Noise – Summary of Key Outcomes

The construction and operational phase noise and vibration impacts associated with the proposed peaking power plant at Buronga have been assessed primarily in accordance with the following policy guidelines published by the Department of Environment & Climate Change (DECC):

- NSW Industrial Noise Policy (INP);
- Environmental Criteria for Road Traffic Noise (ECRTN);
- Chapter 171 of the Environmental Noise Control Manual (ENCM);
- Noise Guide for Local Government (NGLG); and
- Assessing Vibration: A Technical Guideline (AVATG).

Based on the plant noise levels assumed in this modelling, noise level criterions were met for construction and operational phases for the closest existing residence. No noise level exceedances have been predicted for the existing residence, including when a 5dB low frequency noise penalty was applied as a worst case scenario.

The modelled outcomes may be achieved or noise levels further reduced to meet receptor-level criteria by the implementation of relevant plant selection strategies and the incorporation of appropriate noise mitigation technology during plant design and manufacture.

Not withstanding, IPRA would ensure that:

- plant selection and detailed design processes will evaluate noise mitigation options based on the noise limits identified in this noise assessment;
- plant manufacture incorporates the features as determined necessary by the detailed design process to meet noise criteria at the relevant receptors; and
- post-commissioning, the plant noise outputs will be measured to demonstrate that actual noise emissions meet noise criteria at the relevant receptors.

The potential for sleep disturbance from the operation of the development was found to be negligible.

Noise impacts due to extra traffic along Arumpo Road, during the construction and operation of the peaking power plant were found to be negligible.

A preliminary assessment of noise during the construction phase shows no exceedances at the existing residential receivers. These levels would be confirmed prior to commencement based on final specification of plant and machinery. A Construction Noise Management Plan would be developed to ensure a suitable program and that specified noise levels are met.

No vibration impacts are envisaged to occur at the residential receivers either during construction or operation of the facility.

Chapter 11 Noise

11.1 Introduction

The construction and operational phase noise and vibration impacts associated with the proposed Buronga Peaking Power Plant have been assessed primarily in accordance with the following policy guidelines published by the Department of Environment & Climate Change (DECC):

- NSW Industrial Noise Policy (INP);
- Environmental Criteria for Road Traffic Noise (ECRTN);
- Chapter 171 of the Environmental Noise Control Manual (ENCM);
- Noise Guide for Local Government (NGLG); and
- Assessing Vibration: A Technical Guideline (AVATG).

This chapter presents a summary of the noise and vibration assessment conducted by Wilkinson Murray Acoustical Consultants provided within **Appendix D** of this Environmental Assessment.

11.2 Methodology

11.2.1 Vibration

During the construction stage, likely plant which has the potential to give rise to vibration impacts would be limited to rollers. Given that the nearest existing residential receiver will be approximately 3km away from the nearest area of works, the vibration levels would not be perceptible (approximately less than 0.15mm/s) and therefore not impact on any residences.

Once operational, all rotating plant items of the peaking power plant will be required to be correctly aligned and balanced. It is therefore unlikely that any vibration levels will be perceptible at nearby residences.

Given the low risk associated with vibration impacts (both annoyance and structural damage) a detailed vibration assessment was not deemed necessary.

11.2.2 Traffic Noise

Access to the Buronga Peaking Power Plant would be off the Arumpo Road.

Arumpo Road is generally a two way, two lane road with a speed limit of 100km/hr. The typical average daily movements during the peak period of construction activity would be 7 heavy vehicles and 39 light vehicle movements per day (refer **Chapter 10** *Traffic*).

The Roads and Traffic Authority (RTA) conducted traffic counts for a complete week in November 2006 (RTA station 98.156 – Buronga – North of State Highway 22, Silver City Highway), averaging 233 light vehicles and 98 heavy vehicles per day. The additional operational traffic movements per day are considered to be negligible on the overall noise from road traffic due to typical traffic movement on the Arumpo Road.

11.2.3 Construction and Operation Noise

Noise-generating activities during the construction phase will generally only occur between 7.00am and 6.00pm hours. During the operational phase, the facility is most likely to operate at the time of peak electricity demand periods. In NSW these are generally 2:00pm to 8:00pm during the summer and 5:00pm to 7:00pm during the winter.

For this assessment, noise predictions were made using the ENM modelling software algorithm. This is a point-to-point model that takes into account the attenuation factors, including distance, ground absorption, air absorption and the effects of adverse meteorological conditions.

Intervening topography attenuates noise before it reaches receivers. Additionally, noise propagation over distances of at least several hundred metres is influenced by meteorological factors such as wind speed, wind direction and the presence of temperature inversions. In addition to altering noise levels at receivers, these meteorological conditions significantly reduce the attenuating effect of intervening topography (and bunds) since the sound waves follow a curved path that can go over such barriers.

During the night time period, the worst case noise levels are likely to be experienced during temperature inversions and under windy conditions. Temperature inversions are rarely present during the daytime or evening periods. Therefore, the most significant meteorological effect during the daytime and evening periods is wind conditions.

Hourly data for an entire year (2005) was processed for the site by URS using CSIRO's The Air Pollution Model (TAPM). This data included assimilated with wind data from a meteorological station located within Mildura Airport.

Wilkinson Murray has developed a process to assess the weather conditions of an area and their effect on noise that is more rigorous than that required by the *INP*. It identifies the impact due to adverse weather to all receivers by calculating the noise level that occurs 10% of the time. This process has been accepted by the DECC.

Where there exists the possibility that instantaneous, short-duration, high-level noise events may occur during night time hours (10.00pm to 7.00am), the DECC requires that consideration be given to the potential for sleep arousal within residences.

11.3 Existing Environment

11.3.1 Residential Receivers

The site is located in a rural area north east of Buronga in New South Wales. The nearest residential receivers are identified in **Figure 11-1**. The closest residence is Receptor A, approximately 3km south-west of the site.

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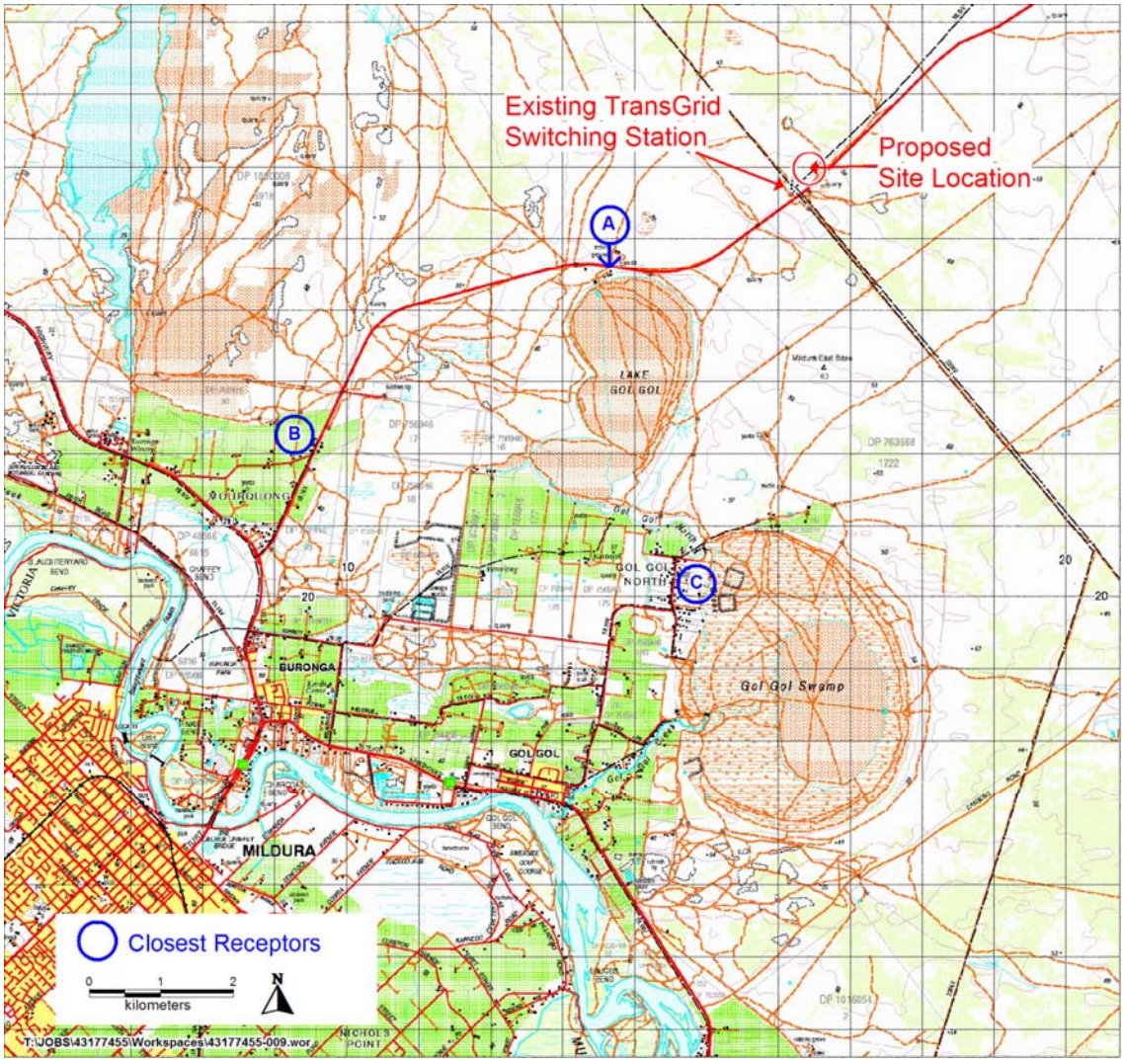
11.3.2 Background Monitoring

Monitoring was conducted at one representative location of the existing noise environment at the nearest residential receiver (Receptor A). At this receptor, the noise logger was installed at the front boundary fence, approximately four metres from the residence. **Figure 11-1** shows the location of the logger with respect to the site and **Table 11-1** summarises the results of the noise monitoring.

Figure 11-1 Location of Residences and Noise Monitoring Location



Source © URS Australia Pty Limited

Table 11-1 Receptor A - Measured Noise Levels - Unattended

Time Period (1)	Rating Background Level RBL (dBA)
Daytime	26
Evening	26
Night Time	24

Note 1) The *INP* considers daytime (7.00am-6.00pm); evening (6.00pm-10.00pm); night time (10.00pm-7.00am). On Sundays and Public Holidays, daytime begins at 8.00am and night time ends at 8.00am.

The residence at Receptor A uses a generator to produce electricity and as such the noise from the generator influenced the background levels. This primarily occurred during the evening.

11.4 Noise Criteria

11.4.1 Operational Noise

The *INP* is designed to assess "industrial noise" using the more stringent of the following two approaches:

- Intrusive noise impacts in the short term for residences; and
- Amenity for particular land uses such as residences.

The *INP's* intrusive goal is set 5dBA above the Rating Background Level (RBL) for each time period (daytime, evening or night time) of interest. The RBL's are derived from the measured L_{A90} noise levels as per the DECC guidelines.

The amenity goal sets an upper limit to the total noise level (L_{Aeq}) in an area from all industrial noise (existing and future). The criterion depends on the time of day, area classifications and the relationship of the total measured L_{Aeq} (and contribution from existing industrial noise) to determine the Acceptable Noise Level (ANL) for the development.

The potentially affected area is classified as "Rural" by the *INP*. Given this, the "acceptable" amenity levels (L_{Aeq} dBA) which apply over the whole day, evening or night period are as follows:

- Daytime (7:00am to 6:00pm) 50dBA
- Evening (6:00pm to 10:00pm) 45dBA
- Night time (10:00pm to 7:00am) 40dBA

The "maximum" amenity levels are 5dBA higher.

There are no other "industrial" noise sources and, in particular, the Wentworth Shire Council's Sewage Treatment Plant is not audible at any of the nearby residential receivers:

Where the noise source contains annoying characteristics, such as dominant low frequency content, adjustment factors as per the *INP* apply.

Further to this, the *INP* requires where noise sources contain certain characteristics (such as tonality, impulsiveness, intermittency or dominate low frequency content) a modifying factor of +5dBA (to a maximum of +10dBA) should be applied because these type of noises typically cause greater annoyance to the community.

These modification factors take effect at the residential receiver and would typically be judged by measurement at the residential receiver where the measurement would be made up of both the plant noise and existing ambient noise environment as currently experienced by the residential receiver.

With regard to gas turbine power plants there is a risk that low frequency noise correction could apply if the noise mitigation is not correctly designed in the detail design process. Therefore these issues should be considered and form part of more detailed assessment if appropriate. In the event that the gas turbine supplier considers that their plant would result in a low frequency modification factor being applied at the residences, then the plant should be designed to meet a level of 5dBA below the criterion to account for low frequency noise.

11.4.2 Sleep Arousal Criteria

Where there exists the possibility that instantaneous, short-duration, high-level noise events may occur during night time hours (10.00pm to 7.00am), the DECC requires that consideration be given to the potential for sleep arousal within residences.

There are two complementary assessment strategies proposed by the DECC. In the first instance, the primary assessment for whether or not sleep disturbance within residences will be occasioned by the project is based on whether the $L_{A1(1minute)}$ noise level (often approximated as the L_{Amax} noise level) from any instantaneous night time noise event related to the project will exceed the background noise level by more than 15dBA when measured external to the bedroom window.

Where levels exceed this goal, then further guidance on the potential for "awakenings" is given in Appendix B of the DECC's *Environmental Criteria for Road Traffic Noise (ECRTN)* in which it is concluded that:

- "maximum internal [to the bedroom] noise levels below 50-55dBA are unlikely to cause awakening reactions", and
- "one or two noise events per night, with maximum internal noise level of 65-70dBA are not likely to affect health and wellbeing significantly".

The primary sleep arousal criteria adopted for this project is 45dBA L_{Amax} (based on the lowest permissible RBL of 30dBA) during the hours 10.00pm to 7.00am assessed external to a bedroom window.

11.4.3 Construction Noise Criteria

Considering the construction duration, the following criterion is appropriate:

> *The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 5dB(A).*

The construction criterion for this project is then L_{A10} 35dBA. It is anticipated that construction will most likely take place from 7.00am to 6.00pm during weekdays and 8.00am to 1.00pm on Saturdays. Should the contractor wish to work outside these "standard" hours, they will need to apply to the relevant authorities for approval.

11.5 Assessment of Impacts

11.5.1 Operational Noise Assessment

The Buronga Peaking Power Plant would operate as a "peaking plant", with three gas turbines. A typical set of worst case scenario data of all three gas turbines operating has been modelled considering and adverse meteorological conditions.

Only the larger and potentially noisier plant / equipment items have been modelled in detail. Other plant items that have been assessed (but not modelled) include the transformers – both low and high voltage that typically have sound power levels < 80dBA. Any small or localised noise sources, such as activity at the workshop, could be treated individually with screens/enclosures or lagging and the like. Adequate vibration isolation will be necessary.

Proposed Conditions - Unmitigated

The unmitigated noise levels have been calculated using the ENM modelling software and typical plant noise levels. These are summarised in **Table 11-2**. Levels for neutral conditions and those adverse conditions that will enhance the propagation of noise are presented.

Table 11-2 Summary of Calculated Noise Levels to Existing Residences - Unmitigated Operation Phase

Residence No.	Time Period	Calculated $L_{Aeq,15min}$ Noise Level (dBA) Meteorological Condition		Noise Criteria $L_{Aeq,15min}$(dBA)
		Acoustically Neutral	Acoustically Enhanced	
Southwest of the proposed site	Daytime	<20	<20	35
	Evening			
	Night Time		21	

Assuming that all three gas turbines are operational, the calculated noise levels for acoustically neutral conditions comfortably meet the criteria. At worst case a level of 21dBA has been calculated during the night time period in the event of adverse meteorological conditions that enhance the noise from source to the nearest receiver.

It is important to note that it has been assumed that all plant may operate at any time. The levels will be up to 5dB lower should only one generating unit operate.

During the day and evening periods the effects of enhanced meteorological conditions are considered. The figures represent the sound level that could be expected 10% of the time during all three time periods.

11.5.2 Assessment of the Potential for Sleep Arousal

The potential for sleep disturbance at Receptor A is likely be greatest during the early morning hours (notionally 2.00am to 4.00am) when background noise levels are at their lowest.

However, there are no sources identified that will produce instantaneous, short-duration, high-level noise events. If a gas turbine begins (or ceases) operation in the early hours of the morning, this will not occur instantaneously but would be a gradual process. Should a gas turbine be operating into the night or early morning period, the process is relatively steady state and free of instantaneous events.

Furthermore there is no reason, other than for emergency response, for the site to be visited during the night-time period even it there is a need to operate the plant. Any repairs or maintenance would normally be scheduled during the daytime period.

It can be concluded that the potential risk of activities associated with the development that may disturb the sleep of nearby residences is very low to negligible.

11.5.3 Construction Noise

Construction of Plant

To predict the worst case noise levels at typical construction stages over the duration of the project, the following scenarios have been considered.

- Scenario 1: A worst case month where activities including earthworks and construction of the internal road are anticipated to occur simultaneously.
- Scenario 2: A worst case month where activities including construction/erection of the buildings and landscaping are anticipated to occur simultaneously.
- Scenario 3: This represents the activities occurring towards the end of the construction programme, associated with commissioning of the plant. This essentially is the noise that will be experienced during operation which has already been calculated.

Table 11-3 summarises the calculated noise levels (unmitigated) at the nearest residence (Receptor A) for calm isothermal conditions for Scenarios 1 and 2 above. **Table 11-3** shows that no exceedances are predicted and that noise criteria are met.

Table 11-3 Calculated Construction Noise Levels at Receptor A

Residence No.	Calculated Noise Level $L_{A10,15min}$ (dBA)		Noise Criteria $L_{A10,15min}$ (dBA)
	Scenario 1	Scenario 2	
Receptor A	<20		35

Once the contractor is selected, the plant and equipment, processes and duration will be identified and a Construction Noise Management Plan would be developed. This would confirm assumptions used and identify the reasonable and feasible noise mitigation measures as necessary. Examples of mitigation measures include:

- Selection of quieter plant and processes;
- Retrofitting reversing alarms that are quieter and display less annoying characteristics, such alarms include “smart alarms” and “quacker alarms”;
- Use of temporary noise barriers;
- Positioning of plant / processes; and
- Limiting the “clustering” of plant / processes.

As the noise will generally be similar in character to noise from agricultural equipment, the residents may not perceive it as a nuisance.

11.6 Conclusion

The construction and operational phase noise and vibration impacts associated with the proposed Buronga Peaking Power Plant have been assessed in accordance with relevant Department of Environment & Climate Change policy documents.

Based on the plant noise levels assumed in this modelling, noise level criterions were met for construction and operational phases for existing residences. No noise level exceedances have been predicted for the closest residence, including when a 5dB low frequency noise penalty was applied as a worst case scenario.

The predicted modelled outcomes may be achieved or noise levels further reduced to meet receptor-level criteria by the implementation of relevant plant selection strategies and the incorporation of appropriate noise mitigation technology during plant design and manufacture.

Not withstanding, IPRA would ensure that:

- plant selection and detailed design processes would evaluate noise mitigation options based on the noise limits identified in this noise assessment;
- plant manufacture incorporates the features as determined necessary by the detailed design process to meet noise criteria at the relevant receptors; and
- post-commissioning, the plant noise outputs would be measured to demonstrate that actual noise emissions meet noise criteria at the relevant receptors.

The potential for sleep disturbance from the operation of the development was found to be negligible.

Noise impacts due to extra traffic along the Arumpo Road, during the construction and operation of the peaking power plant were found to be negligible.

A preliminary assessment of noise during the construction phase shows no exceedances at the nearest residential receiver. These levels would be confirmed prior to commencement with the Contractor, based on final specification of plant and machinery. A Construction Noise Management Plan would be developed to ensure a suitable program and that specified noise levels are met.

No vibration impacts are envisaged to occur at the residential receivers during either construction or operation of the facility.

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11.7 Mitigation Measures

Table 11-4 presents a summary of mitigation measures.

Table 11-4 Summary of Mitigation Measures

Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
A Construction Noise Management Plan is to be developed to confirm assumptions made in the assessment and to investigate reasonable and feasible noise mitigation measures if necessary.	✓	✓	
The Construction Noise Management Plan would consider, if appropriate, – Selection of quiet plant and processes; – Retrofitting reversing alarms that are quieter and display less annoying characteristics, such alarms include “smart alarms” and “quacker alarms”; – Use of temporary noise barriers; – Positioning of plant / processes; and – Limiting the “clustering” of plant / processes.	✓	✓	
Plant selection and detailed design processes would evaluate noise mitigation options based on the noise limits identified in this noise assessment	✓		
Plant manufacture to incorporate the features as determined necessary by the detailed design process to meet noise criteria at the relevant receptors	✓	✓	
Post-commissioning, the plant noise outputs would be measured to demonstrate that actual noise emissions meet noise criteria at the relevant receptors.			✓