Fullerton Cove Sand Extraction

Noise Assessment

January 2009

Prepared for
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EXECUTIVE SUMMARY

This report provides information regarding a noise assessment of proposed sand extraction at Lot 991 DP627179, Lot 1910 DP 557701, Lot 1 DP 1006307, Lot 3 DP 11519, Lot 1 DP 794575 and Lot 201 DP 39968 George Street, Fullerton Cove, NSW (subject site).

The proposal consists of sand extraction from the working face using a wheel loader directly into road trucks for transportation off site. Extraction will commence in the northern section of the site and progress towards the south. As shown on Figure 1, the proposed extraction will remove a sand ridge resulting in a final RL of 3 metres, a similar level to the adjoining land.

The timeframe for extraction is between 12 months and 7.5 years, though is more likely to be in the order of 3 to 5 years.

An assessment of construction, operational and traffic noise emissions from the proposed sand extraction at Fullerton Cove has been undertaken.

Construction noise impacts will generally be in the range L_{Aeq} 55 to 60 dB, but may be as high as L_{Aeq} 77 dB. This is considered acceptable for short-term activities such as those proposed.

No operational noise impacts are predicted, with the exception of the final stage of the development. Measures are proposed to minimize impacts.

Calculated noise levels for traffic movements to and from the site along Coxs Lane and the entry track are below the daytime criterion of $L_{Aeq(1hr)}$ 55 dB. The destination for product will primarily be in the Newcastle direction. Impacts to traffic noise levels on Nelson Bay Road have not been considered due to the existing traffic volumes (high).

To minimise any possible changes to road traffic noise levels between the existing and the final (post extraction) landform, it is recommended that barrier heights be increased as described in Section 4.4.2.

The proposed development, as described in this document, could proceed in compliance with DECC noise guidelines.

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1 INTRODUCTION

1.1 BACKGROUND AND PROJECT DESCRIPTION

This report provides information regarding a noise assessment of proposed sand extraction at Lot 991 DP627179, Lot 1910 DP 557701, Lot 1 DP 1006307, Lot 3 DP 11519, Lot 1 DP 794575 and Lot 201 DP 39968 George Street, Fullerton Cove, NSW (subject site).

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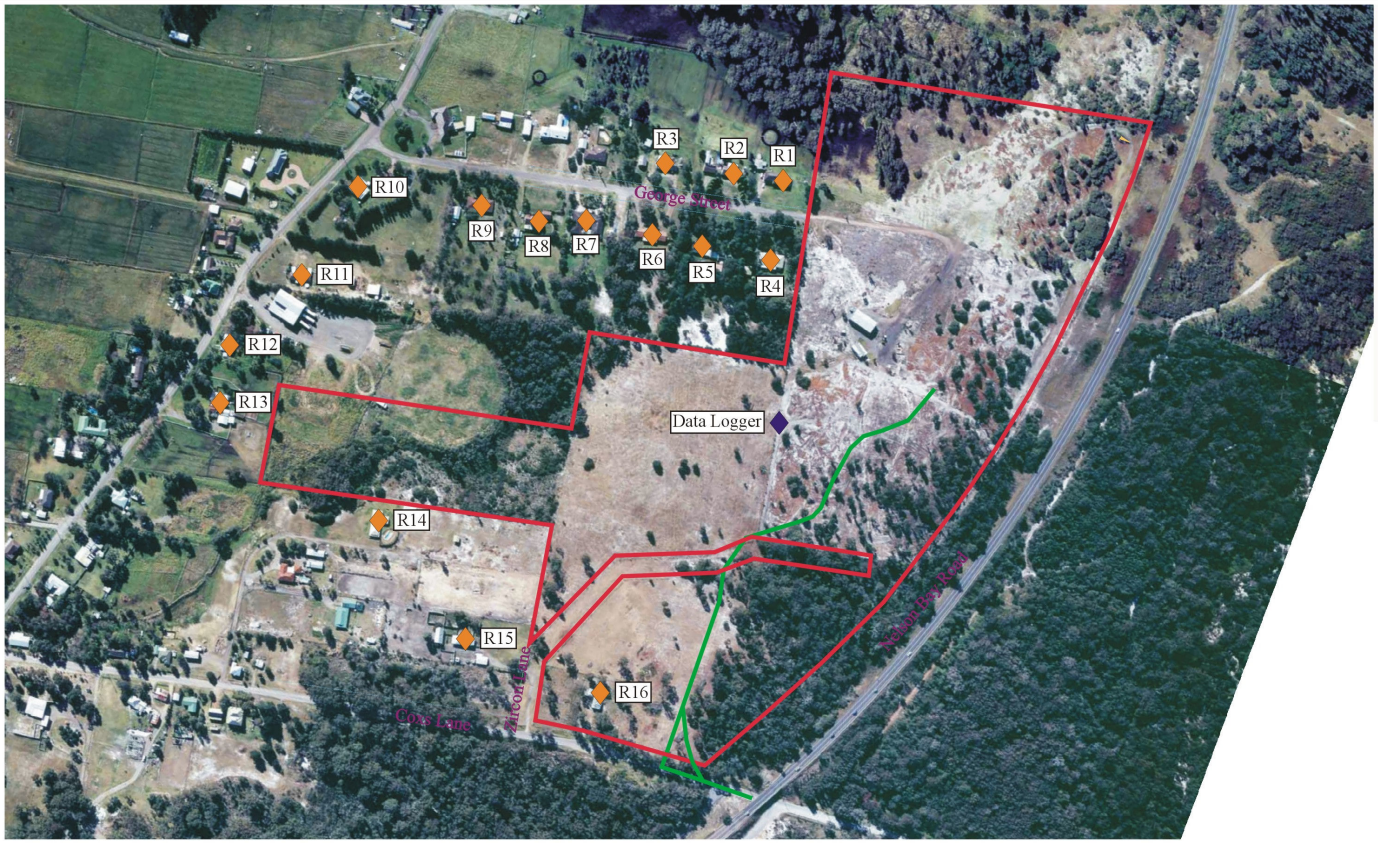
The timeframe for extraction is between 12 months and 7.5 years. While it is highly unlikely that the extraction operation would be completed in 12 months and is more likely to take 3 to 5 years, this timeframe has been chosen as a worst-case scenario.

Noise issues considered in this report include:

- Background noise levels;
- Additional traffic movement impacts;
- Changes to barrier effect on road traffic noise;
- Construction of a noise/visual bund; and
- Operational noise.

Figure 1 shows the location of the subject site and surrounding dwellings.



Source: Orogen

Unattended Monitoring Location
R16 Nearest residences
Haul Route
Study Area

Figure 1 Study Area

1.2 TERMINOLOGY

Some definitions of terminology, which may be used in this report are provided in Table 1.1.

Table 1.1 TERMINOLOGY

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Aeq}	The average noise energy during a measurement period
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Day	The period 7:00am to 6:00pm
Evening	The period 6:00pm to 10:00pm
Night	The period 10:00pm to 7:00am

2 CRITERIA

2.1 CONTRUCTION

The Department of Environment and Climate Change (DECC) have recently released the draft 'Construction Noise Guideline' (August 2008). The guideline specifically relates to construction, maintenance and renewal activities.

The guideline suggests that a qualitative assessment is required where the duration of the works is less than one week, is small-scale construction or undertaken only during the standard construction hours of:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

There are no specific criteria to apply for a qualitative assessment and calculation of construction related noise levels is not required. Instead, a checklist should be completed which considers (but is not limited to) work practices, community consultation, alternative plant and equipment, on-site considerations, work scheduling and barriers.

For major construction projects, or where construction is taking place outside the recommended standard hours, a quantitative assessment is required with comparison to relevant criteria. The maximum recommended management level of $L_{Aeq(15\ min)}$ 75 dB is specified, above which the community is considered to be 'highly noise affected' (DECC, 22008).

Although there are no specific targets for the scale of construction considered in this assessment, an upper limit of $L_{Aeq(15\ min)}$ 75 dB could be adopted for activities greater than one week in duration. All reasonable and feasible noise control methods and community consultation should be considered prior to the commencement of construction.

2.2 OPERATION

The EPA Industrial Noise Policy (INP) states that objectives for environmental noise are '*to account for intrusive noise and ... to protect the amenity of particular land uses*'. To achieve these objectives, limits are specified where the '*intrusiveness criterion essentially means that the equivalent continuous (energy-average) noise level of the source should not be more than 5 decibels (dB) above the measured background level*'. Amenity is protected by '*noise criteria specific to land use and associated activities*'. Amenity criteria '*relate only to industrial-type noise and do not include road, rail or community noise*'.

Applicable intrusiveness and amenity limits are derived independently. These are then compared to determine project specific criteria.

The intrusiveness criterion is expressed as:

$$L_{Aeq,15\ minute} \leq RBL + 5$$

where $L_{Aeq,15\ minute}$ is the $_{LAeq}$ noise level from the source, measured over 15 minutes and RBL is the rating background level. Where the RBL is less than L_{A90} 30 dB, a value of L_{A90} 30 dB can be adopted.

An amenity criterion caps industrial noise levels. Recommended amenity limits from the INP for residences in a suburban area are shown in Table 2.1.

Table 2.1 SUBURBAN AREA AMENITY CRITERIA, L_{Aeq} dB

Period	Acceptable	Maximum
Day	55	60
Evening	45	50
Night	40	45

Notes: 1 Day: 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: 10:00pm to 7:00 am.

The suburban amenity criteria have been selected for the residences surrounding the subject site. The houses in George Street and Fullerton Cove Road are in a township style arrangement. While these roads have typically intermittent traffic flow, the nearby Nelson Bay Road has through traffic with heavy flows during peak periods, which significantly affects the noise environment of the area.

Table 2.2 summarises the intrusiveness and amenity criteria that apply for day, evening and night periods. The lower of the two (intrusiveness or amenity) apply and is adopted as the project specific criterion.

As detailed in Section 4.1, weather conditions resulted in a significant proportion of the data being unsuitable due to elevated wind speeds (according to the INP method). As wind speeds are generally higher in coastal areas, whilst the background levels are technically affected by higher wind speeds, the levels are still representative of this area. As a result, the daytime L_{A90} of 41 dB will be used as the representative background level and used to determine appropriate criterion.

Table 2.2 PROJECT SPECIFIC CRITERIA

Period	RBL	Intrusiveness Criterion L_{Aeq} (dB)	Acceptable Amenity Criterion L_{Aeq} (dB)	Project Specific Criterion L_{Aeq} (dB)
Day	41	46	55 to 60	46

Notes: 1. Day: 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: 10:00pm to 7:00 am.

Noise from the sand extraction activities should be compared with the L_{Aeq} 46 dB criterion.

2.3 CUMULATIVE NOISE

The area surrounding the site is generally sparsely populated with limited industrial activities. The most significant is the Boral sand extraction operation on the opposite side of Nelson Bay Road, approximately 600 metres to the south. Given the distance to the actual operation and the intervening traffic noise, cumulative noise is not considered to be significant and has therefore not been assessed.

2.4 TRANSPORTATION

2.4.1 Operation

In 1999 the EPA released the '*Environmental Criteria for Road Traffic Noise'* (RTNP) guidelines. These criteria are applicable to this project and apply different noise limits dependent upon the development category and receptor type. Table 2.3 shows the applicable criteria for the proposal.

Table 2.3 NSW GOVERNMENT TRAFFIC NOISE CRITERIA

Development Type	Day Criteria $L_{eq(1hr)}$ dB(A)	Night Criteria $L_{eq(1hr)}$ dB(A)	Where Criteria is already exceeded
Land use developments with potential to create additional traffic on local roads	55	50	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, regulated times of use, using clustering, using 'quiet' vehicles, and using barriers and acoustic treatment. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Notes: 1. Day $L_{Aeq(15hr)}$ from 7am to 10pm ~ Night $L_{Aeq(9hr)}$ from 10pm to 7am.

The $L_{Aeq(1hr)}$ criteria for land use developments with potential to create additional traffic on local roads will be applied to traffic entering and leaving the subject site.

2.4.2 Changes to Barrier Effect

In accordance with written correspondence from the Department of Planning (DoP) dated 2 September 2008, a review of the effect of changing the barrier between Nelson Bay Road and George Street residences has been undertaken. Follow up conversations with representatives from DoP resolved that a review showing the relative difference in barrier attenuation from the site would be sufficient.

The RTNP is the most useful policy for this review, however, the RTNP does not specifically address this type of situation. In addition, it should be noted that criteria detailed in the RTNP are not mandatory.

However, the philosophy of the RTNP is that (in this case where noise levels from road traffic already exceed the noise criteria), *'it is expected that strategies be implemented to contain any increases to 2 dB above the prevailing noise levels before re-development begins.'*

In accordance with this, any increase in traffic noise due to changing the barrier between receptors and Nelson Bay Road (quantified by the relative difference in barrier attenuation from pre to post extraction) should be limited to no more than 2 dB above existing levels.

3 METHODOLOGY

3.1 BACKGROUND NOISE MEASUREMENTS

Local environmental noise level measurements were made from 19 to 26 November 2007 using a noise data logger. The logger was configured to provide a statistical noise data summary every 15 minutes. It was placed in the central part of the subject site at Fullerton Cove as shown on Figure 1. This location will be representative of noise levels that will be received by the nearest dwellings to the subject site. Traffic noise from Nelson Bay Road dominates the daytime local acoustic environment.

Logged data was analysed in accordance with the DECC 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' for the determination of background noise levels.

The equipment used to measure and record environmental noise levels are listed in Table 3.1. Calibration certificates are provided in Appendix A.

Table 3.1 MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NL21 data logger	354120	22/05/2009
Bruel &Kjaer 4230 calibrator	523178	11/01/2008

3.2 CONSTRUCTION

Visual/noise bunds will be constructed around the site (as shown in Figure 2) to provide some mitigation from the sand extraction operation. It is anticipated that construction of the bunds will take 2 to 3 weeks and be undertaken primarily by the loader.

In addition, site establishment will include vegetation clearing and road construction using equipment detailed in Table 3.2. It is anticipated that the construction phase will take 4 to 6 weeks to complete.

Table 3.2 PLANT ITEM LIST - CONSTRUCTION

Plant Item	Number	Sound Power L_{Aeq} dB
Small front end loader (FEL) – Komatsu WA120	1	103
CAT 140H grader	1	109
CAT D8 dozer	1	110
Chainsaw	1	114
Chipper/tub grinder	1	116

Construction noise has been calculated over a range of distances. The calculations assume there will be no losses due to barriers, air or ground absorption and are therefore worst case levels.

3.3 OPERATION

Noise levels were calculated to determine the acoustic impact of sand extraction and associated activities. The proximity of receivers means that enhancement or losses due to meteorological conditions are unlikely to be significant. In addition, given activities will only be taking place during daytime hours, it is not necessary to consider the effect of temperature inversions on noise levels.

Several scenarios have been modelled to determine the received noise levels at the nearest residences. Barrier attenuation resulting from the construction of a noise/visual bund prior to the commencement of operation is likely to be an effective noise control. Figure 2 shows the location and size of the bunds. The bunds vary between 2 and 10 metres high and 110 to 500 metres long.

The location of residences and operating scenarios are shown in Figure 2. Scenarios have been selected to provide worst-case noise levels for various operational phases of the project.

Predicted results are L_{Aeq} as per INP requirements. Plant sound powers are provided in Table 3.3. Each operating scenario includes all items of equipment listed in the table below.

Table 3.3 PLANT ITEM LIST – OPERATION

Plant Item	Number	Sound Power L_{Aeq} dB
Highway truck, static @ 1500 rpm	1	100
Small front end loader – Komatsu WA120	1	103

The sound power of the front-end loader assumes 50 per cent operation.

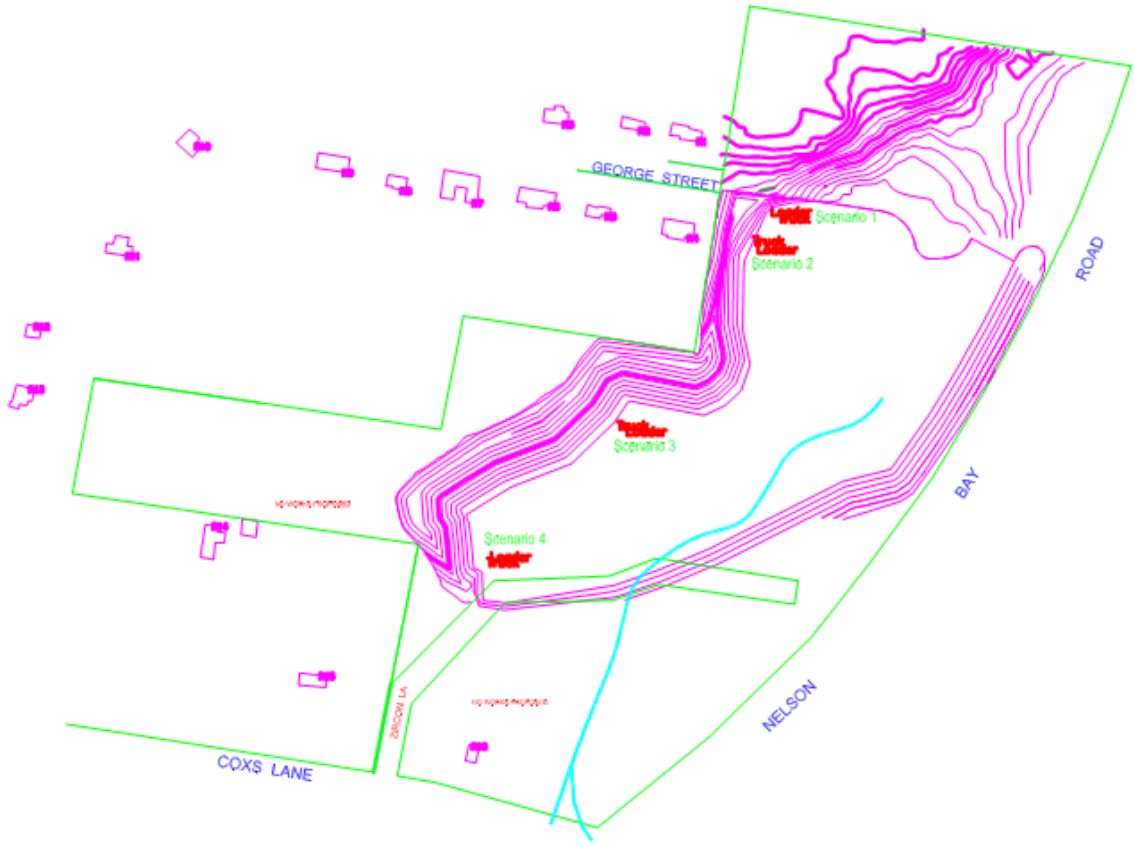


Figure 2 Plant layout for modelling

3.4 TRANSPORTATION

3.4.1 Operation

Road traffic noise levels from proposed additional vehicle movements have been calculated using the '*Federal Highway Administration Model*' (FHWA) (US Department of Transportation, 1978).

Heavy and light vehicles would access the site via Nelson Bay Road, Coxs Lane and then onto a purpose built haul road to the east of Zircon Lane. As vehicles would not pass any houses on Coxs Lane, traffic noise levels (from the proposed haul road) have been calculated specifically for residence R16 (as shown in Figure 1).

3.4.2 Changes to Barrier Effect

This report will look at relative changes in the barrier effects from the before extraction and after extraction landforms. Calculations include several cross sections from the two nearest residences on George Street to Nelson Bay Road. The location of barriers in relation to R1 and R4 (on George Street) are shown on Figure 2.

Residences 1 and 4 have been considered in this assessment as worst-case examples.

4 RESULTS

4.1 BACKGROUND NOISE MEASUREMENTS

Table 4.1 provides a summary of noise logger data, graphs are provided as Appendix B.

Table 4.1 AVERAGE LOGGED NOISE LEVELS FOR OFF GEORGE STREET, FULLERTON COVE

Period	L_{Aeq} dB	L_{A10} dB	L_{A90} dB	L_{A90} dB [1]	RBL
Day	51	53	45	41	40
Evening	49	51	41	37	39
Night	45	48	37	27	27

Notes: *1 Lowest repeated L_{A90};*

2. Day: 7:00 am to 6:00 pm ~ Evening: 6:00pm to 10:00pm ~ Night: 10:00pm to 7:00 am;

3. Levels at Fullerton Cove are high due to the proximity to Nelson Bay Road traffic noise.

Weather conditions resulted in a significant proportion of the data being unsuitable due to elevated wind speeds (according to the INP method). Data was obtained from the nearest representative Bureau of Meteorology station, which in this case was Williamtown. Wind speeds are generally higher in coastal areas and so, whilst the background levels are technically affected by higher wind speeds, the levels are still considered representative of this area.

The RBL value is the single number that represents background noise in accordance with the INP. However, the data exclusion due to elevated wind speeds resulted in a significant proportion of daily levels (ABL's) being unavailable.

As a result, the lowest repeated daytime L_{A90}, the 10^{th} percentile of the entire day data set, is considered to be the representative background level for the area and has been used to determine the criterion.

An L_{A90} of 41 dB has been selected as representative of daytime background levels in this area.

4.2 CONSTRUCTION

L_{Aeq} sound power levels (L_w) for construction equipment is detailed in Table 3.2. Results for a range of distances from the nearest receivers to the barrier construction have been calculated and are detailed in Table 4.2.

Table 4.2 CONSTRUCTION NOISE IMPACTS

Distance	FEL	Grader	Dozer	Chainsaw	Chipper
	L_{Aeq} dB	L_{Aeq} dB	L_{Aeq} dB	L_{Aeq} dB	L_{Aeq} dB
15	71	77	78	82	84
20	69	75	76	80	82
25	67	73	74	78	80
30	65	71	72	76	78
35	64	70	71	75	77
40	63	69	70	74	76
45	62	68	69	73	75
50	61	67	68	72	74
55	60	66	67	71	73
60	59	65	66	70	72
65	59	65	66	70	72
70	58	64	65	69	71
75	57	63	64	68	70
80	57	63	64	68	70
85	56	62	63	67	69
90	56	62	63	67	69
95	55	61	62	66	68
100	55	61	62	66	68
105	55	61	62	66	68
110	54	60	61	65	67
115	54	60	61	65	67
120	53	59	60	64	66
125	53	59	60	64	66
130	53	59	60	64	66

As shown in Table 4.2, the highest construction noise levels occur at the closest distance. This is equivalent to the loader operating on the boundary nearest R4 and is a worst-case predicted level for barrier construction.

There will be limited vegetation clearing and internal road construction near residences with the majority of activities taking place on the eastern side of the site. For most residences, which will generally be a minimum of 100 metres from this equipment, levels less than L_{Aeq} 62 dB are expected.

Due to elevated levels from the tub grinder it is recommended that this item be located on the eastern side of the site, without direct line of sight to residences. Increasing losses due to distance and barriers will reduce levels below those stated in Table 4.2.

Representative noise levels for the dozer operating near the boundary of the site (constructing bunds is the likely worst case scenario) are provided in Table 4.3.

Table 4.3 CALCULATED L_{Aeq} dB, CONSTRUCTION SCENARIO - DOZER

Receptor	Predicted L_{Aeq}
R1	64
R2	62
R3	58
R4	77
R5	63
R6	62
R7	61
R8	59
R9	56
R10	52
R11	54
R12	53
R13	54
R14	64
R15	62
R16	63

4.3 OPERATION

Calculated noise levels for the four operating scenarios described in Section 3.3 are provided in Table 4.4 to Table 4.7.

Table 4.4 CALCULATED L_{Aeq} dB, SCENARIO 1

Receptor	Predicted	Criterion	Exceedance
R1	41	46	Nil
R2	38	46	Nil
R3	35	46	Nil
R4	40	46	Nil
R5	36	46	Nil
R6	34	46	Nil
R7	31	46	Nil
R8	30	46	Nil
R9	28	46	Nil
R10	26	46	Nil
R11	25	46	Nil
R12	24	46	Nil
R13	24	46	Nil
R14	26	46	Nil
R15	24	46	Nil
R16	24	46	Nil

Table 4.5 CALCULATED L_{Aeq} dB, SCENARIO 2

Receptor	Predicted	Criterion	Exceedance
R1	39	46	Nil
R2	37	46	Nil
R3	33	46	Nil
R4	41	46	Nil
R5	36	46	Nil
R6	34	46	Nil
R7	31	46	Nil
R8	29	46	Nil
R9	28	46	Nil
R10	26	46	Nil
R11	25	46	Nil
R12	24	46	Nil
R13	24	46	Nil
R14	25	46	Nil
R15	25	46	Nil
R16	25	46	Nil

Table 4.6 CALCULATED L_{Aeq} dB, SCENARIO 3

Receptor	Predicted	Criterion	Exceedance
R1	28	46	Nil
R2	28	46	Nil
R3	28	46	Nil
R4	31	46	Nil
R5	31	46	Nil
R6	30	46	Nil
R7	29	46	Nil
R8	27	46	Nil
R9	26	46	Nil
R10	23	46	Nil
R11	22	46	Nil
R12	21	46	Nil
R13	22	46	Nil
R14	27	46	Nil
R15	33	46	Nil
R16	37	46	Nil

Table 4.7 CALCULATED L_{Aeq} dB, SCENARIO 4

Receptor	Predicted	Criterion	Exceedance
R1	26	46	Nil
R2	25	46	Nil
R3	25	46	Nil
R4	27	46	Nil
R5	27	46	Nil
R6	27	46	Nil
R7	27	46	Nil
R8	27	46	Nil
R9	26	46	Nil
R10	24	46	Nil
R11	25	46	Nil
R12	24	46	Nil
R13	24	46	Nil
R14	30	46	Nil
R15	39	46	Nil
R16	43	46	Nil

From the above it can be seen that no noise impacts are predicted for sand extraction operations. It is recommended that equipment operate close in behind the barriers (and the advancing extraction face) at all times as this provides maximum noise mitigation.

It should be noted that these results are often worst-case levels as equipment is positioned close to nearby receivers in the scenarios modelled. For the majority of the operation, levels will be lower than those predicted.

However, in the final stages of the operation, material (forming the bund wall) will be removed from the area to the east of George Street to re-establish access to the site from George Street. When this occurs, equipment will have line of sight with residences on George Street. Exceedances of the criterion may occur during this time, however, it is anticipated that this work will take less than one week.

4.4 TRANSPORTATION

4.4.1 Operation

Transportation Heavy and light vehicles would access the site via a purpose built entry, Coxs Lane and Nelson Bay Road using the grade separated intersection. Light vehicles would be able to access the site via Fullerton Cove Road and George Street, however, it is understood that all vehicles will use the access off Coxs Lane.

Two scenarios have been considered for proposed traffic movements:

1. Extraction over a 12 month period, assuming an 8 hour working day, there would be 25 inbound and 25 outbound truck/ truck and trailer movements per hour;
2. Extraction over a 7.5 year period, assuming an 8 hour working day, there would be a maximum of 4 inbound and 4 outbound truck/ truck and trailer movements per hour;

Worst-case noise levels from heavy vehicles using the site access and Coxs Lane were calculated based on the following parameters:

- 40 kilometres per hour speed limit on the entry track (this is a worst case estimate as calculations using a lower speed resulted in lower calculated levels);
- 30 kilometre per hour speed on Coxs Lane (while the speed limit may be higher, the intersection for the entry track is not far along Coxs Lane and traffic will be slower);
- 50 vehicle movements per hour for extraction over a 12 month period; and
- 8 vehicle movements per hour for extraction over a 7.5 year period.

Table 4.8 TRAFFIC NOISE IMPACTS

Location	12 Month Extraction Period $L_{Aeq(1hr)}$ dB	7.5 Year Extraction Period $L_{Aeq(1hr)}$ dB
R16 – Coxs Lane	46	38

All results are below the daytime criterion of $L_{Aeq(1hr)}$ 55 dB.

The destination for the product will primarily be in the Newcastle direction. Impacts to traffic noise levels on Nelson Bay Road have not been considered due to the existing traffic volumes (high). The Traffic Impact Assessment carried out by Mark Waugh Pty Ltd for the development indicates that an increase of 25 vehicle movements per hour represents an increase of less than 3 per cent during peak hours.

4.4.2 Changes to Barrier Effect

Calculated differences for the residences described in Section 3.4.2 are provided in Table 4.8. Calculations based on the original final landform resulted in a relative difference between the existing landform and the post extraction landform that was higher than desired. As a result, heights for both the western and eastern barriers were increased to provide a relative difference closer to 1 dB.

Table 4.9 CHANGES TO BARRIER EFFECT

Receptor	Original Relative Difference (dB)	Revised Relative Difference (dB)
R1	3.5	1.3
R4	1.8	0.6

In order to achieve the revised relative difference in levels between the existing landform and the final (post extraction) landform, the following is recommended:

- Increase the height of the western barrier (adjacent to R4) from RL 7 metres to RL 8.5 metres;
- Increase the height of the eastern barrier (adjacent to Nelson Bay Road) from RL 5 metres to RL 8 metres.

5 DISCUSSION

5.1 CONSTRUCTION

The predicted noise level for hypothetical construction scenarios, as shown in Table 4.2 and Table 4.3 may at some times be significant. To minimise impacts consideration should be given to noise control. Options include:

- Selection of low noise emission plant (some plant can be 5 dB or more quieter with engineering noise controls, smaller plant items are often quieter);
- Use of 'duck quaker' style reverse beepers. This style of reverse beep is less intrusive;
- Locating the tub grinder on the eastern side of the site with no direct line of sight to nearest residences (if possible);
- Operators not to leave plant idling when not in use;
- Temporary noise barriers (erect hoarding adjacent to work areas as required); and
- Educate contractors about quieter work practices (this can be particularly useful with regard to limiting maximum noise levels).

It is recommended that community information be provided and liaison carried out, preferably by direct contact. This is not seen as unreasonable given that the project area is relatively small and not likely to affect many residences.

Construction of the noise and visual bunds will only take 2 to 3 weeks in total, so any direct impact to nearby residences will be for a relatively short period of time.

5.2 OPERATION

An L_{Aeq} is the energy average of all noise levels for a period of time. Noise levels above and below the energy average are likely unless the source is very constant; noise emissions from sand extraction operations are generally not constant.

These results show that use of standard equipment will be satisfactory with no noise impacts predicted. This is primarily due to the barriers between each residence and the operation.

However, in the final stages of the operation, material that comprises the bund wall will be removed from the area to the east of George Street to re-establish access to the site. When this occurs, equipment will have line of sight with residences on George Street and exceedances of the criterion may occur.

In order to mitigate the impacts from this stage of the operation, it is proposed to:

- Educate contractors about quieter work practices including operators not to leave plant idling when not in use;

- Selection of low noise emission plant (some plant can be 5 dB or more quieter with engineering noise controls, smaller plant items are often quieter);
- Use of 'duck quaker' style reverse beepers. This style of reverse beep is less intrusive;
- Operate behind the active extraction face for as long as possible to provide shielding; and
- Monitor noise levels during this stage of the development.

5.3 TRANSPORTATION

Heavy and light vehicles would access the site via a purpose built entry track, Coxs Lane and Nelson Bay Road using the grade separated intersection.

Worst-case noise levels from heavy vehicles using Coxs Lane and the access were calculated for extraction periods ranging between 12 months and 7.5 years.

Both these results are well below the daytime criterion of $L_{Aeq(1hr)}$ 55 dB.

In order to minimise any changes to noise levels from Nelson Bay Road between the existing landform and the final (post extraction) landform, the following is recommended:

- Increase the height of the western barrier (adjacent to R4) from RL 7 metres to RL 8.5 metres;
- Increase the height of the eastern barrier (adjacent to Nelson Bay Road) from RL 5 metres to RL 8 metres.

6 CONCLUSION

6.1 CONCLUSION

An assessment of construction, operational and traffic noise emissions from the proposed sand extraction at Fullerton Cove has been undertaken.

Construction noise impacts will generally be in the range L_{Aeq} 55 to 60 dB, but may be as high as L_{Aeq} 77 dB. This is considered acceptable for short-term activities such as those proposed.

No operational noise impacts are predicted, with the exception of the final stage of the development. Measures are proposed to minimize impacts.

Calculated noise levels for traffic movements from the site along the entry track and Coxs Lane are below the daytime criterion of $L_{Aeq(1hr)}$ 55 dB. The destination for product will primarily be in the Newcastle direction. Impacts to traffic noise levels on Nelson Bay Road have not been considered due to the existing traffic volumes (high).

To minimise any possible changes to road traffic noise levels between the existing and the final (post extraction) landform, it is recommended that barrier heights be increased as described in Section 4.4.2.

The proposed development, as described in this document, could proceed in compliance with DECC noise guidelines.

Global Acoustics Pty Ltd

Appendix

A: Calibration Certificates

Acoustic Research Laboratories
Proprietary Limited
A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Sound Level Meter Test Report

Report Number : 07186.doc

Date of Test : 22/05/2007

Report Issue Date : 22/05/2007

Equipment Tested: **Rion Sound Level Meter**

Model Number: NL-21

Serial Number: 00354120

Client Name : Acoustic Research Laboratories Pty Ltd
Level 7, Building 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Contact Name : Katie Fairjones

Tested by : Morgan Rae

Approved Signatory :

Ken Williams

Date : **22nd May 2007.**

NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Laboratories Pty Ltd is NATA Accredited Laboratory Number. 14172.
This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025

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www.acousticresearch.com.au

Acoustic Research Laboratories
Proprietary Limited A.B.N. 47 050 100 804
Noise and Vibration Monitoring Instrumentation for Industry and the Environment

Acoustic Calibrator Test Report

Report Number : 07005.doc

Date of Test : 11/01/2007

Report Issue Date : 12/01/2007

Equipment Tested: **Bruel & Kjaer Acoustic Calibrator**

Model Number: 4230

Serial Number: 523178

Client Name : Global Acoustics Pty Ltd

Unit 12, 16 Huntingdale Street

Thornton NSW 2322

Contact Name : Gary Mulhearn

Tested by : Will Ford

Approved Signatory :

Will Ford

Date : 12th January 2007.

NATA
WORLD RECOGNISED ACCREDITATION

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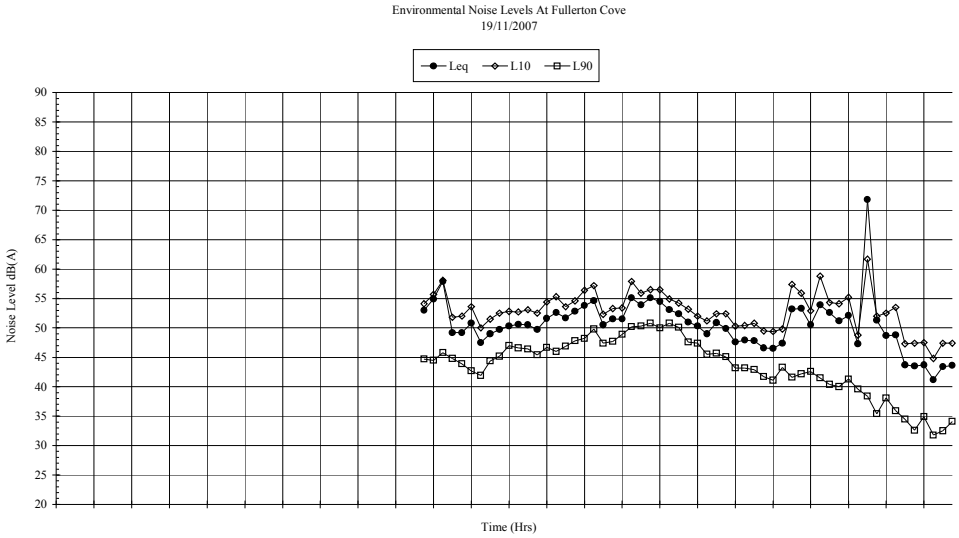
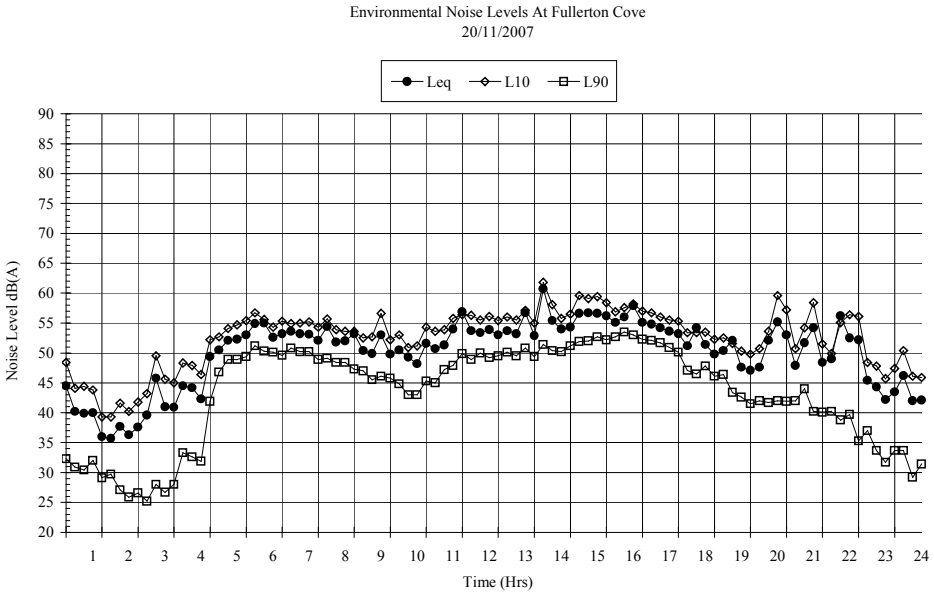
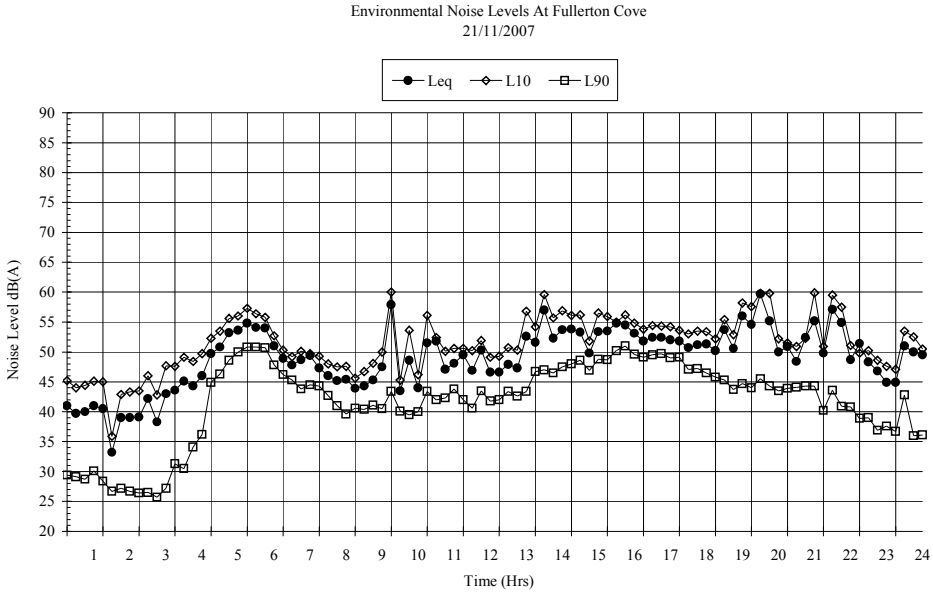
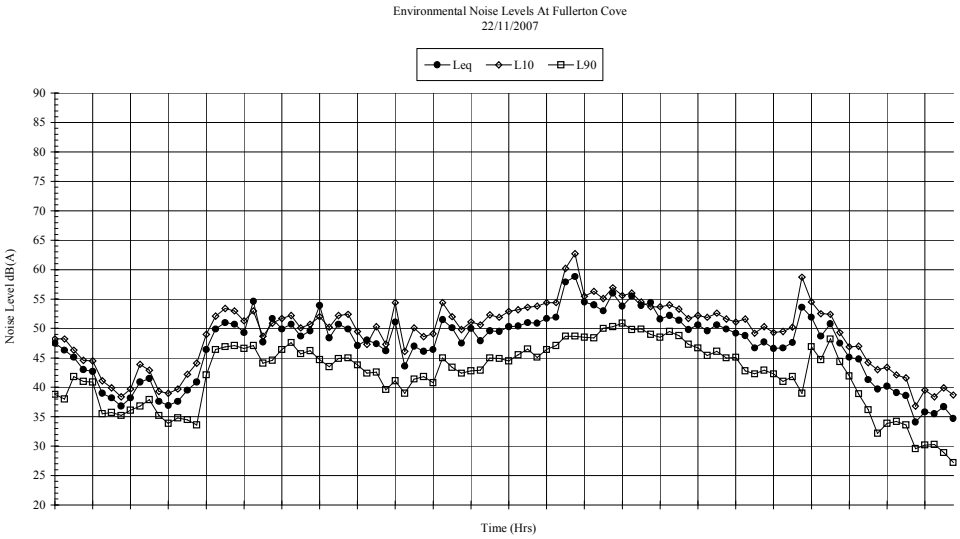
Appendix

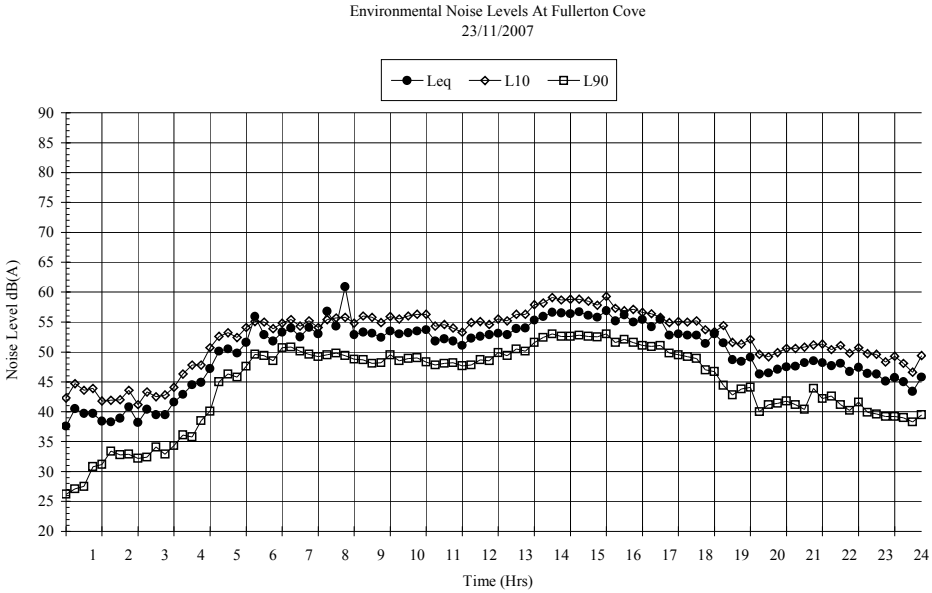
B: Data Graphs

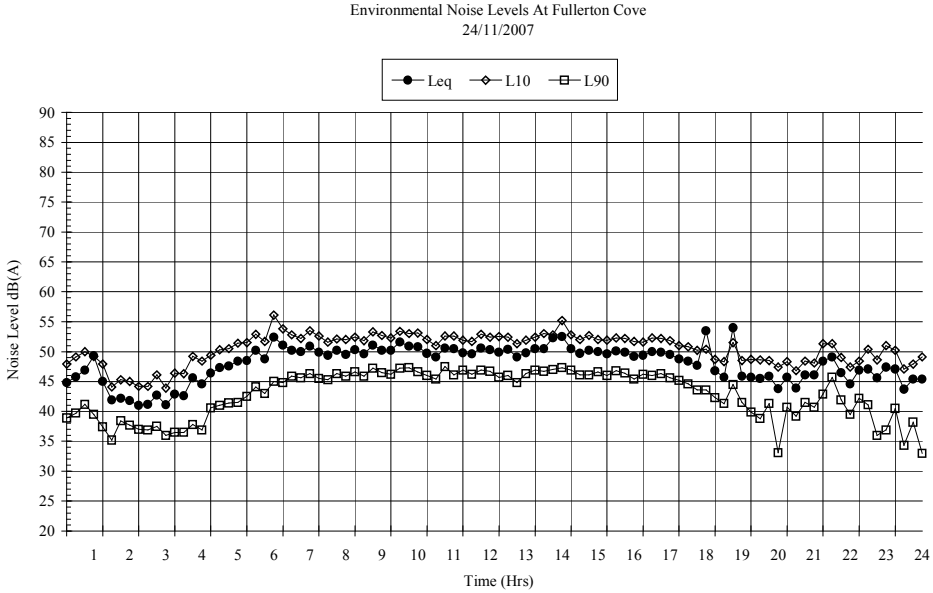

Environmental Noise Levels At Fullerton Cove
19/11/2007
Leq
L10
L90
Noise Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Time (Hrs)

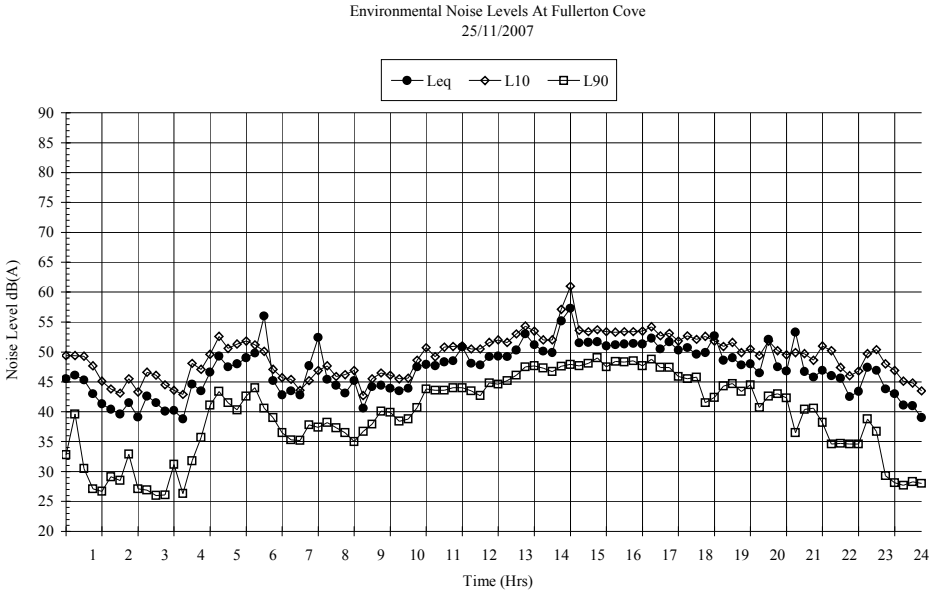

Environmental Noise Levels At Fullerton Cove
20/11/2007
Leq
L10
L90
Noise Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Time (Hrs)

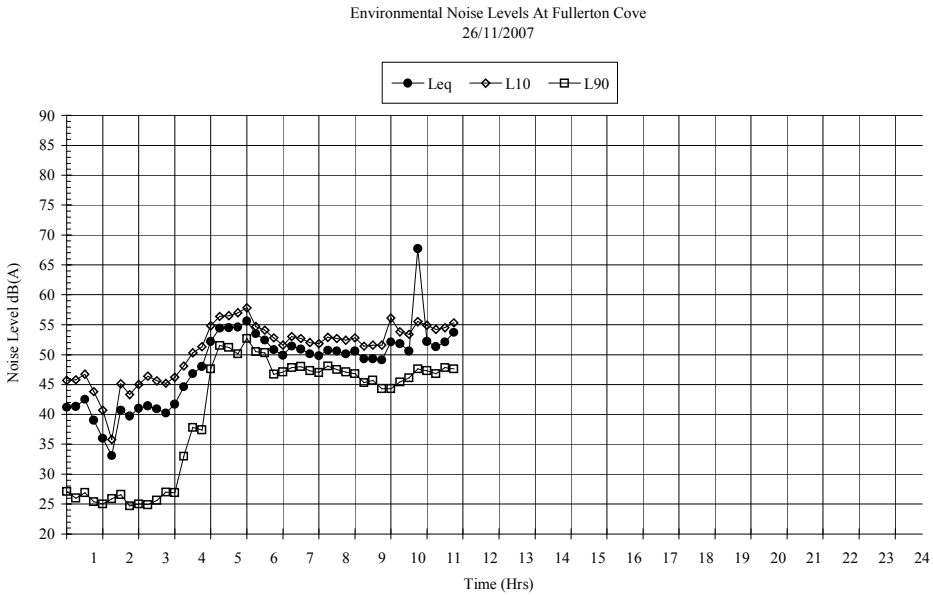

Environmental Noise Levels At Fullerton Cove
21/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)


Environmental Noise Levels At Fullerton Cove
22/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)


Environmental Noise Levels At Fullerton Cove
23/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)


Environmental Noise Levels At Fullerton Cove
24/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)


Environmental Noise Levels At Fullerton Cove
25/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)


Environmental Noise Levels At Fullerton Cove
26/11/2007
Leq
L10
L90
Noise Level dB(A)
Time (Hrs)