning For Noise Control (Queensland EPA, 2004);
- Ecoaccess Guideline: Noise and Vibration from Blasting (Queensland EPA, 2006);
- Ecoaccess Guideline: Assessment of Low Frequency Noise ((Queensland EPA, 2004);
- World Health Organisation Guidelines for Community Noise, 1999;
- Australian/New Zealand Standard AS/NZS 2107-2000, Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors;
- New Zealand Standard NZS 6803:1999 Acoustics – Construction Noise;
- Australian Standard AS 3671-1989: Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction;
- Australian Standards AS1055.1 and AS1055.2, 1997. Description and Measurement of Environment Noise;
- Australian Standard AS 2187.2-2006: Explosives – Storage and Use, part 2, Use of Explosives;
- British Standard BS7385, part 2, Recognised Sleep Disturbance Criteria, 1993;
- Road Traffic Noise Management: Code of Practice (Department of Main Roads, 2007);
- Queensland Rail Code of Practice for Railway Noise Management, Interest in Planning Schemes No. 3 (Queensland Transport), November, 2007;
- British Standard BS6472, Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80 Hz), 1992;
- The Health Effects of Environmental Noise – other than hearing loss (enHealth Council, 2004); and
- The propagation of noise from petroleum and petrochemical complexes to neighbouring communities (Conservation of Clean Air and Water in Europe (CONCAWE), 1981).
- ISO 9613-1: Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere; and
- Caval Ridge Mine Project, Construction and Operational Noise and Vibration Impact Assessment (Heggies REPORT 20-2028-R2, Revision 3, May 2008);
- Ensham Central Project, Environmental Noise Impact Assessment (Bassett Acoustics, April 2006).

9

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 Prospecting Pty Ltd (HPPL) and only those third parties who have been authorised in writing by URS to rely on the 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 Proposal.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between May to September 2010 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.

A

Appendix A Glossary of Acoustical Terminology

A wide range of acoustic parameters and technical terms are used in this report. To assist in understanding the technical contents, a brief description of the acoustic terms is provided in this section.

Typical Noise Levels: Compared to the static air pressure (10^5 Pa), the audible sound pressure variations are very small ranging from about 20 µPa ($20x10^{-6}$ Pa), which is called “threshold of hearing” to 100 Pa. A sound pressure of approximately 100 Pa is so loud that it causes pain and is therefore called “threshold of pain”.

dB (Decibel): A unit of sound level measurement. The human ear responds to sound logarithmically rather than linearly, so it is convenient to deal in logarithmic units in expressing sound levels. To avoid a scale which is too compressed, a factor of 10 is introduced, giving rise to the decibel. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Perception of Sound: The number of sound pressure variation per second is called the frequency of sound, and is measured in Hertz (Hz). The normal hearing for a healthy young person ranges from approximately 20 Hz to 20 kHz. In terms of sound pressure levels, audible sound ranges from the threshold of hearing at 0 dB to the threshold of pain at 130 dB and over. A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to small but noticeable change in loudness. An increase of about 8 – 10 dB is required before the sound subjectively appears to be significantly louder.

Sound Pressure (SPL): Sound pressure is the measure of the level or loudness of sound. Like sound power level, it is measured in logarithmic units. The symbol used for sound pressure level is SPL, and it is generally specified in dB. 0 dB is taken as the threshold of human hearing.

Table A-1 Sound Pressure Levels of Some Common Sources

Sound Pressure Level (dB)	Sound Source	Typical Subjective Description
140	Propeller aircraft; artillery fire, gunner’s position	Intolerable
120	Riveter; rock concert, close to speakers; ship’s engine room	
110	Grinding; sawing	
100	Punch press and wood planers, at operator’s position; pneumatic hammer or drilling (at 2 m)	Very noisy
80	Kerbside of busy highway; shouting; Loud radio or TV	Noisy
70	Kerbside of busy traffic	
60	Department store, restaurant, conversational speech	
50	General office	Moderate
40	Private office; Quiet residential area	Quiet
30	Unoccupied theatre; quiet bedroom at night	
20	Unoccupied recording studio; Leaves rustling	Very quiet
10	Hearing threshold, good ears at frequency of maximum sensitivity	
0	Hearing threshold, excellent ears at frequency maximum response	

Sound Power (SWL): Sound power is the energy radiated from a sound source. This power is essentially independent of the surroundings, while the sound pressure depends on the surroundings (e.g. reflecting surfaces) and distance to the receptor. If the sound power is known, the sound pressure at a point can be calculated. Sound power is also measured in logarithmic units, 0 dB sound power level corresponding to 1 pW (10^{-12} W). The symbol used for sound power level is SWL or Lw, and it is specified in dB.

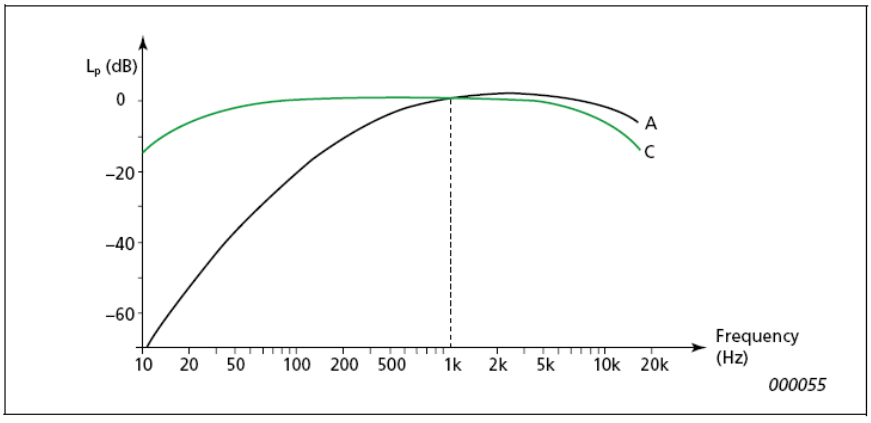
Frequency: Frequency is synonymous to pitch and is measured in units of Hz.

Frequency Spectrum: In environmental noise investigations, it is often found that the single-number indices, such as L_{Aeq}, do not fully represent the characteristics of the noise. If the source generates noise with distinct frequency components, then it is useful to measure the frequency content in octave or one-third octave frequency bands. For calculating noise levels, octave spectra are often used to account for the frequency characteristics of propagation.

"A" Frequency Weighting: The method of frequency weighting the electrical signal with a noise measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. It is based on the 40 dB equal loudness contour. The symbols for the noise parameters often include the letter "A" (e.g. L_{Aeq}) to indicate that frequency weighting has been included in the measurement. See the graph below.

"C" Frequency Weighting: The response of the human ear varies with the sound level. At higher levels, 100 dB and above, the ear's response is flatter, as shown in the C-Weighted Response below.

Although the A-Weighted response is used for most applications, C-Weighting is also available on many sound level meters. C-Weighting is usually used for Peak measurements and also in some industrial and entertainment noise measurement, where the transmission of low frequency noise can be a problem. C-weighted measurements are expressed as dBC or dB(C).



Adverse Weather: Weather effects (wind and temperature inversions) that enhance noise. The prescribed conditions are for wind occurring more than 30 % of the time in any assessment period in any season and/or for temperature inversions occurring more than 30 % of the nights in winter.

Assessment Period: The period in a day over which assessments are made: day (7.00 am – 6.00 pm, Monday to Saturday; or 8.00 am – 6.00 pm on Sundays and public holidays), evening (6.00 pm – 10.00 pm, all days) or night (10.00 pm – 7.00 am, Monday to Saturday; or 10.00 pm – 8.00 am on Sundays and public holidays).

Appendix A

Ambient Noise: The all-encompassing sound at a site comprising all sources such as industry, traffic, domestic, and natural noises. This is represented as the L_{Aeq} noise level in environmental noise assessment. (See also L_{Aeq})

Background Noise: Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is measured statistically as the A-weighted noise level exceed for ninety per cent of a sample period. This is represented as the L_{A90} noise level (See also L_{A90}).

Free Field: An environment in which a sound wave may propagate in all directions without obstructions or reflections. Free field noise measurements are carried out outdoors at least 3.5 m from any acoustic reflecting structures other than the ground.

Extraneous Noise: Noise resulting from activities that are not typical of the area. Untypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.

Impulsive Noise: Noise having a high peak of short duration or a sequence of such peaks. Noise from impacts or explosions, e.g., from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of the sound pressure level.

Intermittent Noise: Noise with a level that abruptly drops to the level of or below the background noise several times during the period of observation. The time during which the level remains at a constant value different from that of the ambient being of the order of 1 s or more.

Meteorological Conditions/Effects: Wind and temperature inversion conditions.

Noise Barrier: Solid walls or partitions, solid fences, earth mounds, earth berms, buildings. Etc used to reduce noise without eliminating it.

Temperature Inversion: An atmospheric condition in which temperature increases with height above the ground.

Tonality: Noise containing a prominent frequency and characterised by a definite pitch.

L_{Aeq}: A-weighted equivalent continuous noise level. This parameter is widely used and is the constant level of noise that would have the same energy content as the varying noise signal being measured. The letter “A” denotes that the A-weighting has been included and “eq” indicates that an equivalent level has been calculated. This is referred to as the ambient noise level. (See Ambient Noise)

L_{A90}: The A-weighted sound pressure level which is exceeded for 90 % of the measurement period. It is determined by calculating the 90^{th} percentile (lowest 10 %) noise level of the period. This is referred to as the background noise level. (See Background Noise)

L_{A10}: The A-weighted sound pressure level which is exceeded for 10 % of the measurement period.

L_{A1}: The A-weighted sound pressure level which is exceeded for 1 % of the measurement period.

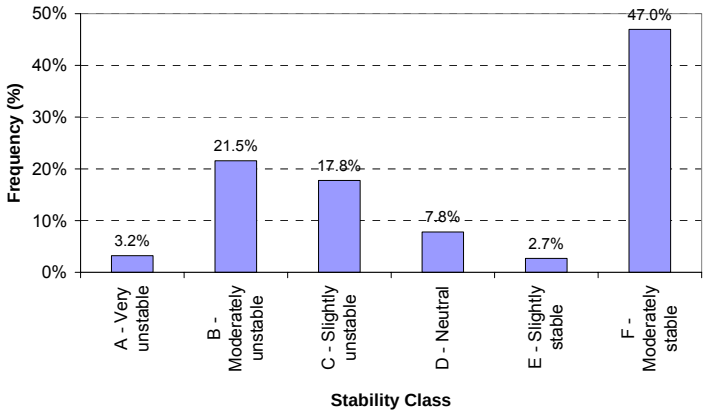
L_{Amax}: The A-weighted maximum Root Mean Square (RMS) sound pressure level measured during the sample period.

L_{LF}: Low frequency noise level in the frequency range 20 Hz to 200 Hz.

B

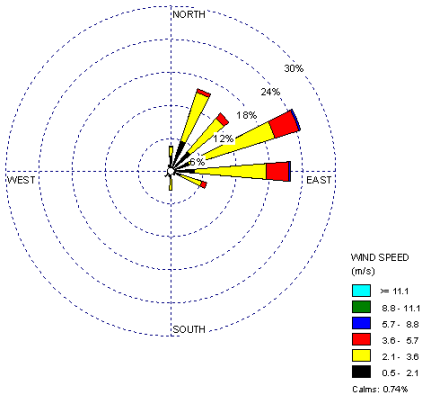
Appendix B Analysis of Meteorological Data

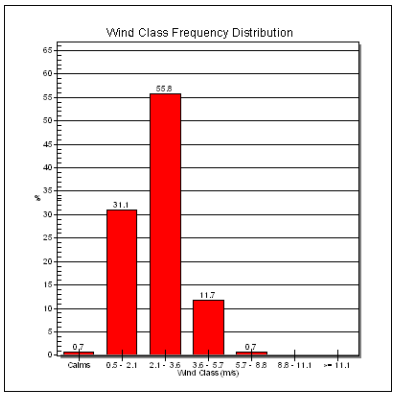
CALMET Stability Categories



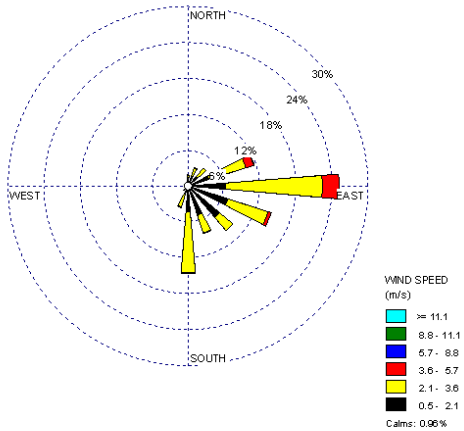
Wind Rose based on CALMET modelling

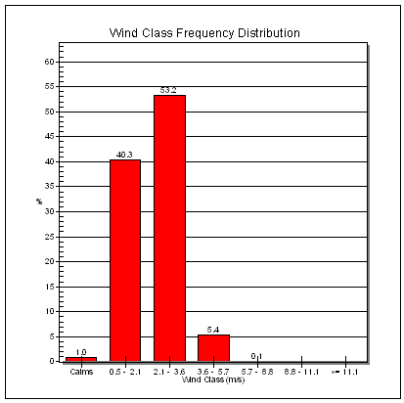
Summer (December – February)





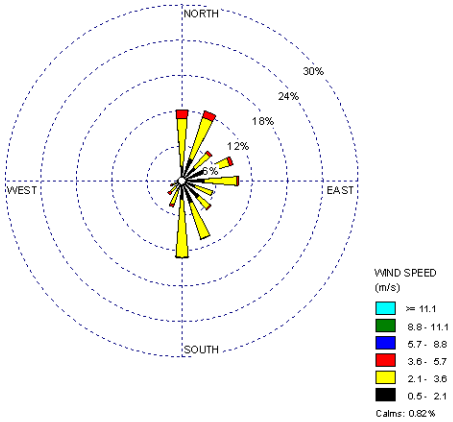
Autumn (March – May)

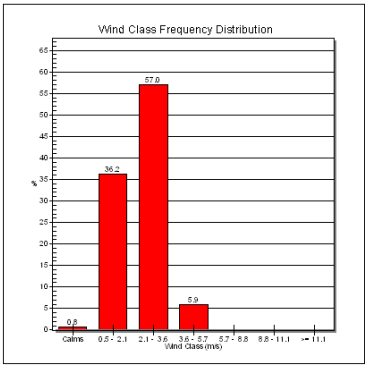




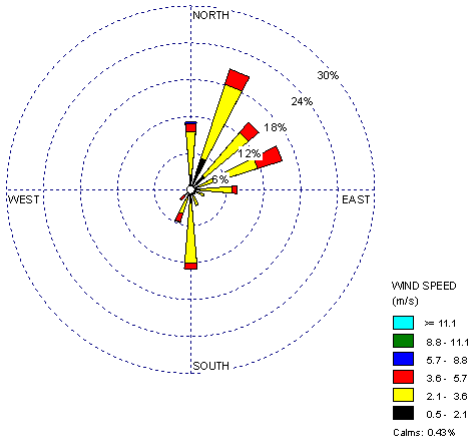
Appendix B

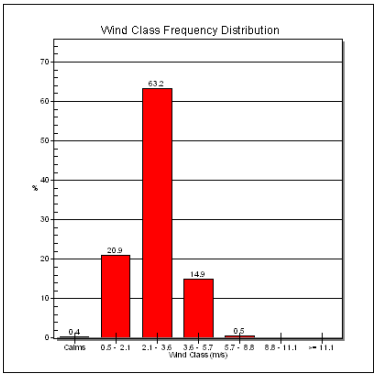
Winter (June – August)



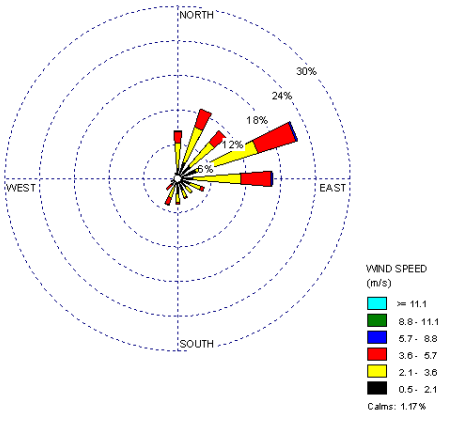


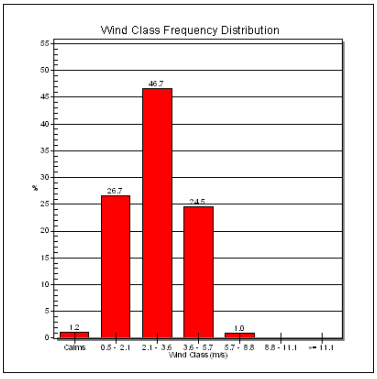
Spring (September – November)



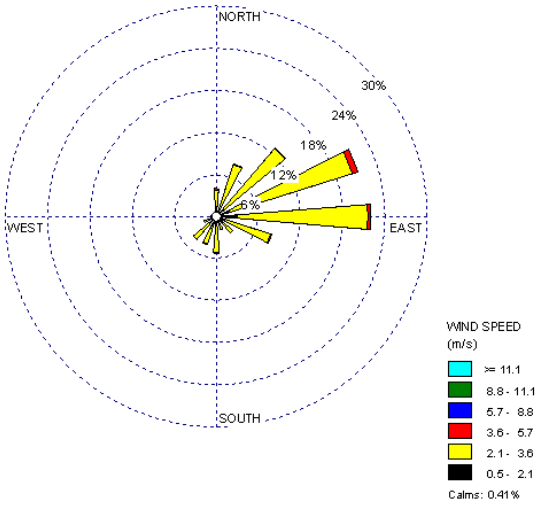


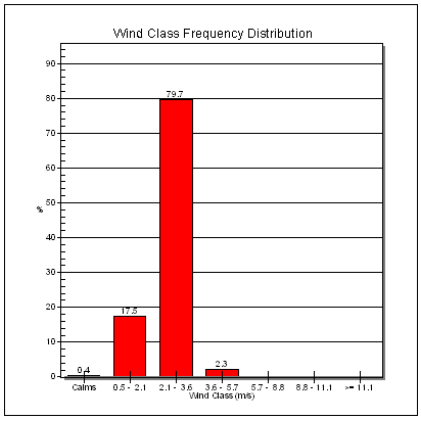
Daytime (0700 – 1800)



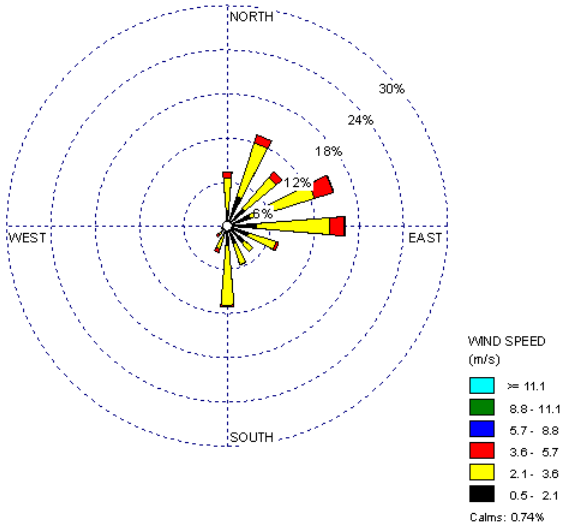


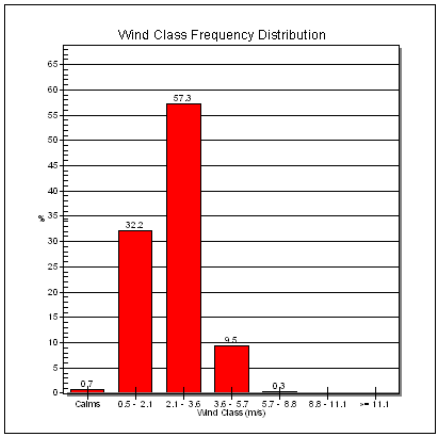
Evening (1800 – 2200)





Night-time (2200 – 0700)





C

Appendix C Detailed Schedules of Equipment

Table C-2 Detailed List of Equipment and Schedule: Operations

Detailed List of Equipment and Schedule: Operations

Mine Equipment Installed				Quantities per year							
Type of Equipment		Scenario :		1	2	3	4	5	6	7	8
		Height (m)	Operating hrs/day	2013	2014	2015	2016	2018	2023	2033	2042
Major Equipment	Marion 8750 Dragline	10	20	0	0	0	1	1	3	8	8
	PH4100 XPB Shovel (56 m^3)	6	18	2	4	6	8	9	9	9	9
	Liebherr R9800 Excavator (800t)	8	17	3	6	6	6	5	3	2	8
	Liebherr R9350BH Excavator (20 m^3)	8	17	1	2	3	4	6	6	6	6
	Cat 994D High Lift Front End Loader	3	14	1	2	2	3	3	3	2	2
	Cat 797 RDT Haul Truck	3	15	18	36	48	61	65	74	75	106
	Cat 793D RDT Haul Truck	3	11	1	2	2	3	4	5	7	8
	Cat 789C Water Truck	3	13	2	3	4	6	6	7	7	9
	Cat 785C RDT Haul Truck	3	14	1	4	5	7	10	6	4	2
	Kress 200-II Coal Haulers	3	14	3	10	16	22	30	34	41	44
	Cat D11T Dozer	2	14	4	10	13	16	17	14	14	18
	Cat D11T Dozer for Dragline assist	2	12	0	0	0	1	1	4	8	9
	Cat D11T Dozer for CHPP	2	13	1	1	1	2	2	2	2	2
	Cat D10T Dozer	2	14	2	5	7	9	10	9	9	10
	Cat 854K RT Dozer	2	14	3	6	8	10	12	11	11	13
	Cat 24M Grader	1	14	2	4	6	7	9	9	9	10
	Drill DR460	1	15	2	4	5	7	7	7	9	12
	Drill D45KS Blast Hole	1	15	1	1	1	2	3	2	1	1
Total Units - Major Equipment :				*47*	*100*	*133*	*175*	*200*	*208*	*224*	*277*
Minor Equipment	Pit Pump	1	12	6	12	12	12	18	18	18	18
	Lighting Plant (Generators)	1	10	12	12	30	30	30	30	30	30
	Low Loader	1	17	2	2	2	2	2	2	2	2
	Cranes	5	8	5	5	5	5	5	5	5	5
Total Units - Minor Equipment :				*25*	*31*	*49*	*49*	*55*	*55*	*55*	*55*

D

Appendix D Noise Modelling Results

D.1 Predicted Operation Noise Levels

Table D-3 Operational Noise - Scenario 1 - 2011 to 2013

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	12	15	28	Nil
B: Eulimbie Homestead	<10	<10	28	Nil
C: Surbiton South Homestead	17	21	28	Nil
D: Burtle Station	16	20	28	Nil
E: Tresillian Homestead	10	13	28	Nil
F: Mentmore Homestead	<10	<10	28	Nil
G: Monklands Homestead	13	17	28	Nil
H: Kia Ora Homestead	14	18	28	Nil
I: Hobartville Homestead	35	39	28	Up to 11 dB(A)
J: Wendouree Station	58	59	29	Up to 30 dB(A)
K: Site Accommodation Village	23	27	28	Nil

Table D-4 Operational Noise - Scenario 2 - October 2013 to September 2014

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	14	18	28	Nil
B: Eulimbie Homestead	<10	10	28	Nil
C: Surbiton South Homestead	19	23	28	Nil
D: Burtle Station	18	21	28	Nil
E: Tresillian Homestead	13	16	28	Nil
F: Mentmore Homestead	<10	10	28	Nil
G: Monklands Homestead	17	21	28	Nil
H: Kia Ora Homestead	16	20	28	Nil
I: Hobartville Homestead	38	43	28	15
J: Wendouree Station	57	60	29	31
K: Site Accommodation Village	26	31	28	3

Appendix D

Table D-5 Operational Noise - Scenario 3 – October 2014 to July 2015

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	16	19	28	Nil
B: Eulimbie Homestead	<10	<10	28	Nil
C: Surbiton South Homestead	20	24	28	Nil
D: Burtle Station	19	22	28	Nil
E: Tresillian Homestead	14	17	28	Nil
F: Mentmore Homestead	<10	12	28	Nil
G: Monklands Homestead	18	22	28	Nil
H: Kia Ora Homestead	17	21	28	Nil
I: Hobartville Homestead	39	44	28	16
J: Wendouree Station	61	63	29	34
K: Site Accommodation Village	28	32	28	4

Table D-6 Operational Noise - Scenario 4 – August 2015 to October 2016

Receptor	Noise Levels – L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	17	20	28	Nil
B: Eulimbie Homestead	<10	12	28	Nil
C: Surbiton South Homestead	22	25	28	Nil
D: Burtle Station	20	24	28	Nil
E: Tresillian Homestead	15	18	28	Nil
F: Mentmore Homestead	10	13	28	Nil
G: Monklands Homestead	20	24	28	Nil
H: Kia Ora Homestead	19	23	28	Nil
I: Hobartville Homestead	42	47	28	19
J: Wendouree Station	62	64	29	35
K: Site Accommodation Village	29	34	28	6

Table D-7 Operational Noise - Scenario 5 – 2017 to 2018

Receptor	Noise Levels – L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	17	21	28	Nil
B: Eulimbie Homestead	<10	12	28	Nil
C: Surbiton South Homestead	22	26	28	Nil
D: Burtle Station	21	24	28	Nil
E: Tresillian Homestead	15	19	28	Nil
F: Mentmore Homestead	10	13	28	Nil
G: Monklands Homestead	20	24	28	Nil
H: Kia Ora Homestead	20	23	28	Nil
I: Hobartville Homestead	42	47	28	19
J: Wendouree Station	62	64	29	35
K: Site Accommodation Village	29	34	28	6

Table D-8 Operational Noise - Scenario 6 – 2018 to 2023

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	17	21	28	Nil
B: Eulimbie Homestead	<10	12	28	Nil
C: Surbiton South Homestead	22	26	28	Nil
D: Burtle Station	21	24	28	Nil
E: Tresillian Homestead	15	19	28	Nil
F: Mentmore Homestead	10	14	28	Nil
G: Monklands Homestead	21	24	28	Nil
H: Kia Ora Homestead	20	24	28	Nil
I: Hobartville Homestead	42	47	28	19
J: Wendouree Station	62	64	29	35
K: Site Accommodation Village	30	34	28	6

Appendix D

Table D-9 Operational Noise - Scenario 7 – 2023 to 2033

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	17	21	28	Nil
B: Eulimbie Homestead	<10	12	28	Nil
C: Surbiton South Homestead	22	26	28	Nil
D: Burtle Station	21	24	28	Nil
E: Tresillian Homestead	15	19	28	Nil
F: Mentmore Homestead	10	14	28	Nil
G: Monklands Homestead	21	24	28	Nil
H: Kia Ora Homestead	21	25	28	Nil
I: Hobartville Homestead	42	47	28	19
J: Wendouree Station	62	64	29	35
K: Site Accommodation Village	30	34	28	6

Table D-10 Operational Noise - Scenario 8 – 2033 to 2043

Receptor	Noise Levels – L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	18	22	28	Nil
B: Eulimbie Homestead	<10	12	28	Nil
C: Surbiton South Homestead	23	26	28	Nil
D: Burtle Station	21	25	28	Nil
E: Tresillian Homestead	16	19	28	Nil
F: Mentmore Homestead	10	14	28	Nil
G: Monklands Homestead	22	25	28	Nil
H: Kia Ora Homestead	23	26	28	Nil
I: Hobartville Homestead	42	47	28	19
J: Wendouree Station	62	64	29	35
K: Site Accommodation Village	30	34	28	6

D.2 Predicted Construction Noise Levels

Table D-11 Construction Noise - Scenario 1

Receptor	Noise Levels – L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	<10	<10	40	Nil
B: Eulimbie Homestead	<10	<10	40	Nil
C: Surbiton South Homestead	<10	11	40	Nil
D: Burtle Station	<10	11	40	Nil
E: Tresillian Homestead	<10	<10	40	Nil
F: Mentmore Homestead	<10	<10	40	Nil
G: Monklands Homestead	<10	<10	40	Nil
H: Kia Ora Homestead	<10	<10	40	Nil
I: Hobartville Homestead	17	22	40	Nil
J: Wendouree Station	38	40	40	Nil
K: Site Accommodation Village	10	14	40	Nil

Table D-12 Construction Noise – Scenario 2

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	<10	<10	40	Nil
B: Eulimbie Homestead	<10	<10	40	Nil
C: Surbiton South Homestead	<10	11	40	Nil
D: Burtle Station	<10	11	40	Nil
E: Tresillian Homestead	<10	<10	40	Nil
F: Mentmore Homestead	<10	<10	40	Nil
G: Monklands Homestead	<10	<10	40	Nil
H: Kia Ora Homestead	<10	<10	40	Nil
I: Hobartville Homestead	17	22	40	Nil
J: Wendouree Station	30	35	40	Nil
K: Site Accommodation Village	10	14	40	Nil

Appendix D

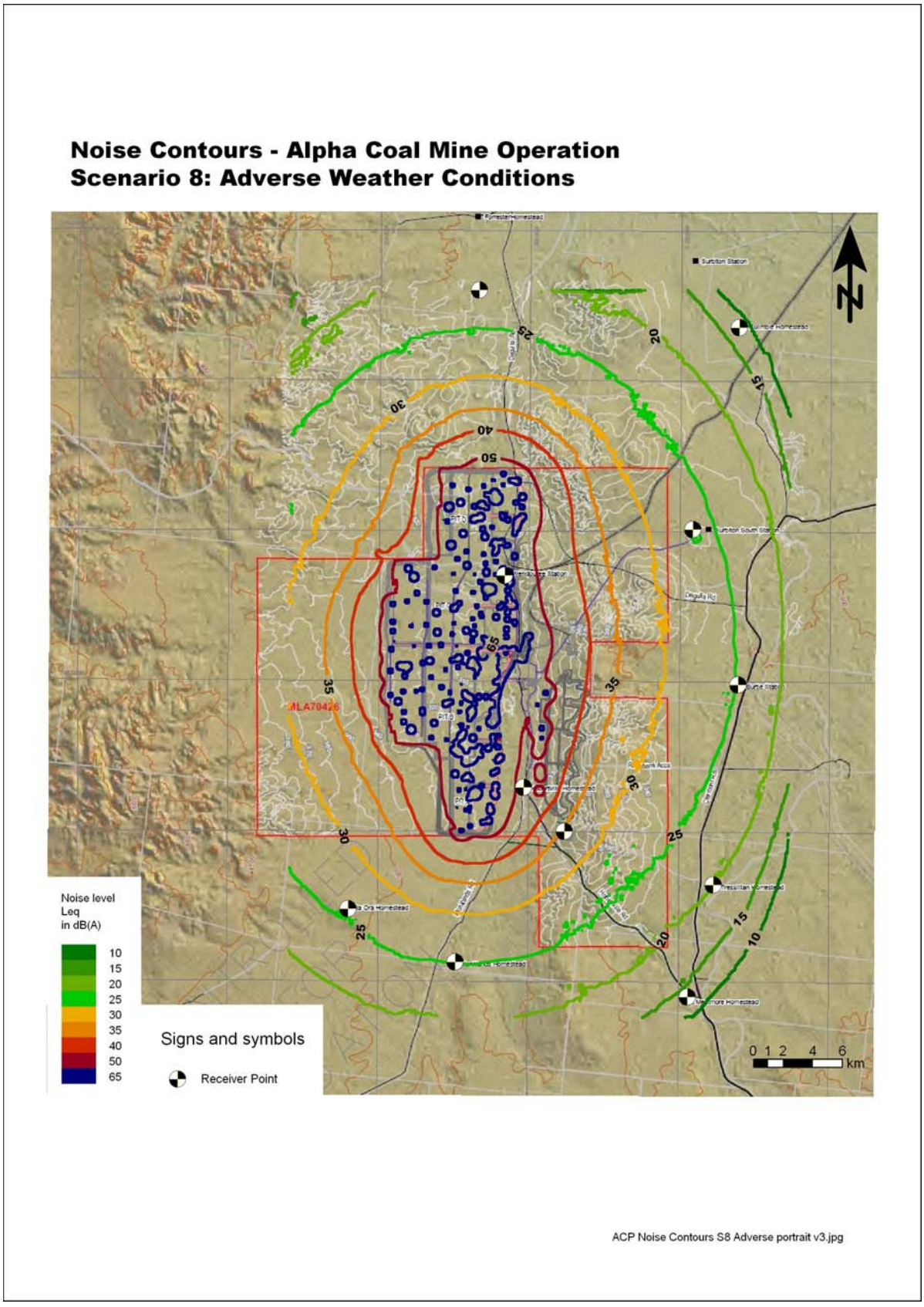
Table D-13 Construction Noise - Scenario 3

Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	<10	<10	40	Nil
B: Eulimbie Homestead	<10	<10	40	Nil
C: Surbiton South Homestead	<10	11	40	Nil
D: Burtle Station	<10	11	40	Nil
E: Tresillian Homestead	<10	<10	40	Nil
F: Mentmore Homestead	<10	<10	40	Nil
G: Monklands Homestead	<10	<10	40	Nil
H: Kia Ora Homestead	<10	<10	40	Nil
I: Hobartville Homestead	18	23	40	Nil
J: Wendouree Station	41	45	40	Up to 5 dB(A)
K: Site Accommodation Village	10	14	40	Nil

Table D-14 Construction Noise - Scenario 4

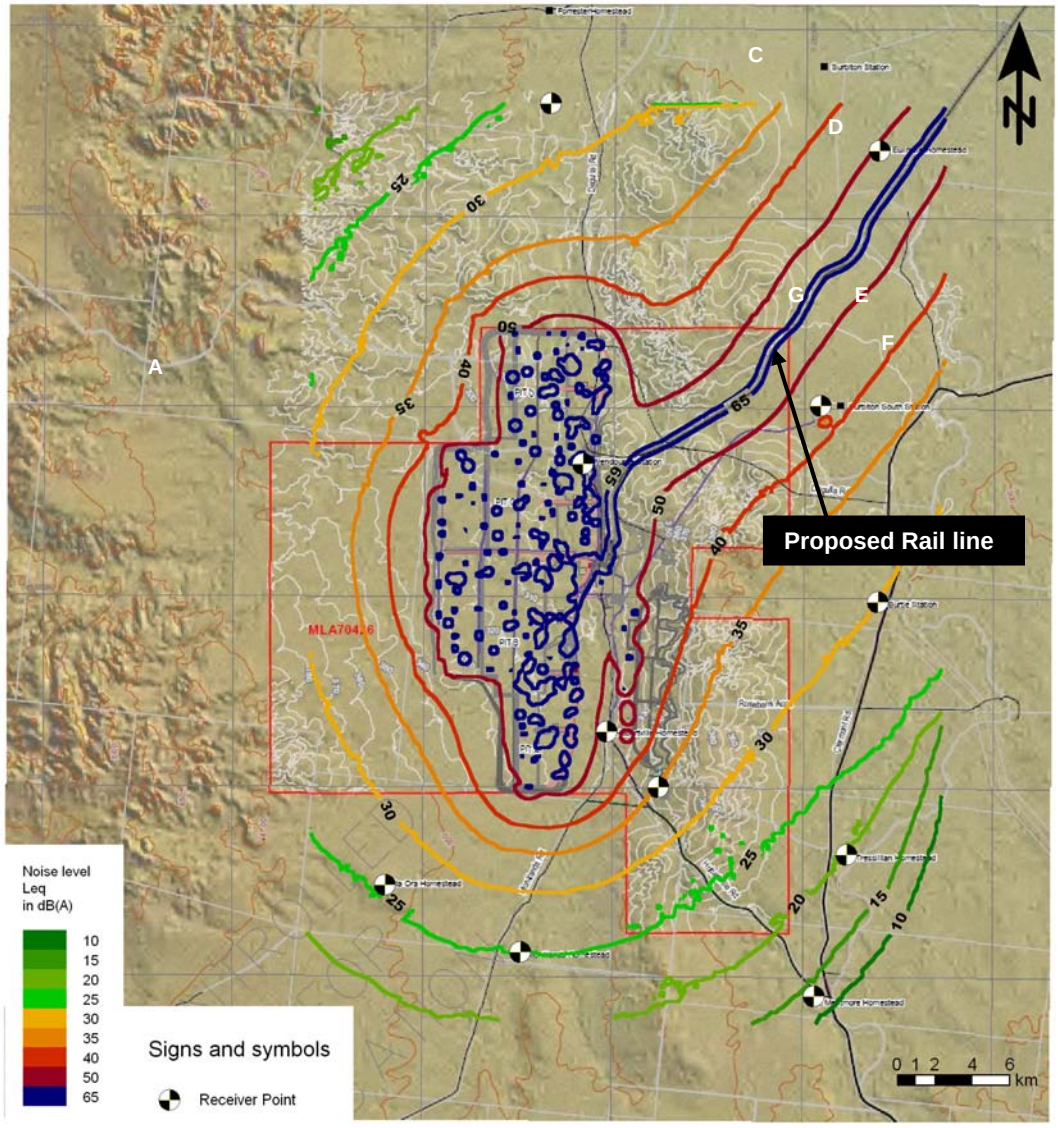
Receptor	Noise Levels - L_{Aeq} dB(A)		Night-Time $L_{Aeq,1hour}$ dB(A) Criterion	Exceedance
	Neutral Weather	Adverse Weather		
A: Forrester Homestead	<10	<10	40	Nil
B: Eulimbie Homestead	<10	<10	40	Nil
C: Surbiton South Homestead	<10	11	40	Nil
D: Burtle Station	<10	11	40	Nil
E: Tresillian Homestead	<10	<10	40	Nil
F: Mentmore Homestead	<10	<10	40	Nil
G: Monklands Homestead	<10	<10	40	Nil
H: Kia Ora Homestead	<10	<10	40	Nil
I: Hobartville Homestead	18	23	40	Nil
J: Wendouree Station	33	38	40	Nil
K: Site Accommodation Village	11	15	40	Nil

Appendix E Noise Contours



Appendix E

Noise Contours - Alpha Coal Mine Cumulative Noise Scenario 8: Adverse Weather Conditions



ACP Noise Contours S8 CUMULATIVE Adverse portrait v2.jpg

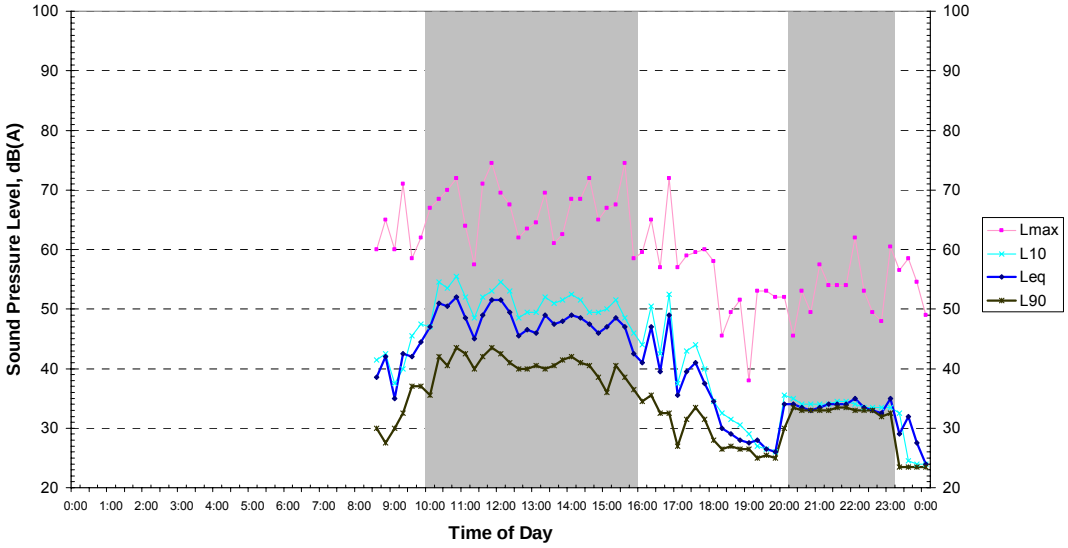
F

Appendix F Daily Noise Monitoring Plots

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Saturday 26 June 2010



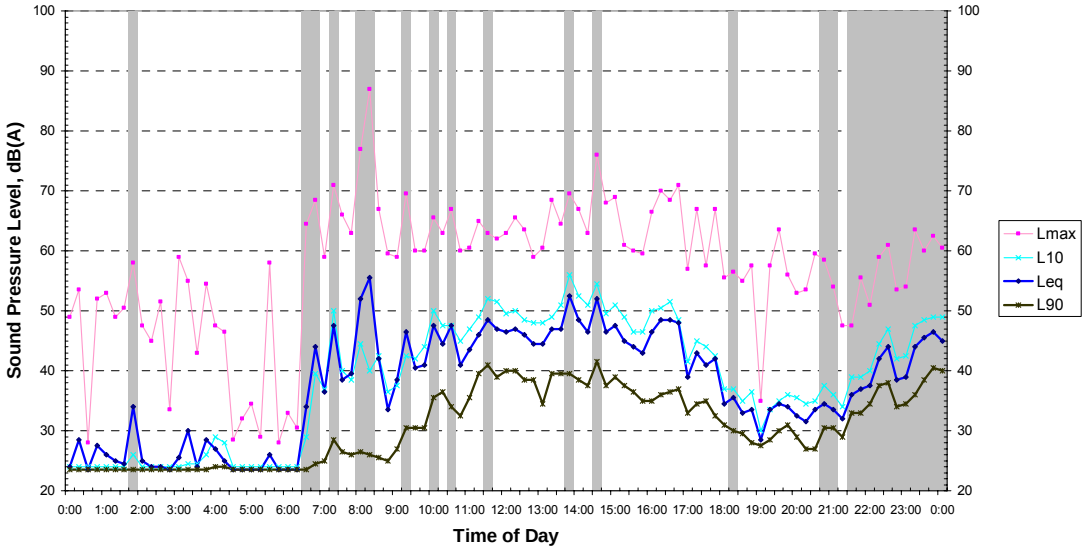
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Sunday 27 June 2010



Note:

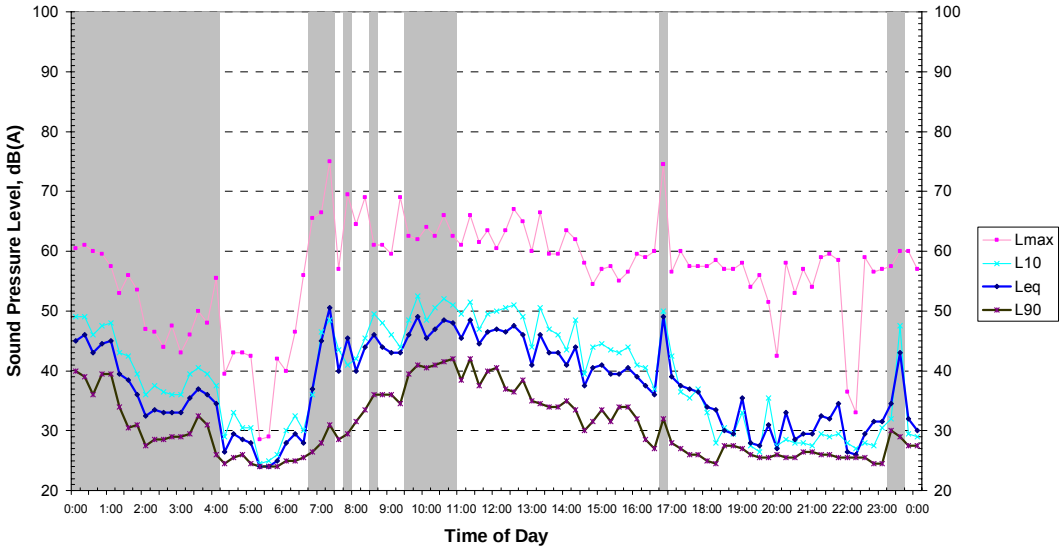
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix F

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Monday 28 June 2010



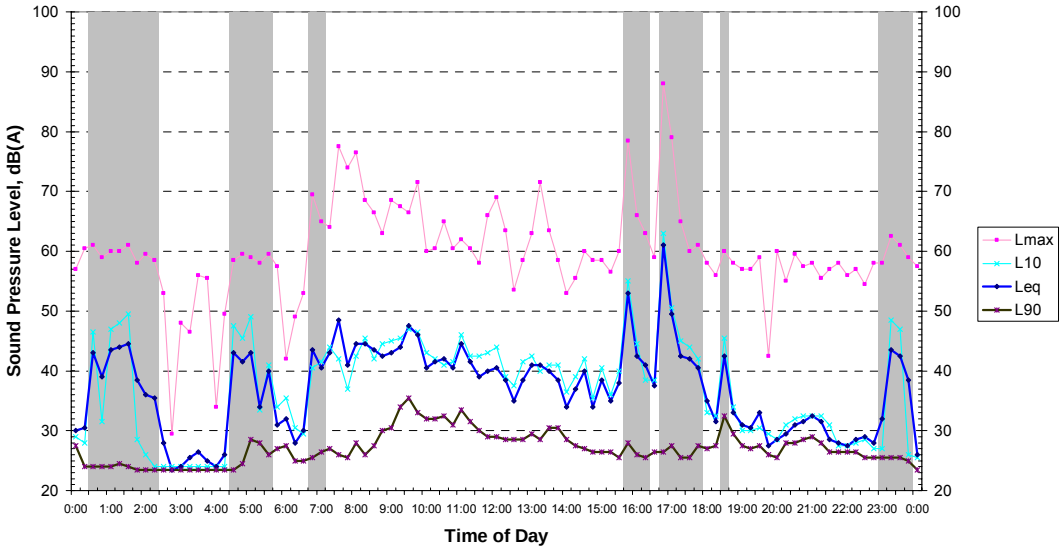
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Tuesday 29 June 2010



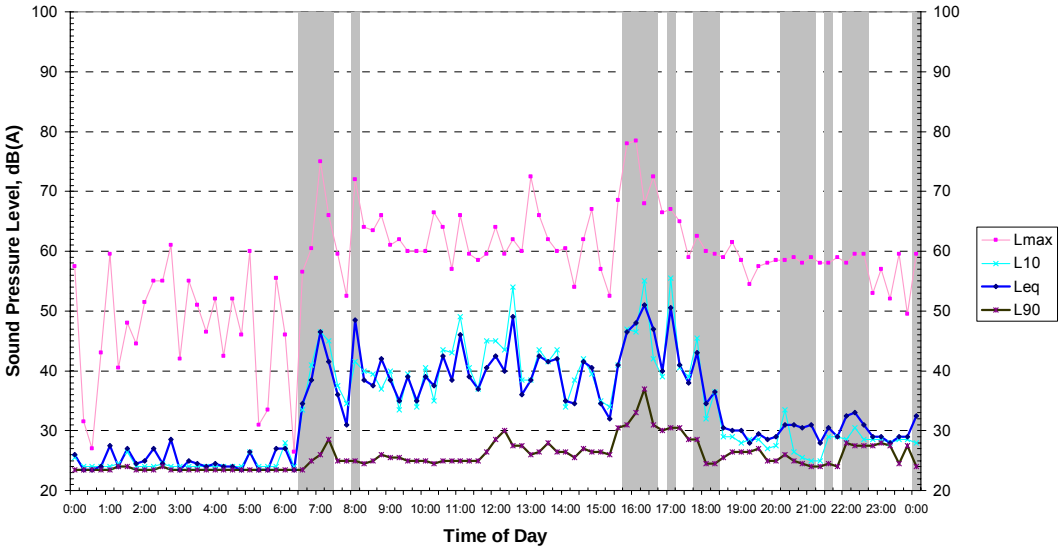
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Wednesday 30 June 2010



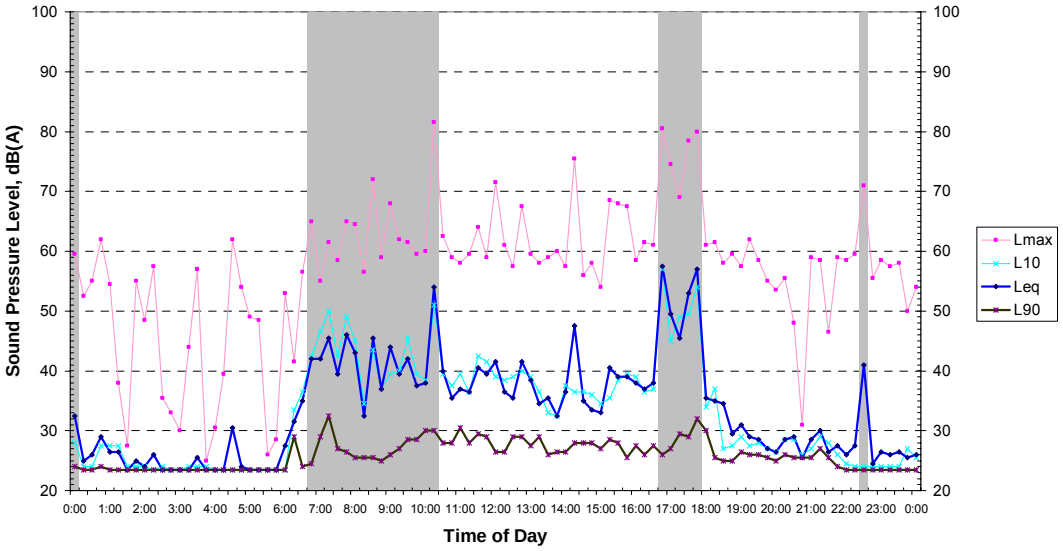
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Thursday 1 July 2010



Note:

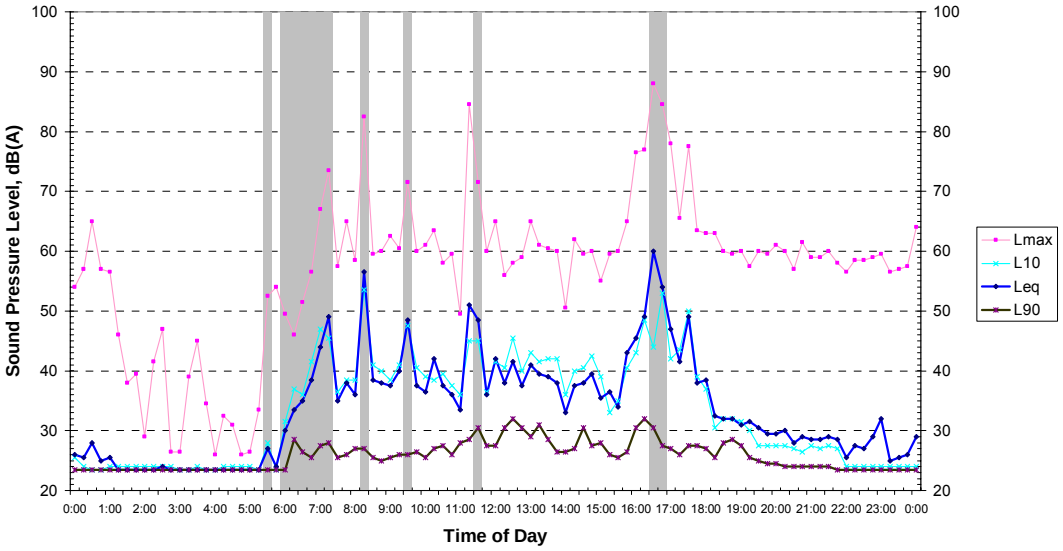
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix F

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Friday 2 July 2010



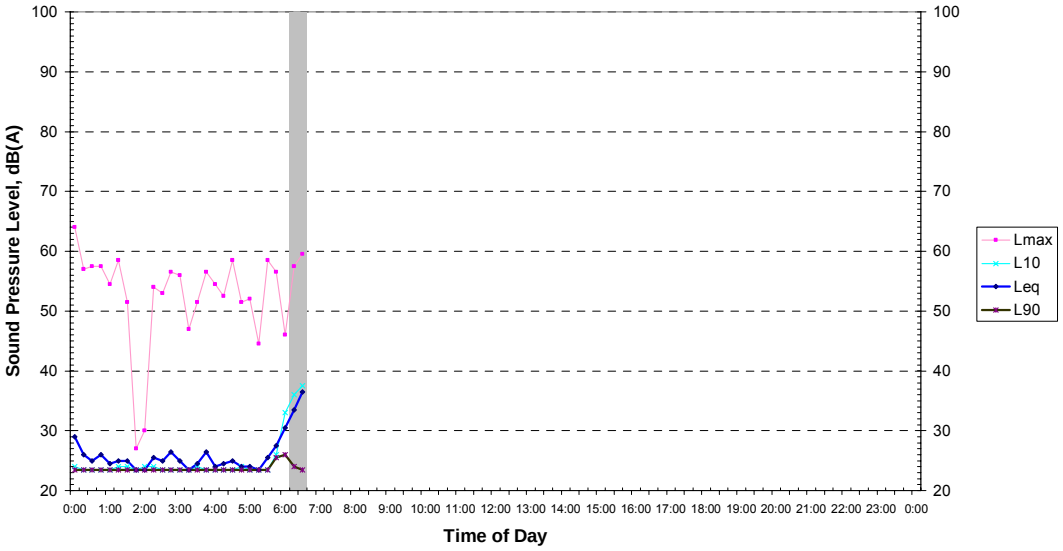
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Monklands Rd, Hobartville, QLD

Saturday 3 July 2010



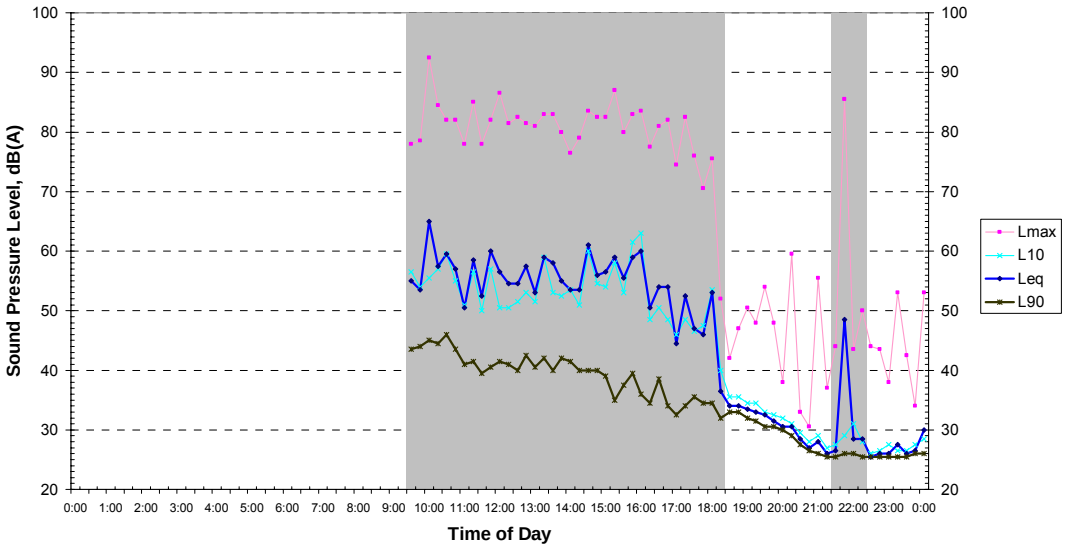
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Wednesday 23 June 2010



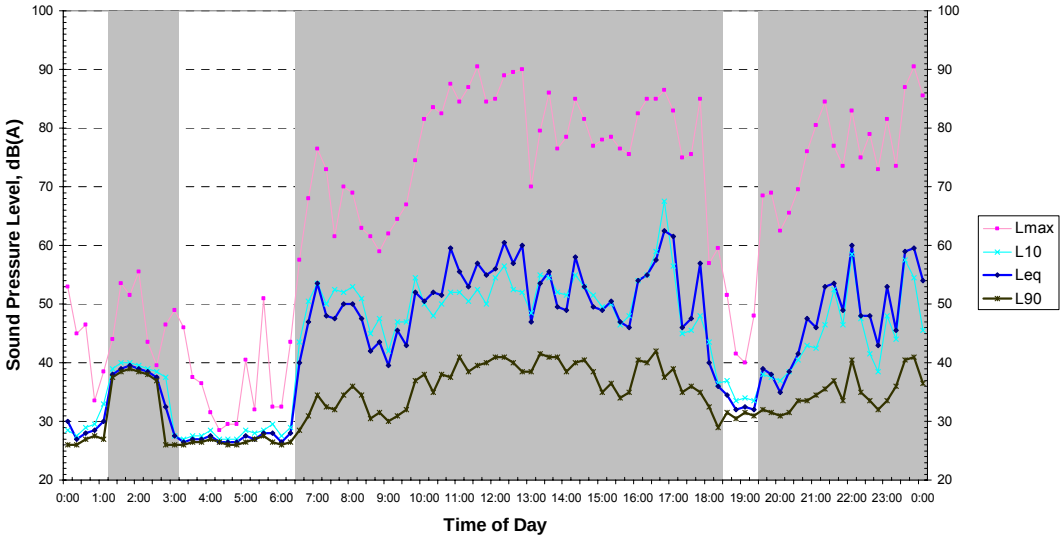
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Thursday 24 June 2010



Note:

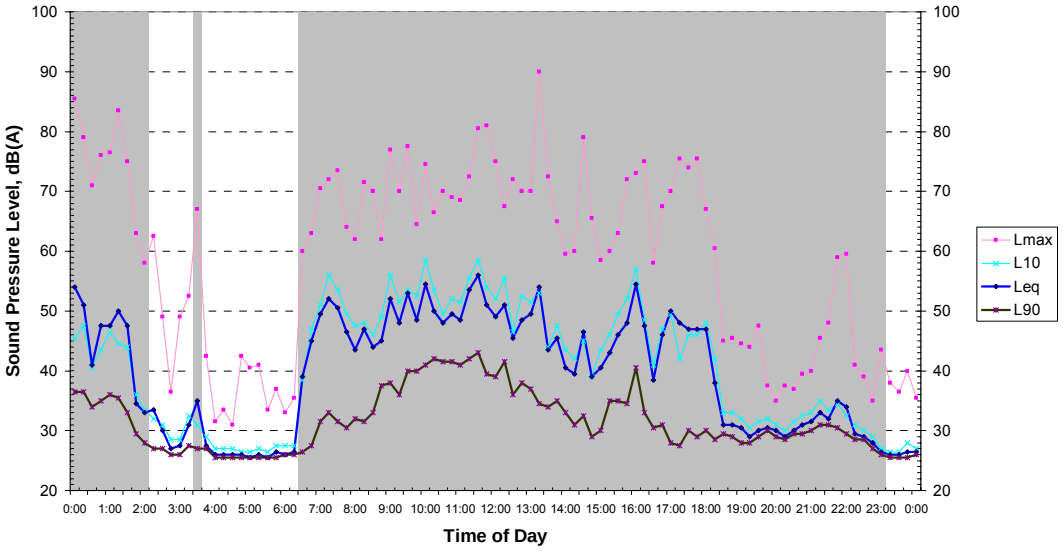
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix F

Daily Noise Monitoring Results

Location : Wendouree, QLD

Friday 25 June 2010



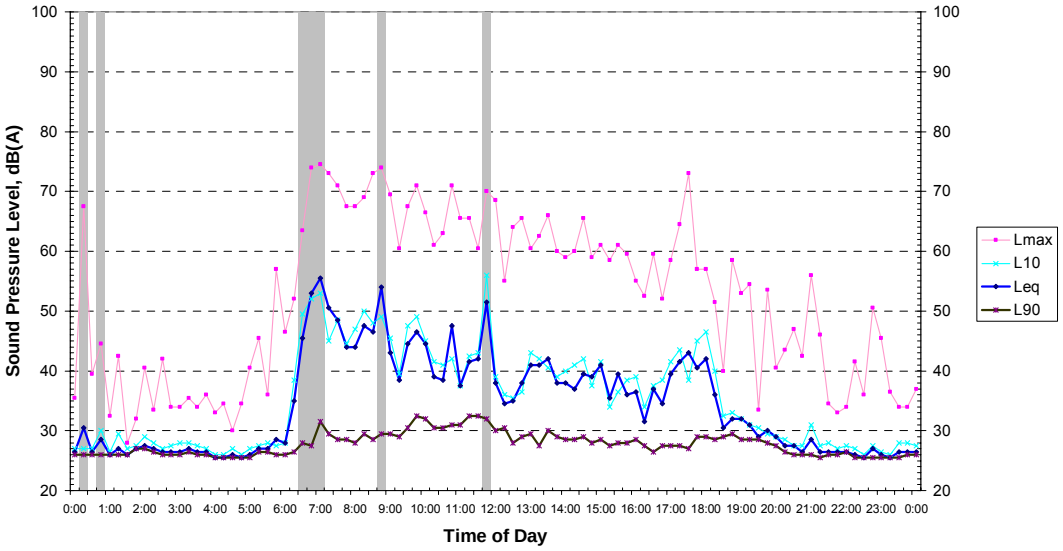
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Saturday 26 June 2010



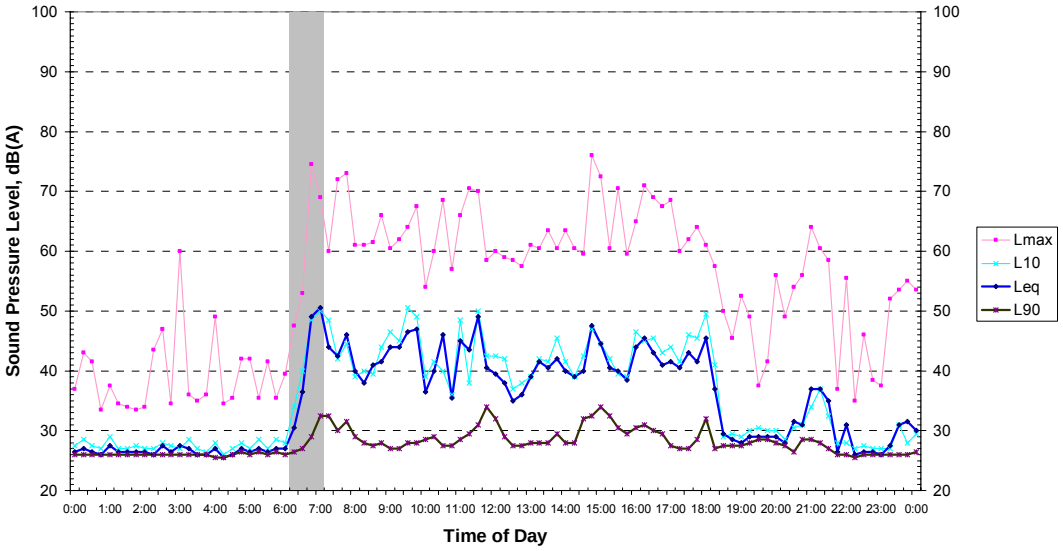
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Sunday 27 June 2010



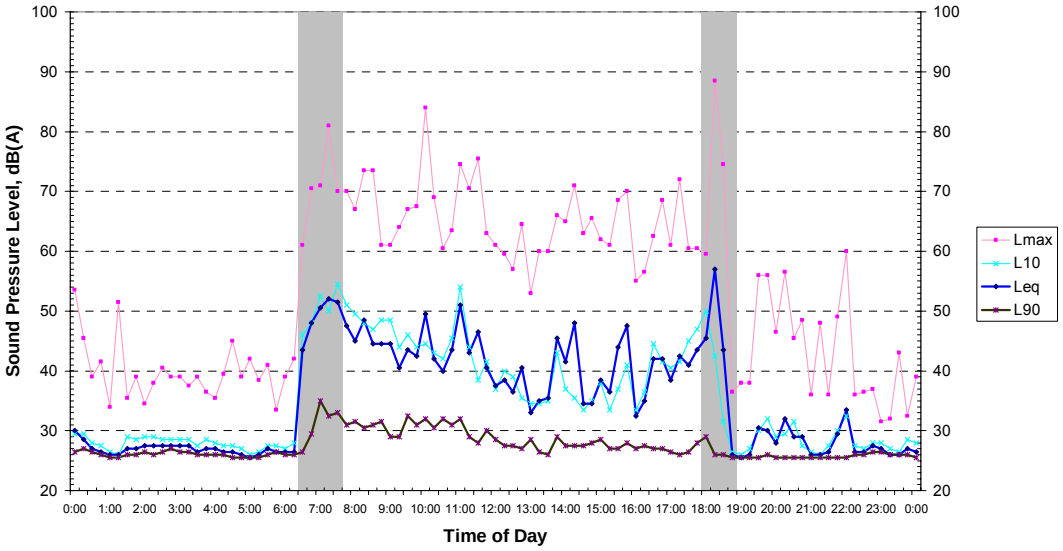
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Monday 28 June 2010



Note:

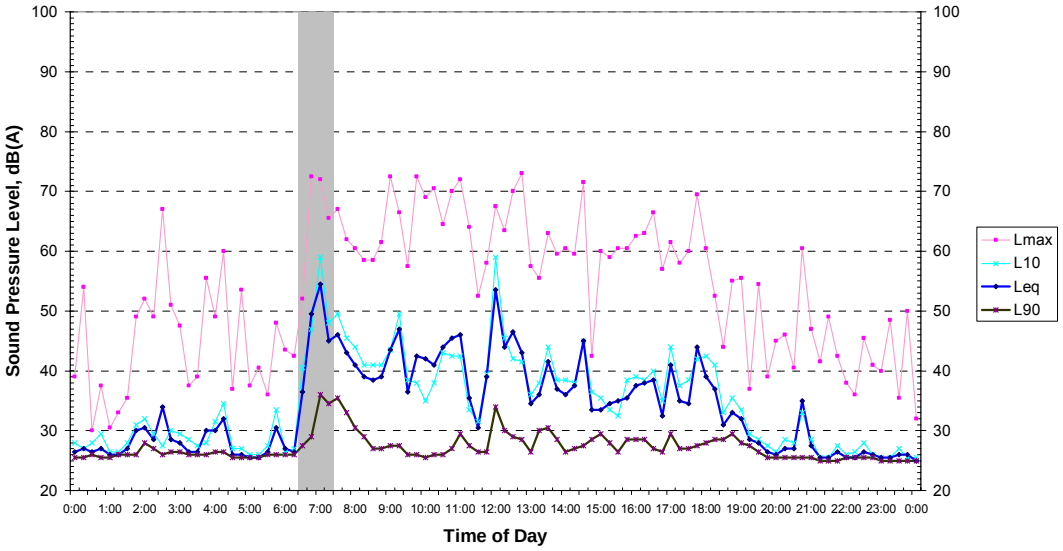
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix F

Daily Noise Monitoring Results

Location : Wendouree, QLD

Tuesday 29 June 2010



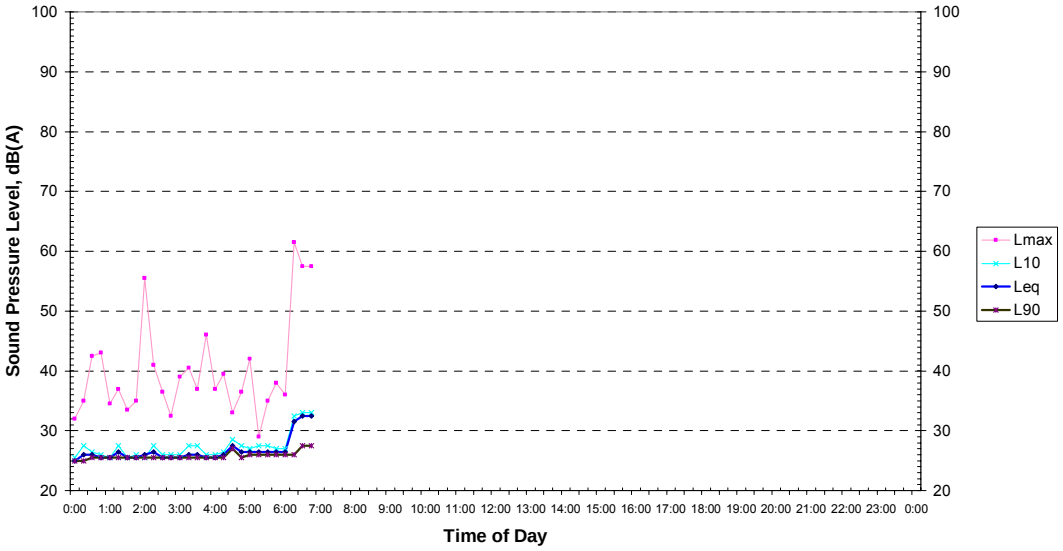
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Location : Wendouree, QLD

Wednesday 30 June 2010



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

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