

Mackas Sand Pty Ltd

Environmental Noise Monitoring September 2011

September 2011



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Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Mackas Sand Pty Ltd

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APPENDICES

1	Glossary and Abbreviations
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1.0 Introduction

1.1 Project Background

Mackas Sand was granted Major Project Approval 08_142 in September 2009 by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* to operate sand extraction operations at Salt Ash, approximately 25 kilometres north-east of Newcastle, in the Port Stephens local government area of New South Wales (refer to **Figure 1.1**).

Mackas Sand Pty Ltd (Mackas Sand) has approval to extract and process sand from Lot 218 and Lot 220 shown on **Figure 1.1**. It has been estimated that approximately 11.4 million tonnes of sand resource will be extracted from Lot 220, with Lot 218 having an identified resource of 9.6 million tonnes however an indefinite extraction life due to the ongoing movement of sand from the mobile dunes into the approved extraction area.

At the time of preparing this report sand extraction was only being undertaken on Lot 220. No extraction activities have occurred on Lot 218. As of September 2011, no sand product had been transported along Lavis Lane from Lot 218.

1.2 Scope

This Noise Monitoring Report has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Mackas Sand. The noise monitoring and reporting requirements for Mackas Sand are outlined in the Major Project Approval 08_0142, Environmental Protection Licence (EPL) 13218 and the Mackas Sand Noise Management Plan (Umwelt 2009).

This report presents the results of attended noise monitoring undertaken in September 2011 as part of the ongoing noise monitoring program for Mackas Sand.

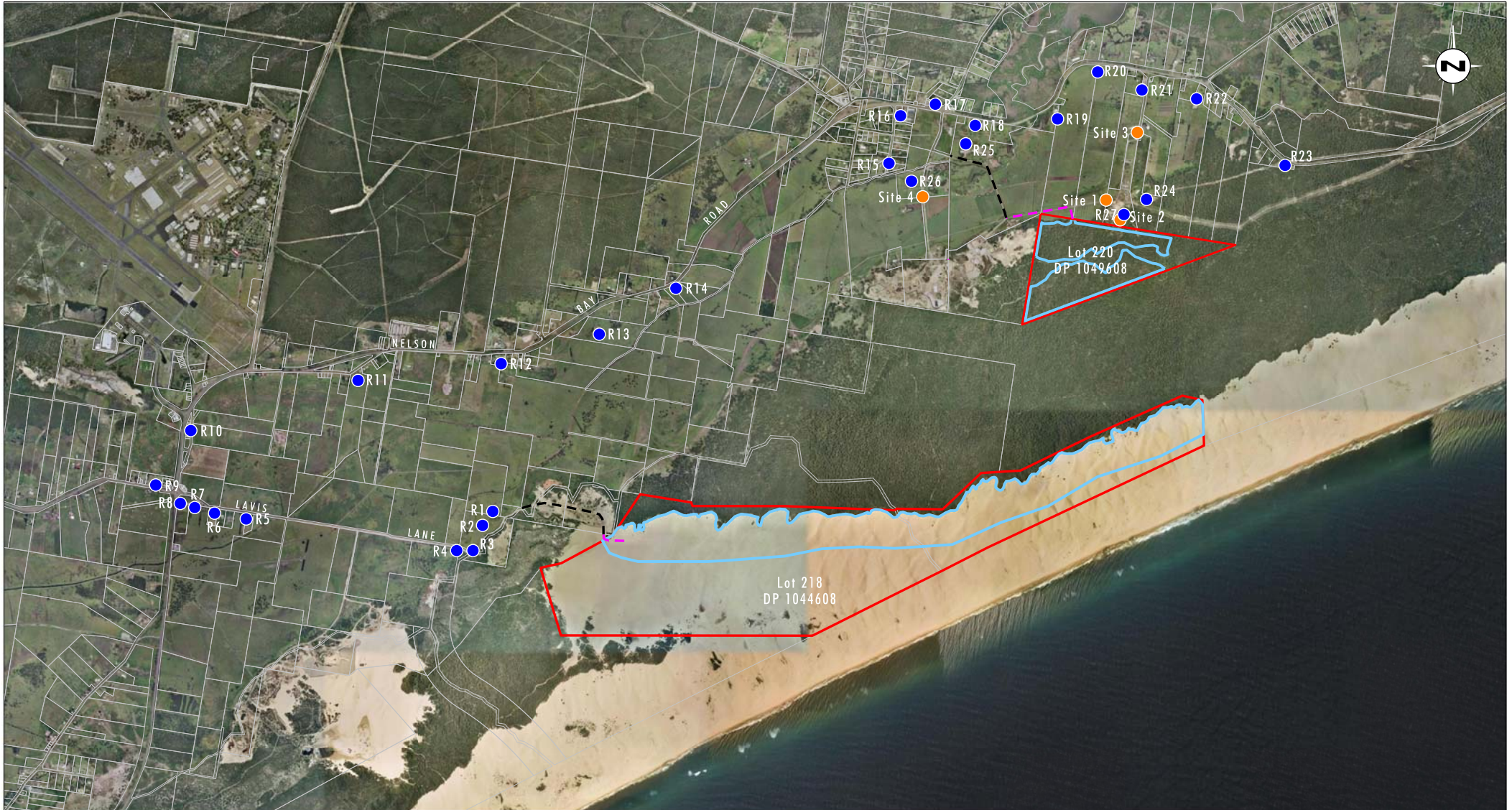
A glossary of terms and abbreviations used in this report is provided in **Appendix 1**.

2.0 Assessment Criteria

The consent conditions for the project, outlined in the Mackas Sand Major Project Approval 08_0142 and EPL 13218, set the noise limits for all stages of the operations. The assessment criteria are presented in **Table 2.1**. The receiver locations are shown in **Figure 1.1**.

Table 2.1 – Noise Impact Assessment Criteria, dB(A)

Location	Day LAeq, 15 min	Evening LAeq, 15 min	Night LAeq, 15 min	Night LA1, 1 min
R18 – 300 Nelson Bay Road	39	39	40	45
R1 – Lavis Lane residence	39	39	39	45
R19 – 316 Nelson Bay Road	36	36	37	45
R26 – Residence opp. Oakvale Farm	36	36	35	45
R27 – Hufnagl residence	36	35	35	45
R17 – 287 Nelson Bay Road	35	35	36	45
All other residences	35	35	35	45



Source: Department of Lands (2003)

0 0.5 1 2 km
1:45 000

Legend

- Lot Boundaries (218 & 220)
- Proposed Operational Area
- Residential Receivers
- Noise Monitoring Location
- Site Access
- Proposed Site Access

File Name (A4): R34_V1/1646_269.dgn

FIGURE 1.1

Noise Monitoring Sites

Day time is 7.00 am to 6.00 pm Monday to Saturday and 8.00 am to 6.00 pm Sundays and Public Holidays, evening is 6.00 pm to 10.00 pm and night time is 10.00 pm to 7.00 am Monday to Saturday and 10.00 pm to 8.00 am Sundays and Public Holidays.

Condition 7 of Schedule 3 of Major Project Approval 08_142 requires that road traffic noise generated by quarry operations does not exceed the criteria stipulated in **Table 2.2**.

Table 2.2 – Traffic Noise Impact Assessment Criteria, dB(A)

Road	Day/Evening LAeq, 1 hour	Night LAeq, 1 hour
Lavis Lane, Oakvale Drive, Nelson Bay Road	60	55

Compulsory Land Acquisition criteria, as set out in Condition 5 of Schedule 3 of Major Project Approval 08_142 are outlined in **Table 2.3** for night time noise levels.

Table 2.3 – Land Acquisition Criteria, dB(A)

Property Location	Night LAeq, 15 min
R1 to R4	42
R20 to R23	41
All other privately owned residences	40

Additional noise mitigation measures as required in Condition 8 of Schedule 3 of Major Project Approval 08_142 must be undertaken if noise levels exceed the criteria in **Table 2.4**.

Table 2.4 – Additional Noise Mitigation Criteria, dB(A)

Property Location	Night LAeq, 15 min
Residences R2 to R4 (and R1)	40
Residences R20 to R23	39
All other privately owned residences	38

Additionally, the Notice of Variation of EPL 13218 for sand extraction operations on Lot 218 and Lot 220 Salt Ash, issued on 1 June 2011, requires that noise from the premises must not exceed the limits specified in **Table 2.5**.

Table 2.5 – EPL 13218 Condition L6.1 Noise Limits, dB(A)

Location	Day LAeq, 15 min	Evening LAeq, 15 min	Night LAeq, 15 min	Night LA1, 1 min
Residences North of private haul road servicing Lot 220	-	40	40	45
Residence R27	36	36	35	45
Residences R1, R2, R3, R4, R5, R6, R7 and R8.	39	39	39	45
All other residences	-	36	35	45

3.0 Assessment Methodology

3.1 Approved Quarry Operational Phases

The approved quarrying operations on Lot 220 were, from a noise perspective, designed to be undertaken in three phases of development. Mackas Sand Noise Management Plan (Umwelt, 2009) outlines the potential noise impacts from each of the phases and presents control measures, monitoring programs and assessment methodologies to minimise the risk of noise impacts on residences adjacent to the quarry operations. **Section 3.1** of this report outlines the planned phases of the quarry operations while **Section 3.2** outlines the corresponding noise monitoring and assessment methodologies. **Section 3.3** discusses the status of quarrying operations as at September 2011 and the methodology used to assess any potential noise impacts from the quarry.

3.1.1 Phase 1 Extraction – Lot 220

Phase 1 operations on Lot 220 consists of extraction and transport off site of material only (no screening). Limited machinery will be used during this phase of the operations, this will include:

- 1 x Volvo 180F Wheel Loader (2009 model) or similar;
- 1 x Komatsu D65PX-15 Bull Dozer (2007 model) or similar; and
- 2 x Volvo A35D Articulated Dump Truck (2003 model) or similar.

All operations during Phase 1 will be in excess of 250 metres from nearest potentially effected residence (R27).

3.1.2 Phase 2 Extraction – Lot 220

During Phase 2 on Lot 220, operations include screening of sand initially using mobile screens and the use of mobile plant in addition to that used during Phase 1. Once sufficient space is established on the quarry floor, the sand processing plant will be constructed. At this time operations will be consistent with Normal Operations described in the environmental assessment (EA) (Umwelt, 2009). Equipment will operate up to seven days per week during daytime, evening and night time periods. In addition to this a product truck and water cart will operate at Lot 220 between the hours of 5.00 am and 10.00 pm Monday to Saturday and 8.00 am and 12.00 pm Sundays and Public Holidays.

Approximately 10 to 20 percent of sand from Lot 220 will be transported from the operation or blended with other products without processing. Approximately 40 to 90 percent of extracted sand will pass through 14 millimetre vibrating screens prior to being loaded onto trucks. The vibrating screens will be portable and will follow the extraction operations, where feasible. Waste material from the screens will consist of sand aggregates, fallen vegetation and leaf litter, and will be incorporated into the final landform of the site.

3.1.3 Phase 3 Extraction – Lot 220

Normal Operations on Lot 220 will involve the processing of sand and extraction of sand from areas greater than 250 metres from receiver R27. Equipment used on Lot 220 during Normal Operations will include the simultaneous use of the sand processing plant, up to four front-end loaders, a vibrating screen and a haul truck.

Phase 3 will consist of Normal Operations for Lot 220 with the following modifications to operations during daytime extraction operations when within 250 metres of receiver R27:

- there will only be two front-end loaders, a vibrating screen and haul truck operating within 250 metres of receiver R27. These will be located within 25 metres of the extraction face and either a localised barrier will be placed around the vibrating screen or it being placed within 5 metres of the extraction face; or
- extraction will be undertaken with only one front-end loader, vibrating screen and haul truck operating within 250 metres of receiver R27.

There will be no extraction equipment operating within 250 metres of receiver R27 during evening and night time periods unless agreement is reached with the landholder.

3.2 Compliance Assessment Methodology per Phase

3.2.1 Phase 1 Extraction – Lot 220

There will be no noise monitoring undertaken during Phase 1 of operations unless complaints from neighbouring land owners warrant noise monitoring being undertaken. Up until November 2010, there was no screening undertaken on Lot 220.

3.2.2 Phase 2 Extraction – Lot 220

Monitoring of Phase 2 operations on Lot 220 and traffic noise from Lot 218 and Lot 220 product haulage on Lavis Lane and Oakvale Drive respectively, will be undertaken as part of compliance monitoring required by EPL 13218 Licence Condition M7. Technically Phase 2 extractions commenced in early November 2010 when a Chieftain 1400 mobile screen was brought to Lot 220, however the screen is only used on an intermittent basis to screen the top layer of sand to remove roots, fallen vegetation and leaf litter.

3.2.3 Phase 3 Extraction – Lot 220

Prior to commencing Phase 3 of operations on Lot 220, detailed monitoring of noise emissions will build on noise monitoring carried out for Phase 2. Noise emissions from both mobile and fixed equipment will be measured and a revised Noise Management Plan addressing extraction operations within 250 metres of receiver R27 will be developed. Phase 3 extractions had not commenced at the time of undertaking this noise compliance assessment.

3.3 Quarry Operations as at September 2011

3.3.1 Outline of Operations as at September 2011

The quarrying operations at Lot 220 on 8 September 2011 were equivalent to Phase 2 extraction operations. The extraction operations were generally consistent with Phase 1 operations, however, a mobile power screen (a Turbo Chieftain 1400) was also located within the quarry.

The power screen was not being used continuously throughout the time of attended monitoring however was in use between approximately 8.27 am to 9.27 am coinciding with attended monitoring being conducted at monitoring locations R24 (9A Janet Parade, Salt

Ash) and R27 (Hufnagl residence, 10 Janet Parade, Salt Ash), the nearest potentially affected residential receiver.

The quarrying operations at the time of monitoring also consisted of a single Sumitomo SH450HD 45 tonne excavator and a Volvo 180F Wheel Loader that were used to quarry and load sand into two Volvo A35D and A40E articulated dump trucks and product trucks. Quarried sand was delivered by the articulated dump trucks via a private haul road to the nearby Mackas Sand and Soil Supplies. Product trucks servicing the quarry arrived and departed the site via the site access road and Oakvale Drive.

No other sand processing plant was present or in use at the quarry face.

3.4 Compliance Assessment

Attended noise surveys are used to quantify and describe the acoustic environment around a site. Typically the results are compared with the noise criteria defined in the relevant project approvals to assess compliance. Attended monitoring is often considered the preferred method for determining compliance with prescribed limits because it allows for an accurate assessment of the contribution, if any, from an industrial noise source to measured ambient noise levels.

The methodology involved the following activities:

- attended noise monitoring surveys to measure the ambient noise levels in the surrounding region and to assess the sand extraction operation's contribution to measured noise levels; and
- comparison of the attended noise monitoring results with the relevant noise impact assessment criteria to assess compliance of the sand extraction operations with the relevant project approval and EPL criteria.

Compliance with the sleep arousal criteria is determined by comparing the LA1, 1 minute noise levels measured during the night period attended noise surveys with the sleep arousal criteria outlined in the development consents and EPLs under which the site operates.

Compliance monitoring of the site generated LAeq, 1 hour road traffic noise contribution was undertaken during the site visit at the closest offset house to Oakvale Drive, at 2642 Nelson Bay Road. However, during the attended traffic noise monitoring program there was no heavy vehicle activity along Oakvale Drive carrying product directly from Lot 220. Road truck movements past the monitoring location during the monitoring period were associated with vehicles servicing the adjoining businesses of Mackas Sand and Soil and Sibelco Australia. Results of the attended traffic noise monitoring program were utilised to correlate the accuracy of the site traffic noise model to existing conditions. The predicted noise levels at the façade of 2642 Nelson Bay Road resulting from peak and average hourly traffic movements associated with the Project were then predicted and assessed against LAeq, 1 hour road traffic criteria.

4.0 Attended Noise Monitoring

4.1 Attended Noise Monitoring – Industrial Noise

Attended industrial noise monitoring was conducted at four locations in the region surrounding the Lot 220 sand extraction site during the night period on 8 September 2011 between 6.00 am to 7.00 am and the day period between 7.00 am to 9.50 am on 8 September 2011.

The purpose of the attended noise survey was to quantify and describe the ambient noise environment in the region surrounding the Lot 220 extraction site and to interpret the results to account for the contribution of sand extraction related activities to the surrounding noise environment. During the attended industrial noise monitoring survey the noise sources contributing to the ambient noise environment were recorded with particular attention focussed on the contribution from the Lot 220 operations site. The weather conditions over the monitoring period were also recorded.

Attended noise monitoring was conducted in accordance with the NSW Government Office of Environment and Heritage (OEH) *Industrial Noise Policy (INP) (2000)* guidelines and the *Australian Standard AS1055-1989, 'Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures'*.

4.2 Attended Noise Monitoring – Traffic Noise

Attended noise monitoring was conducted at one location situated along Oakvale Drive for one hour during the day period on 8 September 2011 between 10.58 am to 11.59 pm.

The purpose of the attended road traffic noise survey was to quantify and describe the ambient noise environment in the region surrounding the Mackas Sand site and to interpret the results to account for the road traffic noise contribution of sand extraction related haulage operations to the surrounding noise environment. During the attended noise monitoring survey the noise sources contributing to the ambient noise environment were recorded with particular attention focussed on the contribution from the road truck movements along Oakvale Drive. The weather conditions over the monitoring period were also recorded.

Attended noise monitoring was conducted in accordance with the NSW Government Office of Environment and Heritage (OEH) *Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999)* guidelines.

4.3 Monitoring Locations

4.3.1 Monitoring Locations – Industrial Noise Impact

The monitoring locations used during the attended industrial noise monitoring program are described in **Table 4.1** and shown on **Figure 1.1**.

Table 4.1 – Monitoring Locations for Industrial Noise Monitoring Program

Monitoring Location	Description
Site 1	Private residence, site boundary (R27 – Hufnagl residence, 10 Janet Parade, Salt Ash) MGA N = 6370803, MGA E = 399426
Site 2	Private residence (R27 – Hufnagl residence, 10 Janet Parade, Salt Ash) MGA N = 6370639, MGA E = 399542
Site 3	Private residence (R24 – 9A Janet Parade, Salt Ash) MGA N = 6371363, MGA E = 399685
Site 4	Private residence (R26 – 6 Oakvale Drive, Salt Ash) MGA N = 6370830, MGA E = 397906

Note: R24 to R27 descriptors are from *Noise Management Plan for Sand Extraction Operations* (Umwelt 2009)

The September 2011 attended industrial noise monitoring survey included monitoring at Sites 1, 2, 3 and 4. Noise monitoring data from the reference sites has been used to assist in identifying and assessing the contribution of the Mackas Sand site sand extraction operations to industrial noise levels at the receiver locations (Sites 1 to 4).

4.3.2 Monitoring Location – Traffic Noise Impact

The monitoring location used during the attended road traffic noise monitoring program is described in **Table 4.2**.

Table 4.2 – Monitoring Location for Traffic Noise Impact Monitoring Program

Monitoring Location	Description
Site 5	Private residence, Lot 2, DP 818198, 2642 Nelson Bay Road, Salt Ash (situated on the corner of Oakvale Drive and Nelson Bay Road) MGA N = 6371455, MGA E = 398102

The September 2011 attended traffic noise monitoring survey includes monitoring at Site 5. Noise monitoring data from this reference site has been used to assist in identifying and assessing the contribution of the Mackas Sand site sand extraction operations to traffic noise levels at the assessed receiver location (Site 5).

The relevant road traffic noise criteria for roads associated with the proposed operations are provided in **Section 2** of this report.

4.4 Monitoring Results

4.4.1 Monitoring Locations – Industrial Noise Impact

Attended noise monitoring was undertaken at four monitoring locations during the night time and day time periods (refer to **Table 4.1**).

Attended noise measurements were undertaken with a Type 1, Svantek 959 noise and vibration analyser, Serial Number 12918. During the attended noise surveys the noise meter was calibrated using a Svantek Model SV 30A Noise Meter Calibrator, Serial Number 14162. The noise monitor was run using three measurement profiles [Z- (Linear), C- and

A- Weighting] and recorded A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period.

Meteorological data was collected for the attended monitoring period from the weather station located at the Williamtown RAAF Base situated approximately 6 kilometres west of the site.

The night time attended noise monitoring was undertaken between 6.15 am to 7.00 am on 8 September 2011. The day time attended noise monitoring was undertaken between 7.00 am to 9.50 am on 8 September 2011.

The night and day time monitoring results shown in **Figures 4.1 to 4.6** and **Tables 4.3** and **4.4** include:

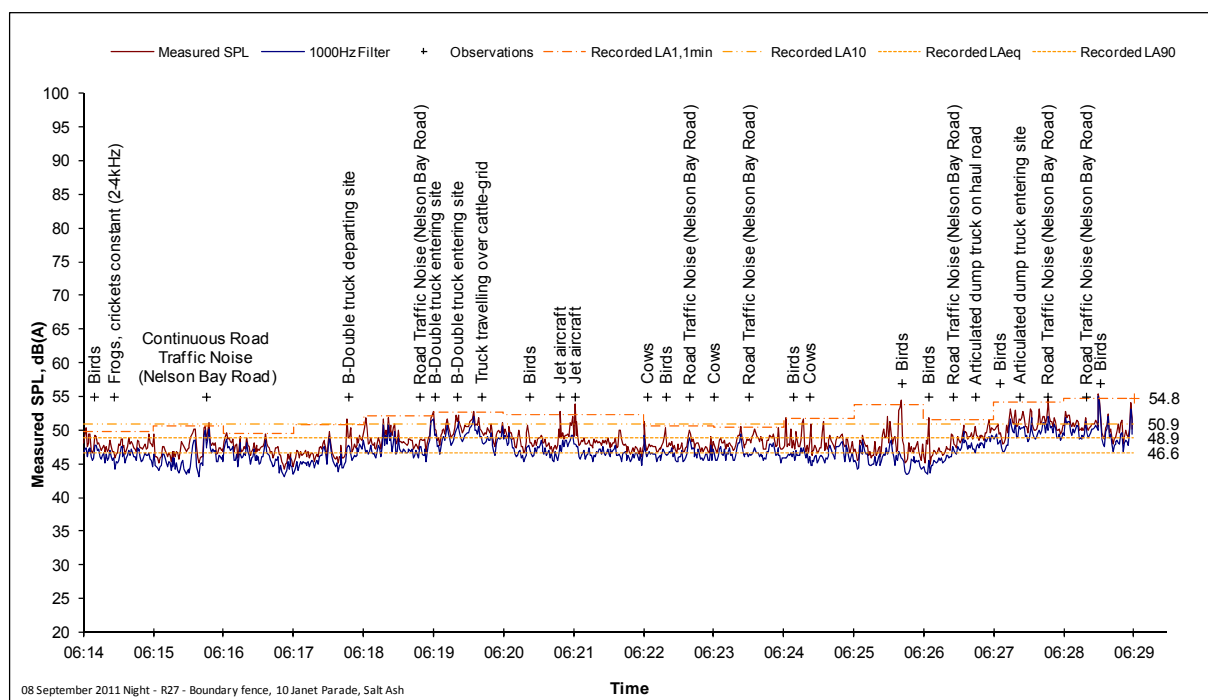
- the recorded overall A-weighted noise levels at 1 second intervals over a 15 minute measurement period;
- the results of a 1000 Hz low pass filter at 1 second intervals over the 15 minute measurement period;
- an assessment of the maximum LA1, 1 minute noise level recorded over the 15 minute measurement period for night period measurements; and,
- the LAeq, 15 minute and LA90, 15 minute noise levels for the 15 minute measurement period.

Comments regarding the noise sources contributing to the ambient noise levels are also presented on **Figures 4.1 to 4.6**.

An assessment of the results from the attended noise monitoring program and the corresponding meteorological conditions are provided in **Section 4.3**.

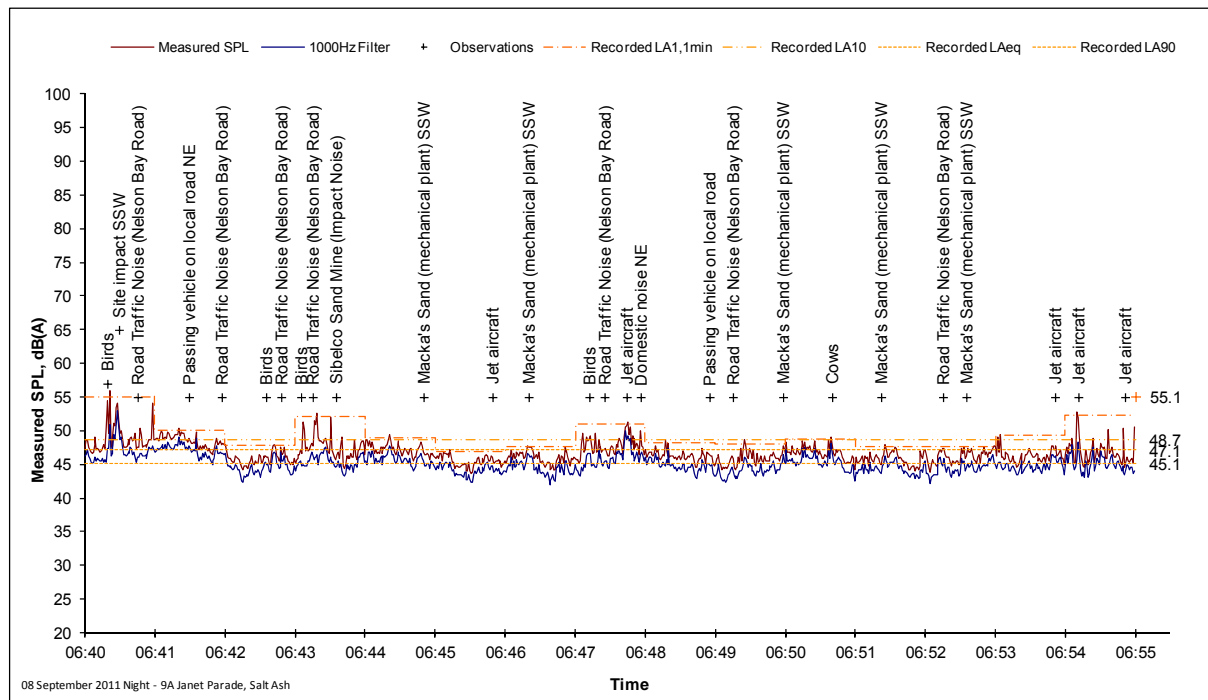
4.4.2 Night Time Period Attended Monitoring on 8 September 2011

Figure 4.1 – Site 1 (Hufnagl site boundary), 8 September 2011



The results in **Figure 4.1** indicate that the ambient noise levels at monitoring location Site 1 (R27 – Hufnagl) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna (bird calls, insects and farm animals) and jet aircraft noise sources. The LAeq, 15 minute noise contribution from the Mackas Sand site discernible from the ambient noise environment at the monitoring location resulted from site articulated haul trucks and B-double road truck activity when travelling along the private haul road that services operations on Lot 220, Mackas Sand and Soil and Sibelco Australia and when entering and departing these premises across the entrance cattle grid. The site LA1, 1 minute noise contribution resulted from a truck travelling across the site entrance cattle grid.

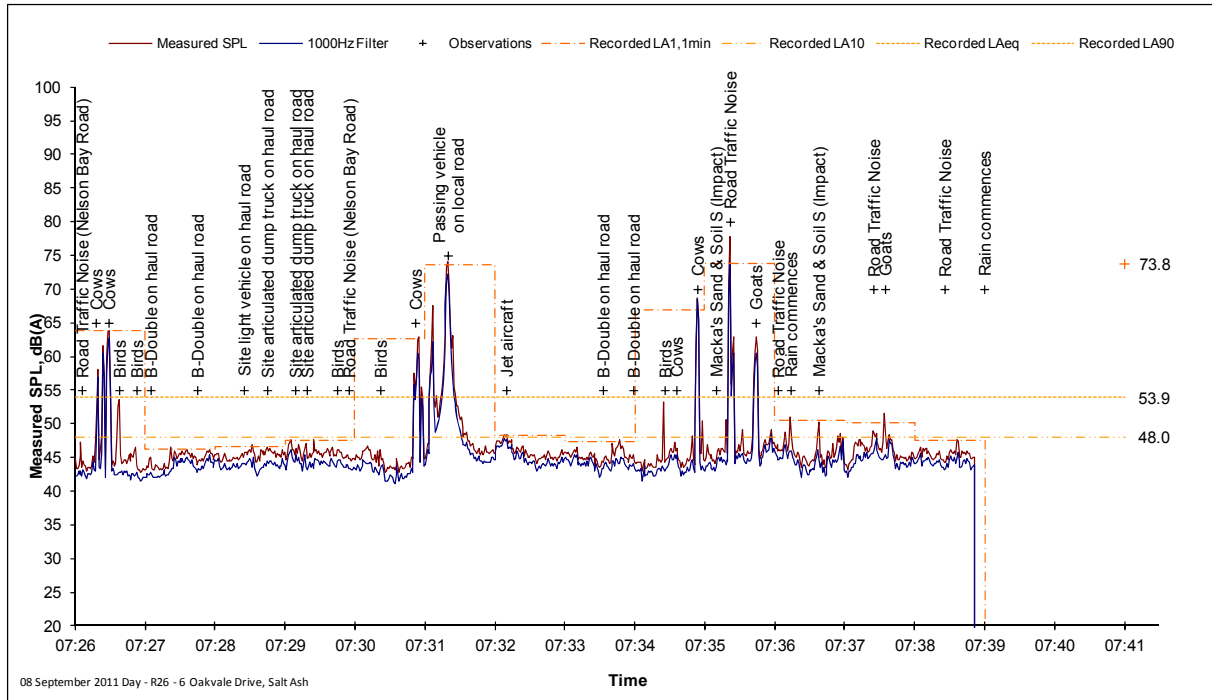
Figure 4.2 – Site 3 (R24 – 9A Janet Parade, Salt Ash), 8 September 2011



The results in **Figure 4.2** indicate that the ambient noise levels at monitoring location Site 3 (R24 – 9A Janet Parade) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna (bird calls, insects and farm animals) and jet aircraft noise sources. The LAeq, 15 minute noise contribution from the Mackas Sand site discernible from the ambient noise environment at the monitoring location likely resulted from audible but not visible wheel loader and excavator operations observed intermittently throughout the monitoring period. The site LA1, 1 minute noise contribution resulted from an impact occurring within the site likely associated with loading activity.

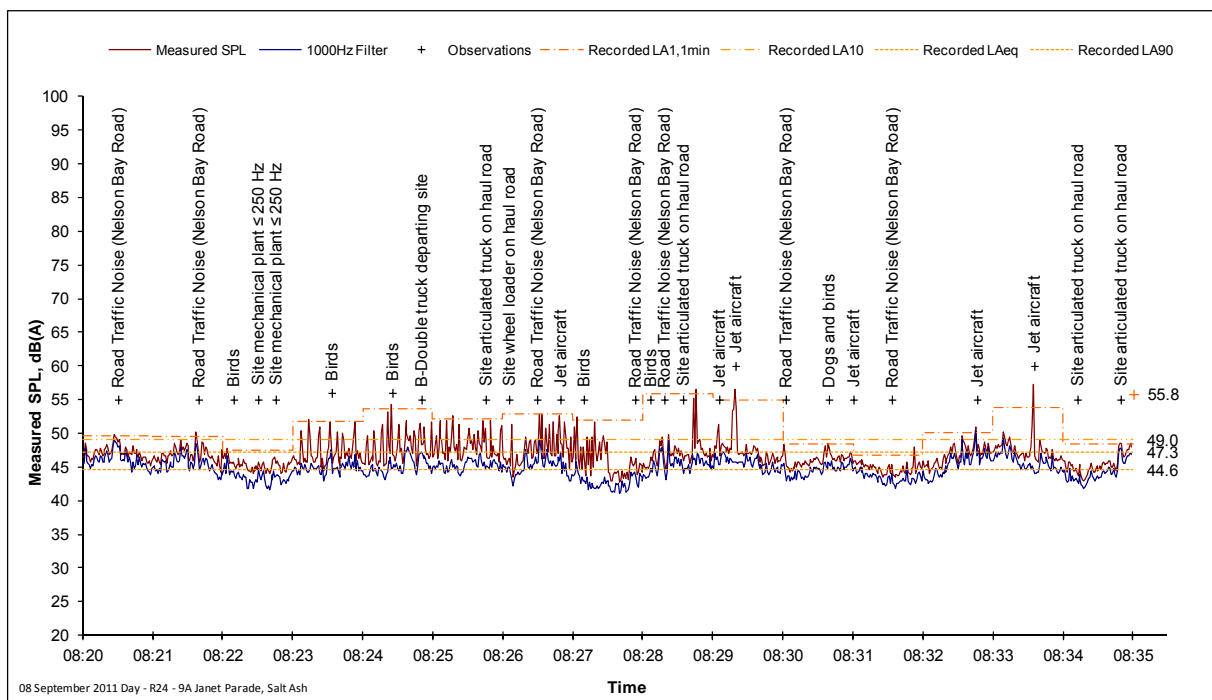
4.4.3 Day Period Attended Monitoring on 8 September 2011

Figure 4.3 – Site 4, 7.25 am (R26 – 6 Oakvale Drive, Salt Ash), 8 September 2011



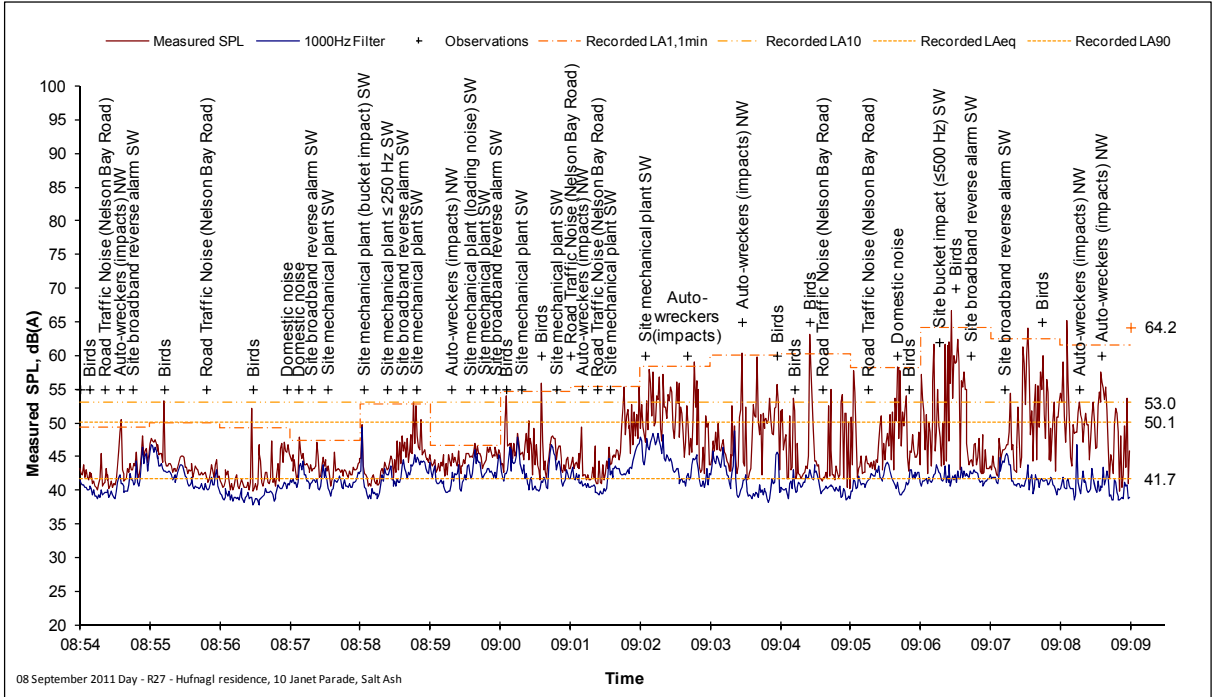
The results in **Figure 4.3** indicate that the ambient noise levels at monitoring location Site 1 (R26 – 6 Oakvale Drive) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna (bird calls, insects and farm animals) and jet aircraft noise sources. The LAeq, 15 minute noise contribution associated with the Mackas Sand site activity discernible from the ambient noise environment at the monitoring location resulted from site articulated haul truck activity when travelling along the private haul road servicing the premises. The measurement was ceased at 7.39 am due to the commencement of rain.

Figure 4.4 – Site 3 (R24 – 9A Janet Parade, Salt Ash), 8 September 2011



The results in **Figure 4.4** indicate that the ambient noise levels at monitoring location Site 3 (R24 – 9A Janet Parade) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna and jet aircraft noise sources. The LAeq, 15 minute noise contribution from the Mackas Sand site discernible from the ambient noise environment at the monitoring location likely resulted from mobile plant items and a Turbo Chieftain 1400 mobile power screen operating within the site, from site articulated haul trucks and B-double road truck activity when travelling along the private haul road servicing Lot 220 operations, Mackas Sand and Soil and Sibelco Australia premises and when entering and departing these sites across the entrance cattle grid.

Figure 4.5 – Site 1 Hufnagl residence (R27 – 10 Janet Parade, Salt Ash), 8 September 2011



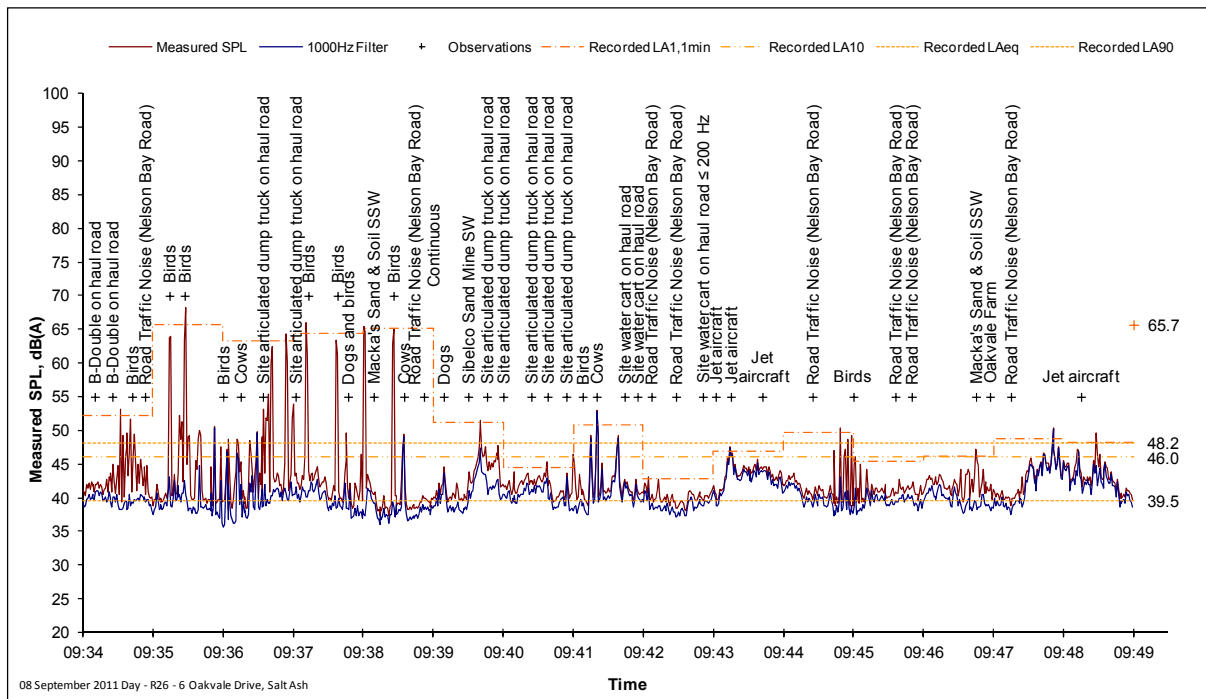
The results in **Figure 4.5** indicate that the ambient noise levels at monitoring location Site 3 (R27 – 10 Janet Parade) were dominated by continuous road traffic noise from Nelson Bay Road, bird calls and noise from an auto-wreckers to the north-west of the site and site noise sources.

The LAeq, 15 minute noise contribution from the Mackas Sand site discernible from the ambient noise environment at the monitoring location likely resulted from audible but not visible wheel loader, excavator and a Turbo Chieftain 1400 mobile power screen operations observed intermittently throughout the monitoring period. Broadband (white sound) reverse alarms were audible at this location and also contributed to the site noise contribution at this monitoring location.

The site LA1, 1 minute noise contribution resulted from an impact occurring within the site likely associated with loading activity.

It is considered that the meteorological conditions of cool morning temperatures and relatively high humidity, along with the monitoring location being downwind of site operations resulted in noise propagation from the premises to this nearest potentially affected residential receiver monitoring location being representative of likely worst-case noise enhancing meteorological conditions.

Figure 4.6 – Site 4, 9.35 am (R26 – 6 Oakvale Drive, Salt Ash), 8 September 2011



The results in **Figure 4.6** indicate that the ambient noise levels at monitoring location Site 1 (R26 – 6 Oakvale Drive) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna (bird calls and farm animals) and jet aircraft noise sources. The LAeq, 15 minute noise contribution associated with the Mackas Sand site activity discernible from the ambient noise environment at the monitoring location resulted from site articulated haul truck and water cart activity when travelling along the private haul road servicing the premises.

4.4.4 Monitoring Locations – Traffic Noise Impact

Attended traffic noise monitoring was undertaken at one monitoring location during the day time period (refer to **Table 4.2**).

Attended traffic noise measurement was undertaken with a Type 1, Svantek 959 noise and vibration analyser, Serial Number 12918. During the attended noise survey the noise meter was calibrated using a Svantek Model SV 30A Noise Meter Calibrator, Serial Number 14162. The noise monitor was run using three measurement profiles [Z- (Linear), C- and A- Weighting] and recorded A-weighted 1/3 octave noise levels at 1 second intervals over four consecutive 15 minute measurement periods resulting in a cumulative 1 hour measurement period. As recommended in Section C *Noise Monitoring Procedures* of the ECRTN, the LAeq for the adopted assessment period was measured 'on a 15-minute basis.'

Meteorological data was collected for the attended monitoring period from the weather station located at the Williamtown RAAF Base situated approximately 6 kilometres west of the site.

The day time attended traffic noise monitoring was undertaken between 10.58 am to 11.59 am on 8 September 2011.

The night and day time monitoring results shown in **Figures 4.7 to 4.10** and **Table 4.5** include:

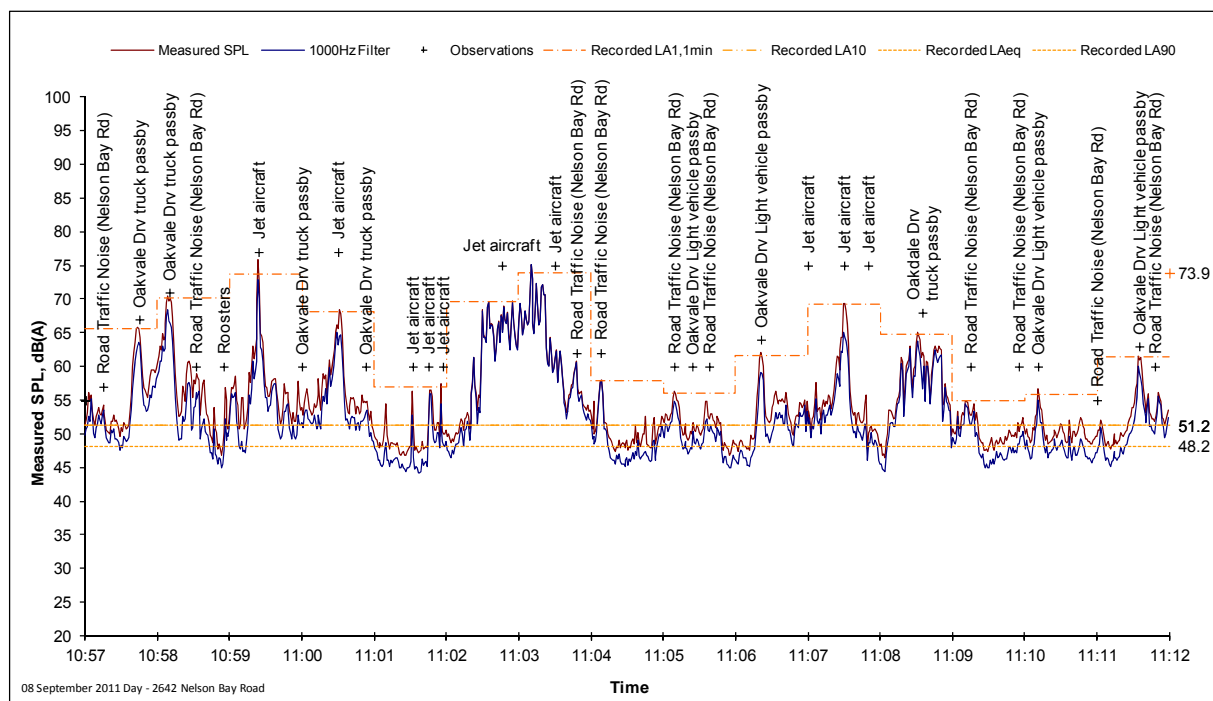
- the recorded overall A-weighted noise levels at 1 second intervals over a 15 minute measurement period;
- the results of a 1000 Hz low pass filter at 1 second intervals over the 15 minute measurement period;
- an assessment of the maximum LA1, 1 minute noise level recorded over the 15 minute measurement period for night period measurements; and,
- the LAeq, 15 minute and LA90, 15 minute noise levels for the 15 minute measurement period.

Comments regarding the noise sources contributing to the ambient noise levels are also presented on **Figures 4.7 to 4.10**.

An assessment of the results from the attended noise monitoring program and the corresponding meteorological conditions are provided in **Section 4.5.2**.

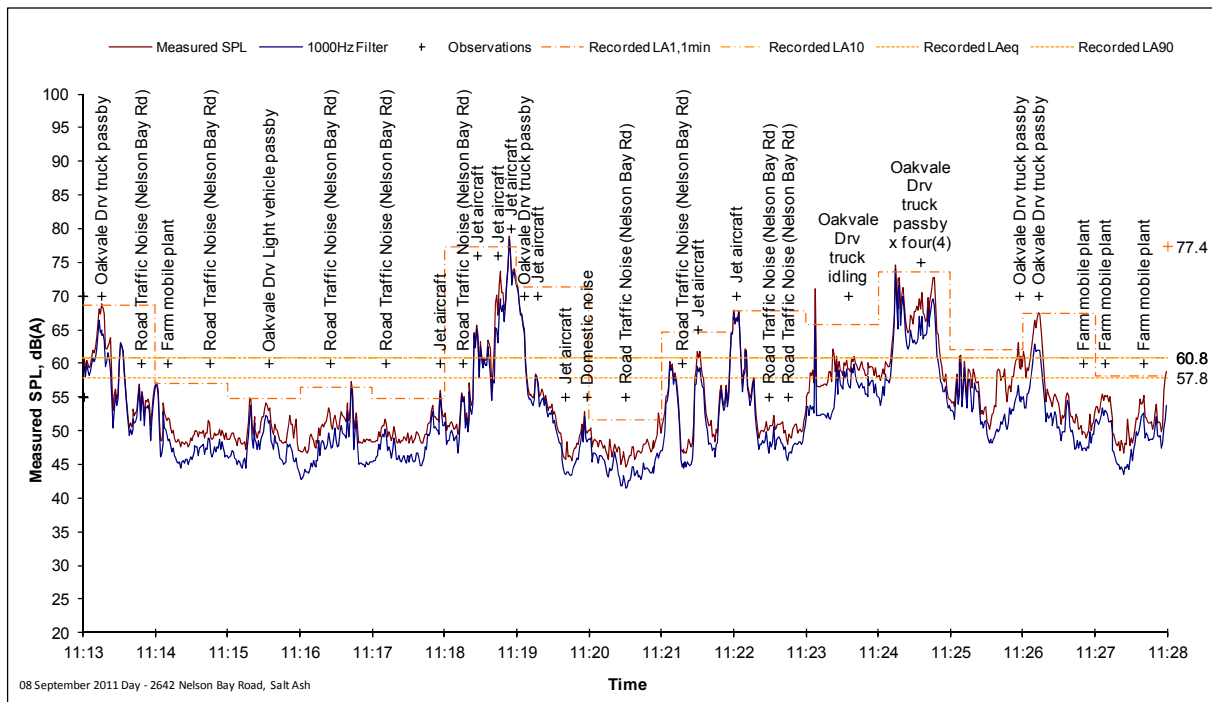
4.4.5 Attended Traffic Noise Monitoring on 8 September 2011

Figure 4.7 – Site 5, 10.58 am (2642 Nelson Bay Road, Salt Ash), 8 September 2011



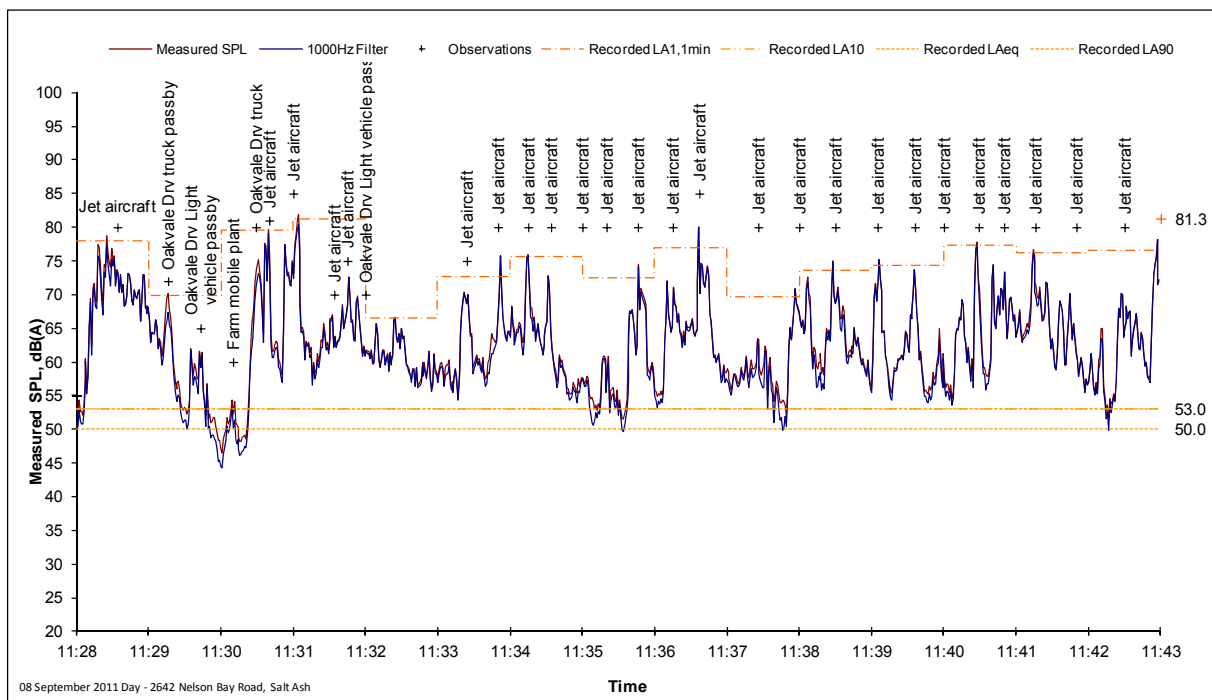
The results in **Figure 4.7** indicate that the ambient noise levels at monitoring location Site 5 (2642 Nelson Bay Road, Salt Ash) were dominated by jet aircraft noise sources, continuous road traffic noise from Nelson Bay Road and intermittent road traffic noise from Oakvale Drive. The LAeq, 15 minute noise contribution resulting from road truck activity along Oakvale Drive was calculated and utilised to derive the LAeq, 1 hour road traffic noise contribution at this monitoring location.

Figure 4.8 – Site 5, 11.13 am (2642 Nelson Bay Road, Salt Ash), 8 September 2011



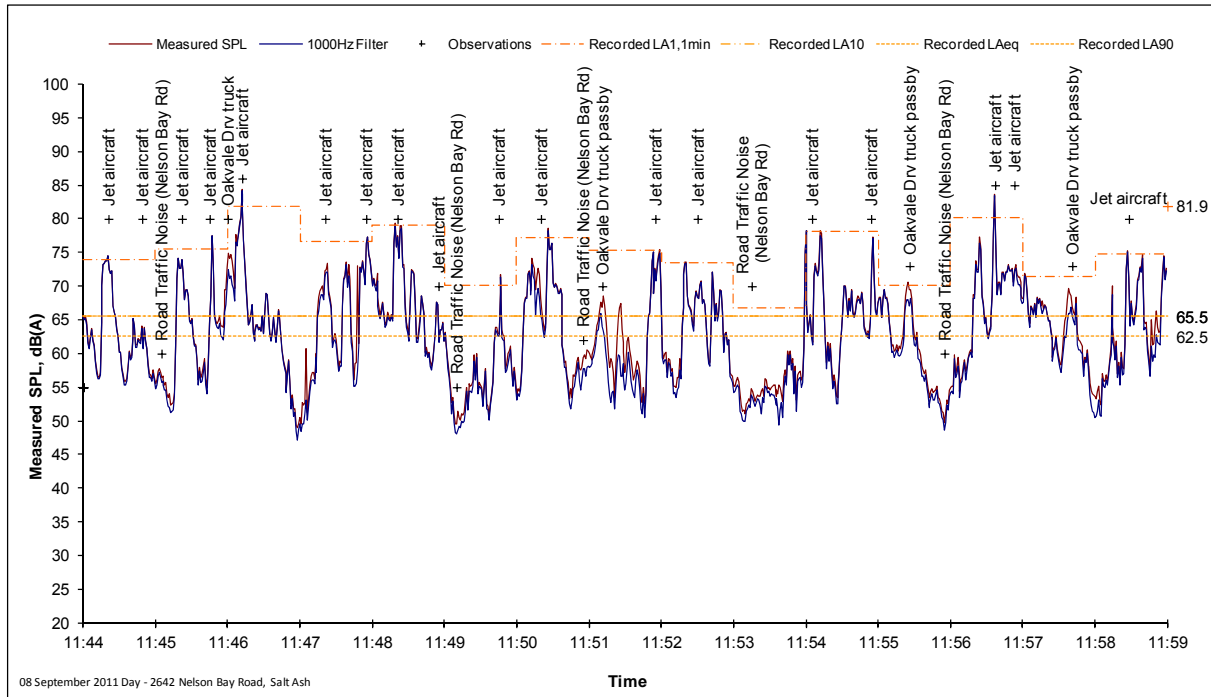
The results in **Figure 4.8** indicate that the ambient noise levels at monitoring location Site 5 were dominated by jet aircraft noise sources, continuous road traffic noise from Nelson Bay Road, intermittent road traffic noise from Oakvale Drive and mobile farming equipment being operated in the vicinity. The LAeq, 15 minute noise contribution resulting from road truck activity along Oakvale Drive was calculated and utilised to derive the LAeq, 1 hour road traffic noise contribution at this monitoring location.

Figure 4.9 – Site 5, 11.29 am (2642 Nelson Bay Road, Salt Ash), 8 September 2011



The results in **Figure 4.9** indicate that the ambient noise levels at monitoring location Site 5 were dominated by jet aircraft noise sources, continuous road traffic noise from Nelson Bay Road, intermittent road traffic noise from Oakvale Drive and mobile farming equipment being operated in the vicinity. The LAeq, 15 minute noise contribution resulting from road truck activity along Oakvale Drive was calculated and utilised to derive the LAeq, 1 hour road traffic noise contribution at this monitoring location.

Figure 4.10 – Site 5, 11.44 am (2642 Nelson Bay Road, Salt Ash), 8 September 2011



The results in **Figure 4.10** indicate that the ambient noise levels at monitoring location Site 3 (R24 – 9A Janet Parade) were dominated by continuous road traffic noise from Nelson Bay Road, local fauna and jet aircraft noise sources. The LAeq, 15 minute noise contribution resulting from road truck activity along Oakvale Drive was calculated and utilised to derive the LAeq, 1 hour road traffic noise contribution at this monitoring location.

4.5 Assessment of Attended Monitoring Results

4.5.1 Assessment of Attended Monitoring Results – Industrial Noise

During the attended monitoring program, the ambient noise levels surrounding the Mackas Sand site were recorded with particular attention paid to the contribution of the Mackas Sand site operations.

The results of the attended noise monitoring program summarised in **Tables 4.3** and **4.4** indicate that, under the meteorological conditions at the time of monitoring, the Mackas Sand site was complying with the LAeq, 15 minute and LA1, 1 minute industrial noise assessment criteria outlined in the development consents and EPLs under which the Mackas Sand operates. Site related assessment criteria for industrial noise are summarised in **Section 2** of this report.

**Table 4.3 – Summary of Attended Industrial Noise Monitoring – September 2011, dB(A)
Night time Period: 6.15 to 7.00 am on 8 September 2011**

Location	Monitoring Period (15 min starting)	Measured Noise Level			Estimated Mackas Sand Contribution		Meteorological Conditions [Wind speed (m/sec), Direction, Temperature (°C), Humidity (%)]
		LA90, 15 min	LAeq, 15 min	LA1, 1min	Measure	Contribution	
Site 1	6.14 am	47	49	49	LAeq, 15 min LA1, 1 min	26 42	4.5 m/s, WSW, 13°C, 77%
Site 2	6.40 am	45	47	55	LAeq, 15 min LA1, 1 min	32 38	4.2 m/s, WSW, 14°C, 73%

Note: No measurements were conducted at Sites 3 and 4 in the night period.

**Table 4.4 – Summary of Attended Industrial Noise Monitoring – September 2011, dB(A)
Day time Period: 7.00 to 9.50 am on 8 September 2011**

Location	Monitoring Period (15 min starting)	Measured Noise Level			Estimated Mackas Sand Contribution		Meteorological Conditions [Wind speed (m/sec), Direction, Temperature (°C), Humidity (%)]
		LA90, 15 min	LAeq, 15 min	LA1, 1min	Measure	Contribution	
Site 2	8.54 am	42	50	64	LAeq, 15 min	34	4.2 m/s, W, 16°C, 65%
Site 3	8.20 am	45	47	56	LAeq, 15 min	29	3.6 m/s, W, 16°C, 70%
Site 4	7.26 am	15	54	74	LAeq, 15 min	26	4.0 m/s, WSW, 14°C, 72%
Site 4	9.34 am	40	48	66	LAeq, 15 min	27	3.1 m/s, WNW, 18°C, 63%

Note: No measurements were conducted at Site 1 in the night period.

4.5.2 Assessment of Attended Monitoring Results – Traffic Noise

During the attended monitoring program, the ambient noise levels at Site 5 (2642 Nelson Bay Road, Salt Ash) were recorded with particular attention paid to the contribution of the product haulage road truck activity on Oakvale Drive.

The results of the attended traffic noise monitoring program are summarised in **Table 4.5**. The LAeq, 1 hour traffic noise level resulting from the contribution of 19 truck movements past the monitoring location was 56 dB(A). None of these trucks were from Mackas Sand operations on Lot 220, however would be representative of a similar number of trucks hauling product from Lot 220.

**Table 4.5 – Summary of Attended Traffic Noise Monitoring – September 2011, dB(A)
Day time Period: 10.58 to 11.59 am on 8 September 2011**

Location	Monitoring Period (1 hour starting)	Measured Noise Level	Estimated road truck contribution		Meteorological Conditions [Wind speed (m/sec), Direction, Temperature (°C), Humidity (%)]
		LAeq	Measure	Contribution	
Site 5	10.58 am	64	LAeq, 1 hour	56	4 m/s, SSW, 19°C, 67%

Note: Monitoring results are noise levels those at 1 m from the worst affected facade.

5.0 Assessment of Compliance

5.1 Compliance Results – Industrial Noise

The measured industrial noise level contribution of the Mackas Sand site resulting from the attended noise surveys and the relevant noise assessment criteria are presented in **Tables 5.1** and **5.2** for the night period and day period respectively.

Table 5.1 – Predicted Night Time Industrial Noise Levels versus Noise Criteria, dB(A)

Location	LAeq, 15 minute		LA1, 1 minute	
	Noise Criteria	Noise Level Contribution	Noise Criteria	Noise Level Contribution
Site 1	35	26	45	42
Site 3	35	32	45	38

Note: No measurements were conducted at Sites 3 and 4 in the night period.

Table 5.2 – Predicted Day Time Industrial Noise Levels versus Noise Criteria, dB(A)

Location	LAeq, 15 minute	
	Noise Criteria	Noise Level Contribution
Site 2	36	34
Site 3	35	29
Site 4	36	26 to 27

Note: No measurements were conducted at Sites 3 and 4 in the night period.

The results from the Mackas Sand compliance noise monitoring presented in **Table 5.1** and **Table 5.2** indicate that the Mackas Sand sand extraction operations were generating noise levels during the periods of attended monitoring below relevant industrial noise criteria outlined in the development consents and EPLs under which the Mackas Sand operates and summarised in **Table 2.1**.

5.2 Compliance Results – Traffic Noise

During the attended road traffic noise monitoring period, between 10.58 am to 11.59 pm, there was no site associated road trucks activity using Oakvale Drive. Road truck movements past the monitoring location during the monitoring period were associated with vehicles servicing Mackas Sand and Soil and Sibelco Australia.

Nonetheless the road truck noise contribution over the hour monitoring period has been used as the basis for assessment of site traffic noise as it is understood that the vehicle fleet that services Mackas Sand and Soil and Sibelco Australia is representative of that servicing Mackas Sand operations on Lot 220.

As presented in Section 6 of the *Noise Management Plan for Sand Extraction Operations* (Umwelt 2009), traffic predictions for the proposed operations were previously made based on the traffic assessment undertaken by B J Bradley & Associates (October 2008). Traffic noise predictions were undertaken based on a maximum of 16 truck movements per hour (two ways) with an average of twelve 12 truck movements (two ways) per hour along Oakvale Drive.

In this case, the traffic noise level resulting from 19 heavy vehicle movements had an acoustic contribution over the hour long monitoring period of LAeq, 1 hour 56 dB(A) as shown in **Table 5.3**.

The results of the attended traffic noise monitoring conducted on the 8 September 2011 have been utilised to correlate the accuracy of the site traffic noise model to existing conditions.

A road traffic noise assessment was undertaken using the United States Federal Highway Administration (USFHWA) LAeq calculation method (reference) (US EPA Report 550/9-74-004, (March 1974) as modified. Based on equations in Appendix A-13 & CoRTN amendments).

The road traffic noise predictions were made using the following assumptions:

- 19 truck movements over the 1 hour period; and
- vehicle speed of 50 km/hr.

Predictions of road traffic noise resulting from the heavy vehicle traffic movements along Oakvale Drive, received at Site 5 (2642 Nelson Bay Road) situated along Oakvale Drive are presented in **Table 5.3**.

Table 5.3 – Comparative Analysis between Predicted and Measured Oakvale Drive Heavy Vehicle Road Traffic Noise, Site 5 (2642 Nelson Bay Road, Salt Ash)

Receiver Location	Heavy vehicle movements (two ways) per hour along Oakvale Drive	Measured heavy vehicle noise contribution LAeq, 1 hour	Predicted heavy vehicle noise contribution LAeq, 1 hour
Site 5	19	56 dB(A)	56 dB(A)

Results presented in **Table 5.3** indicate the site traffic noise model is accurate within ± 0.5 dB(A).

As previously presented in Section 7.4.2 of the *Noise Management Plan for Sand Extraction Operations* (Umwelt 2009), results of traffic noise predictions undertaken based on a maximum of 16 truck movements per hour (two ways) with an average of 12 truck movements (two ways) per hour along Oakvale Drive are presented in **Table 5.34**.

Table 5.4 – Predicted Road Traffic Noise Contribution at Site 5 based on Peak and Average Site Hourly Heavy Vehicle Movements

Receiver Location	Project Related Road Traffic – Peak LAeq, 1 hour	Project Related Road Traffic – Average LAeq, 1 hour	Criteria
Site 5	55 dB(A)	54 dB(A)	55 dB(A) LAeq, 1 hour

Heavy vehicle road traffic noise levels from the site related peak and average heavy vehicle movements are predicted to meet the relevant day time and night time criteria of 60 dB(A)

LAeq, 1 hour day and 55 dB(A) LAeq, 1 hour night at Site 5 (2642 Nelson Bay Road), the assessed residential receiver location along Oakvale Drive.

6.0 Recommendations

6.1.1 Continuous Improvement

During attended monitoring at R27 (Hufnagl), the broadband reverse alarms were audible and even though in compliance with consent requirements, could be quietened to reduce noise levels at this residence. Following discussions with Mackas Sand, it was agreed that Mackas Sand would implement the following noise control measure as a self-applied continuous improvement to minimise project-related noise emissions:

- As broadband reverse alarms were audible at the R27 monitoring location during attended monitoring, the emission volume of the broadband reverse alarms on site mobile plant items operating within the quarrying operations at Lot 220 will be lowered. The broadband reverse alarms only need to be effectively heard within the 'danger zone' or potential zone of impact.

It is noted that future noise-compliance monitoring will aim to be conducted during periods where there is minimal noise contribution from military aircraft bombing range operations. Air Force jet aircraft undertake bombing run sorties at the Williamtown RAAF Base bombing range situated north of the site.

7.0 Statement of Compliance

7.1.1 Statement of Compliance – Industrial Noise

Results of the attended industrial noise monitoring program conducted on 8 September 2011 indicated that Mackas Sand was complying with the LAeq, 15 minute and LA1, 1 minute industrial noise assessment criteria as outlined in the Mackas Sand Major Project Approval 08_0142 and EPL 13218 for the meteorological conditions experienced at the time of monitoring.

7.1.2 Statement of Compliance – Traffic Noise

During the attended traffic noise monitoring program conducted on 8 September 2011 there was no heavy vehicle activity along Oakvale Drive associated with Mackas Sand. Road truck movements past the monitoring location during the monitoring period were solely associated with vehicles servicing Mackas Sand and Soil and Sibelco Australia.

Results of the attended traffic noise monitoring program were utilised to correlate the accuracy of the site traffic noise model to existing conditions for the 19 heavy vehicle movements (two ways) an hour observed on 8 September 2011. Results of the model correlation presented in **Table 5.3** indicate the site traffic noise model is accurate within ± 0.5 dB(A).

Results of traffic noise predictions undertaken based on a maximum of 16 truck movements per hour (two ways) with an average of 12 truck movements (two ways) per hour along Oakvale Drive were presented in **Table 5.4**. The predicted noise levels at the façade of Site 5 (2642 Nelson Bay Road) resulting from peak and average hourly traffic movements associated with the Project would be 55 dB(A) LAeq, 1 hour and 54 dB(A) LAeq, 1 hour respectively.

The predicted road traffic noise results correlated against existing site conditions at Site 5 (2642 Nelson Bay Road) indicate compliance against the traffic noise assessment criteria as outlined in Major Project Approval 08_0142) and EPL 13218 for the meteorological conditions experienced at the time of monitoring.

8.0 References

Australian Standard AS1055-1989. 'Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures'.

NSW Environment Protection Authority 1999. *Environmental Criteria for Road Traffic Noise*.

NSW Environment Protection Authority 1994. *Environmental Noise Control Manual*.

NSW Environment Protection Authority 2000, *New South Wales Industrial Noise Policy*.

Umwelt (Australia) Pty Limited, 2009. *Noise Management Plan for Sand Extraction Operations*.

Umwelt (Australia) Pty Limited, 2009. *Noise Impact Assessment of Sand Extraction Operations from Lot 218 DP 1044608 and Lot 220 DP 1049608, Salt Ash*.

APPENDIX 1

Glossary and Abbreviations

Appendix 1 – Glossary and Definitions – Acoustics

1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit
ABL	Assessment background level - A single-figure background level representing each assessment period – day, evening and night (that is, three assessment background levels are determined for each 24-h period of the monitoring period). It is determined by taking the lowest 10th percentile of the L90 level for each assessment period
Airblast	Sound wave from blasting (overpressure)
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise
dB(A)	Decibels A-weighted
dB(L), dB(Lin)	Decibels Linear or decibels Z-weighted
Decibel (dB)	The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud
Hertz (Hz)	The measure of frequency of sound wave oscillations per second – 1 oscillation per second equals 1 hertz
LA10	The percentile sound pressure level exceeded for 10 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source
LA90	Background Noise Level. The percentile sound pressure level exceeded for 90 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis
LAm _{ax}	The maximum of the sound pressure levels recorded over an interval of 1 second
LA1, 1 minute	The measure of the short duration high-level noises that cause sleep arousal. The noise level is measured as the percentile sound pressure level that is exceeded 1 per cent of measurement period with 'A' frequency weighting calculated by statistical analysis during a measurement time interval of 1 minute

LAeq,t	Equivalent continuous sound pressure level - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. Usually measured in dB with 'A' weighting
LAn	Percentile level – A measure of the fluctuation of the sound pressure level which is exceeded 'n' per cent of the observation time
MIC	Maximum explosive charge mass (kg) detonated per delay (any 8ms interval)
PVS (mm/s)	Peak Vector Sum
PVV (mm/s)	Peak Particle Velocity
RBL	Rating background level - The overall single figure background level representing each assessment period over the whole monitoring period determined by taking the median of the ABLs found for each assessment period
SD (m)	The scaled distance for airblast and ground vibration from the charge to the receiver
SPL (dBL)	Blasting: peak airblast level measured in dB Linear
SPL (dBA)	Noise: Sound pressure level - The basic measure of noise loudness. The level of the root-mean-square sound pressure in decibels given by: $SPL = 10 \cdot \log_{10} (p/p_0)^2$ <p>where p is the rms sound pressure in pascals and p₀ is the sound reference pressure at 20 μPa. decibels</p>
SWL	Sound power level - A measure of the energy emitted from a source as sound and is given by: $SWL = 10 \cdot \log_{10} (W/W_0)$ <p>where W is the sound power in watts and W₀ is the sound reference power at 10⁻¹² watts</p>