Werris Creek Coal Pty Limited
ABN:69 107 169 103

Proposed Modification to the Werris Creek Coal Mine

Noise Assessment

Prepared by

Spectrum Acoustics Pty Limited

March, 2009

Specialist Consultant Studies Compendium: Part 2

Noise Assessment

of the proposed

Werris Creek Coal Mine Modification

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1.0 INTRODUCTION

1.1 SCOPE

The Werris Creek Coal Mine commenced operations in March 2005 under Development Consent DA-172-7-2004 issued by the Minister for Planning on 18 February 2005 and is approved to produce up to 2 million tonnes (of coal) per annum (Mtpa). **Figure 1** provides the regional setting of the Werris Creek Coal Mine, in central northern New South Wales, approximately 250km northwest of the Port of Newcastle to which it is connected by rail. **Figure 2** provides the local setting of the mine approximately 4km south of Werris Creek and 11km north-northwest of Quirindi.

This report investigates the acoustic impact of a proposed modification to the mining area which incorporates changes to the open cut and overburden emplacement designs and development ("the modification"). The modification has been proposed to improve the efficiency of coal recovery for the remaining life of the mine (a period of 3 years).

As the Werris Creek Coal Mine would remain substantially the same development as that approved in 2004, the proposed modification is being assessed under Section 96(2) of the EP&A Act. Under Section 96(2), the assessment of a proposed modification that does not substantially alter the development requires the preparation of a Statement of Environmental Effects. Accordingly, this report has been prepared to accompany the SoEE and does not seek to alter noise criteria as contained in the existing consent (or as established via agreement where applicable).

1.2 DESCRIPTION OF THE PROPOSED MODIFICATION

The proposed modification, if approved, would involve the following activities, the locations of which are shown on **Figure 3**.

- Modification to the open cut area. The northern extent of the open cut area would be widened such that the eastern perimeter corresponds with the eastern extent of the sub-cropping G Seam.
- Dewatering the underground workings of the former Werris Creek Colliery to enable open cut mining through part of these workings.
- Construction of four surface dams within an underground water storage area to store the water pumped from the underground workings.
- Extension of the out-of-pit overburden emplacement to the north along the modified eastern perimeter of the open cut area.
- Modification to the overall shape of the overburden emplacement, with the height increased to approximately 445m AHD to accommodate the increased volume of overburden and revised mine plan associated with the modified open cut design.
- Construction of an additional train loading bin and conveyor at the rail load-out facility to facilitate the separation of product coal for specific markets and therefore increase the efficiency of train loading.

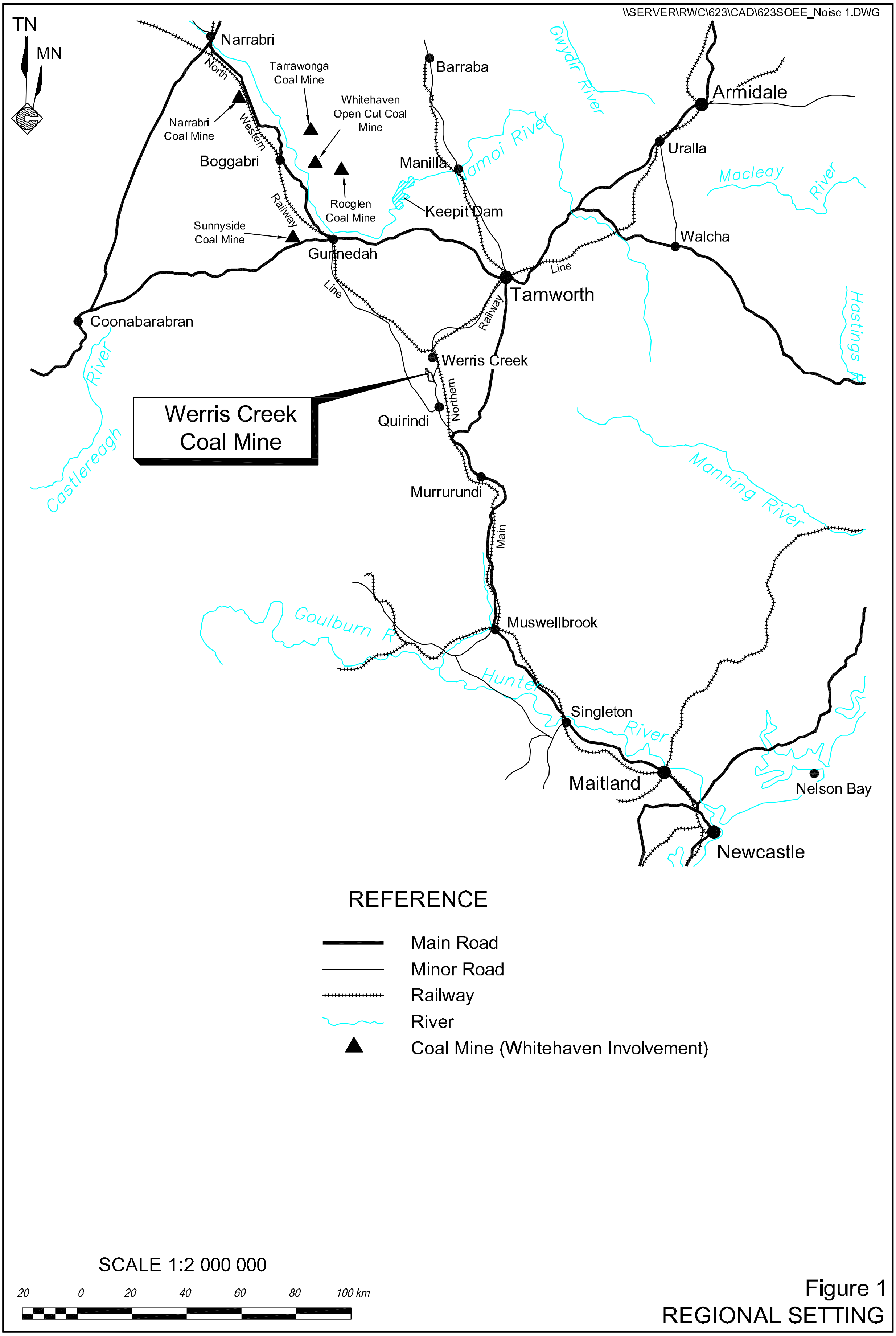

Figure 1
REGIONAL SETTING

Note: A colour version of this figure is available on the Project CD

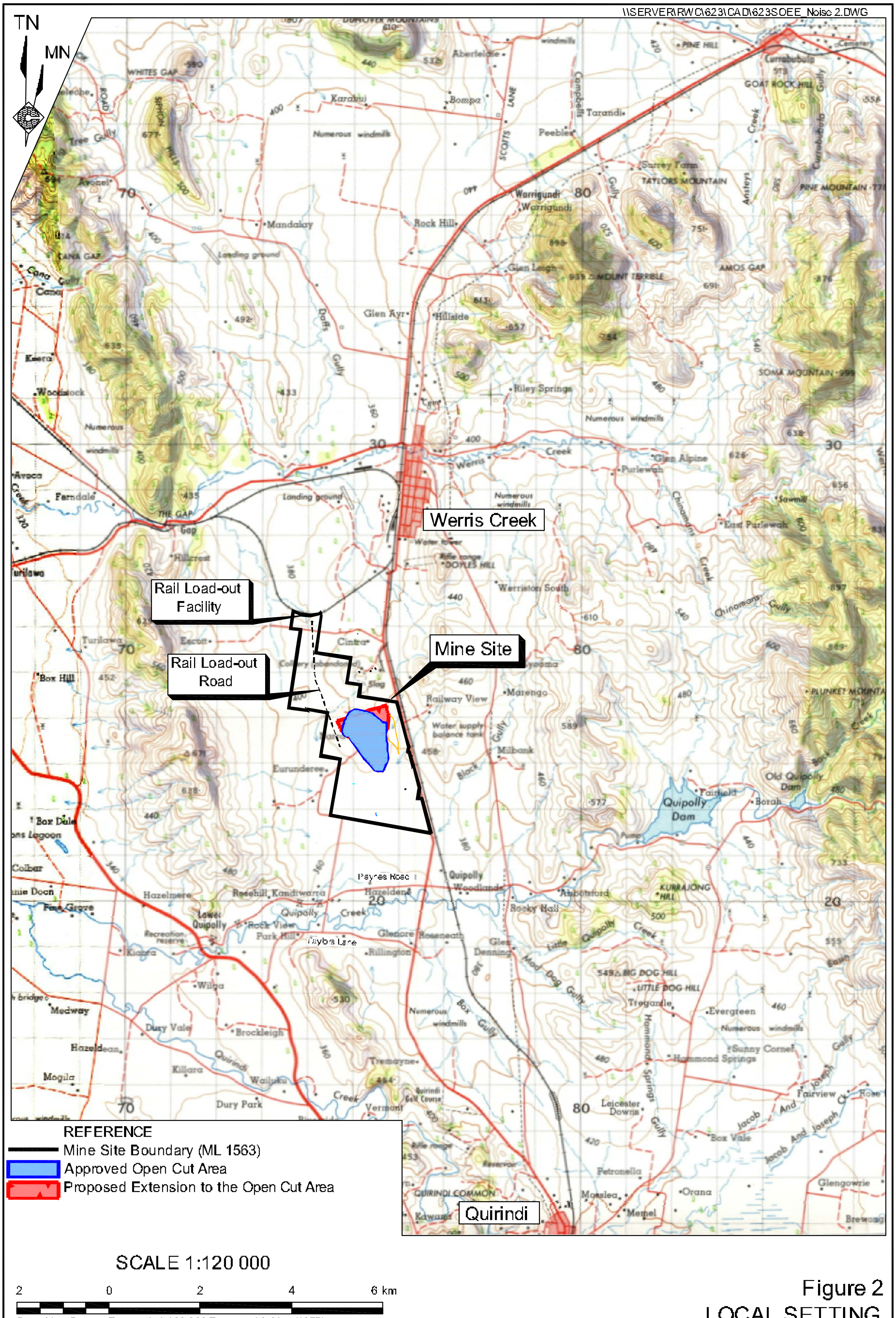

Figure 2
LOCAL SETTING

Base Map Source: Tamworth 1:100 000 Topographic Map (1975)

Note: A colour version of this figure is available on the Project CD

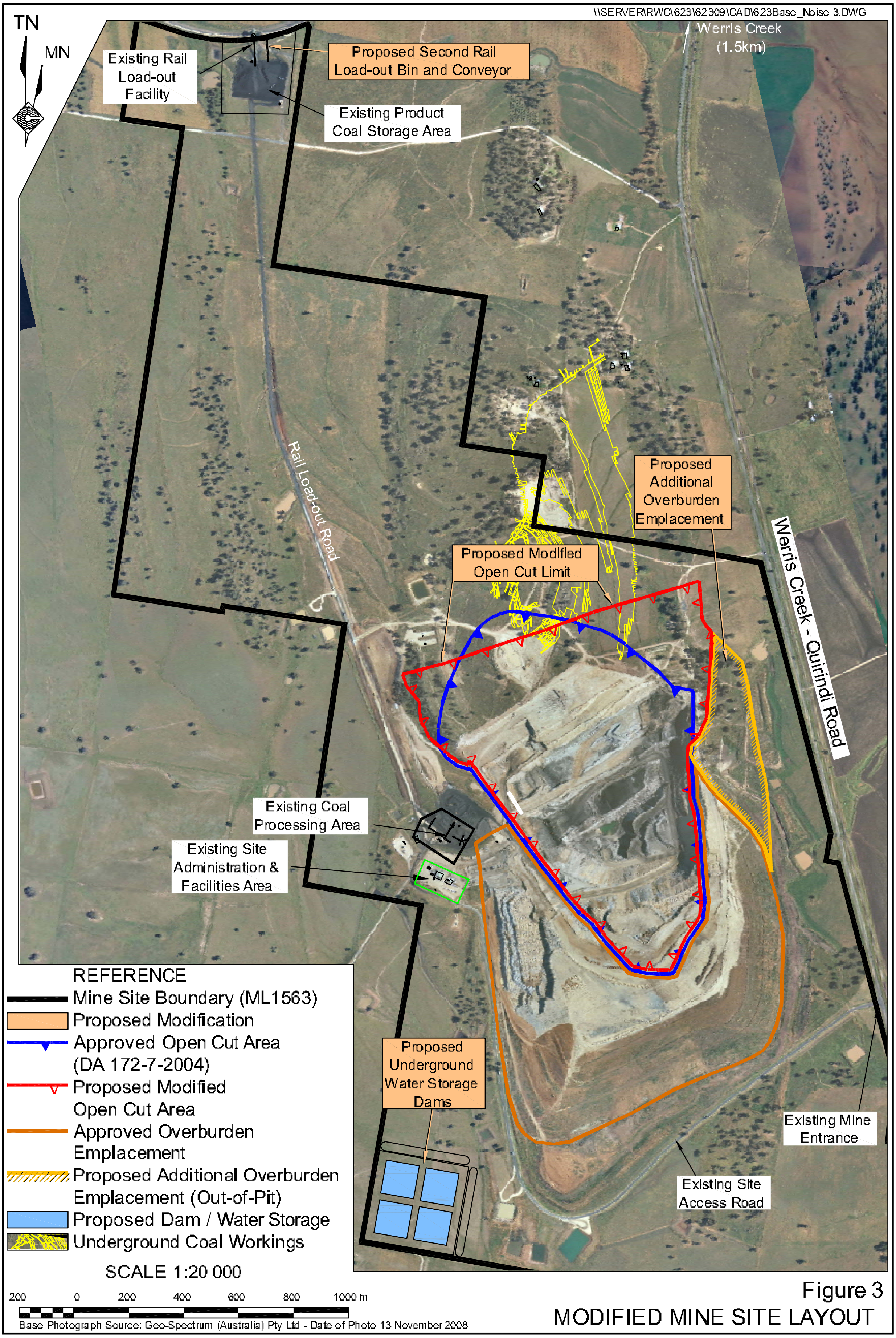

Figure 3
MODIFIED MINE SITE LAYOUT

Note: A colour version of this figure is available on the Project CD

While the rehabilitation objectives and methods would remain consistent within those currently implemented at the Werris Creek Coal Mine, the proposed sequence of rehabilitation, and designated land use on the final landform has been modified slightly from that approved by DA 172-7-2004. In addition, the proposed modification to the open cut area and overburden emplacement would increase the area of an endangered ecological community to be cleared. To offset this clearing a modified biodiversity offset strategy has been proposed.

1.3 RESIDENTIAL RECEIVERS

The locations and descriptions of residential receivers surrounding the mine site are illustrated in **Figure 4**. Several properties have been purchased by the Proponent since approval of the Werris Creek Coal Mine. The residences on these properties are shown in **Figure 2** but have not been included in the noise impact assessment.

2.0 DESCRIPTION OF TERMS

2.1 INTRODUCTION

This section of the report aims to convey an understanding of several commonly used acoustical terms. Various terms are explained in plain language and the effects of certain atmospheric phenomena on noise propagation are discussed. Noise level percentiles are explained with the aid of a diagram of a hypothetical noise signal.

The descriptions in this section are not formal definitions of the terms. Formal definitions may be found in AS1633-1985 "*Acoustics – Glossary of terms and related symbols*".

2.2 GENERAL TERMS

Sound Power Level

The amount of acoustic energy (per second) emitted by a noise source. Usually written as "Lw" or "SWL", the Sound Power Level is expressed in decibels (dB) and cannot be directly measured. Lw is usually calculated from a measured sound pressure level.

Sound pressure Level

The "noise level", in decibels (dB), heard by our ears and/or measured with a sound level meter. Written as "SPL", the sound pressure level generally decreases with increasing distance from a source. Noise levels are often written as dB(A) rather than dB. The "A-weighting" is a correction applied to the measured noise signal to account for the ear's ability to hear sound differently at different frequencies. For example, 40dB at 500Hz (speech frequency) is clearly audible but 40dB at 50Hz (very low bass) would be far less audible. The A-weighted sound pressure level therefore represents the measured (or predicted) noise level as it would be heard by the typical human ear.

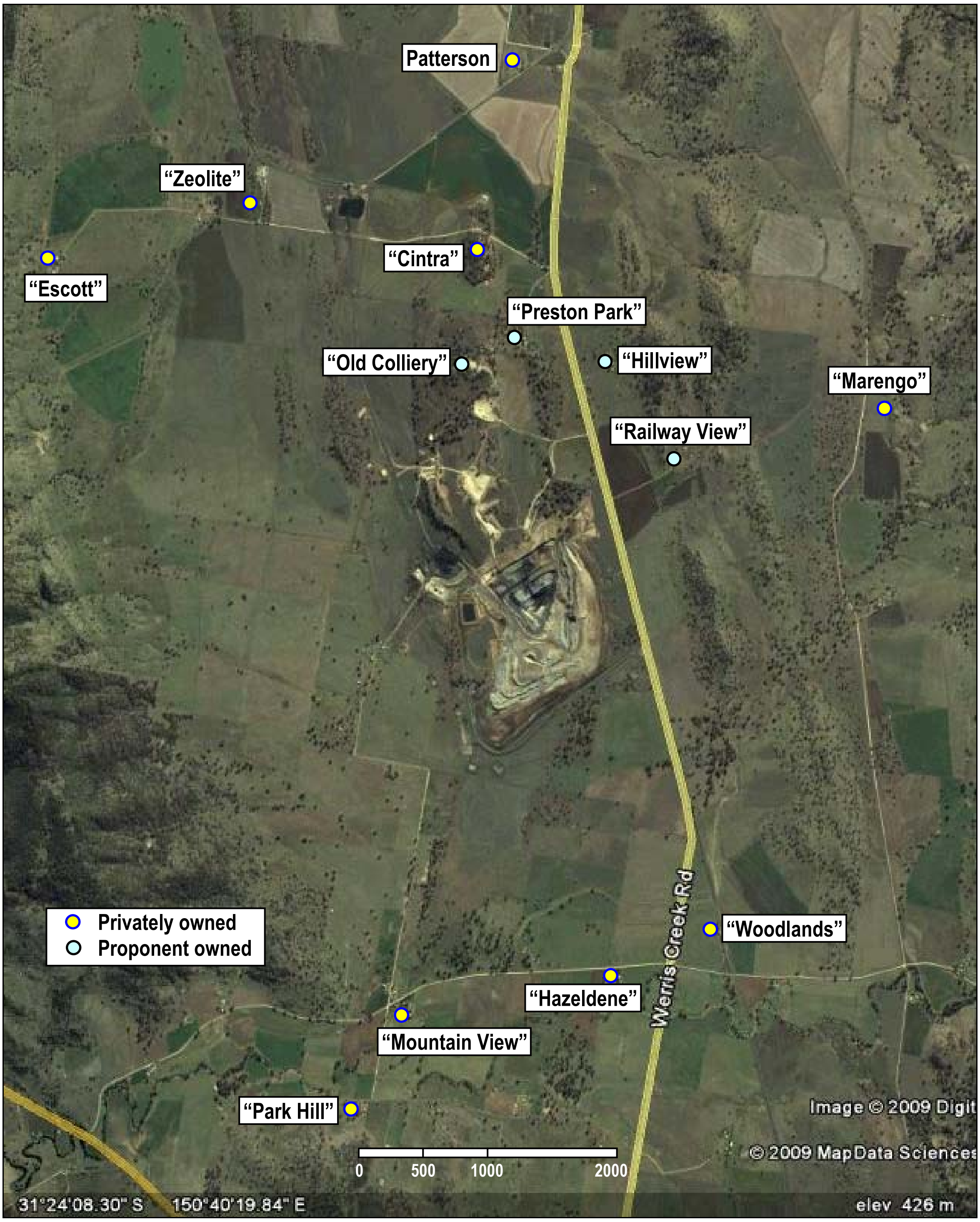

FIGURE 4. Mine site and residential receivers.

Temperature Inversion

An atmospheric state in which the air temperature increases with altitude. Sound travels faster in warmer air than in cold air, so that during an inversion the top of a “sound wave” will move faster than the bottom. This bends (refracts) sound back towards the ground just as light bends upon entering and exiting a glass prism. The result is a “trapping” of sound energy near the ground and an increase in noise levels.

Wind Shear

A moving air mass will experience a “friction drag” at the ground in much the same way as a lava flow will flow quickly on top and “roll over” the lava beneath which must drag along the ground. This increasing wind speed with altitude is called “wind shear”.

For a sound wave travelling down wind, the top of the wave moves faster than the bottom and the wave bends towards the ground. However, for a wave travelling into the wind the top of the wave is slowed down more than the bottom is and the wave bends upwards. **Figure 5** shows several examples of how atmospheric effects can bend sound waves.

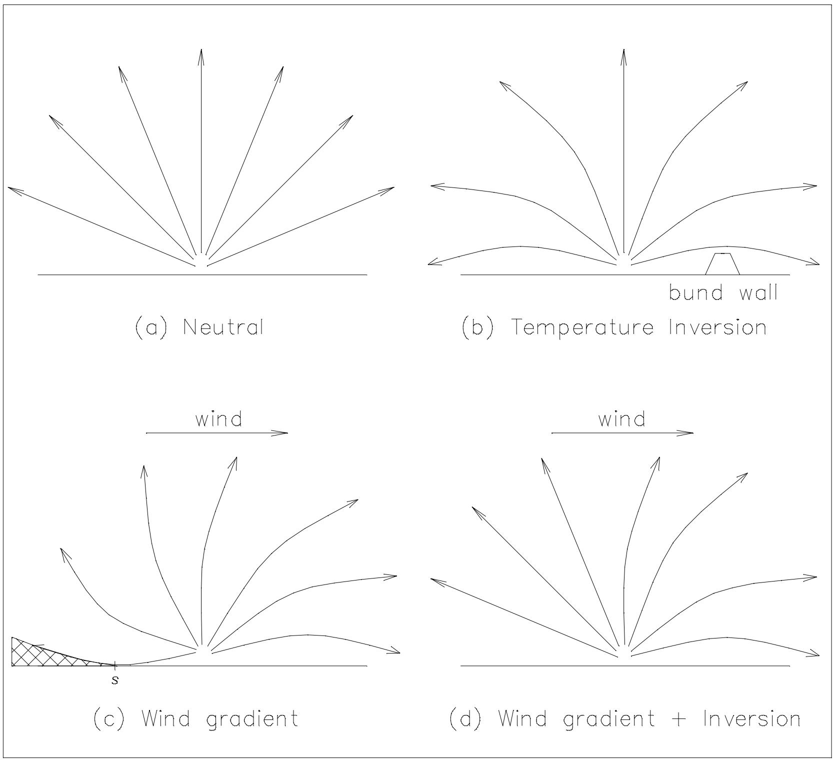

***Figure 5*. Sound refraction under temperature inversions and wind gradients.**

Figure 5 shows that sound rays can be refracted over a barrier (usually a bund wall or small hill) during a temperature inversion, increasing noise levels in the ‘shadow zone’.

Neutral Atmospheric Conditions

An atmosphere that is at a temperature of approximately 23^{0}C from ground level to an altitude of 200m or more. There are no fluctuations in density or humidity and no wind. Such conditions rarely occur, as temperature will usually vary with altitude and there is always movement in various directions in different layers of the atmosphere.

Prevailing Atmospheric Conditions

Atmospheric conditions (with regards to potential effects on noise propagation) which are characteristic of the study area. These will typically include seasonal wind directions and velocities. Temperature inversions will be included as prevailing if they occur, on average, for more than 2 nights per week in winter.

Adverse Atmospheric Conditions

Adverse conditions will include simultaneous winds and temperature inversions, even if the inversions occur for less than 2 nights per week in winter. This represents the worst case scenario for potential noise enhancement due to atmospheric effects.

2.3 NOISE LEVEL PERCENTILES

A noise level percentile (Ln) is the noise level (SPL) in decibels which is exceeded for "n" % of a given monitoring period. Several important Ln percentiles will be explained by considering the hypothetical time signal in **Figure 6**.

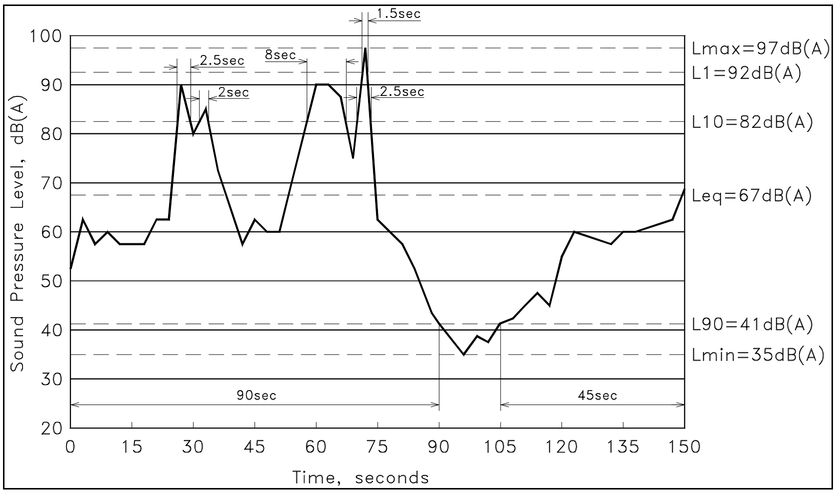

***Figure 6.* Hypothetical time-trace of 150-second sound signal.**

The signal in **Figure 6** has a duration of 2.5 minutes (ie 150 seconds) with noises occurring as follows:

- The instrument is located beside a road and records crickets in nearby grass at a level of around 60 dB (A);
- At about the 30 second mark a motorcycle passes on the road, followed by a car;
- At 60 seconds a truck passes;
- After the truck passes it sounds its air horn at the 73 second mark;
- The crickets are frightened into silence and the truck fades into the distance;
- All is quiet until 105 seconds when the crickets slowly start to make noise, reaching full pitch by 120 seconds;
- The measurement stops at 150 seconds, just when a car is approaching.

L1 Noise Level

Near the top of **Figure 6**, there is a dashed line at 92dB(A). A small spike of 1.5 sec duration extends above this line at around 73 seconds. Since 1.5 sec is 1% of the signal duration (150 seconds), the L1 (or LA_1 to signify A-weighting) noise level of this sample is 92dB(A). The L1 percentile is often called the *average peak noise level* and is used by the NSW Department of Environment and Climate Change[1] (DECC) as a measure of potential disturbance to sleep.

L10 Noise Level

The dashed line at 82 dB(A) is exceeded for four periods of duration 2.5 sec, 2 sec, 8 sec and 2.5 sec, respectively. The total of these is 15 sec, which is 10% of the total sample period. Therefore, the L10 noise level of this sample is 82 dB(A). The L10 percentile is called the *average maximum noise level* and has been widely used as an indicator of annoyance caused by noise.

L90 Noise Level

In similar fashion to L1 and L10, **Figure 6** shows that the noise level of 41 dB(A) is exceeded for 135 seconds (90 + 45 =135). As this is 90% of the total sample period, the L90 noise level of this sample is 41dB(A). The L90 percentile is called the *background noise level*.

Leq Noise Level

Equivalent continuous noise level. As the name suggests, the Leq of a fluctuating signal is the continuous noise level which, if occurring for the duration of the signal, would deliver equivalent acoustic energy to the actual signal. Leq can be thought of as an ‘average’ noise level. Recent research suggests that Leq is the best indicator of annoyance caused by industrial noise and the EPA *NSW Industrial Noise Policy* (INP, 2000) takes this into consideration.

Lmax and Lmin Noise Levels

These are the maximum and minimum SPL values occurring during the sample. Reference to **Figure 6** shows these values to be 97dB(A) and 35dB(A), respectively.

3.0 EXISTING ENVIRONMENT AND CRITERIA

3.1 NOISE CRITERIA

The existing acoustic environment was studied as part of the 2004 EIS and formed the basis for setting noise criteria. A noise criterion of 35dB(A), as per *Condition 4(7)* of Development Consent DA 172-7-2004, has been established for all but the “Zeolite” and “Cintra” residences, for daytime, evening and night time operations. An agreement accepting noise levels up to 5dB(A) above the limit set by *Condition 4(7)* has been negotiated between the Proponent and land owner / residents of the “Zeolite” and “Cintra” residences. Accordingly, these residences area afforded a noise criterion of 40dB(A).

[1] Formerly Environment Protection Authority (EPA).

3.2 RAIL TRAFFIC

The proposed modification provides for the construction and operation of a second rail load-out bin and conveyor to increase the efficiency of loading particular types of coal to rail wagons. Consequently, the trains that would be loaded from this rail load-out bin are not additional to those loaded from the existing rail load-out bin. The operation of the second rail load-out facility would be almost identical to that of the existing bine and would not alter the approved production rate or the number of train movements.

As train noise and vibration levels have previously been assessed as complying with the applicable criteria (as part of the original acoustic assessment for the Werris Creek Coal Mine – Spectrum, 2004), no further assessment of this aspect of the Werris Creek Coal Mine operations has been included.

3.3 BLASTING

Existing blasting criteria are summarised as follows:

- The recommended maximum overpressure level for blasting is 115 dB;
- The level of 115 dB may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 120 dB at any time;
- The recommended maximum vibration velocity for blasting is 5 mm/s Peak Vector Sum (PVS);
- The PVS level of 5 mm/s may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 10 mm/s at any time;
- Blasting should generally only be permitted during the hours of 9 am to 5 pm Monday to Saturday, and should not take place on Sundays and Public Holidays; and
- Blasting should generally take place no more than once per day.

3.4 METEOROLOGY

The atmospheric conditions most relevant to noise assessments are temperature inversions, gentle winds (indicative of possible wind shear) and relative humidity. Monitoring data has been collected at the mine site, with long-term weather monitoring data from Bureau of Meteorology station also considered. The most significant meteorological data with respect to noise propagation is as follows.

- Extremes of relative humidity (RH) are rarely experienced. For modelling purposes, a value of 70% RH was adopted.
- Mild temperature inversions are likely to occur on at least 20-25% of mornings and evenings in winter. The DECC default value of +3^{o}C/100m vertical temperature gradient (INP, Appendix C) was adopted in the noise models.

- Winds experienced at the mine site are predominantly light to moderate (between 1.5 m/s and 8 m/s) from the southeast to south-southeast (approximately 25% combined) and from the west-northwest to north-northwest (approximately 33% combined). Calm wind conditions (wind speed less than 0.5 m/s) were recorded approximately 8.6% of the time throughout the dataset. **Figure 7** presents an annual wind rose generated for the mine site by Heggies (2009), using the Air Pollution Model (TAPM) and based on one year's data collection from the mine site meteorological station (September 2007 to August 2008).

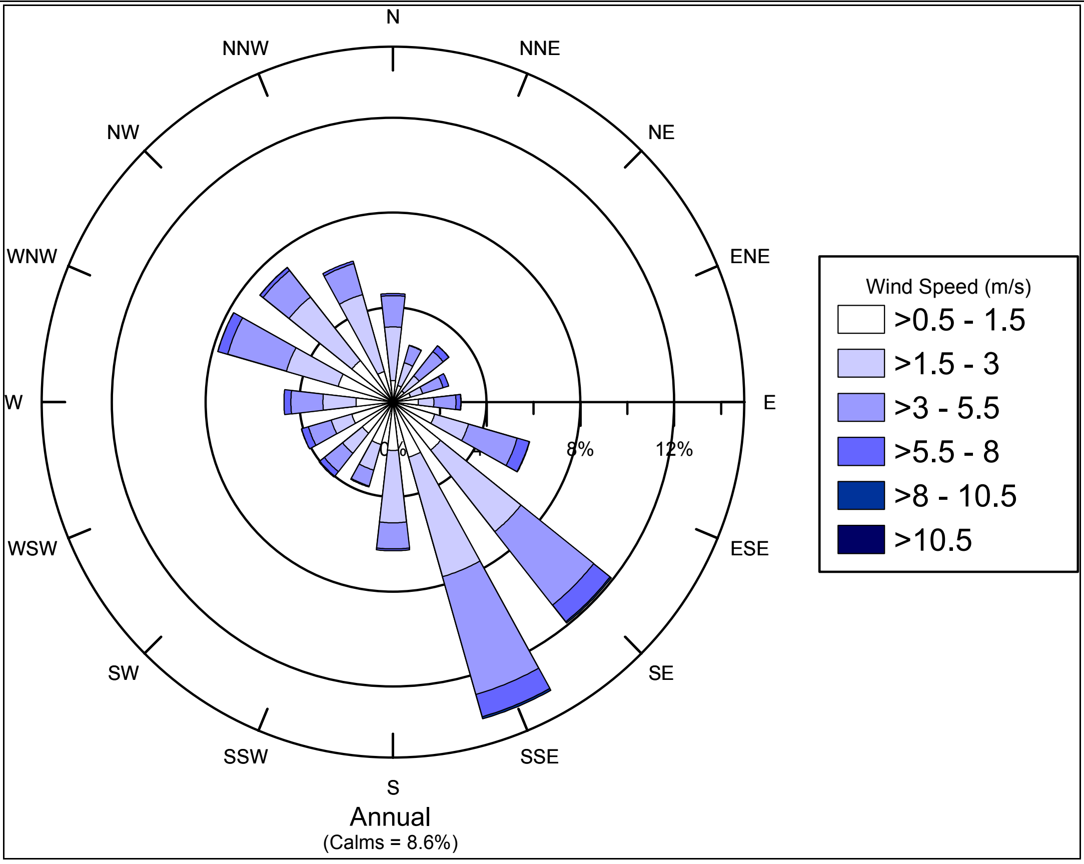

Figure 7
Annual Wind Rose for Mine Site - September 2007 to August 2008

For modelling purposes, a wind speed of 3m/s (at 10m above ground level) was modelled to determine the noise impact under the 'prevailing' southeasterly and northwesterly wind conditions. Typical calm daytime conditions of no wind, 70% RH and $-1^{o}C/100m$ vertical temperature gradient (ie, dry adiabatic lapse rate, DALR) was also modelled.

4.0 ASSESSMENT METHODOLOGY

4.1 OPERATIONAL NOISE

Assessment of operational noise was conducted using RTA Technology's Environmental Noise Model (ENM) v3.06. The noise sources were modelled at their known (for stationary sources such as the rail load-out) or most exposed (for mobile sources such as dump trucks) positions and noise contours and/or point calculations were generated for the surrounding area.

4.1.1 Noise Sources

Source sound power levels for all mining plant used in the modelling have previously been measured by Spectrum Acoustics at the Werris Creek Coal Mine. In particular, a new D10T bulldozer measured on site in January 2009 was modelled at the coal stockpile. The noise level measured on the new DIOT bulldozer is equivalent to the noise level previouslt measured on the D9 bulldozer when limited to 1500rpm in reverese gear.The train load-out was modelled as operating and a train with three locomotives was idling on the spur line east of the load-out bin. Sound power levels of noise sources are shown in **Appendix A**.

4.1.2 Modelled Scenarios

As discussed in Section 3.4, modelling was conducted for the following atmospheric conditions:

- *Daytime lapse* - 20^{0}C, 70% relative humidity (RH), no wind, -2^{o}C/100m vertical temperature gradient (boundary layer lapse);
- *Inversion* – 10^{0}C, 70% R.H., +3^{o}C/100m vertical temperature gradient; and
- *Prevailing wind* – 20^{0}C, 70% R.H., 3m/s wind from the northwest and southeast

Three operating scenarios were modelled:

Scenario 1:

Figure 8a presents the locations of the noise generating activities included in this scenario, designed to represent noise generated during the first year of the modified operations and including the construction of the additional surface facilities. A summary of the noise generating activities is as follows.

- Operation of two rotary overburden drills operating at natural ground level (~430m AHD).
- Overburden excavation and removal from the northwest corner of the open cut area at an elevation of approximately 390m AHD (~20m below natural ground level).
- Coal mining from Strip 10 at an elevation of approximately 360m AHD (~40m below natural ground level).

- Overburden placement and profiling at an elevation of between 350m AHD and 370m AHD (10m to 30m below natural ground level and to the north of more elevated section of the out-of-pit overburden emplacement).
- Stockpile management and coal processing within the Coal Processing Area.
- Heavy vehicle traffic between the Coal Processing Area and Product Coal Storage Area via the Rail Load-out Road.
- Stockpile management and train loading from the existing Rail Load-out Facility within the Product Coal Storage Area.
- Earthmoving operations associated with the construction of dams within the underground water storage area.

Scenario 2:

This scenario is identical to that of Scenario 1, however, instead of two rotary overburden drills operating at natural ground level at natural ground level, one rotary overburden drill and two CAT scrapers have been modelled to replicate concurrent soil stripping and overburden drilling operations (see **Figure 8a**).

Scenario 3:

Figure 8b presents the locations of the noise generating activities included in this scenario, designed to represent noise generated during the final year of the modified operations. A summary of the noise generating activities is as follows.

- Overburden excavation and removal from Strip 12 at an elevation of approximately 360m AHD (~40m below natural ground level).
- Coal mining from Strips 10 and 11 at an elevation of between 310m AHD and 340m AHD (~50m to 80m below natural ground level).
- Overburden placement and profiling at an elevation of between 400m AHD and 430m AHD (40m to 70m above natural ground level and without any acoustic shielding provided by previously constructed sections of the overburden emplacement).
- Stockpile management and coal processing within the Coal Processing Area.
- Heavy vehicle traffic between the Coal Processing Area and Product Coal Storage Area via the Rail Load-out Road.
- Stockpile management and train loading from the existing and additional Rail Load-out Facilities within the Product Coal Storage Area.

4.2 SLEEP DISTURBANCE

Loading of coal trains is likely to occur during the night, as the scheduling of this activity is dictated by Pacific National and the State Rail schedule. A significant potential for sleep disturbance will occur during discharging of coal from the rail load-out bin into train wagons and re-charging of the bins. The noise levels associated with these activities have been modelled to predict the L_{max} noise levels received at residential locations surrounding the rail load-out facility.


Figure 8
NOISE MODELLING SCENARIOS
Figure 8a
Figure 8b
REFERENCE
Mine Site Boundary (ML 1563)
Proposed Modified Open Cut Area
Proposed Overburden Emplacement Area (Out-of-Pit)
Contour (m AHD) (Interval = 10m)
Spot Height (m AHD)
SCALE 1:20 000
200
0
200
400
600
800
1000 m
TN
MN

An assessment of noise from the excavator loading overburden into trucks, overburden dumping and dozer tracks has also been conducted. Sound power levels of modelled L_{max} noise sources are shown in **Appendix A**.

Impact noise was modelled under the noise-enhancing atmospheric conditions discussed in Section 3.4.

4.3 BLASTING

The following sections provide standard equations for predicting blast overpressure and ground vibration levels, sourced from the United States Bureau of Mines. Blast data from coal mines in the Hunter Valley were analysed to determine suitable correction factors that would align the equations with actual measured results. The modified equations were then used to predict blast overpressure and vibration levels from the Proposal.

4.3.1 Blast Overpressure

Unweighted airblast overpressure levels, OP, are predicted from **Equation 1** below.

$$OP = 165 - 24(\log_{10}(D) - 0.3\log_{10}(Q)), \quad \text{dB} \qquad (1)$$

where *D* is distance from the blast to the assessment point (m), and
Q is the weight of explosive per delay (kg).

4.3.2 Blast Vibration

The basic equations for calculation of peak particle vibration (PPV) levels from blasting are as follows:

$$\mathrm{PPV} = 1140\left(\frac{D}{Q^{0.5}}\right)^{-1.6} \text{, mm/s (for average ground type)} \qquad (2)$$

$$\mathrm{PPV} = 500\left(\frac{D}{Q^{0.5}}\right)^{-1.6} \text{, mm/s (for hard rock)} \qquad (3)$$

where *D* and *Q* are defined as in Equation 2.

Note that the only difference between equations (2) and (3) is the value of the coefficient (either 1140 or 500). Geological data for the site show that most of the material to be mined contains bands of sandstone, conglomerate and mudstone, all of which may be considered as relatively hard materials. A coefficient value of 700 was adopted in the equation for prediction of ground vibration levels from blasting.

5.0 RESULTS AND RECOMMENDATIONS

This section of the report presents predicted noise and vibration levels and provides mitigation recommendations where criterion exceedances are predicted.

5.1 PREDICTED NOISE LEVELS

Predicted noise levels for the three operational scenarios detailed in Section 4.1.2 are summarised in **Table 1**. Noise contours for the neutral and inversion scenarios are shown in Appendix B.

5.2 RECOMMENDATIONS

The results presented in **Table 1** predict that the use of topsoil scrapers under inversion or southeast wind conditions do not cause any criterion exceedances, although levels within 2dB of the criterion are predicted at the residences on the “Woodlands”, “Marengo” and “Park Hill” properties under various adverse conditions. It is recommended that these residences be included in a revised noise monitoring program, replacing the residences on the Proponent-owned properties that are currently included as noise monitoring locations.

Table 1
Predicted Noise Levels and Criteria - dB(A),$L_{eq(15min)}$

		Scenario 1				Scenario 2				Scenario 3			
Receiver	**Criteria**	**Nt**	**Inv**	**NW**	**SE**	**Nt**	**Inv**	**NW**	**SE**	**Nt**	**Inv**	**NW**	**SE**
“Zeolite”	40[1]	30	37	24	39	30	38	28	40	30	38	25	40
“Cintra”	40[1]	30	37	40	36	30	40	40	38	30	40	40	35
“Tonsley Park”	35	22	33	25	34	24	36	25	34	24	33	24	30
“Marengo”	35	20	30	30	20	24	33	32	20	24	35	32	20
“Woodlands”	35	<20	28	32	<20	20	30	34	<20	20	31	31	<20
“Hazeldene”	35	<20	29	32	<20	<20	30	35	<20	20	31	32	<20
“Mountain View”	35	23	30	32	20	23	34	35	21	23	33	31	20
“Park Hill”	35	20	28	30	<20	<20	32	33	<20	21	31	29	<20

Notes: (1) Elevated noise criterion provided for by negotiated agreement between the Proponent and land owner / resident.
(2) “Nt” = Neutral, “Inv” = Inversion, “NW” = Northwest wind “SE” = Southeast wind.

5.3 SLEEP DISTURBANCE

5.3.1 Introduction

Assessment of potential sleep disturbance during night time hours usually begins by considering the DECC recommendation that further assessment is required if maximum noise levels[2] (L_{Amax}) exceed the background level (L_{A90}) by more than 15 dB at a bedroom window. If this level is exceeded then further consideration of potential disturbance to sleep includes the nature and level of ambient noise in the area, with some guidance also offered in *Appendix B* of the DECC *Environmental Criteria for Road Traffic Noise* (ECRTN, 1999).

[2] The sleep disturbance criterion is technically the $L_{A1(1minute)}$ level. As this is the loudest 0.6s during a 1-minute period, the L_{Amax} level is adopted.

Predicted maximum noise levels are summarised in **Table 2**. Only Scenarios 1 and 3 have been assessed as the scrapers would not operate at night.

Table *2*
Predicted Maximum Noise Levels and Criteria - dB(A),L_{max}

		Scenario 1				Scenario 3			
Receiver	**Criteria**	**Nt**	**Inv**	**NW**	**SE**	**Nt**	**Inv**	**NW**	**SE**
"Escott"	45	29	38	27	38	29	39	28	40
"Zeolite"	50[1]	33	40	27	41	35	43	29	42
"Cintra"	50[1]	36	42	44	39	36	45	44	41
"Tonsley Park"	45	27	37	27	37	30	38	29	39
"Marengo"	45	25	35	35	23	29	40	40	26
"Woodlands"	45	25	37	38	24	28	40	42	28
"Hazeldene"	45	25	36	37	24	29	39	40	29
"Mountain View"	45	27	37	37	25	31	39	39	28
"Park Hill"	45	24	36	36	24	30	38	38	27

Notes: (1) Elevated noise criterion provided for by negotiated agreement between the Proponent and land owner / resident.
(2) "Nt" = Neutral, "Inv" = Inversion, "NW" = Northwest wind "SE" = Southeast wind.

As may be expected, maximum noise levels for Scenario 3 are greater than for Scenario 1 due to the elevated overburden emplacement. Maximum noise levels are predicted to be at least 5 dB below the sleep disturbance criteria, however, and no further assessment of potential sleep disturbance is required.

5.4 BLASTING

Tables 3 shows predicted 95th percentile blast overpressure and ground vibration levels (PPV) at several residential locations based for a typical blast MIC of 800kg and a maximum MIC of 1600kg, for the Year 7 scenario as presented in the 2004 Werris Creek Coal Mine EIS. Only privately owned residences have been included.

Table *3*[1]
Predicted blasting impacts (Year 7)

Location	Approximate Distance, m	Overpressure, dB		PPV, mm/s	
		MIC 800kg	MIC 1600kg	MIC 800kg	MIC 1600kg
Werris Creek	4000	101	104	0.2	0.3
Zeolite Australia	2500	104	107	0.4	0.7
Cintra	1800	109	112	0.7	1.2
Hazeldene	3700	102	105	0.2	0.3
Wadwell's Lane	3800	102	105	0.2	0.3

1 Extracted from Table 23 of the 2004 Werris Creek Coal Mine Noise Assessment.

Blasting would occur in the northern section of the mine (Strips 10-12) as part of the proposed modification. The nearest residence to blasting under the proposed modification is "Cintra", which is 1 300m to the north. Re-calculated blast overpressure and ground vibration levels at this distance are summarised in **Table 4**.

Table *4*
Predicted blasting impacts at "Cintra"

Location	Approximate Distance, m	Overpressure, dB		PPV, mm/s	
		MIC 800kg	MIC 1600kg	MIC 800kg	MIC 1600kg
"Cintra"	1300	112	115	1.1	1.6

Results in **Table 4** suggest that overpressure levels from the largest overburden blasts may equal the criterion at "Cintra". On the basis that compliance with criteria can be achieved at the "Cintra" residence, it would be experienced at all other receivers which are at greater distances from the site.

6.0 MONITORING PROGRAM

This section of the report sets out a basic noise and vibration monitoring program sufficient to determine compliance with the relevant criteria.

6.1 NOISE MONITORING

Attended noise compliance monitoring is currently conducted monthly and given the potential for the proposed modification to slightly increase noise levels at some distant receivers, it is recommended that the monthly monitoring be continued until such time as DECC is satisfied that criterion exceedances are only rarely, if ever, occurring.

The noise monitoring locations should be revised to remove the Proponent-owned receivers and included additional privately owned residences as summarised in **Table 5**.

Table *5*
Existing and Proposed Noise Monitoring Locations

Existing Noise Monitoring Locations	Proposed Noise Monitoring Locations
"Zeolite Australia"	"Zeolite Australia"
"Cintra"	"Cintra"
"Hillview"	"Marengo"
"Railway View"	"Woodlands"
"Old Colliery"	"Hazeldene"
"Hazeldene"	"Mountain View"
"Mountain View"	"Park Hill"

6.2 BLAST MONITORING

A permanent blast vibration / overpressure logger complying with relevant Standards and DECC guidelines should be installed at "Cintra". A unit which sends an automatic message, via pager, to the Environment Officer after each blast is preferable. Logger data could be accessed by mine personnel for reporting requirements.

6.3 METEOROLOGY

It is recommended that an additional real-time temperature logger be installed at nominally 2m above ground level at the lowest practicable point on the site. This will give a vertical separation of around 40m to 50m to the existing weather station from which temperature inversion strengths can be accurately calculated. Wind speed/direction and other parameters should continue be measured from the 10m tower.

This meteorological information may then be correlated with noise logger data to determine the relationship between weather conditions and received noise levels.

7.0 CONCLUSION

An assessment has been conducted to determine the noise and vibration impact of a proposed modification to the Werris Creek coal mine. Modelling results show no noise level exceedances at privately owned residences. An amended noise monitoring program has been recommended in which Proponent-owned receivers are replaced with privately owned receivers. No exceedances of blast overpressure and vibration limits have been predicted. It has been recommended that a blast monitor be installed near the dwelling at “Cintra”.

We conclude that the proposal can operate without adversely impacting upon the acoustical amenity of any non-mine owned residential receiver, after implementation of recommendations given in this report.

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APPENDIX A

NOISE SOURCE SOUND POWER LEVELS

TABLE A1
Noise Source Sound Power Levels

Construction Noise Sources – dB(A),L_{10}	
Source	**Sound Power Level**
Small excavator (at dams)	114
D9 dozer (at dams)	112
Tip truck (at dams)	108
Grader (at dams)	109
Construction of coal hopper	109
Operational Noise Sources – dB(A),$L_{eq(15min)}$	
Source	**Sound Power Level**
Coal processing area	113
Overburden emplacement	115
Excavator (overburden)	116
Excavator (coal)	114
Trucks on slope (average up/down hill)	115
Trucks on flat	112
Trucks hauling coal	111
Rotary overburden drill	113
Tandem topsoil scrapers	118
Major Impact Sources – dB(A),L_{max}	
Source	**Sound Power Level**
Overburden placement (with dozer)	128
Excavator loading truck	125
Truck pass-by (down hill)	124

APPENDIX B

NOISE LEVEL CONTOURS

Figure B1. Predicted Scenario 1 noise contours dB(A),$L_{eq(15min)}$ – Neutral atmosphere

Figure B2. Predicted Scenario 1 noise contours dB(A),$L_{eq(15min)}$ – Inversion

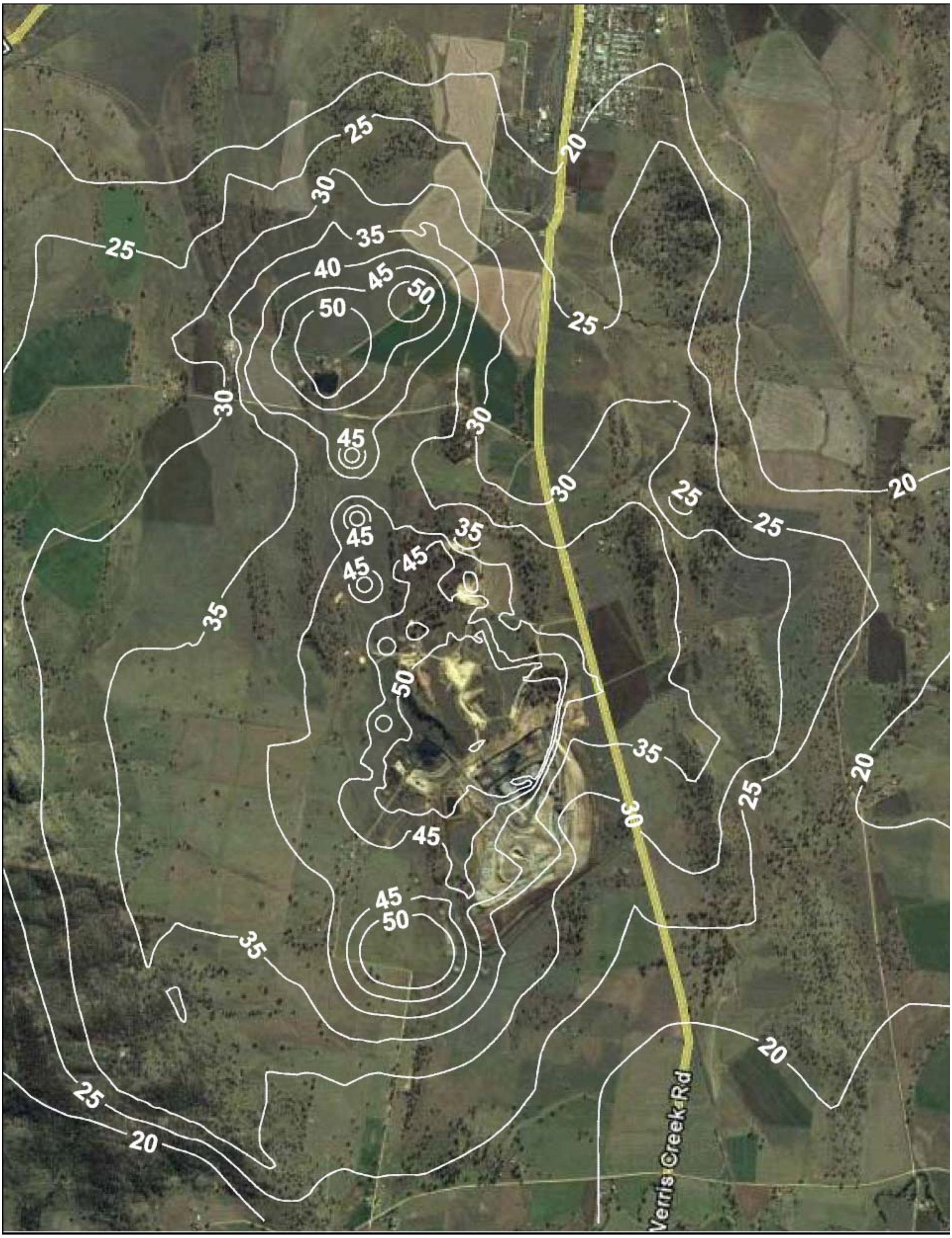

Figure B3. Predicted Scenario 2 noise contours dB(A),$L_{eq(15min)}$ – Neutral atmosphere

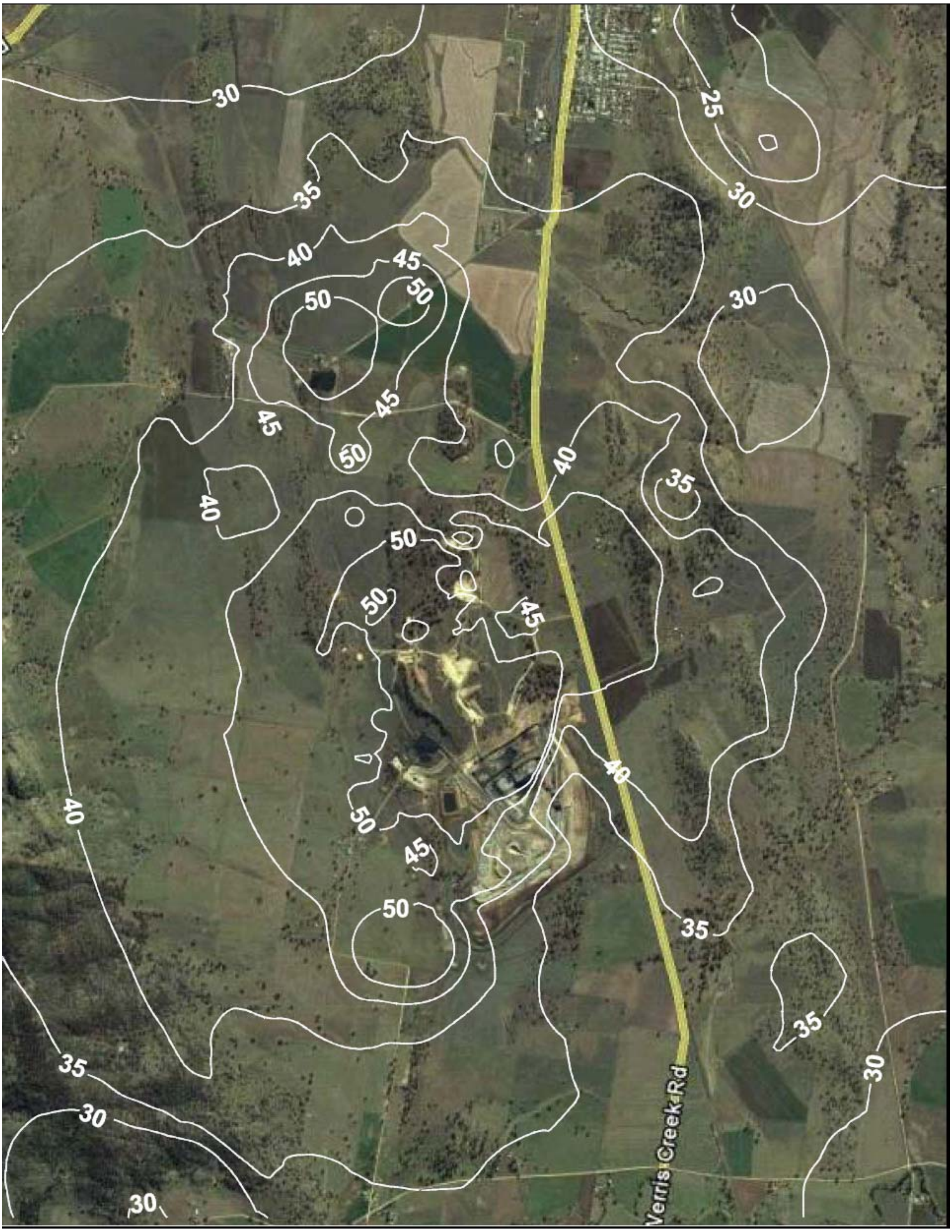

Figure B4. Predicted Scenario 2 noise contours dB(A),$L_{eq(15min)}$ – Inversion

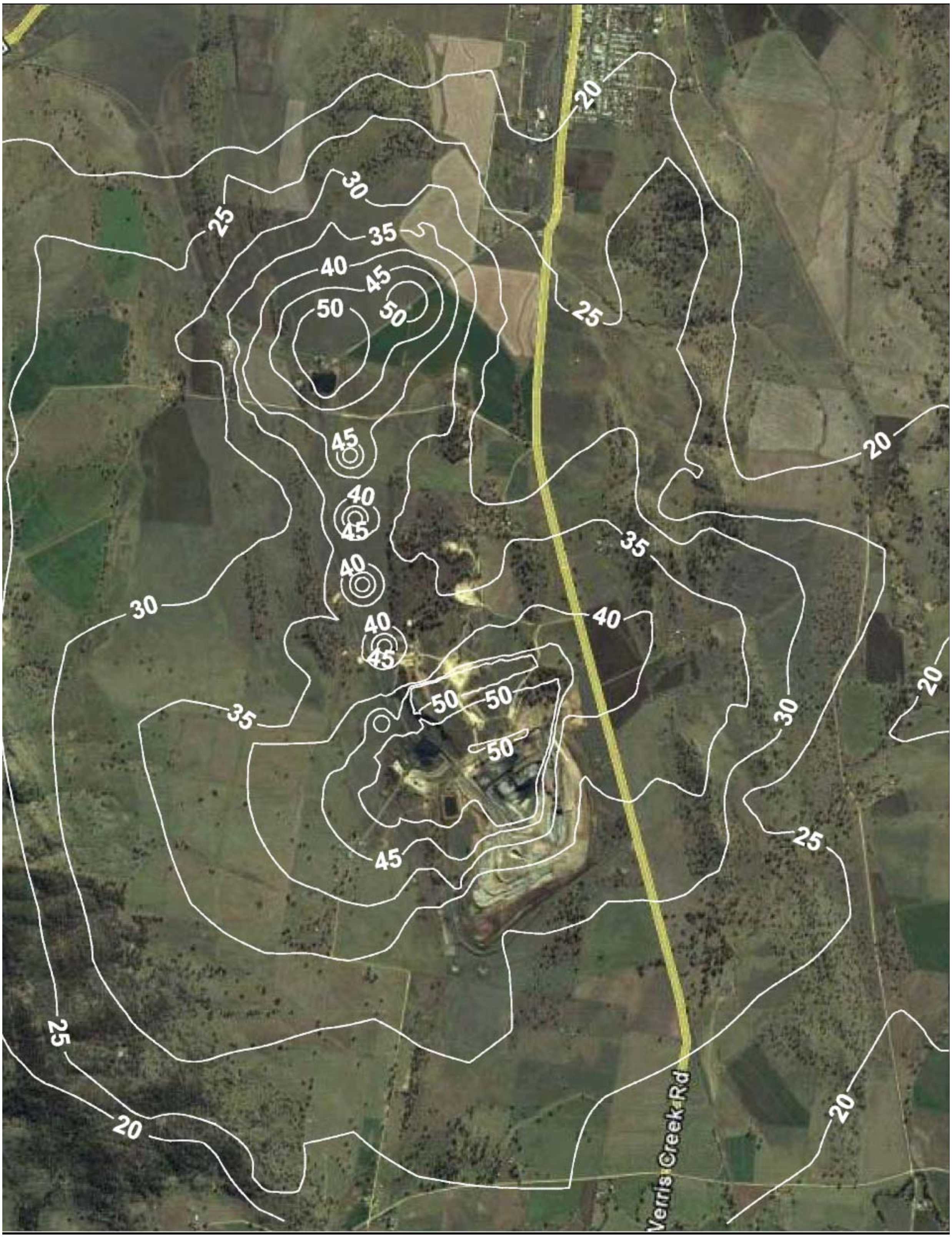

Figure B5. Predicted Scenario 3 noise contours dB(A),$L_{eq(15min)}$ – Neutral atmosphere

Figure B6. Predicted Scenario 3 noise contours dB(A),$L_{eq(15min)}$ – Inversion

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