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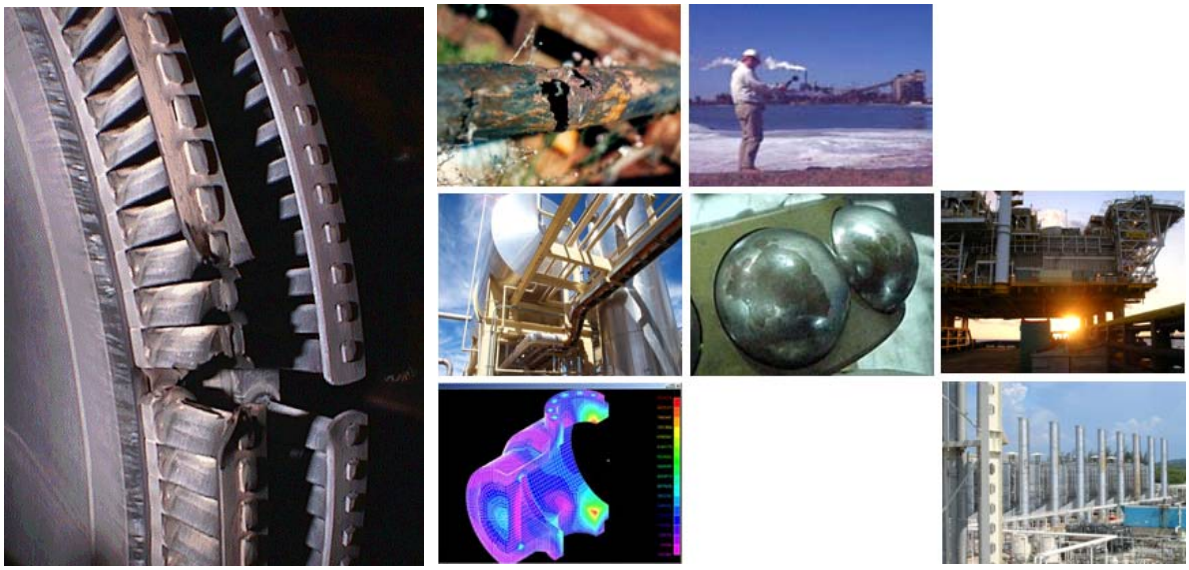
ENVIRONMENTAL NOISE IMPACT ASSESSMENT - PROPOSED CENTRAL WEST COAL PROJECT



URS

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EXECUTIVE SUMMARY

An environmental noise impact assessment has been undertaken of the potential noise emissions associated with the proposed Central West Coal Mining Operations near Eneabba in Western Australia. The assessment addresses noise from normal operations at the mine during the early, mid and late stages of the mine's life assuming worst-case night-time meteorological conditions for sound propagation.

The nearest noise sensitive receiver, R6, is approximately 2 km to the south-south-west of the proposed development site.

Ambient noise levels were recorded in the vicinity of the nearest noise sensitive receiving premises to the proposed power station. The recorded noise data demonstrates that underlying background noise levels are very low and will not provide any significant masking to noise emitted from the mining operations under worst-case conditions for sound propagation. It is likely, therefore, that operations will be audible above background noise at the nearest noise sensitive receivers (R5 and R6) under calm to light down-wind conditions.

Noise modelling of the mining operations demonstrates that noise limits imposed under the Environmental Protection (Noise) Regulations 1997 may be exceeded at location R6 at night-time under worst-case weather conditions for sound propagation. The predicted exceedance increases when considering cumulative impacts of the mining operations and noise emissions associated with Coolimba Power Station. Compliance with regulatory noise limits is demonstrated at all other locations considered.

Noise from the ROM pad and coal stockpile area is most significant and the contribution from the overburden dozers is also significant, but no single item of equipment dominates noise received at R6 and, therefore, a combination of noise reduction and control measures will be required to achieve compliance with regulatory noise limits.

It is likely that some or all of the following noise reduction measures will be required:

- Specification of low noise idlers for conveyors which are not enclosed
- Screening or enclosing of fixed plant (crushing & screening plant and transfer stations)
- Provision of bunding around the ROM pad and stockpile area
- Implementing low noise specifications for dozers and loaders
- Restricting night-time operations based on prevailing meteorological conditions

However, these suggestions should be reviewed during future design stages to ensure that the most effective noise mitigation solutions are identified and implemented.

TABLE OF CONTENTS

1. INTRODCUTION

SVT was commissioned by URS to develop an acoustic noise model of the proposed Central West Coal Project, and compare predicted noise levels against the assigned noise levels under the Environmental Protection (Noise) Regulations 1997.

1.1 Description of Facility

The Central West Coal Project is a proposed 2 Mtpa open cut coal mine, with an expected mine life of 30 years. All coal from the mine will be used to fuel the proposed Coolimba Power Station. The mine will be operational 24 hours per day.

The main economic coal seam is located 120 metres below the current surface level. This will be extracted by a continuous miner, from which a conveyor will move the coal to a truck loading facility on the haul road, adjacent to the pit. B-double trucks will move the coal from the pit to a ROM pad, where it will be sized before being moved by conveyor to the Coolimba Power Station.

The mining pit will have an area of 75 hectare at any point during the mine's life. It will start at the southern end of the mining lease, and advance north at 30ha/year. Overburden removal will be conducted by D11 sized dozers, which will feed the overburden into a mobile sizer breaker. From the sizer breaker, the overburden will be moved by conveyor to the southern wall of the pit, where it will be used for backfill by a mobile stacker.

1.2 Receiving Premises

A list of the nearest noise sensitive premises to the proposed power station was provided for the study and these locations (R1 to R11) are shown in figure A1 in appendix A. (Note that location R3 has been demolished and has not been considered as part of this assessment.)

1.3 Work Undertaken

SVT Engineering Consultants have used in-house data to compile a noise model of the proposed mining operations. Three stages of the mine life have been modelled (early, mid, and late), with the pit and machinery locations adjusted for each stage. Predicted noise levels were calculated at the nearest sensitive receivers under worst case meteorological conditions for sound propagation, and contours showing the noise level expected from site emissions have been generated.

Existing background noise levels have also been measured in the vicinity of the proposed mining operations, at a location representative of the nearest noise sensitive receivers. The monitoring was undertaken as per the requirements of EPA Guidance No.8[1] using a Bruel & Kjaer Model 2238, Class 1 logging sound level meter.

Predicted noise levels have been compared with environmental noise limits imposed under the Environmental Protection (Noise) Regulations 1997 and with existing background noise levels. The cumulative impacts of noise from the proposed coal mining operations and the proposed Coolimba Power Station have also been assessed.

[1] EPA draft guidance no 8, May 2007 "*Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986) – Environmental Noise*"

2. NOISE LIMIT CRITERIA

The *Environmental Protection (Noise) Regulations 1997* govern the maximum permissible noise level at noise sensitive premises. These maximum levels are given in Table 2-1.

Table 2-1: Assigned levels at noise sensitive premises

Type of premises receiving noise	Time of day	Assigned Level – dB(A)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor

In this table, L_{A10} represents the noise level exceeded for 10% of the time, L_{A1} represents the noise level exceeded for 1% of the time, and L_{Amax} represents the maximum noise level.

Influencing Factor is related to the land zoning and proximity of major roads in the vicinity of the receiving premises. Industrial or commercial zoned land and major and secondary roads within 450 metres of the noise sensitive receiver are taken into account when calculating the influencing factor. As all receivers considered are more than 450 metres from any such zoning or roads, the influencing factors are zero.

As the proposed mining is a continuous 24 hour operation the L_{A10} assigned level is used to compare predicted levels against assigned noise levels.

3. AMBIENT NOISE ASSESSMENT

A noise monitor was deployed at location (R3)[2], approximately 2 km to the west of the mid mine life operations. This location is representative of other noise sensitive receivers in the vicinity of the proposed mining operations.

The noise monitoring equipment was set to continuously record L_{A1}, L_{A10} and L_{A90} noise levels at 15 minute intervals, where:

- L_{A1} is the noise level exceeded for 1 % of the time;
- L_{A10} is the noise level exceeded for 10 % of the time; and
- L_{A90} is the noise level exceeded for 90 % of the time.

The logging was undertaken from 10 March to 25 March 2008.

The following section provides the results of the ambient noise monitoring. A summary table is provided which includes the average L_{A10} and L_{A90} values collected over the monitoring period during daytime hours, evening hours and night time hours, and for all periods combined. The standard deviations in the measurement results are also provided. The data has also been analysed to determine the L_{90} of the L_{A90} noise levels for the various time periods. This data provides a good indication of the lowest ambient noise levels. Charts showing the monitored noise data are also presented.

3.1 Noise Monitoring at R3

Table 3-1 : Summary of Ambient Noise Data at R3

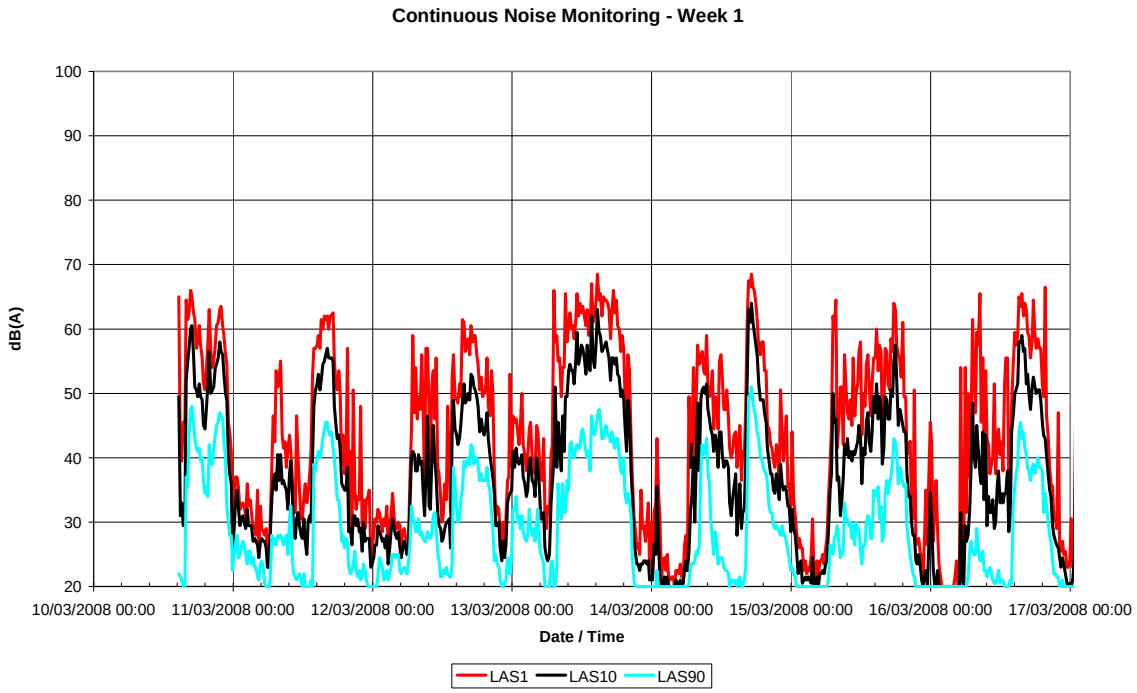
Period	Average L_{A10} dB(A)	Standard Deviation in L_{A10} dB	Average L_{A90} dB(A)	Standard Deviation in L_{A90} dB	L_{90} of L_{A90} dB(A)
Day (07:00 to 19:00 hrs)	49.9	10.7	38.5	11.6	22.5
Evening (19:00 to 22:00 hrs)	44.8	10.8	35.1	9.4	21.5
Night (22:00 to 07:00 hrs)	40.4	16.2	33.6	13.6	<20
All data	45.3	13.8	36.0	12.3	<20

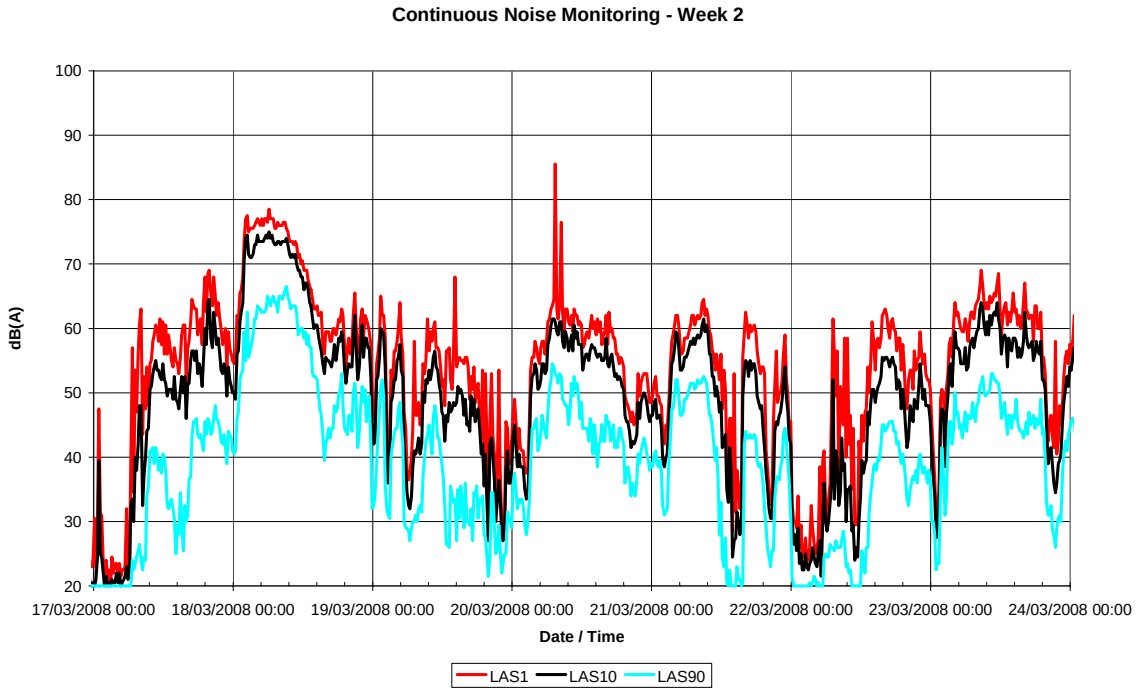
During the first week of monitoring, wind speeds were generally calm to light. However, during the second week wind speeds were generally much higher and had a significant effect on measured

[2] The property at this location has been demolished. However, the data collected is representative of the other receptors in the vicinity of the proposed mining operations.

noise levels. This is clearly demonstrated in the figures below. A daily cycle in noise levels can be seen in the results obtained during the first week of monitoring but this is masked by wind noise during the second week.

The results demonstrate that underlying background noise levels are very low. The large standard deviations in the measured results can be attributed to the effects of wind generated noise.





4. ACOUSTIC MODELLING

4.1 Methodology for Noise Modelling

An acoustics model has been developed using the SoundPLAN noise modelling software developed by Braunstein + Berndt GmbH. The SoundPLAN noise modelling program is approved by the Environmental Protection Agency (EPA) for the purposes of environmental noise modelling. The SoundPLAN program calculates the sound pressure levels at nominated receiver locations or produces noise contours over a defined area of interest around the noise sources. The inputs required are the noise source data, ground topographical data, meteorological data, and noise barriers or buildings, and receiver locations.

The model has been used to generate noise contours for the area surrounding the mine and also predict noise levels at specific residential locations.

The model does not include noise emissions from any sources other than the proposed Central West Coal Project. Therefore, noise emissions from road traffic, rail, domestic sources, entertainment, other industrial sources, etc. are not accounted for.

The acoustic model produces noise contours or noise levels at specified receiver locations for specific meteorological conditions. Therefore, a range of noise levels can be predicted for any given location.

4.2 Modelling Scenarios

Three noise modelling scenarios have been considered representing typical night time operations during the early, mid and late stages of the mine development. The models vary in the locations of the mining pits and associated noise sources.

4.3 Input Data

4.3.1 Noise Sources and Sound Power Levels

The sound power levels of all significant noise sources at the mine and associated facilities are required so that an acoustic model can be developed.

As this is a proposed project, no precise noise data is available for the equipment that will be used in the mining operation. Therefore, noise emissions were estimated based on SVT internal data for similar projects, and the expected site layout.

Table 4-1 shows the noise sources included in the model. The full spectrum of each source can be found in Table B1 of Appendix B.

Table 4-1: A Weighted sound power levels for individual noise sources

Item	Sound Power Level dB(A)	Assumptions
Overburden Conveyor	123.5	Using SVT in-house data
Coal Conveyor	119.6	Using SVT in-house data
Continuous Miner	119.6	Published data from NIOSH Pittsburgh Research Laboratory
Mobile Sizer Breaker	119.1	Estimate based on SVT in-house data for similar equipment
Overburden Dozers (2 off)	116.0 / dozer	Using SVT in-house data
Water Truck	117.0	Using SVT in-house data
Overburden Stacker	116.7	Estimate based on SVT in-house data for similar equipment
Lighting Plants (6 off)	108.8 / unit	Estimate based on SVT in-house data for similar equipment
ROM Crushing and Screening	115.9	Estimate based on SVT in-house data for similar equipment
Fuel and Lube Truck	115.6	Estimate based on SVT in-house data for similar equipment
ROM Front End Loader	115.5	Using SVT in-house data
ROM Transfer Chute	114.1	Estimate based on SVT in-house data for similar equipment
Coal stacker at stockpile	110.0	Estimate based on SVT in-house data for similar equipment
ROM conveyors	115.2	Using SVT in-house data
Stockpile dozers (3 off)	112.4 / dozer	Using SVT in-house data
Truck Loading Transfer Chute in Pit	114.1	Estimate based on SVT in-house data for similar equipment
Conveyor Drive	110.3	Using SVT in-house data
B-Double Haul Truck (2 iff)	105.4 / truck	Estimate based on SVT in-house data for similar equipment
Cumulative Total	130	Combined sound power level for all sources

Note that although the mining conveyors have the greatest sound power level, their effect on the predicted levels at receiver locations is greatly diminished because large portions of the conveyors are located within the pit, and therefore shielded by the pit walls.

4.3.2 Topography and Barriers

Topographic information for the noise model was obtained from URS. Based on diagrams of the proposed pit layouts for early, mid and late mining operations, the topographic surface was altered to include the relevant pit for each phase of the mine. The barrier effects of buildings at the proposed power station are also included. No other barriers, except those associated with the surrounding topography, have been assumed. An absorptive ground type has been used for the model.

4.3.3 Receiver Locations

The model was set to calculate the sound pressure level at a number of residential locations surrounding the proposed mine location. These locations have been labeled R1 through R11, and can be found in Figure A1 of Appendix A. Note that predictions are not provided for location R3 as this residence no longer exists.

4.3.4 Meteorological Conditions

Certain meteorological conditions can increase noise levels at a receiving location by a process known as refraction. Refraction occurs during temperature inversions and where there is a wind gradient. These meteorological effects typically increase noise levels by 5 to 10 dB.

The model developed for this study has been configured to calculate noise levels at the receiver under the worst case meteorological conditions for night-time sound propagation as defined in EPA's draft guidance note no. 8[3]. Table 4-2 shows these conditions. (Night-time conditions have been selected because noise limits are most stringent at night.)

Table 4-2: Worst case meteorological conditions

EPA Guidance No. 8 Default Conditions	SoundPLAN Meteorological Parameters		
	Wind Speed (m/s)	Stability Class	Temperature (°C)
Day	4	E	20
Night	3	F	15

[3] EPA draft guidance no 8, May 2007 "*Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986) – Environmental Noise*"

5. NOISE MODELLING RESULTS

5.1 Overall Levels

Sound pressure levels were calculated at nearby noise sensitive receivers, and contours showing the overall sound pressure level near the mining operations were developed. The predicted noise levels are shown in Table 5-1, and the noise contours are presented in Figure C1 through C3 of Appendix C.

Table 5-1: Predicted worst case night time noise levels

Receiver	Noise Limit – L_{A10} dB(A)	Predicted Sound Pressure Level – dB(A)		
		Early Mine Life	Mid Mine Life	Late Mine Life
R1	35	16.2	22.4	26.2
R2	35	14.6	18.8	20.0
R4	35	22.9	21.4	20.3
R5	35	31.8	30.0	29.7
R6	35	36.0	34.5	34.2
R7	35	8.1	11.5	14.0
R8	35	19.8	17.6	16.4
R9	35	17.6	15.0	12.7
R10	35	12.7	10.8	7.1
R11	35	11.8	9.4	4.1

Location R 6 receives the highest noise levels for all scenarios considered, with the early mine life scenario representing the worst-case for noise emissions at this location.

5.2 Individual Plant Contribution

SoundPLAN allows the noise contribution from each noise source to be ranked in terms of its contribution to overall noise levels. Noise received at location R6 is dominated by plant and equipment at the ROM pad and the coal stockpile. However, no individual item of equipment has a dominating effect, and the highest individual contribution to received noise levels is almost 10 dB below the overall predicted noise level.

6. COMPLIANCE ASSESMENT

6.1 Comparison to Predicted Levels

Table 5-1 shows the predicted and assigned noise levels at nearby noise sensitive locations. It can be seen from this table that predicted noise levels for worst-case meteorological conditions exceed the night-time assigned noise level of 35 dB(A) at location R6.

6.2 Cumulative Noise Impacts

The Environmental Protection (Noise) Regulations require that noise emissions do not exceed, **or significantly contribute** to exceedances of the assigned noise levels.

The nearest receiving locations to the proposed mining operations will also be impacted by noise emissions from the proposed Coolimba Power Station. SVT report No. Rpt01-085132-Rev 1[4] provides a review of noise impacts from the proposed Coolimba Power Station. Noise levels are predicted at locations R1, R2 and R4 to R6. Table 6-1 to Table 6-3 present the cumulative noise levels predicted for the power station and each modelled mining scenario for worst-case meteorological conditions.

Table 6-1: Cumulative noise levels for power station and early mine life operations

Receiver	Night-time Assigned Level dB(A)	Predicted Sound Pressure Level – dB(A)		
		Early Life Mining Operations	Power Station	Cumulative
R1	35	16.2	12.1	17.6
R2	35	14.6	10.6	16.1
R4	35	22.9	23.4	26.2
R5	35	31.8	30.7	34.3
R6	35	36.0	38.8	40.6

Table 6-2: Cumulative noise levels for power station and mid mine life operations

Receiver	Night-time Assigned Level dB(A)	Predicted Sound Pressure Level – dB(A)		
		Mid Life Mining Operations	Power Station	Cumulative
R1	35	22.4	12.1	22.8
R2	35	18.8	10.6	19.4

[4] SVT Report Rpt01-085132-Rev1-5Nov 2008 "*Environmental Noise Impact Assessment of the Proposed Coolimba Power Station*"

Receiver	Night-time Assigned Level dB(A)	Predicted Sound Pressure Level – dB(A)		
		Mid Life Mining Operations	Power Station	Cumulative
R4	35	21.4	23.4	25.5
R5	35	30.0	30.7	33.4
R6	35	34.5	38.8	40.2

Table 6-3: Cumulative noise levels for power station and late mine life operations

Receiver	Night-time Assigned Level dB(A)	Predicted Sound Pressure Level – dB(A)		
		Late Life Mining Operations	Power Station	Cumulative
R1	35	26.2	12.1	26.4
R2	35	20.0	10.6	20.5
R4	35	20.3	23.4	25.1
R5	35	29.7	30.7	33.2
R6	35	34.2	38.8	40.1

It can be seen the predicted cumulative noise levels exceed the night-time assigned noise levels at location R6 only. Predicted noise levels at this location also marginally exceed (by up to 0.6 dB) the 40 dB(A) assigned noise level which applies between 0900 to 1900 hours on Sundays and public holidays and 1900 to 2200 hours for all days.

7. DISCUSSION & RECOMMENDATIONS

The assessment of ambient noise levels provided in Section 3 demonstrates that underlying background noise levels (i.e. the 90th percentile of the recorded L_{A90} noise levels) in the vicinity of the mine are very low and will not provide any significant masking to noise emitted from the mining operations under worst-case conditions for sound propagation. It is likely, therefore, that the mining operations will be audible above background noise at some of the nearest noise sensitive receivers (R5 & R6) under calm to light down-wind conditions.

Predicted noise levels from the mining operations, when considered in isolation, are shown to exceed the night-time assigned noise level of 35 dB(A) at location R6 under worst-case meteorological conditions for sound propagation for the early mine life scenario. The main contributors to this exceedance are plant and equipment at the ROM pad and coal stockpile area as well as the overburden dozers. However, no single item of equipment dominates and therefore noise emission levels for all relevant equipment would need to be lower than those assumed in the model in order to reduce levels to below 35 dB(A).

Cumulative predicted noise levels for the power station and coal mining operations also exceed the 40 dB(A) assigned noise level at R6 which applies between 0900 to 1900 hours on Sundays and public holidays and 1900 to 2200 hours for all days. Achieving full compliance at R6 will require noise reductions from both the power station and coal mining operations. For the mining operations this will require some or all of the following noise control measures to be implemented:

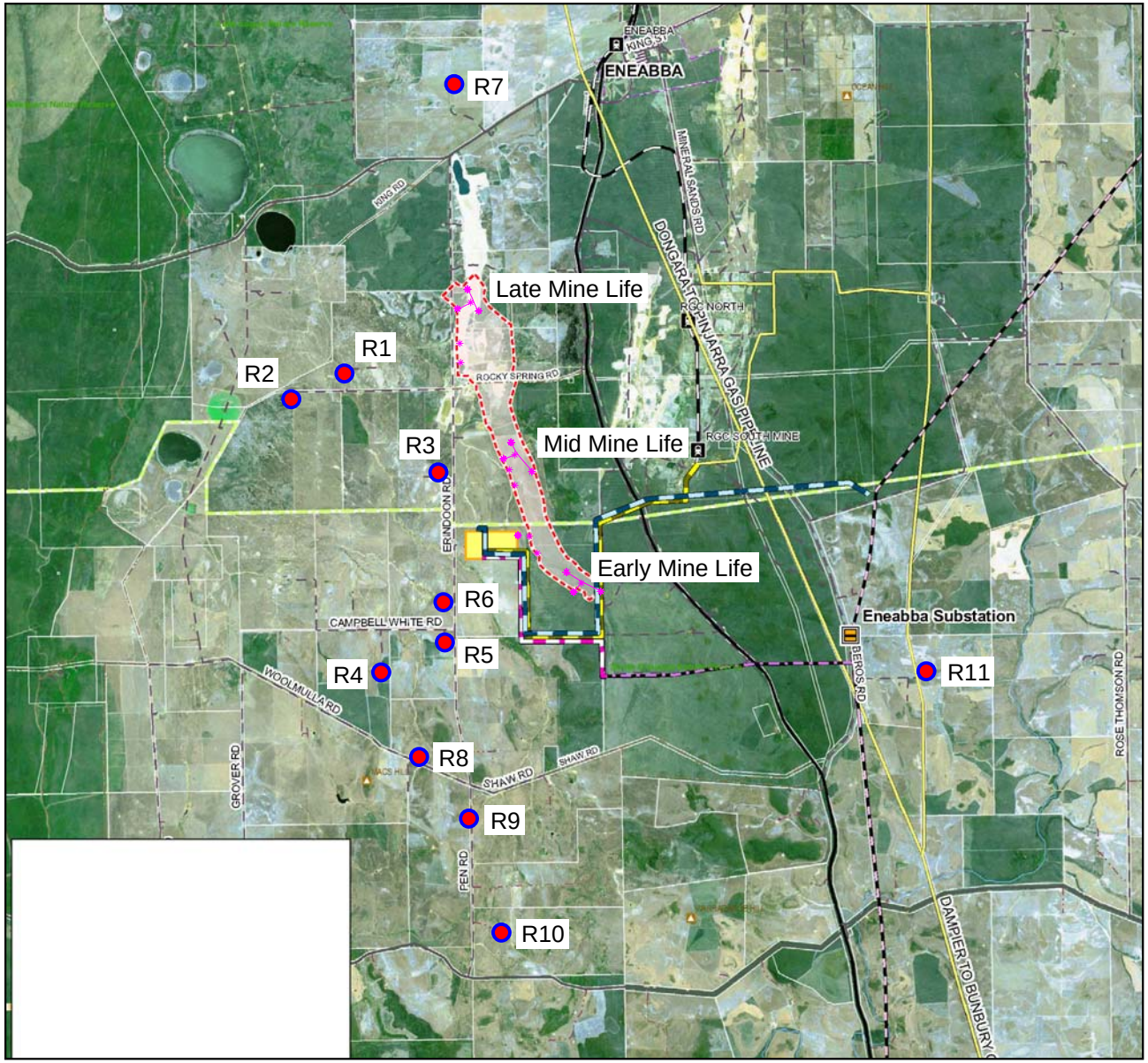
- Specification of low noise idlers for conveyors which are not enclosed
- Screening or enclosing of fixed plant (crushing & screening plant and transfer stations)
- Provision of bunding around the ROM pad and stockpile area
- Implementing low noise specifications for dozers and loaders
- Restricting night-time operations based on prevailing meteorological conditions

It should be noted, that the modelling undertaken for this assessment is based on estimates of noise emissions for the plant and equipment associated with the mining operations. Considering that noise data is not yet available from equipment suppliers and that noise emissions from the Coolimba Power station significantly contribute to exceedances of noise limits, it is not possible to confidently specify which of the above noise control suggestions will be most effective in mitigating noise impacts. Therefore, the available noise controls should be reviewed during future design stages.

APPENDIX A : MODEL LAYOUT

CENTRAL WEST COAL PROJECT
Overall Model Layout

Figure A1



Signs and symbols

- Line source
- Point source
- Area source
- Point receiver

Length Scale 1:200000

0 1 2 4 km

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APPENDIX B : SOUND POWER SPECTRA

Table B 1: Individual equipment sound power spectra

Plant Area	Source	Spectrum – dB(A)									Overall	
		31.5	63	125	250	500	1k	2k	4k	8k	dB(lin)	dB(A)
Coal Removal	Coal Conveyor	71.5	92.7	103.6	108.7	112.7	117.1	108.5	106.4	97.4	125.3	119.6
Coal Removal	Continuous Miner			99.4	106.2	111.6	115.5	114.1	109.2	103.1	121.8	119.6
Haul Road	Haul Truck 1	54.2	79.8	94.4	92.6	98.9	99.0	96.2	99.9	80.9	112.6	105.3
Haul Road	Haul Truck 2	54.2	79.8	94.4	92.6	98.9	99.0	96.2	99.9	80.9	112.6	105.3
Overburden Removal	Fuel and Lube Truck		81.0	103.6	97.0	108.4	112.1	108.7	104.4	94.6	121.1	115.6
Overburden Removal	Lighting Plants (cumulative)	74.6	92.2	94.2	96.7	102.0	112.2	113.2	106.9	95.9	121.0	116.6
Overburden Removal	Mobile Sizer Breaker	73.8	95.7	106.3	109.9	112.9	114.5	111.7	105.4	97.4	126.5	119.0
Overburden Removal	Overburden Conveyor	75.4	96.6	107.5	112.6	116.6	121.0	112.4	110.3	101.3	129.2	123.5
Overburden Removal	Overburden Dozers (cumulative)		86.9	113.5	106.2	110.4	114.5	110.8	105.5	95.0	129.7	119.1
Overburden Removal	Water Truck	76.6	84.5	101.2	102.2	112.4	112.4	109.4	104.7	95.9	122.0	116.9
Pit Backfill	Conveyor Drive	63.3	82.0	91.8	102.1	102.8	106.8	102.9	94.6	84.8	115.8	110.3
Pit Backfill	Overburden Stacker	69.7	87.4	98.7	106.1	110.8	113.3	108.3	101.5	92.9	121.2	116.7
ROM	Crushing and Screening	84.2	95.8	101.4	105.6	109.9	111.0	109.2	103.9	90.9	126.0	115.8
ROM	Front End Loader		83.7	104.7	102.5	109.9	110.4	108.5	103.5	95.3	122.2	115.5

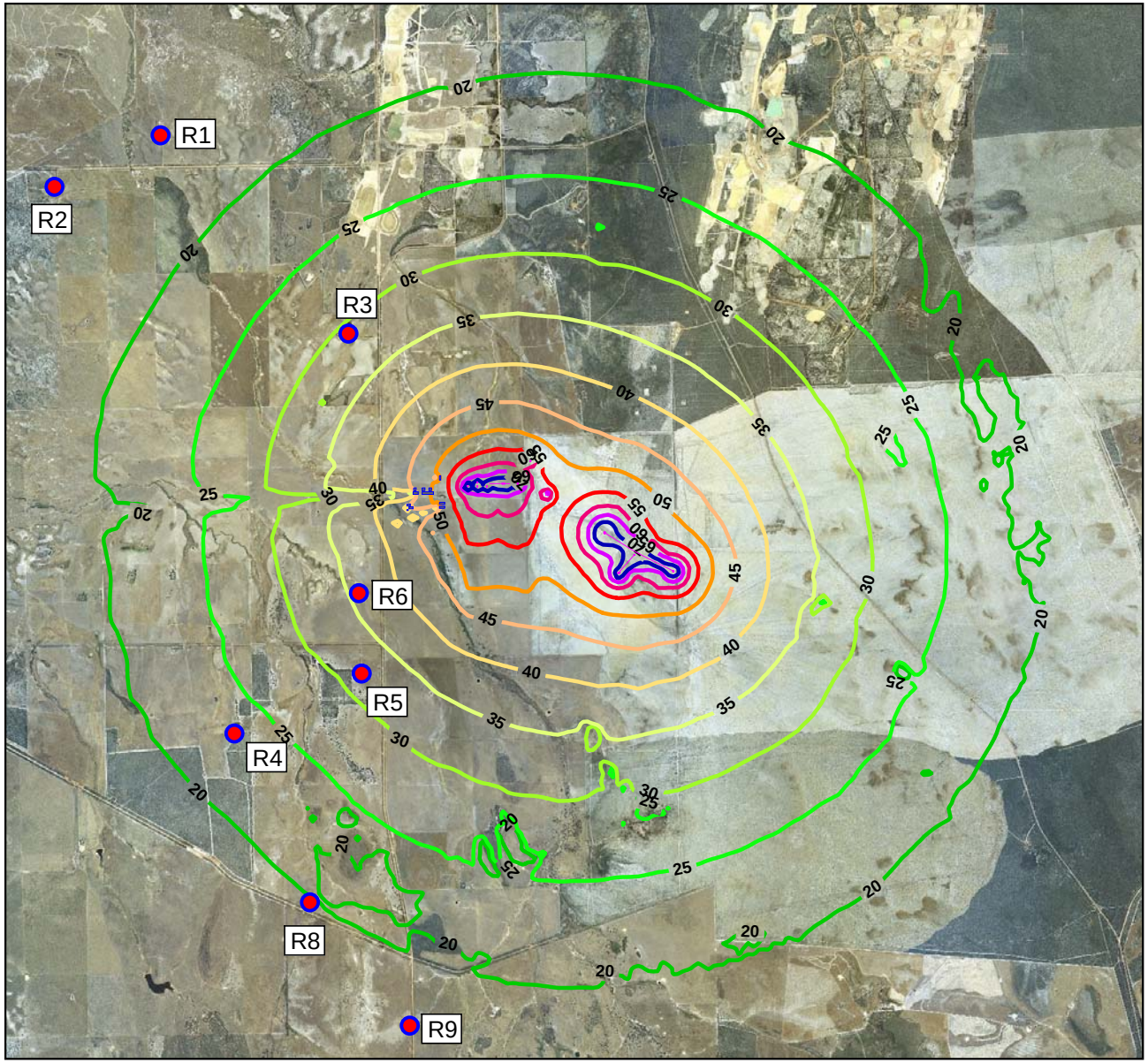
Plant Area	Source	Spectrum – dB(A)									Overall	
		31.5	63	125	250	500	1k	2k	4k	8k	dB(lin)	dB(A)
ROM	Transfer Chute	67.1	84.7	93.0	98.8	106.4	108.0	109.6	106.6	98.0	117.2	114.2
Truck Loading	Conveyor Drive	63.3	82.0	91.8	102.1	102.8	106.8	102.9	94.6	84.8	115.8	110.3
Stockpile	Coal Stacker		79.4	90.9	97.7	103.8	107.2	101.3	93.5	84.9	113.9	110.0
Stockpile	Dozer 1		80.8	100.4	102.6	106.9	108.0	103.2	99.9	89.9	119.1	112.4
Stockpile	Dozer 2		80.8	100.4	102.6	106.9	108.0	103.2	99.9	89.9	119.1	112.4
Stockpile	Dozer 3		80.8	100.4	102.6	106.9	108.0	103.2	99.9	89.9	119.1	112.4
Truck Loading	Haul Truck	54.2	79.8	94.4	92.6	98.9	99.0	96.2	99.9	80.9	112.6	105.3
Truck Loading	Transfer Chute	67.1	84.7	93.0	98.8	106.4	108.0	109.6	106.6	98.0	117.2	114.2

APPENDIX C : NOISE CONTOURS

CENTRAL WEST COAL PROJECT - EARLY LIFE

Noise Contours for Worst Case Night-time Conditions - Prepared 4 Nov 08

Figure C1



Noise levels
dB(A)

20
25
30
35
40
45
50
55
60
65
70

Length Scale 1:100000

0 0.5 1 2 km

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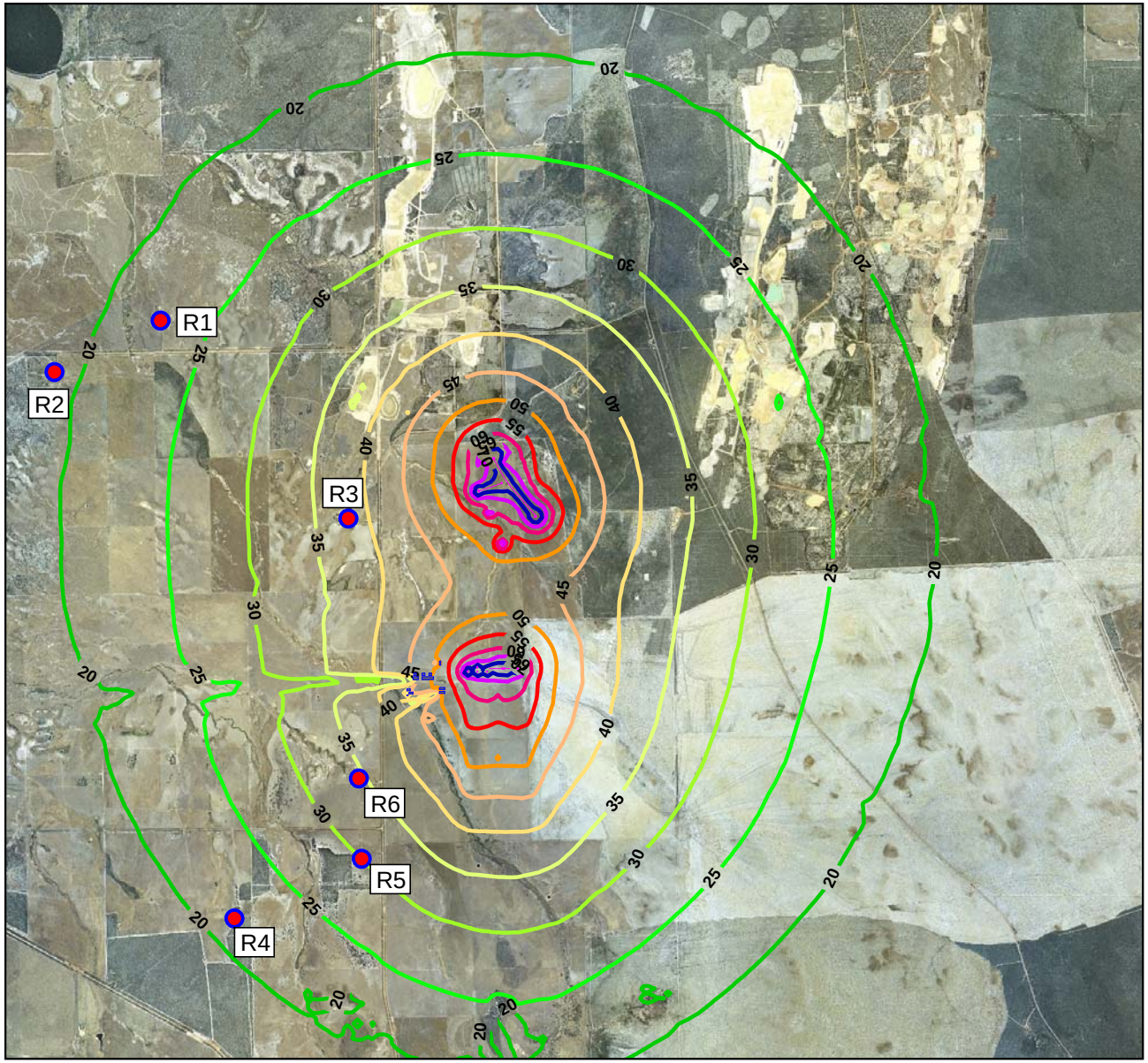
CENTRAL WEST COAL PROJECT - MID LIFE

Noise Contours for Worst Case Night-time Conditions - Prepared 4 Nov 08

Figure C2



Noise levels
dB(A)

20
25
30
35
40
45
50
55
60
65
70

Length Scale 1:100000

0 0.5 1 2 km

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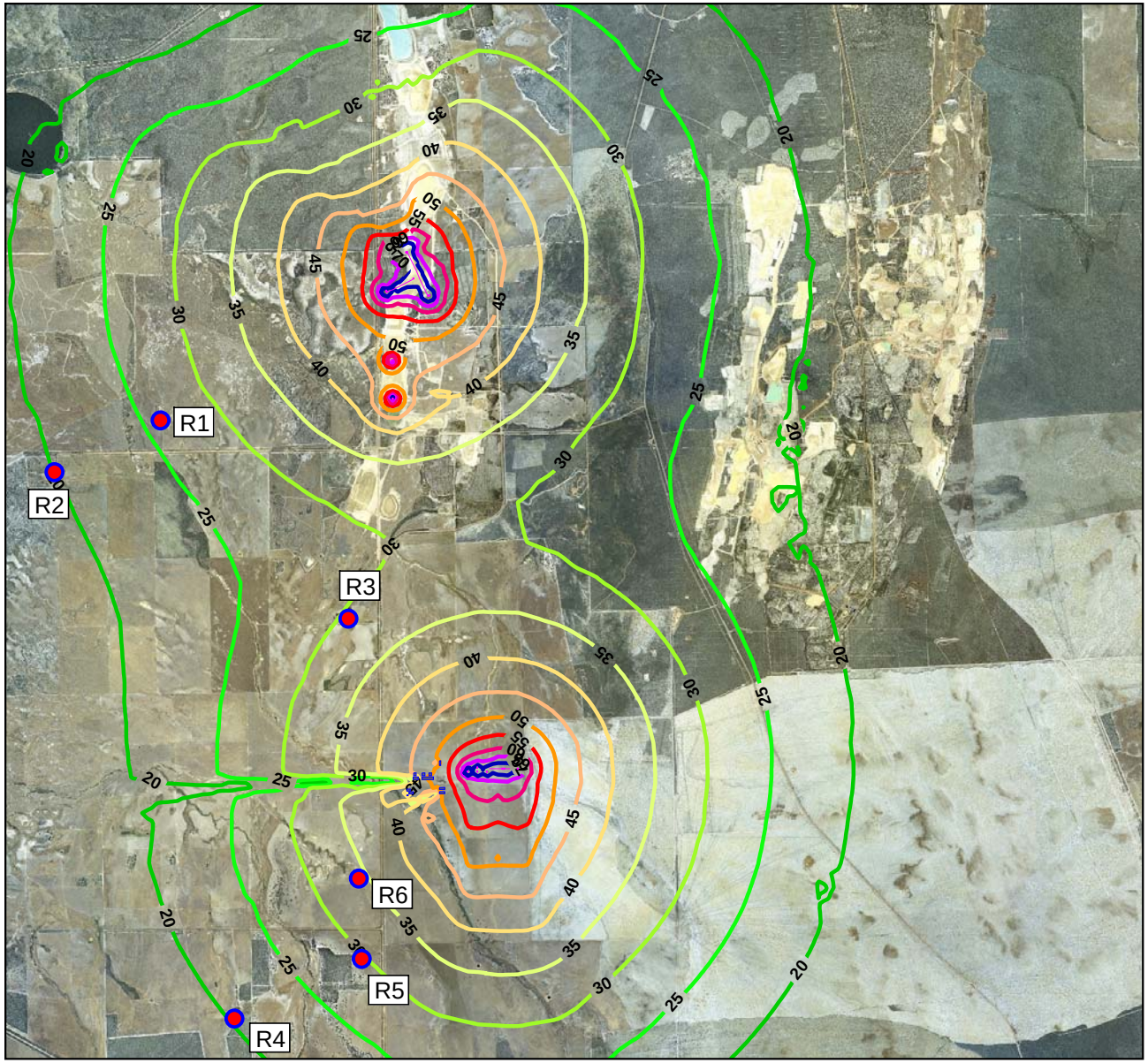
CENTRAL WEST COAL PROJECT - LATE LIFE

Noise Contours for Worst Case Night-time Conditions - Prepared 4 Nov 08

Figure C3



Noise levels
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