



International Power



CHAPTER 11

Noise

URS

Noise – Summary of Key Outcomes

The construction, operational and traffic noise and vibration impacts due to the proposed Peaking Power Plant at Parkes 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)*; and
- *Environmental Noise Control Manual (ENCM)*.

No exceedance is predicted at the existing six closest residences to the site during the operation of the proposed peaking power plant.

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

Noise impacts due to extra traffic along Condobolin Road (both during construction and operation) were found to be negligible.

A preliminary assessment of noise during the construction phase shows no exceedances except potentially at the existing residential receiver at Location 1. The predicted construction noise levels would be reviewed prior to commencement and a Construction Noise Management Plan should be developed to ensure a suitable construction program to avoid or minimise the actual noise levels.

It is predicted that there will be no vibration impacts.

Final selection of the gas turbine type will include consideration of the assumptions included in this assessment and a review of the operational noise impacts of the selected plant. The operational plant will conform to regulatory requirements.

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11.1 Introduction

The construction, operational and traffic noise and vibration impacts due to the proposed Parkes 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); and
- Chapter 171 of the Environmental Noise Control Manual (ENCM).

A noise and vibration assessment was conducted by Wilkinson Murray Acoustical Consultants. This chapter presents a summary of the assessment and the full assessment is presented in **Appendix D**.

11.2 Methodology

11.2.1 Vibration

In terms of vibration sources identified during the construction stage, likely plant would include rollers, dozers and like. Given that the nearest existing residential receivers will be at least 1km away from the closest area of works, the vibration levels would not be perceptible and therefore not impact on the residences. It is highly unlikely that any new residences will be constructed adjacent to the site boundary during the construction stage, anticipated to end by December 2008. 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 past the site boundary and therefore no impact on any new residences (if constructed in the future) nor the existing residences located even further from the peaking power plant is expected.

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

The functional category of Condoblin Road is considered to be "sub-arterial" (RTA Road Design Guide 1996) and using the NSW Department of Environment & Climate Change (DECC) document, the *NSW Environmental Criteria for Road Traffic Noise (ECRTN)*, the applicable noise criteria refer to a day time (7.00am-10.00pm) $L_{Aeq,15hr}$ 60dBA level and a night time (10.00pm-7.00am) $L_{Aeq,9hr}$ 55dBA level. Traffic generating developments are allowed an increase above these limits of 2dB, once all reasonable and feasible mitigation is considered. Analysing the classified traffic data and the estimated vehicle movements during the construction phase, and given the fact that this is the only access, the 2dB limit applies.

There would be minor increases in road noise during the peak construction activities however, there is minimal risk of exceeding the 2dB limit. During the operational stage, there would be minor, light vehicle activity as required and as such negligible impact expected. Given the low risk of exceeding the 2dB limit, a further detailed assessment was not deemed necessary.

11.2.3 Construction and Operation Noise

Unless due to exceptional circumstances, noise-generating construction activities will generally only occur between 0700 and 1800 hours.

The power plant is most likely operate at the time of peak electricity demand periods. In NSW these are generally 1400-2000 hours during the summer and 1700-1900 hours 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 increasing noise levels, 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 both temperature inversions and wind. 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) assimilated with data from a meteorological station located within Parkes Airport. This data included the stability class ratings for inversions (Class A to F), which is relevant in determining the inversion class of the area.

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*, however, provides 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-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 $L_{A1(1\text{minute})}$ noise level (often approximated as the $L_{A\text{max}}$ 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".

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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-7.00am assessed external to a bedroom window.

11.3 Existing Environment

11.3.1 Residential Receivers

The site is located in a rural area west of Parkes. The nearest residential receivers are identified in **Figure 11-1**. The closest existing residence is Location 1, approximately 1km southeast of the site.

11.3.2 Background Monitoring

Monitoring was conducted at a representative location of the existing noise environment. Monitoring was conducted in free-field conditions (i.e. away from building facades and other reflecting surfaces). **Figure 11-1** shows the location of the logger with respect to the site.

Table 11-1 summarises the results of the noise monitoring.

Table 11-1 Measured Noise Levels – Unattended

Location	Time Period ⁽¹⁾	Rating Background Level RBL (dBA)
Logger Location A	Daytime	34
	Evening	27
	Night Time	25

Notes: 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.

According to the *INP*, if the RBL derived from measured background levels is less than 30dBA, then it is set to 30dBA for assessment. Hence the RBL for evening and night time is set to 30dBA for this assessment. Further, analysis of the logger data suggests that it was inadvertently located near a pump that operated (at times) during daytime hours. It is probable that the daytime RBL is less than that measured. As it makes no practical difference to this assessment the daytime noise was not remeasured, and the RBL daytime will be set at 30dBA.

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.



Legend

- Proposed Gas Pipeline Route
- Existing Gas Pipeline
- Existing Residence and Background Monitoring Location
- Gas Pipeline Take-off Point
- Existing Residences

Source: Map compiled using Cadastral Plus, 2004 MapInfo Australain Pty Ltd and PSMA Australia Ltd.

Client

INTERNATIONAL POWER
(AUSTRALIA) PTY LTD

URS

Project

ENVIRONMENTAL ASSESSMENT
- PARKES PEAKING POWER PLANT

Drawn: AJW

Approved: CJ

Date: 21/03/2007

Job No: **43177456**

File No: 43177456.025.wor

Title

**LOCATION OF RESIDENCES AND
BACKGROUND MONITORING**

Figure: **11-1**

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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 and are applicable as there are no other "industrial" noise sources:

- Daytime 50dBA
- Evening 45dBA
- Night time 40dBA

The "maximum" amenity levels are 5dBA higher.

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

11.4.2 Sleep Arousal Criteria

The assessment of the disturbance of sleep is complicated and primarily due the following factors:

- Absolute level (usually presented as the L_{Amax} or $L_{A1(1minute)}$);
- The amount the absolute level "emerges" above the general background noise at the time of the event; and
- Number of events.

Where there exists the possibility that instantaneous, short-duration, high-level noise events may occur during night time hours, the DECC requires that consideration be given to the potential for disturbance of sleep within residences.

With reference to the *NGLG*, the primary assessment for whether or not ones' sleep will be disturbed by activities related to the operation of the Peaking Power Plant 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 operational activities of the facility) will exceed the background noise level by more than 15dBA when measured external to a bedroom window.

This is a simple approach and the *NGLG* acknowledges that further research is needed to define a better relationship between noise levels and sleep disturbance and refers to the *ECRTN* which provides a summary of research on sleep disturbance.

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 5 dB(A).

The construction criterion for this project is then L_{A10} 35 dBA. It is anticipated that construction will most likely take place from 7.00am to possibly up to 6.00pm during weekdays and 8.00am-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 Parkes Peaking Power Plant comprising three gas turbines will operate as a “peaking plant”.

A typical set of worst case scenarios of all three gas turbines operating has been modelled considering any 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 pipe-work could be treated individually with screens/enclosures or lagging and the like. Correct vibration isolation will be necessary.

Proposed Conditions - Unmitigated

The unmitigated noise levels have been calculated using the ENM modelling software and are summarised in **Table 11-2**. In the columns labelled “Adverse Meteorological Conditions”, the noise level presented is the level which would be exceeded 10 percent of the time. In calculating this level all meteorological conditions are considered, and the probability of their occurrence taken into account.

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

Location No.	Time Period	Calculated $L_{Aeq,15min}$	Noise Level	Noise Criteria
		(dBA)		$L_{Aeq,15min}$ (dBA)
		Calm Isothermal Condition	Adverse Meteorological Condition	<i>INP</i>
1	Daytime	32	33	35
	Evening		34	
	Night Time	33		
2	Daytime	<20	<20	
	Evening			
	Night Time			
3	Daytime	19	19	
	Evening		22	
	Night Time	20	21	
4	Daytime	13	13	
	Evening		15	
	Night Time	14		
5	Daytime	<20	<20	
	Evening			
	Night Time			
6	Daytime	<20	<20	
	Evening			
	Night Time			

The calculated noise levels meet the criteria at all residential receivers. At locations 2, 5 and 6 the noise levels will always be less than 20dBA.

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

Conclusion

With respect to the assessing the noise impact to the existing six residences, considering neutral meteorological conditions during the operation of the peaking power plant, no exceedances have been predicted.

11.5.2 Assessment of the Potential for Sleep Arousal

The potential for sleep disturbance within the residences will likely be greatest during the early morning hours (notionally, 2.00-4.00am) when background noise levels are at their lowest.

Based on previous experience with similar power plants it is understood that 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 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 for the site to be visited during the night-time period even if there is a need to operate the facility. Any repairs or maintenance would obviously 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 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 typical scenarios have been considered.

- Scenario 1: A worst case month where activities, including earthworks, construction of the internal roads and construction of the slab is anticipated to occur simultaneously.
- Scenario 2: A worst case month where activities including, construction of the building, fitout and landscaping is anticipated to occur simultaneously.
- Scenario 3: This represents the activities occurring towards the end associated with commissioning. This essentially is the noise that will be experienced during operation and as such is not assessed.

Table 11-3 summarises the calculated noise levels (unmitigated) at the existing residences for calm isothermal conditions for Scenarios 1 and 2 above. .

Table 11-3 Calculated Construction Noise Levels at Existing Receivers

Location No.	Calculated Noise Level		Noise Criteria L _{Aeq,15min} (dBA)
	L _{Aeq,15min} (dBA)		
	Scenario 1	Scenario 2	
1	44	39	35
2	<20	<20	35
3	23	<20	35
4	<20	<20	35
5	<20	<20	35
6	<20	<20	35

Note: The more stringent criteria between Saturdays and weekdays is shown.

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Table 11-3 shows that no exceedances are predicted except at Location 1. A 9dBA exceedance is predicted for the worst case month.

Once the construction contractor is selected, the plant, processes and duration will be better known and reviewed against assumptions made in this assessment. A Construction Noise Management Plan will be developed and all reasonable and feasible noise mitigation measures will be investigated.. In brief, these may include:

- 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 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. The residence at Location 1 should be notified and noise mitigation be discussed as part of the Construction Noise Management Plan.

Building the Natural Gas Pipeline

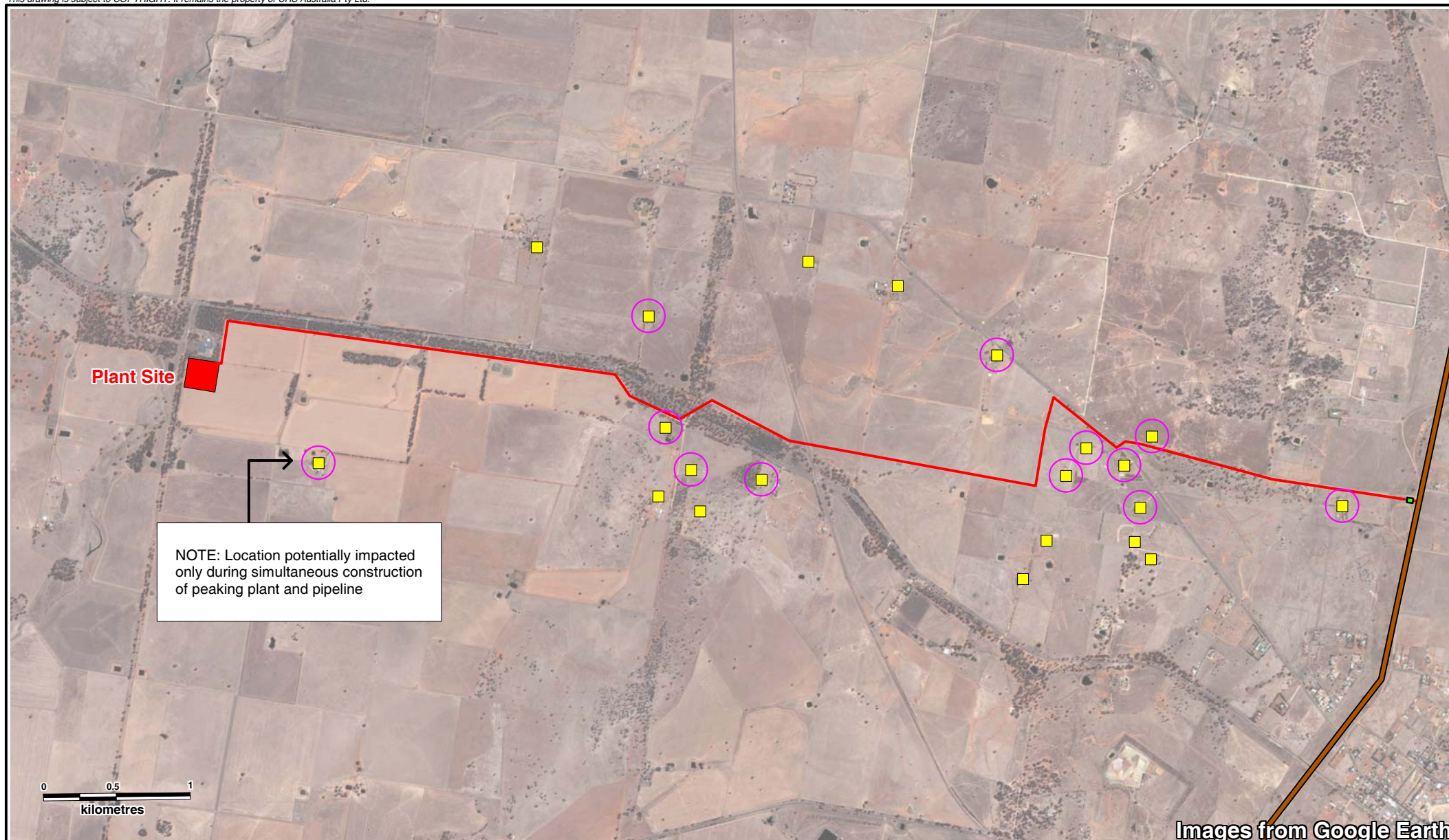
Because the construction site moves along as the pipe is laid, it is estimated that any residence will be impacted by the noise for less than 4 weeks. Hence the noise criterion for this construction is background plus 20dBA. A minimum background of 30dBA is assumed for all residences, hence the noise criterion is 50dBA.

Noise from the site will vary according to the equipment being used, but typically there would be an excavator and one truck operating at any time. Using the typical sound power levels for an excavator and a truck, a typical site sound power level of 113dBA is estimated. If rock breakers are necessary a sound power level of 122dBA could be expected.

The noise level at any residence depends on its distance from the pipeline. Any residence within 600m of the pipeline will experience noise levels above the noise criterion of 50dBA. There are 11 residences identified within this distance as shown on **Figure 11-2**. At the houses within 200m of the construction zone noise levels between 60-64dBA could be expected. All residences within this band should be notified when construction commences.

If the use of a rock breaker is necessary then noise levels would be up to 9dBA higher. All 21 houses shown on **Figure 11-2** would have some noise impact if construction was within approximately 1200m. If extensive use of rock-breakers became necessary then the use of temporary screens would mitigate the noise impact.

Some of these residences are closer to Parkes where the background noise levels could be above 30dBA. Also, the construction noise will be similar in character to agricultural machinery. These factors would mitigate the noise impact to a small extent.



- Proposed Route
- Existing Pipeline
- Gas Pipeline Take-off point
- Houses
- Residences Potentially Impacted by Noise

Client
INTERNATIONAL POWER
(AUSTRALIA) PTY LTD

URS

Project
ENVIRONMENTAL ASSESSMENT
- PARKES PEAKING POWER PLANT

Drawn: AJW Approved: CJ Date: 20/08/2007
Job No: **43177456** File No: 43177456.034

Title
**RESIDENCES POTENTIALLY IMPACTED
BY CONSTRUCTION OF THE PIPELINE**

Figure: **11-2**

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Construction Noise to Velvedere (location 1)

This location is impacted by construction noise of the plant. Because it has a lower construction noise criterion at location 1 compared to other residences, location 1 is also potentially impacted by construction noise from the laying of the pipeline, even though it is approximately 1000m from the closest point of the pipeline.

The typical maximum levels of the pipeline construction would be 39-45dBA at this location. If this coincides with one of the noisier phases of construction of the plant, then the combined noise could be up to 48dBA. Once the construction contractor is selected, the plant, processes and duration will be better known and reviewed against assumptions made in this assessment. A Construction Noise Management Plan will be developed and all reasonable and feasible noise mitigation measures will be investigated as listed above.

The residence at Location 1 should be notified and noise mitigation be discussed as part of the Construction Noise Management Plan.

Conclusion

A preliminary assessment of noise during the construction phase shows no exceedances except potentially at the existing residential receiver at Location 1.

The predicted construction noise levels will be reviewed prior to commencement and a Construction Noise Management Plan should be developed to ensure a suitable construction program to avoid or minimise the actual noise levels.

It is predicted that there will be no vibration impacts (both during construction and operation).

11.6 Mitigation Measures

Table 11-4 presents a summary of mitigation measures as a result of the noise assessment.

Table 11-4 Summary of Mitigation Measures

Mitigation Measures	Implementation of mitigation measures		
	Design	Construction	Operation
Prior to commencement, review assumptions and predicted construction noise levels against known plant and construction methods and 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 barriers; – Positioning of plant / processes; and – Limiting the “clustering” of plant / processes.	✓	✓	
Confirm assumptions used in operational noise assessment based on choice of final turbine system. Confirm requirements for mitigation.	✓		
If extensive use of rock-breakers becomes necessary for construction of the gas pipeline then mitigation measures such as temporary screens would be used to mitigate the noise impact.		✓	