***ANNEXURE C: NOISE AND VIBRATION ASSESSMENT FOR THE NEW PROCESS PLANT LOCATION***

EMGA | MitchellMcLennan

# Noise and Vibration Assessment for the New Process Plant Location

RASP Mine Broken Hill

Prepared for Broken Hill Operations Pty Ltd | 16 September 2010

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# Noise and Vibration Assessment for the New Process Plant Location

Draft Report

Report J10026RP1 | Prepared for Broken Hill Operations Pty Ltd | 16 September 2010

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# 1 Introduction

EMGA Mitchell McLennan Pty Limited (EMM) was engaged by Broken Hill Operations Pty Limited (BHOP) to prepare a noise and vibration assessment for proposed changes to RASP Mine Project (the Project) at Broken Hill. This report is part of supporting documents for the Preferred Project Report submitted by the proponent. Relevant reference reports include the Noise Impact Assessment Report (ERM 2007) and Noise and Vibration Assessment – Addendum (EMGA 2009).

The key change to the Project is the new location of the process plant and changes to haulage to and from this area as a consequence. The processing plant also includes some modifications as described in the Preferred Project Report and as detailed in the noise modelling section of this report. Also, the location of the rail loading facility and rail spur is to be at the northern end of the site, well away from the southern part of Broken Hill.

This report re-assesses the predicted noise emissions from construction and operational activities in accordance with relevant Department of Environment, Climate Change and Water's (DECCW) guidelines and polices.

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# 2 Existing Environment and Noise Criteria

The March 2008 Environmental Assessment (EA) report includes a detailed description and quantification of the existing noise climate at representative residential locations in Broken Hill. This section relies on this information, but also provides additional monitoring data captured in 2010.

The Rasp Mine is bounded by Eyre Street and Holten Drive to the south and east, Menindee Road to the north east, Crystal and Argent Streets to the north, and South Road (Silver City Highway) to the west. These roads form part of the existing truck route through Broken Hill.

## 2.1 Background and Ambient Noise Monitoring ERM 2007 report

*Table 2.1* shows the rating background levels (RBL) as reported in the ERM 2007 document, which are based on long term unattended monitoring in accordance with the Industrial Noise Policy.

**Table 2.1 Summary of Ambient and Rating Background Levels**

| Monitoring Location | | Rating Background Level (RBL) dB(A) | | | Ambient Leq Noise Level, dB(A) | | |
|---|---|---|---|---|---|---|---|
| | | Day | Evening | Night | Day | Evening | Night |
| M1 | 139 Eyre St | 39 | 36 | 34 | 58 | 57 | 49 |
| M2 | 148 Piper St | 33 | 32 | 30 | 49 | 40 | 49 |
| M3 | 237 Hebbard St | 33 | 33 | 32 | 48 | 53 | 46 |
| M4 | 208 Carbon St | 30 | 30 | 30 | 38 | 40 | 34 |
| M5 | 10 Argent St (2001 Data) | 37 | 36 | 30 | 54 | 54 | 39 |

1. *Daytime is defined as 7am to 6pm; Evening is defined as 6pm to 10pm; Night is defined as 10pm to 7am*
2. Source: ERM 2007.

The monitoring data indicates that background noise levels at residences in the vicinity of the Project away from the trucking route are generally typical of rural or relatively quiet suburban residential localities, though are higher at Eyre Street, Argent Street and Crystal Street, where noise levels from road traffic and commercial activity are more prominent than at other locations during the day. For Eyre Street and Crystal Street the night time background and ambient noise levels remain relatively elevated than at other locations due to the current trucking route and general main road traffic thoroughfare. Hence, residences nearer to the town or commercial centres can be represented by Eyre Street and Argent Street for south and north of the site respectively.

## 2.2 Background and Ambient Noise Monitoring In 2010

A logger was installed on Wednesday 21 July 2010 for long term noise monitoring. The logger was placed approximately 45m on the site side of Eyre Street, directly opposite the residence of 419 Eyre Street. Refer to Figure 2.1 for the monitoring location L1. This position is considered representative of the noise environment at the residence, which is shown as A13 in Figure 2.1. This residence is the closest to the proposed processing plant area and represents a part of the town that has not been monitored

previously. At this residence, the noise environment is dominated by road traffic noise, a quarry and commercial landscape facility to the north. It is also important to note that no audible site noise was present during the monitoring period.

While the long term unattended monitor was in place, short term attended measurements were undertaken at two locations shown as S1 and S2 in Figure 2.1. This was done to document the noise environment and to correlate readings between these and the long term monitor location. The results are shown in Table 2.2, where attended noise measurements are correlated with corresponding unattended noise measurements of the logger on site. The data shows that $L_{eq}$ noise levels are comparable between locations, however background noise levels ($L_{90}$) are lower at residences. This correlation has been accounted for in determining representative background noise levels for these residences and subsequent INP based criteria.

**Table 2.2 Background and Ambient Noise Measurements – 21 July 2010**

| Start Time | Location | Noise Measurements (dBA) | | Logger Noise Measurements (dBA) | | Comments (Noise Sources) |
|---|---|---|---|---|---|---|
| | | $L_{90}$ | $L_{eq}$ | $L_{90}$ | $L_{eq}$ | |
| 11:15 am | S1 | 35 | 47 | 37 | 48 | Rear of residence at 419 Eyre St. Mobile plant at quarry, natural sounds, and road traffic. |
| 11:30 am | S1 | 33 | 47 | 41 | 49 | |
| Midday | S2 | 29 | 51 | 38 | 49 | Street side of Piper St residence. Natural sounds, mild traffic noise. |

The derived background noise levels from the long term noise monitor

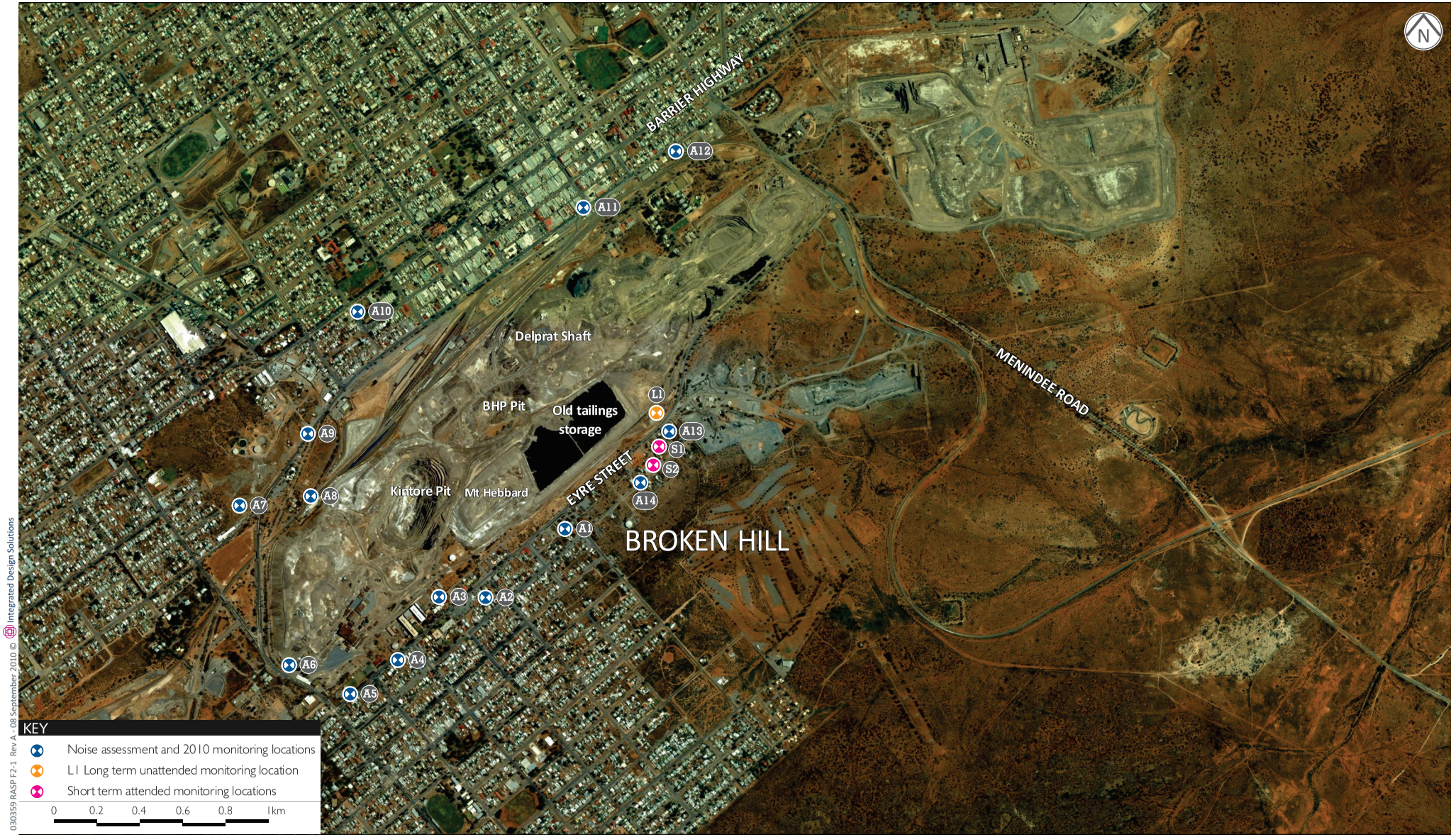




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FIGURE 2.1
Noise Assessment and 2010 Monitoring Locations

## 2.3 Industrial Noise Policy (January 2000)

The EA noise assessment correctly adopted the INP to develop appropriate noise criteria. These are re-produced in *Table 2.3* for locations A1 to A10 and were derived on the basis of background noise plus 5dB. An explanation for the basis of criteria derivation is also provided for each assessment location. For the newer assessment locations A12 to A14, these are based on monitoring data collected in 2010 as described earlier.

**Table 2.3 INP Project Specific Operational Noise Criteria**

| Receiver No | Location | Criterion, $L_{eq,15minute}$ dB(A) | | | Basis of Criteria Derivation (Refer to ERM 2007) |
|---|---|---|---|---|---|
| | | Day | Evening | Night | |
| A1 | Piper St North | 38 | 37 | 35 | Based on long term monitoring at M2 (148 Piper St). This also applies to the southern urban area of Broken Hill. |
| A2 | Piper St Central | 38 | 37 | 35 | Based on long term monitoring at M2 (148 Piper St). This also applies to the southern urban area of Broken Hill. |
| A3 | Eyre St North | 44 | 41 | 39 | Based on long term monitoring at M1 (139 Eyre St). |
| A4 | Eyre St Central | 44 | 41 | 39 | Based on long term monitoring at M1 (139 Eyre St). |
| A5 | Eyre St South | 44 | 41 | 39 | Based on long term monitoring at M1 (139 Eyre St). |
| A6 | Bonanza & Gypsum Sts | 48 | 41 | 39 | Based on correlation of attended short term monitoring at this location and unattended long term monitoring at Eyre St. |
| A7 | Carbon St | 35 | 35 | 35 | Based on long term monitoring at M4 (208 Carbon St). This also applies to the north west urban area of Broken Hill. |
| A8 | South Rd | 48 | 39 | 39 | Based on correlation of attended short term monitoring at this location and unattended long term monitoring at Piper St (for daytime) and Carbon St (for evening and night). |
| A9 | Crystal St | 46 | 39 | 39 | Based on correlation of attended short term monitoring at this location and unattended long term monitoring at Piper St (for daytime) and Carbon St (for evening and night). |

**Table 2.3 INP Project Specific Operational Noise Criteria**

| Receiver No | Location | Criterion, $L_{eq,15minute}$ dB(A) | | | Basis of Criteria Derivation (Refer to ERM 2007) |
|---|---|---|---|---|---|
| | | Day | Evening | Night | |
| A10 | Garnet & Blende Sts | 42 | 41 | 35 | This also applies to the northern urban area of Broken Hill. |
| A11 | Crystal St | 46 | 39 | 39 | Based on A9 since A9 and A11 are located along Crystal St. |
| A12 | Crystal St | 46 | 39 | 39 | Based on A9 since A9 and A12 are located along Crystal St. |
| A13 | 419 Eyre St | 38 | 35 | 35 | Based on correlation of attended short term monitoring at this location and unattended long term monitoring data at M6 (immediately across Holten Dr from this location) in 2010. |
| A14 | Piper St North | 35 | 35 | 35 | Based on correlation of attended short term monitoring at this location and unattended long term monitoring data at M6 across on Holten Dr in 2010. |

*1. The monitoring data and derived criteria for locations A1 to A10 are sourced from ERM 2007.*

## 2.4 Sleep Disturbance Criteria

The above criteria, which consider the average noise emission of a source over 15 minutes, are appropriate for assessing noise from relatively steady-state sources, such as engine noise from mobile plant and processing equipment. However, noise from sources such as reversing alarms, truck tail gates banging and handling wagons are intermittent (rather than continuous) in nature, and as such, needs to be assessed using the $L_1$ or $L_{max}$ noise metrics.

The most important impact of intermittent noises is the disturbance of the sleep of nearby residents. While the INP does not specify a criterion for assessing sleep disturbance, DECCW's *Environmental Criteria for Road Traffic Noise* (EPA 1999) policy indicates that levels below 50 to 55 dB(A) inside residences are unlikely to wake sleeping occupants. The likely number of noise events per night should also be considered. If bedroom windows are open, this corresponds to an external maximum noise level of approximately 60 to 65 dB(A) $L_{max}$ at a residence. However, this is considerably higher than the DECCW's previous position on sleep disturbance in its *Environmental Noise Control Manual* (EPA, 1994) which recommends that $L_1$ noise from a source should not exceed the existing background noise level by more than 15dB. For the purpose of this assessment, the descriptors $L_{max}$ and $L_1$ may be considered interchangeable. This is the DECCW's current position on sleep disturbance criteria.

As part of the background noise monitoring, it was established that background noise levels for some residences are as low as 30dB(A). As such, the sleep disturbance criterion would be as low as 45 dB(A) $L_{max}$ for some residences.

The latter more conservative sleep disturbance criterion was adopted for this study, with proposed criteria for the adopted assessment locations listed in Table 2.4 and applies to the night time assessment period only.

**Table 2.4 Sleep Disturbance Noise Criteria**

| Receiver No | Location | Sleep Disturbance Criteria, $L_{max}$ dB(A) |
|---|---|---|
| | | Night |
| A1 | Piper St North | 45 |
| A2 | Piper St Central | 45 |
| A3 | Eyre St North | 49 |
| A4 | Eyre St Central | 49 |
| A5 | Eyre St South | 49 |
| A6 | Bonanza & Gypsum Sts | 49 |
| A7 | Carbon St | 45 |
| A8 | South Rd | 49 |
| A9 | Crystal St | 49 |
| A10 | Garnet & Blende Sts | 45 |
| A11 | Crystal St | 49 |
| A12 | Crystal St | 49 |
| A13 | 419 Eyre St | 45 |
| A14 | Piper St North | 45 |

## 2.5 Interim Construction Noise Guideline (July 2009)

It is accepted practice to adopt operational noise criteria for construction activities at 'brownfield' mine sites since such activities are often indistinguishable from mining type operations. However, the area proposed for the process plant is significantly removed and isolated from any current sources of noise on the site. Also, the nature of current site operations is mostly limited to underground mining with relatively little surface activities. This combined with the location of potentially impacted receivers suggests proposed construction noise is likely to be clearly distinguishable from any operations. Notwithstanding this, if operational noise limits can be satisfied, construction activities are normally permitted without restrictions.

The Interim Construction Noise Guideline (ICNG) is specifically aimed at managing construction works regulated by the DECCW under the *Protection of the Environment Operations Act 1997* (POEO Act). This provides the current and most relevant guidance for construction noise assessment.

One of the first steps in the ICNG is identification of sensitive receivers, which include residences, classrooms, hospitals, places of worship, passive and active recreation areas.

The local Broken Hill hospital is some 2 km north of the site on Thomas Street. Primary and secondary schools are located on Mica Street and Garnet Street respectively.

Whilst all receivers are important, the most sensitive and those afforded the strictest criteria by the ICNG are residences. For the subject site, residences are also the closest and potentially the most impacted from construction activities. Hence, the assessment will focus on residences. The closest residence south of the site is A13 which is adjacent a wood cutters yard residence and the closest privately owned residences to the north are located along Crystal Street opposite A12 which is a commercial property. The majority of construction activities will be central to the northern area of the site at the proposed processing plant area.

### 2.5.1 Recommended standard hours

The primary management measure is to undertake construction during daytime hours only, which will be adopted for this project in the most part.

The ICNG recommends works are restricted to:

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

The proposed works will generally be undertaken between these hours and hence will satisfy what we view as the main objective of the ICNG. However, given the remote location of the Rasp Mine Project in Broken Hill and therefore extended travel time for construction crews travelling from major cities, contractors will likely need to work during the hours 7am to 7pm and seven days per week. It is generally accepted that construction noise that can be shown to satisfy operational noise targets at residences can occur at anytime. This will be tested in the prediction section of this Report, Section 3.

### 2.5.2 Noise assessment criteria

For major industrial type construction developments, the ICNG recommends a quantitative noise assessment approach. Table 2.5 is an extract from the ICNG and relates to residential receivers only.

### Table 2.5 ICNG Residential Criteria

| Time of Day | Management Level $L_{Aeq\ (15\ min)}$* | How to Apply |
|---|---|---|
| Recommended standard hours: Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays | Noise affected RBL + 10 dB | The noise affected level represents the point above which there may be some community reaction to noise.<br>• Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>• The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected75 dB(A) | The highly noise affected level represents the point above which there may be strong community reaction to noise.<br>• Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:<br>i) times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences<br>ii) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times |
| Outside recommended standard hours | Noise affected RBL + 5 dB | • A strong justification would typically be required for works outside the recommended standard hours.<br>• The proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>• Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.<br>• For guidance on negotiating agreements see section 7.2.2. |

** Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.*

For other receiver types the ICNG provides the recommendations in Table 2.6 (sourced directly from the ICNG).

**Table 2.6 Noise at Sensitive Land Uses (other than residences) Using Quantitative Assessment**

| Land Use | Management Level, LAeq (15 min)(Applies When Properties are Being Used) |
|---|---|
| Classrooms at schools and other educational institutions | Internal noise level - 45 dB(A) |
| Hospital wards and operating theatres | Internal noise level - 45 dB(A) |
| Places of worship | Internal noise level - 45 dB(A) |
| Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion) | External noise level - 65 dB(A) |
| Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation) | External noise level - 60 dB(A) |
| Community centres | Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses. |

For industrial and commercial receivers not covered above, the ICNG provides the following:

> *"The external noise levels should be assessed at the most-affected occupied point of the premises:*
>
> - *industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dB(A)*
> - *offices, retail outlets: external $L_{Aeq\ (15\ min)}$ 70 dB(A)*
> - *other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.*
>
> *The proponent should assess construction noise levels for the project, and consult with occupants of commercial and industrial premises prior to lodging an application where required.*
>
> *During construction, the proponent should regularly update the occupants of the commercial and industrial premises regarding noise levels and hours of work."*

## 2.6 Interim Guideline for Assessment of Noise from Rail Infrastructure Projects (April 2007)

The *Interim Guideline for Assessment of Noise from Rail Infrastructure Projects (April 2007 Interin Guideline)* is a joint DECCW and Department of Planning document. This document describes the environmental benefits of rail, objectives for noise and related assessment procedures.

It should also be noted that the Interim Guideline is on trial for new projects over the next three years.

Also, this Interim Guideline states that impacts from **existing rail operations are not covered** and that a package being developed will address existing situations. However, redevelopment of existing rail lines is addressed, quote:

> *"Redevelopment of an existing rail line applies where residential or noise-sensitive receivers are subject to existing rail noise at or above the noise trigger levels in Table 1 in Chapter 2 for a new rail line development. Typically this will be an existing rail line where it is proposed to carry out works that will increase its capacity to carry rail traffic or alter the track alignment through design or engineering changes. In practice this often means a duplication within an existing rail corridor. Redevelopment does not cover minor works such as crossovers, sidings, turnouts, yards, loops, refuges, relief lines, straightening curves or the installation of track signalling devices where these works will not result in an increase in existing rail noise levels and a level of rail noise beyond the noise trigger levels contained in Tables 1 and 2. For these rail infrastructure projects the potential noise and vibration would be compared against the noise and vibration trigger levels identified in this guideline to decide whether assessment of impacts and feasible and reasonable mitigation measures is necessary*."

Notwithstanding this, and in acknowledgement of the Project's Director-General's requirements, the Interim Guideline is used here as it provides the only current guiding principles for impact assessment. To that end, the rail operations to which this Interim Guideline will be adopted are those parts of the main rail line only, since rail spurs or loops used solely by the site are covered as an industrial source under the INP.

The Interim Guideline specifies criteria for two aspects of rail traffic noise, airborne and ground borne.

### 2.6.1 Airborne noise trigger levels for heavy rail

For residential land uses Table 2.7 provides airborne rail traffic noise criteria according to the Interim Guideline.

**Table 2.7 Airborne Rail Traffic Noise Trigger Levels for Residential Land Uses**

| Type of Development | Noise Trigger Levels dB(A) | | |
|---|---|---|---|
| | **Day (7:00 am–10:00 pm)** | **Night (10:00 pm–7:00 am)** | **Comment** |
| New rail line development | Development increases existing rail noise levels and resulting rail noise levels exceed: | | These numbers represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project. |
| | 60 $L_{Aeq(15h)}$ | 55 $L_{Aeq(9h)}$ | |
| | 80 $L_{Amax}$ | 80 $L_{Amax}$ | |
| Redevelopment of existing rail line | Development increases existing rail noise levels and resulting rail noise levels exceed: | | |

### Table 2.7 Airborne Rail Traffic Noise Trigger Levels for Residential Land Uses

| Type of Development | Noise Trigger Levels dB(A) | | |
|---|---|---|---|
| | **Day (7:00 am–10:00 pm)** | **Night (10:00 pm–7:00 am)** | **Comment** |
| | 65 $L_{Aeq(15h)}$<br>85 $L_{Amax}$ | 60 $L_{Aeq(9h)}$<br>85 $L_{Amax}$ | An 'increase' in existing rail noise levels is taken to be an increase of 2 dB(A) or more in $L_{Aeq}$ in any hour or an increase of 3 dB(A) or more in $L_{Amax}$. |

For land uses other than residential the guideline values are shown in Table 2.8.

### Table 2.8 Airborne Rail Traffic Noise Trigger Levels for Sensitive Land Uses Other Than Residential

| Sensitive Land Use | Noise Trigger Levels dB(A) | |
|---|---|---|
| | **New Rail Line Development** | **Redevelopment of Existing Rail Line** |
| | Development increases existing rail noise levels by 2 dB(A) or more in LAeq in any hour and resulting rail noise levels exceed: | |
| Schools, educational institutions – internal | 40 LAeq(1h) | 45 LAeq(1h) |
| Places of worship – internal | 40 LAeq(1h) | 45 LAeq(1h) |
| Hospitals | 60 LAeq(1h) | 60 LAeq(1h) |
| Hospitals – internal | 35 LAeq(1h) | 35 LAeq(1h) |
| Passive recreation | LAeq as per residential noise level values in Table 1 (does not include maximum noise level component) | |
| Active recreation (e.g. golf course) | 65 LAeq(24h) | 65 LAeq(24h) |

Technical notes to Table 2.7 and Table 2.8 *(source: DECCW & DoP 2007).*

1. *Specified noise trigger levels refer to noise from rail transportation only and do not include ambient noise from other sources. However, they refer to noise from all rail traffic at the receiver location, not only noise due to the specific rail project under consideration.*

2. *The noise level values represent external levels except where otherwise stated.*

3. *'Residential' typically means any residential premises located in a zone as defined in a planning instrument that permits new residential land use as a primary use. Where there is doubt as to the status of the residential land use, the relevant planning authority should be consulted.*

4. *LAeq(T) (where T is the relevant time period) refers to the equivalent continuous noise level from all train movements (excluding shunting activities in designated shunting areas) occurring during the assessment time period.*

5. *LAmax refers to the maximum noise level not exceeded for 95% of rail pass-by events and is measured using the 'fast' response setting on a sound-level meter.*

6. *Noise levels at residences are assessed 1 metre in front of the most affected building façade. Where only free-field measurements can be made, the measured noise level is corrected (generally by + 2.5 dB(A)) to account for the façade reflection effect. In the case of multi-level residential buildings, the external point of reference for measurement for the trigger is the two floors of the building that are most exposed to rail noise, usually the ground and first floors. On other floors, an internal noise level value 10 dB(A) below the relevant external noise level value applies on the basis that openable windows are opened sufficiently to provide adequate ventilation (refer to minimum ventilation requirements in the Building Code of Australia).*

7. *Internal noise level values refer to the noise level at the centre of the habitable room that is most exposed to the noise source and are applied with windows opened sufficiently to provide adequate ventilation. In cases where gaining internal access for monitoring is difficult, external noise level values 10 dB(A) above the internal level values apply.*

8. *The noise level values for sensitive land uses apply for the periods when the premises are in use.*

9. *In assessing noise levels at passive and active recreational areas as well as in hospital grounds, the noise level is assessed at the most affected point within 50 metres of the area boundary.*

10. *For external activities associated with schools, educational institutions and places of worship, the relevant passive or active recreation categories apply.*

11. *Where the category of the premises is not clear, seek advice from the relevant planning authority.*

12. *For sensitive land uses, LAeq(1h) means the highest 10th-percentile hourly A-weighted Leq during the period when the particular class of receiver building/place is in use. Alternatively, the highest measured LAeq(1h) value can be used where insufficient measurements have been made to provide a valid 10th-percentile level and it can be demonstrated that the measured values are representative.*

13. *For new and redeveloped rail projects, the noise trigger levels apply both immediately after operations commence and for projected traffic volumes over an indicative period into the future that represents the expected typical level of rail traffic usage (e.g. 10 years or a similar period into the future).*

14. *Where noise above the noise trigger levels continues even after all feasible and reasonable mitigation measures have been applied to a project, other long-term strategies need to be applied to minimise impacts. These include reducing noise emissions from rolling stock by applying noise standards to new rolling stock; managing noise emissions from rolling stock already in use; and improved planning, design and construction of adjoining land-use developments.*

15. *There may be situations where it is reasonable to vary the standard time periods applied to the day and night periods. For example, there may be instances where the noise levels in an area begin to rise quickly before 7 am (the standard cut-off point between day and night) because of normal early morning activity by the general community. In these cases it is reasonable to consider varying the standard day- and night-time periods to better reflect the actual temporal changes in noise for that location. Appropriate noise level values for these shoulder periods where night-time noise levels rise quickly to daytime noise levels may be negotiated with the determining or regulatory authority on a case-by-case basis.*

### 2.6.2 Ground borne noise trigger levels

Ground borne noise is that generated inside a building by ground-borne vibration generated from the pass-by of vehicles on rail. The Interim Guideline states:

> "*Ground-borne noise level values are relevant only where they are higher than the airborne noise from railways (such as in the case of an underground railway) and where the ground-borne noise levels are expected to be, or are, audible within habitable rooms.*"

The subject site will utilise the existing above ground rail network and does not include an underground section of rail. The proposed rail movements are not expected to generate ground borne noise in a sensitive receiver building which is higher than airborne noise. Hence, the issue of ground-borne noise from rail movements associated with the project does not warrant further consideration.

## 2.7 Assessing Vibration a Technical Guideline (February 2006)

Vibration emission objectives aim to reduce vibration impacts on the community. For this Project this is relevant to intermittent vibration from proposed rail movements. To minimise the impacts of vibration on receivers, all vibration emissions will be assessed in accordance with the *Environmental Noise Management – Assessing Vibration: A Technical Guideline* (DECC, 2006). The Guideline is based on *British Standard (BS) 6472-1992: Evaluation of human exposure to vibration in buildings (1-80Hz)*.

The Guideline provides preferred and maximum values for continuous, impulsive and intermittent vibration. The vibration dose value (VDV) accumulates the vibration energy received over daytime and night-time periods. The vibration dose is described in detail in BS 6472-1992.

While the criteria provided in the guideline are non-mandatory, all feasible and reasonable mitigation measures should be considered in order to achieve them. Table 2.9 reproduces the preferred and maximum values for intermittent vibration as presented in the Guideline.

**Table 2.9 Acceptable Vibration Dose Values (VDV) for Intermittent Vibration ($m/s^{1.75}$)**

| Location | Daytime[1] | | Night-time[1] | |
|---|---|---|---|---|
| | Preferred Value | Maximum Value | Preferred Value | Maximum Value |
| Critical areas[2] | 0.10 | 0.20 | 0.10 | 0.20 |
| Residences | 0.20 | 0.40 | 0.13 | 0.26 |
| Offices, schools, educational institutions and places of worship | 0.40 | 0.80 | 0.40 | 0.80 |
| Workshops | 0.80 | 1.60 | 0.80 | 1.60 |

1. *Day period is 7:00am to 10:00pm; night period is 10:00pm to 7:00am*
2. *Critical areas include, for example, hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against continuous or impulsive criteria for critical areas.*

*Source: BS 6472-1992*

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# 3 Predicted Noise and Vibration Levels

## 3.1 Construction Noise

The construction of the surface processing facility will typically entail two broad stages of construction.

The first stage will be establishment of the run of mine (ROM) pad area and includes civil works using equipment such as excavators, backhoes, tip trucks, compactors, generators, mobile cranes (10T to 50T capacity), agitator trucks and concrete vibrators. The expected duration of this stage of construction is 26 weeks.

The second stage will be the structural phase, including mechanical works, piping and electrical works. Typical equipment needed will include mobile cranes (10T – 100T capacity), generators, welding machines, semi trailers, small trucks and hand-held grinders. The expected duration of this stage of construction is 18 weeks. An estimated 12 months has been provided for the total construction period to allow for interruptions from weather and downtime.

Table 3.1 provides typical sound emission data that was used to predicted potential construction plant noise levels at representative receiver locations.

**Table 3.1 Construction Plant Source Noise Levels**

| Activity | Typical Plant | Typical Representative Leq,15min Sound Power Level, dB(A) |
|---|---|---|
| Civil Works | Excavator (eg Komatsu PC 200Lc) | 106 (EMM file J09021) |
| | Backhoe | 106 (as above) |
| | Tip Truck (eg CAT D350) | 104 (EMM file J09021) |
| | Compactor (eg TanaG520) | 110 (EMM file J09021) |
| | Generator (diesel Cummins 550kVA – enclosed) | 92 (EMM file J09041) |
| | Mobile Crane | 103 (truck mounted) |
| | Agitator Truck | 103 |
| | Concrete Vibrator | 104 |
| Structural Phase | Mobile Crane | 103 (truck mounted) |
| | Generator (diesel Cummins 550kVA – enclosed) | 92 (EMM file J09041) |
| | Welding machine | 99 |
| | Semi-trailer | 103 |
| | Small truck | 103 |
| | Hand-held grinder (8-inch) | 107 (EMM file J09008) |

*Notes: 1. Modelling assumes either excavator or backhoe operate separately, not simultaneously.*

Based on the data in Table 3.1, noise levels at representative receiver locations were predicted using the Environmental Noise Model (ENM) software (a DECCW accepted modelling package).

The results of construction noise predictions are summarised in Table 3.2 for representative residential locations. They are also presented graphically as noise contours in Figure 3.1. The results demonstrate that typical construction activities are expected to satisfy the adopted ICNG criteria at all representative residential locations. To that end, predicted noise levels are generally below background noise levels at corresponding residential locations and well below INP based operational noise targets for both the daytime and evening periods. Hence, the extension of construction hours to between 7:00 am and 7:00 pm seven days per week is not considered unreasonable. As can be seen from Figure 3.2 the change in location of the processing plant has moved the noise sources away from highly populated areas in Broken Hill South to areas with few residences. Previously the worst case noise was predicted at receptor A4 at 40dB(A, the predicted highest noise levels from construction activities are now for receptor A12 a commercial property representing residences at Crystal Street. The predicted highest noise levels are now contained within the lease or are distributed over vacant land (Perilya Mining Lease) towards the quarry where there are no residences. Where available, the previous construction noise level predictions are shown in parenthesis in Table 3.2 from EMGA 2009 report.

**Table 3.2 Predicted Construction Noise Levels**

| Location | | Predicted Leq,15min Construction Noise Level, dB(A) | | ICNG Daytime Criteria (background +10dB) | INP Operational Criteria, dB(A) | |
|---|---|---|---|---|---|---|
| | | Civil Works | Structural Works | | Day | Evening |
| A1 | Piper St North | 24 (34) | 20 (27) | 43 | 38 | 37 |
| A2 | Piper St Central | 22 (37) | 17 (32) | 43 | 38 | 37 |
| A3 | Eyre St North | 19 (37) | 15 (34) | 49 | 44 | 41 |
| A4 | Eyre St Central | 18 (40) | 14 (35) | 49 | 44 | 41 |
| A5 | Eyre St South | 18 (36) | 13 (32) | 49 | 44 | 41 |
| A6 | Bonanza & Gypsum Sts | 19 (32) | 15 (27) | 53 | 48 | 41 |
| A7 | Carbon St | 16 (38) | 13 (29) | 40 | 35 | 35 |
| A8 | South Rd | 19 (33) | 14 (27) | 53 | 48 | 39 |
| A9 | Crystal St | 18 (36) | 14 (28) | 51 | 46 | 39 |
| A10 | Garnet & Blende Sts | 18 (32) | 15 (24) | 47 | 42 | 41 |
| A11 | Crystal St | 29 | 26 | 51 | 46 | 39 |
| A12 | Crystal St | 34 | 30 | 51 | 46 | 39 |
| A13 | Eyre St North 2 | 31 | 28 | 43 | 38 | 35 |
| A14 | Piper St North | 27 | 24 | 40 | 35 | 35 |

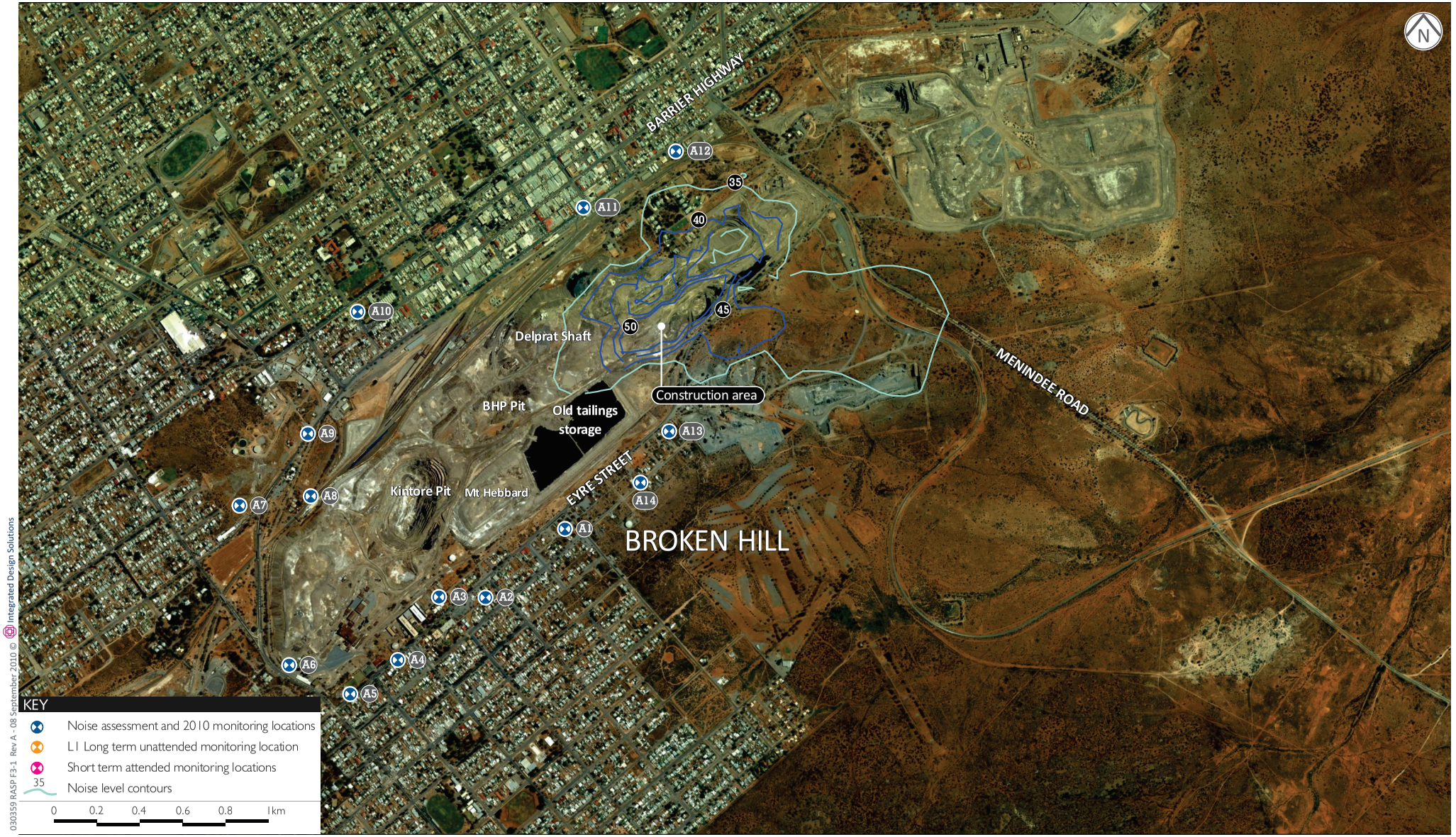




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FIGURE 3.1
Day Time Construction $L_{eq,\ 15\ Minute}$ Noise Level Contours, dB(A)

## 3.2 Operational Noise

This section provides the results of noise predictions for the proposed operations with the process plant in its new location and rail loading at the northern most end of the site as shown in subsequent figures.

### 3.2.1 Operational noise mitigation and management

The mitigation and management of noise emissions outlined in the previous assessments will be incorporated in the current design where these are still relevant. These include the following items:

- positioning the process plant in a natural depression on site;
- cladding of the primary crusher and installing noise abatement bunding to the north and south of the crusher;
- covered conveyors and transfer stations;
- building around the flotation facility providing shielding of the SAG and Ball mills;
- suppression on the front-end-loader;
- suppression on the forklift used at the wagon stockpile area and the rail loading;
- bunding along the southern side of the mine truck haul route and the southern perimeter of the ROM pad;
- two overlapping bunds at the northern side of the wagon stockpile area to shield Crystal Street residences;
- limiting crushing to daytime only; and
- limiting rail shunting and loading to daytime only.

With the above measures in place, the operating scenarios described in Table 3.3 were modelled for the new location of process plant, truck haulage and rail loading as shown in subsequent figures.

## Table 3.3 Operational Modelling Scenarios and Equipment Sound Emission Levels

| Plant | Location | Quantity | Representative $L_{eq,15minute}$ Sound Power Level per item, dB(A) |
|---|---|---|---|
| **24-Hour Operation** | | | |
| Transfer stations | Process Area | 2 | 104 |
| Regrind | Process Area | 1 | 101 |
| Flotation area | Process Area | 1 | 99 |
| Ore Bin | Process Area | 1 | 94 |
| SAG mill | Process Area | 1 | 105 |
| Ball mill | Process Area | 1 | 99 |
| Reagent Handling | Process Area | 1 | 99 |
| Underground mine vent fans | Little Kintore Pit | 2 | 108 |
| Underground mine trucks (eg Toro 40) | Kintore pit to ROM haulage | 5 | 97 |
| Forklift (suppressed) | Wagon Storage | 1 | 93 |
| Flat bed road trucks | Process area and wagon storage haul | 1 | 99 |
| **Daytime Only** | | | |
| Front-end-loader (suppressed) | ROM pad | 1 | 108 |
| Primary Crusher (mitigated) | Process Area | 1 | 106 |
| Secondary Crusher (mitigated) | Process Area | 1 | 106 |
| Conveyors (enclosed) | Process Area | 3 | 75 per lineal metre |
| Flat bed road trucks | Process area to rail load haulage | 1 | 99 |
| Locomotive | Rail load out area | 1 | 101 |
| Forklift (suppressed) | Rail load out area | 1 | 93 |

The results of noise modelling are tabulated in Table 3.4 and shown graphically in Figures 3.3 and 3.4. As per the original operational noise assessment, the daytime predictions were for calm weather conditions and the night time predictions are for calm and temperature inversion conditions, even though inversions were found not to be a 'feature' of the area as defined by the INP.

The results in Table 3.4 demonstrate that predicted noise levels will satisfy INP criteria at all nominated assessment locations. This is supported by the noise contours of Figure 3.2 and Figure 3.3, where the contours are shown to be well below INP criteria at all populated areas of Broken Hill. To that end, the contours demonstrate that the noise exposure of residences from the proposed operations is relatively well contained and the minimum noise criterion level of 35dB(A) is generally limited to the site boundary.

Another important note is that the current noise level predictions are clearly a significant improvement on those of the previous situation as a consequence of the new location of the process plant and rail loading facilities. This is reflected in the lower noise levels predicted for locations A2 to A10 as shown in Table 3.4.

## Table 3.4 Predicted Operational Noise Levels

| Location | | Predicted $L_{eq,15min}$ Noise Level, dB(A) | | | Previous Results (ERM 2007) | | | INP Operational Criteria, dB(A) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Daytime | | Night time | Day | Evening | Night | Day | Evening | Night |
| | | Calm | Calm | Temp. Inv. $3^0$C/100m | | | | | | |
| A1 | Piper St North | <35 | <35 | <35 | 34 | 30 | 30 | 38 | 37 | 35 |
| A2 | Piper St Central | <35 | <35 | <35 | 39 | 37 | 37 | 38 | 37 | 35 |
| A3 | Eyre St North | 37 | 37 | 38 | 40 | 40 | 40 | 44 | 41 | 39 |
| A4 | Eyre St Central | <35 | <35 | <35 | 42 | 40 | 40 | 44 | 41 | 39 |
| A5 | Eyre St South | <35 | <35 | <35 | 42 | 37 | 37 | 44 | 41 | 39 |
| A6 | Bonanza & Gypsum Sts | <35 | <35 | <35 | 46 | 42 | 42 | 48 | 41 | 39 |
| A7 | Carbon St | <35 | <35 | <35 | 37 | 33 | 33 | 35 | 35 | 35 |
| A8 | South Rd | <35 | <35 | <35 | 37 | 33 | 33 | 48 | 39 | 39 |
| A9 | Crystal St | <35 | <35 | <35 | 37 | 36 | 36 | 46 | 39 | 39 |
| A10 | Garnet & Blende Sts | <35 | <35 | <35 | 33 | 36 | 36 | 42 | 41 | 35 |
| A11 | Crystal St | <35 | <35 | <35 | NA | NA | NA | 46 | 39 | 39 |
| A12 | Crystal St | 39 | <35 | 39 | NA | NA | NA | 46 | 39 | 39 |
| A13 | Eyre St North 2 | 37 | <35 | <35 | NA | NA | NA | 38 | 35 | 35 |
| A14 | Piper St North | <35 | <35 | <35 | NA | NA | NA | 35 | 35 | 35 |

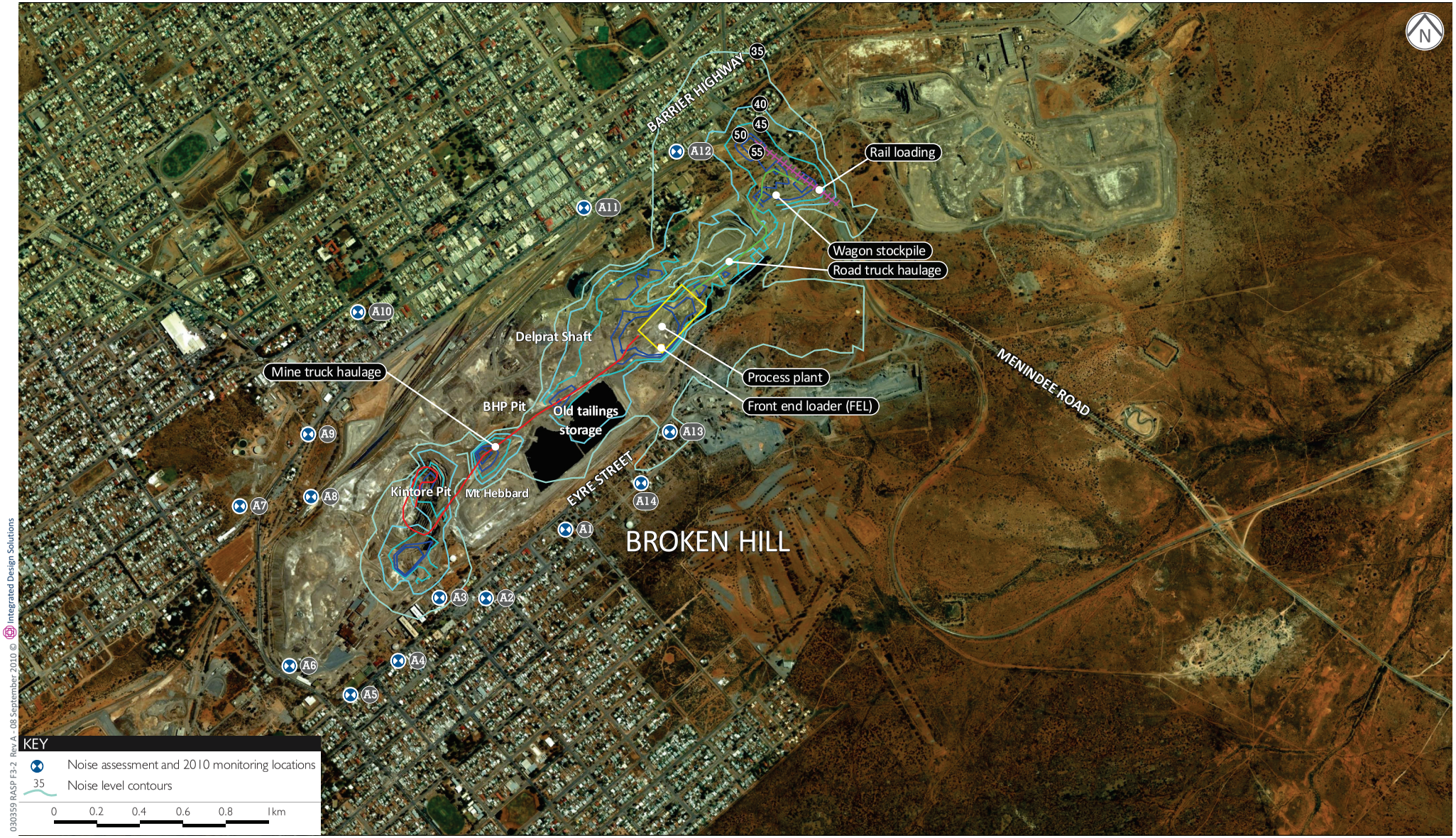




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FIGURE 3.2
Day Time Operational $L_{eq, 15\ Minute}$ Noise Level Contours, dB(A)

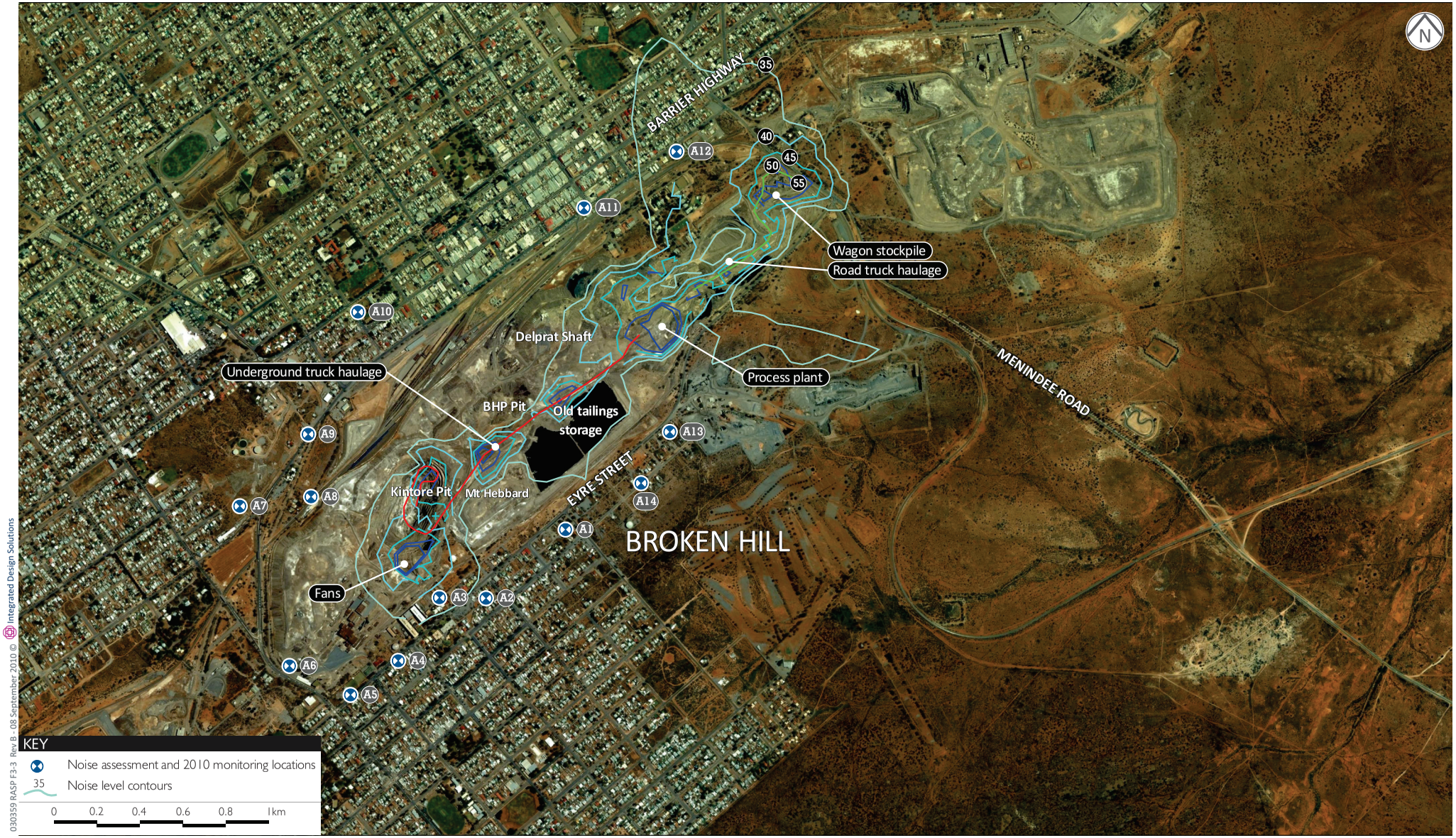




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FIGURE 3.3

Night Time Operational $L_{eq,\ 15\ Minute}$ Noise Level Contours, dB(A) - Temperature Inversion 3°C/100m

## 3.3 Sleep Disturbance Assessment

An assessment of intermittent noise sources was undertaken with the primary focus being on activities associated with wagons being loaded and unloaded by forklift at the wagon stockpile area at night. Typical sound emission factors for maximum noise events was used for modelling purposes (eg 120dB(A) sound power level). Based on this emission factor, Table 3.5 presents results of predicted noise levels at nominated assessment locations for the night time assessment period and during adverse temperature inversion conditions.

The predicted Lmax noise levels satisfy the strict sleep disturbance criteria at most residential locations assessed. The exception is a minor (1dB) exceedance of strict criteria at locations A11 and A12, which represent areas in the northern parts of the town. This is considered to be a very minor level of exceedance that will not be noticeable in reality. All feasible and reasonable noise mitigation is considered to have been applied to reduce this result and includes two 4m high overlapping earth bunds to the north of the concentrate truck haulage route and wagon stock pile area. The number of events of such Lmax noise for any given night could be in the order of five to ten, and is therefore considered relatively minor in quantity. Given the limited benefits of bunding, we would suggest that a driver policy be developed and implemented to ensure truck and forklift drivers are trained in handling wagons so that bangs and clangs are minimised. Table 3.5 also presents the results of modelling for the process plant in the previous location, clearly demonstrating the significant improvement the new location has made to received noise levels at residences.

**Table 3.5 Predicted Lmax Noise Levels**

| | Location | Predicted Lmax Noise Level, dB(A) | Previous Result (ERM 2007) | Lmax Criteria, dB(A) |
|---|---|---|---|---|
| A1 | Piper St North | 28 | 42 | 45 |
| A2 | Piper St Central | 26 | 51 | 45 |
| A3 | Eyre St North | 21 | 52 | 49 |
| A4 | Eyre St Central | 22 | 45 | 49 |
| A5 | Eyre St South | 22 | 46 | 49 |
| A6 | Bonanza & Gypsum Sts | 20 | 39 | 49 |
| A7 | Carbon St | 29 | 49 | 45 |
| A8 | South Rd | 18 | 46 | 49 |
| A9 | Crystal St | 23 | 50 | 49 |
| A10 | Garnet & Blende Sts | 40 | 53 | 45 |
| A11 | Crystal St | **50** | NA | 49 |
| A12 | Crystal St | **50** | NA | 49 |
| A13 | Eyre St North 2 | 32 | NA | 45 |
| A14 | Piper St North | 29 | NA | 45 |

## 3.4 Rail Noise (main rail line only)

The rail operation on the site's dedicated spur is included and assessed as part of industrial noise sources on site, and hence are not considered in this section of the report. This section relates only to the rail movements on the main public line.

To that end, the assessment of main rail line noise was addressed in the addendum report (EMGA 2009) to the original project and findings therein have not changed as a consequence of the location of the new process plant. In fact, given the new rail load area for the current proposal, it is possible that main rail line noise will be less of an issue than it was when assessed previously. This is because the rail movements do not need to pass through Broken Hill necessarily to service the site, and can remain at the northern part of the main line as they approach and depart site. Some trains will however pass through the town as before on route to their destination.

## 3.5 Rail Vibration

The assessment of rail vibration was addressed in the addendum report (EMGA 2009) to the original project and findings therein have not changed as a consequence of the location of the new process plant. As previously stated, given the new rail load area for the current proposal, it is possible that main rail line vibration will be less of an issue than it was when assessed previously.

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# 4 Conclusion

EMM has completed a review and assessment of proposed construction and operational noise, rail noise and rail vibration impacts on the surrounding community from proposed activities for the RASP Mine Project. The review and assessment have been undertaken to address the modifications of the proposal from that of the exhibited project.

The results of this assessment demonstrate that noise levels projected to be generated by the project are expected to generally satisfy current construction and operational noise guidelines and relevant DECCW criteria at the nominated representative receivers. A comprehensive list of noise mitigation and management have been identified and will be adopted to ensure noise emissions are minimised.

Furthermore, proposed construction, site operations, rail noise and vibration impacts are all predicted to be significantly reduced at most receptors of Broken Hill as a consequence of the new process plant location.

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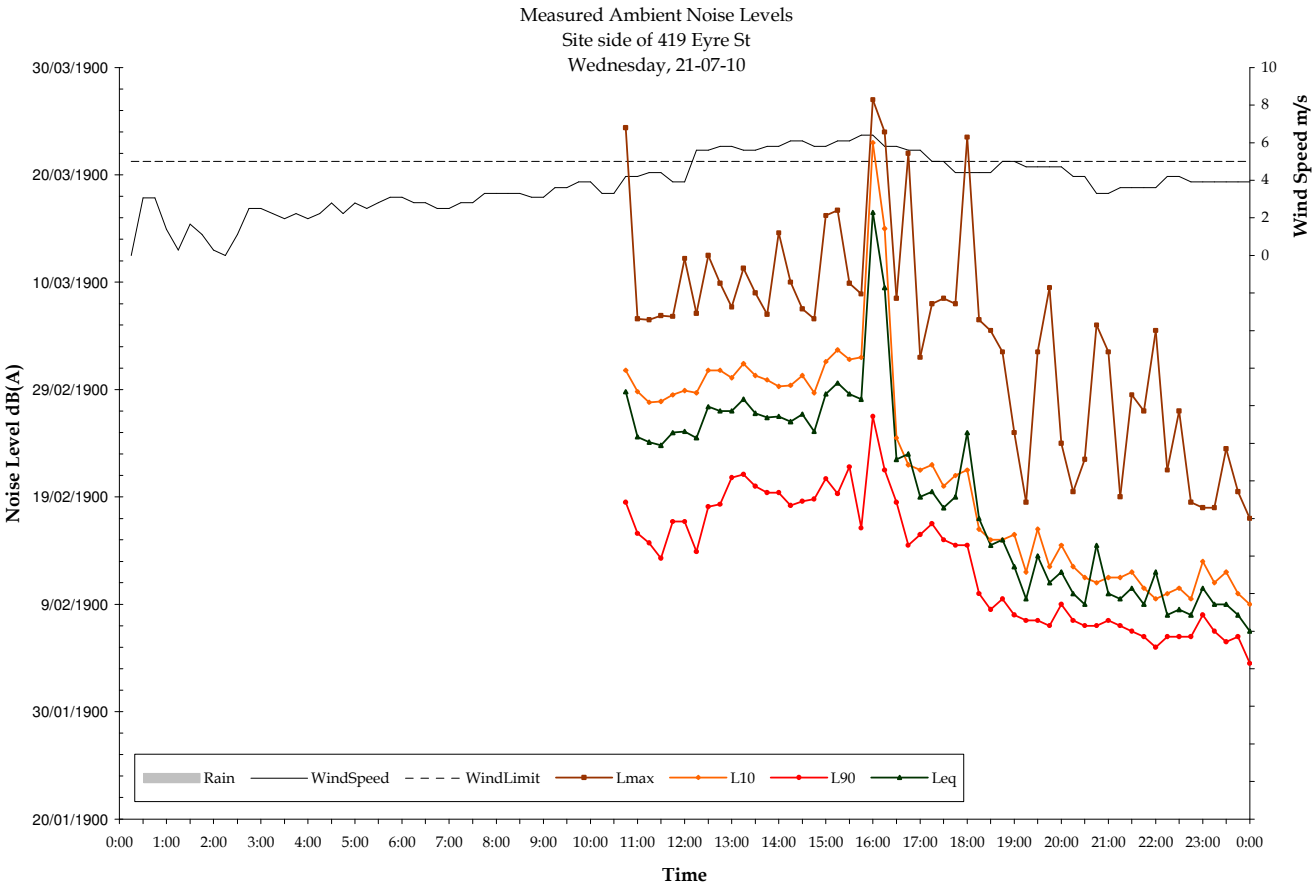
# Appendix A

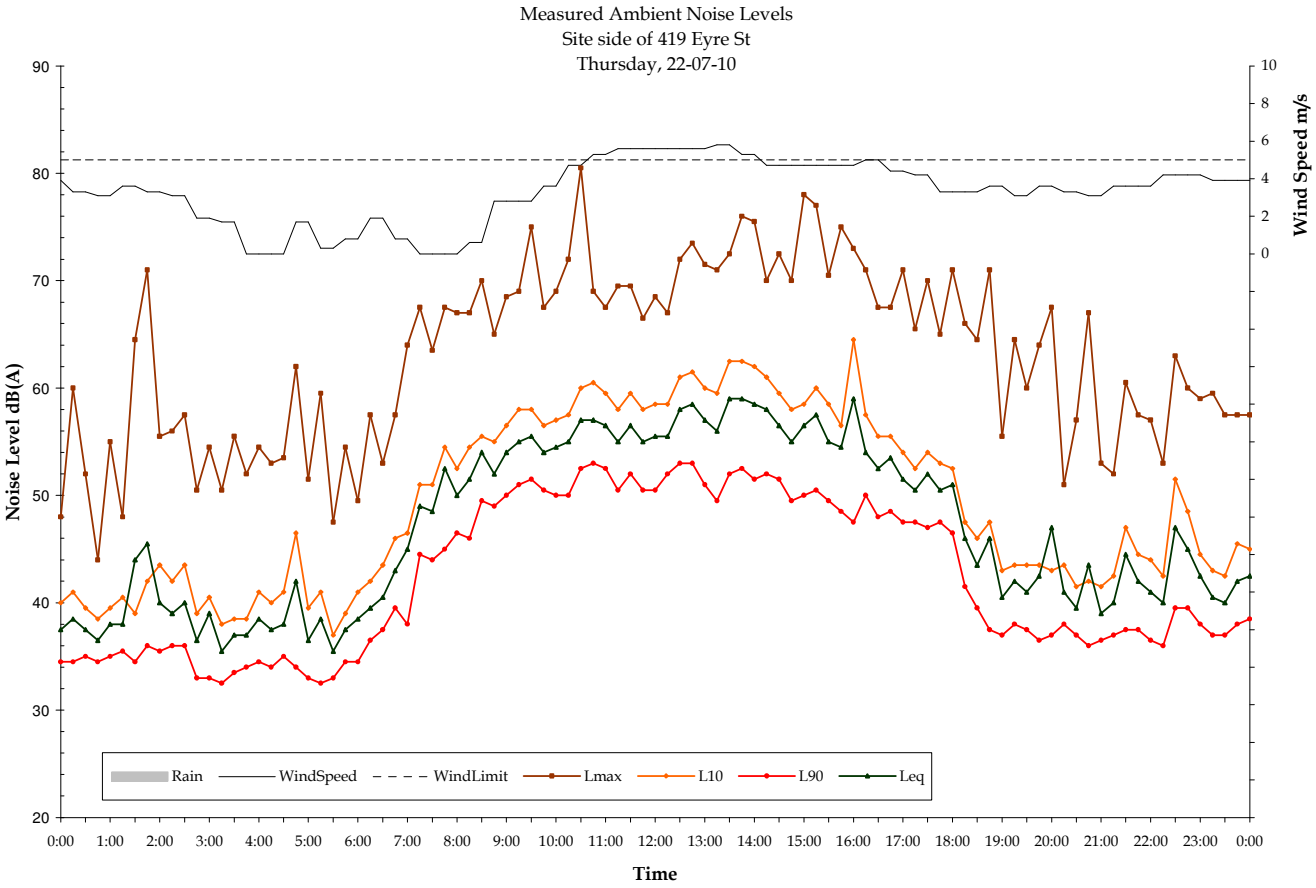
## Long Term Noise Monitoring at L1 in 2010

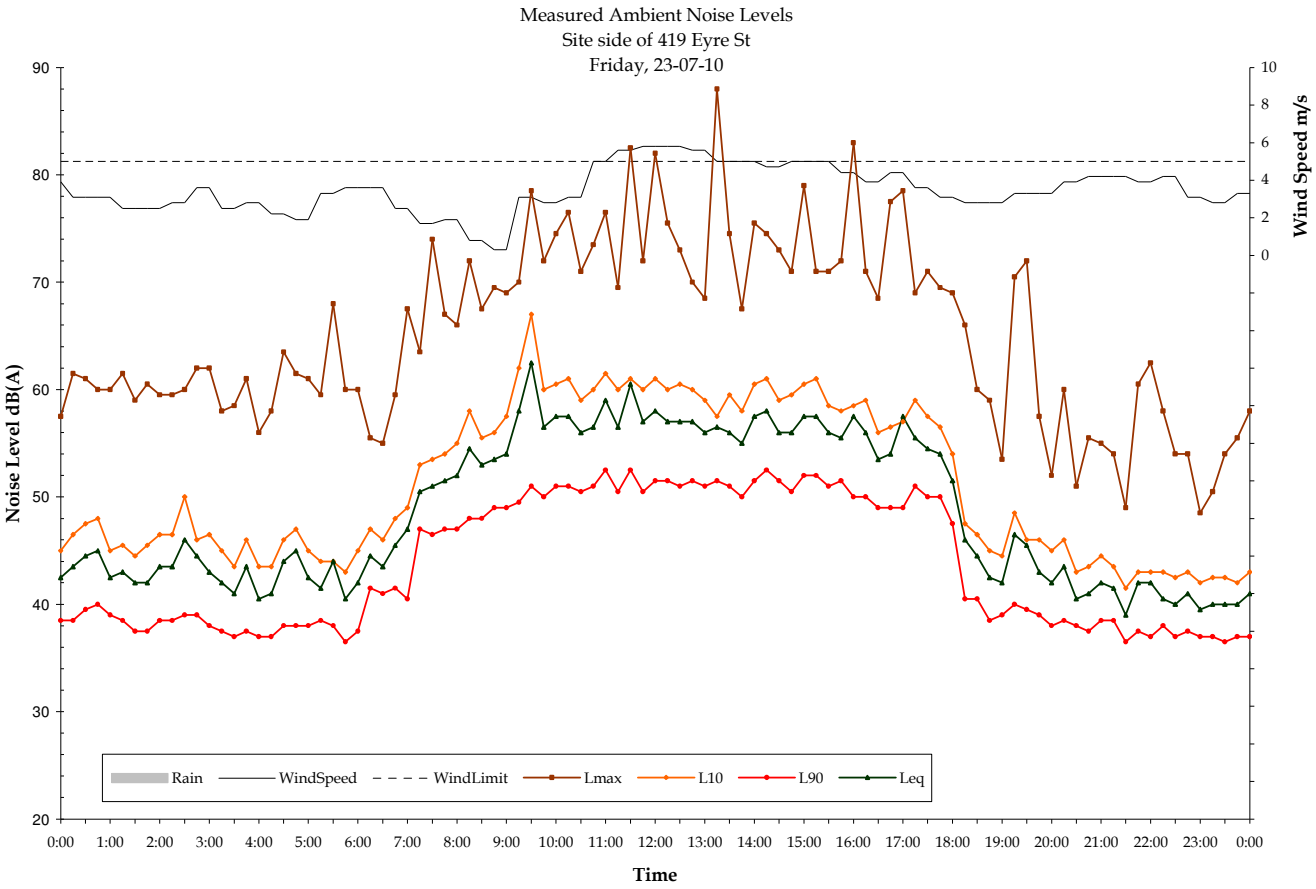
**Table A.1 - Background and Ambient Noise Levels at Site Side of 419 Eyre St Broken Hill**

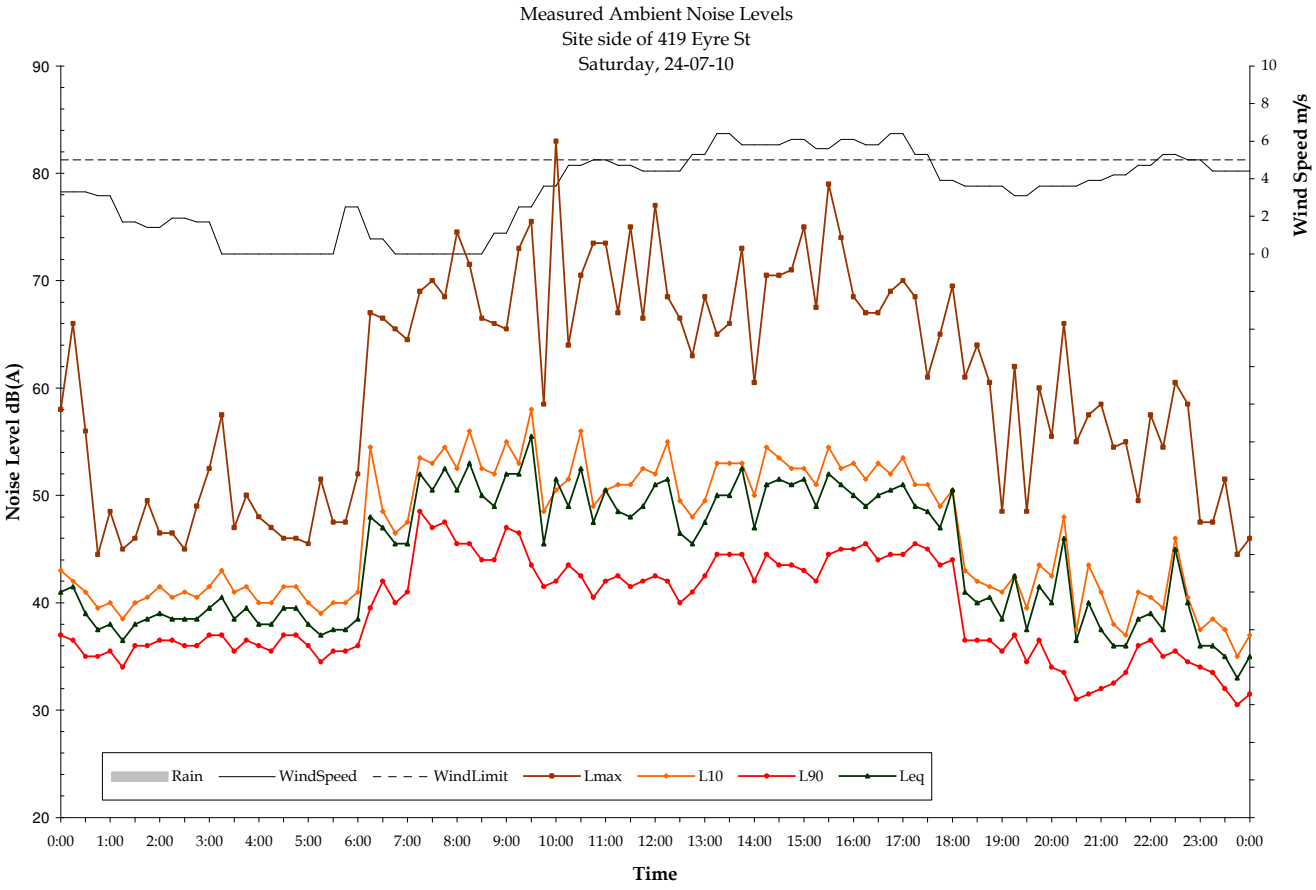
| **Date** | ABL Day | ABL Evening | ABL Night | Leq 11hr Day | Leq 4hr Evening | Leq 9hr Night |
|---|---|---|---|---|---|---|
| Wednesday, 21-07-10 | 0 | 37 | 33 | 0 | 44 | 40 |
| Thursday, 22-07-10 | 47 | 37 | 37 | 55 | 43 | 44 |
| Friday, 23-07-10 | 0 | 37 | 35 | 0 | 43 | 41 |
| Saturday, 24-07-10 | 0 | 32 | 27 | 0 | 40 | 41 |
| Sunday, 25-07-10 | 43 | 33 | 31 | 51 | 39 | 40 |
| Monday, 26-07-10 | 0 | 0 | 30 | 0 | 0 | 39 |
| Tuesday, 27-07-10 | 49 | 39 | 34 | 58 | 43 | 41 |
| Wednesday, 28-07-10 | 41 | 34 | 0 | 52 | 41 | 0 |
| Thursday, 29-07-10 | 40 | 33 | 30 | 50 | 39 | 37 |
| Friday, 30-07-10 | 0 | 30 | 26 | 0 | 38 | 36 |
| Saturday, 31-07-10 | 0 | 31 | 0 | 0 | 39 | 0 |
| Sunday, 01-08-10 | 0 | 35 | 0 | 0 | 42 | 0 |
| Monday, 02-08-10 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tuesday, 03-08-10 | 0 | 33 | 28 | 0 | 41 | 37 |
| Wednesday, 04-08-10 | 0 | 31 | 0 | 0 | 41 | 0 |
| Thursday, 05-08-10 | 0 | 29 | 27 | 0 | 36 | 34 |
| Friday, 06-08-10 | 39 | 31 | 27 | 51 | 41 | 34 |
| Saturday, 07-08-10 | 41 | 33 | 29 | 51 | 38 | 35 |
| Sunday, 08-08-10 | 39 | 32 | 0 | 53 | 39 | 0 |
| Monday, 09-08-10 | 0 | 0 | 27 | 0 | 0 | 35 |
| Tuesday, 10-08-10 | 0 | 32 | 0 | 0 | 40 | 0 |
| **Summary Values** | | | | | | |
| **RBLs** | **41** | **33** | **29** | | | |
| **Average Leq** | | | | **54** | **41** | **39** |

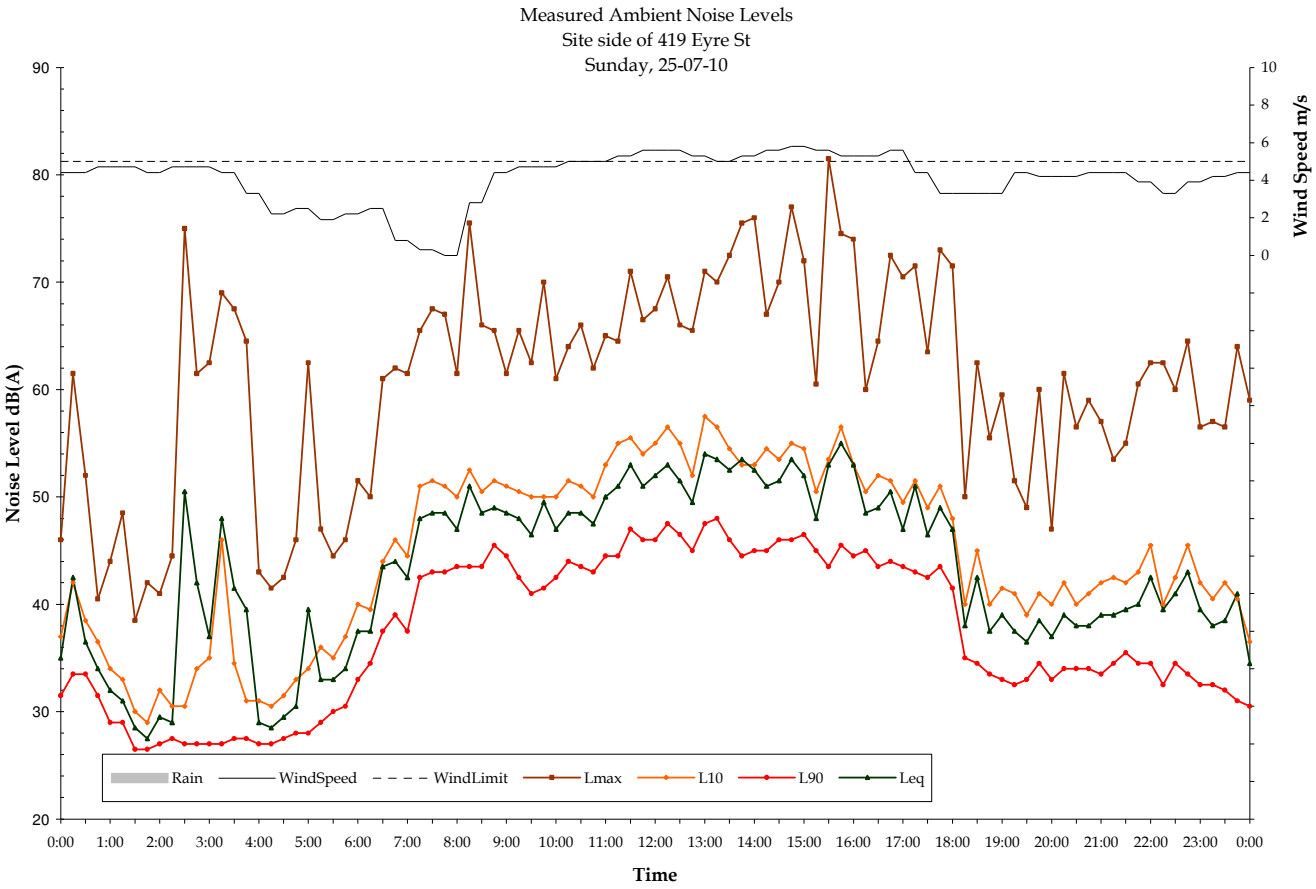
Notes:
0 indicates periods with too few valid samples due to weather or logger operation
Leq24hr encompasses the period 7am to 7am

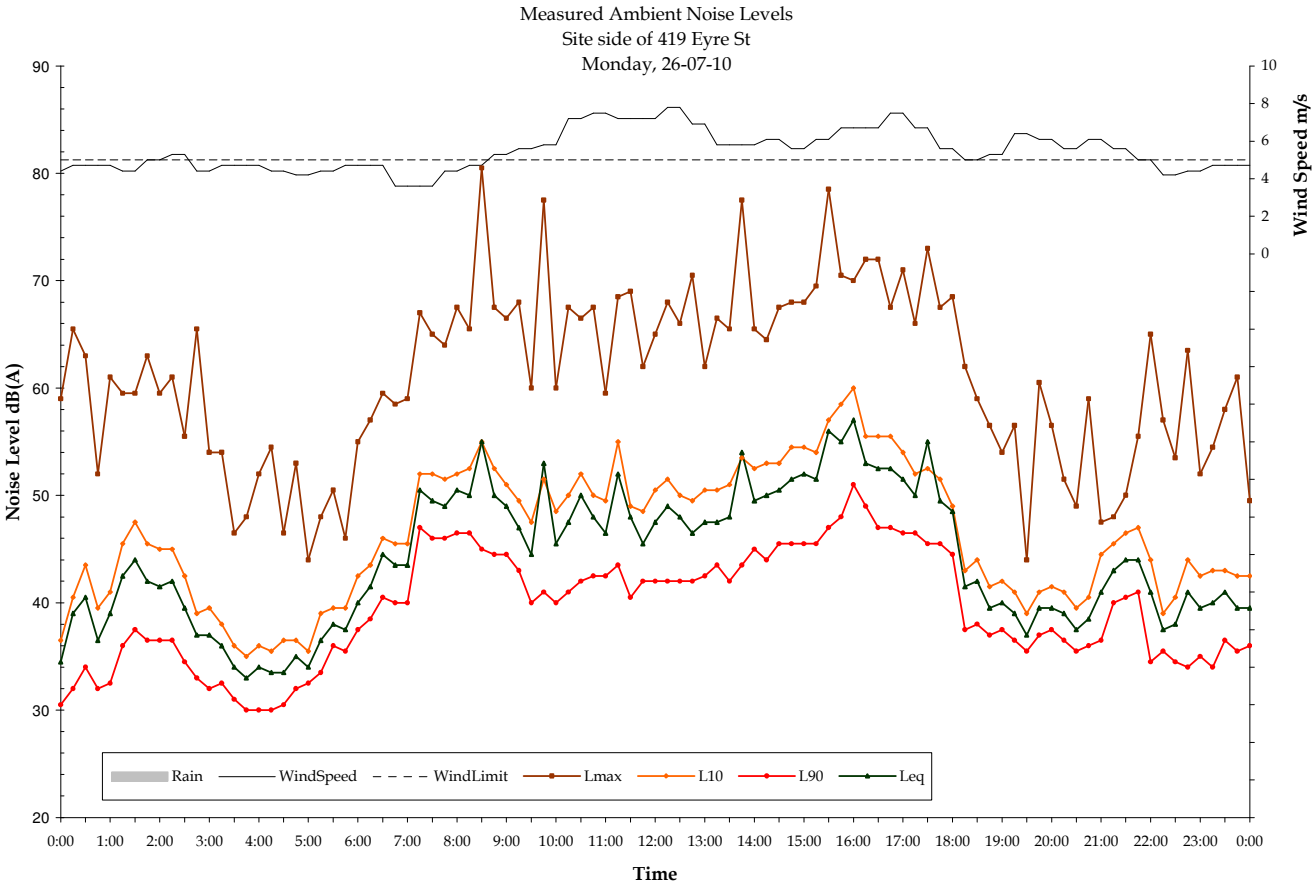

Measured Ambient Noise Levels
Site side of 419 Eyre St
Wednesday, 21-07-10
Noise Level dB(A)
Wind Speed m/s
30/03/1900
20/03/1900
10/03/1900
29/02/1900
19/02/1900
9/02/1900
30/01/1900
20/01/1900
10
8
6
4
2
0
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time

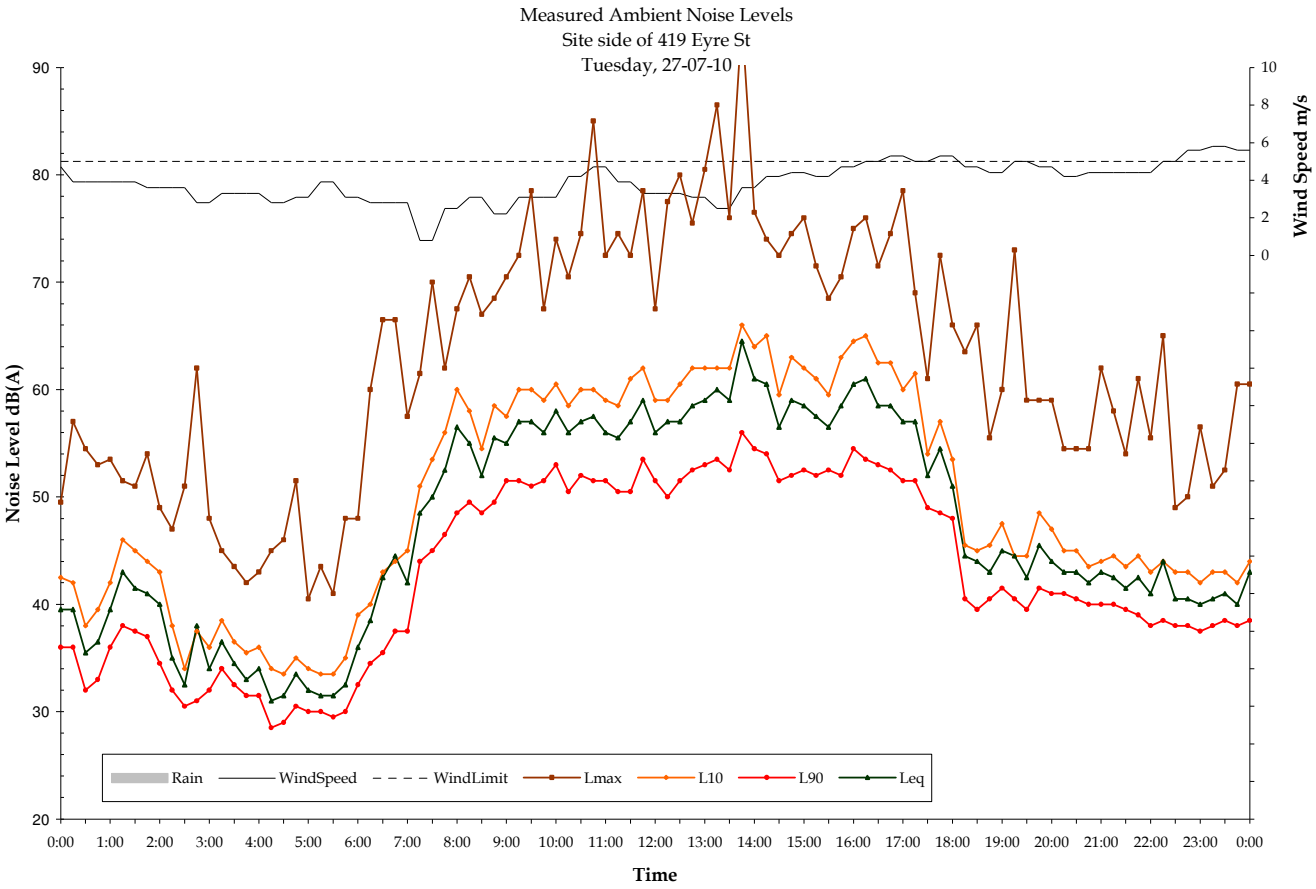

Measured Ambient Noise Levels
Site side of 419 Eyre St
Thursday, 22-07-10
Noise Level dB(A)
Wind Speed m/s
90
80
70
60
50
40
30
20
10
8
6
4
2
0
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time

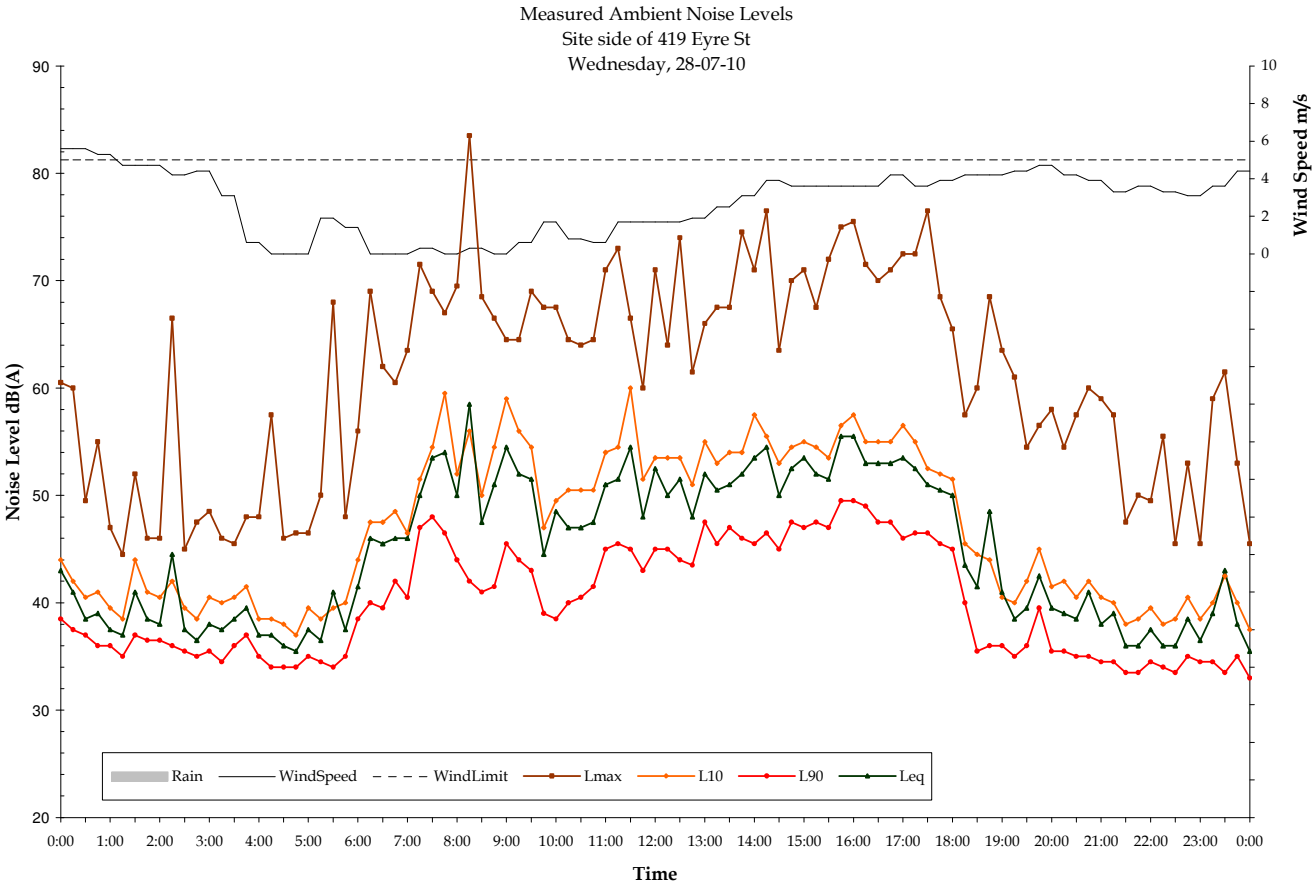

Measured Ambient Noise Levels
Site side of 419 Eyre St
Friday, 23-07-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq

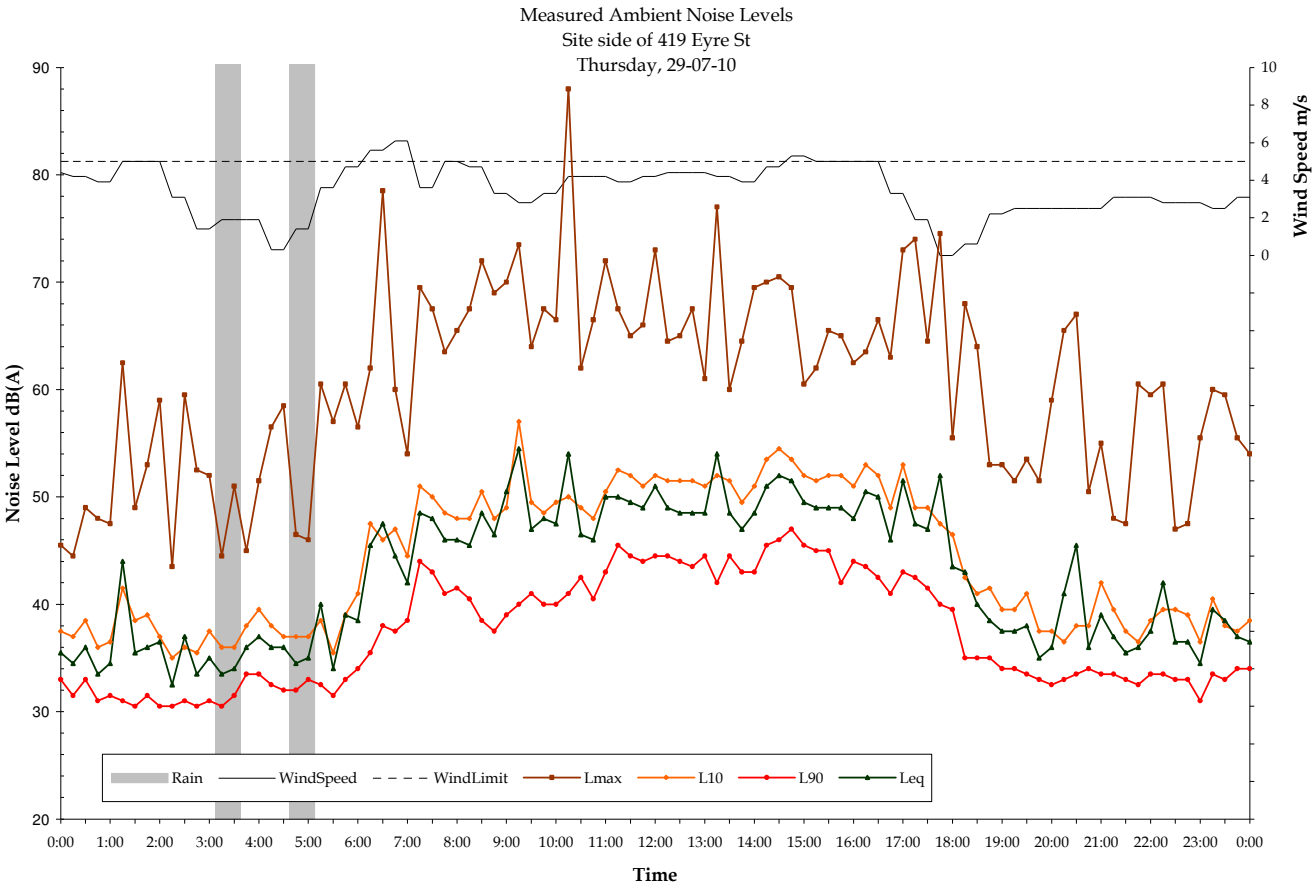

Measured Ambient Noise Levels
Site side of 419 Eyre St
Saturday, 24-07-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq

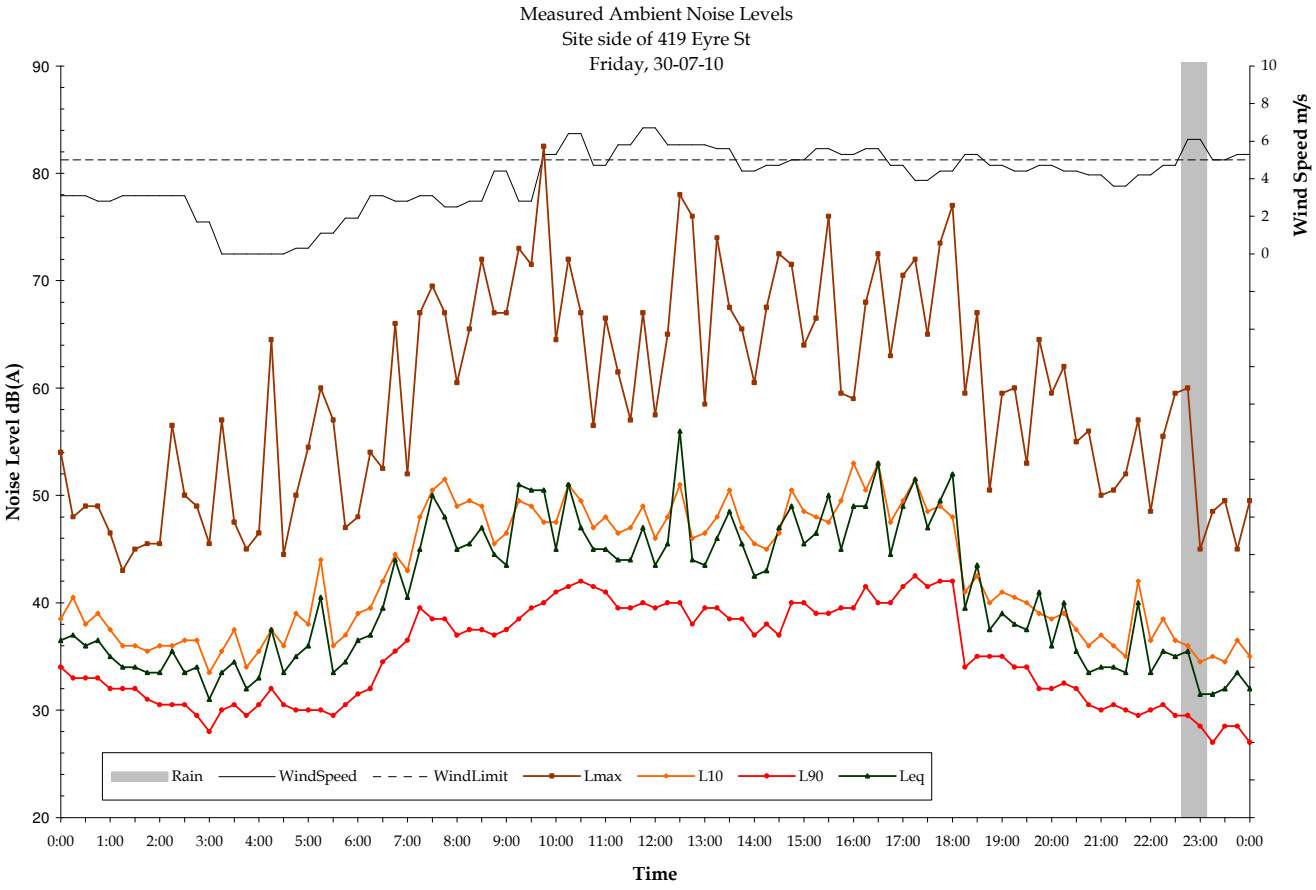

Measured Ambient Noise Levels
Site side of 419 Eyre St
Sunday, 25-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

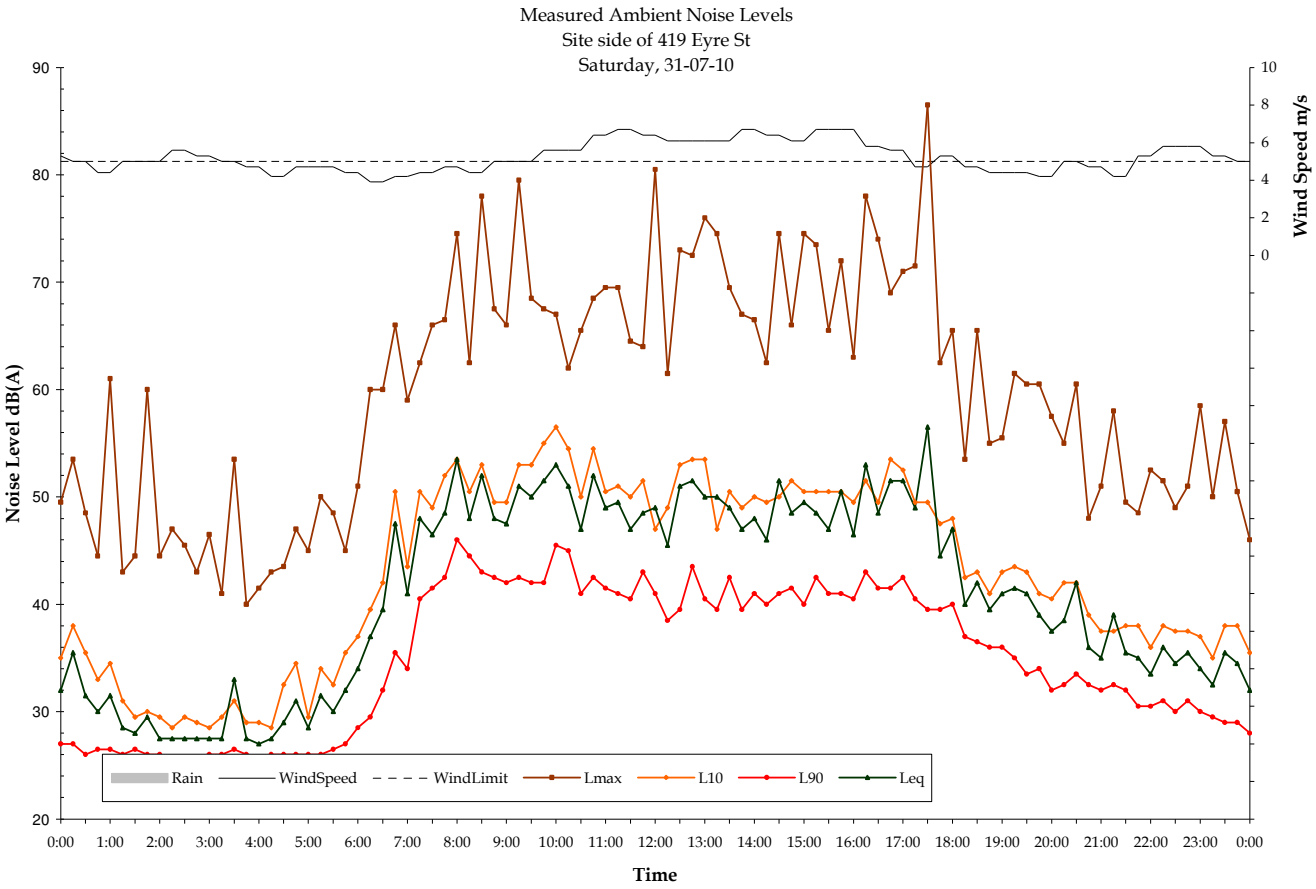

Measured Ambient Noise Levels
Site side of 419 Eyre St
Monday, 26-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

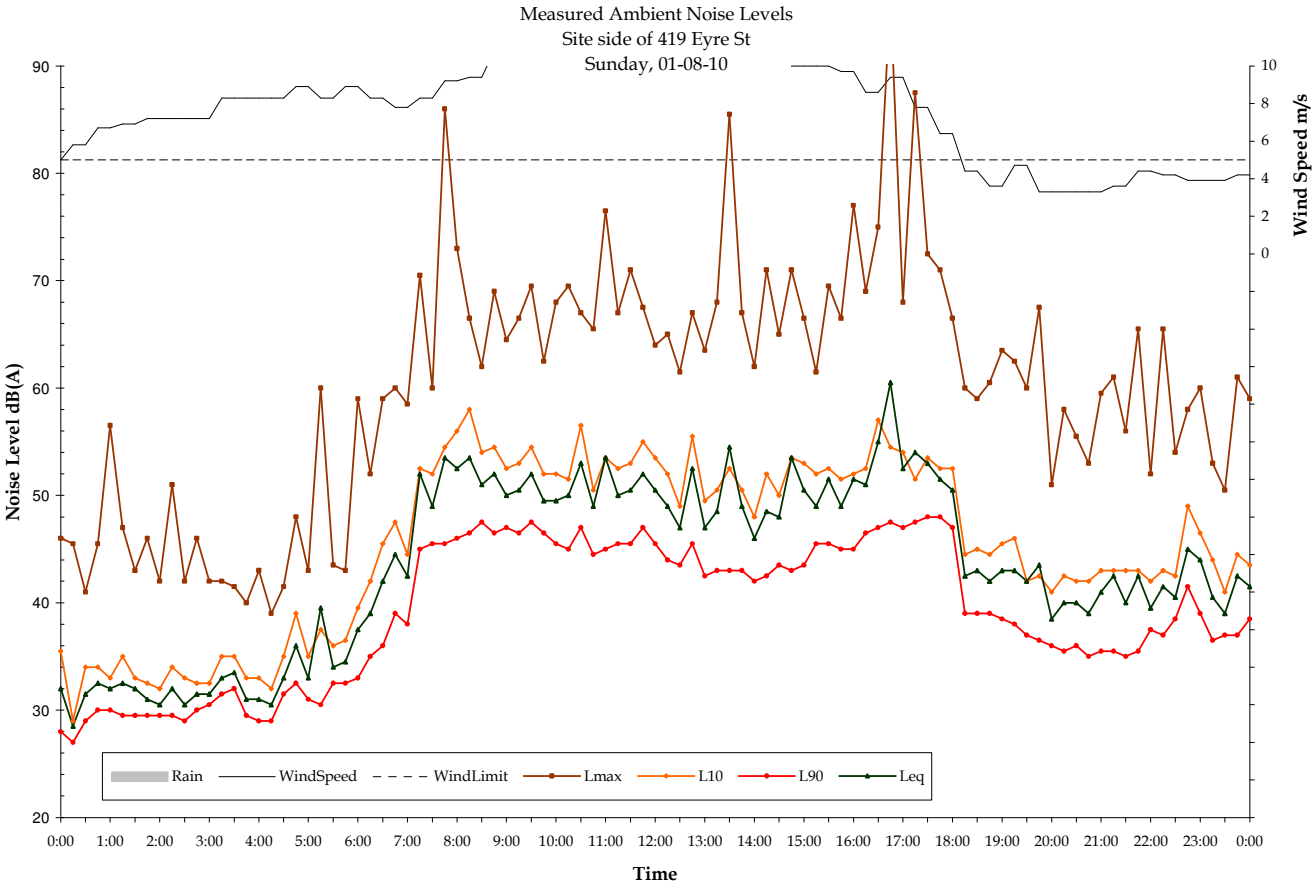

Measured Ambient Noise Levels
Site side of 419 Eyre St
Tuesday, 27-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

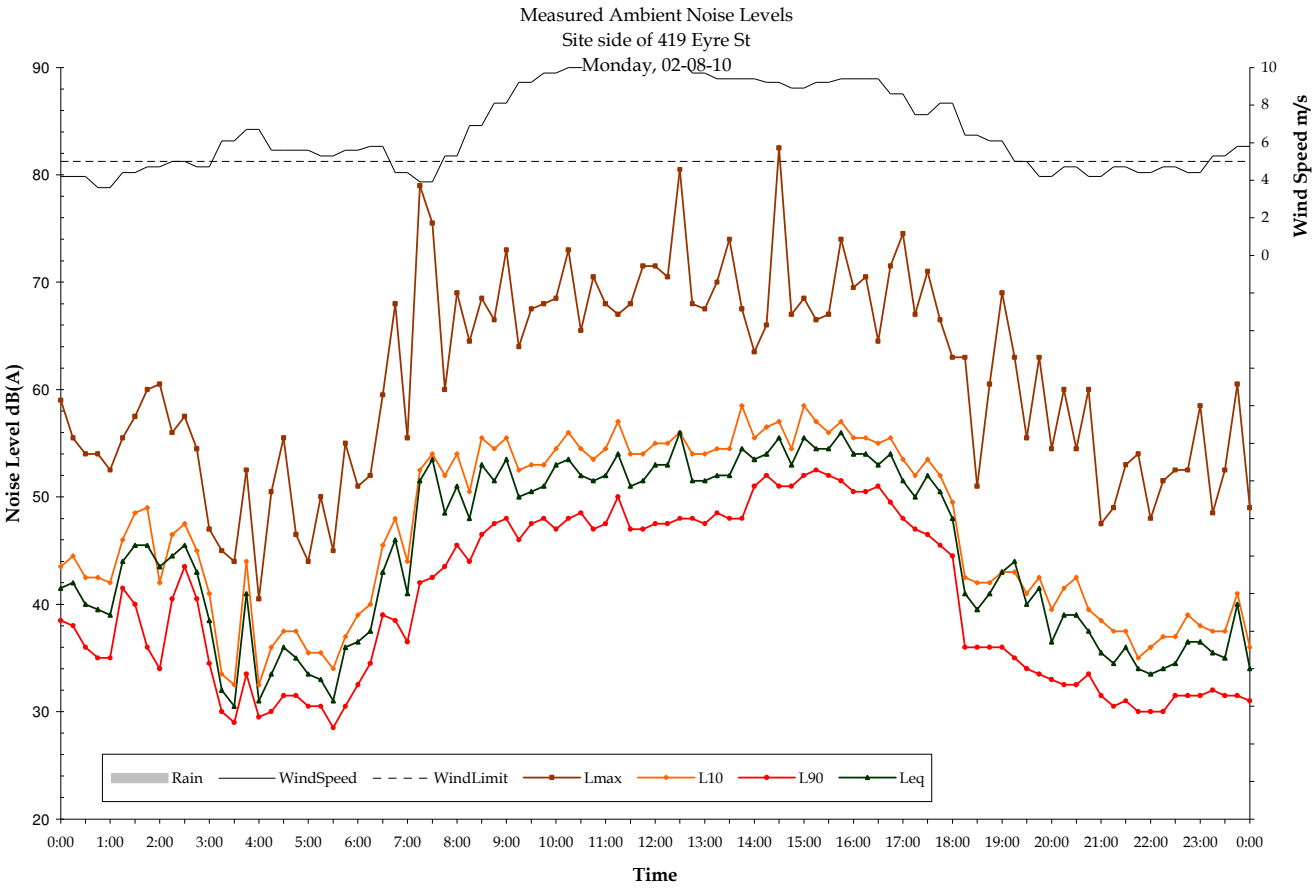

Measured Ambient Noise Levels
Site side of 419 Eyre St
Wednesday, 28-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

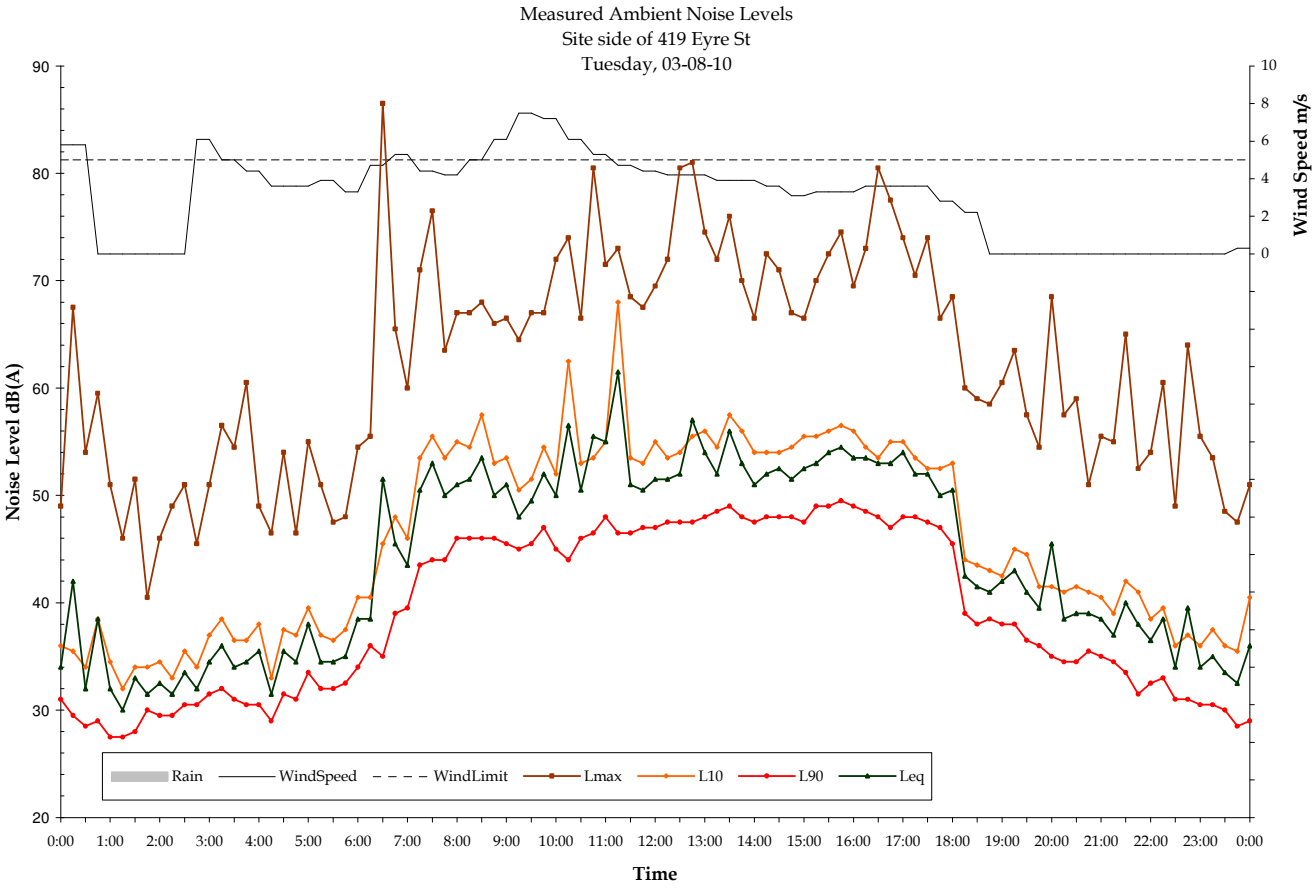

Measured Ambient Noise Levels
Site side of 419 Eyre St
Thursday, 29-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

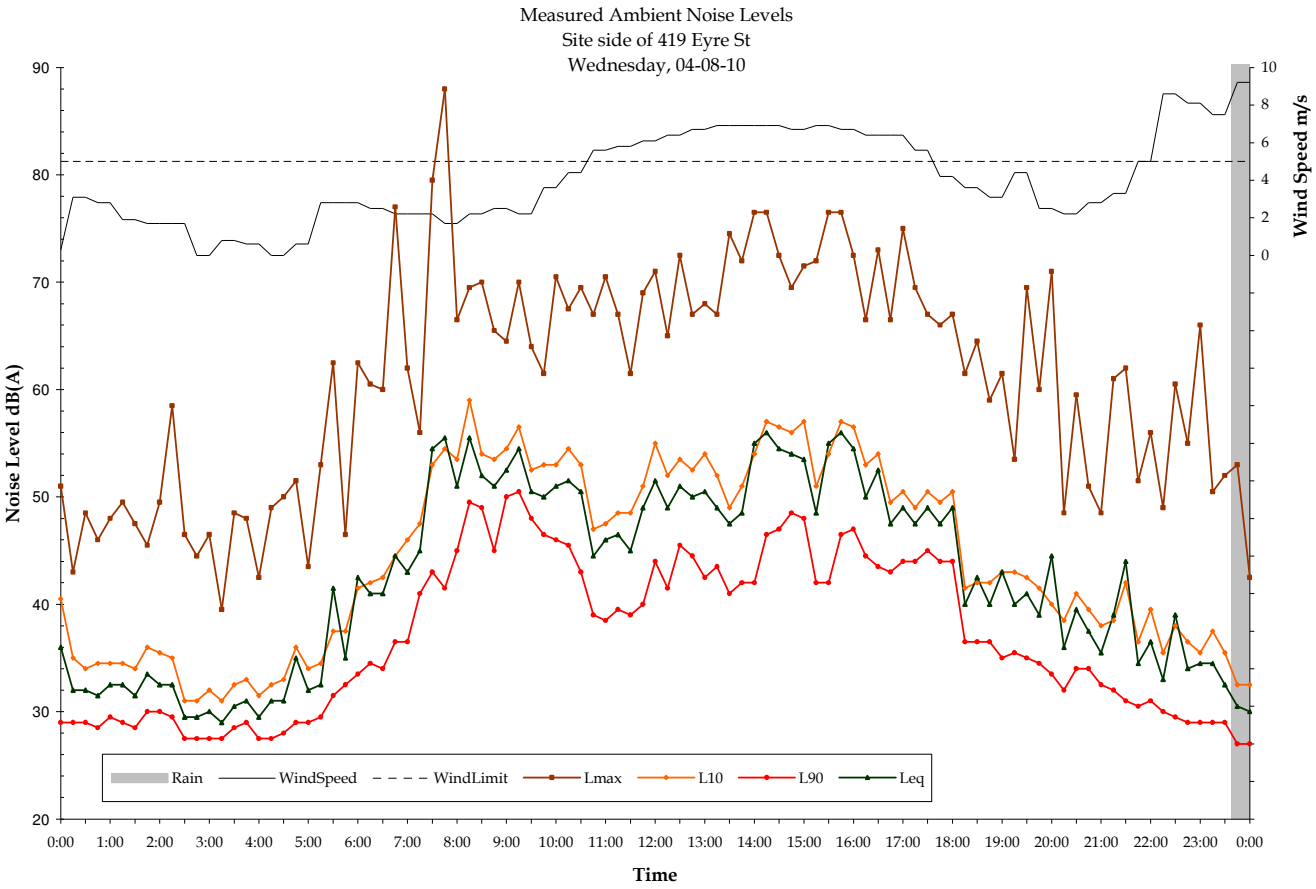

Measured Ambient Noise Levels
Site side of 419 Eyre St
Friday, 30-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

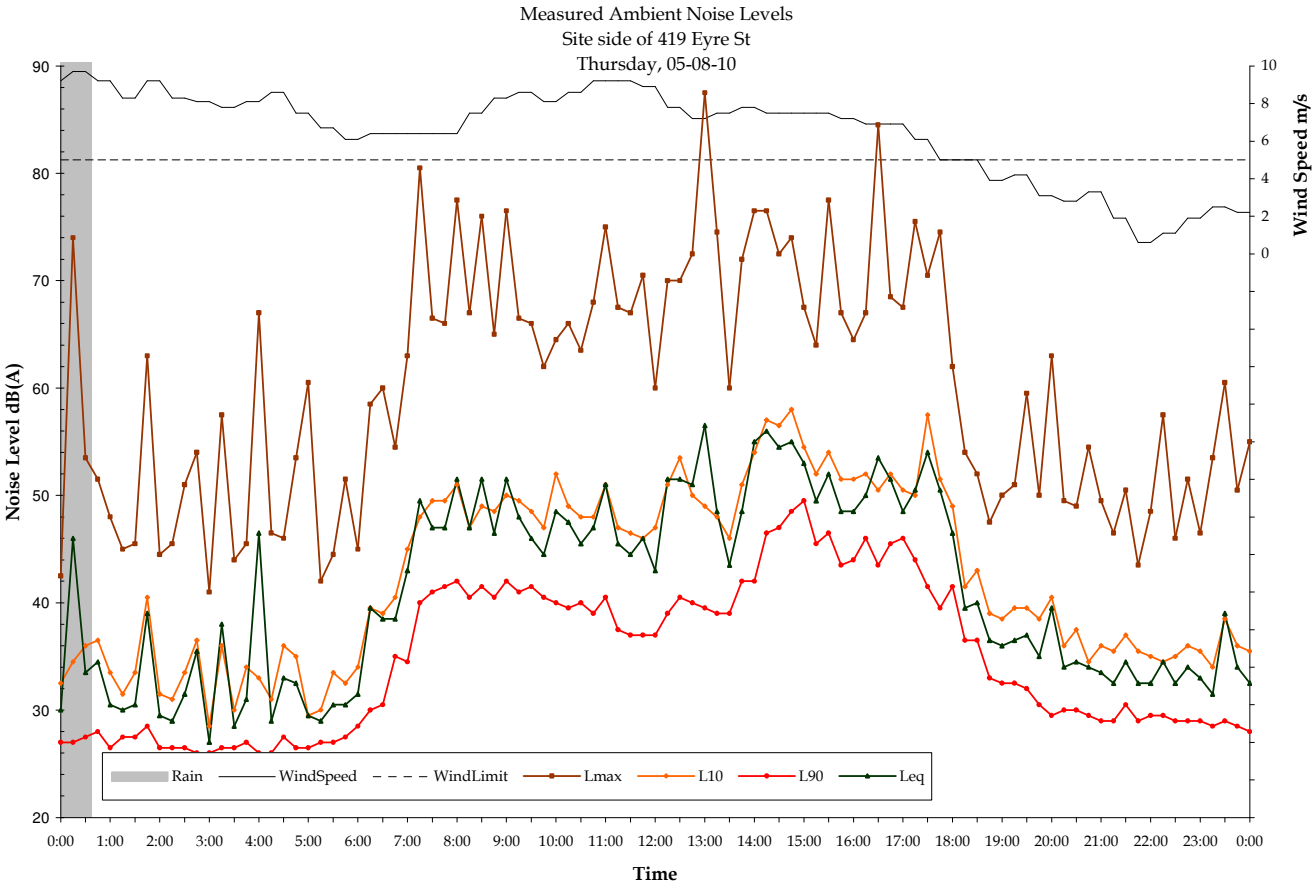

Measured Ambient Noise Levels
Site side of 419 Eyre St
Saturday, 31-07-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

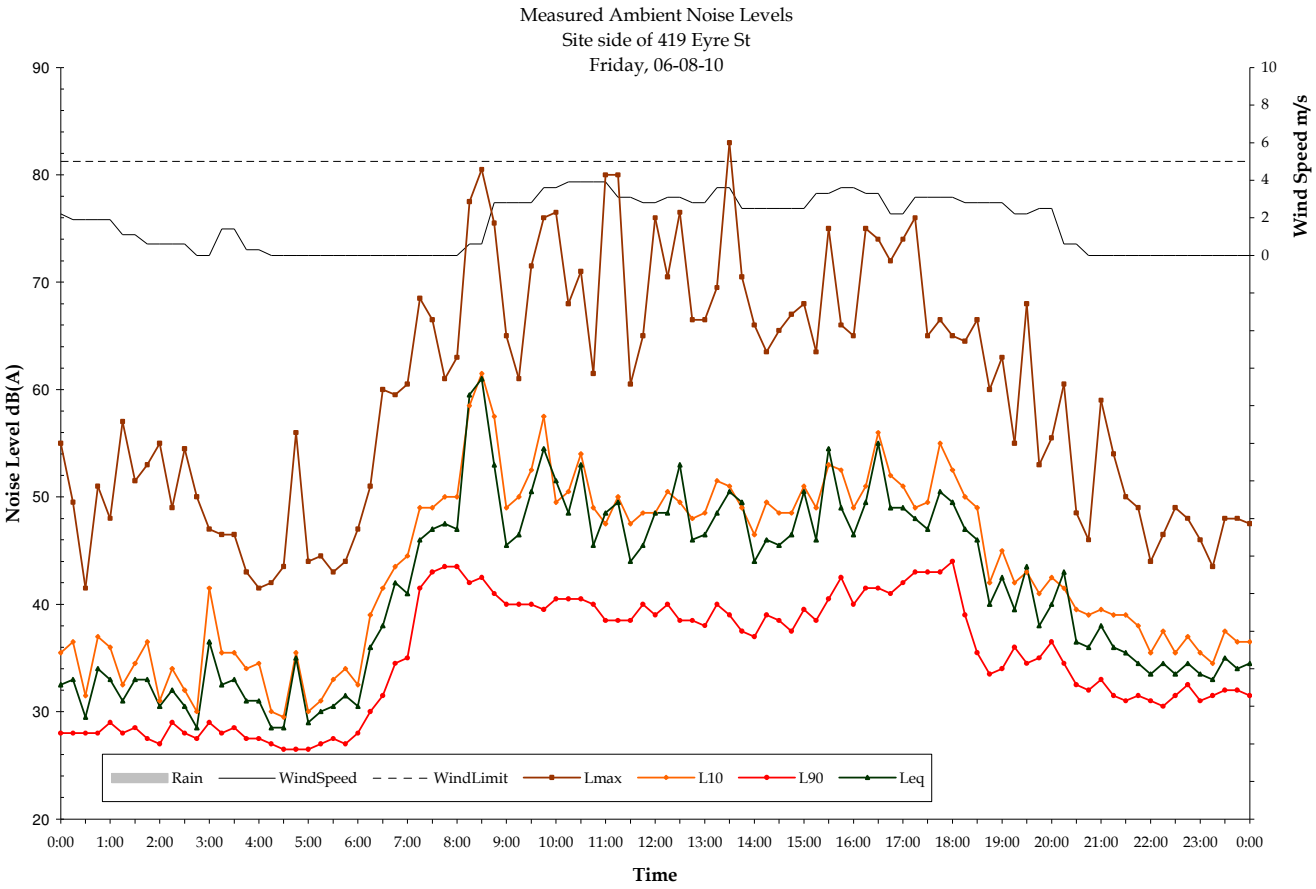

Measured Ambient Noise Levels
Site side of 419 Eyre St
Sunday, 01-08-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time

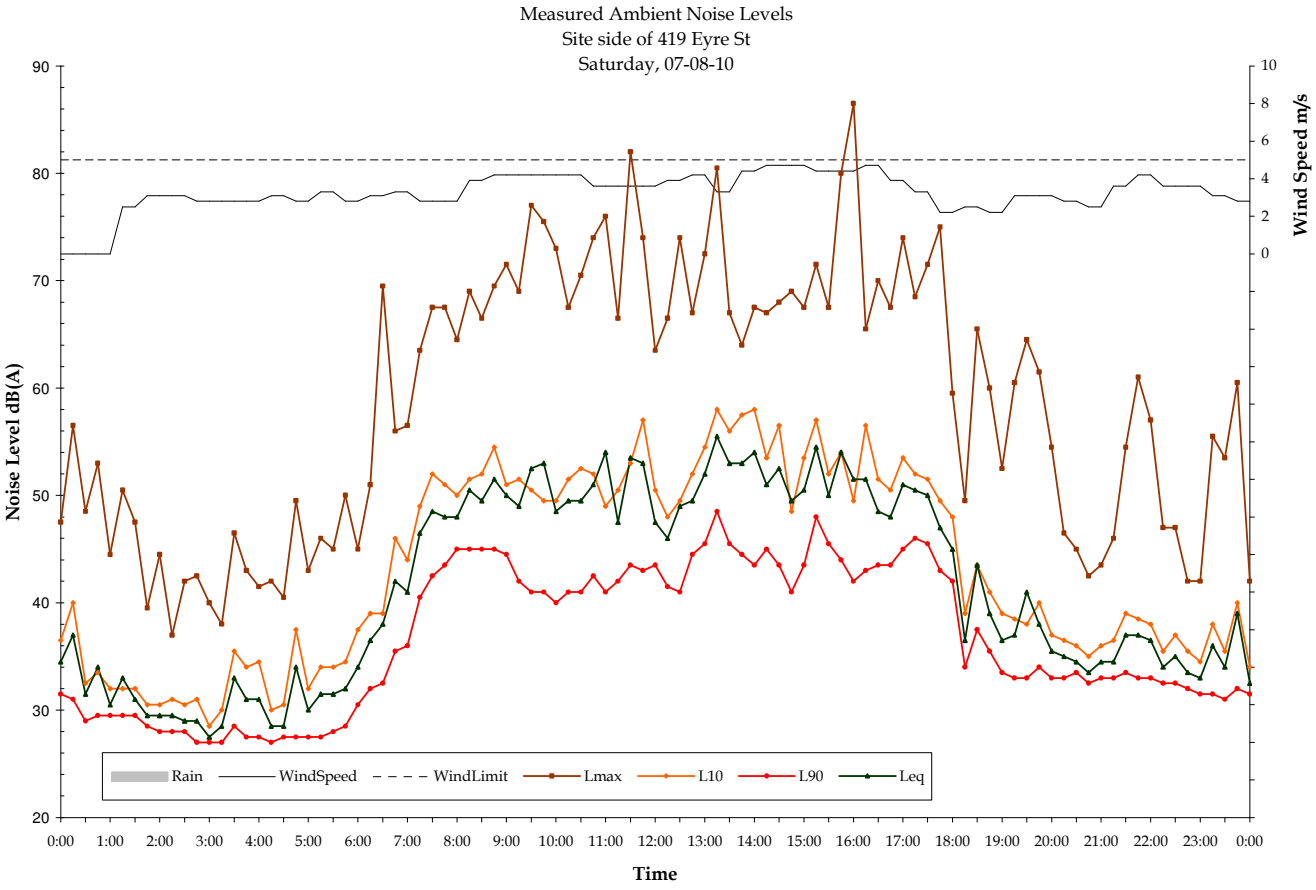

Measured Ambient Noise Levels
Site side of 419 Eyre St
Monday, 02-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq

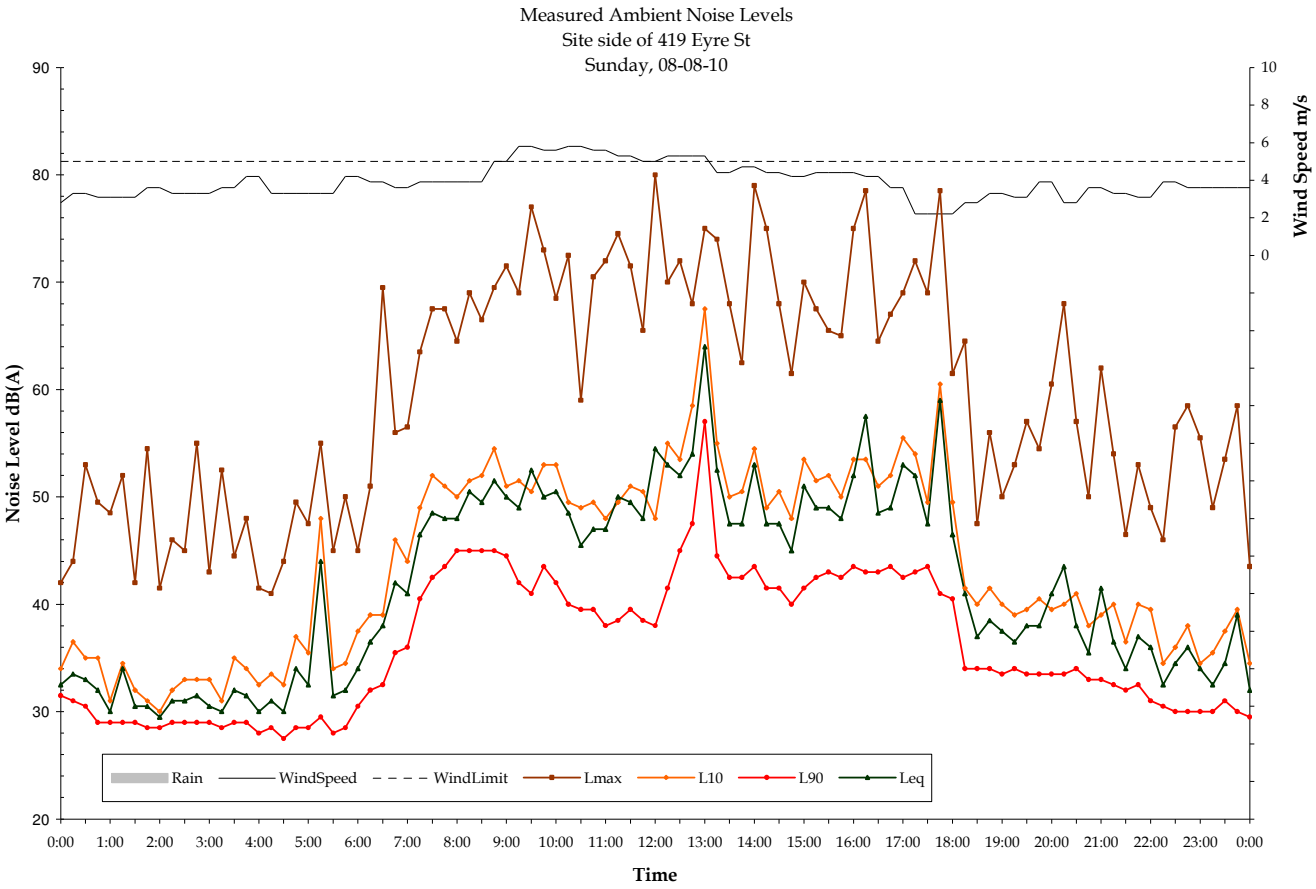

Measured Ambient Noise Levels
Site side of 419 Eyre St
Tuesday, 03-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq

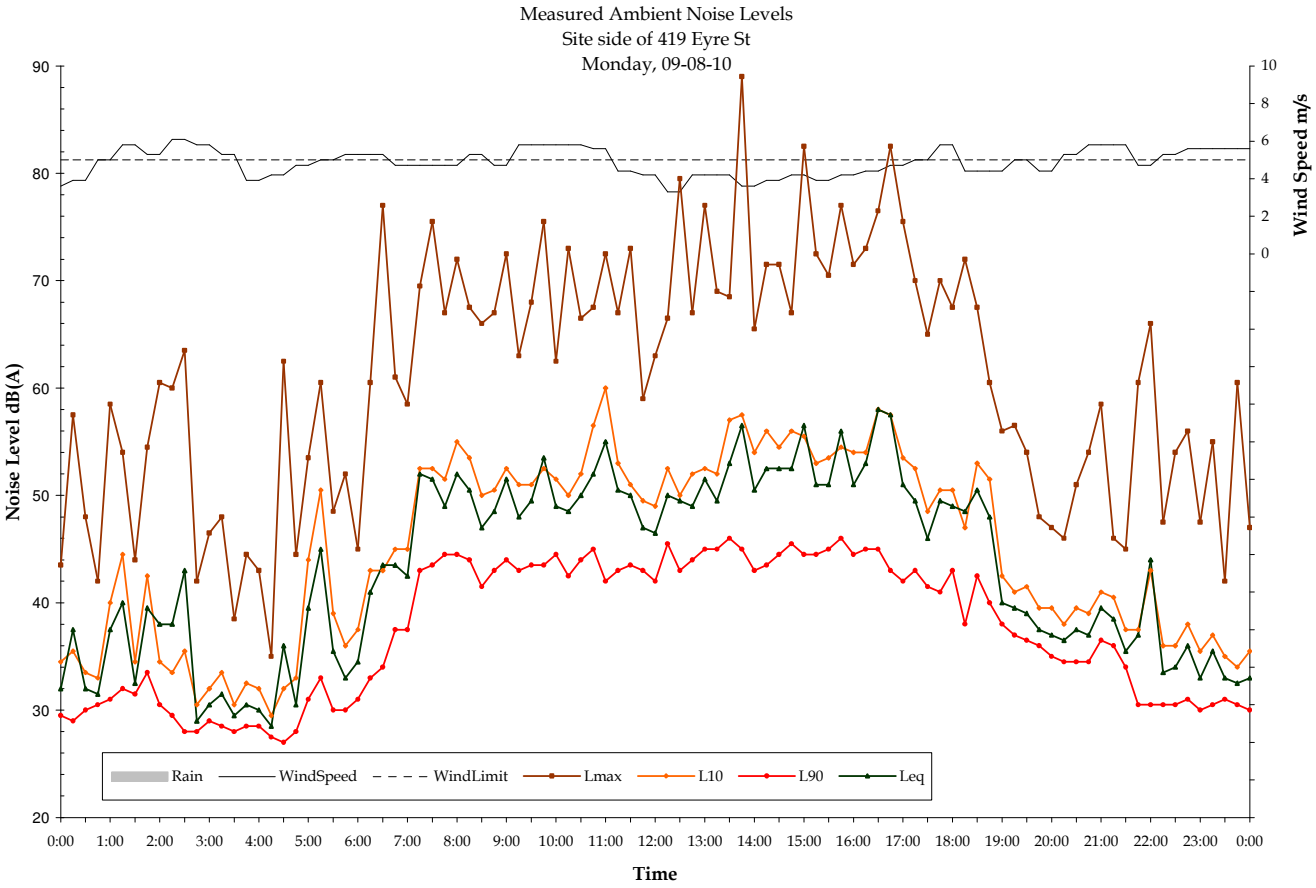

Measured Ambient Noise Levels
Site side of 419 Eyre St
Wednesday, 04-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq

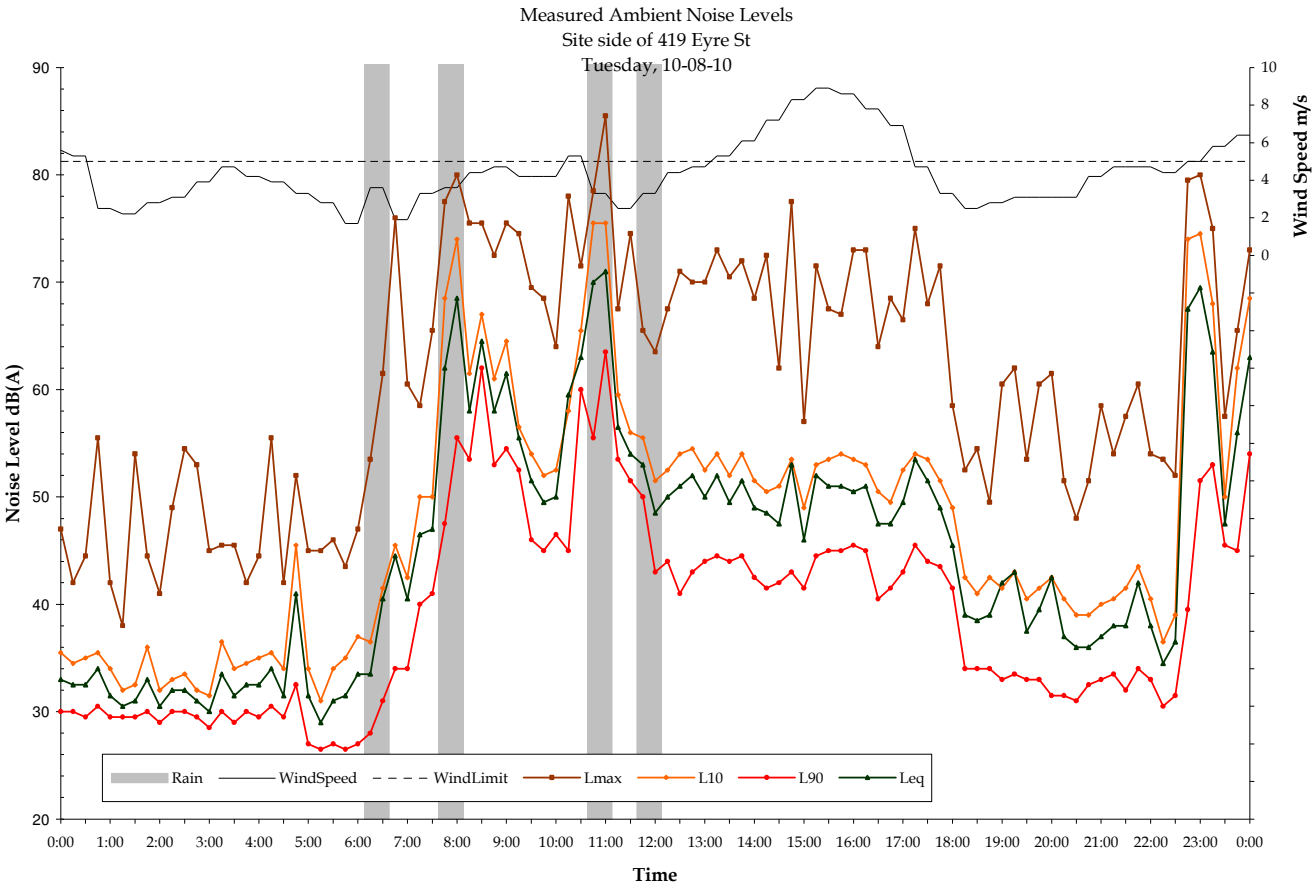

Measured Ambient Noise Levels
Site side of 419 Eyre St
Thursday, 05-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq


Measured Ambient Noise Levels
Site side of 419 Eyre St
Friday, 06-08-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time


Measured Ambient Noise Levels
Site side of 419 Eyre St
Saturday, 07-08-10
Noise Level dB(A)
Wind Speed m/s
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
Time


Measured Ambient Noise Levels
Site side of 419 Eyre St
Sunday, 08-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq


Measured Ambient Noise Levels
Site side of 419 Eyre St
Monday, 09-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq


Measured Ambient Noise Levels
Site side of 419 Eyre St
Tuesday, 10-08-10
Noise Level dB(A)
Wind Speed m/s
Time
Rain
WindSpeed
WindLimit
Lmax
L10
L90
Leq
90
80
70
60
50
40
30
20
10
8
6
4
2
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
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15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00

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