Noise and Vibration

Appendix G

Noise and Vibration Impact Assessment

5.5 MW Biomass Power Plant

6 NOVEMBER 2009

Prepared for

South East Fibre Exports Pty Ltd

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Abbreviations

Abbreviation	Description
ABL	Assessment Background Level
ANL	Acceptable Noise Level
AWS	Automatic Weather Station
dB	Decibel
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EA	Environmental Assessment
ECRTN	Environmental Criteria for Road Traffic Noise
EPA	Environment Protection Authority
INP	Industrial Noise Policy
NATA	National Association of Testing Authorities
NSW	New South Wales
PSNL	Project-Specific Noise Levels
POEO Act	Protection of the Environment Operations Act 1997
RBL	Rating Background Level
SEFE	South East Fibre Exports Pty Ltd
URS	URS Australia Pty Ltd
WHO	World Health Organization

Executive Summary

URS Australia Pty Ltd (URS) has been commissioned by South East Fibre Exports Pty Ltd (SEFE) to undertake a noise impact assessment for the proposed 5 MW Biomass Power Plant (Power Plant) to be located within the existing Munganno Point mill site at Eden, NSW. This report forms part of the Environmental Assessment (EA) which supports the Project Application lodged for the proposal.

Vibration impacts of the proposed construction and operation of the Power plant have not been assessed. Given that the distance from the proposed Power Plant to the nearest receptor is approximately 800 m, the vibration impacts would be negligible.

Potential noise issues related to the proposed development are noise associated with the operation and construction of the Power Plant. The proposed Power Plant would operate 24 hours per day, thus an assessment of sleep disturbance for the nearest potentially affected noise sensitive receptors has been considered in this study.

The nearest potentially affected noise sensitive receptor locations have been identified and the predicted noise impacts of the proposed construction and operation at these locations have been assessed with consideration of the following guidelines:

- NSW Department of Environment, Climate Change and Water (DECCW) *Industrial Noise Policy* (INP, EPA 1999) for the assessment of the operational noise of the proposed development with consideration of NSW INP *Application Notes* (2006);
- NSW DECCW *Environmental Criteria for Road Traffic Noise* (ECRTN, EPA 1999) for the assessment of the off-site traffic noise on public roads;
- NSW DECCW *Interim Construction Noise Guidelines* (DECC, 2009) for the assessment of the noise from construction of the proposed development; and
- World Health Organisation *Guidelines for Community Noise* (1999).

Noise levels from the proposed construction and operation have been predicted using an acoustic computer model created in SoundPLAN Version 6.5. Details of the area's topography, receptor locations and sound power levels of the noise sources have been incorporated into the noise model. Typical and 'worst-case' scenarios have been taken into consideration throughout the noise modelling.

This study has found that the noise emissions from the proposed operation of the Power Plant would be within the noise goal. Once the Power Plant is operational, the cumulative noise emissions taking into account current operations on the SEFE site would be within the daytime noise goals, with some exceedances expected during evening and night-time periods. Given that these exceedances are minimal taking into consideration the existing ambient noise level (primarily wave noise) at the receptor locations, the potential noise impacts due to the SEFE operation would be insignificant. Further noise mitigation measures are not considered practical and necessary.

Operation of the Power Plant and other on-site machinery is not expected to generate noise characteristics, such as tonality, dominant low-frequency content or impulsiveness.

On the basis of this assessment, it is concluded that the cumulative noise impacts of current operations and those of the proposed Power Plant are not expected to degrade the existing acoustic environment nor create annoyance to the community surrounding the facility.

1

Introduction

URS Australia Pty Ltd (URS) has undertaken a noise and vibration impact assessment for the proposed Biomass Power Plant (Power Plant) to be located within the existing South East Fibre Exports Pty Ltd (SEFE) mill site south of Eden, NSW.

This study forms part of the Environmental Assessment (EA) which supports the Project Application for the proposed facility.

Vibration impacts of the proposed construction and operation of the Power plant have not been assessed. Given that the distance from the proposed Power Plant to the nearest receptor is approximately 800 m, the vibration impacts would be negligible.

Potential noise impacts associated with the proposed construction and operational activities are assessed in accordance with the following guidelines:

- NSW Department of Environment, Climate Change and Water (DECCW) *Industrial Noise Policy* (INP, EPA 1999) for the assessment of the operational noise of the proposed development with consideration of NSW INP *Application Notes* (2006);
- NSW DECCW *Environmental Criteria for Road Traffic Noise* (ECRTN, EPA 1999) for the assessment of the off-site traffic noise on public roads;
- NSW DECCW *Interim Construction Noise Guidelines* (DECC, 2009) for the assessment of the noise from construction of the proposed development; and
- World Health Organisation *Guidelines for Community Noise* (1999).

The scope of this assessment is to:

- provide a description of the existing acoustic environment and the proposed development;
- assess the existing acoustic environment and establish appropriate project-specific noise levels (PSNL);
- predict potential noise impacts by means of noise modelling and calculations;
- assess predicted noise levels against the established noise criteria (PSNL);
- provide recommendations for appropriate noise mitigation measures and noise management practices where required; and
- provide a statement of potential noise impacts.

A range of acoustic parameters and technical terms are used in this report. To assist in understanding the technical contents, a detailed description of the acoustic terms is provided in **Appendix A**.

2

Site Locality and Project Description

2.1 Site Location

The proposed Power Plant is to be located within the SEFE's Munganno Point mill site (Site) in the area currently occupied by the wood waste burner (**Figure 2-1**). The Site has been in operation for some 40 years. The Site is situated on the southern shoreline of Twofold Bay and is accessed via the Princes Highway and Edrom Road.

Figure 2-1 SEFE Munganno Point Mill Site

2.2 Project Description

The existing facility includes log receival and storage, debarking, chipping and an associated process plant, and wharf / ship-loading facility for the export of woodchips.

SEFE proposes to construct a 5MW Biomass Power Plant. SEFE would use the 35,000 t of wood waste generated from its current operations together with a further 22,600 t of wood waste available from local timber processing operations to produce approximately 31,000 MWh of electricity per annum.

Construction of the Power Plant would include the following facilities:

- an existing uncovered area for the storage of biomass fuel;
- weather proof fuel storage bunker;
- fuel reclaim bunker and feed conveyor to supply wood waste to the Power Plant;
- fuel storage bin;
- 18 MW grate furnace;
- superheated steam boiler;

2 Site Locality and Project Description

- ash handling system;
- flue gas exhaust stack (35 m high) with an electrostatic precipitator;
- 5 MW multi-stage steam turbine;
- 11 KV generator set connected to the existing 11 KV bus locations in the Site's existing high voltage switch room;
- vacuum steam condenser and cooling water system;
- seawater intake structure, delivery and return water pipelines, and diffuser; and
- ancillary plant items, such as boiler make-up water treatment plant, condensate pumping system and control room.

Normal operating hours of the mill are 7.00 am and 11.00 pm Monday to Friday. Only very occasionally does the mill operate for a single shift on a Saturday, and not in the recent past. For the hardwood chipping line the operation is essentially continuous between these limits, other than for short stops to change chipper knives or attend to plant malfunctions as they randomly arise. For the softwood chipping line the operation is also restricted to Monday to Friday. Operations start at 7.00 am but the shutdown time varies from 6.00 pm to 11.00 pm, dependent on production requirements, which do not conform to a regular pattern.

The Power Plant would operate continuously on a four shift roster, and the noise study has therefore considered the operation during all times of day, evening and night.

3

Existing Acoustic Environment

3.1 Noise Sensitive Receptors

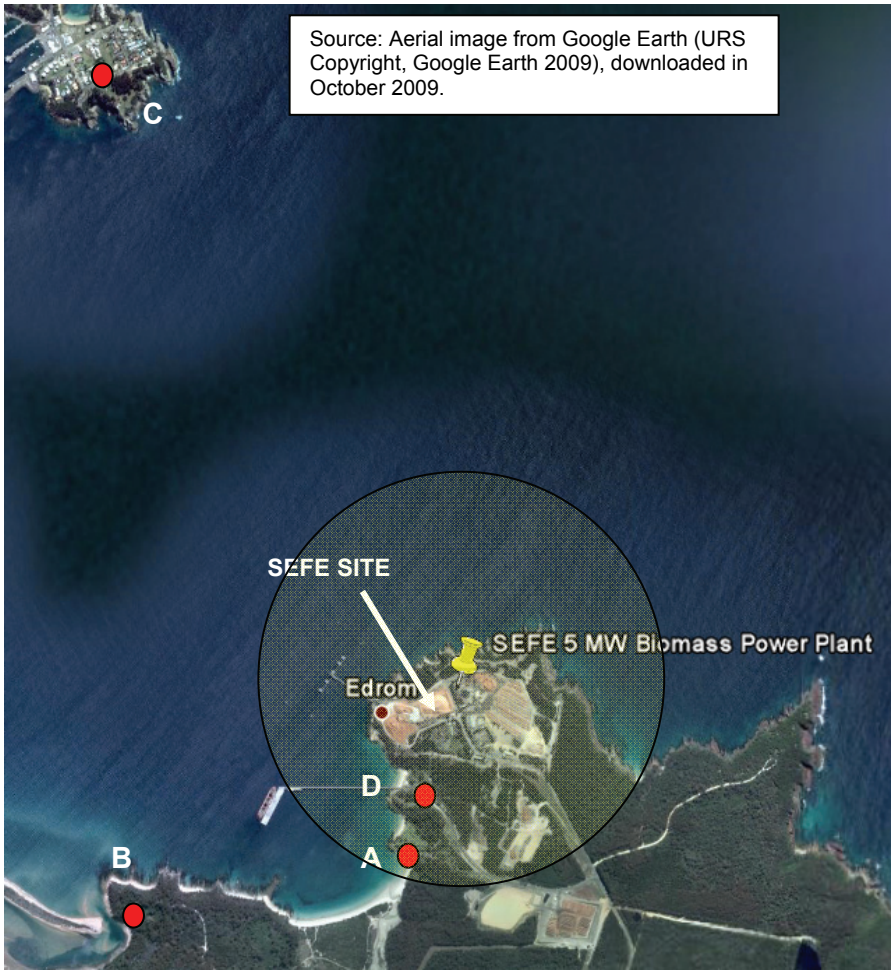
The closest noise sensitive receptor locations shown in **Table 3-1** have been identified from examination of aerial photographs using Google Earth and a site inspection conducted in June 2009.

Table 3-1 Noise Sensitive Receptors

Receptor	Location	Approx Distance from Power Plant (km)	Indicative Noise Amenity Area[1]	Nearest Site Boundary
A	Edrom Lodge, Edrom	0.8	Rural Residence	SSW
B	Boyd Road, East Boyd	2	Rural Residence	SW
C	Bramble Street, Eden	3.5	Suburban Residence	NNW
D	SEFE Camp[2]	0.5	Industrial-Interface Residence	SSW
Notes:	1. According to the NSW Industrial Noise Policy. 2. Only occupied occasionally by SEFE staff.			

Figure 3-1 shows the location of these receptors, together with a reference one-kilometre radius circle from the proposed location of the Power Plant.

Figure 3-1 Site and Noise Sensitive Receptor Locations



3.2 Noise Measurement Methodology

Noise measurements were conducted by long-term unattended monitoring and short-term attended monitoring at the closest noise sensitive receptor locations.

All the noise measurements were undertaken in accordance with AS1055:1997 "*Acoustics – Description and Measurement of Environmental Noise*".

The long-term noise monitoring was undertaken using Acoustic Research Laboratories (ARL) Environmental Noise Loggers, model EL-316. These instruments comply with AS IEC 61672.1 – 2004 "*Electroacoustics – Sound level meters – Specifications*" and are designated as a Type 1 instrument, suitable for field use. The noise loggers were positioned with the microphones at 1.2m above ground level and were set to statistically process and store the measured noise levels every 15 minutes for the whole monitoring period. The noise loggers were calibrated before logging and the calibration was checked after logging using an acoustic calibrator consistent with AS IEC 61672 requirements. No significant discrepancies (greater than 0.3 dB) were noted in the reference calibration sound signals pre and post measurement.

To analyse the measured long-term noise levels, meteorological observation provided by SEFE during the monitoring period and data from the nearest Bureau of Meteorology Automatic Weather Station (AWS), Green Cape (AWS ID: 69137), have been reviewed. Any noise monitoring periods affected by adverse weather conditions (rain and wind) were excluded from the final data analysis. The height difference between the AWS (10m above ground level) and the sound level meter (1.2m above ground level) was taken into consideration with a correction factor to modify wind speed used for the data analysis. This method complies with the guidelines specified in Section 4.2.5.1 of the AS 1170.2:2002 "Structural design actions – Wind actions".

Short-term attended noise monitoring was undertaken using a SVANTEK SVAN959 sound level meter which complies with AS IEC 61672.1 – 2004 "*Electroacoustics – Sound level meters – Specifications*" and is designated as a Type 1 instrument suitable for field and laboratory use. The sound level meter was positioned for each measurement with the microphone approximately 1.2m above ground level. The sound level meter was calibrated using an acoustic calibrator before measurement sessions and the calibration was checked at the end of measurement sessions. No significant discrepancies (greater than 0.1 dB) were noted in the calibration sound signals pre and post measurement.

The weather conditions during the measurement periods would not have adversely affected the results. All the instrumentation used was calibrated by a NATA accredited acoustic laboratory within two years prior to the measurement period.

3.3 Noise Measurement Locations

Noise monitoring locations were chosen after examination of satellite imagery of the locality and a site inspection. These monitoring locations were chosen to establish the representative noise trend at the nearest receptors and so that the noise loggers would not have been affected by extraneous noise (e.g. cattle, pumps, etc) which could result in unrepresentative elevated background noise levels.

The two closest residential receptor locations were selected for the long-term noise monitoring. Short-term attended noise monitoring was also undertaken at Receptors A, C and D to supplement the long-term noise monitoring.

A brief description of each measurement location is given below:

- Receptor A: Edrom Lodge – located approximately 800m to the south-west of the proposed Power Plant.

  This location was used for long-term unattended noise monitoring to obtain background noise levels. Short-term attended noise measurements were also conducted at this location to supplement the long-term noise monitoring.

  The predominant noise sources at this location were waves and local fauna (birds and insects) during the day, evening and night-time periods. Operational noise from the SEFE Site and the neighbouring premises was occasionally noticed during the attended noise monitoring for day and evening period.

- Receptor D: SEFE Camp, located approximately 500m to the south-west of the proposed Power Plant.

  This location was used for long-term unattended noise monitoring to obtain background noise levels. Short-term attended noise measurements were also conducted at this location to supplement the long-term noise monitoring.

  The predominant noise sources at this location were SEFE operation and local fauna (birds and insects) during the day, evening and night-time periods.

- Receptor C: Bramble Street, Eden, located approximately 3.5 km to the north-west of the proposed Power Plant.

  This location was used for short-term attended noise monitoring to obtain background noise levels.

  The predominant noise sources at this location were urban hums, intermittent road traffic and waves.

Noise monitoring has not been conducted at Receptor B. Considering the likely noise environment at this location, background noise levels for this receptor have been conservatively assumed which are presented in **Section 3.5.1**.

3.4 Noise Measurement Results

The results of the long-term noise monitoring are summarised in **Table 3-2** and **Table 3-3**. Any 15-minute period affected by adverse weather conditions or likely extraneous noise was excluded from the analysis.

For the purpose of INP assessment, the following time periods are defined:

- Day: 7.00 am – 6.00 pm Monday to Saturday; 8.00 am – 6.00 pm Sundays and public holidays;
- Evening: 6.00 pm – 10.00 pm all days; and
- Night: 10.00 pm – 7.00 am Monday to Saturday; 10.00 pm – 8.00 am Sundays and public holidays.

Daily noise monitoring plots are provided in **Appendix C** of this report.

3 Existing Acoustic Environment

Table 3-2 Measured Noise Levels – Edrom Lodge, Eden (Location A)

Date	Assessment Background Level (ABL), L_{A90} dB(A)			Ambient Noise Level, L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Tuesday, 23 June 2009	46	46	*	50	51	*
Wednesday, 24 June 2009	44	*	*	49	*	*
Thursday, 25 June 2009	44	46	38	50	50	43
Friday, 26 June 2009	43	44	35	50	47	41
Saturday, 27 June 2009	28	32	31	39	37	39
Sunday, 28 June 2009	27	30	31	38	35	35
Monday, 29 June 2009	*	*	*	*	*	*
Tuesday, 30 June 2009	*	*	*	*	*	*
Wednesday, 1 July 2009	*	-	-	*	-	-
Representative Level[1]	**44**	**44**	**33**	**48**	**47**	**41**

Notes: "-" noise logger deployed and collected during the daytime.
"*" period affected by adverse weather conditions or extraneous noise.
1. Represents median value for L_{A90}, and logarithmic average for L_{Aeq}.

Table 3-3 Measured Noise Levels – SEFE Camp (Location D)

Date	Assessment Background Level, (ABL) L_{A90} dB(A)			Ambient Noise Level, L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Tuesday, 23 June 2009	46	48	*	53	54	*
Wednesday, 24 June 2009	41	*	*	52	*	*
Thursday, 25 June 2009	42	45	41	50	50	48
Friday, 26 June 2009	42	42	38	50	46	45
Saturday, 27 June 2009	33	35	36	44	43	42
Sunday, 28 June 2009	30	31	34	43	41	40
Monday, 29 June 2009	*	*	*	*	*	*
Tuesday, 30 June 2009	*	*	*	*	*	*
Wednesday, 1 July 2009	*	-	-	*	-	-
Representative Level[1]	**42**	**42**	**37**	**50**	**49**	**45**

Notes: "-" noise logger deployed and collected during the daytime.
"*"period affected by adverse weather conditions or extraneous noise.
1. Represents median value for L_{A90}, and logarithmic average for L_{Aeq}.

The noise logging results show that the monitoring at these locations (Receptors A and D) was affected by existing industrial noise during the weekdays. The Site did not operate during the weekend period.

The daily noise logging results generally show consistent daily noise levels throughout each period during the weekdays and weekend at all the monitoring locations. The noise monitoring data is therefore considered representative of the area's acoustic environment and suitable for this assessment.

Table 3-4 presents the short-term attended noise measurement results.

Table 3-4 Attended Measurement Results

Location	Date / Time	Background $L_{A90,10min}$ dB(A)	Ambient $L_{Aeq,10min}$ dB(A)	Comments
A. Edrom Lodge	Tuesday, 23 June 2009 / 9:30 pm	46	50	Noise environment governed by waves, birds and insects. Noise from SEFE and neighbouring premises occasionally noted.
	Tuesday, 23 June 2009 / 9:40 pm	48	52	
	Tuesday, 23 June 2009 / 11:30 pm	47	52	Noise environment governed by waves, birds and insects. No industry operation was noted.
	Wednesday, 24 June 2009 / 11:20 am	44	49	Noise environment governed by waves and birds. No industry operation was noted.
	Wednesday, 24 June 2009 / 11:30 am	43	46	Noise environment governed by waves and birds. No industry operation was noted.
D. SEFE Camp	Tuesday, 23 June 2009 / 09:50 pm	43	46	Noise environment governed by waves, birds and insects and operations of SEFE.
	Tuesday, 23 June 2009 / 11:15 pm	40	43	Noise environment governed by waves, birds and insects. No industry operation was noted.
	Wednesday, 24 June 2009 / 11:45 am	45	47	Noise environment governed by waves and birds. No industry operation was noted.
C. Eden	Wednesday, 24 June 2009 / 1:00 pm	42	47	Noise environment governed by waves and urban hums. No industry operation was noted.

3.5 Establishment of Rating Background Levels

While the Power Plant will operate continuously, the hours of operation for the rest of the Site would continue to be between 7.00 am and 11.00 pm on weekdays. Therefore, the Rating Background Levels (RBL) have been established separately considering the following three operation scenarios:

- 7.00 am – 11.00 pm, Monday to Friday: Site operation including Power Plant operation and shiploading activities;
- 11.00 pm – 7.00 am, Monday to Friday and 24 hours on Saturdays, Sundays and public holidays: Operation of the Power Plant only; and
- 11.00 pm – 7.00 am, Monday to Friday and 24 hours on Saturdays, Sundays and public holidays: Power Plant operation and ship-loading activity (this scenario occurs 18% of the time per year).

3.5.1 Site Operation including Power Plant

As the Site would continue to operate during weekdays from 7.00 am to 11.00 pm, the weekday data were extracted from **Table 3-2** and **Table 3-3** to calculate the representative background and ambient noise levels for each of day, evening and night-time period of the weekdays.

For the night-time period, the representative night-time RBL was calculated using the L_{A90} levels recorded during the period of the Site operation, i.e. between 10.00 pm and 11.00 pm, Monday to Friday.

Reference has also been made to the NSW INP *Application Notes* (2006) to determine the RBL:

- when evening and / or night-time RBL is higher than the daytime RBL; and
- when operations only occur for part of the day, evening or night-time period.

Table 3-5 presents a summary of overall single figure Ambient and Rating Background Levels at Receptors A and D.

Table 3-5 Rating Background Levels – Operation of Site including Power Plant

Location	Rating Background Level (RBL) L_{A90} dB(A)			Ambient Noise Level L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
A: Edrom Lodge	44	44	41[1]	50	49	47[1]
D: SEFE Camp	42	42[2]	42[1,2]	51	50	49[1]

Notes:
1. Representative level of the period between 10.00 pm – 11.00 pm, when SEFE operates.
2. Evening and night-time noise levels adjusted so as not to be greater than the daytime levels.

The RBLs presented were used to derive day, evening and night-time noise limits for operation of the Site including the proposed construction and operation of the Power Plant.

As there are no industries or commercial premises in proximity to Receptors B and C, long-term noise monitoring at these locations was not conducted. However, considering the location of these receptors and land use, the following RBLs have been assumed for each location:

- Receptor B (Boyd Road, East Boyd): 30 dB(A) for the day, evening and night-time period which is the lowest background noise level defined in the NSW INP; and
- Receptor C (Bramble Street, Eden): 45 dB(A), 40 dB(A) and 35 dB(A) for the day, evening and night-time period respectively.

It is our opinion that this assumption is appropriate for the purpose of establishing RBLs.

3.5.2 Operation of Power Plant Only

To define the applicable RBLs, the RBLs of Receptors A and D for the day, evening and night-time period have been reviewed using the weekend L_{A90} levels extracted from **Table 3-2** and **Table 3-3**. For other receptors (B and C), the RBLs assumed in **Section 3.5.1** were used.

As the Power Plant would operate 24 hours a day, the controlling noise criteria will be the night-time criteria, and compliance with the target leads to compliance at all other times (**Table 3-6**).

3 Existing Acoustic Environment

Table 3-6 Rating Background Levels – Operation of Power Plant Only

Location	Night-Time Rating Background Level (RBL) L_{A90} dB(A)
A: Edrom Lodge	31
B: Boyd Road, East Boyd	30
C: Bramble Street, Eden	35
D: SEFE Camp	35

4

Project Acoustic Criteria

4.1 Legislation and Guidelines

The potential noise impacts of the site were assessed in accordance with the following documents:

- NSW Department of Environment, Climate Change and Water (DECCW) *Industrial Noise Policy* (INP, EPA 1999) for the assessment of the operational noise of the proposed development with consideration of NSW INP *Application Notes* (2006);
- NSW DECCW *Environmental Criteria for Road Traffic Noise* (ECRTN, EPA 1999) for the assessment of the off-site traffic noise on public roads;
- NSW DECCW *Interim Construction Noise Guidelines* (DECC, 2009) for the assessment of the noise from construction of the proposed development; and
- World Health Organisation *Guidelines for Community Noise* (1999).

The relevance of these guidelines is outlined in the following sections.

4.2 Operational Noise Criteria

4.2.1 Operation of Site and Power Plant

The INP provides the framework and process for deriving noise limit conditions for consents and licences that enables the DECCW to regulate premises that are scheduled under the NSW *Protection of the Environment Operations Act 1997* (POEO Act). This policy seeks to promote environmental well-being through preventing and minimising noise. Section 1.1 of the INP states the specific policy objectives as follows:

- to establish noise criteria what would protect the community from excessive intrusive noise and preserve amenity for specific land uses;
- to use the criteria as the basis for deriving project specific noise levels;
- to promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- to outline a range of mitigation measures that could be used to minimise noise impacts;
- to provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- to carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the POEO Act.

The policy sets out two criteria (intrusive criterion and amenity criterion) to assess potential noise impacts of industrial sources. The first criterion is used to control intrusive noise impacts in the short-term for residences, and the second criterion is used to maintain noise level amenity for particular land uses including residential and other land uses.

4 Project Acoustic Criteria

Intrusive Noise Impacts

The intrusive criterion is summarised as follows:

- $L_{Aeq,15\ minute} \leq$ rating background level (RBL, L_{A90}) + 5 dB(A)

Where:

- $L_{Aeq,15minute}$ represents the equivalent continuous A-weighted sound pressure level of the source over 15 minutes, unless other descriptors are specified as more appropriate to characterise the source; and
- this is to be assessed at the most affected point on or within the residential property boundary or if that is more than 30m from the residence, then at the most affected point within 30m of the residence.

Protecting Noise Amenity

The amenity criterion is established to limit continuing increases in noise levels. The maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in the INP. **Table 4-1** is a summary of the noise levels from the INP showing amenity criteria applicable to the different types of receptors and areas within the study area.

Table 4-1 Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receptor	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level, dB(A)	
			Acceptable (ANL)	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Industrial Interface	Day	65	70
		Evening	55	60
		Night	50	55

Notes: • Shaded levels represent the Amenity Criteria applicable to this assessment.

For the receptor locations considered in this assessment, the indicative noise amenity areas of “Rural”, “Suburban” and “Industrial Interface” have been adopted for the purpose of establishing the project-specific noise levels. A brief description of each amenity area is as follows:

- Rural: An area with an acoustical environment that is dominated by natural sounds, having little or no road traffic.
- Suburban: An area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area typically has decreasing noise levels in the evening period, and the evening / night noise levels are defined by the natural environment and infrequent human activity.

- Industrial Interface: An area that is in close proximity to industrial premises and that extends out to a point from site boundary where the existing industrial noise from the source has fallen by 5 dB.

The INP specifies that acceptable noise levels (ANLs) should be modified where the existing noise level from industrial noise sources is close to the ANL or already exceeds the ANL for the area in question.

Adjustments are also to be applied to the source noise level received at the assessment point, before comparison with the amenity criterion, where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity and dominant low frequency content, as there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. The maximum correction to be applied is 10 dB(A) where the noise contains two or more modifying factors.

Modification to the ANLs is not required for Receptors B and C as the noise levels of these locations are dominated by the natural environment and not industrial sources.

However, modifications to ANLs at Receptors A and D have been made taking into consideration the estimated existing industrial noise levels. Based on the results of the long-term and short-term noise monitoring, the existing industrial noise levels during day, evening and night-time period are estimated to be:

- at Receptor A: 46 dB(A), 43 dB(A) and 39 dB(A), respectively; and
- at Receptor D: 49 dB(A), 47 dB(A) and 42 dB(A), respectively.

Table 4-2 presents the method for modifying the ANL provided in Table 2.2 of the NSW INP. The modified ANLs at each receptor location are shown in **Table 4-3**.

Table 4-2 Modification to ANL to Account for Existing Level of Industrial Noise

Total Existing L_{Aeq} Noise Level from Industrial Sources, dB(A)	**Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dB(A)**
≥ Acceptable noise level plus 2	If existing noise level is likely to decrease in future: acceptable noise level minus 10 If existing noise level is unlikely to decrease in future: existing level minus 10
Acceptable noise level plus 1	Acceptable noise level minus 8
Acceptable noise level	Acceptable noise level minus 8
Acceptable noise level minus 1	Acceptable noise level minus 6
Acceptable noise level minus 2	Acceptable noise level minus 4
Acceptable noise level minus 3	Acceptable noise level minus 3
Acceptable noise level minus 4	Acceptable noise level minus 2
Acceptable noise level minus 5	Acceptable noise level minus 2
Acceptable noise level minus 6	Acceptable noise level minus 1
< Acceptable noise level minus 6	Acceptable noise level

4 Project Acoustic Criteria

Table 4-3 Modified ANL (L_{Aeq}) at each Receptor Location

Receptor	Existing Industrial Noise Level dB(A)	ANL dB(A)			Modified ANL dB(A)		
		Day	Evening	Night	Day	Evening	Night
A	Day: 46 Evening: 43 Night: 39	50	45	40	50 – 2 = 48	45 – 4 = 41	43 – 6 = 37
D	Day: 49 Evening: 47 Night: 42	65	55	50	65	55	50
Notes: ANL: Acceptable Noise Level (Amenity Criteria)							

It can be seen in **Table 4-3** that a modification from -2 dB to -6 dB has been made for Receptor A which results in more stringent amenity noise criteria.

Project-Specific Noise Levels (PSNL)

The PSNL reflect the most stringent noise level requirement from the criteria derived from both the intrusive and amenity criteria to ensure that intrusive noise is limited and amenity is protected. **Table 4-4** summarises the noise criteria applicable to the operation of the plant.

Table 4-4 Project-Specific Noise Levels (PSNL) – Operation of Site and Power Plant

Receptor Location	Intrusive Criteria $L_{Aeq,15min}$ dB(A)			Amenity Criteria $L_{Aeq,period}$ dB(A)		
	Day	Evening	Night	Day	Evening	Night
A: Edrom Lodge	49	49	46	**48**	**41**	**37**
B: Boyd Road, East Boyd[1]	**35**	**35**	**35**	50	45	40
C: Bramble Street, Eden[2]	**50**	**45**	**40**	55	45	40
D: SEFE Camp	**47**	**47**	**47**	65	55	50

Notes: Shaded results represent the PSNL applicable to the assessment.

1. Background noise (L_{A90}) levels for day, evening and night were assumed 30 dB(A) resulted in most stringent noise limit.
2. Background noise (L_{A90}) levels for day, evening and night were assumed 45, 40 and 35 dB(A) respectively, considering the land use and location of the receptor.

It can been seen in **Table 4-4** that the controlling noise criteria will be the intrusive criteria for Receptors B, C and D which are based on the representative rating background levels for each assessment period. It should be noted that 35 dB(A) $L_{Aeq,15min}$ is the most stringent noise limit in accordance with the INP. Amenity criteria are the controlling noise criteria for Receptor A.

4.2.2 Operation of Power Plant Only

Based on the RBL determined in **Section 3.5.2** and the INP methodology detailed in **Section 4.2.1**, the noise limits applicable to the operation of the Power Plant at all receptor locations are presented in **Table 4-5**.

As the Power Plant would operate 24 hours a day, the controlling noise criteria will be the night-time criteria, and compliance with the target leads to compliance at all other times.

Table 4-5 Project-Specific Noise Levels (PSNL) – Operation of Power Plant Only

Location	Intrusive Criterion $L_{Aeq,15min}$ dB(A)	Amenity Criterion $L_{Aeq,period}$ dB(A)
A: Edrom Lodge[1]	**36**	40
B: Boyd Road, East Boyd	**35**	40
C: Bramble Street, Eden	**40**	40
D: SEFE Camp[1]	**40**	50

Notes: Shaded results represent the PSNL applicable to the assessment.

1. Criteria are based on the weekend RBL which were not affected by industrial noise. Thus modification to ANL is not required.

4.2.3 Sleep Disturbance Criteria

As the Site would continue to operate during the night-time period, an assessment of sleep disturbance for the worst potentially affected residential receptors has also been considered in this study. Where there exists the possibility that instantaneous, short-duration, high-level noise events may occur during night-time hours (10.00 pm – 7.00 am), consideration should be given to the potential for the disturbance of sleep within residences.

The INP does not specifically address sleep disturbance from high noise level events. Reference can be made to the WHO's *Guidelines for Community Noise (1999)*. The guideline recommends that the noise levels outside bedroom windows and inside bedrooms should be limited to L_{Amax} 60 dB(A) and L_{Amax} 45 dB(A), respectively. These limits have been determined taking into consideration the allowed maximum noise levels inside bedrooms to prevent sleep disturbance caused by noise impacts during night-time hours (10.00 pm – 7.00 am).

The 60 dB(A) limit is assessed outdoors at the most exposed side of residential premises. Sleep disturbance thresholds are also determined by factors including noise character and pitch, perceived personal danger, degree of habituation, age, illness or fatigue and the point in time when the noise occurs during the sleep period. For example, noisy events are generally less disturbing to people if confined to the earlier period of the evening when it is still possible to retrieve deep sleep.

4.3 Construction Noise Criteria

The noise criteria set out in the *Interim Construction Noise Guideline* (DECC, July 2009) have been used to assess the potential construction noise impact. This guideline is not mandatory although it will be used to assist DECCW in setting statutory conditions in licences or other regulatory instruments for construction noise. **Table 4-6** summarise the construction noise criteria specified in the Guideline.

4 Project Acoustic Criteria

Table 4-6 Construction Noise Criteria – Noise at Residences

Time of Day	Management Level $L_{Aeq, 15min}$	How to apply
Recommended standard hours: Monday to Friday: 7.00 am to 6.00 pm Saturday: 8.00 am to 1.00 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq, 15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

In accordance with the above guideline, the construction noise management levels applicable for each receptor location within the study area are shown in **Table 4-7**.

Table 4-7 Project-specific Construction Noise Management Levels

Receptor Location	Rating Background Level L_{A90} dB(A)	Management Level $L_{Aeq,15min}$ dB(A)
A: Edrom Lodge	44	44 + 10 = **54**
B: Boyd Road, East Boyd	30	30 + 10 = **40**
C: Bramble Street, Eden	45	45 + 10 = **55**
D: SEFE Camp	42	42 + 10 = **52**

The interim construction noise guideline does not include any criteria to assess off-site traffic noise associated with the construction. The off-site traffic noise has therefore been assessed under the ECRTN. Noise from traffic associated with the proposed construction is minimised as much as practical by limitations on construction hours and Australian Design Rules which apply to road-registered vehicles.

4.4 Off-Site Traffic Noise Criteria

Criteria for off-site road traffic noise are specified in the NSW *Environmental Criteria for Road Traffic Noise* (ECRTN). The applicable criteria are summarised in **Table 4-8** for the Power Plant which falls under the ECRTN category of "Land use developments with potential to create additional traffic on existing freeways / arterials".

Regular vehicle movement within the facility is considered as an industrial noise source and is assessed in accordance with the INP. The worst potentially affected receptor location from off site road traffic would be the Boydtown camping place.

Table 4-8 Environmental Criteria for Road Traffic Noise

Type of Development	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Where criteria are already exceeded
Land use developments with potential to create additional traffic on existing freeways/arterials	60 dB(A)	55 dB(A)	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.
Notes: • Day: 7.00 am – 10.00 pm / Night: 10.00 pm – 7.00 am.			

The day and night-time levels presented above are applicable for all the receptor locations considered in this assessment.

5

Assessment of Potential Acoustic Impacts

5.1 Calculation Methodology

Noise levels due to the proposed construction and operation of the plant at the identified noise sensitive receptor locations have been predicted using an acoustic computer model created in SoundPLAN Version 6.5. This program is used and recognised internationally. This program is also considered by the INP as a preferred computer noise model (Section 6.2 – *Noise Prediction*).

The noise model was developed to allow the prediction of cumulative noise levels from the plant and construction site by calculating the contribution of each noise source. The noise model takes into account:

- sound power levels of each source;
- receptor locations;
- digital terrain map with 2m height intervals;
- screening effects due to topography;
- meteorological effects and attenuation due to distance; and
- ground and atmospheric absorption.

The noise calculations have been carried out using the L_{Aeq} descriptor to assess the operational and construction noise impacts.

The program allows the use of various noise prediction algorithms. To calculate noise emission levels under neutral and adverse meteorological conditions, the CONCAWE algorithm which is designed for industrial sites has been used. The effects of meteorological conditions are explained in more detail in **Section 5.2** below.

5.2 Meteorological Conditions

Adverse meteorological conditions have the potential to increase noise levels at a receptor. Such phenomena generally occur during temperature inversions and where there is a wind gradient with wind direction from the source to the receptor. It is known that these meteorological effects typically increase noise levels by 3 to 10 dB, and even higher than 10 dB in extreme conditions.

Temperature inversions generally occur during the night-time and early morning periods during the winter season, thus the most significant meteorological effect during the daytime period is wind.

For a conservative approach, the following adverse meteorological conditions (wind and temperature inversions) were assumed as a feature of the assessment area in the noise modelling (**Table 5-1**).

Table 5-1 Meteorological Conditions

Time of Day	Pasquill Stability Class	Wind Speed (m/s)	Wind Direction
Day & Evening (7.00 am – 10.00 pm)	D	4	Source-to-receiver
Night (10.00 pm – 7.00 am)	F	2	

5.3 Operational Noise

5.3.1 Sound Power Levels

Table 5-2 and **Table 5-3** present the sound power levels of equipment that has been identified as the primary on-site noise sources. Sound power levels of the existing equipment (**Table 5-2**) have been calculated using field measurements conducted on the Site on 23 June 2009. All source noise was measured in one-third octave frequency bands.

Sound power levels of the equipment items for the Power Plant (**Table 5-3**) have been provided by SEFE as overall levels for linear and A-weighted values. For noise modelling, the levels have been converted to octave frequency band levels based on the sound power levels of similar equipment used for our past projects. The sound power levels presented in the table were input into the noise model.

URS was advised by SEFE that noise emissions from the proposed exhaust stack would be minimal, and they are therefore not considered in the noise modelling.

Ship-loading is undertaken in three-day campaigns around the clock. During loading, two chip dozers are deployed to reclaim chips on the site's chip stacks. This activity occurs up to 22 times per year and therefore ship-loading was also considered in the noise modelling to calculate the 'worst-case' cumulative noise impacts. It is noted that the tracked bulldozer can occasionally be heard at Edrom Lodge, however SEFE has not received any complaints about the noise.

Table 5-2 Sound Power Levels – Existing Mill Operations

Operational Noise Source	Source Height Used in Noise Modelling (m)	Estimated Overall Sound Power Level	
		dB(Lin)	dB(A)
Hardwood Chipping (E1 & E2)	6	128	122
Softwood Chipping (Chipper & Debarking Drum (sound-attenuated)	5	130	124
Shakers	5	127	112
Jetslinger (Stacking Conveyor)	50 (E1 & E2 Chip Storage) 30 (Pine Chip Storage) 10 (Fuel Storage)	114	110
Stacker (Wagner)	3	121	113
Truck unloading	2	95	92
Truck manoeuvring (< 30 km/h)	2	74	64
Conveyor	10 – 15	105	103
Ship-loading activity – 22 campaigns per year (Two tracked bulldozers – engine noise, loading & unloading)	2	122	110

Table 5-3 Sound Power Levels – Biomass Power Plant

Operational Noise Source	Source Height Used in Noise Modelling (m)	Estimated Overall Sound Power Level[1]	
		dB(Lin)	dB(A)
Gas Turbine Unit & Generator (Acoustically enclosed)	5	117	105
Boiler & Furnace (not enclosed)	10	112	108
Ancillary Sources	3	95	92

The acoustic design of the plant specified in **Table 5-3** will be to the sound power levels nominated.

5.3.2 Meteorological Conditions Used in Noise Modelling

Potential noise impacts were predicted for each of the meteorological scenarios in **Table 5-4**.

Table 5-4 Meteorological Conditions used in Noise Modelling

Met. Scenario	Meteorological Condition				
	Temperature (°C)	Relative Humidity (%)	Pasquill Stability Class	Wind Speed (m/s)	Wind Direction
Day & Evening Operation – Neutral Met. Conditions	20	70	D	0	n/a
Night-time Operation – Neutral Met Conditions	10	60	D	0	n/a
Day & Evening Operation – Adverse Met. Conditions	20	70	D	4	source-to-receiver
Night-time Operation – Adverse Met. Conditions	10	60	F	2	source-to-receiver

5.3.3 Assumptions Made in Noise Modelling

The noise modelling is based on likely maximum operating conditions. All sources are positioned within designated operating areas. To assess the cumulative noise impacts of the proposed operation of the plant it was assumed that all the equipment listed operates continuously and simultaneously.

5.3.4 Predicted Operational Noise Levels

The noise modelling results using neutral and adverse meteorological conditions compared to the noise limits are presented in **Table 5-5, Table 5-6** and **Table 5-7**.

5 Assessment of Potential Acoustic Impacts

Table 5-5 Predicted Operational Noise Levels (Power Plant Only)

Receptor Location	Predicted Noise Levels (L_{Aeq}) dB(A)		Noise Limit (L_{Aeq}) dB(A)	Exceedance dB
	Neutral Met Conditions	Adverse Met Conditions	Night-time	
	11.00 pm – 7.00 am	11.00 pm – 7.00 am		
A (Edrom Lodge)	33	36	36	No
B: Boyd Road, East Boyd	< 15	< 15	35	No
C: Bramble Street, Eden	< 15	< 20	40	No
D (SEFE Camp)	33	35	40	No

The results presented in **Table 5-5** show that noise emissions from the proposed operation of the Power Plant are within the noise goal under all meteorological conditions.

Table 5-6 Predicted Operational Noise Levels (Power Plant and Ship-loading)

Receptor Location	Predicted Noise Levels (L_{Aeq}) dB(A)		Noise Limit (L_{Aeq}) dB(A)	Exceedance dB
	Neutral Met Conditions	Adverse Met Conditions	Night-time	
	11.00 pm – 7.00 am	11.00 pm – 7.00 am		
A (Edrom Lodge)	37	40	36	1 ~ 4 (Night-time)
B: Boyd Road, East Boyd	< 20	< 20	35	No
C: Bramble Street, Eden	< 20	< 25	40	No
D (SEFE Camp)	37	39	40	No

The results presented in **Table 5-5** show that exceedances of the night-time noise limit up to 4 dB is predicted due to the operation of the Power Plant and ship-loading under adverse meteorological conditions. It should be noted that ship-loading activity is not considered a typical operation at the site as the activity occurs up to 18 % of the time per year.

5 Assessment of Potential Acoustic Impacts

Table 5-7 Predicted Cumulative Operational Noise Levels (Site, Power Plant & Ship-loading)

Receptor Location	Predicted Noise Levels (L_{Aeq}) dB(A)						Noise Goal (L_{Aeq}) dB(A)	Exceedance dB
	Neutral Met Conditions			Adverse Met Conditions			D/E/N	
	D	E	N	D	E	N		
A (Edrom Lodge)	47	45	41	50	48	44	48 / 41 / 37	D: 2, E: 4 ~ 7, N: 4 ~ 7
B: Boyd Road, East Boyd	< 25	< 25	< 25	< 30	< 30	< 30	35 / 35 / 35	No
C: Bramble Street, Eden	< 25	< 25	< 25	< 30	< 30	< 30	50 / 45 / 40	No
D (SEFE Camp)	50	48	45	51	50	47	47 / 47 / 47	D: 3 ~ 4, E: 1 ~ 3
Notes: D: Day / E: Evening / N: Night								

The results presented in **Table 5-7** show that:

- Receptor A: 'Worst-case' Operation – Site, Biomass Power Plant and Ship-loading
  - Noise levels during daytime would exceed the noise goal by up to 2 dB under adverse meteorological conditions.
  - Noise levels during evening and night-time would exceed the noise goal by up to 4 dB under neutral meteorological conditions, and 7 dB under adverse meteorological conditions.
  - Exceedances during typical operation (i.e. no ship-loading) are expected to be lower by 1 dB.
- Receptors B & C: No exceedance of the noise goals is expected.
- Receptor D (only occupied occasionally by SEFE staff): 'Worst-case' Operation – Site, Biomass Power Plant and Ship-loading
  - Noise levels during daytime would exceed the noise goal by up to 3 dB under neutral meteorological conditions and 4 dB under adverse meteorological conditions.
  - Noise levels during evening would exceed the noise goal by up to 3 dB under adverse meteorological conditions.
  - The exceedances during typical operation (i.e. no ship-loading) are expected to be lower by 1 dB.
  - Noise levels during night-time would be within the noise goal.
- Daytime and evening operation of the biomass Power Plant would give an increase of less than 1 dB to the cumulative noise levels of the existing Site operation which would not be detectable by human ears.
- Night-time operation of the Power Plant would not exceed the noise limit at all locations.
- The cumulative noise levels taking into consideration biomass Power Plant operation and ship-loading activity would result in an increase of 1 – 2 dB to the noise levels of the existing daytime Site operation.
- During ship-loading campaigns, exceedances up to 4 dB would occur during night-time at Receptor A.

Given that the noise from the Power Plant would be steady rather than fluctuating, it was considered that the difference between L_{Aeq} and L_{Amax} noise levels would be less than 15 dB. Therefore, the predicted noise levels are expected to be within the noise goal for protection from sleep disturbance (L_{Amax} 60 dB(A)) at all residential receptors, and the operation is not predicted to give rise to sleep disturbance. Any repairs or maintenance works would be scheduled during the daytime period. While the Site (except for Power Plant) would continue to operate until 11.00 pm, the shutdown time would vary from 6.00 pm to 11.00 pm. As the duration of the night-time operation is only an hour (10.00 pm – 11.00 pm), and the time falls in early night-time period, it was not considered necessary to assess the Site operation against the sleep disturbance criteria. The noise during ship-loading activities would fluctuate during operation of tracked bulldozers. However, the noise would not exceed the sleep disturbance noise goal and is not expected to give rise to sleep disturbance.

Considering the noise levels of the existing operation, degree of exceedance and the existing ambient noise levels (primarily from wave noise) at the receptor locations, the potential noise impact due to the operation would be insignificant. Further noise mitigation measures are not considered practical or necessary.

A further discussion on the predicted results is provided in **Section 6** when applying the Noise Policy to the existing industrial premises that require an upgrade or extensions.

Predicted noise contour maps for the adverse night-time meteorological conditions are presented in **Appendix C**. It should be noted that these noise contours are indicative only due to interpolation within the calculation grid, and the results of the point-to-point calculations presented in **Table 5-7** are more accurate than the noise contours.

Noise intrusion levels at the receptor locations in the one-third octave frequency bands have been reviewed in detail. It was found that the noise from the SEFE operation would not contain tonality and / or low frequency content in accordance with the assessment guideline provided in the NSW INP.

No noise sources are expected to generate instantaneous or short-duration high noise level events, and would therefore not contain impulsive noise.

5.4 Construction Noise

The total construction period is expected to be approximately 15 months. The main construction activities would involve the following stages:

- earthworks including site grading, excavation and piling;
- establishing concrete foundations for the Power Plant;
- construction of buildings and installation of equipment and machinery.

5.4.1 Construction Equipment and Associate Noise Levels

Typical construction equipment expected on the site and corresponding noise levels are summarised in **Table 5-8**. The sound power levels of these items have been taken from Appendix D of AS 2436-1981: “Guide to noise control on construction, maintenance and demolition sites” and library data. The sound power levels presented in the table are indicative only.

Table 5-8 Sound Power Levels – Construction Equipment

Proposed Activities	Equipment / Plant Item	Sound Power Level L_{Aeq} dB(A)
Site preparation & Earthworks (1 – 2 weeks)	Excavator	110
	Bulldozer	110
	Roller	108
	Loader	108
	Steel/Concrete piling rigs & piling	116
	Dump truck	105
Concrete Foundation Works (2 – 3 weeks)	Concrete truck	108
	Concrete mixer	110
	Compactor	114
Building Construction & Equipment Installation (14 months)	Mobile crane	104
	Delivery trucks	106
	Pneumatic tools	112
	Electric tools	102
	Power generators	102
	Hammers	108

5.4.2 Predicted Construction Noise Levels

The noise levels generated by the construction activities listed above have been predicted at each receptor location. Noise emissions will vary as construction progresses. The noise modelling has been carried out considering the adverse meteorological conditions. The results are presented in **Table 5-9**. It should be noted that the predicted noise levels represent the cumulative noise levels of the on-going Site operation and the construction activities.

Table 5-9 Predicted Construction Noise Levels

Receptor	Predicted Noise Level $L_{Aeq,15min}$ dB(A)	Daytime Noise Management Level $L_{Aeq,15min}$ dB(A)	Exceedance
A (Edrom Lodge)	50 – 52	54	No
B: Boyd Road, East Boyd	< 30	40	No
C: Bramble Street, Eden	< 30	55	No
D (SEFE Camp)	51 – 53	52	No

The predicted construction noise levels presented in **Table 5-9** show that the cumulative noise levels are expected to be within the noise management level. A very marginal exceedance of the management level is expected at Receptor D which is negligible.

5.5 Off-Site Traffic Noise

The potential off-site traffic noise impact associated with the proposed construction and operation has been assessed based on the URS Traffic Study undertaken for the development. Traffic generated by the Site's current operations was collected from gatehouse records to characterise existing traffic movements.

5 Assessment of Potential Acoustic Impacts

The SEFE site is accessed via the Princes Highway and Edrom Road. From examination of aerial photographs, the worst potentially affected noise sensitive location would be the Boydtown camping ground located on the Princes Highway. The Princes Highway is generally a two lane carriageway with a 100 km/h speed limit for the majority of the length.

Edrom Road forms a controlled "T" intersection with the Princes Highway, and runs north from the Highway to the Site. On approach to the Site, the Edrom Road speed zone is reduced to 50 kph.

Observations made during a site inspection in June 2009 recorded that both the Princes Highway and Edrom Road were in good condition.

5.5.1 Existing Traffic Volumes

Over the last fours years, between 917,217 and 1,002,968 t of logs have been processed at the Site annually. All timber received by the Site is delivered by trucks. Truck deliveries occur between 7.00 am and 10.00 pm, Monday to Friday, and occasionally between 7.00 am and 2.30 pm on Saturday.

SEFE has advised that the approximately 200 heavy vehicles currently access the Site daily. In addition to log transport, SEFE exports mulch to markets in the metropolitan areas of Sydney and Canberra. Typically 900 truck loads of mulch are sold each year.

5.5.2 Construction

The construction of the Power Plant is likely to generate up to 40 vehicle movements per day (based on an additional 10 heavy vehicles and 10 contractor vehicles) which represents an increase of 9.1 % from the existing traffic volumes. This worst-case scenario is based on an assumption that all construction stages occur simultaneously.

The increase in road traffic noise levels from the Princes Highway at the most potentially affected dwelling is expected to be less than 0.5 dB which is negligible. It should be noted that traffic noise impacts due to the proposed construction are anticipated to be particularly short in duration, restricted largely to the first few weeks of the construction phase when plant, equipment and materials are transported to the Site.

Off-site traffic noise associated with construction will be minimised as much as far as practical through limitations on construction hours and application of Australian Design Rules which apply to road-registered vehicles.

5.5.3 Operation

The proposed operation of the Power Plant would increase the total staff by six from 77. Once the Power Plant is operating, no mulch will be exported from the Site which would result in a reduction of approximately 900 truck dispatches over a year. However, around 920 truck loads of wood waste from other milling operations would be transported to the Site to be consumed as fuel.

The expected increase is 2.3 % from the existing traffic volumes.

The increase in road traffic noise levels from the Princes Highway at the most potentially affected dwelling is expected to be less than 0.3 dB which is negligible.

5.6 Summary of Potential Acoustic Impacts

The following provides a summary of the outcomes of the assessment of potential acoustic impacts:

- Operation:
  - Noise levels generated by the proposed operation of the Power Plant alone would not exceed the noise goals at any receptor location.
  - Cumulative noise levels generated by the proposed overall operation would exceed the noise goals at the closest residential location (Receptor A) during evening and night-time.
  - Some exceedances of the noise goals are expected at the SEFE Camp, but noise impacts on this location will be minimal as the dwelling is generally not occupied.
- Sleep Disturbance:
  - Predicted noise levels are within the sleep disturbance noise limits established in accordance with the WHO guidelines.
- Construction Noise:
  - No exceedance of the construction noise management limit is expected at any residential locations during the construction phase.
- Off-Site Traffic Noise;
  - Construction: The predicted increase in road traffic noise level is less than 0.5 dB at the most potentially affected dwellings. The resulting levels remain within the off-site traffic noise criteria.
  - Operation: The predicted increase in road traffic noise level is less than 0.3 dB at the most potentially affected dwellings. The resulting levels remain within the off-site traffic noise criteria.

6

Discussion and Recommendations

As detailed in **Section 5.3.4**, some exceedances of the noise goals are expected. The cumulative assessment (existing operations and Power Plant) indicates that noise levels during evening and night-time would exceed the noise goal by up to 3 dB under neutral meteorological conditions, and 6 dB under adverse meteorological conditions. Operation of the Power Plant would increase the cumulative noise levels by less than 1 dB which is minimal. It should also be noted that the Site has not received any complaints about the noise in the past.

Chapter 10 – *Applying the policy to existing industrial premises* of the NSW INP provides guidelines for noise reduction programs for existing industrial noise sources, based on an agreed process for assessing and managing noise.

Many existing industrial sources were designed for higher noise emission levels than the criteria outlined in the noise policy. Some industries may have been in existence before noise control legislation was introduced, and the range of mitigation measures available for these sites may be either limited or costly. Therefore, the need for reduced noise from existing sites must be weighed against the wider economic, social and environmental considerations. It should be recognised that in dealing with noise impacts from existing premises, the means available to mitigate noise may be more limited than for new premises.

In this case, the INP states that the project-specific noise levels (PSNL) should not be applied as mandatory noise limits. The INP suggests that if the noise levels from the existing premises are well in excess of the applicable project-specific noise levels (PSNL) at nearby residence (being more than 15 dB above PSNL), complaints are likely to be received and all feasible and reasonable noise control measures should be implemented. However, even with all the feasible and reasonable noise mitigation measures, there would still be minor exceedances of the PSNL when adjoining residential properties are in close proximity of the industrial premises.

Considering the INP guidelines and the current operational conditions at the SEFE site, negotiation of reasonable and achievable noise goals are likely to be required for the site.

Verification of noise emission levels from the Power Plant would be undertaken during the commissioning stage to confirm the noise modelling results.

7

Conclusion

URS has completed a noise impact assessment for the proposed biomass Power Plant to be located within the SEFE's Munganno Point mill site at Edrom, NSW. This assessment has been prepared to support the Environmental Assessment (EA) of the proposed development.

The assessment of potential noise impacts of the proposed construction and operation of the facility on surrounding noise sensitive receptor locations has been carried out using the relevant NSW noise guidelines. Throughout the assessment, typical and 'worst-case' factors have been taken into consideration.

The predicted noise levels would exceed the noise goals at the nearest residences during evening and night-time periods. However, the assessment found that the potential cumulative noise impacts due to operation of the SEFE site and Power Plant would be insignificant due to the level of ambient noise currently experienced (primarily wave noise). The proposed operation of the facility is not expected to significantly degrade the existing acoustic environment nor generate community annoyance.

The predicted noise levels would be verified during commissioning. In the unlikely event of any significant discrepancies from this assessment, there is a scope to provide additional attenuation through measures such as enclosures, silencers and noise barriers.

8

References

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Australian Standard 2004, Electroacoustics – Sound level meters – Specifications, AS IEC 61672.1:2004.

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Guidelines for Community Noise, World Health Organisation, 1999.

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Industrial Noise Policy – Application Notes, NSW Department of Environment and Climate Change, 2006.

Interim Construction Noise Guideline, NSW Department of Environment and Climate Change, 2009.

Standards Australia / New Zealand 2002, Structural design actions – Wind actions, AS/NZS 1170.2:2002.

9

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of South East Fibre Exports Pty Ltd (SEFE) and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 5 May 2009.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between July and October 2009. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

A

Appendix A Glossary of Acoustic Terminology

A

Appendix A Glossary of Acoustic Terminology

A wide range of acoustic parameters and technical terms are used in this report. To assist in understanding the technical contents, a brief description of the acoustic terms is provided in this section.

Typical Noise Levels: Compared to the static air pressure (10^5 Pa), the audible sound pressure variations are very small ranging from about 20 µPa ($20x10^{-6}$ Pa), which is called "threshold of hearing" to 100 Pa. A sound pressure of approximately 100 Pa is so loud that it causes pain and is therefore called "threshold of pain".

dB (Decibel): A unit of sound level measurement. The human ear responds to sound logarithmically rather than linearly, so it is convenient to deal in logarithmic units in expressing sound levels. To avoid a scale which is too compressed, a factor of 10 is introduced, giving rise to the decibel. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Perception of Sound: The number of sound pressure variation per second is called the frequency of sound, and is measured in Hertz (Hz). The normal hearing for a healthy young person ranges from approximately 20 Hz to 20 kHz. In terms of sound pressure levels, audible sound ranges from the threshold of hearing at 0 dB to the threshold of pain at 130 dB and over. A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to small but noticeable change in loudness. An increase of about 8 – 10 dB is required before the sound subjectively appears to be significantly louder.

Sound Pressure (SPL): Sound pressure is the measure of the level or loudness of sound. Like sound power level, it is measured in logarithmic units. The symbol used for sound pressure level is SPL, and it is generally specified in dB. 0 dB is taken as the threshold of human hearing.

Sound Pressure Levels of Some Common Sources		
Sound Pressure Level (dB)	Sound Source	Typical Subjective Description
140	Propeller aircraft; artillery fire, gunner's position	Intolerable
120	Riveter; rock concert, close to speakers; ship's engine room	
110	Grinding; sawing	
100	Punch press and wood planers, at operator's position; pneumatic hammer or drilling (at 2 m)	Very noisy
80	Kerbside of busy highway; shouting; Loud radio or TV	Noisy
70	Kerbside of busy traffic	
60	Department store, restaurant, conversational speech	
50	General office	Moderate
40	Private office; Quiet residential area	Quiet
30	Unoccupied theatre; quiet bedroom at night	
20	Unoccupied recording studio; Leaves rustling	Very quiet
10	Hearing threshold, good ears at frequency of maximum sensitivity	
0	Hearing threshold, excellent ears at frequency maximum response	

Sound Power (SWL): Sound power is the energy radiated from a sound source. This power is essentially independent of the surroundings, while the sound pressure depends on the surroundings (e.g. reflecting surfaces) and distance to the receptor. If the sound power is known, the sound pressure at a point can be calculated. Sound power is also measured in logarithmic units, 0 dB sound

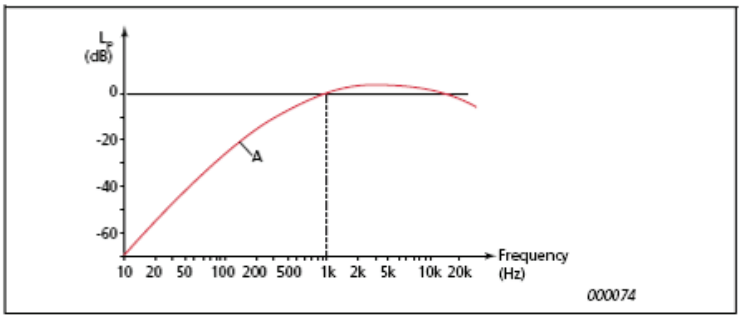
Appendix A

power level corresponding to 1 pW (10^{-12} W). The symbol used for sound power level is SWL or Lw, and it is specified in dB.

Frequency: Frequency is synonymous to pitch and is measured in units of Hz.

Frequency Spectrum: In environmental noise investigations, it is often found that the single-number indices, such as L_{Aeq}, do not fully represent the characteristics of the noise. If the source generates noise with distinct frequency components, then it is useful to measure the frequency content in octave or one-third octave frequency bands. For calculating noise levels, octave spectra are often used to account for the frequency characteristics of propagation.

"A" Frequency Weighting: The method of frequency weighting the electrical signal with a noise measuring instrument to simulate the way the human ear responds to a range of acoustic frequencies. It is based on the 40 dB equal loudness contour. The symbols for the noise parameters often include the letter "A" (e.g. L_{Aeq}) to indicate that frequency weighting has been included in the measurement.



Adverse Weather: Weather effects (wind and temperature inversions) that enhance noise. The prescribed conditions are for wind occurring more than 30 % of the time in any assessment period in any season and/or for temperature inversions occurring more than 30 % of the nights in winter.

Assessment Period: The period in a day over which assessments are made: day (7.00 am – 6.00 pm, Monday to Saturday; or 8.00 am – 6.00 pm on Sundays and public holidays), evening (6.00 pm – 10.00 pm, all days) or night (10.00 pm – 7.00 am, Monday to Saturday; or 10.00 pm – 8.00 am on Sundays and public holidays).

Ambient Noise: The all-encompassing sound at a site comprising all sources such as industry, traffic, domestic, and natural noises. This is represented as the L_{Aeq} noise level in environmental noise assessment. (See also L_{Aeq})

Background Noise: Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is measured statistically as the A-weighted noise level exceed for ninety per cent of a sample period. This is represented as the L_{A90} noise level. (See also L_{A90}).

Assessment Background Level (ABL): A single number representing the typical background noise level during each assessment period (day, evening and night) for each day. The ABLs measured on all the monitoring days are used to determine the overall RBL at a site. (See RBL)

Rating Background Level (RBL): A single number representing the median value of the ABL values of each assessment period over all of the monitoring days.

Appendix A

Free Field: An environment in which a sound wave may propagate in all directions without obstructions or reflections. Free field noise measurements are carried out outdoors at least 3.5 m from any acoustic reflecting structures other than the ground.

Extraneous Noise: Noise resulting from activities that are not typical of the area. Untypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.

Impulsive Noise: Noise having a high peak of short duration or a sequence of such peaks. Noise from impacts or explosions, e.g., from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of the sound pressure level.

Intermittent Noise: Noise with a level that abruptly drops to the level of or below the background noise several times during the period of observation. The time during which the level remains at a constant value different from that of the ambient being of the order of 1 s or more.

Meteorological Conditions/Effects: Wind and temperature inversion conditions.

Noise Barrier: Solid walls or partitions, solid fences, earth mounds, earth berms, buildings. Etc used to reduce noise without eliminating it.

Project-Specific Noise Levels (PSNL): PSNL are target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. The most stringent criteria is determined by measuring the level and nature of existing noise in the area surrounding the actual or proposed noise generating facility.

Temperature Inversion: An atmospheric condition in which temperature increases with height above the ground.

Tonality: Noise containing a prominent frequency and characterised by a definite pitch.

L_{Aeq}: A-weighted equivalent continuous noise level. This parameter is widely used and is the constant level of noise that would have the same energy content as the varying noise signal being measured. The letter “A” denotes that the A-weighting has been included and “eq” indicates that an equivalent level has been calculated. This is referred to as the ambient noise level. (See Ambient Noise)

L_{A90}: The A-weighted sound pressure level which is exceeded for 90 % of the measurement period. It is determined by calculating the 90^{th} percentile (lowest 10 %) noise level of the period. This is referred to as the background noise level. (See Background Noise)

L_{Amax}: The A-weighted maximum Root Mean Square (RMS) sound pressure level measured during the sample period.

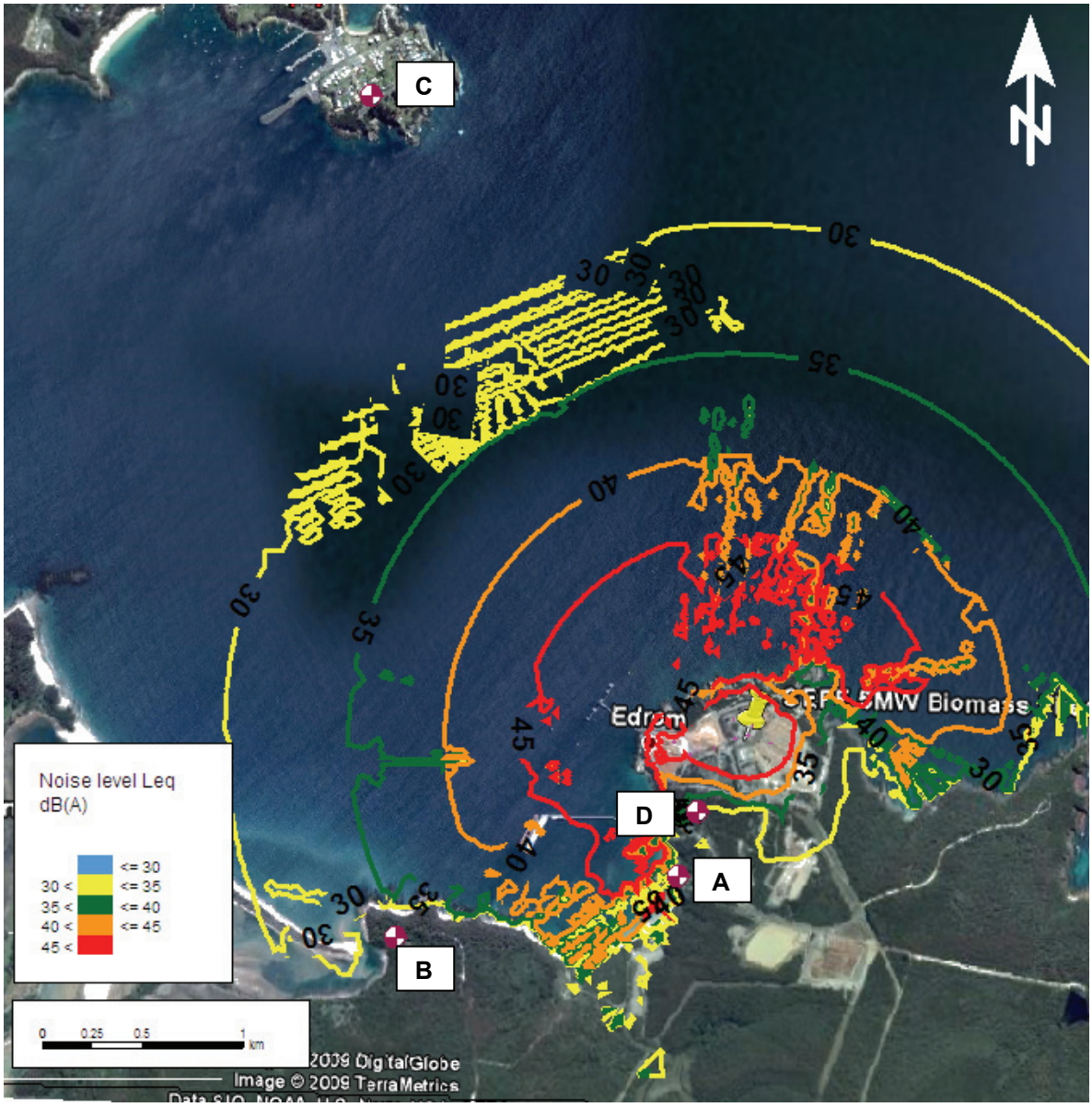
B

Appendix B Noise Contours

B

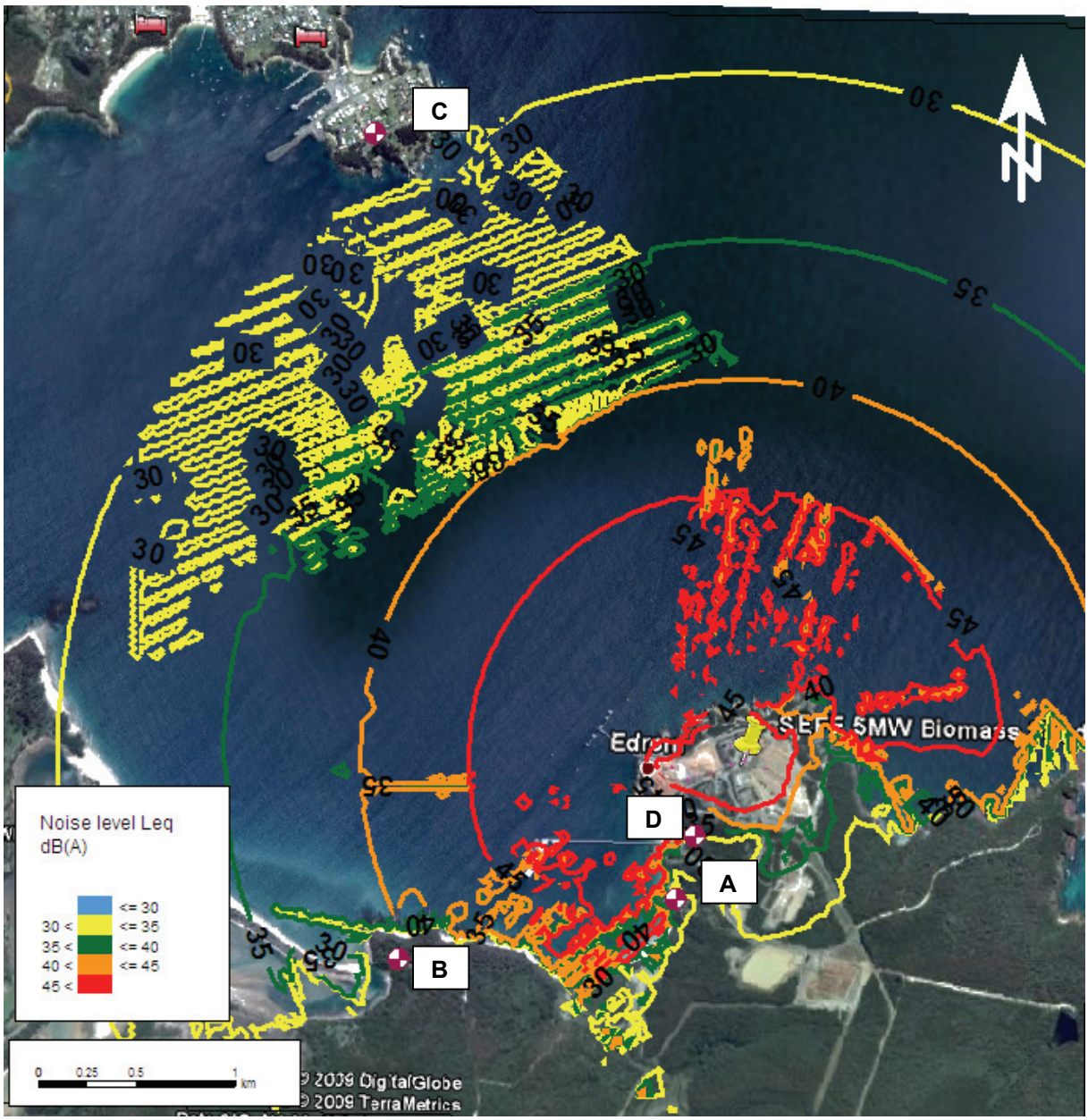
Appendix B Noise Contours

Existing and Power Plant Operation – Day under Neutral Meteorological Conditions



Appendix B

Exiting and Power Plant Operations – Day under Adverse Meteorological Conditions



C

Appendix C Daily Noise Monitoring Plots

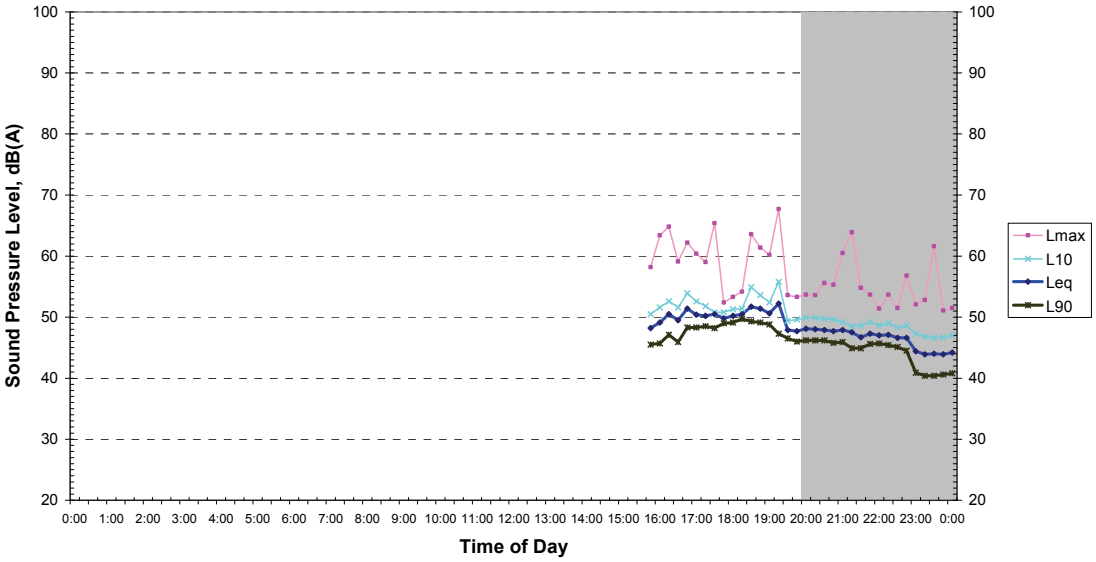
C

Appendix C Daily Noise Monitoring Plots

Daily Noise Monitoring Results

Edrom Lodge , Eden, NSW

Tuesday 23 June 2009



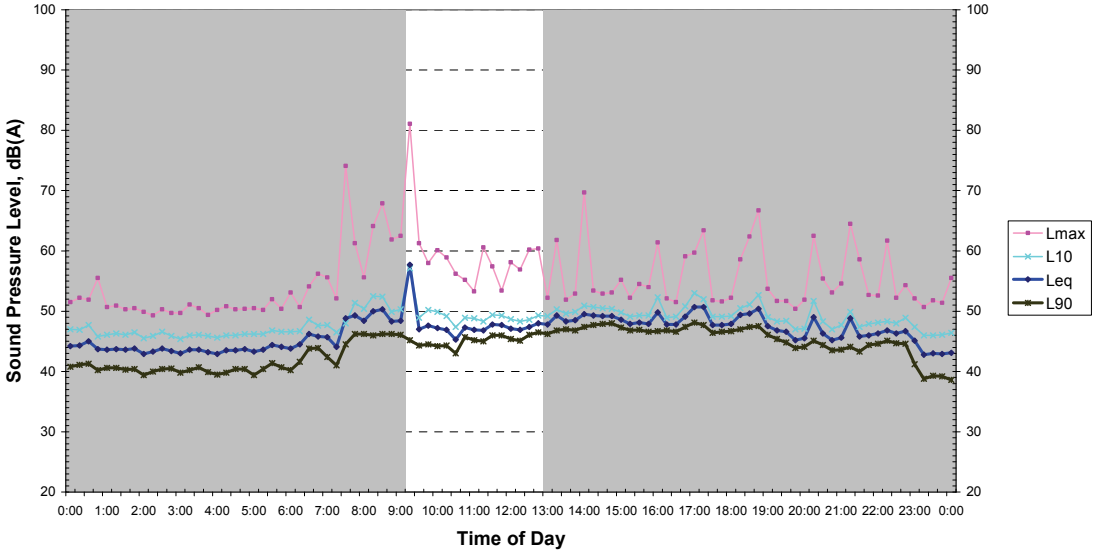
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Edrom Lodge , Eden, NSW

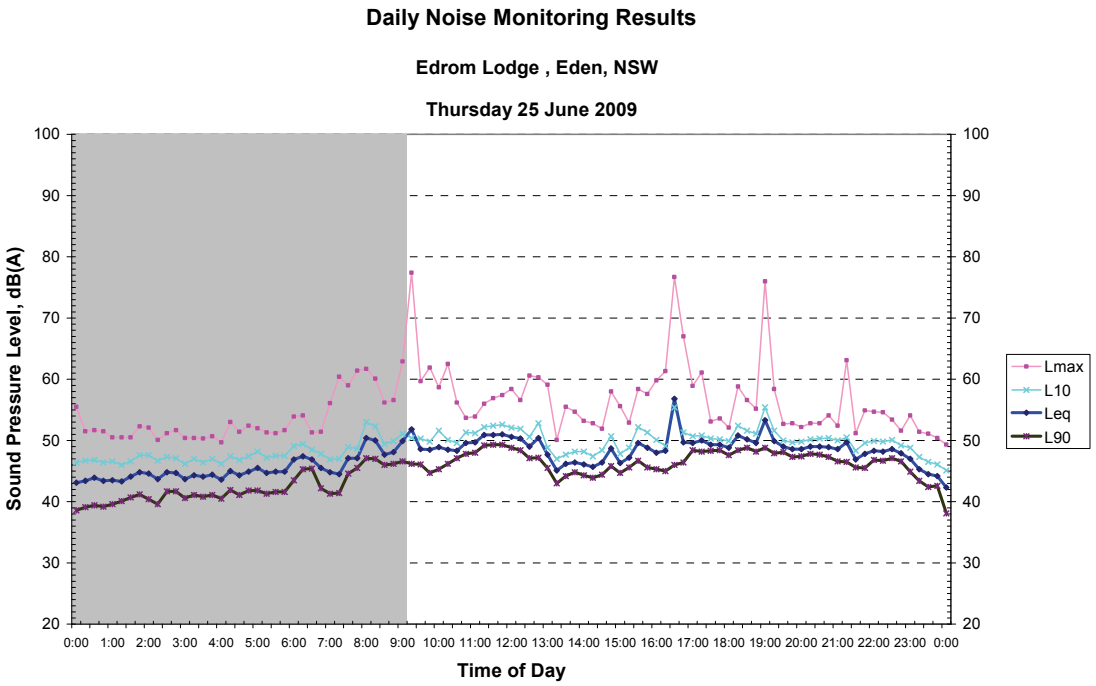
Wednesday 24 June 2009



Note:

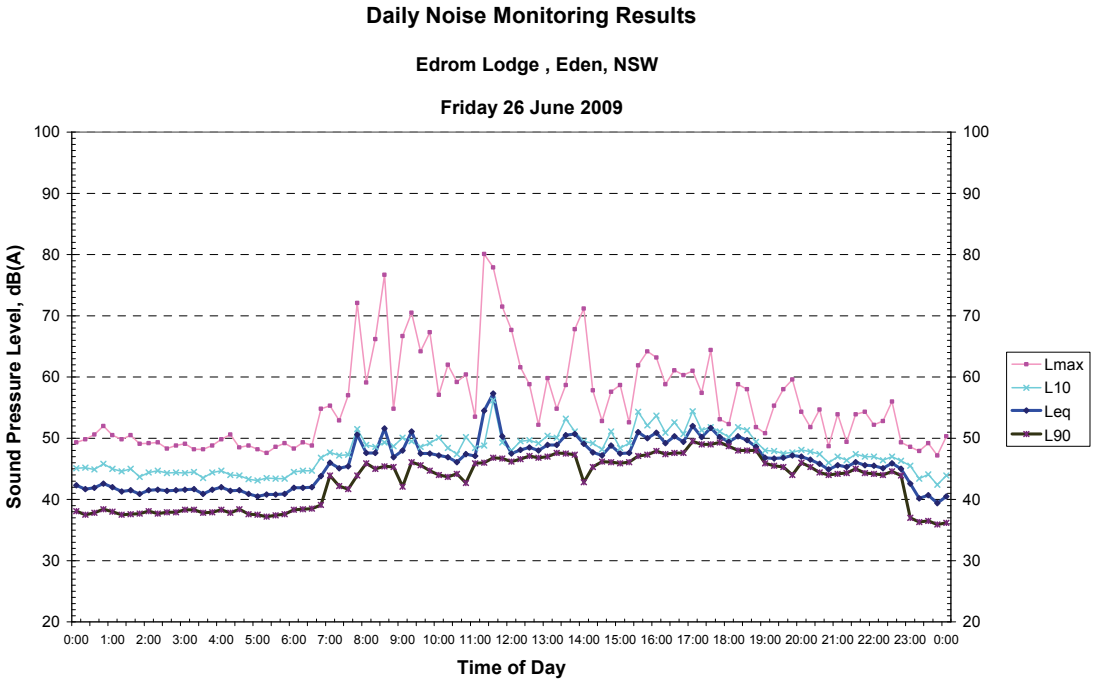
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix C



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.



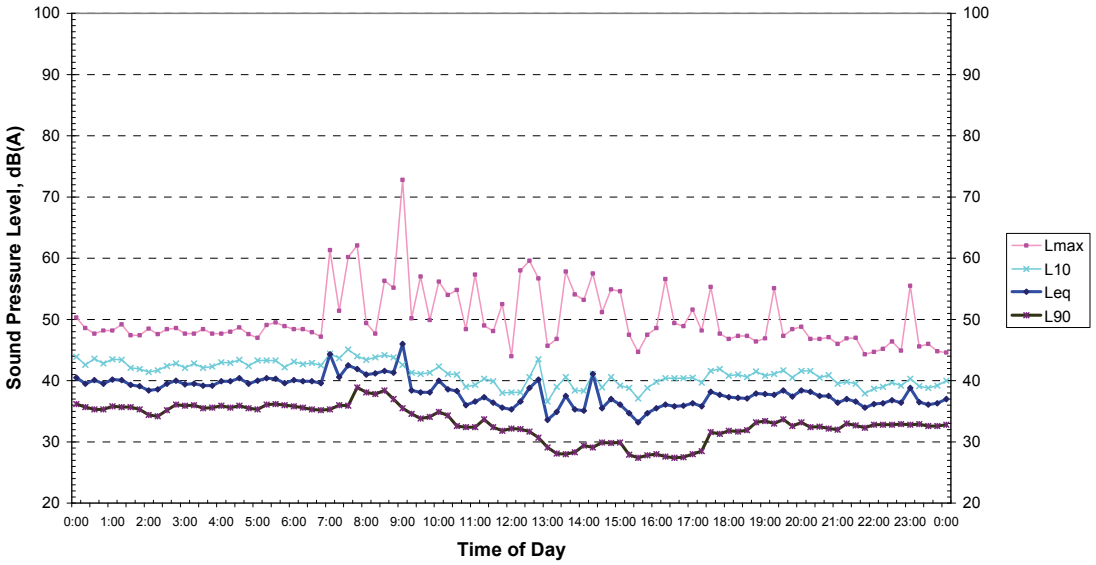
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Edrom Lodge , Eden, NSW

Saturday 27 June 2009



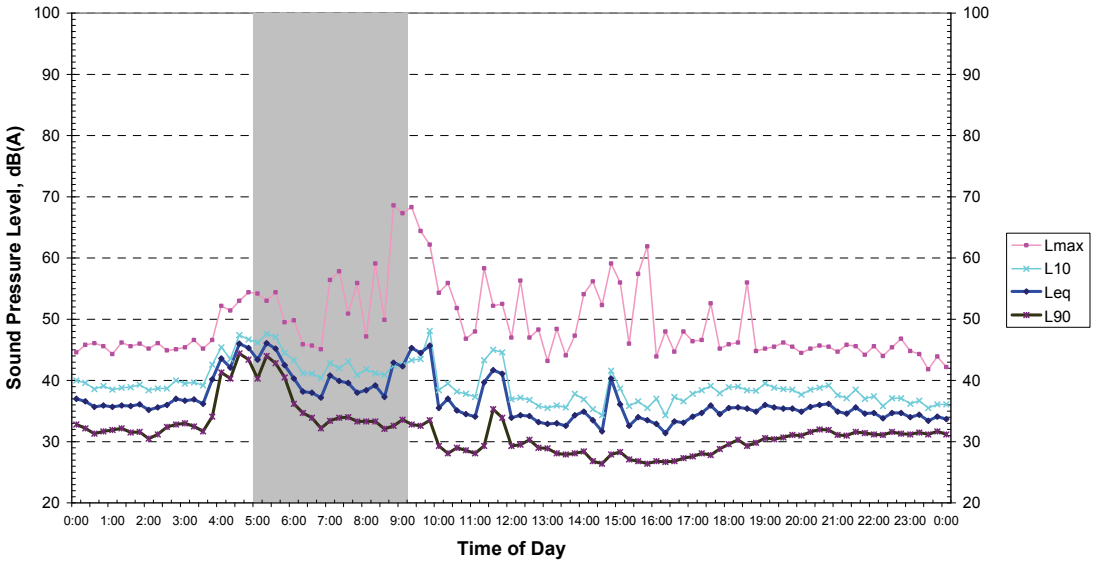
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Edrom Lodge , Eden, NSW

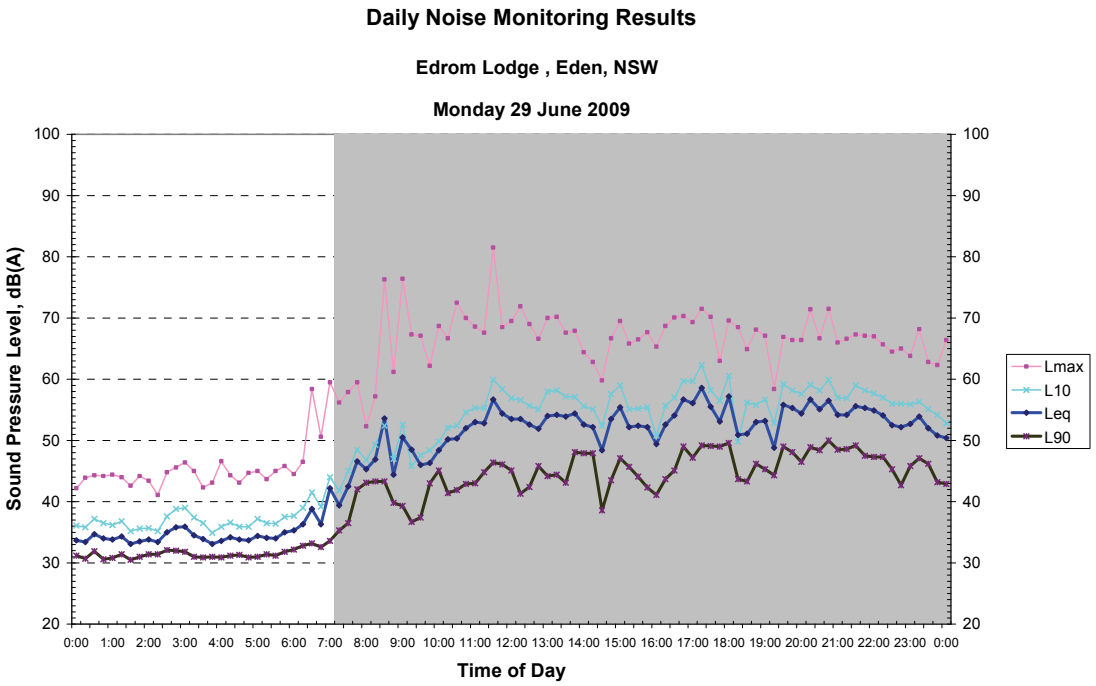
Sunday 28 June 2009



Note:

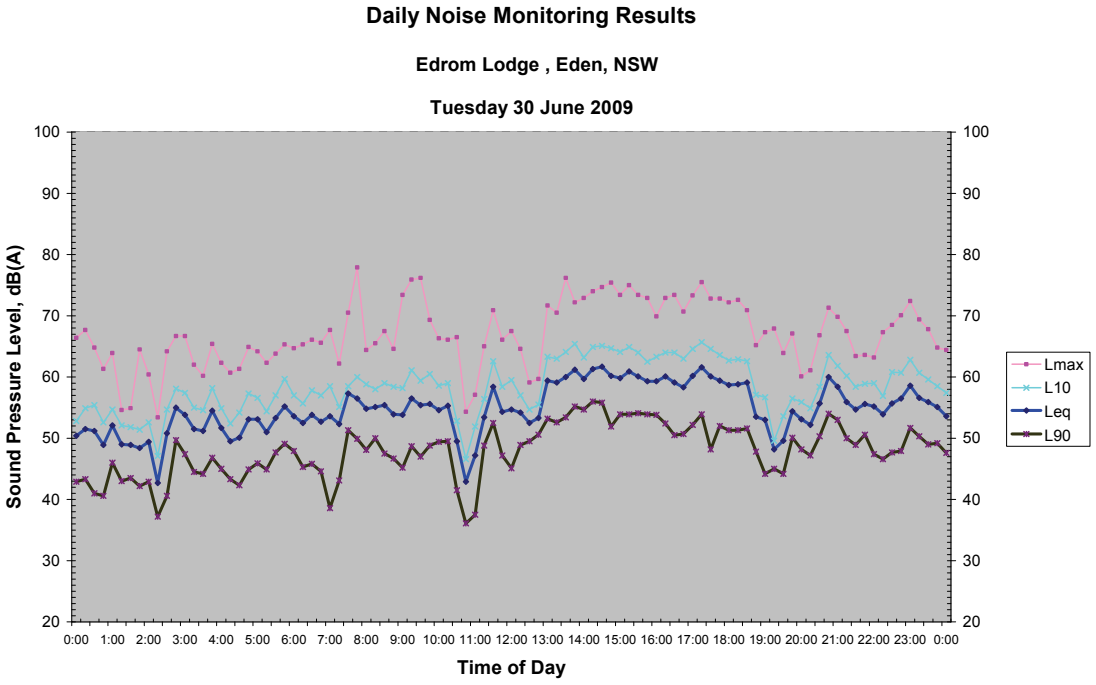
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix C



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.



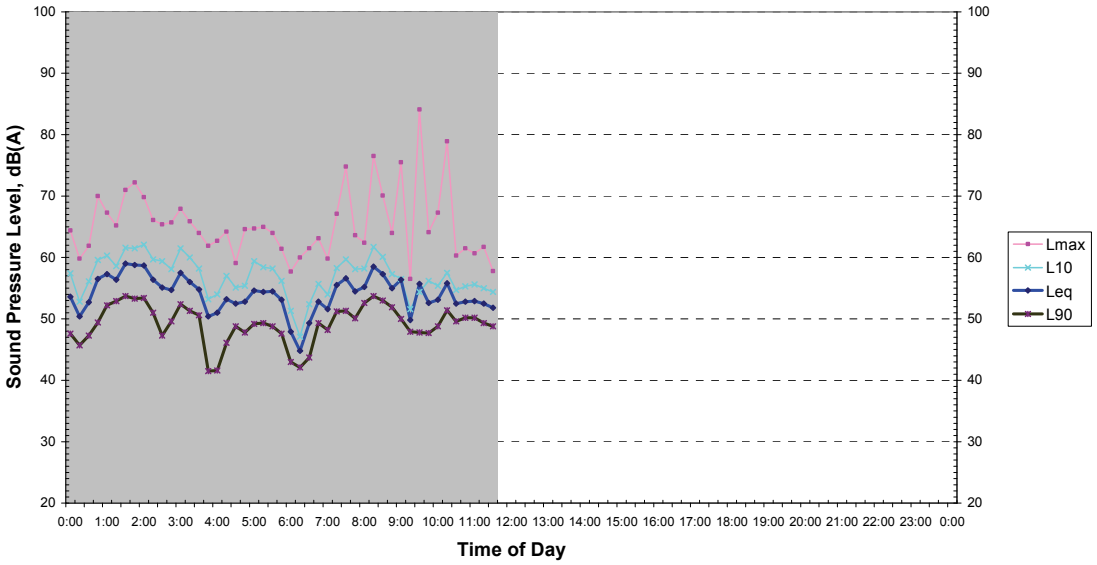
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

Edrom Lodge , Eden, NSW

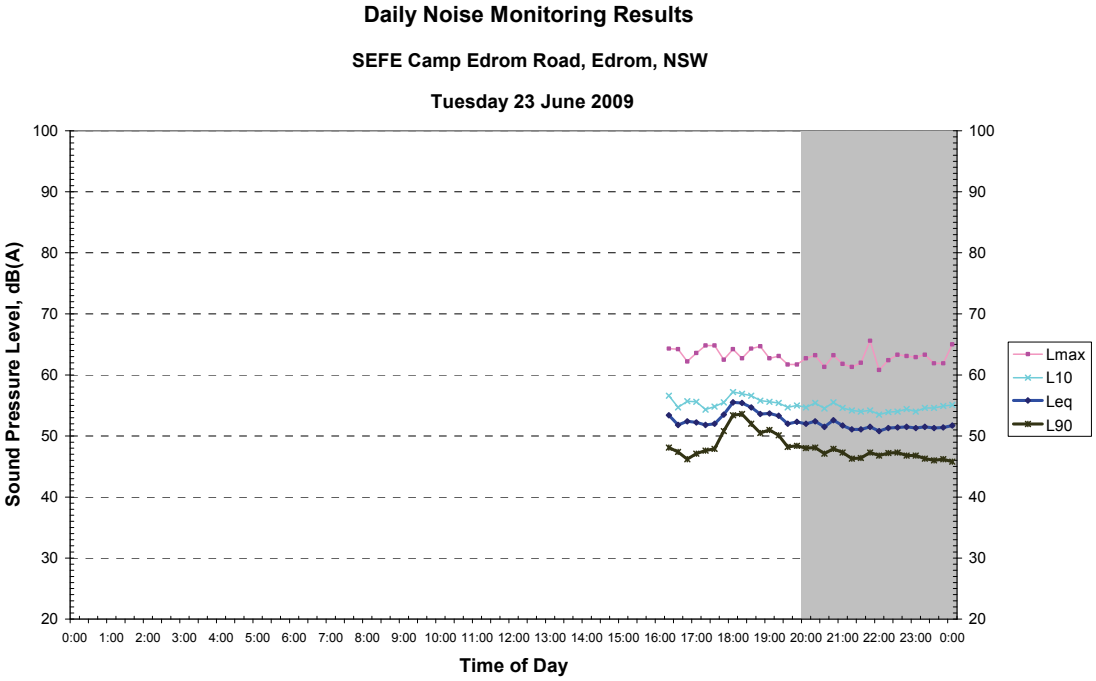
Wednesday 1 July 2009



Note:

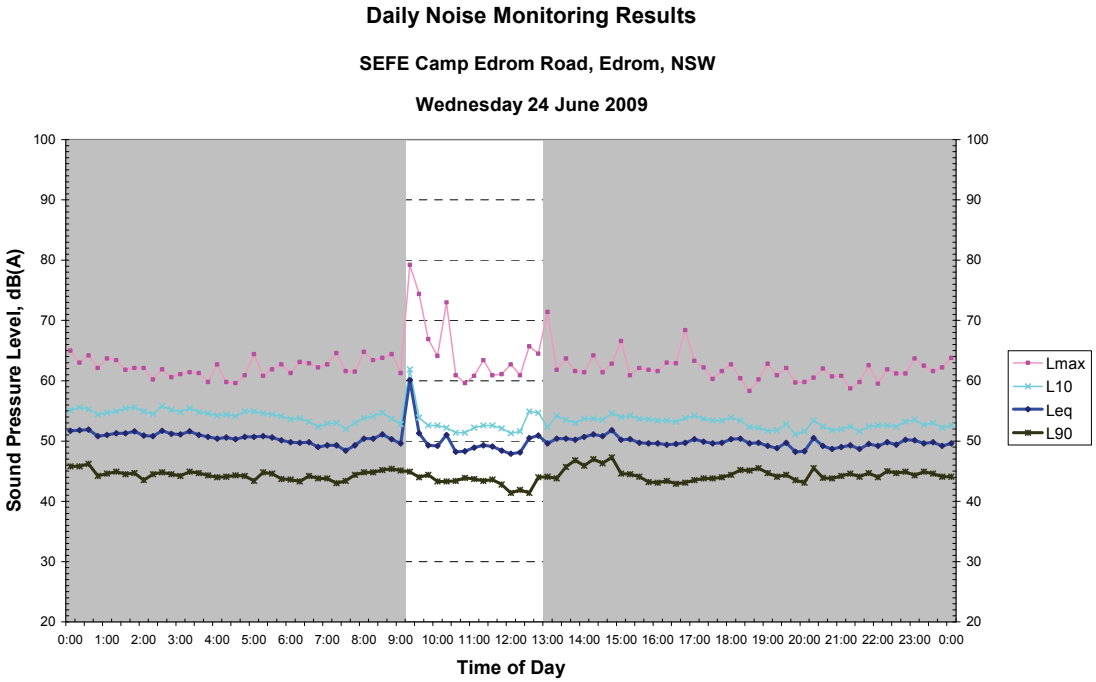
Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix C



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous
Measured data during these periods were excluded from calculation of noise levels averaged for the period.



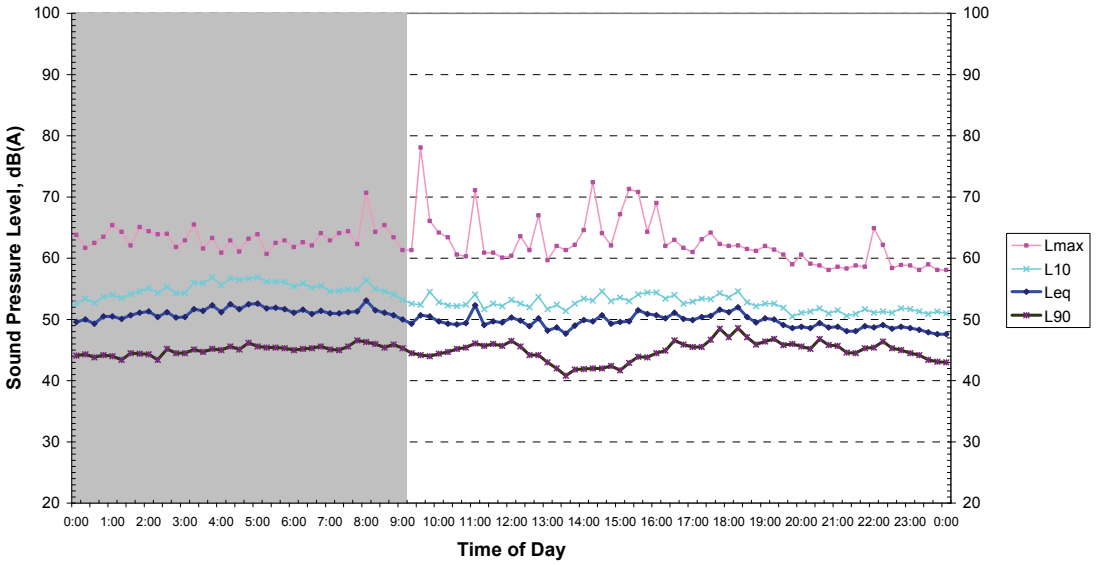
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

SEFE Camp Edrom Road, Edrom, NSW

Thursday 25 June 2009



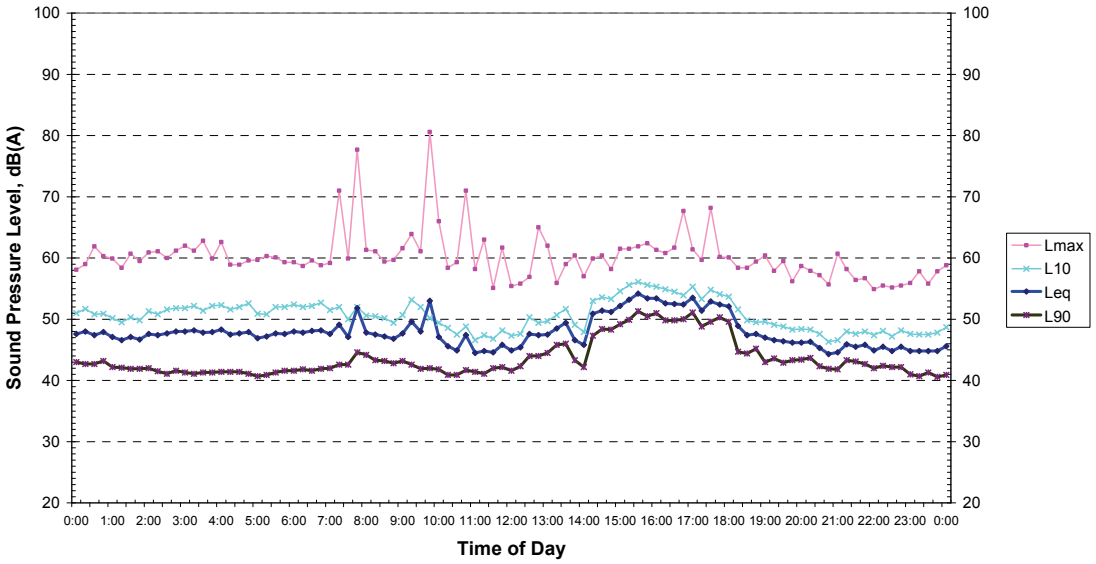
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

SEFE Camp Edrom Road, Edrom, NSW

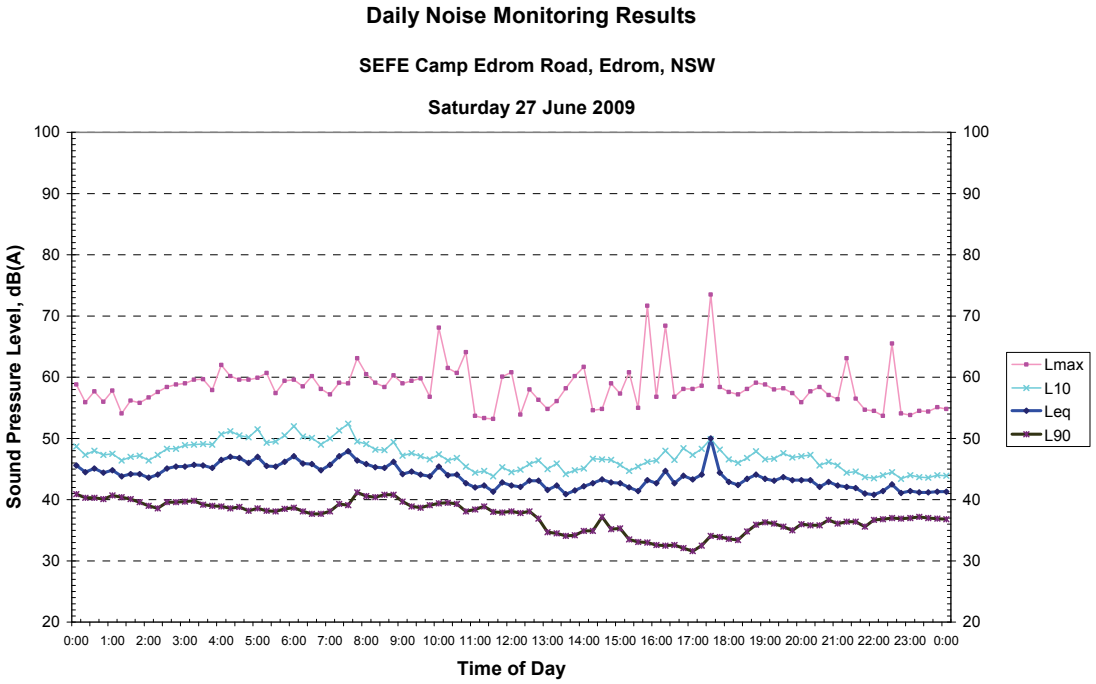
Friday 26 June 2009



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix C



Note:

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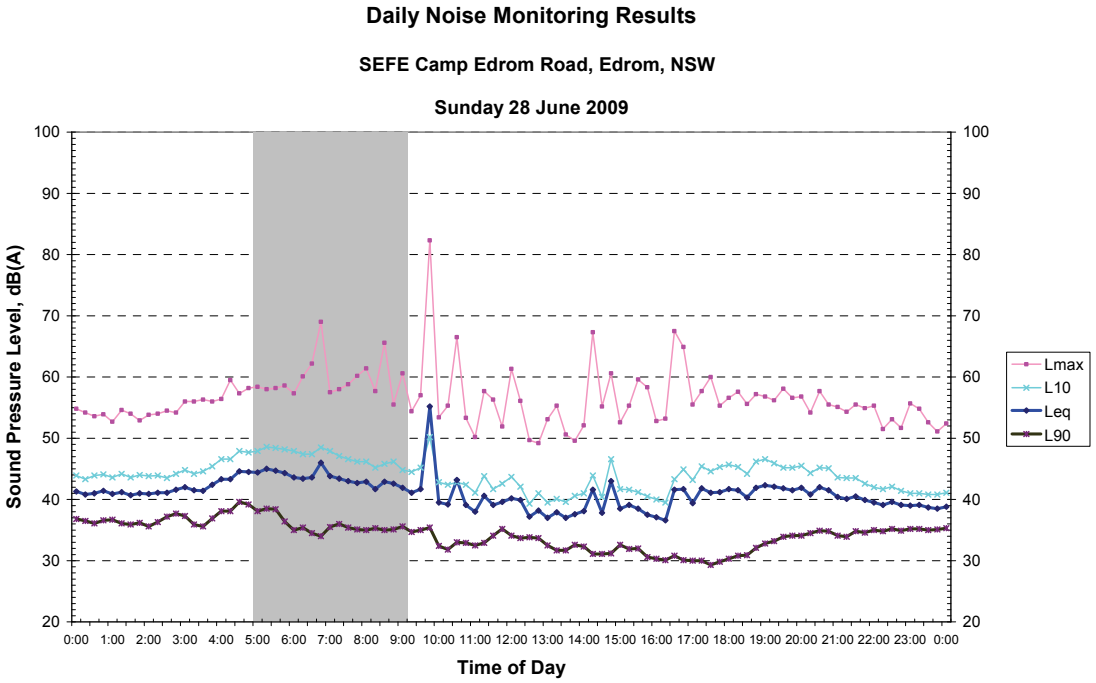
Measured data during these periods were excluded from calculation of noise levels averaged for the period.



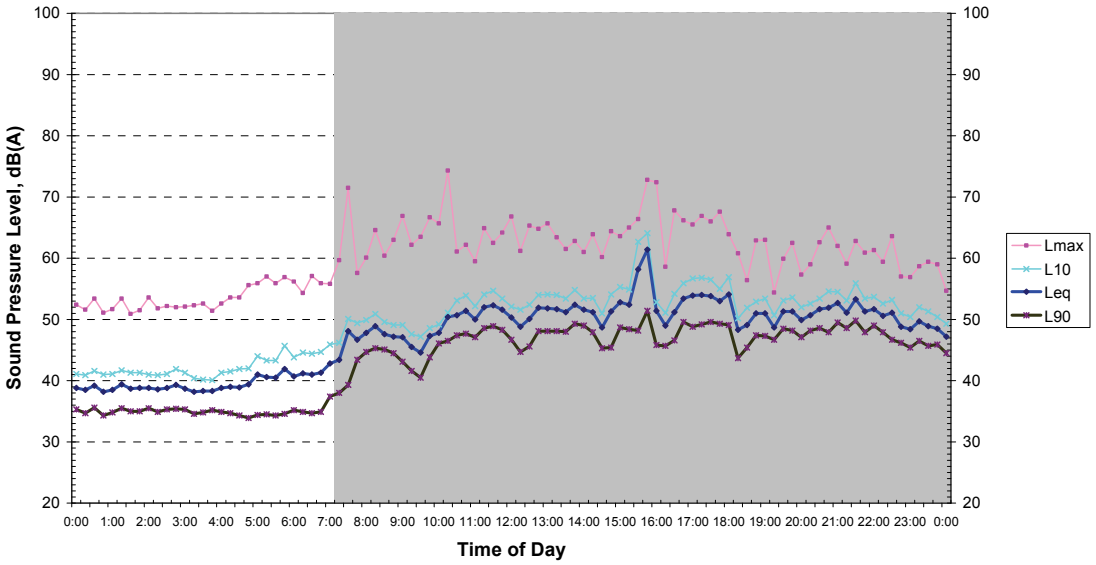
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

SEFE Camp Edrom Road, Edrom, NSW

Monday 29 June 2009



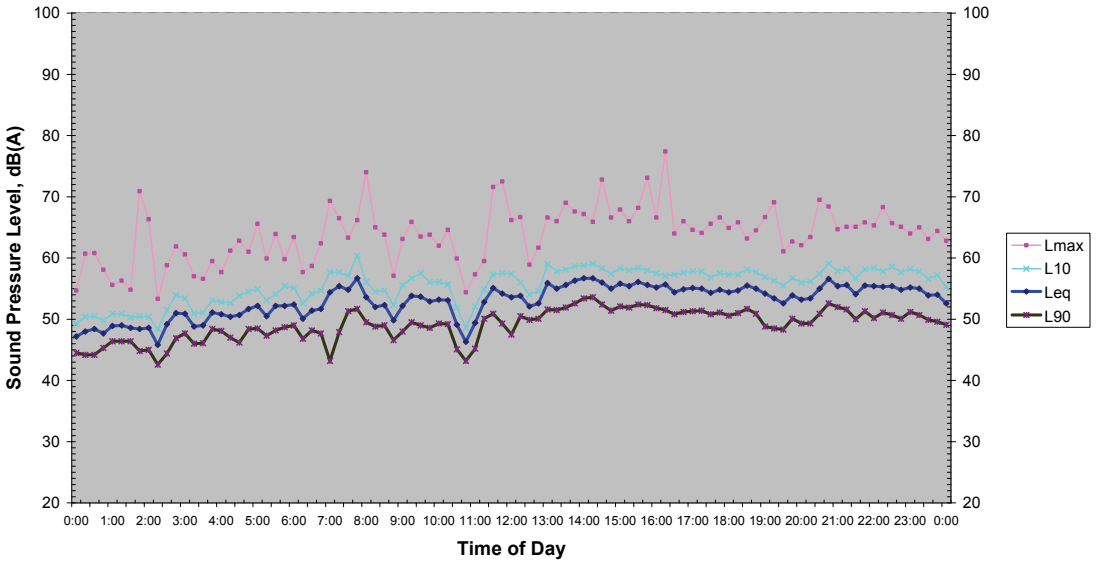
Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Daily Noise Monitoring Results

SEFE Camp Edrom Road, Edrom, NSW

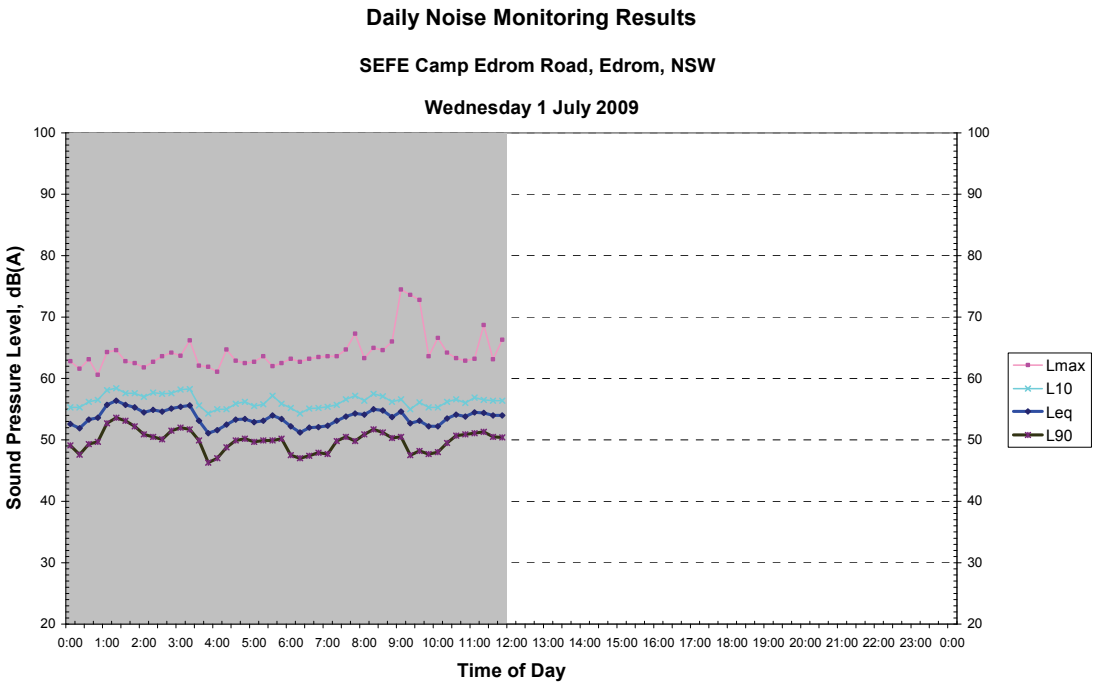
Tuesday 30 June 2009



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

Appendix C



Note:

Shaded periods indicate periods affected by adverse weather conditions or extraneous noise.
Measured data during these periods were excluded from calculation of noise levels averaged for the period.

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