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Noise impact assessment
Wandoan Coal Project
Parsons Brinckerhoff Pty Ltd

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Contents

Predicted Noise Contours

Executive Summary

The development of the new open cut coal mine will introduce new noise sources into the existing rural environment directly west of Wandoan, Queensland. The scope of this noise impact assessment is for all the proposed activities within the Mining Lease Applications (MLAs) throughout the life of the mine based on the production rate of 30 million tonne of run of mine (ROM) coal per annum. Such activities include noise emissions associated with the following mining infrastructure and equipment:

- Draglines and mobile mining equipment
- Coal Handling and Processing Plant (CHPP)
- Rail spur
- Power generation plant

Other associated infrastructure and activities also included in this assessment but outside the MLA areas include:

- a waste water treatment plant at Wandoan
- potable water treatment plant at Wandoan
- a gas supply pipeline connection to the lateral Peat-Scotia Gas Pipeline
- construction haulage traffic along the Leichhardt Highway
- proposed airstrip

Receptors located within the Project study area were identified by an onsite study and through the Community Consultation process. The receptors are listed and identified in Table 6.

A background noise survey has been carried out at three locations to identify the existing noise environment in the area. The survey provides a basis for the determined design noise criteria based on the *Ecoaccess Guideline – Planning for noise control*. A virtual 3D model using SoundPLAN software has been created taking into account the natural ground contours, future pit locations, mining equipment and infrastructure locations as well as worst case meteorological conditions, which was generated as part of the Air Quality study for this Project. Separate models were created for various operating scenarios throughout the life of the mine which identified the worse case scenario emitted noise conditions experienced by all sensitive receptors. Noise predictions were carried out using the ISO 9613 method which by default incorporates meteorological conditions favourable for noise propagation. The predicted noise levels were then assessed against the applicable criteria (*Ecoaccess Guideline – Planning for noise control*). Any predicted exceedances were then remodelled with noise attenuation measures applied to determine if any additional mitigation measures were required.

Based on the results of the noise modelling for each operational scenario, minor exceedances were predicted at various receptors using sound power data for mining equipment in standard specification, without specific noise control treatments fitted.

It has been demonstrated that through the use of noise attenuation measures on appropriate mining equipment, the emitted noise levels can be controlled to within allowable limits for 24 hour operation during these scenarios at most receptors.

This is based on operations within the Frank Creek Pit being limited to truck and excavator removal of overburden with the potential for day time only operation towards the eastern development of the pit based on monitoring data at the most exposed receptors within Wandoan. It is also recommended that regular review of noise monitoring results be carried out at Receptor MLA-378 at Nathan Rd through out the whole project life due to predicted levels being close to or slightly exceeding the night time design criteria. Regular monitoring is also recommended at the most exposed receptors during each operating scenario.

A summary of the recommended mitigation measures to ensure compliance with the *Ecoaccess Guideline – Planning for noise control* near affected receptors for the Project are detailed below:

- implement resilient pads and coatings on dragline bucket jewellery
- broadband reversing sirens to be utilized on all equipment
- operation of Frank Creek Pit using truck and excavator method to remove overburden, rather than draglines
- review permanent monitoring data at Receptor MLA-378 at Nathan Rd (a very rural residence) at regular intervals especially during night time hours during all operation scenarios due to predicted noise levels being constantly close to or slightly exceeding the design criteria
- properties MLA-505 and MLA-595 should be acquired before the mining of Woleebee South Pit and Turkey Hill Pit respectively
- the abattoir (MLA 740 and MLA-741) should be acquired prior to commencement of mining
- use noise attenuated equipment as outlined in Table 9 of this report during specific scenarios at outlined locations as described in Section 8.1 of this report
- periodically monitor noise levels at the most exposed noise receptors as outlined in Section 8.1 of this report
- install a noise barrier approximately one meter from the southern and eastern sides of the cooling tower at the upgraded Potable Water Treatment Plant at Wandoan. The height of the barrier should be equal to the height of the cooling tower (approximately 3.6 m)
- develop an Operational Noise Management Plan in accordance with *Queensland Government Environmental Protection Agency Guideline – Preparing environmental management plans (March 2003)*.

1. Introduction

1.1 Project background

The Wandoan Coal Project (the Project) comprises the development of thermal coal resources situated west of the Wandoan township, located in the Dalby Regional Council local government area. The Project is located approximately 350 km northwest of Brisbane and 66 km north of Miles as shown in Figure 1. The coal reserves for this Project are covered by three mining lease applications, MLA 50229, 50230 and 50231 as shown in Figure 2. The coal resources are proposed to be developed as an open cut mine with related infrastructure. The mining of the coal resources will be undertaken using a combination of truck, excavator, dozer and dragline mining equipment. Coal will be mined at a rate of around 30 million tonnes per annum (Mtpa) run of mine (ROM) coal. The coal will be crushed, sized and washed before being transported by rail to port facilities in the Gladstone area.

The Project will be developed by the Wandoan Joint Venture (WJV). The joint venture partners are Xstrata Coal Queensland Pty Ltd (XCQ), ICRA RPW Pty Ltd and Sumisho Coal Australia Pty Ltd.

1.2 Description of study area

The study area encompasses infrastructure and activities to be carried out within the boundaries of the MLA area as shown in Figure 2. The terrain can be described as rolling with elevation differences of up to 100 m between the highest and lowest points within the MLA areas. The noise impacts are assessed at sensitive receptors surrounding the MLA areas.

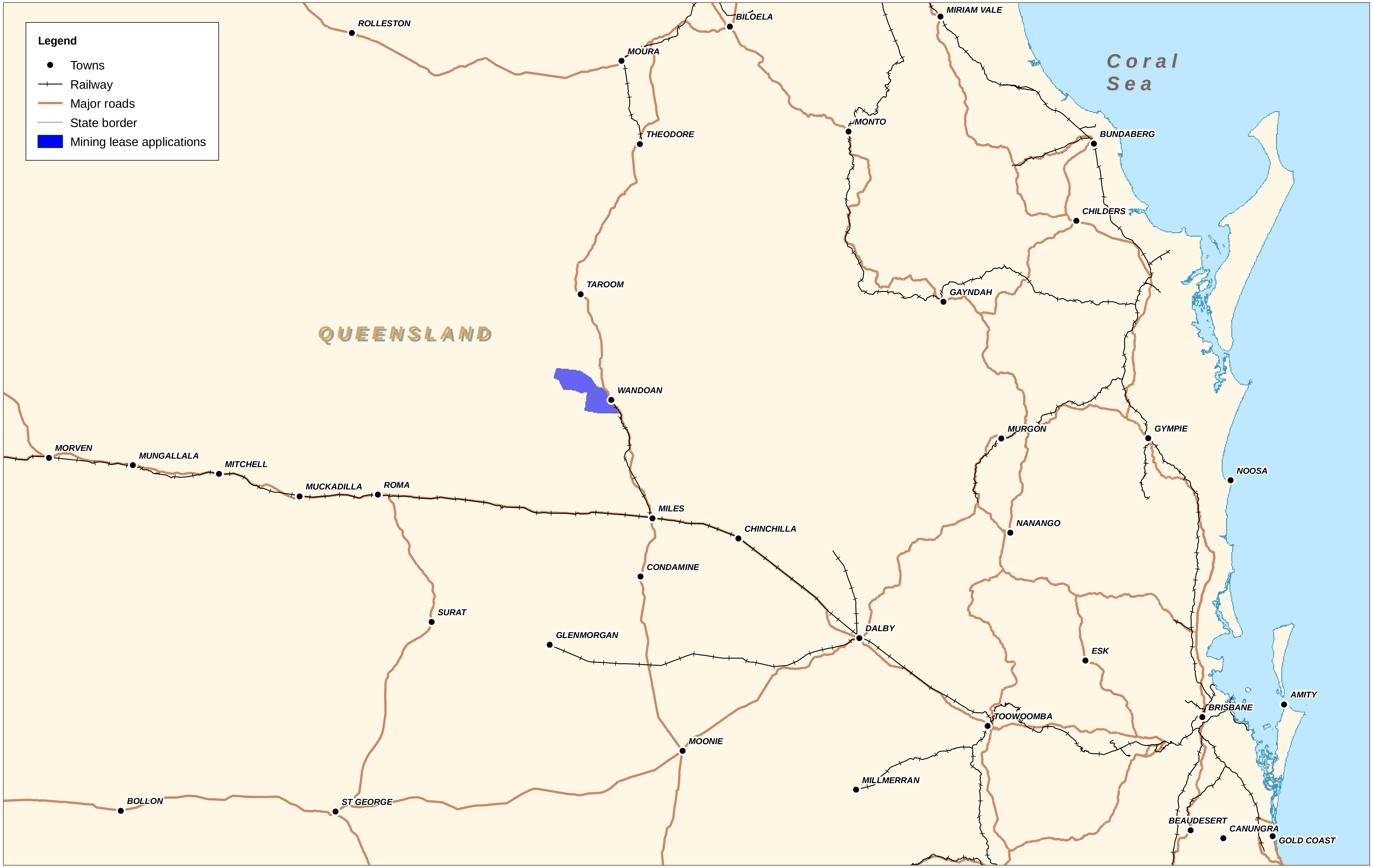
Other areas considered in this report include:

- the existing Wastewater Treatment Plant which is located on the eastern outskirts of the Wandoan township;
- the Potable Water Treatment Plant which is located in the Wandoan township approximately 100 m east from the Leichhardt Highway on the main entrance to the town; and
- the selected route for the Gas Supply Pipeline which begins approximately 25 km north-east of the MLA areas connecting into the Peat-Scotia Gas line.

Currently, agricultural land occupies the MLA areas with no major noise sources operating in the area.

1.3 This report

This report provides information on the existing environment including baseline noise monitoring (Section 3), the proposed development and applicable criteria (Sections 4 and 5), a description on the noise modelling methods and their predictions (Sections 6 & 7), and recommendations based on the modelling outcomes (Section 8).



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 1-1 Project Location.mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, Coastline , boundaries, 1:250K Topo, Geoscience Australia (2006)

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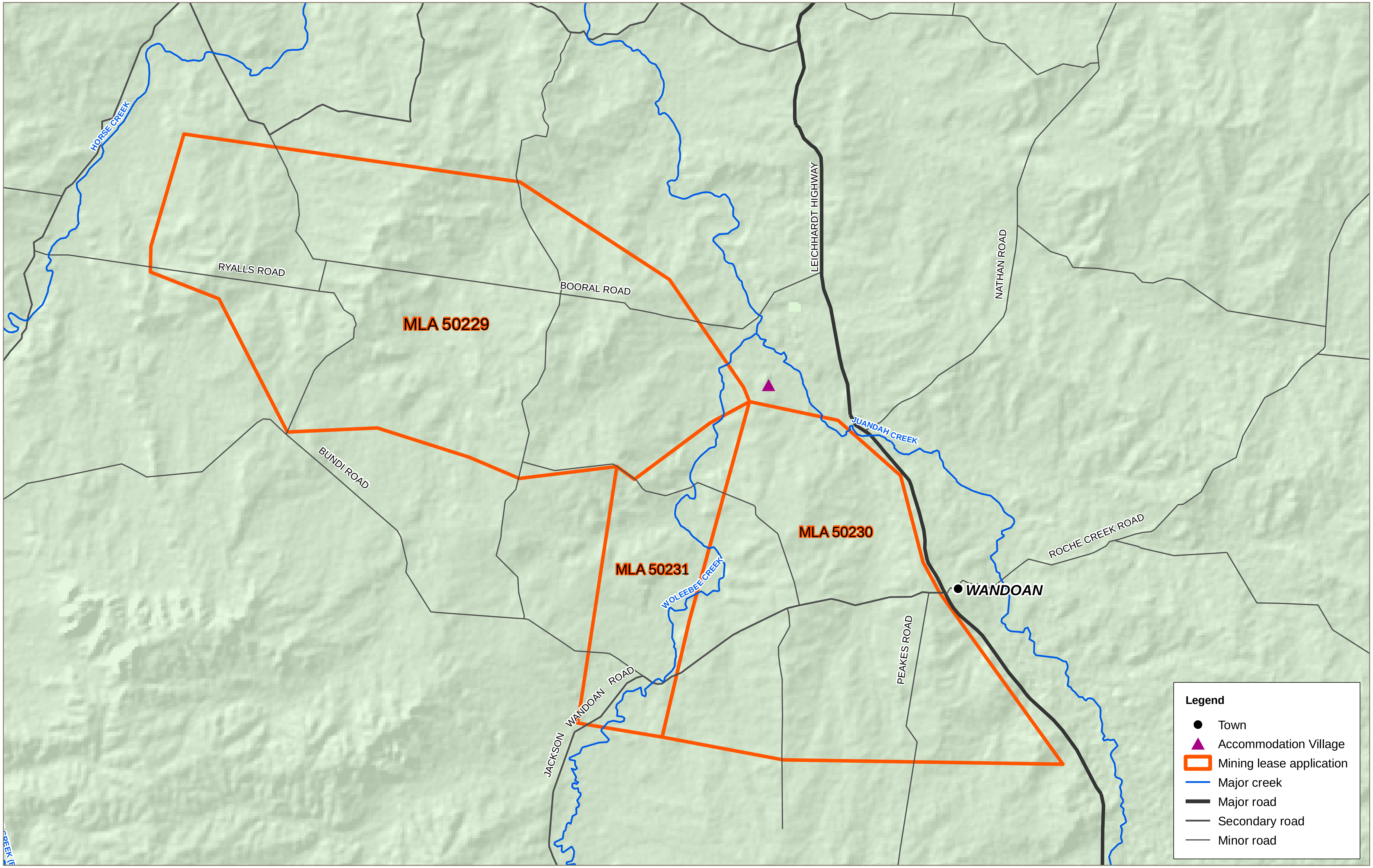
0 25 50 75 100 125
Kilometers

Figure 1
Project Location



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 1-2 Project Area.mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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0 1 2 3 4 5
Kilometers

Figure 2
Project Area

2. Methodology of assessment

2.1 Relevant legislation and guidelines

2.1.1 Environmental Protection (Noise) Policy 1997

Sections 8 and 10 of the *Environmental Protection (Noise) Policy 1997* (EPP (Noise)) provide guidance on how to achieve the objectives of the *Environmental Protection Act 1994* (EP Act) in relation to Queensland's acoustic environment. Under the EPP (Noise), the environmental values to be enhanced or protected are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

Section 11 of EPP (Noise) also provides a numerical value to determine an acoustic quality objective as follows:

- The "acoustic quality objective" is the objective of achieving an ambient noise level of L_{Aeq} 55 dBA or less for most of Queensland's population living in residential areas. The ambient noise level in a residential area is measured over 24 hours as the long term L_{Aeq} outside a dwelling in the area.
- It is intended that the acoustic quality objective be achieved as part of progressively achieving the object of EPP (Noise) over the long term.
- It is not intended that, in achieving the acoustic quality objective, any part of the existing acoustic environment be allowed to significantly deteriorate.

2.1.2 Ecoaccess Guideline – Noise – Planning for Noise Control

The recommended noise levels emitted from industrial sources (which include mines) are outlined in the *Ecoaccess Guideline – Planning for noise control* (Ecoaccess Guideline). Two noise criteria need to be satisfied for noise emission from the Project, being the specific noise level and the planning noise level.

Specific noise level

The specific noise level is based on the existing background noise and is summarised by the following equation:

$$L_{Aeq,\ 1\ hour} \leq minL_{A90,\ 1\ hour} + 3\ dB$$

Note: $minL_{A90,\ 1\ hour}$ is the adjusted Rating Background Level (RBL). RBL is defined as the median value of the measured Assessment Background Levels (ABL) for each period (day/evening/night). ABL is the tenth percentile measured background noise level ($L_{A90,T}$) during each measurement period (day/evening/night) for each 24 hours.

Under the Ecoaccess Guideline, a threshold background noise level of 25 dBA is required to be used if the measured RBL is below this value, on the basis that it is not possible to maintain background levels below 25 dBA as development occurs. This ensures a conservative baseline upon which noise impacts are to be assessed. Recommended outdoor background noise levels are shown in Table 1, as given in the Ecoaccess Guideline.

Table 1 Recommended outdoor background noise level

Receptor Land Use	Receptor Area Dominant Land Use (description of neighbourhood)	Background Noise Level, $minL_{A90,\ 1\ hour}$ (dBA) Time Period		
		Day	Evening	Night
Purely Residential	Very rural	35	30	25
	Rural Residential, church, hospital	40	35	30
	Shop or commercial office	45	40	35
	Light industry	50	45	40

The measured RBL is further adjusted based on a comparison with the values shown in Table 1 which determines the $minL_{A90,\ 1hour}$.

Planning noise level

The planning noise level (PNL) is based on the measured ambient noise level ($L_{Aeq,\ 1\ hour}$) of the receptor. Maximum noise levels from industrial noise sources for the type of noise receptor area are shown in Table 2.

Table 2 Estimated maximum values of planning noise levels (PNL)

Noise area category	Description of neighbourhood	Maximum hourly sound pressure level, $L_{Aeq,\ 1\ hour}$ (dBA) Monday to Saturday Sunday/public holidays		
		Day	Evening	Night
Z1	Very rural, purely residential. Less than 40 vehicles an hour	40	35	30
Z2	Negligible transportation. Less than 80 vehicles an hour	50	45	40
Z3	Low density transportation. Less than 200 vehicles an hour	55	50	45

The PNL from Table 2 is adjusted based on the measured ambient noise level from which the maximum PNL is determined by a set of conditions as outlined in the guideline.

The design criterion for the Project is then taken to be the lower of the specific level and maximum PNL for each time period (day, evening, night).

$$\textit{Design Criterion} = L_{Aeq,\ 1\ hour} - K_1 - K_2$$

Note: K_1 – tonal adjustment, K_2 – impulse adjustment,

Times of day are defined as:

- Day – 7 am to 6 pm;
- Evening – 6 pm to 10 pm;
- Night – 10 pm to 7 am; and
- On Sundays and public holidays: Day – 9 am to 6 pm.

The Ecoaccess Guideline requires inclusion of the effects of temperature inversions (if they occur) for at least 30 percent of the total night time period during the winter period (June, July and August).

2.2 How the noise survey was conducted and information obtained

The noise impact assessment is based on inputs from the environmental noise survey carried out by the Proponent in the study area, along with the design details established by the design team. Details of the environmental noise survey are set out in Section 3.2 below.

Noise measurements carried out by the Proponent were utilized to determine the applicable assessment criteria in accordance with the Ecoaccess Guideline and EPP (Noise)

The Project area site layout details consist of the natural topography with how it will be altered by pit and mine infrastructure locations.

Meteorological conditions for the area were determined as part of the Air Quality assessment for the Project, identifying the extent and frequency of conditions that are favourable for noise propagation to ensure conservative values were used.

A proposed schedule of the operating equipment was provided be Xenith Consulting along with operating scenarios throughout the life of the mine.

Noise emission data for the mining equipment and associated infrastructure (CHPP, power station, conveyors, and wastewater and potable water treatment plants) were provided by the respective manufacturers or measured at other coal mining operations similar the Project, as outlined in Section 6.2 of this report.

Rail spur noise emission data were provided by the Surat Basin Rail Project proponent, with relevant data included in this report.

An onsite assessment by PB has highlighted all of the occupied sensitive receptor locations within the study area a few kilometres from the MLA boundaries.

This information was used in SoundPLAN noise modelling software to create a virtual model of the development during each operating scenario. ISO 9613 was used as the noise dispersion model to predict the noise emissions from the site. The predicted noise level at each nominated sensitive receptor was then assessed against the applicable criteria to confirm compliance. Noise management and attenuation measures were then recommended where required. Further information on the selection process of model and modelling software is discussed in section 6.

2.3 Limitations

Several conservative limitations and assumptions are inherently included in the noise impact assessment process due to the extent and large area of the study. A noise survey was conducted at three locations to obtain a representation of the noise environment at those nearest receptors. This data was extrapolated to represent the noise environment at all the other sensitive receptors with similar location characteristics to the particular noise survey location. This is the practical limitation/assumption in assessing the existing noise environment at each of the receptors.

The models used are theoretical in nature and are known to be conservative in their predictions of noise levels. Actual noise levels will depend on the constantly changing weather conditions in the form of fluctuating wind speeds, wind direction and the degree of atmospheric stability, all of which can significantly affect noise levels at each individual receptor. The predicted noise levels are based on the assumption that the worst case meteorological conditions will occur constantly for the one hour assessment period.

The majority of noise sources were constantly mobile over the assessment period leading to estimations of their positions as well as assumptions of full power operation throughout the mining process (unless stated otherwise in Section 6.2). In addition, noise emissions are assumed to be omnidirectional. Both of these assumptions have led to conservative estimates of noise emissions. This is in contrast to environmental noise impacts of other industrial developments where the majority of the emitted noise levels are associated with stationary plants leading to more accurate predictions at the receptors which are less conservative.

Current noise models are based on empirical corrections to account for shielding by topography, reflections, ground absorption and meteorological conditions. Section 6.1 of this report discusses the limitations of the propagation algorithms in more detail.

The equipment schedules and snapshots for the scenarios below do not reflect the equipment designation throughout that whole year, rather during the specific time in that operational year that has been modelled. Due to the mobile nature of the mining equipment, the area of operation for each piece of mining equipment will vary in between the Scenario years modelled in accordance with mining schedule for every year of operation.

3. Existing environmental values

3.1 Location of sensitive receptors

Sensitive receptors consist of locations at which specific noise levels have to be met and range from residential dwellings, commercial properties, industrial developments to community buildings and facilities. Figure 3 shows the general location of sensitive receptors around the MLAs. Dwellings that are not marked in the vicinity or within the MLAs are not treated as sensitive receptors, as the WJV is currently consulting with owners with a view to acquiring those properties. The accommodation facilities have not been treated as a sensitive receptor as it is part of the mine development. Standard façade construction of the dwellings at the accommodation facility will provide sufficient noise attenuation to provide suitable noise levels within living and sleeping areas as outlined in *AS 2107 "Acoustics – Recommended design sound levels and reverberation times for building interiors", 2000*. No areas of passive recreation were identified to be potentially affected by the Project. An abattoir is located on Lots 156 & 53 on FT 931 which are located within the MLA area.

3.2 Environmental noise survey

Permanent noise logging equipment (using the Svantek 959 Type 1 sound level meter with an omnidirectional microphone and appropriate wind shield) have been installed at three locations (shown in Figure 4) within the vicinity of the MLA areas representing three different types of noise environments in the area:

- N1 Nathan Road – open rural with slight traffic noise contribution, 200 m north from Nathan Road, 1 km east from the Leichhardt Highway
- N2 Wodonga – open rural with no traffic noise contribution, 4 km west of Leichhardt Highway
- N3 Town – town noise, east of Leichhardt Highway

A permanent Project weather station was installed on the Project site (at the property named Jondale) and has been recording weather conditions since April 2007. Those recorded weather conditions have been used to inform calculations and conclusions reached in this report.

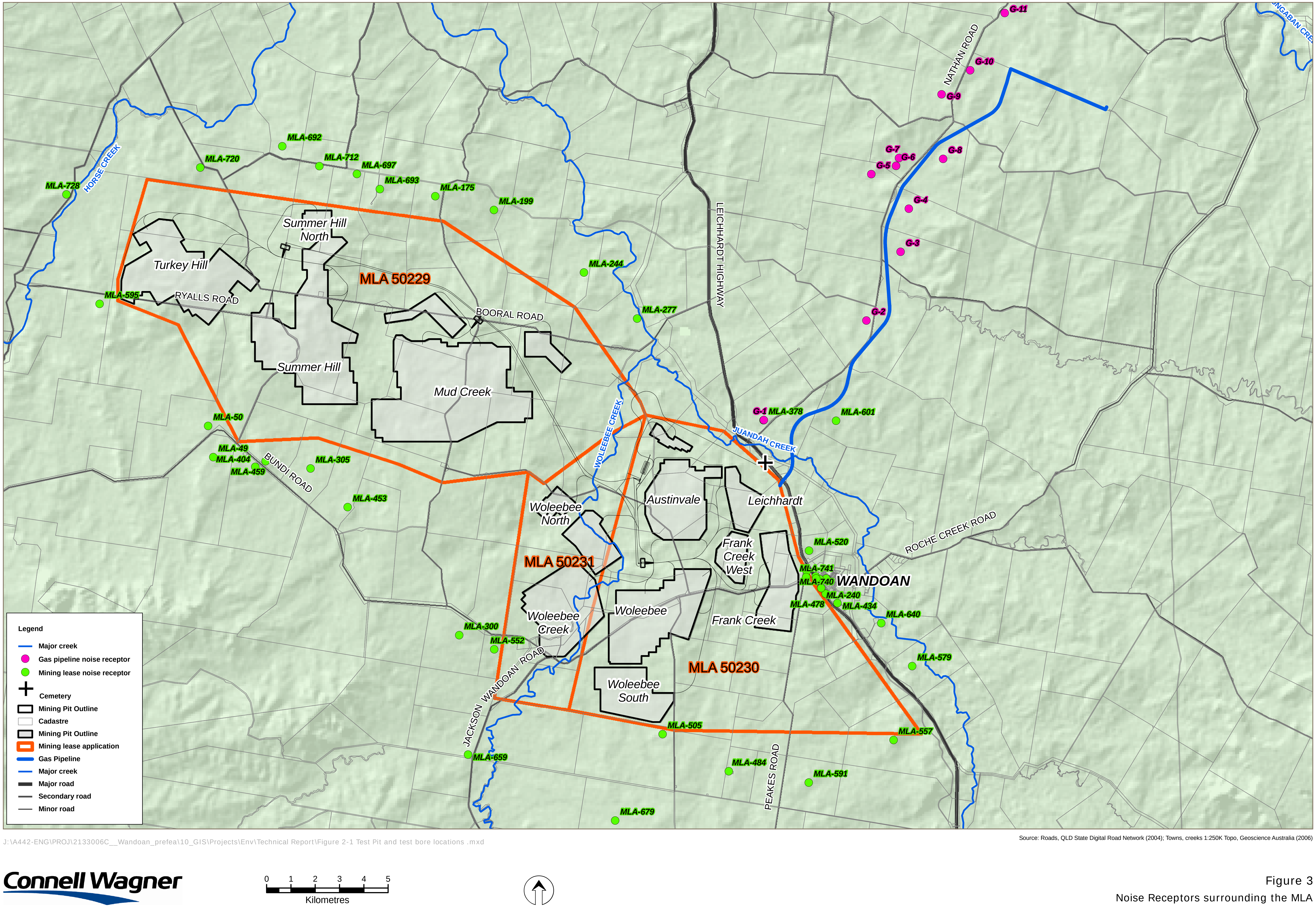
Noise logging data collected from 8 March 2008 through to 3 April 2008 has been analysed to determine the applicable noise criteria. Subsequent logging data (to August 2008) has been analysed and determined that noise criteria set out below remain unchanged. The collected data was filtered to exclude measurement periods when rainfall occurred or when wind speed was in excess of 5 m/s (as per *AS 1055.1 "Acoustics – Description and measurement of environmental noise Part 1: General Procedures", 1997*). The averages of the results of the noise logging are shown in Table 3 with Attachment B showing the collected raw data before analysis. Subsequent logging data (to August 2008) has been analysed and determined that noise criteria set out below remains unchanged.

Table 3 Summary of noise logging results

Time	N1 Nathan Road		N2 Wodonga		N3 Town	
	Average L_{eq} (dBA)	RBL (dBA)	Average L_{eq} (dBA)	RBL (dBA)	Average L_{eq} (dBA)	RBL (dBA)
Day	48	26	45	25	39	26
Evening	49	30	47	35	36	27
Night	38	18	38	19	32	24

3.3 Existing noise sources

Existing noise sources in the area consist predominately of traffic noise along the Leichhardt Highway as well as intermittent agricultural activities. Evening and night time noise is likely to be dominated by insects which can be observed by heightened noise levels at the exposed very rural locations of N1 Nathan Road and N2 Wodonga measurement locations. N3 Town noise during the night would be associated predominately with occasional activity such as a car drive and operation of any domestic appliances. Other noise sources in the town area consist of a timber mill, cattle trucking station and a grain silo facility.



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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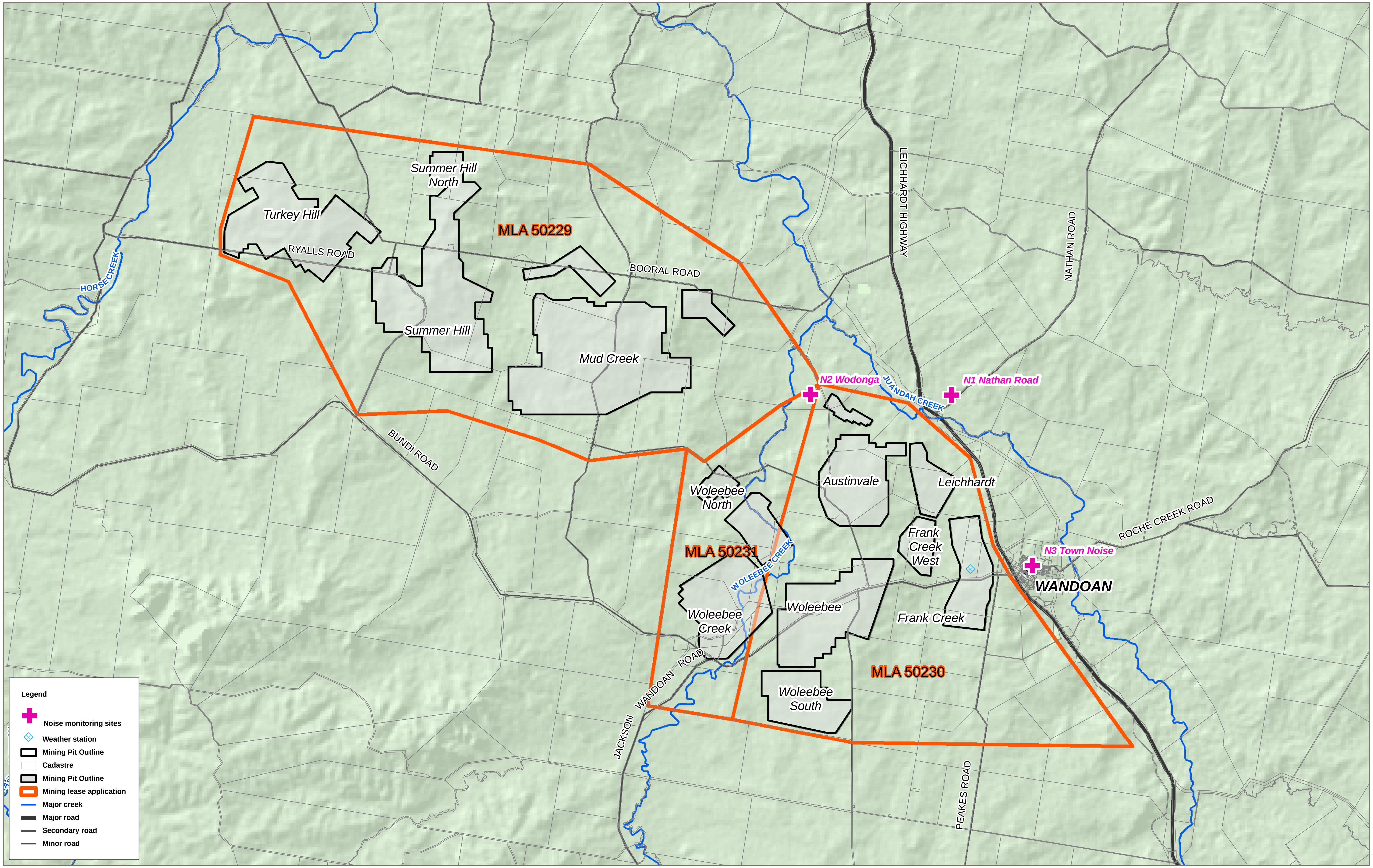
Figure 3

Noise Receptors surrounding the MLA



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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0 1 2 3 4 5
Kilometres

Figure 4
Noise Monitoring Locations

3.4 Meteorological conditions

The Air Pollution Model (TAPM) is a prognostic meteorological prediction software tool that has been used to determine atmospheric stability characteristics specific to the region in the vicinity of Wandoan for an entire year, and was assimilated with observed data from the Wandoan (Jondale) meteorological site for April 2007 to March 2008 to ensure accurate predictions. A detailed description of TAPM as well as associated meteorological parameters and effects are discussed in the Air Quality assessment for this Project in Chapters 7 (Climate) and 13 (Air Quality) of the EIS and the associated technical report.

Figure 5 below shows the annual frequency of wind speeds during all times of day. Figure 6 shows the frequency distribution of wind speeds during night time hours only. Figure 7 shows the annual wind rose which identifies that the wind predominantly occurs from the easterly directions.

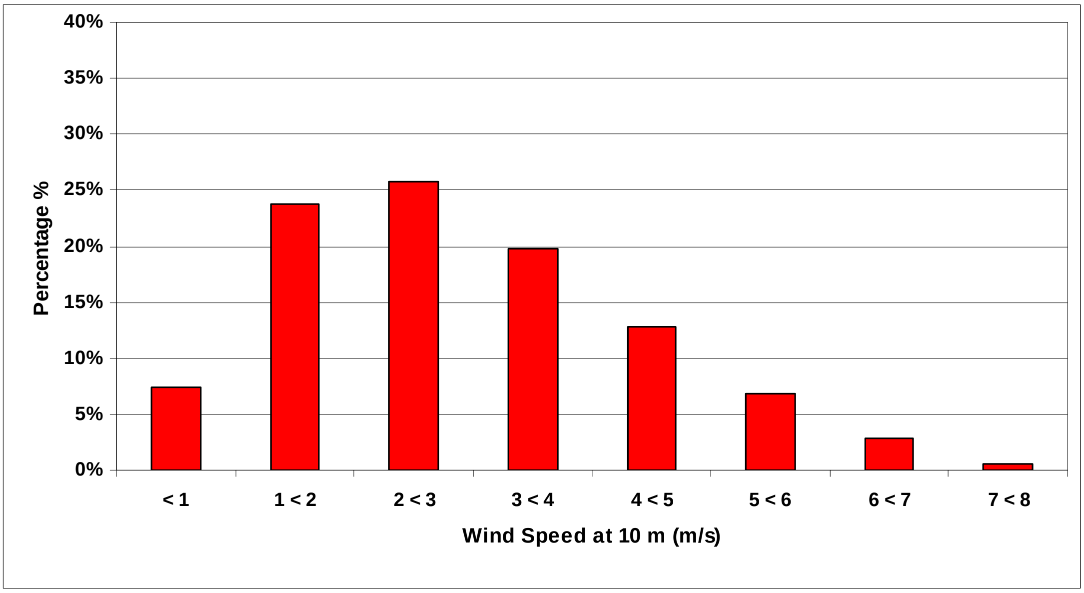


Figure 5 Annual frequencies of wind speeds (m/s) at 10 m above ground (daytime and night time)

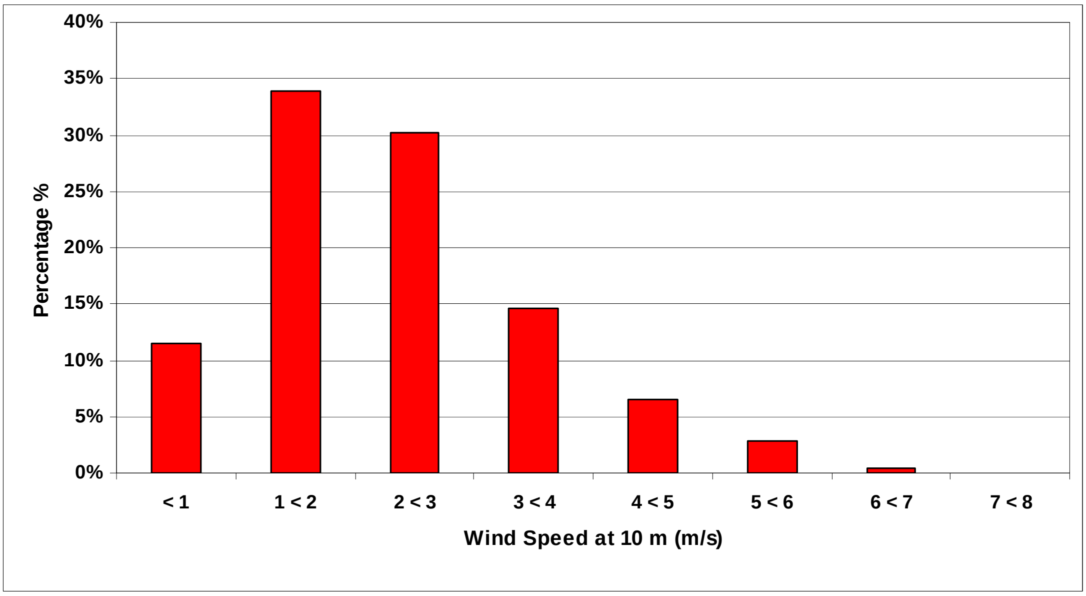


Figure 6 Annual frequencies of night time wind speeds (m/s) at 10 m above ground

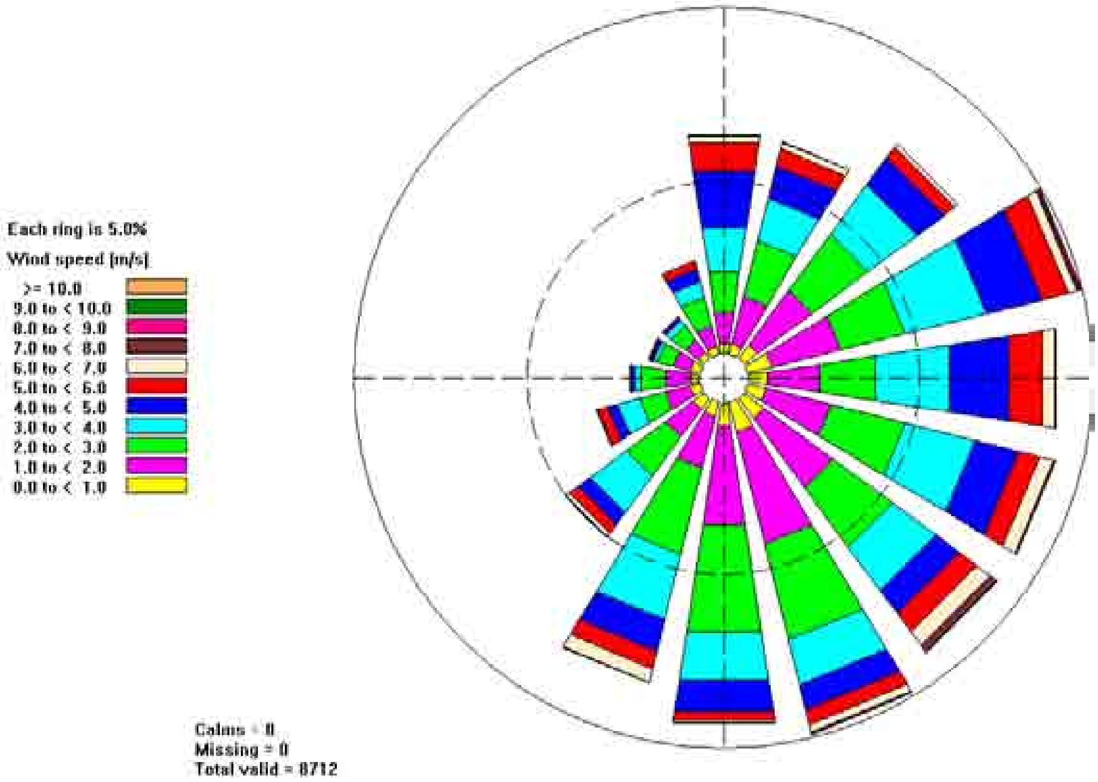


Figure 7 Annual wind rose at 10 m above ground

Based on this data, the worse case wind conditions for noise propagation (ie when the receptor is down wind from the source) occurs for the receptors in Wandoan when the wind is blowing from North West through to South South West. This occurs for approximately 21% of the time which equates to approximately 77 days annually.

Atmospheric stability plays an important role in the propagation of sound over long distances. Pasquill Stability criterion (as outlined by *Pasquill 1961*) classifies atmospheric stability from Class A – "very unstable" through to Class G – "extremely stable" with Class D signifying neutral conditions.
The degree of stability in the atmosphere is determined by the temperature difference between an "air parcel" and the air surrounding it. This difference can cause the "air parcel" to move vertically and this movement is characterised by four basic conditions that describe the general stability of the atmosphere as follows:

- **Stable** conditions occur when vertical movement is discouraged
- For **unstable** conditions the "air parcel" tends to move upward or downward and to continue that movement
- **Neutral** conditions neither encourage nor discourage that movement beyond the rate of adiabatic heating or cooling
- An **inversion** occurs when conditions are **stable** (ie Stability Class E, F or G), cooler air near the surface is trapped by a layer of warmer air above it and there is virtually no vertical air motion

Conditions favourable for sound propagation occur during temperature inversions as the temperature increases with altitude which results in emitted sound waves being refracted back down towards ground level. Figure 8 shows the annual atmospheric stability classes. These conditions are prevalent from approximately one hour before sunset to one hour after sunrise. Figure 9 shows the annual atmospheric stability for the study area during night periods.

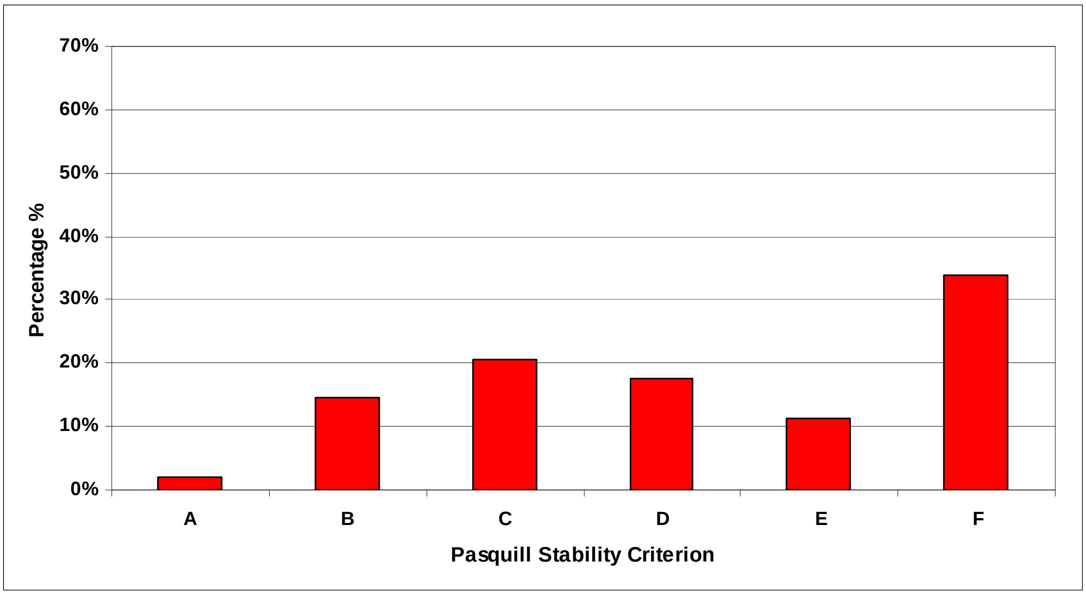


Figure 8 Annual atmospheric stability frequencies

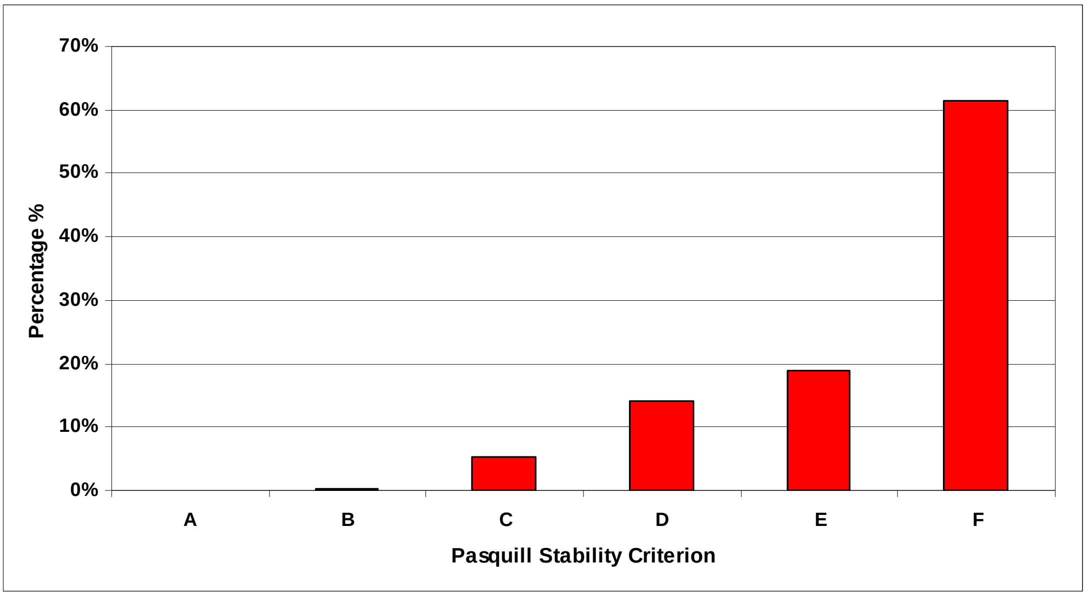


Figure 9 Annual atmospheric stability frequencies during night times only at the study area

It can be seen from Figure 9 that stable conditions (hence temperature inversions) occur for approximately 80% (Stability Criterion E + F) of the time during the night periods throughout the year. Since stable conditions are generally more likely to occur during winter, it can be assumed that the Ecoaccess Guideline criterion to assess the effects of temperature inversions (which is the occurrence of temperature inversions for 30% of the total night-time period during winter months) has been satisfied triggering further assessment during noise modelling.

Noise modelling has been carried out using the ISO 9613 propagation model which takes into account wind speeds between 1 and 5 m/s blowing source to receptor as well as well-developed moderate ground based temperature inversions. The Ecoaccess Guideline identifies that "moderate" temperature inversions occur during Class F stability category. This signifies that the default meteorological settings in the ISO 9613 propagation model are appropriate for worse case noise emission predictions as they represent the conditions to be experienced at the Project area, therefore no meteorological correction factors are required to be implemented in the model. The Ecoaccess Guideline also notes that "drainage-flow wind" conditions can occur concurrently with a moderate (3°/100 m) temperature inversion, however drainage-flow conditions only occur in valleys with undulating terrain or an incline.

4. Description of the Project

4.1 Development profile

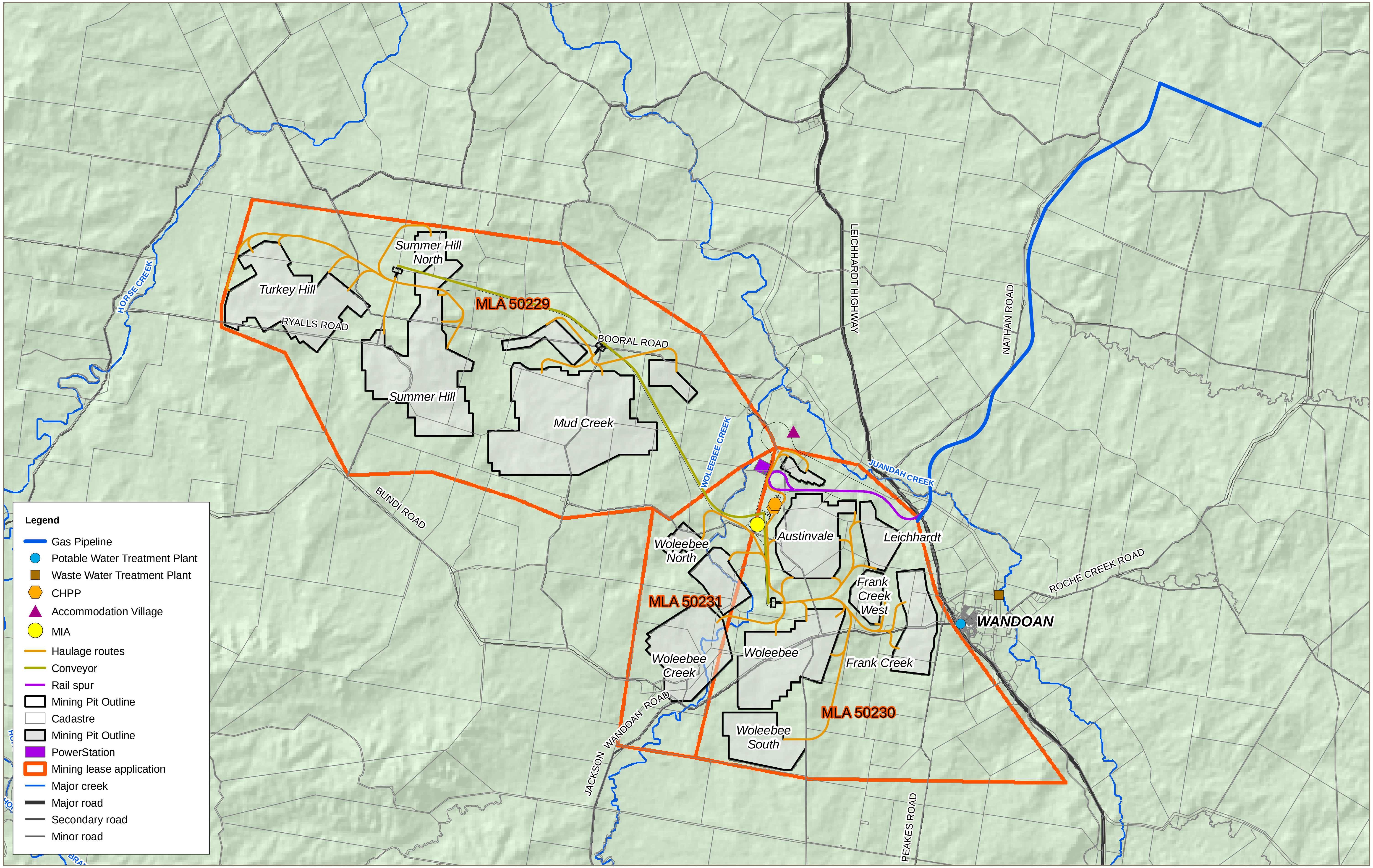
The Project consists of an open cut mine to be located adjacent the Wandoan township which is located in south western Queensland approximately 350 km north west of Brisbane along the Leichhardt Highway.

Consisting of three adjoining mining lease application (MLA) areas and located on the western side of the Leichhardt Highway, the Project is proposed to produce 30 million tonnes per annum (Mtpa) of ROM coal by the third year of operation.

Approximately fifteen distinct mining pits have been identified with a predicted mining schedule of 30 years. Infrastructure on site will consist of haul roads, coal handling and processing plant (CHPP), gas-fired power station (if this power supply option is chosen), an onsite rail spur as well as draglines and mobile mining equipment, accommodation facilities and airstrip. Table 4 outlines the peak operating mining equipment schedule for the site which likely occur in Years 23-26 of operation. The proposed layout of the mine and its infrastructure is shown in Figure 10, with Figure 11 displaying the infrastructure in the vicinity of Wandoan.

Table 4 Peak operation equipment schedule

Equipment	Quantity
Dragline	5
Dozer	24
Dump Truck	27
Excavator (Medium)	2
Excavator (Small)	1
Front End Loader	2
Grader	3
Overburden Drill	7
Water Truck	3



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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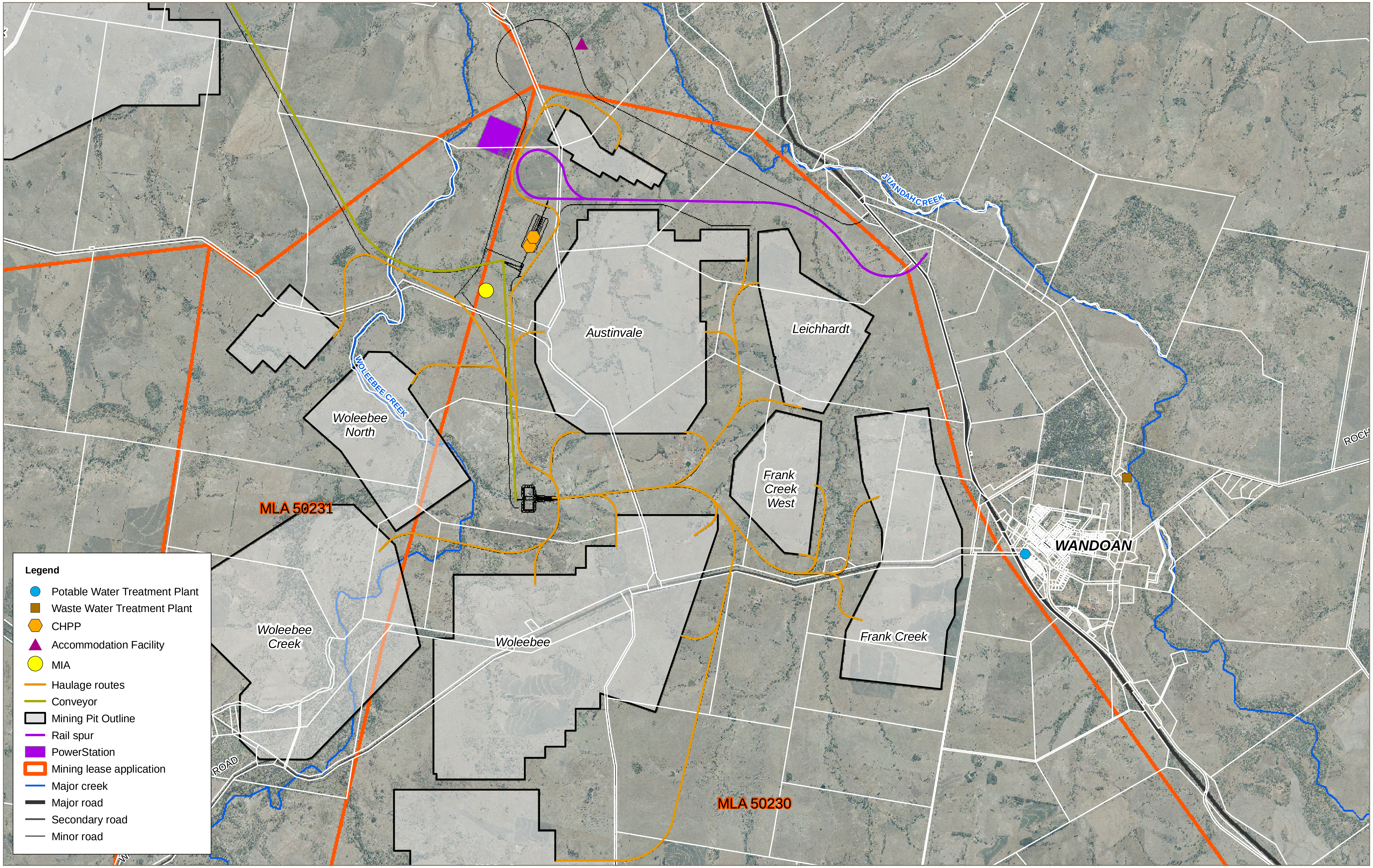
0 1 2 3 4 5
Kilometers

Figure 10
Proposed Infrastructure and mining pits



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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0 0.5 1 1.5 2 2.5
Kilometers

Figure 11
Proposed Infrastructure and mining pits near Wandoan

4.2 Associated infrastructure

4.2.1 Coal Handling and Processing Plant

The CHPP is the collective name for the infrastructure required to process the ROM coal into appropriate standard product, which is then loaded onto train wagons for transport from the site. The processing plant is broken up into several stages:

- ROM Receival and Raw Coal Handling:
  - ROM coal is fed and primarily crushed at three mine located dumps.
  - Coal is transferred by up to two open overland conveyors to a central bin for further processing.
- Coal Processing Plant (the Wash Plant):
  - Recycled and makeup water is added to the raw coal before deslimed using various screens and cyclones.
  - Final coal separation occurs with reject material in the form of coarse reject and desliming cyclone overflow separated from the product coal.
- Rejects Handling:
  - Coarse rejects are transferred by conveyor into rejects bins and discharged onto trucks.
  - Desliming thickener overflow is pumped into tailings dams with recovered water reused.
- Product Coal Handling and Train Load Out:
  - Product coal is delivered by conveyor to one of two bucket wheel stacker/reclaimers discharge coal on to one of two 300,000 t stockpiles.
  - Product coal is reclaimed by the stacker/reclaimer onto a final conveyor which transfers it into a train loading bin.

4.2.2 Rail spur

A balloon loop rail spur has been included within the MLA allowing up to four trains of 2,400 m length to be located in the loop (two arrival, one departure, one holding). Each train will have a coal capacity of approximately 11,400 t with an approximate loading time of 3.5 hours per train.

4.2.3 Power generation

Four options are considered for the substantial power generation required to provide sufficient electrical power to run the processing plant and associated infrastructure.

- Option 1
  - Total supply via a new 132 kV or 275 kV electricity transmission line, from a new substation adjacent to the 275 kV Callide to Tarong line, near Auburn River, east of Wandoan, to a substation at or adjacent to the MLAs
  -
- Option 2
  - Total supply via a new 132 kV electricity transmission line from the Columboola Switchyard east of Miles, which is currently under construction, to a substation at or adjacent to the MLAs
- Option 3
  - An on-site 80 MW gas fired power station likely to be located on MLA 50231 comprising of twelve gas dual fuel engines, each with 8 MW of electrical output. Ten units will operate at a time and two will be on standby
- Option 4
  - Partial supply from a new 132 kV electricity transmission line, and balance of supply from on-site 30 MW on-site gas fired power station likely to be located on MLA 50231. The power station will comprise of six dual fuel gas engines, each with 8 MW of electrical output. Four units are expected to operate at a time with two units on standby mode.

Option 3 is considered to generate the highest levels of noise emissions of the 4 options (the worst case) for noise emissions given the maximum amount of noise emitting equipment to be located on site. Compliance with Option 3 ensures that compliance will occur under Option 4, therefore only Option 3 has been considered during the assessment.

Options 1 and 2 would not be a source of noise generation on site (other than during construction) and has not been considered further in this operational noise assessment.

The infrastructure to be built on the Project area for Option 3 is proposed to include a 2,800 m^2 engine hall, twelve chimneys reaching a height of 21 m, each with a 1.5 m diameter, a switch yard including transformers and cooling radiators along with associated administration buildings.

4.2.4 Municipal wastewater treatment plant

The location of the Wastewater Treatment Plant (WWTP) is approximately 1 km north east of the centre of Wandoan, on the edge of town. The WWTP is located in an area of bushland with the adjacent neighbour to the WWTP being of a golf course.

In order for the Project to utilise the WWTP the proposed upgrades to the plant are as follows:

- improvement of inlet head works;
- Imhoff tanks;
- sludge drying beds;
- baffles for ponds;
- floating aerators;
- flow control structures between ponds; and
- sludge management.

4.2.5 Municipal potable water treatment plant

The existing potable water treatment plant is located as part of the Borehole No 1 infrastructure. This is located within the Wandoan township approximately 100 m east of the Leichhardt Highway on the main entrance to the town. Currently the system comprises of:

- a ground level treated water storage capacity in two tanks of 450 kL and 1,200 kL;
- an elevated storage tank of 136 kL capacity, which pressurizes the system during the night time period;
- a pump station delivering treated water directly to system or elevated storage which pressurises the system during daytime operation
- aeration unit – Cascade tray type;
- a flocculation tank;
- a Lamella Clarifier; and
- two filters.

In order for the Project to utilise the plant the proposed upgrades to the system will include:

- an additional coagulation dosing pump;
- an additional chlorine dosing pump;
- an upgrade to higher capacity submersible borehole pumps;
- a pump station and rising main to mine facilities; and
- a new water cooling tower (7.5 kW fan size).

4.2.6 Gas supply pipeline

If the option of on-site power generation is chosen as the preferred supply, a connection to the nearby Peat-Scotia Gas line has been identified as a potential fuel source for the on-site power generation requirements. The pipeline (if constructed) will consist of approximately 25 to 30 km of underground pipe with 500 - 700mm depth of cover and construction through a section trench and backfill method. The sensitive receptors in the vicinity of the pipeline are shown Figure 3, with the closest identified receptor (G-2) being located 600 from the route.

4.2.7 Highway traffic

Traffic volumes along the existing road infrastructure (especially along the Leichhardt Highway) have the potential to increase during both the construction and operational phase of the Project, leading to additional noise exposure for sensitive receptors. Chapter 12 of the EIS and the associated technical report of Volume 1 of the EIS outline the expected increases in traffic volumes as a result of the Project.

4.2.8 Airstrip

A tentative location of the airstrip within the MLA has been selected. A separate noise study will be carried out with regards to noise associated with aircraft traffic. This study requires details of aircraft models to utilise the airstrip, predicted aircraft takeoff and landing frequency, flight path predictions and runway specification. This information has to be modelled using Integrated Noise Model (INM) software (or similar) to determine applicable aircraft noise contour charts. Therefore noise impacts from the airstrip have not been taken into account in this study.

5. Assessment criteria

5.1 Operational noise

Applicable assessment noise criteria are based on the environmental noise survey results conducted in the vicinity of the proposed Project area as described in section 3.2. Table 5 shows the calculated noise criteria applicable to various types of receptors in each area. Criteria and assessment of blasting activities have been addressed separately in Chapter 16 and the associated technical report of Volume 1 of the EIS. Attachment C provides a step by step example how each assessment criteria was calculated in accordance with the *Ecoaccess Guideline* which is outlined in Section 2.1.2.

Table 5 Operation Assessment noise criteria

Location	Receptor Type	Time of day	Assessment Criteria $L_{Aeq,1hr}$ (dBA)
N1 Nathan Road	Very Rural Residential	Day	34
		Evening	28
		Night	28
N2 Wodonga	Very Rural Residential	Day	33
		Evening	28
		Night	28
N3 Town	Very Rural Residential	Day	34
		Evening	30
		Night	28
	Rural Residential, Church, Hospital	Day	34
		Evening	35
		Night	31
	Shop or Commercial Office	Day	34
		Evening	35
		Night	32
	Light Industry	Day	50
		Evening	45
		Night	40

The criteria from the three background noise monitoring sites can be applied to the assessment of neighbouring properties which are expected to contain similar background noise, as outlined in Table 6. As the guidelines do not provide explicit noise criteria for cemeteries, the set criterion of $L_{Aeq,1hr}$ 40 dBA is based on the day time recommended outdoor background noise level for a church in a residential area.

Table 6 Representative background noise sites with similar design noise criteria

Receptor	Lot	Plan	Relevant Noise Survey Location	Receptor Type
Cemetery	-	-	-	Rural Residential, Church, Hospital
MLA-378	1	RP144130	N1 Nathan Road	Very Rural Residential
MLA-601	22	FT746	N1 Nathan Road	Very Rural Residential
MLA-520	36	FT981	N1 Nathan Road	Very Rural Residential
MLA-706	47	CP868426	N3 Town	Rural Residential, Church, Hospital
MLA-616	-	-	N3 Town	Rural Residential, Church, Hospital
MLA-718	162	FT999	N3 Town	Rural Residential, Church, Hospital
Town Centre	-	-	N3 Town	Rural Residential, Church, Hospital
MLA-240	-	-	N3 Town	Shop or Commercial office
MLA-478	1	RP170166	N3 Town	Rural Residential, Church, Hospital
MLA-434	2	RP147174	-	Light Industry
MLA-640	2	SP106043	N1 Nathan Road	Very Rural Residential
MLA-579	29	FT130	N1 Nathan Road	Very Rural Residential
MLA-557	3	FT695	N1 Nathan Road	Very Rural Residential
MLA-591	59	FT105	N2 Wodonga	Very Rural Residential
MLA-484	1	RP110817	N2 Wodonga	Very Rural Residential
MLA-679	24	FT41	N2 Wodonga	Very Rural Residential
MLA-659	2	RP123884	N2 Wodonga	Very Rural Residential
MLA-505	6	FT788		
MLA-552	16	FT1012	N2 Wodonga	Very Rural Residential
MLA-300	15	FT161	N2 Wodonga	Very Rural Residential
MLA-453	30	FT468	N2 Wodonga	Very Rural Residential
MLA-305	29	FT467	N2 Wodonga	Very Rural Residential
MLA-459	28	FT467	N2 Wodonga	Very Rural Residential
MLA-404	15	SP180948	N2 Wodonga	Very Rural Residential
MLA-49	14	FT165	N2 Wodonga	Very Rural Residential
MLA-50	1	SP210618	N2 Wodonga	Very Rural Residential
MLA-595	38	AB188	N2 Wodonga	Very Rural Residential
MLA-728	131	SP121742	N2 Wodonga	Very Rural Residential

Receptor	Lot	Plan	Relevant Noise Survey Location	Receptor Type
MLA-720	72	FT590	N2 Wodonga	Very Rural Residential
MLA-692	70	FT590	N2 Wodonga	Very Rural Residential
MLA-712	39	FT503	N2 Wodonga	Very Rural Residential
MLA-697	40	FT503	N2 Wodonga	Very Rural Residential
MLA-693	41	CP857459	N2 Wodonga	Very Rural Residential
MLA-175	42	FT505	N2 Wodonga	Very Rural Residential
MLA-199	43	FT506	N2 Wodonga	Very Rural Residential
MLA-244	45	FT507	N2 Wodonga	Very Rural Residential
MLA-277	50	FT508	N2 Wodonga	Very Rural Residential

5.2 Construction noise

There are no specific limits or guidelines specified in the *EPP (Noise)* which relate to noise and vibration generated from construction activities. It is therefore expected that these activities meet the general environmental duty as outlined in section 319 of the *EP Act*. NSW Department of Environment and Climate Change have set criteria for allowable noise emissions from construction activities, however it is also stated on their website that:

> *The criteria may not be applicable to long-term construction such as coal mines, which may take several years. Variations should be made according to local conditions.*

The *Environmental Protection Regulation 1998* (*EPR*) provides a de facto construction noise standard, by providing that that it is an offence to carry out building works on a building site in a way that makes or causes audible noise from the building work on a Sunday or a public holiday at any time, or on a Saturday or business day before 6.30am or after 6.30pm.

Recommended best practice management and mitigation measures to ensure compliance with the EPR are set out in section 8.2 below.

It is assumed that “construction activities” include building activities associated with construction of machinery and infrastructure on site (CHPP, power station (if option chosen), conveyors, stockpile areas, gas pipeline and water treatment upgrades), construction of buildings, haulage road construction and rail spur construction. Removal of overburden is considered to be part of the mining activity and is assessed against the operational noise criteria outlines in Section 5.1.

6. Noise model

6.1 Propagation algorithm

6.1.1 General

The prediction of noise in the environment requires the definition of the sound power level and frequency spectrum of the noise sources as well as any associated directivity for each source and the estimation of noise propagation for each source based on:

- geometric spreading;
- enclosures;
- barriers;
- air absorption;
- wind effects;
- temperature gradient effects; and
- ground effects.

Various prediction methods have been developed over the past thirty years and continue to be developed to more accurately account for environmental effects which are strongly dependent on meteorological conditions. In 2003, the *European Directive 2002/49/EC relating to the Assessment and Management of Environmental Noise* was accepted, acknowledging a lack of harmonised methods of sufficient accuracy for the prediction and assessment of noise from roads, railways and industrial sites. It was considered a main priority in the Harmonise project to improve the description of weather conditions and their influence on sound propagation, because the state-of-the-art methods for noise prediction do not fully account for these effects. For this reason, TAPM was used to properly account for meteorological effects in this assessment, as discussed previously.

SoundPLAN noise modeling software was used for this analysis. It incorporates various analysis methods including:

- German - VDI 2714/2720
- United Kingdom - CONCAWE
- Norwegian – NORD2000
- International - ISO 9613

NORD2000 is rarely used in Australia, hence only CONCAWE and *ISO 9613* are summarised below, with reasoning given as to the preferred method used for this assessment.

6.1.2 CONCAWE

The CONCAWE method (as outlined by *Manning 1981*) for calculating noise attenuation due to meteorological effects includes empirical corrections for wind and temperature inversions. The temperature gradient is expressed in terms of the Pasquill-Gifford Stability category which is then combined with the wind speed and direction to determine one of six meteorological categories (CAT). The attenuation in each octave band for each category are then provided and range from +10 dB being unstable and a strong wind blowing away from the receptor to -5 dB being very stable (temperature inversion) with wind blowing towards the receptor. That is a difference of 15 dB reducing to 0 dB as the distance between source and receptor reduces from 1000 m. It includes corrections for ground absorption and barrier attenuation.

6.1.3 ISO 9613

This standard predicts noise levels under meteorological conditions favourable to propagation. Conditions favourable to propagation are defined as “downwind propagation” (wind speed between approximately 1 m/s and 5 m/s) or “propagation under a well-developed moderate ground based temperature inversion, such as commonly occurs at night”. Otherwise it subtracts a meteorological correction based on the empirically derived formula as shown below:

$$C_{met} = C_0[1-10(h_s+h_r)/d_p]$$

Where:

- C_{met} = Noise attenuation correction applied to the overall A-weighted level
- C_0 = a factor in dB which depends on local weather statistics, range 0 to +10 dB
- h_s = source height (m)
- h_r = receptor height (m)
- d_p = horizontal distance between source and receptor (m)

C_{met} is used to calculate long-term meteorological effects, with C_0 used to correct for short-term meteorological conditions, with this correction then modified based on the relative differences between source and receiver height and their separation distance. This method does not provide spectral corrections based on meteorological conditions, but rather an overall noise level adjustment and it provides little guidance for implementing conditions not favourable for noise propagation, that is, upwind propagation or non stable atmospheric conditions. Its guidance for C_0 states that it "…*may be estimated from an elementary analysis of the local meteorological statistics*" or it "*may be established by the local authorities*", with experience indicating that in practice it is limited to "*the range from 0 to approximately +5 dB, and values in excess of 2 dB are exceptional* ". ISO 9613 does not provide guidance as to the likely attenuation during period of neutral or unfavourable conditions, but does suggest that this could be in the order of "*10dB or more*". This is in contrast to CONCAWE, which indicates a difference of up to 15 dB between inversions with receptors downwind and lapses with receptors upwind. The accuracy of this method is noted as being +/- 3dB.

The major advantage of this method is that it includes a coarse allowance for meteorological effects in barrier and ground attenuation calculations. It also allows for reflections from obstacles (eg hillsides) which CONCAWE does not.

6.1.4 Preferred method

As reported by the European Directive, there are deficiencies in both analysis methods. It has been shown recently by *Malcolm Hunt & Assoc [et al] 2007* that CONCAWE predicts noise levels about 5 dBA more conservatively (that is, higher than the actual measured noise level) than ISO 9613. It should also be noted that the objective of carrying out noise predictions should be to meet the setout noise criteria without the need for an excessive safety margin due to uncertainty in the predicted results. In other environmental noise studies it has been found by *Bass JH [et al] 1998 pp 12* that noise predictions using the ISO 9613 *"…have been validated to agree to within 2 dBA of noise levels measured under practical 'worse case' conditions…".*

The ISO 9613 model was used predominantly in this study to ensure accurate prediction while taking into account meteorological effects in barrier and ground attenuation calculations.

6.2 Noise sources

6.2.1 Mining equipment

Mining equipment includes all mobile machinery that is utilised during the mining process such as dump trucks, dozers, excavators, and draglines. Table 7 outlines the indicative equipment models to be used on site with Table 8 showing the sound power data of the schedule equipment. This sound power used is the worst case scenario for noise emission for the respective equipment in standard configuration.

Table 7 Expected mining equipment to be used on site

Equipment	Model
Dragline	Bucyrus 8750
Dozer	CAT D11R
Dump Truck	CAT 793D Mining Truck
Excavator (Medium)	O&K RH340

Equipment	Model
Excavator (Small)	O&K RH200
Front End Loader	CAT 994F Wheel Loader
Grader	CAT 16M, CAT 24M
Overburden Drill	Tamrock D55SP, Reedrill DR0770
Water Truck	CAT 785C Mining Truck

Table 8 Mining equipment noise levels

Element name	Sound Power Level (dB) in Octave Bands (Hz)								Total		SPL (dBA) @ 100m
	63	125	250	500	1000	2000	4000	8000	dB	dBA	
Bucyrus 8750 – body[1]	121	119	113	118	116	116	106	95	126	121	73
Bucyrus 8750 – bucket[1]	126	128	127	133	124	123	113	104	136	132	84
O&K RH340 Excavator[2]	110	115	119	116	114	109	103	92	123	118	70
CAT D11R – Pushing[3]	119	110	110	107	103	101	96	87	120	109	61
CAT D11R – 2nd gear reverse[3]	122	112	114	122	115	116	106	94	126	122	74
Tamrock D55SP Drill DR0732[3]	115	116	113	113	111	110	104	99	121	116	68
Reedrill DR0770[3]	111	127	116	114	111	110	103	101	127	117	69
CAT 24M Grader[4]	129	128	119	112	109	107	98	89	132	117	69
CAT 16M Grader[4]	125	124	116	108	106	102	99	88	128	114	66
CAT 994F Wheel Loader[4]	108	116	114	116	112	111	106	97	122	118	70
CAT 793D Mining Truck[4]	114	120	115	116	114	113	109	97	124	119	71
CAT 785C Mining Truck[4] (water truck)	125	122	118	121	116	115	109	100	129	122	84

Note 1 – Some noise data provided in 1/3 octave or additional octave frequencies to those shown above.

Note 2 – Noise data for Medium and Small excavators considered to be the same as advised by the manufacturer which has been modeled as O&K RH340

Noise data sources: [1]Bucyrus Australia [2] Terex Mining [3] Xstrata Hunter Valley [4] Caterpillar Inc (USA)

The implementation of these noise sources in SoundPLAN was carried out as follows:

- all mining equipment were modeled as point sources;
- mobile equipment (dump trucks, water trucks and graders) were distributed along haulage routes with periods of increased duration for dump trucks at loading and dump locations;
- D11 Dozer noise was assumed to be 50% pushing and 50% reversing. The logarithmic average was calculated to determine average noise level;

- dragline bucket noise was modelled to emit intermittently for 10% of the operating time and includes a 5 dB penalty for its impulsive noise source characteristics.

6.2.2 Mining equipment attenuated noise levels

Through the implementation of equipment modification or the installation of lower noise emitting components on mining equipment, the emitted sound power can be significantly reduced. Noise reducing measures that were implemented to the mining equipment used at Bengalla mine, near Muswellbrook in the New South Wales Hunter Valley are outlined by *Mills P [et al] 2000*. Table 9 outlines potential noise attenuation measures and their respective noise reduction based on the above referenced report.

Table 9 Mining equipment noise reducing treatment methods and resultant sound powers

Equipment	Attenuation Measures	Noise Reduction	Reduced Sound Power level
Dragline – Body	• Acoustic treatment to fans • Improved engine room treatment	14 dB	107 dBA
Dragline – Bucket	• Resilient pads on rim of bucket and on sides near lifting points (prevent direct metal contact with chains) • Resilient coating on spreader bar and lift chains • Use of archless bucket	16 dB	116 dBA
Excavator	• Radiator louvers • Plenum chambers • Improved engine enclosure • Treated air inlet • Exhaust system improvements • Hydraulically cooled braking system (trucks only)	7 dB	111 dBA
Wheel Loader		7 dB	111 dBA
Wheel Dozer		5 dB	111 dBA
Grader		7 dB	< 110 dBA
Drills		5 dB	< 112 dBA
Mining Truck		10 dB	110 dBA
Water Truck		10 dB	112 dBA
Dozer – Engine		4 dB	112 dBA
Dozer – Tracks	• Removal of 3rd reverse gear • Installation of resilient pads imbedded in track plates	5 dB	114 dBA

Standard reversing sirens emit tonal noise with their sound power is chosen in relation to the noise of the vehicle and the ambient operational environment. By removing the tonal component of a standard reversing alarm and spreading this sound energy over an extended frequency range, the annoyance experienced by sensitive receptors is decreased as the noise blends in with the ambient noise of the environment. It is recommended that all the vehicles operating on site should utilise broadband reversing sirens.

6.2.3 Coal Handling and Processing Plant

The most significant noise emitting equipment of the CHPP have been included in the model. Given the overall position of this plant within the MLA is quite a distance from the closest receptors, the emitted noise from the point of view of the potential receptors is likely to be very low, only providing a small contribution to the overall noise emissions from the Project. The significant equipment noise levels shown in Table 10 have been included in the overall emitted noise models given their closest distance to any receptors and overall emitted sound power.

Table 10 CHPP noise levels

Element name	Sound Power Level (dB) in Octave Bands (Hz)								Total		SPL (dBA) @ 100m
	63	125	250	500	1000	2000	4000	8000	dB	dBA	
Coal Wash Plant[1]	115	110	110	109	109	106	101	94	119	113	65
Conveyor (dB/m)[2]	75	69	71	73	70	67	60	60	79	75	52
Reclaimer[1]	135	121	115	111	105	104	102	99	135	115	67
Train Load Out[1]	129	122	114	113	112	111	109	104	130	118	70

Noise data sources: [1]Clermont Coal Mine Project EIS [2] Carborough Downs Mine EIS

Noise emission data for the CHPP and associated infrastructure has been based on previous coal mines' EIS due to similarity of process and capacity of infrastructure to the proposed plant in the Project. It has been deemed this data to be the best representation of the noise emitted from the proposed plant.

6.2.4 Rail noise

For consistency in results between projects, noise associated with rail movements has been modeled and provided by the Surat Basin Rail Project proponent. The Surat Basin Rail Project proponent utilised the same propagation model (ISO 9613) under the same meteorological conditions as the remaining noise modeling carried out as part of this study. The results provided have been incorporated in the overall noise model of the noise emissions from the MLA. Further details of the method the train noise has been model are outlined in the EIS for the Surat Basin Rail Project..

6.2.5 Power generation

As discussed in Section 4.2.3, only Option 1 has been considered as it is the worse case scenario and the implementation of any other option would result in significantly lower noise emission. Manufacturer engine and exhaust gas noise data for a MAN L51/60 DF as well as guaranteed emissions at the boundary of the power station site (65 dBA at boundary fence which will be at least 20 m from the radiators when utilising a 35 dBA silencer) and outside the engine hall (85 dBA at 1 m) were provided by the manufacturer. Based on this data, the emitted noise levels shown in Table 11 were included in the noise model.

Table 11 Power station noise levels

Element name	Sound Power Level (dB) in Octave Bands (Hz)								Total		SPL (dBA) @ 100m
	63	125	250	500	1000	2000	4000	8000	dB	dBA	
Engine Hall	123	119	119	113	112	107	104	102	126	117	69
Radiators	104	102	98	97	94	91	83	74	107	99	51
Stack Mouth	129	114	108	105	105	106	112	111	129	116	68
Stack Body	91	89	83	81	80	81	87	86	95	91	43

Note – Some noise data provided in 1/3 octave or additional octave frequencies to those shown above

6.2.6 Municipal wastewater treatment plant

Potential noise emissions from the wastewater treatment plant are associated with the sludge drying beds and the floating aerators. Both potentially can increase water flow noise. The remaining equipment does not contain any new major noise sources that will add to the already existing infrastructure. Given the plants remote location, noise issues are not expected to arise from the installation of the new equipment. Any new pump stations associated with the upgrade can be placed in an acoustic enclosure if required once more detailed design specifications are known. The closest sensitive receptor is located approximately 1000 m away.

6.2.7 Municipal potable treatment plant

The main noise source emitted from the site is due to the proposed water cooling tower. Coagulation and chlorine pumps generally emit low noise levels that are approximately 50 dBA at 1 m. The upgraded submersible pump for the borehole will be within an existing enclosure thus minimising the contribution to the noise environment. Table 12 outlines the manufacturer's noise data for the proposed cooling tower to be installed at the site.

Table 12 Potable water treatment plant noise levels

Element name	Sound Pressure Level (dB) @ 1 m in Octave Bands (Hz)								Total SPL @ 1 m	
	63	125	250	500	1000	2000	4000	8000	dB	dBA
Cooling Tower	85	76	78	77	75	72	69	66	87	80

6.2.8 Gas supply pipeline

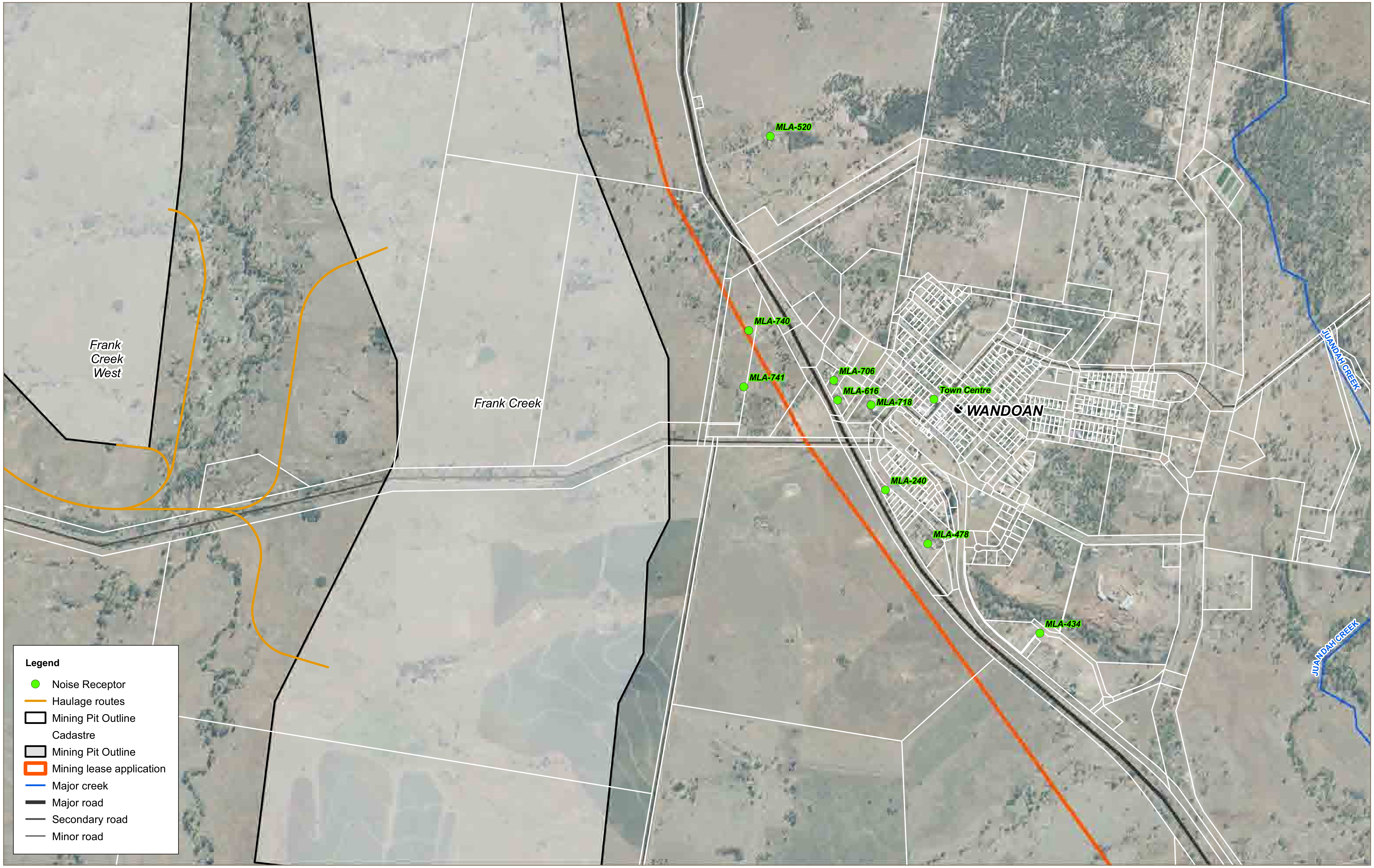
No major noise sources have been identified as part of the operation of this infrastructure as the pipeline will be located underground. The compressor station is part of existing plant, and is assumed not to be augmented or changed as a result of the Project. The only potential noise issues are associated with the construction process of the pipeline. Given there are no specific construction noise criteria in Queensland, construction activities should follow the recommendations outlined in Section 5.2.

6.3 Noise receptors

All noise receptors are assumed to be located 1.5 m above ground level and at least 4 m away from any reflecting surface (other than the ground). Figure 3 shows the assessment positions around the MLA with Figure 12 showing the receptors within Wandoan town that represent the most exposed locations. Satisfying noise criteria at these locations will ensure that the remaining receptors in the town will also comply with the criteria outlined in Table 5.

6.4 Meteorological conditions

ISO 9613 by default calculates worse case noise levels based on favourable noise propagation meteorological conditions (ie downwind propagation or the presence of a well-developed moderate ground based temperature inversion) without the need to input specific wind or stability category data as outlined in Section 3.4.



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

Connell Wagner

0 200 400 600 800 1,000
Meters

Figure 12
Location of modelled receptors at Wandoan

7. Noise predictions

7.1 Modelling scenarios

The overall noise impact assessment examines six distinct scenarios taking into account various years of operation and are considered representative of various stages of mining and potential impacts to surrounding receptors. These scenarios have been used to model air quality and noise. Scenario 3 is broken down into four subsets to take into consideration the proximity of the operating equipment during this time to the Wandoan township and contains the worse case impacts to be experienced by the town. Each scenario takes into account a "snap shot" which shows the number, type and disposition of all operating equipment based on the mining operation scenario occurring during this time.

- Scenario 1
  - This "Do Nothing" Scenario assumes that the coal mine is not constructed and represents existing noise levels in the region.
- Scenario 2
  - This Scenario assumes construction and operation of the coal mine, examining the first year (Year 1) of coal mining, assuming this year to be 2012.
- Scenario 3
  - This Scenario assumes construction and operation of the coal mine, examining Year 5 of coal mining, assuming this year to be 2016.
  - For Frank Creek Pit "subset" scenarios:

    a. operations are examined using blasting of the entire bench height, and the use of a dragline to remove overburden, operating 24 hours a day, seven days a week with the location of the dragline at the southern end of the pit;

    b. operations are examined using blasting of entire bench height, and the use of a dragline to remove overburden, operating 24 hours a day, seven days a week with the location of the dragline at the middle of the pit towards the end of Year 4;

    c. operations are examined using blasting of partial bench height of approximately 10 m, and trucks and excavators to remove overburden, operating <u>24 hours</u> a day, seven days a week; and

    d. operations are examined using blasting of partial bench height of approximately 10 m, and trucks and excavators to remove overburden, operating <u>12 hours</u> a day (daylight hours), seven days a week .
- Scenario 4
  - This Scenario assumes construction and operation of the coal mine, examining Year 10 of coal mining, assuming this year to be 2021.
- Scenario 5
  - This Scenario assumes construction and operation of the coal mine, examining Year 20 of coal mining, assuming this year to be 2031.
- Scenario 6
  - This Scenario assumes construction and operation of the coal mine, examining the final year (assumed Year 30) of coal mining, assuming this year to be 2041.

It is important to highlight that each scenario does not reflect the equipment designation throughout that whole year, rather during the specific time in that operational year that has been modelled. Due to the mobile nature of the mining equipment, the area of operation for each piece of mining equipment will vary in between the Scenario years modelled in accordance with mining schedule for every year of operation.

All scenarios utilise <u>worst case meteorological conditions</u> as defined in previous sections.

It should also be noted that Scenario 3c and 3d from a noise modelling perspective are exactly the same. The assessment period of noise emissions is of worst case conditions during a <u>one hour</u>

interval; these are assumed to be the same regardless whether mining activities would occur over a 24 hour or are limited to 12 hours a day, hence limiting operating times does not affect the noise results during a one hour period. The rate of extraction of coal is also assumed not to affect the maximum noise level emitted during a one hour a period as the difference in simultaneously operating equipment will be very small (if any), therefore the worse case scenario has been predicted.

7.2 Operations phase noise predictions

7.2.1 Scenario 1

The "Do Nothing" scenario does not introduce any new noise sources into the rural area, therefore it can be assumed the existing noise environment will remain unaffected if the Project does not proceed.

7.2.2 Scenario 2 – Year 1

The output during the initial year of operation will be limited to 10 Mt of ROM due to the ongoing establishment of all the equipment and processes on site. The mining activities will be limited to the Austinvale North Pit with the utilisation of only one dragline and three excavators. Table 13 shows the schedule of operating equipment for this scenario.

Table 13 Schedule of operating equipment for Scenario 2

Equipment Designation	Mining Pit	Haulage Road
	Austinvale	
Dragline	1	-
Dozer	5	1
Dump Truck	6	7
Excavator (Medium)	2	-
Excavator (Small)	1	-
Front End Loader	1	-
Grader	-	1
Overburden Drill	3	-
Water Truck	-	1

Predicted noise levels at the receptors are shown in Table 14 below with the complete area noise contours shown in Attachment D.

Table 14 Predicted Noise Levels for Scenario 2

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Dragline Bucket	Day	Night
Cemetery	40	40	40	-
MLA-378	31*	30*	34	28
MLA-601	24	23	34	28
MLA-520	26	25	34	28
MLA-706	26	25	34	31
MLA-616	24	24	34	31
MLA-718	26	26	34	31

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Dragline Bucket	Day	Night
Town Centre	24	23	34	31
MLA-240	24	23	34	32
MLA-478	22	21	34	31
MLA-434	21	20	50	40
MLA-640	< 15	< 15	34	28
MLA-579	< 15	< 15	34	28
MLA-557	< 15	< 15	34	28
MLA-591	< 15	< 15	33	28
MLA-484	< 15	< 15	33	28
MLA-679	< 15	< 15	33	28
MLA-659	< 15	< 15	33	28
MLA-505	15	<15	33	28
MLA-552	21	21	33	28
MLA-300	16	16	33	28
MLA-453	< 15	< 15	33	28
MLA-305	< 15	< 15	33	28
MLA-459	< 15	< 15	33	28
MLA-404	< 15	< 15	33	28
MLA-49	< 15	< 15	33	28
MLA-50	< 15	< 15	33	28
MLA-595	< 15	< 15	33	28
MLA-728	< 15	< 15	33	28
MLA-720	< 15	< 15	33	28
MLA-692	< 15	< 15	33	28
MLA-712	< 15	< 15	33	28
MLA-697	< 15	< 15	33	28
MLA-693	< 15	< 15	33	28
MLA-175	< 15	< 15	33	28
MLA-199	< 15	< 15	33	28
MLA-244	23	23	33	28
MLA-277	27	27	33	28

Note: * - exceedance of night criteria

The results show a small exceedance by 2 dBA at Receptor MLA-378 during the night time period under worst case scenario meteorology, with the dominant noise source being the dragline bucket noise, noise from the bucketwheel stacker reclaimers as well as the train noise from the rail spur. Installing mitigation measures to the dragline bucket reduces the overall noise experienced at Receptor MLA-378 but not to within the required levels. The use of noise attenuated mining equipment will not lower the level sufficiently due to the noise contribution from the stationary infrastructure (eg rail spur and reclaimers). Regular reviews of the noise monitoring data carried out at Receptor MLA-378 should be performed to identify whether the noise limit is actually exceeded and the practical extent of this exceedance. It should be noted that the exceedance is so low that it would not be perceivable at the sensitive receptors.

7.2.3 Scenario 3a – Year 5 Dragline at southern end of Frank Creek Pit

Scenario 3a is considered to have the worst case scenario impacts on the receptors in the vicinity of Wandoan given the proximity of the mobile equipment and the dragline in Frank Creek Pit to the town. Table 15 shows the schedule of operating equipment for this scenario.

Table 15 Schedule of operating equipment for Scenario 3a

Equipment Designation	Mining Pit			Haulage Road
	Frank Creek	Woleebee	Austinvale	
Dragline	1	1	1	-
Dozer	4	5	5	1
Dump Truck	3	3	3	10
Excavator (Medium)	1	-	1	-
Excavator (Small)	-	1	1	-
Front End Loader	1	1	-	-
Grader	1	-	-	2
Overburden Drill	-	2	1	-
Water Truck	-	-	-	3

Predicted noise levels at the receptors are shown in Table 16 with the complete area noise contours shown in Attachment D.

Table 16 Predicted noise levels for Scenario 3a

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Dragline Bucket	Day	Night
Cemetery	40	40	40	-
MLA-378	32*	32*	34	28
MLA-601	25	25	34	28
MLA-520	39+	38+	34	28
MLA-706	42+	41+	34	31
MLA-616	40+	39+	34	31
MLA-718	41+	40+	34	31
Town Centre	39+	33*	34	31
MLA-240	40+	38+	34	32

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Dragline Bucket	Day	Night
MLA-478	39+	35+	34	31
MLA-434	37	33	50	40
MLA-640	30*	25	34	28
MLA-579	24	21	34	28
MLA-557	21	18	34	28
MLA-591	23	20	33	28
MLA-484	25	24	33	28
MLA-679	16	16	33	28
MLA-659	15	15	33	28
MLA-505	28	27	33	28
MLA-552	26	26	33	28
MLA-300	21	21	33	28
MLA-453	< 15	< 15	33	28
MLA-305	< 15	< 15	33	28
MLA-459	< 15	< 15	33	28
MLA-404	< 15	< 15	33	28
MLA-49	< 15	< 15	33	28
MLA-50	< 15	< 15	33	28
MLA-595	< 15	< 15	33	28
MLA-728	< 15	< 15	33	28
MLA-720	< 15	< 15	33	28
MLA-692	< 15	< 15	33	28
MLA-712	< 15	< 15	33	28
MLA-697	< 15	< 15	33	28
MLA-693	< 15	< 15	33	28
MLA-175	< 15	< 15	33	28
MLA-199	< 15	< 15	33	28
MLA-244	23	23	33	28
MLA-277	27	27	33	28

Note: +– exceedance of day and night criteria, * – exceedance of night criteria

As can be observed from the above results, both the day and night criteria are exceeded at numerous locations under standard equipment specifications. The noise environment would be dominated by the intermittent impact noise of the dragline bucket jewellery as well as the mining machinery at or near natural surface level. Implementing noise reduction measures to the dragline bucket as outlined in Table 9, that is, by installing resilient pads and coatings on impact surfaces on the bucket, would significantly reduce the noise level. However, the impulsive nature of the noise source would result in noise emissions above the allowable levels, especially when the dragline is positioned further north along Frank Creek Pit.

7.2.4 Scenario 3b – Year 4 Dragline in the middle of Frank Creek Pit

The use the of dragline has been excluded as a method to remove overburden from Frank Creek Pit, given the results from Scenario 3a and other limiting factors such as dust emissions and blasting restrictions, as discussed in Chapters 13 and 16 respectively in the EIS Volume 1 and associated technical reports. This has made Scenario 3b redundant therefore no noise predictions have been carried out.

7.2.5 Scenario 3c/d – Year 5 Truck and Excavator mining of Frank Creek Pit

This scenario provides an alternative method for mining the eastern edge of Frank Creek Pit, through the use of a truck and excavator arrangement instead of a dragline to remove the overburden. Table 17 outlines the applicable equipment schedule for this case with the predicted noise levels shown in Table 18 with the complete area noise contours shown in Attachment D.

Table 17 Schedule of operating equipment for Scenario 3c/d operations with truck and excavator in Frank Creek Pit

Equipment Designation	Mining Pit			Haulage Roads
	Frank Creek	Woleebee	Austinvale	
Dragline	-	1	1	-
Dozer	3	5	5	1
Dump Truck	4	3	3	10
Excavator (Medium)	2	-	1	-
Excavator (Small)	-	1	1	-
Front End Loader	1	1	-	-
Grader	1	-	-	2
Overburden Drill	-	2	1	-
Water Truck	-	-	-	3

Table 18 Predicted noise levels for Scenario 3c/d

Receptor	Predicted Noise $L_{eq\,(1\,hour)}$ (dBA)		Criteria $L_{eq\,(1\,hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
Cemetery	40	40	40	-
MLA-378	31*	30*	34	28
MLA-601	25	24	34	28
MLA-520	38+	33*	34	28
MLA-706	40+	34*	34	31
MLA-616	38+	33*	34	31
MLA-718	39+	34*	34	31
Town Centre	33*	28	34	31

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
MLA-240	37+	32	34	32
MLA-478	34*	29	34	31
MLA-434	32	27	50	40
MLA-640	25	20	34	28
MLA-579	20	16	34	28
MLA-557	18	15	34	28
MLA-591	20	15	33	28
MLA-484	23	20	33	28
MLA-679	16	15	33	28
MLA-659	15	< 15	33	28
MLA-505	27	25	33	28
MLA-552	26	24	33	28
MLA-300	21	19	33	28
MLA-453	< 15	< 15	33	28
MLA-305	< 15	< 15	33	28
MLA-459	< 15	< 15	33	28
MLA-404	< 15	< 15	33	28
MLA-49	< 15	< 15	33	28
MLA-50	< 15	< 15	33	28
MLA-595	< 15	< 15	33	28
MLA-728	< 15	< 15	33	28
MLA-720	< 15	< 15	33	28
MLA-692	< 15	< 15	33	28
MLA-712	< 15	< 15	33	28
MLA-697	< 15	< 15	33	28
MLA-693	< 15	< 15	33	28
MLA-175	< 15	< 15	33	28
MLA-199	< 15	< 15	33	28
MLA-244	23	23	33	28
MLA-277	27	27	33	28

Note: + – exceedance of day and night criteria, * – exceedance of night criteria

The overall levels using standard equipment still exceed both the day and night criteria at a few locations as shown above. Through the implementation of noise reduction measures <u>to all equipment</u> that will be operating in Frank Creek Pit, the overall noise levels are reduced so that it is possible to mine the eastern edge of Frank Creek Pit under any meteorological conditions during the <u>day time</u>

only. Table 19 shows the predicted noise levels under neutral weather conditions using noise attenuated equipment. Neutral weather conditions are assumed to be no downwind propagation and no occurrence of a temperature inversion during the assessment period of one hour. No exceedances occur under these conditions therefore night time mining would only be possible under neutral weather conditions in Frank Creek Pit.

Table 19 Predicted noise levels for Scenario 3c/d under neutral weather conditions

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)	Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Attenuated Equipment	Day	Night
MLA-378	27	34	28
MLA-601	20	34	28
MLA-520	28	34	28
MLA-706	29	34	31
MLA-616	28	34	31
MLA-718	29	34	31
Town Centre	23	34	31
MLA-240	27	34	32
MLA-478	24	34	31

7.2.6 Scenario 4 – Year 10

Scenario 4 contains equipment spread out across all MLA areas, reaching the western boundary of the development with the operation of the initial mining strips at the Turkey Hill Pit. Table 20 shows the schedule of operating equipment for this scenario.

Table 20 Schedule of operating equipment for Scenario 4

Equipment Designation	Mining Pit					Haulage Roads
	Turkey Hill	Summer Hill	Mud Creek	Woleebee	Austinvale	
Dragline	1	1	-	1	-	-
Dozer	5	5	-	5	1	2
Dump Truck	6	2	-	4	1	14
Excavator (Medium)	1	1	-	-	-	-
Excavator (Small)	-	1	-	1	-	-
Front End Loader	1	-	-	1	-	-
Grader	-	1	-	-	-	2
Overburden Drill	2	1	1	1	-	-
Water Truck	-	-	-	-	-	3

Predicted noise levels at the receptors are shown in Table 21 with the complete area noise contours shown in Attachment D.

Table 21 Predicted noise levels for Scenario 4

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
Cemetery	40	40	40	-
MLA-378	29*	28	34	28
MLA-601	23	22	34	28
MLA-520	25	23	34	28
MLA-706	24	22	34	31
MLA-616	24	22	34	31
MLA-718	24	22	34	31
Town Centre	23	21	34	31
MLA-240	23	22	34	32
MLA-478	21	19	34	31
MLA-434	21	18	50	40
MLA-640	< 15	< 15	34	28
MLA-579	< 15	< 15	34	28
MLA-557	< 15	< 15	34	28
MLA-591	< 15	< 15	33	28
MLA-484	21	16	33	28
MLA-679	18	< 15	33	28
MLA-659	18	< 15	33	28
MLA-505	30*	24	33	28
MLA-552	26	22	33	28
MLA-300	22	18	33	28
MLA-453	19	15	33	28
MLA-305	23	18	33	28
MLA-459	24	20	33	28
MLA-404	24	20	33	28
MLA-49	24	19	33	28
MLA-50	28	23	33	28
MLA-595	40+	35+	33	28
MLA-728	31*	27	33	28
MLA-720	36+	28	33	28
MLA-692	27	21	33	28
MLA-712	28	21	33	28
MLA-697	26	20	33	28

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
MLA-693	27	20	33	28
MLA-175	22	17	33	28
MLA-199	17	< 15	33	28
MLA-244	23	22	33	28
MLA-277	27	26	33	28

Note: + – exceedance of day and night criteria, * – exceedance of night criteria

Using standard specification equipment, high exceedances are predicted at Receptor MLA-595 because of its close location to the edge of the Turkey Hill Pit (less than 1 km) as well as small exceedances at other receptors (MLA-728 and 720) due to the position of the haulage route which brings the equipment within 2 km from the receptors and Receptor MLA-505 due to Woleebee Pit activities. Through the installation of attenuation measures to excavators, tracked dozers, mining trucks and water trucks the noise levels can be reduced to within acceptable limits for both day and night time operations under worse case meteorological conditions with the exception of Receptor MLA-595. It is recommended that Receptor MLA-595 be bought out by the Proponent to eliminate it as a sensitive receptor as significant noise exceedances are predicted especially during night operation.

Given the limited “safety” margin between predicted noise levels and criteria, it is recommended that continuous noise monitoring with regular review especially during favourable noise propagating conditions and operation of Turkey Hill Pit to qualify the accuracy of the noise model be undertaken.

7.2.7 Scenario 5 – Year 20

Scenario 5 sees the mine operate all of the scheduled equipment across seven mining pits including all 5 draglines. The equipment is spread quite evenly across the whole MLA. Table 22 shows the schedule of operating equipment for this scenario.

Table 22 Schedule of operating equipment for Scenario 5

Equipment Designation	Mining Pit							Haulage Roads
	Turkey Hill	Summer Hill	Mud Creek	Woleebee North	Woleebee Creek	Austinvale	Leichhardt	
Dragline	1	1	-	2	-	-	1	-
Dozer	4	3	2	5	3	1	3	3
Dump Truck	3	3	3	2	-	1	1	14
Excavator (Medium)	-	-	1	-	-	-	1	-
Excavator (Small)	-	1	-	-	1	-	-	-
Front End Loader	1	-	-	1	-	-	-	-
Grader	-	-	1	-	-	-	-	2
Overburden Drill	1	1	1	2	1	-	1	-
Water Truck	-	-	-	-	-	-	-	3

Predicted noise levels at the receptors are shown in Table 23 below with the complete area noise contours shown in Appendix B.

Table 23 Predicted noise levels for Scenario 5

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
Cemetery	42[+]	40	40	-
MLA-378	33*	30*	34	28
MLA-601	26	23	34	28
MLA-520	34*	28	34	28
MLA-706	31	26	34	31
MLA-616	31	25	34	31
MLA-718	30	25	34	31
Town Centre	29	24	34	31
MLA-240	29	24	34	32
MLA-478	28	22	34	31
MLA-434	26	21	50	40
MLA-640	19	< 15	34	28
MLA-579	< 15	< 15	34	28
MLA-557	< 15	< 15	34	28
MLA-591	< 15	< 15	33	28
MLA-484	15	< 15	33	28
MLA-679	< 15	< 15	33	28
MLA-659	< 15	< 15	33	28
MLA-505	20	16	33	28
MLA-552	27	22	33	28
MLA-300	24	19	33	28
MLA-453	25	20	33	28
MLA-305	29*	22	33	28
MLA-459	30*	24	33	28
MLA-404	28	21	33	28
MLA-49	26	19	33	28
MLA-50	30*	24	33	28
MLA-595	29	22	33	28
MLA-728	19	< 15	33	28
MLA-720	28	22	33	28
MLA-692	28	21	33	28
MLA-712	27	20	33	28
MLA-697	24	18	33	28

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
MLA-693	25	19	33	28
MLA-175	23	17	33	28
MLA-199	22	17	33	28
MLA-244	25	23	33	28
MLA-277	28	27	33	28

Note: + – exceedance of day and night criteria, * – exceedance of night criteria

As can be observed from the above results exceedances occurred at receptors closest to the southern end of Summer Hill Pit (MLA-305, MLA-459 and MLA-50). As the equipment progresses towards the southern end of that pit, it is recommended that attenuation measures are fitted to excavators, tracked dozers, mining trucks and water trucks equipment to minimise the night time impacts on these receptors if monitoring at Receptors MLA-305, MLA-459 and MLA-50 indicates that they are needed.

Due to the operation of Leichhardt Pit, higher noise levels are experienced at the cemetery as well as at Receptors MLA-378 and MLA-520. It is recommended that noise attenuated mining equipment is used in this pit. It is predicted that, even after the implementation of these measures, under favourable meteorological conditions, the noise level generated at Receptor MLA-378 will still exceed the criterion during night time operations. However this exceedance is so low that it would not be perceivable at the sensitive receptors. It is once again recommended that continuous noise monitoring with regular review especially during favourable noise propagating conditions to qualify the accuracy of the noise model be undertaken with particular focus for Receptor MLA-378.

7.2.8 Scenario 6 – Year 30

Scenario 6 sees the mine operate predominantly in the Woleebee pits as well as finishing mining coal from the pits in the western MLA 50229. Table 24 shows the schedule of operating equipment for this scenario.

Table 24 Schedule of operating equipment for Scenario 6

Equipment Designation	Mining Pit						Haulage Roads
	Summer Hill North	Mud Creek	Woleebee North	Woleebee Creek	Woleebee South	Austinvale	
Dragline	1	1	1	1	1	-	-
Dozer	3	3	3	5	4	1	3
Dump Truck	1	4	1	3	1	1	16
Excavator (Medium)	-	1	-	1	-	-	-
Excavator (Small)	1	-	-	1	-	-	-
Front End Loader	1	-	1	-	1	-	-
Grader	-	1	-	-	-	-	2
Overburden Drill	1	1	1	2	2	-	-
Water Truck	1	-	-	-	-	-	2

Predicted noise levels at the receptors are shown in Table 25 with the complete area noise contours shown in Attachment D.

Table 25 Predicted noise levels for Scenario 6

Receptor	Predicted Noise $L_{eq\,(1\,hour)}$ (dBA)		Criteria $L_{eq\,(1\,hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
Cemetery	40	40	40	-
MLA-378	29*	28	34	28
MLA-601	23	22	34	28
MLA-520	26	23	34	28
MLA-706	25	22	34	31
MLA-616	25	22	34	31
MLA-718	25	22	34	31
Town Centre	24	22	34	31
MLA-240	25	22	34	32
MLA-478	23	19	34	31
MLA-434	22	18	50	40
MLA-640	< 15	< 15	34	28
MLA-579	< 15	< 15	34	28
MLA-557	< 15	< 15	34	28
MLA-591	17	< 15	33	28
MLA-484	25	19	33	28
MLA-679	25	19	33	28
MLA-659	25	19	33	28
MLA-505	37+	32*	33	28
MLA-552	35+	29*	33	28
MLA-300	30*	23	33	28
MLA-453	31*	25	33	28
MLA-305	28	22	33	28
MLA-459	24	19	33	28
MLA-404	23	18	33	28
MLA-49	17	< 15	33	28
MLA-50	21	17	33	28
MLA-595	29*	23	33	28
MLA-728	< 15	< 15	33	28
MLA-720	25	20	33	28
MLA-692	29*	23	33	28
MLA-712	33*	26	33	28
MLA-697	32*	25	33	28

Receptor	Predicted Noise $L_{eq\ (1\ hour)}$ (dBA)		Criteria $L_{eq\ (1\ hour)}$ (dBA)	
	Unattenuated Sound Power	Attenuated Equipment	Day	Night
MLA-693	32*	26	33	28
MLA-175	28	22	33	28
MLA-199	25	19	33	28
MLA-244	25	23	33	28
MLA-277	27	26	33	28

Note: + – exceedance of day and night criteria, * – exceedance of night criteria

There is a high exceedance (using unattenuated equipment) at Receptor MLA-505 due to its close location to the edge of the Woleebee South Pit (less than 1 km) as well as a significant exceedance at Receptor MLA-552 due to the high numbers of equipment in operation, especially at surface level at the southern end of Woleebee Creek Pit. Exceedances during night time period also occur around the receptors near Summer Hill North (MLA-692, MLA-712, MLA-697 and MLA-693).

Through the use of attenuated equipment (excavators, tracked dozers, mining trucks and water trucks) at the Summer Hill North Pit, noise levels can be controlled to within allowable limits for these receptors.

Implementing attenuated equipment (overburden drills, excavators, tracked dozers, mining trucks and water trucks) in Woleebee Creek pit will lower the noise level to meet the night time criteria. This exceedance is so low that it would not be perceivable at the sensitive receptors. Continuous noise monitoring with regular review especially during favourable noise propagating conditions is required to qualify the accuracy of the noise model especially at Receptor MLA-552.

Even with the use of attenuated equipment, noise levels at Receptor MLA-505 would still significantly exceed the night criteria. It is therefore recommended that Receptor MLA-505 be bought out by the Proponent to eliminate it as a sensitive receptor.

7.3 Road traffic noise

Based on the findings of the *PB Wandoan Coal Project Transportation impact study, August 2008*, the expected increase in traffic volumes along the Leichhardt Highway in the vicinity of Wandoan during the construction and operational phases of the Project is negligible. The expected increase for both phases of the Project is less than 5% (except for shift change days during the construction phase only),. This leads to an insignificant increase in traffic noise. For comparison, a doubling of the traffic volume (ie 100% growth) results in a 3 dBA increase in noise levels.

7.4 Potable water treatment plant

The receptors in the vicinity of the treatment plant are all commercial properties, with the closest being located approximately 40 m south east from the site. The cooling tower is approximately 3.6 m high (prominent noise source) and it will be positioned at an elevated level 4.5 m off the ground on the flocculation tanks. To control the emitted noise levels at the closest receptor, it is recommended a noise barrier be erected approximately one meter from the southern and eastern sides of the cooling tower. The height of the barrier should be at least the same as that of the cooling tower (approximately 3.6 m) from the base of the cooling tower. Due to the limited information known regarding the existing equipment and noise emitted from the site, the specified control measures have been designed only for the additional infrastructure to be installed at the existing site.

However due to the commercial nature of the properties in the vicinity of the treatment plant, noise impacts are expected to be insignificant

7.5 Wastewater treatment plant

Given the remote location of this plant (closest sensitive receptor is located approximately 1000 m away), noise issues are not expected to arise from installation of the new equipment.

8. Recommendations

8.1 Operational noise mitigation strategies

Noise mitigation measures can be broken down into management of mining activities and equipment attenuation. Details of sound reducing modifications for mining equipment are outlined in Section 6.2.2 of this report.

Management strategies include regular noise monitoring at sensitive locations to determine the extent of the impact, taking into account weather conditions as well as the activities to be carried out in the vicinity of the receptors. Should certain stages of operation exceed the criteria, they should be limited to times of day where least disturbance would occur (generally during the day time). Alternative mining techniques (for example use of a truck and excavator versus dragline to remove overburden) can reduce noise at certain stages of the Project due to the elimination of equipment that is associated with "noisy" mining techniques. The use of more experienced equipment operators closer to receptors can reduce noise levels through better operation of the respective machinery such as draglines (better operators can minimise the occurrence of jewellery impacts on the bucket). The implementation of a meteorological forecasting system can also allow site managers to operate certain areas of the mine during weather periods which minimise the noise transmitted to the receptor and comply with the respective criteria.

Given the extent of this Project and the scatter of receptors, it is recommended to have a combined approach to noise reduction which includes management of the activities on site along with the use of lower noise machinery, as this should provide the most efficient method in mining areas close to residents while minimising impacts on them. The subsequent sections outline recommended noise attenuation measures associated with each modelled scenario.

8.1.1 Common mitigation measures

The following attenuation and monitoring measures should be considered for <u>all scenarios where monitoring and modelling confirms impacts on noise sensitive receptors</u>:

- install resilient pads and coatings on all dragline buckets
- broadband reversing sirens to be utilised on all vehicles
- review permanent monitoring data at Receptor MLA-378 on a three monthly basis, especially for night time hours and during all operation scenarios, due to predicted noise levels having no margin of safety relative to the design criteria. This is primarily because of the continuous noise levels associated with the rail spur and bucketwheel stacker reclaimers.
- The WJV will consult with the owner of the abattoir (MLA-740 and MLA-741) with a view to reaching agreement on appropriate mitigation arrangements prior to the commencement of mining within the Frank Creek Pit.

8.1.2 Scenario 3 – Year 5

The following attenuation and monitoring measures should be implemented for Scenario 3 activities undertaken as part of the Project in Year 5 <u>where monitoring and modelling confirms impacts on noise sensitive receptors</u>:

- mine Frank Creek Pit using truck and excavator method only, to remove overburden
- monitor noise levels at the most exposed receptors in the Wandoan township (ie Receptor MLA-520 and MLA-706) should be carried out on a monthly basis upon commencement and throughout ongoing mining of Frank Creek Pit. One monitoring period should be carried out one month before the commencement of mining at Frank Creek Pit.
- based on the monitoring data, if night time levels exceed criteria, limit operations in Frank Creek Pit to daytime only operation, as mining progresses towards the eastern edge of the pit, thereby becoming closer to Wandoan township
- use noise attenuated excavators, tracked dozers, mining trucks and water trucks in the Frank Creek Pit, so as to satisfy the overall noise levels outlined in Table 9 for truck and excavator operations in Frank Creek Pit

8.1.3 Scenario 4 – Year 10

The following attenuation and noise monitoring measures should be implemented for Scenario 4 activities undertaken as part of the Project in Year 10 where monitoring and modelling confirms impacts on noise sensitive receptors:

- The owner of the property upon which Receptor MLA-595 is located will be consulted by the proponent with a view to reaching agreement on appropriate mitigation arrangements before mining activities commence at Turkey Hill Pit (as noise emissions modelled in this report are predicted to significantly exceed the criteria from operations at Turkey Hill Pit)
- periodically monitor noise levels at Receptor MLA-720 and MLA-728 on a monthly basis to ensure compliance with criteria once operation of Turkey Hill Pit will commence
- use noise attenuated excavators, tracked dozers, mining trucks and water trucks, so as to satisfy the overall noise levels outlined in Table 9 for operations in Turkey Hill Pit

8.1.4 Scenario 5 – Year 20

The following attenuation and noise monitoring measures should be implemented for Scenario 5 activities undertaken as part of the Project in Year 20 where monitoring and modelling confirms impacts on noise sensitive receptors:

- use noise attenuated excavators, tracked dozers, mining trucks and water trucks, so as to satisfy the overall noise levels outlined in Table 9 for operations in Leichhardt Pit and Summer Hill Pit
- apply acoustic treatment to Dragline 5 body in Leichhardt Pit as per Table 9
- periodically monitor noise levels at Receptor MLA-459 on a monthly basis once mining the northern 50% if Summer Hill Pit will be reached

8.1.5 Scenario 6 – Year 30

The following attenuation and noise monitoring measures should be implemented for Scenario 6 activities undertaken as part of the Project in Year 30 where monitoring and modelling confirms impacts on noise sensitive receptors:

- The owner of the property upon which Receptor MLA-505 is located will be consulted by the proponent with a view to reaching agreement on appropriate mitigation arrangements before mining activities commence at Woleebee South Pit (as noise emissions modelled in this report are predicted to significantly exceed the criteria from operations at Woleebee South Pit)
- use noise attenuated overburden drills, excavators, tracked dozers, mining trucks and water trucks, so as to satisfy the overall noise levels outlined in Table 9 for operations in Woleebee Creek Pit
- use noise attenuated excavators, tracked dozers, mining trucks and water trucks, so as to satisfy the overall noise levels outlined in Table 9 for operations in Summer Hill North Pit
- apply acoustic treatment to Dragline 4 body in Woleebee Creek as per Table 9
- periodically monitor noise levels at Receptor MLA-552 on a monthly basis once mining of Woleebee Creek Pit commences identifying any potential exceedances
- periodically monitor noise levels at Receptor MLA-712 on a monthly basis once mining of Summer Hill North Pit commences identifying any potential exceedances

8.1.6 Onsite gasfired power station

The following attenuation measures should be implemented at the power station as per the manufacturer specification:

- the use of an exhaust silencer on each engine providing a minimum insertion loss of 20 dB across the whole noise spectrum
- an engine hall to satisfy 85 dBA at 1 m
- the Project is to satisfy 65 dBA at boundary fence which is a minimum 20 m from radiator coolers (manufacturer specification)

8.1.7 Potable water treatment plant

The following attenuation measure should be implemented at the potable water treatment plant:

- install a noise barrier approximately 1 m from the southern and eastern sides of the cooling tower, from the base of the cooling tower up to its height (approximately 3.6 m from the elevated base)

8.2 Construction noise

As no specific construction noise and vibration criteria are specified by the EPA guideline, best practice processes and methods should be implemented to manage the construction noise to minimise disturbance to sensitive receptors.

Given the majority of the construction activities will be at large distances (minimum 5 km for most mining infrastructure and 2 km for rail spur) from sensitive receptors, best practice and management processes should sufficiently control any potential impacts on the sensitive receptors. To ensure best practice, management processes need to be implemented throughout the construction phase. The following actions are proposed:

- Permission should be sought from the administering authority to conduct construction activities during all hours. However if noise monitoring indicates that Project construction activities will or are likely to cause audible noise at a sensitive receptor, relevant Project construction activities will not be undertaken during the following hours (as per Section 6W of *Environmental Protection Regulation 1998*):
  - on a Sunday or Public holiday at any time; and
  - on a Saturday or business day before 6:30 am or after 6.30 pm.
- Implementation of recommendations given in *AS 2436 “Guide to noise control on construction, maintenance and demolition sites”, 1981* in the Construction Management Plan.
- Use low noise machinery where possible.
- Place stationary equipment such as air compressors and generators as far as possible from noise sensitive areas.
- Provide advance notification to the community of construction activities.
- Minimise idling equipment where possible.
- Use temporary structures or screens to limit noise exposure.
- Develop a Noise Management Plan which would include the routine monitoring of noise levels during construction as well as the logging and assessment of any complaints.

8.3 Noise Management Plan

The purpose of this Noise Management Plan is to detail the performance objectives, actions and procedures to be carried out during procurement, commissioning and operation of the mine. This details the actions and commitments to be followed by the mine operator. A detailed noise management plan should be prepared for the Project in accordance with *Queensland Government Environmental Protection Agency Guideline - Preparing environmental management plans (March 2003)*.

8.3.1 Procurement phase

Noise specifications should be provided in tender documentation to ensure equipment purchased complies with prescribed noise limits.

8.3.2 Commissioning phase

Equipment specification compliance

Noise measurements of equipment should be carried out to ensure vendors/contractors meet their noise guarantee commitments. Equipment installed and constructed at the Project site should comply with the noise limits contained in Section 6.2. These measurements should be carried out by a suitably qualified Acoustic Engineer.

Noise emissions verification

Following commissioning of the infrastructure and equipment on site, an environmental noise survey shall be conducted at the noise sensitive receptors with the plant operating as close as possible to its design capacity. The measured environmental noise levels should be verified with the predicted noise levels in this document and assessed against the noise emission criteria in Table 5. These measurements should be carried out by suitably qualified Acoustic Engineer.

8.3.3 Operating phase

Noise monitoring

Continuous noise monitoring should be carried by the Proponent during the operation of the mine as follows:

- fixed automated monitoring (existing) at N1 Nathan Road (Receptor MLA-378) and N3 Town Noise;
- mobile automated continuous monitoring using an unattended noise logger for a 7 day period at
  - Scenario 3 – During Operation of Frank Creek Pit – Receptors MLA-520 and MLA-706
  - Scenario 4 – During Operation of Turkey Hill Pit – Receptor MLA-720 and MLA-728
  - Scenario 5 – Once mining of the northern 50% of Summer Hill Pit will be reached – Receptor MLA-459
  - Scenario 6 – During Operation of Woleebee Creek – Receptor MLA-552 and during operation of Summer Hill North Pit – Receptor MLA-712
  - any site from which noise complaints are likely to be raised especially when the mining equipment begins to approach the boundary of the MLA areas;
- spot measurements to be taken to validate the noise logger result s and to provide additional monitoring data from around the site; and
- required monitoring parameters to include: L_{Amax}, L_{A1}, L_{A10}, L_{Aeq}, and L_{A90} at 15 minute intervals.

Proactive / predictive noise management

As part of the noise management measures, it is recommended that the Proponent undertake the following proactive steps to deal with noise emission issues:

- All plant machines and equipment should be maintained regularly to minimise noise generation.
- Undertake validation testing and inspection of significant plant during procurement. Perform a visual check to ensure that equipment is fitted with appropriate noise suppression devices as specified in the design documentation.
- Conduct regular noise monitoring both on-site and at the potential noise-affected receptor areas in accordance with this management plan and relevant regulations or Australian Standards.
- Prepare maintenance procedures for all equipment and ensure that equipment is operating in good condition.
- Maintain and inspect noise control treatments (including silencers, acoustic lining, vibration mountings, etc) regularly to make sure they continue to be effective.
- Develop and maintain a positive relationship with local residents and government, and inform of progress and alleviate concerns by proactive mine management.
- Develop and maintain an equipment noise register that details all significant environmental noise contributors.

Reactive / passive noise management

It is recommended that the Proponent provide a procedure to receive community feedback as well as measures to response process as follows:

- Provide an interface for complaints to be raised by the community either through a phone hotline or noise complaint register
- Respond to all valid noise complaints
- Develop strategies and targets based on the annual review of noise monitoring results and the review of valid noise complaints.

Receptor noise management

In the event that the Project specific noise criteria are exceeded by 1-5 dBA, then noise impacts could range from negligible to moderate. It is recommended that management procedures be implemented including:

- Noise monitoring on-site and within the community.
- Prompt response to any community issues of concern.
- Review and refinement of noise mitigation measures and operating procedures where necessary and practicable.
- Consideration of acoustic mitigation at receptors where substantiated unacceptable impact is confirmed by monitoring results.

Considerations of negotiated agreements with landowners are recommended where substantiated unacceptable impacts are confirmed by monitoring results.

8.4 Health effects

The *enHealth Council 2004* report on the health effect of environmental noise sets out various criteria for adverse health effects based on numerous worldwide studies carried out. The health effects identified and their respective minimum criteria are as follows:

- annoyance and decreases in quality of life (Outdoor $L_{Aeq,\ 16hr}$ 50, Indoor $L_{Aeq,\ 16hr}$ 35)
- sleep disturbance (Outdoor $L_{Aeq,\ 16hr}$ 45, Indoor $L_{Aeq,\ 16hr}$ 30)
- reduced performance and learning in school children (Outdoor $L_{Aeq,\ 16hr}$ 50, Indoor $L_{Aeq,\ 16hr}$ 35)
- cardiovascular disease (Outdoor $L_{Aeq,\ 16hr}$ 65)

The enHeath Council Report states that environmental noise cannot be identified as the cause of serious mental health and stress problems, rather people already suffering these conditions are more sensitive to noise. It was also noted that further study is required whether chronic noise exposure has any long-term effects.

The criteria presented above in the ehHealth Council Report are much higher than the noise levels experienced anywhere outside the MLA, particularly at the sensitive receptors. Therefore, based on the predicted noise levels it can be concluded that no adverse health effects due to noise exposure from the operation of the mine should be experienced by any of the sensitive receptors.

8.5 Low frequency noise

The Queensland EPA has unpublished guidelines in draft format for the assessment of low frequency noise (*Ecoaccess Guideline: Noise – Assessment of Low Frequency Noise (DRAFT))*. The guideline outlines initial screening criteria as follows:

> *Where a noise imission occurs exhibiting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB (linear) to avoid complaints of low frequency annoyance. If the dB (linear) measurement exceeds the dBA measurement by more than 15 dBA, a one-third octave band measurement in the frequency range 10 to 200 Hz should be carried out.*

All noise sources' noise emission (with the exception of the bucket stacker reclaimers) satisfy the criteria of (Total (dB) – Total (dBA) ≤ 15 dB). Receptor MLA-378 is the most exposed sensitive receptor to the noise emitted from bucket stacker reclaimers (the only source with significant low frequency noise). The worse case noise level at Receptor MLA-378 (after implementation of Scenario specific attenuation measures) occurs during Scenario 2 with an incident level of 30 dBA (Table 14) or 51 dB (linear). The existing dwelling façade will provide sufficient attenuation to drop this overall level below the 50 dB (linear) criteria outlined above. The remaining sensitive receptors will be exposed to lower levels of low frequency noise that will satisfy the screening criteria thus eliminating further investigation into low frequency noise.

9. Residual impacts

Residual noise impacts are dependant on the operational scenario occurring at the mine. This will determine the schedule and the location of the noise emitting equipment as well as their respective noise levels after the implementation of the appropriate mitigation measure and strategy. Provided the purchases of Receptor MLA-505, MLA-595 and the abattoir (MLA 740 and MLA-741) are undertaken, small residual impacts have been predicted during each of the modelled operational scenarios even with the implementation of noise attenuation measures applied to the operating equipment as discussed in Section 7.2. Most of the exceedances are sufficiently small that they can be mitigated through the implementation of the noise management plan.

The mitigation and management measures recommended in Section 8 will mitigate residual noise impacts.

10. Conclusions

The development of the mine will introduce new noise sources into the rural environment near the rural town of Wandoan. A background noise survey has been carried out to identify the existing noise environments in the area which provides a basis for the determined design noise criteria. A virtual 3D model using SoundPLAN software was created taking into account the natural ground contours, future pit locations and worse case meteorological conditions. Separate models were created for each of the operating scenarios throughout the life of the mine which identified the worse case emitted noise conditions experienced by all sensitive receptors.

Based on the predicted noise levels, the following conclusions are made:

- Through the use of operating scenario specific noise mitigation measures, 24 hour operation can be carried out at all proposed mining pits with the exception of Frank Creek Pit.
- Operation of Frank Creek Pit will be limited to truck and excavator method to remove overburden.
- Based on noise monitoring data, operation of Frank Creek Pit can be restricted to daytime hours during favourable noise propagation conditions.
- Continuous noise monitoring is required through the operation of the mine at the most exposed receptors to ensure emitted noise levels comply with assessment criteria.
- The increase in traffic noise on Leichhardt Highway due to the development will be negligible.
- Criteria for Health effects and low frequency noise will be satisfied.

11. Summary of mitigation strategies

Recommended mitigation strategies to minimise potential impacts of the Project based on the carried out noise modelling, as previously detailed in this noise impact assessment, are summarised below:

- Implement resilient pads and coatings on all dragline bucket jewellery
- Broadband reversing sirens are to be utilised on all vehicles and mobile plant
- Operation of Frank Creek Pit using truck and excavator method to remove overburden.
- Receptors MLA-505 and MLA-595 should be acquired before the mining of Woleebee South Pit and Turkey Hill Pit respectively
- The abattoir (MLA 740 and MLA-741) should be acquired prior to commencement of mining
- Review permanent monitoring data at Receptor MLA-378 at regular intervals, especially during night time hours, during all operation scenarios due to predicted noise levels being equivalent to the assessment criteria.
- Use noise attenuated equipment as outlined in Table 9 during specific scenarios at outlined locations as described in Section 8.1.
- Periodically monitor noise levels at most exposed noise receptors as outlined in Section 8.1.
- Install a noise barrier approximately 1 m from the southern and eastern sides of the cooling tower at the Potable Water Treatment Plant. The height of the barrier should be equal to the height of the cooling tower (approximately 3.6 m).
- Develop an Operational Noise Management Plan in accordance with *Queensland Government Environmental Protection Agency Guidelines*.

12. References

Australian Standard *AS 1055.1 "Acoustics – Description and measurement of environmental noise Part 1: General Procedures", 1997*

Australian Standard *AS 2107 "Acoustics – Recommended design sound levels and reverberation times for building interiors", 2000*

Australian Standard *AS 2438 "Guide to noise control on construction, maintenance and demolition sites", 1981*

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ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation", 15 December 1996

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Mills, P, Bridges, M and Juillerat, E, *Noise Reduction in New Open-Cut Coal Mines, Coal Handling and Preparation Plants,* pp 31-44. This article was first presented at the 8th Australian Coal Preparation Society Conference at Port Stephens, November 12-16, 2000

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Queensland Government Environmental Protection Agency, *Guideline Preparing environmental management plans,* 28 March 2003

Rio Tinto Coal Australia, Clermont, *Clermont Coal Mine Project – Environmental Impact Statement Volume 1,* August 2004

Attachment A

Glossary

Attachment A

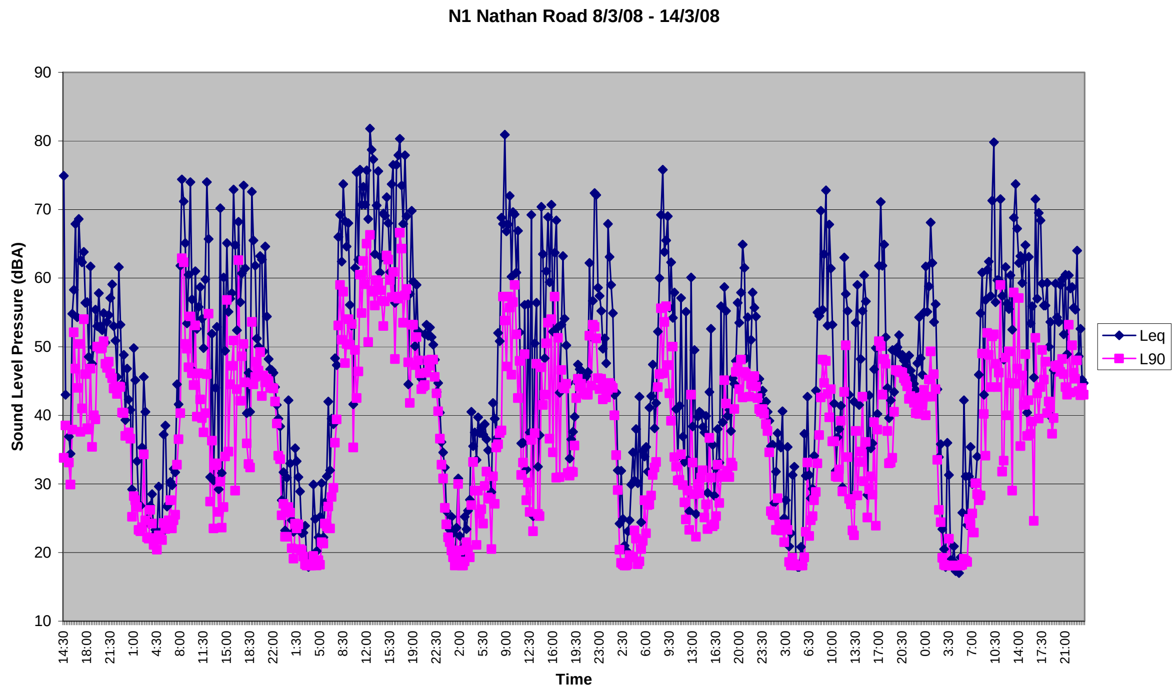
Glossary

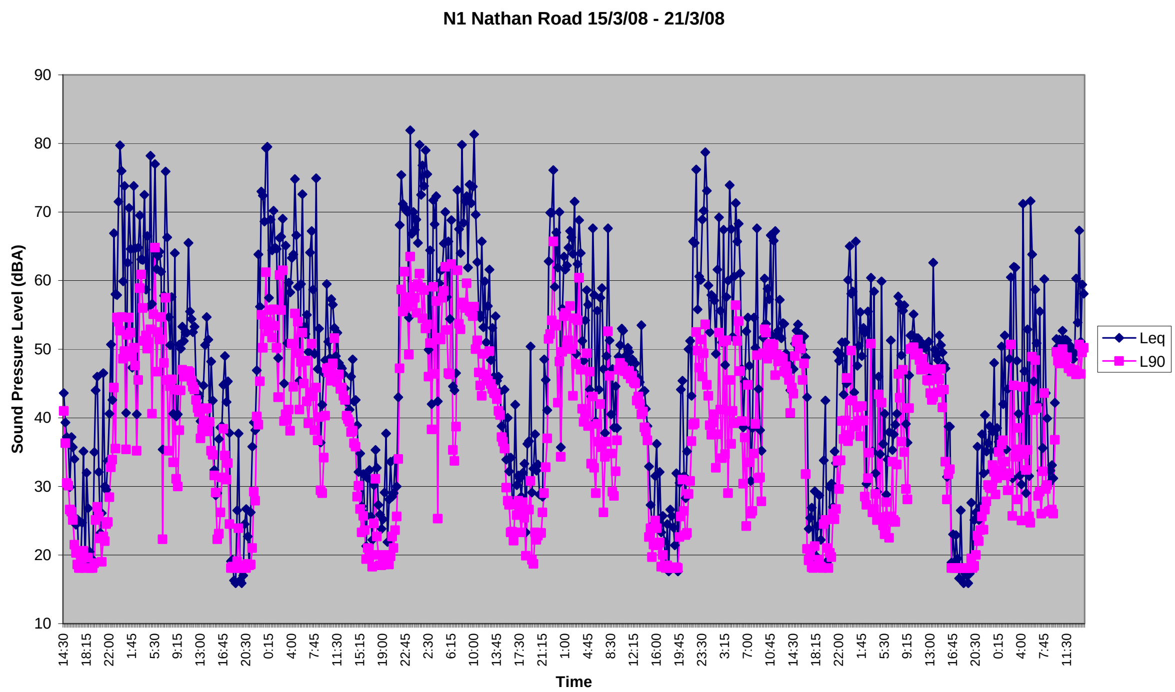
ABL	Assessment Background Level – single-figure background level representing each assessment period – day, evening, night (ie three ABLs are determined for each 24 hour period of the monitoring period). ABL is a measure of background noise level in the absence of noise from the source.
Ambient noise	See L_{eq}
Background noise	See L_{90}
CHPP	Coal Handling and Processing Plant
dBA	A unit of measurement, decibels (A), of sound pressure level which has its frequency characteristics modified by a filter (A-weighted) which approximates the frequency response of the human ear.
EP Act	Environmental Protection Act 1994
EPP (Noise)	Environmental Protection (Noise) Policy 1997
L_{90}	The noise level which is equalled or exceeded for 90% of the measurement period. L_{90} is an indicator of the mean minimum noise level, and is the descriptor for background noise
L_{eq}	The equivalent continuous noise level for the measurement period, weighted for duration and intensity. L_{eq} is an indicator of the average noise level which is the descriptor for ambient noise.
$\min L_{A90}$	The adjusted RBL based on the recommended outdoor background noise planning levels
MLA	Mining Lease Application
PNL	Planning Noise Level
Project	Wandoan Coal Project
Proponent	Wandoan Joint Venture
Receptor	Noise-sensitive land use at which noise from a development can be heard. Referred to as “receiver” in *Ecoaccess Guidelines*.
RBL	The overall single-figure background level representing each assessment period (day, evening, night) over the whole monitoring period
ROM	Run of mine
Sound Power Level (SWL)	Property of the source of the sound and it gives the total acoustic power emitted by the source
Sound Pressure Level (SPL)	Property of the sound at a given observer distance from the source and can be measured by a single microphone
WJV	Wandoan Joint Venture

Attachment B

Noise Survey Results

Attachment B





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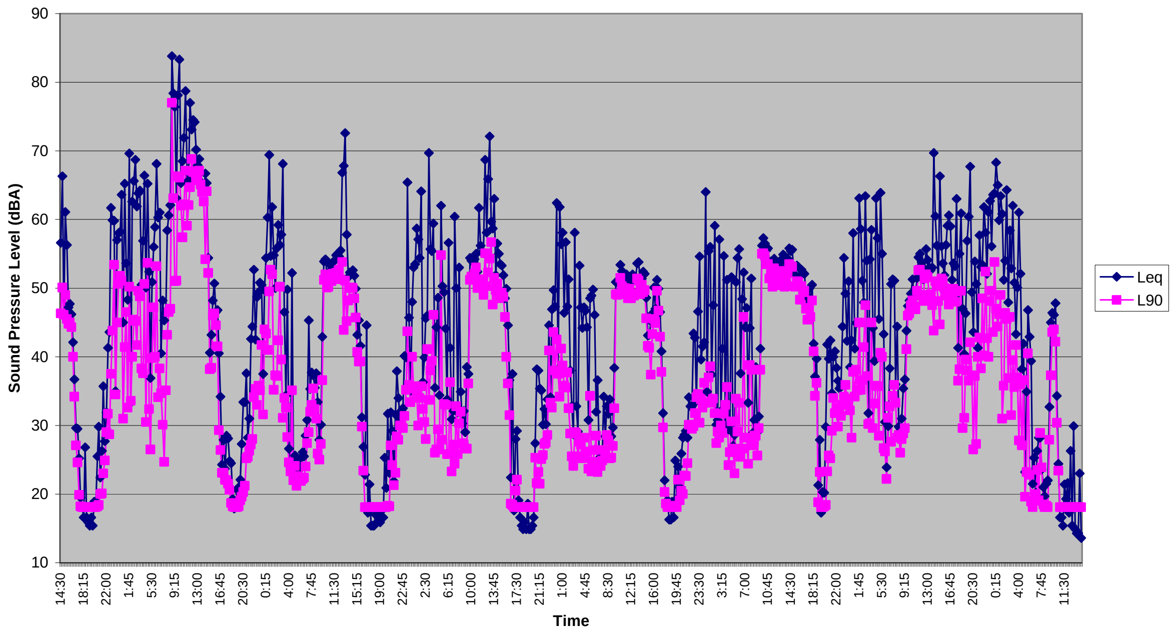
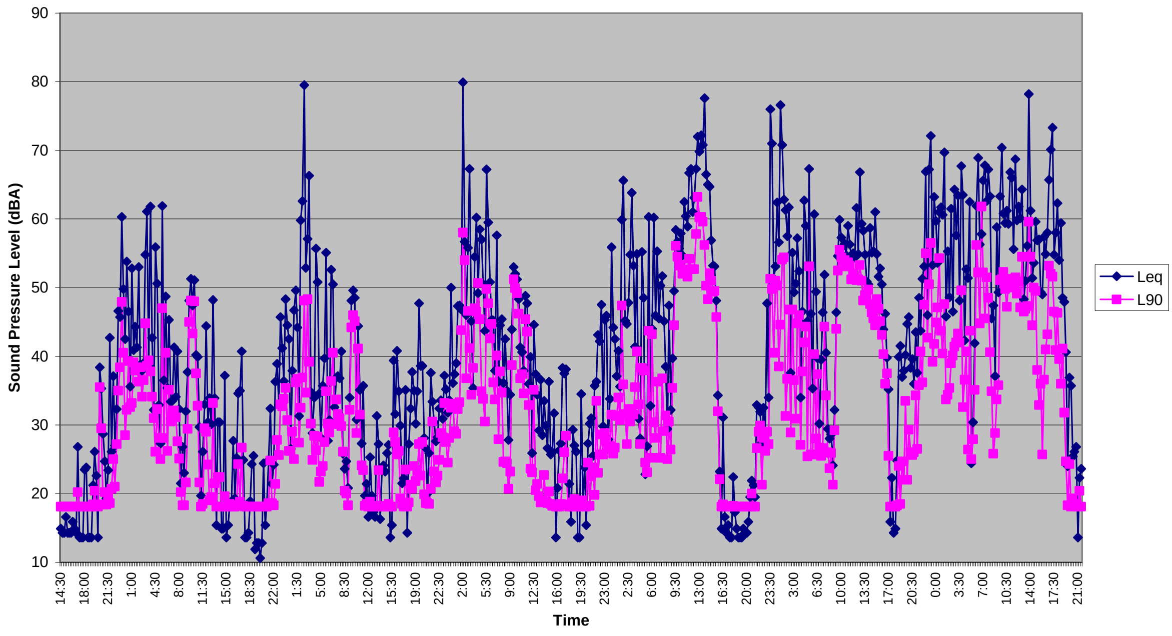
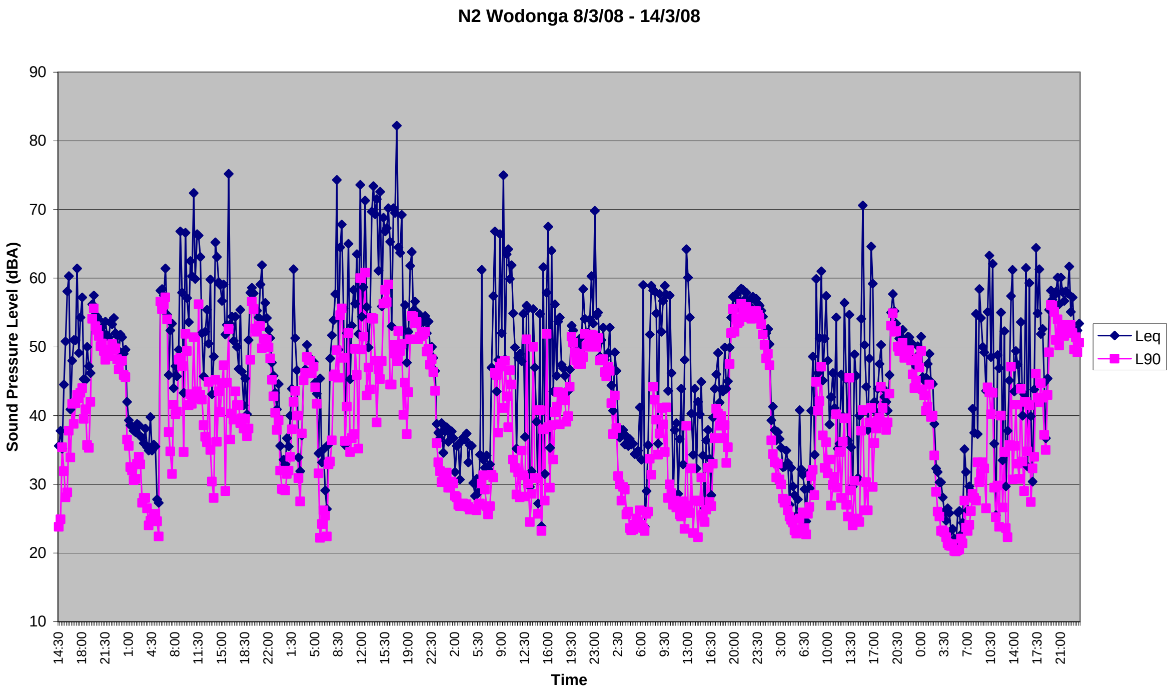
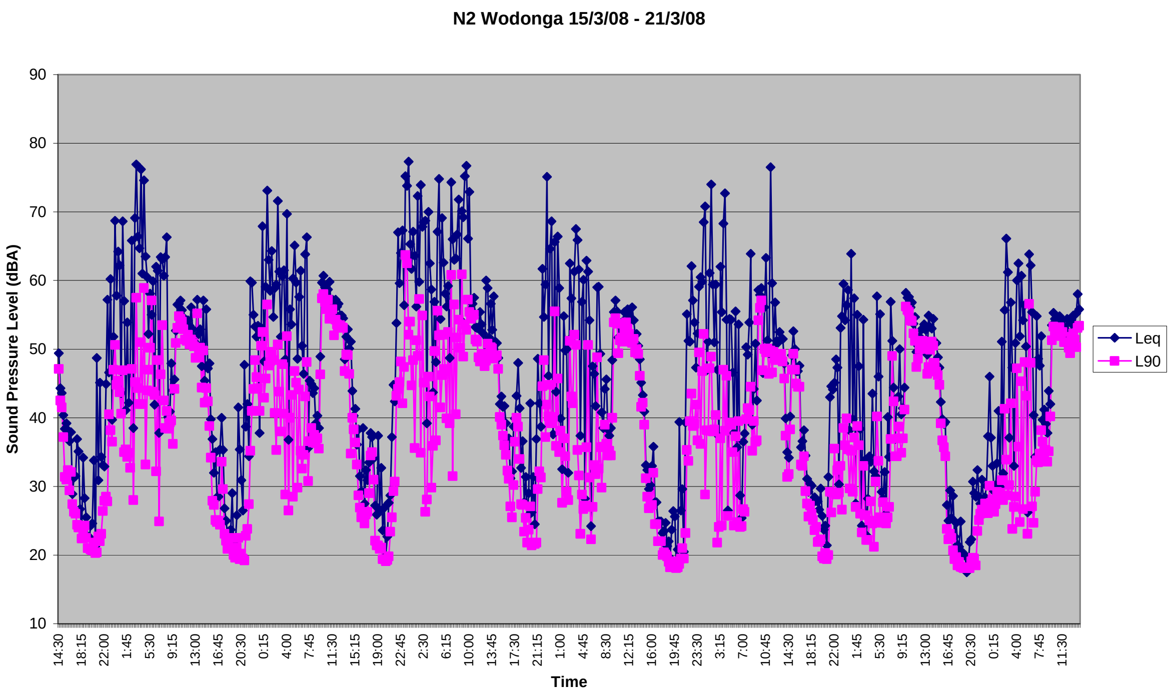


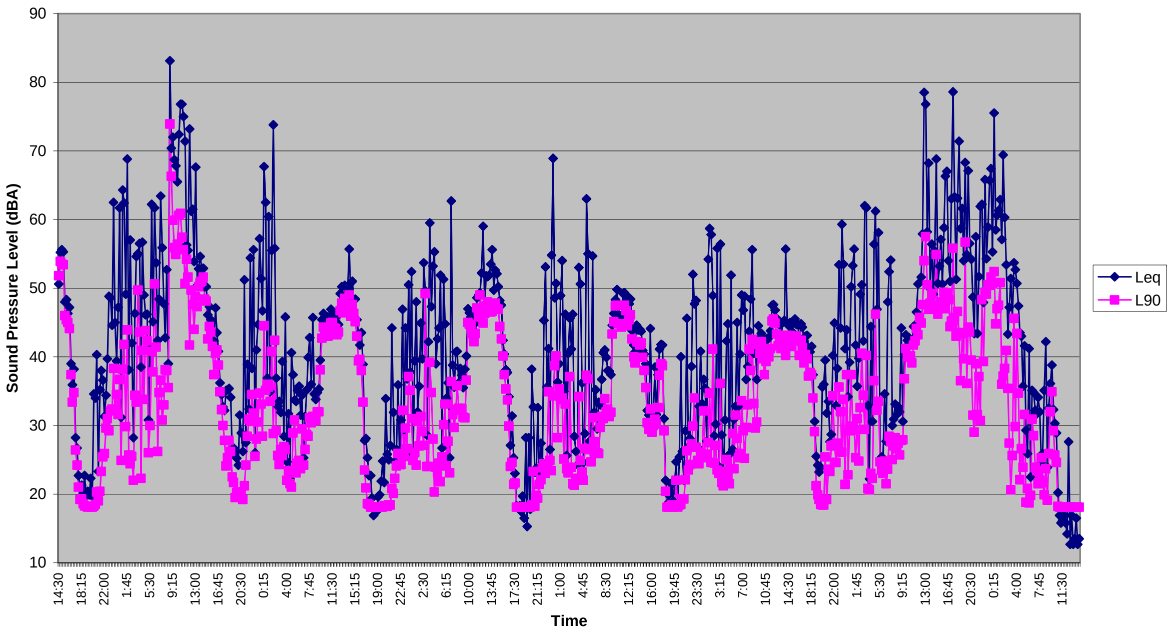
N1 Nathan Road 29/3/08 - 4/4/08



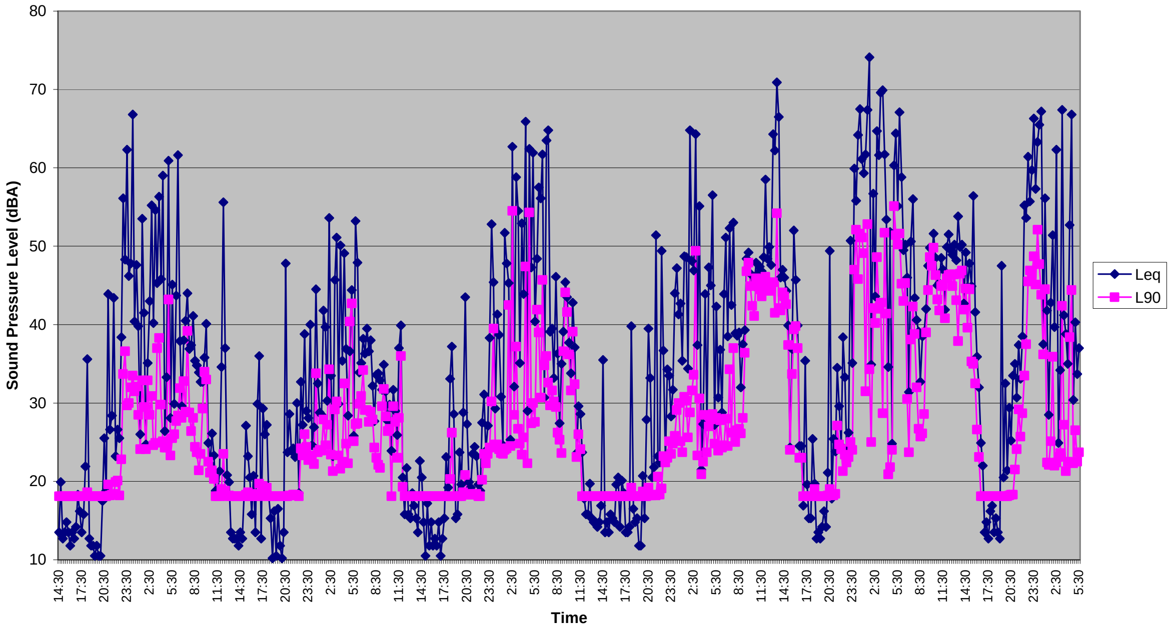

N2 Wodonga 8/3/08 - 14/3/08
Sound Pressure Level (dBA)
Time
Leq
L90

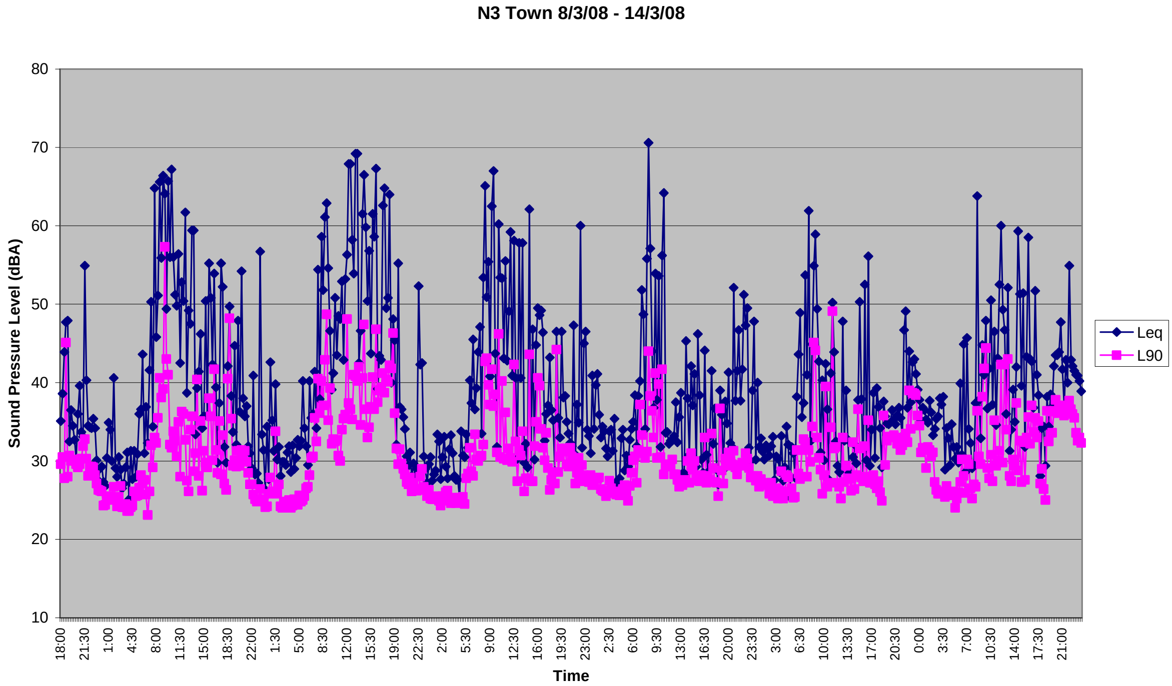

N2 Wodonga 15/3/08 - 21/3/08
Sound Pressure Level (dBA)
Time
Leq
L90

N2 Wodonga 22/3/08 - 28/3/08



N2 Wodonga 29/3/08 - 3/4/08




N3 Town 8/3/08 - 14/3/08
Sound Pressure Level (dBA)
80
70
60
50
40
30
20
10
18:00
21:30
1:00
4:30
8:00
11:30
15:00
18:30
22:00
1:30
5:00
8:30
12:00
15:30
19:00
22:30
2:00
5:30
9:00
12:30
16:00
19:30
23:00
2:30
6:00
9:30
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20:00
23:30
3:00
6:30
10:00
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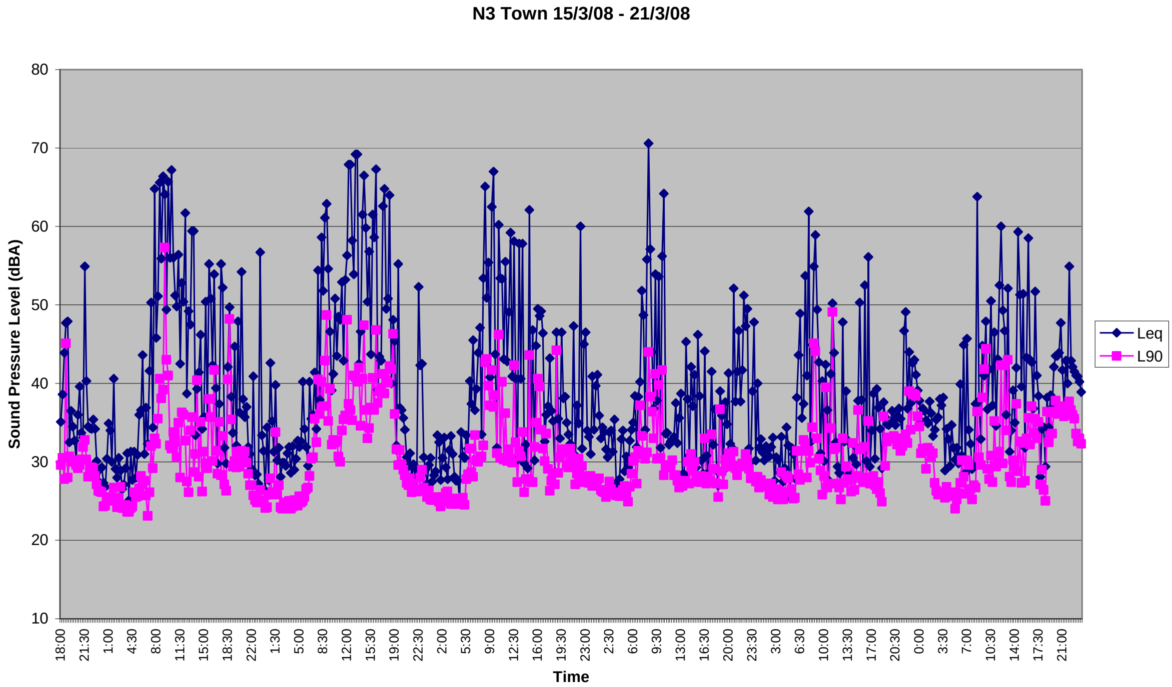
21:00
Time
Leq
L90


N3 Town 15/3/08 - 21/3/08
Sound Pressure Level (dBA)
80
70
60
50
40
30
20
10
18:00
21:30
1:00
4:30
8:00
11:30
15:00
18:30
22:00
1:30
5:00
8:30
12:00
15:30
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2:00
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9:00
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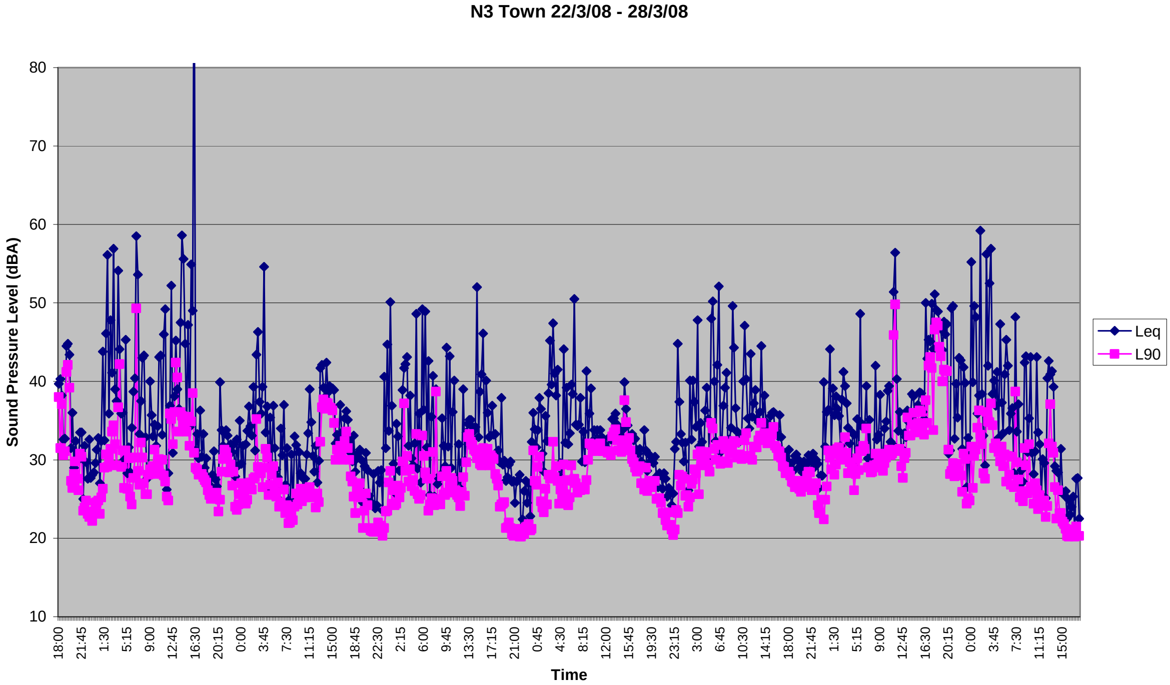
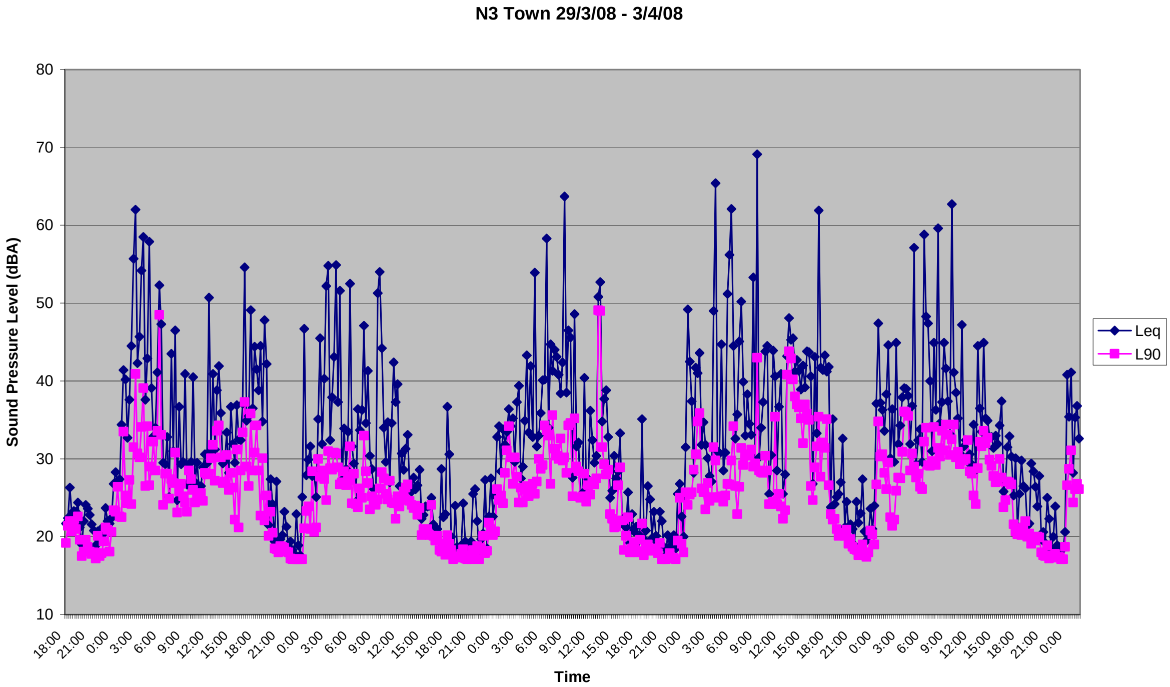
Time
Leq
L90


N3 Town 22/3/08 - 28/3/08
Sound Pressure Level (dBA)
Time
Leq
L90


N3 Town 29/3/08 - 3/4/08
Sound Pressure Level (dBA)
Time
Leq
L90

Attachment C

Calculation of Noise Assessment Criteria

Attachment C

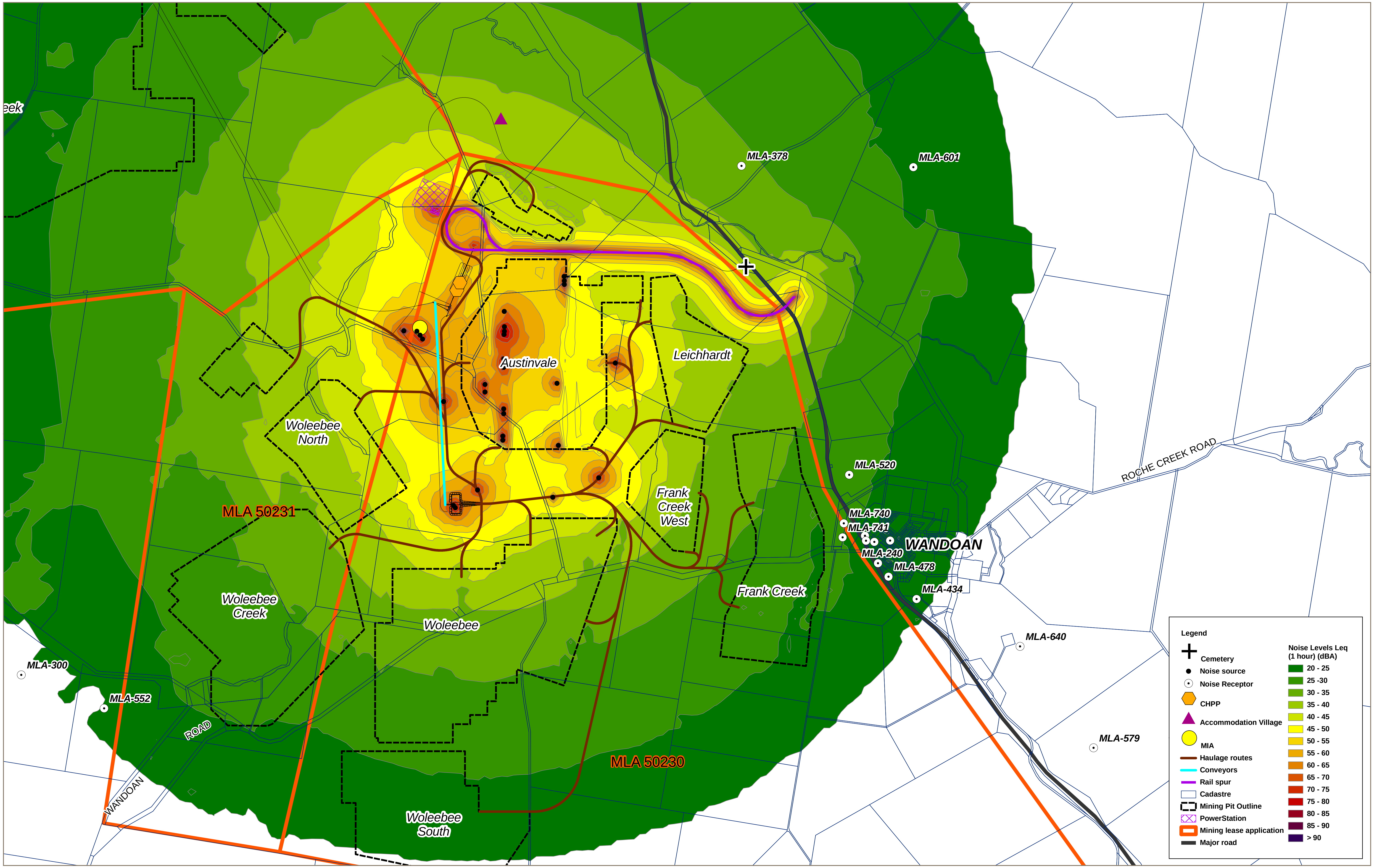
Calculation of Noise assessment criteria

This step by step procedure is intended to be read with a copy of the *Ecoaccess guideline* for reference which is available at http://www.epa.qld.gov.au/publications?id=1369, (8 September 2008). All references to Tables and equations relate to those specified in the *Ecoaccess guideline.* The development of the criteria based on measurements taken at N1 Nathan Road is shown in the table below:

N1 Nathan Road	Day	Evening	Night	Notes
Intial Survey L_{A90}	26	30	18	
Acceptable (measured) L_{A90}	26	30	25	
Recommended L_{A90} (Table 1)	35	30	25	Land Use: Very Rural
Differences (Table 2)	(35-26) = 9	(30-30) = 0	(25-25) = 0	
Adjustment to background (Table 2)	+5	-10	-10	
Max Planning Level	(26+5) = 31	25*	25*	* set at threshold
Existing (measured) L_{Aeq}	48	49	38	
PNL (Table 3)	40	35	30	Category: Z1
Differences (Table 4)	(40-48) = -8	(35-49) = -14	(30-38) = -8	>PNL+2
Max PNL (Table 4) $L_{Aeq\ 1hr}$	38	39	28	Existing - 10
Specific Level (Equation 1) $L_{Aeq\ 1hr}$	(31+3) = 34	(25+3) = 28	(25+3) = 28	
CRITERIA	34	28	28	

Attachment D

Predicted Noise Contours



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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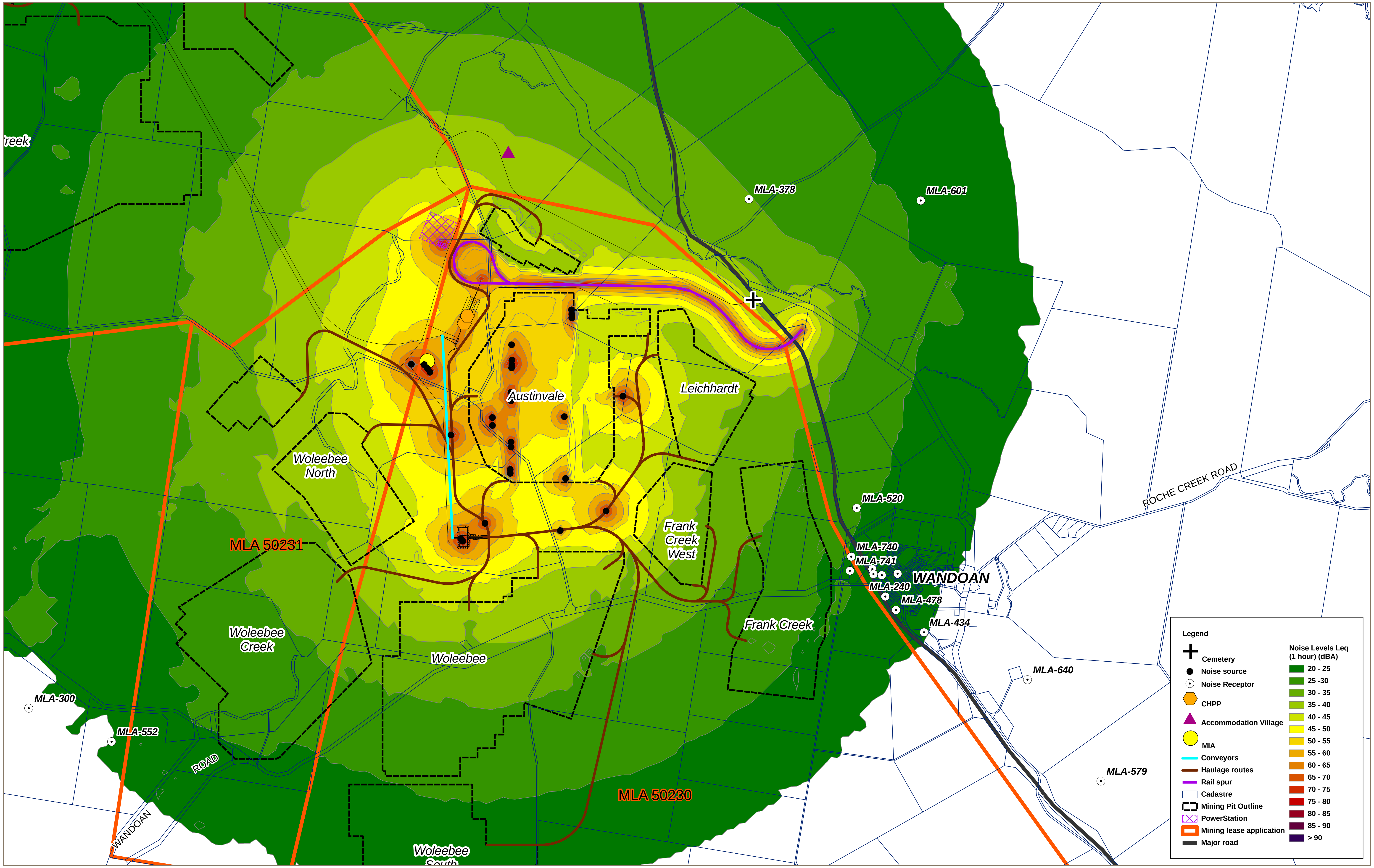
0 0.5 1 1.5 2 2.5

Kilometres

Scenario 2 - Year 1: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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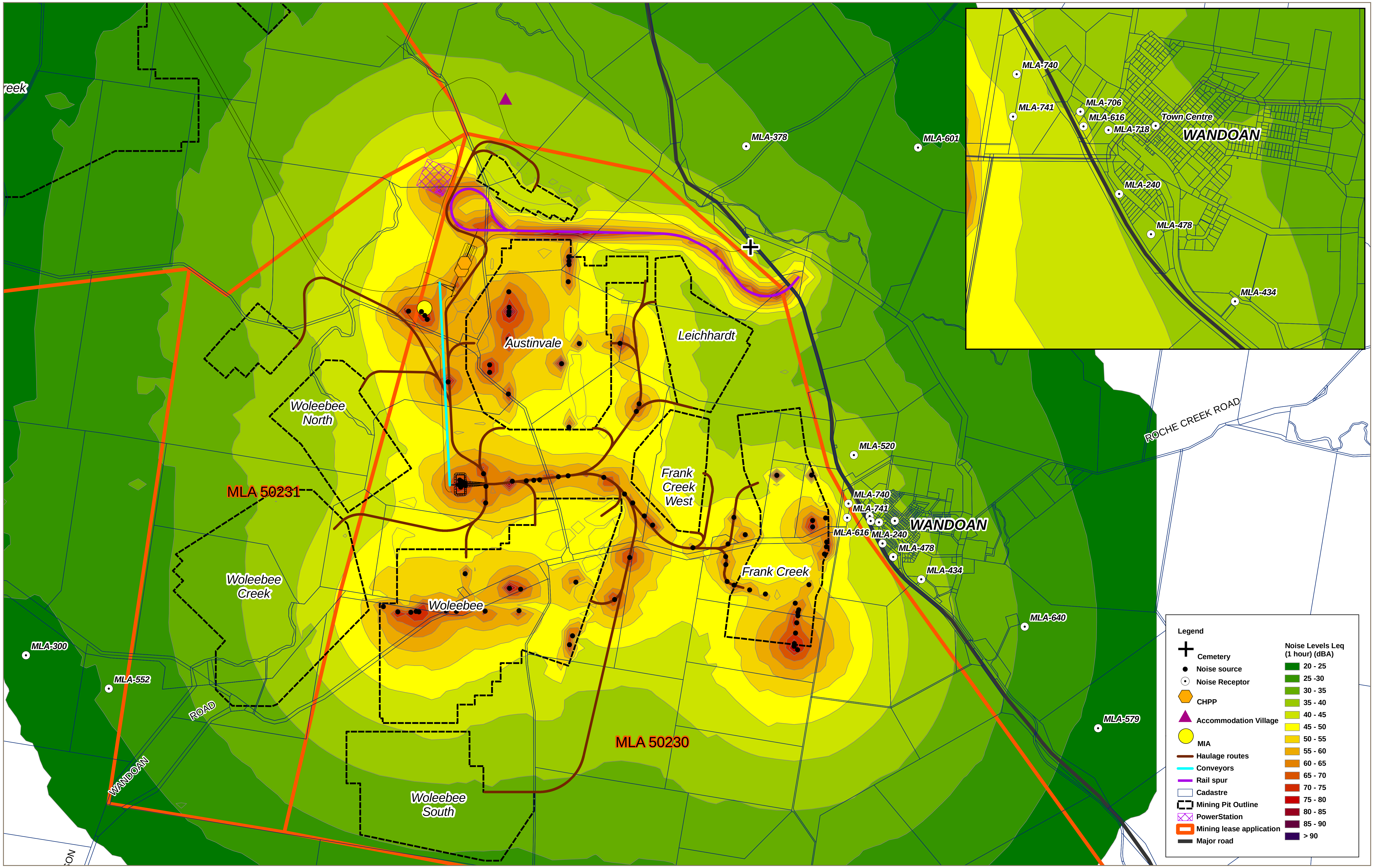
0 0.5 1 1.5 2 2.5

Kilometres

Scenario 2 - Year 1: Attenuated Dragline Bucket



Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

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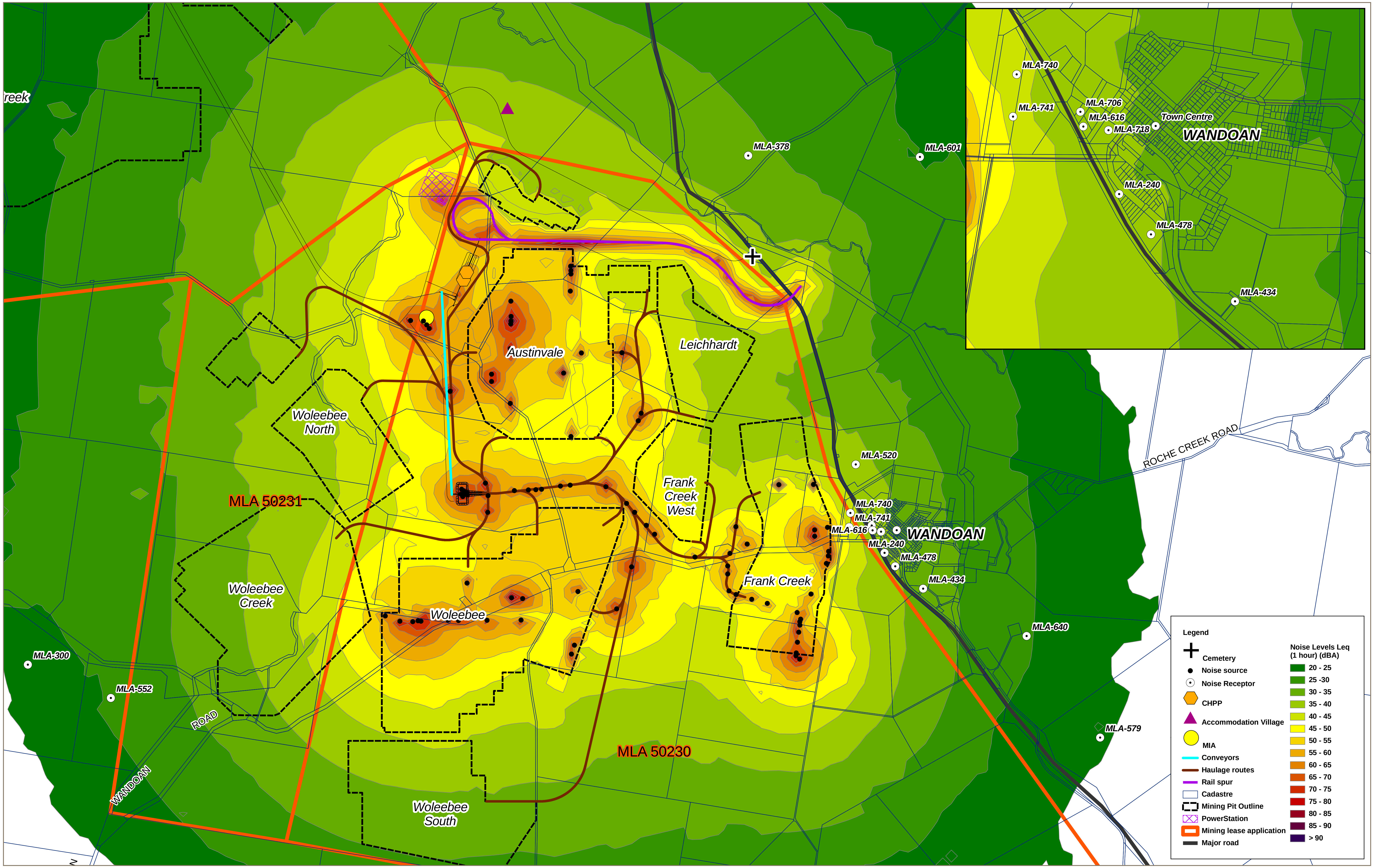
0 0.5 1 1.5 2 2.5
Kilometres

Scenario 3a - Year 5: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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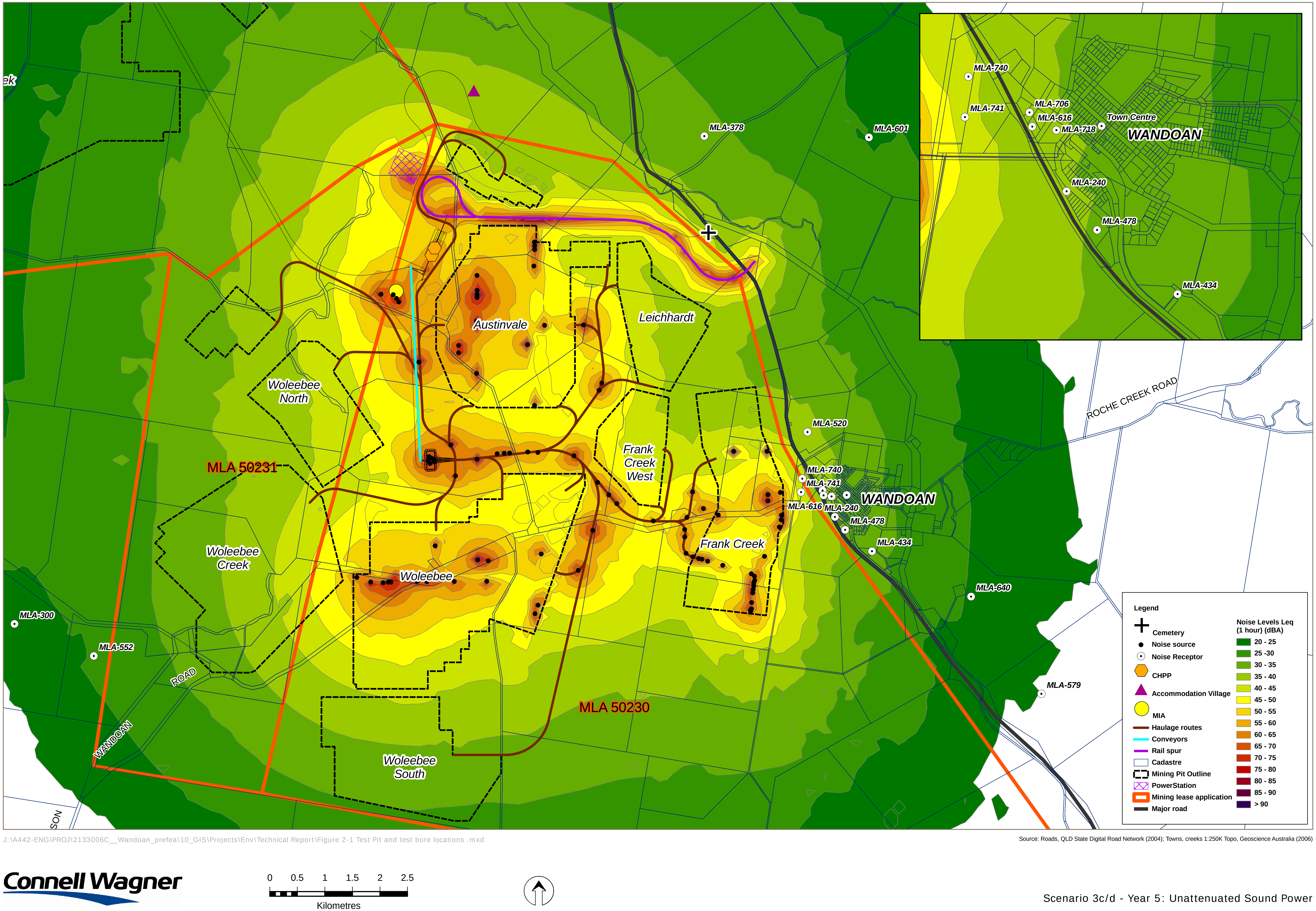
0 0.5 1 1.5 2 2.5
Kilometres

Scenario 3a - Year 5: Attenuated Dragline Bucket



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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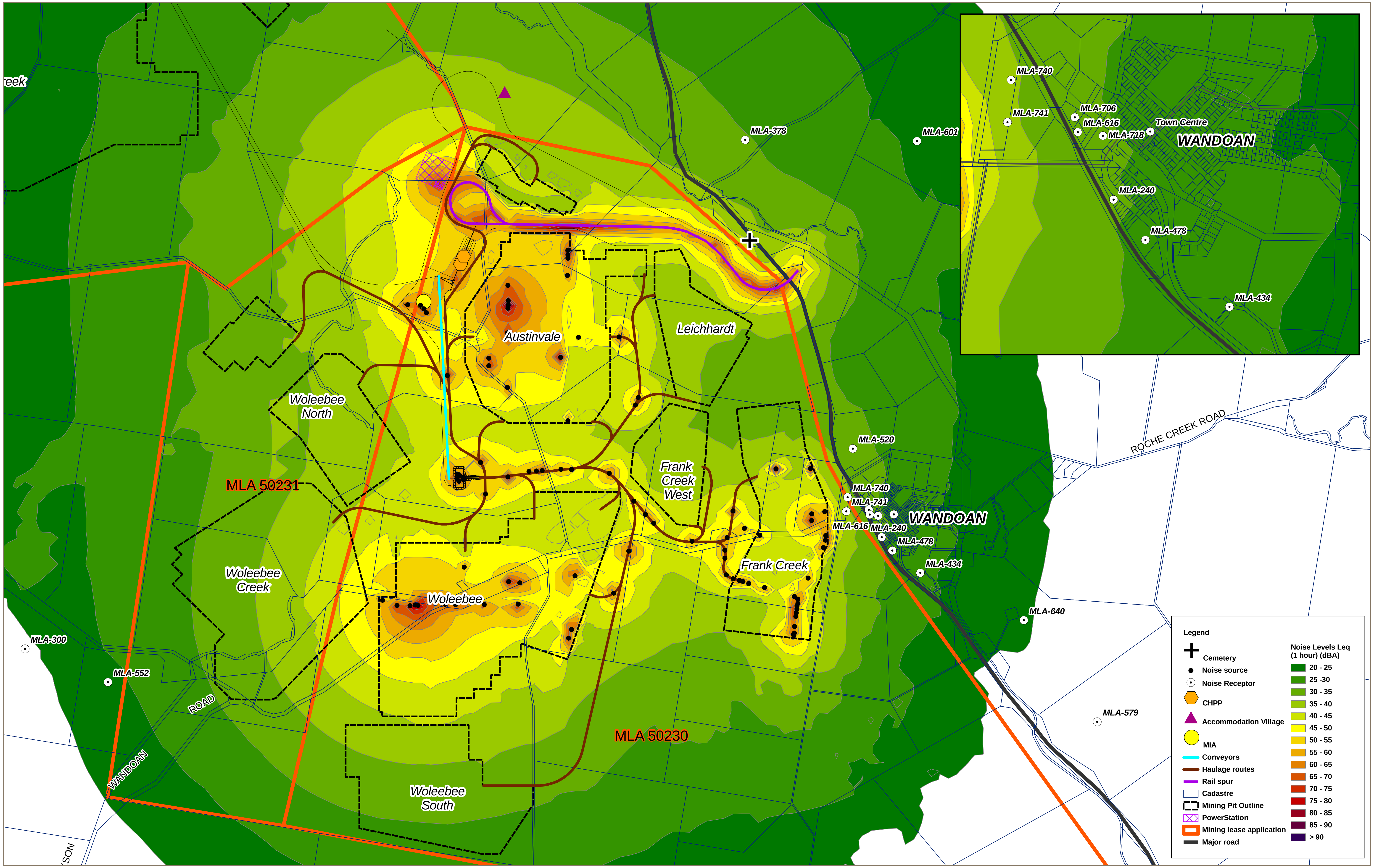
Scenario 3c/d - Year 5: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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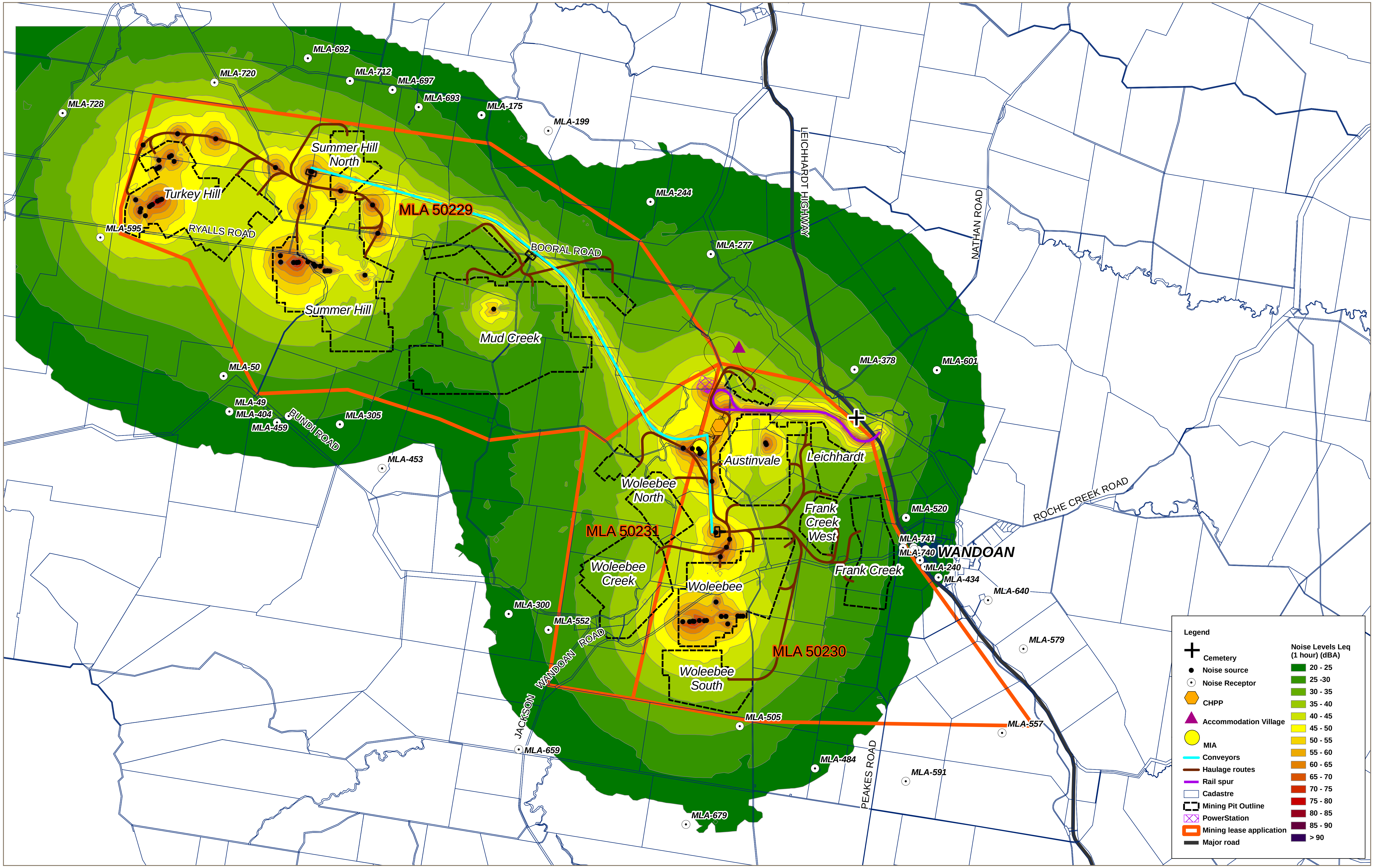
0 0.5 1 1.5 2 2.5
Kilometres

Scenario 3c/d - Year 5: Attenuated Equipment



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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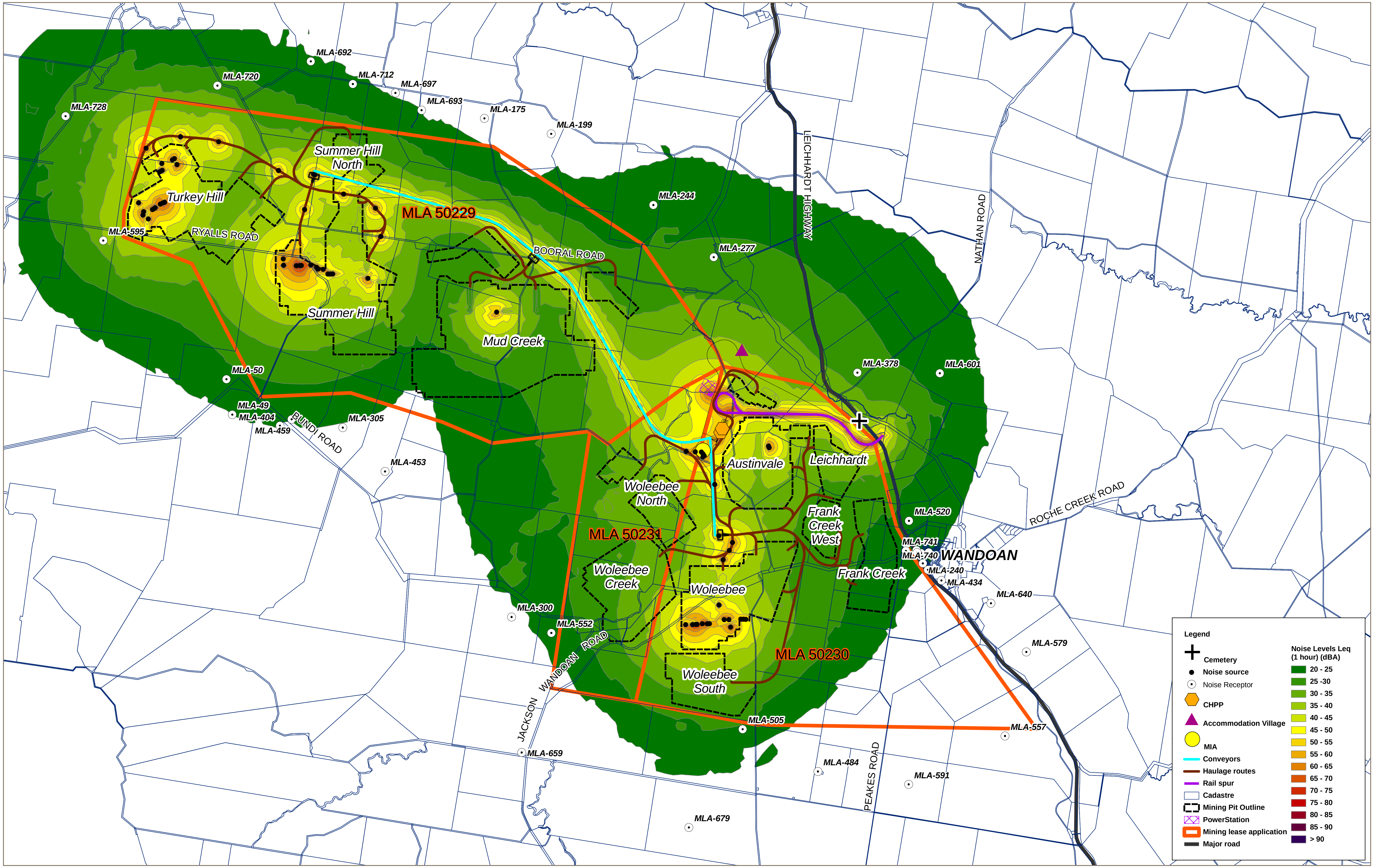
0 1 2 3 4 5

Kilometres

Scenario 4 - Year 10: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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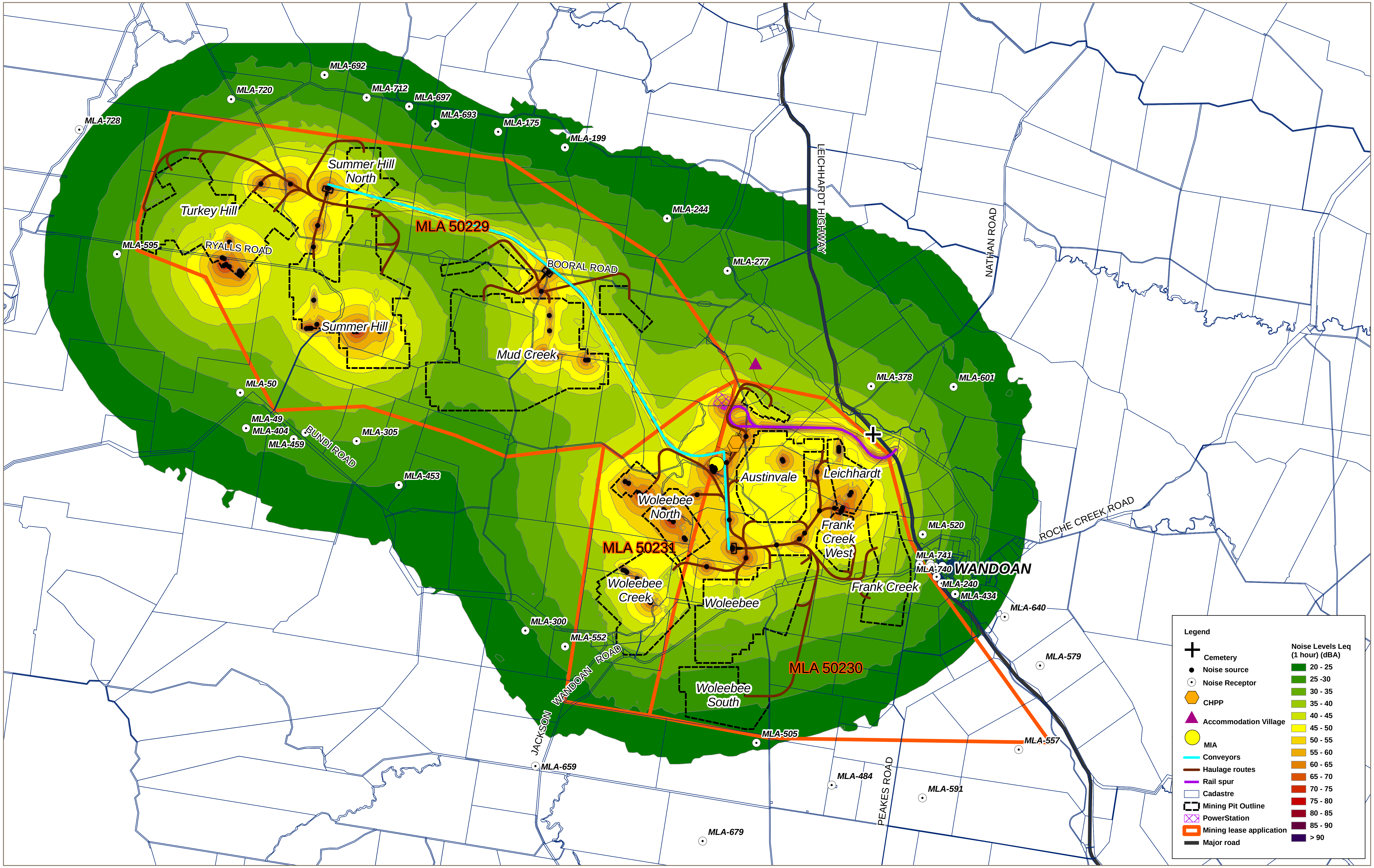
0 1 2 3 4 5
Kilometres

Scenario 4 - Year 10: Attenuated Equipment



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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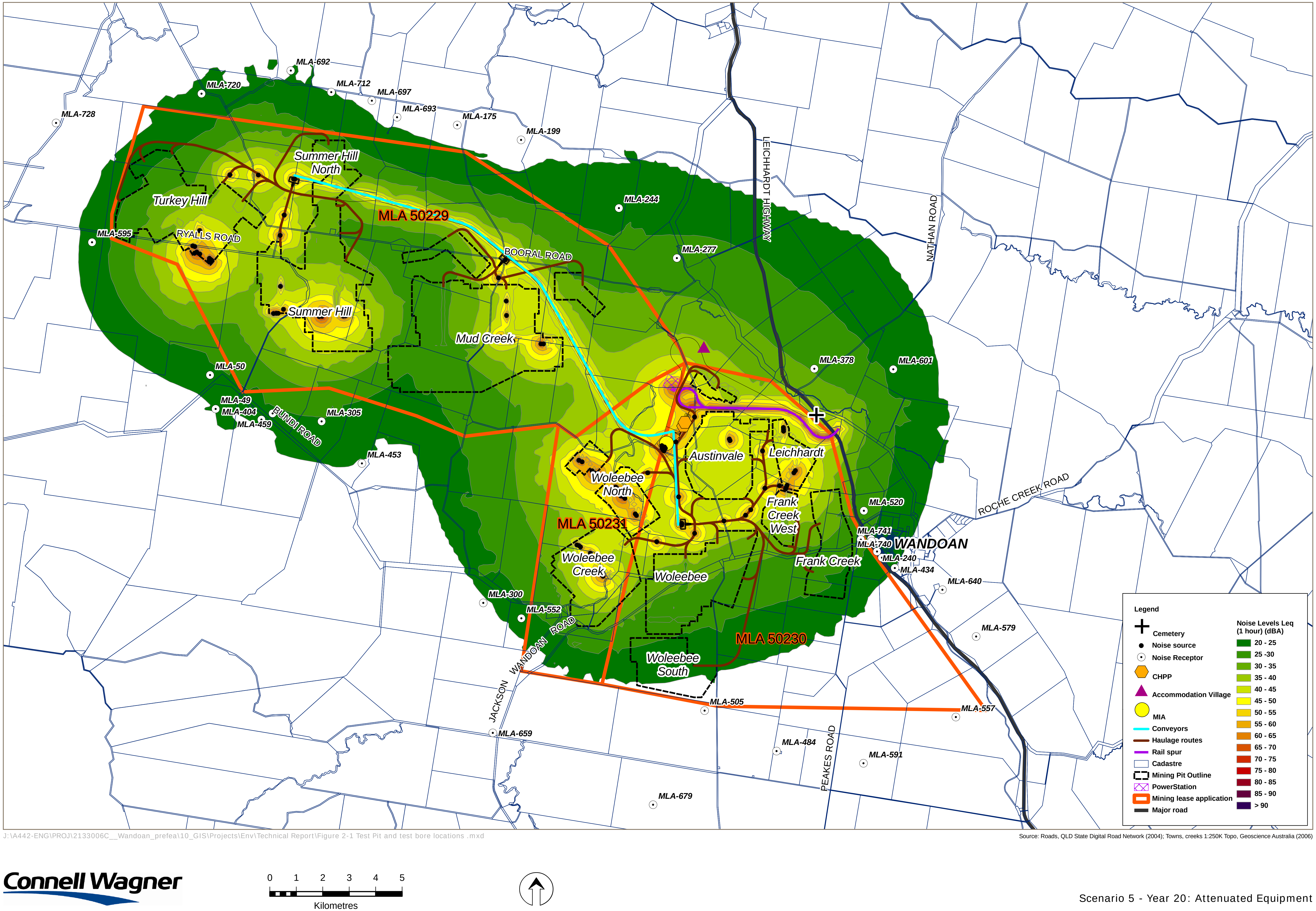
0 1 2 3 4 5
Kilometres

Scenario 5 - Year 20: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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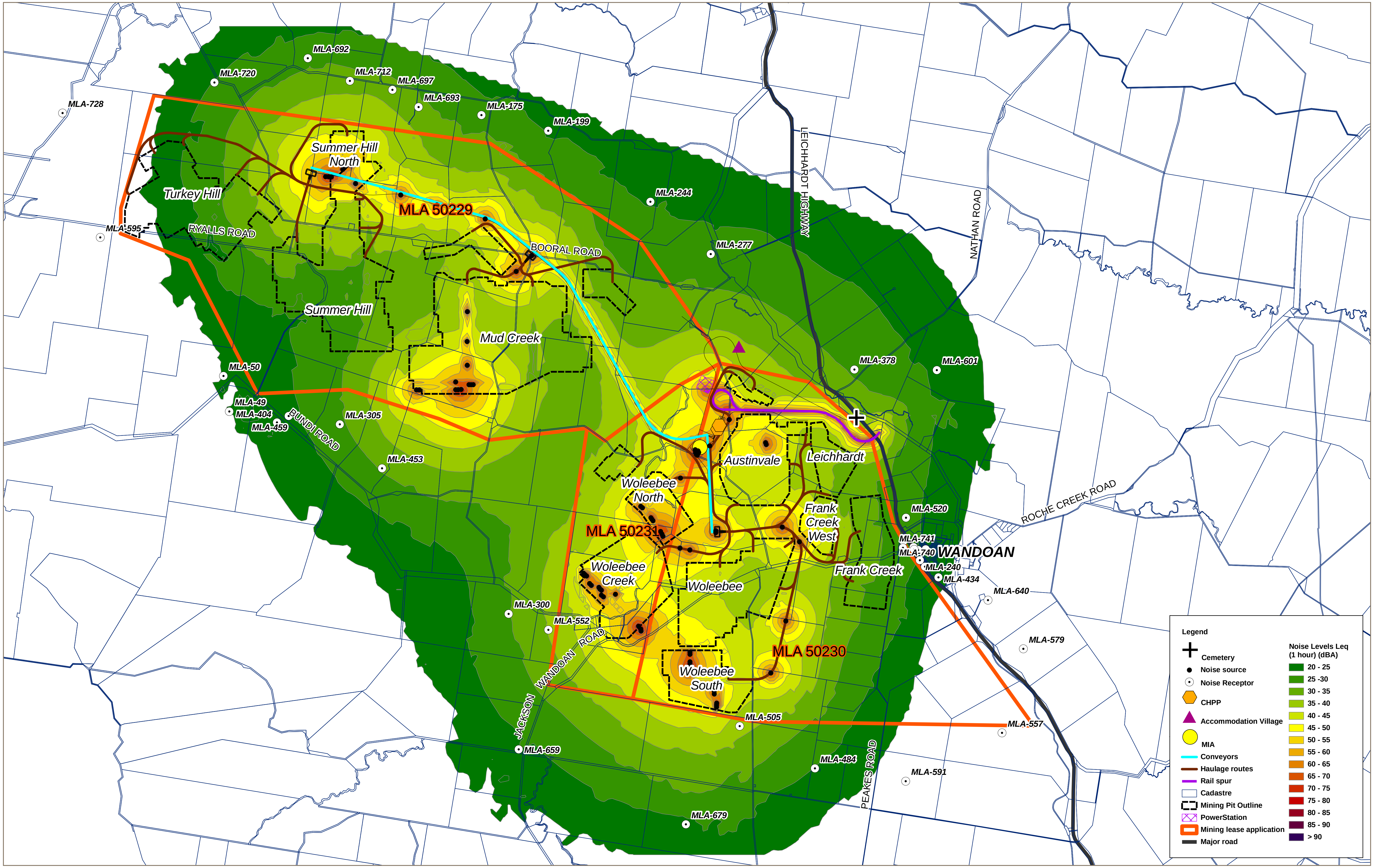
Scenario 5 - Year 20: Attenuated Equipment



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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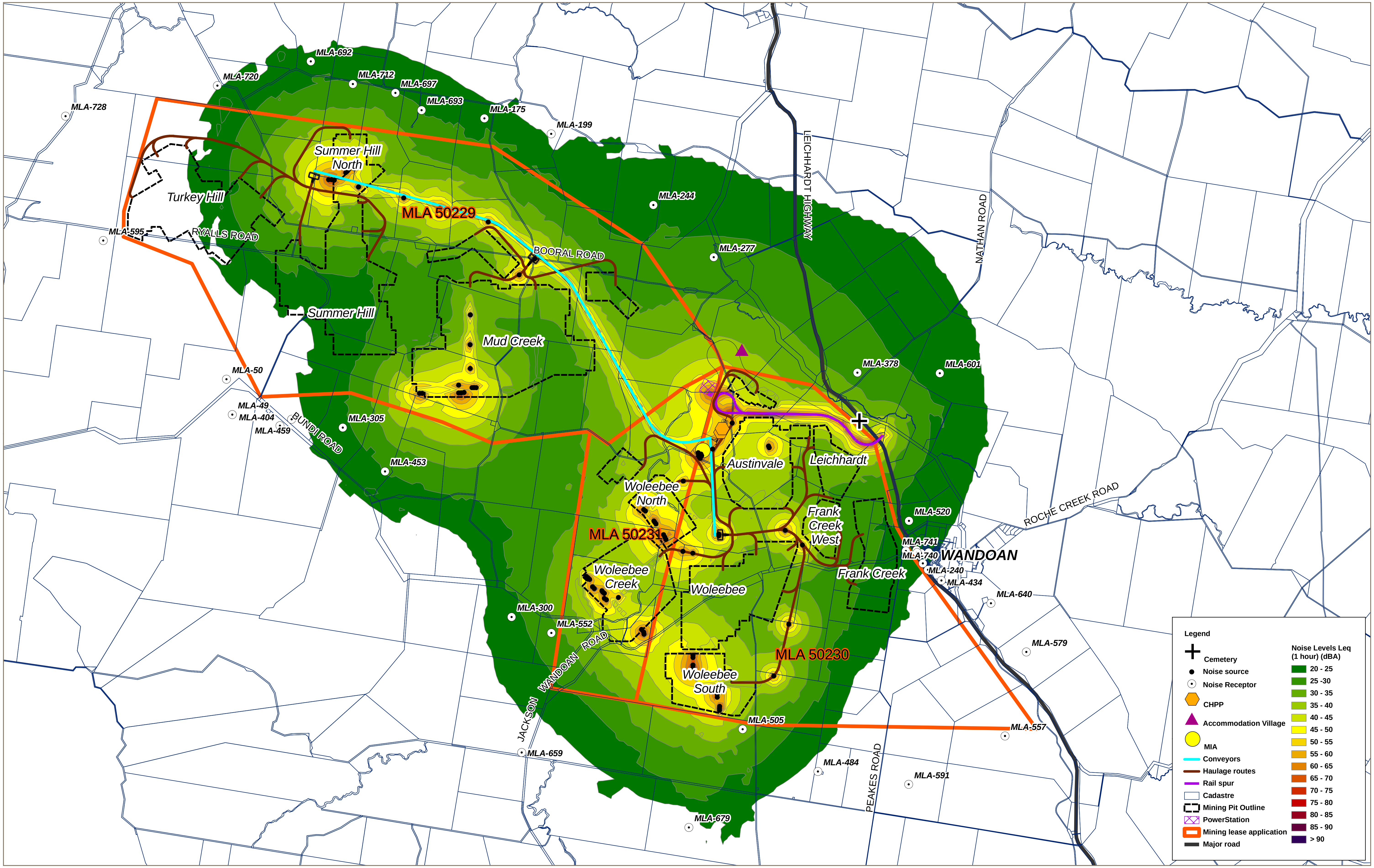
0 1 2 3 4 5
Kilometres

Scenario 6 - Year 30: Unattenuated Sound Power



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 2-1 Test Pit and test bore locations .mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

Connell Wagner

0 1 2 3 4 5
Kilometres

Scenario 6 - Year 30: Attenuated Equipment