



ANNEX

N

**Noise Assessment**



## **Addendum**

*The approved Master Plan MP 20-4-2005 for Fern Bay Seaside Village was signed by the Minister on 8 August 2006. A number of technical assessments supported the Master Plan, including the attached Noise Assessment.*

*As the Noise Assessment is a supporting document to the approved Master Plan, it has not been updated. The EA report in support of the Project Plan has however been prepared in accordance with the approved Master Plan (as detailed in Section 2.4 of the EA). The Project Plan application is essentially consistent with the items listed in Schedule 2 of the Master Plan, with minor amendments to the project plan to account of the requirements of government agencies and site constraints, including lot layout and configuration changes. These changes do not impact the assessment and outcomes of the Noise Assessment. The updated project plan is detailed in the EA.*





FERN BAY

seaside village

# Fern Bay Estate

## Master Plan Study



WINTEN  
PROPERTY  
GROUP



CVC Limited



### Fern Bay Estate


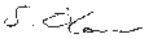
### *Noise Assessment Report*

Winten Property Group & Continental Venture Capital Limited

April 2005

0012720 Final

[www.erm.com](http://www.erm.com)

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<b>Signed:</b>	

Environmental Resources Management Australia Pty Ltd Quality System

# Fern Bay Estate

## Noise Assessment Report

Prepared by: Darren Jurevicius  
Winten Property Group & Continental Venture Capital Limited  
April 2005

0012720 Final

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A noise assessment has been carried out to determine the impact of external noise sources on the subdivision and development of part of Lot 16, DP 258848, No. 85 Nelson Bay Road, Fern Bay for residential purposes. The location of the site is shown in *Figure 1.1*. This assessment is based on the concept plan for the proposed subdivision as illustrated in *Figure 1.2*.

*Chapter 1* of this report provides details of noise descriptors commonly used to characterise the noise environment. *Chapter 2* presents the noise impact assessment and the final chapter, *Chapter 3* provides conclusions based on the noise assessment.

## 1.1

## GLOSSARY

*Table 1.1* provides a glossary of terms used in this assessment.

**Table 1.1**      *Glossary of Terms*

Term	Description
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear at low sound pressure levels.
dB(Linear)	The sound pressure level expressed as decibels with no frequency weighting.
L10	A noise level that is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
L90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
Leq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
Lmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
Sound power level (SWL)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment.



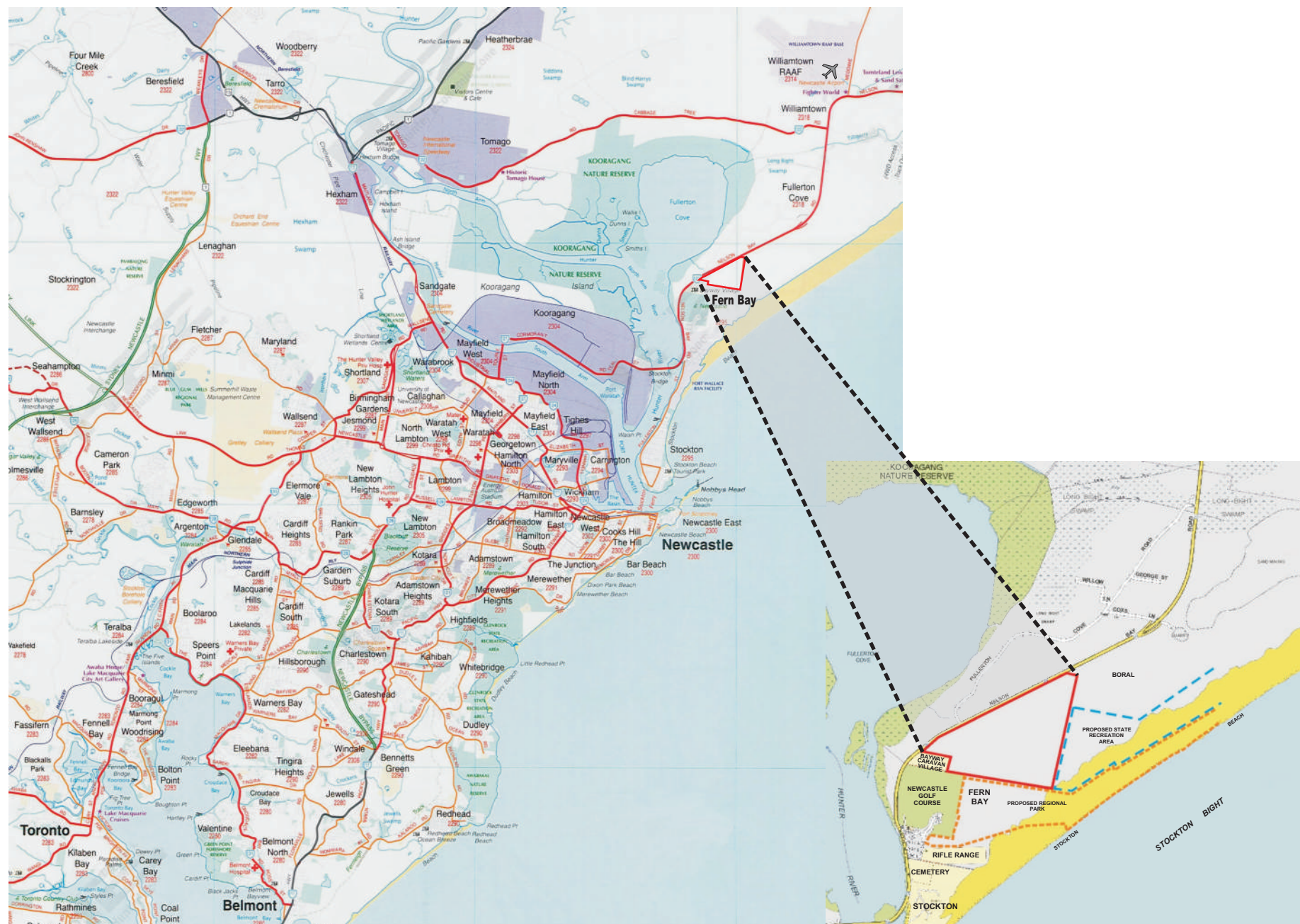


Figure 1.1

## Locality Plan



LEGEND

- Residential Integrated Housing
- Residential Villas 340m<sup>2</sup> to 399m<sup>2</sup>
- Residential Premium Villas 400m<sup>2</sup> to 449m<sup>2</sup>
- Residential Courtyard 450m<sup>2</sup> to 589m<sup>2</sup>
- Residential Conventional lots 590m<sup>2</sup> +
- Residential Duplex 750m<sup>2</sup> +
- Part of Existing DA
- Part of Approved Development Footprint
- Recreational Facilities/Community Centre
- Active Recreational Facility
- Open Space - conservation areas
- Open Space - Landscaped areas, playground
- Community Nursery
- Aboriginal Heritage Reserve
- Fern Bay Study Area
- Fire Trail
- Major Walking trail

ALLOTMENT TYPES AND NUMBERS

Residential Integrated Housing	94 units
3.78ha x 25/ha	
Residential Villas 340m <sup>2</sup> to 399m <sup>2</sup>	123 lots
Residential Premium Villas 400m <sup>2</sup> to 449m <sup>2</sup>	120 lots
Residential Courtyard 450m <sup>2</sup> to 589m <sup>2</sup>	255 lots
Residential Conventional lots 590m <sup>2</sup> +	186 lots
Residential Duplex 750m <sup>2</sup> +	20 units
Existing DA	149 lots
TOTAL	947

- 1(a) Rural Agriculture 1(a) Zone
- 2(a) Residential 2(a) Zone
- 7(a) Environment Protection 7(a) Zone



Source: Robertsdav, Town Planning Design

## 2.1 BACKGROUND MONITORING

Background noise levels were originally measured from 22<sup>nd</sup> November to 1<sup>st</sup> December 2000 inclusive at two locations on site (refer to *Figure 1.2*). The following equipment was used to measure and log environmental noise levels:

- 2 x ARL EL215 noise data loggers (serial numbers 194437 and 194669); and
- a Bruel and Kjaer Type 4230 sound level calibrator (serial number 523178).

*Tables 2.1* and *2.2* present the measured assessment background levels (ABL) and ambient noise levels  $L_{Aeq,15hr}$  and  $L_{Aeq,9hr}$  for each logger location respectively. The ambient noise levels are inclusive of the 2.5dB facade correction for correlation with ECRTN.

The monitoring results include the assessment background level (ABL) for each day, evening and night period as well as the ambient noise levels for day and night. The rating background level (RBL), which is often used to assess the intrusiveness of a noise source, is defined as the median assessment background level over all days for each period.

**Table 2.1** *Measured Noise Levels in 2000 – Logger Location 1*

Date	ABL Day	ABL Evening	ABL Night	LAeq 15hr Day	LAeq 9hr Night
Wednesday, 22-11-00	-	32.0	28.5	-	43.3
Thursday, 23-11-00	36.0	32.5	28.5	55.9	45.0
Friday, 24-11-00	36.0	30.0	27.0	52.6	41.6
Saturday, 25-11-00	39.5	31.0	27.0	54.5	43.8
Sunday, 26-11-00	31.5	35.0	30.0	57.5	52.6
Monday, 27-11-00	45.5	29.0	27.0	57.9	43.2
Tuesday, 28-11-00	49.5	37.0	34.0	58.0	43.9
Wednesday, 29-11-00	37.0	34.0	31.0	58.1	49.6
Thursday, 30-11-00	53.0	34.5	29.5	61.1	49.2
<b>Summary Values</b>	<b>38.3<sup>2</sup></b>	<b>32.5<sup>2</sup></b>	<b>28.5<sup>2</sup></b>	<b>57.6<sup>3</sup></b>	<b>47.4<sup>3</sup></b>

1. Day: 7:00 to 18:00 ~ Evening: 18:00 to 22:00 ~ Night: 22:00 to 7:00.

2. Rating Background Level (RBL).

3. Median ambient noise level over all days for each period.

**Table 2.2**      *Measured Noise Levels in 2000 – Logger Location 2*

Date	ABL Day	ABL Evening	ABL Night	LAeq 15hr Day	LAeq 9hr Night
Wednesday, 22-11-00	-	39.0	29.0	-	49.8
Thursday, 23-11-00	40.0	40.0	34.0	56.3	47.3
Friday, 24-11-00	42.5	38.0	33.0	51.5	45.7
Saturday, 25-11-00	39.0	37.5	28.5	50.9	47.7
Sunday, 26-11-00	35.5	40.5	36.0	50.7	53.3
Monday, 27-11-00	42.0	36.5	33.5	55.1	49.4
Tuesday, 28-11-00	40.5	41.0	36.5	53.2	47.3
Wednesday, 29-11-00	43.5	40.5	38.5	53.1	48.1
Thursday, 30-11-00	42.0	43.5	39.5	60.1	50.5
<b>Summary Values</b>	<b>41.0 <sup>2</sup></b>	<b>40.0 <sup>2</sup></b>	<b>34.0 <sup>2</sup></b>	<b>55.1 <sup>3</sup></b>	<b>49.4 <sup>3</sup></b>

1. Day: 7:00 to 18:00 ~ Evening: 18:00 to 22:00 ~ Night: 22:00 to 7:00.
2. Rating Background Level (RBL).
3. Median ambient noise level over all days for each period.

The noise increase due to annual traffic growth from 2000 to 2004 is calculated to be 1 dB and therefore the background noise levels detailed in *Tables 2.1* and *2.2*, measured at the end of 2000, are considered indicative of the current (mid 2004) acoustic environment. A site inspection during June 2004, which included some attended noise measurements, was also conducted to ensure the validity of the year 2000 logged results.

The logger locations are shown in *Figure 1.2*, and the graphed daily results for the two monitoring sites are presented in *Annex A*.

## 2.2 NOISE CONSTRAINTS

### 2.2.1 Traffic Noise

The Department of Environment and Conservation (DEC) recommends that traffic noise impacts on potentially affected residences be assessed according to the *Environmental Criteria for Road Traffic Noise* (ECRTN)(EPA 1999). The criteria set out in the policy have been adopted in this report for assessment of operational noise from Nelson Bay Road.

The criteria is defined in terms of  $L_{Aeq, T(hr)}$ , which represent the continuous equivalent sound pressure level at a receiving location, measured over a specific time period (T) between 7 am to 10 pm (daytime) and between 10 pm to 7 am (night time). For the level of traffic noise to be considered acceptable, the relevant criteria in terms of  $L_{Aeq, T(hr)}$  should be met for both day and night.

The relevant criteria for new residential developments affected by noise from arterial roads are listed in *Table 2.3*.

**Table 2.3 Road Traffic Noise Criteria**

Type of Development	Day dB(A)	Night dB(A)
New residential developments affected by freeway/arterial traffic noise	Leq(15hr) 55	Leq(9hr) 50
1. Source: <i>Environmental Criteria for Road Traffic Noise</i> (EPA 1999).		

In relation to new residential developments affected by traffic noise the policy recommends that:

*‘Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria for occupants via judicious design and construction of the development. Relevant strategies will include optimum location and orientation of buildings on site, planning internal layouts carefully, choosing the most appropriate building materials, and using good construction techniques’.*

A standard setback is the simplest method to achieve compliance with the noise criteria. The above methods may be considered as alternatives.

A setback contour from Nelson Bay Road has been calculated based on annual average traffic flow.

## 2.2.2 Modelling Method

Noise levels were calculated using ERM’s ‘in-house’ developed ROADent software that implements the Calculation of Road Traffic Noise (CoRTN) algorithm. The UK Department of Transport devised the CoRTN algorithm and with suitable corrections, this method has been shown to give accurate predictions of traffic noise levels under Australian conditions.

The noise model for this project incorporated the following features:

- traffic volume and/or percentage of cars on the roadway;
- traffic volume and/or percentage of medium/heavy trucks on the roadway;
- individually specified car, medium and heavy truck vehicle speeds;
- corrections for asphalt pavement surface;
- road chainage and x, y, z coordinates of traffic lanes and topographic features imported from electronic data (DXF format);
- receptor x, y, z grid coordinates ‘meshed’ to topographic ground contours;
- source heights of 0.5 meters, 1.5 meters and 3.6 meters used for cars, heavy vehicles and heavy vehicle exhausts respectively;
- intervening ground cover (ie hard or soft ground);

- attenuation from roadside or topographic barriers;
- corrections for roadway gradients; and
- 0.8dB correction for facade effects (CoRTN standard corrected for Australian conditions (DMR 1987)).

Calculations performed by the noise model include  $L_{eq,15hr}$  (day),  $L_{eq,9hr}$  (night) and  $L_{max}$  for each receptor point. Noise contours are generated by triangulation with linear interpolation between modelled receptor grid points<sup>1</sup>.

### 2.2.3 *Modelling Parameters*

Average Annual Daily Traffic (AADT) flow for traffic on Nelson Bay Road was obtained from an RTA Pavements Branch assessment performed in February 2002 using count station 5.399. The predicted AADT for the year 2005 assumed a 2.9 percent linear growth rate per annum and the percentage of medium and heavy vehicles passing along Nelson Bay is also not likely to exceed 2.7 and 1.7 percent respectively.

Therefore, resulting noise levels contours were calculated based on the following parameters:

- an AADT of 19,494 in 2005;
- dense graded asphalt as the road surface; and
- 100 kilometres per hour car and truck speed (per current speed zones).

No specific noise control measures have been included in the calculations.

### 2.2.4 *Predicted Results*

#### *Equivalent Continuous Traffic Noise ( $L_{aeq}$ )*

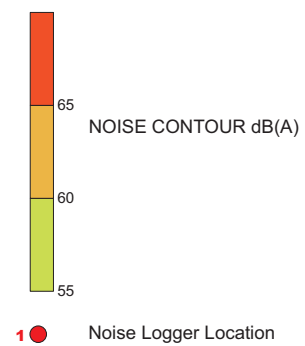
Predicted noise contours for  $L_{eq,15hr}$  (day) and  $L_{eq,9hr}$  (night) are illustrated in Figures 2.1 and 2.2.

The governing setback contour suitable for lot layout design, in the absence of roadside mitigation (ie. barriers), is the 55 dB(A) $L_{eq(15hr)}$  contour line, which equates to an approximate 200 metre setback distance from the site's northern boundary. In this case the required minimum 200 metre ecological corridor removes the need for roadside barriers to maximise available land use.

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<sup>1</sup> Note: 40 metre grid point resolution.





- 1(a)** Rural Agriculture 1(a) Zone
- 2(a)** Residential 2(a) Zone
- 7(a)** Environment Protection 7(a) Zone



Source: Robertsdav, Town Planning Design



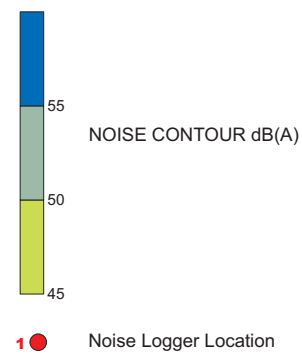
0 100m  
Approximate only

Figure 2.1

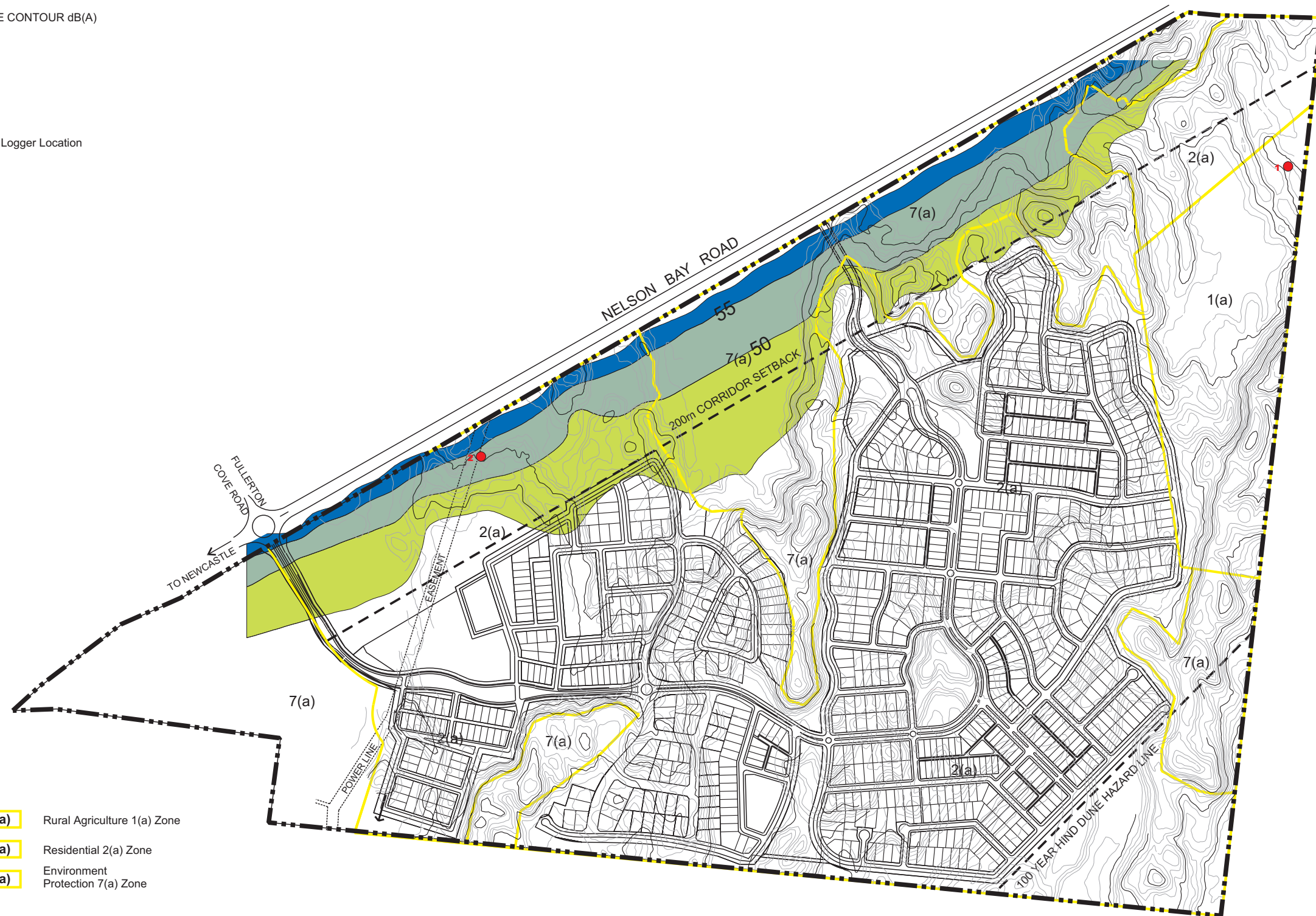
**Noise Contours -  $L_{Aeq, 15hr}$**

Winten Property Group - CVC Limited - Fern Bay Estate





- 1(a)** Rural Agriculture 1(a) Zone
- 2(a)** Residential 2(a) Zone
- 7(a)** Environment Protection 7(a) Zone



Source: Robertsdry, Town Planning Design



0 100m  
Approximate only

Figure 2.2

**Noise Contours -  $L_{Aeq, 9hr}$**

Winten Property Group - CVC Limited - Fern Bay Estate



If a 4.5 metre high noise wall were positioned 10 metres inside the site's northern boundary, then the setback requirement to ensure compliance with ECRTN would be in the order of 30 metres.

#### *Sleep Disturbance ( $L_{Amax}$ )*

ECRTN addresses sleep disturbance briefly in its Appendix B with the following general conclusions drawn:

- maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions; and
- one or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to significantly impact health and well being.

Predicted theoretical maximum noise contours  $L_{max}$  are illustrated in Figure 2.3. In accordance with the ECRTN guideline, the internal noise level should not exceed a value 10 dB below the relevant external noise level on the basis of operable windows being opened sufficiently to provide adequate ventilation (Note: the relevant external noise level is 65 dB(A)). For most residences, this equates to a minimum 20 percent of the window area left open. The results show that with a 200 metre setback, sleep disturbance would be unlikely for single or two-storey dwellings.

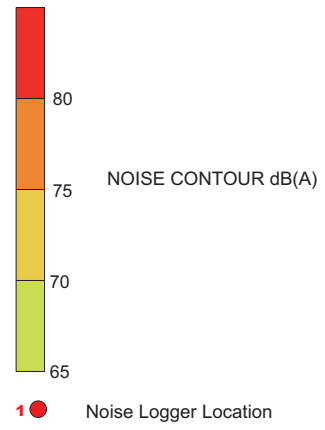
## 2.3

### *AIRCRAFT NOISE*

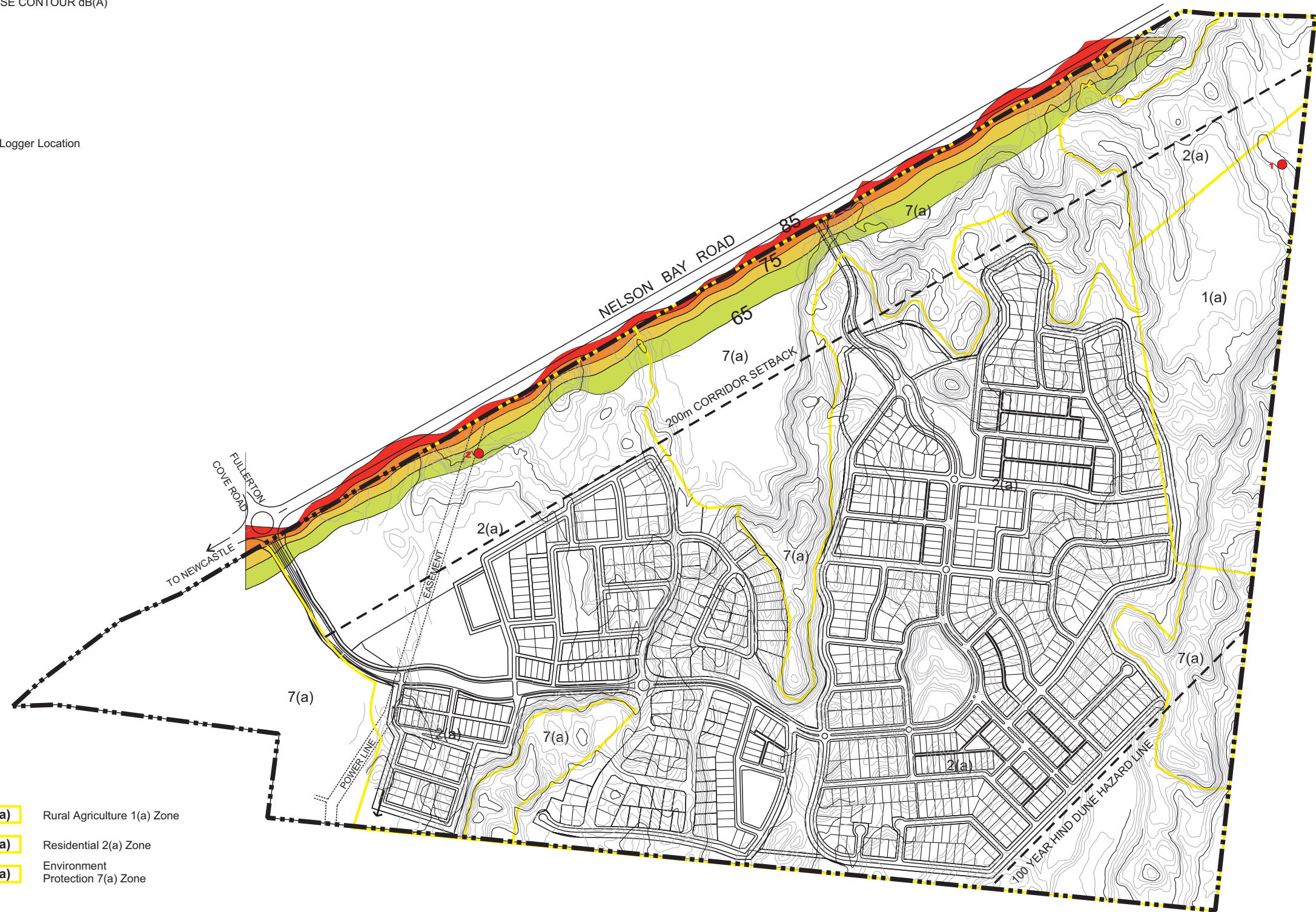
In accordance with Australian Standard AS 2021 *Acoustics - Aircraft noise intrusion - Building siting and construction*, residences should not be permitted in areas of Australian Noise Exposure Forecast (ANEF) greater than 25 and should only be permitted subject to certain conditions inside an ANEF 20 contour.

Noise exposure associated with RAAF operations at Williamtown are provided in the 2012 *ANEF for RAAF Base Williamtown and Summary Report* (GHD 2003). The report predicts ANEF contours including the extent of the 20 ANEF zone.

The proposed subdivision is well removed from the ANEF 20 contour and therefore operation of RAAF Williamtown does not impose a constraint for residential development on the site under Port Stephens Council's *Aircraft Noise Exposure* policy and AS2021. It is also located transverse to the runway/flightpath and as such is not exposed to significant aircraft noise.



- 1(a)** Rural Agriculture 1(a) Zone
- 2(a)** Residential 2(a) Zone
- 7(a)** Environment Protection 7(a) Zone



Source: Robertsdav, Town Planning Design



0 100m  
Approximate only

Figure 2.3

Noise Contours - L<sub>max</sub>

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Boral Resources (Country) is the closest sand extraction operation to the site being approximately one kilometre from the north eastern end of the proposed subdivision.

TollBulkSands extraction boundary is approximately five kilometres to the north east and will not affect the acoustic environment of the proposed subdivision.

### 2.4.1

#### *Sand Extraction Criteria*

To permit residential use of lots in the north eastern end of the subdivision, noise from existing sand quarries must meet criteria described in DEC's *Industrial Noise Policy* (INP) (EPA 2000). This policy sets out two separate noise criteria designed to ensure developments meet environmental noise objectives. The first criteria account for intrusive noise and the other applies to protection of amenity of particular land uses. Applying both criteria and adopting the more stringent of the two assesses the allowable noise level for the proposed development.

The 'intrusiveness' criterion essentially means that the equivalent continuous noise level ( $L_{eq}$ ) of a noise source should not be more than 5 dB above the rating background noise level (RBL). This criterion applies to new developments impacting on nearby residential developments.

The 'amenity' assessment is based on noise criteria specific to land use and associated activities. The criteria relates to industrial-type noise and does not include road, rail or community noise. Amenity criterion is important in the assessment of the cumulative impact of a proposal in conjunction with other proposed or existing industrial noise sources.

The proposed subdivision is best classed as 'Suburban' with the appropriate criteria listed in *Table 2.4*. The intrusiveness criteria were derived from Logger 1 results.

**Table 2.4** *Criteria Based Upon Receptor Classification*

Type of Receiver	Period	Intrusiveness Noise Criteria, dB(A) $L_{eq}$	Acceptable Amenity Noise Criteria, dB(A) $L_{eq}$	Project-specific Noise Criteria, dB(A) $L_{eq}$
Suburban (residence)	Day	43	55	43
	Evening	38	45	38
	Night	35	40	35
1. Derived from Table 2.2 of the INP.				
2. Day: 7:00 to 18:00 ~ Evening: 18:00 to 22:00 ~ Night: 22:00 to 7:00				

Given the sand extraction operations will be during the day, a limiting intrusiveness criterion of 43dB(A) $L_{eq}$  would apply. Modifying factor corrections in accordance with INP Table 4.1 are not necessary in this case.

## 2.4.2 *Predicted Noise Levels - Boral*

Boral Resources (Country) Pty Limited's site is located adjacent to the north eastern boundary of the site. This operation involves extraction of sand material for the concrete industry and a selection of other industrial uses as opposed to selective heavy mineral sand mining.

Wilkinson Murray (Report No 9202, September 1992) undertook an assessment of Boral's potential noise impacts. According to this report, the typical rate of sand extraction would be 1,000 tons per day carried out over an eight to ten hour working day resulting in 40 truck loads (80 movements) leaving the site each day on an access road off Cox's Lane onto Nelson Bay Road. The intended start time would be 6.30 am, 6 days per week (Monday to Saturday) for between 48 and 52 weeks per year.

Wilkinson Murray (1992) calculated average maximum noise levels ( $L_{10}$ ) for various scenarios as shown in Table 2.5.

**Table 2.5** *Boral Sand Mining Predicted Noise (WM, 1992)*

Distance – Sand extraction to residence (m)	Barrier Height (m)	Predicted noise level at residence dB(A) $L_{10}$	Criterion <sup>(2)</sup> dB(A) $L_{10}$	Criterion Exceedance dB(A)
440	-	53	39	14
	5	40	39	1
880	-	44	39	5
	5	31	39	-

1. Source: Wilkinson Murray Report No 9202 (1992).

2. Derived prior to the implementation of the INP.

Without a five metre high noise barrier significant exceedances of the noise criteria were predicted at the north eastern boundary of the site (approximately 300 metres from the approved extraction boundary). With a five metre high noise wall, noise levels were predicted to fall into an acceptable range with a marginal 1 dB(A) exceedance at the closest point of extraction. It should be noted in this case that the average maximum noise levels ( $L_{10}$ ) in Table 2.5 would be approximately three decibels higher than the equivalent continuous noise level ( $L_{eq}$ ) for comparison with project specific criteria derived from Table 2.4.

During November 2000, ERM conducted noise logging (Logger 1) at a location identified as worst affected by Boral's extraction activities in order to determine likely noise impacts at the north eastern boundary of the site. The results indicated that the noise contribution from Boral operations was clearly evident.

Inspection of the noise logger graphs revealed the following:

- background noise levels during the night drop to around 30 dB(A);
- a daily peak, expected to be due to bird calls, occurs every morning between 5 am and 6 am;
- sand mining noise begins around 7 am and continues constantly through the day at between 50 to 60 dB(A) generally reducing from around 4 pm and returning to background levels shortly after 6 pm; and
- a daily drop in noise levels at around 1 pm is evidence of a lunch break.

At the time of noise logging (November 2000), Boral's extraction pit was approximately 600 metres from the logger location. The equivalent continuous noise level ( $L_{eq}$ ) regularly exceeded 55 dB(A) and occasionally exceeded 60 dB(A).

The current noise emissions of Boral operations (2005) affecting the site is likely to be similar to that previously measured in 2000 as it is understood by ERM that operations have not significantly changed since 2000.

Table 2.5 indicates that the predicted noise level at 880 metres from the Boral operations, without mitigation, would be 44 dB(A)  $L_{10}$  or 41 dB(A)  $L_{eq}$ . This predicted  $L_{Aeq}$  noise level is 2 dB below the project specific noise level for day time operations. Based on the assumption that the nearest residents with the proposed Fern Bay Estate would be approximately one kilometre from the nearest Boral sand extraction operation and given noise attenuation is provided by the intervening topography, noise levels at residences within the proposed estate would be within DEC guidelines.

## 2.5

### OTHER INDUSTRIAL NOISE

Apart from the sand mining and extraction operations assessed above, other significant industrial noise sources are located on Kooragang Island and include the Port Waratah Coal Services (PWCS) loading facilities, a fertiliser manufacturing plant, a metal scrapyards and several other industrial and port businesses.

The noise sources on Kooragang Island are located approximately four kilometres from the site. The existing residential area at Fern Bay is approximately half the distance that the proposed subdivision is from the industrial sources on Kooragang Island. It is known that PWCS has EPA licence conditions limiting noise levels at the residences of Fern Bay.

The proposed subdivision is at a sufficient distance away from Kooragang Island industries for the acoustic environment not to be affected and therefore industrial noise does not impose a constraint on the site.

## CONCLUSION

The location of the proposed subdivision has been assessed for external noise sources with the potential to impact on residential amenity. Potential noise sources include:

- traffic noise from Nelson Bay Road;
- aircraft noise from Williamtown RAAF Base;
- Boral sand extraction operations; and
- industrial sources on Kooragang Island.

If a 4.5 metre high noise wall were positioned 10 metres inside the site's northern boundary, then future residential lots could be constructed as close as 30 metres from this boundary as traffic noise at these lots would be within acceptable levels. However, in order to provide an effective ecological corridor and to minimise the visual impact of the proposed residential estate, a setback distance of at least 200 metres is proposed from the site's northern boundary. This setback will ensure that traffic noise at future residences within the estate is within DEC guidelines.

It has been concluded that TollBulkSands operations and industry on Kooragang Island will not impose a constraint on the proposed subdivision and the site is well outside the ANEF contours for Williamtown RAAF Base.

It has been demonstrated that the future residential lots positioned within the constraints of the proposed subdivision footprint would not be exposed to intrusive noise by Boral's sand extraction operations.

In summary, with the minimum 200 metre setback from the site's northern boundary, the proposed subdivision could proceed without any adverse noise impacts being experienced by future residents.

## **REFERENCES**

Department of Main Roads (1987) **Road Traffic Noise – Guidelines for prediction and measurement of Road Traffic Noise including guidelines for the provision of Noise Attenuation Measures**

Environment Protection Authority (1999) **Environmental Criteria for Road Traffic Noise**

Environment Protection Authority (2000) **Industrial Noise Policy**

GHD (2003) **2012 ANEF for RAAF Base Williamtown and Summary Report**

Port Stephens Council (2003) **Aircraft Noise Exposure Policy**

Standards Australia (2000) **Australian Standard AS 2021: Acoustics - Aircraft noise intrusion - Building siting and construction**

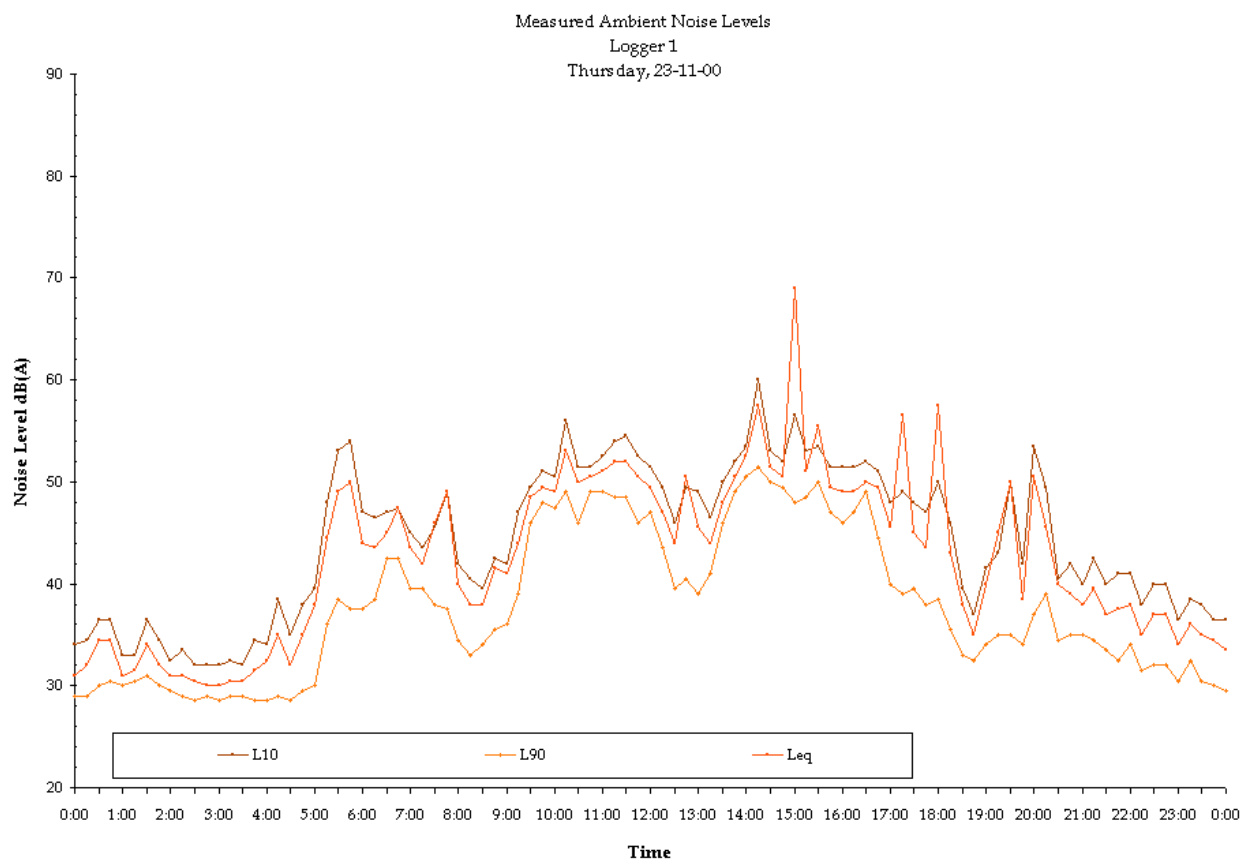
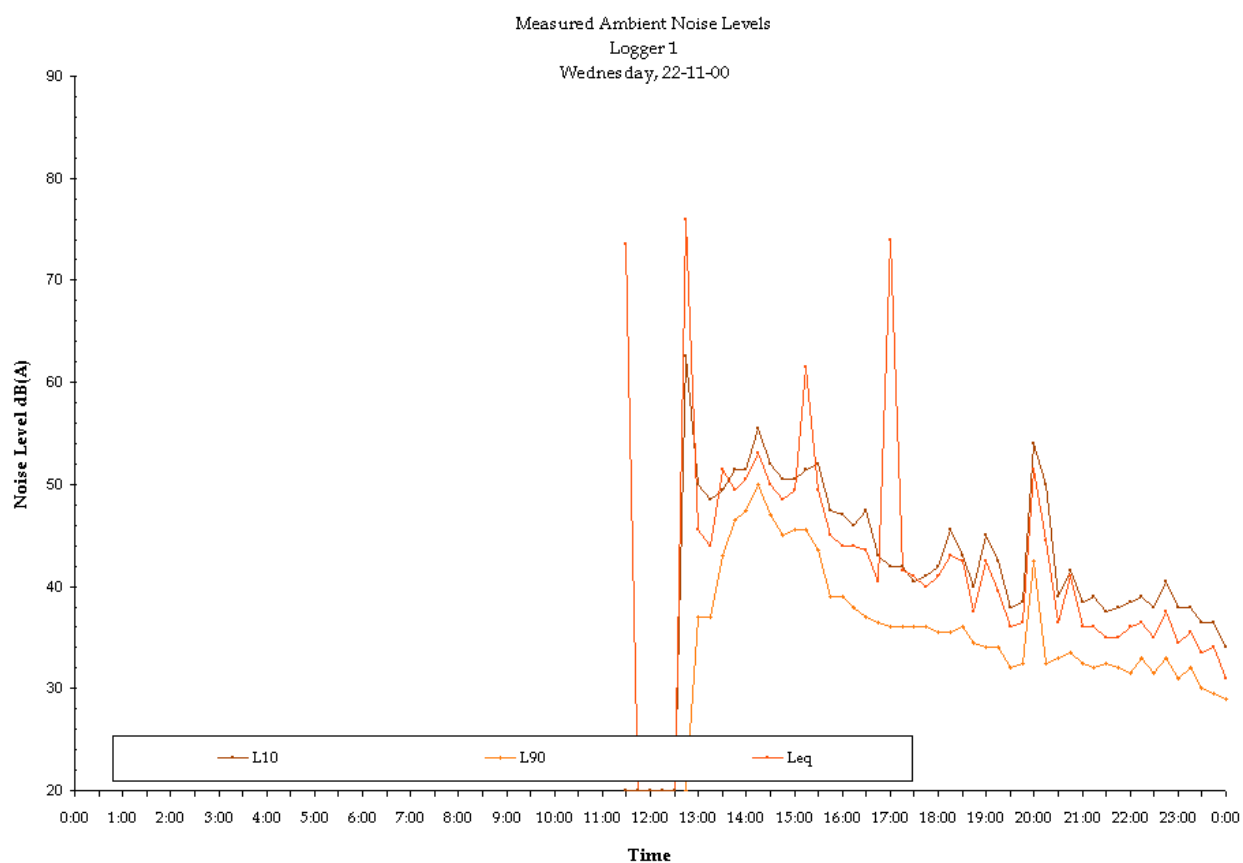
Wilkinson Murray Pty Ltd (1992) **Fern Bay Environmental Noise Assessment Proposed Residential Development Area (Report No 9202)**

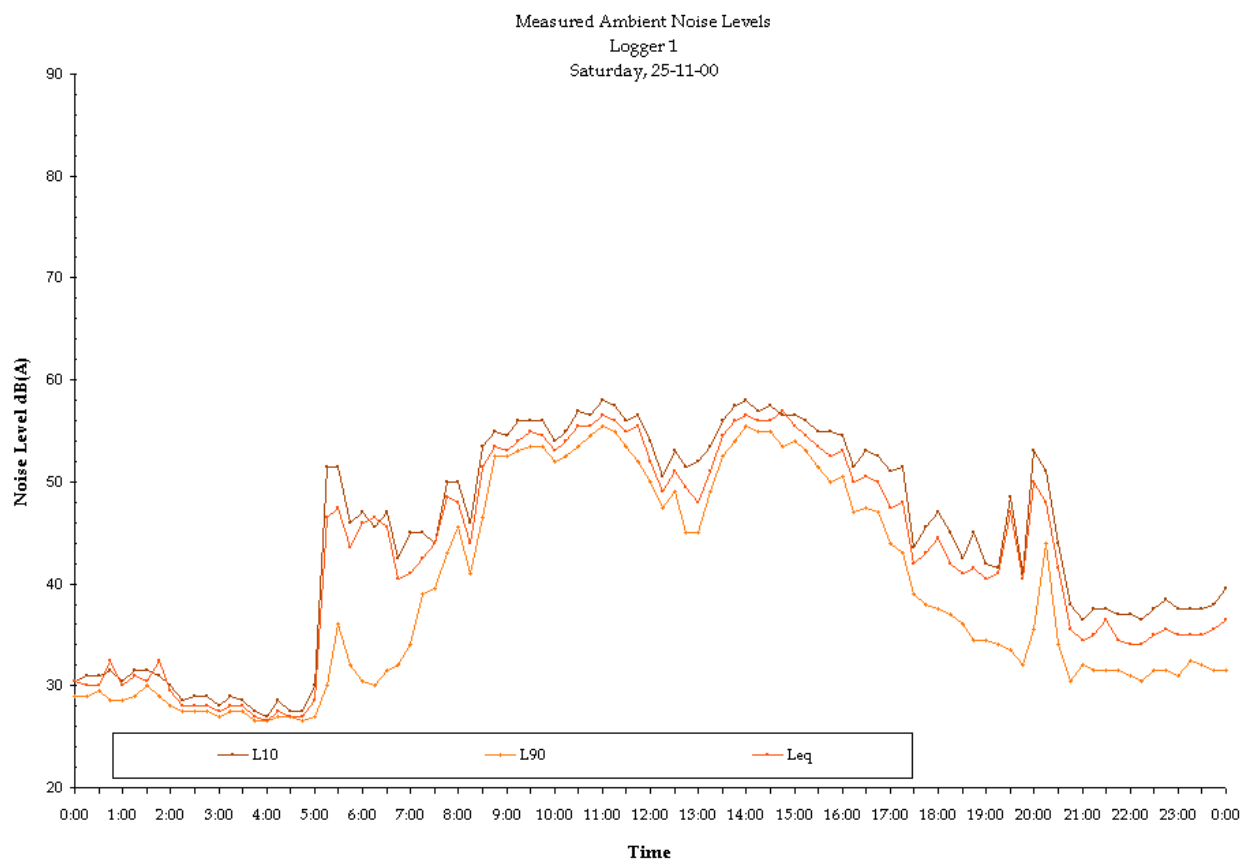
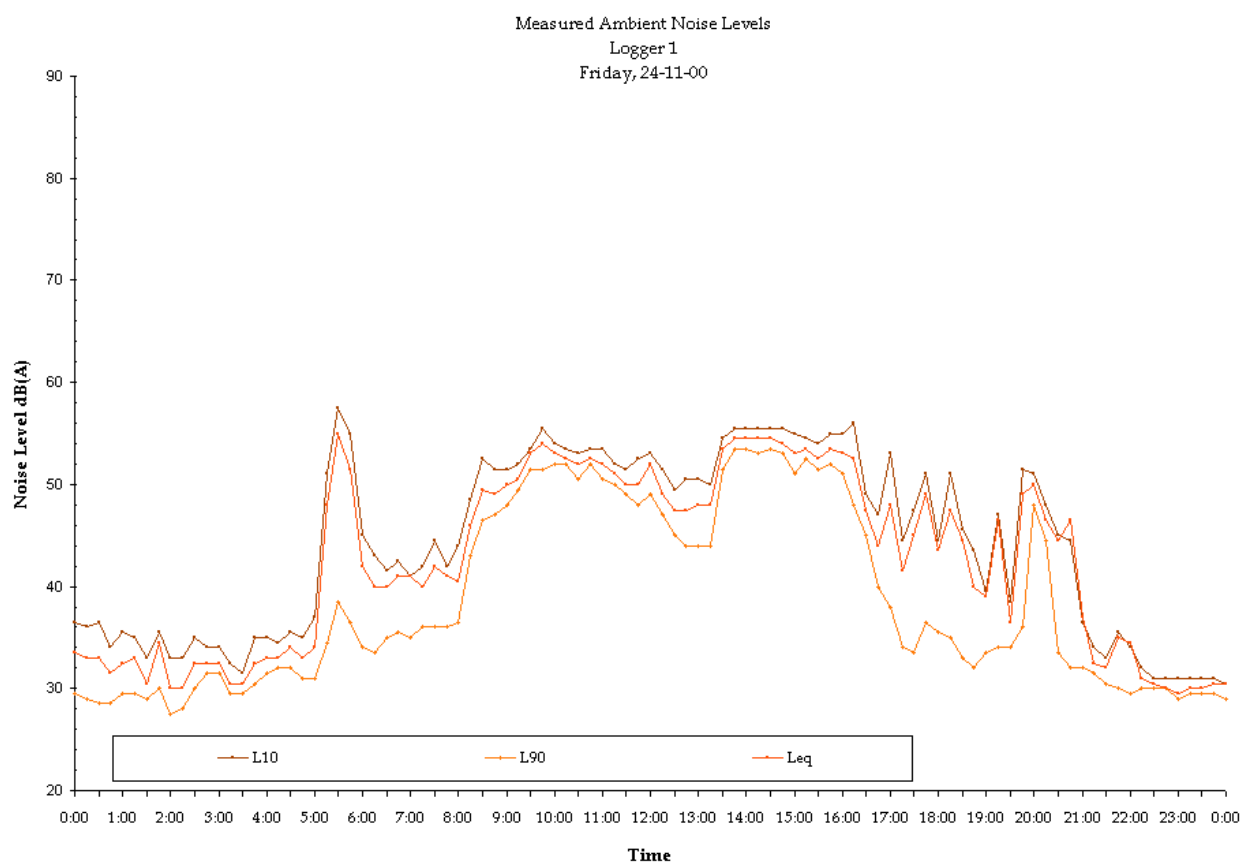


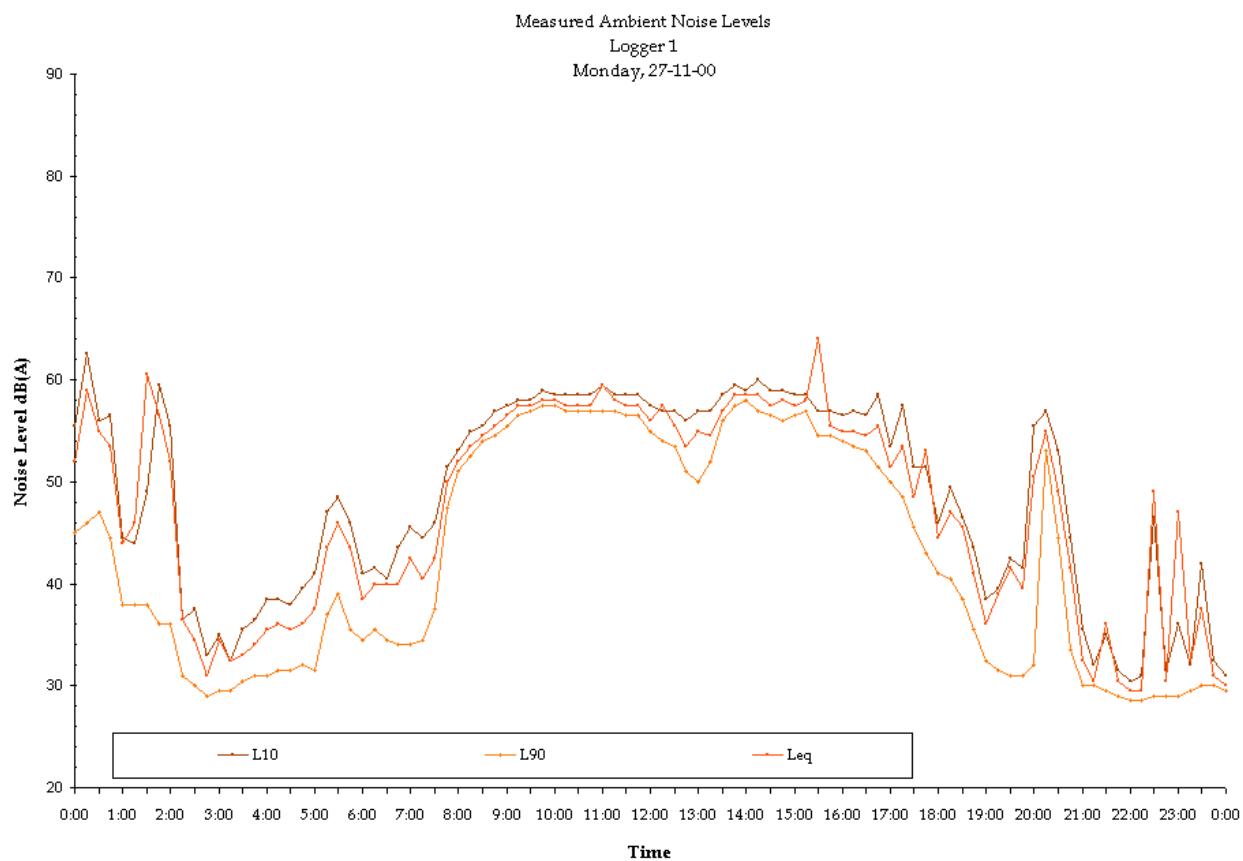
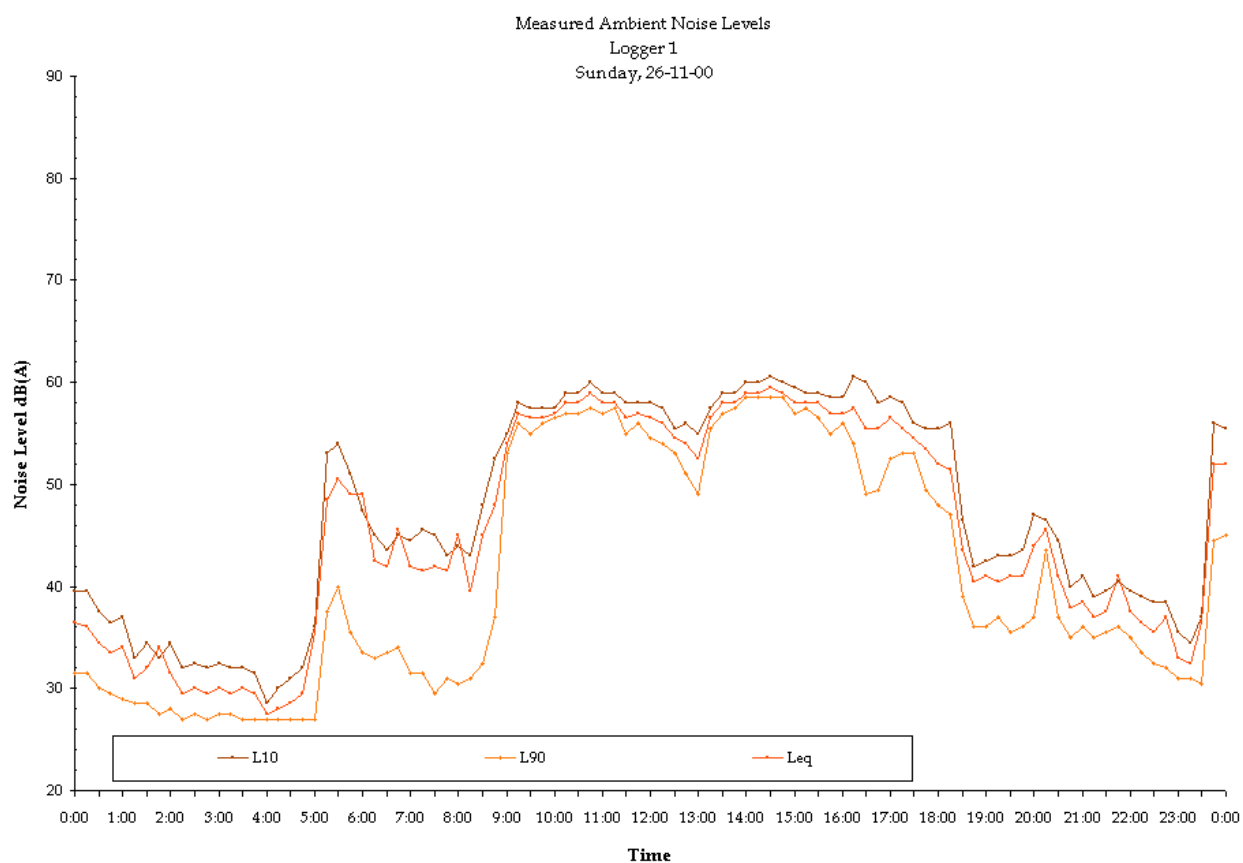


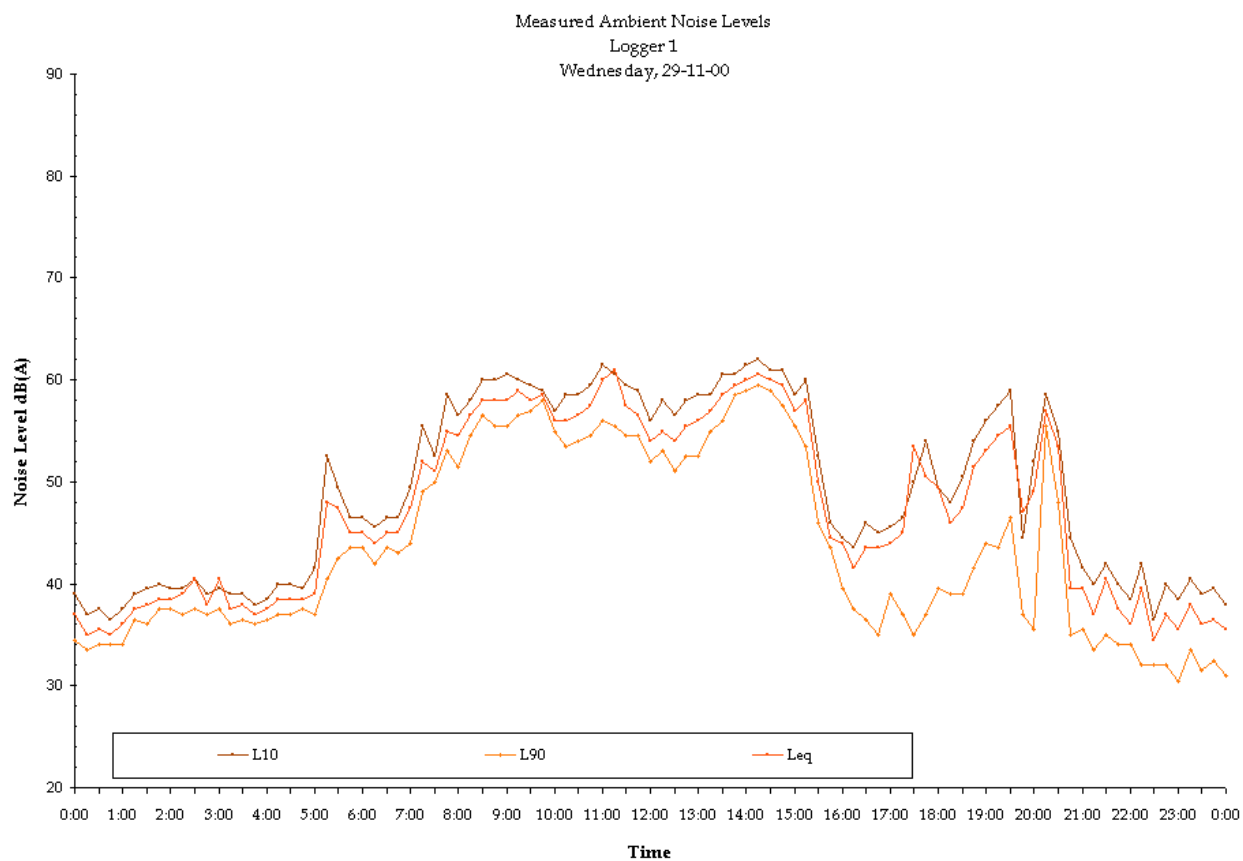
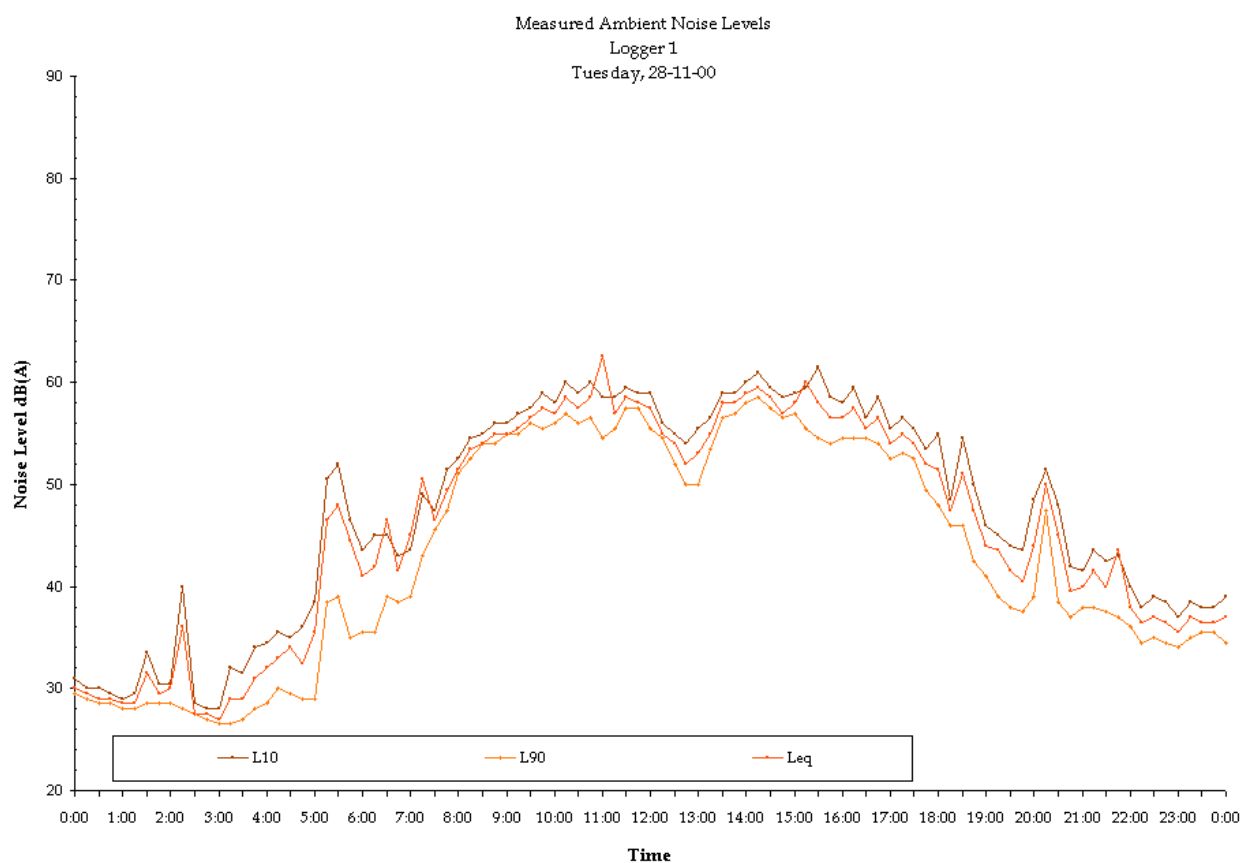
Annex A

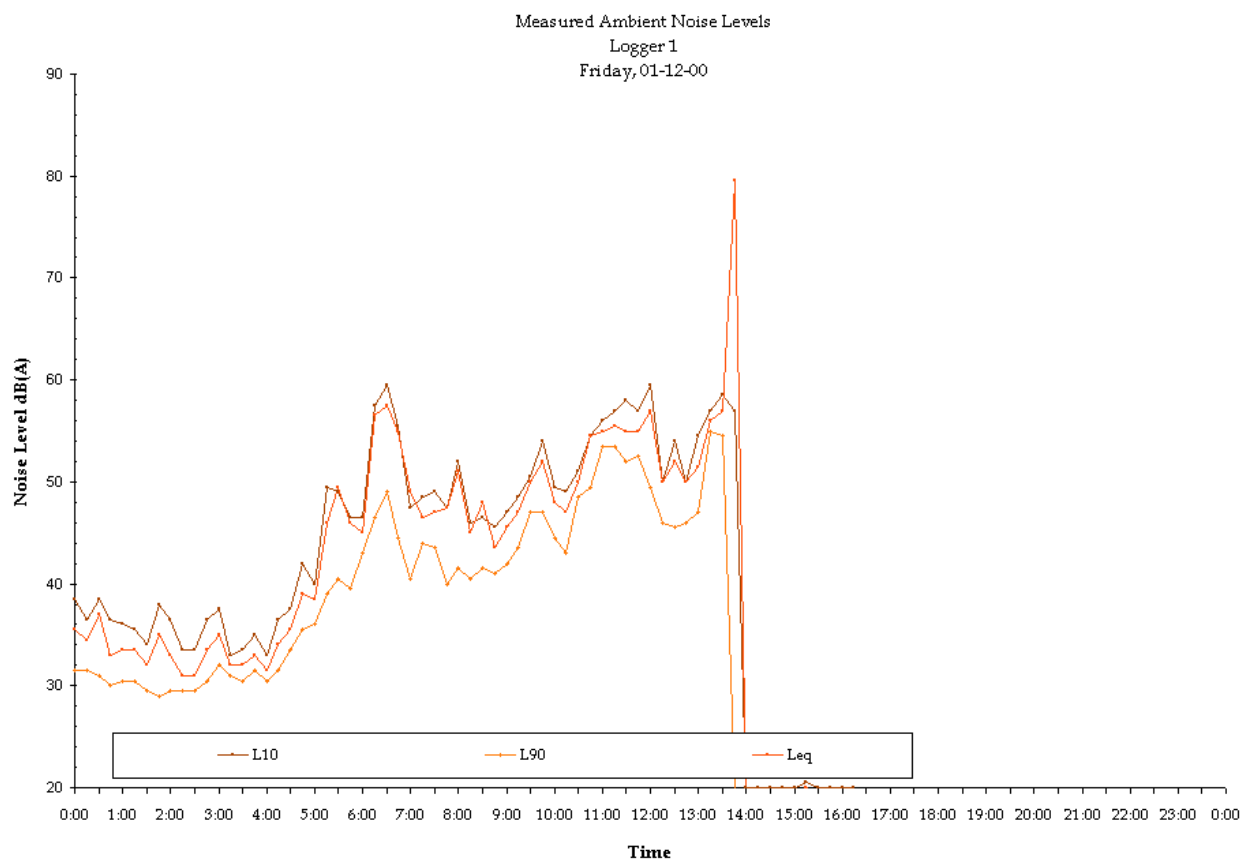
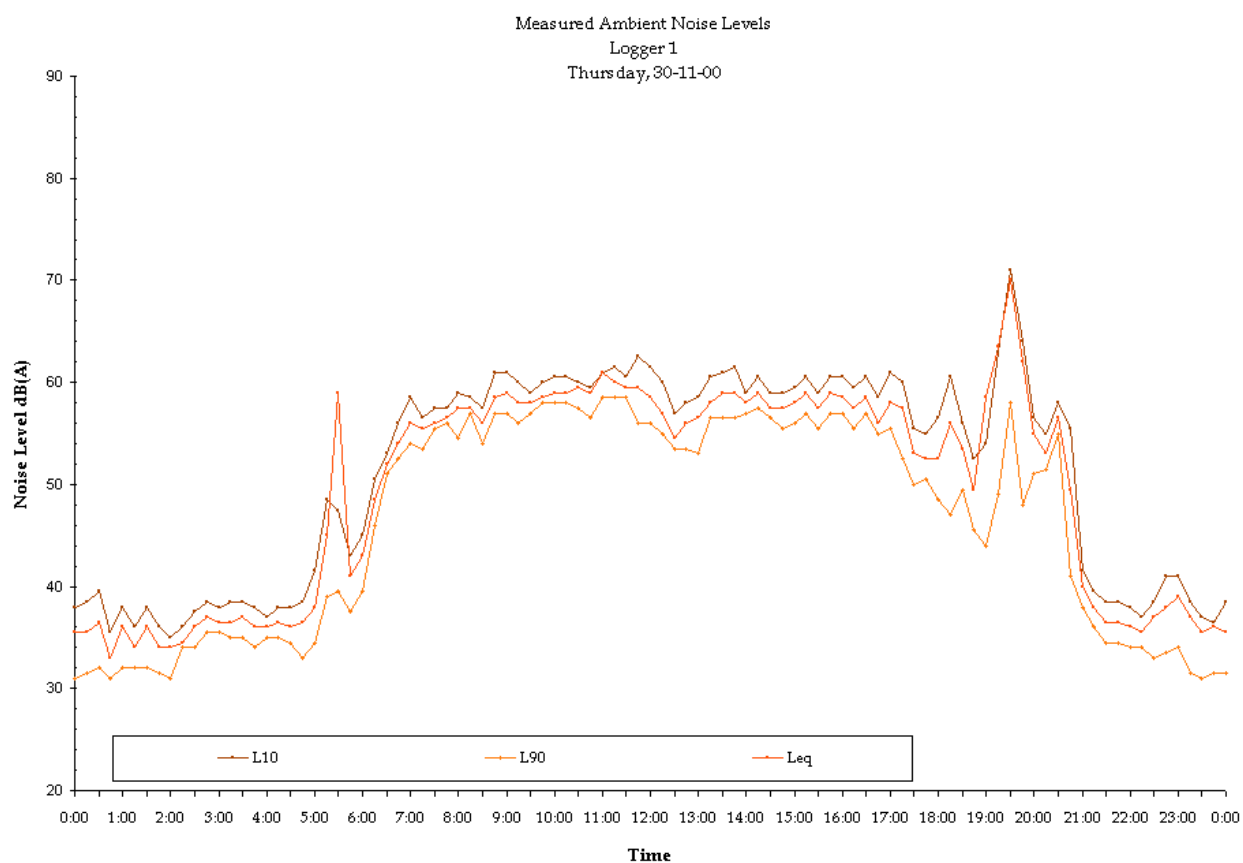
## Noise Logger Graphs

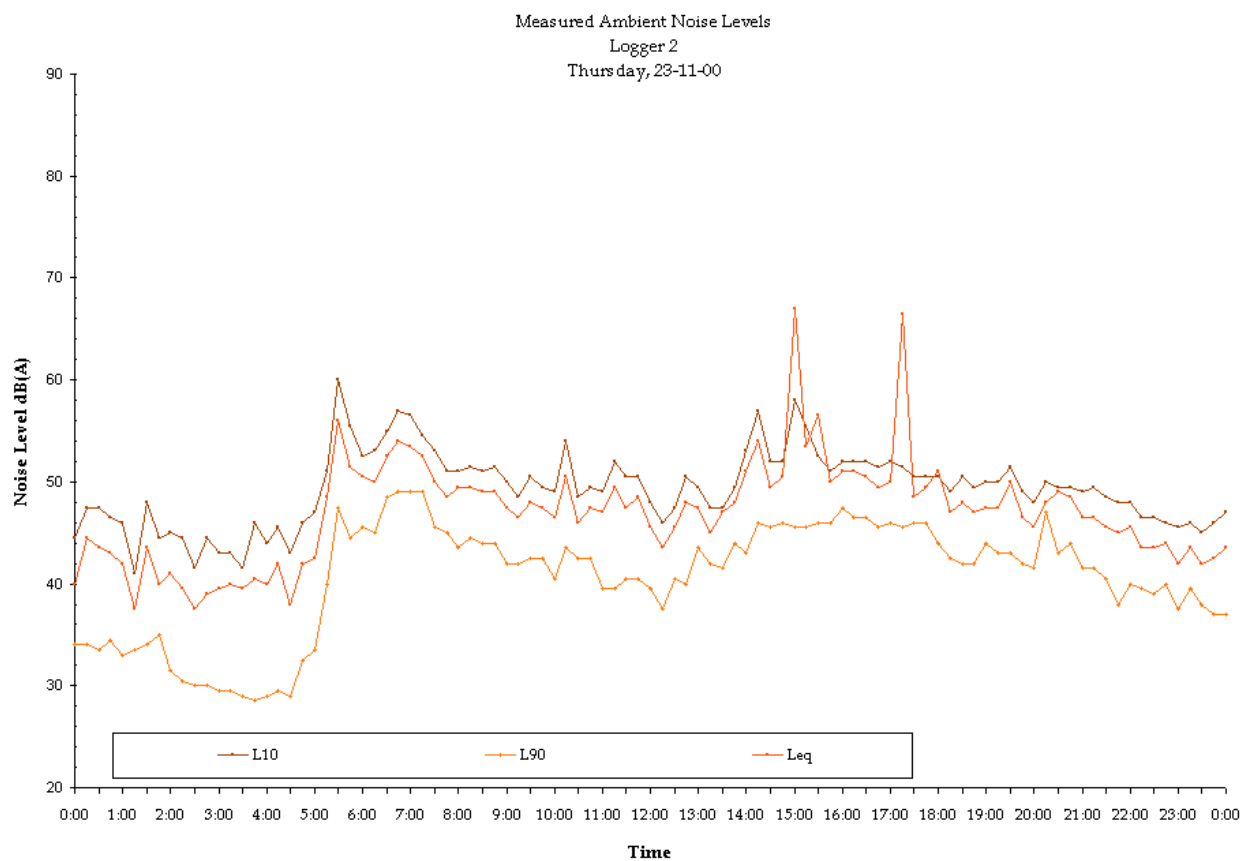
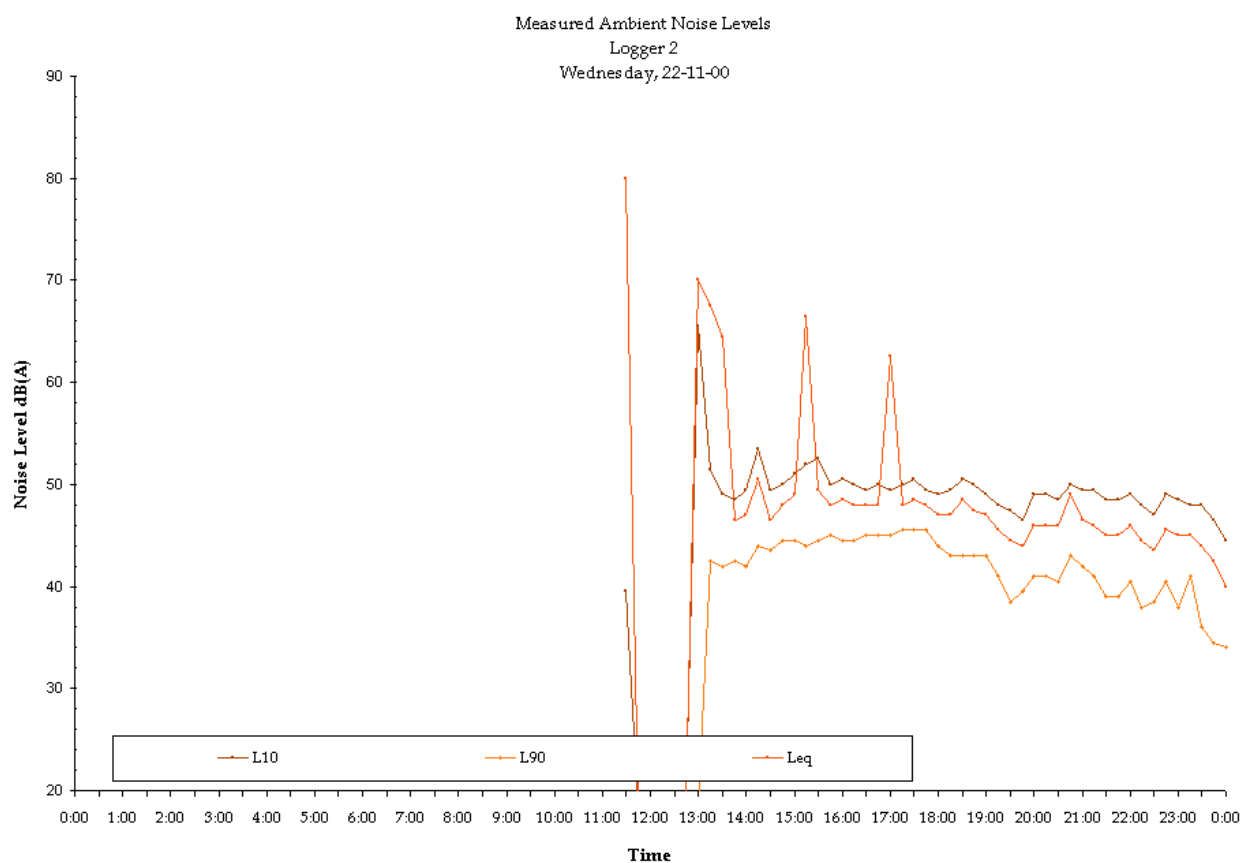


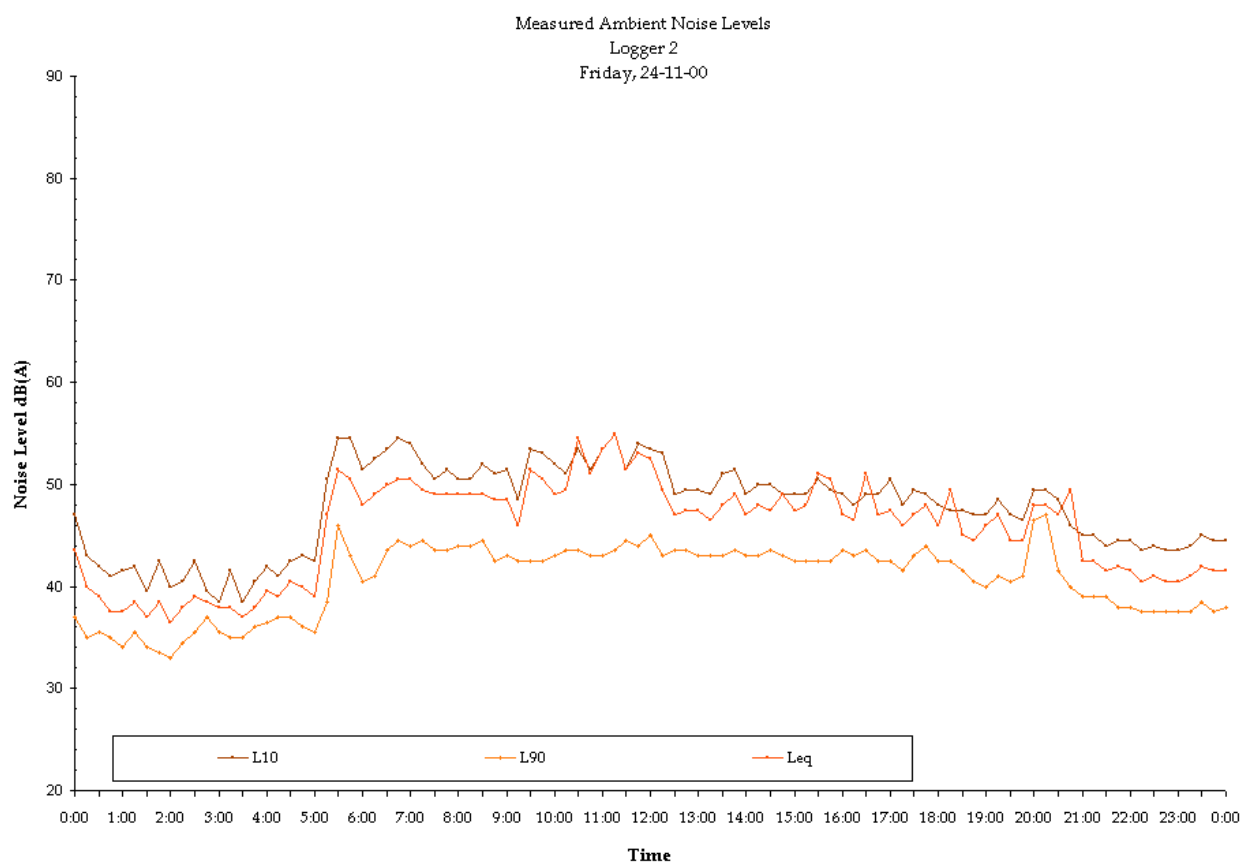




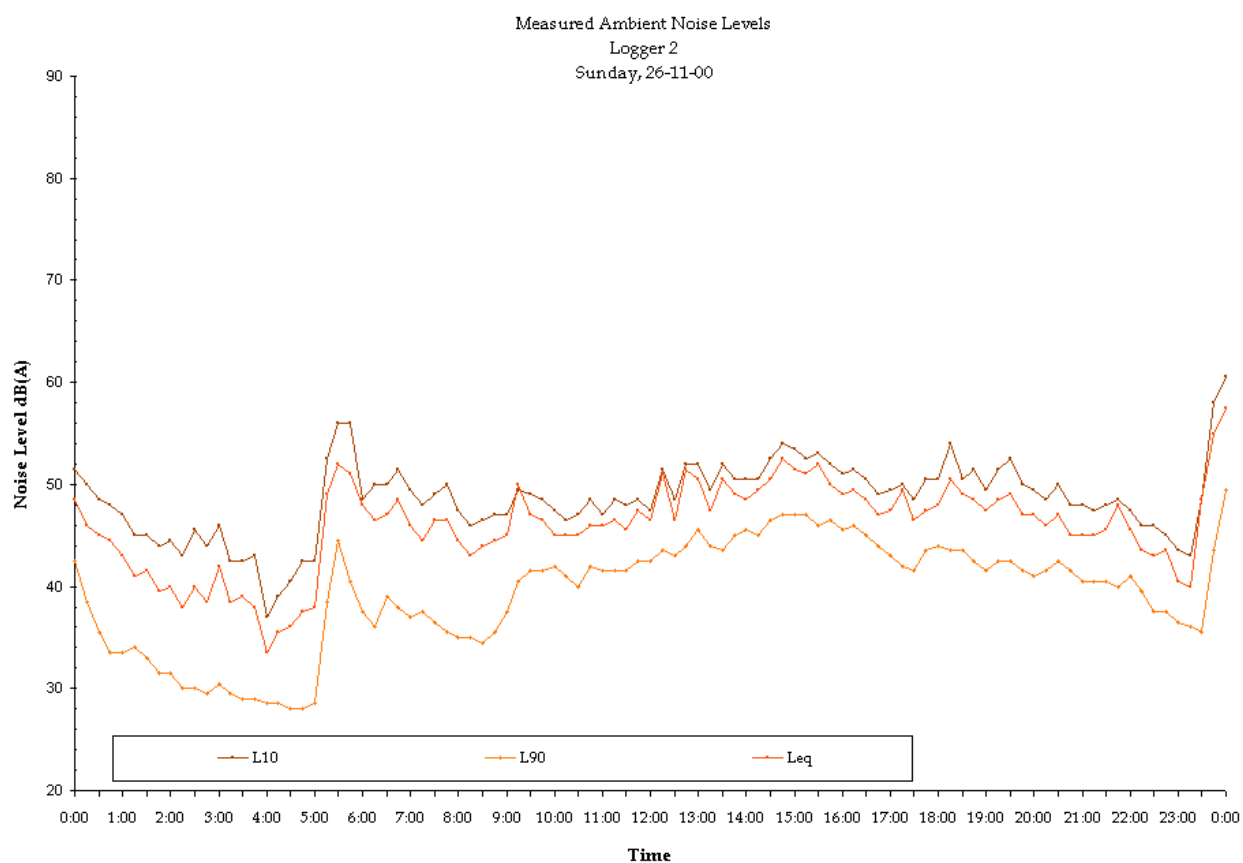


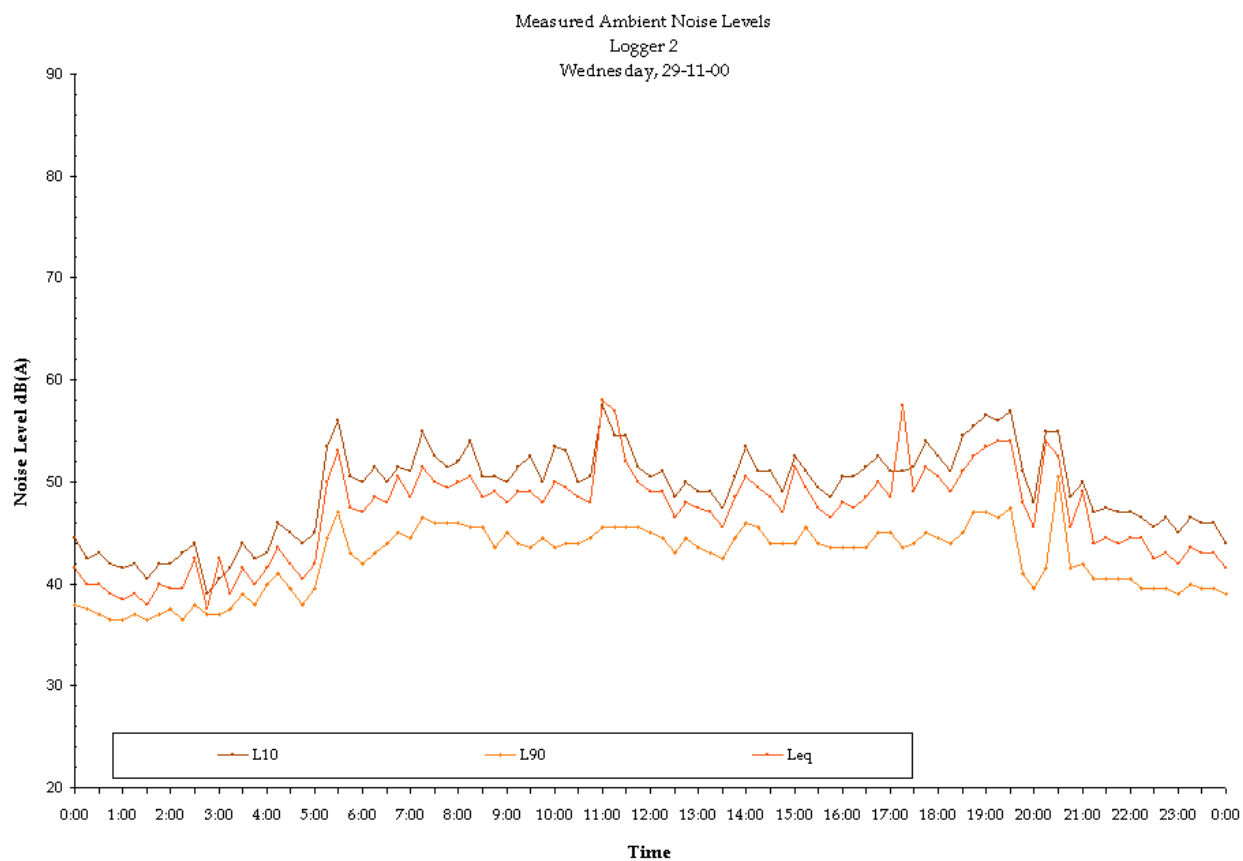


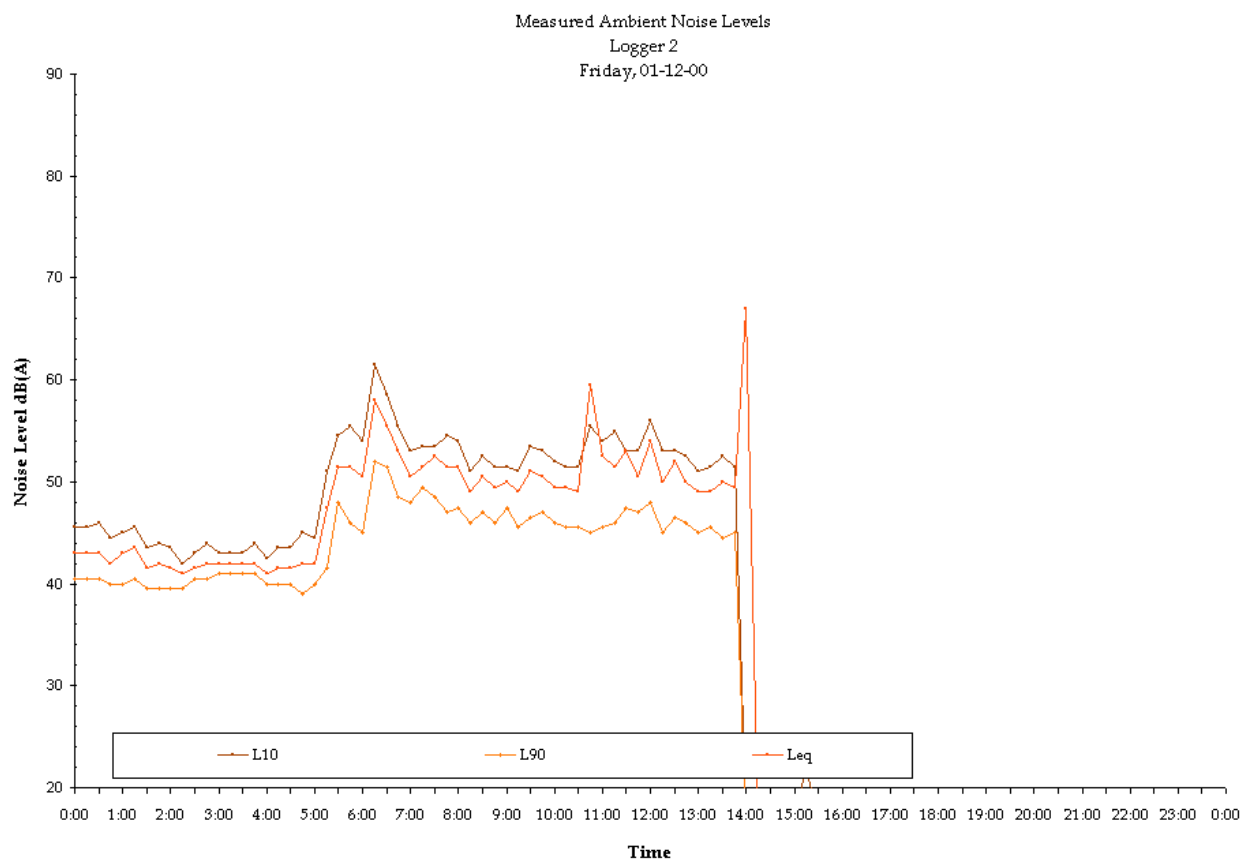
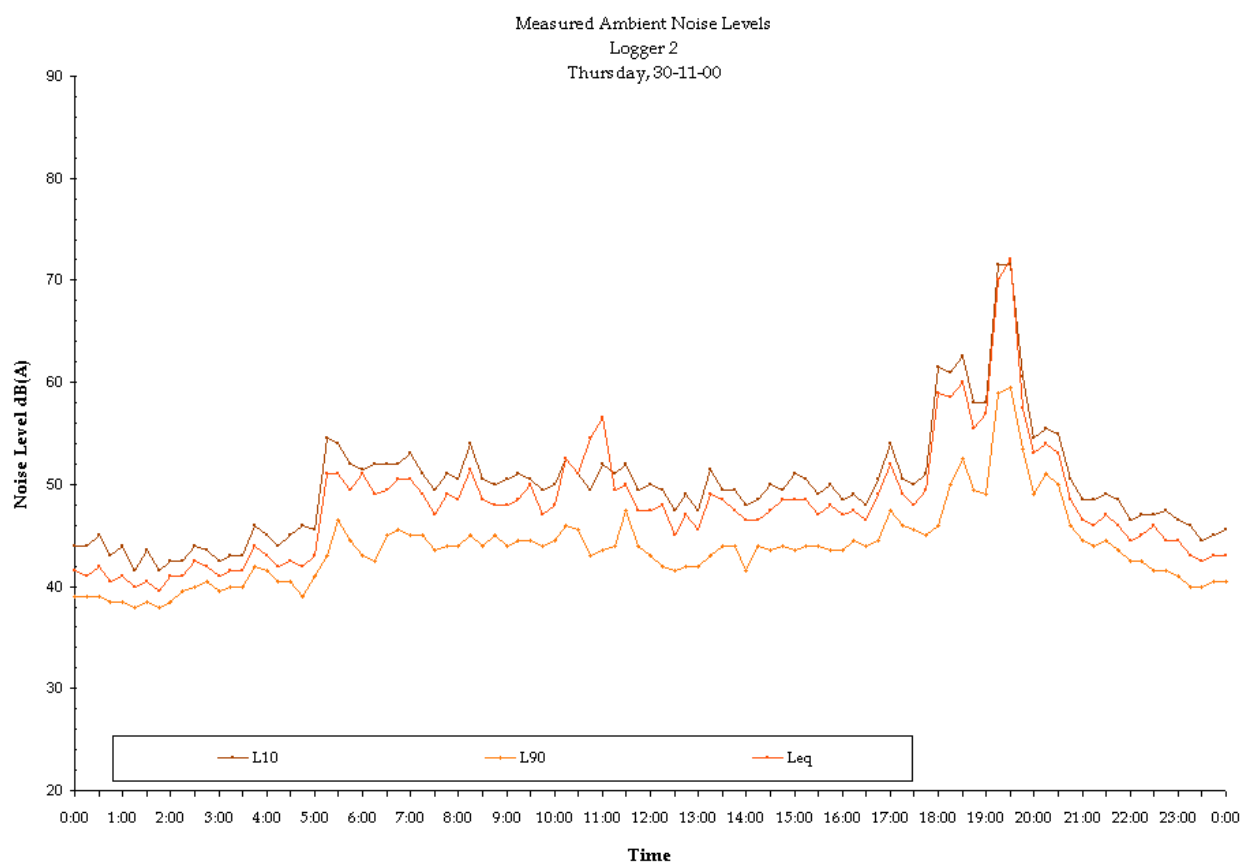














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