Appendix D
Noise & Vibration Assessment – Site Preparation

MARULAN GAS TURBINE FACILITIES

ENVIRONMENTAL ASSESSMENT

JOINT CONCEPT APPLICATION

VOLUME 2 | APPENDICES | August 2008

MARULAN GAS TURBINE FACILITIES

EXCAVATION NOISE AND VIBRATION ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 05255
VERSION C

WILKINSON MURRAY

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JULY 2008

PREPARED FOR

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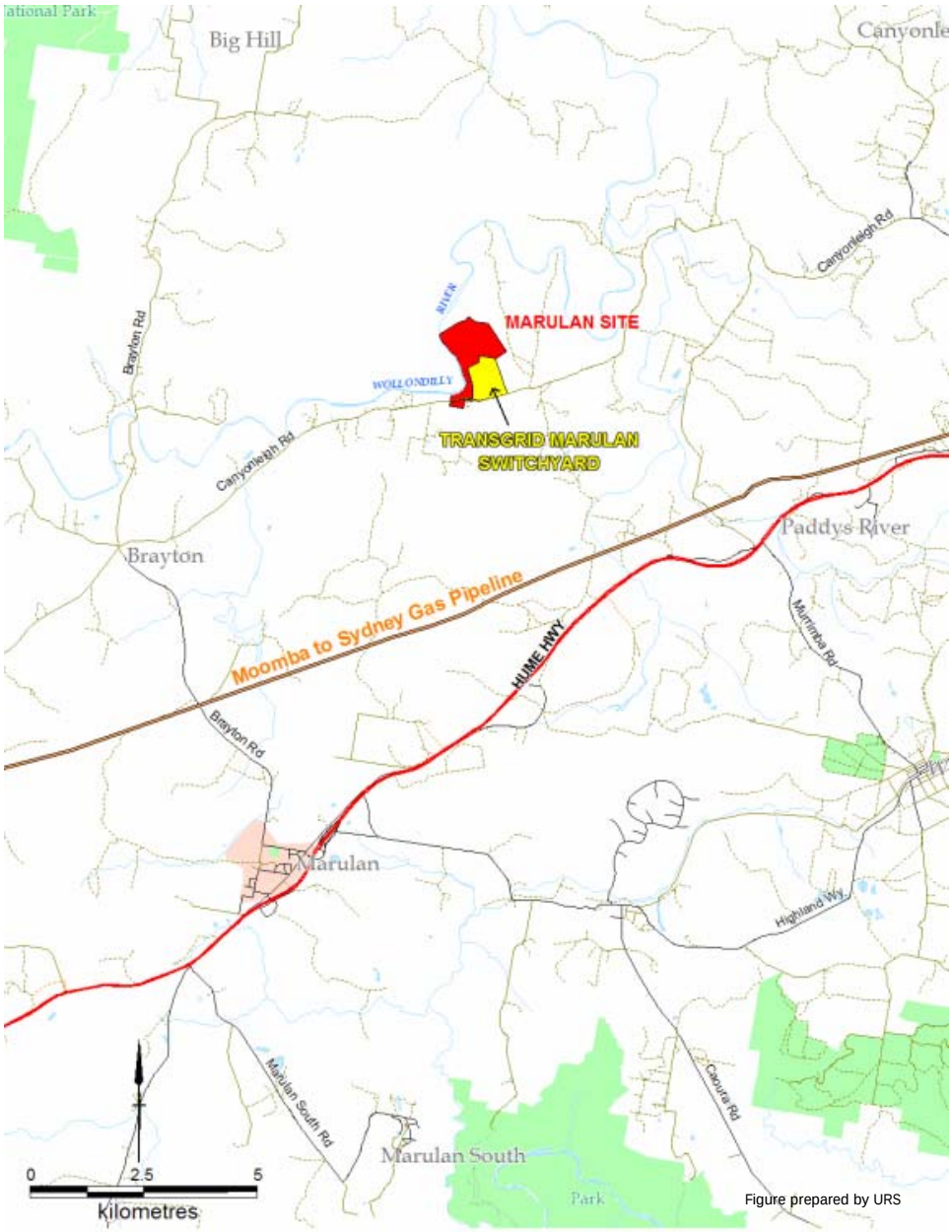
1 INTRODUCTION

Wilkinson Murray has been engaged to conduct a noise and vibration assessment for the bulk earthworks phase of the Marulan Gas Turbine Facilities Project proposed by Delta Electricity and EnergyAustralia at the Marulan Site to support the concept plan prepared under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* for the development of Gas Turbine Facilities at the Site (approximately 12 km northwest of Marulan). The location of the Site is shown in Figure 1-1 below.

Figure 1-1 Locality Map.



2 DESCRIPTION OF SITE, PROPOSED FACILITY & SURROUNDINGS

2.1 Site Description

The 'Marulan Site' is located on Canyonleigh Road, Brayton, approximately 12km northeast of the village of Marulan. The site is 19.6km from the Marulan Highway turnoff and 10km from the Canyonleigh-Brayton Road turnoff (refer to Figure 1-1). The Marulan Site is currently jointly owned by Delta Electricity and EnergyAustralia.

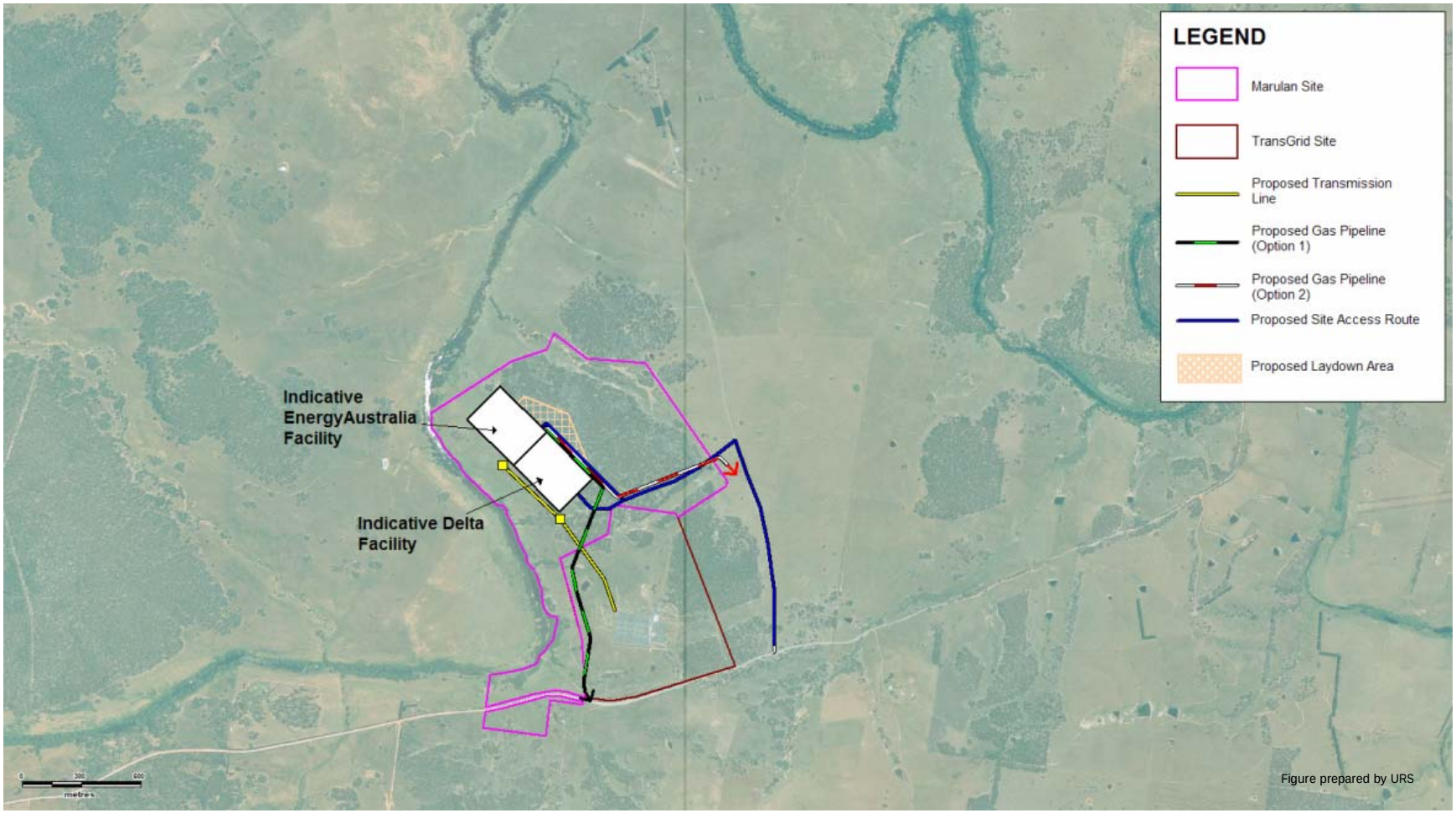
Marulan is historically a primarily rural farming area. In recent years the area has experienced increasing levels of rural residential development and more recently proposed quarrying operations. The topography varies from flat valley areas which have typically been cleared for grazing to steeper ridges where vegetation has been retained.

2.2 Proposed Excavation Works

Bulk earthworks for the site would be undertaken for the two Proponents, either in a staged manner or at the same time. For the purposes of this assessment it has been assumed that the earthworks are conducted in a single stage as this would provide a worst case scenario for all construction activities.

The bulk earthworks would involve clearing of vegetation for the Facilities, access road and transmission line. A total area of approximately 25 ha is proposed to be cleared for these works. This assessment seeks Project Approval for these works. The separate respective Project Applications for the Facilities address works commencing after bulk earthworks are complete. For the noise assessment the site clearing and excavation works were located approximately in the centre of the site footprint as shown in Figure 2-1.

Figure 2-1 Indicative Location of the Proposed Site.



2.3 Surrounding

Adjoining the site are rural lands that include residences. Table 2-1 summarises the residential receiver locations surrounding the Marulan Switchyard Site within an approximate 3 km radius from the centre of the site. The noise assessment will concentrate on residential receivers within the 3 km radius of the facility.

A number of structures near the Marulan Site were assessed to confirm potential receivers. Council has advised that a property to the south of the Marulan Site had a development application approved for a dwelling on 29 March 1994, however no evidence of physical commencement of work has been presented to Council, and as such, the Development Consent may have lapsed. There is currently a shed on the property to the south of the Marulan Site that does not appear to be a habitable dwelling and accordingly, is not considered a receiver.

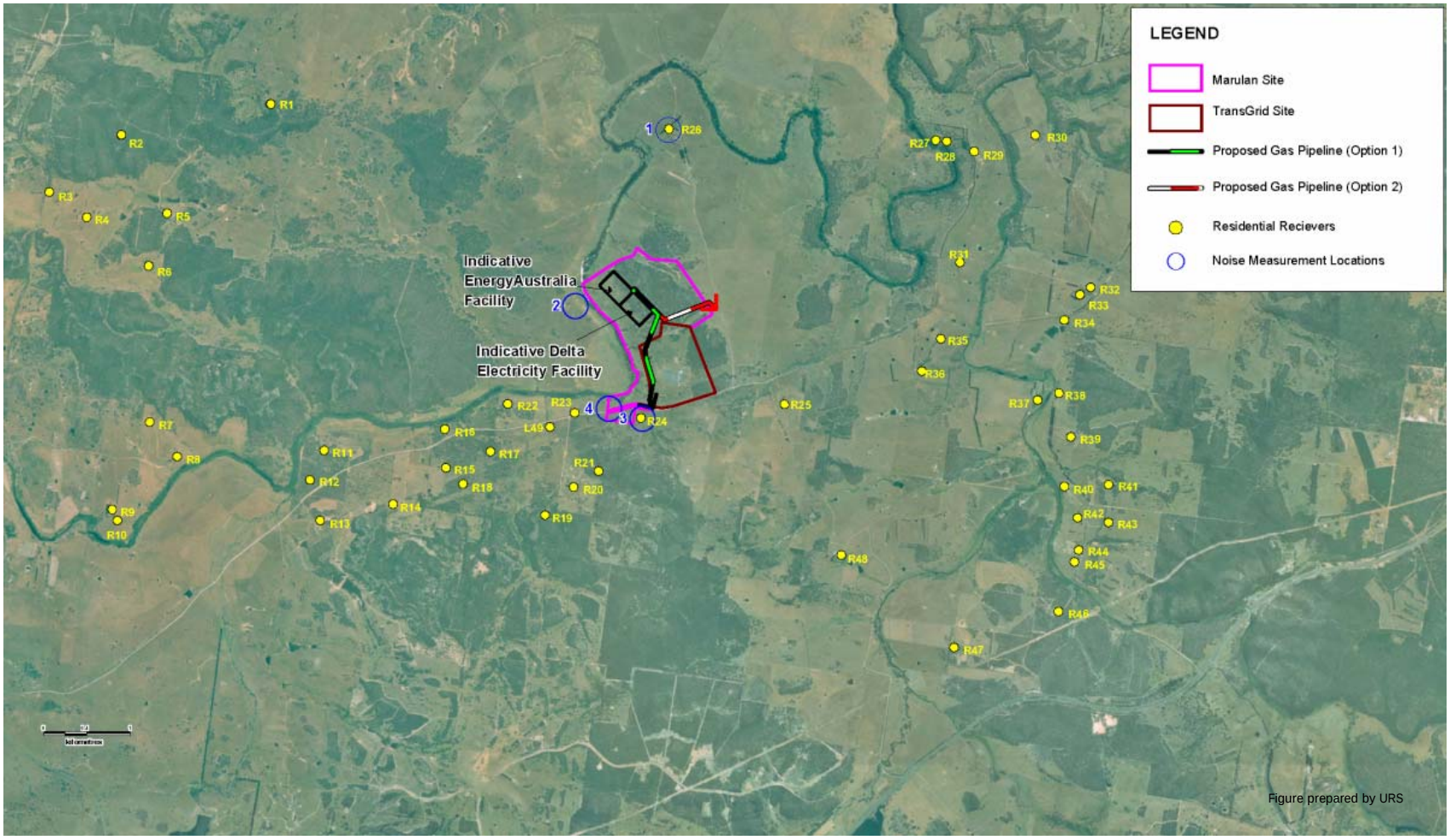
Another structure to the north of the Marulan Site is not considered a receiver as it is shearers quarters used by students of the University of Sydney for approximately one week every two months, these quarters are not permanently occupied.

Table 2-1 Summary of Residential Receiver Locations Identified

Receiver Location	Building Type
R15	Rural Residence
R16	Rural Residence
R17	Rural Residence
R18	Rural Residence
R19	Rural Residence
R20	Rural Residence
R21	Rural Residence
R22	Rural Residence
R23	Rural Residence
R24	Rural Residence
R25	Rural Residence
R26	Rural Residence

Figure 2-3 shows the location of the residential receiver locations in relation to the Site.

Figure 2-3 Locality Map Showing Residential Receivers



3 EXISTING ACOUSTIC ENVIRONMENT

Four noise loggers were placed at various locations on site from Sunday, 7 May 2006 to Thursday, 18 May 2006. Figure 2-3 shows the location of noise monitoring locations relative to the residential receivers and the development site.

The noise loggers were set to an A-weighting, fast response and to continuously monitor over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The loggers determine a variety of noise descriptors, including L_{A90} and L_{Aeq} levels (see Appendix A for definitions) of the existing noise environment. From the background noise levels (L_{A90}) the Rating Background Levels (RBLs) were determined using methodology as recommended by the NSW Department of Environment & Climate Change (DECC) document, the *NSW Industrial Noise Policy (INP)*. The DECC considers the RBL to represent the background noise level.

Table 3-1 presents a summary of the RBL levels from the unattended noise measurements.

Table 3-1 Summary of RBL Levels from Unattended Noise Measurements

Measurement Location	Relevant Proposed Receivers	Rating Background Level RBL (dBA)		
		Day	Evening	Night
1	R26	28[2]	30	31[1]
2	MS Site	27[2]	29[2]	29[2]
3	R15, R16, R17, R18, R19, R20, R21, R23, R24	27[2]	29[2]	29[2]
4	R24, R25	29	42[1]	31[1]

1. Extraneous noise influence and will not be used as part of this assessment. Lowest permissible RBL, as listed in *INP*, of 30dBA will be used instead.

2. Where the measured RBL is less than 30 dBA, the lowest permissible RBL, as listed in *INP*, of 30dBA will be used instead.

As required by the *INP*, extraneous noise and any effects due to adverse meteorological conditions (rain and wind speed greater than 5m/s at a height of 1.5m) have been excluded.

4 CONSTRUCTION NOISE CRITERIA

With respect to construction noise, the requirements outlined in Chapter 171 of the DECC *Environmental Noise Control Manual* are usually applied and this approach is reproduced below.

Level Restrictions

(i) Construction period of 4 weeks and under.
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 20 dB(A).

(ii) Construction period greater than 4 weeks and not exceeding 26 weeks.
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 10 dB(A).

Time Restrictions

Monday to Friday	*7am–6pm*
Saturday	*7am–1pm (if inaudible at residential premises)*
	8am–1pm (if audible at residential premises)

No construction work to take place on Sundays or Public Holidays

Silencing

All possible steps should be taken to silence construction site equipment. It is particularly important that silenced equipment should be used on road or rail works where 24 hour operation is necessary.

There is no suggested criterion for projects that occur for greater than 26 weeks. However, the following criterion is typically used and 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).

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.

The proposed clearing and excavation has been estimated to be approximately 3 months and remainder of the gas turbine facility construction is estimated to be over 12 months.

The daytime construction criterion adopted for all residential receivers for this project is 35dBA L_{A10} (based on the lowest permissible RBL of 30dBA+5dBA) as the construction is greater than 26 weeks duration.

5 CONSTRUCTION NOISE ASSESSMENT

The likely plant to be used has been assumed for the bulk earthworks phase. The sound power level (SWL) of these plant items has been sourced from Wilkinson Murray's extensive database of actual measured plant items under different usage. Table 4-1 summarises the plant proposed to be used for the clearing and excavation works.

Table 4-1 Equipment Numbers & Sound Power Levels

Plant / Equipment Item	Maximum Sound Power Level (dBA)	Number of Items Modelled
Grader	110	1
Water Cart	108	1
20 to 30t Excavator	110	1
D8 Dozer	113	1
Scraper	115	4
Roller	112	1

All equipment listed in Table 4-1 would not be working at the maximum power levels simultaneously. Experience indicates that these maximum noise levels occur only rarely, and the L_{A10} noise levels will be at least 7 dBA below the maximum levels. For this reason, 7 dBA was subtracted from the calculated "worst case" maximum noise levels to give an estimate of the typical L_{A10} noise level from the site. Using the assumed plant items and their associated maximum sound power levels (with consideration given to the operational changes, intermittent processes and changes in distance of mobile plant), the combined L_{A10} sound power levels for clearing and excavation works is 114dBA.

Table 4-2 summarises the calculated $L_{A10,15min}$ noise levels under daytime adverse meteorological conditions.

Table 4-2 Calculated Construction Noise Levels at Existing Receivers

Residence No.	Calculated Noise Level $L_{A10,15min}$ (dBA)	Noise Criteria $L_{A10,15min}$ (dBA)	Compliance (Yes/No)
R15	32	35	Yes – compliance achieved
R16	32	35	Yes – compliance achieved
R17	34	35	Yes – compliance achieved
R18	32	35	Yes – compliance achieved
R19	32	35	Yes – compliance achieved
R20	33	35	Yes – compliance achieved
R21	33	35	Yes – compliance achieved
R22	31	35	Yes – compliance achieved
R23	40	35	No – exceedance of up to 5dBA
R24	38	35	No – exceedance up to 3dBA
R25	29	35	Yes – compliance achieved
R26	35	35	Yes – compliance achieved

The assessment of noise during the bulk earthworks (clearing / excavation phase) of the Project shows general compliance with the construction noise criteria. However, some marginal exceedances of the construction noise criterion are identified at locations R23 and R24.

Once the excavation contractor is selected, the plant, processes and duration will be better known and a Construction Noise Management Plan is to be developed so that our assumptions confirmed and reasonable and feasible noise mitigation measures can be investigated if necessary. In brief, these may include:

- Positioning of plant / processes; and
- Limiting the “clustering” of plant / processes.

6 TRAFFIC NOISE ASSESSMENT

This section assesses the impact of increased noise potentially impacting residential receivers due to additional road traffic generated by the development.

With respect to access to the site, all road traffic movements will travel along Canyonleigh Road. The functional category of this road is considered to be "sub-arterial" (RTA Road Design Guide 1996) and using the 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 traffic data and the estimated vehicle movements during the construction phase as supplied by URS, and given the fact that this is the only access, the 2dB limit applies.

There will be minor increases in road noise during the peak construction activities however, there is minimal risk of exceeding the 2dB limit.

7 VIBRATION ASSESSMENT

This section provides a qualitative appreciation of the effect of vibration from the proposed clearing and excavation works.

In terms of vibration sources identified during the construction stage, likely plant would include rollers, dozers, etc. Given that the nearest existing residential receivers will be at least 1,000m away from the closest area of works, the vibration levels would not be perceptible and therefore would not impact on the residences.

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

8 CONCLUSION

For the development of the Marulan Site for the construction of Gas Turbine Facilities bulk earthworks need to be undertaken to create a pad that is cleared and excavated. Further assessment of the construction (beyond bulk earthworks addressed in this report) and Facility operation is provide in separate reports.

A construction noise and vibration assessment has been conducted in accordance with appropriate environmental standards, notably the NSW Department of Environment and Climate Change Chapter 171 of the Environmental Noise Control Manual and Industrial Noise Policy. Impacts at relevant sensitive receivers such as residential dwellings have been quantified. The major conclusions of this assessment are as follows.

- The existing noise environment around the proposal is typical of a quiet rural area, with little exposure from existing traffic noise and no exposure from any existing industrial noise.
- The assessment of noise during the clearing excavation phase of the project shows general compliance with the construction noise criterion. However, some marginal exceedances of the construction noise criterion are identified at locations R23 and R24. These levels are to be confirmed prior to commencement with the Contractor. A Construction Noise Management Plan should be developed to ensure a suitable program and that these levels are managed.
- Noise impacts due to extra construction traffic for the Marulan Site along Canyonleigh Road was found to be negligible.
- No vibration impacts are envisaged to occur at the residential receivers.

Note
All materials specified by Wilkinson Murray Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

Quality Assurance
We are committed to and have implemented AS/NZS ISO 9001:2000 “Quality Management Systems – Requirements”. This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC
This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
A	Final	19-02-2008	Jimi Ang	John Wassermann
B	Final	1-04-2008	Jimi Ang	John Wassermann
C	Final	7-05-2008	Jimi Ang	John Wassermann
C	Final	11-07-2008	Jimi Ang	John Wassermann

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

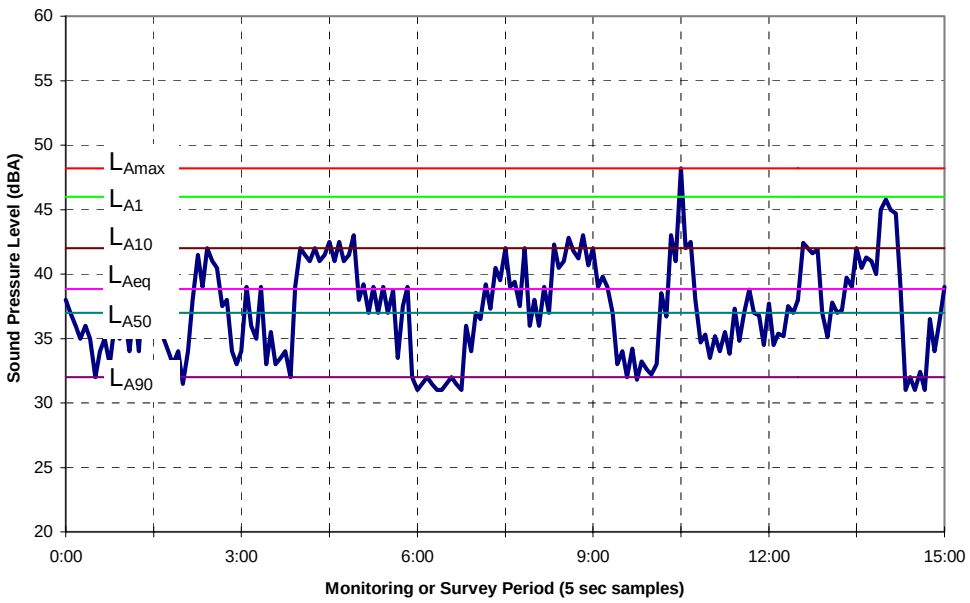
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)